1964 OLDSMOBILE

Service manual

CONTENTS

NO. 2

1964 OLDSMOBILE

SERVICE MANUAL

NUMBER 2

MANUAL NO.

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FOREWORD

This manual is compiled to provide service procedures, adjustments and specifications for the 1964 Oldsmobiles. An understanding of the material contained herein and in monthly issues of the Oldsmobile Service Guild and Dealer Technical Information Bulletins, issued when necessary, will assist service personnel in properly maintaining the quality to which Oldsmobile cars are built.

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MANUAL NUMBER 2

SERVICE DEPARTMENT
OLDSMOBILE DIVISION
GENERAL MOTORS CORPORATION
LANSING, MICHIGAN

Litho in U.S.A.
GMP 8-1875

HYDRA-MATIC

(4-S)

34-35-36-38 & 39 SERIES

CONTENTS OF SECTION 6

PERIODIC MAINTENANCE

The fluid level should be checked at every engine oil change interval and should be changed at 24,000 mile intervals. The fluid level should be checked with the selector lever in "Park" position, the engine running at idle speed and the car on a level surface. The oil level indicator and filler tube are located under the hood at the right rear corner of the engine.

Approximately 5-1/2 quarts of oil are required to fill the Hydra-Matic transmission after the transmission has been drained. Approximately 6-1/2 quarts will be required to fill the transmission if the oil pan has been removed and drained at the same time that the fluid is changed. Approximately nine quarts are required after an overhaul.

When changing the transmission oil, add five quarts, start the engine, and add oil to bring fluid level to the "Full" mark on the oil level indicator.

Fluid only with the following identification on the container should be used: brand name, including the words ". . . . Fluid Type A, plus the mark "AQ-ATF" - number and a letter "A" embossed on the top of the can as follows: "AQ-ATF - number - A".

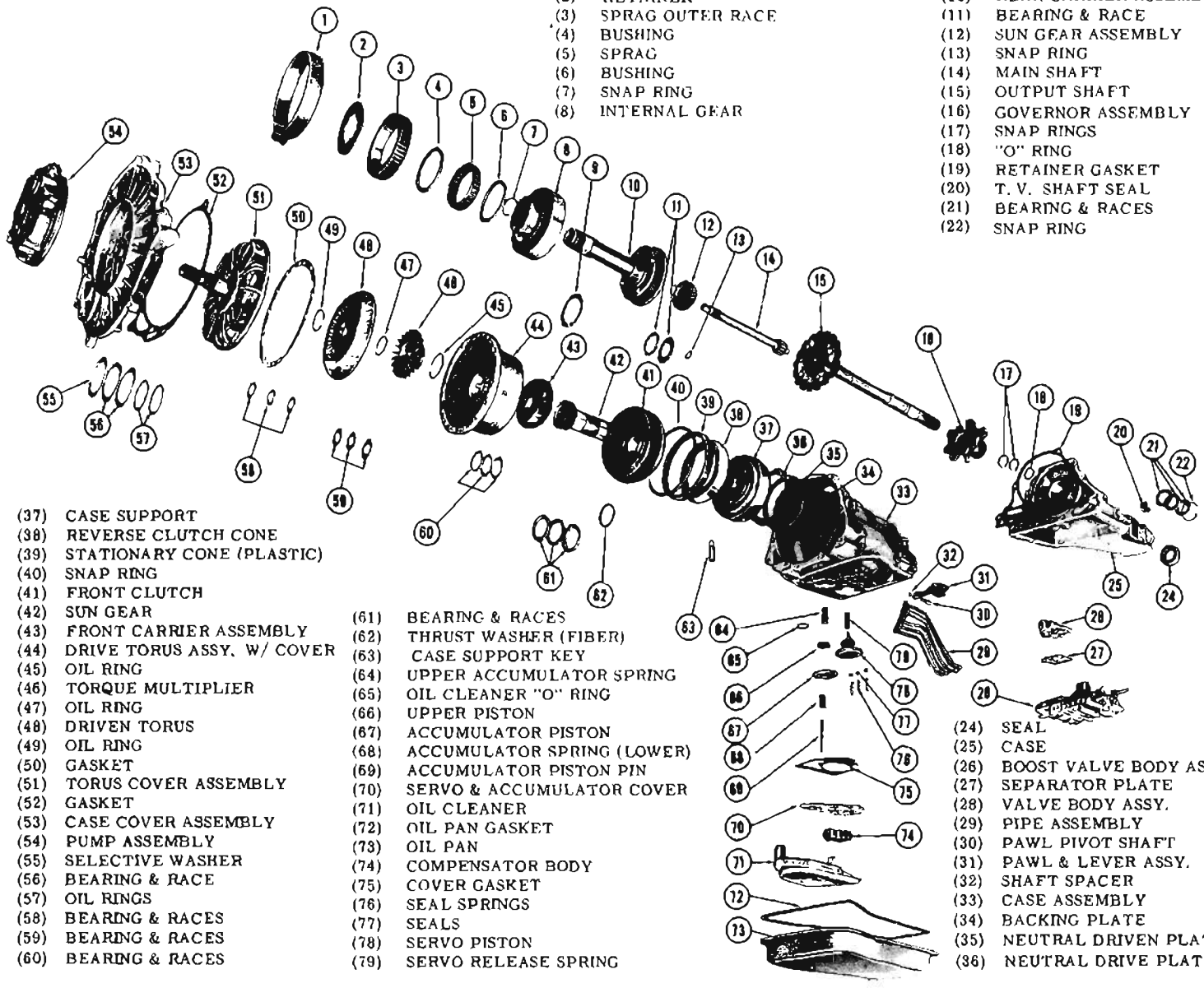
TRANSMISSION OPERATION

OPERATION IN DRIVE RANGE

The transmission offers three selective drive ranges, "D", "S" and "L". In "D" range, the transmission starts in first and shifts automatically to second, third and fourth.

With the selector lever in "S" range, the transmission will shift to third and remain in third until approximately 70 to 82 mph, regardless of throttle opening. This provides additional acceleration for long hills or traffic driving, as well as engine braking power when descending long grades. When car speed reaches approximately 70 to 82 mph the transmission automatically upshifts to fourth. If the car speed decreases to approximately 65 to 78 mph, the transmission will automatically downshift to third.

With the selector lever in "L" range, the transmission will not shift beyond second regardless of throttle opening or car speed. "L" range is



(1) BAND
(2) RETAINER
(3) SPRAG OUTER RACE
(4) BUSHING
(5) SPRAG
(6) BUSHING
(7) SNAP RING
(8) INTERNAL GEAR
(9) THRUST BEARING
(10) REAR CARRIER ASSEMBLY
(11) BEARING & RACE
(12) SUN GEAR ASSEMBLY
(13) SNAP RING
(14) MAIN SHAFT
(15) OUTPUT SHAFT
(16) GOVERNOR ASSEMBLY
(17) SNAP RINGS
(18) "O" RING
(19) RETAINER GASKET
(20) T. V. SHAFT SEAL
(21) BEARING & RACES
(22) SNAP RING
(24) SEAL
(25) CASE
(26) BOOST VALVE BODY ASSY.
(27) SEPARATOR PLATE
(28) VALVE BODY ASSY.
(29) PIPE ASSEMBLY
(30) PAWL PIVOT SHAFT
(31) PAWL & LEVER ASSY.
(32) SHAFT SPACER
(33) CASE ASSEMBLY
(34) BACKING PLATE
(35) NEUTRAL DRIVEN PLATE
(36) NEUTRAL DRIVE PLATE
(37) CASE SUPPORT
(38) REVERSE CLUTCH CONE
(39) STATIONARY CONE (PLASTIC)
(40) SNAP RING
(41) FRONT CLUTCH
(42) SUN GEAR
(43) FRONT CARRIER ASSEMBLY
(44) DRIVE TORUS ASSY. W/ COVER
(45) OIL RING
(46) TORQUE MULTIPLIER
(47) OIL RING
(48) DRIVEN TORUS
(49) OIL RING
(50) GASKET
(51) TORUS COVER ASSEMBLY
(52) GASKET
(53) CASE COVER ASSEMBLY
(54) PUMP ASSEMBLY
(55) SELECTIVE WASHER
(56) BEARING & RACE
(57) OIL RINGS
(58) BEARING & RACES
(59) BEARING & RACES
(60) BEARING & RACES
(61) BEARING & RACES
(62) THRUST WASHER (FIBER)
(63) CASE SUPPORT KEY
(64) UPPER ACCUMULATOR SPRING
(65) OIL CLEANER "O" RING
(66) UPPER PISTON
(67) ACCUMULATOR PISTON
(68) ACCUMULATOR SPRING (LOWER)
(69) ACCUMULATOR PISTON PIN
(70) SERVO & ACCUMULATOR COVER
(71) OIL CLEANER
(72) OIL PAN GASKET
(73) OIL PAN
(74) COMPENSATOR BODY
(75) COVER GASKET
(76) SEAL SPRINGS
(77) SEALS
(78) SERVO PISTON
(79) SERVO RELEASE SPRING

Fig. 6-1 Hydra-Matic

designed for engine braking when descending steep grades. It may also be used to hold the car in second for maximum pulling power.

PART THROTTLE DOWNSHIFT— FOURTH TO THIRD

A part throttle downshift can be made any time the transmission is in fourth and the car speed is below approximately 35 mph. Since this downshift will occur at part throttle opening, the advantage of third stage power is obtained without a wide open throttle. This feature is desirable in traffic conditions where a wide open throttle would be unnecessary.

FORCED DOWNSHIFTS (Detent)

In "D" range the transmission can be downshifted from fourth to third, and from third to second within set speed ranges. In "S" range a third to second forced downshift can be made within a set speed range. A warning "feel" on the accelerator pedal makes it possible for the driver to obtain full throttle performance with or without downshift, as desired.

CLOSED THROTTLE DOWNSHIFTS

DRIVE RANGE

When the transmission is in fourth "D" range and the driver takes his foot off the accelerator, the transmission will automatically downshift from fourth to second when coming to a stop.

SUPER RANGE

When the transmission is in fourth "S" range (over 75 mph) and the driver takes his foot off the accelerator, the transmission will automatically downshift from fourth to third at approximately 75 mph and downshift from third to second when coming to a stop.

LOW RANGE

If the car is being driven in "L" range, the transmission will not upshift to third.

If the car is being driven in "S" range and the driver moves the selector lever to "L" range and takes his foot off the accelerator, the transmission will automatically downshift from third to second at approximately 30 to 40 mph.

If the car is being driven in "D" range (above 75 mph) and the driver moves the selector lever to "L" range and takes his foot off the accelerator, the transmission will automatically downshift from fourth to third at approximately 70 mph and from third to second at approximately 30 to 40 mph.

REVERSE

Reverse is accomplished through use of a friction clutch applied by oil pressure and designed for ease in "rocking" the car. A reverse blocker piston prevents movement of the selector lever to the "R" position above 13 mph.

PARK

The Hydra-Matic indicator has a "P" position which is desirable for parking and starting the car when on an incline. The engine can also be started with the selector lever in the "N" position.

With the selector lever in "P" position, a parking pawl engages with lugs on the output shaft flange and locks the output shaft to the transmission case. A detent in the steering column prevents accidental movement of the selector lever to the "P" position.

STALL TESTING

Under NO condition should the transmission be STALL TESTED because the excessive heat developed will damage the unit.

VALVES AND THEIR FUNCTIONS

PRESSURE REGULATOR VALVE

The pressure regulator valve controls line pressure by regulating the output of the pump. This valve is constructed with two areas where pressures can be applied to overcome regulator spring force which in turn either increases or decreases the line pressure. (Fig. 6-2)

THROTTLE VALVE

The throttle valve regulates to obtain a pressure proportional to carburetor opening by the throttle valve spring and T.V. plunger which is operated

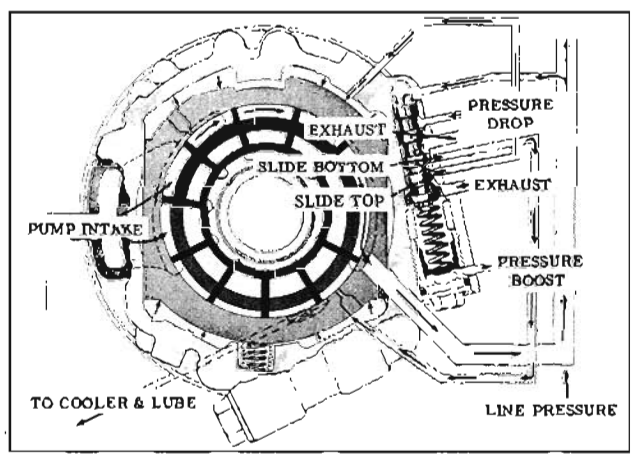


Fig. 6-2 Pressure Regulator Valve and Pump

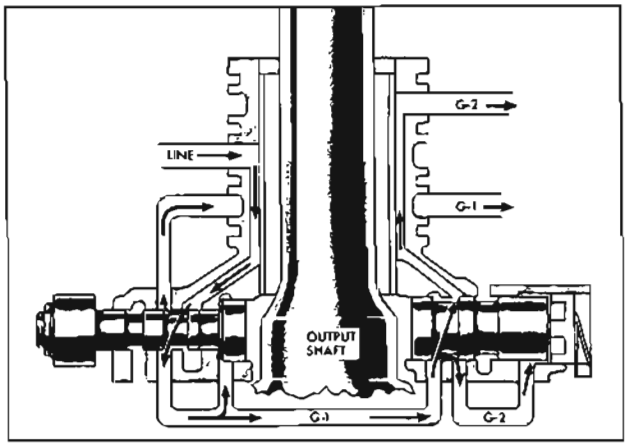


Fig. 6-3 Governor Assembly

mechanically by the throttle linkage. The T.V. pressure decreases when the oil temperature goes below approximately 75°F. This is accomplished by a bimetal thermostatic element which contacts the throttle valve at temperatures less than 75°F, and opposes the force of the regulator spring.

GOVERNOR

The governor contains two valves, of different weight, which rotate with the output shaft permitting each valve to produce a different pressure proportional to the vehicle speed. G-1 pressure operates at low speeds and G-2 pressure at the higher speeds. (Fig. 6-3)

MANUAL VALVE

The manual valve distributes pressures to place the transmission in either neutral, drive range, super range, low range, or reverse. It is controlled mechanically, through linkage, by the selector lever.

2-3 SHIFT VALVE

The 2-3 shift valve provides for the 2-3 and 3-2 shifts and is actuated by T.V. and G-1 governor pressures.

3-4 SHIFT VALVE

The 3-4 shift valve provides the 3-4 and 4-3 shifts and is actuated by T.V. and both G-1 and G-2 governor pressures.

COUPLING FEED LIMIT VALVE

This valve is located in the pump body and provides a direct feed to the coupling from the pump in neutral, first, second and reverse. It is controlled by coupling signal pressure but opens only when coupling signal pressure is greater than 70 psi.

COUPLING EXHAUST VALVES

The coupling exhaust valves are located in the torus cover assembly and they seal the coupling exhaust ports whenever coupling signal pressure is directed to close them.

COUPLING TIMING VALVE

The coupling timing valve controls the exhaust and fill of the coupling. It is controlled by front clutch pressure on the 2-3 shift and delays the exhaust of the coupling until clutch capacity is sufficient to carry the torque. On a 3-4 shift it is controlled by 3-4 pressure and shifts immediately after the 3-4 shift valve.

PRESSURE BOOST VALVE

The pressure boost valve controls the flow of oil to the line boost area of the pressure regulator valve. It is shifted by front clutch pressure and is timed to move after the clutch has assumed the torque.

PRESSURE DROP VALVE

The pressure drop valve controls the flow of oil to the line drop area of the pressure regulator valve. It provides a varying pressure inversely proportional to T.V. pressure which results in a modulated line pressure.

3-2 DOWNSHIFT VALVE

The 3-2 downshift valve regulates the exhaust of the front clutch on throttle 3-2 downshifts. It is designed to gradually release the clutch while the coupling is being filled to prevent a sudden increase in engine rpm.

FRONT CLUTCH EXHAUST VALVE

The front clutch exhaust valve controls the release of the front clutch during a throttle 3-2 downshift. It provides a wide open clutch exhaust when coupling pressure is sufficient.

TV PLUNGER

The T.V. plunger provides the part throttle 4-3 and the detent 4-3 and 3-2 shifts, and also provides accelerator pedal assist. It is operated mechanically by the T.V. linkage.

REVERSE BLOCKER VALVE

The reverse blocker valve prevents a shift into reverse at speeds above 13 mph. It is controlled by G-1 pressure and provides a mechanical stop for the manual linkage.

3-2 CUTOFF VALVE

The 3-2 cutoff valve is controlled by T.V. pressure and shifts at about 28 psi. It provides an immediate exhaust of front clutch oil on closed throttle 3-2 downshifts and provides a source for 3-4 boost pressure on light 3-4 upshifts.

3-4 BOOST VALVE

The 3-4 boost valve provides 3-4 boost pressure on light throttle 3-4 upshifts to momentarily increase pump pressure until the coupling reaches sufficient pressure.

NEUTRAL CLUTCH VALVE

The neutral clutch valve regulates neutral clutch apply oil to satisfy various throttle opening conditions. This results in a slow neutral clutch fill with a light throttle and a quick fill for a heavy throttle, insuring a smooth but firm clutch application under all conditions.

OVERRUN BAND AND SERVO

The overrun band and servo are used to obtain engine braking when coasting in first, second or third with the selector lever in super or low speed range position. To prevent the transmission from overrunning, the overrun band assembly is applied to the rear unit internal gear thus holding the rear internal and front unit sun gears stationary for the desired braking.

An overrun band servo is used to apply and release the overrun band.

First Stage

Band apply pressure acts against the servo piston moving the piston, servo springs, retainer and piston pin against the release spring to start the application of the band. When the band has been applied to the rear internal gear it begins to offer resistance to the travel of the piston pin.

Second Stage

As band apply pressure continues to build up under the piston, the piston begins to travel up on the piston pin against the force of the servo springs. The piston then moves away from the washer which allows a small portion of the band apply pressure to bleed to exhaust through the bleed hole in the piston. Overrun band apply pressure under the piston then continues to build up at a slower rate and causes a greater force to be applied to the band. (Fig. 6-4)

Third Stage

When the piston travels up far enough to contact the servo spring retainer, the bleed hole is sealed off again. This allows the band apply pressure to build up quickly again and causes the piston to apply its full force directly against the servo spring retainer and piston pin to give the final full apply force.

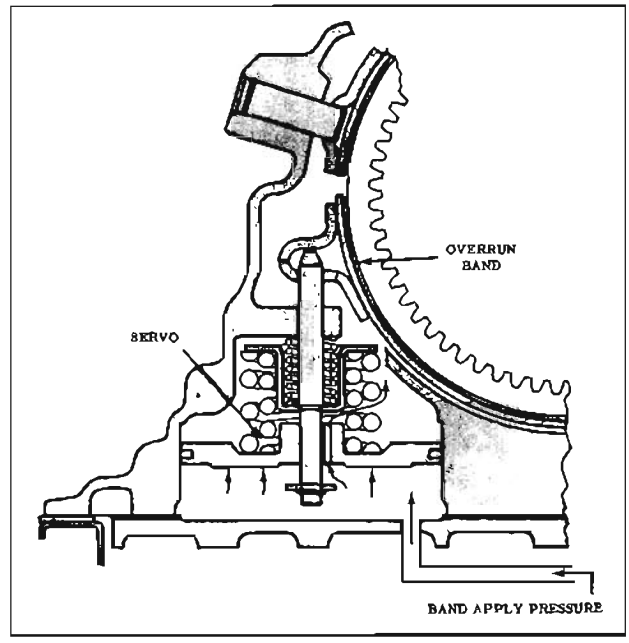


Fig. 6-4 Overrun Band and Servo

The design of the servo is such as to provide for a smooth gradual apply of the band under all driving conditions and oil pressures.

COMPENSATOR VALVES (Fig. 6-5)

The compensator valves are regulated by T.V. pressure and supply compensator pressure to control the front clutch accumulator.

3-STAGE COMPENSATOR VALVE ("O", "OC" AND "OCH" TRANSMISSIONS)

The primary and secondary compensator valve regulate drive oil to become compensator pressure. To prevent compensator pressure from exceeding the desired maximum value, orifice T.V.

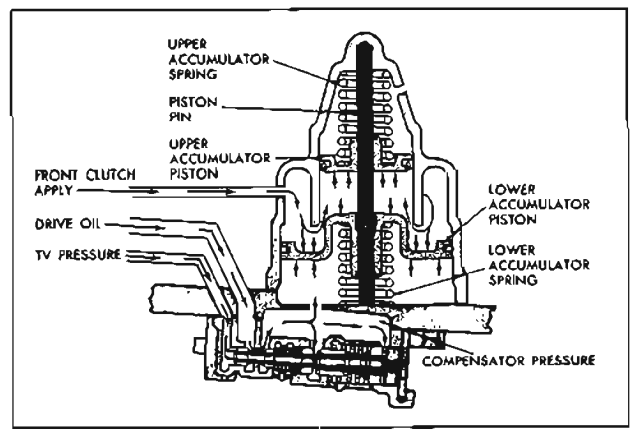


Fig. 6-5 Compensator and Accumulator

pressure acting on the compensator limit valve is allowed to exhaust thus limiting the maximum value of compensator pressure. Compensator pressure is used to control the accumulation rate of the accumulator with different throttle opening for smooth clutch application.

FRONT CLUTCH ACCUMULATOR (Fig. 6-5)

The front clutch accumulator is a cushioning and timing device which enables the front clutch to apply smoothly under all throttle and torque conditions.

When the front clutch is engaging, front clutch apply oil is also directed to the front clutch accumulator. Front clutch oil compresses the pistons against spring pressure, causing the accumulator to absorb an amount of clutch apply oil. During the initial application of the front clutch piston, a comparatively small quantity of clutch apply oil is diverted to the accumulator. When the clutch piston is in its apply position, the accumulator pistons move against spring pressure and the amount of oil absorbed by the accumulator will increase, thereby decreasing the flow to the front clutch. Since the pistons moving against their springs meet increasing resistance to their motion, the oil pressure applying the front clutch increases gradually to provide a smooth application.

When the pistons reach the ends of their strokes, the front clutch pressure rises to main line pressure to insure positive and complete engagement following the shift.

NEUTRAL (ENGINE RUNNING)

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG—INEFFECTIVE**
NEUTRAL CLUTCH—OFF	**OVERRUN BAND—OFF**	**FRONT CLUTCH—OFF**

Whenever the engine is running, line pressure is always directed to the:

1. Pressure Regulator
2. Pressure Relief Valve
3. Coupling Feed Limit Valve
4. Throttle Valve
5. Coupling Timing Valve
6. Manual Valve
7. 3 to 4 Governor Valve
8. Governor Assembly
9. Pressure Boost Valve

BASIC CONTROL

Line pressure through the coupling timing valve is directed into the signal passage. Signal oil closes the coupling exhaust valves and opens the coupling feed limit valve to provide coupling feed oil. Line pressure through the orifice at the coupling timing valve provides an additional source of coupling feed oil to fill the coupling. The neutral clutch is released, therefore the sprag or roller clutch is ineffective.

PRESSURE CONTROL

Line pressure to the throttle valve is regulated to a variable pressure called T.V. pressure. The throttle valve, which regulates T.V. pressure, is controlled by the T.V. spring and throttle plunger through adjustable linkage from the carburetor throttle. As the throttle is opened, the linkage depresses the throttle plunger to increase the force of the T.V. spring, thus causing the throttle valve to regulate T.V. pressure to a higher value. T.V. pressure is designed to vary in proportion to throttle opening and is used throughout the system to activate or control different valves at various times in relation to throttle opening.

Line pressure through the pressure boost valve enters two passages to become pressure boost and pressure drop signal oil. Pressure boost oil is directed against the boost plug in the pressure regulator to give an increase in line pressure. Pressure drop signal pressure is routed to the pressure drop valve where T.V. pressure acting on the end of the pressure drop valve regulates pressure drop signal oil to a variable decreasing pressure which in turn is applied against the second land of the pressure regulator valve.

At closed throttle, line drop pressure is maximum thus causing the greatest drop in line pressure; at full throttle, line drop pressure is regulated to exhaust resulting in high line pressure. Line pressure is controlled to vary with throttle opening from 132 to 180 psi.

Line pressure directed to the governor will be regulated to become two variable governor pressures; G-1 and G-2.

SUMMARY

The coupling is filled and the neutral clutch is released, thereby causing the transmission to be in neutral.

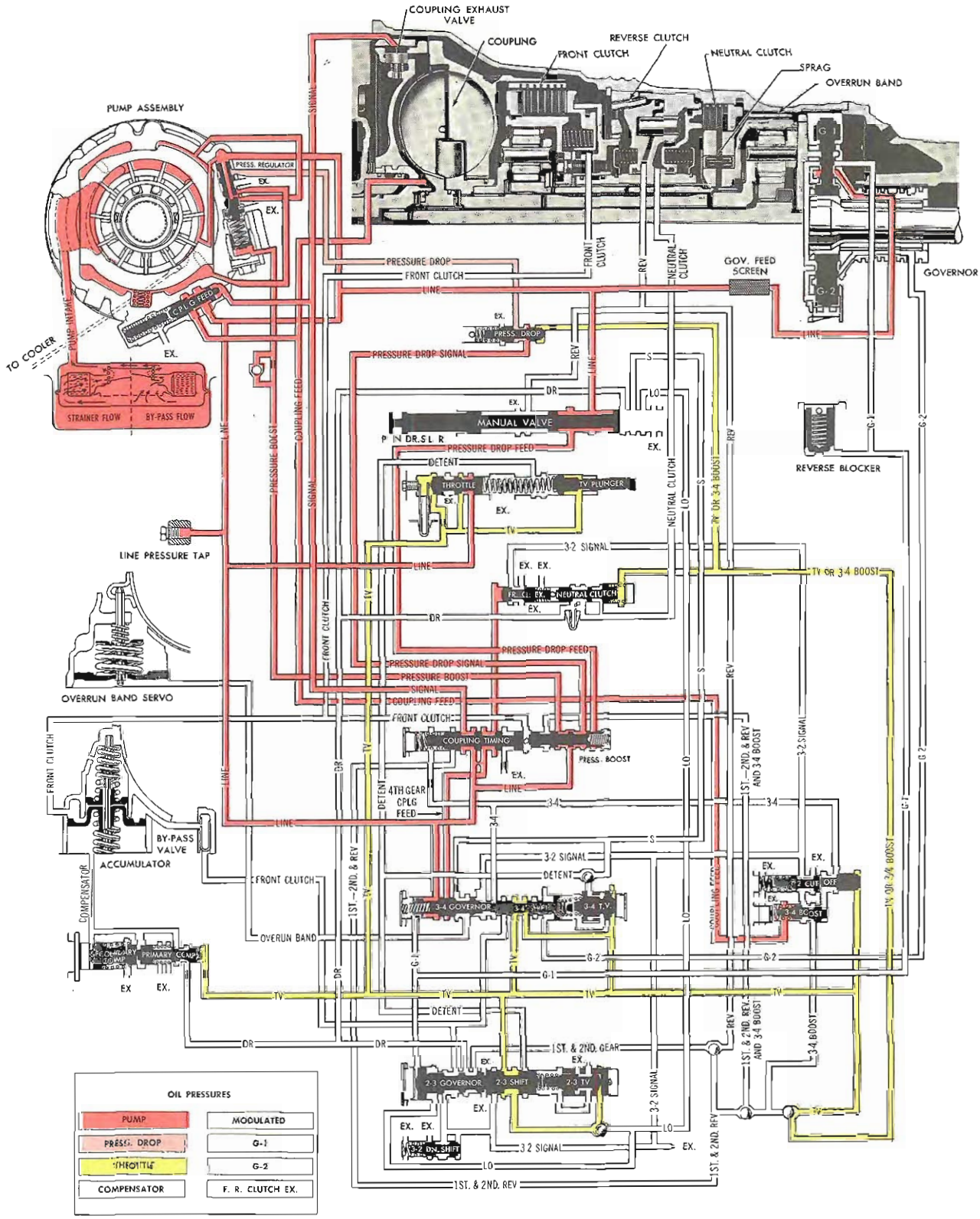


Fig. 6-6 Neutral (Engine Running)

DRIVE RANGE (FIRST STAGE)
RATIO 3.32:1

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG—EFFECTIVE**
FRONT CLUTCH—OFF	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

When the selector lever is moved to the drive position, the manual valve is repositioned to allow line pressure to enter the drive oil circuit. Drive oil then flows to the following:

1. Neutral Clutch Valve
2. 2 to 3 Governor Valve
3. Pressure Boost Valve
4. Primary Compensator Valve

BASIC CONTROL

Drive oil to the neutral clutch valve is directed into the neutral clutch apply passage. The neutral clutch valve senses a balance between neutral clutch apply pressure and T.V. plus spring pressure to regulate the flow of neutral clutch apply pressure to insure a smooth but firm clutch application under all throttle conditions. As the neutral clutch applies, the sprag becomes effective for first.

PRESSURE CONTROL

Line pressure will vary from 132 to 180 psi depending on the amount of T.V. pressure or throttle opening.

TIMING CONTROL

Drive oil and T.V. pressure are directed to the primary compensator valve. Drive oil flowing through compensator valves will become regulated to a pressure called compensator. Increasing T.V. pressure (which increases with throttle opening) will cause the compensator to regulate to an increasing value. Compensator pressure is then designed to vary with throttle opening but in such a way as to be proportional to engine torque. Compensator pressure is directed to the accumulator for use during the 2 to 3 shift.

FAIL SAFE FEATURES

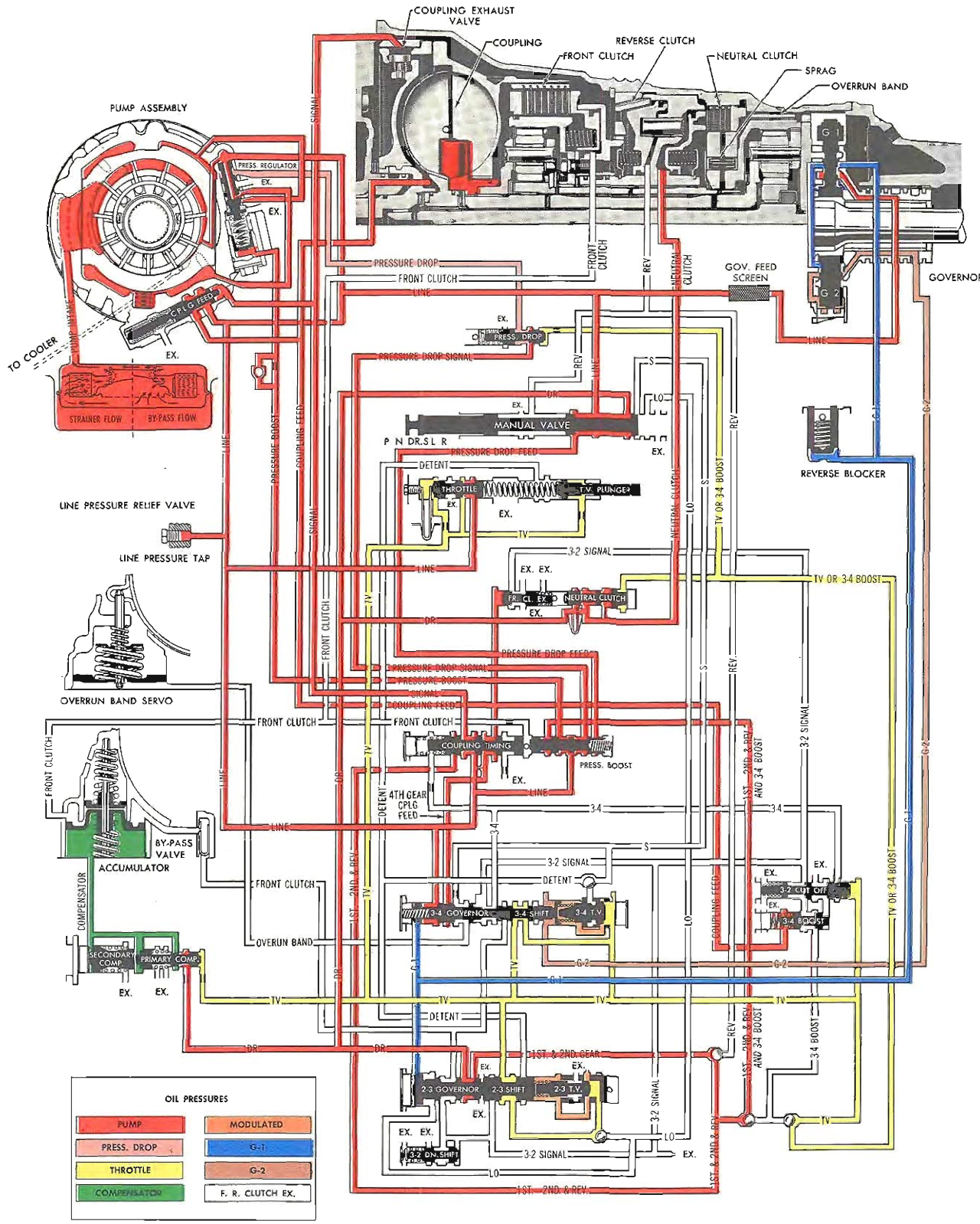
To provide a safety feature, drive oil to the 2 to 3 shift valve is routed into the first stage passage past two ball-check valves to the pressure boost valve. If for any reason the line boost valve has remained in neutral or third stage position, first stage oil will flow past the pressure boost valve to become line boost oil which is necessary in first.

First stage oil flowing past one ball-check is resting on the coupling timing valve. Again, if for any reason the coupling timing valve should remain in the third stage position, first stage oil will flow past the valve to become coupling signal oil. This insures that the coupling can be filled in first regardless of the position of the coupling timing valve.

SUMMARY

The coupling is filled, the neutral clutch is applied and the sprag is effective, placing the transmission in first.

The reduction in first is due to the 2.933 rear unit gear reduction, times the 1.2 coupling torque multiplication, less the .2 engine torque acting on the output shaft through the accel-a-rotor.



1/3 THROTTLE

Fig. 6-7 Drive Range (First Stage)

DRIVE RANGE (SECOND STAGE)
RATIO 2.933:1

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG—EFFECTIVE**
FRONT CLUTCH—OFF	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

When the selector lever is moved to the drive position, the manual valve is repositioned to allow line pressure to enter the drive oil circuit. Drive oil then flows to the following:

1. Neutral Clutch Valve
2. 2 to 3 Governor Valve
3. Pressure Boost Valve
4. Primary Compensator Valve

BASIC CONTROL

Drive oil to the neutral clutch valve is directed into the neutral clutch apply passage. The neutral clutch valve senses a balance between neutral clutch apply pressure and T.V. plus spring pressure to regulate the flow of neutral clutch apply pressure to insure a smooth but firm clutch application under all throttle conditions. As the neutral clutch applies, the sprag become effective for first and second.

PRESSURE CONTROL

Pressure control in second is identical to that in first and neutral. Line pressure will vary from 132 to 180 psi depending on the amount of T.V. pressure or throttle opening.

TIMING CONTROL

Drive oil and T.V. pressure are directed on the primary compensator valve. Drive oil flowing through compensator valves will become regulated to a pressure called compensator. Increasing T.V. pressure (which increases with throttle opening) will cause compensator to regulate to an increasing value. Compensator pressure is then designed to vary with throttle opening but in such a way as to be proportional to engine torque. Compensator pressure is directed to the accumulator for use during the 2 to 3 shift.

FAIL SAFE FEATURES

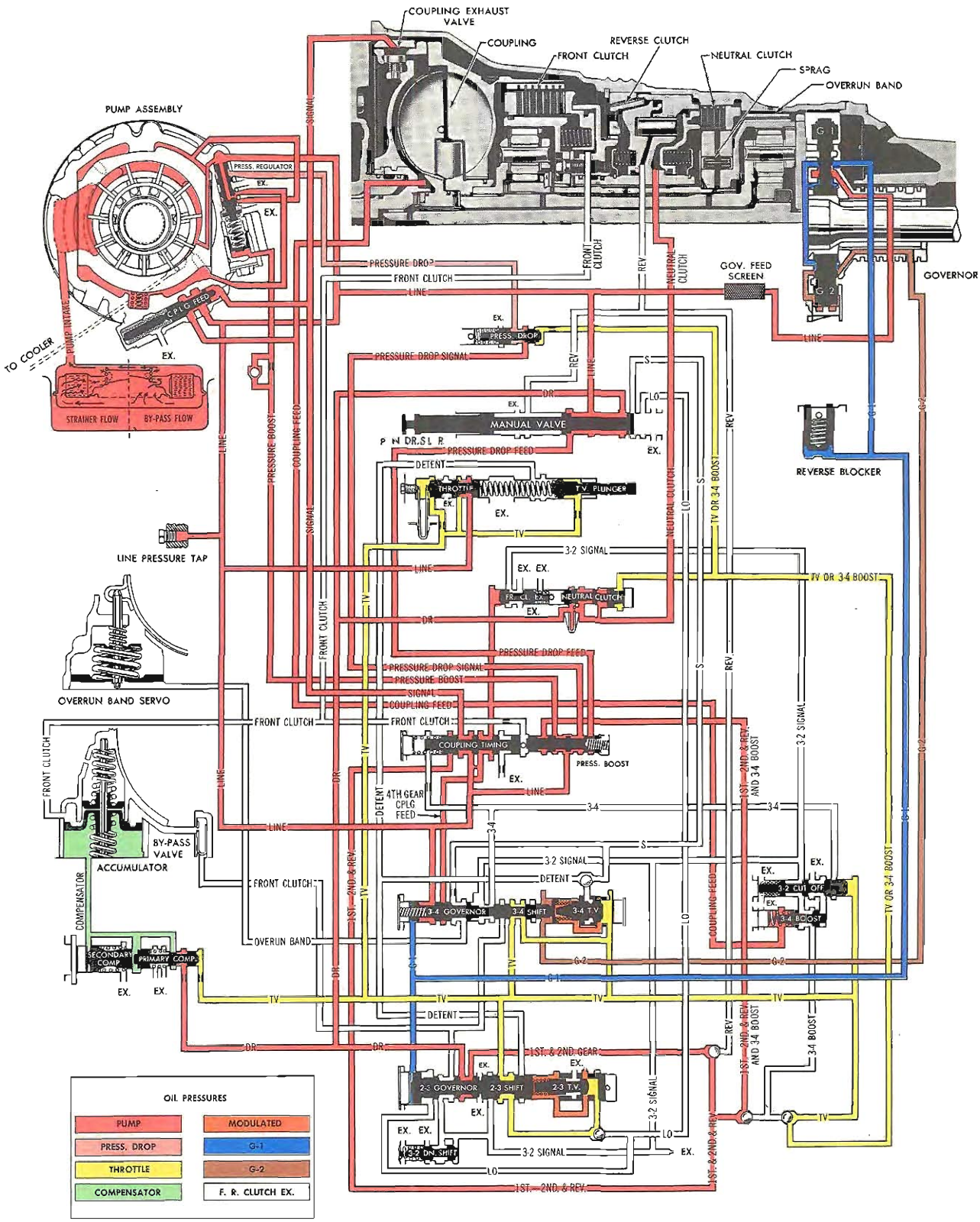
To provide a safety feature, drive oil to the 2 to 3 shift valve is routed into the first stage passage past two ball-check valves to the pressure boost valve. If for any reason the line boost valve has remained in the neutral or third stage position, second stage oil will flow past the pressure boost valve to become line boost oil which is necessary in second.

Second stage oil flowing past one ball-check is resting on the coupling timing valve. Again, if for any reason the coupling timing valve should remain in the third stage position, second stage oil will flow past the valve to become coupling signal oil. This insures that the coupling can be filled in second regardless of the position of the coupling timing valve.

SUMMARY

The coupling is filled, the neutral clutch is applied and the sprag is effective, placing the transmission in second.

The reduction in second is due to the 2.933:1 rear unit gear reduction only.



1/3 THROTTLE

Fig. 6-8 Drive Range (Second Stage)

DRIVE RANGE (THIRD STAGE)
RATIO 1.56:1

COUPLING—EMPTY **REVERSE CONE—OFF** **SPRAG—EFECTIVE**

CLUTCH—ON **NEUTRAL CLUTCH—ON** **OVERRUN BAND—OFF**

As car speed and G-1 pressure increases, the force of G-1 acting on the 2 to 3 governor valve will overcome the force of the 2 to 3 shift valve spring, 2 to 3 T.V. spring, and modulated T.V. pressure. This causes the 2 to 3 shift valve to open, which allows drive oil to enter the front clutch passage. Simultaneously, T.V. pressure to the 2 to 3 regulator valve is cut off at the 2 to 3 shift valve, and second stage oil is exhausted through the 2 to 3 shift valve.

BASIC CONTROL

Front clutch oil from the 2 to 3 shift valve then is directed to the following places:

1. 3 to 4 shift valve for later use and, after passing an orificed one way check valve to the:
2. Front Clutch
3. Front Clutch Accumulator
4. Coupling Timing Valve
5. Pressure Boost Valve

Front clutch oil applies the clutch and moves the coupling timing valve against the spring cutting off line pressure to the signal passage. As signal pressure is cut off, the coupling exhaust valves open, thus allowing the coupling to empty and the coupling feed limit valve to close, cutting off coupling feed pressure to the coupling.

PRESSURE CONTROL

Front clutch oil to the line boost valve overcomes the spring at the opposite end, thus moving the valve to cut off line pressure from entering the pressure boost passage and pressure drop signal passage. Because line drop feed is now directed through the pressure boost valve into the pressure drop signal passage, line pressure will drop to a variable value of 74 to 105 psi. Front clutch oil is used on the pressure boost valve since it is a signal oil which notifies the pressure boost valve that the oil pressure in the clutch itself is sufficiently high to allow the clutch to carry third stage torque. Also, if the line pressure were not kept in a boosted condition temporarily, the neutral clutch would not have sufficient pressure to prevent its slipping before the transmission had completed the shift to third.

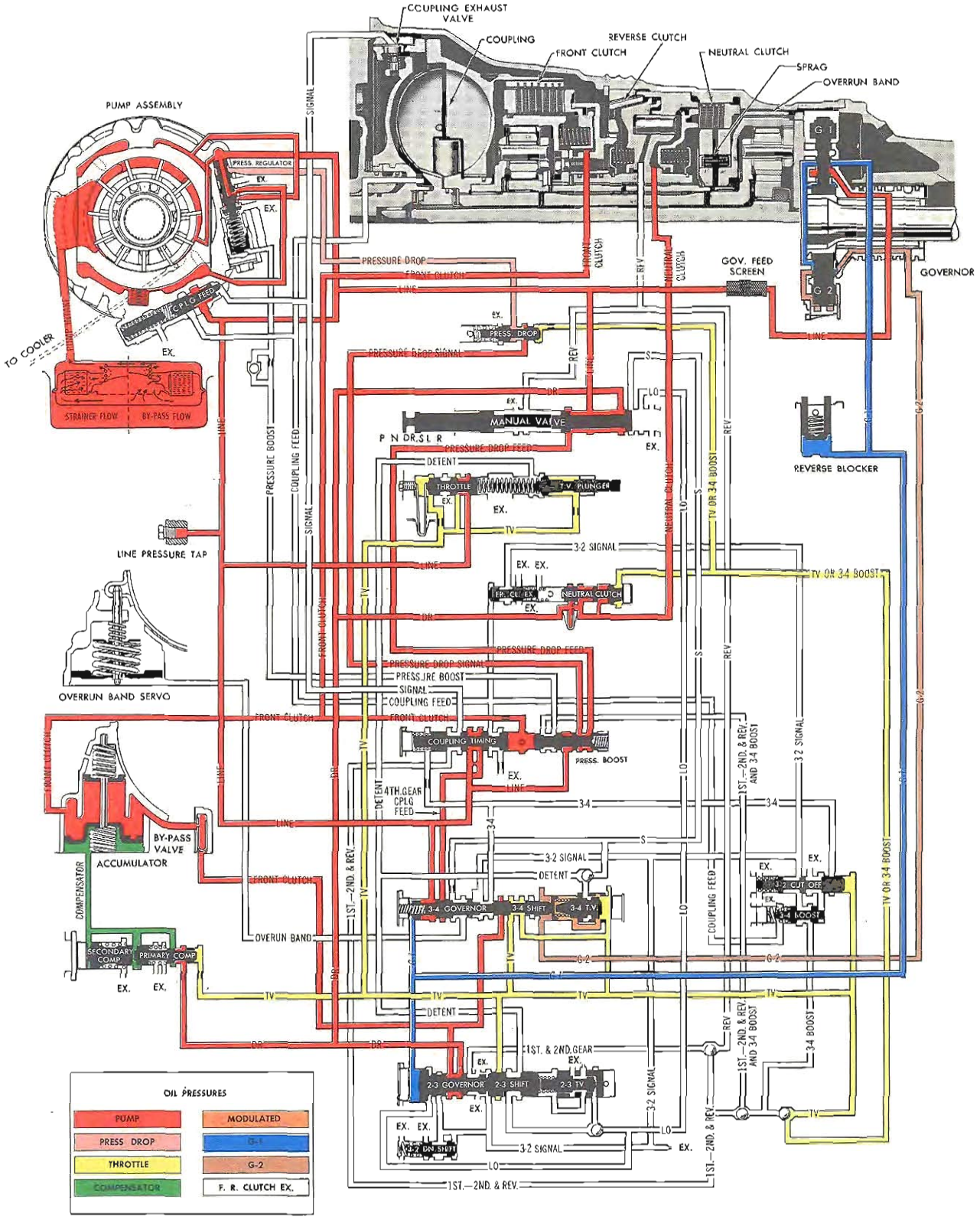
TIMING CONTROL

Front clutch oil is directed to the accumulator to provide a cushion for clutch apply pressure. Compensator pressure is also fed to the accumulator to control the amount of cushioning the accumulator will provide according to throttle opening. At light throttle, compensator pressure is low, thus allowing the accumulator to absorb a greater amount of clutch oil for greater cushioning. At heavy throttle, compensator assists the lower accumulator spring in acting against clutch pressure to give a firmer but smooth clutch application. Front clutch oil acting on the coupling timing valve times the movement of the valve and the resulting exhaust of the coupling to coincide with the application of the front clutch.

SUMMARY

The front clutch is applied and the coupling is empty, shifting the transmission into third.

Because the coupling is empty no power is transmitted through the torus members and all torque multiplication in third is due to the 1.56:1 front unit gear ratio.



1/3 THROTTLE

Fig. 6-9 Drive Range (Third Stage)

DRIVE RANGE (FOURTH STAGE)

RATIO 1:1

COUPLING—FILLED	**REVERSE CONE—OFF**	**SPRAG—INEFFECTIVE**
FRONT CLUTCH—ON	**NEUTRAL CLUTCH—ON**	**OVERRUN BAND—OFF**

As car speed increases, G-1 and G-2 pressure and the 3 to 4 shift valve spring acting on the 3 to 4 shift valve train will overcome the force of the T.V. regulator spring and modulated pressure on the 3 to 4 shift valve. The shift valve will then open allowing front clutch pressure and line pressure to enter the 3 to 4 and 4th stage coupling fill passage. T.V. pressure is now cut off from entering the shift T.V. passage.

BASIC CONTROL

3 to 4 oil then repositions the coupling timing valve to allow signal pressure to close the coupling exhaust valves and open the coupling feed limit valve to provide coupling fill. Under some throttle conditions signal pressure may not be great enough to open the coupling feed limit valve. In this case all coupling feed pressure comes from the coupling timing valve. Fourth stage coupling feed pressure flows to the coupling timing valve where it provides an additional source for coupling feed pressure.

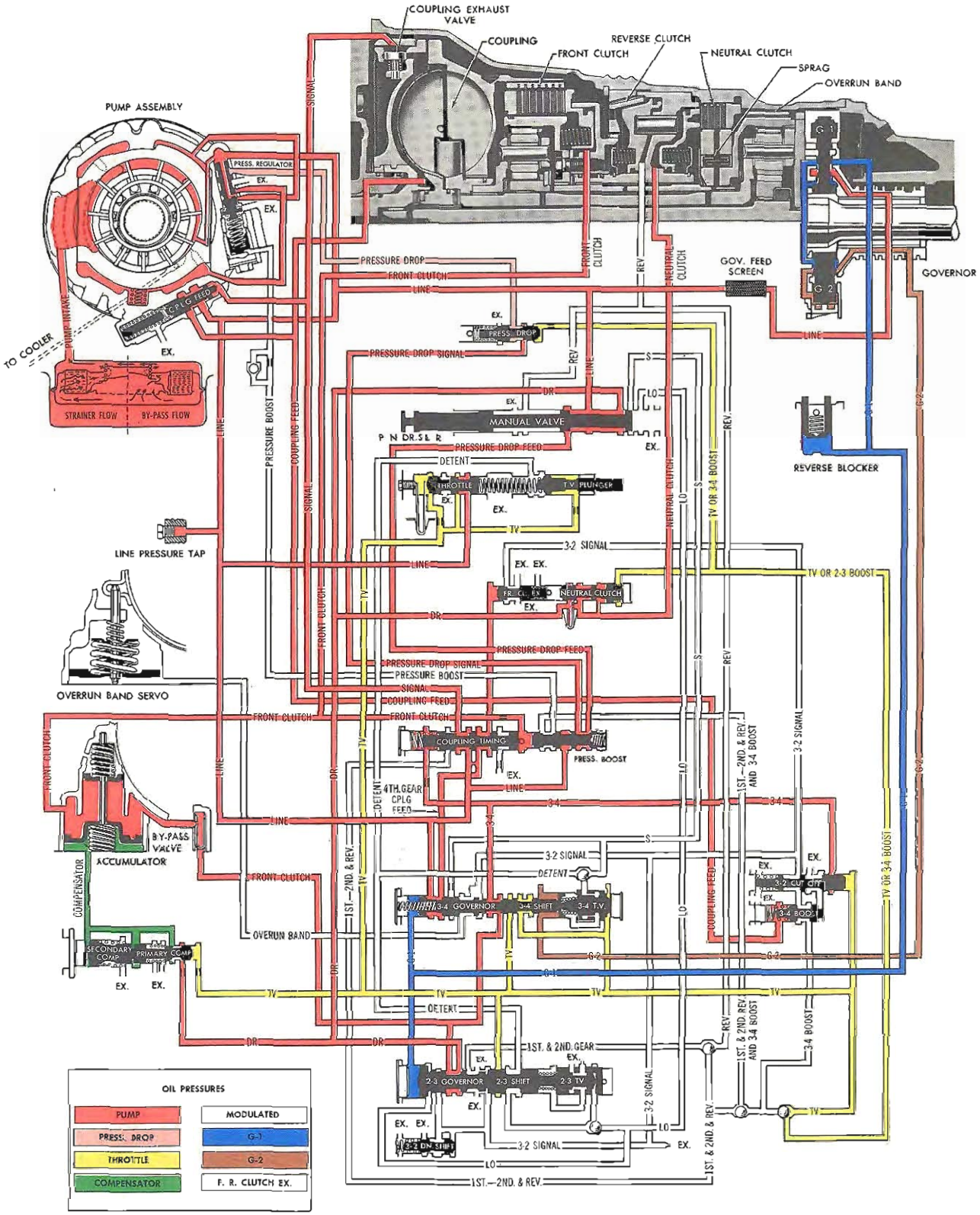
PRESSURE CONTROL

Under most driving conditions line pressure is not changed between third and fourth. However, below approximately 28 psi T.V. pressure, the 3 to 2 cutoff valve opens against T.V. pressure to allow 3 to 4 pressure to enter the 3 to 4 transfer passage. This will cause a temporary boost in line pressure as described under DRIVE RANGE-LIGHT THROTTLE 3 TO 4 UPSHIFT.

SUMMARY

The front clutch remains applied and the coupling is filled.

Both planet carriers and the output shaft are connected, the front sun gear and rear internal gear are connected, and the front internal gear and rear unit sun gear are turning at approximately the same speed, thus the entire train must revolve as a unit in direct drive.



MEDIUM THROTTLE

Fig. 6-10 Drive Range (Fourth Stage)

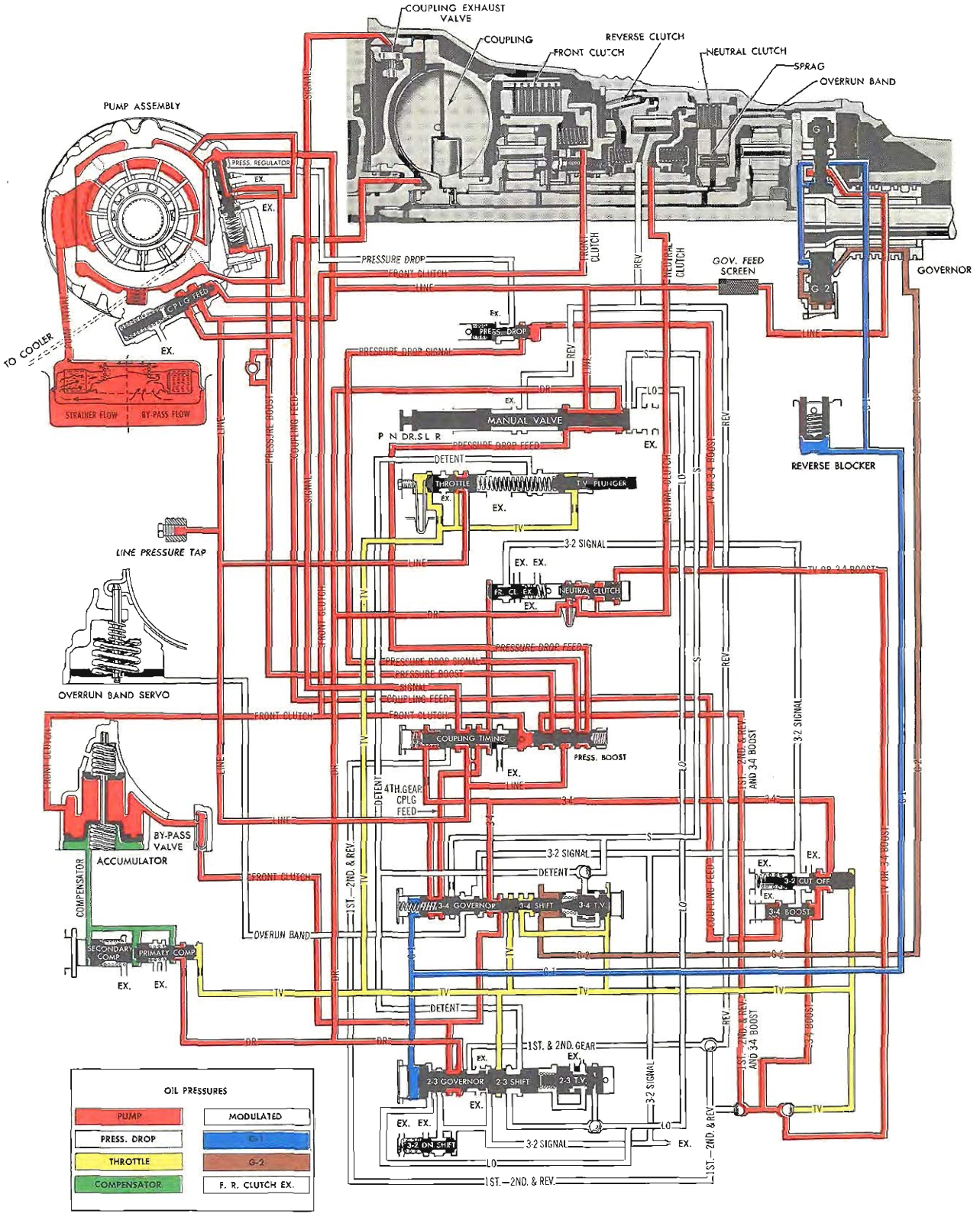
DRIVE RANGE—LIGHT THROTTLE 3 TO 4 UPSHIFT

BASIC CONTROL

The basic control on light throttle 3 to 4 upshifts is the same as a basic 3 to 4 upshift.

PRESSURE CONTROL

When a 3 to 4 upshift is made at throttle positions giving less than approximately 28 psi T.V. pressure, the 3 to 2 cut off valve is positioned against T.V. pressure by the spring. This allows 3 to 4 oil to flow past the 3 to 2 cut off valve, thus opening the 3 to 4 boost valve against the spring. This allows 3 to 4 oil to flow into the 3 to 4 boost passage and in turn past a ball check valve to the pressure drop valve. This closes the pressure drop valve cutting off pressure drop. Simultaneously, 3 to 4 boost oil flows past another ball check into the 1st, 2nd, Reverse and 3 to 4 boost passage where it supplies an alternate source for pressure boost. Line pressure is then raised to sufficient value to provide a fast coupling feed. As the coupling fills and reaches operating pressure, coupling feed pressure acts on the end of the 2 to 3 boost valve to cut off the source of boost pressure. With 3 to 4 boost cut off, T.V. pressure is again directed through the ball check valve to control the pressure drop valve. Line pressure will then drop to its normal fourth stage value of 74 to 105 psi.



(VALVES SHOWN PRIOR TO COUPLING REACHING FULL CHARGE PRESSURE)

Fig. 6-11 Drive Range (Light Throttle 3-4 Upshift)

DRIVE RANGE—4 TO 3 PART THROTTLE DOWNSHIFT

COUPLING—EXHAUSTING

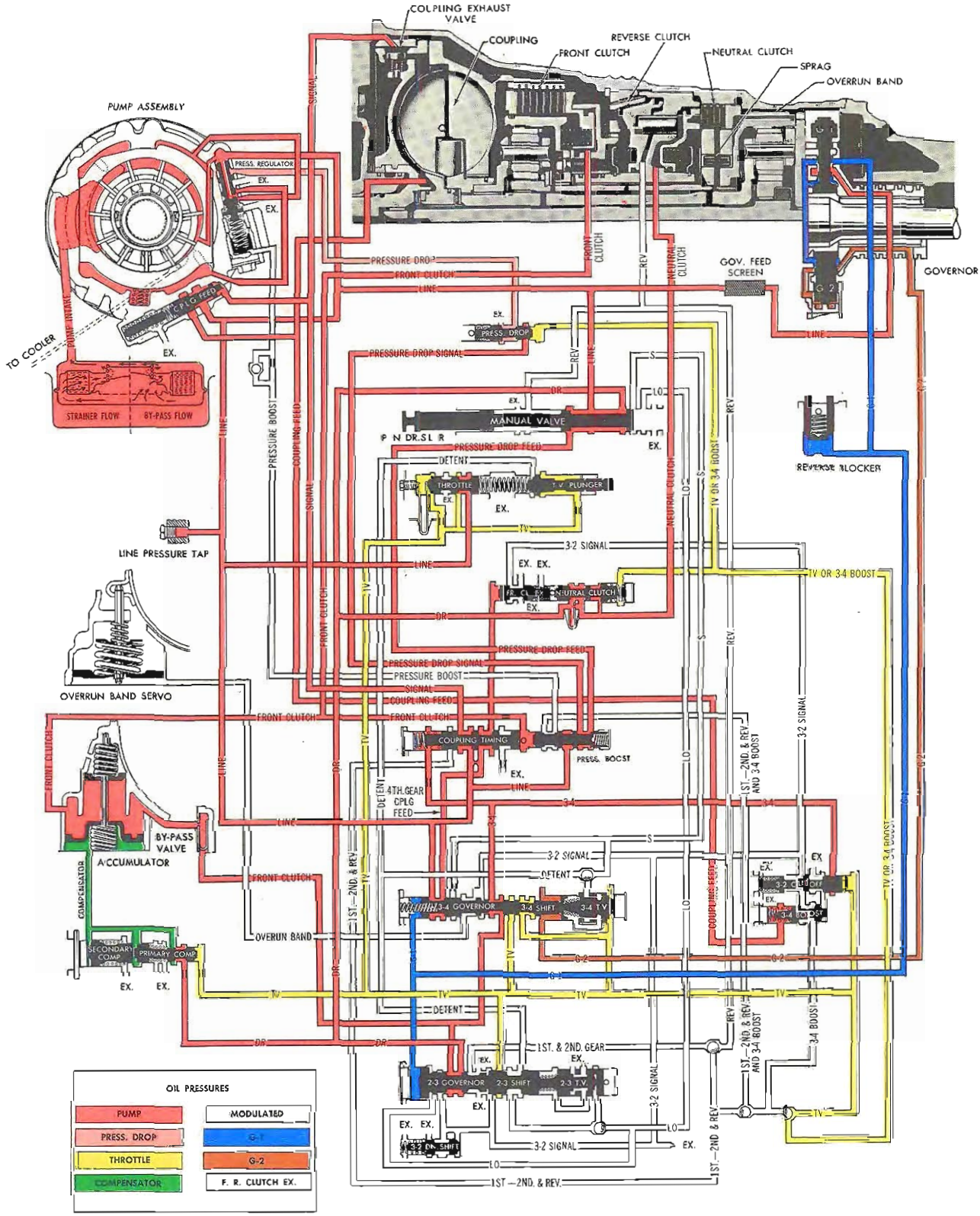
At vehicle speeds below approximately 35 mph a 4 to 3 downshift can be obtained by depressing the accelerator a given amount. When the accelerator is depressed sufficiently, T.V. pressure acting behind the large end of the 3 to 4 T.V. regulator valve is high enough to cause the 3 to 4 shift valve to close.

BASIC CONTROL

As the 3 to 4 shift valve closes, 3 to 4 oil with 4th stage coupling fill oil from the 3 to 4 shift valve are cut off, thereby causing the coupling to exhaust, shifting the transmission back into third.

PRESSURE CONTROL

The pressure remains the same as in fourth.



(VALVES IN FOURTH PRIOR TO DOWNSHIFT)

Fig. 6-12 Drive Range (4-3 Part Throttle Downshift)

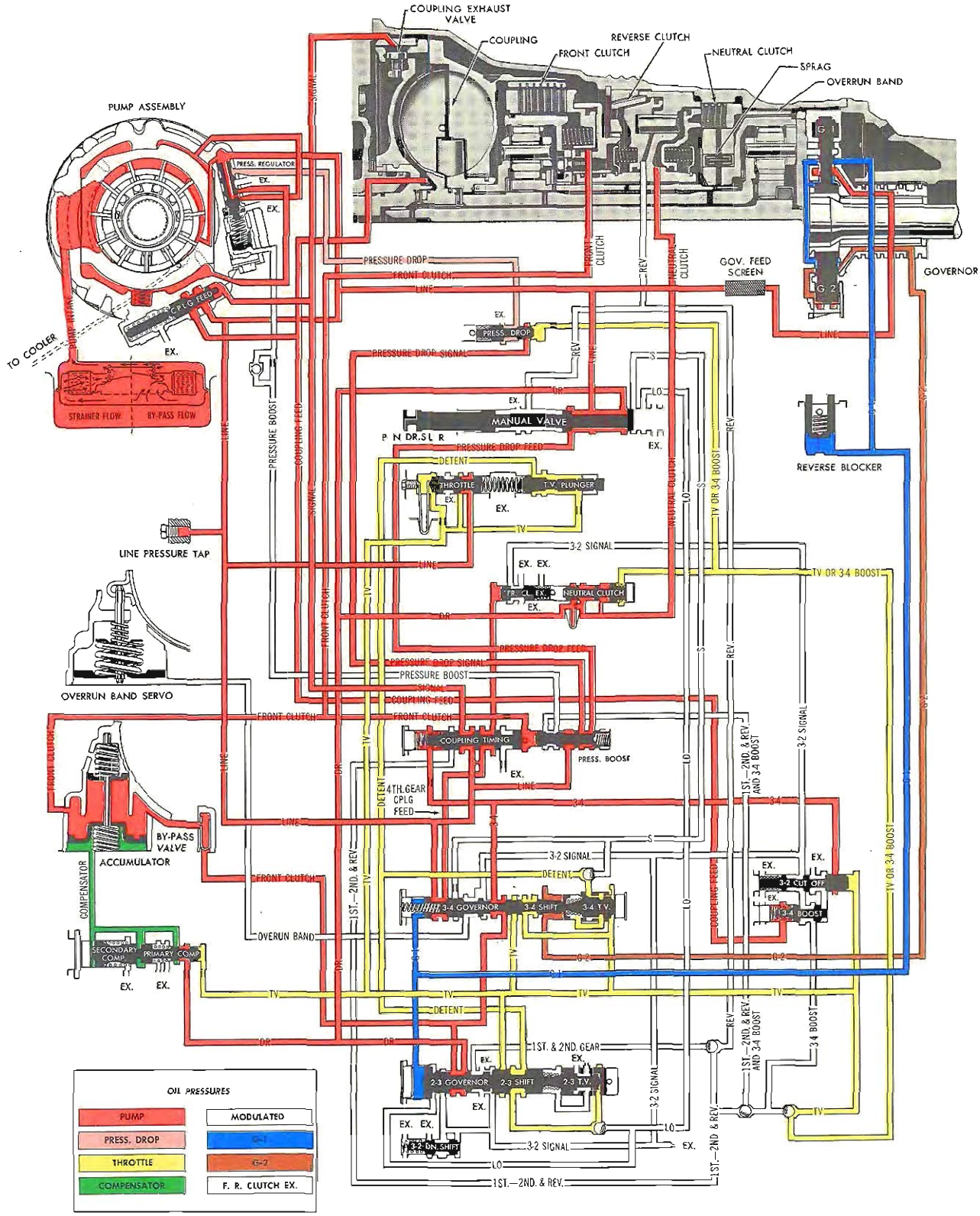
DRIVE RANGE—4 TO 3 DETENT DOWNSHIFT

COUPLING—EXHAUSTING

While operating in fourth at speeds below approximately 65 mph, a forced or detent 4 to 3 downshift is available. This is accomplished by depressing the accelerator fully past the noticeable stop at full throttle.

As this is done, the T.V. plunger is fully depressed exposing the detent passage to T.V. pressure. Detent pressure which flows past the ball check is directed against the large land of the 3 to 4 shift valve.

The force, due to pressure detent will overcome the force of G-1 and G-2 pressure and one spring acting in the opposite direction, thereby causing the 3 to 4 shift valve to close. The transmission will then shift into third.



(VALVES SHOWN IN FOURTH PRIOR TO DOWNSHIFT)

Fig. 6-13 Drive Range (4-3 Detent Downshift)

DRIVE RANGE—3 TO 2 DETENT DOWNSHIFT

COUPLING—FILLING

At car speeds below approximately 22 mph in third, a forced or detent 3 to 2 downshift can be obtained by depressing the accelerator fully past the detent. This causes the T.V. plunger to open the detent passage to T.V. pressure. Detent pressure then enters the 2 to 3 shift T.V. passage to act against the 2 to 3 T.V. valve. This causes the 2 to 3 shift valve to close against the force of G-1 pressure.

BASIC CONTROL

As the 2 to 3 shift valve closes, drive oil to the front clutch is cut off and all front clutch pressure in the front clutch and accumulator is compelled to exhaust the 3 to 2 signal passage. The spring and 3 to 2 signal pressure repositions the coupling timing valve to provide coupling signal pressure and coupling feed pressure.

PRESSURE CONTROL

Drive oil acting on the pressure boost valve repositions the valve against exhausting front clutch oil to provide both boost pressure and line drop signal with line pressure at 180 psi.

TIMING CONTROL

During a heavy throttle 3 to 2 downshift, the release of the clutch must be timed to coincide with the filling of the coupling. To accomplish this timing, exhausting front clutch oil or 3 to 2 signal oil is used as follows:

1. It flows through the closed 3 to 4 shift valve into the 3 to 4 passage to rapidly reposition the coupling timing valve for coupling fill.
2. It flows to the 3 to 2 cut off valve where a rapid exhaust is obtained at light throttles only, but no effect is obtained at heavy throttle 3 to 2 shifts.
3. It regulates to exhaust through the 3 to 2 downshift valve to a value that will hold the front clutch torque in third but not in second. This feature permits the front clutch to handle the transmission torque in third until such time that second stage torque is predominate.
4. It rests against the front clutch exhaust valve until such time that coupling pressure attains a sufficient value to handle torque capacity in second. Coupling pressure then opens the front clutch exhaust valve to exhaust all remaining 3 to 2 signal or front clutch oil.

FRONT CLUTCH—EXHAUSTING

FAIL SAFE FEATURES

Drive oil flows past the closed 2 to 3 shift valve into a passage that supplies an auxiliary feed to the coupling timing valve. This oil provides an additional feed for signal oil in the event that the coupling timing valve should hang up in the closed position or is slow to move to the open position.

Drive oil into the second stage passage also flows through the ball check valves and supplies a source for line boost pressure to rapidly fill the coupling prior to the time that the Line boost valve has had a chance to be repositioned in the first and second stage position.

DRIVE RANGE—3 TO 2 LIGHT THROTTLE DOWNSHIFT

(Illustration Shows Second Stage Just After The Downshift)

During a light or closed throttle 3 to 2 downshift, as the 2 to 3 shift valve closes, drive oil to the front clutch passage is cut off; however, all front clutch pressure in the system is exhausted into the 3 to 2 signal passage. Because T.V. pressure is slight with light throttle, the 3 to 2 cut off valve is open to exhaust the 3 to 2 signal oil. This allows an immediate exhaust of front clutch oil.

Drive oil which formerly applied the front clutch when the 2 to 3 shift valve was open is not directed into the second stage passage which flows through the ball check valves and supplies a source for pressure boost pressure to rapidly fill the coupling prior to the time that the pressure boost valve has had a chance to be repositioned in the first and second stage position.

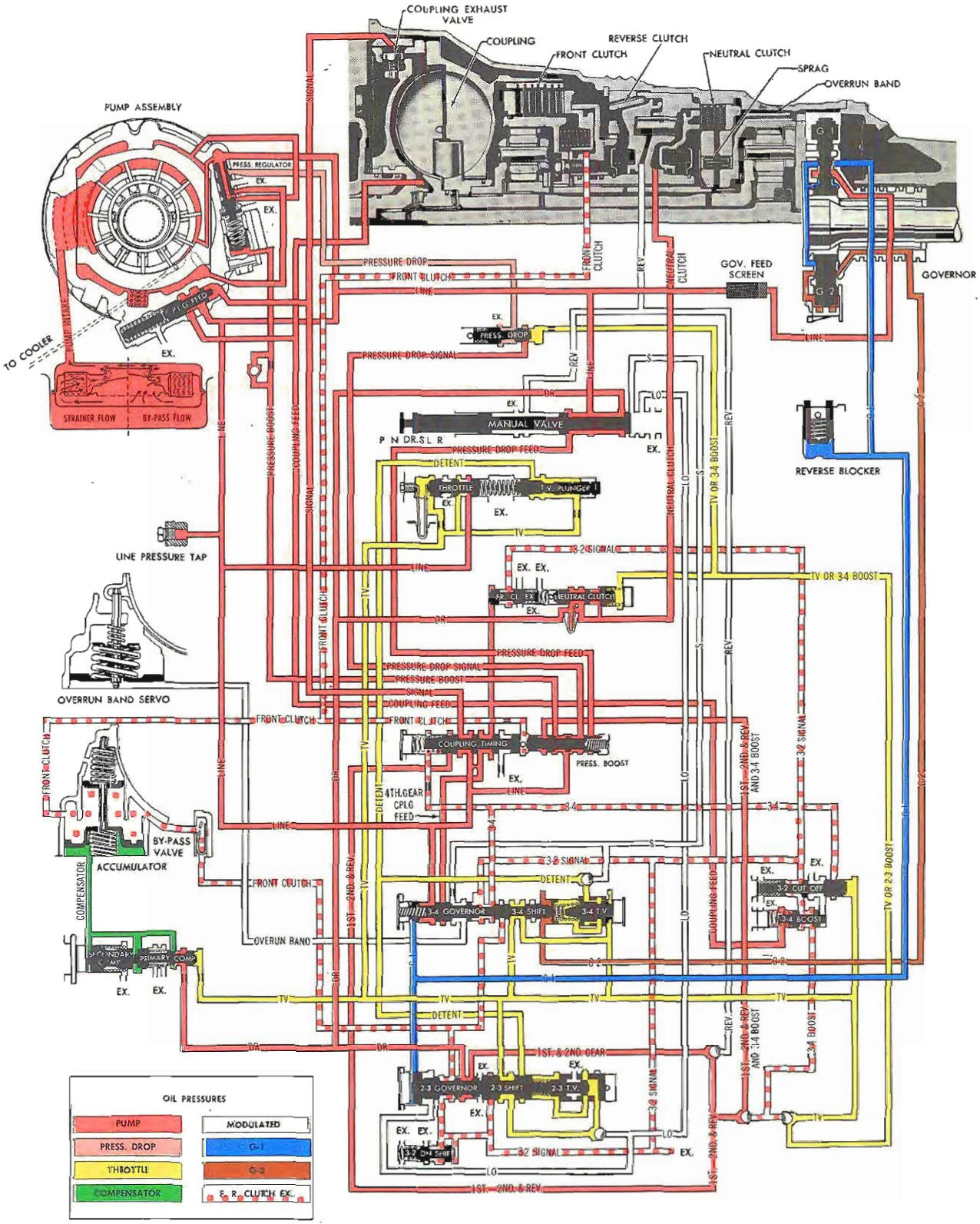


Fig. 6-14 Drive Range (3-2 Detent Downshift)

"S" RANGE—THIRD STAGE

REVERSE CONE—OFF	**SPRAG—EFFECTIVE**	**NEUTRAL CLUTCH—APPLIED**
COUPLING—EMPTY	**FRONT CLUTCH—APPLIED**	**OVERRUN BAND—ON**

Oil flow in "S" range, third, is primarily identical to that in drive range third, with the following exceptions:

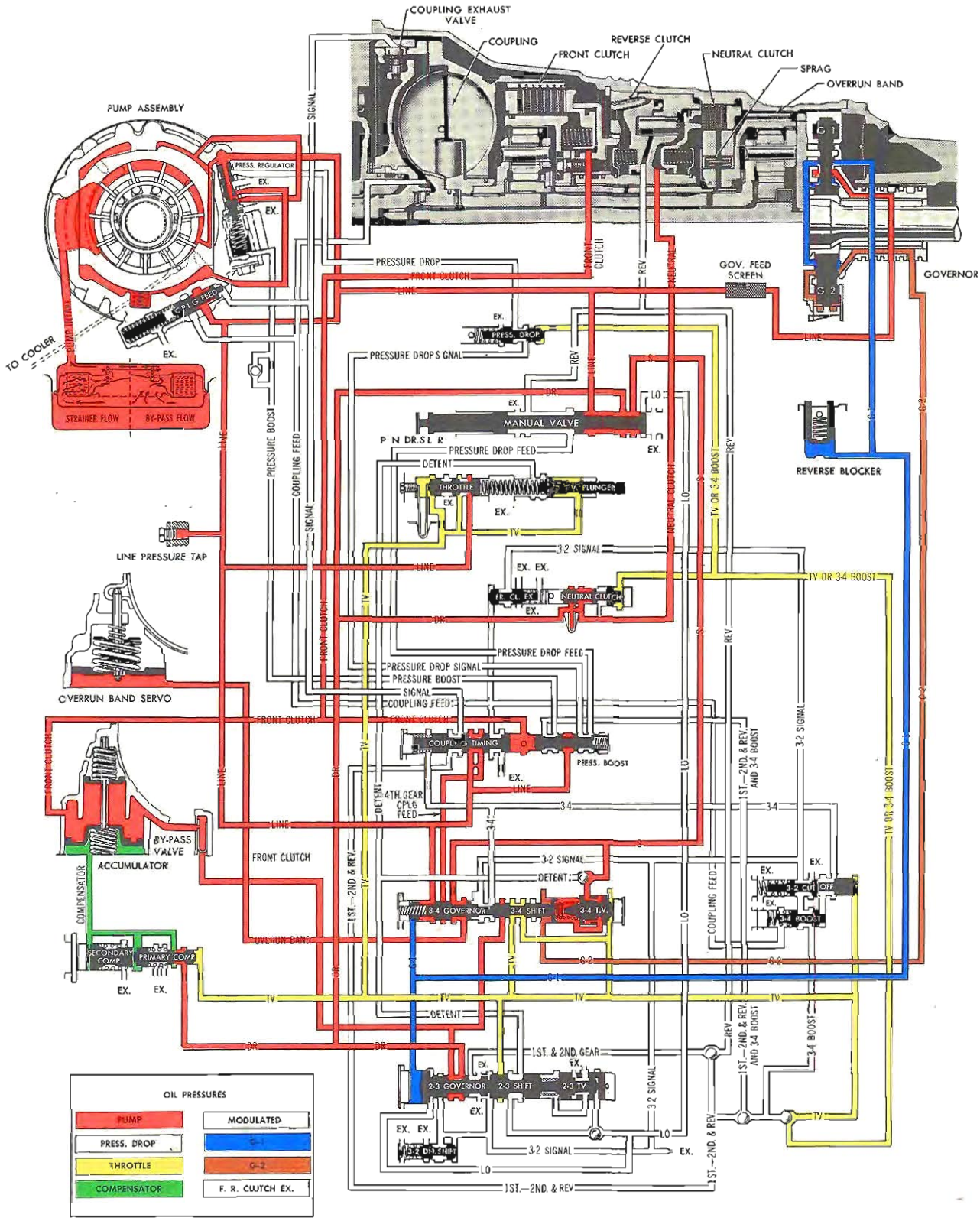
1. Oil Pressure

   When the manual valve is in the "S" position the line drop feed passage is cut off. This stops the source of line drop pressure so that line pressure is constant at approximately 105 psi regardless of throttle opening.

2. "S" Range Pressure

   "S" range pressure from the manual valve performs two functions. First, it is directed through the ball check against the large end of the 3 to 4 shift valve to prevent a 3 to 4 shift from normally occurring in "S" range.* Secondly, it is directed through the 3 to 4 governor valve to apply the overrun servo and band for engine braking in third.

   *As a safety feature, it is possible to obtain a 3 to 4 upshift in "S" range but only above the speed at which the normal drive range through detent 3 to 4 upshift occurs.



LIGHT THROTTLE

Fig. 6-15 "S" Range (Third Stage)

LOW RANGE—SECOND STAGE

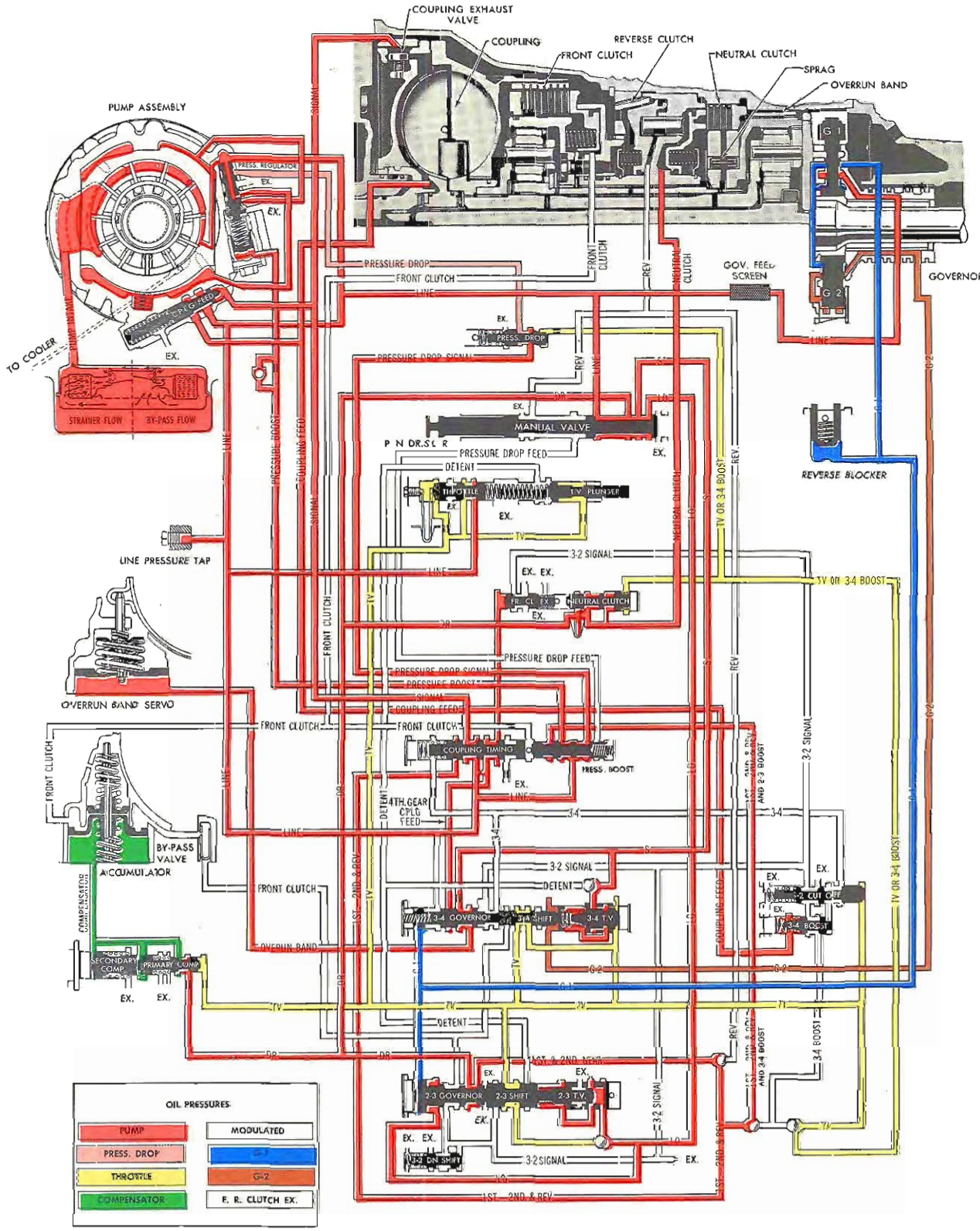
When the selector lever is placed in the "L" position, the Manual Valve is moved to uncover an additional source of pressure, "L" range oil.

"L" range oil is directed in two locations:

1. Against the large end of the 2 to 3 governor valve to work against the force of G-1 pressure.

2. Through the ball check valve, past the 2 to 3 T.V. regulator valve to act against the 2 to 3 shift valve to further assist in keeping the 2 to 3 shift valve closed against G-1 pressure.

The primary purpose of "L" range oil is to provide a definite means of preventing a 2 to 3 upshift from occurring in the "L" range position.



LIGHT THROTTLE

Fig. 6-16 Low Range (Second Stage)

REVERSE
RATIO 3.11:1

COUPLING—FILLED	**REVERSE CONE—ON**	**SPRAG—INEFFECTIVE**
FRONT CLUTCH—OFF	**NEUTRAL CLUTCH—OFF**	**OVERRUN BAND—OFF**

When the selector lever is moved to the "R" position, the manual valve is repositioned to exhaust Drive, "S" Range and "L" Range oil. Reverse oil pressure from the manual valve is allowed to enter the control system.

BASIC CONTROL

Reverse pressure applies the reverse cone.

Line pressure, through the coupling timing valve enters the signal passage to close the coupling exhaust valves and open the coupling feed limit valve for coupling fill.

PRESSURE CONTROL

Pressure control in reverse is identical to that obtained in neutral. Line pressure will vary from 132 to 181 psi depending on T.V. pressure.

FAIL SAFE FEATURES

Reverse pressure is also directed through a ball check valve, to the coupling timing valve, to feed the coupling signal passage if the coupling timing valve should remain in the second stage position.

Line drop feed from the manual valve and reverse pressure through the ball check valves are directed to the pressure boost valve to provide a secondary source for pressure drop and pressure boost if for any reason the pressure boost valve had remained in the third stage positon.

SUMMARY

The total reduction in reverse is due to the 1.2 coupling torque ratio times the 2.49 gear ratio plus the .2 engine torque acting on the accel-a-rotor which results in a 3.11:1 reduction at the output shaft in the reverse direction.

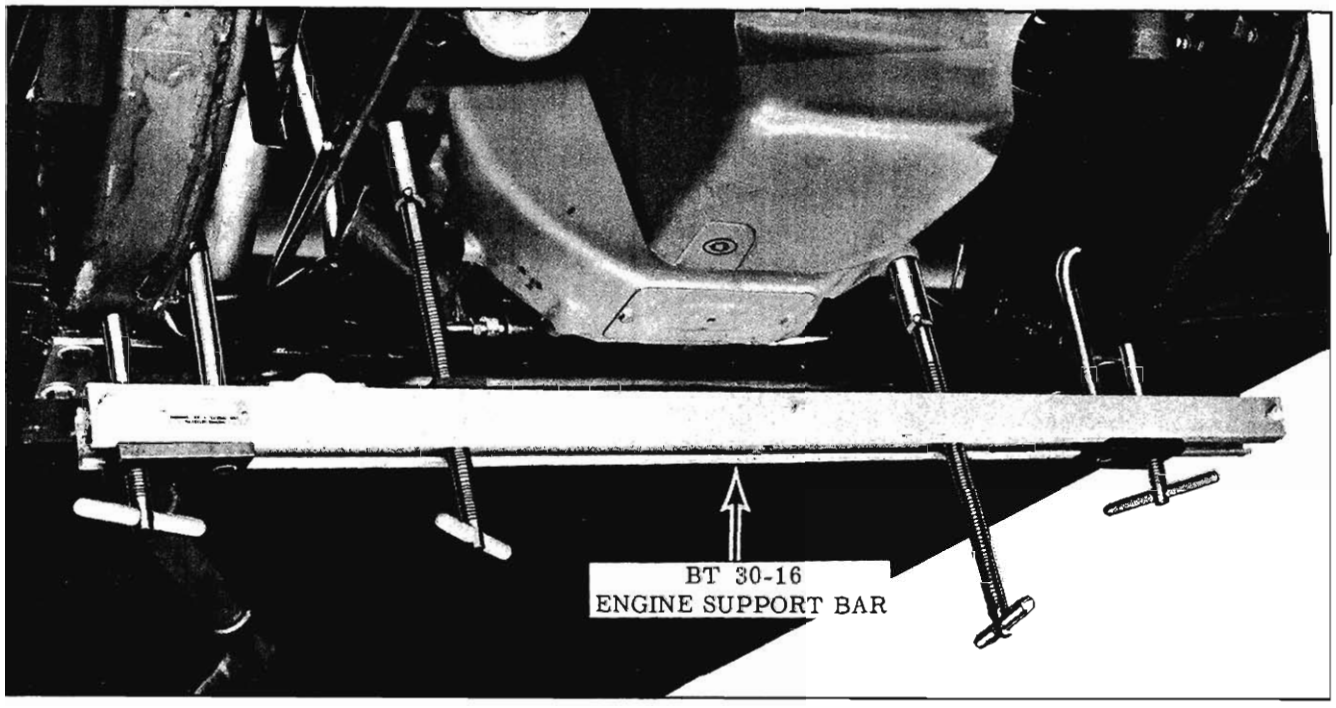


Fig. 6-18 Engine Support Bar

enough fluid to bring level to the "Full" mark on the oil level indicator.

NOTE: Transmission capacity: approximately 6-1/2 quarts (for oil change, pan removed). Approximately nine quarts (after complete overhaul).

Adjust throttle and manual control linkage. (See MINOR SERVICE ADJUSTMENTS)

NOTE: If pressure regulator valve spring was replaced, it will be necessary to check line pressure. Pressure should be checked with shift selector in "N" or "P", engine running on fast idle and T.V. lever disconnected and held first rearward against its stop, which will give minimum T.V. pressure, and then forward to its stop, which will give maximum T.V. pressure. The correct line pressure is 124 to 129 psi with minimum T.V. pressure and 176 to 184 psi with maximum T.V. pressure. If line pressures are not within above limits, it will be necessary to install a new booster plug. Booster plugs can be identified as follows:

A. Lowest pump pressure = "V" groove on end of booster plug.

B. Medium pump pressure = "Bead" on end of booster plug.

C. Highest pump pressure = End of booster plug is plain.

GENERAL SERVICE PRECAUTIONS

When servicing the transmission, it is recommended that upon disassembly of a unit, all parts should be cleaned and inspected as outlined under CLEANING AND INSPECTION, then the unit should be reassembled before disassembly of other units to avoid confusion and interchanging of parts.

1. Before disassembly of the unit, thoroughly clean the exterior.

2. Disassembly and reassembly of the unit and the sub-assemblies must be made on a clean work bench. As in repairing any hydraulically operated unit, cleanliness is of the utmost importance; therefore, the bench, tools, and parts must be kept clean at all times.

3. Before installing cap screws into aluminum parts, ALWAYS DIP SCREWS INTO HYDRA-MATIC OIL to prevent cap screws from galling the aluminum threads and also to prevent the screws from seizing.

4. Always use a torque wrench when installing cap screws into aluminum parts to prevent the possibility of stripping the threads.

5. If taped threads in aluminum parts are stripped or damaged, the part can be made serviceable by the use of Heli-Coils.

6. Seal protecting tools must be used when assembling the units to prevent damage to the seals. The slightest flaw in the sealing surface of the seal can cause an oil leak.

7. The aluminum castings and the valve parts are very susceptible to nicks, burrs, etc., and care should be exercised while handling them.

8. The internal snap rings should be expanded and the external snap rings compressed if they are to be reused. This will insure proper seating when installed. DO NOT REUSE TRU-ARC SNAP RINGS.

9. Replace all "O" rings, gaskets and oil seals that are removed.

10. During assembly of each unit, all internal parts must be lubricated with Hydra-Matic oil.

11. The rear unit steel clutch plates must be installed in an un-nested position. Follow procedure.

12. The fluid coupling is a balanced unit and if either the drive torus or torus cover are damaged, both units will have to be replaced as a matched assembly.

13. Always assemble the output shaft to the rear planet carrier in the same relative position.

PARTS CLEANING AND INSPECTION

After complete disassembly of a unit, all metal parts should be washed in a clean solvent and dried with compressed air. All oil passages should be blown out and checked to make sure that they are not obstructed. The small passages, such as in the front pump slide, should be checked with tag wire. All parts should be inspected to determine which parts are to be replaced.

The various inspections of parts are as follows:

1. Inspect linkage and pivot points for excessive wear.

2. Bearing and thrust surfaces of all parts should be checked for excessive wear and scoring.

3. Check for broken seal rings, damaged ring lands and damaged threads.

4. Inspect seals and "O" rings.

5. Mating surfaces of castings and end plates should be checked for burrs and irregularities. If a good seal is not apparent, burrs and irregularities may be removed by lapping the surface with crocus cloth. The crocus cloth should be held on a flat surface, such as a piece of plate glass.

6. Castings should be checked for cracks and sand holes.

7. Gear teeth should be checked for chipping, scoring, and excessive wear.

8. Valves should be free of burrs and the shoulders of the valves must be square. Any burrs or irregularities may be removed by honing. Valves should be free to slide in their respective bores.

9. Inspect composition clutch plates for damaged surfaces and loose facings. If flakes of facing material can be removed with the thumbnail, the plates should be replaced; however, composition plate discoloration is not an indication of failure.

10. Inspect steel clutch plates for scored surfaces.

11. Inspect springs for distortion or collapsed coils. Slight wear (bright spots) on the sides of the springs is permissible.

12. When inspecting bushings, fit the mating part into the bushing and observe the amount of looseness. Bushing clearance is excessive if more than .008" exists when checked with a wire feeler gauge.

13. If the transmission shows evidence that foreign material has circulated throughout the transmission or if the oil cleaner is dirty, the oil cleaner should be discarded and a new one installed upon assembly of the transmission.

TRANSMISSION DISASSEMBLY

CONTROL VALVE BODY, ACCUMULATOR AND SERVO REMOVAL

1. Attach transmission Holding Fixture J-8763 to transmission case.

2. Place transmission and Holding Fixture into Bench Adaptor J-6115-A, then rotate transmission so that oil pan is up. (Fig. 6-19)

3. Remove oil pan and gasket.

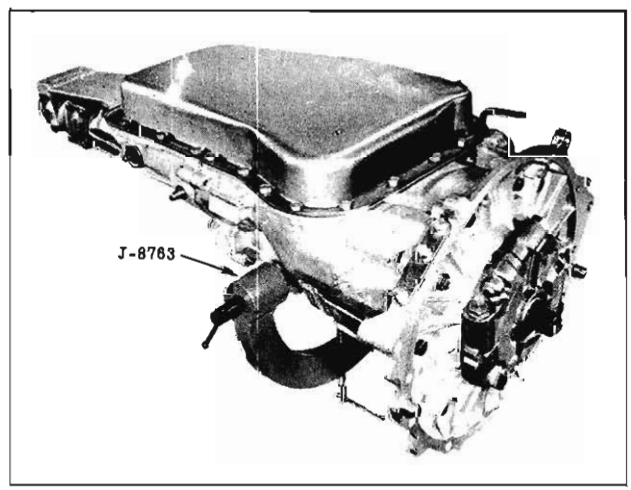


Fig. 6-19 Transmission Holding Fixture

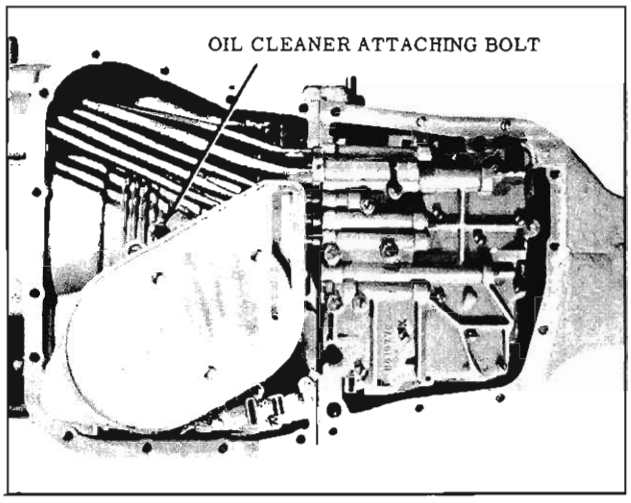


Fig. 6-20 Oil Cleaner

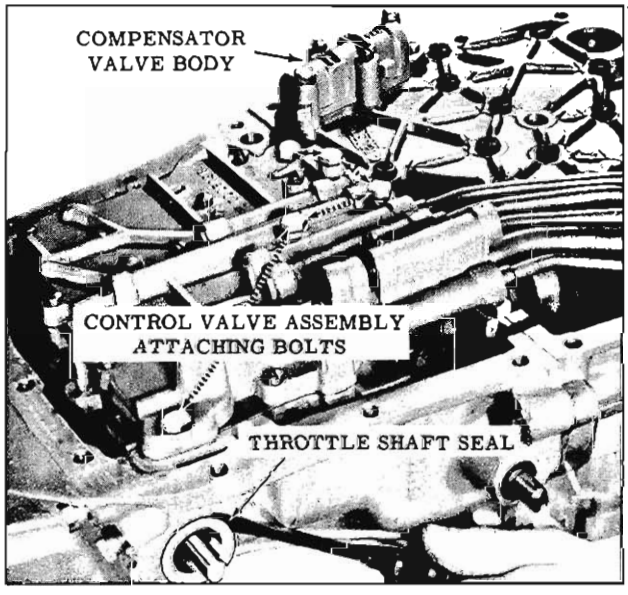


Fig. 6-21 Valve Bodies and Seal

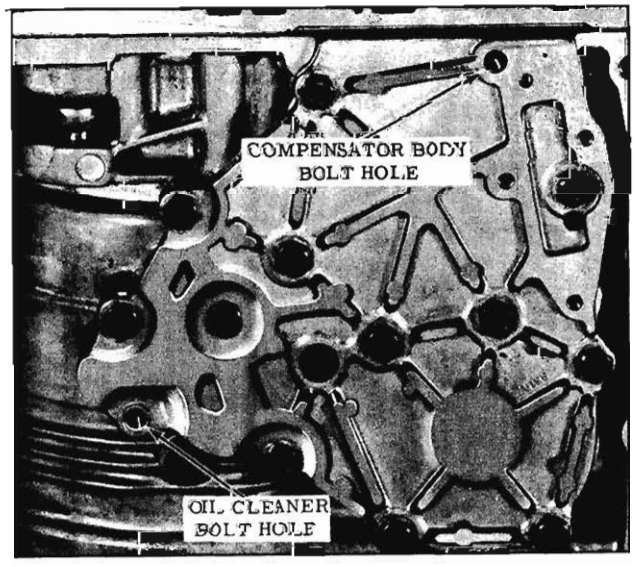


Fig. 6-22 Accumulator and Servo Cover

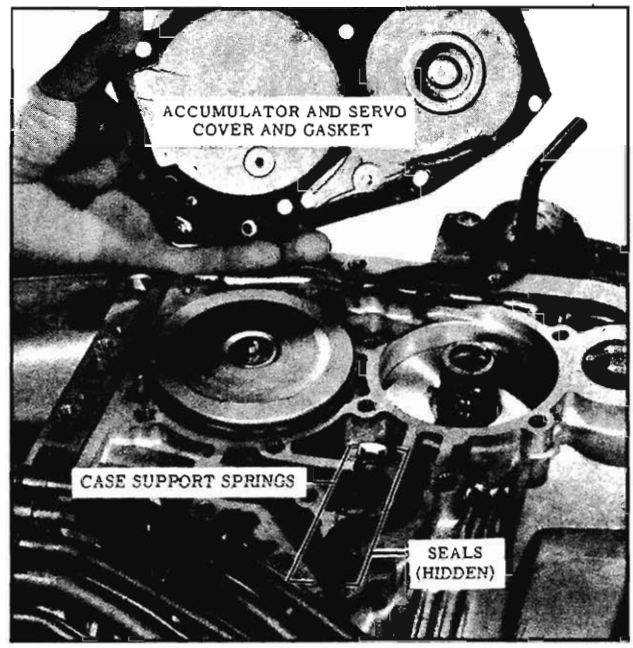


Fig. 6-23 Case Support Springs and Seals

4. Remove oil cleaner attaching bolt and oil cleaner. (Fig. 6-20)

5. Inspect and if necessary, remove the oil cleaner to case seal ring with a small screwdriver.

6. Pry T.V. shaft seal from side of rear bearing retainer. (Fig. 6-21)

7. Remove five control valve assembly attaching bolts and carefully remove control valve assembly from the pipe assembly and rear bearing retainer. (Fig. 6-21) DO NOT DROP THE MANUAL VALVE.

8. Remove manual valve from control valve assembly.

9. Remove the compensator valve body assembly from the servo and accumulator cover by removing one bolt and three screws. (Fig. 6-21)

10. Remove the servo and accumulator cover and gasket by removing the 12 remaining cover bolts. (Fig. 6-22) Cover is under spring tension.

11. Remove the three case support springs and seals. (Seals may remain in transmission case). (Fig. 6-23)

12. Remove the servo piston assembly and the servo release spring from bore in case. (Fig. 6-24)

13. Remove the lower accumulator spring and piston. (Fig. 6-24)

14. Remove the accumulator piston pin, then using

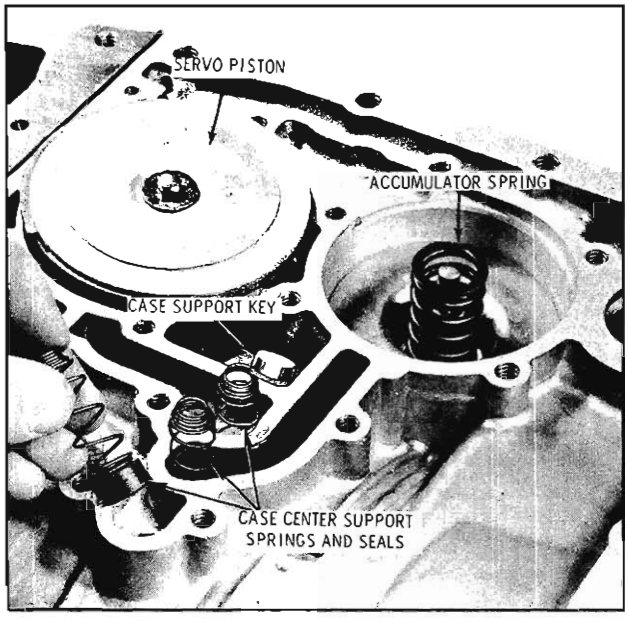


Fig. 6-24 Accumulator and Servo

the stem of the accumulator pin as a tool, remove the upper accumulator piston. (Fig. 6-25)

15. Remove the upper accumulator spring.
16. Remove the ring and seal from the lower and upper accumulator pistons.
17. Remove the pipe assembly attaching bolt, washer and seal from front of case cover and withdraw the pipe assembly and seals from transmission. Multiple seals may have remained in transmission. (Fig. 6-26)

If transmission is not to be disassembled further, refer to Page 6-54 for servicing of the valve body or Page 6-50 for servicing of the accumulator and servo.

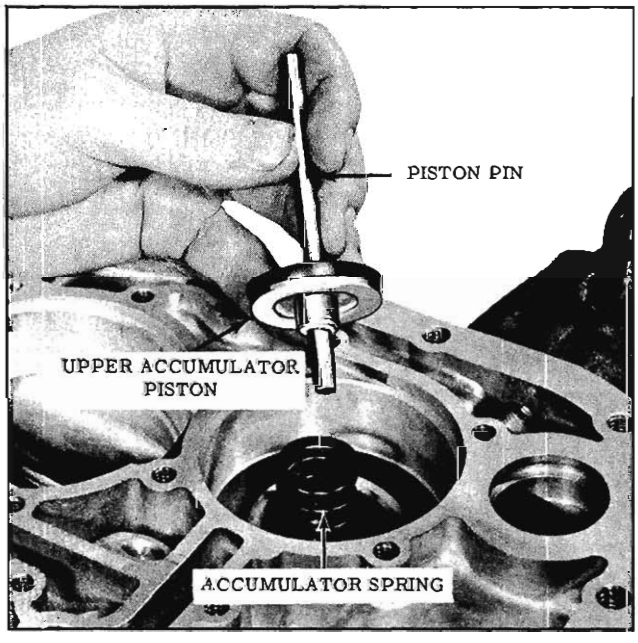


Fig. 6-25 Accumulator Removal

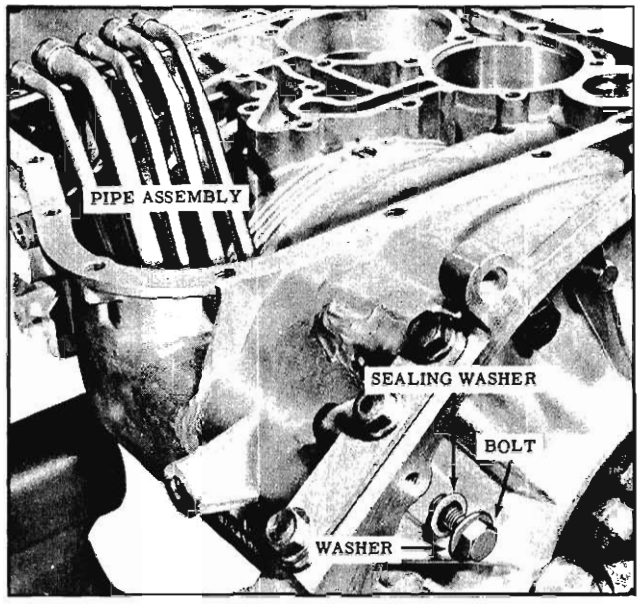


Fig. 6-26 Pipe Assembly Removal

FRONT UNIT END PLAY CHECK

If transmission is to be completely disassembled, measure front unit end play as follows:

1. Remove one case cover to case attaching bolt.
2. Install Tool J-6126 into transmission case. (Fig. 6-27)
3. Assemble Neutral Clutch Retainer J-6135 on the input shaft.
4. Clamp dial indicator on bolt from Tool J-6126

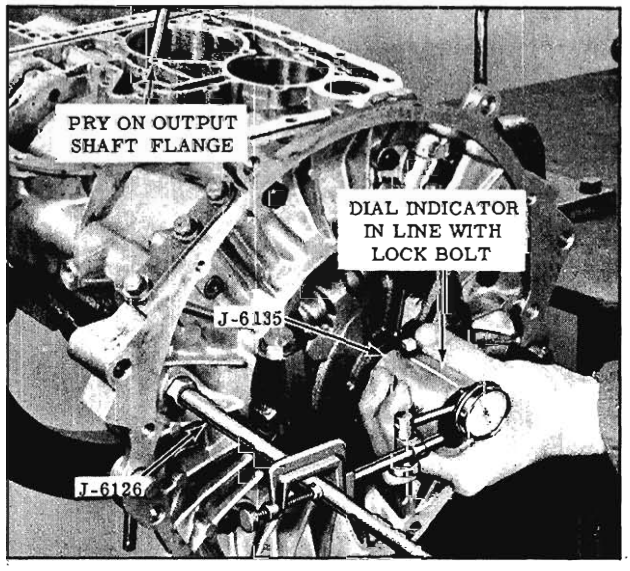


Fig. 6-27 Check End Play

and index indicator with end of Tool J-6135 in line with lock screw on tool.

5. Position a screwdriver through case, BEHIND OUTPUT SHAFT FLANGE and gently pry forward on output shaft to position units forward.

6. At the same time move Tool J-6135 and record end play. (Fig. 6-27)

7. End play should be .005" to .020". Record end play.

8. Remove the tools.

REAR BEARING RETAINER AND GOVERNOR REMOVAL

1. If rear seal replacement is necessary, drive seal from rear bearing retainer using a chisel.

2. Remove the rear bearing retainer cover and gasket by removing the four attaching bolts.

3. Rotate the transmission so that the output shaft is up, then remove the rear bearing retainer to case attaching bolts (six on outside and two on inside of rear bearing retainer.) (Fig. 6-28)

4. Reaching through access hole in rear bearing retainer, cut and remove "O" ring from output shaft, unseat the rear output shaft snap ring using Tool J-8872 and move snap ring upward over output shaft "O" ring groove. (Fig. 6-29)

5. Carefully, remove the rear bearing retainer and gasket from output shaft.

CAUTION: Care should be exercised to prevent manual shaft retainer from falling out of front face of rear bearing retainer.

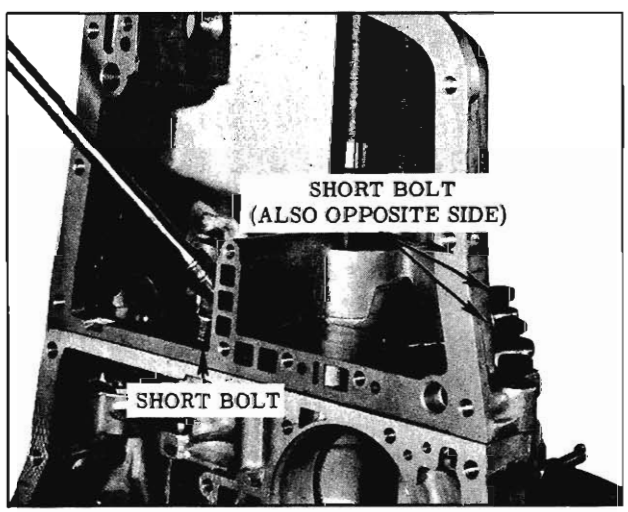


Fig. 6-28 Rear Bearing Retainer Bolts

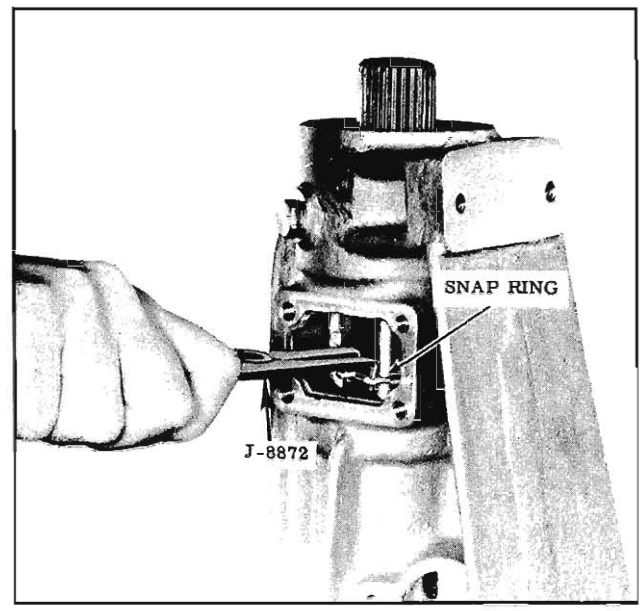


Fig. 6-29 Unseating Snap Ring

6. Remove the dislodged snap ring from rear bearing retainer.

7. Remove the remaining snap ring from the output shaft using Tool J-8872.

8. Remove the four governor attaching bolts, governor assembly and gasket from output shaft. (Fig. 6-30)

9. If alignment marks are not visible, mark one dowel pin and nearest tooth on the output shaft flange for ease in re-assembling.

CAUTION: Do not punch or scratch ground surface on output shaft flange for marking.

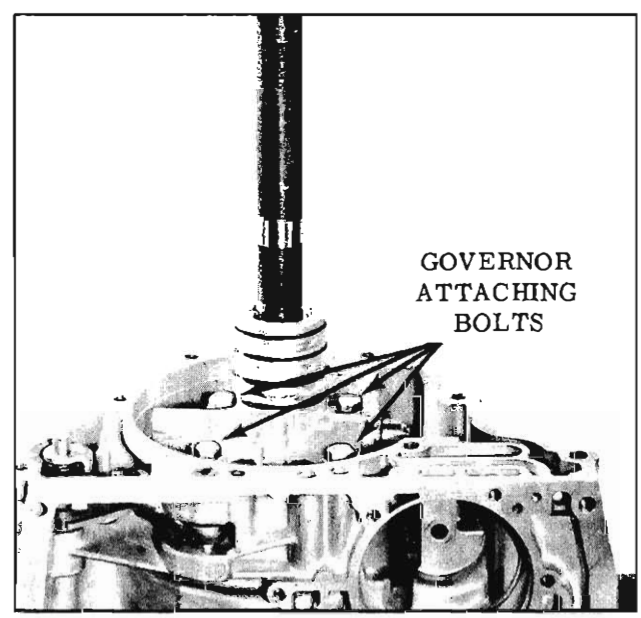


Fig. 6-30 Governor Removal

Fig. 6-31 Removing Oil Pump Seal

10. Remove the output shaft assembly from transmission by lifting straight up.

If transmission is not to be disassembled further, refer to Page 6-46 for servicing of the governor or Page 6-49 for servicing of the rear bearing retainer.

CASE COVER AND FRONT PUMP REMOVAL

1. Rotate the transmission so that the case cover and pump are up.

2. If necessary, remove and discard the pump seal by crimping seal as shown in Fig. 6-31 and withdrawing seal with needle nose pliers.

NOTE: If transmission is NOT to be disassembled, install seal as follows:

a. Place Seal Protector J-8828 over input shaft.

b. Apply seal lubricant Part No. 567196 to the sealing lip of a new seal.

c. Apply a film of sealer, Part No. 557622 to the outer diameter of the seal.

d. Install seal using Tool J-8761. (Fig. 6-32)

3. Remove six large and three small case cover to case attaching bolts.

NOTE: Two of the small bolts are attached from the case side of the case cover.

4. Install Seal Protector J-8828 over input shaft, if pump seal was not removed.

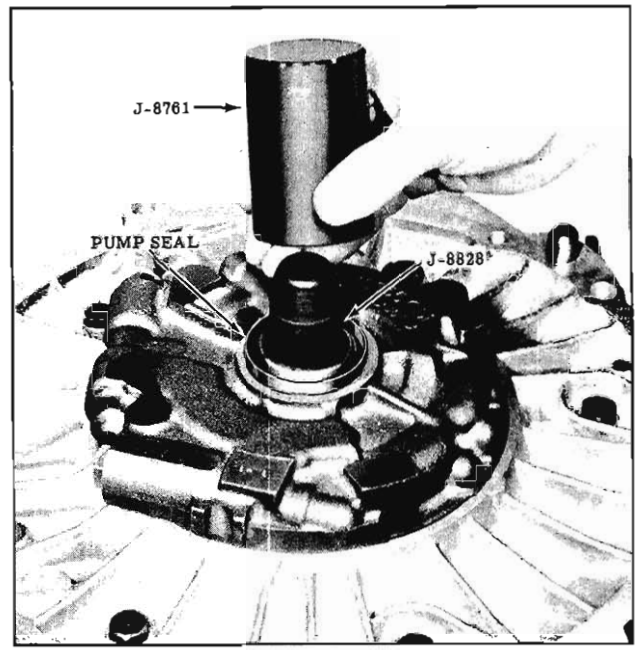


Fig. 6-32 Installing Pump Seal

5. Remove case cover and pump assembly by lifting straight up. Slight tapping with plastic hammer may be necessary.

6. Remove case cover to case gasket and discard.

7. Remove bearing race if it remained on the torus cover.

If transmission is not to be disassembled further, refer to Page 6-41 for servicing of the case cover or Page 6-42 for servicing of the oil pump.

TORUS REMOVAL

1. Install a box end wrench as a holding tool,

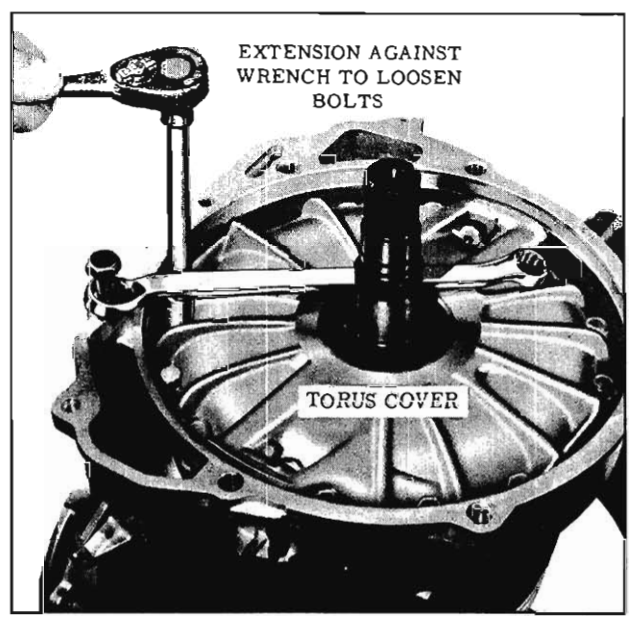


Fig. 6-33 Removing Torus Cover Bolts

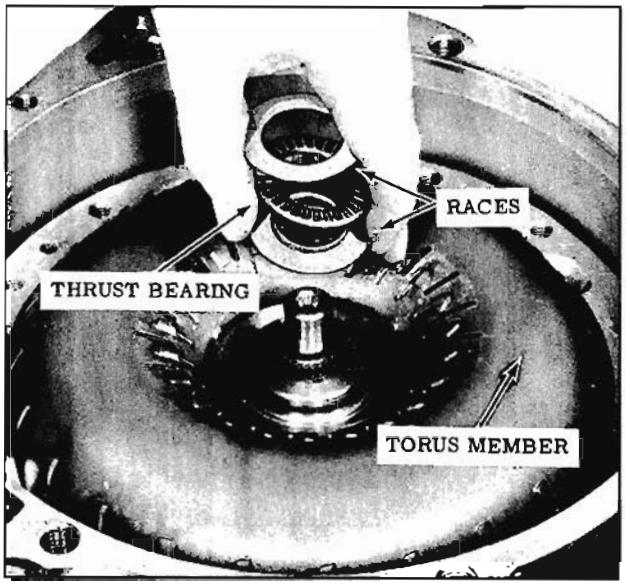


Fig. 6-34 Removing Bearing and Races

using a large case cover attaching bolt. (Fig. 6-33)

2. Completely loosen 12 torus cover attaching bolts and remove the holding wrench.

3. Remove torus cover from torus assembly by lifting input shaft straight up.

4. Remove and DISCARD torus cover to drive torus gasket.

5. Remove race, thrust bearing, and race from either torus cover or torus member. Parts may have remained with either unit. (Fig. 6-34)

6. Rotate transmission to horizontal position with bottom up.

7. From the front of the transmission remove the driven torus member to main shaft Spirolox ring, with a small pointed tool. (Fig. 6-35)

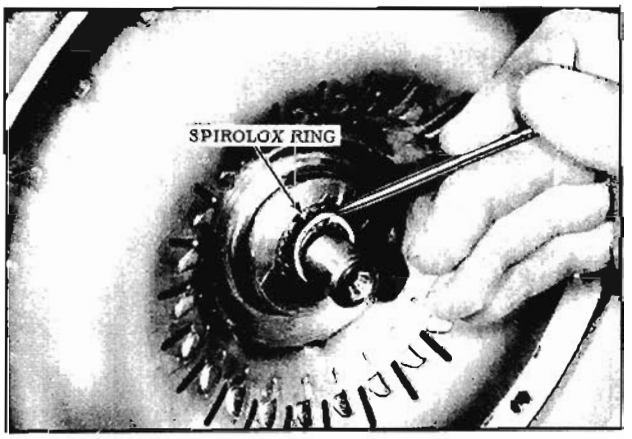


Fig. 6-35 Removing Spirolox Ring

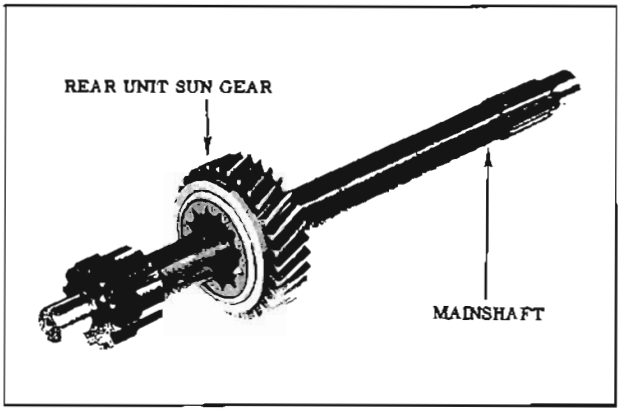


Fig. 6-36 Sun Gear Removal

8. Push main shaft through driven torus member and remove driven torus member.

9. Remove race, thrust bearing and race from drive torus member.

NOTE: Some of these parts may have been removed with the driven torus member.

10. Remove the mainshaft and sun gear from the rear of the transmission.

11. Remove the bearing and race from the rear carrier.

NOTE: These parts may have remained with the main shaft.

12. Remove sun gear from main shaft. (Fig. 6-36)

13. From the front of the transmission, remove the drive torus member and accel-a-rotor as a unit. (Fig. 6-37)

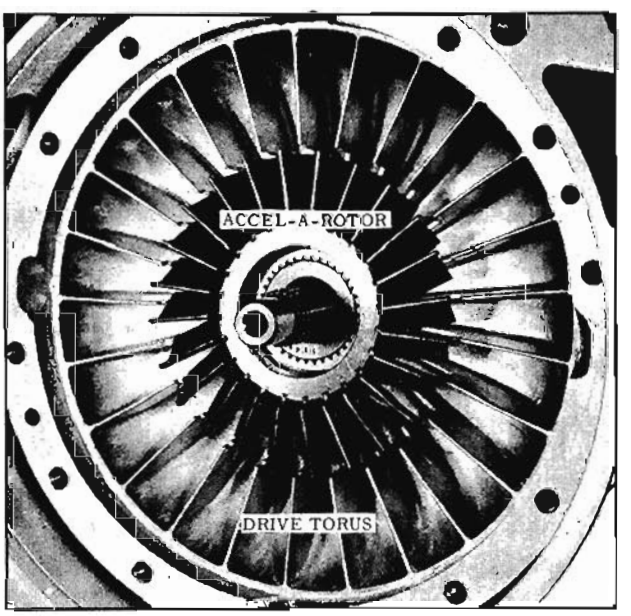


Fig. 6-37 Drive Torus and Accel-A-Rotor

Fig. 6-38 Accel-A-Rotor

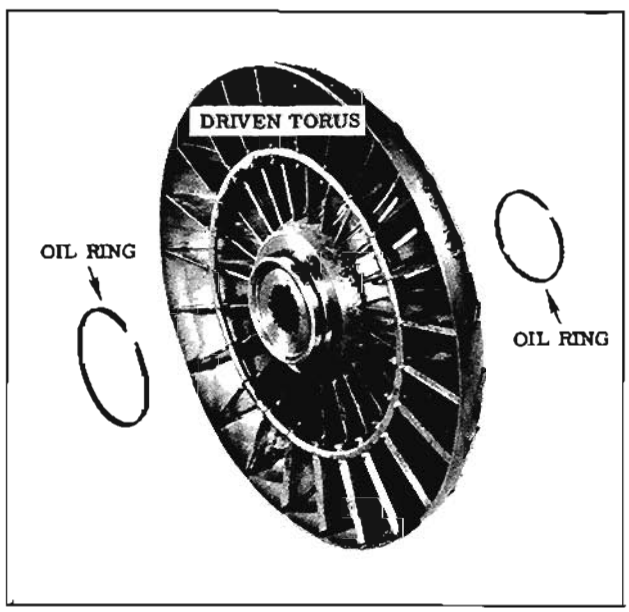


Fig. 6-39 Driven Torus

14. Remove the accel-a-rotor by pushing from rear of the drive torus member.

15. If necessary, remove oil rings from drlven torus member and accel-a-rotor (three rings). (Figs. 6-38 and 6-39)

    If transmission is not to be disassembled further, refer to Page 6-46 for servicing of the torus cover.

FRONT AND REAR UNITS REMOVAL

1. Remove front carrier to carrier shaft snap ring. (Fig. 6-40)

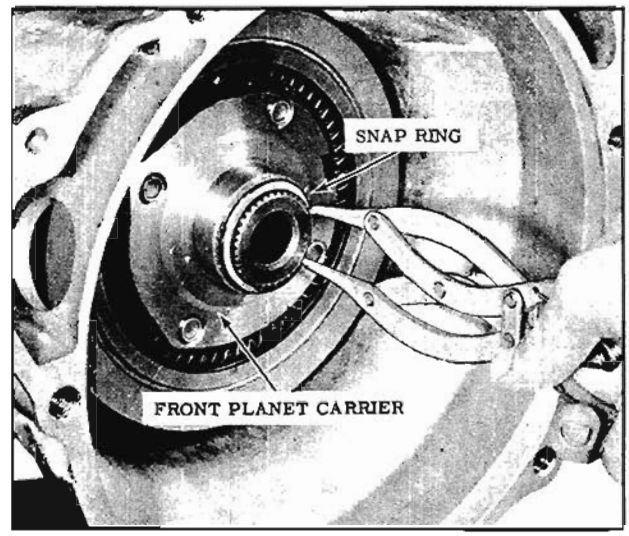


Fig. 6-40 Removing Snap Ring

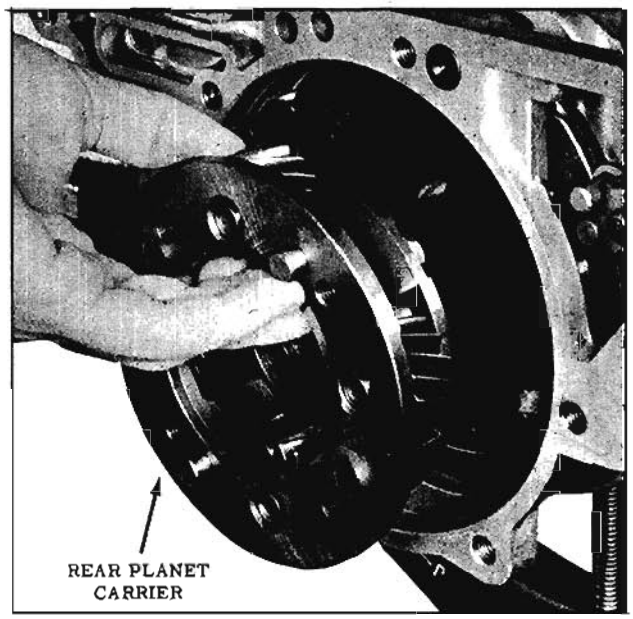


Fig. 6-41 Removing Rear Carrier

2. Remove the front unit carrier assembly.

3. Remove race, thrust bearing and race.

    NOTE: Some of these parts may have remained with the carrier.

4. Remove the rear carrier and shaft assembly from the rear of the transmission. (Fig. 6-41)

5. Remove the thrust bearing from the rear unit carrier assembly. (Fig. 6-42)

    NOTE: Thrust bearing may have remained with the rear unit internal gear.

6. Make certain parking pawl is disengaged, then remove the rear unit internal gear and clutch assembly. (Fig. 6-43)

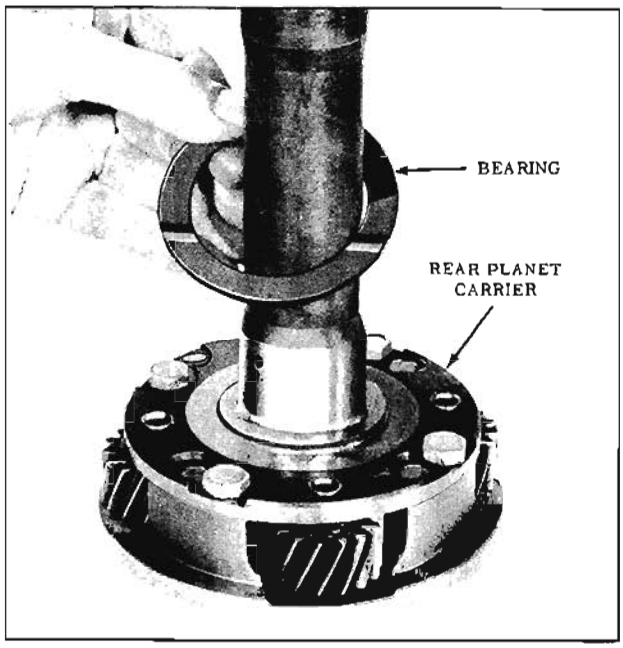


Fig. 6-42 Thrust Bearing

7. Rotate the transmission 90° so that the front of transmission is up.

   CAUTION: Transmission parts are loose and will drop out if transmission is not rotated as described.

8. Remove the front unit sun gear assembly, race, thrust bearing and race. (Fig. 6-44)

9. Remove the front unit gear and clutch assembly from the front of transmission.

10. Remove the fiber thrust washer from the front clutch drum. (Fig. 6-45)

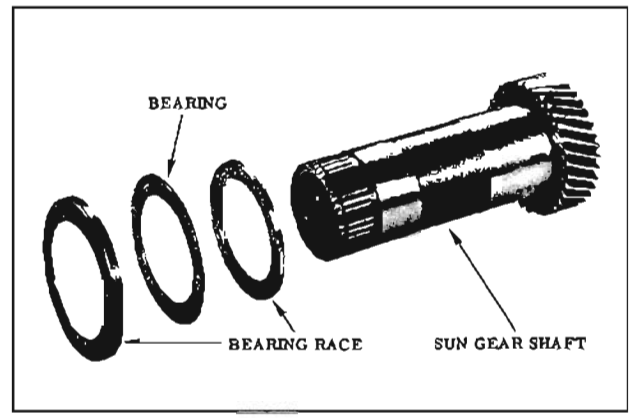


Fig. 6-44 Bearing and Races

NOTE: The fiber thrust washer may have remained on the case support.

11. Remove the reverse stationary cone to case snap ring.

12. Using Reverse Cone Puller, J-8768, remove the reverse cone and reverse stationary cone. Position tool under lugs of reverse cone and pull upward. (Fig. 6-46)

    A slide hammer (J-6125) can be used as illustrated.

13. Remove the reverse and neutral piston and case support assembly.

    NOTE: If assembly is tight in case, loosen both holding fixture screws slightly and gently tap case support with soft hammer from rear.

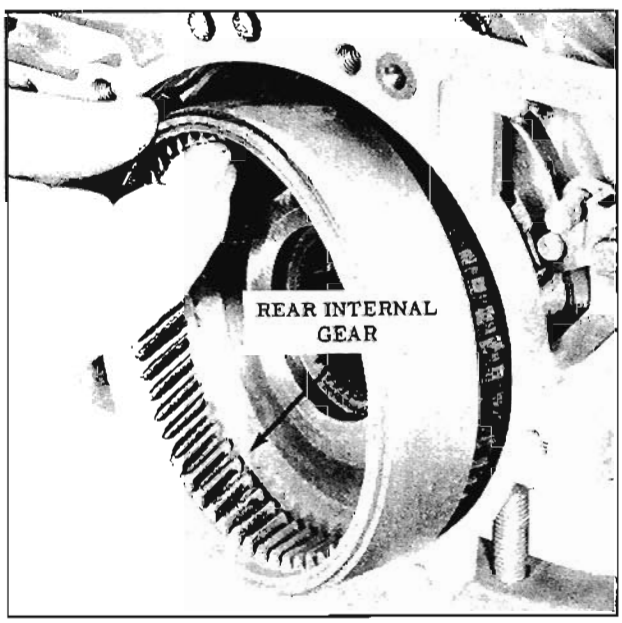


Fig. 6-43 Removing Internal Gear

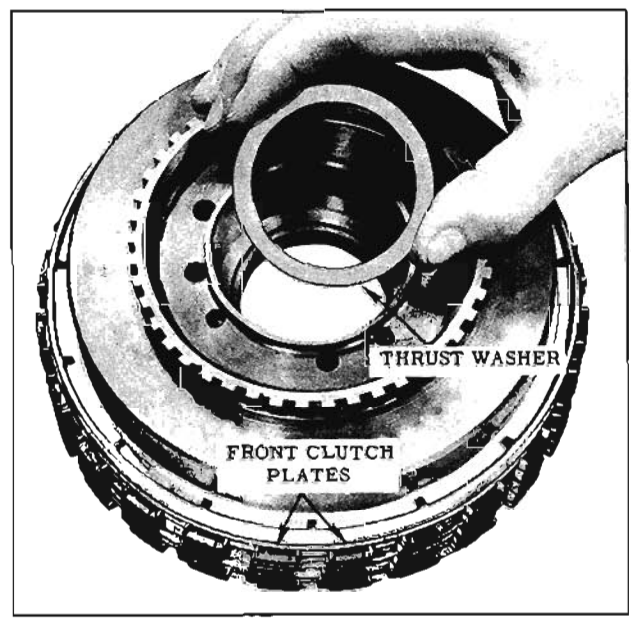


Fig. 6-45 Front Clutch

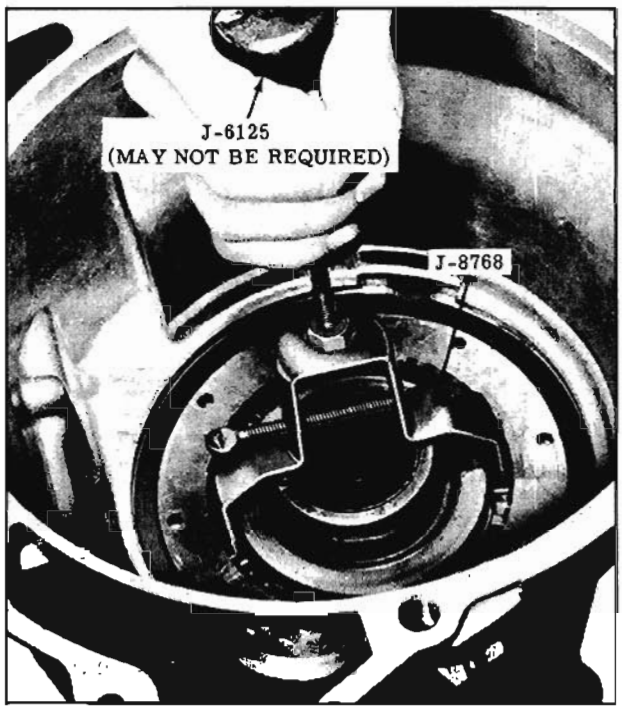


Fig. 6-46 Removing Reverse Cone

14. Remove the case support key from the transmission case if still in position. (Fig. 6-47)
15. Remove the neutral clutch plates (four drive composition and four driven steel) and clutch backing plate from transmission case. (Fig. 6-47)
16. Rotate the transmission so that the rear of the case is up.
17. Unhook the band from the anchor and lift upwards to remove. (Fig. 6-48)

If transmission is not to be disassembled further, refer to Page 6-44 for servicing of the reverse and neutral clutch, Page 6-51 for servicing of the front clutch, or Page 6-52 for servicing of the rear internal gear and sprag.

PARKING PAWL LINKAGE REMOVAL

If necessary, remove the parking pawl linkage

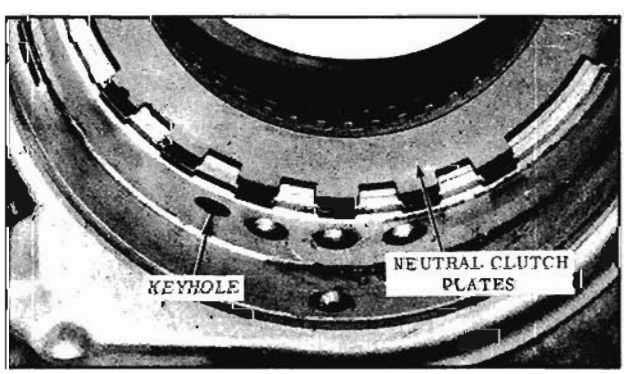


Fig. 6-47 Case Support Key

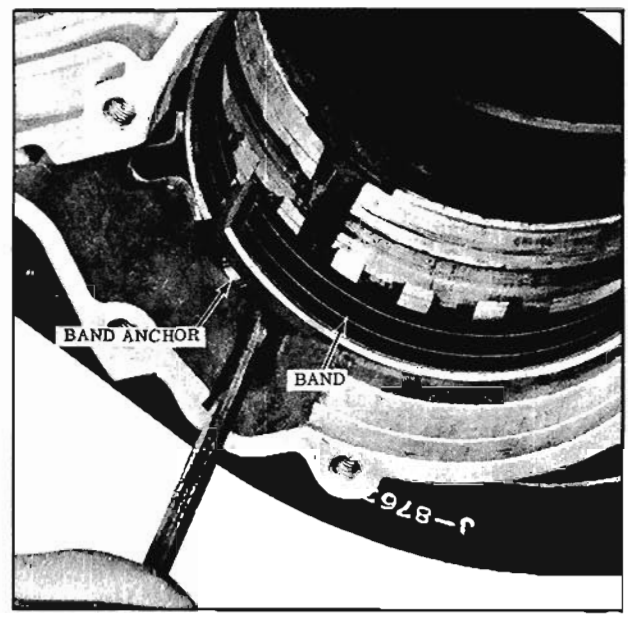


Fig. 6-48 Removing Overrun Band

as follows:

1. While holding parking brake link stop against parking bracket pin, unhook spring from parking lever assembly. (Fig. 6-49 and Fig. 6-50).
2. Remove parking bracket and spring.
3. Remove parking bracket pin.
4. Remove parking pawl shaft and spacer. Spacer might drop from case.
5. Remove parking pawl, link and lever assembly.

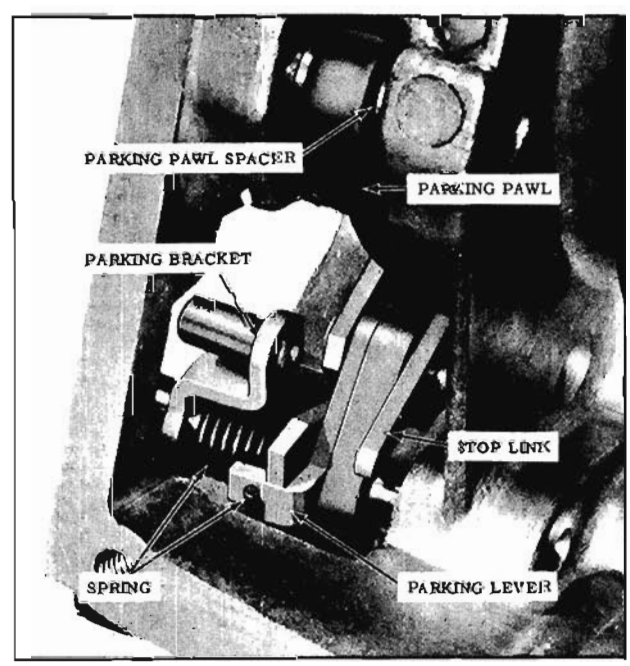


Fig. 6-49 Parking Pawl Linkage

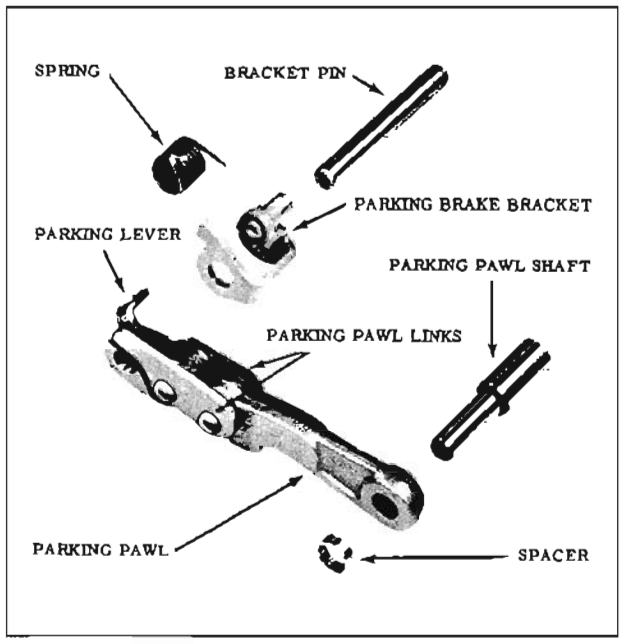


Fig. 6-50 Parking Pawl Assembly

DISASSEMBLY AND ASSEMBLY OF INDIVIDUAL UNITS

CAUTION: Before installing cap screws into aluminum parts, the screws should be dipped into Hydra-Matic oil to prevent galling and/or seizing of threads.

CASE COVER DISASSEMBLY

1. Loosen six case cover to pump attaching bolts approximately four turns.

2. Support cover so that pump is off bench and gently tap loosened bolts to disengage pump from case cover. (Fig. 6-51)

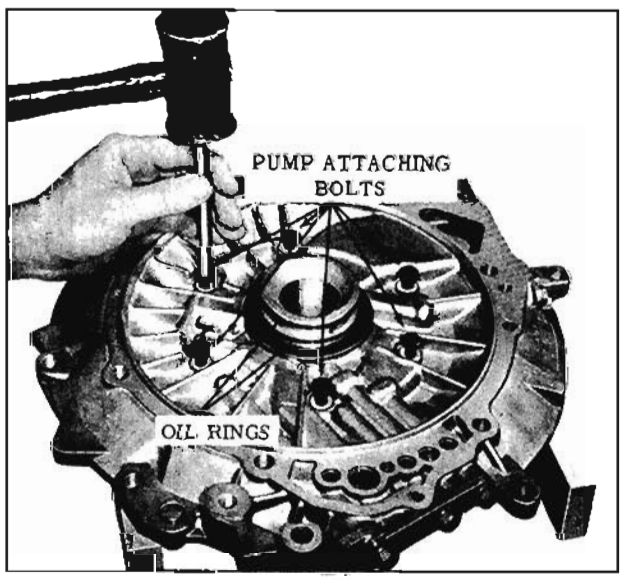


Fig. 6-51 Removing Oil Pump

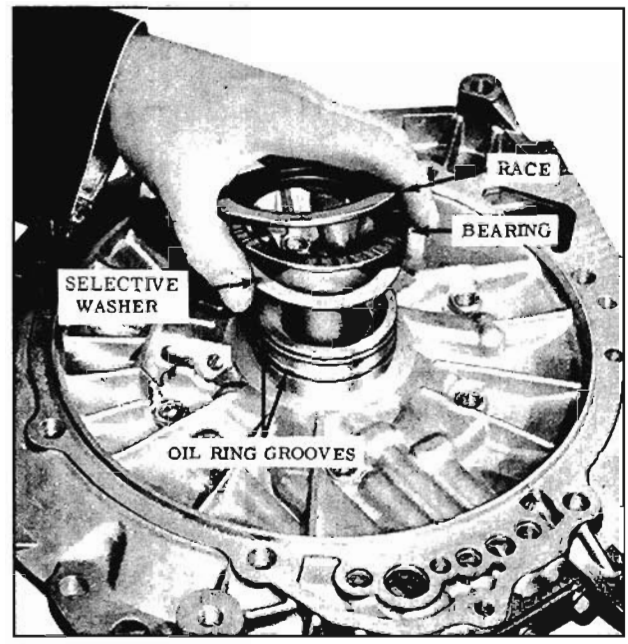


Fig. 6-52 Removing Race, Bearing and Washer

3. Remove six bolts from case cover.

4. Remove two lock type oil rings from case cover.

5. Remove race, thrust bearing, race and selective washer(s) from case cover. (Fig. 6-52)

6. Remove three case cover bolts, plate and gasket and the remaining bolt and seal in the case cover, if necessary for cleaning passages.

ASSEMBLY OF CASE COVER

1. If removed, install case cover plate and gasket with three attaching bolts and seal washers.

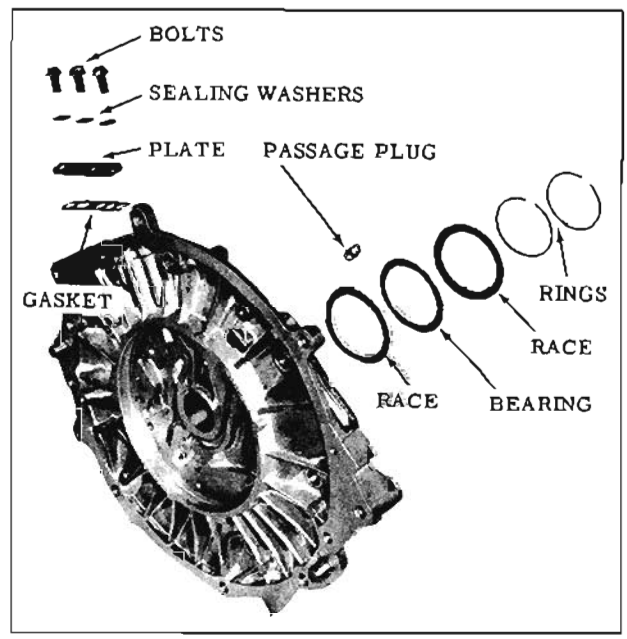


Fig. 6-53 Case Cover Assembly

Torque 18 to 20 ft. lbs. (Fig. 6-53)

2. If removed, install bolt and seal washer in case cover. Torque 18 to 20 ft. lbs.

3. Install selective washer(s) over tower of case cover.

   NOTE: If end-play was incorrect during disassembly, check thickness of old washer, then refer to selective washer chart and install new thrust washer.

4. Install race, thrust bearing and cupped race (cup side down) and retain with petrolatum.

5. Install two lock type oil rings on tower.

SELECTIVE THRUST WASHER CHART

PART NO.	THICKNESS	COLOR INDENT.
8620697	.027"-.029"	Bright & Notched
8620698	.036"-.038"	Copper
8620699	.045"-.047"	Black
8620700	.054"-.056"	Bright

PUMP DISASSEMBLY (Fig. 6-54)

1. Inspect and remove "O" ring from pump, if condition indicates replacement is necessary.

2. Remove the pump cover to body attaching screw.

3. Remove the pump cover from the pump and roll pin. Do not pry to remove. Rotating the cover will aid removal. Remove ball check.

4. Remove the top vane ring, rotor, 11 vanes and bottom vane ring.

5. Remove the pump slide by compressing slide against priming springs and lift up on opposite end.

6. Remove the inner and outer priming springs.

7. Remove the coupling feed limit plug and "O" ring.

8. From the same bore remove the coupling limit spring, guide pin and valve.

9. Remove the pressure regulator plug assembly and "O" ring.

10. Remove the booster plug from the pressure regulator plug.

11. Remove the booster plug stop sleeve from pump.

12. Remove the pressure regulator valve spring and valve.

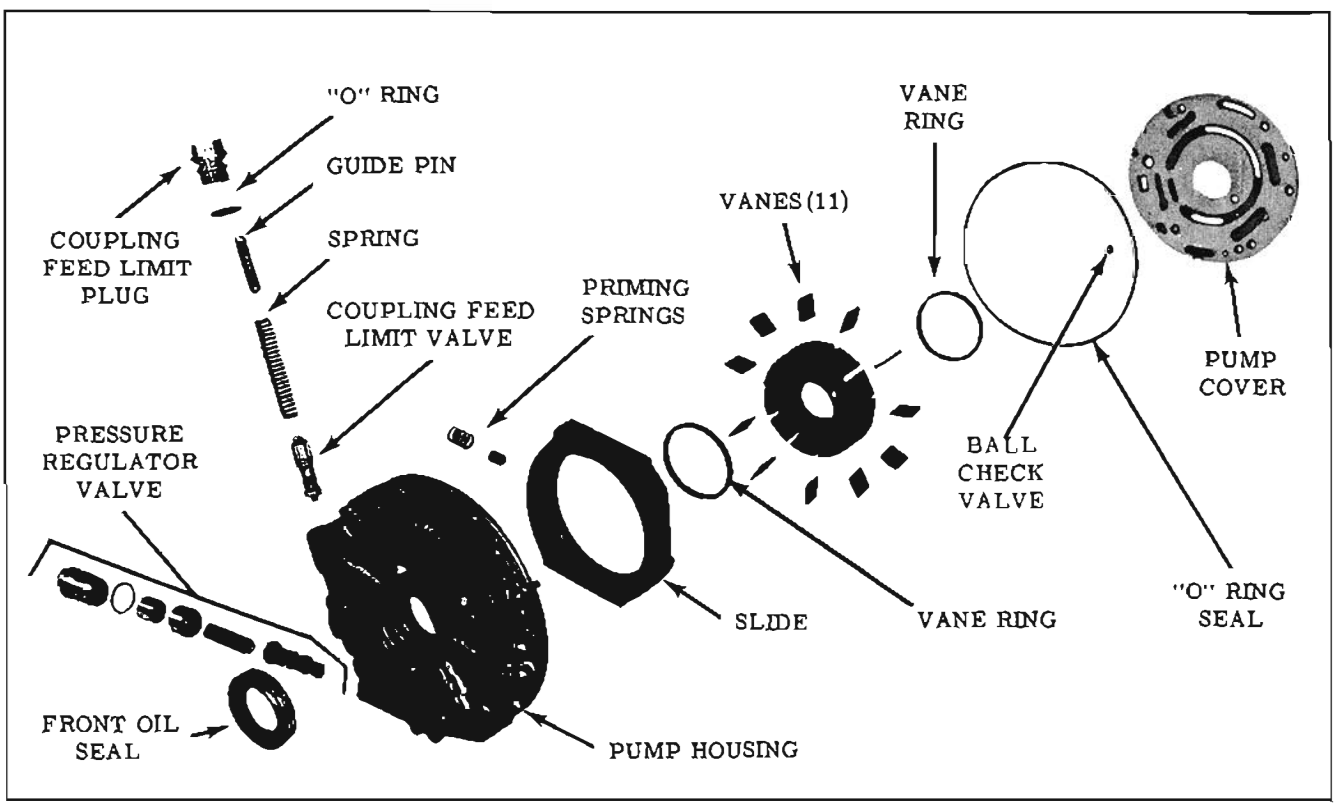


Fig. 6-54 Oil Pump Assembly

13. If necessary, remove rubber cushion from pressure regulator valve.

PUMP ASSEMBLY (Fig. 6-54)

1. Install new cushion on pressure regulator valve if previously removed, and install pressure regulator spring on valve.

   NOTE: If a new pressure regulator spring is installed, it will be necessary to check line pressure after transmission is installed. If line pressure is incorrect, it will be necessary to install a selective booster plug. This information is included in the transmission installation procedure.

2. Install pressure regulator valve and spring in bore of pump.

3. Install pressure regulator booster plug stop into pump, over the spring.

4. Install new "O" ring on pressure regulator plug, if condition warrants.

5. Install booster plug into pressure regulator plug, cup side out.

6. Install plug assembly into pump. Torque 15 to 20 ft. lbs.

7. Install coupling limit valve, spring and pin into pump.

8. Install new "O" ring on coupling feed limit valve plug, if condition warrants.

9. Install coupling feed limit valve plug into pump. Torque 15 to 20 ft. lbs.

10. Install inner and outer pump priming springs into bottom cavity of pump.

11. Assemble slide into pump body by compressing slide against priming springs at lower end until slide can be fully installed into pump. (Fig. 6-55)

12. Install bottom vane ring into pump cavity.

13. Install pump rotor (hub side down) in pump pocket over vane ring.

14. Install 11 vanes into rotor and install ball check. (Fig. 6-56)

    NOTE: Install the vanes so that the ring wear pattern on the edge of the vane is against the guide ring.

15. Install top vane ring on rotor.

16. Install pump cover over roll pin, center cover and torque screw 6 to 8 ft. lbs. (Fig. 6-57)

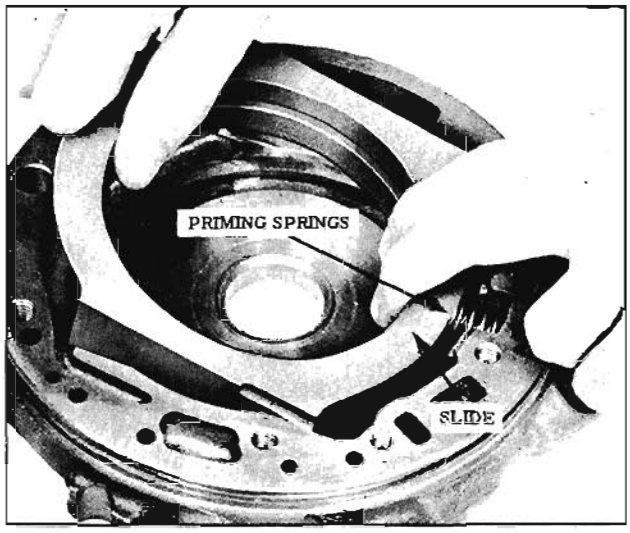


Fig. 6-55 Installing Pump Slide

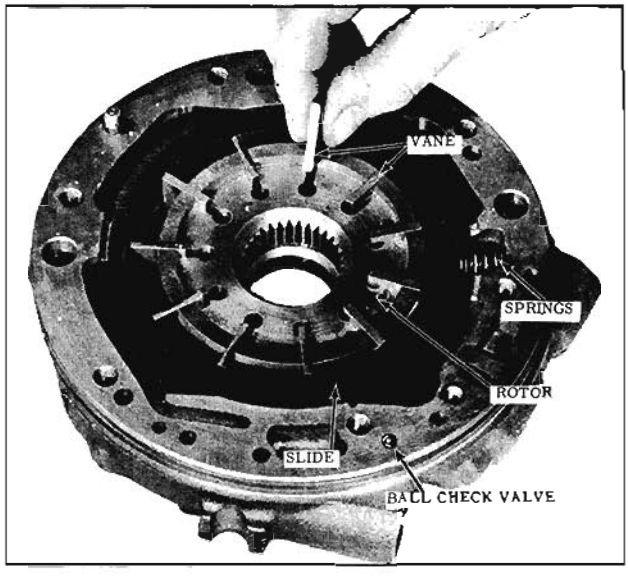


Fig. 6-56 Installing Pump Vanes

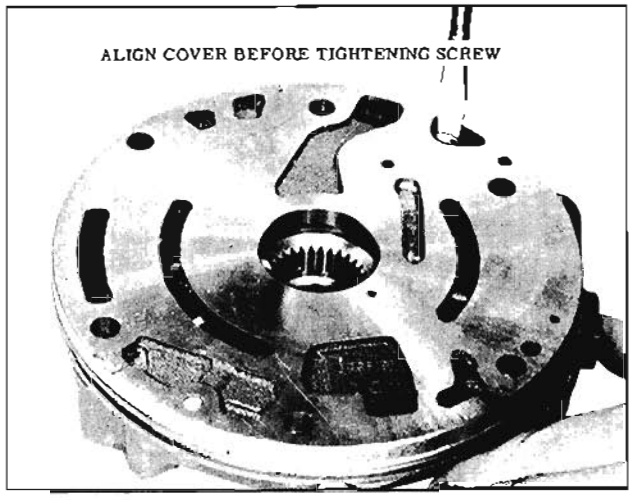


Fig. 6-57 Installing Pump Cover

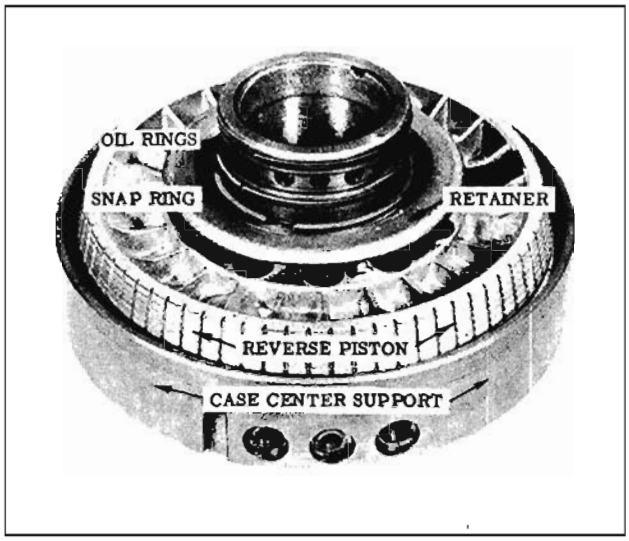


Fig. 6-58 Case Support and Reverse Piston

17. Install "O" ring on pump, if removed.

18. If front seal was removed, install a NEW one as follows:
    a. Apply seal lubricant Part No. 567196 to the sealing lip of a new seal.
    b. Apply a light coat of sealer Part No. 557622 to the outer diameter of the seal.
    c. Position seal into pump and install seal with Tool J-8761.

ASSEMBLY OF PUMP ASSEMBLY TO CASE COVER

1. Position the case cover on the pump, aligning the bolt holes.

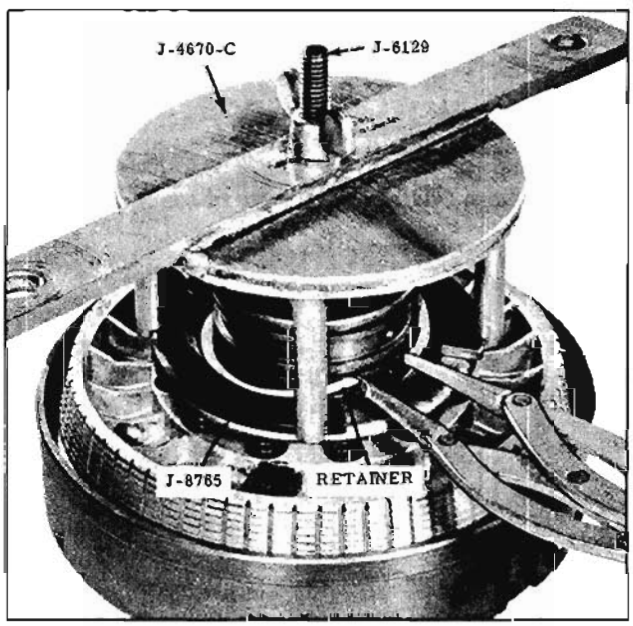


Fig. 6-59 Removing Reverse Release Spring Retainer

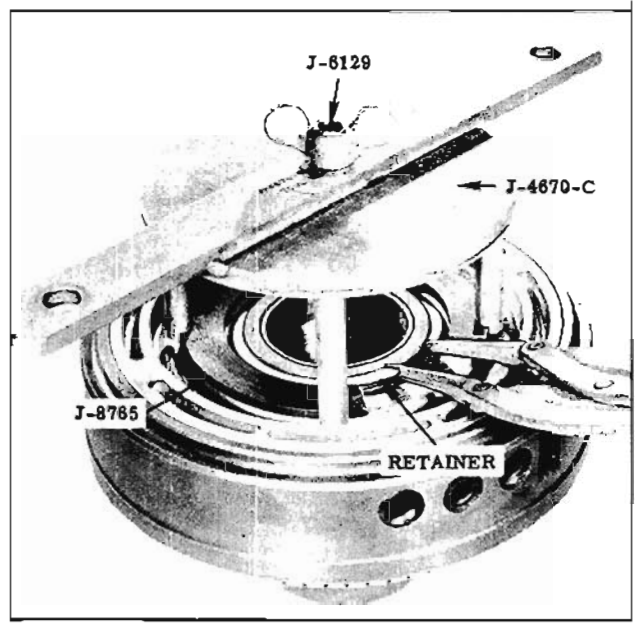


Fig. 6-60 Removing Neutral Clutch Retainer

2. Install six case cover to pump attaching bolts, draw the bolts up evenly to properly seat the "O" ring seal in the case cover. Torque 15 to 18 ft. lbs.

If other units are not to be serviced, refer to Page 6-65.

REVERSE AND NEUTRAL CLUTCH DISASSEMBLY

1. Remove two oil rings from hub of case support. (Fig. 6-58)

2. Using Tools J-8765, J-6129, and J-4670-C, remove reverse release spring retainer snap ring. (Fig. 6-59)

3. Remove tools from the reverse and neutral clutch assembly.

4. Remove the reverse release spring retainer and 12 release springs.

5. Remove reverse clutch piston. It may be necessary to tap housing to permit removal.

6. Remove inner and outer reverse piston seal rings and discard.

7. Using Tools J-8765, J-6129, and J-4670-C, remove neutral clutch release spring retainer snap ring. (Fig. 6-60) Remove tools.

8. Remove neutral clutch release spring retainer and 16 neutral clutch release springs. Do not mix springs with reverse release springs. (Neutral clutch springs are longer).

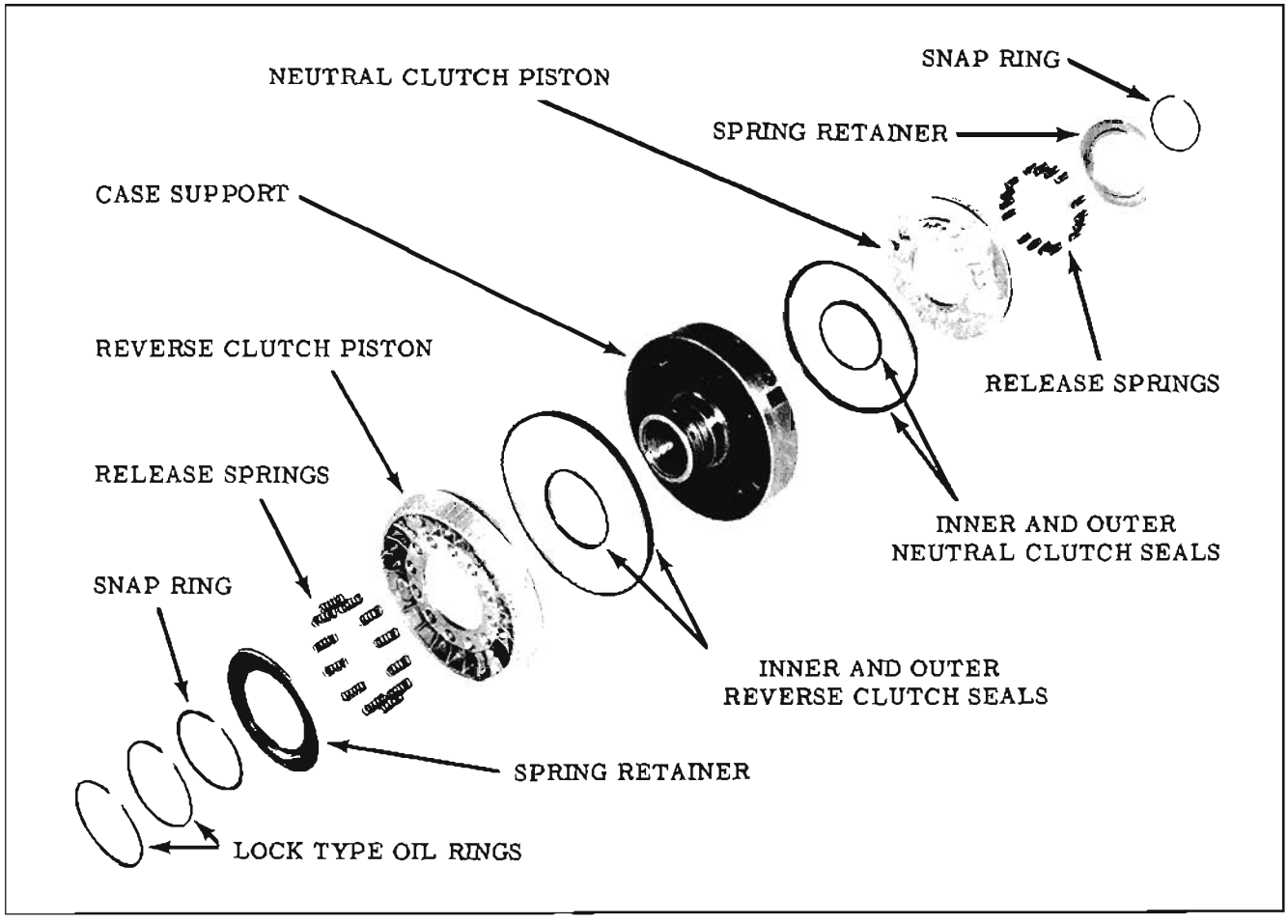


Fig. 6-61 Reverse and Neutral Clutch Assembly

9. Remove neutral clutch piston. It may be necessary to tap housing.

10. Remove inner and outer neutral clutch seal rings and discard.

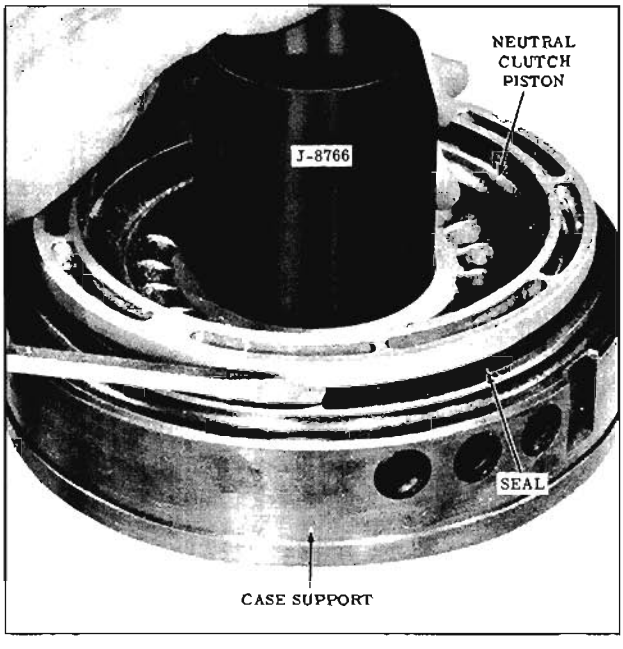


Fig. 6-62 Installing Neutral Clutch Piston

ASSEMBLY OF REVERSE AND NEUTRAL CLUTCH (Fig. 6-61)

1. Install new inner and outer neutral clutch seals. Lip of seals should face the neutral clutch housing.
2. Install Inner Seal Protector J-8766 over neutral clutch hub. (Fig. 6-62)
3. Install neutral clutch piston so that spring pockets are not over web in case support. Use small blade screwdriver to depress lip of seal into case support. Remove seal protector.
4. Install 16 release springs into spring pocket of neutral clutch piston and place spring retainer over spring. (Neutral clutch springs are longer than reverse piston springs.)
5. Using Tools J-8765, J-6129, and J-4670-C, compress neutral clutch release springs and install retainer snap ring. (Fig. 6-60) Remove tools.
6. Install Inner Seal Protector Tool J-8766 over reverse piston hub and install Reverse Outer Seal Protector Tool J-8767 into case support. (Fig. 6-63)

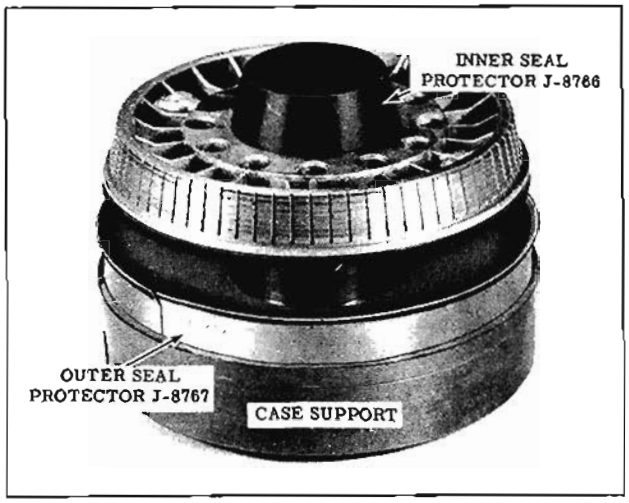


Fig. 6-63 Installing Reverse Piston

7. Install new inner and outer reverse piston seals on reverse piston, lip of seals facing dowel pins.

8. Install reverse piston, aligning piston to index with dowel pins, then remove tools.

9. Install 12 reverse piston release springs into spring pockets.

10. Install reverse piston spring retainer.

11. Using Tools J-8765, J-6129 and J-4670-C, compress release springs. (Fig. 6-59)

12. Install reverse piston spring retainer snap ring and remove tools.

13. Check all springs for proper position in pockets.

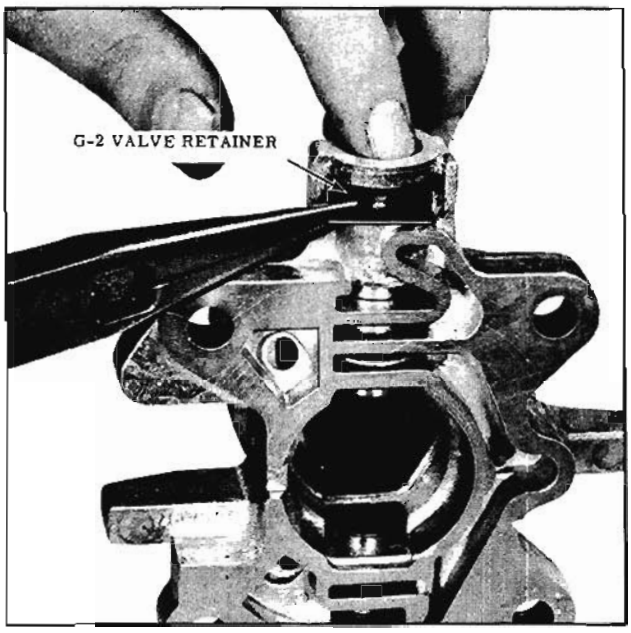


Fig. 6-64 Removing Retainer

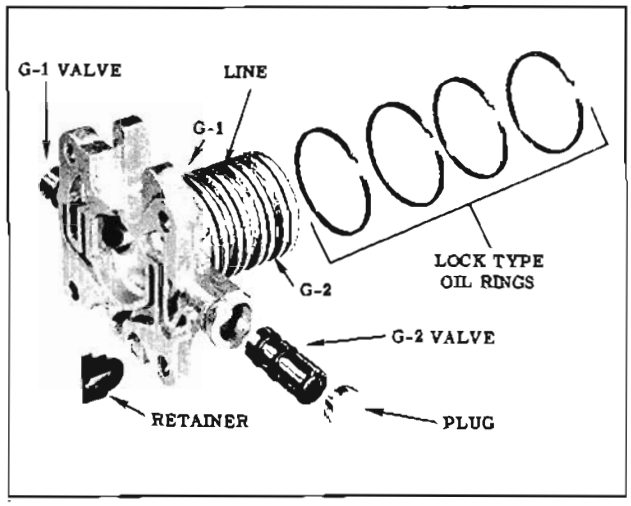


Fig. 6-65 Governor Assembly

14. Install two lock type oil rings on hub of case support.

If other units are not to be serviced, refer to Page 6-60.

GOVERNOR DISASSEMBLY

1. Compress tang of G-2 plug retainer and remove. (Fig. 6-64)
2. Remove G-2 plug and G-2 valve.
3. Inspect and remove if necessary, four governor lock type oil rings from governor tower.

ASSEMBLY OF GOVERNOR (Fig. 6-65)

1. If removed, install four lock type governor oil rings on governor tower.
2. Install G-2 valve (small land first) into governor.
3. Install G-2 plug with the flat side out.
4. Install G-2 plug retainer with tang side out.

If other units are not to be serviced, refer to Page 6-64.

DISASSEMBLY OF TORUS COVER (Fig. 6-66)

1. Inspect and remove if necessary, hook type oil ring from input shaft.
2. Install Exhaust Valve Retaining Tool J-6122-1.
3. Remove torus exhaust valve cover screw with Tool J-8874. An impact wrench will aid removal.
4. Remove exhaust valve cover, steel gasket, valve and spring. Discard the gasket.

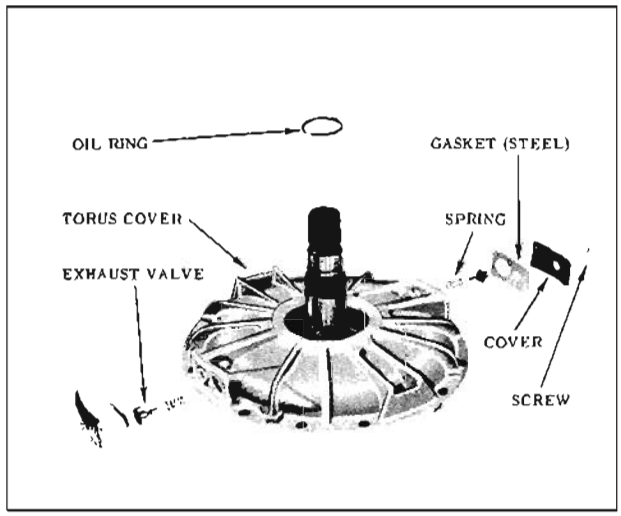


Fig. 6-66 Torus Cover Assembly

5. Repeat operation for second exhaust valve.

ASSEMBLY OF TORUS COVER (Fig. 6-66)

1. Install exhaust valve spring and valve.
2. Install Exhaust Valve Retaining Tool J-6122-1. (Fig. 6-67)
3. Install torus cover exhaust valve gasket and cover. Torque the retaining screw 20 to 25 ft. lbs. using Tool J-8874. (Fig. 6-67)
4. Repeat operation for second exhaust valve.
5. Install lock type oil ring on input shaft, if removed.

If other units are not to be serviced, refer to Page 6-65.

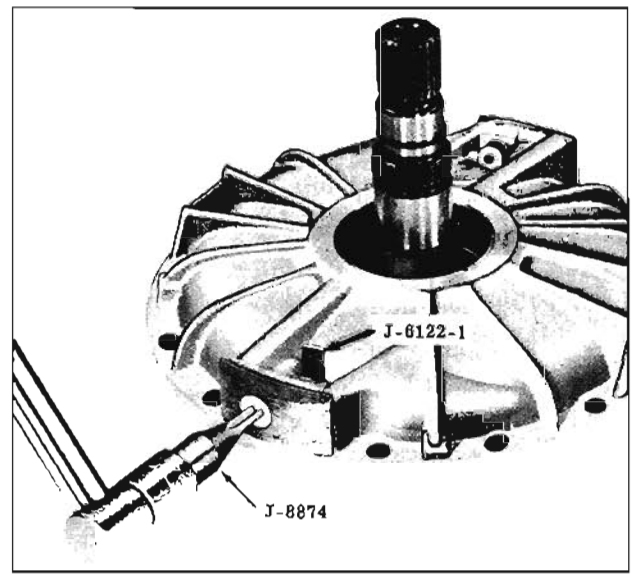


Fig. 6-67 Installing Exhaust Valve Cover

COMPENSATOR VALVE

The "O", "OC", and "OCH" transmissions use a three stage valve and the "OA", "OB" and "OBH" use a two stage valve, refer to respective procedure.

DISASSEMBLY OF TWO STAGE COMPENSATOR VALVE BODY (Fig. 6-68)

1. Compress compensator plug and remove retaining pin and plug.
2. Remove secondary compensator valve and spring.
3. Remove primary compensator valve and spring.

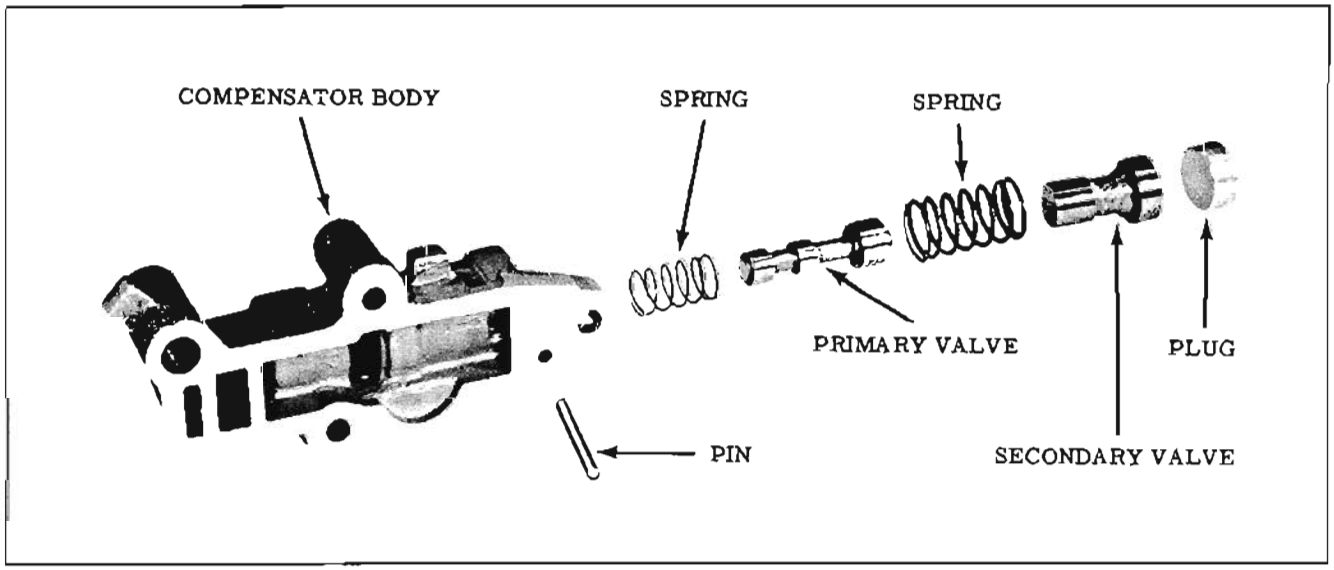


Fig. 6-68 Two Stage Compensator Valve ("OA", "OB" and "OBH")

ASSEMBLY OF TWO STAGE COMPENSATOR VALVE BODY (Fig. 6-68)

1. Install primary compensator spring on primary compensator valve.
2. Install primary compensator spring and valve (small end first into body).
3. Install secondary compensator spring on secondary compensator valve.
4. Install the secondary spring and valve into compensator body (spring end first).
5. Install compensator plug, compress and install retaining pin.

DISASSEMBLY OF THREE STAGE COMPENSATOR VALVE BODY (Fig. 6-69)

1. Remove the retaining pin from the end of the compensator body.

   CAUTION: The parts are under spring tension.

2. Remove the bore plug, secondary compensator valve and spring and the primary compensator valve and spring.
3. Remove the compensator limit valve retaining ring with a needle nose pliers.
4. Remove the compensator limit valve and spring.

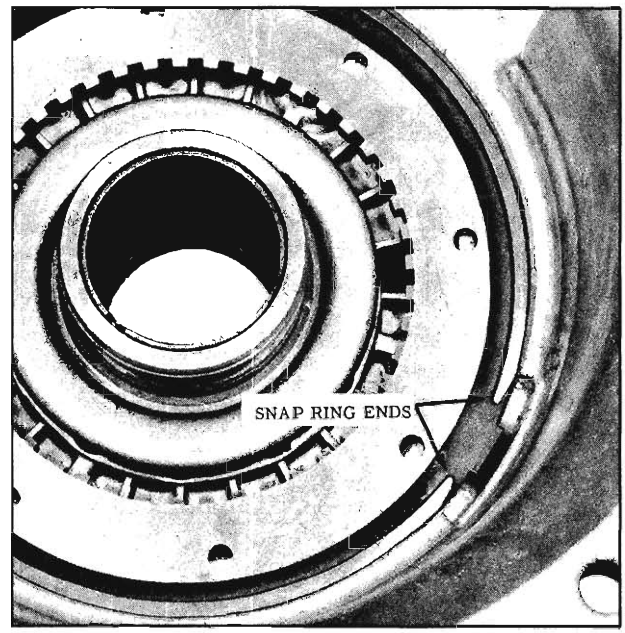


Fig. 6-69 Three Stage Compensator Valve ("O", "OC" & "OCH")

ASSEMBLY OF THREE STAGE COMPENSATOR VALVE BODY

1. Install the compensator limit valve spring.
2. Install the compensator limit valve, straight land first into the body.
3. Compress the valve against the spring and install the retaining ring over the groove in the limit valve.
4. Install the primary compensator spring and

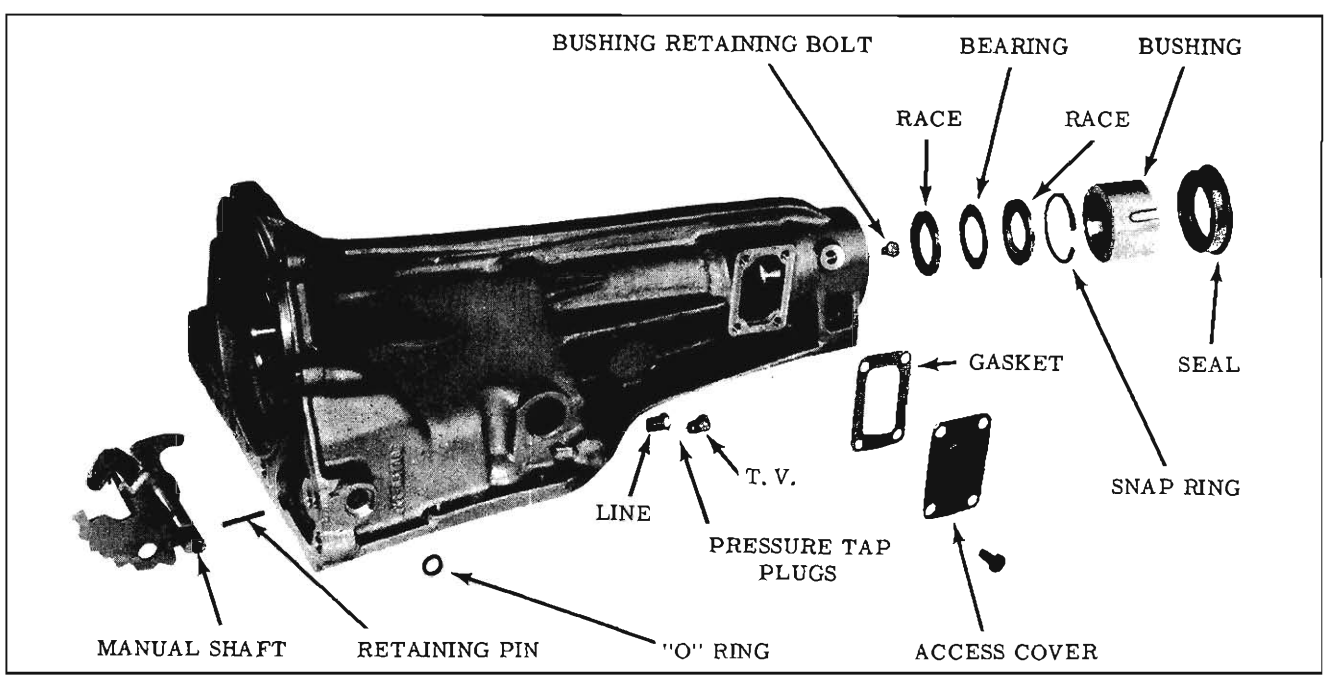


Fig. 6-70 Rear Bearing Retainer

valve (straight land first).

5. Install the secondary compensator spring and valve.
6. Install the bore plug and retaining pin.

If other units are not to be serviced, refer to Page 6-69, Step 14.

DISASSEMBLY AND ASSEMBLY OF REAR BEARING RETAINER (Fig. 6-70)

Disassembly

1. Using Tool J-8873 remove the rear bearing race to rear bearing retainer snap ring through access hole in retainer.
2. Remove rear race, bearing and front race.
3. Remove inside manual lever and shaft assembly retaining pin from case side of retainer.
4. Pull shaft outward and remove manual shaft "O" ring.
5. Rotate lever and shaft assembly to remove from inside rear bearing retainer.
6. If it is necessary to replace the bushing and sleeve assembly, the rear seal must be removed, then:
   a. Remove the rear bearing retainer bushing and sleeve assembly retaining bolt.
   b. Drive the bushing and sleeve assembly from the rear bearing retainer with a drift.
7. If necessary to replace the "O" ring seal, remove the cap screw and retainer, and withdraw the assembly.

Clean and Inspect Rear Bearing Retainer (Fig. 6-71)

Assembly of Rear Bearing Retainer (Fig. 6-70)

1. If removed, install the bushing and sleeve

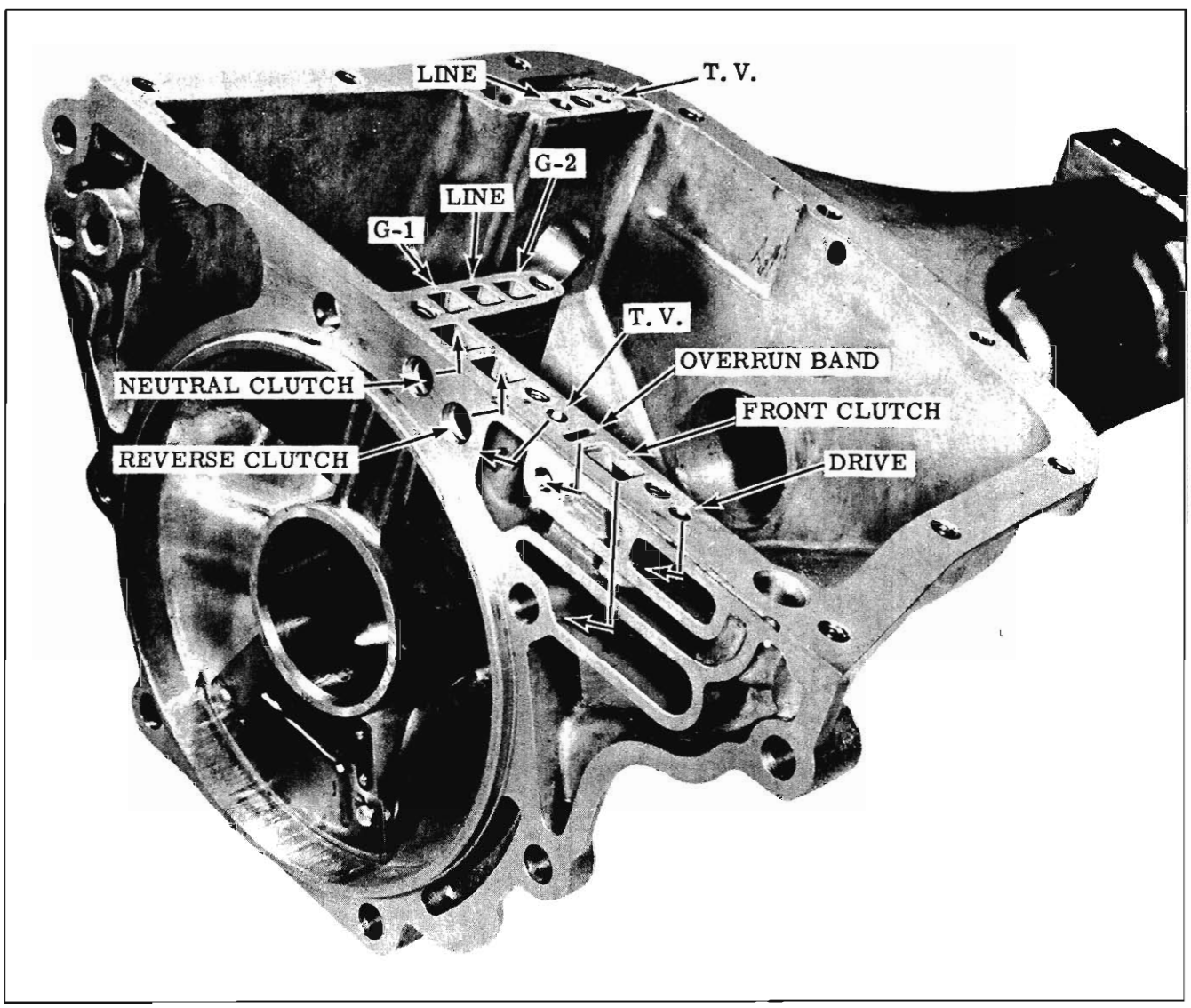


Fig. 6-71 Rear Bearing Retainer Passages

assembly in end of rear bearing retainer with chamfered end first, aligning short slot in bushing with locking screw hole in rear bearing retainer with a drift.

2. If rear seal was removed, coat sealing lip of new seal with lubricant Part No. 567196, coat the outer diameter of seal with sealer, Part No. 557622 and install seal using Tool J-5154.

3. Install bushing lock screw and torque 12 to 15 ft. lbs.

4. Install race, thrust bearing and race into rear bearing retainer through access hole.

5. Install snap ring through access hole of retainer, concave side towards rear (identification side away from race) and align ear of snap ring with top slot in retainer.

6. Install manual lever and shaft assembly into rear bearing retainer.

7. Install manual shaft "O" ring. (Fig. 6-72)

8. Align annular groove in shaft with retainer pin hole then install manual shaft retaining pin.

If other units are not to be serviced, refer to Page 6-64.

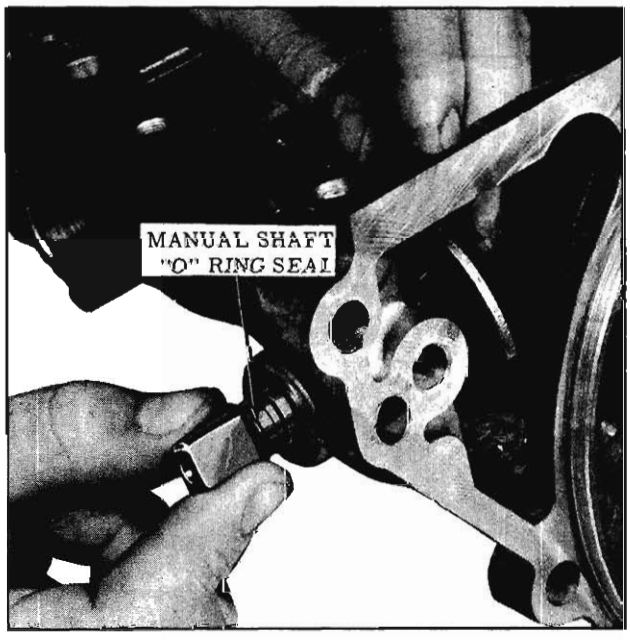


Fig. 6-72 Installing "O" Ring Seal

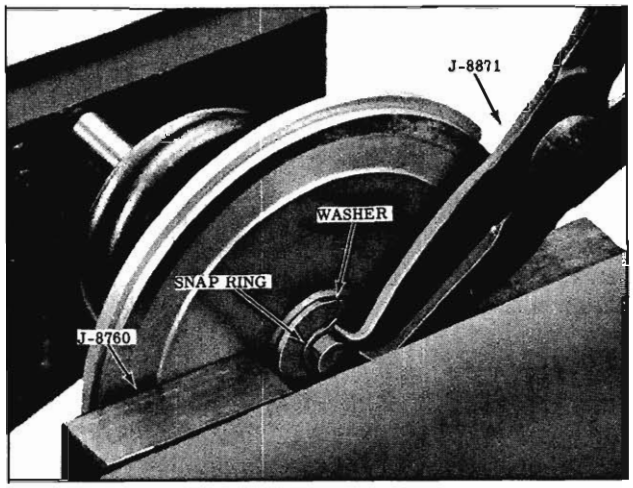


Fig. 6-73 Servo Disassembly

SERVO PISTON ASSEMBLY

Disassembly

1. Position Speedometer Gear Puller Adapter J-8760 against the servo piston and place the piston assembly and spacer between the jaws of a bench vise. (Fig. 6-73)

2. Tighten the vise sufficiently to remove the snap ring.

3. Remove the servo piston to piston pin snap ring and washer.

4. Carefully, remove piston assembly from the vise.

5. Remove the servo piston, springs and retainer.

6. If necessary, remove piston rings.

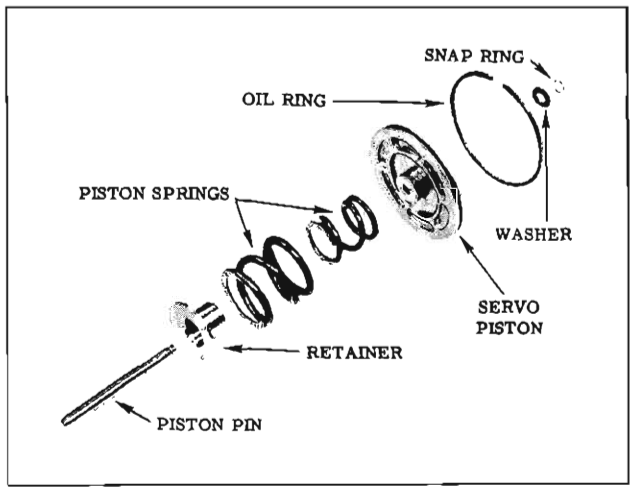


Fig. 6-74 Servo Assembly

1. Install the spring retainer, spring and servo piston over the servo piston pin.
2. Place the assembled servo components with Speedometer Gear Puller Adapter J-8760 against the servo piston into a vise and carefully compress the assembly to allow the flat washer and snap ring to be installed.
3. Install the washer and snap ring.
4. Remove the servo piston assembly and tools from the vise.
5. If removed, install piston rings.

If other units are not to be serviced, refer to Page 6-67.

FRONT CLUTCH (Fig. 6-75)

Disassembly

1. Remove the bronze thrust washer from the front clutch assembly if it is not removed.
2. Insert two studs, Tool J-3387-2 into dowel holes on back side of front clutch assembly.
3. Install front clutch assembly with studs into vise so that studs are retained by the vise jaws. (Fig. 6-75)
4. Remove four front internal gear to front clutch housing attaching bolts.
5. Remove assembly from vise, place on bench with internal gear up and gently tap dowel pins with a punch to remove front internal gear from front clutch housing.
6. Remove front internal gear and clutch backing plate.
7. Remove seven drive and seven driven front unit clutch plates.

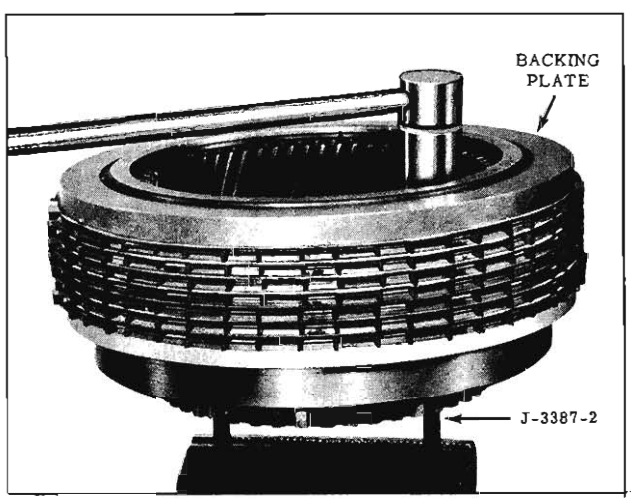


Fig. 6-75 Front Clutch Disassembly

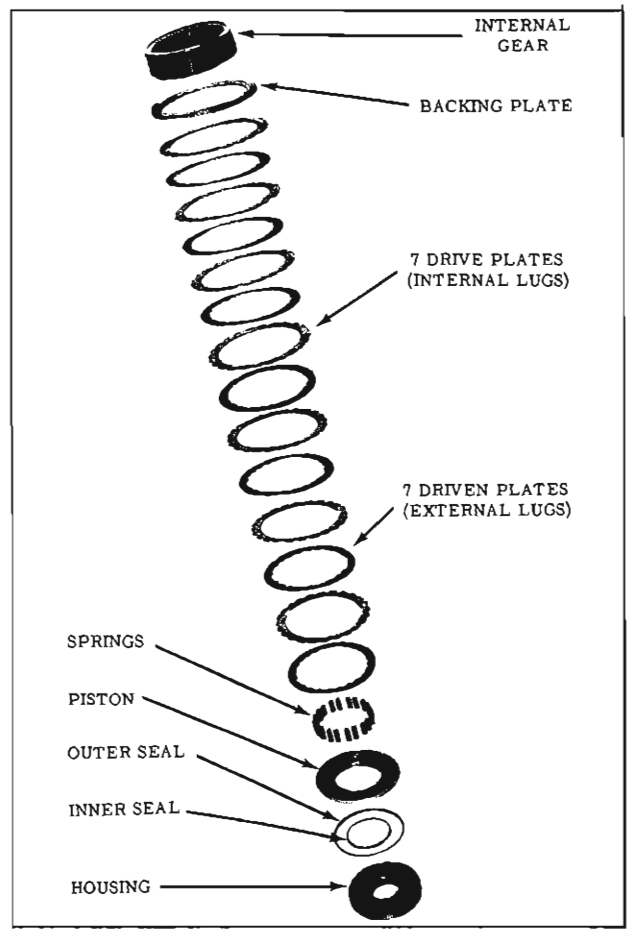


Fig. 6-76 Front Clutch Assembly

8. Remove 20 front clutch release springs.
9. Remove front clutch piston from front clutch housing.
10. Remove front clutch piston outer seal from piston, remove clutch inner piston seal from clutch housing and discard seals.

Assembly

1. Install new inner piston seal on front clutch housing with lip of seal facing down.
2. Install new outer piston seal on clutch piston with lip facing away from spring pockets.
3. Install clutch housing over clutch piston, carefully rotating assembly while depressing lip of piston seal with a small screwdriver.
4. Install piston release springs (20) into spring pockets in piston.
5. Install front clutch backing plate on front internal gear with undercut facing flange on internal gear.
6. Lubricate clutch plates and install seven composition drive and seven steel driven clutch

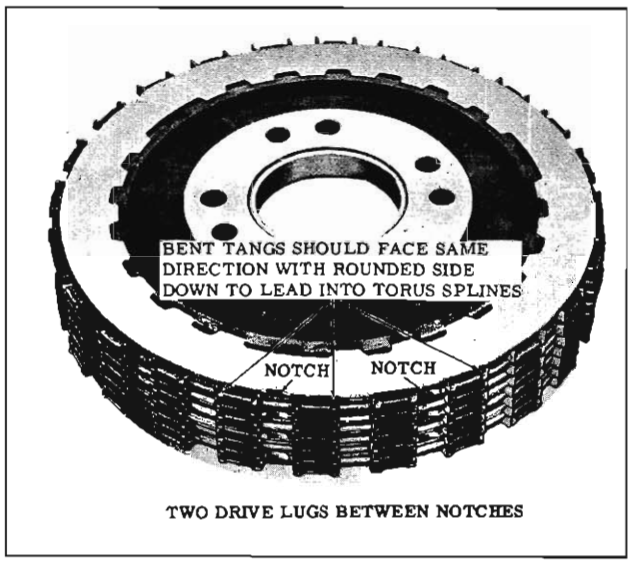


Fig. 6-77 Clutch Plate Alignment

plates alternately over the front internal gear starting with a composition clutch plate.

NOTE: Composition clutch plate tangs must face toward the front clutch piston housing. The steel clutch plates must be assembled in an un-nested position as follows: (Fig. 6-77)

a. Place a composition plate and the first steel plate over the internal gear noticing the location of the slight half moon notch in the edge of the steel plate.

b. Install another composition plate and then the second steel plate so that the half moon notch is located two drive lugs on the internal gear away from the notch in the first steel plate.

c. Continue to alternately install the composition and steel plates so that the notches in the odd numbered steel plates are one above the other and the notches in the even numbered steel plates are one above each other.

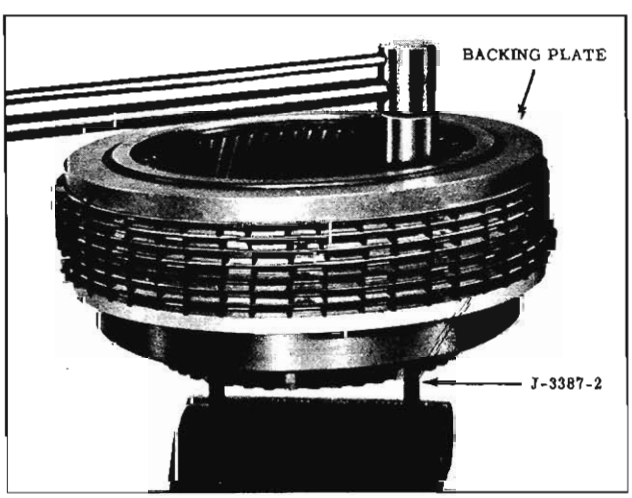


Fig. 6-78 Assembly of Front Clutch

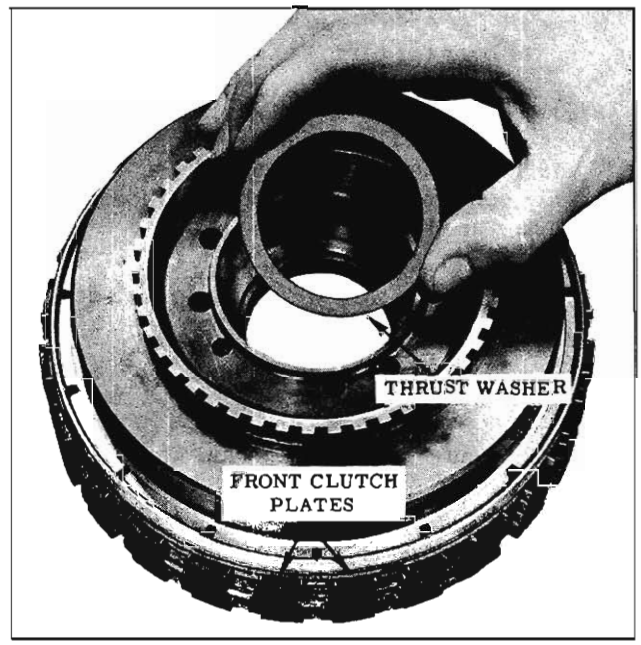


Fig. 6-79 Installing Thrust Washer

7. Position front unit internal gear with plates on clutch release springs, aligning dowels.

8. Loosely install the internal gear front clutch bolts.

9. Insert Tool J-3387-2 into dowel holes in back side of front clutch assembly, then install front clutch assembly with studs into vise so studs are retained by vise jaws. (Fig. 6-78)

10. Tighten bolts snugly and check bottom steel clutch plate for freedom after tightening bolts. Torque the four front unit internal gear to front clutch housing bolts 22 to 27 ft. lbs.

NOTE: Alternately tighten bolts to properly seat front internal gear on dowels.

11. Install bronze thrust washer into recessed I.D. of front clutch housing bore using petroleum to retain. (Fig. 6-79)

CAUTION: If new clutch plates were installed, check to see if clutch plates can be moved by the drive lugs. A moderate preloading of clutch plates is satisfactory, however, if drive plates cannot be rotated, it will be necessary to replace the clutch piston.

If other units are not to be serviced, refer to Page 6-62, Step 14.

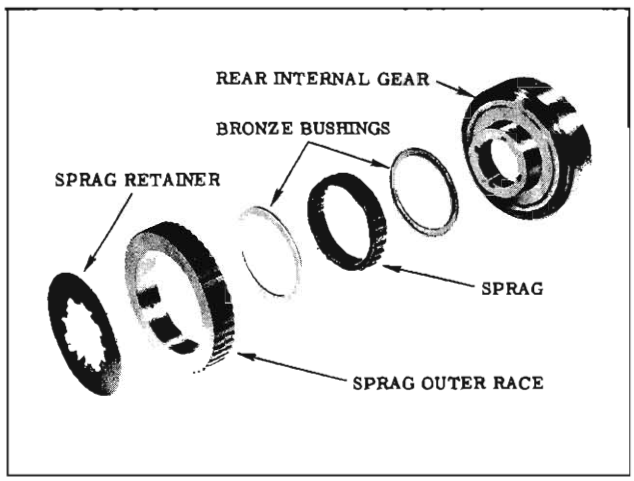


Fig. 6-80 Sprag Assembly

REAR INTERNAL GEAR AND SPRAG (Fig. 6-80)

Disassembly

1. Remove sprag retainer.
2. Remove sprag outer race from sprag assembly and rear internal gear.
3. Remove the sprag and bushing assembly (two bronze bushings) from internal gear.

Assembly

1. Place one bronze bushing over inner race of internal gear with cup side facing up.
2. Place sprag assembly into the sprag outer race.
3. With shoulder side of sprag up, start sprag and outer race over internal gear hub. (Fig. 6-81)
4. Press sprag and outer race down against internal gear.

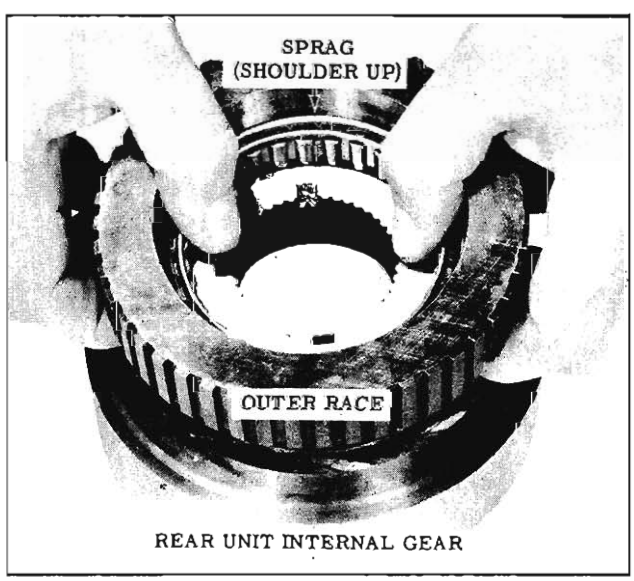


Fig. 6-81 Installing Sprag

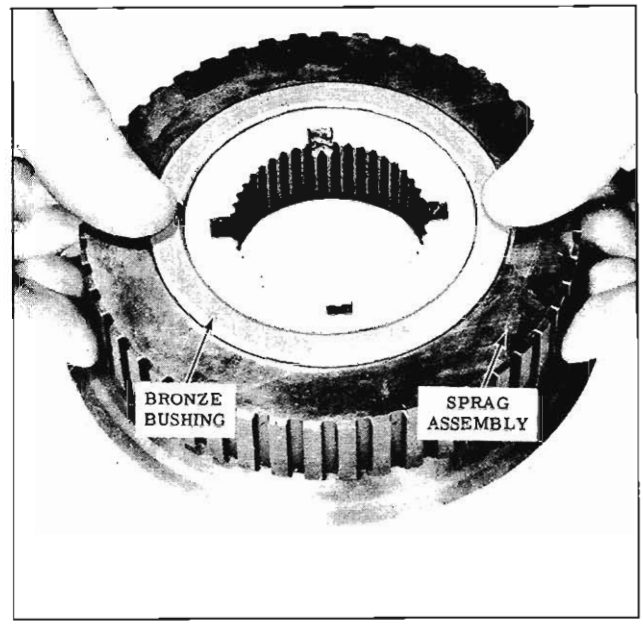


Fig. 6-82 Installing Bushing

5. Install second bronze bushing, cup side down, against sprag assembly. (Fig. 6-82)
6. Apply petrolatum on sprag retainer and install sprag retainer on internal gear aligning tangs with the internal gear slots. (Fig. 6-83)

NOTE: Check to make certain sprag assembly is properly installed by rotating outer race counterclockwise. Outer race should not turn clockwise.

DISASSEMBLY OF 3 TO 4 BOOST BODY (Fig. 6-87)

1. Remove the 3 to 4 boost body assembly by

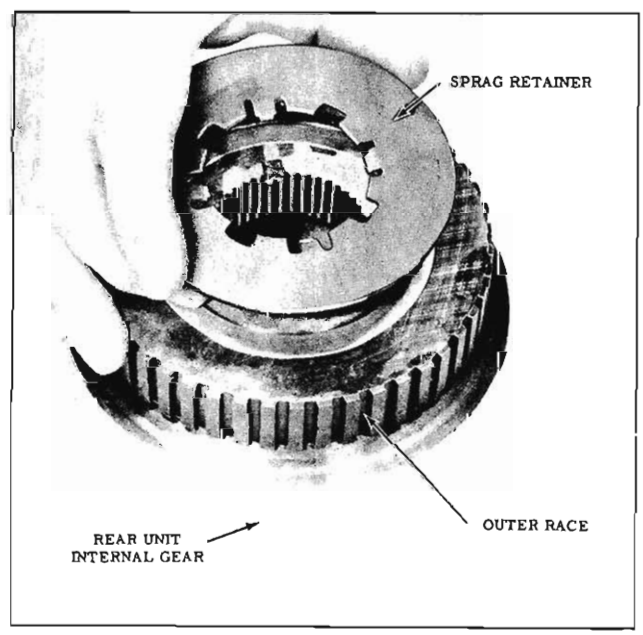


Fig. 6-83 Installing Sprag Retainer

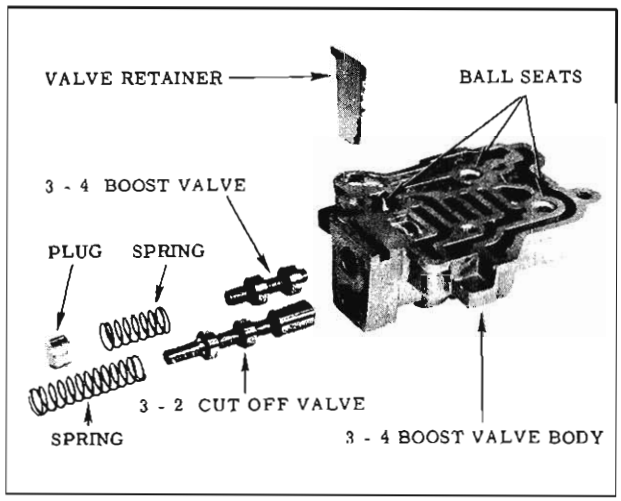


Fig. 6-84 3 to 4 Boost Body Assembly

removing four attaching screws. (One screw is located on channel plate side of body).

CAUTION: The 3 to 4 boost body contains three loose check balls.

2. Remove the three check balls and spacer plate from the 3 to 4 boost body.
3. Remove the retainer from the 3 to 4 boost body. Retainer is under spring pressure.
4. Remove the 3 to 2 cut off valve spring, 3 to 2 cut off valve, 3 to 4 boost plug, 3 to 4 boost spring and the 3 to 4 boost valve.

ASSEMBLY OF 3 TO 4 BOOST BODY (Fig. 6-87)

1. Install the 3 to 4 boost valve, long stem out, spring and plug in the bore of the boost body nearest the cored face.
2. Compress the 3 to 4 boost plug against spring tension and partly install the 3 to 4 boost body retainer.
3. Install the 3 to 2 cut off valve, stem out, and spring in remaining bore of boost body.
4. Compress the 3 to 2 cut off valve spring and slide 3 to 4 boost body retainer over spring.

NOTE: Leave spacer plate and check balls loose at this time.

If other units are not to be serviced, refer to Page 6-60, Step 5.

DISASSEMBLY AND ASSEMBLY OF CONTROL VALVE ASSEMBLY (Fig. 6-88)

1. Remove channel body from valve body assembly by removing two attaching screws from

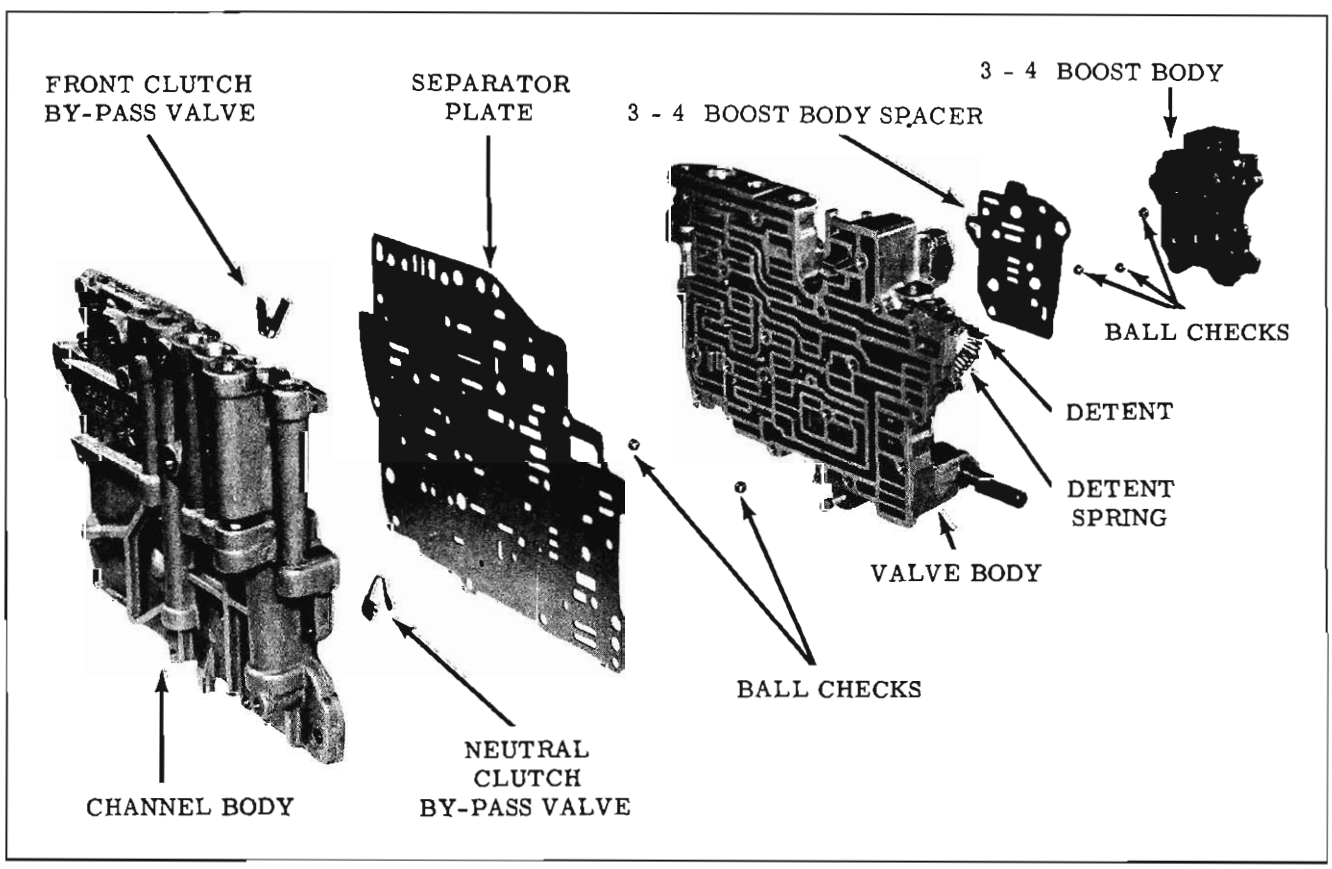


Fig. 6-85 Control Valve Body Assembly

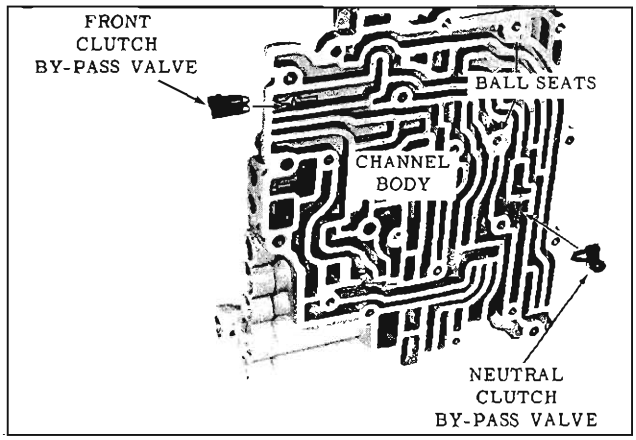


Fig. 6-86 Channel Body

the valve body side and 13 screws from the channel body side.

2. Remove neutral clutch by-pass valve and the front clutch by-pass valve from channel body. (Fig. 6-86)

NOTE: Assemble loose parts into channel body after inspection. (Fig. 6-86)

a. Install neutral clutch by-pass valve and front clutch by-pass valve into channel body.

5. Place separator plate on channel body and check alignment of by-pass valves.

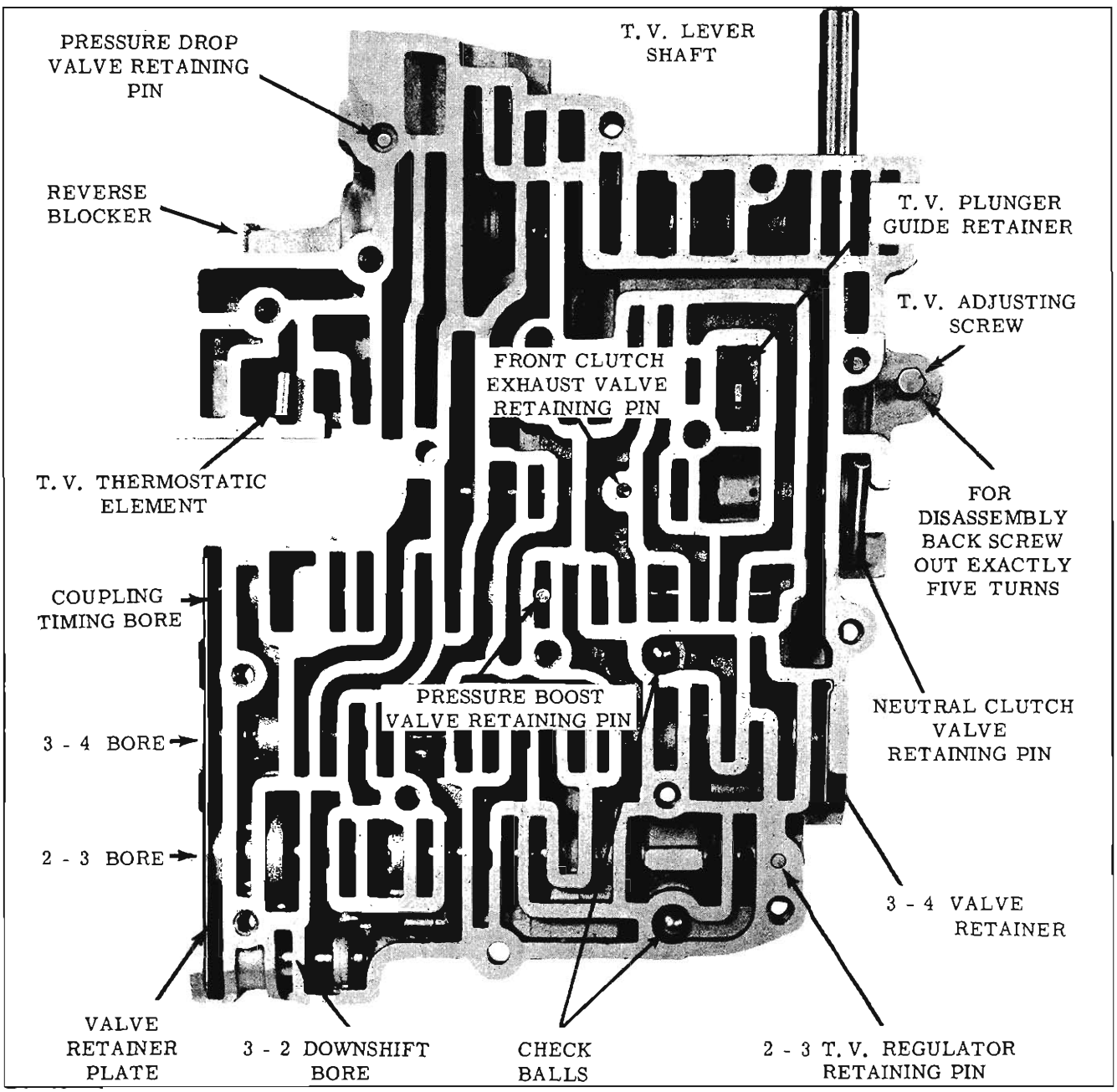


Fig. 6-87 Valve Body

6. Remove two check balls and the T.V. thermostatic element. (Fig. 6-87)

7. Remove T.V. plunger guide retainer located in cored passage near T.V. adjusting screw. Position control valve assembly with the cored side up and the T.V. lever positioned on the top right hand side. (Fig. 6-87)

8. Remove multiple valve plug retainer located in lower left hand corner.

   NOTE: Plugs are under spring tension.

9. Remove the 3 to 2 downshift spring and valve from the lowest bore.

10. Remove the valve bore plug, by threading a valve body attaching screw into plug, and slide plug out from the adjacent bore.

11. Remove the 2 to 3 governor valve from the same bore.

12. Remove the valve bore plug and the 3 to 4 governor valve from the adjacent bore.

13. Remove the valve bore plug, coupling timing valve spring and valve from the next adjacent bore.

14. Remove the pressure boost valve retaining pin from the same bore on the cored side of the valve body.

15. Remove the pressure boost valve from the same bore.

16. On the opposite side of the valve body, start with the lower bore and remove the retaining pin.

17. Remove the 2 to 3 T.V. bushing and valve from the same bore.

18. Remove the 2 to 3 T.V. spring and valve spring, then remove the 2 to 3 valve from the same bore.

19. Remove the valve bore plug retainer and plug, while holding finger over plug as plug is under spring pressure, from the adjacent bore.

20. Remove the 3 to 4 T.V. valve, spring and bushing from the same bore.

21. Remove the 3 to 4 valve and spring from the same bore.

22. Remove the retaining pin and valve bore plug from the fourth bore.

23. Remove the neutral clutch valve spring and neutral clutch valve.

24. Remove the front clutch exhaust valve retaining pin from the same bore on the cored side of valve body. Compress spring with a small screwdriver to remove pin.

25. Remove the front clutch exhaust valve spring and valve.

26. Remove the pressure drop retaining pin, spring and valve from the last bore on the opposite side of the control valve assembly.

27. Loosen T.V. adjustment screw EXACTLY five TURNS. (Fig. 6-87)

28. Turn the valve body over and remove the throttle lever by removing the outside "C" ring and washer, positioning the shaft so that the lever will clear the T.V. adjustment screw, then remove the lever and washer.

29. Remove T.V. plunger and sleeve, then remove the T.V. spring and valve ("OB" transmission has two springs).

30. If necessary, remove the reverse blocker piston retaining pin spring and reverse blocker piston.

31. Remove detent spring.

    NOTE: Do not remove detent lever unless replacement is necessary.

32. If necessary to remove detent lever, use a small screwdriver to pry the lever free of the pin, then remove pin. A new lever will be required on assembly.

33. Clean and inspect all parts.

ASSEMBLY—CONTROL VALVE ASSEMBLY (Fig. 6-88)

NOTE: All attaching screws are to be torqued 2.5 to 3.5 ft. lbs. and all attaching bolts are to be torqued 6 to 8 ft. lbs.

1. If previously removed, install manual detent by positioning manual detent in valve body and installing retaining pin.

2. Install detent spring into manual detent.

3. If removed, install the reverse blocker piston, spring and pin.

4. Install the pressure drop valve, stem end of valve last, then install spring and retaining pin in the top bore adjacent to the detent spring.

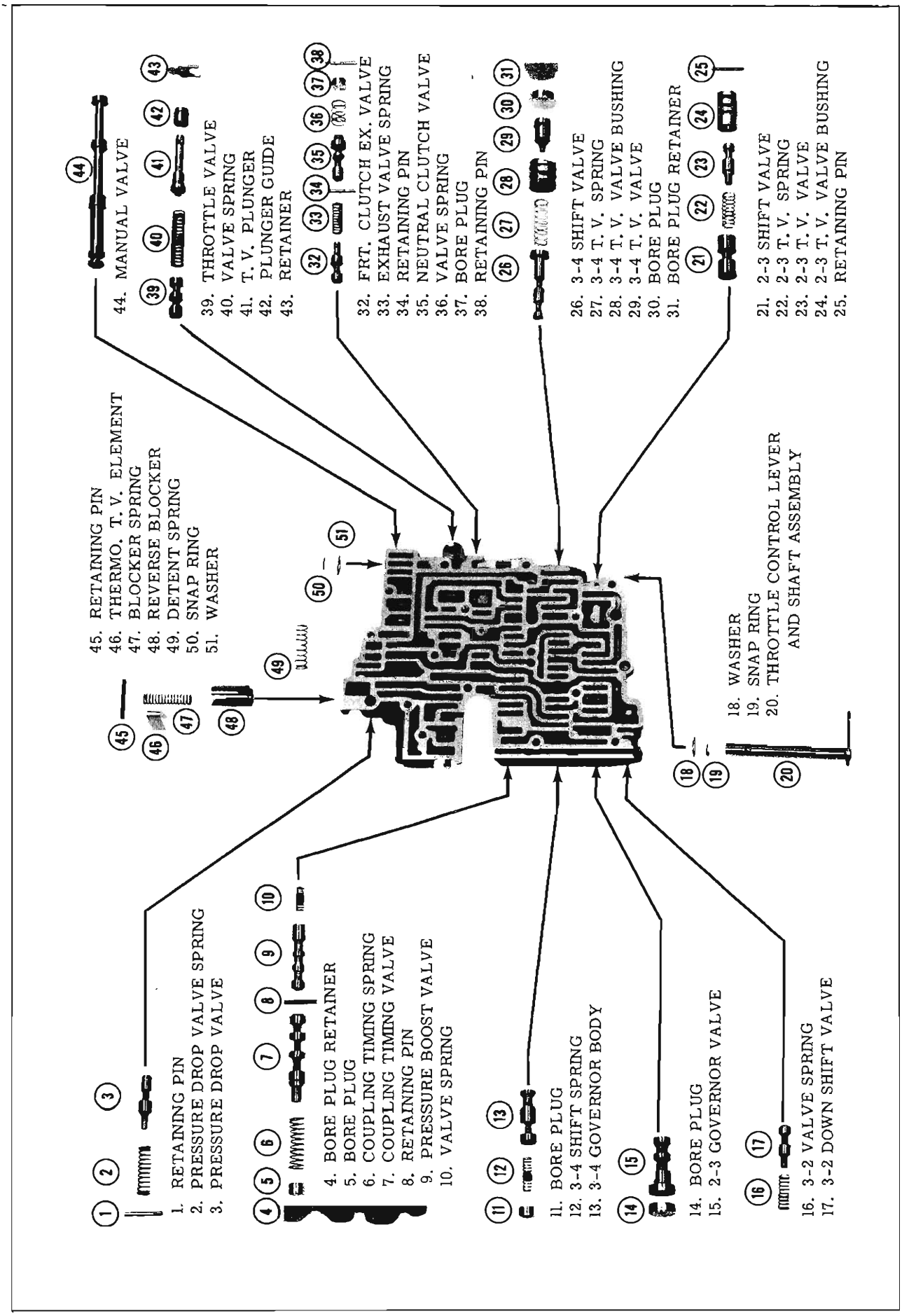


Fig. 6-88 Oil Control Valve Body

5. Install the T.V. valve (round end first), spring, plunger and sleeve into the T.V. bore adjacent to the manual valve bore.

6. Place washer against "C" ring on T.V. lever shaft.

7. Install T.V. lever shaft through hole in valve body so that the T.V. lever will index between the T.V. plunger and throttle adjusting screw.

8. Install washer and "C" ring securing lever assembly to valve body.

9. Turn T.V. adjusting screw back to original position, EXACTLY five TURNS. (Fig. 6-88)

10. Install the T.V. plunger guide retainer through cored side of valve body into annular groove in T.V. plunger guide.

11. Install the front clutch exhaust valve (land end first) and front clutch exhaust valve spring in the bore adjacent to the T.V. bore.

12. Install short retaining pin through cored side of valve body while compressing the front clutch exhaust valve spring.

13. Install the neutral clutch valve (small end first) and spring in the same bore.

14. Compress the neutral clutch valve spring and install valve bore plug (hole end out) and long (copper) retaining pin.

15. In the next open bore install the 3 to 4 valve.

16. Place the 3 to 4 T.V. spring into the 3 to 4 shift valve.

17. Install the 3 to 4 T.V. valve into the 3 to 4 regulator bushing so that valve will completely enter bore of bushing.

18. Install the 3 to 4 T.V. valve and bushing into the 3 to 4 bore. (Small end of T.V. valve first.)

19. Install the 3 to 4 valve bore plug and retainer.

20. Install the 2 to 3 valve in the bore adjacent to the 3 to 4 valve.

21. Install the 2 to 3 T.V. valve spring in the same bore.

22. Install the 2 to 3 T.V. valve into the bushing, stem end out.

23. Install the 2 to 3 T.V. valve and bushing into the 2 to 3 bore, stem end first.

24. Compress the bushing and install retaining pin from the cored side of the valve body.

25. In the bore adjacent to the "U" shaped "cut-out" install the pressure boost spring and valve, using brass rod to guide valve into bore, (long land first). Install retaining pin through core face of body.

26. Install coupling timing valve (land end first) into the same bore.

27. Install coupling timing valve spring over stem end of coupling timing valve.

28. Install valve bore plug in valve body compressing and partially installing multiple plug retainer. Install retainer in such a manner that only one corner of the plug is retained. This will permit the installation of the remaining valves. (Fig. 6-89)

29. Install the 3 to 4 governor valve and spring into the adjacent 3 to 4 bore (flat end first).

30. Install the 3 to 4 valve bore plug open end over the 3 to 4 spring, compressing plug against spring tension into the bore and position the retainer so that edge of plug is secure.

31. Install the 2 to 3 governor valve into the adjacent 2 to 3 shift valve bore.

32. Install the 2 to 3 bore plug, compressing the valve against spring pressure and position multiple retainer.

33. Install the 3 to 2 downshift valve (land end first) into the remaining bore.

34. Place 3 to 2 downshift (spring over 3 to 2 downshift valve, compressing spring and secure with multiple retainer.

35. Install the T.V. element (open end down) in

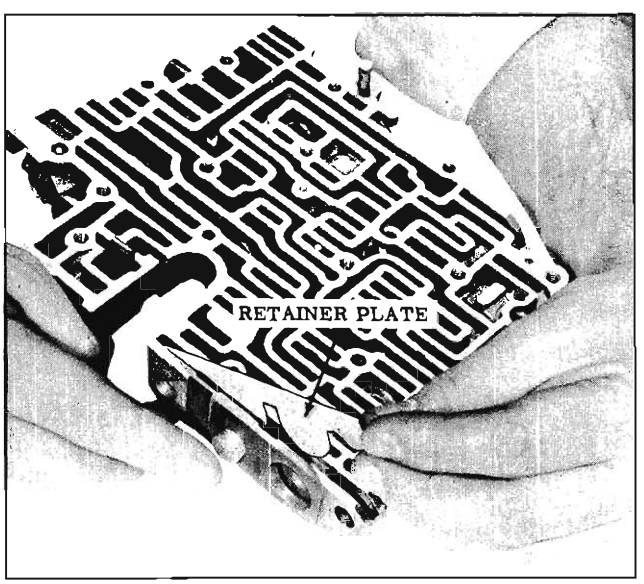


Fig. 6-89 Installing Retainer Plate

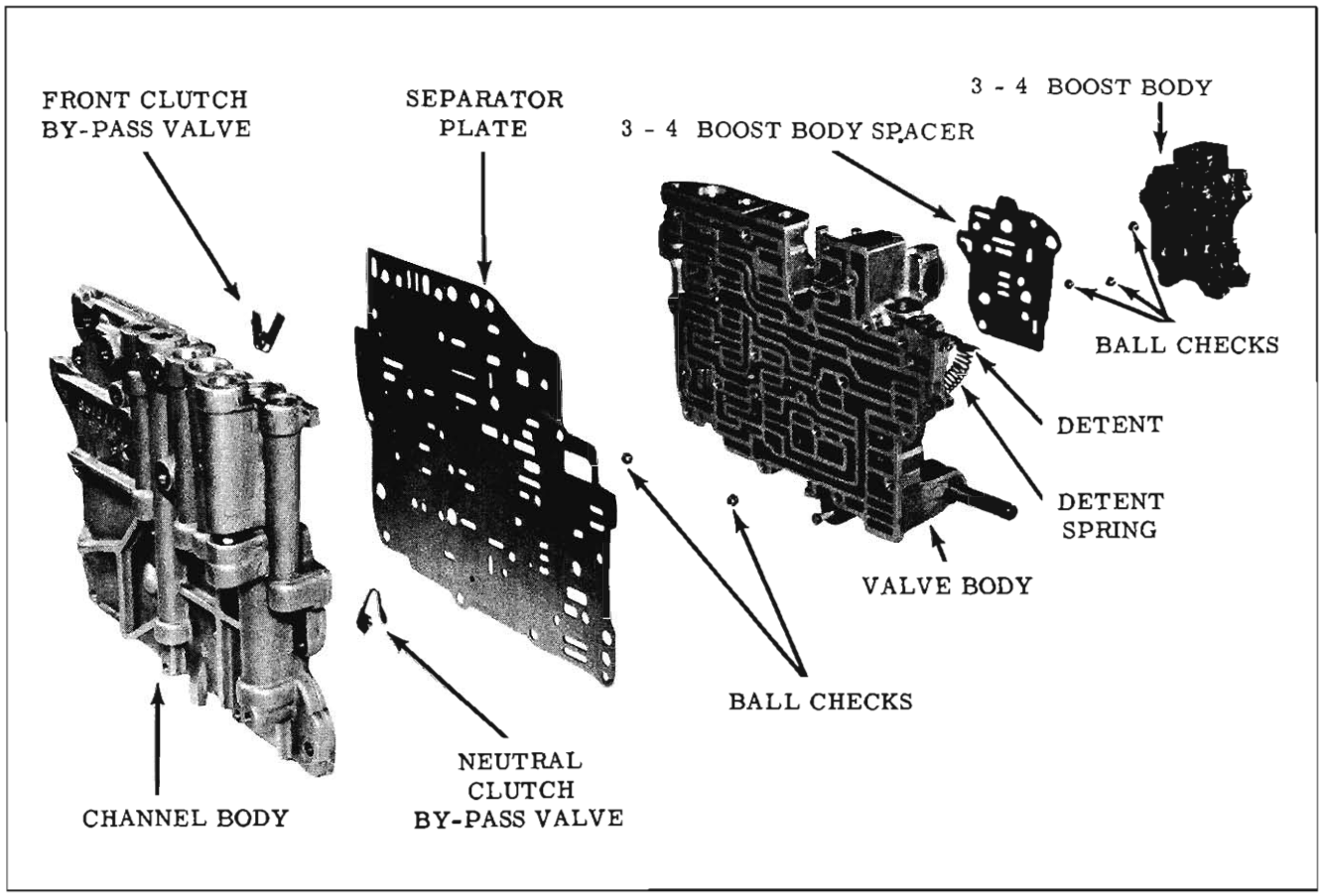


Fig. 6-90 Control Valve Body Assembly

cavity behind throttle valve.

FINAL ASSEMBLY OF THE COMPLETE CONTROL VALVE ASSEMBLY (Fig. 6-90)

1. Install two ball check valves into pockets on cored side of valve body.
2. Position separator plate over cored side of control valve body.
3. Position channel body on valve body and attach with 13 screws, leave loose for final adjustment.
4. Turn control valve assembly over and install one large and two small ball check valves into pockets.
5. Place 3 to 4 boost body to valve separator on valve body.
6. Place 3 to 4 boost body on separator plate and install three attaching screws. (Do not tighten screws at this time).
7. Install two screws, valve body to channel body.
8. Turn valve assembly over and install the 3 to 4 boost body to control valve body long attaching screw.
9. Tighten 19 control valve body assembly attaching screws. Torque 2.5 to 3.5 ft. lbs.

CLEAN AND INSPECT TRANSMISSION CASE (Fig. 6-91)

ASSEMBLY OF INDIVIDUAL UNITS INTO TRANSMISSION CASE

CAUTION: Before installing cap screws into aluminum parts, the screws should be dipped into Hydra-Matic oil to prevent galling and/or seizing of threads.

Front and Rear Units

1. Place transmission case in holding fixture with the front end up.
2. Install neutral clutch backing plate into case (flat side up).
3. Install four neutral clutch drive and driven clutch plates as follows:
   a. Position every other steel plate so that the notched lug is on the opposite side of the wide space. The steel plates must be installed one above the other in this arrangement to properly un-nest the clutch pack. (Fig. 6-92)

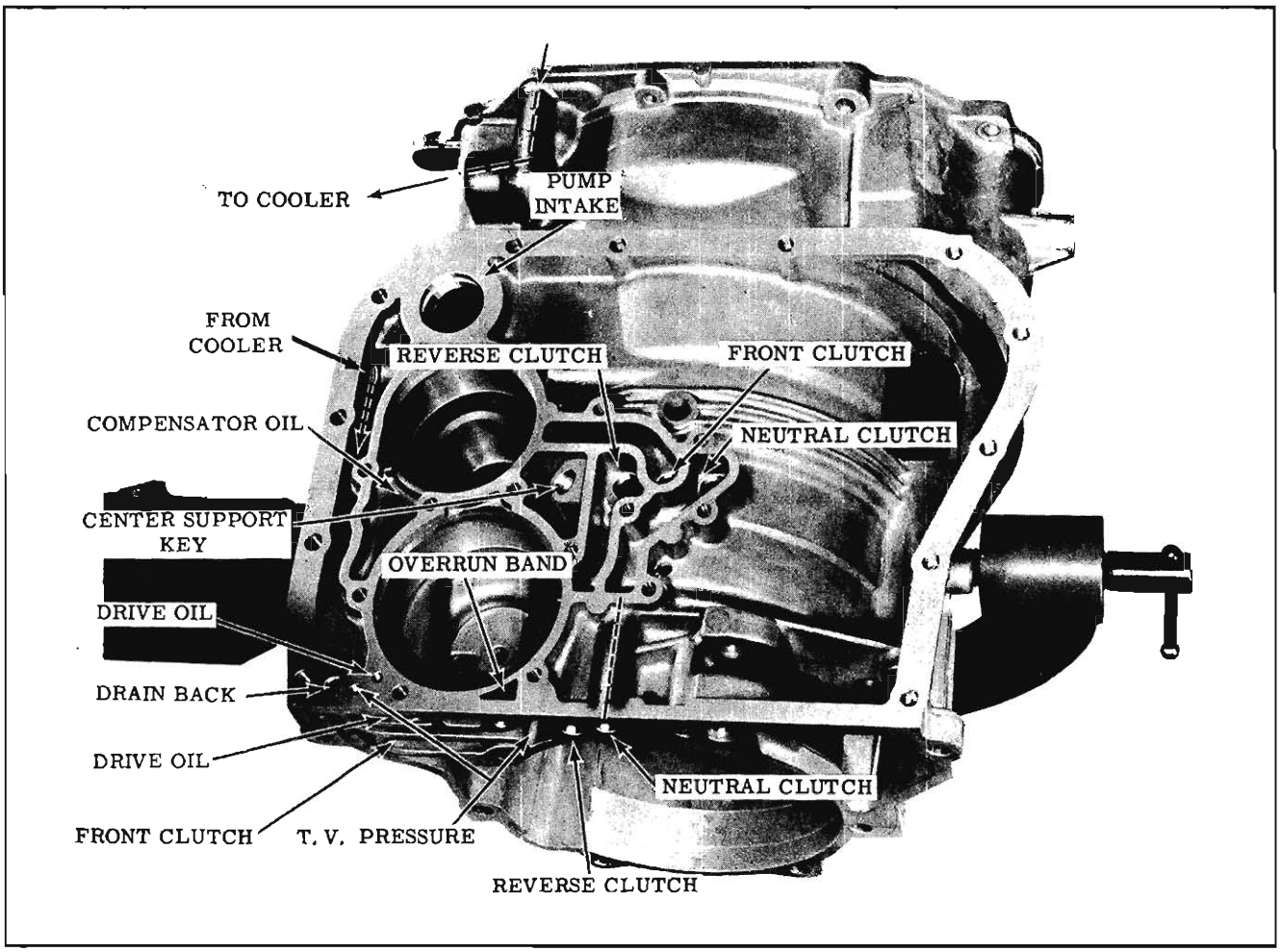


Fig. 6-91 Case Passages

b. Install the composition drive and steel driven clutch plates alternately starting with a composition clutch plate and be certain that the steel plates are stacked as previously arranged.

4. Install long case support key, (chamfered side up).

5. Mark the case to indicate the keyhole to assist in alignment for installation of case support. (Fig. 6-93)

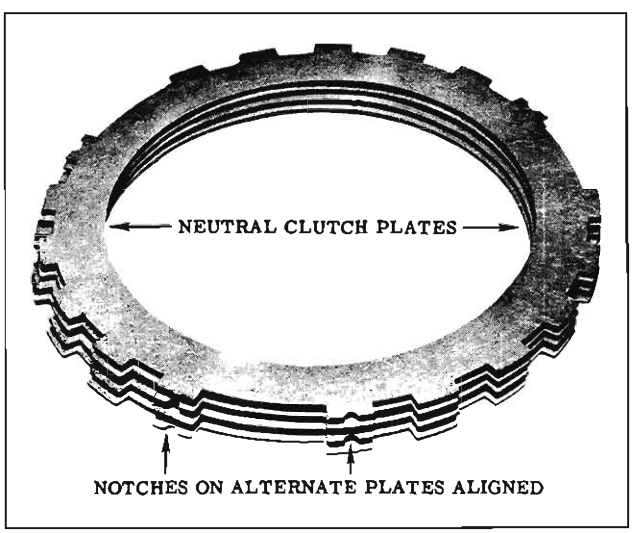


Fig. 6-92 Clutch Plate Alignment

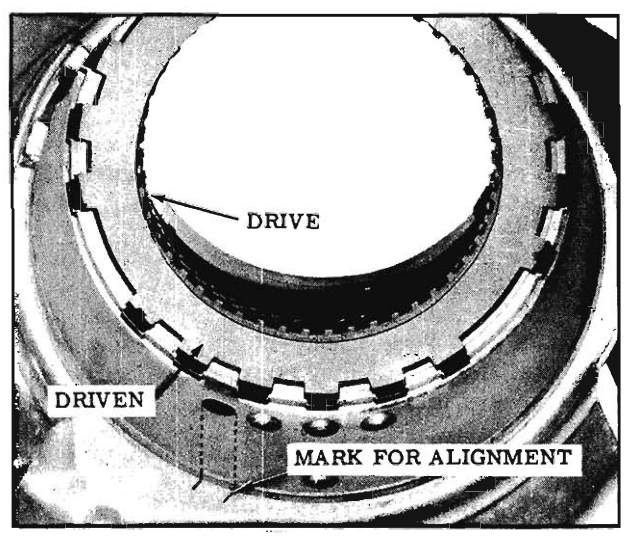


Fig. 6-93 Alignment Marks

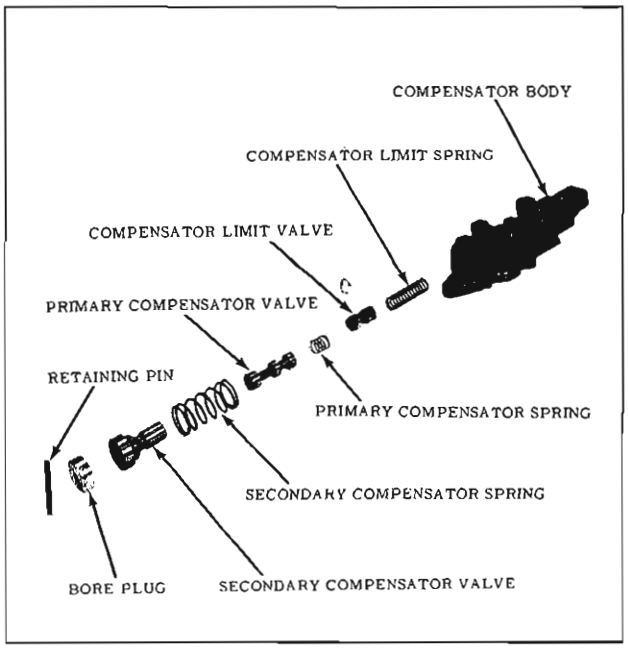


Fig. 6-94 Snap Ring Location

6. Install neutral and reverse clutch assembly into case, aligning case support keyway with keyhole in case.
7. Install case support key into case (square end first).

   IMPORTANT: Key should not protrude above accumulator cover surface of case.
8. Install reverse cone (steel) into case over reverse piston.
9. Install reverse stationary cone (plastic), aligning reverse stationary cone with the keyway. Lightly tap into place, if required.
10. Install large reverse cone snap ring into snap ring groove in case. (Fig. 6-94)
11. Reposition transmission, rear end up, and install overrun band over anchor in case.
12. Install rear unit internal gear assembly into case, aligning neutral clutch plates with outer race.

    NOTE: Be sure assembly bottoms against case support to insure engagement of all plates.
13. Reposition transmission (bottom side up).
14. Install front clutch assembly into front of transmission.

    NOTE: Be sure bronze washer is positioned in counterbore of front unit clutch drum.
15. Install thick bearing race, thrust bearing and the thin cupped bearing race on front sun gear and shaft assembly. (Fig. 6-95)

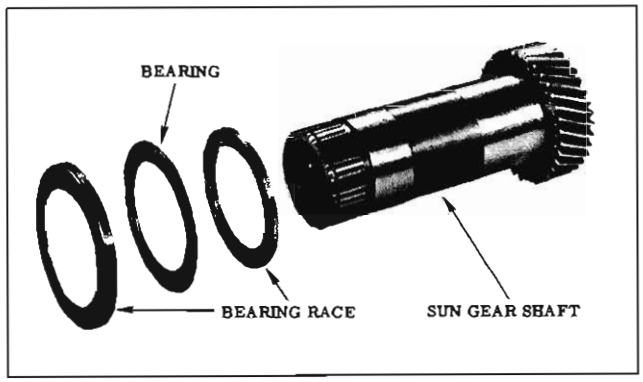


Fig. 6-95 Bearing and Races

16. Install front sun gear and shaft assembly through case support, aligning splines of sun gear shaft with rear internal gear and cutaway splines with clutch retainer.
17. Install bearing on rear planet carrier. Retain with petrolatum. (Fig. 6-96)
18. Install rear planet carrier through front unit sun gear shaft from rear of transmission. (Fig. 6-97)
19. Install thrust bearing and races as shown and retain with petrolatum. (Fig. 6-98)
20. Holding the rear planet carrier forward, install front unit carrier.
21. Install front unit carrier to rear planet

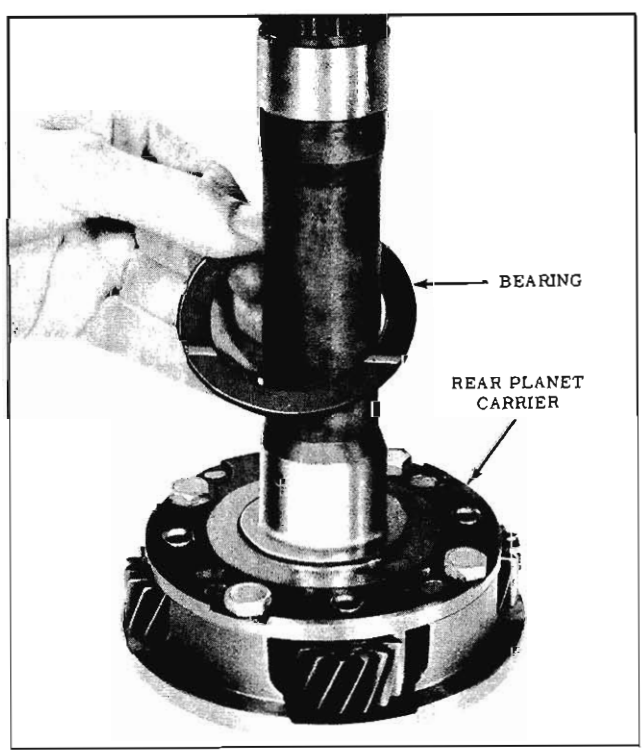


Fig. 6-96 Thrust Bearing

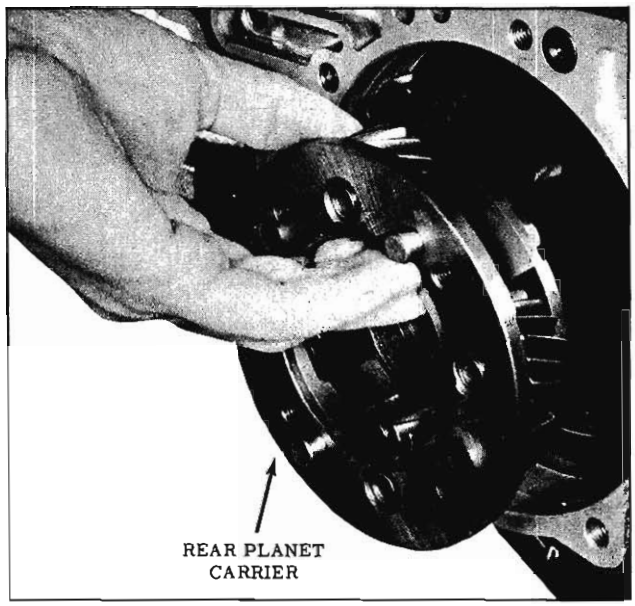


Fig. 6-97 Installing Rear Carrier

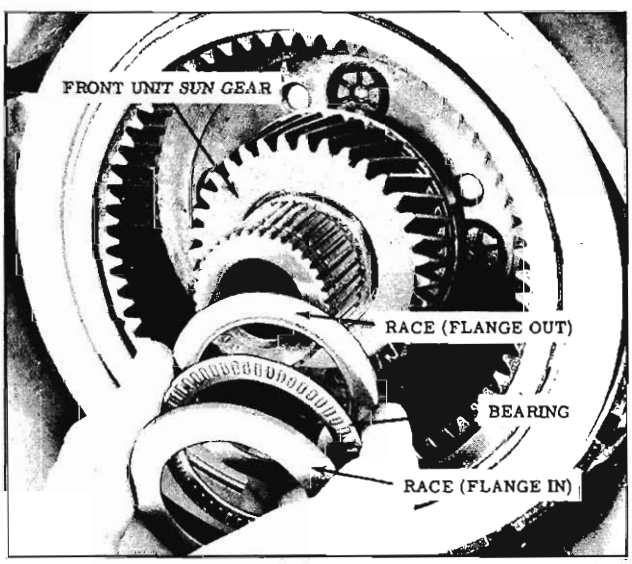


Fig. 6-98 Installing Bearing and Races

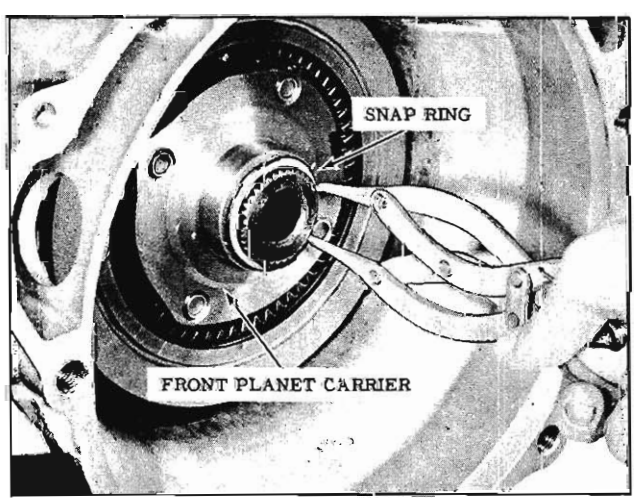


Fig. 6-99 Installing Snap Ring

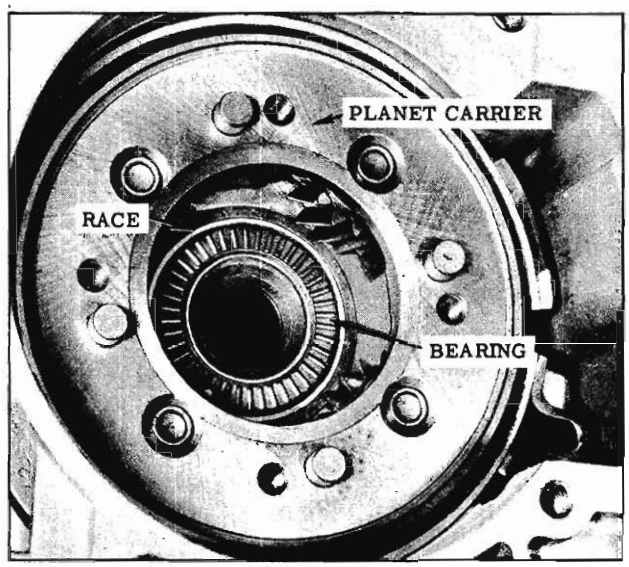


Fig. 6-100 Installing Thrust Bearing

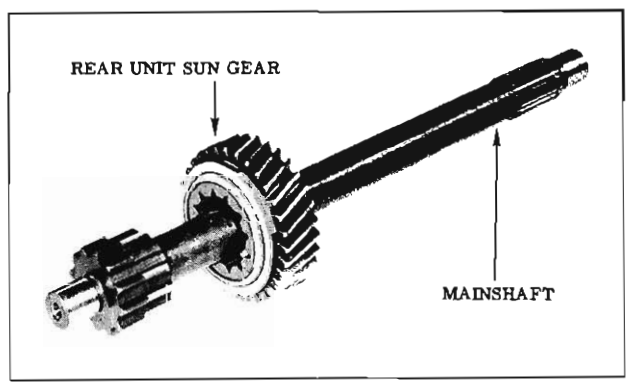


Fig. 6-101 Installing Sun Gear

carrier shaft snap ring while holding rear carrier forward. (Fig. 6-99)

22. Reposition transmission (rear end up).

23. Install rear unit sun gear to rear carrier bearing race into rear carrier with flange up, retain with petrolatum.

24. Install rear unit sun gear to rear carrier thrust bearing into bearing race. (Fig. 6-100)

25. Assemble rear unit sun gear to mainshaft, if removed, and install through rear carrier. (Fig. 6-101)

Parking Pawl Linkage (Fig. 6-102)

1. Install parking pawl spacer into transmission case.

2. Position parking pawl and linkage assembly against spacer with tooth of parking pawl facing toward center of case and install parking pawl pin.

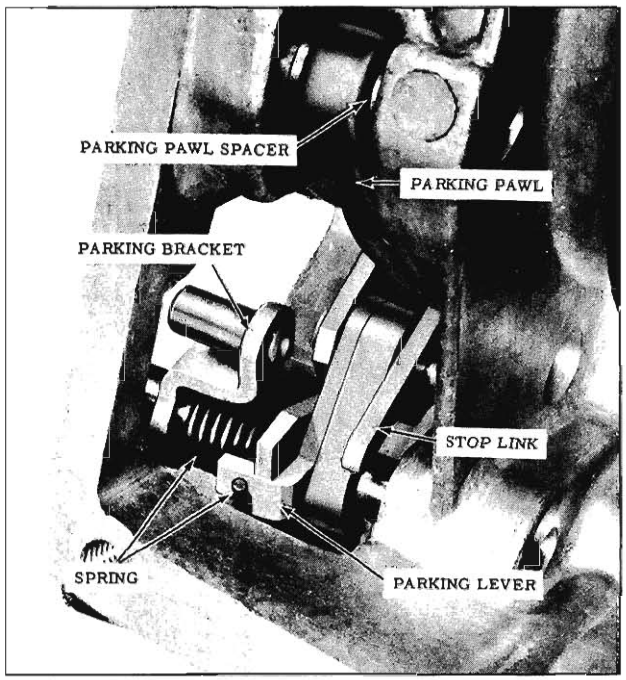


Fig. 6-102 Parking Pawl Assembly

3. Install parking bracket shaft through linkage and into case.

4. Install parking brake spring into parking bracket, with hook end of spring facing opposite to free end of dowel pin and with straight leg of spring in narrow slot between sides of bracket, and install over bracket shaft with dowel pin facing up.

5. Hook spring on parking lever, holding stop against pin. (Fig. 6-102)

6. Move parking pawl to disengage position.

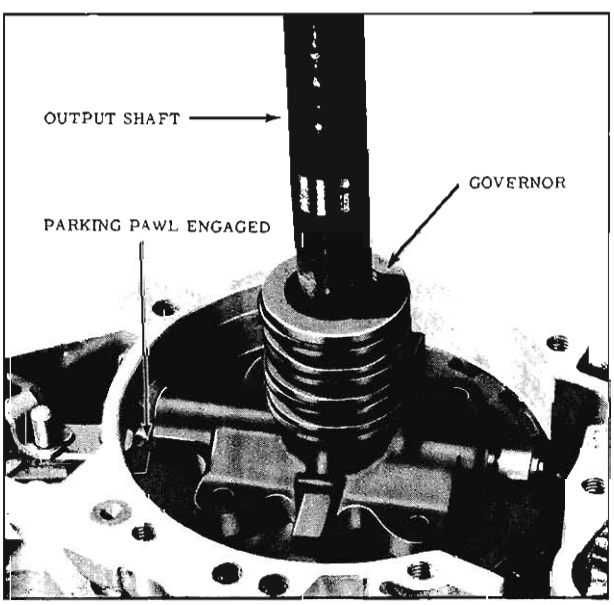


Fig. 6-103 Installing Governor

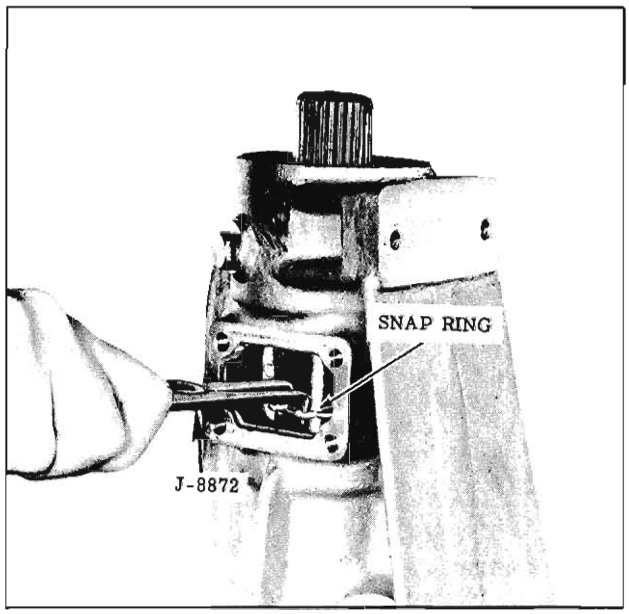


Fig. 6-104 Installing Snap Ring

Output Shaft, Governor and Rear Bearing Retainer

1. Place governor assembly on output shaft.

2. Install snap ring in output shaft groove (nearest to governor).

3. Install output shaft to rear carrier assembly using alignment marks.

4. Engage parking pawl. (Fig. 6-103)

5. Install four governor attaching bolts. Torque 19 to 24 ft. lbs.

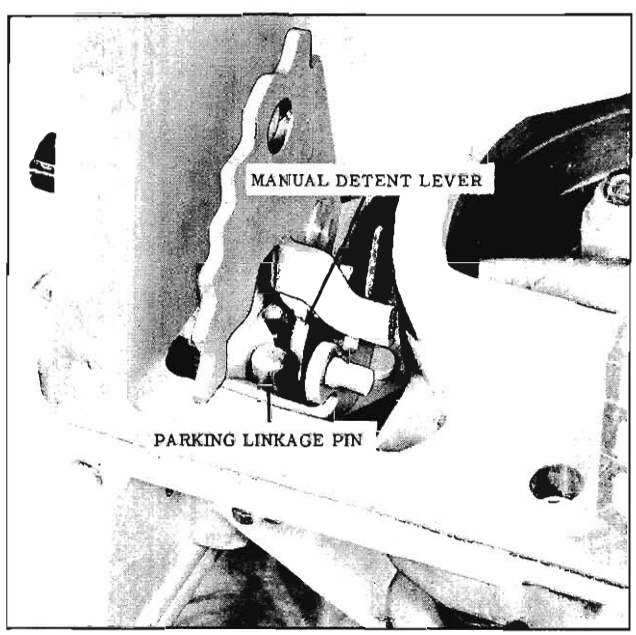


Fig. 6-105 Aligning Parking Linkage

6. Install rear bearing retainer gasket on rear bearing retainer and retain with petrolatum.

7. Start rear bearing retainer down over output shaft and install rear output shaft snap ring through access hole and over end of output shaft while retainer is being carefully lowered over governor assembly. (Fig. 6-104)

8. Carefully align parking linkage pin and manual detent lever as rear bearing retainer is aligned with dowel pin and case. (Fig. 6-105)

9. Install eight rear bearing retainer to case attaching bolts as shown in Fig. 6-106. Torque all bolts 20 to 25 ft. lbs.

10. Using Tool J-6133-A, seat rear bearing snap ring. It may be necessary to move output shaft rearward to locate snap ring, by repositioning transmission to horizontal position and pushing on front unit carrier.

11. Install "O" ring seal over output shaft and into groove.

12. If rear seal was removed, lubricate sealing lip of new seal with Lubricant Part No. 567196 and apply a light coat of sealer Part No. 557622 to the outer diameter of the seal, then install seal, using Tool J-5154.

13. Install rear bearing retainer cover plate and gasket with four attaching bolts. Torque 6 to 8 ft. lbs.

14. Reposition transmission (front end up).

Torus Members, Pump and Case Cover

1. Install front unit drive torus, aligning front unit clutch plates with drive torus. Look through vent port in case to make sure that all clutch plates are engaged.

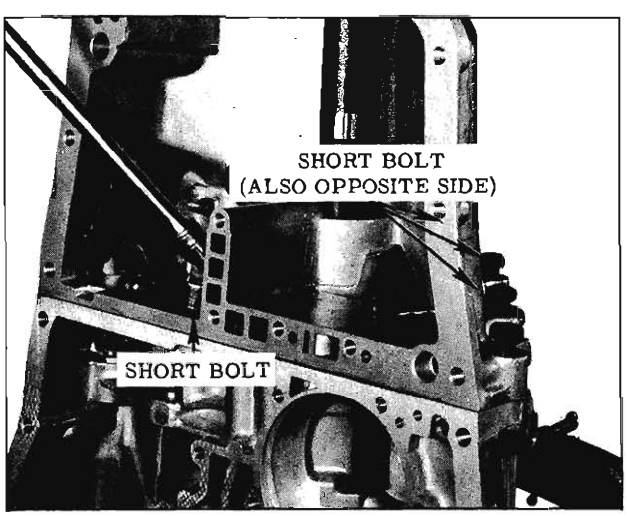


Fig. 6-106 Rear Bearing Retainer Bolts

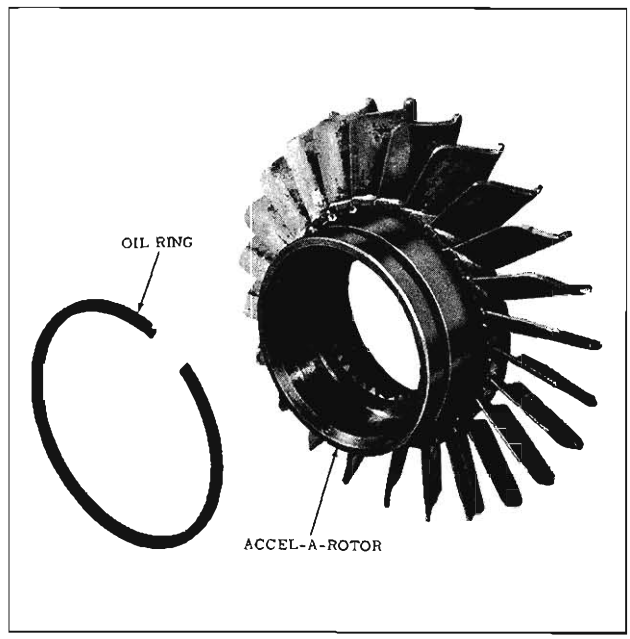


Fig. 6-107 Accel-A-Rotor

2. Install lock type oil ring on Accel-A-Rotor hub, if removed. (Fig. 6-107)

3. Install lock type oil ring on front and rear hubs of driven torus member, if removed. (Fig. 6-108)

4. Install Accel-A-Rotor into drive torus aligning splines and position Accel-A-Rotor so that the I.D. of the hub of the Accel-A-Rotor is flush with the planet carrier shaft. (Fig. 6-109) A light tap with a plastic hammer may be required.

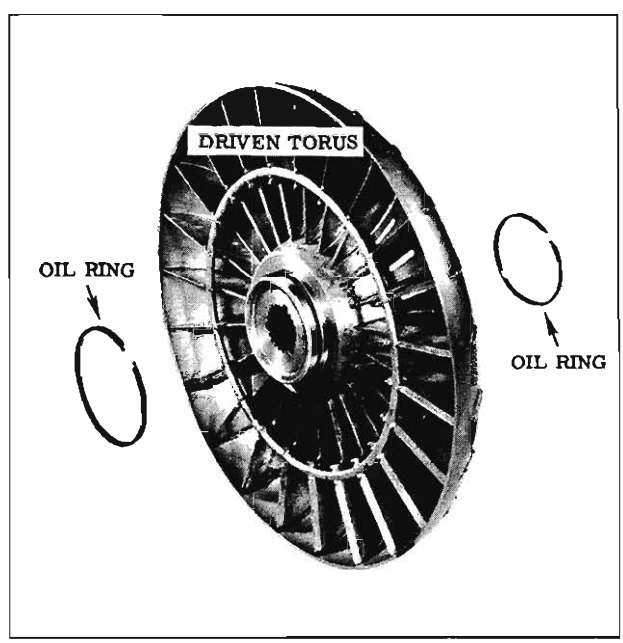


Fig. 6-108 Driven Torus

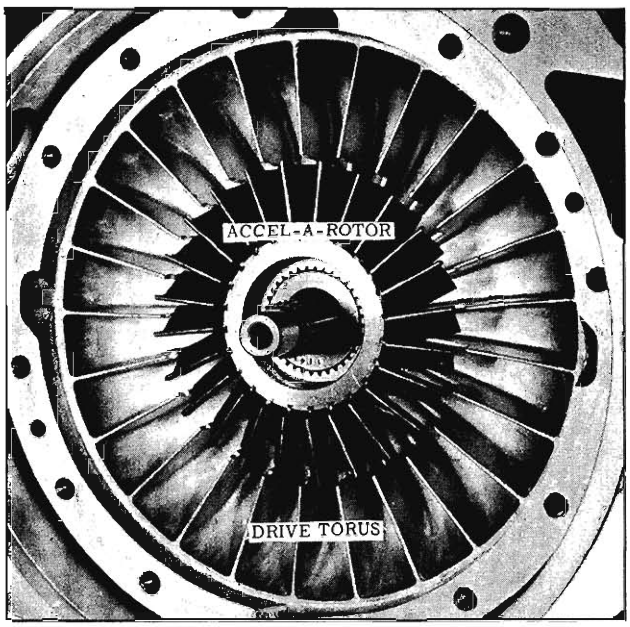


Fig. 6-109 Accel-A-Rotor Installation

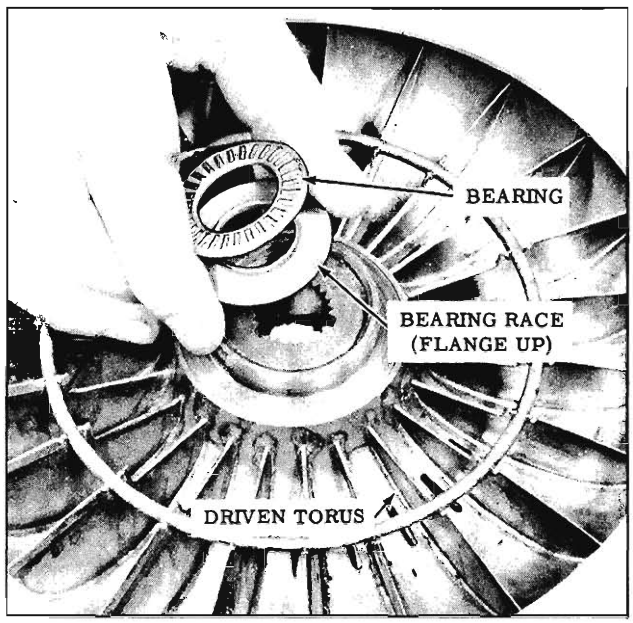


Fig. 6-111 Installing Race and Bearing

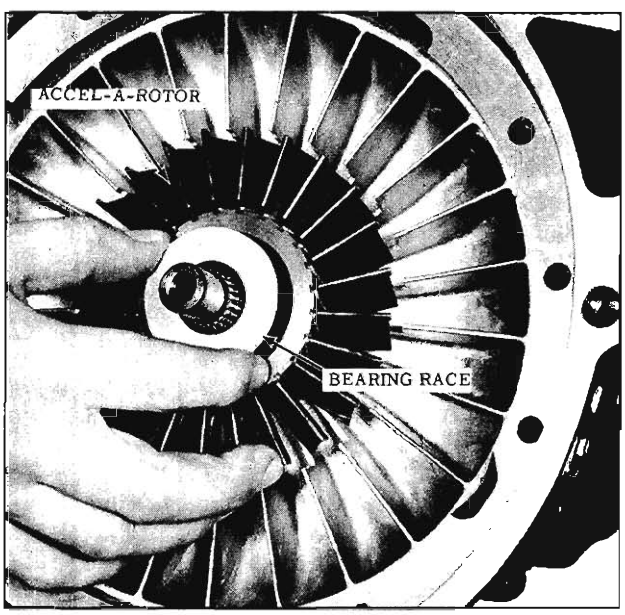


Fig. 6-110 Installing Bearing Race

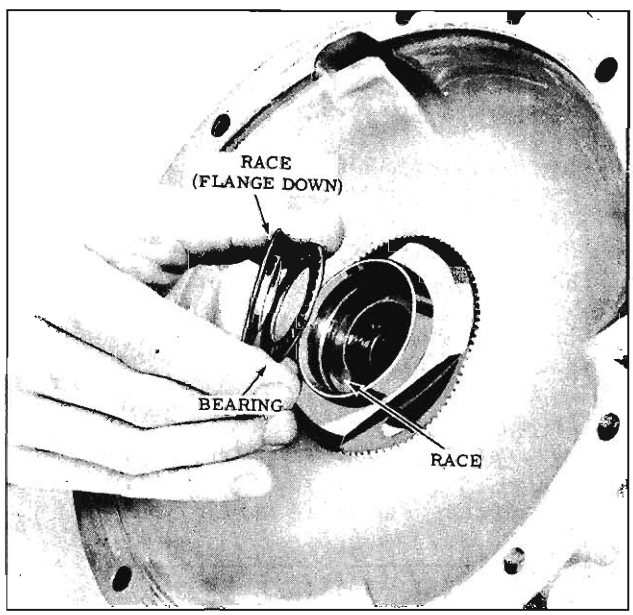


Fig. 6-112 Installing Bearing and Races

5. Install driven torus to Accel-A-Rotor rear bearing race into Accel-A-Rotor. (Fig. 6-110)

6. Install flanged race into driven torus (flange side up). (Fig. 6-111)

7. Install bearing into flanged race and retain with petrolatum.

8. Install driven torus member over main shaft, pull up on main shaft while repositioning transmission (pan side up).

9. Hold main shaft forward while installing driven torus to main shaft retaining ring.

10. Reposition transmission (front end up).

11. Install NEW drive torus to torus cover metal gasket on drive torus. Retain with petrolatum.

12. Install flat bearing race into torus cover.

13. Install bearing into flanged race, coat with petrolatum and install into torus cover with flanged side down. (Fig. 6-112)

14. Coat new gasket with petrolatum and install on torus cover.

15. Install torus cover to the drive torus member, aligning dowel pins.

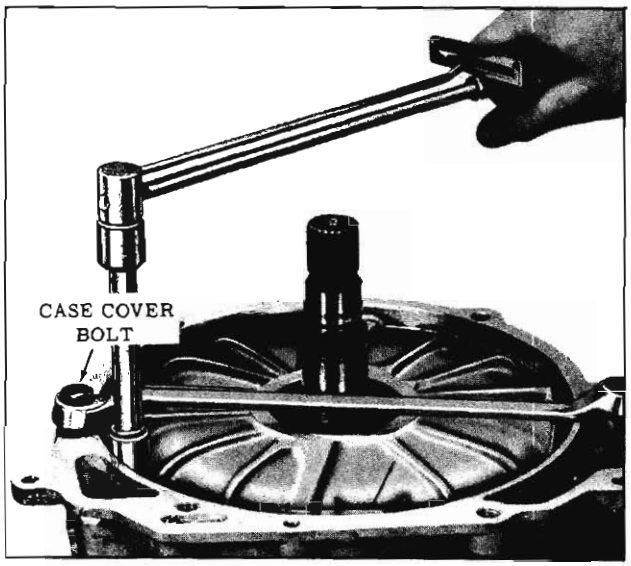


Fig. 6-113 Torus Cover Installation

16. Install box end wrench on case, as a holding tool, and install 12 torus cover to drive torus attaching bolts, cross tightening the bolts. Torque 17 to 20 ft. lbs. (Fig. 6-113)

17. Remove box end wrench.

18. Install gasket, coated with petrolatum, on case cover.

19. Install Seal Protector Tool J-8828 over input shaft. (Fig. 6-114)

20. Install case cover and pump assembly on transmission case.

21. Install six large case cover to case attaching bolts with copper washers and torque 30 to 35 ft. lbs. Install the three small attaching bolts as shown in Fig. 6-114 and torque 15 to 18 ft. lbs. Remove seal protector.

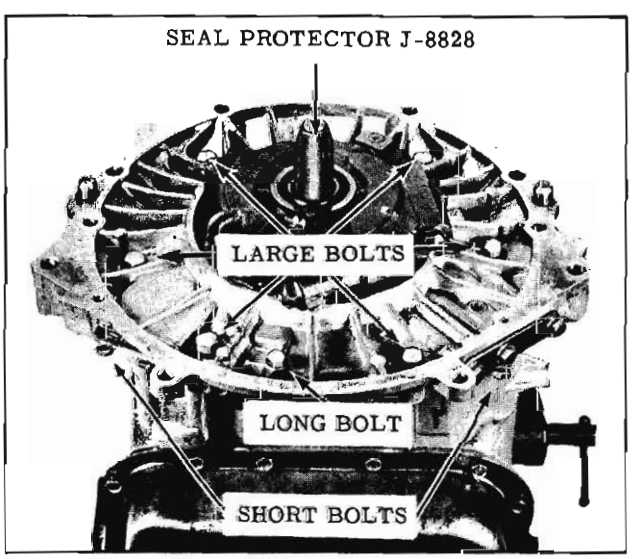


Fig. 6-114 Seal Protector and Bolt Location

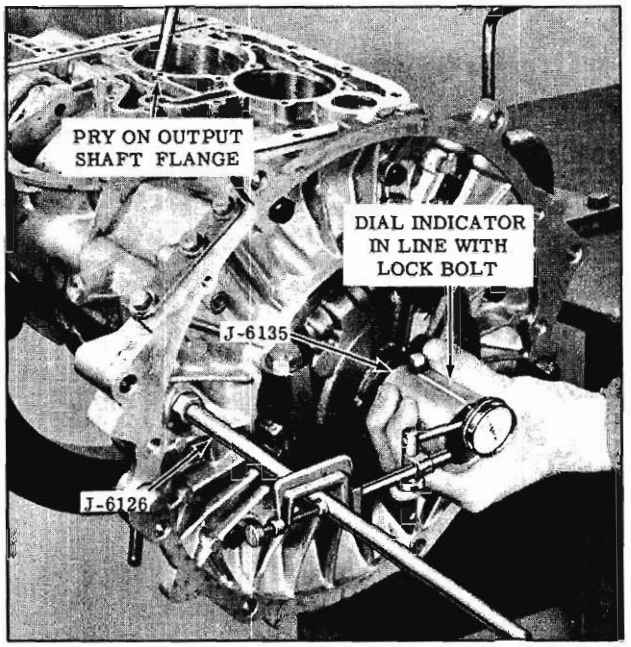


Fig. 6-115 Checking End Play

Front Unit End Play Check

1. Remove one case cover to case attaching bolt.

2. Install Tool Bolt J-6126 into transmission case.

3. Assemble Neutral Clutch Retainer Tool J-6135 on the input shaft of the torus cover.

4. Clamp dial indicator on Tool J-6126 and index indicator with end of Tool J-6135 in line with the lock screw.

5. Position a screwdriver through case, BEHIND THE FLANGE ON THE OUTPUT SHAFT and gently pry forward on output shaft to position units forward. At the same time move tool handle and record end play. (Fig. 6-115)

6. End play should be .005" to .020". If end play is incorrect, refer to selective shim washer chart and install new selective shim washer(s). (Page 6-42)

7. Remove tools and reinstall case cover to case attaching bolt. Torque bolt 30 to 35 ft. lbs.

8. Rotate transmission (pan side up).

Accumulator, Servo and Valve Body

1. Install accumulator pin into case. (Fig. 6-116)

2. Install upper accumulator spring (tapered end down).

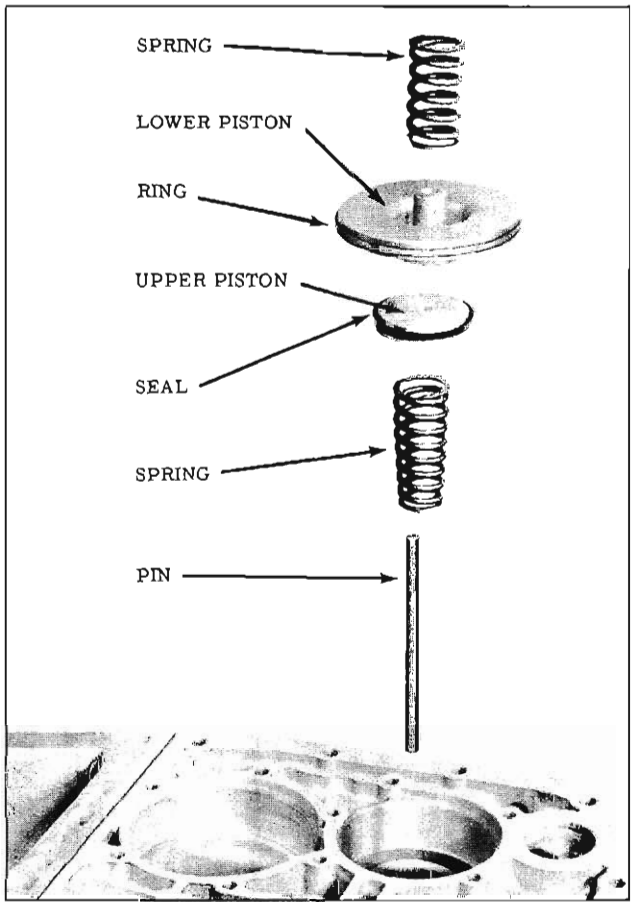


Fig. 6-116 Accumulator Installation

3. Install NEW small accumulator piston seal with lip of seal facing flat side of piston.
4. Install small accumulator piston with lip of seal facing up.
5. Install large accumulator piston ring on piston, if removed.

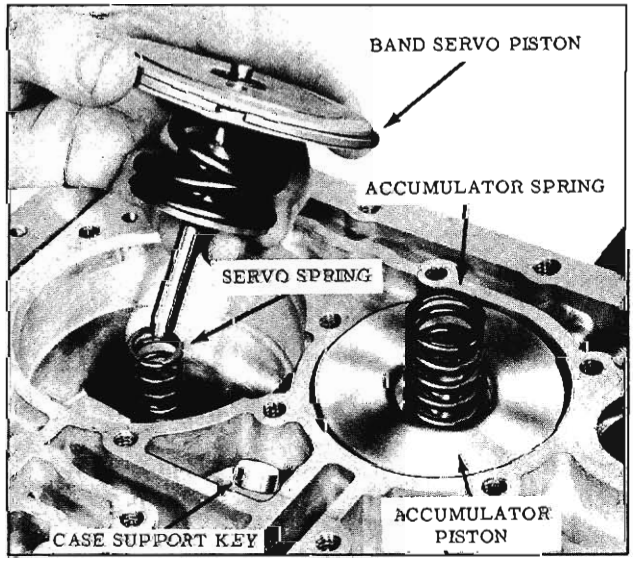


Fig. 6-117 Servo Installation

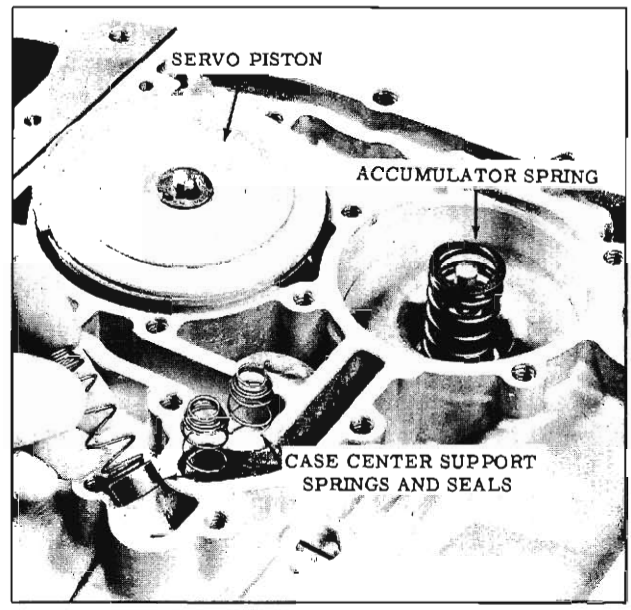


Fig. 6-118 Installing Seals and Springs

6. Install large accumulator piston over pin with spring pocket up.
7. Install short accumulator spring into spring pocket.
8. Install servo release spring into case bore. (Fig, 6-117)
9. Install servo piston assembly into case (stem down).
10. Install three case support to case seals and springs (seals down). (Fig. 6-118)
11. Install servo and accumulator gasket, coated with petrolatum, on servo and accumulator cover.
12. Check to make sure case support key is properly installed.

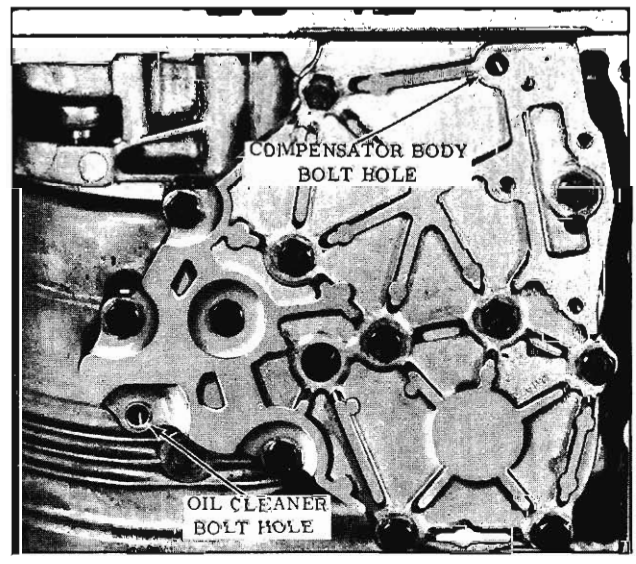


Fig. 6-119 Accumulator Cover Bolt Location

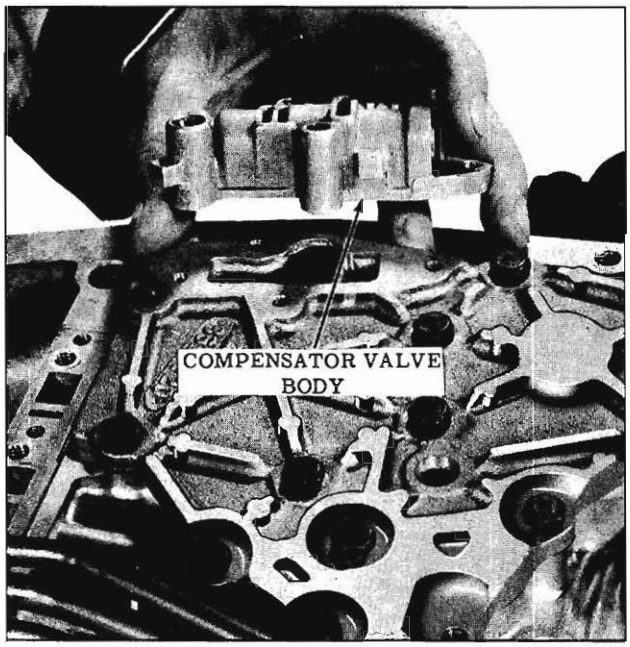


Fig. 6-120 Installing Compensator Body

13. Install servo and accumulator cover. Use 4 bolts through center of cover to locate the cover and align case support to case seals and accumulator seal ring. After cover is lined up, depress cover and tighten bolts. Torque 6 to 8 ft. lbs.

14. Install eight servo and accumulator cover bolts. Leave the remaining bolts out. (Fig. 6-119) Torque 6 to 8 ft. lbs.

15. Install compensator body assembly on accumulator cover using three screws and one bolt. (Fig. 6-120) Torque screws 2.5 to 3.5 ft. lbs. and torque bolt 6 to 8 ft. lbs.

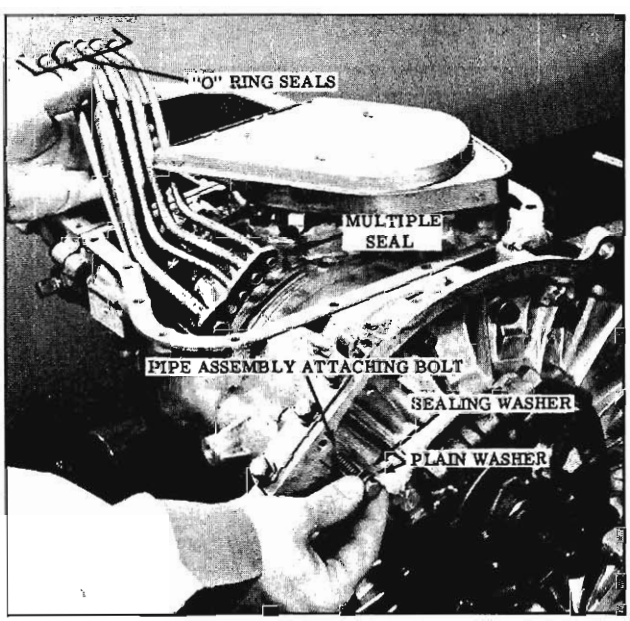


Fig. 6-121 Installing Pipe Assembly

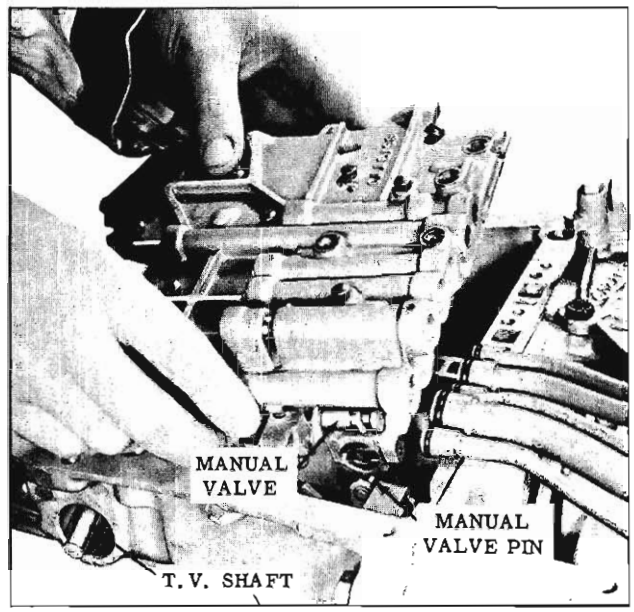


Fig. 6-122 Installing Valve Body

16. Install a case to oil cleaner pipe "O" ring in case bore, if removed.

17. Install oil cleaner with pipe in case bore and secure oil cleaner with one remaining cover attaching bolt. Torque 6 to 8 ft. lbs.

18. Install seals on pipe assembly, if removed.

19. Install pipe assembly into case through opening in case. (Fig. 6-121)

20. Install seal and washer, if removed, on pipe assembly attaching bolt, and install bolt to pipe assembly from front side of case cover. Torque 10 to 12 ft. lbs.

21. Install manual valve in valve body.

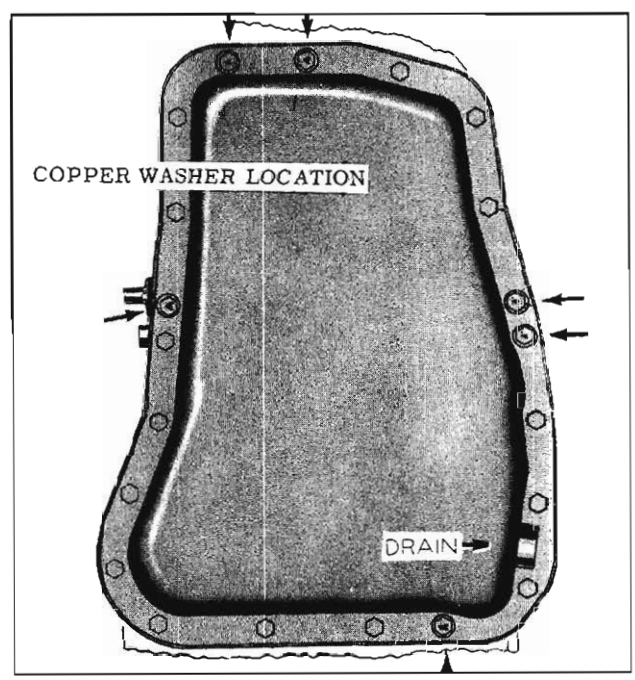


Fig. 6-123 Oil Pan Installation

22. Apply petrolatum to valve body pipe ports and install valve body assembly by guiding T.V. shaft through opening in rear bearing retainer and positioning manual valve on pick up pin. Position pipe assembly to index with pipe ports in valve body and move forward to seat pipe seals. (Fig. 6-122) Install five valve body attaching bolts. Torque 6 to 8 ft. lbs.
23. Install throttle shaft seal over T.V. shaft into case.
24. Install new oil pan gasket on transmission.
25. Install oil pan. (Fig. 6-123) Torque 12 to 15 ft. lbs.

SERVICING THE OIL COOLER

The oil cooler is located in the lower tank of the radiator and its purpose is to cool the oil in the event excessive temperature tends to develop.

In a major transmission failure, where particles of metal have been carried with the oil throughout the units of the transmission, it will be necessary to flush out the oil cooler and connecting lines. The oil cooler is a sealed container providing a passage for oil to flow from the inlet to the outlet. Clean solvent can be flushed through the cooler with air pressure. (An engine desludge gun may be used.) The cooler should be back-flushed first through the return line to remove all foreign material possible. Then flush through the inlet line and finish by flushing through the return line. Clean remaining solvent from cooler with compressed air applied to the return line and flush with Hydra-Matic oil.

MINOR SERVICE ADJUSTMENTS

THROTTLE LINKAGE ADJUSTMENTS (Fig. 6-124)

1. Adjust T.V. Lever at Side of Transmission

a. Raise car and remove lower T.V. rod from T.V. lever "A" at side of transmission. (Fig. 6-125)

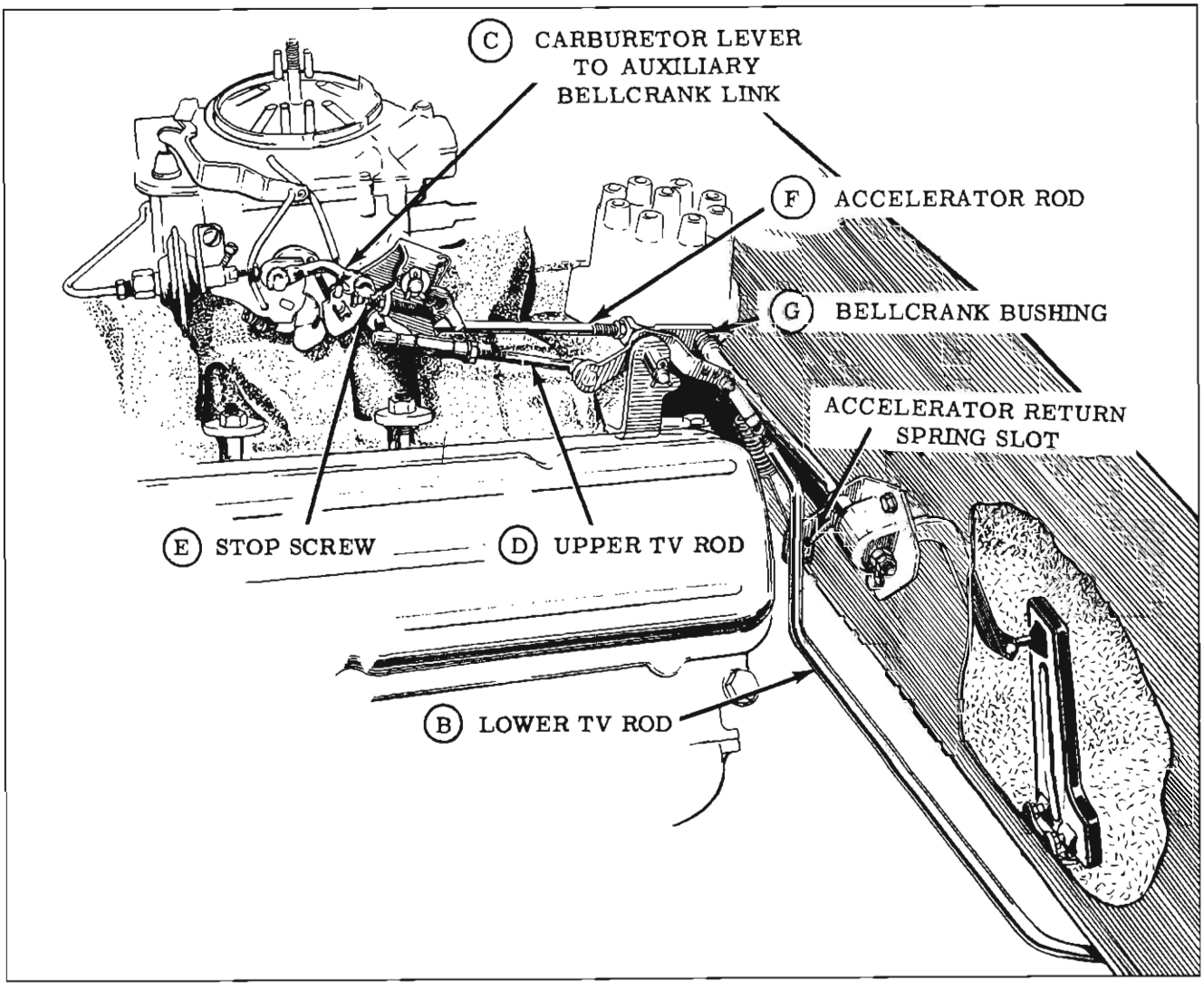


Fig. 6-124 Throttle Linkage Adjustment

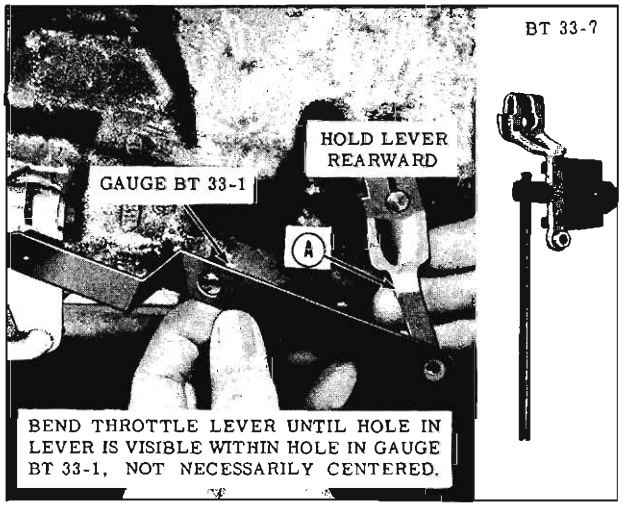


Fig. 6-125 Checking T.V. Lever Adjustment

b. Place short end of T.V. lever Gauge BT-33-1 into manual lever shaft. While holding T.V. lever at the end of its rearward travel, the T.V. lever hole should be visible within the hole in the gauge. (Fig. 6-125)

c. If T.V. lever hole is not completely visible within the gauge hole, bend lever with Tool BT-33-7 and recheck adjustment. After adjustment has been made, assemble T.V. rod to T.V. lever.

d. Lower car.

THE FOLLOWING LINKAGE ADJUSTMENT STEPS MUST BE MADE WITH THE CARBURETOR THROTTLE VALVES IN THE CLOSED BORE POSITION.

LOWER T.V. ROD ADJUSTMENT (Step 2)

CARBURETOR LEVER TO AUXILIARY BELLCRANK LINK ADJUSTMENT (Step 3)

UPPER T.V. ROD ADJUSTMENT (Step 4)

To completely close throttle valves, start engine, remove air cleaner and block intermediate choke lever at climatic control housing to release fast idle cam. Install throttle return check holding Tool J-6342-01 to hold plunger away from throttle lever. Turn off ignition switch and BACK OUT SLOW IDLE ADJUSTING SCREW UNTIL CARBURETOR THROTTLE VALVES ARE COMPLETELY CLOSED. In a true closed bore position, clearance will be present at the end of the fast idle screw, slow idle screw, and the throttle return check plunger.

2. Adjust Lower T.V. Rod (B, Fig. 6-124)

a. Loosen jam nut on lower T.V. rod "B" and remove both rods from T.V. bellcrank. Upper T.V. rod has socket and ball stud connections which snap on and off.

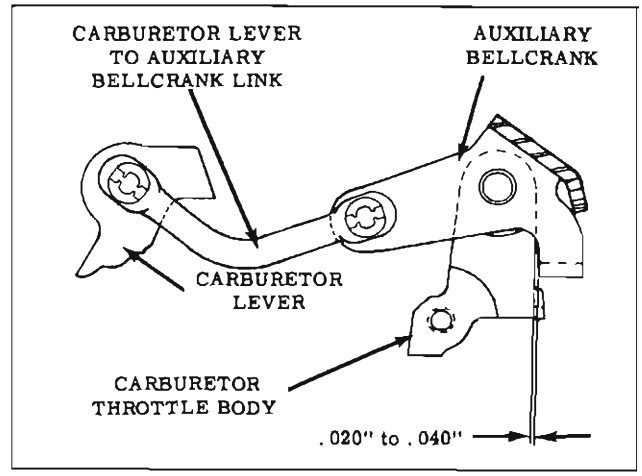


Fig. 6-126 Checking Carburetor Link (4 Bbl.)

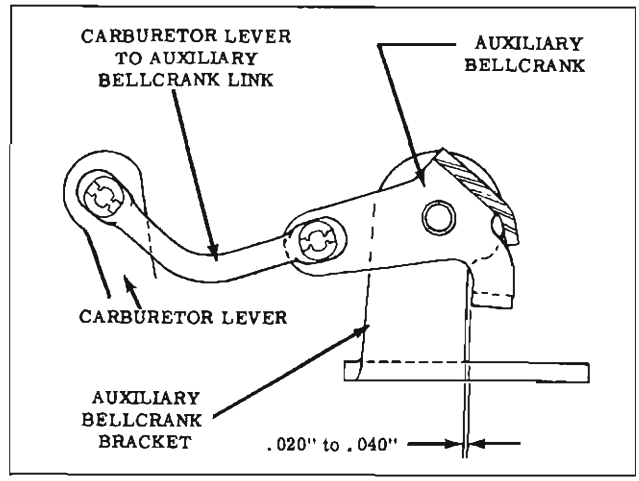


Fig. 6-127 Checking Carburetor Link (2 Bbl.)

b. With T.V. bellcrank and transmission lower T.V. rod "B" held against their rearward stops, adjust lower T.V. rod clevis so that the pin will enter freely into holes in clevis and T.V. bellcrank. (Fig. 6-125)

c. Install cotter pin and tighten jam nut on lower T.V. rod "B".

3. Adjust Carburetor Lever to Auxiliary Bellcrank Link (C, Fig. 6-124)

a. Measure clearance as shown in Fig. 6-126 (four barrel) or Fig. 6-127 (two barrel) with feeler gauge. To obtain proper clearance of .020" to .040" remove link "C" and bend. Reinstall link and recheck clearance. Link can be installed up or down.

4. Adjust Upper T.V. Rod (D, Fig. 6-124)

IMPORTANT: Before attaching the upper T.V. rod to the bellcrank, check the swivel to be sure it turns FREELY on the threads.

a. Adjust upper T.V. rod "slightly short" and snap it onto the ball stud.

b. While holding the T.V. bellcrank against its stop, lengthen the rod until the swivel turns freely and feels "sloppy". Continue to lengthen the rod by turning the swivel until a very slight resistance is felt. At this point the upper rod is properly adjusted.

The resistance occurs when the loose feeling or end play has been taken up by the lengthening of the rod.

NOTE: The resistance that is felt, is very slight and is a matter of feel and it may be necessary to perform this step more than once to obtain the correct adjustment.

c. Tighten lock nut while holding swivel in adjusted position.

5. Idle Speed Adjustment

a. Remove block holding choke valve open, start engine and allow it to reach normal operating temperature.

b. With throttle return check Holding Fixture J-6342-01 in place, set slow idle speed according to the following chart and instructions.

SLOW IDLE SPEED	
SELECTOR LEVER	RPM
"D"	500
Factory Installed Air Conditioning-Air Conditioning turned OFF. Idle Compensator held closed = 550 rpm. Dealer Installed Air Conditioning (Without Idle Compensator) - Air Conditioning turned ON.	

NOTE: When setting idle speed make sure the idle compensator is closed by holding it down with a pencil or other suitable tool. If the idle speed increases when the air cleaner is installed, do not reduce idle speed setting since the idle compensator is open. If idle speed decreases, readjust to correct rpm.

THE FOLLOWING ADJUSTMENTS MUST BE MADE WITH THE CHOKE COMPLETELY OFF, FAST IDLE OFF, AND THE CARBURETOR THROTTLE VALVES IN THE SLOW IDLE POSITION.

THROTTLE STOP SCREW ADJUSTMENT (Step 6)

ACCELERATOR PEDAL HEIGHT (Step 7)

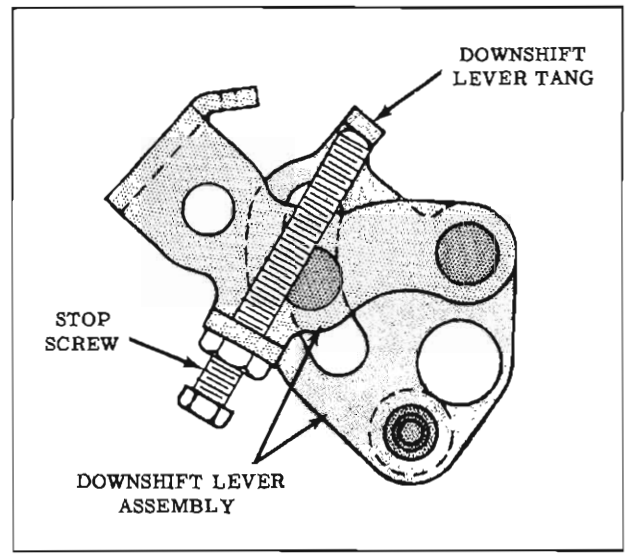


Fig. 6-128 Throttle Downshift Stop Screw Adjustment

6. Adjust Throttle Downshift Stop Screw (E, Fig. 6-124)

a. Loosen jam nut and back out stop screw several turns. Push rearward on accelerator pedal lever until throttle valves are wide open, then hold in wide open position with left hand on carburetor throttle lever. Rotate T.V. bellcrank counterclockwise with right hand to the point of maximum transmission lever travel. This point is a matter of feel, do not bend or stretch linkage beyond this point.

b. With linkage held in this position, adjust

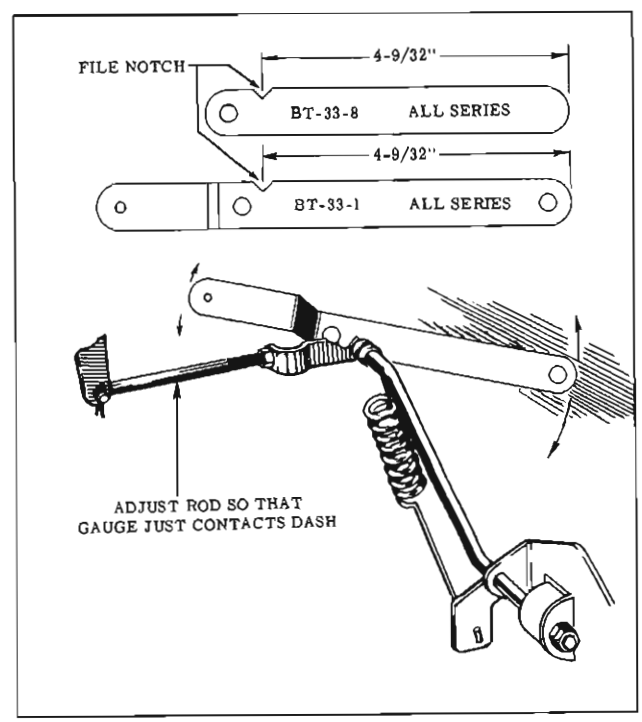


Fig. 6-129 Accelerator Pedal Height Adjustment

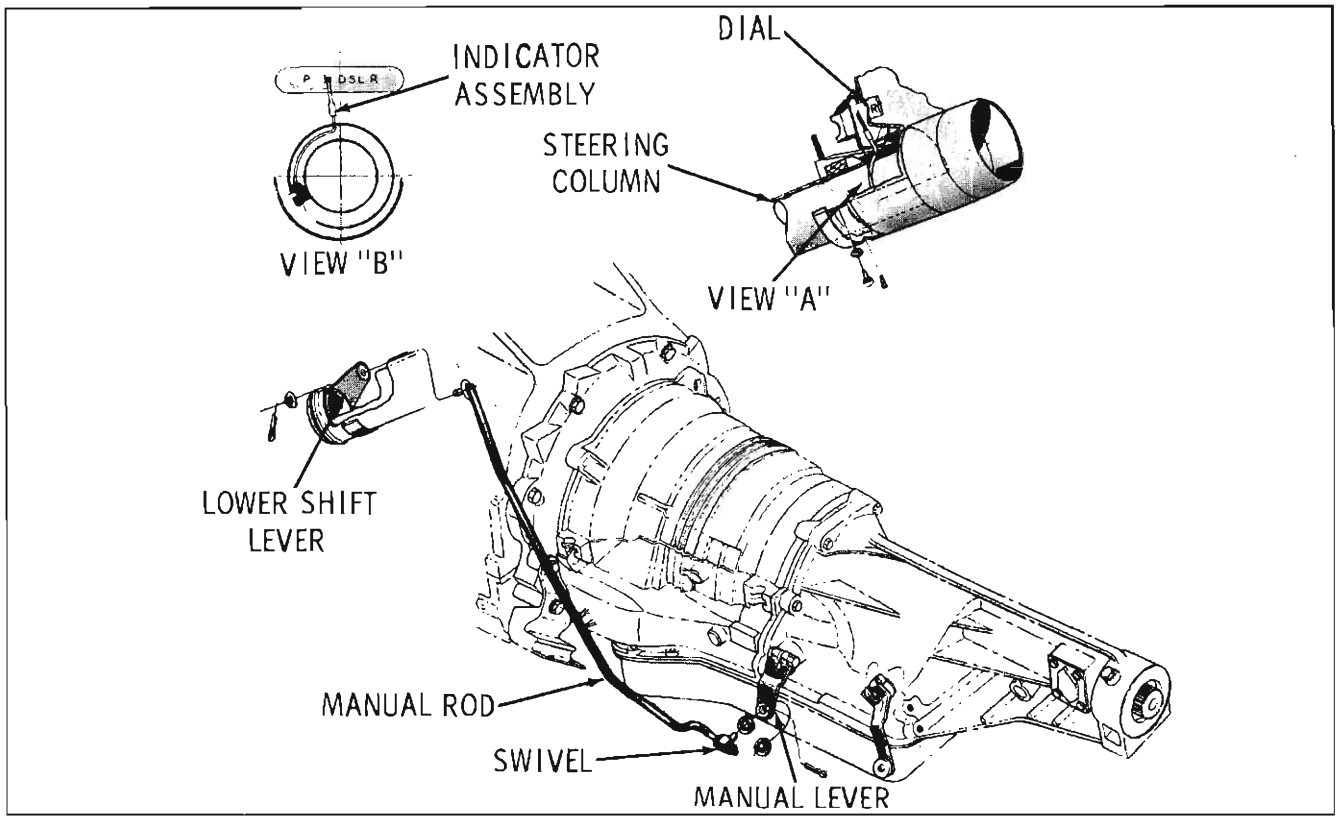


Fig. 6-130 Manual Lever Adjustment.

stop screw "E" to just touch the tang on the downshift lever.

c. Allow the throttle valves to return to a closed position, then turn stop screw in 1-1/2 to 2 turns and tighten jam nut. (Fig. 6-128)

7. Adjust Accelerator Pedal Alignment and Height

a. Disconnect accelerator pedal bellcrank link from pedal and check alignment. If pedal and link are misaligned, bend the left ball stud up or down as required.

b. Adjust accelerator rod "F" to position accelerator rod to bellcrank bushing "G" so that gauge just touches dash. (Fig. 6-129)

c. Lubricate linkage pivot points with 10W30 engine oil.

MANUAL LEVER ADJUSTMENT (WITHOUT CONSOLE) (Fig. 6-130)

The following adjustment provides proper clearance between the neutral detent in the transmission and the stop for the manual shift lever in the upper steering column mast jacket.

1. Loosen both swivel locknuts on the manual rod.
2. Set transmission manual lever in neutral detent position.
3. Hold lower shift lever upward so selector lever is positioned against stop in upper steering column. Do not raise lever.
4. Tighten rear nut finger tight against swivel.
5. Adjust manual rod short, by tightening rear nut two turns.
6. Lock swivel in position, by tightening front nut.

CONSOLE SHIFT LINKAGE (Fig. 6-131)

For linkage removal, refer to Fig. 6-131. To remove the shift lever or bracket assembly, the console must be removed.

MANUAL LEVER ADJUSTMENT (WITH CONSOLE)

The manual lever adjustment provides for proper clearance between the neutral detent in the transmission and the stop for the selector lever in the console.

1. Place the selector lever in the neutral position.
2. Disconnect the manual rod from the transmission manual lever.
3. Place the transmission manual lever in the neutral detent position.

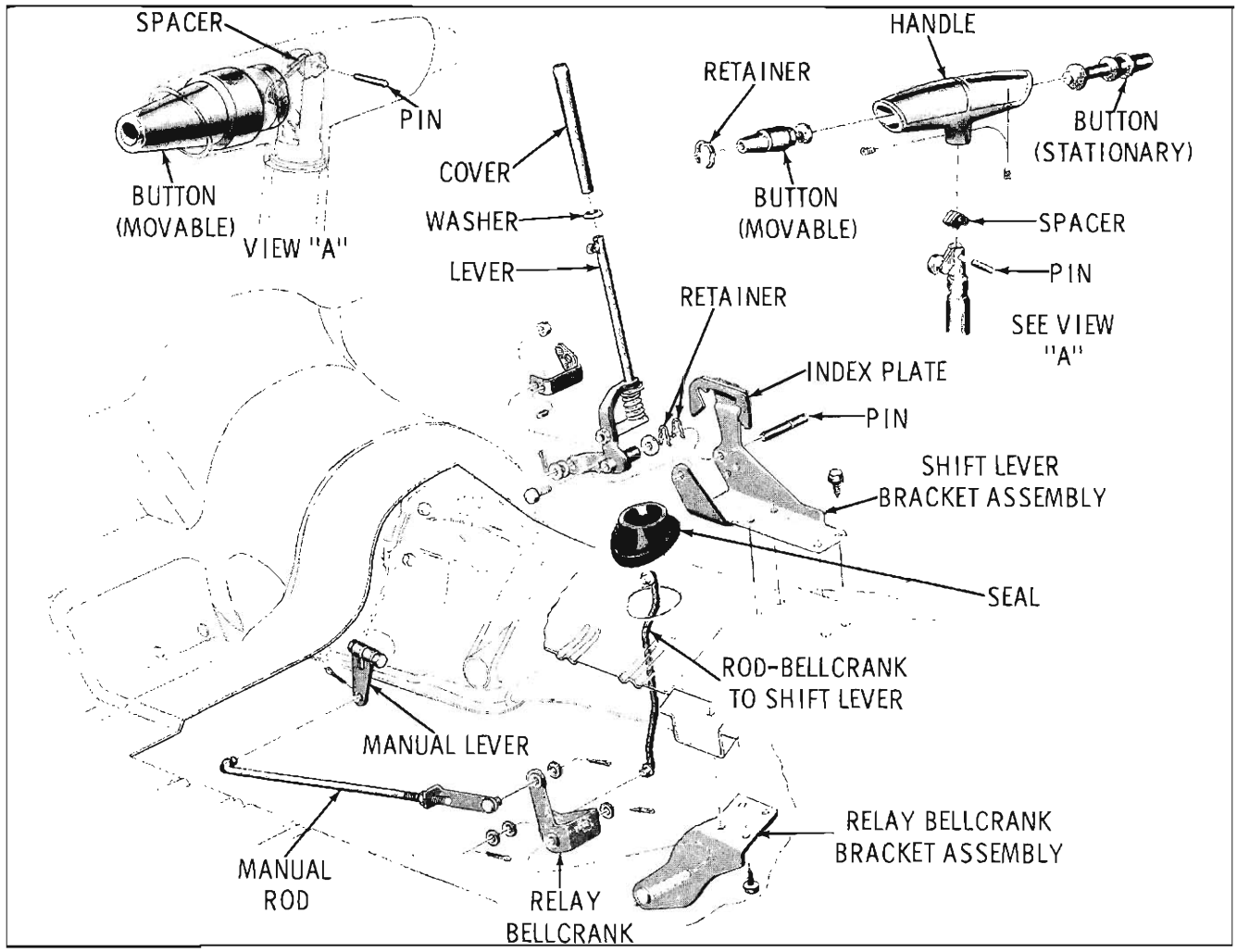


Fig. 6-131 Console Shift Linkage

4. Loosen lock nut on manual rod. With selector lever held against its stop in the neutral position and the transmission manual lever in the neutral detent position, adjust the manual rod until the manual rod enters the transmission manual lever.
5. Lengthen manual rod four turns and check alignment. Readjust if necessary.
6. Connect manual rod to transmission manual lever and install washer and cotter pin. Tighten lock nut on manual rod.

DIAGNOSIS

This information is an aid to and not a substitute for a good basic understanding of the Principles of Operation. It is of utmost importance to observe and perform all preliminary steps outlined in this Diagnosis Guide. Make certain that all "on the car repairs" possibilities have been exhausted before the transmission is removed from the car.

Prior to attempting to correct any assumed malfunctions of the transmission, always check and test as follows:

CHECK OIL LEVEL

Always check the oil level before road testing. Erratic shifting or other malfunctions can in some cases be traced to improper oil level.

ROAD TEST

For a proper diagnosis, a thorough knowledge of the operation of the transmission is essential. Where possible, a test route should be established to include some hilly section to test for open throttle downshifts, a level section for testing upshift points and a quiet section for testing for noise.

Check all upshifts and downshifts for smoothness of operation in "D" range. Also check transmission in "S" and "L" range and "R".

NOTE: There are only two gear upshifts in "D" range, 2nd to 3rd and 3rd to fourth.

While road testing, the transmission oil pressure gauge should be connected and the pressures checked as follows:

Check in "S" Range with steady road load at approximately 25 mph. Reading should be between 98.6 and 11.4 psi. (Transmission in 3rd stage)

CAUTION: Do not stall test transmission under any conditions.

LOW OIL PRESSURE

POSSIBLE CAUSES:

1. Oil Level - Low
2. Boost Plug - Wrong - Stuck
3. Pressure Regulator Valve
4. Strainer and "O" Ring
5. Manual Valve - Misaligned
6. Foaming or Cavitation
7. Control Valve Assembly - Stuck Valve(s)
8. Internal Leak
9. Front Pump - Slide - Low Output

HIGH OIL PRESSURE

POSSIBLE CAUSES:

1. Pressure Regulator Valve - Stuck
2. Boost Plug - Wrong - Stuck
3. Manual Valve - Misaligned With Quadrant
4. Control Valve Assembly - Stuck Valve
5. Front Pump - Slide - High Output

Always be certain the engine is operating at peak performance. The engine and transmission are designed to operate as an integral power unit. Failure of the engine to deliver peak power can result in improper shift characteristics and apparent transmission malfunction.

EXTERNAL LINKAGE

The importance of proper linkage adjustment cannot be over emphasized. Improper linkage adjustment can cause rough erratic shifting, missing shifts, or the inability to select one or more of the ranges.

OIL LEAKS

Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases the source of the leak can be deceiving due to "wind flow" around the engine and transmission. There are several ways to determine the source of oil leaks.

When attempting to diagnose the source of oil leaks, the following will aid in locating the leaks:

1. Wash off excess oil with cleaning solvent.
2. Spray around leaking area with foot powder.

This foot powder is sold at drug stores in pressurized cans. It is a liquid when sprayed, but turns to an absorbent powder when dry and the source of the leak can be detected on the white powder.

BLACK LIGHT

Comparing the oil from the leak to that on the engine or transmission dipstick when viewed by "Black Light", Tool J-6640 will determine the source of the leak.

POSSIBLE POINTS OF OIL LEAKS

1. TRANSMISSION OIL PAN
   a. Improperly installed or damaged gasket.
   b. Attaching bolts not correctly torqued.
   c. Filler pipe flange weld or stripped threads.
   d. Filler pipe.
   e. Oil pan not flat.
   f. Rear bearing retainer and/or case not positioned correctly at oil pan.
   g. Copper oil pan sealing gaskets incorrectly installed. Refer to Fig. 6-123.
2. REAR BEARING RETAINER
   a. Rear seal not installed properly or damaged.
   b. Gasket (rear bearing retainer to case) damaged or improperly installed.
   c. Rear bearing retainer to case attaching bolts not correctly torqued.
   d. Main line pressure plug not tight.
   e. T.V. line pressure plug not tight.
   f. Inner T.V. lever seal.
   g. Cover plate gasket improperly installed or defective.
   h. Cover plate screws not correctly torqued.
3. COOLER CONNECTIONS
   a. Adapter not correctly torqued.
   b. Adapter defective.
4. CASE COVER ASSEMBLY LEAKS
   a. Gasket - Case to Case Cover improperly installed.

b. Bolts - Improperly torqued.

c. Washer Seals - Damaged.

d. Plate or Gasket - Defective.

5. FRONT END LEAKS

a. Pump "O" ring cut or improperly installed.

b. Front seal.

c. Case to case cover gasket.

d. Case cracked or porus.

e. Cut or improperly installed "O" ring - coupling feed limit valve, (oil pump).

f. Cut or improperly installed "O" ring - pressure regulator assembly.

g. Breather pipe.

h. Manual shaft "O" ring - defective or improperly installed.

NO DRIVE IN "D" RANGE

POSSIBLE CAUSES:

1. Low Oil Level
2. Linkage, Manual
3. Control Valve Assembly
4. Internal Leak
5. Low Oil Pressure
6. Neutral Clutch
7. Sprag Assembly - Or Race
8. Coupling
9. Passage Restricted
10. Reverse Cone Engaged

FIRST AND SECOND STAGE ONLY

POSSIBLE CAUSES:

1. Governor
2. Control Valve Assembly
3. Clutch

DRIVE IN THIRD AND FOURTH ONLY

POSSIBLE CAUSE:

1. Control Valve Assembly

DRIVE IN FIRST, SECOND AND FOURTH ONLY

(MIGHT BE REPORTED AS 2 TO 3 SLIP)

POSSIBLE CAUSES:

1. Control Valve Assembly
2. Coupling

DRIVE IN FIRST, SECOND AND THIRD ONLY

POSSIBLE CAUSES:

1. Governor (G-2)
2. Control Valve Assembly

DRIVE IN "N"

POSSIBLE CAUSES:

1. Linkage, Manual
2. Neutral Clutch

NO REVERSE

POSSIBLE CAUSES:

1. Linkage, Manual
2. Low Pressure
3. Reverse Cone Clutch
4. Restricted Passage
5. Neutral Clutch

DRIVE IN "S" OR "L" RANGE ONLY

POSSIBLE CAUSES:

1. Sprag Assembly
2. Neutral Clutch

ROUGH 2 TO 3 STAGE

POSSIBLE CAUSES:

1. T.V. Linkage
2. Control Valve Assembly
3. Accumulator
4. Compensator Body Assembly
5. 2 to 3 Oil Passage
6. Coupling
7. Front Clutch

ERRATIC SHIFTS

POSSIBLE CAUSES:

1. Governor Assembly

2. Control Valve Assembly

SLIPPING ALL RANGES

POSSIBLE CAUSES:

1. Low oil level
2. Low oil pressure

SLIPPING—2 TO 3 STAGE

(CAN BE REPORTED AS 1, 2 to 4 ONLY)

POSSIBLE CAUSES:

1. T.V. Linkage
2. Low Oil Pressure
3. Control Valve Assembly
4. Compensator Body Assembly
5. Accumulator
6. 2 to 3 Oil Passages
7. Front Clutch

SLIPPING—3 TO 4

POSSIBLE CAUSES:

1. Control Valve Assembly
2. Coupling
3. Linkage Adjustment

NO ENGINE BRAKING IN "S" OR "L" RANGE

POSSIBLE CAUSES:

1. Overrun Servo
2. Overrun Band

NO PART THROTTLE OR DETENT DOWNSHIFTS

POSSIBLE CAUSES:

1. T.V. Linkage
2. Accelerator Travel
3. Control Valve Assembly
4. Governor

SELECTOR LEVER WILL NOT GO INTO "R"

POSSIBLE CAUSES:

1. Manual Linkage
2. Reverse Blocker Valve
3. Governor

SELECTOR LEVER WILL NOT GO INTO "P"

POSSIBLE CAUSES:

1. Parking Linkage
2. Manual Linkage

FORWARD DRIVE IN "R"

POSSIBLE CAUSES:

1. Manual Linkage
2. Neutral Clutch

REVERSE DRIVE IN "N"

POSSIBLE CAUSE:

Reverse Cone Clutch

HIGH UPSHIFTS

POSSIBLE CAUSES:

1. Upper T.V. Rod Too Long or Lower T.V. Rod Too Short.
2. T.V. Lever
3. T.V. Pressure
4. Control Valve Assembly
5. Governor
6. Governor Oil Passages

UPSHIFTS LOW

POSSIBLE CAUSES:

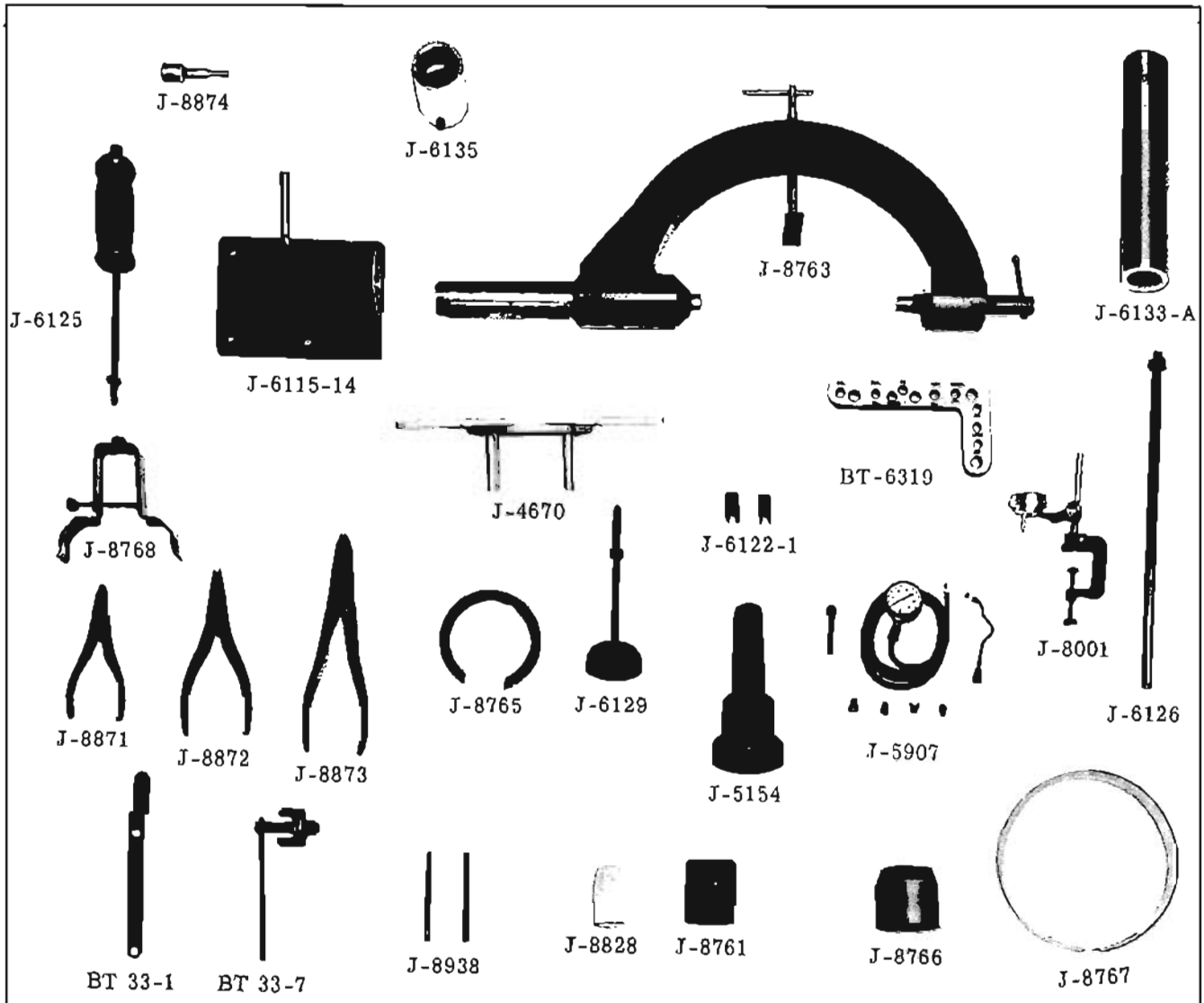
1. Upper T.V. Rod Too Short or Lower T.V. Rod Too Long.
2. Control Valve Assembly
3. Governor
4. T.V. Lever
5. Governor Passages
6. T.V. Pressure

NOISE DIAGNOSIS

CONDITION	CAUSE
1. All Ranges - More pronounced with Hot oil - 1st and 2nd stage approximately 1000 to 1200 rpm (Moan)	1. Oil Pump
2. 3 to 2, 1 - 3 to 4 stage (Whine)	2. Oil Pump
3. 3rd & Reverse Gear Noise Low rpm (Only)	3. Front Unit Gear Set
4. 1st-2nd-3rd, Reverse & Neutral Gear Noise - High rpm Predominant noise in 3rd during 3 to 4 stage.	4. Rear Unit Gear Set
5. 3 to 4 stage noise with Hot oil and low rpm	5. (Coupling Fill) Pump Whine
6. Noise In All Except 3rd	6. Coupling
7. Buzzing Noise	7. T.V. Valves, Governor or Pressure Regulator Valve
8. Rattle - Light Load - 4th	8. Damper

TORQUE SPECIFICATIONS

LOCATION	TORQUE (Ft. Lbs.)
Valve Bodies	
Channel Plate to 3 to 4 Boost Body	2.5 to 3.5
Channel Plate to Valve Body	2.5 to 3.5
Valve Body to Channel Plate	2.5 to 3.5
3 to 4 Boost Body to Valve Body	2.5 to 3.5
Compensator Body to Servo & Accumulator Cover	2.5 to 3.5
Valve Body to Case	6 to 8
Compensator Valve Body to Case	6 to 8
Rear Bearing Retainer	
Rear Bearing Retainer Cover to Retainer	6 to 8
Rear Bearing Retainer to Bushing Sleeve	12 to 15
Rear Bearing Retainer to Case	20 to 25
Pump and Case Cover	
Oil Cooler Control Valve to Case Cover	2.5 to 3.5
Pump Cover to Pump Body	6 to 8
Case Cover to Case (5/16-18)	15 to 18
Case Cover to Case (7/16-14)	30 to 35
Case Cover to Pump	15 to 18
Case Cover to Pipe	10 to 12
Plate to Case Cover	18 to 20
Torus Feed Limit Valve Plug	15 to 20
Pressure Regulator Plug	15 to 20
Front and Rear Units	
Front Internal Gear to Clutch Housing	22 to 27
Rear Planet Shaft to Carrier	19 to 23
(Governor) Output Shaft to Carrier	19 to 23
Torus Exhaust Valve Cover to Torus Cover	24 to 29
Torus Cover to Drive Torus	17 to 20
Oil Pan to Case	12 to 15
Servo and Accumulator Cover to Case	6 to 8
Case Cover to Engine and Lower Flywheel Housing	50 to 55



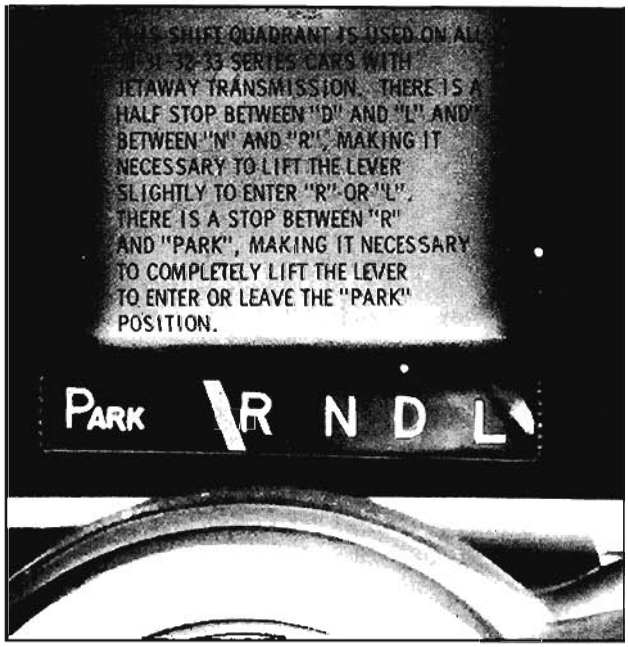
BT 33-1	Transmission T. V. Lever Gauge	J-8761	Oil Pump Seal Installer (Transmission)
BT 33-7	T. V. Lever Bending Tool	J-8763	Holding Fixture
BT-6319	Air Checking Fixture	J-8765	Reverse & Neutral Clutch Retainer Adapter
J-4670	Clutch Spring Compressor	J-8766	Reverse & Neutral Clutch Inner Seal Protector
J-5154	Rear Oil Seal Installer	J-8767	Reverse Clutch Outer Seal Protector
J-5907	Oil Pressure Gauge	J-8768	Reverse Cone Puller
J-6115-14	Holding Fixture Bench Adapter	J-8828	Oil Pump Seal Protector
J-6122-01	Coupling Valve Retainers	J-8871	No. 22-90 Degree Truarc Plier External
J-6125	Slide Hammers	J-8872	No. 24-90 Degree Truarc Plier External
J-6126	Dial Indicator Support	J-8873	No. 25-90 Degree Truarc Plier Internal
J-6129	Clutch Spring Compressor	J-8874	F-30 Clutch Head 3/8 Drive Bit
J-6133-A	Rear Bearing and Speedometer Gear Installing Tool	J-8938 (J-3387-2)	Internal Gear & Clutch Housing Assembly (Holding Studs)
J-6135	Neutral Clutch Retainer (Output Shaft End Play Adapter)		
J-8001	Dial Indicator Set		

Fig. 6-132 Hydra-Matic Tools

JETAWAY

(30-31-32-33 SERIES)

CONTENTS OF SECTION 6



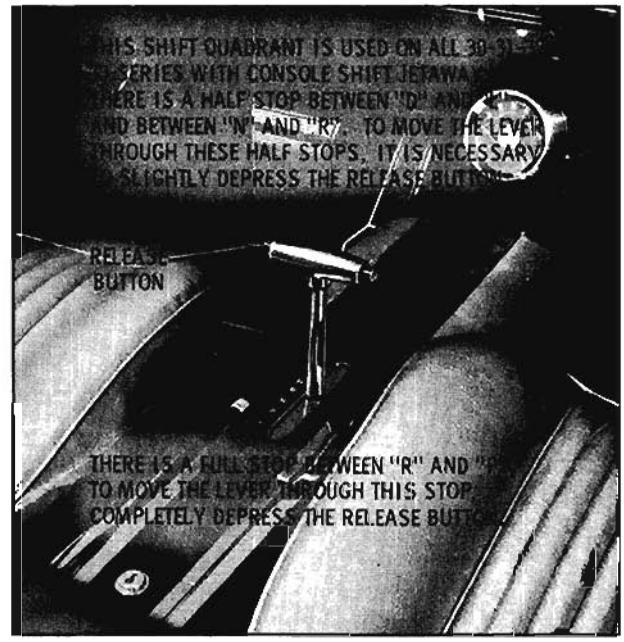


Fig. 6-201 Shift Quadrant

DESCRIPTION

The Jetaway transmission is a combination torque converter and planetary geared transmission. Torque multiplication is obtained hydraulically through the converter, and mechanically through a compound planetary gear set. The gear set, in combination with the torque converter, provides a high starting ratio for acceleration from a stop, up steep grades, etc. The torque converter provides torque multiplication for performance and exceptionally smooth operation. It functions as a fluid coupling at normal road load conditions and at higher speeds. Description of transmission is divided into six basic sections: (1) Torque Converter, (2) Oil Pump, (3) Planetary Gear Set and Controls, (4) Reverse Clutch, (5) Governor, (6) Valve Body.

TORQUE CONVERTER

The torque converter is connected to the engine flywheel and serves as a hydraulic coupling through which engine torque is transmitted to the input shaft. The torque converter steps up or multiplies engine torque whenever operating conditions demand greater torque than the engine alone can supply. The torque converter consists of three (3) basic sections: (a) Converter Pump, (b) Stator, (c) Converter Turbine.

Converter Pump (Fig. 602)

The function of the converter pump is to convert engine torque into an energy transmitting flow of oil to drive the converter turbine into which the oil is projected. The converter pump operates as a centrifugal pump, picking up oil at its center and discharging the oil at its rim. However, the converter is shaped to discharge the oil parallel to its axis in the form of a spinning hollow cylinder.

Stator (Fig. 6-203)

The stator is located between the converter turbine and the converter pump, and is supported by the stator shaft. The stator is equipped with an overrunning clutch assembly. When the clutch assembly is held stationary, it changes the direction of oil flow from the turbine to the proper angle for smooth entrance into the converter pump. As the turbine approaches pump speed the direction of oil flow changes until the stator no longer opposes pump rotation. The stator then free wheels so that it will not interfere with the flow of oil between the turbine and converter pump. For normal operation in Drive range the stator blades are set at low angle. For increased acceleration and performance, torque is obtained by setting the stator blades at high angle.

Converter Turbine (Fig. 6-204)

The function of the converter turbine is to absorb energy from the oil projected into it by the pump and convert the energy into torque and transmit that torque to the input shaft.

OIL PUMP (Fig. 6-205)

A positive displacement internal-external gear type oil pump is used to supply oil to fill the converter, for engagement of forward and reverse

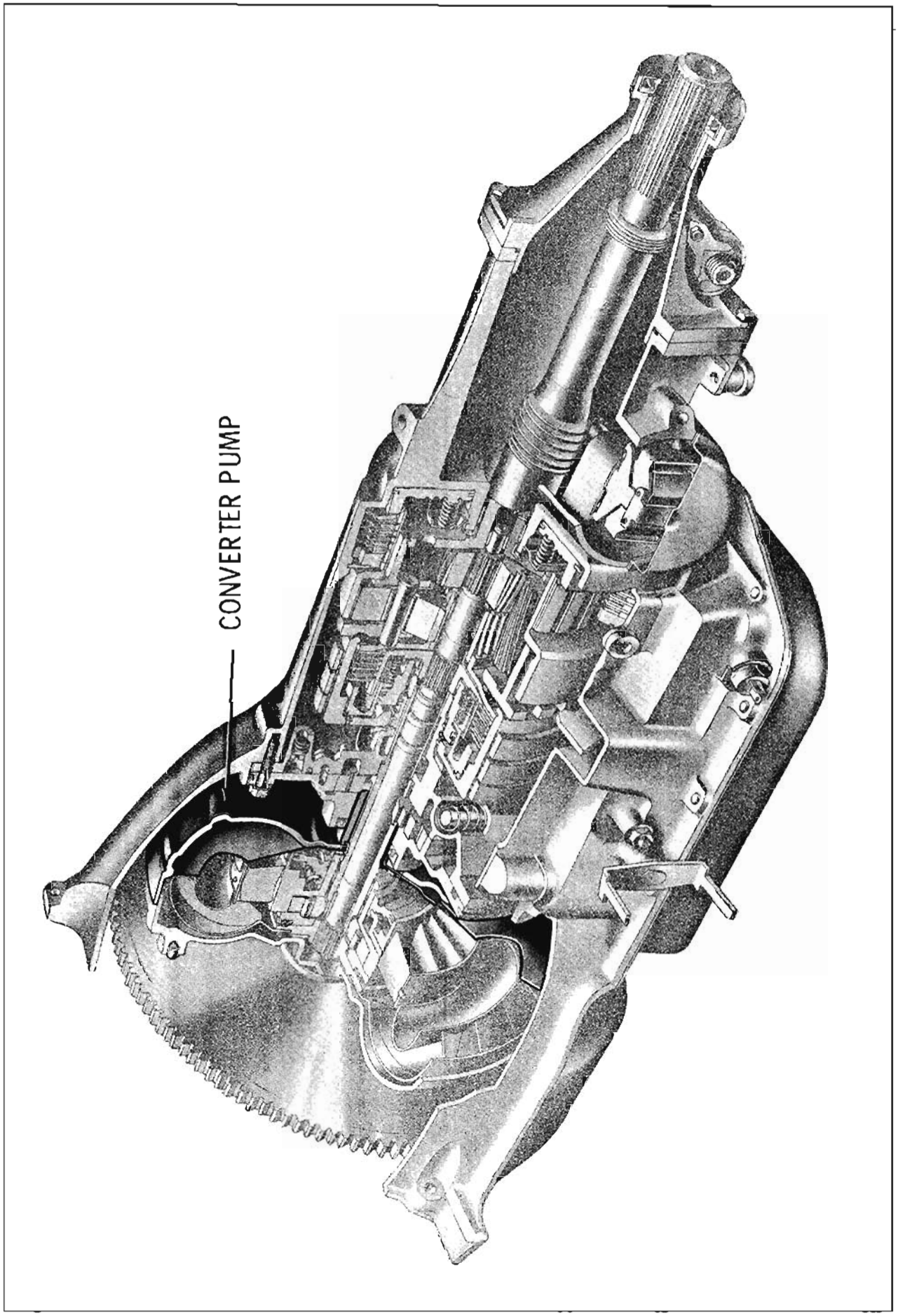


Fig. 6-202 Converter Pump

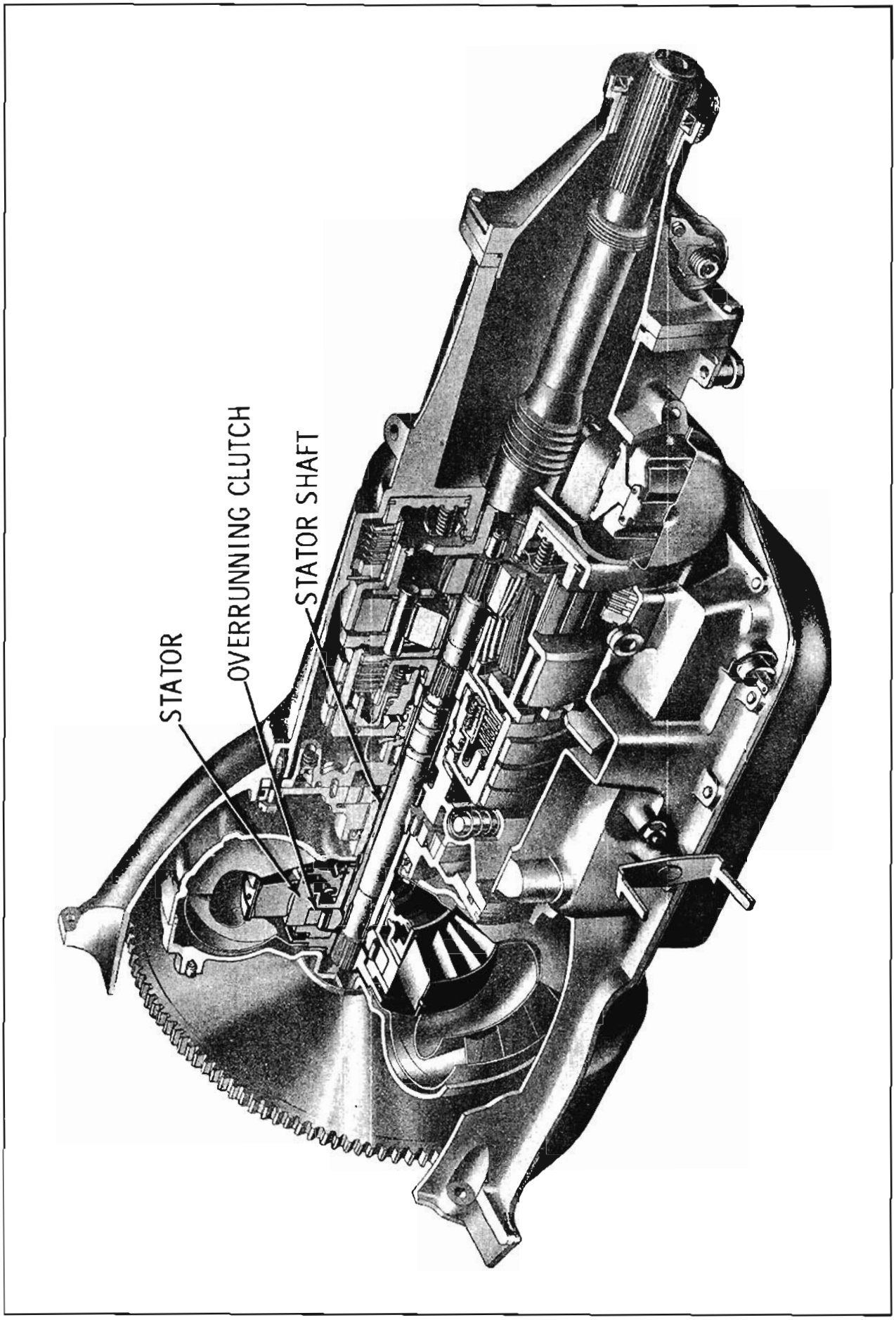


Fig. 6-203 Stator

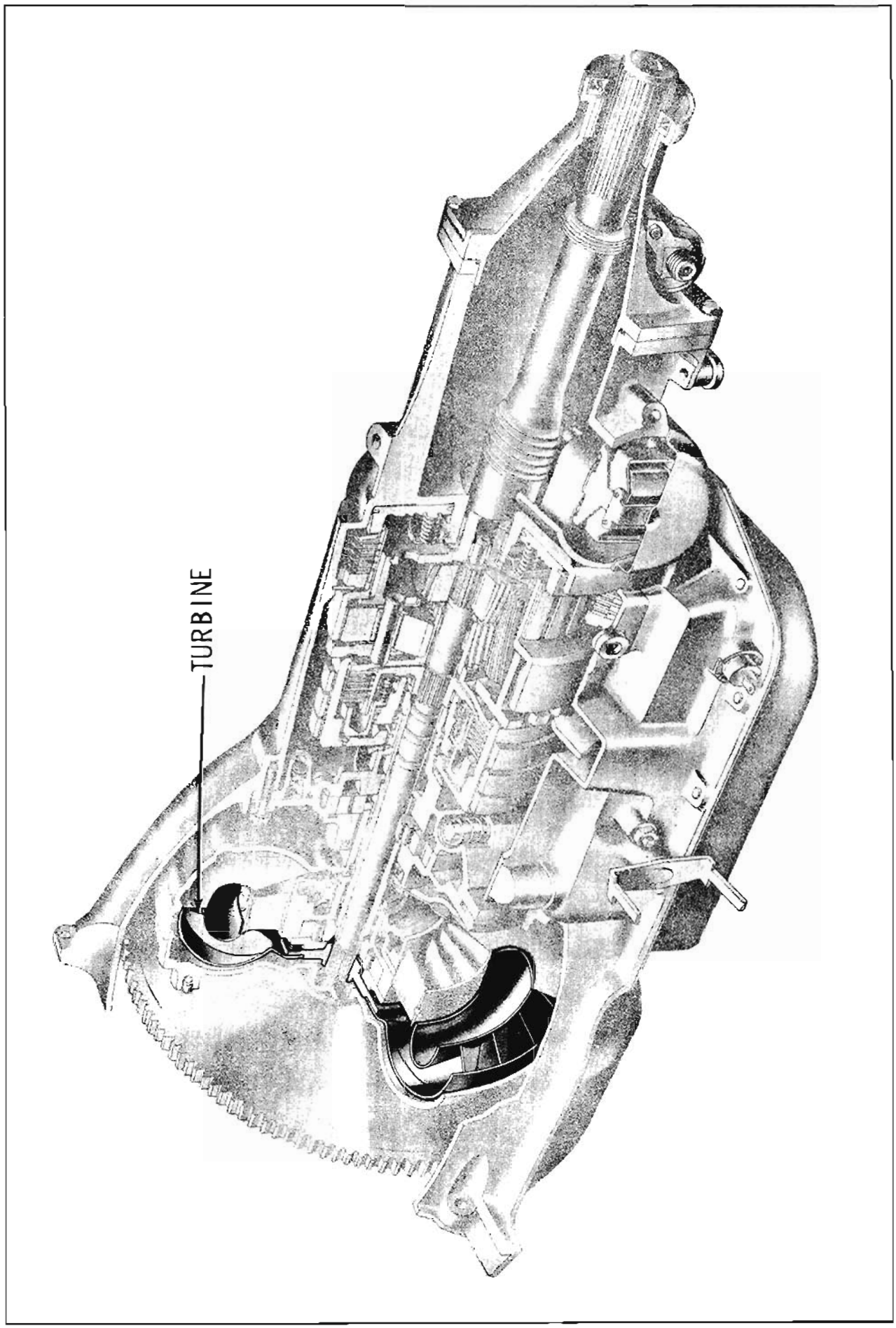


Fig. 6-204 Turbine

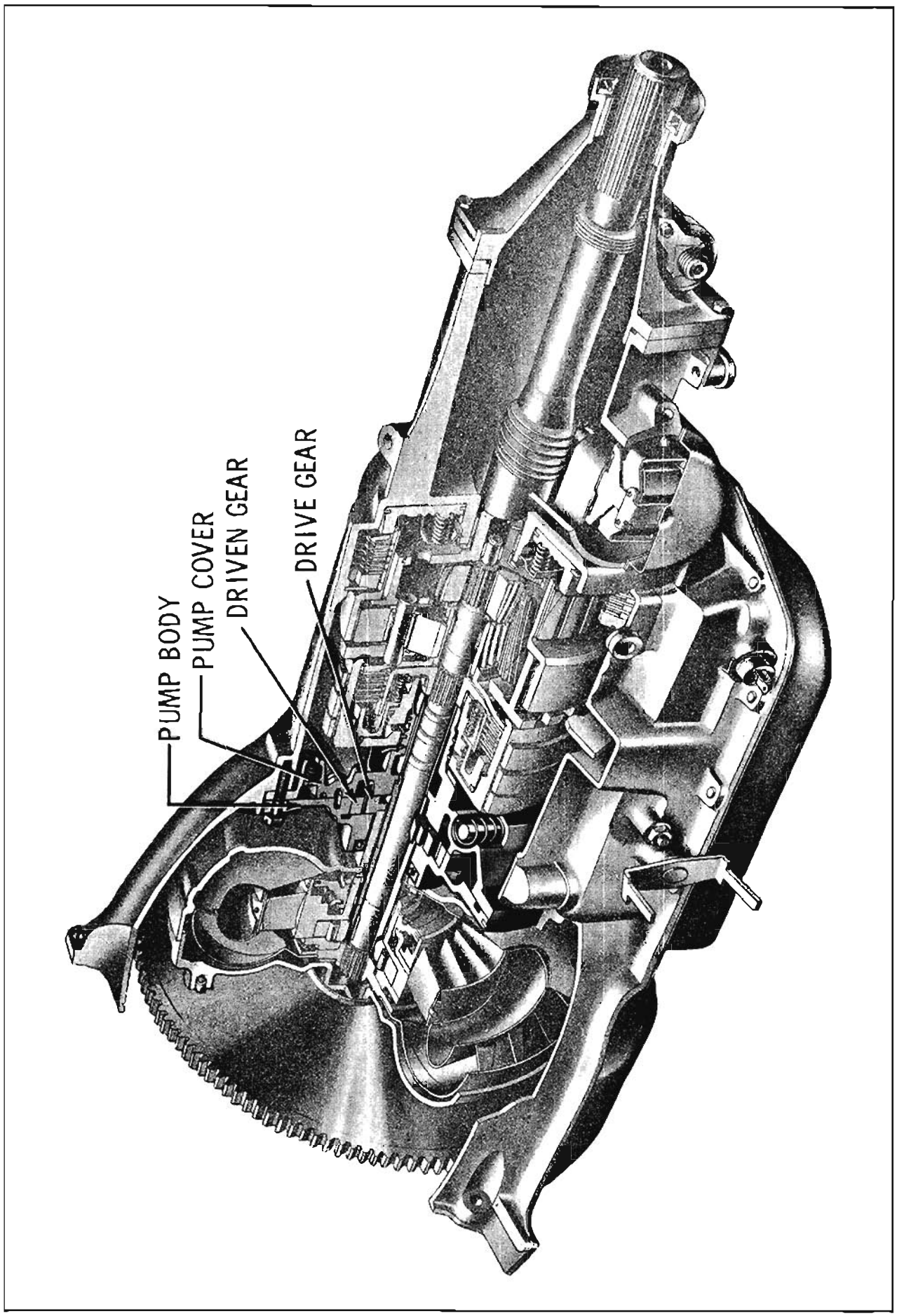


Fig. 6-205 Oil Pump

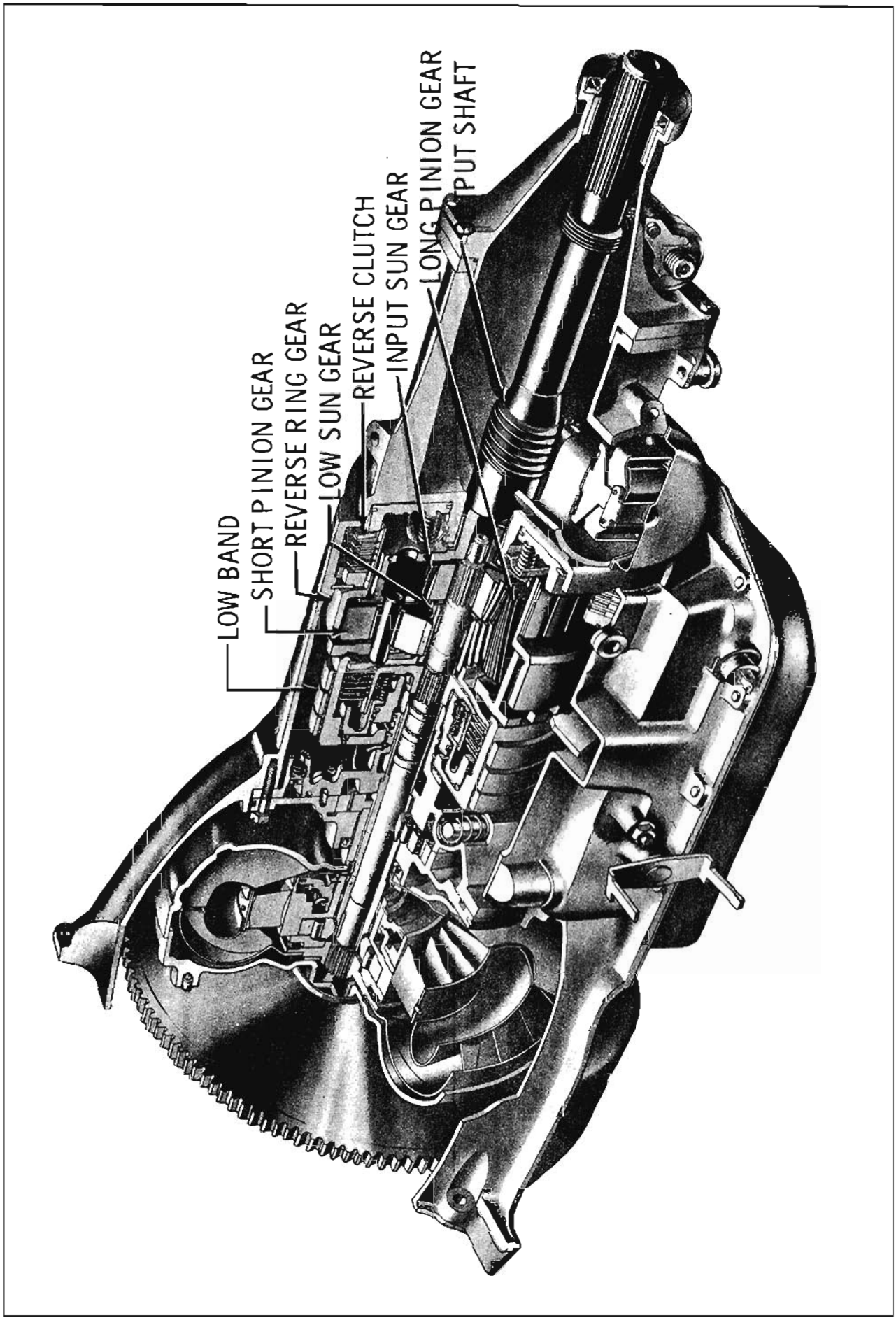


Fig. 6-206 Planetary Gear Set

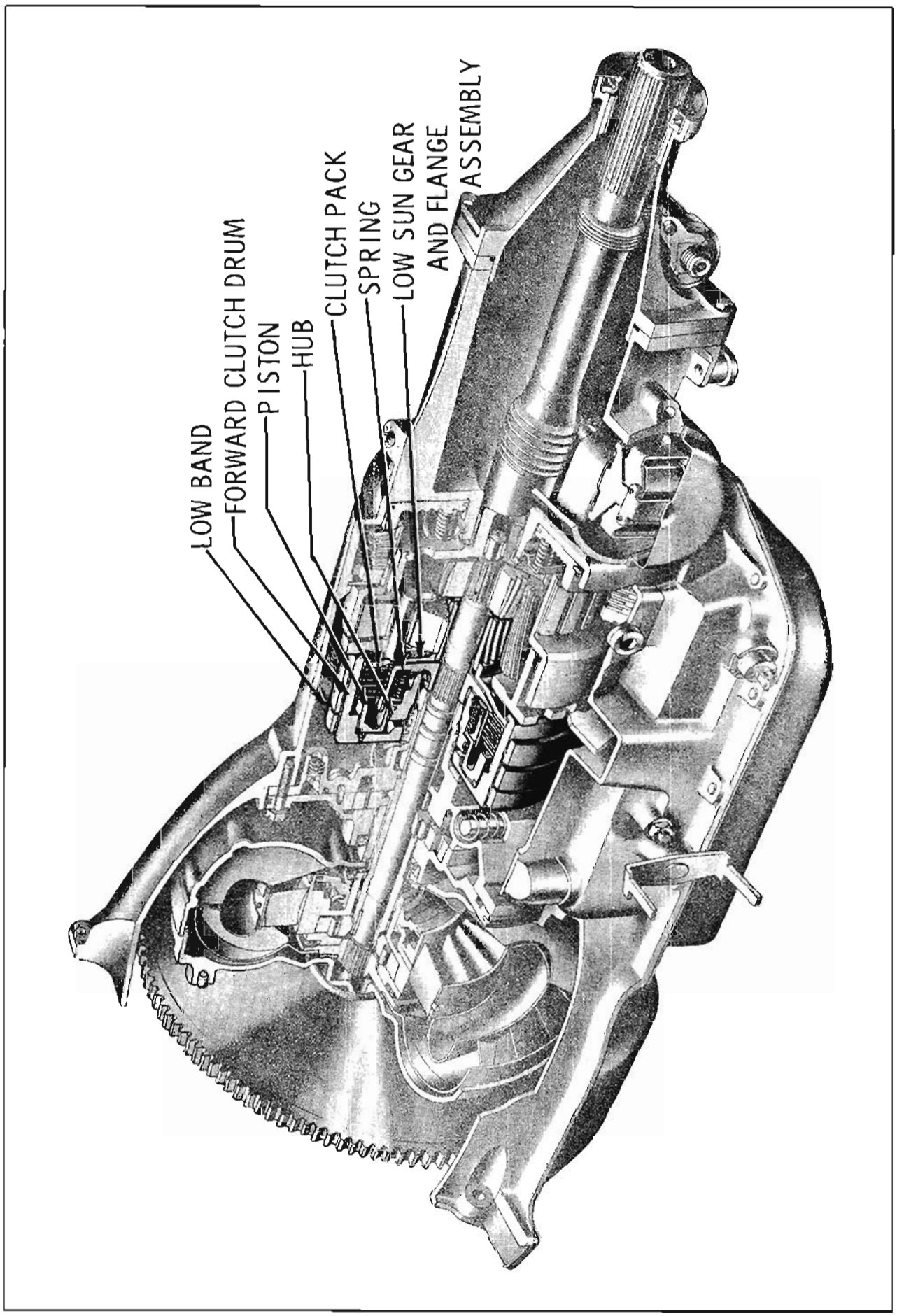


Fig. 6-207 Forward Clutch

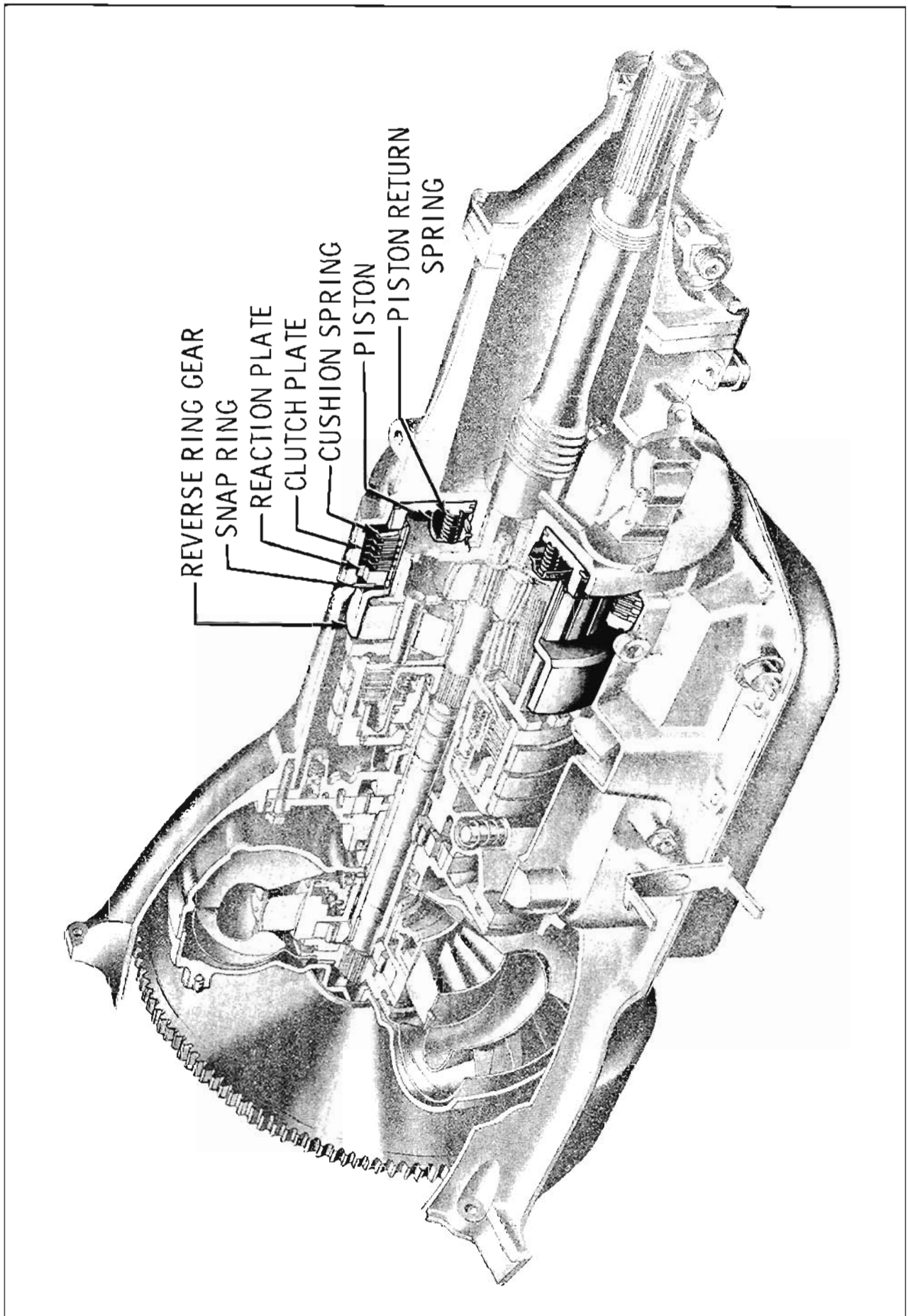


Fig. 6-208 Reverse Clutch

clutches, for application and release of the low band and to provide oil for lubrication and heat transfer.

PLANETARY GEAR SET (Fig. 6-206)

The planetary gear set consists of an input sun gear, low sun gear, short and long pinions, a reverse ring gear and a planet carrier. The input sun gear is splined to the input shaft. The low sun gear, which is part of the forward clutch assembly, may revolve freely until the low band is applied. The input sun gear is in mesh with three (3) long pinions and the long pinions are in mesh with three (3) short pinions. The short pinions are in mesh with the low sun gear and reverse ring gear. The input sun gear and short pinions always rotate in the same direction. Application of either the low band or the reverse clutch determines whether the output shaft rotates forward or backward.

Forward Clutch (Fig. 6-207)

The forward clutch assembly consists of a drum, piston, springs, piston seals, and a clutch pack. These parts are retained inside the drum by the low sun gear and the flange assembly and retainer ring. When oil pressure is applied to the piston, the clutch plates are pressed together connecting the clutch drum to the input shaft through the clutch hub. Engagement of the clutch causes the low sun gear to rotate with the input shaft.

Low Band (Fig. 6-207)

The low band is a double-wrap steel band faced with a bonded lining which surrounds the forward clutch drum. The band is hydraulically applied by the low servo piston, and released by spring pressure.

REVERSE CLUTCH (Fig. 6-208)

The reverse clutch assembly consists of a piston, inner and outer seal, cushion spring, coil springs, clutch pack, and reaction plate. These parts are retained inside the case by a retaining snap ring. When oil pressure is applied to the piston, the clutch plates are pressed together holding the reverse ring gear stationary. This engagement of the clutch causes reverse rotation of the output shaft.

GOVERNOR

The governor is located to the rear of the transmission case on the left side and is driven off the output shaft. The purpose of the governor is to generate a speed sensitive modulating oil pressure that increases up to a point with output shaft or car speed.

VALVE BODY

The valve body assemblies are bolted to the bottom of the transmission case and are accessible for service by removing the oil pan. The main valve body assembly consists of manual control valve, detent valve, shift valve, modulator limit valve, and high speed downshift timing valve. The stator valve body consists of a stator control valve.

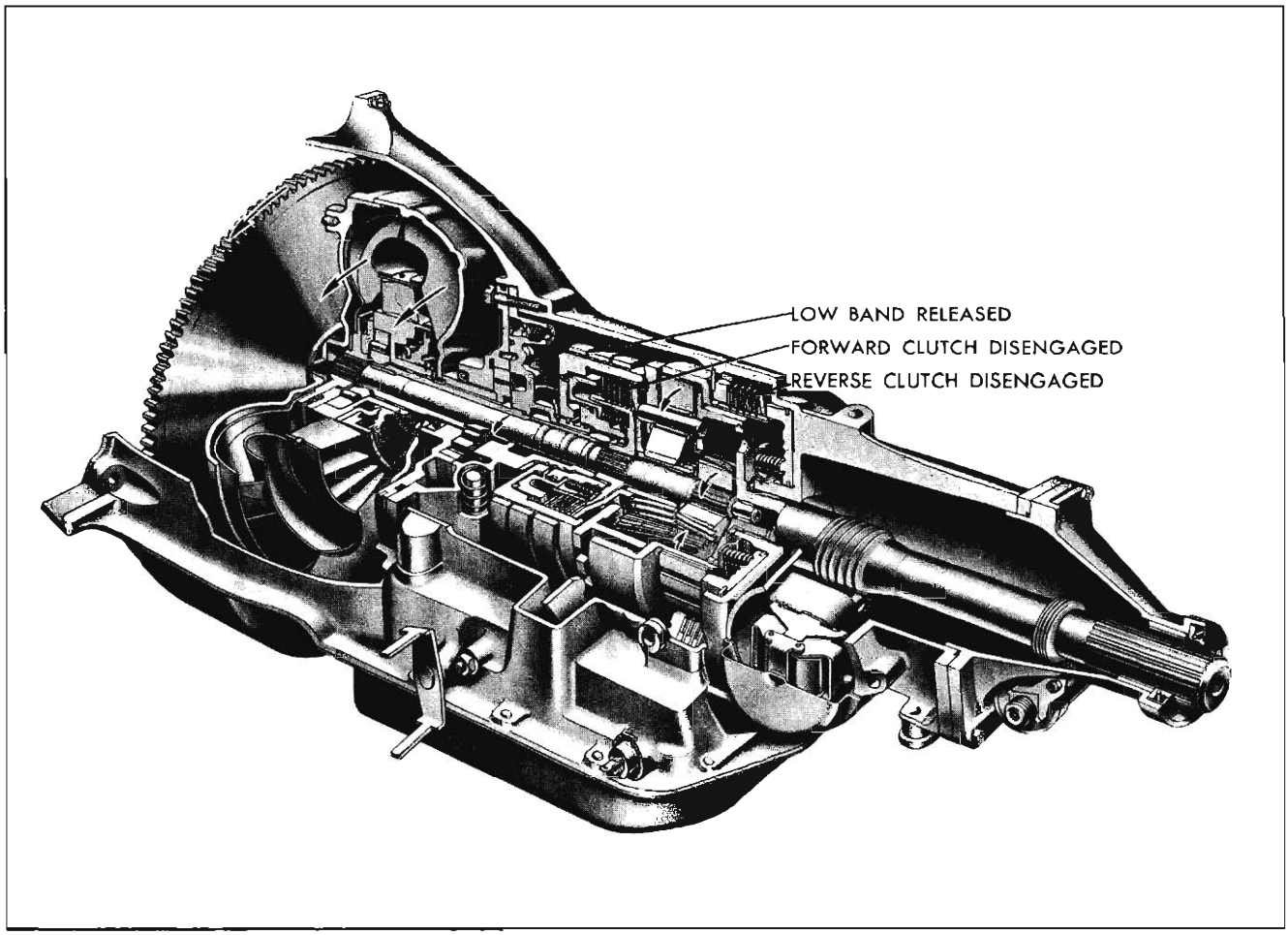


Fig. 6-209 Neutral or Park

NEUTRAL OR PARK

FORWARD CLUTCH—DISENGAGED **REVERSE CLUTCH—DISENGAGED**

LOW BAND—RELEASED

Operation of Units in Neutral or Park

With the shift lever in "N" position, the output shaft remains stationary. The clutches and low band are released; therefore, there is no reaction member to provide positive drive. All gears are free to spin around their own axis, and no motion is imparted to the planet carrier.

In "P", a positive gear train lock is provided when the parking pawl is engaged with the heavy teeth spaced around the front face of the planetary carrier. The linkage is actuated by direct manual action, but the parking pawl is activated by spring action. If the pawl is in line with a tooth of the planet carrier, rather than a space between teeth, the linkage remains in the "P" position with the spring holding pressure against the pawl. Slight rotation of the planet carrier will immediately seat the pawl and lock the output shaft to the case.

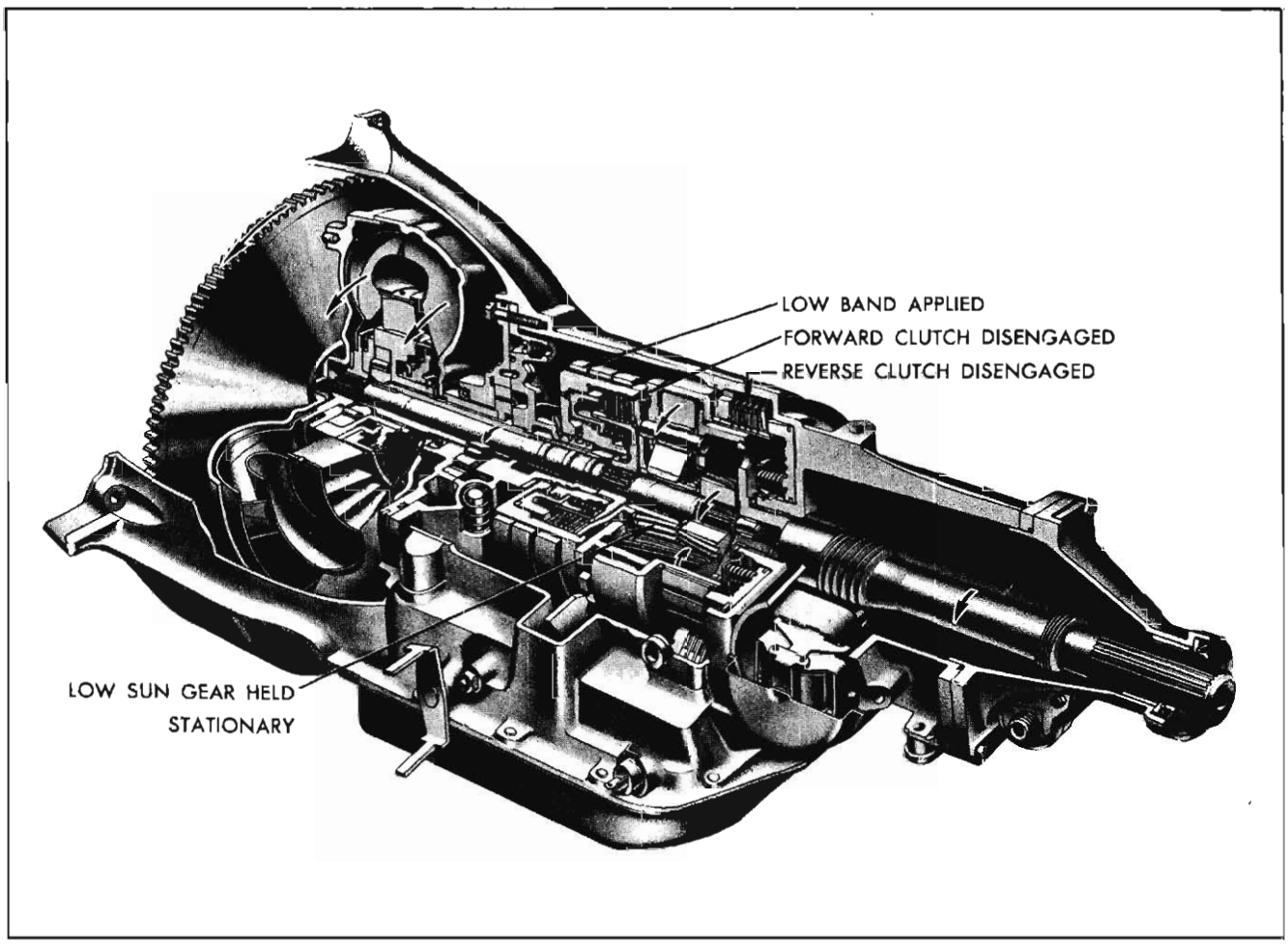


Fig. 6-210 Drive Range-Reduction and Low Range

DRIVE RANGE—REDUCTION AND LOW RANGE

FORWARD CLUTCH—DISENGAGED **REVERSE CLUTCH—DISENGAGED**

LOW BAND—APPLIED

Operation of Units in Drive Range—Reduction and Low Range

With the shift lever in "D" or "L" range, the transmission starts in reduction. The forward clutch is released and the low band is applied to the outside diameter of the forward clutch drum. With the low band applied, the low sun gear and flange assembly is held stationary. Drive is from the converter through the input shaft to the input sun gear in the planetary gear set. The input sun gear drives the long planet pinions which in turn drive the short planet pinions. The short pinions are in mesh with the low sun gear. With the low sun gear held stationary by the low band application, the short pinions will walk around the low sun gear. As they walk around the sun gear, they carry with them the planet carrier and the output shaft to which they are attached.

With the shift lever in "L", the transmission remains in reduction.

With the shift lever in "D", the upshift into direct drive is dependent upon car speed and throttle opening.

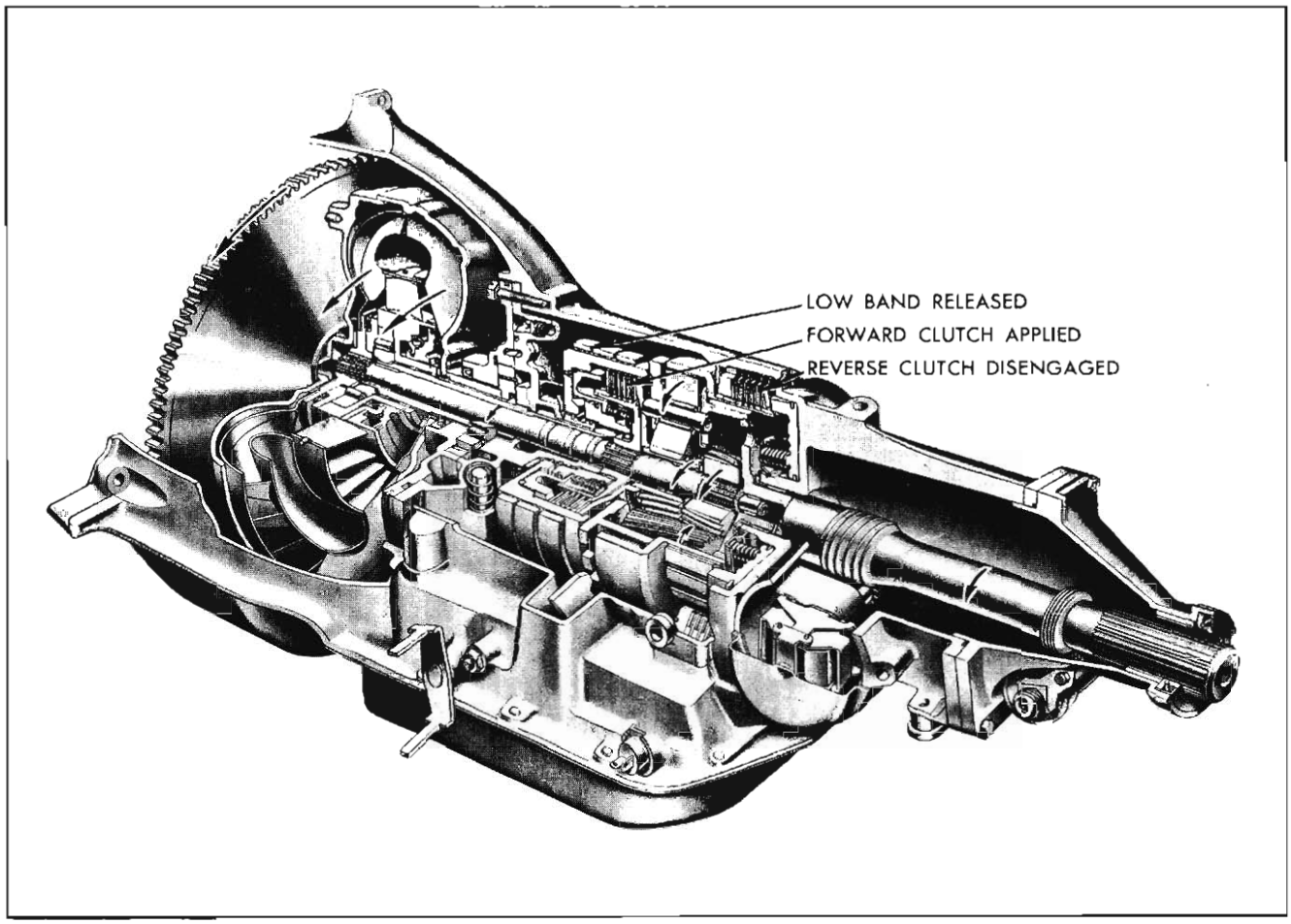


Fig. 6-211 Drive Range-Direct Drive

DRIVE RANGE—DIRECT DRIVE

LOW BAND—RELEASED **FORWARD CLUTCH—APPLIED**

REVERSE CLUTCH—DISENGAGED

Operation of Units in Drive Range—Direct Drive

In drive range the transmission starts in reduction.

The upshift into direct drive is dependent upon car speed and throttle opening. When the shift occurs, the low band is released and the forward clutch is applied. Application of the forward clutch locks the planetary system causing it to rotate as a unit. With the clutch applied, the clutch hub which is splined to the input shaft is locked to the low sun gear and flange assembly through the clutch plates. The low sun gear is meshed to the short pinions, the short pinions are meshed with the long pinions, and the long pinions are meshed with the input sun gear; the sun gear is also splined to the input shaft. Since both the low sun gear and input sun gear are now locked to the input shaft, the entire planetary unit will revolve at input shaft speed.

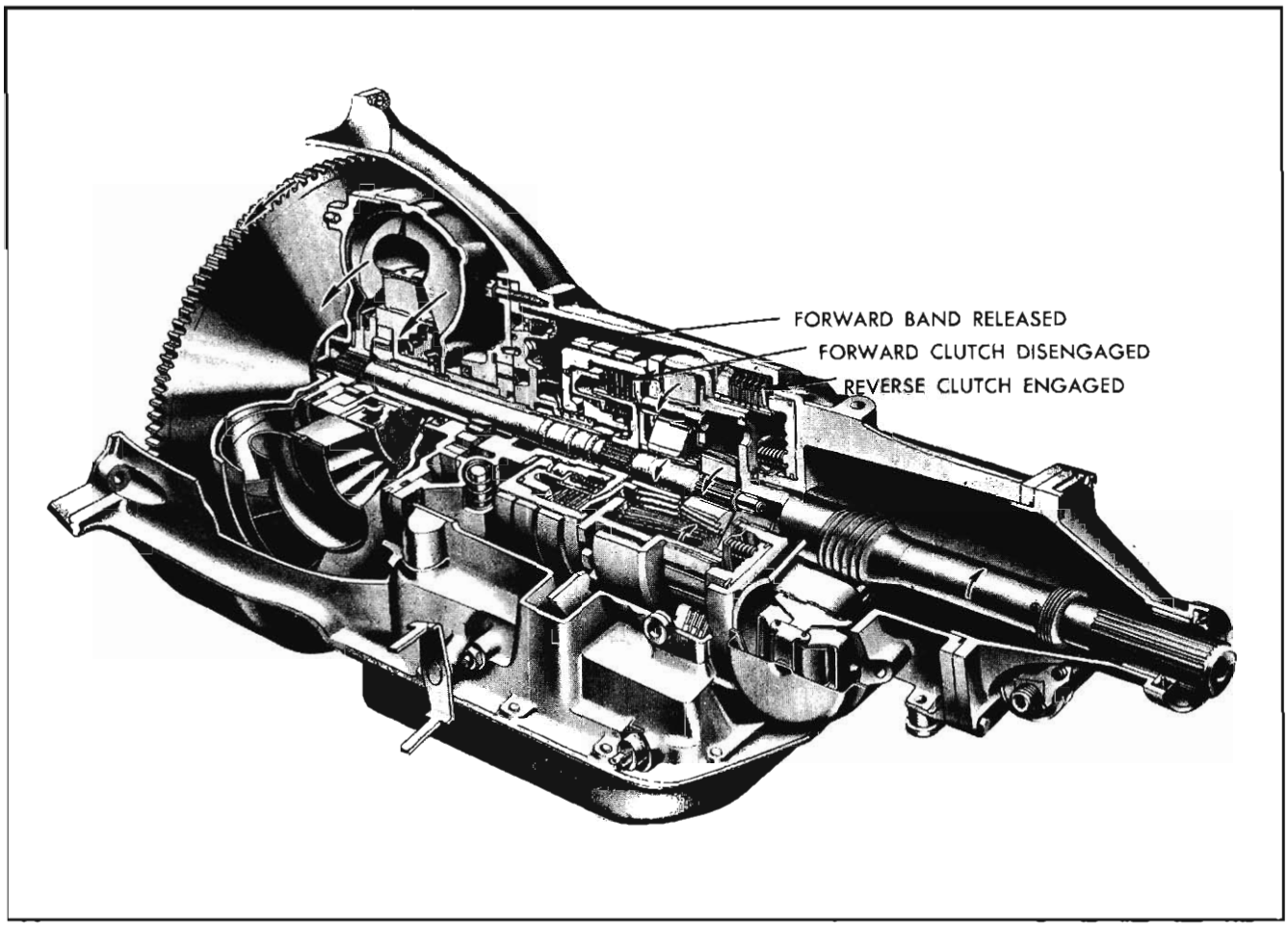


Fig. 6-212 Reverse

REVERSE

REVERSE CLUTCH—APPLIED **FORWARD CLUTCH—RELEASED**

LOW BAND—RELEASED

Operation of Units in Reverse

When the shift lever is in "R" position, the forward clutch and low band are released, and the reverse clutch is applied, holding the ring gear stationary.

Drive is through the input shaft and input sun gear to the long pinions and then to the short pinions. The short pinions mesh with the reverse ring gear which is held stationary by the reverse clutch. The short pinions walk around the inside of the ring gear in a reverse direction, turning the output shaft to which they are attached.

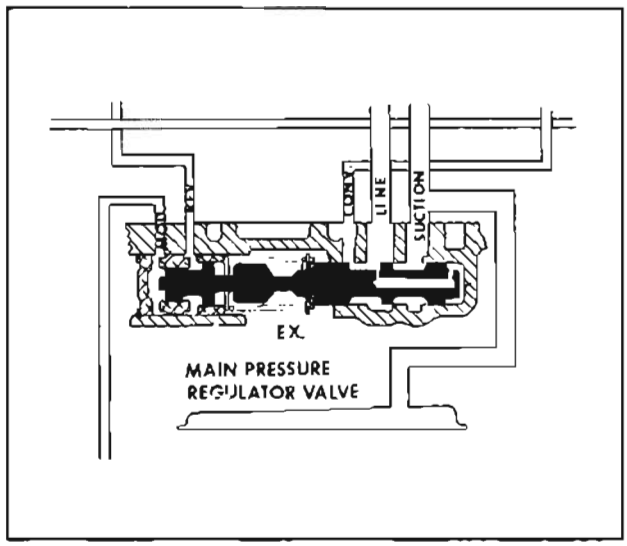


Fig. 6-213 First Stage Regulation

HYDRAULIC CONTROLS

OIL PUMP AND PRESSURE REGULATOR

A positive displacement internal-external gear-type oil pump is used to supply oil to fill the converter, engage the forward and reverse clutches, apply and release the low band, and furnish oil for lubrication and heat transfer.

The pressure regulator valve, located in the pump cover, is used as the basic control of hydraulic pressure within the transmission.

First Stage Regulation (Fig. 6-213)

When the engine is idling or has just been started, oil enters the main pressure regulator valve from the line passage and flows through the drilled passages in the valve to force the valve to the left against its spring to uncover the port which directs oil to the converter, oil cooler and transmission lubrication system.

Second Stage Regulation (Fig. 6-214)

As higher engine speeds are attained, the volume of oil leaving the pump increases until the valve moves to the position shown, which opens a port to allow main line oil to escape to the suction side of the pump to regulate pressure. Second stage regulation is only necessary during operation at high speeds or operation with cold oil.

Boost Valve

A boost valve at the spring end of the pressure regulator valve functions to raise line pressure, when necessary, by adding hydraulic pressure to the spring pressure on the main pressure regulator valve.

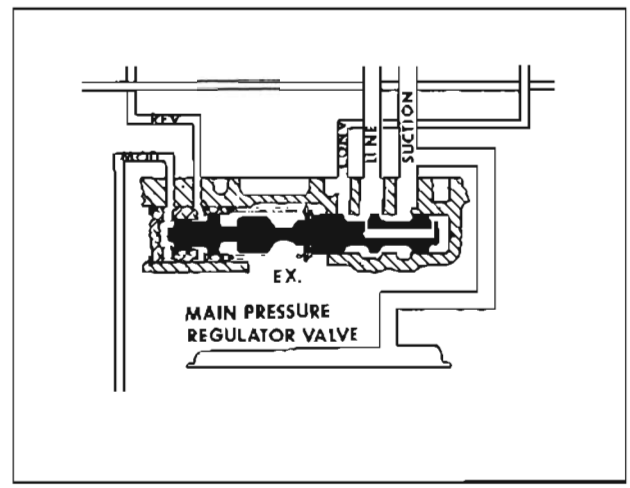


Fig. 6-214 Second Stage Regulation

Modulator Boost

With the manual shift control valve in "D" range, oil under pressure varied by operating conditions (load, car speed, grade, etc.) is directed through the modulator passage to assist the spring to force the valve to the right. Oil under pressure in this space has the same effect as increasing the spring pressure against the pressure regulator valve; that is, it increases main line oil pressure.

Reverse Boost

With the manual shift control valve positioned in "R" range, oil under pressure is directed through the reverse passage and acts on the boost valve. The boost valve acts on the spring end of the pressure regulator valve adding to the spring pressure of the valve, thus increasing main line oil pressure for operation in reverse range.

VALVES AND THEIR FUNCTIONS

MANUAL SHIFT CONTROL VALVE (Fig. 6-215)

The manual shift control valve in the valve body directs oil to the controlling devices that govern operation in "D", "L" (Mod. Bst.) and "R". In "N" and "P" ranges, the manual shift control

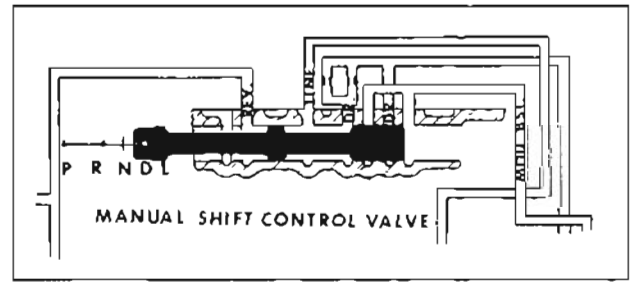


Fig. 6-215 Manual Shift Control Valve

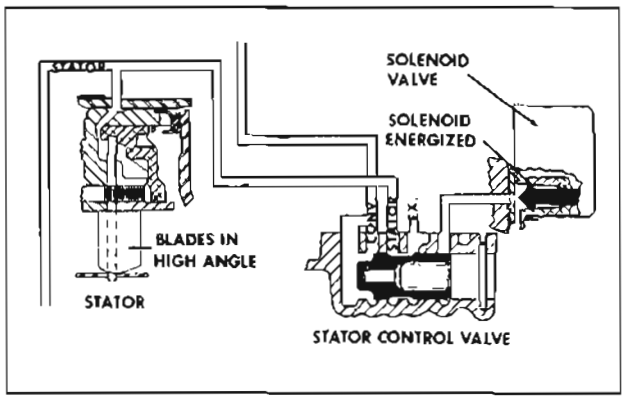


Fig. 6-216 Stator Blades In High Angle

valve cuts off oil pressure to the low servo and forward clutch ("D" passage). The manual shift control valve is connected by mechanical linkage to the manual control lever on the steering column.

STATOR CONTROL VALVE (Fig. 6-216)

The stator control valve is a spring loaded valve located in the stator control valve body. The function of this valve is to control high or low angle of the stator blades. See Figs. 6-216 and 6-217. The action of the valve is affected by spring force and a solenoid valve. When the stator control valve solenoid is energized, the valve plunger is retracted, uncovering an exhaust port through which oil may escape from the spring side of the stator control valve. Oil thus escaping, allows oil at converter charging pressure to move the valve against its spring. With the stator valve positioned against the valve plug, no oil is directed to the front of the stator blade piston and converter charging pressure then moves the piston (connected to the stator blade cranks) to shift the blades to high angle (high torque).

SHIFT VALVE AND SHIFT CONTROL VALVE (Fig. 6-218)

The shift valve and shift control valve are in the same bore in the main valve body. They react

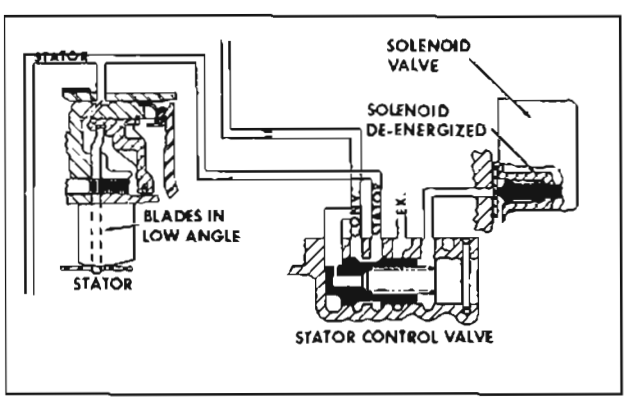


Fig. 6-217 Stator Blades in Low Angle

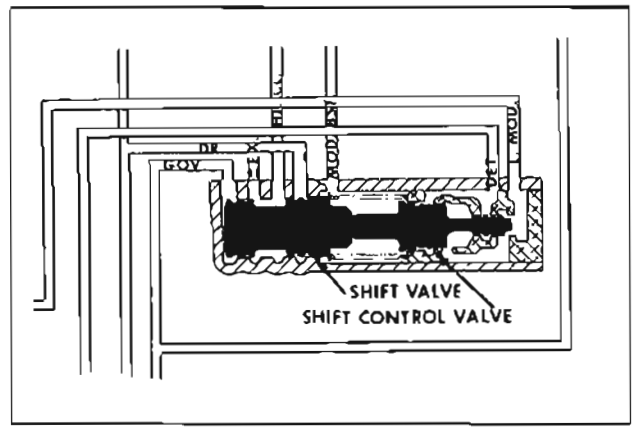


Fig. 6-218 Shift Valve and Shift Control Valve

to oil pressure from the governor valve and vacuum modulator valve to make the shift from reduction to direct drive or from direct drive to reduction.

Upshift From Reduction to Direct Drive (Fig. 6-219)

Before the upshift occurs, the shift valve and shift control valve are positioned as shown. The shift control valve is held against the end of its bore by spring force and L. Mod. pressure. With the shift valve in this position, the high clutch piston and spring side of the low servo piston are open to exhaust. The high clutch is released and the low band is applied; the transmission is in reduction.

When the proper relationship between car speed and throttle opening exists, governor oil pressure on the shift control valve will overcome spring force and limited modulator oil pressure and move both valves to the right as shown in Fig. 6-219.

With the valves thus positioned, oil under pressure is directed to the forward clutch piston and the spring side of the low servo piston to apply the clutch and release the band.

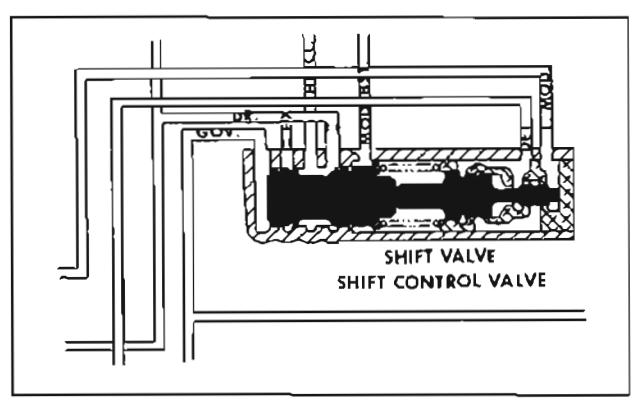


Fig. 6-219 Upshifted

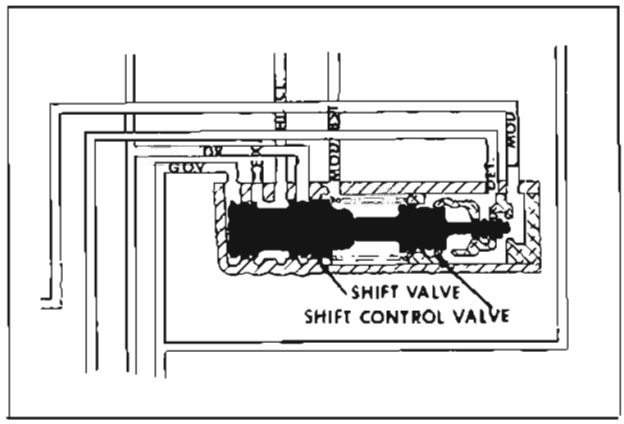


Fig. 6-220 Manual Low Range

With the shift control valve positioned to the right, as shown, limited modulator pressure is acting only on the right end of the valve and a greater throttle opening (providing greater limited modulator pressure) is necessary to cause a downshift than was required to allow an upshift at a given car speed.

Downshift From Drive To Reduction

When limited modulator pressure against the right end of the shift control valve, in combination with the shift valve spring, reaches a pressure sufficient to overcome governor valve pressure against the left end of the shift valve, both valves move to the left and the transmission is downshifted by cutting off oil pressure to the forward clutch and spring side of the low servo piston. See Fig. 6-218.

Low Range (Fig. 6-220)

With the manual shift control valve positioned in "L" range, Mod. Bst. pressure is directed to the space between the shift valve and the shift control valve. This pressure adds to the shift valve spring force and keeps the shift valve to the left. With the shift valve in this position, an upshift will not occur.

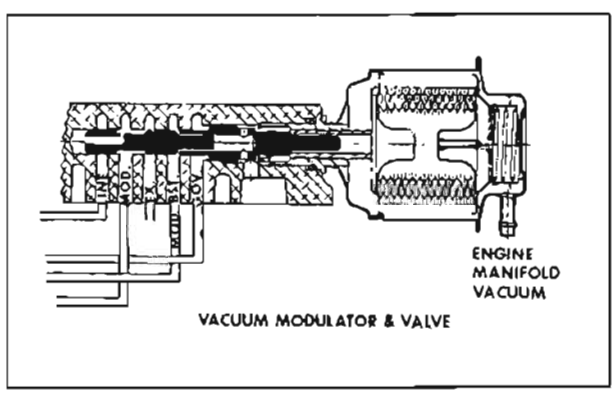


Fig. 6-221 Vacuum Modulator and Valve

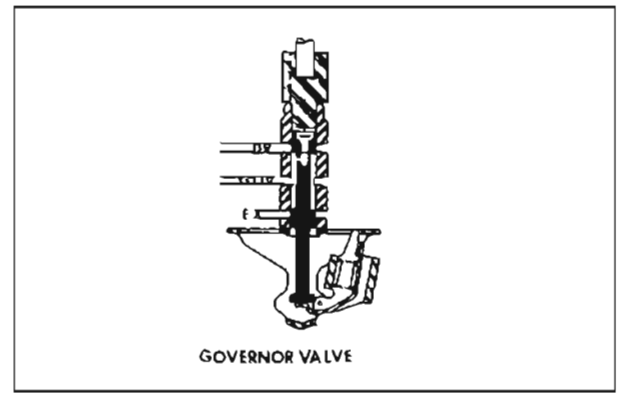


Fig. 6-222 Governor Valve

VACUUM MODULATOR AND VALVE (Fig. 6-221)

The vacuum modulator and valve assembly is a device to translate load (engine manifold vacuum), barometric pressure (altitude) and speed (governor valve oil pressure) into modulated oil pressures to regulate main line oil pressure to an efficient value.

Main line oil enters the valve through the drilled ports and is directed to the left end of the valve. This oil, when it reaches sufficient pressure, moves the valve against its spring to regulate the exhausting of modulator oil.

Manifold Vacuum Effect

The modulator valve spring is housed in a sealed container in such a way that engine manifold vacuum may act upon it to reduce the force of the spring against the valve and thus affect modulator oil pressure. Conditions of load or grade that lowers manifold vacuum increases modulator oil pressure, while high manifold vacuum decreases modulator oil pressure.

Altitude Or Barometric Pressure Effect

If the car is operated at high altitudes where barometric pressure is reduced, the aneroid device in the vacuum modulator housing expands and acts against the valve spring to reduce modulator oil pressure in proportion to the barometric pressure

At high altitudes, engine output is reduced. Comparable reduction in transmission main line oil pressure is necessary to accomplish smooth shifts under these conditions.

Governor

As car speed increases, governor valve oil pressure increases (up to the limit of the valve). Governor pressure acting on the vacuum modulator valve has the effect of reducing the spring

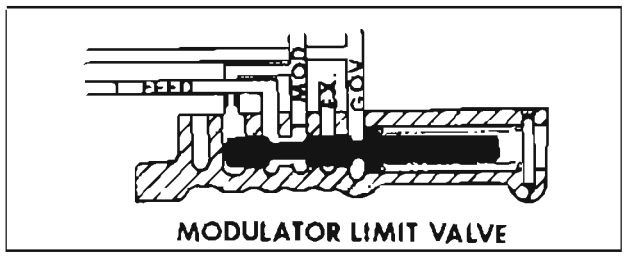


Fig. 6-223 Modulator Limit Valve (First Stage)

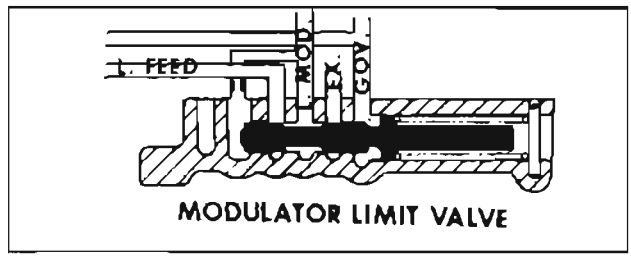


Fig. 6-224 Modulator Limit Valve (Second Stage)

force against the valve, thereby reducing modulator oil pressure as governor pressure (car speed) increases.

Modulator Boost Effect

With the manual shift control valve positioned in "L" range, main line pressure separates the two pieces of the modulator valve and tends to move the valve to the bottom of its bore. Thus, modulator oil under pressure is directed to the main line pressure regulator valve to provide an increase in main line oil pressure in low range, regardless of engine vacuum. If driving conditions result in low engine vacuum however, the vacuum modulator valve spring will move the two sections of the valve back together. Then both the valve spring and the pressure of main line oil at the line port of the valve will regulate modulator oil pressure.

GOVERNOR VALVE (Fig. 6-222)

The governor valve is a pressure regulator valve. Governor pressure is determined by car speed acting through the centrifugal force of a pair of dual weights; the inner pair of which is spring loaded.

As the car begins to move, the weight assemblies move outward to provide a regulating force against the valve through the springs between the primary and secondary weights. As car speed is further increased, regulating force against the valve is provided by the secondary weights moving outward. At approximately 35 mph, the primary weights have reached the limit of their travel and the force against the valve is then entirely through the secondary weights.

Thus, governor pressure is determined at very low speeds by the primary weights; at intermediate speeds, by the springs between the weights; and at higher speeds, by the secondary weights. In this manner, governor pressure is increased rapidly but smoothly from very low speeds to approximately 40 mph, where it levels off.

Regulated oil from the governor valve is channeled to the shift valve, vacuum modulator valve, modulator limit valve and high speed downshift timing valve.

MODULATOR LIMIT VALVE (Fig. 6-223)

The modulator limit valve is a pressure regulator valve that regulates the point at which a wide open throttle upshift will occur.

The valve regulates limited feed oil (main line pressure) to provide diminishing oil pressure acting at the L. Mod. port and on the shift control valve as car speed is increased. This decrease in oil pressure is accomplished by governor valve pressure directed through the governor port and on the valve to oppose spring force as car speed (governor pressure) increases. See Figs. 6-223 and 6-224.

The modulator limit valve is in operation only before the upshift during wide open throttle operation with the manual shift control valve in "D" position.

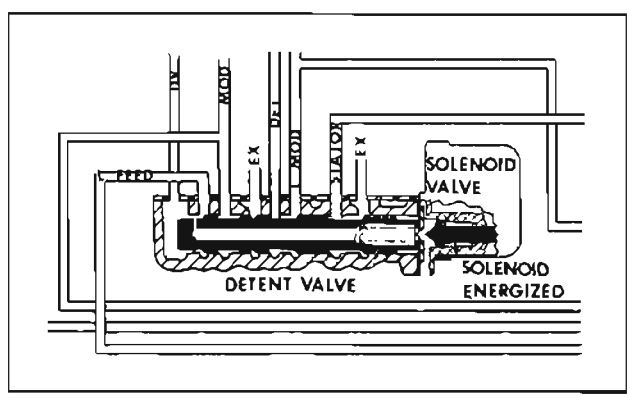


Fig. 6-225 Solenoid Energized

DETENT VALVE (Fig. 6-226)

The detent valve is a solenoid operated two-position valve that provides a downshift at wide open throttle, if car speed is low enough.

Electrical contacts on the carburetor linkage energize the detent solenoid as wide open throttle is reached. Energizing the solenoid retracts its plunger and allows oil from the center of the valve to flow to exhaust. Main line oil pressure at the drive port and left end of the valve moves the valve against its spring as shown.

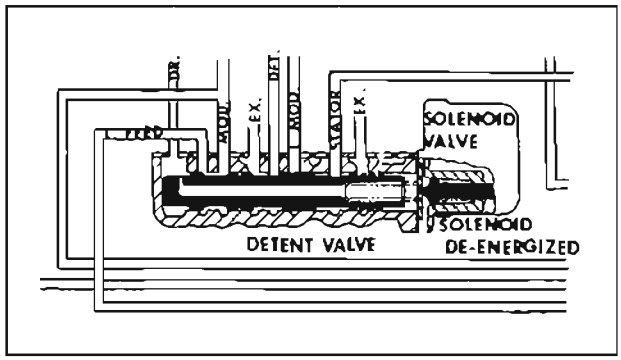


Fig. 6-226 Solenoid De-Energized

With the valve in this position, ports are opened to direct oil to the modulator limit valve and limited modulator oil to flow to the detent port of the shift control valve. When the solenoid is de-energized, the spring loaded plunger seals the port in the valve center. Oil at main line pressure then occupies the center of the valve and acts against the right end of the valve as well as the left end. The detent valve spring then moves the valve to the position shown, closing off the modulator, detent and limited modulator ports.

HIGH SPEED DOWNSHIFT TIMING VALVE (Fig. 6-227)

The high speed downshift timing valve is a spring loaded valve located in the main valve body. Its function is to control the rate of low servo application at high road speeds.

At sufficiently high road speeds, governor pressure against the left end of the valve overcomes spring force to move the valve to the position shown. With the valve in this position, oil for low servo application must pass two orifices as shown. At lower car speeds, governor valve pressure is not sufficient to overcome the spring pressure and low servo application is made through passages containing one orifice as shown in Fig. 6-228.

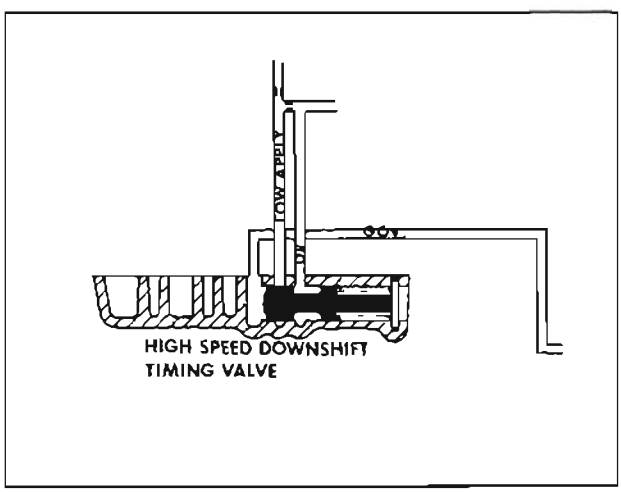


Fig. 6-227 High Speed Downshift Timing Valve

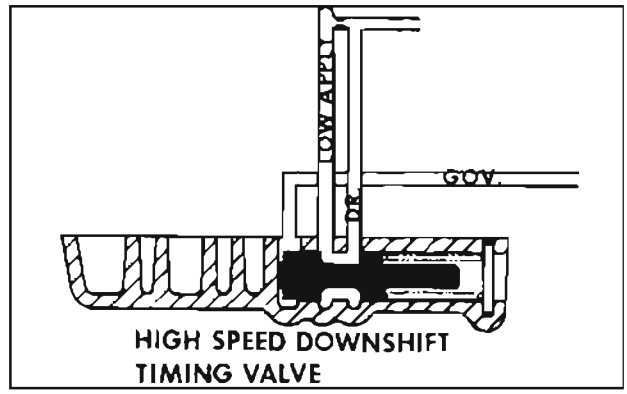


Fig. 6-228 High Speed Downshift Timing Valve Regulated

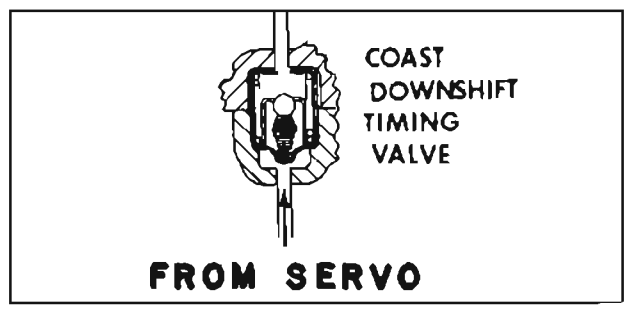


Fig. 6-229 Coast Downshift Timing Valve

COAST DOWNSHIFT TIMING VALVE (Fig. 6-229)

As the car is decelerating with closed throttle or very light throttle (such as when approaching a stop), governor valve pressure diminished to a point where spring force moves the shift valve to the downshift position. When this occurs, oil is exhausted from the band release chamber of the low servo through the coast downshift timing valve.

A rush of oil through the valve moves the ball retainer and ball, against light spring force, off its seat. Oil may then escape around the ball retainer and spring. This action cushions the initial engagement of the low band.

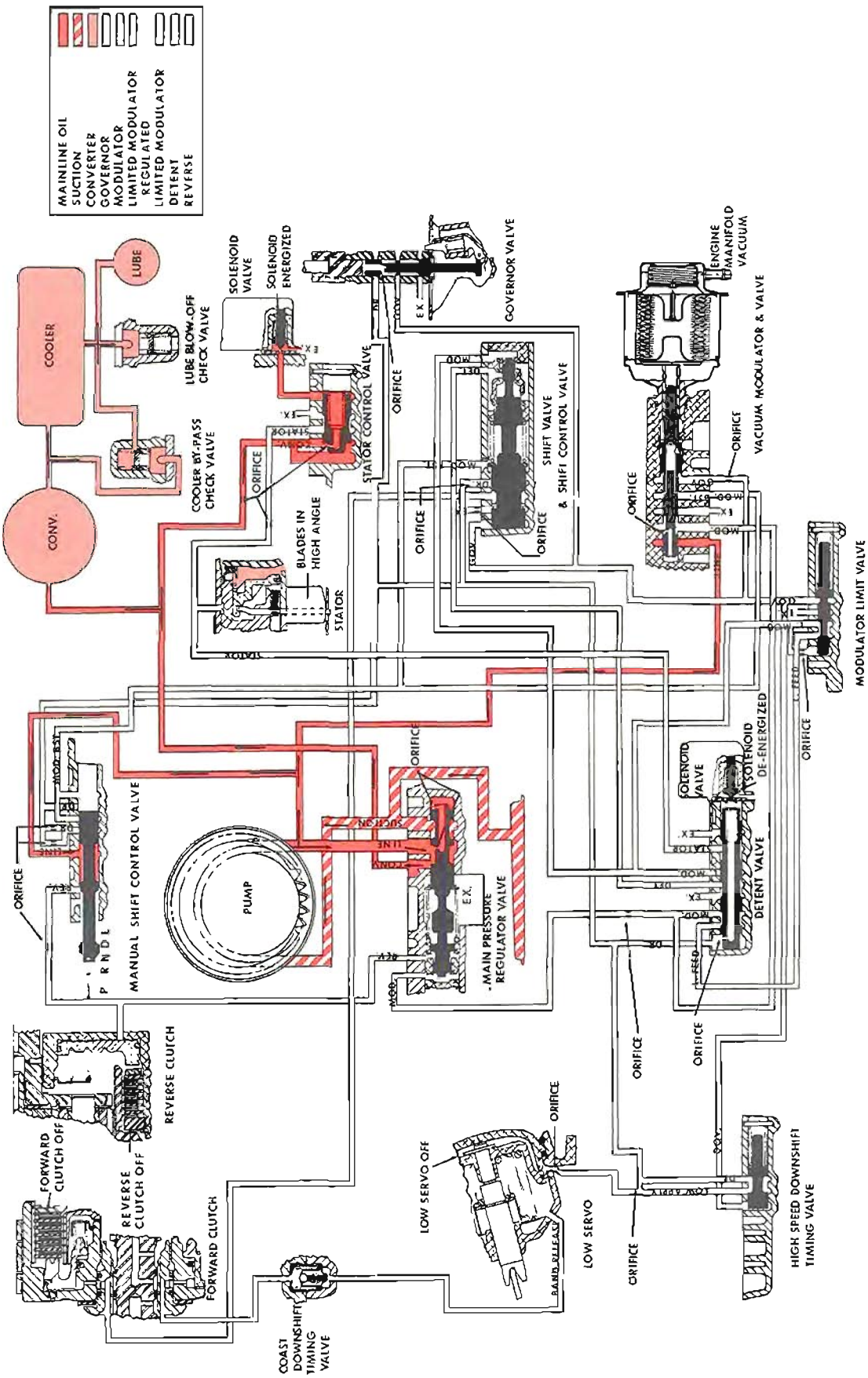


Fig. 6-230 Neutral (Closed Throttle)

OPERATION OF HYDRAULIC CONTROLS IN NEUTRAL

(CLOSED THROTTLE)

FORWARD CLUTCH—OFF **BAND—OFF** **REVERSE CLUTCH—OFF**

When the engine is started, the oil pump directs pressure to the hydraulic control system, converter, cooler and lubrication system. The converter remains pressurized in all ranges and speeds.

At any closed throttle condition, regardless of selector lever position, a switch at the carburetor will energize the stator control solenoid, switching the stator pitch to high angle. By switching the pitch to high angle, it will allow higher engine rpm in relation to turbine speed. With the solenoid energized, the valve will bottom in its bore allowing the stator oil pressure to exhaust. As stator oil pressure exhausts, converter oil pressure on the other side of the stator piston switches the pitch to high angle.

During operation in neutral, the manual shift control valve is positioned as shown. Main line oil is directed to the manual shift control valve and to the vacuum modulator valve.

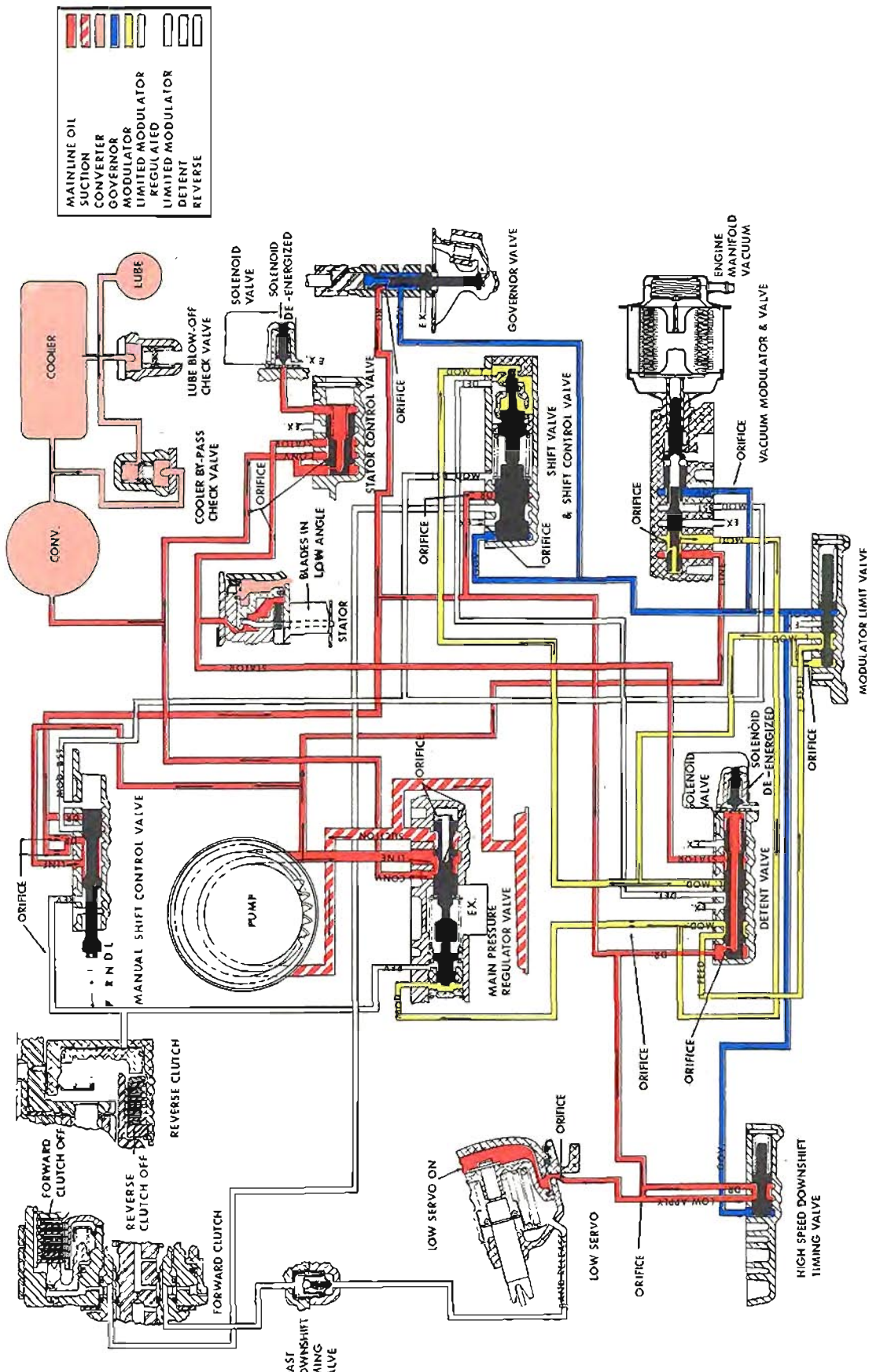


Fig. 6-231 Drive Range-Reduction

OPERATION OF HYDRAULIC CONTROLS IN DRIVE RANGE—REDUCTION

FORWARD CLUTCH—OFF **BAND—APPLIED** **REVERSE CLUTCH—OFF**

During operation in drive range, the manual shift control valve is positioned as shown. Main line oil is directed to the modulator valve and the manual shift control valve. Main line oil entering the manual shift control valve is directed into the drive oil passage and then to the governor valve, shift valve, detent valve, high speed downshift timing valve and low servo piston.

The low band is applied by drive oil directed through the open high speed downshift timing valve to the area behind the low servo piston.

Main line oil directed to the modulator valve enters between the lands. During part throttle acceleration, low engine vacuum at the vacuum modulator tends to keep the valve toward the bottom of its bore. In this position, oil is directed through a drilled passage in the valve to the space between the end of the valve and the valve body. Oil under pressure in this area, plus governor pressure on the land of the modulator valve, tends to move the valve against vacuum modulator spring force to regulate modulator oil pressure. Modulator oil leaves the modulator valve and is directed to the boost valve, detent valve, modulator limit valve and shift control valve. Modulator pressure applies a force to the space between the end of the boost valve and oil pump body causing it to move to the right. As the boost valve moves to the right, it contacts the pressure regulator valve. This hydraulic force, combined with normal spring force on the pressure regulator valve, results in higher main line pressure. Also, modulator pressure is directed through the detent valve and modulator limit valve to apply force between the lands of the shift control valve and the valve body.

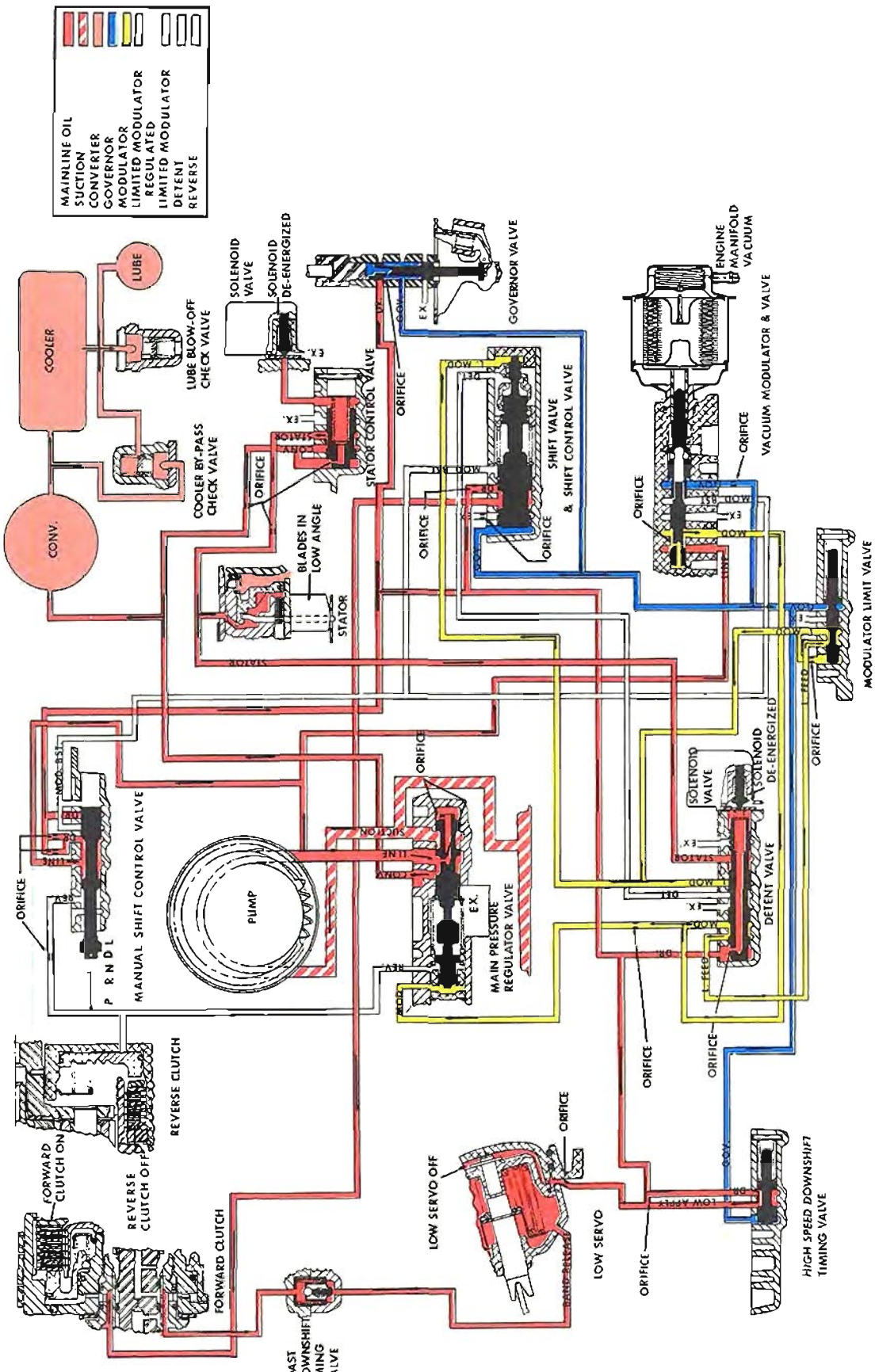


Fig. 6-232 Drive Range-Direct Drive (Part Throttle)

OPERATION OF HYDRAULIC CONTROLS IN DRIVE

RANGE—DIRECT DRIVE (PART THROTTLE)

FORWARD CLUTCH—APPLIED **REVERSE CLUTCH—OFF** **BAND—OFF**

During operation in drive range, the manual shift control valve is positioned as shown. During part throttle acceleration, main line oil is directed to the modulator valve and manual shift control valve. Main line oil entering the manual shift control valve is directed into the drive oil passage and then to the governor valve, shift valve, detent valve, high speed downshift timing valve and low servo piston.

Main line oil directed to the modulator valve enters between the lands. At low engine vacuum, the vacuum modulator tends to keep the valve toward the bottom of its bore. In this position, oil is delivered through a drilled passage in the valve to the space between the end of the valve and the valve body. Oil under pressure in this area, plus governor pressure on the land of the modulator valve, tends to move the valve against the force of the vacuum modulator spring to regulate modulator oil pressure. Modulator oil leaves the modulator valve and is directed to the boost valve, detent valve, modulator limit valve and to the shift control valve. Modulator pressure directed to the boost valve moves it to the right. As the boost valve moves to the right, it contacts the pressure regulator valve. This hydraulic force combined with normal spring force on the pressure regulator valve results in higher main line pressure. Also, modulator pressure is directed through the detent valve and modulator limit valve to apply force to the shift control valve to oppose governor pressure on the other end of the valve.

When sufficient car speed has been obtained, governor pressure is directed to the left end of the shift valve, to the vacuum modulator valve, modulator limit valve and to the high speed downshift timing valve. As governor pressure increases on the modulator valve, it will tend to move the valve against the vacuum modulator spring, reducing modulator pressure.

When governor pressure reaches a high enough value, the shift valve will move to the right, allowing drive oil to apply the forward clutch and release the low band.

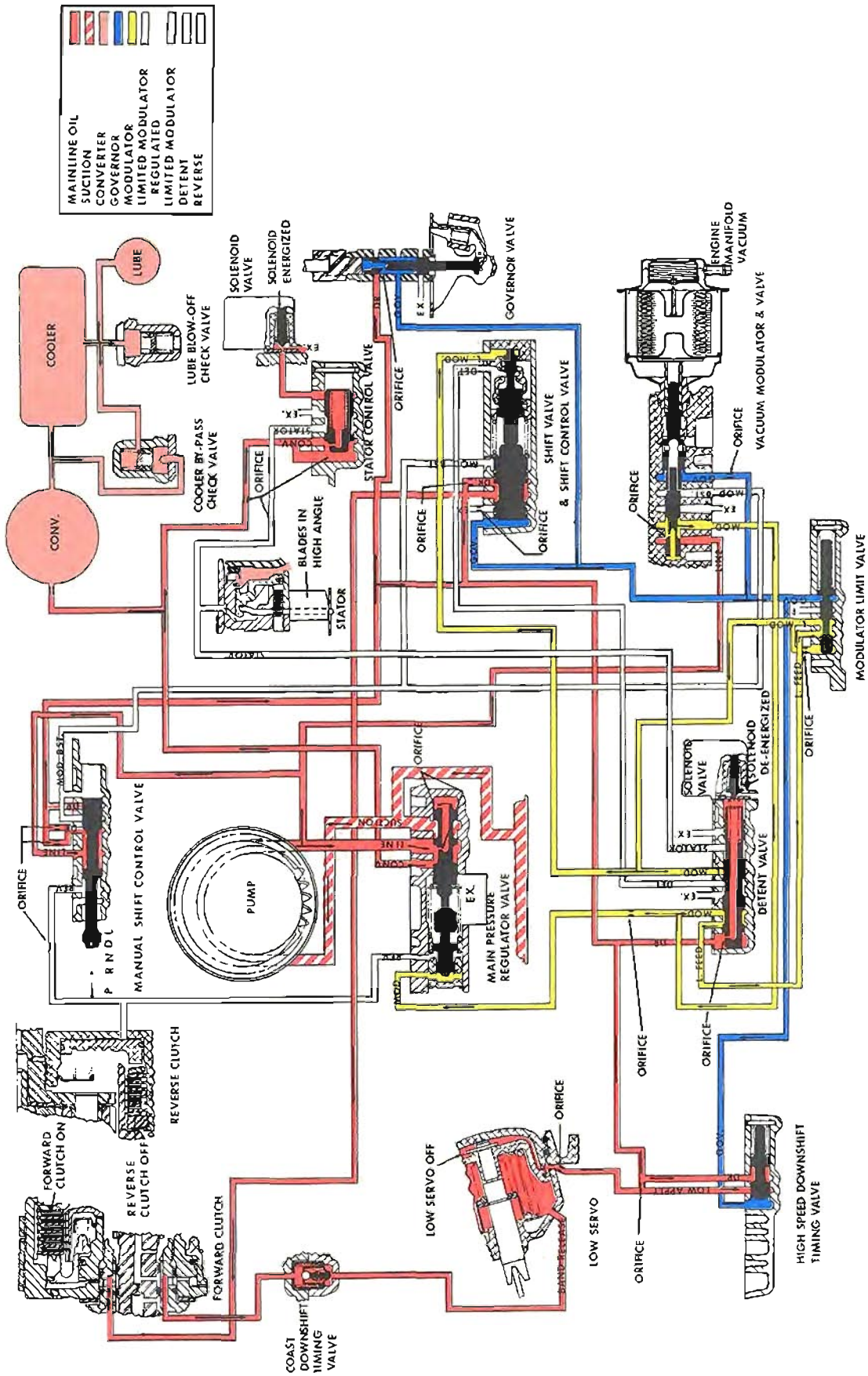


Fig. 6-233 Drive Range-Direct Drive-(Heavy Throttle)

OPERATION OF HYDRAULIC CONTROLS IN DRIVE RANGE

DIRECT DRIVE—(HEAVY THROTTLE)

REVERSE CLUTCH—OFF **FORWARD CLUTCH—APPLIED** **BAND—OFF**

During operation in drive range, at full throttle without detent (Switch pitch only), the stator control solenoid is energized.

Main line oil passes through the pressure regulator valve to the converter and stator control valve. Energizing the stator control solenoid allows oil from the center of the stator control valve to flow to exhaust. Pressure against the end of the stator control valve moves the valve against its spring until it bottoms in its bore. When the valve reaches the bottom of its bore, it will exhaust the stator oil, switching the blades to high angle.

With full throttle and the stator positioned for maximum torque, an increase in pump pressure is obtained as follows. When the throttle is opened, the resulting low vacuum at the vacuum modulator allows the vacuum modulator spring to move the valve to the bottom of its bore. This increases modulator pressure. This higher modulator pressure is directed to the boost valve, detent valve, modulator limit valve and the shift control valve. Modulator pressure applies a force to the space between the end of the boost valve and the oil pump body causing it to move to right. As the boost valve moves to the right, it contacts the pressure regulator valve. This hydraulic force combined with normal spring force on the pressure regulator valve results in a higher main line pressure. Also, limited modulator feed pressure is directed through the detent valve and to the modulator limit valve. Limited modulator pressure from the modulator limit valve is directed to the right end of the shift control valve.

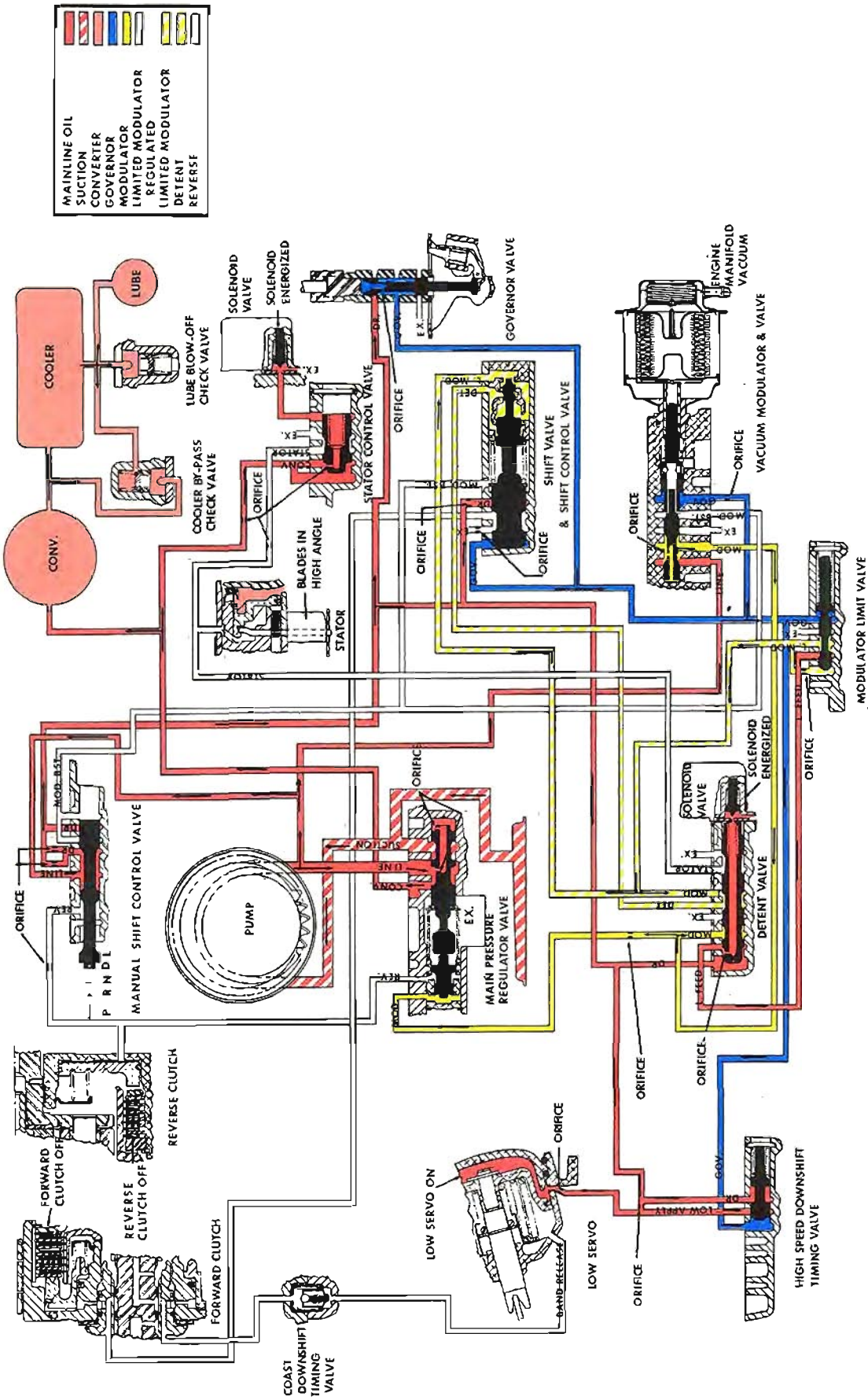


Fig. 6-234 Drive Range-Reduction (Detent Downshift)

OPERATION OF HYDRAULIC CONTROLS IN DRIVE

RANGE—DIRECT DRIVE (DETENT DOWNSHIFT)

FORWARD CLUTCH—OFF **REVERSE CLUTCH—OFF** **BAND—APPLIED**

During full throttle acceleration, main line oil is directed to the modulator valve and manual shift control valve. Main line oil through the manual shift control valve is directed into the drive oil passage and then directed to the governor valve, shift valve, high speed downshift timing valve, low servo piston and detent valve. With the detent valve solenoid energized, drive oil pressure will enter into the limited feed line. When limited modulator pressure reaches a high enough value and exerts enough force to overcome spring force on the modulator limit valve, the valve will regulate, governing the limited modulator and detent pressure behind the shift control valve and moves it to the left, releasing the clutch and exhausting band release pressure. Governor pressure overcomes spring force and moves the high speed downshift timing valve to the right. This movement blocks the nonrestricted line, directing the servo apply oil through the restricted orifice. On a downshift, this restriction of flow causes the band apply to be delayed slightly and is thus timed to the forward clutch release for a smooth downshift.

Main line pressure is increased as follows. Main line oil directed to the modulator valve enters between the lands. At low engine vacuum, the vacuum modulator spring tends to keep the valve toward the bottom of its bore. In this position, oil is delivered through a drilled passage in the valve to the space between the end of the valve and the valve body. Oil pressure in this area, plus governor pressure on the land of the second modulator valve, tends to move the valve against the vacuum modulator spring to regulate oil pressure leaving the valve.

Modulator pressure applies force to the left end of the boost valve causing it to move to the right. As the boost valve moves to the right, it contacts the pressure regulator valve. This hydraulic force, combined with normal spring force on the pressure regulator valve, results in a higher main line pressure.

During operation in drive range, at full throttle through the detent, the stator control valve and detent valve solenoids are energized. The manual shift control valve is positioned as shown.

Main line oil passes through the pressure regulator valve to the converter and stator and detent valve. When the stator control valve solenoid is energized, it allows oil from the center of the valve to flow to exhaust. Oil that is applying force to the area between the valve body and the end of the valve moves the valve against its spring force to the bottom of its bore.

When the valve reaches the bottom of its bore, it will exhaust the stator oil, switching the pitch to high angle. Converter oil pressure applies force to the area between the valve body and the end of the valve, keeping it at the bottom of its bore as long as the solenoid is energized.

Energizing the detent solenoid allows oil from the center of the valve to flow to exhaust. Drive oil pressure in the area between the valve body and the end of the valve moves the valve against its spring force to the bottom of its bore.

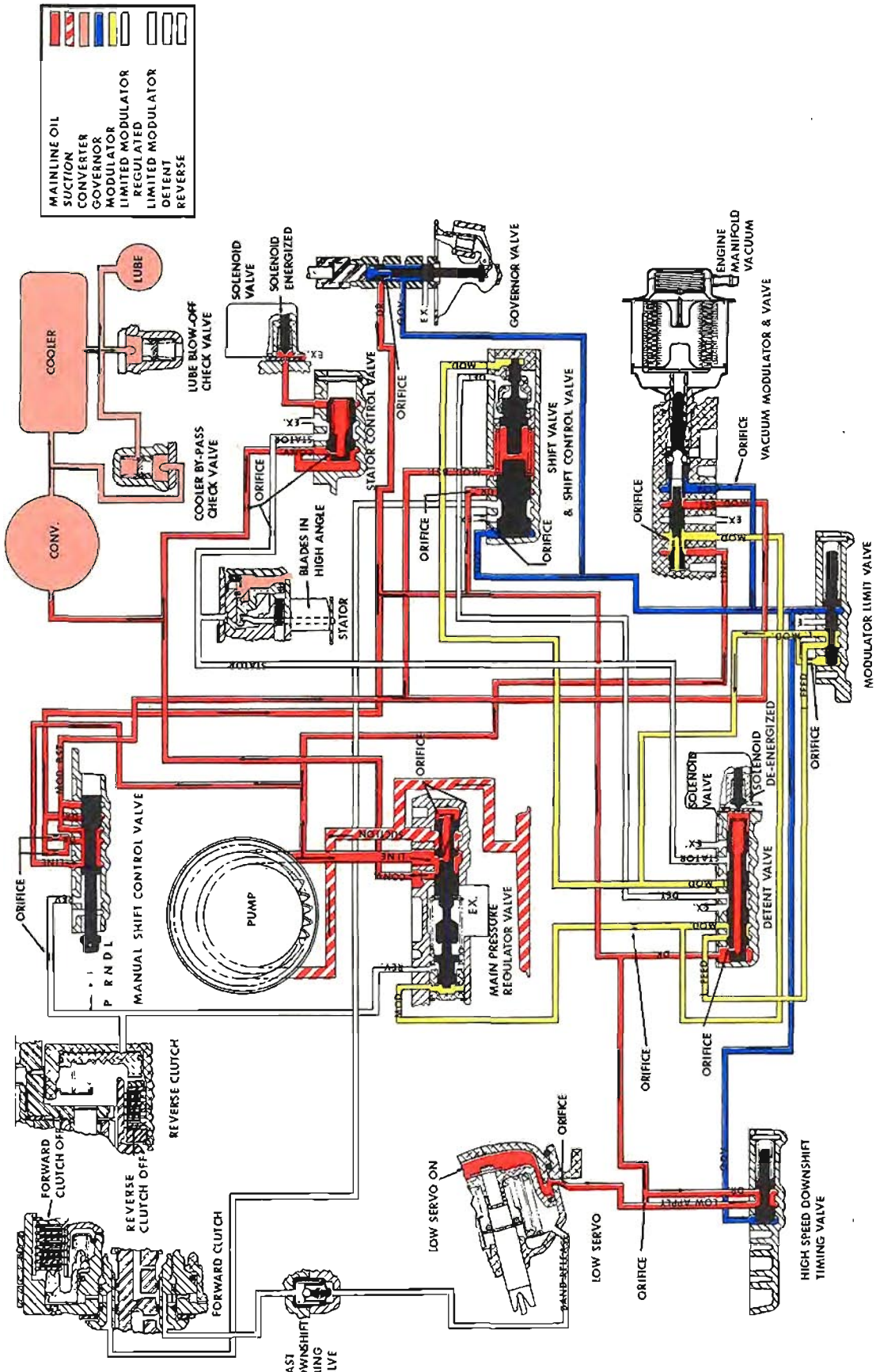


Fig. 6-235 Low Range-Reduction (Closed Throttle)

OPERATION OF HYDRAULIC CONTROLS IN LOW RANGE—

REDUCTION (CLOSED THROTTLE)

FORWARD CLUTCH—OFF

BAND—APPLIED

During operation in low range, the manual shift control valve is positioned as shown. During closed throttle in low range, main line oil is directed to the modulator valve and manual shift control valve. Main line oil entering the manual shift control valve is directed into the drive oil passage and modulator boost passage. Oil in the drive oil passage is directed to the governor valve, shift valve, detent valve, high speed downshift timing valve and low servo piston. Oil in the modulator boost passage is directed to the shift valve and vacuum modulator valve.

Modulator boost oil separates the two pieces of the modulator valve and tends to move the valve to the bottom of its bore independent of the vacuum modulator spring. Modulator oil under pressure is directed to the main line pressure regulator valve to provide an increase in main line oil pressure in low range, regardless of engine vacuum.

Modulator boost oil enters the shift valve between the shift valve and the shift control valve, moving the shift valve to the left and holding it in the bottom of its bore, thus exhausting the forward clutch. Drive oil directed from the manual shift control valve will apply the low servo.

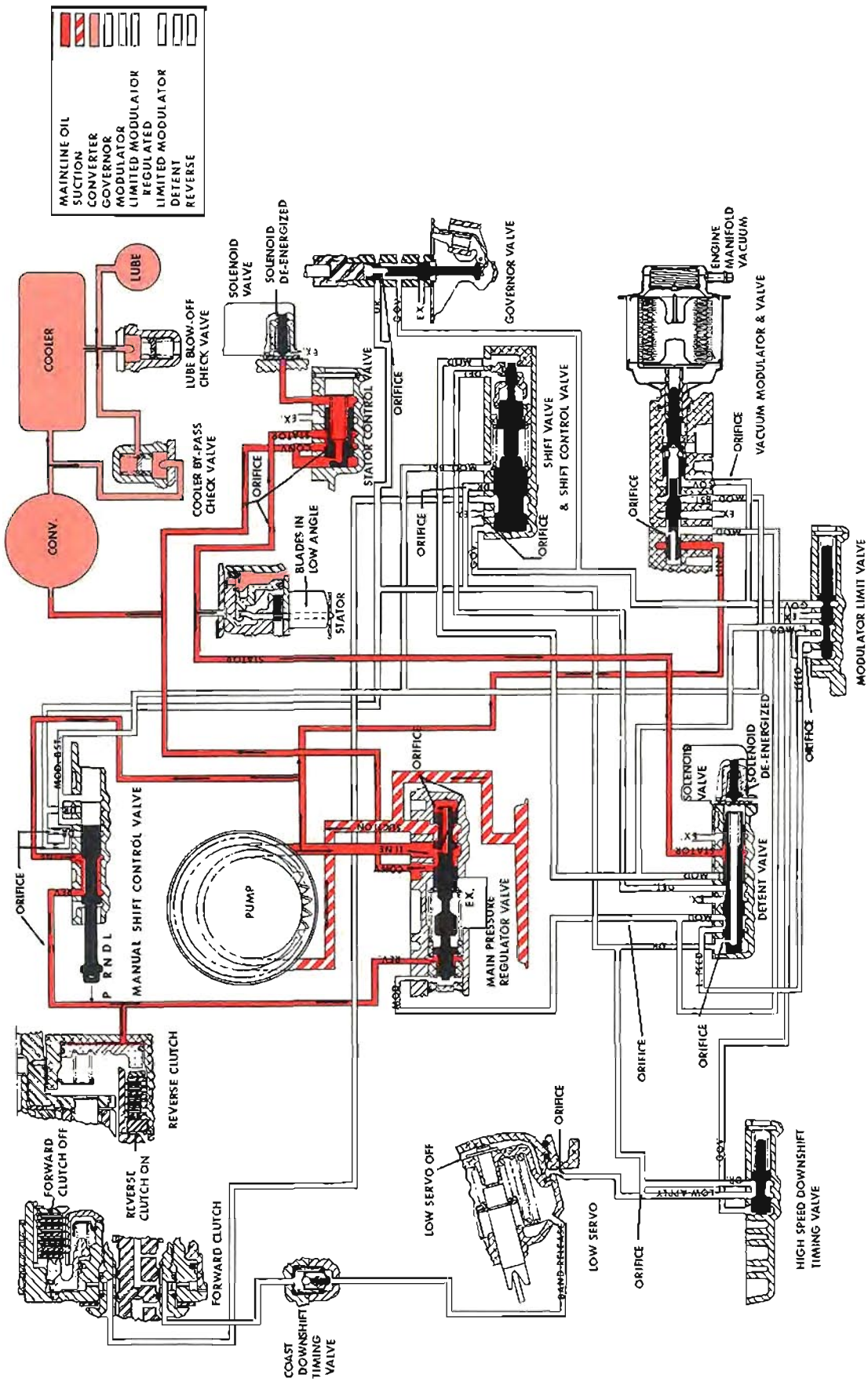


Fig. 6-236 Reverse

OPERATION OF HYDRAULIC CONTROLS IN REVERSE—

(LIGHT THROTTLE)

REVERSE CLUTCH—APPLIED **BAND—OFF** **REVERSE CLUTCH—OFF**

During operation in reverse, the manual shift control valve is positioned as shown. Main line oil entering the manual shift control valve is directed to the reverse clutch and between the lands of the boost valve, causing it to move to the right. As the boost valve moves to the right, it contacts the pressure regulator valve. This hydraulic force combined with normal spring force on the pressure regulator valve results in a higher main line pressure. When the manual shift control valve is in reverse, the forward clutch and low servo are released and the reverse clutch is applied.

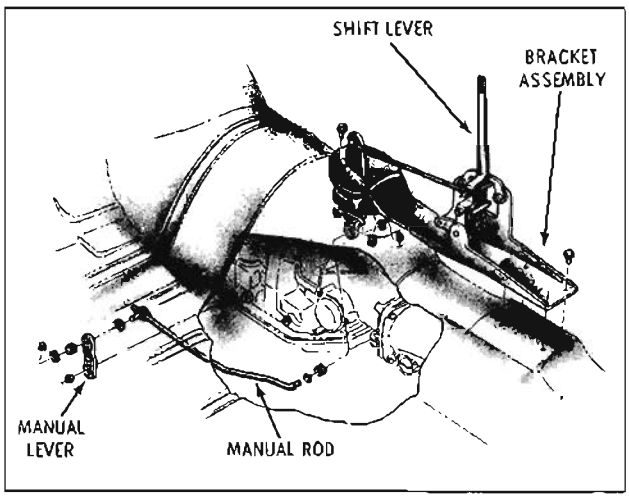


Fig. 6-237 Manual Shift Control

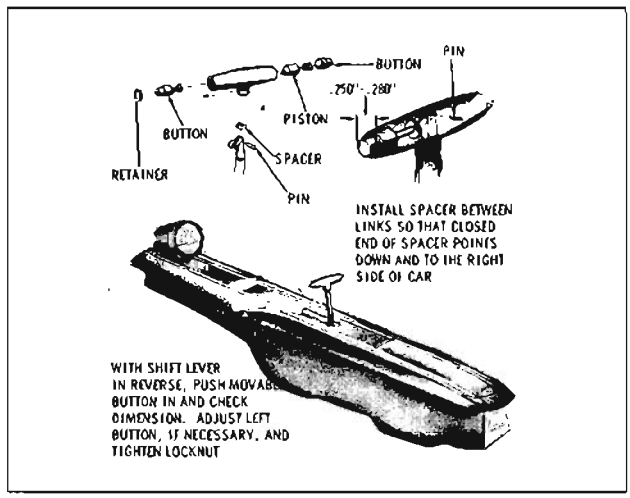


Fig. 6-238 Console Shift Lever

MANUAL SHIFT LINKAGE ADJUSTMENT (Figs. 6-237, 6-238 & 6-239)

The proper manual linkage adjustment is obtained by positioning the shift lever in "D" (Drive Range) against the stop and the manual lever in "D" detent, and adjusting the swivel to a free pin fit at the manual lever. If a free pin cannot be obtained, then adjust the rod one-half turn short.

SHIFT INDICATOR ADJUSTMENT

The shift indicator can be adjusted by removing the snap-on cover and loosening the set screw.

ENGINE SUPPORT BAR (Figs. 6-248 & 6-249)

The engine support bar must be installed whenever the transmission assembly is removed from the car.

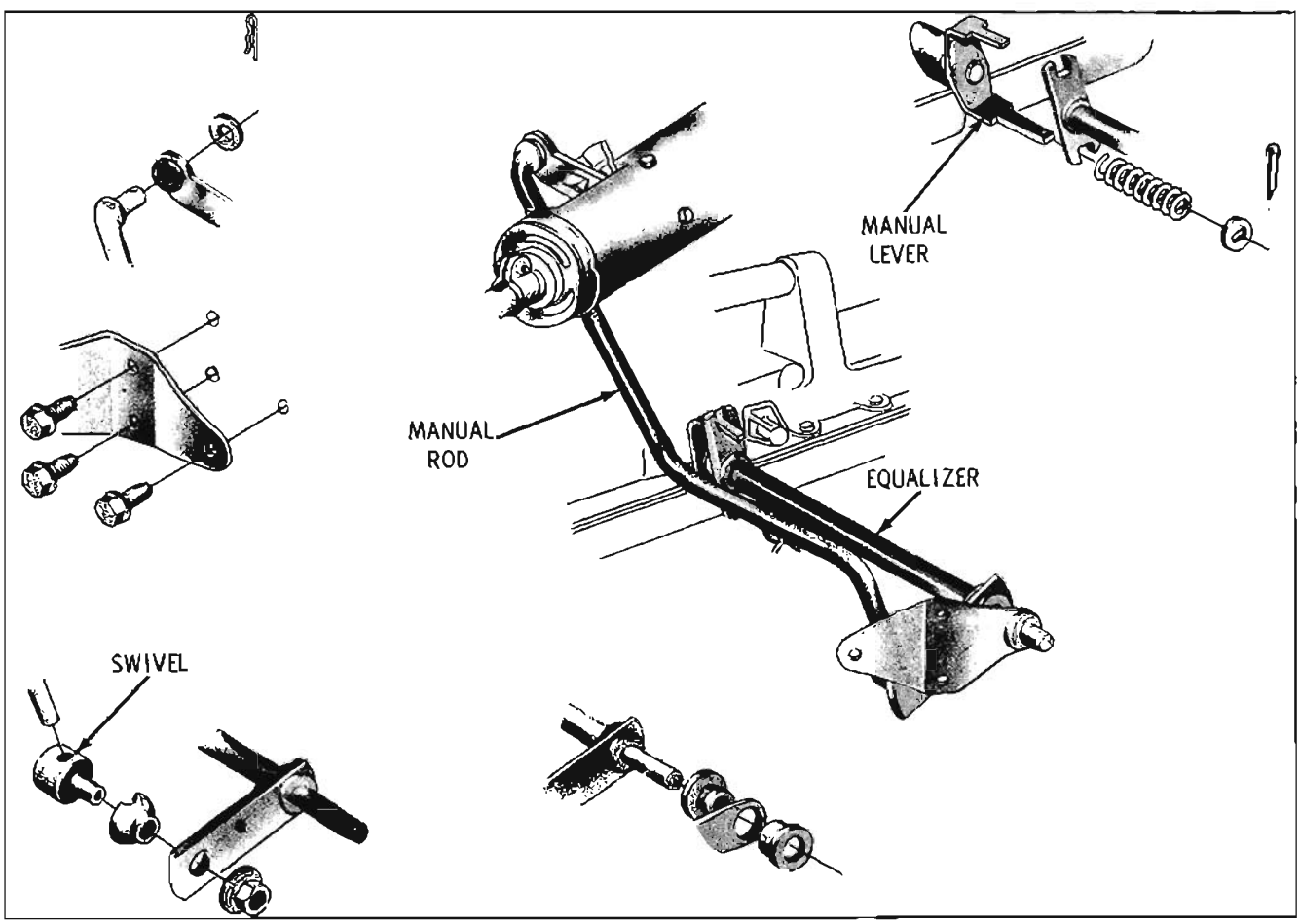


Fig. 6-239 Column Shift Linkage—V-6

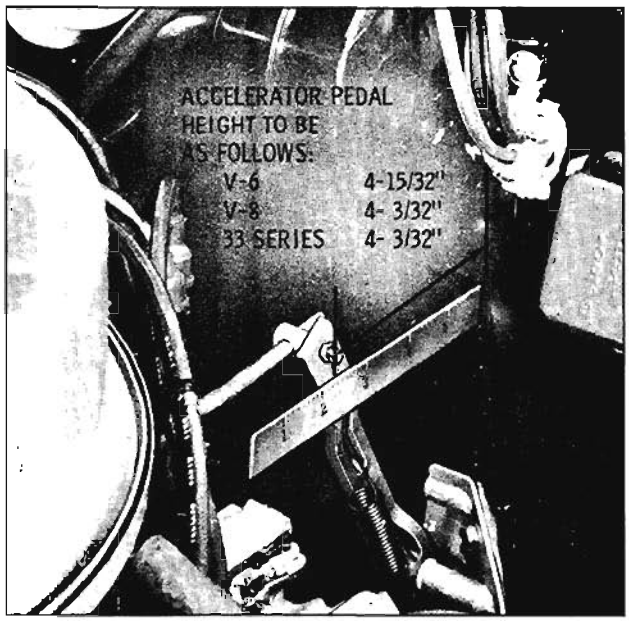


Fig. 6-240 Accelerator Pedal Height

CAUTION: If the support strap (Fig. 6-249) is not installed on all V-8 engines equipped with air conditioning, the engine may tip forward and damage the radiator.

THROTTLE LINKAGE ADJUSTMENT (Figs. 6-240, 6-241, 6-242 & 6-243)

If improper part throttle or full throttle downshift is encountered, it will be necessary to adjust the throttle linkage. Before adjusting the throttle linkage, refer to the CARBURETION Section 4 for proper carburetor settings.

1. Adjust accelerator pedal height. (Fig. 6-240)
2. Adjust dashpot assembly as follows:

   Required Conditions:

   A. Slow idle to be properly adjusted.

   B. Fast idle cam positioned to allow throttle

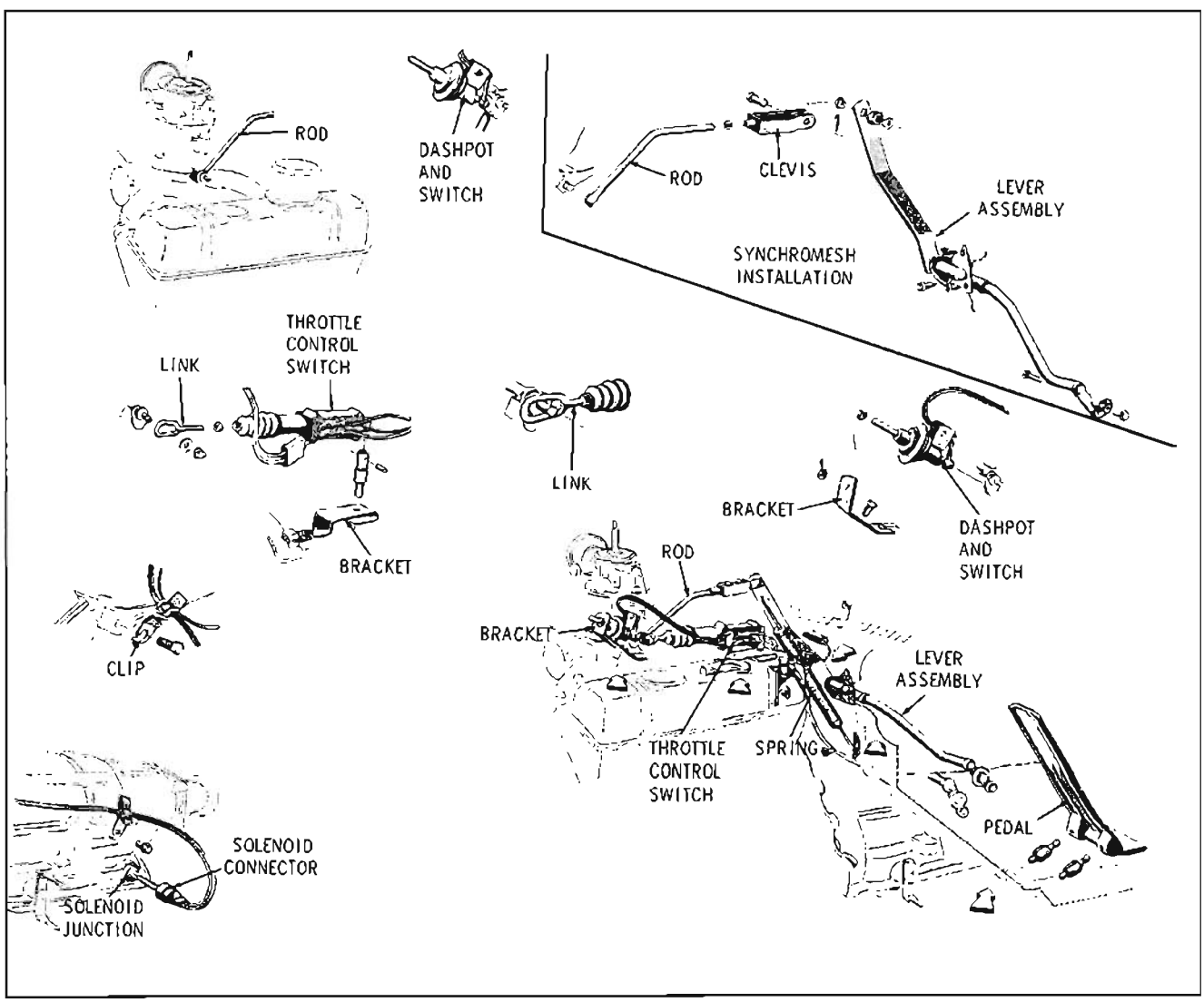


Fig. 6-241 Throttle Linkage—V-6

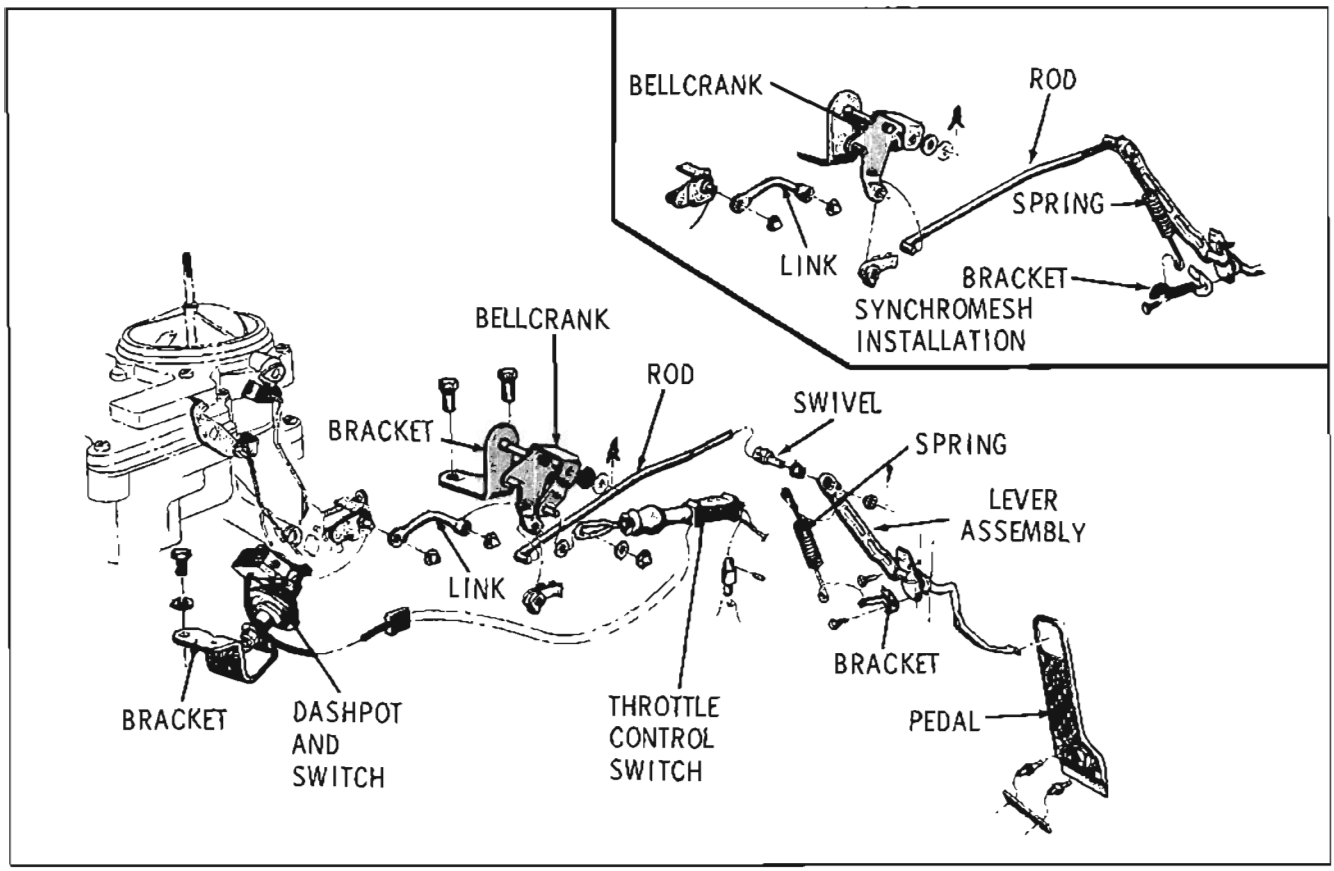


Fig. 6-242 Throttle Linkage—2 GC.

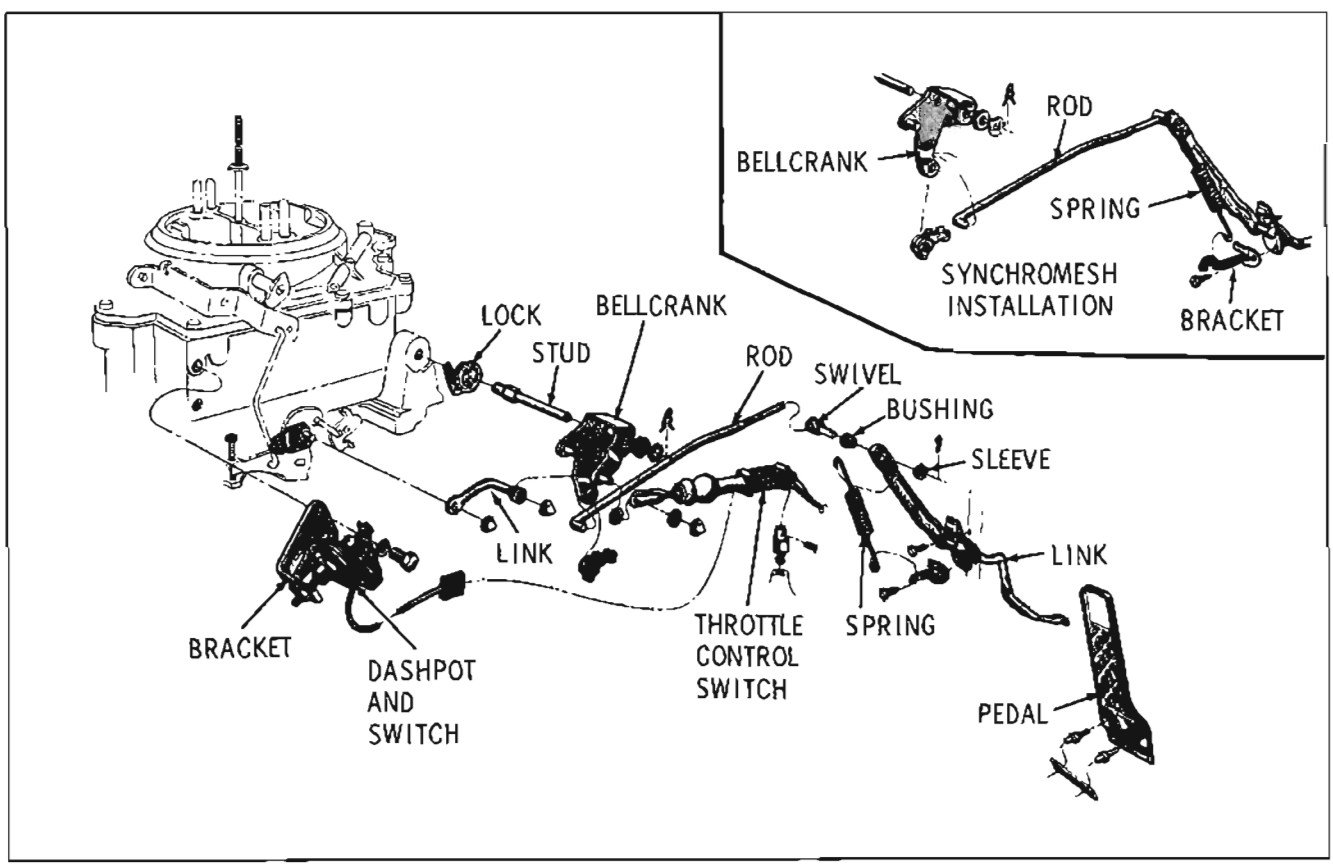


Fig. 6-243 Throttle Linkage—4 GC.

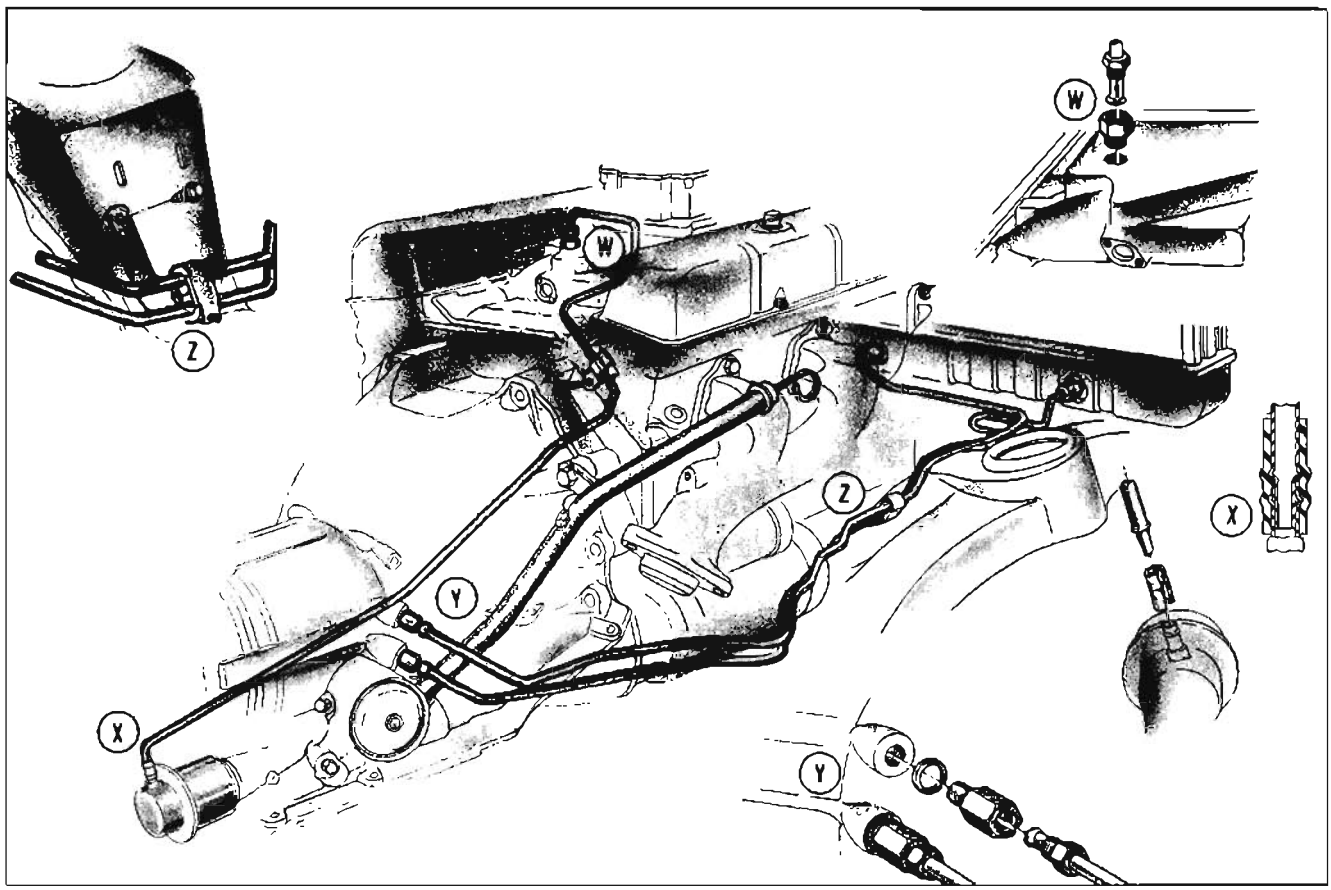


Fig. 6-244 Oil Cooler Lines—V-6

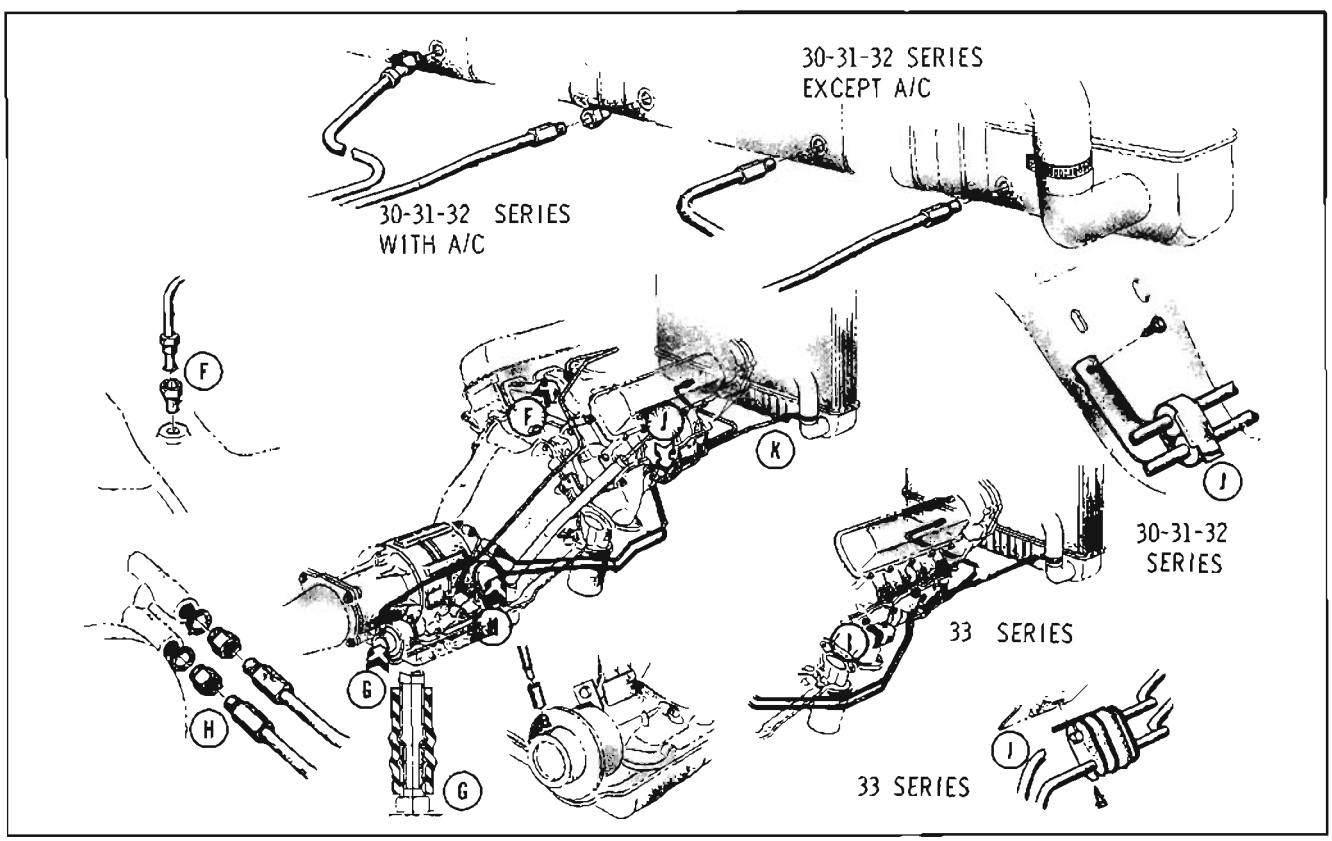


Fig. 6-245—Oil Cooler Lines—V-8

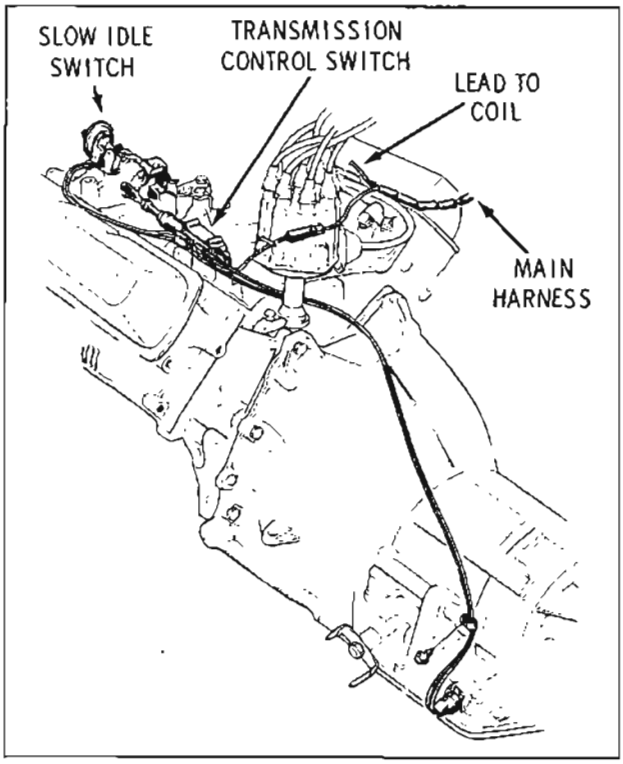


Fig. 6-246—Transmission Control Cable— 30-31-32 Series

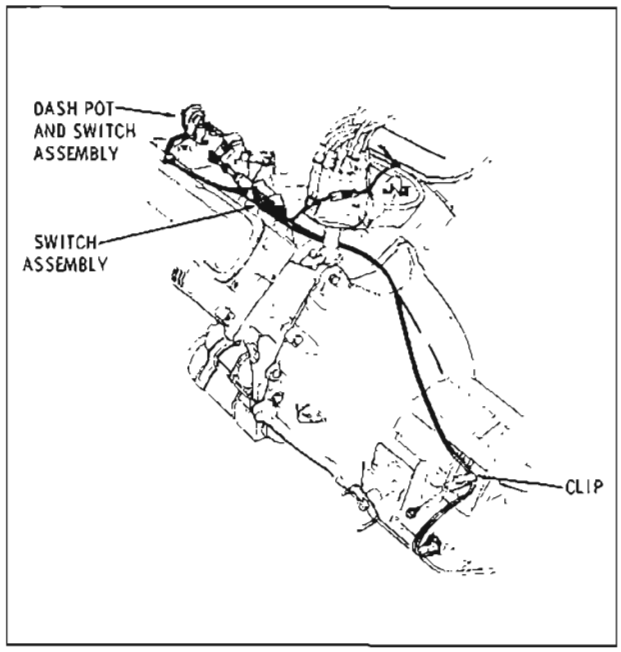


Fig. 6-247 Transmission Control Cable—33 Series

return spring to hold carburetor lever in slow idle position.

C. Dashpot adjusted away from carburetor

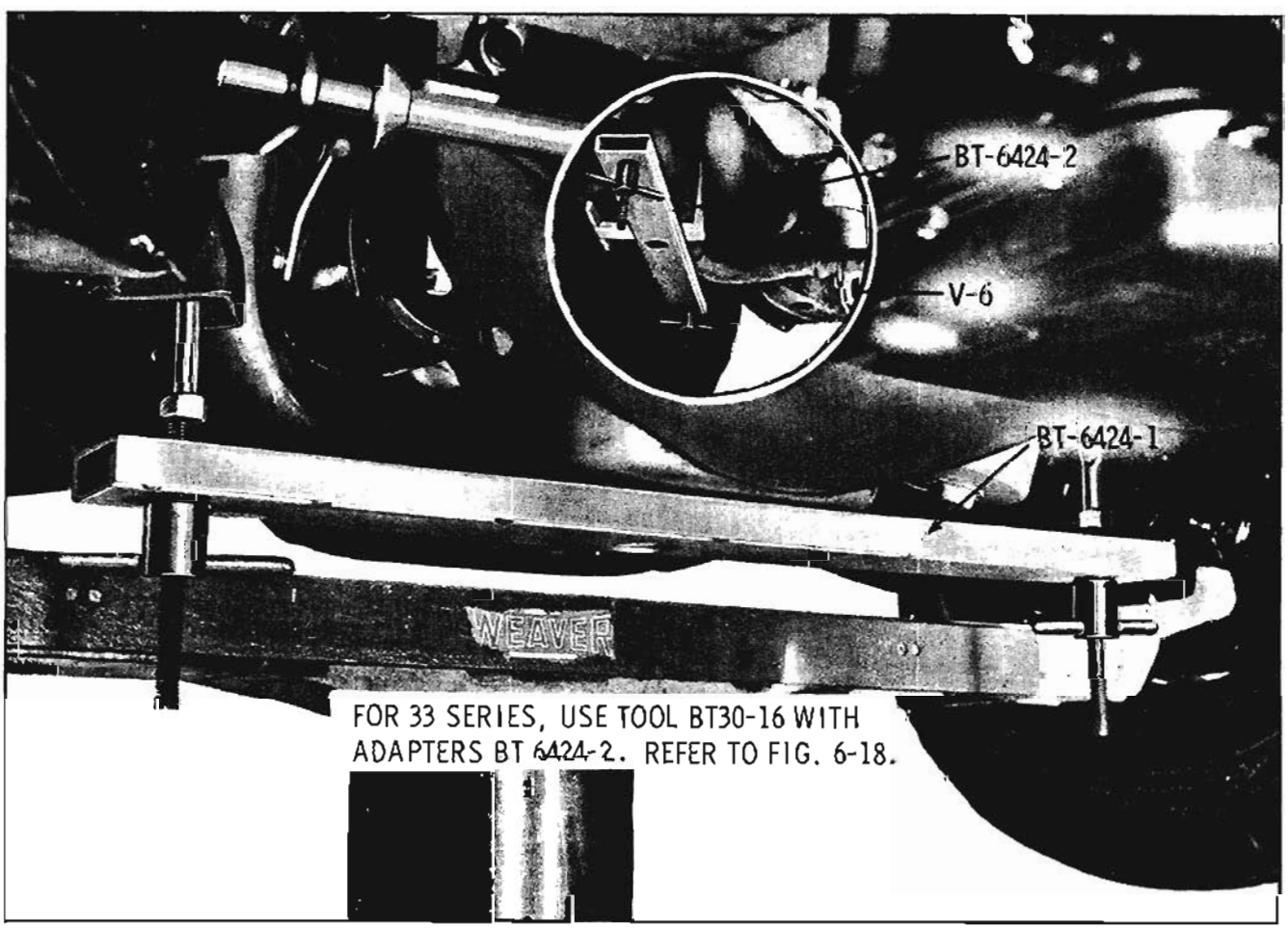


Fig. 6-248 Engine Support Bar

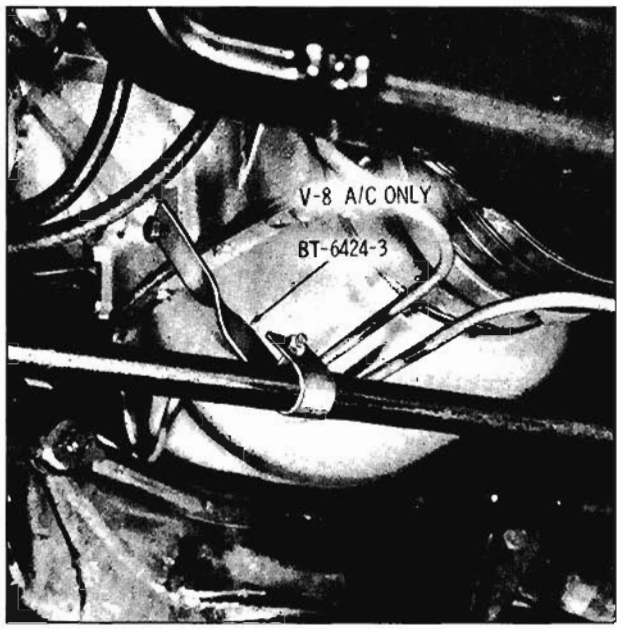


Fig. 6-249 Engine Support Bar A/C Bracket

lever.

D. Ignition switch turned on.

E. Test light connected to black lead terminal on throttle switch and ground.

Adjustment:

By turning nut on bracket, adjust dashpot into carburetor lever until test light comes on. Then adjust dashpot in further by turning nut one complete turn (6 wrench flats) more on V-8 models and one and two-thirds turns (10 wrench flats) on V-6 models.

3. Adjust throttle control switch as follows:

Required Conditions:

A. Auxiliary bellcrank to carburetor link properly adjusted.

B. Throttle switch and link assembly adjusted short.

C. Ignition switch turned on and engine not running.

D. Test light connected to white lead terminal on throttle switch and ground.

Adjustment:

A. Hold a .040" wire gauge in front of the wide open throttle stop on the throttle body.

B. Open carburetor by pulling on accelerator lever to auxiliary bellcrank rod until tang on carburetor lever stops against gauge.

C. With carburetor held in this position, length on link and switch assembly by turning switch plunger until test light comes on. Tighten locknut.

NOTE: This adjustment can only be made by lengthening switch assembly. If necessary to shorten switch assembly, let carburetor return to idle, shorten beyond necessary amount and then repeat procedure of opening carburetor to gauge and lengthening switch and link assembly.

OPERATIONS NOT REQUIRING TRANSMISSION REMOVAL

The following operations can be performed as outlined below without removing the transmission from the car.

1. Oil Pan

Refer to Figs. 6-254, 6-473 and 6-474.

*2. Oil Strainer and/or Pipe

Refer to Figs. 6-255 through 6-259 and 6-467 through 6-472.

3. Rear Bearing Retainer

NOTE: It will be necessary to remove the propeller shaft.

Refer to Figs. 6-277 through 6-281 and 6-451 through 6-456.

4. Vacuum Modulator

Refer to Figs. 6-284, 6-285, 6-286, 6-477, 6-478 and 6-479.

*5. Valve Body

Refer to Figs. 6-260 through 6-269, 6-307 through 6-315 and 6-457 through 6-465.

6. Governor

Refer to Figs. 6-282, 6-283, 6-475, 6-476 and 6-372 through 6-382.

*7. Low Servo

Refer to Figs. 6-271, 6-272, 6-429, 6-430, 6-431 and 6-432.

*8. Selector and Parking Mechanism

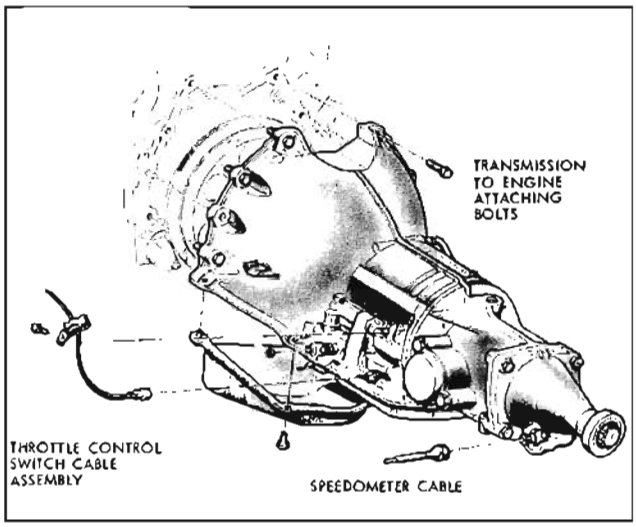


Fig. 6-250 Transmission Assembly

Refer to Figs. 6-297 through 6-304 and 6-411 through 6-416.

*These operations require the removal of the oil pan.

JETAWAY TRANSMISSION ASSEMBLY

REMOVAL (Fig. 6-250)

1. Remove transmission filler pipe.
2. Raise car on hoist.
3. Disconnect transmission control wires at transmission.
4. Disconnect manual rod from transmission lever.
5. Remove propeller shaft assembly.
6. Remove flywheel dust cover.

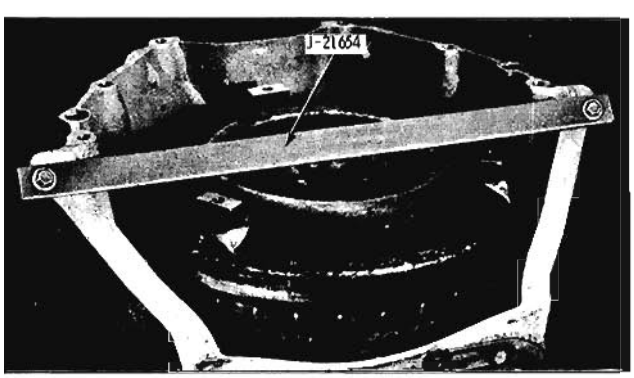


Fig. 6-251 Converter Holding Tool J-21654

7. Install Engine Support Bar BT-6424.
8. Remove transmission cross support bar to rear transmission mount attaching bolts.
9. Remove cross support bar to frame attaching brackets and remove cross support bar.

   NOTE: On models equipped with dual exhaust it may be necessary to disconnect the left hand exhaust pipe at the exhaust manifold to provide clearance.

10. Disconnect oil cooler lines and cap immediately.
11. Disconnect speedometer cable (or speed adapter, if so equipped) from speedometer driven gear.
12. Remove three flywheel to converter attaching bolts.

    NOTE: Mark flywheel and converter so they can be reassembled in the same relationship.

13. Install Converter Holding Tool J-21654. (Fig. 6-251)
14. Support transmission with unit lift and remove transmission to flywheel housing bolts.

    NOTE: It may be necessary to lower engine slightly to permit removal of transmission to flywheel housing upper bolts.

15. Carefully move transmission rearward and lower from car.

Installation

When installing transmission, tighten the attaching parts to the following specified torque ratings:

a. Transmission to flywheel housing	30 to 45 ft. lbs.
b. Flywheel to converter	30 to 35 ft. lbs.
c. Cross support bar brackets to frame	30 to 40 ft. lbs.
d. Cross support bar to rear transmission mount	30 to 45 ft. lbs.
e. Flywheel dust cover	4 to 7 ft. lbs.
f. Propeller shaft U-bolt nuts	12 to 16 ft. lbs.

Fill transmission as recommended in Periodic Maintenance - Section 2.

DISASSEMBLY

Before starting disassembly of the transmission

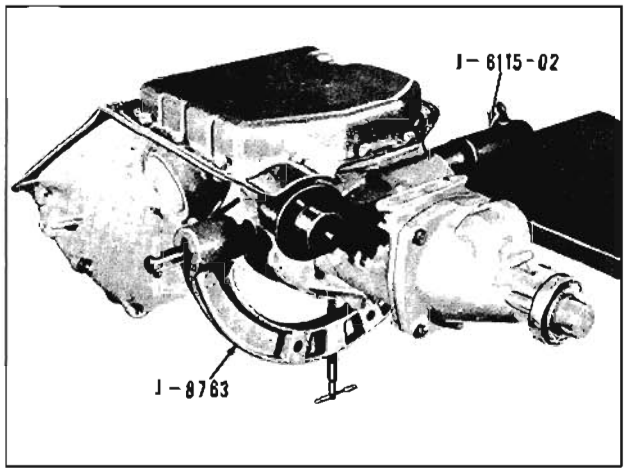


Fig. 6-252 Removing Converter

it should be thoroughly cleaned externally to avoid getting dirt inside.

Place transmission on a CLEAN work bench and use CLEAN tools during disassembly. Provide CLEAN storage space for parts and units removed from transmission. An excellent working arrangement is provided by assembling the transmission to Holding Fixture J-8763. (Fig. 6-253)

The transmission contains parts which are ground and highly polished, therefore, parts should be kept separated to avoid nicking and burring surfaces.

When disassembling transmission carefully inspect all gaskets at times of removal. The imprint of parts on both sides of an old gasket will show whether a good seal was obtained. A poor imprint indicates a possible source of oil leakage due to gasket condition, looseness of bolts, or uneven surfaces of parts.

None of the parts require forcing when dis-

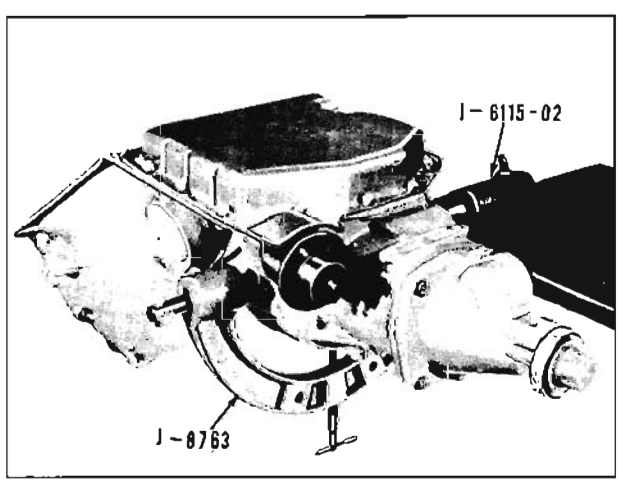


Fig. 6-253 Transmission Holding Tool J-21654

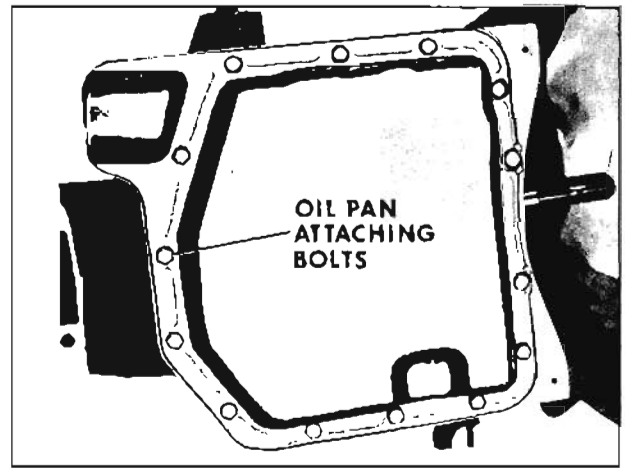


Fig. 6-254 Removing Oil Pan

assembling or assembling transmission. Use a rawhide or plastic mallet to separate tight fitting cases - do not use a hard hammer.

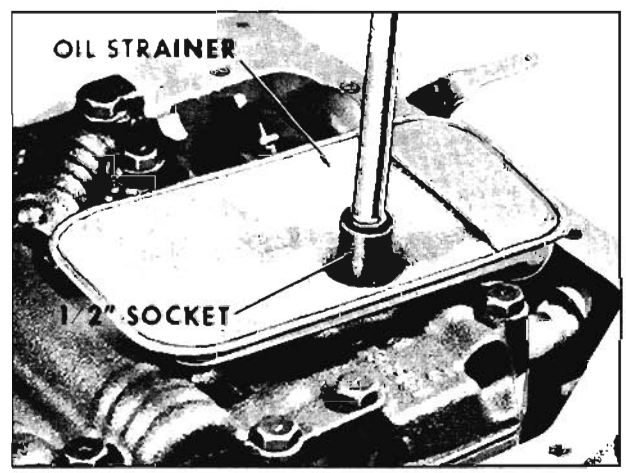


Fig. 6-255 Removing Oil Strainer Attaching Bolt

Removal of Oil Pan

1. With transmission in horizontal position remove converter holding tool and pull converter from case. (Fig. 6-252)
2. Place transmission in Fixture J-8763. (Fig. 6-253)
3. Remove 14 oil pan attaching bolts using a 1/2" socket. (Fig. 6-254)
4. Remove oil pan and gasket from transmission.

Removal of Oil Strainer and Pipe

1. Remove bolt retaining oil strainer to valve body using a 1/2" socket. (Fig. 6-255)
2. With a twisting motion remove oil strainer from oil strainer pipe. (Fig. 6-256)

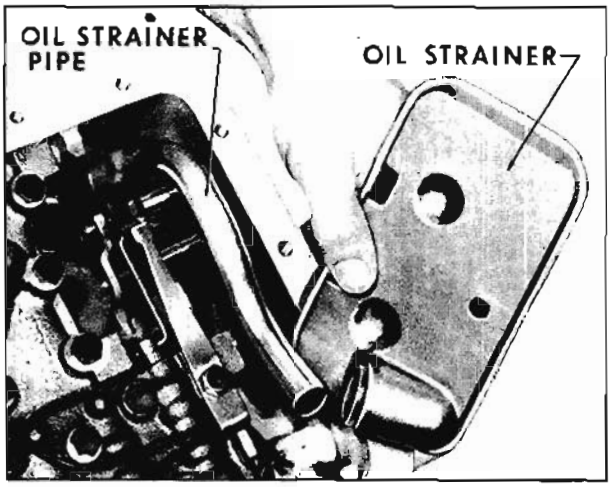


Fig. 6-256 Removing Oil Strainer

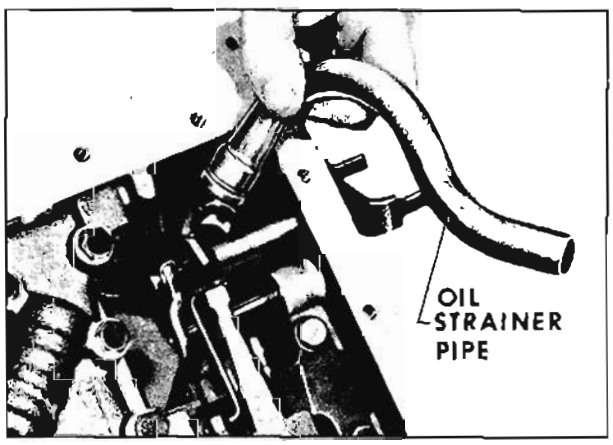


Fig. 6-257 Removing Oil Strainer Pipe

3. Lift oil strainer pipe from transmission case. (Fig. 6-257)

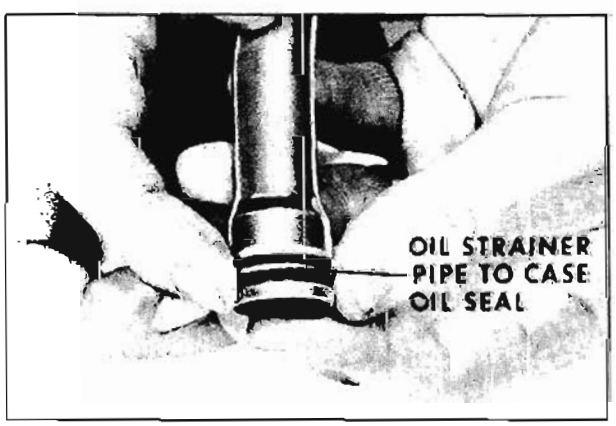


Fig. 6-258 Oil Strainer Pipe to Case Oil Seal

4. Examine oil strainer to case oil seal. If nicked, torn or worn, remove seal. (Fig. 6-258)

5. Examine oil strainer to oil strainer pipe grommet. If nicked, torn or worn, remove grommet. (Fig. 6-259)

Fig. 6-259 Oil Strainer Grommet

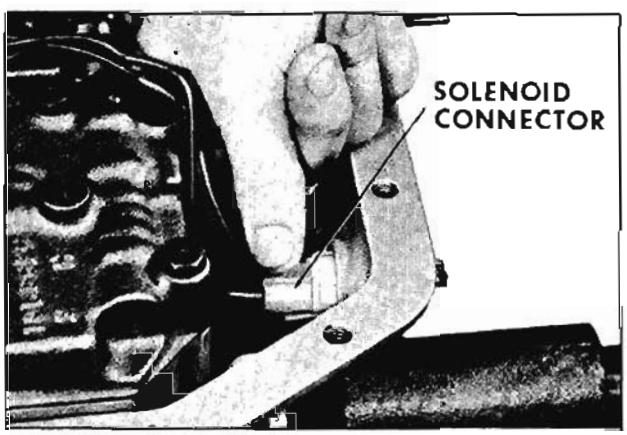


Fig. 6-260 Disconnecting Solenoid Connector

Removal of Valve Body

1. Disconnect solenoid connector from solenoid junction. (Fig. 6-260)

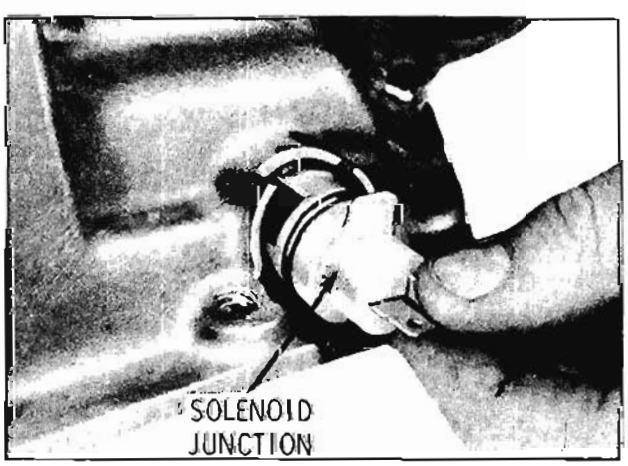


Fig. 6-261 Removing Solenoid Junction

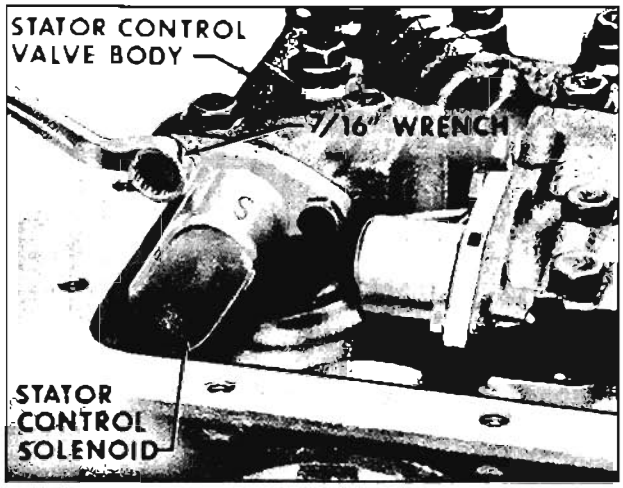


Fig. 6-263 Removing Solenoid

2. Remove solenoid switch from case. Inspect switch "O" ring. If nicked, torn or worn replace. (Fig. 6-261)

3. With a grease pencil mark stator control solenoid with an "S". This "S" will identify stator control solenoid for reassembly. (Fig. 6-263)

4. Remove two solenoid to stator control valve body retaining bolts with 7/16" wrench. Remove stator control solenoid gasket. (Fig. 6-263)

5. Remove spring detent assembly bolt with a 1/2" socket. Remove spring detent assembly from valve body. (Fig. 6-264)

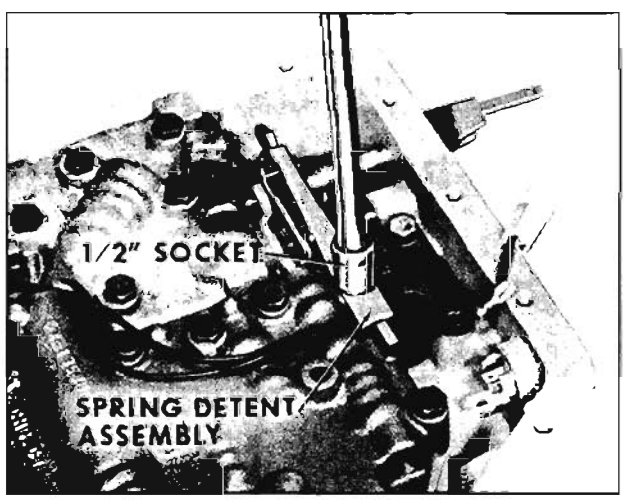


Fig. 6-264 Removing Spring Detent Assembly

6. Remove seven bolts retaining stator control valve body to transmission case using a 1/2" socket. Remove stator control valve body. (Fig. 6-265)

7. Remove stator control valve body plate. (Fig. 6-266)

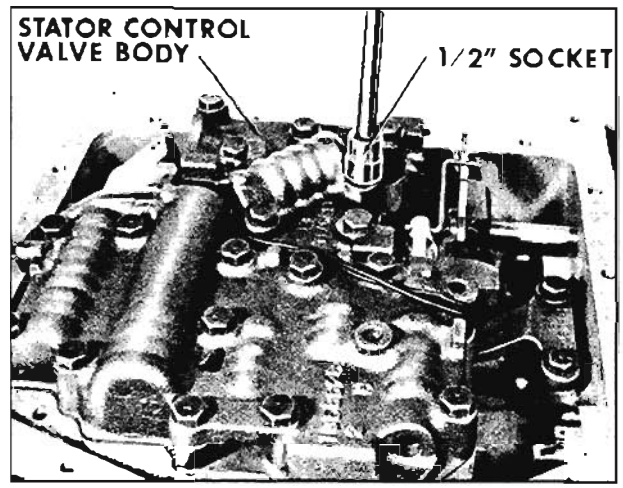


Fig. 6-265 Removing Stator Control Valve Body

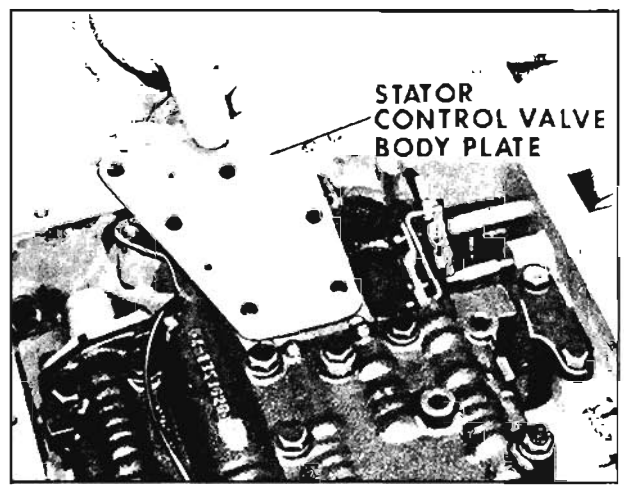


Fig. 6-266 Removing Stator Control Valve Body Plate

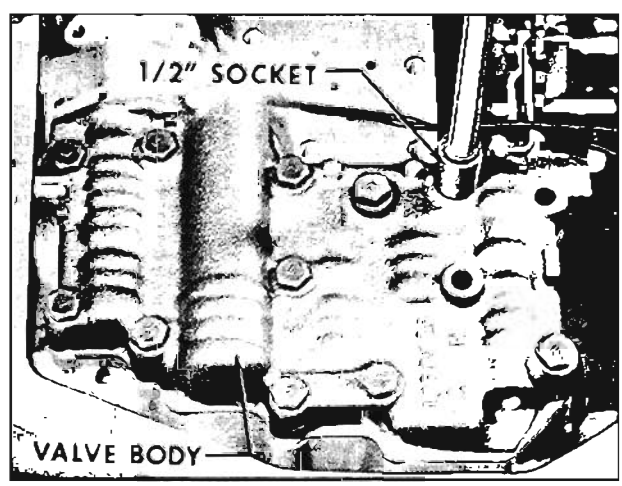


Fig. 6-267 Removing Valve Body

8. Remove 11 valve body to case bolts only using a 1/2" socket. Do not remove valve body. (Fig. 6-267)

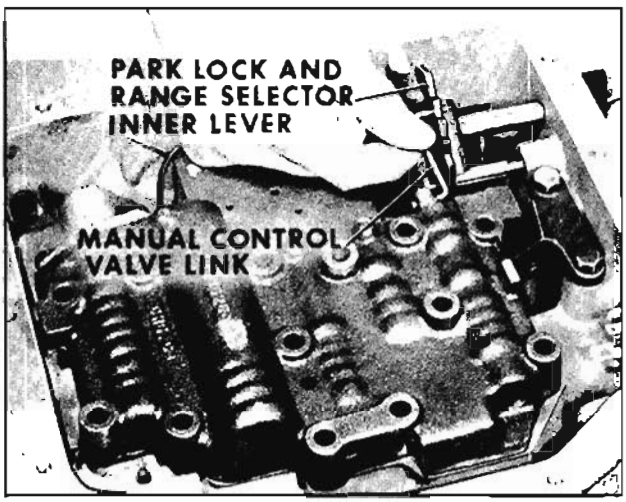


Fig. 6-268 Removing Inner Lever

9. Remove manual control valve link by rotating valve body in a counterclockwise direction to remove link from Park lock and range selector inner lever. (Fig. 6-268)

10. Remove manual control valve and link from valve body assembly. Remove valve body.

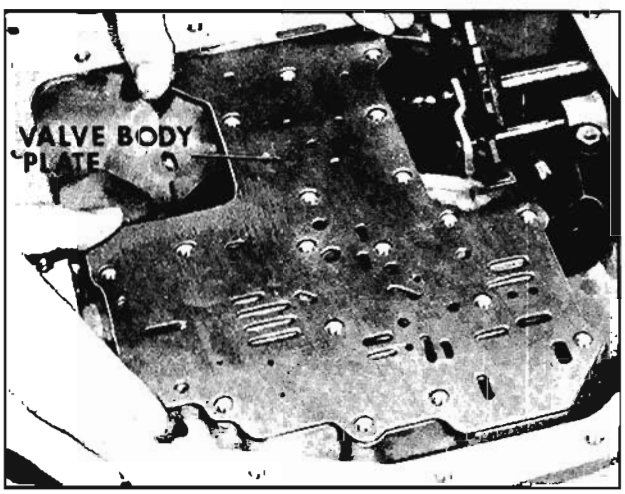


Fig. 6-269 Removing Valve Body Plate and Gasket

11. Remove valve body plate and gasket. (Fig. 6-269)

Removal of Low Servo Cover and Piston Assembly

1. Release tension on low band adjusting screw retaining nut. Release tension on low band by turning adjusting screw in a counterclockwise direction. Use a 7/32" Allen Wrench. (Fig. 6-270)

2. Remove low servo cover snap ring. Use Tool J-21495-1 to compressor servo cover so snap ring can be removed. (Fig. 6-271)

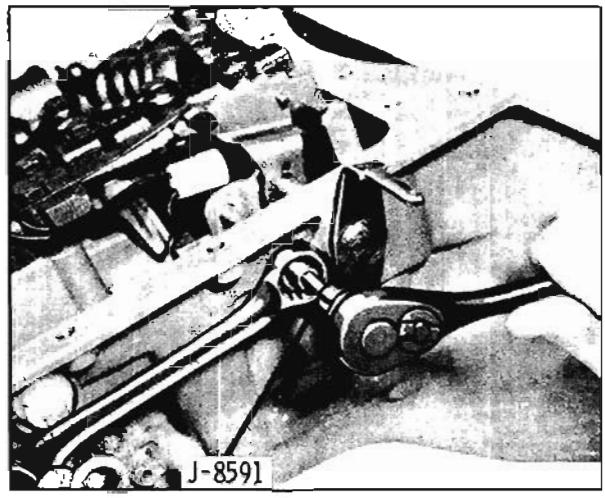


Fig. 6-270 Low Band Adjusting Screw

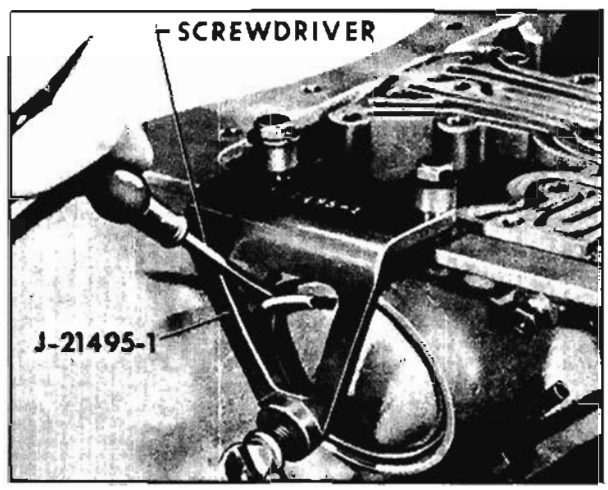


Fig. 6-271 Removing Low Servo Cover Snap Ring

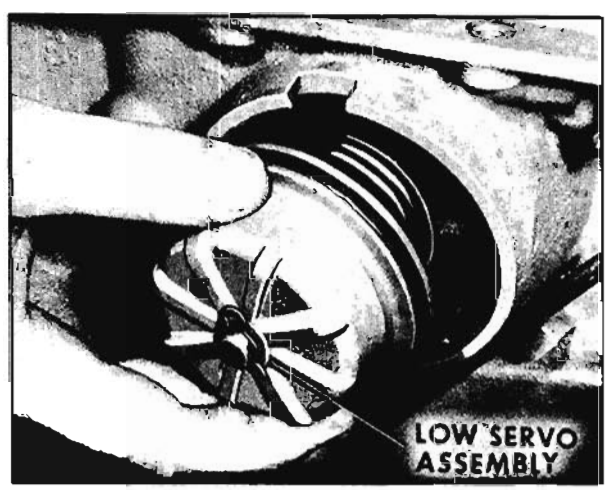


Fig. 6-272 Removing Low Servo Piston

3. Loosen thumb screw on tool, then remove Tool J-21495-1 from case. Remove low servo cover. NOTE: If necessary aid removal with screwdriver.

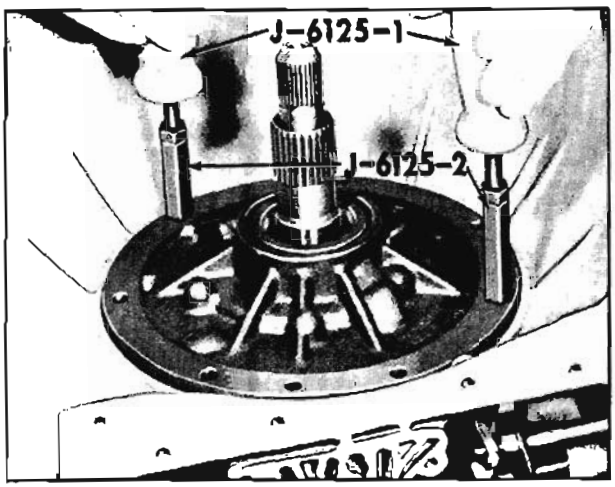


Fig. 6-273 Removing Oil Pump

4. Inspect low servo cover seal. If nicked, torn, or worn, discard.

5. Remove low servo piston assembly from case. (Fig. 6-272)

Removal of Oil Pump

NOTE: Before removing oil pump assembly, check oil pump clearance as shown in Fig. 6-446 and record reading.

1. With transmission in vertical position, remove eight pump attaching bolts with "O" ring seals, then install Slide Hammers J-6125-1 with Adapters J-6125-2 into threaded holes in pump. Using slide hammer, loosen pump from case. Remove pump and gasket from case. (Fig. 6-273)

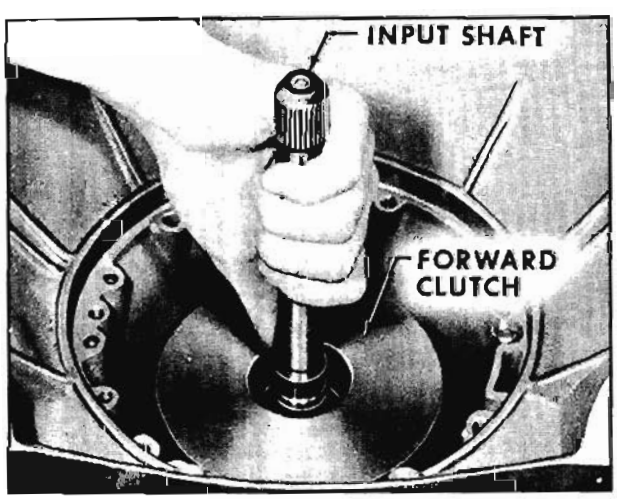


Fig. 6-274 Removing Input Shaft

Removal of Forward Clutch

1. Remove input shaft from forward clutch drum. (Fig. 6-274)

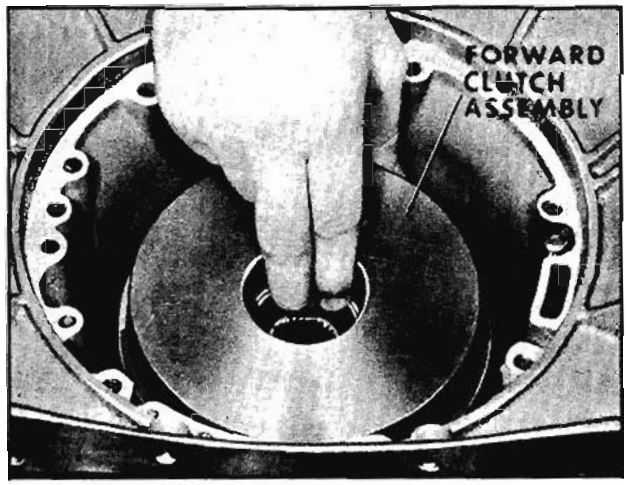


Fig. 6-275 Removing Forward Clutch

2. Examine input shaft oil rings. If nicked or worn, remove rings.

3. Remove forward clutch assembly by pulling straight out of case. Make certain low band has been released before attempting to remove forward clutch. (Fig. 6-275)

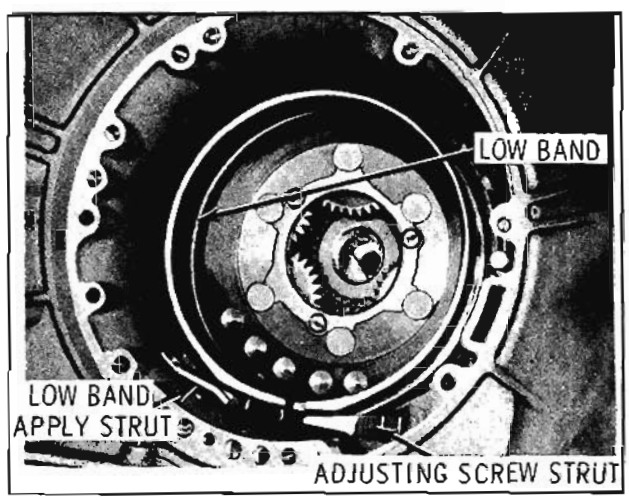


Fig. 6-276 Removing Low Band

Removal of Low Band

1. Remove low band and struts from inside the case. (Fig. 6-276)

2. Remove low band adjusting screw.

Removal of Speedometer Driven Gear

1. With transmission in horizontal position, remove speedometer driven gear sleeve retainer. (Fig. 6-277)

2. Remove speedometer driven gear sleeve. If speedometer driven gear sleeve cannot be removed by hand, available Tool BT-6422 may be used as shown in Fig. 6-278.

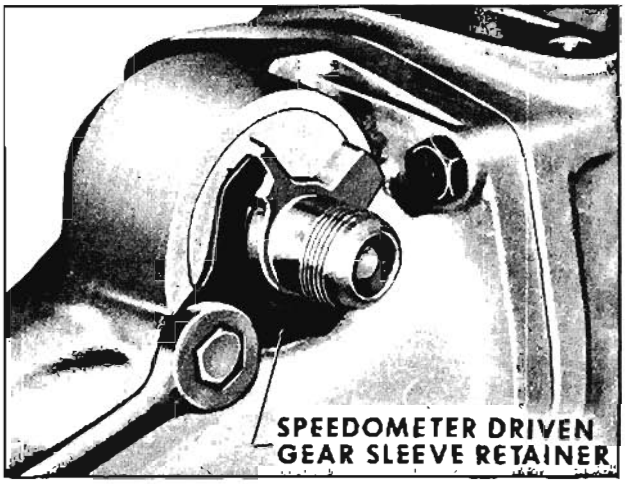


Fig. 6-277 Removing Speedometer Driven Gear Retainer

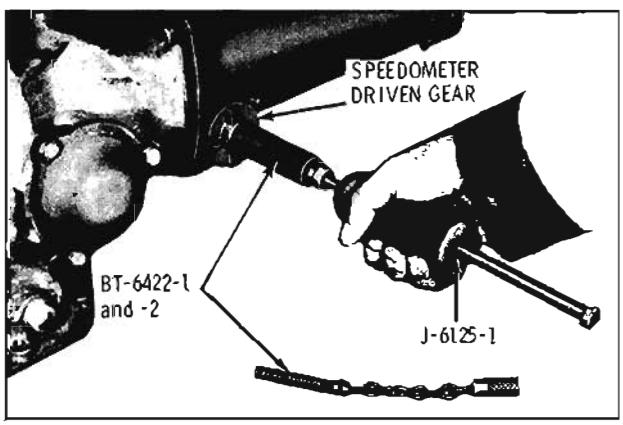


Fig. 6-278 Removing Speedometer Driven Gear

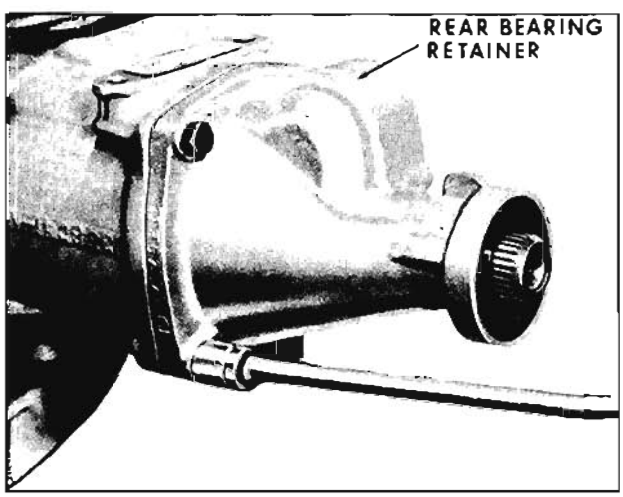


Fig. 6-279 Removing Rear Bearing Retainer

Removal of Rear Bearing Retainer

1. Remove four rear bearing retainer bolts with a 9/16" socket. Remove rear bearing retainer from case. (Fig. 6-279)

2. Remove rear bearing retainer to case seal. (Fig. 6-280)

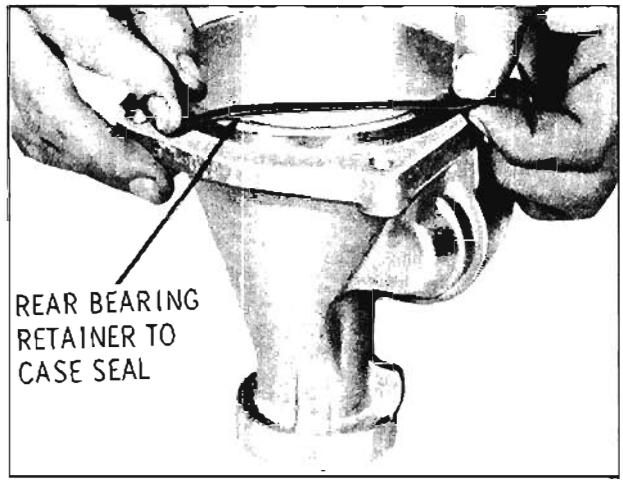


Fig. 6-280 Removing Rear Bearing Retainer to Case Seal

Removal of Speedometer Driving Gear

1. Place transmission in "P" range, then remove speedometer driving gear with J-6123. (Fig. 6-281)

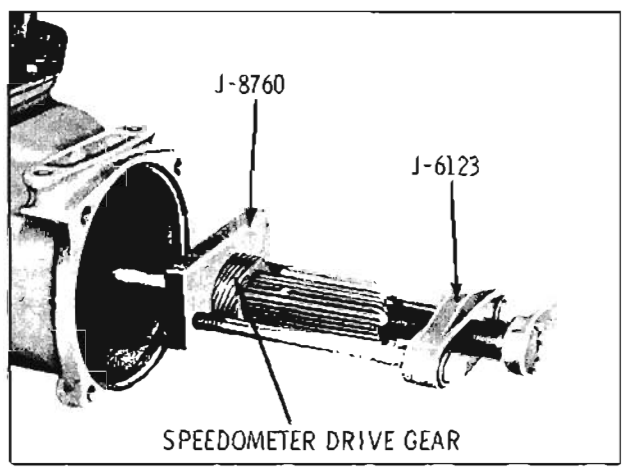


Fig. 6-281 Removing Speedometer Drive Gear

NOTE: Use 6-1/2" bolts for standard housing and 16" bolts threaded approximately 5" for extended housing.

Removal of Governor

1. Remove three attaching bolts retaining governor cover to case using a 1/2" socket. Remove cover and gasket. (Fig. 6-282)

2. With a twisting motion, slide governor assembly out of its bore in case. (Fig. 6-283)

Removal of the Vacuum Modulator Assembly

1. Remove vacuum modulator retainer bolt and retainer using a 1/2" socket. Remove vacuum modulator and valve assembly. (Figs. 6-284 and 6-285)

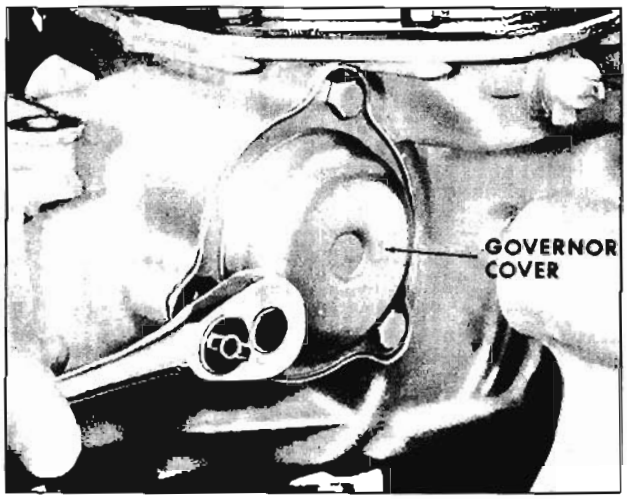


Fig. 6-282 Removing Governor Cover

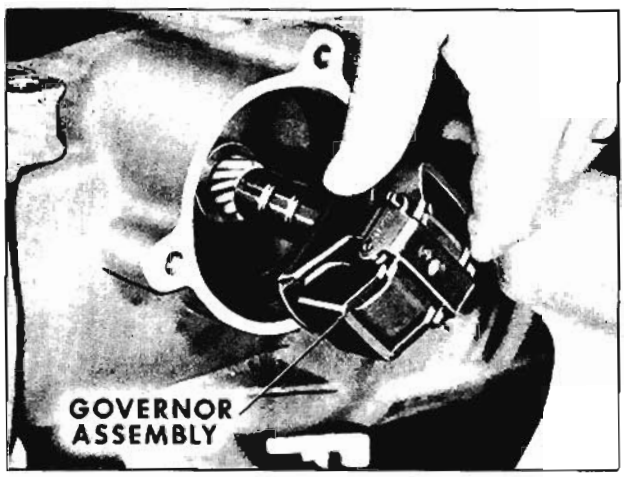


Fig. 6-283 Removing Governor

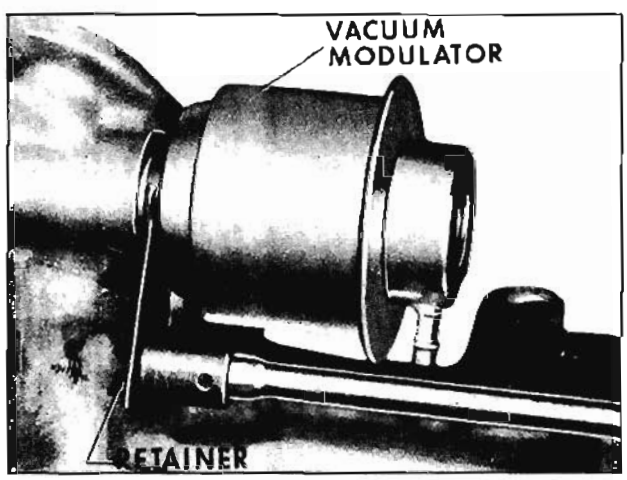


Fig. 6-284 Removing Vacuum Modulator Retainer

2. Inspect and if necessary remove vacuum modulator to case oil seal. (Fig. 6-286)

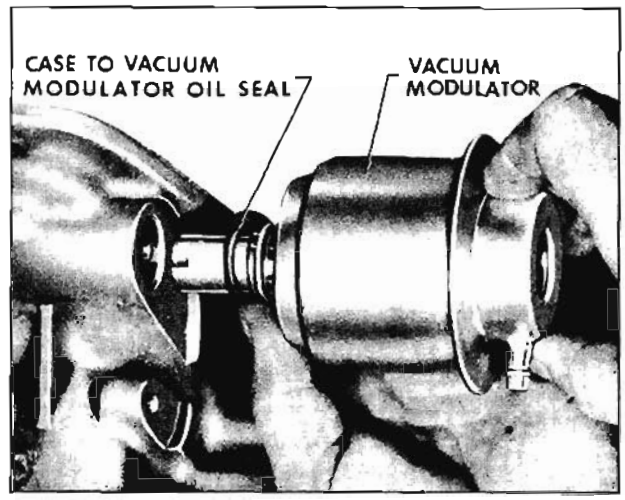


Fig. 6-285 Removing Vacuum Modulator

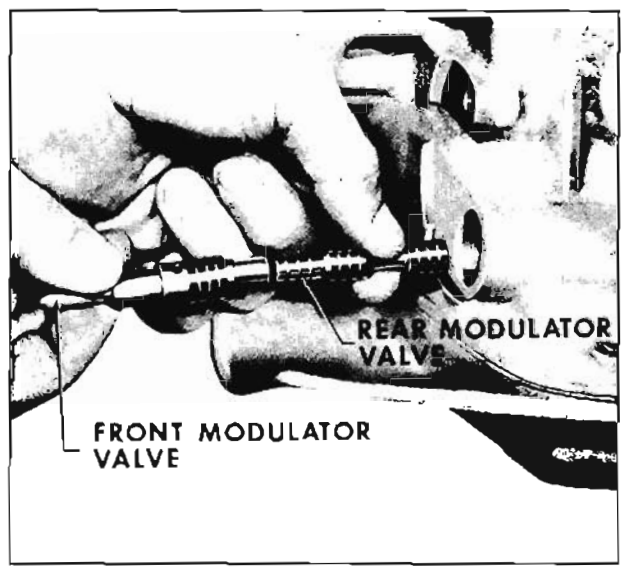


Fig. 6-286 Removing Vacuum Modulator Valve

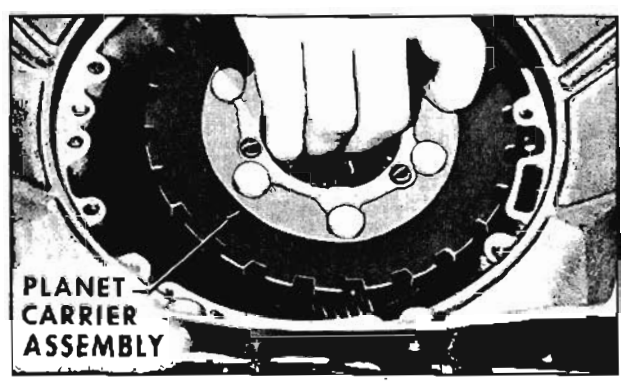


Fig. 6-287 Removing Planetary Gear Set

Removal of Planetary Gear Set

1. Remove planet carrier assembly from case, using care not to damage case bushing. (Fig. 6-287)

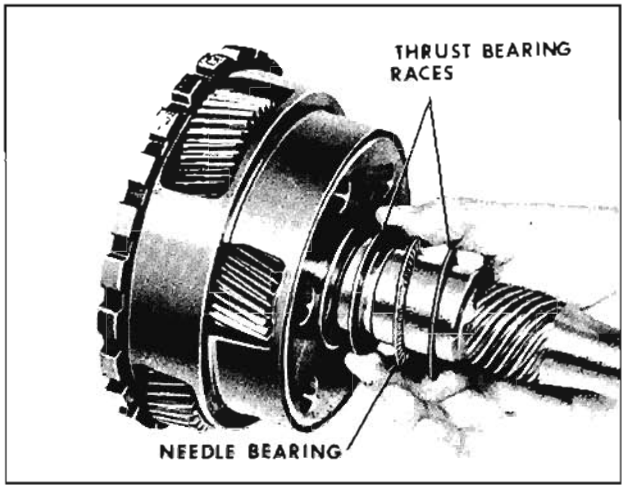


Fig. 6-288 Removing Planetary Gear Thrust Bearing

2. Remove needle bearing and two bearing races from rear of planet carrier. (Fig. 6-288)

NOTE: Bearing assembly may stay in transmission when plant carrier is removed.

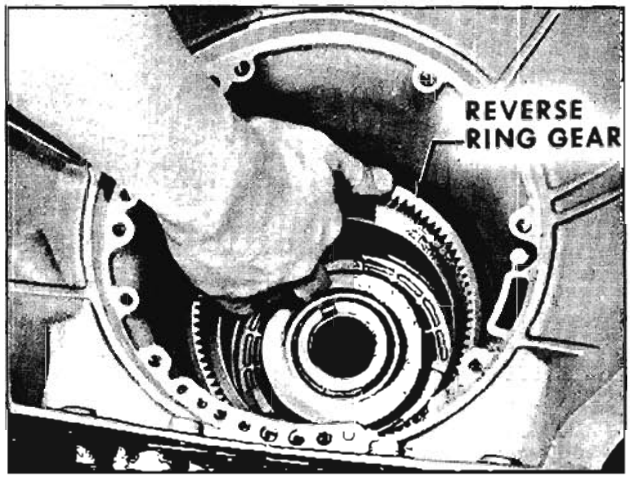


Fig. 6-289 Removing Reverse Ring Gear

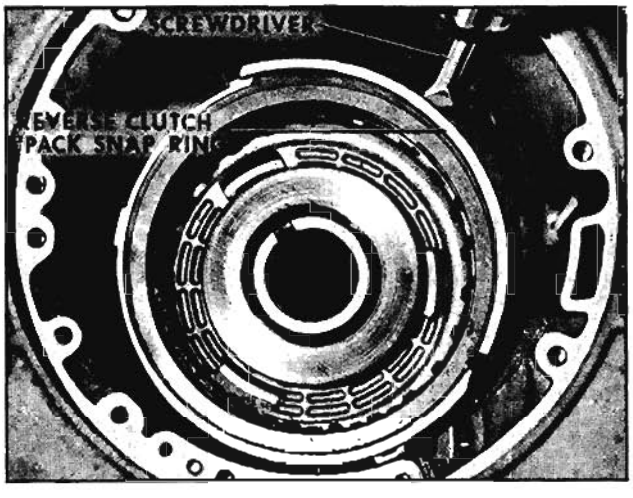


Fig. 6-290 Removing Reverse Clutch Snap Ring

2. Remove reverse ring gear from case. (Fig. 6-289)

Removal of Reverse Clutch

NOTE: The Jetaway used with the V-6 engine has four steel reverse plates and four lined reverse plates. The V-8 engine requires additional steel and one additional lined plate.

1. Place transmission in vertical position and remove reverse clutch pack snap ring with screwdriver. (Fig. 6-290)

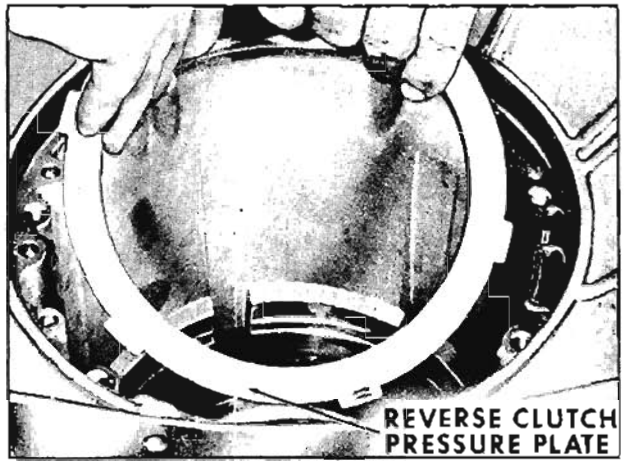


Fig. 6-291 Removing Reverse Clutch Pressure Plate

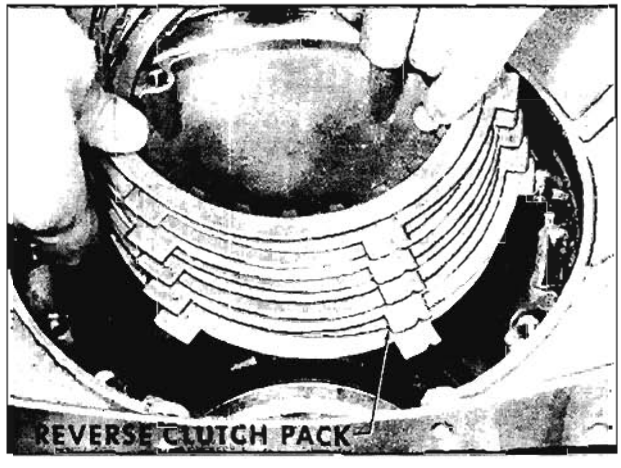


Fig. 6-292 Removing Reverse Clutch Pack

2. Lift reverse clutch pressure plate from transmission case. (Fig. 6-291)

3. Remove reverse clutch pack from transmission case. (Fig. 6-292)

4. Remove reverse clutch cushion spring. (Fig. 6-293)

5. To remove reverse piston center Tool J-21420-1 on reverse piston return seat.

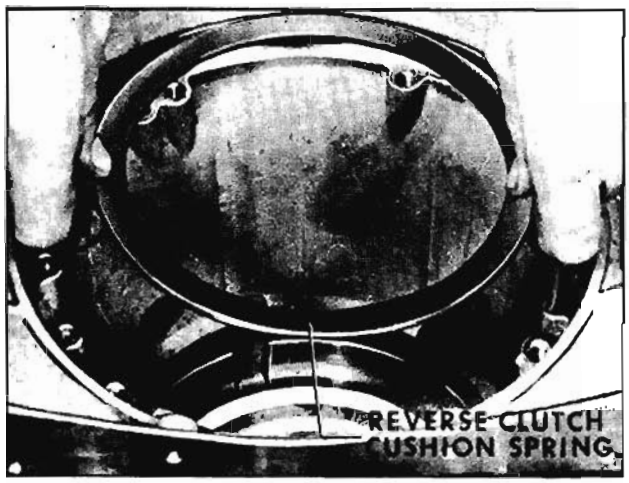


Fig. 6-293 Removing Reverse Clutch Cushion Spring

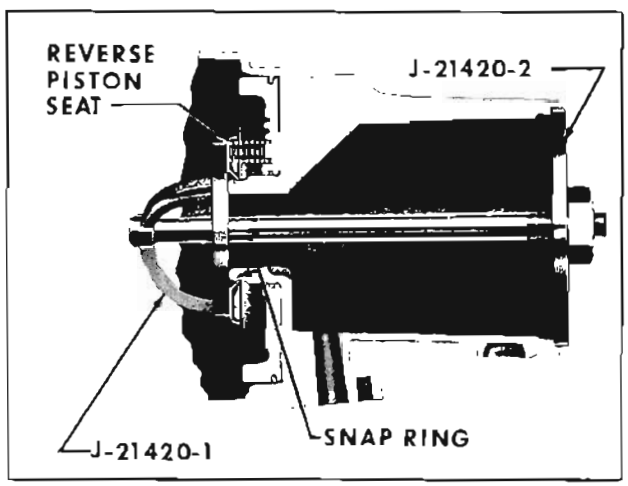


Fig. 6-294 Removing Reverse Clutch Piston

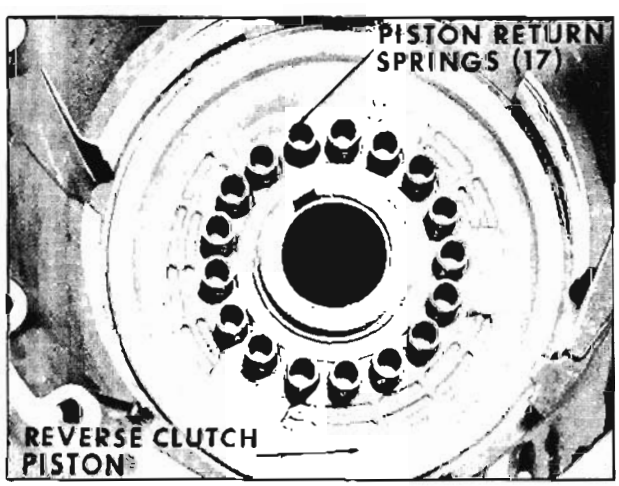


Fig. 6-295 Removing Reverse Clutch Piston Return Springs

Install Flat Plate J-21420-2 over threaded shaft at rear of case. Position webs of tool away from end of snap ring. Tighten nut to compress piston return seat; then remove snap ring with Pliers J-5586. (Fig. 6-294)

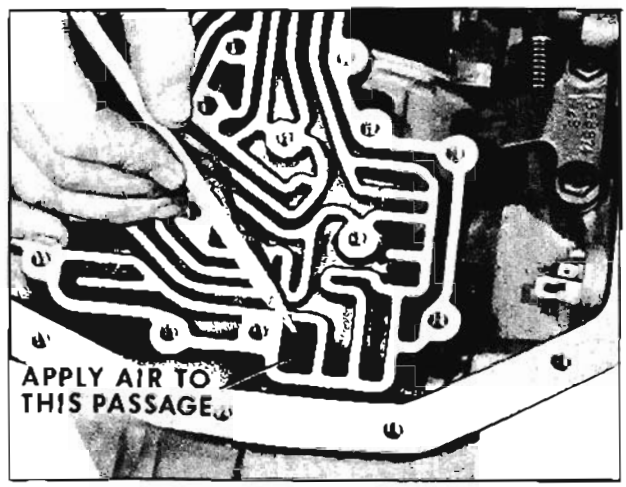


Fig. 6-296 Reverse Clutch Apply Passage

6. Remove tool J-21420-1 & 2 being careful that piston return seat does not catch in snap ring groove. Remove piston return seat and remove 17 piston return springs. (Fig. 6-295)

7. Place transmission in a horizontal position and remove reverse clutch piston with compressed air. As air is applied to the rear surface of the piston, it will pop out far enough so it can be removed. Insert air nozzle to rear of case as shown in Fig. 6-296.

Removal of Range Selector Lever and Shaft, and Parking Lock Actuator

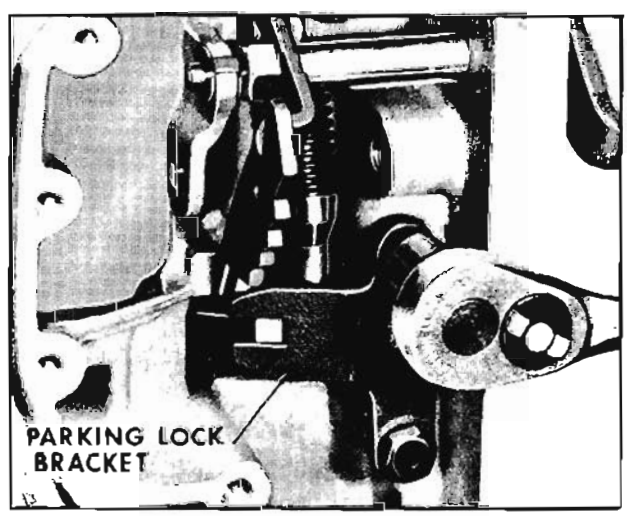


Fig. 6-297 Removing Parking Lock Bracket

1. Remove two parking lock bracket bolts with 1/2" socket. Remove parking lock bracket. (Fig. 6-297)

2. Remove range selector shaft retainer. (Fig. 6-298)

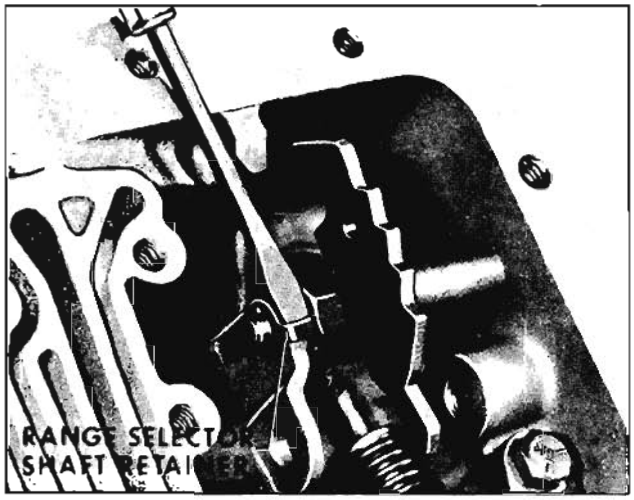


Fig. 6-298 Removing Selector Shaft Retainer

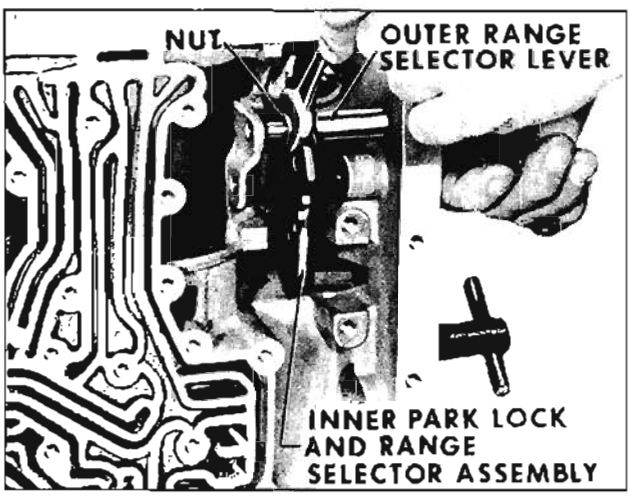


Fig. 6-299 Loosening Selector Lever Locknut

3. With a 9/16" wrench, fully loosen nut that retains outer range selector lever to inner park lock and range selector lever. (Fig. 6-299)

4. Slide outer range selector lever out of case. Remove nut, inner park lock and range selector lever. (Fig. 6-300)

5. Remove retaining ring which holds inner park lock and range selector to park lock assembly. (Fig. 6-301)

6. Disconnect parking lock pawl spring, then slide parking lock pawl shaft out of parking lock pawl. Remove parking lock pawl and spring. (Fig. 6-302)

REPAIR OF UNITS

At this point all of the main units have been removed from the transmission. The following pages cover the repair of each of these individual units.

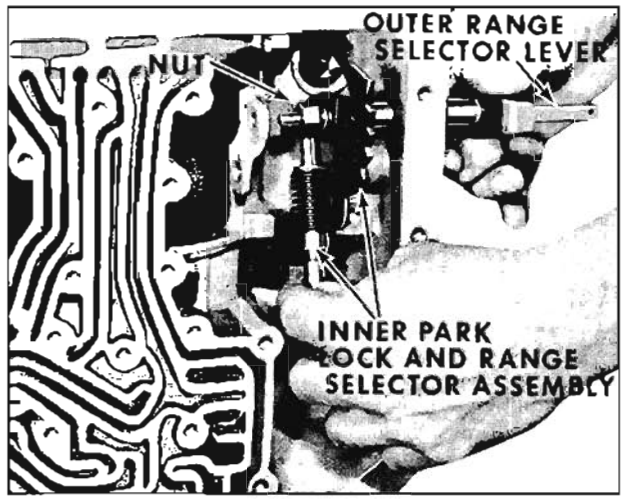


Fig. 6-300 Removing Outer Range Selector Lever

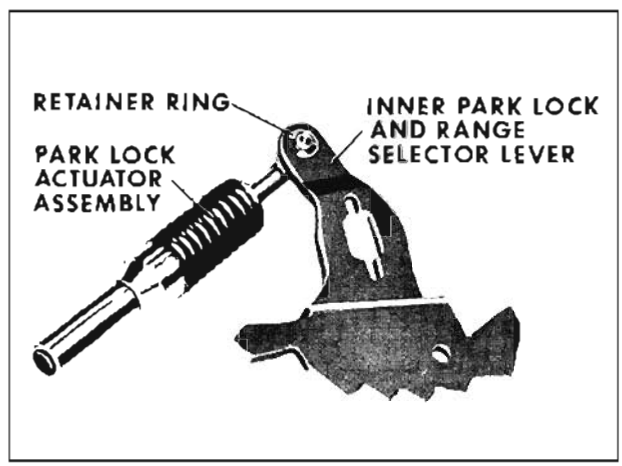


Fig. 6-301 Removing Park Lock Actuator

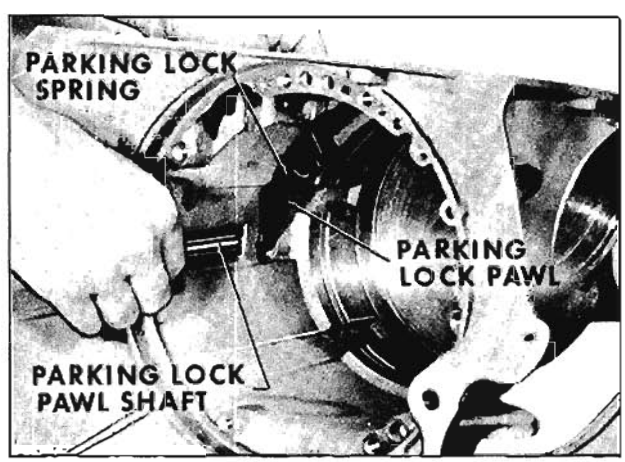


Fig. 6-302 Removing Parking Pawl

OUTER SHIFT LEVER OIL SEAL

Examine outer shift lever oil seal. If nicked, torn, or worn, remove seal. (Fig. 6-303)

Install outer shift lever seal using J-8855-3 Make certain lip of seal points toward center of case. (Fig. 6-304)

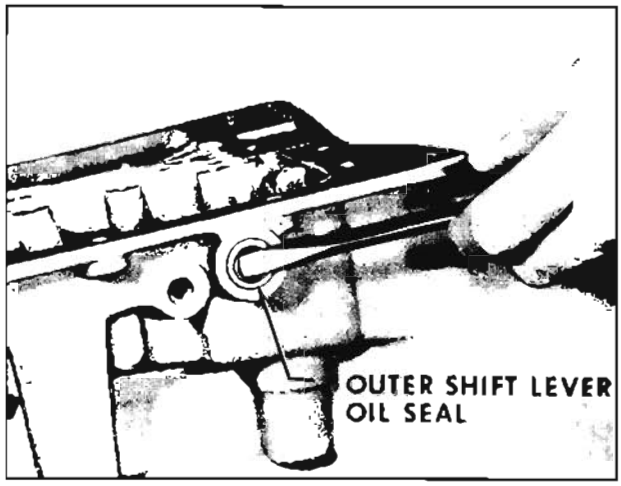


Fig. 6-303 Removing Outer Shift Lever Seal

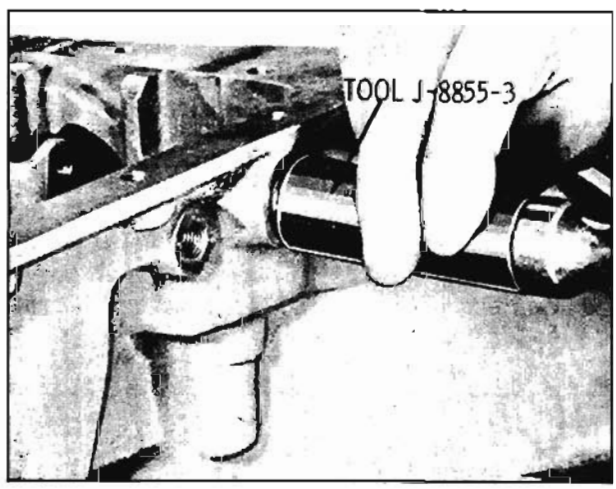


Fig. 6-304 Installing Outer Shift Lever Seal

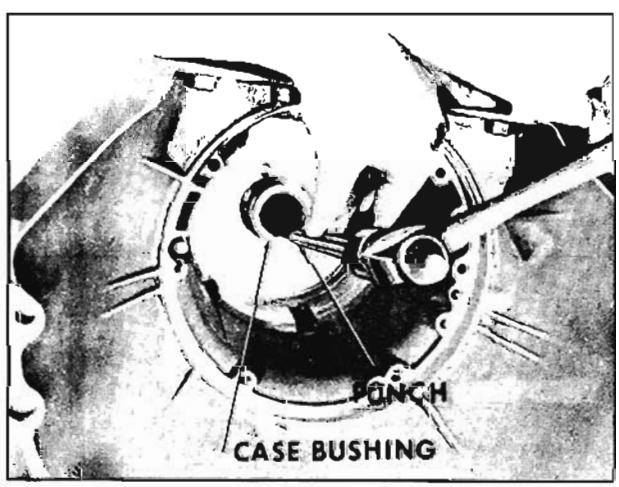


Fig. 6-305 Removing Case Bushing

Removal of Case Bushing

1. Inspect case bushing for nicks, scoring or excessive wear. If damaged, remove as follows: Place small chisel or Tool J-8400-1 in notch in case, then tap with hammer to collapse bushing. (Fig. 6-305)

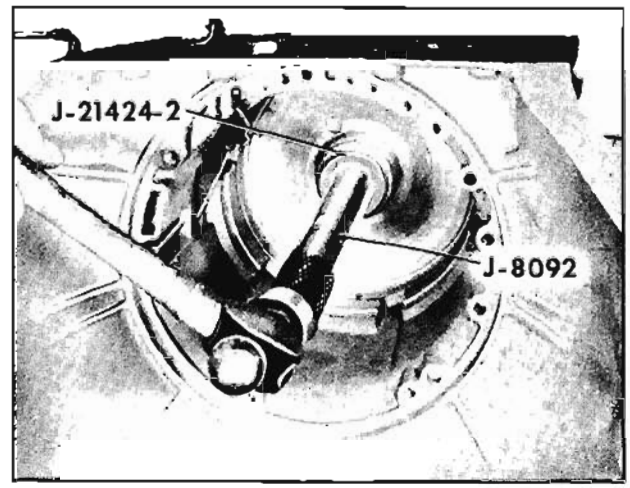


Fig. 6-306 Installing Case Bushing

2. Install case bushing. (Fig. 6-306)

VALVE BODY DISASSEMBLY INSPECTION AND REASSEMBLY

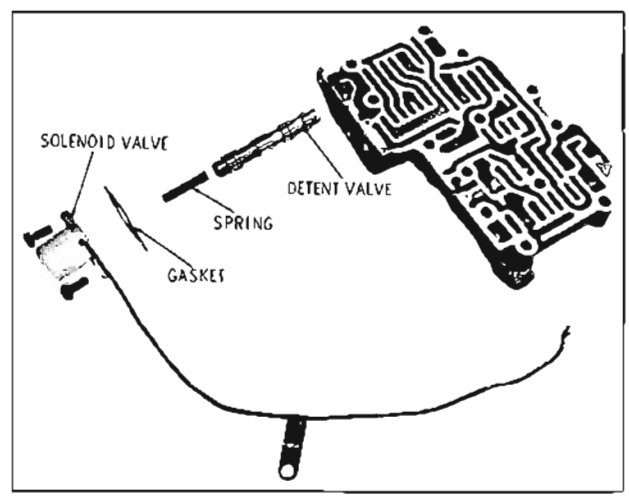


Fig. 6-307 Removing Detent Solenoid and Detent Valve

Disassembly

1. Remove two bolts attaching stator and detent solenoid valve. Remove the solenoid valve, gasket, spring and stator and detent valve (Fig. 6-307)

   NOTE: Notice cutout notch on solenoid valve gasket.

2. Depress shift control valve sleeve and remove retaining pin by turning valve body over so pin will fall free. Remove shift control valve sleeve, shift control valve, spring, washer, and shift valve. (Fig. 6-308)

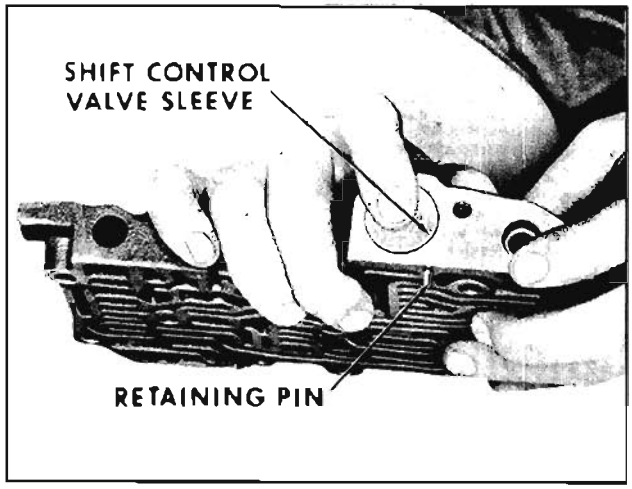


Fig. 6-308 Removing Shift Control Valve and Shift Valve

3. Depress modulator limit spring, turn valve body over and retaining pin will fall free. Remove spring and valve from body. (Fig. 6-309)

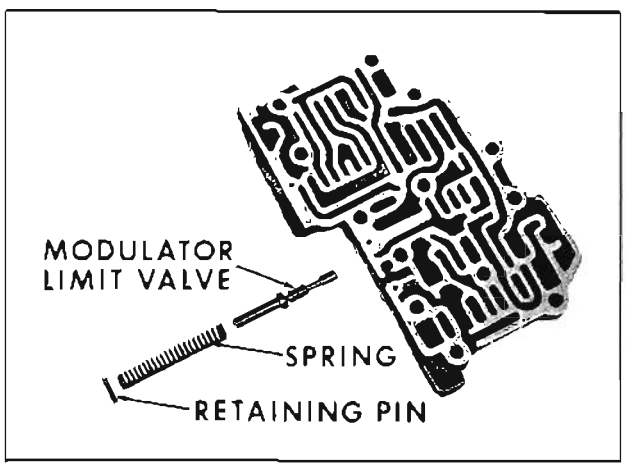


Fig. 6-309 Removing Modulator Limit Valve

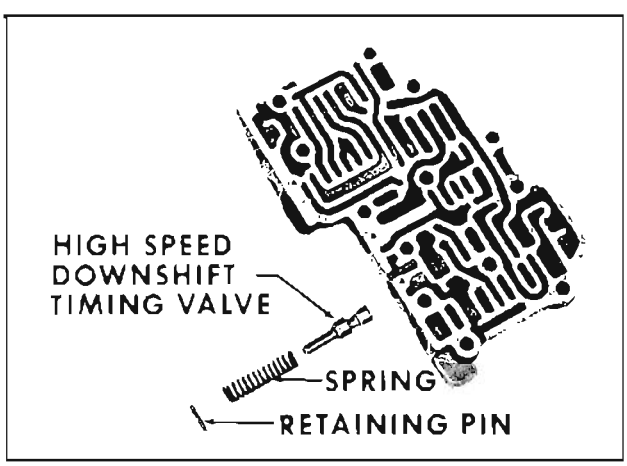


Fig. 6-311 Installing High Speed Downshift Timing Valve

NOTE: Modulator limit spring is under moderate pressure. Care should be exercised in removal.

4. Depress high speed down shift timing valve plug and remove pin by turning valve body over so pin will fall free. (Fig. 6-311)

Inspection

1. Thoroughly clean all valves and valve body in solvent. Inspect valves and valve body for evidence of wear or damage due to foreign material. Dry valve body and valves with clean air blast.

2. Test each valve in its bore. All valves must move freely of their own weight.

Reassembly of Valve Body

1. Install high speed downshift timing valve, spring and plug. Depress plug with finger and install retaining pin. (Fig. 6-311)

2. Install modulator limit valve and spring into bore of valve body. Compress spring and install retaining pin. (Fig. 6-309)

3. Install shift valve, washer, spring, shift control valve and shift control valve sleeve. Depress shift control valve sleeve with thumb and install retaining pin. (Fig. 6-313)

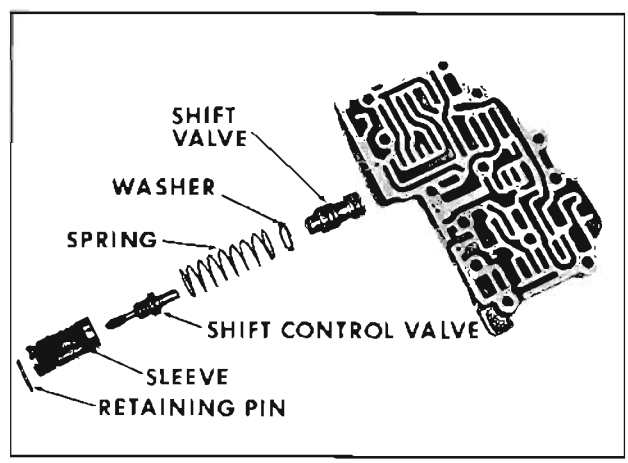


Fig. 6-313 Installing Shift Control Valve

4. Install detent valve and spring. Install gasket to solenoid with notch facing bottom of valve body. Install solenoid to valve body using two 7/16" bolts. (Fig. 6-314)

STATOR CONTROL VALVE BODY

Disassembly

1. Compress stator control valve plug. Turn

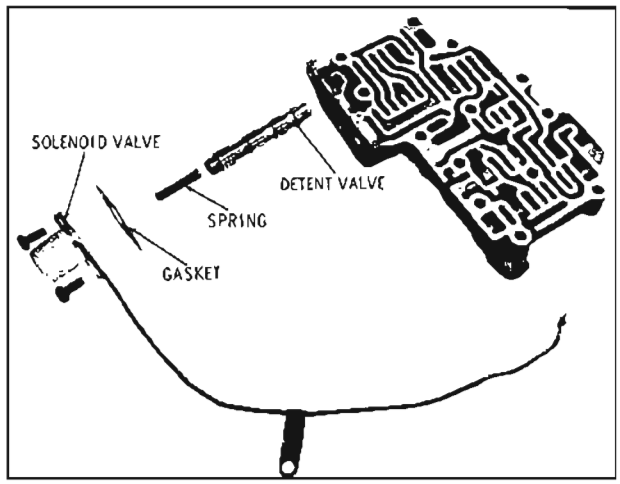


Fig. 6-314 Installing Detent Valve and Detent Solenoid

valve body over and retaining pin will fall free. Remove plug, spring and valve from body. (Fig. 6-315)

Reassembly

2. Install stator control valve, spring and plug into bore of valve body. Compress plug and install retaining pin. (Fig. 6-315)

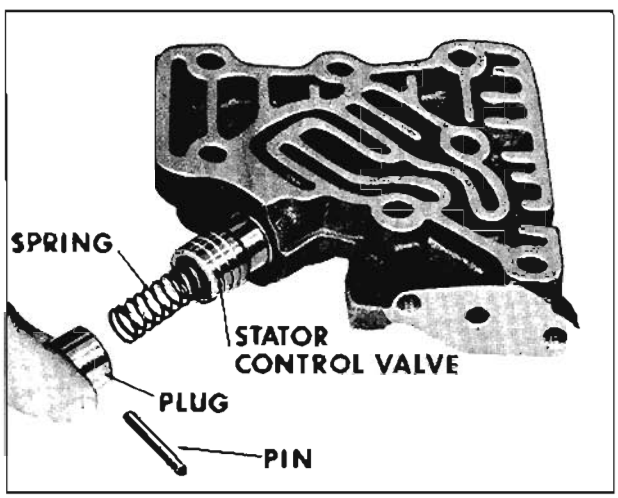


Fig. 6-315 Removing and Installing Stator Control Valve

LOW SERVO

Disassembly

1. Remove low servo piston seal. (Fig. 6-316)

2. Compress low servo piston and remove retaining pin. EXTREME CAUTION MUST BE TAKEN WHEN THE LOW SERVO IS BEING COMPRESSED.

NOTE: After retaining pin has been removed, release vise very slowly. (Fig. 6-317)

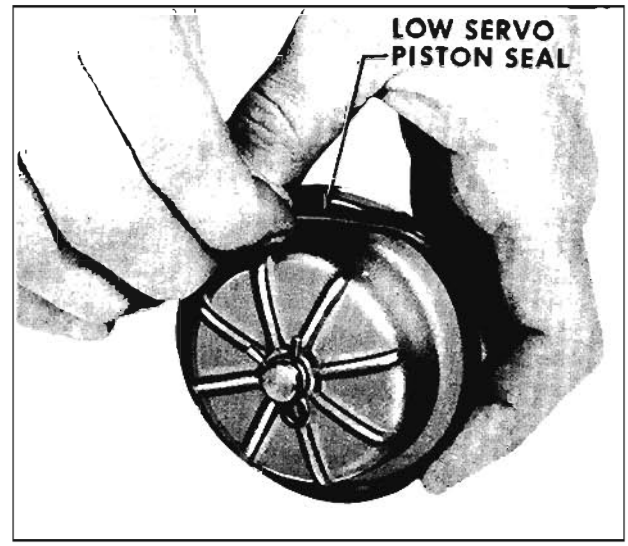


Fig. 6-316 Removing and Installing Low Servo Piston Seal

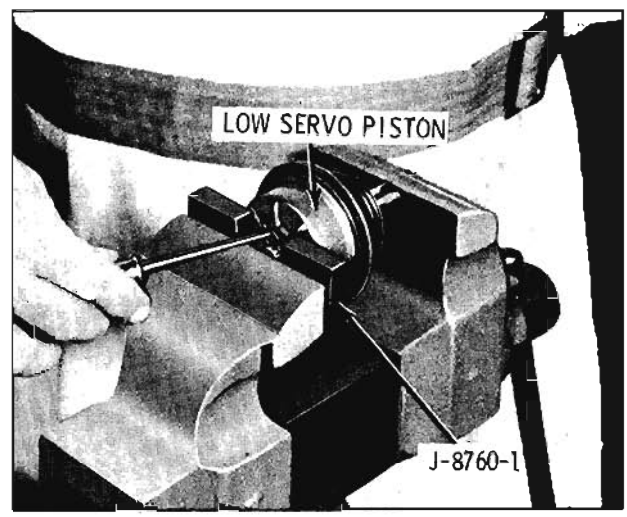


Fig. 6-317 Disassembly of Low Servo Assembly

3. After vise has been released, remove piston low servo supply piston spring inner, outer return springs, spring retainer, washer and piston apply rod. (Fig. 6-318)

Reassembly

1. Assemble the inner and outer return springs into the piston. Install spring retainer. (Fig. 6-318) Install this assembly into the vise as shown in Fig. 6-319.

2. Assemble tools on top of piston in same manner as removing. Center spring retainer and compress springs. Install piston apply rod and washer through hole in press plate and install retainer pin.

CAUTION: BEFORE RELEASING VISE,

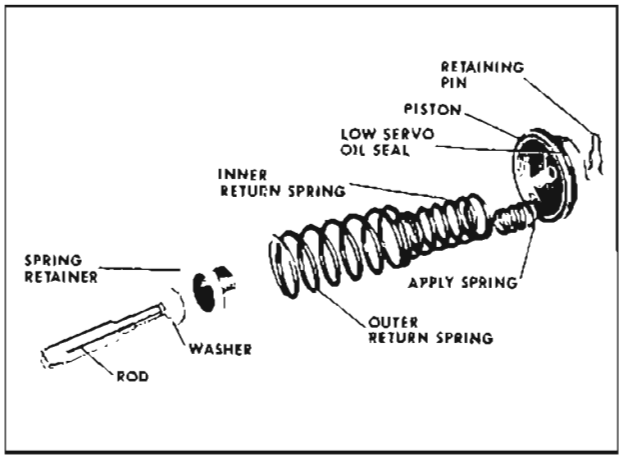


Fig. 6-318 Low Servo Piston Assembly (Exploded)

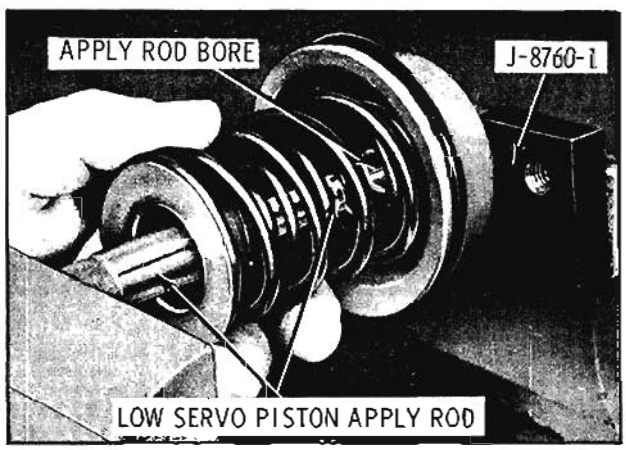


Fig. 6-319 Assembly of Low Servo Piston

MAKE CERTAIN RETAINER PIN IS PROPERLY INSTALLED.

Install low servo piston seal. (Fig. 6-316)

OIL PUMP

Disassembly

Fig. 6-320 Removing the Oil Seal Rings

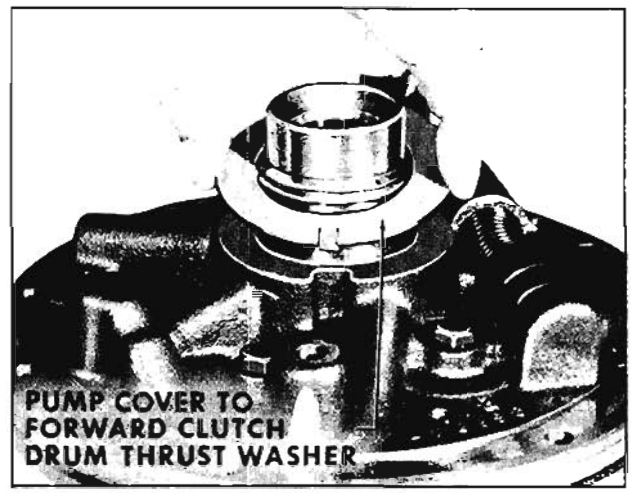


Fig. 6-321 Removing Thrust Washer

1. Remove the two lock-type oil sealing rings from pump hub. (Fig. 6-320)

2. Remove pump cover to forward clutch drum thrust washer. (Fig. 6-321)

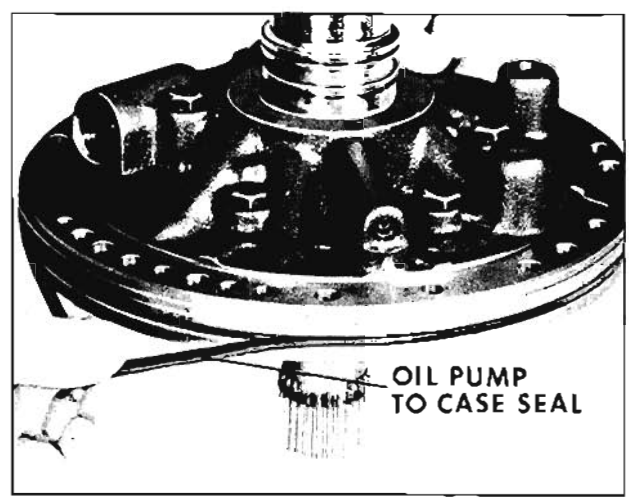


Fig. 6-322 Removing Oil Pump to Case Seal

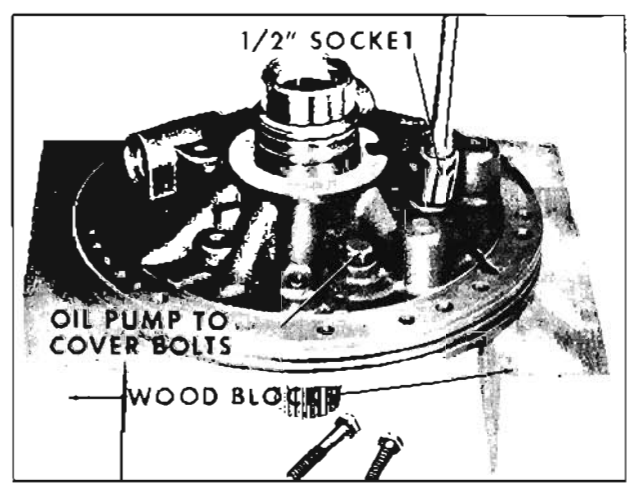


Fig. 6-323 Removing Oil Pump Cover Attaching Bolts

3. Remove oil pump to case seal and discard. (Fig. 6-322)

4. Support oil pump on wood blocks. Remove five pump cover bolts with 1/2" socket. Remove pump cover. (Fig. 6-323)

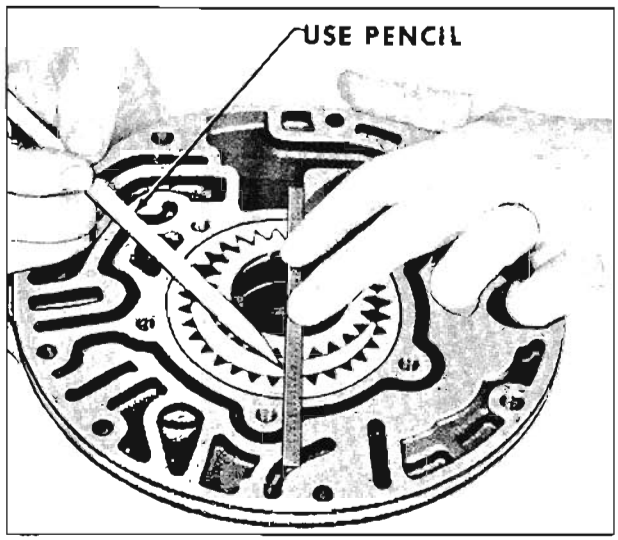


Fig. 6-324 Marking Oil Pump Gears

5. Mark, but do not scar, gear faces so gears can be reassembled in same manner. (Fig. 6-324)

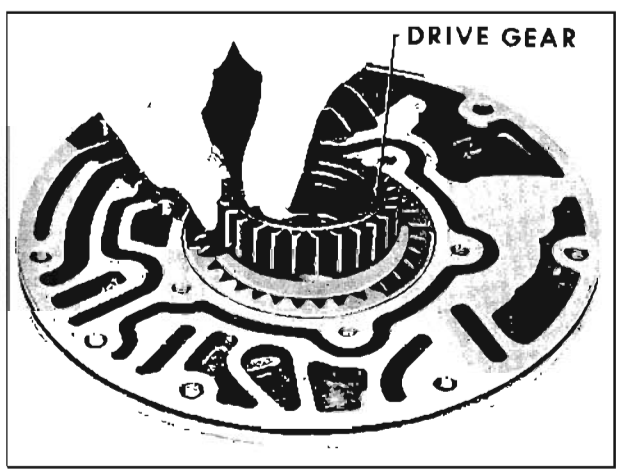


Fig. 6-325 Removing Oil Pump Drive Gear

6. Remove oil pump drive gear. (Fig. 6-325)

7. Remove oil pump driven gear. (Fig. 6-326)

8. Remove seat, valve and spring from cooler bypass valve and lube blow off valve. Use Tool J-21361 attached to a slide hammer to remove seat from bore in pump cover. (Fig. 6-327)

9. Remove coast downshift timing valve from the pump cover and inspect for damage. Carefully check to be sure the spring returns the ball to its seat. (Fig. 6-326)

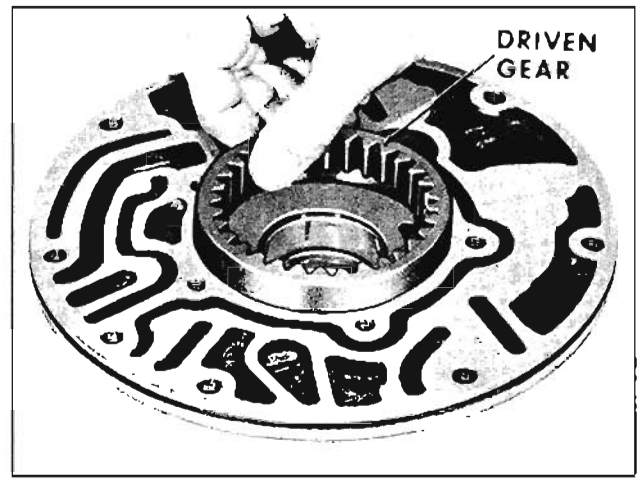


Fig. 6-326 Removing Oil Pump Driven Gear

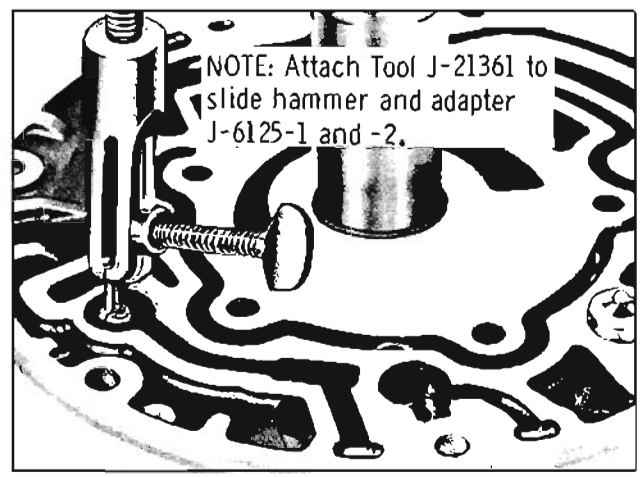


Fig. 6-237 Removing Lube Blow Off Valve

Fig. 6-328 Removing Coast Downshift Timing Valve

NOTE: Do not attempt to remove pressure valve without removing the pump from the transmission.

10. Compress reverse and modulator boost valve with thumb and remove retaining snap ring. (Fig. 6-239)

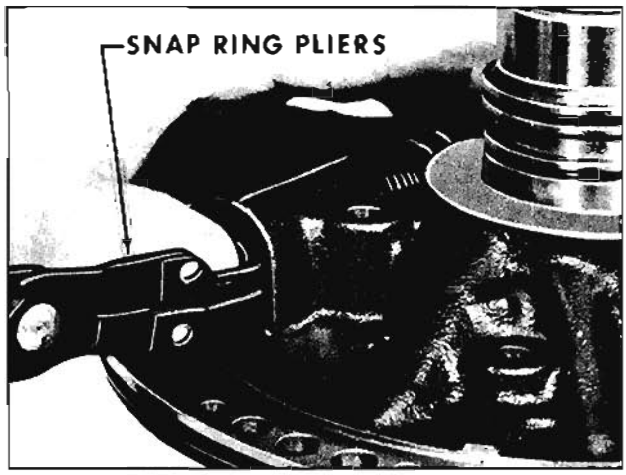


Fig. 6-329 Removing Snap Ring

CAUTION: Reverse and modulator boost valve sleeve is under extreme spring pressure. Extreme care should be taken after retaining snap ring has been removed.

11. After retaining snap ring has been removed, remove reverse and modulator boost valve sleeve and valve, spring, washer, and pressure regulator valve.

12. Examine oil pump seal. If nicked, torn or worn, remove seal as follows. Support oil pump body on wood blocks. Remove oil seal with a chisel and discard. (Fig. 6-330)

NOTE: If seal is being replaced with pump in transmission, pry under lip of seal.

13. Check oil pump bushing for nicks, severe scoring or wear. If bushing replacement is necessary, proceed as follows: Support oil pump on wood blocks. Using Tool J-21424-6 and Drive Handle J-8092 press bushing out of pump body.

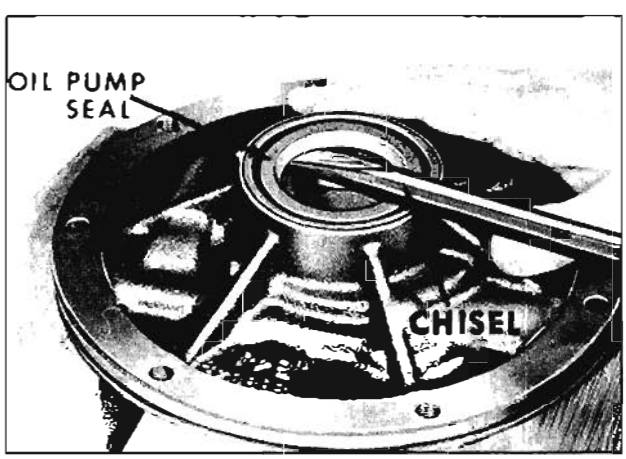


Fig. 6-330 Removing Oil Seal

14. Check stator shaft bushing for nicks, severe scoring or wear. If bushing replacement is necessary, proceed as follows: Assemble Bushing Remover J-21424-7 to Extension J-21424-1. Assemble this assembly to Drive Handle J-8092. Holding stator shaft as shown in Fig. 6-332, drive out bushing.

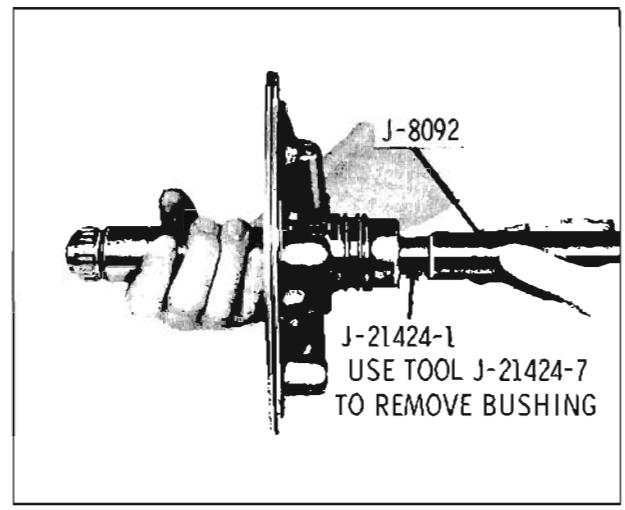


Fig. 6-332 Removing Stator Shaft Bushing

Inspection

1. Wash all parts in a cleaning solvent and blow out oil passages with compressed air.

2. Inspect pump gears for nicks or damage.

3. Inspect pump body for nicks or scoring.

4. Check condition of bushing in oil pump body, if damaged replace.

5. With parts clean and dry, install pump gears, noting mark on gears for identification of the side that faces the pump cover. After gears have been installed, proceed as follows:

a. Check clearance between OD of driven

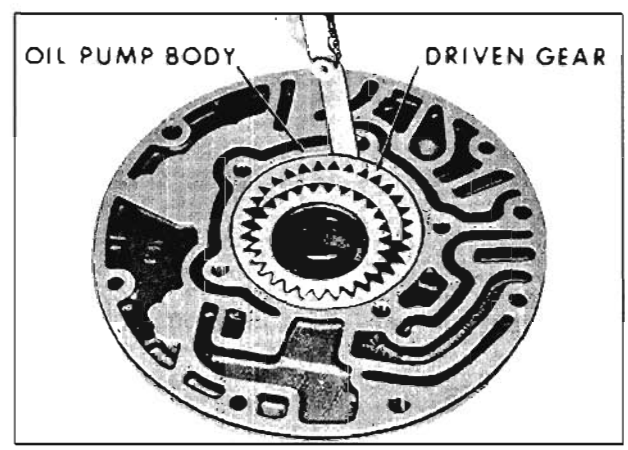


Fig. 6-333 Checking Clearance

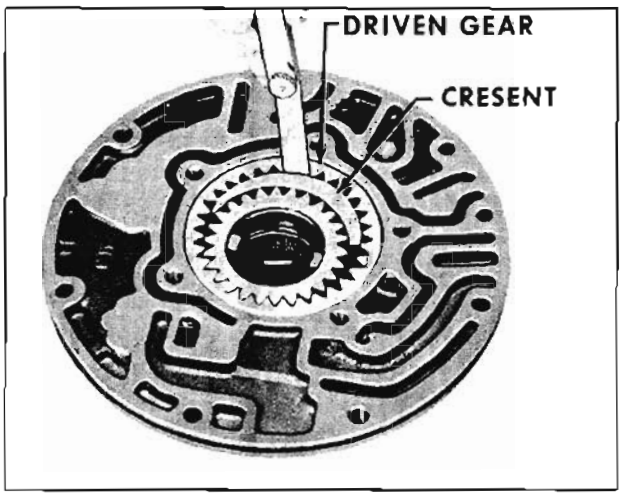


Fig. 6-334 Checking Clearance

gear and pump body. The clearance allowed is .004" to .006". (Fig. 6-333)

b. Check clearance between oil pump driven gear and crescent. The clearance allowed is .005" to .010". (Fig. 6-334)

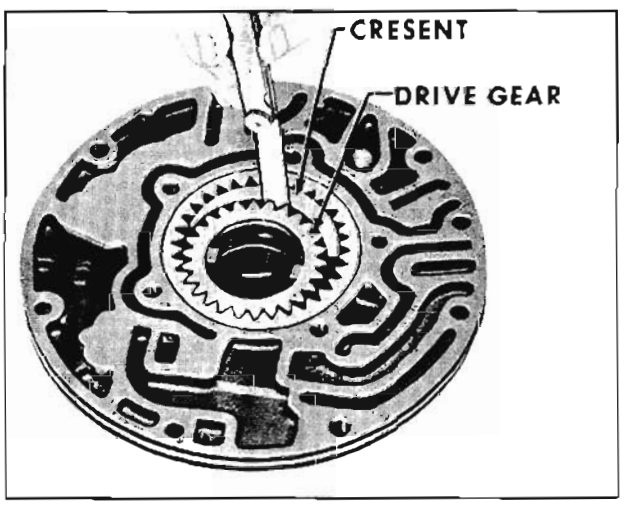


Fig. 6-335 Checking Clearance

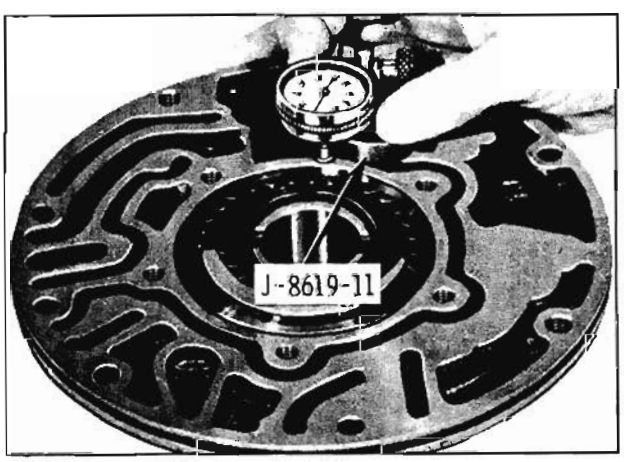


Fig. 6-336 Checking End Clearance

c. Check clearance between oil pump drive gear and crescent. The clearance allowed is .004" to .009". (Fig. 6-335)

d. With dial indicator set, check end clearance. The clearance allowed is .005" to .015". (Fig. 6-336)

Reassembly

1. Using Tool J-24426-6 press new bushing into pump body until it is flush with top of pump hub.

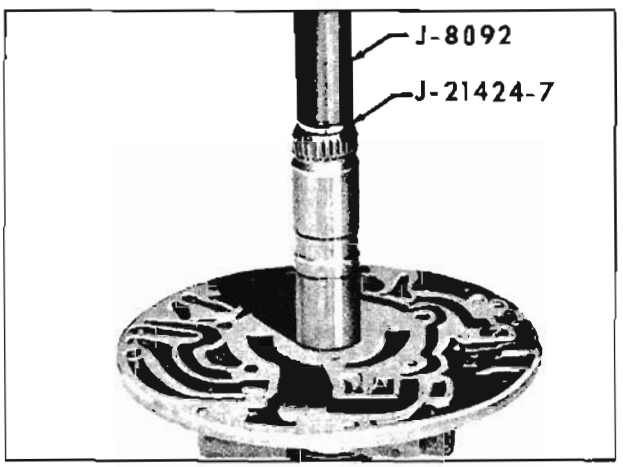


Fig. 6-338 Installing Stator Shaft Bushing

2. Install stator shaft bushing as follows: Position bushing into the front end of stator shaft, using Installer J-21424-7 and Drive Handle J-8092, tap bushing into shaft until tool is flush with top of shaft. (Fig. 6-338)

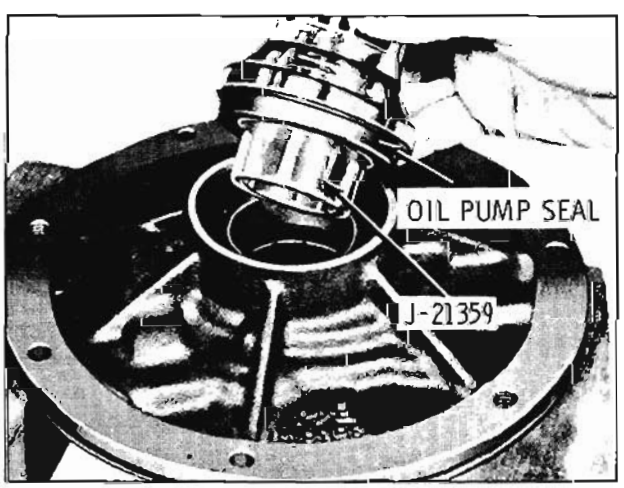


Fig. 6-339 Install Oil Seal

3. Using Installer J-21359, tap in new oil seal. (Fig. 6-339)

NOTE: Seal can be installed with pump in transmission.

4. Install new oil pump to case seal. (Fig. 6-340)

5. Assemble pressure regulator valve, washer, spring, reverse and modulator boost valve and sleeve. (Fig. 6-341)

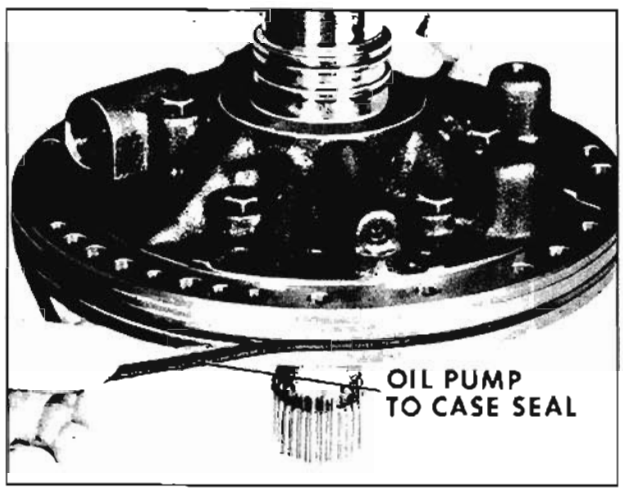


Fig. 6-340 Installing Oil Pump to Case Seal

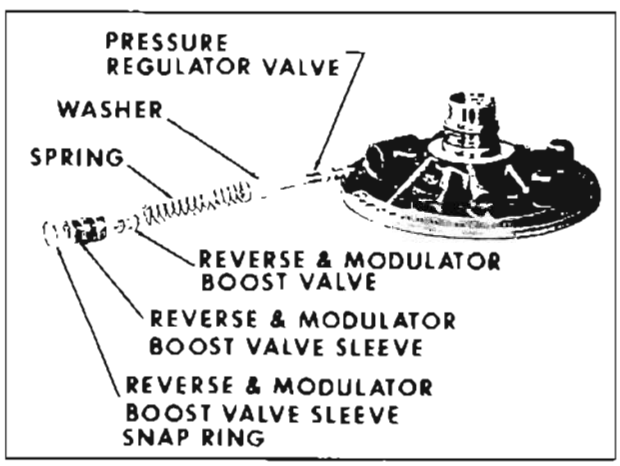


Fig. 6-341 Pressure Regulator Valve—Exploded View

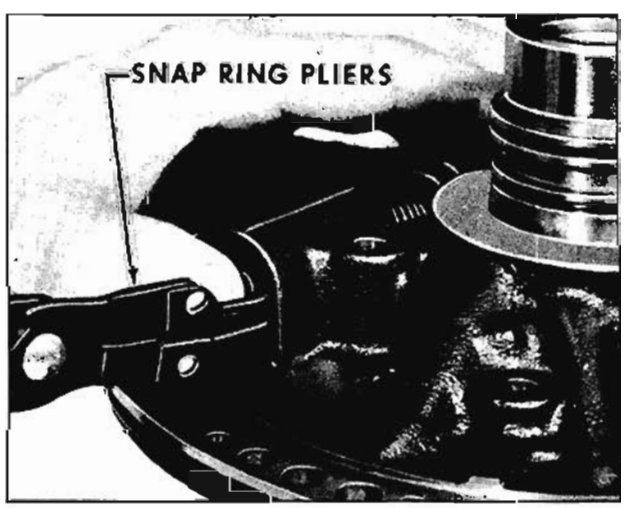


Fig. 6-342 Installing Snap Ring

6. Compress reverse and modulator boost valve with thumb, then install retaining snap ring. (Fig. 6-342)

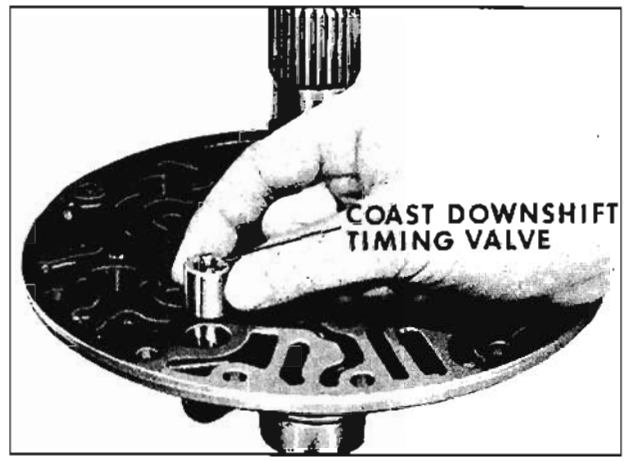


Fig. 6-343 Installing Coast Downshift Timing Valve

7. Install coast downshift timing valve "button end" up in cover. (Fig. 6-343)

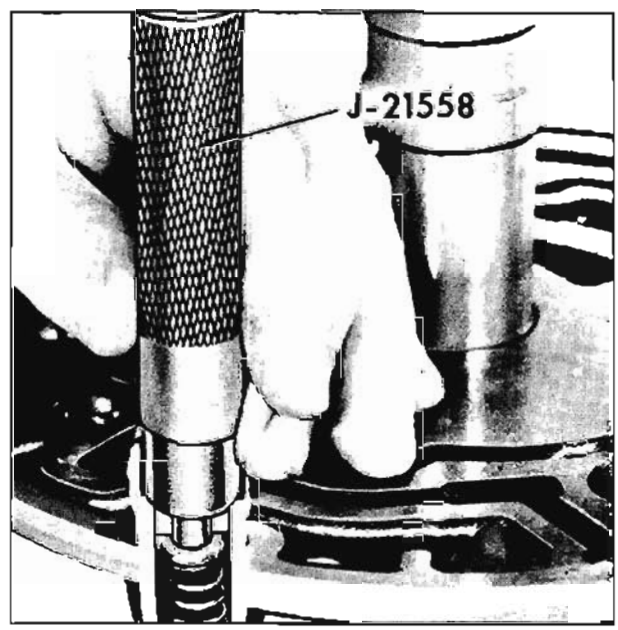


Fig. 6-344 Installing Cooler Bypass Valve and Lube Blow Off Tube

8. Install spring, valve and seat into cooler bypass valve and lube blow off valve. Using Tool J-21558 press seat into bore of pump body until tool bottoms on face of pump. (Fig. 6-344)

NOTE: Thrust washer and oil pump sealing ring will be installed during later operation.

9. Install pump cover to pump body. Install five retaining bolts but do not tighten. Place Tool J-21368 around pump to obtain proper

alignment. Tighten bolts 16 to 24 ft. lbs. (Fig. 6-345)

NOTE: The bolt location at the pressure regulator takes a longer bolt.

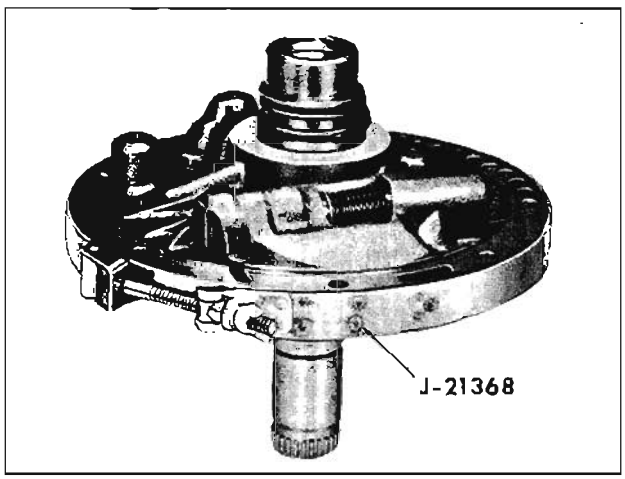


Fig. 6-345 Installing Pump Cover to Pump Body

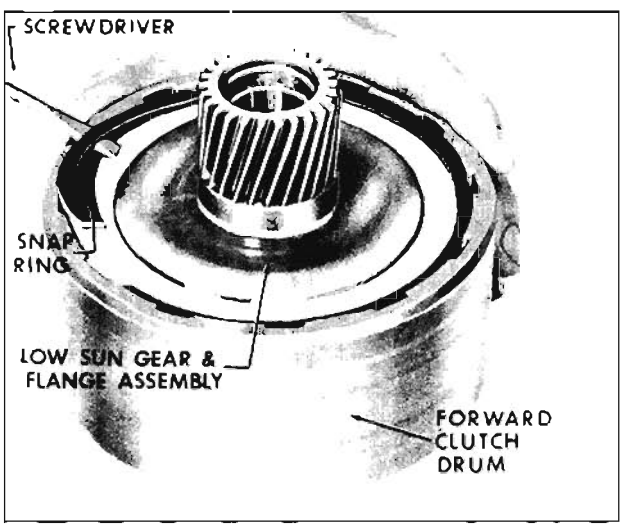


Fig. 6-346 Removing Snap Ring

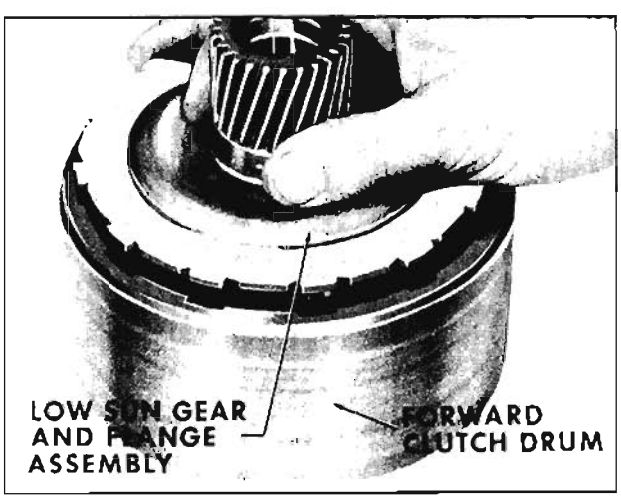


Fig. 6-347 Removing Low Sun Gear and Flange Assembly

FORWARD CLUTCH

Disassembly

1. Remove low sun gear and flange assembly retainer snap ring. (Fig. 6-346)

2. Remove low sun gear and flange assembly. (Fig. 6-347)

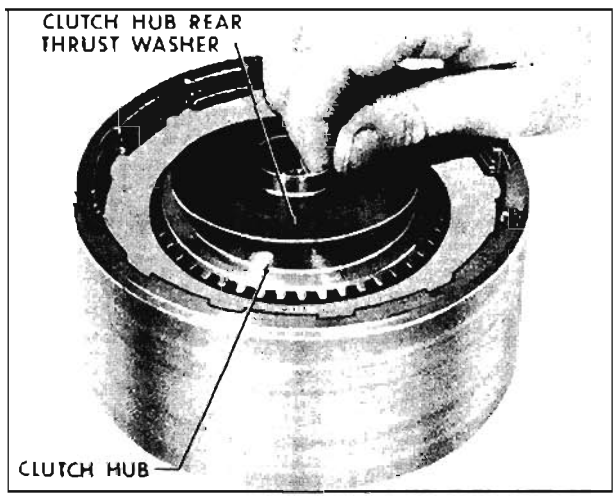


Fig. 6-348 Removing Thrust Washer

3. Remove clutch hub rear thrust washer. (Fig. 6-348)

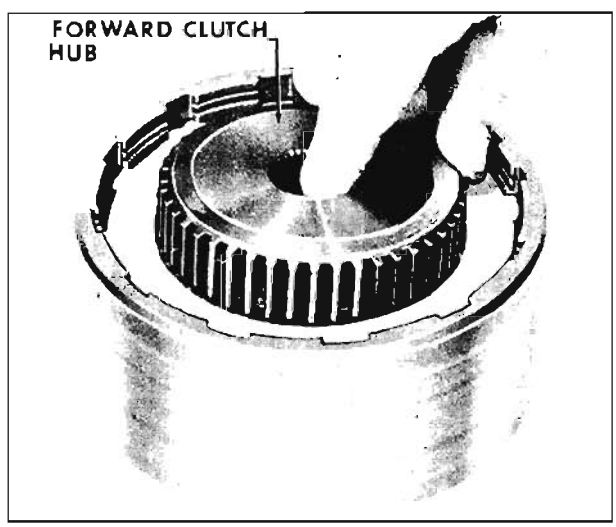


Fig. 6-349 Removing Clutch Hub

4. Lift forward clutch hub from clutch pack. (Fig. 6-349)

5. Remove clutch hub front thrust washer. (Fig. 6-350)

6. Remove clutch pack from forward clutch drum. (Fig. 6-351)

Fig. 6-350 Removing Thrust Washer

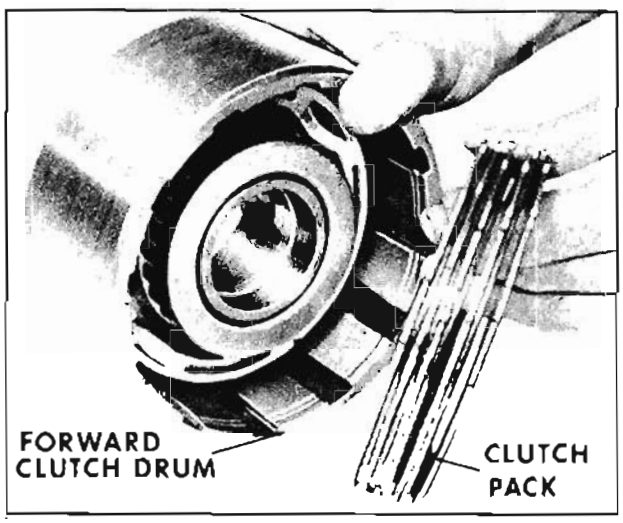


Fig. 6-351 Removing Clutch Pack

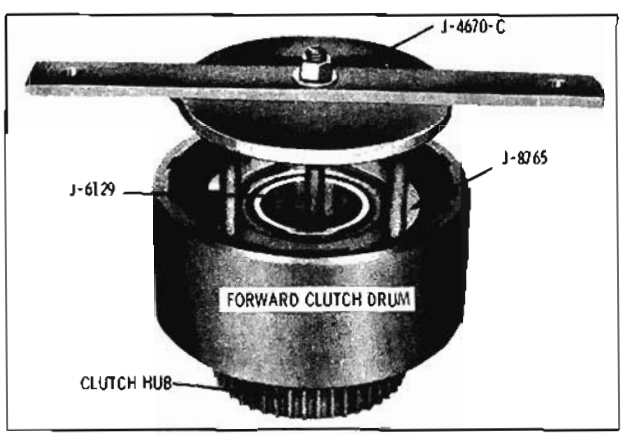


Fig. 6-352 Removing Snap Ring

7. Using Tools J-4670-C, J-8765, and J-6129 compress spring retainer and remove snap ring. Remove tools and component parts, being careful that spring retainer does not catch in snap ring groove. (Fig. 6-352)

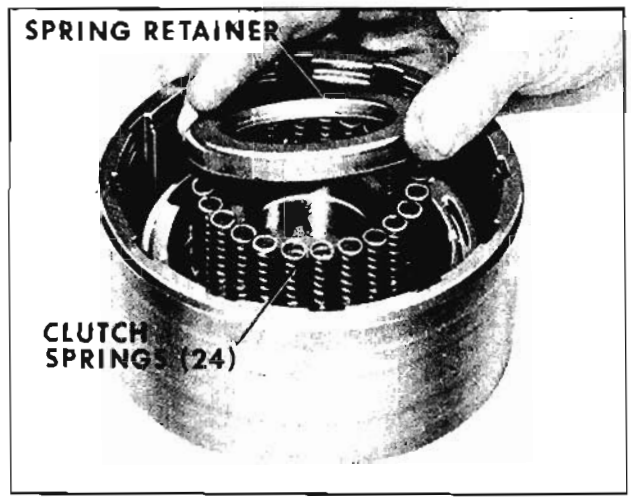


Fig. 6-353 Removing Spring Retainer and Springs

8. Lift off spring retainer and 24 clutch springs. (Fig. 6-353)

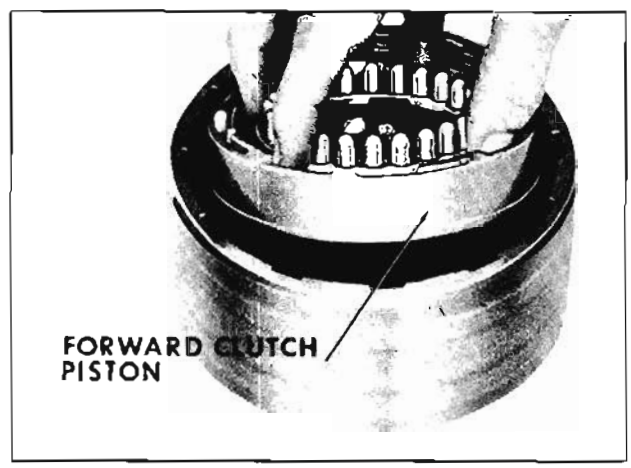


Fig. 6-354 Removing Forward Clutch

9. Lift up on forward clutch piston with a twisting motion and remove. (Fig. 6-354)

10. Examine forward clutch piston outer seal. If nicked, torn or worn, remove seal. (Fig. 6-355)

11. Examine forward clutch piston inner seal. If nicked, torn or worn, remove seal. (Fig. 6-356)

12. Check forward clutch drum bushing for nicks, severe scoring or wear. If bushing replacement is necessary, proceed as follows: Using Tool J-21424-5, press damaged bushing from forward clutch drum. (Fig. 6-357)

13. Check low sun gear and flange assembly bushing for nicks, severe scoring, or wear. If bushing replacement is necessary, proceed as follows: Support flange assembly on wood blocks using Tool J-21424-4 and Drive Handle

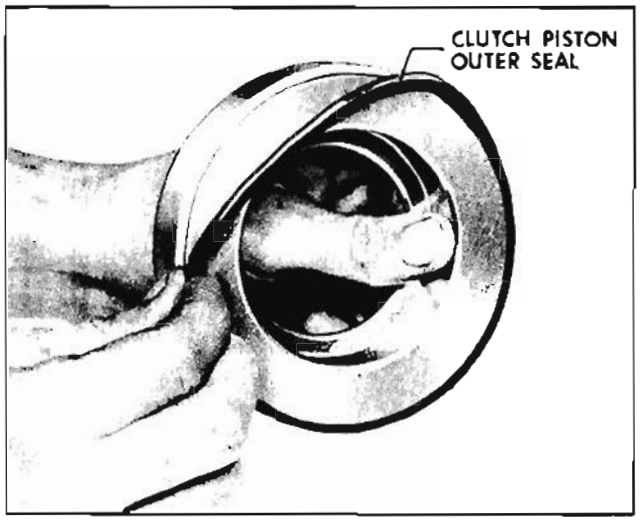


Fig. 6-355 Removing Outer Seal

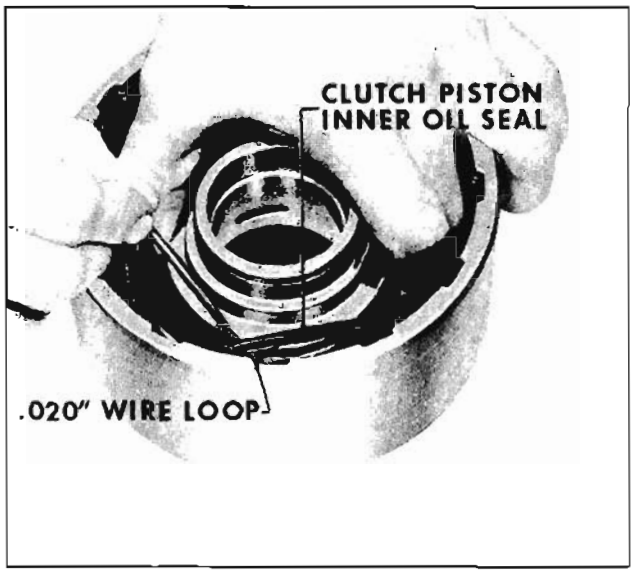


Fig. 6-356 Removing Inner Seal

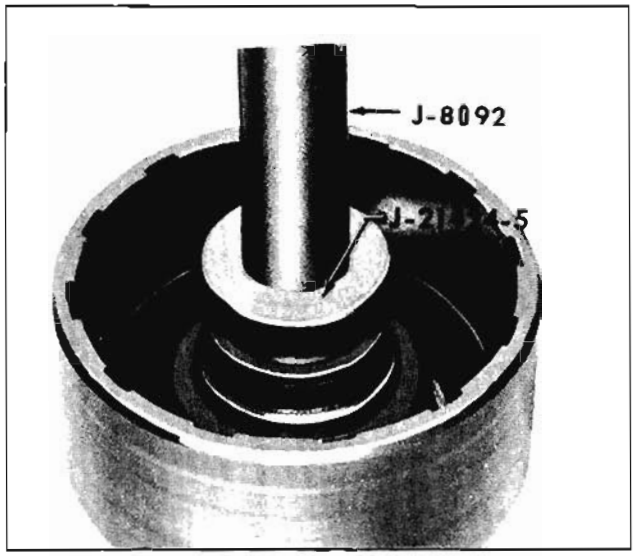


Fig. 6-357 Removing Clutch Drum Bushing.

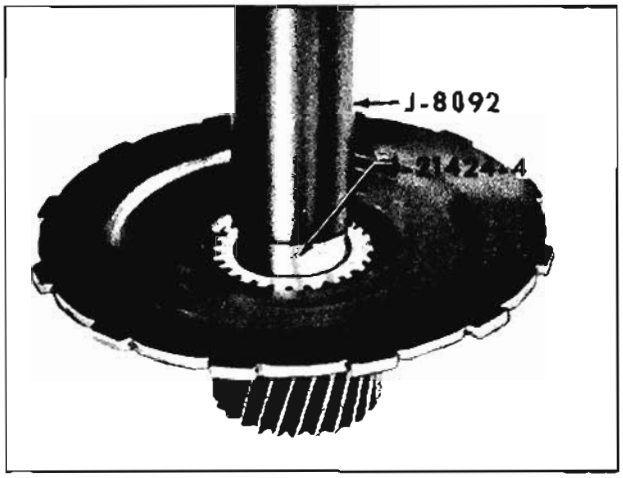


Fig. 6-358 Removing Low Sun Gear and Flange Assembly Bushing

J-8092, press out bushing. (Fig. 6-358)

Inspection

1. Wash all parts in a suitable cleaning solvent. Use compressed air to dry.

2. Check steel ball in the forward clutch drum. Be sure it is free to move in hole and that orifice leading to front of clutch drum is open.

3. Check clutch plates for wear or scoring.

Reassembly

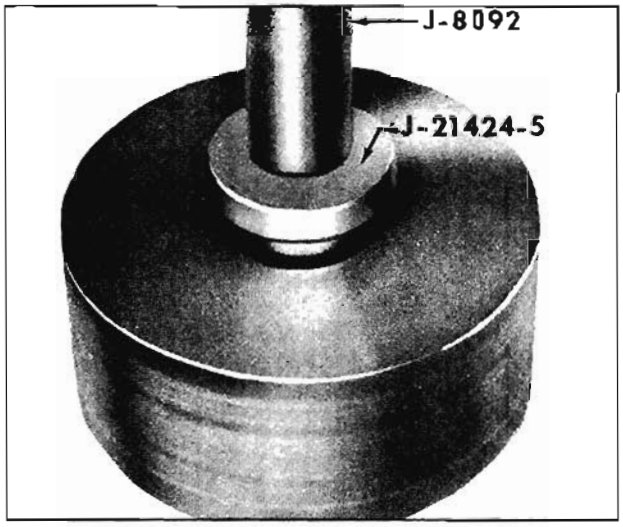


Fig. 6-359 Installing Clutch Drum Bushing

1. Install J-21424-5 in front of forward clutch drum. Using Drive Handle J-8092, press bushing into bore until Tool J-21424-5 bottoms on hub. (Fig. 6-359)

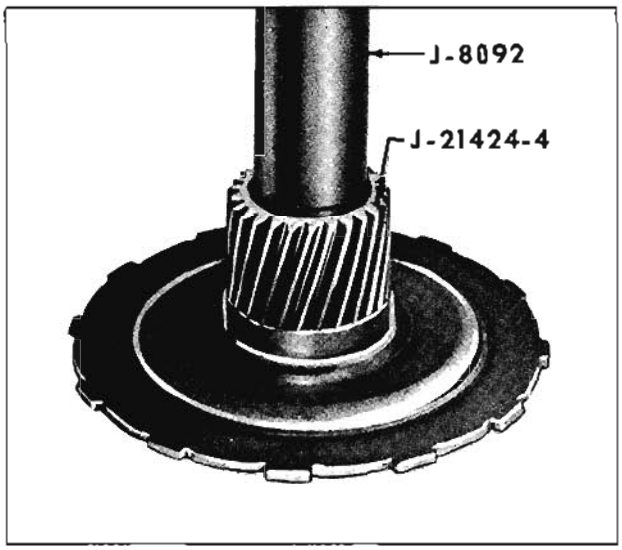


Fig. 6-360 Installing Low Sun Gear and Flange Assembly Bushing

2. Install Tool J-21424-4 into low sun gear. Using Drive Handle J-8092, press bushing into low sun gear until bushing installer is flush with top of low sun gear. (Fig. 6-360)

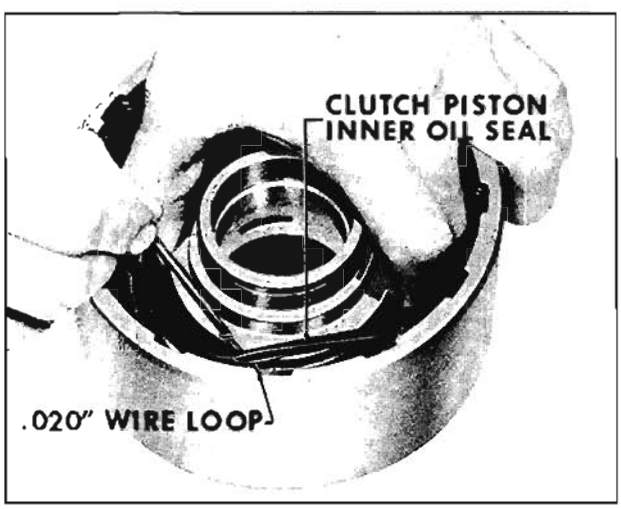


Fig. 6-361 Installing Inner Seal

3. Lubricate with transmission oil and install new forward clutch piston inner seal with seal lip pointing downward. (Fig. 6-361)

NOTE: Run hand around seal after it is installed to see if seal is fully in groove.

4. Lubricate with transmission oil and install new forward clutch piston outer seal in clutch piston. Seal lip must point down. (Fig. 6-362)

5. Install forward clutch piston into clutch drum using a .005" feeler gauge to start lip of seal into bore. (Fig. 6-363)

6. Carefully reassembly return springs, retainer and snap ring. (Fig. 6-364)

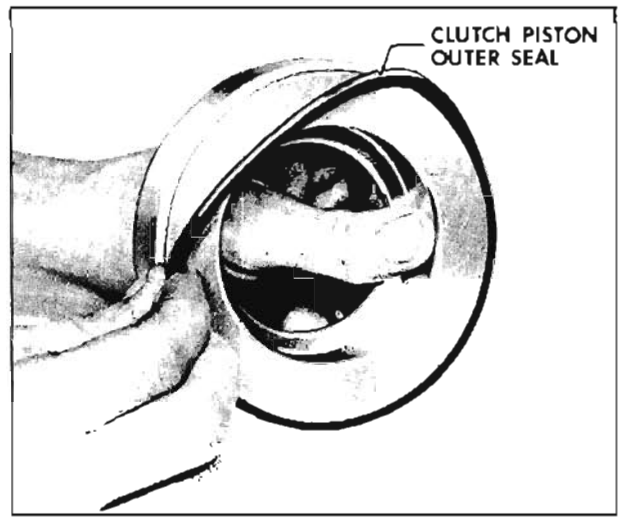


Fig. 6-362 Installing Outer Seal

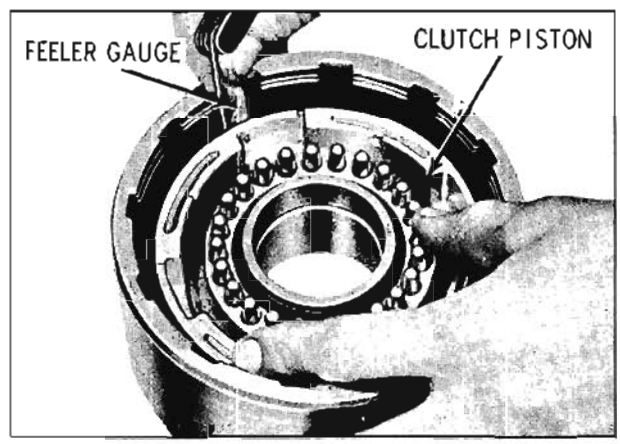


Fig. 6-363 Installing Clutch Piston

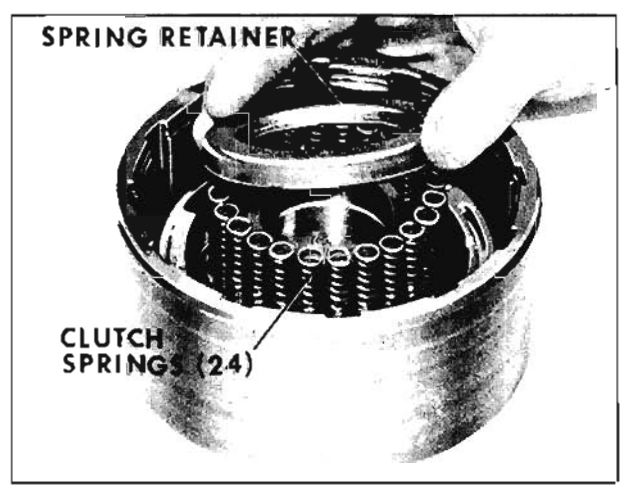


Fig. 6-364 Installing Springs and Retainer

7. With spring retainer in place, compress spring retainer with Tools J-4670-C, J-8765

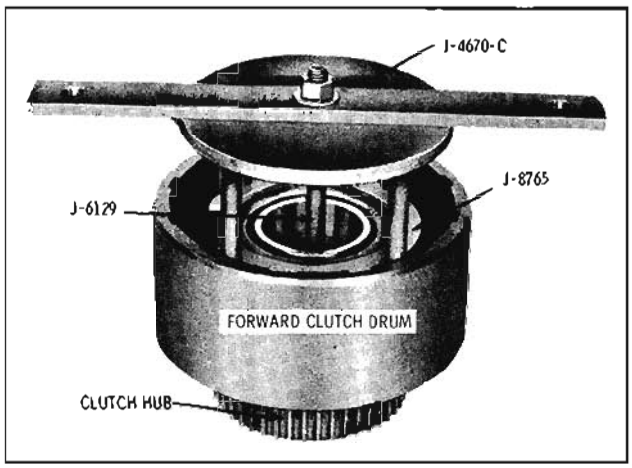


Fig. 6-365 Installing Snap Ring

and J-6129 far enough so the spring retainer snap ring can be installed. Make sure retainer doesn't catch in snap ring groove when compressing springs. (Fig. 6-365)

NOTE: Place a piece of hard board between Tool J-2590-3 and forward clutch drum.

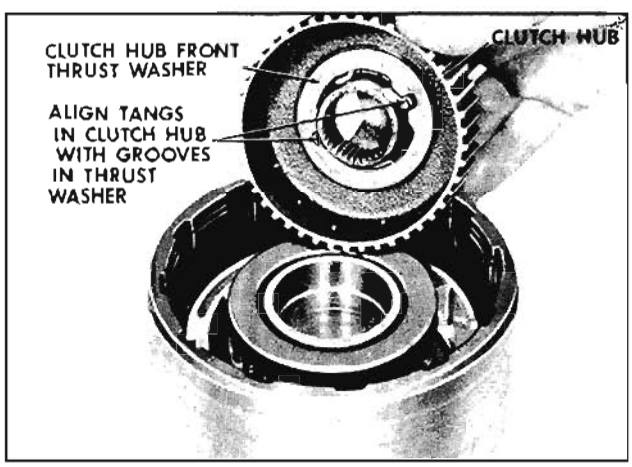


Fig. 6-366 Installing Clutch Hub

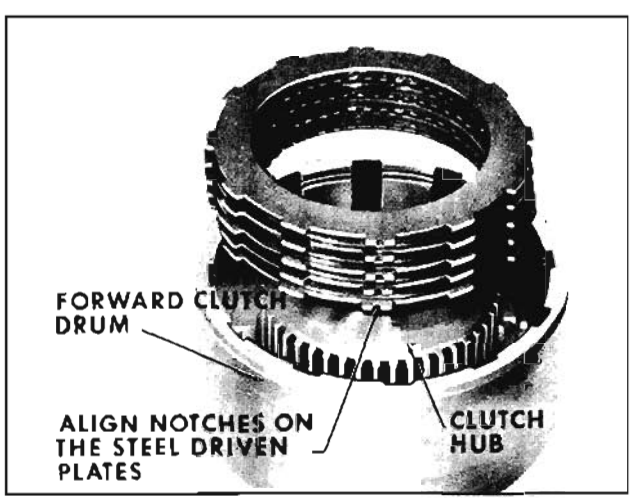


Fig. 6-367 Installing Clutch Pack

8. Install clutch hub front thrust washer to clutch hub (retain with grease) aligning tangs in clutch hub with grooves in thrust washer. Install clutch hub. (Fig. 6-366)

9. Align notches on steel driven plates. Install steel driven plates and lined drive plates alternately, beginning with a steel driven plate. (Fig. 6-367)

NOTE: Cars equipped with V-6 engines have four drive plates and five driven plates. Cars equipped with V-8 engines have five drive plates and six driven plates.

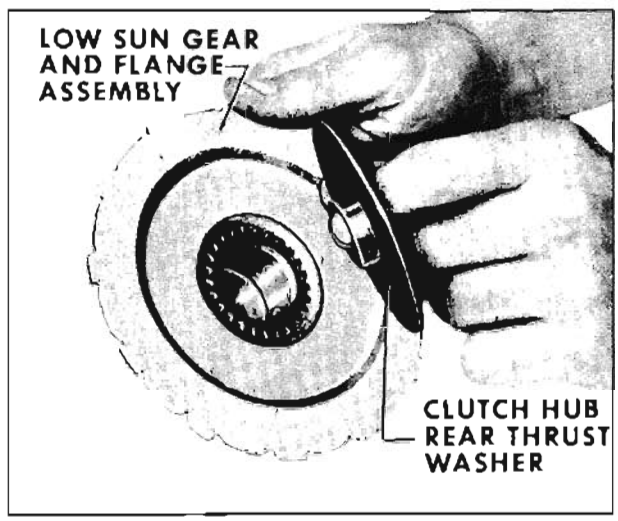


Fig. 6-368 Installing Thrust Washer

10. Install clutch hub rear thrust washer with its flange toward low sun gear and flange assembly. (Fig. 6-368)

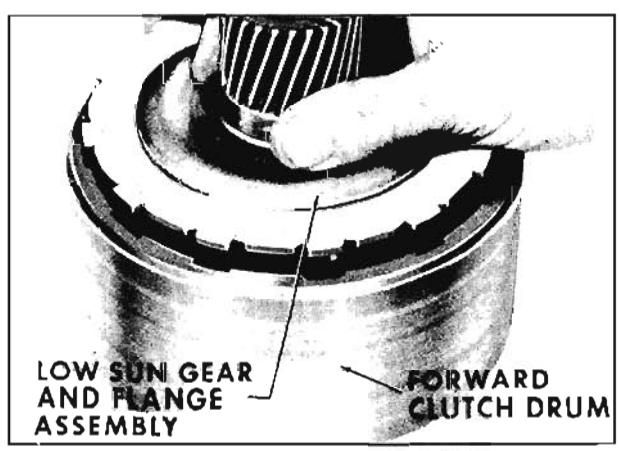


Fig. 6-369 Installing Low Sun Gear and Flange Assembly

11. Install low sun gear and flange assembly. (Fig. 6-369)

12. Install low sun gear and flange assembly retaining ring. Position snap ring so gap is centered between slots in drum. (Fig. 6-370)

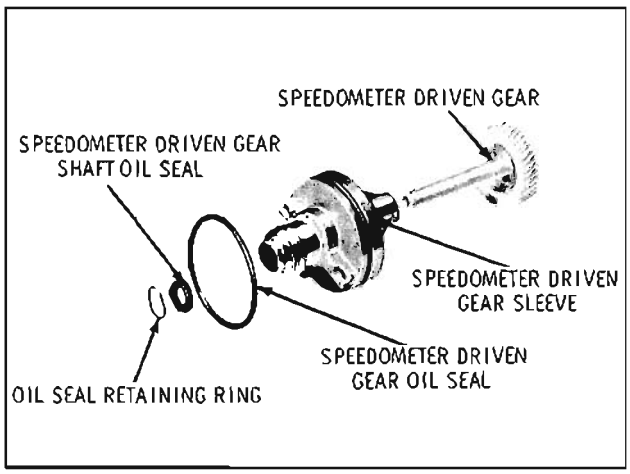


Fig. 6-371 Speedometer Driven Gear

SPEEDOMETER DRIVEN GEAR

Disassembly

1. Remove speedometer driven gear. (Fig. 6-371)
2. Examine speedometer driven gear oil seal. If nicked, torn or worn, remove seal. (Fig. 6-371)
3. Examine speedometer driven gear shaft oil seal. If nicked, torn or worn, remove seal.

Reassembly

1. Install speedometer driven gear shaft oil seal with lip of seal pointing toward rear of speedometer gear sleeve. Install oil seal retaining ring.
2. Install speedometer driven gear oil seal. (Fig. 6-371)
3. Install speedometer driven gear.

GOVERNOR

Disassembly

1. With side cutters, remove governor weight pins and discard. (Fig. 6-372)
2. Remove governor weight pins. (Fig. 6-373)
3. Remove governor thrust cap. (Fig. 6-374)
4. Remove both sets of primary and secondary governor weight assemblies. Separate primary and secondary weights, governor weight spring will fall free. (Fig. 6-375)

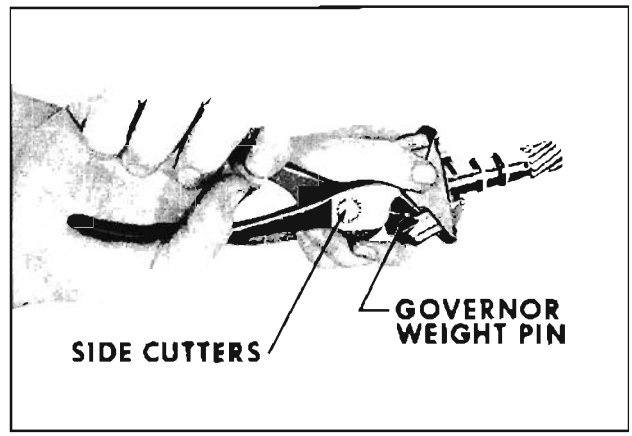


Fig. 6-372 Cutting Governor Weight Pins

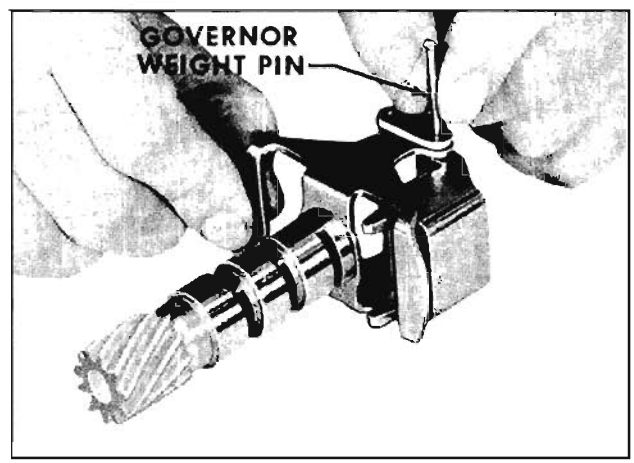


Fig. 6-373 Removing Governor Weight Pins

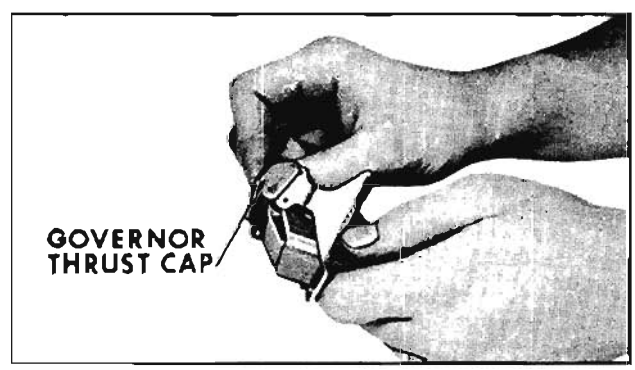


Fig. 6-374 Removing Thrust Cap

5. Remove governor valve from drive gear and sleeve assembly. (Fig. 6-376)

Inspection

1. Clean all parts in a suitable cleaning solvent.
2. Inspect governor valve for nicks or burrs.

Reassembly

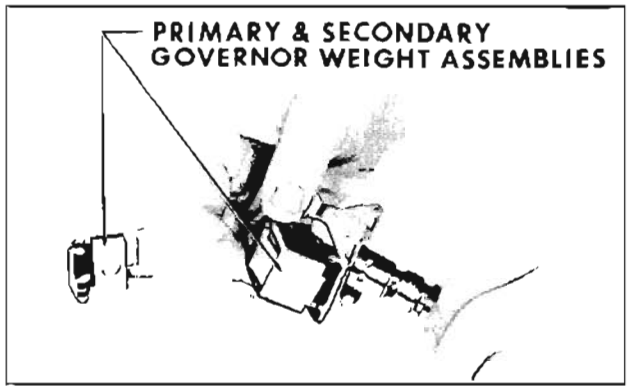


Fig. 6-375 Removing Weights

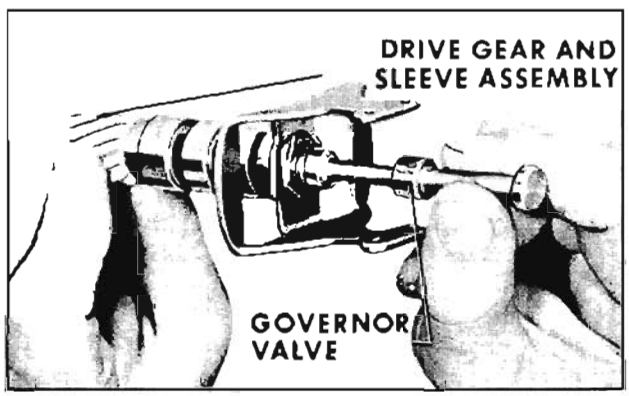


Fig. 6-376 Removing Governor Valve

1. Install governor valve into drive gear and sleeve assembly. (Fig. 6-376)

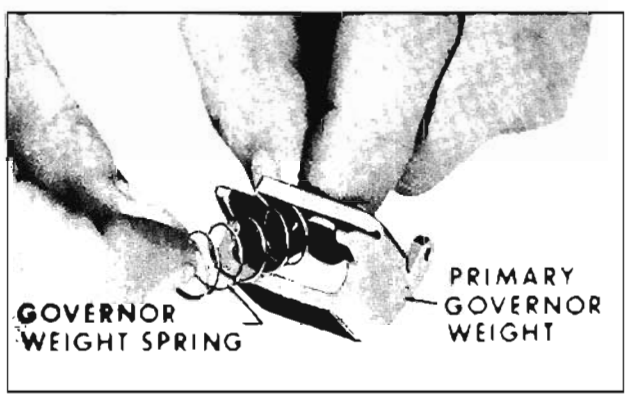


Fig. 6-377 Installing Primary Governor Weight Spring

2. Install governor weight spring into primary governor weight. (Fig. 6-377)

3. Retaining governor weight spring in primary governor weight with finger, insert secondary governor weight. Repeat Steps 2 and 3 for other governor weight. (Fig. 6-378)

4. Install primary and secondary governor weights into drive gear and sleeve assembly. (Fig. 6-379)

5. Install governor thrust cap. (Fig. 6-380)

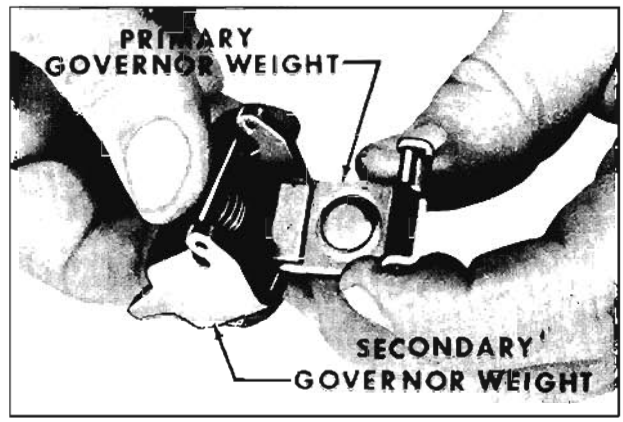


Fig. 6-378 Installing Secondary Governor Weight

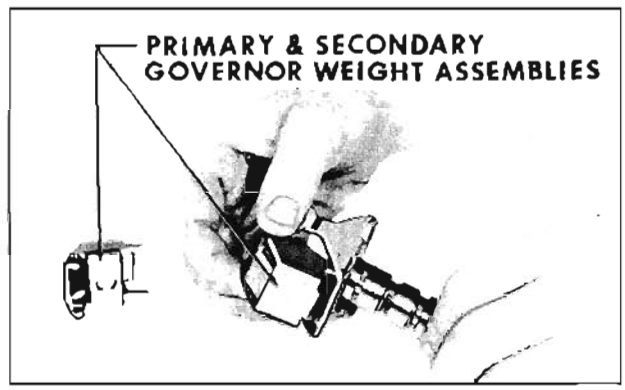


Fig. 6-379 Installing Governor Weights

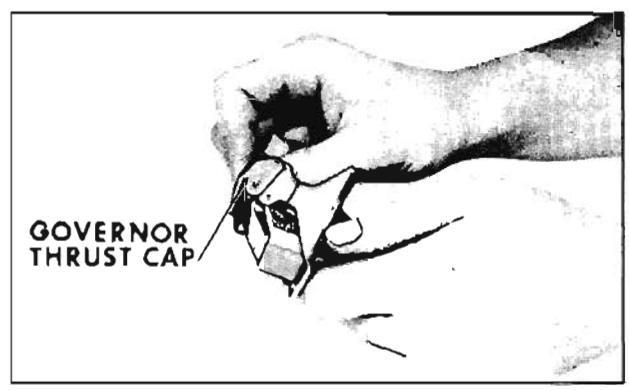


Fig. 6-380 Installing Thrust Cap

6. Install governor weight pins. (Fig. 6-381)

7. Install NEW governor weight pins. Crimp end of pins in a vise. (Fig. 6-382)

PLANET CARRIER

Disassembly

1. Remove three planet pinion shaft lock plate screws and lockwashers. (Fig. 6-384)

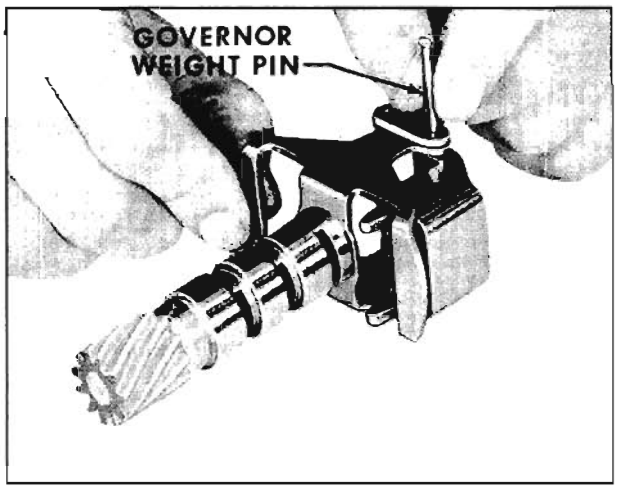


Fig. 6-381 Installing Governor Weight Pins

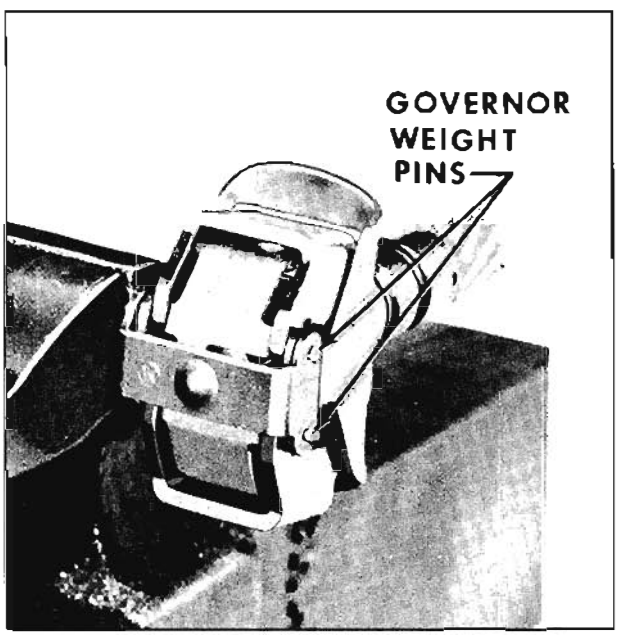


Fig. 6-382 Crimping Governor Weight Pins

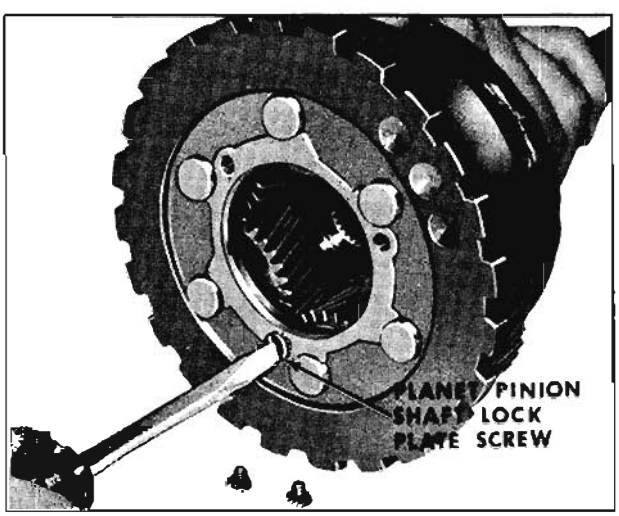


Fig. 6-384 Removing Lock Plate Screws

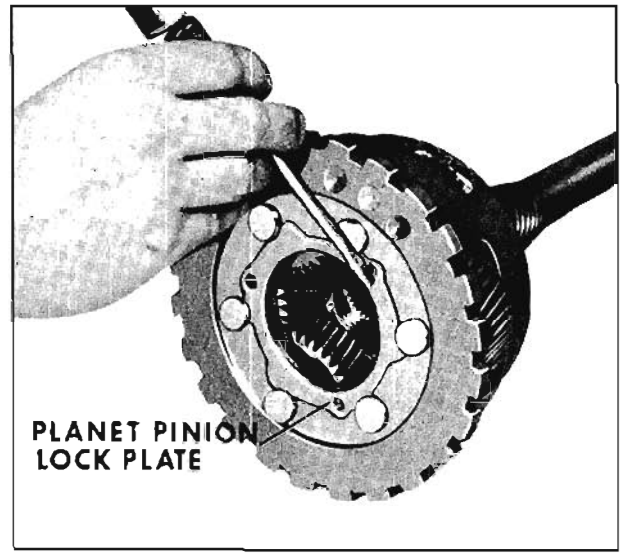


Fig. 6-385 Removing Lock Plate

2. Rotate planet pinion lock plate and remove. (Fig. 6-385)

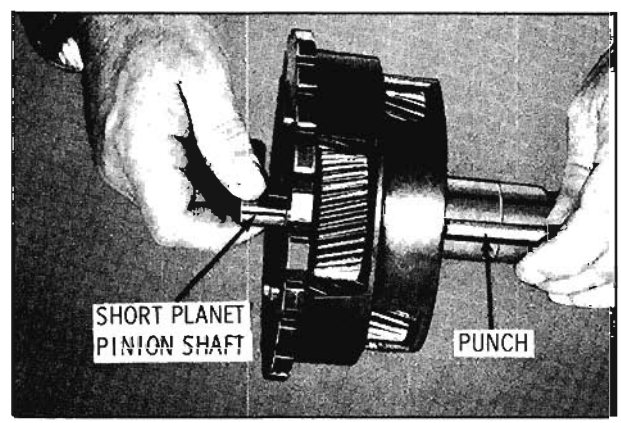


Fig. 6-386 Removing Short Planet Pinion Gear

3. Remove the short planet pinion shafts and short pinions. (Fig. 6-386)

4. Remove needle bearings and thrust washers from the short planet pinion gears.

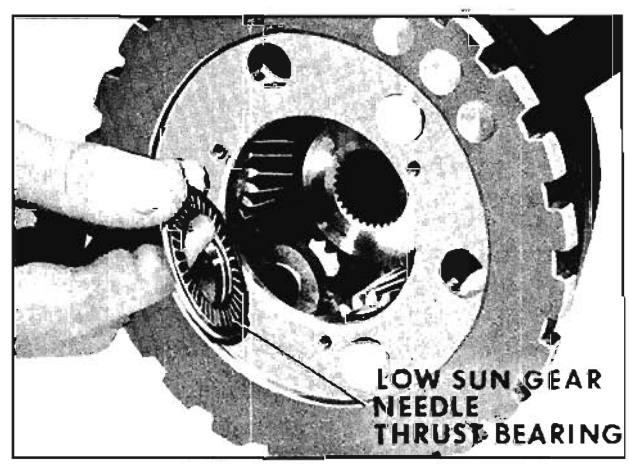


Fig. 6-387 Removing Low Sun Gear Thrust Bearing

5. Remove low sun gear needle thrust bearing. (Fig. 6-387)

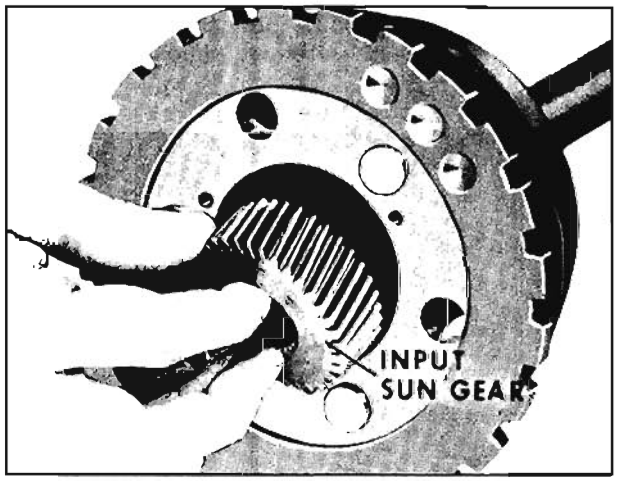


Fig. 6-388 Removing Input Sun Gear

6. Remove input sun gear. (Fig. 6-388)

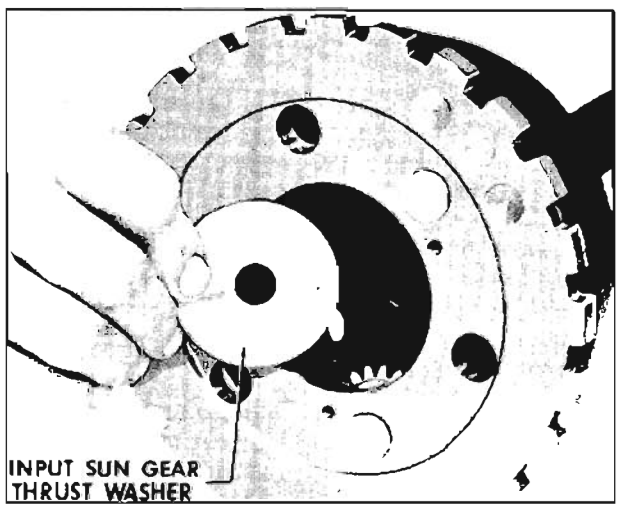


Fig. 6-389 Removing Front Thrust Washer

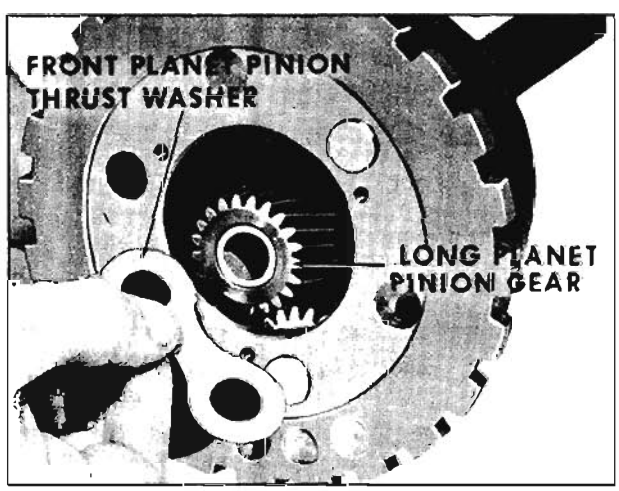


Fig. 6-390 Removing Long Planet Pinion Gear

7. Remove input sun gear thrust washer. (Fig. 6-389)

8. Remove the long planet pinion shafts and long planet pinion gears. (Fig. 6-390)

9. Remove front planet pinion thrust washer. (Fig. 6-390)

10. Remove needle bearings, spacers and thrust washers from the long planet pinion gears.

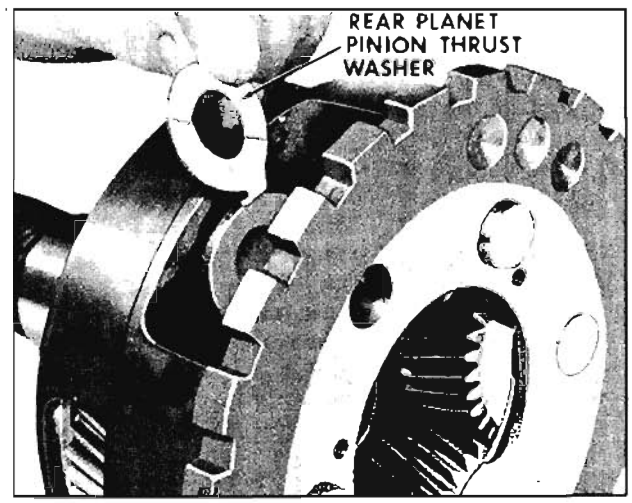


Fig. 6-391 Removing Rear Thrust Washer

11. Remove rear planet pinion thrust washer. (Fig. 6-391)

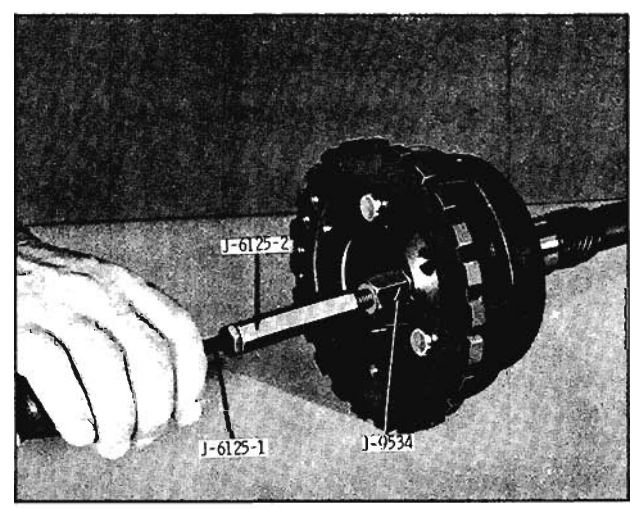


Fig. 6-392 Removing Output Shaft Bushing

12. Check output shaft bushing for nicks, severe scoring or wear. If bushing replacement is necessary, continue as follows. Install Bushing Remover J-9534 into bushing. Install Slide Hammer J-2619 into J-9534, using slide hammer, remove bushing from planet carrier. (Fig. 6-392)

Inspection of Planet Carrier Parts

1. Wash all parts in a cleaning solvent and air dry.
2. Check the planet pinion gears and input sun gear tooth for excessive wear.
3. Check the planet pinion thrust washers and input sun gear thrust washer.
4. Check planet pinion needle bearings. If bearings show excessive wear, all the needle bearings must be replaced.
5. Check the planet pinion shafts closely, if worn replace the worn shafts.
6. Check the output shaft bushing, if worn replace.

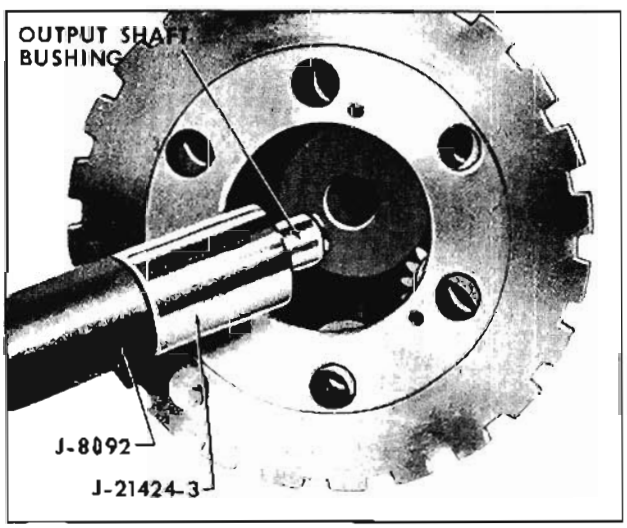


Fig. 6-393 Installing Output Shaft Bushing

Reassembly

1. Using Tool J-21424-3 and J-8592, press the new bushing in until J-21424-3 touches the machined surface of the planet carrier assembly. (Fig. 6-393)
2. Install the long planet pinion gears, then install the rear planet pinion thrust washers. Oil groove must be toward pinion gear. (Fig. 6-394)

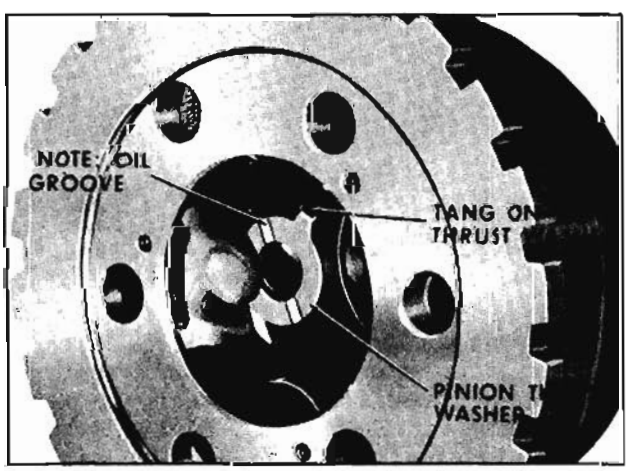


Fig. 6-394 Installing Rear Thrust Washer

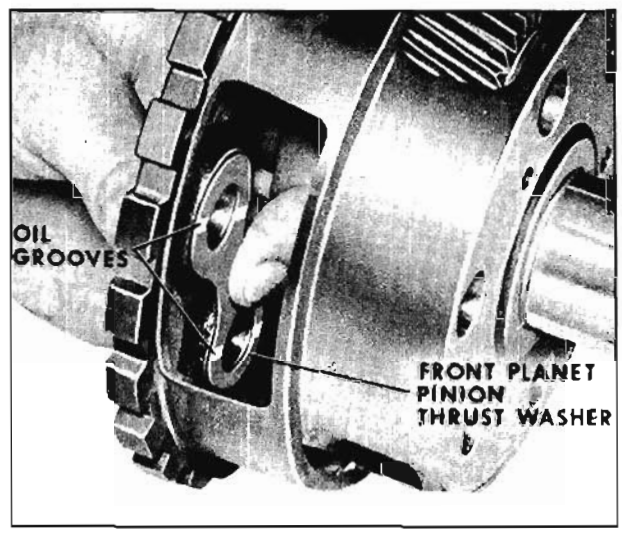


Fig. 6-395 Installing Front Thrust Washer

3. Install front planet pinion thrust washer. Retain thrust washer to case with grease. Oil grooves on the thrust washer must be toward the pinion gears. (Fig. 6-395)
4. Install needle bearings, thrust washers and spacers. (Fig. 6-396) Refer to Figs. 6-397 and 6-398 and lock the needle bearings. On the long pinion, it will be necessary to lock both sets of needle bearings.

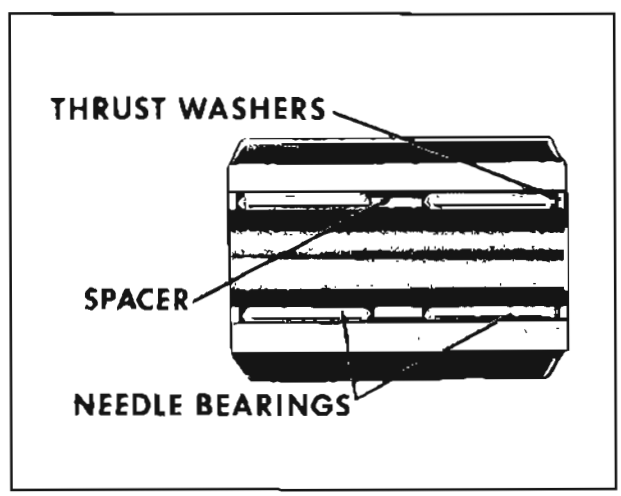


Fig. 6-396 Long Pinion Gear

5. Position the long planet pinions with the thrust washers at each end in the planet carrier. Install the pinion shafts from the rear of the carrier. As the shaft is being pushed in, make certain that it picks up the

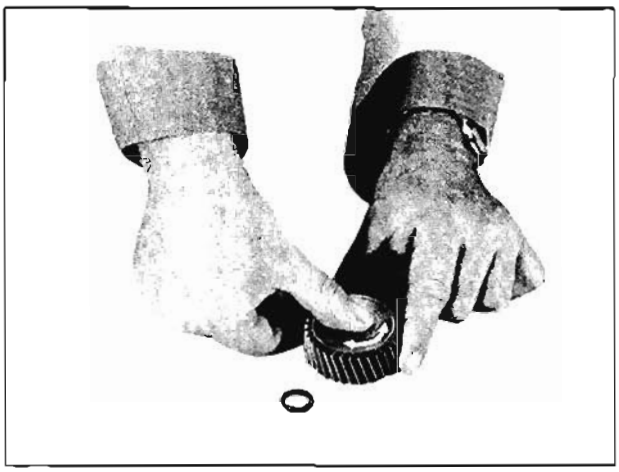


Fig. 6-397 Locking Needle Bearings

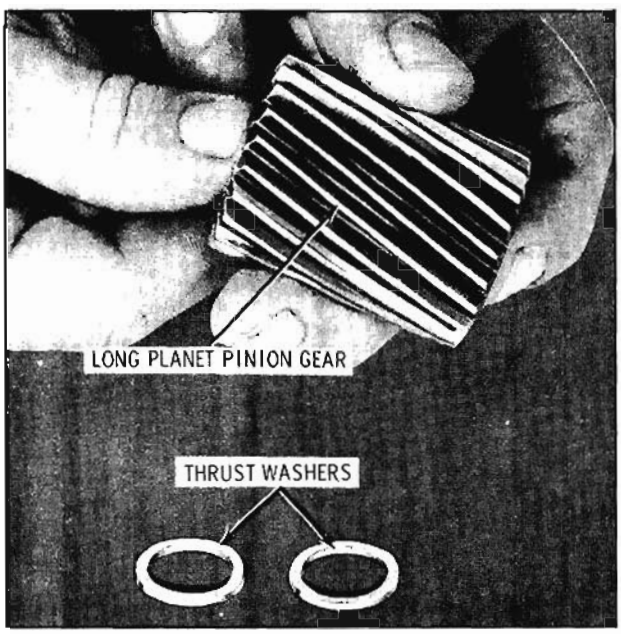


Fig. 6-398 Locking Second Row of Needle Bearings

thrust washer. Turn the pinion shaft so the groove faces the center of the planet carrier. (Fig. 6-399)

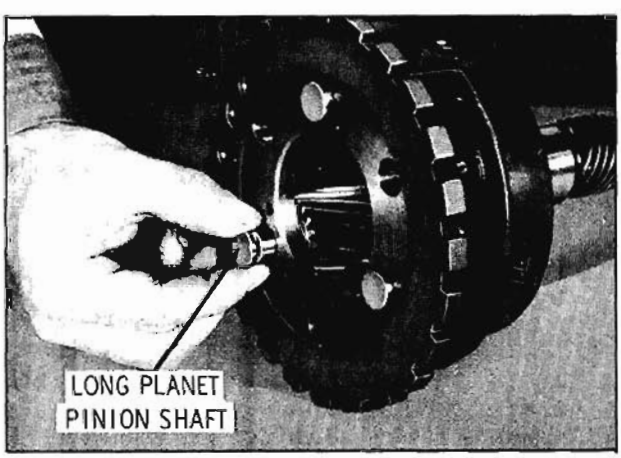


Fig. 6-399 Installing Long Pinion Gear Shaft

6. Install the input sun gear thrust washer with the oil groove facing input sun gear. (Fig. 6-400)

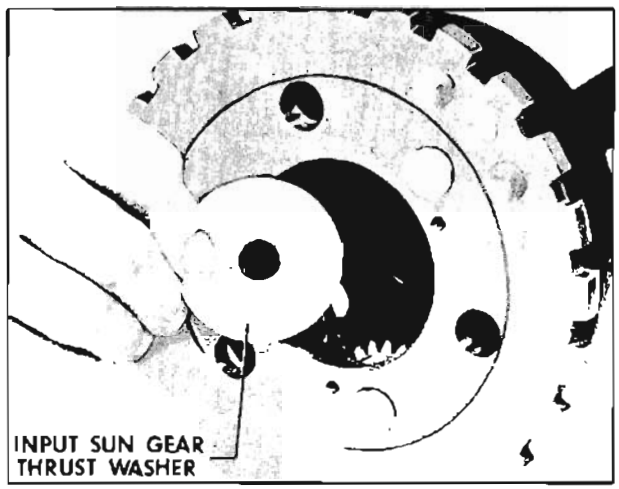


Fig. 6-400 Installing Thrust Washer

7. Install input sun gear into planet carrier. (Fig. 6-401)

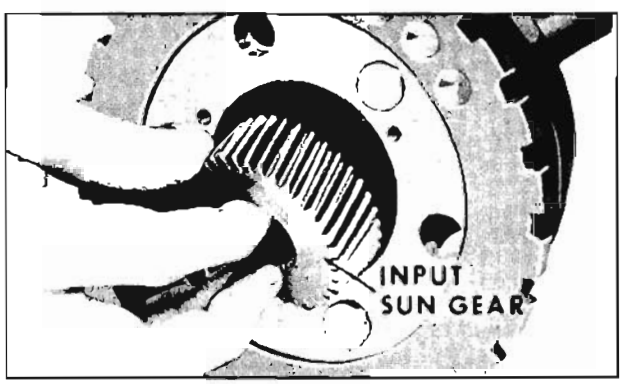


Fig. 6-401 Installing Input Sun Gear

8. Install low sun gear needle thrust bearing. (Fig. 6-402)

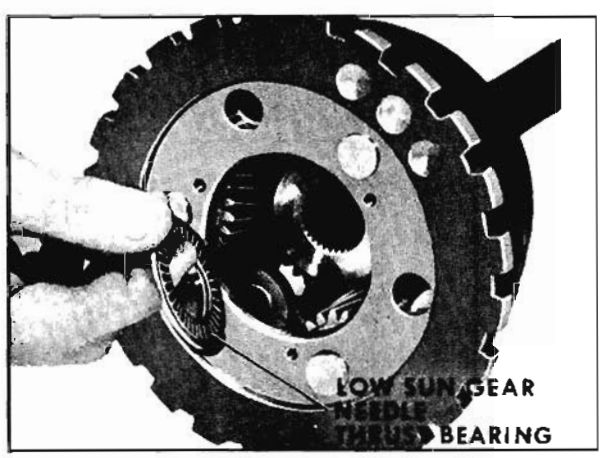


Fig. 6-402 Installing Thrust Bearing

9. Install the rear planet pinion thrust washer. Oil groove must be toward pinion gear. (Fig. 6-403)

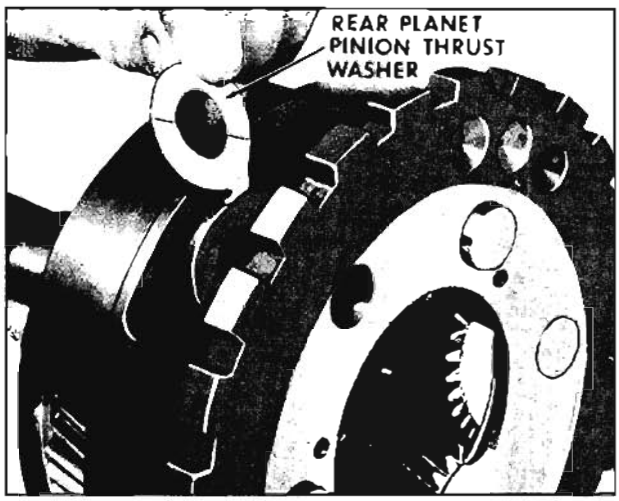


Fig. 6-403 Installing Rear Planet Pinion Thrust Washer

NOTE: The front thrust washer already installed with the long planet pinions also is used for the short planet pinions, as the two pinions are paired together on one set of thrust washers.

10. Install 20 needle bearings and thrust washers. (Fig. 6-404) Lock needle bearings as shown in Fig. 6-397.

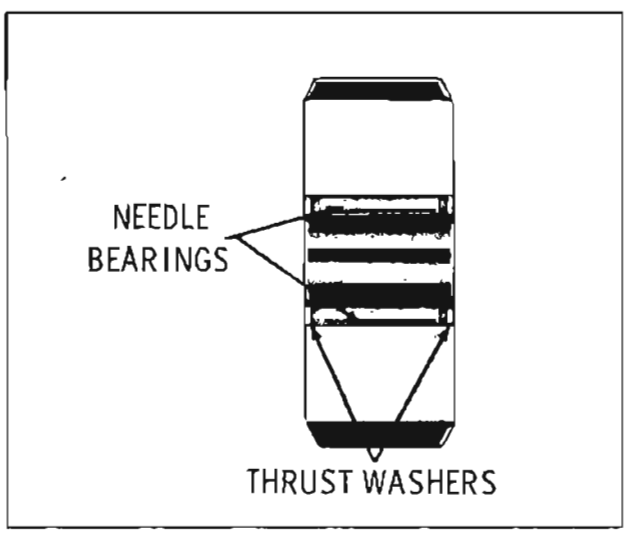


Fig. 6-404 Short Pinion Gear

11. Position short planet pinions with thrust washers at each end of the planet carrier. Install pinion shafts from the rear of planet carrier. As the pinion shaft is being pushed in, make certain that it picks up the thrust washers. Turn the pinion shaft so the groove faces center of planet carrier. (Fig. 6-405)

12. Install planet pinion lock plate. Rotate plate so extended portions align with slots in planet

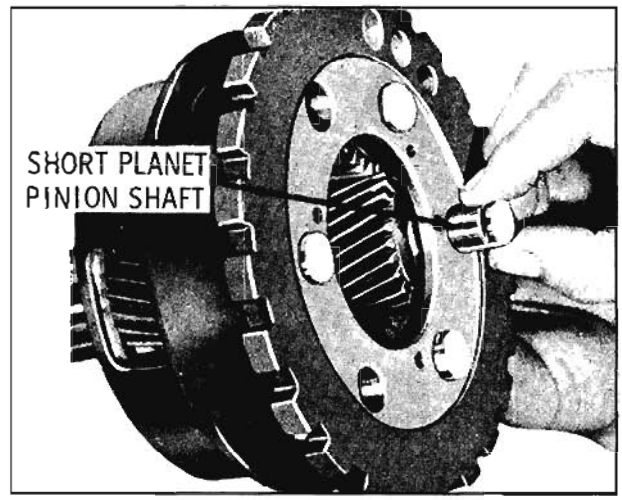


Fig. 6-405 Installing Short Pinion Gear

pinion shafts and three attaching screw holes. (Fig. 6-406)

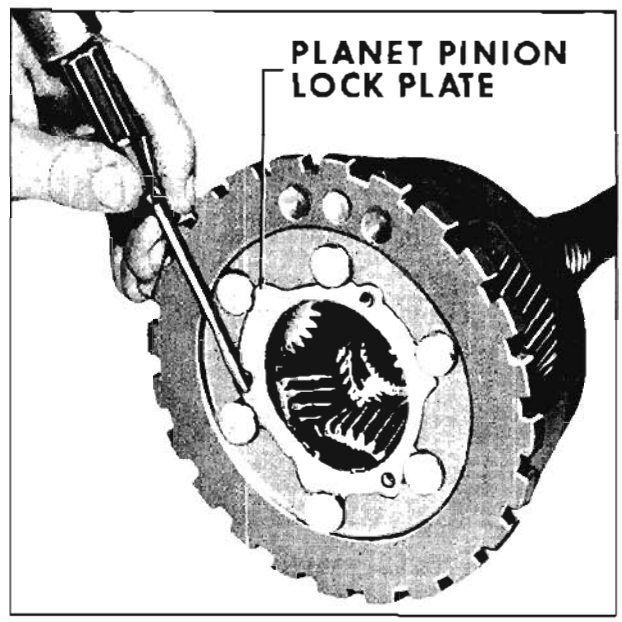


Fig. 6-406 Installing Lock Plate

13. Install three planet pinion shaft lock plate screws and lockwashers. (Fig. 6-407)

REVERSE CLUTCH PISTON SEALS

1. Examine reverse clutch piston outer seal. If nicked, torn or worn, remove seal. (Fig. 6-408)

2. Lubricate with transmission oil and install reverse clutch piston outer seal. (Fig. 6-408)

3. Examine reverse clutch piston inner seal. If nicked, torn or worn, remove seal. (Fig. 6-409)

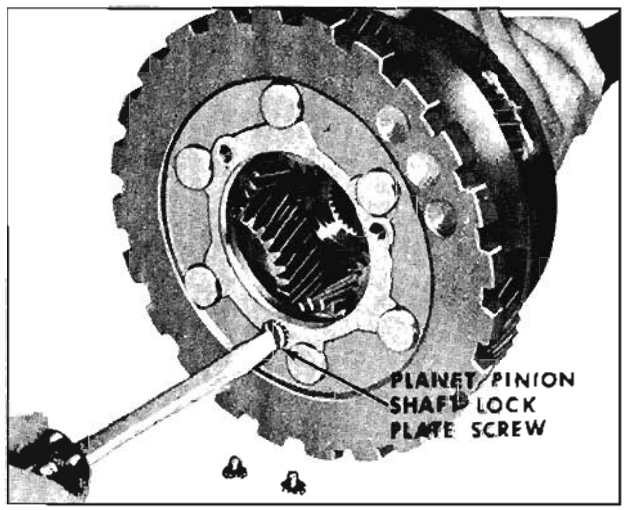


Fig. 6-407 Installing Lock Plate Screws

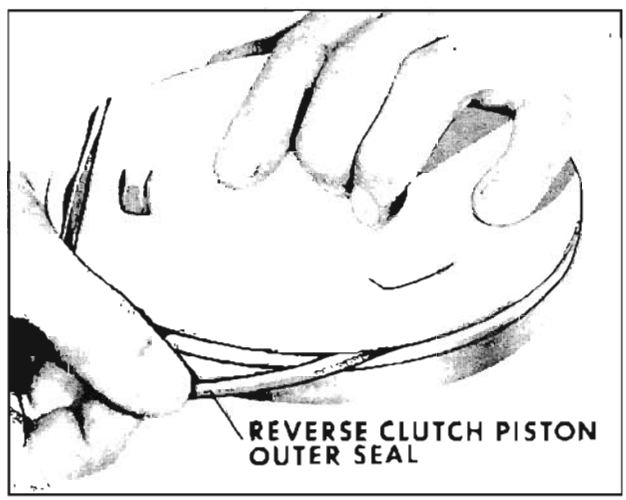


Fig. 6-408 Reverse Piston Outer Seal

Fig. 6-409 Reverse Piston Inner Seal

4. Lubricate with transmission oil and install reverse clutch piston inner seal. (Fig. 6-409)

Assembly

Before starting to assemble the transmission make certain that all parts are absolutely clean. Keep hands and tools clean to avoid getting dirt into assembly. If work is stopped before assembly is completed, cover all openings with clean cloths.

All moving parts should be given a light coating of transmission oil before installation. Thrust washers may be held in place with petroleum jelly, sparingly applied.

Replace all "O" rings, gaskets and oil seals that are removed.

Use care to avoid making nicks or burrs on parts, particularly at bearing surfaces and surfaces where gaskets are used.

5. It is extremely important to tighten all parts evenly and in proper sequence to avoid distortion of parts and leakage at gaskets and other joints. Use a reliable torque wrench to tighten all bolts and nuts to specified torque and in the specified sequence.

Installing Range Selector Lever, Shaft and Parking Lock Actuator

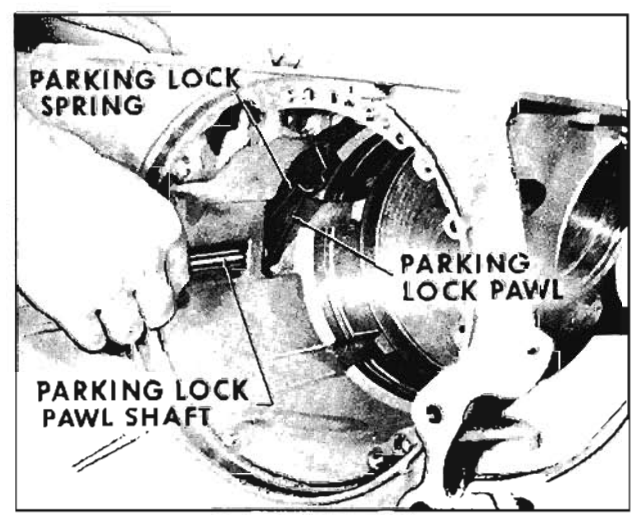


Fig. 6-410 Installing Parking Lock

1. Retain parking lock pawl and spring in case with parking lock pawl shaft. (Fig. 6-410)

NOTE: Make certain parking pawl shaft is bottomed in its bore in case.

2. With a twisting motion, insert outer range selector lever into case. (Fig. 6-411) Use new seal.

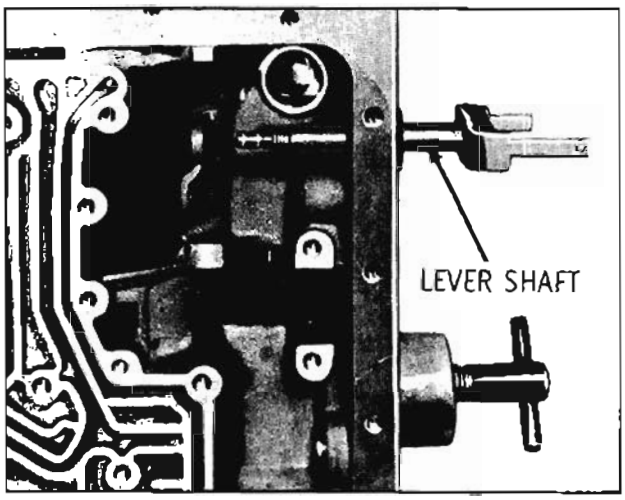


Fig. 6-411 Installing Selector Lever

3. Assemble park lock actuator assembly to inner park lock and range selector. (Fig. 6-412)

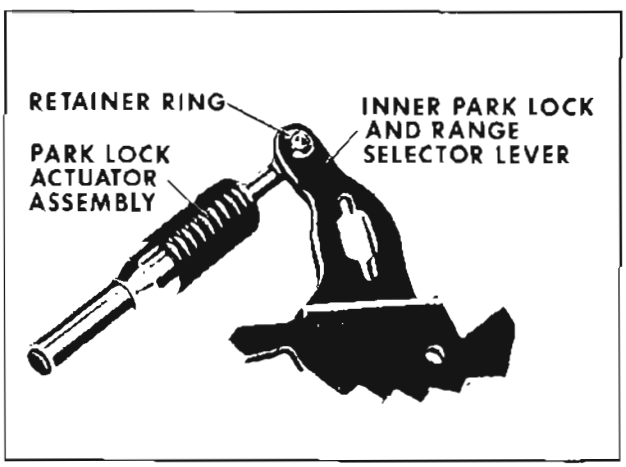


Fig. 6-412 Assembling Actuator

4. Install inner park lock and range selector assembly to outer range selector lever. Install nut on range selector lever. (Fig. 6-413)

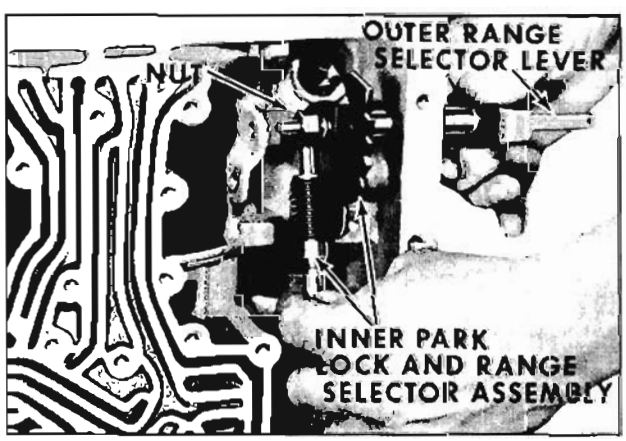


Fig. 6-413 Installing Actuator and Selector Assembly

NOTE: Make certain longest end on range selector lever is to the bottom of transmission.

5. Slide outer range selector lever into case and tighten nut using a 9/16" wrench. (Fig. 6-414)

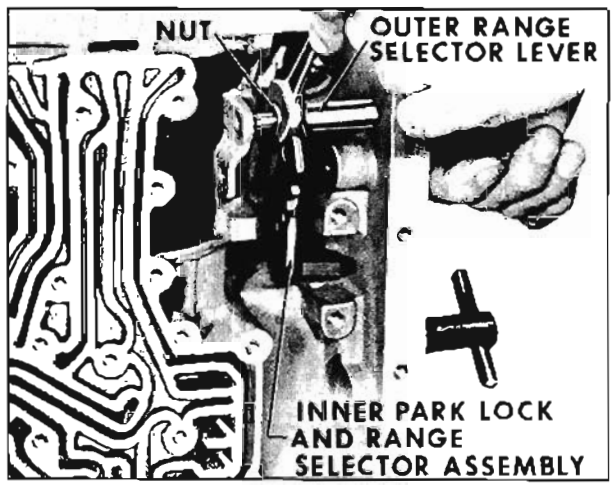


Fig. 6-414 Installing Outer Range Selector Lever

6. Install range selector shaft retainer. (Fig. 6-415)

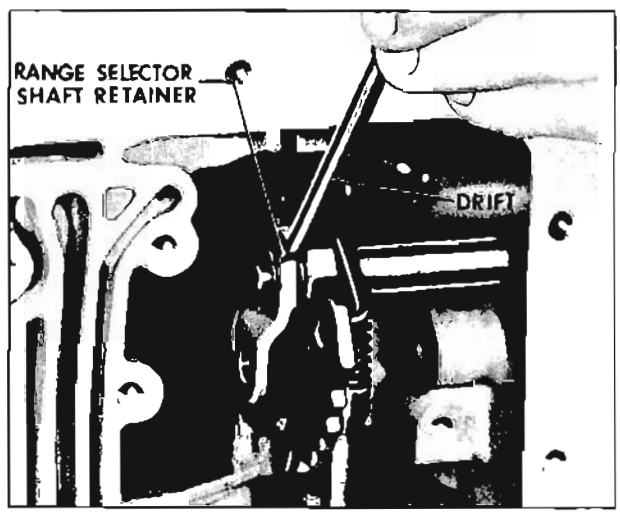


Fig. 6-415 Installing Retainer

7. Install parking bracket to transmission case. Torque bolts 8 to 12 ft. lbs. (Fig. 6-416)

Installing Reverse Clutch

1. With transmission in vertical position, install the reverse clutch piston into case. Tap piston with hammer handle to make certain piston is seated in case. (Fig. 6-417)

2. Install 17 clutch piston return springs. (Fig. 6-418)

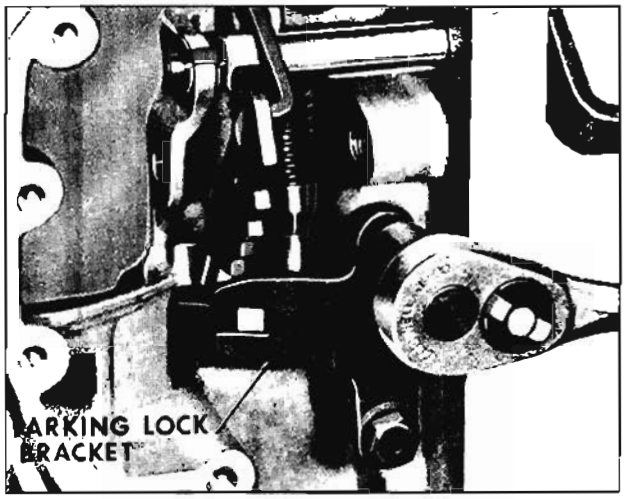


Fig. 6-416 Installing Parking Lock Bracket

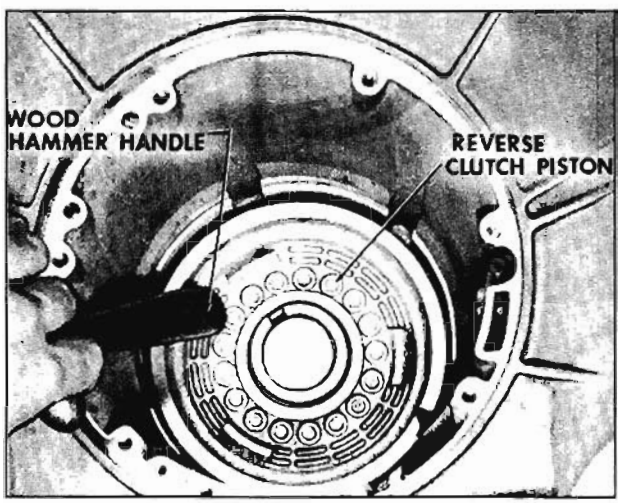


Fig. 6-417 Installing Reverse Clutch Piston

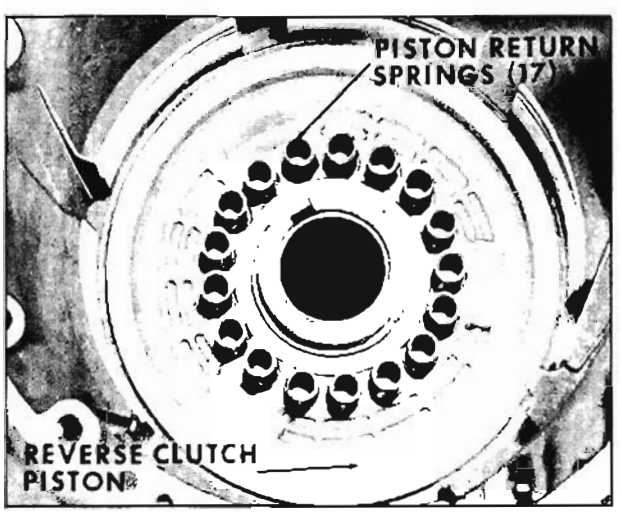


Fig. 6-418 Installing Return Springs

3. Position piston return seat on piston return springs. Place snap ring on return seat so that ring may be easily installed when seat is compressed with tool. (Fig. 6-419)

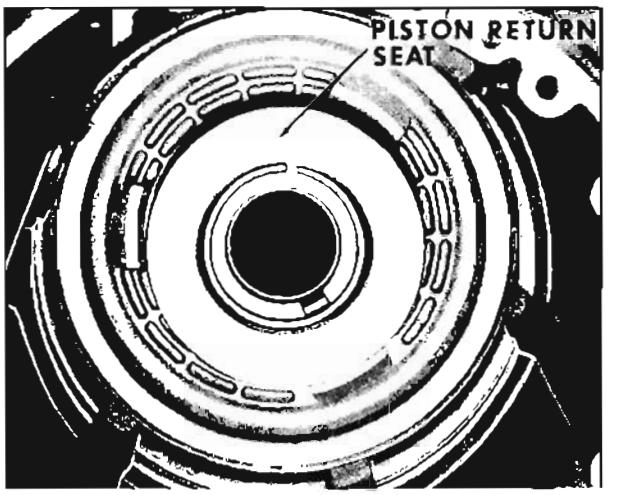


Fig. 6-419 Installing Return Seat

4. Using J-21420-1 and J-21420-2 compress piston return seat so snap ring may be installed with J-5586 Pliers. (Fig. 6-420)

CAUTION: Make certain inner edge of seat does not hang up on snap ring groove while being compressed.

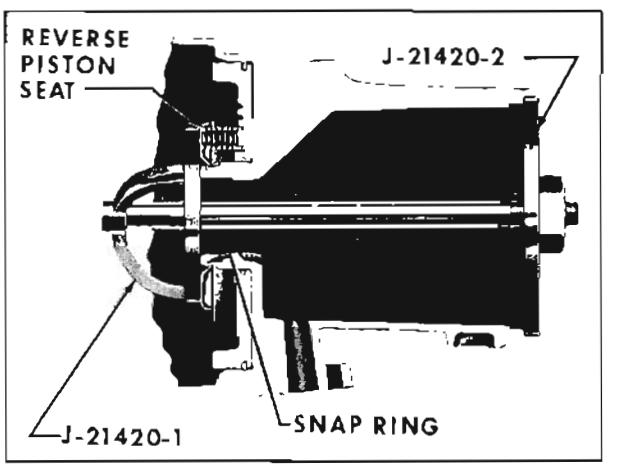


Fig. 6-420 Installing Snap Ring

5. Install reverse clutch cushion spring. Install the cushion spring with the dished or concave side up. (Fig. 6-421)

6. Align notches on the steel driven plates. Install the steel driven plates and lined drive plates alternately, beginning with a steel driven plate. The notched lug on each driven plate goes in the five o'clock groove in case. (Fig. 6-422)

CAUTION: Steel plates are waved and should all face same direction. For this reason, notches are provided to indicate correct installation.

NOTE: Cars equipped with V-6 engines have four driven and four drive clutch plates.

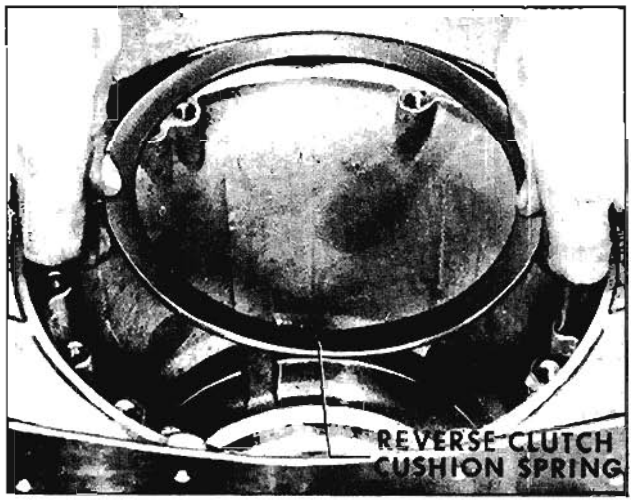


Fig. 6-421 Installing Cushion Spring

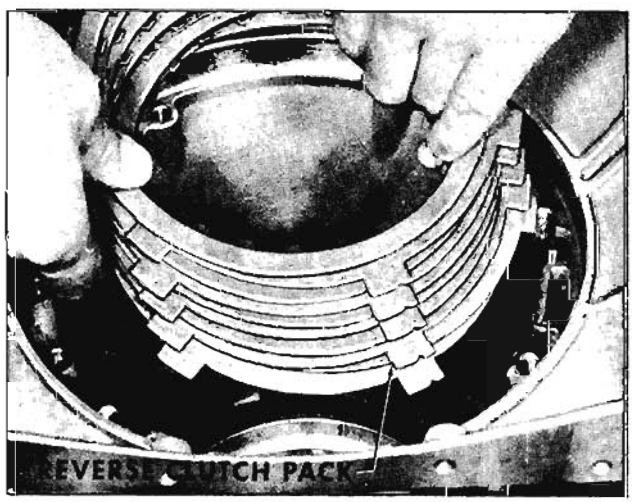


Fig. 6-422 Installing Reverse Clutch Pack

Cars equipped with V-8 engine have five driven and five drive clutch plates.

7. Install reverse clutch pressure plate with the identification mark being installed in the five o'clock groove in case. (Fig. 6-423)

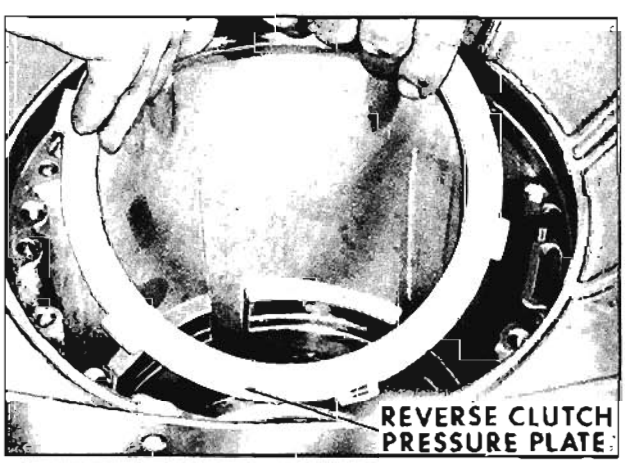


Fig. 6-423 Installing Pressure Plate

8. Install reverse clutch pack snap ring. (Fig. 6-424)

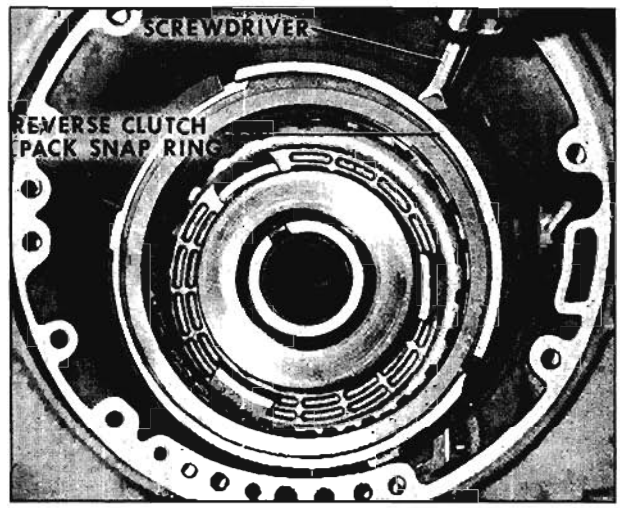


Fig. 6-424 Installing Snap Ring

9. Insert feeler gauge between any reaction plate and adjacent faced plate. (Fig. 6-425) Clearance for different reaction plates are shown below.

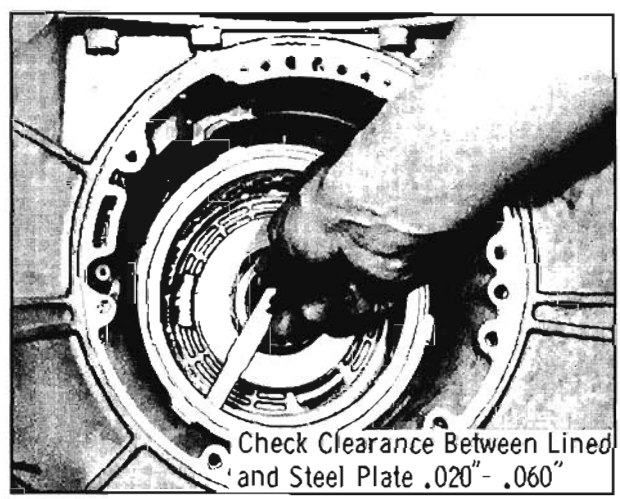


Fig. 6-425 Checking Clearance

When the dimension between the reaction plate and adjacent plate is between .058" and .021" use the reaction plate with one identification mark. When the dimension is between .095" and .058" use plate with two marks. When clearance is between .133" and .095" use plate with three identification marks.

Installing Planetary Gear Set

1. Install thrust bearing race with a lip, needle bearing and a second plain thrust bearing race to the rear face of the planetary gear set. Retain with grease. (Fig. 6-426)

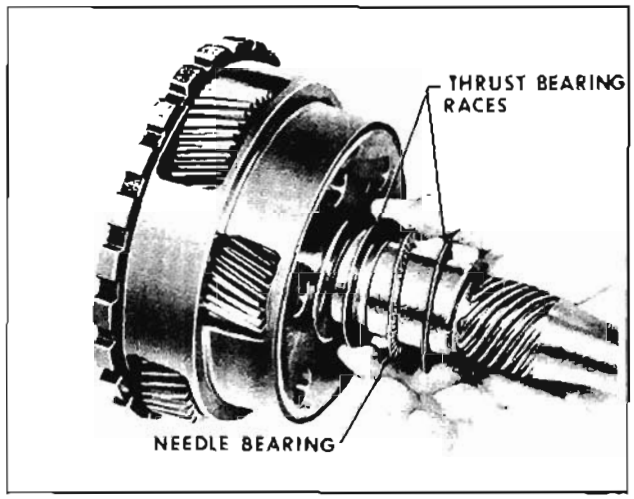


Fig. 6-426 Installing Thrust Bearing

2. Install reverse ring gear into case. (Fig. 6-427)

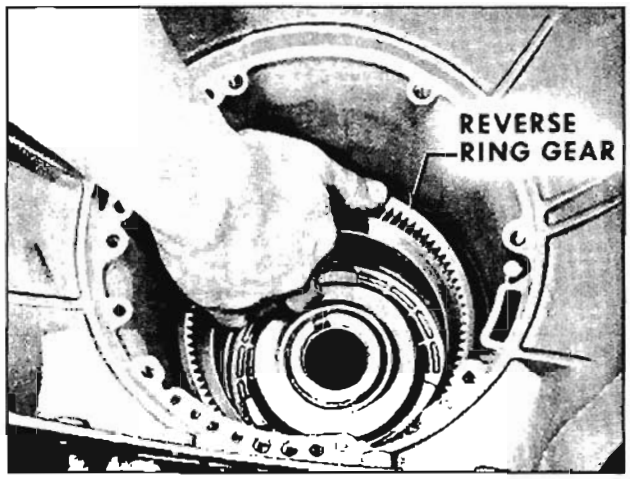


Fig. 6-427 Installing Reverse Ring Gear

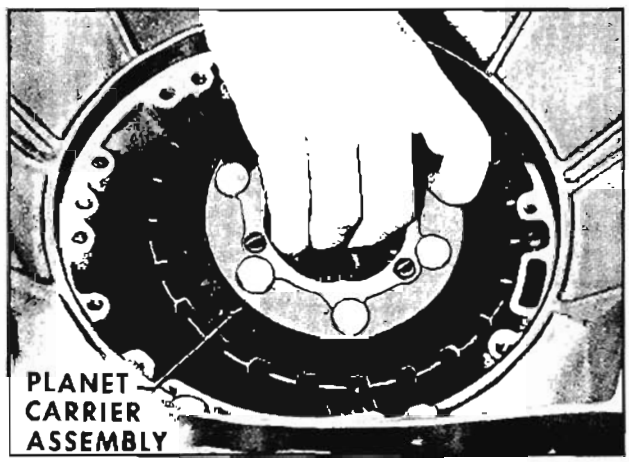


Fig. 6-428 Installing Planet Carrier

3. Install planetary gear set into case. (Fig. 6-428)

Installing Low Servo

1. Install low servo piston assembly into case (Fig. 6-429)

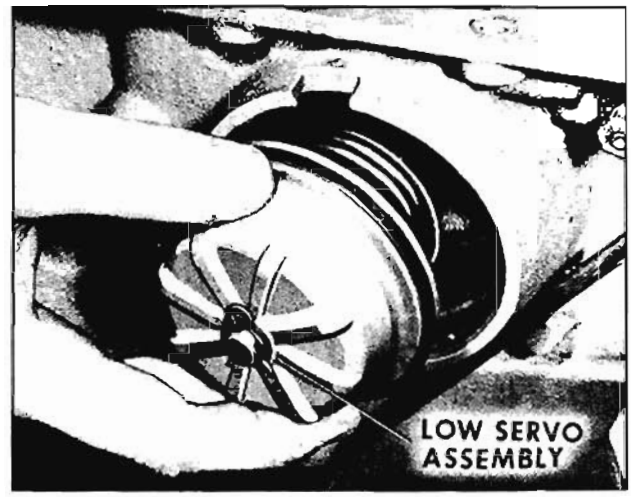


Fig. 6-429 Installing Low Servo

2. Install low servo cover oil seal. (Fig. 6-430)

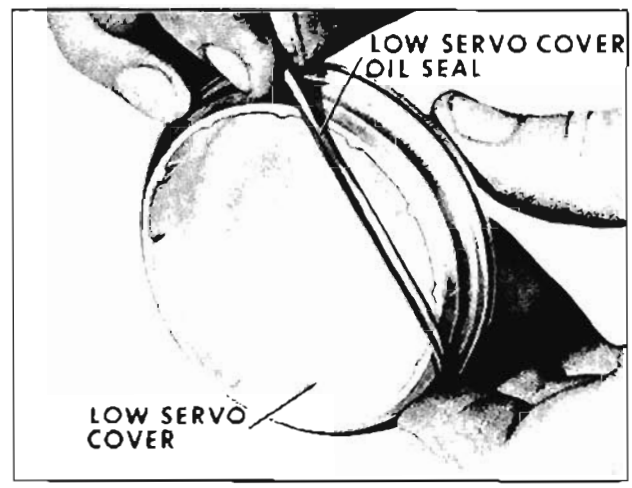


Fig. 6-430 Installing Low Servo Cover Oil Seal

3. Install low servo cover to case. (Fig. 6-431)

4. Compress low servo cover with J-21495-1 and install retaining snap ring. (Fig. 6-432)

Installing Low Band

1. With transmission in vertical position, install band adjusting screw into case. (Fig. 6-433)

2. Install low band into case. (Fig. 6-434)

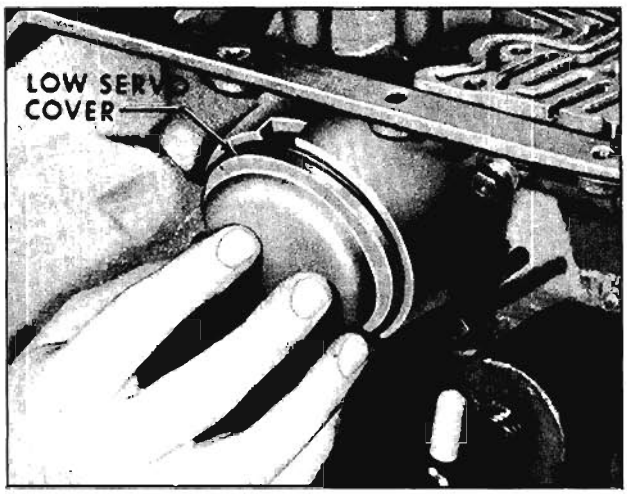


Fig. 6-431 Installing Low Servo Cover

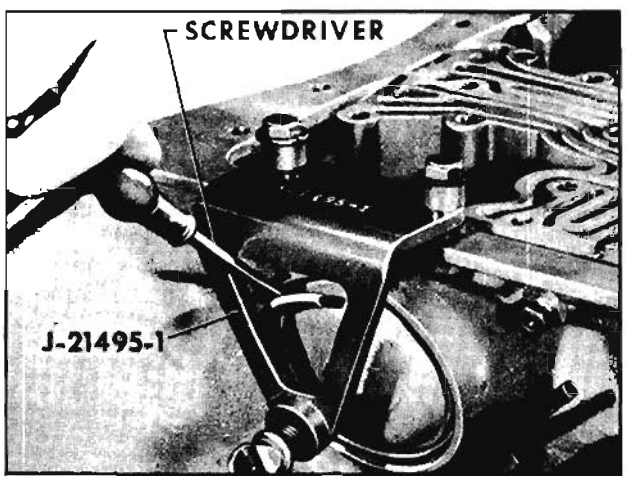


Fig. 6-432 Installing Snap Ring

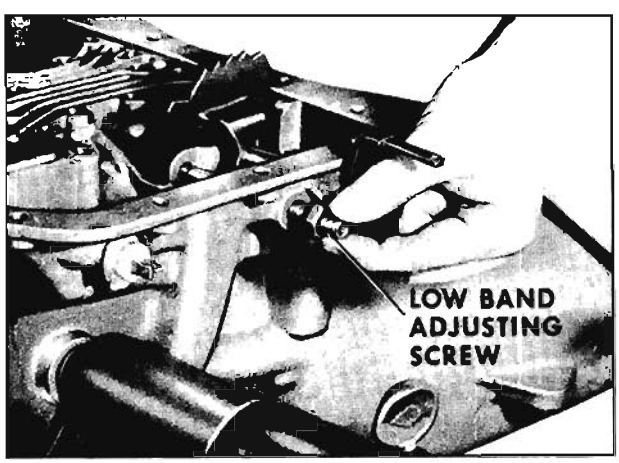


Fig. 6-433 Installing Low Band Adjusting Screw

3. Fig. 6-435 illustrates the proper positioning of the low band apply strut and band adjusting screw anchor strut.

4. Install low band apply strut and band adjusting screw strut. After both struts have been installed, tighten low band adjusting screw enough to prevent struts from falling out. (Fig. 6-436)

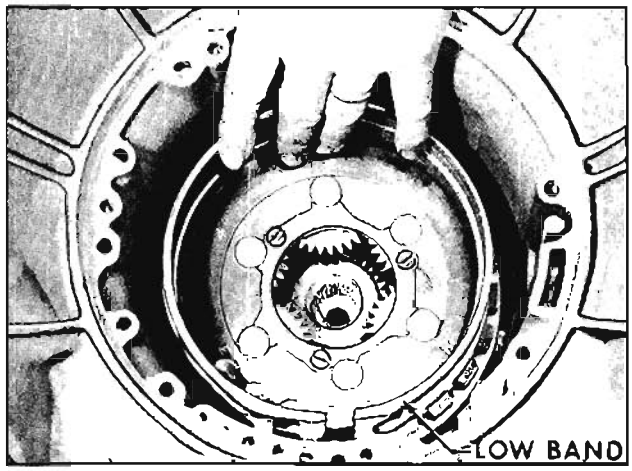


Fig. 6-434 Installing Low Band

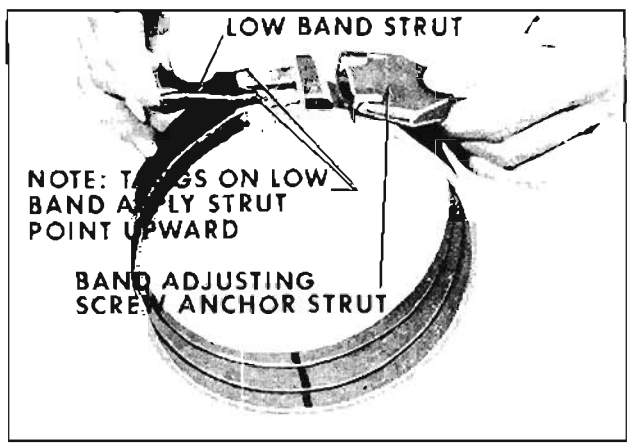


Fig. 6-435 Positioning Band Apply Strut

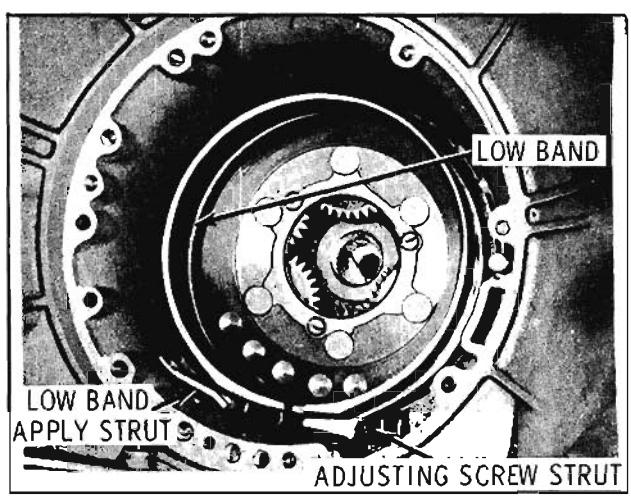


Fig. 6-436 Installing Band Apply Strut

Installing the Forward Clutch Assembly

1. Install forward clutch assembly turning slightly to engage low sun gear with planet pinions. (Fig. 6-437)

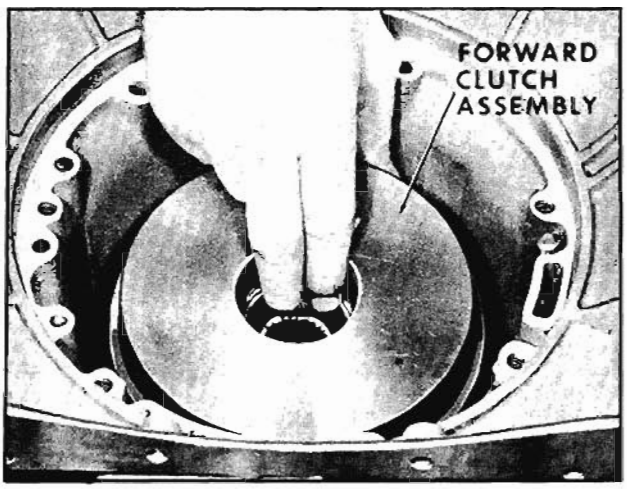


Fig. 6-437 Installing Forward Clutch

INSTALLING OIL PUMP GUIDE PIN, GASKET AND OIL PUMP ASSEMBLY

1. Install selective fit washer to pump cover hub. (Fig. 6-438)

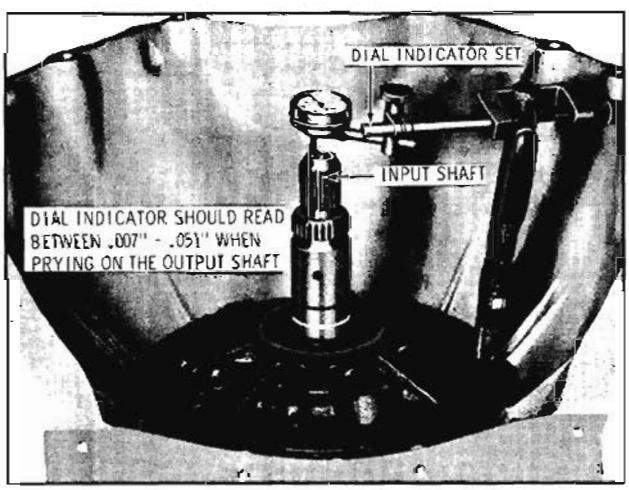


Fig. 6-438 Oil Pump End Play Check

2. Install two pump covers to clutch drum oil sealing rings. (Fig. 6-439)
3. Install oil pump to case seal. (Fig. 6-440)
4. Install new pump gasket and guide pins. (Fig. 6-441)
5. Install input shaft oil rings. (Fig. 6-442)
6. Install input shaft into oil pump; then install pump into case. Apply a thin coat of oil around edge of pump. (Fig. 6-443)
7. Remove guide pins and install eight retaining bolts (with new "O" rings under head). (Fig. 6-444)

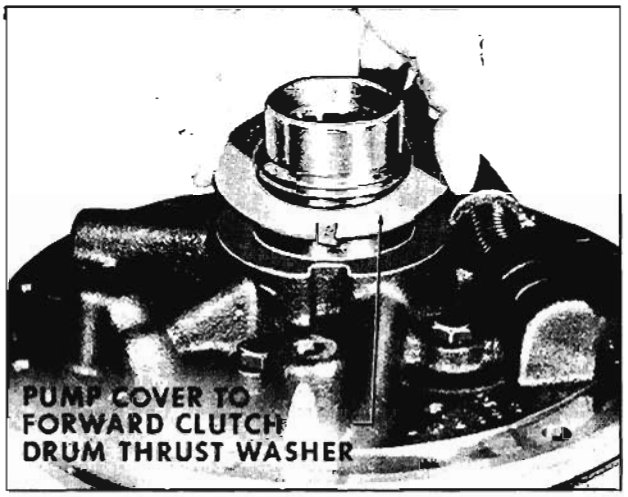


Fig. 6-439 Installing Selective Washer

Fig. 6-440 Installing Oil Sealing Rings

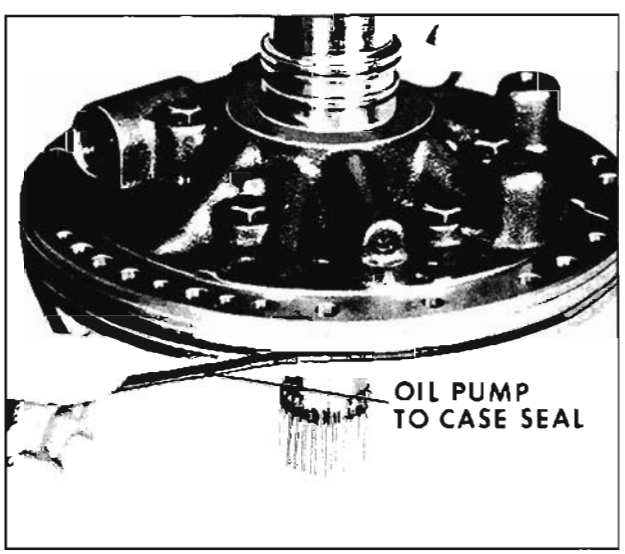


Fig. 6-441 Installing Oil Pump to Case Seal

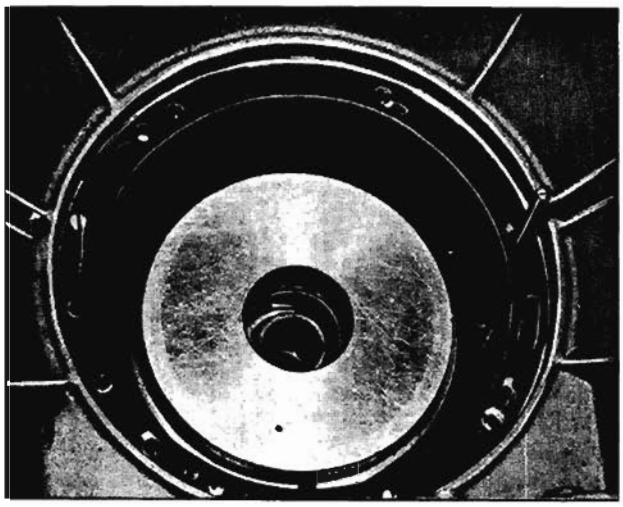


Fig. 6-442 Installing Oil Pump Gasket and Guide Pins

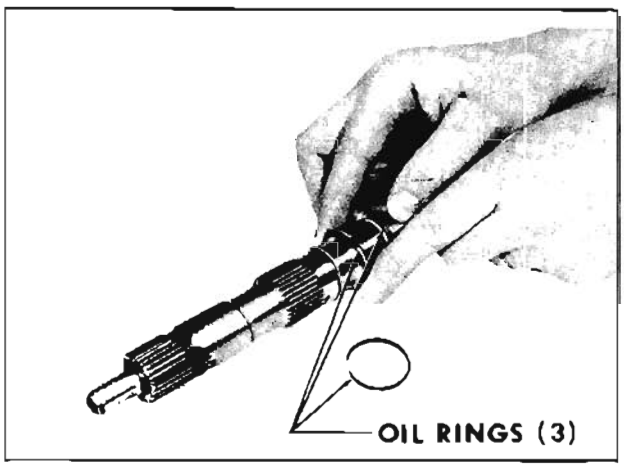


Fig. 6-443 Installing Oil Rings

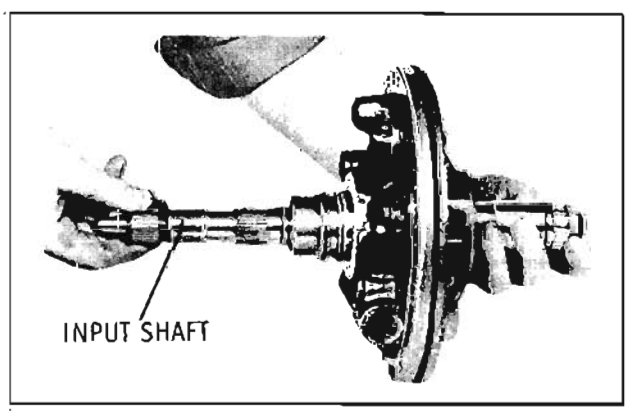


Fig. 6-444 Installing Input Shaft

8. Tighten bolts evenly and torque 16 to 24 ft. lbs. (Fig. 6-445)

9. Check forward clutch to oil pump clearance as follows:

   a. Position a dial indicator on the end of the input shaft. (Fig. 6-446)

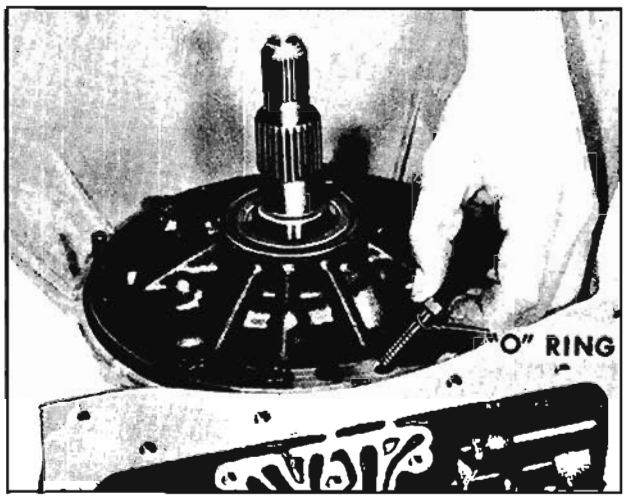


Fig. 6-445 Installing Pump

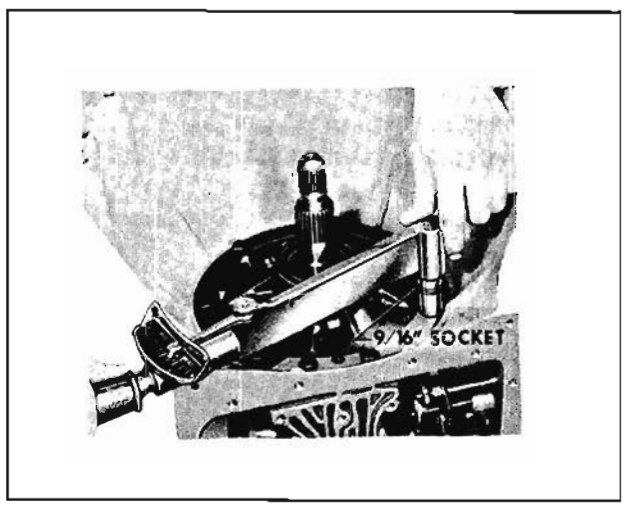


Fig. 6-446 Installing Pump Attaching Bolts

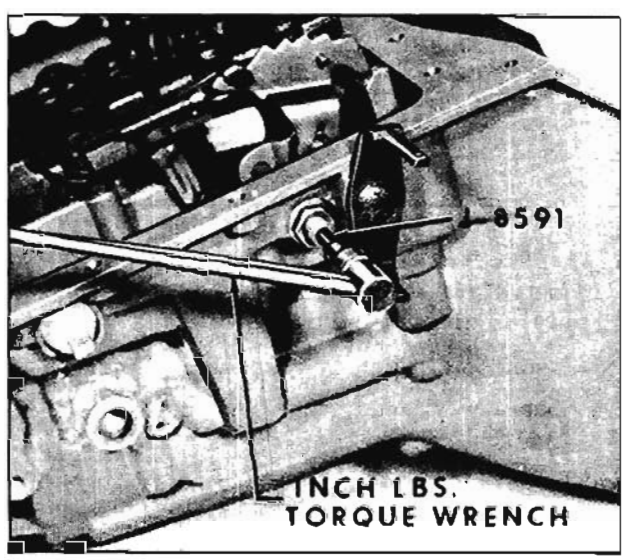


Fig. 6-447 Low Band Adjustment

   b. Push the input shaft rearward and zero the dial indicator.

c. Pry the output shaft forward and read the dial indicator. The reading should be between .007" and .051".

d. If the end play is not within specifications, remove the oil pump and with a micrometer determine the thickness of the selective thrust washer and replace with the proper selective thrust washer to bring it within specifications. Thrust washers are available in three sizes:

.059"-.063"
.077"-.081"
.095"-.099"

These washers have no identification other than the part numbers on the packages.

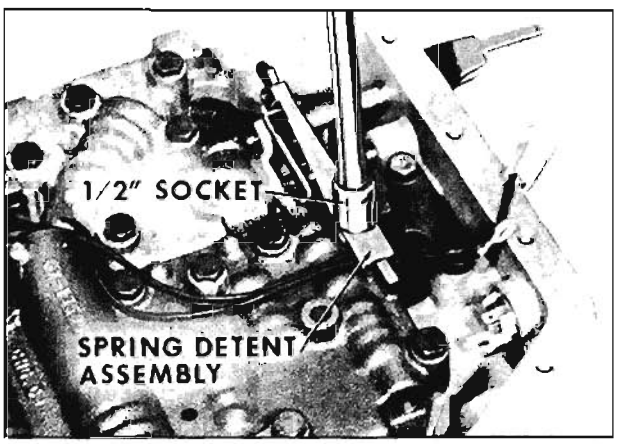


Fig. 6-448 Low Band Adjustment

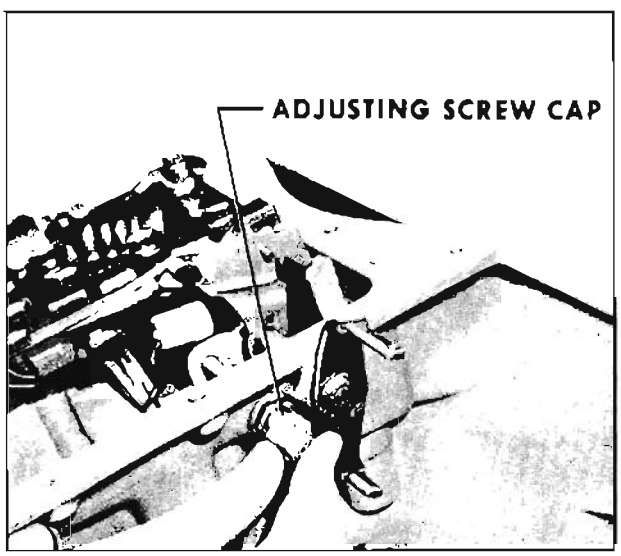


Fig. 6-449 Adjusting Screw Cap

LOW BAND ADJUSTMENT

1. Adjust low band by first tightening adjusting screw to 40 in. lbs. torque. (Fig. 6-447)
2. Back off band adjusting screw four turns and lock nut. (Fig. 6-448)
3. Install adjusting screw cap. (Fig. 6-449)

INSTALLING SPEEDOMETER DRIVING GEAR

1. With transmission in a horizontal position, position speedometer driving gear. Place transmission in "P" range. Using Tools J-21421-1 and J-21421-2, drive speedometer driving worm gear onto output shaft. Drive gear on until J-21421-2 bottoms on end of output shaft. When tool bottoms, speedometer driving gear is in proper location. (Fig. 6-450)

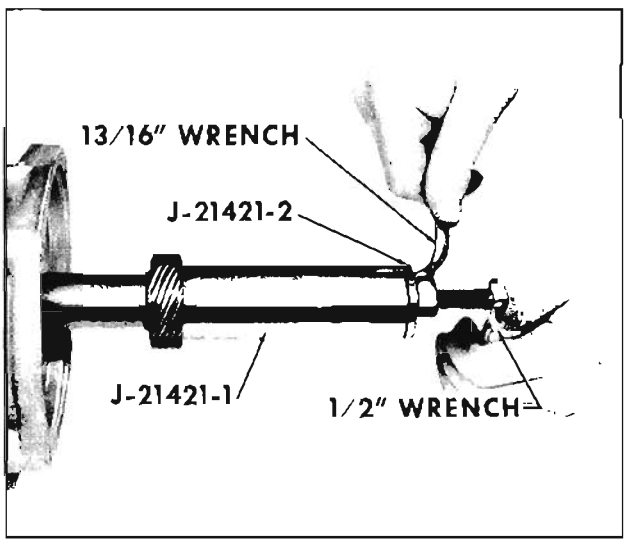


Fig. 6-450 Installing Speedometer Drive Gear

NOTE: On cars equipped with the extended output shaft, use Tool J-21421-3.

REAR BEARING RETAINER OIL SEAL AND BUSHING

Removal and Installation

1. Remove the rear bushing as shown in Fig. 6-451A.
2. Using Drive Handle J-8092 and Installer J-21424-1, install rear bearing retainer bushing. (Fig. 6-451B)
3. Remove the rear bearing oil seal as shown in Fig. 6-452A.
4. Install output shaft to rear bearing retainer oil seal using Installer J-21426. (Fig. 6-452B)

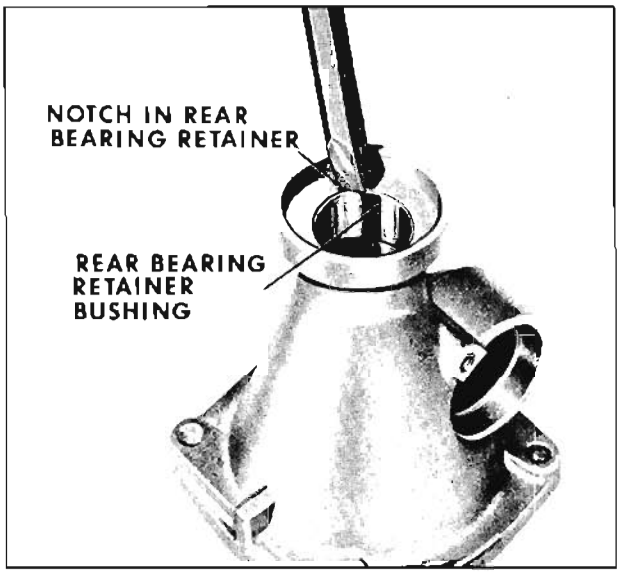


Fig. 6-451A Removing Rear Bearing Retainer Bushing

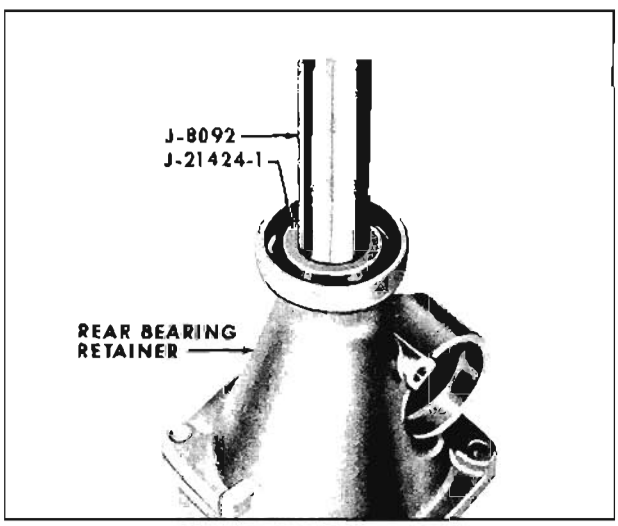


Fig. 6-451B Installing Rear Bearing Retainer Bushing

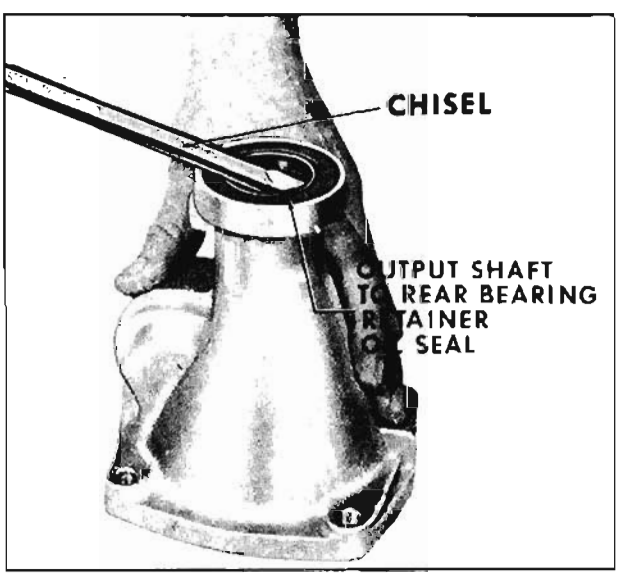


Fig. 6-452A Removing Oil Seal

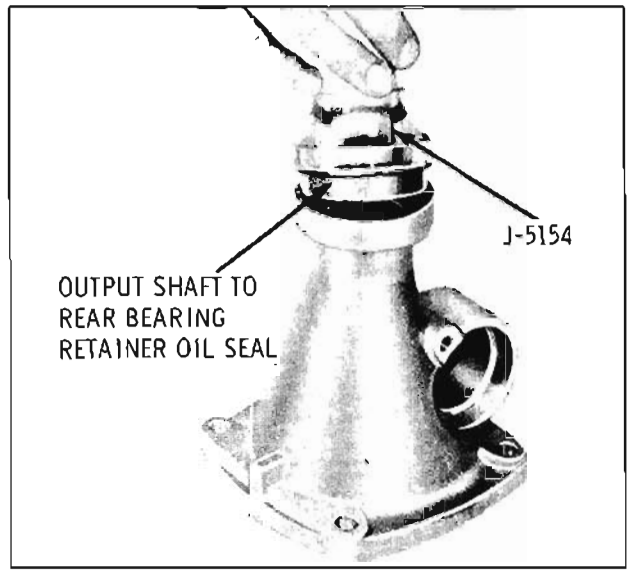


Fig. 6-452B Installing Oil Seal

Installing Rear Bearing Retainer

1. Install rear bearing retainer to case oil seal. (Fig. 6-453)

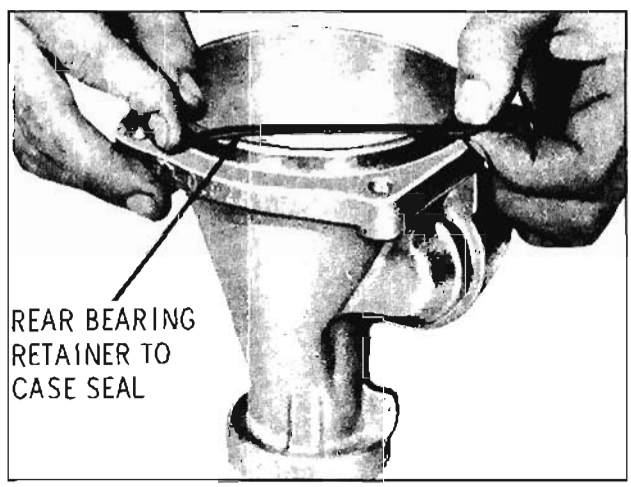


Fig. 6-453 Installing Rear Bearing Retainer to Case Oil Seal

2. Install rear bearing retainer to case and install four retaining bolts, using a 9/16" socket. Torque bolts 25 to 35 ft. lbs. (Fig. 6-454)

INSTALLING SPEEDOMETER DRIVEN GEAR ASSEMBLY

1. Install speedometer driven gear assembly into rear bearing retainer. (Fig. 6-455)

2. Install speedometer driven gear sleeve retainer. Torque bolt 8 to 12 ft. lbs. (Fig. 6-456)

INSTALLING VALVE BODY

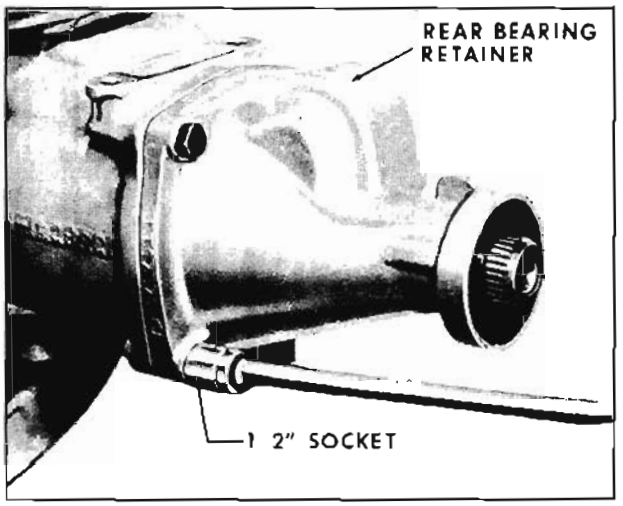


Fig. 6-454 Installing Rear Bearing Retainer

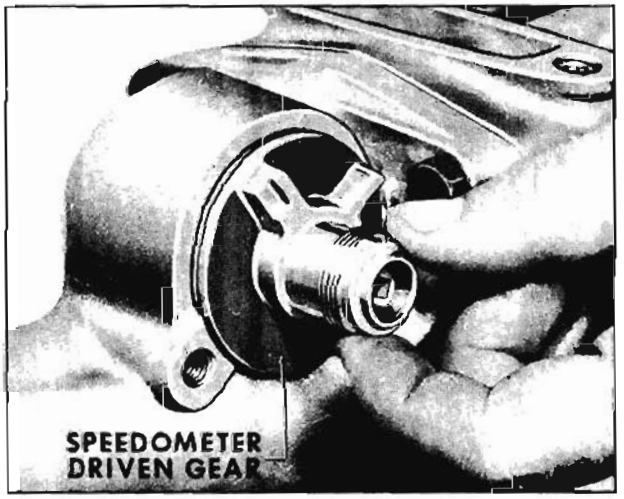


Fig. 6-455 Installing Speedometer Driven Gear

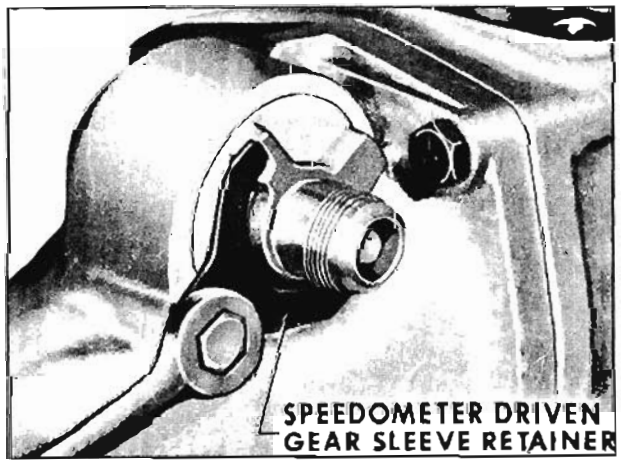


Fig. 6-456 Installing Speedometer Driven Gear Retainer

1. With transmission in horizontal position, install valve body to plate gasket. (Fig. 6-457)

2. Install valve body plate. (Fig. 6-458)

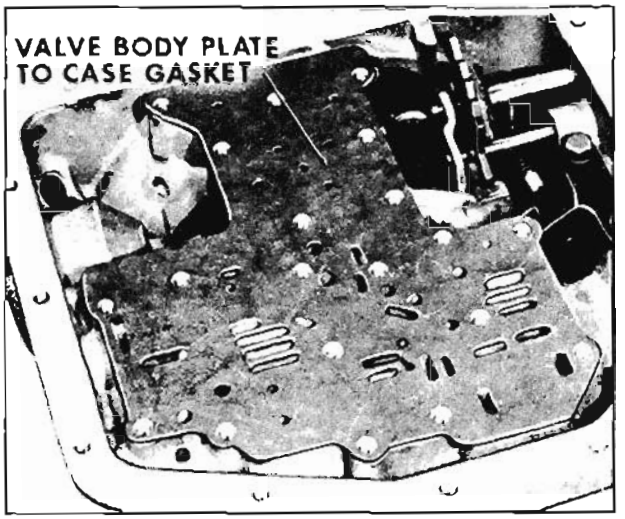


Fig. 6-457 Installing Valve Body Gasket

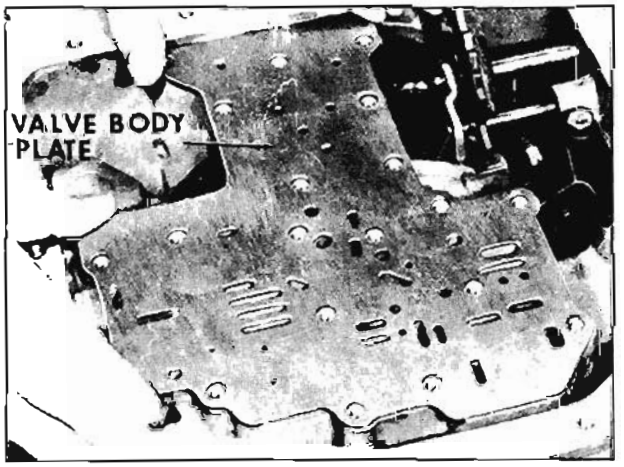


Fig. 6-458 Installing Valve Body Plate

3. Install manual control valve and link into valve body assembly. (Fig. 6-459)

4. Install manual control valve link into park, lock and range selector inner lever. (Fig. 6-460)

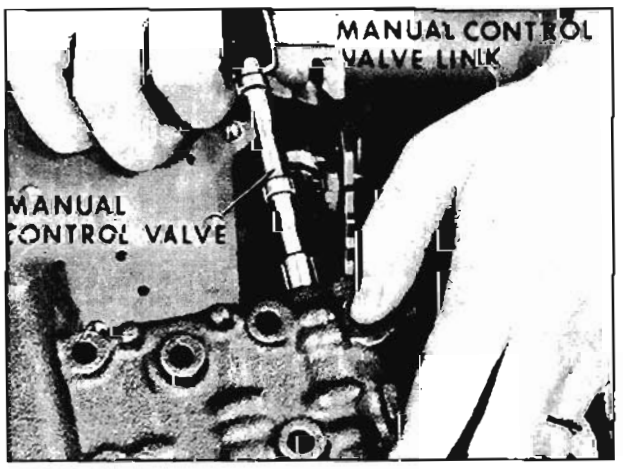


Fig. 6-459 Installing Valve Body

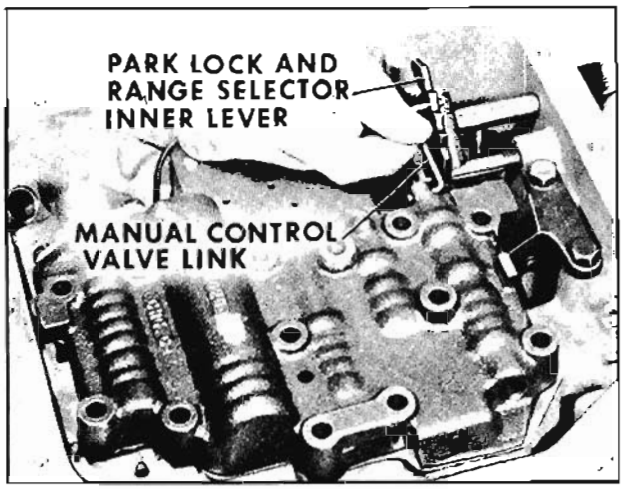


Fig. 6-460 Installing Link

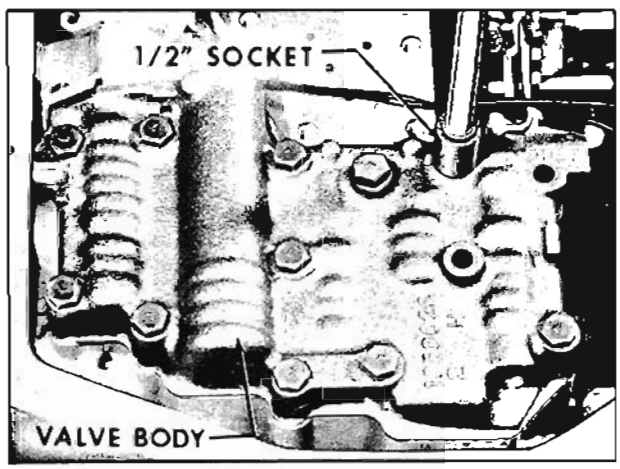


Fig. 6-461 Installing Valve Body Attaching Bolts

5. Install 11 valve body to case retaining bolts. Torque bolts 8 to 11 ft. lbs. (Fig. 6-461)

6. Install the stator control valve plate. (Fig. 6-462)

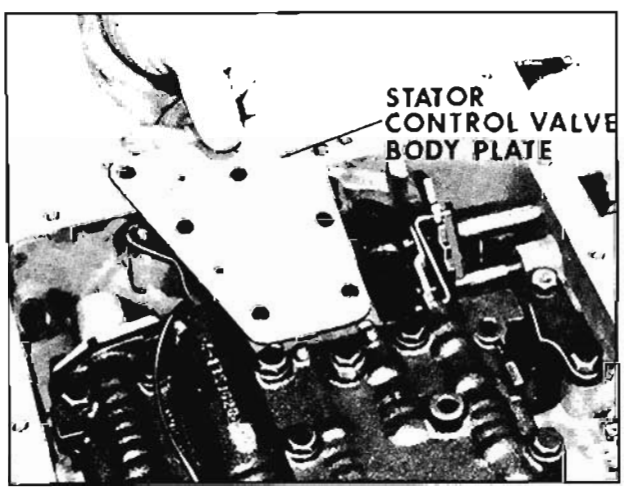


Fig. 6-462 Installing Plate

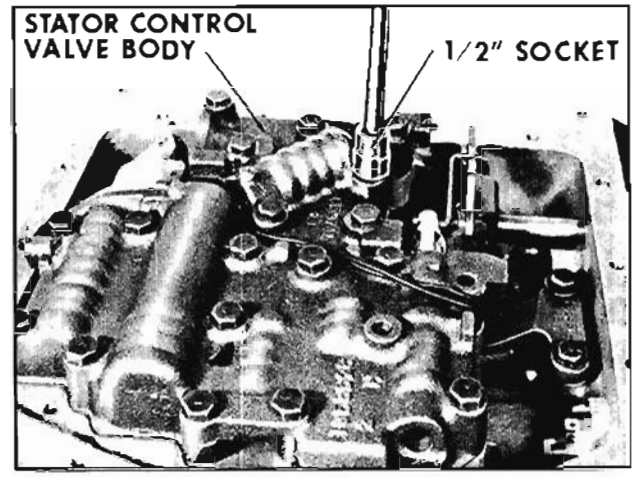


Fig. 6-463 Installing Stator Control Valve Body

7. Install the seven bolts retaining the stator control valve body. Torque bolts 8 to 11 ft. lbs. (Fig. 6-463)

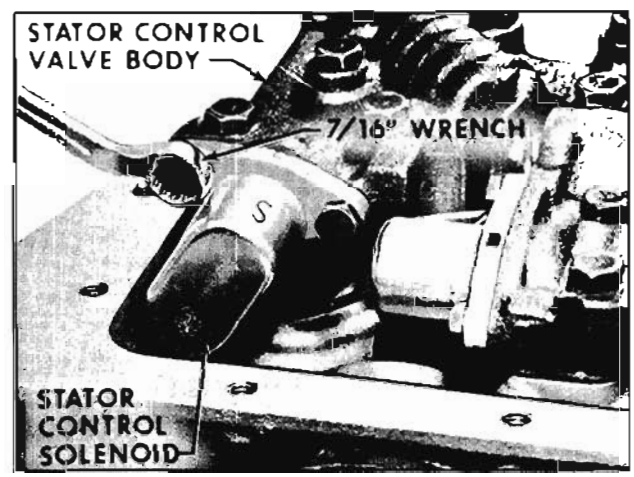


Fig. 6-464 Installing Stator Control Solenoid

8. Install stator control solenoid and gasket to stator control valve body. Torque bolts 8 to 12 ft. lbs. (Fig. 6-464)

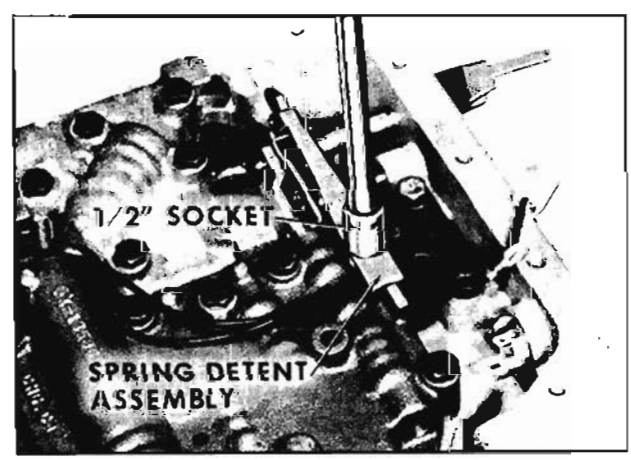


Fig. 6-465 Installing Spring Detent Assembly

9. Before installing spring detent assembly, note routing of solenoid wires. Install spring detent assembly. Torque bolt 8 to 12 ft. lbs. (Fig. 6-465)

10. Install solenoid junction into case. (Fig. 6-466)

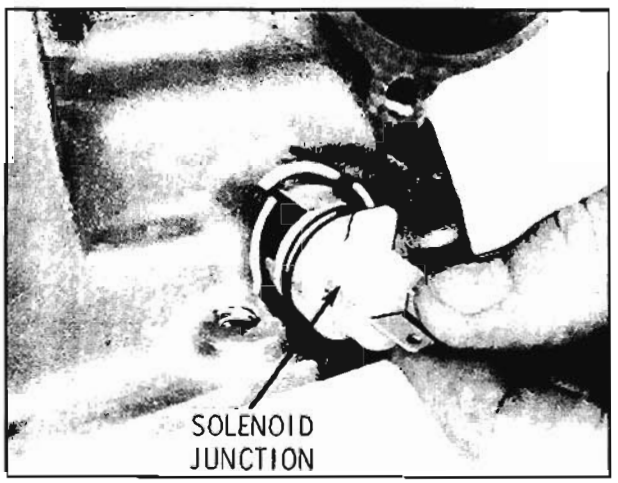


Fig. 6-466 Installing Solenoid Junction

11. Install solenoid connector to solenoid junction. (Fig. 6-467)

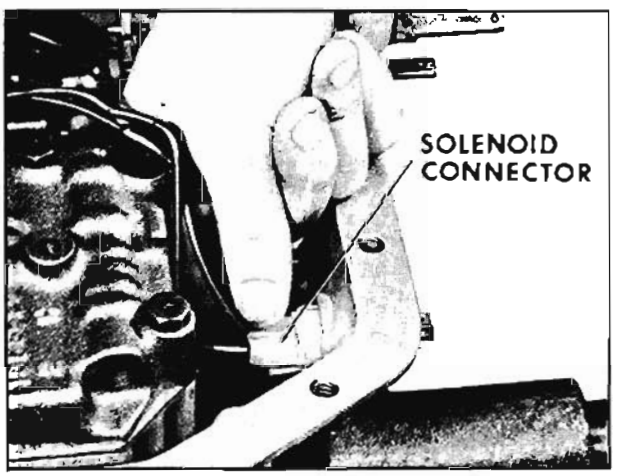


Fig. 6-467 Installing Solenoid Connector

12. Install oil strainer pipe to case seal. (Fig. 6-468)

13. Install strainer pipe to transmission case. (Fig. 6-469)

14. Install oil strainer to oil strainer pipe grommet. (Fig. 6-470)

15. With a turning motion, install oil strainer to oil strainer pipe. (Fig. 6-471)

16. Torque oil strainer retaining bolt 8 to 12 ft. lbs. (Fig. 6-472)

Fig. 6-468 Oil Strainer Pipe to Case Oil Seal

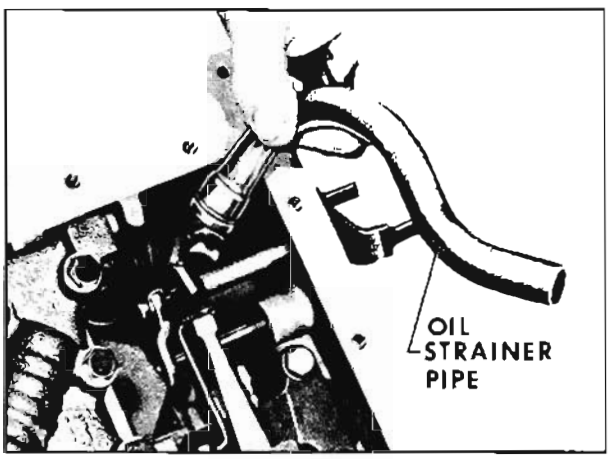


Fig. 6-469 Installing Oil Strainer Pipe

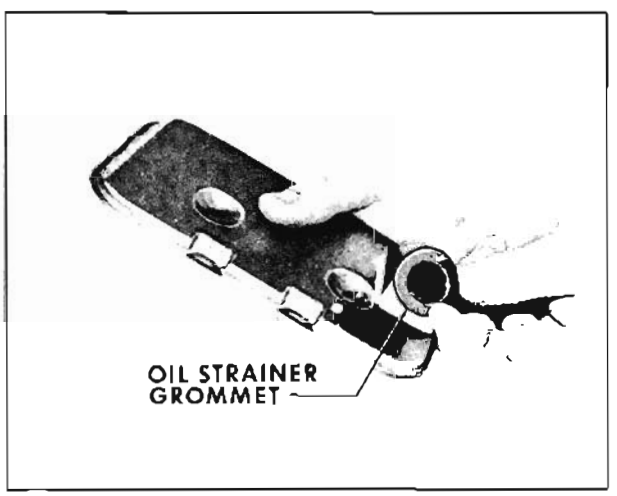


Fig. 6-470 Installing Oil Strainer Grommet

17. Install oil pan gasket and pan. (Fig. 6-473)

18. Install 14 oil pan attaching bolts. Torque bolts 10 to 12 ft. lbs. (Fig. 6-474)

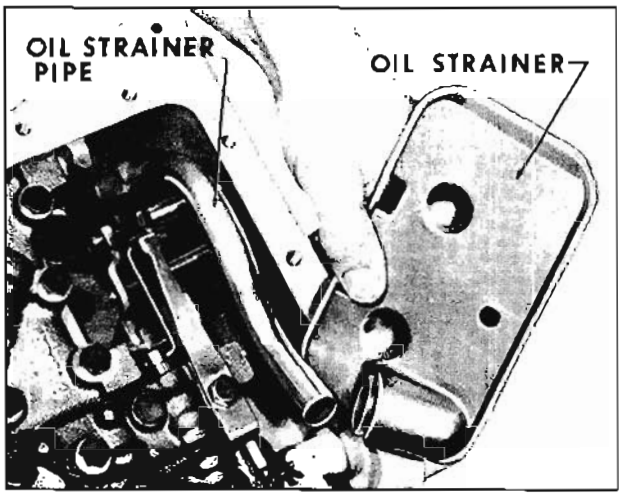


Fig. 6-471 Installing Oil Strainer

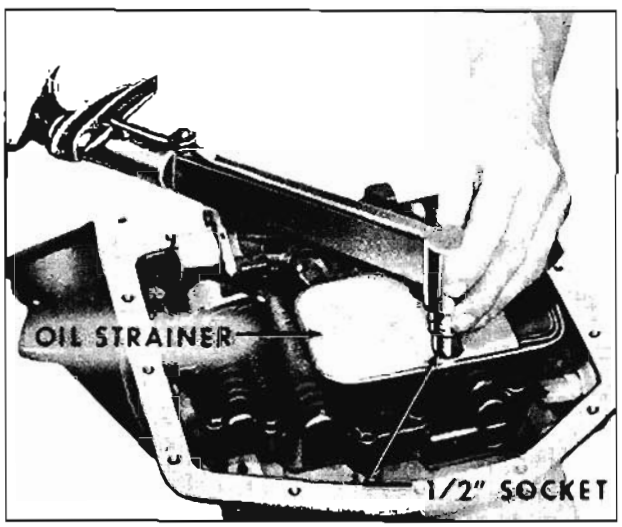


Fig. 6-472 Attaching Oil Strainer

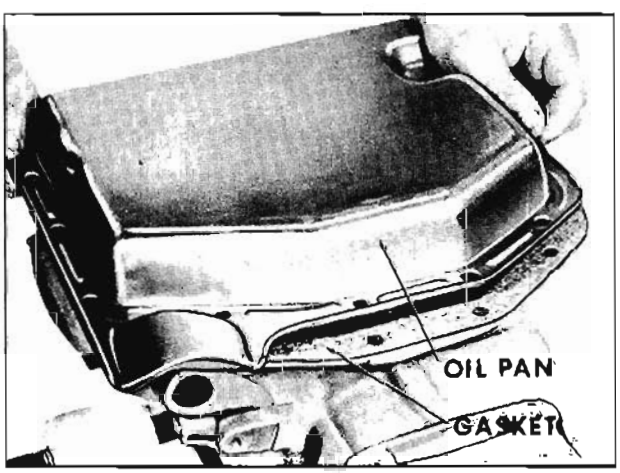


Fig. 6-473 Installing Oil Pan and Gasket

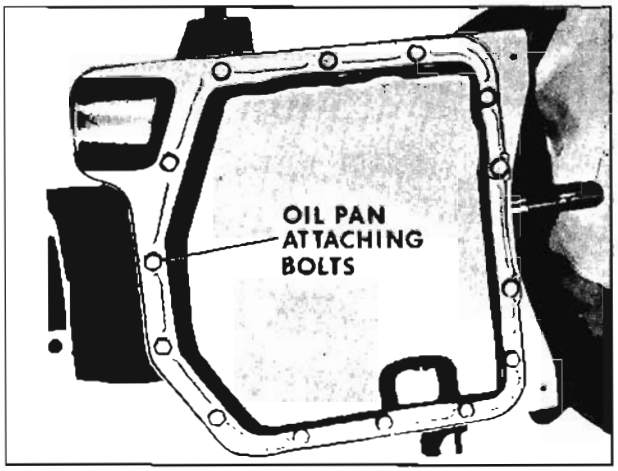


Fig. 6-474 Installing Oil Pan Attaching Screws

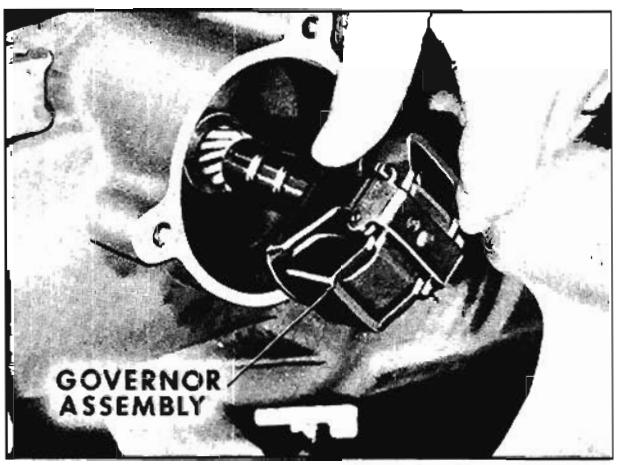


Fig. 6-475 Installing Governor Assembly

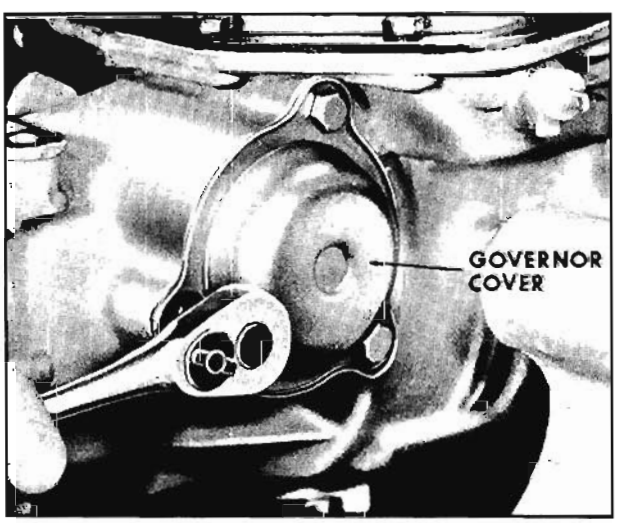


Fig. 6-476 Installing Governor Cover

Installing Governor

1. Slide governor into its bore in case. Turn governor assembly so teeth on governor gear engage teeth on output shaft. (Fig. 6-475)

2. Install governor gasket and cover to case. Torque bolts 8 to 12 ft. lbs. (Fig. 6-476)

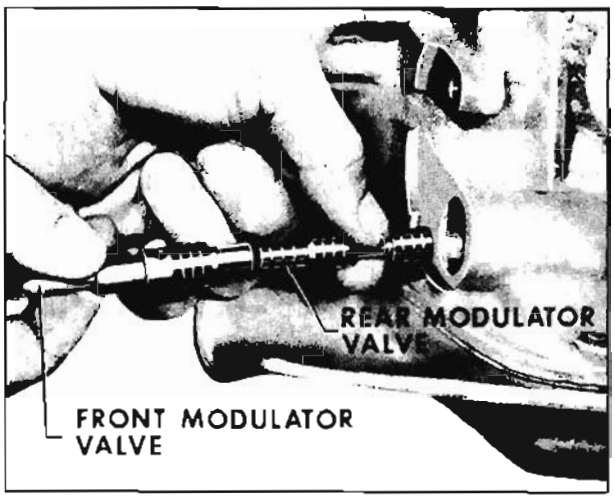


Fig. 6-477 Installing Modulator Valve

Installing Vacuum Modulator

1. Slide rear modulator valve into front modulator valve, then install into bore in case (Fig. 6-477)

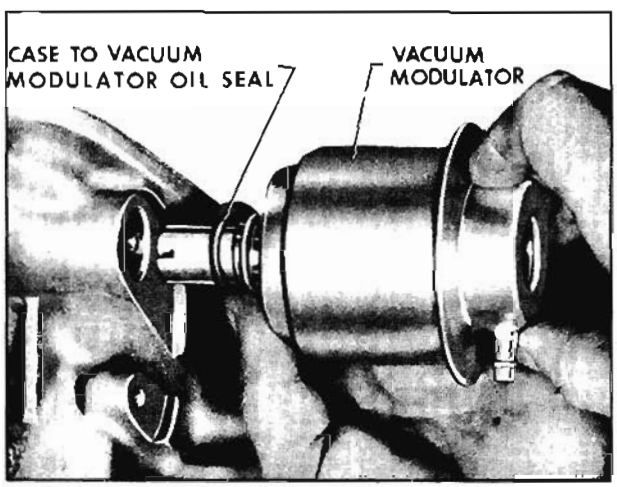


Fig. 6-478 Installing Vacuum Modulator

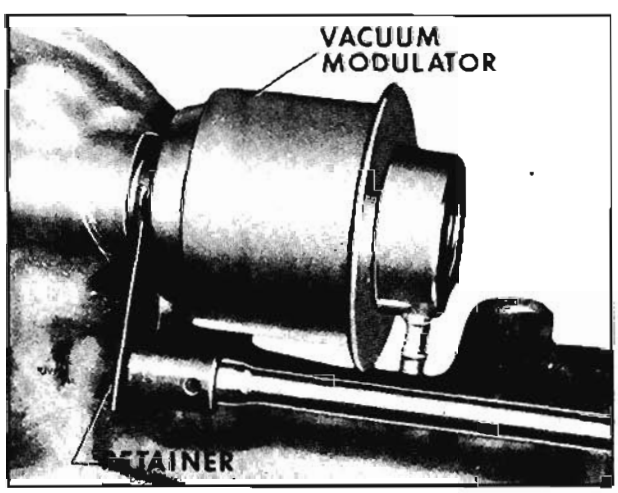


Fig. 6-479 Installing Vacuum Modulator Retainer

2. Install case to vacuum modulator oil seal. Install modulator into case. (Fig. 6-478)

3. Install vacuum modulator retainer. Install retainer so tang points toward vacuum modulator. Torque bolts 8 to 12 ft. lbs. (Fig. 6-479)

CHECKING CONVERTER

1. Check converter for leaks as follows:

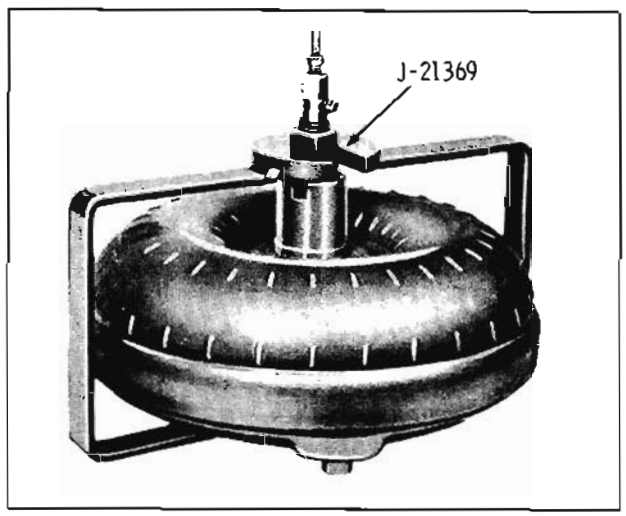


Fig. 6-480 Installing Tool J-21369

a. Install available Tool J-21369 and tighten. (Fig. 6-480)

b. Fill converter with air; 80 psi.

c. Submerge in water and check for leaks.

2. Check converter end clearance as follows:

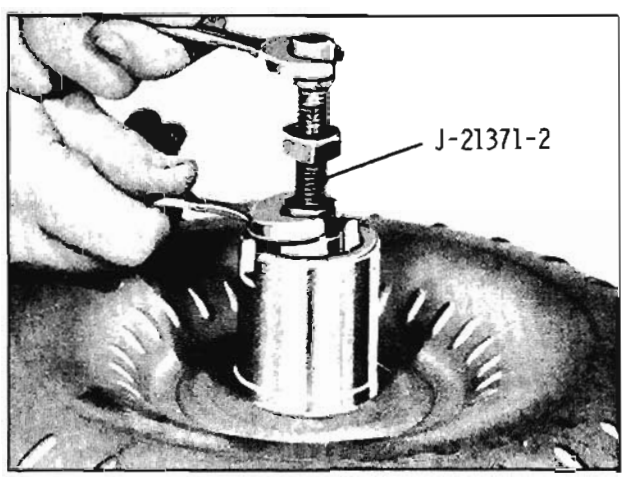


Fig. 6-481 Installing Tool J-21371-2

a. Install available Tool J-21371-2 and tighten brass nut. (Fig. 6-481)

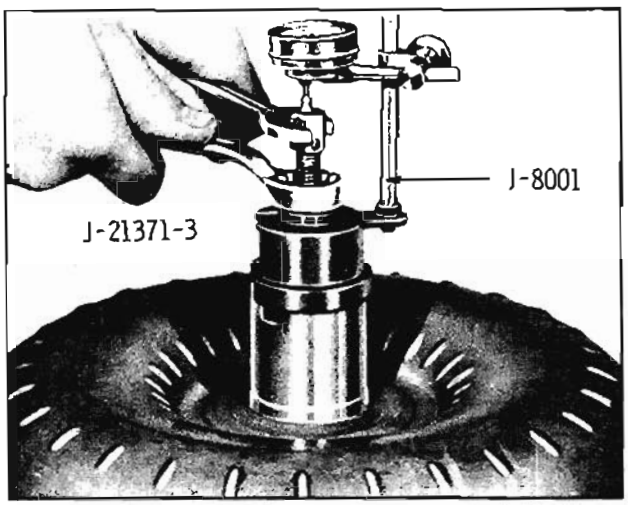


Fig. 6-482 Installing Tool J-21371-3

b. Install available Tool J-21371-3 and tighten hex nut. (Fig. 6-482)

c. Install dial indicator set at zero as shown in Fig. 6-482.

d. Loosen hex nut. When nut is fully loosened, the reading obtained on the dial indicator will be converter end clearance. End clearance should be less than .050".

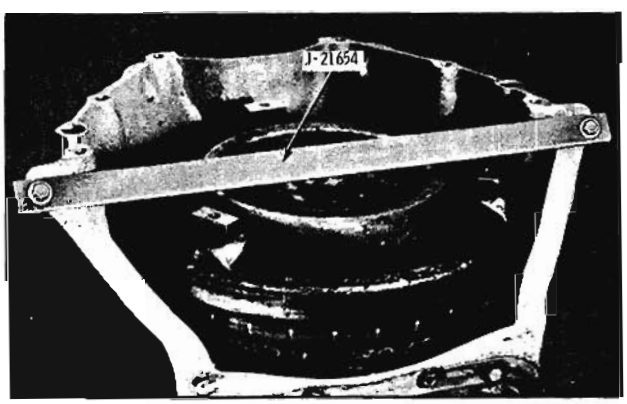


Fig. 6-484 Converter Holding Tool

3. Install converter. (Fig. 6-483)

4. Install Converter Holding Tool J-21654. (Fig. 6-484)

TROUBLE DIAGNOSIS GUIDE (Figs. 6-486, 6-487 & 6-488)

No Drive in Any Selector Position; Cannot Load Engine

1. Low oil level.

2. Clogged oil strainer screen or suction pipe loose.

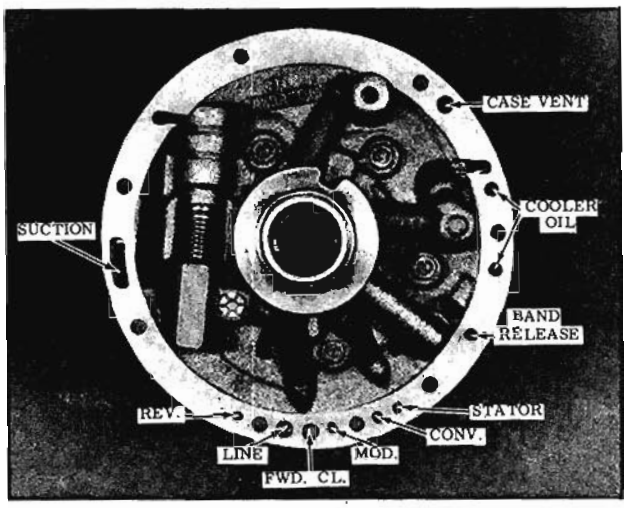


Fig. 6-485 Oil Passage Identification

3. Defective pressure regulator valve.

4. Front pump defective.

5. Input shaft broken.

Engine Speed Flares on Standstill Starts But Acceleration Lags

1. Low oil level.

2. Clogged oil strainer screen.

3. Servo piston seal leaking.

4. Band facing worn.

5. Low band apply struts disengaged or broken.

Engine Speed Flares on Upshifts

1. Low oil level.

2. Improper band adjustment.

3. Clogged oil strainer screen.

4. Forward clutch partially applied.

5. Forward clutch plates worn.

6. Forward clutch piston hanging up.

7. Forward clutch drum relief ball not sealing.

8. Vacuum modulator.

Upshifts Harsh

1. Vacuum modulator line broken or disconnected.

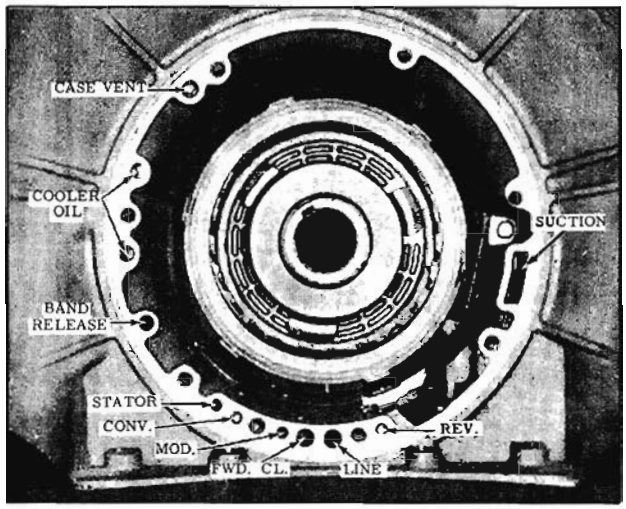


Fig. 6-486 Oil Passage Identification

2. Vacuum modulator diaphragm leaks.

3. Vacuum modulator valve stuck.

Closed Throttle (coast) Downshift Harsh

1. Improper low band adjustment.

2. High engine idle speed.

3. Downshift timing valve malfunction.

4. High main line pressure. Check the following:

   a. Vacuum modulator line broken or disconnected.

   b. Modulator diaphragm ruptured.

   c. Sticking pressure regulator coast valve, pressure regulator valve or vacuum modulator valve.

Clutch Failure

1. Low band adjusting screw backed off more than specified.

2. Improper order of clutch plate assembly.

3. Extended operation with low oil level.

4. Forward clutch drum relief ball stuck.

Car Creeps Excessively in Drive

1. Idle speed too high.

2. Closed throttle stator switch improperly adjusted.

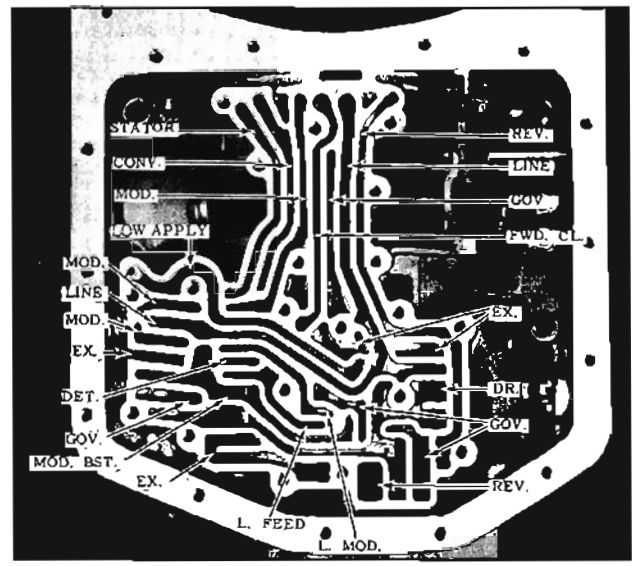


Fig. 6-487 Oil Passage Identification

Car Creeps in Neutral

1. Forward clutch or low band not released.

No Drive In Reverse

1. Reverse clutch piston stuck.

2. Reverse clutch plates worn out.

3. Reverse clutch seal leaking excessively.

4. Blocked reverse clutch apply orifice.

Transmission Case and Extension Oil Seal Leaks

1. Extension oil seal.

2. Outer shift lever oil seal.

3. Speedometer driven gear fitting.

4. Oil cooler pipe connections.

5. Vacuum modulator assembly and case.

Oil Forced Out of Filler Tube

1. Oil level too high, foaming caused by planet carrier running in oil.

2. Water in oil.

3. Leak in pump suction circuits.

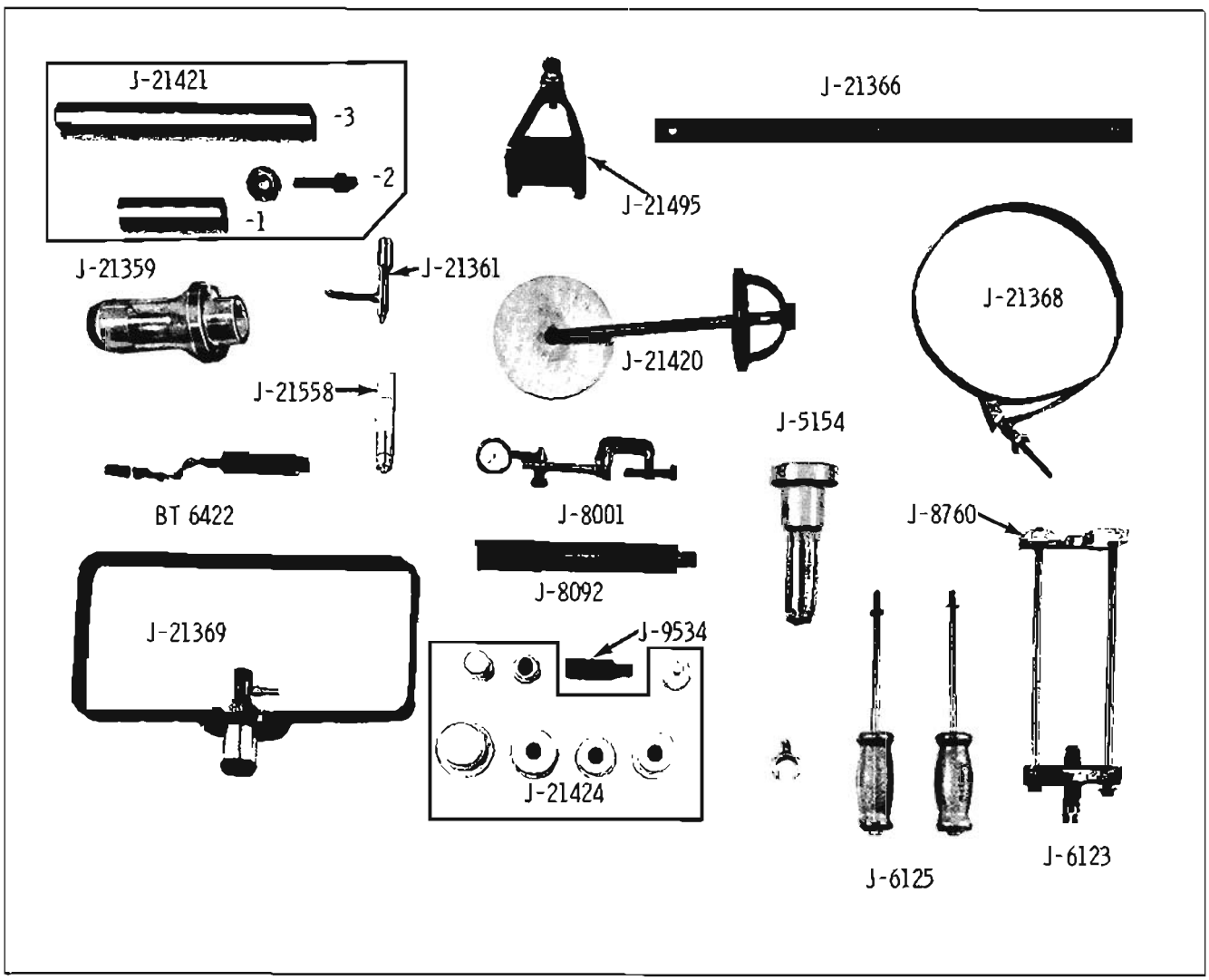


Fig. 6-488 Tools

J-5154	Rear Bearing Retainer Seal Installer
J-6123	Speedometer Gear Puller
J-6125	Slide Hammer
J-8001	Dial Indicator Set
J-8092	Driver Handle
J-8760	Speedometer Gear Remover Adapter
J-9534	Planet Carrier Bushing Remover
J-21359	Oil Pump Seal Installer
J-21361	Check Valve Seat Remover
J-21366	Converter Holding Strap
J-21368	Pump Body and Cover Alignment Band
J-21369	Converter Leak Tester
J-21420	Reverse Clutch Spring Compressor
J-21421	Speedometer Drive Gear Installer
J-21424	Bushing Remover and Installer Tool Set
J-21558	Check Valve Seat Installer
BT-6422	Speedometer Driven Gear Puller

SYNCHROMESH AND CLUTCH

34 AND 35 SERIES

CONTENTS OF SECTION 7

SYNCHROMESH

PERIODIC MAINTENANCE

The lubricant level should be checked at each engine oil change interval and if found to be below the filler plug level, add SAE 80 (preferred) or SAE 90 Multi-Purpose Gear Lubricant. Periodic or seasonal change of lubricant is not recommended.

ADJUSTMENT OF SHIFT RODS

The Synchromesh transmission requires two linkage adjustments to properly position the hand shift lever with respect to the steering wheel.

Shift Lever Adjustment (Fig. 7-1)

1. Set the transmission outer shift lever "A" in the second gear position (Lever "A" forward, lever "C" rearward).
2. Disconnect the shift rod from the steering column lower shift lever at clevis "B"
3. Hold the steering column lower shift lever upward against its stop in the steering column.
4. Install clevis pin through lower shift lever from the bottom side, then adjust clevis "B" so it slides over pin freely (Inset Fig. 7-1). Then shorten shift rod by turning clevis "B" 5-1/2 turns.
5. Install the clevis pin and cotter pin, then tighten the clevis lock nut.

Cross Shift Linkage Adjustment

1. Disconnect the cross shift rod from the steering column cross shift lever "E".

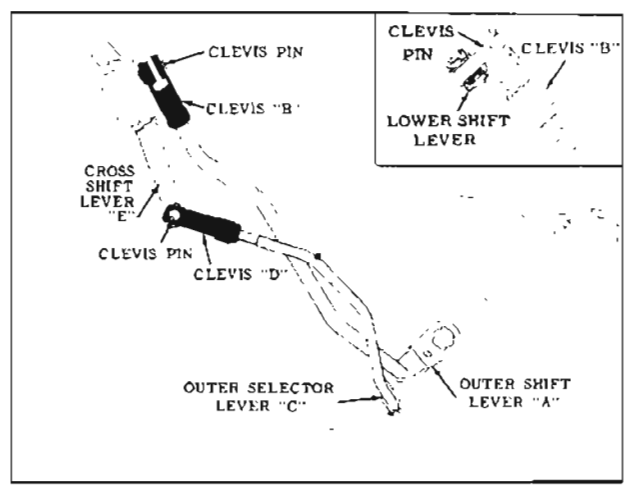


Fig. 7-1 Shift Lever Adjustment

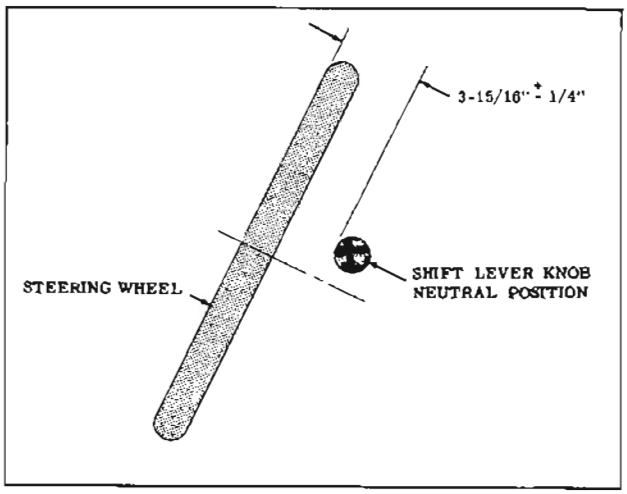


Fig. 7-2 Position of Shift Lever

2. With the transmission selector lever "C" rearward against its stop, adjust clevis "D" so that the clevis pin will easily enter the hole in lever "E" while holding the cross shift lever rearward to take up the lash. Then remove the clevis pin and lengthen the rod by five full turns of the clevis. This should bring the hand shift knob to within 3-15/16" ± 1/4" of the top of the steering wheel. (Fig. 7-2)

3. Install the clevis pin and cotter pin, then tighten the clevis lock nut.

THROTTLE CONTROL ADJUSTMENT (Fig. 7-3)

The throttle control adjustment must be made with the choke open and the throttle valves completely closed.

NOTE: Due to the split choke design, make sure fast idle cam is not touching fast idle adjusting screw.

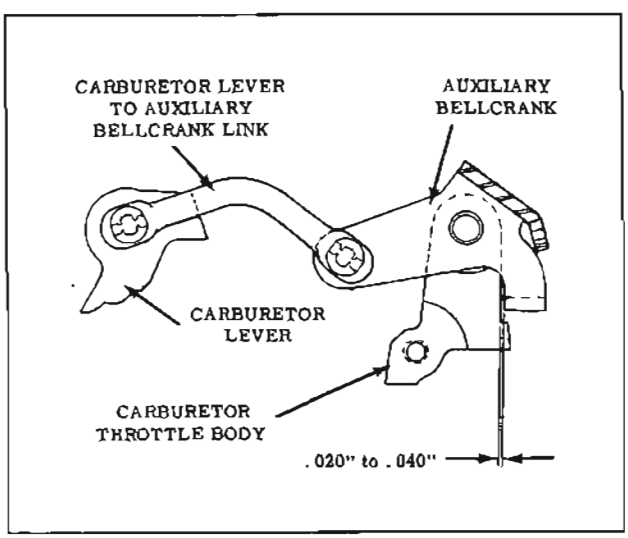


Fig. 7-3 Carburetor Lever to Auxiliary Bellcrank Adjustment (4 Barrel)

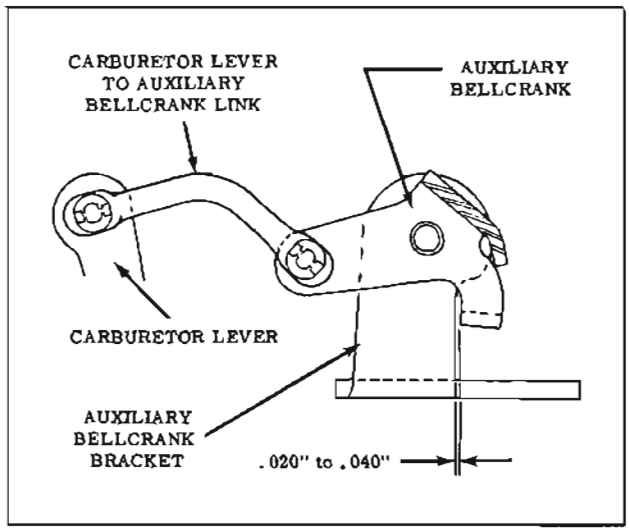


Fig. 7-4 Carburetor Lever to Auxiliary Bellcrank Adjustment (2 Barrel)

1. Place transmission in neutral.
2. Remove air cleaner.
3. Adjust throttle lever to auxiliary bellcrank link as follows:
   a. 4GC - With the use of a feeler or wire gauge, measure distance between machined surface of carburetor throttle body and the auxiliary bellcrank gauging tang. Clearance should be .020" to .040". If adjustment is necessary, remove auxiliary bellcrank link and bend as required. Install link and recheck clearance. (Fig. 7-3)
   b. 2GC - Repeat Step "a" with the exception that the clearance is measured between the auxiliary bellcrank bracket, bolted to the manifold, and the auxiliary bellcrank. (Fig. 7-4)
4. Adjust throttle rod to obtain the correct accelerator pedal height as indicated in Fig. 7-5.
5. Adjust slow idle as outlined in the TUNE-UP SECTION.

REAR BEARING RETAINER OIL SEAL

REMOVE AND INSTALL (With Propeller Shaft Removed)

1. Remove oil seal by prying seal from bearing retainer.
2. Coat outside diameter of new seal sparingly with Sealer Part No. 557622. Apply lubricant

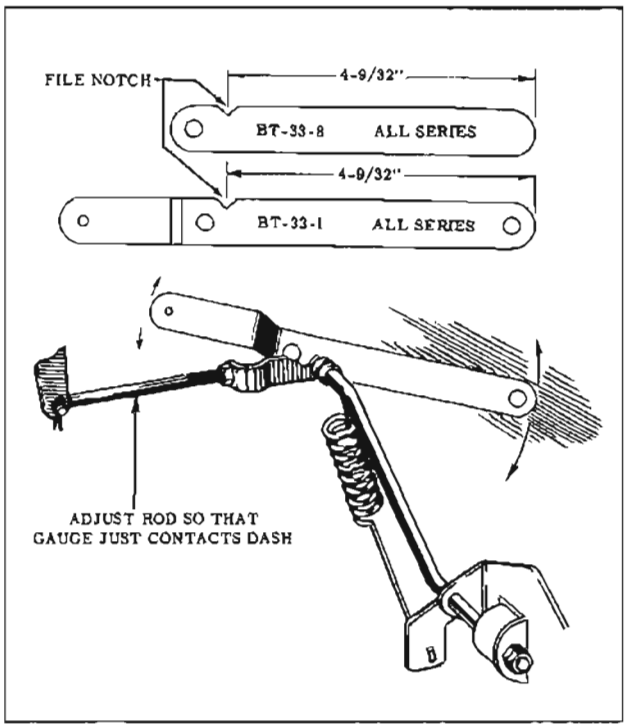


Fig. 7-5 Accelerator Pedal Adjustment

Part No. 567196 to the sealing lip of seal.

3. Drive seal into the rear bearing retainer using Seal Installing Tool J-5154 until seal is fully seated. (Fig. 7-6)

TRANSMISSION

REMOVE AND INSTALL

1. Drain transmission and disconnect control rods at the transmission.

2. Remove the propeller shaft.

3. Remove the four transmission to clutch housing attaching bolts and slide the transmission rearward until the main drive shaft clears the clutch housing. Lower the transmission.

To install the transmission, apply a light film of lubricant Part No. 567196 to the pilot on the main drive gear. Reverse the removal sequence and torque the transmission to clutch housing bolts 60 to 70 ft. lbs. Install propeller shaft and torque universal joints to differential companion flange 14 to 18 ft. lbs. Remove the hex plug on the rear bearing retainer and fill the rear bearing retainer with 1/2 pint of SAE 80 Multi-Purpose Gear Lubricant. (This will eliminate any chance of the rear bearing retainer bushing running dry until enough oil passes through the main shaft bearing to fill the rear bearing retainer.) Install the hex plug and torque 6 to 8 ft. lbs. Fill the transmission to the level of the filler plug hole with SAE 80 Multi-Purpose Lubricant, approximately two pints additional.

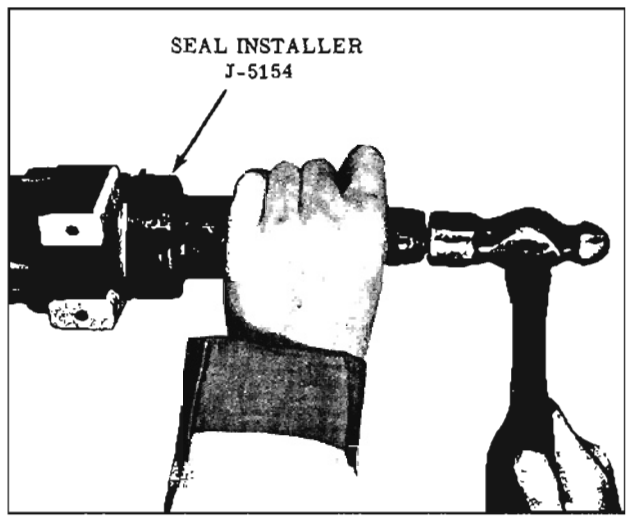


Fig. 7-6 Installing Rear Bearing Retainer Oil Seal

DISASSEMBLY

(Transmission Removed)

1. Clean the exterior of the transmission thoroughly.

2. Remove the return spring, spring extension, spring clip, cover, and cover gasket. (Fig. 7-7)

3. Remove rear bearing retainer and gasket.

4. Remove the set screws from two shifter yokes. (Fig. 7-13)

5. Pull the mainshaft rearward until the rear bearing clears the case.

NOTE: If fit between bearing and transmission case is tight, it may be necessary to

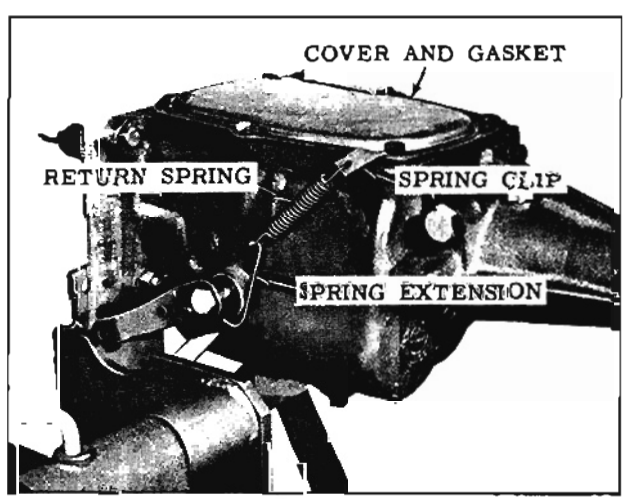


Fig. 7-7 Return Spring Assembly

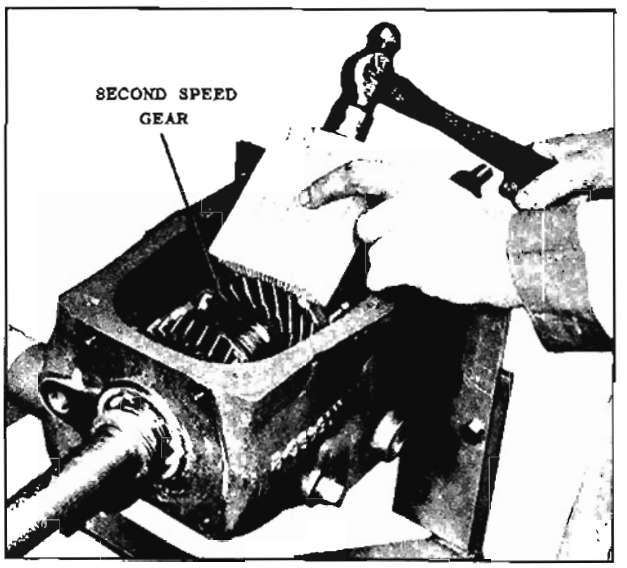


Fig. 7-8 Freeing Rear Bearing From Case

tap the second speed gear as shown in Fig. 7-8.

6. Remove the synchronizing clutch from the main shaft. (Fig. 7-9)

   NOTE: If necessary to service only the main drive shaft, main drive gear, or main drive shaft bearing, the assembly can be removed at this point in the disassembly. (Refer to Step 19)

7. Remove the snap ring holding the second speed gear on the main shaft. (Fig. 7-10)

8. Remove the keyed thrust washer, the second speed gear, and the rear thrust washer from the main shaft. (Fig. 7-11)

9. Remove the low and reverse gear retaining ring and slide the gear off the main shaft. (Fig. 7-12)

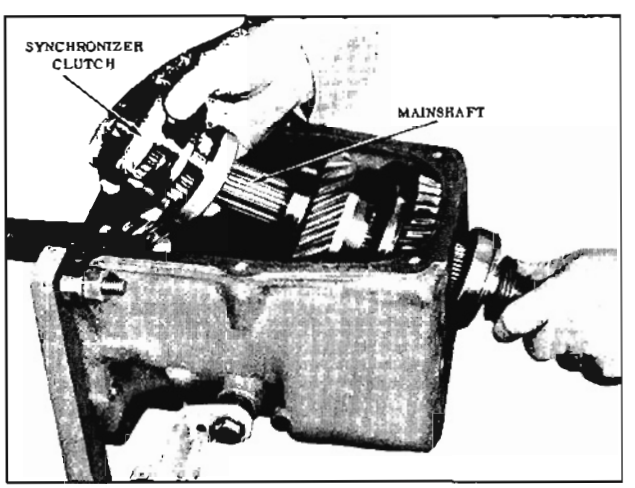


Fig. 7-9 Removing Synchronizing Clutch

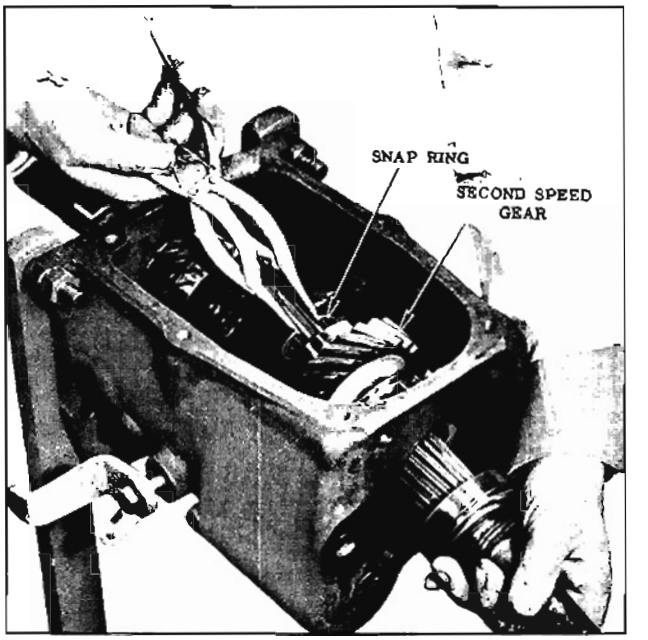


Fig. 7-10 Removing Second Speed Gear Snap Ring

10. Pull the main shaft from the rear of the case.

11. Loosen the outer shift lever bolt. Position the lever so that the inner shift levers are vertical and remove the outer shift lever. (Fig. 7-12)

12. Remove the set screws from the inner shift levers. (Fig. 7-13)

13. Pull selector shaft away from the second and third speed shifter shaft and remove the interlock retainer. (Fig. 7-14)

14. Drive the selector shaft out through the right side of the case. The welch plug will be driven out by the shaft. Do not allow levers of interlock to drop into the case.

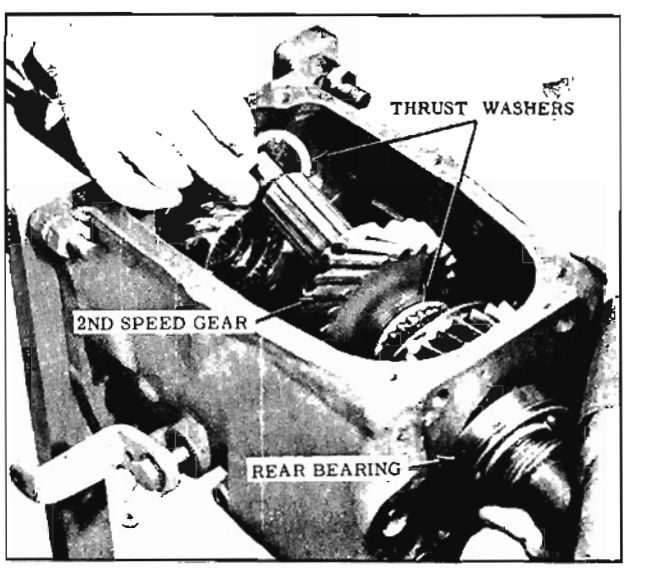


Fig. 7-11 Removing Second Speed Gear

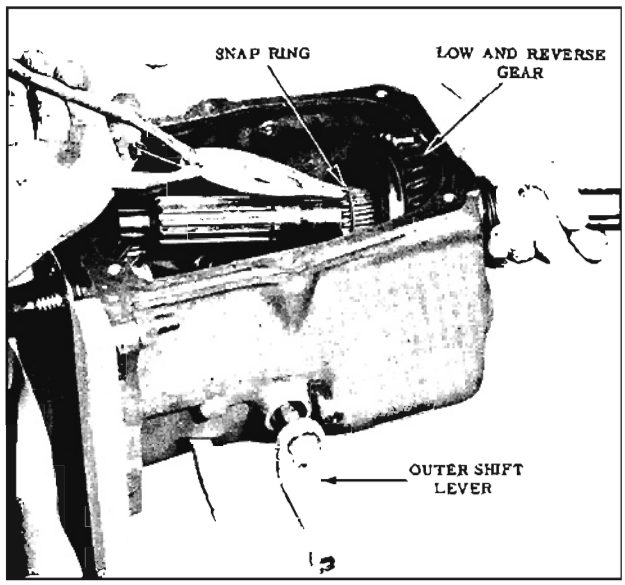


Fig. 7-12 Low and Reverse Gear Snap Ring

NOTE: The selector shaft can be removed from the left side of the case, however, damage to the selector shaft seals will result.

15. Push or tap the first and reverse shifter shaft out through the rear of the case, taking care to prevent the poppet ball and spring from flying out. Remove the first and reverse shifter yoke, ball and spring.

16. Push or tap the second and third shifter shaft out through the front of the transmission case, taking care to prevent the poppet ball and spring from flying out. Remove the second and third shifter yoke, ball and spring.

17. Remove the first and reverse interlock pin from the case near the selector shaft seals. (Fig. 7-15)

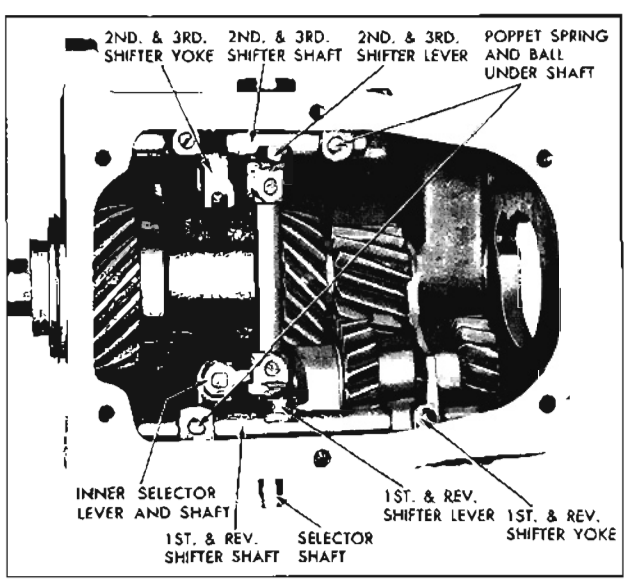


Fig. 7-13 Shift Mechanism

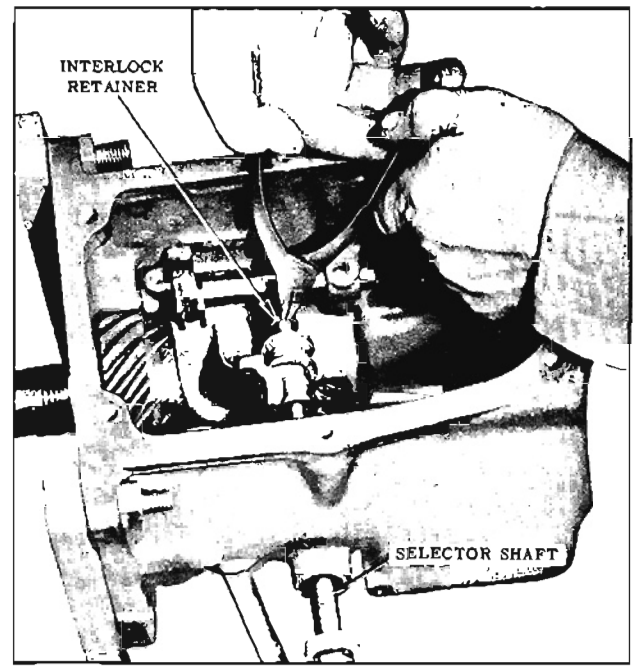


Fig. 7-14 Removing Interlock Retainer

18. Drive the counter gear shaft lock pin into the shaft. (Fig. 7-16)

19. Remove the retaining ring from the main drive gear bearing outer race and tap the drive gear and bearing assembly toward the rear of the case. Remove the main drive gear assembly from the case.

20. Drive the counter gear shaft out through the rear end of the case using Bearing Loader Tool J-1001-A and a brass hammer. Make

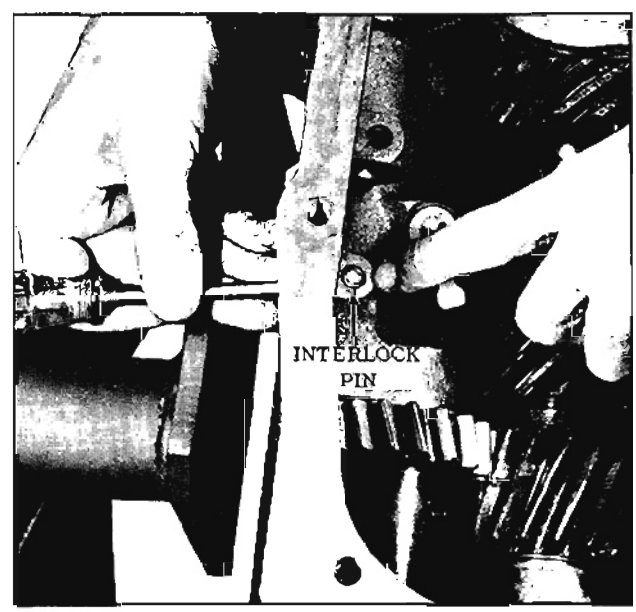


Fig. 7-15 Removing First and Reverse Interlock Pin

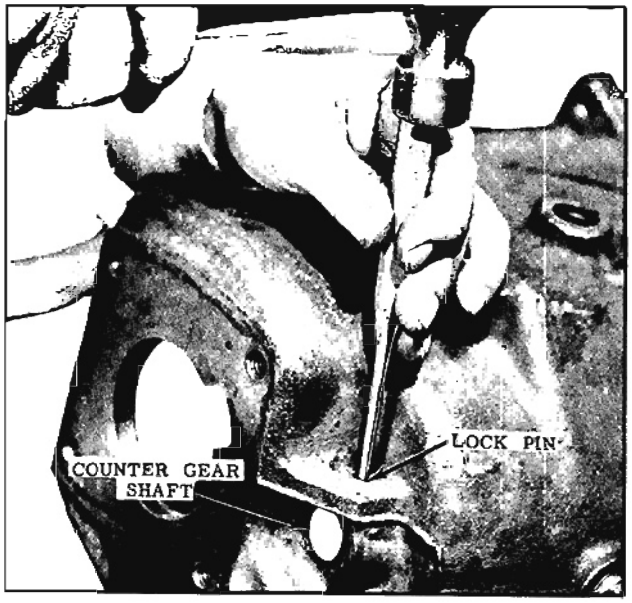


Fig. 7-16 Driving Lock Pin Into Shaft

sure that the bearing loader tool follows the shaft closely so that the counter gear bearings and thrust washers will be held in place. (Fig. 7-17)

21. Remove the counter gear assembly from the case.

22. Remove the transmission outer selector lever nut, lock washer, lever and seal, then remove the inner selector shaft and lever assembly.

23. Drive the reverse idler gear shaft lock pin into the shaft. (Fig. 7-18)

24. Drive the reverse idler gear shaft out the rear of the case.

NOTE: A 1/2" x 8" brass drift should be used to remove the shaft by driving on the

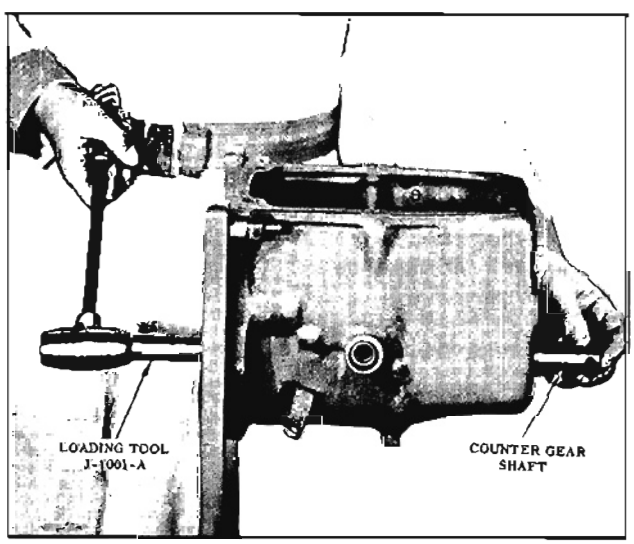


Fig. 7-17 Removing Counter Gear Shaft

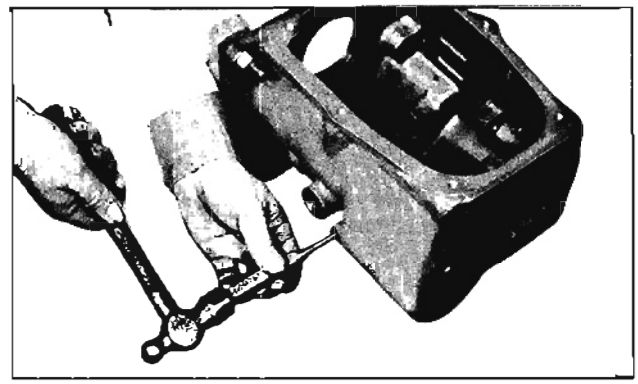


Fig. 7-18 Driving Lock Pin Into Idler Shaft

idler gear shaft through the counter gear shaft boss in front of case.

25. Remove the reverse idler gear shaft, gear, and thrust washer from the case. (Fig. 7-19)

26. Remove lock pin from reverse idler gear shaft.

CLEANING AND INSPECTION

1. Wash all bearings thoroughly in clean solvent, then air dry. Lubricate bearings with light engine oil and check for roughness.
2. Wash the transmission case thoroughly inside and out with cleaning solvent. Inspect case for cracks, burrs on the front or rear faces of case and for rough or damaged bearing or shaft bores.
3. Wash the rear bearing retainer thoroughly inside and out with cleaning solvent. Inspect retainer for cracks, roughness or scores in bearing bore.

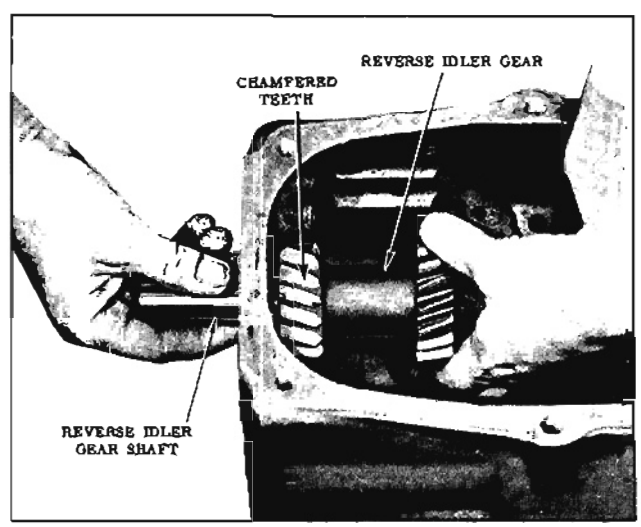


Fig. 7-19 Removing Reverse Idler Gear Shaft

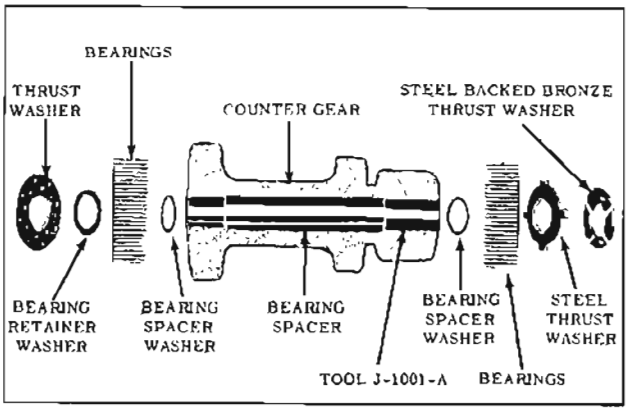


Fig. 7-20 Counter Gear Assembly

4. Inspect all gears for excessive wear, chips or cracks. Replace gears as necessary.

5. Inspect main shaft and main drive gear splines for nicks or excessive wear.

6. Inspect companion flange for SCARS, NICKS or excessive wear on the bearing or sealing surfaces. Any of these conditions requires replacement of the flange.

SERVICING INDIVIDUAL UNITS

Counter Gear Assembly (Fig. 7-20)

If the counter gear bearings or gear requires replacement, the bearings, retaining washer, thrust washers, and bearing spacer must be removed from the counter gear. Assemble the parts as follows:

1. Install the bearing spacer and the bearing spacer washers on Bearing Loader Tool J-1001-A, then insert the tool into the counter gear.

2. Install 26 needle bearings in each end of the gear around the bearing loader tool. Position the first bearing under the loader tool so that the tool is centered in the bore of the gear.

3. Install the bearing retainer washer and large perforated thrust washer on the loader tool at the large end of the counter gear. Use petrolatum to retain the washers in place.

4. Install the steel thrust washer on the loader tool at the small end of the counter gear, indexing the four tangs with the four slots in gear. Then install the bronze and steel thrust washer on the tool. Retain with petrolatum.

   NOTE: Steel side of washer must be toward case.

5. Leave the Bearing Loader Tool J-1001-A in place until the counter gear is installed in the case.

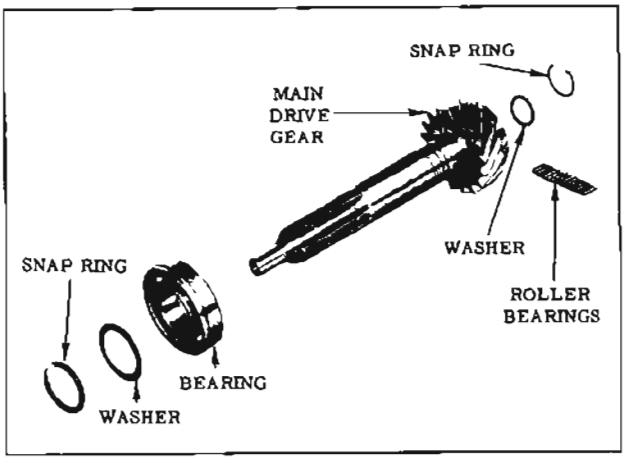


Fig. 7-21 Main Drive Gear Assembly

Main Drive Gear

If necessary, the main drive gear ball bearing or roller bearings may be replaced.

1. Remove the retaining ring and washer holding the main drive gear bearing to the main drive gear. (Fig. 7-21)

2. Remove the bearing by jarring the shaft on a block of wood.

3. Pry the wire lock ring from the bore of the main drive gear, then remove retaining washer and 14 needle bearings.

4. To assemble, hold the shaft in the vertical position and install the needle bearings in the bore of the gear, using petrolatum if neces-

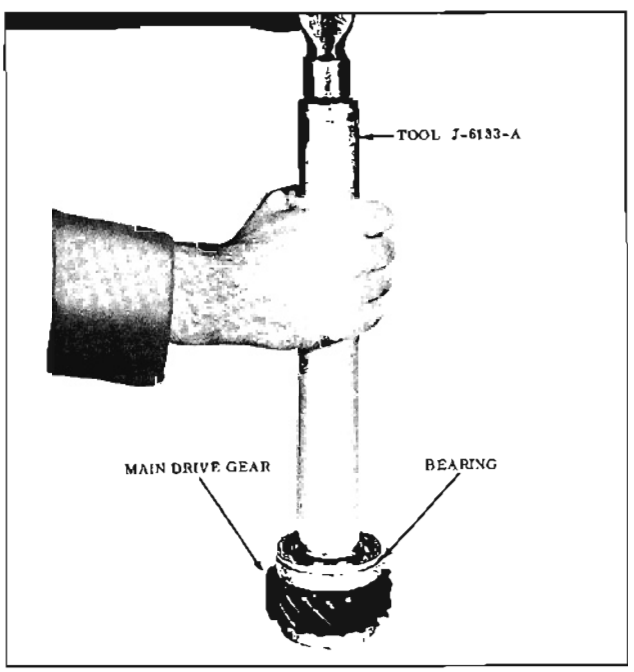


Fig. 7-22 Installing Bearing

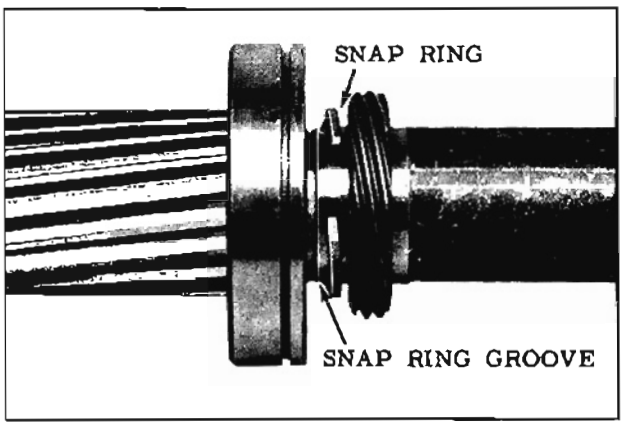


Fig. 7-23 Snap Ring Position Prior to Disassembly of Main Shaft

sary to retain the bearings. Install the retaining washer and lock ring.

5. Install the main drive gear bearing on the shaft, shielded side toward gear with Tool J-6133-A. (Fig. 7-22)

6. Install the washer, dished side TOWARD the bearing, then install the retaining ring on the shaft against the washer.

Main Shaft

The speedometer drive gear and rear bearing can be removed from the main shaft as follows:

1. Bend the speedometer gear spacer and remove from the shaft. Discard spacer.

NOTE: In some cases the spacer and speedometer drive gear may have already been removed from the main shaft.

2. Remove the retaining ring from the groove and slide along the shaft toward the speedometer drive gear. (Fig. 7-23)

3. Place the first and reverse gear on the main shaft with the flat side of the gear toward the bearing. Using the first and reverse gear as a slide hammer, remove the speedometer drive gear, retaining ring and bearing from the shaft. (Fig. 7-24)

4. To assemble the parts, install the bearing on the main shaft with the shielded side toward the shoulder of the first and reverse splines on the main shaft and seat the bearing against the first and reverse gear splines on the main shaft. (Fig. 7-25)

5. Install the retaining ring against the inner race of the bearing.

NOTE: It is not necessary to install a spacer or speedometer drive gear as the speedometer is driven by the left front wheel.

Rear Bearing Retainer

The only item serviced in the rear bearing retainer is the seal. If the seal requires replacement, pry seal out and install a new one as follows:

1. Apply a coating of lubricant Part No. 567196 to the sealing lip of the seal.
2. Apply a light coat of sealer; Part No. 557622 to the outer diameter of the seal.

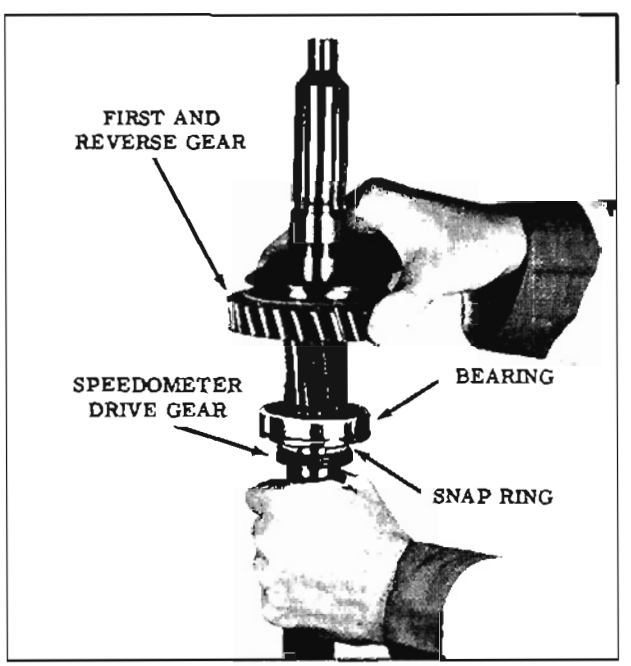


Fig. 7-24 Removing Bearing and Gear

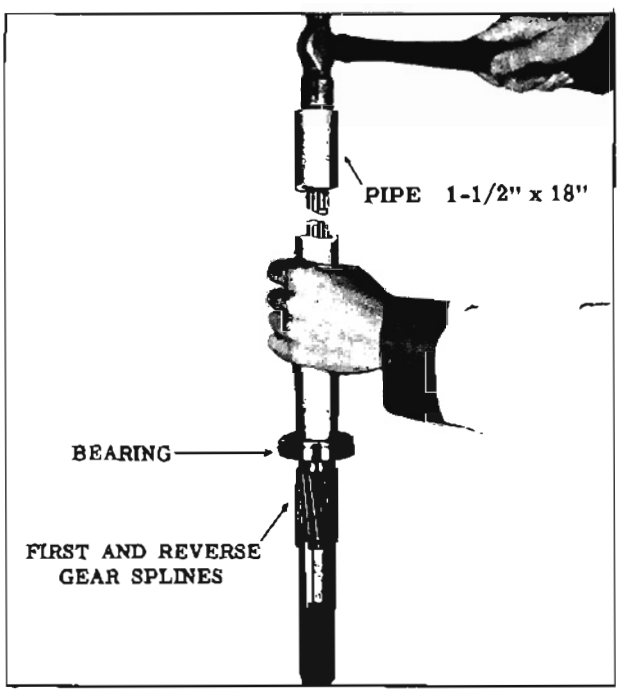


Fig. 7-25 Installing Rear Bearing

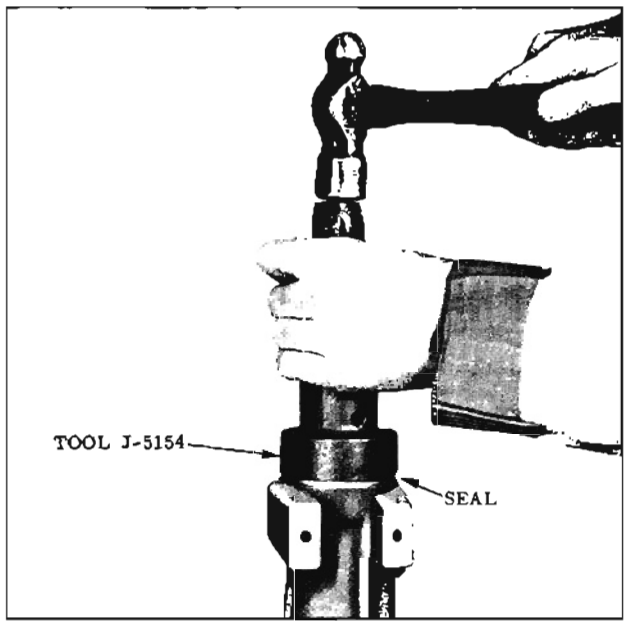


Fig. 7-26 Installing Rear Bearing Retainer Oil Seal

3. Install the seal into the rear bearing retainer using Seal Installing Tool J-5154. (Fig. 7-26)

Synchronizing Clutch

The synchronizing clutch detent springs are serviced separately and replacement, if necessary, can be accomplished by prying each spring loose from the gear and pushing it out of the groove. (Fig. 7-27) New springs can be installed by pushing them into position in the grooves.

Selector Shaft Seals

The selector shaft seals can be removed and replaced if necessary. Pry out the old seals from the case. Coat the sealing lip of the new seals with lubricant, Part No. 567196, coat the outer diameter of the seals with Sealer, Part No. 557622. Install the seal without the garter spring in the case using a tool such as a socket until it bottoms in the case. Install the seal, with the garter spring, toward the transmission until it is flush with the case.

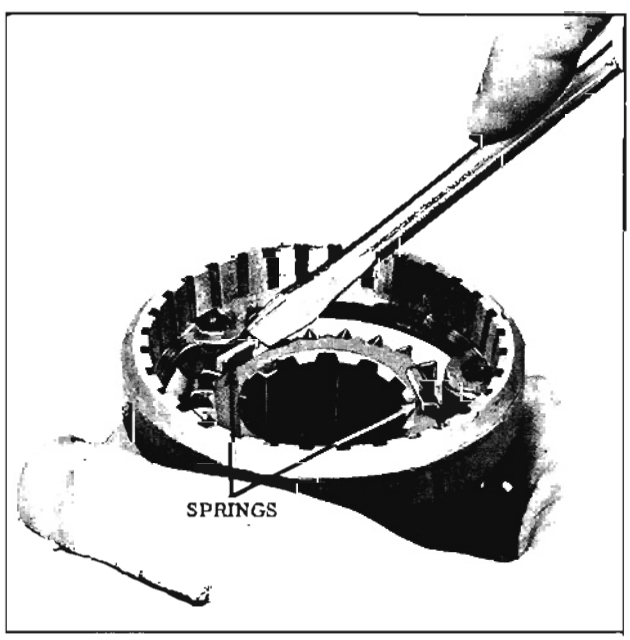


Fig. 7-27 Removing Synchronizing Clutch Springs

Reverse Idler Gear Bushings

The reverse idler gear bushings can be replaced if necessary. However, the new bushings must be line reamed after they are installed. Drive out the old bushings, then install the new ones until they are positioned just beyond the chamfer in the gear. New reverse idler gears contain bushings which are machined to size.

TRANSMISSION

ASSEMBLY

1. Install the reverse idler gear as follows:

   a. Position the reverse idler gear and bronze thrust washers into the case (chamfered teeth to the rear of the case), then install the idler gear shaft (slotted end out) until the front of the shaft picks up the front thrust washer and just starts into the inner support in the case. (Fig. 7-28)

   b. Coat the protruding end (slotted) of the shaft with sealer Part No. 557622.

   c. Make sure the lock pin hole in the shaft is in line with the lock pin hole in the case. The slot in the end of the idler gear shaft is for this purpose. Finish driving the shaft into the case using a brass drift and a hammer.

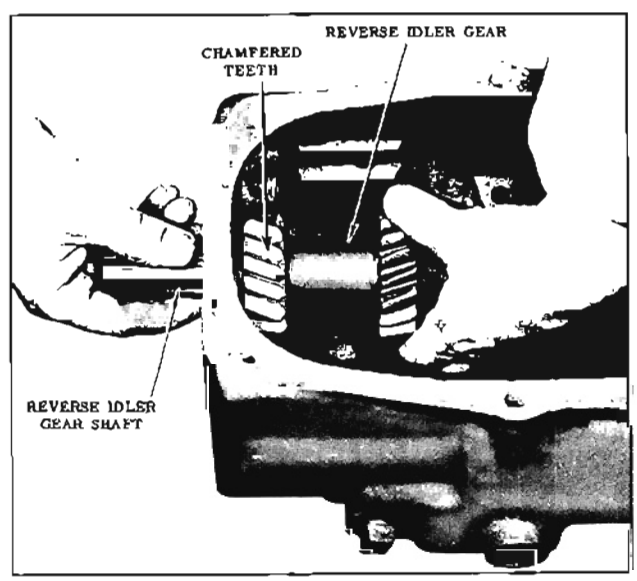


Fig. 7-28 Installing Reverse Idler Shaft

d. Coat a new lock pin with sealer Part No. 557622. Drive the lock pin 1" below the surface of the boss on the case.

2. Install the counter gear as follows:

a. Position the counter gear assembly into the case, with the large bronze thrust washer toward the front of the case.

b. Align the counter gear assembly with the counter gear shaft holes in the case. The tang of the combination steel and bronze thrust washer must index with the case. Install the counter gear shaft, small end first, from the rear of the case until the front end of the shaft just enters the bore in the front wall of the case. Make sure that the shaft closely follows the bearing loader Tool J-1001-A so that the bearings and thrust washers are held in place.

c. Line up the lock pin hole in the shaft with the lock pin hole in the case, then coat the protruding end of the shaft with sealer Part No. 557622. Finish driving the shaft into the case using a brass drift and a hammer.

d. Coat a new lock pin with sealer, Part No. 557622, and drive pin flush with case.

3. Install the spring washer, flat washer, and the oil seal on the inner selector shaft in that order, with the crowned side of the spring washer against the flat washer. (Fig. 7-29)

4. Apply lubricant Part No. 567196 to the inner selector shaft, insert the shaft in the transmission case, then install the seal, outer selector lever, washer, and nut so that the bend of the lever is down.

5. Install the main drive gear shaft into front of case. Install bearing retainer ring.

6. Install a new welch plug coated with sealer, Part No. 557622, in the side of the case opposite the selector shaft seals. The welch plug is seated when it bottoms in the bore in the case.

7. Install the selector shaft and shifter levers as follows: (Fig. 7-30)

a. Coat the sealing lips of the seals with lubricant, Part No. 567196, then insert the selector shaft through the seals until it just protrudes inside the case.

b. Engage the first and reverse shifter lever with the inner selector lever in the case, then depress the inner selector lever while sliding the selector shaft through the first and reverse shifter lever.

NOTE: The flat ground surface of the shifter lever must face left side of case.

c. Install the second and third shifter lever on the selector shaft, installing the flat ground surface of the lever toward the right side of case. Place the second and third speed interlock on the selector shaft. Install a new interlock retainer on the shaft. Do not install set screws at this time.

NOTE: The retainer can be installed and clinched with a pair of needle nose pliers.

8. Install the selector shaft interlock pin in the case. Move selector shaft until the interlock pin engages groove in selector shaft. (Fig. 7-30)

9. Install the spring and poppet ball for the first and reverse shifter shaft in the case, then install the shifter shaft from the rear of the case with the grooved end rearward and place the first and reverse shifter yoke on the shaft with the set screw hole facing up. Use a punch to depress the poppet ball and spring when

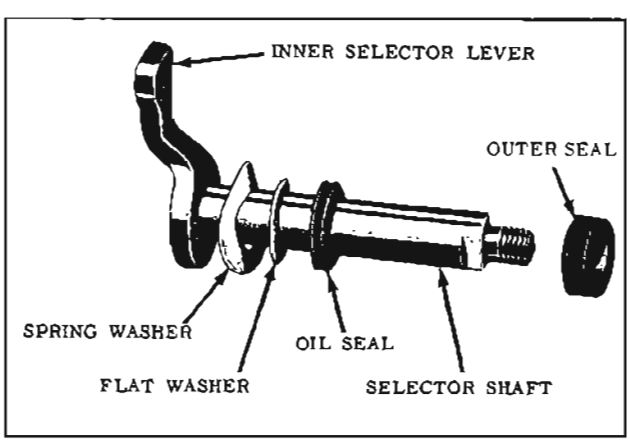


Fig. 7-29 Inner Selector Lever and Shaft

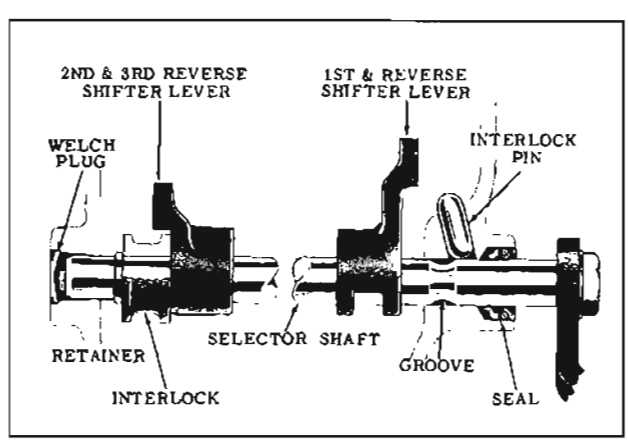


Fig. 7-30 Selector Shaft and Related Parts

installing the shaft. Do not install the set screw at this time.

10. Install the spring and poppet ball for the second and third speed shifter shaft in the case. Move selector shaft so that the second and third interlock will be directly under the second and third shifter shaft. Install the shaft from the front of the case with three notched detents rearward and place the second and third shifter yoke on the shaft with the set screw hole facing up. Do not install the set screw at this time.

11. Position first and reverse and the second and third shifter shafts so that the notch in each shaft is directly above the selector shaft.

    NOTE: This is the neutral position.

12. Install NEW set screws in the shifter levers and tighten with a screwdriver socket and torque 15 to 20 ft. lbs. Stake set screws to prevent loosening.

13. Install the outer shift lever, lock washer and bolt on the selector shaft.

14. Insert the main shaft through the bore in the rear of the transmission case, then slide the first and reverse gear on the shaft with flat side of the gear rearward. Install the first and reverse gear (thin) retaining ring in groove in spline.

15. Line up the small wire spacer ring in the ring groove in the main shaft with the machined thrust washer keyway groove on the second speed gear bearing surface. (Fig. 7-31)

    NOTE: There are two grooves machined the full length of the second speed gear bearing surface of the main shaft. The shallow angle groove is for lubrication purposes only and should not be obstructed. The deep groove, similar to a spline, is designed to receive the tangs of the two second speed gear thrust washers.

16. Install the second speed gear inner thrust washer, indexing the tang with the proper groove on the main shaft.

17. Place the second speed gear on the main shaft with the cone clutch surface facing forward, install outer thrust washer and retain with a NEW retaining ring.

18. Install the synchronizing drum on the main shaft with the counterbored end of the gear toward the second speed gear. (Fig. 7-32) Engage the synchronizing drum with the second and third speed shifter yoke and index the first and reverse shifter yoke, then tap the main shaft forward until it pilots in the main drive gear and the rear bearing pilots in the case.

19. Install the rear bearing retaining ring.

20. Install NEW set screws in the shifter yokes and tighten 15 to 20 ft. lbs. Stake set screws to prevent loosening.

    NOTE: These screws are deformed at the slotted end to provide a self-locking feature to prevent screws from loosening. This feature is lost if the screws are used a second time.

21. Coat the rear bearing retainer bushing with SAE 80 Multi-Purpose Gear Lubricant, then

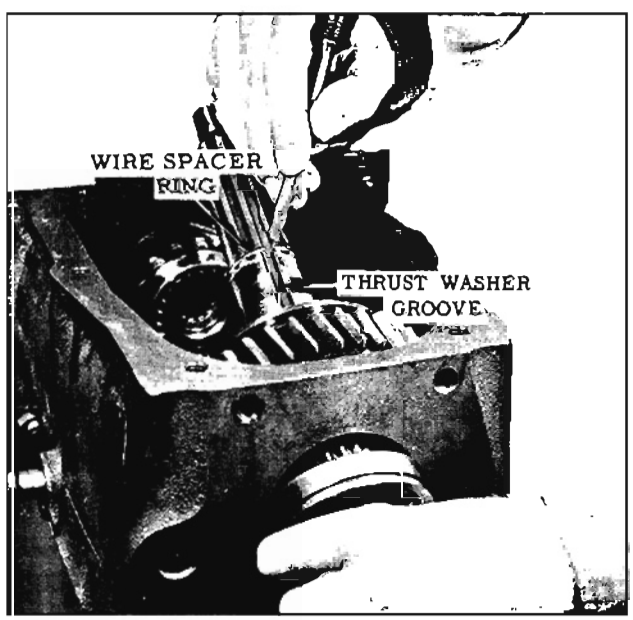


Fig. 7-31 Lining Up Wire Spocer Ring

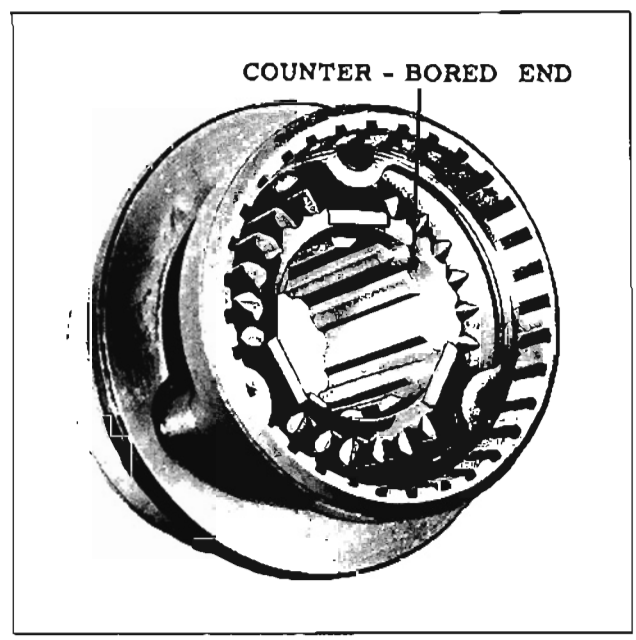


Fig. 7-32 Synchronizing Drum

position a new rear bearing retainer gasket and the rear bearing retainer on the transmission case.

22. Apply sealer, Part No. 557622 on the rear bearing retainer screws. Install the screws and tighten 28 to 33 ft. lbs.

23. Coat the sealing lip of the rear bearing retainer oil seal with lubricant Part No. 567196. Coat the outer diameter of the seal with sealer, Part No. 557622.

24. Install the seal into the rear bearing retainer using Seal Installing Tool J-5154.

25. Position a new top cover gasket on the transmission case and install the top cover, spring clip, attaching screws and lock washers. Torque screws 10 to 12 ft. lbs.

26. Install the toggle spring and spring extension between the spring clip and the outer shift lever.

To install the transmission, apply a light film of lubricant, Part No. 567196, to the pilot on the main drive gear. Reverse the removal sequence and torque the transmission to clutch housing bolts 60 to 70 ft. lbs. Install propeller shaft and torque universal joints to differential companion flange 14 to 18 ft. lbs. Remove the hex plug from the rear bearing retainer and fill the rear bearing retainer with 1/2 pint of SAE 80 Multi-Purpose Gear Lubricant. (This will eliminate any chance of the rear bearing retainer bushing running dry until enough oil passes through the main shaft bearing to fill the rear bearing retainer.) Install the hex plug and torque 6 to 8 ft. lbs. Fill the transmission to the level of the filler plug hole with SAE 80 Multi-Purpose Lubricant (approximately two pints additional).

CLUTCH HOUSING ALIGNMENT

(WITH TRANSMISSION AND CLUTCH ASSEMBLY REMOVED)

If any of the following conditions arise, a misaligned flywheel housing is indicated.

1. Excessive gear noise.
2. Transmission jumps out of third gear.
3. Early bearing failure.

FACE RUNOUT (Fig. 7-33)

NOTE: It is not necessary to have the lower flywheel housing in place when checking face and radial runout.

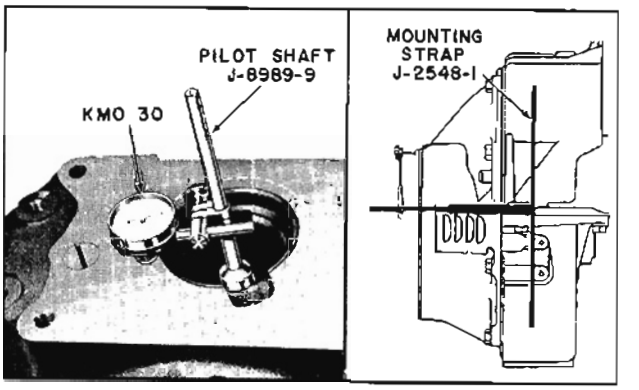


Fig. 7-33 Checking Face Runout

1. Install Pilot Mounting Strap J-5248-1 on flywheel.
2. Install Pilot Shaft J-8989-9 to mounting strap. Mount Dial Indicator KMO-30 (with a large contact button) on the shaft.
3. Tap crankshaft to the rear of the engine.
4. Bring the indicator into contact with the face of the housing with approximately .015" compression. The point of contact should be 2-1/4" from the center of the crankshaft.
5. Rotate the flywheel through 360° (Tool J-972-A may be used to rotate flywheel) and note the indicator reading. If the total indicator reading exceeds .003", shim as necessary between the housing and the engine block.

RADIAL RUNOUT (Fig. 7-34)

1. Assemble Dial Indicator KMO-30 so that the lever rides in the bore of the housing with approximately .015" compression.
2. Position the indicator at (A) and set the dial at zero. Rotate the flywheel until indicator is at (B) and note indicator reading. Indicator

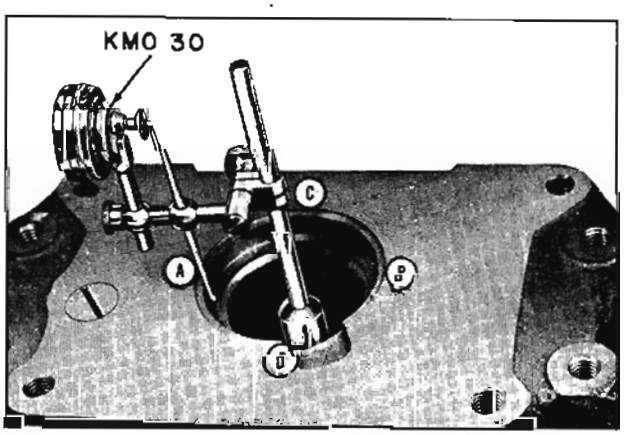


Fig. 7-34 Checking Radial Runout

reading at (B) must not be more than .004" on either side of the initial reading, indicating that the center of housing bore is within .002" on either side of crankshaft.

3. Position the indicator lever at the top of the bore (C) with the dial set at .000". Rotate the flywheel until the indicator is at (D). Reading must be between .000" to + .008", indicating the center of housing bore is .000" to .004" below center of crankshaft.

4. If readings are not within specifications, it will be necessary to remove the clutch housing and the dowel pins.

   NOTE: Saw off the dowel pins close to the block before driving pins through; otherwise, the pins will strike the flywheel before clearing the dowel pin holes.

5. Install the clutch housing and recheck radial runout as outlined under steps 1 through 3. If dial indicator readings are not within specifications, loosen the clutch housing to block cap screws slightly, then shift the housing to bring within limits. After aligning housing again tighten housing attaching bolts and recheck radial runout.

6. Using Reamer J-4832-3 (roughing reamer) and Ratchet Wrench J-808-6, ream the two engine block to clutch housing dowel pin holes. Then finish ream using Reamer J-4832-4 and install oversize dowel pins, Part No. 557754 (large chamfer end out).

   NOTE: The above reamers must be shortened to 4" overall length in order to perform this operation with engine in the car.

7. Clean all cuttings from housing.

8. Remove dial indicator set-up.

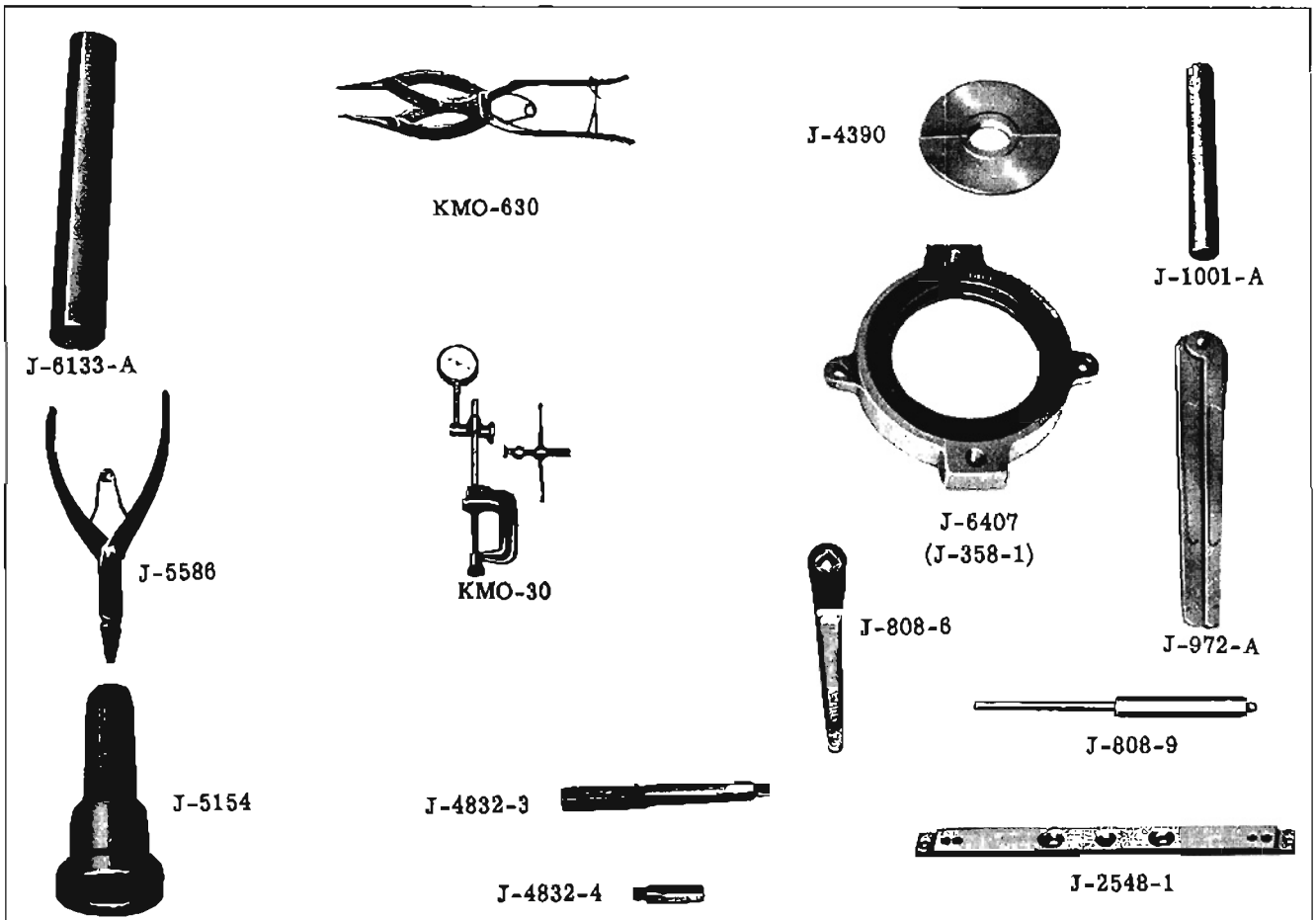
SYNCHROMESH TRANSMISSION SPECIFICATIONS

CAPACITY	2-1/2 Pts.
GEAR RATIOS	
1st	2.15:1
2nd	1.37:1
3rd	Direct
Rev	2.28:1

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
Transmission to Clutch Housing Bolts	60 to 70
Cover Bolts	10 to 12
Rear Bearing Retainer Bolts	28 to 33
Hex Plug (Rear Bearing Retainer)	6 to 8
Shifter Lever and Yoke Set Screws	15 to 20



KMO-30	Dial Indicator Set	J-4390	Speedometer Gear Remover and Installer (Used as Mainshaft Bearing Installer)
KMO-630	Snap Ring Pliers	J-4832-3	Roughing Reamer
J-808-6	Ratchet Handle	J-4332-4	Finish Reamer
J-808-9	Pilot Shaft	J-5154	Rear Bearing Retainer Seal Driver
J-972-A	Differential Adjusting Nut Wrench (Used to Turn Flywheel)	J-5586	Snap Ring Pliers
J-1001-A	Needle Bearing Loader	J-6133-A	H. M. Rear Oil Pump Bearing and Speedometer Gear Installer
J-2548-1	Flywheel Housing Alignment Tool Set	J-6407 (J-358-1)	Press Plate Holder

Fig. 7-35 Synchromesh Tools

CLUTCH

PERIODIC MAINTENANCE

The clutch linkage should be lubricated with SAE 20 engine oil at each engine oil change interval. The clutch pedal free travel should also be checked at this time.

The clutch release bearing should be lubricated sparingly with a sodium soap, fine fiber grease whenever the transmission is removed or major clutch service is required.

GENERAL DESCRIPTION (Fig. 7-51)

The single plate, dry disc clutch is mounted with a free sliding fit on the splines of the Synchromesh Transmission mainshaft. Engagement of the clutch is accomplished by a spring loaded pressure plate.

When the clutch pedal is depressed, the clutch release yoke moves the release bearing forward on the transmission bearing retainer sleeve until the bearing moves the inner end of the release levers. The release levers pivot at yokes (attached to the cover plate) and overcome the pressure spring force to move the pressure plate rearward to disengage the driven plate.

When the clutch pedal is released, the pressure springs compress the driven plate between the pressure plate and the flywheel to engage the clutch. The engagement of the clutch is cushioned by springs mounted between the facing discs of the clutch plate. As the speed of the engine increases, the weighted outer ends of the release levers, through centrifugal force, add to the spring force exerted on the driven plate, thereby increasing clutch pressure and increasing the clutch torque capacity.

Torsional vibrations from the engine are prevented from being transmitted to the transmission by coil springs mounted in the hub of the driven plate. Balance is obtained by means of narrow sheet metal strips crimped around the webs of the driven disc.

CLUTCH LINKAGE (Fig. 7-52)

The clutch linkage consists of the clutch pedal, pedal to bellcrank pedal rod, pedal bellcrank to clutch release bellcrank rod and the clutch release bellcrank to release yoke rod.

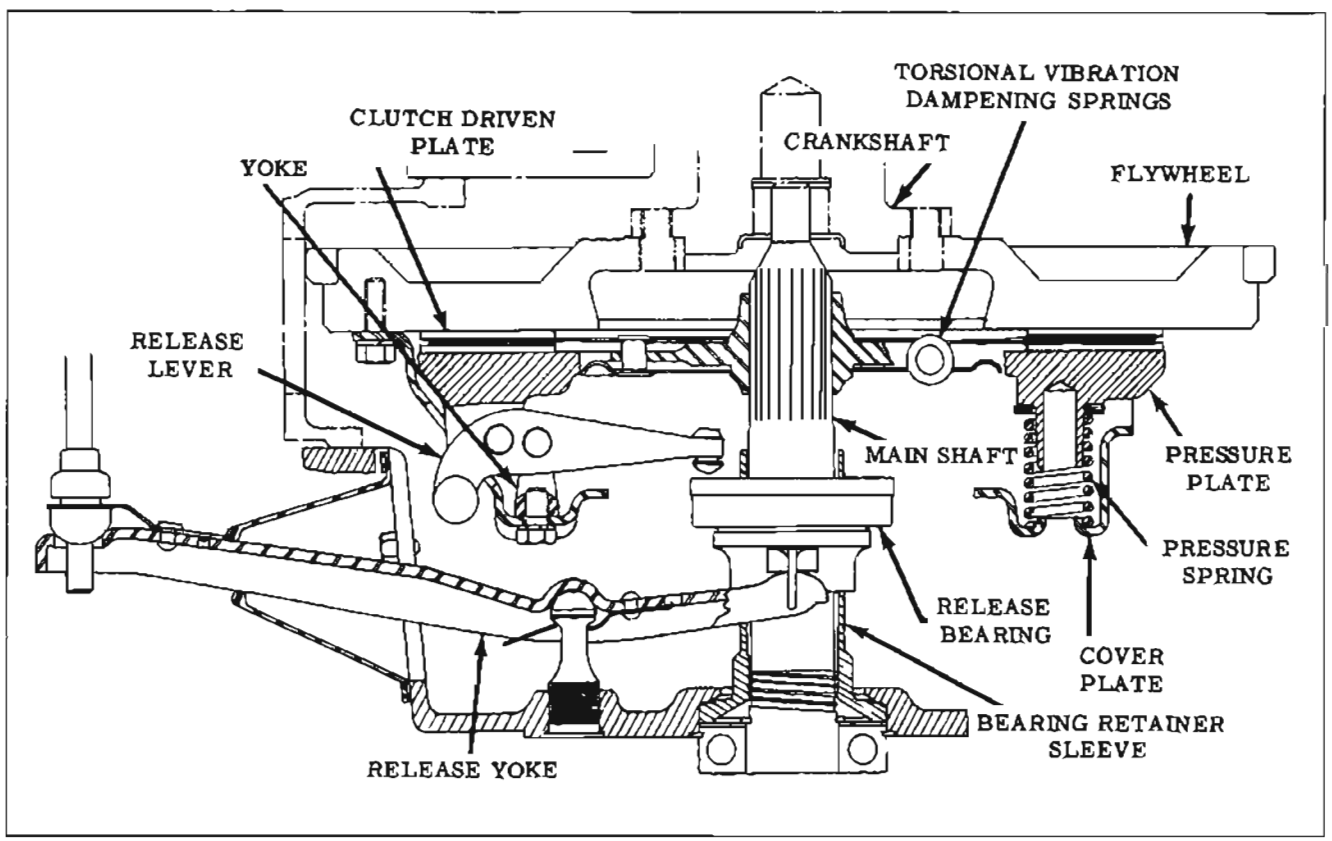


Fig. 7-51 Clutch Assembly

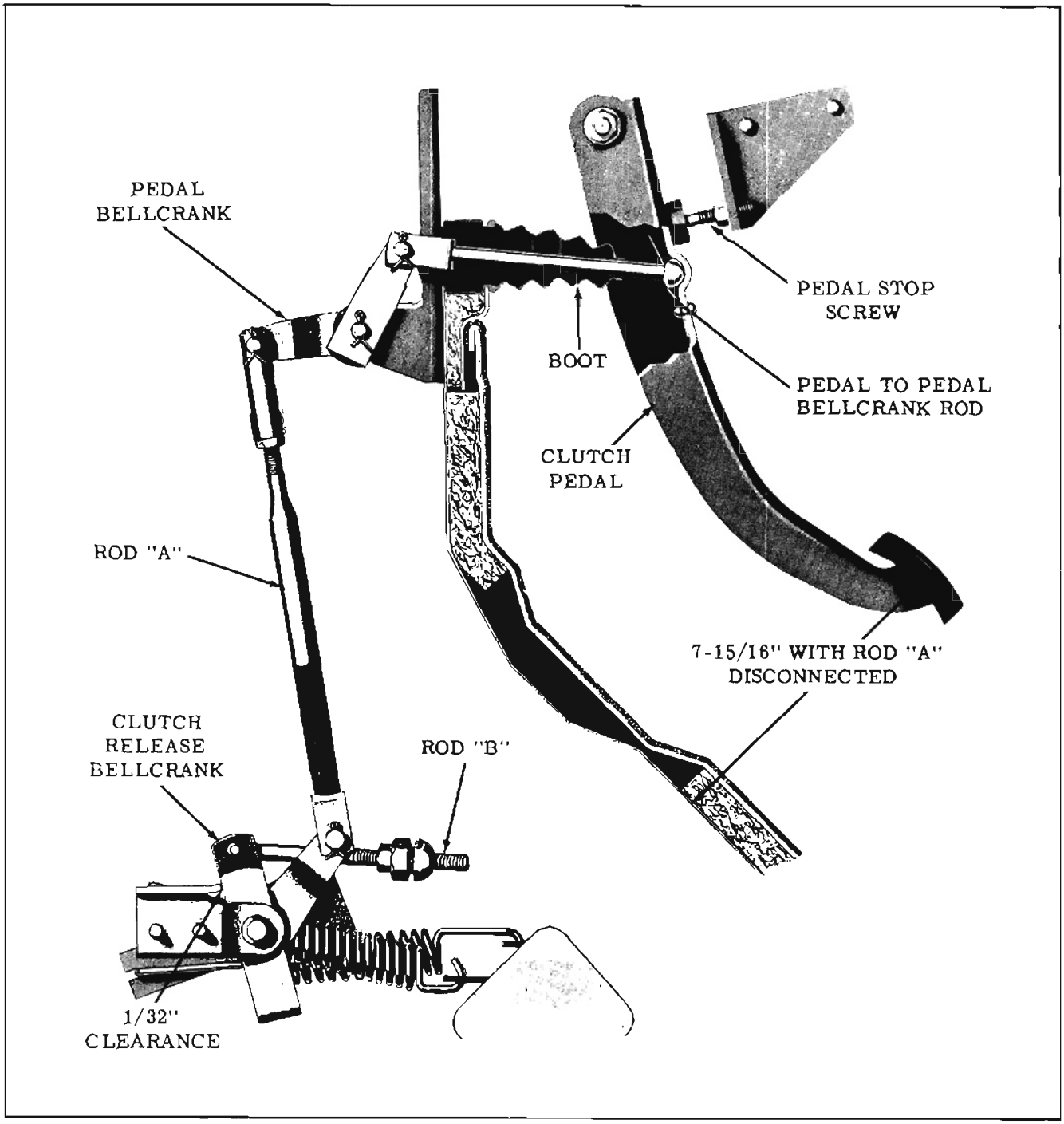


Fig. 7-52 Clutch Linkage

MINOR SERVICE OPERATIONS

CLUTCH PEDAL

Remove and Install

1. Remove cotter pin, clevis pin and spring washer from clutch pedal to pedal bellcrank rod.
2. Remove nut, washer and spring washer from clutch pedal pivot shaft.
3. Slide clutch pedal from pivot shaft and disconnect clutch pedal rod from pedal.

To install, lubricate nylon bushings and pedal rod ball socket with lubricant Part No. 567196 and reverse removal procedure. Torque pivot shaft nut 10 to 18 ft. lbs.

ADJUSTMENTS

CLUTCH LINKAGE (Fig. 7-52)

1. Turn back floor mat and adjust clutch pedal

bumper until the top of the pedal pad is 7-15/16" from the floor pan.

NOTE: Clutch pedal height of 7-15/16" must be obtained with clearance between the clutch release bellcrank and its stop.

2. Remove cotter pin, clevis pin and spring washer from clevis at upper end of rod "A".

3. Move spherical nut on rod "B" forward until the clutch release yoke is free.

4. With the pedal bellcrank in the raised position, adjust clevis on rod "A" until holes in the clevis line up with the hole in the bellcrank.

5. Lengthen rod "A" by turning clevis three turns, then install rod "A" into bellcrank.

6. Check clearance between clutch release bellcrank and stop. Clearance should be 1/32".

7. Rotate spherical nut until 1" to 1-1/4" free pedal travel is obtained.

CLUTCH—REMOVE AND INSTALL

(TRANSMISSION REMOVED)

1. Remove transmission bearing retainer sleeve.

2. Remove the right and left lower flywheel housing bolts.

3. Disconnect adjustable rod at yoke.

4. Support rear of engine using Engine Support Tool 30-16. Remove the engine rear mount bolts at the clutch housing, then remove frame cross member.

5. Remove remaining bolts securing clutch housing to flywheel housing and remove clutch housing and release yoke.

6. Mark flywheel and clutch cover for correct positioning at reassembly.

7. Alternately loosen the six clutch cover to flywheel attaching bolts one or two turns at a time so as not to distort the cover, then remove clutch assembly.

To install, reverse sequence of operations. Seal the area between the bearing retainer sleeve and the clutch housing as shown in Fig. 7-53. Use an old transmission drive gear to align clutch disc while tightening clutch to flywheel. Repack reservoir behind the crankshaft pilot bearing with 1/4 ounce (level tablespoonful) of front wheel bearing grease. Lubricate bearing surface of release

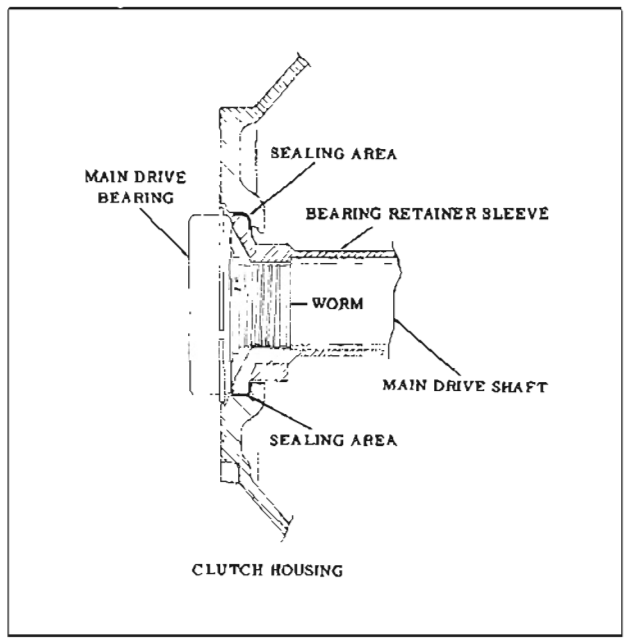


Fig. 7-53 Sleeve Installation

levers with front wheel bearing grease. Adjust transmission and clutch linkage. Lubricate clutch release bearing as outlined under PERIODIC MAINTENANCE.

INSPECTION

1. Inspect the clutch driven plate for broken or distorted torsion springs and worn, loose or oily facings. If any of these conditions exist, install a new clutch plate assembly.

2. Inspect the pressure plate and cover assembly for scores or cracks. If the pressure plate springs have been overheated, the paint will be burned off or they will show a pronounced blue color indicating the temper has been drawn. If any defects are found, the pressure plate and cover must be replaced as an assembly.

ADJUSTMENT OF CLUTCH RELEASE LEVERS

1. Before adjustment of clutch release levers is attempted, levers must be worked several times to center the bearings.

2. Place Gauge J-1048 on a flywheel in the position normally occupied by the driven plate.

3. Mount pressure plate assembly to flywheel, alternately tightening attaching screws one or two turns at a time so as not to distort pressure plate assembly cover.

4. Lay a short straight edge across the center boss of the gauge as a guide for positioning release levers. (Fig. 7-54)

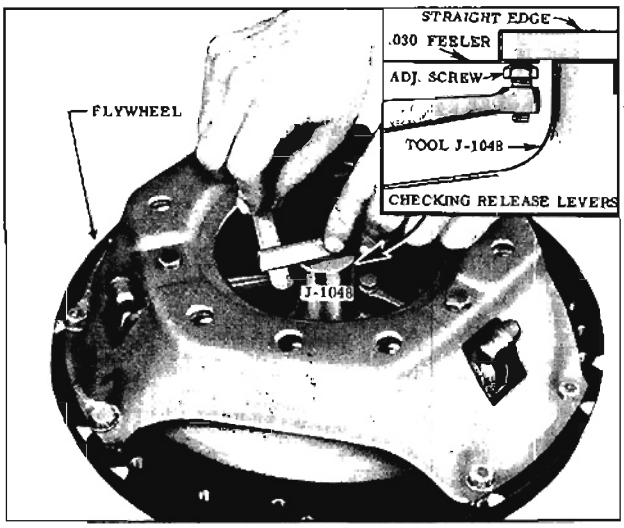


Fig. 7-54 Checking Release Levers

5. The level of bearing surfaces on all lever adjusting screws should be from .000" to .062" below the level of the gauge center boss, and each lever should lie within .031" of the other two levers.

6. If the levers are more than .031" out of plane or do not lie within .000" to .062" below the center boss, it will be necessary to adjust the release lever screws as follows:

   a. Using a standard hack-saw blade, remove the original stakes from the required release lever adjusting screws.

   b. Adjust screw (or screws) until all levers are within .031" of each other and lie not more than .062" below the level of the gauge center boss.

   c. With head of screw resting on a solid block, use a blunt chisel to restake the screws to the lever.

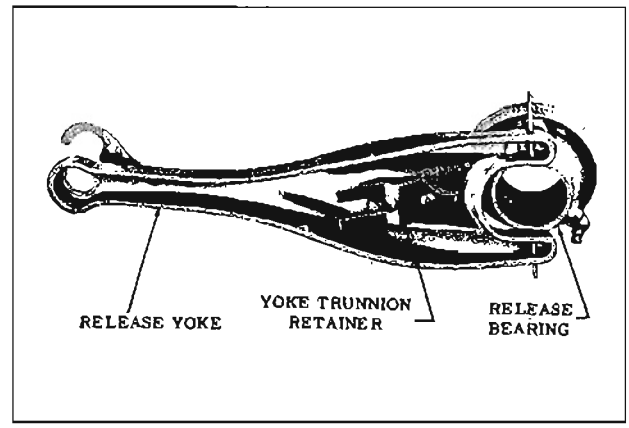


Fig. 7-55 Clutch Yoke Assembly

   d. Recheck release lever adjustment as outlined in steps 1 through 5.

RELEASE YOKE, REMOVE AND INSTALL (Fig. 7-5)

To remove the clutch release yoke, proceed as follows:

1. Remove transmission and bearing retainer sleeve.

2. Disconnect adjusting rod from yoke.

3. Remove the clutch housing.

4. Snap yoke off ball stud by pushing in on end of yoke, then remove yoke.

To install, reverse sequence of removal operations. Lubricate clutch release bearing as outlined in the Lubrication Section. Lubricate clutch release yoke trunnion with lubricant, Part No. 567196. Check and adjust clutch linkage. (Refer to Clutch Linkage Adjustment)

CLUTCH SPECIFICATIONS

1. DISC FACINGS	
a. Area - Total Square Inches	56.5
b. Diameter - Inside	7"
c. Diameter - Outside	11"
d. Number Used	2
e. Thickness	.136"
2. DRIVEN DISC ASSEMBLY	
Overall Thickness (Clutch Engaged)	.315"
3. PEDAL FREE TRAVEL	1" to 1-1/4"
4. PEDAL HEIGHT	7-15/16"
5. PRESSURE SPRINGS	
a. Number Used	9
b. Compression Pressure - lbs.	227 at 1-47/64"
c. Color	Red Paint
6. RELEASE BEARING	
a. Thickness	.665"
b. Type	Ball

TORQUE SPECIFICATIONS

NOTE: Specified torque is for installation of parts only. Checking of torque during inspection may be 15% below the specified minimum.

Application	Ft. Lbs.
Clutch to Flywheel Bolts	14 to 17
Clutch Release Ball Stud	35 to 40
Clutch Housing to Block Bolts	50 to 55
Rear Engine Mount to Clutch Housing Bolts	45 to 60
Frame Cross Member Bolts	45 to 65
Frame Cross Member to Rear Engine Mount	45 to 60

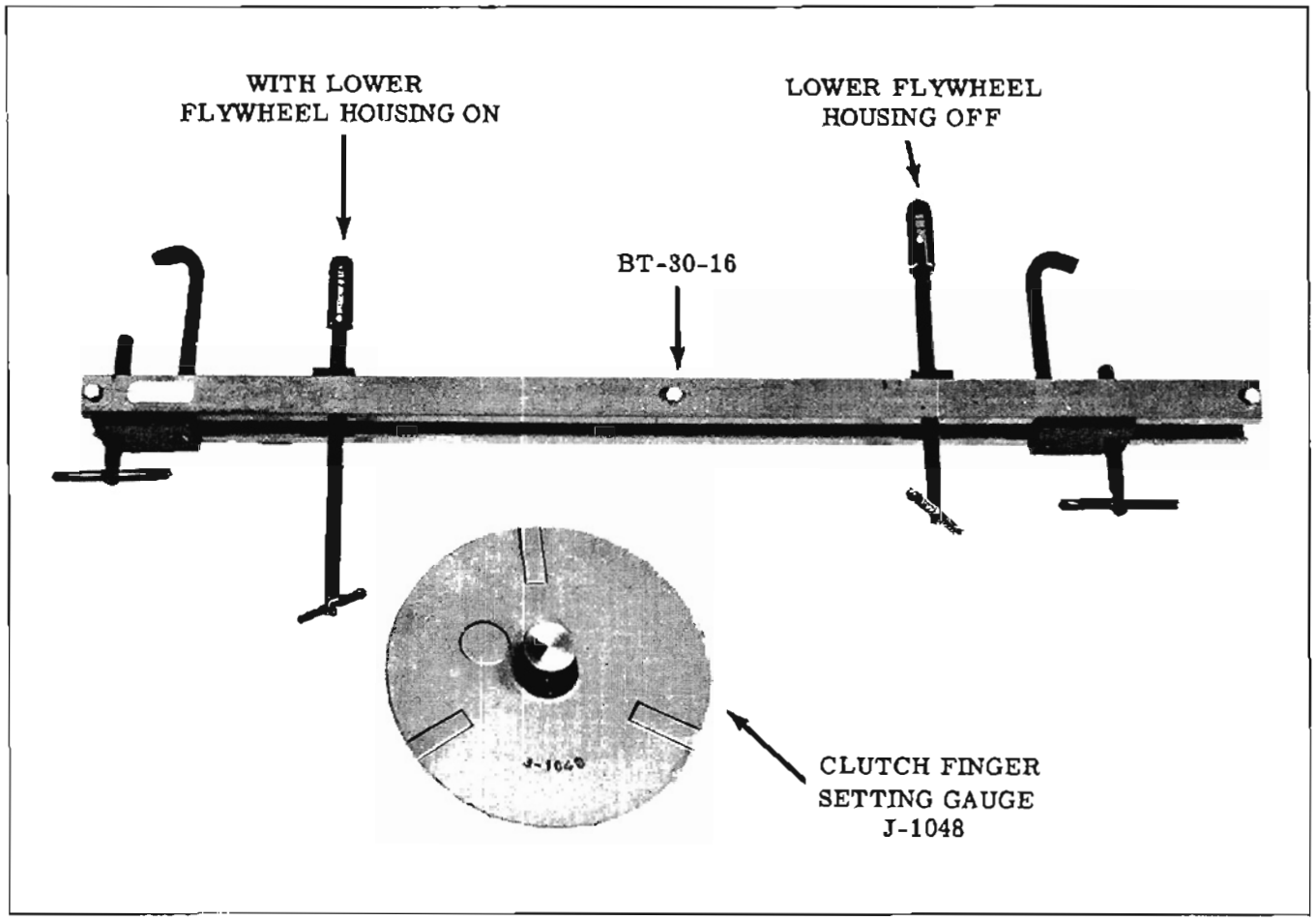


Fig. 7-56 Clutch Tools

SYNCHROMESH AND CLUTCH

3000, 3100, 3200, 3300 SERIES

CONTENTS OF SECTION 7

THREE-SPEED TRANSMISSION

FOUR-SPEED TRANSMISSION

CLUTCH

THREE-SPEED TRANSMISSION

GENERAL DESCRIPTION

A three-speed synchromesh transmission (Figs. 7-101 and 7-102) is used as standard equipment. This transmission incorporates all helical gears which are machined from drop forged steel gear blanks, heat treated and shot peened for strength and long life. The shafts are machined from high grade steel, heat treated and ground to close limits.

The rear end of the clutch gear is supported by a heavy duty ball bearing at the front end of the transmission case and is piloted at its front end in an oil impregnated bushing mounted in the engine crankshaft. The front end of the mainshaft is piloted in a double set of roller bearings set into the hollow end of the clutch gear and the rear end is carried by a ball bearing.

The countergear is carried on roller bearings at both ends while thrust is taken on thrust washers located between each end of gear and the case. Roller bearing thrust washers are installed

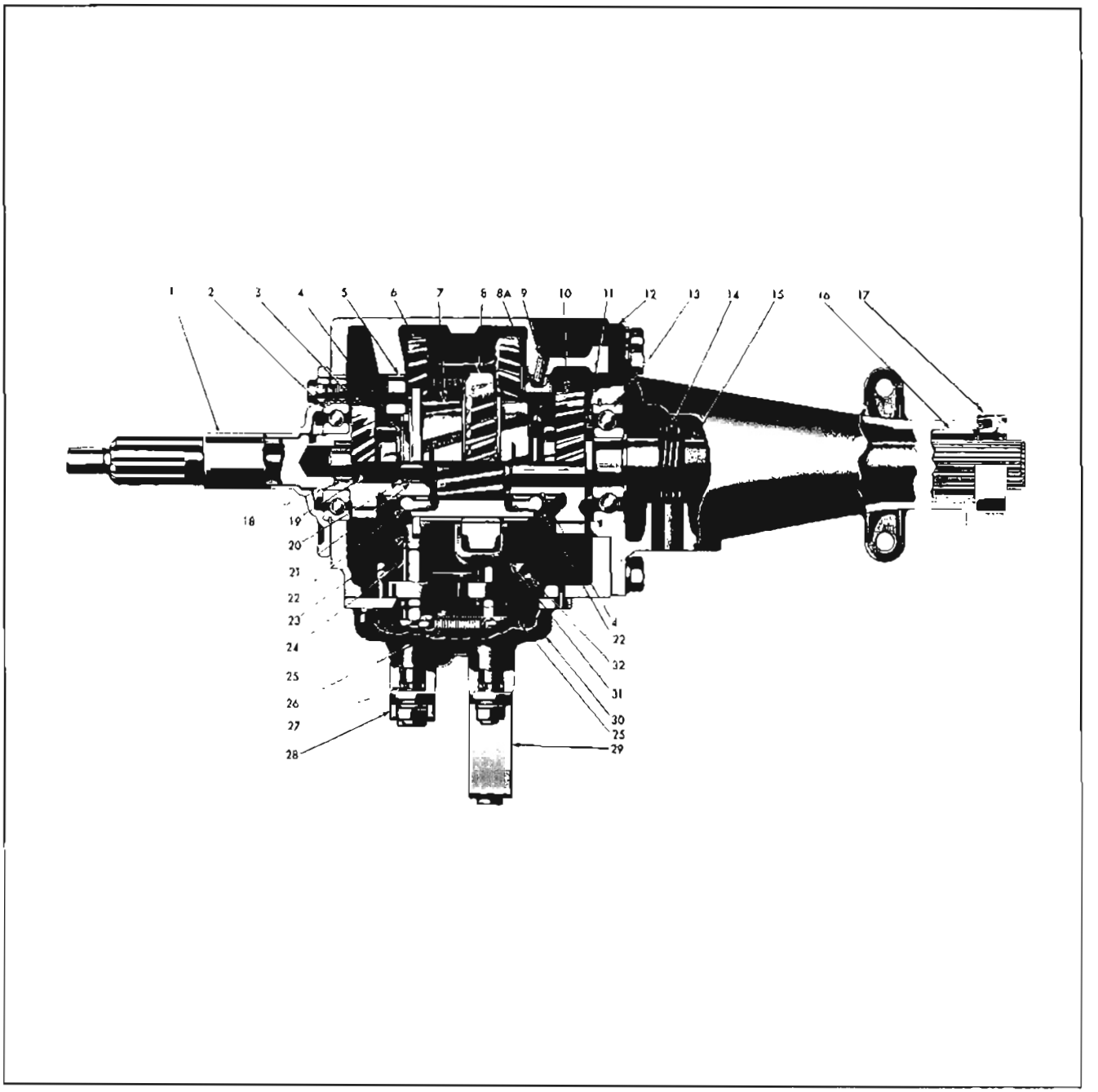


Fig. 7-101 Three-Speed Synchromesh (Top View)

between the countergear thrust washers and the roller bearings.

The reverse idler gear is carried on ball-indented bronze bushings. Forward thrust of the gear is taken on a washer located between front of gear and the case, and rearward thrust is taken on a radial needle bearing and a washer located between rear of gear and case.

Gearshifting is manual through shift control rods to the transmission cover located on the side of the transmission. Shifting is accomplished by two rotating cranks which directly engage the gears to be shifted, thus affording a highly efficient mechanical action.

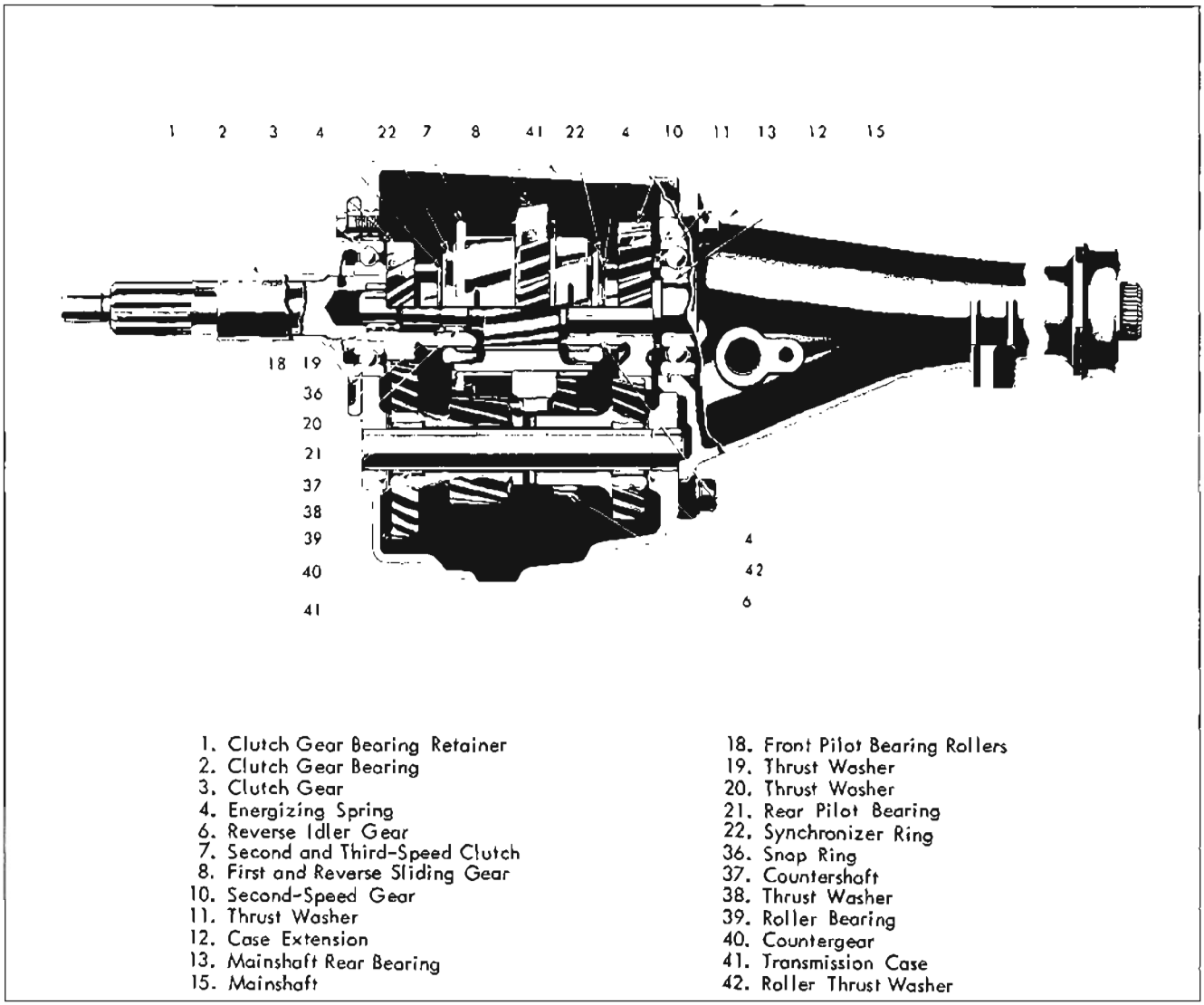
MAINTENANCE AND ADJUSTMENTS

SHIFT LINKAGE ADJUSTMENT (Fig. 7-103 through 7-111)

Refer to the appropriate Figures depending on how the car is equipped.

In cases where the gearshift linkage has been disconnected, it should be adjusted as follows:

1. Move both transmission shift levers until transmission is in neutral. Neutral detents in transmission cover must both be engaged to make this adjustment correctly. (To check, start engine with clutch disengaged and release clutch slowly).



1. Clutch Gear Bearing Retainer
2. Clutch Gear Bearing
3. Clutch Gear
4. Energizing Spring
6. Reverse Idler Gear
7. Second and Third-Speed Clutch
8. First and Reverse Sliding Gear
10. Second-Speed Gear
11. Thrust Washer
12. Case Extension
13. Mainshaft Rear Bearing
15. Mainshaft
18. Front Pilot Bearing Rollers
19. Thrust Washer
20. Thrust Washer
21. Rear Pilot Bearing
22. Synchronizer Ring
36. Snap Ring
37. Countershaft
38. Thrust Washer
39. Roller Bearing
40. Countergear
41. Transmission Case
42. Roller Thrust Washer

Fig. 7-102 Three-Speed Synchromesh (Side View)

2. Move selector lever to neutral position. Align first and reverse shifter lever with the second and third shifter lever. (Fig. 7-106 or 7-108)

3. Install control rods on shifter levers.

4. Refer to the appropriate figure and adjust both shift control rods so as to have a "free pin" fit where rods enter shifter levers. Be sure all shifter levers remain aligned in neutral.

5. Move selector lever through all positions to check adjustment and to insure overtravel in all positions.

NOTE: If mast jacket lower dash clamp has been disturbed at its mounting on dash, its adjustment to the steering mainshaft should be checked as outlined in the procedure in Section 8 of this manual.

SPEEDOMETER DRIVEN GEAR

Disconnect speedometer cable, remove lock plate to housing bolt and lockwasher and remove lock plate. Insert screwdriver in lock plate slot in fitting and pry fitting, gear and shaft from housing. Pry "O" ring from groove in fitting.

Install new "O" ring in groove in fitting. Coat "O" ring and driven gear shaft with transmission lubricant and insert shaft.

Hold the assembly so slot in fitting is toward lock plate boss on housing and install in housing. Push fitting into housing until lock plate can be inserted in groove and attach to housing.

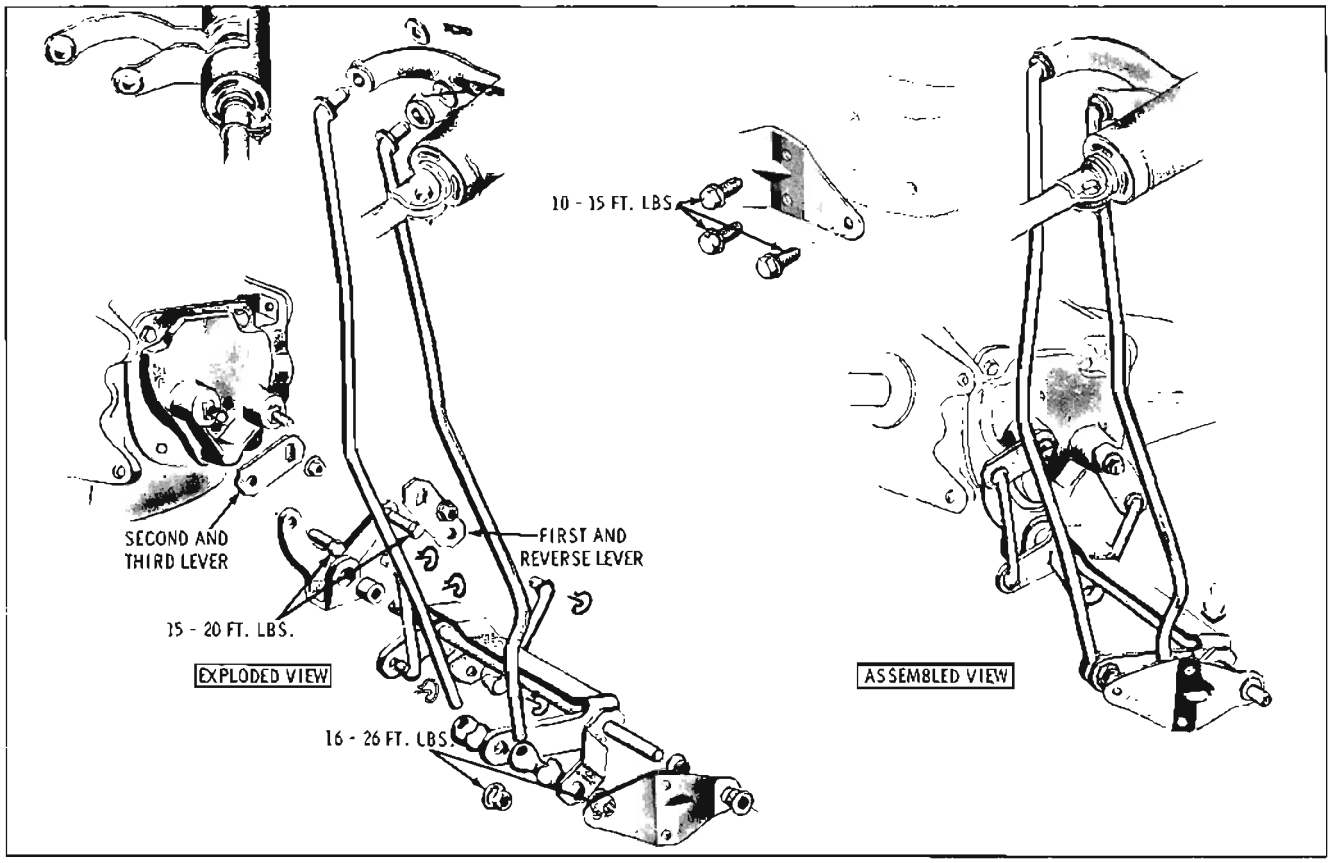


Fig. 7-103 V-6 Column Shift Linkage

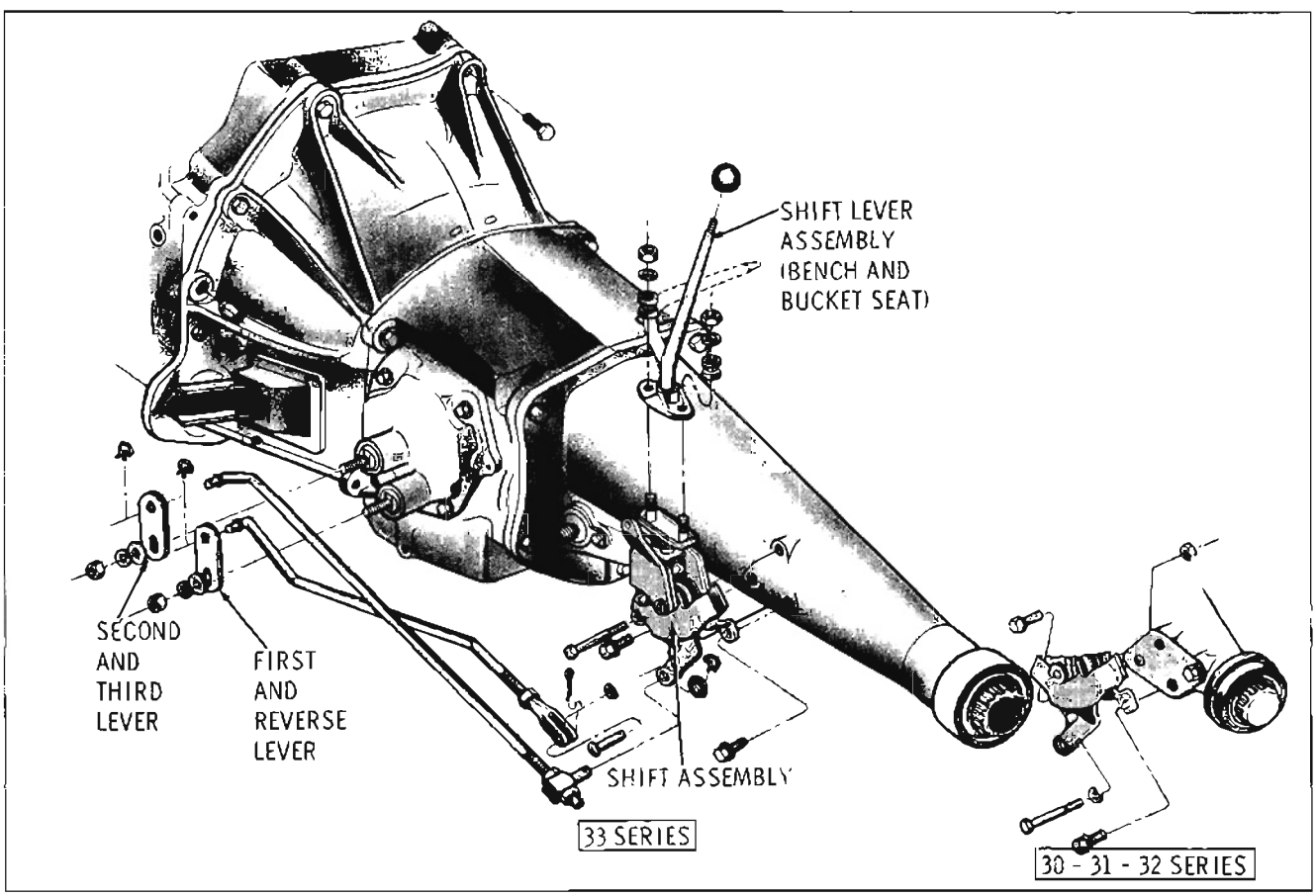


Fig. 7-104 V-8 Floor Shift Linkage

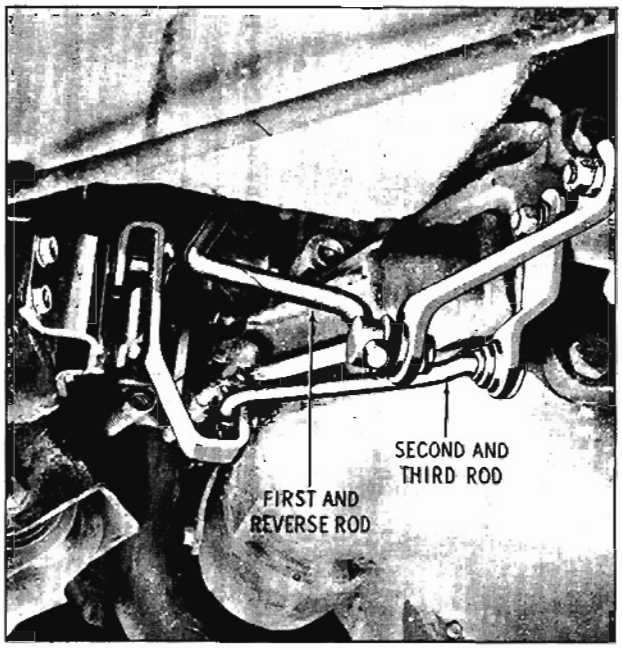


Fig. 7-105 V-8 (30-31-32 Series) Column Shift Linkage

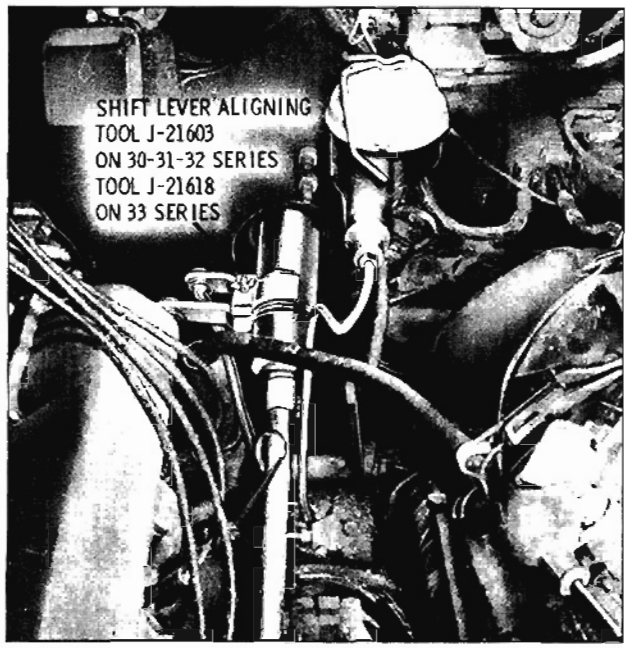


Fig. 7-106 Shift Lever Holding Tool

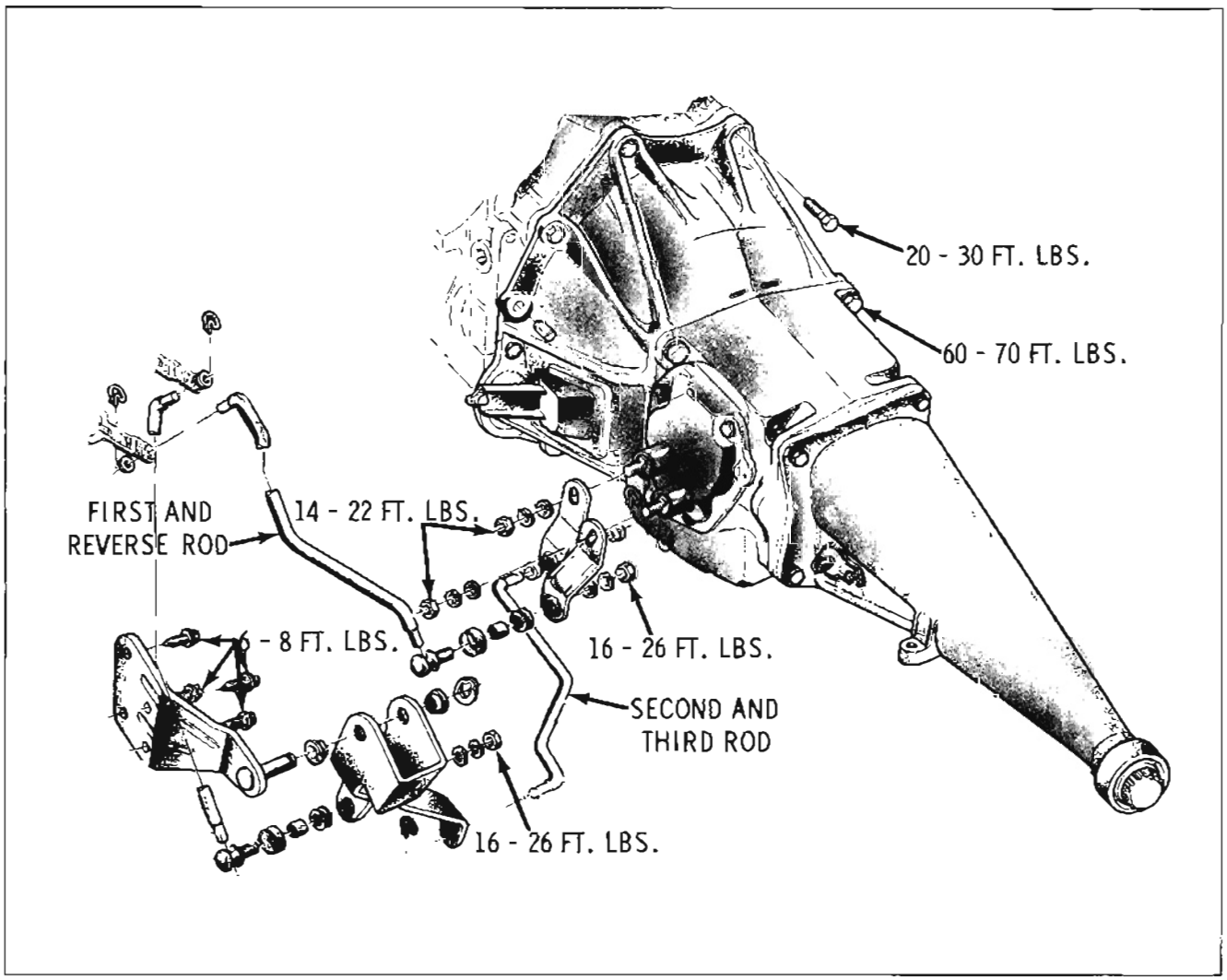


Fig. 7-107 V-8 (33 Series) Column Shift Linkage

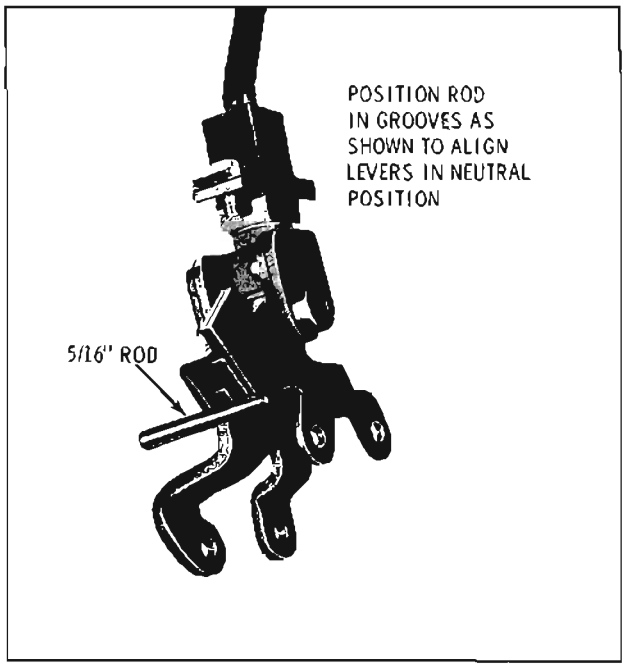


Fig. 7-108 Shift Lever Positioning

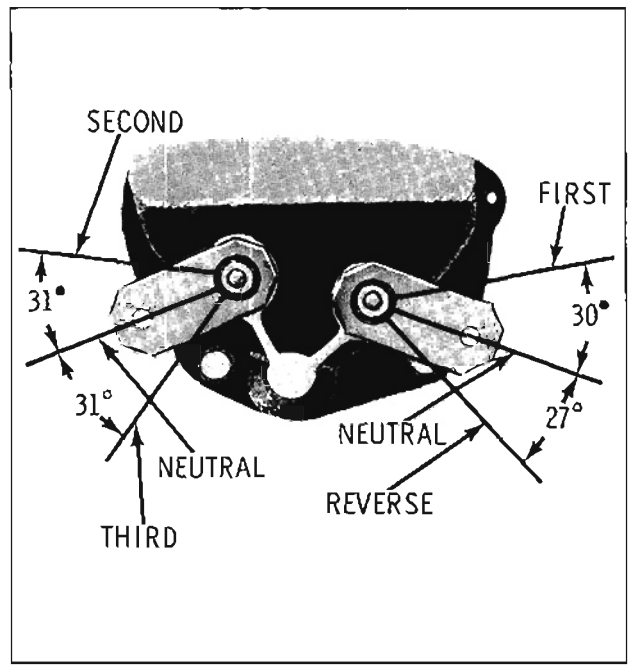


Fig. 7-109 Shifter Lever Positioning

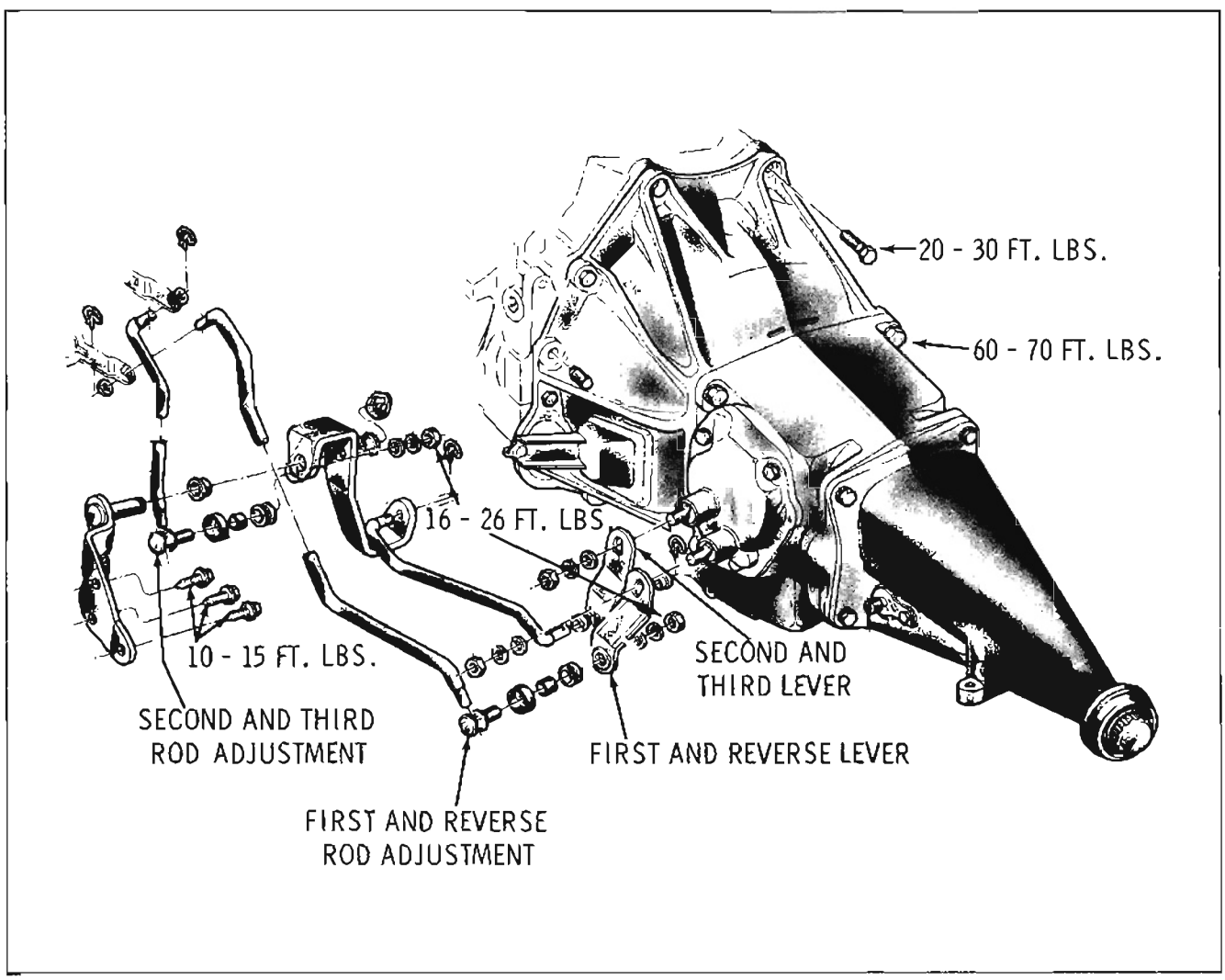


Fig. 7-110 V-8 (30-31-32 Series) Column Shift Linkage

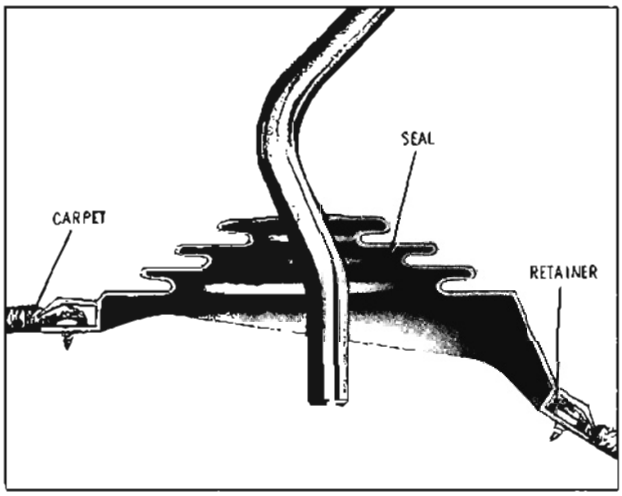


Fig. 7-111 Floor Shift Seal

MAINSHAFT OIL SEAL REPLACEMENT

1. Remove propeller shaft as outlined in Section 10 and disconnect any necessary items to obtain clearance.
2. Using a punch against exposed end of seal, drive seal out of extension.
3. Wash counterbore with cleaning solvent and inspect for damage.
4. Coat new seal with P.O.B. #3 or equivalent and start straight in bore in case extension. Using Tool J-5154, tap seal into counterbore.
5. Reinstall propeller shaft and any items removed to obtain clearance.

TRANSMISSION SIDE COVER

On any replacement of parts in the side cover assembly, it is necessary to remove cover from transmission case.

1. Disconnect control rods from levers.
2. Remove cover assembly from transmission case.
3. Remove outer shifter lever, retainer nuts and washers, and pull levers from shafts.
4. Remove nuts, locks and shifter interlock retainer. This will allow removal of shifter shaft, fork assembly and cam assembly, or interlock, from cover.
5. Replace necessary parts. Coat shifter shaft "O" ring seal with transmission lubricant before installing in cover. Install shifter interlock retainer and bend tabs on locks after installing nuts.

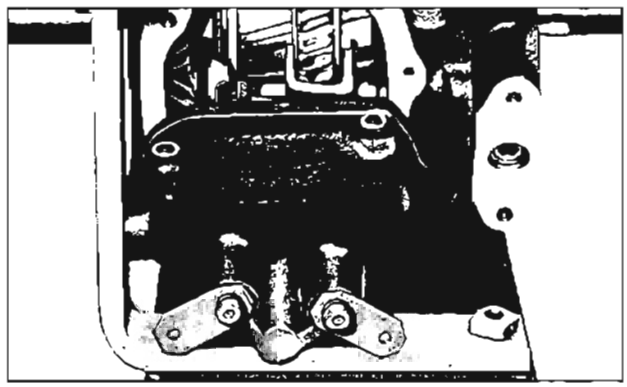


Fig. 7-112 Transmission Side Cover

6. Install outer shifter levers on shafts and washers and retainer nuts.
7. With transmission gears in neutral and shifter forks in neutral, install cover to transmission using a new gasket. Coat screws with P.O.B. #2 or equivalent. Tighten remaining cap screws 15 to 18 ft. lbs. torque.

   NOTE: Hump on first and reverse shifter fork (Fig. 7-112) must be toward rear of transmission.
8. Attach control rods to shifter levers.
9. Fill transmission with transmission lubricant as specified in Section 2 to level of filler plug.

MAJOR SERVICE OPERATIONS

REMOVAL

1. Raise car.
2. Remove propeller shaft.
3. Disconnect shift rods from shift levers.
4. If equipped with floor shift, disconnect shift lever bracket assembly from extension housing and remove transmission shifter levers to shifter shafts, (leave linkage connected to levers). Bracket assembly, levers and linkage can be left hanging in car.
5. Install Engine Support Bar BT-6424. (Refer to Engine Section).
6. Remove cross support bar-to-rear transmission mount attaching bolts.

7. Remove cross support bar-to-frame attaching brackets and remove cross support bar.

   NOTE: If equipped with dual exhaust, it may be necessary to disconnect the left hand exhaust pipe at the exhaust manifold to provide clearance.

8. Disconnect speedometer cable.

9. Remove four transmission-to-engine attaching bolts.

10. Carefully slide transmission rearward and remove from car.

INSTALLATION

1. Inspect clutch pilot bushing and lubricate with wheel bearing grease.

2. Reverse removal procedure, using the following specified torque ratings for the attaching parts:

a. Transmission to engine	60 to 70 ft. lbs.
b. Shift lever assembly to extension housing	20 to 30 ft. lbs.
c. Exhaust pipe to exhaust manifold	10 to 18 ft. lbs.
d. Cross support bar brackets to frame	30 to 40 ft. lbs.
e. Cross support bar to rear transmission mount	30 to 45 ft. lbs.
f. Propeller shaft "U" bolt nuts	12 to 16 ft. lbs.

DISASSEMBLY

1. Remove the capscrews from the transmission side cover and remove the cover and gasket.

   NOTE: Under ordinary circumstances it is not necessary to disassemble the cover assembly. Servicing of cover is outlined under MAINTENANCE AND ADJUSTMENTS.

2. Remove extension-to-transmission case bolts and lockwashers and pull extension and mainshaft out of transmission case, leaving second and third-speed clutch assembly and first and reverse gear in case. Do not force mainshaft. Rotate mainshaft and second and third-speed clutch gear to obtain alignment of clutching teeth and splines. (Fig. 7-113)

3. Slide first and reverse gear from clutch sleeve, then remove them separately through side opening in transmission case.

4. Remove pilot bearing rollers from clutch gear.

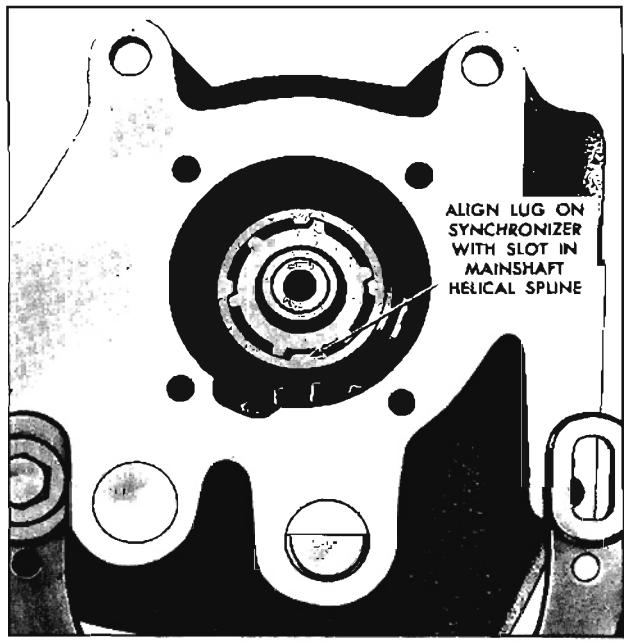


Fig. 7-113 Synchromesh Alignment

5. Remove the four clutch gear bearing retainer screws, shakeproof washers and remove the retainer. Note the screw holes in the retainer are unevenly spaced so the retainer may be assembled to the case in only one position, matching up the oil return slot with the hole in the case.

6. Remove the countershaft by driving it from front to rear of the case, using a soft steel drift. Lower the countergear to bottom of case.

   NOTE: It is necessary to lower the countergear before removing the clutch gear and bearing, otherwise the bearing will strike the countergear.

7. Remove clutch gear bearing snap ring. Tap end of shaft with soft hammer to move gear and bearing assembly into case and remove through rear of case.

8. Remove the countergear, rollers and thrust washers from case.

9. Drive the idler shaft lock pin into the shaft. This pin is shorter than the diameter of the shaft so the shaft may be slipped out when the pin is driven in.

10. Using a drift pin, tap rear of shaft to drive out plug ahead of shaft. Do not turn the shaft while removing, as the lock pin may drop down between the idler gear bushings.

11. Remove reverse idler gear, thrust washer, thrust bearing and bearing washer.

12. To remove mainshaft from extension, expand

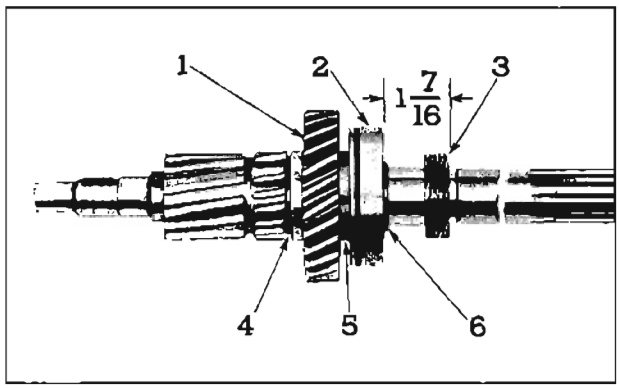


Fig. 7-114 Mainshaft Assembly

bearing snap ring and tap rear of shaft with a soft hammer to bring shaft, speedometer drive gear, second-speed gear and bearing, as an assembly, forward out of extension. (Fig. 7-114)

CLEANING AND INSPECTION

Bearings

1. Wash the bearings thoroughly in a cleaning solvent.

2. Blow out the bearings with compressed air.

   CAUTION: Do not allow the bearings to spin, but turn them slowly by hand. Spinning bearings will damage the race and balls.

3. After making sure the bearings are clean, lubricate them with light engine oil and check them for roughness. Roughness may be determined by slowly turning the outer race by hand.

Transmission Case and Extension

Wash the transmission case and extension inside and outside with a cleaning solvent and inspect for cracks. Inspect the faces for burrs and, if any are present, dress them off with a fine cut mill file. Inspect oil seal, bushing and snap ring in extension and, if worn or damaged, replaced as outlined under Repairs.

Gears

1. Inspect all gears and, if necessary, replace any that are worn or damaged.

2. Check the first and reverse sliding gear to make sure it slides freely on clutch sleeve.

3. Check the clutch sleeve to see that it slides freely on mainshaft.

Reverse Idler Gear Bushings

1. The bushings used in the idler gear are pressed into the gear, then peened into holes in the bores to lock them into place, and are accurately bored with special diamond boring tools. This insures the positive alignment of the bushings and their shafts, as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushings are not serviced separately.

2. Check bushings for excessive wear by using a narrow feeler gauge between the shaft and the bushing. The proper clearance is from .002" to .004".

Countergear Needle Bearings

All countergear needle bearings should be inspected closely and, ifexcessive wear shows, they should all be replaced as well as the shaft.

REPAIRS

Mainshaft, Rear Bearing, Second-Speed Gear and Speedometer Drive Gears (Fig. 7-115)

1. Press speedometer drive gear off mainshaft, using suitable split plates in an arbor press.

2. Remove bearing to mainshaft snap ring and press bearing off shaft.

3. Remove second-speed gear thrust washer and second-speed gear.

4. Coat bore with transmission lubricant and slide second-speed gear on mainshaft and install thrust washer with oil grooves toward gear.

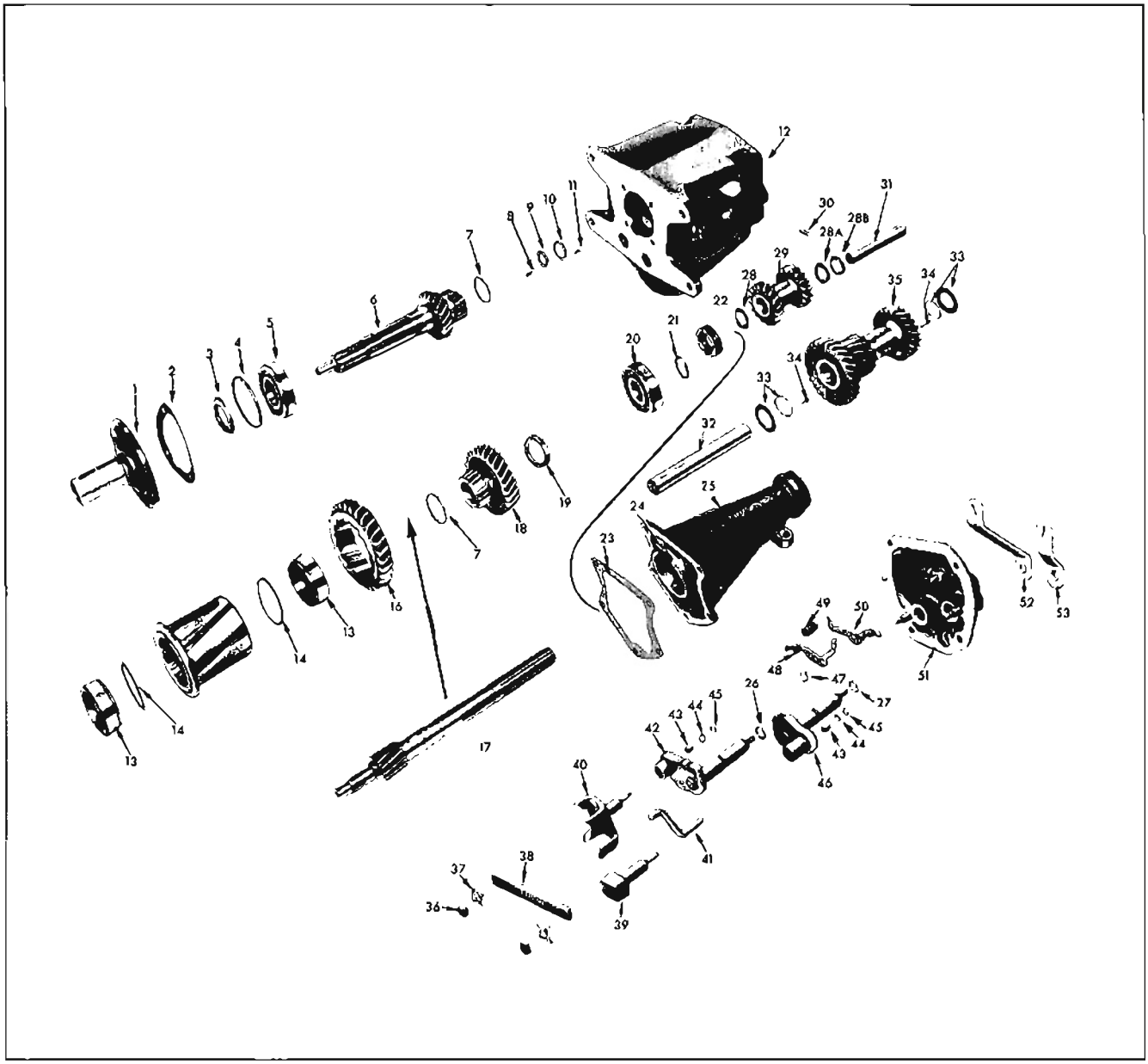
5. Install new bearing, groove in OD of bearing toward second-speed gear.

6. Select one of four available snap rings so end play of bearing on shaft is a maximum of .004". This may be easily determined by installing successively larger rings. Use the thickest ring that will enter snap ring groove on shaft.

7. Start speedometer drive gear on shaft with chamfered ID of gear toward bearing. Press gear on shaft until rear face of gear is 1 7/16" from face of bearing.

Clutch Gear Bearing

1. Place the clutch gear in a vise with soft jaws and remove the bearing retainer nut and oil



1. Clutch Gear Bearing Retainer
2. Bearing Retainer Gasket
3. Bearing Nut and Oil Slinger
4. Bearing Snap Ring
5. Clutch Gear Bearing
6. Clutch Gear
7. Energizing Spring
8. Front Pilot Bearing Roller
9. Thrust Washer
10. Thrust Washer
11. Rear Pilot Bearing Rollers
12. Transmission Case
13. Synchronizer Ring
14. Snap Ring
15. Second and Third-Speed Clutch
16. First and Reverse Sliding Gear
17. Mainshaft
18. Second-Speed Gear
19. Thrust Washer
20. Mainshaft Rear Bearing
21. Snap Ring
22. Speedometer Drive Gear
23. Case Extension Gasket
24. Rear Bearing Snap Ring
25. Case Extension
26. First and Reverse Shifter Shaft "O" Ring
27. Second and Third Shifter Shaft "O" Ring
28. Thrust Washer
28a. Thrust Bearing
28b. Thrust Bearing Washer
29. Reverse Idler Gear
30. Reverse Idler Shaft Pin
31. Reverse Idler Shaft
32. Countershaft
33. Countergear and Roller Thrust Washers
34. Bearing Roller
35. Countergear
36. Shifter Interlock Retainer Stud Nut
37. Shifter Interlock Retainer Stud Nut Lock
38. Shifter Interlock Retainer
39. Second and Third Shifter Fork
40. First and Reverse Shifter Fork
41. Shifter Interlock Shaft
42. First and Reverse Shifter Shaft & Plate Ass'y.
43. Shifter Fork Spacer
44. Shifter Fork Washer
45. Shifter Fork Retainer
46. Second and Third Shifter Shaft & Plate Ass'y.
47. Detent Cam Retainer
48. First and Reverse Detent Cam
49. Detent Cam Spring
50. Second and Third Detent Cam
51. Side Cover
52. First and Reverse Shifter Lever (Outer)
53. Second and Third Shifter Lever (Outer)

Fig. 7-115 Layout of Transmission Parts

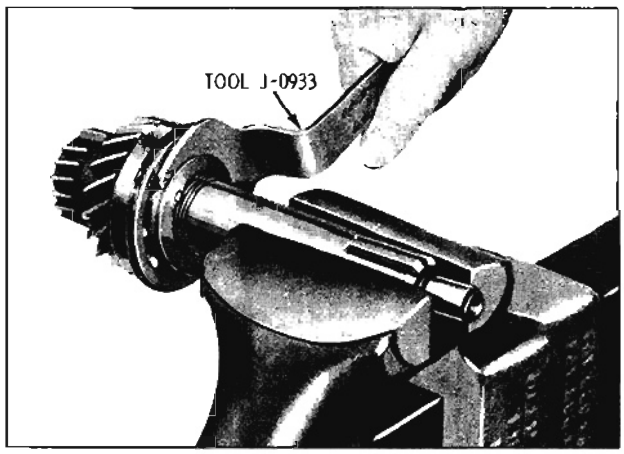


Fig. 7-116 Removing Bearing Retainer Nut and Oil Slinger

slinger, using Tool J-0933. (Fig. 7-116) The retaining nut and oil slinger is a one-piece steel casting machined with a left-handed thread and is locked in place on the clutch gearshaft by being staked into a hole provided for that purpose. Drill out staking before removing nut.

2. Install gear and bearing in transmission case and install snap ring on bearing.

3. Support rear of case in arbor press as shown in Fig. 7-117 and press shaft from bearing. Tap bearing from case.

4. Using an arbor press, press the clutch gear bearing on the clutch gear with the locating ring groove toward the front of the gearshaft.

5. Install the combination clutch bearing retaining nut and oil slinger on the clutch gearshaft and draw it up tight, using Tool J-0933.

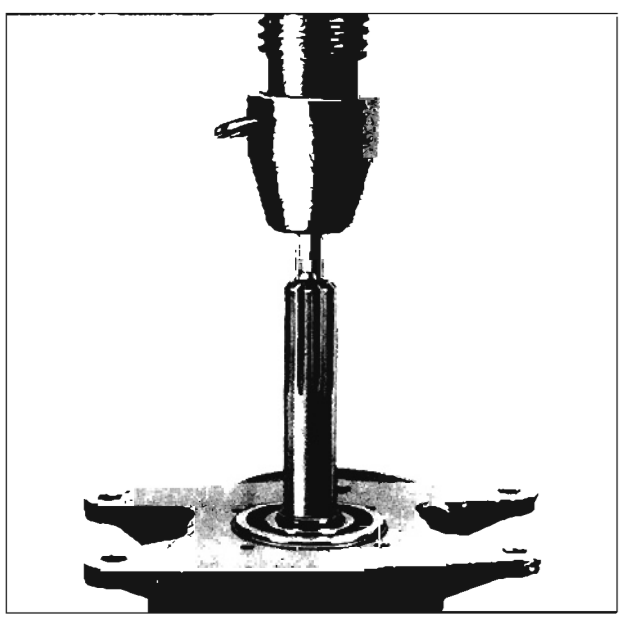


Fig. 7-117 Removing Clutch Gear from Bearing

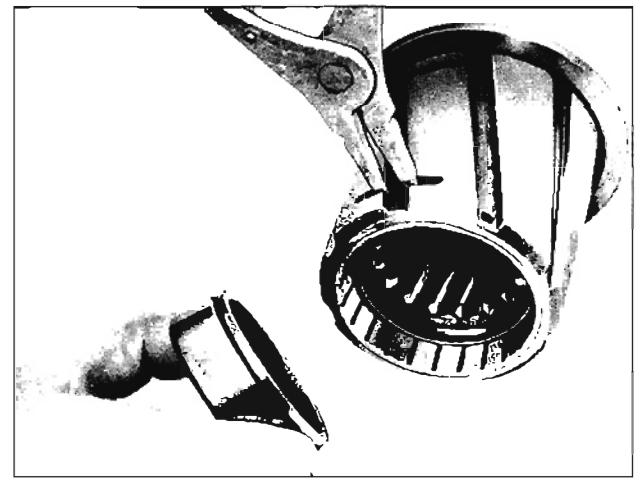


Fig. 7-118 Removing Synchronizer Ring

6. Lock the retaining nut oil slinger in place by staking it into the hole with a center punch. Care must be used not to damage the threads on the shaft.

CAUTION: The bearing must turn as freely after it is installed to the shaft as it turned before being placed on the shaft.

Clutch Sleeve and Synchronizer Rings

1. Remove the first and reverse sliding gear.

2. Turn the synchronizer ring in the clutch sleeve until the ends of the synchronizer ring retainer can be seen through the slot in the clutch sleeve.

3. Using Tool J-0932, expand the retainer into the counterbore in the clutch sleeve. This raises the retainer from the groove in the ring so ring may be easily slipped out. (Fig. 7-118)

4. Check the synchronizing cones for wear or for being loose in the clutch sleeve. If cones are damaged in any way, it will be necessary to replace the clutch sleeve assembly and both synchronizer rings.

5. Inspect the synchronizer rings for smoothness.

6. Place the synchronizer rings in the synchronizing cones and check with thumbs to see that rings do not rock. Excessive rocking indicates a poor fit between the rings and cone, which will not permit proper synchronizing of gears during shifting.

7. Install the synchronizer ring retainers in the counterbores in the ends of the clutch sleeve.

8. Using Tool J-0932 in slot in clutch sleeve,

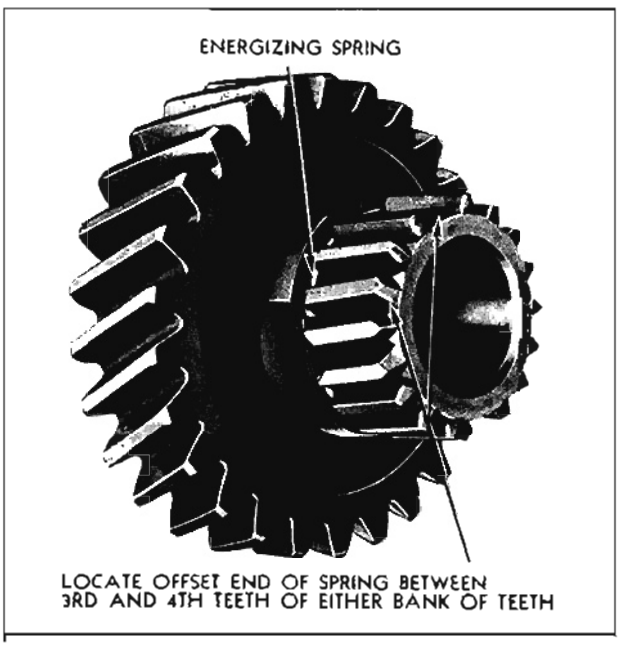


Fig. 7-119 Position of Energizing Spring

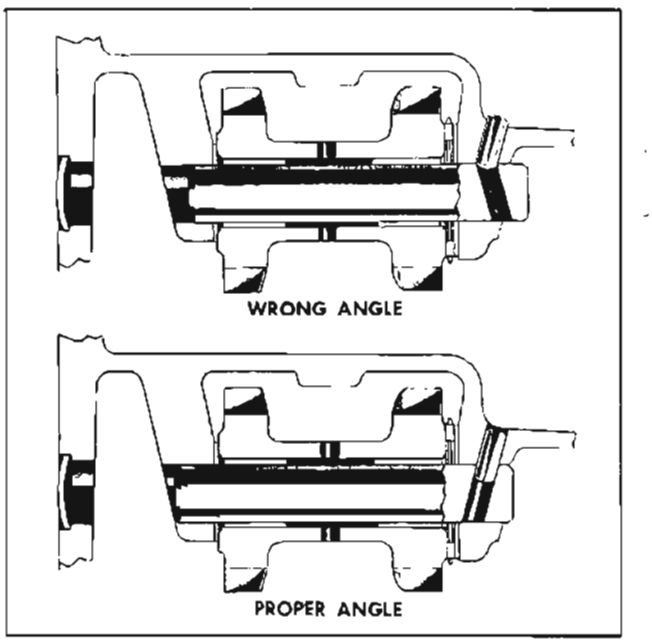


Fig. 7-120 Reverse Idler Gear Shaft and Lock Pin

expand each retainer in the counterbore, lubricate each synchronizer ring with light oil and install in clutch sleeve.

NOTE: Make sure retainers seat in groove all the way around the rings so rings will turn freely.

9. Install the first and reverse sliding gear on the clutch sleeve.

Synchronizer Energizing Springs

1. It will be noticed upon examining these springs that one of the ends is slightly offset. Each spring must be assembled in its groove in the clutch gear and the second-speed gear with the offset or locking end between the third and fourth teeth of either of the two banks of teeth on these gears, thus keeping the spring from turning in its groove. (Fig. 7-119)

2. Under normal operation it should never be necessary to replace the energizing springs; however, should an energizing spring be removed for any reason, a new spring should be installed. The spring may be removed by slipping a thin blade under the spring and raising it sufficiently to slide it off over the gear teeth.

Transmission Case Extension Oil Seal, Bushing and Mounting Block

If bushing in rear of extension requires replacement, remove oil seal and use Tool J-5778 to drive bushing into case extension. Using the same tool, drive new bushing in from rear until end of bushing is slightly below counterbore for oil seal. Coat ID of bushing with transmission lubricant, then install new oil seal using Tool J-5154.

If extension or mounting block is to be replaced, remove mounting block to extension bolt and washers.

To install mounting block to extension, install two bolts and washers and tighten bolts.

ASSEMBLY

Reverse Idler Gear

1. Coat thrust washers and the needle thrust bearing with grease and position them on gear; needle bearing against end with chamfered gear teeth; large washer against bearing; small washer at opposite end of gear. (Fig. 7-120) Coat bushings with transmission lubricant.

2. Place gear assembly in position in case so thrust bearing is toward rear.

3. Install the idler shaft, making sure the lock pin hole in the shaft lines up with the hole in the case at the same angle.

4. Use a new idler shaft lock pin, coat the pin with Permatex or its equivalent and drive it in approximately 1/16" beyond flush with case; peen the hole slightly. This lock pin must be a tight fit in the case to prevent oil leaks.

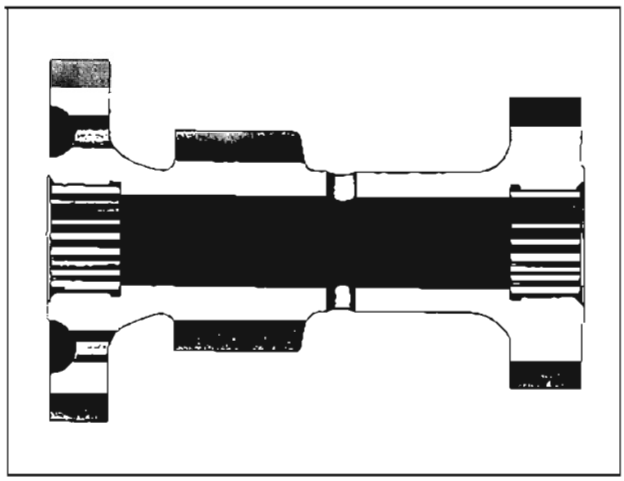


Fig. 7-121 Countergear and Rollers

5. Install the idler shaft expansion plug in the case. A new plug should be used whenever possible.

Countergear and Clutch Gear

1. Place some cup grease in the roller bearing area of each end of the countergear and install the 25 rollers in each end. The grease will hold the rollers in place while installing. (Fig. 7-121)

2. Insert Tool J-5777 in countergear.

3. Apply grease to bearing thrust washers and countergear thrust washers and place one of each at each end of countergear.

4. Insert the countergear (with Tool J-5777) in transmission case and rest it on bottom of case.

5. Place some cup grease in the mainshaft pilot hole in the clutch gear and install the roller bearings. (Fig. 7-122) Install the 14 group and small ID spacer, then the large ID spacer and the 24 group.

   After being assembled in the pilot hole, care must be taken in handling to avoid misplacing rollers.

6. Insert clutch gear in case from inside case and using a brass drift, tap the outer race of the clutch gear bearing until the bearing locating ring groove is outside the front of the case, being careful to drive the assembly straight to prevent damage. (Fig. 7-123)

7. Install snap ring on bearing and tap clutch gear rearward until snap ring is firmly against case.

8. Install the clutch gear bearing retainer and gasket, making sure the oil slot in the retainer lines up with the oil slot in the front face

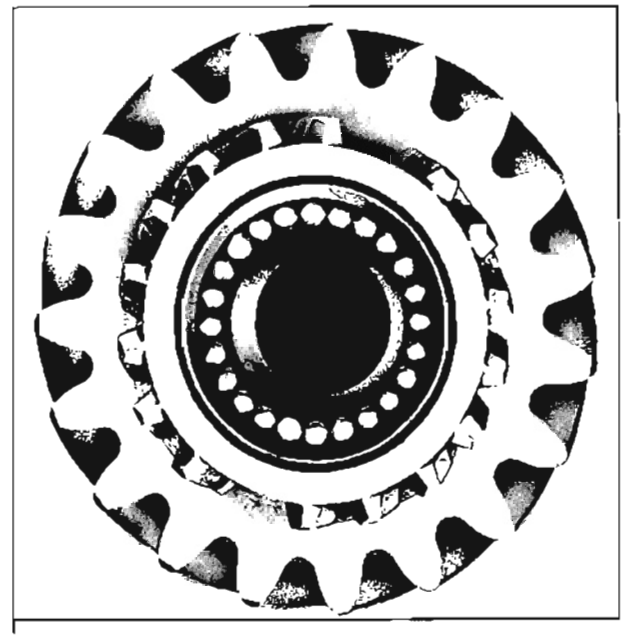


Fig. 7-122 Mainshaft Pilot Roller Bearings in Clutch Gear

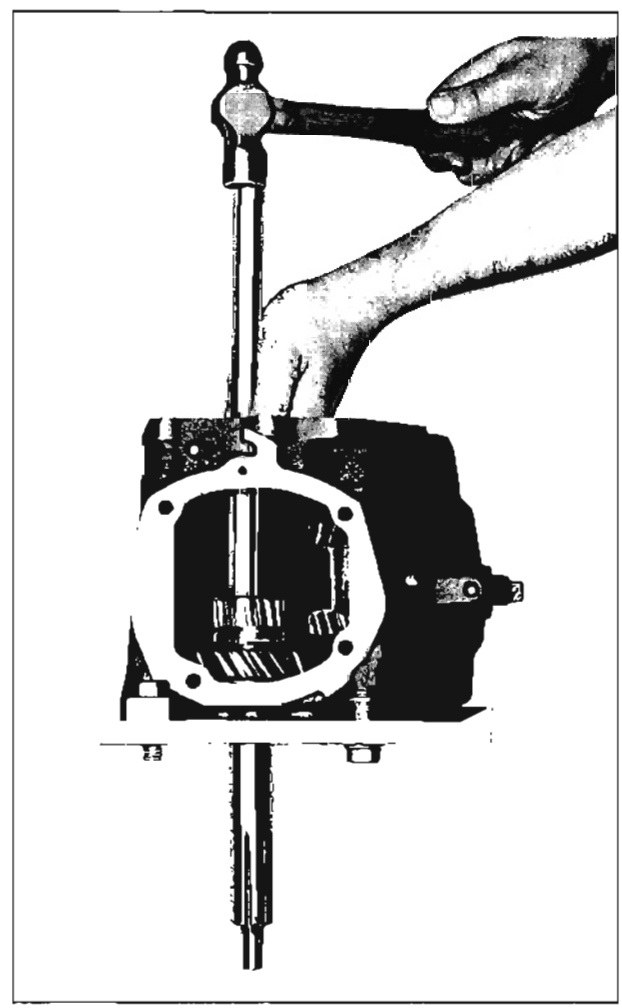


Fig. 7-123 Installing Clutch Gear and Bearing

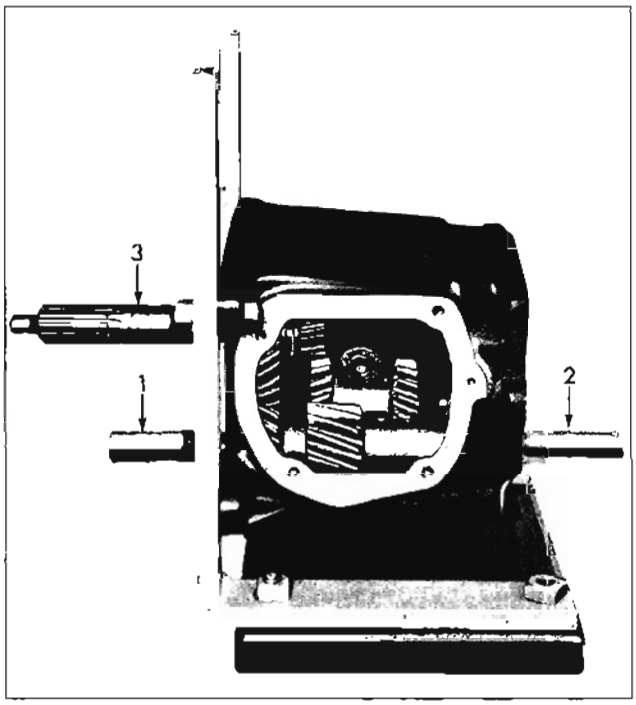


Fig. 7-124 Assembly of Countershaft

of the transmission case. Do not allow the gasket to protrude beyond the edge of the retainer.

9. Coat the retainer screws with P.O.B. No. 2 or equivalent and install in retainer, using the special shakeproof washers. Tighten the retaining capscrews 12 to 15 ft. lbs. torque.

10. Lubricate and insert countershaft in rear of case, align countergear with shaft and tap shaft through, pushing assembly tool out front of case. (Fig. 7-124)

11. Turn countershaft so flat on end of shaft is horizontal.

    NOTE: The flat on shaft must be horizontal at the bottom or the transmission case extension cannot be assembled to transmission case.

12. Make sure front end of shaft is in line with hole in front of case and drive shaft into case until flat on shaft is flush with rear of case.

Clutch Sleeve

Assemble first and reverse gear on the clutch assembly. Insert both pieces into the side opening of the case by tipping the front end of the assembly into the opening first. Align the lug of the synchronizing ring with the synchronizing slot of the clutch gear, and position the assembly on gear to receive the mainshaft.

Mainshaft

1. Install the mainshaft assembly in the transmission case extension.

2. Install clutch gear rear roller spacer on mainshaft making sure chamfered ID is toward rear.

3. Install gasket on transmission case.

4. Align lugs on synchronizer rings with slots in mainshaft so lugs on the synchronizer rings slide in slots on gear. Check clutch gear to make sure rollers are still in position. Push the shaft into the clutch sleeve until transmission case extension is tight against case. Install bolts and lockwashers.

   NOTE: The extension lower bolt should be coated with P.O.B. #2 or equivalent before installation. Torque 40 to 45 ft. lbs.

   CAUTION: Keep mainshaft in line with clutch gear during installation to avoid disrupting rollers in clutch gear.

TRANSMISSION ALIGNMENT

If transmission slips out of high gear, particularly at 50 mph and up, after all other probable causes have been corrected as outlined under TROUBLES AND REMEDIES, the alignment of the engine crankshaft pilot, clutch housing bore and the transmission should be checked.

A special tool on which is mounted a dial indicator is necessary to check the transmission rear bearing bore alignment. This tool may be made from a new, or good used, clutch gear which has a good bearing surface on the crankshaft pilot and front main bearing.

The splines on the clutch gear shaft should be ground off so the shaft may be rotated in a clutch disc hub without interference when assembled in the car. Weld a piece of 1/4" rod 8" long in the mainshaft pilot bore. Assemble a good bearing on the shaft and secure it with clutch gear bearing nut.

Procedure

1. Remove the transmission from the car and completely disassemble as outlined.

   NOTE: In any case where the clutch gear pilot or pilot bearing is excessively loose or worn, the pilot bearing should be replaced before checking the transmission rear bearing bore alignment by the dial indicator method.

2. Install the case extension on the case and tighten the extension-to-case bolts securely.

3. Carefully install the special tool with the dial indicator into the transmission case with the face of the indicator and the tracing finger to the rear of the transmission. Secure in place with a clutch gear bearing retainer.

4. Carefully rotate the gear and make final adjustment of the indicator with the tracing finger of the indicator pointing to the rear and in the center of the rear bearing bore in the case extension.

5. Assemble the transmission case to the clutch housing and tighten the four transmission mounting bolts securely.

   NOTE: Be sure to clean off any paint or other foreign material on the mating faces of the clutch housing and transmission as any foreign material on these faces will change alignment; also, check carefully for dings or burrs on these mating surfaces and remove carefully as necessary.

6. Install transmission support and support-to-transmission mounting block bolts.

7. Remove the jack or other support from under the engine and let the weight of the engine rest on the transmission mounting in the normal position.

8. Dial indicate the transmission rear bearing bore and record the indicator readings in the 12, 3, 6 and 9 o'clock positions, with the weight on the transmission mounting as outlined above.

   NOTE: Start the reading at the 6 o'clock position then record the 9, 12 and 3 o'clock readings.

9. Install temporary shims between the transmission case and the clutch housing at the bolt locations as necessary to bring misalignment at the transmission rear bearing bore to a maximum of .010 indicator reading in either the vertical or horizontal plane.

   NOTE: Installation of a .002" shim between the transmission case and the clutch housing at two bolt locations opposite to the high indicator reading will change the transmission rear bore reading approximately .003" to .004".

10. After the position and quantity of shims has been determined and recorded, transmission case may be removed.

    NOTE: The clutch housing should then be marked, showing the position where shims are to be installed and the thickness of shims at each location.

11. Inspect the clutching teeth of the clutch gear. Inspect the second and third-speed clutch gear and the internal clutching teeth on the high gear (forward end). If the teeth of either gear are worn or tapered due to long continued previous disengagement, the gears should be replaced. Reassemble transmission.

12. Install the transmission assembly to the clutch housing, using the correct number of shims at the proper locations as previously determined.

DIAGNOSIS

CONDITION AND PROBABLE CAUSE	CORRECTION
Slips Out of High Gear	
Transmission loose in clutch housing.	Tighten mounting bolts.
Control rods interfere with engine mounts or clutch throw-out lever.	Replace or bend levers and rods to eliminate interference.
Control linkage does not work freely, binds.	Adjust and free upshift linkage. Torque reactions of engine should not cause the lever on transmission to move. The movement of transmission with respect to body and frame should be transferred to the control linkage.
Does not fully engage.	Measure length of engagement pattern on clutching teeth. If less than 7/64", check for bent levers, shifter shafts, detent cam plates, control rods and other shift linkage. Replace or straighten defective parts.
Damaged mainshaft pilot bearing.	Replace pilot bearing.
Clutch gear bearing retainer broken or loose.	Tighten or replace clutch gear bearing retainer.
Dirt between transmission case and clutch housing.	Clean mating surfaces.
Misalignment of transmission. Refer to TRANSMISSION ALIGNMENT under MAJOR SERVICE OPERATIONS.	Shim between transmission case and clutch housing.
Slips Out of Low and/or Reverse	
First and/or Reverse gears damaged from operating during partial engagement.	Determine cause, for example, worn shift fork and control lever or rod interference. Replace worn or bent parts.
Improper mated splines on inside of first and reverse gear and/or external spline on second and third clutch sleeve.	Replace second or third-speed clutch sleeve and/or first and reverse sliding gear. Possible correction is to change index of gear on clutch sleeve approximately 180° and/or turning the rear side of first and reverse gear to the front of the transmission.
Improperly adjusted linkage.	Adjust linkage.
Noisy in All Gears	
Insufficient lubricant.	Fill to correct level.

DIAGNOSIS (Continued)

CONDITION AND PROBABLE CAUSE	CORRECTION
Noisy in All Gears (Continued)	
Worn countergear bearings.	Replace countergear bearings and shaft.
Worn or damaged clutch gear and countershaft drive gear.	Replace worn or damaged gears.
Damaged clutch gear or mainshaft ball bearings.	Replace damaged bearings.
Damaged speedometer gears.	Replace damaged gears.
Noisy in High Gear	
Damaged clutch gear bearing.	Replace damaged bearing.
Damaged mainshaft bearing.	Replace damaged bearing.
Damaged speedometer gears.	Replace speedometer gears.
Noisy in Neutral with Engine Running	
Damaged clutch gear bearing.	Replace damaged bearing.
Damaged mainshaft pilot bearing roller.	Replace damaged bearing roller.
Noisy in All Reduction Gears	
Insufficient lubricant.	Fill to correct level.
Worn or damaged clutch gear or countergear.	Replace faulty or damaged gears.
Noisy in Second Only	
Damaged or worn second-speed constant mesh gears.	Replace damaged gears.
Worn or damaged countergear rear bearings.	Replace countergear bearings and shaft.
Noisy in Low and Reverse Only	
Worn or damaged first and reverse sliding gear.	Replace worn gear.
Damaged or worn countergear.	Replace countergear assembly.

DIAGNOSIS (Continued)

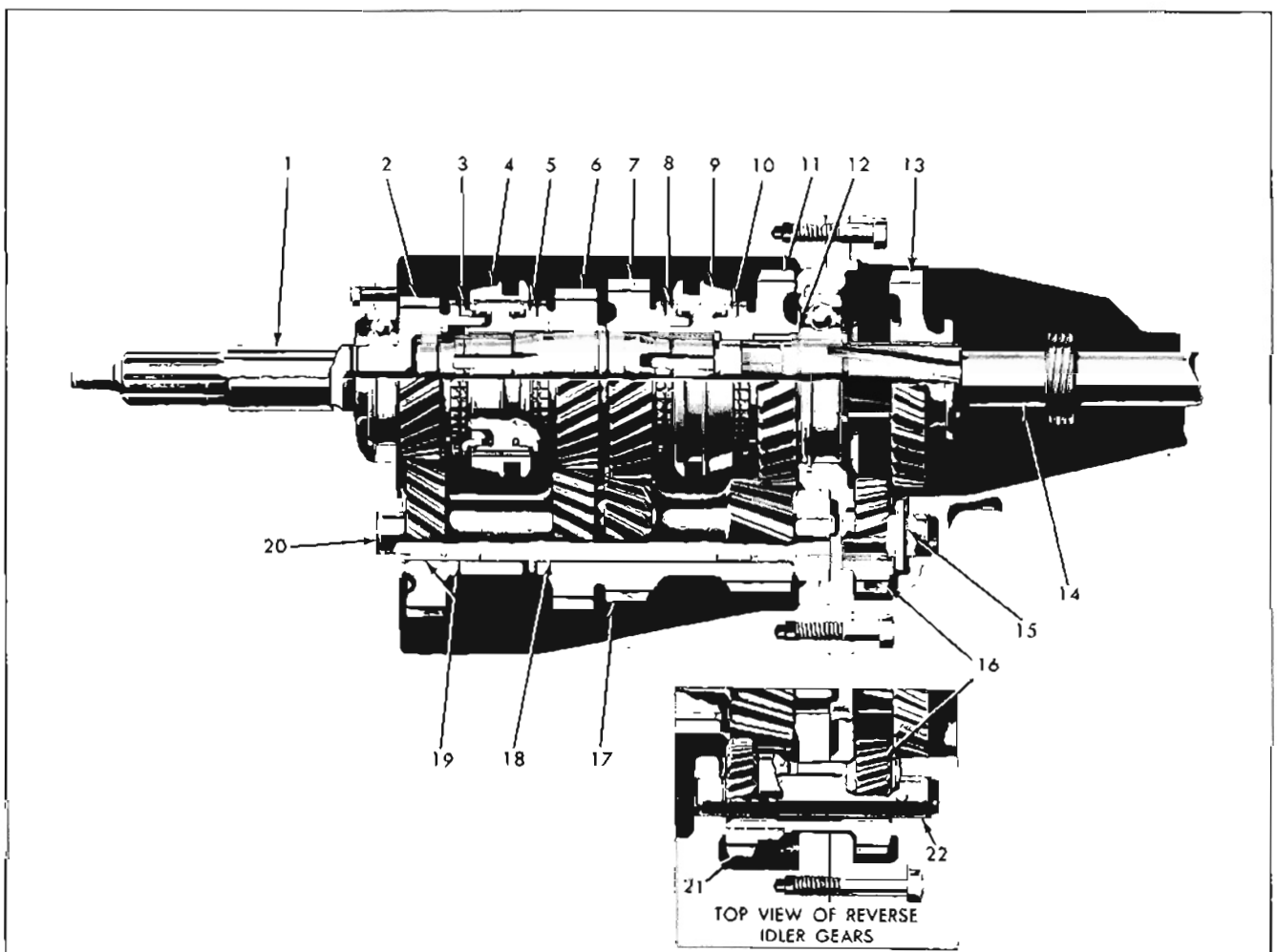
CONDITION AND PROBABLE CAUSE	CORRECTION
Noisy in Reverse Only (Continued)	
Worn or damaged reverse idler gear.	Replace reverse idler gear.
Worn reverse idler gear bushings.	Replace reverse idler gear.
Damaged or worn reverse countergear.	Replace countergear assembly.
Excessive Backlash in Second Only	
Second-speed gear thrust washer worn.	Replace thrust washer.
Mainshaft rear bearing not properly installed in case.	Replace bearing, lock or case as necessary.
Worn countergear rear bearing.	Replace countergear bearings and shaft.
Excessive Backlash in All Reduction Gears	
Worn countergear bearings.	Replace countergear bearings and shaft.
Excessive end play in countergear.	Replace countergear thrust washers.
Leaks Lubricant	
Excessive amount of lubricant .	Drain to correct level.
Loose or broken clutch gear bearing retainer.	Tighten or replace retainer.
Clutch gear bearing retainer gasket damaged.	Replace gasket.
Cover loose or gasket damaged.	Tighten cover or replace gasket.
Operating shaft seal leaks.	Replace operating shaft seal.
Idler shaft expansion plugs loose.	Replace expansion plugs.
Countershaft loose in case.	Replace case.
Lack of sealant on bolts.	Coat bolts with sealant.
Worn extension oil seal.	Replace seal.

FOUR-SPEED TRANSMISSION

GENERAL DESCRIPTION

The four-speed Synchromesh transmission (Fig. 7-201) incorporates helical gears throughout, specially designed to provide high torque capacity without additional weight, and gear teeth proportioned to operate at high speeds with neither excessive heat generation nor excessive frictional losses. Shafts, bearings, high capacity clutches and other precision parts are held to close limits, providing proper clearances necessary for durability during extended heavy usage.

The main drive gear is supported by a heavy duty ball bearing at the front end of the transmission case and is piloted at its front end in an oil impregnated bushing mounted in the engine crankshaft. The front end of the mainshaft is



1. Bearing Retainer
2. Main Drive Gear
3. Fourth Speed Synchronizing Ring
4. Third and Fourth Speed Clutch Assembly
5. Third Speed Synchronizing Ring
6. Third Speed Gear
7. Second Speed Gear
8. Second Speed Synchronizing Ring
9. First and Second Speed Clutch Assembly
10. First Speed Synchronizing Ring
11. First Speed Gear
12. Thrust Washer
13. Reverse Gear
14. Mainshaft
15. Reverse Idler Shaft Roll Pin
16. Reverse Idler Gear (Rear)
17. Countergear
18. Countershaft Bearing Roller Spacer
19. Countershaft Bearing Roller
20. Countershaft
21. Reverse Idler Gear (Front)
22. Reverse Idler Shaft

Fig. 7-201 Four-Speed Transmission Cross Section

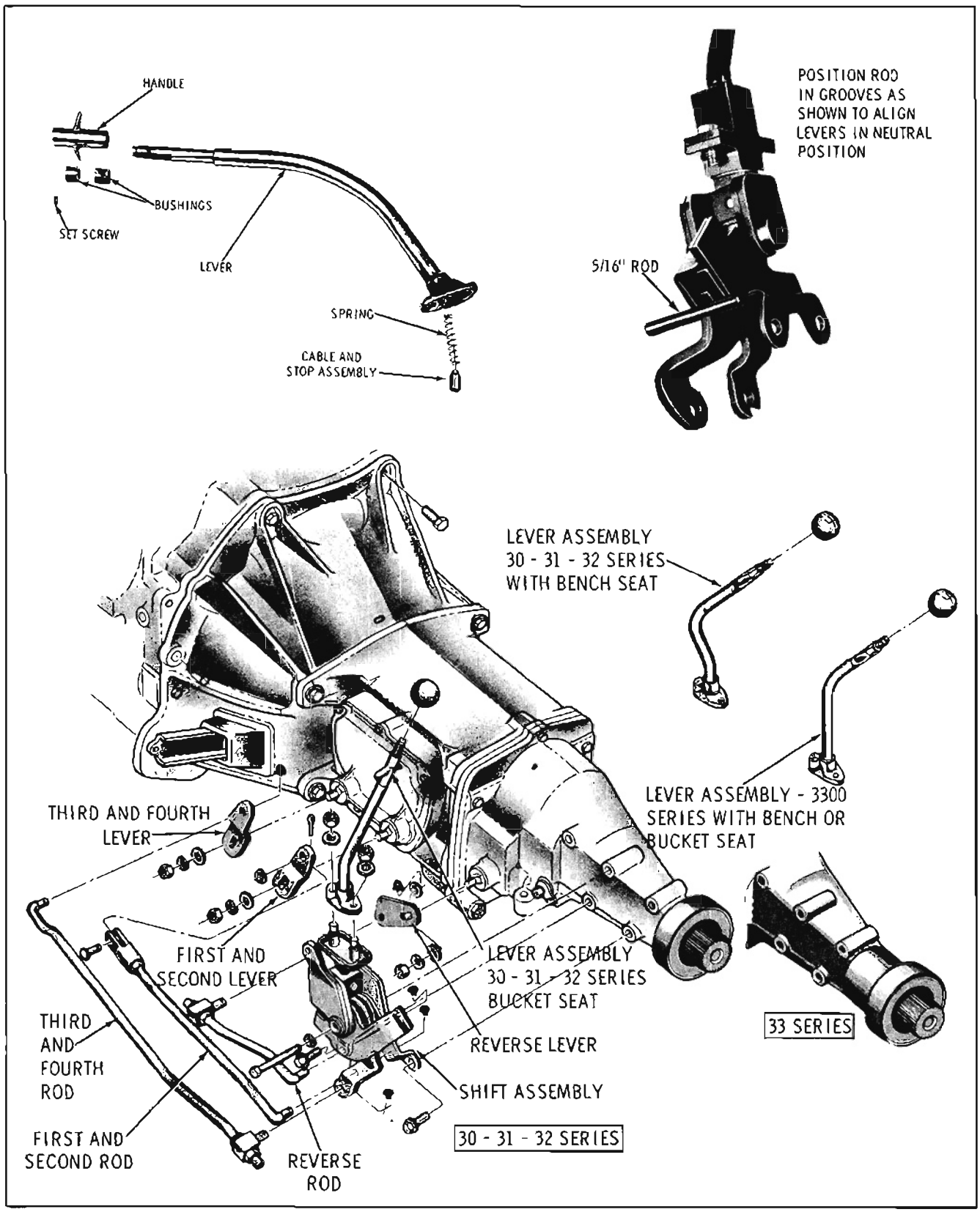


Fig. 7-202 Shift Linkage Adjustment

piloted in a row of roller bearings set into the hollow end of the main drive gear and the rear end is carried by a heavy duty ball bearing mounted at the rear end of the transmission case in a retainer casting.

The countergear is carried on a double row of rollers at both ends while thrust is taken on thrust washers located between the ends of the gear and the thrust bosses in the case.

The two-piece reverse idler gear is carried on bronze bushings while thrust is taken on thrust washers located between the front of the gear and the back of the reverse idler thrust boss and between the rear of the gear and the reverse idler shaft boss in the case extension.

Gearshifting is manual through shift control rods to the transmission cover shifter levers for first through fourth gears, and to the reverse lever located in the case extension. The shifter lever to the rear of the transmission cover controls first and second gears while the lever to the front controls third and fourth gears. All four forward gears are fully synchronized. The transmission may be used as an aid in deceleration by downshifting in sequence without double clutching or gear clashing. Reverse is not synchronized, however it is a helical gear to insure quiet operation.

MAINTENANCE AND ADJUSTMENTS NOT REQUIRING TRANSMISSION REMOVAL

SHIFT LINKAGE ADJUSTMENT (Fig. 7-202)

SPEEDOMETER DRIVEN GEAR AND OIL SEAL

Replacement

Disconnect speedometer cable, remove retainer to housing bolt and lockwasher and remove retainer. Insert screwdriver in slot in fitting and pry fitting, gear and shaft from housing. Pry "O" ring from groove in fitting.

Install new "O" ring in groove and insert shaft. Hold the assembly so slot in fitting is toward boss on housing and install in housing. Push fitting into housing until retainer can be inserted in groove and install retainer lockwasher and bolt.

TRANSMISSION SIDE COVER

Removal

1. Disconnect control rods from levers.
2. Shift transmission into second speed before removing cover by moving 1-2 (Rear Cover) shifter lever into forward detent position.
3. Remove cover assembly from transmission case carefully and allow oil to drain.

Disassembly (Fig. 7-203)

1. Remove the outer shifter lever nuts, lockwashers and flat washers. Pull levers from shafts.

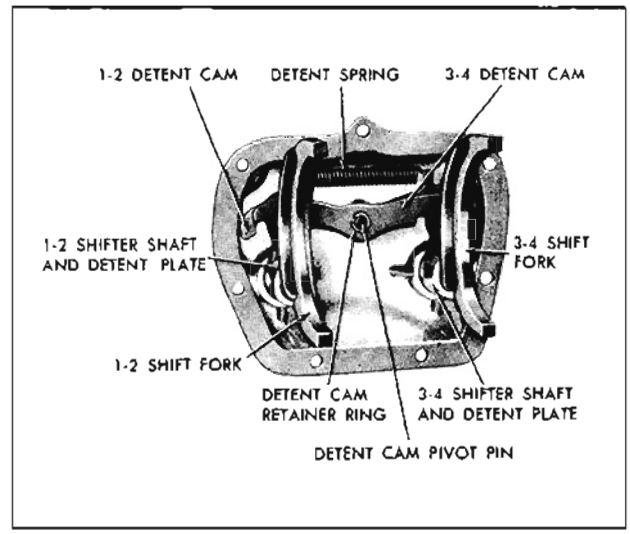


Fig. 7-203 Transmission Side Cover, Shift Fork and Detent Assembly

2. Remove both shift forks from shifter shaft and detent plate assemblies. Remove both shifter shaft assemblies from cover. Lip seals in side cover may now be pryed out if replacement is required because of damage.
3. Remove detent cam spring and pivot retainer "C" ring. Remove both detent cams.
4. Replace necessary parts.

Assembly (Fig. 7-203)

1. Install 1-2 detent cam to cover pivot pin first, then install 3-4 detent cam so the detent spring notches are offset or opposite each other. Detent cam notches must be facing downward.
2. Install detent cam retaining "C" ring to pivot shaft and hook spring into detent cam notches.
3. Install both shifter shaft assemblies in cover, being careful not to damage lip seals. Install both shift forks to detent plates, lifting up on detent cam to allow forks to fully seat into position.
4. Install outer shifter levers, flat washers, lockwashers and nuts.

Installation (Fig. 7-204)

1. Shift 1-2 shifter lever into second-speed (forward) position. Position cover gasket on case.
2. Carefully position side cover into place, mak-

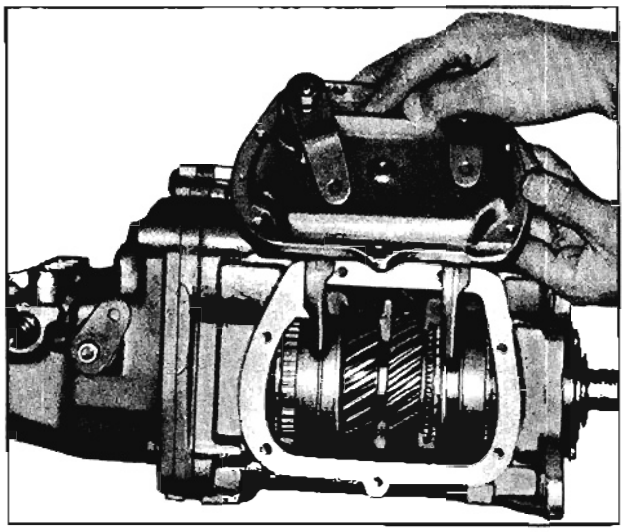


Fig. 7-204 Installing Side Cover Assembly

ing sure the shift forks are aligned with their respective mainshaft clutch sliding sleeves.

3. Install cover attaching bolts and tighten evenly 15 to 20 ft. lbs. torque.

4. Remove filler plug and add lubricant to level of filler plug hole.

EXTENSION OIL SEAL

Replacement

1. Remove propeller shaft.

2. Pry out the extension oil seal.

3. Press new oil seal carefully into place in extension using J-5154 or similar tool.

CAUTION: Do not excessively force the seal against the seat in the extension.

TRANSMISSION ASSEMBLY

REMOVAL

1. Raise car.

2. Remove propeller shaft.

3. Disconnect shift rods from shift levers.

4. Disconnect back-up lamp switch wires if so equipped.

5. Install Engine Support Bar BT-6424. (Refer to ENGINE Section).

6. Remove cross support bar-to-rear transmission mount attaching bolts.

7. Remove cross support bar-to-frame attaching brackets and remove cross support bar.

NOTE: On models equipped with dual exhaust, it may be necessary to disconnect the left hand exhaust pipe at the exhaust manifold to provide clearance.

8. Disconnect speedometer cable at transmission.

9. Remove three bolts that retain shift lever assembly to extension housing. If shift lever assembly removal is not required, it may be left hanging in floor seal.

10. Remove four transmission-to-engine attaching bolts.

11. Carefully slide transmission rearward and remove from car.

Installation

1. Inspect clutch pilot bushing and lubricate with wheel bearing grease.

2. Reverse removal procedure using the following specified torque ratings for the attaching parts:

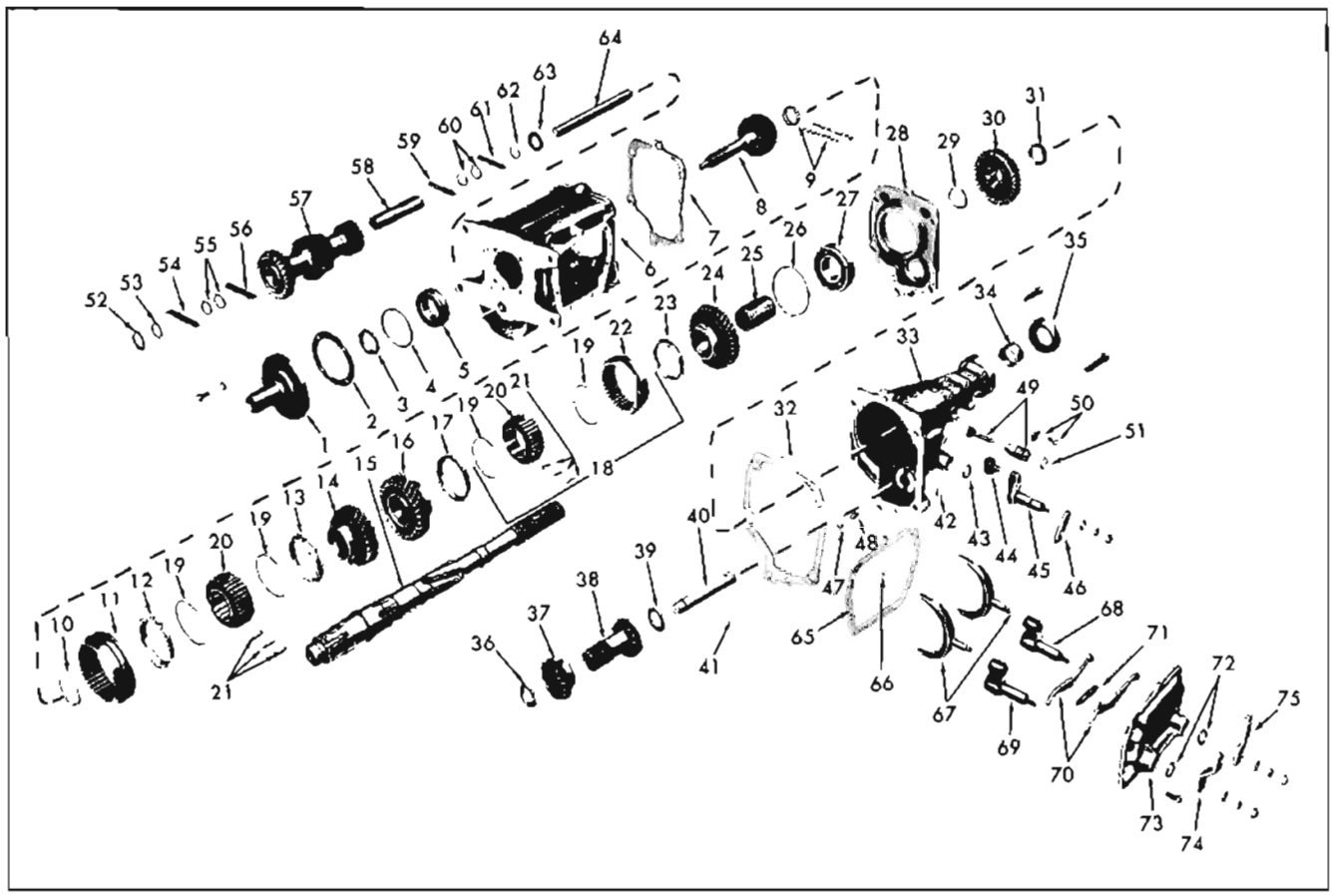
a. Transmission to engine	60 to 70 ft. lbs.
b. Shift lever assembly to extension housing	20 to 30 ft. lbs.
c. Exhaust pipe to exhaust manifold	10 to 18 ft. lbs.
d. Cross support bar brackets to frame	30 to 40 ft. lbs.
e. Cross support bar to rear transmission mount	30 to 45 ft. lbs.
f. Propeller shaft U-bolt nuts	12 to 16 ft. lbs.

Disassembly

1. Remove transmission side cover as outlined under MAINTENANCE AND ADJUSTMENTS.

2. Remove four bolts from front bearing retainer and remove retainer and gasket.

3. Remove the main drive gear retaining nut (Fig. 7-206) using Tool J-0933, after locking up transmission by shifting into two gears.



1. Bearing Retainer
2. Gasket
3. Bearing Retaining Nut
4. Bearing Snap Ring
5. Main Drive Gear Bearing
6. Transmission Case
7. Rear Bearing Retainer Gasket
8. Main Drive Gear
9. Bearing Rollers (17) & Cage
10. Snap Ring
11. Third and Fourth Speed Clutch Sliding Sleeve
12. Fourth Speed Gear Synchronizing Ring
13. Third Speed Synchronizing Ring
14. Third Speed Gear
15. Mainshaft
16. Second Speed Gear
17. Second Speed Gear Synchronizing Ring
18. First and Second Speed Clutch Assembly
19. Clutch Key Spring
20. Clutch Hub
21. Clutch Keys
22. First and Second Speed Clutch Sliding Sleeve
23. First Speed Gear Synchronizing Ring
24. First Speed Gear
25. Sleeve
26. Rear Bearing Snap Ring
27. Rear Bearing
28. Rear Bearing Retainer
29. Selective Fit Snap Ring
30. Reverse Gear
31. Speedometer Drive Gear
32. Rear Bearing Retainer to Case Extension Gasket
33. Case Extension
34. Extension Bushing
35. Rear Oil Seal
36. Reverse Idler Front Thrust Washer (Tanged)
37. Reverse Idler Gear (Front)
38. Reverse Idler Gear (Rear)
39. Flat Thrust Washer
40. Reverse Idler Shaft
41. Reverse Idler Shaft Roll Pin
42. Reverse Shifter Shaft Lock Pin
43. Reverse Shifter Shaft Lip Seal
44. Reverse Shift Fork
45. Reverse Shifter Shaft and Detent Plate
46. Reverse Shifter Lever
47. Reverse Shifter Shaft
48. Reverse Shifter Shaft Ball Detent Spring
49. Speedometer Driven Gear and Fitting
50. Retainer and Bolt
51. "O" Ring Seal
52. Tanged Washer
53. Spacer (.050")
54. Bearing Rollers (20)
55. Spacers (2-.050")
56. Bearing Rollers (20)
57. Countergear
58. Countergear Roller Spacer
59. Bearing Rollers (20)
60. Spacers (2-.050")
61. Bearing Rollers (20)
62. Spacer (.050")
63. Tanged Washer
64. Countershaft
65. Gasket
66. Detent Cams Retainer Ring
67. Forward Speed Shift Forks
68. First and Second Speed Gear Shifter Shaft and Detent Plate
69. Third and Fourth Speed Gear Shifter Shaft and Detent Plate
70. Detent Cams
71. Detent Cam Spring
72. Lip Seals
73. Transmission Side Cover
74. Third and Fourth Speed Shifter Lever
75. First and Second Speed Shifter Lever

Fig. 7-205 Four-Speed Transmission-Exploded View

The retaining nut has a left handed thread and is staked in place. This staking must be removed before removing nut.

4. With transmission gears in neutral, drive lock pin from reverse shifter lever boss as shown in (Fig. 7-206), and pull shifter shaft out about 1/8". This disengages the reverse shift fork from reverse gear.

5. Remove six bolts attaching the case extension to the case. Tap extension with soft hammer in a rearward direction to start. When the reverse idler shaft is out as far as it will go, move extension to left so reverse fork clears reverse gear and remove extension and gasket.

6. The rear reverse idler gear, shaft and flat

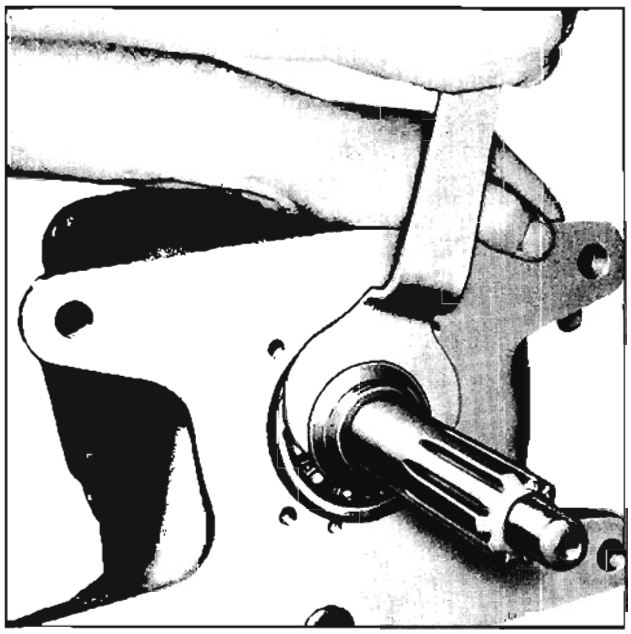


Fig. 7-206 Removing Main Drive Gear Retaining Nut

thrust washer may now be removed.

7. Remove speedometer gear and reverse gear. The speedometer gear may be removed using Tool J-6123 as shown in Fig. 7-208.

   NOTE: Slide 3-4 synchronizer clutch sleeve to fourth-speed gear position (forward) before trying to remove mainshaft assembly from case. (Fig. 7-209)

8. Carefully remove the rear bearing retainer and entire mainshaft assembly from the case by tapping bearing retainer with a soft hammer.

9. Unload bearing rollers from main drive gear and remove fourth-speed synchronizer blocker ring.

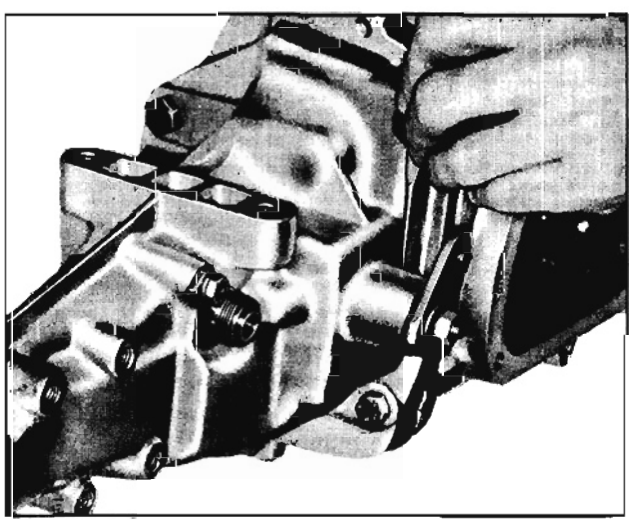


Fig. 7-207 Removing Reverse Shifter Shaft Lock Pin

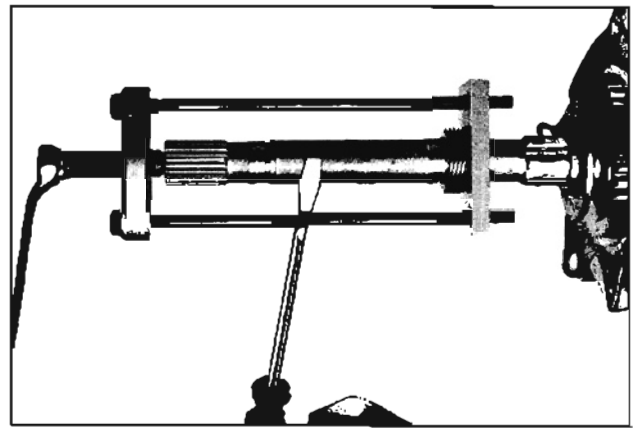


Fig. 7-208 Removing Speedometer Gear with J-6123

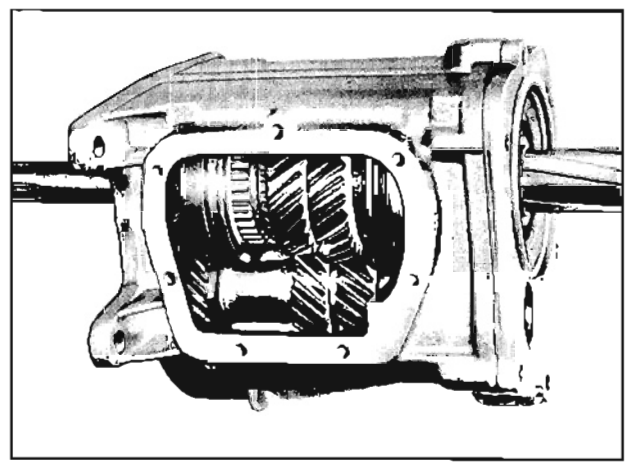


Fig. 7-209 Third and Fourth Speed Synchronizer Clutch Sleeve In Fourth Gear Position

10. Lift the front half of reverse idler gear and its tanged thrust washer from case.

11. Press main drive gear down from front bearing. (Fig. 7-210)

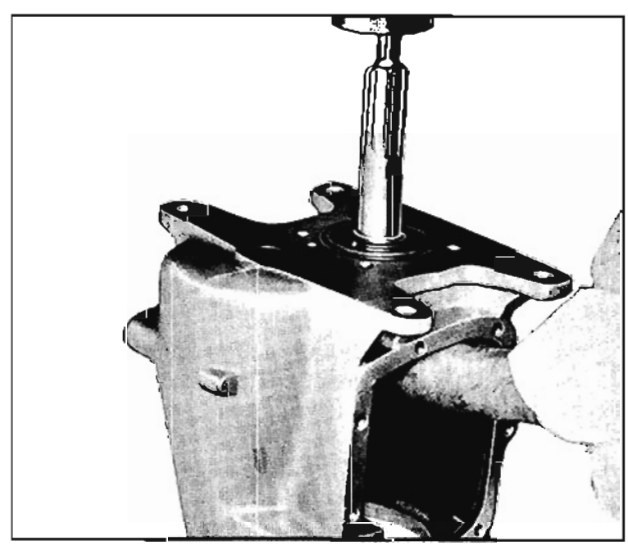


Fig. 7-210 Removing Main Drive Gear

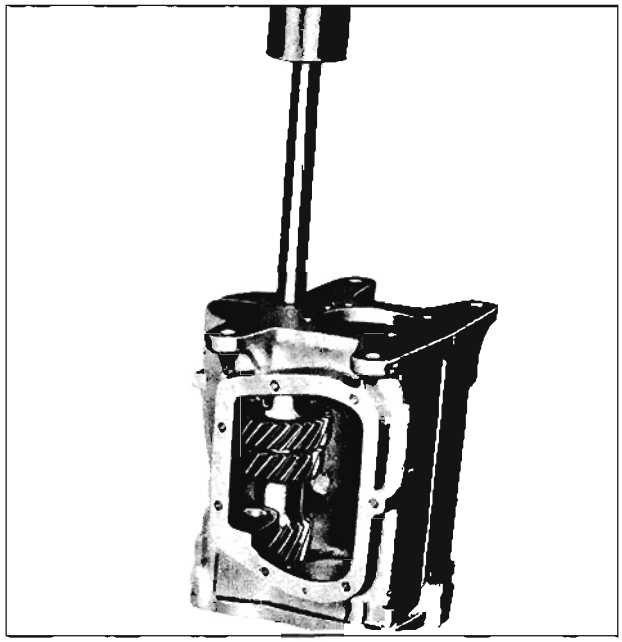


Fig. 7-211 Removing Countershaft with J-21629

12. From inside case, tap out front bearing and snap ring.

13. From the front of the case, press out the countershaft (Fig. 7-211) using Tool J-21629; then remove the countergear and both tanged washers.

14. Remove the 80 rollers, six .050" spacers and roller spacer from countergear.

15. Remove mainshaft front snap ring as shown in Fig. 7-212 and slide third and fourth-speed clutch assembly, third-speed gear and synchronizing ring from front of mainshaft.

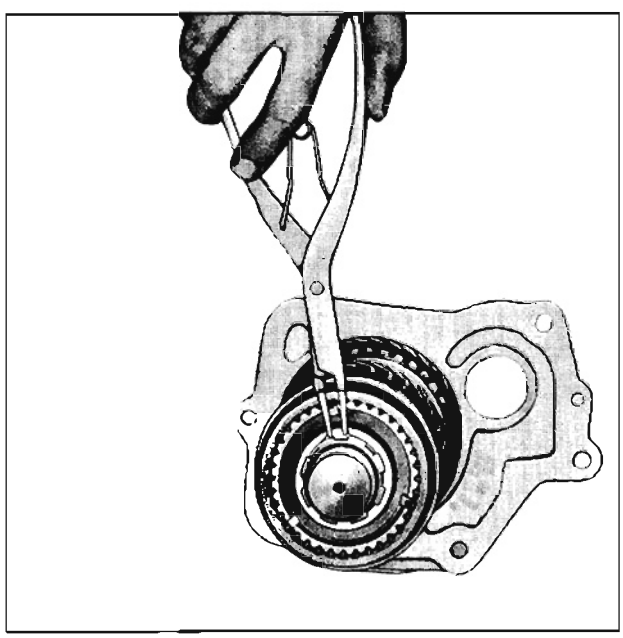


Fig. 7-212 Removing Mainshaft Front Snap Ring

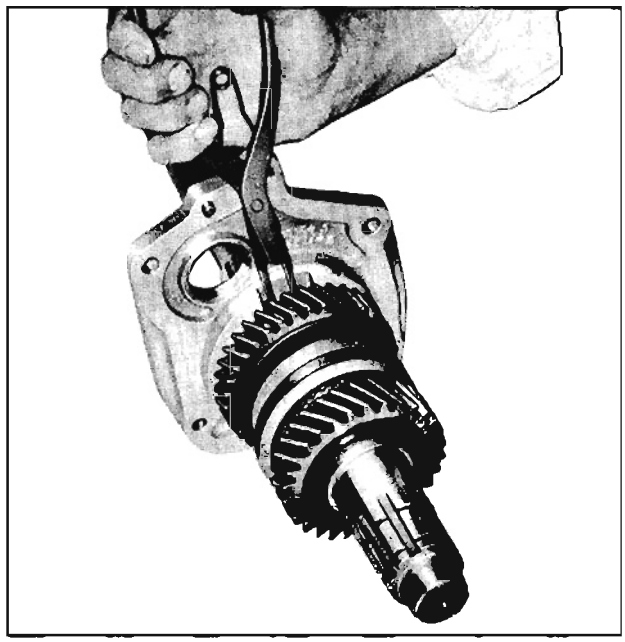


Fig. 7-213 Removing Rear Bearing Retainer

16. Spread rear bearing retainer snap ring and press mainshaft out of the retainer. (Fig. 7-213)

17. Remove the mainshaft rear snap ring. Support first-speed gear as shown in Fig. 7-214 and press against rear of mainshaft to remove shaft from rear bearing, first-speed gear thrust washer, first-speed gear and synchronizing ring.

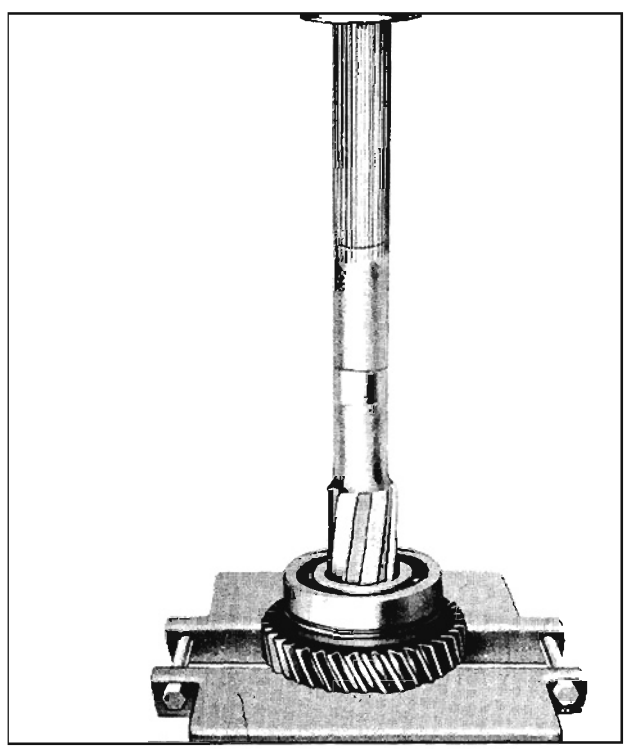


Fig. 7-214 Removing Mainshaft from Rear Bearing and First Speed Gear

Fig. 7-215 Removing 1-2 Speed Synchronizer Clutch Assembly Retainer Snap Ring

18. Remove 1-2 speed synchronizer clutch assembly retaining sleeve (Fig. 7-215) and remove 1-2 synchronizer assembly, second-speed synchronizer ring and second-speed gear from mainshaft.

CLEANING AND INSPECTION

Transmission Case

Wash the transmission case inside and out with a cleaning solvent and inspect for cracks. Inspect the front face which fits against clutch housing for burrs and if any are present, dress them off with a fine cut mill file.

Front and Rear Bearings

1. Wash the front and rear bearings thoroughly in a cleaning solvent.

2. Blow out bearings with compressed air.

   CAUTION: Do not allow the bearings to spin, but turn them slowly by hand. Spinning bearings will damage the race and balls.

3. Make sure bearings are clean, then lubricate them with light engine oil and check them for roughness. Roughness may be determined by slowly turning the outer race by hand.

Bearing Rollers and Spacers

All main drive gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect countershaft at the same time and replace if necessary. Replace all worn spacers.

Gears

Inspect all gears and replace all that are worn or damaged.

Reverse Idler

1. The bushings used in the idler gear are pressed into the gear, then peened into holes in the bores and are bored in place. This insures the positive alignment of the bushings and their shafts, as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushings are not serviced separately.

2. Check bushings for excessive wear by using a narrow feeler gauge between the shaft and the bushing or use a micrometer. The proper clearance is from .003" to .005".

REPAIRS

Reverse Shifter Shaft and Seal

Replacement

1. With case extension removed from transmission, the reverse shifter shaft lock pin will already be removed. (See Step 4 under Disassembly.)

2. Remove shift fork.

3. Carefully drive shifter shaft into case extension, allowing ball detent to drop into case. Remove shaft and ball detent spring.

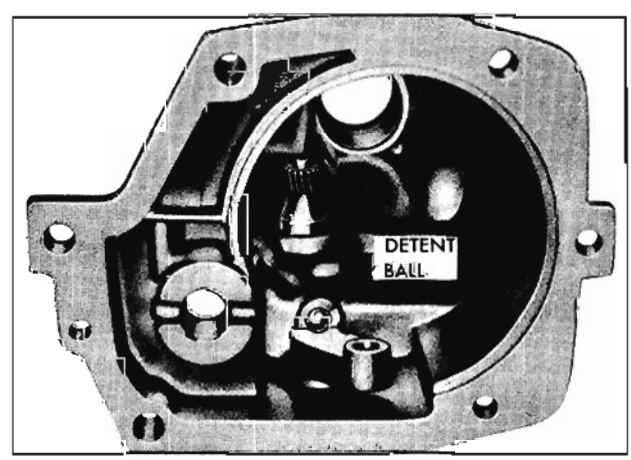


Fig. 7-216 Installing Reverse Shifter Shaft and Detent Ball

4. Place ball detent spring into detent spring hole and from inside extension install shifter shaft fully into its opening until the detent plate is butted against inside of extension housing.

5. Place detent ball on spring (Fig. 7-216) and, holding ball down with your thumb or a suitable tool, push the shifter shaft back in away from case until it is directly over the ball and turn until the ball drops into detent on the shaft detent plate.

6. Install shift fork.

NOTE: Do not drive the shifter shaft lock pin into place until the extension has been installed on the transmission case.

Extension Oil Seal or Bushing

If bushing in rear of extension requires replacement, remove oil seal and use Tool J-5778 to drive bushing into case extension. Using the same tool, drive new bushing in from the rear. Coat ID of bushing with transmission lubricant, then install new oil seal using Tool J-5154.

Clutch Keys and Springs

NOTE: The clutch hubs and sliding sleeves are a selected assembly and should be kept together as originally assembled, but the three keys and two springs may be replaced if worn or broken.

Replacement

1. Push the hub from the sliding sleeve. The keys will fall free and the springs may be easily removed.

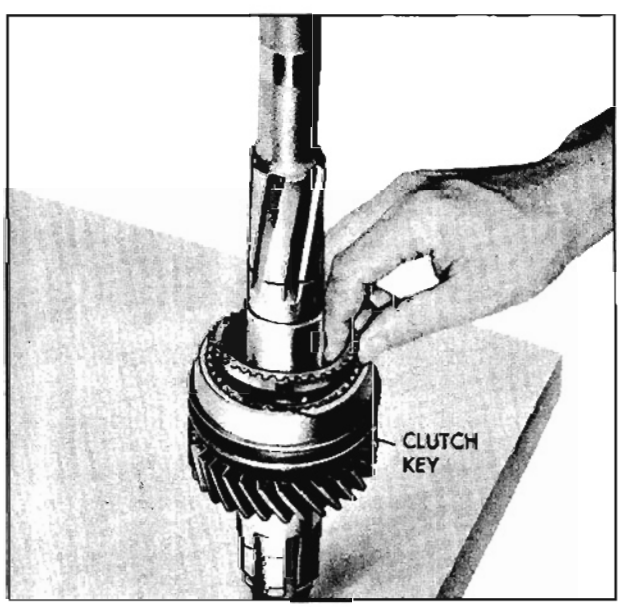


Fig. 7-217 Installing Synchronizing Ring

2. Place the two springs in position (one on each side of the hub), so all three keys are engaged by both springs. Place the keys in position and, holding them in place, slide the hub into the sleeve.

ASSEMBLY

Mainshaft Assembly

1. From the rear of the mainshaft, assemble the second-speed gear (with hub of gear toward rear of shaft).

2. Install 1-2 synchronizer clutch assembly to mainshaft (sliding clutch sleeve taper toward the rear, hub to the front); together with a synchronizing ring on either side so their keyways line up with the clutch keys. (Fig. 7-217) Install larger of two synchronizer retaining snap rings to mainshaft with ends of snap ring behind spline teeth.

3. Install the first-speed gear with hub toward front.

4. Using 1-5/8" ID pipe cut to a suitable length, press on the rear bearing with the snap ring groove toward the front of the transmission. (Fig. 7-218) Firmly seat the bearing.

5. Choose the correct selective fit snap ring (.084", .087", .090", .093", or .096") and install it in the groove in mainshaft behind the rear bearing. With proper ring, maximum distance between snap ring and rear face of bearing will be from zero to .005".

NOTE: Always use new snap rings when reassembling transmission and do not expand the snap ring further than necessary for assembly.

6. Install the third-speed gear (hub to front of transmission) and the third-speed gear synchronizing ring (notches to front of transmission).

7. Install the third and fourth-speed gear clutch assembly (hub and sliding sleeve) with both sleeve taper and hub toward the front, making sure the keys in the hub correspond to the notches in the third-speed gear synchronizing ring.

8. Install snap ring in the groove in mainshaft in front of the third and fourth-speed clutch assembly with ends of snap ring seated behind spline teeth.

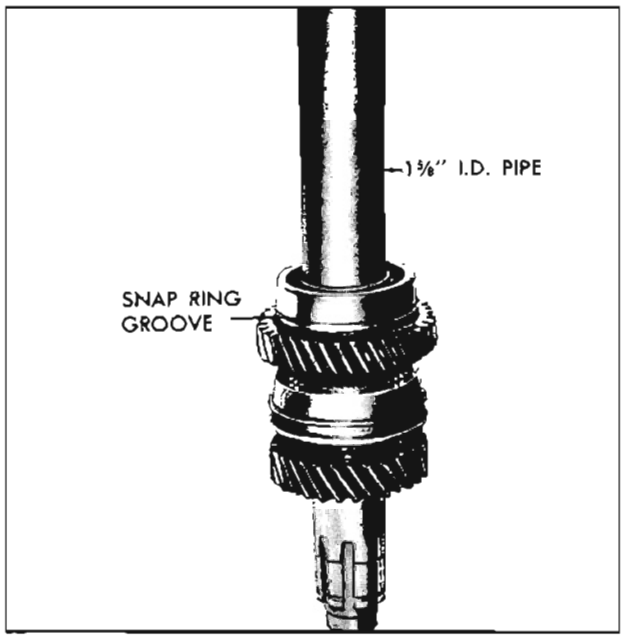


Fig. 7-218 Installing Rear Bearing

9. Install the rear bearing retainer. (Fig. 7-213) Spread the snap ring in the plate to allow the snap ring to drop around the rear bearing and press on the end of the mainshaft until the snap ring engages the groove in the rear bearing.

10. Install the reverse gear (shift collar to rear).

11. Press speedometer drive gear onto the mainshaft, using a suitable press plate such as J-1453. Position the speedometer gear to get a measurement of 4-5/16" from the forward side of the gear to the flat surface of the rear bearing retainer (Fig. 7-219) or until centered on the mainshaft speedometer drive gear boss.

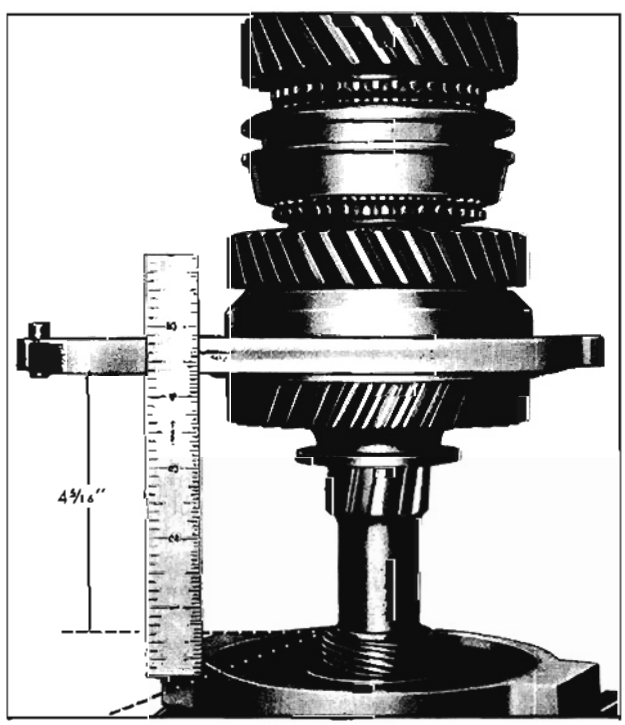


Fig. 7-219 Installing Speedometer Drive Gear

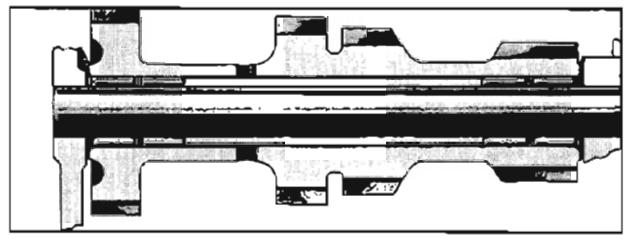


Fig. 7-220 Cross-Section of Countergear Assembly

Countergear Assembly

1. Install roller spacer in countergear.

2. Using heavy grease to retain the rollers, install 20 rollers in either end of the countergear, two .050" spacers, 20 more rollers, then one .050" spacer. Install in the other end of the countergear, 20 rollers, two .050" spacers, 20 more rollers and another .050" spacer. (Fig. 7-120)

3. Insert Tool J-21629 into countergear.

Transmission Assembly

1. Rest the transmission case on its side with the side cover opening toward the assembler. Put countergear tanged thrust washers in place, retaining them with heavy grease, making sure the tangs are resting in the notches of the case.

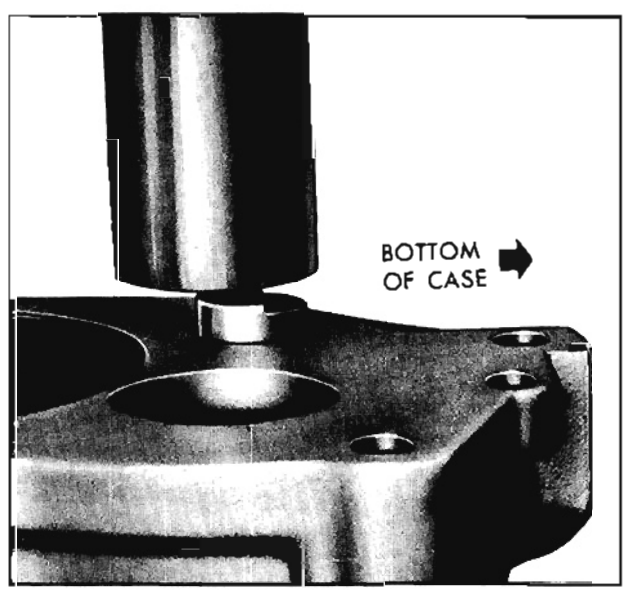


Fig. 7-221 Installing Countershaft

2. Set countergear in place in bottom of transmission case, making sure that tanged thrust washers are not knocked out of place.

3. Position the transmission case resting on its front face.

4. Lubricate and insert countershaft in rear of case. Turn countershaft so flat on end of shaft is horizontal and facing bottom of case.

   NOTE: The flat on shaft must be horizontal and toward the bottom to mate with rear bearing retainer when installed.

5. Align countergear with shaft in rear and hole in front of case and press countershaft into case (pushing assembly tool out front of case) until flat on shaft is flush with rear of case. Be sure thrust washers remain in place. (Fig. 7-121)

6. Attach a dial indicator as shown in Fig. 7-122 and check end play of the countergear. If end play is greater than .025", new thrust washers must be installed.

7. Install the 17 roller bearings into main drive gear, using heavy grease to hold the bearings and cage in place.

8. Install main drive gear and pilot bearings through the side cover opening and into position in transmission front bore.

9. Place gasket in position on front face of rear bearing retainer.

10. Install the fourth-speed synchronizing ring on main drive gear with the notches toward the rear of the transmission.

11. Position the reverse idler gear thrust washer

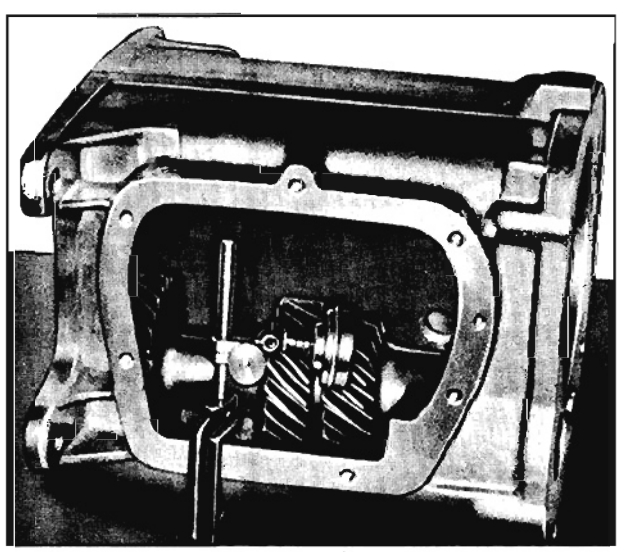


Fig. 7-222 Checking Countergear End Play

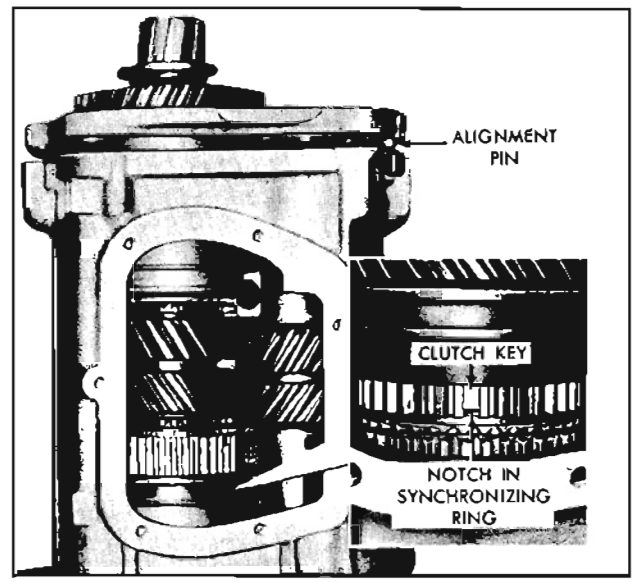


Fig. 7-223 Installing Mainshaft Assembly

(tanged) on the machined face of the ear cast in the case for the reverse idler shaft and hold with heavy grease. Position the front reverse idler gear next to the thrust washer, with the hub facing toward rear of the case.

CAUTION: Before attempting to install mainshaft assembly to case, slide the 3-4 synchronizing clutch sleeve forward into fourth-speed detent position. (Fig. 7-209)

12. Lower the mainshaft assembly into the case, making certain the notches on the fourth-speed synchronizing ring correspond to the keys in the clutch assembly. (Fig. 7-123)

13. With the guide pin in rear bearing retainer aligned with hole in rear of case, tap rear bearing retainer into position with a soft hammer.

14. From the rear of the case, insert the rear reverse idler gear, engaging the splines with the portion of the front gear inside the case.

15. Using heavy grease, place gasket in position on rear face of rear bearing retainer.

16. Install the remaining flat thrust washer on reverse idler shaft. If new idler shaft is being used, drive out the roll pin and press it into new shaft.

17. Install reverse idler shaft, roll pin and thrust washer into gears and front boss of case. Make sure to pickup front tanged thrust washer.

    NOTE: Roll pin should be in a vertical position.

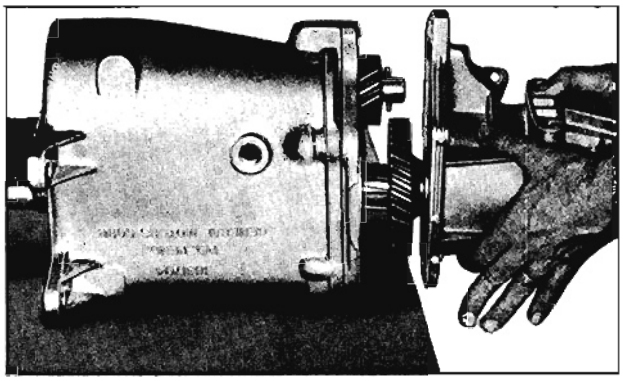


Fig. 7-224 Installing Case Extension

18. Pull reverse shifter shaft to left side of extension and rotate shaft to bring reverse shift fork forward in extension (reverse detent position). Start the extension onto the transmission case (Fig. 7-124), while slowly pushing in on the shifter shaft to engage the shift fork with the reverse gear shift collar; then pilot the reverse idler shaft into the extension housing, permitting the extension slide onto the transmission case.

19. Install six extension and retainer-to-case attaching bolts. Torque upper three bolts 15 to 25 ft. lbs.; lower three bolts 25 to 35 ft. lbs.

20. Push or pull reverse shifter shaft to line up groove in the shaft with the holes in the boss and drive in the lock pin. Install shifter lever.

21. Press bearing onto main drive gear (snap ring groove to front) and into case until several main drive gear retaining nut threads are exposed.

22. Lock up transmission by shifting into two gears. Install main drive gear retaining nut on the gear shaft and draw it up tight using Tool J-0933. Be sure bearing fully seats against shoulder on gear. Torque retaining nut to 40 ft. lbs. and lock in place by staking securely into main drive gear shaft hole with a center punch. Care must be used to avoid damaging the threads on the shaft.

23. Install the main drive gear bearing retainer, gasket and four attaching bolts using a suitable sealer on bolts. Torque 15 to 20 ft. lbs.

24. Shift mainshaft 3-4 sliding clutch sleeve into neutral position and 1-2 sliding clutch sleeve into second gear (forward) detent position. Shift side cover 3-4 shifter lever into neutral detent and 1-2 shifter lever into second gear detent position.

25. Install side cover gasket and carefully position side cover into place. There is a dowel pin in the cover to assure proper alignment with the case. Install attaching bolts and tighten evenly to avoid side cover distortion. Torque 15 to 20 ft. lbs.

DIAGNOSIS

CONDITION AND PROBABLE CAUSE	CORRECTION
Shifts Hard	
a. Clutch not releasing engine or slow to release.	a. Adjust or repair clutch.
b. Shift linkage binding or selector not properly adjusted.	b. Free up and adjust as required.
Shifts Hard on Downshift	
a. Downshifting at too high an engine speed.	a. Shifting into low gear above 45 mph and second above 65 mph causes extra work for synchronizers and will require extra time or more force on lever to complete. There is also danger of over-speeding the engine if low or second is used at high car speeds.
	b. Lubricant cold or too high viscosity.

DIAGNOSIS (Continued)

CONDITION AND PROBABLE CAUSE	CORRECTION
Disengages from Gear	
Improperly adjusted linkage.	Adjust linkage.
Transmission loose at clutch housing.	Tighten mounting bolts.
Dirt between transmission case and clutch housing.	Clean mating surfaces.
Clutch gear bearing retainer broken or loose.	Tighten or replace clutch gear bearing retainer.
Damaged mainshaft pilot bearing rollers.	Replace pilot bearing rollers.
Clutch teeth worn or defective and/or clutch hub spline worn.	Replace gear, clutch sleeve and clutch hub.
Clutch housing misaligned with engine.	Shim transmission or replace clutch housing. (Refer to three-speed)
Noisy in All Gears	
Insufficient lubricant.	Fill to filler plug opening level.
Worn countergear bearings.	Replace countergear bearings and shaft.
Worn or damaged clutch gear and countershaft drive gear.	Replace worn or damaged gears.
Damaged clutch gear or mainshaft ball bearings.	Replace damaged bearings.
Damaged speedometer gears.	Replace damaged gears.
Noisy in High Gear	
Damaged clutch gear bearing.	Replace damaged bearing.
Damaged mainshaft bearing.	Replace damaged bearing.
Damaged speedometer gears.	Replace speedometer gears.
Noisy in Neutral with Engine Running	
Damaged clutch gear bearing.	Fill to filler plug opening level.
Damaged mainshaft pilot bearing rollers.	Replace faulty or damaged gears.
Noisy in All Reduction Gears	
Insufficient lubricant.	Replace damaged bearing.
Worn or damaged clutch gear or countergear.	Replace bearing rollers.

DIAGNOSIS (Continued)

CONDITION AND PROBABLE CAUSE	CORRECTION
Noisy in One Gear Only	
Damaged or worn mainshaft constant mesh gear.	Replace damaged gear.
Damaged or worn countergear teeth.	Replace countergear.
Excessive Backlash in All Reduction Gears	
Worn countergear bearings.	Replace countergear bearings and shaft.
Excessive end play in countergear.	Replace countergear thrust washers.
Leaks Lubricant	
Excessive amount of lubricant.	Drain to correct level.
Loose or broken clutch gear bearing retainer.	Tighten or replace retainer.
Clutch gear bearing retainer gasket damaged.	Replace gasket.
Cover loose or gasket damaged.	Tighten cover or replace gasket.
Shifter shaft seal leaks.	Replace shifter shaft lip seal.
Countershaft loose in case.	Replace case.
Lack of sealer on bolts.	Coat bolts with sealant.
Worn extension oil seal.	Replace seal.

CLUTCH

MAINTENANCE RECOMMENDATIONS

The clutch release bearing is a prepacked sealed unit which requires no periodic lubrication. The clutch linkage should be lubricated at each lubrication period with engine oil. The clutch pedal free travel should be checked whenever the car is in the service area. Free travel should be 7/8" to 1".

DESCRIPTION (Fig. 7-301)

A single plate, dry disc-type clutch is used on all 30, 31, 32 and 3300 cars with synchromesh transmissions. The clutch assembly consists of the clutch driven plate assembly, the clutch cover and pressure plate assembly and the clutch release mechanism.

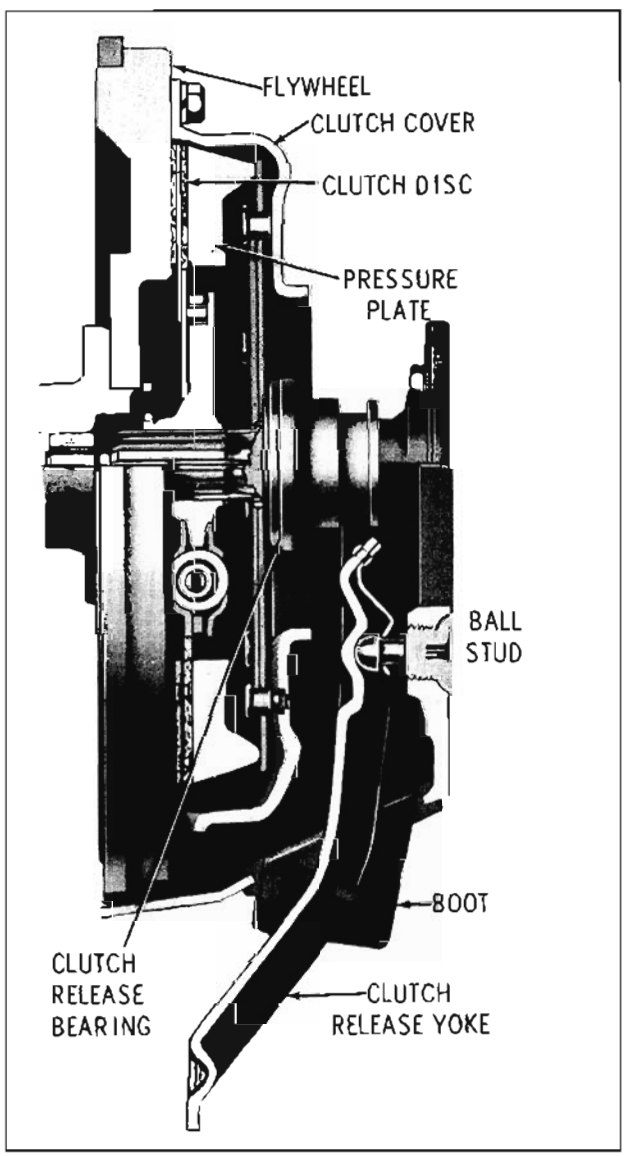


Fig. 7-301 Clutch Assembly

The driven plate for the V-6 and V-8 clutches differ from each other in plate size and damper spring calibration. Grooves on both sides of the clutch plate lining prevent the sticking of the plate to the flywheel and pressure plate due to vacuum between the members.

The driven plate incorporates a damper assembly in the hub to prevent the transmitting of vibration from engine to transmission.

The clutch pressure plate is of the disc spring type. The V-6 and V-8 clutch pressure plates differ in size and spring load. There is an overcenter effect inherent in the action of the disc spring itself. This eliminates the need for an overcenter assist spring.

Pressure plate spring pressure forces the driven plate against the flywheel, thereby coupling the engine to the transmission.

The clutch release mechanism consists of a ball thrust bearing, appropriate levers and linkage to manually control the action of the bearing. When pressure is applied to the clutch pedal to release the clutch, the clutch release yoke pivots on its ball socket. The inner end then pushes the release bearing forward so that it presses against the inner ends of the clutch release levers, releasing the clutch. Pedal effort is transmitted by the pedal to the equalizer assembly and thence through the clutch release yoke.

CLUTCH LINKAGE ADJUSTMENT OR THE REMOVAL AND REPLACEMENT OF EACH PART OF LINKAGE

Fig. 7-302 V-6 Clutch Linkage (30-31 Series)
Fig. 7-303 V-8 Clutch Linkage (30-31-32 Series)
Fig. 7-304 V-8 Clutch Linkage (33 Series)

1. Check for worn linkage, broken or disconnected pedal return spring.
2. Lubricate with engine oil as required.

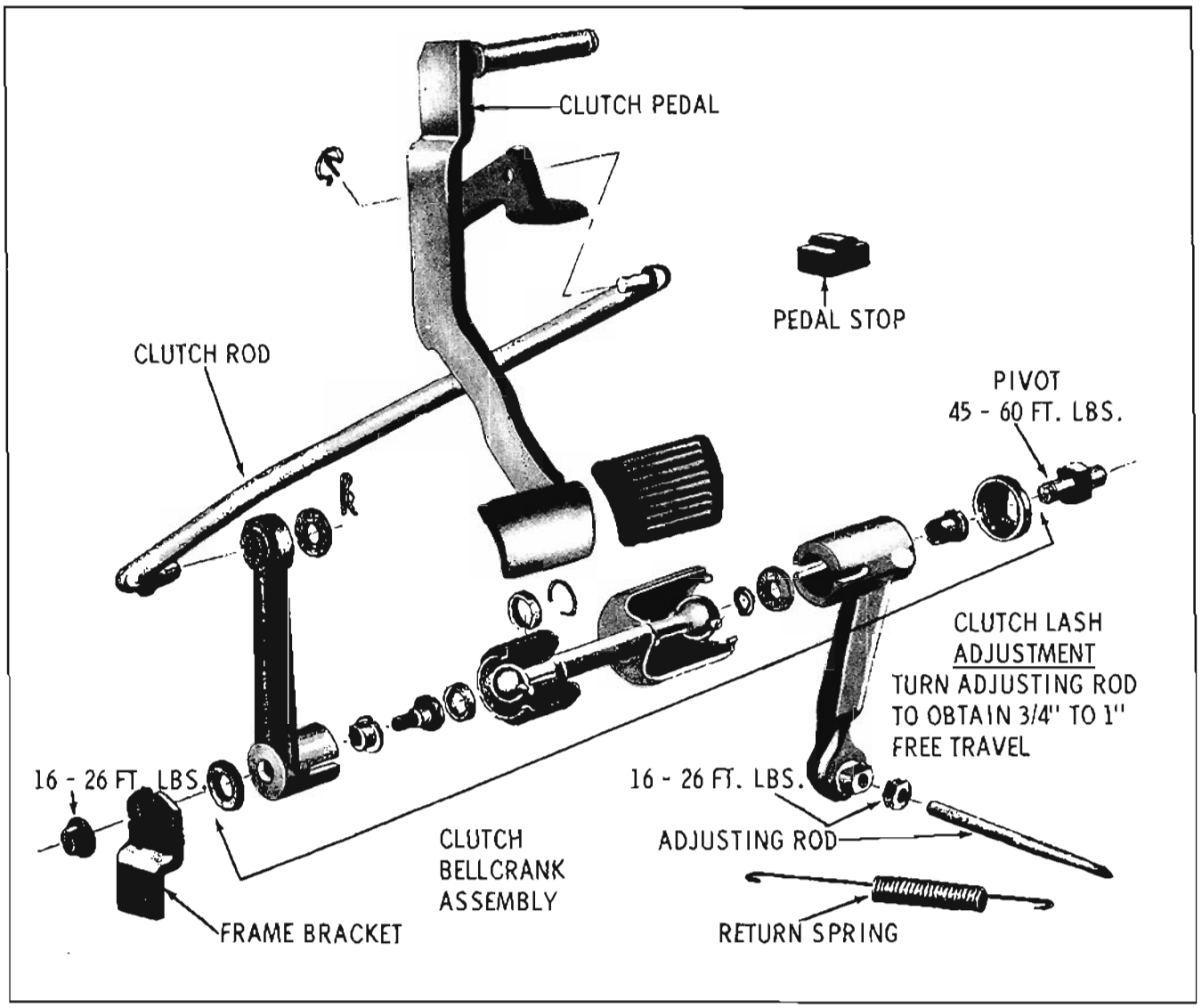


Fig. 7-302 V-6 Clutch Linkage

CLUTCH ASSEMBLY RELEASE BEARING, RELEASE YOKE, AND BALL STUD

Removal

1. Remove transmission.
2. Disconnect the clutch return spring and clutch rod assembly.
3. Remove the clutch release bearing.
4. Remove flywheel housing leaving starter attached to engine. Release yoke and ball stud will remain with housing. The clutch release yoke, boot and ball stud are accessible for service.
5. Scribe mark the clutch cover assembly to flywheel for correct reassembly.
6. Remove clutch cover assembly to flywheel attaching bolts and remove clutch cover and clutch disc.

Installation

1. Lubricate pilot bearing with wheel bearing grease.

   NOTE: If necessary to replace pilot bearing, refer to ENGINE, Section 3 for procedure.

2. Install clutch disc and clutch cover assembly being careful to align scribe marks. Install attaching bolts but do not tighten.
3. Place an old drive gear in disc and into pilot bearing to align disc. Tighten clutch cover assembly attaching bolts alternately and torque 14 to 17 ft. lbs.

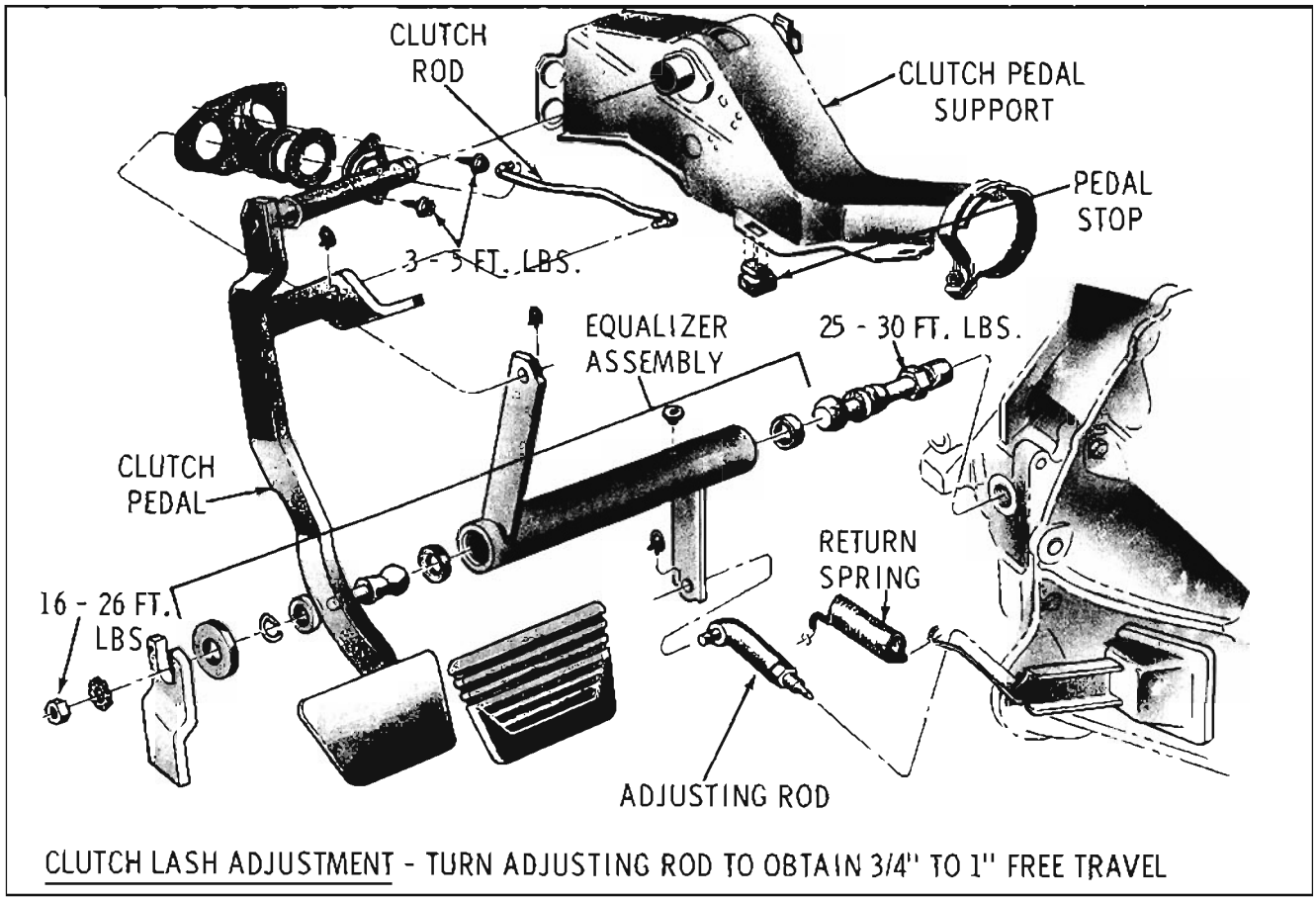


Fig. 7-303 30-31-32 Series Clutch Linkage

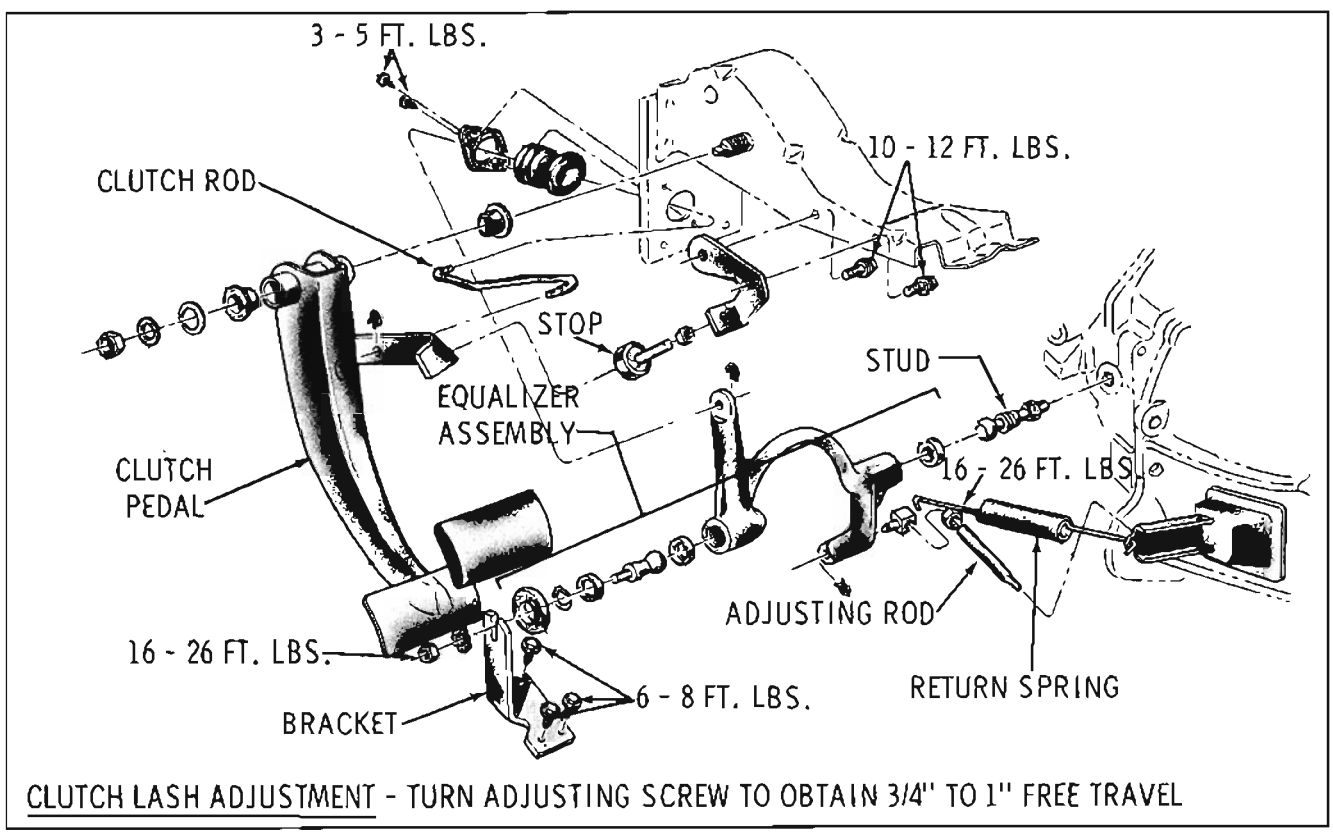


Fig. 7-304 33 Series Clutch Linkage

4. Lubricate the internal groove of the release bearing and the release yoke ball stud with 567196 lubricant and install bearing.
5. Remove old drive gear, install flywheel housing and transmission. Connect and adjust linkage.

TORQUE SPECIFICATIONS

3-SPEED

APPLICATION	FT. LBS.
Seal and retainer	1 - 1.5
Lock Plate to Rear Bearing Retainer	4 - 7
Bracket Assembly Shift Relay Lever to Frame (V-8)	10 - 15
Clutch Cover to Housing	14 - 17
Equalizer Bracket to Transmission (V-6)	15 - 20
Upper Lever Assembly to Lower Lever and Bracket Assembly	14 - 22
Shifter Levers to Transmission	15 - 20
Shift Lever and Bracket Assembly to Transmission	20 - 30
Shift Rods to Transmission Lever and Relay Lever	16 - 26
Shifts Rods to Equalizer	10 - 15
Transmission Filler Plug	35 - 40

4-SPEED

APPLICATION	FT. LBS.
Seal and Retainer	1 - 1.5
Lock Plate to Rear Bearing Retainer	4 - 7
Clutch Cover to Housing	14 - 17
Upper Lever Assembly to Lower Lever and Bracket Assembly	14 - 22
Shifter Levers to Transmission	15 - 20
Shift Lever and Bracket Assembly to Transmission	20 - 30
Shift Rods to Transmission Lever and Relay Lever	16 - 26
Shift Rods to Equalizer	10 - 15
Transmission Filler Plug	35 - 40

CLUTCH

APPLICATION	FT. LBS.
Retainer - Clutch Seal Release Rod to Dash	1 - 1.5
Clutch Cover to Flywheel	14 - 17
Flywheel Housing to Cylinder Block	20 - 30
Ball Stud Equalizer to Frame (V-8)	16 - 26
Rod to Equalizer Lever	16 - 26
Flywheel to Crankshaft	85 - 95
Transmission to Flywheel Housing	60 - 70
Ball Stud Equalizer to Engine	25 - 30
Clutch Equalizer Lever to Cylinder Block	45 - 60
Clutch Release Fork Ball Stud	35 - 45

CLUTCH SPECIFICATIONS

DISC FACINGS	
Diameter - Inside V-6	6.12"
V-8	6.50"
Diameter - Outside V-6	9.12"
V-8	10.40"
Number Used	2
Thickness	.135"
DRIVEN DISC ASSEMBLY	
Overall Thickness (Clutch Engaged)	0.300"
Hub Dimensions	1-1/8" - 10 Spline
PEDAL FREE TRAVEL	7/8" - 1"
PRESSURE SPRING IS A SINGLE DISC SPRING	
RELEASE BEARING	
Type	Sealed Ball
CLUTCH PILOT BEARING	
Type	Oil Impregnated Bushing

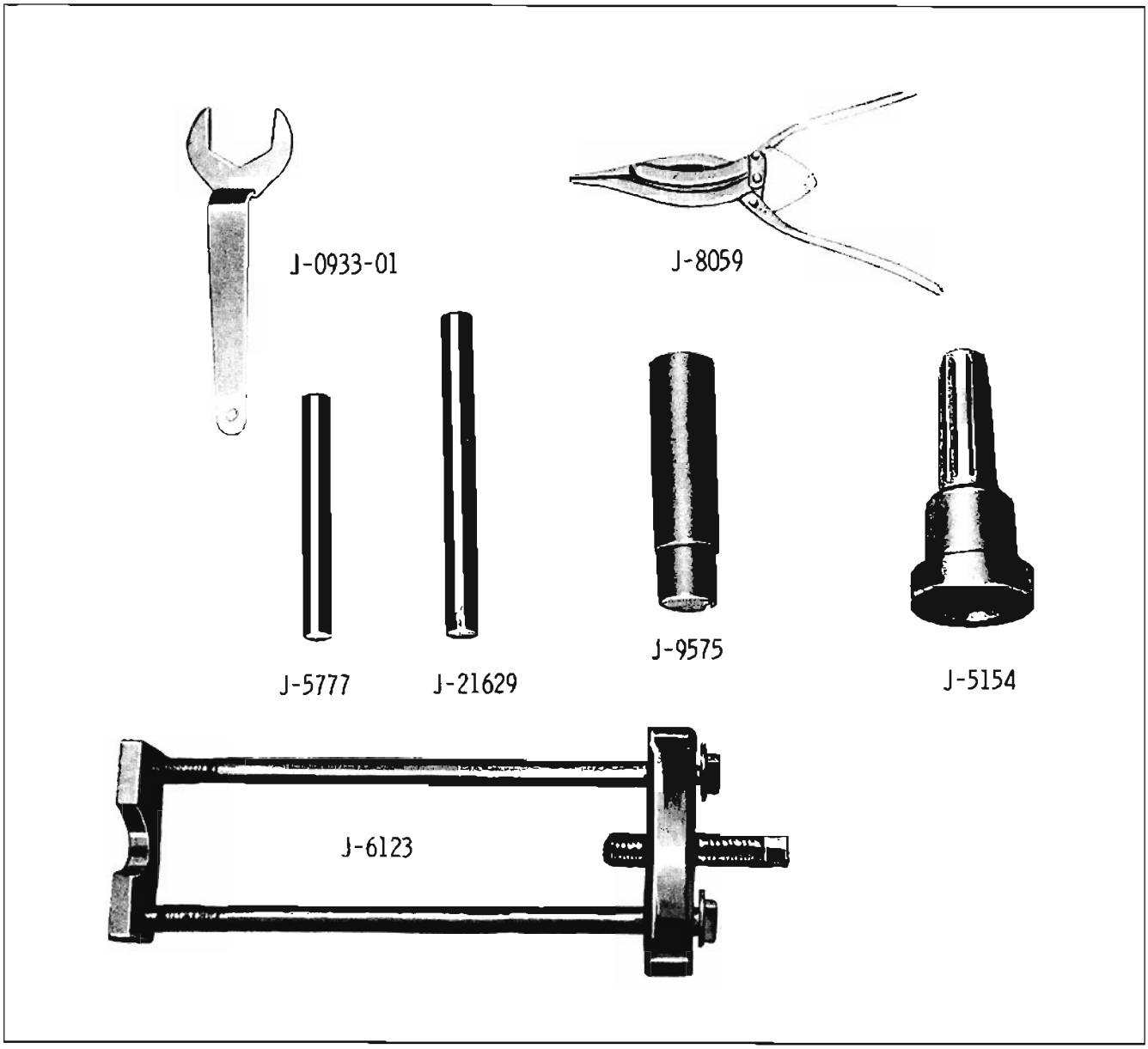


Fig. 7-305 Tools

J-5154	Extension Housing Seal Installer
J-5777	Countergear Loading Tool (3-Speed Transmission)
J-6123	Speedometer Drive Gear Remover
J-8059	Retainer Snap Ring Pliers
J-9575	Extension Housing Bushing Remover and Installer
J-21629	Countergear Loading Tool
J-0933-01	Clutch Gear Bearing Retainer Wrench