AUTOMATIC TRANSMISSION

GENERAL

This section carries information on theory of operation, including detailed description of the mechanical functions, maintenance and adjustments, and overhaul. It is most important that vehicles having a combination automatic transmission and 4-wheel drive use the proper terminology when describing various operational terms. To avoid possible confusion, it is suggested the following terminology be used.

Automatic Transmission Gear Selections: Park, Reverse, Neutral, Drive, Drive 2, and Drive 1.

Each automatic transmission has its own serial number, stamped on a plate, at the right side of the transmission case.

Any communication concerning an automatic transmission should include the serial number.

TOWING THE VEHICLE

All Jeep vehicles can be towed at reasonable and safe speeds (such as specified by state law) by following the procedures given below.

With Ignition Key

With the anti-theft ignition key in the off position (to unlock the steering wheel and the selector linkage), shift the transfer case and automatic transmission into NEUTRAL. On models equipped with Quadra-Trac, Full Time 4-Wheel Drive, the rear propeller shaft **must** be removed. Tow the vehicle forward or backward with all four wheels on the ground, or forward with the front end raised (see Towing in Reverse).

Without Ignition Key

Steering and automatic transmission are locked. Remove rear propeller shaft or use a dolly under the rear wheels and tow **with the front end raised.**

Towing in Reverse — All 4-Wheel Drive Models

When towing the vehicle in reverse, **remove** the front axle shaft driving flanges to prevent the front differential from rotating. If the steering wheel cannot be unlocked on Cherokee, Wagoneer, and Truck Models use a dolly under the front axle.

If the vehicle is equipped with free-wheeling selective drive hubs, lock the hubs in the free-wheeling position.

DESCRIPTION

The automatic transmission is a fully automatic unit consisting primarily of a three-element hydraulic torque converter and a compound planetary gear set (fig. 7-1). Three multiple-disc clutches, two roller clutches, and two bands provide the friction elements required to obtain the desired function of the compound planetary gear set.

The torque converter couples the engine to the planetary gears through oil and provides hydraulic torque multiplication when required. The compound planetary gear set produces three forward speeds and reverse (fig. 7-2).

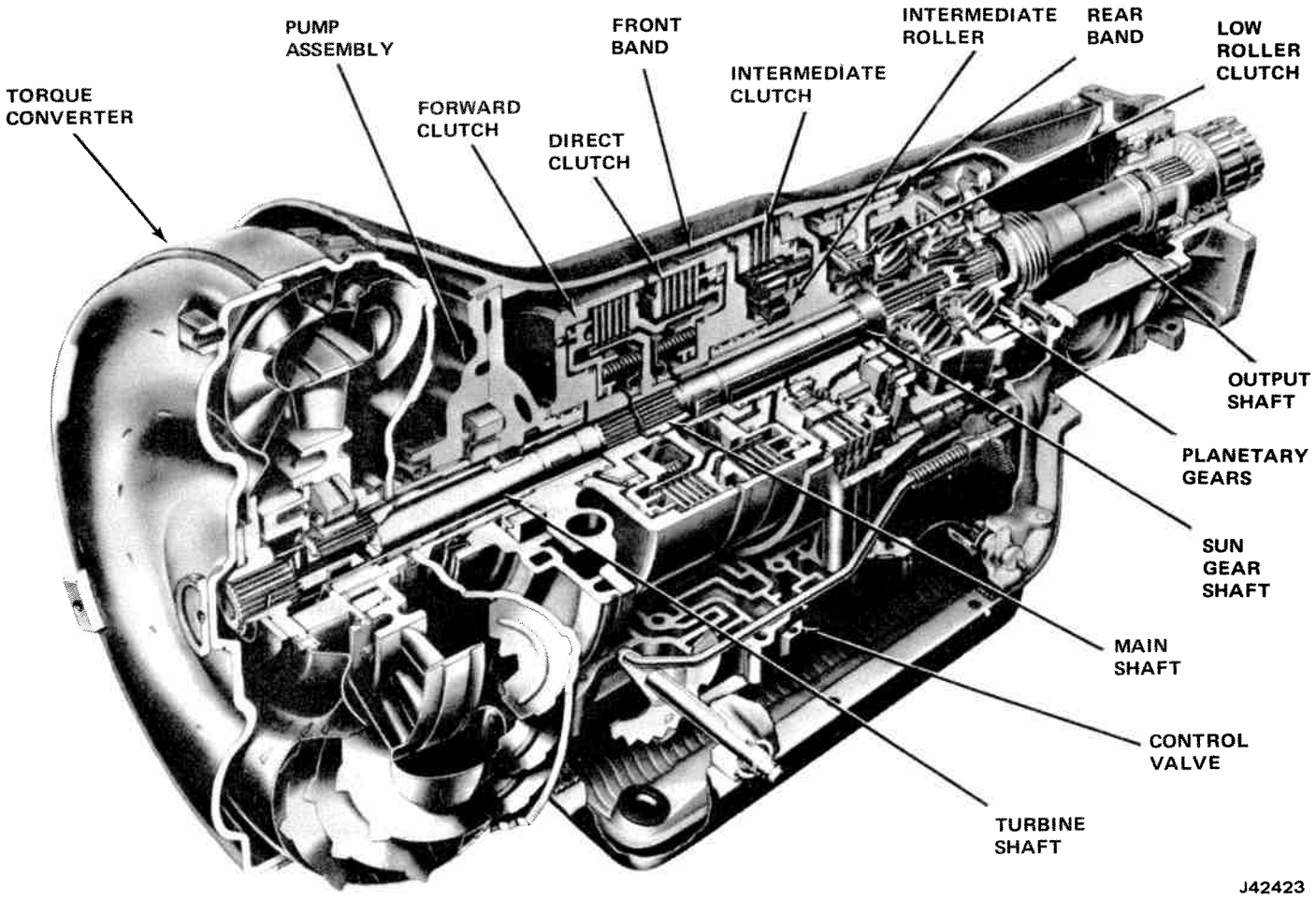


Fig. 7-1 Automatic Transmission-Cross Sectional View

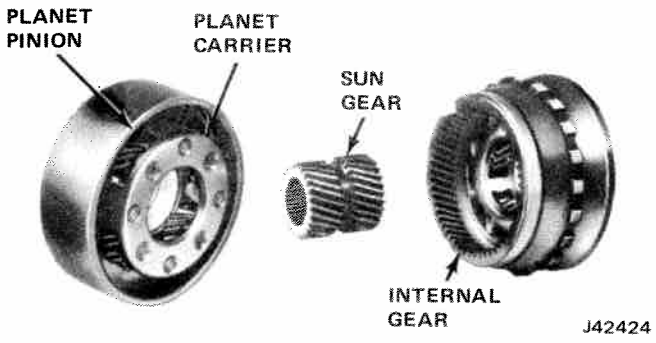


Fig. 7-2 Planetary Gear Arrangement

The three-element torque converter consists of a pump or driving member, a turbine or driven member, and a stator assembly. The stator when viewed from the front is mounted on a one-way roller clutch which will allow the stator to turn clockwise, but not counter-clockwise (Fig. 7-3).

As the 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 its pumping action (fig. 7-3). So at low turbine speeds, the oil is redirected by the stator to the converter pump which actually assists the converter pump to deliver power or multiply engine torque.

As turbine 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, its roller clutch releases and it revolves freely on its shaft. Once the stator becomes inactive there is no further multiplication of engine torque within the converter. At this point, the converter is merely acting as a fluid coupling as both the converter pump and turbine are being driven at approximately the same speed — or at a one-to-one ratio.

A hydraulic system pressurized by a gear-type pump provides the working pressure required to operate the friction elements and automatic controls.

External control connections to transmission are:
Manual Linkage—To select the desired operating range.

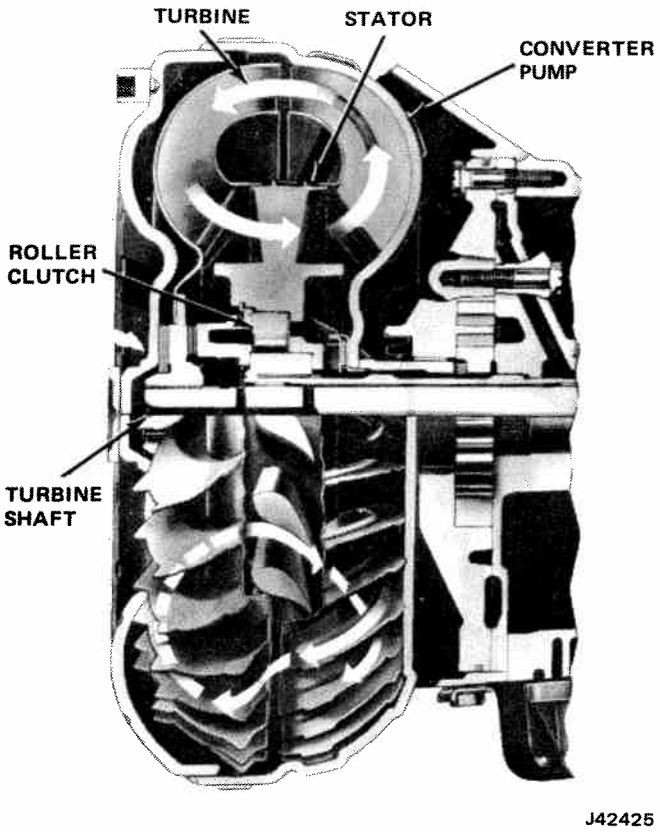


Fig. 7-3 Converter Components

Engine Vacuum—To operate a vacuum modulator unit.
12-Volt Electrical Signal—To operate an electrical detent solenoid.

Approximate gear or torque ratios of the transmission are:

- First — 2.5:1
- Second — 1.5:1
- Third — 1:1
- Reverse — 2.08:1

NOTE: *Second and third are also multiplied.*

A vacuum modulator is used to automatically sense any change in the torque input to the transmission. The vacuum modulator transmits this signal to the pressure regulator for line pressure control to the 1-2 accumulator valve and to the shift valves. This meets all torque and shift speed requirements of the transmission and smooth shifts are obtained at all throttle openings.

The detent solenoid is activated by the detent switch on the accelerator pedal. When the throttle is fully opened, the switch is closed, activating the detent solenoid causing the transmission to downshift at speeds below approximately 70 mph.

Planetary Gear Train

Gear ratios are obtained through planetary gears in the automatic transmission. A planetary gear train consists of three members: sun gear, a planet carrier with four planet pinion gears, and an internal gear. The gear is surrounded by and meshes with the planet pinion gears, which rotate freely on pins attached to a common support called the planet carrier. A part with gear teeth machined on the inside circumference surrounds the assembly and meshes with the planet pinion gears. This is called the internal gear, because of its internal teeth.

Roller Clutches

A one-way roller clutch allows rotation of a unit in one direction and locks the unit from rotating in the opposite direction. Roller clutches are used to lock one member of each planetary gear set for reduction. In direct drive the roller clutches allow free rotation.

HYDRAULIC SYSTEM

Pressure Control

The transmission is automatically controlled by a hydraulic system. Hydraulic pressure is supplied by the transmission gear-type oil pump, which is engine driven. Main line pressure is controlled by a pressure regulator valve train located in the pump. This regulator controls line pressure automatically, in response to a pressure signal from a modulator valve. The torque requirements of the transmission are met and smooth shifts are obtained at all throttle openings.

Vacuum Modulator

The engine vacuum signal is provided by the vacuum modulator, consisting of an evacuated metal bellows, a diaphragm, and springs. These are so arranged that the bellows and one spring apply a force which acts on the modulator valve to increase modulator pressure. Engine vacuum and the other 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 Assembly

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 on the flyweights is imposed on the regulator valve, causing it to regulate a pressure signal that increases with increasing speed.

SERVO OPERATION

Front Servo

The front servo applies the second overrun band to provide engine braking in second gear in DRIVE-2 and DRIVE-1. It is also used as an accumulator for the apply of the direct or third clutch and, in conjunction with a series of check balls and controlling orifices, is a part of the timing for the release of the direct or third clutch.

To prevent the apply of the second overrun band in Neutral, Drive and Reverse ranges, oil is directed from the manual valve to the release side of the servo piston.

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

Direct clutch oil is directed to the front servo accumulator piston where spring force (plus third clutch pressures) strokes the piston up against the force of servo release oil. This lowers the clutch apply pressure for a smooth engagement.

The release of the direct clutch and the exhausting of the front servo accumulator is slowed down by three check balls and three orifices. This permits a soft return of the drive load to the intermediate sprag. It also allows engine rpm to increase during a detent 3-2 downshift in preparation for the lower gear ratio, which results in a smooth shift and better acceleration.

Reverse — Neutral — Drive — First Speed

Servo oil from the manual valve in Drive range charges the accumulator by stroking the servo and accumulator pistons against the accumulator spring. This prepares the accumulator for the controlled apply of the direct clutch on a 2-3 shift. The charging of the accumulator in Drive range, first gear, also makes it possible to have a controlled 1-3 let-up 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 second gear Drive range when intermediate clutch apply oil is directed between the servo and accumulator pistons.

Servo oil in Reverse and Neutral ranges is incidental.

Drive Range — Second Speed

Servo oil charging the accumulator is present in first and second gears and has the servo and accumulator pistons stroked 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 in intermediate clutch oil attempting to stroke the servo piston.

Drive Range—Third Speed

Direct clutch pressure rises to a value such that the force from it, plus the accumulator spring force, overcomes the force from the servo pressure and moves the accumulator piston to the stop on the accumulator piston pin. This strokes the servo piston at the same amount of travel, which allows it to just contact the band-apply washer on the servo pin, but it will not move the pin and apply the band.

The stroking of the accumulator piston absorbs some direct clutch oil and permits the direct clutch to apply at reduced pressure for a smooth 2-3 shift.

Drive Range—3-2

The release of the direct clutch is softened by the front servo, three orifices, and three check balls to allow a smooth transfer of the drive load to the intermediate sprag. The controlled release pressure lets the engine increase its rpm during detent downshifts to prepare for the lower gear ratio of second gear, which results in a smooth shift and better acceleration.

Servo oil seats a check ball, intermediate clutch oil seats another check ball, and oil must pass through the two orifices which slows the stroking of the servo and accumulator pistons. The exhausting direct clutch oil from the accumulator and the direct clutch seats a third check ball. The exhausting direct clutch oil passes through an orifice which controls the clutch pressure during the direct clutch release.

DRIVE-D-2 — Second Speed

Intermediate clutch oil from the 1-2 shift valve seats the check ball, passes through an orifice, and applies the front band. The pressure applying the band is reduced by the action of the accumulator piston, which is moved by orificed flow of intermediate clutch oil and resisted by the accumulator spring and exhausting orificed direct clutch oil in a manual downshift 3-2 for a smoothing apply of the band for DRIVE-2 range engine braking.

Rear Servo

The rear servo applies the rear band for overrun engine braking in DRIVE-1 range first gear. 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, it serves as an accumulator for the intermediate clutch to provide a smooth shift.

Drive-1—First Speed

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

DRIVE-2 — Second Speed

Intermediate clutch apply oil is directed to the rear servo accumulator piston, stroking 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 — First Speed

Overrun engine braking in DRIVE-1 range first gear is provided for by the rear servo applying the band to hold the reaction carrier from clockwise rotation, viewed from front of the car.

The 1-2 accumulator oil is directed to the accumulator piston, which attempts to prevent the servo from applying.

Low range oil directed to the servo piston, which has the larger area, applies the band. Because 1-2 accumulator oil is present, the force applying the band is lowered. This provides a smooth apply.

DRIVE-2 — Second Speed

In second gear, the rear band is released. Intermediate clutch oil is directed to the release side of the servo piston which, with 1-2 accumulator oil, balances out the low range oil on the apply side of the servo piston, and the servo release spring strokes the servo piston to the 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 the band holding the reaction carrier for the reverse gear ratio, line pressure is increased in Reverse and no other oil pressures are present in the servo to resist the apply of the servo piston.

1-2 Accumulator

The 1-2 accumulator oil charges the rear servo accumlator in first gear in preparation for the apply of the intermediate clutch on the 1-2 shift. The 1-2 accumulator oil pressure is used to obtain greater flexibility in attaining the desired curve for various engine requirements. Drive oil is directed to the 1-2 accumulator valve and is regulated to become 1-2 accumulator oil. Modulator pressure is directed to the 1-2 accumulator valve. This results in 1-2 accumulator pressure being engine-torque conscious and adjusts for smooth shifts according to engine-torque output.

Detent oil is directed to the 1-2 accumlator valve to raise 1-2 accumulator pressure during detent 1-2 shifts for clutch durability. DRIVE-1 range oil is directed to the 1-2 accumulator valve during DRIVE-1 range operation to raise 1-2 accumulator pressure to 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 smooth manual shift to DRIVE-1 range first gear, or for a 2-1 shift in DRIVE-1 range.

DETENT AND DETENT REGULATOR VALVES

When the accelerator pedal is depressed all the way to the floor, 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 normal 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. The shift points are fixed at relatively high speeds.

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 directed to the modulator valve to prevent modulator pressure from dropping below approximately 60 psi which , in turn, prevents line pressure from dropping below approximately 105 psi.

In DRIVE-1 range operation, 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. Low oil is also directed to the detent regulator valve, to passage which is used as an exhaust when the valve is regulating. Low oil in these two areas prevents the detent valve from regulating, and drive oil 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 will downshift the 1-2 valve at speeds below approximately 40 mph, and will prevent the transmission from upshifting out of first gear regardless of vehicle speed.

TRANSMISSION LINKAGE ADJUSTMENT

The adjustment on vehicles equipped with automatic transmission is accomplished by adjusting the length of the shift-rod, with the transmission shift lever and selector lever in their neutral positions. Procedure for making the adjustment is given below:

Make sure the transmission shift lever is in the neutral detent position.

Place the selector lever in the neutral position and hold it firmly forward against the stop.

Loosen the lock nut at the bellcrank end of the adjusting rod, and position the block on the shift rod so it may be freely inserted on the transmission shift lever without moving the lever. Tighten the nuts to 6-12 Foot Pounds torque.

Operate selector lever to be sure transmission detents are engaging in their respective positions.

ROAD TEST

Shift Pattern Check

Drive Range

Position selector lever in DRIVE RANGE 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 the throttle opening). As the vehicle decreases in speed to zero mph, the 3-2 and 2-1 shifts 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. (No 2-3 shift can be obtained in this range). The 1-2 shift point will vary with throttle opening. As the vehicle decreases in speed to zero mph, a 1-2 shift should occur. Note: The 1-2 shift in DRIVE 2 is somewhat firmer than in DRIVE RANGE. This is normal.

Drive-1 Range

Position the selector lever in DRIVE-1 RANGE and accelerate the vehicle from zero mph. No upshift should occur in this range, except in some vehicles which have a high numerical axle ratio and/or high engine rpm.

2nd Gear — Overrun Braking

Position the selector in DRIVE RANGE, and with the vehicle speed at approximately 35 mph, move the selector lever in DRIVE-2. The tranmission should downshift to 2nd. An increase in engine rpm and an engine braking effect should be noticed. Line pressure should change from approximately 70 psi to approximately 150 psi in 2nd.

1st Gear — Overrun Braking

Position the selector lever in DRIVE-2 at approximately 30 to 40 mph, with throttle closed. Move the selector lever to DRIVE-1. A 2-1 downshift should occur in the speed range of approximately 40 to 20 mph, depending on 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. Line pressure should be approximately 150 psi. Stop vehicle.

Reverse Range

Position the selector lever in REVERSE POSITION and check for reverse operation.

DIAGNOSIS GUIDES

Causes of Oil Leaks

Transmission Oil Pan Leaks

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

Case Extension Leak

- Attaching bolts not correctly torqued.
- Rear seal assembly — damaged or improperly installed (propeller shaft yoke damaged).
- Gasket or seal - (extension to case) damaged or improperly installed.
- Porous casting.
- Damaged O-ring on output shaft (oil leak at yoke).

Case Leak

- Filler pipe O-ring seal damaged or missing; misposition of filler pipe bracket to engine — loading one side of the O-ring.
- Modulator assembly 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 porosity.
- Leak at speedometer driven-gear housing or seal. Leak at speedo hole plug.
- Manual shaft seal — damaged, improperly installed.
- Line pressure tap plug — stripped, shy sealer compound.
- Vent pipe.
- Porous case, or cracked at pressure plug boss.

Front End Leak

- Front seal — damaged (check converter necks for nicks, etc., also for pump bushing moved forward), garter spring missing.
- Pump attaching bolts, and seals — damaged, missing, bolts loose.
- Converter — leak in weld.
- Pump O-ring seal — damaged. (Also check pump oil ring groove and case bore.)
- Porous casting (pump or case).
- Pump — drain-back hole not open.

Oil comes out vent pipe

- Transmission overfilled.
- Water in oil.
- Filter O-ring damaged or improperly assembled causing oil to foam.
- Foreign material between pump and case or between pump cover and body, or variable stator solenoid screws too long — holding pump halves apart.
- Case — porous, pump face improperly machined.
- Pump — shy of stock, porous.
- 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 Assy.

- Diaphragm defective.

Causes of Burned Clutch Plates

Forward Clutch

- Check ball in clutch housing damaged, stuck or missing.

(Continued on page 7-13).

TRANSMISSION MALFUNCTION RELATED TO OIL PRESSURE

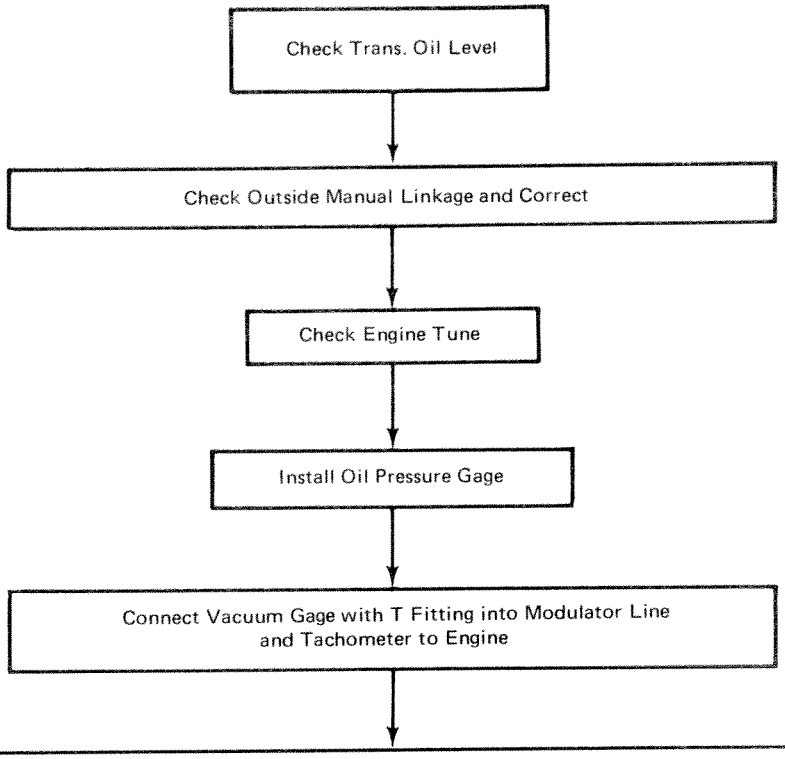
(Pressures Obtained By The Preliminary Checking Procedures)

Malfunction	Drive Brakes Applied 1000 rpm	Reverse Brakes Applied 1000 rpm	D-2 or D-1 Brakes Applied 1000 rpm	Neutral Brakes Applied 1000 rpm	Drive 30 mph Closed Throttle	Drive Idle	Pressure Drop Occurs While Engine rpm Increases From 1000 to 3000 rpm Wheels free to Move *	Possible Cause of Malfunction
	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	Drop	Malfunction in Control Valve Assy.
	Normal	Normal	Normal	Normal	Normal	Normal	No Drop	Malfunction in Governor or Governor Feed System
	High	Normal	Normal	Normal	High	—	—	Malfunction in Detent System
	High	High	Normal	High	—	—	—	Malfunction in Modulator or Vacuum Feed System to Modulator
Slipping — Reverse	Normal	Low	Normal	Normal	Normal	—	—	Oil Leak in Feed System to The Direct Clutch
Slipping — 1st Gear	Low	Normal	Low to Normal	Normal	Low to Normal	—	—	Oil Leak in Feed System to The Forward Clutch
Downshift With Zero Throttle and No Engine Braking In Drive	Normal	Normal	Normal	Normal	High	High	—	Stator and Detent Wires Switched

*Drive Range, Vacuum Line Disconnect to Modulator.

J42427

PRELIMINARY CHECKING PROCEDURE



CAUTION: Total running time for this combination not to exceed 2 minutes.

Check Oil Pressures In Following Manner		
Range	**Oil Pressure**	**Normal psi**
Drive – Brakes Applied Engine at 1000 rpm		60 TO 90
Drive-2 or Drive-1 – Brakes Applied Engine at 1000 rpm		135 TO 160
Reverse – Brakes Applied Engine at 1000 rpm		95 TO 150
Neutral – Brakes Applied Engine at 1000 rpm		55 TO 70
Drive Idle Set Engine Idle To Specifications		60 TO 85
Drive – 30 mph Closed Throttle or On Hoist*		55 TO 70

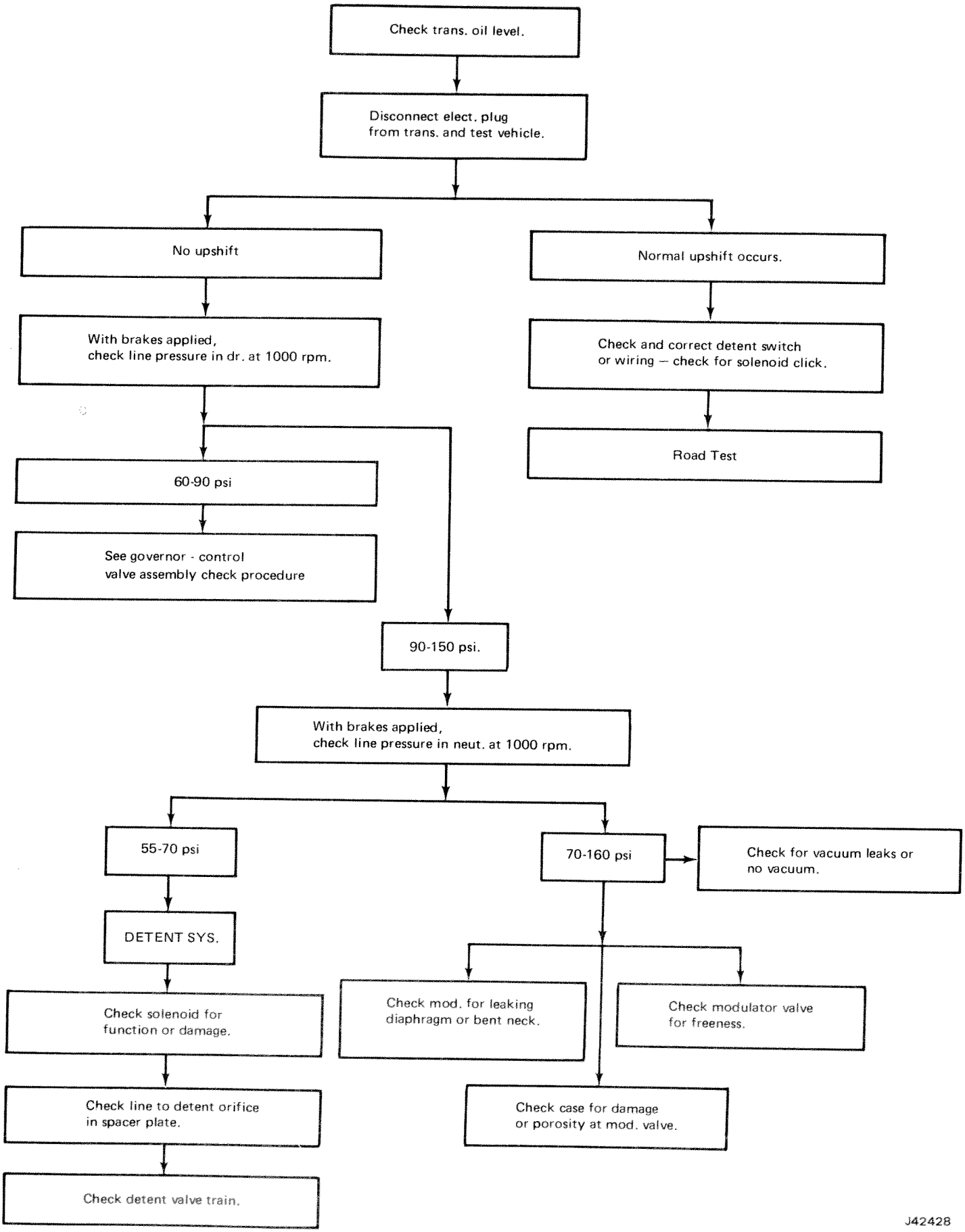
*The Drive-30 mph closed throttle pressure reading may be taken during a road test or:

1. Vehicle on hoist – driving wheels off ground, foot off brake, in drive range.
2. Engine 2000 rpm.
3. Close throttle (foot off accelerator) and take pressure reading engine 2000-1200 rpm.

NOTE: With closed throttle and driving wheels off the ground, engine rpm will drop rapidly. Pressure reading must be taken within rpm's indicated and with closed throttle.

J42426

NO 1-2 UPSHIFT AND/OR DELAYED UPSHIFT OR 1-2 & 2-3 UPSHIFT – FULL THROTTLE ONLY



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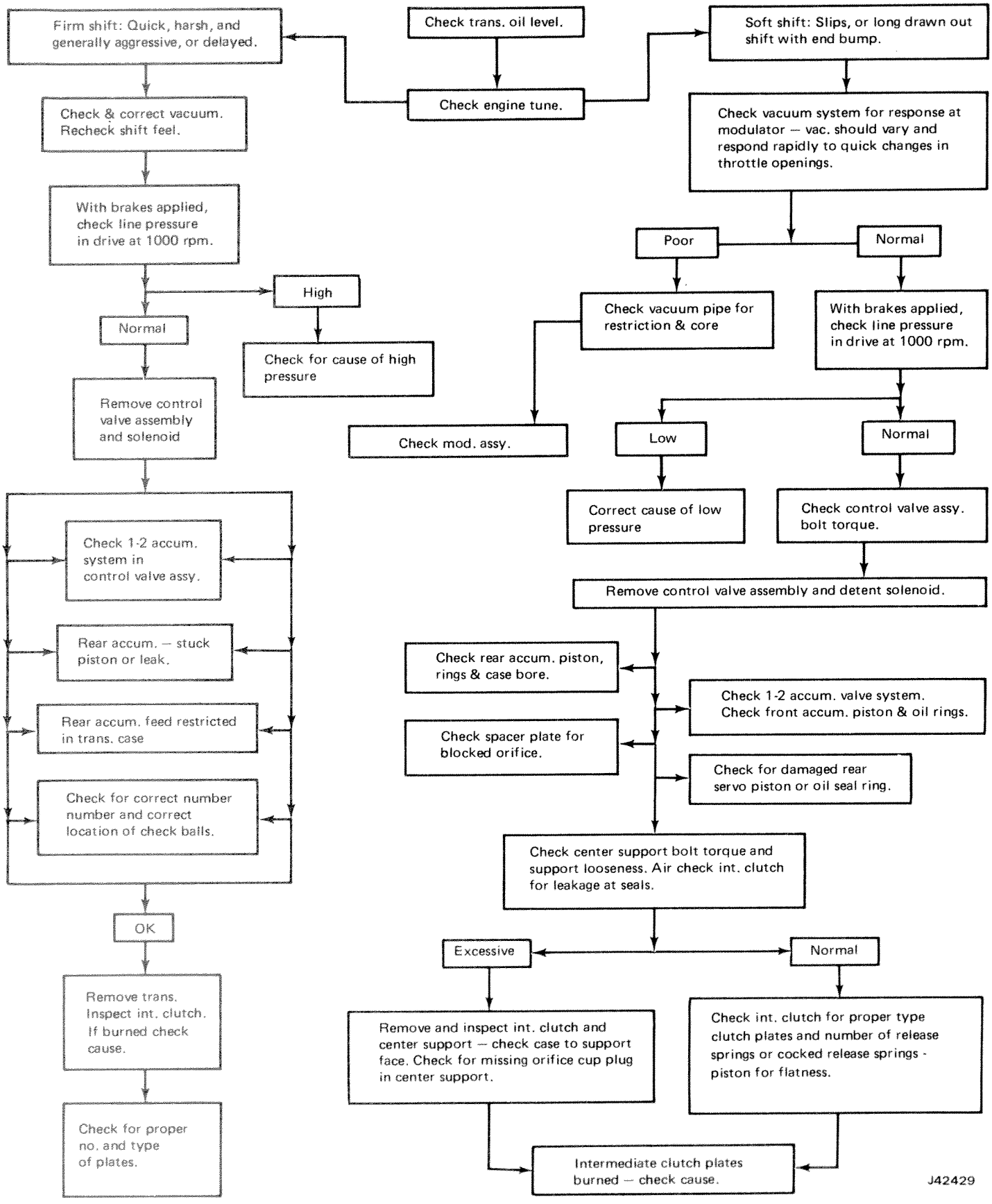
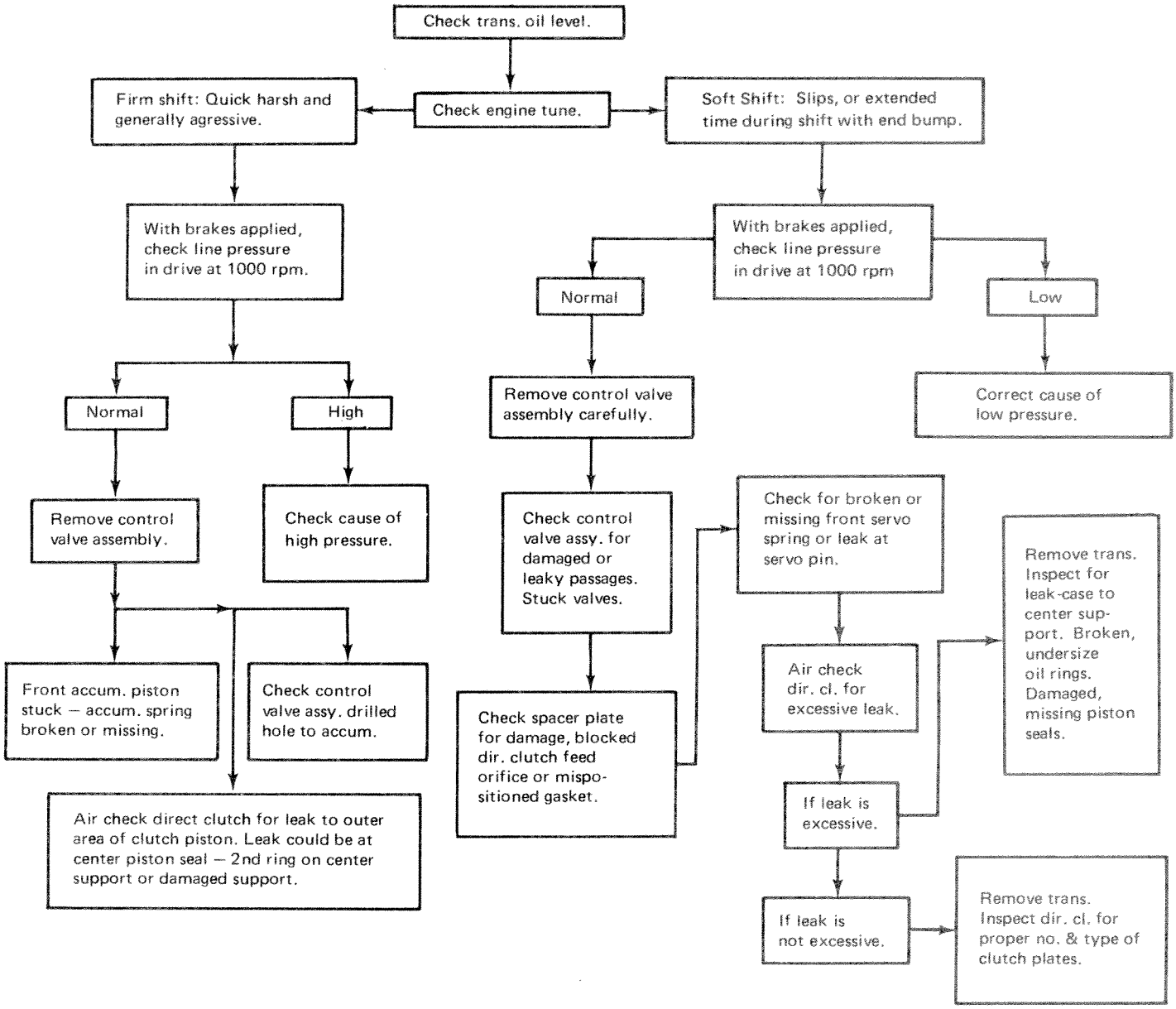
1-2 SHIFT COMPLAINT



2-3 SHIFT COMPLAINT



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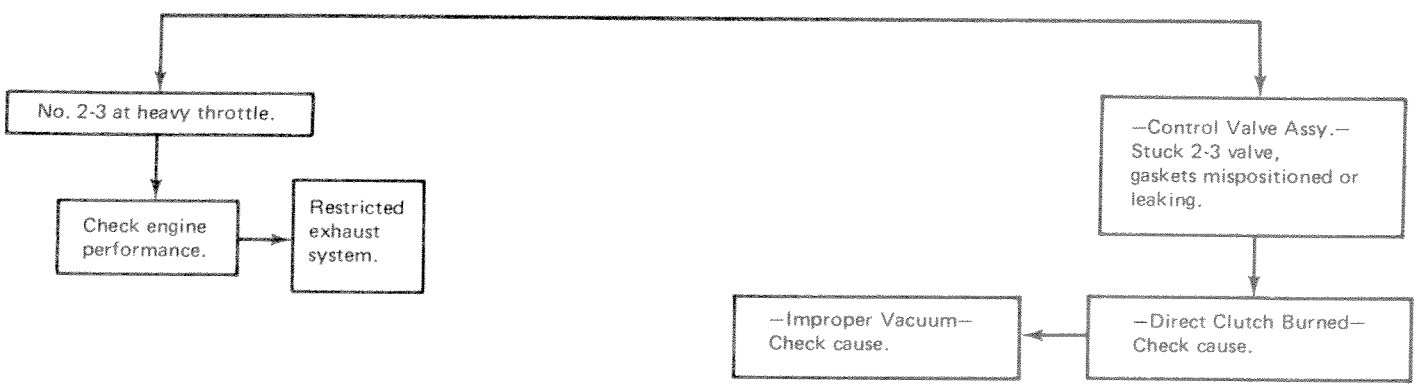
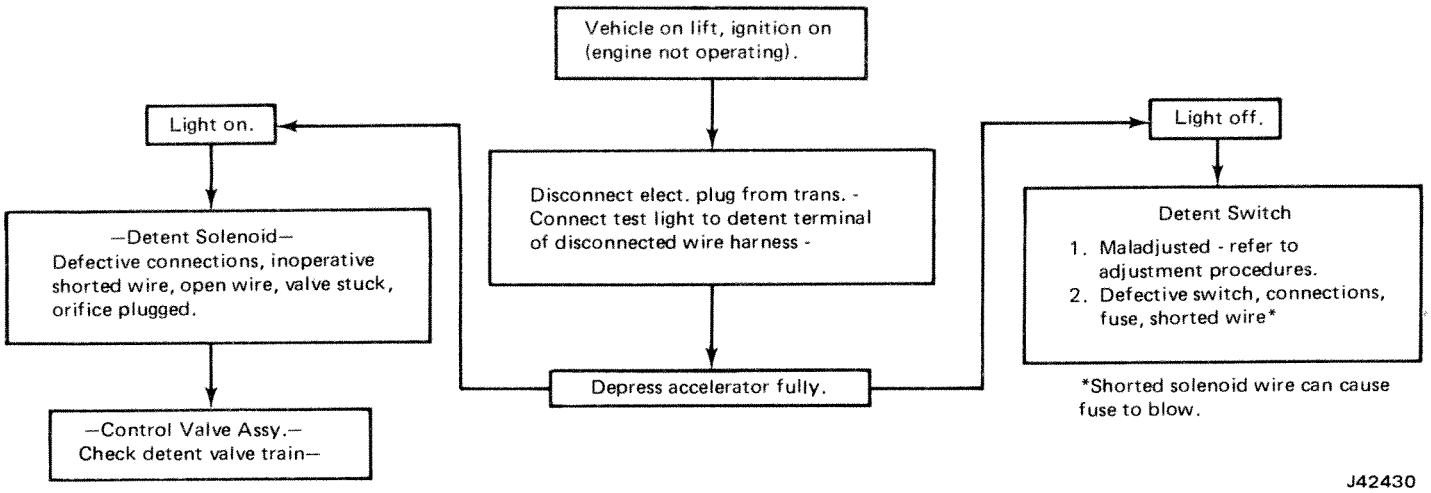
1ST & 2ND SPEEDS ONLY, NO 2-3



NO DETENT DOWNSHIFTS



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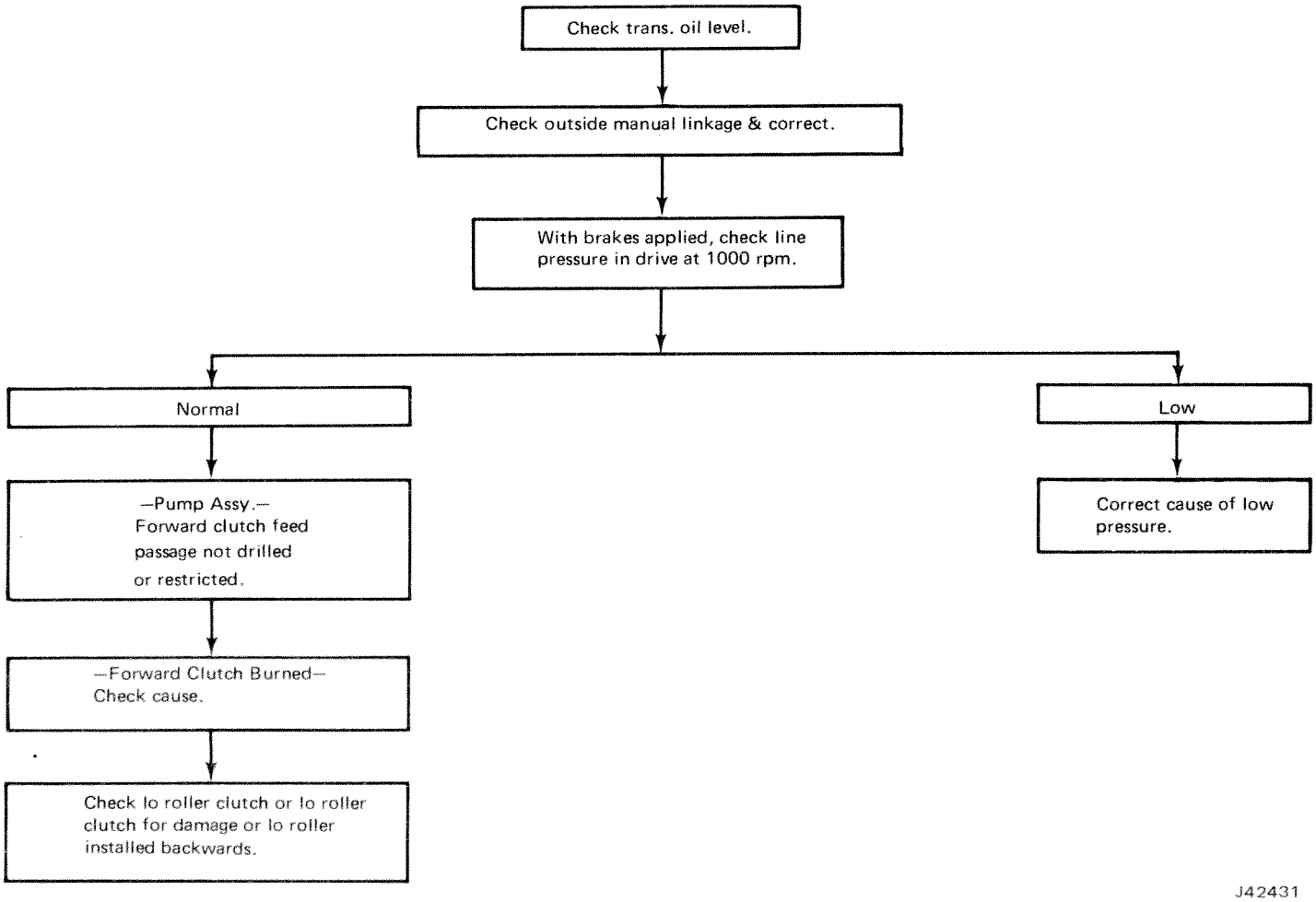
NO DRIVE IN DRIVE RANGE



J42431

Causes of Burned Clutch Plates (Cont'd)

Forward Clutch

- Clutch piston cracked, seals damaged or missing.
- Low line pressure.
- Manual valve mispositioned.
- Restricted oil feed to forward clutch (examples: clutch housing to inner and outer areas not drilled, restricted or porosity in pump).
- Pump cover oil seal ring missing, broken or undersize; ring groove oversize.
- Case valve body face not flat or porosity between channels.
- Manual valve bent and center land not ground properly.

Intermediate Clutch

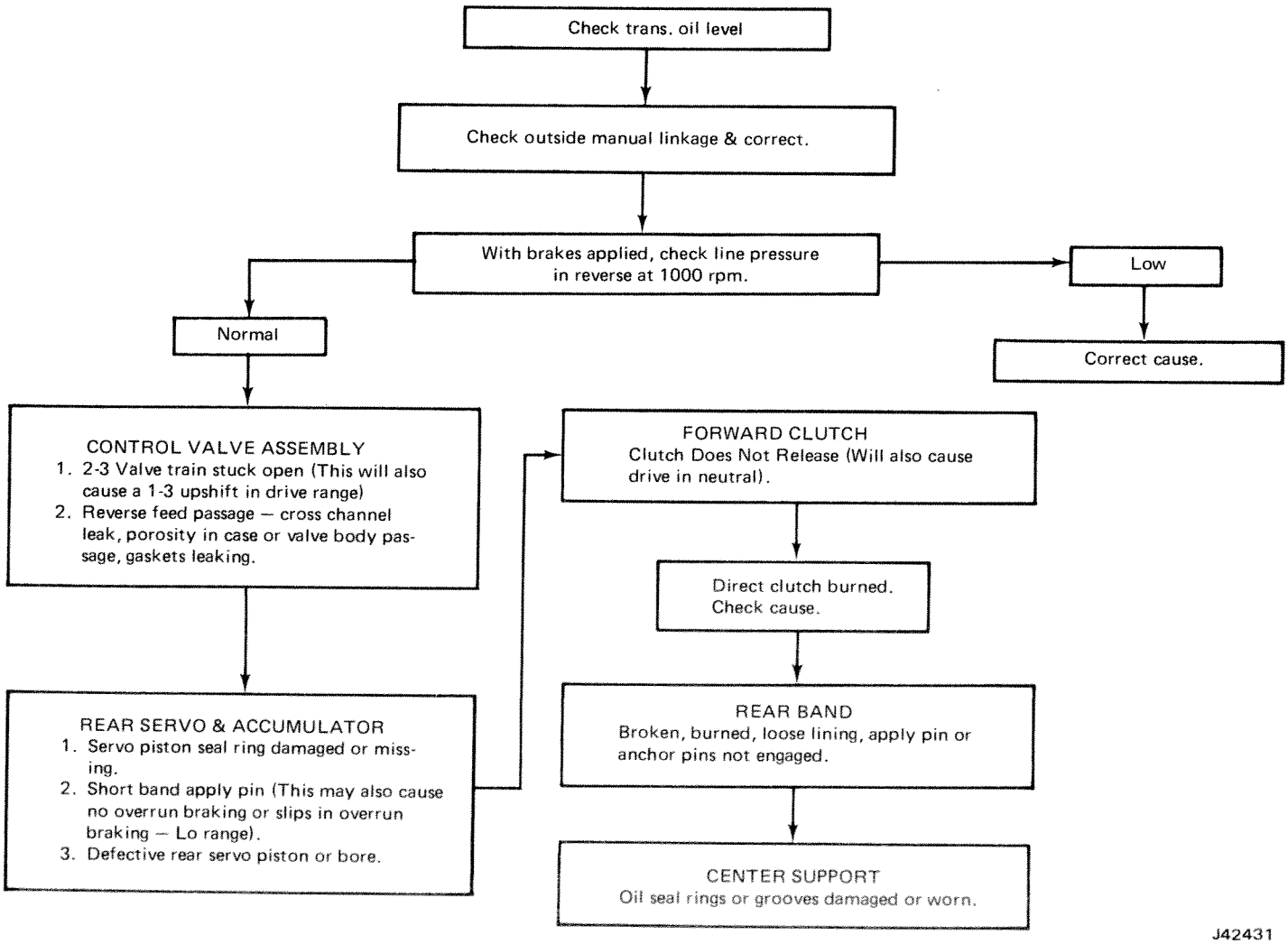
- Constant bleed orifice in center support missing.
- Rear accumulator piston oil ring damaged or missing.
- 1-2 accumulator valve stuck in control valve assembly.
- Intermediate clutch piston seals damaged or missing.
- Center support bolt loose.
- Low line pressure.
- Intermediate clutch plug in case 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 or missing.
- Front and rear servo pistons and seals damaged.
- Manual valve bent and center land not cleaned up.

(Continued on page 7-16.)

NO REVERSE OR SLIPS IN REVERSE



J42431

NO ENGINE BRAKING – INTERMEDIATE RANGE – SECOND GEAR

FRONT SERVO & 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 – LO RANGE – 1ST GEAR

CASE ASSEMBLY
Lo-reverse check ball mispositioned or missing. Case damaged at lo-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 & 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 & correct.

↓

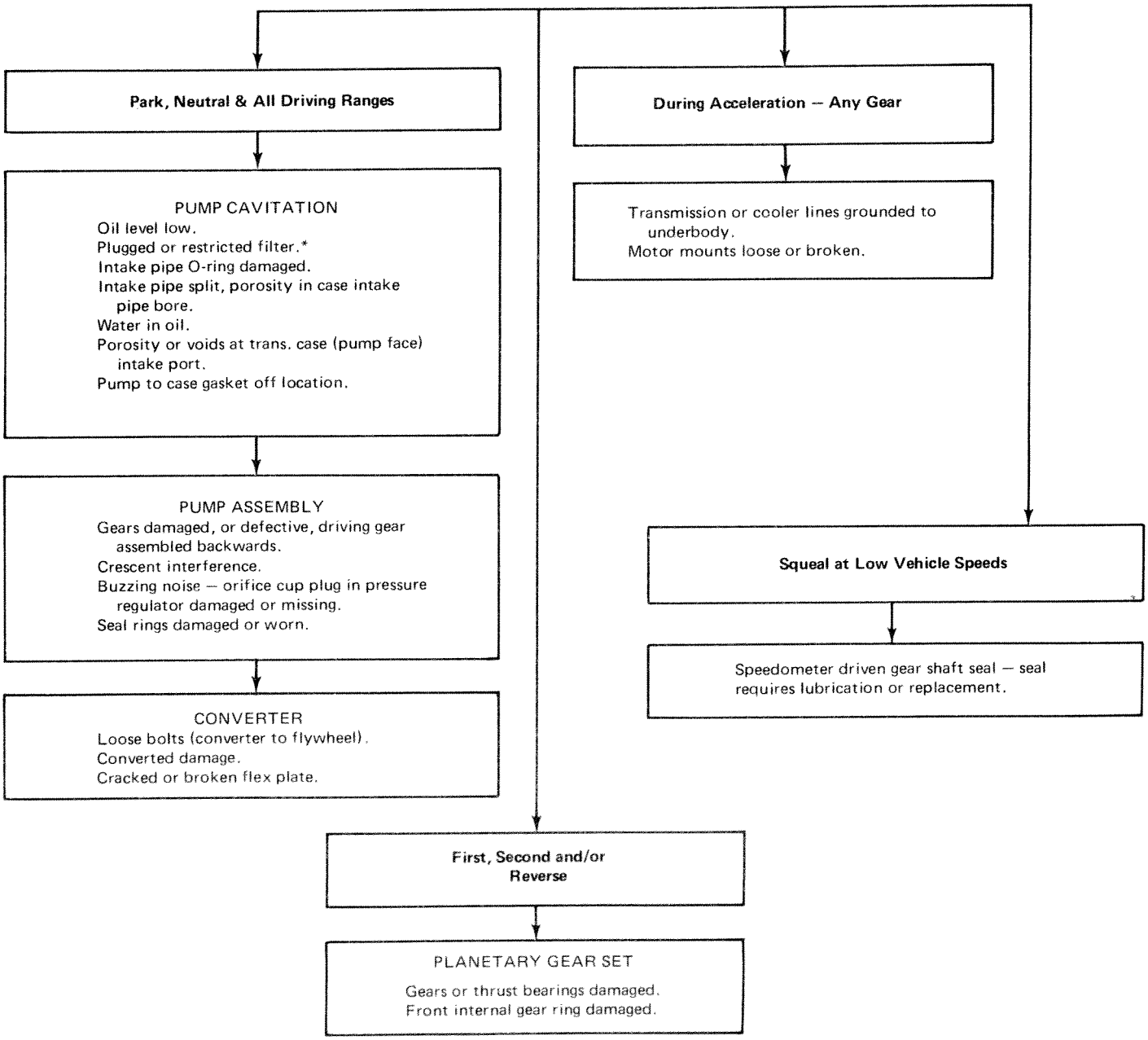
INTERNAL LINKAGE
1. Parking brake rod assy. (Check actuator for chamfer).
2. Parking pawl broken, chamfer omitted.
3. Parking brake bracket loose, burr or rough edges, or incorrectly installed.
4. Parking pawl return spring missing, broken or incorrectly hooked.

J42432

AUTOMATIC TRANSMISSION

CAUTION: *Before checking 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.*

TRANSMISSION NOISY



*If the filter is suspected of being plugged or restricted, it must be replaced.

J42433

Causes of Burned Clutch Plates (Cont'd)

Direct Clutch

- Case valve body face not flat or porosity between channels.
- Intermediate roller clutch installed backwards.
- 3-2 valve, 3-2 spring, or 3-2 spacer pin installed in the wrong sequence in 3-2 valve bore.
- 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, such as large pieces of composition clutch plate material peeling off.*

Checking Transmission Oil Level

(1) Engine running.
(2) Vehicle on level surface.
(3) Brakes applied.
(4) Move lever through all ranges.
(5) Place transmission in park.
(6) Check oil level.
(7) If oil is low, check for possible causes.

The oil 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. Also, at normal operating temperature, the oil will heat the gauge end of the dipstick to a degree so that it cannot be grasped without discomfort.

If the transmission is not at operating temperature, the oil level should be approximately ¼ inch below the "add" mark with the oil at approximately 75° F (room temperature). If the oil level is correctly established at room temperture (75° F), it should be at the "full" mark on the dip stick when the transmission reaches normal operating temperature (170° F).

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

Manual Linkage Adjustment

The transmission manual linkage must be adjusted so that the pointer on the indicator quadrant and linkage detents or stops corresponds with the transmission inside detent lever detents. If the linkage is not adjusted properly, an internal leak could occur at the manual valve which could cause a clutch and/or front band failure.

Cause of Low Line Pressure

Low Transmission Oil Level

Modulator Assembly

Filter

- Blocked or restricted.
- O-ring on intake pipe and/or grommet omitted or damaged.
- Split or leaking intake pipe.
- Wrong filter assembly.

Pump

- Pressure regulator or boost valve stuck.
- Gear clearance, damaged, worn (pump will become damaged if drive gear is installed backwards, or if converter pilot does not enter crankshaft freely).
- Pressure regulator spring too weak.
- Not enough spacers in pressure regulator.
- Pump to case gasket mispositioned.
- Defective pump body and/or cover.
- Mismatch 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, int. and drive — pressure low in reverse). Check center support oil seal rings.
- Check direct clutch outer seal for damage. Check rear servo and front accum. pistons and rings for damage or missing.

Case Assembly

- Porosity in intake bore area.
- Check case for intermediate clutch plug leak or blown out plugs.
- Drive-1-Reverse check ball mispositioned or missing (this will cause no reverse and no overun braking in Drive-1 range).
- If the filter is suspected of being plugged or restricted, it must be replaced.

Causes of High Line Pressure

Vacuum Leak

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

Damaged Modulator

- Stuck valve.
- Water in modulator.
- Not operating properly.

Detent System

- Detent switch (plunger stuck, or shorted, or misadjusted).
- Detent wiring shorted.
- Detent solenoid stuck open.
- Detent feed orifice in spacer plate blocked.
- Detent solenoid loose.
- Detent valve bore plug damaged.
- Detent reg. valve pin short.

Pump

- Pressure regulator and/or boost valve stuck.
- Incorrect pressure regulator spring or valve.
- Too many pressure reg. valve spacers.
- Pump casting bad.
- 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

- Control valve assy. to spacer gasket off location.
- Gaskets installed in reverse order.

Causes of Improper Vacuum At Modulator

Engine

- Tune up.
- Loose vacuum fittings.
- Vacuum operated accessory leak (hoses, vacuum advance, etc.)
- Engine exhaust system restricted.

Vacuum Line To Modulator

- Leak.
- 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) Install line pressure gage.
(2) Disconnect vacuum line to modulator.
(3) With car on hoist (rear wheels off ground, foot off brake, in drive) check line pressure at 1000 rpm.
(4) Slowly increase engine rpm to 3000 rpm and determine if a line pressure drop occurs (7 psi or more).
(5) If pressure drop occurs, disassemble, clean and inspect control valve assembly.
(6) If no pressure drop occurs:

Inspect Governor.

- Stuck valve.
- Weight freeness.
- Restricted orifice in governor valve.

Governor Feed System.

- Check screen in control valve assembly or case.
- Check for restrictions in governor pipe.

Modulator Assembly Diagnosis 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 oil.
(2) If oil is found, replace the modulator.
(3) Transmission oil 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 oil the modulator should not be changed.*

Atmospheric Leak Check

(1) Apply a liberal coating of soap bubble solution to vacuum connector pipe seam, crimped upper-to-lower housing seam, and threaded screw seal.
(2) Use short piece of rubber tube, apply air pressure to vacuum pipe by blowing into tube and observe for leak bubbles. If bubbles appear, replace the modulator.

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

MINOR MAINTENANCE AND ADJUSTMENTS

Services outlined below can be performed without removing the transmission from the vehicle. Complete procedures are not given for all of these services, since they are covered in detail under disassembly and reassembly.

Neutralizer Switch Adjustment

The neutralizer switch must be adjuted so that the vehicle will start in the park or neutral position, but will not start in the other positions.

Pressure Regulator Valve Removal

(1) Raise vehicle on hoist or place on jack stands. Provide container to catch oil.
(2) Remove bottom pan and gasket. Drain oil.
(3) Remove oil filter retaining bolt and lift out pump intake pipe and oil filter assembly.
(4) Remove and discard intake pipe O-ring and bottom pan gasket.
(5) Using a screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring.

CAUTION: *Pressure regulator spring is under extreme pressure and will force valve bushing out of bore when snap ring is removed if valve bushing is not held securely.*

(6) Continue to exert pressure on valve bushing and remove snap ring, using snap ring pliers. Gradually release pressure on valve bushing until all spring force is exhausted.
(7) Carefully remove regulator boost valve bushing and valve, and pressure regulator spring. Be careful not to drop parts, as they will fall out if they are not held.
(8) Remove pressure regulator valve and spring retainer. Remove spacers if present. Be careful not to drop pressure regulator valve when removing it from bore.

Pressure Regulator Valve Installation

(1) Install spring retainer on pressure regulator spring. Install spacers if previously removed.
(2) Install pressure regulator valve on spring, stem end first.
(3) Install boost valve into bushing, stem end out, and stack parts with pressure regulator spring against valve bushing.
(4) Install complete assembly into pressure regulator valve bore, being careful not to drop parts during installation.
(5) Using a 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 installation of snap ring, encircle it around screwdriver or steel rod, compress tangs with snap ring pliers, and slide snap ring upward into ring groove in valve bore.*

(6) Install new intake pipe O-ring onto intake pipe and install pipe and oil filter assembly into transmission case bore, retaining oil filter with retainer bolt.
(7) Install new gasket on bottom pan and install bottom pan.
(8) Install bottom pan attaching screws. Tighten screws to 10 to 13 foot pounds torque.
(9) Lower vehicle to floor and add fluid to tranmission as required.

Control Valve Body Removal

(1) Remove bottom pan and oil filter.
(2) Remove and discard intake pipe O-ring and pan gaskets.
(3) Disconnect solenoid lead from connector terminal.
(4) Remove control valve body attaching screws and detent roller spring assembly.

NOTE: *Do not remove solenoid attaching screws.*

(5) Remove control valve body assembly and governor pipes. Make certain the six check balls stay in place above the spacer plate.

CAUTION: *Do not drop manual valve.*

(6) Remove the governor pipes and manual valve from control valve body.
(7) Remove and discard control valve assembly to spacer gasket.

Control Valve Body Installation

Installation of the control valve body is the reverse of the removal, using new control valve assembly to spacer gasket, intake pipe O-ring and pan gasket. Refill, adding oil as required.

Governor Removal

(1) Remove governor cover attaching screws, cover and gasket. Discard gasket.
(2) Withdraw governor assembly from case.

Governor Installation

Installation of the governor assembly is the reverse of the removal. Use a new gasket under the governor cover. Refill, adding oil as required.

Modulator and Modulator Valve Removal

(1) Remove modulator assembly attaching screw and retainer.

(2) Remove modulator assembly from case. Discard O-ring seal.

(3) Remove modulator valve from case.

Modulator and Modulator Valve Installation

Installation of the modulator assembly and modulator valve is the reverse of the removal. Use a new O-ring seal on the modulator assembly. Refill adding oil as required.

Parking Linkage Removal

(1) Remove bottom pan and oil filter. Discard gasket.

(2) Unthread jam nut holding detent lever to manual shaft.

(3) Remove manual shaft retaining pin from case.

(4) Remove manual shaft and jam nut from case.

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

(6) Remove parking pawl bracket attaching screws and bracket.

(7) Remove parking pawl return spring.

(8) Remove parking pawl shaft retainer.

(9) Remove cup plug, parking pawl shaft and parking pawl.

Parking Linkage Installation

Installation of the parking linkage is the reverse of the removal. Use new seals and gasket. Refill, adding oil as required.

NOTE: *As a normal maintenance procedure it is recommended that the manual shaft be lubricated with oil at the point where it enters the transmission case.*

TRANSMISSION REMOVAL AND INSTALLATION

Removal

(1) Remove dipstick tube to engine bolt.

(2) Remove carpet trim ring.

(3) On Model 20 remove top cover and lever on transfer case.

(4) Mark and remove rear propeller shaft.

(5) Remove exhaust pipe clamp bolt, shift lever, down shift wire and speedometer cable.

(6) Position transmission jack and remove rear crossmember.

(7) Remove exhaust pipe(s).

(8) Mark and remove front propeller shaft at transfer case end.

(9) Remove oil cooler lines and vacuum line.

(10) On Quadra-Trac transfer case remove diaphragm control hoses and Lock-Out signal switch wire.

(11) Remove converter housing splash pan.

(12) Remove converter to flywheel bolts and mark the converter and flywheel for alignment during installation.

(13) Remove converter housing to engine bolts and remove transmission.

Installation

(1) Install transmission and install engine bolts.

(2) Install converter to flywheel bolts, making sure mark made during removal is in alignment.

(3) Install converter front splash pan.

(4) Install oil cooler lines and vacuum line.

(5) On Quadra-Trac transfer case install diaphragm control hoses and Lock-Out signal switch wire.

(6) Install front propeller shaft, making sure mark made during removal is in alignment.

(7) Install exhaust pipe. DO NOT TIGHTEN.

(8) Install crossmember and remove transmission jack.

(9) Tighten exhaust pipe.

(10) Install exhaust pipe clamp bolt, shift lever, speedometer cable and down shift wire.

(11) Install rear propeller shaft, making sure mark made during removal is in alignment.

(12) On Model 20 install top cover and shift lever transfer case.

(13) Install carpet trim ring.

(14) Install dip stick tube to engine bolt.

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

Torque Converter Removal

With transmission in cradle on portable jack, remove torque converter assembly from transmission case by pulling straight out.

NOTE: *Converter contains a large amount of oil.*

Holding Fixture and Tool Base Installation

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

NOTE: *Do not overtorque holding screw. This will bind center support.*

(2) Install fixture and transmission into Holding Tool Base J-3289-20 with bottom pan of transmission case facing upward, as shown in figure 7-4.

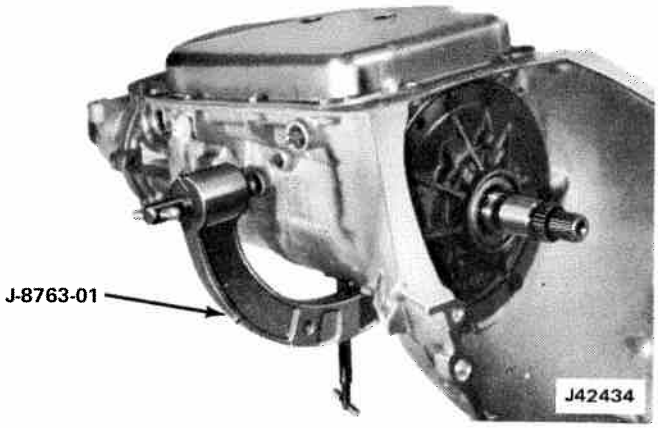


Fig. 7-4 Transmission in Holding Fixture J-8763-01

(3) Remove modulator assembly, attaching screw and retainer from transmission case.

(4) Remove modulator assembly and O-ring seal from adapter.

(5) Remove adapter from transmission case.

(6) Remove modulator valve from transmission case.

Governor, Oil Pan, Oil Filter and Intake Pipe Removal

(1) Remove attaching screws, governor cover and gasket from transmission case. Discard gasket (fig. 7-5)

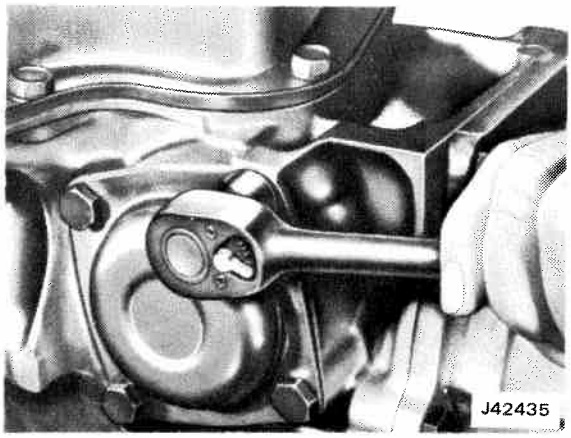


Fig. 7-5 Removing Governor Cover Attaching Screw

(2) Withdraw governor assembly from case.

(3) Remove bottom pan and gasket from transmissions case. Discard gasket, (fig. 7-6).

(4) Remove oil filter retainer bolt.

(5) Remove oil filter assembly from transmission case (fig. 7-7).

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

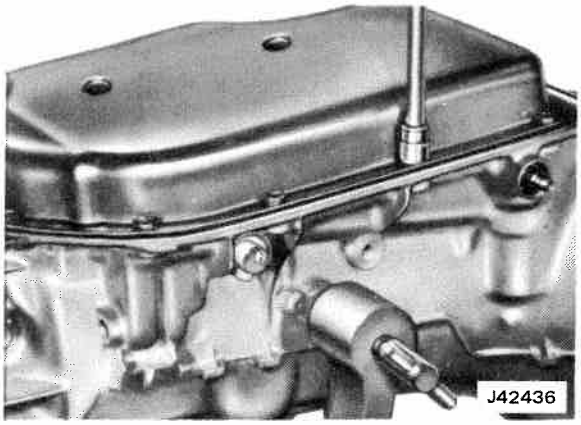


Fig. 7-6 Removing Transmission Oil Pan

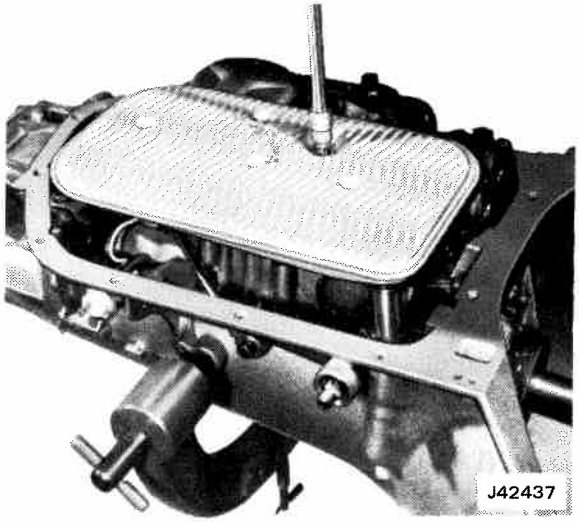


Fig. 7-7 Removing or Installing Oil Filter

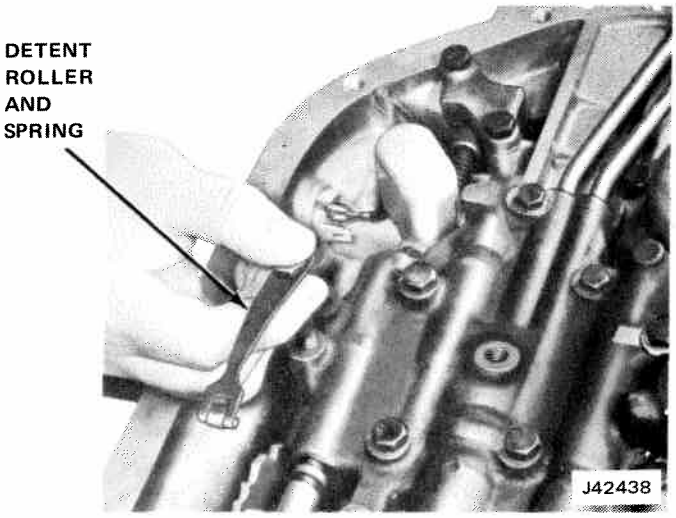


Fig. 7-8 Removing or Installing Detent Roller Assembly and Spring

Control Valve Assembly, Solenoid Connector, Governor Pipes, and Detent Spring Assembly

Removal

(1) Remove attaching screws of control valve body and detent roller spring assembly from transmission case as shown in fig. 7-8.

(2) Disconnect solenoid lead from connector terminal.

(3) Remove control valve body assembly and governor pipes from transmission case (fig. 7-9).

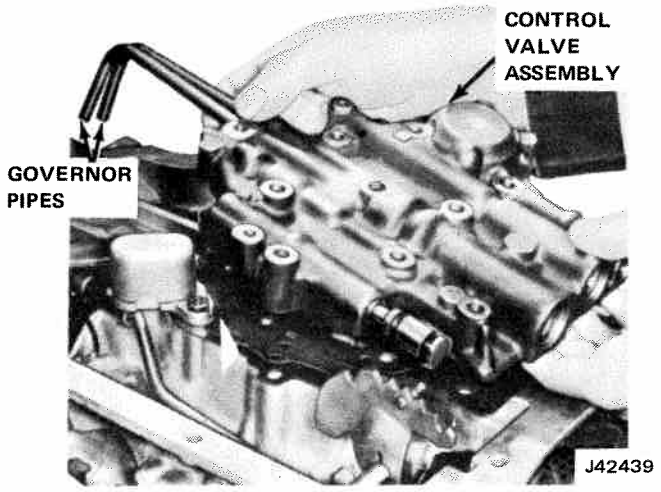


Fig. 7-9 Removing Control Valve Assembly and Governor Pipes

(4) Remove governor screen assembly from end of governor feed pipe or governor feed pipe hole in case (fig. 7-10).

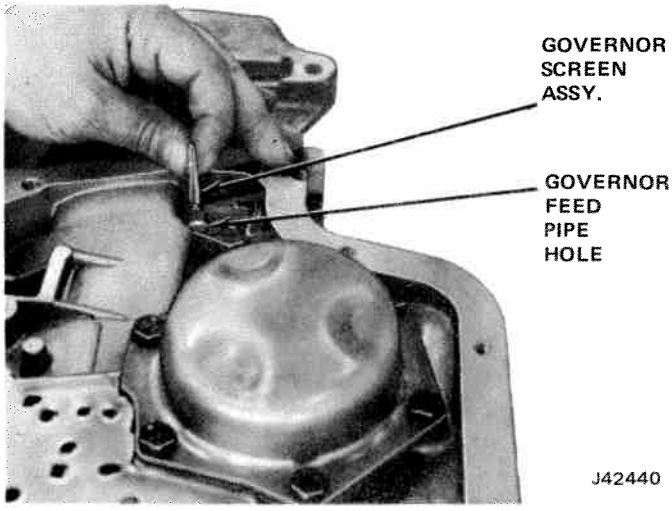


Fig. 7-10 Governor Screen

CAUTION: *Do not drop manual valve.*

(5) Remove governor pipes from control valve assembly.

(6) Remove control valve assembly to spacer gasket.

Rear Servo Removal

(1) Remove rear servo cover attaching screws, servo cover and gasket from transmission case. Discard gasket (fig. 7-11).

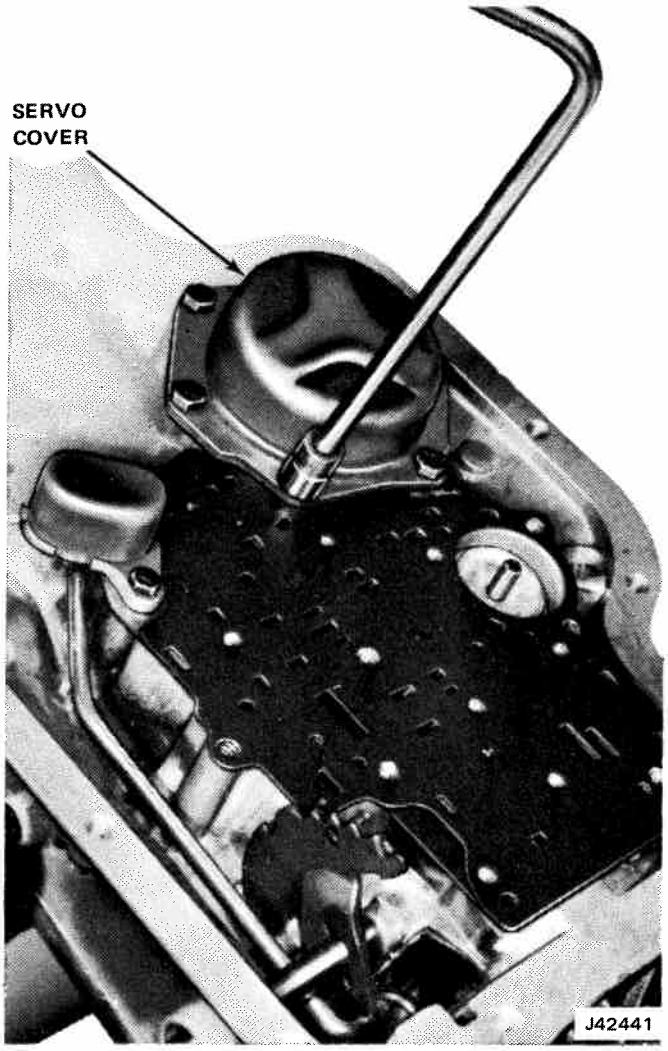


Fig. 7-11 Removing or Installing Rear Servo Cover

(2) Remove rear servo assembly from transmission case, as shown in figure 7-12.

(3) Remove rear servo accumulator spring from transmission case.

Selection of Rear Band-Apply Pin

(1) Attach Fixtures J-21370-5 andJ-21370-6 to transmission case by means of rear servo assembly attaching screws, as shown in fig. 7-13. These fixtures will be used to select a band-apply pin. One of three lengths of band-apply pin must be selected, to adjust operation of rear servo.

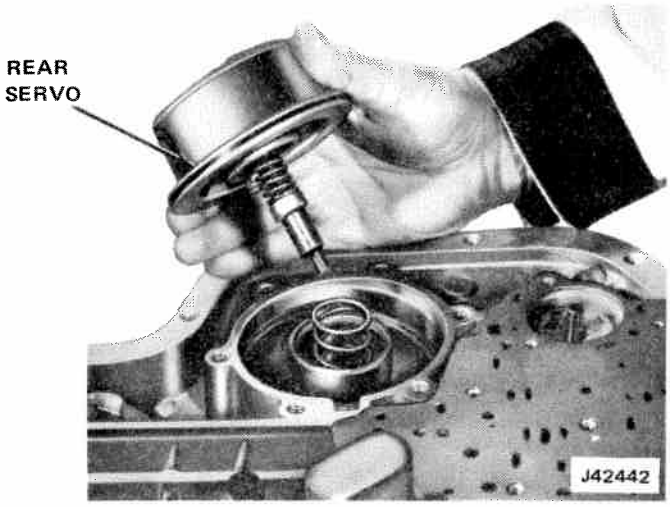


Fig. 7-12 Removing or Installing Rear Servo Assembly

(2) Apply 25 foot-pounds torque, then select proper length of band-apply pin (to be used during assembly of transmission) as follows: If both steps of J-21370-5 pin fixture are below gauge surface, select long pin, identified by three rings; if gauge surface is between steps, select medium pin, identified by two rings; if both steps are above the gauge surface, select short pin, identified by one ring. Identification ring is located on band lug end of the pin.

Detent Solenoid, Control Valve Spacer, and Front Servo Removal

(1) Remove solenoid attaching screws, detent solenoid assembly, and gasket from transmission case. Discard gasket (fig. 7-14).

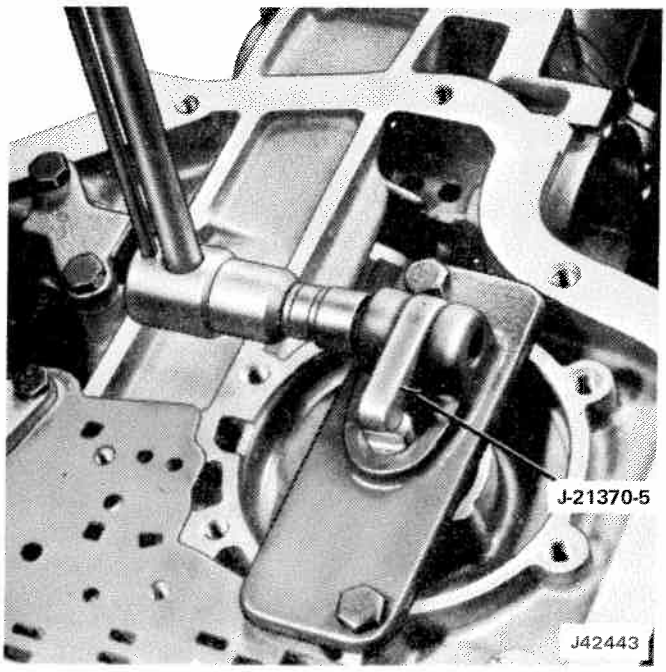


Fig. 7-13 Checking Band-Apply Pin of Rear Bands

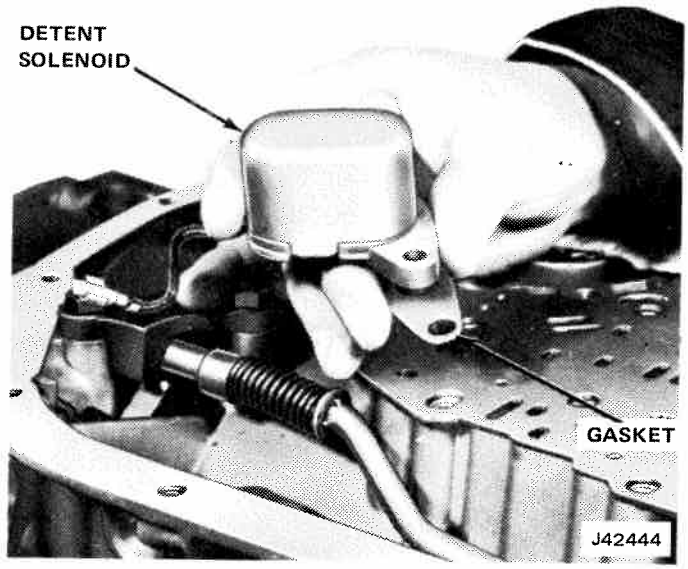


Fig. 7-14 Detent Solenoid and Gasket Removal and Installation

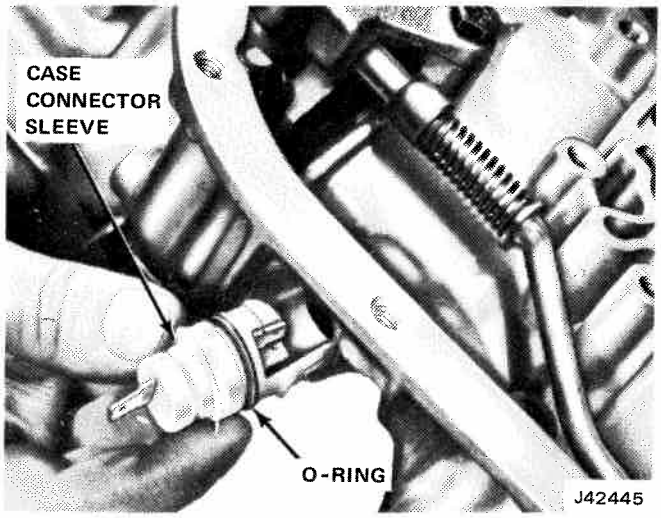


Fig. 7-15 Removing-Installing Case Connector Sleeve and O-Ring Seal

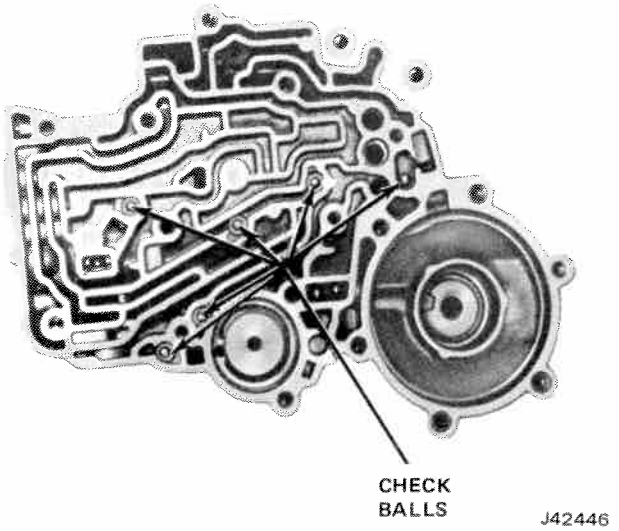


Fig. 7-16 Location of Check Balls

(2) Withdraw detent solenoid case sleeve connector and O-ring seal from Transmission case, as shown in figure 7-15.

(3) Remove control valve assembly spacer plate and gasket.

(4) Remove six check balls from cored passages in transmission case. Refer to fig. 7-16.

(5) Remove front servo piston, washer, pin, retainer, and spring from tranmission case, as shown in fig. 7-17.

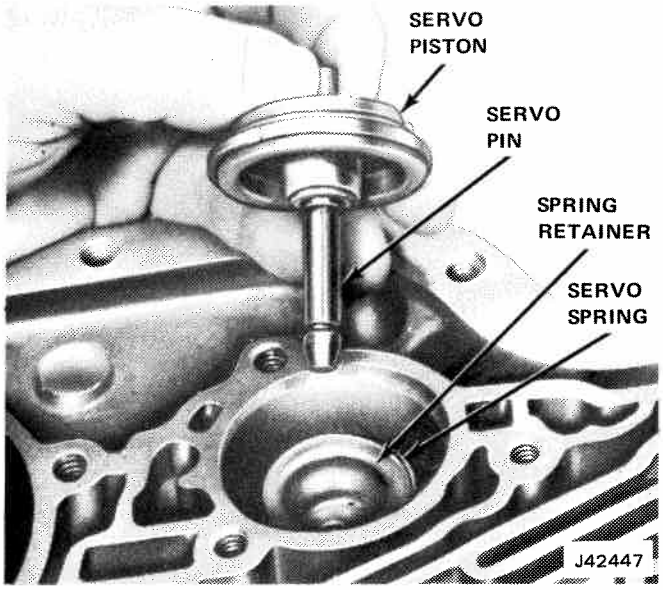


Fig. 7-17 Removing-Installing Front Servo Piston

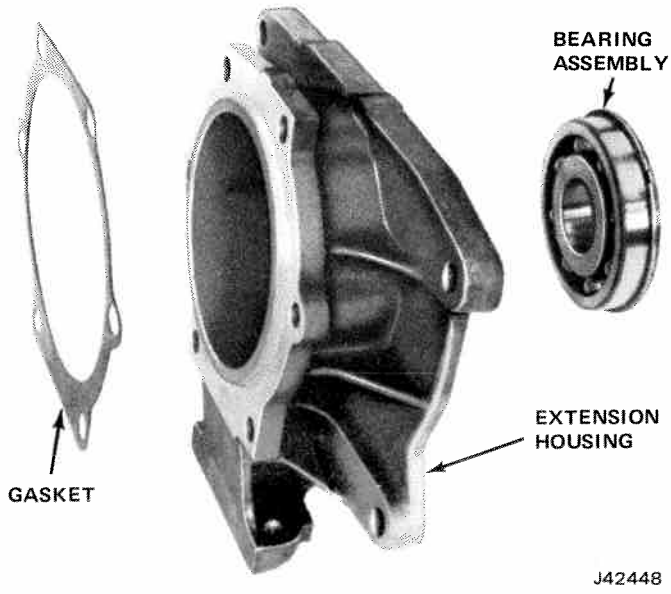


Fig. 7-18 Extension Housing Assembly

Rear Oil Seal and Extension (Housing) 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.

(6) Remove the two seals if necessary. Refer to fig. 7-18.

(7) Inspect sleeve, splines, and snap ring groove for damage. Inspect bearing.

Front Unit End Play

(1) Remove one front pump attaching bolt and washer from either 5 or 10 o'clock position.

(2) Install a ⅜ inch - 16 threaded slide hammer bolt, into bolt hole.

(3) Mount a dial indicator on rod, then index indicator to register with end of turbine shaft, as shown in fig. 7-19.

(4) Push turbine shaft rearward.

(5) Push output shaft forward.

(6) Set dial indicator to zero.

(7) Pull turbine shaft forward.

(8) Read resulting travel, or end play, which should be 0.003 to 0.024 inch.

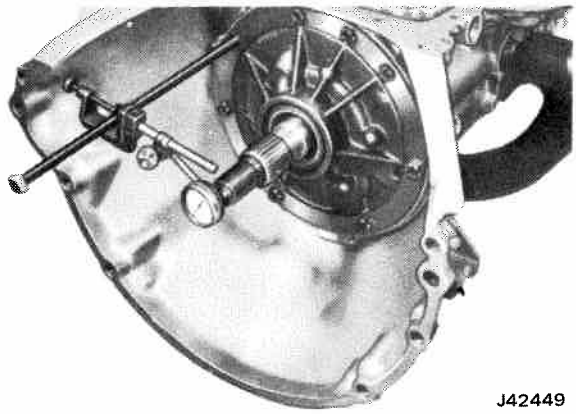


Fig. 7-19 Front Unit End Play

Important:

Selective washer controlling this end play is the thrust washer, located between pump cover and forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select proper washer from the following chart:

0.060 to 0.064	Yellow
0.071 to 0.075	Blue
0.082 to 0.086	Red
0.093 to 0.097	Brown
0.104 to 0.108	Green
0.115 to 0.119	Black
0.126 to 0.130	Purple

NOTE: *An oil-soaked washer may tend to discolor, so it will be necessary to measure washer for its actual thickness.*

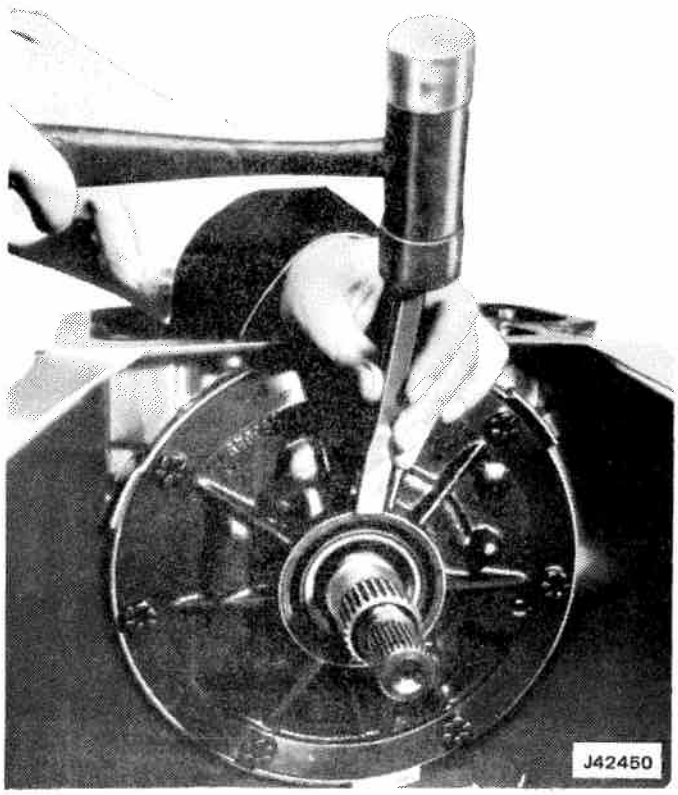


Fig. 7-20 Removing Front Seal

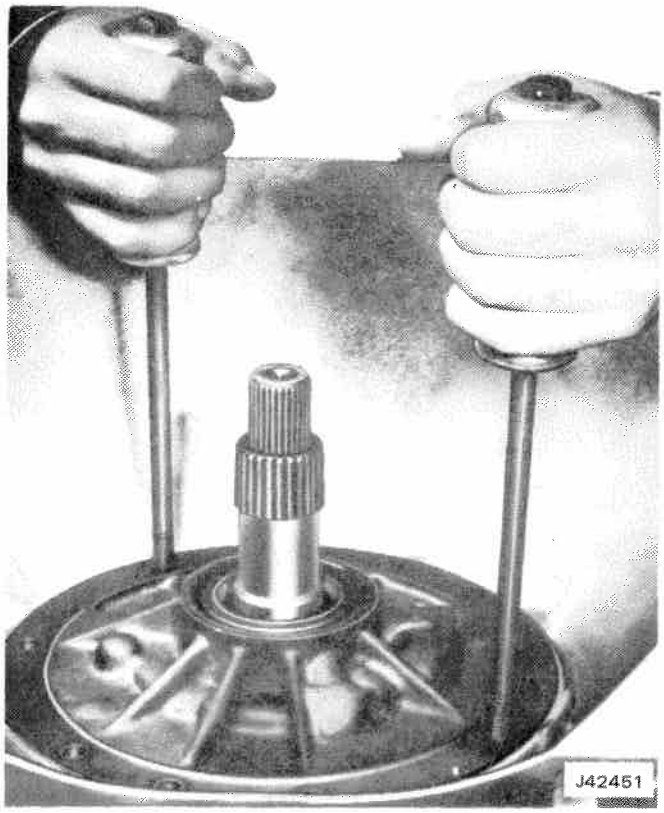


Fig. 7-21 Removing Oil Pump Assembly

Oil Pump, Forward Clutch, Turbine Shaft, and Direct Clutch Removal

(1) If necessary to replace, pry front seal from oil pump (fig. 7-20).

(2) Remove pump attaching bolts and bolt washers.

(3) Install 3/8-16 inch threaded slide hammers into threaded holes in pump body at 5 and 10 o'clock positions.

(4) Remove pump assembly from case (fig. 7-21).

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

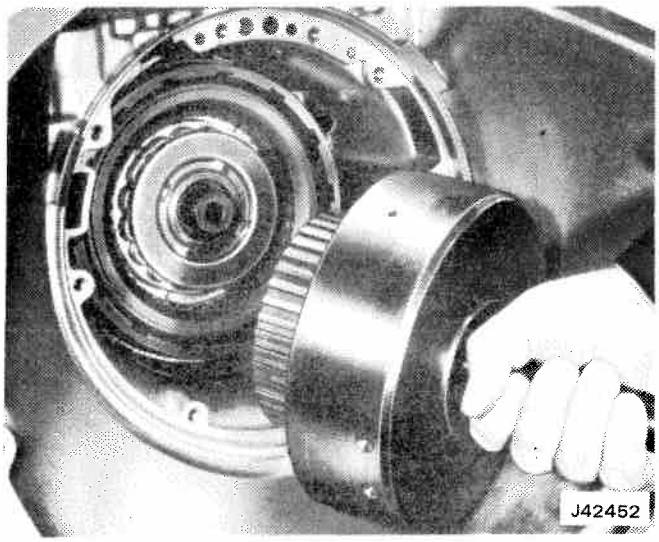


Fig. 7-22 Removing-Installing Forward Clutch Assembly

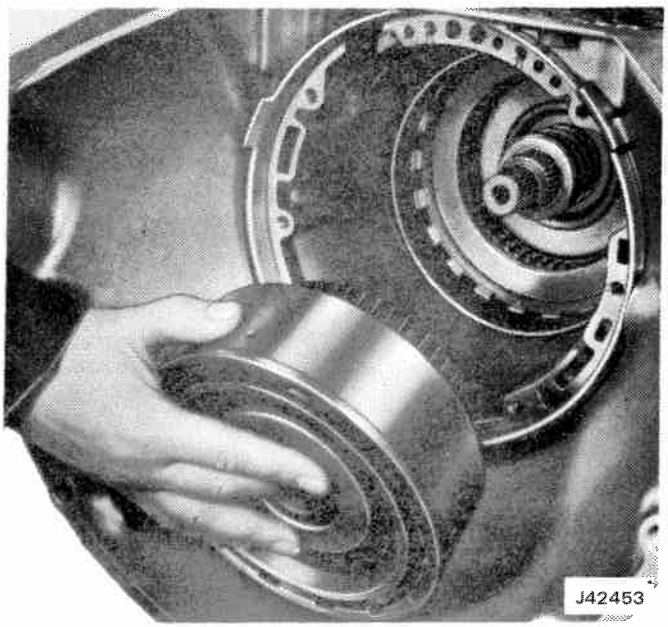


Fig. 7-23 Removing-Installing Direct Clutch Assembly

(6) Remove forward clutch assembly and turbine shaft from transmission case, as shown in fig. 7-22.

(7) Remove forward clutch hub to direct clutch hous-

ing thrust washer, if it did not come out with forward clutch housing assembly.

Remove direct clutch assembly from transmission case (fig. 7-23).

Manual Linkage Removal

(1) Unthread jam nut holding detent lever to manual shaft.

(2) Remove manual shaft retaining pin from transmission case, as shown in fig. 7-24.

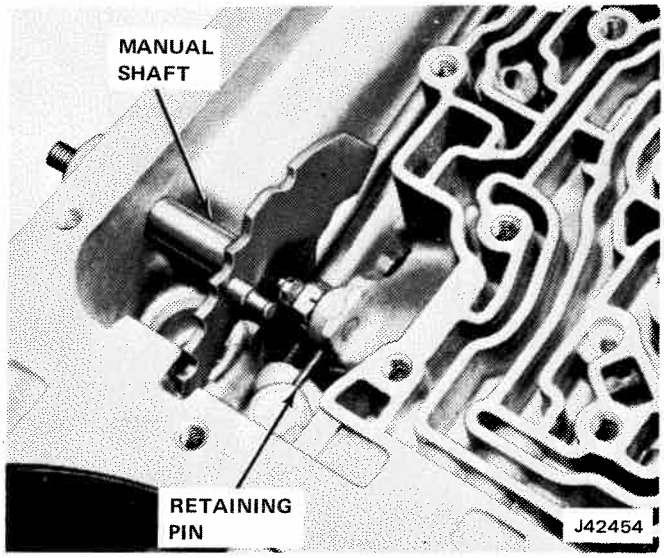


Fig. 7-24 Manual Shaft and Retaining Pin

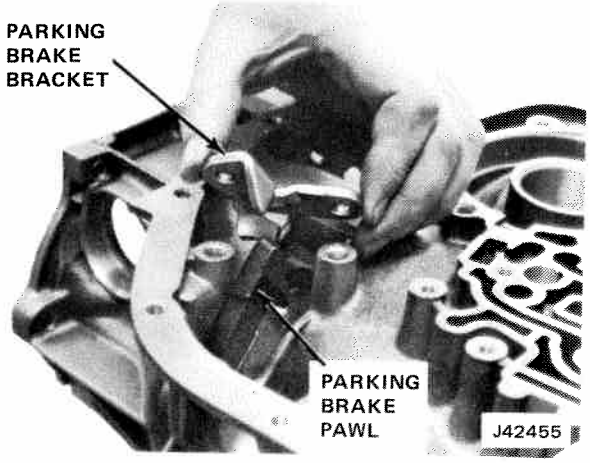


Fig. 7-25 Removing Parking Braket

CAUTION: *Do not lose jamnut as it becomes free from manual shaft.*

(3) Remove jamnut, manual shaft, and seal from transmission case.

(4) Remove parking actuator rod and detent lever assembly from transmission case.

(5) Remove attaching screws and parking bracket from transmission case (fig. 7-25).

(6) Remove parking pawl return spring from pawl and transmission case, as shown in fig. 7-26.

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

(8) Remove parking pawl shaft cup plug, parking pawl shaft, and the parking pawl from transmission (fig. 7-28).

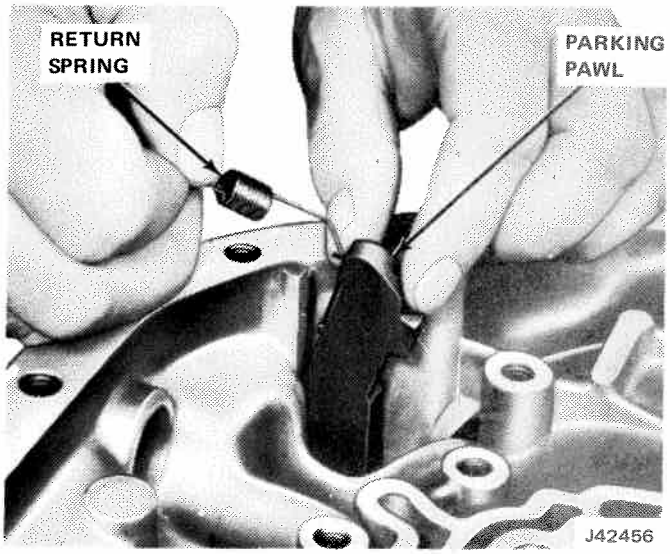


Fig. 7-26 Removing-Installing Return Spring From Parking Brake Pawl

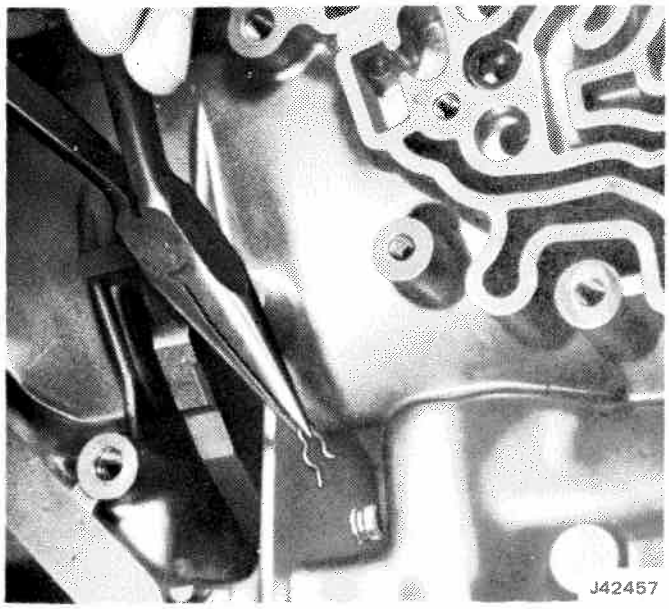


Fig. 7-27 Removing-Installing Retainer Spring From Parking Pawl Shaft

Front Band Assembly and Sun Gear Shaft Removal

(1) Remove front band assembly from transmission case (fig. 7-29).

(2) Remove sun gear shaft as shown in fig. 7-30.

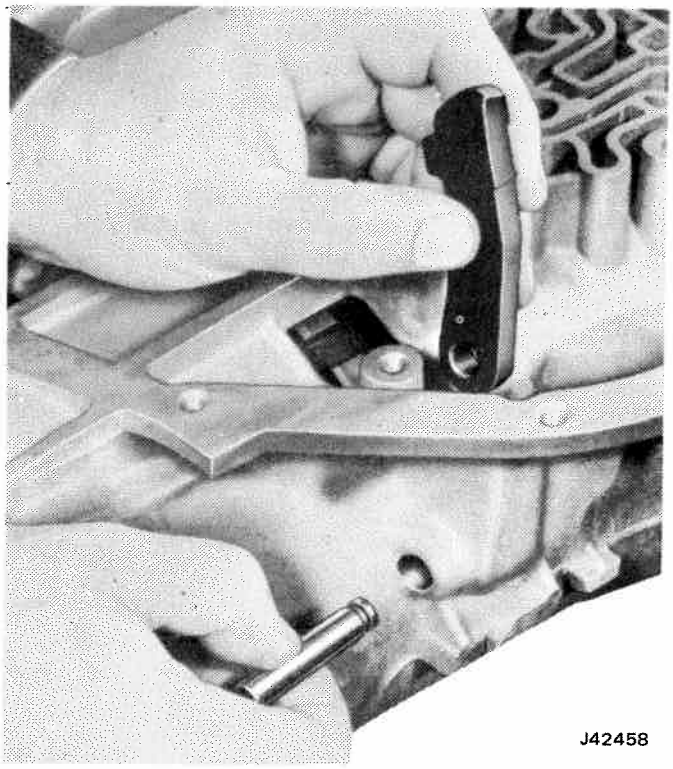


Fig. 7-28. Removing-Installing Parking Brake Pawl and Pawl Shaft

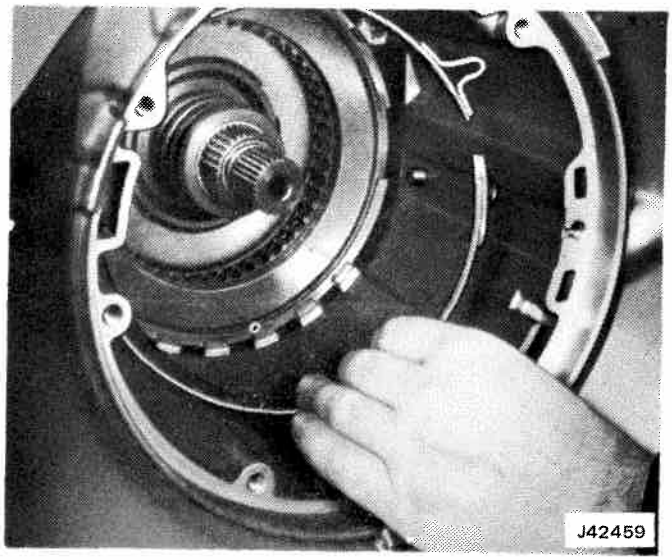


Fig. 7-29 Removing-Installing Front Band Assembly

Rear End Play Check

(1) Install rod from Tool C-3752 into an extension housing attaching bolt hole.

(2) Mount the Dial Indicator on the rod and index with the end of the output shaft (fig. 7-31).

(3) Move the output shaft in and out to read the end play.

(4) End play should be from 0.007 to 0.019 inch.

(5) The selective washer controlling this end play is the steel washer having three lugs that is located between the thrust washer and the rear face of the transmission case. If a different washer thickness is required

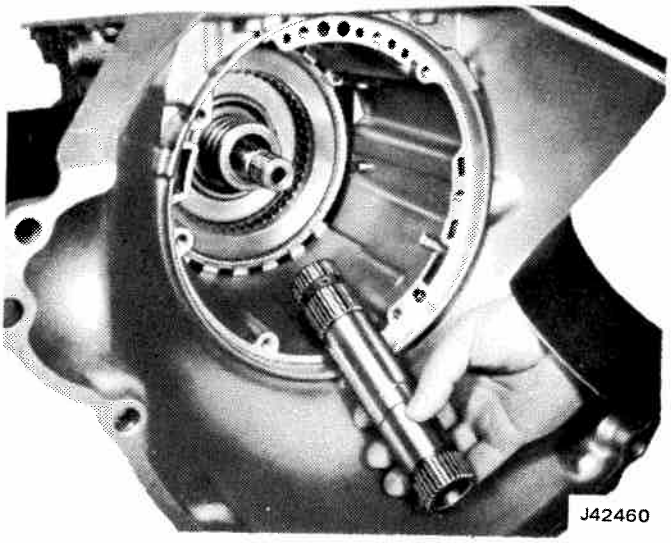


Fig. 7-30. Removing Sun Gear Shaft

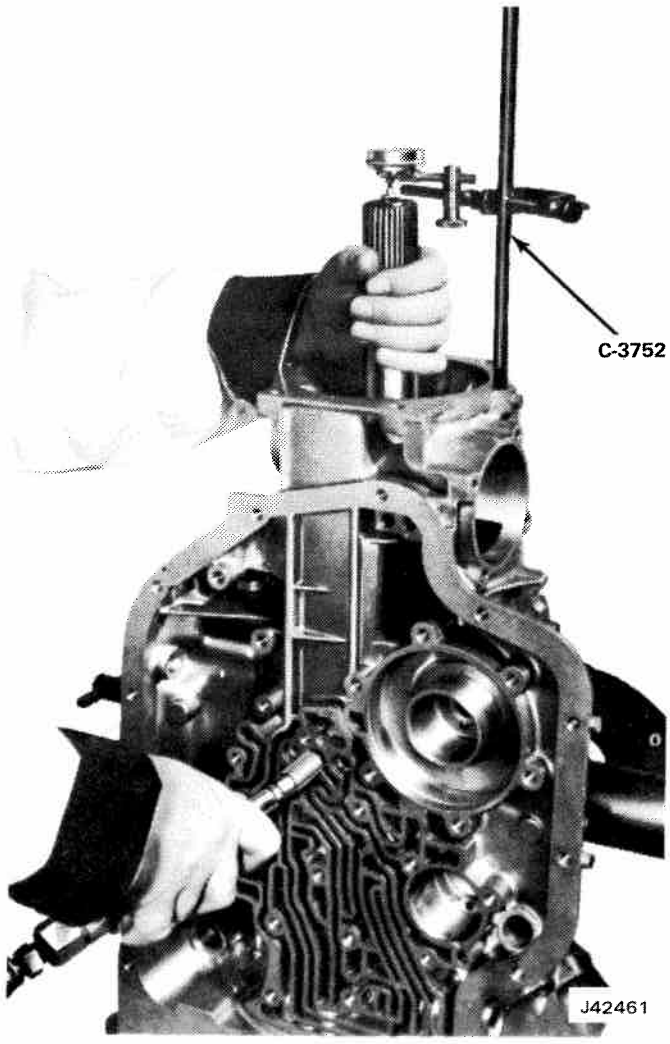


Fig. 7-31 Rear Unit End Play

to bring the end play within specification, it can be selected from the following 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

Intermediate Clutch Removal

(1) Remove bolt which secures center support to case, using a ⅜ inch 12-point thin wall deep socket (fig.7-32).

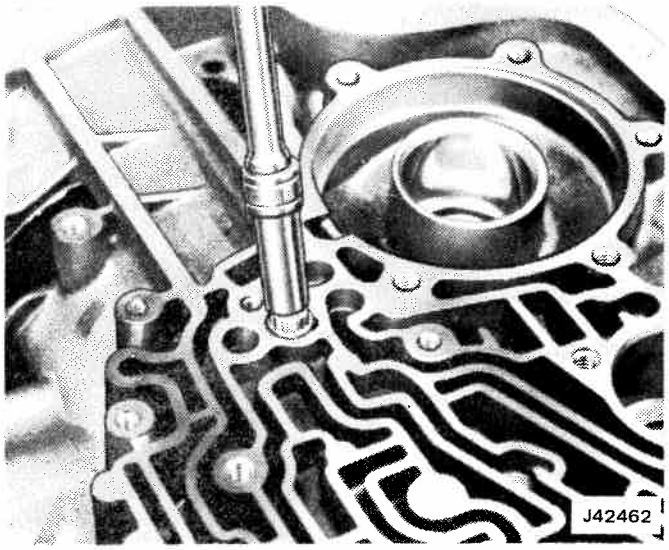


Fig. 7-32 Removing Center Support Bolt

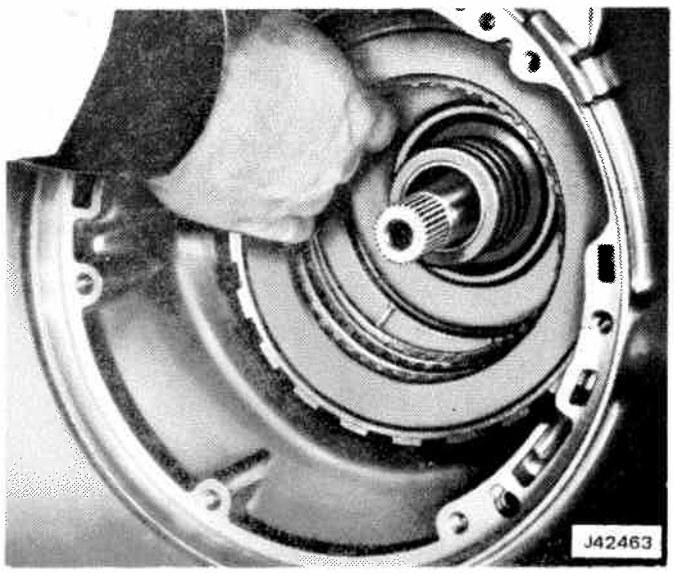


Fig. 7-33 Intermediate Clutch

(2) Remove intermediate clutch backing plate to case snap ring.

(3) Remove intermediate clutch backing plate, three composition, and three steel clutch plates from transmission case (fig. 7-33).

Center Support and Gear Unit Assembly, Support-to-Case Spacer, Rear Band Assembly Removal

(1) Remove center support to case snap ring as shown in fig. 7-34.

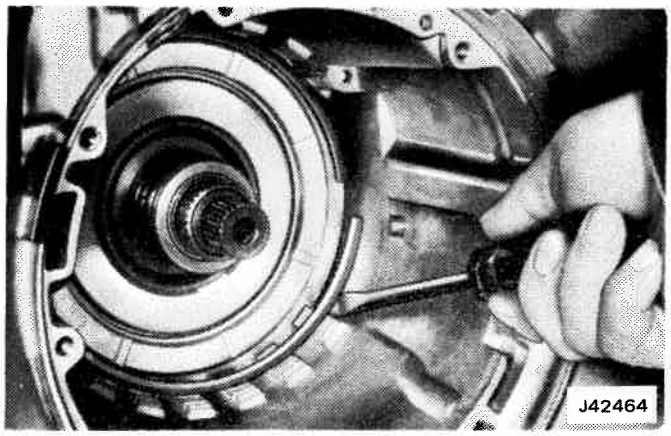


Fig. 7-34 Removing Center Support Snap Ring

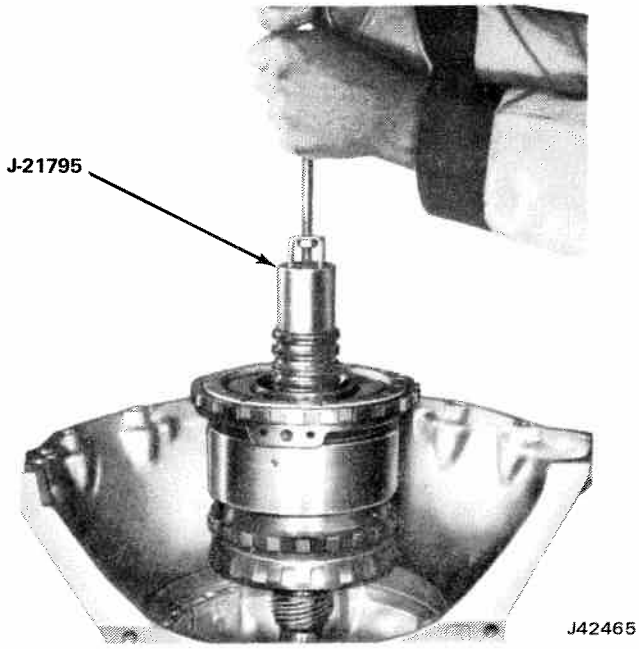


Fig. 7-35 Removing Center Support and Gear Unit

(2) Remove entire gear unit asssembly from transmission case by lifting with Gear Assembly Installing and Removing Tool J-21795, with Slide Hammer C-3752 (fig. 7-35).

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

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

(5) Remove rear unit selective washer from transmission case, as in fig. 7-36.

(6) Remove support to case spacer ring (fig. 7-36).

(7) Remove rear band assembly from transmission case (fig. 7-37).

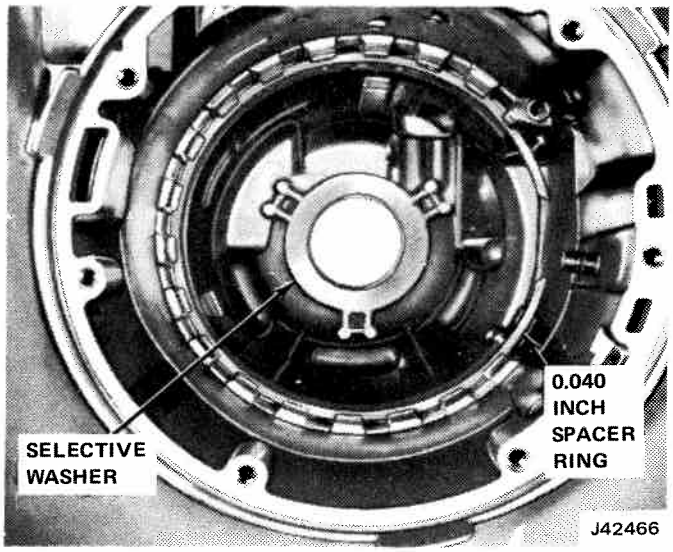


Fig. 7-36 Selective Washer and Spacer Ring

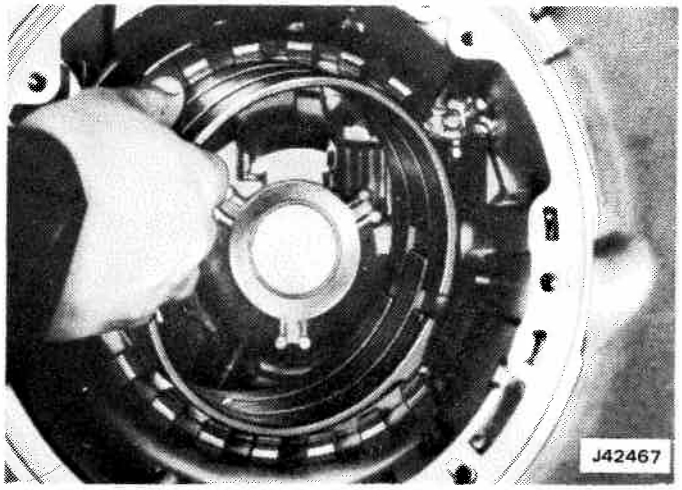


Fig. 7-37 Removing Rear Band

SUBASSEMBLY OVERHAUL

Gear Unit Disassembly

(1) Remove case center support assembly from gear unit assembly (fig. 7-38).

(2) Remove thrust washer which is normally between center support and reaction carrier, as shown in fig. 7-39.

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

Fig. 7-38 Removing Center Support from Gear Unit

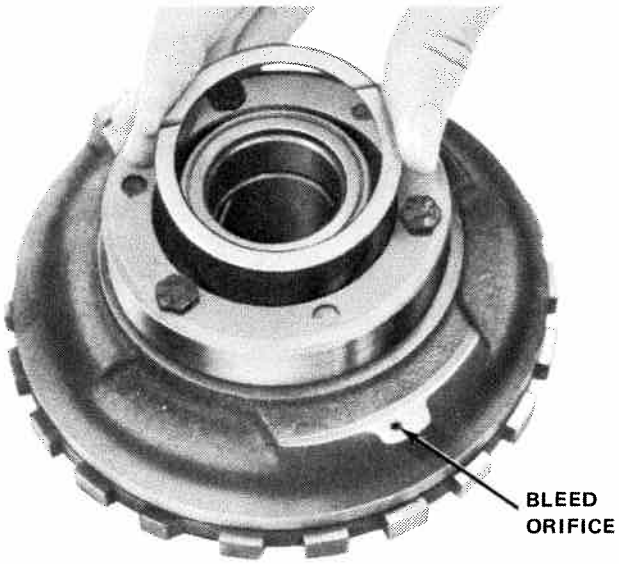


Fig. 7-39 Removing-Installing Center Support Thrust Washer

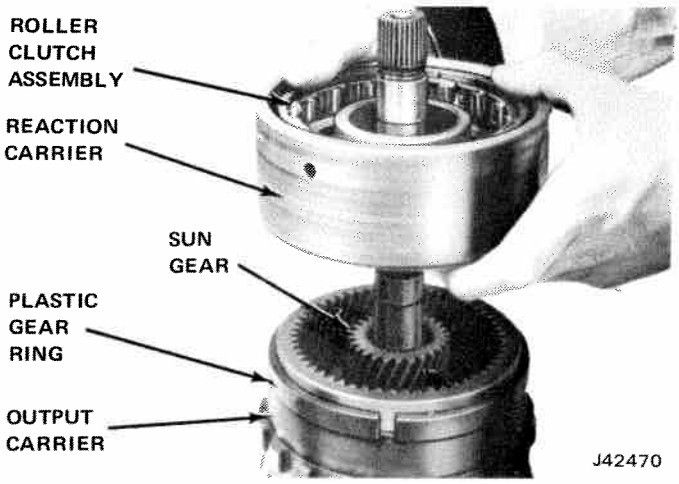


Fig. 7-40 Removing Reaction Carrier and Roller From Output Carrier Clutch

(4) Remove reaction carrier and roller clutch assembly from output carrier assembly, as shown in fig. 7-40.

(5) Remove front internal gear ring from output carrier assembly.

(6) Remove sun gear from output carrier assembly. Refer to fig. 7-41.

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

(8) Turn assembly over.

(9) Remove snap ring which fastens output shaft to output carrier.

(10) Withdraw 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 assembly (fig. 7-42).

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

(14) If necessary, remove rear internal gear-to-main shaft snap ring to remove gear from shaft, as shown in fig. 7-42.

Fig. 7-41 Removing Sun Gear

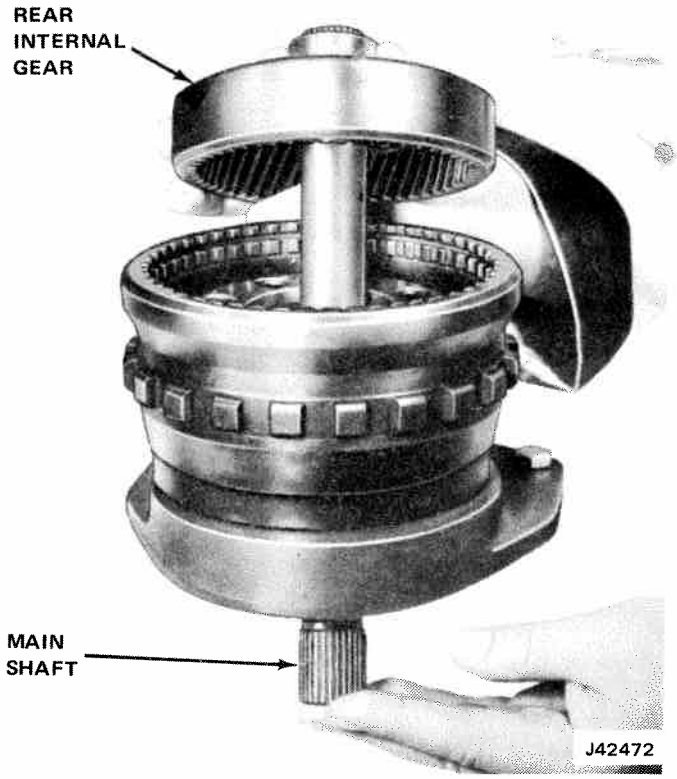


Fig. 7-42 Removing Rear Internal Gear and Main Shaft From Output Carrier Assembly

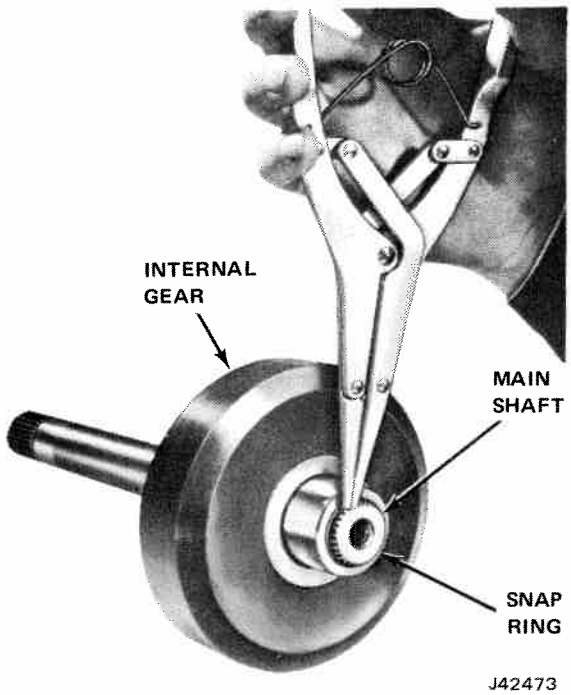


Fig. 7-43 Removing Main Shaft Snap Ring

GOVERNOR

All components of governor assembly, with exception of driven gear, are a select-fit and each assembly is calibrated. **The governor, including the driven gear, is serviced as a complete assembly.** However, the driven gear can also be serviced separately.

It is necessary to disassemble governor assembly in order to replace driven gear. Disassembly may also be necessary due to foreign material causing improper operation.

Disassembly

(1) Cut off one end of each governor weight pin and remove pins, governor thrust cap, governor weights and

springs. Governor weights are interchangeable from side to side and need not be indentified (fig. 7-44.)

(2) Remove governor valve from governor sleeve. Be careful not to damage valve.

Cleaning and Inspection

Wash all parts in cleaning solvent, air dry, and blow out all passages.

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

Check governor sleeve for free operation in bore of transmission case.

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

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

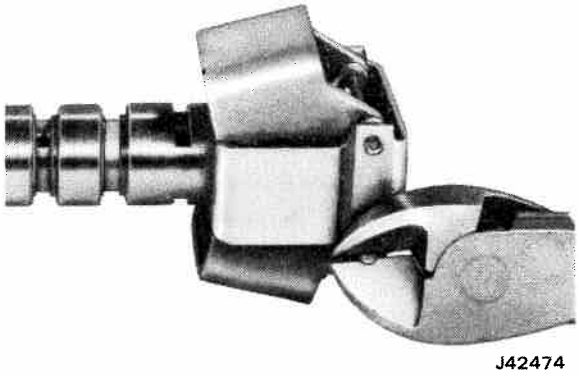


Fig. 7-44 Removing Weight Pin From Governor

Check governor driven gear for looseness on governor sleeve.

Inspect governor weight springs for distortion or damage.

Check governor weights for free operation in their retainers.

Check valve opening at entry and exhaust (0.020-inch minimum).

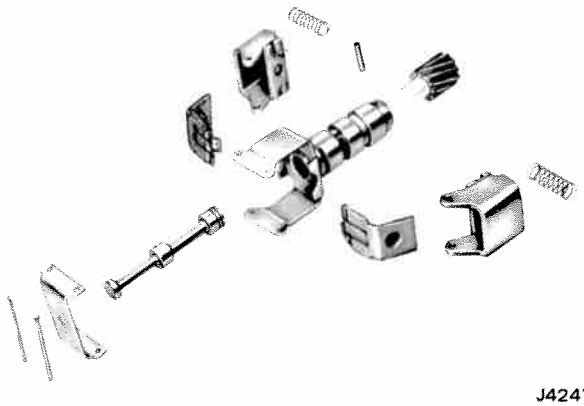


Fig. 7-45 Governor Assembly

Driven Gear Replacement

To facilitate governor repair in the field, 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 one governor gear retainer split pin. Replacement of gear must be performed with care in the following manner:

(1) Drive out split pin, which retains governor gear on governor sleeve, using small punch (fig. 7-46.)

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

(3) Place in arbor press. Then with a long punch, press gear out of sleeve.

(4) Carefully clean governor sleeve of chips that remain from original gear installation.

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

(6) Position new gear in sleeve.

(7) With a suitable socket, press gear into sleeve until nearly seated.

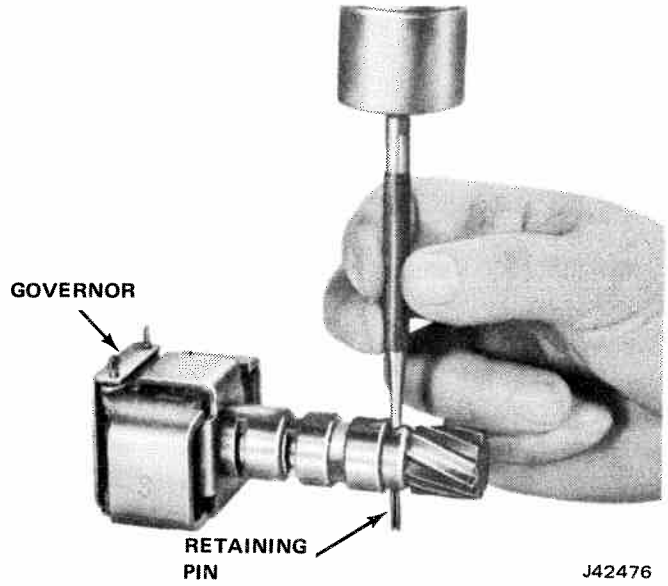


Fig. 7-46 Governor Retaining Pin

(8) Carefully remove any chips that may have shaved off gear hub and press gear in until it bottoms on shoulder.

(10) A new pinhole must be drilled through sleeve and gear.

(10) Locate hole position 90° from existing hole, center punch and then, while supporting governor in press, drill new hole through sleeve and gear using a standard 1/8-inch drill.

(11) Install retaining pin to secure gear to sleeve.

(12) Wash governor assembly thoroughly to remove any chips that may have collected.

Assembly

(1) Install governor valve in bore of governor sleeve.
(2) Install governor weights and springs, then thrust cap on governor sleeve.
(3) Align pin holes in thrust cap, governor weight assemblies, and governor sleeve, then install new pins. Crimp both ends of pins to prevent them from falling out.
(4) Check governor weight assemblies for free operation on pins.

REAR SERVO

Inspection

Inspect servo pin for damage.
Inspect piston for damaged oil ring groove. Check freedom of ring in groove (fig. 7-47).

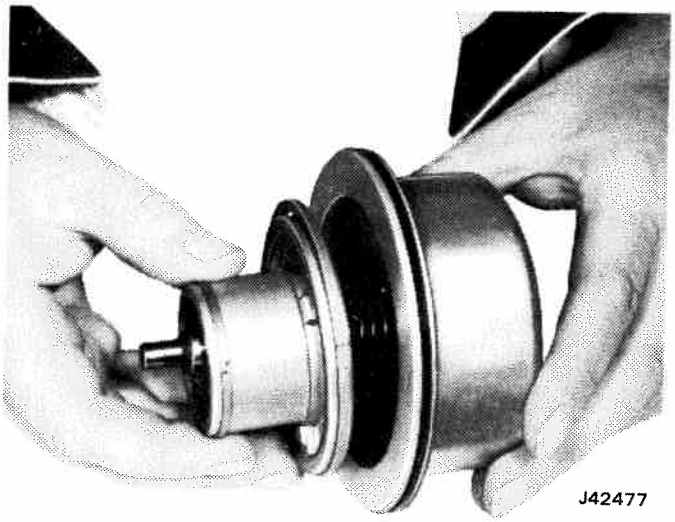


Fig. 7-47 Inspecting Rear Servo

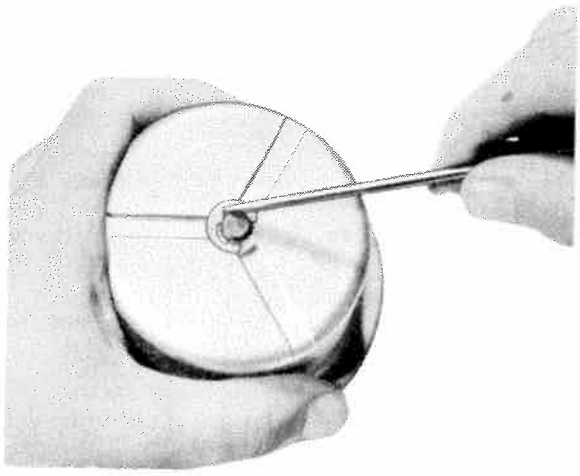


Fig. 7-48 Removing E-Type Retainer Ring

Disassembly

(1) Remove rear accumulator piston from rear servo piston.
(2) Remove E-ring retaining rear servo piston to servo pin. (fig. 7-48).

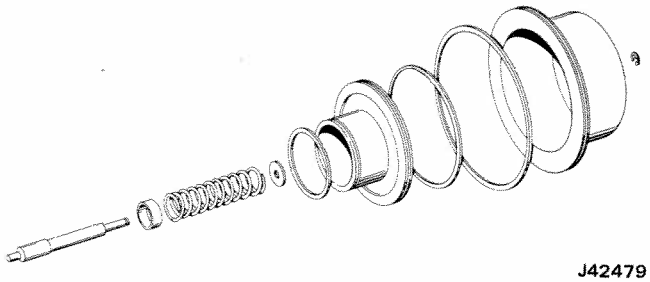


Fig. 7-49 Rear Servo Assembly

(3) Remove rear servo piston and seal from servo pin (fig. 7-49).
(4) Remove washer, spring and retainer.

Inspection

Inspect freedom of accumulator piston in servo piston.
Inspect fit of servo pin for scores or cracks.
Inspect accumulator and servo piston for cracks and porosity.

Assembly

(1) Install spring retainer (with cap down), spring, and flat washer on servo pin.
(2) Insert servo pin into bore of servo piston and secure with E-type retaining ring.

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 for service, use the aluminum oil seal ring. The rear accululator piston, large diameter ring groove depth is machined shallower to take the large teflon oil seal ring; if this requires replacement, use only the teflon oil seal ring.*

(3) Install outer and inner oil rings on accumulator piston, if removed.
(4) Assemble into bore of servo piston.

CONTROL VALVE

Disassembly

(1) Position control valve assembly with cored face up and accumulator pocket nearest operator.
(2) Remove manual valve from upper bore.
(3) With Ring Remover and Installer Tool J-22269-01, remove retaining ring at accumulator piston (fig. 7-50).

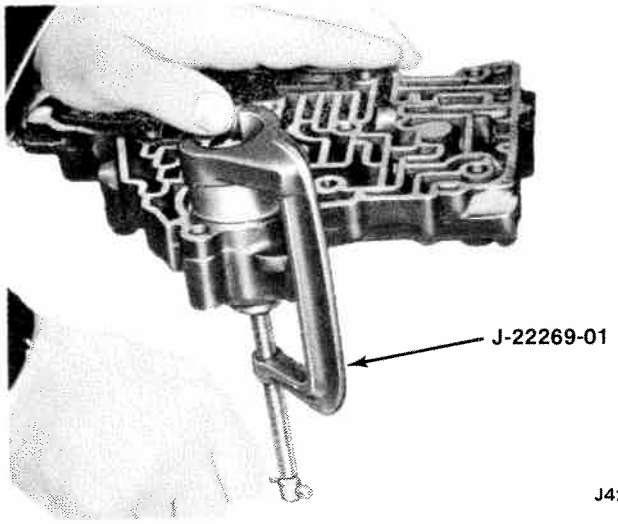


Fig. 7-50 Removing S-Type Retaining Ring

(4) Remove accumulator poston and spring from valve assembly (fig. 7-51).

(5) At right side of valve assembly, adjacent to manual valve, remove retaining pin, bushing, 1-2 regulator valve, spring, 1-2 detent valve, and 1-2 shift valve from valve body. Refer to fig. 7-53.

(6) From next bore down, remove retaining pin, modulator valve bushing, 2-3 shift valve spring. 2-3 modulator valve, 3-2 intermediate spring, and 2-3 shift valve from valve body.

(7) From next bore down, remove retaining pin, bore plug, spring, spacer, and 3-2 valve from valve body.

(8) At other end of valve body, top bore, remove retaining pin, bore plug, detent valve, detent regulator valve, spring, and spacer from valve body.

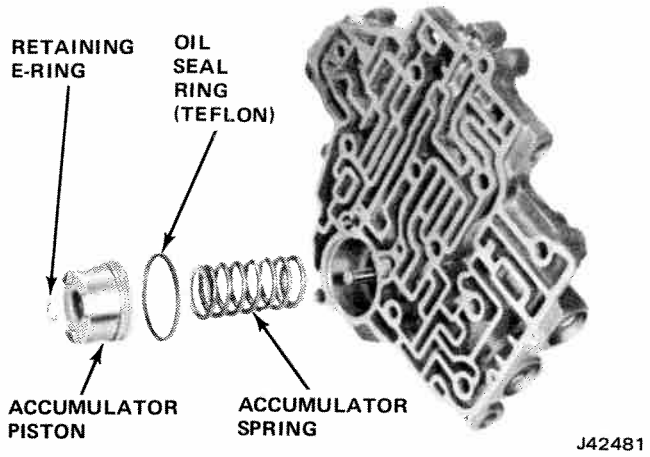


Fig. 7-51 Accumulator Piston and Spring

(9) From the next bore down, remove the grooved retaining pin, bore plug, and the 1-2 accumulator valve. Refer to fig. 7-52.

Inspection

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

Inspect bushings for cracks, scratches or distortion.

Inspect valve body for cracks or scored bores.

Check all springs for distortion or collapsed coils.

Clean governor oil screen in cleaning solvent.

Assembly

(1) Install front accumulator spring and piston into valve body (fig. 7-51).

(2) Compress spring and piston, install Special Tool

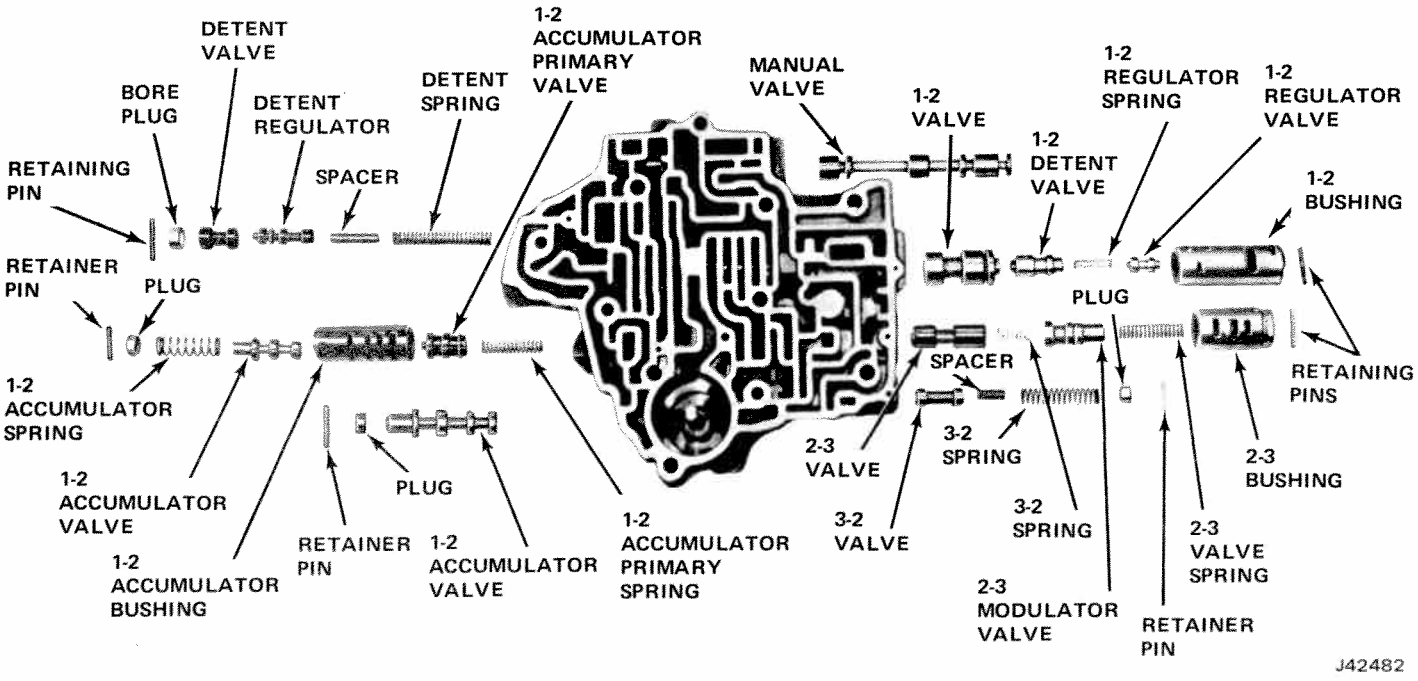


Fig. 7-52 Control Valve Assembly

J-22269-01, and secure piston with E-type retaining ring as shown in figure 7-50.

(3) 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 the valve body, with the grooves entering the pin hole last. Tap pin with hammer until flush with cast surface.

(6) Into next bore up, insert detent spring and spacer. Compress spring, then retain spring and spacer with small screwdriver (fig. 7-53). Insert detent regulator valve, wide land first, then detent valve, narrow land first.

(8) Install bore plug (hole out).

(9) Pressing plug inward to compress spring, secure plug in valve body with retaining pin, then withdraw screwdriver from valve body.

(10) In lower right hand bore of valve body, insert 3-2 valve, 3-2 valve spring, spacer, and bore plug (hole out). Refer to figure 7-52.

(11) Press plug into valve body to compress spring, then secure plug in body with retaining pin.

(12) Into next bore of valve body, insert 2-3 shift valve (stem end out) and 3-2 intermediate spring.

(13) Install 2-3 modulator valve in bushing and insert both parts into valve body bore.

(14) Insert 2-3 shift valve spring into valve body, compress, then secure with retaining pin.

(15) Into next bore of valve body insert 1-2 shift valves (stem end out).

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

(17) Align spring in bore of detent valve; then insert parts into valve body bore.

(18) Press bushing into valve body to compress spring; then secure bushing in valve body with retaining pin.

(19) Install manual valve in valve body, with detent pin groove to the right.

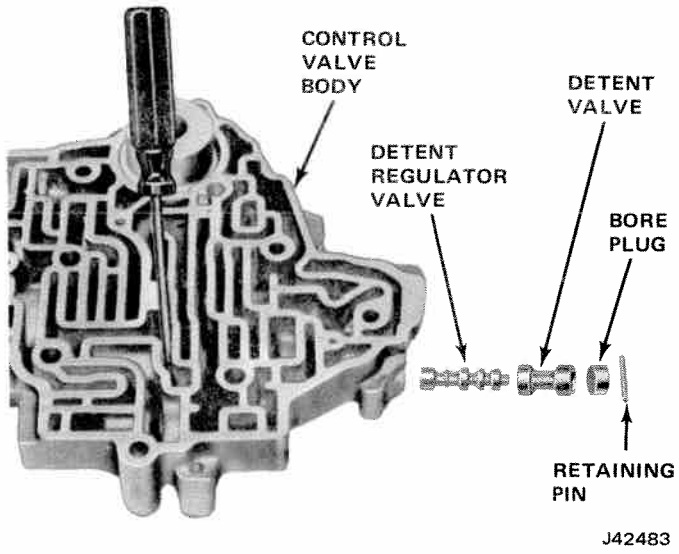


Fig. 7-53 Detent and Regulator Valve

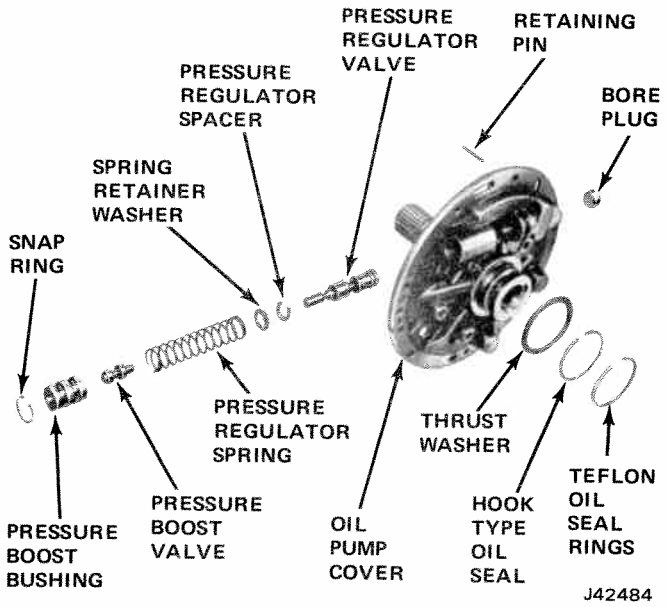


Fig. 7-54 Oil Pump Cover Assembly

OIL PUMP

Disassembly

(1) Place oil pump assembly in hole in bench and Adapter J-21364.

(2) Compress pressure boost valve bushing against pressure regulator spring and remove snap ring from pump cover (fig. 7-54).

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

(4) If furnished, remove spring retainer washer, pressure regulator spacer, and pressure regulator valve from pump cover.

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

(6) Remove retaining pin and remove bore plug from pressure regulator bore of pump cover (fig. 7-55).

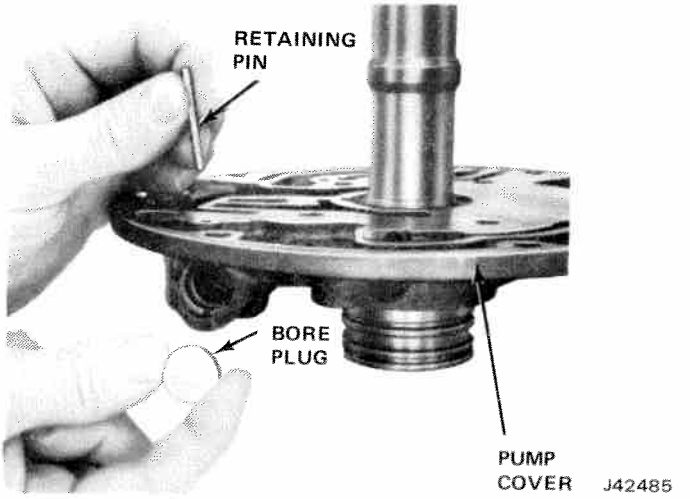


Fig. 7-55 Pressure Regulator Plug and Retaining Pin

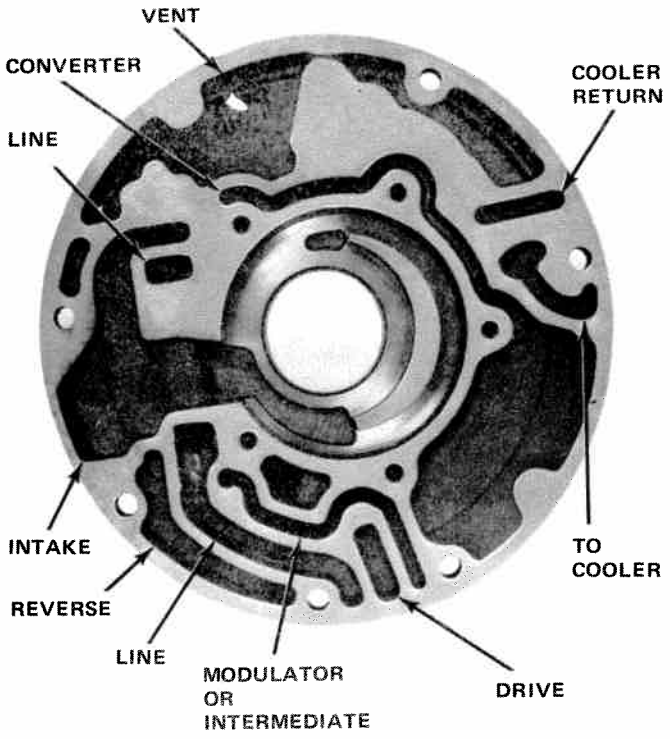


Fig. 7-56 Pump Body Oil Passages

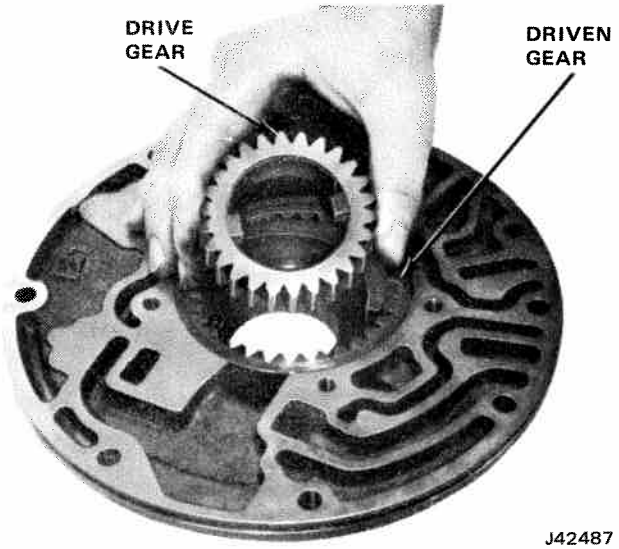


Fig. 7-57 Removing-Installing Pump Gears

(7) Remove hook type oil rings and thrust washer from pump cover (fig. 7-54).

(8) Mark drive and driven gears in oil pump body for alignment, and remove gears from pump body (fig. 7-57).

Inspection

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

Position pump gears in pump body and check pump body face-to-gear clearance; it should be 0.0008 to 0.0035 inch (fig. 7-59).

Check face of pump body for scores or nicks. Inspect oil passages. Check for damaged cover bolt attaching threads. Check for overall flatness of pump body face. Check bushing for scores or nicks (fig. 7-56).

Inspect pump attaching bolts for damage and replace if necessary.

Inspect pump cover face for overall flatness. Check for scores or chips in pressure regulator bore. Check that all passages are open and not interconnected. Check for scoring or damage at pump gear face. Inspect stator shaft for damaged splines, or scored bushings. Inspect oil ring grooves for damage or wear. Inspect selective thrust washer face for wear or damage. In-

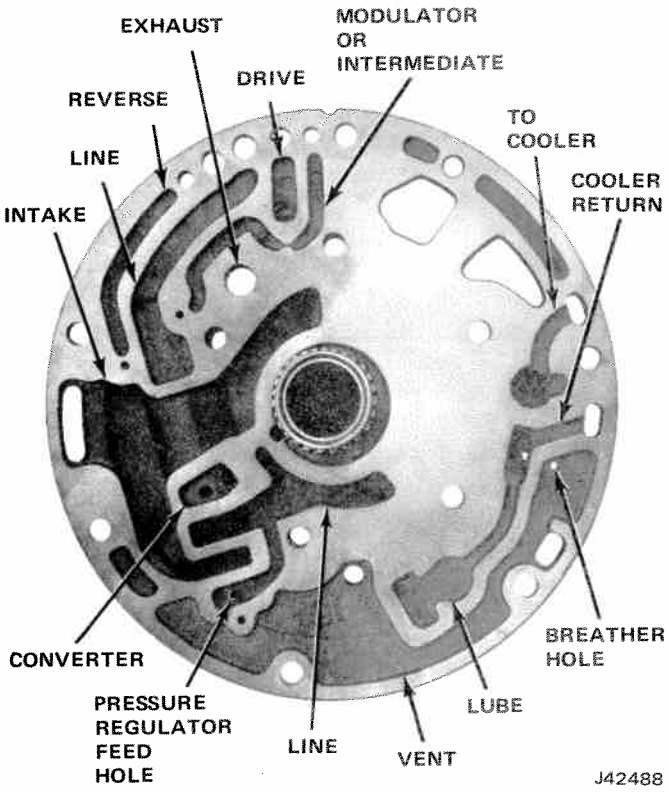


Fig. 7-58 Pump Cover Oil Passages

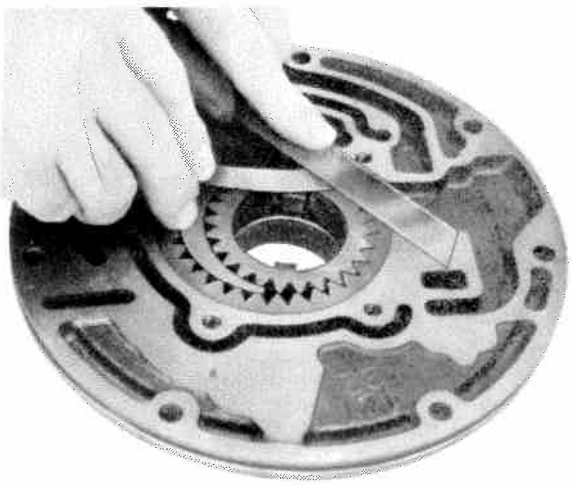


Fig. 7-59 Checking Clearance Pump Body Face to Gear

spect pressure regulator and boost valve for free travel through bore pump cover.

Inspect pump cover for open ⅛-inch diameter breather hole. Refer to figure 7-58.

Assembly

(1) Install drive and driven pump gears in pump body, with alignment marks up (fig. 7-57).

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

(2) With stator shaft protected, clamp pump cover in vise.

(3) Insert spacer(s), if used, spring retainer washer and spring into pressure regulator bore of pump cover (fig. 7-54).

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

(5) Install boost valve into bushing, stem end out; then insert both parts into pump cover.

(6) Compress bushing against spring, and secure into pump cover with retaining snap ring.

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

(8) Install selective thrust washer and one hook type oil seal ring and one teflon oil seal ring on delivery sleeve of pump cover.

NOTE: *A forward clutch failure can occur if the bore that the oil seal rings on the pump cover go into, is oversize.*

(9) Secure pump cover to pump body with attaching bolts.

NOTE: *Leave bolts one turn loose at this time.*

(10) Place pump Aligning Strap J-21368 over pump body and cover, and tighten tool (fig. 7-60). Tighten the pump cover bolts 15 to 20 foot-pounds torque.

(11) Remove Aligning Strap J-21368.

(12) Install pump-to-transmission case O-ring oil seal in pump assembly, with chamfer outward.

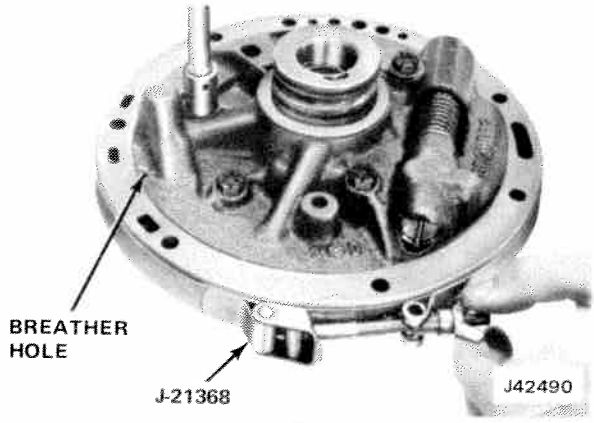


Fig. 7-60 Alignment of Oil Pump Cover to Body

FORWARD CLUTCH

Disassembly

(1) Place forward clutch and turbine shaft in hole in bench, and remove snap ring which fastens forward clutch housing to direct clutch hub (fig. 7-61).

(2) Remove hub from housing.

(3) Remove forward clutch hub and thrust washers from clutch assembly (fig. 7-62).

(4) Remove four composition and four steel clutch plates from forward clutch housing.

(5) Place forward clutch and turbine shaft in arbor press, and press turbine shaft from clutch housing (fig. 7-63).

Fig. 7-61 Removing Forward Clutch Housing Snap Ring

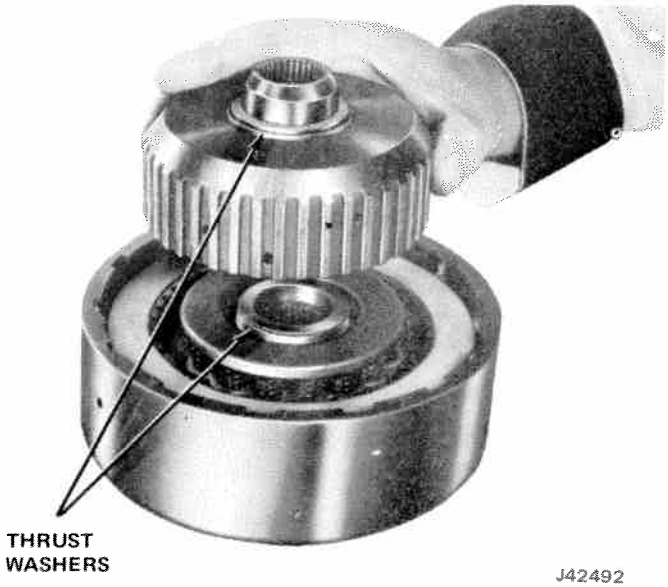


Fig. 7-62 Removing Hub and Thrust Washers From Forward Clutch Assembly

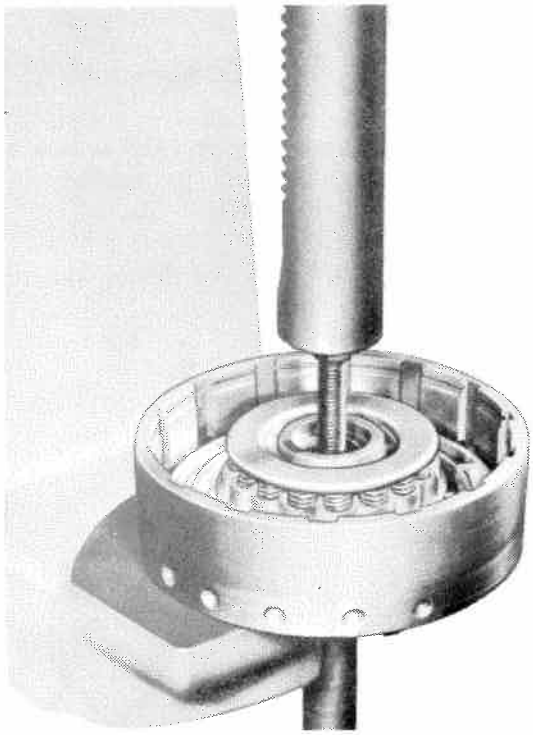


Fig. 7-63 Pressing Turbine Shaft from Forward Clutch Housing

(6) Using Clutch Spring Compressor W-306 and arbor press, compress spring retainer and remove snap ring which fastens spring retainer to clutch piston.

(7) Remove snap ring, spring retainer, and sixteen clutch release springs from clutch piston.

(8) Remove forward clutch piston from clutch housing. Remove inner and outer clutch piston seals from piston (fig. 7-64).

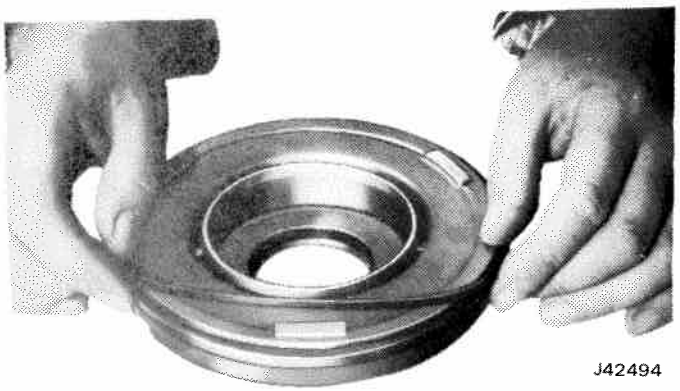


Fig. 7-64 Removing Forward Clutch Piston Outer Seal

(9) Remove center piston seal from forward clutch housing (fig. 7-65).

Inspection

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

Inspect sixteen springs for collapsed coils or signs of distortion.

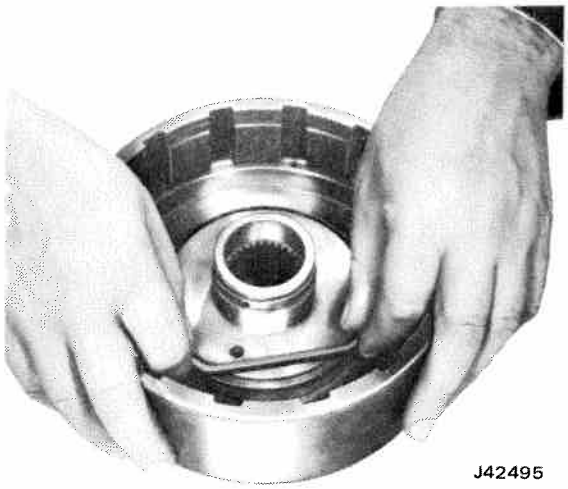


Fig. 7-65 Forward Clutch Housing with Center Piston Seal

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

Inspect clutch piston for cracks.

Inspect clutch housing for wear, scoring, open oil passages, and free operation of ball check.

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

NOTE: *Turbine shaft and clutch housing are serviced separately. Shaft may be removed from housing by using a suitable size bolt in an arbor press (fig. 7-63).*

Assembly

NOTE: *Apply automatic transmission oil to all seals and clutch plates before reassembly.*

(1) Install new inner and outer oil seals on clutch piston; lips face away from spring pockets (fig. 7-64).

(2) Install a new center seal in clutch housing, lip face upward (fig. 7-65).

NOTE: *The forward and direct clutch pistons have identical inside and outside diameters. It is possible to reverse the pistons during assembly; therefore care should be exercised to make certain the proper piston is installed in the clutch assemblies.*

(3) The forward clutch piston can be identified by the blind hole in the clutch apply face of the piston as shown in fig. 7-66.

(4) Place Seal Protector Tool J-21362 over clutch hub, and install outer clutch piston seal protector into clutch housing. Fit piston to housing; then rotate piston in housing until seated (fig. 7-67).

(5) Install sixteen clutch release springs into pockets in piston, and place spring retainer over spring.

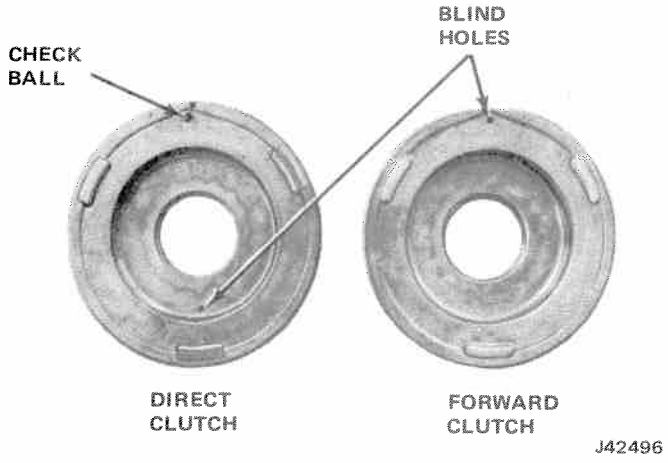


Fig. 7-66 Forward and Direct Clutch Piston Identification

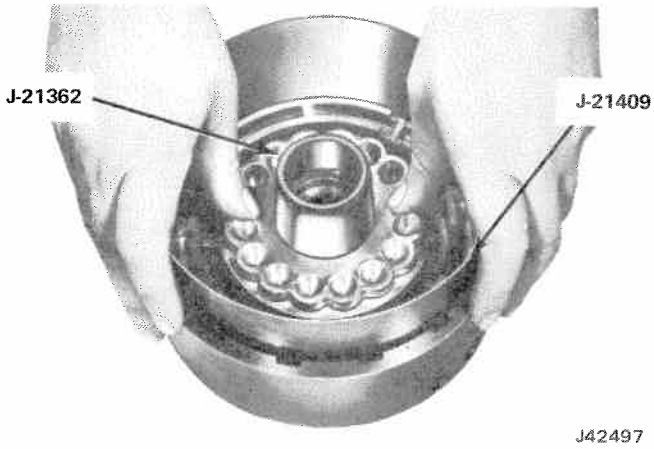


Fig. 7-67 Installing Forward Clutch Piston

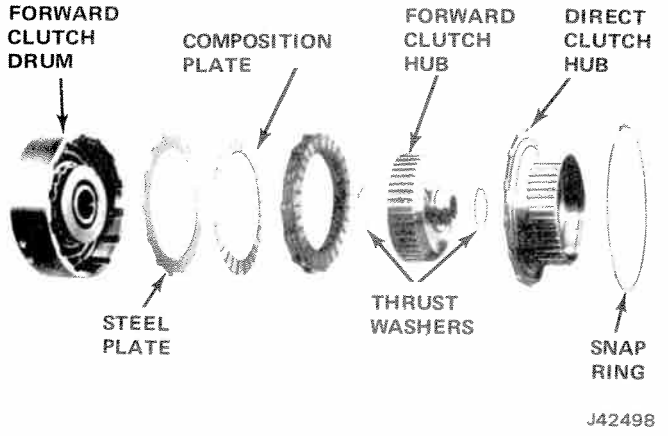


Fig. 7-68 Forward Clutch Assembly

(6) Use Clutch Spring Compressor W-306 and arbor press to compress springs; then fasten spring retainer to piston with snap ring.

(7) If removed, press short-spline end of turbine shaft into forward clutch housing, using arbor press.

(8) Place thrust washers on forward clutch hub. Retain with petroleum jelly or equivalent.

(9) Install hub and washers in clutch housing, as shown in fig. 7-70.

(10) Oil and install four composition, three flat steel, and one waved steel clutch plate (plate with U-notches) in clutch housing; install waved steel plate first, then install alternately composition plates and steel plates (figs. 7-68, -69).

CAUTION: *Do not confuse the flat steel clutch plate (plate with V-notch) with the waved steel clutch plate (plate with U-notch). See fig. 7-73.*

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

(11) Install direct clutch hub in clutch housing, and secure with snap ring, (fig. 7-61).

(12) Place forward clutch assembly on delivery sleeve of oil pump, and apply compressed air to check clutch operation (fig. 7-71).

Fig. 7-69 Installing Forward Clutch Plates

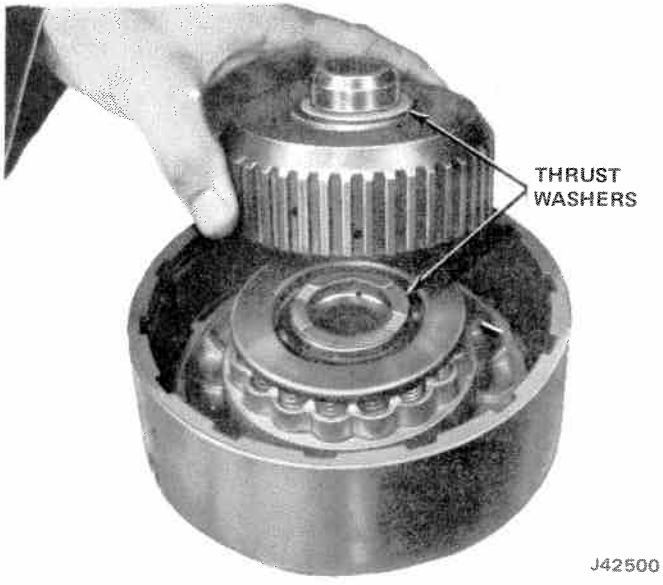


Fig. 7-70 Installing Thrust Washers On Forward Clutch Hub

DIRECT CLUTCH AND INTERMEDIATE CLUTCH SPRAG

Disassembly

(1) Remove snap ring which fastens intermediate clutch retainer to direct clutch housing (fig. 7-72).

(2) Remove retainer, intermediate clutch outer race, and intermediate clutch roller assembly, from direct clutch housing (fig. 7-74).

(3) From other side of clutch assembly, remove snap ring which fastens backing plate to direct clutch housing (fig. 7-75).

(4) Remove backing plate, four composition, and four steel clutch plates from direct clutch assembly (fig. 7-76).

Fig. 7-71 Checking Forward Clutch Operation

Fig. 7-72 Removing Intermediate Clutch Roller Snap Ring

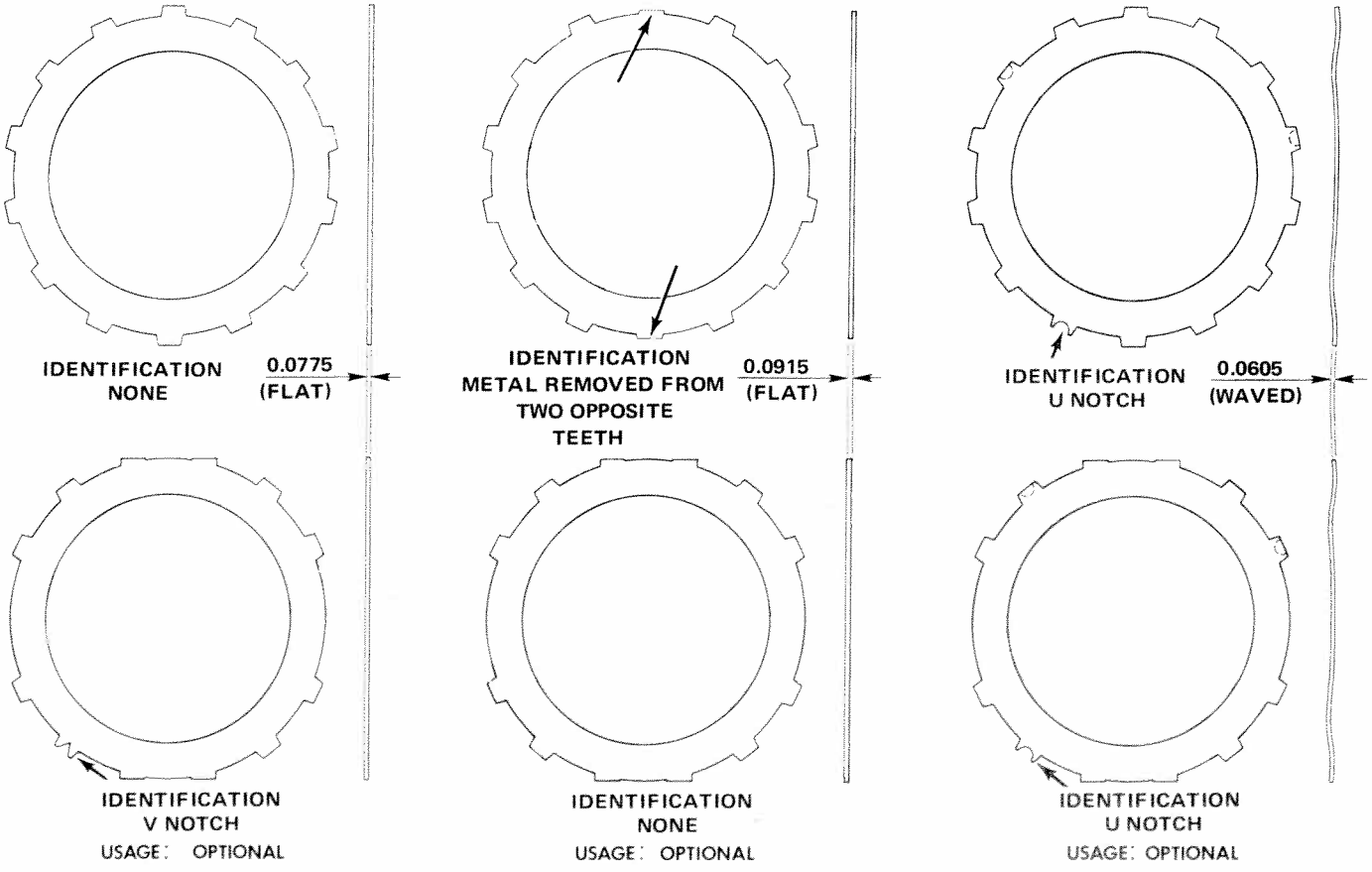


Fig. 7-73 Direct Clutch Plate Identification

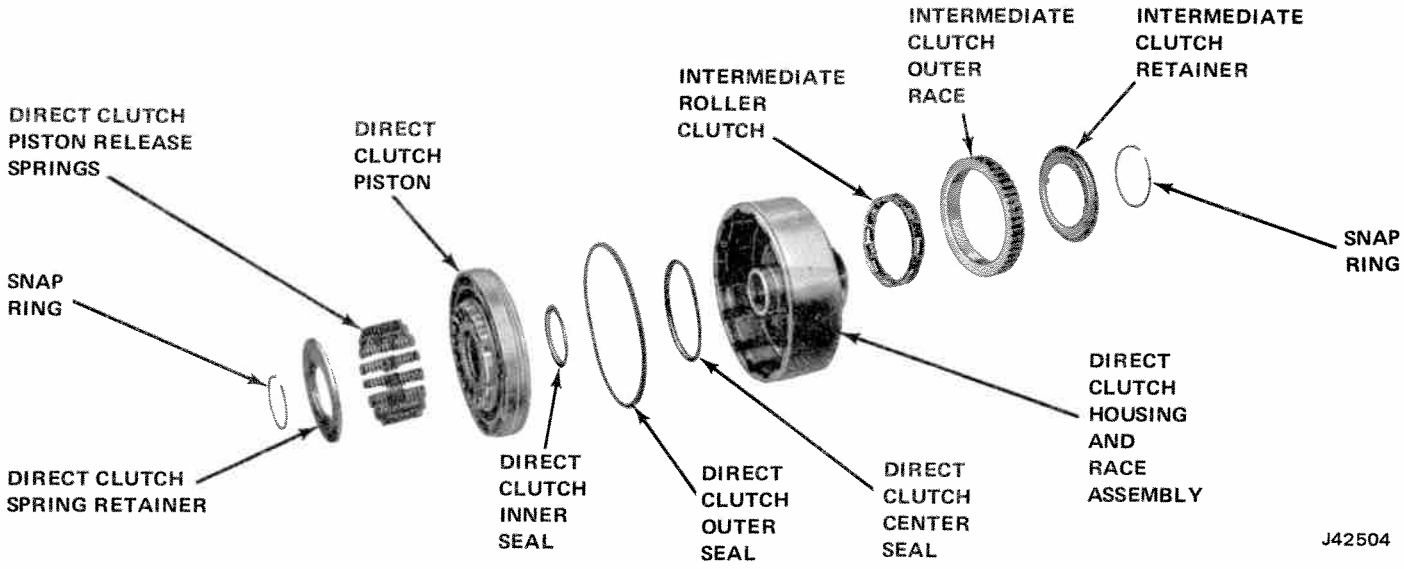


Fig. 7-74 Intermediate Clutch, Roller, and Direct Clutch Components

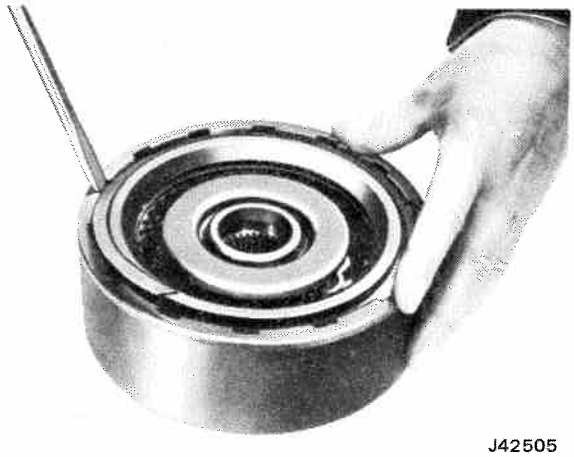


Fig. 7-75 Removing Direct Clutch Snap Ring

press, compress spring retainer and remove snap ring which fastens spring retainer to direct clutch housing (fig. 7-74).

(6) Remove spring retainer, release springs, and piston from direct clutch housing (fig. 7-77).

(7) Remove outer seal and inner seal from piston (fig. 7-74).

(8) Remove center seal from direct clutch housing.

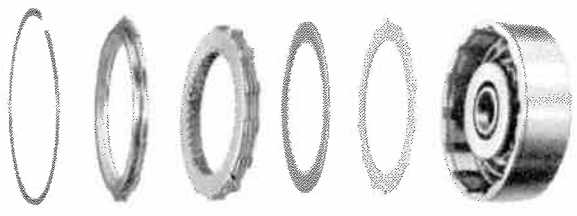


Fig. 7-76 Direct Clutch Assembly

NOTE: *The fourteen direct clutch release springs are not serviced. If one or more of these springs require replacement, discard all of them and install the sixteen service direct clutch springs.*

Inspection

Inspect roller assembly for damaged roller. Inspect inner cam and outer races of roller assembly (inner cam on clutch housing) for scratches or wear.

Inspect direct clutch housing for cracks, wear, proper opening of oil passages or wear on clutch plate drive lugs. Inspect composition faced and steel plates for sign of wear or burning. Inspect backing plate for scratches or other damage. Inspect piston for cracks and free operation of ball check.

Assembly

NOTE: *Apply Automatic Transmission oil to all seals. Make certain piston has ball check. Refer to fig. 7-79.*

Fig. 7-77 Removing Piston From Direct Clutch Housing

(1) Install a new inner seal on piston of direct clutch, with lip of seal facing away from spring pockets (fig. 7-78).

Fig. 7-78 Installing Inner Seal on Direct Clutch Piston

(2) Install a new outer direct clutch piston seal with lip facing away from spring pocket (7-79).

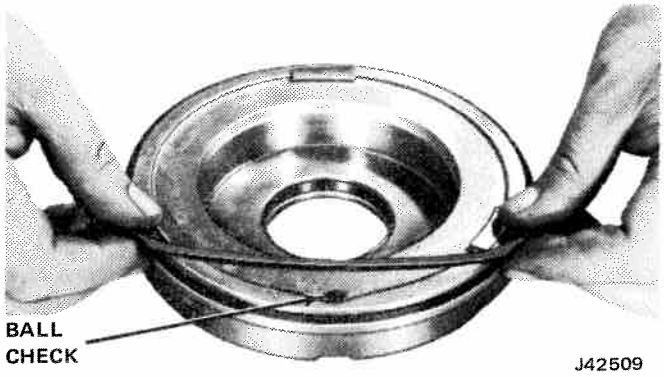


Fig. 7-79 Installing Outer Seal on Direct Clutch Piston

(3) Install a new center seal in clutch housing, with lip of seal facing upward (fig. 7-80).

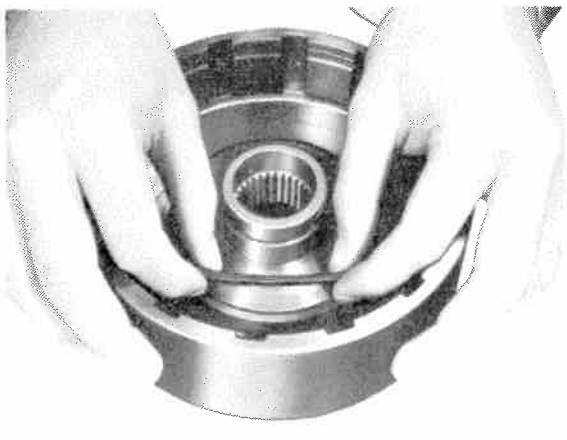


Fig. 7-80 Installing Center Seal in Direct Clutch Housing

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

(5) Install direct clutch piston in housing with a rotating motion (fig. 7-81).

(6) Place fourteen release springs into recesses of piston and install spring retainer over springs (fig. 7-74).

(7) Use Spring Compressor W-307 and arbor press to compress springs, then install snap ring to fasten spring retainer to clutch housing.

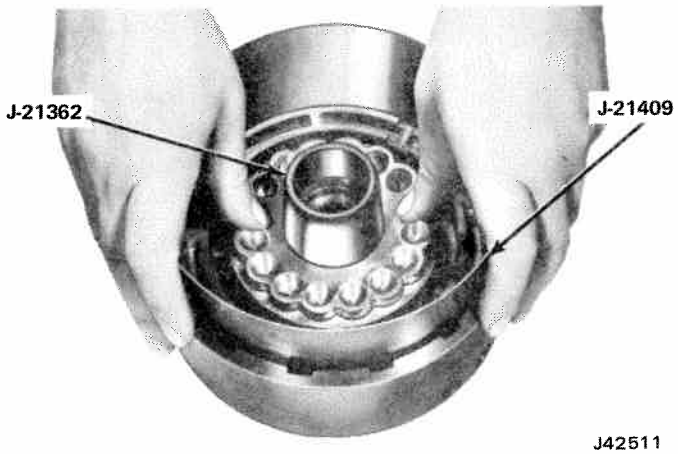


Fig. 7-81 Installing Piston in Direct Clutch Housing

NOTE: *Make certain clutch release springs are not leaning. If necessary, straighten springs, using a small screwdriver.*

(8) Lubricate with transmission oil and install flat, waved steel and composition clutch plates, starting with the waved steel plate and alternating composition and steel plates. Refer to fig. 7-82.

Fig. 7-82 Direct Clutch Assembly

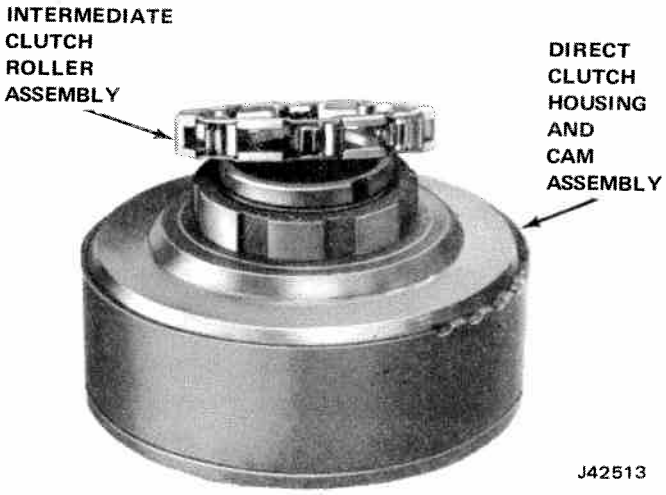


Fig. 7-83 Installing Roller Assembly

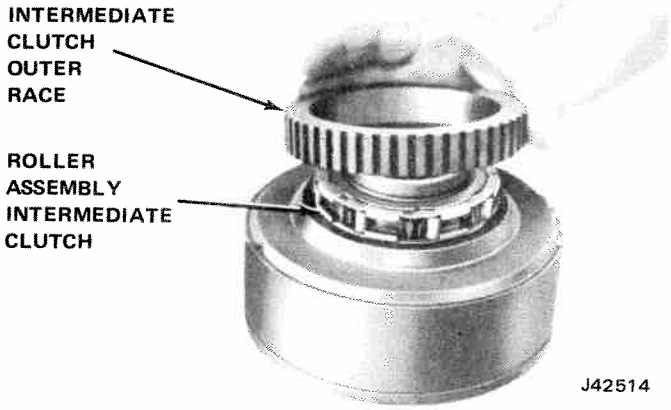


Fig. 7-84 Installing Outer Race

Fig. 7-85 Installing Retainer

NOTE: *Do not use radial grooved composition plates here.*

(9) Install backing plate in clutch housing (fig. 7-75). Secure backing plate to housing with snap ring.

Fig. 7-86 Checking Operation of Direct Clutch Assembly

(10) On opposite side of clutch assembly, install one roller assembly on inner cam of clutch housing (fig. 7-74).

(11) Place roller assembly and outer race on housing with a clockwise rotary motion (fig. 7-83, -84).

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

(12) Install retainer over intermediate clutch roller components (fig. 7-85), and secure to direct clutch housing with snap ring (fig. 7-72).

(13) Position direct clutch assembly on center support assembly, and apply compressed air to check operation of direct clutch (fig. 7-86).

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

CENTER SUPPORT

Disassembly

(1) Remove four Teflon oil seal rings from center support assembly (fig. 7-87).

(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 and intermediate clutch spring guide and piston from center support.

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

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

Inspection

Inspect inner race of roller clutch assembly (on center support) for scratches or indentations. Be sure lubrication hole is open.

NOTE: *Be sure constant bleed plug orifice (approx. 0.020 inch dia.) is open as shown in fig. 7-37.*

Inspect for scoring, wear, or galling.

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

Inspect release springs for breaks, fatigue, and distortion.

Inspect support to case spacer for burrs or raised edges. If present, remove with a stone or fine sandpaper.

Assembly

(1) Install new inner seal on intermediate clutch piston, with lip of seal facing away from spring pocket (fig. 7-88).

(2) Install new outer seal on piston with lip of seal facing away from spring pocket (fig. 7-89).

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

(4) Install intermediate clutch piston on center support, indexing spring pockets of piston into cored areas of center support (fig. 7-90). Wipe outer seal with smooth screwdriver blade while installing.

(5) Install three release springs into spring holes of spring guide (fig. 7-92). Space springs equally during assembly.

(6) Place spring retainer over springs. Compress spring retainer to center support assembly and secure with snap ring.

(7) Install spring retainer and snap ring as shown in figures 7-93, -94.

(8) Install four Teflon oil rings on center support assembly.

(9) Apply compressed air to check operation of intermediate clutch (fig. 7-95).

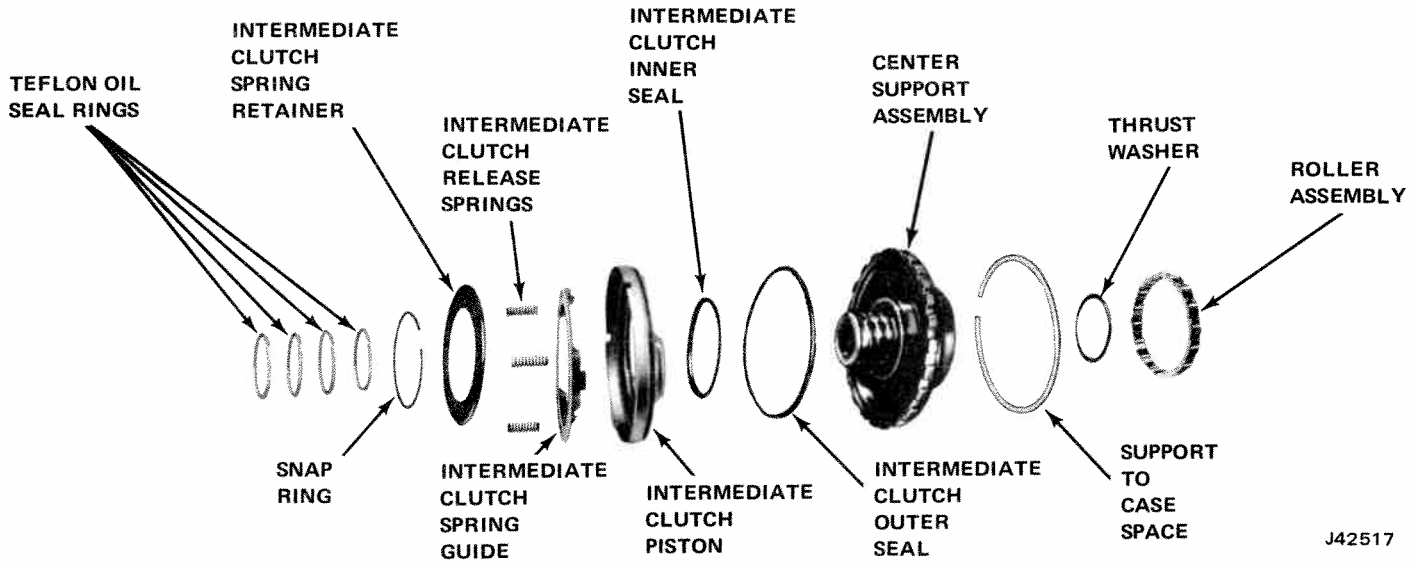


Fig. 7-87 Center Support Components

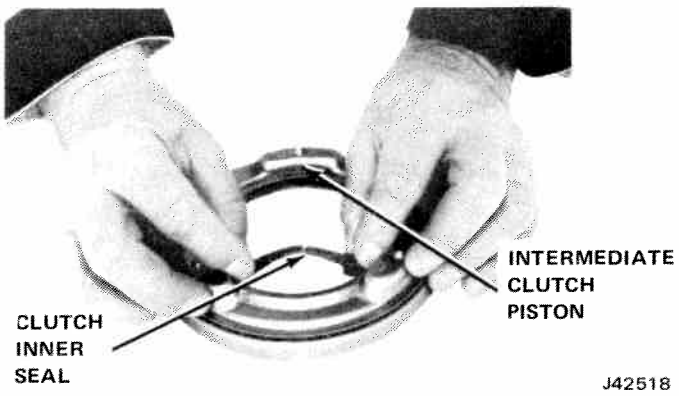


Fig. 7-88 Installing Inner Seal on Intermediate Clutch Piston

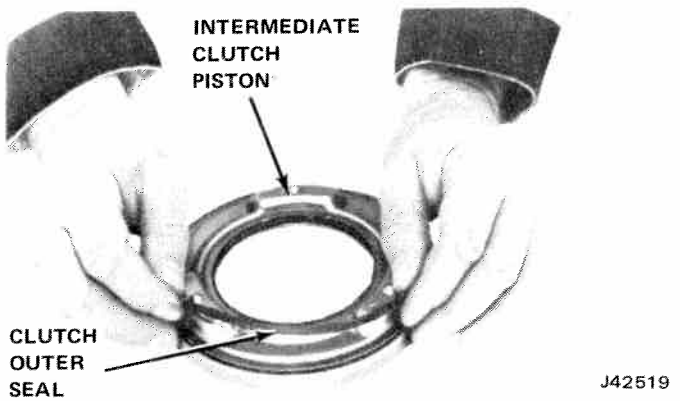


Fig. 7-89 Installing Outer Seal on Intermediate Clutch Piston

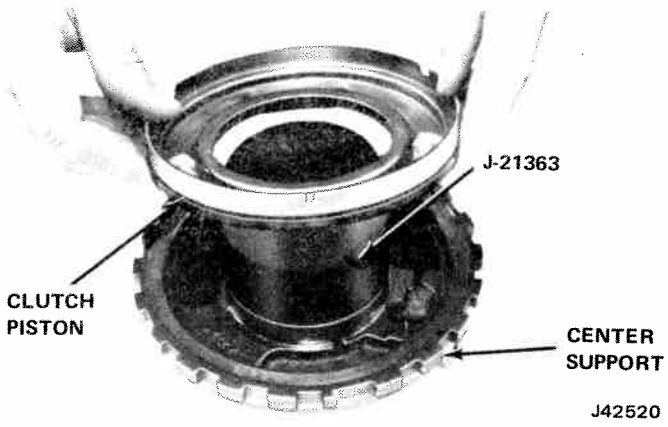


Fig. 7-90 Intermediate Clutch Piston Installation

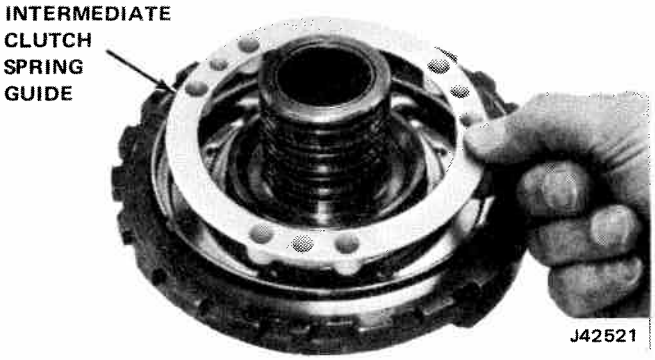


Fig. 7-91 Installing Spring Guide

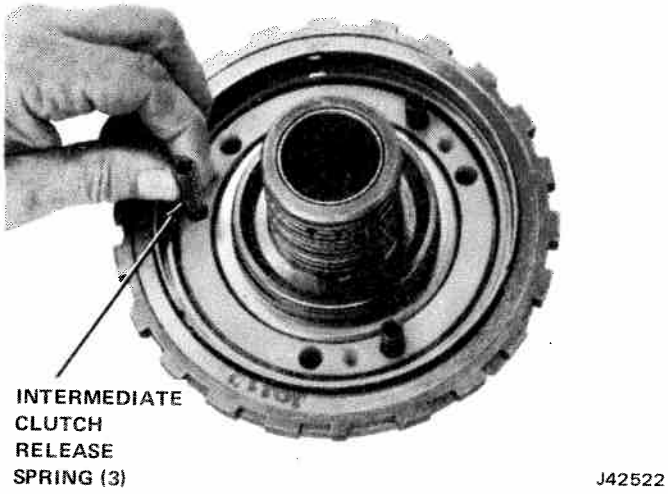


Fig. 7-92 Intermediate Clutch Release Springs

REACTION CARRIER, ROLLER CLUTCH, AND OUTPUT CARRIER

Inspection

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

Inspect roller clutch outer race for scoring or wear. Inspect thrust washer surfaces for signs of scoring or wear. Inspect roller clutch for damaged members. Inspect roller clutch cage and retaining spring for damage. Inspect front internal gear ring for flaking. Inspect bushings for damage.

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

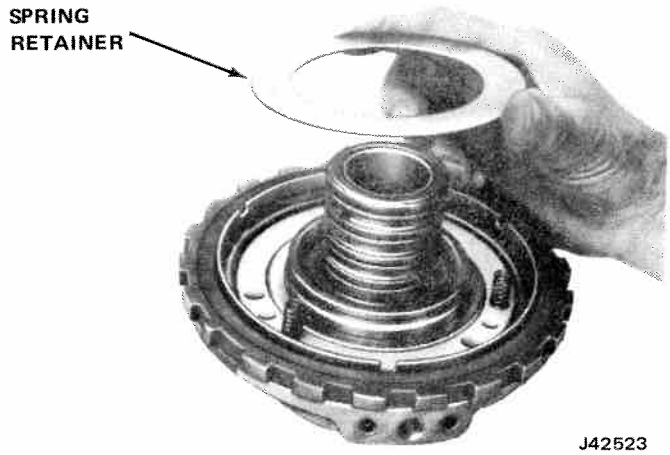


Fig. 7-93 Installing Spring Retainer

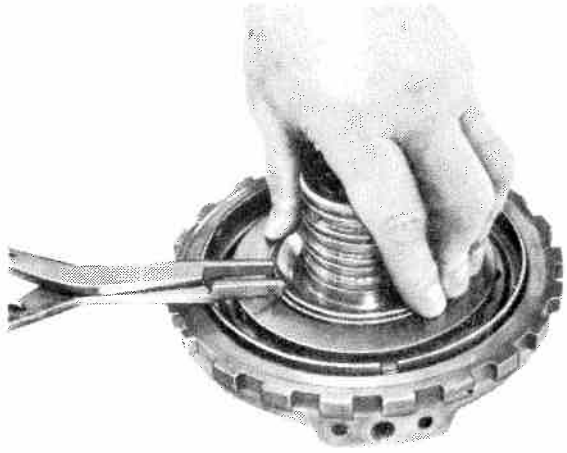


Fig. 7-94 Installing Spring Retainer Snap Ring

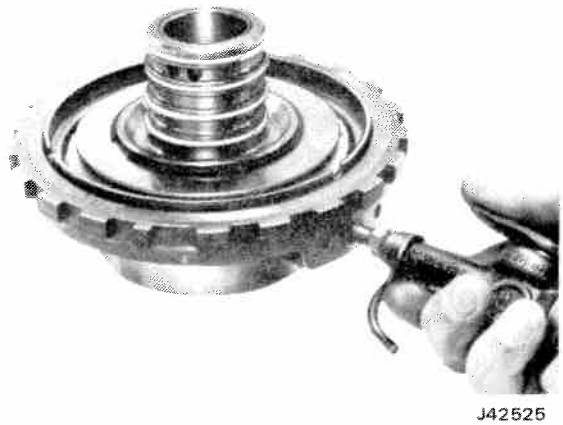


Fig. 7-95 Checking Operation of Intermediate Clutch Assembly

Inspect 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. 7-96). Inspect frontal internal gear (output carrier) for damaged teeth.

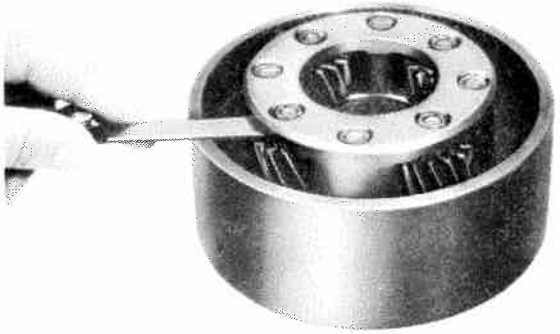


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Fig. 7-96 Checking End Play of Pinions

Inspect output carrier pinions for damage, rough bearings or excesive tilt. Check pinion end play. Pinion end play should be 0.009 to 0.024 inch (fig. 7-97). Inspect parking pawl lugs for cracks or damage Inspect output locating splines for damage.

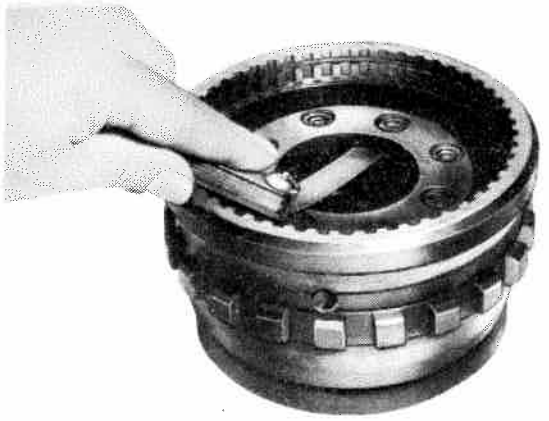

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Fig. 7-97 Checking End Play of Pinions in Output Carrier

Pinion Replacement, Reaction Carrier, and Output Carrier

(1) Support carrier assembly on its front face. Using a ½ inch diameter drill, remove stake marks from end of the pinion pin or pins to be replaced. This will reduce the probability of cracking the carrier when pinion pins are pressed out.

CAUTION: *Do not allow drill to remove any stock from the carrier as this this will weaken the part and future failure would be probable.*

(2) Using a tapered punch, press pinion pins out of carrier (fig. 7-98).

(3) Remove pinions, thrust washers and roller needle bearings (fig. 7-99), from carrier.

(4) Inspect thrust faces of pinion pockets in carrier for burrs. Remove any burrs.

(5) Install eighteen needle bearings into each pinion, using petroleum jelly to hold bearings in place. Use pinion pin as guide (fig. 7-99).

(6) Place one bronze and one steel washer on each side of pinion, so steel washer is against pinion; hold washers in place with petroleum jelly.

(7) Position pinion assembly in carrier; then install a pilot shaft through rear face of assembly to hold parts in place.

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Fig. 7-98 Removing Planet Pinion Pins

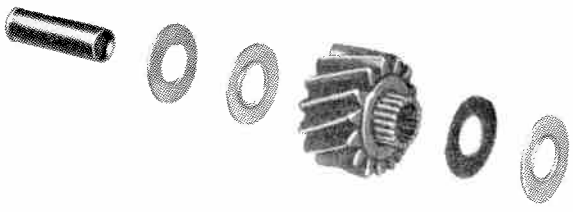

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Fig. 7-99 Planet Pinion Components

(8) While rotating pinion from front press a new pinion pin into place being sure that headed end is flush or below face of carrier (fig. 7-100).

NOTE: *Headed end of pin should be upward when pin is pressed into carrier.*

(9) Place a large punch in a bench vise, to be used as an anvil, and stake opposite end of pinion pin in three places, as shown in fig. 7-101.

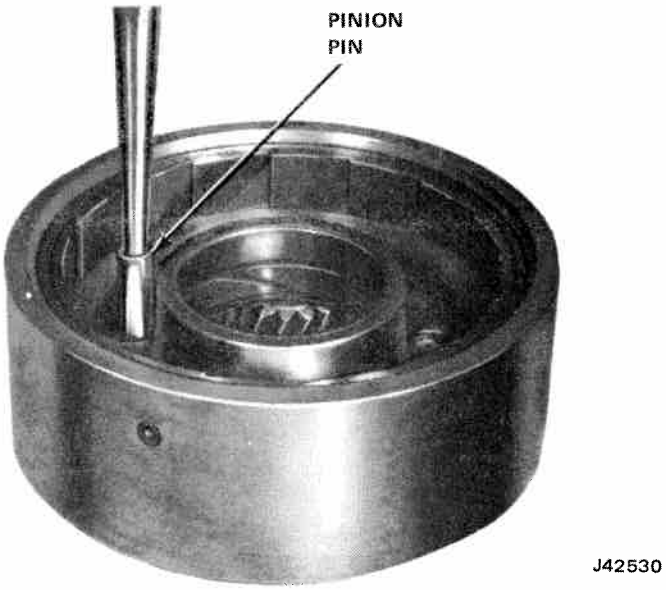

Fig. 7-100 Installing Planet Pinion Pin

Fig. 7-101 Staking Pinion Pin

NOTE: *Both ends of pinion pin must lie below face of 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, the orificed cup plug in lubrication passage for clogged condition, and the drive lugs for damage. Inspect bushing for wear or galling.

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 oil lubrication hole is not clogged.

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

MAINSHAFT

Inspection

Inspect the shaft for cracks or distortion, the splines for damage, the ground bushing journals for damage, and the snap ring groove for damage. Inspect orificed cup plug pressed into one end of main shaft. Be sure it is not clogged.

FRONT AND REAR BAND

Inspection

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

CASE EXTENSION

Inspection

Be sure that the drain located between the two seals is not obstructed. In event of leakage from drain hole: oil with red dye indicates that transmission seal leaks; black grease indicates that transfer case seal leaks. Inspect bushing for excessive wear or damage. Inspect housing for cracks or porosity.

MODULATOR AND VALVE

Inspection

NOTE: *Check for vacuum diaphragm leak by turning the modulator so the vacuum line stem points downward. If transmission oil comes out, the vacuum diaphragm is defective and the modulator must be replaced.*

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

Inspect modulator assembly for any signs of bending or distortion (fig. 7-102).

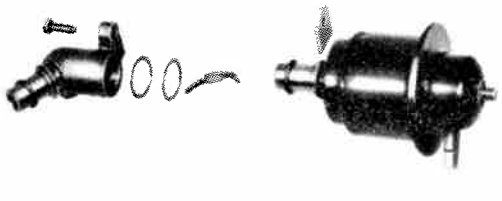

Fig. 7-102 Modulator Assembly

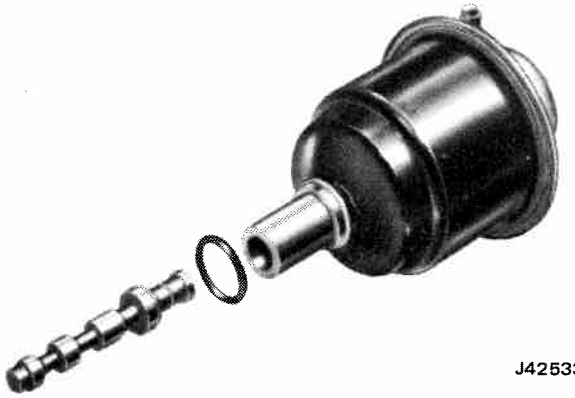

Fig. 7-103 Modulator O-Ring and Valve

Inspect seat of O-ring seal for damage (figs. 7-102 and -104).

Apply suction to vacuum tube and check for diaphragm leaks.

Check modulator bellows (modulator plunger is under pressure — 16 lbs). If bellows is damaged, plunger will have very little pressure.

Inspect modulator valve for nicks or damage. The second spool, on small end of valve, has a flat spot to bleed or allow some oil to pass and to obtain more constant line pressure, resulting in smoother shifting.

Check freeness of valve operation in case bore.

MANUAL AND PARKING LINKAGE

Inspection

Inspect parking actuator rod for cracks, or broken spring retainer lugs (fig. 7-105).

Inspect spring of parking brake actuator assembly for damage. Inspect actuator for free fit on actuator rod.

Inspect parking pawl for cracks or wear. Inspect pawl shaft for damaged retainer groover. Inspect pawl return spring for deformed coils or ends.

Inspect manual shaft for damaged threads or loose lever.

Inspect inside detent lever for cracks or a loose pin.

Inspect parking brake bracket for cracks or wear.

Inspect detent roller and spring assembly for damage.

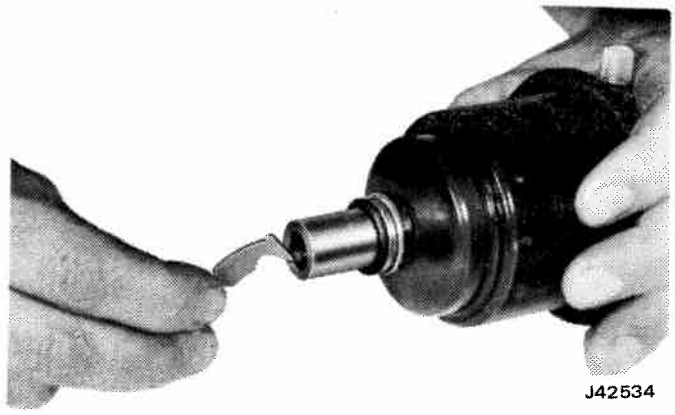

Fig. 7-104 Modulator Reaction Lever

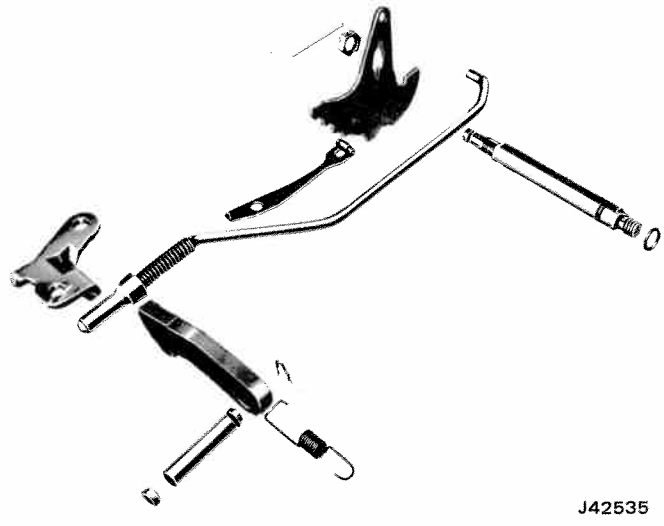

Fig. 7-105 Manual and Parking Linkage

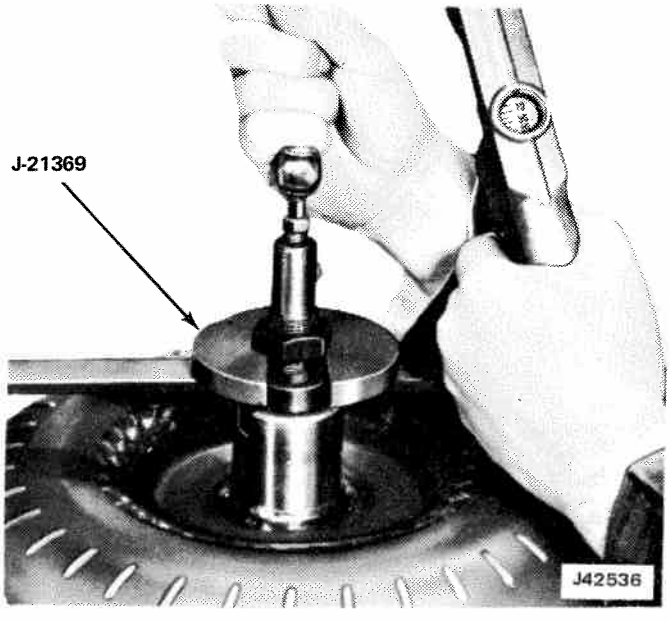

Fig. 7-106 Air-Checking Converter

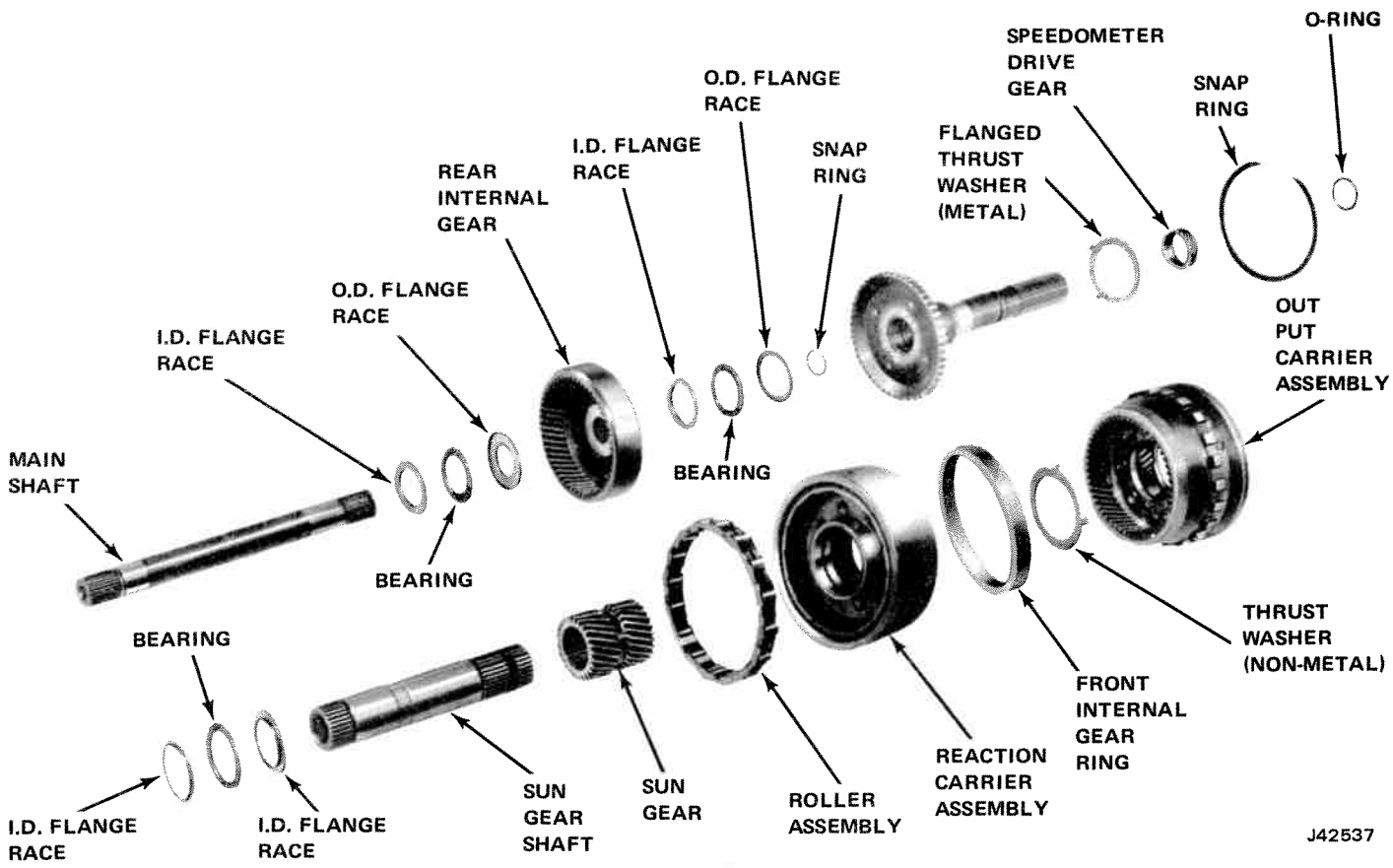

Fig. 7-107 Gear Unit Assembly

TRANSMISSION CASE

Inspection

Inspect case assembly for cracks, porosity, or interconnected or clogged oil passages.

Check for good retention of band anchor pins.

Inspect all threaded holes for thread damage.

Inspect intermediate clutch driven plate lugs for damage or signs of wear.

Inspect two snap ring grooves for damage.

Inspect bore of governor assembly for scratches or scoring.

Inspect modulator valve bore for scoring or damage.

Inspect cup plug inside case for good staking and sealing.

Inspect case bushing for wear or galling.

TORQUE CONVERTER

Inspection

Check hub surfaces of torque converter for scoring or wear. Check drive lugs for damage. Check torque converter housing for leaks as follows:

Install and tighten Leak Detecting Fixture J-21369 on torque converter housing (fig. 7-106).

Apply 80 psi air pressure to fixture.

Submerge housing in water and check for leaks.

GEAR UNIT

Assembly

(1) If rear internal gear has been removed from mainshaft, insert rear spline of shaft into gear, then secure gear to shaft with snap ring (fig. 7-107).

2) Install sun gear-to-internal gear races and thrust bearings against inner face of rear internal gear as follows retaining with petroleum jelly: place large race against internal gear with flange facing forward or

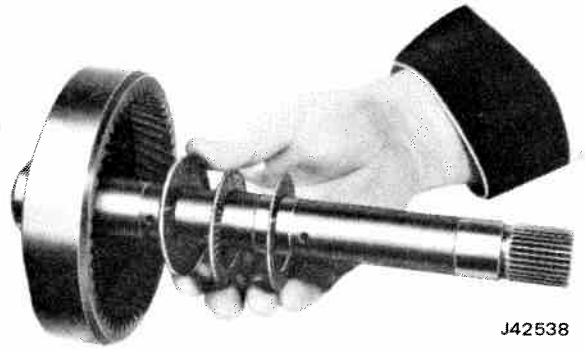

Fig. 7-108 Mainshaft and Bearing

upward as shown in fig. 7-108, install thrust bearing in race, and place small race against bearing with inner flange facing into bearing, or downward.

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

(4) Reposition components thus far assembled so that main shaft extends downward through hole in bench and back face of rear internal gear is upward.

(5) Install rear internal gear-to-output shaft races and thrust bearing and retain with petroleum jelly as shown in fig. 7-109.

(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 cupped over bearing.

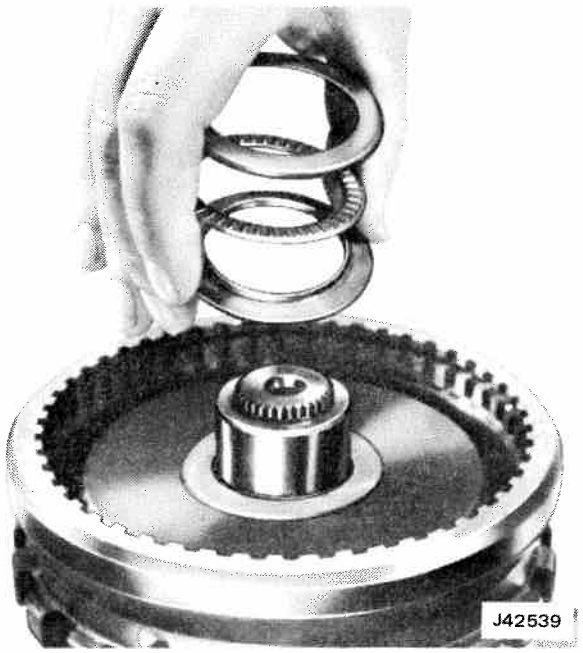

Fig. 7-109 Rear Internal Races and Thrust Bearing

(8) Install output shaft into output carrier assembly as shown in fig. 7-110, then secure shaft to carrier with snap ring, as indicated in fig. 7-107.

(9) Reposition and support components thus far assembled so that output shaft extends downward.

(10) Install reaction carrier-to-output carrier thrust. washer on output carrier, with tabs of washer faced downward into corresponding pockets of carrier and retain with petroleum jelly.

(11) Insert sun gear into output carrier, splines with chamfer downward, so that it meshes with planet gears.

(12) Insert rear spline of (long spline) sun gear shaft into spline of sun gear.

(13) Position front internal gear ring on output carrier, as shown in fig. 7-111, then install reaction carrier assembly on output carrier and ring, so that planet gears of carrier mesh with sun gear (fig. 7-112).

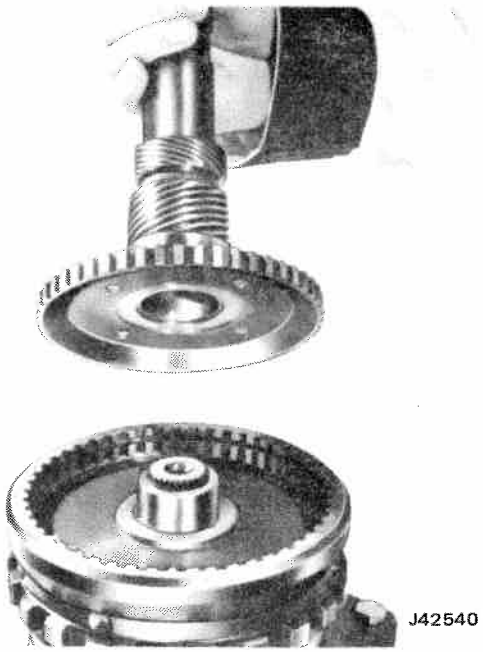

Fig. 7-110 Installing Output Shaft Into Output Carrier Assembly

NOTE: *When a new output carrier and/or reaction carrier is being installed and if the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the SERVICE ring.*

(14) Install center support-to-sun gear thrust bearing and races retaining with petoleum jelly.

(15) Install large race over sun gear shaft, with center flange of race upward, and seat against sun gear; seat thrust bearing over race; seat remaining race, with center flange upward, on washer. Refer to fig. 7-113.

Fig. 7-111 Positioning Front Internal Gear Ring

Fig. 7-112 Installing Reaction Carrier Assembly

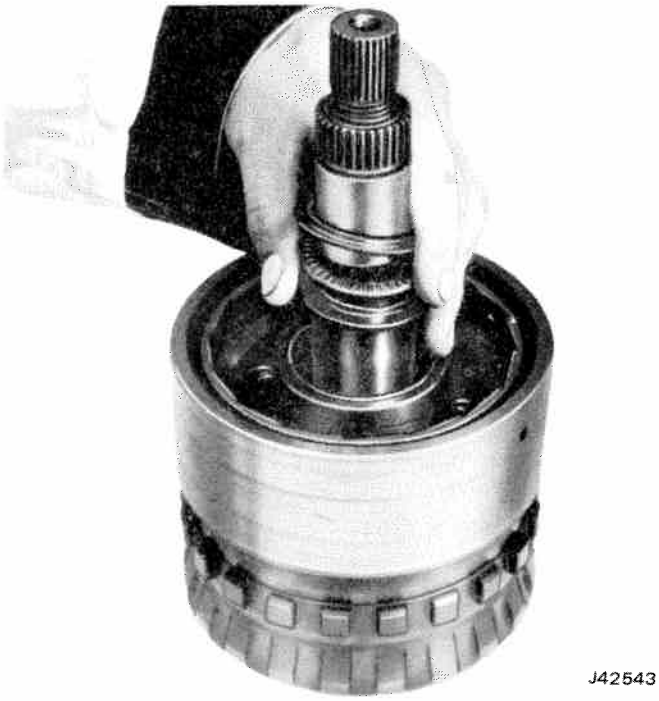

Fig. 7-113 Center Support to Sun Gear Thrust Bearing and Races

(16) Install rollers that have come out of the roller cage by compressing the energizing spring with forefinger and inserting roller from the center outer side. Refer to fig. 7-115.

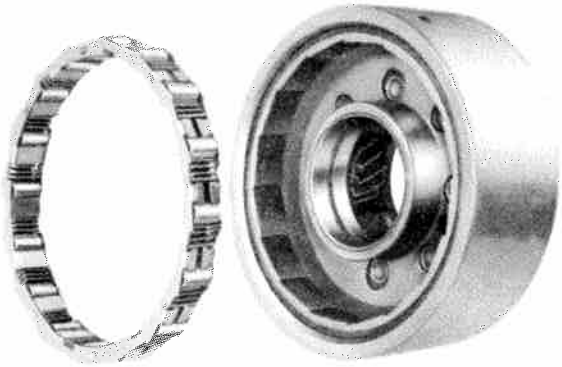

Fig. 7-114 Roller Clutch Assembly

Fig. 7-115 Installing Roller in Roller Clutch

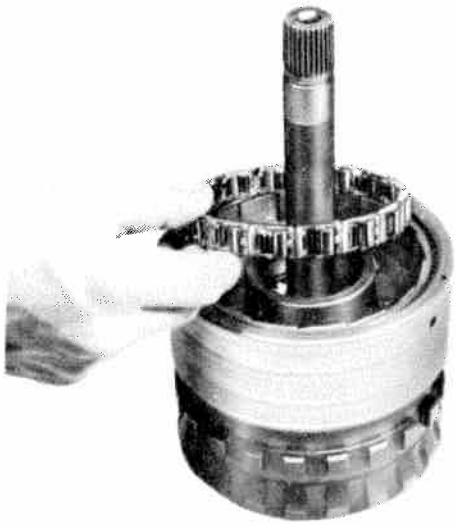

Fig. 7-116 Installing Roller Clutch

(17) Install roller clutch assemly into reaction carrier outer race. Refer to figure 7-116.

(18)Install center support to reaction carrier thrust washer into recess in center support assembly and retain with petroleum jelly.

(19) Install case center support into reaction carrier and roller clutch assembly as shown in figure 7-117.

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Fig. 7-117 Installing Center Support

NOTE: *With reaction carrier held, center support should turn counterclockwise only.*

(20) Use Gear Assembly Clamp Set J-21795 to clamp gear unit assembly together until it can be installed in transmission case.

(21) Install output shaft-to-case thrust washer and seat so that tabs of washers are inserted into corresponding indents of shaft, and retain with petroleum jelly. Do not use plastic washers here (fig. 7-118).

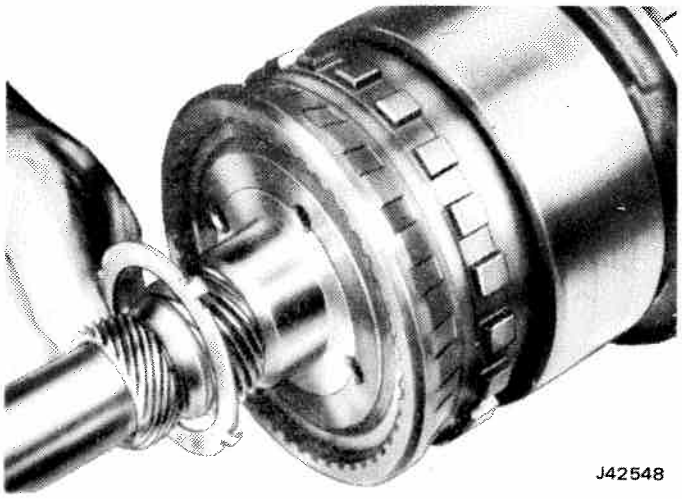

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Fig. 7-118 Installing Output Shaft to Case Thrust Washers

ASSEMBLY

NOTE: *When reassembling the transmissions, it is important that bearing surfaces be given an initial lubrication.*

Bushings can be lubricated with petroleum jelly, or the part and bushing dipped in transmission oil.

Thrust washers should be lubricated on both surfaces with petroleum jelly before installation.

Lubrication in this recommended manner will prevent damage to thrust washers and bushings due to running dry on the initial start up.

Gear Unit and Intermediate Clutch Installation

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

(2) Install parking pawl shaft retainer clip.

(3) Install new cup plug, using a ⅜-inch diameter rod, and drive into transmission case until parking pawl shaft bottoms on case rib. Refer to figure 7-119.

(4) Install parking pawl return spring, square end hooked on pawl, and other end of case.

(5) Install parking brake bracket guides over pawl, using two attaching bolts; tighten bolts to 15 to 20 foot-pounds (fig. 7-122).

(6) Install rear band assembly in transmission case, so that two lugs index with two anchor pins. Check band to make sure band is seated on lugs.

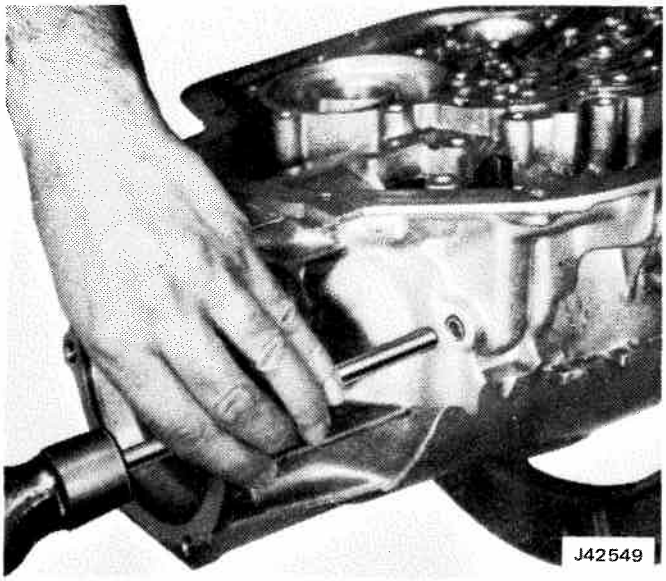

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Fig. 7-119 Installing Cup Plug

(7) Install support to case spacer against shoulder at bottom of case splines and gap located adjacent to band anchor pin.

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 without the 0.040-inch spacer ring in the case.*

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

(9) Install complete center support and gear unit assembly into case making certain center support bolt hole is properly aligned with hole in case. Use Tool Kit J-21795.

(10) Install center support-to-case retaining snap ring, **with bevel side up and locating gap adjacent to band anchor pin** to secure center support in case. **Make certain ring is properly seated in case.**

(11) Install case-to-center-support bolt by placing center support locating tool into case direct clutch passage, with handle of tool pointing to right as viewed from front of transmission and parallel to bell housing mounting face.

(12) Apply pressure downward on tool handle which will tend to rotate center support counter-clockwise as viewed from front of transmission.

(13) While holding center support firmly counter-clockwise against case splines, tighten case to center support bolt to 20 to 25 foot-pounds using a ⅜-inch, 12-point thin-wall deep socket. Refer to figure 7-120.

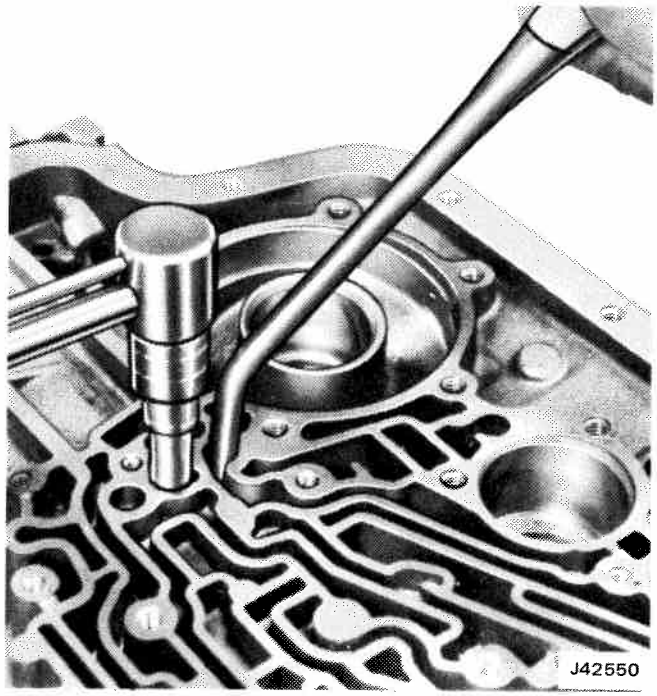


Fig. 7-120 Installing Center Support Screw

CAUTION: *When using the locating tool, care should be taken not to raise burrs on the case valve body mounting face.*

NOTE: *Piston in center support applies intermediate clutch. If piston seals leak, clutch failure, slipping, or loss of second speed may result.*

(14) Lubricate with transmission oil two flat and one waved steel plates and three composition intermediate clutch plate assemblies and install, starting with waved steel plate and alternating composition and steel plates.

(15) Install intermediate clutch backing plate, ridge upward or forward, and fasten in case with backing plate-to-case snap ring. **This snap ring is flat on both sides. Locate gap of snap ring opposite band anchor pin. Refer to figure 7-121.**

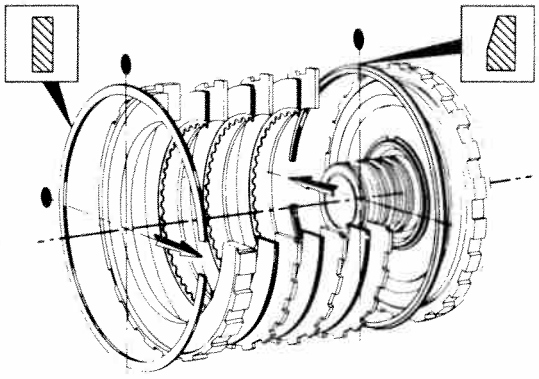


Fig. 7-121 Snap Ring Installation

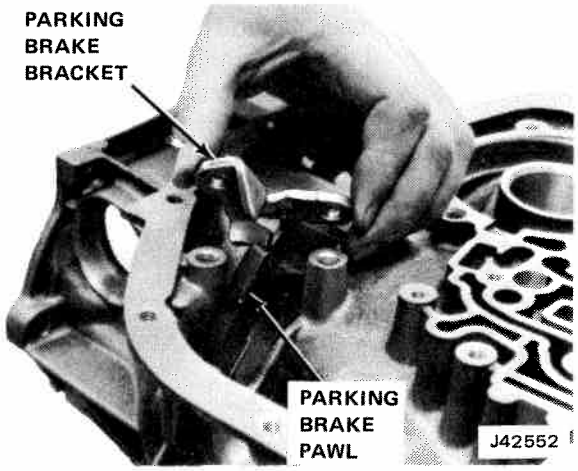


Fig. 7-122 Installing Parking Bracket

Rear End Play Check

Refer to figure 7-123.

(1) Install Slide Hammer C-3752 into an extension housing attaching bolt hole.

(2) Mount Dial Indicator on rod and index with end of output shaft.

(3) Apply air pressure to apply intermediate clutch (center oil passage) while moving output shaft in and out to read end play.

(4) End play should be from 0.007 to 0.019-inch. The selective washer controlling this end play is the steel washer having 3 lugs that is located between the thrust washer and the rear face of the transmission case.

If a different washer thickness is required to bring the end play within specification, it can be selected from the following chart.

Thickness	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 O.D.	4
0.106 to 0.110	2 Tabs O.D.	5
0.114 to 0.118	3 Tabs O.D.	6

Front Band Installation

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

Manual Linkage Installation

(1) Install new O-ring on manual shaft.
(2) If removed, insert actuator rod into manual detent lever from side opposite pin.
(3) Install actuator rod plunger under parking bracket and over parking pawl, as shown in figure 7-124.
(4) Insert manual shaft assembly through case and detent lever, and secure with jamnut and retaining pin.
(5) Tighten nut to 15 to 20 foot-pounds. Index mark on pin should coincide with groove on shaft.

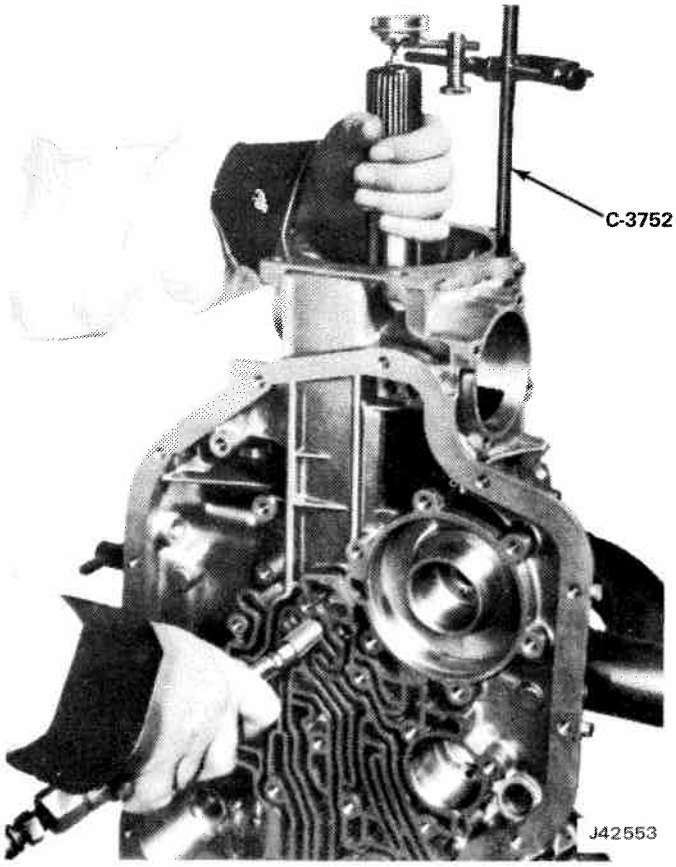


Fig. 7-123 Rear Unit End Play

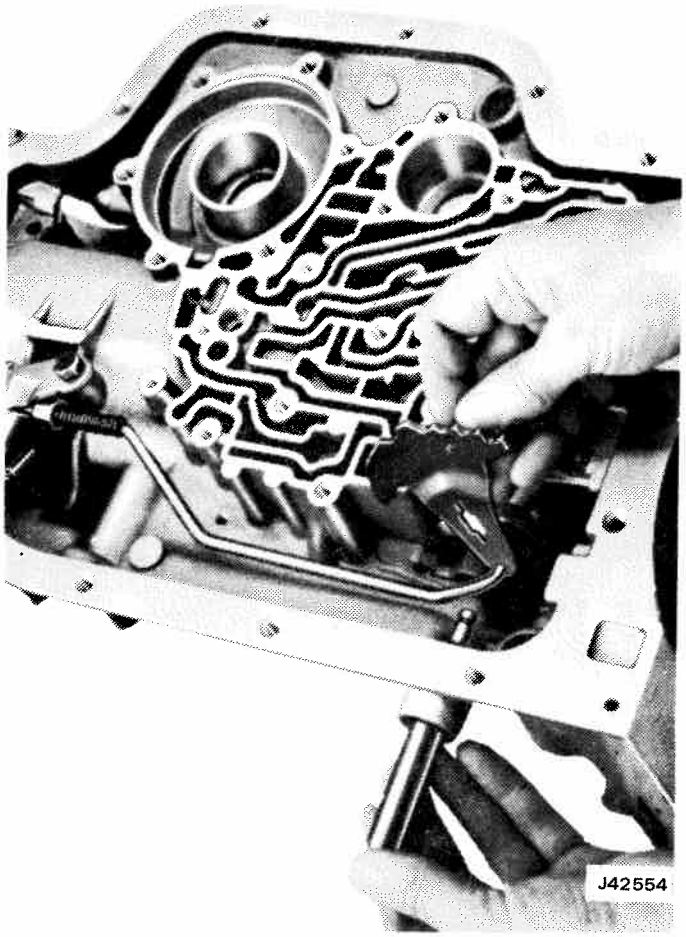


Fig. 7-124 Manual Shaft Installation

(6) Rotate transmission to vertical position, and remove Tool Kit J-21795.

Direct Clutch and Forward Clutch Installation

(1) Install direct clutch and intermediate sprag assembly, in transmission case, to front of intermediate clutch.
(2) Rotate housing of direct clutch, causing outer race of sprag assembly to meet plates of intermediate clutch, which, in turn, will cause hub of clutch housing to touch sun gear shaft.

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

(3) Install forward clutch hub-to-direct clutch housing thrust washer on hub of forward clutch. Retain with petroleum jelly.
(4) Install forward clutch and turbine shaft, indexing direct clutch hub so end of mainshaft will bottom on end of forward clutch hub. When forward clutch is seated, it will be approximately 1¼-inch from pump face in case.

Oil Pump Installation

(1) Guide pins can be fabricated by grinding heads from two valve body bolts.

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

(3) Position oil pump gasket to pump face of transmission case.

(4) Apply petrolatum to hold gasket in place.

(5) Install pump assembly in transmission case and fasten with all but one pump attaching bolt and washer; bolt and washer should be omitted from either 5 or 10 o'clock position. Tighten bolts to 20 to 25 foot-pounds.

NOTE: *If turbine shaft cannot be rotated as pump is being pulled into place, forward or direct clutch housings have not been properly installed to index with all clutch plates. This condition must be corrected before pump is pulled fully into place.*

(6) If necessary to install a new front seal, use a non-hardening sealer on outside of seal body, and using Seal Driver J-21359, drive seal in place, as shown in figure 7-125.

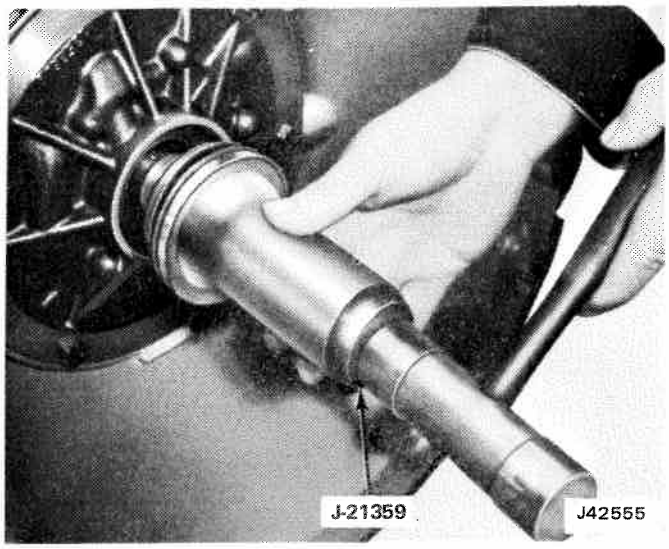


Fig. 7-125 Installing Pump Seal

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

(8) Install remaining oil pump attaching bolt and washer. Tighten to 20 to 25 foot-pounds torque.

Check Ball, Front Servo, Gasket, Spacer, and Solenoid Installation

(1) Install front servo spring and retainer into transmission case.

(2) Install flat washer on front servo pin at end opposite taper, then install pin into transmission case so that tapered end is contacting band.

(3) Install oil seal ring on front servo piston, if removed, and install piston on servo pin so that identification numbers on shoulders are exposed. Check freeness of piston by stroking piston in bore.

(4) Instail two guide pins and gasket. Install six check balls into transmission case pockets, then install valve body spacer to case gasket (gasket with extension for solenoid). See fig. 7-16 for check ball location.

(5) Install valve body to case spacer plate.

(6) Install detent solenoid assembly and gasket in transmission case with electrical connector facing outer edge of case.

(7) Install bolts, but do not tighten.

(8) Install O-ring oil seal on electrical connector sleeve.

(9) Lubricate sleeve and insert into transmission case with lock tabs facing into case, positioning locator tabs in notch at side of case.

(10) Connect detent solenoid wire to connector terminal.

Rear Servo Installation

(1) Select proper length of band-apply pin.

(2) Install rear accumulator spring in transmission case, as shown in figure 7-126.

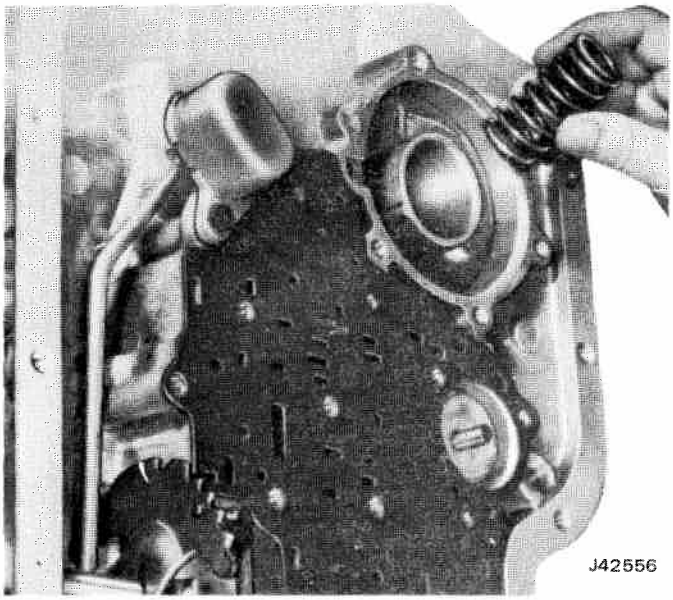


Fig. 7-126 Rear Accumulator Spring Installation

(3) Lubricate and install rear servo assembly into transmission case.

(4) Install rear servo and gasket cover on transmission case as shown in figure 7-127, and secure with attaching screws. Tighten screws 15 to 20 foot-pounds.

Control Valve Assembly and Governor Pipe Installation

(1) Install control valve-to-spacer gasket on spacer, as shown in figure 7-128.

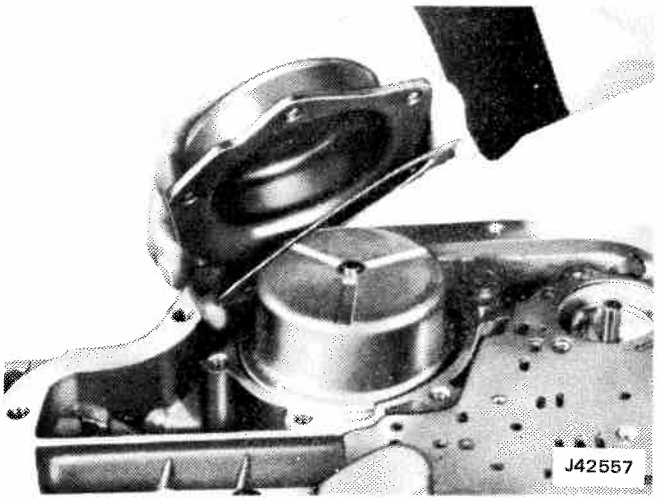


Fig. 7-127 Installing Cover and Gasket Over Rear Servo Assembly

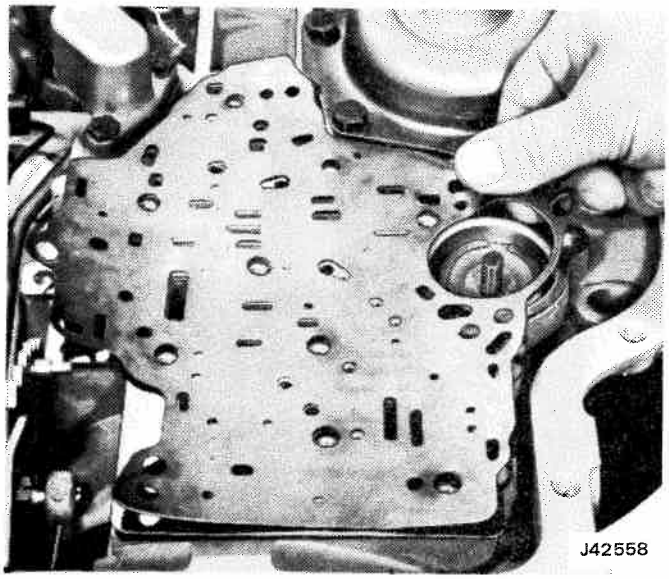


Fig. 7-128 Installing Control Valve Spacer Gasket

(2) Insert governor pipes into valve body.

(3) Install control valve assembly and governor pipes on transmission case, as shown in figure 7-129.

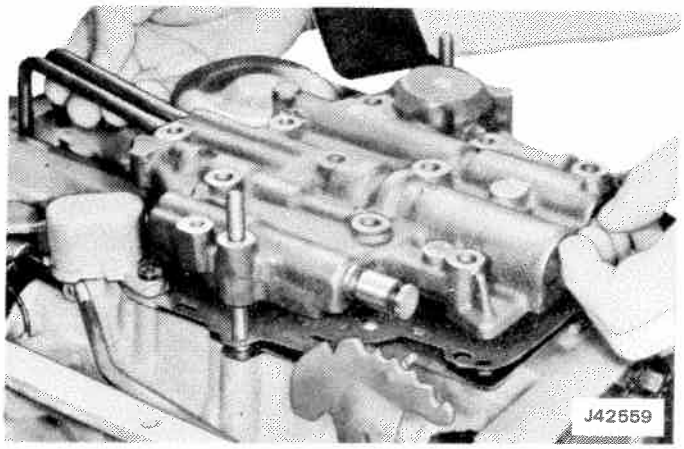


Fig. 7-129 Installing Control Valve Assembly

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

(4) Install control valve assembly attaching bolts, manual detent, and roller assembly in transmission case.

(5) Tighten detent solenoid and control valve attaching bolts. Tighten valve body bolts to 6 to 10 foot-pounds torque and solenoid bolts 4 to 10 foot-pounds torque.

Oil Filter Oil Pan Installation

(1) Install case to intake pipe O-ring seal on intake pipe and assemble new filter to intake pipe.

(2) Install filter and intake pipe assembly, attaching filter to control valve assembly with retainer bolt.

NOTE: *After any major repair the oil filter must be replaced.*

(3) Install new bottom pan gasket and bottom pan with attaching screws. Tighten screws to 10 to 13 foot-pounds torque.

Modulator Valve, Vacuum Modulator Installation

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

(2) Install adapter at valve, then mount retainer on transmission case with attaching screws. Tighten screws 15 to 20 foot-pounds.

(3) Install O-ring oil seal on vacuum modulator, then insert into adapter.

(4) Secure retainer to transmission case with attaching screws. Tighten screws 15 to 20 foot-pounds.

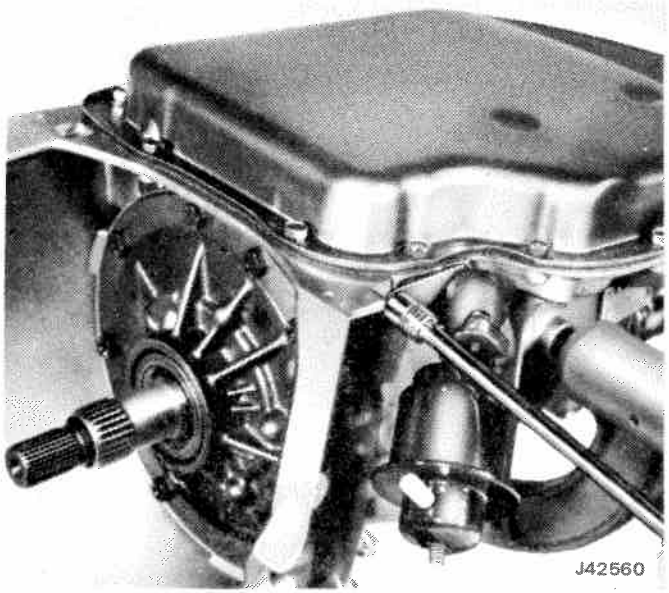


Fig. 7-130 Installing Modulator Retainer

Governor Installation

(1) Insert sleeve of governor assembly into transmission case, so that driven gear of governor meshes with drive gear in case (fig. 7-131).

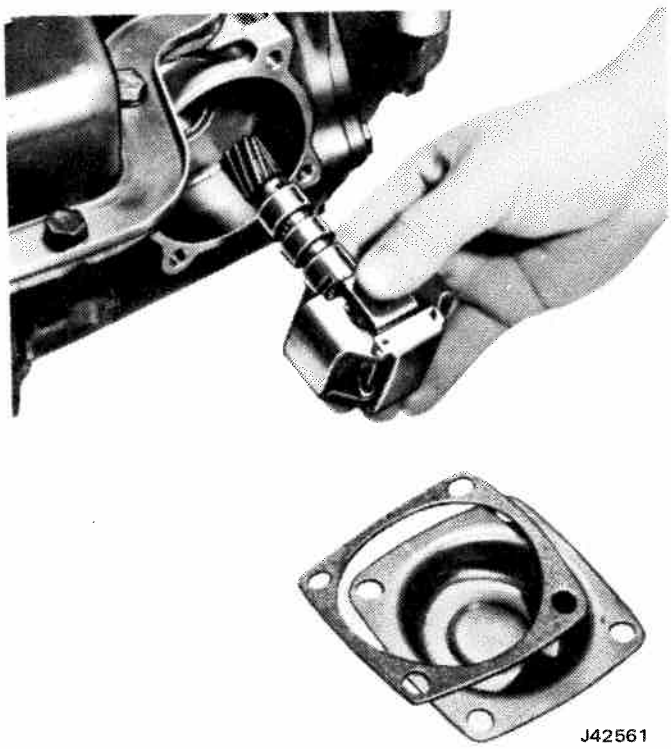


Fig. 7-131 Installing Governor Assembly

(2) Install a new gasket on governor cover and mount cover on transmission case with attaching bolts. Tighten bolts 15 to 20 foot-pounds torque.

TRANSMISSION SPECIFICATIONS

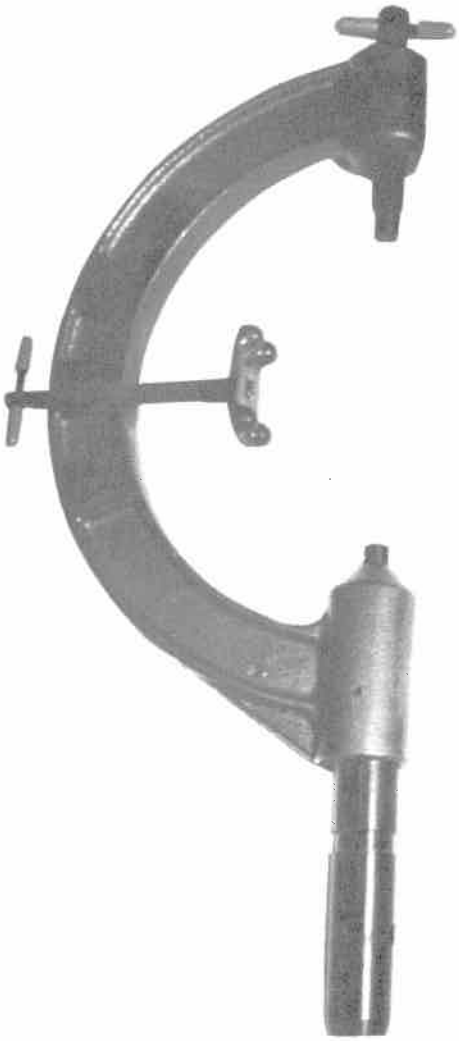
Model	400
Ratios:	
Low	2.4815 to 1
Intermediate	1.4815 to 1
High	1 to 1
Reverse	2.0769 to 1
Converter Stall Ratio	2.4 to 1
Oil Capacity	22 pt.
Modulator	Vacuum Control
Converter Elements	3
Cooling	Water
Carrier Pinion End Play	0.009 to 0.024 inch
Pump Face to Rotor End Play	0.0008 to 0.0035 inch
Front Unit End Play	0.003 to 0.024 inch
Rear Unit End Play	0.007 to 0.019 inch

TORQUE SPECIFICATIONS

	Foot-Pounds
Bottom Pan Attaching Screws	12
Case Center Support Bolt	23
Case Center Support Screw	5
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
Parking Pawl Bracket Bolts	18
Pump Cover Bolts	18
Pump to Case Attaching Bolts	18
Rear Servo Cover Bolts	18
Transmission to Engine Mounting Bolts	28

TECHNICAL SERVICE LETTER REFERENCE

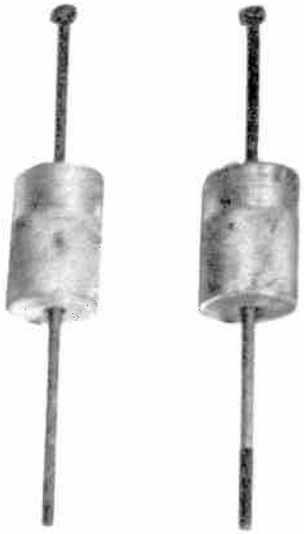
Date	Letter No.	Subject	Changes information on Page No.



J-8763-01 TRANSMISSION
HOLDING FIXTURE

J-21368 ALIGNMENT STRAP
PUMP AND BODY

J-21363 INTERMEDIATE CLUTCH
INNER SEAL
PROTECTOR

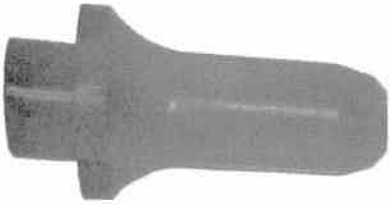


C-3752 SLIDE HAMMERS

J-22269-01 ACCUMULATOR PISTON
RETAINER RING REMOVER-INSTALLER

J-21370-6 REAR BAND APPLY
PIN SELECTOR FIXTURE

J-21370-5 PIN - REAR BAND APPLY



J-21359 PUMP OIL SEAL
DRIVER

W-307 DIRECT CLUTCH
SPRING COMPRESSOR

J-21409 FORWARD CLUTCH
OUTER SEAL PROTECTOR

J-21364 REAR UNIT AND PUMP
PROTECTOR HUB

J-21362 FORWARD AND DIRECT
CLUTCH INNER SEAL PROTECTOR

W-306 FORWARD CLUTCH
SPRING COMPRESSOR

Fig. 7-132 Automatic Transmission Tools

J42564