AUTOMATIC TRANSMISSION

TRANSMISSION DIAGNOSIS—OPERATION—TEST PROCEDURES

GENERAL

The automatic transmission used in all Jeep Models is a fully automatic three-speed unit combining a torque converter and planetary gear system. The transmission case and converter housing are an integral (one-piece) aluminum casting (fig. 7-1).

Description

The transmission consists of a three element torque converter, a compound planetary gear set, three multiple disc clutches, two roller clutches and two bands, all of which combine to provide one reverse and three forward gear ratios.

IDENTIFICATION

A metal plate, with the transmission serial number stamped on it is attached to the right side of every transmission case. The serial number must be included in any communication involving parts ordering or request for transmission information.

BASIC POWER FLOW

The torque converter is connected to the engine crankshaft by a drive plate. In operation, engine torque is transmitted through the torque converter to the turbine shaft and then to the main shaft through multiple disc clutches in the transmission. From the main shaft, engine torque is further transmitted through the compound planetary gear set and to the transmission output shaft.

FLUID COOLING AND FILTRATION

The transmission fluid is cooled by circulating the fluid through an external oil cooler located in the radiator lower tank.

Transmission fluid is filtered by a Dacron element filter attached to the valve body.

VENTING

The transmission is vented through the pump housing.

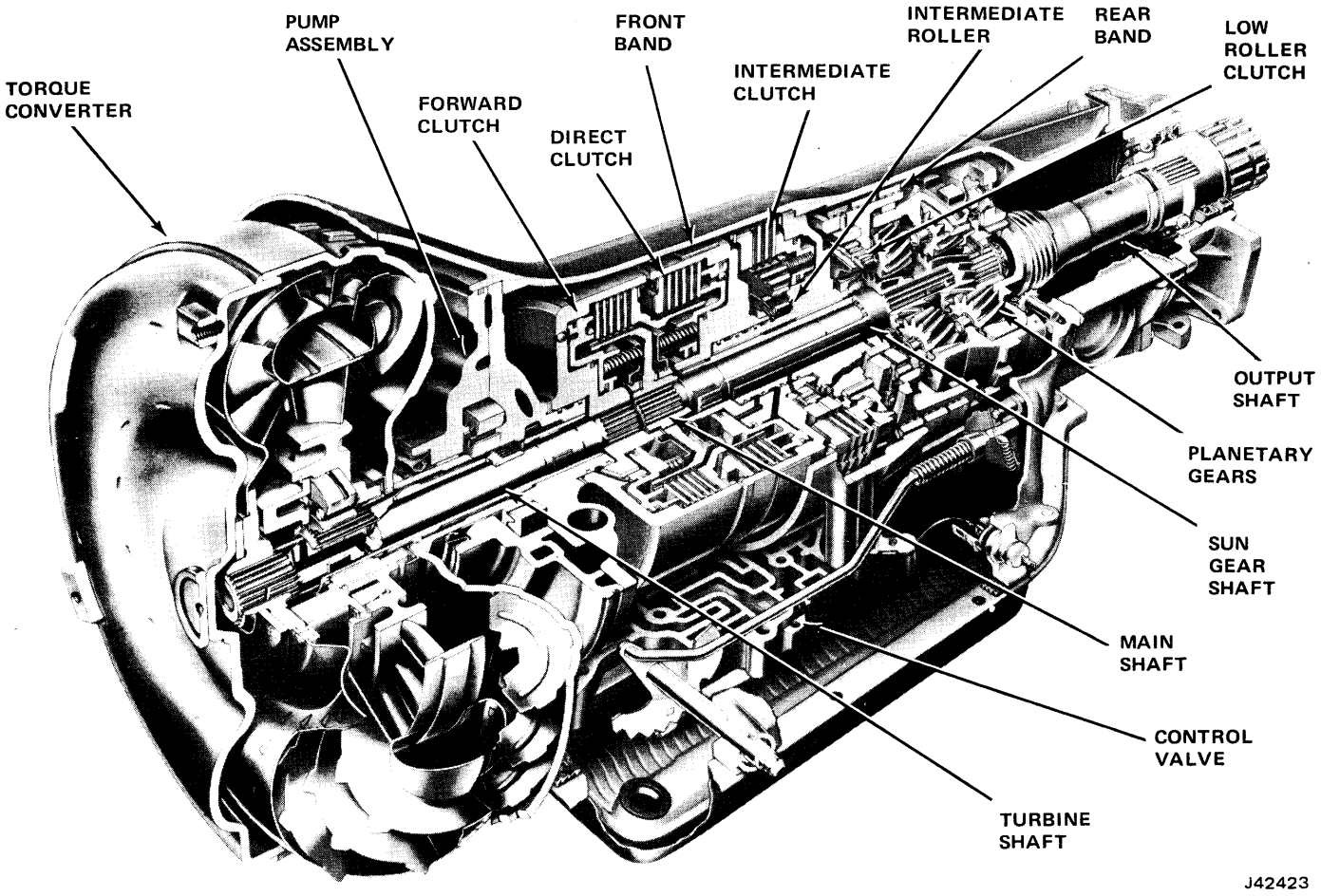


Fig. 7-1 Automatic Transmission—Cross-Sectional View (Typical)

TORQUE CONVERTER

The three-element torque converter consists of a pump or driving member, a turbine or driven member and a stator assembly. The stator is mounted on a one-way roller clutch which allows the stator to turn in a clockwise direction only (fig. 7-2).

As oil passes through the turbine, it travels in such a direction that if it were not redirected by the stator it would hit the rear of the converter pump blades and impede pumping action (fig. 7-2). At low turbine rotating speeds, oil is redirected by the stator to the converter pump to assist the converter pump in multiplying engine torque.

As turbine rotating speed increases, the direction of the oil leaving the turbine changes and flows against the rear side of the stator vanes in a clockwise direction. Since the stator is now impeding the smooth flow of oil, the stator roller clutch releases allowing the stator to revolve freely on the stator shaft. When the stator freewheels, there is no further multiplication of engine torque within the converter. At this point, the converter functions as a fluid coupling as both the converter pump and turbine are being driven at approximately the same speed.

MODULATOR—MANUAL LINKAGE—DETENT SOLENOID

External and internal transmission controls consist of:

- Manual Linkage—To select the desired operating range.
- Engine Vacuum—To operate a vacuum modulator unit.
- A 12-Volt Electrical Signal—To operate an electrical detent solenoid.

The vacuum modulator is used to sense changes in engine torque input to the transmission. The modulator transmits this signal to the pressure regulator which controls line pressure to the 1-2 accumulator valve and to the shift valves.

The detent solenoid is activated by the detent switch (fig. 7-3). At full throttle, the detent switch closes, activating the solenoid and causing the transmission to downshift at speeds below approximately 65 mph.

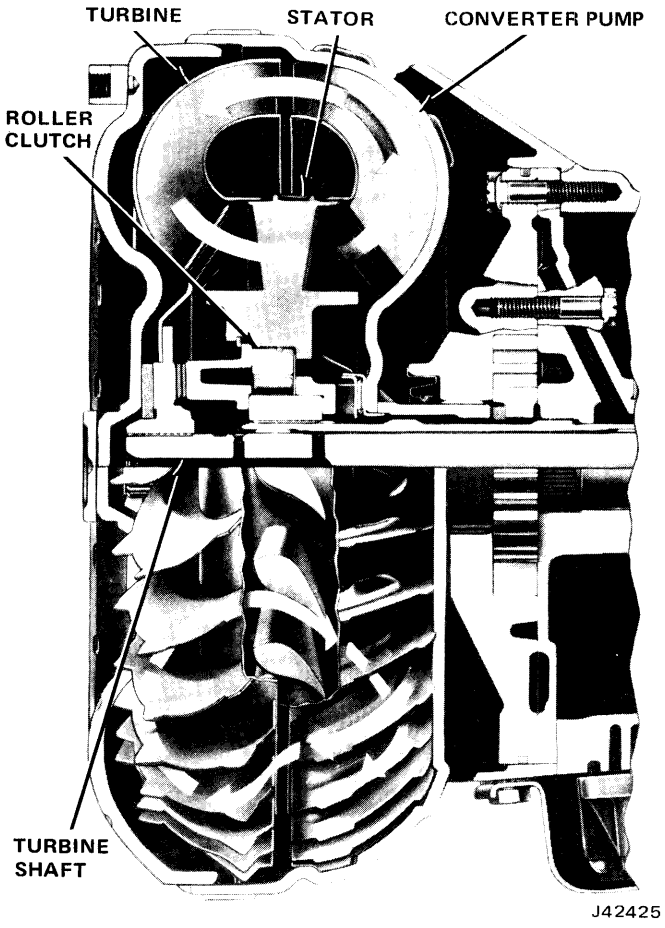


Fig. 7-2 Converter Components

PLANETARY GEAR TRAIN

The planetary gear train consists of three members: a sun gear, a planet carrier with four planet pinion gears, and an internal gear (fig. 7-1). The sun gear meshes with the planet pinion gears, which rotate freely on pins attached to a common support called the planet carrier. An internal gear encases the assembly and meshes with the planet pinion gears.

ROLLER CLUTCHES

A roller clutch permits rotation of a unit in one direction only. Roller clutches are used to lock one member of each planetary gear set for gear reduction. In direct drive the roller clutches allow free rotation.

HYDRAULIC SYSTEM OPERATION

Pressure Control

The transmission is controlled by a hydraulic system. Hydraulic pressure is supplied by the gear-type transmission oil pump which is driven by the torque converter oil pump. Main line pressure is controlled by a pressure regulator valve located in the pump housing. This valve regulates line pressure automatically and in response to vacuum signals from the modulator valve.

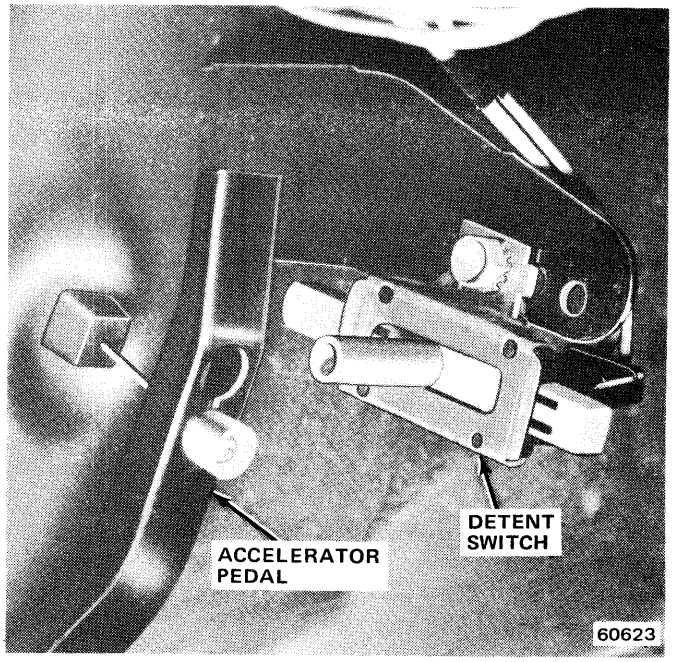


Fig. 7-3 Detent Switch

Vacuum Modulator

The engine-to-transmission vacuum signal is provided by the vacuum modulator which consists of an evacuated metal bellows, a diaphragm, and two springs. The bellows and one spring apply a force which acts on the modulator valve to increase modulator pressure. Engine vacuum and the second spring act in the opposite direction to decrease modulator pressure. Low engine vacuum results in high modulator pressure, while high engine vacuum results in low modulator pressure.

Governor

The vehicle speed signal to the modulator valve is supplied by the transmission governor which is driven by the output shaft. The governor consists of two sets of flyweights, two springs and a regulator valve. Centrifugal force acting on the flyweights is transmitted to the regulator valve causing the valve to send a pressure signal that increases with vehicle speed.

Front Servo

The front servo applies the front band to provide engine braking in second gear in Drive-2 and Drive-1. The front servo also functions as an accumulator in applying the direct clutch. In conjunction with a series of check balls and controlling orifices, the servo assists in timing release of the direct clutch.

To prevent application of the front band in Neutral, Drive, and Reverse, oil is directed from the manual valve to the release side of the servo piston.

In Drive range, servo-release oil from the manual valve is used to charge the servo in preparation for direct clutch application.

Direct clutch oil is applied to the front servo accumulator piston where spring force, plus direct clutch pressure, moves the piston upward against the force exerted by servo release oil. This decreases clutch apply pressure for smoother engagement.

The release of the direct clutch and exhausting of the front servo accumulator is slowed by three check balls and three orifices to permit a smoother return of drive load to the intermediate roller clutch.

Drive Range-First Gear

Servo oil from the manual valve in Drive range charges the accumulator by moving the servo and accumulator pistons against the accumulator spring. This prepares the accumulator for controlled apply of the direct clutch on a 2-3 upshift. Charging of the accumulator in Drive range-first gear, also makes it possible to have a controlled 3-1 lift-foot shift as the accumulator is prepared for direct clutch apply in first gear.

Servo oil and the servo release spring prevent the apply of the band in Drive range-second gear when intermediate clutch apply oil is directed between the servo and accumulator pistons.

Drive Range—Second Gear

Servo oil charging the accumulator is present in first and second gears and has moved the servo and accumulator pistons against the accumulator spring.

In second gear, intermediate clutch oil is directed between the servo and accumulator pistons but does not separate the pistons. The force of servo oil holding the piston down is equal to the force of intermediate clutch oil attempting to move the piston upward.

Drive Range—Third Gear

Increasing direct clutch pressure, plus accumulator spring force, overcomes servo pressure and moves the accumulator piston to the stop on the accumulator piston pin. This moves the servo piston at the same amount of travel allowing the piston to just contact the band-apply washer on the servo pin, but not move the pin and apply the band.

Movement of the accumulator piston absorbs some direct clutch oil and permits the direct clutch to apply at reduced pressure for a smoother 2-3 upshift.

Drive Range—3-2 Downshift

Direct clutch release is softened by the front servo, three orifices, and three check balls for a smoother transfer of drive load to the intermediate roller clutch. The controlled release pressure permits an increase in engine rpm during detent downshifts to prepare for the lower gear ratio of second gear, resulting in a smoother shift and acceleration.

Servo oil and intermediate clutch oil seat two check balls which direct oil through two orifices, slowing movement of the servo and accumulator pistons. Direct clutch oil that is exhausted from the accumulator and direct clutch seats a third check ball. This channels the oil being exhausted from the direct clutch through an orifice which controls direct clutch pressure during clutch release.

Drive-2 Range

Intermediate clutch oil from the 1-2 shift valve seats the check ball, and is directed through an orifice to apply the front band. Pressure applying the band is reduced by action of the accumulator piston, which is moved by intermediate clutch oil and further resisted by the accumulator spring and oil being exhausted from the direct clutch.

Rear Servo

The rear servo applies the rear band for overrun engine braking in Drive-1 range. It applies the band in Reverse to hold the reaction carrier to provide the reverse gear ratio.

On the 1-2 shift in Drive and Drive-2 ranges, the rear servo operates as an accumulator for the intermediate clutch to provide smoother shifts.

Drive-1 Range

In Drive-1 and Drive-2 ranges, 1-2 accumulator oil is directed to the rear servo accumulator piston in preparation for the 1-2 shift.

Drive-2 Range

Intermediate clutch apply oil is directed to the rear servo accumulator piston moving the piston against 1-2 accumulator oil and the accumulator spring. This action absorbs some intermediate clutch apply oil and permits the intermediate clutch to apply at reduced pressure for a smooth 1-2 shift.

Drive-1 Range—First Gear

Overrun engine braking in Drive-1 range first gear is obtained by charging the rear servo which applies the rear band preventing the reaction carrier from rotating in a clockwise direction (as viewed from the front of the vehicle).

The 1-2 accumulator oil is directed to the accumulator piston, which attempts to prevent the servo from applying. However, low range oil directed to the larger servo piston will apply the band. Because 1-2 accumulator oil is present, the force applying the band is decreased, providing a smoother band application.

Drive-2 Range—Second Gear

In second gear, the rear band is released. Intermediate clutch oil is directed to the release side of the servo piston along with 1-2 accumulator oil. This balances the low range oil acting on the apply side of the servo piston, allowing the servo release spring to move the servo piston to a released position.

Reverse

In reverse, the rear band is applied to hold the reaction carrier. Reverse oil is directed to the servo piston to apply the band. To ensure that the band holds the reaction carrier in reverse, line pressure is increased and no other oil pressures are present in the servo to resist movement of the servo piston.

1-2 Accumulator

In first gear, 1-2 accumulator oil charges the rear servo accumulator in preparation for application of the intermediate clutch on the 1-2 shift. Main line oil pressure is directed to the 1-2 accumulator valve and is further regulated to become 1-2 accumulator oil. Modulator pressure is directed to the 1-2 accumulator valve, which causes 1-2 accumulator pressure to become sensitive to engine torque and provide smoother shifts in response to engine torque output.

Detent oil is directed to the 1-2 accumulator valve to raise 1-2 accumulator pressure during detent 1-2 shifts to improve clutch life. In Drive-1 range, oil is directed to the 1-2 accumulator valve to raise 1-2 accumulator pressure to the same value line pressure. This increased pressure, directed to the rear servo accumulator piston, resists servo apply pressure and slows down the apply of the rear band for a smoother manual shift to Drive-1 range first gear, or for a 2-1 downshift in Drive-1 range.

Detent and Detent Regulator Valves

When the accelerator pedal is fully depressed, the detent valve train replaces the modulator as a controller of shift points. Line pressure is fed through a small orifice to one end of the detent valve. In normal throttle operation, the cavity at this end of the valve is sealed by a needle valve in the detent solenoid assembly. This line pressure holds the detent valve train in an inoperative or neutral position.

When the throttle is opened wide, the detent switch on the accelerator pedal is closed, energizing the detent solenoid. The needle valve is opened by the solenoid, causing a pressure drop on the end of the detent valve. The detent regulator valve spring then shifts the detent valve, and causes the detent regulator to regulate detent oil to a fixed pressure of approximately 60 psi. When the detent valve shifts, it routes this fixed or detent pressure into the modulator passages. The detent valve train also routes detent pressure into the detent passages to the shift valve train. The detent upshift points are controlled by detent pressure in the modulator passages, and the detent downshifts by detent pressure in the detent passages.

Detent pressure is directed to the 1-2 accumulator valve to increase 1-2 accumulator pressure for clutch durability during detent shifting. Detent pressure is prevented from dropping below approximately 60 psi which, in turn, prevents line pressure from dropping below approximately 105 psi.

In Drive-1 range, oil is directed to the detent regulator valve and spacer; the spring then moves the detent and regulator valves to the opposite end of the valve bore. Oil pressure is also directed to the detent regulator valve passage which is used as an exhaust when the valve is regulating. Low range oil in these two areas prevents the detent valve from regulating, and drive range oil then passes through the detent regulator valve into the detent and modulator passages at Drive-1 range pressure of 150 psi. This increase in detent and modulator pressures downshifts the 1-2 valve at speeds below approximately 40 mph, and prevents the transmission from upshifting regardless of vehicle speed except in those vehicles which have a high numerical axle ratio or are able to develop high engine rpm.

TOWING

Emergency Towing

If the vehicle is to be towed with the **front or rear wheels off the ground**, towing speed must be limited to 30 mph and the vehicle towed for a distance no greater than 15 miles.

Automatic Transmission with Quadra-Trac Less Low Range Reduction Unit

Ignition Key Available: Turn ignition key to OFF position to unlock steering column and gearshift linkage. Place gearshift lever lever in Neutral. If the vehicle is to be towed with all four wheels on the ground, disconnect **both** propeller shafts at the axle yokes (be sure to mark the shafts and yokes for assembly alignment reference), secure the shafts to the underside of the vehicle and proceed with towing. However, if the vehicle is to be towed with the front end raised, disconnect the rear propeller shaft only.

Ignition Key Not Available: Place a dolly under the rear wheels and tow the vehicle with the front end raised. Or, disconnect the rear propeller shaft at the axle yoke (be sure to mark the shaft and yoke for assembly alignment reference), secure the shaft to the underside of the vehicle and tow with the front wheels raised.

Automatic Transmission With Quadra-Trac and Low Range Reduction Unit

Ignition Key Available: The vehicle can be towed with all four wheels on the ground without disconnecting either of the the propeller shafts. Turn the

Road Testing Procedure

Drive Range

Installation Chart.

(5) Connect vacuum gauge, using T-fitting, to mod-

ignition key to the OFF position to unlock the steering wheel. Place the transmission gearshift lever in Neutral and shift the low range lever to Neutral.

CAUTION: *If the Emergency Drive control (in the glove box) was in the Emergency Drive position when the engine was stopped, restart the engine and turn the control knob to the Normal position. If the engine will not restart, place a dolly under the rear wheels and tow with the front wheels raised.* **Never tow the vehicle with the Emergency Drive control activated or the reduction unit in low range.**

Ignition Key Not Available: Place a dolly under the rear wheels and tow the vehicle with the front wheels raised. Or, disconnect the rear propeller shaft at the axle yoke (be sure to mark the shaft and yoke for assembly alignment reference), secure the shaft to the underside of the vehicle and tow with the front wheels raised.

Recreational Towing

Jeep vehicles can be towed behind a recreational vehicle such as a motor home, however, the following instructions must be followed explicitly in order to avoid damaging driveline components. In addition, be sure to check and comply with federal, state and local requirements/ordinances regarding vehicle lighting, tow bars and trailer hitches.

Automatic Transmission Without Quadra-Trac Low Range Unit

Turn the ignition key to the OFF position to unlock the steering wheel. Shift the transmission into **Neutral**. Disconnect both propeller shafts at the axle yokes and secure the shafts to the underside of the vehicle or remove the shafts completely. Be sure to mark the shafts and yokes for assembly alignment reference before disconnecting them.

Automatic Transmission With Quadra-Trac Low Range Reduction Unit

Turn the ignition key to the Off position to unlock the steering wheel. Shift the **transmission** into **Park**. Shift the **low range unit** into **Neutral**. Tow the vehicle with all four wheels on the ground. It is not necessary to disconnect either of the propeller shafts in this case.

CAUTION: *If the Emergency Drive control (in the glove box) was in the Emergency Drive position when the engine was stopped, restart the engine and turn the*

(4) Move gearshift lever through all ranges.
(5) Shift transmission into park.
(6) Check fluid level.
(7) If fluid is low, add fluid as required and check for leaks.

The fluid level should be between the ADD and FULL marks at normal operating temperature (170°F). This temperature is obtained after at least 15 miles of expressway driving or equivalent city driving. At normal operating temperature the oil will heat the gauge end of the dipstick to such a degree that it cannot be grasped without discomfort.

If the transmission is not at operating temperature, the fluid level should be approximately 1/4 inch below the ADD mark with the oil at approximately 75°F (room temperature). If the fluid level is correctly established at room temperature (75°F), it should be at the FULL mark on the dipstick when the transmission reaches normal operating temperature (170°F).

CAUTION: *Do not overfill the transmission as this will cause fluid foaming and loss of fluid through the vent pipe.*

ROAD TESTING

Prior to road testing a vehicle, be sure that the transmission fluid level and manual linkage adjustment have been checked and are correct.

Note engine performance when road testing. A poorly tuned engine will have an adverse affect on transmission operation.

During a road test, operate the transmission in all gearshift selector ranges to check for shift variations and shift speeds (refer to the Shift Speed Chart). Note whether shifts are erratic, harsh, or spongy, and if slippage or engine speed flareup occurs during shifts. Slippage or flareup may indicate clutch, band, or roller clutch problems.

In most cases, a clutch, band, or roller clutch that is malfunctioning can be determined by comparing which internal units are applied in each selector position as shown in the Clutch and Band Application Chart.

Clutch and Band Application Chart

	P	R	N	D			2		1
				1	2	3	1	2	
Forward Clutch				●	●	●	●	●	●

(2) Recheck line pressures as indicated on Preliminary Checking Procedure Chart.
(3) If high line pressures are still obtained, proceed to Engines Without EGR Valve.

Engines Without EGR Valve

If high line pressures are experienced on vehicles without EGR or with EGR line plugged, it may be that

Tool J-23788, or equivalent. This tool permits the application of definite amounts of vacuum to the modulator to obtain consistent line pressures for evaluation. Refer to the Test Gauge Installation Chart for tool installation.

(1) Disconnect and plug vacuum hose at modulator.
(2) Connect vacuum tool to modulator and apply 20 inches of vacuum.
(3) Recheck line pressures according to Pressure

NOTE: *Analyzing road test results will help in determining which internal unit is affected by a malfunction. Road testing should be followed up with hydraulic pressure testing to determine if a hydraulic or mechanical component is the cause of a malfunction.*

Road Testing Procedure

Drive Range

Position the gearshift selector lever in Drive and accelerate the vehicle from zero mph. A 1-2 and 2-3 shift should occur at all throttle openings; The shift points will vary with throttle opening. As vehicle speed approaches zero mph, 3-2 and 2-1 downshifts should occur.

Drive-2 Range

Position the selector lever in Drive-2 and accelerate the vehicle from zero mph. A 1-2 shift should occur at all throttle openings; A 2-3 upshift should not occur in this range. The 1-2 shift point will vary with throttle opening. As vehicle speed approaches zero mph, a 2-1 downshift should occur.

NOTE: *The 1-2 upshift in Drive-2 is somewhat firmer than in Drive range. This is normal.*

Drive-1 Range

Position the selector lever in Drive-1 and accelerate the vehicle from zero mph. A 1-2 upshift should not occur in this range, except in some vehicles which have a high numerical axle ratio or high engine rpm capability.

Drive-2 Range—Overrun Braking

Position the selector in Drive range and increase vehicle speed to approximately 35 mph; then move the selector lever to Drive-2. The transmission should downshift to Second. An increase in engine rpm and an engine braking effect should be noticed. If a pressure test gauge has been installed, line pressure should change from approximately 70 psi to approximately 150 psi when the transmission is shifted into Drive-2.

Drive-1 Range—Overrun Braking

Position the selector lever in Drive-2 and increase vehicle speed to approximately 30 to 40 mph. Close the throttle, and move the selector lever to Drive-1. A 2-1 downshift should occur in the speed range of approximately 40 to 20 mph, depending upon axle ratio and valve body calibration. The 2-1 downshift at closed throttle will be accompanied by increased engine rpm and an engine braking effect should be noticed. If a pressure test gauge has been installed, line pressure should be approximately 150 psi after downshifting.

Reverse Range

Position the selector lever in Reverse and check reverse operation.

PRESSURE TEST PROCEDURE

(1) Check and correct fluid level.
(2) Check and adjust manual linkage if necessary.
(3) Check engine performance. A poorly tuned engine will affect transmission operation adversely.
(4) Install oil pressure gauge. Refer to Test Gauge Installation Chart.
(5) Connect vacuum gauge, using T-fitting, to modulator vacuum line and connect tachometer to engine. Refer to Test Gauge Installation Chart.

WARNING: *Do not permit anyone to stand in front of the vehicle during the pressure test.*

(6) Check pressures in the sequence outlined in Pressure Test Procedure and Specifications Chart.
(7) Consult Pressure Test Diagnosis Chart to analyse results of pressure test.

CONTROL VALVE AND GOVERNOR LINE PRESSURE CHECK

(1) Install oil pressure gauge.
(2) Install tachometer.
(3) Disconnect vacuum line to modulator.
(4) Check line pressure at 1000 rpm with vehicle on hoist (driving wheels off ground), in Drive, and with brakes released.
(5) Slowly increase engine rpm to 3000 rpm and check for a drop in line pressure of 10 psi or more.
(6) If line pressure drops 10 psi or more, remove, disassemble, and clean and inspect control valve assembly.
(7) If line pressure drop is less than 10 psi, remove and inspect governor for following:

- Stuck valve.
- Sticking weight.
- Restricted orifice in governor valve.
- Check governor valve entry and exhaust port clearance (0.020 inch minimum).
- Check screen in control valve assembly or case for restrictions or damage.
- Restriction in governor pipe.
- Governor pipes loose in case holes.

High Initial Line Pressure

Engines with EGR Valve

On vehicles with an Exhaust Gas Recirculation (EGR) valve, the throttle is open enough in Drive range (1000 rpm) to cause the EGR valve to open. When the EGR valve opens, exhaust gas enters the intake manifold, and decreases intake manifold vacuum. When intake manifold vacuum is decreased, the transmission line pressure will increase accordingly and may go above the upper specification limit. For this reason, if high line pressures are obtained, proceed as follows:

(1) Disconnect EGR vacuum line at EGR valve and plug vacuum line.

(2) Recheck line pressures as indicated on Preliminary Checking Procedure Chart.

(3) If high line pressures are still obtained, proceed to Engines Without EGR Valve.

Engines Without EGR Valve

If high line pressures are experienced on vehicles without EGR or with EGR line plugged, it may be that the engine is not producing enough vacuum to decrease transmission line pressure to within specifications. Current production engines with emission controls characteristically develop less engine vacuum than previous engines. To obtain line pressures suitable for evaluation, it is recommended that vacuum be applied to the modulator using an external vaccum source such as Vacuum Tool J-23788, or equivalent. This tool permits the application of definite amounts of vacuum to the modulator to obtain consistent line pressures for evaluation. Refer to the Test Gauge Installation Chart for tool installation.

(1) Disconnect and plug vacuum hose at modulator.

(2) Connect vacuum tool to modulator and apply 20 inches of vacuum.

(3) Recheck line pressures according to Pressure Test and Specifications Chart.

(4) If line pressures are still high, proceed to specific Service Diagnosis Chart that applies to the malfunction encountered.

(5) If line pressures are normal with external vacuum applied, check engine vacuum and vacuum systems for leaks.

Pressure Test Procedure and Specifications Chart

Steps	Range	Normal Pressure (PSI)
1	Neutral – Brakes Applied. Engine at 1000 RPM	55-70
2	Drive – Engine at Hot Idle Speed	60-85
3	Drive – Brakes Applied. Engine at 1000 RPM	60-90*
4	Lo – Brakes Applied. Engine at 1000 RPM	135-160
5	Reverse – Brakes Applied. Engine at 1000 RPM	95-150
6	Drive – Brakes Applied. Engine at 1000 RPM – Kickdown Switch Activated	90-110
7	Governor Check – See Governor Line Pressure Check	Drop of 10 PSI or More**
8	Drive – 30 MPH – Closed Throttle on Load or on Hoist	55-70

*** See High Initial Line Pressure. ** See Control Valve and Governor Line Pressure Check.** 70531

Pressure Test Diagnosis Chart

	1	2	3	4	5	6	7	8	
MALFUNCTION	NEUTRAL BRAKES APPLIED 1000 RPM	DRIVE IDLE	DRIVE BRAKES APPLIED 1000 RPM	SUPER OR LO BRAKES APPLIED 1000 RPM	REVERSE BRAKES APPLIED 1000 RPM	DRIVE–BRAKES APPLIED 1000 RPM DOWNSHIFT SWITCH ACTIVATED	PRESSURE DROP OCCURS WHILE ENGINE RPM INCREASES FROM 1000 TO 3000 RPM WHEELS FREE TO MOVE*	DRIVE 30 MPH CLOSED THROTTLE	POSSIBLE CAUSE OF MALFUNCTION
	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE		OIL PRESSURE	
NO 1-2 UPSHIFT AND/OR DELAYED UPSHIFT	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	10 PSI DROP OR MORE	NORMAL	MALFUNCTION IN CONTROL VALVE ASSY.
	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	LESS THAN 10 PSI DROP	NORMAL	MALFUNCTION IN GOVERNOR OR GOVERNOR FEED SYSTEM
	NORMAL	HIGH	HIGH	NORMAL	NORMAL	NORMAL	DROP	HIGH	MALFUNCTION IN DETENT SYSTEM
	HIGH	HIGH	HIGH	NORMAL	HIGH	–	–	–	MALFUNCTION IN MODULATOR OR VACUUM FEED SYSTEM TO MODULATOR
SLIPPING–REVERSE	NORMAL	NORMAL	NORMAL	NORMAL	LOW	NORMAL	DROP	NORMAL	OIL LEAK IN FEED SYSTEM TO THE DIRECT CLUTCH
SLIPPING–1ST GEAR	NORMAL	LOW TO NORMAL	LOW TO NORMAL	LOW TO NORMAL	NORMAL	LOW TO NORMAL	–	LOW TO NORMAL	OIL LEAK IN FEED SYSTEM TO THE FORWARD CLUTCH
NOT DETENT DOWNSHIFTS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	LOW	NORMAL	NORMAL	MALFUNCTION IN DETENT SYSTEM

* DRIVE RANGE, VACUUM LINE DISCONNECTED FROM MODULATOR. J43009

NOTE: A DASH (-) IN THE ABOVE CHART MEANS THAT THE OIL PRESSURE READING HAS NO MEANING UNDER THE TEST CONDITION.

Shift Speed Chart

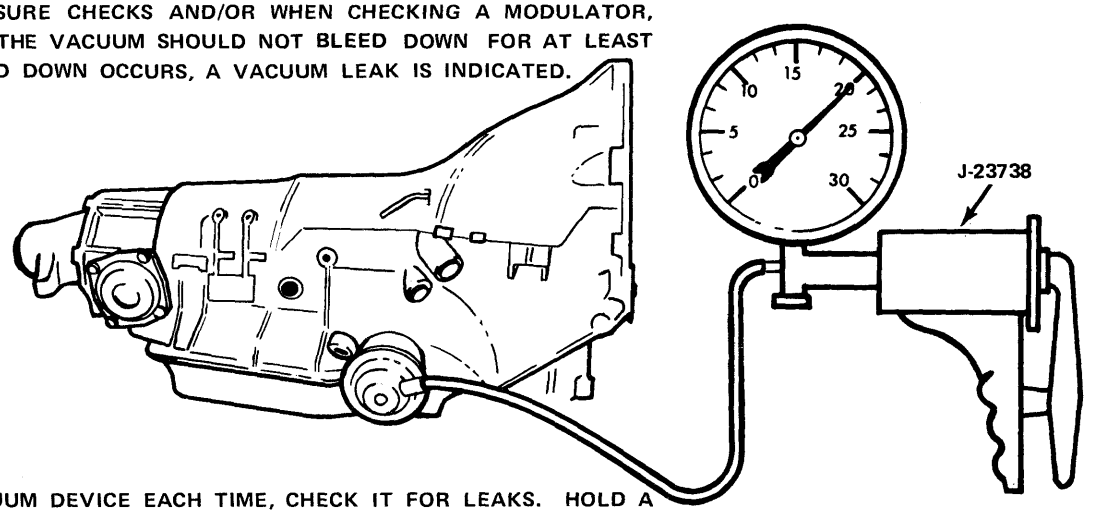
Series	CJ-7				Wagoneer Cherokee		J-10 Truck		J-10 and J-20 Truck			
Transmission	400-JC		400-JS		400-JM		400-JK		400-JR			
Engine	258		304		360-401		258		360/401			
Axle	3.54	4.09	3.54	4.09	3.07	3.54	3.54	4.09	3.54	3.73	4.09	4.09
Tire Size	F78 x 15 HR78 x 15		F78 x 15 HR78 x 15		H78 x 15 HR78 x 15		H78 x 15 HR78 x 15		H78 x15 HR78 x 15	8.00 x 16.5 8.75 x 16.5	9.50 x 16.5	H78 x 15 HR78 x 15
Tire Rev. Per Mile	750		750		728		728		728	707	677	728
Closed Throttle:												
1-2	3-11	2-10	3-11	2-10	6-14	5-13	4-12	3-11	4-12	4-12	3-11	3-11
2-3	10-18	8-16	11-19	9-17	20-28	17-25	15-23	12-20	10-18	10-18	9-17	8-16
Part Throttle:												
1-2	6-16	5-15	6-16	5-15	18-28	16-24	11-21	9-19	9-19	9-19	8-18	7-17
2-3	17-27	14-24	25-35	21-31	41-51	36-44	25-35	21-31	32-42	32-42	30-40	27-37
To Detent:												
1-2	16-26	13-23	19-29	16-26	30-40	25-35	20-30	16-26	23-33	23-33	21-31	19-29
2-3	33-43	28-38	41-51	35-45	52-62	45-55	39-49	33-43	45-55	44-54	42-52	38-48
Wide Open Throttle:												
1-2	24-36	20-32	29-41	24-36	36-48	31-43	26-38	21-33	31-43	30-42	28-40	26-38
2-3	43-55	38-48	54-66	46-58	65-77	56-68	49-61	42-54	61-73	60-72	57-69	52-64
Kickdown:												
Wide Open Throttle												
3-1	10-22	8-20	11-23	9-21	20-32	17-29	15-27	12-24	24-36	23-35	22-34	20-32
3-2	41-53	35-47	52-64	44-56	61-73	52-64	47-59	40-52	59-71	57-69	54-66	50-62
Kickdown:												
Part Throttle												
3-2	26-38	22-34	34-46	29-41	43-55	36-48	32-44	27-39	31-43	30-42	29-41	26-38

60624

Test Gauge Installation Chart

USING HAND OPERATED VACUUM TESTER

WHEN USING THE HAND OPERATED VACUUM DEVICE TO PROVIDE A CONSISTENT VACUUM FOR LINE PRESSURE CHECKS AND/OR WHEN CHECKING A MODULATOR, APPLY 20" OF VACUUM. THE VACUUM SHOULD NOT BLEED DOWN FOR AT LEAST 30 SECONDS. IF A BLEED DOWN OCCURS, A VACUUM LEAK IS INDICATED.

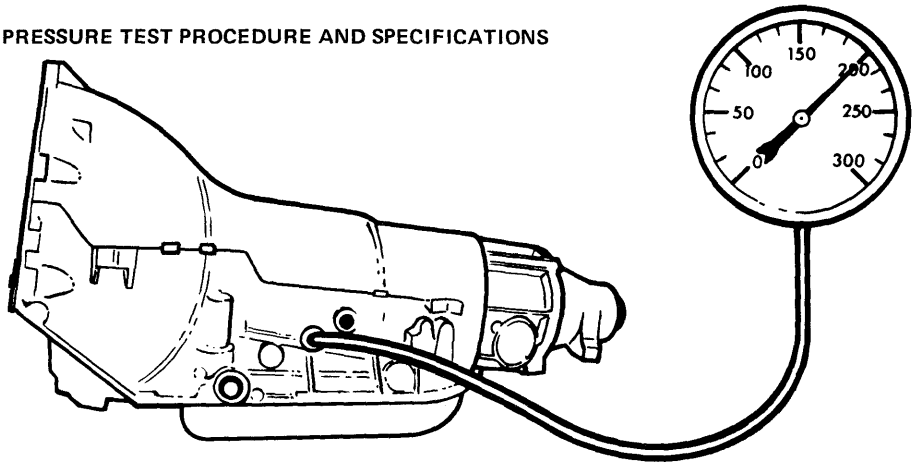


NOTE:

BEFORE USING THIS VACUUM DEVICE EACH TIME, CHECK IT FOR LEAKS. HOLD A FINGER FIRMLY AGAINST THE END OF THE HOSE AND APPLY 20" OF VACUUM. VACUUM MUST NOT DROP ANY FOR AT LEAST 30 SECONDS. ALSO, MAKE SURE THE HOSE THAT FITS OVER THE MODULATOR VACUUM PIPE IS VERY TIGHT.

OIL PRESSURE GAUGE INSTALLATION

REFER TO PRESSURE TEST PROCEDURE AND SPECIFICATIONS

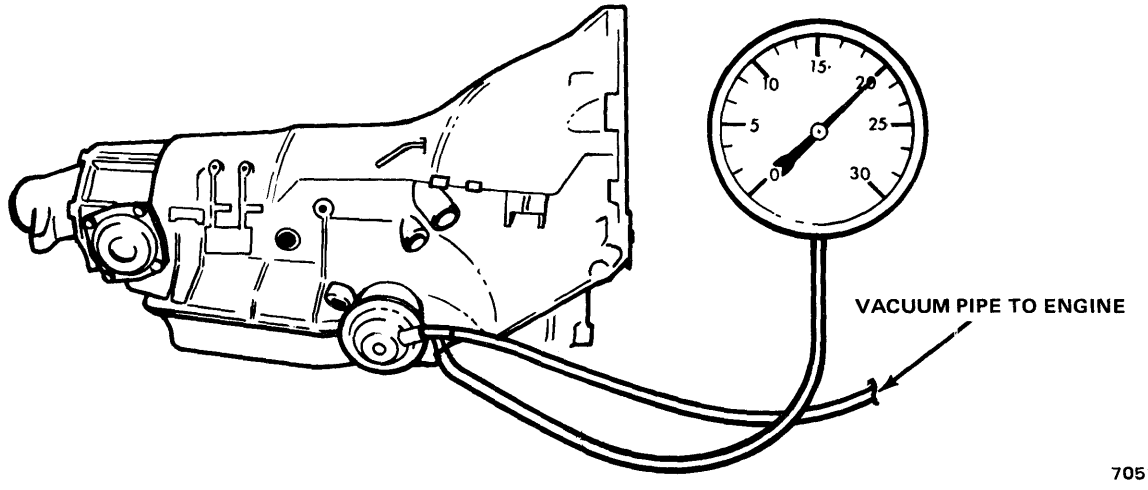


NOTE:

GAUGE SHOULD HAVE MINIMUM OF 300 PSI CAPACITY

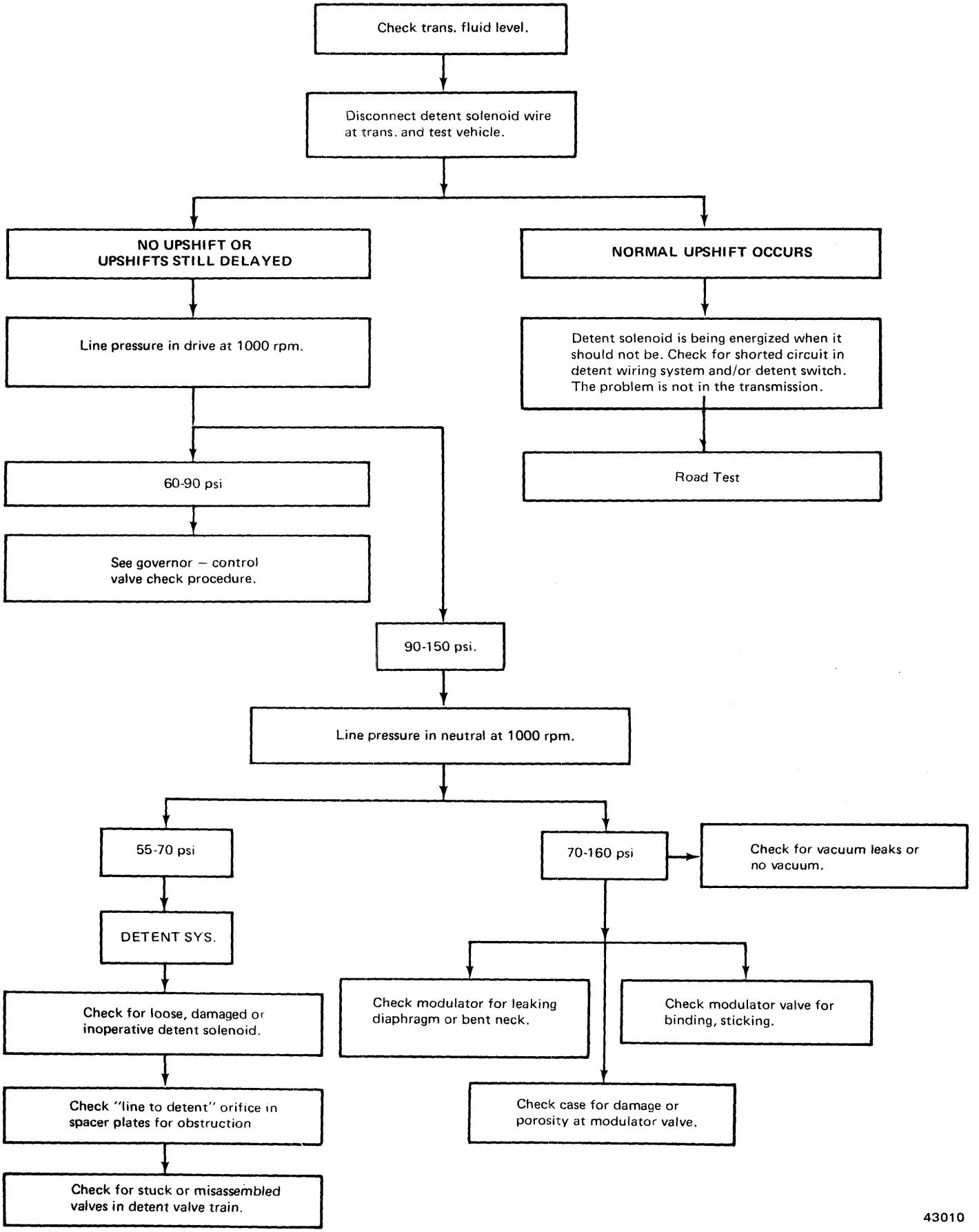
VACUUM GAUGE INSTALLATION

REFER TO PRESSURE TEST PROCEDURE AND SPECIFICATIONS



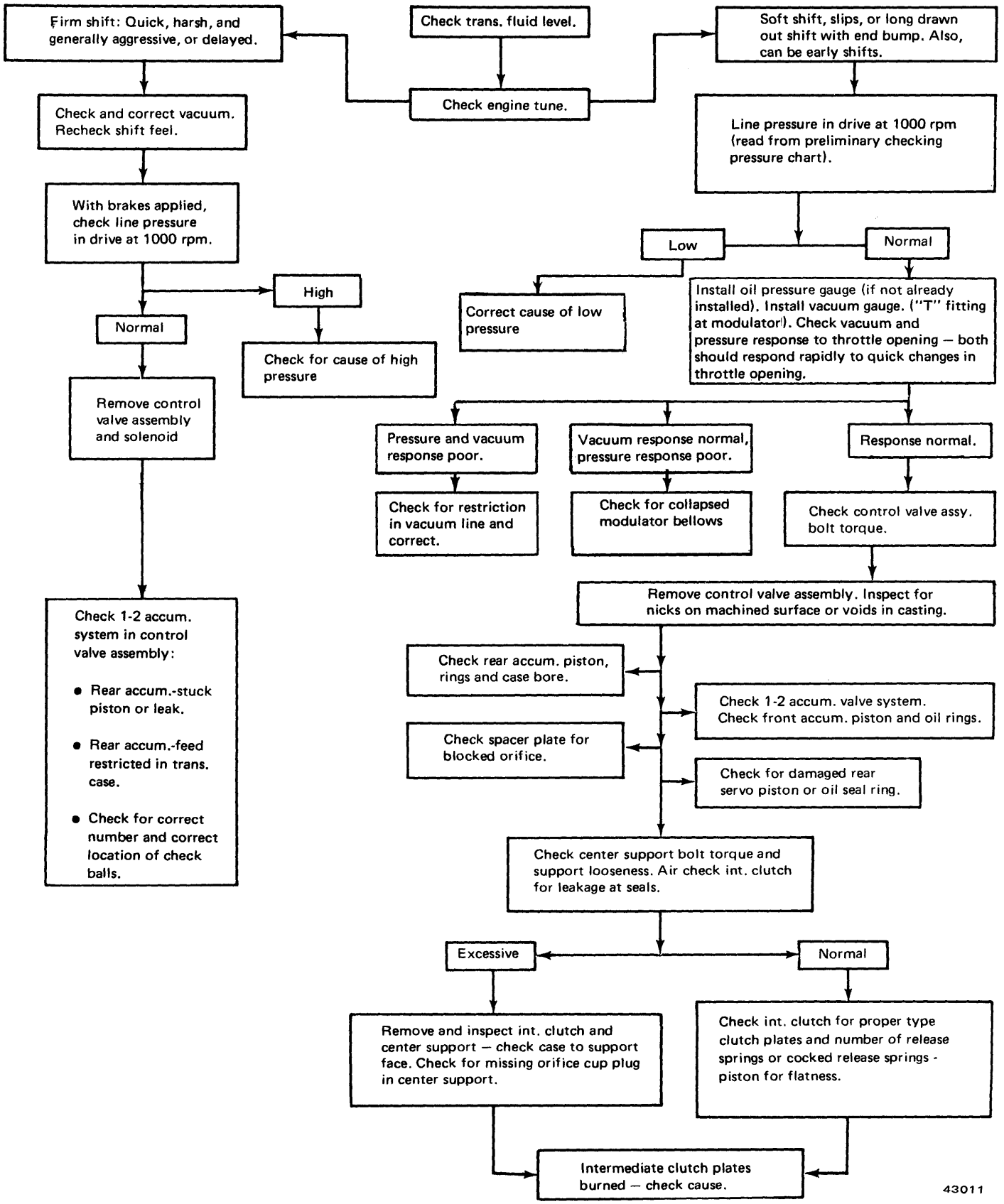
70518

NO UPSHIFTS, DELAYED UPSHIFTS, OR FULL THROTTLE UPSHIFTS ONLY

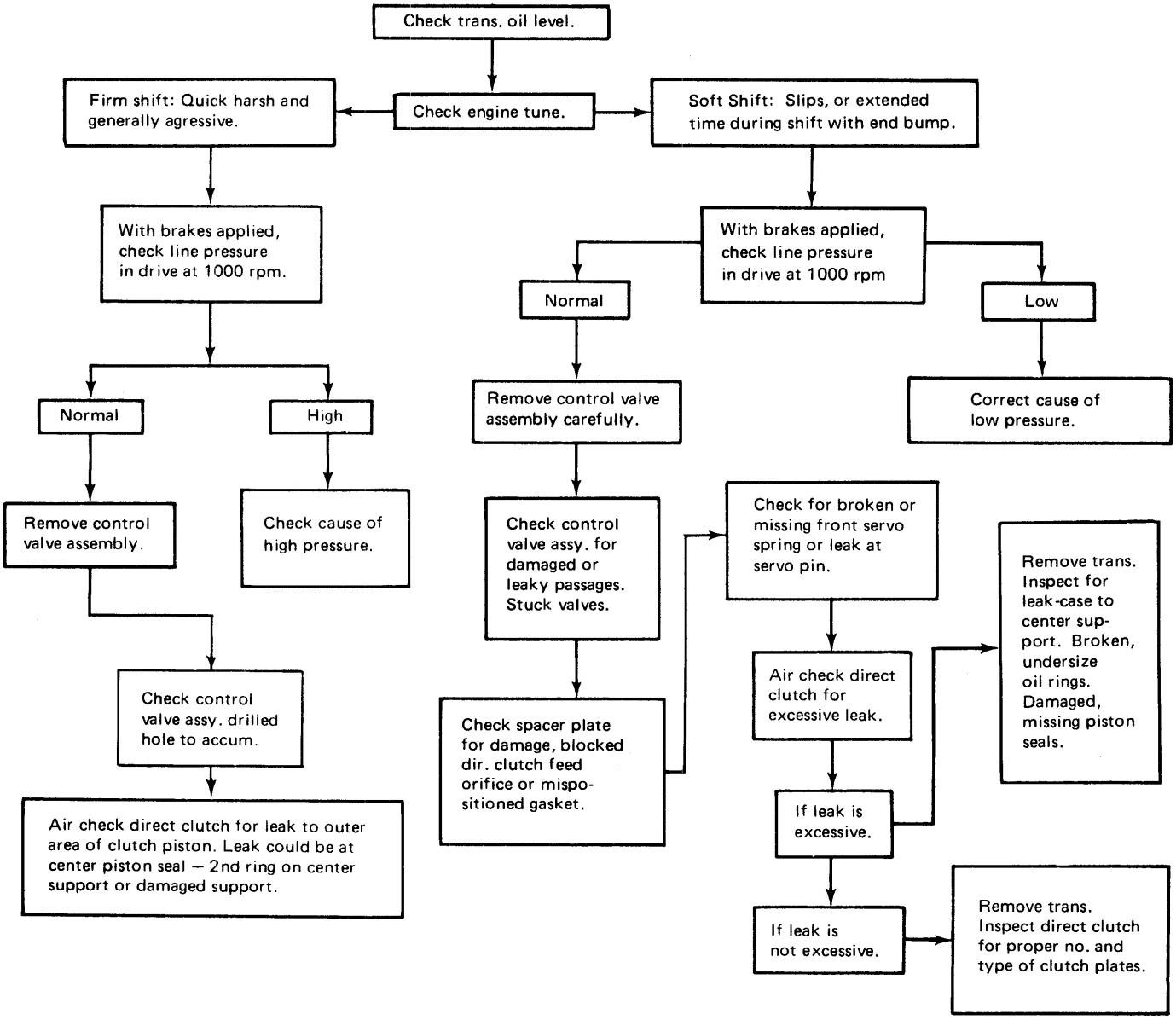


43010

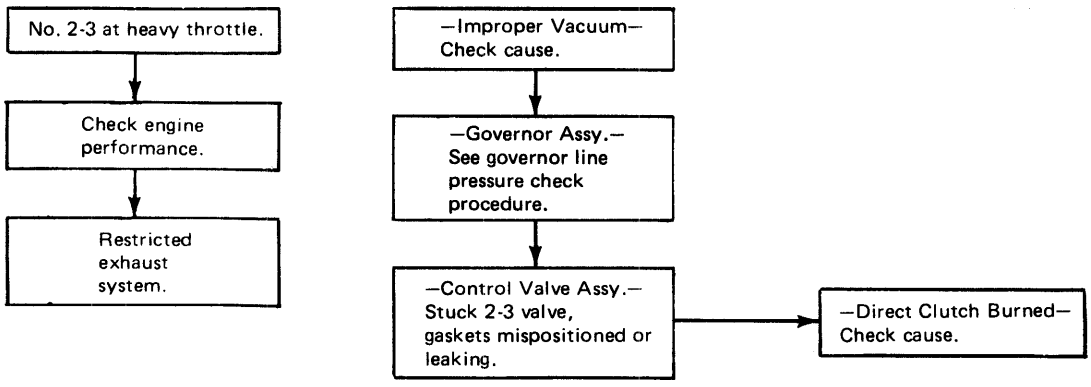
1-2 SHIFT COMPLAINT



2-3 SHIFT COMPLAINT



1ST & 2ND SPEEDS ONLY, NO 2-3



43012

MISSES SECOND ESPECIALLY WHEN TRANSMISSION IS AT OPERATING TEMPERATURE

The complaint is described in several ways. such as:

- Misses second gear.
- Transmission hunts 1-3-1.
- Shifts 1-3.
- Engine flare on downshift.
- Slips in second.
- Goes to neutral on downshift.
- No second except D-2

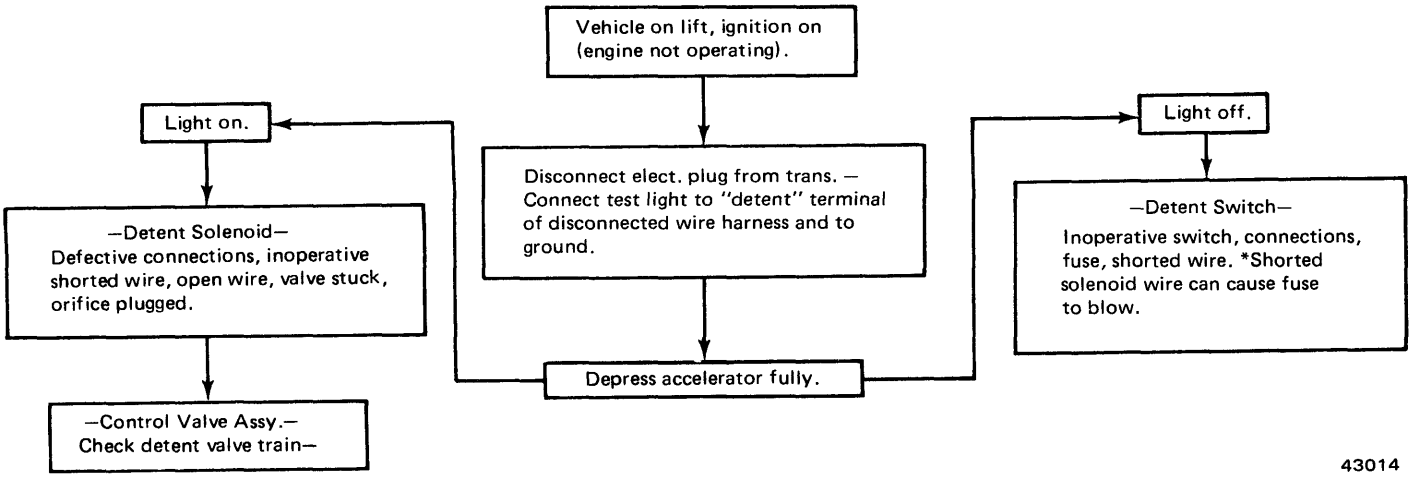
↓

FRONT BAND AND DIRECT CLUTCH PLATES MAY BE BURNED OR SHOW DISTRESS.

↓

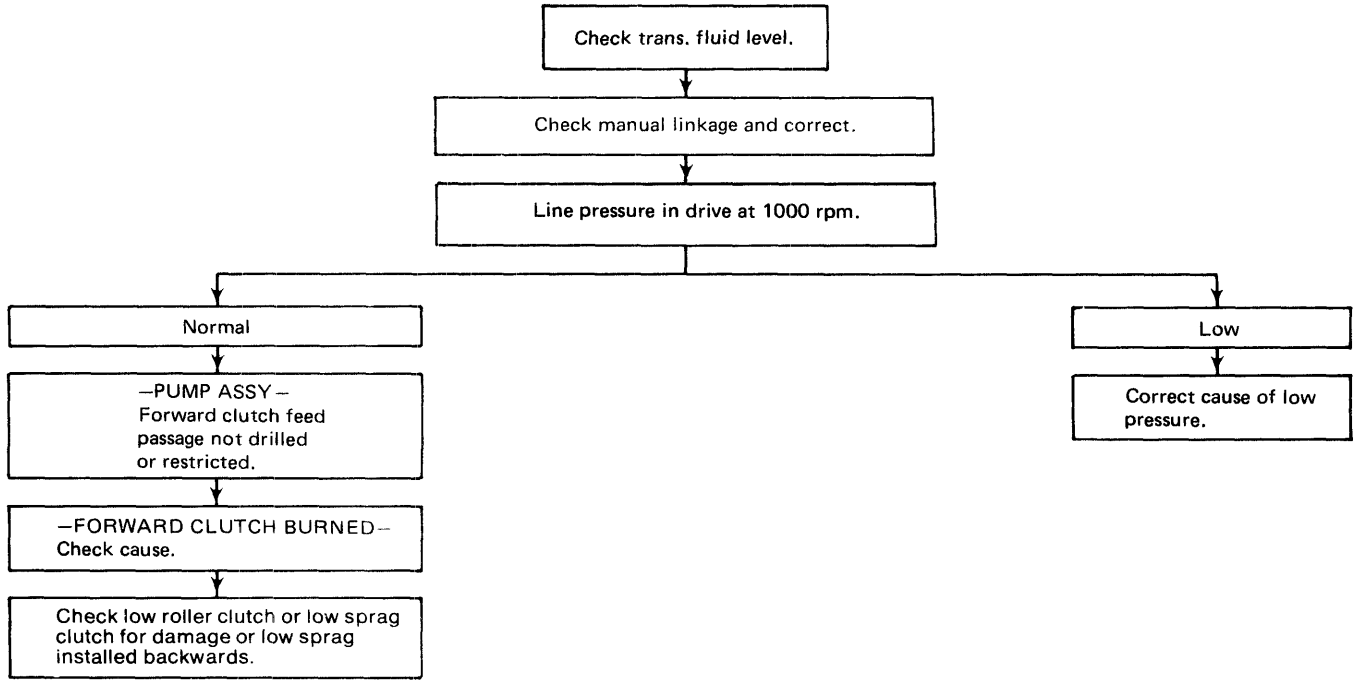
REPLACE INTERMEDIATE CLUTCH PISTON SEALS.

NO DETENT DOWNSHIFTS

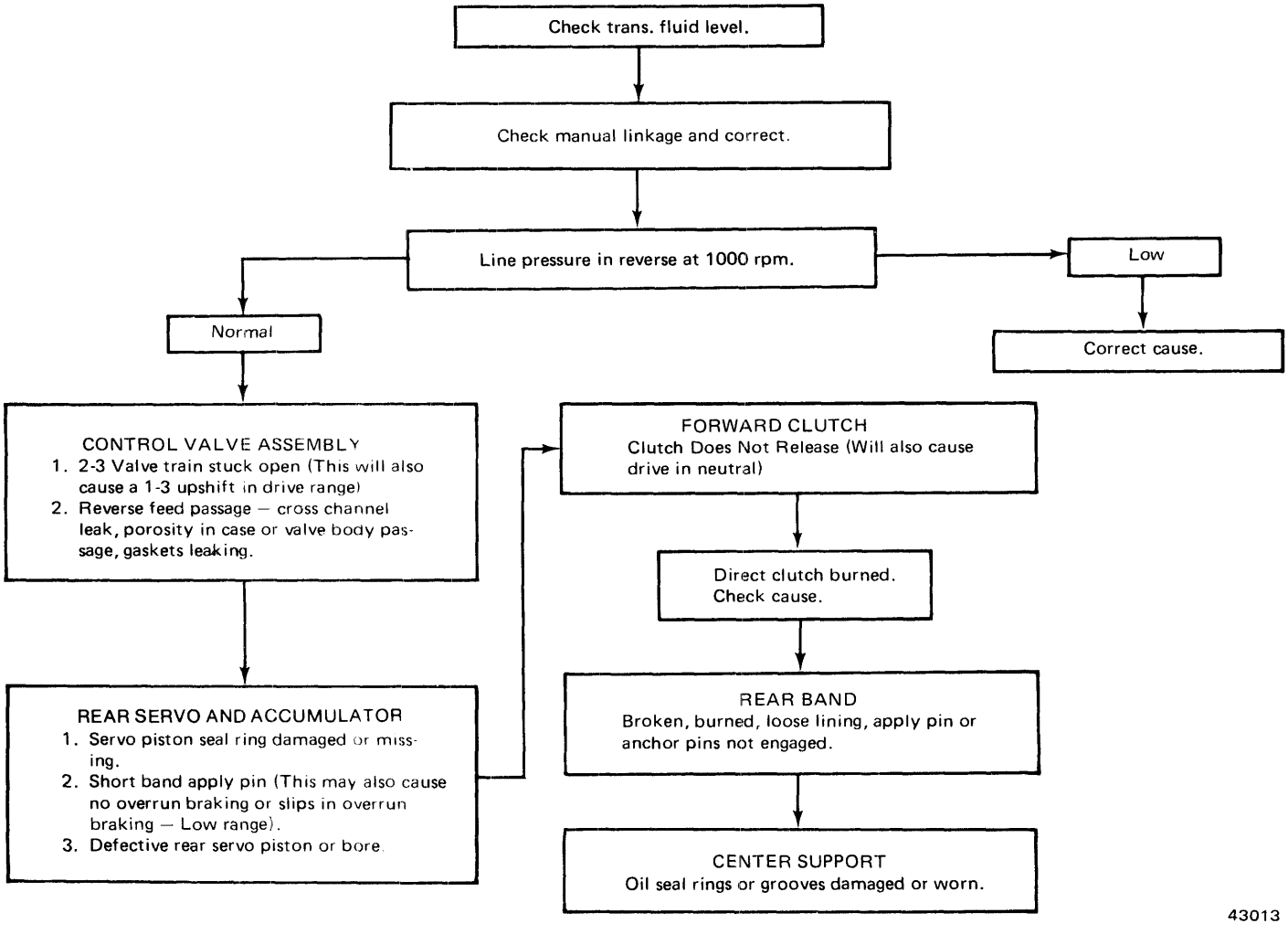


43014

NO DRIVE OR SLIPS IN DRIVE



NO REVERSE OR SLIPS IN REVERSE



43013

NO ENGINE BRAKING – INTERMEDIATE RANGE – SECOND GEAR

FRONT SERVO AND ACCUMULATOR
Oil rings and/or bores leaking or front servo piston cocked or stuck.

↓

Incorrect combination of front servo and accumulator parts.

↓

FRONT BAND
Broken, burned (check for cause), not engaged on anchor pin and/or servo pin.

NO ENGINE BRAKING – LOW RANGE – FIRST GEAR

CASE ASSEMBLY
Lo-reverse check ball mispositioned or missing. Case damaged at low-reverse check ball area.

↓

REAR SERVO
Oil seal ring, bore or piston damaged. Rear band apply pin short, improperly assembled.

↓

REAR BAND
Broken, burned (check for cause), not engaged on anchor pins and/or servo pin.

DRIVE IN NEUTRAL

Check outside manual linkage and correct.

↓

INTERNAL LINKAGE
Manual valve disconnected or end broken, inside detent lever pin broken.

↓

PUMP ASSEMBLY
Trans. lube pressure leaking into forward clutch apply passage.

↓

FORWARD CLUTCH
Burned plates – check cause.

Incorrect clutch plate usage.

WON'T HOLD IN PARK OR WON'T RELEASE FROM PARK

Check outside manual linkage and correct.

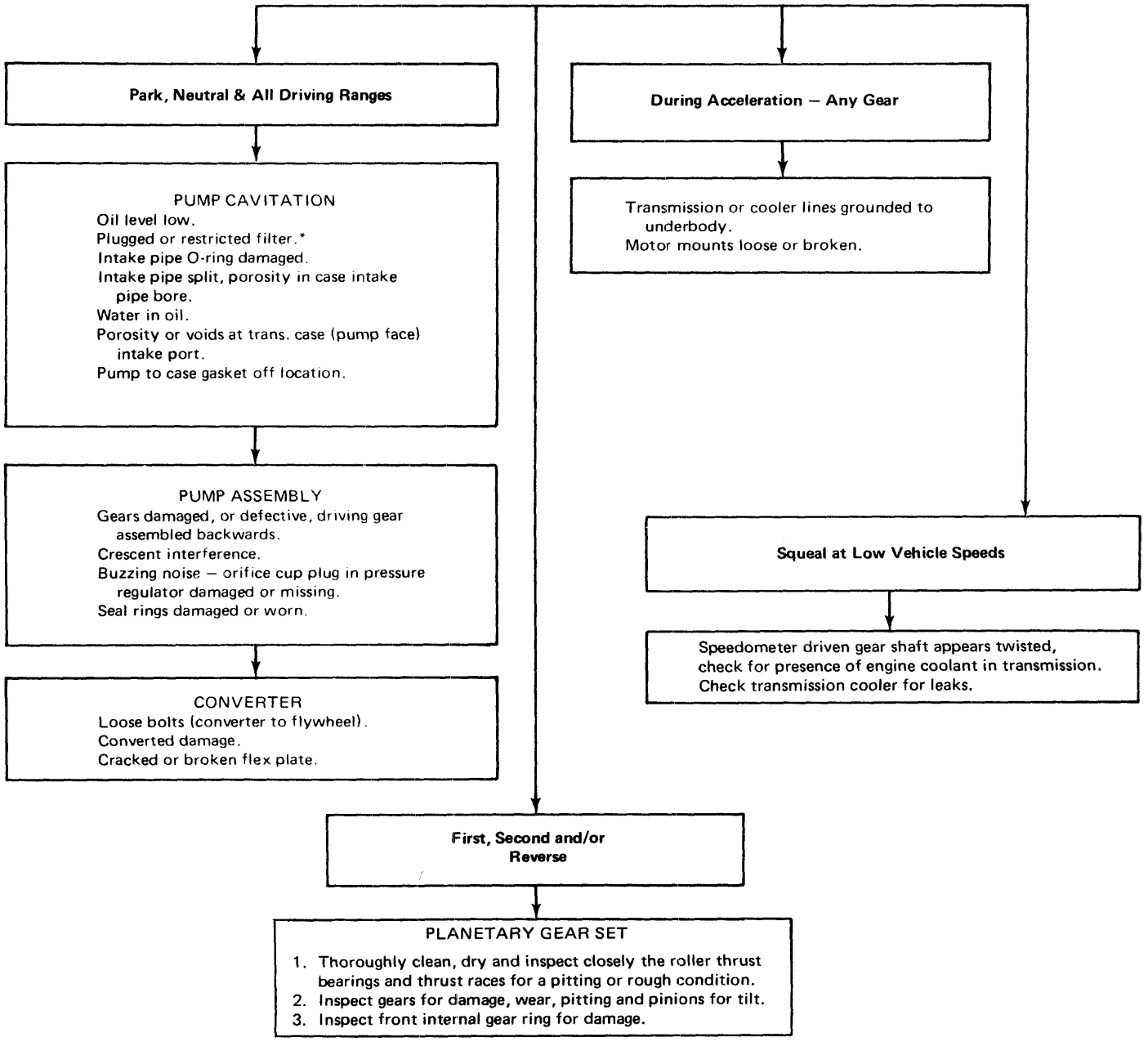
↓

INTERNAL LINKAGE
1. Parking brake rod assy. (Check actuator for chamfer).
2. Parking pawl broken, chamfer omitted.
3. Parking brake bracket loose, burr or rough edges, or incorrectly installed.
4. Parking pawl return spring missing, broken or incorrectly hooked.

43015

TRANSMISSION NOISY

CAUTION: *Before checking the transmission for what is believed to be transmission noise, make certain the noise is not from the water pump, alternator, air conditioner, power steering, etc. These components can be isolated by removing the proper belt and running the engine not more than two minutes at one time.*



*There is no approved way of checking or cleaning the filter. If the filter is suspected of being plugged or restricted, it must be replaced.

43016

MODULATOR TESTING

Vacuum Diaphragm Leak Check

(1) Insert a pipe cleaner into vacuum connector pipe as far as possible and check for presence of transmission fluid.

(2) Replace modulator if fluid is found in connector pipe. Transmission fluid may be lost through diaphragm and burned in engine.

NOTE: *Gasoline or water condensation may settle in the vacuum side of the modulator. If this is found without the presence of fluid, the modulator should not be changed.*

Atmospheric Leak Check

(1) Apply liberal coating of soap bubble solution to vacuum connector pipe seam, crimped upper-to-lower housing seam, and threaded screw seal.

(2) Using short piece of rubber tube, apply air pressure to vacuum pipe by blowing into tube and check for leak bubbles. If bubbles appear, replace modulator.

CAUTION: *Do not use any method other than human lung power for applying air pressure, as pressure over 6 psi may damage the modulator.*

DIAGNOSIS GUIDES

Causes of Oil Leaks

Transmission Oil Pan Leak

- Attaching bolts not correctly tightened.
- Improperly installed or damaged oil pan gasket.
- Oil pan gasket mounting face not flat.

Extension Housing Leak

- Attaching bolts not correctly tightened.
- Rear seal assembly damaged or improperly installed or propeller shaft yoke damaged.
- Extension housing gasket or seal damaged or improperly installed.
- O-ring on output shaft damaged (oil leak at yoke).

Transmission Case Leak

- Filler pipe O-ring seal damaged or missing; misalignment of filler pipe bracket to engine, loading one side of O-ring.
- Modulator O-ring seal damaged or improperly installed.
- Connector O-ring seal damaged or improperly installed.
- Governor cover, gasket, and bolts damaged, loose; case face damaged or porous.
- Leak at speedometer driven gear housing or seal. Leak at speedometer hole plug.
- Valve body manual shaft seal damaged or improperly installed.
- Line pressure plug stripped or shy of sealer compound.
- Case porous or cracked at pressure plug boss.

Converter Area Leak

- Front seal damaged. Check converter neck for nicks and pump bushing for having moved forward, or for missing seal garter spring.
- Pump attaching bolts and seals damaged, missing, or bolts loose.
- Leak at welded seam of converter.
- Pump O-ring seal damaged. Also check pump oil ring groove and case bore.
- Casting porous (pump or case).
- Pump drain back hole not open.

Vent Pipe Leak

- Transmission overfilled.
- Water in fluid.
- Filter O-ring damaged or improperly assembled causing oil to foam.
- Foreign material between pump and case or between pump cover and body holding pump halves apart.
- Case porous or pump face improperly machined.
- Pump-to-case gasket mispositioned.
- Pump breather hole blocked or missing.
- Hole in intake pipe.
- Check ball in forward clutch housing stuck open or missing.

Oil Cooler Lines

- Connections at radiator loose or stripped.
- Connections at case loose or stripped.

Modulator

- Diaphragm defective.

Causes of Burned Clutch Plates

Forward Clutch

- Check ball in clutch housing damaged, stuck, or missing.
- Clutch piston cracked or seals damaged or missing.
- Low line pressure.
- Manual valve mispositioned.
- Restricted oil feed to forward clutch (clutch housing to inner and outer areas not drilled or restricted or porous pump).
- Pump cover oil seal rings missing, broken, or undersize; ring groove oversized.

- Case valve body face not flat or porosity between channels.
- Manual valve bent and or center land not ground properly.

Intermediate Clutch

- Constant bleed orifice in center support missing.
- Rear accumulator piston oil ring damaged or missing.
- One-two accumulator valve stuck in control valve assembly.
- Intermediate clutch piston seals damaged or missing.
- Center support bolt loose.
- Low line pressure.
- Intermediate clutch cup plug in case missing.
- Case valve body face not flat or porosity between channels.
- Manual valve bent and center land not ground properly.

Direct Clutch

- Restricted orifice in vacuum line to modulator (poor vacuum response).
- Check ball in direct clutch piston damaged, stuck, or missing.
- Defective modulator bellows.
- Center support bolt loose. Bolt may be tight in support but not holding support tight to case.
- Center support oil rings or grooves damaged or missing.
- Clutch piston seals damaged, missing, or improperly installed.
- Front and rear servo pistons and seals damaged.
- Manual valve bent and center land not cleaned.
- Case valve body face not flat or porosity between channels.
- Intermediate roller clutch installed backward.
- Three-two valve, valve spring, or valve spacer pin installed in wrong sequence in valve bore.
- Incorrect combination of front servo and accumulator parts. If direct clutch plates and front band are burned, check manual linkage. Burned clutch plates can be caused by incorrect usage of clutch plates. Also, antifreeze in transmission fluid can cause severe damage (e.g., large pieces of composition clutch plate material peeling off).

Causes of Low Line Pressure

- Low fluid level
- Oil filter plugged or restricted.
- O-ring on oil filter intake pipe omitted or damaged.
- Split or leaking intake pipe.
- Incorrect oil filter.

Oil Pump

- Pressure regulator or boost valve stuck.
- Excessive gear clearance, damaged or worn gears, pump drive gear installed backward, or converter pilot does not enter crankshaft freely and completely.
- Pressure regulator spring too weak.
- Not enough spacers in pressure regulator.
- Pump-to-case gasket mispositioned.
- Defective pump body and cover.
- Mismatched pump cover/pump body.

Internal Circuit Leaks

- Forward clutch leak (pressure normal in neutral and reverse—pressure low in drive). Check pump rings or forward clutch seals.
- Direct clutch leak (pressure normal in neutral, low, intermediate, and drive—pressure low in reverse). Check center support oil seal rings.
- Check direct clutch outer seal for damage. Check rear servo and front accumulator pistons and rings for damage or missing parts.

Transmission Case

- Porosity in intake bore area.
- Check case for intermediate clutch plug leak or other leaking or loose plugs.
- Drive-1—Reverse check ball mispositioned or missing causing loss of reverse and overrun braking in Drive-1.
- If filter is suspected of being plugged or restricted, replace it.

Causes of High Line Pressure

Vacuum Leak

- Vacuum line disconnected.
- Partial leak in line from engine to modulator.
- Insufficient engine vacuum.
- Vacuum-operated accessory leak (hoses, vacuum advance, etc.).

Modulator

- Hole in diaphragm.
- Stuck valve.
- Water in modulator.
- Modulator inoperative.

Detent System

- Detent switch plunger stuck, shorted, or misadjusted).
- Detent wiring shorted.
- Detent solenoid stuck open.
- Detent feed orifice in valve body spacer plate blocked.

- Detent solenoid loose.
- Detent valve bore plug damaged.
- Detent regulator valve pin short.

Pump

- Pressure regulator or boost valve stuck.
- Incorrect pressure regulator spring or valve.
- Too many pressure regulator valve spacers.
- Pump casting poor.
- Pressure boost valve installed backwards or defective.
- Aluminum bore plug has hole or otherwise defective.
- Pressure boost bushing broken or otherwise defective.

Control Valve Assembly

- Check balls mispositioned.
- Control valve assembly-to-spacer gasket off location.
- Gaskets installed in reverse order.

Causes of Improper Vacuum at Modulator

Engine

- Poor engine operation.
- Loose vacuum fittings.
- Vacuum-operated accessory leak (hoses, vacuum advance, etc.).
- Engine exhaust system restricted.

Vacuum Line to Modulator

- Hole in line.
- Loose fitting.
- Restricted orifice or incorrect orifice size.
- Carbon buildup at modulator vacuum fitting.
- Pinched line.
- Grease in pipe (delayed or no upshift cold).

Control Valve Assembly—Governor Line Pressure Check

(1) Raise car on hoist.
(2) Install oil pressure test gauge.
(3) Disconnect vacuum line to modulator.
(4) With car on hoist (rear wheels off ground, brakes released, and transmission in Drive range, check line pressure at 1000 rpm.
(5) Slowly increase engine rpm to 3000 rpm and determine if a line pressure drop of 7 psi or more occurs.
(6) If pressure drop occurs, remove, disassemble, and clean and inspect control valve assembly.
(7) If pressure drop does not occur, inspect governor for stuck valve or weight, or restricted orifice in valve. Also check feed system for plugged screen in control valve or case, or for restrictions in governor pipe.

HIGH INITIAL LINE PRESSURE

Engines with EGR Valves

On vehicles with Exhaust Gas Recirculation (EGR) valve, the throttle is open enough in Drive range (1000 rpm) to cause the EGR valve to open. When the EGR valve opens, exhaust gas enters the intake manifold which lowers intake manifold vacuum. When intake manifold vacuum is lowered, the transmission line pressure raises accordingly and may go above the upper specification limit. For this reason, if high line pressures are obtained, proceed as follows:
(1) Disconnect EGR vacuum line at EGR valve and plug vacuum line.
(2) Recheck line pressures as indicated on Preliminary Checking Procedure Chart.
If high line pressures are still obtained, proceed to Engines Without EGR Valve.

Engines Without EGR Valve

If high line pressures are experienced on vehicles without EGR or with EGR line plugged, it may be that the engine is not producing enough vacuum to lower transmission line pressure within specifications. The newer engines with emission controls characteristically have lower engine vacuum than previous engines. To obtain line pressures suitable for evaluation, it is recommended that vacuum be applied to the modulator using an external vacuum source such as Vacuum Tool J-23788, or equivalent. The unit allows definite amounts of vacuum to be applied to the modulator so that consistent line pressures may be obtained for evaluation.
(1) Disconnect vacuum hose at modulator, and plug vacuum hose.
(2) Attach vacuum tool and apply 20 inches of vacuum.
(3) Recheck line pressures according to Preliminary Checking Procedure Chart.
(4) If line pressures are still high, proceed to specific Service Diagnosis Chart that applied to the malfunction encountered.
(5) If line pressures are normal with external vacuum applied, check engine vacuum and vacuum systems for leaks.

MODULATOR TEST PROCEDURE

Vacuum Diaphragm Leak Check

(1) Insert a pipe cleaner into the vacuum connector pipe as far as possible and check for the presence of transmission fluid.
(2) If fluid is found, replace modulator.
(3) Transmission fluid may be lost through diaphragm and burned in the engine.

NOTE: *Gasoline or water condensation may settle in the vacuum side of the modulator. If this is found without the presence of fluid, the modulator should not be changed.*

Atmospheric Leak Check

(1) Apply liberal coating of soap bubbles solution to vacuum connector pipe seam, crimped upper-to-lower housing seam, and threaded screw seal.

(2) Using short piece of rubber tube, apply air pressure to vacuum pipe by blowing into tube, and observe for leak bubbles. If bubbles appear, replace modulator.

CAUTION: *Do not use any method other than human LUNG power for applying air pressure, as pressure over 6 psi may damage the modulator.*

DIAGNOSIS GUIDES

Causes of Oil Leaks

Transmission Oil Pan Leaks

(1) Attaching bolts not correctly tightened.
(2) Improperly installed or damaged oil pan gasket.
(3) Oil pan gasket mounting face not flat.

Case Extension Leak

(1) Attaching bolts not correctly tightened.

(2) Rear seal assembly damaged or improperly installed. Propeller shaft yoke damaged.

(3) Gasket or seal (extension to case) damaged or improperly installed.

(4) O-ring on output shaft damaged (oil leak at yoke).

Case Leak

(1) Filler pipe O-ring seal damaged or missing; misalignment of filler pipe bracket to engine, loading one side of O-ring.

(2) Modulator assembly O-ring seal damaged or improperly installed.

(3) Connector O-ring seal damaged or improperly installed.

(4) Governor cover, gasket, and bolts damaged; loose; case face damaged or porous.

(5) Leak at speedometer driven gear housing or seal. Leak at speedometer hole plug.

(6) Manual shaft seal damaged or improperly installed.

(7) Line pressure plug stripped or shy of sealer compound.

(8) Case porous or cracked at pressure plug boss.

Front End Leak

(1) Front seal damaged (check converter neck for nicks and pump bushing moved forward) or garter spring missing.

(2) Pump attaching bolts and seals damaged, missing, or bolts loose.

(3) Leak at welded seam of converter.

(4) Pump O-ring seal damaged (also check pump oil ring groove and case bore).

(5) Casting porous (pump or case).

(6) Pump drain back hole not open.

Vent Pipe Leak

(1) Transmission overfilled.

(2) Water in fluid.

(3) Filter O-ring damaged or improperly assembled causing oil to foam.

(4) Foreign material between pump and case or between pump cover and body holding pump halves apart.

(5) Case porous or pump face improperly machined.

(6) Pump-to-case gasket mispositioned.

(7) Pump breather hole blocked or missing.

(8) Hole in intake pipe.

(9) Check ball in forward clutch housing stuck open or missing.

Oil Cooler Lines

(1) Connections at radiator loose or stripped.

(2) Connections at case loose or stripped.

Modulator Assembly

Diaphragm defective.

Causes of Burned Clutch Plates

Forward Clutch

(1) Check ball in clutch housing damaged, stuck, or missing.

(2) Clutch piston cracked or seals damaged or missing.

(3) Lower line pressure.

(4) Manual valve mispositioned.

(5) Restricted oil feed to forward clutch (clutch housing to inner and outer areas not drilled or restricted or porous pump).

(6) Pump cover oil seal rings missing, broken, or undersize; ring groove oversized.

(7) Case valve body face not flat or porosity between channels.

(8) Manual valve bent and or center land not ground properly.

Intermediate Clutch

(1) Constant bleed orifice in center support missing.

(2) Rear accumulator piston oil ring damaged or missing.
(3) 1-2 accumulator valve stuck in control valve assembly.
(4) Intermediate clutch piston seals damaged or missing.
(5) Center support bolt loose.
(6) Low line pressure.
(7) Intermediate clutch cup lug in case missing.
(8) Case valve body face not flat or porosity between channels.
(9) Manual valve bent and center land not ground properly.

Direct Clutch

(1) Restricted orifice in vacuum line to modulator (poor vacuum response).
(2) Check ball in direct clutch piston damaged, stuck, or missing.
(3) Defective modulator bellows.
(4) Center support bolt loose. (Bolt may be tight in support but not holding support tight to case.)
(5) Center support oil rings or grooves damaged or missing.
(6) Clutch piston seals damaged or missing.
(7) Front and rear servo pistons and seals damaged.
(8) Manual valve bent and center land not cleaned.
(9) Case valve body face not flat or porosity between channels.
(10) Intermediate roller clutch installed backward.
(11) 3-2 valve, 3-2 spring, or 3-2 spacer pin installed in the wrong sequence in 3-2 valve bore.
(12) Incorrect combination of front servo and accumulator parts.

NOTE: *If direct clutch plates and front band are burned, check manual linkage.*

NOTE: *Burned clutch plates can be caused by incorrect usage of clutch plates. Also, antifreeze in transmission fluid can cause severe damage (e.g., large pieces of composition clutch plate material peeling off).*

Causes of Low Line Pressure

Low Transmission Fluid Level—Modulator Assembly—Filter

(1) Blocked or restricted.
(2) O-ring on intake pipe and grommet omitted or damaged.
(3) Split or leaking intake pipe.
(4) Wrong filter assembly.

Pump

(1) Pressure regulator or boost valve stuck.
(2) Gear clearance, damaged, worn (pump will become damaged if drive gear is installed backwards, or if converter pilot does not enter crankshaft freely.)
(3) Pressure regulator spring too weak.
(4) Not enough spacers in pressure regulator.
(5) Pump-to-case gasket mispositioned.
(6) Defective pump body and cover.
(7) Mismatched pump cover/pump body.

Internal Circuit Leaks

(1) Forward clutch leak (pressure normal in neutral and reverse—pressure low in drive). Check pump rings or forward clutch seals.
(2) Direct clutch leak (pressure normal in neutral, low, intermediate, and drive—pressure low in reverse). Check center support oil seal rings.
(3) Check direct clutch outer seal for damage.

SERVICE PROCEDURES—IN VEHICLE

MANUAL LINKAGE ADJUSTMENT

(1) Place steering column gearshift lever in Neutral (N) position.
(2) Raise vehicle on hoist.
(3) Loosen locknut on gearshift rod trunnion just enough to permit movement of gearshift rod in trunnion.
(4) Place transmission outer range selector lever fully into neutral detent position and tighten trunnion locknut to 9 foot-pounds torque.

(5) Lower car and operate steering column gearshift lever in all ranges. Vehicle should start in Park and Neutral only and column gearshift lever should engage properly in all detent positions. Adjust linkage if operation is not satisfactory.

NEUTRAL SWITCH ADJUSTMENT

(1) Apply parking brake.
(2) Check and adjust manual linkage if necessary.
(3) Remove neutral switch from steering column.
(4) Place gearshift selector lever in Park position and lock steering column.
(5) Move switch actuating lever until it is aligned with letter "P" stamped on back of switch.
(6) Insert 3/32-inch drill in hole located below letter "N" stamped on back of switch.
(7) Move switch actuating lever until it stops against drill.
(8) Position switch on column, install attaching screws, and remove drill.
(9) Check switch operation. Engine should start in Park and Neutral positions only. Backup lamp should light when selector lever is in Reverse position only.

PRESSURE REGULATOR VALVE

Removal

CAUTION: *The solid-type pressure regulator valve does not contain oil holes and an orifice cup plug like the previous type pressure regulator valve. The solid-style valve must ONLY be used in the pump cover with the squared off pressure regulator boss (pressure boost bushing end) (fig. 7-4). The previous pressure regulator valve with the oil holes and orifice cup plug will be used to service either type pump cover.*

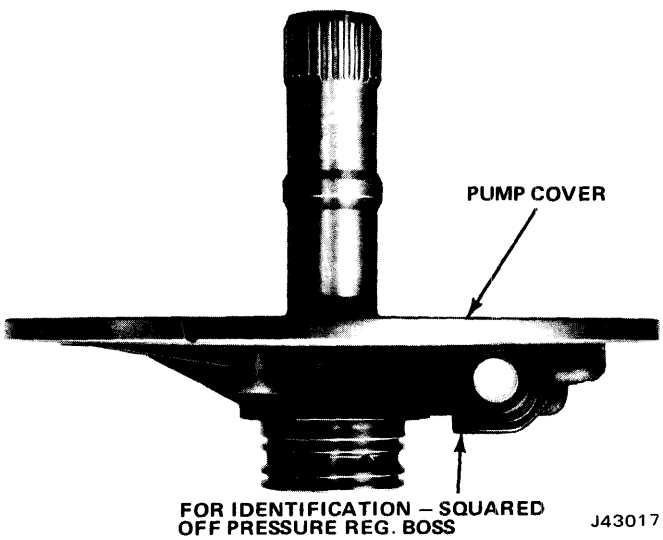


Fig. 7-4 Pressure Regulator Valve Application

(1) Raise vehicle.
(2) Position drain pan under transmission.
(3) Remove oil pan and gasket and drain oil.
(4) Remove oil filter retaining bolt and remove pump intake pipe and oil filter assembly.
(5) Remove and discard intake pipe O-ring and oil pan gasket.
(6) Using screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring.

CAUTION: *The pressure regulator spring is tightly compressed and will force the valve bushing out of the bore when the snap ring is removed if the bushing is not held securely.*

(7) Continue to exert pressure on valve bushing and remove snap ring, Release pressure on valve bushing until spring force is relieved.
(8) Remove regulator boost valve bushing, valve, and pressure regulator spring.
(9) Remove pressure regulator valve and spring retainer. Remove spacers if used.

Installation

(1) Install spring retainer on pressure regulator spring. Install spacers if used.
(2) Install pressure regulator valve on spring, stem end first.
(3) Install boost valve into bushing, stem end out, and assemble parts with pressure regulator spring against valve bushing.
(4) Install assembly in pressure regulator valve bore.
(5) Using screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring until it is beyond snap ring groove, and install snap ring.

NOTE: *To facilitate snap ring installation, place the snap ring on a screwdriver or steel rod, compress the tangs using snap ring pliers, and slide the snap ring upward into the ring groove in the valve bore.*

(6) Install intake pipe O-ring on intake pipe and install pipe and oil filter. Install oil filter retainer bolt.
(7) Install gasket on oil pan and install oil pan.
(8) Install oil pan attaching bolts. Tighten bolts to 12 foot-pounds torque.
(9) Lower vehicle.
(10) Fill transmission with Jeep transmission fluid, Dexron, or equivalent.

DETENT SOLENOID

Removal

(1) Raise vehicle.
(2) Position drain pan under transmission.
(3) Remove oil pan and oil filter.

(4) Remove and discard oil pan gasket and intake pipe O-ring seal.

(5) Disconnect detent solenoid lead from electrical connector.

(6) Remove bolts attaching detent solenoid to transmission case and remove detent solenoid and gasket. Discard gasket.

Installation

(1) Install gasket and detent solenoid. Be sure raised portions of gasket are facing mounting flange of solenoid. Tighten attaching bolts to 7 foot-pounds torque.

(2) Connect detent solenoid wire to electrical connector.

(3) Install O-ring seal on intake pipe.

(4) Install intake pipe and filter.

(5) Install oil pan gasket and oil pan. Tighten oil pan bolts to 12 foot-pounds torque.

(6) Lower vehicle.

(7) Fill transmission with Jeep transmission fluid, Dexron, or equivalent.

CONTROL VALVE AND OIL FILTER

Removal

(1) Raise vehicle.

(2) Position drain pan under transmission oil pan.

(3) Remove oil pan and oil filter.

(4) Remove and discard intake pipe O-ring and oil pan gasket.

(5) Disconnect detent solenoid lead from electrical connector.

(6) Remove detent roller spring assembly.

(7) Remove control valve attaching bolts, but do not remove detent solenoid attaching bolts.

(8) Remove control valve and governor pipes. Do not allow manual valve to fall out of valve body during removal.

NOTE: *The governor screen may remain in the case when the governor pipes are removed. Note the location and position of the screen for assembly reference.*

(9) Insert piece of 0.020-inch thick shim stock or feeler gauge between spacer plate and front servo pistons to prevent assembly from falling out after control valve removal.

(10) Remove governor pipes and manual valve from valve body. If governor screen came out with governor pipes, note location of screen for assembly reference.

(11) Remove and discard control valve to spacer gasket.

(12) Refer to Service Procedures—Out of Vehicle for control valve service.

Installation

(1) Position control valve-to-spacer plate gasket on control valve.

(2) Install governor pipes and manual valve in valve body.

(3) Install governor screen in governor pipe.

(4) Remove shim stock or feeler gauge from between spacer plate and front servo piston. Install control valve and governor pipes. Be sure governor pipes are aligned in case bores.

(5) Install control valve attaching bolts. Tighten bolts evenly to 8 foot-pounds torque.

(6) Install detent roller spring assembly.

(7) Connect detent solenoid wire to electrical connector.

(8) Install intake pipe O-ring and install oil filter.

(9) Install gasket on oil pan and install oil pan. Tighten oil pan bolts to 12 foot-pounds torque.

(10) Lower vehicle.

(11) Fill transmission with Jeep transmission fluid, Dexron, or equivalent.

GOVERNOR VALVE

Removal

(1) Raise vehicle.

(2) Remove governor cover attaching screws, cover, and gasket. Discard gasket.

(3) Remove governor assembly.

(4) Refer to Service Procedures—Out of Vehicle for governor valve service procedures.

Installation

(1) Install governor assembly.

(2) Install attaching screws, gasket, and cover.

(3) Lower vehicle.

(4) Add transmission fluid, if required. Check level as outlined in Checking Fluid Level.

MODULATOR AND MODULATOR VALVE

Removal

(1) Raise vehicle.

(2) Remove modulator assembly attaching screw and retainer.

(3) Remove modulator assembly. Discard O-ring seal.

(4) Remove modulator valve from case.

Installation

(1) Install modulator valve into case.

(2) Install new O-ring seal on modulator assembly.

(3) Install modulator assembly, attaching screws, and retainer.

(4) Lower vehicle. Check and correct fluid level as outlined in Checking Fluid Level.

PARKING LINKAGE

Removal

(1) Raise vehicle.
(2) Remove oil pan and oil filter. Discard pan gasket.
(3) Unthread jamnut holding detent lever on manual shaft.
(4) Remove manual shaft retaining pin from case (bend pin with pliers).
(5) Remove manual shaft and jamnut from case.
(6) Remove parking actuator rod and detent lever assembly.
(7) Remove parking pawl bracket attaching screws and bracket.
(8) Remove parking pawl return spring.
(9) Remove parking pawl shaft retainer.
(10) Remove cup plug, parking pawl shaft, and parking pawl.

Installation

(1) Install cup plug, parking pawl shaft, and parking pawl.
(2) Install parking pawl into retainer.
(3) Install parking pawl return spring.
(4) Install parking pawl bracket attaching screws and bracket.
(5) Install parking actuator rod and detent lever assembly.
(6) Install manual shaft and jamnut to case.
(7) Install manual shaft retaining pin to case.
(8) Thread jamnut holding detent lever to manual shaft.
(9) Install oil filter, oil pan gasket, and oil pan. Tighten oil pan bolts to 12 foot-pounds torque.
(10) Lower vehicle.
(11) Fill transmission with Jeep transmission fluid, Dexron, or equivalent.

SERVICE PROCEDURES—OUT OF VEHICLE

TRANSMISSION REMOVAL

(1) Remove transmission dipstick.
(2) Raise vehicle on hoist.
(3) Mark front and rear universal joints and axle yokes for assembly reference.
(4) On Cherokee, Wagoneer and Truck models, remove parking brake cable jamnut and adjuster nut, remove clip attaching parking brake cable to crossmember and pull cable out of crossmember.
(5) On Cherokee and Wagoneer models with low range reduction unit, remove reduction unit shift lever from shift shaft.
(6) On CJ and Truck models with low range reduction unit, disconnect shift rod at reduction unit shift lever.
(7) Disconnect speedometer cable.
(8) Mark Emergency Drive control vacuum lines for assembly reference and disconnect lines.
(9) Disconnect Emergency Drive indicator lamp wire.
(10) Remove bolt attaching vacuum line routing bracket to rear of transfer case.
(11) Disconnect detent solenoid wire at transmission connecter.
(12) Remove starter.
(13) Remove transmission converter housing inspection cover.
(14) Mark torque converter and drive plate for assembly reference.
(15) Remove torque converter-to-drive plate attaching bolts.
(16) Remove rear support cushion-to-crossmember attaching nuts.
(17) Support transmission using transmission jack. Secure transmission to jack using safety chain.
(18) Remove rear crossmember.
(19) On all except six-cylinder CJ models, disconnect exhaust pipe at exhaust manifold, disconnect exhaust pipe at muffler and remove exhaust pipe. If equipped with catalytic converter, disconnect exhaust pipe at converter flange and remove pipe.

(20) Remove spring clip and flat washer from transmission shift rod trunnion, disengage trunnion at bell crank and remove wave washer from trunnion.

(21) Remove spring clip attaching bellcrank to transmission shift lever.

(22) Remove bolts attaching bellcrank bushing bracket to frame and remove bellcrank and bracket as assembly.

(23) Disconnect front propeller shaft at transfer case yoke and secure shaft to frame using wire.

(24) Disconnect transmission oil cooler lines at transmission fittings.

(25) Disconnect engine-to-modulator vacuum hose at modulator.

(26) Position support stand under engine.

(27) Remove transmission filler tube.

(28) Remove converter housing-to-engine attaching bolts.

(29) Move transmission rearward until it clears crankshaft.

(30) Hold converter in position and lower transmission until it clears engine.

(31) If necessary, the following components can now be serviced:

- Torque converter
- Oil pump and seal
- Engine core hole plugs
- Engine oil galley plugs

TRANSMISSION INSTALLATION

(1) Raise transmission and align torque converter and drive plate using reference marks made during transmission removal.

(2) Move transmission forward and manuever transmission as necessary to align engine dowels with converter housing dowel holes.

(3) Install two converter housing-to-engine lower attaching bolts and tighten bolts alternately and evenly to pull transmission into place against engine.

(4) Install remaining converter housing-to-engine bolts and tighten bolts to 28 foot-pounds torque.

(5) Install transmission filler tube.

(6) Remove engine support stand.

(7) Connect vacuum hose to modulator.

(8) Connect transmission oil cooler lines to transmission fittings.

(9) Connect front propeller shaft to transfer case yoke and tighten universal joint U-bolts to 15 foot-pounds torque.

(10) Mount bellcrank and bracket assembly on frame and install attaching bolts.

(11) Install bellcrank-to-transmission shift lever retaining spring clip.

(12) Install exhaust pipe if removed.

NOTE: *If the vehicle is equipped with a catalytic converter, the flange gasket surface must be cleaned thoroughly to prevent any exhaust leaks which could burn out the gasket.*

(13) Install rear crossmember.

(14) Remove transmission jack.

(15) Install rear support cushion-to-crossmember attaching nuts.

(16) Install torque converter-to-drive plate attaching bolts.

(17) Install converter housing inspection cover.

(18) Install starter.

(19) Connect detent solenoid wire to transmission connector.

(20) Install vacuum hose routing bracket attaching bolt.

(21) Connect Emergency Drive indicator lamp wire to switch.

(22) Connect Emergency Drive vacuum lines to transfer case vacuum control.

(23) Connect speedometer cable.

(24) On Wagoneer and Cherokee models with reduction unit, install shift lever on reduction unit shift shaft.

(25) On CJ and Truck models with reduction unit, connect shift rod to shift lever.

(26) On Wagoneer, Cherokee and Truck models, insert parking brake cable through crossmember, install retaining clip and install cable adjuster nut and jamnut. Adjust parking brake as outlined in Section 9—Brakes.

(27) Install rear propeller shaft. Refer to alignment reference marks made during shaft removal.

(28) Connect transmission shift rod adjuster trunnion to bellcrank and adjust linkage as outlined in this section.

(29) Lower vehicle.

(30) Fill transmission to correct level using Jeep Automatic Transmission Fluid, Dexron or equivalent.

(31) Road test vehicle to verify proper transmission operation.

TORQUE CONVERTER

With the transmission removed and mounted on a transmission jack, remove the torque converter by pulling it straight out of the housing.

NOTE: *It is not necessary to replace the converter when a transmission malfunction has occurred unless the converter has malfunctioned or is damaged. However, it is recommended that the transmission and converter be properly cleaned, oil filter replaced and cooler and cooler lines flushed after any problem that generates sludge, dirt, or chips.*

TRANSMISSION DISASSEMBLY

(1) Remove transfer case.

(2) Install Holding Fixture J-8763-01 on transmission case with modulator positioned on side of holding fixture nearest bench.

CAUTION: *Do not overtighten the holding fixture clamp screw. This will bind the center support.*

(3) Install fixture and transmission in Holding Tool Base J-3289-20 with oil pan facing upward (fig. 7-5).

(4) Remove modulator attaching screw and retainer.

(5) Remove modulator and O-ring seal from adapter and remove adapter.

(6) Remove modulator valve.

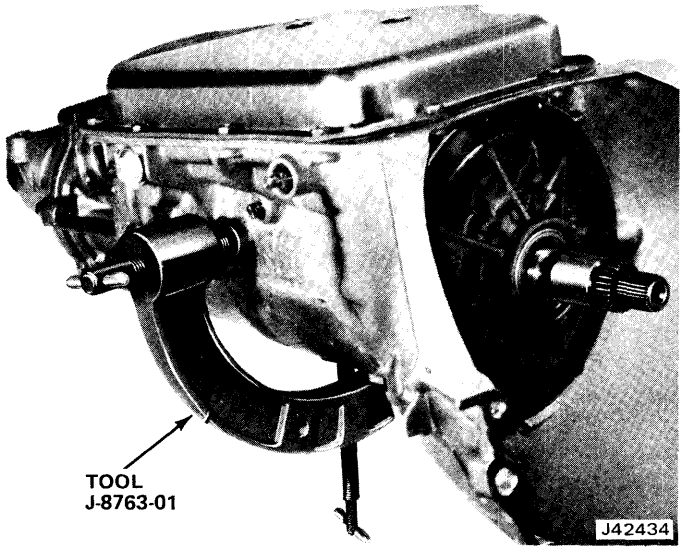


Fig. 7-5 Transmission Mounted in Holding Fixture J-8763-01

Governor-Oil Pan-Oil Filter-Intake Pipe

Removal

(1) Remove governor cover attaching screws and remove cover and gasket (fig. 7-6). Discard gasket.

(2) Remove governor assembly.

(3) Remove oil pan and gasket (fig. 7-7). Discard gasket.

(4) Remove oil filter retainer bolt and remove oil filter and intake pipe (fig. 7-8). Discard filter.

(5) Remove intake pipe-to-case O-ring from intake pipe or case. Discard O-ring.

Detent Roller and Spring-Control Valve-Governor Screen-Governor Pipes

Removal

(1) Remove detent roller spring (fig. 7-9). Do not remove detent solenoid bolts.

(2) Disconnect detent solenoid wire at electrical connector.

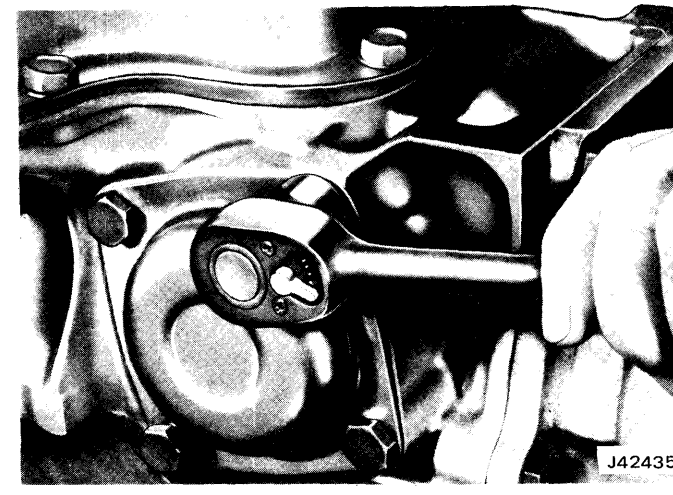


Fig. 7-6 Removing—Installing Governor Cover

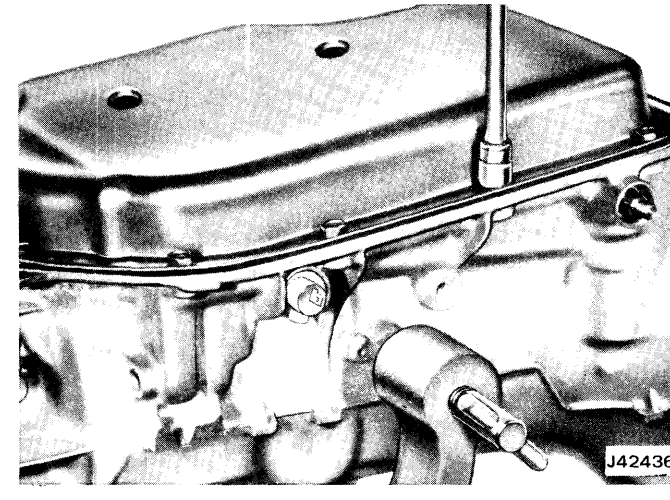


Fig. 7-7 Removing—Installing Oil Pan

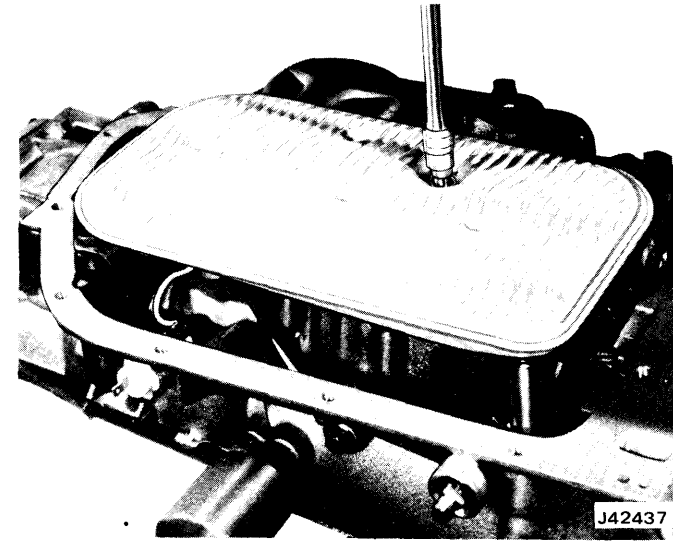


Fig. 7-8 Removing—Installing Oil Filter

(3) Remove control valve attaching bolts and remove control valve and governor pipes (fig. 7-10).

CAUTION: *Do not allow the manual valve to fall out when removing the control valve.*

(4) Remove governor screen from end of governor pipe or governor pipe hole in case (fig. 7-11). Clean screen in solvent and allow it to air dry.

(5) Remove governor pipes from control valve assembly.

(6) Remove control valve-to-spacer gasket.

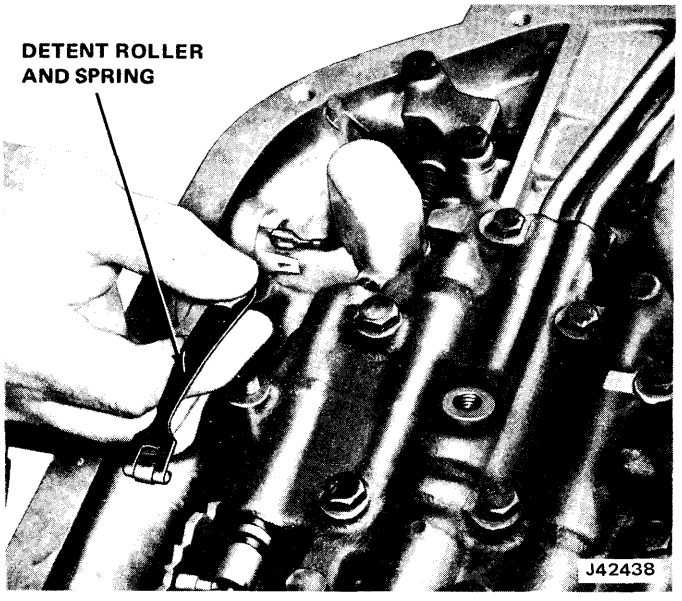


Fig. 7-9 Removing—Installing Detent Roller and Spring

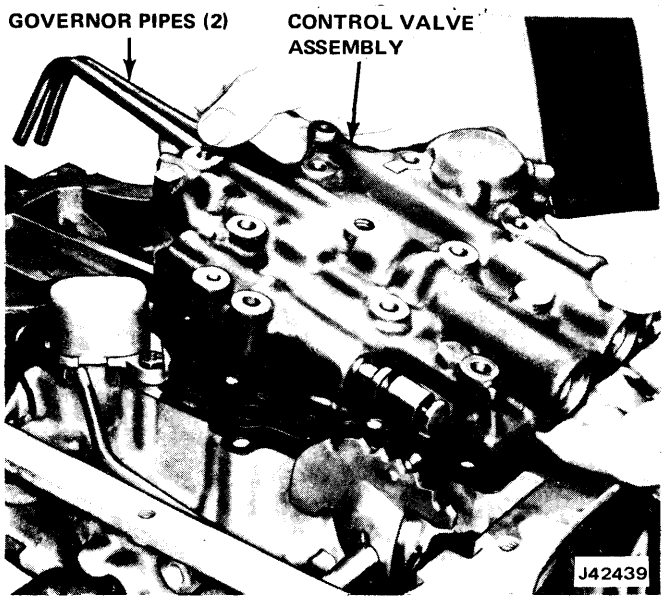


Fig. 7-10 Removing Control Valve and Governor Pipes

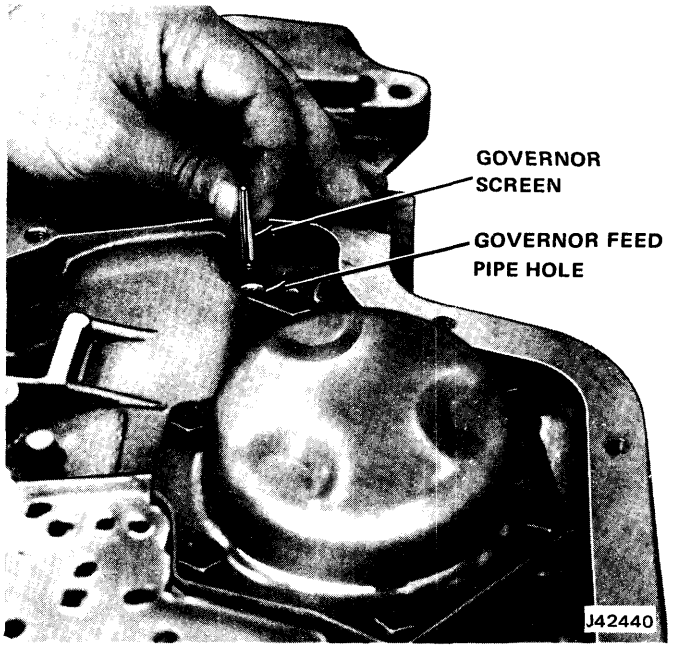


Fig. 7-11 Removing—Installing Governor Screen

Rear Servo

Removal

(1) Remove rear servo cover and gasket. Discard gasket (fig. 7-12).

(2) Remove rear servo assembly (fig. 7-13).

(3) Remove rear servo accumulator spring from case.

Selecting Rear Band Apply Pin

(1) Attach Fixtures J-21370-5 and J-21370-6 to transmission case using rear servo cover attaching screws (fig. 7-14). Tighten screws to 8 foot-pounds torque.

NOTE: *These fixtures will be used to determine the correct rear band-apply pin. Band-apply pins are supplied in three lengths to adjust rear servo operation.*

(2) Apply 25 foot-pounds torque to Fixture J-21370 (fig. 7-14) and determine proper band-apply pin to be used during transmission assembly as follows:

(a) If both steps of J-21370-5 pin fixture are below gauge surface, use longest pin which has three identifying rings.

(b) If gauge surface is between steps, use medium length pin which has two identifying rings.

(c) If both steps are above gauge surface, use short pin which has one identifying ring.

NOTE: *The identifying rings are located on the band lug-end of each pin.*

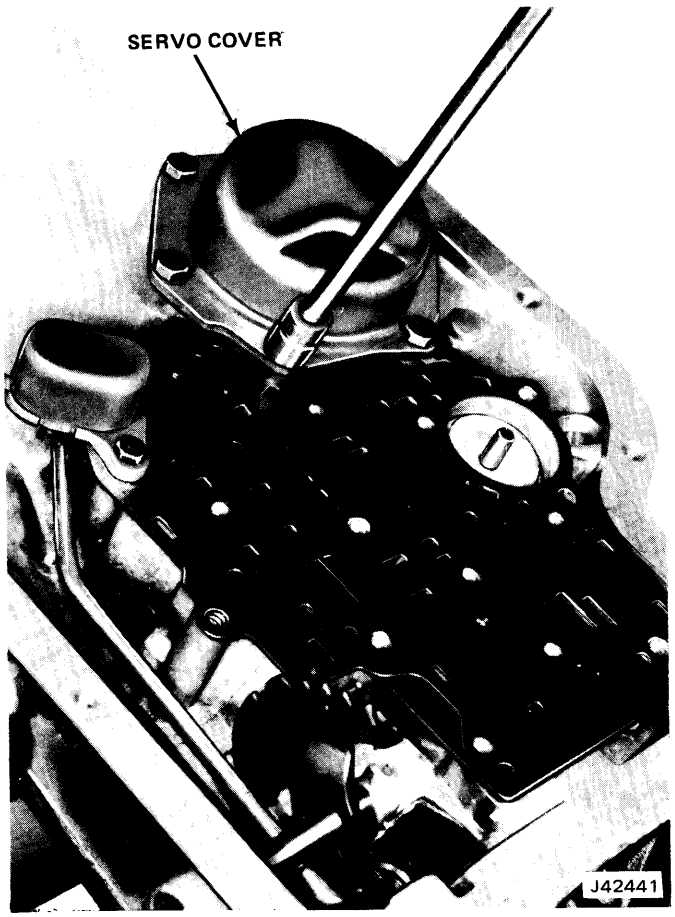


Fig. 7-12 Removing—Installing Rear Servo Cover

Fig. 7-13 Removing—Installing Rear Servo

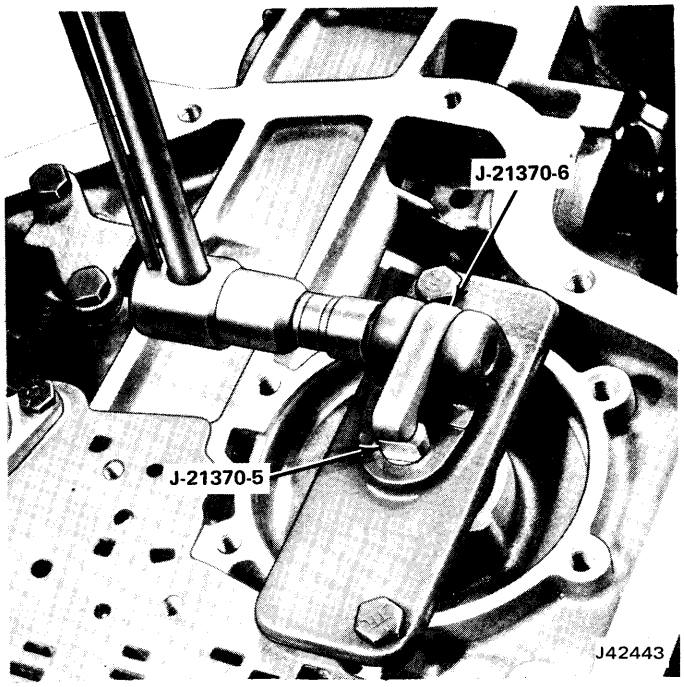


Fig. 7-14 Selecting Rear Band-Apply Pin

Detent Solenoid-Electrical Connector-Control Valve Spacer-Front Servo

Removal

(1) Remove detent solenoid and metal gasket. Discard gasket (fig. 7-15).

(2) Remove detent solenoid electrical connector and O-ring seal (fig. 7-16).

(3) Remove control valve spacer plate and gasket.

(4) Remove six check balls from passages in case (fig. 7-17).

(5) Remove front servo piston, washer, pin, retainer and spring (fig. 7-18).

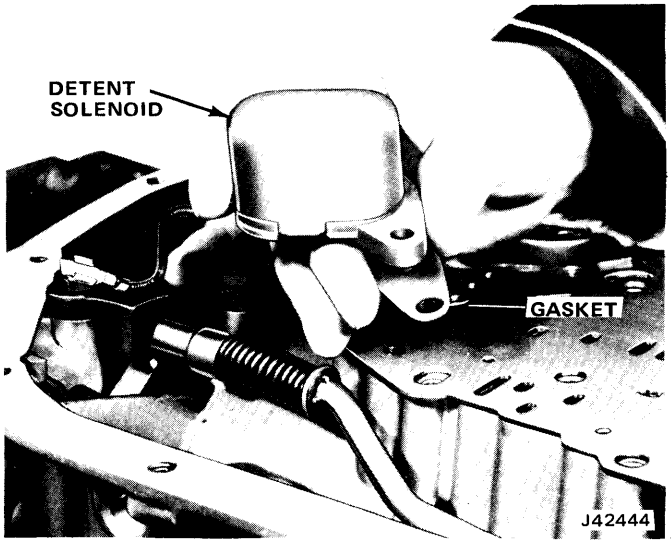


Fig. 7-15 Removing—Installing Detent Solenoid and Gasket

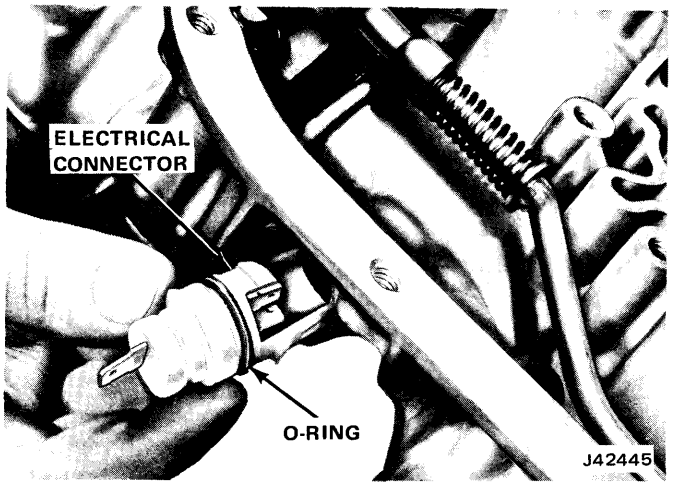


Fig. 7-16 Removing—Installing Electrical Connector and O-Ring

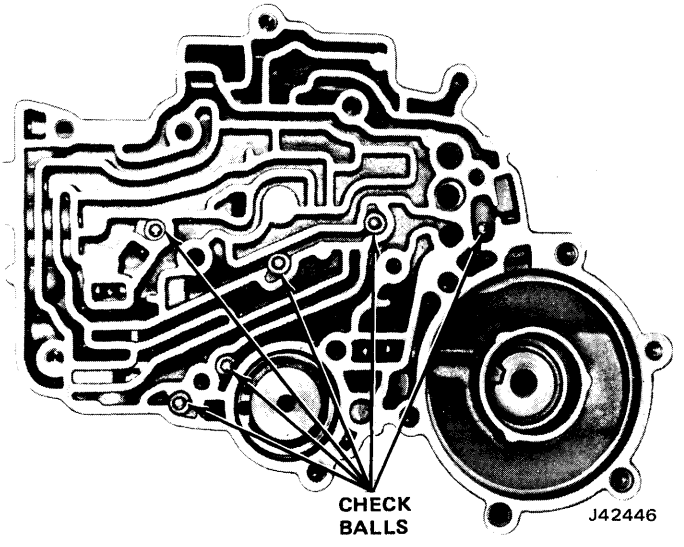


Fig. 7-17 Control Valve Check Ball Location

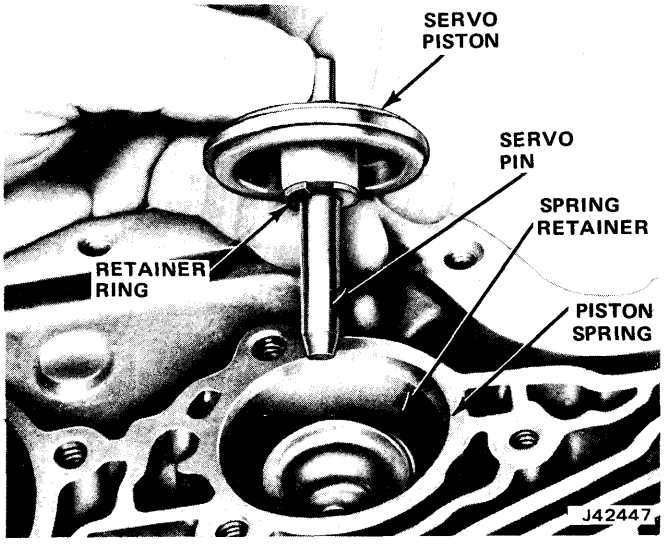


Fig. 7-18 Removing—Installing Front Servo Piston

Extension Housing and Rear Bearing

Removal

(1) Remove snap ring from output shaft sleeve.
(2) Remove gear.
(3) Remove output shaft sleeve-to-bearing snap ring.
(4) Remove output shaft sleeve from bearing.
(5) Remove bearing-to-case extension snap ring and remove bearing. Remove two seals if necessary.
(6) Remove extension housing (fig. 7-19).
(7) Inspect bearing, sleeve, splines, and snap ring groove for damage.

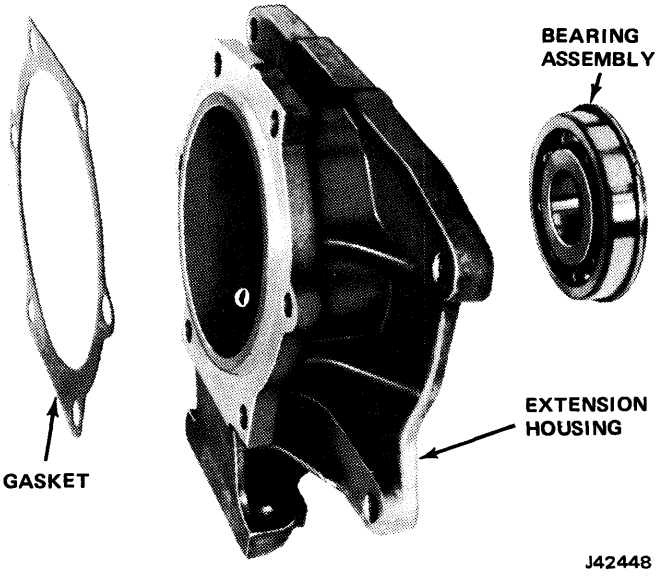


Fig. 7-19 Extension Housing and Rear Bearing

Measuring Front Unit End Play

(1) Remove one oil pump attaching bolt and washer from 5 or 10 o'clock position on pump.
(2) Install 3/8—16 slide hammer bolt in bolt hole.
(3) Mount dial indicator on slide hammer bolt and position indicator stylus so it contacts end of turbine shaft (fig. 7-20).
(4) Push turbine shaft rearward.
(5) Move output shaft forward to remove front unit end play.
(6) Insert screwdriver between case and rear gear unit and pry gear unit and output shaft forward.
(7) Set dial indicator to zero.
(8) Pull turbine shaft forward and measure end play. Front unit end play should be 0.003 to 0.024 inch. Record reading for assembly reference.

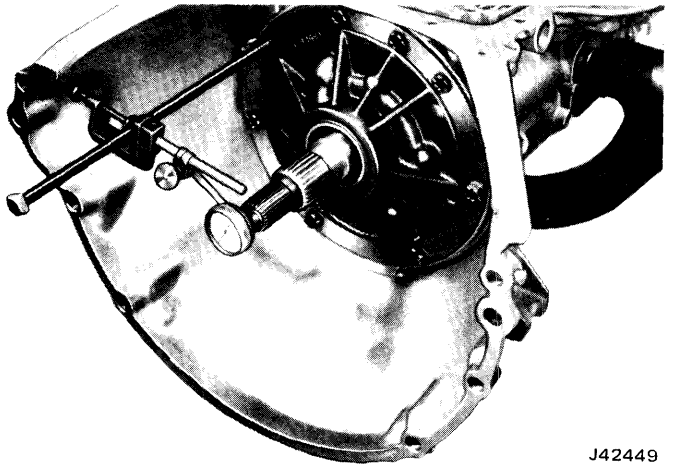


Fig. 7-20 Measuring Front Unit End Play

NOTE: *The selective thrust washer that determines front unit end play is located between the pump cover and forward clutch housing. If increased or decreased washer thickness is required to adjust end play to within specifications, select the necessary thrust washer from one of the following:*

Front Unit End Play Thrust Washer Chart

Thickness (Inch)	Notches and/or Numeral	
0.074 to 0.078	None	1
0.082 to 0.086	1 Tab Side	2
0.090 to 0.094	2 Tabs Side	3
0.098 to 0.102	1 Tab OD	4
0.106 to 0.110	2 Tabs OD	5
0.114 to 0.118	3 Tabs OD	6

70519

NOTE: *An oil-soaked washer will tend to discolor, so it may be necessary to measure the existing washer in order to determine the actual thickness.*

Oil Pump-Forward Clutch-Turbine Shaft-Direct Clutch

Removal

(1) Remove front seal from oil pump (fig. 7-21).

(2) Remove pump attaching bolts and washers.

(3) Install two 3/8—16 slide hammer bolts in threaded holes in pump body at 5 and 10 o'clock positions.

(4) Bump outward evenly with slide hammers and remove pump (fig. 7-22).

(5) Remove and discard pump-to-case seal ring and gasket.

(6) Remove forward clutch and turbine shaft (fig. 7-23).

(7) Remove forward clutch hub to direct clutch housing thrust washer if it did not come out with forward clutch housing.

(8) Remove direct clutch (fig. 7-24).

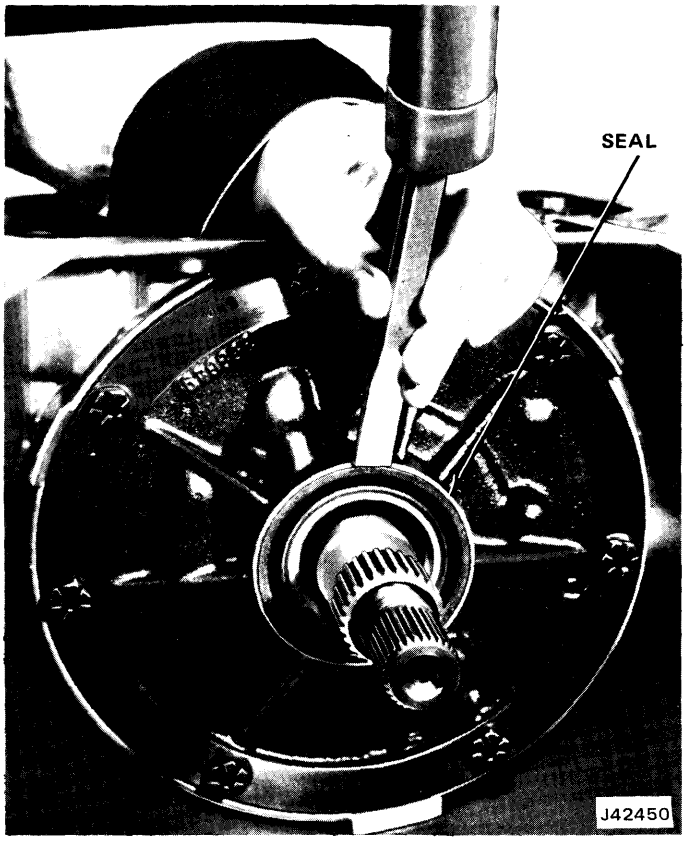


Fig. 7-21 Removing Oil Pump Seal

Fig. 7-22 Removing Oil Pump

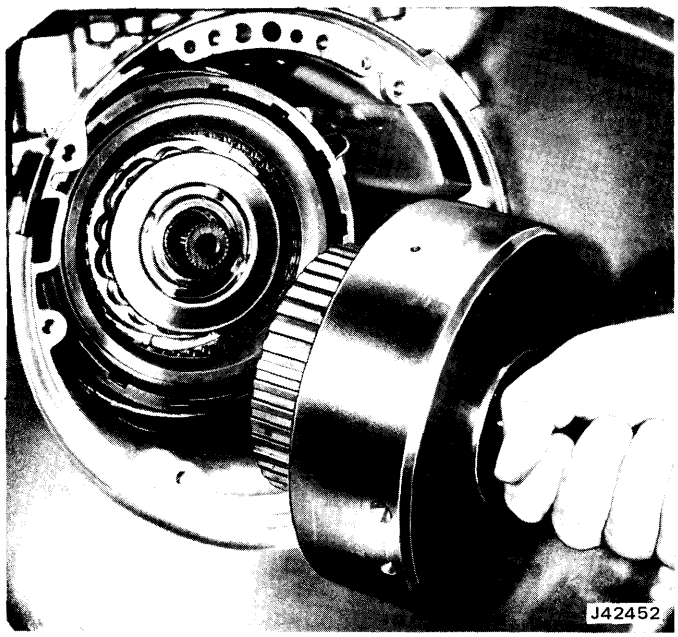


Fig. 7-23 Removing—Installing Forward Clutch

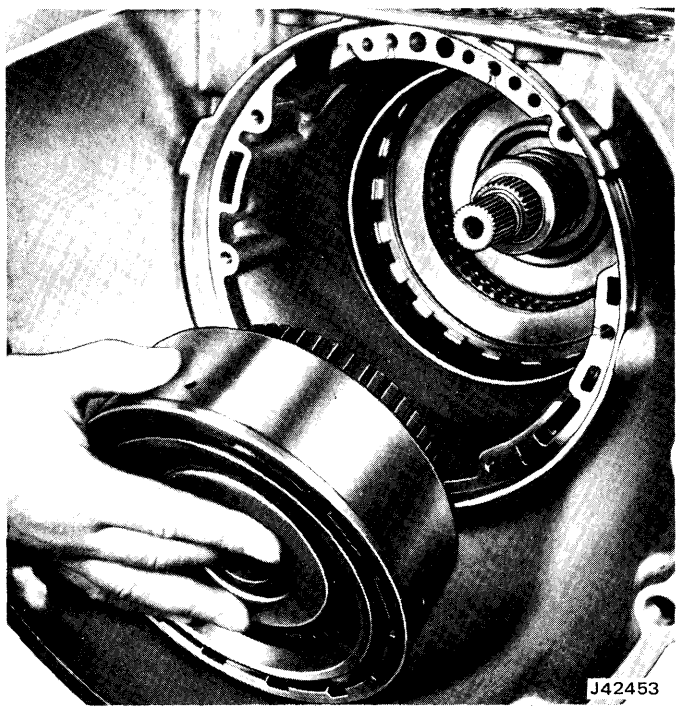


Fig. 7-24 Removing—Installing Direct Clutch

Manual Shaft and Parking Pawl

Removal

(1) Unthread jamnut retaining detent lever on manual shaft.

(2) Remove manual shaft retaining pin (fig. 7-25).

CAUTION: *Do not unthread the jamnut as it comes off the manual shaft.*

(3) Remove jamnut, manual shaft, and seal.

(4) Remove manual shaft-to-case seal using screwdriver.

(5) Remove parking actuator rod and detent lever assembly.

(6) Remove parking bracket attaching screw and remove bracket (fig. 7-26).

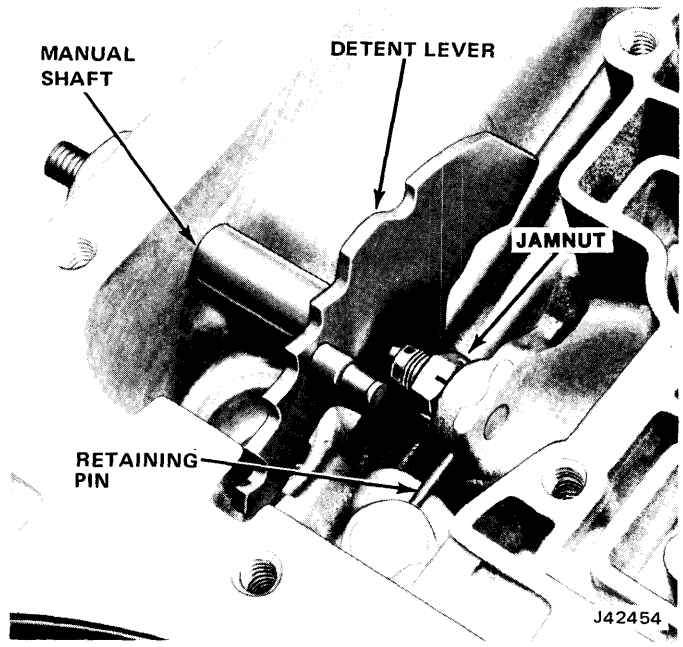


Fig. 7-25 Manual Shaft and Retaining Pin

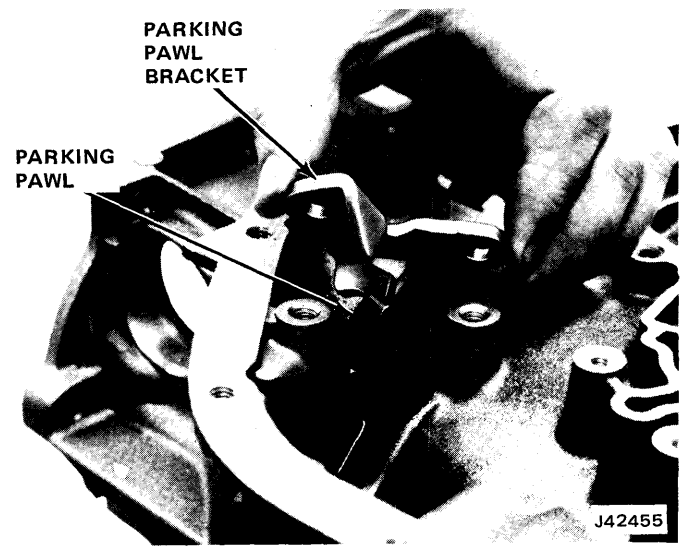


Fig. 7-26 Removing Parking Pawl Bracket

(7) Remove retainer spring from parking pawl shaft (fig. 7-27).

(8) Remove parking pawl shaft cup plug. Insert screwdriver between parking pawl shaft and case rib and pry outward on shaft to remove plug (fig. 7-28).

(9) Remove parking pawl return spring, parking pawl shaft, and parking pawl (fig. 7-29).

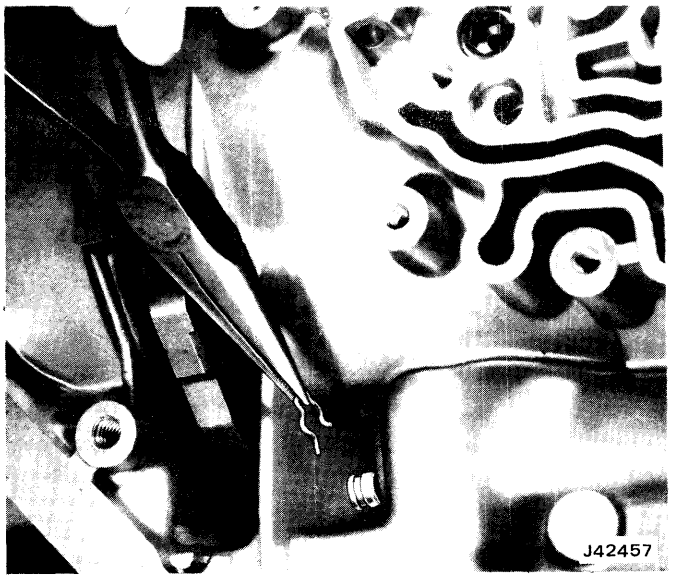


Fig. 7-27 Removing—Installing Parking Pawl Shaft Retainer Spring

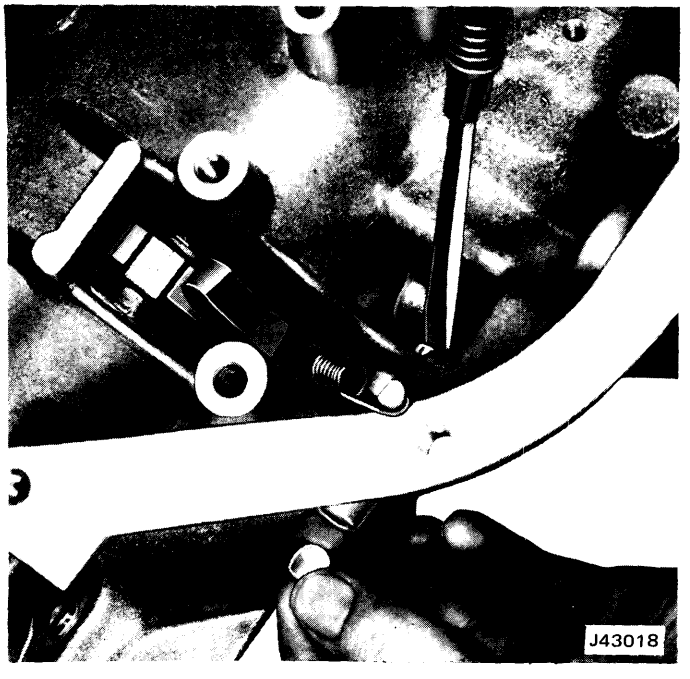


Fig. 7-28 Removing Parking Pawl Shaft Cup Plug

Front Band and Sun Gear Shaft

Removal

(1) Remove front band assembly (fig. 7-30).
(2) Remove sun gear shaft (fig. 7-31).

Measuring Rear Unit End Play

(1) Install rod from Tool J-25118 in extension housing attaching bolt hole.
(2) Mount dial indicator on rod and position indicator so stylus contacts end of output shaft (fig. 7-32).

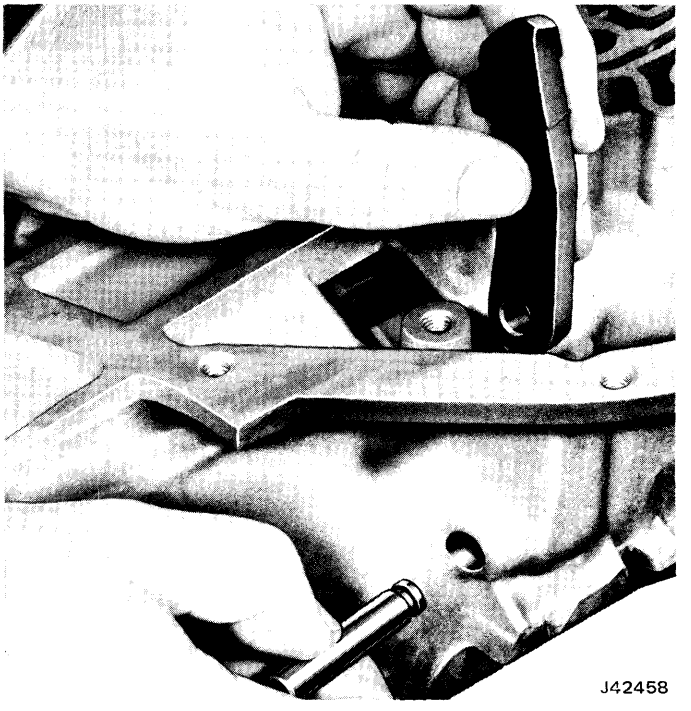


Fig. 7-29 Removing Parking Pawl and Pawl Shaft

(3) Move output shaft inward and outward and measure end play. End play should be 0.007 to 0.019 inch. Selective washer that determines rear unit end play is steel washer with three lugs and is located between thrust washer and rear face of transmission case. If different washer thickness is required to adjust end play select it from following chart:

Rear Unit Thrust Washer Chart

Thickness (Inch)	Notches and/or Numeral	
0.074 to 0.078	None	1
0.082 to 0.086	1 Tab Side	2
0.090 to 0.094	2 Tabs Side	3
0.098 to 0.102	1 Tab OD	4
0.106 to 0.110	2 Tabs OD	5
0.114 to 0.118	3 Tabs OD	6

70519

Intermediate Clutch

Removal

(1) Remove center support-to-case retaing bolt using a 3/8, 12-point, thin wall deep socket (fig. 7-33).
(2) Remove intermediate clutch backing plate-to-case snap ring.
(3) Remove intermediate clutch backing plate, three composition clutch plates and three steel clutch plates (fig. 7-34).

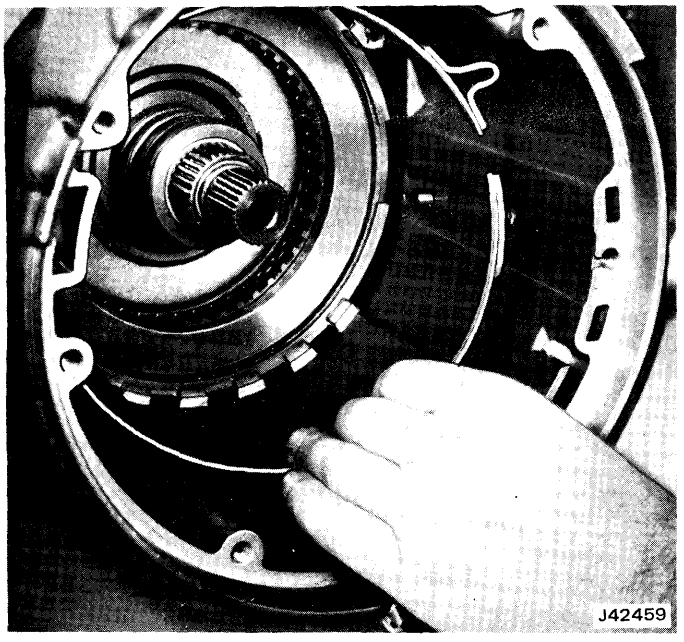


Fig. 7-30 Removing—Installing Front Band

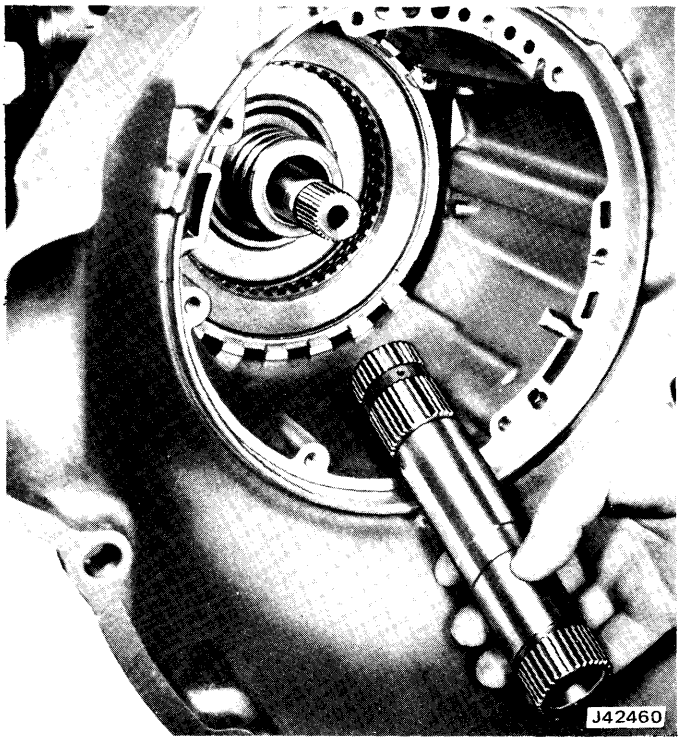


Fig. 7-31 Removing Sun Gear Shaft

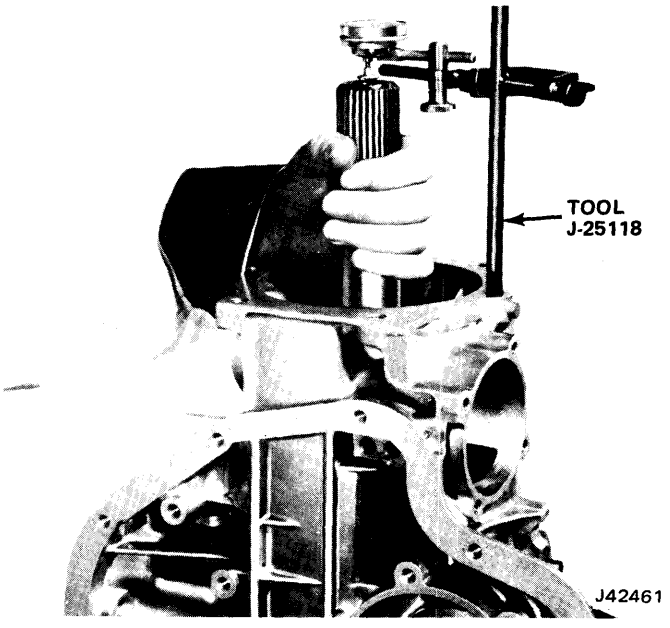


Fig. 7-32 Measuring Rear Unit End Play

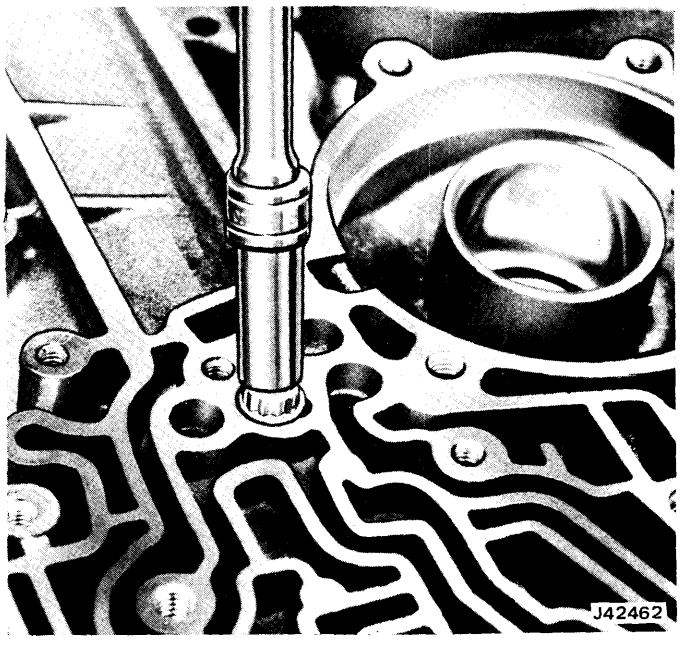


Fig. 7-33 Removing—Installing Center Support Bolt

Center Support and Rear Band

Removal

(1) Remove center support to case snap ring (fig. 7-35).

(2) Remove center support and gear unit from transmission case using Remover and Installer Tool J-21795 and Slide Hammer J-25118 (fig. 7-36).

(3) Remove metal output shaft-to-case thrust washer from rear of output shaft or from case.

(4) Place gear unit assembly, with output shaft facing downward, in hole in work bench and Holding Fixture J-21364.

(5) Remove rear unit selective washer from transmission case (fig. 7-37).

(6) Remove support-to-case spacer ring (fig. 7-37).

(7) Remove rear band (fig. 7-38).

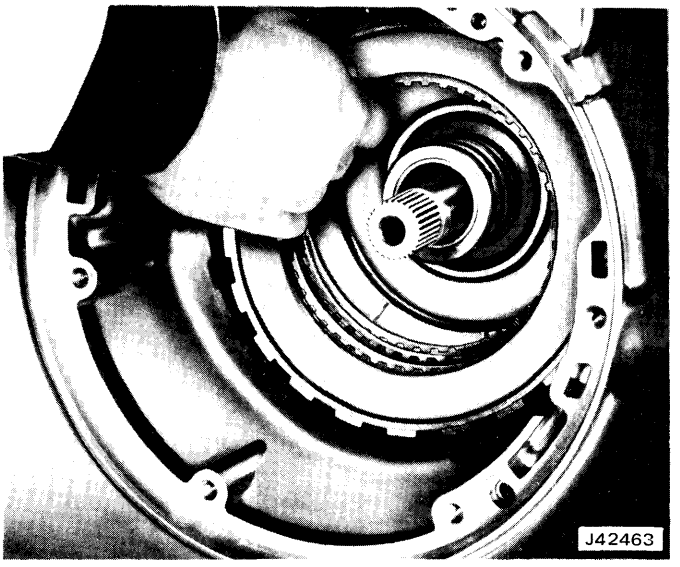


Fig. 7-34 Removing Intermediate Clutch Plates

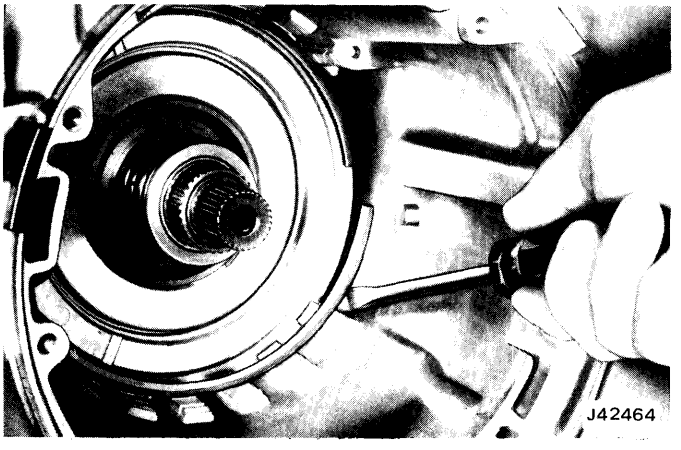


Fig. 7-35 Removing Center Support Snap Ring

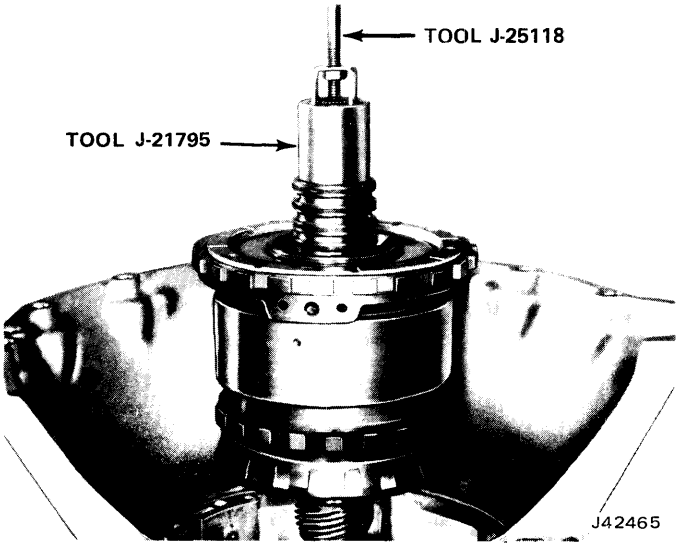


Fig. 7-36 Removing Center Support and Gear Unit

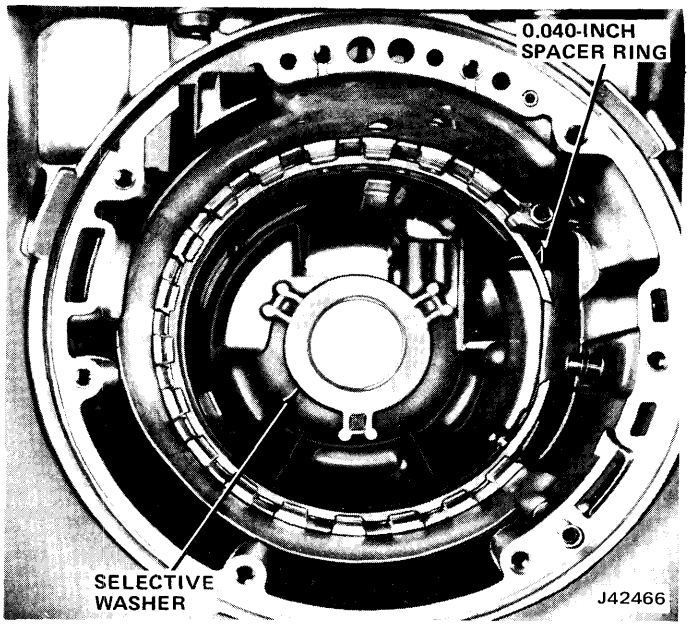


Fig. 7-37 Selective Washer and Spacer Ring

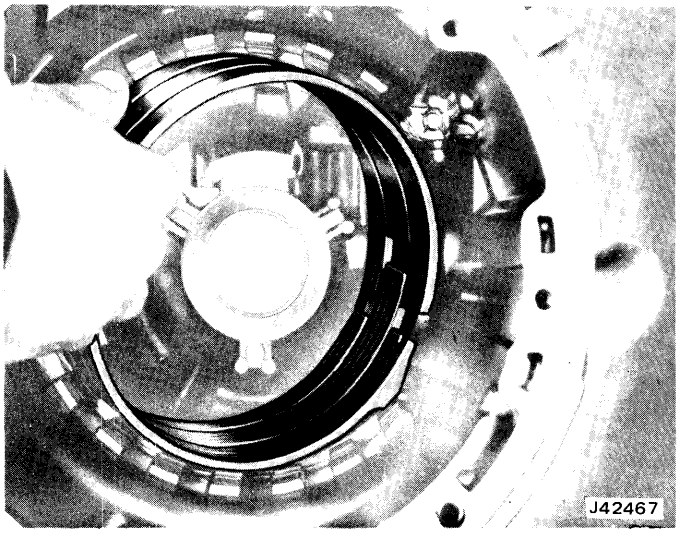


Fig. 7-38 Removing Rear Band

SUBASSEMBLY OVERHAUL

Center Support and Gear Unit

(1) Lift and remove center support from gear unit (fig. 7-39).

(2) Remove thrust washer located between center support and reaction carrier (fig. 7-40).

(3) Remove center support-to-sun gear races and thrust bearing.

(4) Remove reaction carrier and roller clutch from output carrier as assembly (fig. 7-41).

(5) Remove front internal gear ring from output carrier (fig. 7-41).

(6) Remove sun gear from output carrier (fig. 7-42).

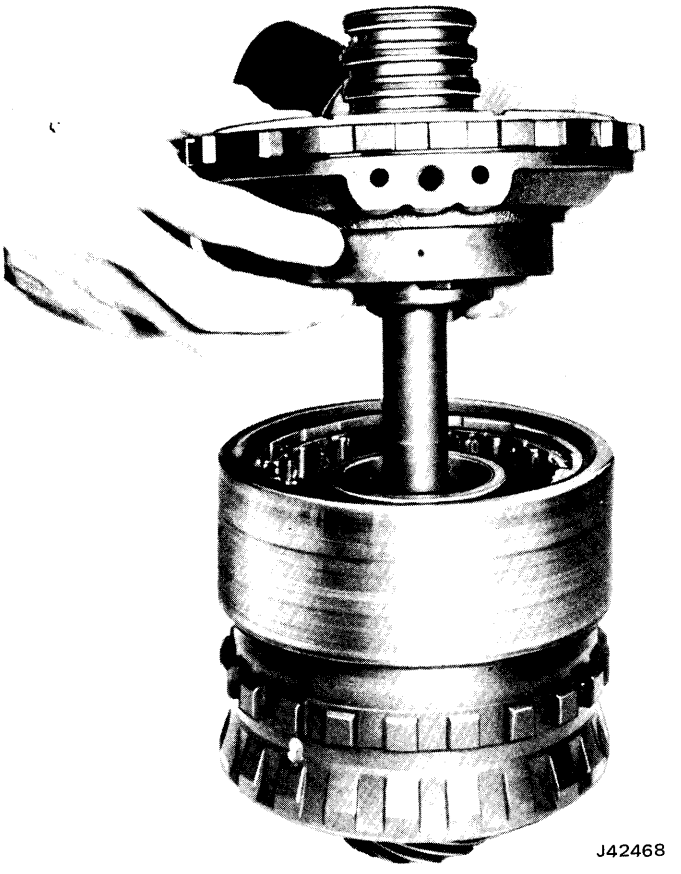


Fig. 7-39 Removing Center Support from Gear Unit

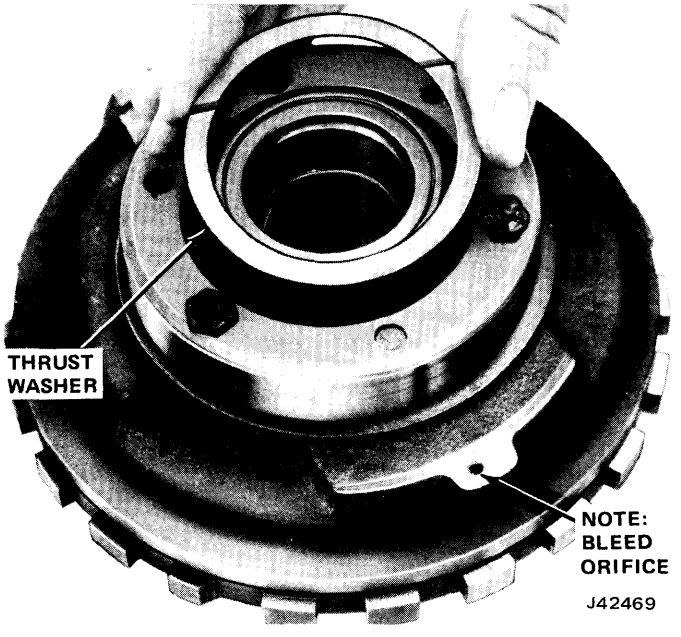


Fig. 7-40 Removing—Installing Center Support Thrust Washer

(7) Remove plastic or metal thrust washer located between reaction carrier and output carrier.

NOTE: *The plastic washer is factory installed only. Service replacement washers are made of metal.*

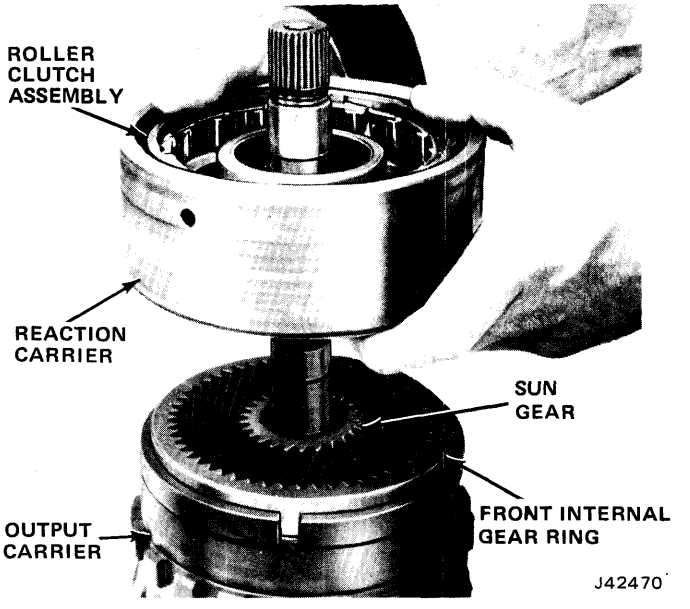


Fig. 7-41 Removing Reaction Carrier and Roller Clutch from Output Carrier

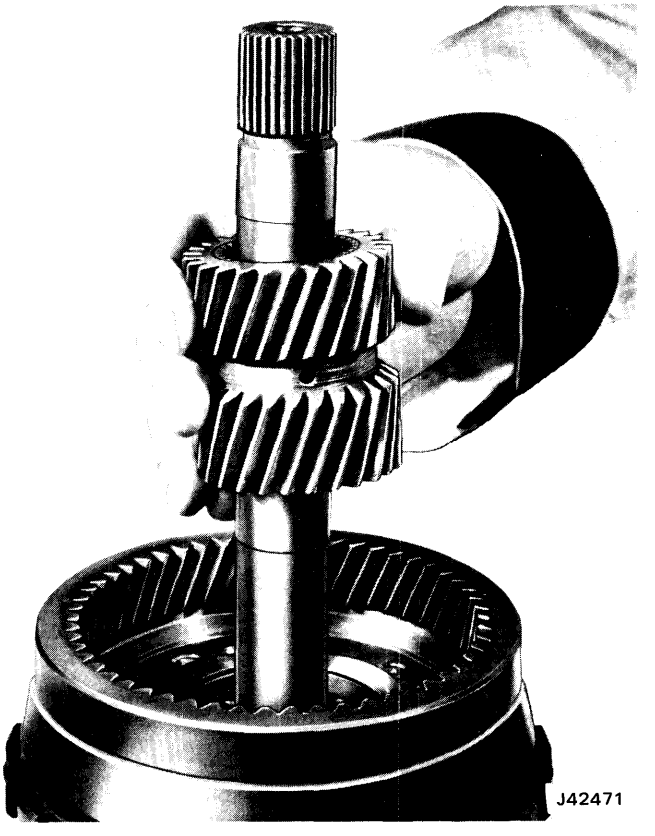


Fig. 7-42 Removing Sun Gear

(8) Turn output carrier over.

(9) Remove snap ring retaining output shaft to output carrier.

(10) Remove shaft from carrier.

(11) Remove output shaft-to-rear internal gear thrust bearing and two races from rear internal gear and main shaft.

(12) Remove rear internal gear and main shaft from output carrier (fig. 7-43).

(13) Remove rear internal gear to sun gear thrust bearing and two races from main shaft.

(14) Remove rear internal gear-to-main shaft snap ring and remove gear from shaft (fig. 7-44).

Governor

All governor components, except the driven gear, are select-fit components and are individually calibrated assemblies. **The governor, including the driven gear, is serviced as a complete assembly only.** However, the driven gear may be serviced separately if required.

In order to replace the driven gear, it is necessary to disassemble the governor assembly.

NOTE: *Disassembly may also become necessary if dirt or foreign material has entered the governor causing improper operation.*

Disassembly

(1) Cut one end off each governor weight pin and remove pins, thrust cap, weights and springs (fig. 7-45).

NOTE: *The governor weights are interchangeable from side to side and need not be identified.*

(2) Remove governor valve from governor sleeve. Do not damage valve.

Cleaning and Inspection

Wash all parts in clean solvent, air dry the parts and blow out all passages using compressed air.

Inspect the governor sleeve for nicks, burrs, scoring, or galling.

Check the governor sleeve for free operation in the case bore.

Inspect the governor valve for nicks, burrs, scoring, or galling.

Check the governor valve for free operation in the governor sleeve bore. Inspect the governor driven gear for nicks, burrs, or damage.

Check the governor driven gear for looseness on the governor sleeve. The sleeve must be tight on the carrier.

Inspect the governor weight springs for distortion or damage.

Check the governor weights for free operation in their retainers.

Check the valve opening at entry using a feeler gauge. Hold the governor so the weights are fully extended (fig. 7-46). Valve opening should be 0.020 inches minimum.

Check the valve opening at exhaust using a feeler gauge. Hold the governor so the weights are fully retracted (fig. 7-47). Valve opening should be 0.020 inches minimum.

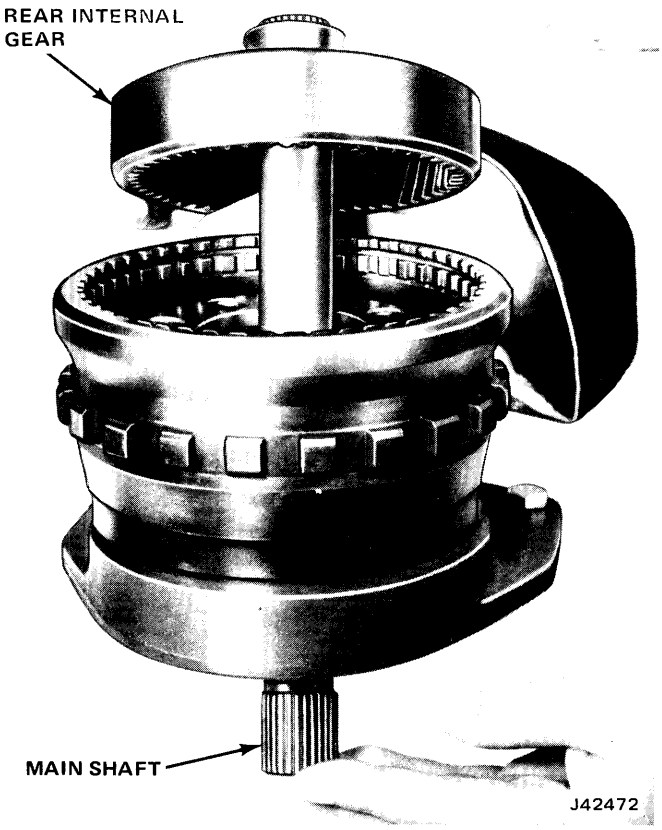


Fig. 7-43 Removing Rear Internal Gear and Main Shaft from Output Carrier

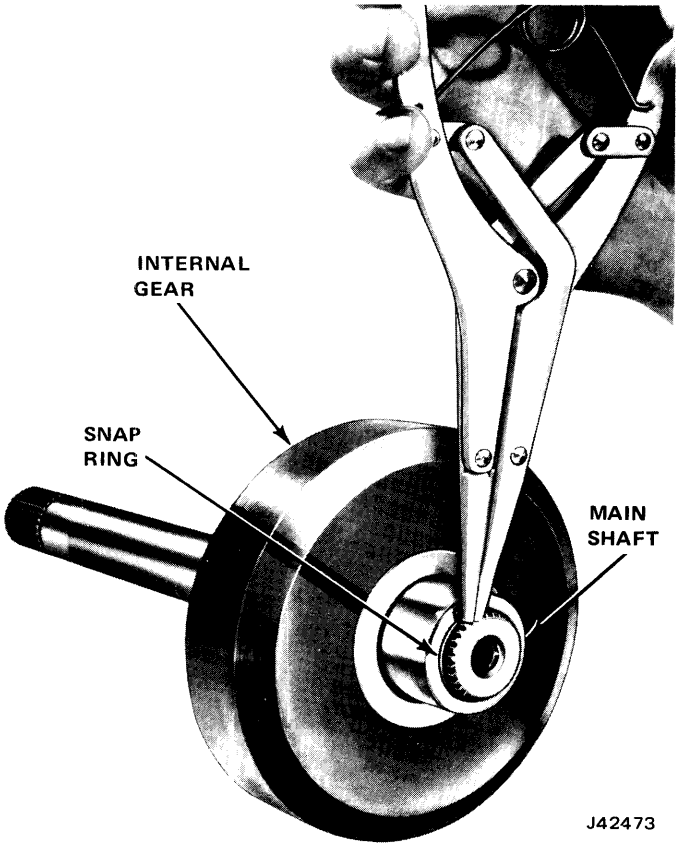


Fig. 7-44 Removing Main Shaft Snap Ring

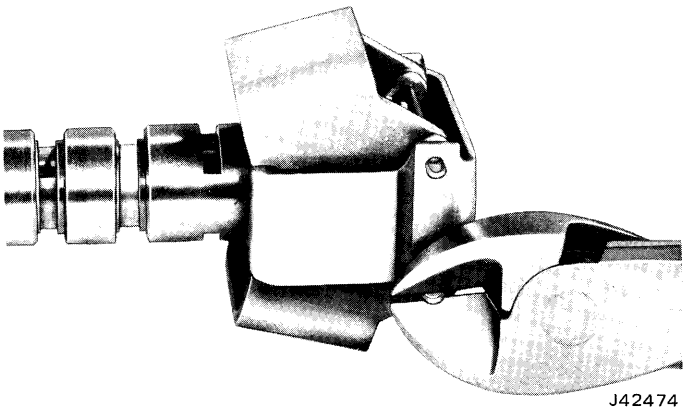


Fig. 7-45 Removing Governor Weight Pins

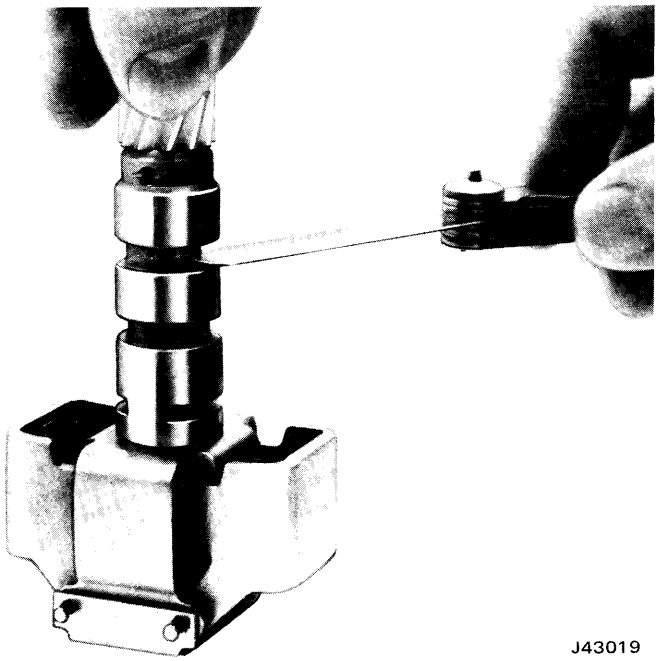


Fig. 7-46 Measuring Valve Opening at Entry

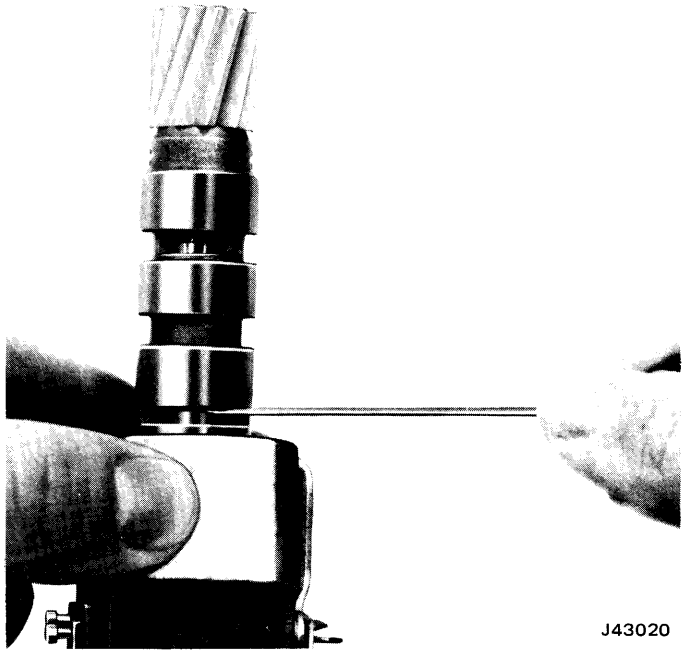


Fig. 7-47 Measuring Valve Opening at Exhaust

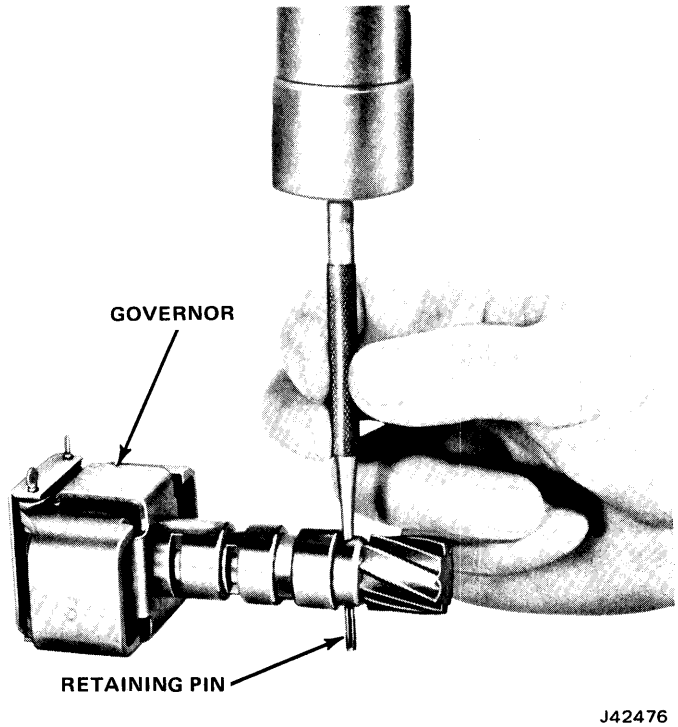


Fig. 7-48 Removing Governor Driven Gear Retaining Pin

Governor Driven Gear Replacement

A governor driven gear and replacement pins are available for service use.

The service package contains a nylon driven gear, two governor weight retaining pins and a governor gear retainer split pin. Gear replacement must be performed carefully and in the following sequence:

(1) Remove split pin that retains governor gear on governor sleeve using small punch (fig. 7-48).

(2) Support governor using 7/64-inch thick plates installed in exhaust slots of governor sleeve (fig. 7-49).

(3) Mount assembled parts in arbor press and use long punch to press gear out of sleeve.

(4) Clean chips from governor sleeve.

(5) Support governor on 7/64-inch plates installed in exhaust slots of sleeve.

(6) Insert replacement gear in sleeve.

(7) Press gear into sleeve using suitable size socket until gear is nearly seated (fig. 7-49).

(8) Remove any chips that may have shaved off gear hub and press gear inward until it bottoms on shoulder of sleeve.

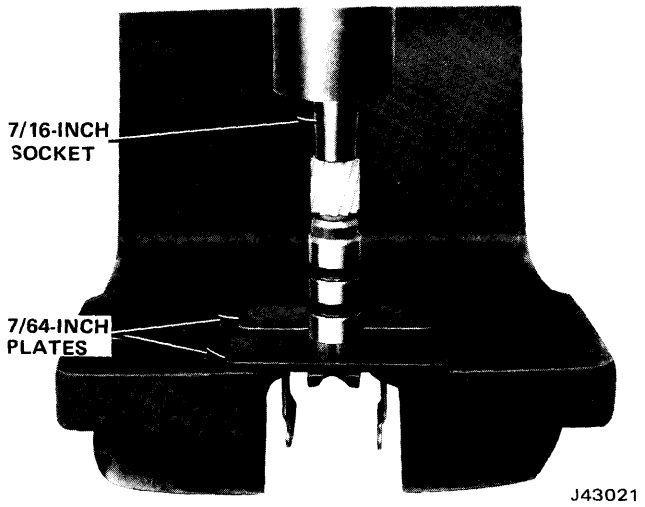


Fig. 7-49 Removing—Installing Governor Driven Gear

(9) Mark location of new pin hole in gear and sleeve. Center punch gear and sleeve and mount gear and sleeve in drill press.

NOTE: *Locate the new pin hole 90° from the original hole hole.*

(10) Drill new hole through sleeve and gear using 1/8-inch drill.

(11) Install retaining pin through gear and sleeve.

(12) Wash governor assembly thoroughly to remove chips.

Assembly

(1) Install governor valve in bore of governor sleeve (fig. 7-50).

(2) Install weights and springs.

(3) Install thrust cap on governor sleeve.

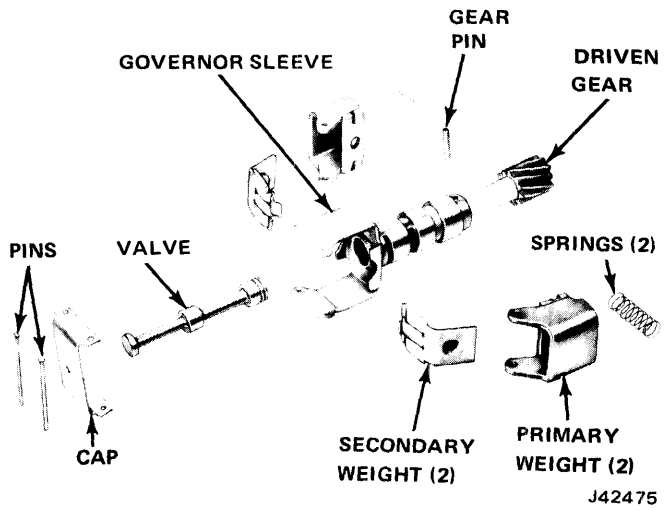


Fig. 7-50 Governor Assembly

(4) Align pin holes in thrust cap, governor weight assemblies and governor sleeve and install replacement pins. Crimp ends of pins to prevent them from falling out.

(5) Check governor weight assemblies for free operation on pins and check governor valve for free operation in sleeve.

Front Servo

NOTE: *Do not remove the teflon oil seal ring from the front servo piston unless the seal ring requires replacement. Service oil seal rings are aluminum instead of teflon.*

CAUTION: *The spring retainer, servo pin, retainer ring, and servo piston are identical for 1971 through 1976 transmissions but are not interchangeable with pre-1971 parts.*

Inspection

Inspect the servo pin for damage.

Inspect the piston, oil seal ring and seal ring groove for damage. Check for free movement of the ring in the ring groove.

Inspect the piston for cracks or porosity and check the fit of the servo pin in the piston (fig. 7-51).

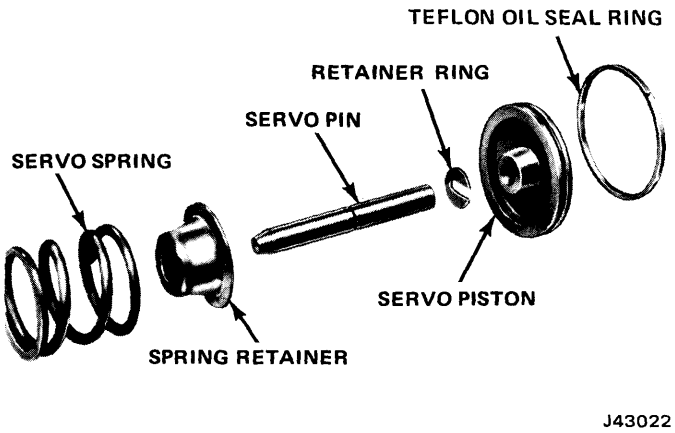


Fig. 7-51 Front Servo Assembly

Rear Servo and Accumulator

Disassembly

(1) Remove rear accumulator piston from rear servo piston (fig. 7-52).

(2) Remove E-Ring retaining rear servo piston to servo pin (fig. 7-53).

(3) Remove rear servo piston and seal from servo pin (fig. 7-53).

(4) Remove washer, spring, and retainer.

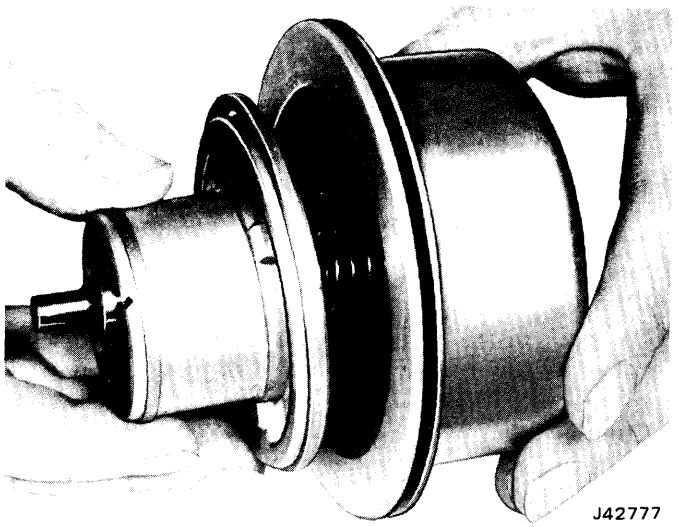


Fig. 7-52 Removing Accumulator Piston

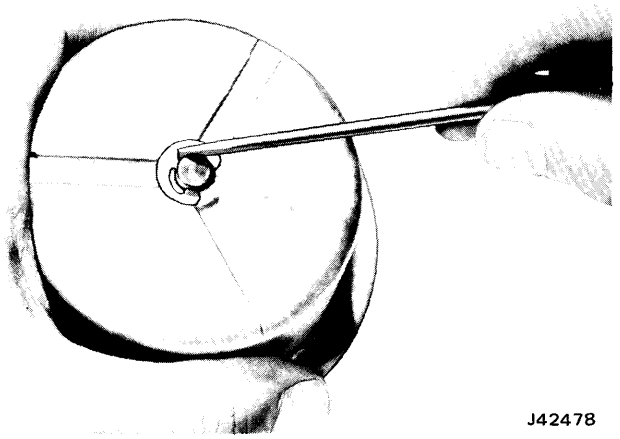


Fig. 7-53 Removing E-Ring Retainer

Inspection

NOTE: *Do not remove the teflon oil seal rings from the rear accumulator piston unless the oil seal rings require replacement. If the teflon inner oil seal ring (small diameter) requires replacement, use the aluminum oil seal ring supplied in the service replacement kit. The depth of the large diameter ring groove in the rear accumulator piston is machined shallower to accept the large teflon oil seal ring. If this ring requires replacement, use only a teflon oil seal ring as a replacement.*

Inspect the servo piston and piston oil grooves for damage (fig. 7-54).

Check for free movement of the seal rings in the piston grooves.

Check for free movement of the accumulator piston in the servo piston.

Inspect the servo pin for scores or cracks.

Inspect the accumulator and servo piston for cracks and porosity.

Assembly

(1) Install spring retainer with cap facing downward and install spring, and flat washer on servo pin (fig. 7-54).

(2) Insert servo pin into bore of servo piston and install E-Ring retainer.

(3) Install inner and outer oil rings on accumulator piston if removed.

(4) Install accumulator piston in bore of servo piston.

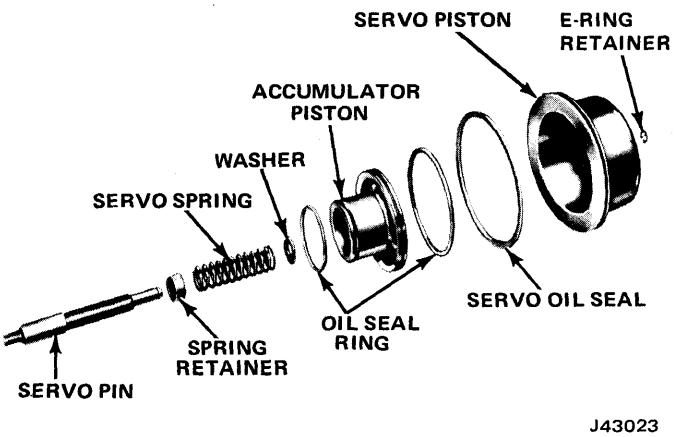


Fig. 7-54 Rear Servo and Accumulator Assembly

Control Valve

Disassembly

(1) Position control valve assembly so transmission mating surface is facing upward.

(2) Remove manual valve from upper bore.

(3) Remove accumulator piston retaining ring using Tool J-22269-01 (fig. 7-55).

(4) Remove accumulator piston and spring (fig. 7-56).

(5) Remove retaining pin, at right side of valve body and remove 1-2 bushing, 1-2 regulator valve, 1-2 regulator spring, 1-2 detent valve, and 1-2 valve (fig. 7-57).

(6) Remove retaining pin from next bore. Remove 2-3 bushing, 2-3 valve spring (if equipped), 2-3 modulator valve, 2-3 spring, and 2-3 valve (fig. 7-58).

(7) Remove retaining pin from next bore and remove bore plug, 3-2 spring, spacer, and 3-2 valve (fig. 7-58).

(8) Remove retaining pin, bore plug detent valve, detent regulator, detent spring, and spacer from upper bore in opposite side of valve body.

(9) Remove retaining pin from next bore and remove bore plug, 1-2 accumulator valve and 1-2 accumulator primary spring (fig. 7-57).

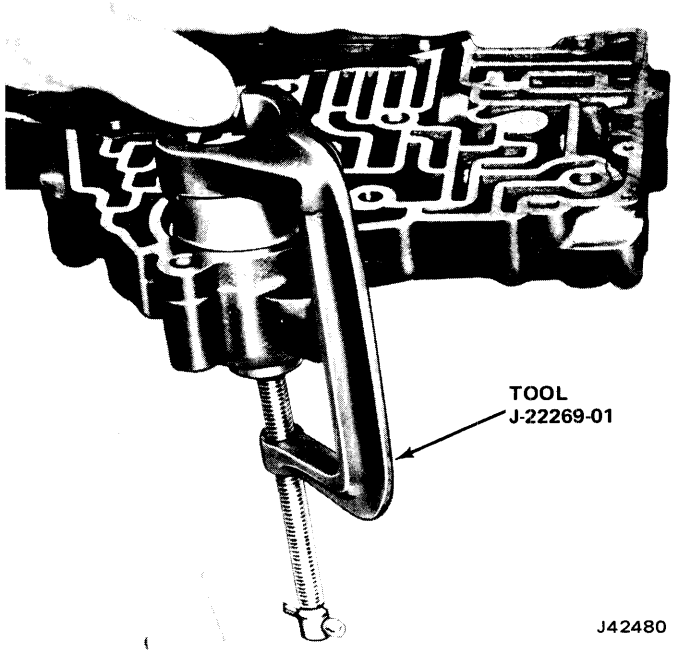


Fig. 7-55 Removing E-Ring Retainer

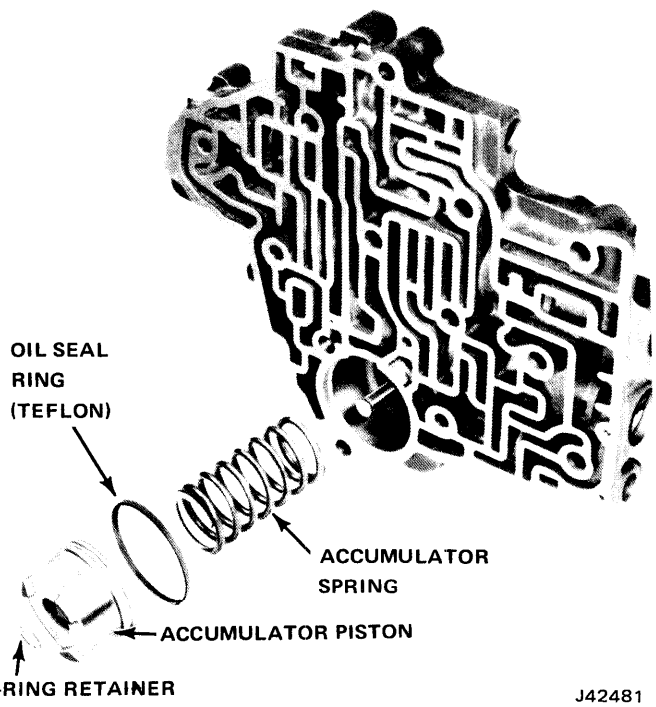


Fig. 7-56 Accumulator Piston and Spring

NOTE: *The 1-2 accumulator primary spring is not used in CJ models with six-cylinder engine.*

Inspection

Wash all components thoroughly in clean solvent and dry using compressed air.

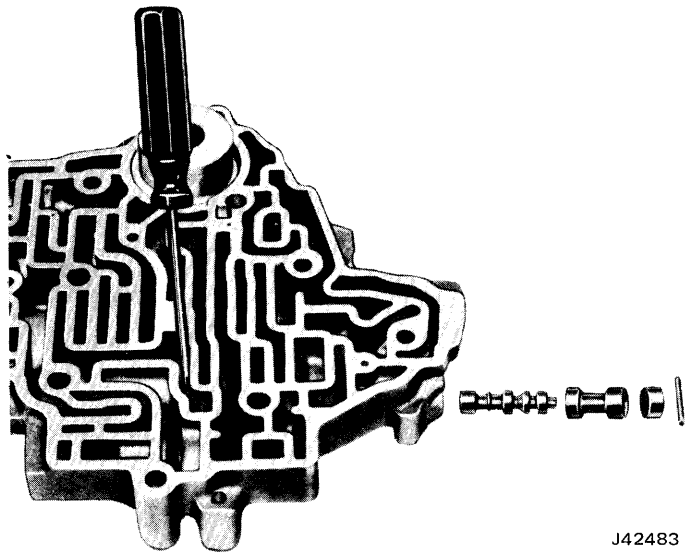


Fig. 7-57 Detent and Regulator Valve

Inspect all valves for scoring, cracks, and for free movement in their bores.

Inspect all bushings for cracks, scratches, or distortion.

Inspect the valve body for cracks or scored bores.

Check all springs for distortion or collapsed coils.

Assembly

(1) Install front accumulator spring and piston (fig. 7-52).

(2) Install spring and piston. Install Tool J-22269-01, compress piston and install E-ring retainer (fig. 7-55).

(3) Install 1-2 accumulator primary spring (if equipped) and install 1-2 accumulator valve (stem end out) in lower left bore.

(4) Install bore plug.

(5) Install grooved retaining pin from cast surface side of control valve, with grooves entering pin hole last. Tap pin with hammer until flush with cast surface.

(6) Install detent spring and spacer in next bore.

(7) Compress spring and retain spring and spacer using small screwdriver (fig. 7-57).

(8) Insert detent regulator valve, wide land first; then install detent valve, narrow land first.

(9) Install bore plug with cup end facing outward (fig. 7-58).

(10) Push plug inward to compress spring, install bore plug pin and remove screwdriver.

(11) Insert 3-2 valve, 3-2 valve spring, spacer, and bore plug (cup end out) in lower right-hand bore. Push plug into control valve to compress spring and install retaining pin.

(12) Install 2-3 shift valve (stem end out) and 3-2 spring into next bore.

(13) Insert 2-3 modulator control valve in bushing and install both parts in valve bore.

(14) Install 2-3 shift control valve spring, compress spring and install retaining pin.

(15) Install 1-2 shift valve (stem end out) in next bore.

(16) Install 1-2 regulator valve, 1-2 regulator valve spring and detent valve in bushing.

(17) Align spring in bore of detent control valve and install parts in valve bore.

(18) Press bushing into control valve to compress spring, and install retaining pin.

(19) Install manual valve with detent pin groove facing to right.

Oil Pump

Disassembly

(1) Mount oil pump assembly in Adapter J-21364 and into hole in work bench.

(2) Compress pressure boost valve bushing against pressure regulator spring and remove snap ring from pump cover (fig. 7-59).

(3) Remove pressure boost valve bushing and valve and remove pressure regulator spring from pump cover.

(4) Remove spring retainer washer, pressure regulator spacer (if equipped) and pressure regulator valve.

(5) Remove pump cover attaching bolts and remove cover from pump body.

(6) Remove retaining pin and bore plug from pressure regulator bore in pump cover (fig. 7-60).

(7) Remove oil rings and thrust washer from pump cover (fig. 7-59).

(8) Mark oil pump drive and driven gears for assembly alignment reference and remove gears (fig. 7-61).

Inspection

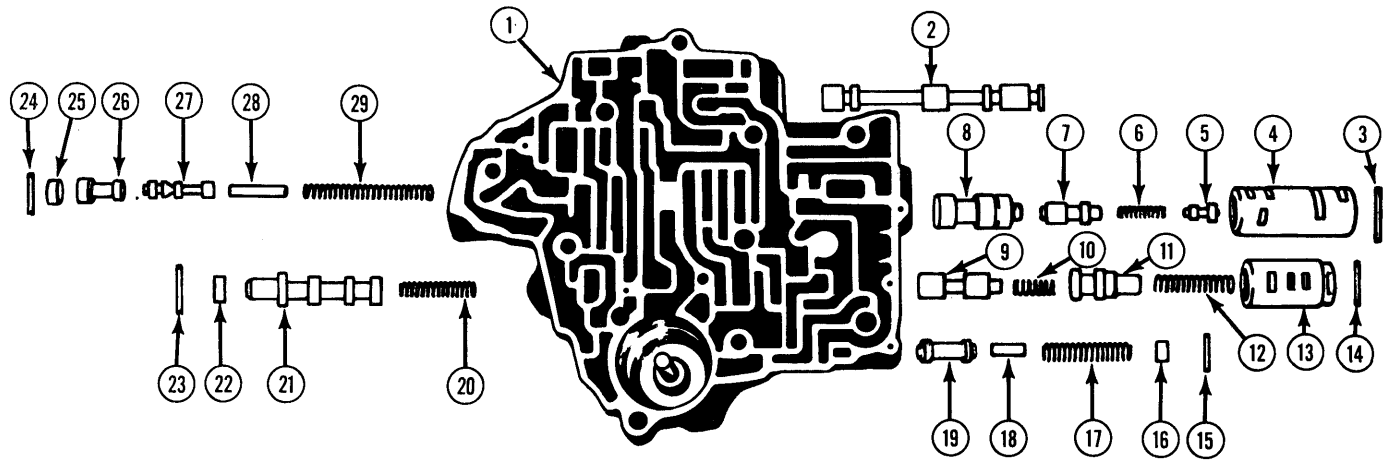
CAUTION: *The solid-type pressure regulator valve does not contain oil holes and an orifice cup plug like earlier-type pressure regulator valves. The solid style valve must* **only** be used in pump covers that have a squared off pressure regulator boss at the pressure boost bushing end of the cover (fig. 7-4). The earlier-type pressure valve with the oil holes and orifice cup plug will be used to service either type pump cover.

Inspect the drive gear, driven gear, gear pocket, and crescent for scoring, galling, or other damage.

Position the pump gears in the pump body and check pump body face-to-gear clearance. Clearance should be 0.0008 to 0.0035 inch (fig. 7-62).

Check the face of the pump body for scores or nicks. Inspect the oil passages. Check for damaged cover bolt attaching threads. Check surface flatness of the pump body face and check the bushing for scores or nicks (fig. 7-63).

Inspect the pump attaching bolts for damage and replace as necessary.



1. Control Valve
2. Manual Valve
3. Retaining Pin
4. 1-2 Bushing
5. 1-2 Regulator Valve
6. 1-2 Regulator Spring
7. 1-2 Detent Valve
8. 1-2 Valve
9. 2-3 Valve
10. 2-3 Spring
11. 2-3 Modulator Valve
12. 2-3 Valve Spring (Not used in CJ with Six-Cylinder Engine)
13. 2-3 Bushing
14. Retaining Pin
15. Retaining Pin
16. Bore Plug
17. 3-2 Spring
18. Spacer
19. 3-2 Valve
20. 1-2 Accumulator Primary Spring (Not used in any model with Six-Cylinder Engine)
21. 1-2 Accumulator Valve
22. Bore Plug
23. Retaining Pin
24. Retaining Pin
25. Bore Plug
26. Detent Valve
27. Detent Regulator
28. Spacer
29. Detent Spring

42482

Fig. 7-58 Control Valve Assembly

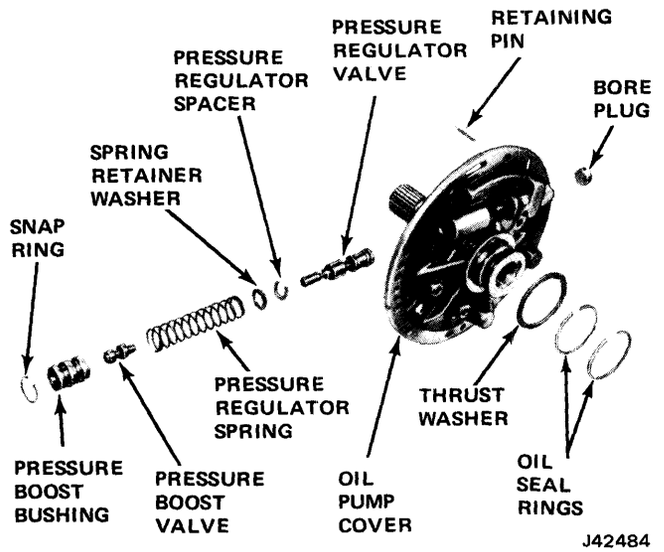


Fig. 7-59 Oil Pump Cover Assembly

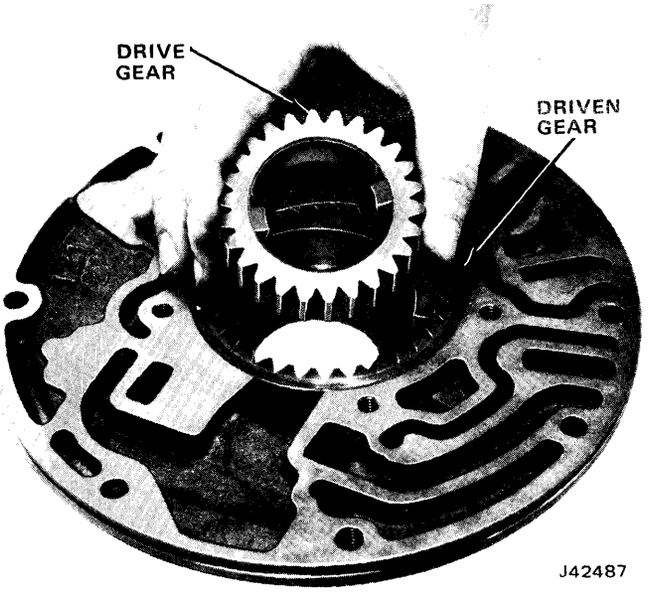


Fig. 7-61 Removing—Installing Pump Gears

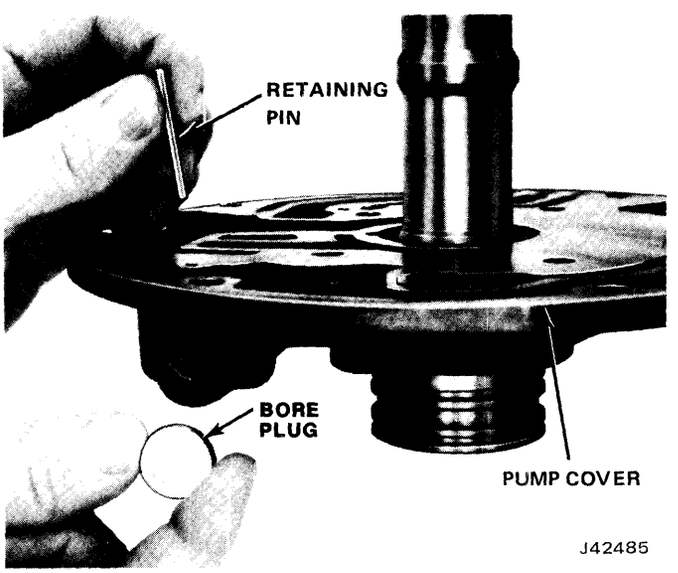


Fig. 7-60 Pressure Regulator Plug and Retaining Pin

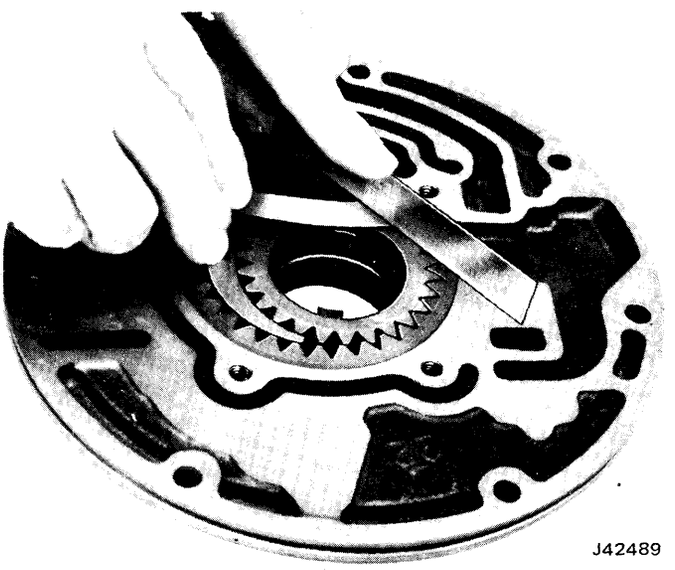


Fig. 7-62 Checking Pump Body Face-to-Gear Clearance

Inspect surface flatness of the pump cover face. Check for scores or chips in the pressure regulator bore and be sure all passages are open and not interconnected. Check for scoring or damage at the pump gear face. Inspect the stator shaft for damaged splines or scored bushings. Inspect the oil ring grooves for damage or wear. Inspect the selective thrust washer face for wear or damage and inspect the pressure regulator and boost valve for free travel through the pump cover bore.

Inspect the pump cover for open 1/8-inch breather hole (fig. 7-64).

Inspect the oil rings for damage or wear.

NOTE: *All service replacement pump cover oil seal rings are hook-type cast iron.*

Assembly

(1) Install drive and driven gears in pump body with alignment marks facing upward (fig. 7-61).

NOTE: *Position the drive gear with the drive tangs facing upward.*

(2) Protect stator shaft and clamp pump cover in vise.

(3) Insert spacer(s), if used, spring retainer washer and spring in pressure regulator bore of pump cover (fig. 7-59).

(4) Install pressure regulator valve, stem end first, from opposite end of bore.

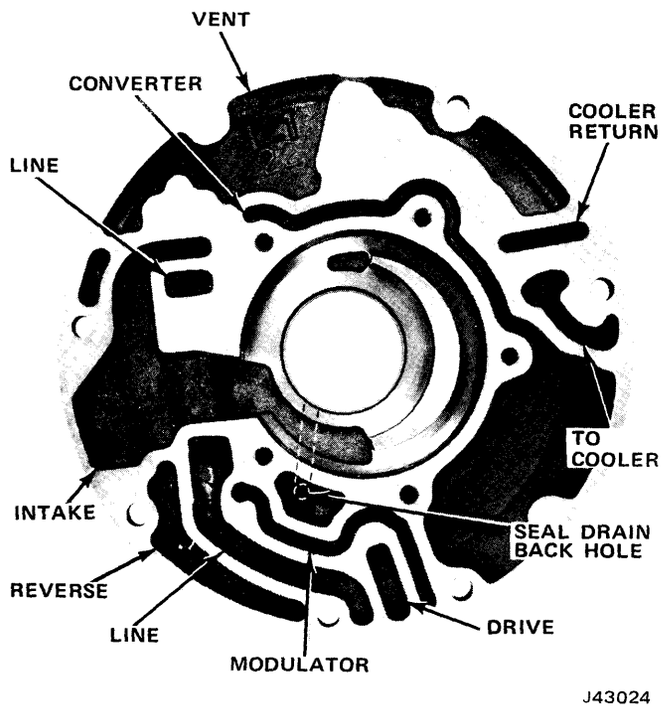


Fig. 7-63 Pump Body Oil Passages

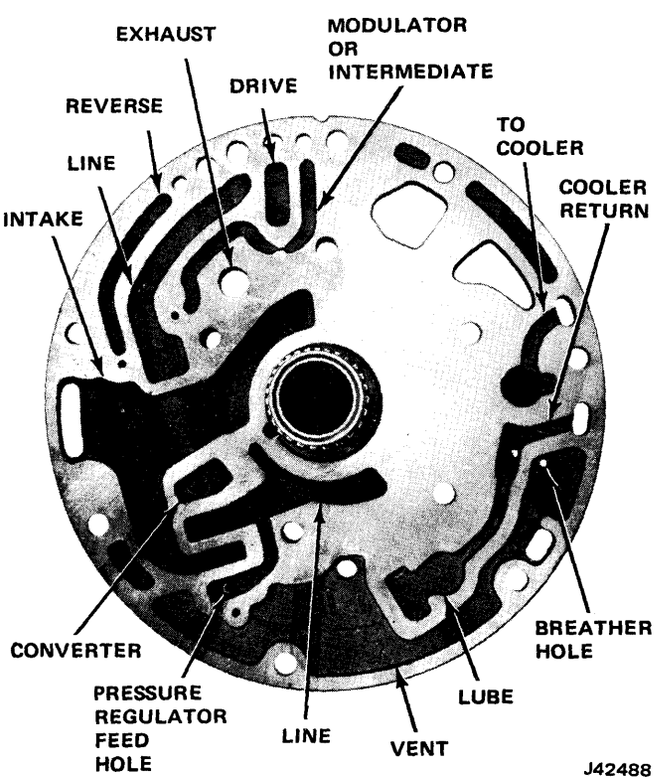


Fig. 7-64 Pump Cover Oil Passage

(5) Install boost valve in bushing, stem end out, and install valve and bushing in pump cover.

(6) Compress bushing against spring and install retaining snap ring.

(7) Install pressure regulator valve bore plug at opposite end of bore and install retaining pin.

(8) Install selective thrust washer over pump cover delivery sleeve.

(9) Install oil seal rings if removed.

NOTE: *If teflon rings are reused, be sure the slit ends are assembled in the same relation as cut (fig. 7-65).*

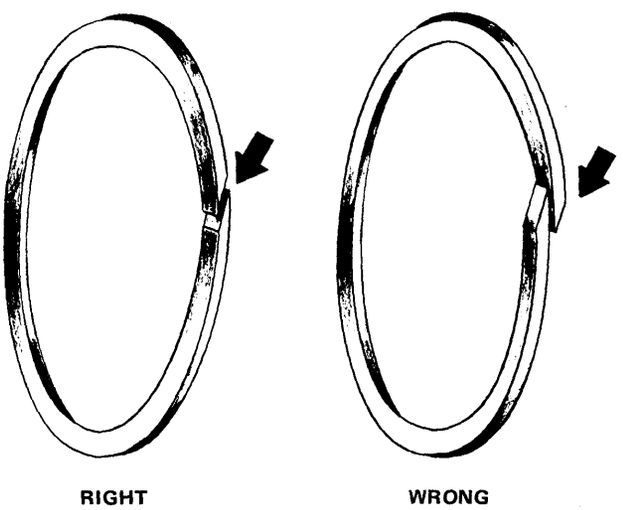


Fig. 7-65 Correct Ring Installation

(10) Install pump cover on pump body and install attaching bolts.

NOTE: *Do not tighten the bolts completely. Leave the bolts one turn loose at this time.*

(11) Place pump Aligning Strap J-21368 over assembled pump body and cover and tighten strap (fig. 7-66).

(12) Tighten pump cover bolts to 15 to 20 foot-pounds torque.

(13) Remove Aligning Strap J-21368 and install pump-to-transmission case O-ring oil seal in pump.

Forward Clutch

Disassembly

(1) Place forward clutch and turbine shaft in hole in bench and remove snap ring which retains forward clutch housing to direct clutch hub (fig. 7-67).

(2) Remove clutch hub from housing.

(3) Remove forward clutch hub and thrust washers (fig. 7-68).

(4) Remove four composition-faced and four steel clutch plates.

(5) Mount forward clutch and turbine shaft in arbor press, and press turbine shaft out of clutch housing (fig. 7-69).

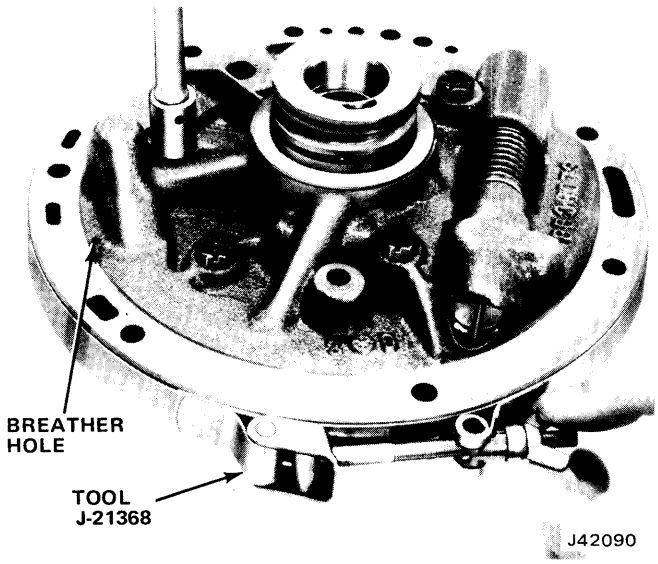


Fig. 7-66 Alignment of Oil Pump Cover to Body

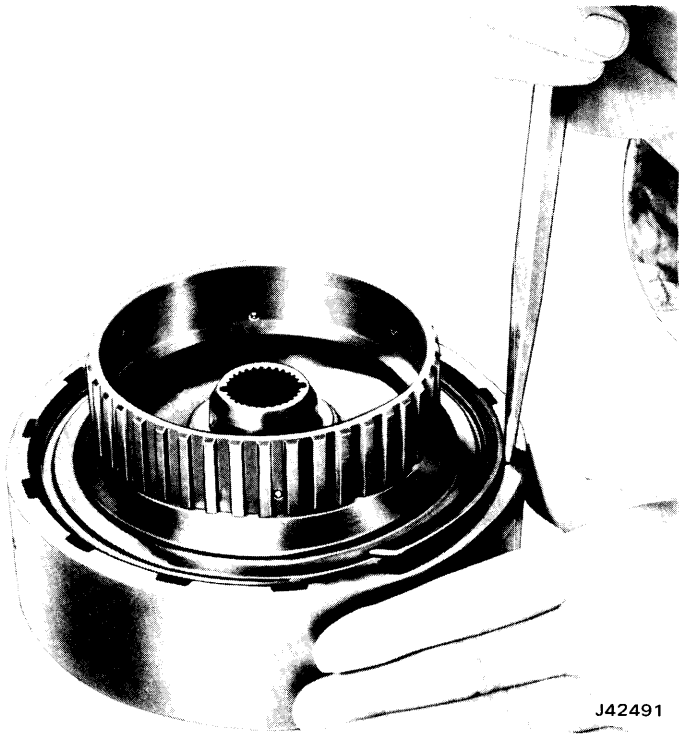


Fig. 7-67 Removing Forward Clutch Housing Snap Ring

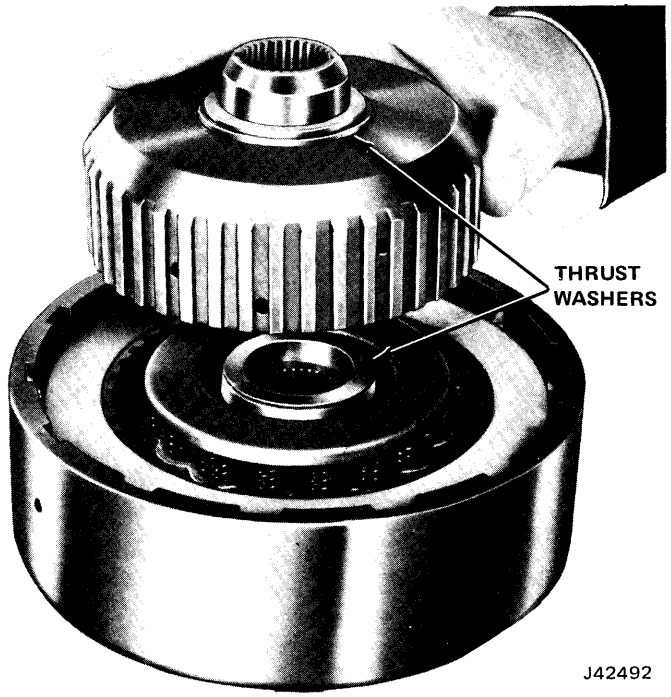


Fig. 7-68 Removing Hub and Thrust Washers from Forward Clutch Assembly

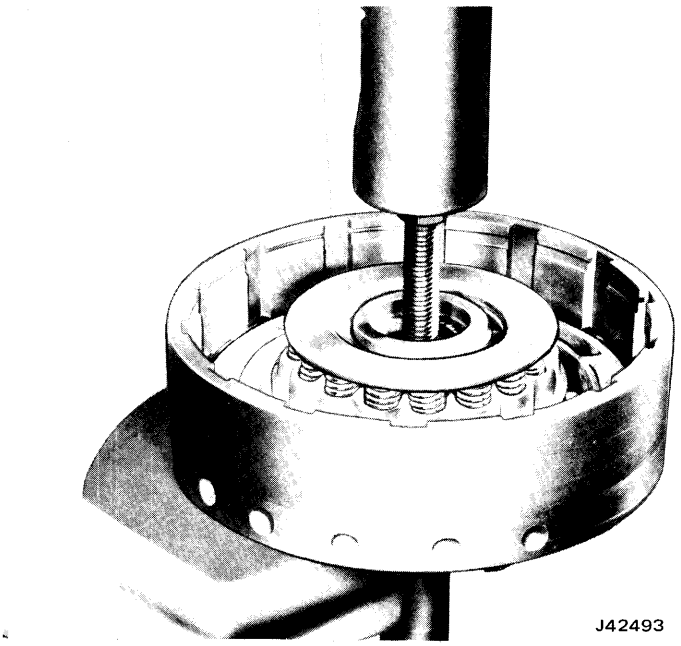


Fig. 7-69 Pressing Turbine Shaft Out Of Forward Clutch Housing

(6) Compress spring retainer using Clutch Spring Compressor J-25148 and arbor press, and remove snap ring which fastens spring retainer to clutch piston.

(7) Remove snap ring, spring retainer, and 16 clutch release springs.

NOTE: *Keep springs separate from direct clutch release springs.*

(8) Remove forward clutch piston.

(9) Remove clutch inner and outer piston seals (fig. 7-70).

NOTE: *Production-built transmissions use a direct clutch piston without a check ball. The forward and direct clutch pistons are similar in appearance. Be sure the forward clutch piston is identified during disassembly so it will be installed correctly. Also, the production-built forward clutch piston will be aluminum or stamped steel.*

(10) Remove center piston seal from forward clutch housing (fig. 7-71).

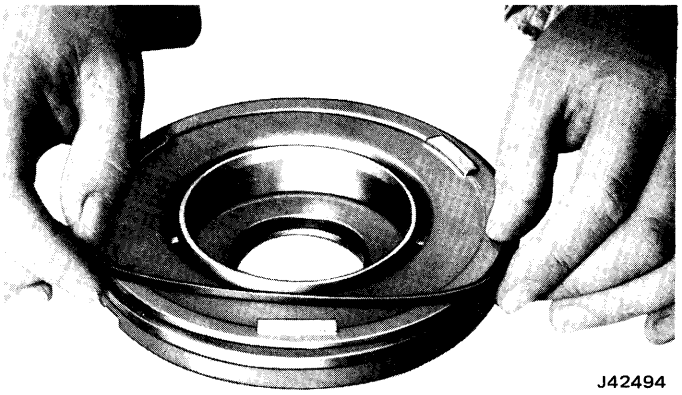


Fig. 7-70 Removing Forward Clutch Piston Outer Seal

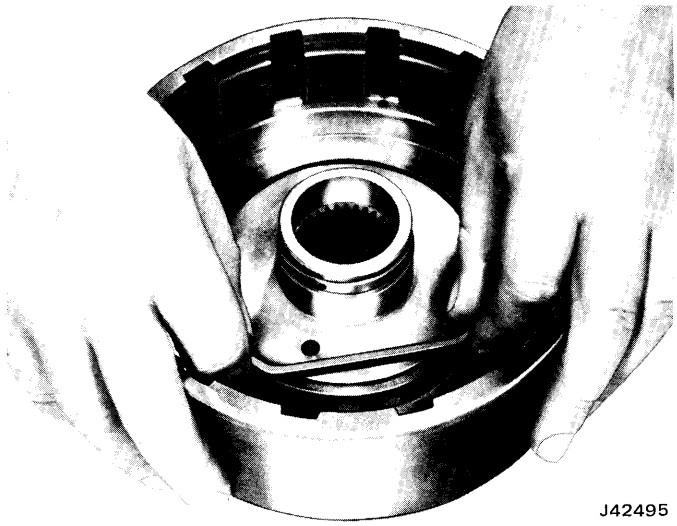


Fig. 7-71 Installing Forward Clutch Housing Center Piston Seal

Inspection

Inspect composition-faced and steel clutch plates for burning, scoring, or wear.

Inspect the 16 clutch springs for collapsed coils or signs of distortion.

Inspect the direct clutch hub and forward clutch hub for worn splines, restricted lubrication holes or scored thrust faces.

Inspect the clutch piston for cracks and porosity and inspect the clutch housing for wear, scoring, restricted oil passages and for free operation of the check ball.

Inspect the turbine shaft for open lubrication passages at each end, damaged splines or damaged bushing journals and for cracks or distortion.

NOTE: *The turbine shaft and clutch housing are serviced separately. The shaft may be removed from the housing by using a suitable size bolt in an arbor press (fig. 7-69).*

Assembly

NOTE: *Apply automatic transmission fluid to all seals and clutch plates before assembly.*

(1) Install inner and outer oil seals on clutch piston with seal lips facing away from spring pockets (fig. 7-70).

(2) Install center seal in clutch housing with lip facing upward (fig. 7-71).

(3) Place Seal Protector Tool J-21362 over clutch hub and install outer clutch Piston Seal Protector Tool J-21049 in clutch housing. Assemble piston and housing, and rotate piston in housing until seated (fig. 7-72).

(4) Install 16 clutch release springs in piston pockets, and place spring retainer over springs.

NOTE: *Be sure the clutch release springs are straight. If necessary, straighten the springs using small screwdriver.*

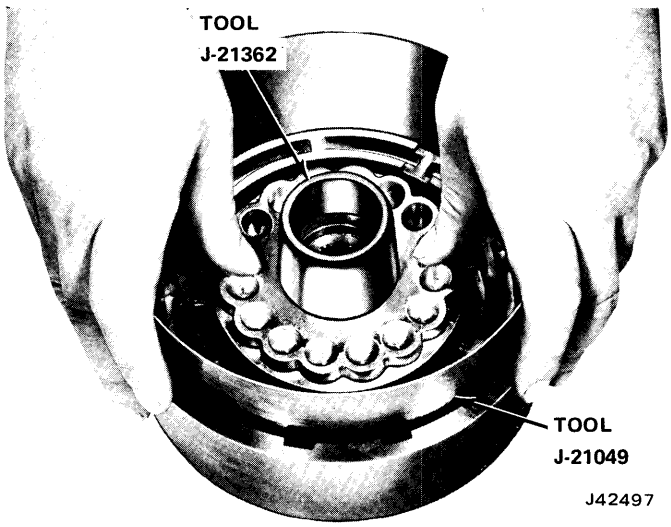


Fig. 7-72 Installing Forward Clutch Piston

(5) Compress springs using Clutch Spring Compressor J-25148 and arbor press and install spring retainer-to-piston snap ring.

(6) Press short-spline end of turbine shaft into forward clutch housing using arbor press if shaft was removed.

(7) Place thrust washers on forward clutch hub. Be sure bronze washer is installed on side of hub facing forward clutch housing. Use petroleum jelly to retain washers.

(8) Install hub and washers in clutch housing (fig. 7-73).

(9) Install four composition-faced, three flat steel, and one waved steel clutch plate (plate with U-notches) in clutch housing. Install waved steel plate first, then alternately install composition-faced plates and flat steel plates (fig. 7-74 and 7-75).

CAUTION: *Do not confuse the flat steel clutch plate (plate with V-notch) with the waved steel clutch plate (plate with U-notch) (fig. 7-76).*

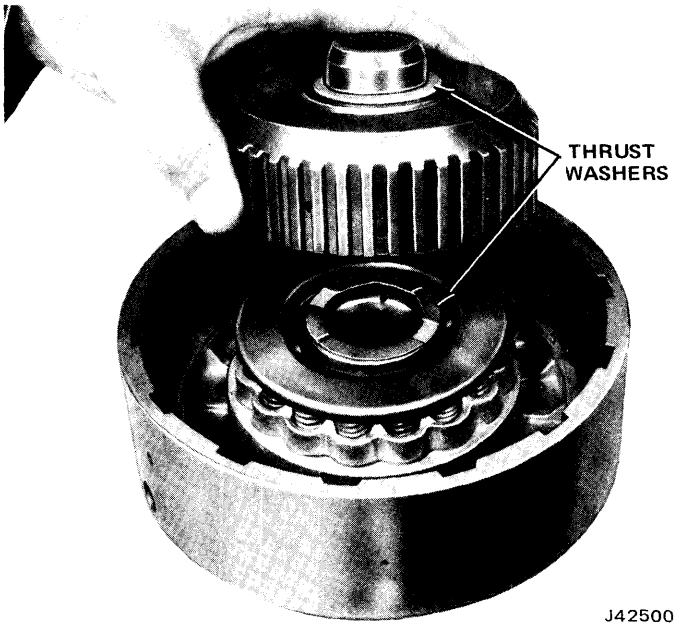


Fig. 7-73 Installing Forward Clutch Hub and Washers

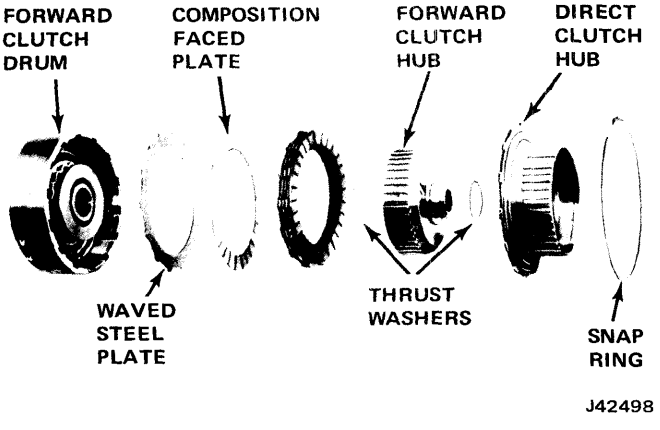


Fig. 7-74 Forward Clutch Assembly

NOTE: *Radially grooved composition-faced clutch plates are installed at the factory only. All service composition-faced plates have a smooth surface configuration.*

(10) Install direct clutch hub in clutch housing and install retaining snap ring (fig. 7-67).

(11) Install forward clutch assembly on delivery sleeve of oil pump, and apply compressed air to check clutch operation (fig. 7-77).

Direct Clutch and Intermediate Roller Clutch

Disassembly

(1) Remove snap ring attaching intermediate clutch retainer to direct clutch housing (fig. 7-78).

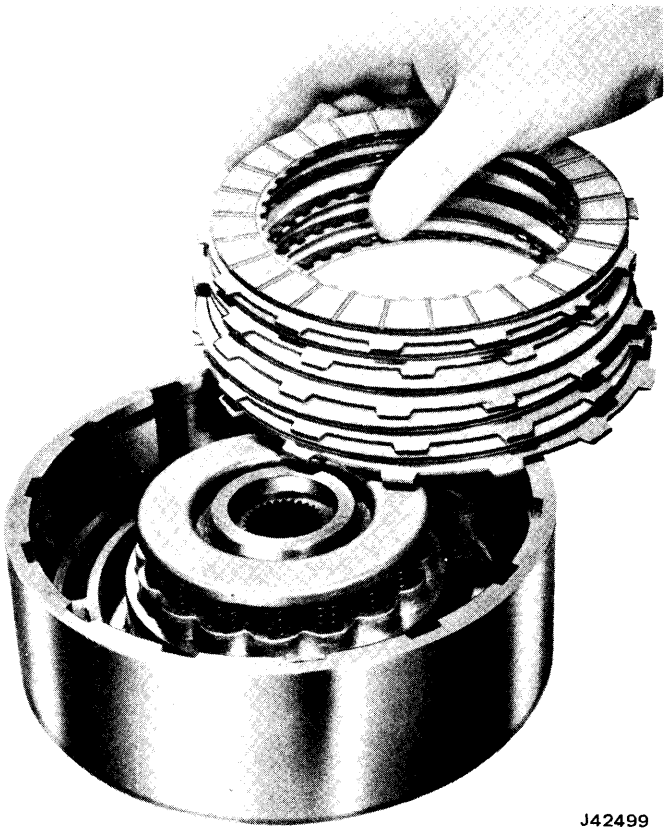


Fig. 7-75 Installing Forward Clutch Plates

(2) Remove retainer, intermediate clutch outer race, and intermediate roller clutch (fig. 7-79).

(3) Remove snap ring attaching backing plate to direct clutch housing (fig. 7-80).

(4) Remove backing plate, composition-faced and steel clutch plates (fig. 7-81).

(5) Using Clutch Spring Compressor Tool J-25149 and arbor press, compress spring retainer and remove snap ring attaching spring retainer to direct clutch housing.

(6) Remove spring retainer, release springs, and piston (fig. 7-82).

NOTE: *Production-built transmissions use a direct clutch piston without a check ball. The forward and direct clutch pistons are similar in appearance. Be sure the direct clutch piston is identified during disassembly so it will be installed correctly. The service replacement direct clutch piston contains a check ball. Also, the production-built direct clutch piston will be aluminum or stamped steel.*

(7) Remove outer seal and inner seal from piston (fig. 7-79).

(8) Remove center seal from direct clutch housing.

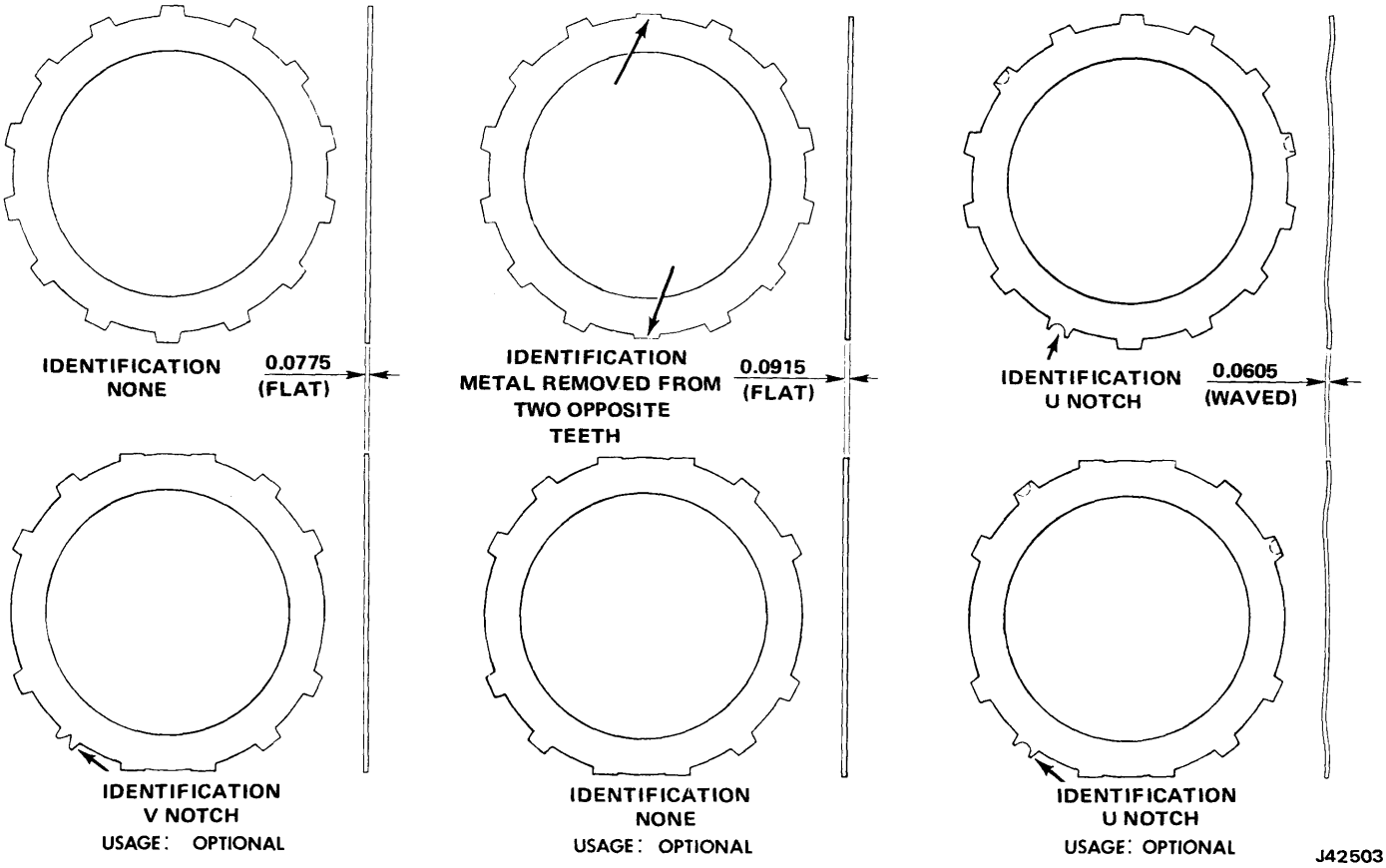


Fig. 7-76 Clutch Plate Identification

Fig. 7-77 Checking Forward Clutch Operation

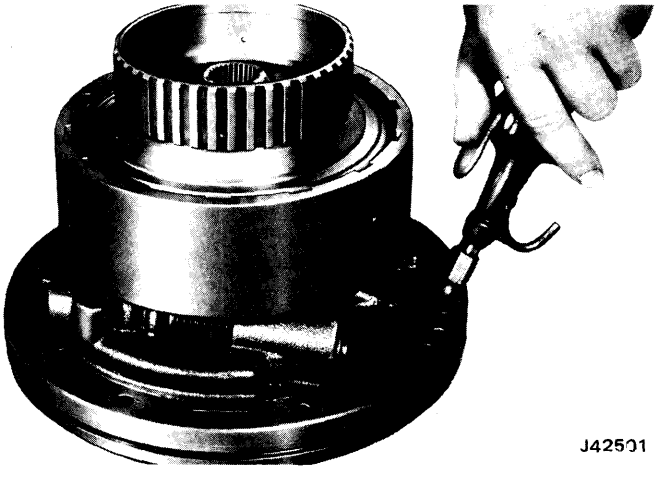


Fig. 7-78 Removing Intermediate Roller Clutch Snap Ring

Inspection

Inspect the roller clutch for damaged rollers and inspect the inner cam and outer races (inner cam on clutch housing) for scratches or wear.

Inspect the direct clutch housing for cracks, wear, restricted oil passages, or wear of the clutch plate drive lugs.

Inspect the composition-faced and steel plates for signs of wear or burning. Inspect the backing plate for scratches or other damage. Inspect the piston for cracks and for free operation of the check ball. Inspect the springs for distortion or signs of collapse.

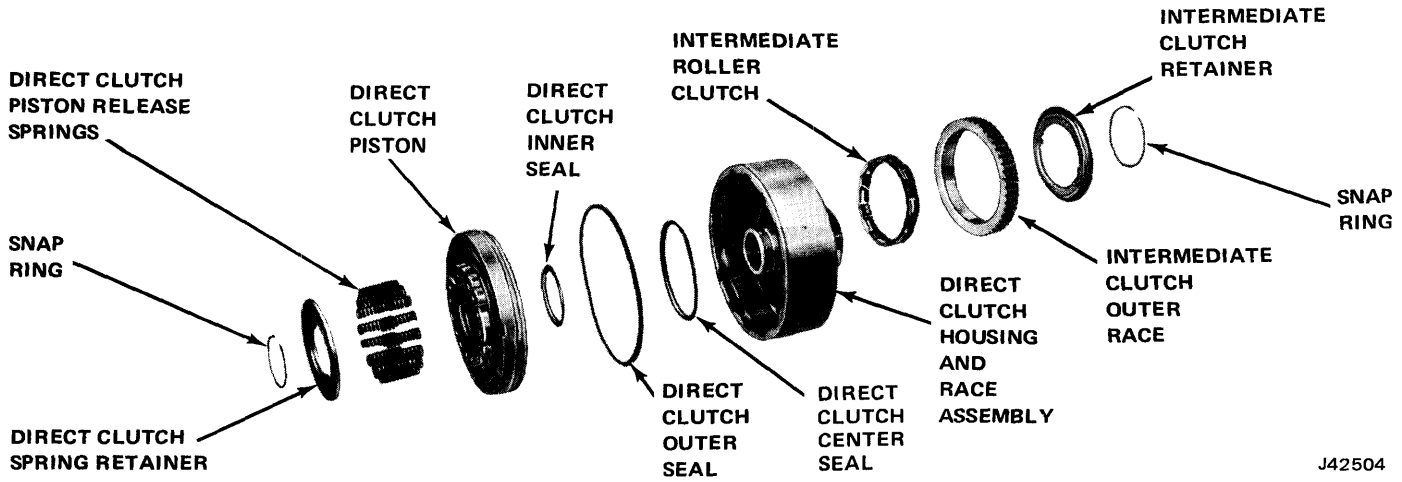


Fig. 7-79 Intermediate Roller Clutch and Direct Clutch Components

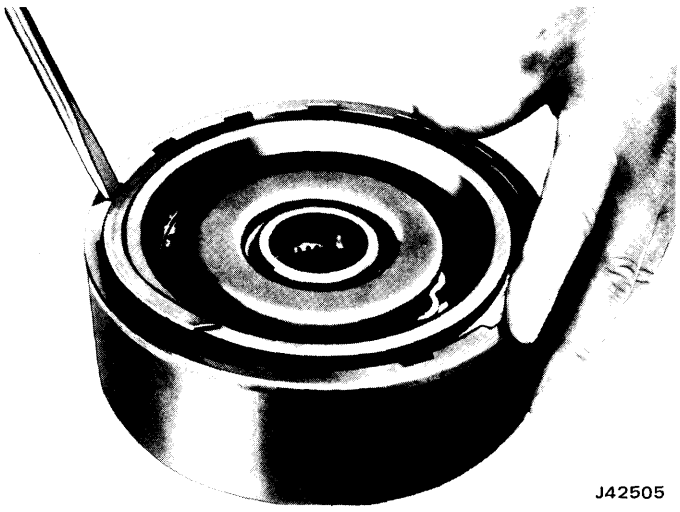


Fig. 7-80 Removing Direct Clutch Snap Ring

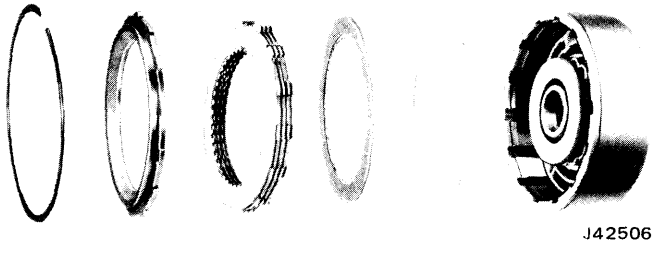


Fig. 7-81 Direct Clutch Housing Assembly

NOTE: *If one or more of these springs require replacement, discard all of them and install 16 service replacement springs.*

Assembly

(1) Apply automatic transmission fluid to all seals and clutch plates.

Fig. 7-82 Removing Piston from Direct Clutch Housing

CAUTION: *Be sure the clutch piston is equipped with a check ball.*

(2) Install inner seal on piston with lip of seal facing away from spring pockets (fig. 7-83).

(3) Install outer seal on piston with lip facing away from spring pocket (fig. 7-84).

(4) Install center seal in clutch housing with lip of seal facing upward (fig . 7-85).

CAUTION: *A check ball is used in the direct clutch housing (fig. 7-86). If the housing requires replacement and the replacement housing does not contain a check ball, replace the direct clutch piston with a service piston which has a check ball.*

(5) Place Inner Seal Protector J-21362 and Outer Seal Protector J-21409 over hub and clutch housing.

(6) Install direct clutch piston in housing with rotating motion (fig. 7-87).

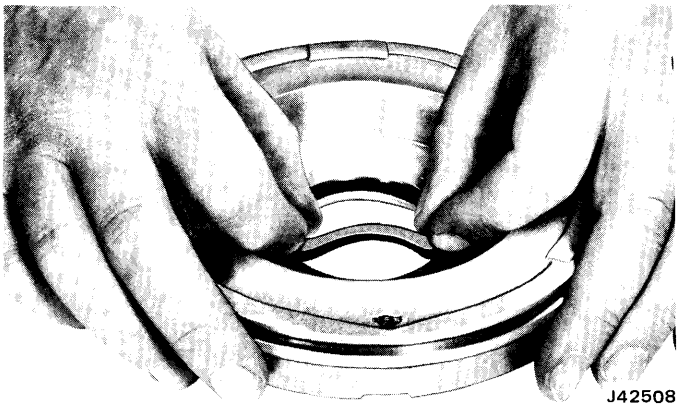


Fig. 7-83 Installing Inner Seal on Direct Clutch Piston

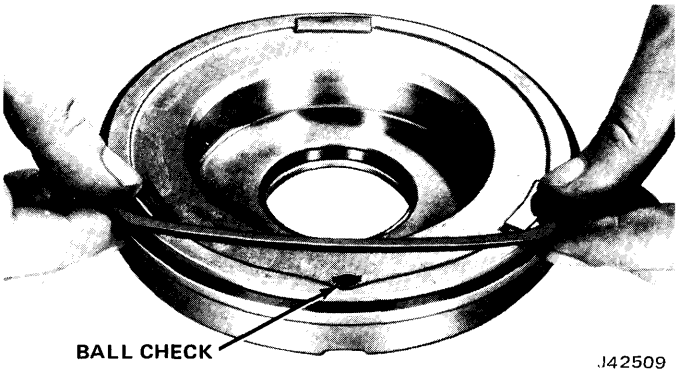


Fig. 7-84 Installing Outer Seal on Direct Clutch Piston

Fig. 7-85 Installing Center Seal in Direct Clutch Housing

(7) Place 14 release springs in recesses of piston and install spring retainer over springs (fig. 7-79).

(8) Compress springs using Spring Compressor J-25149 and arbor press and install retaining snap ring.

NOTE: *Be sure the clutch release springs are straight. If necessary, straighten the springs using a small screwdriver.*

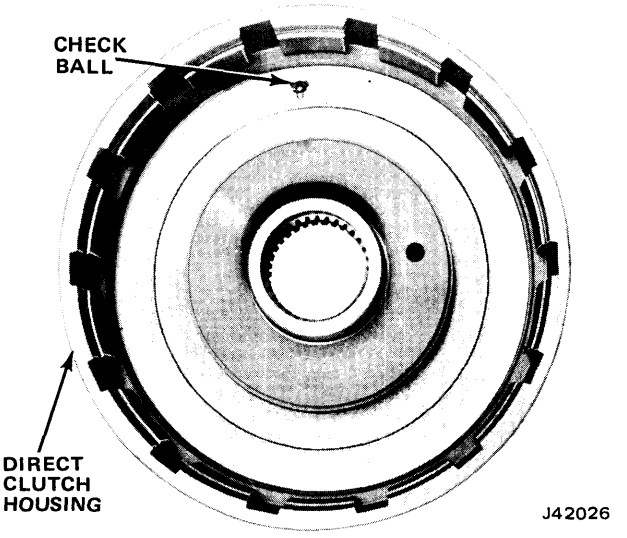


Fig. 7-86 Check Ball Location

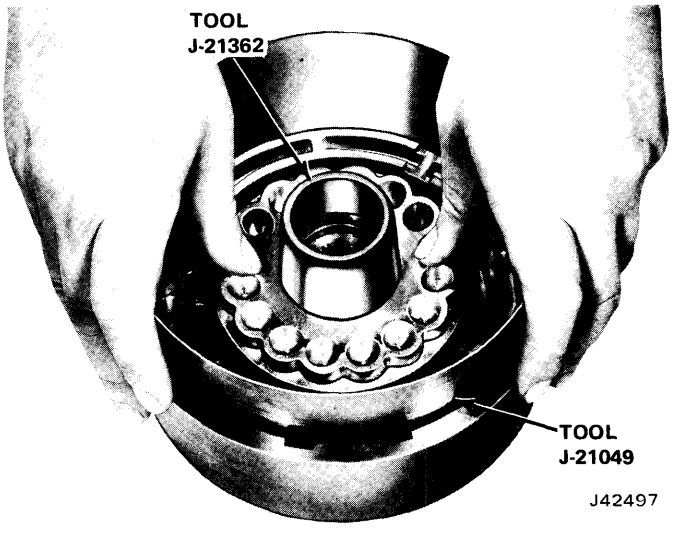


Fig. 7-87 Installing Direct Clutch Piston in Housing

(9) Install waved steel and composition-faced clutch plates. Start with waved steel plate and alternately install remaining composition-faced and flat steel plates (fig. 7-88). Refer to specifications for plate useage.

NOTE: *All direct clutch flat steel plates are 0.0195 inch thick.*

(10) Install backing plate in clutch housing and install retaining snap ring (fig. 7-81).

(11) Install rollers in cage by compressing energizing spring with forefinger and inserting rollers from outer side of cage.

(12) Install clutch roller and outer race on housing using clockwise rotary motion (fig. 7-89 and 7-90).

NOTE: *When installed, outer race should not turn counterclockwise.*

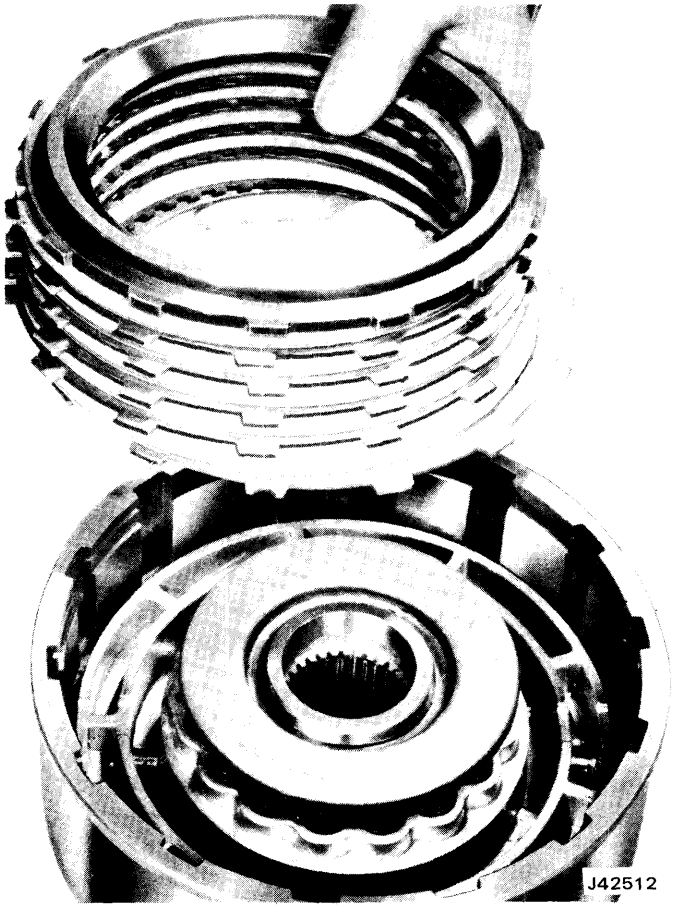


Fig. 7-88 Installing Clutch Plates in Direct Clutch Housing

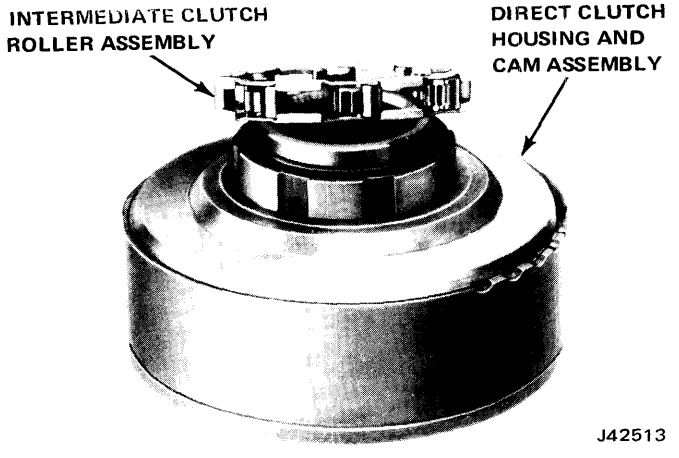


Fig. 7-89 Installing Roller Clutch

(13) Install retainer over intermediate clutch roller components (fig. 7-91) and install snap ring.

(14) Install direct clutch assembly on center support assembly and apply compressed air to check direct clutch operation (fig. 7-92).

NOTE: *Apply air through the left oil feed hole only to actuate the clutch piston. If air is applied through the reverse passage (right oil feed hole), it will escape from the direct clutch passage. This is considered normal.*

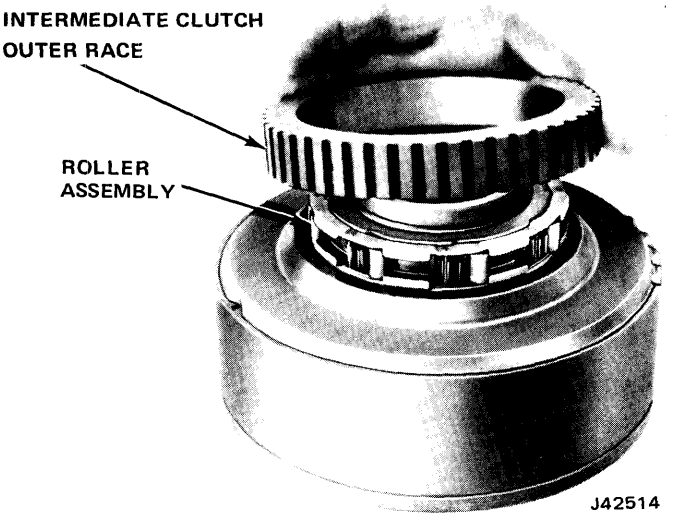


Fig. 7-90 Installing Outer Race

Fig. 7-91 Installing Retainer

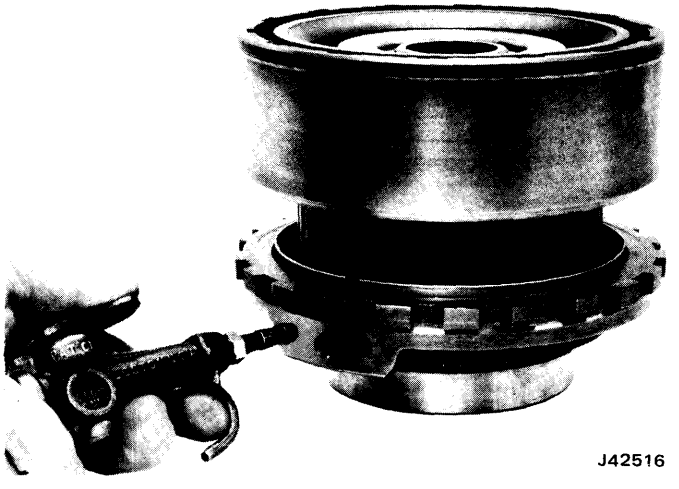


Fig. 7-92 Checking Direct Clutch Operation

Center Support

Disassembly

(1) Remove four oil seal rings (fig. 7-93).

NOTE: *All service replacement rings are hook-type cast iron.*

(2) Compress spring retainer to center support assembly, remove snap ring, and carefully release pressure on spring retainer.

(3) Remove spring retainer, three release springs, intermediate clutch spring guide and piston.

(4) Remove inner and outer seals from intermediate clutch piston.

NOTE: *Do not remove the three screws attaching the roller clutch inner race to the center support.*

Inspection

Inspect the roller clutch inner race (on center support) for scratches or indentations and be sure the lubrication hole is open.

NOTE: *Also be sure the constant bleed plug orifice (approximately 0.020-inch diameter) is open (fig. 7-40).*

Check the clutch piston oil ring grooves for damage. Using compressed air check the oil passages to be sure they are not interconnected. Inspect the piston sealing surfaces for scratches, inspect the piston seal grooves for nicks or other damage and inspect the piston for cracks.

Inspect the release springs for cracks, fatigue, and distortion.

Inspect the support-to-case spacer for burrs or raised edges. Remove any burrs using an oilstone or fine sandpaper. Inspect the oil rings for damage.

Assembly

(1) Install inner seal on intermediate clutch piston, with lip of seal facing away from spring pocket (fig. 7-94).

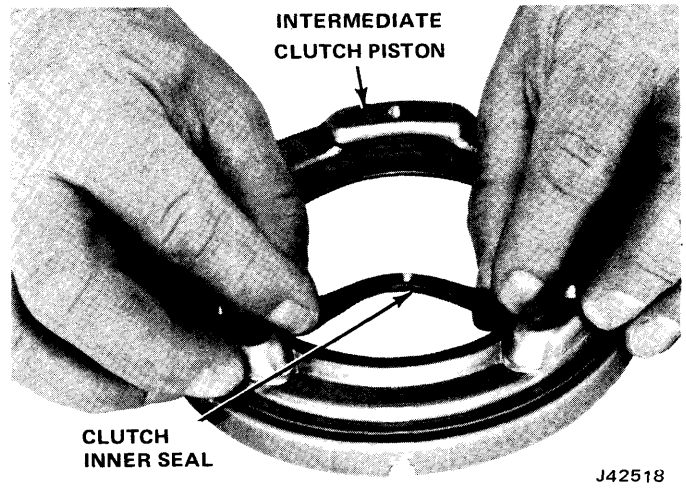


Fig. 7-94 Installing Inner Seal on Intermediate Clutch Piston

(2) Install outer seal on piston with lip of seal facing away from spring pocket (fig. 7-95).

(3) Place Inner Seal Protector J-21363 on hub of center support.

(4) Install intermediate clutch piston on center support. Index spring pockets of piston with cored areas of center support (fig. 7-96). "Wipe" outer seal lip with smooth screwdriver blade to install.

(5) Install spring guide (fig. 7-97).

(6) Install three release springs in spring holes of spring guide (fig. 7-98). Space springs equally.

(7) Place spring retainer over springs (fig. 7-99).

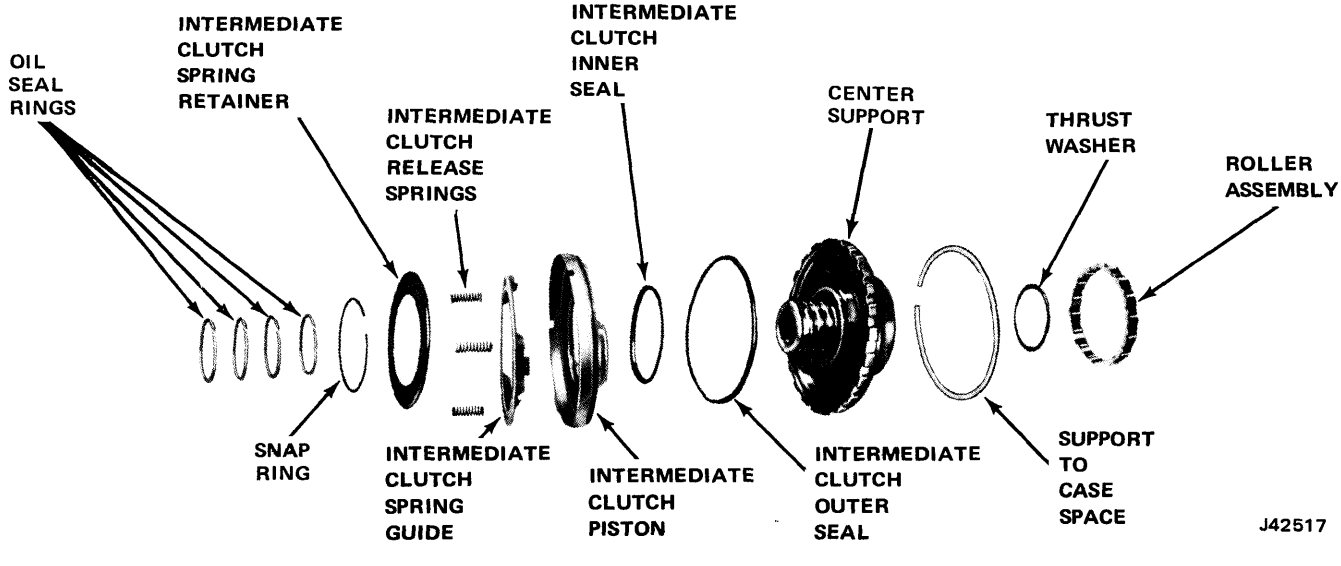


Fig. 7-93 Center Support Components

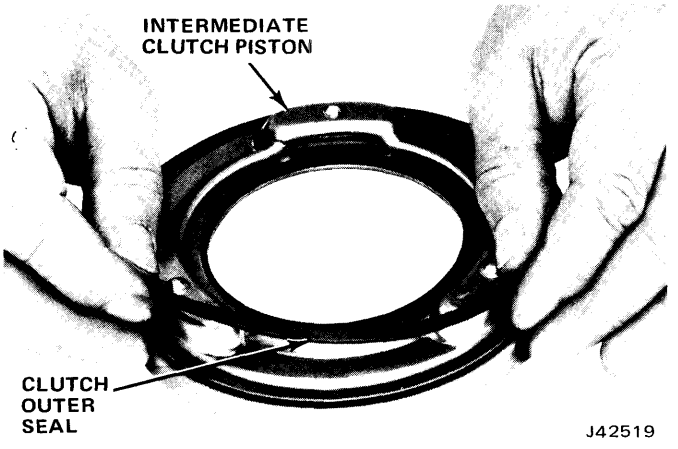


Fig. 7-95 Installing Outer Seal on Intermediate Clutch Piston

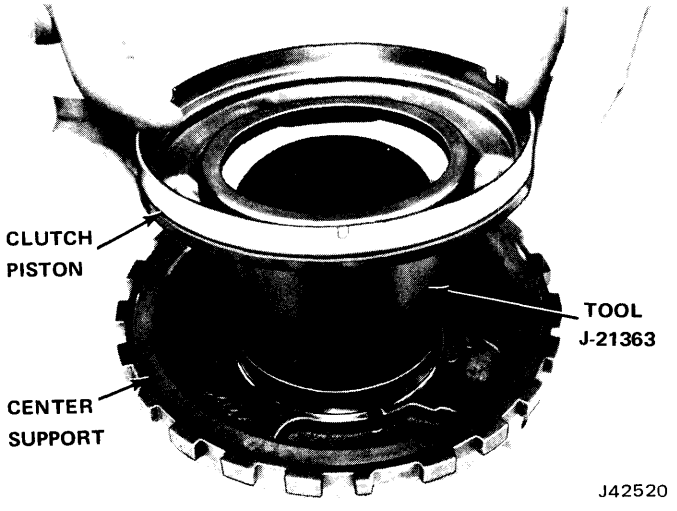


Fig. 7-96 Installing Intermediate Clutch Piston

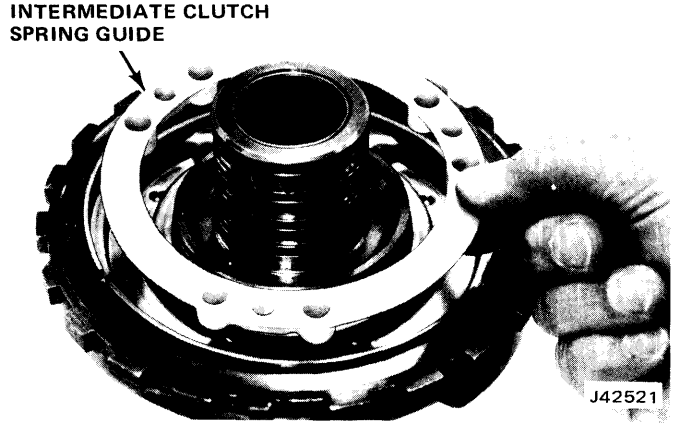


Fig. 7-97 Installing Spring Guide

(8) Compress spring retainer to center support assembly and install snap ring (fig. 7-100).

(9) Install four oil rings on center support assembly.

Fig. 7-98 Installing Intermediate Clutch Release Springs

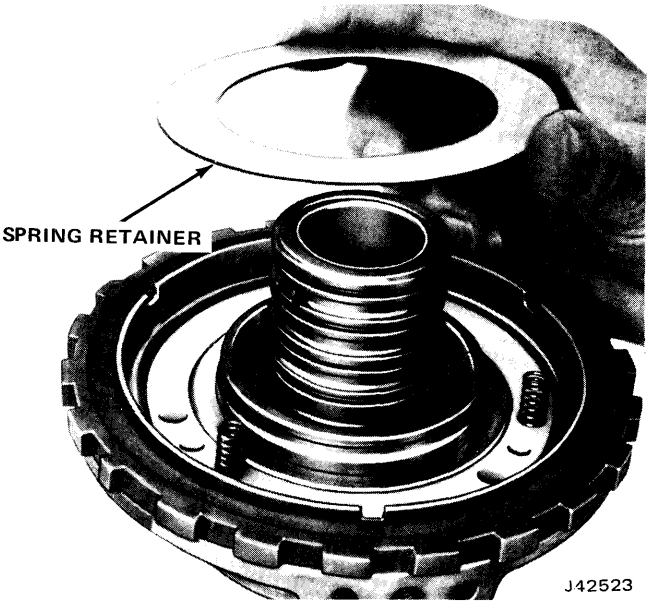


Fig. 7-99 Installing Spring Retainer

NOTE: *If teflon rings are reused, be sure the split ends are assembled in the same relation as cut (fig. 7-65).*

(10) Check operation intermediate clutch operation using compressed air (fig. 7-101).

Reaction Carrier, Roller Clutch, and Output Carrier

Inspection

NOTE: *If the reaction carrier has a spacer ring in an undercut at the the bottom of the roller cam ramps, inspect it for damage (fig. 7-102).*

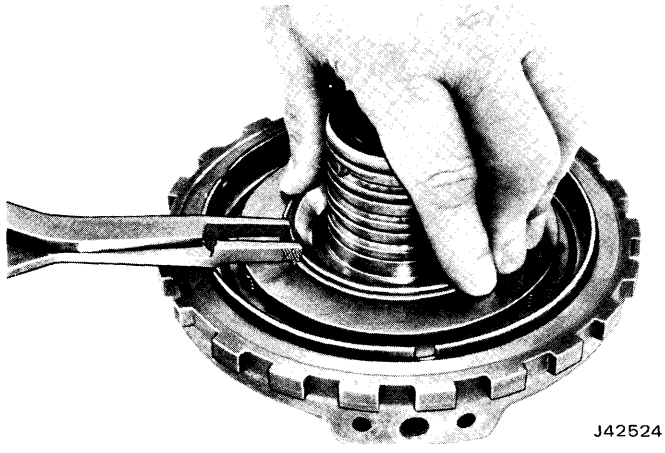


Fig. 7-100 Installing Spring Retainer Snap Ring

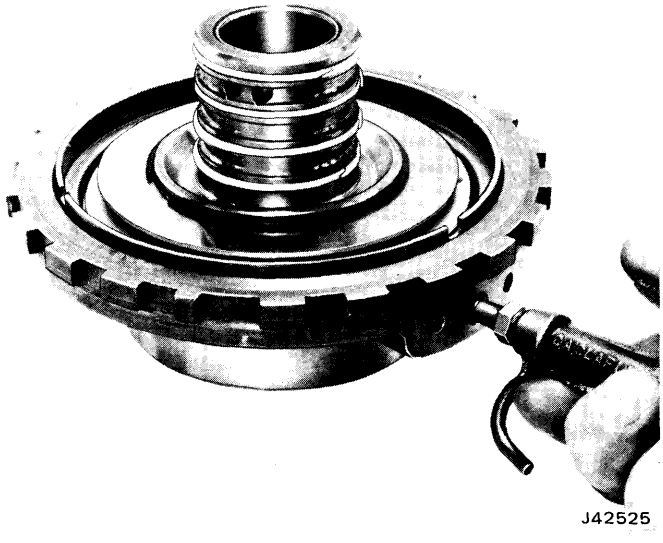


Fig. 7-101 Checking Intermediate Clutch Operation

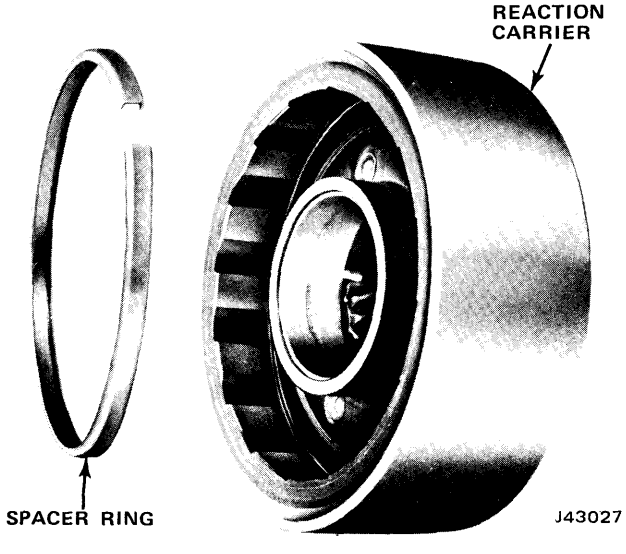


Fig. 7-102 Reaction Carrier Spacer Ring

NOTE: *The reaction carrier with the undercut and spacer ring is used optionally and interchangeably with the reaction carrier which does not have an undercut and spacer ring.*

Inspect the band surface of the reaction carrier for burning or scoring.

Inspect the roller clutch outer race for scoring or wear.

Inspect the thrust washer surfaces for signs of scoring or wear. Inspect the roller clutch for damaged components. Inspect the roller clutch cage and retaining spring for damage. Inspect the front internal gear ring for chipping or flaking and inspect the carrier bushing for damage.

NOTE: *If the bushing is damaged, the reaction carrier must be replaced.*

Inspect the reaction carrier pinions for damage, rough bearings, or excessive tilt. Check pinion end play. Pinion end play should be 0.009 to 0.024 inch (fig. 7-103). Inspect the front internal gear (output carrier) for damaged teeth.

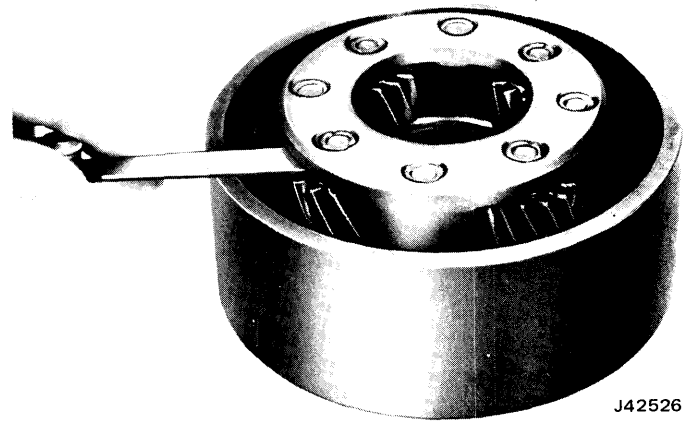


Fig. 7-103 Checking Pinion End Play

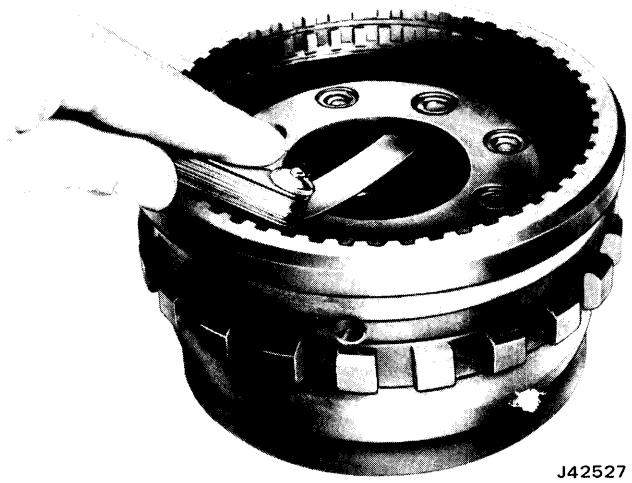
Inspect the output carrier pinions for damage, rough bearings, or excessive tilt and check pinion end play. Pinion end play should be 0.009 to 0.024 inch (fig. 7-104). Inspect the parking pawl lugs for cracks or damage and inspect the output locating splines for damage.

Reaction and Output Carrier Pinion Pin Replacement

(1) Position and support carrier assembly on front face.

(2) Using 1/2-inch diameter drill, remove stake marks from end of pinion pin(s) to be replaced. This will reduce probability of cracking carrier when pinion pins are pressed out.

CAUTION: *Do not allow the drill to remove any stock from the carrier as this will weaken the part.*



J42527

Fig. 7-104 Checking Output Carrier Pinion End Play

(3) Press pinion pins out of carrier using tapered punch (fig. 7-105).

(4) Remove pinions, thrust washers, and roller needle bearings (fig. 7-106).

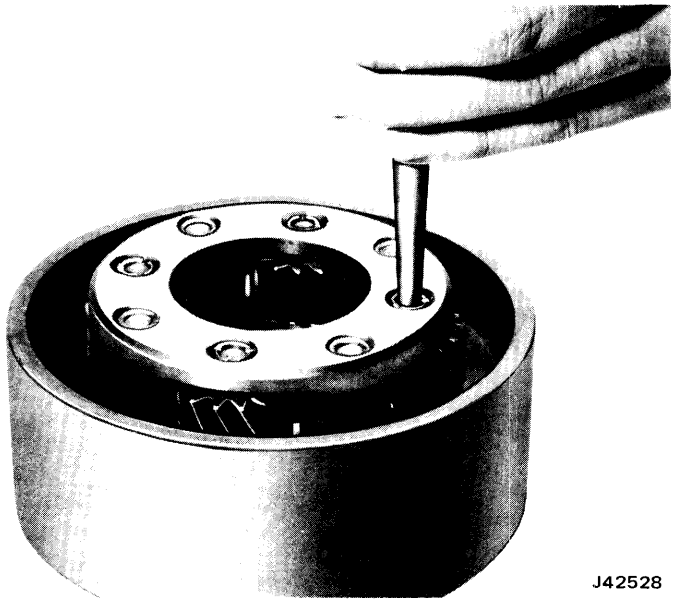
(5) Inspect thrust faces of pinion pockets in carrier for burrs. Remove any burrs using crocus cloth.

(6) Install 18 needle bearings in each pinion gear. Use petroleum jelly to retain bearings and use pinion pin as guide (fig. 7-106).

(7) Place one steel and one bronze washer on each side of pinion. Install steel washers first. Use petroleum jelly to retain washers.

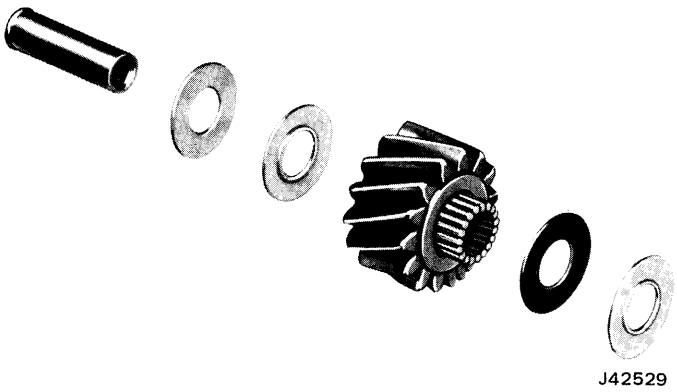
(8) Install pinion assembly in carrier, and install a pilot shaft through rear face of assembly to hold parts in place.

(9) Press pinion pin(s) in place while rotating pinion from front. Be sure headed end of pin is flush with or below face of carrier (fig. 7-107).



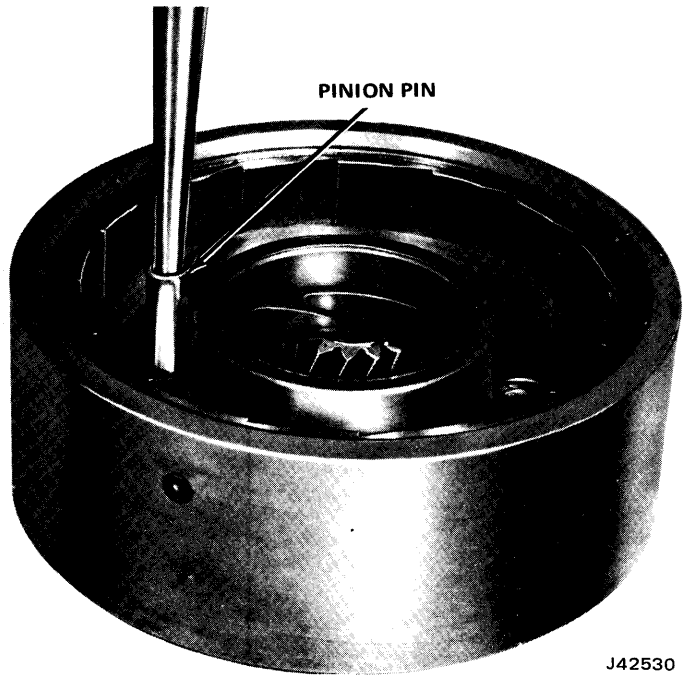
J42528

Fig. 7-105 Removing Pinion Pins



J42529

Fig. 7-106 Pinion Gear assembly



J42530

Fig. 7-107 Installing Pinion Pin

NOTE: *Headed end of pin must face upward when pin is pressed into carrier.*

(10) Install large punch in bench vise to serve as anvil and stake opposite end of pinion pin in three places (fig. 7-108).

NOTE: *Both ends of the pin must be below the face of the carrier or interference may occur.*

Output Shaft

Inspection

Inspect the bearing and thrust washer surfaces for damage, the governor drive gear for rough or damaged teeth, the splines for damage, and the drive lugs for damage. Inspect bushing for wear or galling.

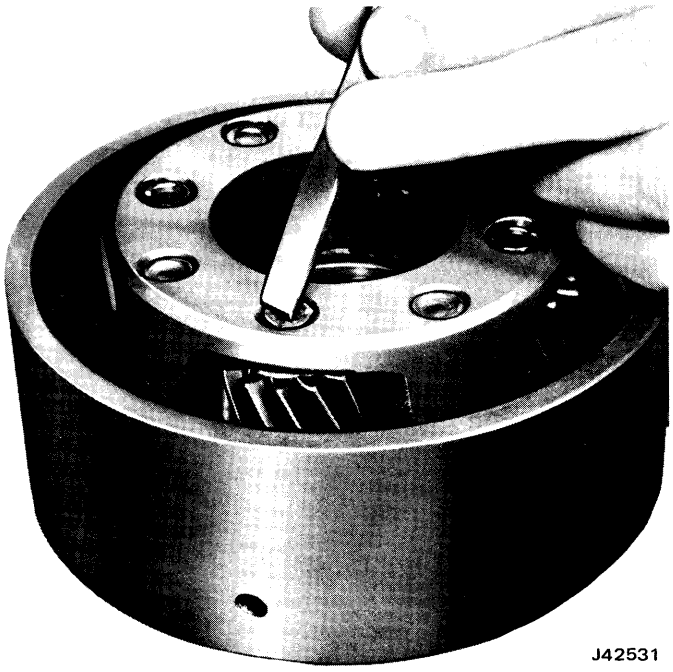


Fig. 7-108 Staking Pinion Pin

Rear Internal Gear

Inspection

Inspect the gear for cracks, the gear teeth for damage or wear, and the splines for damage.

Sun Gear and Shaft

Inspection

Inspect the gear teeth for damage or wear and check the splines for damage. Be sure that the oil lubrication hole is not restricted.

Inspect the shaft for cracks or splits, the splines for damage, and the bushing journals for damage. Inspect bushing for scoring or galling. Be sure that oil lubrication hole is not clogged.

Main Shaft

Inspection

Inspect the shaft for cracks or distortion, the splines for damage, the bushing journals for damage, and the snap ring groove for damage. Be sure the oil lubrication holes are open.

Front and Rear Band

Inspection

Inspect the lining for cracks, flaking, burning, or looseness. Check the band for cracks or distortion and check the end of the band for damage at the anchor lugs or apply lugs.

Extension Housing

Inspection

Inspect the housing for cracks or porosity and inspect the gasket mounting face for damage or flatness.

Inspect the ball bearing. If necessary, remove the bearing from the extension housing.

NOTE: *Although the bearing is not a press-fit in the extension housing, it may be necessary to remove the bearing using a brass drift and hammer.*

Install the ball bearing assembly from the rear of the case extension with the snap ring groove side facing out. It may be necessary to tap the bearing outer race with a rubber mallet to install it.

Modulator and Valve

Inspection

Check for vacuum diaphragm leaks by turning the modulator so the vacuum line stem points downward. If transmission fluid comes out, the vacuum diaphragm is leaking and the modulator must be replaced.

Gasoline or water vapor may settle in the vacuum side of the modulator. If vapor is found without the presence of oil, the modulator should not be replaced.

Inspect the modulator for any signs of bending or distortion (fig. 7-109).

Inspect the reaction lever and O-ring seal seat for damage (fig. 7-110 and 7-111).

Apply suction to the vacuum tube and check for diaphragm leaks.

Check the modulator bellows plunger. The plunger is under a pressure of 16 pounds. If the bellows are damaged, the plunger will have very little pressure on it.

Inspect the modulator valve for nicks or damage. However, note that the second spool on the small end of the valve has a flat spot machined on it. The flat spot allows a slight bleed and permits some oil to bypass.

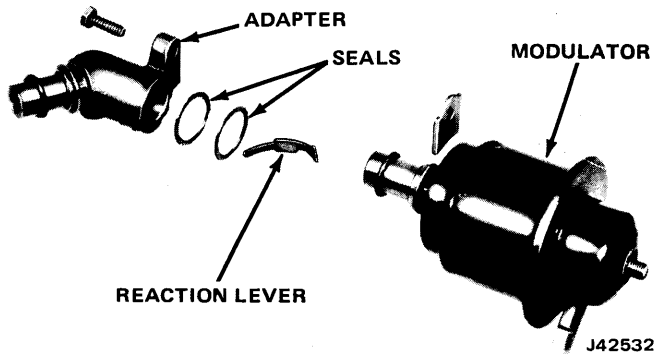


Fig. 7-109 Modulator Assembly

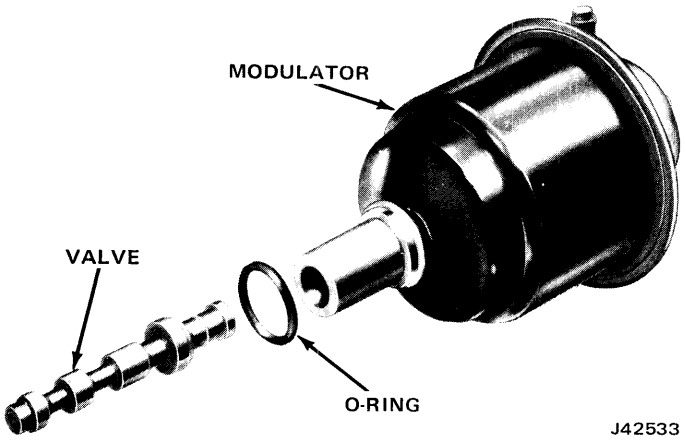


Fig. 7-110 Modulator O-Ring and Valve

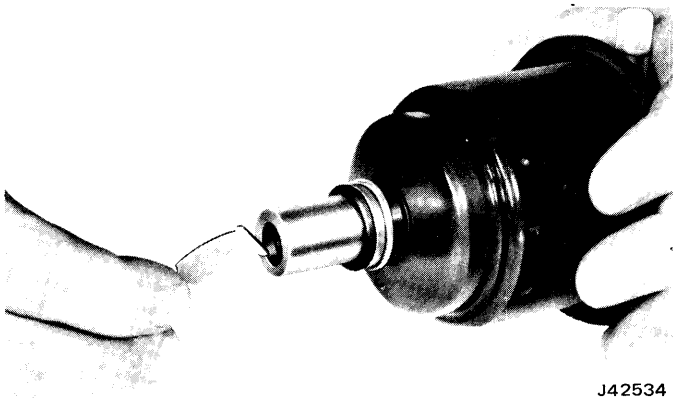


Fig. 7-111 Installing Modulator Reaction Lever

This results in a more constant line pressure and produces smoother shifts.

Check for smooth movement of the valve in the case bore.

Manual and Parking Linkage

Inspection

Inspect the parking actuator rod for cracks or broken spring retainer lugs (fig. 7-112).

Inspect parking brake actuator spring for damage. Inspect the actuator for a free fit on the actuator rod.

Inspect the parking pawl for cracks or wear and inspect the pawl shaft for damaged retainer grooves. Inspect the pawl return spring for deformed coils or coil ends.

Inspect the manual shaft for damaged threads or a loose lever.

Inspect the inside detent lever for cracks or a loose pin.

Inspect the parking pawl bracket for cracks or wear.

Inspect the detent roller and spring assembly for damage.

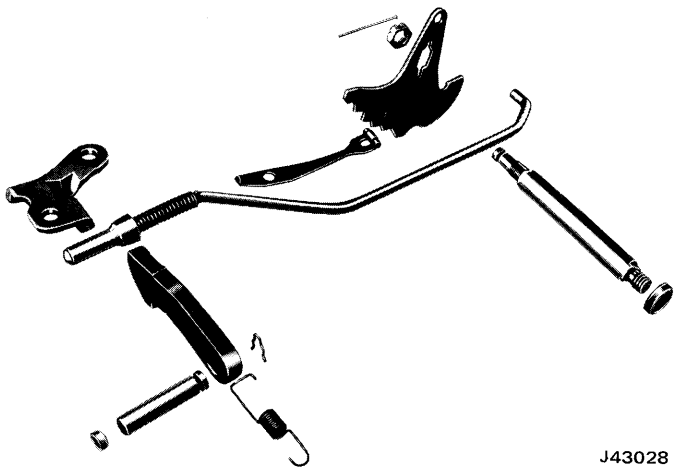


Fig. 7-112 Manual and Parking Linkage

Transmission Case

Inspection

Inspect the case for cracks, porosity, or interconnected or restricted oil passages (fig. 7-113).

Check for good retention of the band anchor pins.

Inspect all threaded holes for thread damage. Inspect the intermediate clutch driven plate lugs for damage or signs of wear and inspect the two snap ring grooves for damage.

Inspect the governor and modulator bores for scratches or scoring.

Inspect the intermediate clutch cup plug (inside case) for good staking and sealing (fig. 7-114).

Inspect the case bushing for wear or galling.

NOTE: *If the case requires replacement, be sure to remove the center support-to-case spacer from the existing case and install it in the replacement case. In addition, if a replacement case is required, be sure to remove the nameplate from the existing case and transfer it to the replacement case. Attach the nameplate to the replacement case using the truss head-type screws supplied with the service replacement case.*

Torque Converter

Inspection

Check the hub surfaces for scoring or wear and check the drive lugs for damage.

Check the torque converter housing for leaks as follows:

(1) Install and tighten Leak Detecting Fixture J-21369 on torque converter housing (fig. 7-115).

(2) Apply 90 psi air pressure to fixture.

(3) Submerge housing in water and check for leaks.

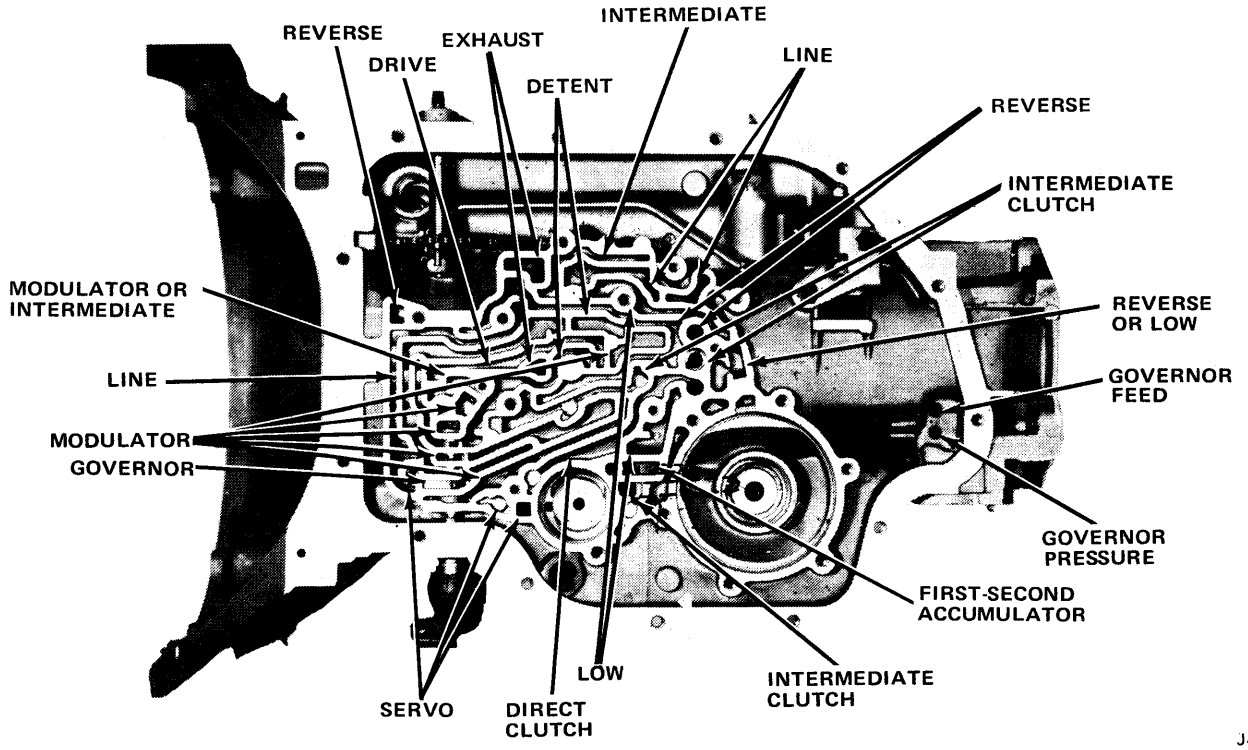


Fig. 7-113 Transmission Case Passages

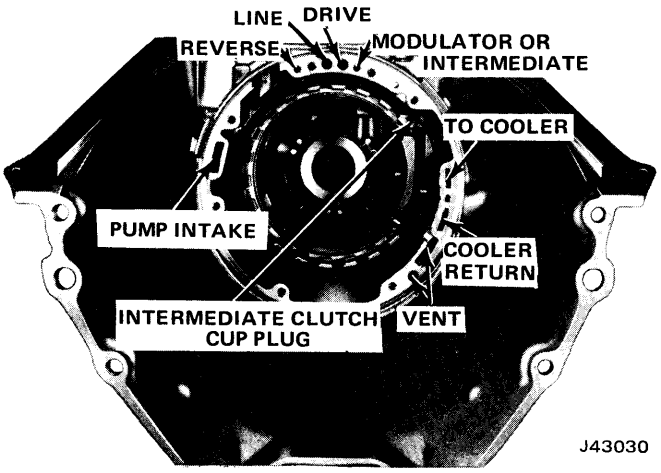


Fig. 7-114 Intermediate Clutch Cup Plug Location

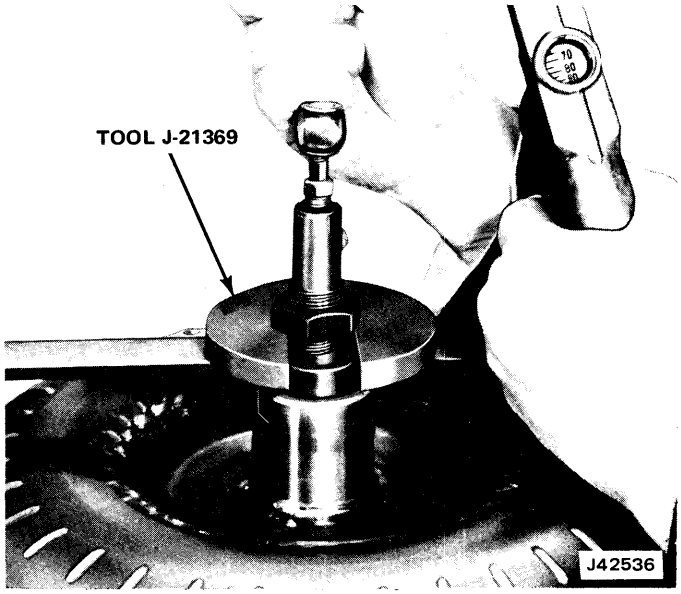


Fig. 7-115 Air Checking The Torque Converter

TRANSMISSION ASSEMBLY

NOTE: *When assembling the transmission and subassembly units, lubricate all bushings, bearings and bearing thrust surfaces with transmission fluid and lubricate both sides of all thrust washers with petroleum jelly.*

Gear Unit

(1) Insert rear spline of main shaft into rear internal gear and install snap ring (fig. 7-116).

(2) Install sun gear-to-internal gear bearing races and thrust bearings against inner face of rear internal gear as follows:

(a) Coat bearings and washers with petroleum jelly.

(b) Install large bearing race against internal gear with flange facing forward or upward (fig. 7-117).

(c) Install thrust bearing in race and place small race against bearing with inner flange facing into bearing, or downward.

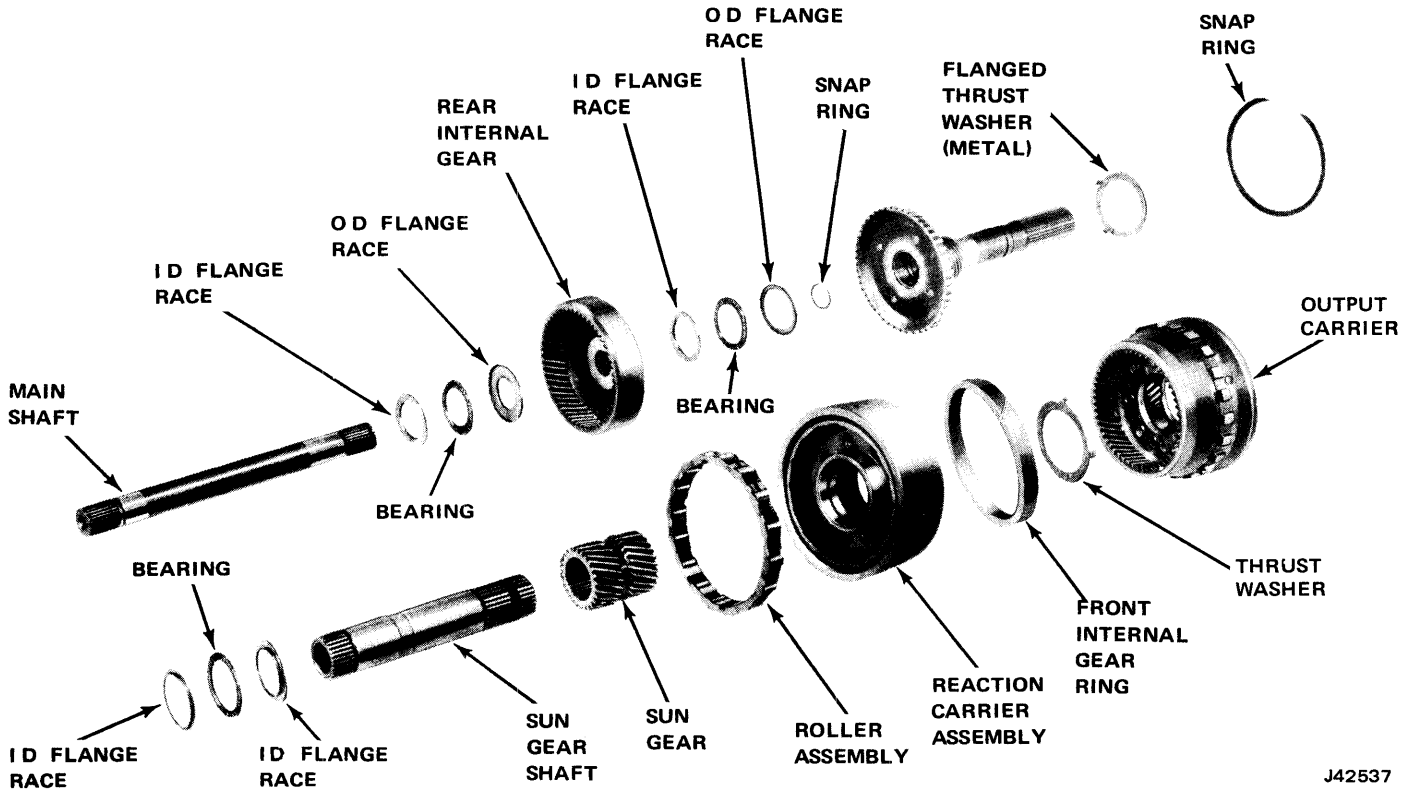


Fig. 7-116 Planetary Gear Assembly

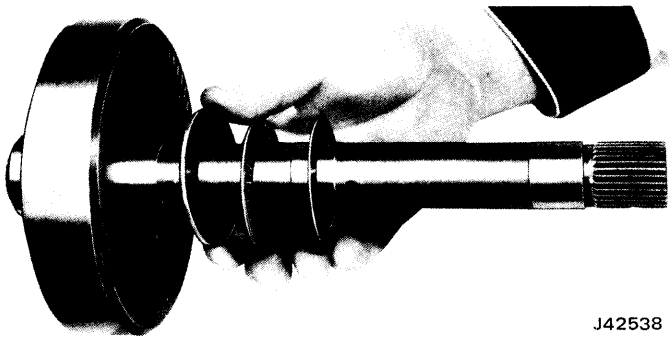


Fig. 7-117 Installing Thrust Bearing and Bearing Races On Main Shaft

(3) Install output carrier over main shaft and mesh carrier pinions with rear internal gear.

(4) Position assembled components so that main shaft extends downward through hole in bench and rear surface of rear internal gear faces upward.

(5) Install rear internal gear-to-output shaft races and thrust bearing (fig. 7-118). Use petroleum jelly to retain parts.

(6) Place small race against internal gear with center flange facing upward.

(7) Install thrust bearing in race and place large race over small race, with outer flange of race cupped over bearing.

(8) Install output shaft in output carrier assembly (fig. 7-119).

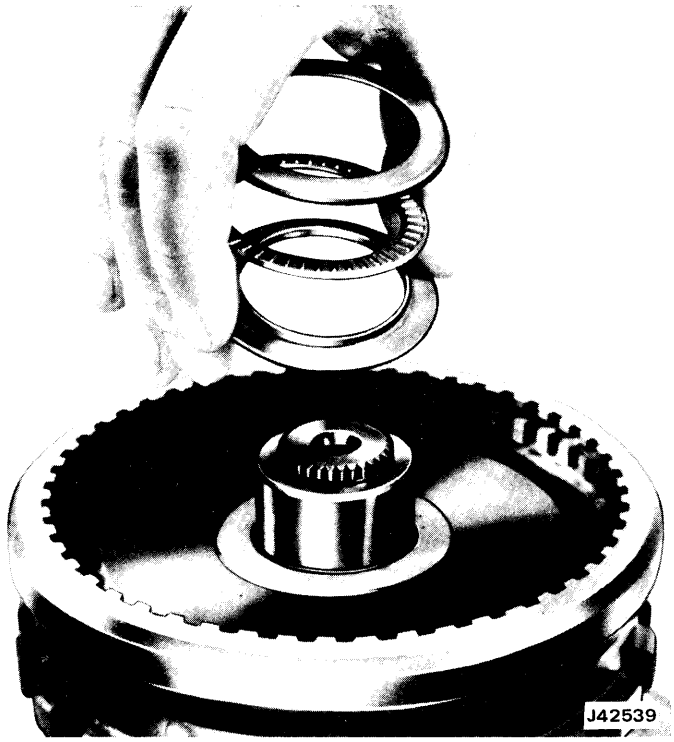


Fig. 7-118 Installing Rear Internal Thrust Bearing and Bearing Races

(9) Install shaft-to-carrier snap ring (fig. 7-116).

(10) Position and support assembled components so that output shaft extends downward.

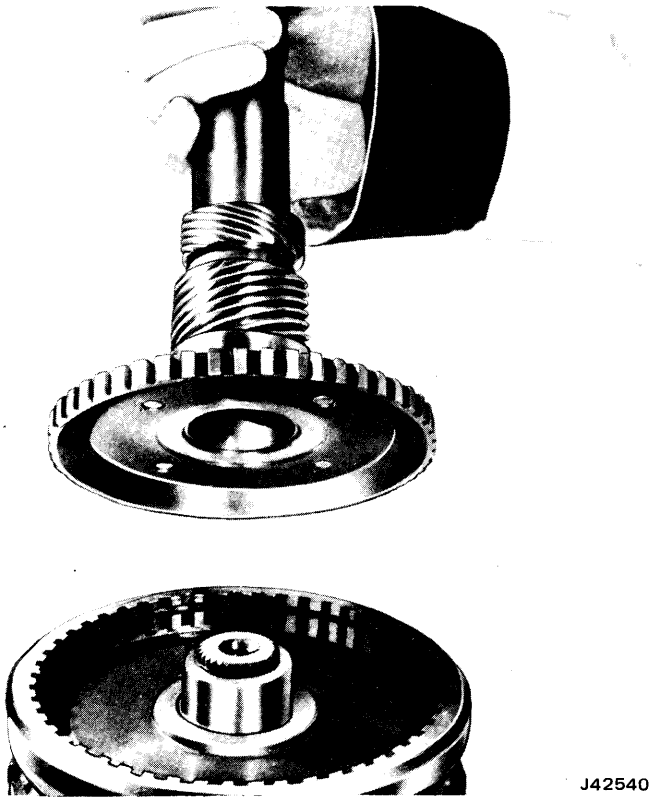


Fig. 7-119 Installing Output Shaft in Output Carrier

(11) Install reaction carrier-to-output carrier thrust washer on output carrier with washer tabs facing downward and located in corresponding pockets of carrier. Use petroleum jelly to retain parts.

NOTE: *Service replacement washers are metal.*

(12) Install sun gear in output carrier, with chamfer facing downward, and mesh sun gear with planet pinion gears.

(13) Install front internal gear ring on output carrier (fig. 7-120).

(14) Install reaction carrier assembly on output carrier and ring, so that output carrier planet pinion gears mesh with sun gear (fig. 7-121).

NOTE: *When a replacement output or reaction carrier is being installed and the front internal gear ring prevents installation of either carrier, it will be necessary to install a service replacement front internal gear ring.*

(15) Install center support-to-sun gear thrust bearing and races as follows:

(a) Coat bearings and races with petroleum jelly.

(b) Install large race over main shaft with center flange of race facing upward and seat race against sun gear.

(c) Install thrust bearing over race and seat remaining race with center flange facing upward on washer (fig. 7-120).

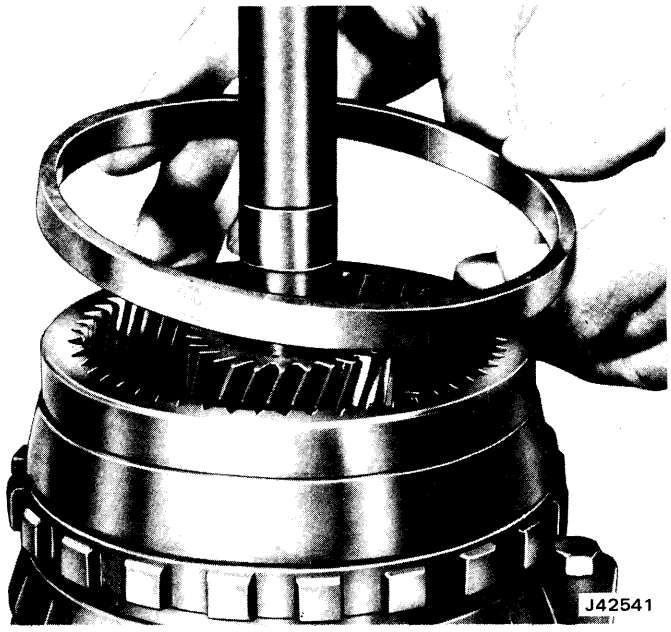


Fig. 7-120 Installing Front Internal Gear Ring

Fig. 7-121 Installing Reaction Carrier

(16) Install clutch rollers in roller cage by compressing energizing spring with forefinger and inserting rollers from center-outer side of cage (fig. 7-123 and 7-124).

(17) Install roller clutch on reaction carrier outer race (fig. 7-125).

(18) Install center support-to-reaction carrier thrust washer in recess in center support. Use petroleum jelly to retain thrust washer.

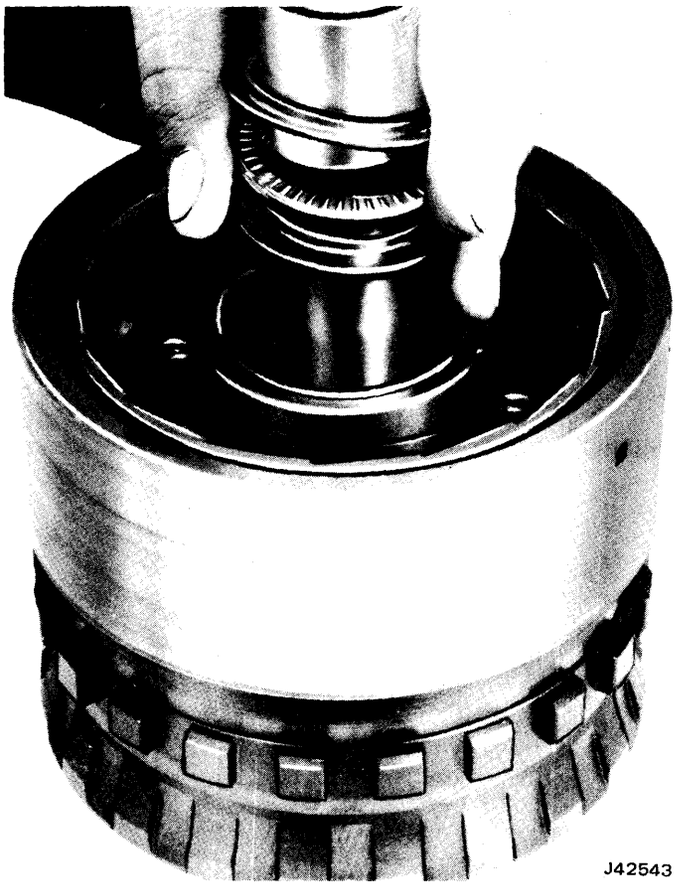


Fig. 7-122 Installing Center Support-to-Sun Gear Thrust Bearing and Races

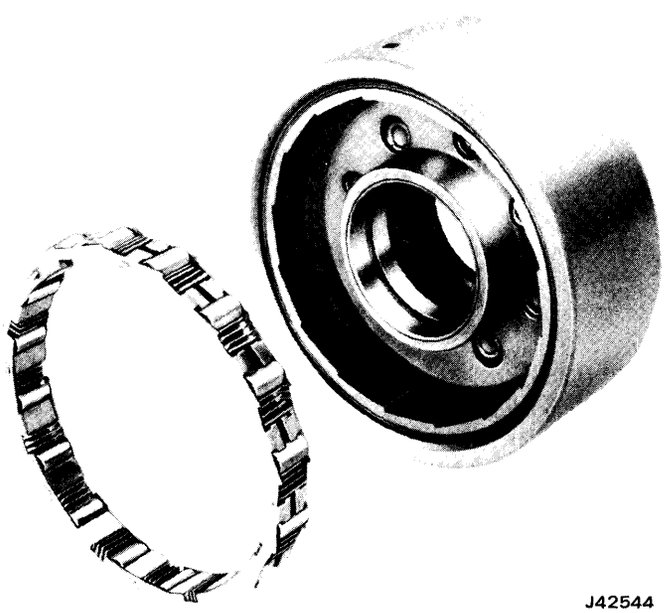


Fig. 7-123 Roller Clutch Assembly

(19) Install center support in reaction carrier and roller clutch (fig. 7- 126).

(20) Insert rear spline (longest spline) of sun gear-shaft into sun gear spline.

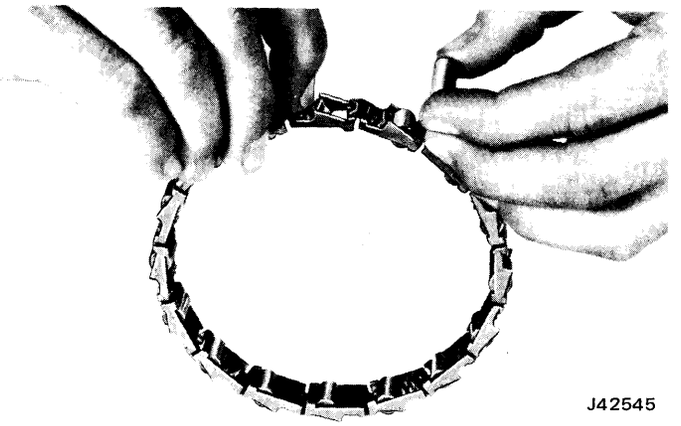


Fig. 7-124 Installing Clutch Rollers in Cage

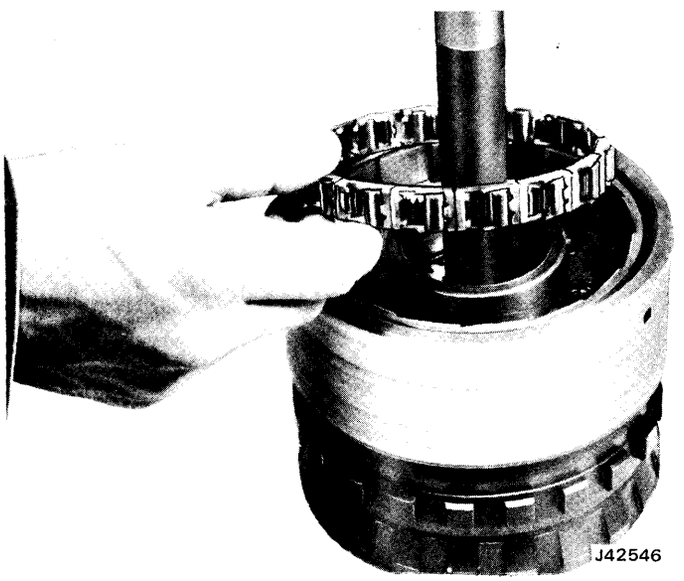


Fig. 7-125 Installing Roller Clutch

NOTE: *When the reaction carrier is held stationary, the center support should turn counterclockwise only.*

(21) Using Gear Assembly Clamp Set J-21795, clamp gear unit assembly together until it is installed.

(22) Install output shaft-to-case thrust washer and seat washer so washer tabs are inserted into corresponding holes of shaft (fig. 7-127). Use petroleum jelly to retain thrust washer.

NOTE: *Do not use a plastic thrust washer.*

Gear Unit and Intermediate Clutch

(1) Install parking pawl with tooth facing toward inside of case and parking pawl shaft.

(2) Install parking pawl shaft retainer clip (fig. 7-128).

(3) Install cup plug using 3/8-inch diameter rod, and install plug in case until parking pawl shaft bottoms on case rib (fig. 7-128).

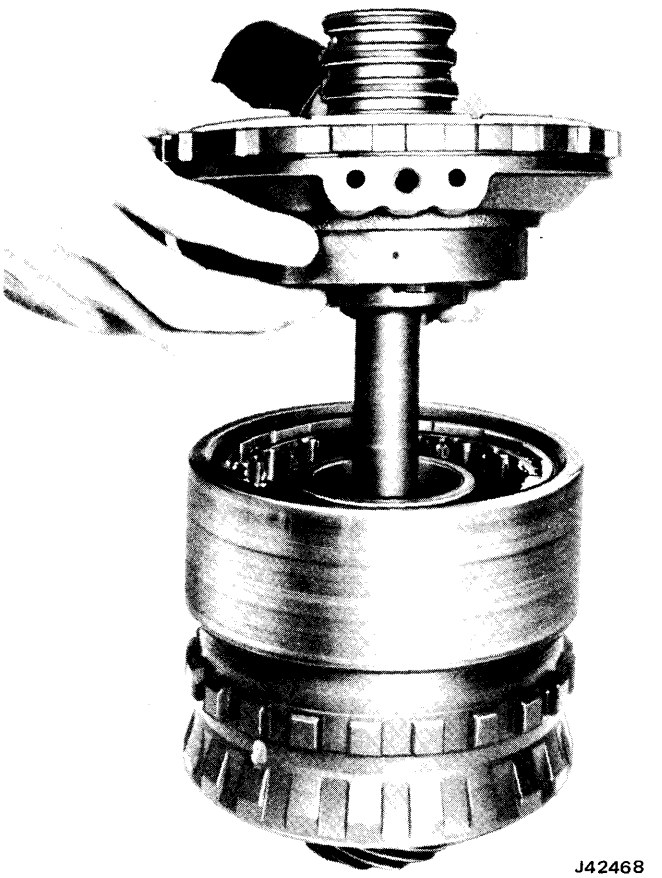


Fig. 7-126 Installing Center Support

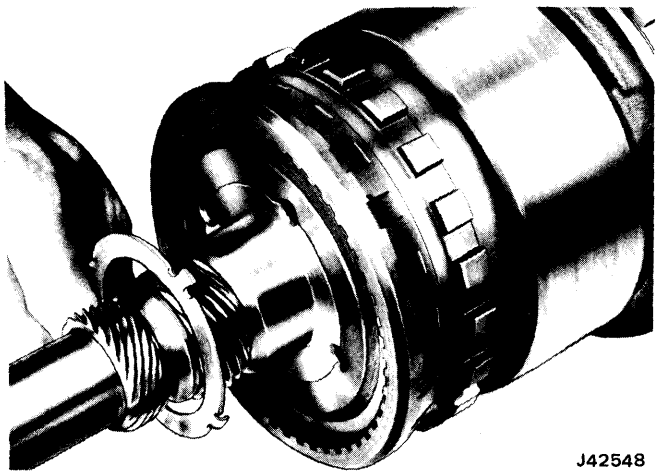


Fig. 7-127 Installing Output Shaft-to-Case Thrust Washer

(4) Install parking pawl return spring, with square end hooked on pawl, on opposite end of case (fig. 7-112).

(5) Install parking pawl bracket guides over pawl and install two attaching bolts. Tighten bolts to 18 foot-pounds torque (fig. 7-129).

(6) Install rear band in case so that two band lugs index with two anchor pins. Be sure band is seated on lugs.

Fig. 7-128 Installing Cup Plug

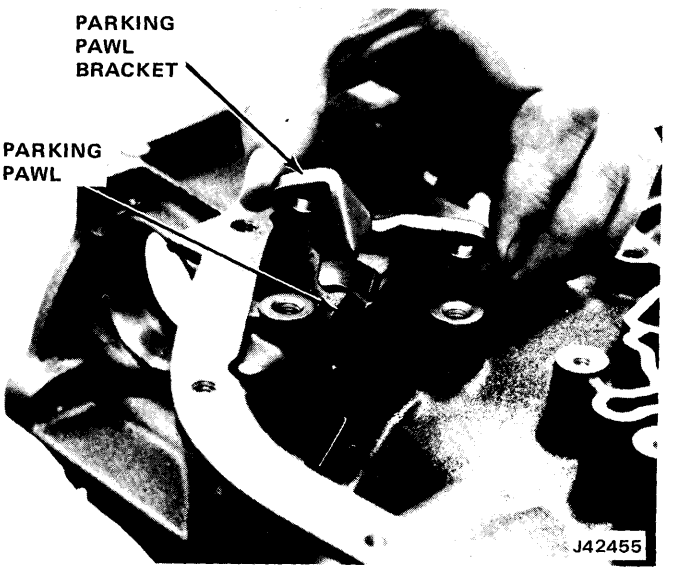


Fig. 7-129 Installing Parking Pawl Bracket

(7) Install support-to-case spacer against shoulder at bottom of case splines so that end gap of snap ring is adjacent to band anchor pin (fig. 7-130).

CAUTION: *Do not confuse this spacer (0.040-inch thick and both sides flat) with either the center support-to-case snap ring (one side beveled) or the backing plate-to-case snap ring (0.093-inch thick and both sides flat). Do not attempt to install the early-type center support with the 0.040-inch spacer ring in the case, and do not install the new center support until the 0.040-inch spacer ring is installed in the case.*

(8) Install proper rear unit selective washer (proper washer determined by previous end play check) into corresponding slots in rear of transmission case.

(9) Install center support and gear unit in case. Be sure center support bolt hole is properly aligned with hole in case. Use Tool Kit J-21795 to install assembly.

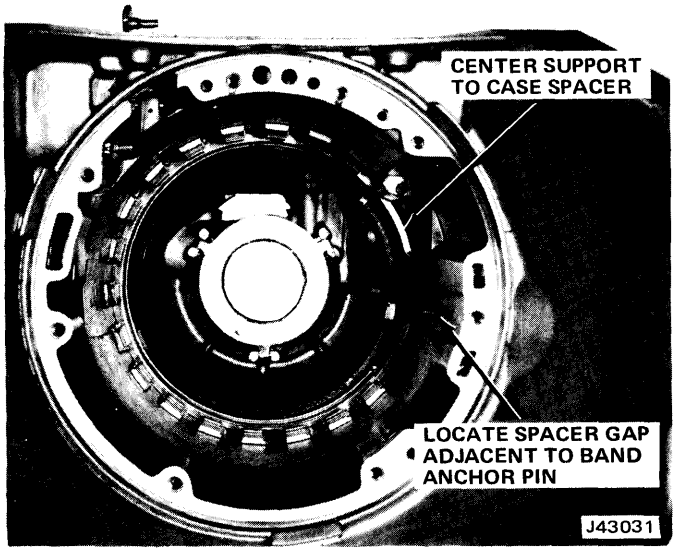


Fig. 7-130 Installing Center Support Spacer

(10) Install center support-to-case retaining snap ring, **with beveled side of ring facing upward**. Locate snap ring end gap adjacent to band anchor pin to secure center support in case. Be sure ring is properly seated in case (fig. 7-131).

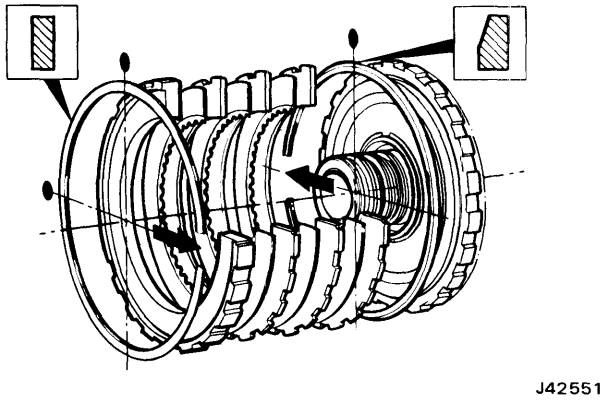


Fig. 7-131 Snap Ring Installation

(11) Install case-to-center support bolt. Place Center Support Locating Tool J-23093 in case direct clutch passage with handle of tool pointing to right (as viewed from front of transmission) and parallel to converter housing mounting face (fig. 7-132).

(12) Apply downward pressure on tool handle to rotate center support counterclockwise as viewed from front of transmission.

(13) Hold center support counterclockwise against case splines and tighten case to center support bolt to 23 foot-pounds torque. Use 3/8-inch, 12-point, thin-wall deep socket to tighten bolt (fig. 7-132).

CAUTION: *When using the locating tool, do not create any burrs on the case valve body mounting face.*

Fig. 7-132 Installing Center Support Bolt

NOTE: *The piston in the center support applies the intermediate clutch. If the piston seals leak, clutch slippage or loss of second gear range may result.*

(14) Lubricate two flat and one waved steel plates and three composition-faced intermediate clutch plates with transmission fluid. Install plates starting with waved steel plate and alternating composition-faced and steel plates.

(15) Install intermediate clutch backing plate, with ridge facing upward or forward, and install backing plate-to-case snap ring. **This snap ring is flat on both sides. Locate gap of snap ring opposite band anchor pin (fig. 7-131).**

Measuring Rear Unit End Play

(1) Install Slide Hammer J-25118 in extension housing attaching bolt hole (fig. 7-133).

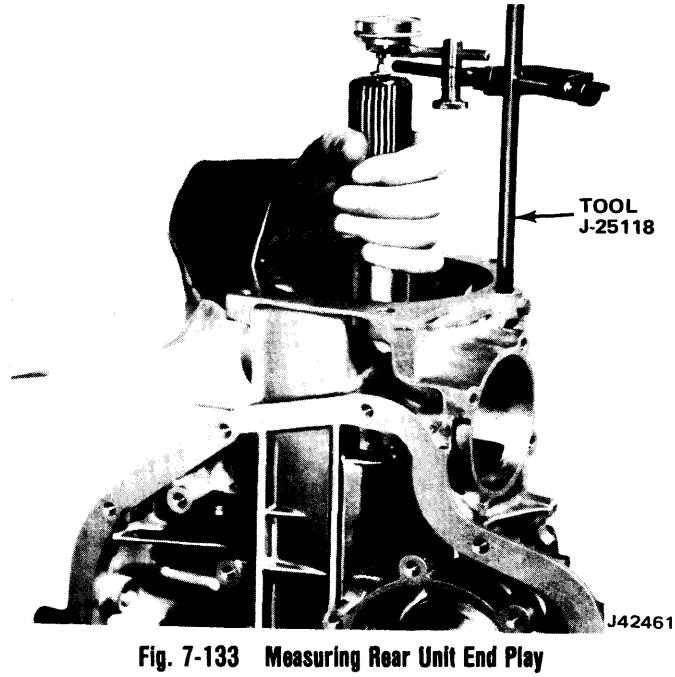


Fig. 7-133 Measuring Rear Unit End Play

(2) Mount dial indicator on rod and position indicator stylus against end of output shaft.

(3) Move output shaft inward and outward and note end play. End play should be 0.007 to 0.019 inch.

NOTE: *The selective washer that determines end play is located between the thrust washer and rear face of the transmission case. The washer is steel and has three lugs.*

(4) If different washer thickness is required to adjust end play, select washer from following chart:

Rear Unit Thrust Washer Chart

Thickness (Inch)	Notches and/or Numeral	
0.074 to 0.078	None	1
0.082 to 0.086	1 Tab Side	2
0.090 to 0.094	2 Tabs Side	3
0.098 to 0.102	1 Tab OD	4
0.106 to 0.110	2 Tabs OD	5
0.114 to 0.118	3 Tabs OD	6

70519

Front Band

Install front band with band anchor hole positioned over band anchor pin and band apply lug facing servo hole.

Manual Linkage

(1) Install O-ring on manual shaft.

(2) Install parking actuator rod in manual detent lever from side opposite pin.

(3) Install parking actuator rod plunger under parking bracket and over parking pawl (fig. 7-134).

(4) Install manual shaft assembly through case and detent lever, and install jamnut and retaining pin.

(5) Install retaining pin. Index pin with groove in manual shaft.

(6) Install shaft seal using socket and hammer.

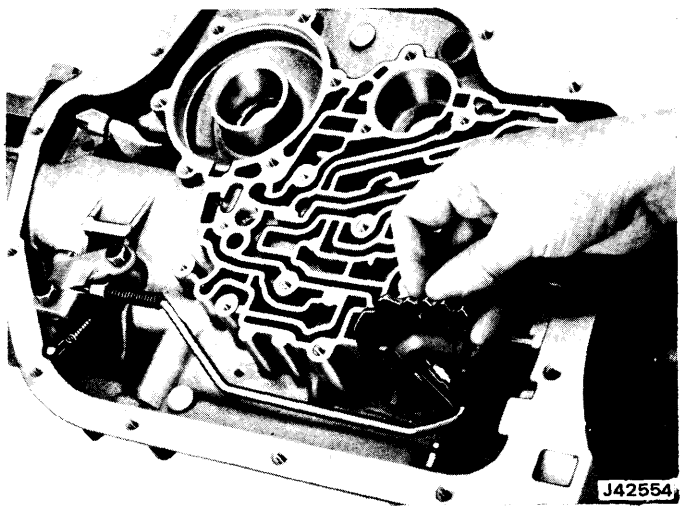


Fig. 7-134 Manual Shaft Installation

Direct Clutch-Forward Clutch

(1) Install direct clutch and intermediate roller clutch assembly.

(2) Rotate direct clutch housing until outer race of roller clutch contacts intermediate clutch plates and hub of clutch housing contacts sun gear shaft.

NOTE: *It may be helpful to remove the composition plates and steel plates from the direct clutch housing while seating the assembly.*

(3) Install forward clutch hub-to-direct clutch housing thrust washer on hub of forward clutch if not installed previously. Use petroleum jelly to retain washer.

(4) Install forward clutch and turbine shaft. Position direct clutch hub so end of main shaft will bottom on end of forward clutch hub. When forward clutch is seated, it will be approximately 1-1/4 inch from case oil pump face.

Oil Pump

(1) Fabricate guide pins by grinding heads from two spare 5/16-18 valve body bolts.

(2) Install guide pins in pump mounting bolt holes of transmission case.

(3) Position oil pump gasket on pump face of transmission case. Use petroleum jelly to retain gasket.

(4) Install pump assembly and all but one pump attaching bolt and washer. Omit bolt and washer from either 5 or 10 o'clock position.

(5) Tighten installed pump attaching bolts to 22 foot-pounds torque.

CAUTION: *If the turbine shaft cannot be rotated as the pump is pulled into place, either the forward or direct clutch housing has been improperly installed and will not index with the clutch plates. This condition must be corrected before the pump can be installed.*

(6) Install oil pump seal. Use nonhardening sealer on outside of seal and install seal using Tool J-21359 (fig. 7-135).

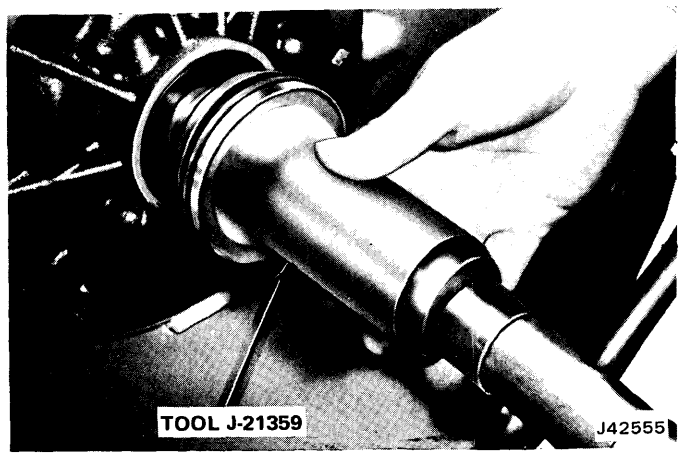


Fig. 7-135 Installing Oil Pump Seal

(7) Measure front unit end play, and replace selective washer if necessary.

(8) Install remaining oil pump attaching bolt and washer. Tighten bolt to 22 foot-pounds torque.

Check Balls-Control Valve Spacer Plate and Gaskets-Detent Solenoid-Front Servo-and Electrical Connector

(1) Install guide pins (fabricated previously) in valve body mounting holes in transmission case.

(2) Install six check balls into ball seat pockets in transmission case (fig. 7-136).

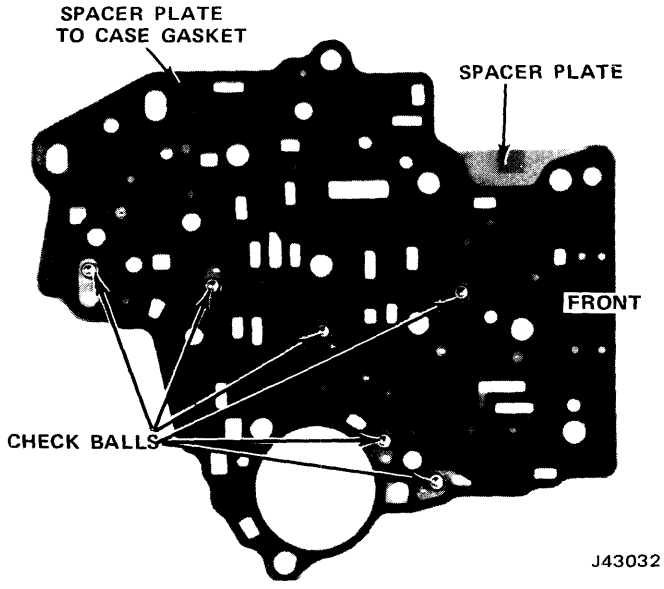


Fig. 7-136 Spacer Plate Check Ball Location

(3) Install front servo spring and spring retainer in servo bore (fig. 7-137).

(4) Install retainer ring in front servo pin groove and install pin in case so that tapered end contacts band. Be sure retainer does not become dislodged during installation (fig. 7-18 and 7-51).

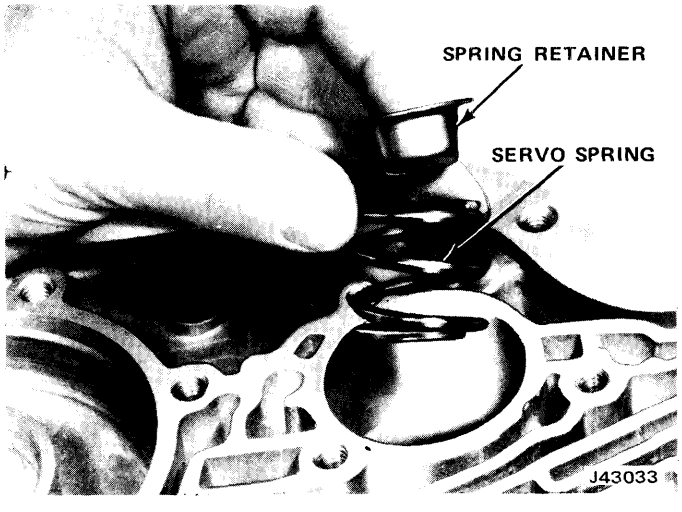


Fig. 7-137 Installing Servo Spring and Retainer

(5) Install seal ring on servo piston (if removed) and install piston on servo pin with flat side of piston facing oil pan (fig. 7-18 and 7-51).

(6) Install control valve spacer plate to case gasket (this gasket has extension for detent solenoid and has a "C" mark near front servo location).

(7) Install control valve spacer plate and spacer plate-to-control valve gasket (fig. 7-138).

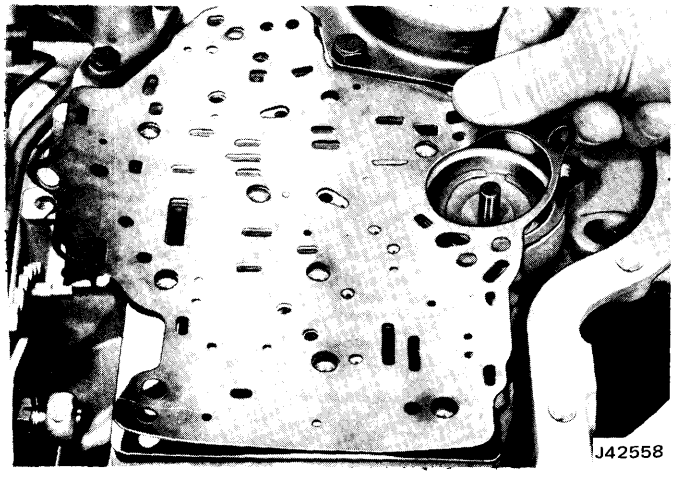


Fig. 7-138 Installing Control Valve Spacer Gasket

(8) Install detent solenoid gasket with raised portions of gasket facing upward.

(9) Install detent solenoid with connector facing outer edge of case. Tighten bolts finger-tight only.

(10) Install O-ring seal on electrical connector (fig. 7-16).

(11) Install electrical connector in case with lock tabs facing into case and locating tab in locating notch on side of case.

(12) Connect detent solenoid wire to electrical connector. Be sure wire is solidly connected to terminal on electrical connector.

Rear Servo

(1) Install proper length band-apply pin. Refer to Selection of Rear Band Apply Pin.

(2) Install rear accumulator spring (fig. 7-139).

(3) Lubricate rear servo assembly with transmission fluid and install servo assembly.

(4) Install rear servo gasket and cover (fig. 7-140). Install cover attaching bolts and tighten bolts to 18 foot-pounds torque.

Control Valve-Governor Screen-Governor Pipes

(1) Insert governor pipes into valve body and install governor screen in case.

NOTE: *Be sure the governor screen is in position before installing the control valve and governor pipes. The open end of the screen must face the interior of the transmission case.*

(2) Install control valve and governor pipes (fig. 7-141).

NOTE: *Be sure the manual valve is properly indexed with the pin on the manual detent lever and that the governor pipes are properly installed in the case.*

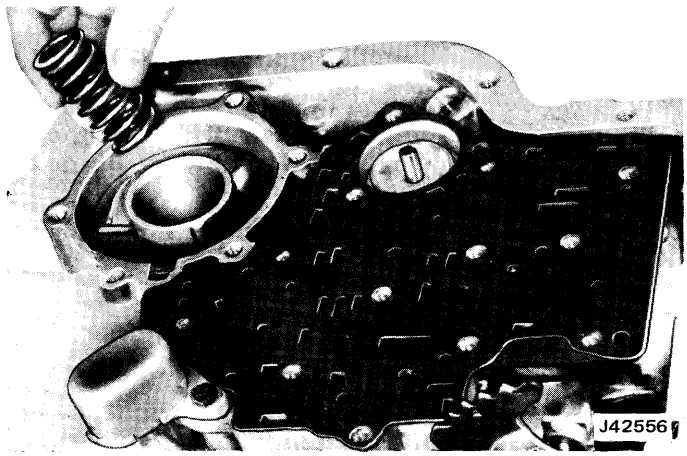


Fig. 7-139 Installing Rear Accumulator Spring

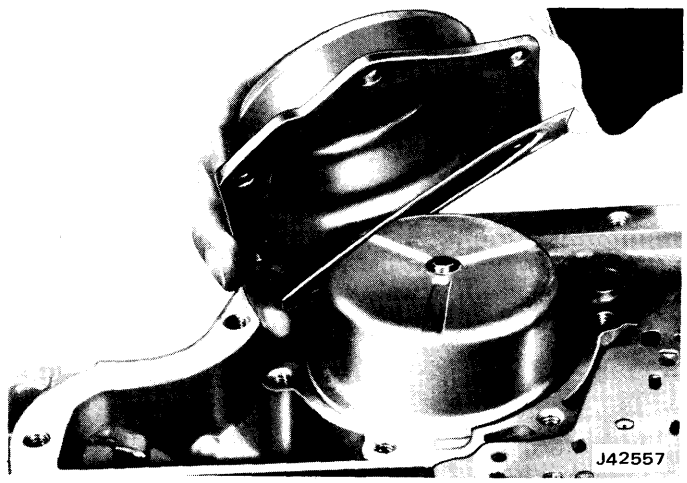


Fig. 7-140 Installing Rear Servo Cover and Gasket

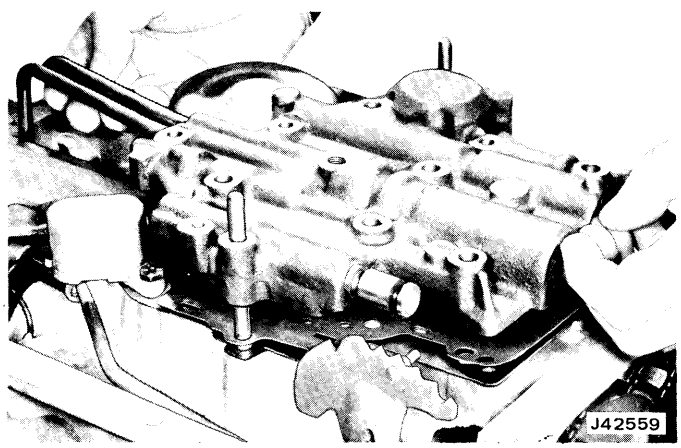


Fig. 7-141 Installing Control Valve

(3) Install control valve attaching bolts, and manual detent and roller assembly.

(4) Tighten detent solenoid and control valve attaching bolts to 8 foot-pounds torque and tighten detent solenoid bolts to 7 foot-pounds torque.

Oil Filter-Oil Pan

(1) Install case-to-intake pipe O-ring seal on intake pipe.

(2) Install replacement filter on intake pipe. Install filter on end of intake pipe marked "filter."

(3) Install assembled filter and intake pipe and install filter-to-control valve retainer bolt (fig. 7-142).

CAUTION: *The oil filter must be replaced after any major repair.*

(4) Position oil pan gasket on case.

(5) Position oil pan on case and install oil pan bolts. Tighten oil pan bolts to 12 foot-pounds torque.

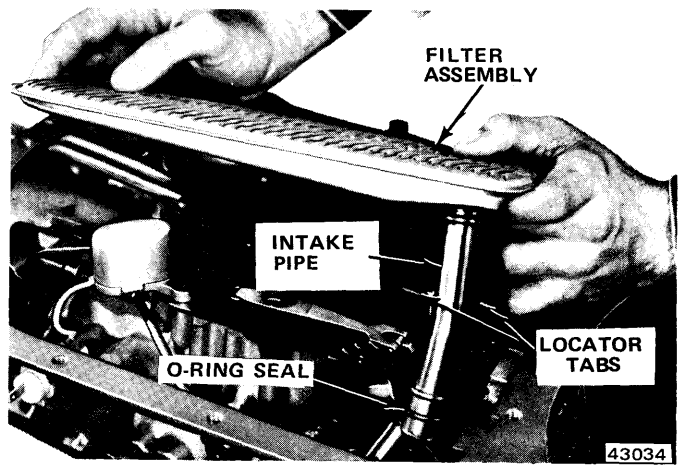


Fig. 7-142 Installing Oil Filter and Intake Pipe

Modulator Valve and Modulator Vacuum Diaphragm

(1) Insert modulator valve into transmission case, stem end outward.

(2) Install adapter at valve and install retainer on transmission case. Tighten attaching bolts to 18 foot-pounds torque.

(3) Install O-ring seal on vacuum diaphragm and install diaphragm adapter.

(4) Install retainer-to-transmission case attaching bolts. Tighten bolts to 18 foot-pounds torque (fig. 7-143).

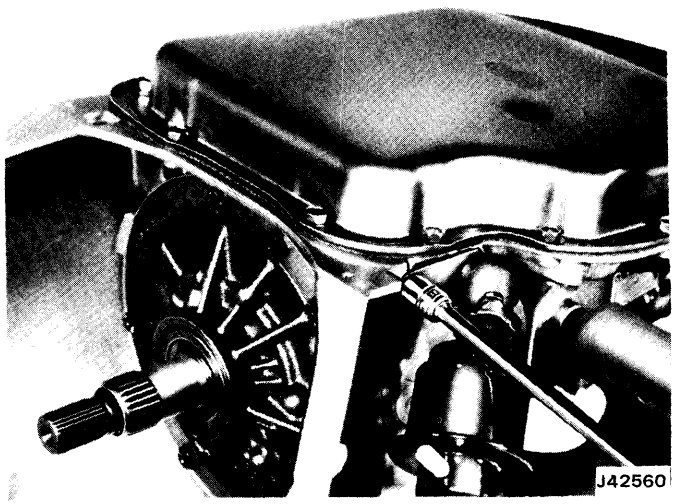


Fig. 7-143 Installing Modulator Valve Retainer

Governor

(1) Insert governor assembly into transmission case and mesh driven gear of governor with drive gear in case (fig. 7-144).

(2) Install gasket on governor cover and install cover on transmission case. Tighten cover bolts to 18 foot-pounds torque.

(3) Install transfer case on transmission.

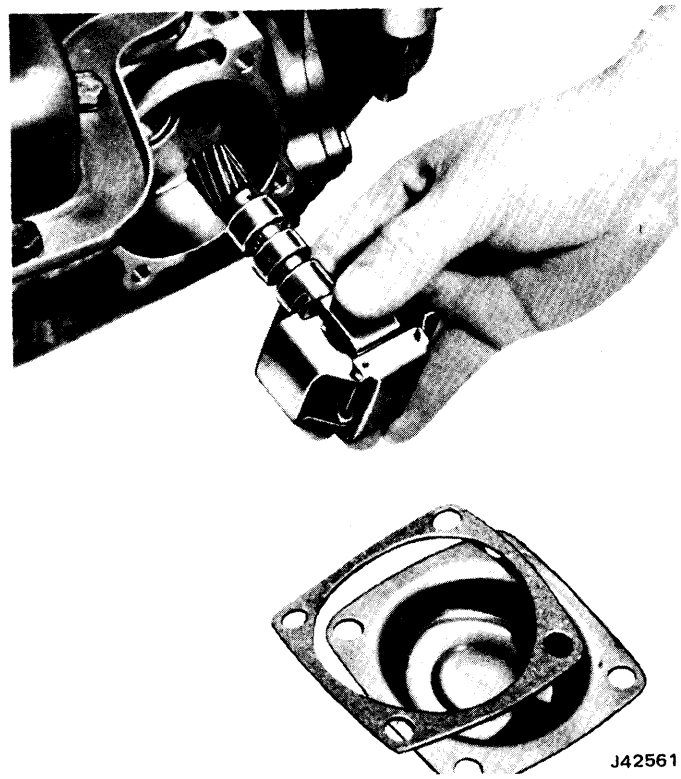


Fig. 7-144 Installing Governor Assembly

SPECIFICATIONS

Transmission Specifications

Model	400
Ratios:	
Low	2.4815 to 1
Intermediate	1.4815 to 1
High	1 to 1
Reverse	2.0769 to 1
Converter Stall Ratio	2.4 to 1
Oil Capacity	22 pt.
Modulator	Vacuum Control
Converter Elements	3
Cooling	Water
Carrier Pinion End Play	0.009 to 0.024 inch
Pump Face to Rotor End Play	0.0008 to 0.0035 inch
Front Unit End Play	0.003 to 0.024 inch

70520A

Direct Clutch Plate Usage

Engine CID	Flat Steel Plates	Waved Steel Plates	Composition Plates
258/304	3	1	4
360/401	4	1	5

70520C

Torque Specifications

Service Set-To Torques should be used when assembling components.

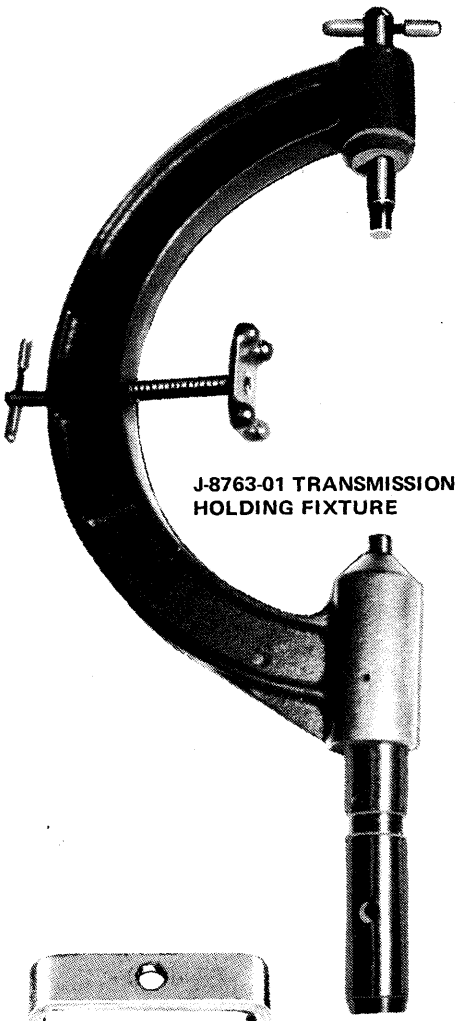
	Service Set-To Torque
Case Center Support Bolt	23
Control Valve Body Bolts	8
Converter Dust Shield Screws	8
Converter to Flywheel Bolts	33
Detent Solenoid Bolts	7
Extension Housing Bolts	23
Governor Cover Bolts	18
Linkage Swivel Clamp Nut	4
Manual Lever to Manual Shaft Nut	8
Manual Shaft to Inside Detent Lever	18
Modulator Retaining Bolt	18
Oil Pan Attaching Bolts	12
Parking Pawl Bracket Bolts	18
Pump Cover Bolts	22
Pump to Case Attaching Bolts	22
Rear Servo Cover Bolts	18
Transmission to Engine Mounting Bolts	28

All torque values given in foot-pounds with dry fits unless otherwise specified.

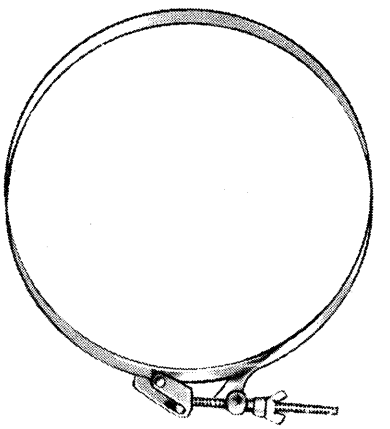
Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

70520B

Special Tools

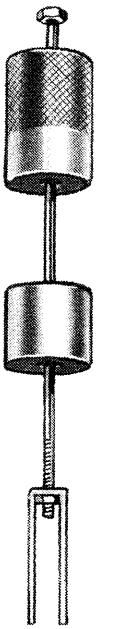


J-8763-01 TRANSMISSION HOLDING FIXTURE



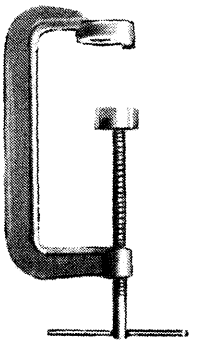
J-21368 ALIGNMENT STRAP PUMP AND BODY

J-21363 INTERMEDIATE CLUTCH INNER SEAL PROTECTOR



J-21795 GEAR ASSEMBLY REMOVING AND INSTALLING TOOL

J-25118 SLIDE HAMMERS

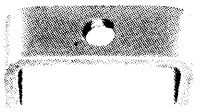


J-21885 ACCUMULATOR PISTON RETAINER RING REMOVER-INSTALLER

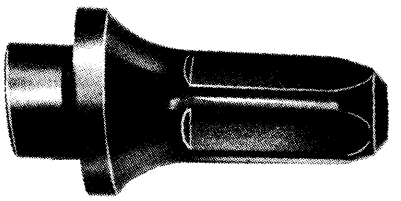
J-21370-6 REAR BAND APPLY PIN SELECTOR FIXTURE

J-21370-5 PIN–REAR BAND APPLY

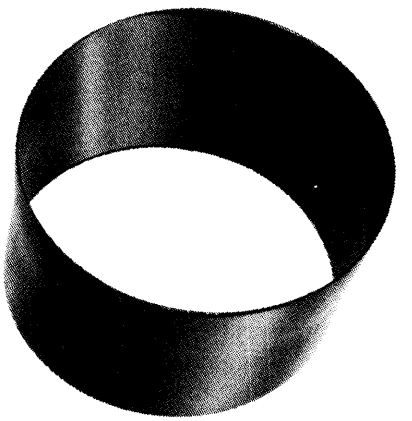
J-25149 DIRECT CLUTCH SPRING COMPRESSOR



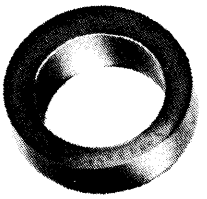
J-25148 FORWARD CLUTCH SPRING COMPRESSOR



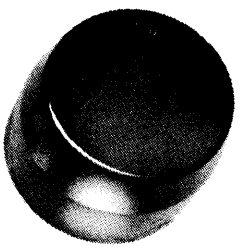
J-21359 PUMP OIL SEAL DRIVER



J-21409 FORWARD CLUTCH OUTER SEAL PROTECTOR



J-21364 REAR UNIT AND PUMP PROTECTOR HUB



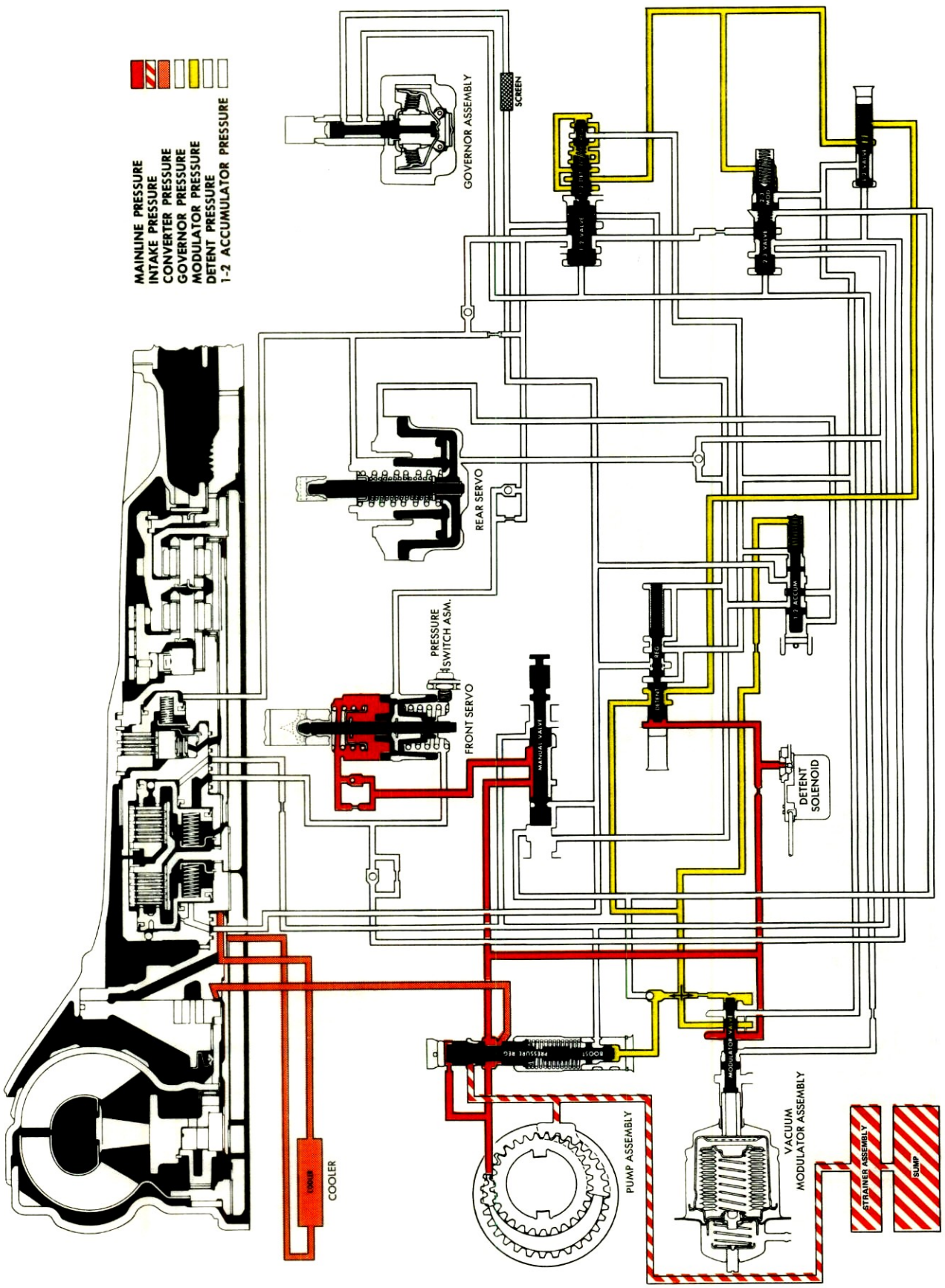
J-21362 FORWARD AND DIRECT CLUTCH INNER SEAL PROTECTOR

J42564

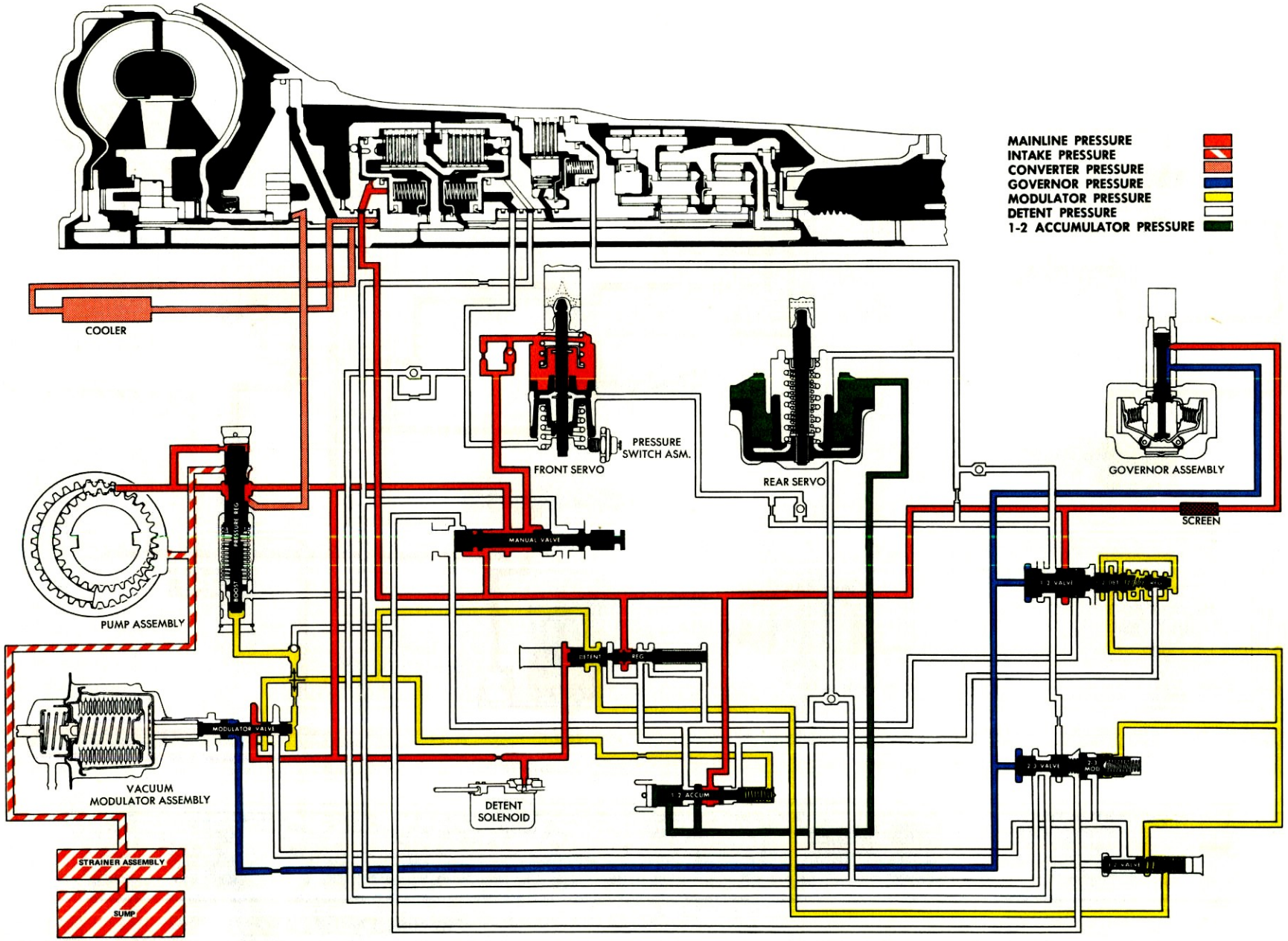
TECHNICAL BULLETIN REFERENCE

Date	TB No.	Subject	Changes Information on Page No.

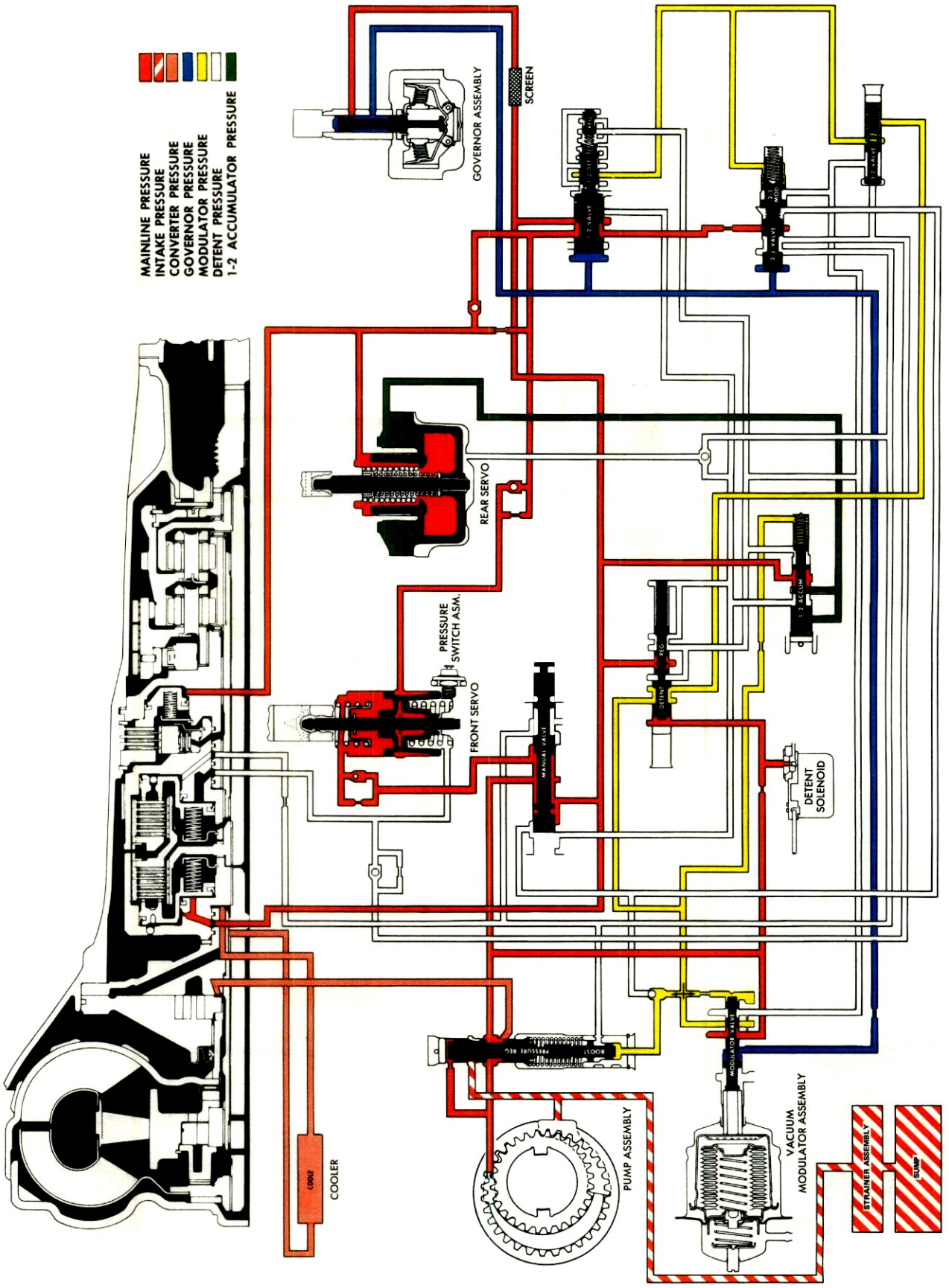
AUTOMATIC TRANSMISSION HYDRAULIC FLOW CHARTS


MAINLINE PRESSURE
INTAKE PRESSURE
CONVERTER PRESSURE
GOVERNOR PRESSURE
MODULATOR PRESSURE
DETENT PRESSURE
1-2 ACCUMULATOR PRESSURE
GOVERNOR ASSEMBLY
SCREEN
REAR SERVO
PRESSURE SWITCH ASM.
FRONT SERVO
MANUAL VALVE
DETENT SOLENOID
COOLER
PUMP ASSEMBLY
VACUUM MODULATOR ASSEMBLY
STRAINER ASSEMBLY
SUMP

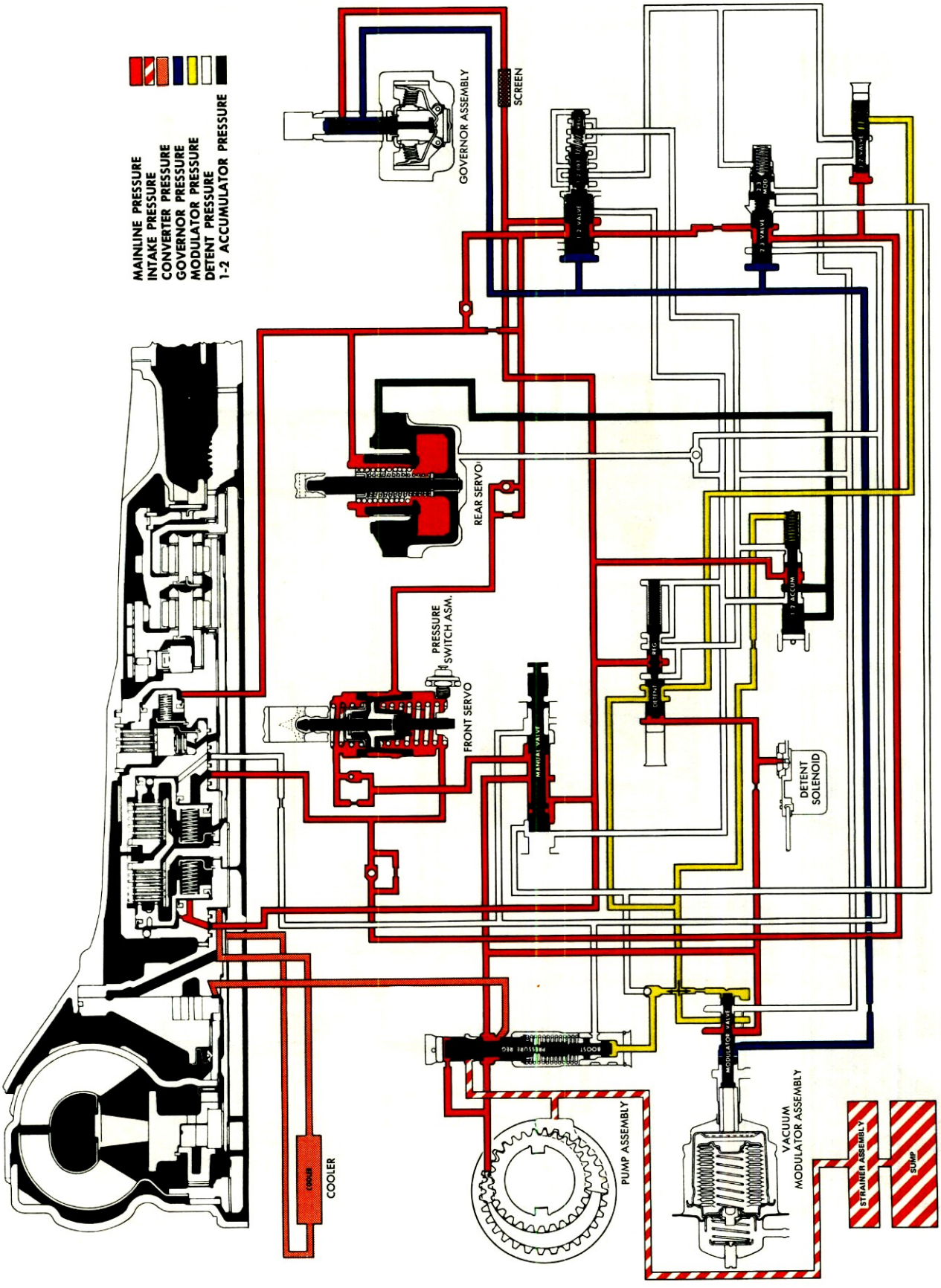
Neutral



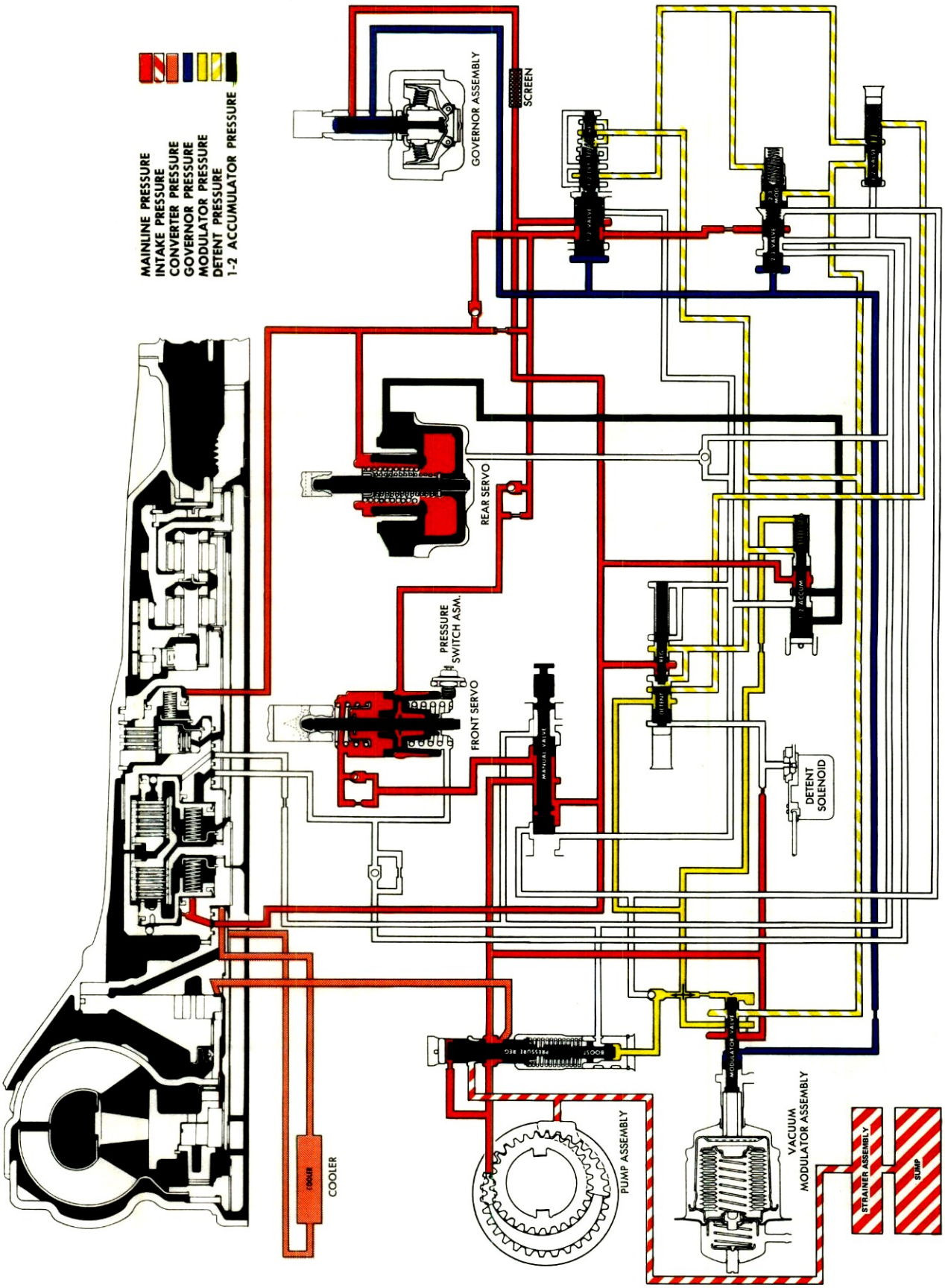
Drive Range—First Gear



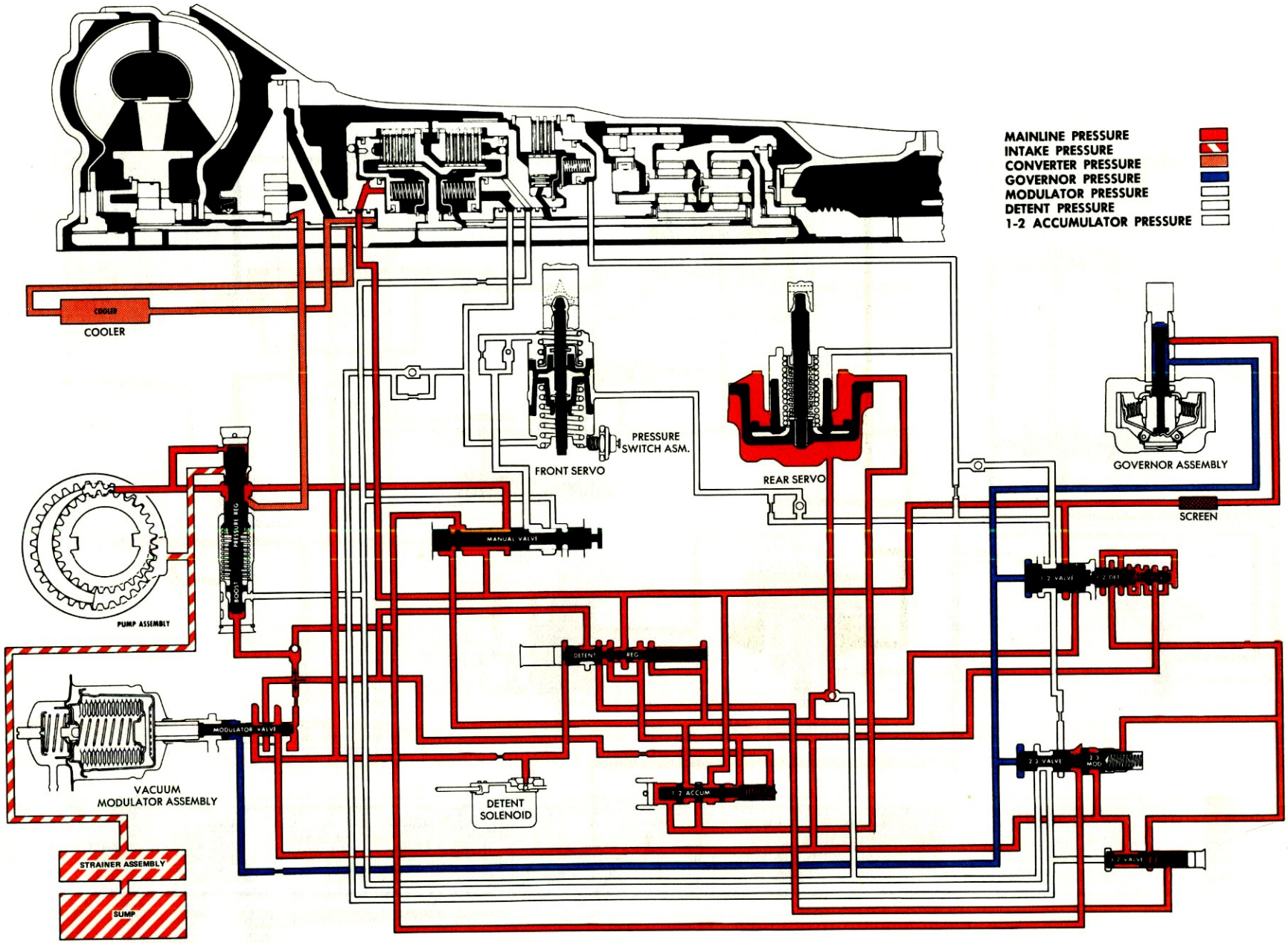
Drive Range — Second Gear



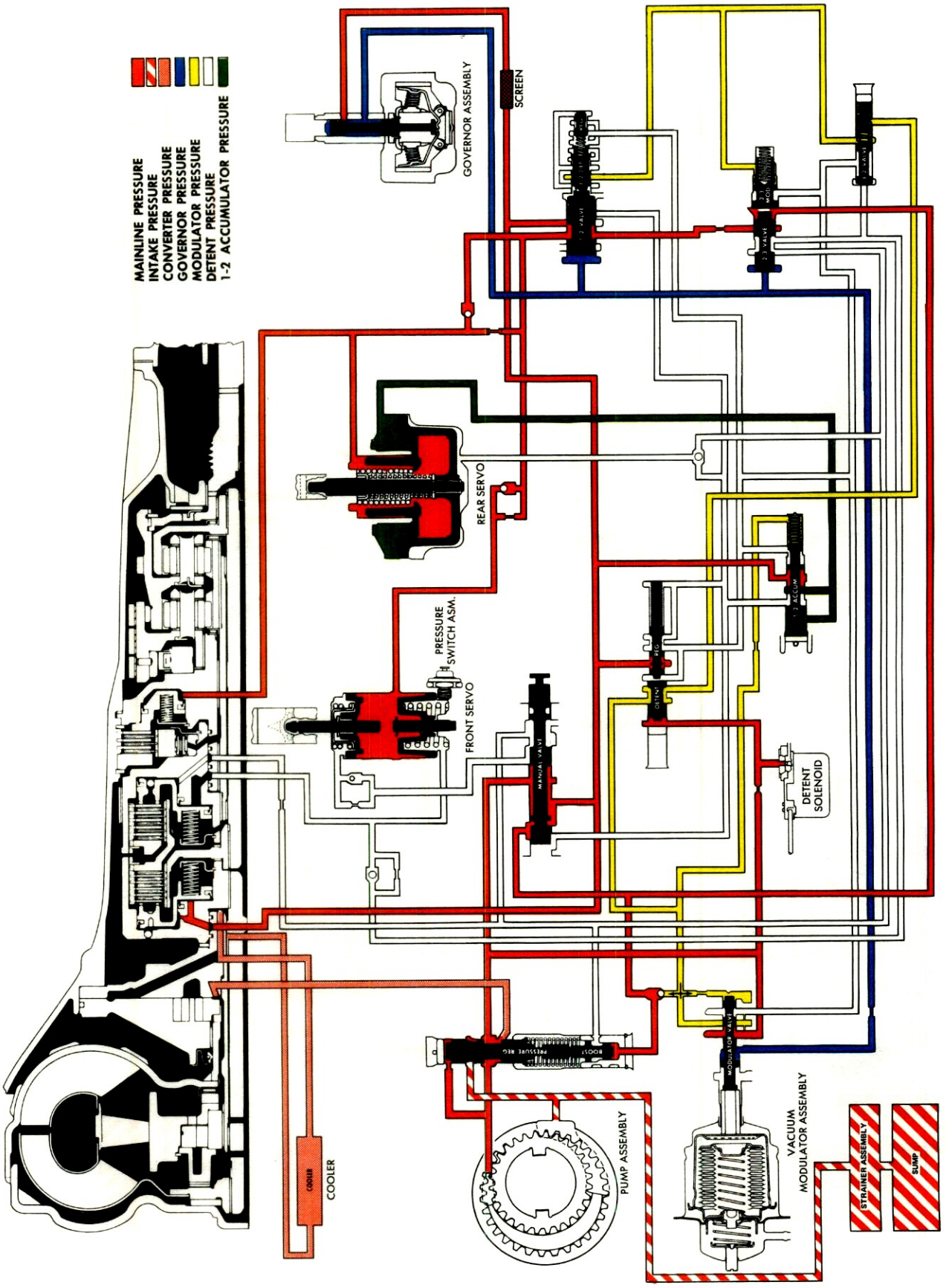
Drive Range — Third Gear



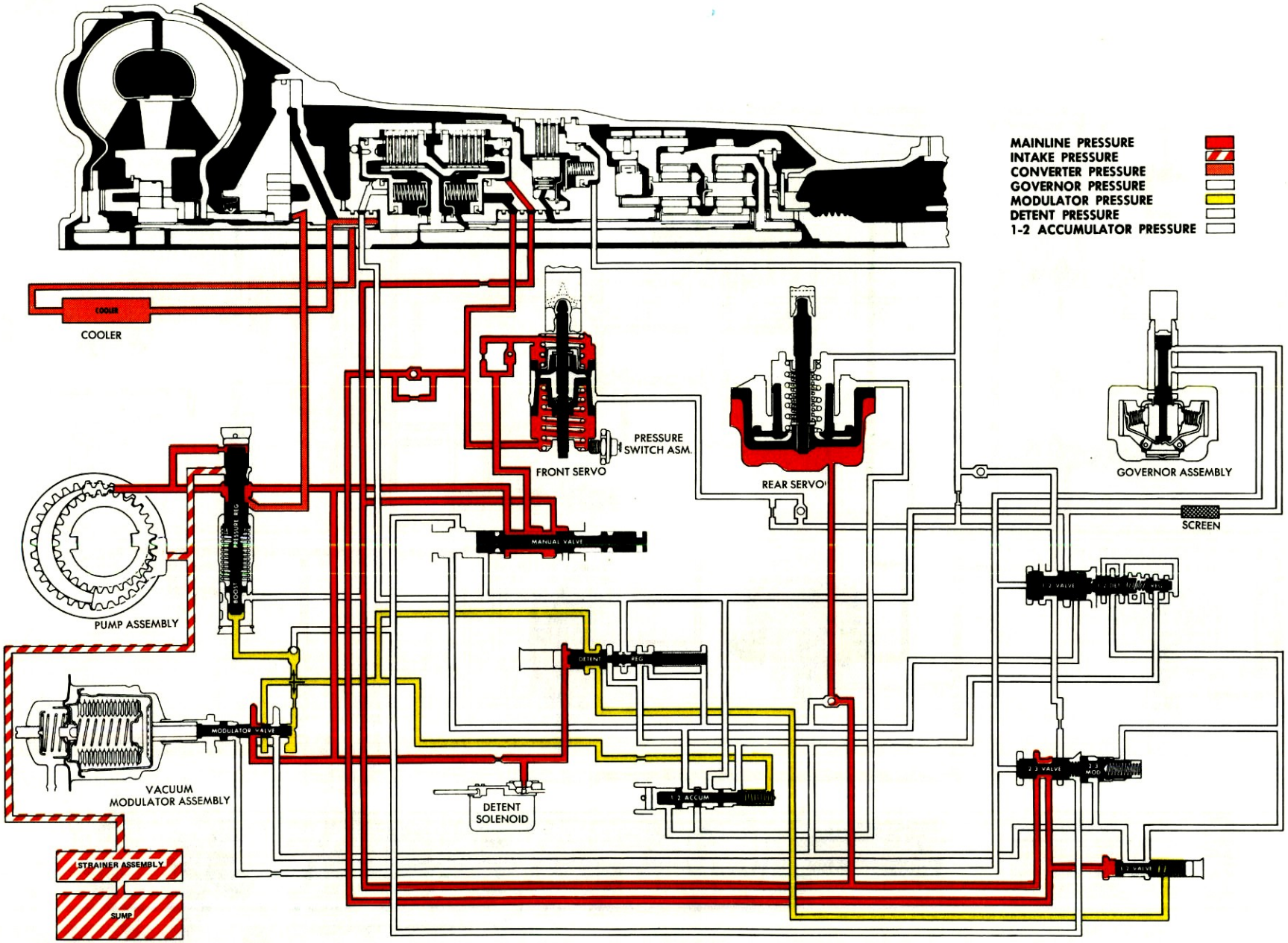
Drive Range — 3-2 Downshift



1 Range — Manual First Gear



2 Range — Manual Second Gear


MAINLINE PRESSURE
INTAKE PRESSURE
CONVERTER PRESSURE
GOVERNOR PRESSURE
MODULATOR PRESSURE
DETENT PRESSURE
1-2 ACCUMULATOR PRESSURE
COOLER
COOLER
PRESSURE SWITCH ASM.
FRONT SERVO
REAR SERVO
GOVERNOR ASSEMBLY
SCREEN
MANUAL VALVE
PUMP ASSEMBLY
MODULATOR VALVE
VACUUM MODULATOR ASSEMBLY
DETENT SOLENOID
STRAINER ASSEMBLY
SUMP

Reverse