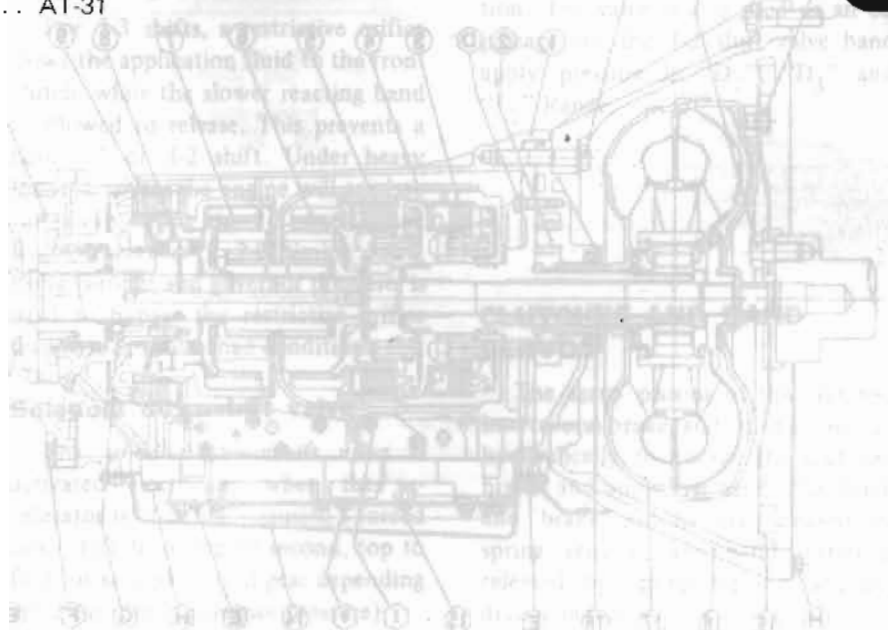
SECTION AT

AUTOMATIC TRANSMISSION

CONTENTS



DESCRIPTION

The 3N71B transmission is a fully automatic unit consisting primarily of a 3 element hydraulic torque converter and two planetary gear sets. Two multiple-disc clutches, a multiple-disc brake, brake band, and one-way clutch provide the friction elements necessary to obtain the desired function of the two planetary gear-sets.

A hydraulic control system is used to operate the friction elements and automatic shift controls.

TORQUE CONVERTER

The torque converter is attached to the crankshaft through a flexible drive plate. Heat generated in the torque converter is dissipated by circulating the transmission fluid through an oil-to-water type cooler in the radiator lower tank.

The welded construction of the torque converter prevents disassembly or service unless highly specialized equipment is available.

FLUID RECOMMENDATION

Use "DEXRON" type automatic transmission fluid only.

IDENTIFICATION NUMBER

Stamped position :

The plate is attached to the right hand side of transmission case.

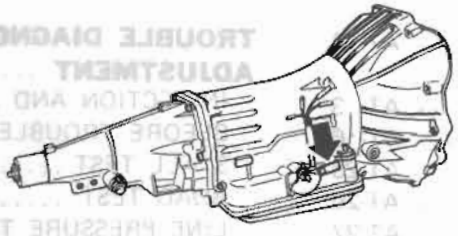


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Fig. AT-1 Identification Number

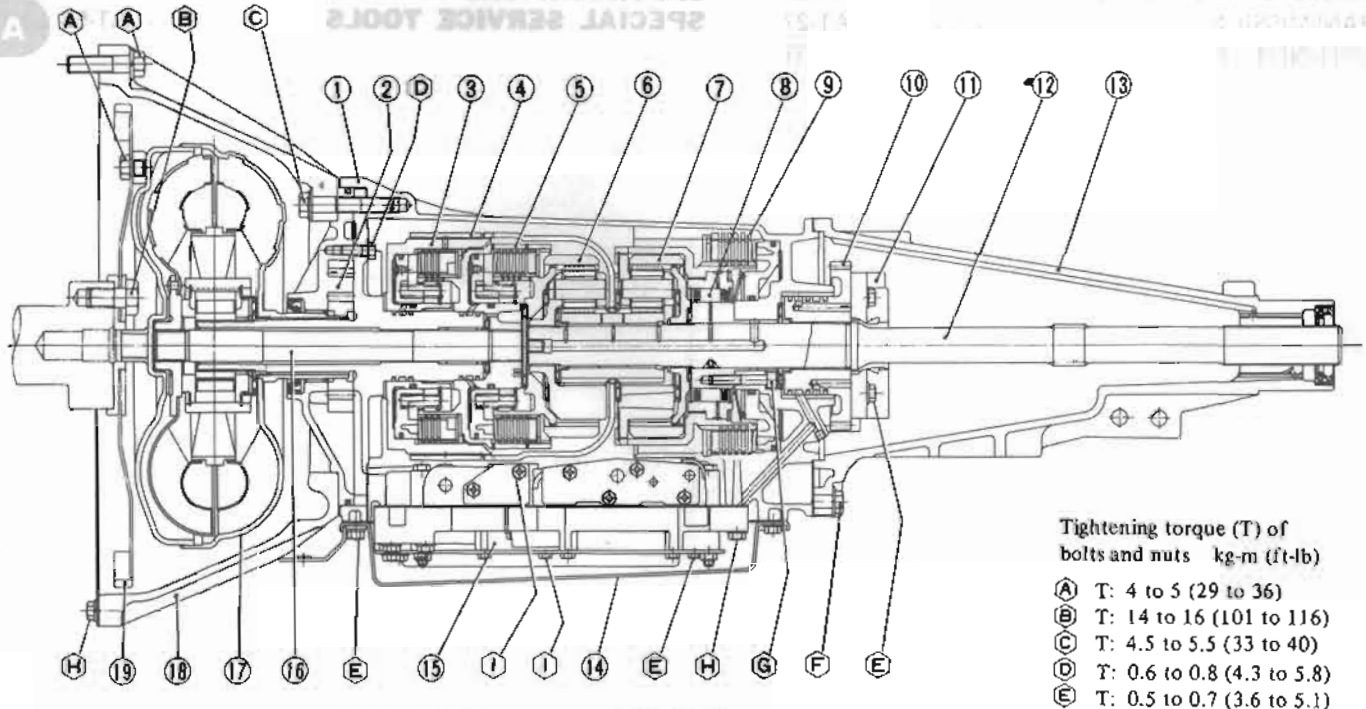
Identification of number arrangements :

JAPAN AUTOMATIC TRANSMISSION CO.,LTD
MODEL X0123
NO. 7601234

Number designation

7 6 0 1 2 3 4

- Serial production number for the month
- Month of production (1: Jan., 2: Feb., ... X: Oct., Y: Nov., Z: Dec.)
- Last figure denoting the year (A.D.)



1 Transmission case
2 Oil pump
3 Front clutch
4 Band brake
5 Rear clutch
6 Front planetary gear
7 Rear planetary gear
8 One-way clutch
9 Low & Reverse brake
10 Oil distributor
11 Governor
12 Output shaft
13 Rear extension
14 Oil pan
15 Control valve
16 Input shaft
17 Torque converter
18 Converter housing
19 Drive plate

Tightening torque (T) of bolts and nuts kg-m (ft-lb)

Ⓐ T: 4 to 5 (29 to 36)
Ⓑ T: 14 to 16 (101 to 116)
Ⓒ T: 4.5 to 5.5 (33 to 40)
Ⓓ T: 0.6 to 0.8 (4.3 to 5.8)
Ⓔ T: 0.5 to 0.7 (3.6 to 5.1)
Ⓕ T: 2.0 to 2.5 (14 to 18)
Ⓖ T: 1.3 to 1.8 (9 to 13)
Ⓗ T: 0.55 to 0.75 (4.0 to 5.4)
Ⓘ T: 0.25 to 0.35 (1.8 to 2.5)

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Fig. AT-2 3N71B Automatic Transmission

HYDRAULIC CONTROL UNIT AND VALVES

The hydraulic, or automatic control system is comprised of four (4) basic groups: the pressure supply system, the pressure regulating system, the flow control valves, and the friction elements.

PRESSURE SUPPLY SYSTEM

The pressure supply system consists of a gear type oil pump driven by the engine through the torque converter. The pump provides pressure for all hydraulic and lubrication needs.

PRESSURE REGULATOR VALVES

The pressure regulating valves control the output pressure of the oil pump.

Pressure regulator valve

The pressure regulator valve controls mainline pressure, based on throttle opening, for the operation of the band, clutches and brake.

Governor valve

The governor valve transmits regulated pressure, based on car speed, to the shift valves to control upshifts and downshifts.

Vacuum throttle valve

The vacuum throttle valve transmits regulated pressure, based on engine load (vacuum). This pressure controls the pressure regulator valve. Also this pressure is applied to one end of the shift valves in opposition to governor pressure, which acts on the other end of the shift valves, controlling upshift and downshift speeds.

FLOW CONTROL VALVES

Manual valve

The manual valve is moved manually by the car operator to select the different drive ranges.

1-2 Shift valve

The 1-2 shift valve automatically shifts the transmission from first to second or from second to first depending upon governor and throttle pressure along with accelerator position *(solenoid downshift valve). See Hydraulic Control Circuits, "Drive 2".*

2-3 Shift valve

The 2-3 shift valve automatically shifts the transmission from second to top gear or from top to second depending upon governor and throttle pressure, or accelerator position (solenoid downshift valve). *See Hydraulic Control Circuits "Drive 3" Range.*

2-3 Timing valve

For 2-3 shifts, a restrictive orifice slows the application fluid to the front clutch, while the slower reacting band is allowed to release. This prevents a hard 2-3 or 3-2 shift. Under heavy load, however, the engine will tend to run away during the 2-3 or 3-2 shift pause, therefore a 2-3 timing valve, using throttle and governor pressure, is used to bypass the restrictive orifice during such heavy load conditions.

Solenoid downshift valve

The solenoid downshift valve is activated electrically when the accelerator is "floored", causing a forced downshift from top to second, top to first, or second to first gear depending upon car speed (governor pressure).

Pressure modified valve

The pressure modifier valve assists the mainline pressure regulator valve in lowering mainline pressure during high speed light load conditions, such as steady speed cruise. Governor pressure, working against a spring, opens the valve which allows modified throttle pressure to work against the pressure regulator valve spring, lowering mainline pressure. Lower operating pressure under light load reduces oil temperature, and increases transmission life.

Throttle back-up valve

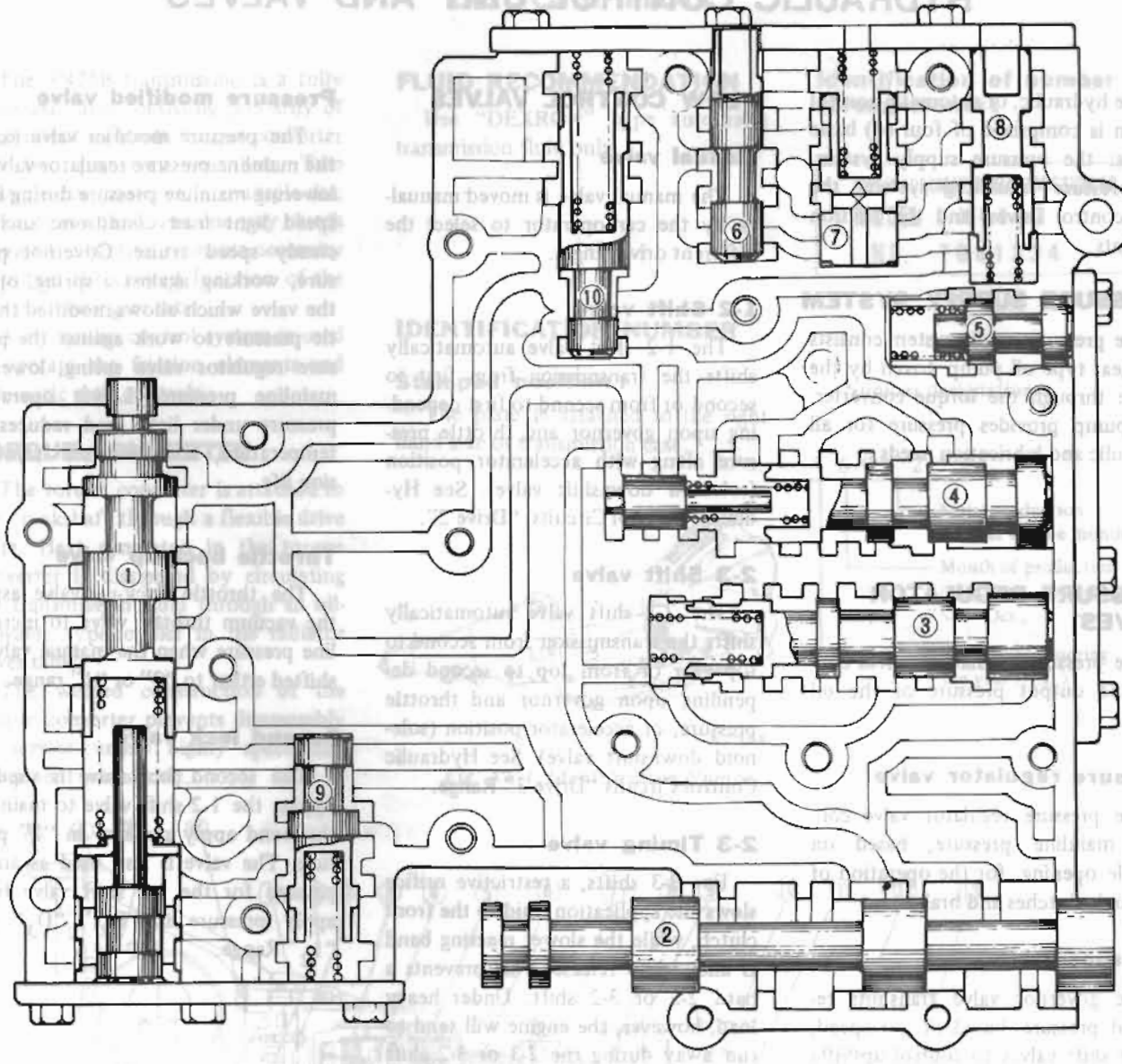
The throttle back-up valve assists the vacuum throttle valve to increase line pressure when the manual valve is shifted either to "2" or "1" range.

Second lock valve

The second lock valve is used to bypass the 1-2 shift valve to maintain the band apply pressure in "2" position. The valve is also used as an oil passage for the 1-2 shift valve band apply pressure in "D_2", "D_3" and "1_2" Range.

CLUTCHES AND BAND SERVOS

The servo pistons of the clutches, low reverse brake, and band are moved hydraulically to engage the clutches, brake, and apply the band. The clutch and brake pistons are released by spring tension, and band piston is released by spring tension and hydraulic pressure.



1 Pressure regulating valve
2 Manual valve
3 1st-2nd shift valve
4 2nd-3rd shift valve
5 Pressure modifier valve
6 Vacuum throttle valve
7 Throttle back-up valve
8 Solenoid down shift valve
9 Second lock valve
10 2 - 3 timing valve

Fig. AT-3 Control Valve

OIL CHANNEL IDENTIFICATION

The circuit numbers shown in each Hydraulic Control Circuit are classified as follows according to the function.

Pressure source of the line: 7

Operating line pressure for friction elements:
1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12.

Auxiliary line pressure: 13

Torque converter pressure: 14

Governor pressure: 15

Throttle system pressure:
16, 17, 18, 19.

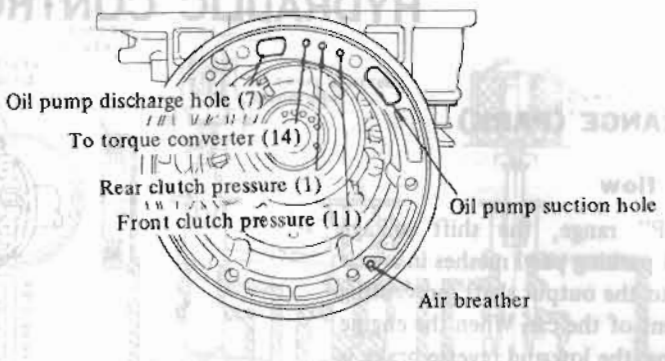


Fig. AT-5 Oil Channels in Case Front Face

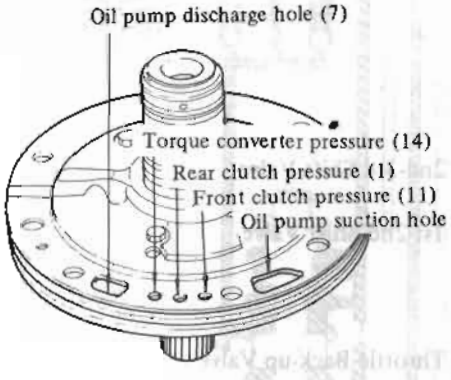


Fig. AT-4 Oil Channels in Oil Pump

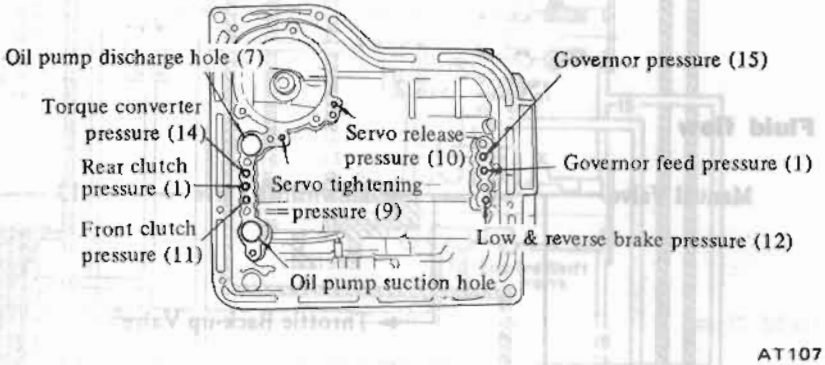


Fig. AT-6 Oil Channels in Case Face

MECHANICAL OPERATION

In the 3N71B automatic transmission, each part operates as shown in the following table at each gear select position.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

Note: The low & reverse brake is applied in "1_1" range to prevent free wheeling when coasting and allows engine braking.

HYDRAULIC CONTROL CIRCUITS

"P" RANGE (PARK)

Power flow

In "P" range, the shift linkage actuated parking pawl meshes in a gear splined to the output shaft, preventing movement of the car. When the engine is running, the low and reverse brake is applied by pressure from the manual valve passing through the 1-2 shift valve.

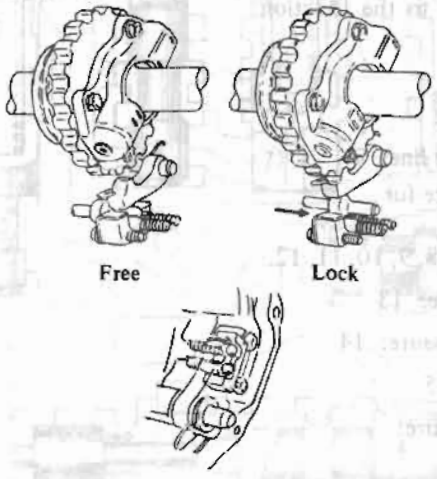
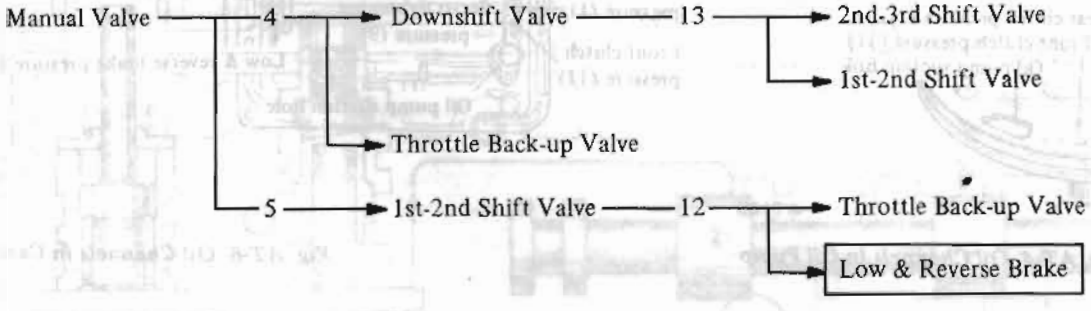


Fig. AT-7 Parking Mechanism

Fluid flow



"P" range (Park)

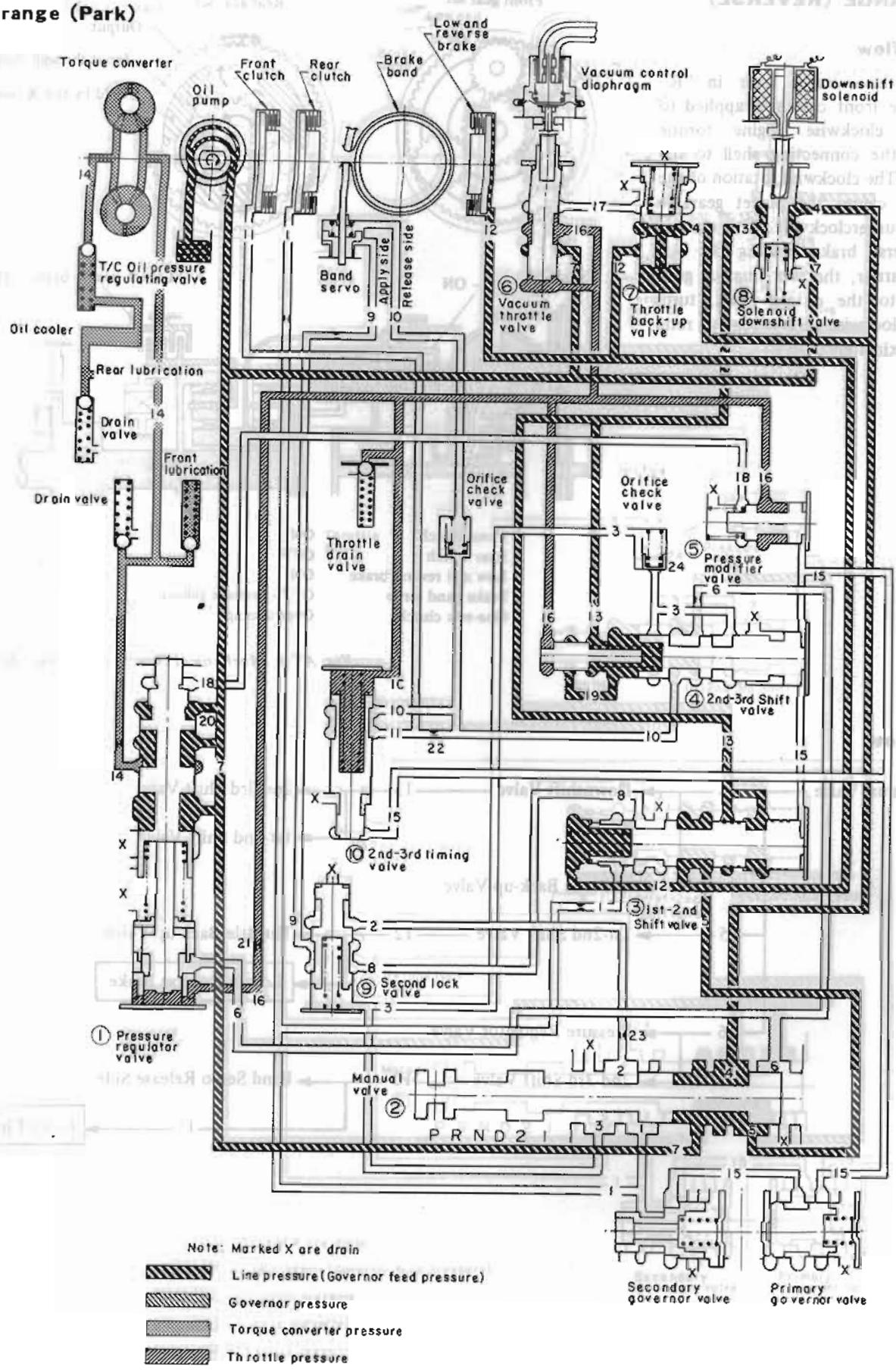


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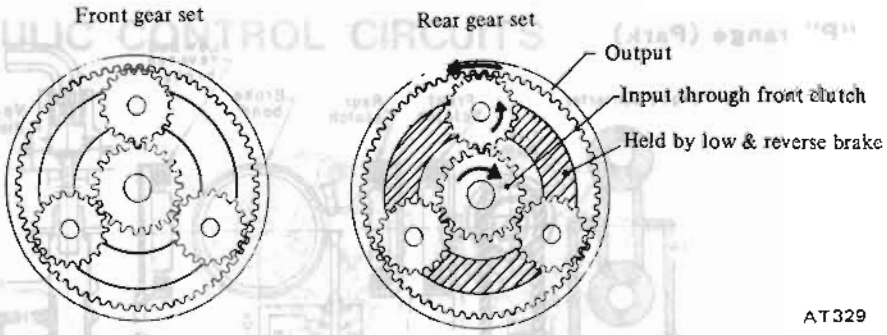
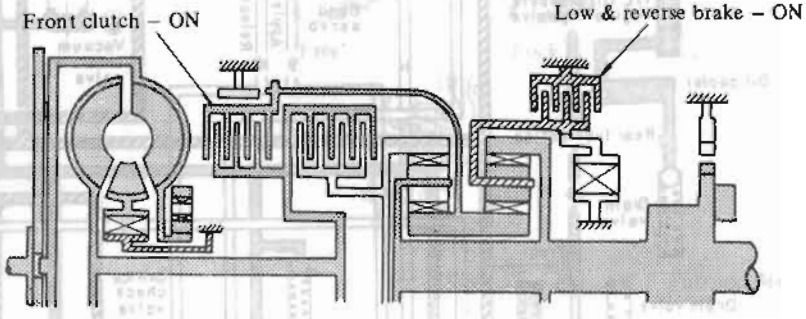
Fig. AT-8 Oil Pressure Circuit Diagram — "P" range (Park)

"R" RANGE (REVERSE)

Power flow

With the selector lever in "R" range, the front clutch is applied to transmit clockwise engine torque through the connecting shell to the sun gear. The clockwise rotation of the sun gear causes the planet gears to rotate counterclockwise. With the low and reverse brake holding the rear planet carrier, the rear internal gear, splined to the output shaft, turns counterclockwise in a reduction ratio of approximately 2.18 to 1.

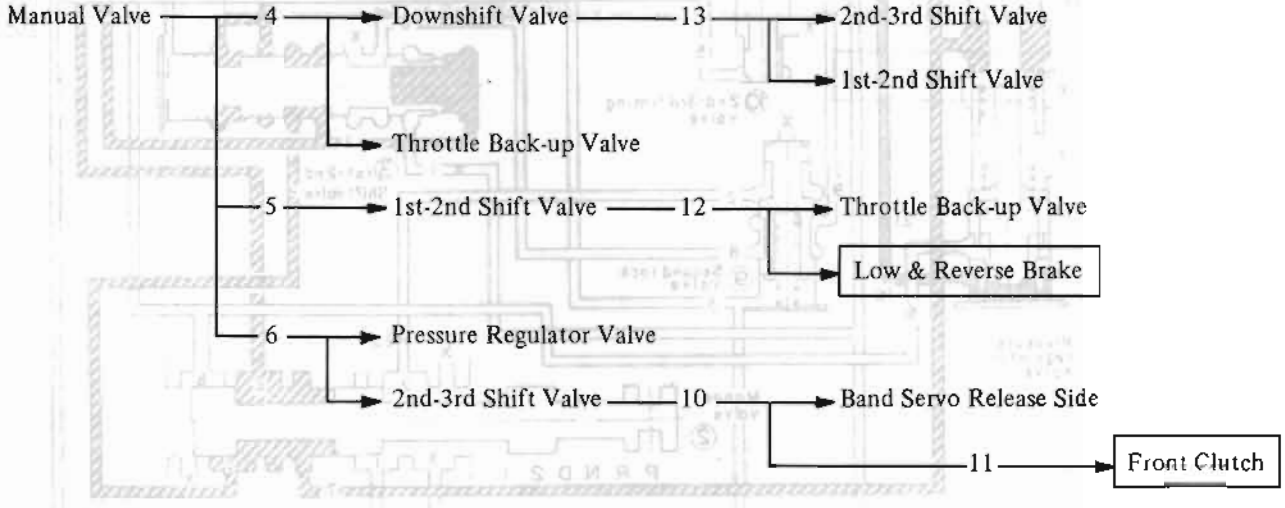




Front clutch	ON
Rear clutch	OFF
Low and reverse brake	ON
Brake band servo	OFF - Pressure release
One-way clutch	Overrunning

Fig. AT-9 Mechanical Operation during "R" Range

Fluid flow



"R" range (Reverse)

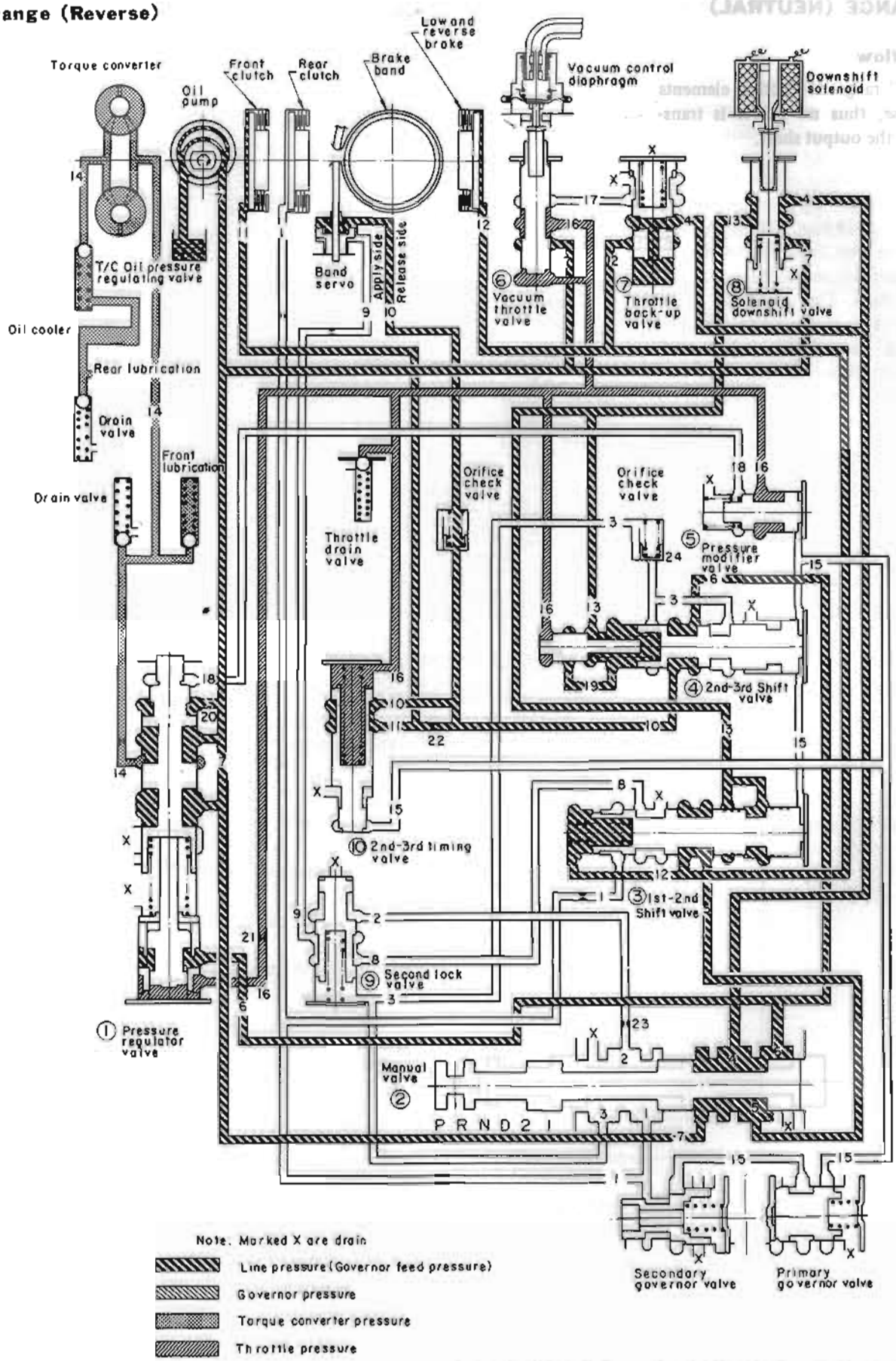
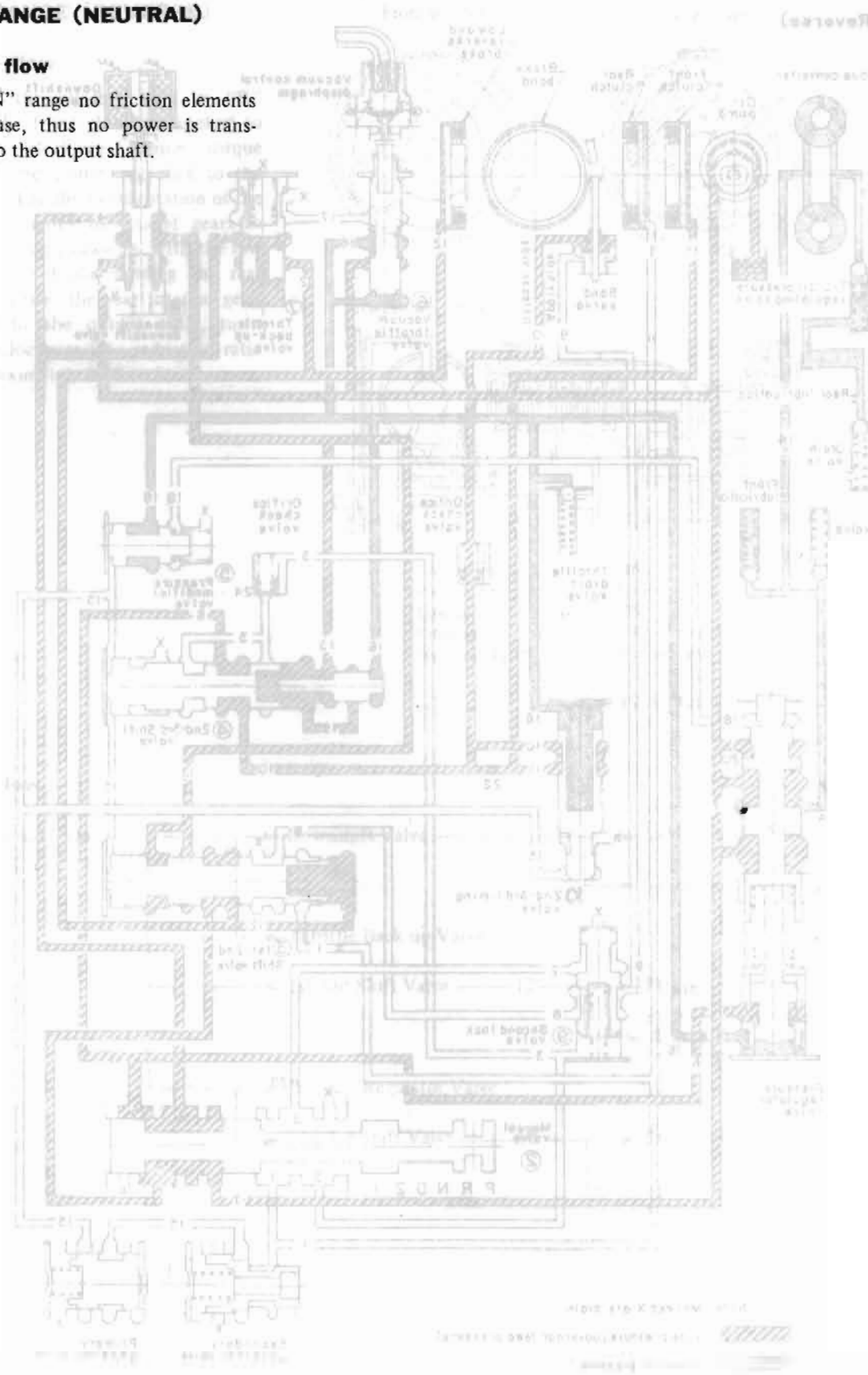


Fig. AT-10 Oil Pressure Circuit Diagram — "R" range (Reverse)

"N" RANGE (NEUTRAL)

Power flow

In "N" range no friction elements are in use, thus no power is transmitted to the output shaft.



"N" range (Neutral)

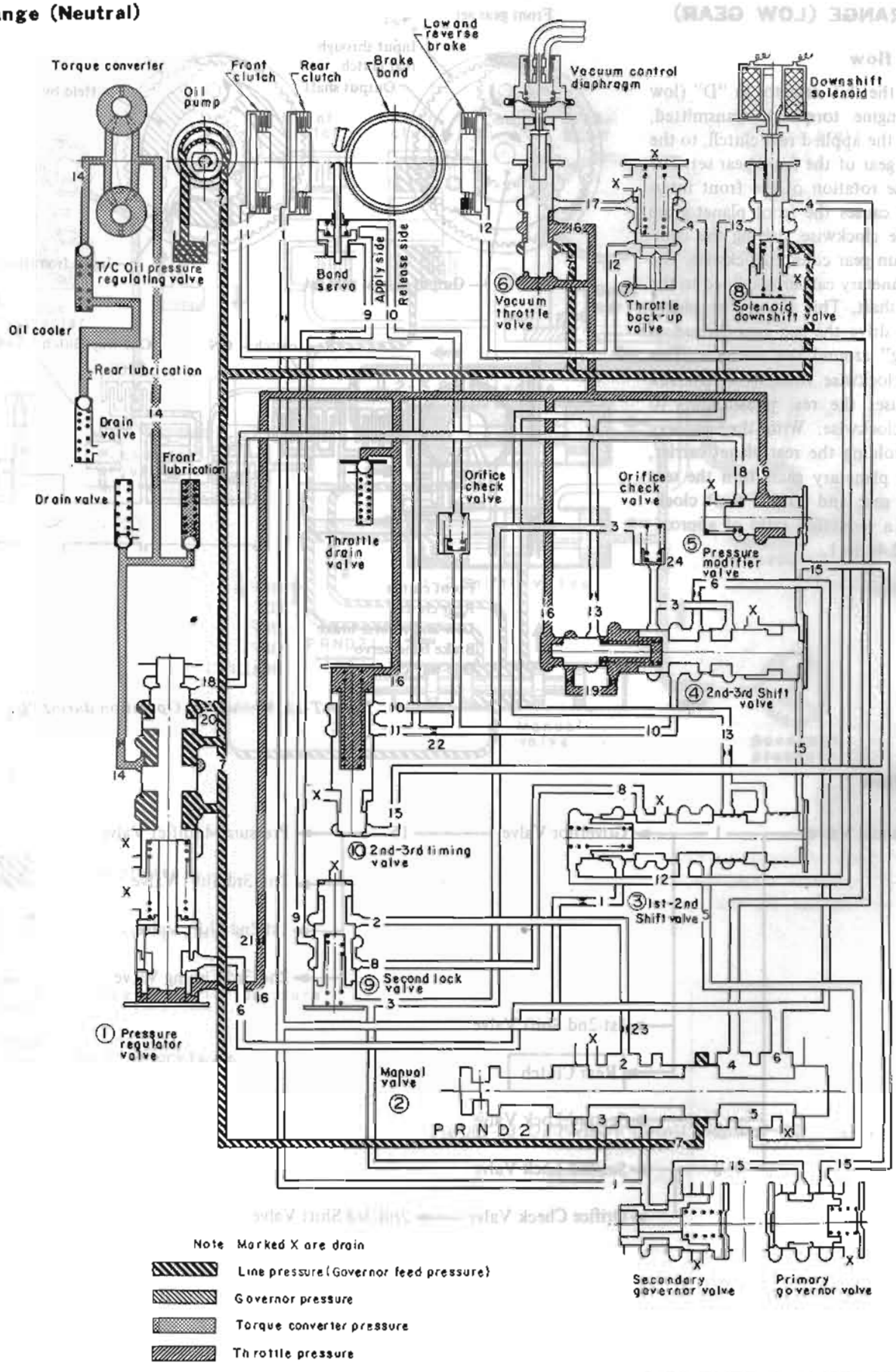
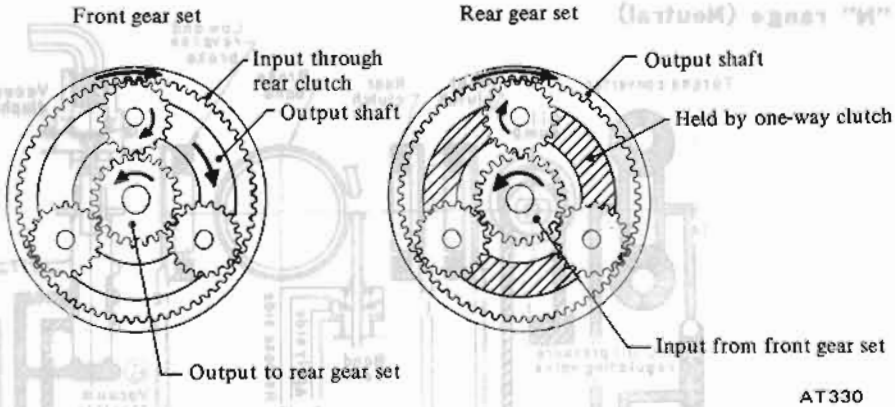


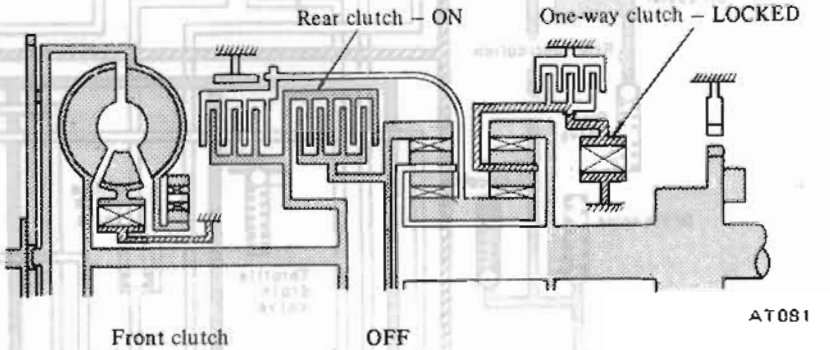
Fig. AT-11 Oil Pressure Circuit Diagram — "N" range (Neutral)

"D_1" RANGE (LOW GEAR)

Power flow

With the shift selector in "D" (low gear), engine torque is transmitted, through the applied rear clutch, to the internal gear of the front gear set. The clockwise rotation of the front internal gear causes the front planet gears to rotate clockwise, driving the compound sun gear counterclockwise. The front planetary carrier is splined to the output shaft. This causes the planet gears to drive the sun gear instead of "walking" around the sun gear. This counterclockwise rotation of the sun gear causes the rear planet gears to rotate clockwise. With the one-way clutch holding the rear planet carrier, the rear planetary gears turn the rear internal gear and output shaft clockwise in a reduction ratio of approximately 2.46 to 1.

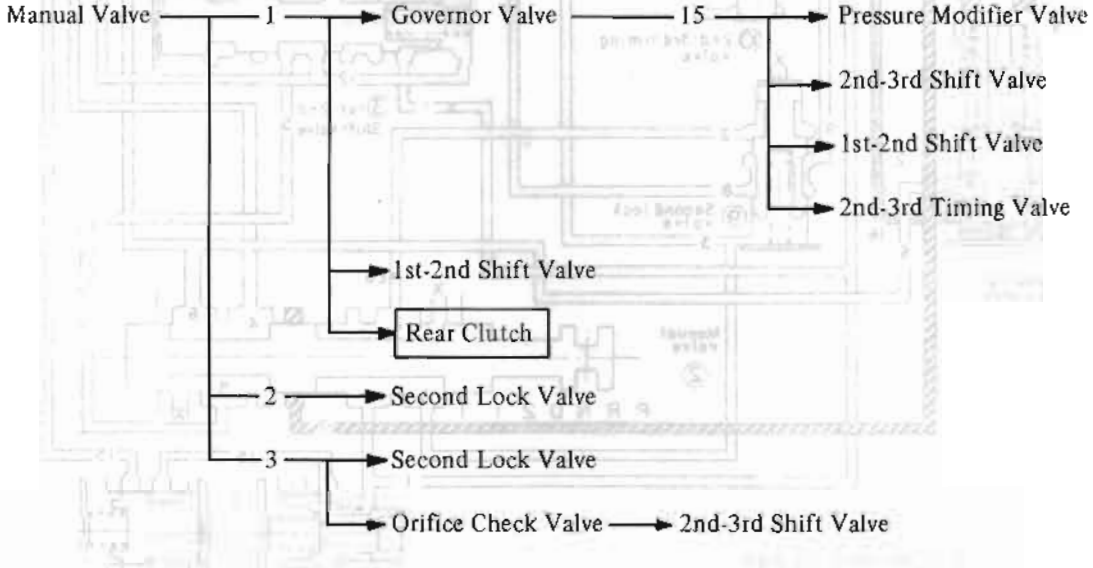




Front clutch	OFF
Rear clutch	ON
Low and reverse brake	OFF
Brake band servo	OFF
One-way clutch	HOLDING

Fig. AT-12 Mechanical Operation during "D_1" Range

Fluid flow



"D_1" range (Low gear)

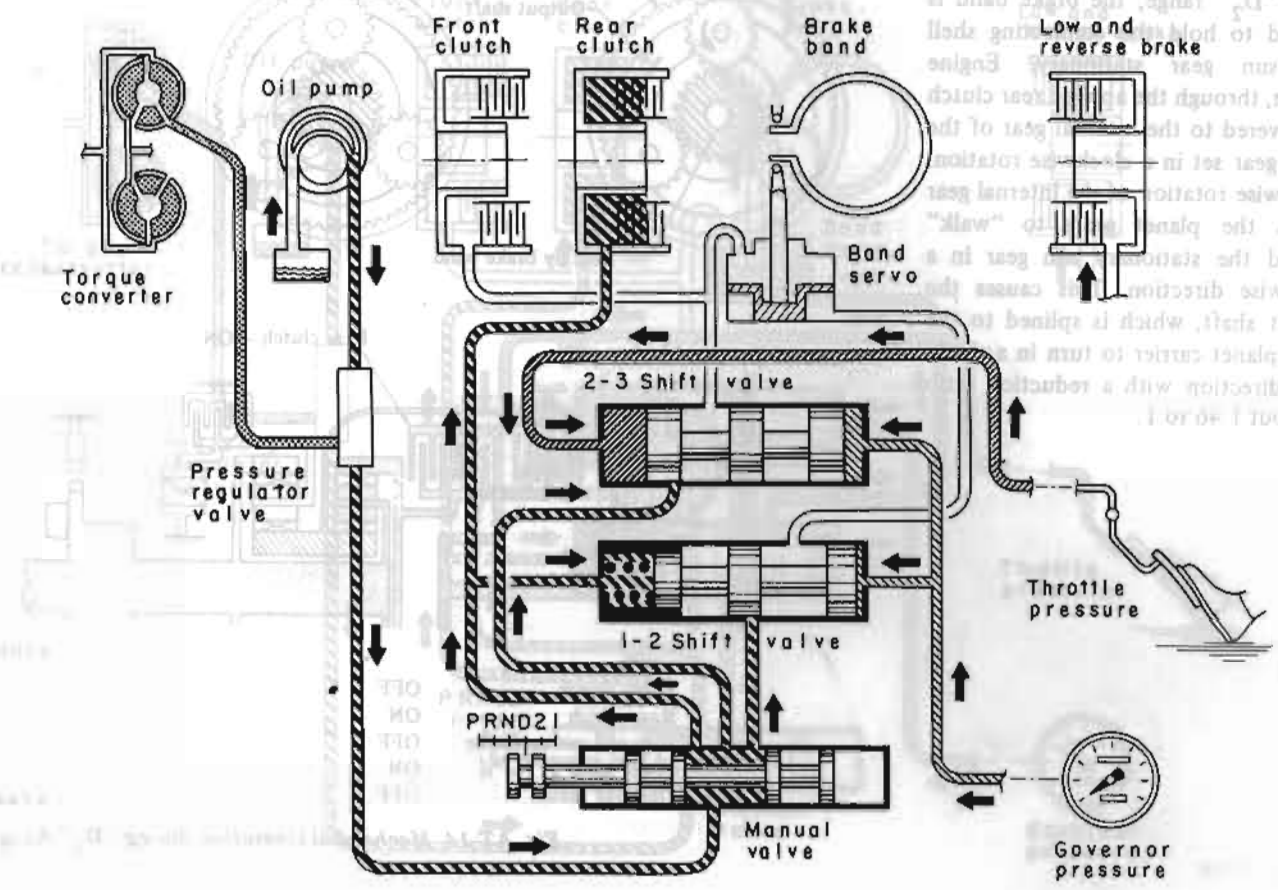


Fig. AT-13 Oil Pressure Circuit Diagram — "D_1" range (Low gear)

"D_2" RANGE (2ND GEAR)

Power flow

In "D_2" range, the brake band is applied to hold the connecting shell and sun gear stationary. Engine torque, through the applied rear clutch is delivered to the internal gear of the front gear set in a clockwise rotation. Clockwise rotation of the internal gear causes the planet gears to "walk" around the stationary sun gear in a clockwise direction. This causes the output shaft, which is splined to the front planet carrier to turn in a clockwise direction with a reduction ratio of about 1.46 to 1.

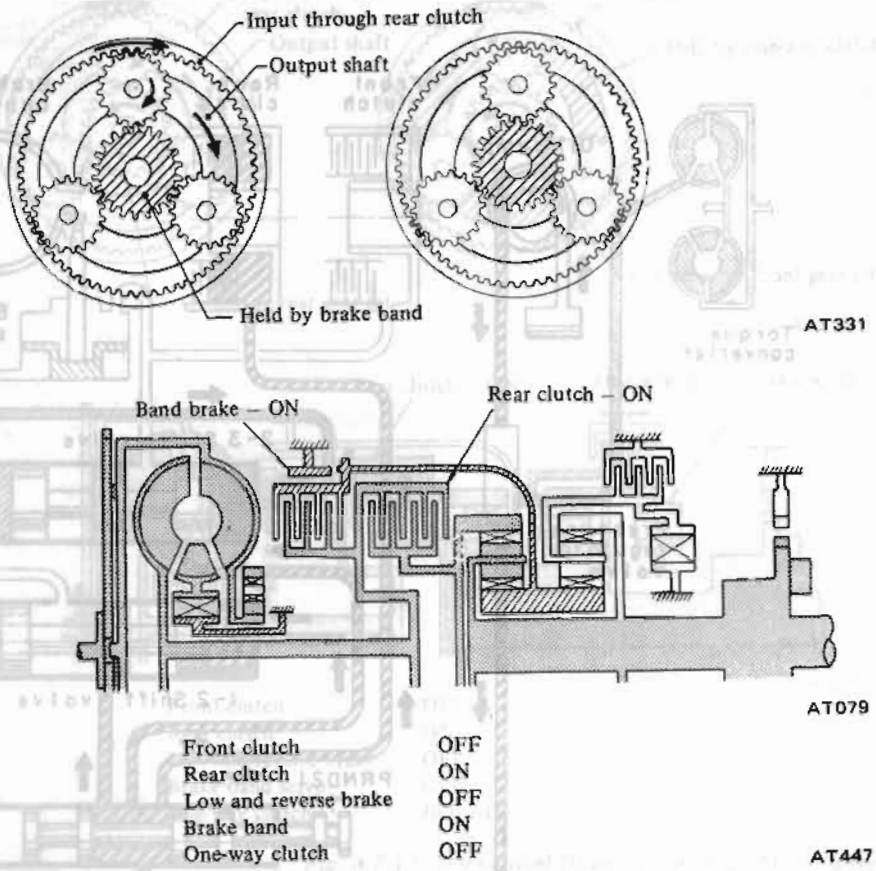
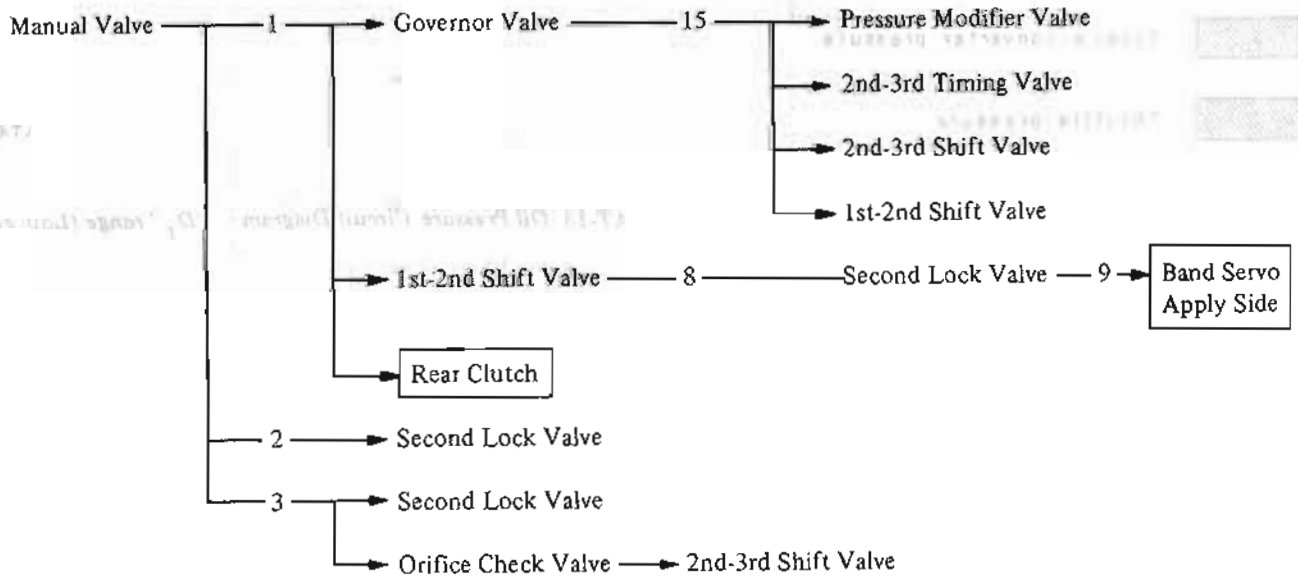


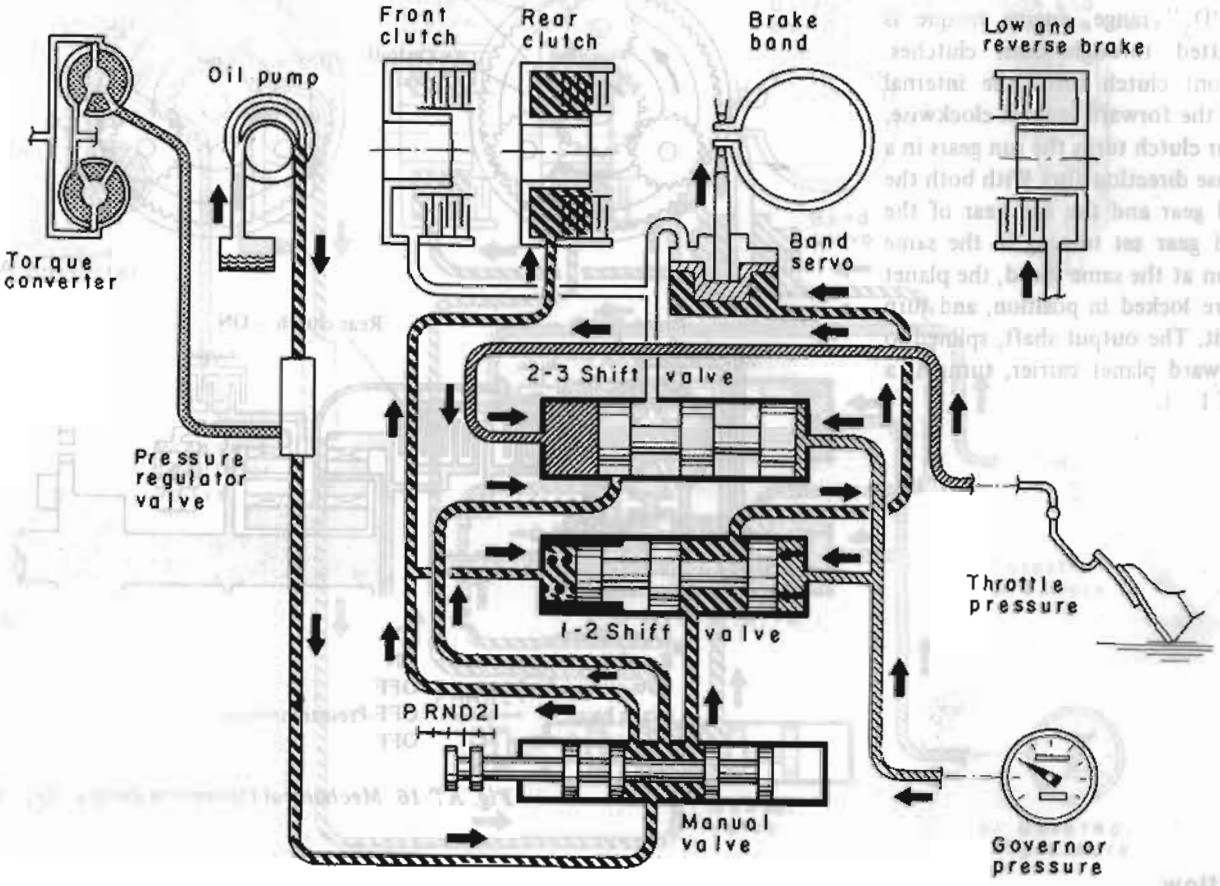
Fig. AT-14 Mechanical Operation during "D_2" Range

Fluid flow

As car speed and governor pressure increase, the governor pressure acting on the end of the 1-2 shift valve overcomes the force of the 1-2 shift valve spring and line pressure. This allows the 1-2 shift valve to move to the upshift position which directs line pressure through the 2nd lock valve and on to the brake band.



"D_2" range (2nd gear)



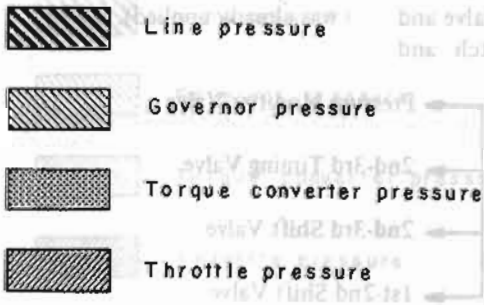


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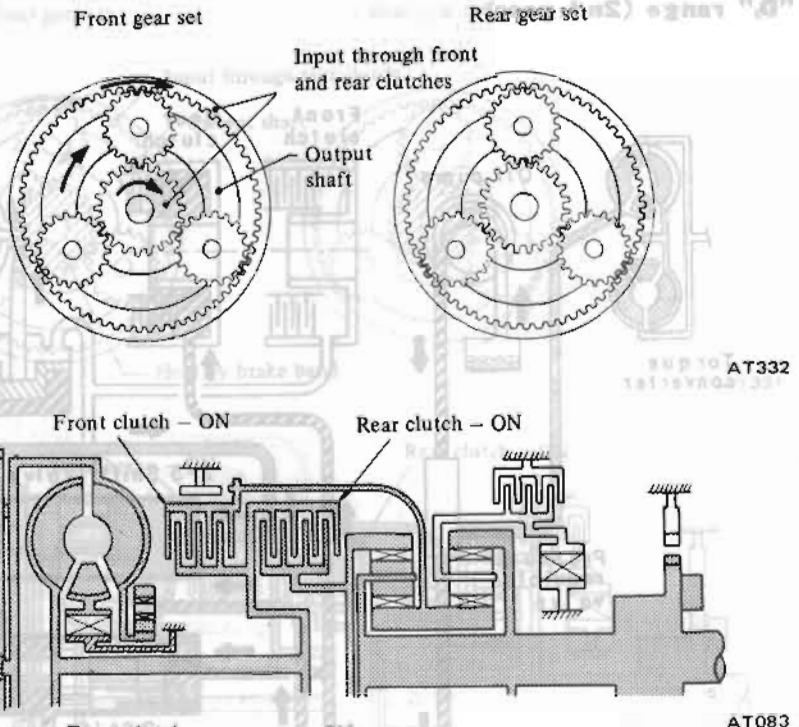
Fig. AT-15 Oil Pressure Circuit Diagram — "D_2" range (2nd gear)

"D_3" RANGE (3RD GEAR)

Power flow

In "D_3" range, engine troque is transmitted through both clutches. The front clutch turns the internal gear of the forward gear set clockwise. The rear clutch turns the sun gears in a clockwise direction also. With both the internal gear and the sun gear of the forward gear set turning in the same direction at the same speed, the planet gears are locked in position, and turn as a unit. The output shaft, splined to the forward planet carrier, turns at a ratio of 1 : 1.

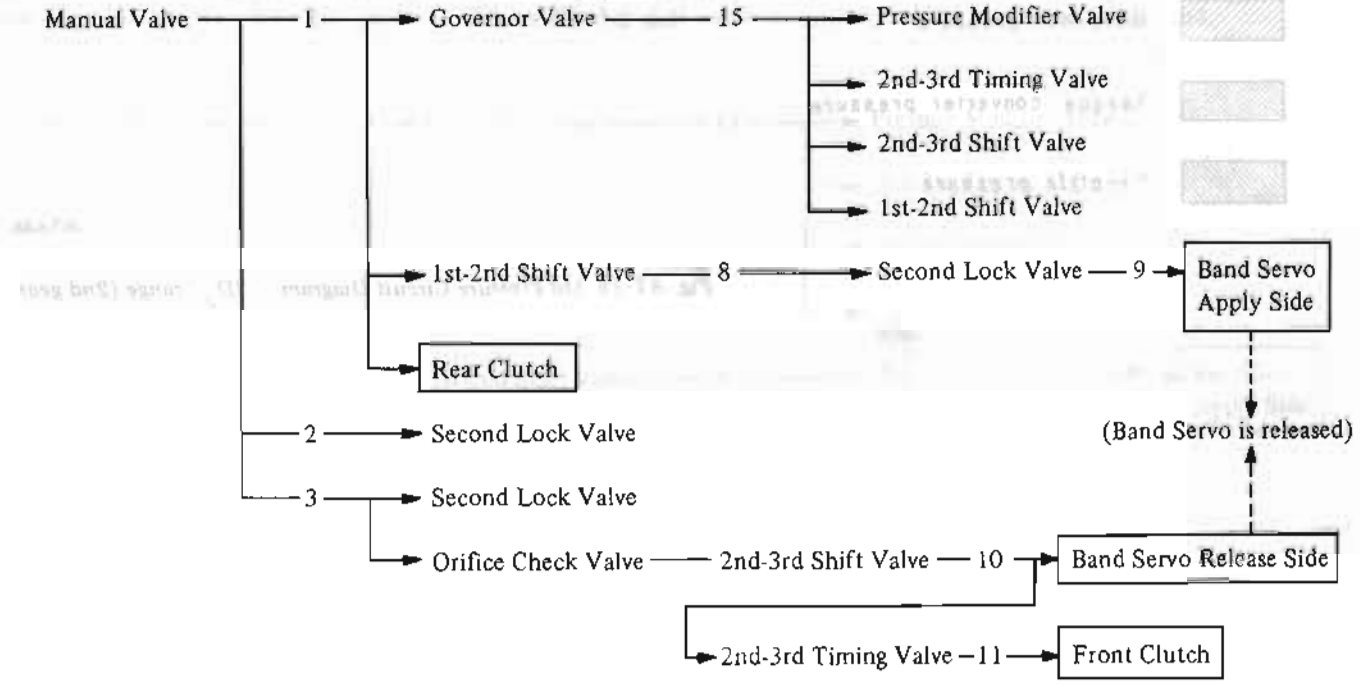


Front clutch	ON
Rear clutch	ON
Low-reverse brake	OFF
Brake band	OFF-Pressure release
One-way clutch	OFF

Fig. AT-16 Mechanical Operation during "D_3" Range

Fluid flow

Governor pressure increases to the point that it can overcome the combined forces of spring and throttle pressure and move the 2nd-3rd shift valve. When the 2nd-3rd shift valve opens, pressure passes through the valve lands to the 2-3 timing valve and on to apply the front clutch and release the brake band. The car is now in D_3 or direct drive (the rear clutch was already applied).



"D3" range (3rd gear)

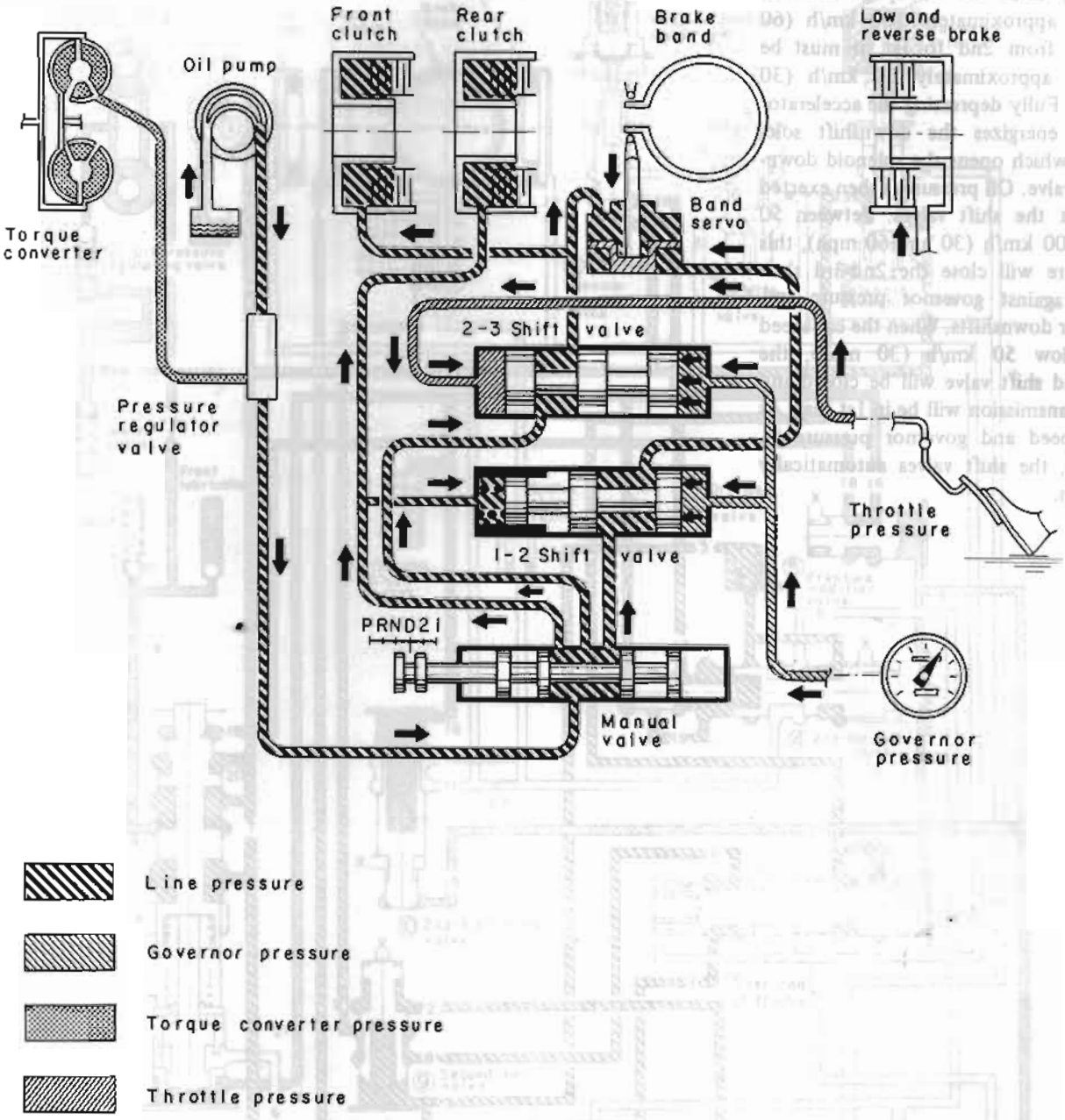


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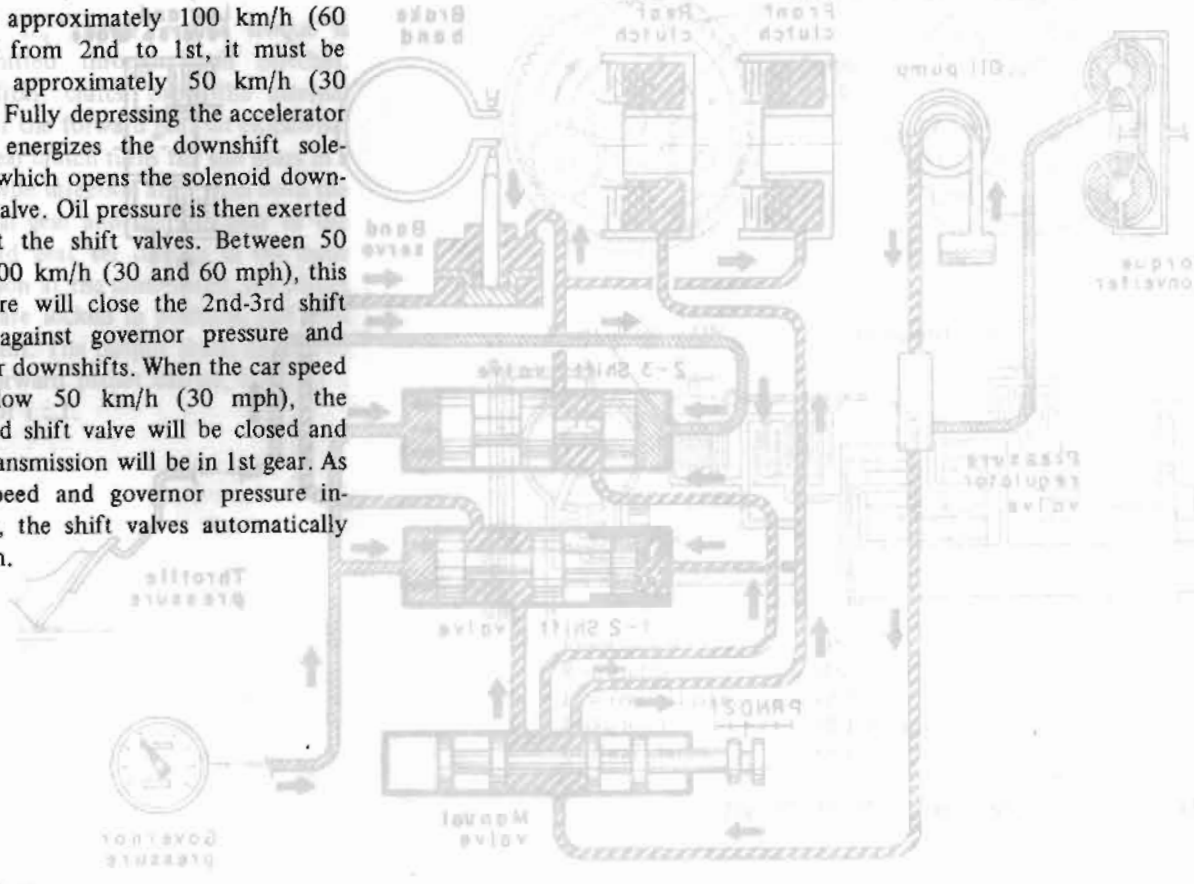
Fig. AT-17 Oil Pressure Circuit Diagram — "D_3" range (3rd gear)

"D" RANGE KICKDOWN

To achieve a forced downshift from 3rd to 2nd, the car speed must be under approximately 100 km/h (60 mph); from 2nd to 1st, it must be under approximately 50 km/h (30 mph). Fully depressing the accelerator pedal energizes the downshift solenoid, which opens the solenoid downshift valve. Oil pressure is then exerted against the shift valves. Between 50 and 100 km/h (30 and 60 mph), this pressure will close the 2nd-3rd shift valve against governor pressure and the car downshifts. When the car speed is below 50 km/h (30 mph), the 1st-2nd shift valve will be closed and the transmission will be in 1st gear. As car speed and governor pressure increase, the shift valves automatically reopen.



"D" range kickdown (Shift valves in 2nd gear position)

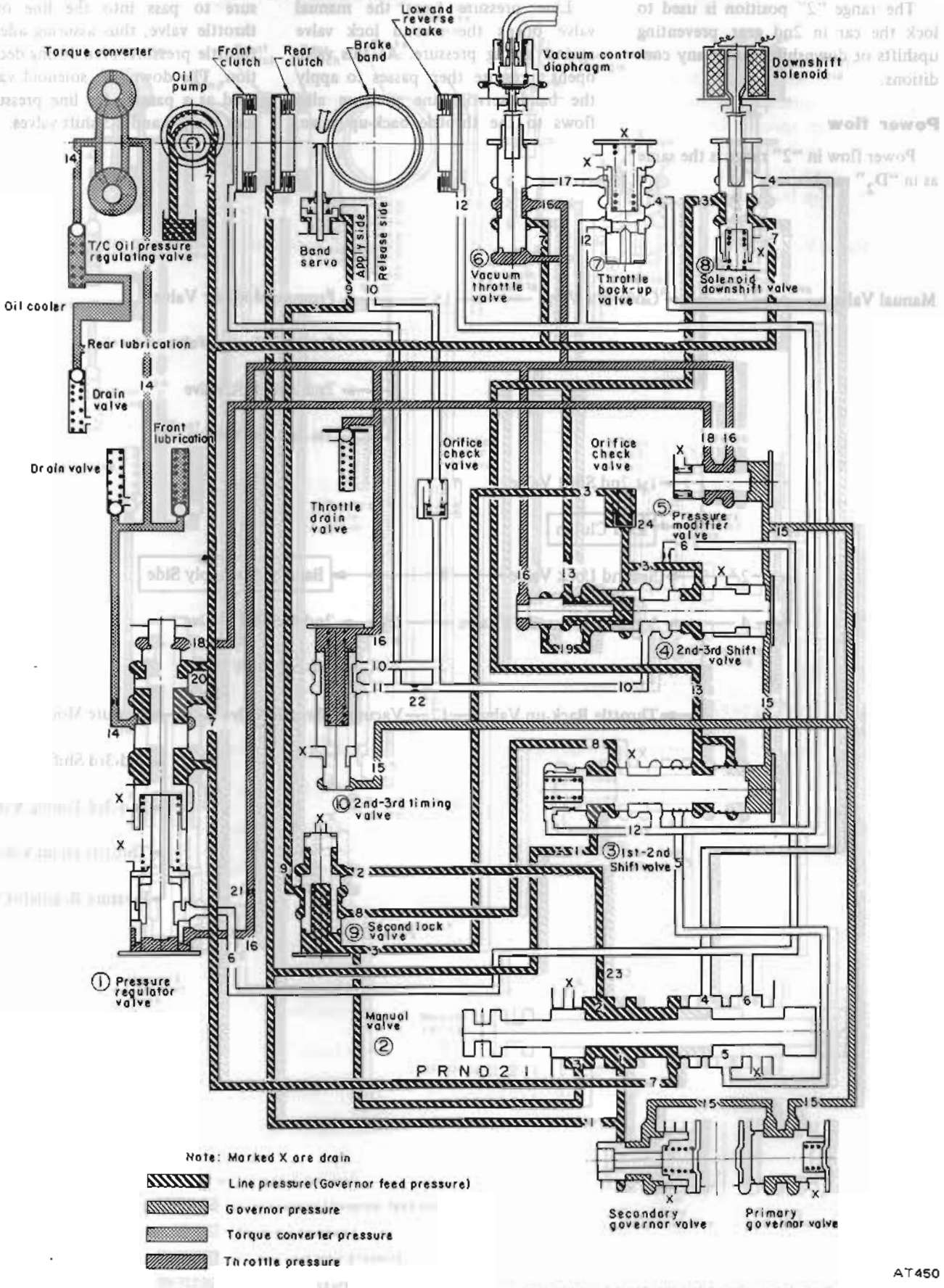


Fig. AT-18 Oil Pressure Circuit Diagram — "D" range kickdown (shift valves in 2nd gear position)

"2" RANGE (2ND GEAR)

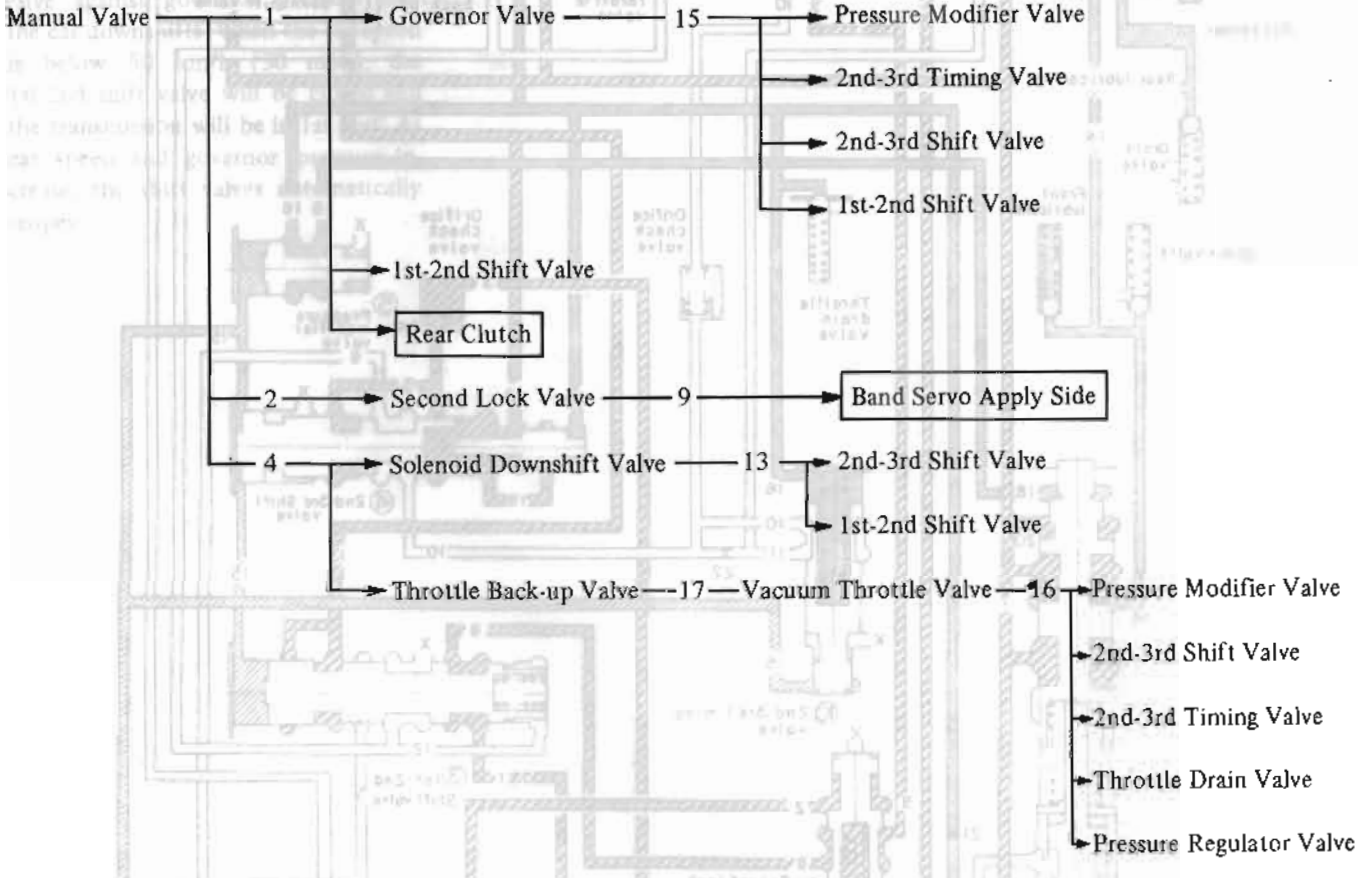
The range "2" position is used to lock the car in 2nd gear, preventing upshifts or downshifts under any conditions.

Power flow

Power flow in "2" range is the same as in "D_2" range.

Fluid flow

Line pressure from the manual valve opens the second lock valve against spring pressure. As this valve opens, pressure then passes to apply the band servo. Line pressure also flows to the throttle back-up valve, opening the valve and allowing pressure to pass into the line of the throttle valve, thus assuring adequate throttle pressure, even during deceleration. The downshift solenoid valve is used as a passage for line pressure to lock the 1-2 and 2-3 shift valves.



"2" range (2nd gear)

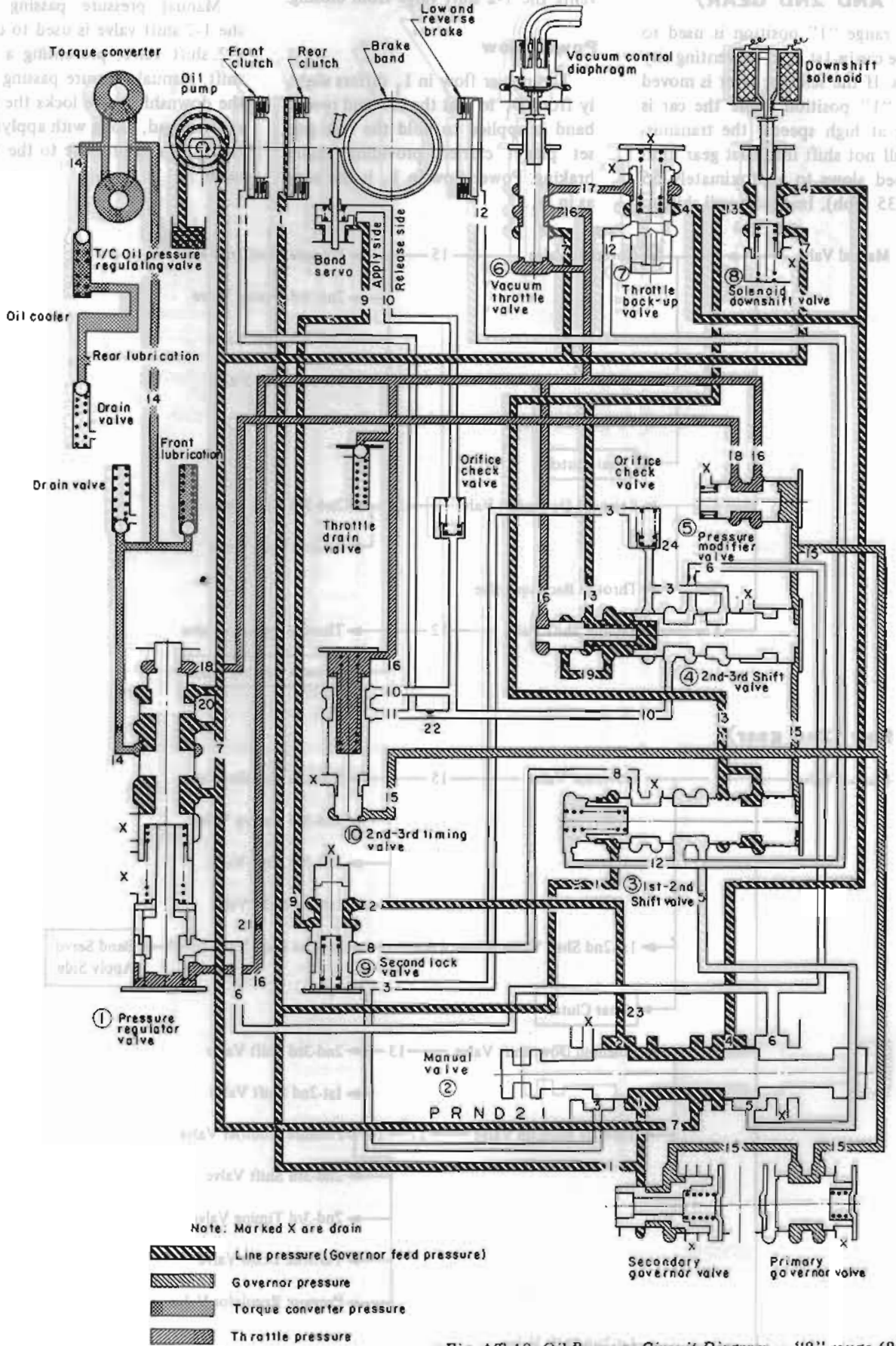


Fig. AT-19 Oil Pressure Circuit Diagram — "2" range (2nd gear)

"1" RANGE (LOW AND 2ND GEAR)

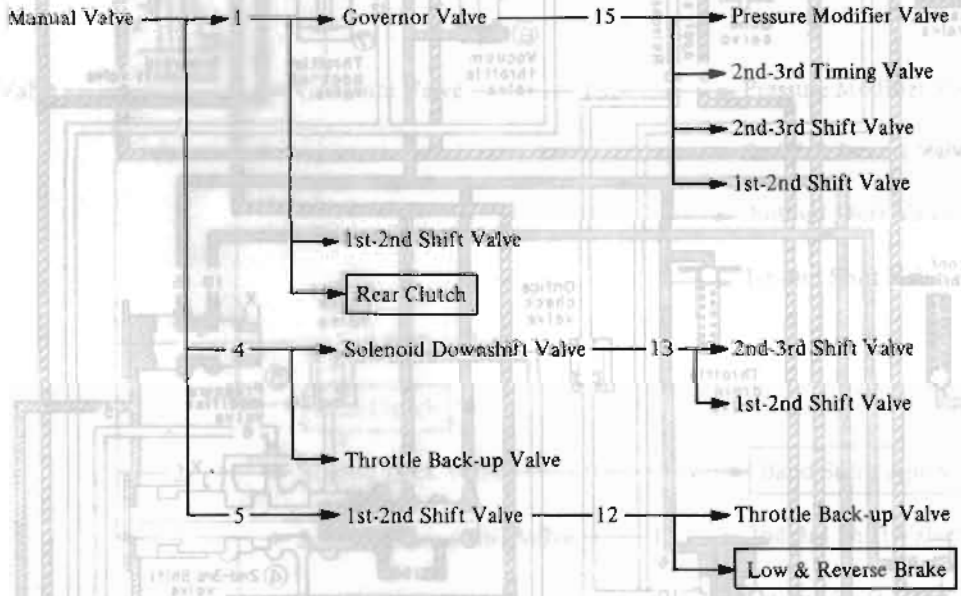
The range "1" position is used to lock the car in 1st gear, preventing any upshifts. If the selector lever is moved to the "1" position while the car is moving at high speeds, the transmission will not shift into first gear until car speed slows to approximately 55 km/h (35 mph). Instead it will shift to second (1_2), as governor pressure prevents the 1-2 shift valve from closing.

Power flow

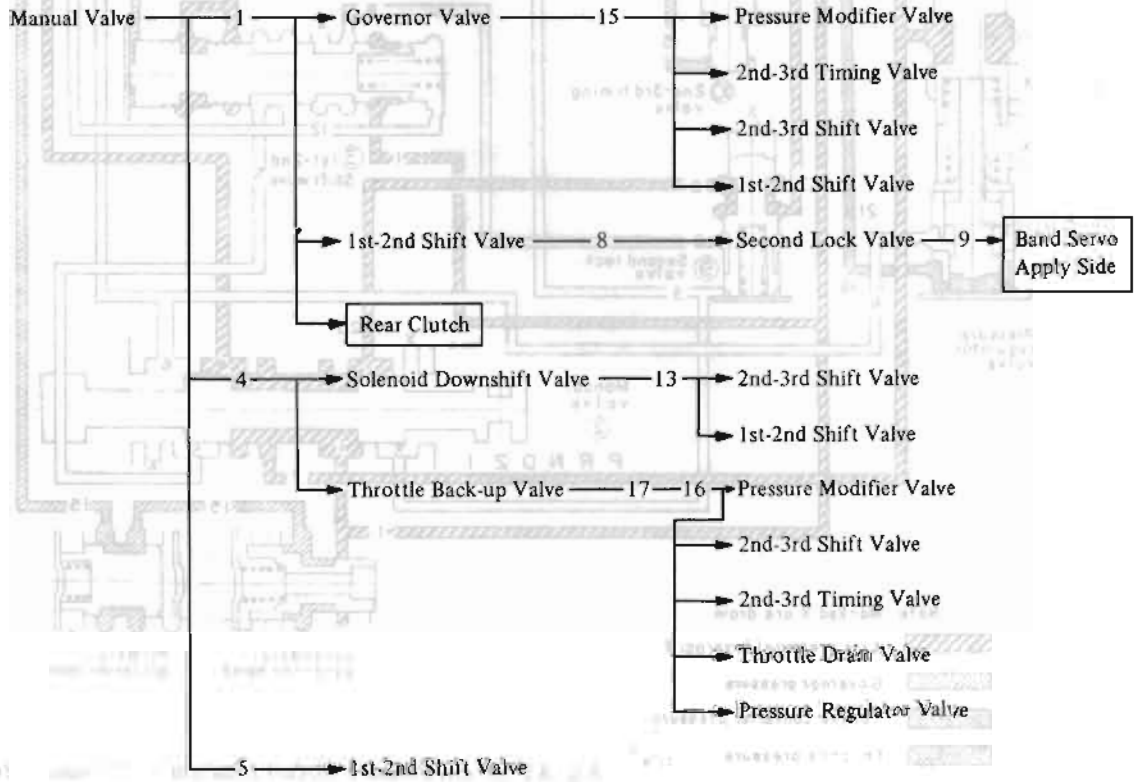
The power flow in 1_1 differs slightly from D_1 in that the low and reverse band is applied to hold the rear gear set planet carrier, providing engine braking. Power flow in 1_2 is the same as in D_2.

Fluid flow (Low gear)

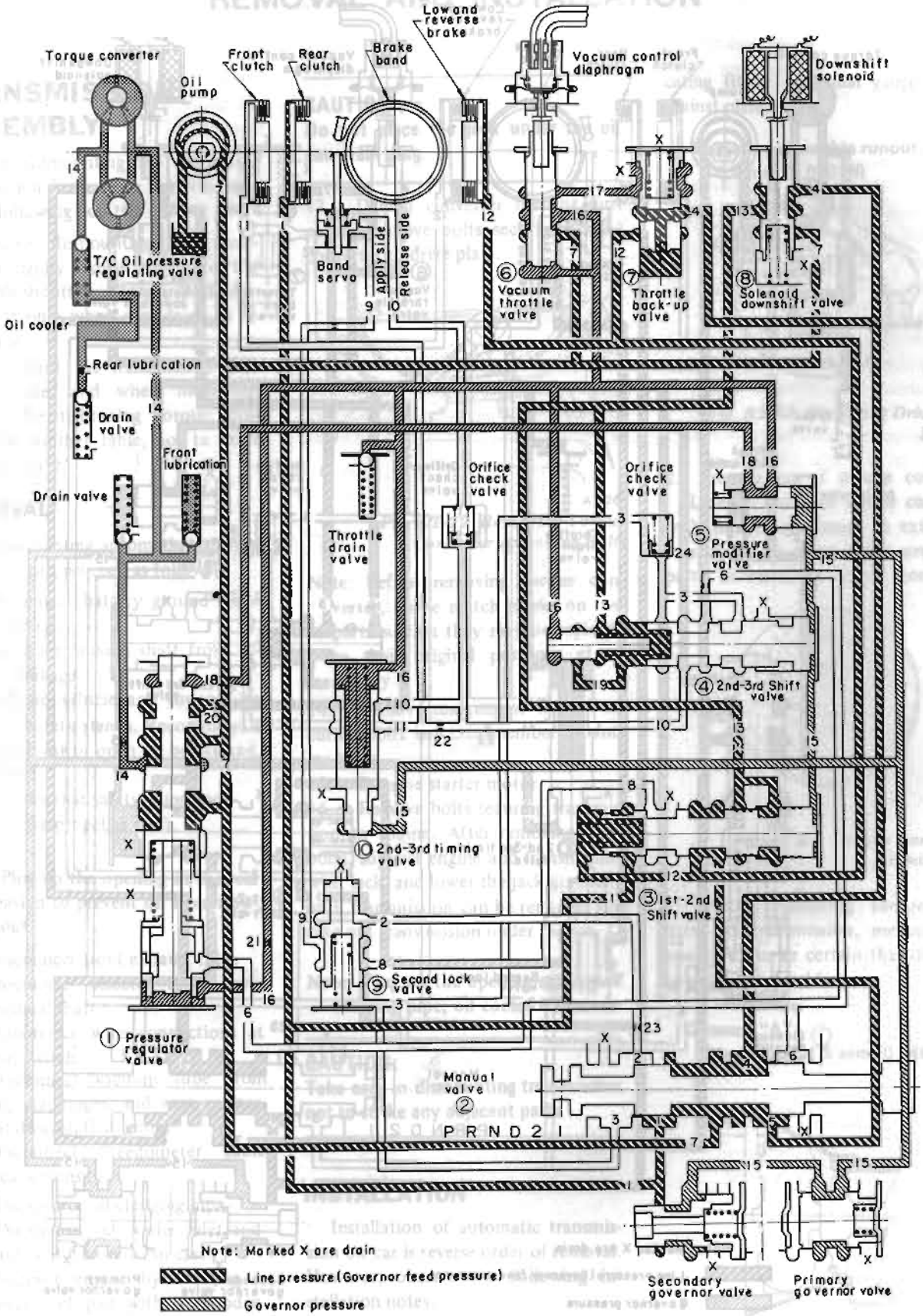
Manual pressure passing through the 1-2 shift valve is used to close the 1-2 shift valve, preventing a 1-2 upshift. Manual pressure passing through the downshift valve locks the 2-3 shift valve closed, along with applying additional closing pressure to the 1-2 shift valve.



Fluid flow (2nd gear)



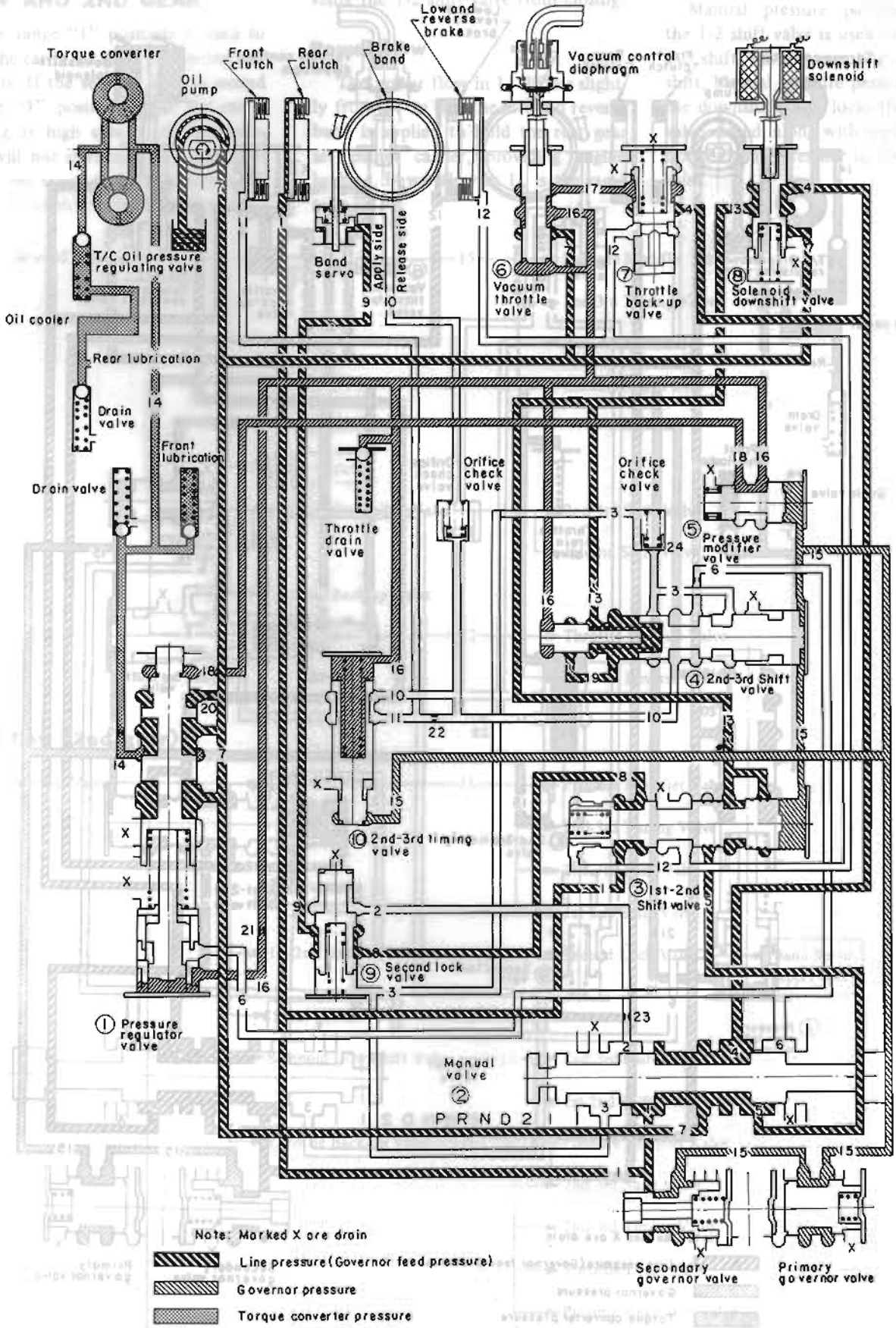
"1," range (Low gear)



AT452

Fig. AT-20 Oil Pressure Circuit Diagram — "1," range (Low gear)

"1_2" range (2nd gear)



AT453

Fig. AT-21 Oil Pressure Circuit Diagram — "1_2" range (2nd gear)

REMOVAL AND INSTALLATION

TRANSMISSION ASSEMBLY

When dismounting the automatic transmission from a car, pay attention to the following points:

1. Before dismounting the transmission, rigidly inspect it by aid of the "Trouble-shooting Chart", and dismount it only when considered to be necessary.
2. Dismount the transmission with utmost care; and when mounting, observe the tightening torque indicated on another table, not to exert excessive force.

REMOVAL

In dismounting automatic transmission from car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. Disengage torsion shaft from accelerator linkage.
3. Jack up vehicle and support its weight on safety stands. Recommend a hydraulic hoist or open pit be utilized, if available.

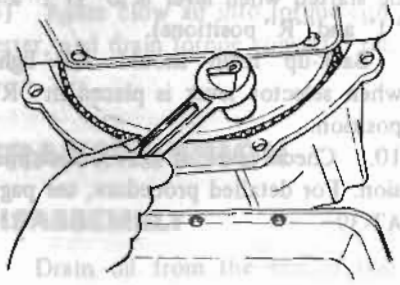
   Make sure that safety is insured.
4. Remove propeller shaft.

Note: Plug up the opening in the rear extension to prevent oil from flowing out.

5. Disconnect front exhaust tube.
6. Disconnect selector range lever from manual shaft.
7. Disconnect wire connections at inhibitor switch.
8. Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid.
9. Disconnect speedometer cable from rear extension.
10. Disconnect oil charging pipe.
11. Disconnect oil cooler inlet and outlet tubes at transmission case.
12. Support engine by locating a jack under oil pan with a wooden block used between oil pan and jack. Support transmission by means of a transmission jack.

CAUTION:
Do not place the jack under the oil pan drain plug.

13. Detach converter housing dust cover. Remove bolts securing torque converter to drive plate.



AT261

Fig. AT-22 Removing Torque Converter Attaching Bolts

Note: Before removing torque converter, scribe match marks on two parts so that they may be replaced in their original positions at assembly.

14. Remove rear engine mount securing bolts and crossmember mounting bolts.
15. Remove starter motor.
16. Remove bolts securing transmission to engine. After removing these bolts, support engine and transmission with jack, and lower the jack gradually until transmission can be removed and take out transmission under the car.

Note: Plug up the opening such as oil charging pipe, oil cooler tubes, etc.

CAUTION:
Take care in dismounting transmission not to strike any adjacent parts.

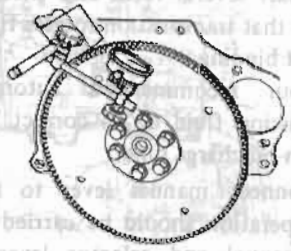
INSTALLATION

Installation of automatic transmission on car is reverse order of removal. However, observe the following installation notes.

1. Drive plate runout

Turn crankshaft one full turn and measure drive plate runout with indicating finger of a dial gauge resting against plate.

Maximum allowable runout:
0.5 mm (0.020 in)



AT268

Fig. AT-23 Measuring Drive Plate Runout

2. Installation of torque converter

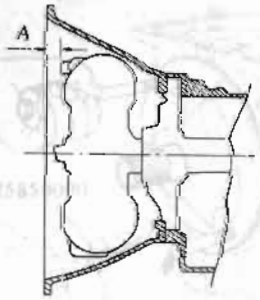
Line up notch in torque converter with that in oil pump. Be extremely careful not to cause undue stresses in parts in installing torque converter.

AT116

Fig. AT-24 Torque Converter Aligning Cut

3. When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
More than 21.5 mm (0.846 in)



AT117

Fig. AT-25 Installing Torque Converter

4. Bolt converter to drive plate.

Note: Align chalk marks painted across both parts during disassembling processes.

5. After converter is installed, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.

6. Pour recommended automatic transmission fluid up to correct level through oil charge pipe.

7. Connect manual lever to shift rod. Operation should be carried out with manual and selector levers in "N".

8. Connect inhibitor switch wires.

Note:

a. Refer to page AT-40 for Checking and Adjusting Inhibitor Switch.

b. Inspect and adjust switch as above whenever it has to be removed for service.

9. Check inhibitor switch for operation:

Starter should be brought into operation only when selector lever is in "P" and "N" positions (it should not be started when lever is in "D", "2", "1" and "R" positions).

Back-up lamp should also light when selector lever is placed in "R" position.

10. Check level of oil in transmission. For detailed procedure, see page AT-39.

11. Move selector lever through all positions to be sure that transmission operates correctly.

With hand brake applied, rotate engine at idling. Without disturbing the above setting, move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.

Note: See page AT-40 for Checking Engine Idling Revolution.

12. Check to ensure that line pressure is correct. To do this, refer to page AT-43 for Line Pressure Test.

13. Perform stall test as described in page AT-41.

MAJOR REPAIR OPERATION

SERVICE NOTICE FOR DISASSEMBLY AND ASSEMBLY

1. It is advisable that repair operations be carried out in a dust-proof room.
2. Due to the differences of the engine capacities, the specifications of component parts for each model's transmission may be different. They do, however, have common adjustment and repair procedures as well as cleaning and inspection procedures, outlined hereinafter.
3. During repair operations, refer to "Service Data and Specifications" section for the correct parts for each model.
4. Before removing any of subassemblies, thoroughly clean the outside of the transmission to prevent dirt from entering the mechanical parts.
5. Do not use a waste rag. Use a nylon or paper cloth.
6. After disassembling, wash all disassembled parts, and examine them to see if there are any worn, damaged or defective parts, and how they are affected. Refer to "Service Data" for the extent of damage that justifies replacement.
7. As a rule, packings, seals and similar parts once disassembled should be replaced with new ones.

TORQUE CONVERTER

The torque converter is a welded construction and can not be disassembled.

INSPECTION

1. Check torque converter for any sign of damage, bending, oil leak or deformation. If necessary, replace.
2. Remove rust from pilots and bosses completely.

If torque converter oil is fouled or contaminated due to burnt clutch, flush the torque converter as follows:

(1) Drain oil in torque converter.
(2) Pour non lead gasoline or kerosene into torque converter [approximately 0.5 liter (1 ⅛ U.S.pt., ⅞ Imp. pt.)].
(3) Blow air into torque converter and flush and drain out gasoline.
(4) Fill torque converter with torque converter oil [approximately 0.5 liter (1 ⅛ U.S.pt., ⅞ Imp.pt.)].
(5) Again blow air into torque converter, and drain torque converter oil.

TRANSMISSION

DISASSEMBLY

1. Drain oil from the end of rear extension. Mount transmission on Transmission Case Stand ST07870000 or ST07860000. Remove oil pan.

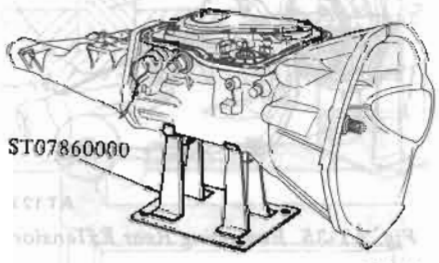


Fig. AT-26 Removing Oil Pan

2. Remove bolts securing converter housing to transmission case. Remove torque converter housing.
3. Remove speedometer pinion sleeve bolt. Withdraw pinion.
4. Remove downshift solenoid and vacuum diaphragm. Do not leave diaphragm rod at this stage of disassembly. Rod is assembled in top of vacuum diaphragm.

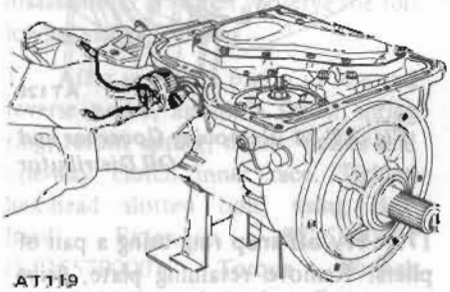


Fig. AT-27 Downshift Solenoid and Vacuum Diaphragm

5. Remove bolts which hold valve body to transmission case.

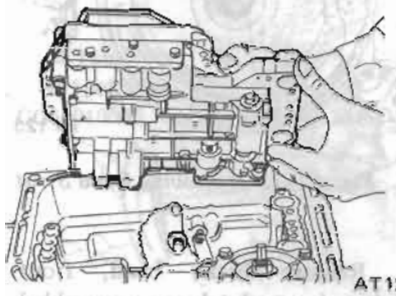


Fig. AT-28 Removing Valve Body

6. Loosen lock nut ② on piston stem ①.
Then tighten piston stem in order to prevent front clutch drum from falling when oil pump is withdrawn.

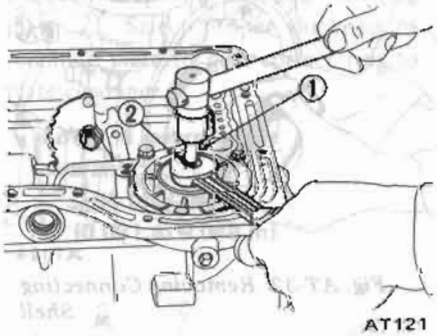


Fig. AT-29 Loosening Band Servo

7. Pull out input shaft.
8. Withdraw oil pump using Sliding Hammer ST25850000. Do not allow front clutch to come out of position and drop onto floor.

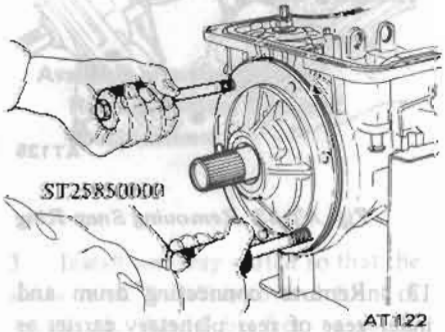


Fig. AT-30 Removing Oil Pump

9. Remove band strut. This can be done by loosening piston stem further.

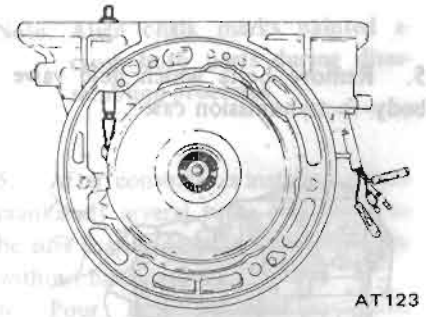


Fig. AT-31 Removing Band Strut

10. Remove brake band, front clutch and rear clutch as an assembled unit.

11. Remove connecting shell, rear clutch hub and front planetary carrier as a unit.

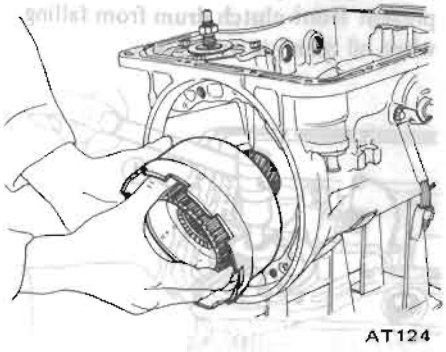


Fig. AT-32 Removing Connecting Shell

12. With the aid of Snap Ring Remover HT69860000, pry snap ring off output shaft.

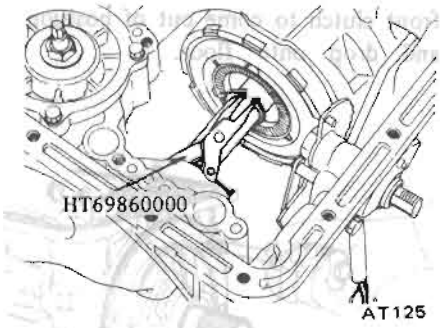


Fig. AT-33 Removing Snap Ring

13. Remove connecting drum and inner gear of rear planetary carrier as an assembly.

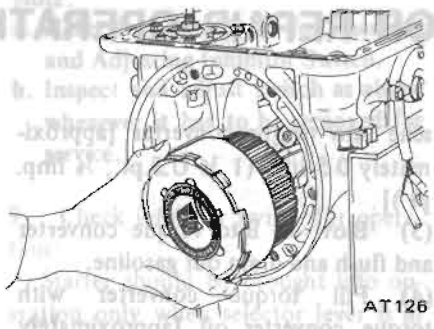


Fig. AT-34 Removing Connecting Drum

14. Remove snap rings and then remove rear planetary carrier, internal gear, connecting drum, one-way clutch outer race and one-way clutch in that order.

15. Remove rear extension by loosening securing bolts.

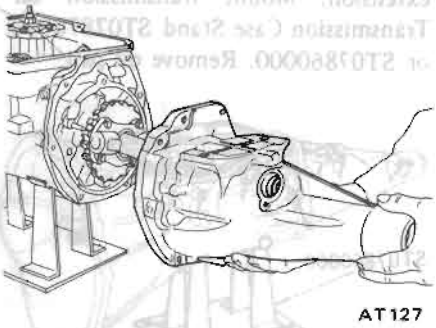


Fig. AT-35 Removing Rear Extension

16. Pull out output shaft; remove oil distributor ② together with governor valve ①.

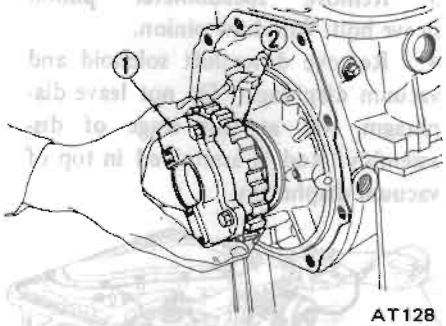


Fig. AT-36 Removing Governor and Oil Distributor

17. Pry off snap ring using a pair of pliers. Remove retaining plate, drive plate, driven plate and dish plate in that order.

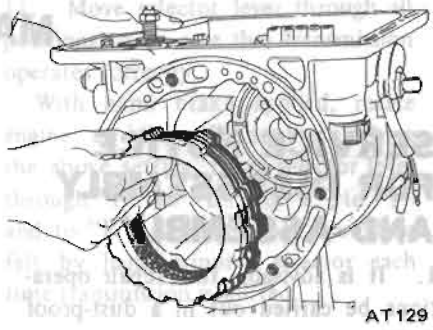


Fig. AT-37 Removing Drive and Driven Plates

18. Reaching through back side of transmission case, remove hex-head slotted bolts. To do this, use Hex-head Extension ST25570001 (ST25570000). One-way clutch inner race, thrust washer, piston return spring and thrust spring ring can now be removed.

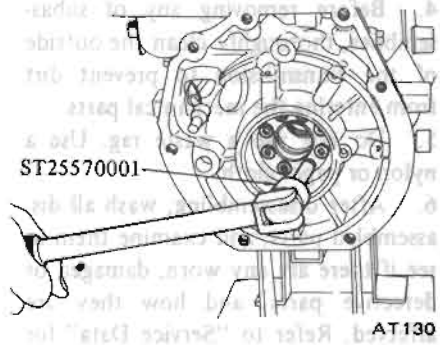


Fig. AT-38 Removing Hex-head Slotted Bolt

19. Blow out low and reverse brake piston by directing a jet of air into hole in cylinder.

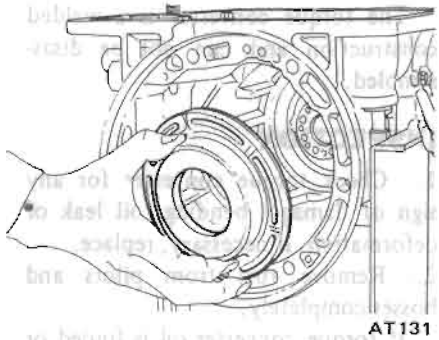


Fig. AT-39 Removing Piston

20. Remove band servo loosening attaching bolts.

Note: If difficulty is encountered in removing retainer, direct a jet of air toward release side.

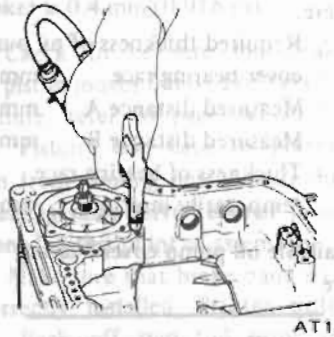


Fig. AT-40 Removing Band Servo

21. Pry snap rings ① from both ends of parking brake lever ② and remove the lever. Back off manual shaft lock nut ③ and remove manual plate ④ and parking rod ⑤.

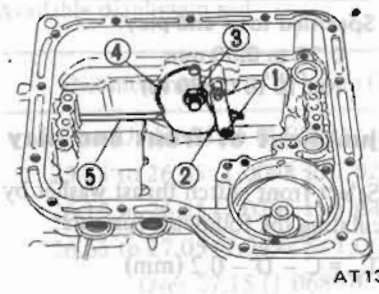


Fig. AT-41 Removing Manual Plate

22. Remove inhibitor switch and manual shaft by loosening two securing bolts.

INSPECTION

Torque converter housing, transmission case and rear extension

1. Check for damage or cracking; if necessary, replace.
2. Check for dents or score marks on mating surfaces. Repair as necessary.
3. If rear extension bushing is worn or cracked, replace it as an assembly of bushing and rear extension housing.

Gaskets and O-ring

1. Always use new gaskets when the units are to be disassembled.
2. Check O-rings for burrs or cracking. If necessary, replace with new rings.

Oil distributor

1. Check for signs of wear on seal ring and ring groove, replacing with new ones if found worn beyond use.
2. Check that clearance between seal ring and ring groove is correct. If out of specification, replace whichever is worn beyond limits.

Clearance between seal ring and ring groove:
0.04 to 0.16 mm
(0.0016 to 0.0063 in)

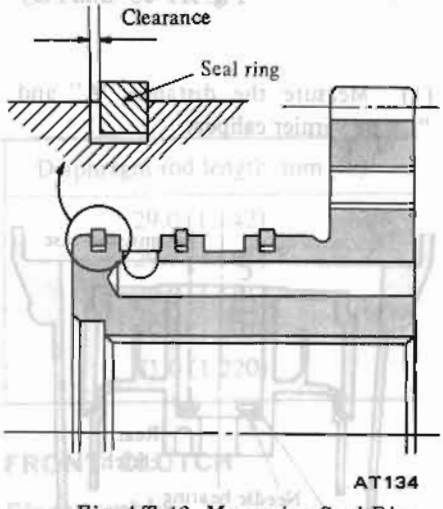


Fig. AT-42 Measuring Seal Ring to Ring Groove Clearance

ASSEMBLY

Assembly is in reverse order of disassembly. However, observe the following assembly notes.

1. After installing piston of low and reverse brake, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race. Tighten hex-head slotted bolt, using Hex-head Extension ST25570001 (ST25570000), Torque Wrench GG93010000 and Socket Extension ST25490000 (ST25512001).

Ⓣ **Tightening torque:**
One-way clutch inner race to transmission case
1.3 to 1.8 kg-m
(9 to 13 ft-lb)

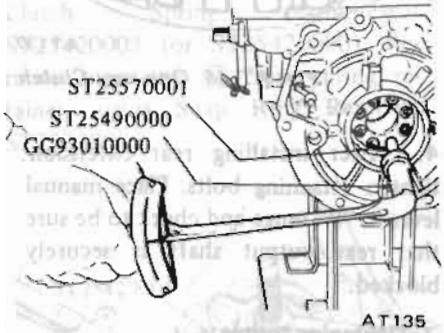


Fig. AT-43 Installing One-way Clutch Inner Race

2. After low and reverse brake has been assembled, measure the clearance between snap ring ① and retaining plate ②. Select proper thickness of retaining plate to give correct ring to plate clearance.

Low and reverse brake clearance:
0.80 to 1.25 mm
(0.031 to 0.049 in)

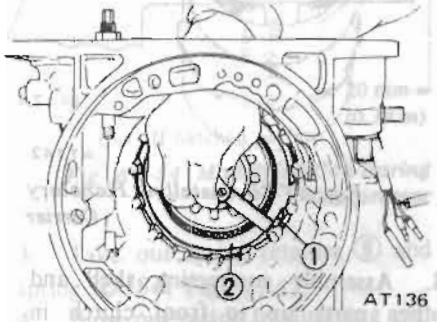
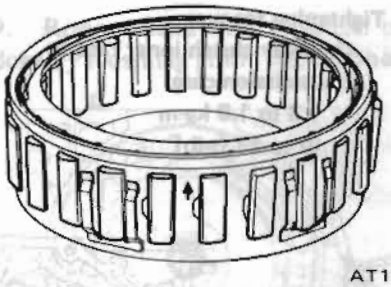


Fig. AT-44 Measuring Ring to Plate Clearance

Available retaining plate:
Refer to Service Data and Specifications.

3. Install one-way clutch so that the arrow mark "→" is toward front of vehicle. It should be free to rotate only in clockwise direction.



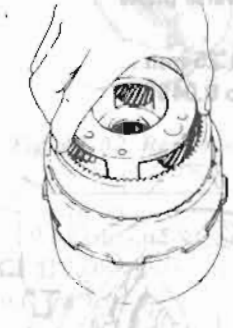
AT137

Fig. AT-45 One-way Clutch

4. After installing rear extension, tighten attaching bolts. Place manual lever in "P" range and check to be sure that rear output shaft is securely blocked.

Ⓣ Tightening torque:
Transmission case to rear extension
2.0 to 2.5 kg-m
(14 to 18 ft-lb)

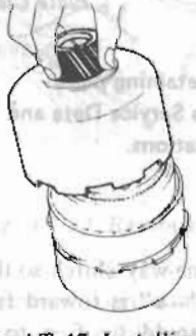
5. Tighten servo retainer temporarily at this stage of assembly.
6. Place rear clutch assembly with needle bearing on front assembly.
7. Install rear clutch hub and front planetary carrier.



AT142

Fig. AT-46 Installing Planetary Carrier

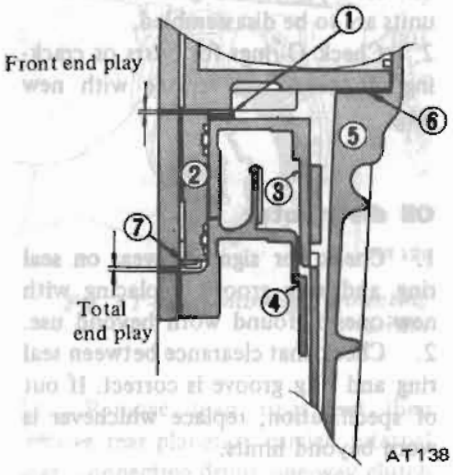
8. Assemble connecting shell and other parts up to front clutch in reverse order of disassembly.



AT143

Fig. AT-47 Installing Connecting Shell

9. Adjust total end play and front end play as follows:

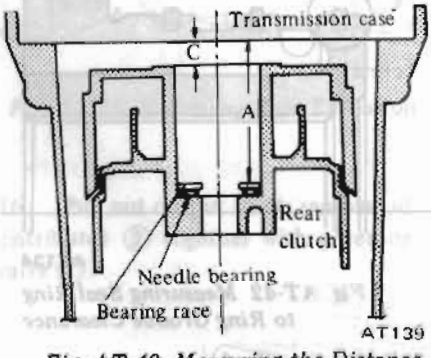


AT138

1	Front clutch thrust washer	5	Transmission case
2	Oil pump cover	6	Oil pump gasket
3	Front clutch	7	Oil pump cover bearing race
4	Rear clutch		

Fig. AT-48 End Play

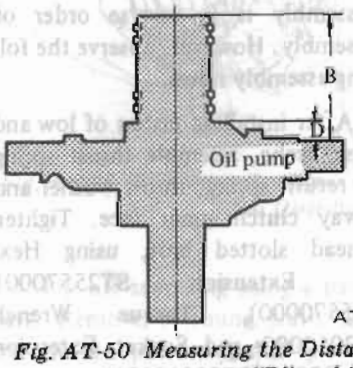
(1) Measure the distance "A" and "C" by vernier calipers.



AT139

Fig. AT-49 Measuring the Distance "A" and "C"

(2) Measure the distance "B" and "D" of oil pump cover.



AT140

Fig. AT-50 Measuring the Distance "B" and "D"

Adjustment of total end play

Select oil pump cover bearing race by calculating the following formula:

$$T_T = A - B + W$$

where,

T_T : Required thickness of oil pump cover bearing race mm (in)
A : Measured distance A mm (in)
B : Measured distance B mm (in)
W : Thickness of bearing race temporarily inserted mm (in)

Available oil pump cover bearing race

Thickness mm (in)
1.2 (0.047)
1.4 (0.055)
1.6 (0.063)
1.8 (0.071)
2.0 (0.079)
2.2 (0.087)

Specified total end play:
0.25 to 0.50 mm
(0.010 to 0.020 in)

Adjustment of front end play

Select front clutch thrust washer by calculating the following formula:

$$T_F = C - D - 0.2 \text{ (mm)}$$

where,

T_F: Required thickness of front clutch thrust washer mm (in)
C : Measured distance C mm (in)
D : Measured distance D mm (in)

Available front clutch thrust washer

Thickness mm (in)
1.5 (0.059)
1.7 (0.067)
1.9 (0.075)
2.1 (0.083)
2.3 (0.091)
2.5 (0.098)
2.7 (0.106)

Specified front end play:
0.5 to 0.8 mm
(0.020 to 0.031 in)

Note:
a. Correct thickness of bearing race and thrust washer is always the one which is nearest the calculated one.
b. Installed thickness of oil pump gasket is 0.4 mm (0.016 in).

10. Check to be sure that brake servo piston moves freely. For detailed procedure, refer to page AT-33 for Servo Piston. Use care to prevent piston from coming out of place during testing since servo retainer is not tightened at this point of assembly.
11. Make sure that brake band strut is correctly installed. Tighten piston stem. Back off two full turns and secure with lock nut.

Ⓣ **Tightening torque:**
Piston stem
1.2 to 1.5 kg-m
(9 to 11 ft-lb)
Piston stem lock nut
1.5 to 4.0 kg-m
(11 to 29 ft-lb)

12. After inhibitor switch is installed, check to be sure that it operates properly in each range. For detailed procedure, refer to page AT-40 for Checking and Adjusting Inhibitor Switch.
13. Check the length "L" between case end to rod end of vacuum throttle valve fully pushed in. Then select adequate diaphragm rod of corresponding measured length.

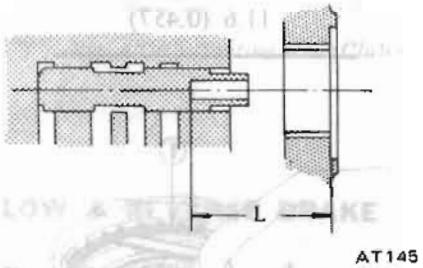


Fig. AT-51 Measuring the Distance "L"

Available diaphragm rod

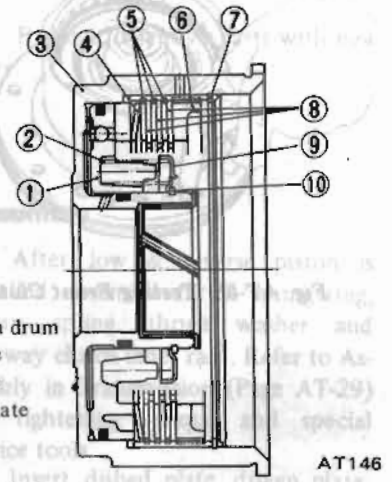
Distance measured "L" mm (in)	Diaphragm rod length mm (in)
Under 25.55 (1.0059)	29.0 (1.142)
25.65 to 26.05 (1.0098 to 1.0256)	29.5 (1.161)
26.15 to 26.55 (1.0295 to 1.0453)	30.0 (1.181)
26.65 to 27.05 (1.0492 to 1.0650)	30.5 (1.201)
Over 27.15 (1.0689)	31.0 (1.220)

COMPONENT PARTS

The transmission consists of many small parts that are quite alike in construction yet machined to very close tolerances. When disassembling parts, be sure to place them in order in part rack so they can be restored in the unit in their proper positions. It is also very important to perform functional test whenever it is designated.

FRONT CLUTCH

Disassembly



1 Piston
2 Coil spring
3 Front clutch drum
4 Dished plate
5 Driven plate
6 Retaining plate
7 Snap ring
8 Drive plate
9 Spring retainer
10 Snap ring

Fig. AT-52 Sectional View of Front Clutch

1. Pry off snap ring Ⓣ with a suitable screwdriver or a pair of pliers. Remove a retaining plate ⑥, drive plate ⑧, driven plate ⑤ and dished plate ④ in the order listed, as shown in Fig. AT-52.
2. Compress clutch springs, using Clutch Spring Compressor ST25420001 (or ST25420000). Remove snap ring ⑩ from spring retainer, using Snap Ring Remover ST25320001.

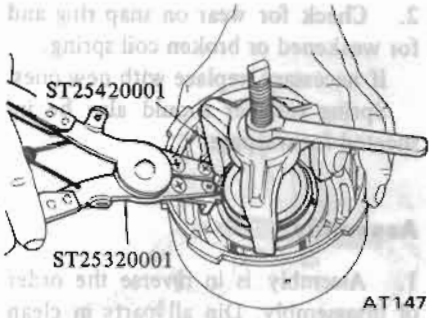
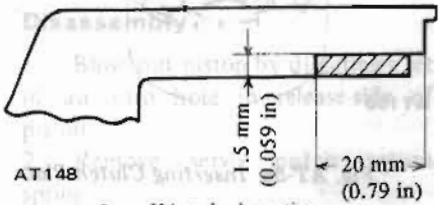


Fig. AT-53 Removing Snap Ring

Note: When Clutch Spring Compressor ST25420000 is to be used, cut the toe-tips of three legs by a grinding wheel.



Cut off hatched portion

Fig. AT-54 Modifying Coil Spring Compressor

3. Take out spring retainer ⑨ and spring ②. See Fig. AT-52.
4. Blow out piston by directing a jet of air into hole in clutch drum.

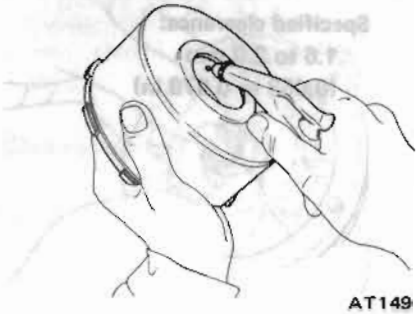


Fig. AT-55 Blowing Out Piston

Inspection

1. Check for signs of wear or damage to clutch drive plate facing. If found worn or damaged excessively, discard.

Drive plate thickness:
Standard
1.5 to 1.65 mm
(0.059 to 0.065 in)
Allowable limit
1.4 mm (0.055 in)

2. Check for wear on snap ring and for weakened or broken coil spring.
If necessary, replace with new ones.
Spring retainer should also be inspected for warpage.

Assembly

1. Assembly is in reverse the order of disassembly. Dip all parts in clean automatic transmission fluid before installing.

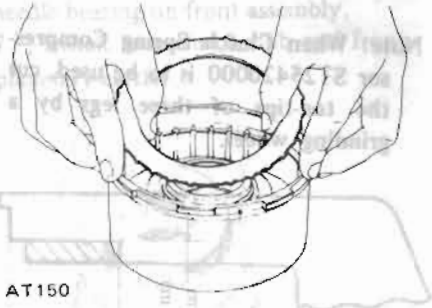


Fig. AT-56 Inserting Clutch Plate

2. After clutch is assembled, make sure that clearance between snap ring ① and retaining plate ② is held within specified limits. If necessary, try with other retaining plate having different thickness until correct clearance is obtained.

Specified clearance:
1.6 to 2.0 mm
(0.063 to 0.079 in)

Available retaining plate

Thickness mm (in)
10.6 (0.417)
10.8 (0.425)
11.0 (0.433)
11.2 (0.441)
11.4 (0.449)
11.6 (0.457)

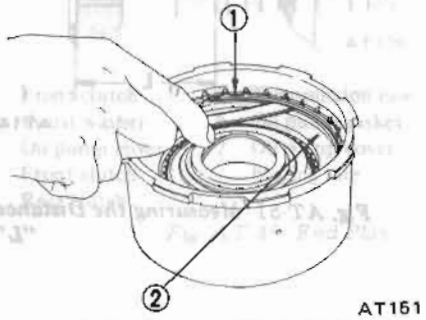


Fig. AT-57 Measuring Ring to Plate Clearance

3. Testing front clutch
With front clutch assembled on oil pump cover, direct a jet of air into hole in clutch drum for definite clutch operation.

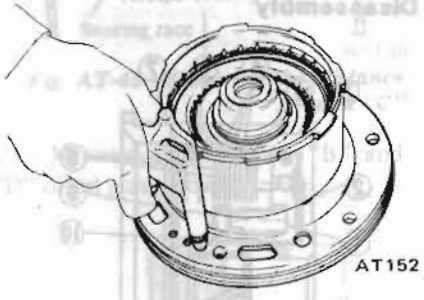
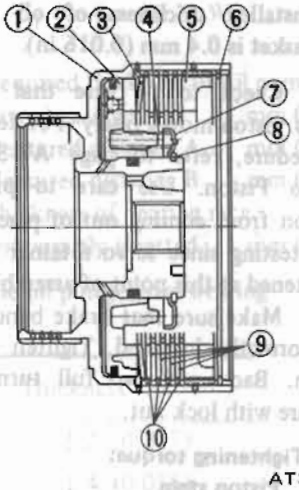


Fig. AT-58 Testing Front Clutch

REAR CLUTCH

Disassembly



1	Rear clutch drum	6	Snap ring
2	Piston	7	Spring retainer
3	Dished plate	8	Snap ring
4	Coil spring	9	Drive plate
5	Retaining plate	10	Driven plate

Fig. AT-59 Sectional View of Rear Clutch

1. Take out snap ring ⑥, retaining plate ⑤, drive plate ⑨, driven plate ⑩ and dished plate ③. Same technique can be applied as in disassembling front clutch.
2. Remove snap ring from coil spring retainer.

Fig. AT-60 Removing Snap Ring

3. Blow out piston by directing a jet of air into hole in clutch drum.

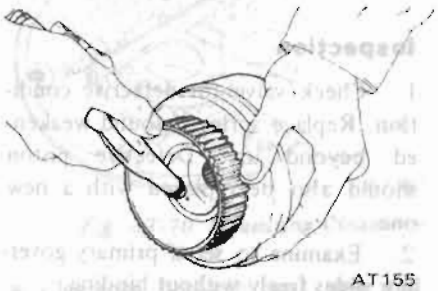


Fig. AT-61 Blowing out Piston

Inspection

Refer to page AT-32 for Inspection of Front Clutch.

Assembly

Assemble in reverse the order of disassembly. Dip all parts in clean automatic transmission fluid before assembling. Note that the number of drive and driven plates varies with type of vehicle. For details, refer to "Service Data & Specifications".

1. After rear clutch is assembled, check to be sure that clearance between snap ring ① and retaining plate ② is held within specified clearance.

Specified clearance:
0.8 to 1.6 mm
(0.031 to 0.063 in)

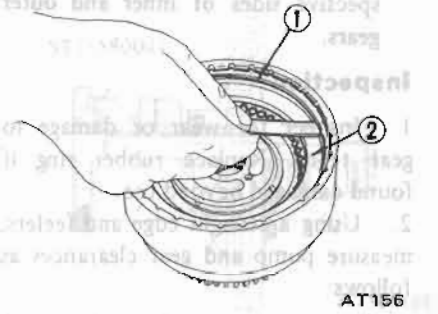


Fig. AT-62 Measuring Ring to Plate Clearance

2. Testing rear clutch

Install rear clutch on oil pump cover.

Blow compressed air into oil hole to test for definite clutch operation.

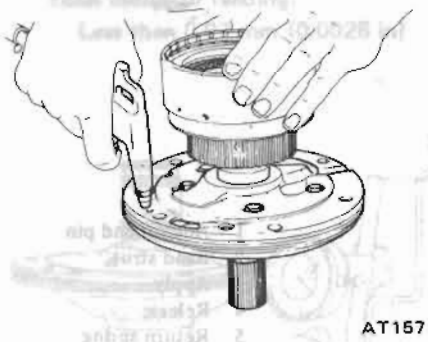


Fig. AT-63 Testing Rear Clutch

LOW & REVERSE BRAKE

Disassembly

1. Follow steps as described in page AT-27 for Transmission Disassembly.
2. Blow out piston by directing a jet of air into oil hole in clutch piston.

Inspection

1. Check drive plate facing for wear or damage; if necessary, replace.

Drive plate thickness:
Standard
1.9 to 2.05 mm
(0.075 to 0.081 in)
Allowable limit
1.8 mm (0.071 in)

2. Test piston return spring for weakness. Discard if weakened beyond use.
3. Replace defective parts with new ones.

Assembly

1. After low & reverse piston is installed, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race. Refer to Assembly in Transmission (Page AT-29) for tightening torque and special service tools.
2. Insert dished plate, driven plate, drive plate and retaining plate into transmission case in that order. Install snap ring to secure the installation.
3. Without disturbing the above setting, check to be sure that clearance between snap ring and retaining plate is within specified limits. If necessary, use other plates of different thickness until correct clearance is obtained.

Specified clearance:
0.80 to 1.25 mm
(0.031 to 0.049 in)

4. Blow compressed air into oil hole in low & reverse brake to test for definite brake operation.

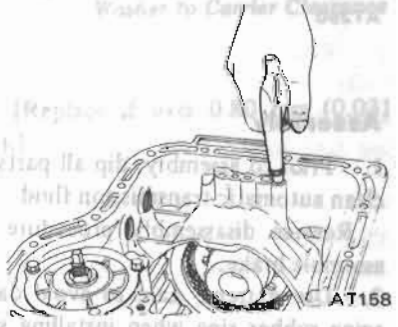


Fig. AT-64 Testing Low & Reverse Brake

SERVO PISTON

Disassembly

1. Blow out piston by directing a jet of air into hole in release-side of piston.
2. Remove servo piston return spring.

Inspection

Check piston for wear, damage or other defects which might interfere with proper brake operation.

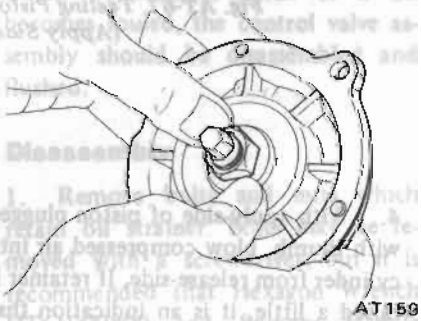
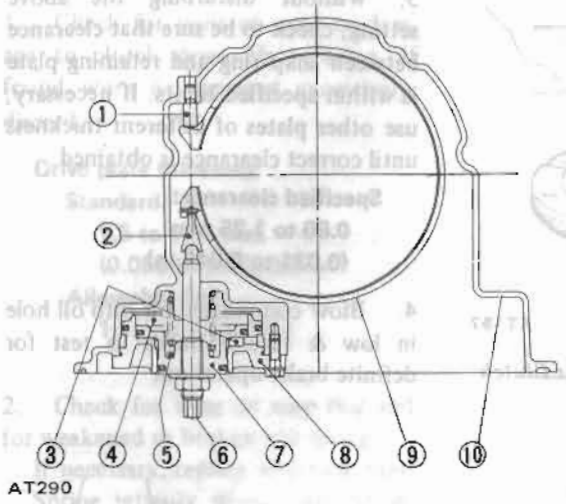


Fig. AT-65 Removing Piston



1 Anchor end pin
2 Band strut
3 Apply
4 Release
5 Return spring
6 Band servo piston stem
7 Band servo piston
8 Servo retainer
9 Brake band assembly
10 Transmission case

Fig. AT-66 Sectional View of Servo Piston

Assembly

1. Prior to assembly, dip all parts in clean automatic transmission fluid.

Reverse disassembly procedure to assemble brake.

2. Use extreme care to avoid damaging rubber ring when installing seal lace.
3. Blow compressed air from apply-side of piston to test for definite piston operation.

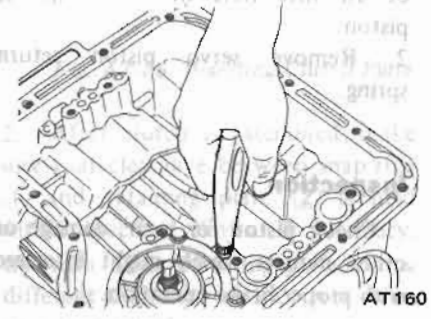


Fig. AT-67 Testing Piston (Apply Side)

4. With apply-side of piston plugged with thumb, blow compressed air into cylinder from release-side. If retainer is raised a little, it is an indication that attaching bolts are loose, calling for retightening.

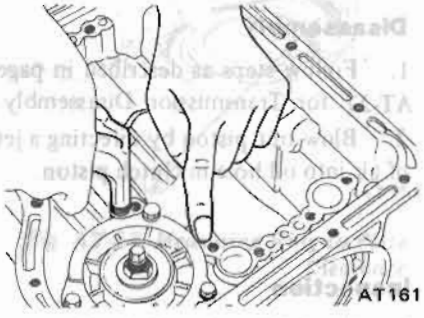
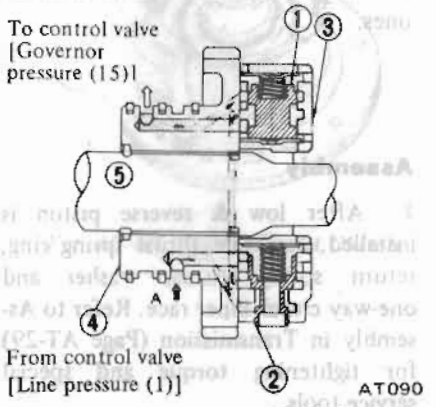


Fig. AT-68 Testing Piston (Release side)

GOVERNOR

Disassembly

1. Separate governor from oil distributor by unscrewing attaching bolts.
2. To disassemble secondary governor, remove spring seat, spring and secondary governor valve from valve body in that order.



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

Fig. AT-69 Testing Secondary Governor

3. If primary governor is to be disassembled for any purpose, remove spring seat, primary governor valve, spring and spring seat.

Inspection

1. Check valve for defective condition. Replace spring if found weakened beyond use. Defective piston should also be replaced with a new one.
2. Examine to see if primary governor slides freely without binding.
3. To determine if secondary governor is in good condition, blow air under light pressure into hole at "A" and listen for noise like that of a model plane.

Assembly

Reverse disassembly procedure to assemble governor.

Note: Do not confuse springs. Secondary governor spring is stronger than primary governor spring. After installation, check that spring is not deflected.

OIL PUMP

Disassembly

1. Free pump cover from pump housing by removing attaching bolts.
2. Take out inner and outer gears from pump housing.

Note: Be careful not to confuse respective sides of inner and outer gears.

Inspection

1. Inspect for wear or damage to gear teeth. Replace rubber ring if found damaged beyond use.
2. Using a straight edge and feelers, measure pump and gear clearances as follows:

- Clearance between inner (or outer) gear and pump cover.

Standard clearance:
0.02 to 0.04 mm
(0.001 to 0.002 in)

[Replace if over 0.08 mm (0.003 in).]

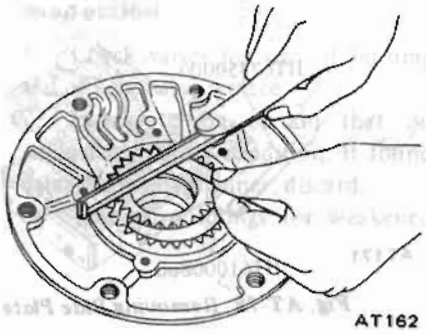


Fig. AT-70 Measuring Clearance

- Clearance between seal ring and ring groove.

Standard clearance:
0.04 to 0.16 mm
(0.002 to 0.006 in)

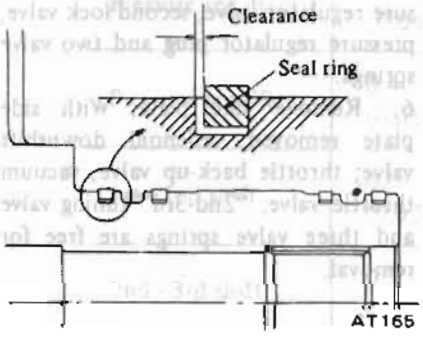


Fig. AT-71 Measuring Clearance

Assembly

1. Set up pump housing with inner and outer pump gears on it.
2. Using Oil Pump Assembling Gauge ST25580001, install pump cover to pump housing.

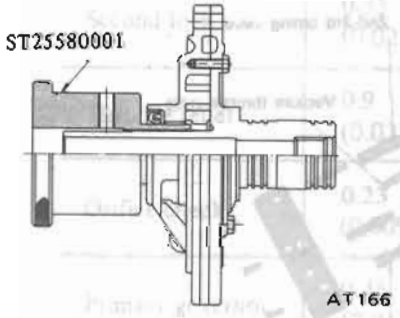


Fig. AT-72 Centering Oil Pump

3. Temporarily tighten pump securing bolts.
4. Set the runout of oil pump cover within specified total indicator reading.

Total indicator reading:
Less than 0.07 mm (0.0028 in)

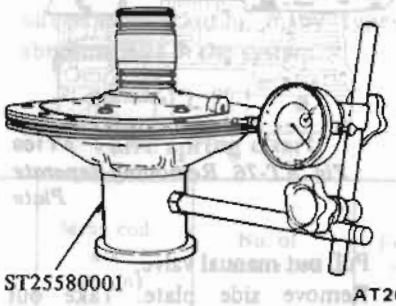


Fig. AT-73 Measuring Runout

5. Tighten pump securing bolts to specified torque.

Ⓣ **Tightening torque:**
Oil pump housing to oil pump cover
0.6 to 0.8 kg-m
(4.3 to 5.8 ft-lb)

Note: Be sure to align converter housing securing bolt holes.

6. Again, check the runout of oil pump cover.

Note: When former Oil Pump Assembling Gauge is to be used, make a screw hole in side of it.

PLANETARY CARRIER

The planetary carrier cannot be divided into its individual components.

If any part of component is defective, replace the carrier as a unit.

Inspection

Check clearance between pinion washer and planetary carrier with a feeler.

Standard clearance:
0.20 to 0.70 mm
(0.008 to 0.028 in)

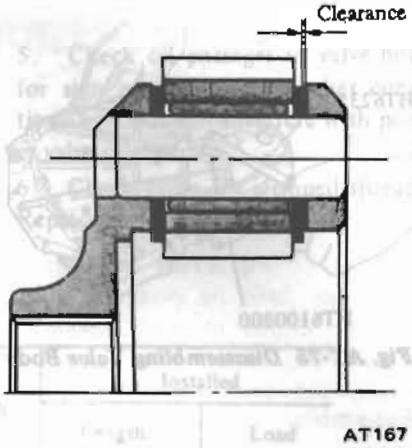


Fig. AT-74 Measuring Pinion Washer to Carrier Clearance

[Replace if over 0.80 mm (0.031 in).]

CONTROL VALVE

The control valve assembly consists of many precision parts and requires extreme care when it has to be removed and serviced. It is good practice to place parts in a part rack so that they can be reassembled in valve body in their proper positions. Added care should also be exercised to prevent springs and other small parts from being scattered and lost.

Before assembly, dip all parts in clean automatic transmission fluid and check to be certain that they are free of lint and other minute particles. If clutch or band is burnt or if oil becomes fouled, the control valve assembly should be disassembled and flushed.

Disassembly

1. Remove bolts and nuts which retain oil strainer. Bolts may be removed with a screwdriver, but it is recommended that Hexagon Wrench HT61000800 and Spinner Handle HT62350000 be used.

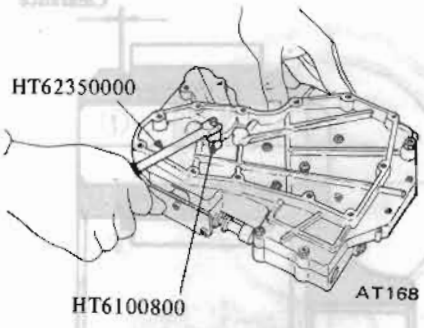


Fig. AT-75 Disassembling Valve Body

2. Remove attaching bolts. With bolts removed, lower valve body, separate plate, and upper valve body are free for removal.

CAUTION:
Do not allow orifice check valve and valve spring in lower valve body to be scattered and lost when removing separate plate.

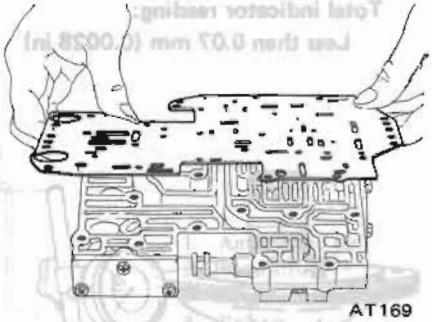


Fig. AT-76 Removing Separate Plate

3. Pull out manual valve.
4. Remove side plate. Take out "1st-2nd" shift valve, "2nd-3rd" shift valve, pressure modifier valve and three valve springs.

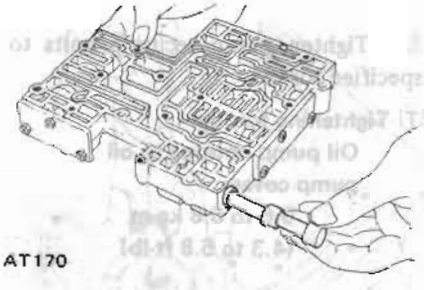


Fig. AT-77 Removing Manual Valve

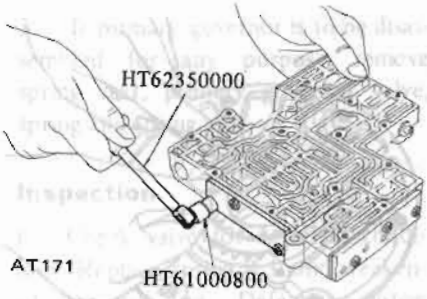


Fig. AT-78 Removing Side Plate

CAUTION:
Do not work it off with screwdrivers. To avoid damaging machine screws do not work it off with screwdriver.

5. Remove side plate; pull out pressure regulator valve, second lock valve, pressure regulator plug and two valve springs.
6. Remove side plate. With side plate removed, solenoid downshift valve; throttle back-up valve, vacuum throttle valve, "2nd-3rd" timing valve and three valve springs are free for removal.

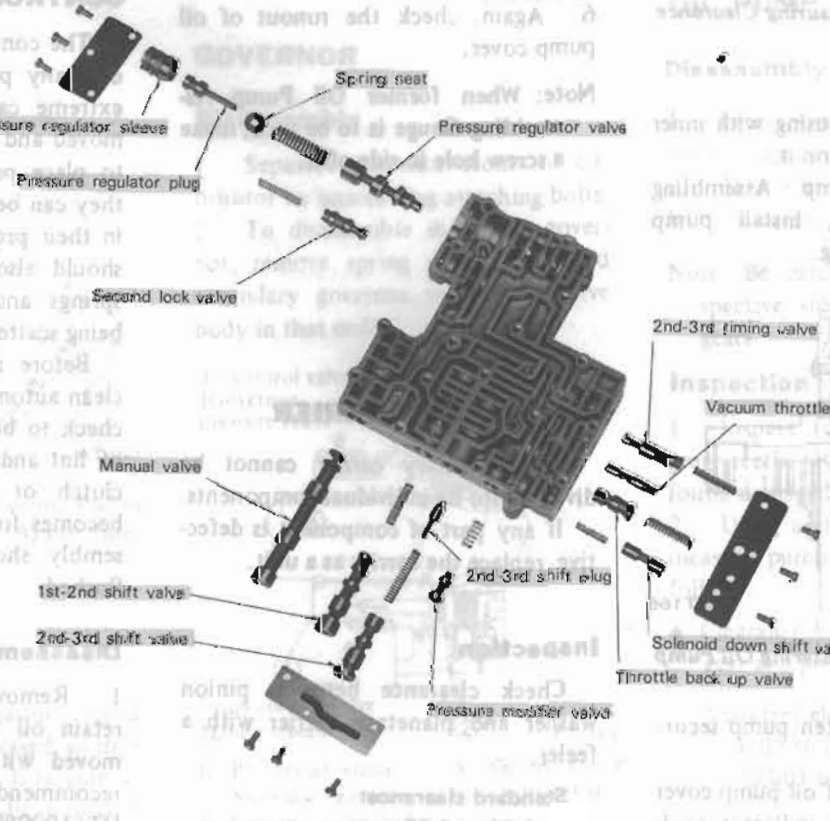


Fig. AT-79 Components Parts of Control Valve

Inspection

1. Check valves for sign of burning and, if necessary, replace.
2. Check to be certain that oil strainer is in good condition. If found damaged in any manner, discard.
3. Test valve springs for weakened tension; if necessary replace.
4. Examine for any sign of damage or score marks on separate plate. If left unheeded, oil will bypass correct oil passages causing many types of abnormalities in the system.
5. Check oil passages in valve body for sign of damage and other conditions which might interfere with proper valve operation.
6. Check bolts for stripped threads. Replace as required.

Valve spring chart

Valve spring	Wire dia. mm (in)	Mean coil dia. mm (in)	No. of active coil	Free length mm (in)	Installed	
					Length mm (in)	Load kg (lb)
Manual detent	1.3 (0.051)	6.0 (0.236)	15.0	32.4 (1.276)	26.5 (1.043)	5.5 (12.1)
Pressure regulator	1.2 (0.047)	10.5 (0.413)	13.0	43.0 (1.693)	23.5 (0.925)	2.8 (6.2)
Pressure modifier	0.4 (0.016)	8.0 (0.315)	5.0	18.5 (0.728)	9.0 (0.354)	0.1 (0.2)
1st - 2nd shift	0.6 (0.024)	6.0 (0.236)	16.0	32.0 (1.260)	16.0 (0.630)	0.625 (1.378)
2nd - 3rd shift	0.7 (0.028)	6.2 (0.244)	18.0	41.0 (1.614)	17.0 (0.669)	1.40 (3.09)
2nd - 3rd timing	0.7 (0.028)	5.5 (0.217)	15.0	32.5 (1.280)	27.0 (1.063)	0.55 (1.21)
Throttle back-up	0.8 (0.031)	6.5 (0.256)	14.0	36.0 (1.417)	18.8 (0.740)	1.92 (4.23)
Solenoid downshift	0.55 (0.0217)	5.0 (0.197)	12.0	22.0 (0.866)	12.5 (0.492)	0.60 (1.32)
Second lock	0.55 (0.0217)	5.0 (0.197)	16.0	33.5 (1.319)	21.0 (0.827)	0.60 (1.32)
Throttle relief	0.9 (0.035)	5.6 (0.220)	14.0	26.8 (1.055)	19.0 (0.748)	2.19 (4.83)
Orifice check	0.23 (0.0091)	4.77 (0.1878)	12.0	15.5 (0.610)	11.5 (0.453)	0.01 (0.02)
Primary governor	0.45 (0.0177)	8.3 (0.327)	5.0	21.8 (0.858)	7.5 (0.295)	0.215 (0.474)
Secondary governor	0.7 (0.028)	8.5 (0.335)	5.5	25.2 (0.992)	10.5 (0.413)	1.10 (2.43)

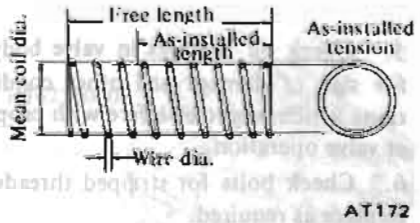


Fig. AT-80 Valve Spring

Assembly

Assemble in reverse order of disassembly. However, observe the following assembly notes. Refer to "Valve Spring Chart" and illustration in assembling valve springs. Dip all parts in clean automatic transmission fluid before assembly. Tighten parts to specifications when designated.

1. Slide valve into valve body and be particularly careful that they are not forced in any way.
2. Install side plates using Torque Driver ST25160000 and Hexagon Wrench HT61000800.

Ⓣ Tightening torque:
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

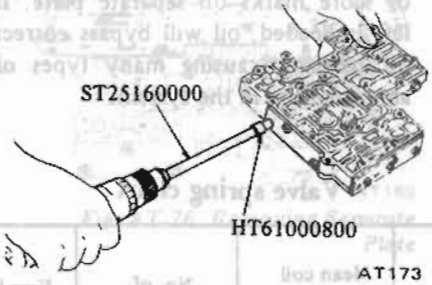


Fig. AT-81 Installing Side Plate

3. Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.

CAUTION:
Install check valve and relief spring so that they are properly positioned in valve body. See Figure AT-83.

4. Install upper and lower valve bodies.

Ⓣ Tightening torque:
Reamer bolt
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)
Other bolts
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

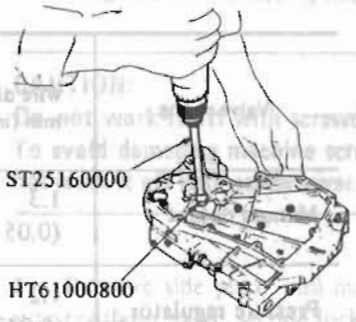


Fig. AT-82 Installing Valve Body

5. Install oil strainer.

Ⓣ Tightening torque:
0.3 to 0.4 kg-m
(2.2 to 2.9 ft-lb)

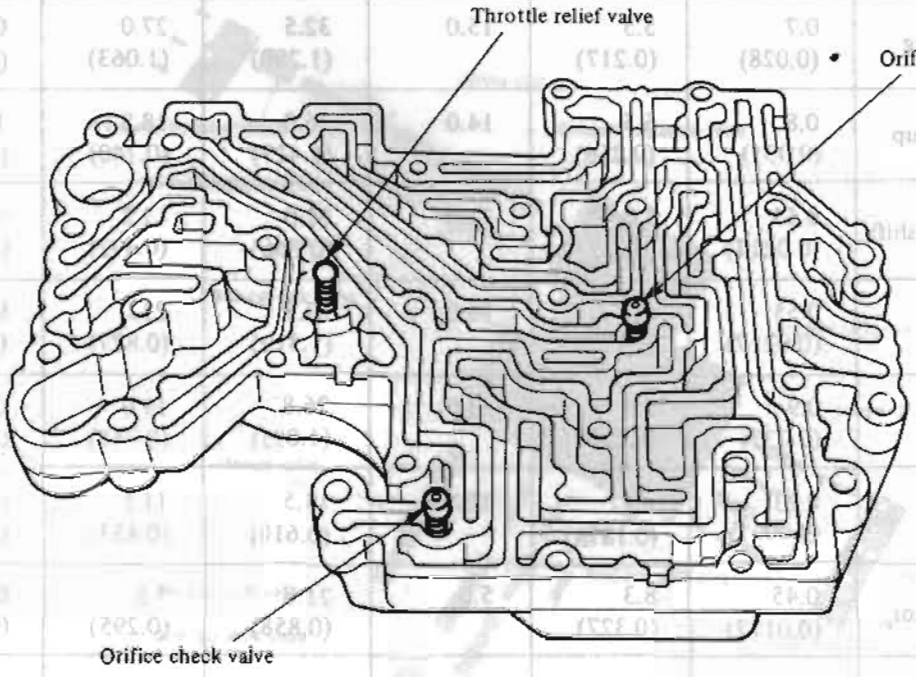


Fig. AT-83 Position of Check Valve and Spring

TROUBLE DIAGNOSIS AND ADJUSTMENT

Since most automatic transmission troubles can be repaired by simple adjustment, do not disassemble immediately.

Firstly inspect and adjust the automatic transmission in place utilizing the "Trouble Shooting Chart".

If the trouble can not be solved by this procedure, remove and disassemble the automatic transmission. It is advisable to check, overhaul and repair each part in the order listed in the "Trouble Shooting Chart".

1. In the "Trouble Shooting Chart" the diagnosis items are arranged according to difficulty from easy to difficult, therefore please follow these items. The transmission should not be removed, unless necessary.
2. Tests and adjustments should be made on the basis of standard values and the data should be recorded.

INSPECTION AND ADJUSTMENT BEFORE TROUBLE DIAGNOSIS

TESTING INSTRUMENT FOR INSPECTION

1. Engine tachometer
2. Vacuum gauge
3. Oil pressure gauge

It is convenient to install these instruments in a way that allows measurements to be made from the driver's seat.

CHECKING OIL LEVEL

In checking the automatic transmission the oil level and the condition of oil around the oil level gauge should be examined every 5,000 km (3,000 miles). This is an easy and effective trouble shooting procedure since some changes in oil condition are often linked with developed troubles.

For instance:

Lack of oil causes defective operation by making the clutches and brakes slip, resulting in severe wear.

This is because the oil pump sucks air causing oil foaming, thus rapidly deteriorating the oil quality and producing sludge and varnish.

Excessive oil is also bad because of oil foaming caused by the gears stirring up the oil. During high speed driving excessive oil in the transmission often blows out from the breather.

Measuring oil level

To check the fluid level, start the engine and run it until normal operating temperatures [oil temperature: 50 to 80°C (122 to 176°F). Approximately ten-minute of operation will raise the temperature to this range.] and engine idling conditions are stabilized. Then, apply the brakes and move the transmission shift lever through all drive positions and place it in park "P" position. In this inspection, the car must be placed on a level surface.

The amount of the oil varies with the temperature. As a rule the oil level must be measured after its temperature becomes sufficiently high.

1. Fill the oil to the line "H". The difference of capacities between both "H" and "L" is approximately 0.4 liter (¾ U.S.pt., ¾ Imp.pt.) and, therefore, do not to fill beyond the line "H".
2. When topping-up and changing oil, care should be taken to prevent mixing the oil with dust and water.

Inspecting oil condition

The condition of oil sticking to the level gauge indicates whether to overhaul and repair the transmission or look for the defective part.

If the oil has deteriorated to a varnish-like quality, it causes the control valve to stick. Blackened oil indicates a burned clutch, brake band, etc. In these cases, the transmission must be repaired.

CAUTION:

a. In checking oil level, use special paper cloth to handle the level gauge and be careful not to let the scraps of paper and cloth stick to the gauge.

b. Use automatic transmission fluid having "DEXRON" identifications only in the 3N71B automatic transmission.

c. Pay attention because the oil to be used differs from that used in the Nissan Full Automatic Transmission 3N71A. Never mix the oils.

Note: Insert the gauge fully and take it out quickly before splashing oil adheres to the gauge. Then observe the level.

INSPECTION AND REPAIR OF OIL LEAKAGE

When oil leakage takes place, the portion near the leakage is covered with oil, presenting difficulty in detecting the spot. Therefore, the places where oil seals and gaskets are equipped are enumerated below:

1. Converter housing
- Rubber ring of oil pump housing.
- Oil seal of oil pump housing.
- Oil seal of engine crankshaft.
- Bolts of converter housing to case.

2. Transmission and rear extension
- Junction of transmission and rear extension.
- Oil cooler tube connectors.
- Oil pan.
- Oil-pressure inspection holes (See Fig. AT-87).
- Mounting portion of vacuum diaphragm and downshift solenoid.
- Breather and oil charging pipe.
- Speedometer pinion sleeve.
- Oil seal of rear extension.

To exactly locate the place of oil leakage, proceed as follows:

• Place the vehicle in a pit, and by sampling the leaked oil, determine if it is the torque converter oil. The torque converter oil has a color like red wine, so it is easily distinguished from engine oil or gear oil.

• Wipe off the leaking oil and dust and detect the spot of oil leakage. Use nonflammable organic solvent such as carbon tetrachloride for wiping.

• Raise the oil temperature by operating the engine and shift the lever to "D" to increase the oil pressure. The spot of oil leakage will then be found more easily.

Note: As oil leakage from the breather does not take place except when running at high speed, it is impossible to locate this leakage with vehicle stationary.

CHECKING ENGINE IDLING REVOLUTION

The engine idling revolution should be properly adjusted.

If the engine revolution is too low, the engine does not operate smoothly, and if too high, a strong shock or creep develops when changing over from "N" to "D" or "R".

CHECKING AND ADJUSTING KICKDOWN SWITCH AND DOWNSHIFT SOLENOID

When the kickdown operation is not made properly or the speed changing point is too high, check the kickdown switch, downshift solenoid, and wiring between them. When the ignition key is positioned at the 1st stage and the accelerator pedal is depressed deeply, the switch contact should be closed and the solenoid should click. If it does not click, it indicates a defect. Then check each part with the testing instruments.

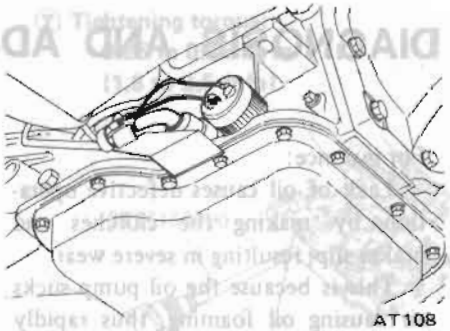


Fig. AT-84 Downshift Solenoid

Note: Watch for oil leakage from transmission case.

INSPECTION AND ADJUSTMENT OF MANUAL LINKAGE

The adjustment of manual linkage is equally important as "Inspection of Oil Level" for the automatic transmission. Therefore, great care should be exercised because incorrect adjustment will result in the breakdown of the transmission.

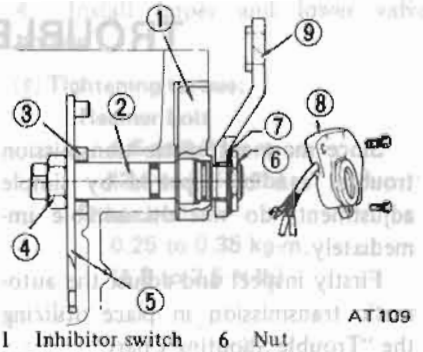
Inspection

Pull the selector lever toward you and turn it as far as "P" to "1" range, where clicks will be felt by the hand. This is the detent of manual valve in the valve body, and indicates the correct position of the lever.

Inspect whether the pointer of selector dial corresponds to this point, and also whether the lever comes in alignment with the stepping of position plate when it is released.

CHECKING AND ADJUSTING INHIBITOR SWITCH

The inhibitor switch lights the reverse lamp in the range "R" of the transmission operation and also rotates the starter motor in the ranges "N" and "P".



1 Inhibitor switch
2 Manual shaft
3 Washer
4 Nut
5 Manual plate
6 Nut
7 Washer
8 Inhibitor switch
9 Range select lever

Fig. AT-85 Construction of Inhibitor Switch

Check whether the reverse lamp and the starter motor operate normally in these ranges. If there is any trouble, first check the linkage. If no defect is found in the linkage, check the inhibitor switch.

Separate the manual lever from the remote control selector rod and turn the range select lever to "N".

Note: In the position "N" the slot of the manual shaft is vertical.

Using the tester, check the two black-yellow (BY) wires from the inhibitor switch in the ranges "N" and "P" and the two red-black (RB) wires in the range "R" for continuity. Turn range select lever in both directions from each lever set position and check each continuity range. It is normal if the electricity is on while the lever is within an angle of about 3° on both sides from each lever set line. However, if its continuity range is obviously unequal on both sides, adjustment is required.

If any malfunction is found, unscrew the fastening nut of the range selector lever and two fastening bolts of the switch body and then remove the machine screw under the switch body. Adjust the manual shaft correctly to the position "N" by means of the selector lever. (When the slot of the shaft becomes vertical, the detent works to position the shaft correctly with a clicking sound.)

Move the switch slightly aside so that the screw hole will be aligned

with the pin hole of the internal rotor combined with the manual shaft and check their alignment by inserting a 1.5 mm (0.059 in) diameter pin into the holes. If the alignment is correct, fasten the switch body with the bolts, pull out the pin, tighten up the screw in the hole, and fasten the selector lever as before. Check the continuity again with the tester. If the malfunction still remains, replace the inhibitor switch.

STALL TEST

The purpose of this test is to check the transmission and engine for trouble by measuring the maximum numbers of revolutions of the engine while vehicle is held in a stalled condition. The carburetor is in full throttle operation with the selector lever in ranges "D", "2" and "1" respectively. Compare the measured results with the standard values.

Components to be tested and test items

1. Clutches, brake and band in transmission for slipping
2. Torque converter for proper functioning
3. Engine for overall properly

STALL TEST PROCEDURES

Before testing, check the engine oil and torque converter oil; warm up the engine cooling water to suitable temperature by running at 1,200 rpm with the selector lever in the range "P" for several minutes. Warm up the torque converter oil to suitable temperature [60 to 100°C (140 to 212°F)].

1. Mount the engine tachometer at a location that allows good visibility from the driver's seat and put a mark on specified revolutions on the meter.
2. Secure the front and rear wheels with chocks and apply the hand brake. Be sure to depress the brake pedal firmly with the left foot before depressing the accelerator pedal.
3. Throw the selector lever into the range "D".
4. Slowly depress the accelerator pedal until the throttle valve is fully opened. Quickly read and record the engine revolution when the engine begins to rotate steadily and then release the accelerator pedal.
5. Shift the selector lever to "N" and operate the engine at approximately 1,200 rpm for more than one minute to cool down the torque converter oil and coolant.
6. Make similar stall tests in ranges "2", "1" and "R".

CAUTION:
The stall test operation as specified in item (4) should be made within five seconds. If it takes too long, the oil deteriorates and the clutches, brake and band are adversely affected. Sufficient cooling time should be given between each test for the four ranges "D", "2", "1" and "R".

JUDGEMENT

1. High stall revolution more than standard revolution

If the engine revolution in stall condition is higher than the standard values, it indicates that one or more clutches in the transmission are slipping and, therefore, no further test is required.

For the following abnormalities, the respective causes are presumed.

- High rpm in all ranges . . . Low line pressure
- High rpm in "D", "2" and "1" and normal rpm in "R" . . . Rear clutch slipping
- High rpm in "D" and "2" and normal rpm in "1" . . . One-way clutch slipping
- High rpm in "R" only . . . Front clutch or low and reverse brake slipping

To determine which is slipping, front clutch or low and reverse brake, a road test is needed.

If, while coasting, after starting with the lever in "1" range, engine braking does not work properly, the low and reverse brake is slipping. Otherwise, the front clutch is slipping.

Slipping of the band brake is difficult to ascertain. However, if it occurs with the lever in "2" range, engine revolution increases up to the same level as in "1st" range. It is impossible to check it in the stall test.

2. Standard stall revolution

If the engine revolution in stall condition is within the standard values, the control elements are normally operating in the ranges "D", "2", "1" and "R".

Also, the engine and one-way clutch of the torque converter are normal in performance and operation.

The one-way clutch of the torque converter, however, sometimes sticks. This is determined in the road test.

3. Lower stall revolution than standard revolution

If the engine revolution in stall condition is lower than the standard values, it indicates that the engine is in abnormal condition or the torque converter's one-way clutch is slipping.

4. Others

(1) If the accelerating performance is poor until vehicle speed of approximately 50 km/h (30 MPH) is attained and then normal beyond that speed, it can be judged that the torque converter's one-way clutch is slipping.

(2) If the torque converter's one-way clutch sticks, vehicle speed can not exceed approximately 80 km/h (50 MPH) in the road test. In such a case, the torque converter oil temperature rises abnormally and so special care is required.

(3) If the transmission does not operate properly at all vehicle speeds, it indicates poor engine performance.

ROAD TEST

An accurate knowledge of the automatic transmission is required for an exact diagnosis.

It is recommended that a diagnosis guide chart with the standard vehicle speeds for each stage of the up- and down-shiftings be prepared. Measured vehicle speeds are to be filled in the adjoining column after each testing.

Also it is advisable to mount a stopper for positioning the throttle opening.

CAR SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

Intake manifold vacuum –mmHg (–inHg)	Gearshift	Car speed ** km/h (MPH)	Propeller shaft rpm	Line pressure kg/cm² (psi)
0 [Kickdown]	$D_1 \rightarrow D_2$	61 to 69 (38 to 43)	1,870 to 2,120	7.3 to 8.9 (104 to 127)
	$D_2 \rightarrow D_3$	104 to 112 (65 to 70)	3,210 to 3,460	
	$D_3 \rightarrow D_2$	103 to 95 (64 to 59)	3,170 to 2,920	
	$D_2 \rightarrow D_1$	54 to 46 (34 to 29)	1,670 to 1,420	
100 (3.94)	$D_1 \rightarrow D_2$	19 to 28 (12 to 17)	600 to 850	5.8 to 7.4 (82 to 105)
	$D_2 \rightarrow D_3$	59 to 67 (37 to 42)	1,830 to 2,080	
	$D_3 \rightarrow D_2$	42 to 34 (26 to 21)	1,300 to 1,050	
	$D_2 \rightarrow D_1$	19 to 11 (12 to 7)	600 to 350	
0 [Full throttle]	$1_2 \rightarrow 1_1$*	55 to 47 (34 to 29)	1,700 to 1,450	7.7 to 9.3 (109 to 132)
300 (11.81)	$1_2 \rightarrow 1_1$*	55 to 47 (34 to 29)	1,700 to 1,450	7.7 to 9.3 (109 to 132)

*: Reduce the speed by shifting to "1" range from "D" range (output shaft 2,000 rpm).

**: Car speed can be calculated by the following formula;

$$V = \frac{2 \times \pi \times r \times Np \times 60}{R_F \times 1{,}000}$$

where, V = Car speed (km/h)
N_P = Propeller shaft revolution (rpm)
R_F = Final gear ratio
r = Tire effective radius (m)
π = The ratio of circumference of a circle to its diameter: 3.14

Note: $R_F = 3.545$
r = 0.305 m [195/70HR-14]

CHECKING SPEED CHANGING CONDITION

The driver's feeling during gear changes should also be checked attentively.

1. A sharp shock or unsmoothness is felt during a gear change.

This indicates that the throttle pressure is too high or some valve connected to the throttle is faulty.

2. A gear change is made with a long and dragging feeling.

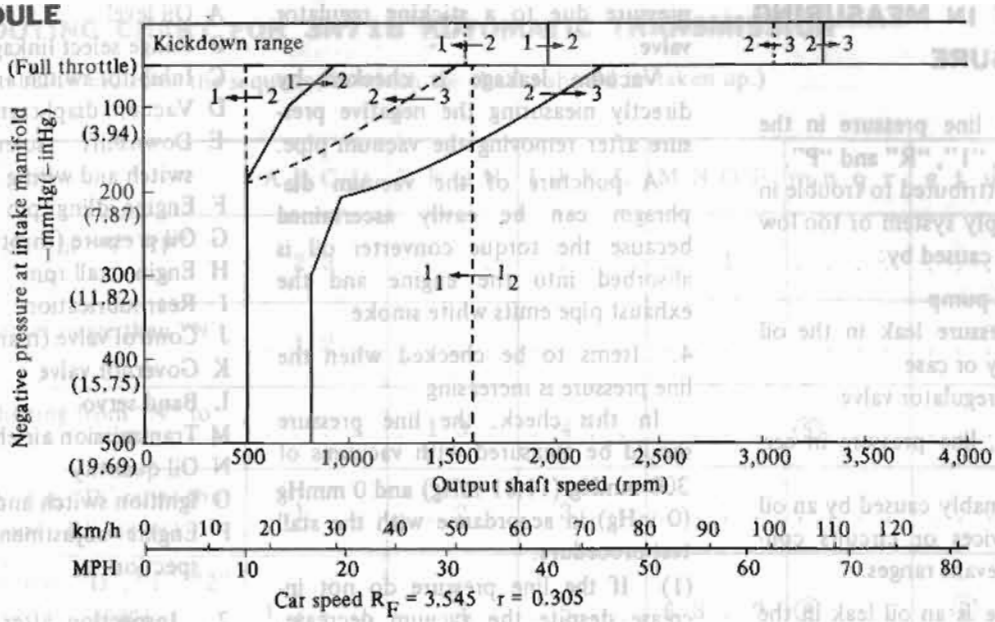
This indicates that the throttle pressure is too low or some valve connected to the throttle is faulty.

CHECKING ITEMS DURING SPEED CHANGE

1. In "D" range, gear changes, $D_1 \rightarrow D_2 \rightarrow D_3$ are effected. In "R" range, the speed does not increase.
2. The kickdown operates properly.
3. By moving the lever from "D" to "1", gear changes $D_3 \rightarrow 2(1_2) \rightarrow 1_1$ are effected. In the ranges "1_2" and "1_1", the engine braking works properly.
4. In "1", the speed does not increase.
5. Should be quickly fixed at "2" range.
6. In "P", vehicle can be parked properly.

If any malfunction occurs in second gear during the road test, that is, if vehicle shakes, drags or slings while shifting up from "D_1", directly to "D_3" or in shifting up from "D_1" to "D_2", the brake band should be adjusted. If these troubles remain after the brake band is adjusted, check the servo piston seal for oil leakage.

SHIFT SCHEDULE



AT433

Fig. AT-86 Shift Schedule

LINE PRESSURE TEST

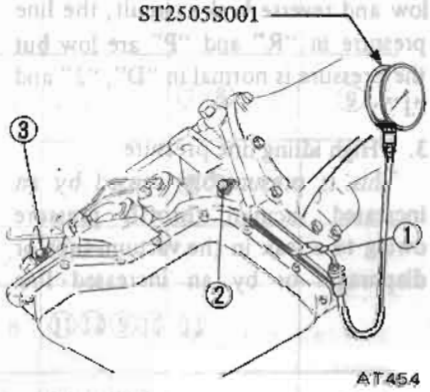
When any slipping occurs in clutch or brake, or the feeling during a speed change is not correct, the line pressure must be checked.

Measuring line pressure is done by a pressure gauge attached to pressure measuring holes after removing blind plugs located at transmission case.

The line pressure measurement is begun at idling and taken step by step by enlarging the throttle opening.

For line pressure data when shifting gears, refer to "Road Test".

1. A sharp shock in up-shifting or too high changing speeds are caused mostly by too high throttle pressure.
2. Slipping or incapability of operation is mostly due to oil pressure leakage within the gear trains or spool valve.



AT454

1 Line pressure
2 Governor pressure
3 Servo release pressure

Fig. AT-87 Measuring Line Pressure

LINE PRESSURE (GOVERNOR FEED PRESSURE)

At idling

Range	Line pressure kg/cm² (psi)
R	5.2 to 7.1 (74 to 101)
D	3.2 to 3.8 (46 to 54)
2	7.9 to 13.8 (112 to 196)
1	3.2 to 3.8 (46 to 54)

At stall test

Range	Line pressure kg/cm² (psi)
R	21.3 to 24.4 (303 to 347)
D	11.5 to 13.0 (164 to 185)
2	12.3 to 13.8 (175 to 196)
1	11.5 to 13.0 (164 to 185)

JUDGEMENT IN MEASURING LINE PRESSURE

1. Low idling line pressure in the ranges "D", "2", "1", "R" and "P".

This can be attributed to trouble in the pressure supply system or too low output of power caused by:

(1) A worn oil pump
(2) An oil pressure leak in the oil pump, valve body or case
(3) A sticking regulator valve

2. Low idling, line pressure in certain ranges only

This is presumably caused by an oil leak in the devices or circuits connected to the relevant ranges.

(1) When there is an oil leak in the rear clutch and governor, the line pressure in "D", "2" and "1" are low but the pressure is normal in "R".
(2) When an oil leak occurs in the low and reverse brake circuit, the line pressure in "R" and "P" are low but the pressure is normal in "D", "2" and "1".

3. High idling line pressure

This is presumably caused by an increased vacuum throttle pressure owing to a leak in the vacuum tube or diaphragm or by an increased line pressure due to a sticking regulator valve.

Vacuum leakage is checked by directly measuring the negative pressure after removing the vacuum pipe.

A puncture of the vacuum diaphragm can be easily ascertained because the torque converter oil is absorbed into the engine and the exhaust pipe emits white smoke.

4. Items to be checked when the line pressure is increasing

In this check, the line pressure should be measured with vacuums of 300 mmHg (11.81 inHg) and 0 mmHg (0 inHg) in accordance with the stall test procedure.

(1) If the line pressure do not increase despite the vacuum decrease, check whether the vacuum rod is incorporated.
(2) If the line pressure do not meet the standard, it is caused mostly by a sticking pressure regulating valve, pressure regulating valve plug, or amplifier.

TROUBLE-SHOOTING CHART

INSPECTING ITEMS

1. Inspection with automatic transmission on vehicle.

A Oil level
B Range select linkage
C Inhibitor switch and wiring
D Vacuum diaphragm and piping
E Downshift solenoid, kickdown switch and wiring
F Engine idling rpm
G Oil pressure (throttle)
H Engine stall rpm
I Rear lubrication
J Control valve (manual)
K Governor valve
L Band servo
M Transmission air check
N Oil quantity
O Ignition switch and starter motor
P Engine adjustment and brake inspection

2. Inspection after inspecting automatic transmission on vehicle.

m Rear clutch
n Front clutch
q Band brake
r Low and reverse brake
s Oil pump
t Leakage of oil passage
u One-way clutch of troque converter
v One-way clutch of transmission
w Front clutch check ball
x Parking linkage
y Planetary gear

TROUBLE-SHOOTING CHART FOR 3N71B AUTOMATIC TRANSMISSION

(The number shown below indicates the sequence in which the checks should be taken up.)

Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
Engine does not start in "N", "P" ranges.	. 2 3 .	. . . .	. . . .	. . 1 .	. . . .	. . . .	. . .
Engine starts in other range than "N" and "P".	. 1 2 .	. . . .	. . . .	. . . .	. . . .	. . . .	. . .
Sharp shock in shifting from "N" to "D" range.	. . . 2	. 1 3 .	. 4 . .	. . . .	⑤ . . .	. . . .	. . .
Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	. 1 . .	. . 2 .	. 3 . .	. . . .	. . . .	④ . . .	. . .
Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1 2 . .	. . 4 .	. 5 . .	6 3 . 7	⑧ . . .	. ⑨ . .	. . .
Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges.) Clutch slips. Very poor acceleration.	1 2 . .	. . 3 .	. 5 . .	6 4 . .	⑨⑧ . ⑦	. ⑩ . .	⑪ . .
Vehicle will not run in any range.	1 2 . .	. . 3 .	. 5 . .	6 4 . .	. . . .	⑦⑧ . .	. ⑨ .
Clutches or brakes slip somewhat in starting.	1 2 . 6	. . 3 .	. 5 . .	7 4 . .	. . . .	⑧⑨ . .	. . .
Vehicle runs in "N" range.	. 1 . .	. . . .	. 3 . .	. 2 . .	④ . . .	. . . .	
Maximum speed not attained. Acceleration poor.	1 2 . .	. . 4 5	. 7 . 6	. 3 . 8	⑪⑫⑨⑩	⑬ . . .	. . .
Vehicle braked by throwing lever into "R" range.	. . . .	. . . .	. . . 3	2 1 . .	④ . ⑤ .	. . . .	. ⑥ .
Excessive creep.	. . . .	. 1 . .	. . . .	. . . .	. . . .	. . . .	. . .
No creep at all.	1 2 . .	. 3 . .	. 5 . .	. 4 . .	⑧⑨ . .	⑥⑦ . .	. . .
Failure to change gear from "2nd" to "3rd".	. 1 . 2	3 . . .	. 5 6 8	7 4 . .	. . ⑨ .	. ⑩ . .	. . .
Failure to change gear from "1st" to "2nd",	. 1 . 2	3 . . .	. 5 6 8	7 4 . .	. ⑨ . .	. ⑩ . .	⑪ . .
Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd".	. . . 1	2 . 3 .	. 5 6 .	. 4 . .	. . . .	. ⑦ . .	. . .
Gear change directly from "1st" to "3rd" occurs.	. . . .	. . . .	. 2 4 .	3 1 . .	. . ⑤ .	. ⑥ . .	. . .

Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
Too sharp a shock in change from "1st" to "2nd".	. . . 1	. . . 2	. 4 . 5	. 3 . .	. . ⑥ .	. . . .	. . .
Too sharp a shock in change from "2nd" to "3rd".	. . . 1	2 . 3 .	. 3 . 5	4 . . .	. ⑥ . .	. . . .	. . .
Almost no shock or clutches slipping in change from "1st" to "2nd".	1 2 . 3	. . 4 .	. 6 . 8	7 5 . .	. . ⑨ .	. ⑩ . .	. . .
Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely.	1 2 . 3	. . 4 .	. 6 . 8	7 5 . .	. ⑨ . .	. ⑩ . .	⑪ . .
Vehicle braked by gear change from "1st" to "2nd".	. . . .	. . . .	. 2 . .	. 1 . .	. ④ . ③	. . . ⑤	. . .
Vehicle braked by gear change from "2nd" to "3rd".	. . . .	. . . .	. 3 . 2	. 1 . .	. . ④ .	. . . .	. . .
Failure to change gear from "3rd" to "2nd".	. . . 1	. . . .	. 3 4 6	5 2 . .	. ⑦ ⑧ .	. ⑨ . .	. . .
Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".	. . . 1	. . . .	. 3 4 6	5 2 . .	. . ⑦ .	. . . ⑧	. . .
Gear change shock felt during deceleration by releasing accelerator pedal.	. 1 . 2	3 . 4 .	. 5 6 .	. . . .	. . . .	. ⑦ . .	. . .
Too high a change point from "3rd" to "2nd", from "2nd" to "1st".	. 1 . 2	3 . 4 .	. 5 6 .	. . . .	. . . .	. ⑦ . .	. . .
Kickdown does not operate when depressing pedal in "3rd" within kickdown vehicle speed.	. . . 2	1 . . .	. 4 5 .	. 3 . .	. . ⑥ .	. ⑦ . .	. . .
Kickdown operates or engine overruns when depressing pedal in "3rd" beyond kickdown vehicle speed limit.	. 1 . 2	. . 3 .	. 5 6 .	7 4 . .	. ⑧ . .	. ⑨ . .	. . .
Races extremely or slips in changing from "3rd" to "2nd" when depressing pedal.	. . . 1	. . 2 .	. 4 . 6	5 3 . .	. ⑦ ⑧ .	. ⑨ . .	⑩ . .
Failure to change from "3rd" to "2nd" when changing lever into "2" range.	. 1 . .	. . 2 .	. 4 . 5	. 3 . .	. . ⑥ .	. ⑦ . .	. . .
Gear change from "2nd" to "1st" or from "2nd" to "3rd" in "2" range.	. 1 . .	. . 2 .	. 3 . .	. . . .	. . . .	. . . .	. . .

Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
No shock at change from "1" to "2" range or engine races extremely.	1 2 . 3	. 4 . 1	. 6 . .	7 5 . .	. . ⑨ .	⑩ . . .	. . .
Failure to change from "3rd" to "2nd" when shifting lever into "1" range.	. 1 . .	. . 2 .	. 4 5 7	6 3 . .	. ⑧⑨ .	. ⑩ . .	. . .
Engine brake does not operate in "1" range.	. 1 . .	. . 2 .	. 4 . .	5 3 . .	. . . ⑥	. ⑦ . .	. . .
Gear change from "1st" to "2nd" or from "2nd" to "3rd" in "1" range.	. 1 . .	. . . .	. 2 . .	. . . .	. . . .	. ③ . .	. . .
Does not change from "2nd" to "1st" in "1" range.	1 2 . .	. . . .	. 4 5 6	7 3 . .	. . . ⑧	. ⑨ . .	. . .
Large shock changing from "2nd" to "1st" in "1" range.	. . . 1	. . . 2	. 4 . .	. 3 . .	. . . ⑤	. . . .	. . .
Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	. 1 . .	. . . .	. . . .	. . . .	. . . .	. . . .	. ② .
Transmission overheats.	1 . . .	. . 3 4	2 6 . 8	7 5 . .	. ⑨⑩⑪	⑫⑬⑭ .	. . ⑮
Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1 . . 3	. . 5 6	2 7 . .	8 4 . .	. ⑨⑩⑪	⑫⑬⑭ .	. . ⑮
Offensive smell at oil charging pipe.	1 . . .	. . . .	. . . .	. 2 . .	③④⑤⑥	⑦⑧⑨ .	. . ⑩
Transmission noise in "P" and "N" ranges.	1 . . .	. 2 .	. . . .	. . . .	. . . .	③ . . .	. . .
Transmission noise in "D", "2", "1" and "R" ranges.	1 . . .	. . 2 .	. . . .	. . . .	③ . . .	④ . . ⑤	. . ⑥

TROUBLE-SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION

Order	Test item	Procedure
Checking	1. Oil level gauge	Check gauge for oil level and leakage before and after each test.
	2. Downshift solenoid	Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON".
	3. Manual linkage	Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.
	4. Inhibitor switch	Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.
	5. Engine idling rpm.	Check whether idling rpm meet standard.
	6. Vacuum pressure of vacuum pipe.	Check whether vacuum pressure is more than 450 mmHg (17.72 inHg) in idling and whether it decreases with increasing rpm.
	7. Operation in each range.	Check whether transmission engages positively by shifting "N"→"D", "N"→"2", "N"→"1" and "N"→"R" range while idling with brake applied.
	8. Creep of vehicle.	Check whether there is any creep in "D", "2", "1" and "R" ranges.
Stall test	1. Oil pressure before testing.	Measure line pressures in "D", "2", "1" and "R" range while idling.
	2. Stall test.	Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation. Note: Temperature of torque converter oil used in test should be from 60° to 100°C (140° to 212°F) i.e., sufficiently warmed up but not overheated. **CAUTION:** **To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range. Measurement time must not be more than 5 seconds.**
	3. Oil pressure after testing	Same as item 1.
Road test	1. Slow acceleration, 1st → 2nd 2nd → 3rd	Check vehicle speeds and engine rpm in shifting up 1st→2nd range and 2nd→3rd range while running with lever in "D" range and engine vacuum pressure of about 200 mmHg (7.87 inHg).
	2. Quick acceleration, 1st → 2nd 2nd → 3rd	Same as item 1 above except with engine vacuum pressure of 0 mmHg (0 inHg) (i.e., in position just before kickdown.).
	3. Kick-down operation, 3rd → 2nd or 2nd → 1st	Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 37, 43 MPH) in "D_3" range.

Order	Test item	Procedure
	4. Shift down, $D_3 \rightarrow D_2 \rightarrow D_1$	Check vehicle speeds and engine rpm in shifting down from 3rd → 2nd → 1st (sequentially) while coasting with accelerater pedal released in "D_3" range and engine vacuum pressure of about 450 mmHg (17.72 inHg).
	5. Shift down, $D_3 \rightarrow 1_2 \rightarrow 1_1$	Check for shifting down $D_3 \rightarrow 1_2$ and engine braking, and further for shifting down $1_2 \rightarrow 1_1$ and engine braking, after shifting the lever into "1" range with the accelerator pedal released and the engine vacuum pressure of 0 mmHg while driving at about 50 km/h (30 MPH) in "D_3" range.
	6. Shift down, $D_3 \rightarrow 2$	Check for quick shifting down $D_3 \rightarrow 2$ and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (30 MPH) in "D_3" range. Further, check for locking of the transmission in 2nd gear ratio regardless of vehicle speed.
	7. Shift up, $1_1 \rightarrow 1_2$	Check for failure of the transmission to shift up during acceleration, when starting in "1" range.
	8. Shift up or down when starting in "2" range.	Check the transmission for not shifting up or down during acceleration or deceleration, when starting in "2" range.
	9. Parking.	Confirm that vehicle will not move on grade when shifting to "P" range.
Others	Abnormal shock, oil leakage.	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance.

SERVICE DATA AND SPECIFICATIONS

General specifications

Automatic transmission model	3N71B
Stall torque ratio	2.0 : 1
Transmission gear ratio	
1st	2.458
2nd	1.458
Top	1.000
Reverse	2.182
Oil	Automatic transmission fluid "Dexron" type
Oil capacity	5.5 liters (5⅞ US qt, 4⅞ Imp qt) Approximately 2.7 liters (2⅞ US qt, 2⅜ Imp qt) in torque converter

Specifications and adjustment

Automatic transmission assembly

Model code number	•X2707

Torque converter assembly

Stamped mark on the T/C	20-D

Front clutch

Number of drive plates		3
Number of driven plates		3
Clearance	mm (in)	1.6 to 2.0 (0.063 to 0.079)
Thickness of retaining plate	mm (in)	10.6 (0.417) 10.8 (0.425) 11.0 (0.433) 11.2 (0.441) 11.4 (0.449) 11.6 (0.457)

Rear clutch

Number of drive plates		5
Number of driven plates		5
Clearance	mm (in)	0.8 to 1.6 (0.031 to 0.063)
Thickness of retaining plate	mm (in)	8.35 (0.3287)

Low & reverse brake

Number of drive plates		5
Number of driven plates		5
Clearance	mm (in)	0.80 to 1.25 (0.031 to 0.049)
Thickness of retaining plate	mm (in)	7.8 (0.307) 8.0 (0.315) 8.2 (0.323) 8.4 (0.331) 8.6 (0.339) 8.8 (0.346)

Brake band

Piston size	mm (in)	
Big dia.		64 (2.52)
Small dia.		40 (1.57)

Control valve assembly

Stamped mark on strainer		MEJ

Governor assembly

Stamped mark on governor body		M33

Stall revolution rpm ..... 2,100 to 2,400

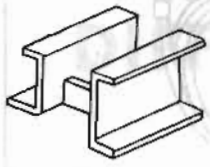
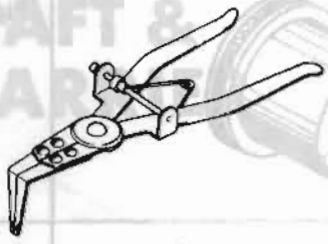
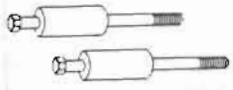
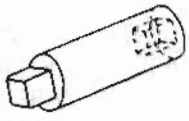
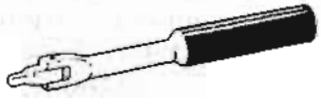
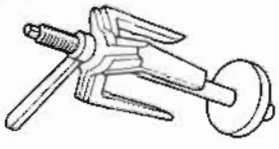
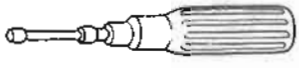
Tightening torque kg-m(ft-lb)

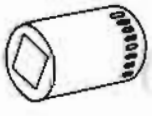
Drive plate to crankshaft	14.0 to 16.0	(101 to 116)
Drive plate to torque converter	4.0 to 5.0	(29 to 36)
Converter housing to engine	4.0 to 5.0	(29 to 36)
Transmission case to converter housing	4.5 to 5.5	(33 to 40)
Transmission case to rear extension	2.0 to 2.5	(14 to 18)
Oil pan to transmission case	0.5 to 0.7	(3.6 to 5.1)
Servo piston retainer to transmission case	0.5 to 0.7	(3.6 to 5.1)
Piston stem (when adjusting band brake)	*1.2 to 1.5	(9 to 11)
Piston stem lock nut	1.5 to 4.0	(11 to 29)
One-way clutch inner race to transmission case	1.3 to 1.8	(9 to 13)
Control valve body to transmission case	0.55 to 0.75	(4.0 to 5.4)
Lower valve body to upper valve body	0.25 to 0.35	(1.8 to 2.5)
Side plate to control valve body	0.25 to 0.35	(1.8 to 2.5)
Nut for control valve reamer bolt	0.5 to 0.7	(3.6 to 5.1)

Oil strainer to lower valve body	0.3 to 0.4	(2.2 to 2.9)
Governor valve body to oil distributor	0.5 to 0.7	(3.6 to 5.1)
Oil pump housing to oil pump cover	0.6 to 0.8	(4.3 to 5.8)
Inhibitor switch to transmission case	0.5 to 0.7	(3.6 to 5.1)
Manual shaft lock nut	3.0 to 4.0	(22 to 29)
Oil cooler pipe to transmission case	3.0 to 5.0	(22 to 36)
Test plug (oil pressure inspection hole)	1.4 to 2.1	(10 to 15)
Support actuator (parking rod inserting position) to rear extension	0.8 to 1.1	(5.8 to 8.0)

* Turn back two turns after tightening.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST07870000 (ST07860000) Transmission case stand 	J 25607 Fig. AT-26	ST25320001 Snap ring remover 	J 25710 Fig. AT-53 Fig. AT-60
ST25850000 Sliding hammer 	J 25721 Fig. AT-30	ST25570001 (ST25570000) Hex-head extension 	J 25718 Fig. AT-38 Fig. AT-43
HT69860000 Snap ring remover 	—— Fig. AT-33	ST25490000 (ST25512001) Socket extension 	J25713 Fig. AT-43
GG93010000 Torque wrench 	J 25703 Fig. AT-43	HT62350000 Spinner handle 	—— Fig. AT-75 Fig. AT-78
ST25420001 (ST25420000) Clutch spring compressor 	J 26063 Fig. AT-53 Fig. AT-60	ST25160000 Torque driver 	—— Fig. AT-81 Fig. AT-82

Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.	Tool number & tool name	Kent-Moore No. / Reference page or Fig. No.
ST25580001 Oil pump assembling gauge 	J 25719 Fig. AT-72 Fig. AT-73	ST2505S001 Oil pressure gauge set 	J 25695 Fig. AT-87
HT61000800 Hexagon wrench 	— Fig. AT-75 Fig. AT-78 Fig. AT-81 Fig. AT-82		