

GENERAL INFORMATION

N21BABE

Safety goggles should be worn at all times when working on these transmissions.

Model KM148 automatic transmission combine a torque converter and fully automatic 4-speed transmission.

The transmission control lever and transfer control lever are located on the floor.

The overdrive switch is provided on the selector handle part of the transmission control lever.

When the vehicle is driven in the "D" range while the overdrive switch is ON (the switch is unpressed), shifting within the range from 1st gear to 4th gear is automatic; when the overdrive switch is OFF (the switch is pressed) and the vehicle is driven in the "D" range, shifting within the range from 1st gear to 3rd gear is automatic.

The transfer control lever can be used to select either rear-wheel drive or four-wheel drive, in order to thereby obtain the most appropriate drive power according to the road surface conditions.

In addition, four-wheel drive has both the HIGH range and the LOW range.

The torque converter, transmission area and transfer area are housed in an integral aluminum die casting.

The transmission oil sump and the transfer oil sump of model KM148-4WD transmission are separated.

Accordingly, the filling of oil is necessary to perform separately to the transmission and to the transfer.

The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in bottom of the radiator. The torque converter assembly is a sealed unit that cannot be disassembled.

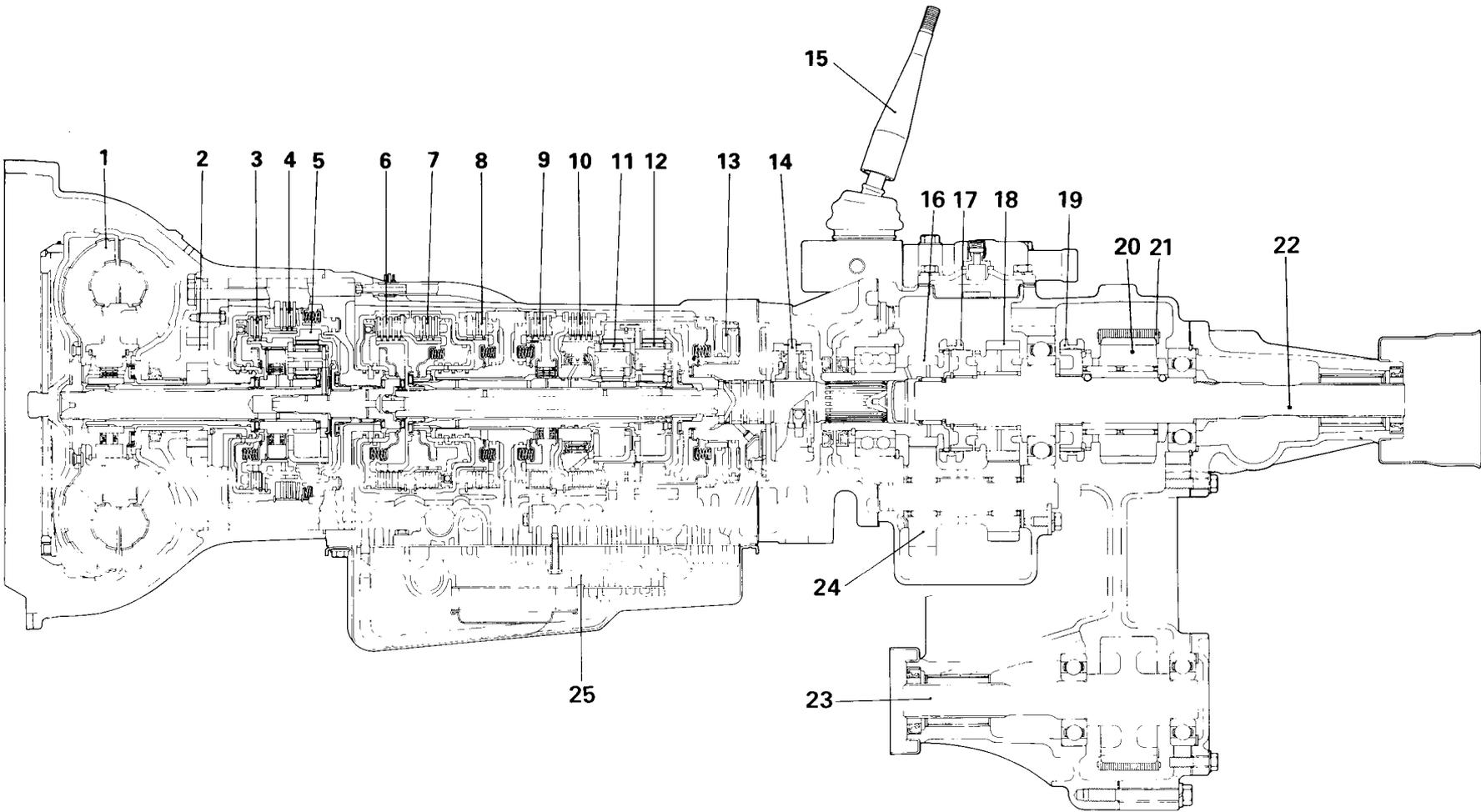
The transmission fluid is filtered by an interval filter attached to the lower side of the valve body assembly.

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple-disc clutches in the transmission. The power flow depends on the application of the clutches and brakes. Refer to "TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER " chart in this section.

The transmission consists of three multiple-disc clutches, three one-way clutches, four multiple-disc brakes, and two planetary gear sets to provide four forward ratios and a reverse ratio.

The hydraulic control circuits show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operation of transmission.

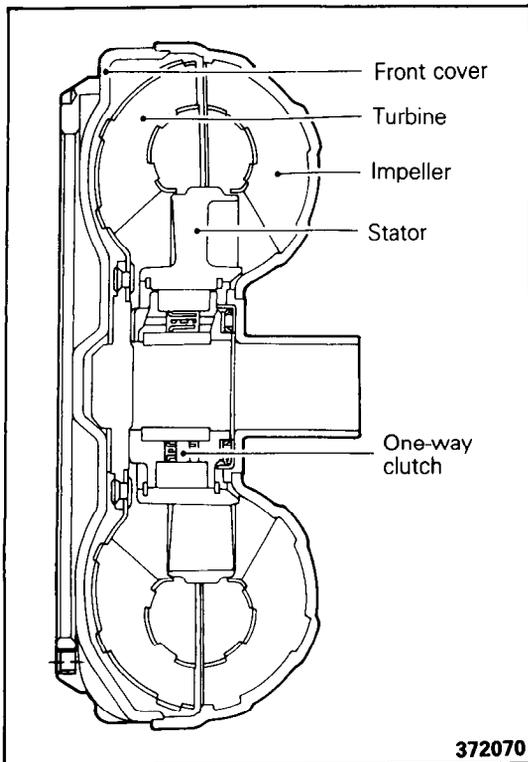
The transfer has a high/low selection and a 2WD/4WD selection. By operating the transfer control lever, the running at 2WD high (2H), 4WD high (4H) or 4WD low (4L) can be selected freely.



- 1. Torque converter
- 2. Oil pump
- 3. Over drive clutch
- 4. Over drive brake
- 5. Over drive planetary gear
- 6. Forward clutch
- 7. Direct clutch
- 8. Brake No.1
- 9. Brake No.2

- 10. Brake No.3
- 11. Front planetary gear
- 12. Rear planetary gear
- 13. Brake No.3 piston
- 14. Governor
- 15. Transfer control lever
- 16. Input gear
- 17. High-low clutch
- 18. Low speed gear

- 19. 2WD-4WD clutch
- 20. Drive sprocket
- 21. Chain
- 22. Rear output shaft
- 23. Front output shaft
- 24. Counter gear
- 25. Valve body



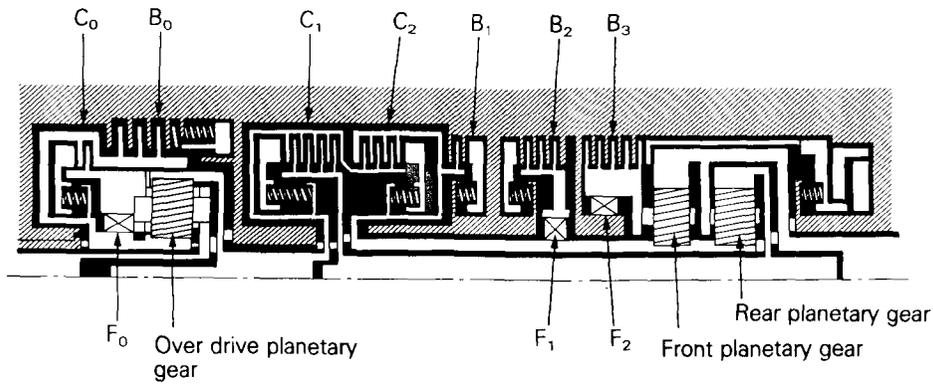
TORQUE CONVERTER

The torque converter consists of an impeller (rear cover), turbine, stator, one-way clutch, front cover, and other parts. It is a non-maintainable assembly with a sealed construction, in which outer surfaces of shell (front and rear covers) are welded together. Since the torque converter is connected to the engine crankshaft via the drive plate, the shell (front cover and impeller) always rotates together with the engine. This means that the transmission oil pump is also driven at the same speed as the engine by the hub welded at the center of the shell's rear part. The boss provided in the front part of the shell is fitted into the hole located at the rear end of the crankshaft to support the torque converter.

TRANSMISSION POWER TRAIN

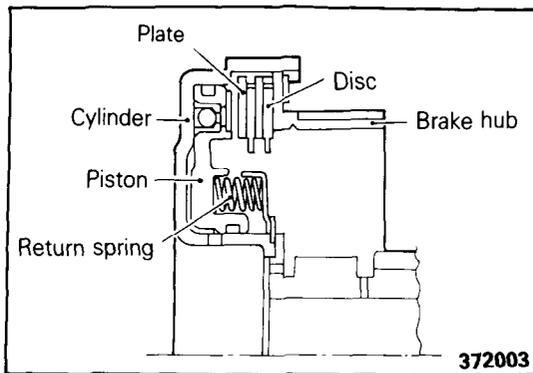
The transmission power train consists of three sets of multiple disc clutches, four sets of multiple disc brakes, three sets of one-way clutches, and a single-row and a double-row Simpson planetary gear set. The three sets of clutches are an element that controls the input to the planetary gear set, while the four sets of brakes and three sets of one-way clutches act to hold some of the elements of the planetary gear set stationary or prevent them from turning. An appropriate gear ratio for each driving condition can thus be obtained through the operation of these elements which select the point from which the driving force is input and points to be held stationary in the planetary gear set.

The following Table "TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER" shows particular elements in action in different selector lever positions.

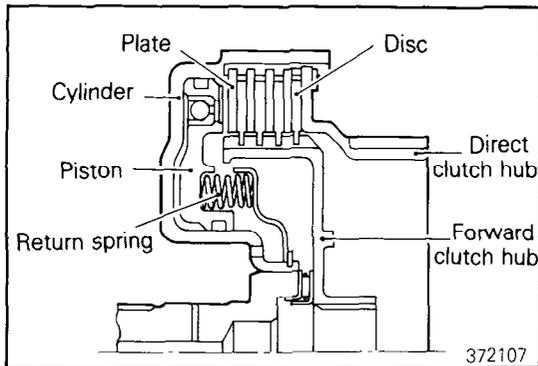


- C₀: Over drive clutch
- C₁: Forward clutch
- C₂: Direct clutch
- B₀: Over drive brake
- B₁: Brake No.1
- B₂: Brake No.2
- B₃: Brake No.3
- F₀: Over drive one-way clutch
- F₁: One-way clutch No.1
- F₂: One-way clutch No.2

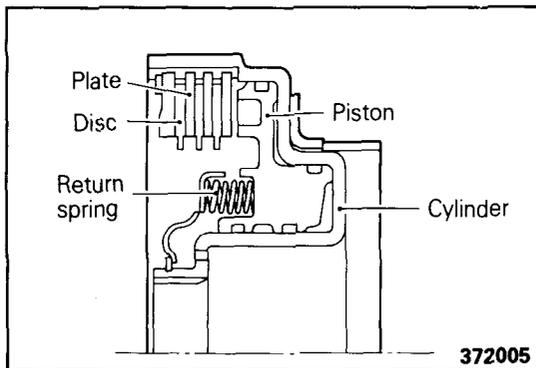
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**OVERDRIVE CLUTCH**

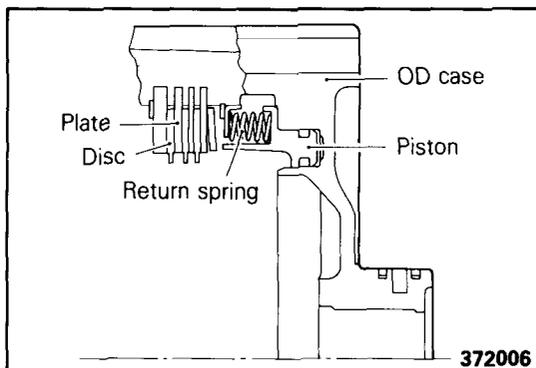
The overdrive clutch, of the multiple-disc type, is actuated when the shift is in a position other than the 4th speed or overdrive. It couples the sun gear to carrier of the overdrive on planetary gear set, thus imparting the input from the carrier to the forward clutch cylinder via the ring gear.

**FORWARD CLUTCH**

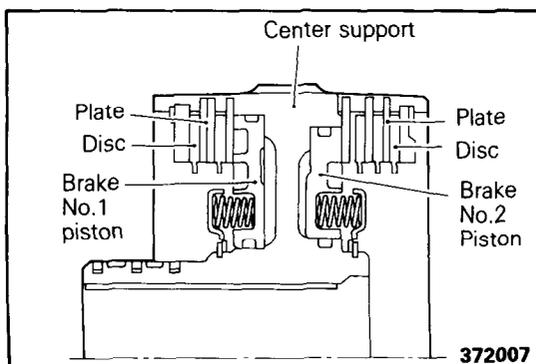
Of the multiple-disc type, the forward clutch is actuated whenever the vehicle is in the forward motion. It imparts the input to the ring gear of the rear planetary gear set via the intermediate shaft.

**DIRECT CLUTCH**

The multiple-disc direct clutch, actuated in the 3rd and 4th speeds and in reverse, transmits the input force to the sun gear, driving the pinions of the front planetary gear set.

**OVERDRIVE BRAKE**

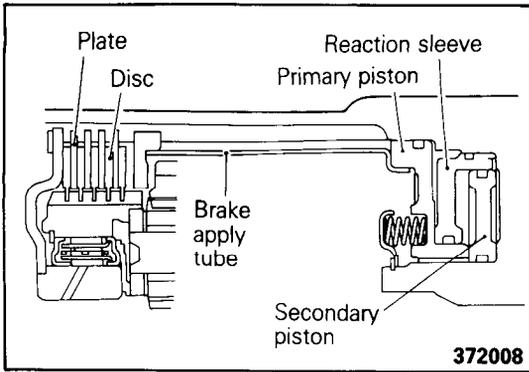
The overdrive (OD) brake, of the multiple-disc type, is installed in the OD case. Actuated in the 4th speed (overdrive), the brake holds the sun gear of the OD planetary gear set.

**BRAKE NO.1**

The brake No.1, actuated in the 2nd speed of the "2" range, holds the sun gear stationary.

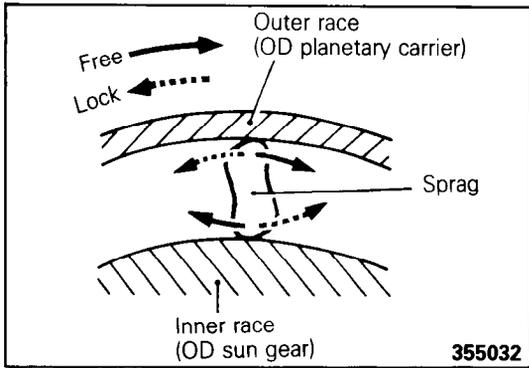
BRAKE NO.2

The brake No.2, actuated in the 2nd, 3rd, and 4th speeds of the "D" range and in the 2nd speed of the "2" range, holds the outer race of one-way clutch No.1 stationary, allowing the one-way clutch No.1 to act as an overrunning clutch.



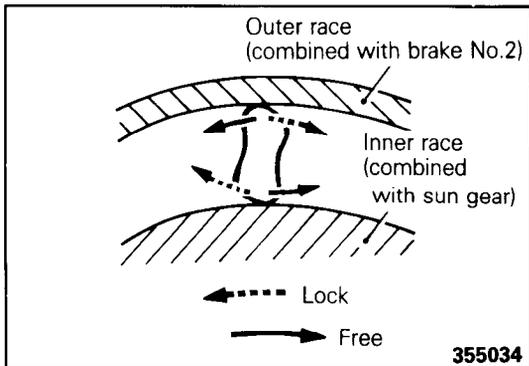
BRAKE NO.3

The brake No.3, operated in the "L" and "R" ranges, brakes the carrier of the front planetary gear set to a standstill.

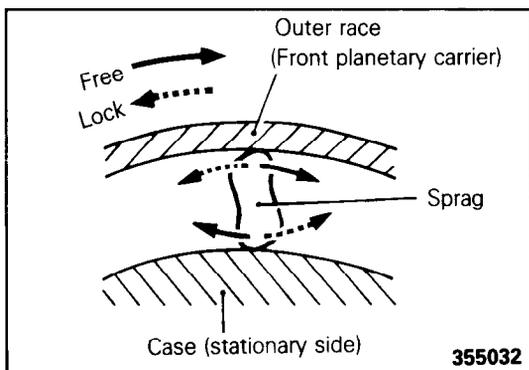


ONE-WAY CLUTCH

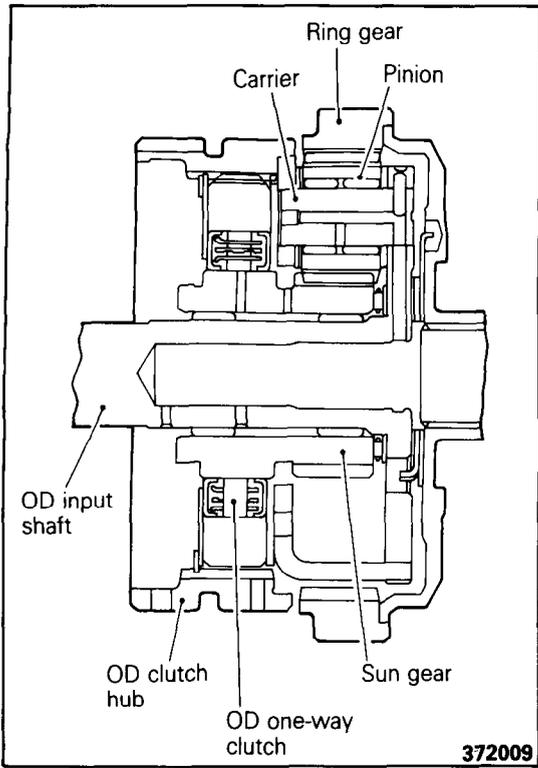
The three sets of one way clutches are of the sprag type. The overdrive (OD) one-way clutch is operated during gearshifting between 3rd and 4th (OD) speeds, ensuring smooth selection between the OD clutch and OD brake. It is in free state when the carrier of the OD planetary gear set rotates clockwise and locks when the sun gear turns clockwise.



The one-way clutch No.1 functions as an overrunning clutch only when the brake No.2 is actuated and prevents the sun gear from turning counterclockwise. This means that no engine braking is given in the 2nd speed of the "D" range. In the 2nd speed of the "2" range, however, engine braking is given since the brake No.1 holds the sun gear stationary.

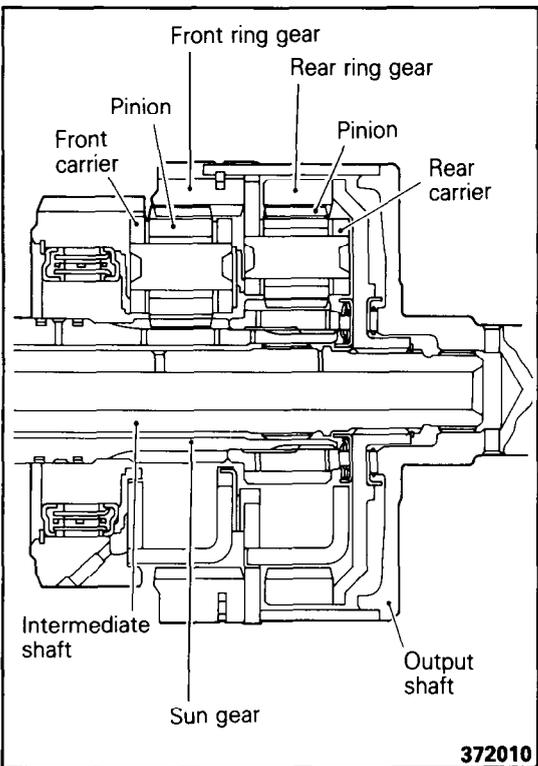


The one-way clutch No.2 prevents the front planetary carrier from turning counterclockwise, actuated in the 1st speed. So, no engine braking is given in the 1st speed of the "D" as well as "2" range. Engine braking is, however, given in the "L" range in which the carrier is held stationary by the brake No. 3.



OVERDRIVE PLANETARY GEAR

The planetary gear, of a single-row type, consists of the sun gear, pinion, carrier, and ring gear. The input from the OD input shaft is imparted to the carrier.



PLANETARY GEAR SET

This planetary gear set called the Simpson type is made up of two planetary gear sets, each consisting of pinions, carrier, and sun gear. The sun gear is connected to the direct clutch, front carrier to brake No.3, and the rear ring gear to forward clutch. The front ring gear and rear carrier are coupled to the output shaft.

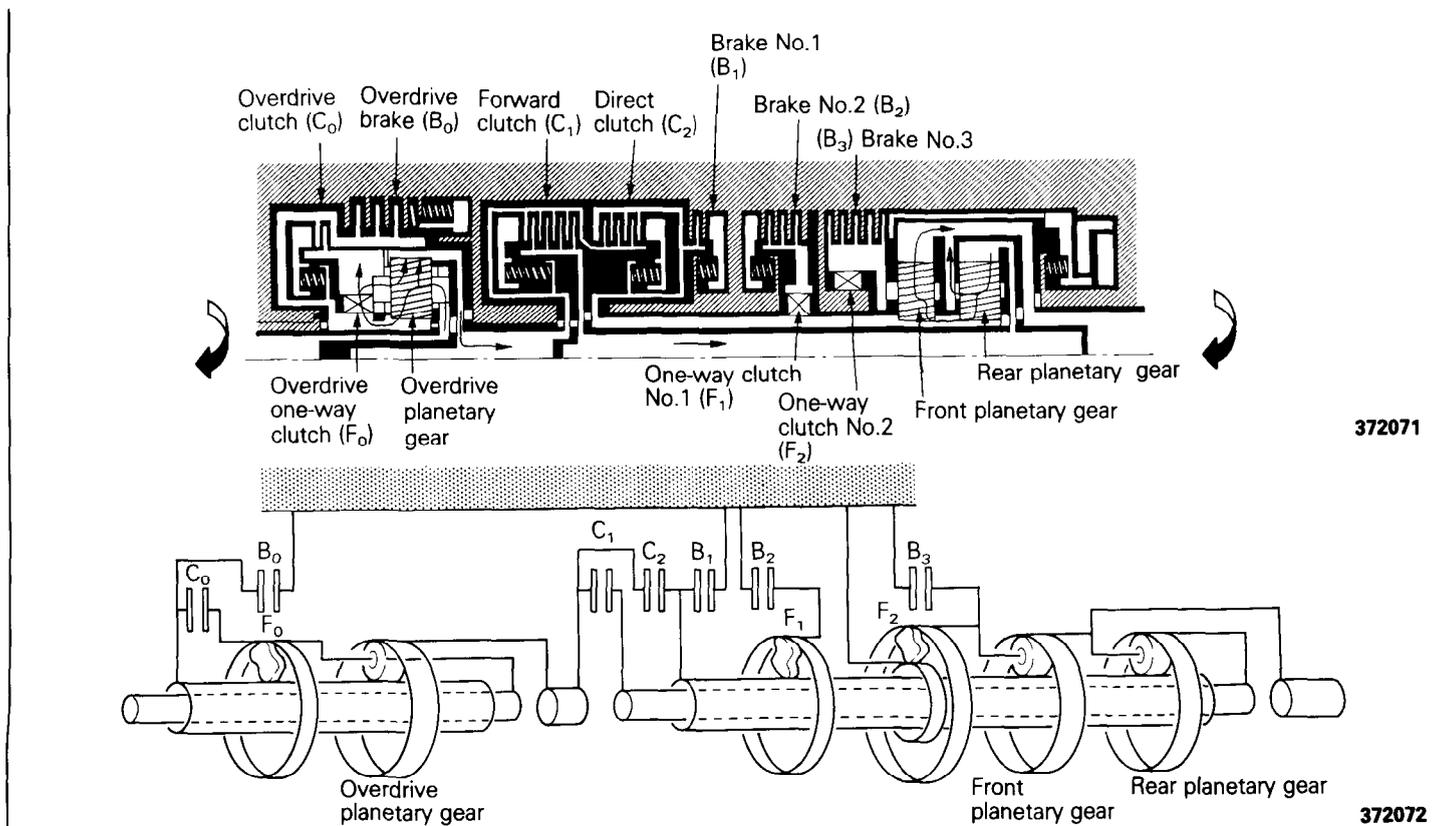
TABLE FOR OPERATION ELEMENTS AT EACH POSITION OF SELECTOR LEVER

REMARKS: IP=Inner Piston, OP=Outer Piston

Selector lever position	OD-OFF switch	Gear shift stage	Gear ratio	Engine start	Parking mechanism	Clutch				Brake					One-way clutch			
						C ₀	C ₁	C ₂		B ₀	B ₁	B ₂	B ₃		F ₀	F ₁	F ₂	
								IP	OP				IP	OP				
P	–	Neutral	–	OK	○	○												
R	–	Reverse	2.703	–		○		○	○				○	○	○			
N	–	Neutral	–	OK		○												
D	ON	1st	2.826	–		○	○								○			○
		2nd	1.493	–		○	○				○				○	○		
		3rd	1.000	–		○	○		○		○				○			
		4th	0.688	–			○		○	○		○						
D	OFF	1st	2.826	–		○	○								○			○
		2nd	1.493	–		○	○				○				○	○		
		3rd	1.000	–		○	○				○				○			
2	–	1st	2.826	–		○	○								○			○
		2nd	1.493	–		○	○			○	○				○	○		
L	–	1st	2.826	–		○	○							○	○	○		○

POWER FLOW

The following is the description of the element operation and the power transmission at each gear shift stage. As for the element operation at each gear shift stage, it is summarized on the above table.



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First in "D" range

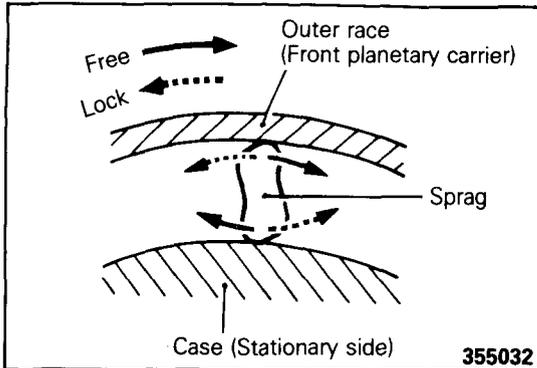
When the vehicle speed is relatively low with a greater throttle valve opening angle, which requires a greater acceleration, the OD clutch (C_0), OD one-way clutch (F_0), forward clutch (C_1), and one-way clutch No.2 (F_2) operate to shift gears into the 1st speed position, the output shaft turning clockwise at a gear ratio of 2.826.

In the forward (excluding 4th speed of "D" range) and reverse ranges, C_0 and F_0 are actuated to transmit the input to the forward clutch cylinder via the OD input shaft. As C_0 and F_0 are actuated, the OD planetary carrier and sun gear are locked together to rotate bodily. This causes the turning force of the OD input shaft to be transmitted to the planetary carrier, allowing the carrier to rotate clockwise together with the sun gear, thus holding the pinion to a standstill. Now, the entire planetary gear set rotates bodily, which couples the OD input shaft directly to the forward clutch cylinder to allow them to rotate clockwise.

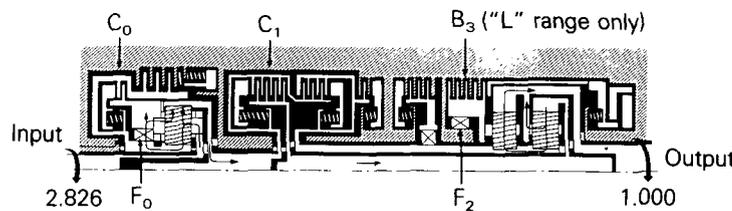
In the 1st speed, C_1 is also actuated allowing the turning force of forward clutch cylinder to be transmitted via the intermediate gear to the rear planetary carrier (output shaft), which turns the carrier clockwise. The sun gear (rotating counterclockwise) in mesh with the pinion of the rear planetary gear set, on the other hand, tends to turn the front planetary carrier counterclockwise; however, F_2 acts to prevent the carrier from rotating, hence the turning force in the clockwise direction is transmitted to the output shaft.

Though acting to prevent the front planetary carrier from rotating counterclockwise, F_2 is driven from the axle shaft end during engine braking, thus allowing its outer race to rotate in the direction to free the clutch. Hence, no engine braking. This also applies when the shift is in the 1st speed of "2" range. F_1 functions in the same manner in the 2nd speed of "D" range.

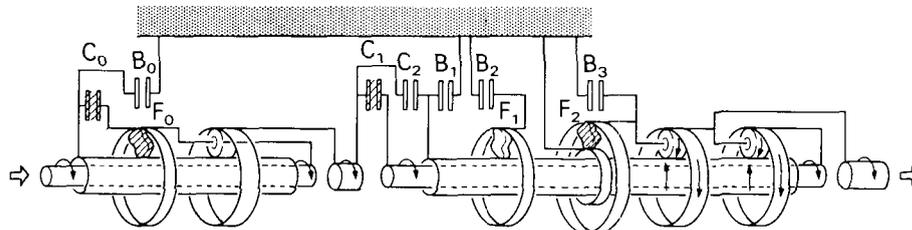
In the "L" range, the brake No.3 (B_3) is actuated to hold the front planetary carrier stationary, thus providing engine braking.



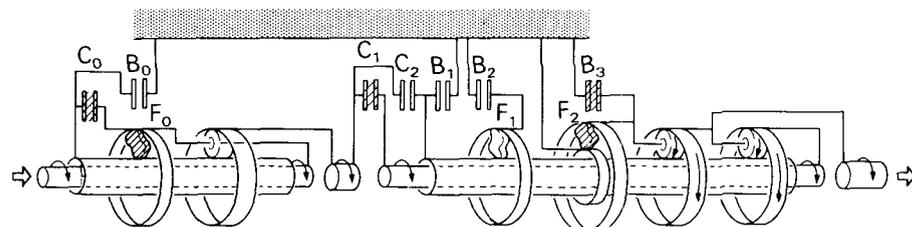
"D" or "2" Range-1st

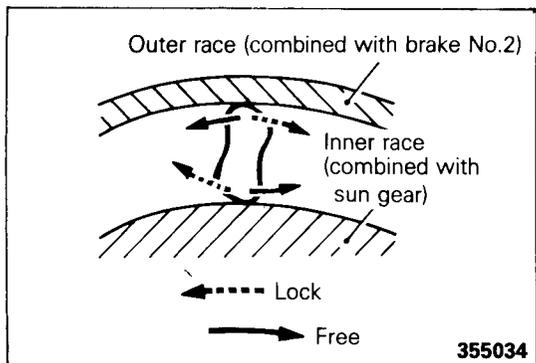


"D" Range-1st



"L" Range-1st

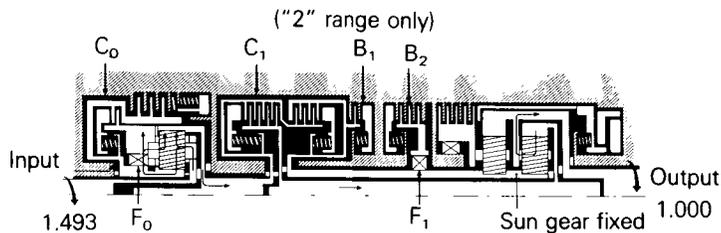




Second in "D" range

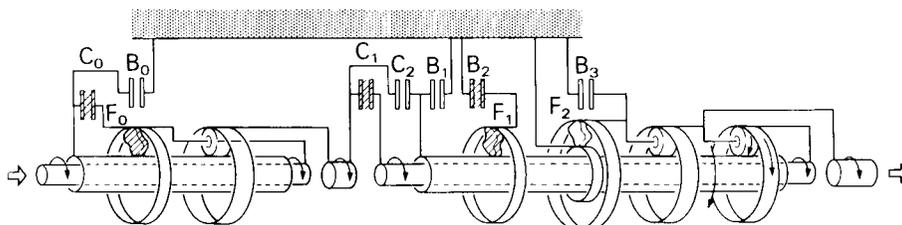
As the vehicle speed is accelerated from the 1st speed, the brake No.2 (B_2) is actuated to shift into the 2nd gear, allowing the output shaft to rotate clockwise at a gear ratio of 1.493. The OD planetary gear set operates in the same way as in the 1st speed. In 2nd speed, C_1 is actuated, which causes the turning force of forward clutch cylinder to be transmitted via the intermediate shaft and rear planetary ring gear to the pinion. Then, the sun gear, which is in mesh with the pinion, receives a turning force in the counter-clockwise direction; however, since F_1 , activated by B_2 , prevents the sun gear from rotating, the pinion moves around the sun gear. This motion causes the carrier to rotate, transmitting a rotating force in the clockwise direction to the output shaft. No rotating force is transmitted to the front planetary gear as the sun gear does not turn. In the 2nd speed of "2" range, the brake No.1 (B_1) is actuated to hold the sun gear stationary, thus providing engine braking.

"D" or "2" RANGE-2nd



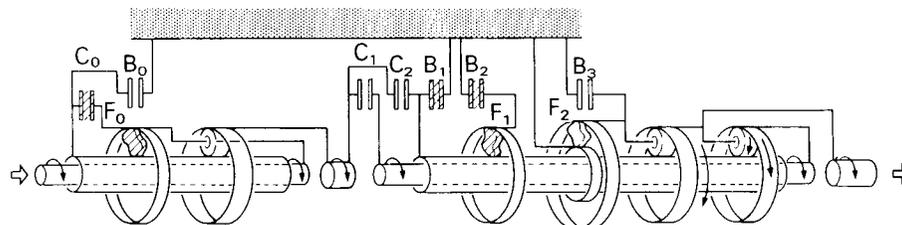
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"D" RANGE-2nd



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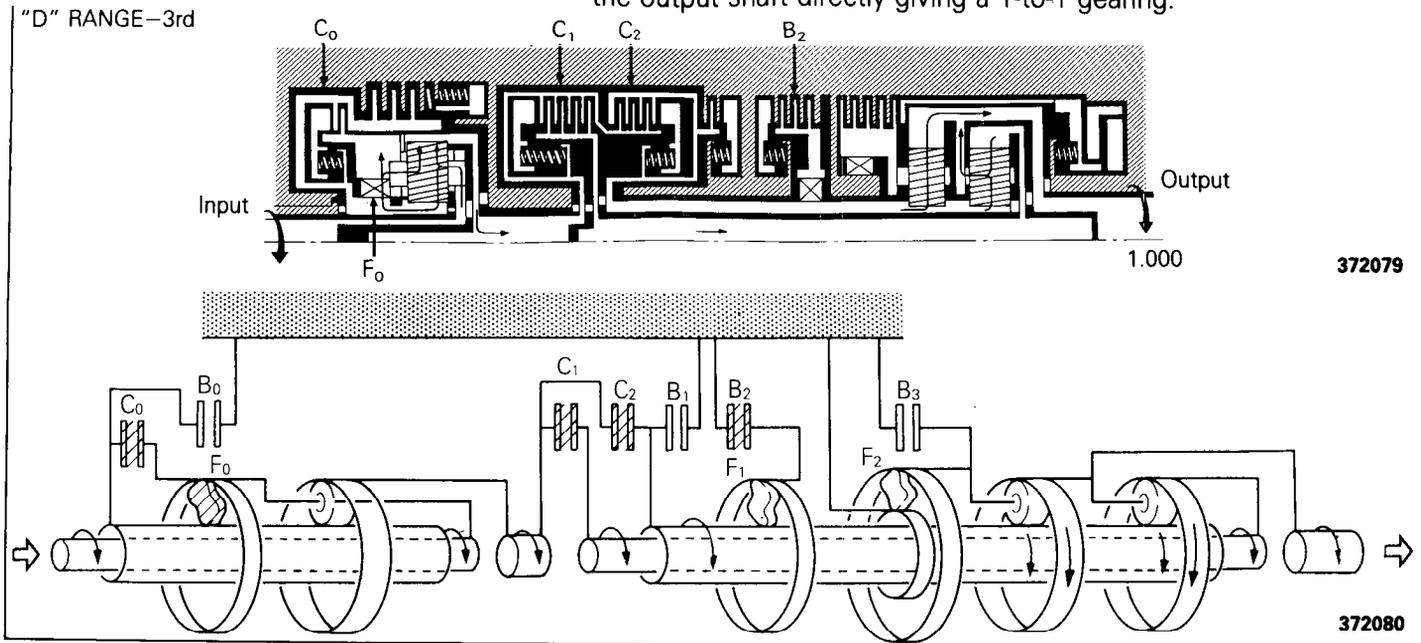
"2" RANGE-2nd



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Third in "D" range

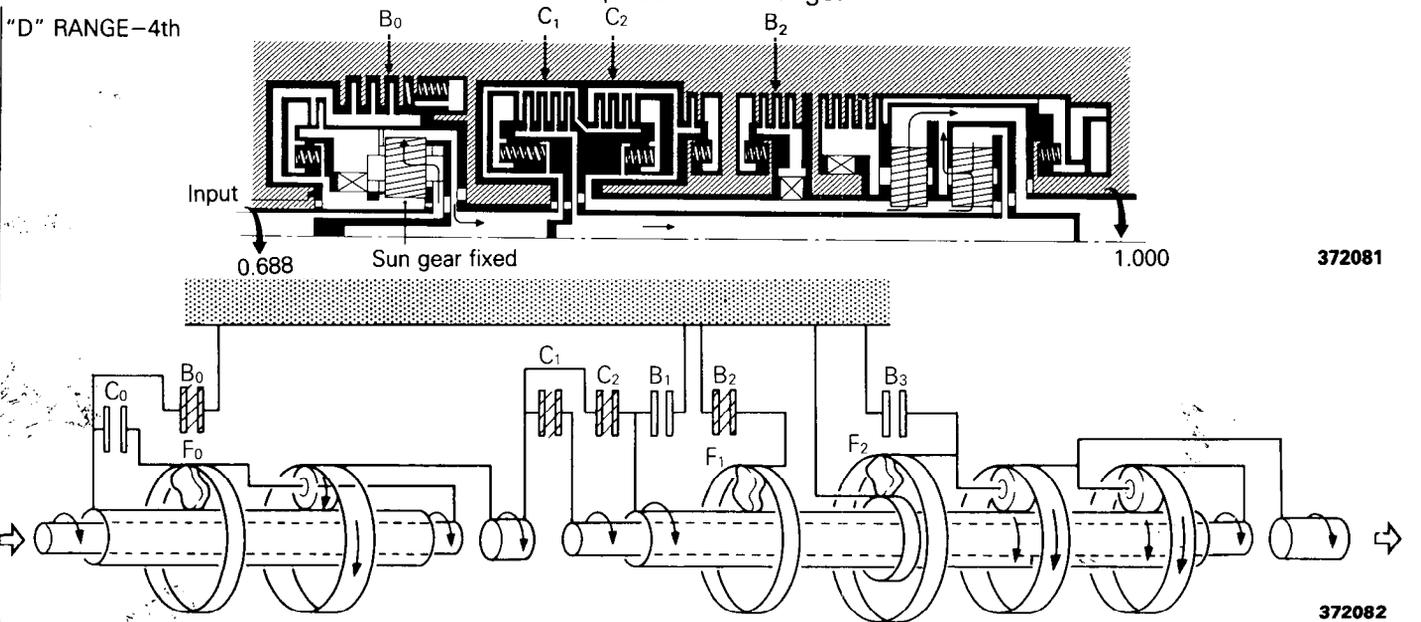
As the vehicle is further accelerated, the direct clutch (C_2) comes into play to shift into the 3rd speed. In 3rd speed, both C_1 and C_2 operate, allowing the intermediate shaft and sun gear to rotate in the same direction. So, the pinion is locked causing the entire planetary gear set to rotate bodily. This couples the input shaft to the output shaft directly giving a 1-to-1 gearing.



Fourth (overdrive) in "D" range

When the vehicle is further accelerated with the OD-OFF switch turned ON, the OD clutch (C_0) is released and, at the same time, the OD brake (B_0) is actuated to shift into the 4th speed, allowing the output shaft to rotate in the clockwise direction at a ratio of 0.688.

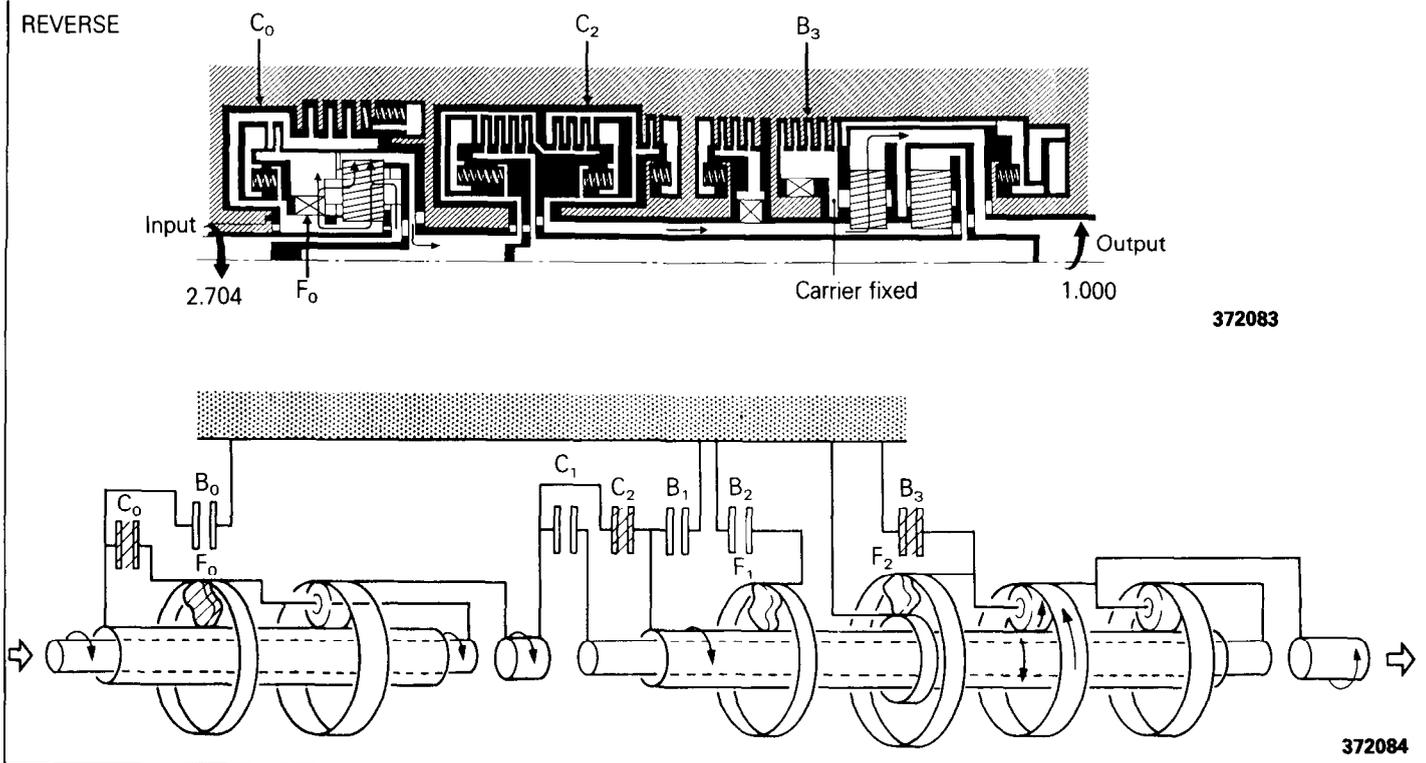
In this gear position, B_0 holds the OD sun gear stationary. The rotating force of the OD input shaft is therefore transmitted via the OD planetary gear pinion to the ring gear and the forward clutch cylinder, which is accelerated in reference to the OD input shaft, rotates clockwise. The rotating force of the forward clutch cylinder is transmitted to the output shaft in the same way as in the 3rd speed of "D" range.



Reverse

When the shift is in reverse gear, the OD clutch (C_0), OD one-way clutch (F_0), direct clutch (C_2), and brake No.3 (B_3) are actuated and the rear output shaft rotates counterclockwise at a ratio of 2.703. The operation of the OD planetary gear set is the same as in the 1st speed of "D" range.

Since C_2 is activated, the rotating force of the input shaft is transmitted to the front planetary gear pinion via the sun gear. As the front planetary carrier is held stationary by B_3 , the rotating force of the sun gear is transmitted to the ring gear via pinion, turning the output shaft in the counterclockwise direction.



SELECT PATTERN

Select pattern refers to the indication of transmission positions to be manually selected by the driver. This transmission is provided with six positions; P-R-N-D-2-L.

The following text explains the function of each position selected.

P-Parking

All elements do not operate at all, and the engine output is not transmitted to the output shaft.

The output shaft is mechanically locked and the vehicle does not move either in the forward or reverse direction.

The engine can be started.

R-Reverse

The vehicle is in the reverse range.

The engine cannot be started.

N-Neutral

The engine output is not transmitted to the output shaft as in the case of "P".

The engine can be started.

D-Drive

Corresponding to the degree that the accelerator pedal is pressed down (throttle valve opening angles) and vehicle speed, "D" automatically shifts between the four forward speeds, or three forward speeds when the OD-OFF switch is in OFF position.

The automatic shifting is performed according to the shift pattern shown on P.21-61.

The vehicle is started with the gear in first speed position.

Kickdown refers downshifting accomplished when the accelerator pedal is depressed while the vehicle is in motion in 2nd, 3rd, or 4th speed. In the shift pattern, it occurs when the load exceeds the downshift point.

This function is useful when the driver is accelerating to pass another vehicle.

No engine braking is given when the shift is in 1st speed.

2-Second

The "2" automatically shifts between the 1st and 2nd speeds, and no shifting into 3rd will be performed.

The vehicle is started with the gear in 1st speed position.

When the "2" range is selected while the vehicle is in motion in the 3rd or 4th speed of "D" range, gear is downshifted to 2nd or 3rd speed as the vehicle speed reaches predetermined levels.

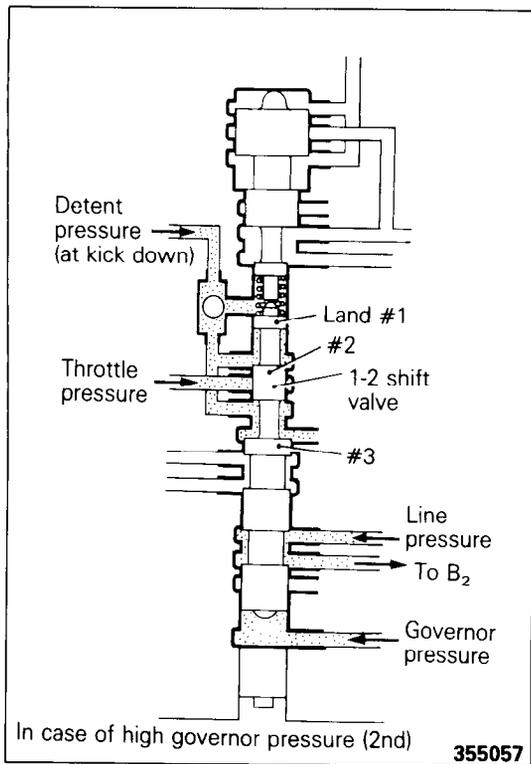
As in the case of "D" range, no engine braking is given when the shift is in 1st speed position.

L-Lockup

While "L" performs downshifting from 2nd to 1st, it does not shift into high, from 1st to 2nd or to 3rd. This is what we call the "1st gear holding".

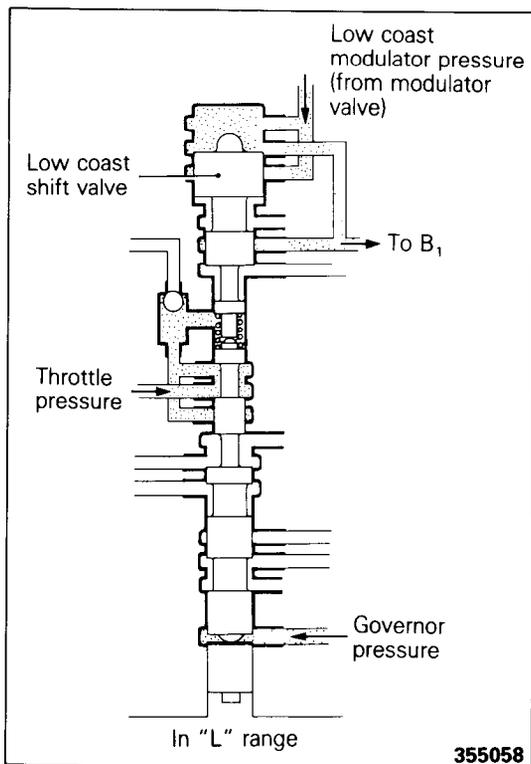
The vehicle is started with the gear in 1st speed position, when the engine braking is given.

If the "L" range is selected while the vehicle is in motion in "D" or "2" range, downshifting from 4th to 3rd, 3rd to 2nd, or 2nd to 1st is performed as the vehicle reaches the respective speeds predetermined for each gear.

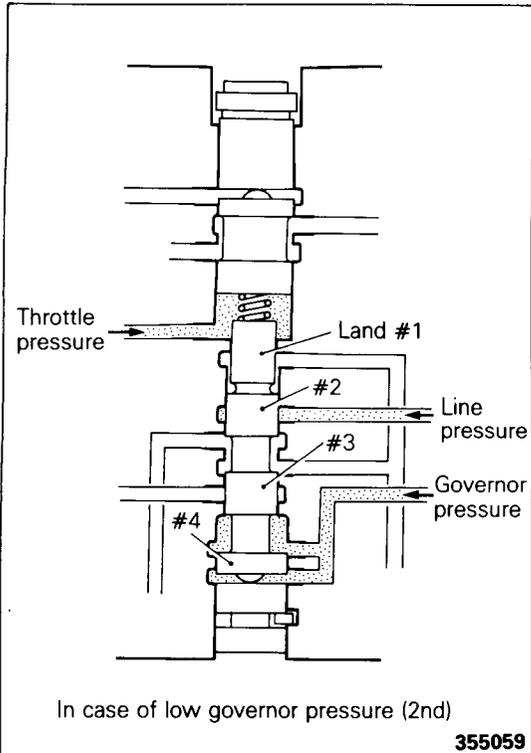


When the governor pressure is greater than the combined downward pressure of throttle pressure and spring tension, the 1-2 shift valve is pushed up, opening the circuit to B₂ to set the 2nd speed. Hysteresis (difference in vehicle speed) of the shift timing between 1st and 2nd speed occurs when the land #2 closes the passage to throttle pressure as the 1-2 shift valve is pushed down in 2nd speed. In other words, the closed throttle pressure circuit provides for a downshift to 1st speed taking place involving only the spring tension and governor pressure. Hence, a downshift at a constant vehicle speed.

Kickdown is provided when the detent pressure from the kickdown valve is applied to the top of 1-2 shift valve (land #1) to push down the valve.



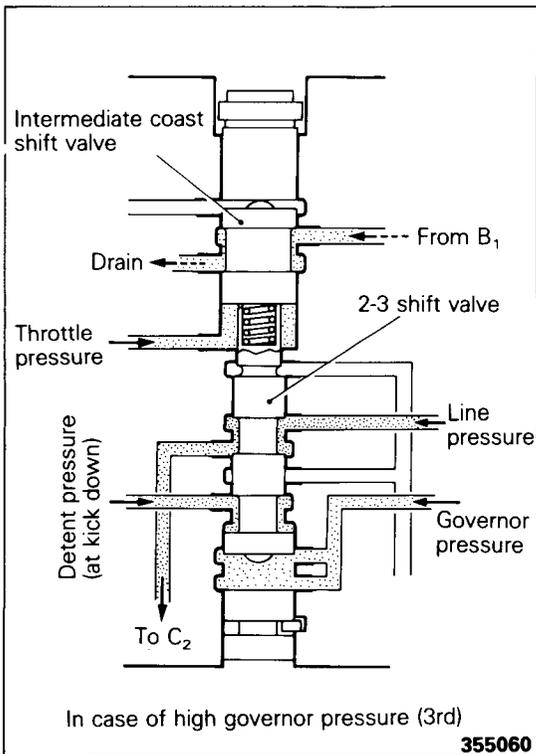
With the shift in "L" range, the low-coast modulator pressure is applied to the low-coast shift valve, keeping the low-coast shift valve and 1-2 shift valve down. This sets the 1st speed and no upshift to 2nd will not take place. The low-coast shift valve also opens the circuit to brake No.3 (B₃), thus providing for engine braking.



2-3 Shift Valve

The 2-3 shift valve automatically selects between the 2nd and 3rd speed according to the governor and throttle pressure. The throttle pressure is applied to the top of 2-3 shift valve (land #1), which forms, together with the spring tension, a downward pressure to the valve.

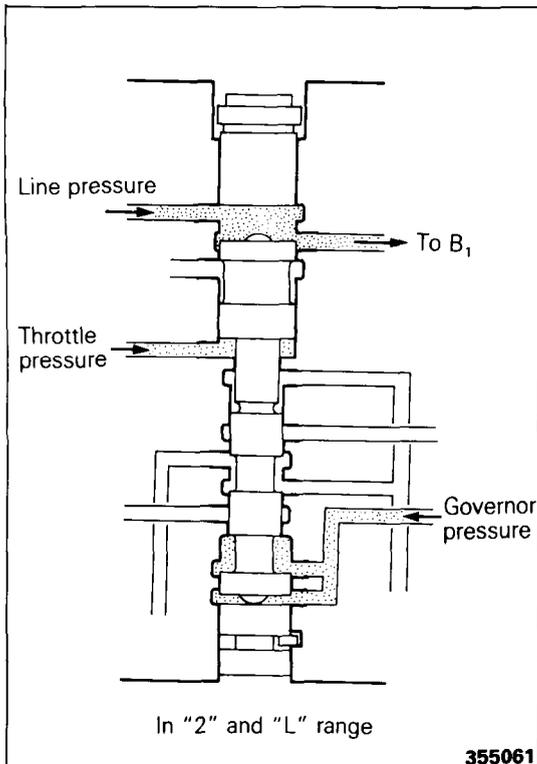
Applied to the bottom of the valve is the upward governor pressure. When the governor pressure is smaller than the combined force of the throttle pressure and spring tension, the valve is pushed down, closing the circuit to the direct clutch (C_2) to set the 2nd speed.



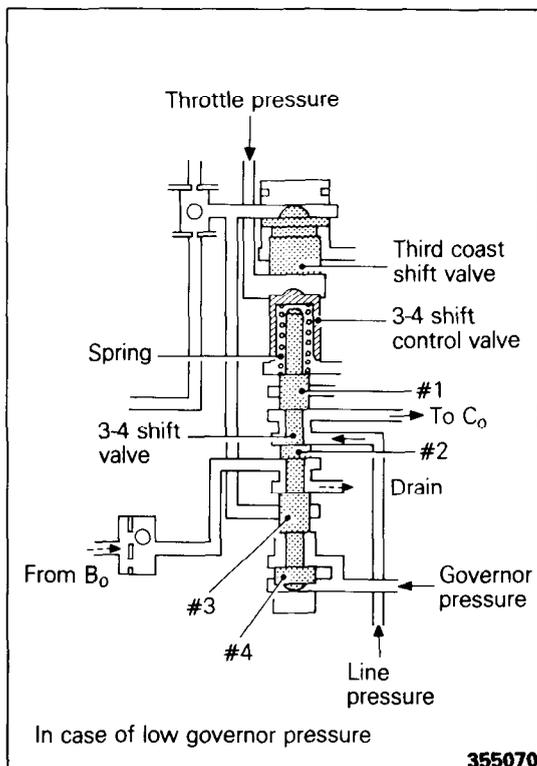
When the governor pressure is greater than the downward pressure of throttle pressure and spring tension, the valve is pushed up, opening the circuit to C_2 to set the 3rd speed

The difference in vehicle speed at the point at which the gear shift occurs when changing up from 2nd to 3rd and down from 3rd to 2nd (Hysteresis) is due to the difference in areas of the valve to which governor pressure is applied. The area in downshift (land #4) is greater than that (land #3) in upshift and downshift takes place at a lower speed (governor pressure).

Kickdown is provided when the detent pressure from the kickdown valve is applied to the valve, pushing it down.

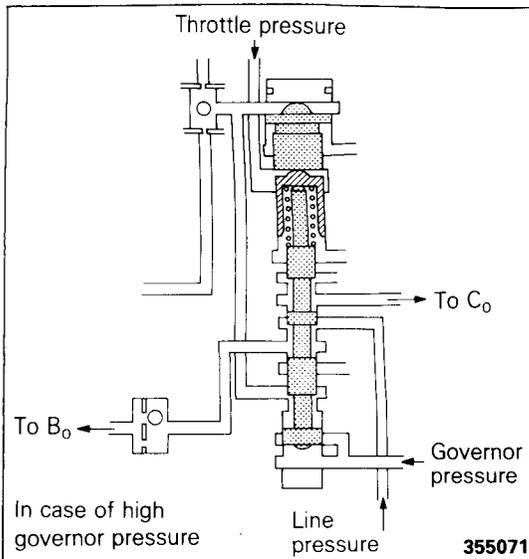


In "2" and "L" range, the line pressure from the manual valve is applied to the intermediate shift valve, keeping the intermediate shift valve as well as 2-3 shift valve down. This sets the 2nd speed and no upshift will not take place. The intermediate low-coast shift valve also opens the circuit to brake No.1 (B₁), allowing for engine braking.



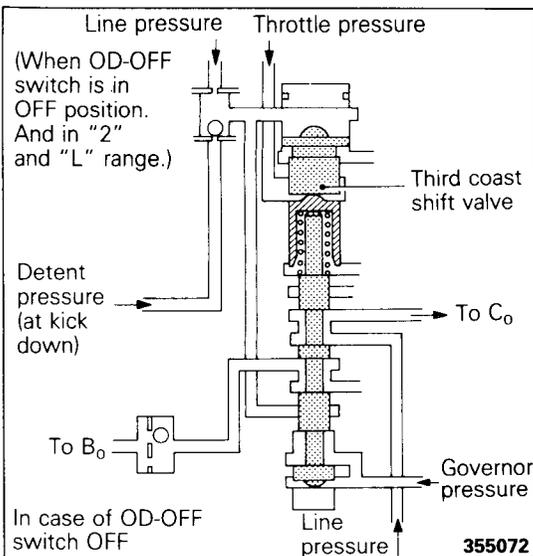
3-4 Shift Valve

The 3-4 shift valve automatically selects between the 3rd and 4th (OD) speed according to the governor and throttle pressure. The throttle pressure is applied to the top of the 3-4 shift valve and line pressure to the middle part of the valve. These form a downward pressure applied to the valve, together with the spring tension. Applied to the bottom of the valve is the upward governor pressure. When the upward governor pressure is smaller than the combined downward pressure of throttle pressure, line pressure, and spring tension, the valve is pushed down opening the circuit to the OD clutch and, at the same time, releasing the circuit to OD brake to set the 3rd speed.



When the governor pressure is greater than the downward combined pressure, the valve is pushed up opening the circuit to OD brake to set the 4th speed.

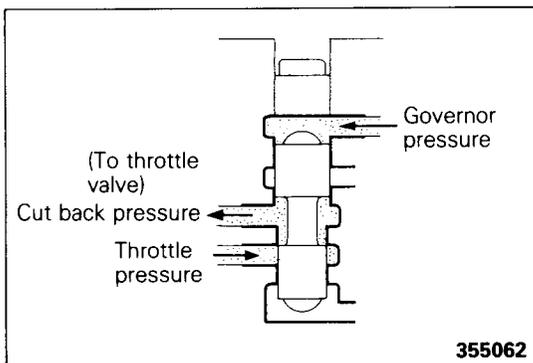
Hysteresis (difference in vehicle speed) of the shift timing between 3rd and 4th speed occurs because of the following reason. In 4th speed, since no line pressure is applied, the area of land in downshift (#4) is greater than that in upshift (#3) and downshift takes place at a lower speed (governor pressure).



When the OD-OFF switch is in the OFF position, the solenoid valve is also OFF closing the drain circuit of the OD solenoid valve. This causes the line pressure to be applied to the third coast shift valve, pushing down the third coast shift valve and 3-4 shift valve, hence no upshift to 4th speed taking place.

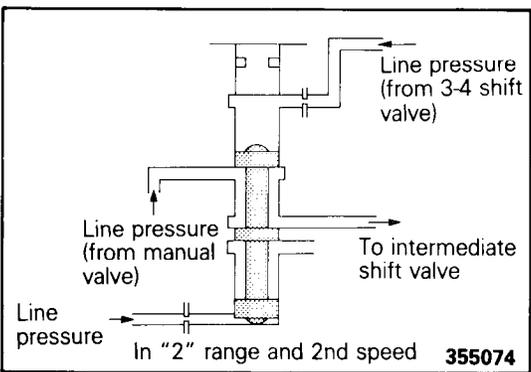
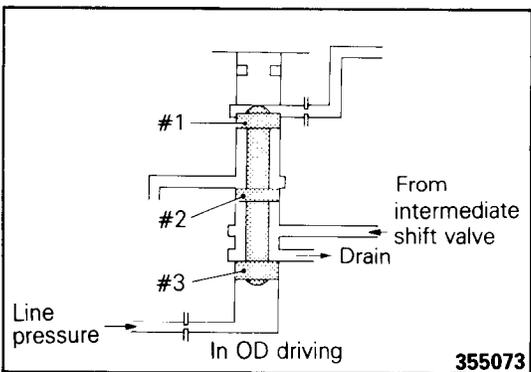
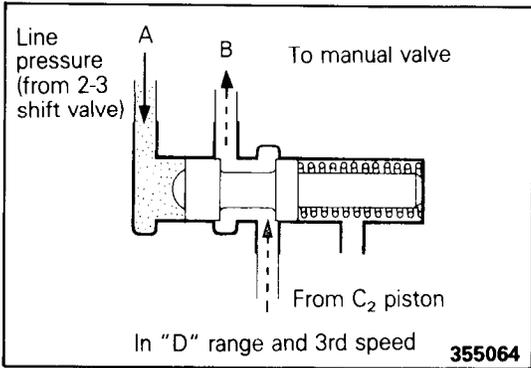
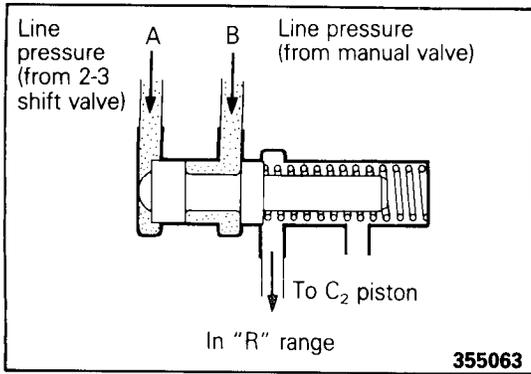
In "2" and "L" range, the line pressure from manual valve is applied to the third coast shift valve.

Kickdown is provided when the detent pressure from the kickdown valve is applied to the third coast shift valve and 3-4 shift valve, pushing the 3-4 shift valve down.



Cut-Back Valve

The cut-back valve regulates the cut-back pressure which provides the throttle valve with the effects of vehicle speed. It applies the cut-back pressure to the throttle valve to reduce the throttle pressure. It also applies the throttle pressure to the primary regulator valve to reduce the line pressure. By so doing, it helps eliminate the power loss caused by the oil pump. When the governor pressure is applied to the top of valve, it causes the valve to be pushed down. This opens the circuit from the throttle valve causing the throttle pressure to be applied to push up the valve because of the difference in valve diameters. The cut-back pressure is the pressure when this upward pressure balances with the downward pressure of the governor pressure. While the throttle pressure remains low, there is no force involved to push up the valve and the circuit from the throttle valve is always open. So, the throttle pressure is applied as the cut-back pressure.

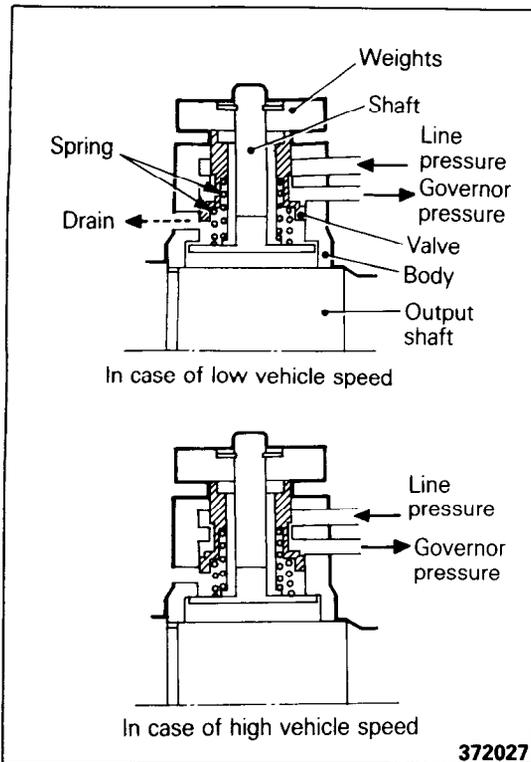


Reverse Clutch Sequence Valve

The reverse clutch sequence valve, acting to dampen shocks generated when the gear is shifted into "R" range, is controlled by the line pressure applied to the inner piston of direct clutch (C₂). With the shift in "R" range, the line pressure is applied both to the circuits A and B; however, since the circuit B does not open before the pressure A being applied to this valve, i.e. the line pressure applied to the inner piston, overcomes the spring tension, the outer piston operates with a lag behind the inner piston. With the shift in 3rd speed in "D" range, the circuit B is closed by the manual valve, allowing only the inner piston to apply pressure. At the time, the circuit B acts to release hydraulic pressure to be applied to the outer piston.

D-2 Down Timing Valve

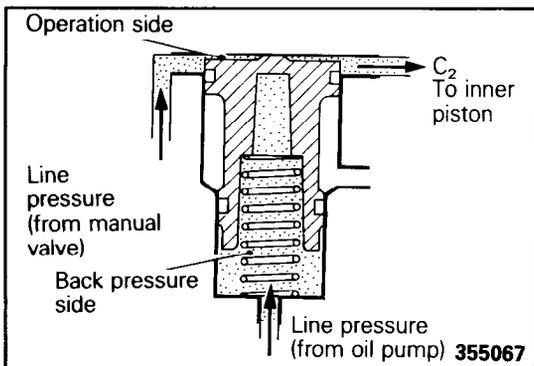
The D-2 down timing valve ensures that engine braking is given mildly when the select lever is shifted into the "2" range during 4th speed (OD) mode. Gear is shifted from OD to 3rd and to 2nd, instead of directly from OD into 2nd. While the vehicle is in motion in 4th speed, this valve is located on the top end. When gear is shifted into "2" range, the line pressure from the manual valve pushes down the 3-4 shift valve setting the 3rd speed. At the same time, the line pressure is also applied to the top of D-2 down timing valve, pushing the valve down because of the difference in land diameters (#1=#2>#3). This opens the circuit to the intermediate shift valve, allowing the line pressure to be applied to push down the 2-3 shift valve, thus setting the 2nd speed.



GOVERNOR

Installed on the output shaft, the governor counterbalances the line pressure from the primary regulator valve with the centrifugal force applied to the governor weights, thus providing the governor pressure in proportion to the output-shaft speed, or the vehicle speed. As the output shaft rotates, the governor weights, shaft, valve, and spring move bodily outward, allowing the line pressure, which has been blocked off by the governor valve, to enter the governor valve. This causes the governor valve to move inward cutting off the line pressure. The governor pressure thus refers to the one produced when the outward force of the governor weight centrifugal force and spring tension balances with the inward pressure applied to the governor valve by the line pressure.

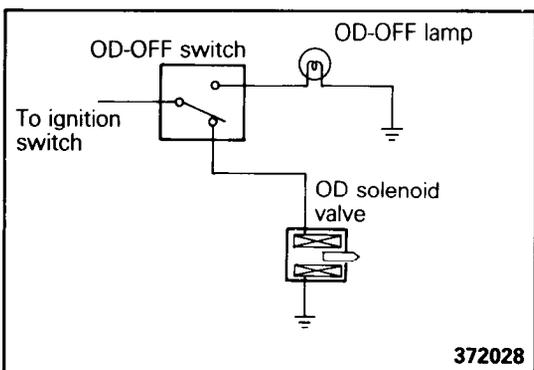
As the output-shaft speed further increases, the governor weights and shaft are blocked by the governor body. After that, the governor pressure is obtained when the centrifugal force of the governor valve balances with the spring tension.



ACCUMULATOR

Accumulators are provided for C_1 , C_2 , and B_2 , respectively, to dampen shocks when each is actuated.

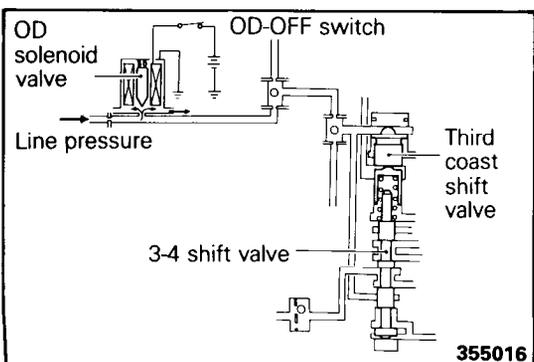
The area of the pressure receiving side of the accumulator piston is made greater than that of the back pressure side. The line pressure is always applied to the back pressure side, keeping the piston in up position. When the circuit to the pressure receiving side opens causing the line pressure to be applied to the piston, the piston is slowly pushed downward, thus dampening shocks when each device is operated.



FOURTH (OD) CONTROL SYSTEM

A solenoid valve is used to electrically select the hydraulic circuit to shift into the 4th speed. When the OD-OFF switch on the select lever is turned ON, the OD solenoid is energized to select a circuit to set the 4th speed.

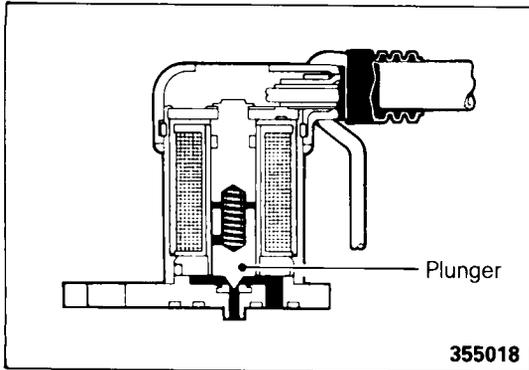
When the OD-OFF switch is turned OFF, the OD-OFF indicator on the meter panel comes on.



OD-OFF Switch

The OD-OFF switch is located on the select lever on the driver's seat. It turns ON or OFF the OD solenoid valve to control the shift into 4th speed (OD).

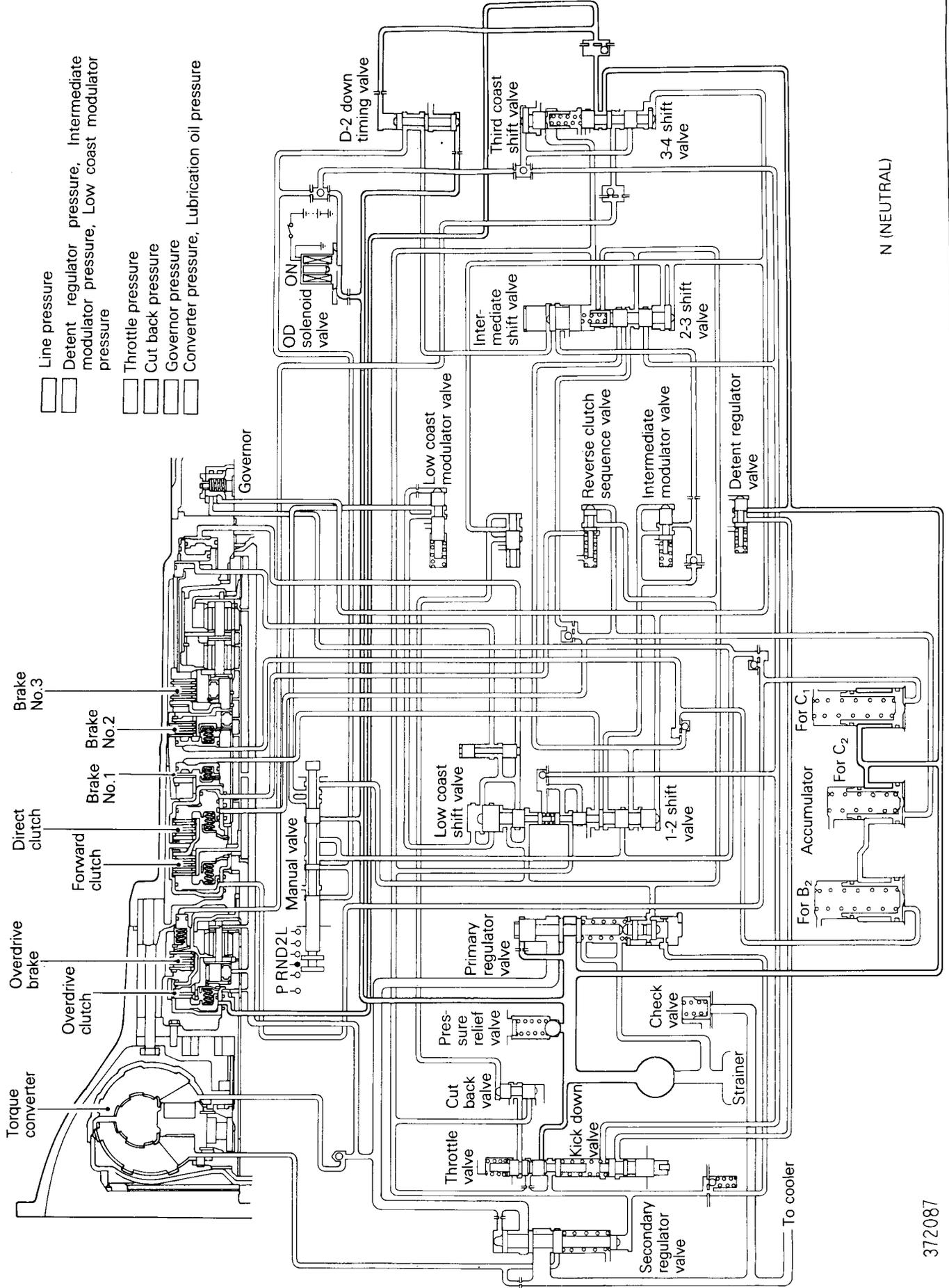
When this switch is turned ON, the OD solenoid is energized to turn ON the solenoid valve, allowing for shift into 4th speed. When the switch is OFF, the solenoid valve is OFF and no shift into 4th speed takes place.



OD Solenoid Valve

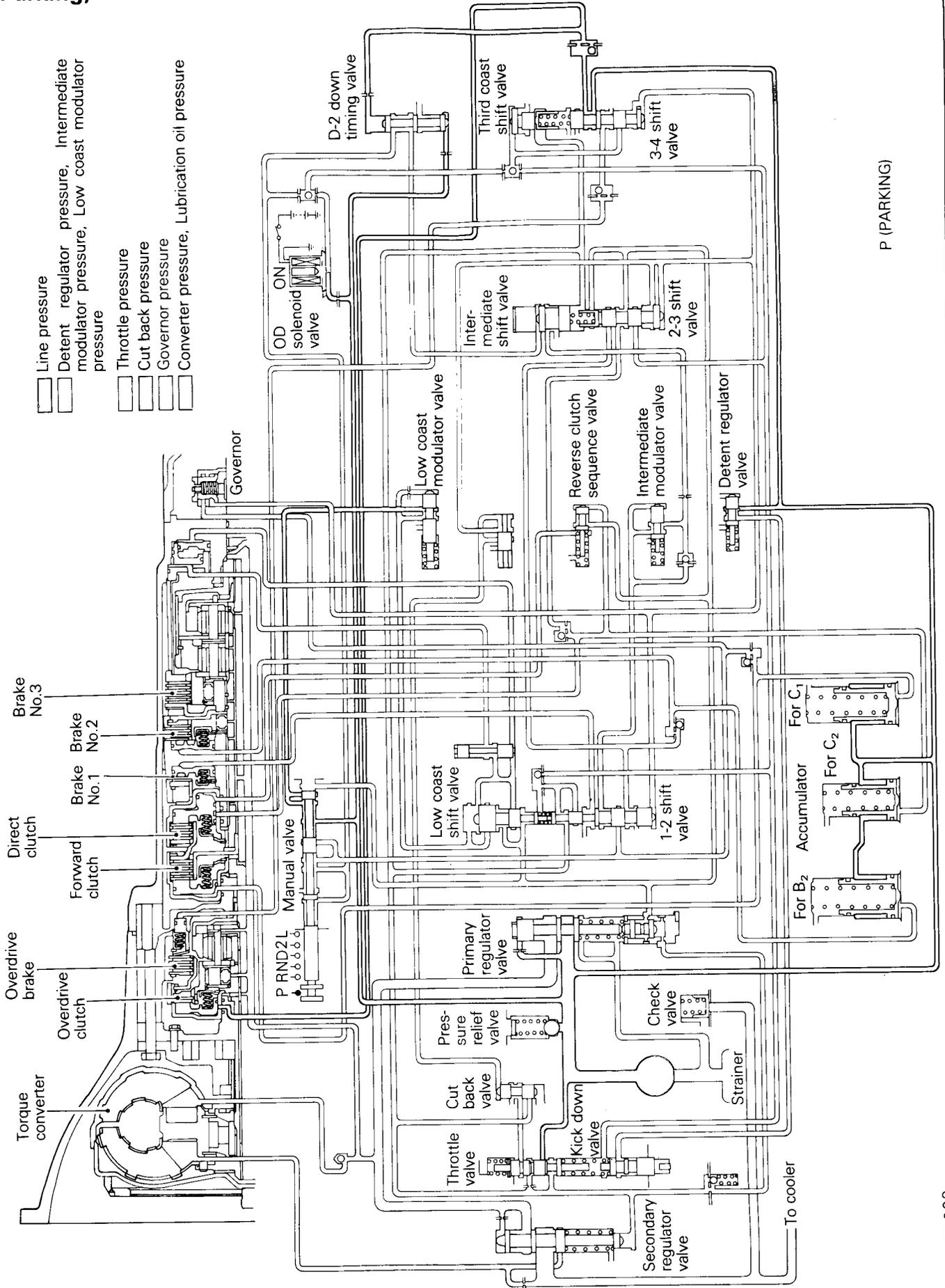
The OD solenoid valve, installed to the left of the transmission case, turns ON or OFF by the operation of the OD-OFF switch to select the hydraulic circuit. When the solenoid valve turns ON, the plunger is pulled, releasing the line pressure to be applied to the third coast shift valve. This positions the third coast shift valve in the up side, allowing shift into 4th speed. When the solenoid valve is OFF, the plunger is pushed down by spring tension, closing the release circuit, which causes the line pressure to be applied to the third coast shift valve. This causes the third coast shift valve and 3-4 shift valve to be pushed down, and no shift into 4th speed takes place.

N (Neutral)



N (NEUTRAL)

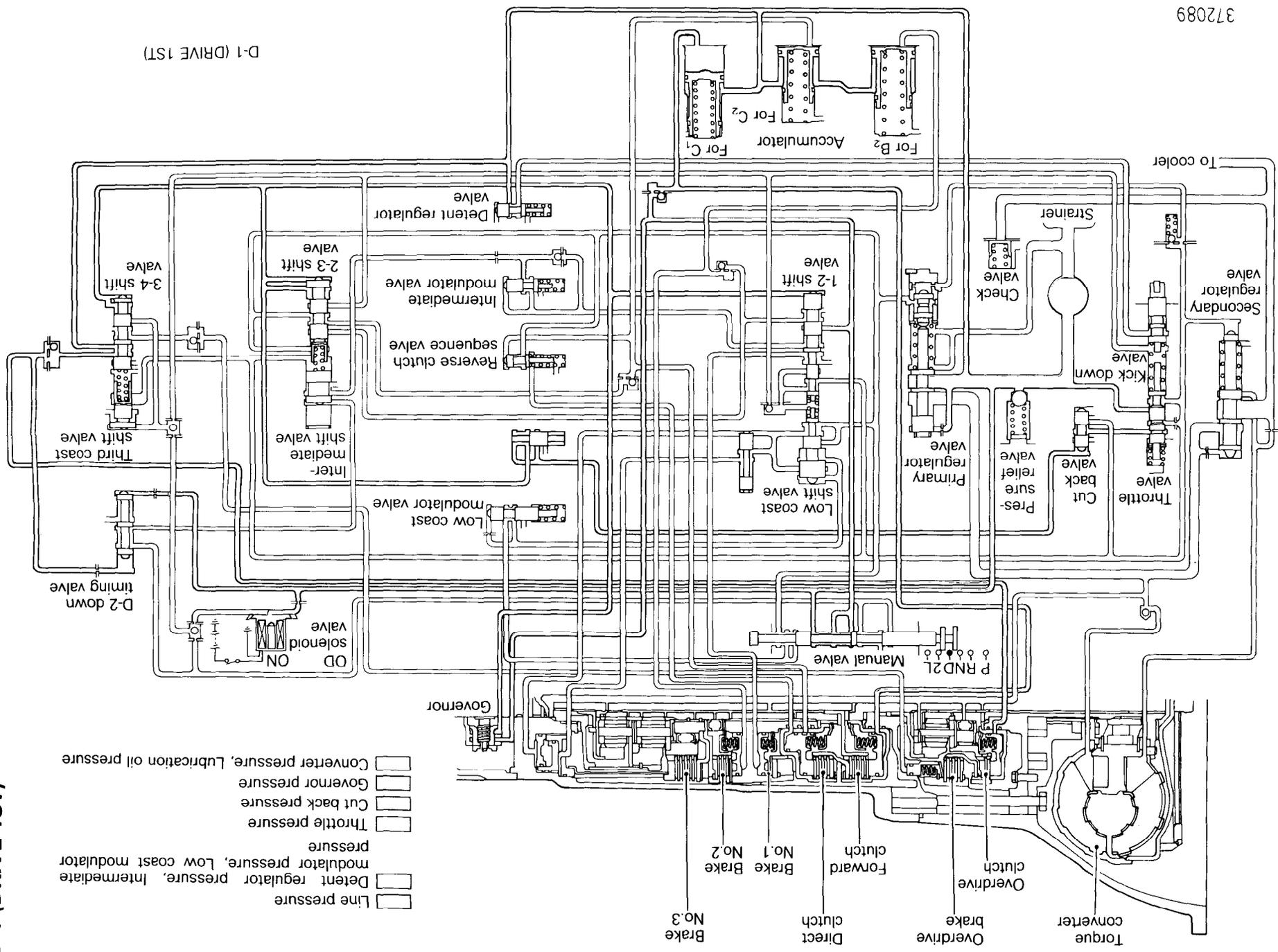
P (Parking)



- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

P (PARKING)

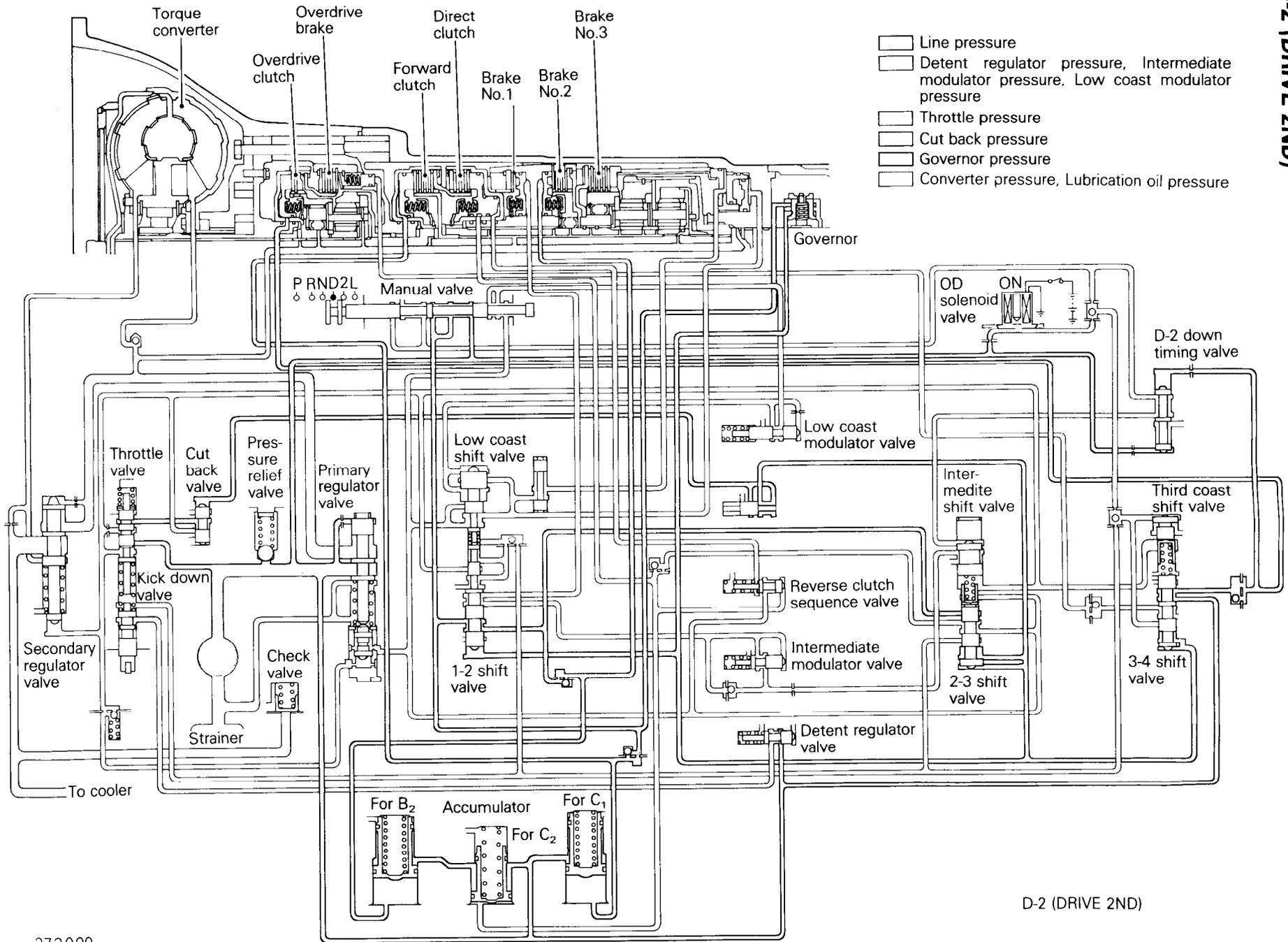
D-1 (DRIVE 1ST)



D-1 (DRIVE 1ST)

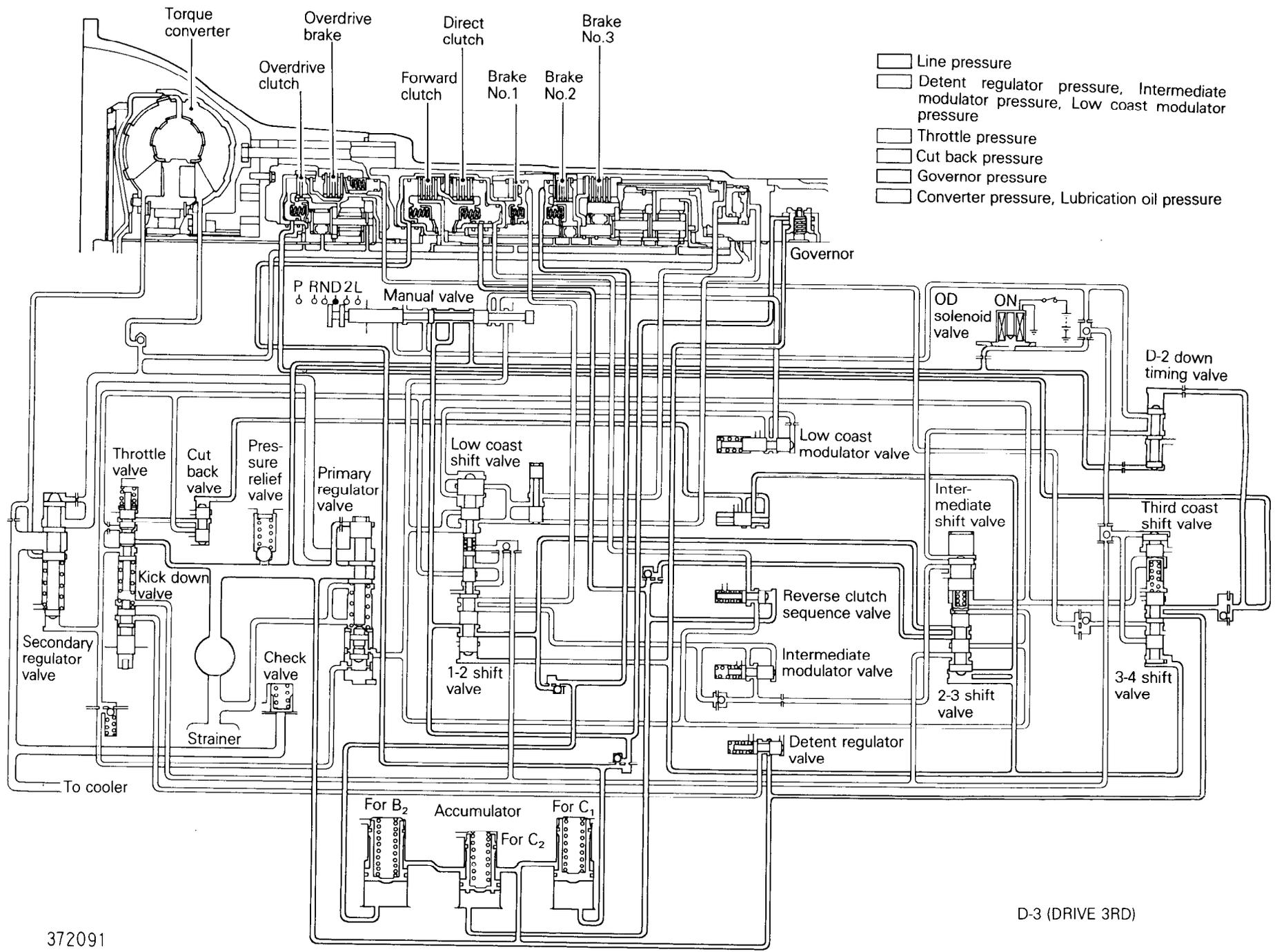
372089

- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure



372090

D-2 (DRIVE 2ND)

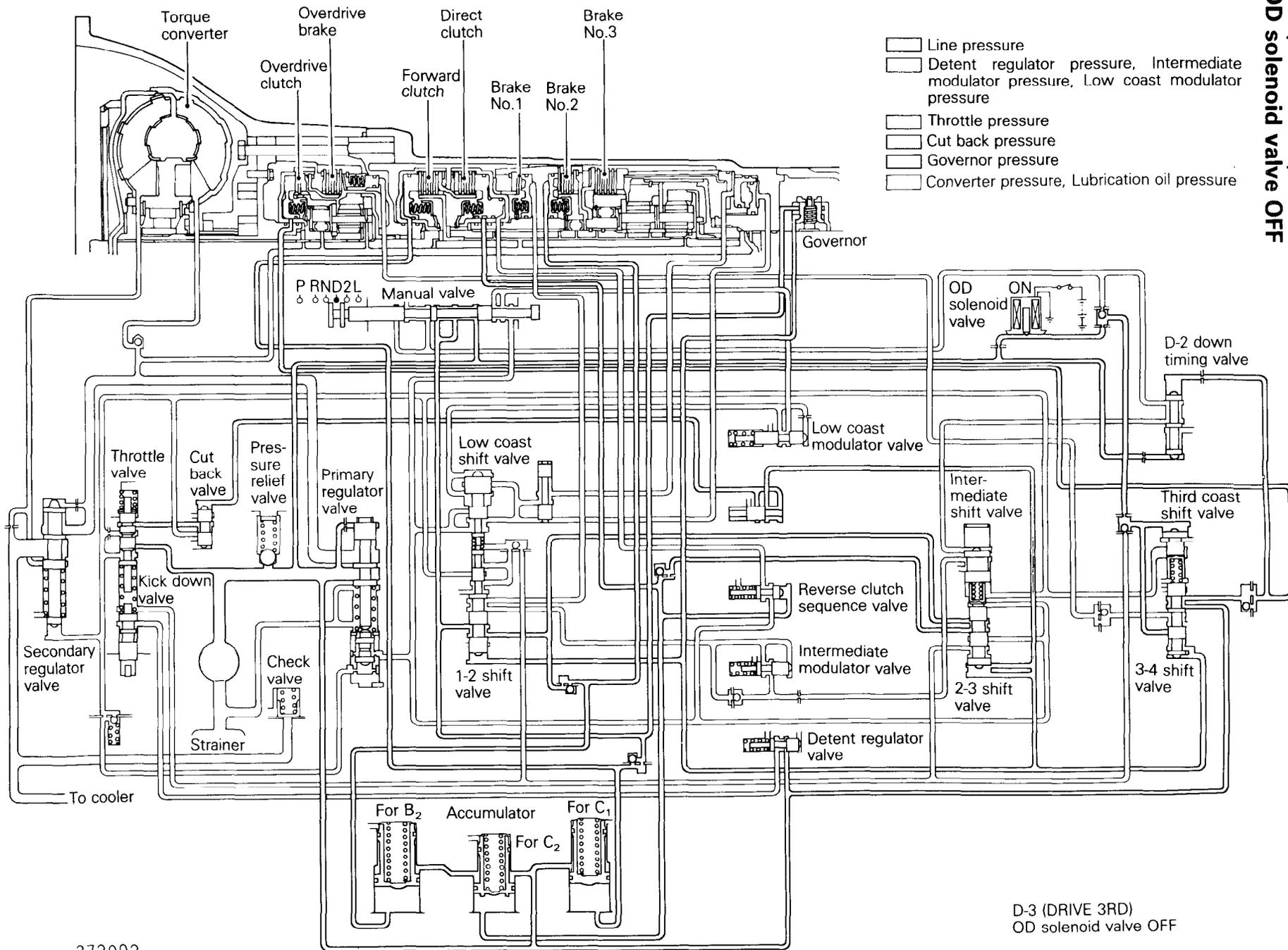


- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

372091

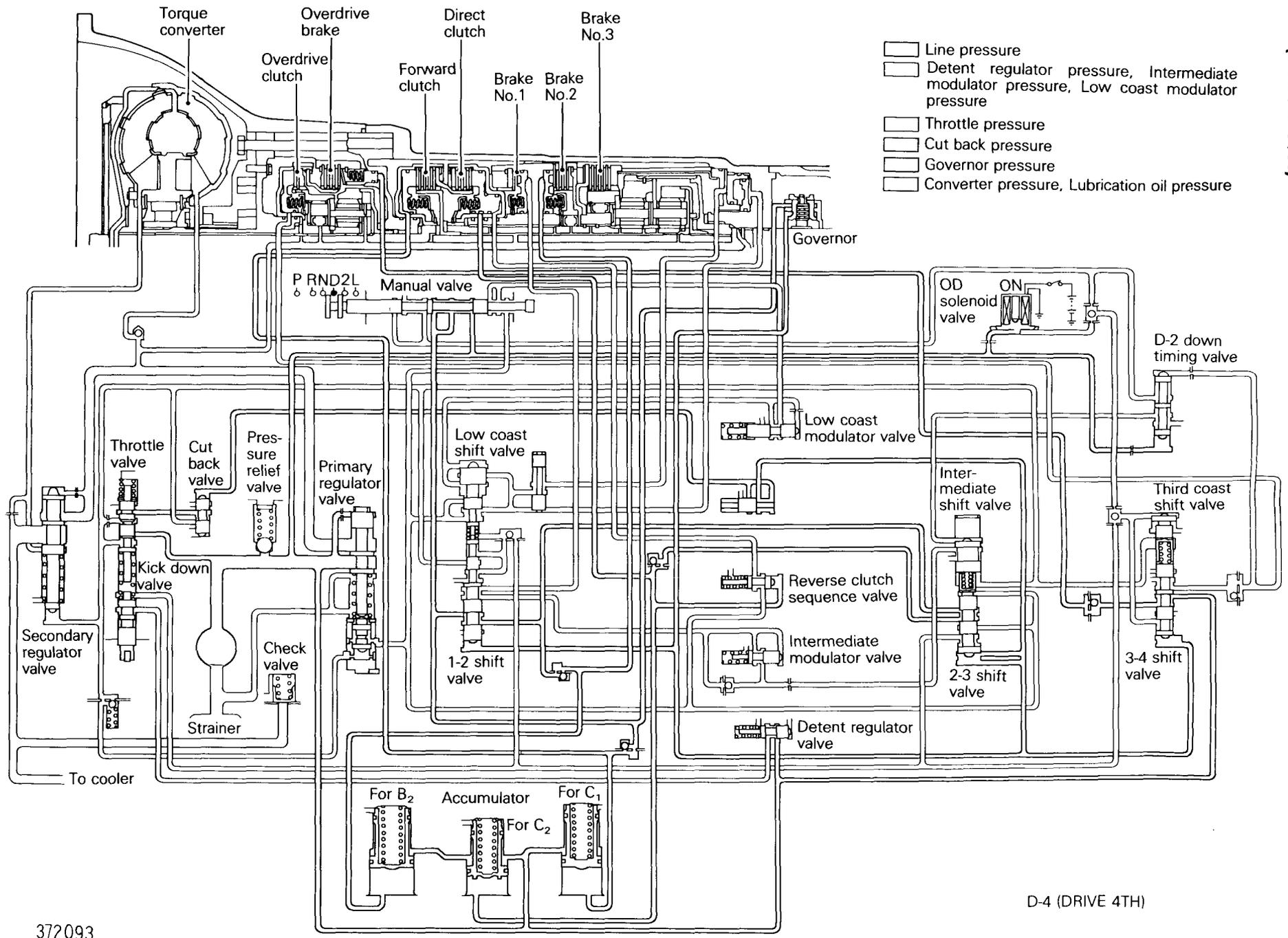
D-3 (DRIVE 3RD)

**D-3 (DRIVE 3RD)
OD solenoid valve OFF**



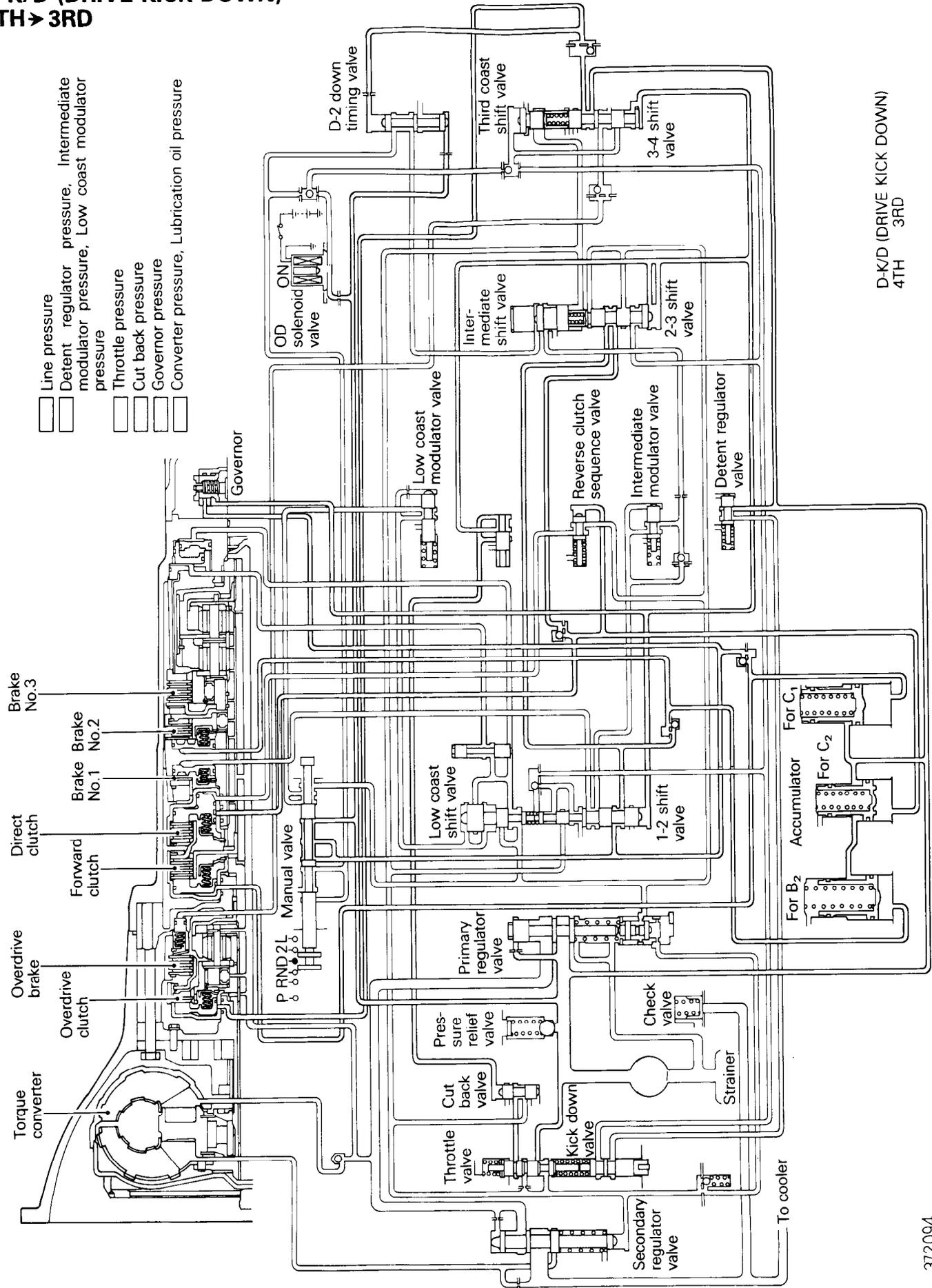
D-3 (DRIVE 3RD)
OD solenoid valve OFF

372092



D-4 (DRIVE 4TH)

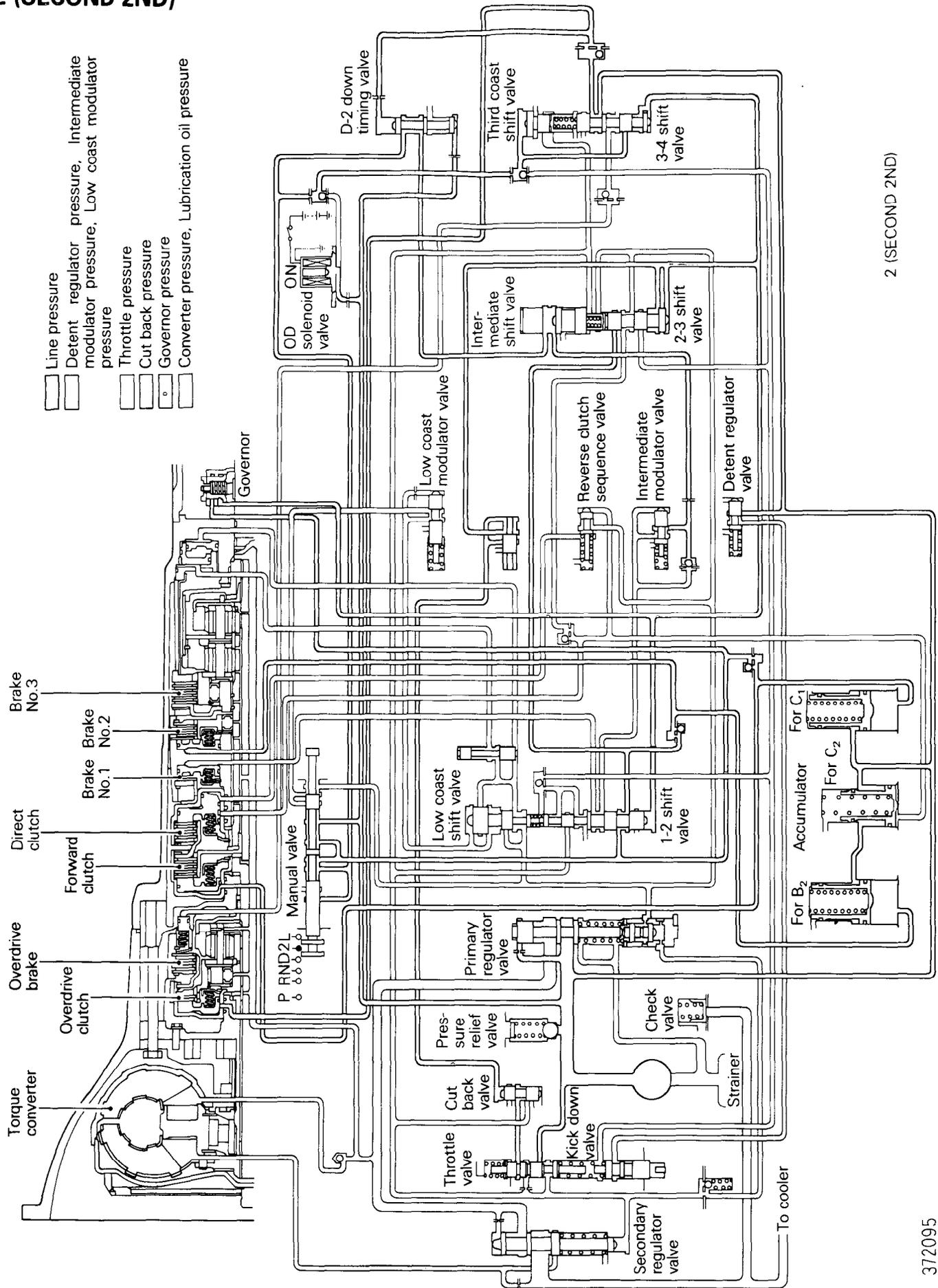
D-K/D (DRIVE KICK DOWN)
4TH → 3RD



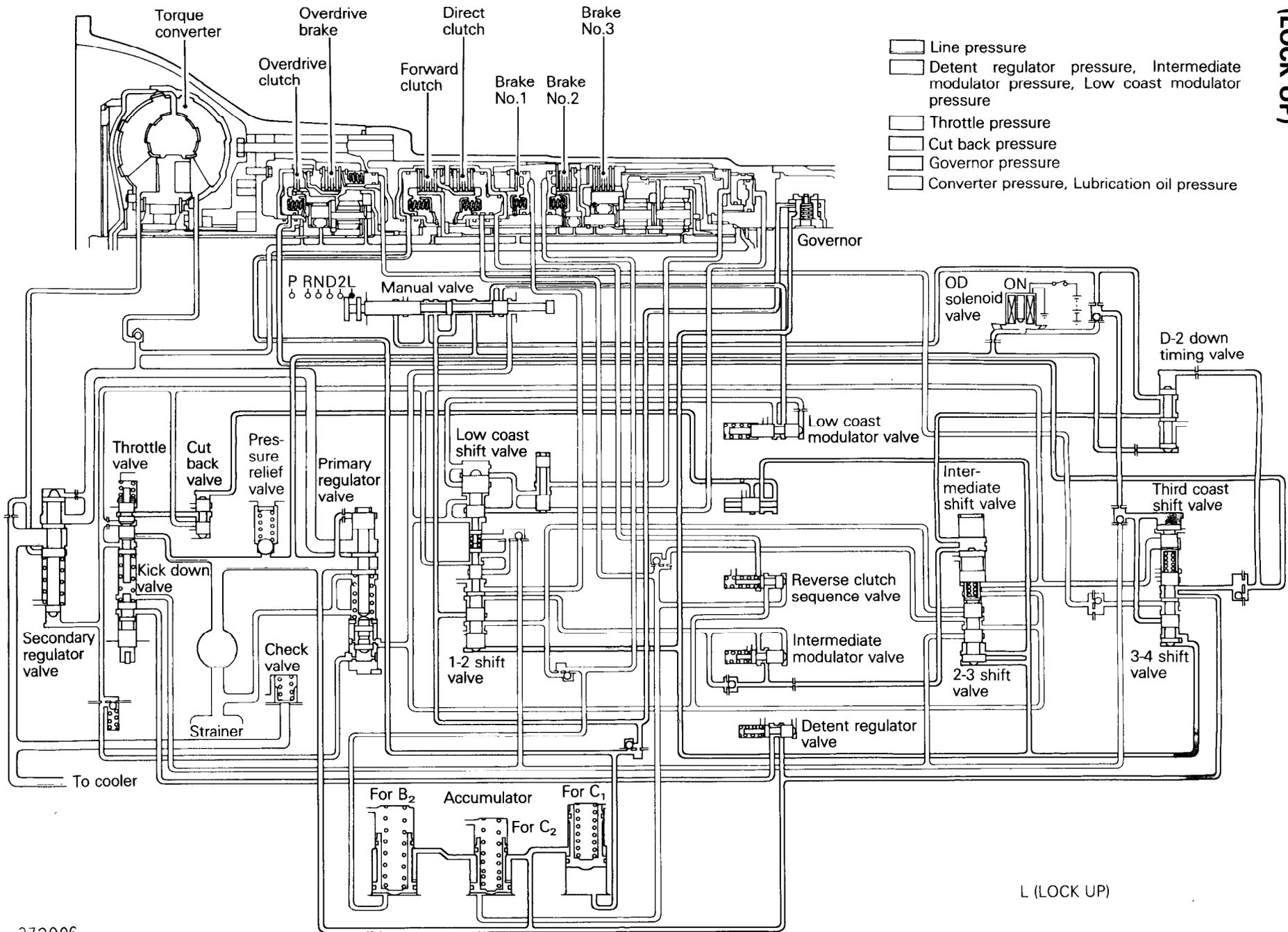
- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

D-K/D (DRIVE KICK DOWN)
4TH → 3RD

2 (SECOND 2ND)



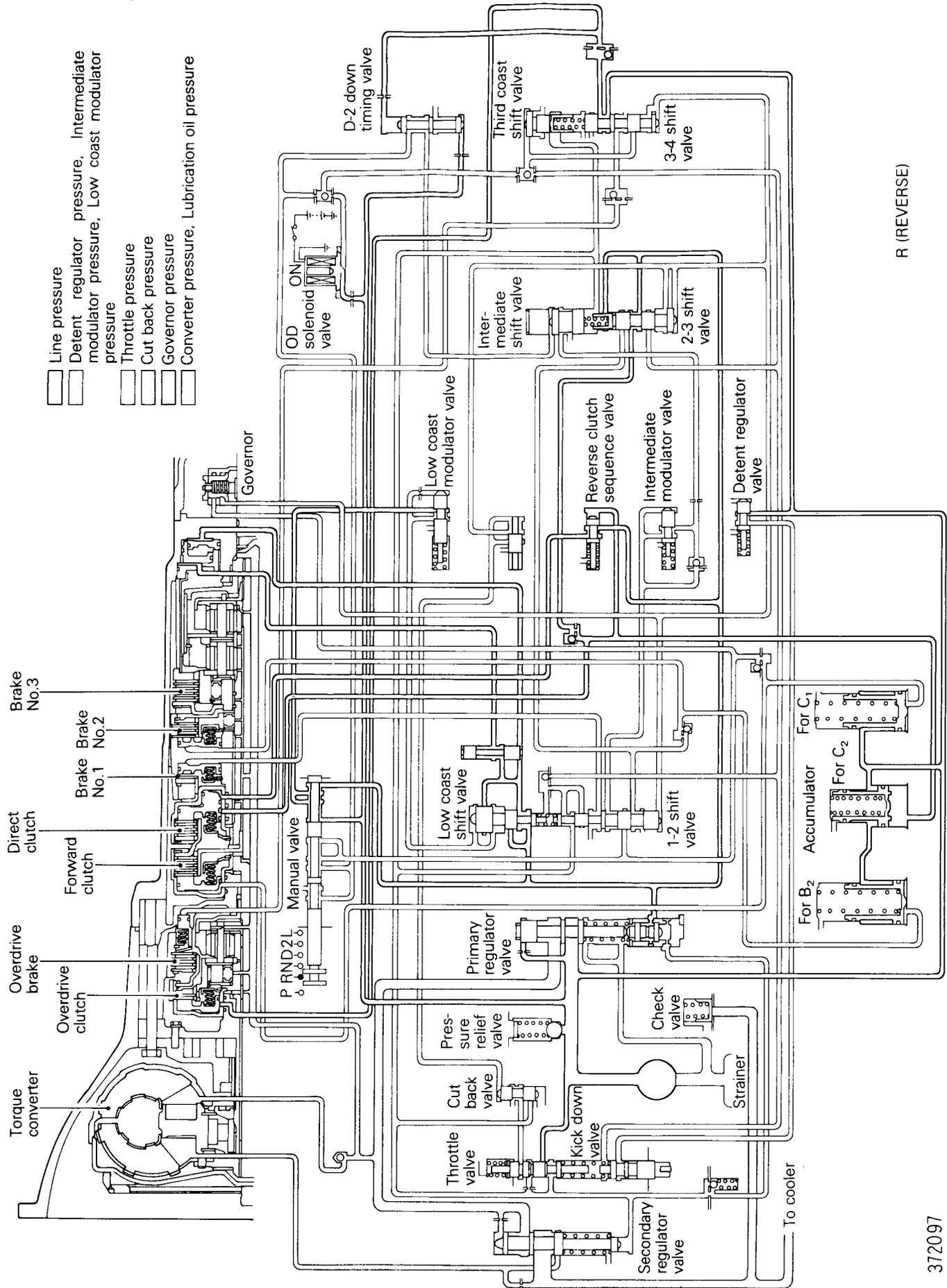
2 (SECOND 2ND)



372096

L (LOCK UP)

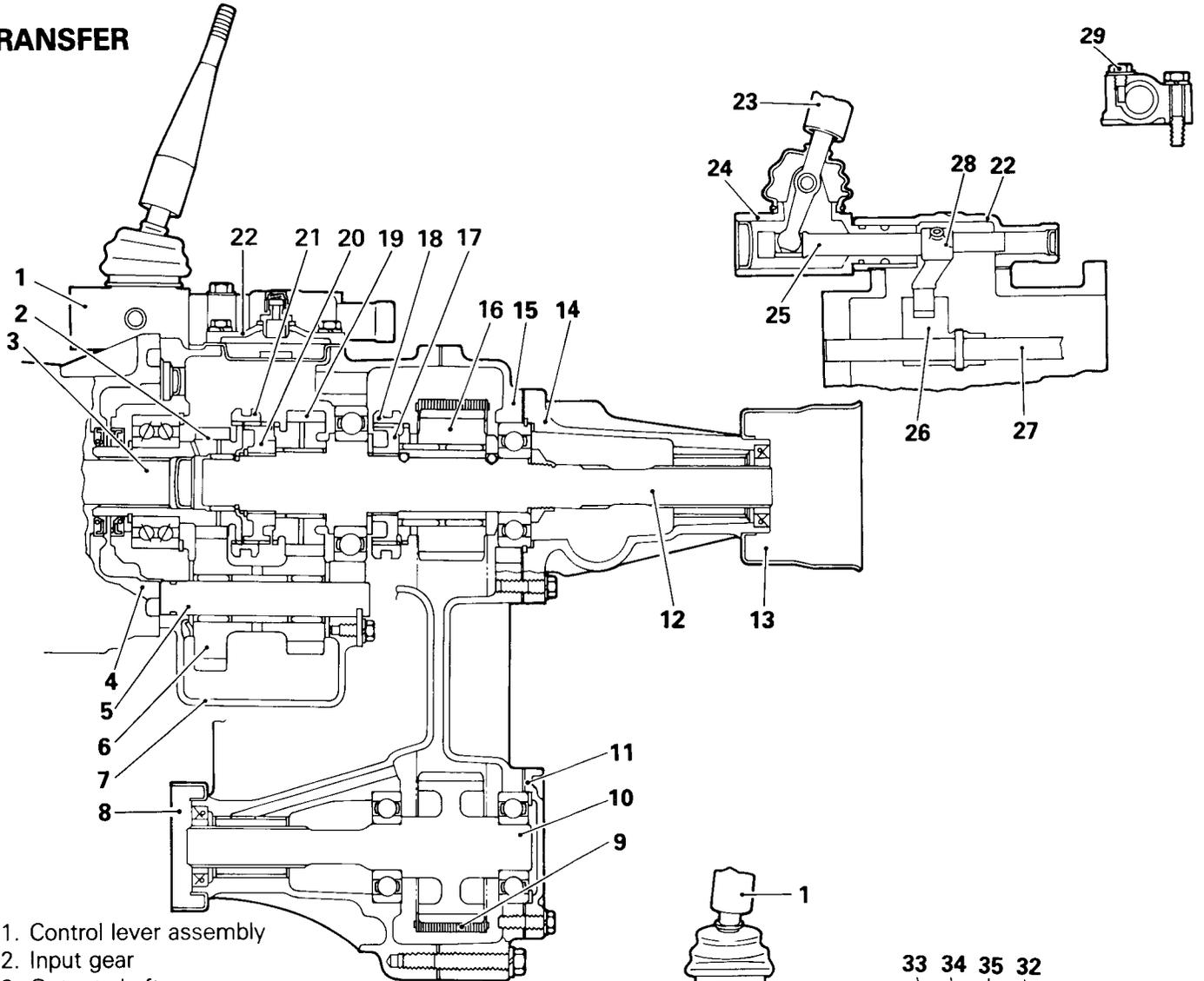
R (REVERSE)



- Line pressure
- Detent regulator pressure, Intermediate modulator pressure, Low coast modulator pressure
- Throttle pressure
- Cut back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

R (REVERSE)

TRANSFER



- 1. Control lever assembly
- 2. Input gear
- 3. Output shaft
- 4. Adapter
- 5. Counter gear shaft
- 6. Counter gear
- 7. Transfer case
- 8. Dust seal guard
- 9. Chain
- 10. Front output shaft
- 11. Cover
- 12. Rear output shaft
- 13. Dust seal guard

- 14. Rear cover
- 15. Chain cover
- 16. Drive sprocket

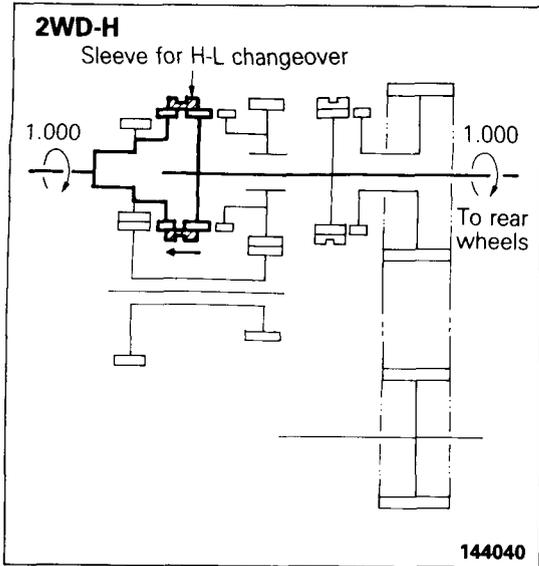
- 17. Clutch hub (2-4WD)
- 18. Clutch sleeve (2-4WD)
- 19. Low speed gear
- 20. Clutch hub (for H-L)
- 21. Clutch sleeve (for H-L)

- 22. Control housing
- 23. Control lever
- 24. Control sleeve
- 25. Control shaft
- 26. Shift lug (2-4WD)

- 27. Shift rail (2-4WD)
- 28. Control finger
- 29. Set screw
- 30. Shift fork (2-4WD)
- 31. Oil guide

- 32. Shift rail (H-L)
- 33. Shift fork (H-L)
- 34. Control housing cover
- 35. Vent plug
- 36. Select plunger

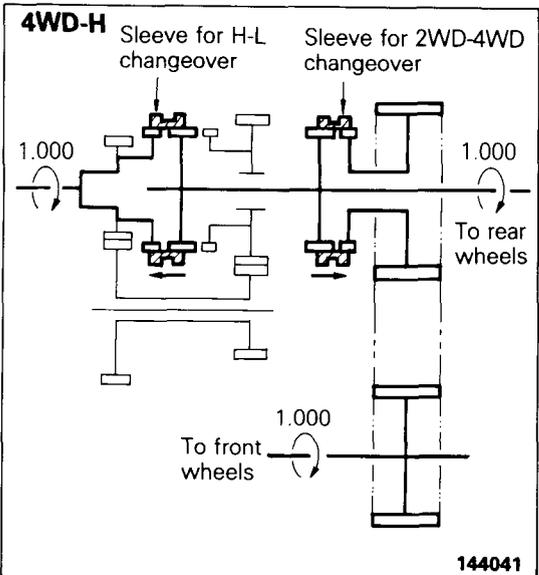
148001
148002
148003
148004



POWER FLOW

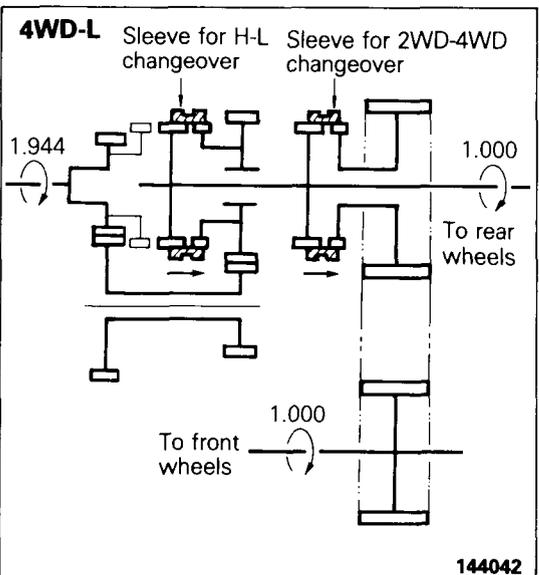
2WD-H

When the H-L selector sleeve is shifted forward and engaged with the clutch gear of input gear, the input gear is directly coupled to the rear output shaft, thus transmitting power to the rear wheels. This is the power transmission of 2WD-H, which involves no other gears, making for quiet driving.



4WD-H

When the 2WD-4WD selector sleeve is shifted to the rear and in mesh with the clutch gear of the drive sprocket, power is transmitted from the drive sprocket to the front output shaft via the chain, thus driving the front wheels. If the H-L selector sleeve is in the forward position at the time, the mode is 4WD-H.



4WD-L

When the H-L selector sleeve is shifted toward rear, power is imparted from the input gear to counter gear and to low speed gear and the rear and front wheels are driven by the rear and front output shaft, respectively. This mode is 4WD-L.

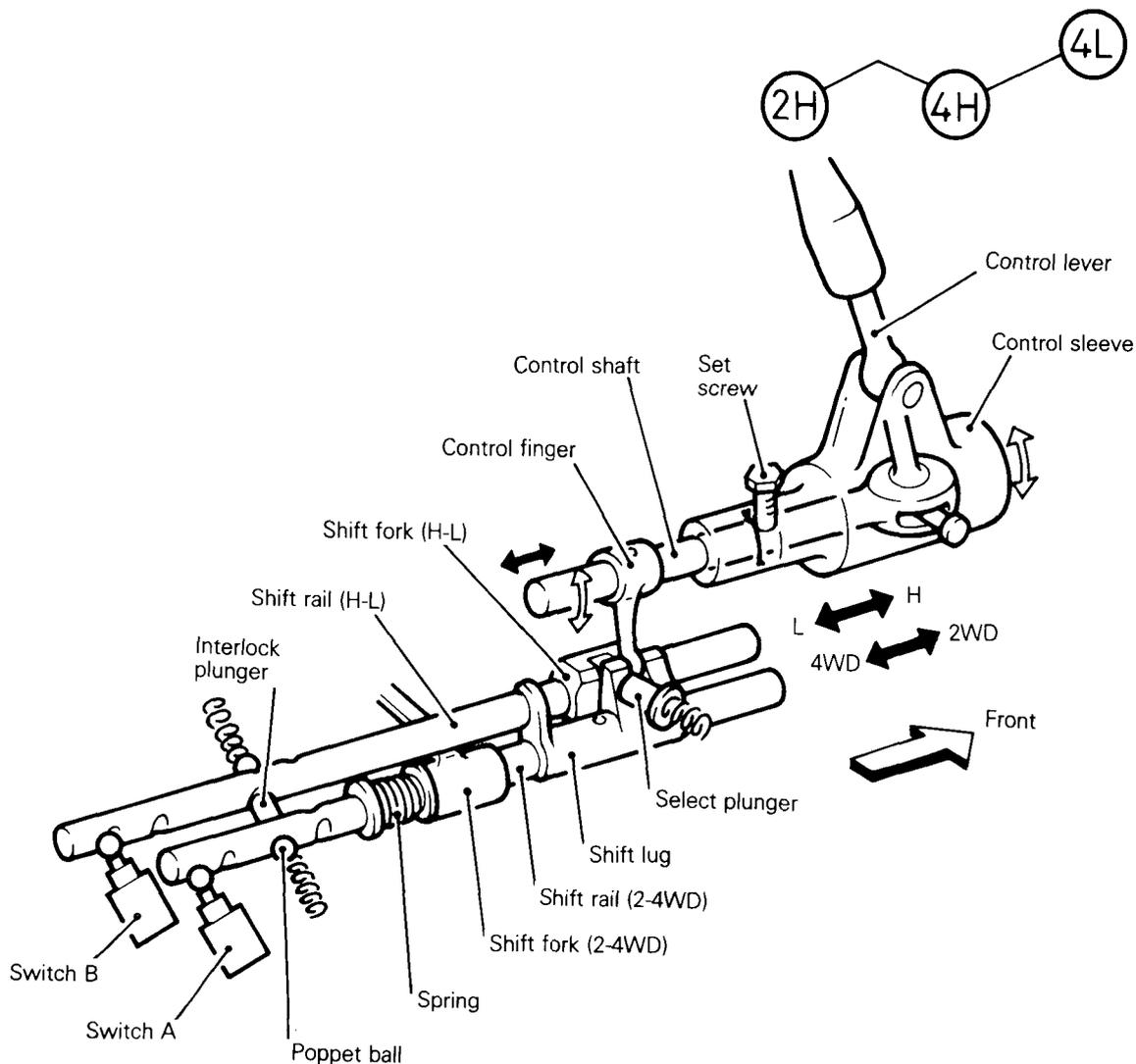
TRANSFER CONTROL MECHANISM

The transfer control mechanism employs the floor shift control as in manual transmission model. As shown below, the mechanism uses the control lever, shift rails, shift forks, and related parts to provide a direct-change control. The only difference from that of the manual transmission models is the control lever. With the introduction of four-speed automatic transmission model, the position of the transfer has to be moved backward as compared with the conventional manual transmission-4WD model. To locate the control lever in the same position as before, the control sleeve and shaft are used and, as a result, the lever is now located ahead the transfer.

H-L Shift Mechanism

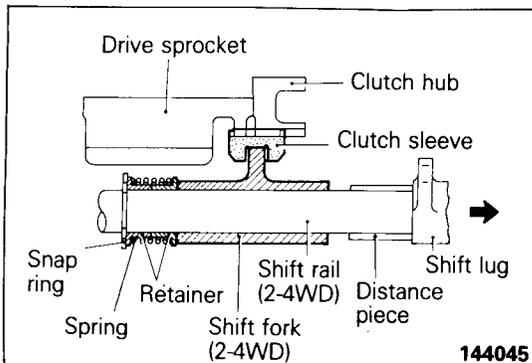
A shift fork with a shift lug is used to directly operate the H-L selector clutch sleeve according to the movement of the control finger interlocking the control lever.

The shift rail is secured to the shift fork with a spring pin. Provided on the rear end of rail are the dents for interlock, poppet, and 4WD indicator light switch ON-OFF.

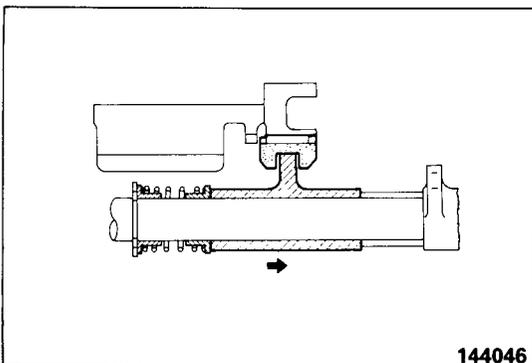


2WD-4WD Shift Mechanism

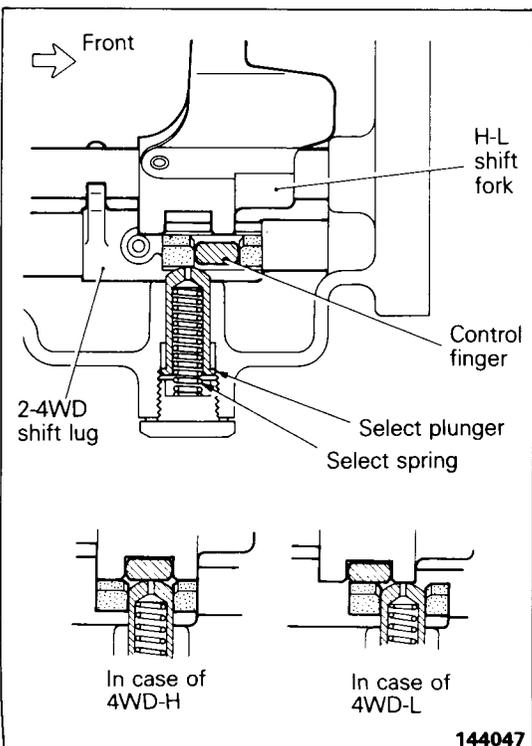
In the 2WD-4WD shift mechanism, the shift lug and shift fork are separate. The shift lug is fastened to the shift rail with a spring pin, while the shift fork is not secured but can slide over the shift rail, which ensures smooth shifting from 4WD-H into 2WD-H.



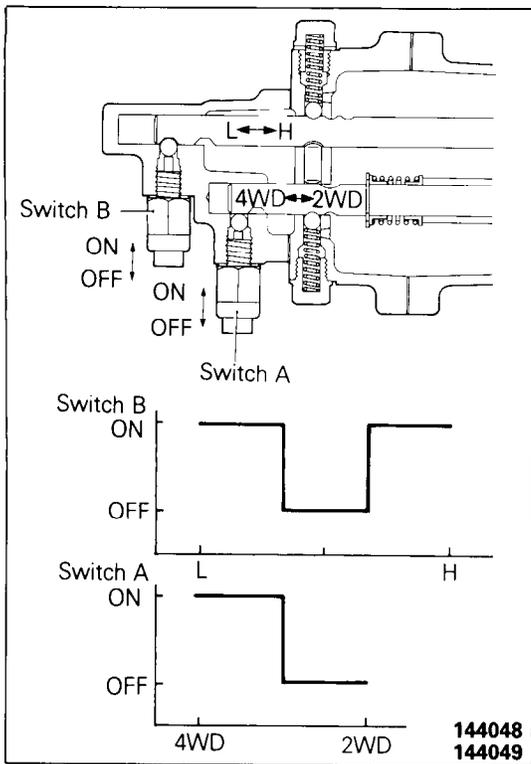
When shifting into 2WD-H while the vehicle is in motion in 4WD-H mode, the clutch hub and drive sprocket clutch gear tend to encounter torque in the rotating direction, impeding the clutch sleeve's sliding motion. In such cases, the shift rail is first shifted to the 2WD-H position, the shift fork and clutch sleeve being in the 4WD position.



As the vehicle receives road shocks and as torque fluctuates, and when the clutch sleeve gets loose on the clutch hub and drive sprocket, the shift fork is shifted by the spring force into 2WD position, allowing the clutch sleeve to be off drive sprocket clutch gear, thus setting 2WD mode.

**Select Plunger**

The select plunger and select spring push the control finger tightly against the H-L shift fork when the control lever is in the 4WD-H position, thereby preventing the lever from oscillating or coming off position. They also provides a resistance when shifting into 2WD-H.



4WD Indicator Light Switch

There are two switches installed that control the 4WD indicator light which tells the driver that the vehicle is in 4WD mode. When shift is made from 2WD-H to 4WD-H or between 4WD-H and 4WD-L, the 4WD indicator light comes on. When shifting from 4WD-H to 4WD-L, or vice versa, the switch B causes the light to go off in the mid shift motion, allowing the driver to know that a selection has been completed.

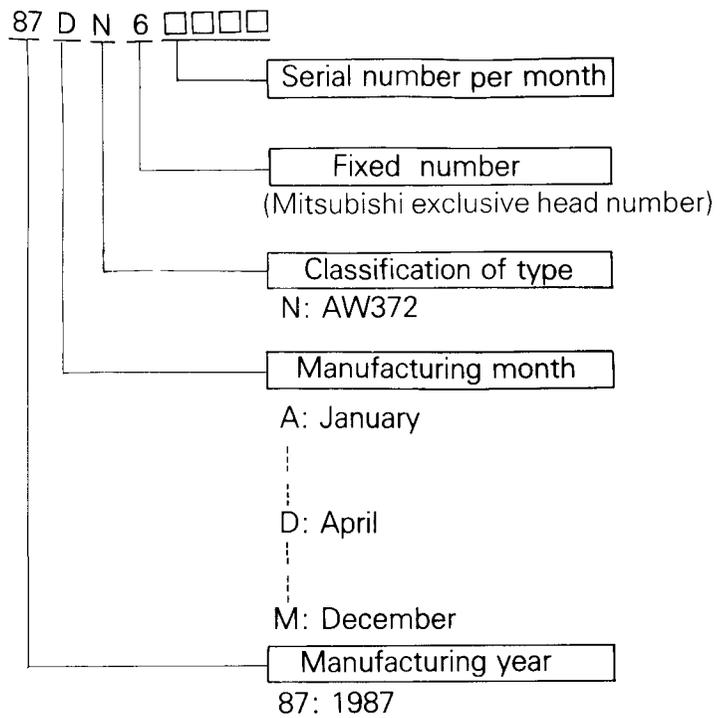
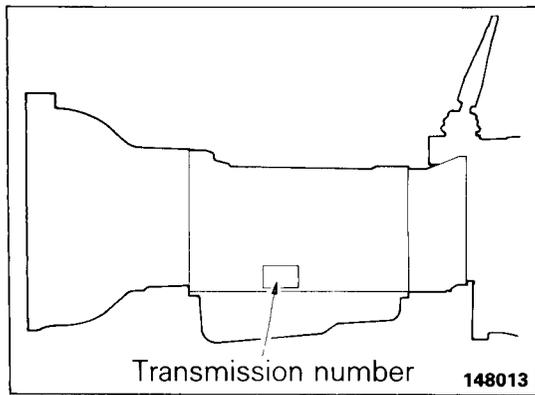
SPECIFICATIONS

GENERAL SPECIFICATIONS

N21CA--

Items	Specifications
Automatic transmission and transfer case model	KM148
Torque converter	
Type	3 elements, 1-step 2-phase system
Stall torque ratio	1.96
One-way clutch	Sprag type
Transmission	
Type	Forward 4 gears, reverse 1 gear, single-line planetary gear and Simpson planetary gear
Control elements	
Clutch	Multiple disc type 3 pairs
Brake	Multiple disc type 4 pairs
One-way clutch	Sprag type 3 pairs
Gear ratios	
1st gear	2.826
2nd gear	1.493
3rd gear	1.000
4th gear	0.688
Reverse	2.703
Shift control method	Floor shift type
Select pattern	P-R-N-D-2-L and overdrive switch
Oil pump	
Type	Gear type
Drive system	Directly coupled to engine via torque converter
Hydraulic control system	Throttle opening and vehicle speed detection
Oil-cooling system	Air-cooled system + water-cooled system oil cooler (secondary cooling method)
Transfer	
Type	Always-engaged type
Shift control method	Single-lever floor-shift type
Shift ratios	
LOW	1.944
HIGH	1.000
Speedometer gear ratio	26/8

TRANSMISSION NUMBER MARKING POSITION AND DESIGNATION



SERVICE SPECIFICATIONS

N21CB--

Items	Specifications
Standard value	
Stall speed rpm	2100–2400
Governor pressure kPa (psi)	
1000 rpm	138–166 (20–24)
2000 rpm	246–284 (36–41)
3200 rpm	402–460 (59–66)
Line pressure kPa (psi)	
“D” range	
When idling	452–529 (66–76)
During stall	991–1166 (144–169)
“R” range	
When idling	687–804 (100–116)
During stall	1471–1863 (214–270)
Input shaft end play mm (in.)	0.3–0.9 (.012–.035)
Overdrive brake clearance mm (in.)	0.35–1.6 (.0143–.062)
Overdrive clutch return spring	
Free length mm (in.)	14.9 (.587)
Overdrive brake return spring	
Free length mm (in.)	16.1 (.634)
Sleeve and selector lever clearance	15.2–15.9 (.60–.62)
Transfer	
H-L clutch hub end play mm (in.)	0–0.08 (0–.003)
Input gear bearing end play mm (in.)	0–0.06 (0–.002)
Input gear end play mm (in.)	0–0.06 (0–.002)
Limit	
Overdrive clutch return spring	
Free length mm (in.)	14.5 (.571)
Overdrive brake return spring	
Free length mm (in.)	15.7 (.618)

TORQUE SPECIFICATIONS

N21CC--

Items	Nm	ft.lbs.
Transmission		
Converter housing installation bolt		
10 mm (.39 in.) dia. bolt	27-42	20-30
12 mm (.47 in.) dia. bolt	48-68	35-49
Oil pump assembly installation bolt	18-25	13-18
Oil pump body and cover-tightening bolt	6-9	4.3-6.5
Center support installation bolt	24-28	17-20
Adapter installation bolt	27-42	20-30
Cover plate installation screw	6-9	4.3-6.5
All bolts of valve body	5-6	3.6-4.3
Throttle cam installation bolt	6-9	4.3-6.5
Valve body assembly installation bolt	8-12	5.8-9
Oil screen installation bolt	5-6	3.6-4.3
Parking cam plate installation bolt	6-9	4.3-6.5
Oil pan installation bolt	4-5	2.9-3.6
Union	20-30	14-22
Elbow connector	20-30	14-22
Plug (for hydraulic test)	6-9	4.3-6.5
Oil pan drain plug	18-23	13-17
Overdrive solenoid valve installation bolt	10-16	7-12
Plug	10-16	7-12
Manual lever installation nut	14-18	10-13
Transmission control rod (B) to pin	10-13	7-9
Cross shaft bracket (A) to body	10-13	7-9
Transmission control arm to bracket	18-24	13-17
Transmission oil cooler eye bolts	30-35	22-25
Oil filler tube to transmission	20-27	14-20
Rear propeller shaft to rear differential	50-60	36-43
Front exhaust pipe mounting bolt	20-30	15-22
Bell housing cover to transmission	10-12	7-9
No. 2 crossmember to body	55-75	40-54
Rear engine support member to body	10-13	7-9
No. 2 crossmember to transmission	18-25	13-18
Transmission to starter motor	43-55	31-40
Transmission to engine A, B	43-55	31-40
D	20-27	14-20
Torque converter to drive plate	35-42	25-30
Selector handle mounting screw	2	0.4
Transmission oil cooler tube flare nut	40-50	29-36

Items	Nm	ft.lbs.
Transfer		
Transfer case installation bolt	30-42	22-30
Transfer case installation nut	30-42	22-30
Chain cover bolt	31-42	22-30
Side cover bolt	8-10	5.8-7
Rear cover bolt	15-22	11-16
Cover bolt	15-22	11-16
Control housing bolt	15-22	11-16
Oil filler plug	30-35	22-25
Drain plug	30-35	22-25
Select plug	30-35	22-25
Locking plate bolt	15 22	11-16
Rear output shaft lock nut	100-130	72-94
Speedometer sleeve clamp bolt	1.5-2.2	1.1-1.6
Seal plug	30-42	22-30
4WD switch	30	22
Control shaft set screw	8-10	5.8-7
Control lever assembly to control housing	8-10	5.8-7
Front propeller shaft to front differential	50-60	36-43
Transfer mounting bracket to transfer	18-25	13-18
Transfer mounting bracket to pipe	30-42	22-29

LUBRICANTS

N21CD--

Items	Specified lubricants	Quantity
Automatic transmission fluid	Automatic transmission fluid "DEXRON II" type	Approx. 7.2 lit. (15.2 U.S. pints, 12.7 Imp. pints)
Transfer oil	MOPAR Hypoid Gear Oil Part No. 3744994 or equivalent	Approx. 2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Propeller shaft oil seal lip	MOPAR Multi-Mileage lubricant Part No. 2525035 or equivalent	Small quantity
Transmission control sliding part	MOPAR Multi-Mileage Lubricant Part No. 2525035 or equivalent	Small quantity
Transfer control lever assembly O-ring	MOPAR Hypoid Gear Oil Part No. 3744994 or equivalent	Small quantity

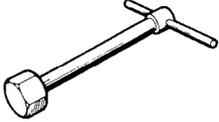
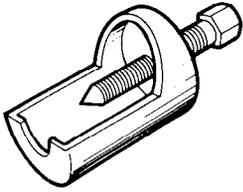
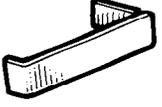
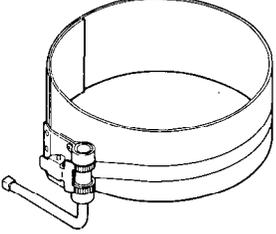
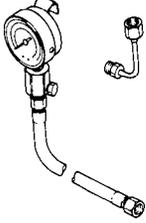
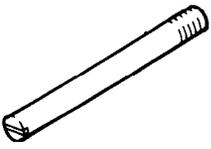
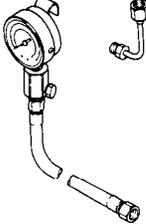
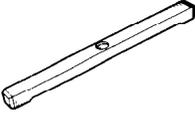
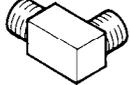
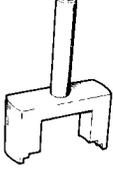
SEALANTS AND ADHESIVES

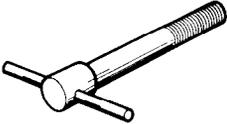
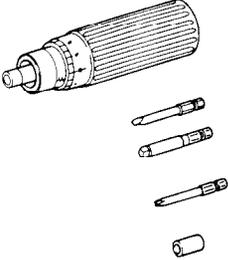
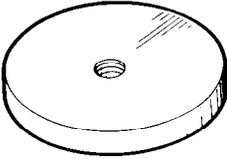
N21CE--

Items	Specified sealants and adhesives	Quantity
Oil pump installation bolt (threads)	SH 780 (TORAY SILICONE)	as required
Adaptor gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Air breather (press-in circumference)	MOPAR Part No. 4318025 or equivalent	as required
Chain cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Rear cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Cover gasket (both sides)	MOPAR Part No. 4318025 or equivalent	as required
Control housing gasket (cover side surface only)	MOPAR Part No. 4318025 or equivalent	as required
Bolt (threads)	3M Adhesive Nut Locking 4171 or equivalent	as required
Speedometer cable grommet	MOPAR Part No. 4318025 or equivalent	as required

SPECIAL TOOLS

N21DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998218 Wrench 	Inspection of torque converter	MD998212 Oil pump puller 	Removal of oil pump
MD998219 Stopper 	Inspection of torque converter	MD998335 Oil pump band 	Assembly of oil pump
MD998330 (includes MD998331) Oil pressure gage (3000 kPa) (427 psi) 	Measurement of oil pressure	MD998412 Guide 	Installation of oil pump
MD999563 (includes MD998331) Oil pressure gage (1000 kPa) (142 psi) 	Measurement of oil pressure	MD998217 Gage 	Check of quality of assembly condition
MD998206 Adapter 	Connection of oil pressure gage	MD998207 Spring compressor 	Disassembly and assembly of clutch and brake

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998210 Bolt 	Disassembly and assembly of No. 3 brake spring	MD998353 Torque driver set 	Tightening of valve body screw
MD998211 Retainer 	Disassembly and assembly of No. 3 brake spring		

TROUBLESHOOTING

N21EBAE

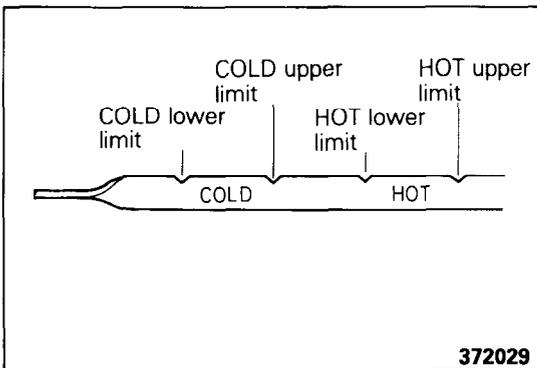
GENERAL

Automatic transmission malfunctions may be caused by the following conditions:

- (1) Improper maintenance and adjustment
- (2) Mechanical malfunctions
- (3) Hydraulic malfunctions
- (4) Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known.

Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.



FLUID LEVEL AND ATF CONDITION

- (1) Place the vehicle on a level surface.
- (2) Before removing the dipstick, wipe all dirt from area around the dipstick.
- (3) With the selector lever in the "P" position and the parking brake applied, start the engine.
- (4) The engine should be running at idle and the transmission should be warmed up sufficiently.
- (5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then, place the lever in the "N" or "P" position.
- (6) Check to see that the fluid level is within the range between "COLD" upper limit and the "HOT" lower limit on the dipstick. If the fluid level is low, top up until the level rises to within the range between the "HOT" lower and upper limits.

Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup.

If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

Along with the fluid level, it is equally important to check condition of fluid. When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.

TORQUE SPECIFICATIONS

N21CC--

Items	Nm	ft.lbs.
Transmission		
Converter housing installation bolt		
10 mm (.39 in.) dia. bolt	27-42	20-30
12 mm (.47 in.) dia. bolt	48-68	35-49
Oil pump assembly installation bolt	18-25	13-18
Oil pump body and cover-tightening bolt	6-9	4.3-6.5
Center support installation bolt	24-28	17-20
Adapter installation bolt	27-42	20-30
Cover plate installation screw	6-9	4.3-6.5
All bolts of valve body	5-6	3.6-4.3
Throttle cam installation bolt	6-9	4.3-6.5
Valve body assembly installation bolt	8-12	5.8-9
Oil screen installation bolt	5-6	3.6-4.3
Parking cam plate installation bolt	6-9	4.3-6.5
Oil pan installation bolt	4-5	2.9-3.6
Union	20-30	14-22
Elbow connector	20-30	14-22
Plug (for hydraulic test)	6-9	4.3-6.5
Oil pan drain plug	18-23	13-17
Overdrive solenoid valve installation bolt	10-16	7-12
Plug	10-16	7-12
Manual lever installation nut	14-18	10-13
Transmission control rod (B) to pin	10-13	7-9
Cross shaft bracket (A) to body	10-13	7-9
Transmission control arm to bracket	18-24	13-17
Transmission oil cooler eye bolts	30-35	22-25
Oil filler tube to transmission	20-27	14-20
Rear propeller shaft to rear differential	50-60	36-43
Front exhaust pipe mounting bolt	20-30	15-22
Bell housing cover to transmission	10-12	7-9
No. 2 crossmember to body	55-75	40-54
Rear engine support member to body	10-13	7-9
No. 2 crossmember to transmission	18-25	13-18
Transmission to starter motor	43-55	31-40
Transmission to engine		
A, B	43-55	31-40
D	20-27	14-20
Torque converter to drive plate	35-42	25-30
Selector handle mounting screw	2	0.4
Transmission oil cooler tube flare nut	40-50	29-36

Items	Nm	ft.lbs.
Transfer		
Transfer case installation bolt	30–42	22–30
Transfer case installation nut	30–42	22–30
Chain cover bolt	31–42	22–30
Side cover bolt	8–10	5.8–7
Rear cover bolt	15–22	11–16
Cover bolt	15–22	11–16
Control housing bolt	15–22	11–16
Oil filler plug	30–35	22–25
Drain plug	30–35	22–25
Select plug	30–35	22–25
Locking plate bolt	15–22	11–16
Rear output shaft lock nut	100–130	72–94
Speedometer sleeve clamp bolt	1.5–2.2	1.1–1.6
Seal plug	30–42	22–30
4WD switch	30	22
Control shaft set screw	8–10	5.8–7
Control lever assembly to control housing	8–10	5.8–7
Front propeller shaft to front differential	50–60	36–43
Transfer mounting bracket to transfer	18–25	13–18
Transfer mounting bracket to pipe	30–42	22–29

LUBRICANTS

N21CD--

Items	Specified lubricants	Quantity
Automatic transmission fluid	Automatic transmission fluid "DEXRON II" type	Approx. 7.2 lit. (15.2 U.S. pints, 12.7 Imp. pints)
Transfer oil	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W or 75W-85W	Approx. 2.2 lit. (4.7 U.S. pints, 3.9 Imp. pints)
Propeller shaft oil seal lip	Multipurpose grease SAE J310, NLGI No. 2	Small quantity
Transmission control sliding part	Multipurpose grease SAE J310, NLGI No. 2	Small quantity
Transfer control lever assembly O-ring	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W, 75W-85W	Small quantity

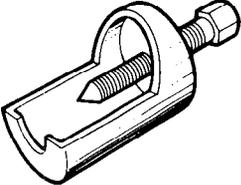
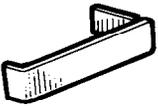
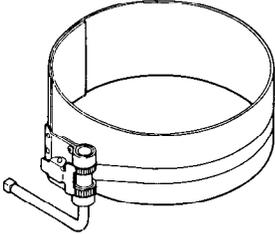
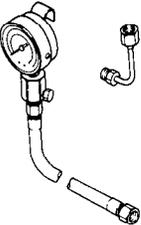
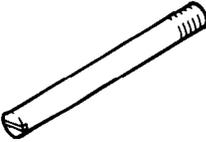
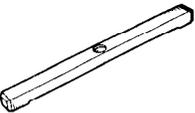
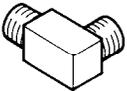
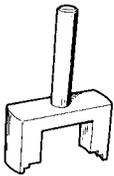
SEALANTS AND ADHESIVES

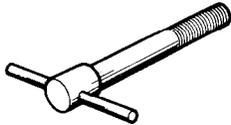
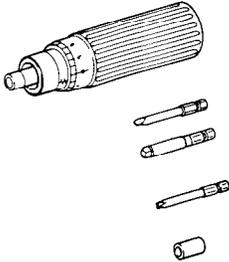
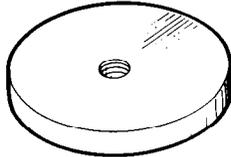
N21CE--

Items	Specified sealants and adhesives	Quantity
Oil pump installation bolt (threads)	SH 780 (TORAY SILICONE)	As required
Adaptor gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Air breather (press-in circumference)	3M ART Part No. 8001 or equivalent	As required
Chain cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Rear cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Cover gasket (both sides)	3M ART Part No. 8001 or equivalent	As required
Control housing gasket (cover side surface only)	3M ART Part No. 8001 or equivalent	As required
Bolt (threads)	3M Adhesive Nut Locking 4171 or equivalent	As required
Speedometer cable grommet	3M ART Part No. 8001 or 8011, or equivalent	As required

SPECIAL TOOLS

N21DA--

Tool (Number and name)	Use	Tool (Number and name)	Use
MD998218 Wrench 	Inspection of torque converter	MD998212 Oil pump puller 	Removal of oil pump
MD998219 Stopper 	Inspection of torque converter	MD998335 Oil pump band 	Assembly of oil pump
MD998330 (includes MD998331) Oil pressure gage (3000 kPa) (427 psi) 	Measurement of oil pressure	MD998412 Guide 	Installation of oil pump
MD999563 (includes MD998331) Oil pressure gage (1000 kPa) (142 psi) 	Measurement of oil pressure	MD998217 Gage 	Check of quality of assembly condition
MD998206 Adapter 	Connection of oil pressure gage	MD998207 Spring compressor 	Disassembly and assembly of clutch and brake

Tool (Number and name)	Use	Tool (Number and name)	Use
<p>MD998210 Bolt</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>	<p>MD998353 Torque driver set</p> 	<p>Tightening of valve body screw</p>
<p>MD998211 Retainer</p> 	<p>Disassembly and assembly of No. 3 brake spring</p>		

TROUBLESHOOTING

N21EBAE

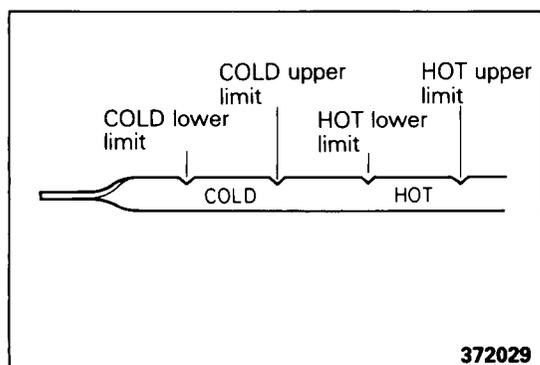
GENERAL

Automatic transmission malfunctions may be caused by the following conditions:

- (1) Improper maintenance and adjustment
- (2) Mechanical malfunctions
- (3) Hydraulic malfunctions
- (4) Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known.

Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.



FLUID LEVEL AND ATF CONDITION

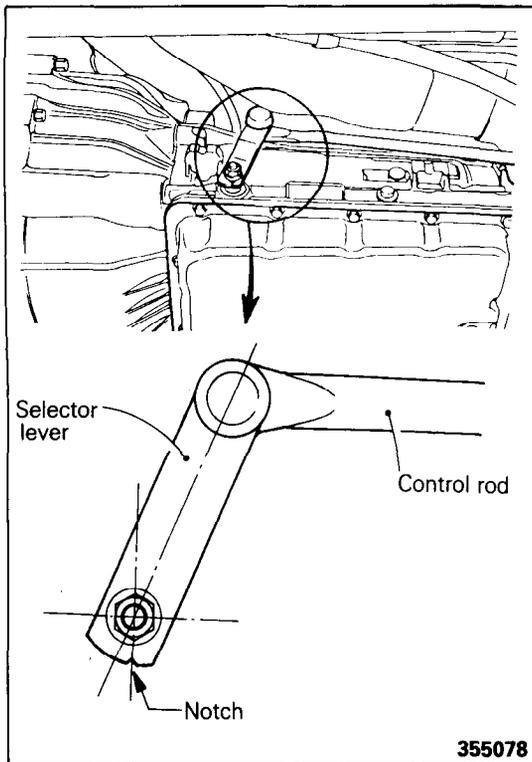
- (1) Place the vehicle on a level surface.
- (2) Before removing the dipstick, wipe all dirt from area around the dipstick.
- (3) With the selector lever in the "P" position and the parking brake applied, start the engine.
- (4) The engine should be running at idle and the transmission should be warmed up sufficiently.
- (5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then, place the lever in the "N" or "P" position.
- (6) Check to see that the fluid level is within the range between "COLD" upper limit and the "HOT" lower limit on the dipstick. If the fluid level is low, top up until the level rises to within the range between the "HOT" lower and upper limits.

Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup.

If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

Along with the fluid level, it is equally important to check condition of fluid. When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.



MANUAL LINKAGE

The inhibitor switch is installed on the selector lever. After checking normal operation of this switch, place the selector lever in the "N" position. If the notch of the selector lever on the transmission side faces directly down, the linkage has been adjusted correctly.

THROTTLE CONTROL CABLE

Throttle control cable adjustment is very important to assure normal operation of the transmission. Shift speed control, shift feeling and transmission slip depend greatly on this adjustment.

If the throttle outer cable is set too long (namely, the inner cable is too tight), the throttle valve is already in operating state and consequently, presence of hydraulic pressure higher than specified is suspected. The throttle pressure acts on each shift valve and when upshifting, the governor pressure that counteracts against the throttle pressure is higher than normal. Namely, if the outer cable is set too long, upshift takes place at vehicle speed higher than normal.

On the other hand, if the outer cable is set too short (the inner cable is slack), upshift takes at vehicle speed lower than normal.

INHIBITOR SWITCH

Check to see that the engine starts only when the selector lever is in the "N" or "P" position and that it does not start when the selector lever is in other positions.

SELECTOR LEVER

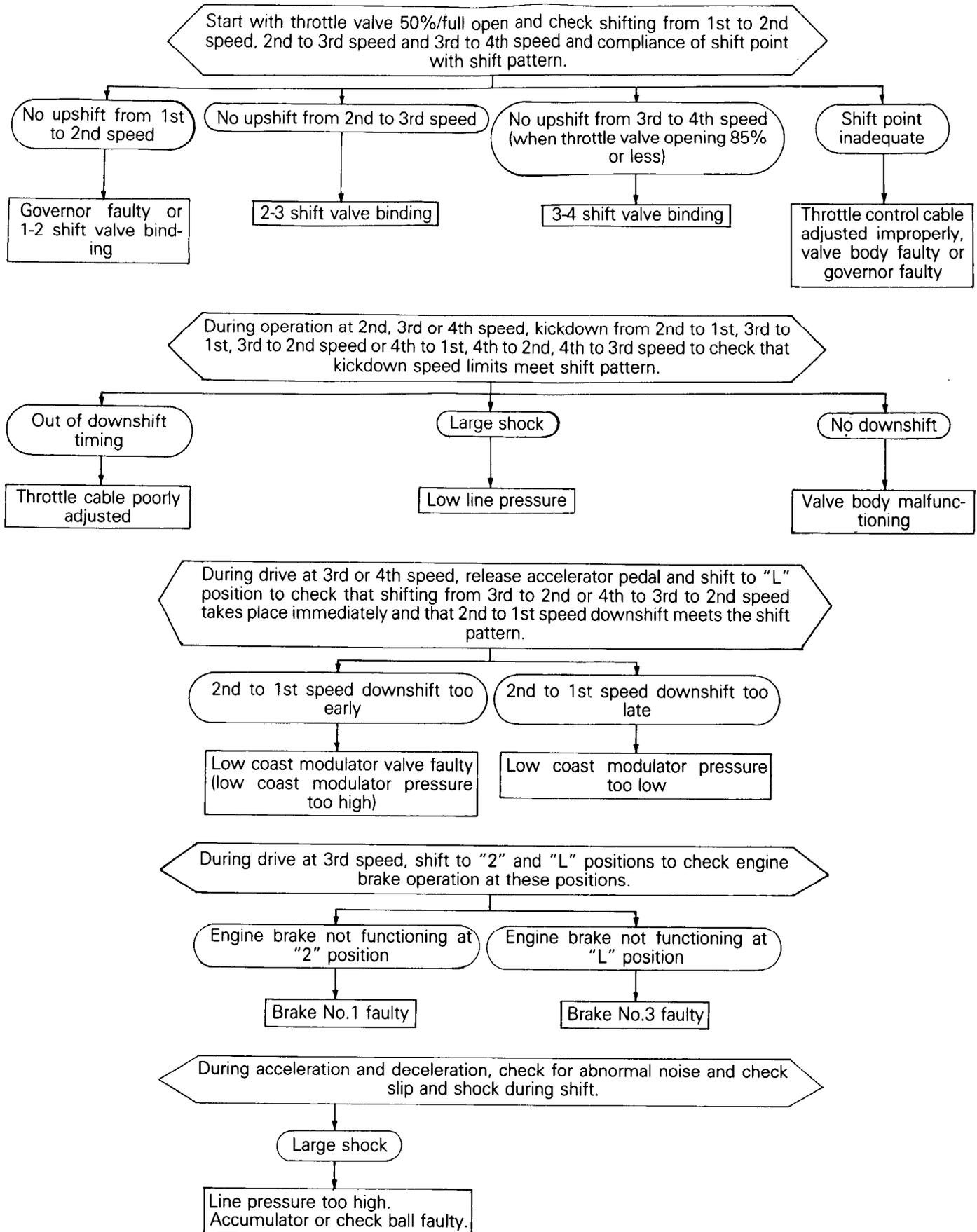
- (1) Check to see that the vehicle moves forward when the selector lever is shifted from the "N" position to the "D" range and that the vehicle reverses when the lever is shifted to the "R" range.
- (2) Stop the engine.
- (3) Shift the selector lever from the "N" position to the "D" range and then to the "2" position to check that the lever can be operated smoothly and engage at each position with reasonable firmness.
- (4) Check to see that shifting to each of the "P", "R", "2" and "L" positions can take place only when the selector lever is pushed in.

ROAD TEST

Prior to performing road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For road test, the transfer must be placed in the 2H (2WD-high) position.

In road test, various changes such as slips in transmission and shifting conditions are checked and hence the transmission operation at each shift position must have been checked.

"D" RANGE TEST



NOTE

Drive at "D" range 3rd speed and check for abnormal noise and vibration. Check carefully as abnormal noise and vibration are sometimes caused by unbalanced propeller shaft, differential, tires, torque converter, engine, etc.

"2" RANGE TEST

- (1) Shift to "2" position and start with throttle valve 50%/full open and check if 1st to 2nd speed upshift point at these throttle openings meets the shift pattern.
- (2) Kickdown at 2nd speed in "2" range to check that 2nd to 1st kickdown speed limits meet shift pattern.
- (3) Check for abnormal noise during acceleration/deceleration and check for shock during up/downshift.

"L" RANGE TEST

- (1) Drive at the "L" range and check that upshift to 2nd speed does not take place.
- (2) Check for abnormal noise during acceleration/deceleration.

"R" RANGE TEST

- (1) Shift to the "R" range and start forward with full throttle to check for slip.
- (2) While the vehicle is running, lightly depress the accelerator pedal to check for slip.

"P" RANGE TEST

With the vehicle parked on a slope (about 5 degrees or steeper), shift to the "P" range and release the parking brake to check to see that the parking brake system functions to keep the vehicle stationary.

CONVERTER STALL TEST

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the "D" or "R" range is measured to check operation of the torque converter, stator and one-way clutch and check holding performance of the transmission clutch (including brake).

Caution

Do not stand in front or at rear of the vehicle during this test.

- (1) Check the transmission fluid level. The fluid temperature should be at the level after normal operation [50 to 80°C (120 to 180°F)]. The engine coolant temperature should also be at the level after normal operation [80 to 90°C (180 to 195°F)].
- (2) Apply checks to the rear wheels (right and left).
- (3) Mount an engine tachometer.
- (4) Apply fully the parking and service brakes.
- (5) Start the engine.
- (6) With the selector lever in the "D" range, fully depress the accelerator pedal and read off the engine maximum speed. When doing so, do not keep the engine running with throttle full open for more than necessary duration (8 seconds or more). If two or more stall tests are needed, place the selector lever in the "N" position and run the engine at about 1,000 rpm to allow the transmission fluid to cool before another stall test.

Standard value : 2100–2400 rpm

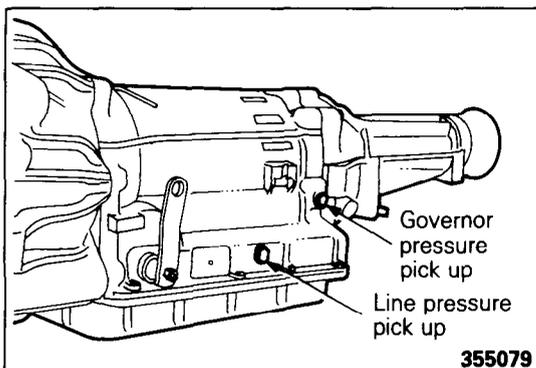
- (7) Place the selector lever in the "R" range and perform the test as above.

Judgement of Stall Test Results

Stall speed in "D" and "R" range is equal to each other but lower than the nominal value.	(1) Engine output is low. (2) Stator one-way clutch is faulty. (Faulty torque converter is suspected if it is lower than nominal by more than 600 rpm.)
Stall speed in "D" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Forward clutch slipping (4) One-way clutch No.2 faulty (5) Low line pressure
Stall speed in "R" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Direct clutch slipping (4) Brake No.3 slipping (5) Low line pressure

Hydraulic pressure testing is one of the most important steps in troubleshooting. These tests usually reveal causes of most transmission problems.

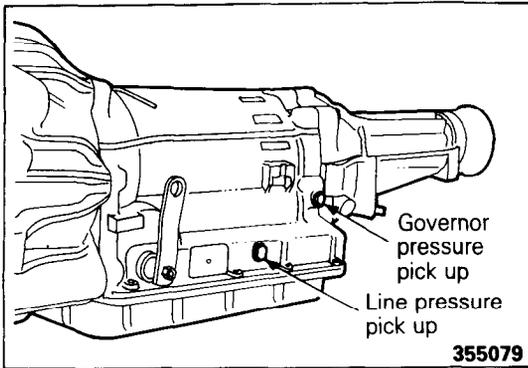
Before performing pressure tests, perform basic checks and adjustment including fluid level and condition check and throttle cable adjustment. Prior to pressure tests, the engine and transmission must have been warmed up enough [engine coolant temperature 80 to 90°C (180 to 195°F)] and the transfer must be at 2H (2WD-High).

**GOVERNOR PRESSURE TEST**

- (1) Place the vehicle on a chassis dynamometer.
- (2) Remove the plug from the governor pressure takeoff port.
- (3) Connect an oil pressure gauge using Adapter MD998206 (special tool) and bring the gauge into the inside of the vehicle.
- (4) Apply the parking brake.
- (5) Start the engine.
- (6) Release the parking brake.
- (7) Place the selector lever in the "D" range and measure the governor pressure.

If the governor pressure is not normal, incorrect line pressure, oil leaks from the governor pressure circuit or faulty governor is suspected.

Output shaft speed	Governor pressure
1000 rpm	138–166 kPa (20–24 psi)
2000 rpm	246–284 kPa (36–41 psi)
3200 rpm	402–460 kPa (59–66 psi)



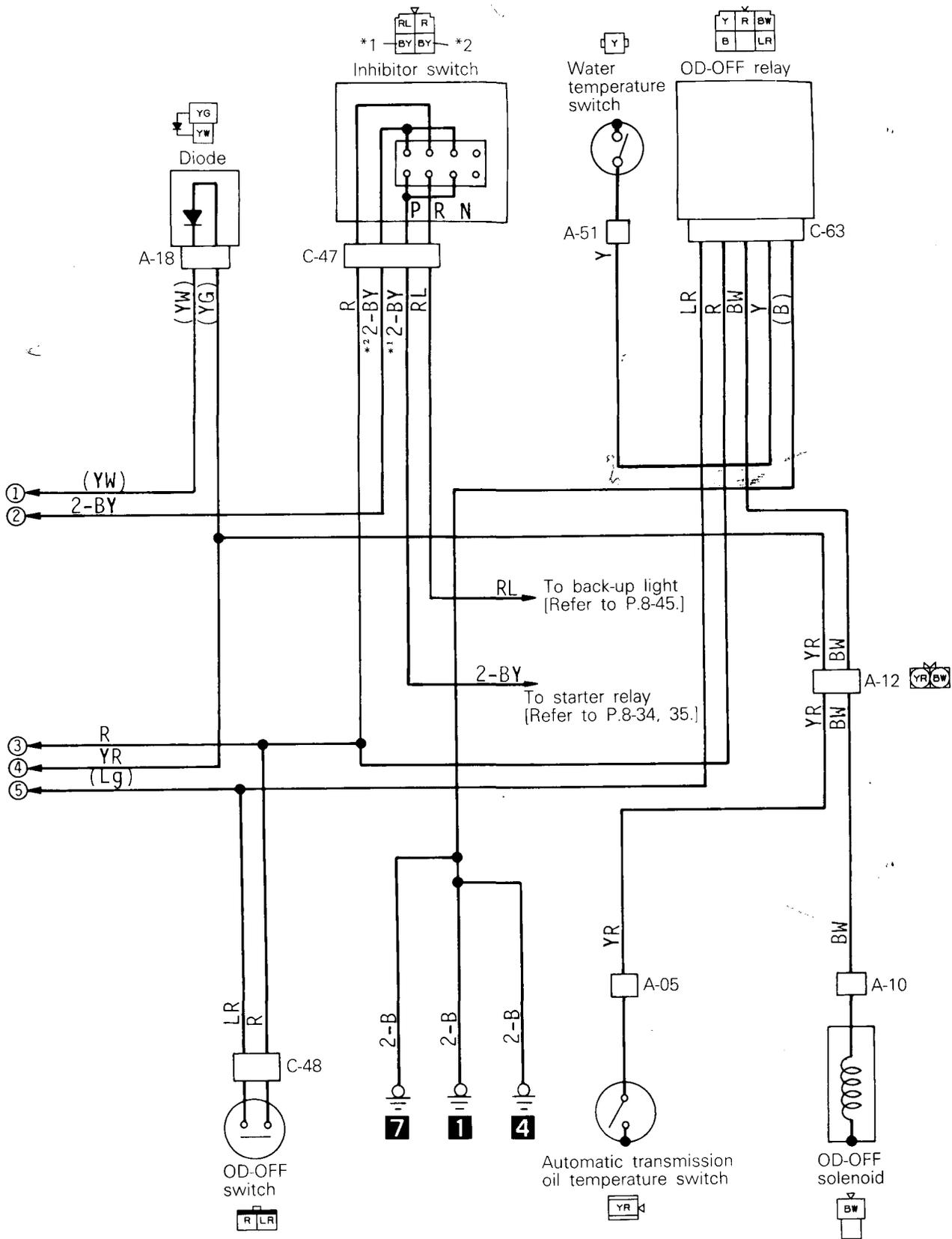
LINE PRESSURE TEST

- (1) Place the vehicle on a chassis dynamometer.
- (2) Remove the plug from the line pressure takeoff port.
- (3) Connect an oil pressure gauge using Adapter MD998206 (special tool) and bring the gauge into the inside of the vehicle.
- (4) Apply the parking brake.
- (5) Start the engine.
- (6) Place the selector lever in the "D" range.
- (7) Depress the brake pedal firmly by the left foot and operates the accelerator pedal by the right foot to measure the line pressure at each engine rpm. If the measured pressure is not nominal, check adjustment of the throttle cable and readjust if necessary before conducting the test again.
- (8) Place the selector lever in the "R" range and test as above.

Standard value	Line pressure	
	"D" range	"R" range
At idle	452–529 kPa 66–76 psi	687–804 kPa 100–116 psi
At stall	991–1166 kPa 144–169 psi	1471–1863 kPa 214–270 psi

Judgement by Line Pressure

Hydraulic pressure higher than nominal in all ranges	(1) Regulator valve faulty (2) Throttle valve faulty (3) Throttle control cable incorrectly adjusted
Hydraulic pressure lower than nominal in all ranges	(1) Oil pump faulty (2) Regulator valve faulty (3) Throttle valve faulty (4) Throttle control cable incorrectly adjusted (5) O.D. clutch faulty
Hydraulic pressure lower than nominal in "D" range	(1) Large fluid leaks in "D" range hydraulic circuit (2) Forward clutch faulty (3) O.D. clutch faulty
Hydraulic pressure lower than nominal in "R" range	(1) Large fluid leaks in "R" range hydraulic circuit (2) Brake No.3 faulty (3) Direct clutch faulty (4) O.D. clutch faulty



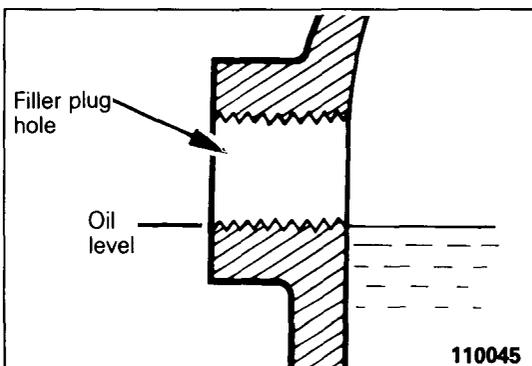
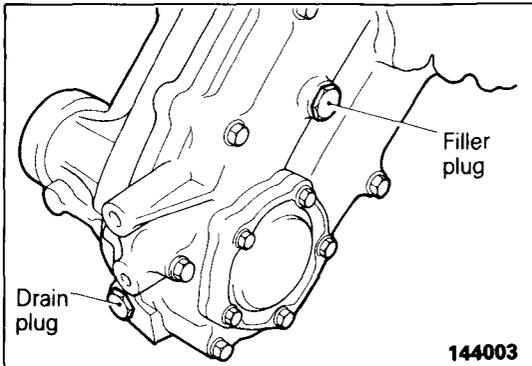
Wiring color code
 B: Black Br: Brown G: Green Gr: Gray L: Blue Lg: Light green
 Ll: Light blue O: Orange P: Pink R: Red Y: Yellow W: White

37W619

SERVICE ADJUSTMENT PROCEDURES

CHECKING TRANSMISSION FLUID LEVEL AND CHANGING FLUID

- (1) Check the fluid level (automatic transmission and transfer case) every year or after 20,000 km (12,500 miles) of operation.
- (2) For the checking procedures of automatic transmission fluid (ATF), see following.
- (3) Check the transfer case oil level with the filler plug removed.



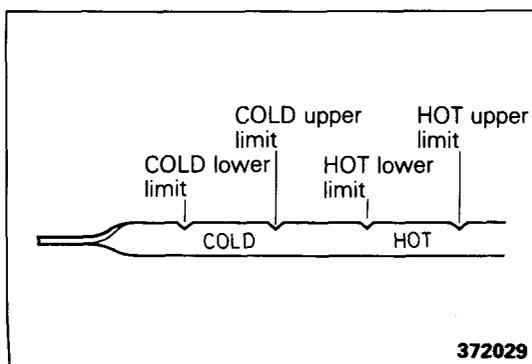
- (4) The fluid level is okay if it is at the same level as the lowest point of the filler plug hole.

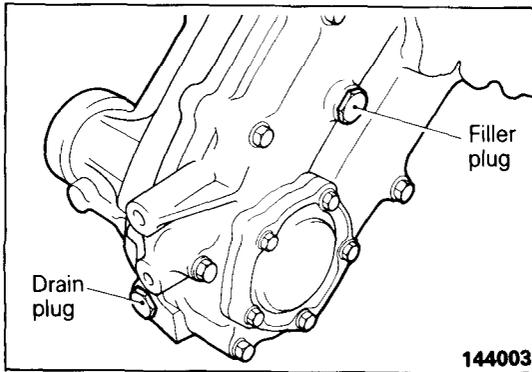
ATF CHANGING PROCEDURES

Caution

If ATF change is required due to damage to the transmission, be sure to clean the cooler system.

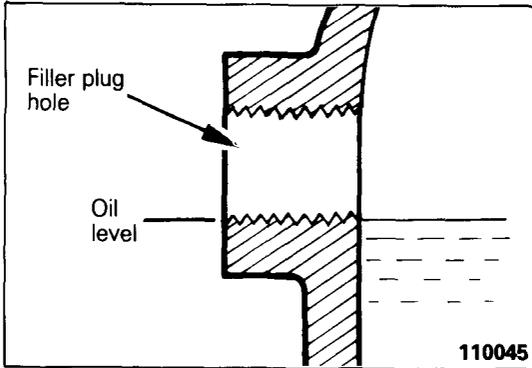
- (1) Raise the vehicle on hoist. Place a drain container with large opening under the drain plug (located in bottom of the oil pan).
- (2) Remove the drain plug to let ATF drain.
- (3) Refit the drain plug and gasket.
- (4) Pour ATF through the oil level gauge hole until its level reaches the COLD lower limit of the level gauge.
- (5) Start the engine and allow to idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever through all positions and finally place in the "N" or "P" position.
- (6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level, which must be between the HOT upper limit and HOT lower limit marks.
- (7) Insert the dipstick fully to prevent dirt from entering the transmission.



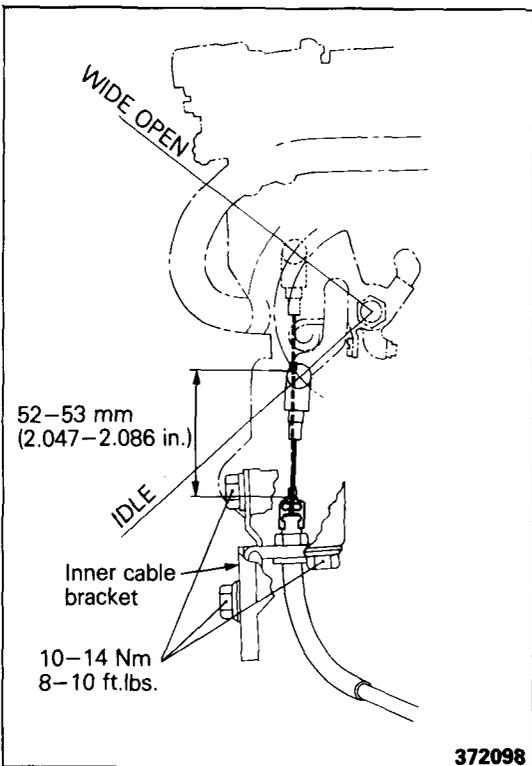


TRANSFER CASE OIL CHANGING PROCEDURES

- (1) Remove the filler plug.
- (2) Place a drain container with large opening under the drain plug.
- (3) Remove the drain plug to let oil drain.
- (4) Refit the drain plug and gasket.



- (5) Pour specified transfer case oil up to specified level.
- (6) Refit the filler plug and gasket.



ADJUSTMENT OF THE THROTTLE CONTROL CABLE

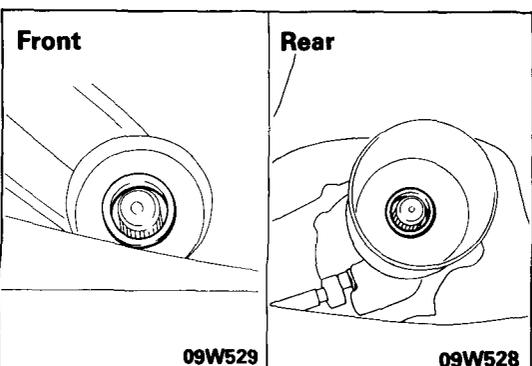
- (1) Check the engine idle adjustment. If necessary, readjust.

Caution

When engine adjustment (idle adjustment) has been performed, always adjust the throttle control cable.

- (2) Make sure that no bending or deformation exists on the carburetor throttle lever and throttle cable bracket.
- (3) Measure the length between the inner cable stopper and the cover end with the carburetor throttle valve full open. If it does not satisfy the standard value, adjust the inner cable bracket moving upward or downward.

Standard value: 52–53 mm (2.047–2.086 in.)



REPLACEMENT OF THE PROPELLER SHAFT OIL SEALS

N21FGAB1

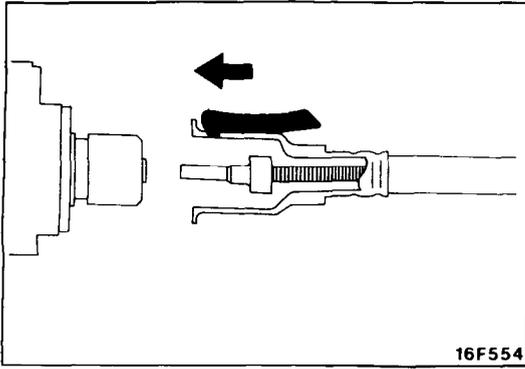
- (1) Using a screwdriver or a similar tool, remove the oil seals.
- (2) Install the oil seals.

Caution

Use a new oil seal.

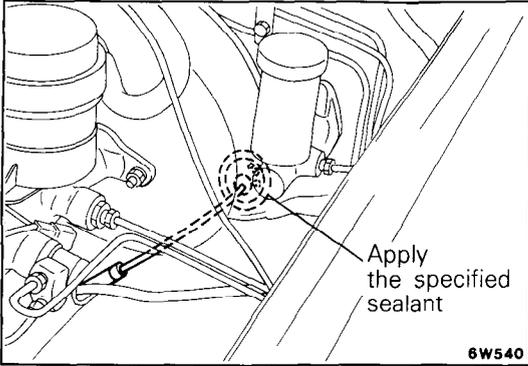
- (3) Apply a coating of the specified grease to the lip of the oil seals.

Specified grease : Multipurpose grease SAE J310, NLGI No. 2



REPLACEMENT OF THE SPEEDOMETER CABLE N21FEAD

- (1) Replace the cable assembly if there is a malfunction.
- (2) When connecting the cable to the meter, insert the cable until its stopper properly fits to the meterside groove.



- (3) After installing the speedometer, pull the speedometer cable through the grommet in the toe-board until the cable marking is visible from the engine compartment side.
- (4) Apply the specified sealant to the outside surface of the grommet.

Specified sealant : 3M ART Part No. 8001 or 8011, or equivalent

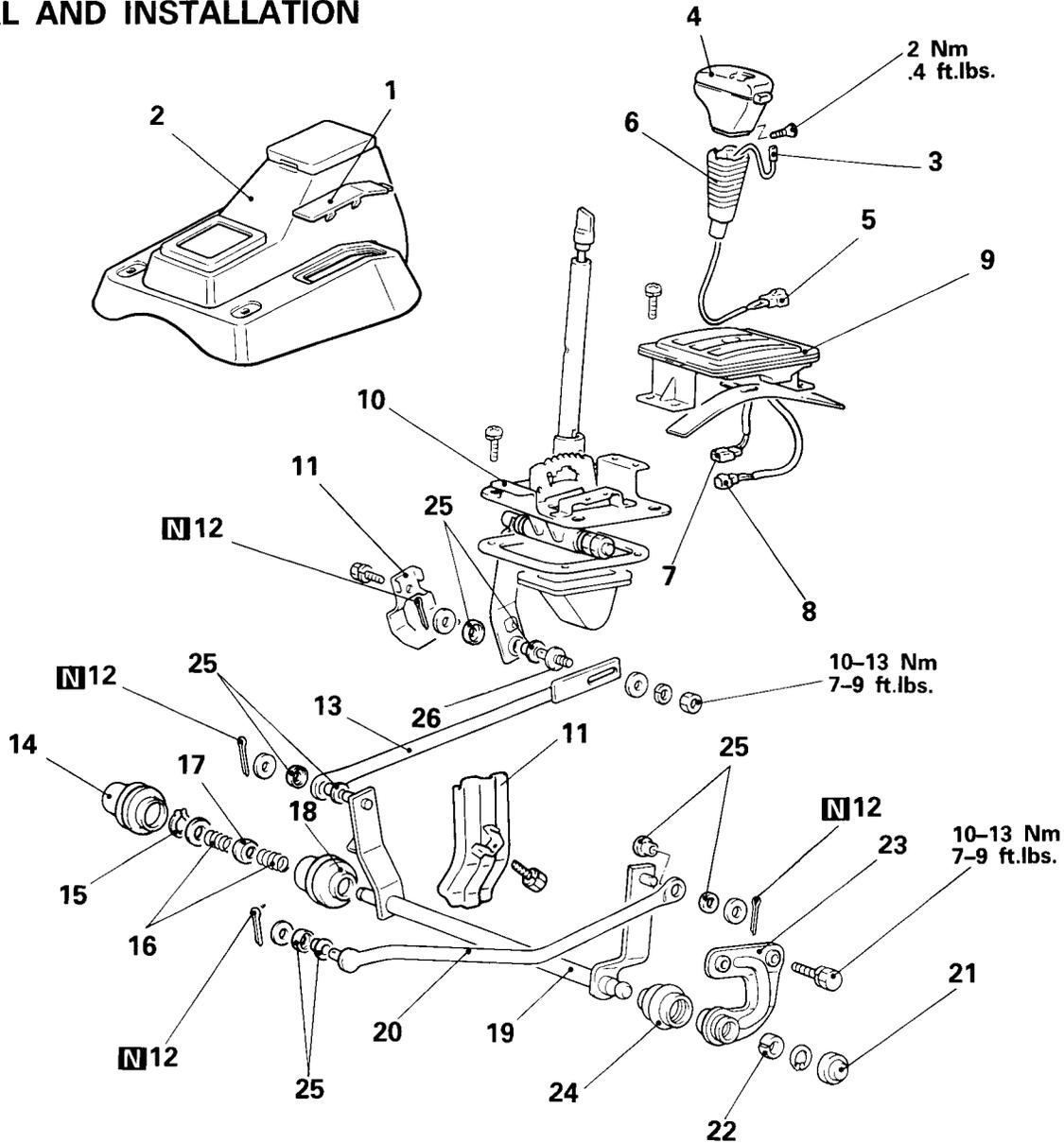
- (5) Securely clamp the transmission side marking (L.H. drive vehicles; green, R.H. drive vehicles; yellow) of speedometer cable to the frame side clip.

Caution

Poor installation of the cable may cause a fluctuating meter pointer, or noise and a damaged harness inside the instrument panel.

**TRANSMISSION CONTROL
REMOVAL AND INSTALLATION**

N211A--

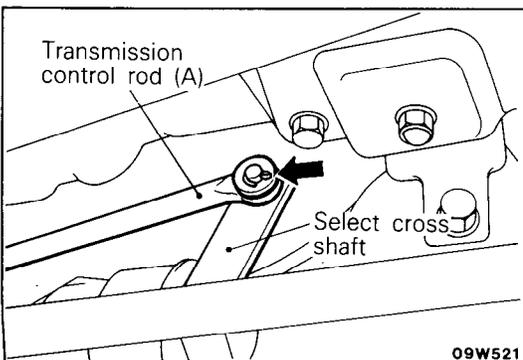
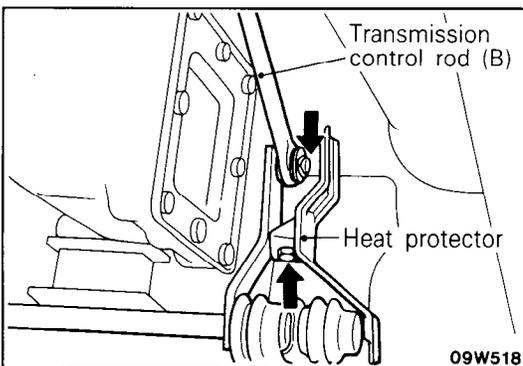
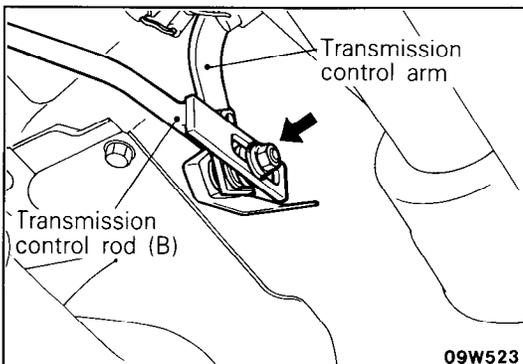
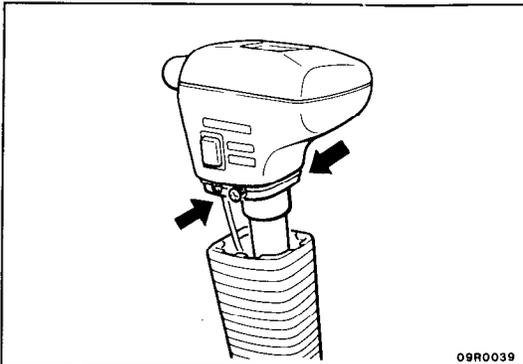
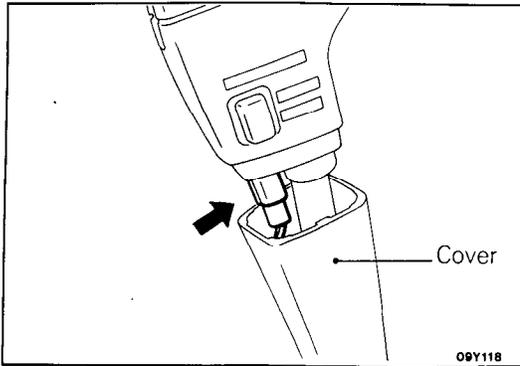


Removal steps

- | | |
|---|--|
| 1. Plate B | 15. Snap ring |
| 2. Floor console | ◆◆ 16. Spring |
| 3. Overdrive switch connection | ◆◆ 17. Cross shaft bushing |
| ◆◆ 4. Selector handle | ◆◆ 18. Cross shaft boot (B) |
| 5. Overdrive switch harness and front wiring harness connection | ◆◆ ◆◆ 19. Select cross shaft |
| 6. Cover | ◆◆ ◆◆ 20. Transmission control rod (A) |
| 7. Inhibitor switch and front wiring harness connection | ◆◆ 21. Cap |
| 8. Position indicator light and front wiring harness connection | ◆◆ 22. Bushing |
| 9. Indicator panel | ◆◆ 23. Cross shaft bracket (A) |
| 10. Bracket assembly | ◆◆ 24. Cross shaft boot |
| 11. Heat protector | ◆◆ 25. Bushing |
| 12. Cotter pin | ◆◆ 26. Pin |
| ◆◆ ◆◆ 13. Transmission control rod (B) | |
| 14. Dust cover | |

NOTE
 (1) Reverse the removal procedures to reinstall.
 (2) ◆◆ : Refer to "Service Points of Removal".
 (3) ◆◆◆◆ : Refer to "Service Points of Installation".
 (4) **N** : Non-reusable parts

09W542

**SERVICE POINTS OF REMOVAL****4. REMOVAL OF SELECTOR HANDLE**

- (1) Press the cover downward.
- (2) Disconnect the overdrive switch connector from the selector handle.

- (3) Remove the selector handle from the shift lever.

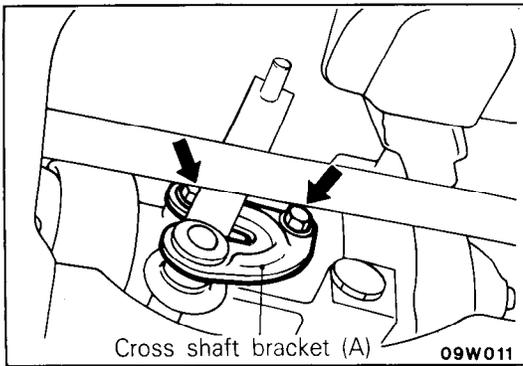
13. DISCONNECTION OF TRANSMISSION CONTROL ROD (B)

- (1) Disconnect the transmission control rod (B) from the transmission control arm by loosening the nut from under the floor.

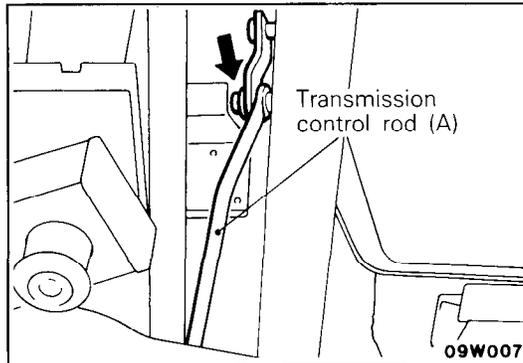
- (2) Disconnect the select cross shaft from the heat protector.
- (3) Disconnect the select cross shaft from transmission control rod B.

19. REMOVAL OF SELECT CROSS SHAFT/20. TRANSMISSION CONTROL ROD (A)

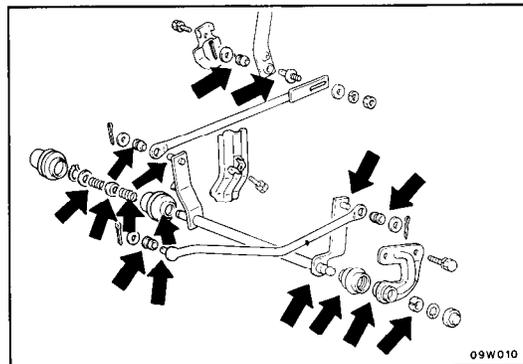
- (1) Disconnect the select cross shaft from transmission control rod A.



- (2) Remove the dust cover, and then remove the snap ring that holds the spring.
- (3) Remove the cross shaft bracket mounting bolts from the transfer assembly.
- (4) Detach the cross shaft bracket from the bracket on the No. 1 crossmember side.



- (5) Remove transmission control rod A from the transmission.



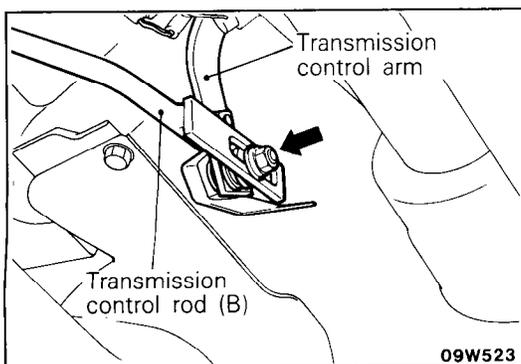
SERVICE POINTS OF INSTALLATION

N21DAH

- 26. APPLICATION OF GREASE TO PIN/25. BUSHING/24. CROSS SHAFT BOOT/23. CROSS SHAFT BRACKET (A)/22. BUSHING/20. TRANSMISSION CONTROL ROD (A)/19. SELECT CROSS SHAFT/18. CROSS SHAFT BOOT (B)/17. CROSS SHAFT BUSHING/16. SPRING**

Apply a coating of the specified grease to the bushing inner surface and the sliding parts shown in the figure.

Specified grease : Multipurpose grease SAE J310, NLGI No. 2

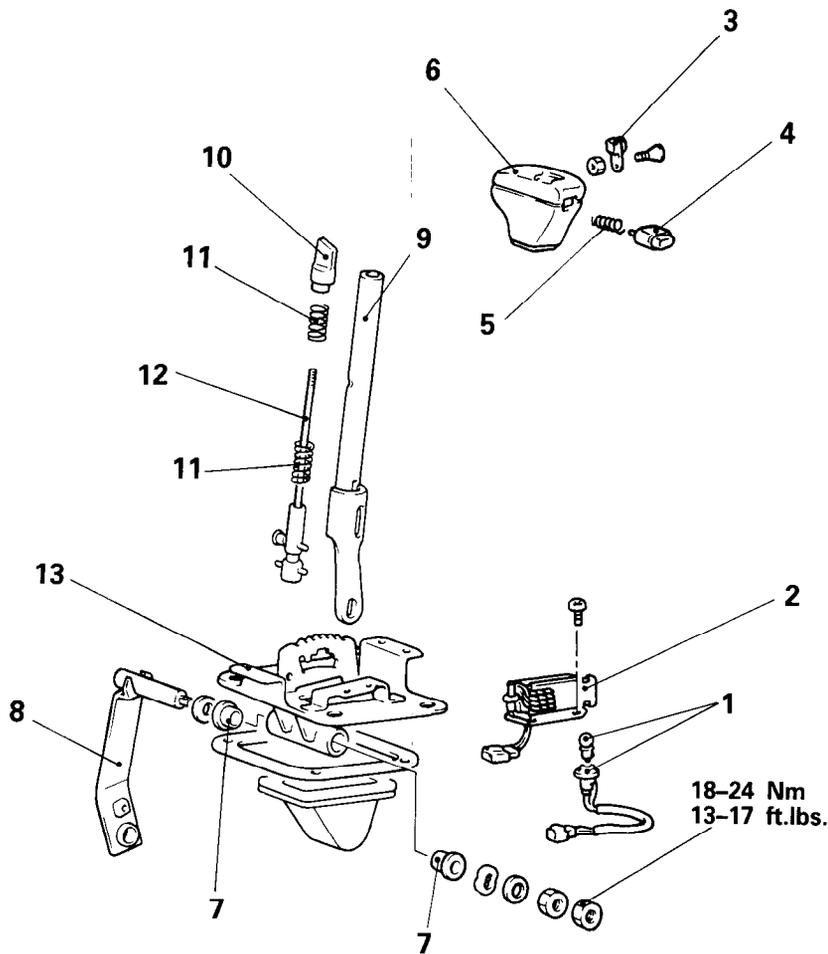


13. INSTALLATION OF TRANSMISSION CONTROL ROD (B)

- (1) Move the transmission and shift lever to the "N" position, and then install the transmission control arm and transmission control rod (B) as shown in the figure.
- (2) Check, while driving, to be sure that the transmission is set to each range when the selector lever is shifted to each position.
- (3) Check, while driving, to be sure that the overdrive is activated and cancelled correctly when the overdrive switch is used.

DISASSEMBLY AND REASSEMBLY

N211E--



09W543

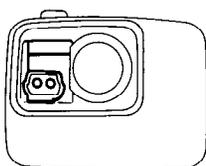
Removal steps

- | | |
|--------------------------------|---------------------|
| ◆◆ 1. Position indicator light | 9. Shift lever |
| ◆◆ 2. Inhibitor switch | ◆◆ 10. Sleeve |
| ◆◆ 3. Overdrive switch | ◆◆ 11. Spring |
| ◆◆ 4. Pushbutton | ◆◆ 12. Rod assembly |
| 5. Spring | 13. Bracket |
| ◆◆ 6. Selector handle | |
| ◆◆ 7. Bushings | |
| ◆◆ 8. Transmission control arm | |

NOTE

- (1) Reverse the disassembly procedures to reassemble.
 (2) ◆◆ : Refer to "Service Points of Reassembly".

Overdrive switch



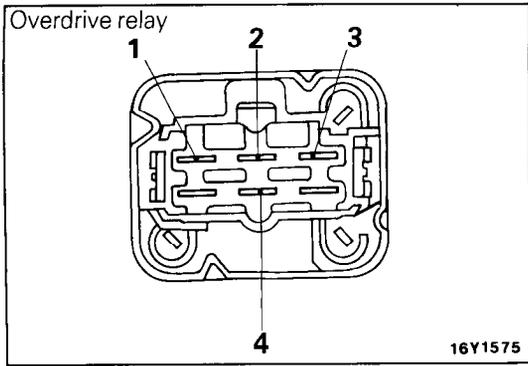
09Y115

INSPECTION

N211GAA

- Check for unusual wear of the bracket's detent plate part.
- Check for unusual wear of the rod end pin.
- Check for unusual wear of the pushbutton and sleeve contact surface.
- Check for unusual wear of each bushing.
- Check for weakness of the spring.
- Check the operation of the overdrive switch. (Check the continuity.)

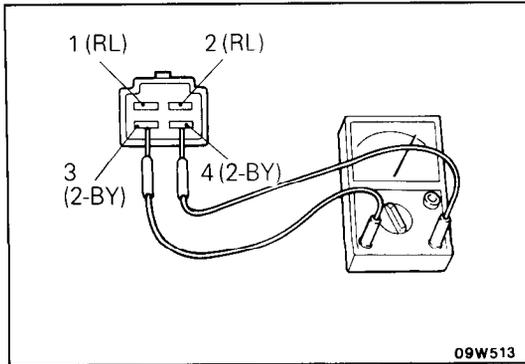
When the overdrive switch is OFF: continuity
 When the overdrive switch is ON: non-continuity



Overdrive relay

Check the continuity between terminals during no current flow and during current flow.

During no current flow	Between terminals 1 and 3	Continuity
	Between terminals 2 and 4	Continuity
During current flow (between terminals 2 and 4)	Between terminals 1 and 3	Non-continuity



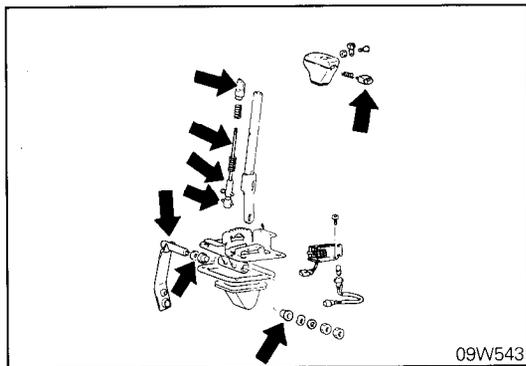
Inhibitor switch

Check the continuity with the select lever at each position.

Select lever position \ Terminals	1	2	3	4
P			○—○	
R	○—○			
N			○—○	○—○

NOTE

○—○ indicates that there is continuity between the terminals.



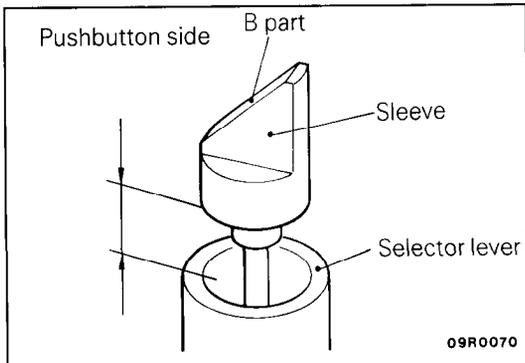
SERVICE POINTS OF REASSEMBLY

N21IHAB

12. APPLICATION OF GREASE TO ROD ASSEMBLY/11. SPRING/10. SLEEVE/8. TRANSMISSION CONTROL ARM/7. BUSHINGS/4. PUSHBUTTON

Apply the specified grease to each sliding part of the lever.

Specified grease : Multipurpose grease SAE J310, NLGI No. 2



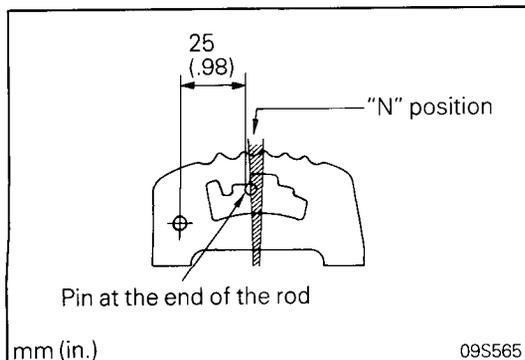
10. INSTALLATION OF SLEEVE

Move the selector lever to the "N" position, and turn the sleeve so that the angled surface of the sleeve is at the pushbutton side. At this time, adjust the clearance between the sleeve and the selector lever so that it is the standard value.

Standard value : 15.2–15.9 mm (.60–.62 in.)

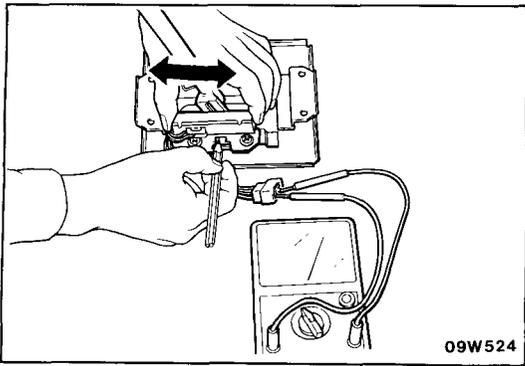
NOTE

Move the B part of the sleeve to the pushbutton side (driver's seat side).

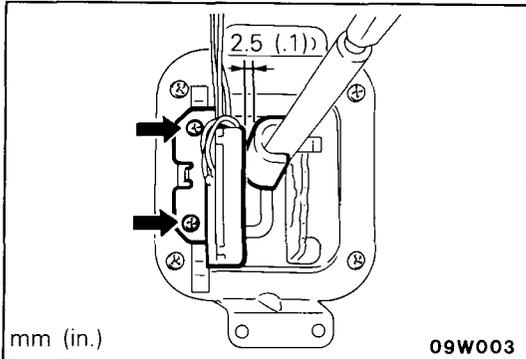


2. INSTALLATION OF INHIBITOR SWITCH

- (1) Temporarily install the inhibitor switch.
- (2) Set the shift lever so that the pin at the end of the rod is at the position shown in the figure.



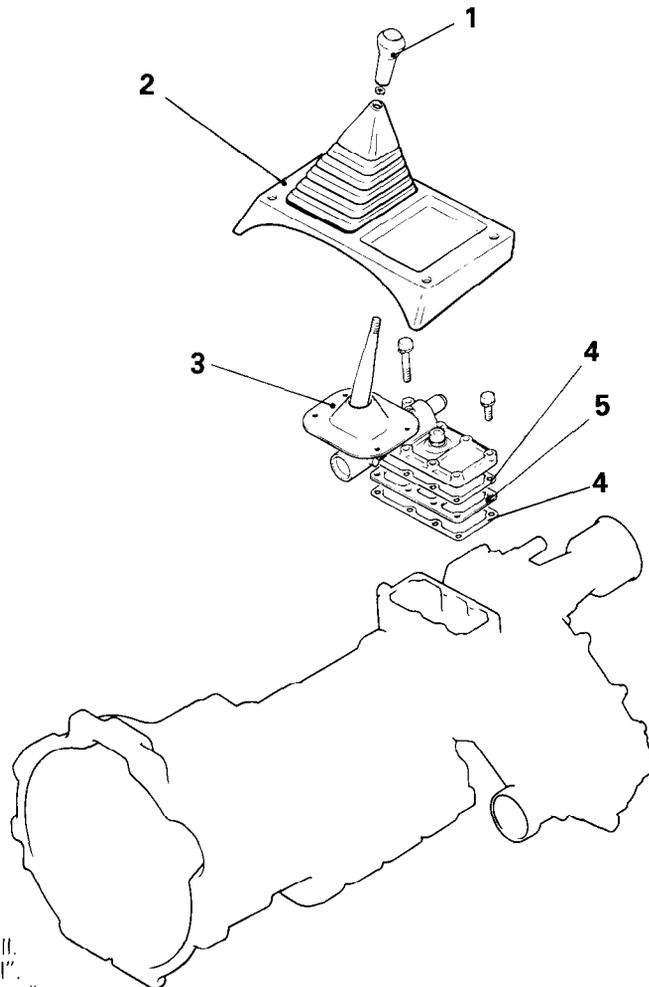
- (3) Using a circuit tester between 2-BY and 2-BY of the inhibitor switch connector, check the continuity when the inhibitor switch is moved back and forth, and mark the bracket.



- (4) Tighten the inhibitor switch mounting screws at the position where the clearance between the inhibitor switch and the selector lever is the specified distance.

**TRANSFER CONTROL
REMOVAL AND INSTALLATION**

N21KA--



Removal steps

- 1. Transfer shift lever knob
- 2. Front floor console
- ◄◄ 3. Control lever assembly
- ◄◄ 4. Control housing gasket
- ◄◄ 5. Control housing cover

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◄◄ : Refer to "Service Points of Removal".
- (3) ◄◄ : Refer to "Service Points of Installation".

09W548

SERVICE POINTS OF REMOVAL

N21KBAA

3. REMOVAL OF CONTROL LEVER ASSEMBLY

Move the control lever to the "2H" position and remove the control lever assembly.

SERVICE POINTS OF INSTALLATION

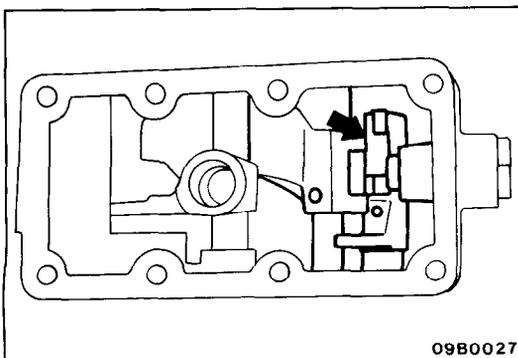
N21KDAA

4. APPLICATION OF SEALANT TO CONTROL HOUSING GASKET

Apply semi-drying sealant to both surfaces of the control housing gasket.

3. INSTALLATION OF CONTROL LEVER ASSEMBLY

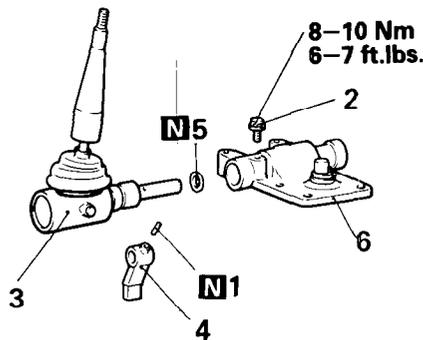
Check to be sure that the control lever assembly installation (transmission side) part is at the position shown in the illustration.



09B0027

DISASSEMBLY AND REASSEMBLY

N21KE--



Disassembly steps

- ◆◆ 1. Spring pin
- ◆◆ 2. Set screw
- ◆◆ 3. Control lever assembly
- ◆◆ 4. Control finger
- ◆◆ 5. O-ring
- ◆◆ 6. Control housing

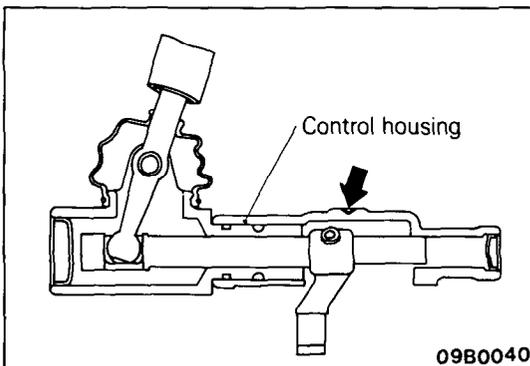
Reassembly steps

- ◆◆ 3. Control lever assembly
- ◆◆ 5. O-ring
- ◆◆ 6. Control housing
- ◆◆ 4. Control finger
- ◆◆ 1. Spring pin
- ◆◆ 2. Set screw

NOTE

- (1)◆◆ : Refer to "Service Points of Disassembly".
 (2)◆◆ : Refer to "Service Points of Reassembly".
 (3)□ : Non-reusable parts

09B0045



09B0040

SERVICE POINTS OF DISASSEMBLY

N21KFAA

1. REMOVAL OF SPRING PIN

- (1) Drill 12 mm (.47 in.) diameter hole in the center of the boss 16 mm (.63 in.) diameter on the control housing not to damage the control finger and control lever assembly.
- (2) Draw out the spring pin using a punch.

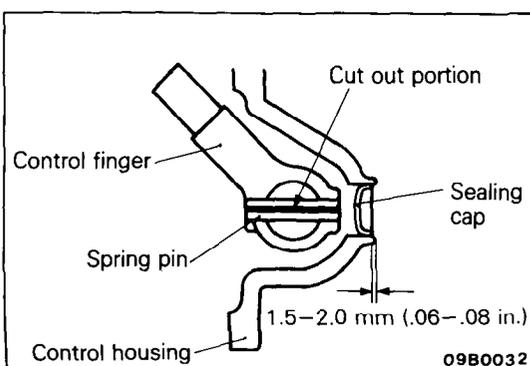
SERVICE POINTS OF REASSEMBLY

N21KHAA

5. APPLICATION OF LUBRICANT TO O-RING

Install the O-ring to the control lever assembly and apply a small amount of the specified oil on the O-ring.

Specified oil : Hypoid Gear Oil API Classification GL-4 or higher SAE viscosity No. 80W, 75W-85W



09B0032

1. INSTALLATION OF SPRING PIN

- (1) Drive the spring pin using a punch so that the cut out portion of the spring pin is in the axial direction of the control lever assembly.
- (2) Apply the sealant in the inner surface of the worked hole and drive the sealing cap up to the dimension shown in the figure.

TRANSMISSION OIL COOLER

REMOVAL AND INSTALLATION

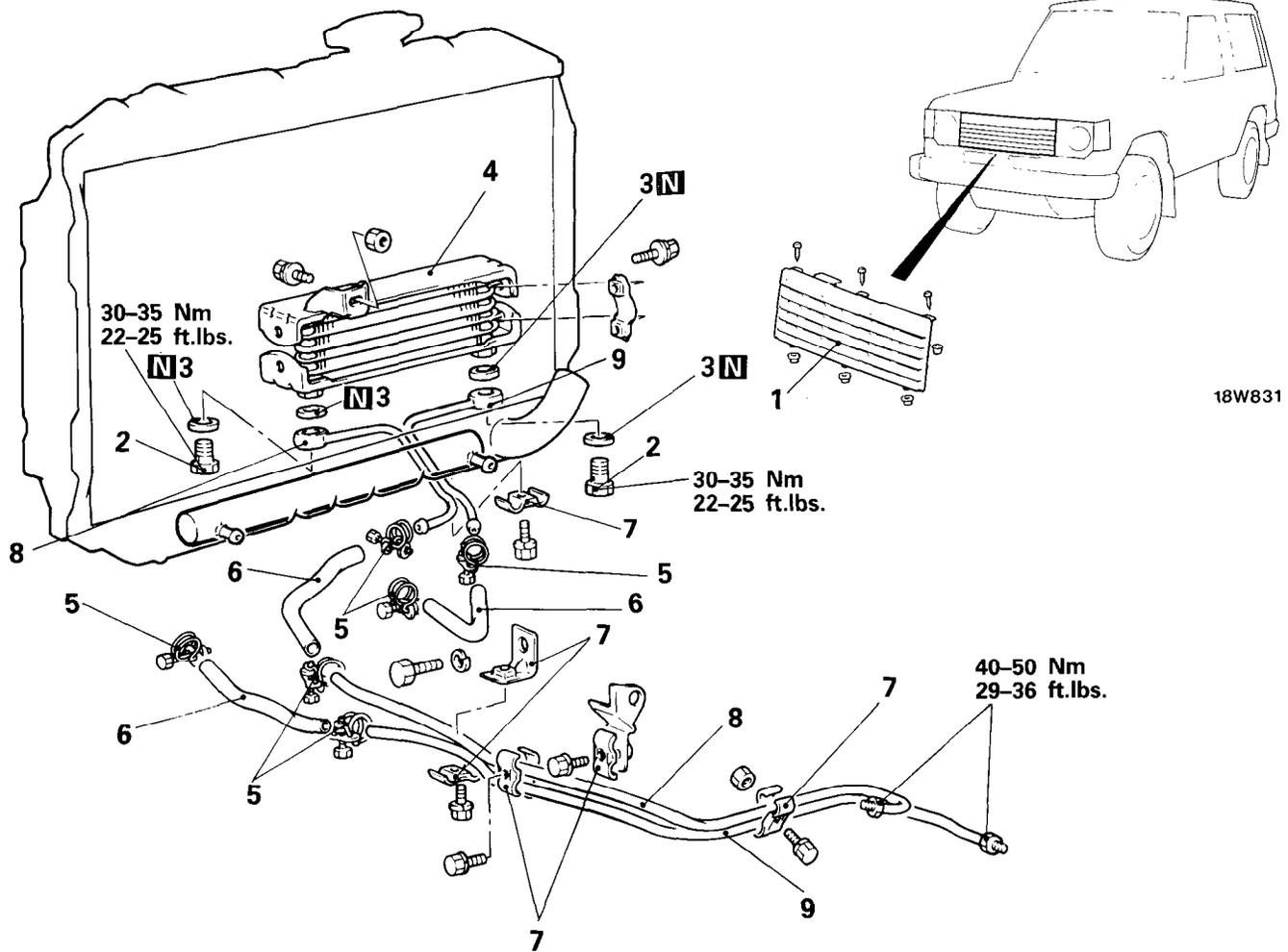
N21SA--

Pre-removal Operation

- Removal of Under Cover and Under Skid Plate (Refer to GROUP 23 BODY-Under Guard)
- Bleeding of the automatic transmission fluid. (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

Post-installation Operation

- Installation of Under Cover and Under Skid Plate (Refer to GROUP 23 BODY-Under Guard)
- Supplying of Automatic Transmission Fluid. (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

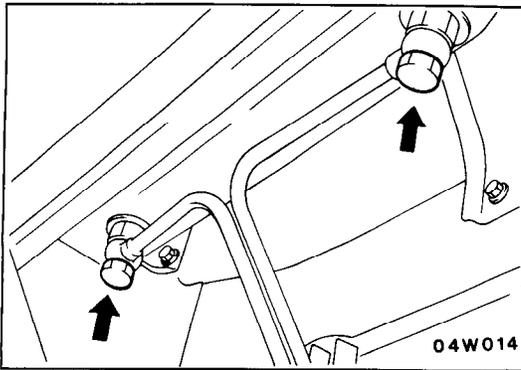


Removal steps

- 1. Radiator grille
- ↔ 2. Eye bolts
- 3. Gaskets
- 4. Oil cooler assembly
- 5. Hose clamp
- 6. Hose
- 7. Oil cooler tube clamp
- ↔ 8. Feed tube
- ↔ 9. Return tube

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ↔ : Refer to "Service Points of Removal".
- (3) ↔ : Refer to "Service Points of Installation".
- (4) N : Non-reusable parts



SERVICE POINTS OF REMOVAL

N21SBAB

2. REMOVAL OF EYE BOLTS

Remove the eye bolts and disconnect the oil cooler tubes from the oil cooler.

Caution

Loosen the eye bolts while tightening the weld nut of the oil cooler.

INSPECTION

N21SCAD

- Check the oil cooler fins for bend, damage and foreign matters caught between fins.
- Check the oil cooler tubes for crack, damage, clogging and deterioration.
- Check the gaskets for damage and deformation.
- Check the eye bolts for clogging and deformation.

SERVICE POINTS OF INSTALLATION

N21SDAA

9. INSTALLATION OF RETURN TUBE/8. FEED TUBE

For installation of the feed tube and return tube to the transmission, first loosely tighten each coupling and clamp, and then make the final tightening in sequence from the feed tube and return tube coupling.

TRANSMISSION AND TRANSFER ASSEMBLY

REMOVAL AND INSTALLATION

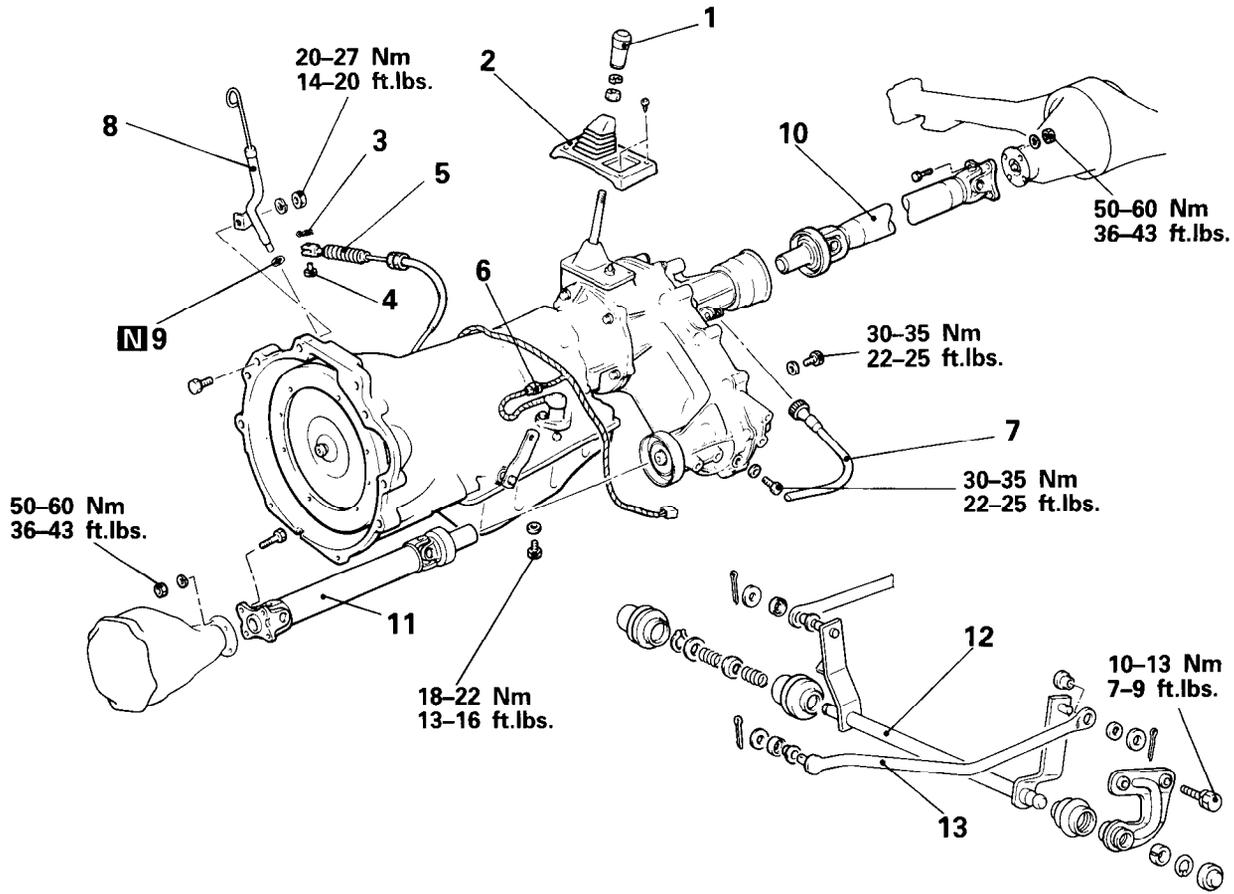
N21LA--

Pre-removal Operation

- Removal of Cross Shaft Protector
- Removal of Transfer Case Protector
- Bleeding of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)

Post-installation Operation

- Installation of Cross Shaft Protector
- Installation of Transfer Case Protector
- Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP 0 LUBRICATION AND MAINTENANCE-Maintenance Service)



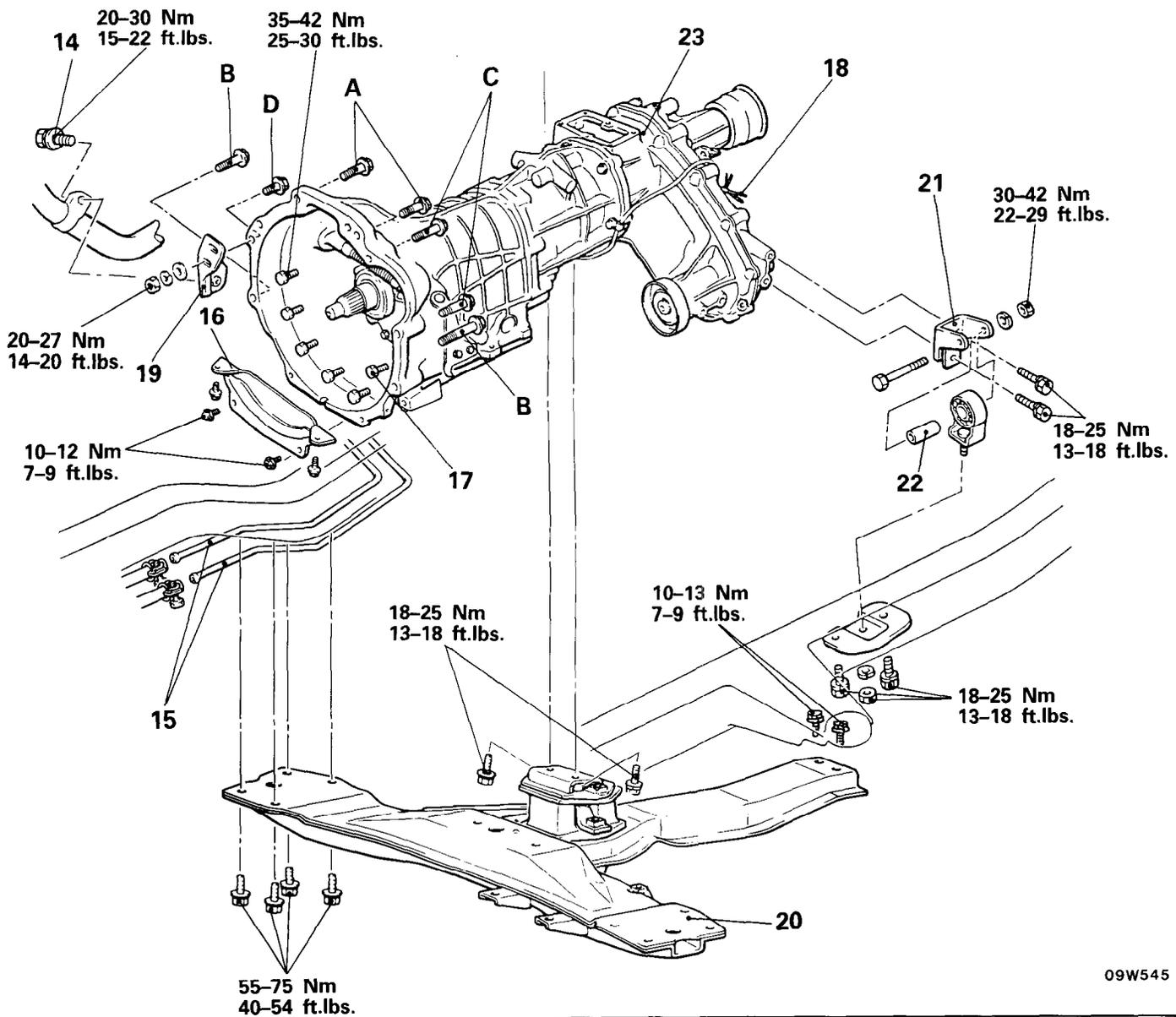
09W544

Removal steps

1. Transfer shift lever knob
2. Front floor console
3. Snap pin
4. Clevis pin
- ◆◆ 5. Throttle control cable
- ◆◆ 6. Connection of overdrive solenoid valve connector
- ◆◆ 7. Speedometer cable
8. Oil filler tube
- ◆◆ 9. O-ring
- ◆◆◆◆ 10. Rear propeller shaft
- ◆◆◆◆ 11. Front propeller shaft
- ◆◆◆◆ 12. Select cross shaft
- ◆◆◆◆ 13. Transmission control rod

NOTE
 (1) Reverse the removal procedures to reinstall.
 (2) ◆◆ : Refer to "Service Points of Removal".
 (3) ◆◆◆◆ : Refer to "Service Points of Installation".
 (4) **N** : Non reusable parts

21-120 AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly



09W545

	Nm	ft.lbs.	O.D. x Length	mm (in.)	Bolt identification
A	43-55	31-40	⑦ 10 x 40 (.4 x 1.6)		⑦ D x L
B	43-55	31-40	⑦ 10 x 65 (.4 x 2.6)		 L Y09512
C	27-34	20-25	⑦ 10 x 65 (.4 x 2.6)		
D	20-27	15-20	⑦ 8 x 25 (.3 x 1.0)		

- 14. Front exhaust pipe mounting bolt
- 15. Connection of oil cooler feed tube and return tube
- 16. Bell housing cover
- 17. Special bolts
- 18. Connection of 4WD indicator light switch
- 19. Exhaust pipe mounting bracket
- 20. Rear engine support member and No. 2 crossmember.
- 21. Transfer mounting bracket
- 22. Pipe
- 23. Transmission and transfer assembly

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◀▶ : Refer to "Service Points of Removal".
- (3) ▶▶▶ : Refer to "Service Points of Installation".

SERVICE POINTS OF REMOVAL

N21LBAG

10. REMOVAL OF REAR PROPELLER SHAFT/11. FRONT PROPELLER SHAFT

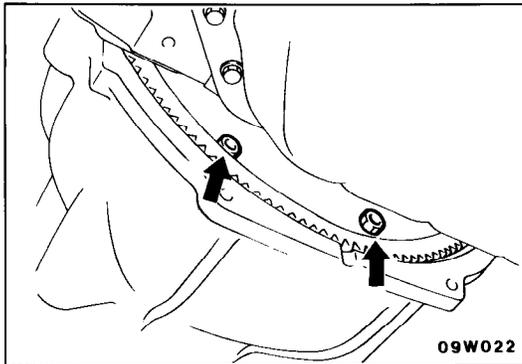
Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft.

12. REMOVAL OF SELECT CROSS SHAFT/13. TRANSMISSION CONTROL ROD

Refer to P.21-110.

17. REMOVAL OF SPECIAL BOLTS

Remove the special bolts (six) coupling the torque converter and drive plate.



23. REMOVAL OF TRANSMISSION AND TRANSFER ASSEMBLY

- (1) Disconnect the transmission and transfer assembly from the engine by pulling it slowly toward the rear of the vehicle.
- (2) When lowering the transmission and transfer assembly, tilt the front of the transmission downward and slowly lower forward, while using care to make sure that the rear of the transmission does not hit the No. 4 crossmember.

NOTE

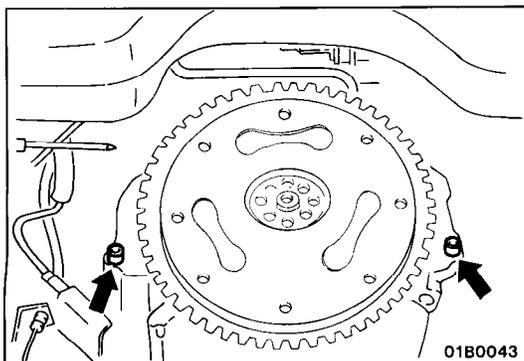
Detach so that the torque converter does not remain at the engine side.

SERVICE POINTS OF INSTALLATION

N21LDAG

23. INSTALLATION OF TRANSMISSION AND TRANSFER ASSEMBLY

On the engine side, there are two centering locations. Make sure that the transmission mounting bolt holes are aligned with them before mounting the transmission and transfer assembly to the engine.



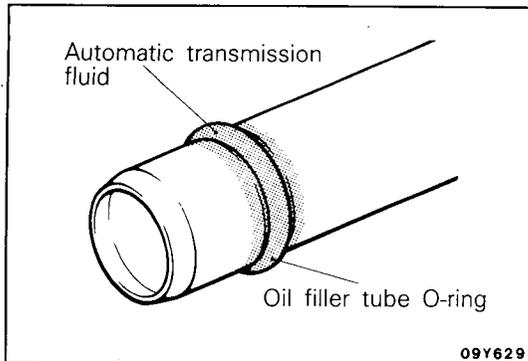
21-122 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly

13. INSTALLATION OF TRANSMISSION CONTROL ROD/12. SELECT CROSS SHAFT

Refer to P.21-111.

11. INSTALLATION OF FRONT PROPELLER SHAFT/10. REAR PROPELLER SHAFT

Refer to GROUP 16 PROPELLER SHAFT AND UNIVERSAL JOINTS – Propeller Shaft.



9. APPLICATION OF LUBRICANT TO O-RING

Apply a small amount of the specified automatic transmission fluid to the O-ring and then install.

Specified transmission fluid : ATF DEXRON II Type

7. CONNECTION OF SPEEDOMETER CABLE

Refer to P.21-108.

5. CONNECTION OF THROTTLE CONTROL CABLE

Refer to P.21-107.

DISASSEMBLY

N21LE--

Caution

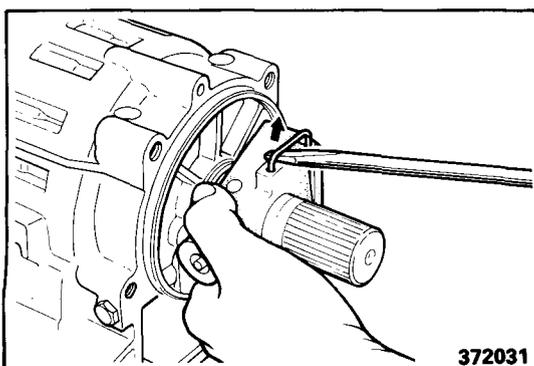
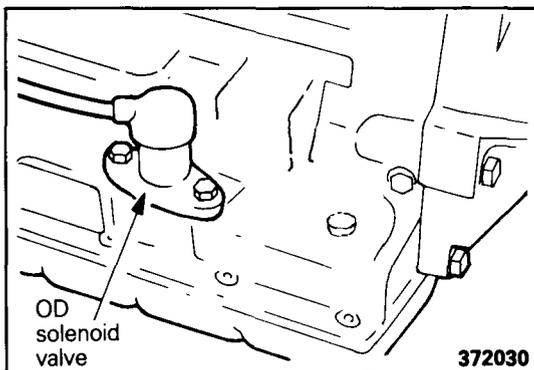
1. When removing the transmission assembly from the vehicle, use care so that the oil pan is not hit by the transmission jack.
2. The automatic transmission is built of accurately machined parts which should be handled during disassembly with utmost care to prevent damage.
3. When separating light alloy metal parts such as the case, do not pry with a screwdriver but tap lightly with a soft headed hammer (plastic hammer).
4. Place rubber mat on the work bench and keep it clean.
5. During disassembly, do not wear cloth gloves or use rags. If necessary, use nylon cloth or paper towel.
6. Clean all parts that have been disassembled. Ordinary detergent may be used for cleaning metallic parts but after washing, be sure to dry with air.
7. Wash the clutch disc, brake disc, resin and rubber parts in ATF (automatic transmission fluid) and keep them free from dust.
8. If the transmission itself is damaged, disassemble and clean the cooler system.

- (1) Remove sand and dirt from the outside of the transmission.
- (2) Remove the transfer (P.21-174).
- (3) Place the transmission assembly on a bench with the oil pan down.

Caution

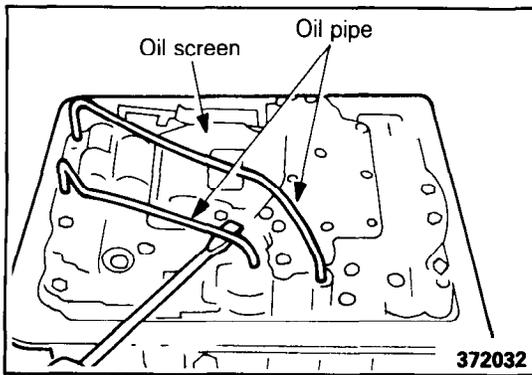
Do not place the assembly with the oil pan up before the oil pan is removed. This is necessary to prevent foreign matter in the oil pan from entering the valve body.

- (4) Remove the torque converter.
- (5) Remove the O.D. solenoid valve.

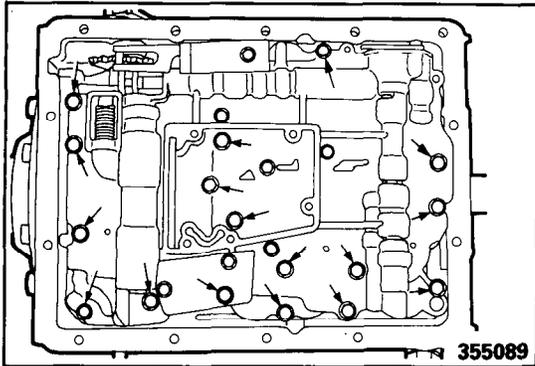


- (6) Remove the adapter and gasket.
- (7) Remove the governor mounting bolt.
- (8) Lift up the governor retaining ring lightly by a screwdriver and remove the governor assembly from the output shaft.

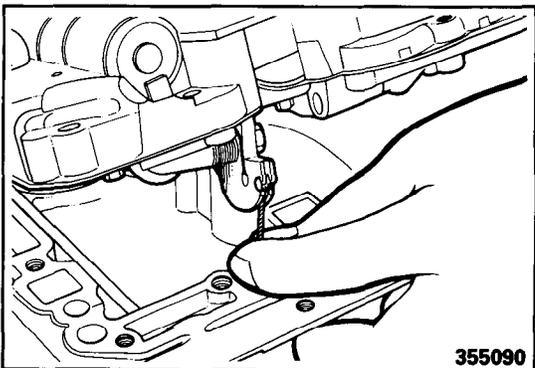
21-124 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



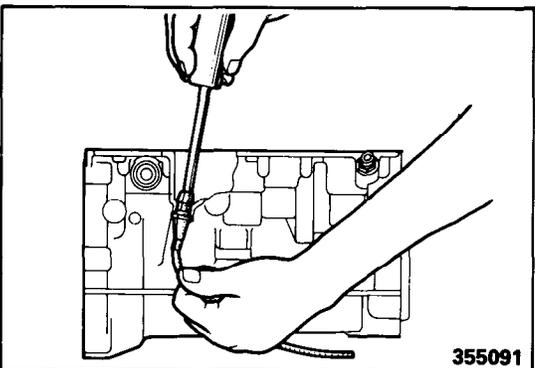
- (9) With the oil pan down, remove the oil pan bolts and then remove the oil pan and gasket.
- (10) Place the assembly with the valve body up.
- (11) Remove the oil pipe, prying with a screwdriver and using care not to cause deformation.
- (12) Remove the oil screen.



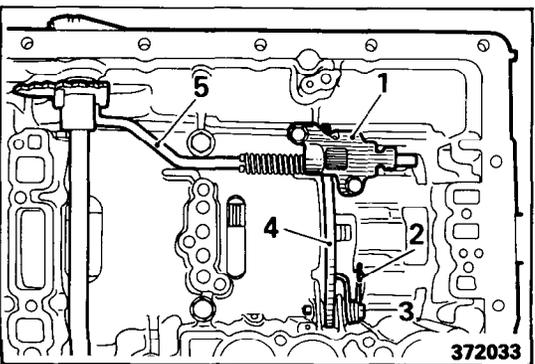
- (13) Remove 17 bolts attaching the valve body assembly.



- (14) Raise the valve body assembly slowly and remove the throttle inner cable from the throttle cam. Then, remove the valve body assembly.

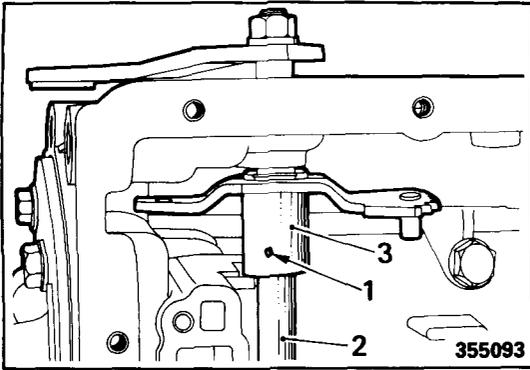


- (15) Push the throttle cable adapter to disconnect the throttle cable from the case.

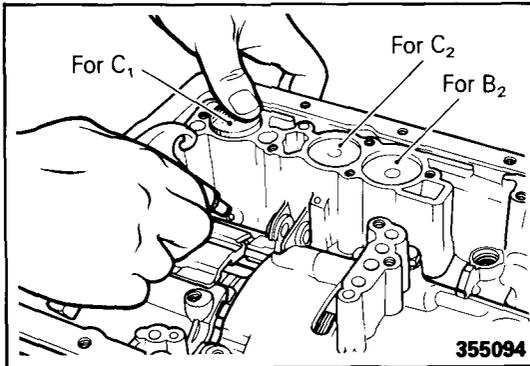


- (16) Remove the plate 1 and parking pawl torsion spring 2. Then, pull out pivot pin 3 and remove parking pawl 4. Remove parking rod 5 from the manual valve detent lever.

AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly 21-125



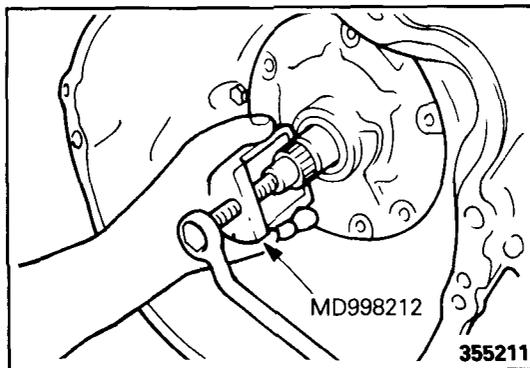
- (17) Drive out spring pin 1 and remove shaft 2 and manual valve lever 3.
- (18) Remove the oil seal from the manual valve shaft using a screwdriver.
When installing the oil seal, do so evenly.



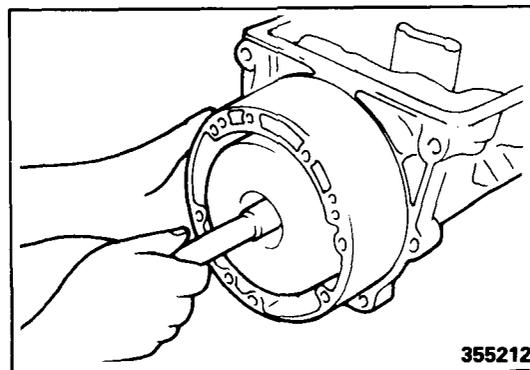
- (19) Remove the accumulator piston by blowing air from the illustrated position.

Caution

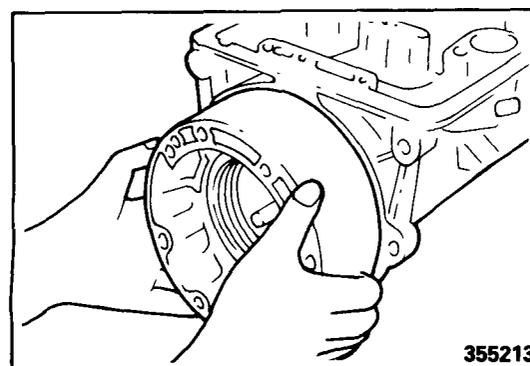
Use care as the piston and fluid pops and gushes out. Pistons for B₂, C₂, and C₁ have been installed from the front to rear in the order shown. Store the removed pistons and springs arranged in this order.



- (20) Remove the oil pump attaching bolts.
- (21) Remove the oil pump by using the special tool.
- (22) Remove the converter housing attaching bolts.
- (23) Holding the O.D. input shaft by hand, remove the converter housing.

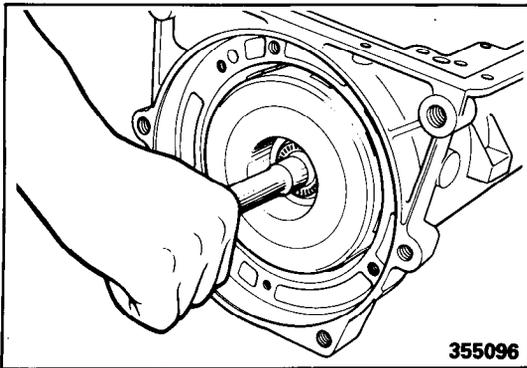


- (24) Remove the O.D. input shaft, planetary gear and O.D. clutch assembly from the O.D. case.

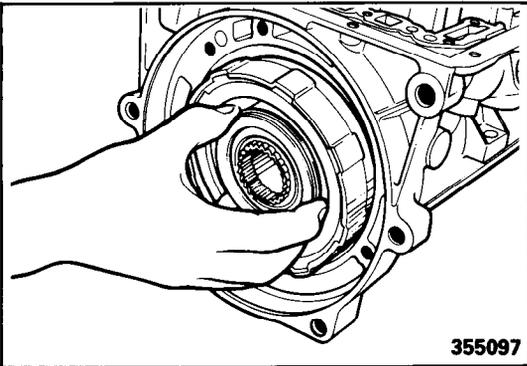


- (25) Remove the O.D. case assembly.

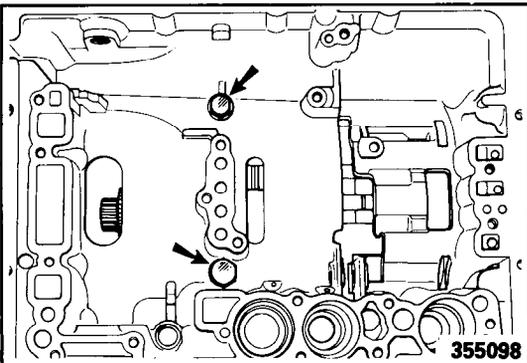
21-126 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



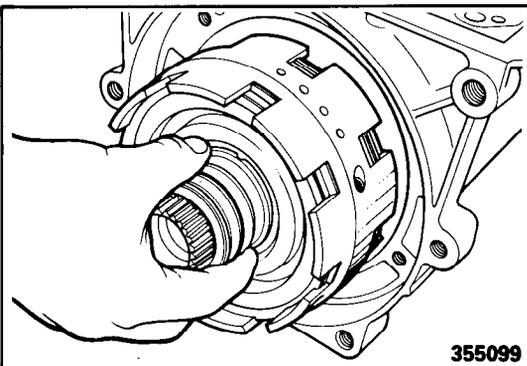
(26) Remove the forward clutch assembly.



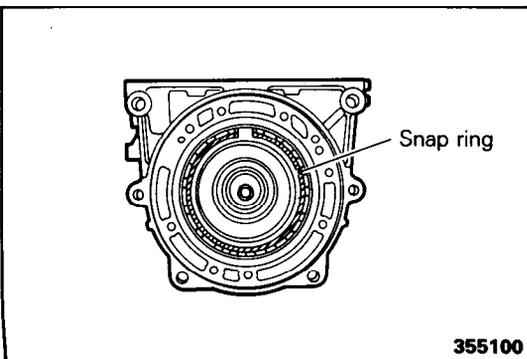
(27) Remove the direct clutch assembly.



(28) Remove the two center support attaching bolts.

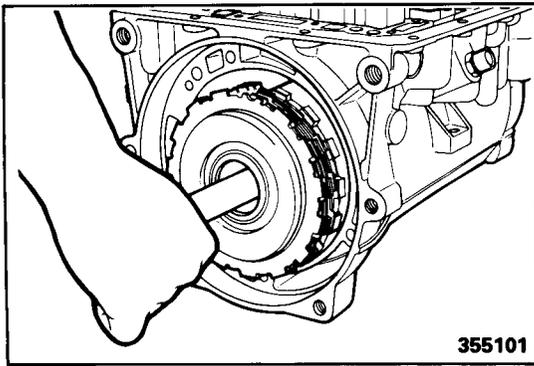


(29) Remove the center support and sun gear assembly together from the case.

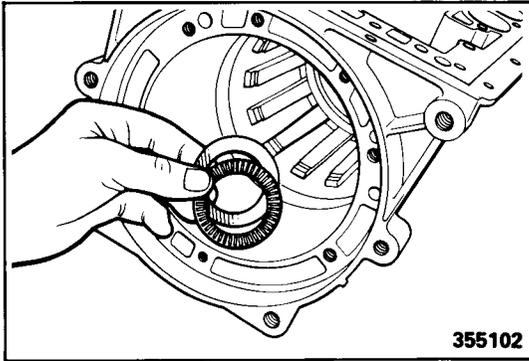


(30) Remove the snap ring from the front planetary carrier by using a screwdriver.

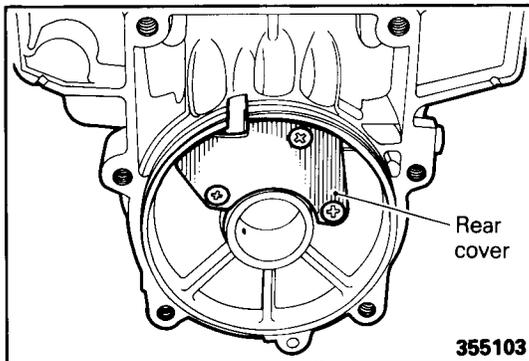
AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly 21-127



(31) Holding the intermediate shaft, remove the carrier assembly from the case.



(32) Remove the output shaft thrust bearing and race from the case.



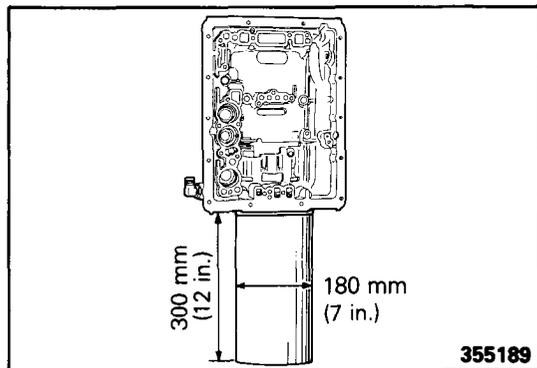
(33) Remove the rear cover and gasket.

REASSEMBLY

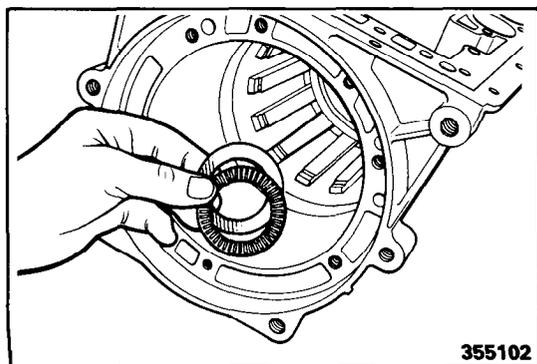
N21LF--

Caution

1. The automatic transmission is built of accurately machined parts which should be handled during reassembly with utmost care to prevent damage. Damaged parts could cause fluid leaks or affect performance. Check the parts carefully before reassembly.
2. Clean all parts that are to be reassembled. Ordinary detergent may be used for cleaning metallic parts but after washing, be sure to dry well with air.
3. Wash the clutch disc, resin thrust plate and rubber parts in ATF and keep them free from dust.
4. Do not reuse gasket, oil seal and other rubber parts. At reassembly, replace them with new ones.
5. Never use grease other than petrolatum or industrial petrolatum.
6. Apply ATF to friction elements, rotating parts and sliding parts before installation.
7. New clutch disc and brake disc should be immersed in ATF for more than two hours before installation.
8. Do not apply sealer or adhesive to gaskets.
9. When bushing must be replaced, replace assembly which includes it.
10. Tighten parts to specified torque.



- (1) Place the transmission case on a cylinder as illustrated. Use of a cylinder measuring 300 mm (12 in.) long and 180 mm (7 in.) in diameter is recommended. Place shock absorbing material between the case and the cylinder to prevent damage to the case.

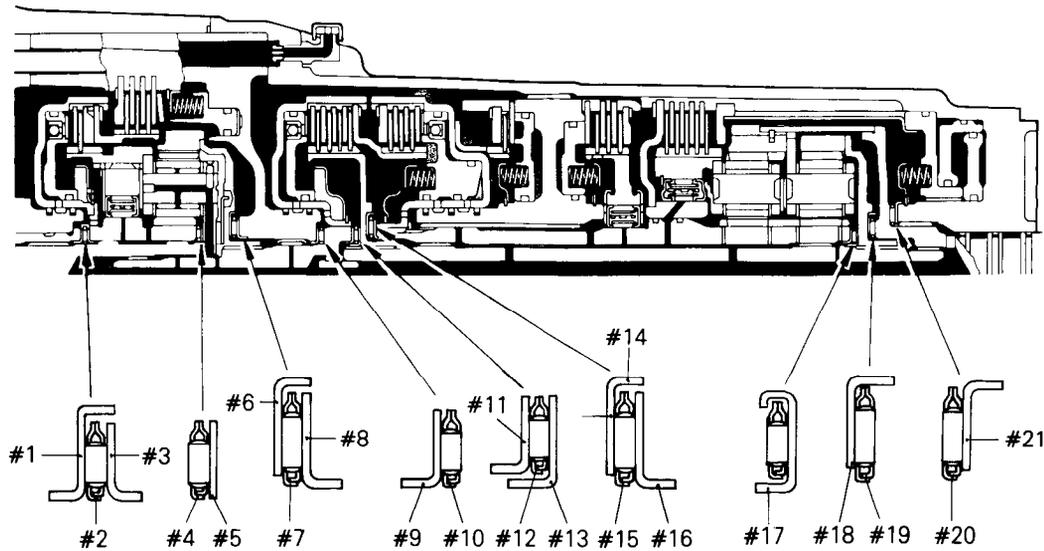


- (2) Install output shaft thrust bearing race #21 and thrust bearing #20 in the case.

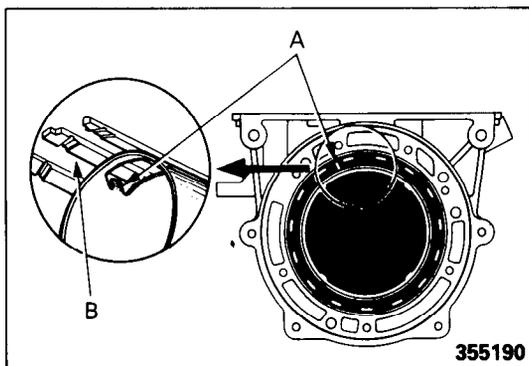
Caution

When installing the thrust bearing and race, note their direction, referring to the illustration.

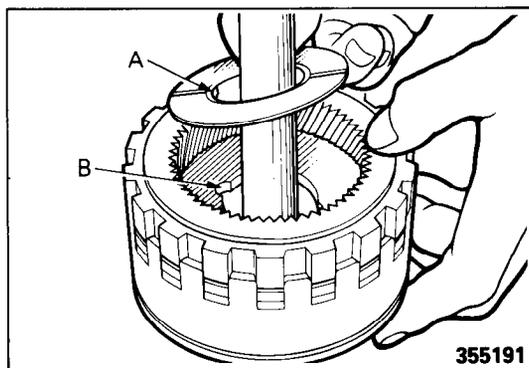
AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly 21-129



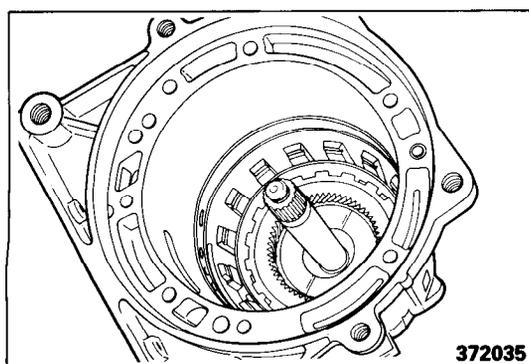
372034



- (3) Install the apply tube in the case. Make sure that the pawl at the end of the tube is inserted to inside of the piston.

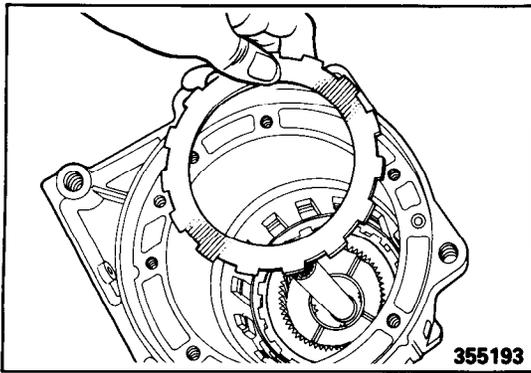


- (4) Install the thrust washer on the planetary carrier, seating its pawl (A) securely in the (B) of the carrier.

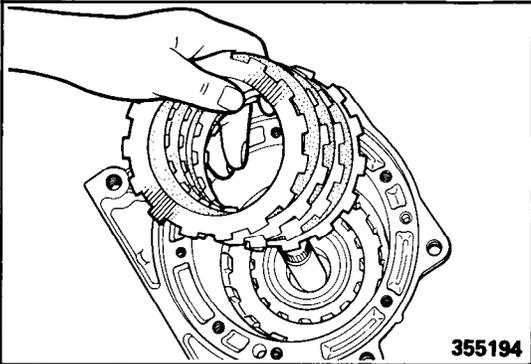


- (5) Install the rear planetary gear and output shaft assembly in the case. Insert slowly and taking care not to hit at the bearing.

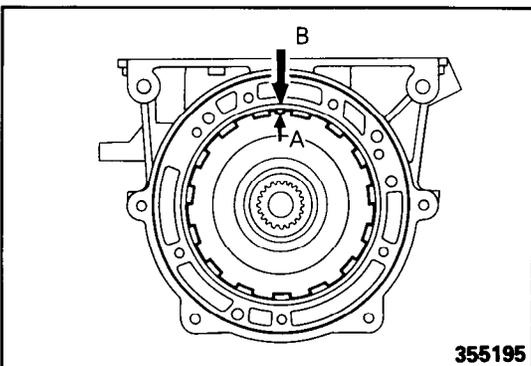
21-130 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



- (6) Install the backing plate in the case. Insert firmly until it comes into contact with the apply tube.



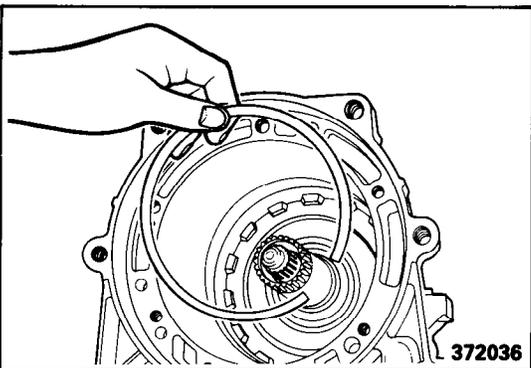
- (7) Apply grease to the thrust washer and attach it to the front planetary gear carrier. Then install the front planetary gear assembly in the ring gear.
(8) Install the clutch discs and plates alternately in this order on the backing plate.



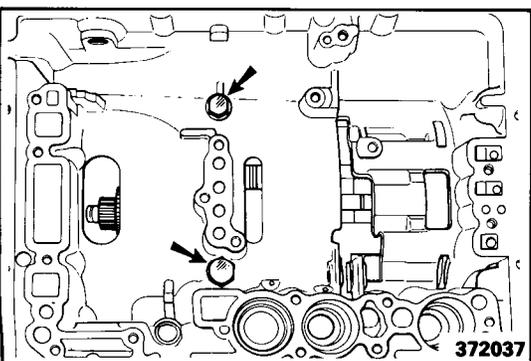
- (9) Plate the transmission case on a bench with the oil pan mounting surface up.
(10) Insert the sun gear in the one-way clutch inner race and install the assembly in the case, aligning (A) of the one-way clutch inner race with (B) of the case. If the inner race is hard to engage, turn the sun gear while holding the front planetary ring gear. Then, holding the one-way clutch inner race, remove the sun gear. Fit the removed sun gear to the center support.

Caution

Check the snap ring end gap position to make sure that the carrier is seated completely.

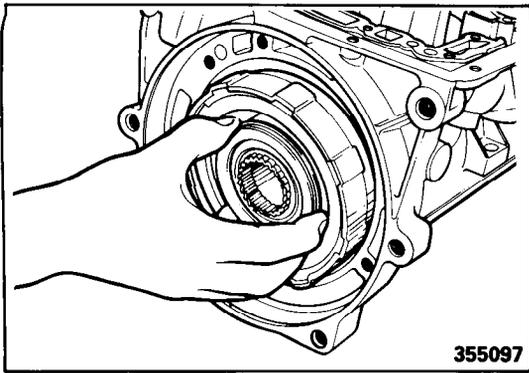


- (11) Install the snap ring.

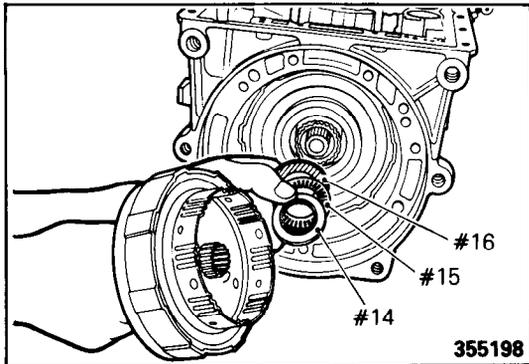


- (12) Install the center support assembly in the case, checking correct seating of the one-way clutch on the center support and pushing the center support while pulling the sun gear. The center support will not be installed completely in the case if the one-way clutch is floating.
(13) Pushing the center support backward, tighten the bolts alternately on side (A) in about 7 Nm (5 ft.lbs.) increments. Finally tighten to specified torque.

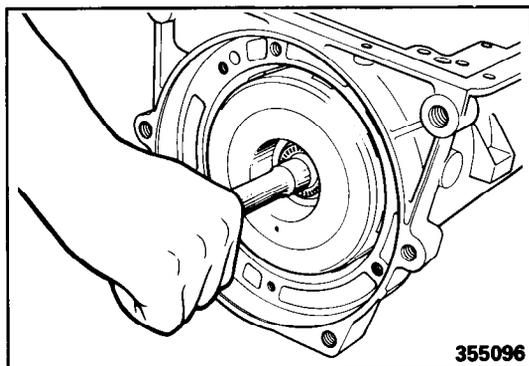
AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-131



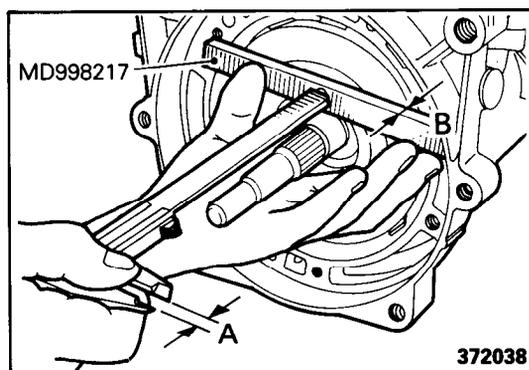
(14) Install the direct clutch assembly.



(15) Attach thrust race #14, bearing #15 and thrust race #16 onto the rear of the forward clutch hub using petrolatum and noting the direction of the thrust bearing race.

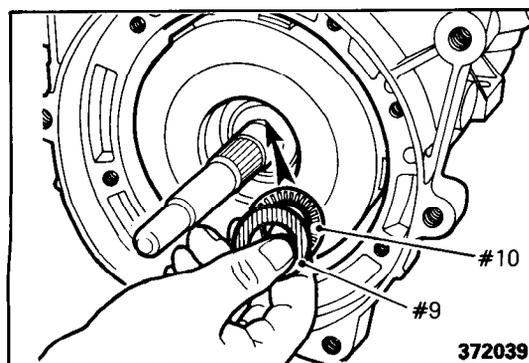


(16) Install the forward clutch assembly, using care not to drop the thrust bearing attached in the step above.



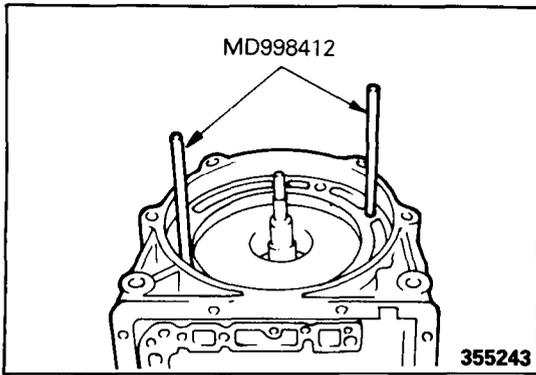
(17) Check that the forward clutch has been installed completely by using the special tool.
Measured value (A) - gauge thickness (B) = forward clutch installation height

Standard value : Approx. 1.5 mm (.059 in.)

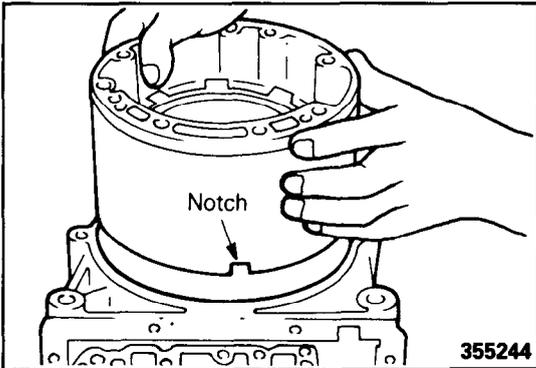


(18) Attach thrust bearing #10 and race #9 to the forward clutch using petrolatum and noting the direction of the thrust bearing race.

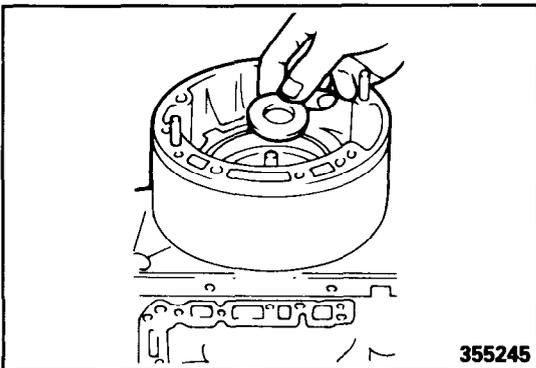
21-132 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



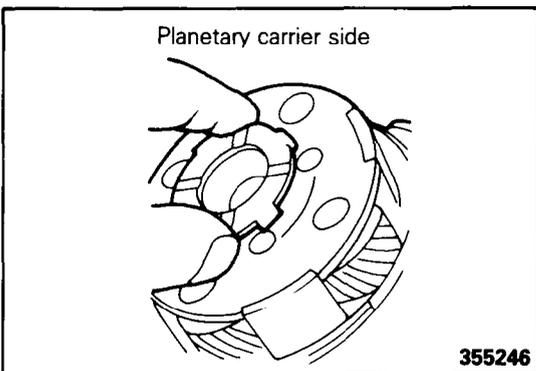
(19) Install special tool in the transmission case.



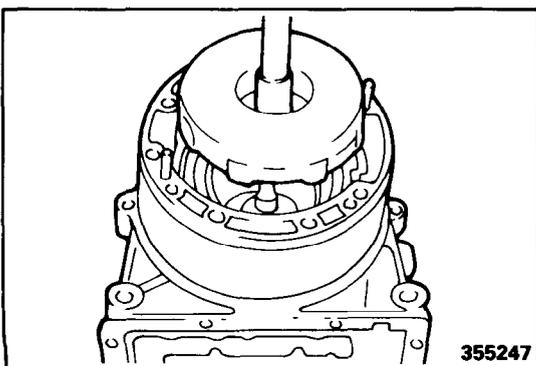
(20) Along the guides, install the O.D. case assembly in the transmission case, positioning the O.D. case notch as illustrated.



(21) Install the thrust washer on the O.D. planetary gear.



(22) Apply petrolatum to the rear of the O.D. planetary carrier and attach the thrust washer thereon.

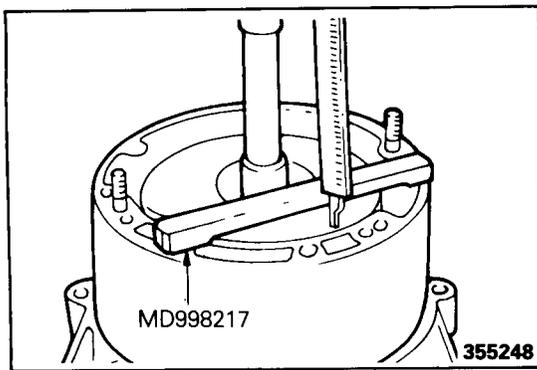


(23) Install the O.D. clutch and planetary gear assembly with the thrust washer in the case slowly.

NOTE

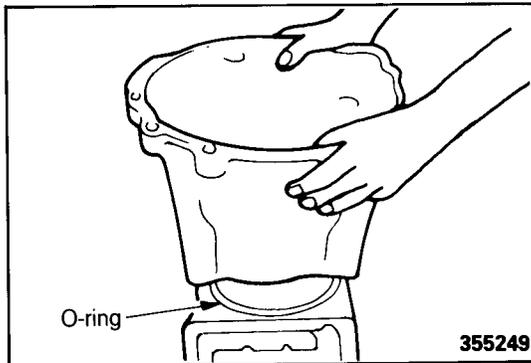
Align the O.D. case clutch disc lugs.

AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-133

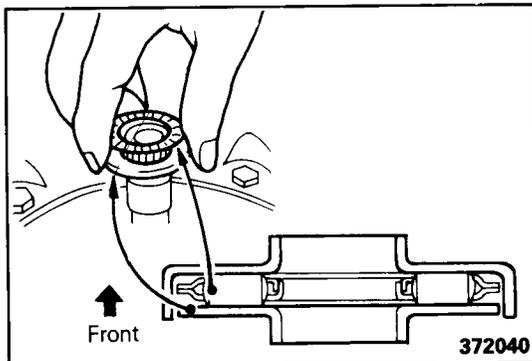


- (24) Check that the O.D. clutch and planetary gear set assembly has been installed completely by using the special tool. Measured value - gauge thickness = O.D. clutch assembly installed height

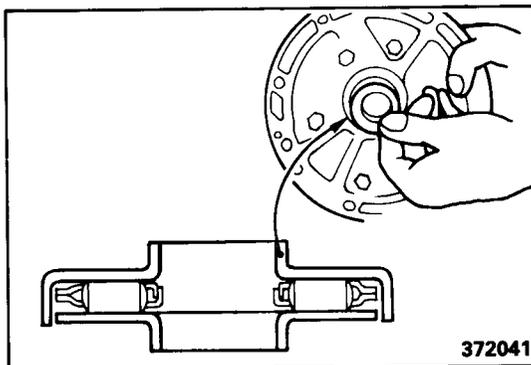
Standard value : Approx. 2 mm (.08 in.)



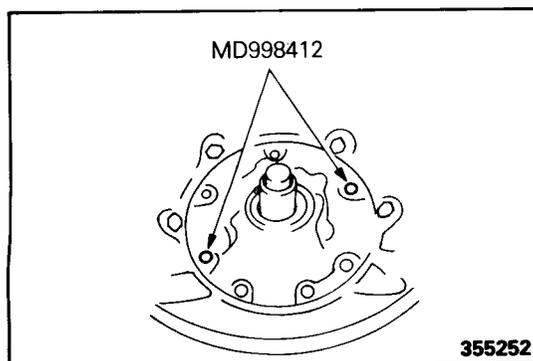
- (25) Install the O-ring at illustrated position and then install the converter housing.



- (26) Install race #3 and bearing #2 over the O.D. input shaft.



- (27) Apply petrolatum to the oil pump and install thrust race #1.



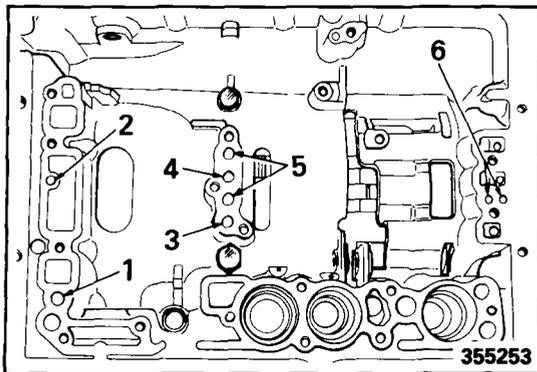
- (28) Install the oil pump slowly by using the special tools.
(29) Apply sealer to the set bolts and tighten them uniformly and little by little. Check input shaft end play and check that the shaft turns lightly.

Specified sealant : SH700 (Toray)

- (30) Tighten the oil pump assembly attaching bolts to specified torque and check the input shaft end play.

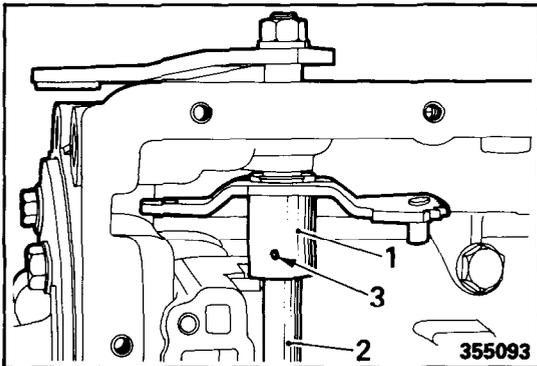
Standard value : 0.3–0.9 mm (.012–.035 in.)

21-134 AUTOMATIC TRANSMISSION - Transmission and Transfer Assembly



(31) Supply low pressure air to each circuit and check operation by operating noise.

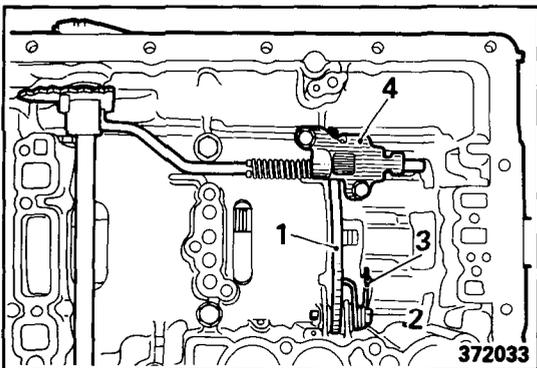
1. O.D. clutch
2. Forward clutch
3. Brake No.1
4. Brake No.2
5. Direct clutch
6. Brake No.3



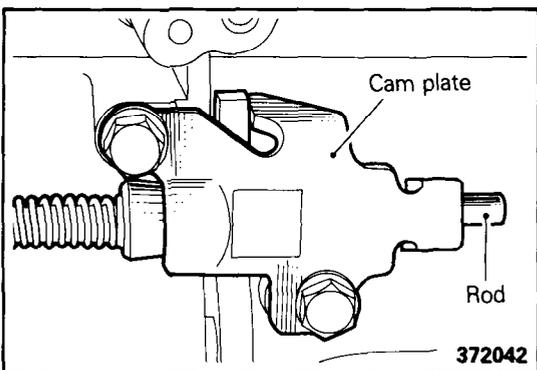
(32) Install the parking rod assembly on manual valve lever 1 and insert manual valve lever shaft 2 in the case. Then, drive in slotted spring pin 3.

Caution

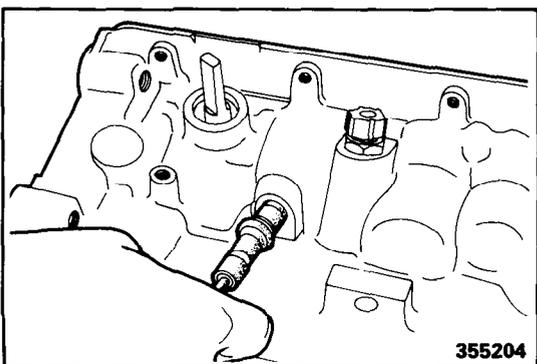
1. Be sure to use a new slotted spring pin.
2. Install the slotted spring pin in such a way that its end protrudes approx. 1 mm from the lever.



(33) Place parking pawl 1 in the case and install pivot pin 2 and spring 3.

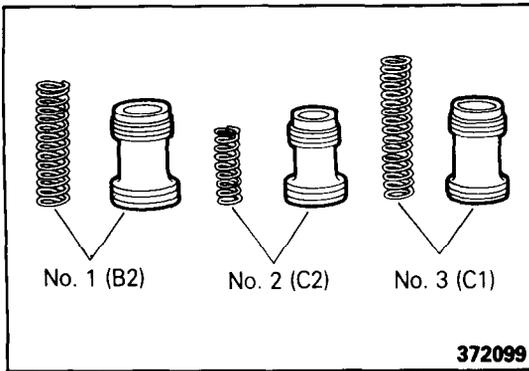


(34) Install the cam plate, making sure that the parking rod assembly protrudes from the cam plate.



(35) Insert the throttle cable in the case, using care not to damage the O-ring.

AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly 21-135



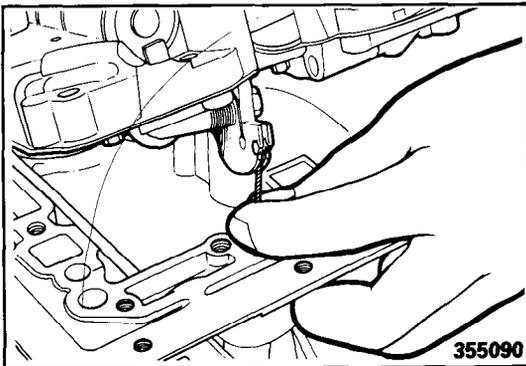
(36) Install accumulator pistons and springs; No.1 (B2), No.2 (C2) and No.3 (C1) from front side.

Accumulator Pistons Identification

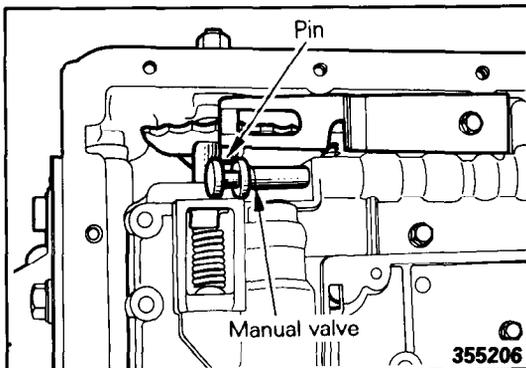
	O.D.	Length
No. 1	34.8 mm (1.370 in.)	48.5 mm (1.909 in.)
No. 2	31.8 mm (1.252 in.)	45 mm (1.772 in.)
No. 3	31.8 mm (1.252 in.)	49.5 mm (1.949 in.)

Accumulator Springs Identification

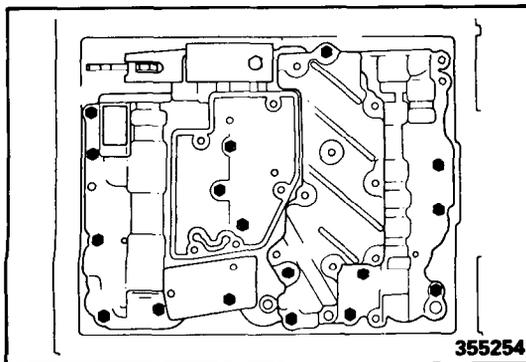
	Free length	O.D.	Wire diameter	Ident. color
No. 1	66.7 mm (2.626 in.)	17.3 mm (.681 in.)	2.8 mm (.110 in.)	Red
No. 2	55.2 mm (2.173 in.)	16.4 mm (.646 in.)	2.3 mm (.091 in.)	–
No. 3	64.7 mm (2.547 in.)	17.5 mm (.689 in.)	2.0 mm (.079 in.)	–



(37) Install throttle cable to the throttle cam of the valve body assembly.

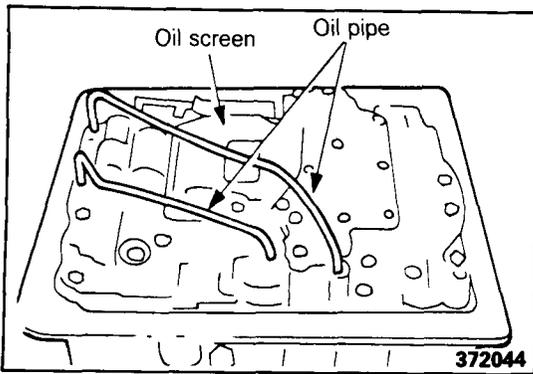


(38) Install two or three valve body attaching bolts temporarily and place the manual valve lever pin in the manual valve groove.



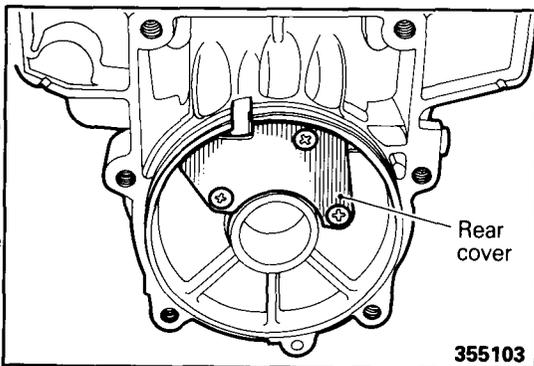
(39) Install 17 valve body attaching bolts and tighten uniformly to specified torque.

21-136 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly

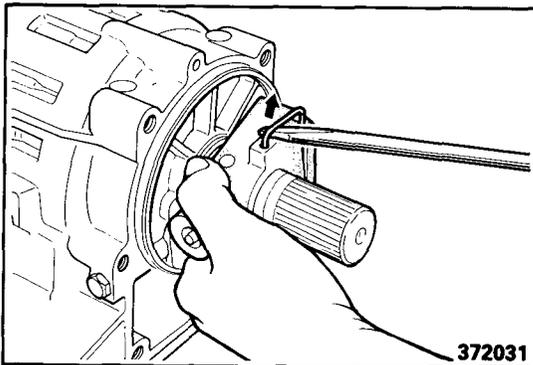


- (40) Install the oil screen.
- (41) Shift to "L" and "P" to check that the *detent spring roller* is completely seated in each portion of the detent lever.
- (42) Install the oil pipe.

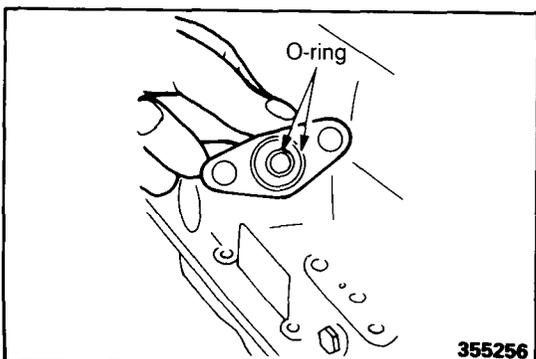
- (43) Attach the magnet to the oil pan (to area directly below the oil screen).
- (44) Install the oil pan with oil pan gasket attached. First tighten 14 bolts temporarily and then tighten to specified torque uniformly.



- (45) Install the rear cover on the transmission rear with a gasket.



- (46) Insert a slot screwdriver between the governor retaining ring and governor body and install the governor to the output shaft.
- (47) Install the adapter and gasket.



- (48) Install the O.D. solenoid.

Caution
Be sure to use two O-rings.

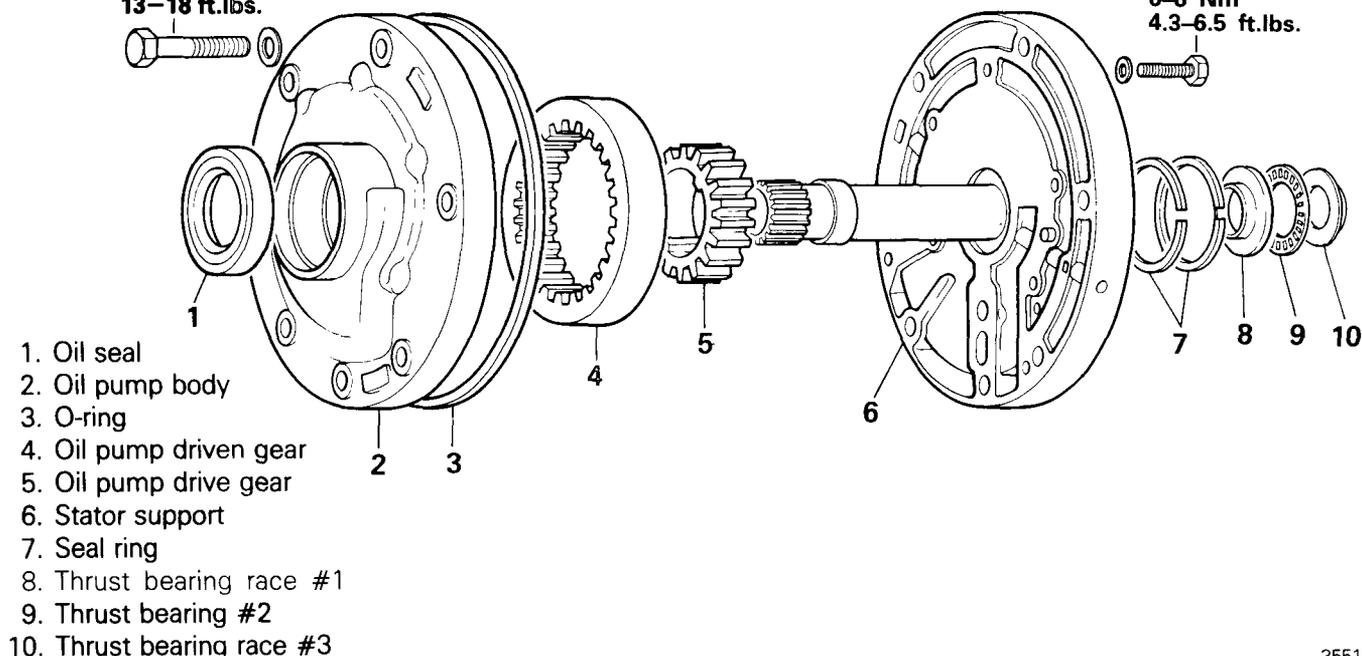
- (49) Install torque converter to transmission.
- (50) Install the transfer assembly (P.21-178).

OIL PUMP

N21LG--

18–25 Nm
13–18 ft.lbs.

6–8 Nm
4.3–6.5 ft.lbs.



355104

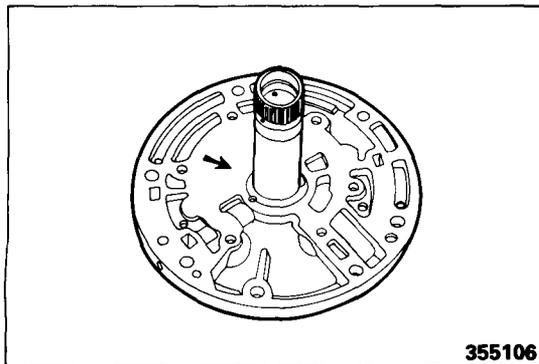
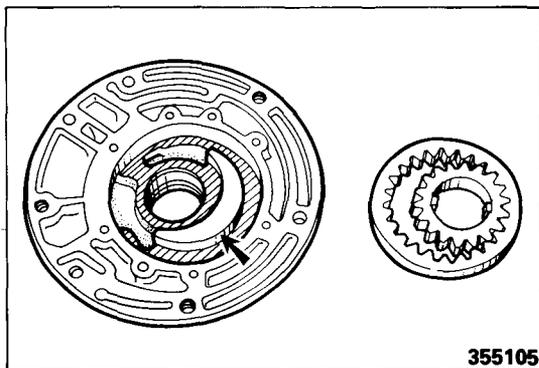
DISASSEMBLY

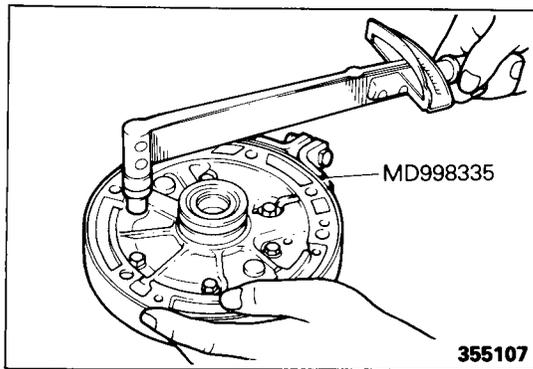
- (1) Remove six screws and remove the stator support from the oil pump body.
- (2) Take out the oil pump drive gear and driven gear from the pump body. Put mating marks on the side of removed gears for their reassembly in correct direction. (Use a felt marker or equivalent.)
- (3) Remove the seal ring from the stator support.

INSPECTION

Wash the parts and dry with air. Then, check the following and replace if faulty.

- (1) Oil seal damage
- (2) Ridged wear on body and drive gear contact surfaces and damage to the body crescent portion (indicated by arrow)
- (3) Damage or wear of the stator support surface in contact with the oil pump gear (indicated by arrow)
- (4) Wear of the oil pump bushing
- (5) Wear of the stator support bushing (both front and rear sides)
- (6) Smooth insertion of the stator support into the torque converter and without abnormally large play. If faulty, replace.
- (7) Wear or damage of the stator support seal ring groove and seal ring



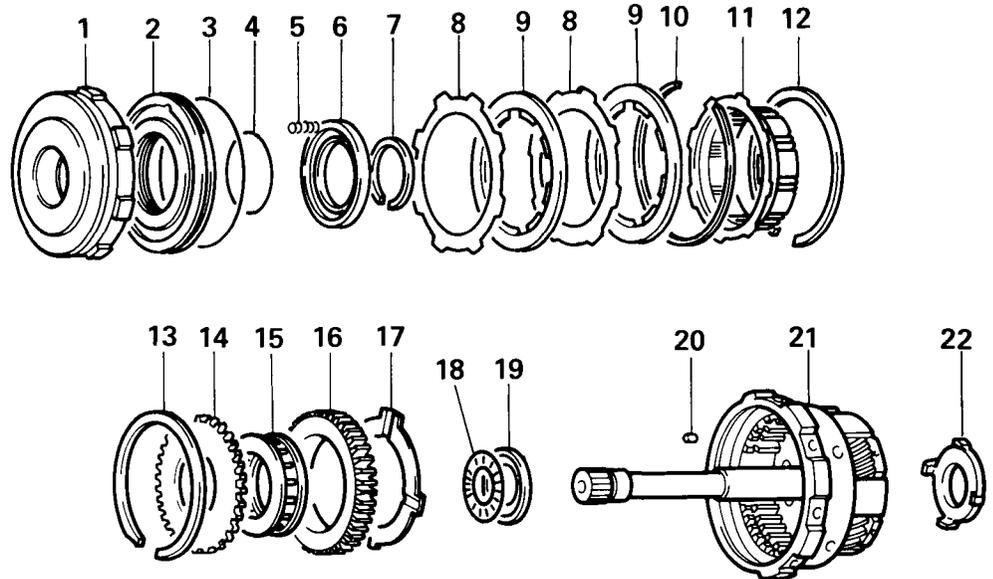
**REASSEMBLY**

- (1) Apply ATF to the drive and driven gears and install them in the body.
- (2) Assemble the body and stator support and tighten the six bolts finger-tight.
- (3) Tighten outside of the cover and support by using the special tool.
- (4) Tighten the bolts to specified torque.
- (5) After reassembly, check with a screwdriver that the drive gear turns lightly.

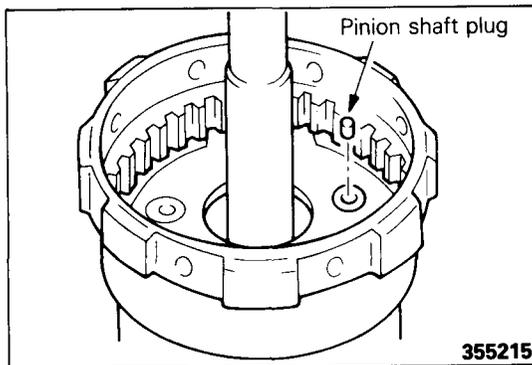
OVERDRIVE CLUTCH AND PLANETARY GEAR SET

N21LHEA

1. OD clutch cylinder
2. OD clutch piston
3. O-ring
4. O-ring
5. Return spring
6. Spring retainer
7. Snap ring
8. Clutch plate
9. Clutch disc
10. Snap ring No.1
11. OD brake hub
12. Snap ring No.2
13. Snap ring No.3
14. One-way clutch retainer
15. One-way clutch assembly
16. One-way clutch outer race
17. Thrust washer
18. Thrust bearing #4
19. Thrust bearing race #5
20. Pinion shaft plug
21. OD planetary gear
22. Thrust washer

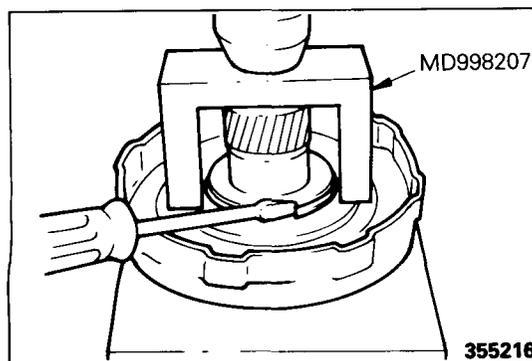


372045

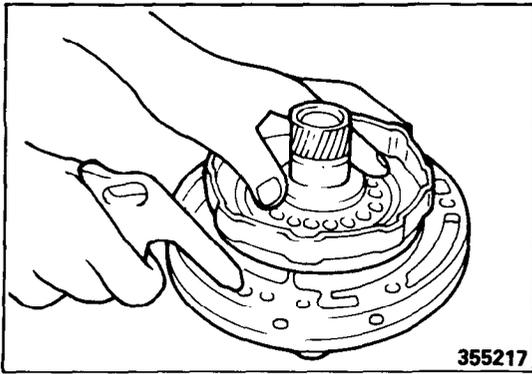


DISASSEMBLY

- (1) Remove snap ring No.2 and remove the O.D. brake hub. Then, disassemble the O.D. planetary gear set and O.D. clutch assembly.
- (2) Remove snap ring No.3 from the O.D. planetary gear assembly and remove the thrust washer, O.D. one-way clutch, outer race, thrust bearing and four pinion shaft plugs.



- (3) Remove snap ring No.1 from the O.D. clutch assembly and remove the clutch flange, clutch discs and plates.
- (4) Compress the spring and remove the snap ring by using the special tool.
- (5) Remove the spring seat and return spring.



- (6) Install the O.D. clutch cylinder on the oil pump and blow air into the oil pump oil hole to remove the piston.

Caution

Hold down the piston with hand to prevent it from popping out.

INSPECTION

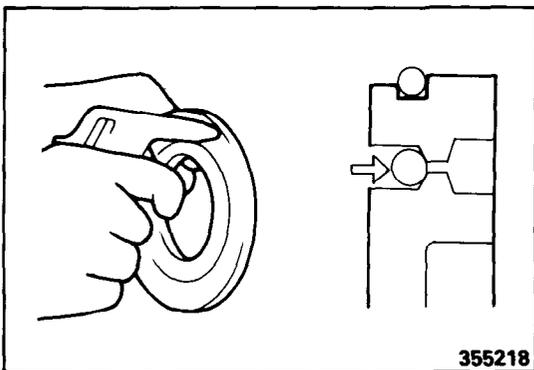
Wash the disassembled parts and dry with air before checking the following. Replace parts that are found faulty.

- (1) Check the O.D. planetary gear for pinion wear, damage, turning condition, spline wear and damage.
- (2) Check the O.D. one-way clutch for wear and damage of spring, ribbon spring and outer race.
- (3) Check the O.D. clutch cylinder for wear and damage of the O.D. sun gear and piston sliding surface (cylinder). Also check for wear and damage of the thrust washer and one-way clutch contact surfaces and seal ring sliding surface.
- (4) Check the clutch disc and plate for wear and damage of the friction surfaces and of cylinder to hub engaging portions.
- (5) Check the clutch piston for wear and damage of its outside and inside surfaces.
- (6) Check the spring for damage and deterioration.

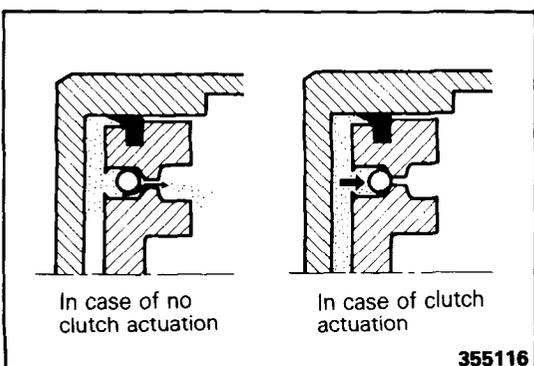
Free length

Standard value : 14.9 mm (.587 in.)

Limit : 14.5 mm (.571 in.)

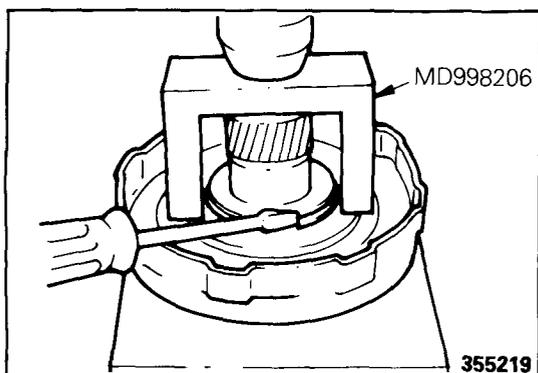


- (7) Shake the piston to check that the check ball is not binding. Also apply air pressure to the piston to see that it is free from leaks. Apply air pressure to the piston inside.



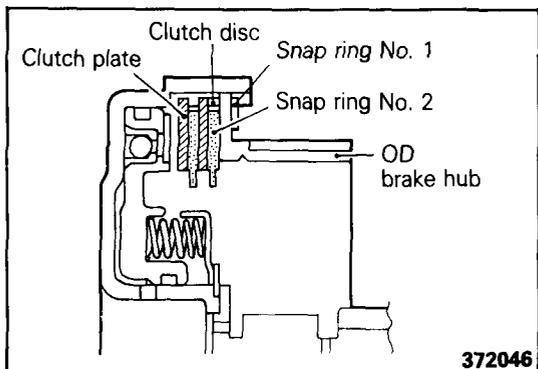
The O.D. clutch, forward clutch and direct clutch have a check ball installed inside as illustrated. This is to prevent oil remaining in the cylinder from working to actuate the clutch by centrifugal force that develops when the clutch cylinder is rotated at high speed. Namely, the centrifugal force developed at high speed rotation causes the ball to separate from the seat, thus opening the oil path to release oil pressure that would otherwise actuate the clutch.

- (8) Check the O.D. brake hub for abnormal tooth wear and damage.
- (9) Check the bearings, races and thrust washers for wear and damage.

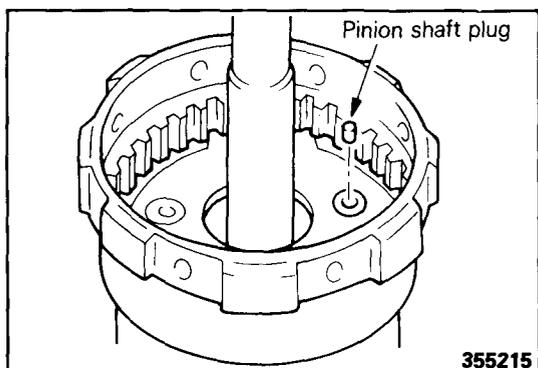


REASSEMBLY

- (1) Fit new O-rings in inside and outside grooves of the piston.
- (2) Apply ATF to the O-rings and insert the piston into the O.D. clutch cylinder using care not to damage the O-rings.
- (3) Install the return spring and spring seat in the clutch cylinder. Then, place the clutch assembly on a press bench and install the snap ring by using the special tool.



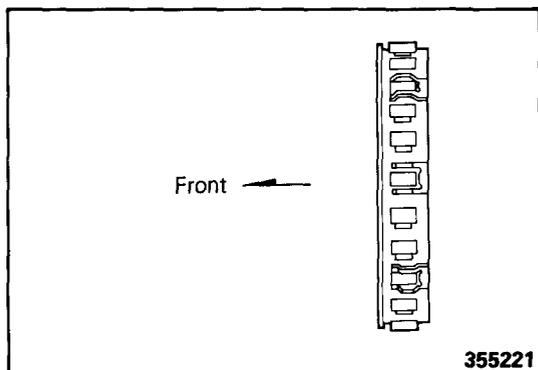
- (4) Install the clutch plates and clutch discs in the clutch cylinder and fit snap ring No.1 (narrower one).
- (5) Install the O.D. brake hub and then fit snap ring No.2 (wider one).



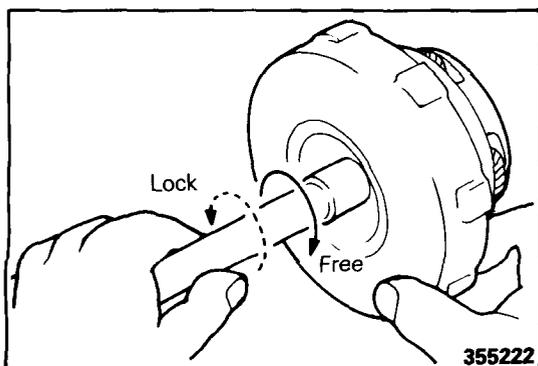
- (6) Install the pinion shaft plug in the shaft portion of the O.D. planetary gear set and install the thrust bearing race, thrust bearing and thrust washer in the order shown.

NOTE

Install the thrust washer directing its oil groove to the front side.



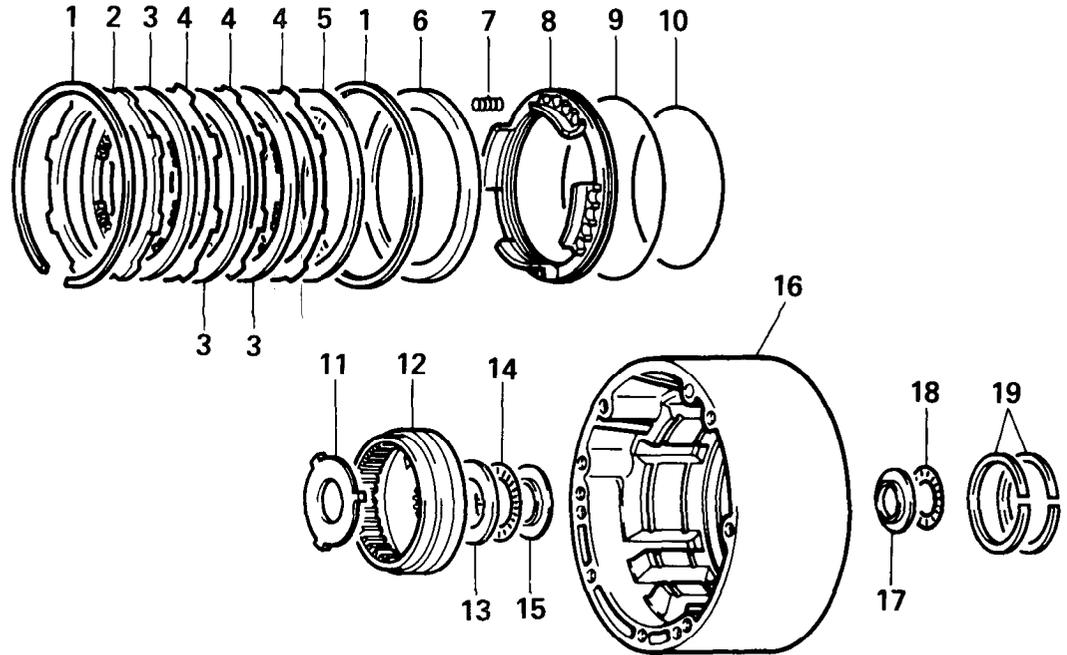
- (7) Assemble the one-way clutch outer race to the one-way clutch assembly and then install the assembly in the planetary gear, noting the mounting direction.
- (8) Install the one-way clutch retainer and snap ring.
- (9) Install the O.D. planetary gear set on the O.D. clutch assembly.



- (10) Check operation of the one-way clutch. With the clutch cylinder held by hand, turn the input shaft clockwise to see that the shaft turns smoothly and turn it counter-clockwise to see that the shaft is locked.

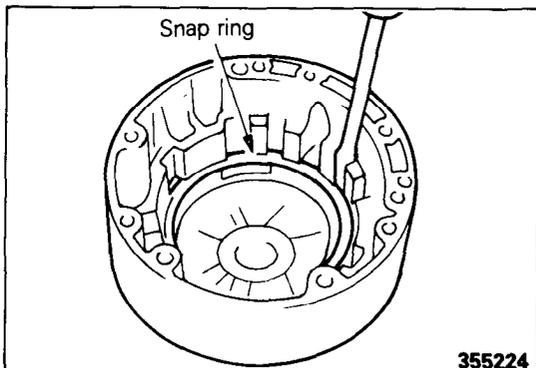
OVERDRIVE BRAKE

N21LIAA



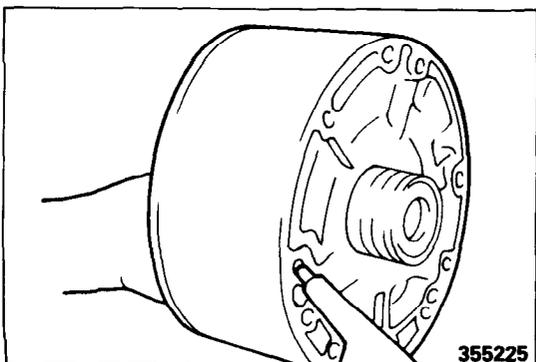
- 1. Snap ring
- 2. Backing plate
- 3. Brake disc
- 4. Brake plate
- 5. Cushion plate
- 6. Spring retainer
- 7. Return spring
- 8. Brake piston
- 9. O-ring
- 10. O-ring
- 11. Thrust race
- 12. Planetary ring gear
- 13. Thrust bearing race #6
- 14. Thrust bearing #7
- 15. Thrust bearing race #8
- 16. OD case
- 17. Thrust bearing race #9
- 18. Thrust bearing #10
- 19. Seal ring

355223



DISASSEMBLY

- (1) Remove the snap ring and take out the backing plate, brake discs, brake plates, cushion plate, thrust washer, planetary ring gear, bearing and race from the O.D. case.
- (2) Remove the snap ring and take out the spring retainer and return spring.



- (3) Blow air into the O.D. case through the oil hole to remove the piston.
- (4) Remove the O-ring from the piston.

INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the O.D. case for wear and damage of the piston sliding surfaces, seal ring and ring groove.
- (2) Check the piston for wear and damage of its outside (surface in contact with the case).
- (3) Check the spring for damage and deterioration.

Free length

Standard value : 16.1 mm (.634 in.)

Limit : 15.7 mm (.618 in.)

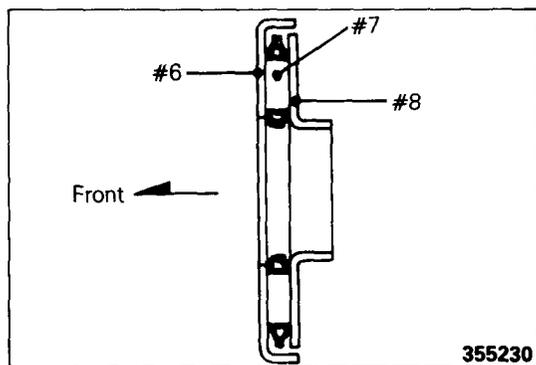
- (4) Check the discs and plates for wear and damage of the friction surfaces. Also check the case and hub engagement for wear and damage.
- (5) Check the planetary ring gear for wear and damage of tooth surfaces and splines.
- (6) Check the bearings, races and thrust washers for wear and damage.

REASSEMBLY

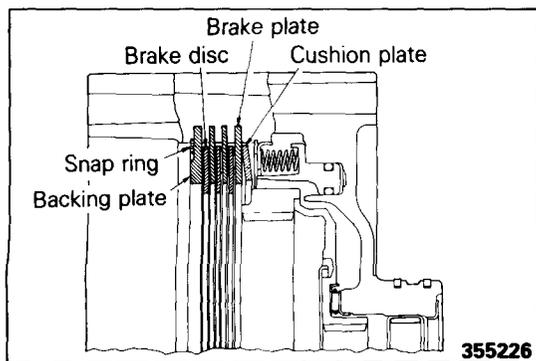
- (1) Install new O-rings in the piston outside and inside grooves.
- (2) Apply a light coat of ATF to the O-rings and install the piston in the case, using care not to damage O-rings.
- (3) Install the return spring and spring retainer and fit the snap ring.

Caution

1. **Make sure that the springs is installed without inclination.**
2. **Make sure that the snap ring is seated in the groove correctly.**



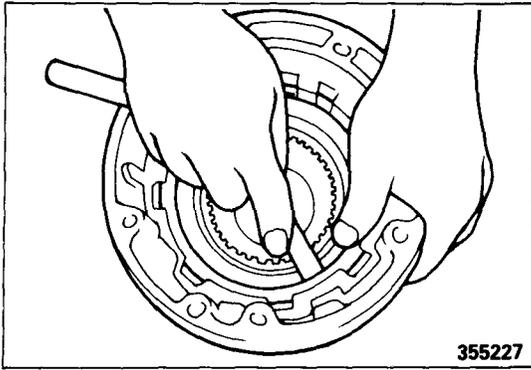
- (4) Install bearing races #6 and #8, thrust bearing #7, planetary ring gear and thrust washer in the O.D. case. Thrust bearing races #6 and #8 should be installed in the illustrated direction.



- (5) Install the cushion plate and then install the brake plates and brake discs alternately. Then, install the backing plate and fit the snap ring.

Caution

Note the direction of installation of the cushion plate.



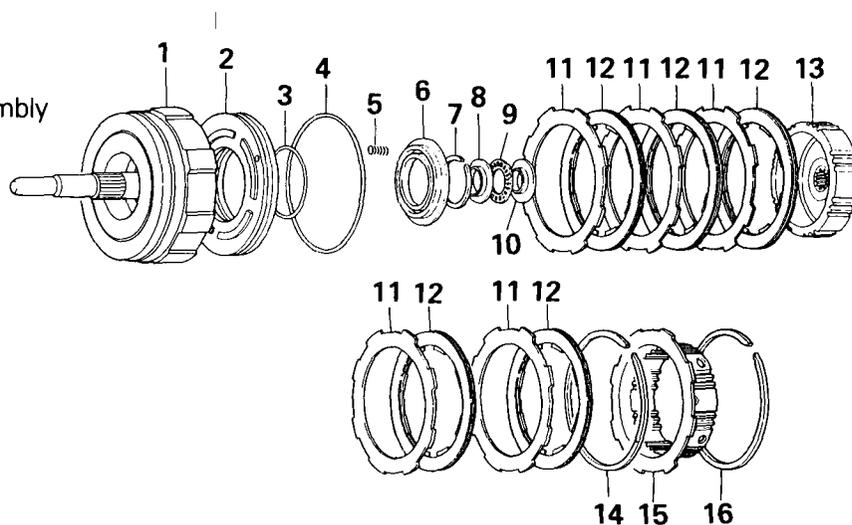
- (6) Measure the brake clearance.
 Measure the backing plate to snap ring clearance. If it is larger than nominal, replace the clutch disc or plate. If it is smaller than nominal, incorrect installation is suspected. Disassemble and reinstall.

Standard value : 0.35–1.6 mm (.04–.062 in.)

FORWARD CLUTCH

N21LHDB

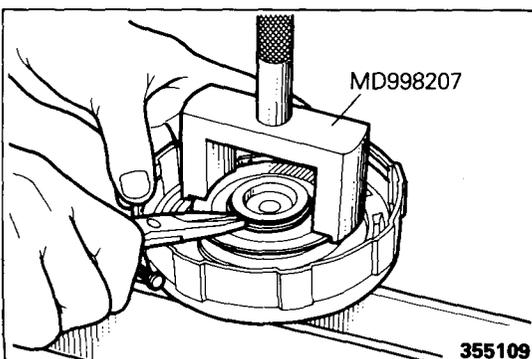
1. Forward clutch cylinder assembly
2. Forward clutch piston
3. O-ring
4. O-ring
5. Clutch return spring
6. Spring retainer
7. Snap ring
8. Thrust bearing race
9. Thrust bearing
10. Thrust bearing race
11. Clutch plate
12. Clutch disc
13. Forward clutch hub
14. Snap ring
15. Direct clutch hub
16. Snap ring



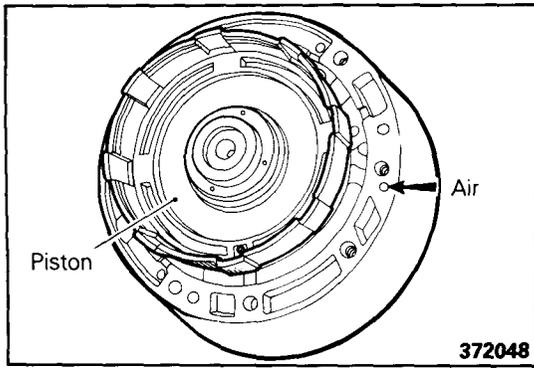
372100

DISASSEMBLY

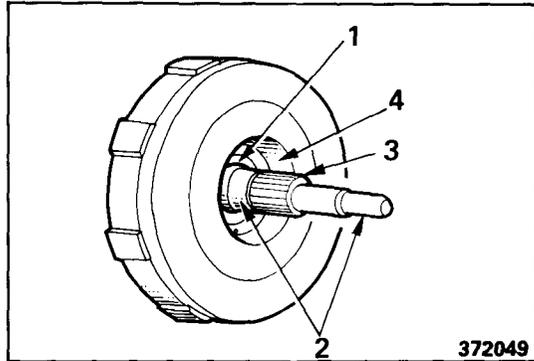
- (1) Remove the snap ring (for installation of the direct clutch hub) and remove the direct clutch hub, forward clutch hub and clutch disc from the clutch cylinder.
- (2) Remove the needle bearing and thrust bearing races.
- (3) Remove the snap ring and remove the clutch plates and clutch discs.



- (4) Place the front clutch cylinder on a press bench and compress the clutch return spring by using the special tool. Remove the snap ring.
- (5) Remove the spring retainer and return spring.



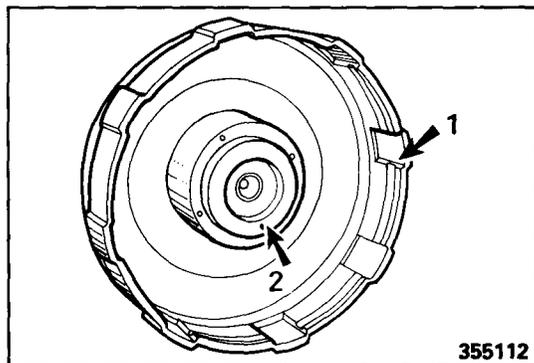
- (6) Install the clutch cylinder in the O.D. case and blow air into the O.D. case through the oil hole to remove the piston from the clutch cylinder.
- (7) Remove the O-ring from the piston.



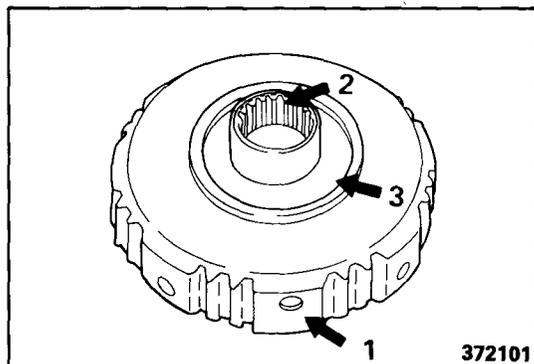
INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

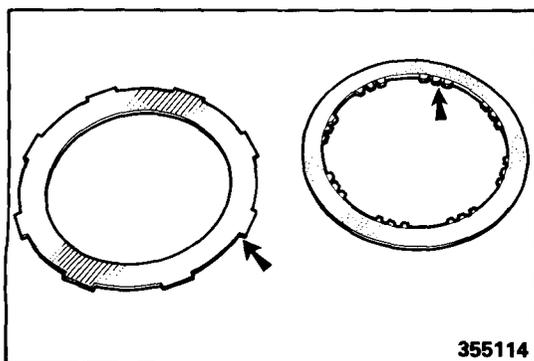
- (1) Check the input shaft and clutch cylinder for excessive wear and binding of thrust bearing contact surface 1 and bushing sliding surface 2, for damage of splines 3 and for wear of O.D. case seal ring contact surface 4.



- (2) Check the forward clutch cylinder for wear and damage of clutch drum teeth 1, for wear and binding of piston sliding surface and for damage and binding of thrust bearing seating surface 2.



- (3) Check the front clutch for abnormal wear and damage of teeth 1 and splines 2 and for wear, binding and damage of hub thrust surface 3.



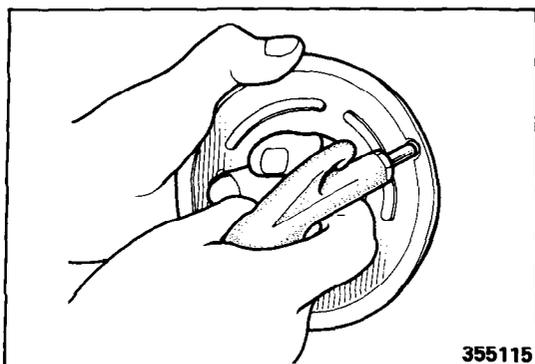
- (4) Check the clutch disc and clutch plate for wear and binding of friction surfaces and for wear and damage of engagement with the cylinder and hub (indicated by arrows).
- (5) Check the clutch return spring for damage and cracks. Also check for spring outside wear and deterioration.

Coil O.D.

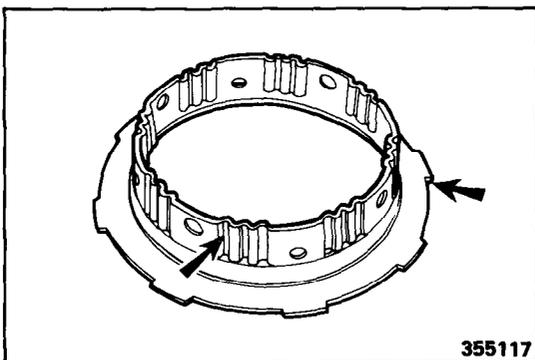
Standard value : 8.0 mm (.315 in.)

Free length

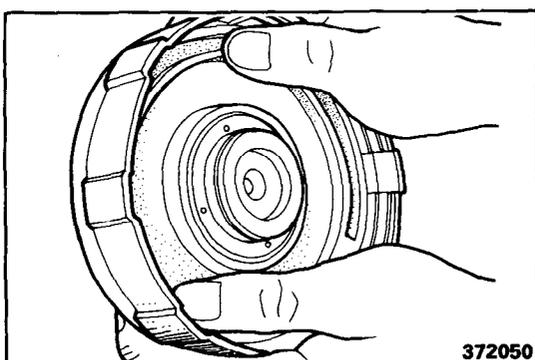
Standard value : 15.1 mm (.594 in.)



- (6) Check the clutch piston for wear and damage of the outside (surface in contact with the cylinder). Shake the piston to check for binding check ball. Also apply air pressure to the piston inside to check for air leaks.

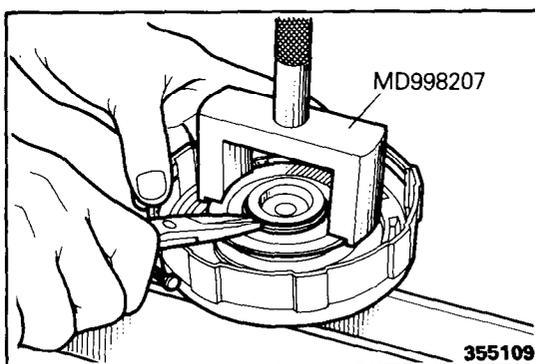


- (7) Check the direct clutch hub for abnormal wear and damage of the key ways (indicated by arrows).

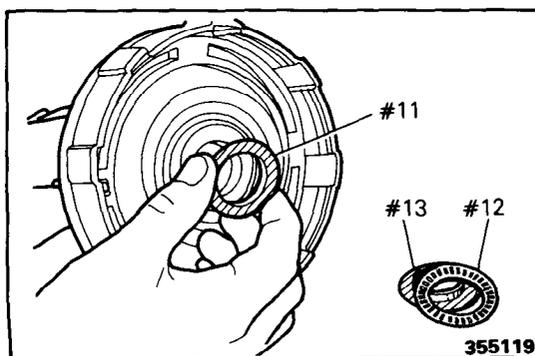


REASSEMBLY

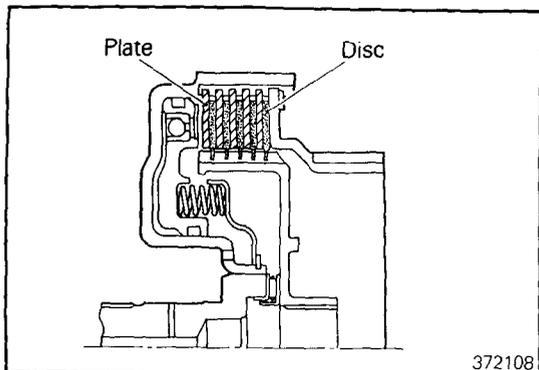
- (1) Install new O-ring in the piston outside and inside grooves.
- (2) Apply a light coat of ATF to the O-rings and install the piston in the case, using care not to damage O-rings.



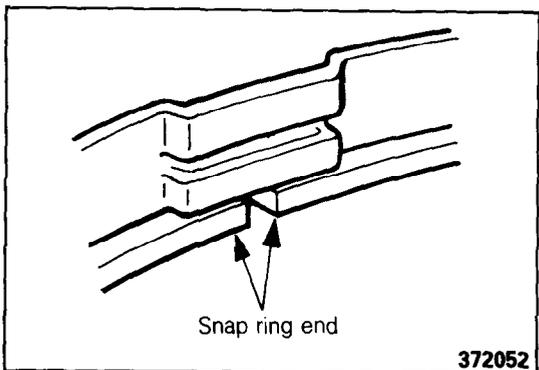
- (3) Install the return spring and spring retainer in the clutch cylinder and compress the spring by using the special tool. Fit the snap ring.



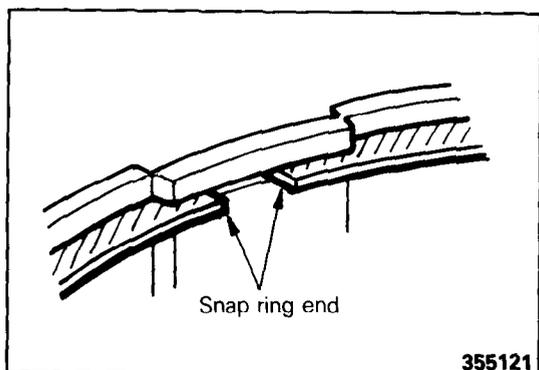
- (4) Using vaseline, attach thrust bearing race #11, bearing #12 and race #13 in the order shown onto the input shaft rear end.



- (5) Install the forward clutch hub in the clutch cylinder.
- (6) Install the clutch plates and clutch discs alternately in the clutch cylinder and fit the snap ring (narrower one) in the cylinder ring groove.



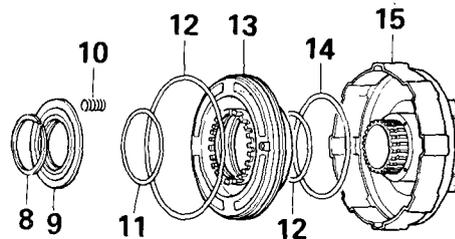
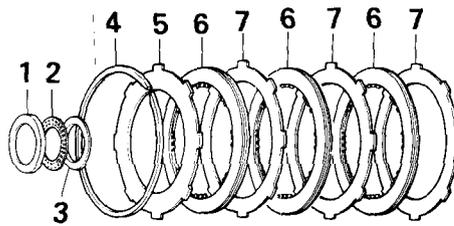
- (7) The snap ring should be located with its ends as illustrated.



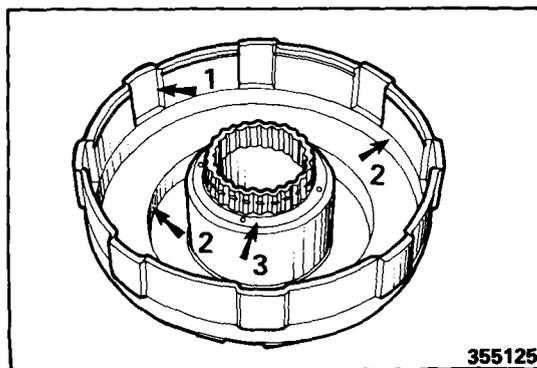
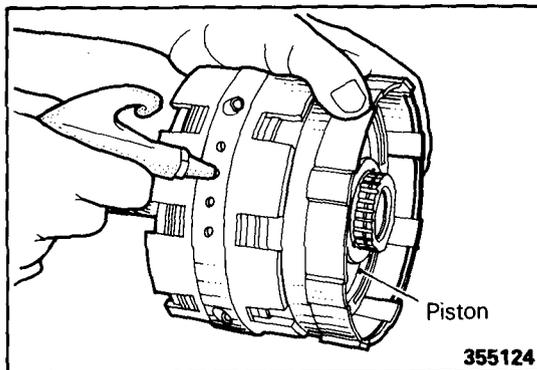
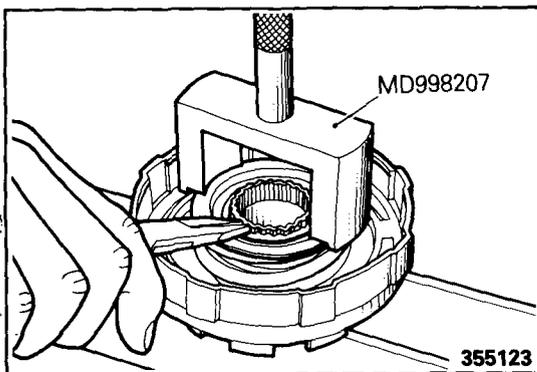
- (8) Install one clutch disc and then install the direct clutch hub and fit the snap ring (wider one) at illustrated location.

DIRECT CLUTCH

- 1. Thrust bearing race
- 2. Thrust bearing
- 3. Thrust bearing race
- 4. Snap ring
- 5. Clutch backing plate
- 6. Clutch disc
- 7. Clutch plate
- 8. Snap ring
- 9. Spring retainer
- 10. Piston return spring
- 11. O-ring
- 12. O-ring
- 13. Direct clutch piston
- 14. O-ring
- 15. Direct clutch cylinder



372053



DISASSEMBLY

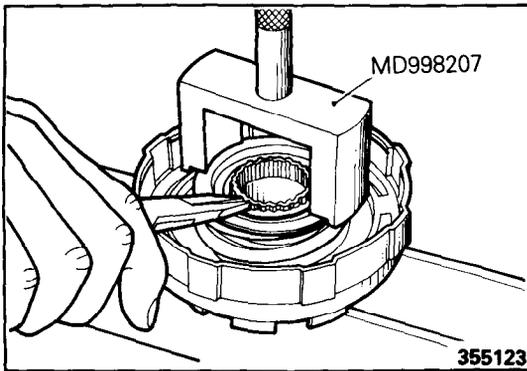
- (1) Remove the snap ring and remove the clutch backing plate, clutch discs and clutch plates from the direct clutch cylinder.
- (2) Place the rear clutch on a press bench by using the special tool, compress the return spring to remove the snap ring. Then, remove the spring retainer and piston return spring.

- (3) Install the clutch cylinder in the center support and blow air through the oil hole of the center support to remove the piston from the cylinder.
- (4) Remove the O-rings from the piston.

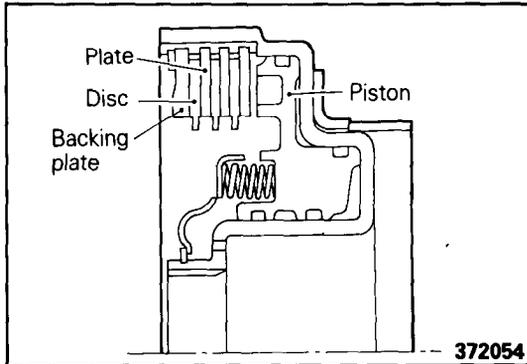
INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the clutch cylinder for wear and damage of grooves 1 and piston sliding surface 2, for wear and damage of thrust bearing surface and for wear and damage of seal ring sliding surface.
- (2) For inspection of the clutch disc, plate, piston and spring, see FRONT CLUTCH.

**REASSEMBLY**

- (1) Fit new O-rings in inside and outside grooves of the piston.
- (2) Apply a light coat of ATF to the O-rings and insert the piston into the cylinder using care not to damage the O-rings.
- (3) Place the clutch cylinder on a press bench and install the clutch return spring and spring retainer.
- (4) Compress the return spring, fit the snap ring by using the special tool.

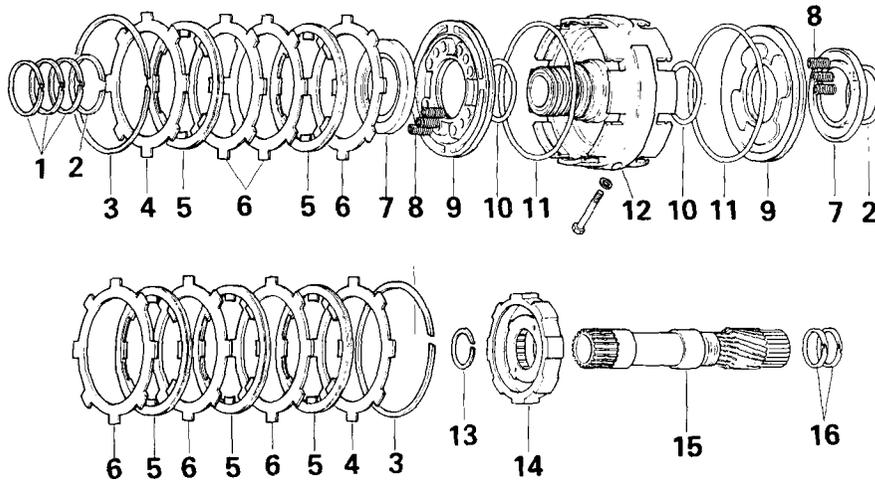


- (5) Install the clutch plates, clutch discs and clutch backing plate in the clutch cylinder and fit the snap ring.

Caution

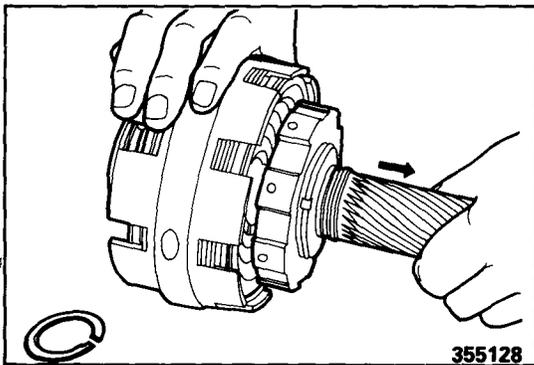
Note the direction of installation of the backing plate.

CENTER SUPPORT



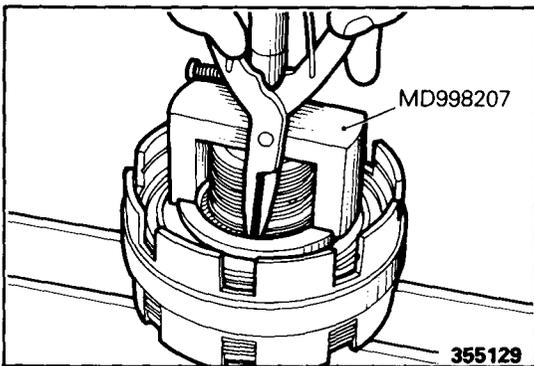
- | | | |
|-------------------------|------------------------|--|
| 1. Seal ring | 7. Spring retainer | 13. Snap ring |
| 2. Snap ring | 8. Brake return spring | 14. Brake No.2 hub one-way clutch
No.1 assembly |
| 3. Snap ring | 9. Brake piston | 15. Planetary sun gear |
| 4. Clutch backing plate | 10. O-ring | 16. Seal ring |
| 5. Clutch disc | 11. O-ring | |
| 6. Clutch plate | 12. Center support | |

372055

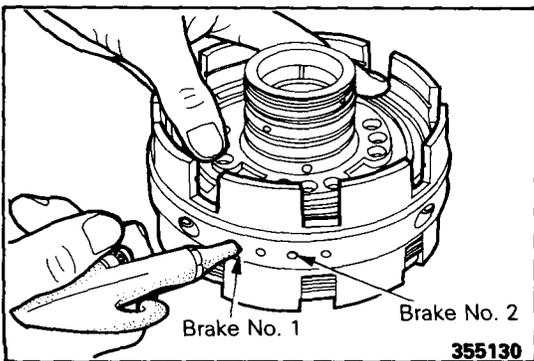


DISASSEMBLY OF BRAKE NO.1

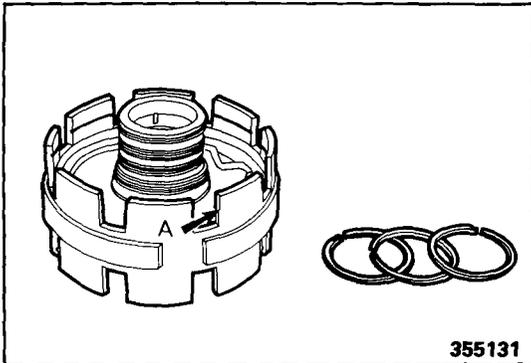
- (1) Remove the snap ring from the front of the sun gear and remove the sun gear (with one-way clutch) from the center support.
- (2) Remove the snap ring from the center support and remove the backing plate, clutch discs and clutch plates.



- (3) Plate the center support on a press bench by using the special tool. Compress the spring, remove the snap ring. Then, remove the spring retainer and 12 brake return springs.



- (4) Blow air into the oil way of the center support to remove the brake No.1 piston.
- (5) Remove the O-rings from the piston.
- (6) Remove the seal rings from the center support.



INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the center support for damage and deterioration of the seal rings, for abnormal wear and ridge wear of seal ring groove, for abnormal wear and binding of bushing and for wear of clutch plate slot (section A).
- (2) Check the brake piston for damage of its outside (surface in contact with the center support cylinder). For inspection of the disc and plate, see FRONT CLUTCH.
- (3) Check the brake return spring for damage, squareness and for compliance with the spring specifications.

Coil O.D.

Standard value : 8.0 mm (.315 in.)

Free length

Standard value : 16.1 mm (.634 in.)(reference)

Load at height

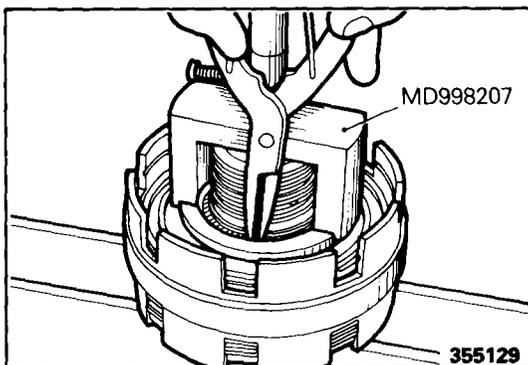
Standard value 11.5 mm (.453 in.) : 21–23N (4.7–5.2 lbs.)(reference)

REASSEMBLY OF BRAKE NO.1

- (1) Install three seal rings on the center support.
- (2) Install new O-rings on outside and inside of the No.1 brake piston.
- (3) Apply a light coat of ATF to the O-rings and insert the piston in the cylinder, using care not to damage the O-rings.
- (4) Place the center support on a press bench and fit 12 brake return springs in recesses of the piston. Then place the spring retainer thereon.
- (5) Compress springs by using the special tool and fit the snap ring.
- (6) Install the clutch plates, clutch discs and backing plate in the support and fit the snap ring.

Caution

Note the direction of installation of the backing plate.

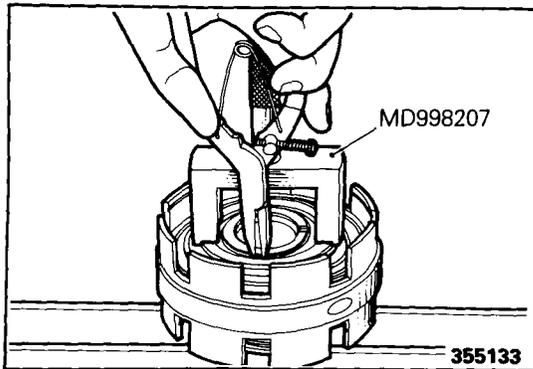


DISASSEMBLY AND INSPECTION OF BRAKE NO.2

For disassembly and inspection, see BRAKE NO.1.

REASSEMBLY OF BRAKE NO.2

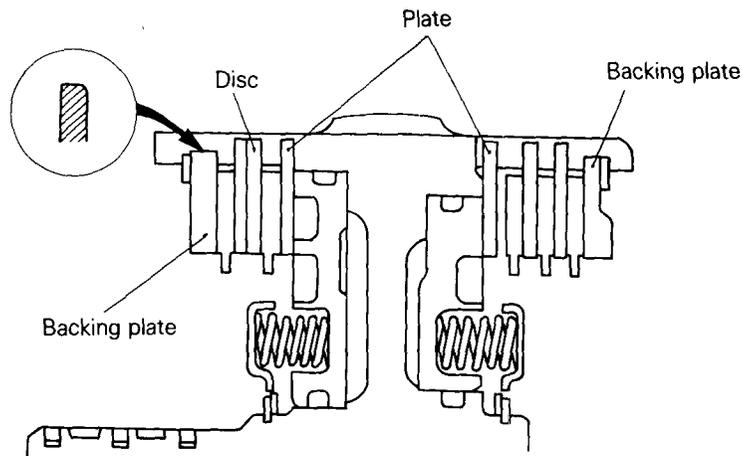
- (1) Install new O-rings on outside and inside of the No.2 brake piston.
- (2) Apply a light coat of ATF to the O-rings and insert the piston in the cylinder, using care not to damage the O-rings.
- (3) Place the center support on a press bench and fit 12 brake return springs in recesses of the piston. Then place the spring retainer thereon.



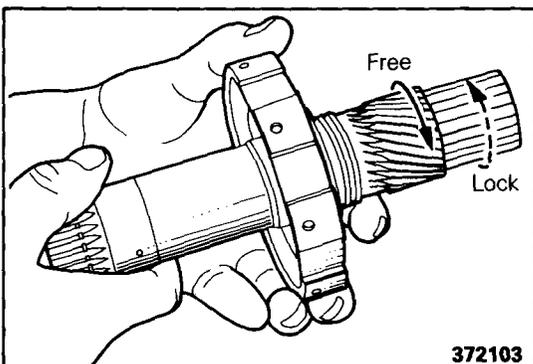
- (4) Compress the springs and fit the snap rings by using the special tool.
- (5) Install the clutch plates, clutch discs and backing plate in the support and fit the snap ring.

Caution

Note the direction of installation of the backing plate.



372102

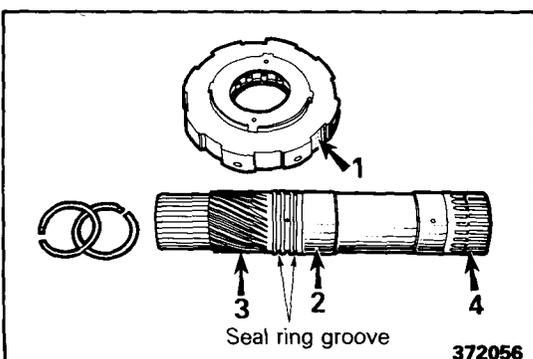
**INSPECTION**

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

Caution

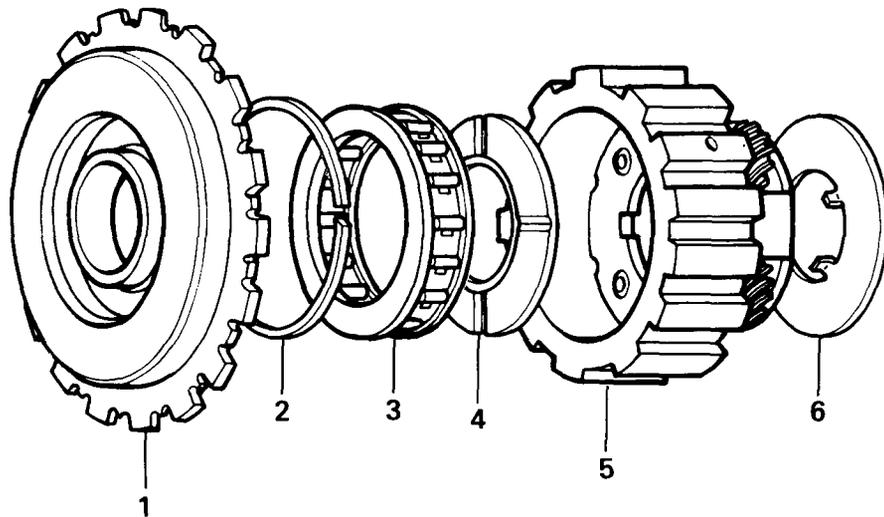
When drying the one-way clutch by air, use care as the sprag is likely to pop out.

- (1) Fix the brake No.2 hub (outer race) and check that the sun gear (inner race) turns smoothly when rotated clockwise and that it locks securely when rotated counter-clockwise. If the one-way clutch is found faulty, replace the brake No.2 hub and one-way clutch assembly.
- (2) Remove the sun gear from the one-way clutch 1 and check for wear and damage of its surface contacting with the one-way clutch springs. Also check for wear and damage of the seal ring and ring groove and for damage of the sun gear teeth 3 and splines 4.

**REASSEMBLY**

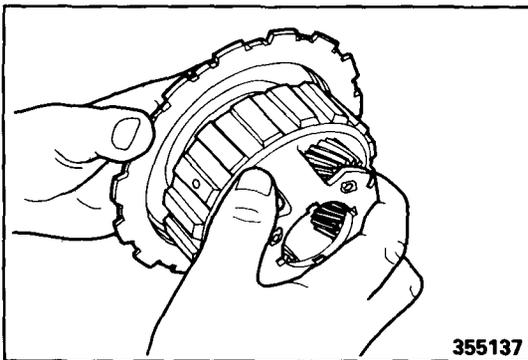
- (1) Install two seal rings in sun gear grooves.
- (2) Insert the sun gear in the one-way clutch No.1 and check rotation.

ONE WAY CLUTCH NO. 2 AND FRONT PLANETARY GEAR SET N21LK-



- | | |
|------------------------------|-------------------------|
| 1. One-way clutch inner race | 4. Thrust washer |
| 2. Retaining ring | 5. Front planetary gear |
| 3. One-way clutch No.2 | 6. Thrust washer |

355136



DISASSEMBLY

- (1) Disassemble the one-way clutch inner race and front planetary carrier.
- (2) Remove the retaining ring from the front planetary carrier and remove the one-way clutch No.2 assembly and thrust washers.

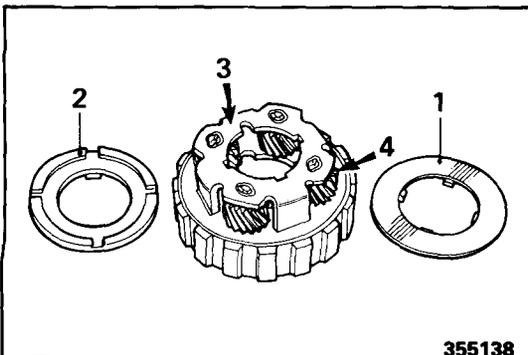
355137

INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

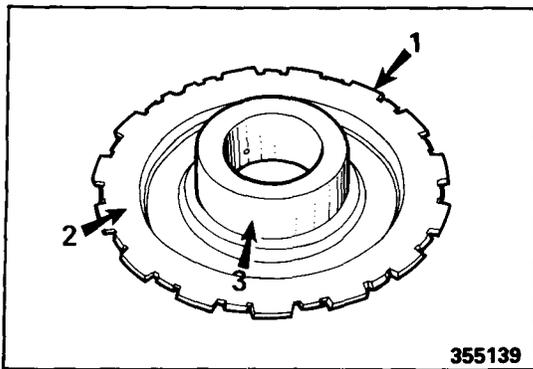
Caution

When drying the one-way clutch by air, use care as the sprag is likely to pop out.

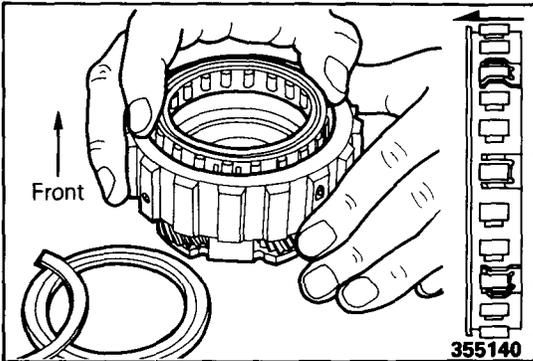


- (1) Check the thrust washers 1 and 2 for wear, bend and binding.
- (2) Check the front planetary gear for wear of carrier thrust surface 3, for wear and damage of pinion 4 and for wear of the one-way clutch outer race surface.
- (3) Check one-way clutch No.2 for wear and damage of springs, ribbon and sprag.

355138

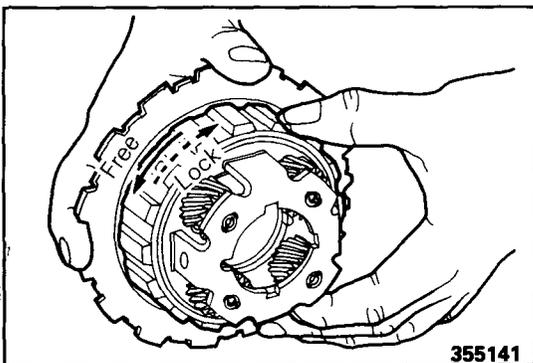


- (4) Check the one-way clutch inner race for wear and damage of teeth 1 and disc sliding surface 2 and for wear and damage of inner race surface 3.



REASSEMBLY

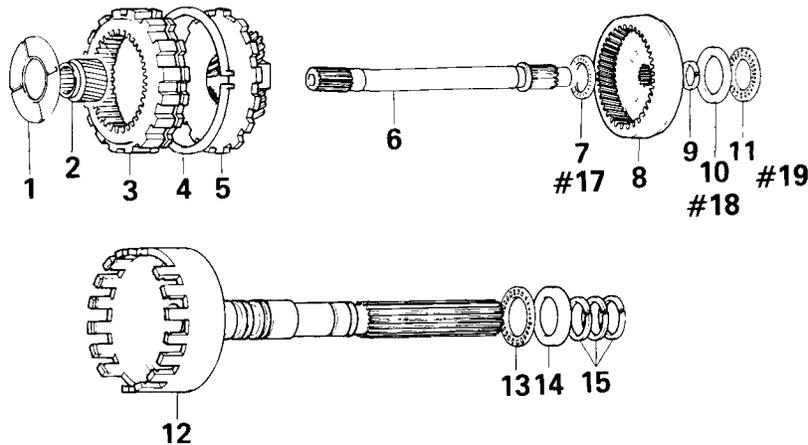
- (1) Install the thrust washer (front) on the planetary gear.
- (2) Install two end bearings on the one-way clutch and noting the direction, install the clutch on the front planetary gear and fix with the retaining ring.
- (3) Install the one-way clutch inner race on the front planetary carrier.



- (4) Fix the inner race and check that the outer race (planetary gear carrier) turns smoothly when rotated counter-clockwise and that it locks securely when rotated clockwise.
- (5) Apply vaseline to the thrust washer (rear) and attach it to the front planetary gear carrier.

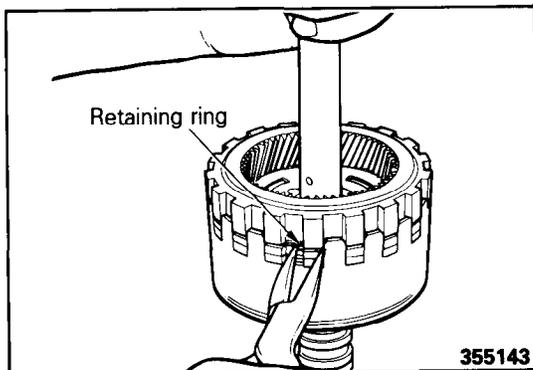
REAR PLANETARY GEAR AND OUTPUT SHAFT

N21LZ--



372057

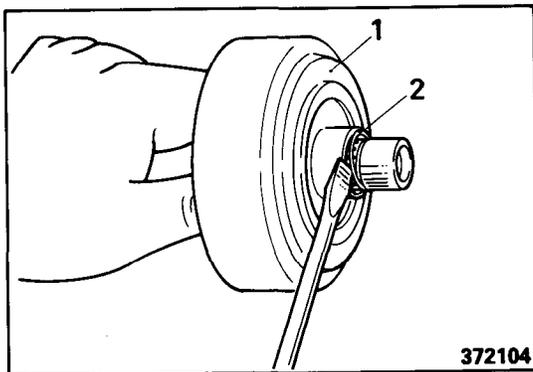
- | | | |
|------------------------------|-----------------------------|---------------------------|
| 1. Thrust washer | 6. Intermediate shaft | 11. Thrust bearing #19 |
| 2. Planetary sun gear | 7. Thrust bearing #17 | 12. Output shaft assembly |
| 3. Front planetary ring gear | 8. Rear planetary ring gear | 13. Thrust bearing |
| 4. Retaining ring | 9. Retaining ring | 14. Thrust bearing race |
| 5. Rear planetary gear | 10. Thrust bearing race #18 | 15. Seal ring |



355143

DISASSEMBLY

- (1) Loosen the retaining ring and remove the intermediate shaft (front planetary ring gear and rear planetary gear) from the output shaft assembly.
- (2) Remove the front planetary ring gear, thrust washer and rear planetary gear from the intermediate shaft.



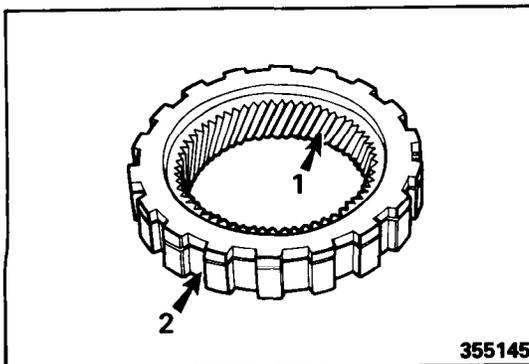
372104

- (3) Remove retaining ring 1 from the rear of the intermediate shaft and remove rear planetary ring gear 2 and thrust bearing #17.

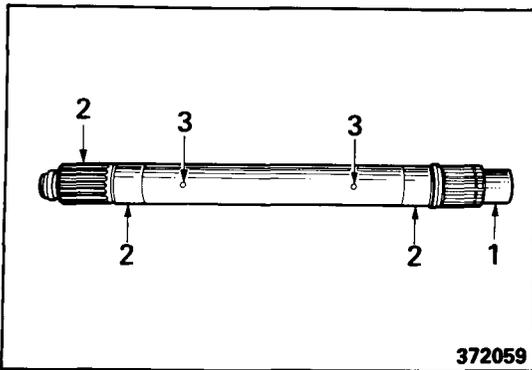
INSPECTION

Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

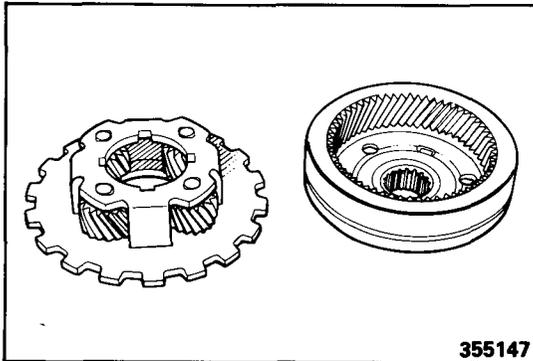
- (1) Check the front planetary ring gear for wear and damage of internal gear teeth 1 and parking pawl teeth 2.



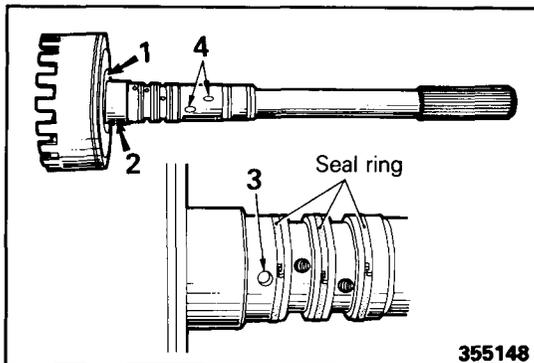
355145



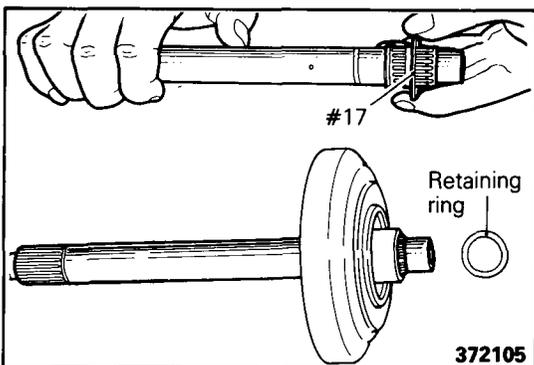
- (2) Check the intermediate shaft for wear and damage of splines 1 and bushing seating surfaces 2 and for clogging of oil holes 3 in shaft.



- (3) Check the rear planetary gear for wear of the carrier thrust surface, for wear, damage and play in thrust direction of the pinion.
 (4) Check the rear planetary ring gear for wear and damage of the internal gear teeth and internal splines.

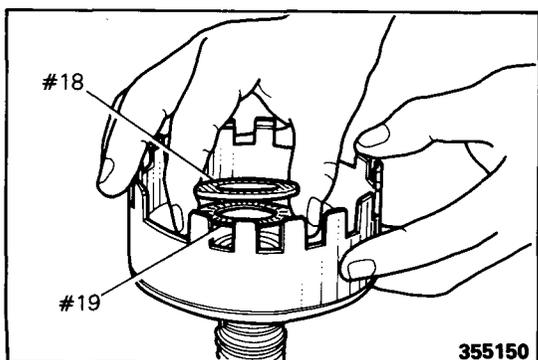


- (5) Check the output shaft for wear and damage of flange thrust bearing surface 1 and shaft bushing seating surface 2 and for clogging of shaft oil hole 3 and governor oil way 4.
 (6) Check the thrust washer and thrust race for wear and binding of the bearing surfaces.
 (7) Check the seal ring for wear and damage. Also check the groove.

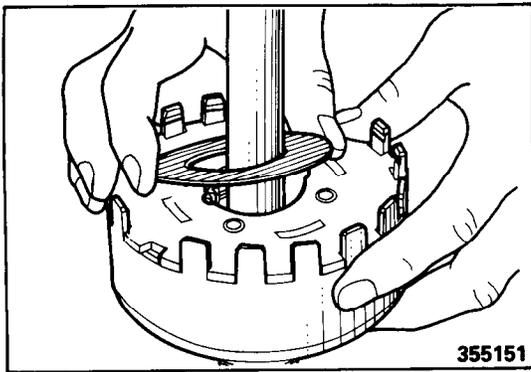


REASSEMBLY

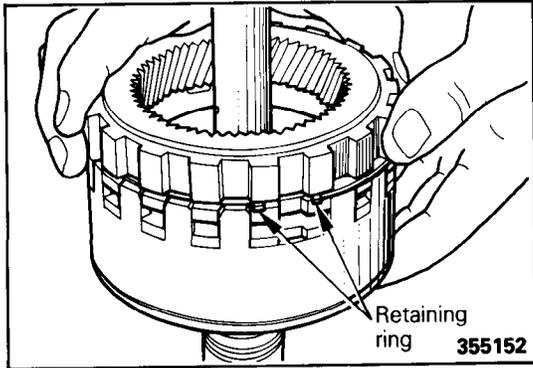
- (1) Install thrust bearing #17 on the intermediate shaft and then install the rear planetary ring gear and fix with the retaining ring.



- (2) Install thrust bearing #19 and bearing race #18 on the output shaft.



- (3) Install the intermediate shaft together with the rear planetary ring gear on the output shaft flange.
- (4) Install the rear planetary gear set and thrust washer.



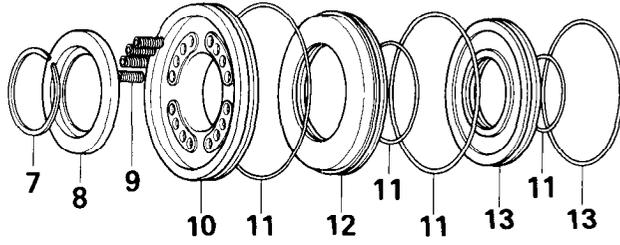
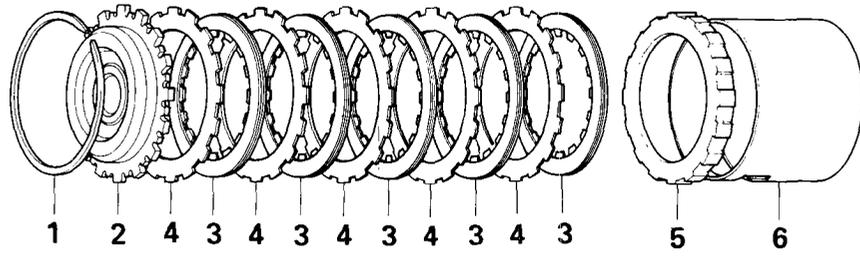
- (5) Install the retaining ring on the front planetary ring gear and install the ring gear on the output flange while compressing the retaining ring.

Caution

Pay attention to location of retaining ring ends.

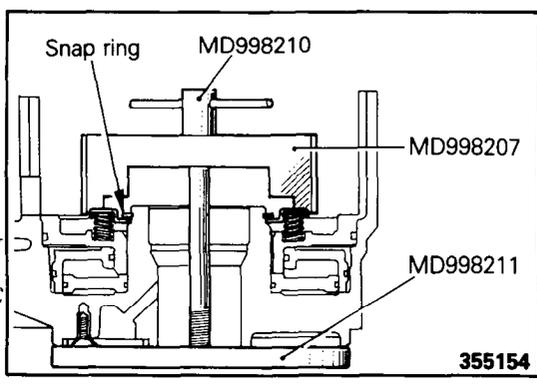
BRAKE NO. 3

N21LIBA



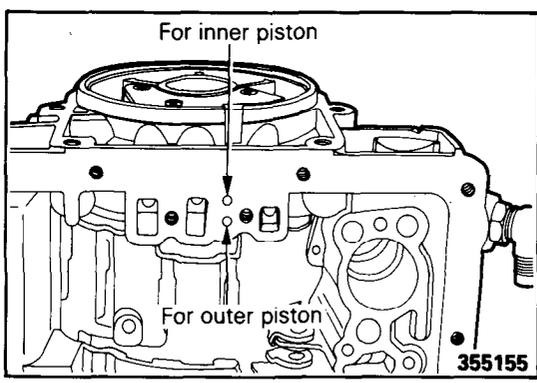
- | | | |
|------------------------------|-------------------------------|---------------------------------|
| 1. Retaining ring | 6. Brake apply tube | 11. O-ring |
| 2. One-way clutch inner race | 7. Snap ring | 12. Reaction sleeve |
| 3. Clutch disc | 8. Spring retainer | 13. Brake No.3 secondary piston |
| 4. Clutch plate | 9. Brake return spring | |
| 5. Backing plate | 10. Brake No.3 primary piston | |

372060

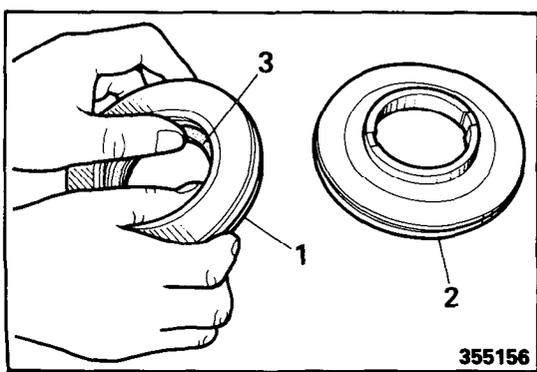


DISASSEMBLY

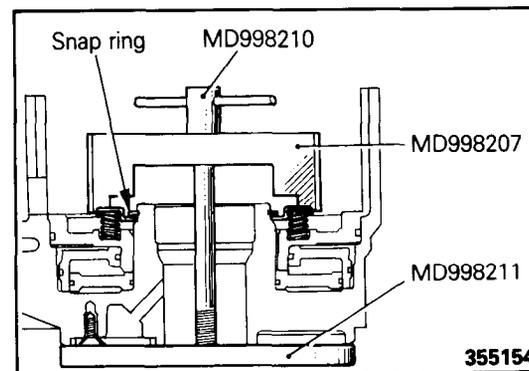
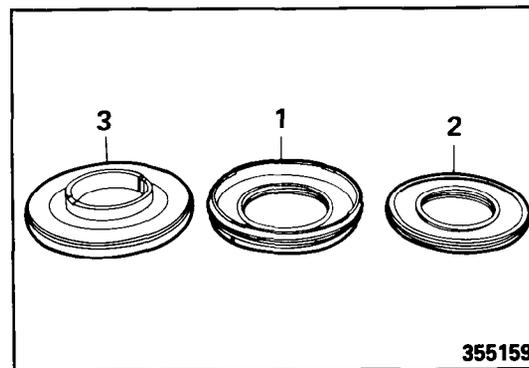
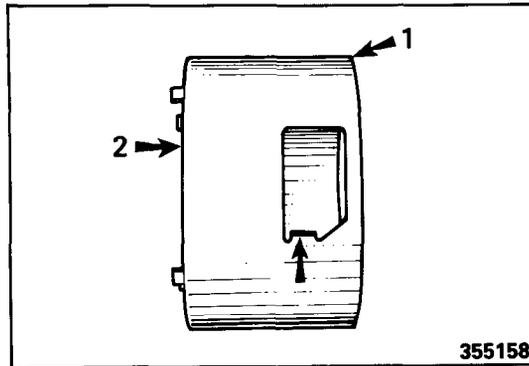
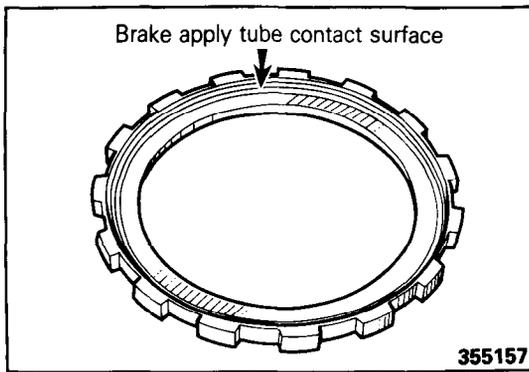
- (1) Compress the spring and remove the snap ring by using the special tools.
- (2) Remove the spring retainer and 16 piston return springs.



- (3) Place the transmission case with the front end down and using two air guns, blow air into inside through the inner and outer piston oil holes simultaneously to remove the inner and outer pistons and reaction sleeve as an assembly. Place rag below the case to protect the pistons.



- (4) Remove primary piston 2 and secondary piston 3 from reaction sleeve 1.
- (5) Remove O-rings from the pistons and reaction sleeve.



INSPECTION

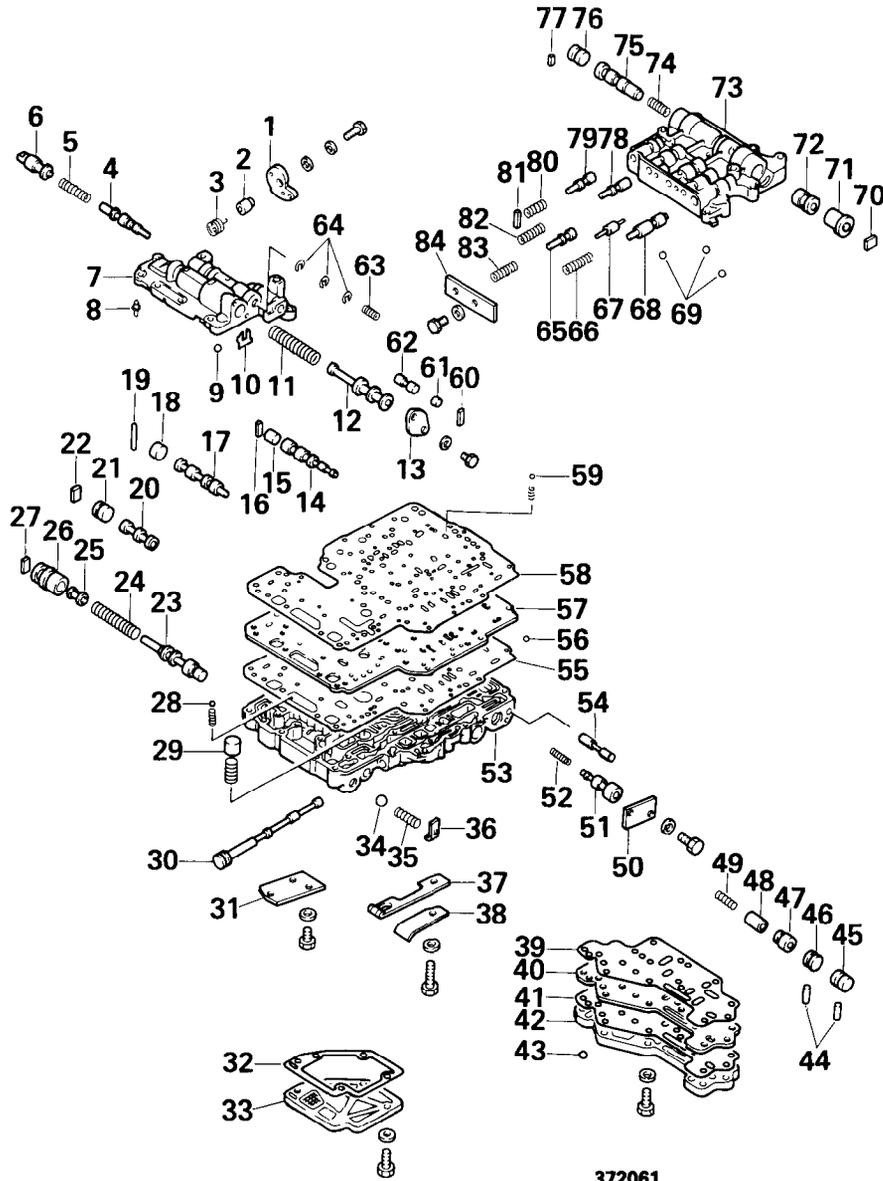
Wash the removed parts and dry with air. Then, check the following and replace faulty parts.

- (1) Check the clutch discs and clutch plates for wear and binding of the friction surfaces and for wear of parts in engagement with the transmission case and hub.
- (2) Check the backing plate for wear and binding of disc friction surface and for wear and damage of brake apply tube contact surface.
- (3) Check the brake apply tube for deformation and damage, for wear and damage of backing plate contact surface 1 and piston contact surface 2 and for wear and deformation of tube detent lug 3.
- (4) Check the brake piston and reaction sleeve for damage and wear of their outside in contact with the cylinder.
- (5) For inspection of the brake return springs, see the paragraph on inspection of brake No.1 springs.

REASSEMBLY

- (1) Install new O-rings on the primary and secondary pistons and reaction sleeve.
- (2) Apply ATF to the O-rings and push inner piston 2 into reaction sleeve 1 and then install outer piston 3.
- (3) Slide the pistons and reaction sleeve assembled in the step above into the cylinder, using care not to damage the O-rings.
- (4) Apply grease to 16 brake return springs and install them on the outer piston. Then, install the spring retainer.
- (5) Compress the springs and fit the snap ring by using the special tools.

VALVE BODY



372061

1. Throttle cam
2. Cam spacer
3. Return spring
4. Throttle valve
5. Throttle valve primary spring
6. Kickdown valve
7. Upper front valve body
8. Check valve
9. Check ball
10. Throttle valve keep plate
11. Secondary regulator valve spring
12. Secondary regulator valve
13. Front valve end cover
14. 1-2 shift valve
15. 1-2 shift valve plug
16. Valve retainer
17. 3-4 shift valve
18. 3-4 shift valve plug
19. Locating pin
20. D-2 down timing valve
21. D-2 down timing valve plug
22. Valve retainer
23. Primary regulator valve
24. Primary regulator valve spring
25. Primary regulator valve plunger
26. Primary regulator valve sleeve
27. Valve retainer
28. Check valve
29. Check valve
30. Manual valve
31. Plate
32. Oil screen gasket
33. Oil screen
34. Pressure relief valve
35. Pressure relief valve spring
36. Retainer
37. Detent spring
38. Detent spring plate
39. Lower valve body cover gasket (upper)
40. Lower valve body cover plate
41. Lower valve body cover gasket (lower)
42. Lower valve body cover
43. Check valve
44. Locating pin
45. Manual plug
46. Third coast shift valve plug
47. Third coast shift valve
48. 3-4 shift control valve
49. 3-4 shift control valve spring
50. Low coast shift valve cover
51. Low coast shift valve
52. 1-2 shift valve spring
53. Lower valve body
54. Plug
55. Lower valve body gasket
56. Check valve
57. Separate plate
58. Valve body gasket
59. Check valve
60. Valve retainer
61. Cut back plug
62. Cut back valve
63. Throttle valve secondary spring
64. E-ring
65. Reverse brake sequence valve
66. Low coast modulator valve spring
67. Plug
68. Low coast modulator valve
69. Check valve
70. Valve retainer
71. Intermediate coast shift valve plug
72. Intermediate coast shift valve
73. Upper rear valve body
74. 2-3 shift valve spring
75. 2-3 shift valve
76. 2-3 shift valve plug
77. Valve retainer
78. Intermediate coast modulator valve
79. Detent regulator valve
80. Detent regulator valve spring
81. Valve retainer
82. Intermediate coast modulator valve spring
83. Reverse clutch sequence valve spring
84. Rear valve cover

DISASSEMBLY

For disassembly, observe the precautions given below.

- (1) Keep the disassembled parts orderly for efficient reassembly operation. Attach tags to springs for identification.
- (2) When disassembling the valve, do not attempt to remove the valve with undue force. The valve and valve hole could be damaged or burred, leading to faulty valve operation.
- (3) When removing the front upper and rear valve bodies from the lower valve body, use care not to lose check balls and springs.

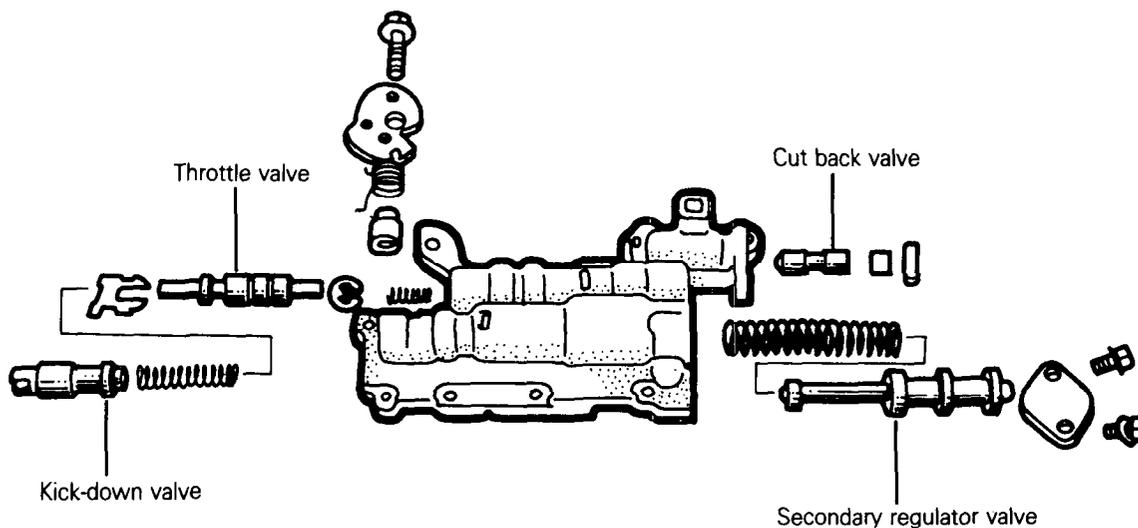
INSPECTION

Wash the removed parts and dry with air. Then, make the following checks.

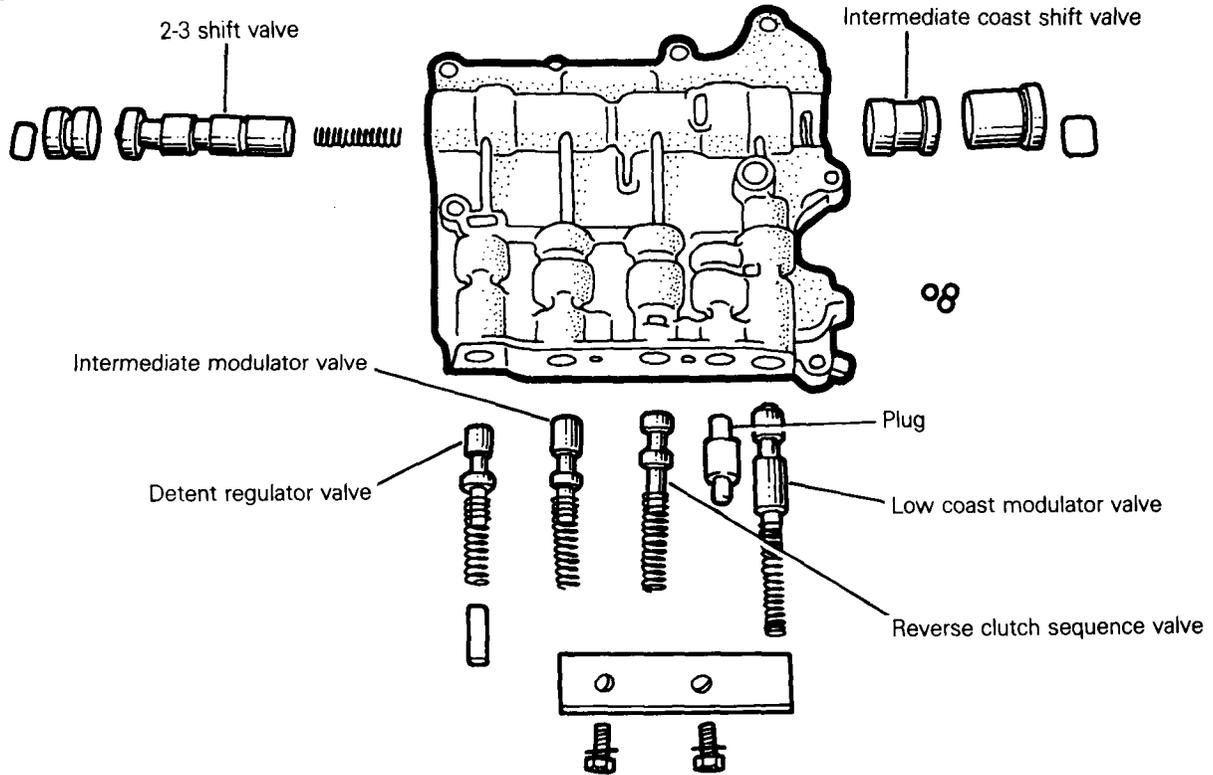
Caution

When making checks, use care not to damage valve land outside and valve body holes.

- (1) Check the valves for damage and wear.
- (2) Insert the valves in the valve body and check smooth rotation and sliding.
- (3) Check the valve body for damage and wear of valve hole bores and for clogging of oil holes and oil ways.
- (4) Check for damage of the valve body plate wear and damage of check balls.
- (5) Check for clogging of the oil strainer.

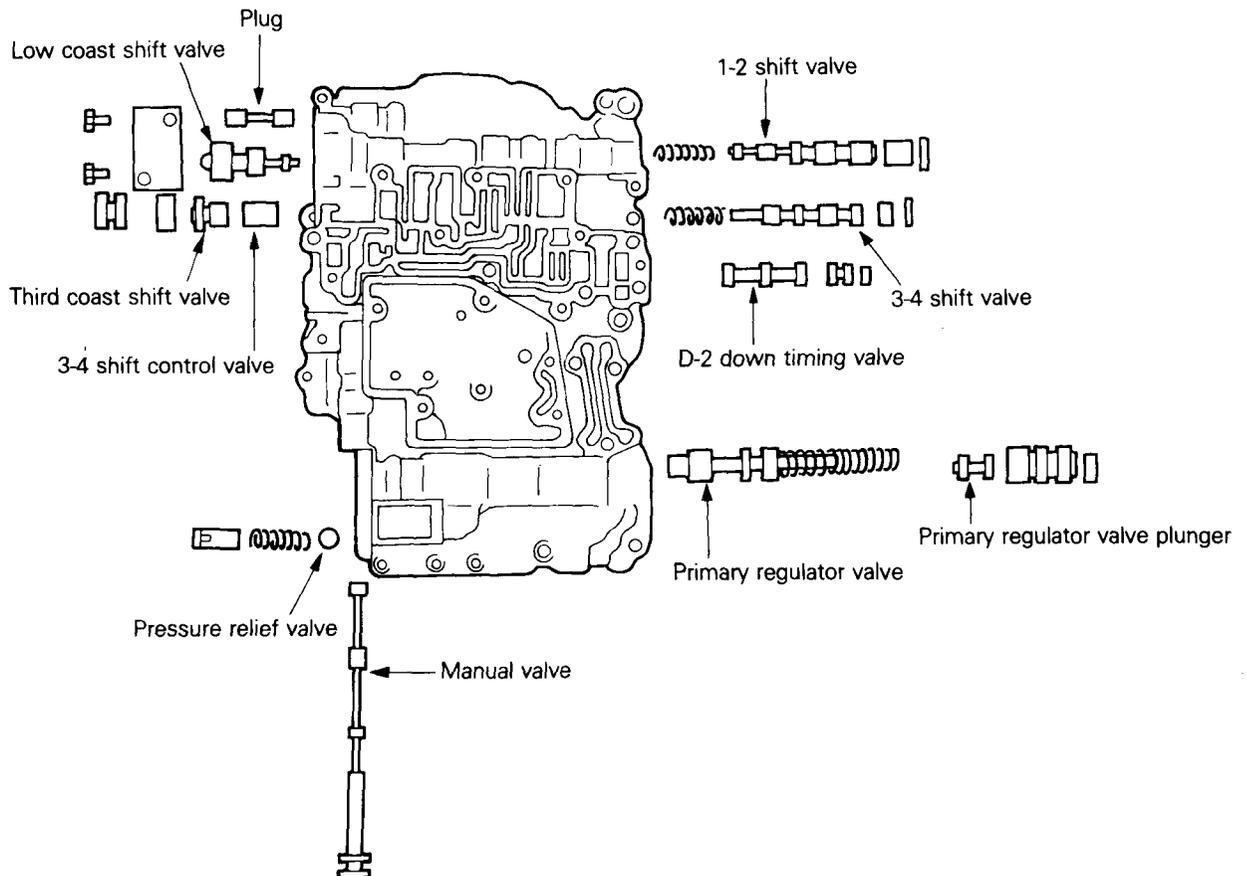
UPPER FRONT VALVE BODY

UPPER REAR VALVE BODY



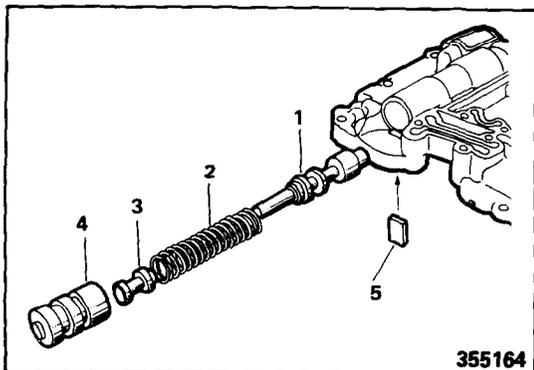
(6) Check the springs and replace if broken or excessively deteriorated. (See the table on page 21-164.)

LOWER VALVE BODY



Valve Spring Identification

	Name	Spring outer di- ameter mm (in.)	Free length (refer- ence mm value)(in.)	Number of turns	Wire diameter mm (in.)	Identification color
Upper front valve body	Spring (for throttle valve)	8.58 (.338)	19.24 (.757)	8	0.71 (.028)	-
	Spring (for kickdown valve)	10.87 (.428)	43.44 (1.710)	15.5	1.20 (.047)	Orange
	Spring (for secondary regulator valve)	17.43 (.686)	71.27 (2.806)	15	1.93 (.076)	Green
Upper rear valve body	Spring (for intermediate modulator valve)	9.04 (.356)	27.26 (1.073)	9.5	1.10 (.043)	Green
	Spring (for sequence valve)	9.32 (.367)	33.72 (1.327)	13	1.32 (.052)	Yellow
	Spring (for low coast modulator valve)	9.24 (.364)	42.35 (1.667)	15	0.84 (.033)	-
	Spring (for 2-3 shift valve)	8.96 (.353)	35.10 (1.382)	12.5	0.76 (.030)	White
	Spring (for detent regulator valve)	8.90 (.350)	30.43 (1.198)	13	0.90 (.035)	Green
Lower valve body	Spring (for 1-2 shift valve)	7.56 (.298)	34.62 (1.363)	13	0.56 (.022)	-
	Spring (for 3-4 shift valve)	10.60 (.417)	35.18 (1.385)	14.5	1.10 (.043)	Green
	Spring (for pressure relief valve)	13.14 (.517)	32.14 (1.265)	9	2.03 (.080)	-
	Spring (for check valve)	13.82 (.544)	33.32 (1.312)	7	1.32 (.052)	Yellow
	Spring (for primary regulator valve)	17.20 (.677)	61.20 (2.409)	13	1.80 (.071)	White
	Spring (for primary regulator valve damp- ing)	4.97 (.196)	20.00 (.787)	16	0.40 (.016)	-

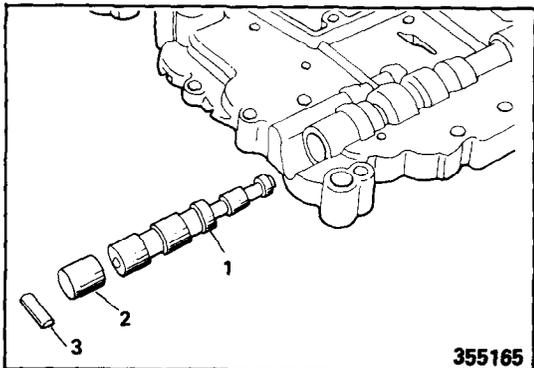


REASSEMBLY

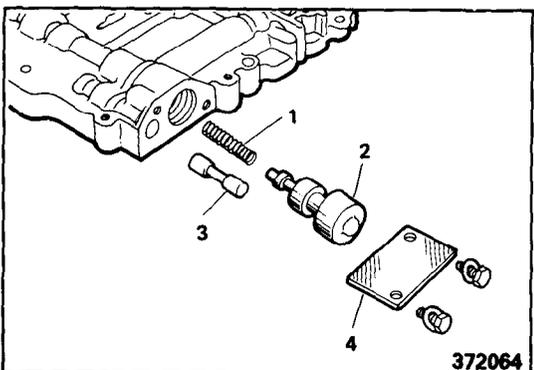
Caution

Before reassembly, wash the parts in a clean detergent and dry with air. Do not wipe with rags for drying. Entry of dust could cause faulty valve operation.

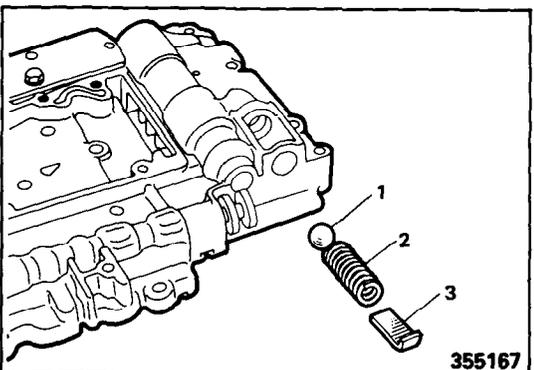
(1) Install primary regulator valve 1, spring 2, plunger 3 and sleeve 4 in the lower valve body in the order shown and insert retainer 5 to prevent the valve and other parts from coming loose.



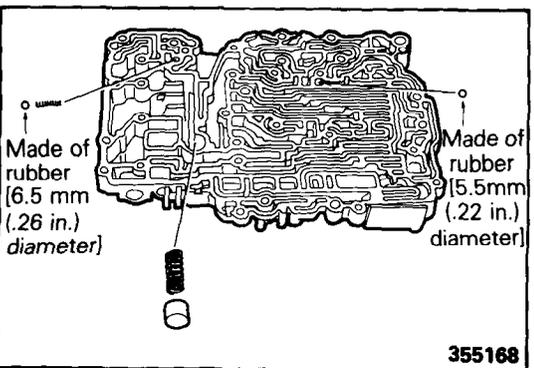
(2) Install 1-2 shift valve 1 and valve plug and insert retainer 3 to prevent the valve from coming loose.



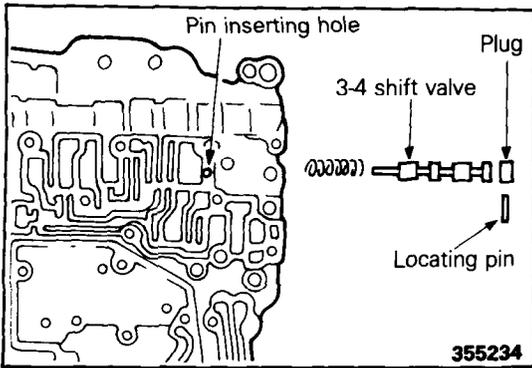
(3) Install 1-2 shift valve spring 1, low coast shift valve 2 and plug 3 and fit low coast shift valve cover 4.



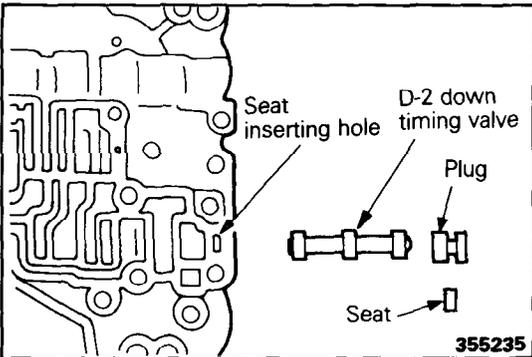
(4) Install pressure relief valve 1, spring 2 and retainer 3.



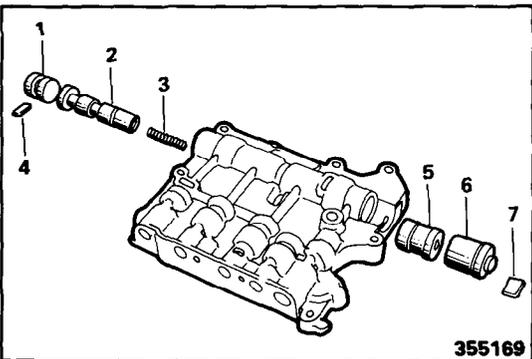
(5) Install spring, check valve and check valve spring at illustrated locations.



(6) Install the spring, 3-4 shift valve and plug and then insert the locating pin.

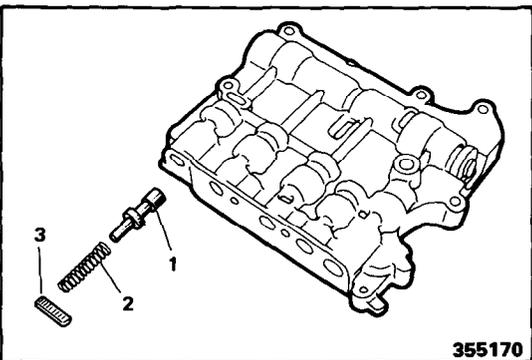


(7) Install the D-2 down timing valve and plug and insert the seat.

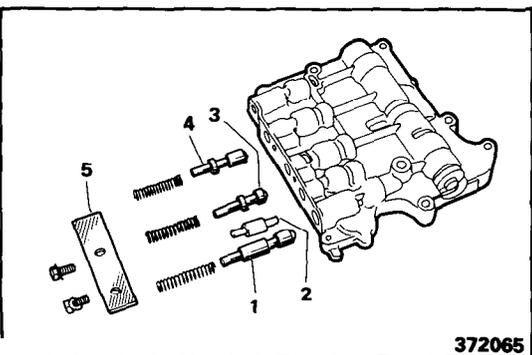


(8) Install 2-3 shift valve spring 1, 2-3 shift valve 2, 2-3 shift valve plug 3 and retainer 4 in the upper rear valve body.

(9) Install intermediate coast shift valve 5, plug 6 and retainer 7.



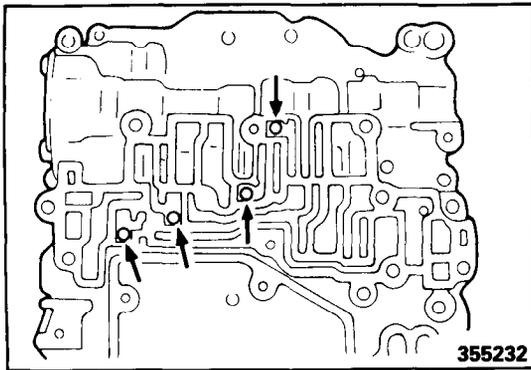
(10) Install detent regulator valve 1, spring 2 and retainer 3 in the order shown.



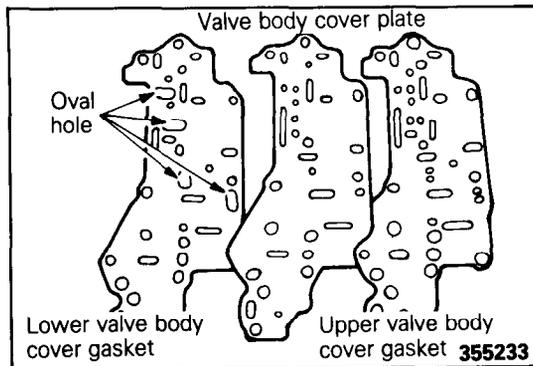
(11) Install low coast modulator valve 1, plug 2, reverse brake sequence valve 3 and intermediate coast modulator valve 4.

(12) Install valve springs.

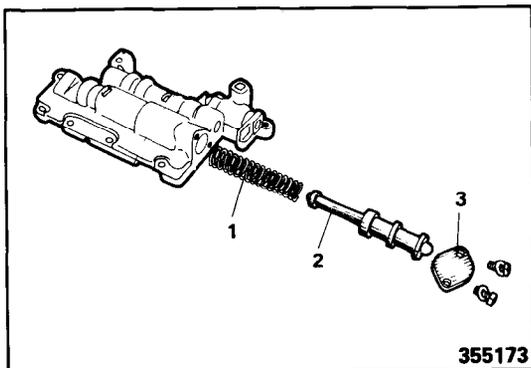
(13) Install rear valve cover 5.



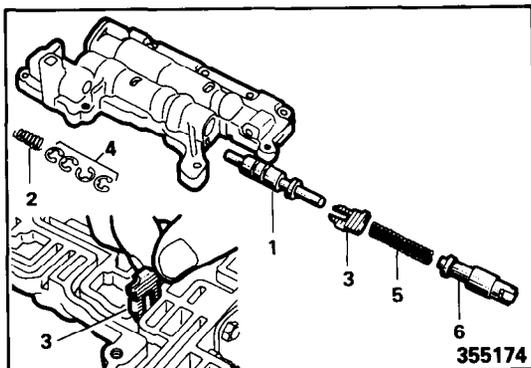
(14) Place check balls (rubber) at illustrated locations in oil ways in the bottom of the lower valve body.



(15) When installing the lower valve body cover, use the correct gasket. One with oval holes for check balls is for the lower valve body.



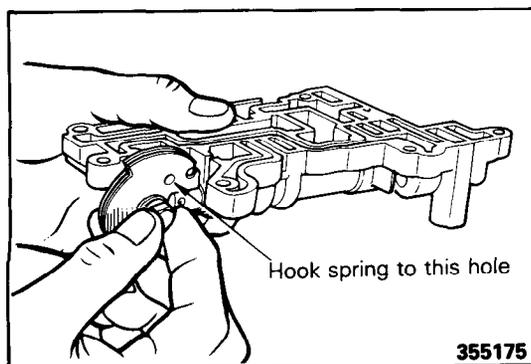
(16) Insert secondary regulator valve spring 1 and secondary regulator valve 2 in the front upper valve body and install front valve end cover 3.



(17) Insert throttle valve 1, throttle valve secondary spring 2 and E rings 4 in the order shown and fit key plate 3 in the oil way at illustrated location. Then, install throttle valve primary spring 5 and kickdown valve 6.

Caution

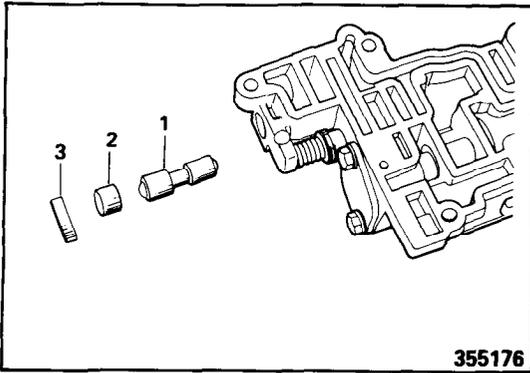
1. Install same number of E rings as before disassembly for not disturbing throttle valve adjustment.
2. Insertion of the throttle valve key plate at incorrect location could cause faulty valve operation.



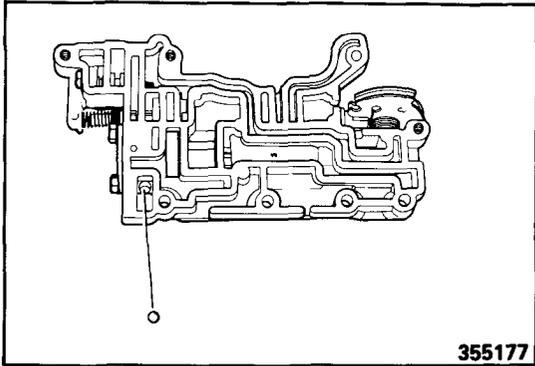
(18) Install the throttle cam and spring on the upper front valve body and tighten bolts temporarily. When installing, note the location of the spring end on the body side. Then, hook the other end of the spring to the cam and bolt the cam to the valve body. After installation, check that the throttle cam turns through full stroke smoothly.

Caution

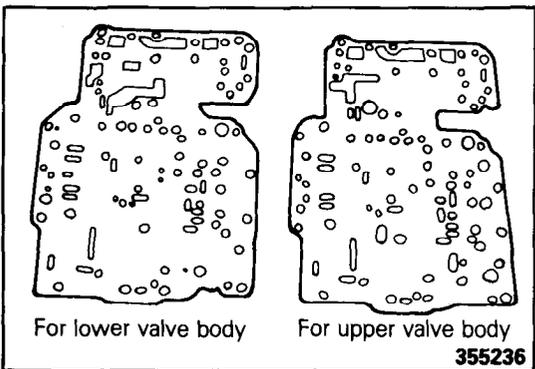
Hook the spring to the correct hole.



(19) Install cut back valve 1, valve plug 2 and retainer 3. Install the cut back plug with the larger land end facing out.

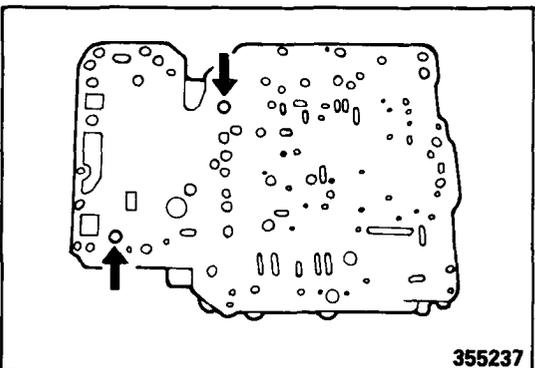


(20) Install the check ball (rubber) at the illustrated location.

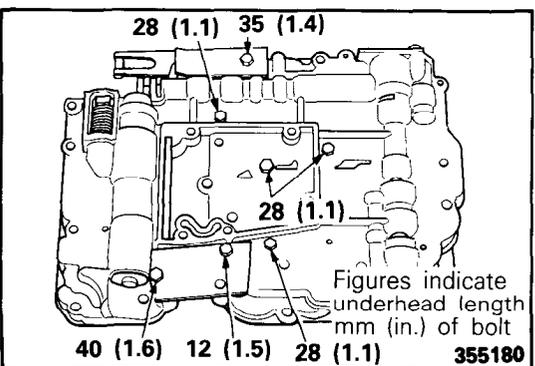


(21) Place a new lower valve body gasket on the lower valve body.

NOTE
Do not use gasket for the upper valve body.



(22) Install the separator plate and tighten bolts at illustrated locations temporarily.



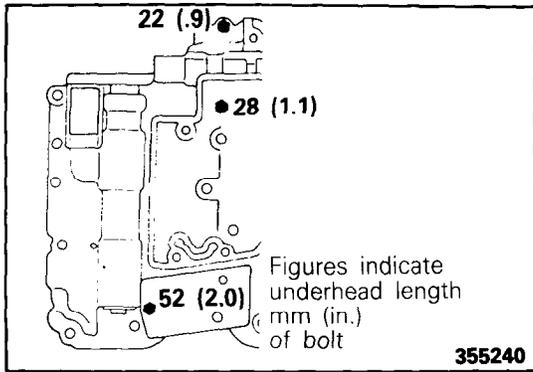
(23) Place a gasket for upper valve body, aligning with the separator plate.

(24) While using care not to disturb check valve position on the rear upper valve body, install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (A)) temporarily from the lower valve body side.

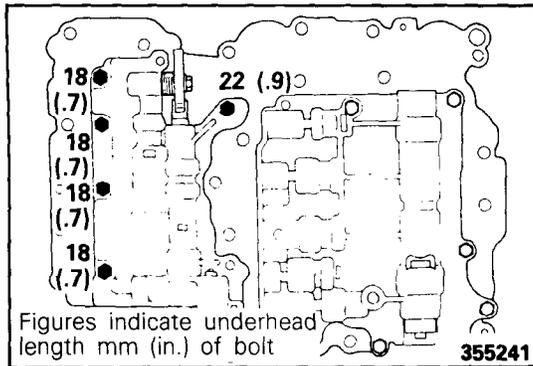
(25) Remove the two bolts tightened in step (22).

(26) Install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (B)) temporarily from the lower valve body side.

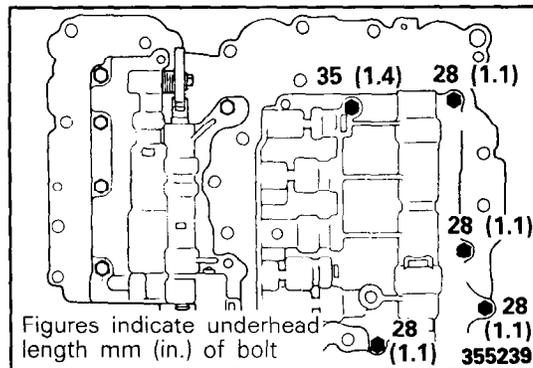
(27) Install the detent plate.



(28) Install the lower valve body onto the upper front valve body and temporarily tighten the bolts shown at left from the lower valve body side.



(29) Turn the valve body upside down and temporarily tighten the illustrated bolts from the upper valve body side.



(30) Then, temporarily tighten the remaining valve body bolts as illustrated.

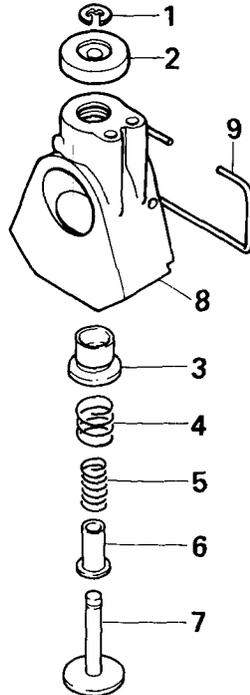
(31) Tighten all bolts of the valve body to specified torque.

(32) Install the manual valve.

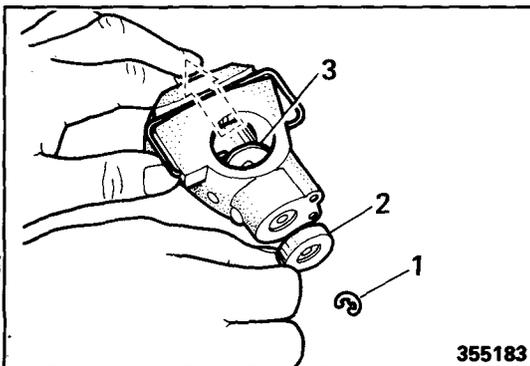
GOVERNOR

N21NA--

1. E-ring
2. Governor weight
3. Governor valve
4. Outer governor spring
5. Inner governor spring
6. Secondary weight
7. Governor valve shaft
8. Governor body
9. Governor retaining ring



372066

**DISASSEMBLY**

- (1) Remove the E-ring 1 and remove governor weight 2.
- (2) Remove governor shaft 3, spring and governor valve in the direction of arrow. Remove the governor valve from the output shaft hole.

INSPECTION

Wash removed parts and dry with air. Then, make the following checks.

- (1) Check the governor valve for damage and wear and check that it slides smoothly while rotating it in the body.
- (2) Check the governor body for damage and wear of the valve sliding surface and for clogging of the oil hole and oil way.
- (3) Check the governor spring.

		Outer	Inner
Coil outer diameter	mm (in.)	15.34 (.604)	11.55 (.455)
Free length	mm (in.)	12.76 (.520)	11.49 (.452)
Wire diameter	mm (in.)	0.85 (.034)	0.85 (.034)
Identification color		White	White

REASSEMBLY

Reassemble the governor following the disassembly steps in reverse order.

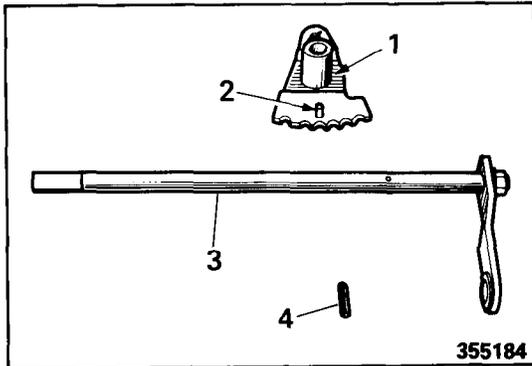
TRANSMISSION CASE

N21NB--

INSPECTION

Make the following checks and replace faulty parts.

- (1) Check the bushing for wear and binding.
- (2) Check the accumulator bore surface for damage.
- (3) Check the brake No.3 cylinder surface for damage.
- (4) Check the case inside splines for excessive wear or damage.
- (5) Check mating surfaces with other parts for damage.



MANUAL VALVE LEVER

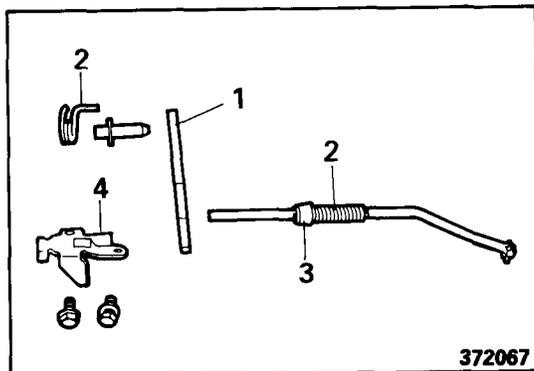
INSPECTION

Make the following checks and replace faulty parts.

- (1) Check the lever detent spring collar contact surface 1 for wear and damage.
- (2) Check manual valve lever pin 2 for wear.
- (3) Check shaft 3 for wear.
- (4) Check slotted spring pin 4 for wear.

Caution

When disassembled, do not reuse the slotted spring pin.

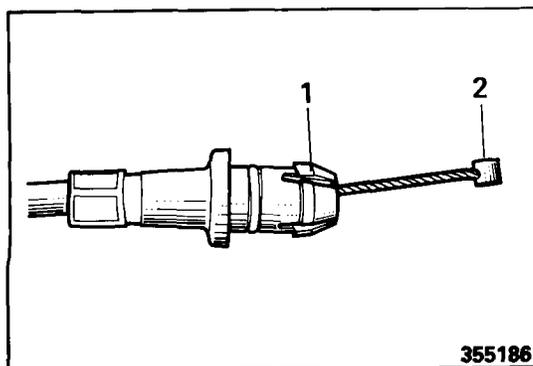


PARKING SYSTEM

INSPECTION

Make the following checks and replace faulty parts.

Check parking lock pawl 1, spring 2, cam collar 3 and cam plate 4 for wear and damage.



THROTTLE CONTROL CABLES

INSPECTION

Make the following checks and replace faulty parts.

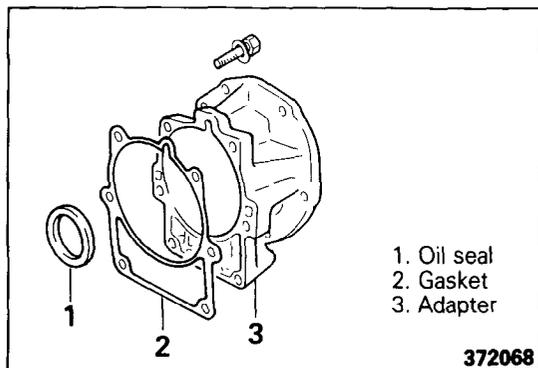
- (1) Check the outer cable for cracks and damage.
- (2) Check motion of the inner cable in the outer cable.
- (3) Check adapter 1 and nipple 2 for wear and deformation.
- (4) Check the boot for damage.

THRUST BEARING AND THRUST WASHERS

N21NC--

INSPECTION

- (1) Check the thrust bearings and thrust washers for wear and binding and replace if faulty.



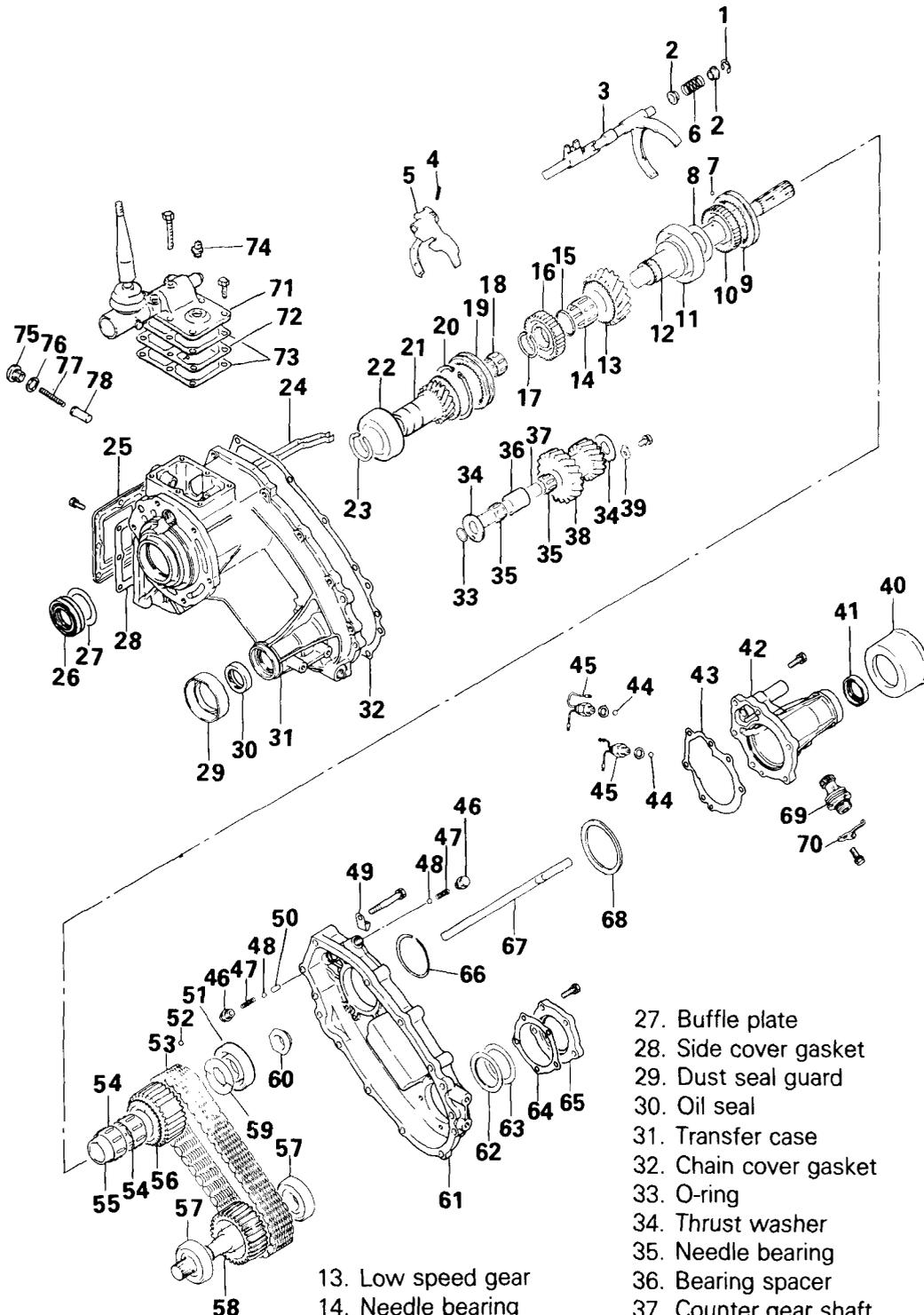
ADAPTER

INSPECTION

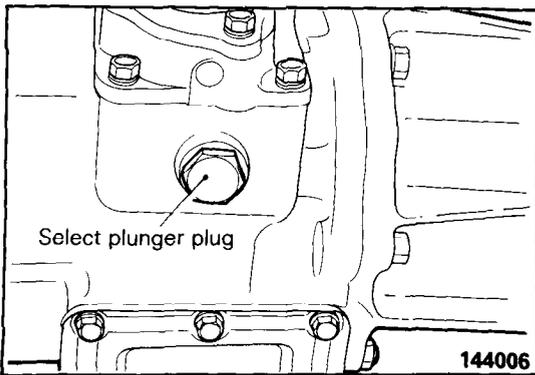
- (1) Check the adapter rear end for leaks and check the oil seal lip for damage and replace the oil seal if faulty.
When installing the oil seal, apply grease to its lip.

TRANSFER

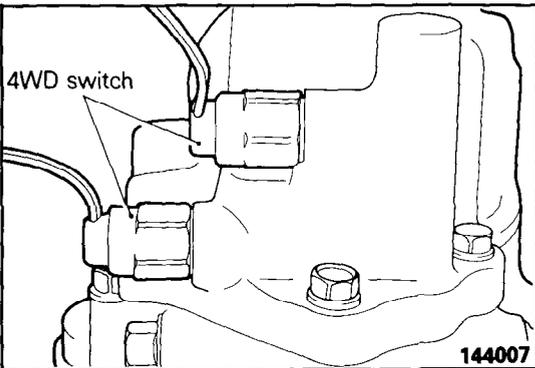
N21ND--



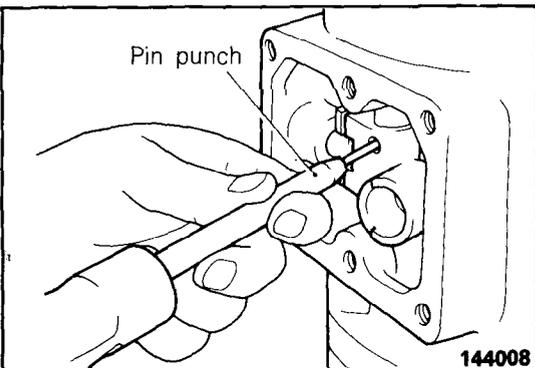
- | | | |
|------------------------|--------------------------|---------------------------------|
| 1. Snap ring | 13. Low speed gear | 50. Interlock plunger |
| 2. Spring retainer | 14. Needle bearing | 51. Ball bearing |
| 3. Shift rail assembly | 15. Bearing spacer | 52. Steel ball |
| 4. Cotter pin | 16. H-L clutch hub | 53. Chain |
| 5. H-L shift fork | 17. Snap ring | 54. Needle bearing |
| 6. Spring | 18. Needle bearing | 55. Sprocket sleeve |
| 7. Steel ball | 19. Clutch sleeve | 56. Drive sprocket |
| 8. Stopper plate | 20. Snap ring (optional) | 57. Bearing |
| 9. Clutch sleeve | 21. Input gear | 58. Front output shaft |
| 10. Clutch hub | 22. Bearing | 59. Sprocket spacer |
| 11. Bearing | 23. Snap ring | 60. Lock nut |
| 12. Rear output shaft | 24. Oil guide | 61. Chain cover |
| | 25. Side cover | 62. Wave spring |
| | 26. Oil seal | 63. Spacer (if required) |
| | | 64. Gasket |
| | | 65. Cover |
| | | 66. Snap ring |
| | | 67. H-L shift rail |
| | | 68. Wave spring |
| | | 69. Speedometer sleeve assembly |
| | | 70. Sleeve clamp |
| | | 71. Control lever assembly |
| | | 72. Control housing cover |
| | | 73. Gasket |
| | | 74. Breather |
| | | 75. Plug |
| | | 76. Gasket |
| | | 77. Select spring |
| | | 78. Select plunger |

**REMOVAL**

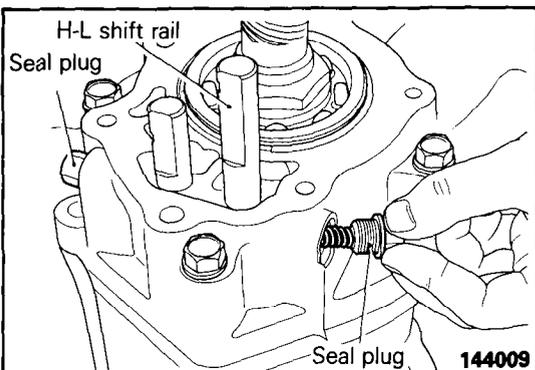
- (1) Remove the plug from the right side of the transfer case and take out the select spring and select plunger.
- (2) Remove the control lever housing assembly, cover and gasket.
- (3) Remove the transfer case to adapter attaching bolts and nuts.
- (4) Pull the transfer case back to separate from the adapter.

**DISASSEMBLY**

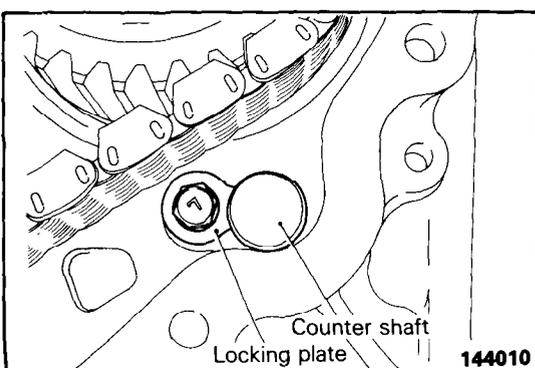
- (1) Remove two 4WD light switches. Take out two steel balls.
- (2) Remove the speedometer sleeve clamp and remove the speedometer sleeve assembly.
- (3) Remove the rear cover attaching bolts and remove the spacer and gasket.
- (4) Remove the cover (front output shaft portion) and take out the wave spring, spacer (if inserted) and gasket.
- (5) Remove the side cover and gasket.



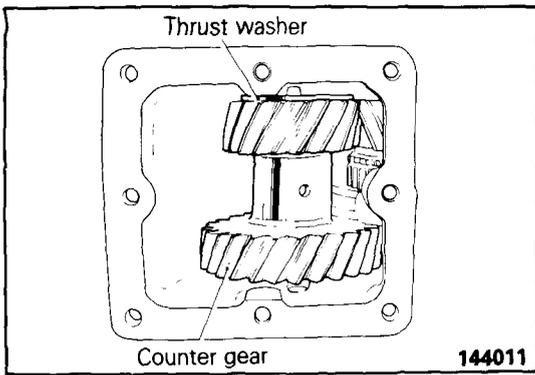
- (6) Drive out the spring pin from the H-L shift fork by using the special tool or a pin punch (commercially available).



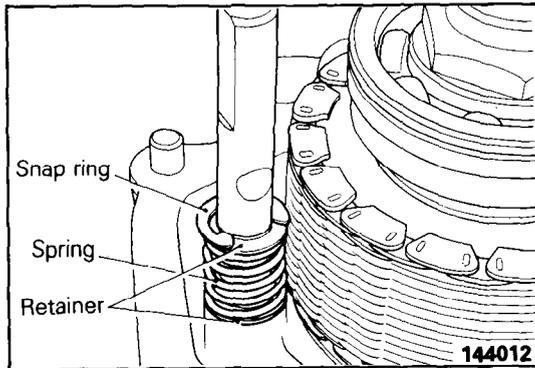
- (7) Remove the two seal plugs and take out the two poppet springs and balls.
- (8) Pull out the H-L shift rail rearward.
- (9) Take out the interlock plunger.
- (10) Remove the snap ring from the rear output shaft rear bearing.
- (11) Remove the chain cover.
- (12) Remove the oil guide.



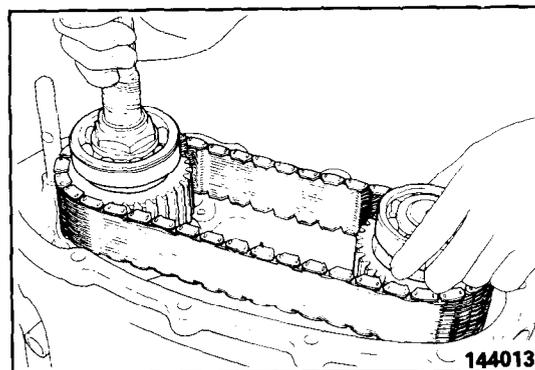
- (13) Remove the countershaft locking plate and pull out the countershaft.



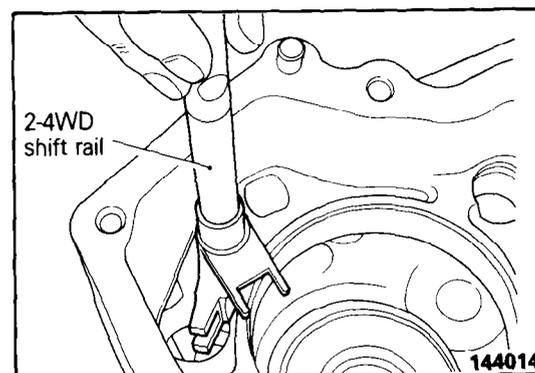
(14) Take out the counter gear, two thrust washers and needle bearings and spacer from the side cover hole.



(15) Remove the snap ring from the 2-4WD shift rail and remove the two spring retainers and spring from the shift rail.



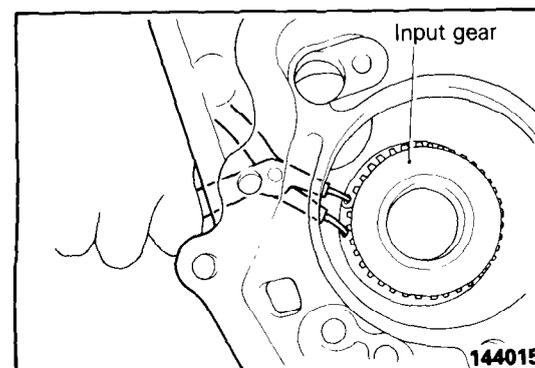
(16) Take out the front output shaft, rear output shaft and chain together from the transfer case.



(17) Remove the 2-4WD shift rail.

(18) Remove the H-L shift fork and clutch sleeve.

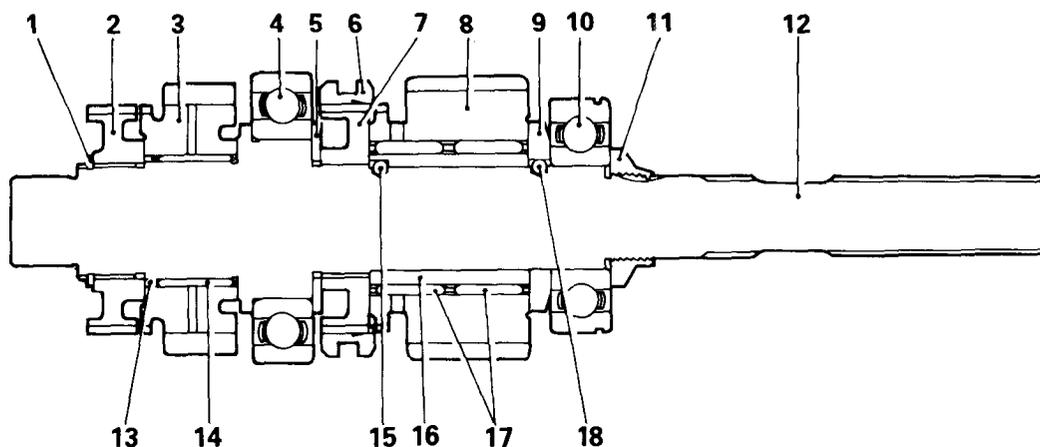
(19) Remove the needle bearing from the input gear.



(20) Remove the snap ring and then remove the input gear assembly.

DISASSEMBLY OF REAR OUTPUT SHAFT

- (1) Remove the snap ring from the rear output shaft front end and remove the H-L clutch hub, low speed gear, thrust washer and needle bearing.
- (2) Pry up the staked portion of the rear output shaft lock nut and loosen and remove the lock nut.
- (3) Remove the ball bearing from the rear end using a bearing puller (commercially available) or a press.
- (4) Remove the sprocket spacer and steel ball.
- (5) Remove the drive sprocket, two needle bearings, sprocket sleeve and steel ball.
- (6) Remove the 2-4WD clutch sleeve, hub and stop plate and pull out the ball bearing using a puller or press.

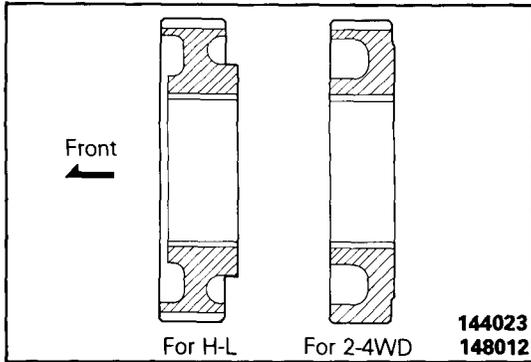


- | | | |
|------------------------|-----------------------|---------------------|
| 1. Snap ring | 7. 2-4WD clutch hub | 13. Thrust washer |
| 2. H-L clutch hub | 8. Drive sprocket | 14. Needle bearing |
| 3. Low speed gear | 9. Sprocket spacer | 15. Needle ball |
| 4. Ball bearing | 10. Ball bearing | 16. Sprocket sleeve |
| 5. Stop plate | 11. Lock nut | 17. Needle bearing |
| 6. 2-4WD clutch sleeve | 12. Rear output shaft | 18. Steel ball |

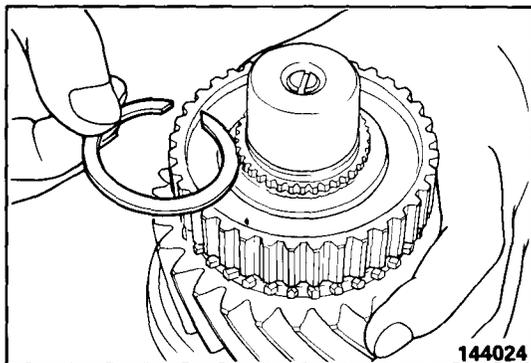
REASSEMBLY OF REAR OUTPUT SHAFT

For reassembly, follow the disassembly steps in reverse order, paying attention to the following.

- (1) Prior to reassembly, wash parts and check sliding and rotating parts for damage. Replace parts if excessively worn or damaged.
- (2) Apply transmission oil to rotating and sliding parts before reassembly.



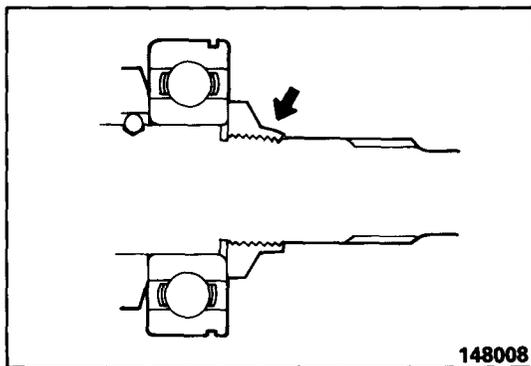
- (3) When installing the clutch hub, note the direction. Also check that the sleeve slides smoothly when installed. The clutch sleeve may be installed in either direction.



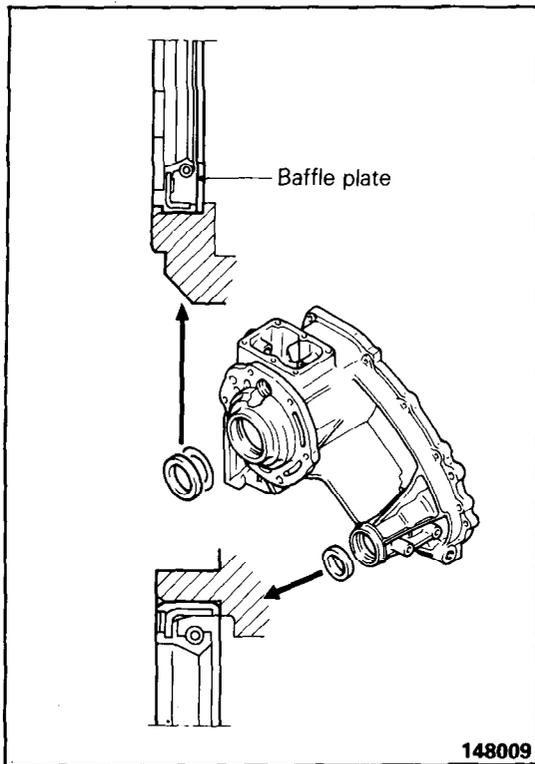
- (4) Install a snap ring for H-L clutch hub on the front end of the rear output shaft. Use the thickest snap ring that fits in the groove.

H-L clutch hub end play

Standard value: 0–0.08 mm (0–.003 in.)

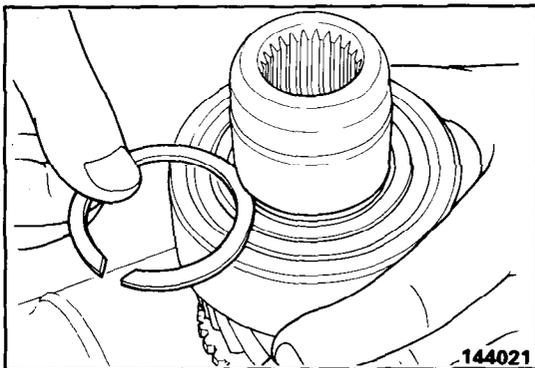


- (5) Tighten the lock nut to specified torque and then stake at the illustrated location, aligning with the groove.
- (6) Check that the low speed gear and drive sprocket ball bearing rotate smoothly.

**REASSEMBLY**

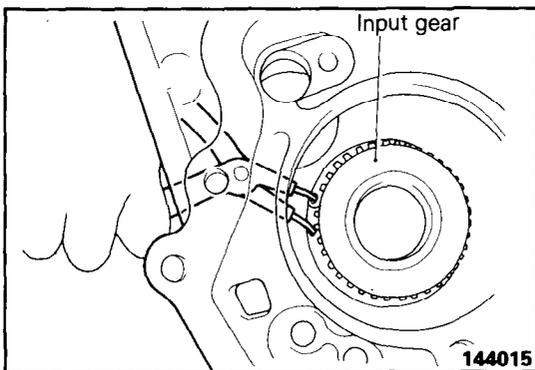
- (1) Press fit new oil seals in the input gear portion and front output shaft portion of the transfer case. Fit the baffle plate on the input shaft side. Apply specified oil to the oil seal lips.

Specified gear oil : Hypoid Gear Oil API Classification GL-4 or higher SAE viscosity No. 80W, 75W-85W



- (2) Press fit the ball bearing to the input gear, pushing the inner race. Check that the bearing rotates smoothly.
- (3) Fit a snap ring on the front end of the input gear. Use the thickest one that fits in the groove.

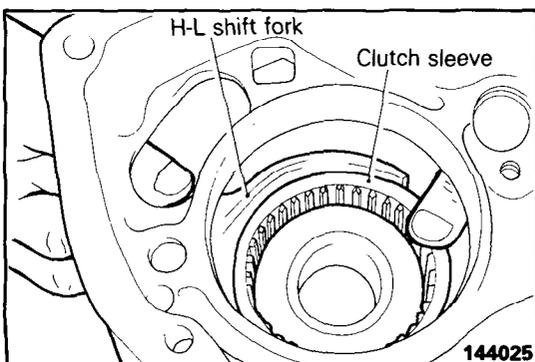
Standard value : 0 – 0.06 mm (0–.002 in.)



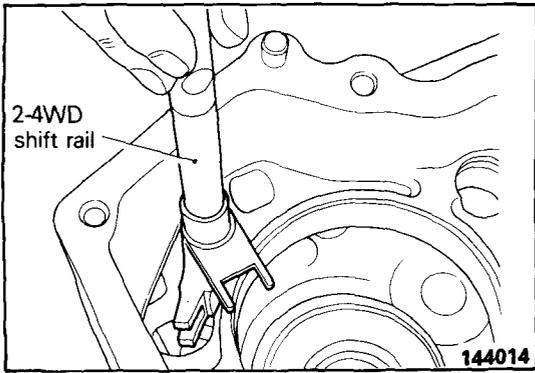
- (4) Insert the input gear assembly in the transfer case and fit a snap ring. Use the thickest one that fits in the groove.

Standard value : 0 – 0.06 mm (0–.002 in.)

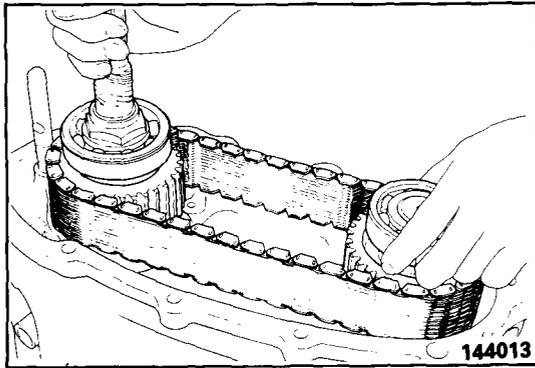
- (5) Insert the needle bearing in the input gear.



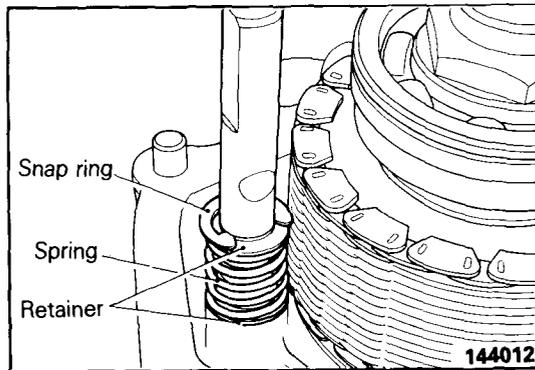
- (6) Install the H-L clutch sleeve and shift fork.



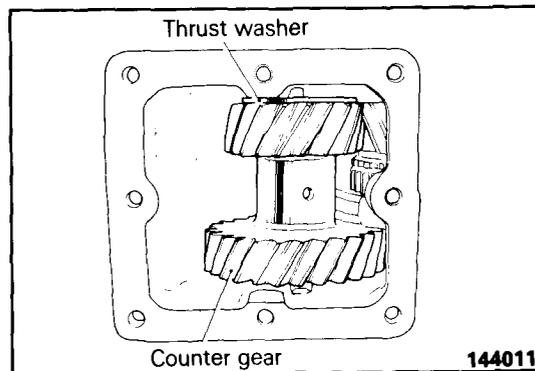
(7) Install the 2-4WD shift rail.



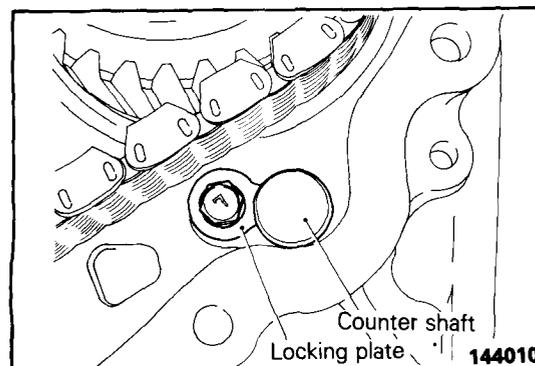
(8) Engage chain securely with the rear output shaft and front output shaft sprockets. Then, install the rear and front output shafts and chain together, while sliding the 2-4WD shift fork with the clutch sleeve attached over the 2-4WD shift rail.



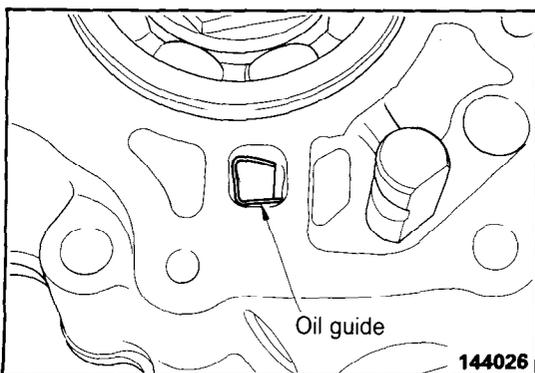
(9) Install two spring retainers and spring over the 2-4WD shift rail and fit a snap ring.



(10) Insert two needle bearings and spacer in the counter gear and install the assembly in the transfer case. Install a thrust washer on each of the counter gear.



(11) Insert the countershaft and fit the locking plate.



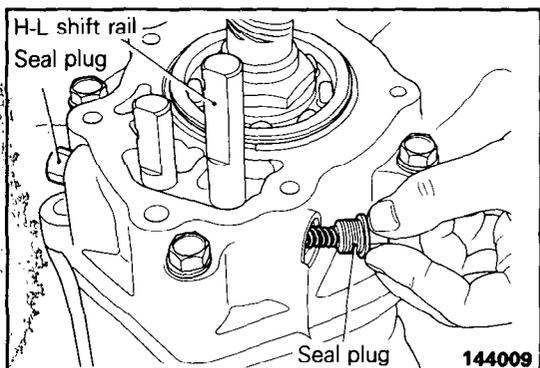
- (12) Install the oil guide.
 (13) Install the chain cover and gasket, making sure that the oil guide edge is in the chain cover window. Apply sealer to the gasket.

Specified sealant : 3M ART Part No. 8001 or equivalent

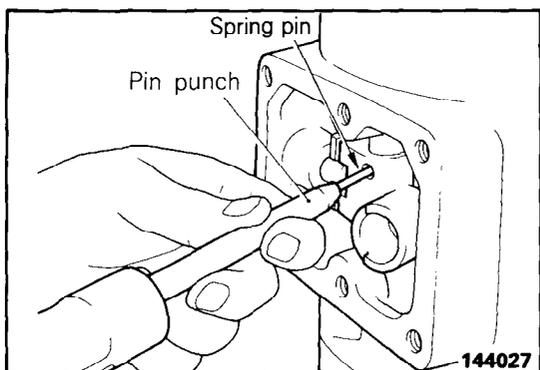
- (14) Tighten the chain cover bolts to specified torque. Apply adhesive to threads of bolts fitted in holes that go through the case.

Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent

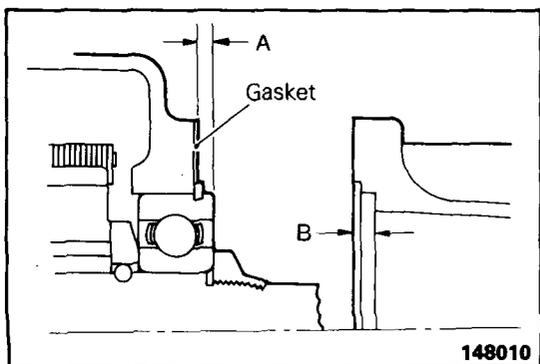
- (15) Fit a snap ring in the groove of the bearing at the rear end of the rear output shaft.



- (16) Insert the interlock plunger in the hole of the chain cover.
 (17) Insert the H-L shift rail through the H-L shift fork. The H-L shift rail cannot be inserted unless the 2-4WD shift rail is shifted to the 4WD side.
 (18) Install poppet balls and springs two each and fit the seal plugs. Face the smaller end of poppet springs toward the ball.



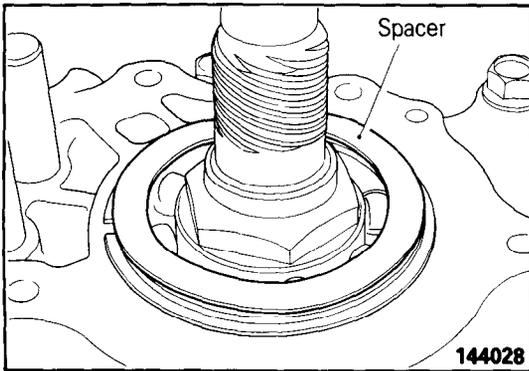
- (19) Aligning the spring pin holes of the H-L shift fork and shift rail, drive in the spring pin by using the special tool or a pin punch (commercially available). When installing the spring pin, face its slit toward the shift rail center.



- (20) Measure the output shaft rear bearing protrusion A and rear cover recess B to calculate the end play. Select the spacer that gives specified end play.

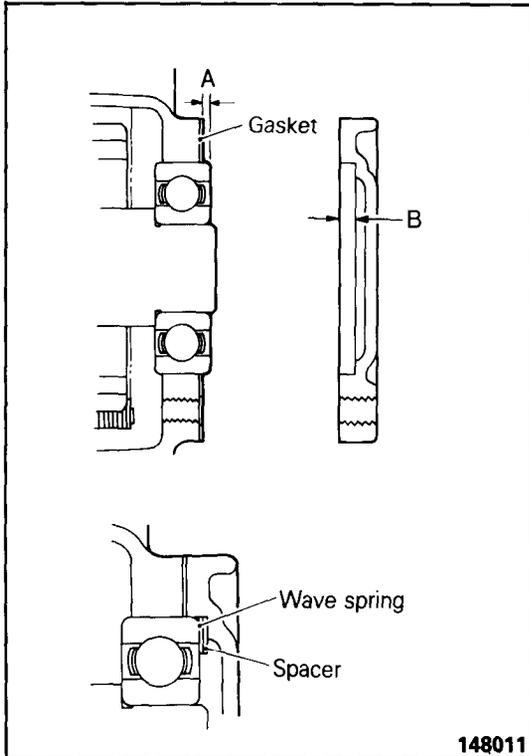
- (21) Apply sealer to a new rear cover gasket and attach it to the chain cover side.

Specified sealant : 3M ART Part No. 8001 or equivalent



- (22) Install the selected spacer on the rear of the output shaft rear bearing.
- (23) Install the rear cover and tighten the bolts to specified torque. Apply adhesive to threads of bolts fitted in holes that go through the case.

Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent



- (24) Measure protrusion A of the front output shaft rear bearing and recess B of the cover and calculate the clearance. If it is more than nominal, place a spacer at illustrated location.

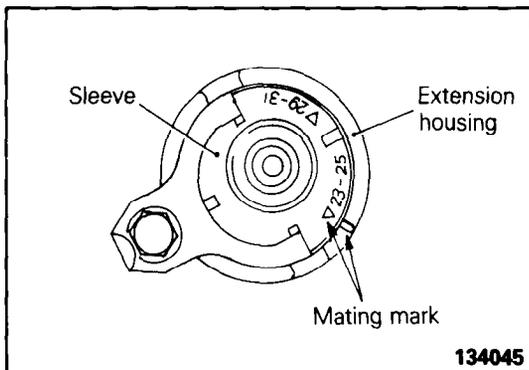
Standard value : 2 mm (.078 in.)

- (25) Apply sealer to a new cover gasket and attach it to the chain cover.

Specified sealant : 3M ART Part No. 8001 or equivalent

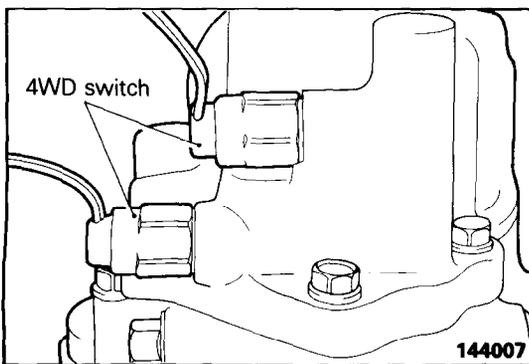
- (26) Install the wave spring spacer (if necessary) on the rear of the bearing.
- (27) Install the cover and tighten the bolts to specified torque. Apply adhesive to threads of bolts.

Specified adhesive : 3M Adhesive Nut Locking 4171 or equivalent



- (28) Insert the speedometer sleeve assembly in the rear cover. Line up the mating mark on the extension housing with the mark corresponding to the speedometer driven gear tooth number range put on the sleeve.

- (29) Install the sleeve clamp and tighten the bolt.



- (30) Install the two 4WD light switches, making sure that steel balls are fitted.

REASSEMBLY

For reassembly, follow the removal steps in reverse order, paying attention to the following.

1. Apply sealer to one side of the two control housing gaskets and attach them to both sides of the control housing cover.

Specified sealant : 3M ART Part No. 8001 or equivalent

2. Apply sealer to the adapter gasket.

Specified sealant : 3M ART Part No. 8001 or equivalent