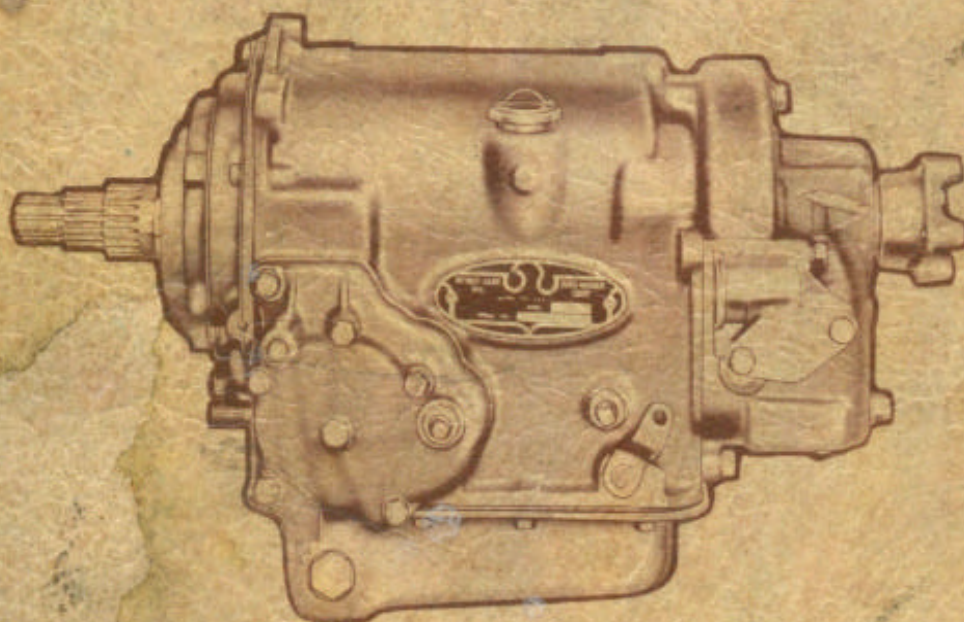


# HUDSON AUTOMATIC TRANSMISSION



## SERVICE MANUAL



HUDSON MOTOR CAR COMPANY • DETROIT 15, MICHIGAN

STOCK NO. T-228



# FOREWORD

This manual is a guide and a reference book to be used in the proper servicing of the Hudson Automatic Transmission.

The procedures covering: Operation, testing, diagnosis, adjustments, removal, disassembly, inspection, re-assembly and installation of the complete transmission or its subassemblies are defined herein and can be easily located by referring to the alphabetical index at the front of this manual. The units that can be removed without removing the transmission from the car are grouped under the heading, "Repair Procedures With Transmission in Car". Units requiring removal of the transmission are grouped under, "Repairs Requiring Removal of

the Transmission From the Car".

Before attempting any repairs, refer to the "Testing and Diagnosis" section of this manual to ascertain the actual malfunction. This will minimize the need for major transmission repairs.

Pages in this manual are numbered consecutively. Illustrations are also in consecutive order.

Tools referred to or illustrated in this manual are available through the Kent-Moore Organization, Detroit, Michigan

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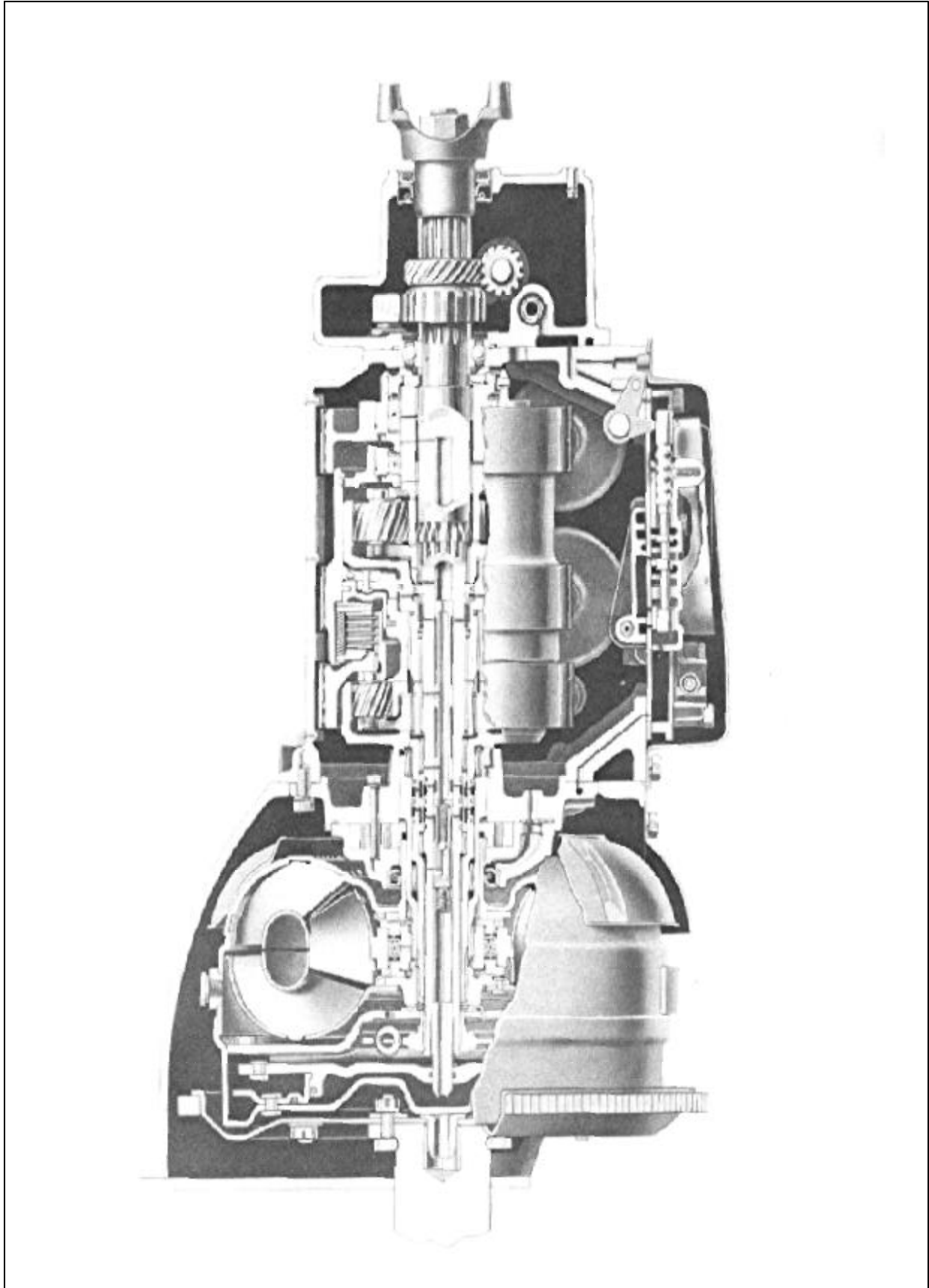
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CROSS SECTION - AUTOMATIC TRANSMISSION

# DRIVING INSTRUCTIONS

Operation of the Hudson Automatic Transmission is controlled by a selector (gear shift) lever mounted on the steering column. The position of the lever is indicated by the quadrant pointer, Figure 1. The quadrant has five positions as follows:

P-N-D-L-R

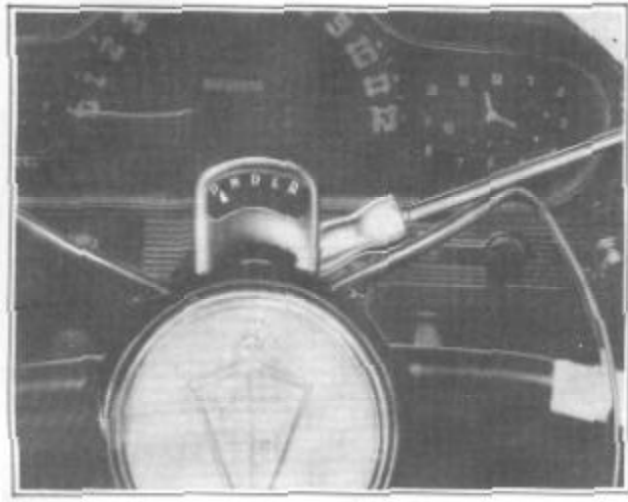


FIGURE 1

To start the engine, the selector lever must be in the "P" or "N" position.

## "P" (Park)

Move the pointer to the park position by lifting the selector lever toward you then moving it upward. Moving the selector lever to "P" position actuates a mechanical device in the transmission which prevents the drive shaft from turning in either direction. When the car has been parked on a grade; releasing the selector lever from the "P" position will usually require a sharp movement of the selector lever (not a steady pull).

## "N" (Neutral)

When the quadrant pointer is in the "N" position, the engine can be started and idled indefinitely. With the pointer at "N" the car can be moved or coasted whether or not the engine is running.

Do not use the "N" position for parking, use the "P" position.

## "D" (Drive)

Provides all normal forward driving and automatic shifting between first, second and third. After the engine has been started and the lever has been moved to the "D" position, it should be left there for all forward driving except under certain conditions requiring additional power and acceleration, hard pulling or extra fast getaway.

## "L" (Low)

In this range the transmission operates only in first speed and will not shift beyond first regardless of car speed.

This range provides maximum power for extra heavy pulling or for rocking the car out of mud, sand or snow or for use on unusually long or steep grades. The "L" range may be used for engine braking or steep descents at speeds under 40 M.P.H.

The change to the "L" position from "P", "N" or "D" positions can be made by raising the selector lever toward you and moving the pointer on the quadrant to the "L" position.

**CAUTION: Do not shift from "D" to the "L" position at speeds above 40 M.P.H. or on slippery pavements.**

## "R" (Reverse)

Provides reverse driving range. Always come to a full stop before shifting from the "D" to the "R" position. To select the "R" position, pull the selector lever downward to the stop at "L", raise the lever slightly and pull the lever on downward to the "R" position. There is no stop between the "L" and "R" positions and when shifted from "R" to "L" alternately it provides the method of rocking the car out of mud, sand or snow.

### STARTING THE ENGINE

Apply the hand brake, place the quadrant pointer at either "P" or "N". If you are parked on an incline, select the "P" position. Depress the accelerator pedal half-way and release.

**CAUTION :** Never pump the accelerator or race the engine. Turn the ignition key to the right and crank the engine.

**NOTE:** If the engine fails to start within ten seconds, it is possible that the carburetor is flooded. In that case, it will be necessary to depress the accelerator to the wide open position while continuing to crank the engine.

### STARTING ENGINE BY PUSHING

Place the selector lever in the "N" position. Turn the ignition key to the on position. Depress the accelerator pedal half-way and release it. When the car has reached a speed of 20 to 30 M.P.H., move the selector lever to the "D" position.

**CAUTION :** Do not tow the car to start the engine, when the engine does start, you will be "in gear" and there is the danger of overtaking and colliding with the car ahead.

### NORMAL DRIVING

With the engine started, you are now ready to drive. For all normal driving, move the pointer from "P" or "N" (which is used for starting) to the "D" position. From here on out, accelerate or brake as the traffic conditions indicate, without again moving the lever. Actually, when starting from rest, the transmission remains in what corresponds to first gear of conventional transmissions, shifting itself to intermediate gear and then to high as the road speed and load require. When additional load is put upon the engine to climb hills, increase pressure on the accelerator and, when it is fully to the floorboard, the transmission will automatically shift itself back into second

gear. When the pointer is at "D", control the speed by the accelerator or brake pedal and, of course, control the direction of the car with the steering wheel.

### PASSING ACCELERATION (FORCED DOWNSHIFT)

For quick acceleration at speeds below 65 M.P.H. when passing other cars or when climbing grades and with selector lever in the "D" position, press the accelerator pedal down to the floorboard past the wide open throttle position. This will automatically shift the transmission into second ratio for rapid acceleration and will return to direct drive automatically as the car speed increases above approximately 72 M.P.H. or when you next release the accelerator pedal.

### STOPPING THE CAR

To stop the car; release the accelerator pedal and apply the brakes in the conventional manner. The selector lever remains in the "D" position and the engine remains "in gear" and helps to slow down the car.

**CAUTION:** Always return the selector lever to the "N" position whenever the car is left unattended with the engine running. For additional safety always apply the hand brake. This precaution prevents movement of the car should the accelerator pedal be accidentally depressed.

### PROLONGED IDLING

If it is necessary to idle the car for a long time, as in low temperatures, place the selector lever in either the "N" or "P" positions depending on the location of the car.

### STEEP CLIMBS AND DESCENTS

When climbing long, steep hills and increase in power from the engine is required, depress the accelerator all the way to the floor, past wide open throttle and the transmission will automatically and immediately

shift itself into the intermediate power range. If additional power should be required, move the selector lever to the "L" position, (at speeds below 40 M.P.H.). When descending steep hills, use the foot brakes to reduce the car speed below 40 M.P.H. and then place the selector lever in the "L" position. The transmission will immediately shift itself to the power range and the engine will then act as a brake and assist in making the descent.

**HOLDING CAR ON GRADE .**

By slightly depressing the accelerator pedal while the selector lever is in the "D" position, it is possible to hold the car from moving backward when stopping on slight upgrades. This practice, however, is not recommended on steep grades or for any extended length of time.

## PARKING

Apply hand brake, turn off ignition key, place selector lever in the "P" position. When car has been parked on a grade, a sharp impact of the hand on the selector lever will release the selector lever from the Park position, allowing movement to another position on the quadrant.

## ROCKING OUT OF MUD, SAND OR SNOW

To rock the car back and forth until it is possible to drive out of the difficulty either forward or backward, alternately select the "R" and "L" positions of the pointer on the quadrant, holding foot on the accelerator very gently and lightly throughout the operation.

The reason gentle accelerator pressure is stressed in rocking to and fro out of mud, sand, or snow, is that at forward speeds above 3 to 5 miles per hour, selection of the "R" position will result in neutral. In jockeying out of snow, sand, or mud, directional changes between forward and reverse must necessarily be made quickly to take advantage of each improvement in momentum. This requires selecting the "R" position when the car is actually moving forward. To get a "lockup" into reverse on the next accelerator pressure, the speed during the rocking procedure must be kept below 3 to 5 miles per hour.

## TOWING

Should be done with the selector lever in the "N" position.  
Car should not be towed in excess of 30 M.P.H.

**NOTE: If the transmission is not functioning properly, the propeller shaft should be disconnected to prevent damage to the transmission.**

## REFERENCE

[illegible]

## THE HUDSON AUTOMATIC TRANSMISSION

The Hudson Automatic Transmission consists of a torque converter and a hydraulically controlled planetary transmission.

### **TORQUE CONVERTER ASSEMBLY**

The torque converter is a power transmission device which is capable of multiplying input torque as required by variable operating conditions before transmitting it to the output shaft. A torque converter has two distinct functions, as follows:

A. Receive engine torque and transmit it through a fluid to the propeller shaft.

B. Provide for multiplication of this torque to give the best possible torque ratio for the various driving conditions encountered in starting, acceleration, and high speed operation.

To better understand the operation of the torque converter, let us first examine the operation of a fluid coupling (a unit which acts only to transmit power) and then show how this coupling can be changed to also provide for torque multiplication.

An elementary idea of what a fluid coupling is and what it does can be obtained by considering two electric fans placed a few inches apart and facing each other. If the switch on one of the fans is turned on, causing the fan blades to rotate and move the air against the blades of the second fan, the second fan will also rotate. In this arrangement, we supply power to one fan which, in turn, transmits the power to the other fan by means of a moving fluid, "air". To adapt this principle for practical use, the following changes are necessary.

1. Oil is substituted for the air as a transfer medium.
2. The fans are replaced by a specially designed pump and turbine members.

For the unit to operate, the pump and turbine members are mounted facing one another with a very small clearance between their faces. The two members are mounted in a housing filled with oil. The pump member is connected to the power source (engine) and the turbine member to the output shaft (main-shaft).

When the engine is running and causing the pump member to rotate, rotary motion is imparted to the oil by the vanes in the pump, causing the oil to move in the same direction as the pump. This rotary motion, in addition, causes a centrifugal force which tends to throw the oil outward and which causes the oil to move in a circular path from the pump to the turbine member. As a means of keeping this flow between the two halves of the coupling smooth and even, a split guide ring is often installed. In operation then, both a rotary and circular motion are imparted to the oil by the pump member. The circular motion causes the oil to move from the pump to the turbine.

It should also be noted that both members can function either as a pump or a turbine. This enables power to be transmitted from the rear wheels to the engine and makes the engine effective as a brake on car speeds during deceleration.

While the fluid coupling transmits torque smoothly and, generally efficiently, it is not capable of multiplying input torque. Therefore, some changes must be made to obtain the torque multiplication required for starting, acceleration, and heavy pulling. The first step in changing from a fluid coupling to a torque converter type of transmission is to add a set of curved blades, commonly called a stator, to the unit. In addition, the pump blades will be given a curve which will enable them to impart greater circular motion to the oil. To utilize as much as possible the turbine blades are also given a curved design.

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The change in the form of the turbine blades also poses a problem, in that now oil leaving the turbine blades is moving in a direction opposite to the rotation of the pump. Since the oil is moving opposite to the direction of the pump as it leaves the turbine, the energy left in it acts to oppose the rotation of the pump, attempting to slow it down and taking energy from it which could otherwise be used to drive the car.

To turn this energy from an opposing to a helping force, it is necessary to change the direction of the oil flow as it leaves the turbine so that the energy left in the oil at this time aids the pump instead of hindering it. This is done by the addition of the stator or reaction member previously mentioned, between the exit portion of the turbine and the entrance of the pump. These blades then reverse the flow of the oil leaving the turbine so that its path is directly toward the entrance of the pump. Due to this aid or supercharging effect, the pump can deliver more power to the turbine and the converter is able to provide for torque multiplication.

The oil, in changing directions, exerts a considerable force against the blades of the stator, attempting to rotate it in a direction opposite to the rotation of the pump and turbine. To prevent it from rotating in this direction and to allow it to absorb this reaction force, the stator is locked to the case through a free-wheel unit. The stator gets its name from the fact that, when the unit is operating as a torque converter, it does not rotate with the pump and turbine members, but is held stationary.

As torque multiplication is required only for starting, fast acceleration, and heavy pulling, it is advantageous from an efficiency standpoint if the unit can be arranged to act as a fluid coupling when torque multiplication is not needed. When the forces are such that the pump and turbine operate at substantially the same speeds, there is very little circular motion of the oil, and hence little need for the stator to control the direction of the circular flow. In fact, the stator blades, if held stationary, would interfere with the rotary motion of

the oil and under these conditions, actually cause a loss of power. To eliminate this, the free wheel unit permits them to rotate in the same direction as the pump and turbine when the speeds of these two members are substantially equal as in high speed operation or in light, steady loads where torque multiplication is not required.

When torque multiplication is required, at which time the stator tends to rotate opposite to the direction of rotation of the pump and turbine members, the free wheel unit holds the stator stationary, enabling it to re-direct the flow of oil in the converter. The resultant unit acts as a torque converter when torque multiplication is desired and automatically changes to the form of a fluid coupling when conditions permit.

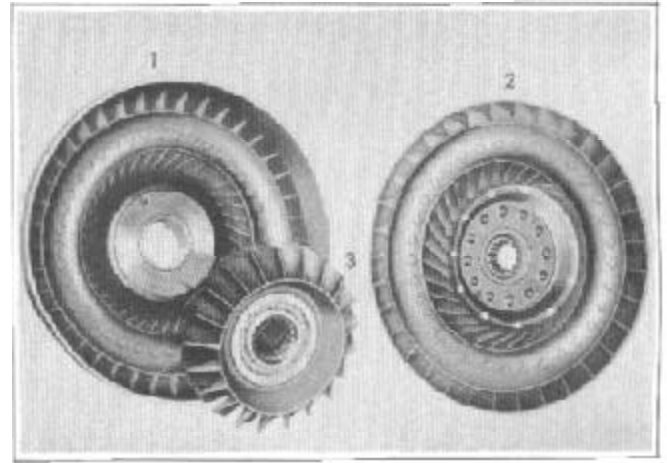


FIGURE 2

The torque converter contained in the Hudson Automatic Transmission is very similar to the theoretical unit just described and consists of a pump member (driving member) (1), Figure 2, driven by the engine, a turbine member (2) which is splined to the ring gear of the front planetary unit in the transmission, and a stator (3) which is fastened through a free wheel unit (2), Figure 3, to the transmission case. Being connected directly to the crankshaft, the pump member always rotates at engine speed. It receives the power output of the engine and transmits it to the turbine member (1) by means of the oil in the unit. These two units constitute a fluid coupling, and, while they are capable of transmitting torque, they are not able to provide torque

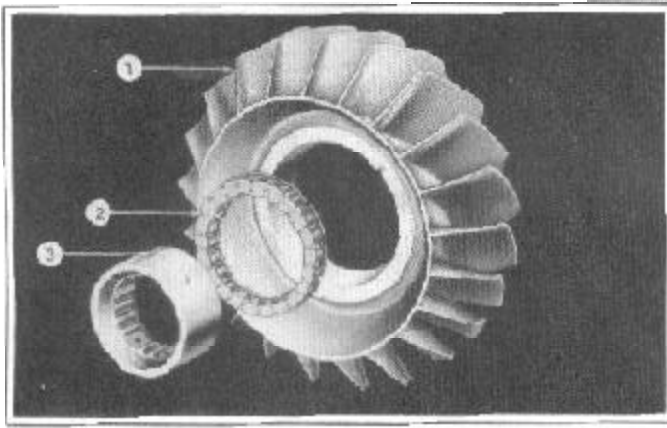


FIGURE 3

multiplication. This is accomplished by use of the stator (3), Figure 4, which changes the direction of the oil flow as it leaves the turbine so that it enters the pump impeller (driving member) at the most efficient angle to assist the engine in driving the pump impeller.

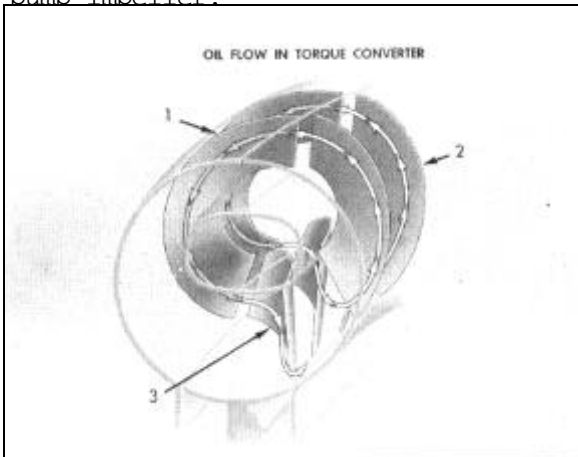


FIGURE 4

As long as the speed of the turbine is less than the speed of the pump member, torque multiplication exists. When these speeds become approximately equal, the forces on the stator, instead of trying to make it rotate opposite to the pump member and turbine, cause it to free-wheel in the direction of pump member and turbine rotation. The converter then ceases being a torque multi-

plier and becomes a fluid coupling, transmitting direct engine torque to the planetary gear system.

Maximum torque ratio available through the torque converter is approximately 2 to 1 under extreme load conditions and diminishes to 1 to 1 when conditions permit the unit to act as a fluid coupling.

### DIRECT DRIVE CLUTCH ASSEMBLY

The direct drive clutch assembly is an integral part of the converter assembly and consists of a friction member (2), Figure 5, connected to the transmission mainshaft, a hydraulically-operated pressure plate (1), and a backing plate (3), items (1) and (3) being connected to the converter housing. The converter housing, in turn, is connected to the drive plate (Flywheel) and the drive plate is connected to the engine crankshaft. In direct drive, oil pressure is supplied to the clutch pressure plate piston, moving the pressure plate in contact with the friction member and forcing it against the backing plate, thus locking the three members together. As the friction member is splined directly to the transmission mainshaft, this shaft must then turn at engine speed. This connection produces a direct power flow from the engine to the rear wheels, bypassing the torque converter and the planetary gear system.

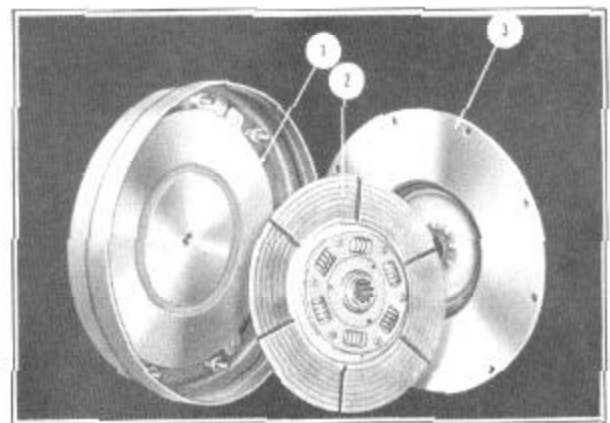


FIGURE 5

# HYDRAULICALLY CONTROLLED PLANETARY TRANSMISSION

The hydraulic control system of the automatic transmission consists of:

1. An internal, external gear type front pump (2), Figure 6, driven by the engine through the medium of the converter hub. It is the function of the front pump to supply the necessary oil pressure to the torque converter and the hydraulic system, and oil for lubrication during the idling, low speed, and reverse operations.

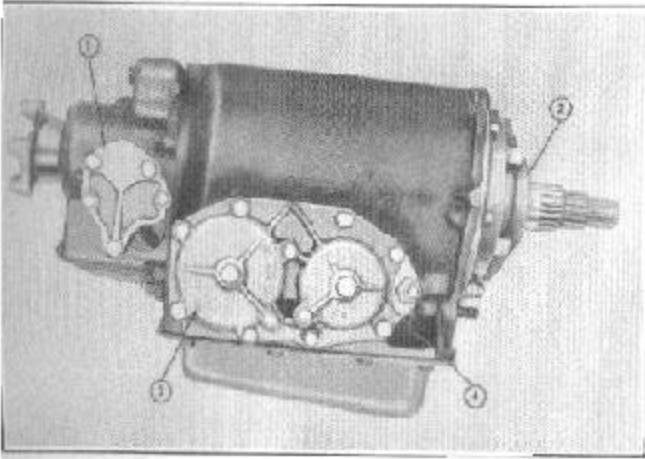


FIGURE 6

2. A rear pump which is a conventional external gear type pump, mounted in the extension case of the transmission (1), Figure 6. The rear pump, driven by the propeller shaft through the transmission mainshaft, supplies the necessary oil pressure to engage the proper bands or clutches when pushing the car to start the engine. When the rear pump reaches an adequate speed, it supplies all the oil pressure required for normal driving and the front pump pressure is cut out for greater efficiency. The rear pump also supplies lubrication to the transmission when the car is being towed.
3. A low (4) and forward (3) servo cylinder assembly located on the right side of the transmission controls the operation of the low and forward brake bands.
4. A reverse servo cylinder (1), Figure 7, located on the left side of the transmission, controls the operation of the reverse brake band.

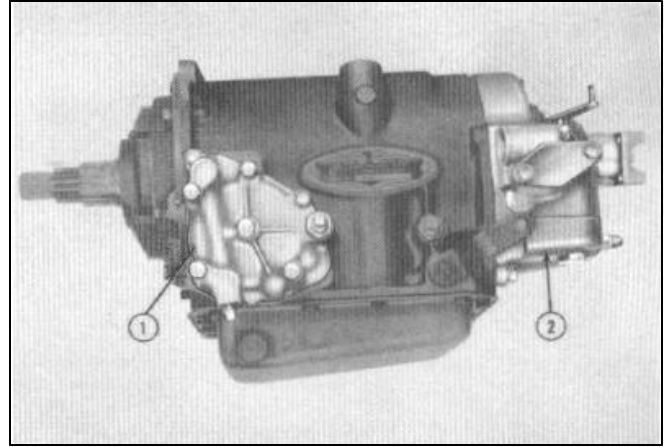


FIGURE 7

5. An extension case assembly (2), Figure 7, mounted at the rear of the transmission case, includes a governor assembly (14), Figure 26, a governor valve assembly (10), rear oil pump assembly (1), parking pawl and toggle assembly, Figure 47, speedometer drive gear (3), Figure 39, a parking interlock piston (2), Figure 27, and a direct drive control assembly consisting of the direct drive pawl (8), Figure 26, pawl spring (7), rocker arm (9), governor valve fork (10), retainer plate (11) and governor control detent cam and plunger assembly (12).

The governor valve positioned in the extension housing is controlled by the combined operation of the centrifugal-mechanical governor and the accelerator pedal. This governor valve has three positions: (First, second and direct). A hydraulic detent piston holds the governor valve in the direct drive position to eliminate "hunting". One end of the centrifugal governor is positioned by the accelerator pedal, which is an indication of torque demand. The speed demand is indicated by the R.P.M. of the governor, which is driven by the propeller shaft.

The parking brake pawl and toggle assembly is operated by the selector lever located on the left side of the transmission which is actuated through the movement of the selector lever (gear-shift) located at

## 8 AUTOMATIC TRANSMISSION

the steering column below the steering wheel. When applied, the parking pawl engages the teeth of the parking brake gear and prevents the rear wheels from turning in either direction. A parking interlock piston which prevents engagement of the parking pawl when the car is moving forward.

The direct drive pawl mechanism operated by the governor control cam and plunger, unlocks the governor valve to allow the shift from direct drive to intermediate drive on deceleration.



FIGURE 8

6. A valve block assembly mounted on the base of the transmission case, Figure 8, controls the flow of oil in the hydraulic system. The valves contained in the valve block assembly are:

- A. A selector valve, operated from the control lever on the steering column, controls the oil flow from the pump to the brake band cylinder, through the governor valve to the multiple disc clutch and the direct drive clutch.
- B. A front and rear pump relief valve assembly which regulates the pressure of the front and rear pumps.
- C. A converter valve which regulates and supplies oil to the torque converter.
- D. A reverse interlock valve which prevents shifting into reverse when the car is moving forward.

7. A mainshaft assembly, Figure 9, supported in the transmission case at the rear by a ball bearing and at the front by the front

oil pump and collector ring assembly, consists primarily of the mainshaft (1), three

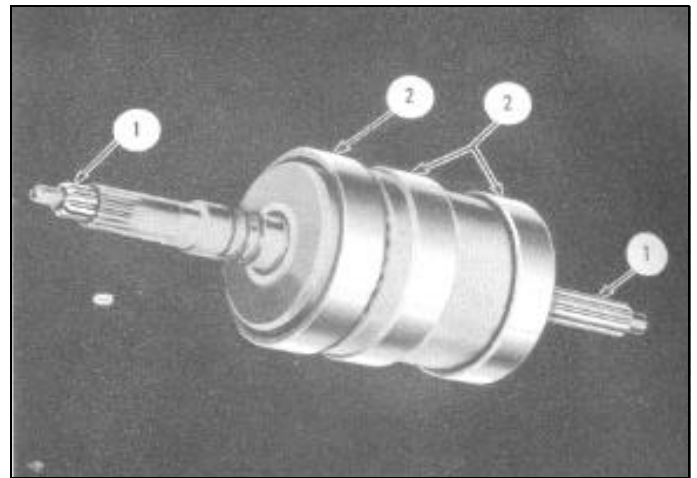


FIGURE 9

brake drums (2), multiple disc clutch (3) (indicated by arrow), Figure 10, and the planetary gear sets, as shown in Figure 11.

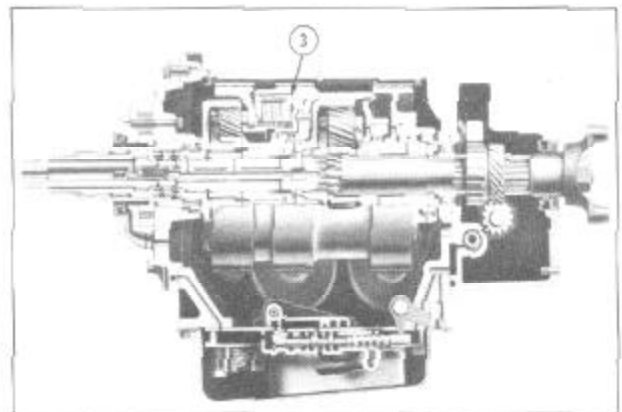


FIGURE 10

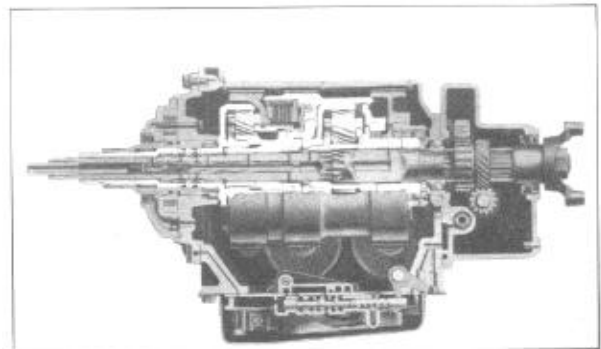


FIGURE 11

The speed ratios through the transmission required for low, intermediate, low range, or reverse are obtained by holding the drums with brake bands or engaging the multiple disc clutch in the proper combinations. In reverse, the reverse drum is held by the reverse band. In low (direct), the low drum is held by the reverse free wheel assembly. In intermediate and direct drive, the forward drum is held by the forward band. In low range, both the low drum and forward drum are held by their respective bands. The multiple disc clutch locks the members of the front planetary set into a single unit when a straight drive through this unit is desired as in intermediate drive.

In direct drive, the transmission main-shaft transmits power directly from the direct drive clutch to the propeller shaft.

smooth shifts from low, through intermediate (second speed) to direct drive.

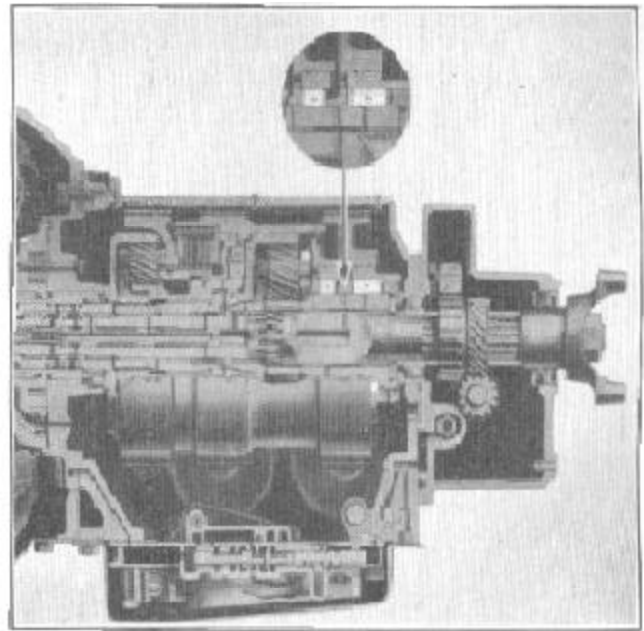


FIGURE 12

8. Two free wheeling units, Figure 12, simplify the valving required to accomplish

## REFERENCE

[illegible]

# HYDRAULIC ACTION IN THE AUTOMATIC TRANSMISSION

Now we will explain in some detail the combined operation of the hydraulic and mechanical units used in the Hudson Automatic Transmission. To simplify the explanation of the operation, the components of the transmission will be illustrated schematically in the following diagrams.

The operation of the transmission is controlled by the position of the selector lever as indicated by the quadrant pointer, Figure 13. The selector lever has five positions as follows:

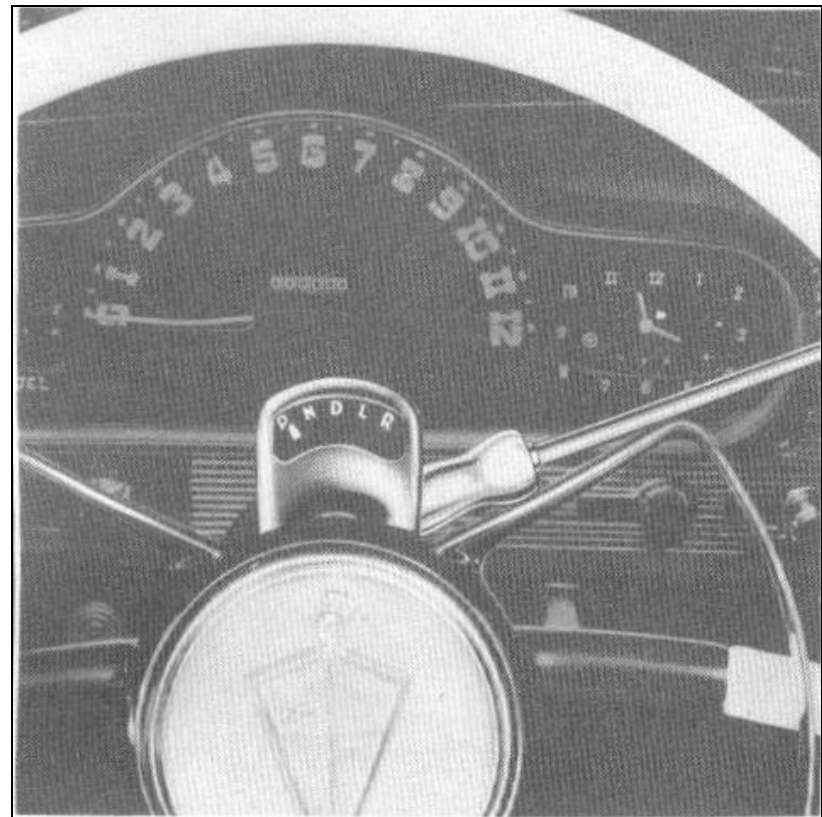


FIGURE 13

**"P" OR PARK:**

Movement of the selector lever to the "P" position actuates a mechanical locking device in the transmission which prevents the rear wheels from turning in either direction. The engine can be started with the selector lever in the "P" position.

**"N" OR NEUTRAL:**

Permits idling the engine. May also be used when starting the engine.

**"D" OR DRIVE:**

For all normal forward driving.

**"L" OR LOW:**

Is an emergency power range for heavy pulling, rapid acceleration from a standstill and engine braking while descending steep hills. Combined with the use of reverse, it provides for rocking the car out of mud, sand, or snow.

**"R" OR REVERSE:**

Provides a reverse driving range.

## REFERENCE

Source of Information	Date	Subject

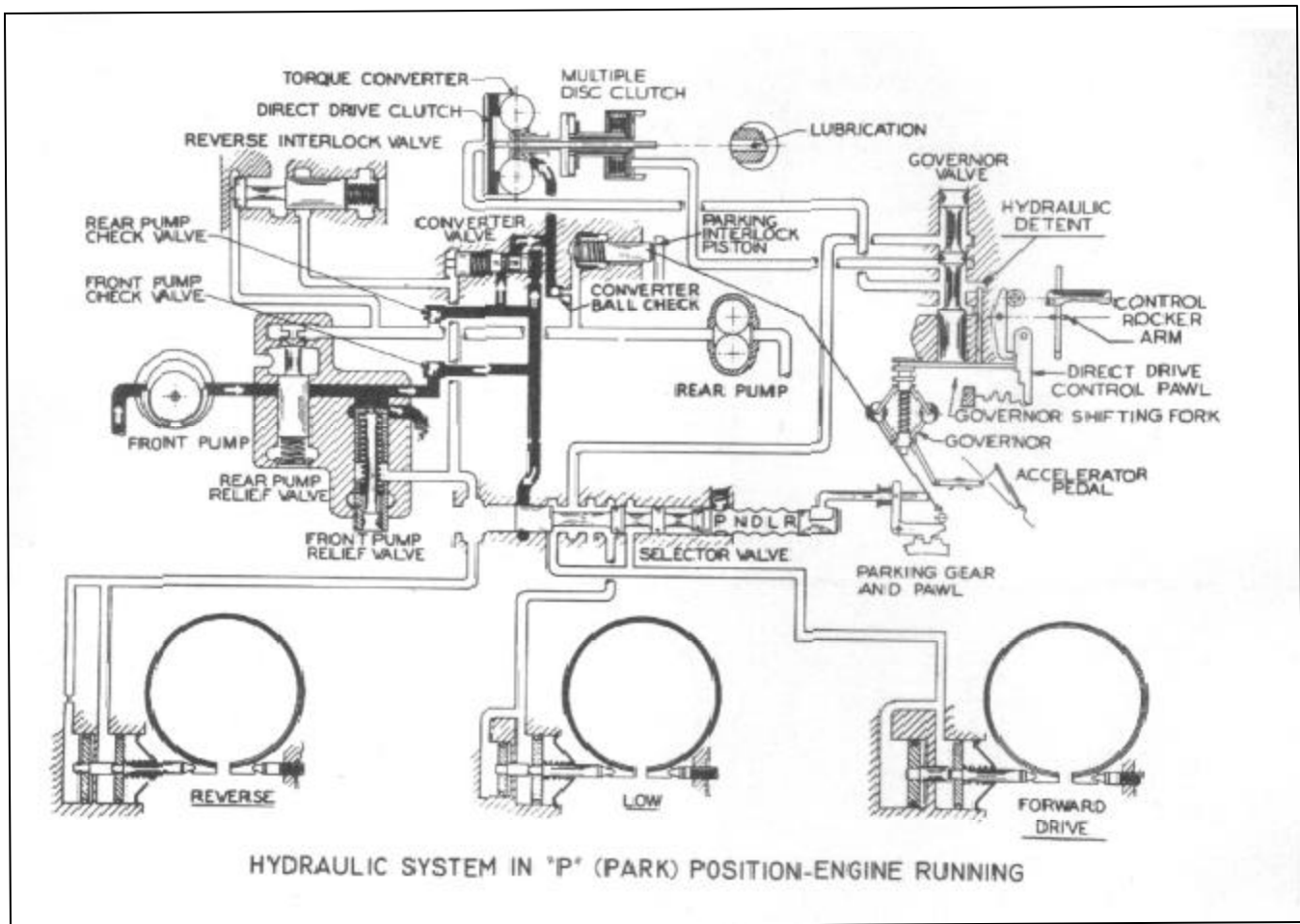


FIGURE 14

### HYDRAULIC SYSTEM IN "P" (PARK) POSITION - ENGINE RUNNING

With the selector lever in the "P" Park position and with the engine running, the front pump is operating and the front pump relief valve is maintaining line pressure and directing oil pressure to the converter valve to maintain converter pressure and to provide lubrication to the transmission through the mainshaft. Oil is also directed to the selector lever where it is closed off by the selector valve, cutting off oil pressure to the servo mechanisms and the clutches, Figure 14.

With the selector lever in this position and the car standing still, the parking pawl engages the parking gear which is splined to the transmission mainshaft, locking the mainshaft to the transmission case and preventing the rear wheels from turning.

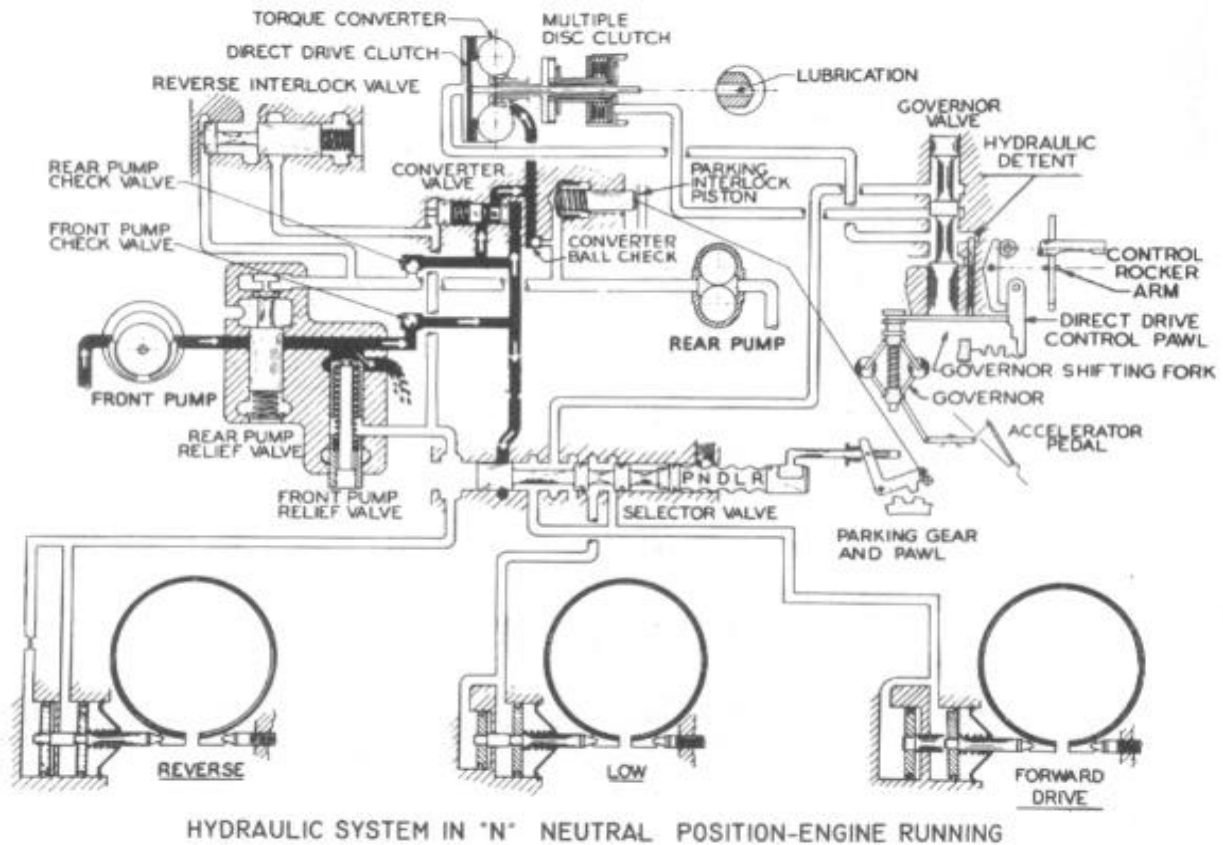


FIGURE 15

### HYDRAULIC SYSTEM IN "N" (NEUTRAL) POSITION - ENGINE RUNNING

With the selector lever in the "N" (Neutral) position, the selector valve does not admit oil pressure to the bands or clutches, however with the engine running, the oil pressure from the front pump is directed to the converter valve to maintain a converter pressure of 27 P.S.I. and to provide lubrication for the transmission internal parts, Figure 15.

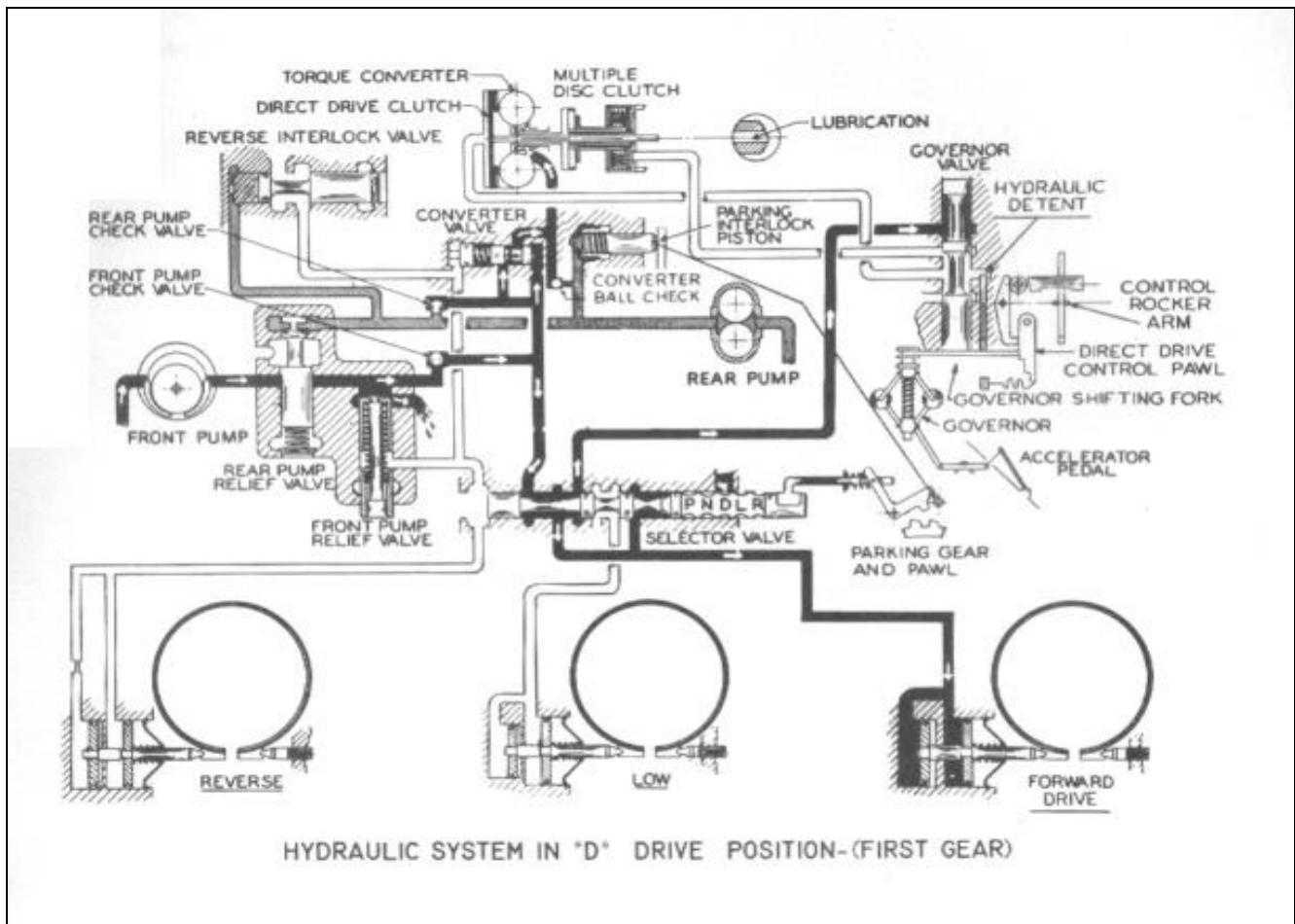


FIGURE 16

### HYDRAULIC SYSTEM IN "D" (DRIVE) POSITION - (FIRST GEAR)

With the selector lever in the "D" (Drive) position, the selector valve allows line pressure from the front pump to flow through passages to the forward servo cylinder, applying the forward servo band, Figure 16.

The forward band holds the torque reaction from the sun gears of the front and rear planetary sets through the two rear free wheel units, which allows free wheeling when coasting.

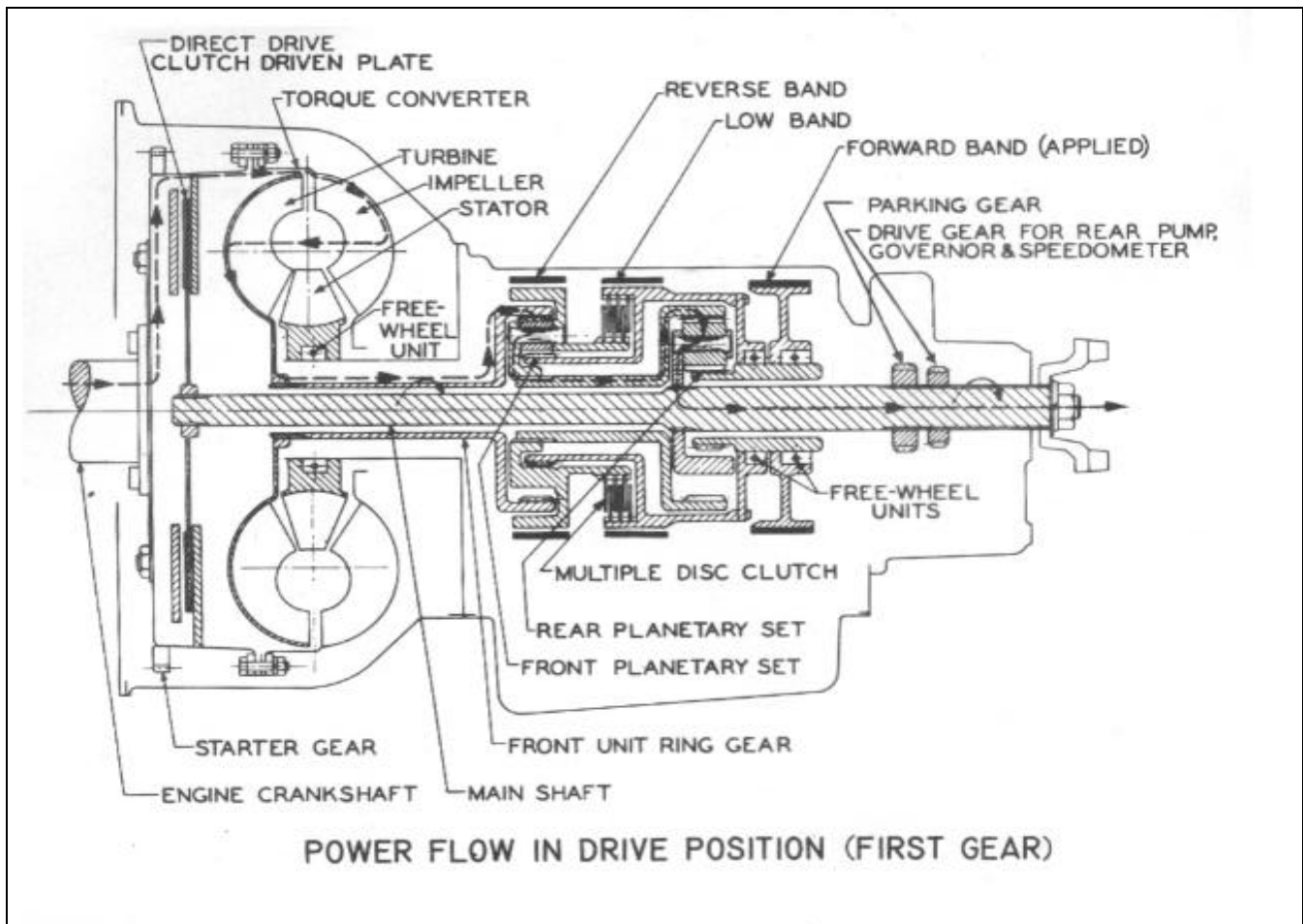


FIGURE 17

### POWER FLOW IN DRIVE POSITION - (FIRST GEAR)

Power flow is from the engine to the converter to the front planetary ring gear and through the planet pinion gears to the planet carrier. The front sun gear is held stationary through the action of the reverse free wheel, and the rear sun gear is held stationary through the action of the forward drive free wheel being locked by the forward drive drum and band. Since the front planet carrier is connected to the ring gear of the rear planetary set, the power flow continues through the rear unit planet pinions to the rear unit planet carrier which is connected to the output shaft, Figure 17. The product of the ratios of the two planetary sets is 2.308 to 1. This ratio, multiplied by the conversion ratio of the converter at stall, gives a maximum overall ratio at the rear axle of approximately 5.00 to 1. As the car speed increases in low gear and as the turbine speed and pump speed becomes substantially equal, the torque multiplication of the converter diminishes, the stator reactionary member freewheels and the converter becomes a hydraulic fluid coupling, transmitting engine torque to the transmission.

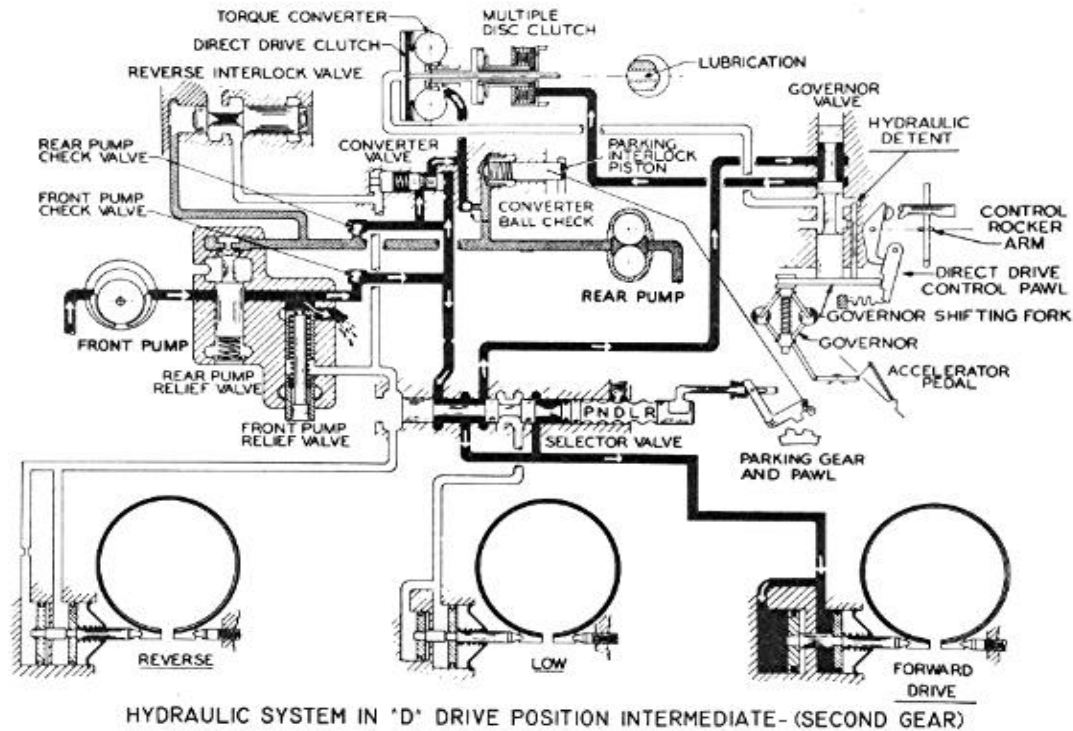


FIGURE 18

**HYDRAULIC SYSTEM IN "D"  
DRIVE POSITION  
INTERMEDIATE -  
(SECOND GEAR)**

With the selector lever in the "D" position, line pressure from the front pump and the front pump relief valve is directed by the selector valve to the forward band servo mechanism, and through the governor valve to the piston of the multiple disc clutch, Figure 18.

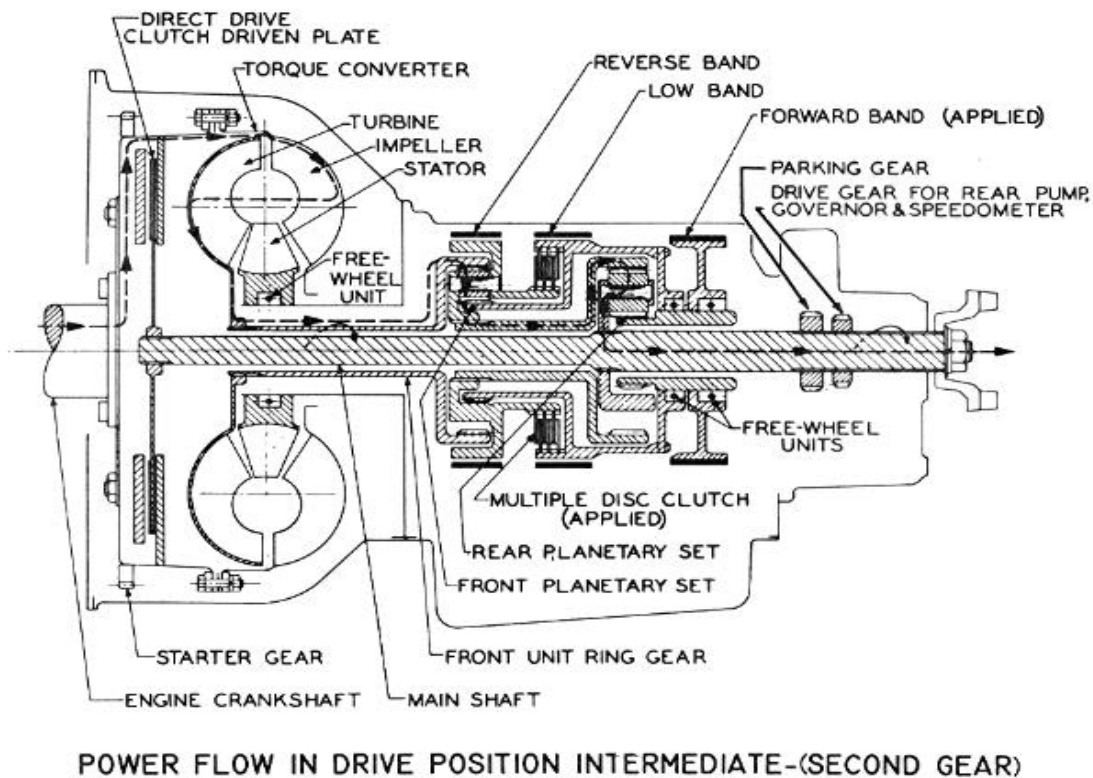


FIGURE 19

**POWER FLOW IN DRIVE  
POSITION INTERMEDIATE -  
(SECOND GEAR)**

Power flow is from the engine to the torque converter to the ring gear of the front planetary set, Figure 19. Since the front planetary set revolves at unity through the action of the reverse free wheel and the multiple disc clutch, the power is transmitted with no torque multiplication from the front planetary carrier to the ring gear of the rear planetary set as these units are directly connected together. Therefore, the rear planetary set transmits the power to the transmission mainshaft at a torque ratio of approximately 1.4 to 1. The ratio of the rear planet multiplied by the ratio of the converter, gives a maximum ratio at the rear axle of approximately 3.10 to 1 at stall. As the car speed again increases and the turbine speed and pump speed become the same, the converter again becomes a hydraulic fluid coupling.

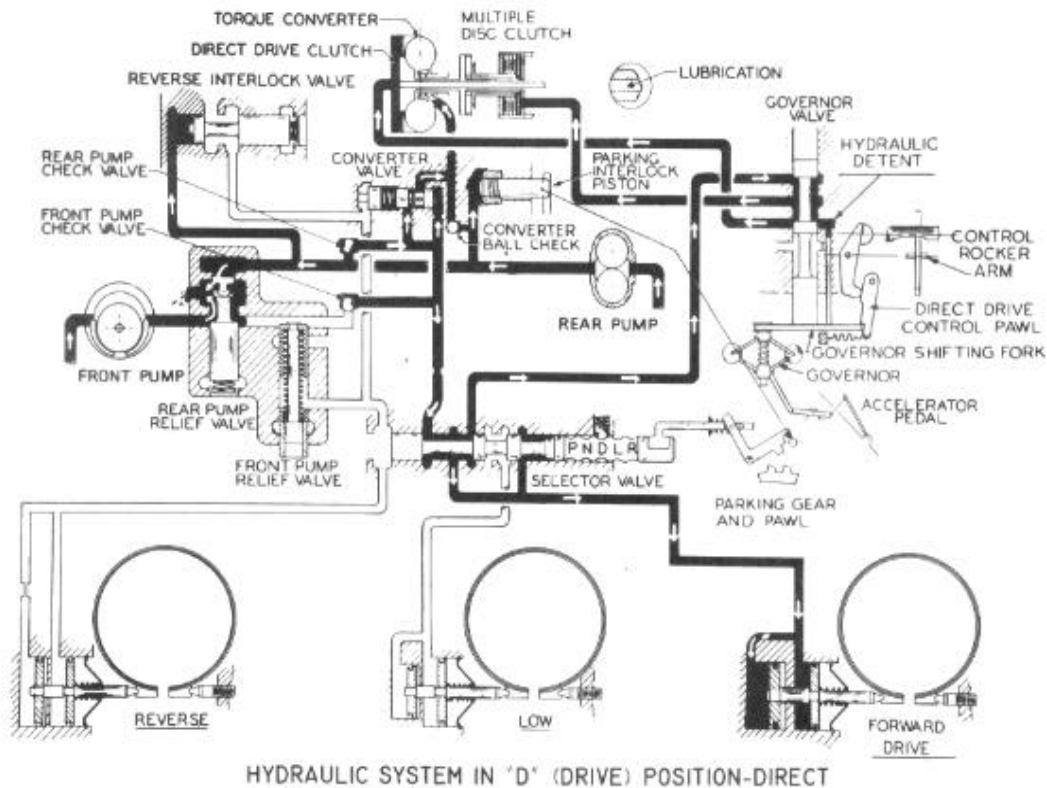


FIGURE 20

### HYDRAULIC SYSTEM IN "D" (DRIVE) POSITION - DIRECT

In direct drive, the forward and multiple disc clutch remain applied as in second speed. A further increase in speed will cause the governor to position the governor valve so that line pressure is also allowed to flow to the direct drive clutch hydraulic piston in the flywheel section of the converter, thereby applying this clutch and causing the shift into direct drive, Figure 20.

Furthermore, as car speed increases, the oil pressure output of the rear pump becomes sufficient to supply the needs of the transmission hydraulic system. Also, the rear pump relief valve acts to regulate rear pump pressure and to return the output of the front pump directly to the oil pan. Power required to drive the front pump is greatly reduced, increasing overall efficiency of operation.

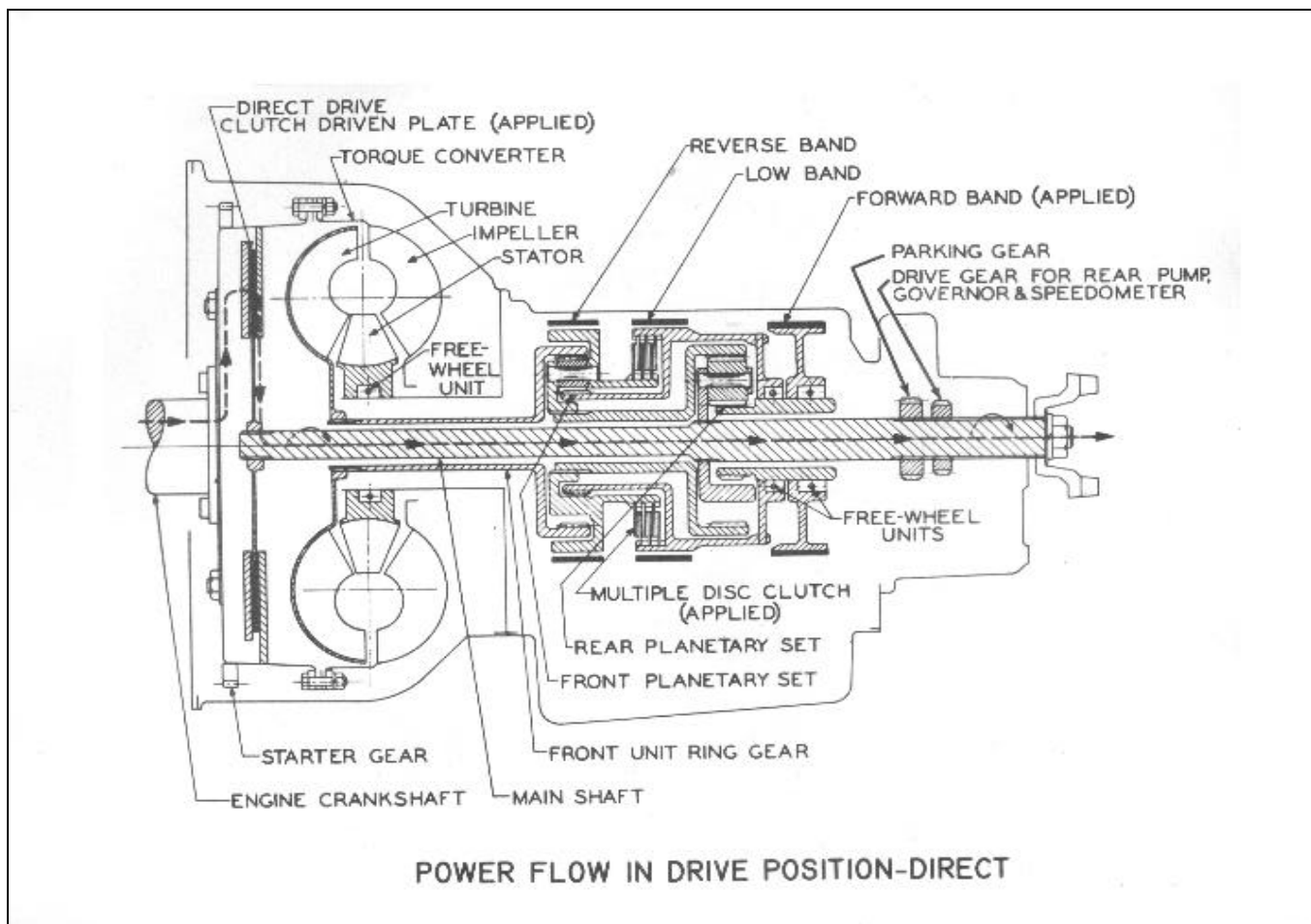


FIGURE 21

### POWER FLOW IN DRIVE POSITION - DIRECT

Power flow with the direct drive clutch engaged is from the engine through the direct drive clutch to the output shaft (transmission mainshaft), by-passing the two planetary gear sets and the torque converter unit. This provides a positive drive from the engine to the rear axle, Figure 21.

In this range, there is no torque multiplication.

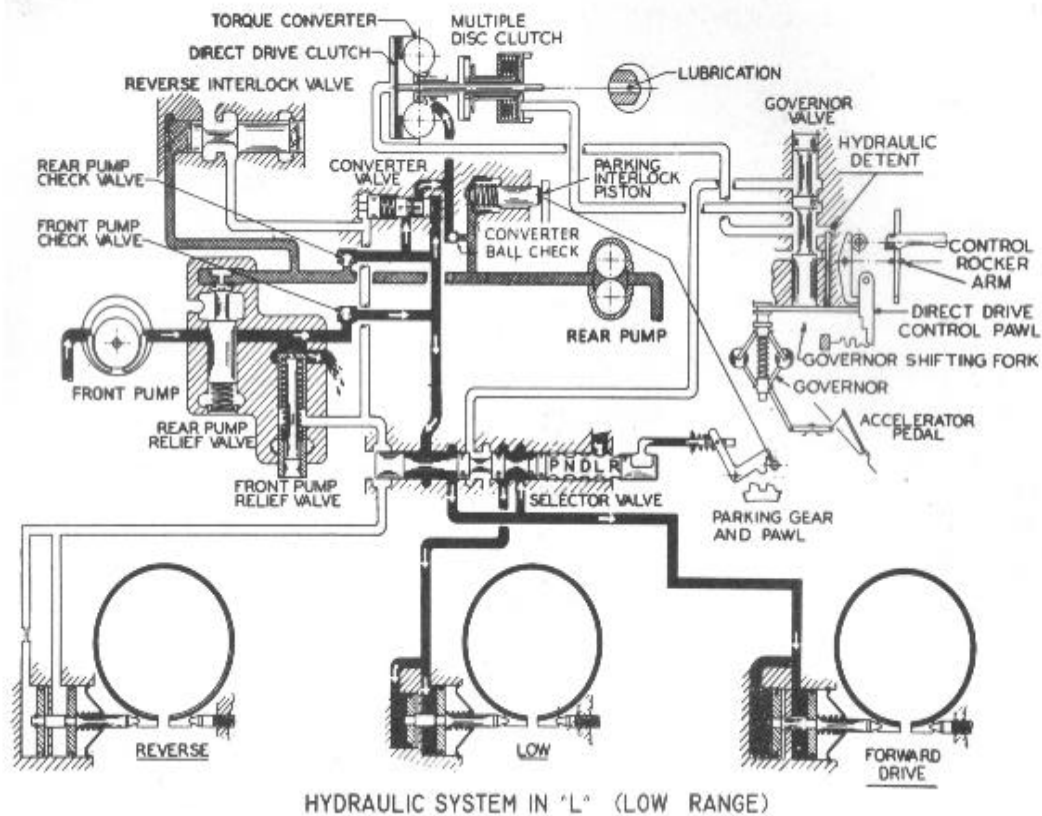


FIGURE 22

### HYDRAULIC SYSTEM IN "L" (LOW) RANGE

With the selector lever in the "L" (Low) position, the selector valve allows line pressure to flow to the servo cylinders of the low and forward bands, applying both bands, Figure 22. In this position, the selector valve also cuts off oil pressure to the governor valve and with the governor valve closed off, there is no line pressure to the direct drive clutch and the multiple disc clutch, preventing these units from being applied, regardless of car speed in the Low range.

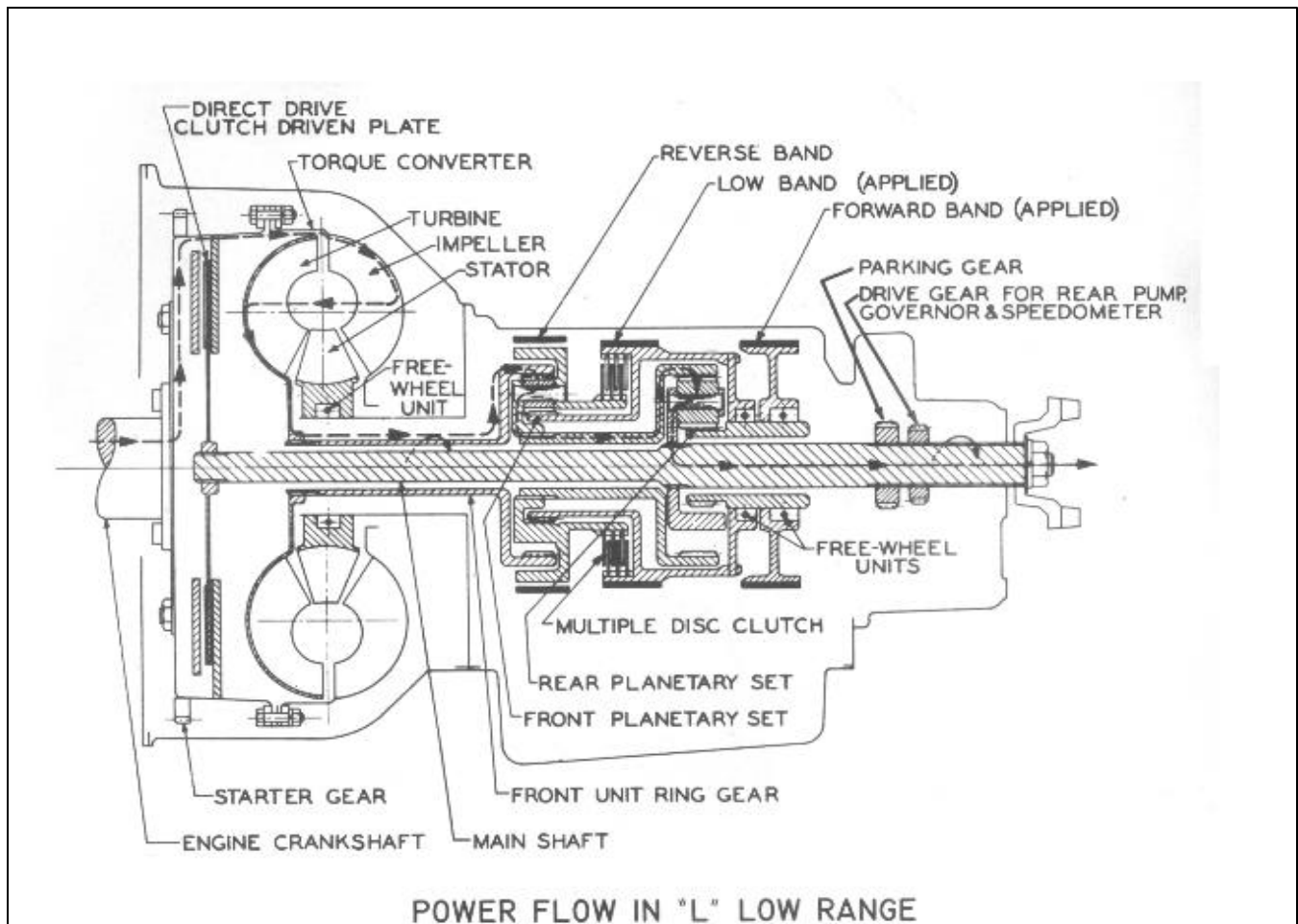


FIGURE 23

### POWER FLOW IN "L" LOW RANGE

Power flow is from the engine to the torque converter, Figure 23, to the ring gear of the front planetary set. With the bands applied, the low band holds the sun gear of the front planetary set stationary, while the forward drive band holds the sun gear of the rear planetary set stationary through the medium of the rear free wheeling unit, Figure 22. The power then goes from the planet carrier of the front planetary set to the ring gear of the rear planetary set and out the planet carrier of the set to the transmission mainshaft to the rear wheels. The product of the ratios through the front planetary set and the rear planetary set is approximately 2.3 to 1 and this, combined with torque multiplication through the converter, will give a maximum torque ratio in Low of approximately 4.3 to 1.

Engine braking is provided through the application of low band.

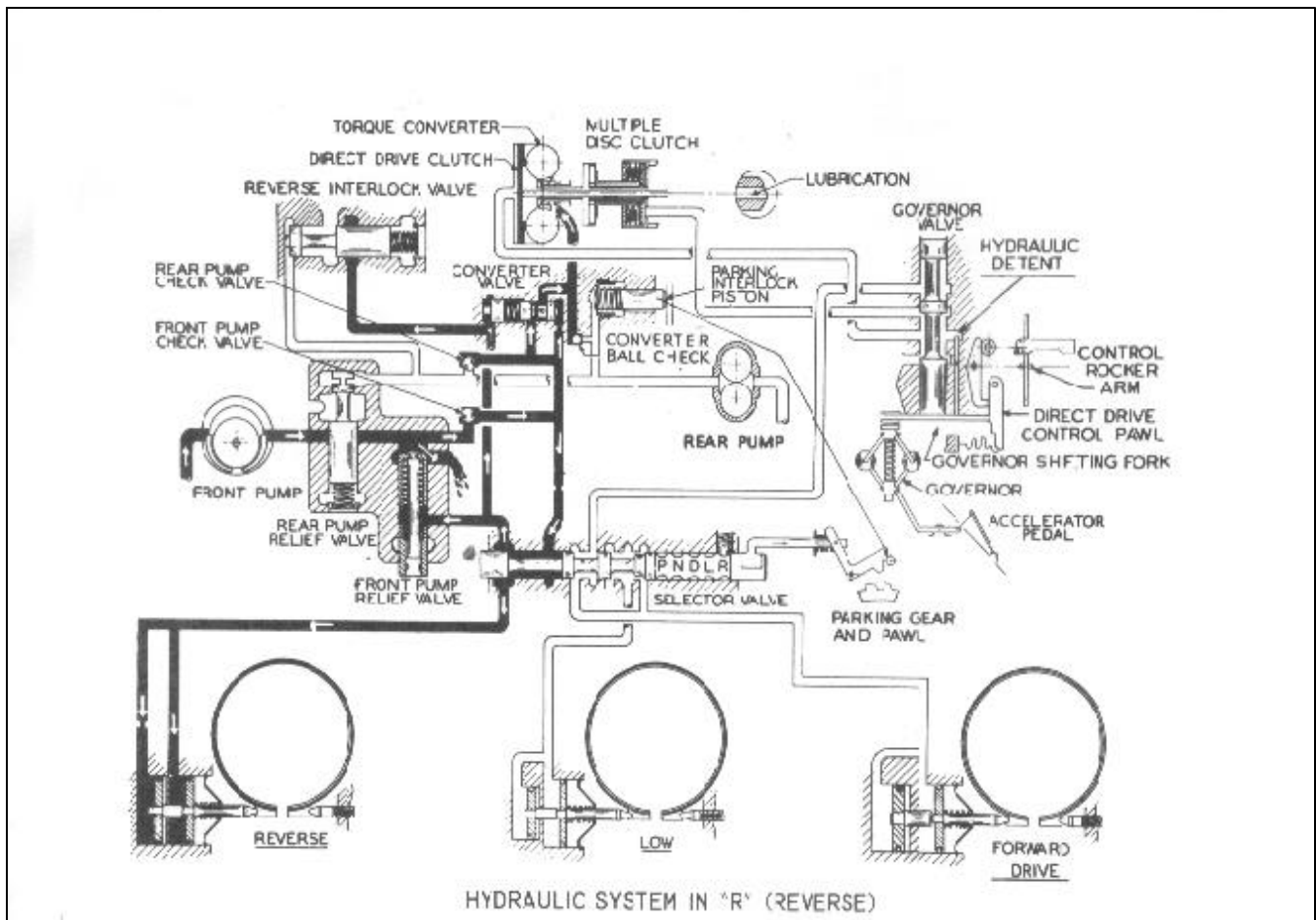


FIGURE 24

### HYDRAULIC SYSTEM IN "R" (REVERSE)

In reverse gear the selector valve directs line pressure to the reverse band servo mechanism, applying the reverse band. Line pressure is also directed to the back of the front pump relief valve; this pressure plus the value of the front pump relief valve spring increases line pressure from 90 P.S.I. to 200 P.S.I. A connecting passage also allows line pressure to flow to the back of the converter valve and this pressure plus the converter valve spring maintains converter pressure at approximately 27 P.S.I., Figure 24. In reverse gear, oil pressure for the hydraulic system is supplied by the front pump as the rear pump is being operated in reverse rotation and therefore supplies no pressure. Oil is also directed to the reverse interlock valve but is closed off by spring pressure. The reverse interlock valve which is operated by rear pump pressure prevents engagement of the reverse band in the event the selector lever be accidentally placed in the "R" position at higher forward car speeds.

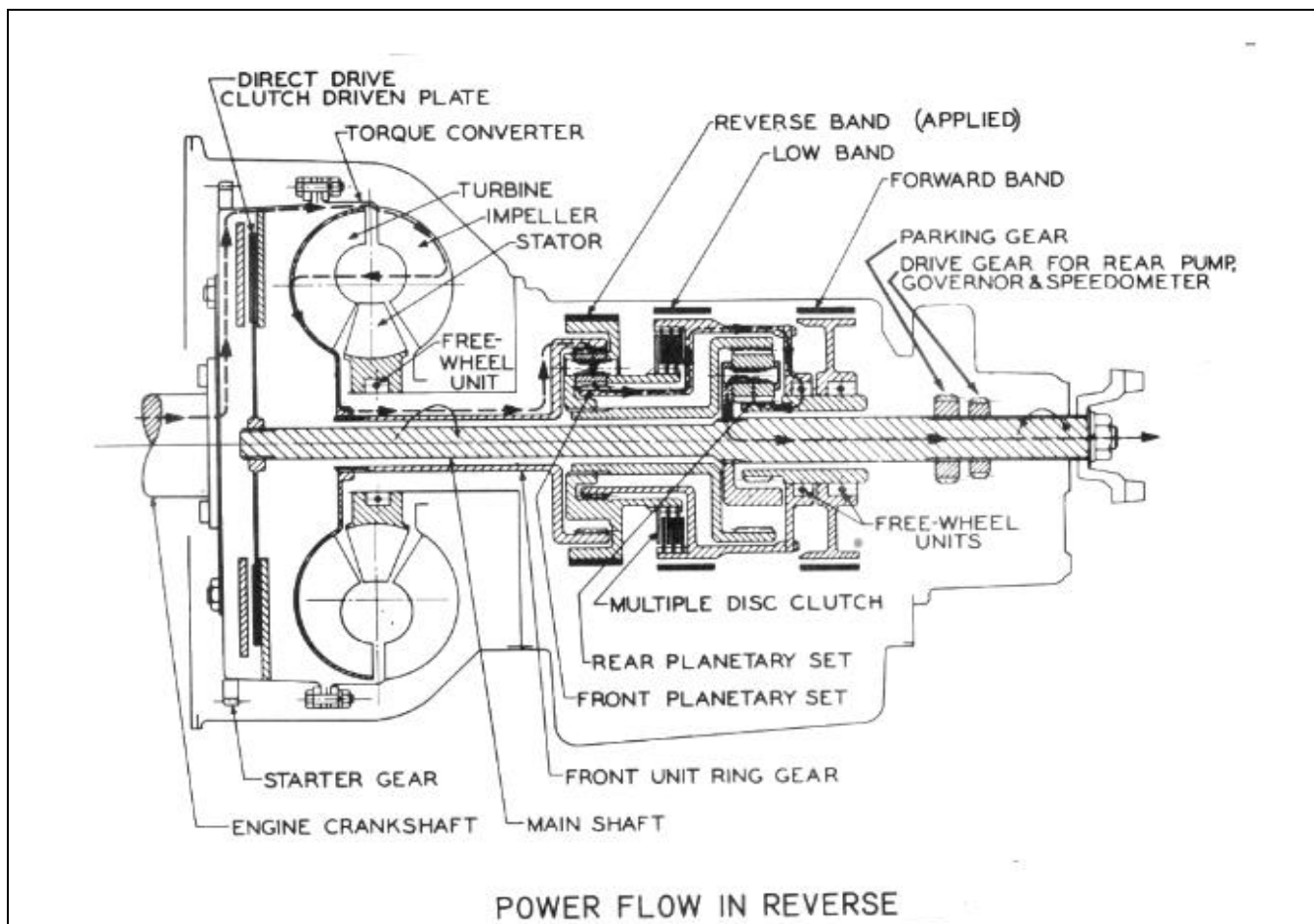


FIGURE 25

### POWER FLOW IN REVERSE

The power flow is from the engine to the torque converter to the front unit ring gear, and as the front planet carrier is being held stationary by the reverse band, the front unit planet pinions cause an overdrive reverse rotation to the front unit sun gear, Figure 25. This reverse rotation is transmitted to the rear unit sun gear through the front free wheel unit which does not free-wheel in this reverse direction. Since the ring gear of the rear unit is connected to the front unit planet carrier, it is also held stationary by the reverse band. The rotation of the rear unit sun gear causes the rear unit pinions to walk around this stationary ring gear and carry the rear unit planet carrier and output shaft in the reverse rotation. The product of the gear ratio's supplied by the planetary sets is a reverse ratio of approximately 2 to 1. The combination of this gear reduction and the torque multiplication through the torque converter provides a maximum reverse ratio of approximately 4.34 to 1 through the Automatic Transmission in reverse.

# REPAIR PROCEDURES WITH TRANSMISSION IN CAR

## EXTENSION CASE

### REMOVAL

1. Raise car.
2. Disconnect the front propeller shaft at the transmission companion flange.
3. Disconnect the governor control rod at the governor control lever.
4. Disconnect the speedometer cable at the, speedometer gear housing and remove the speedometer driven gear.
5. Shift the selector control shaft lever into the Park position (furthest forward position): this will hold the mainshaft from turning when removing the universal joint companion flange nut.
6. Remove the companion flange nut, lock washer and washer. Use J-820 Puller to remove the companion flange.
7. Shift selector lever to the neutral position, place an oil drain pan under the transmission at the extension case end to catch oil that will drain when extension housing will be removed.
8. Remove six cap screws attaching the extension case to the transmission housing (9/16" wrench).
9. Slide the extension case rearward carefully, Figure 26.

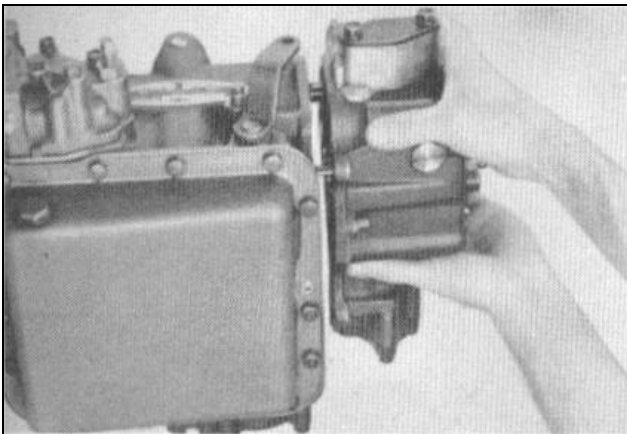


FIGURE 26

**CAUTION :** Do not drop gears and spacers that may slide from the mainshaft when removing the extension case. DO NOT allow the mainshaft to move rearward as any rearward movement would dislodge the thrust washers in the gear train.

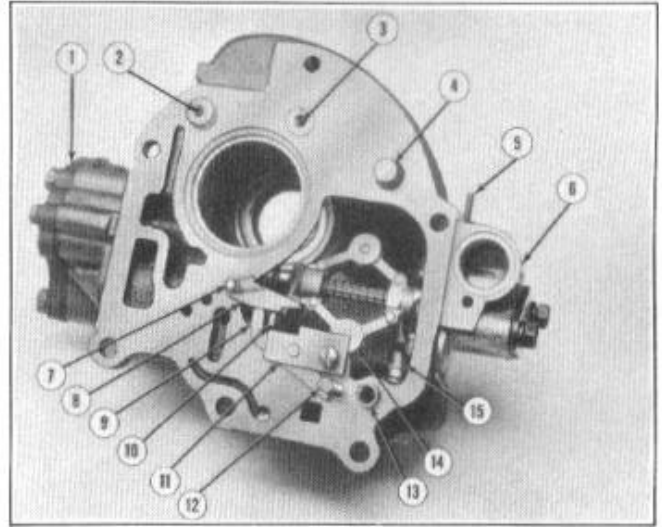


FIGURE 27

### LEGEND

1. Rear Pump
2. Parking Interlock Piston
3. Pivot Pin
4. Toggle Shaft
5. Governor Control Lever
6. Speedometer Gear Housing
7. Direct Drive Pawl Spring
8. Direct Drive Pawl
9. Governor Control Rocker Arm
10. Governor Fork and Valve
11. Rocker Arm Plate
12. Governor Control Plunger
13. Governor Control Detent Spring
14. Governor Assembly
15. Governor Control Shaft Yoke

### INSPECTION

1. Check both end brackets of the governor assembly to see that they operate freely on the governor shaft.
2. The direct drive pawl (2) Figure 27, must unlock the governor valve to allow the shift from direct drive to intermediate drive on deceleration.

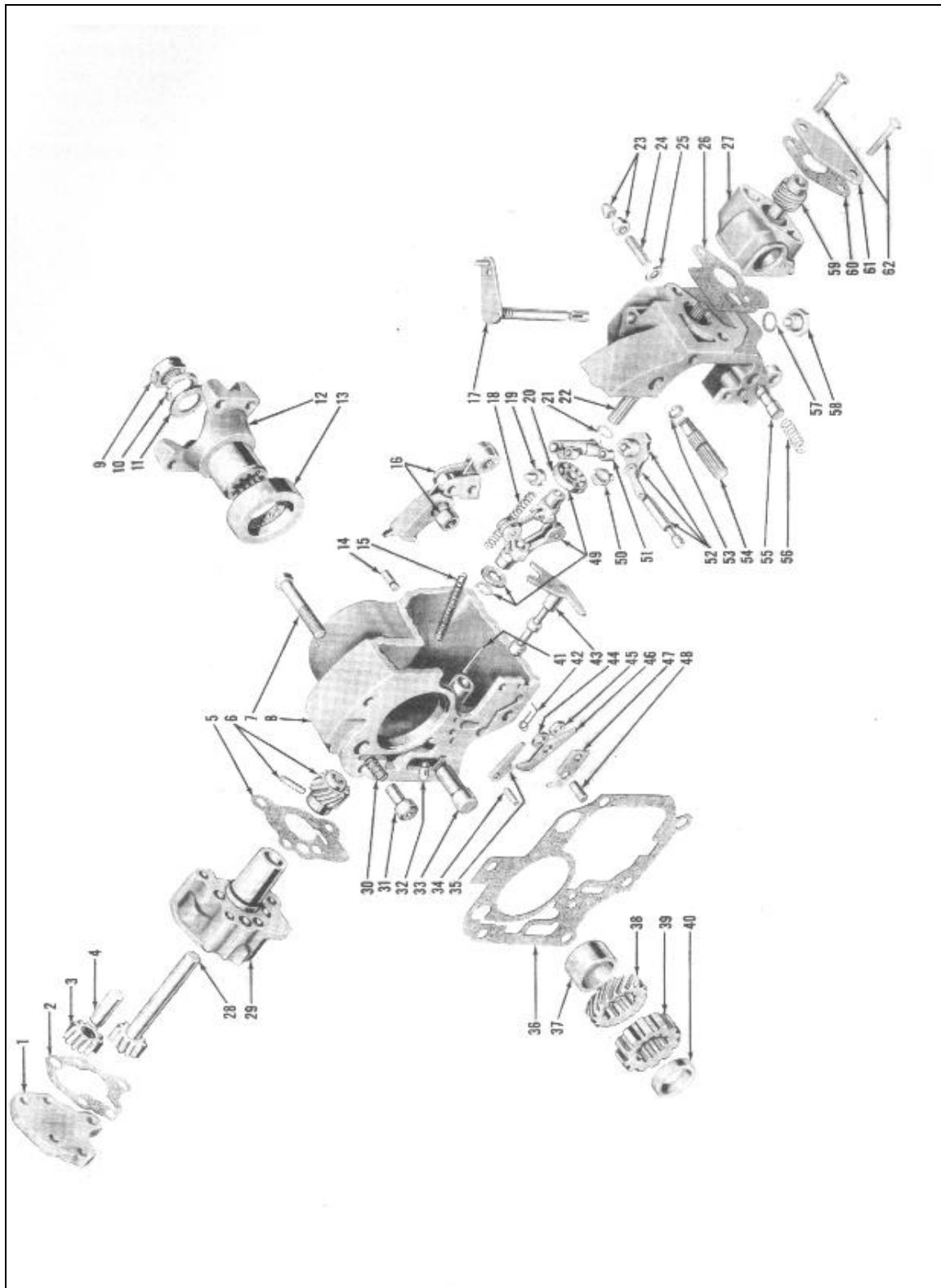


FIGURE 27A - EXPLODED VIEW - EXTENSION CASE, GOVERNOR, REAR OIL PUMP, SPEEDOMETER GEAR HOUSING AND PARKING TOGGLE

**LEGEND**

- |   |  |
|---|--|
| 1. Rear Oil Pump Cover                        | 32. Governor Valve Stop Pin                      |
| 2. Rear Oil Pump Cover Gasket                 | 33. Parking Brake Pawl Pivot Pin                 |
| 3. Rear Oil Pump Idler Gear                   | 34. Direct Drive Pawl Pivot Pin                  |
| 4. Rear Oil Pump Idler Shaft                  | 35. Direct and Second Speed Interlock Pawl       |
| 5. Rear Oil Pump To Case Gasket               | 36. Extension Case To Transmission Gasket        |
| 6. Pump Driven Gear And Pin                   | 37. Universal Joint Flange Spacer                |
| 7. Extension Case To Transmission Bolts       | 38. Mainshaft Governor Drive Gear                |
| 8. Extension Case (Governor Housing)          | 39. Mainshaft Parking Brake Gear                 |
| 9. Universal Joint Flange Nut                 | 40. Governor Drive Gear Spacer                   |
| 10. Universal Joint Flange Nut Washer (Lock)  | 41. Governor Valve Detent                        |
| 11. Universal Joint Flange Nut Washer (Plain) | 42. Interlock Pawl Spring                        |
| 12. Universal Joint Flange                    | 43. Governor Valve And Fork                      |
| 13. Extension Case Rear Oil Seal              | 44. Pawl Release Rocker Arm Spacer               |
| 14. Governor Return Spring Anchor             | 45. Governor Valve Stop Plate Spacer             |
| 15. Governor Control Shaft Yoke Return Spring | 46. Direct Drive Pawl Release Rocker Arm         |
| 16. Parking Brake Pawl And Toggle             | 47. Governor Valve Stop Plate                    |
| 17. Governor Control Shaft And Lever          | 48. Rocker Arm Pivot Pin                         |
| 18. Governor Tension Spring                   | 49. Governor                                     |
| 19. Governor Control Shaft Yoke Shoe (2)      | 50. Governor Control Shaft Yoke Shoe (2)         |
| 20. Governor Bearing                          | 51. Governor Control Shaft Yoke                  |
| 21. Governor Bearing Retainer Snap Ring       | 52. Control Cam, Link And Plunger                |
| 22. Governor Shaft                            | 53. Toggle Retaining Snap Ring                   |
| 23. Control Cam Stop Screw Nut And Cap        | 54. Parking Brake Toggle Shaft                   |
| 24. Control Cam Stop Screw                    | 55. Accelerator Detent Plunger                   |
| 25. Control Cam Stop Screw Washer             | 56. Accelerator Detent Plunger Spring            |
| 26. Speedometer Gear Housing To Case Gasket   | 57. Governor Control Shaft "0" Ring              |
| 27. Speedometer Gear Housing                  | 58. Governor Control Shaft Bushing               |
| 28. Rear Oil Pump Shaft And Gear              | 59. Speedometer Drive Gear                       |
| 29. Rear Oil Pump Body                        | 60. Speedometer Gear Housing Cover Gasket        |
| 30. Parking Brake Interlock Piston Spring     | 61. Speedometer Gear Housing Cover               |
| 31. Parking Brake Interlock Piston            | 62. Speedometer Gear Housing And Cover Bolts (2) |

3. Examine direct drive pawl (8), rocker arm (9), retaining plate (11), and governor fork (1) for burrs or damage.
4. Check to be sure that the governor valve (10), or governor control plunger assembly (12), is not sticking in the housing bore. Use a fine stone to remove small burrs or rough spots to eliminate bind.
5. Check to see that the extension case and all oil passages are clean.
6. Check end play of the governor fork (1), Figure 28, in the groove of the governor end bracket (2).

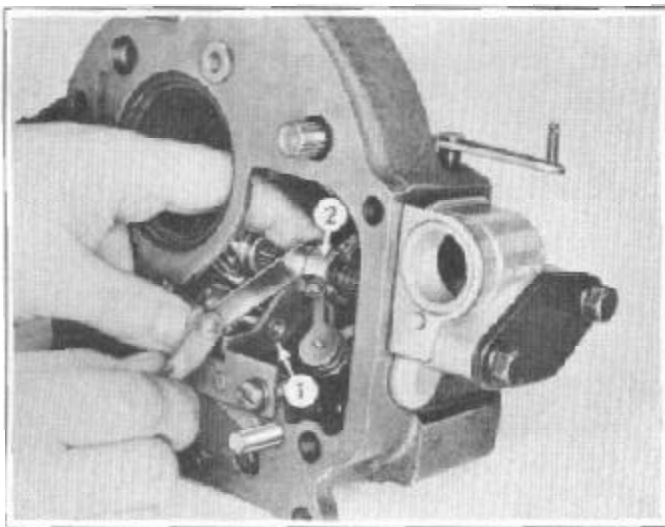


FIGURE 28

If there is more than .030" clearance with governor fully extended, replace governor assembly.

### INSTALLATION

1. Install the parking interlock piston spring (2), Figure 29, into the extension case, slip the stem of the piston (1) into the spring and push the piston into the bore of the case. Check the piston to make sure it moves freely in the bore in case.

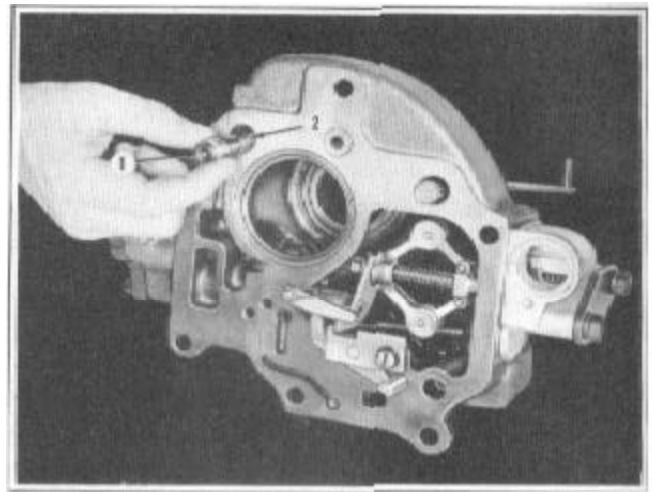


FIGURE 29

2. Install the governor control detent (1), Figure 30, into the case with the tapered end first.

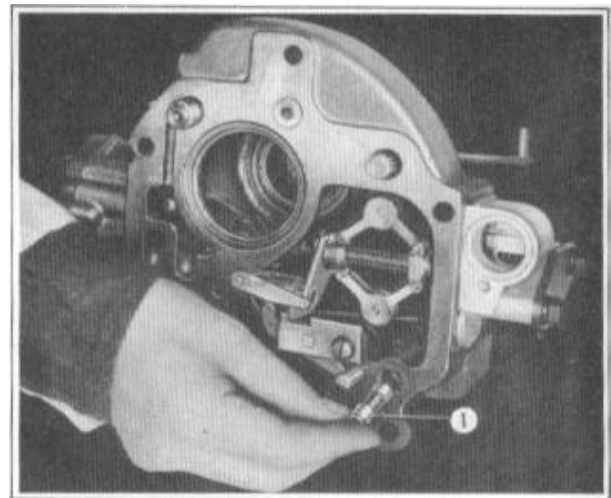


FIGURE 30

3. Install the governor control detent spring (1), Figure 31, in the detent bore. Check operation of detent spring and piston for free movement in the case bore.
4. Install a new extension case to transmission case gasket, retain gasket in place with petroleum jelly.

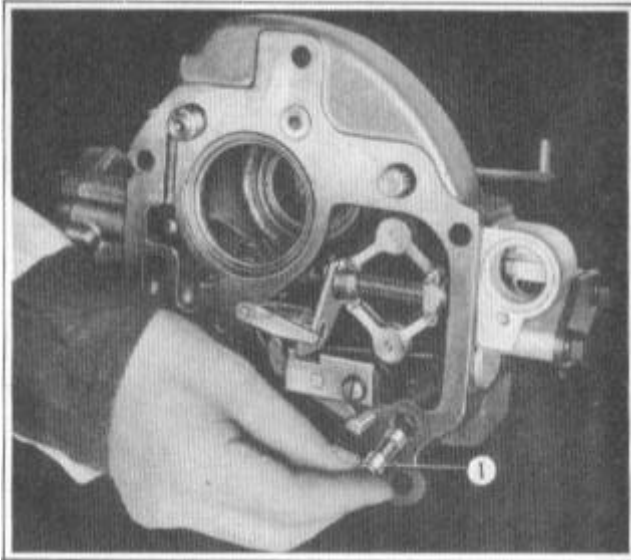


FIGURE 31

5. Place transmission selector lever in the "L" position, this will place the parking brake toggle arm sleeve (1) wide spline so that it will index properly with toggle shaft in the extension case. Groove will be to the left side of transmission case shown at (A), Figure 32.

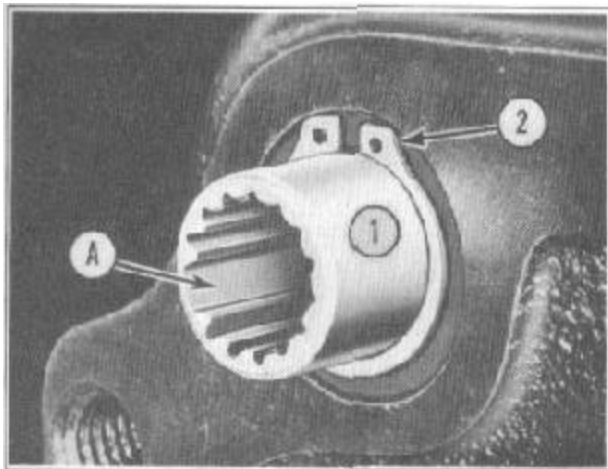


FIGURE 32

6. Install the governor drive gear spacer (1), Figure 33, parking brake gear (2), governor drive gear (3), and transmission companion flange spacer (4) in their proper order. The beveled side of the parking brake gear must be to the rear of transmission.

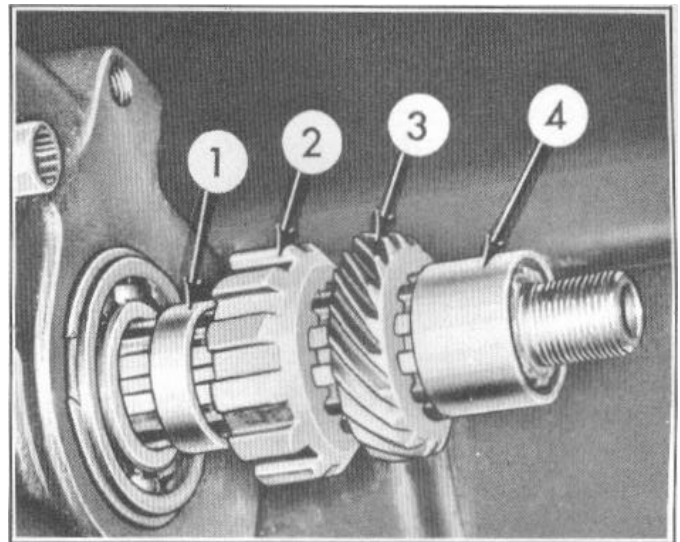


FIGURE 33

7. Lubricate all moving parts with Hudson approved Automatic Transmission Fluid, Type "A".
8. Turn the toggle arm splined shaft so that the wide spline is to the left, to index with the toggle arm sleeve in the transmission case, Figure 28.
9. Lift the extension case into position, start two long bolts at bottom of case and engage the splines of the toggle arm shaft with the toggle arm shaft sleeve splines. It may be necessary to move the selector control shaft lever slightly to facilitate installation.
10. With the extension case properly aligned, install the extension case cap screws and tighten them finger tight.
11. Place the selector control shaft lever in the Park position (full forward position).
12. Install the transmission companion flange.
13. Install the notched washer, lock washer and nut and tighten to 90-100 foot pounds.

**NOTE:** This tightening operation is very important since the transmission companion flange controls the end play in the rear half of the mainshaft assembly.

14. After determining that the oil seal is properly positioned on the companion shaft hub, tighten the extension case attaching screws to 28-33 foot pounds.
15. Check the operation of the parking brake pawl and toggle assembly as outlined under "Parking Brake and Toggle Adjustment", Page 34.
16. Assemble the propeller shaft, universal joint cross and bearings to the companion flange, install "U" bolts, washers and nuts and tighten nuts to 20-25 foot pounds.
17. Install a new gasket in the speedometer gear housing bore, assemble the speedometer driven pinion in the end of the speedometer cable and install the gear and cable assembly into the housing and install attaching screw.
18. Connect governor control rod to the governor control lever and check the governor control rod adjustment, see "Linkage Adjustments", Page 88.
19. Connect the selector control rod to the selector control lever.
20. Add automatic transmission fluid as outlined under "Draining and Refilling Transmission", Page 87, to bring fluid to proper level.

### GOVERNOR ASSEMBLY

#### REMOVAL

1. Remove the extension case, see "Extension Case Removal and Inspection", Page 23.
2. Remove the two screws attaching speedometer gear housing (6), Figure 27, to the extension case and remove the cover and cover gasket.
3. Remove the gear housing (1) and gasket (3), Figure 34, from the extension case. The speedometer drive gear is inside the gear housing and will be removed with the housing.

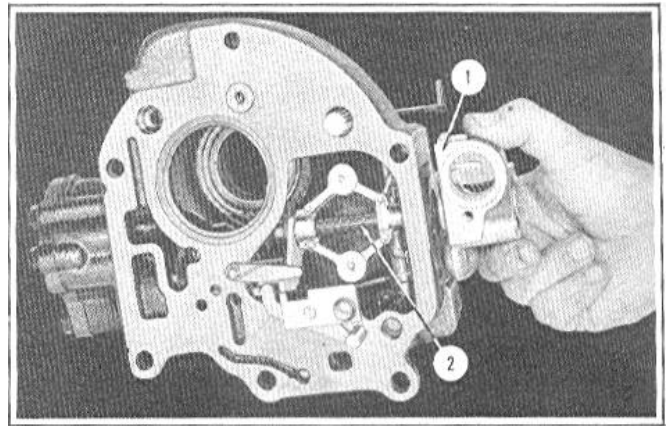


FIGURE 34

4. Remove the governor shaft (2) from the governor assembly.
5. Disengage the governor end bracket (1), Figure 35, from the valve fork (2).

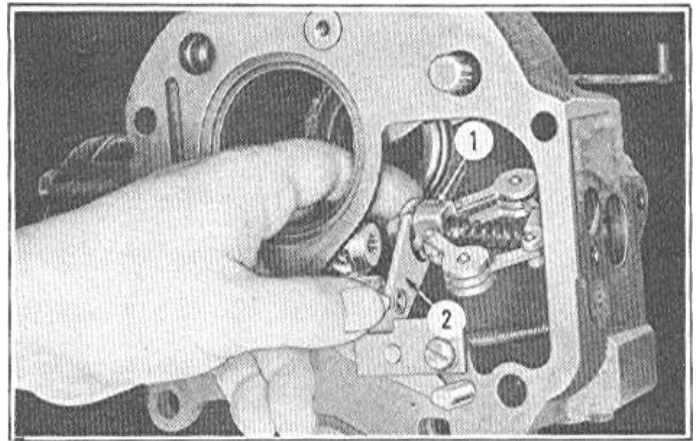


FIGURE 35

6. Slide the governor bearing (2), Figure 36, out of the governor control shaft yoke shoes (1) and remove the governor and bearing as an assembly.

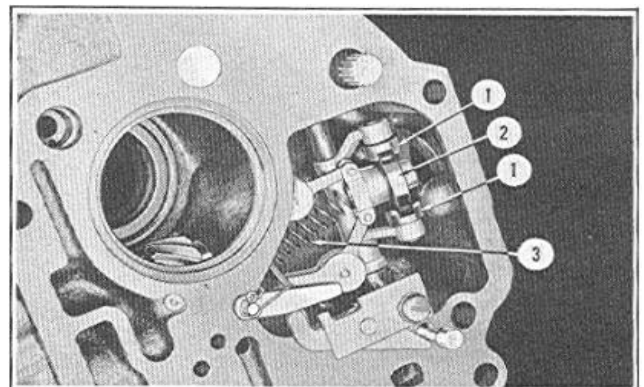


FIGURE 36

7. Remove the yoke shoes (1), Figure 37.

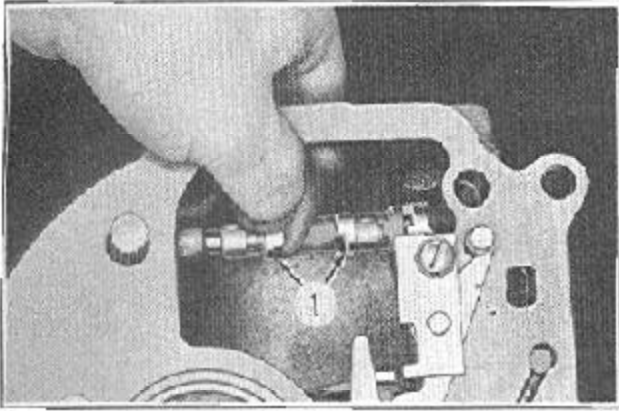


FIGURE 37

#### INSPECTION

1. Check governor shaft for burrs, nicks and scored splines.

**NOTE:** Burrs on the governor shaft can be caused by the governor spring not seating properly.

2. Check governor valve (2), Figure 38, for free operation in the valve sleeve and that the hydraulic detent piston (1) is in place.
3. Check the length of the governor spring; should be 2-1/2" long.

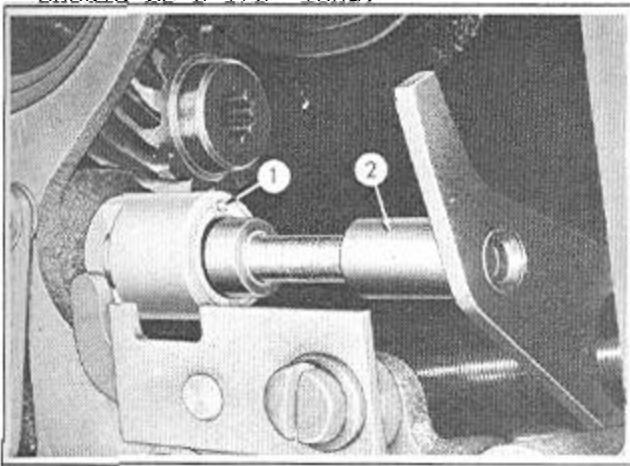


FIGURE 38

#### INSTALLATION

1. Insert one end of the governor spring in the governor; compress the spring and install the other end. Be sure the spring seats properly.

2. Install governor shaft yoke shoes (1), Figure 37.
3. Align the slots of the shoes (1), Figure 36, and slide the governor bearing (2) into position in the shoes then engage the groove of the governor inner end bracket with the governor fork (2), Figure 35.
4. Install a new speedometer gear housing gasket.
5. Insert the governor shaft and speedometer drive gear assembly into the gear housing.
6. With the governor shaft (2), properly aligned with the governor end bracket (1), insert the shaft in the governor, Figure 39.

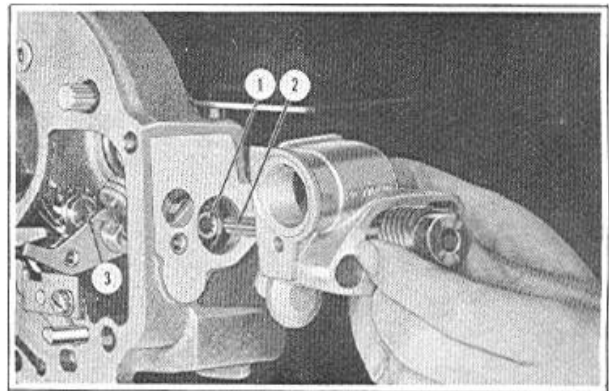


FIGURE 39

7. With the governor shaft through the governor assembly, hold the governor inner end bracket in place on the governor fork and engage the shaft in the splines of the rear oil pump gear (3).

**NOTE:** It may be necessary to shift the end of the governor slightly to align the governor shaft with the oil pump gear.

8. Align the speedometer gear housing with the extension case, install new cover gasket and after making sure the gasket and cover are properly aligned install the two attaching

bolts. Tighten the screws to 10-19 foot pounds.

**NOTE:** If a new governor is installed it is necessary to check the clearance between the governor end brackets when the governor valve is in its full open position and the governor control lever is in its full forward position, Figure 40. This clearance should be approximately .010" minimum.

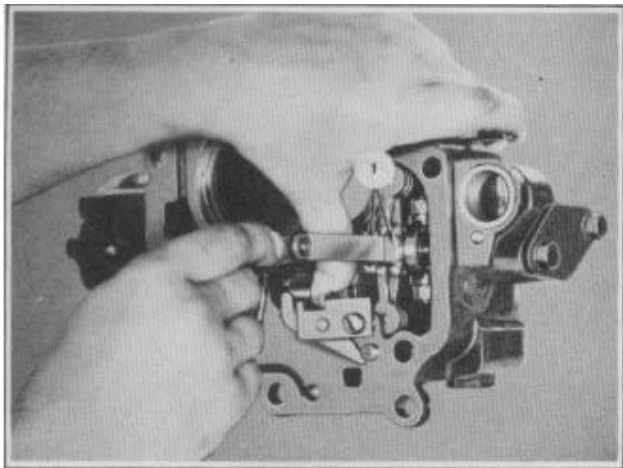


FIGURE 40

9. If the clearance is incorrect, remove the acorn nut located on the rear of the extension case, loosen the lock nut (1), Figure 41, and turn the screw (2) in (clock-wise) until the proper clearance is obtained.

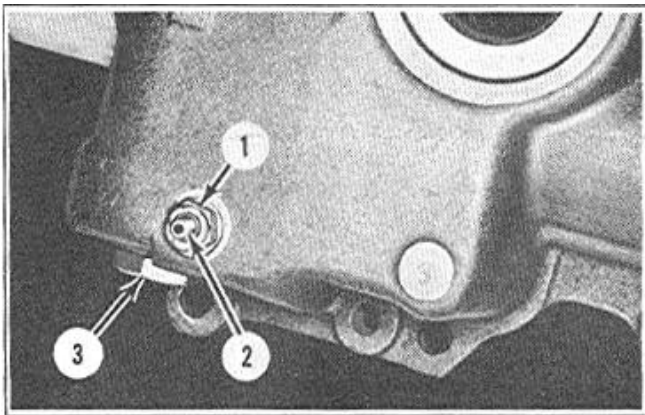


FIGURE 41

10. Road test car; if after road test, the kickdown or upshift speeds are too high, turn the adjusting screw (2) in (clockwise) a little at a time until the proper upshift

speed is obtained. Turning the screw 1/4 turn changes the shift speed approximately two miles per hour. See "Shift Points and Stall Speed Chart", Page 92.

11. Inspect and install the extension case. See "Extension Case Inspection and Installation", Page 23.

### GOVERNOR DRIVE SHAFT AND SPEEDOMETER DRIVE GEAR ASSEMBLY

#### REMOVAL AND INSTALLATION

Perform the operations outlined under "Governor, Removal, Inspection and Installation", Page 28.

**NOTE:** The governor will drop out of its position when the governor shaft is removed and cannot be aligned unless the extension case is removed from the transmission.

### SPEEDOMETER GEAR HOUSING

Perform the operations outlined under "Governor, Removal, Inspection and Installation", Page 28.

### GOVERNOR SPRING

#### REMOVAL AND INSTALLATION

Perform the operations outlined under "Governor, Removal, Inspection and Installation", Page 28.

**NOTE:** The correct spring free length is 2-1/2" long. Do not cut or stretch the spring to obtain the proper length.

### GOVERNOR RETURN SPRING

#### REMOVAL

1. Perform the operations outlined under "Extension Case Removal", Page 23, and proceed as follows:
2. Perform the operations outlined under "Governor, Removal", Page 28, and "Governor Control Shaft Yoke Removal", Page 32.

3. With the aid of needle nose pliers, unhook the end of the governor return spring from the anchor pin (1), Figure 42, and the other end of the spring from the governor control shaft yoke (2), Figure 43.

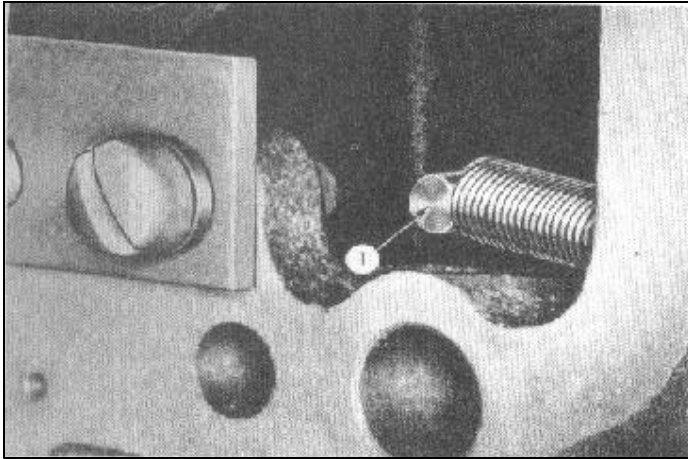


Figure 42

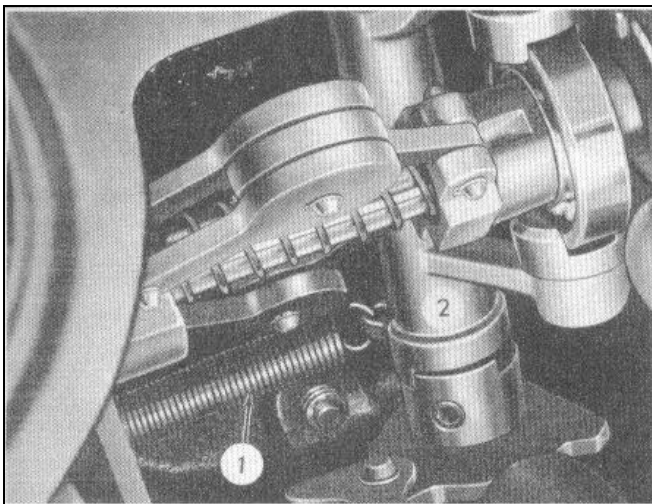


Figure 43

#### INSTALLATION

1. Hook one end of the spring on the governor control shaft yoke (2), Figure 43.
2. Hook the other end of the spring over the anchor pin (1), Figure 42. Be sure spring is firmly seated in groove of anchor pin and is positioned so as not to interfere with the case.
3. Perform the operations outlined under "Extension Case Inspection and Installation", Pages 23 and 26.

### GOVERNOR CONTROL SHAFT AND LEVER

#### REMOVAL

1. Perform the operations outlined under "Extension Case Removal", Page 23.
2. While holding the shaft and yoke in position, loosen set screw (1), Figure 44, using Wrench J-5482.
3. Withdraw the governor control shaft and lever through the top of the extension case. If the shaft sticks in the governor control detent cam, remove the governor control shaft bushing (3), Figure 41, (7/8" wrench) and with a brass drift tap the shaft out of the governor control detent cam.

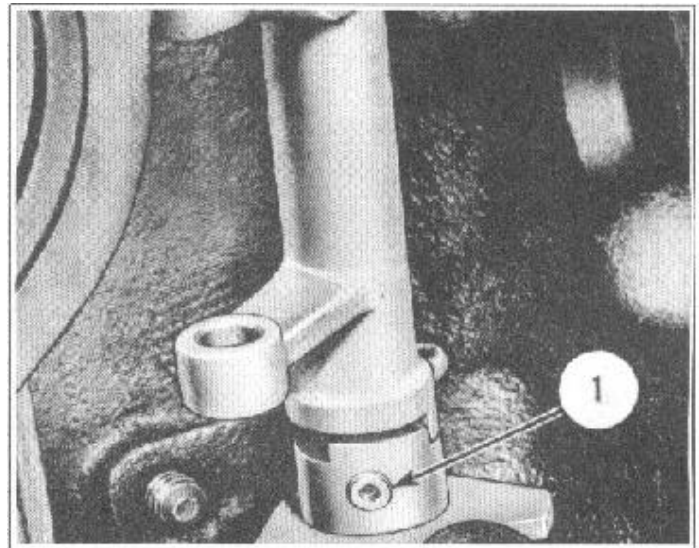


FIGURE 44

#### INSTALLATION

1. Install the key in the governor control shaft and install the control shaft in the case, and while holding the governor control shaft yoke in position enter the shaft with key into the governor control detent cam.
2. After determining that the shaft is fully seated in the detent cam, tighten the set screw securely.

3. Use a new "O" ring seal in the governor control shaft bushing and install the bushing into the extension case. Tighten bushing plug securely.

### **GOVERNOR CONTROL DETENT CAM AND PLUNGER ASSEMBLY**

#### **REMOVAL**

1. Perform the operations outlined under "Governor Removal", Page 28, "Governor Control Shaft", Page 31 and "Lever Removal", Page 31.
2. Remove the governor detent (1), Figure 30.
3. Pull the detent cam hub toward governor and toward rear of case and remove the governor control detent cam and plunger as an assembly.

**NOTE:** It may be necessary to back off the governor control shaft and lever adjusting screw (2), Figure 41, to allow for clearance when removing the plunger assembly.

#### **INSTALLATION**

1. Install the governor control cam and plunger by entering the shaft from inside of case and position the plunger in bore of case.
2. Perform the operations outlined under "Governor Control Shaft and Lever Installation", Page 31.
3. Install governor control detent in case bore, with tapered end in first and install detent spring.
4. Perform the operations outlined under "Governor Installation", Page 29, and "Extension Case, Inspection and Installation", Page 26.

### **GOVERNOR CONTROL SHAFT YOKE**

#### **REMOVAL AND INSTALLATION**

1. Perform the operations outlined under "Governor Control Shaft, Removal and Installation", Page 31.

### **GOVERNOR CONTROL SHAFT YOKE SHOES**

#### **REMOVAL AND INSTALLATION**

1. Perform the operations outlined under "Governor Removal, Inspection and Installation", Page 28.

### **GOVERNOR CONTROL DIRECT AND SECOND SPEED INTER- LOCK PAWL**

#### **REMOVAL**

1. Perform the operations outlined under "Extension Case Removal and Inspection", Page 23.
2. Remove the cotter pin.
3. Remove the pawl spring (7) and pawl (8), Figure 27.

#### **INSTALLATION**

Reverse procedure of removal and check operation of interlock pawl; also perform operations outlined under "Extension Case Installation", Page 26.

### **GOVERNOR CONTROL DIRECT DRIVE RELEASE ROCKER ARM**

#### **REMOVAL**

1. Perform the operations outlined under "Extension Case Removal and Inspection", Page 23.
2. Remove governor valve stop plate screw, Figure 27, plate (11) and spacer washer behind the stop plate.
3. Remove the rocker arm (9) and flat washer behind the rocker arm.

#### **INSTALLATION**

1. Place the small flat washer on the rocker arm pivot pin and place the rocker arm (9) on the pin.
  2. Place the retainer plate (11) on the rocker arm over the pin and slip the spacer washer between the plate and the case.
  3. Align the spacer washer and install the retaining screw.
  4. Check operation of governor and linkage.
-

5. Perform the operations outlined under "Extension Case Installation", Page 26.

### GOVERNOR VALVE AND HYDRAULIC DETENT PISTON

#### REMOVAL

1. Perform the operations outlined under "Governor Removal", Page 28.
2. Turn the governor (2), Figure 38, so that the end of the fork is out of the notch of the direct drive rocker arm retaining plate; then pull the valve out of the sleeve.

**CAUTION: Do not force the governor valve out of its bore.**

3. Remove the hydraulic detent piston. If the piston is stuck in the bore, position the governor fork so that it contacts the stop on the retaining plate. Cover the valve body to governor oil passage (3), Figure 45, and the multiple disc clutch passage (4), then using compressed air, blow into the direct drive passage (2) to force the detent piston out of the bore against the governor valve fork.

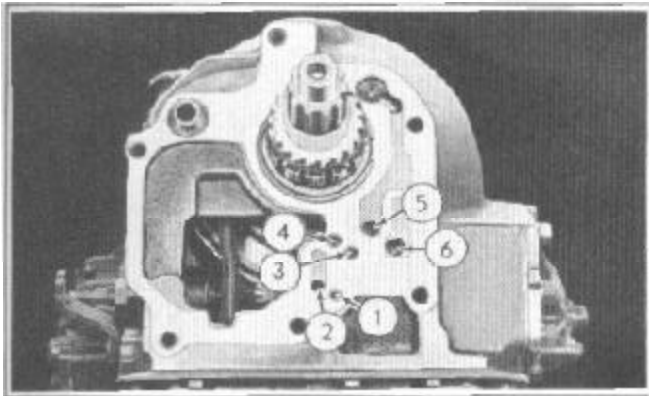


FIGURE 45

#### INSTALLATION

1. Apply Hudson Approved Automatic Transmission Fluid, Type "A" to the governor valve and the hydraulic detent piston.
2. Insert the detent piston in its bore and the control valve in the sleeve, placing the end

of the fork in position in the notch of the direct drive rocker arm retaining plate.

3. Perform the operations outlined under "Governor Installation", Page 29.

### GOVERNOR DRIVE AND PARKING BRAKE GEARS

#### REMOVAL

1. Perform the operations outlined under "Extension Case Removal", Page 23.
2. Remove the companion flange spacer (4), Figure 46.
3. Slide the governor drive gear (3), and parking brake gear (2) off the mainshaft.

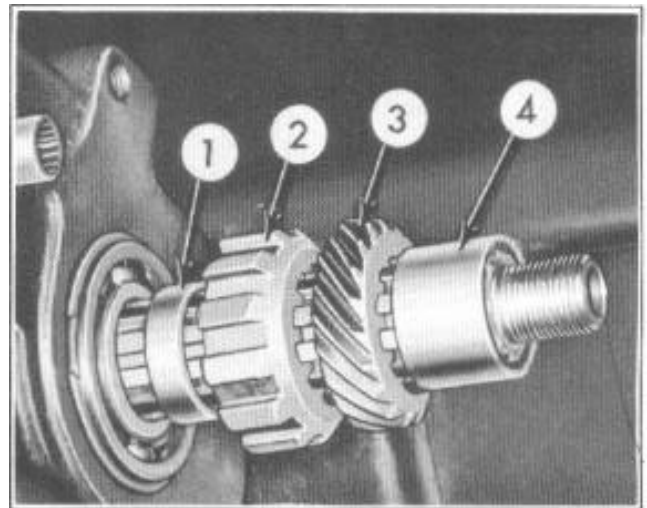


FIGURE 46

#### INSTALLATION

1. With the governor drive gear spacer (1) in position, install the parking brake gear (2) on the mainshaft with beveled side of gear to the rear mainshaft.
2. Install the governor drive gear (3) and the companion flange spacer (4) on the mainshaft.
3. Perform the operations outlined under "Extension Case, Inspection and Installation", Page 23.

## PARKING BRAKE PAWL AND TOGGLE ASSEMBLY

### REMOVAL

1. Perform the operations outlined under "Extension Case, Removal", Page 23.
2. Remove the toggle pivot pin (2), Figure 47. If the pin is stuck in the case, thread a screw (5/16" -24) in the pin, and with pliers pull the pin out of the case.
3. Remove the toggle shaft (3) by pulling it out of the case.
4. Remove the pawl and toggle assembly from the case.

NOTE: No "O" rings used on pivot or splined ,toggle shaft.

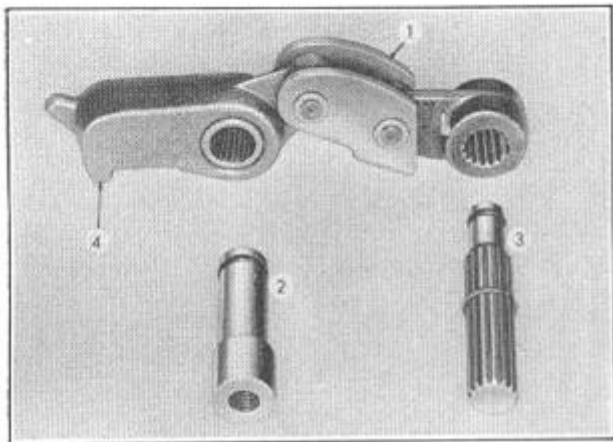


FIGURE 47

### INSTALLATION

1. Position the pawl and toggle assembly in the extension case with the dog of the pawl (4) pointing down.
2. Align the pawl with holes in case and install the pivot pin (2).
3. Align the wide spline of the toggle shaft (3) with the toggle lever and install the toggle shaft.
4. Perform the operations outlined under "Extension Case, Inspection and Installation", Page 23.

## PARKING BRAKE PAWL AND TOGGLE ASSEMBLY

### ADJUSTMENT

1. Place the selector control shaft lever at transmission into the neutral position.
2. Turn the propeller shaft manually and at the same time, move the selector control shaft lever toward the park position (full forward position). If the toggle shaft is in proper adjustment, a slight ratcheting of the parking pawl on the parking brake gear should be felt as the selector lever is moved from the neutral towards park position.
3. If an adjustment is necessary:
  - A. Drain the transmission and remove the oil pan.
  - B. Loosen the lock nut (2), Figure 48, on the parking brake actuating rod (1).
  - C. With a screw driver turn the actuating rod clockwise to move the parking pawl towards the parking brake gear and counter-clockwise to move the pawl away from the gear.

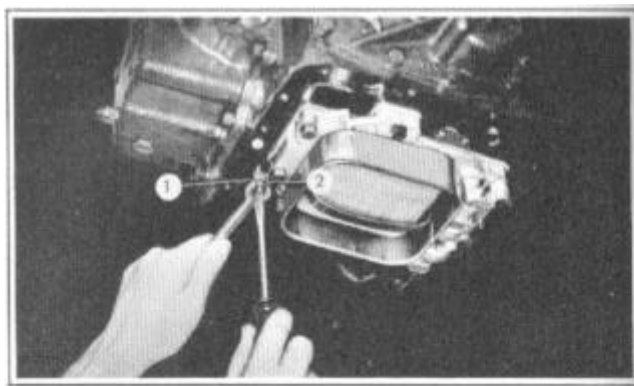


FIGURE 48

- D. After proper adjustment, tighten lock nut to 3-4 foot pounds.
- E. Install a new oil pan gasket and oil pan. Tighten oil pan screws to 10-13 foot pounds.
- F. Refill transmission as outlined under "Draining and Refilling Transmission", Page 87.

## PARKING BRAKE INTERLOCK PISTON AND SPRING

### REMOVAL AND INSTALLATION

Perform the operations outlined under "Extension Case, Removal, Inspection and Installation", Page 23.

## GOVERNOR CONTROL CAM DETENT AND SPRING

### REMOVAL AND INSTALLATION

Perform the operations outlined under "Extension Case, Removal, Inspection and Installation", Page 23.

## EXTENSION CASE REAR OIL SEAL

### REMOVAL

1. Raise car.
2. Remove nuts, washers and "U" bolts attaching the propeller shaft to the transmission companion flange. Protect the joint cross and bearings from damage and dirt.
3. Place the selector control shaft lever in the Park position (furthest forward position); this will hold the mainshaft from turning when loosening the companion flange nut.
4. Remove the companion flange nut, lock washer and washer. Punch mark one spline of the mainshaft and one groove of the flange to facilitate reassembly and remove the flange with puller tool J-820.
5. Pry out oil seal from rear of case, being careful not to damage the bore of the extension case.

### INSTALLATION

1. Clean bore of extension case.
2. Coat the outer surface of the seal with a film of white lead and place the oil seal in the bore of the case.

**NOTE:** The seal should be installed with the felt part of the seal and lettered side of seal toward the rear of case (facing the Oil Seal Driver).

3. Using a suitable Driver, start the seal into the case making sure that the seal enters the bore squarely and press the seal in until it is flush with the outside of case.
4. Install the companion flange, aligning the punch marks on the flange and transmission mainshaft.
5. Place the selector control shaft lever at transmission in the Park position, (full forward position).
6. Install the washer, lock washer and companion flange nut, tighten nut to 90-100 foot pounds.
7. Assemble the propeller shaft universal joint cross and bearings to the companion flange, install "U" bolts, washers and nuts and tighten nuts to 20-25 foot pounds.

## REAR OIL PUMP

### REMOVAL

1. Remove the extension case as outlined under "Extension Case, Removal", Page 23.
2. The rear oil pump can be removed after removing the extension case from the transmission by removing the three screws (1/2" socket) and carefully sliding the oil pump out of the case.

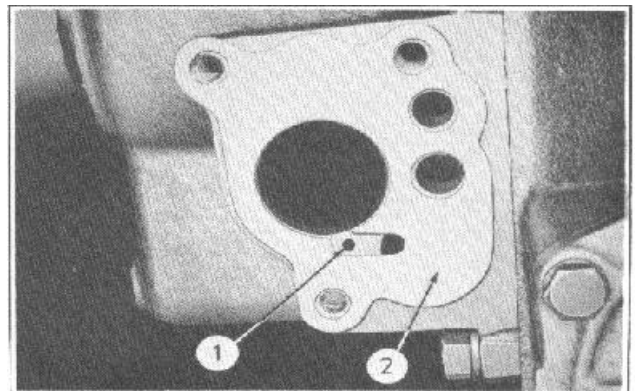


FIGURE 49

## INSTALLATION

**NOTE:** The rear pump is serviced only as an assembly. If the pump is damaged or has a worn cover, worn shafts or worn gears, the complete pump will have to be replaced.

1. Install a new gasket to the face of the extension housing and retain gasket (2), Figure 49, in place with a thin film of petroleum jelly. Make sure that the governor valve drain hole (1), is open and that the gasket does not cover this drain hole.
2. Insert the end of the pump through the opening in the case and with the face of the pump parallel to the face of the case, push the pump into the case and engage the splines of the pump gear and governor shaft. It may be necessary to turn the pump slightly to facilitate engagement of the splines.
3. With the pump fully installed, install the three pump retaining screws and tighten to 15-18 foot pounds (1/2" wrench).
4. Install extension case as outlined under "Extension Case, Inspection and Installation", Page 23.

## REAR OIL PUMP GASKET

### REPLACEMENT

1. Remove the two pump cover attaching screws (7/16" wrench), and the three pump attaching screws (1/2" wrench).

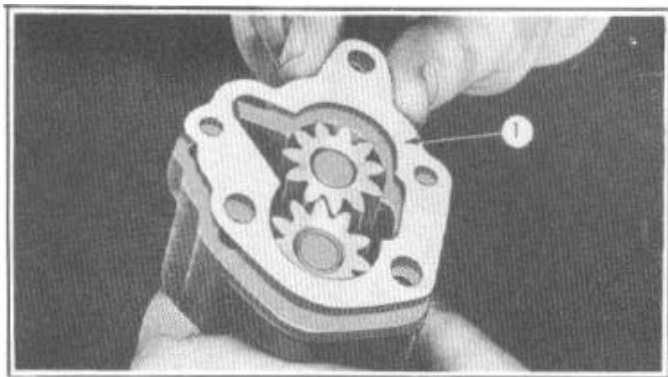


FIGURE 50

2. Remove the cover and cover gasket.

**NOTE:** Always use a gasket of the same thickness as the gasket to be replaced. Inspect cover for score marks and wear.

## SELECTOR CONTROL SHAFT AND LEVER

### REMOVAL

1. Raise car.
2. Drain the fluid from the transmission unit only.
3. Remove the oil pan and oil pan gasket.
4. Disconnect the selector control rod at the selector control shaft outer lever (6), Figure 51.

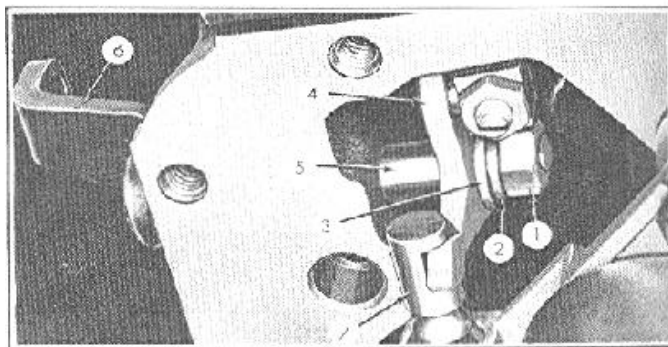


FIGURE 51

5. Remove nut (1), washer (2), and flat washer (3) attaching the selector control shaft inner lever (4) to the selector control shaft (5).
6. Pull the selector shaft assembly out of the selector control shaft inner lever, and out of the case.
7. Pry out the oil seal in the counter-bore in the transmission case.

### INSPECTION

1. Clean the selector lever shaft and shaft bore in case.
2. Check the shaft and bore for roughness.
3. Check selector lever for tightness on shaft.

**INSTALLATION**

1. Install a new seal in case counterbore (2), Figure 52, with the numbered face

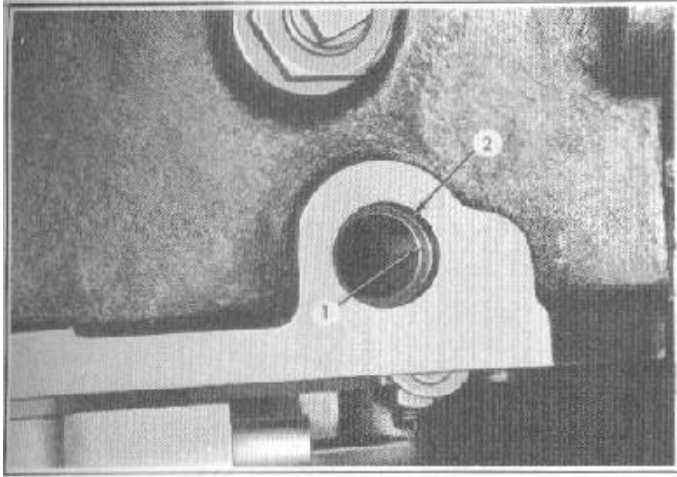


FIGURE 52

2. Install the flat washer on the selector control shaft. Lubricate the shaft with Type "A" Automatic Transmission Fluid, and install the selector control shaft into the transmission case.
3. Turn the selector control shaft outer lever (6) Figure 51, so that it points toward the top of transmission and align the slot of the inner lever (4) with the flat on the control shaft (5) and install the inner lever (4) on the control shaft (5). Make sure that the inner lever (4) is in the slot of the selector valve (7).
4. Install the flat washer (3), lock washer (2), and nut (1) and tighten the nut securely.
5. Make a manual check for proper operation of the selector control shaft and lever and the selector valve.
6. Connect the selector control rod to the selector control lever and recheck operation of selector valve.
7. Install a new oil pan gasket and oil pan.
8. Install oil pan screws and tighten to 10-13 foot pounds.

9. Lower car.

10. Refill transmission as outlined under "Draining and Refilling Transmission", Page 87.

### SELECTOR CONTROL SHAFT OIL SEAL

**REMOVAL AND INSTALLATION**

Perform the operations outlined under "Selector Control Shaft and Lever Removal, Inspection and Installation", Page 36.

**OIL PAN AND OIL SCREEN****REMOVAL**

1. Raise car and drain fluid from the transmission unit only.
2. Remove the oil pan attaching screws and lock washers and remove the oil pan.
3. Remove the screen retainer (1), Figure 53, and screen (2).

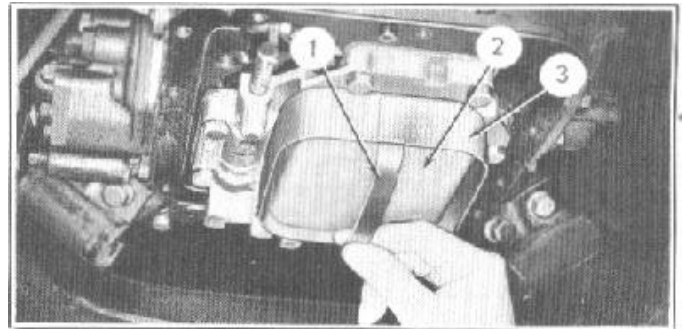


FIGURE 53

**INSTALLATION**

1. Clean the screen thoroughly and inspect for damage, also check oil pan flange for distortion.
2. Place the oil screen (2) in the shroud (3) and install the screen retainer. Make sure the retainer is snapped securely in place.

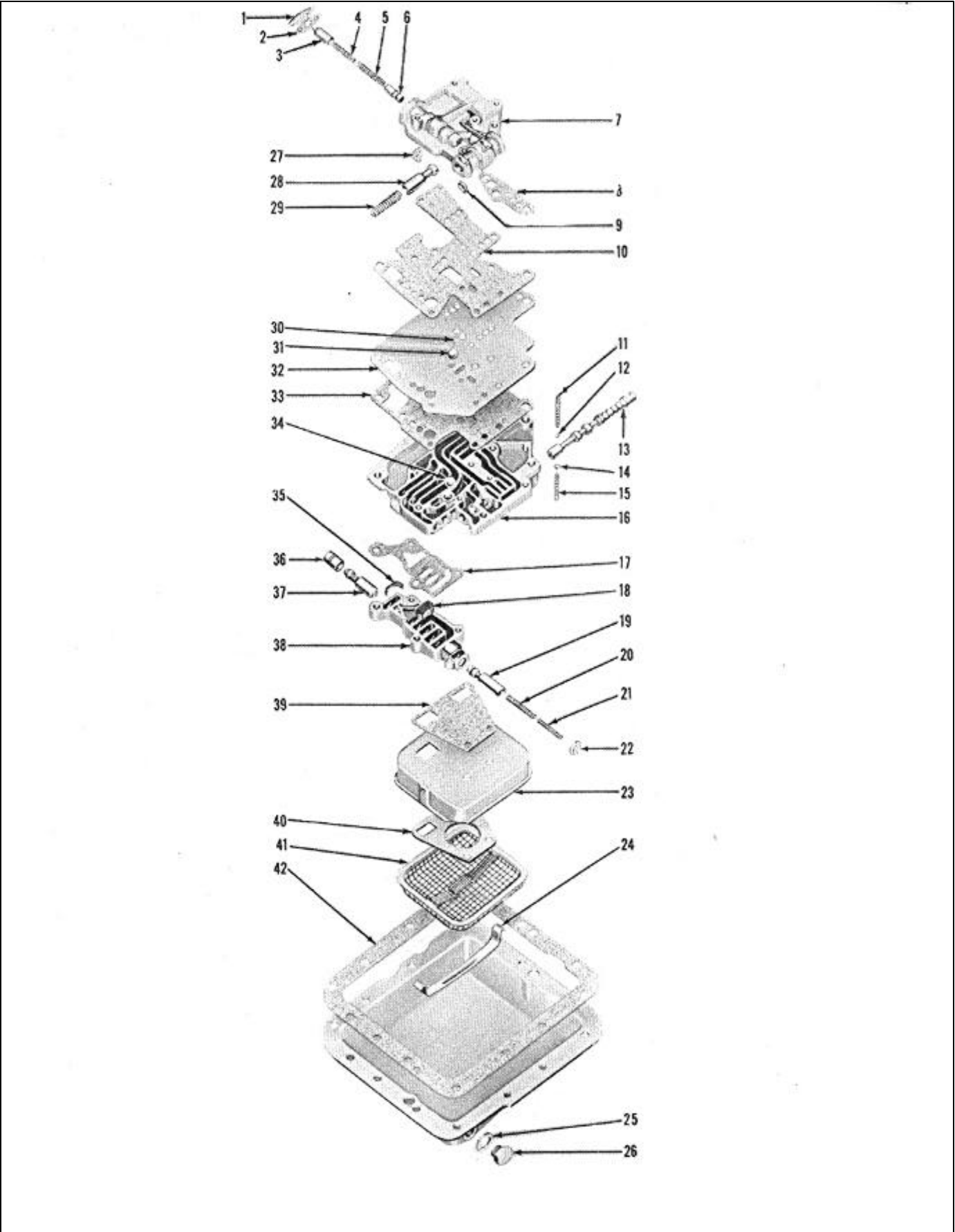


FIGURE 53A

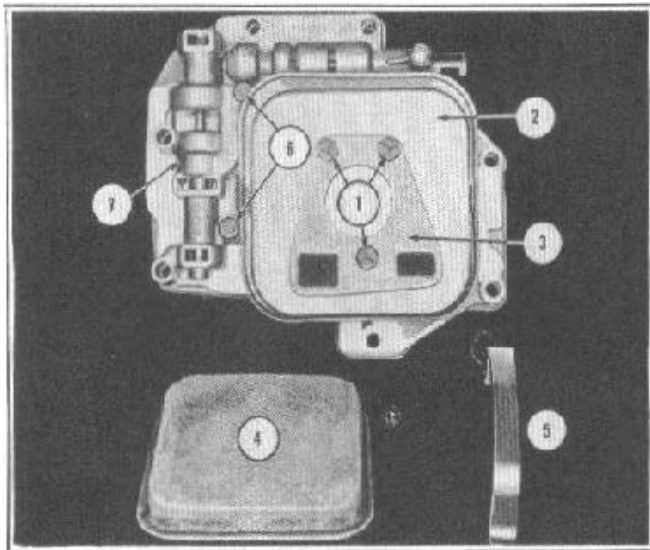
FIGURE 53A

## EXPLODED VIEW - VALVE BLOCK ASSEMBLY

## LEGEND

- |  |  |
|--|--|
| 1. Converter Valve Body Cover                    | 22. Rear Pump Relief Valve Retainer                    |
| 2. Converter Valve Body Gasket                   | 23. Oil Pan Shroud                                     |
| 3. Compensating Piston                           | 24. Oil Screen Retainer                                |
| 4. Compensating Piston Spring, Outer             | 25. Drain Plug Gasket                                  |
| 5. Compensating Piston Spring, Inner             | 26. Drain Plug   |
| 6. Valve Piston                                  | 27. Reverse Interlock Valve Stop Plate                 |
| 7. Converter Valve Body                          | 28. Reverse Interlock Valve Piston                     |
| 8. Base Plate Rear Gasket                        | 29. Reverse Interlock Valve Piston Spring              |
| 9. Reverse Interlock Valve Spring Retainer       | 30. Governor Ball Check Valve                          |
| 10. Converter Body Gasket                        | 31. Rear Pump Ball Check Valve                         |
| 11. Selector Valve Detent Spring                 | 32. Manifold Base Plate                                |
| 12. Selector Valve Detent Ball                   | 33. Manifold Plate Gasket                              |
| 13. Manifold Selector Valve                      | 34. Front Pump Valve Ball Check                        |
| 14. Selector Valve Detent Ball                   | 35. Valve Spring Retainer                              |
| 15. Selector Valve Detent Spring                 | 36. Front Pump Relief Valve Piston Sleeve              |
| 16. Manifold Plate                               | 37. Front Pump Relief Valve Piston and Spring Assembly |
| 17. Front and Rear Pump Relief Valve Body Gasket | 38. Front and Rear Pump Relief Valve Body              |
| 18. Front and Rear Pump Relief Valve Body Screen | 39. Oil Pan Screen Shroud Gasket                       |
| 19. Rear Pump Relief Valve Piston                | 40. Shroud Reinforcing Plate                           |
| 20. Rear Pump Relief Valve Spring, Outer         | 41. Transmission Oil Screen                            |
| 21. Rear Pump Relief Valve Spring, Inner         | 42. Oil Pan To Case Gasket                             |

3. Install a new oil pan gasket, position gasket in place with petroleum jelly.
4. Install oil pan, making sure the pan does not interfere with the pressure take-off plugs.
5. Install oil pan screws and tighten screws to 10-13 foot pounds.
6. Refill transmission as outlined under "Draining and Refilling Transmission", Page 87.

**FIGURE 54****OIL SCREEN SHROUD****REMOVAL**

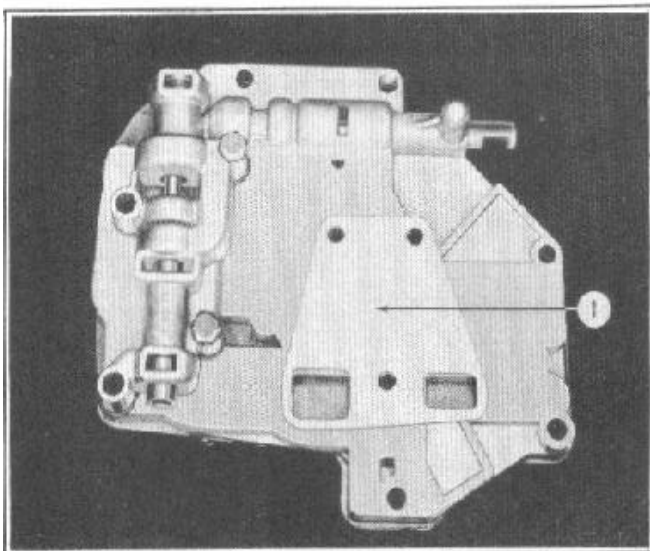
1. Perform the operations outlined under "Oil Pan and Oil Screen Removal", Page 37.
2. Remove the three shroud to valve block screws (1), Figure 54, and remove the reinforcing plate (3) and shroud (2).
3. Remove the shroud gasket (1), Figure 55.

**INSTALLATION**

1. Clean the shroud thoroughly and inspect for damage or distortion.
2. Install a new shroud gasket on the valve block, make sure oil openings are aligned.
3. Install shroud on the gasket and the shroud reinforcing plate on the shroud.
4. Align holes of the plate, shroud and gasket and install the retaining screws (7/16" socket). Tighten to 6-8 foot pounds.
5. Perform the operations outlined under "Oil Pan and Oil Screen Installation", Page 37.

**FRONT AND REAR PUMP  
RELIEF VALVE BODY****REMOVAL**

1. Perform the operations outlined under "Oil Pan and Oil Screen Removal", Page 37.
2. Remove the screws attaching the relief valve body and valve block assembly to the transmission case (1/2" socket).
3. Remove the two cap screws (6), Figure 56, attaching the front and rear pump relief valve body assembly (7) to the valve block assembly (7/16" socket).
4. Remove the relief valve body and gasket.

**FIGURE 55**

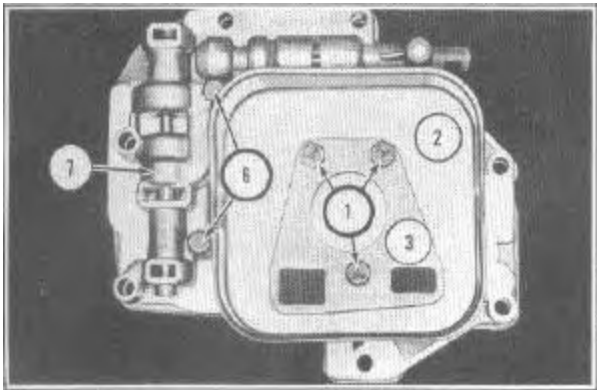


FIGURE 56

#### DISASSEMBLY

1. Remove the rear pump relief valve screen, Figure 57.

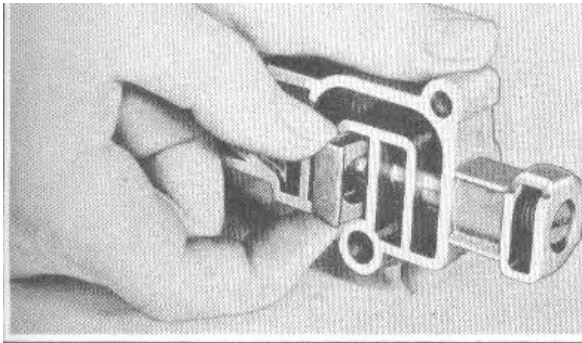


FIGURE 57

2. Compress the rear pump relief valve spring with the bayonet type Spring Unloader J-4547, Figure 59, and position the spring retainer tool (Part of Spring Unloader set J-4547) between

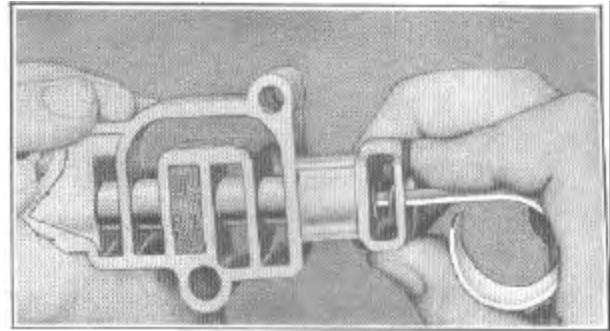


FIGURE 59

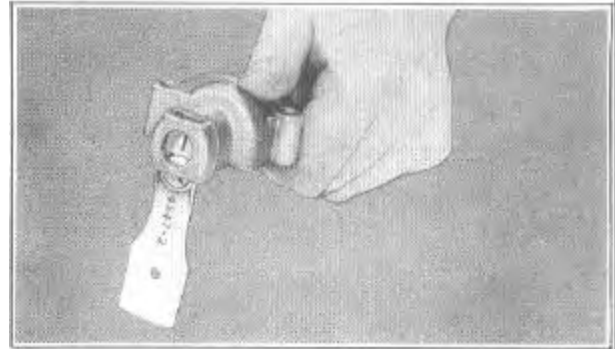


FIGURE 60

the spring retainer and spring, Figure 60.

3. Remove the spring compressor and slip the spring retainer (9), Figure 58, out of the relief valve body.
4. Reinstall the spring compressor to permit removal of the retainer tool, then remove the compressor tool and remove the two relief valve springs (7) and (8), piston (6).

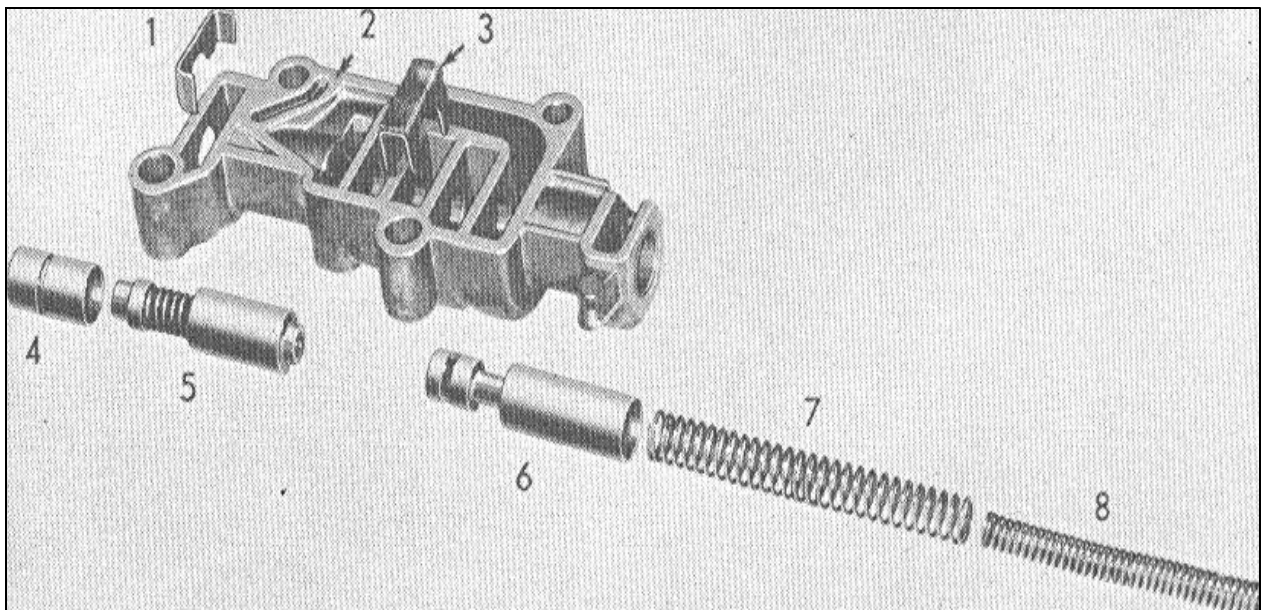


FIGURE 58

6. Remove the front pump relief valve piston sleeve retainer (1) and slip the piston sleeve (4) and relief valve piston and spring assembly (5) out of the relief valve body.

### INSPECTION

1. Check both valves for damage and scoring and freedom of movement in the body bore. Slight scratches may be considered normal.

**NOTE: If a valve or if the valve body bore is badly scored or scratched, a new relief body assembly must be installed.**

2. Check springs for distortion or collapsed coils.
3. Clean the rear pump relief valve screen.
4. Clean all parts thoroughly.

### ASSEMBLY

1. Install the front pump relief valve piston and spring assembly (5), Figure 58, and sleeve (4) into the relief valve body. The sleeve must be installed with counterbore end of sleeve toward front pump relief valve piston. Install the piston sleeve retainer with lips of retainer facing rear pump relief valve as shown in Figure 58. After valve, sleeve and retainer have been installed, check for free movement of the front pump relief valve assembly in valve body.
2. Install the rear pump relief valve piston (6) and springs (7) and (8) into the valve body. Compress the springs with Valve Spring Unloader Tool J-4547, Figure 59. Slip the spring retainer tool in position, Figure 60, (flanges of tool up) and withdraw the compressor tool.
3. With retainer tool in position, install spring retainer (9). Insert the compressor tool to compress the springs while removing the retainer tool.
4. Install the rear pump relief valve screen, Figure 57, making sure the screen is fully seated in the passage and flush with or below the surface of the valve body.

### INSTALLATION

1. Install a new relief valve to valve block gasket.
2. Install the two screws attaching the relief valve body to valve block, but do not tighten.
3. Install the two cap screws attaching the relief valve body and valve block assembly to the transmission case. Tighten relief valve to block screws to 6-8 foot pounds and valve block to transmission case screws to 10-13 foot pounds.
4. Perform operations outlined under "Oil Pan Inspection and Installation", Page 37.

### VALVE BLOCK ASSEMBLY

#### REMOVAL

1. Perform the operations outlined under "Oil Pan and Oil Screen Removal", Page 37.
2. Remove the seven cap screws attaching the valve block assembly to transmission case (1/2" wrench) and remove the valve block assembly.
3. Remove the valve block base plate rear gasket (1), Figure 61.

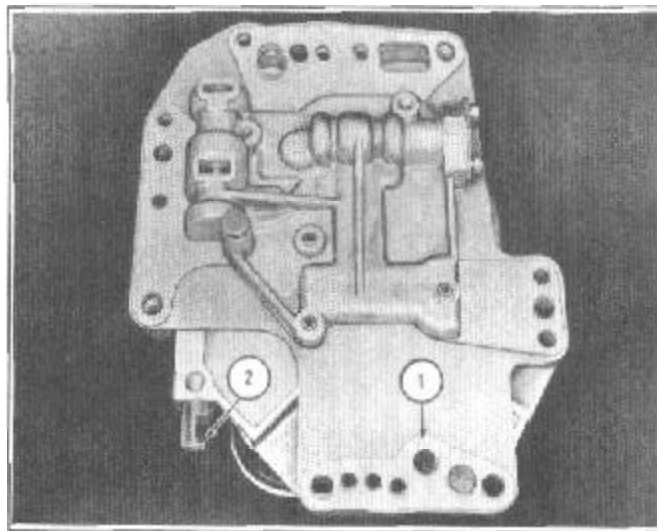


FIGURE 61

**CAUTION:** Selector valve (2) should not be moved out of its normal operating range.

**DISASSEMBLY**

1. Place the valve block assembly on a clean lintless cloth and remove the oil screen retainer (5), Figure 62,

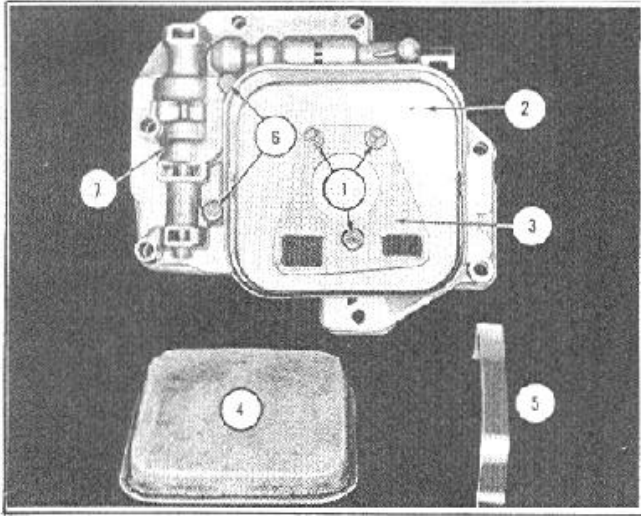


FIGURE 62

2. Remove the three shroud to block cap screws (1) and remove the shroud reinforcing plate (3) and shroud (2) and gasket.
3. Remove the two cap screws (6) and remove the relief valve body (7) and gasket (1), Figure 72.
4. Remove the one cap screw (1), Figure 63, attaching the converter valve body (2) to the valve block.

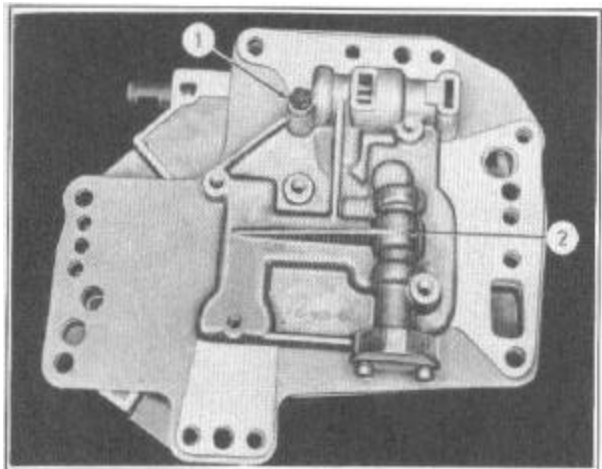


FIGURE 63

5. Carefully lift off the converter valve body from the valve block base plate (4), Figure 64, and remove the converter ball check (2) and rear pump ball check (1).

**CAUTION:** Use care when removing the converter valve body as the selector valve detent spring and ball are located underneath the base plate and may become lost when the converter valve body is removed.

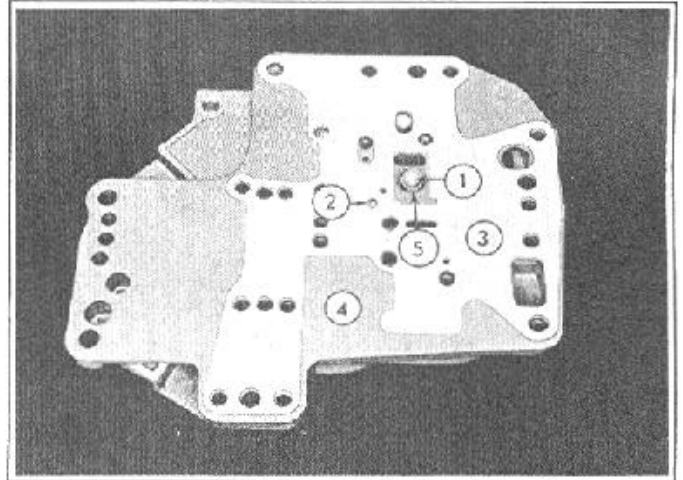


FIGURE 64

6. Remove the converter control valve body gasket (3) from the base plate (4).
7. Separate the base plate from the valve block manifold and remove the valve manifold gasket, Figure 65.

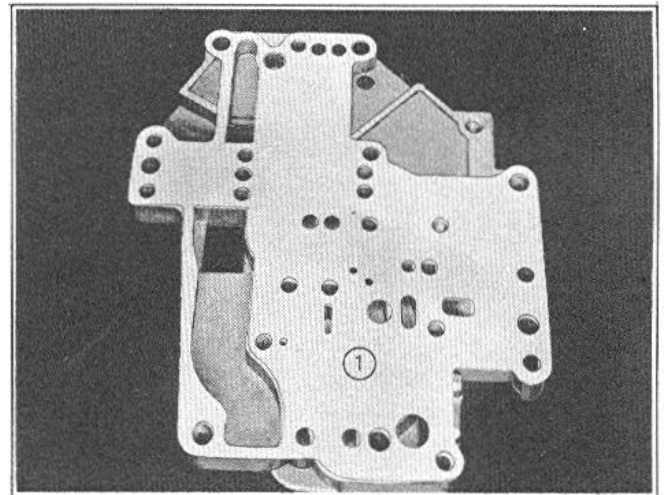


FIGURE 65

8. Remove front pump ball check (1), Figure 66.

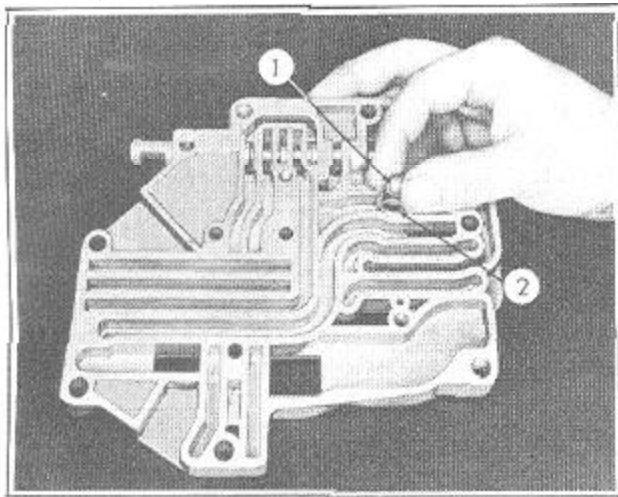


FIGURE 66

9. Disassemble the front and rear pump relief valve body assembly as outlined under "Front and Rear Pump Relief Valve Body Disassembly", Page 41.
10. Use the Valve Spring Unloader Tool J-4547 in the same manner as outlined under, "Front and Rear Pump Relief Valve Body Disassembly", Page 41; remove the reverse interlock valve spring retainer (1), Figure 67, and remove the reverse interlock valve spring (2) and valve piston (3).
11. Remove the converter valve cover plate screws (12), converter cover plate (11), gasket (10), compensating piston (9), springs (8) and (7) and converter valve.

12. Turn the selector valve (1), Figure 68, so that the milled slot is away from the selector valve detent ball (2) and spring.

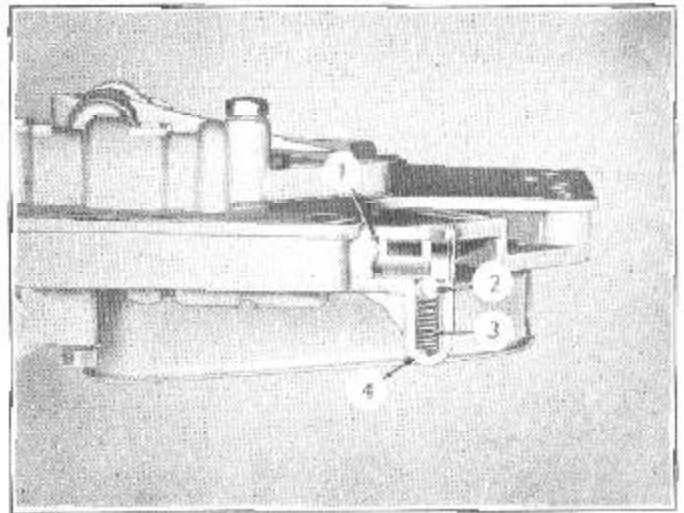


FIGURE 68

13. Push the selector valve into the valve block manifold past the detent ball and spring.

**CAUTION:** The two detent balls are under spring pressure, place a cloth over the opening to catch the balls as the valve is pushed into the manifold,

14. Remove the detent spring (3), and selector valve (1), by pushing the valve back and out of the valve body.

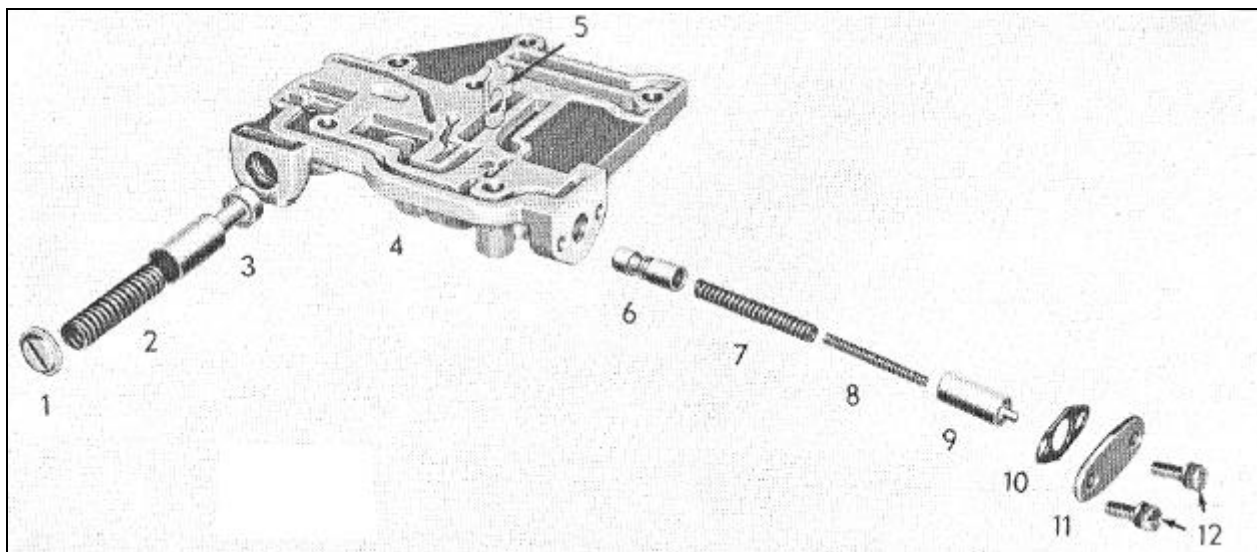


FIGURE 67

## INSPECTION

1. Wash all parts thoroughly in a good clean solvent.
2. Inspect all valve and valve bores for evidence of scratches or scoring.

NOTE: Slight scratches should be polished, if necessary, to insure free valve operation, however, if a valve or valve body bore is badly scratched or scored, that valve body assembly must be replaced.

3. Check all oil passages in the valve block manifold for obstruction, Figure 69. Also check castings for cracks and sand holes.

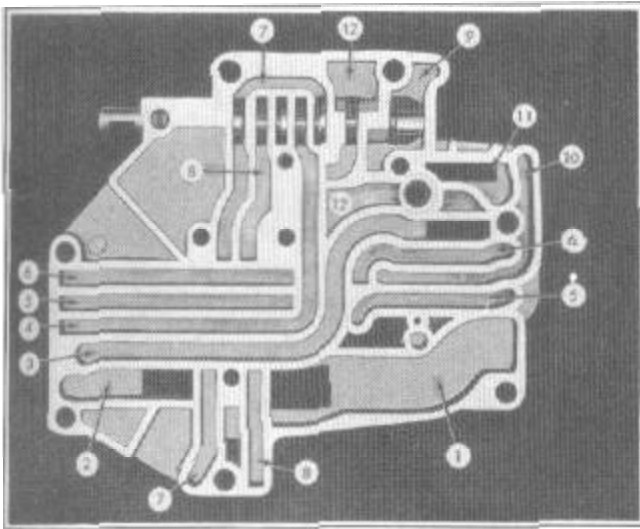


FIGURE 69

## LEGEND

1. Front pump inlet passage
2. Rear pump inlet passage
3. Rear pump pressure passage
4. Governor valve passage
5. Multiple disc clutch passage
6. Direct drive clutch passage
7. Forward servo passage
8. Low servo passage
9. Reverse servo passage
10. Converter pressure passage
11. Front pump pressure passage
12. Front or rear pump pressure passage

4. Check the front pump ball check seat (2), Figure 66, and the rear pump check ball

seat (5), Figure 64; these seats must be tight in the manifold and in the manifold base plate.

5. Clean the rear pump relief valve intake screen.

## ASSEMBLY

1. After determining that all parts of the valve block assembly are thoroughly cleaned, care must be taken to keep the parts clean during assembly operation.
2. Install the selector valve in the valve block manifold so that the end of the valve clears the opening in the detent housing. Make sure the valve notch is away from the detent housing, Figure 68. Install the detent spring (3), Figure 68, and detent ball (2) in the detent housing (4). While holding the detent ball down with a small screw driver, move the selector valve over the detent ball. Move the selector valve out until the detent ball locks up in the first groove in the valve, then turn the valve so that the milled slot is toward the valve block manifold.
3. Install the converter valve piston (6), Figure 67, stop (5), springs (7) and (8) and the compensator piston (9). Install a new gasket (10), cover plate (11) and attaching screws and lock washers (12).
4. Install the reverse interlock valve piston (3) and spring (2) in the converter body. Use the Valve Spring Unloader Tool J-4547 as outlined under "Front and Rear Pump Relief Valve Assembly", Page 42, and install the reverse interlock valve spring retainer.
5. Assemble the front and rear pump relief valve body assembly as outlined under "Front and Rear Pump Relief Valve Assembly", Page 42.
6. Install the front pump ball check (1) in the valve manifold, Figure 66. Place the manifold plate gasket (1), Figure 65, on the valve manifold, making sure that all holes are aligned and install the base plate.

7. Place the converter control valve body gasket (3) in position on the base plate (4), Figure 64.
8. Install the converter ball check (2), Figure 64, and rear pump ball check (1) on their proper seats.
9. Install the converter control valve body onto the base plate, being careful not to dislodge the ball checks.
10. Install the cap screw (1), Figure 63; tighten screw finger tight.
11. Turn the valve block assembly over and install the front and rear pump relief valve body gasket (1), Figure 70, on the valve body manifold.

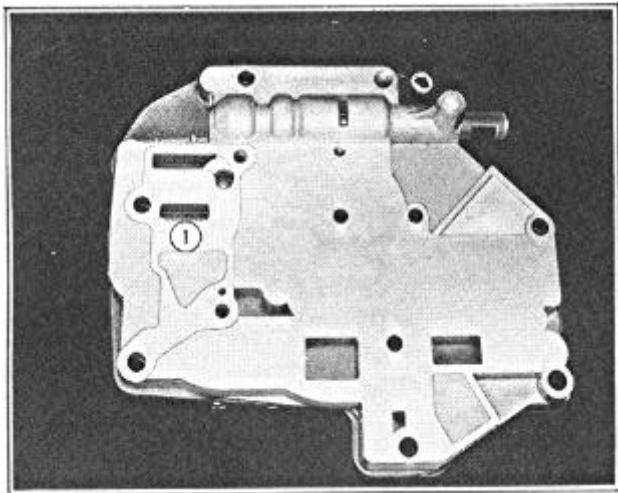


FIGURE 70

12. Place the relief valve body on the gasket and after aligning the holes, install the two cap screws (1), Figure 71. Move the relief valve body (2) as far as possible in the direction indicated by arrows and tighten screws finger tight.
13. Install the oil screen shroud gasket (1), Figure 72, on the valve block manifold, aligning all holes and openings.
14. Install the shroud and shroud reinforcement plate. Install the three 1-1/4" attaching screws finger tight.

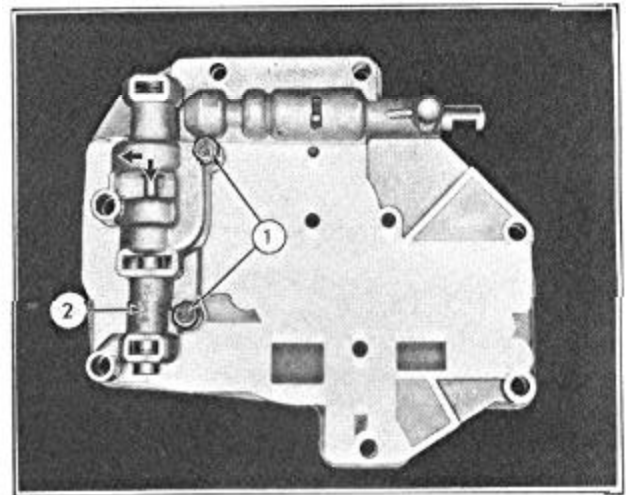


FIGURE 71

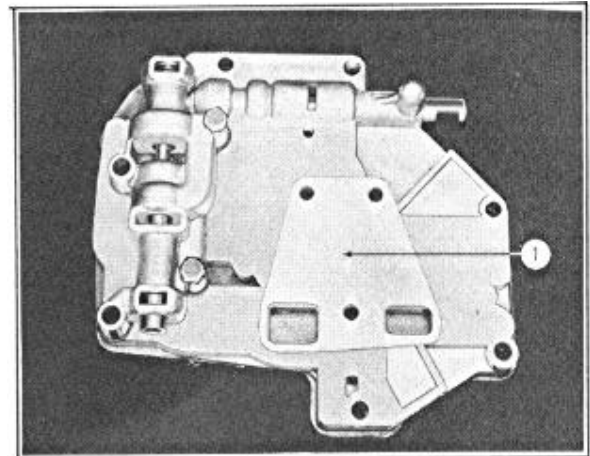


FIGURE 72

15. Make sure that all parts are properly aligned by inserting the valve block to case attaching screws in their respective holes in the valve body and tighten all cap screws to 6-8 foot pounds, (7/16" socket).

## INSTALLATION

1. Install a new valve block base plate rear gasket (1), Figure 61. Align the holes of the gasket with the holes in the base plate, retain in position with petroleum jelly.
2. Install the valve block assembly to the transmission case while guiding the inner selector control shaft inner lever into the slot of the selector valve.

**CAUTION:** Recheck position of base gaskets, make sure gaskets are still aligned with the holes and not curled up or folded over.

3. Install the seven valve block assembly attaching screws and tighten finger tight.
4. Disconnect the selector lever control rod at the selector lever outer at transmission and move the selector lever outer through its full travel to make certain that no bind exists between the inner selector lever and the selector valve. If there is a bind, loosen the valve block assembly cap screws (1/2" wrench) and reposition the assembly to relieve the bind. Retighten screws to 10-13 foot pounds.
5. Connect the selector lever control rod at transmission selector outer lever.
6. Perform the operations outlined under "Oil Pan and Oil Screen Inspection and Installation", Page 37.

### REVERSE SERVO OUTER CYLINDER ASSEMBLY

#### REMOVAL

1. Clean off all dirt at left side of transmission.
2. Disconnect the selector lever control rod at the transmission selector lever outer.
3. Hold the low band adjusting screw (1), Figure 73, loosen and remove lock nut (2).
4. Place a clean drain pan under the reverse unit to catch the oil as the servo unit is removed.
5. Remove the six cap screws and lock washers attaching the reverse servo unit to the transmission case (1/2" socket).
6. Remove the reverse servo outer cylinder and plate as an assembly. DO NOT damage the threads of the low band adjusting screw.

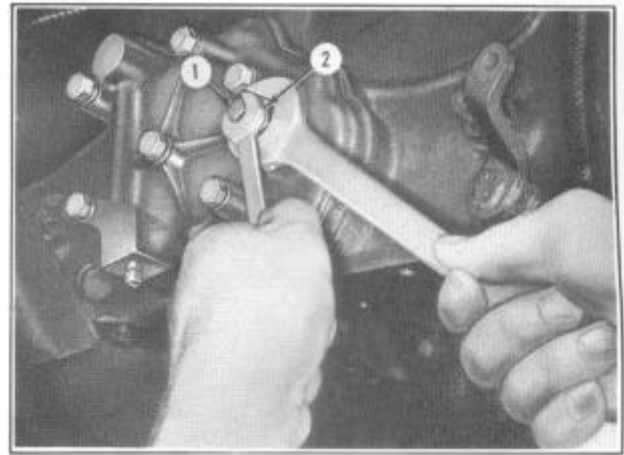


FIGURE 73

7. Remove the cylinder inner gasket from the transmission case.

**CAUTION:** Use care when removing the reverse servo outer cylinder to prevent the inner brake piston from coming out of the transmission case. If the inner piston is accidentally removed when removing the outer cylinder it will be necessary to perform the operations outlined under "Valve Block Assembly, Removal and Installation", Page 42, and "Reverse Servo Inner Piston Assembly Installation", Page 52.

#### DISASSEMBLY

1. Separate the reverse servo cylinder plate (37), Figure 74, from the cylinder (42) and slide the plate off the piston rod of the outer piston (40).
2. Remove the cylinder outer gasket (39).
3. Grasp the outer piston rod and pull the piston (40) out of the cylinder (42).
4. Using a hook tool, remove "O" ring seal (38) out of the groove in the cylinder plate (37). Discard the seal.
5. Lift the piston seal (41) out of the groove of the piston (40) and bring it over the top of the piston and out of the piston groove,. Discard the seal.

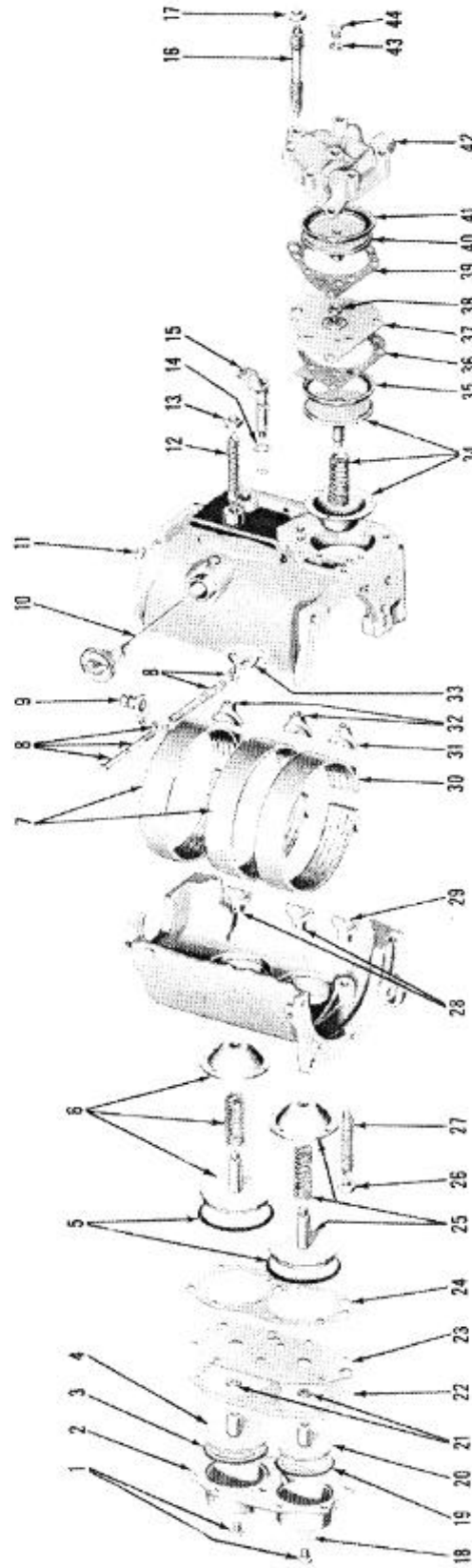


FIGURE 74 - EXPLODED VIEW - TRANSMISSION CASE, SERVOS, SERVO BANDS  
SELECTOR LEVER AND PARKING BRAKE ACTUATING ROD

**LEGEND**

- |   |  |
|---|--|
| 1. Pressure Take Off Screw                      | 23. Low and Forward Servo Cylinder Plate         |
| 2. Low and Forward Servo Cylinder               | 24. Low and Forward Servo Cylinder Plate Gasket  |
| 3. Servo Piston Seal                            | 25. Servo Inner Piston Assembly (Low)            |
| 4. Servo Outer Piston Assembly (Forward)        | 26. Band Adjusting Screw Nut                     |
| 5. Piston Seal                                  | 27. Band Adjusting Screw (Reverse)               |
| 6. Servo Inner Piston Assembly (Includes Strut) | 28. Servo Piston Anchor Strut                    |
| 7. Band Assembly (Low and Forward)              | 29. Band Anchor Side Strut                       |
| 8. Parking Brake Actuating Rod                  | 30. Band Assembly (Reverse)                      |
| 9. Parking Brake Toggle Arm Lever               | 31. Reverse Servo Piston Strut                   |
| 10. Oil Level Gauge                             | 32. Band Anchor Side Strut (Low)                 |
| 11. Toggle Arm Lever Snap Ring                  | 33. Selector Control Inner Lever                 |
| 12. Band Adjusting Screw (Forward)              | 34. Servo Inner Piston Assembly (Includes Strut) |
| 13. Band Adjusting Screw Lock Nut               | 35. Piston Seal (Reverse)                        |
| 14. Selector Control Shaft Washer               | 36. Reverse Servo Cylinder Plate Gasket          |
| 15. Selector Control Shaft and Lever Assembly   | 37. Reverse Servo Cylinder Plate Assembly        |
| 16. Band Adjusting Screw (Low)                  | 38. "O" Ring (Reverse Piston)                    |
| 17. Servo Cylinder To Case Bolt                 | 39. Reverse Servo Cylinder Gasket                |
| 18. Pressure Take-Off Screw Washer              | 40. Servo Outer Piston Assembly                  |
| 19. Servo Piston Seal (Low)                     | 41. Servo Piston Seal                            |
| 20. Servo Outer Piston Assembly                 | 42. Reverse Servo Cylinder                       |
| 21. Servo Piston "O" Ring Seals (2)             | 43. Pressure Take-Off Screw Washer               |
| 22. Low and Forward Servo Cylinder Gasket       | 44. Pressure Take-Off Screw                      |

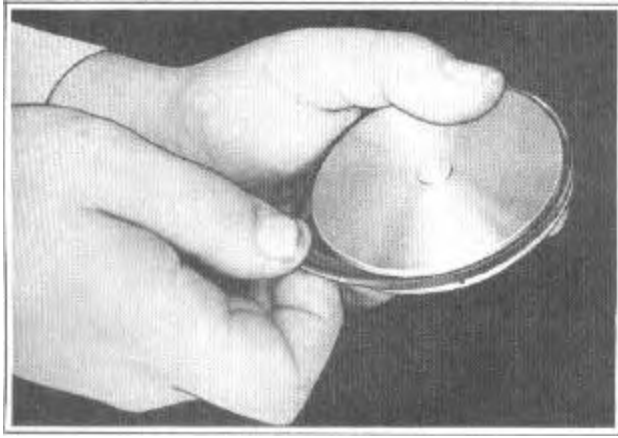


FIGURE 75

### INSPECTION

1. Clean all parts thoroughly in a good CLEAN solvent.
2. Check the gasket surface of the cylinder and cylinder plate for warpage.
3. Check the bore of the cylinder for pits or scoring.
4. Check piston shaft for burrs and sharp edges at end of shaft.

### ASSEMBLY

1. Lubricate a new piston seal with Type "A" Automatic Transmission Fluid and slip the edge of the seal into the groove of the piston at one point and work progressively around the piston, seating the seal in the piston groove.

**NOTE:** Make sure the lip of the seal is toward the outer face of the piston, Figure 75. Avoid stretching the seal any more than is necessary to install the seal on the piston.

2. Lubricate the new "O" ring seal with Automatic Transmission Fluid and install the seal in the groove of the cylinder plate, Figure 76.
3. Install the piston and seal assembly (1) and (2) into the cylinder by entering the piston at an angle Figure 77. After all of the piston and seal is below the mounting

surface of the cylinder (3), straighten the piston and bottom it in the cylinder.

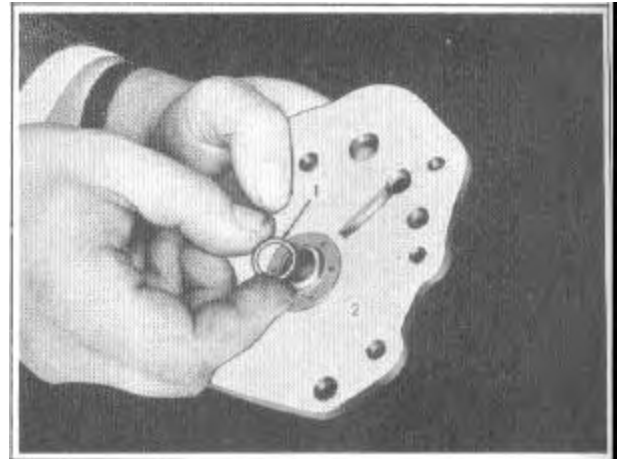


FIGURE 76

**CAUTION:** Use care not to damage lip of seal.

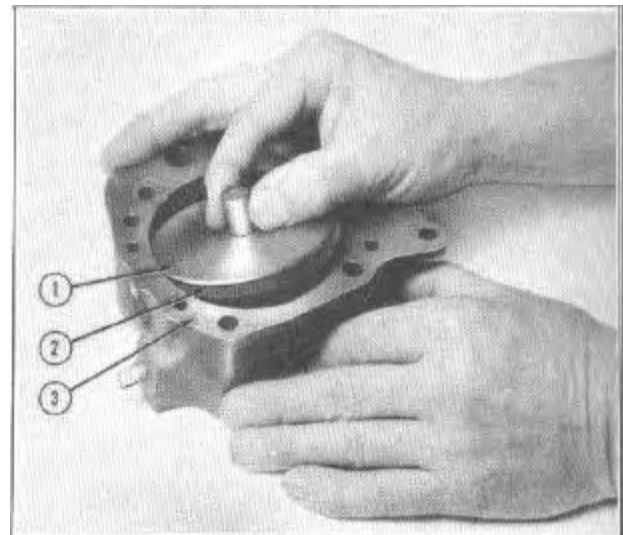


FIGURE 77

4. Install a new outer gasket on the machined surface of the cylinder; retaining gasket in place with a thin coat of petroleum jelly.
5. Align the holes of the gasket with the cylinder and install the cylinder plate on the cylinder and gasket, entering the piston shaft through the "O" ring seal in the plate.

### INSTALLATION

1. Install a new cylinder plate inner gasket

on the transmission case and retain the gasket in place with petroleum jelly.

2. Position the reverse servo outer cylinder and plate assembly over the low band adjustment screw and against the transmission case.
3. Align the holes and install the attaching cap screws. Tighten the 5/16" x 2-1/4" and 5/16" x 1" cap screws to 15-18 foot pounds and the 5/16" x 3" cap screws to 10-13 foot pounds, (1/2" socket).
4. Install the low band adjustment screw lock nut and tighten to 40-50 pounds.
5. Check the adjustment of the low band and the reverse band as outlined under "Band Adjustments", Page 89.
6. Retorque the reverse cylinder attaching screws.
7. Connect the selector lever control rod to the selector outer lever.
8. Refill transmission as outlined under "Draining a n d Refilling Transmission", Page 87.

### **REVERSE SERVO CYLINDER PLATE OR CYLINDER PLATE GASKET**

#### **REMOVAL AND INSTALLATION**

Perform the operations outlined under "Reverse Servo Outer Cylinder Assembly, Removal, Inspection and Installation", Page 47.

### **REVERSE SERVO OUTER PISTON OR PISTON SEAL**

#### **REMOVAL AND INSTALLATION**

Perform the operations outlined under "Reverse Servo Outer Cylinder Assembly, Removal, Inspection and Installation", Page 47.

### **REVERSE SERVO CYLINDER PLATE "O" RING SEAL**

#### **REPLACEMENT**

Proceed as outlined under "Reverse Servo Outer Cylinder Assembly, Removal", Page 47, and replace the "O" ring seal.

### **REVERSE SERVO INNER PISTON ASSEMBLY OR PISTON SEAL**

#### **REMOVAL**

1. Perform the operations outlined under "Valve Block Assembly Removal", Page 42.
2. Perform the operations outlined under "Reverse Servo Outer Cylinder Removal", Page 47.
3. Remove the inner piston assembly by placing the thumb against the piston spring retainer and the fingers on top of the piston to prevent dropping the piston as it is removed, Figure 78. Push the retainer outward to disengage the strut (2) from the band shoe (3) and remove the piston assembly from the transmission case.

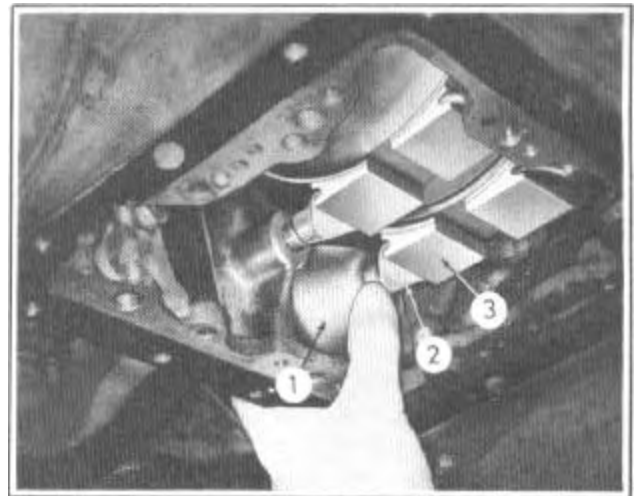


FIGURE 78

4. Lift the piston seal out of the groove and over the top of the piston and pull it the rest of the way out of the piston groove, Figure 79.



FIGURE 79

### INSPECTION

1. Clean the piston assembly thoroughly.
2. Check the bore of the transmission case for pits or scoring.
3. Check the spring to make sure it is not distorted or broken.
4. Make sure the strut is tight on the piston shaft.
5. Make sure the strut retaining pin in the brake band is firmly in position.

### INSTALLATION

1. Lubricate the new piston seal with automatic transmission fluid and slip the edge of the seal into the groove of the piston at one point and work progressively around the piston, seating the seal in the piston groove.

**NOTE :** Make sure the lip of the seal is toward the outer face of the piston, Figure 79. Avoid stretching the seal any more than is necessary to install the seal on the piston.

2. Insert the piston assembly into the bore of the case with the notch of the strut to the rear.
3. Align the notch in the strut with the pin in the brake band shoe and push the assembly into the bore, being careful not to turn the

seal over or damage the lip of the seal.

4. Proceed as outlined under "Reverse Servo Cylinder Assembly, Inspection and Installation" , Page 50.
5. Inspect and install the valve block assembly as outlined under "Valve Block Assembly, Inspection and Installation", Page 45.
6. Install oil pan as outlined under "Oil Pan Inspection and Installation", Page 37.
7. Refill transmission as outlined under "Draining and Refilling Transmission", Page 87.

### LOW AND FORWARD SERVO CYLINDER

#### REMOVAL

1. Remove front muffler.
2. Remove the dirt around the servo unit and right hand side of transmission.
3. Loosen the reverse band adjusting screw lock nut while hold in g the adjustment screw from turning.
4. Remove the cylinder attaching screws (1/2" socket).
5. Remove the cylinder and plate as an assembly from the case.

**CAUTION:** Do not damage the threads of the reverse servo band adjusting screw when removing the cylinder.

6. Remove the cylinder plate gasket.

**NOTE:** Do not allow the forward servo piston or the low servo inner pistons to come out of the case. If either piston comes out, it will be necessary to remove the oil pan and valve block assembly as outlined under "Valve Block Assembly, Removal, Inspection and Installation", Page 42, and reinstall the pistons as outlined under "Forward and Low Servo Inner Piston Installation", Page 55.

### DISASSEMBLY

1. Remove the cylinder plate by sliding the plate off the piston rods.
2. Remove the cylinder plate inner gasket.
3. Pull the forward and low pistons out of the cylinder.
4. Use a hook tool and remove the "O" ring seals from the grooves in the cylinder plate. Discard the seals.
5. Lift the piston seals out of the grooves in the pistons, Figure 75.

### INSPECTION

1. Clean all parts thoroughly in a good CLEAN solvent.
2. Check the gasket surface of the cylinder and cylinder plate for warpage.
3. Check the "O" ring retainers on the cylinder plate to make sure they are spotwelded securely.
4. Check the bores of the cylinder for pits or scoring.
5. Check piston shafts for burrs and sharp edges at end of shafts.

### ASSEMBLY

1. Lubricate the new piston seals with Automatic Transmission Fluid Type "A".
2. Install the edge of the seal into the groove of the piston at one point and work progressively around the piston, seating the seal in the piston groove. Same procedure for both pistons.

**NOTE: Make sure the lips of the seals are toward the outer face of the pistons, Figure 75. Avoid stretching the seals any more than is necessary to install the seals on the pistons.**

3. Lubricate the new "O" ring seals with Automatic Transmission Fluid and install the seals in the grooves in the cylinder plate, Figure 80.

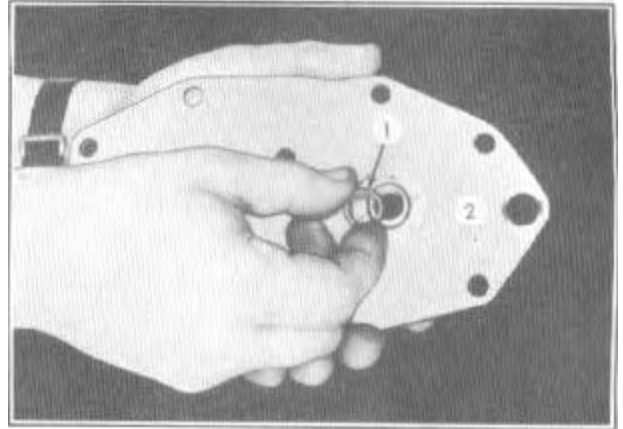


FIGURE 80

4. Install the low piston (2-1/2" diameter) and seal assembly into the cylinder, entering the piston at an angle. After all of the piston and seal is below the mounting surface of the cylinder, straighten the piston and bottom it in the bore of the cylinder.

**CAUTION: Do not damage lip of seal at installation.**

5. Install the forward piston (3-1/4" diameter) in the same manner as the low piston in the preceding operation (No. 4 above).
6. Install a new outer gasket on the machined surface of the cylinder; retaining gasket in place with a thin coat of petroleum jelly.
7. Install the cylinder plate on the cylinder and gasket, entering the piston shafts through the "O" ring seals in the cylinder plate.

### INSTALLATION

1. Apply a thin coat of petroleum jelly to the transmission case and install a new outer cylinder plate inner gasket (1), Figure 81.
2. Align the gasket with the holes in the transmission case and with the cylinder plate, cylinder gasket and cylinder holes properly aligned, install the cylinder assembly to the case.

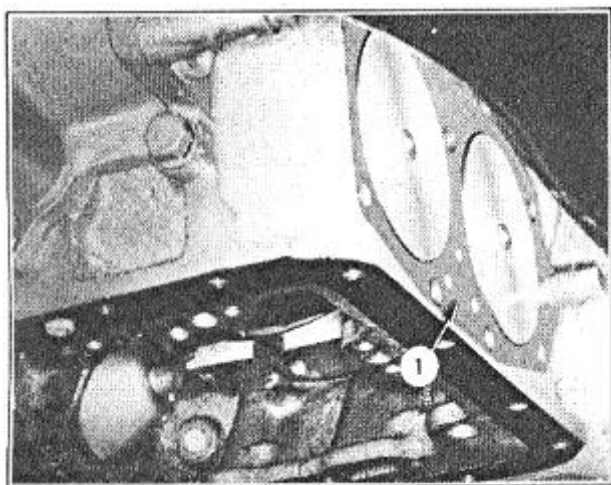


FIGURE 81

3. Install the cylinder attaching screws finger tight, then tighten all screws to 15-18 foot pounds.
4. Install the reverse band adjusting screw lock nut and tighten nut to 40-50 foot pounds.
5. Adjust the bands as outlined under "Band Adjustments", Page 89.
6. After making band adjustments, re-torque the servo attaching screws.
7. Refill transmission as outlined under, "Draining and Refilling Transmission", Page 87.

### **LOW AND FORWARD SERVO CYLINDER PLATE OR CYLINDER PLATE GASKET**

#### **REMOVAL AND INSTALLATION**

Perform the operations outlined under "Low and Forward Servo Cylinder, Removal, Inspection, and Installation", Page 52.

### **LOW AND FORWARD CYLINDER PLATE "O" RING SEALS**

#### **REPLACEMENT**

Proceed as outlined under "Low and Forward

Servo Cylinder, Removal, Inspection and Installation", Page 52, and re place "O" ring seals.

### **LOW AND FORWARD SERVO OUTER PISTONS OR SEALS**

#### **REMOVAL AND INSTALLATION**

Perform the operations outlined under "Low and Forward Servo Cylinder, Removal, Inspection and Installation", Page 52.

### **LOW AND FORWARD SERVO INNER PISTONS OR PISTON SEALS**

#### **REMOVAL**

1. Perform the operations outlined under "Valve Block Assembly, Removal", Page 42.
2. Perform the operations outlined under "Low and Forward Servo Cylinder, Removal", Page 52.
3. Remove the low servo inner piston assembly by placing the thumb against the piston spring retainer and push the piston out of the case, Figure 82.

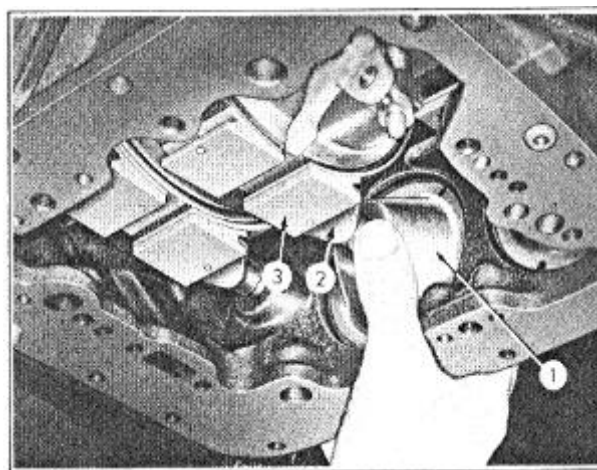


FIGURE 82

4. Remove the forward servo inner piston in the same manner as the low servo inner piston assembly, Figure 83.

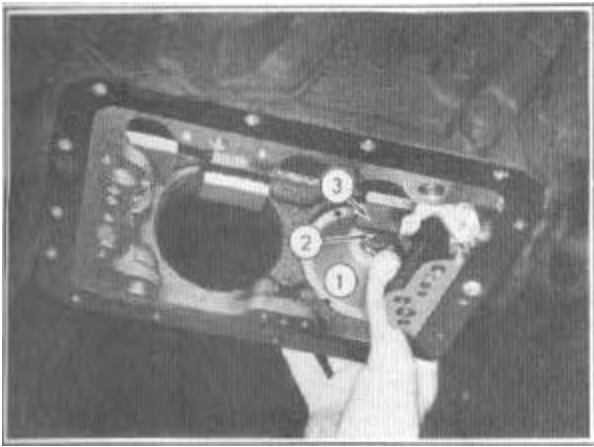


FIGURE 83

5. Lift the piston seal out of the groove of the piston, Figure 79, and over the top of the piston, pulling it the rest of the way out of the piston. Same procedure for both pistons. Discard the seals.

#### INSPECTION

1. Clean the piston assemblies thoroughly.
2. Check the bores in the transmission case for pits or scoring.
3. Check for broken or distorted springs.
4. Make sure the strut is tight on the piston shaft.
5. Make sure the strut retaining pin in the brake band anchor is firmly in position.

#### INSTALLATION

1. Lubricate the new piston seals with Automatic Transmission Fluid Type "A".
2. Slip the edge of the seal into the groove of the piston at one point and work progressively around the piston, seating the seal in the piston groove.

**NOTE:** Make sure the lip of the seal is toward the outer face of the piston, Figure 79. Avoid stretching the seal any more than is necessary to install the seal on the piston.

3. Both inner pistons are installed in the same manner. Hold the piston assembly with the offset notch of the strut to the front of case and insert the assembly in the bore of case. Align the notch in the strut (2), Figure 84, with the pin in the brake band shoe (3) and push the assembly into the bore.

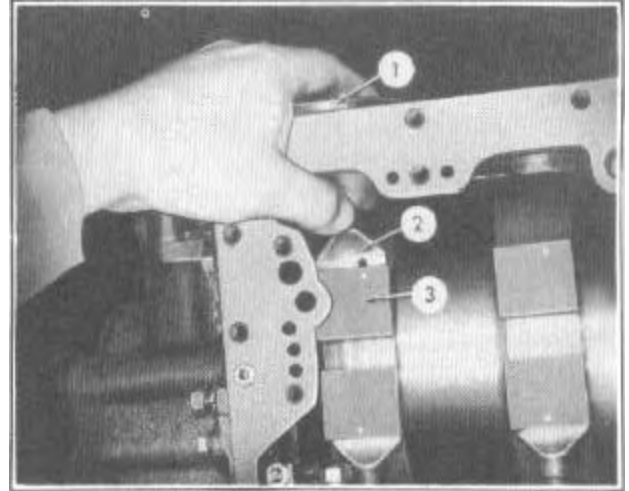


FIGURE 84

**CAUTION:** DO NOT turn seal (1) over or damage the lip of the seal.

4. Make sure all servo band struts are properly engaged with the brake band shoes.
5. Proceed as outlined under "Low and Forward Servo Cylinder, Inspection and Installation", Page 53.
6. Inspect and install the valve block assembly as outlined under "Valve Block Assembly, Inspection and Installation", Page 45.
7. Install oil pan as outlined under "Oil Pan Inspection and Installation", Page 37.
8. Refill the transmission as outlined under "Draining and Refilling Transmission", Page 87.

## REPAIRS REQUIRING REMOVAL OF THE TRANSMISSION FROM THE CAR

### FRONT PUMP AND COLLECTOR RING ASSEMBLY

#### REMOVAL

1. Remove the transmission as outlined under "Transmission Removal", Page 78.
2. Install transmission in transmission holding fixture.
3. Place the Ring Gear Retaining Clip J-4668-3 on the mainshaft with the lip of the retainer clip installed in the recess between the mainshaft and the face of the front ring gear hub and retain the clip (2) in place with a rubber band (1), Figure 85.

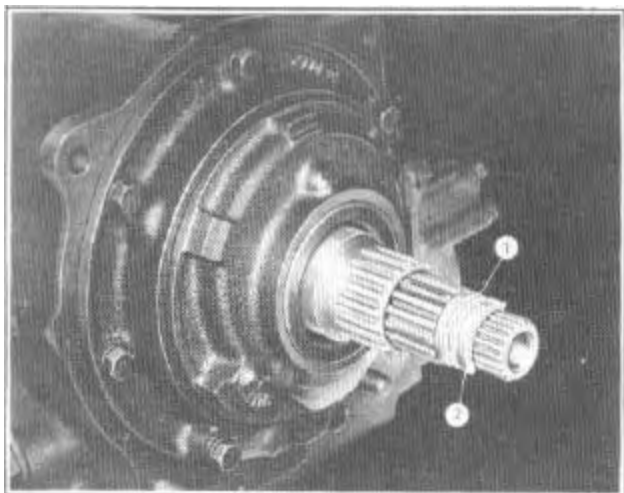


FIGURE 85

**NOTE:** This retaining clip must be in place to prevent movement of the ring gear and eliminate the possibility of dislocating the thrust washers in the gear train.

4. Remove the seven cap screws attaching the pump and collector ring to the transmission case (1/2" socket).
5. Use a soft hammer and lightly tap the front pump and collector ring assembly loose from the transmission case and carefully slide the assembly forward off the mainshaft.

#### DISASSEMBLY

1. Remove the front ring gear selective thrust washer (6), Figure 86, from the

rear face of the front pump and collector ring assembly.

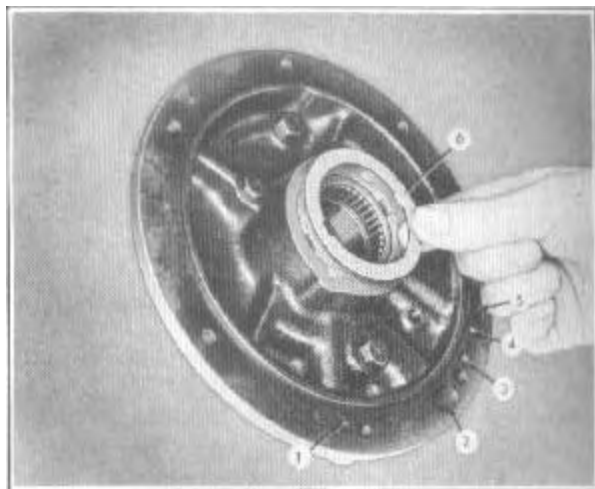


FIGURE 86

2. Remove the five screws attaching the front pump to the collector ring while supporting the pump with your hand to keep the pump from dropping when the attaching screws are removed.
3. Remove the drive and driven gears from the pump housing, Figure 87.

**NOTE:** Mark gears for proper mating on assembly.

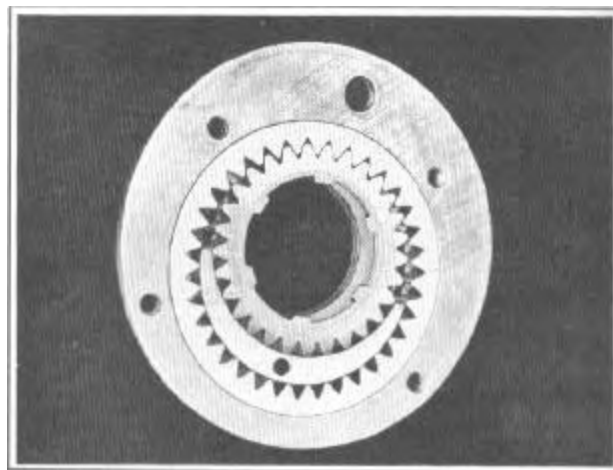


FIGURE 87

4. Remove the small (1/2" I.D.) "O" ring at the front pump pressure passage and the large (5-1/2" I.D.) "O" ring from the collector ring. Discard seals.

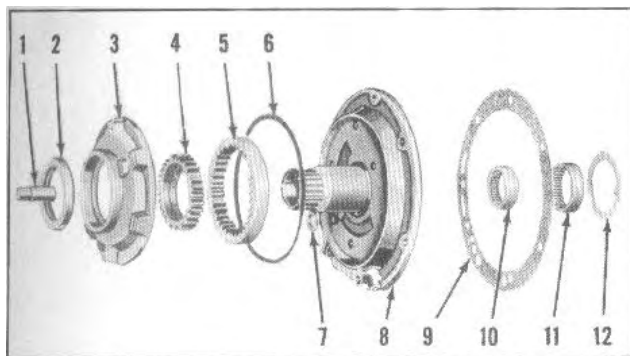


FIGURE 88

**LEGEND**

1. Mainshaft Oil Transfer Tube
2. Front Pump Oil Seal
3. Front Pump Body
4. Front Pump Drive Gear
5. Front Pump Driven Gear
6. Front Pump "O" Ring (Large)
7. Front Pump "O" Ring (Small)
8. Front Pump Collector Ring
9. Collector Ring To Case Gasket
10. Collector Ring Bearing, Front
11. Collector Ring Bearing, Rear
12. Front Ring Gear Front Washer

**INSPECTION**

1. Thoroughly clean all parts in a good CLEAN solvent, make sure all passages are clear, the passages are identified in Figure 86 as follows:

1. Converter pressure passage
2. Front pump pressure passage
3. Direct drive passage
4. Intermediate passage
5. Front pump intake passage

2. Check oil pump gears and oil pump casting for damage or wear.

**NOTE:** If the gears are worn or if the pump body is damaged or worn or if the pump body bushing is worn, the front pump body and gears will have to be replaced as an assembly.

3. Check the collector ring for wear or damage. Check splines for wear and nicks. Small nicks can be removed by honing.

**NOTE:** If the collector ring or bearings are damaged or worn the complete collector ring assembly must be replaced.

**ASSEMBLY**

1. Install the gears in the front pump body (the driven gear should be installed first). Lubricate the gears with Automatic Transmission Fluid Type "A".
2. Clean the collector ring face, install the large "O" ring seal in groove in collector ring and the small "O" ring seal in the groove at front pump pressure passage (2) in collector ring, Figure 86.
3. Install the oil pump and gears on the collector ring, aligning the holes in the pump with the holes in the collector ring.

**CAUTION:** Make sure "O" ring seals are not misplaced during this operation.

4. Install the pump attaching screws and tighten all screws finger tight, then tighten the one screw (7/16" socket) to 10-12 foot pounds and the four screws (1/2" socket) to 15-18 foot pounds.

**INSTALLATION**

**NOTE:** Before installing the front pump and collector ring assembly, check the end play of the mainshaft assembly to determine the thickness of the front ring gear thrust washer that is required to obtain proper end play.

1. Make sure the extension case attaching bolts are properly tightened and that the companion flange is torqued to 90-100 foot pounds.
2. Install the Mainshaft End Play Checking Gauge J-4668 over the mainshaft and front ring gear shaft and fit it into the transmission case, Figure 89.

**CAUTION: DO NOT damage the oil seal rings.**

3. Hold the gauge against the transmission case and retain it securely in position with three of the oil pan attaching screws (2), Figure 89.

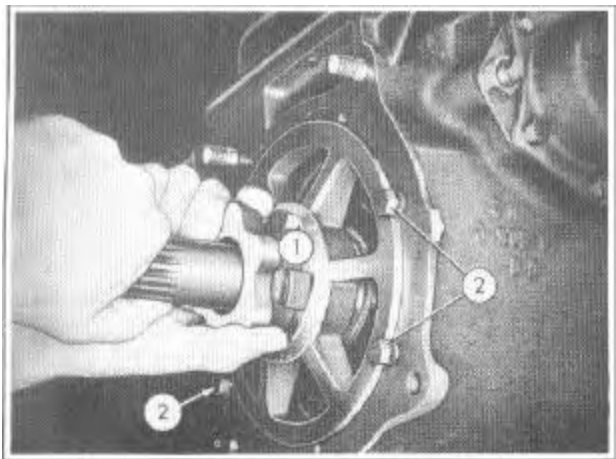


FIGURE 89

4. Turn the hub of the gauge so that the indicator is over the start step, then while pushing the hub inward with steady pressure on the hub, rotate the hub counterclockwise. The step over which the indicator is stopped by the next higher step represents the thickness of the thrust washer to be used. The code number of the thrust washer and thickness in thousandths are stamped on the face of the gauge ring opposite the indicator step. The thrust washers are furnished in four thicknesses identified with letter stamped on bronze face.

No Marking	.052" - .054"
"A"	.061" - .063"
"B"	.072" - .074"
"C"	.082" - .084"

5. Remove the checking gauge. Apply a thin film of petroleum jelly to the collector ring flange and install a new gasket on the flange. Gasket should be free of wrinkles. Align gasket holes with screw holes and oil passages in collector ring.

6. Coat the hub of the collector ring with petroleum jelly and install the correct thickness front ring gear front thrust washer on the rear face of the assembly, Figure 86. Fully engage the tongs of the washer in the slots in the hub.

7. Check the three oil seal rings to make sure they are not broken or damaged.

**NOTE: If the rings are to be replaced, perform the operations as outlined under "Oil Seal Rings (Front Ring Gear), Removal and Installation", Page 59.**

8. Coat the rings with petroleum jelly and center the rings in the grooves to prevent damage to the rings.

9. Install the front pump and collector ring assembly on the mainshaft and position the assembly on the transmission case, holding mainshaft level.

**CAUTION: Do not pull assembly into place with the attaching screws.**

10. Align all holes and make sure gasket is not damaged. Install all attaching screws finger tight.

12. Remove the J-4668-3 Ring Gear Retaining Clip from the mainshaft. While holding the ring gear shaft (1), Figure 85, turn the mainshaft (2) in both directions to make sure that it operates freely without bind.

13. Install transmission as outlined under "Transmission Installation", Page 78.

### FRONT PUMP BODY OIL SEAL

#### REMOVAL

1. Perform the operation outlined under "Front Pump and Collector Ring Assembly, Removal, Disassembly and Inspection", Page 56.

2. Use a drift and carefully pry the oil seal out of the pump body bore.

**CAUTION: DO NOT damage the pump body bushing during this operation.**

#### **INSTALLATION**

1. Remove all old sealer from pump body bore.
2. Apply a thin coat of white lead to the outside of seal and press the seal in place, using an arbor press and J-2639 Rear Axle Pinion Seal Installer.

**NOTE: The lettered side of the seal should be up (towards front of transmission).**

3. Perform the operations outlined under "Front Pump and Collector Ring, Assembly and Installation", Page 57.

### **OIL SEAL RINGS (FRONT RING GEAR)**

#### **REMOVAL**

1. Perform the operations outlined under "Front Pump and Collector Ring, Removal", Page 56.
2. Wrap a thin piece of shim stock around the shaft of the front ring gear to protect the shaft from m scuffing and to bridge t h e grooves in the shaft when removing the two inner rings.
3. Remove the rings one at a time by holding one-half of the oil ring tightly in the ring groove while pressing against the lower part of the other half of the ring. This procedure will cause the end of the ring to lift and separate the ends of the ring, Figure 90.
4. Spread the ring just enough to permit the removal from the groove and remove the ring from the shaft.
5. Remove the other two rings in the same manner.

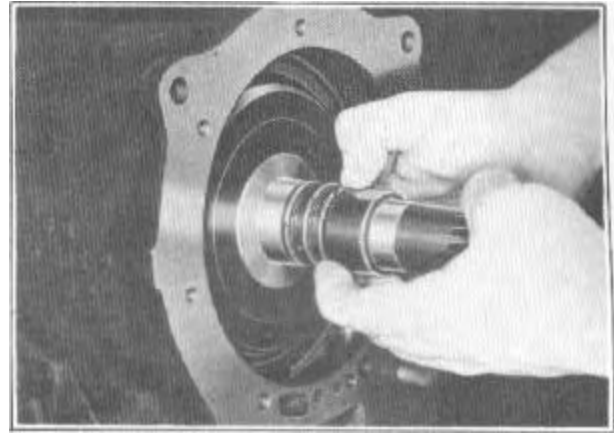


FIGURE 90

#### **INSTALLATION**

1. Wrap a thin piece of shim stock over the shaft of the front ring gear to protect the shaft scuffing and to bridge the grooves in the shaft when installing the two inner rings.
2. Spread the new rings just enough to permit slipping it over the shaft and the shim stock and slide the ring into its position in the groove.
3. Hold one-half of the ring tightly in the ring groove and press against the lower part of the other half which will lift one end of the ring above the other end, then slide your finger toward the end of the ring to lock the ends of the ring together.
4. Perform the operations outlined under "Front Pump and Collector Ring, Inspection and Installation", Page 57.

### **FRONT PUMP**

#### **REMOVAL AND INSTALLATION**

Perform the operations outlined under "Front Pump and Collector Ring, Removal, Disassembly, Inspection, Assembly and Installation", Page 56.

## MAINSHAFT ASSEMBLY

### REMOVAL

1. Remove transmission as outlined under "Transmission Removal", Page 78.
2. Install transmission in holding fixture.
3. Install the Ring Gear Retaining Clip J-4668-3 on the mainshaft and retain the clip in place with a rubber band, Figure 85.
4. Remove the extension case as outlined under "Extension Case, Removal", Page 23.
5. Remove the oil pan as outlined under "Oil Pan, Removal", Page 37.
6. Remove the valve block assembly as outlined under "Valve Block, Removal", Page 42.
7. Remove the front pump and collector ring as outlined under "Front Pump and Collector Ring, Removal", Page 56.
8. Remove the transmission companion flange spacer (4), Figure 46, governor drive gear (3), parking brake gear (2), and the governor drive gear spacer (1) from the mainshaft.

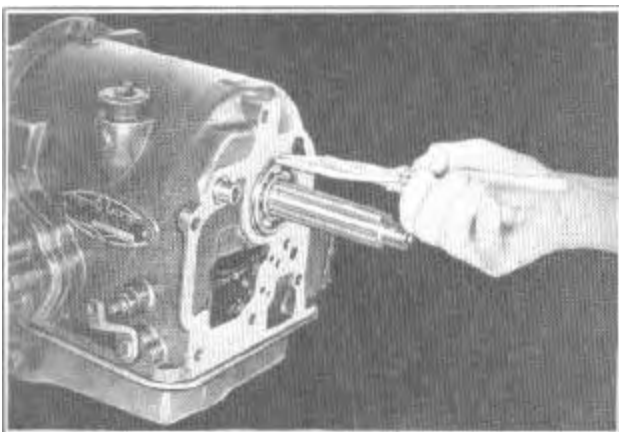


FIGURE 91

9. Remove the mainshaft rear bearing lock ring using KMO-630 Snap Ring Pliers, Figure 91.

10. Grasp the mainshaft and the front ring gear shaft and while holding the main-shaft assembly compressed, move the mainshaft assembly towards front of case. The mainshaft rear bearing should be removed with the mainshaft assembly to assist in holding the mainshaft together as an assembly. If the bearing sticks in the case bore, use a piece of pipe with an 1.195" I.D. and 1.500" O.D. and 7" long, drive against the inner race of the bearing to move the bearing and mainshaft forward and out of the case bore.

**NOTE: Make sure the Ring Gear Retainer Clip J-4668-3 is still in place on the front end of the mainshaft.**

11. Pull the mainshaft forward and out of the case, Figure 92, being careful not to disengage the ends of the bands from the band struts or dislodge the bands from the guide at the top of the transmission case, as any cocking of the bands will restrict the removal of the mainshaft assembly.

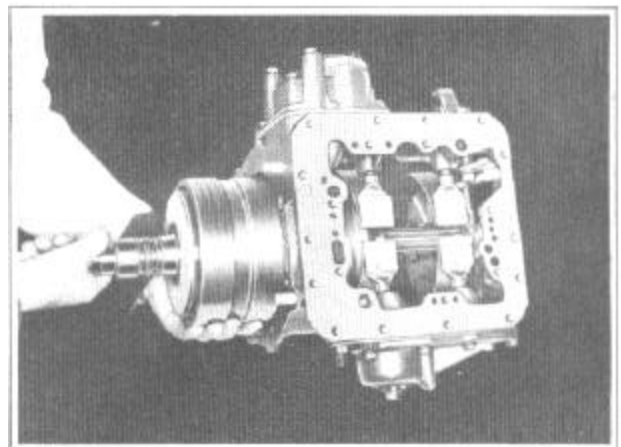


FIGURE 92

### INSPECTION

1. Check the drums for damage or scoring and bands for damage or wear.

### INSTALLATION

1. With the J-4668-3 Retaining Clip in position on the front of the mainshaft and the main-shaft rear bearing

shaft rear bearing in position on the rear of the mainshaft, insert the mainshaft assembly into the transmission case, Figure 92, threading it through the bands and seating the rear bearing in the bore of the rear face of the case.

2. Install the mainshaft rear bearing lock ring, Figure 91, then push the mainshaft forward until the lock ring rests against the transmission case.
3. Install the extension case as outlined under "Extension Case, Inspection and Installation", Page 23.
4. It will be necessary to check the end play of the assembly to determine the thickness of the front ring gear selective washer required to obtain proper end play. Perform operations 1 through 5 outlined under "Front Pump and Collector Ring, Installation", Page 57.
5. Install the proper thickness thrust washer on the hub of the front pump and collector ring assembly so that the steel face of the washer is against the hub of the assembly.
6. Inspect and install the front pump and collector ring as outlined under "Front Pump and Collector Ring, Inspection and Installation", Items 6 through 13, Page 58.
7. Install the valve block assembly as outlined under "Valve Block, Inspection and Installation", Page 45.
8. Install transmission as outlined under "Transmission Installation", Page 78.
9. Refill transmission as outlined under "Draining and Refilling Transmission", Page 87.

## MAINSHAFT ASSEMBLY (Removed from Transmission)

### DISASSEMBLY

1. Place mainshaft assembly on a clean area on the work bench, remove Ring Gear Retaining Clip J-4668-3 and remove the front ring gear (1) by sliding it forward, disengaging it from the front planetary carrier pinions (2), Figure 93.

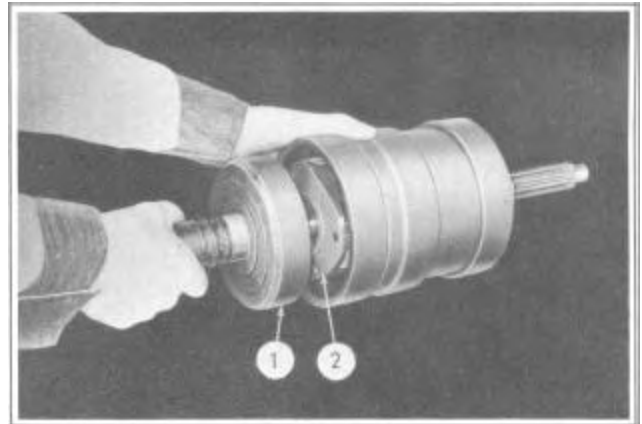


FIGURE 93

2. If the front ring gear oil seal rings are to be replaced due to wear or breakage, proceed as outlined under "Oil Seal Rings (Front Ring Gear), Removal and Installation", Page 59.

**NOTE: The front ring gear and bearings assembly is serviced as an assembly only. The bearings are not serviced separately.**

3. Remove the front ring gear thrust washer (1), Figure 94, from the front face of the front planetary carrier (3).

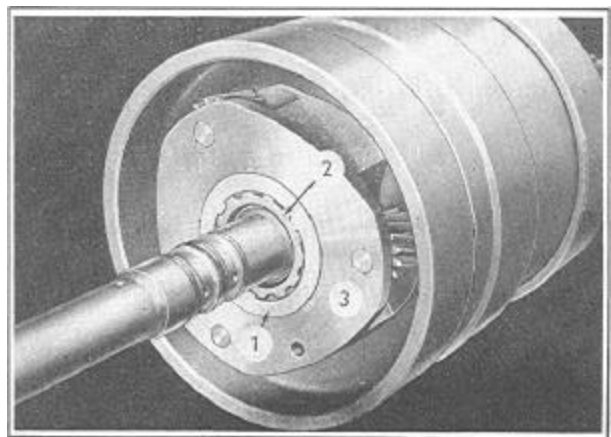


FIGURE 94

## 62 AUTOMATIC TRANSMISSION

4. Remove the reverse drum and front planetary carrier assembly by sliding it forward and off the mainshaft, Figure 95.

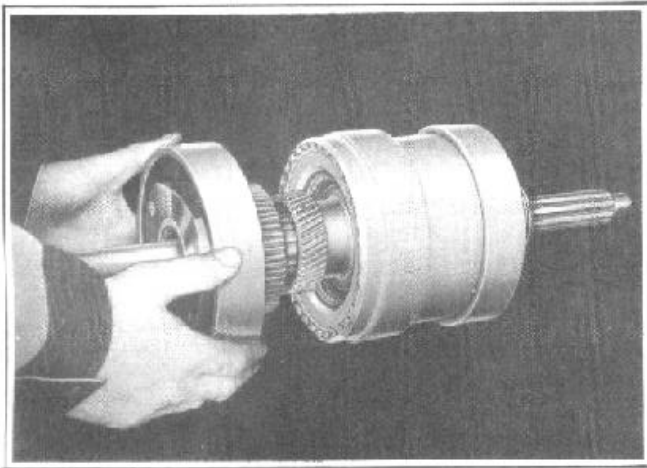


FIGURE 95

5. Remove the front sun gear thrust washer (1), Figure 96, from the hub of the front planetary carrier or the inner hub of front sun gear.

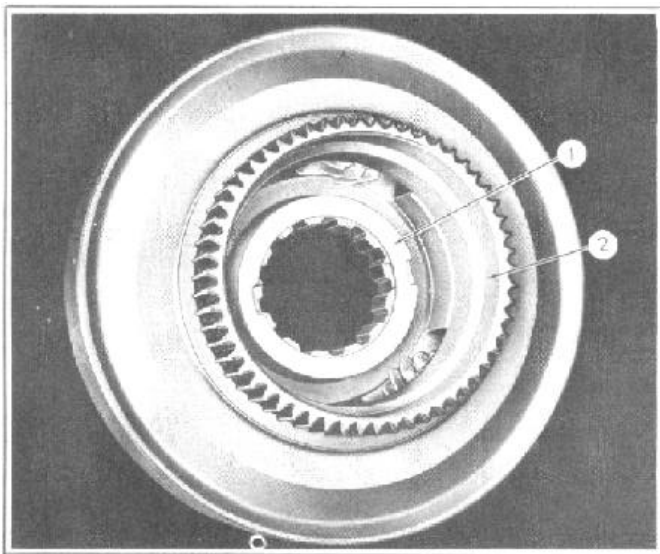


FIGURE 96

**NOTE:** Do not disassemble the front planet carrier and the reverse brake drum unless either part is to be replaced.

6. If necessary to remove the reverse drum from the front planetary carrier, remove the snap ring (1), Figure 97, by inserting a small screw driver in the slot of the snap ring and lifting

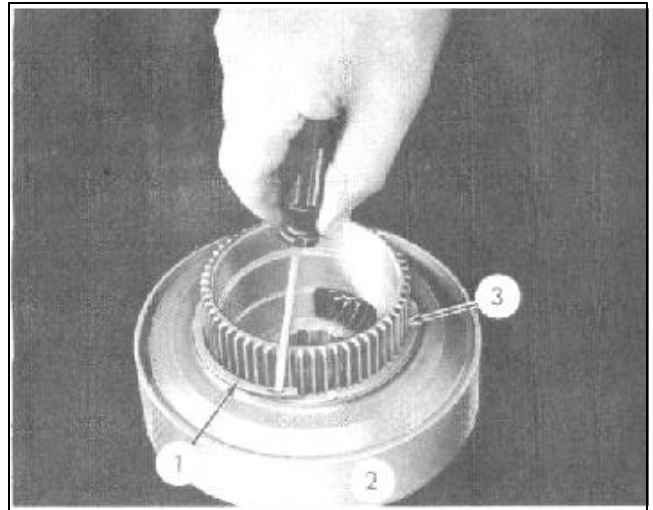


FIGURE 97

the end of the snap ring out of the groove and with the use of an arbor press, press out the carrier (1) from the drum (2), Figure 98.

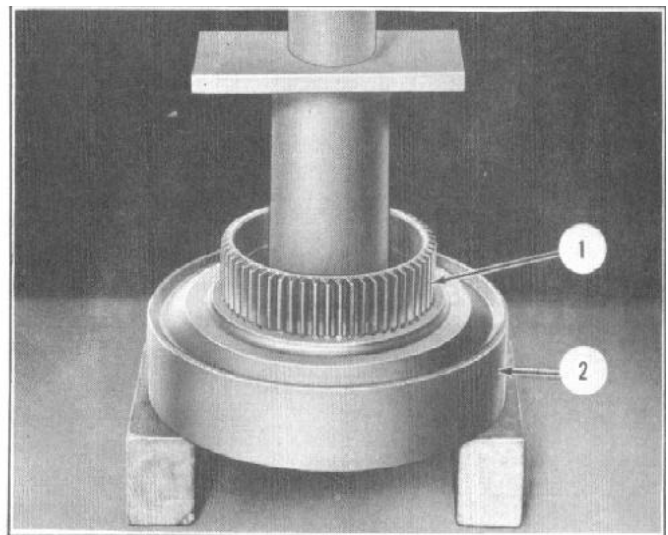


FIGURE 98

**NOTE:** The planetary carrier and pinion is serviced as an assembly only.

7. Remove the mainshaft rear bearing.

**NOTE:** The rear bearing can be removed by tapping the rear end of the mainshaft on a hardwood block. Position the hands in a manner so that the fingers will not be pinched between the forward brake drum and the bearing when removing the bearing.

8. Remove the rear bearing spacer (1), Figure 99.
9. Remove the forward brake drum assembly by sliding it rearward on the main-shaft, Figure 100.

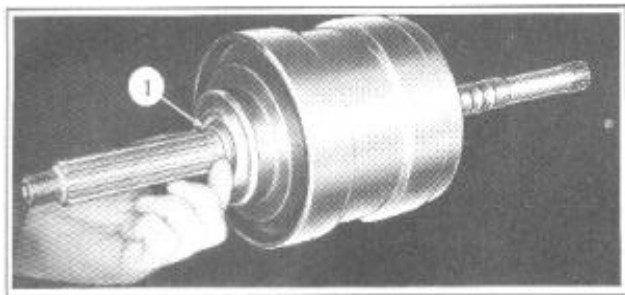


FIGURE 99

9. Remove the forward brake drum assembly by sliding it rearward on the main-shaft, Figure 100.

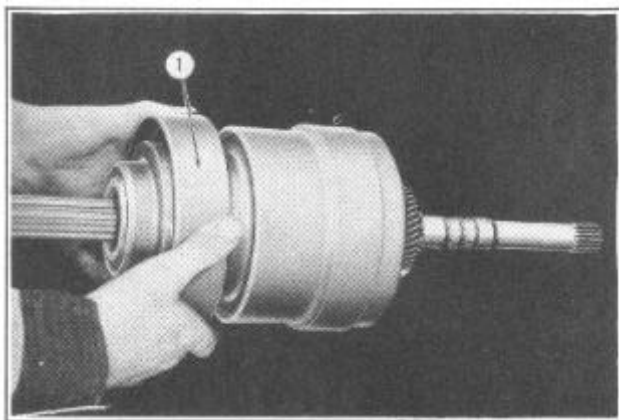


FIGURE 100

10. Remove the forward free wheel unit spacer snap ring (1), Figure 101, by prying

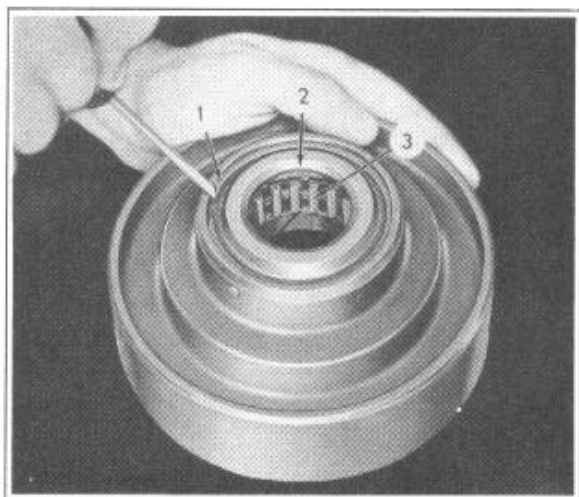


FIGURE 101

the snap ring up with a small screw-driver

11. remove the spacer plate (2), Figure 101, from the forward brake drum
12. Remove the spacer plate dowel pin (1), Figure 102.

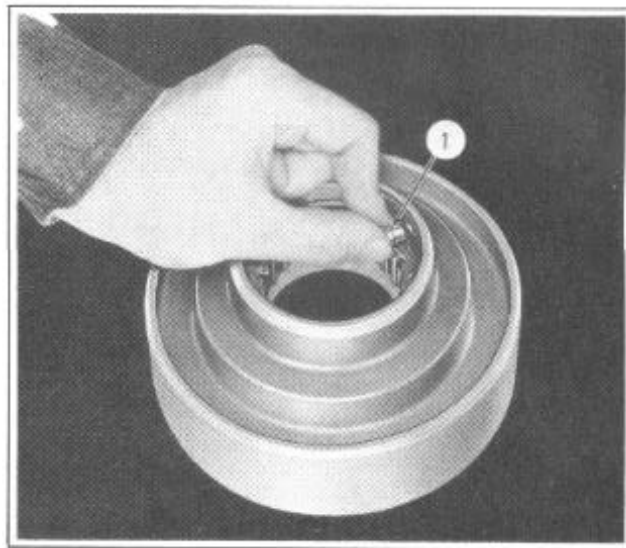


FIGURE 102

13. Remove the forward free wheel unit snap ring, Figure 103, and remove the free wheel unit from the forward brake drum.



FIGURE 103

**NOTE:** The forward brake drum and bushing are sold as an assembly only. The bushing is not sold separately.

## 64 AUTOMATIC TRANSMISSION

14. Remove the rear sun gear rear spacer washer (1), Figure 104, and thrust washer (2) from the mainshaft.

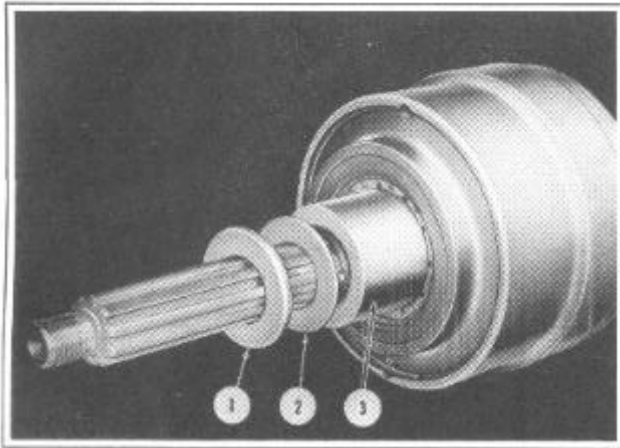


FIGURE 104

15. With the ends of the low brake drum plate snap ring (2), Figure 105, over one of the slots in the brake drum, use a small screwdriver and lift one end of the snap ring and remove the ring from its groove.

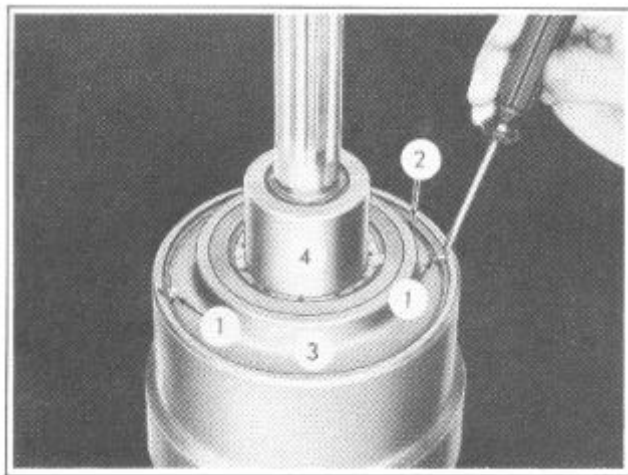


FIGURE 105

16. Remove the two dowels (1) out of the slots of the low brake drum plate (3).
17. Remove the low brake drum plate (1) and the rear sun gear (2) as an assembly, Figure 106.

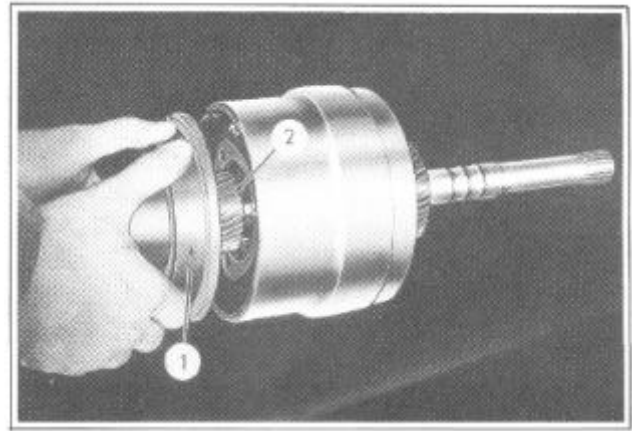


FIGURE 106

18. Slide the rear sun gear (2) out of the reverse free wheel unit and remove the free wheel unit.

**NOTE: The rear sun gear bushings and the low brake drum plate bushing are not serviced separately.**

19. Pull the mainshaft rearward and remove the mainshaft and rear planetary carrier assembly from the low brake drum assembly, Figure 107.

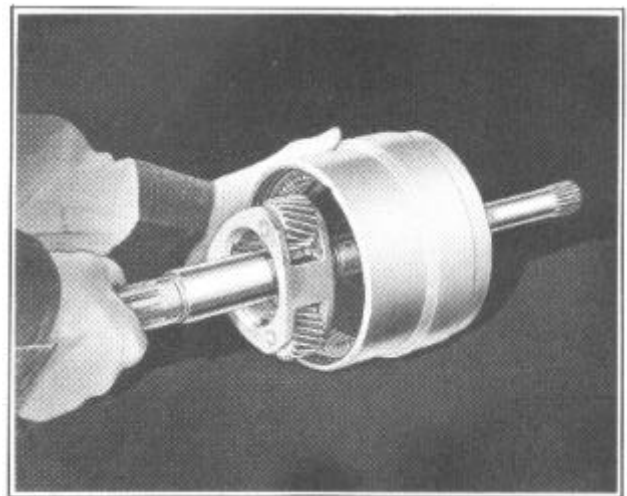


FIGURE 107

20. Remove the rear planet carrier front thrust washer from mainshaft (1), Figure 108.

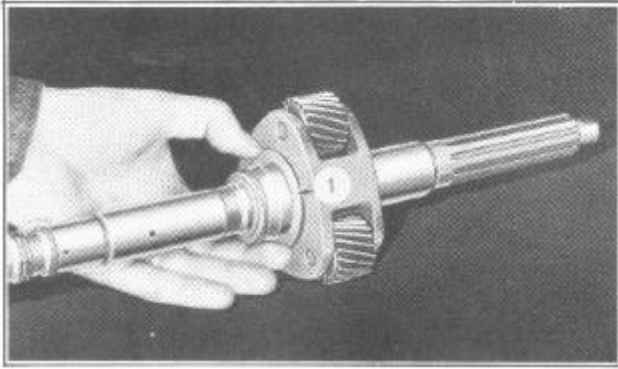


FIGURE 108

21. Remove the rear planetary carrier oil seal ring retainer snap ring (1), Figure 109.

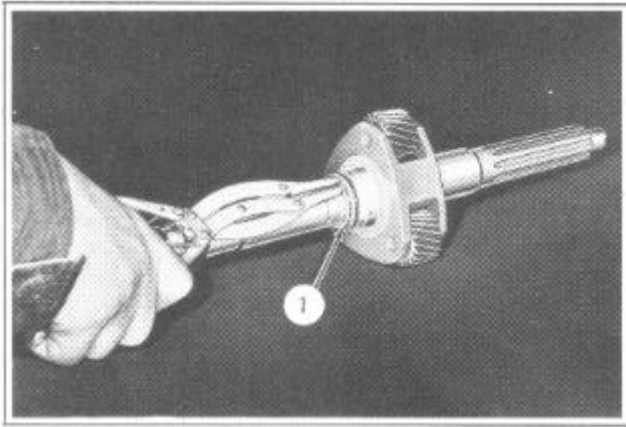


FIGURE 109

**NOTE:** The rear planetary carrier is held in position on the splines of the mainshaft, by the planetary carrier oil seal ring retainer and snap ring.

22. Remove the planetary carrier from the mainshaft (if either the planetary carrier or mainshaft are to be replaced) by placing the assembly in an arbor press with the rear of mainshaft pointing down and planetary carrier supported on press bed, then press the mainshaft out of the seal retainer and carrier.

23. Remove the seal retainer (1), Figure 110, rear planetary carrier (2) and the rear

sun gear thrust washer (4) from the mainshaft.

**NOTE :** Beginning with transmission serial No. HA-5704, the rear planet carrier has been counterbored in the inside front face. The counterbored carrier with the new rear planet carrier washer (3), Figure 110, can be used as a replacement for the carrier without the counterbore.

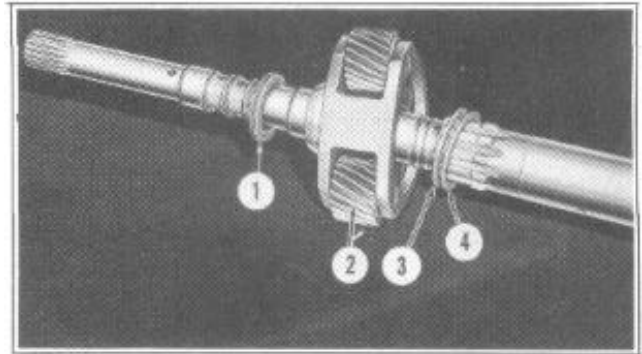


FIGURE 110

1. If necessary to remove the oil seal rings of the mainshaft, follow the same procedure as outlined under "Oil Ring Seals (Front Ring Gear), Removal and Installation", Page 59.

**NOTE:** The rear planetary carrier and pinions is serviced as an assembly only.

2. Remove the rear ring gear (1), Figure 111, from the low brake drum (2).

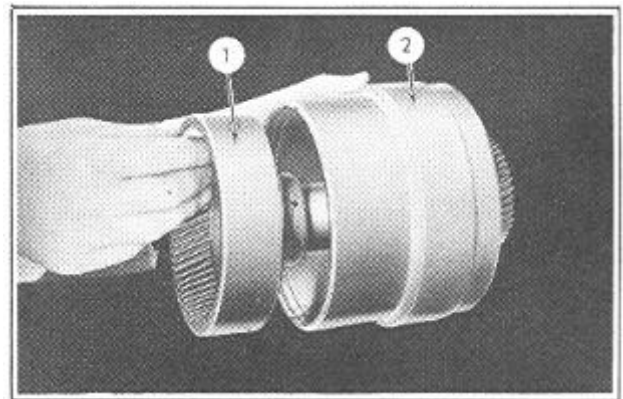


FIGURE 111

26. Remove the inner "O" ring seal (1), Figure 112, from the inside bore of the rear ring gear. A scratch awl will greatly facilitate the removal of the seal. Discard old seal.

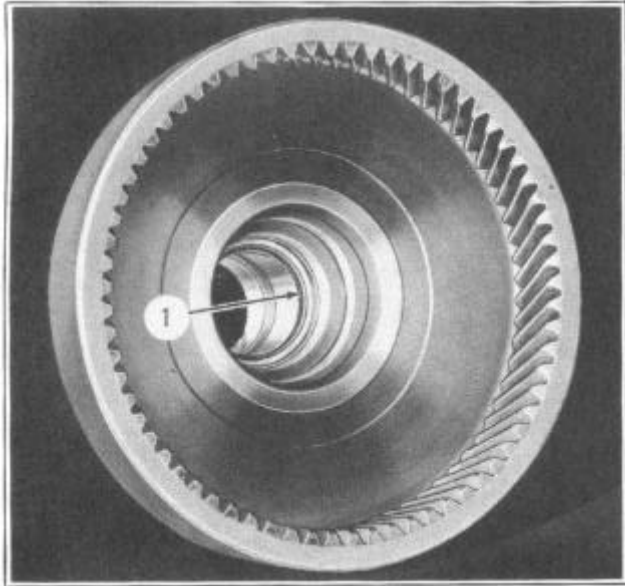


FIGURE 112

27. Remove the outer "O" ring seal (2), Figure 113, out of the groove in the hub of the rear ring gear. Discard old seal.

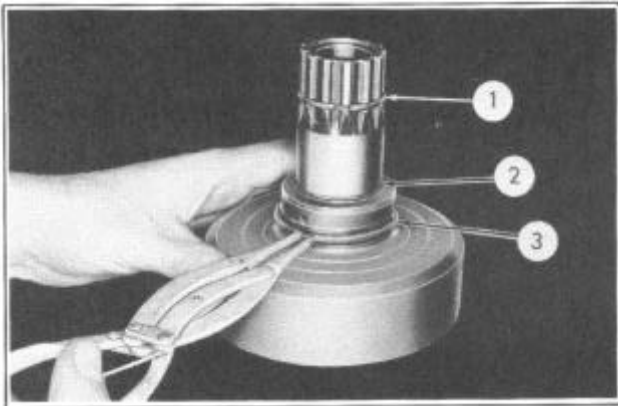


FIGURE 113

28. Remove the oil seal ring (3).

**NOTE :** The rear ring gear with bushings is serviced as an assembly only. The bushings are not serviced separately.

29. Place the low brake drum and multiple disc assembly in an arbor press and place the Multiple Disc C l u t c h Fixture J-5478 on the retractor spring retainer as shown in Figure 114. Place a steel plate on the fixture and apply just sufficient pressure to relieve the pressure of the retractor spring retainer against the retainer snap ring.

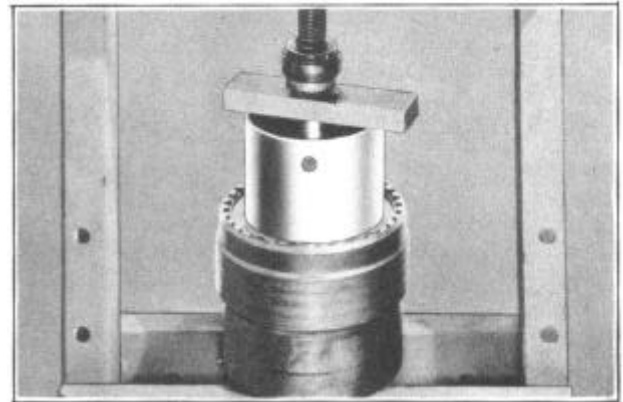


FIGURE 114

30. Use a small screwdriver and pry the end of the snap ring out of the groove and remove the snap ring (23), Figure 115, then slowly release the arbor press to gradually release the retractor spring pressure.
31. Remove the Fixture J-5478 and remove the retractor spring retainer (24), retractor springs (27).
32. Lift the clutch steel plates (25), clutch discs (26) and retractor spring seat (28) out of the low brake drum.

**CAUTION:** Use care when removing the clutch piston so as not to damage the piston bore on the front sun gear teeth. As an added precaution place masking tape around the lower edges of the front sun gear teeth.

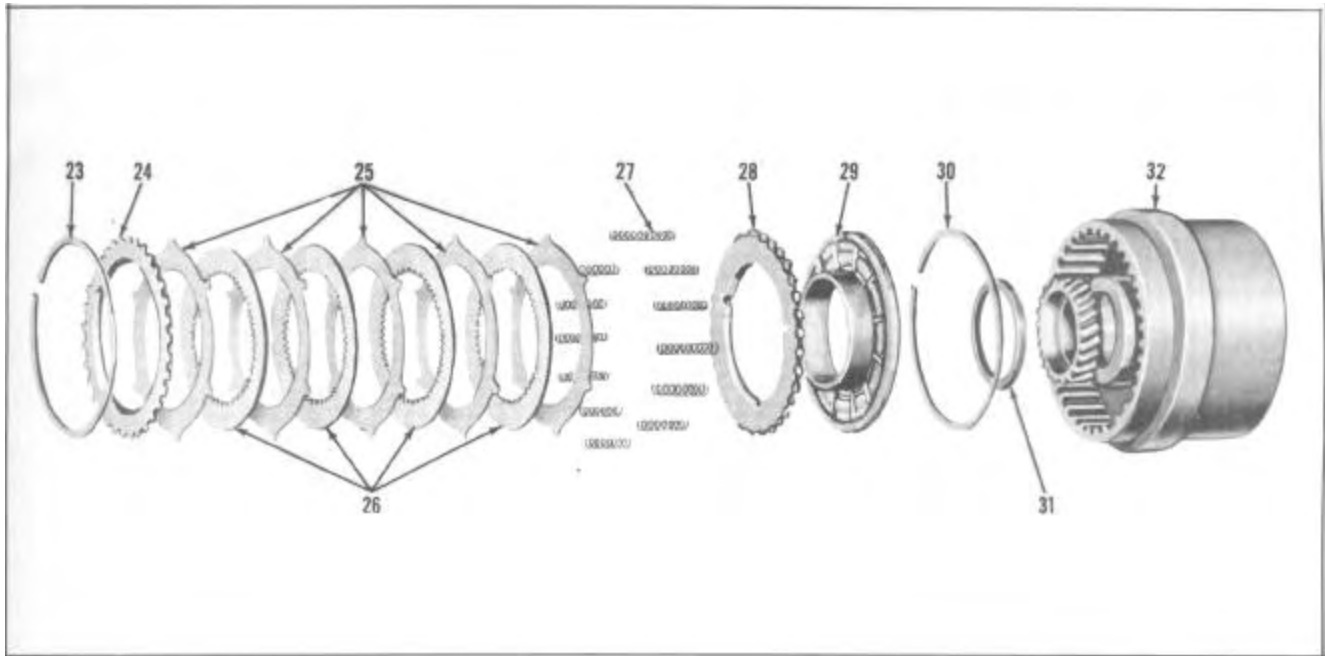


FIGURE 115

33. Install the Piston Installing Pins J-5487 in the grooves of the low brake drum equally spaced as shown in Figure 116. These pins will allow the clutch piston oil seal ring to slip past the circular grooves inside the low brake drum. Lift the piston out of the drum using needle nose pliers.

pick it out of the groove and then removing it from drum, Figure 117.

**NOTE : The low brake drum bushing is not serviced separately.**

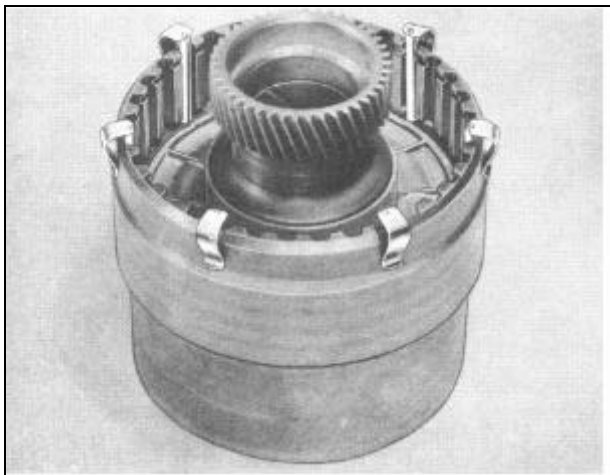


FIGURE 116

34. Remove the piston inner seal (31), Figure 115, by squeezing the seal to one side to

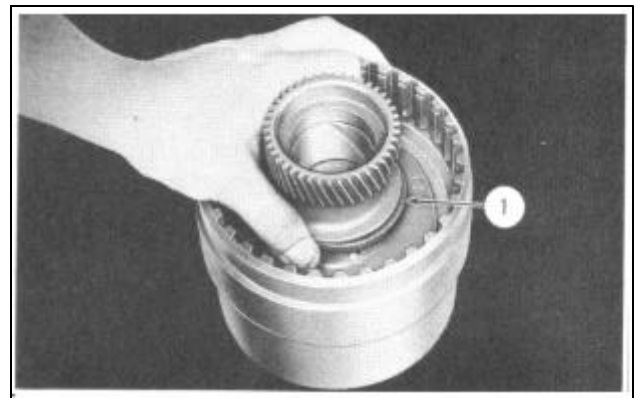


FIGURE 117

**NOTE: A centrifugal check (bleed) valve is installed in the back wall of the multiple disc clutch cylinder in the low brake drum, Figure 119. This check valve is not serviced separately.**

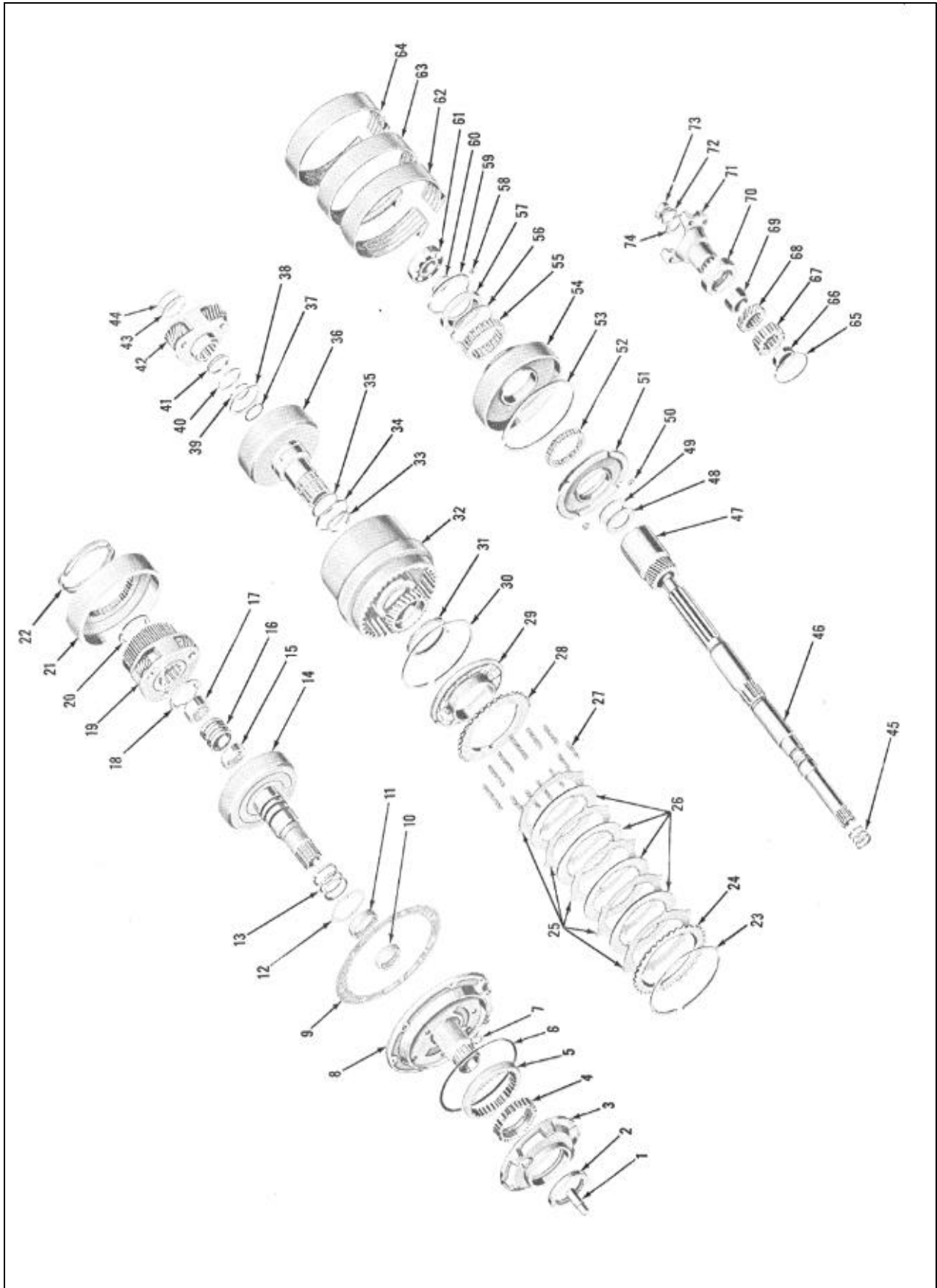


FIGURE 118 - EXPLODED VIEW - FRONT PUMP & COLLECTOR RING,  
MAINSHAFT, MULTIPLE DISC CLUTCH AND DRUMS

## LEGEND

- |   |  |
|---|--|
| 1. Mainshaft Oil Transfer Tube              | 38. Rear Planet Carrier Washer                       |
| 2. Front Pump Oil Seal                      | 39. Rear Planet Carrier Ring Seal Retainer Snap Ring |
| 3. Front Pump Body                          | 40. Rear Planet Carrier Ring Seal                    |
| 4. Front Pump Drive Gear                    | 41. Rear Planet Carrier Ring Seal Retainer           |
| 5. Front Pump Driven Gear                   | 42. Rear Planet Carrier and Pinions                  |
| 6. Front Pump "0" Ring (Large)              | 43. Rear Planet Carrier Washer - Steel               |
| 7. Front Pump "0" Ring (Small)              | 44. Rear Sun Gear Washer - Thrust                    |
| 8. Front Pump Collector Ring                | 45. Mainshaft Seal (3)                               |
| 9. Collector Ring To Case Gasket            | 46. Mainshaft Assembly                               |
| 10. Collector Ring Bearing, Front           | 47. Rear Sun Gear Assembly                           |
| 11. Collector Ring Bearing, Rear            | 48. Rear Sun Gear Washer                             |
| 12. Front Ring Gear Front Washer            | 49. Rear Sun Gear Thrust Washer                      |
| 13. Front Ring Gear Oil Seal (3)            | 50. Low Drum Plate To Drum Dowel (3)                 |
| 14. Front Ring Gear                         | 51. Low Drum Plate                                   |
| 15. Front Ring Gear Bearing, Front          | 52. Reverse Free Wheel Unit                          |
| 16. Front Ring Gear Bearing Spacer          | 53. Low Drum Snap Ring                               |
| 17. Front Ring Gear Bearing, Rear           | 54. Forward Brake Drum Assembly                      |
| 18. Front Planetary Carrier Thrust Washer   | 55. Forward Free Wheel Unit                          |
| 19. Front Planetary Carrier Assembly        | 56. Forward Free Wheel Unit Snap Ring                |
| 20. Front Sun Gear Thrust Washer            | 57. Forward Free Wheel Unit Plate Spacer             |
| 21. Reverse Brake Drum                      | 58. Spacer Dowel                                     |
| 22. Reverse Brake Drum Snap Ring            | 59. Spacer Snap Ring                                 |
| 23. First Clutch Retainer Plate Snap Ring   | 60. Mainshaft Rear Bearing Spacer                    |
| 24. First Clutch Retractor Spring Retainer. | 61. Mainshaft Rear Bearing                           |
| 25. First Clutch Plates                     | 62. Band Assembly (Reverse)                          |
| 26. First Clutch Discs                      | 63. Band Assembly (Low)                              |
| 27. First Clutch Retractor Springs          | 64. Band Assembly (Forward)                          |
| 28. First Clutch Retractor Plate            | 65. Mainshaft Rear Bearing Snap Ring                 |
| 29. First Clutch Piston                     | 66. Governor Drive Gear Spacer                       |
| 30. First Clutch Piston Ring                | 67. Mainshaft Parking Brake Gear                     |
| 31. First Clutch Piston Seal                | 68. Mainshaft Governor Drive Gear                    |
| 32. Sun Gear and Low Brake Drum             | 69. Universal Joint Flange Spacer                    |
| 33. Front Planetary Carrier Snap Ring       | 70. Extension Case Rear Oil Seal                     |
| 34. Rear Ring Gear Seal (1-5/8" Rubber)     | 71. Universal Joint Flange                           |
|   | 72. Universal Joint Flange Nut Washer (Lock)         |
|   | 73. Universal Joint Flange Nut                       |
|   | 74. Universal Joint Flange Nut Washer (Plain)        |

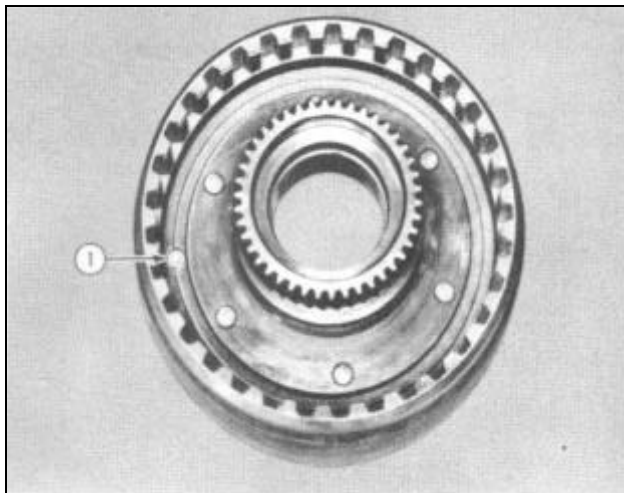


FIGURE 119

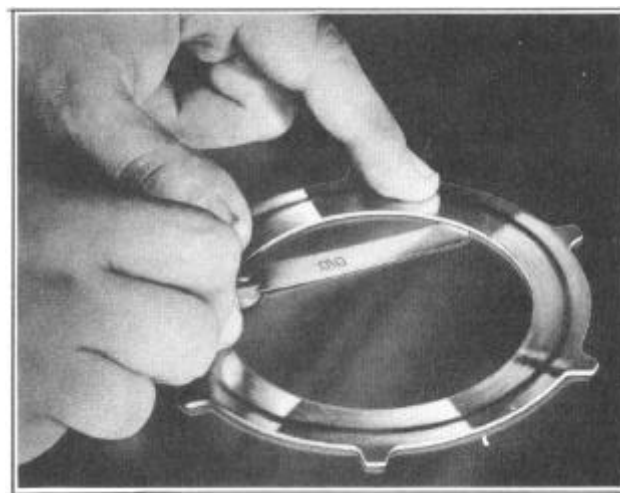


FIGURE 120

**INSPECTION**

1. Clean all parts thoroughly in a good CLEAN solvent.
2. Inspect all planetary carriers, planet pinions, ring gear, and sun gear teeth for excessive wear or damage.
3. Inspect all bushings and machine surfaces for wear or scoring.
4. Inspect oil seals for wear or damage.
5. Inspect the thrust washers for wear or scoring.
6. Inspect the lining of the multiple disc clutch friction discs and the multiple clutch disc plates for proper dish.

**NOTE :** If the dish is more than .010", the plate must be replaced. Check the plate on a flat surface using a .010" feeler gauge. Check for this clearance at the inner diameter of the plate, Figure 120.

7. Inspect the brake drums for scoring.

**NOTE:** If drums show evidence of scoring, check brake bands and lining.

8. Inspect the free wheel unit sprags for damage or wear.

**NOTE:** If the reverse free wheel (52), Figure 118, is worn or damaged, the low drum plate (51) and the rear sun gear (47)

should also be replaced. If the forward brake drum free wheel unit (55) is damaged, the forward brake drum and rear sun gear should be replaced.

9. Check the centrifugal check valve in the low brake drum cylinder for free operation.
10. Check position and tightness of the lubrication valve located in transmission mainshaft, see Cross Section, Page IV. The lubrication valve is threaded at the front end. To test for tightness, install Test Rod 1-5481 onto the threaded end of the lubrication valve and tap end of Test Rod, Figure 121.

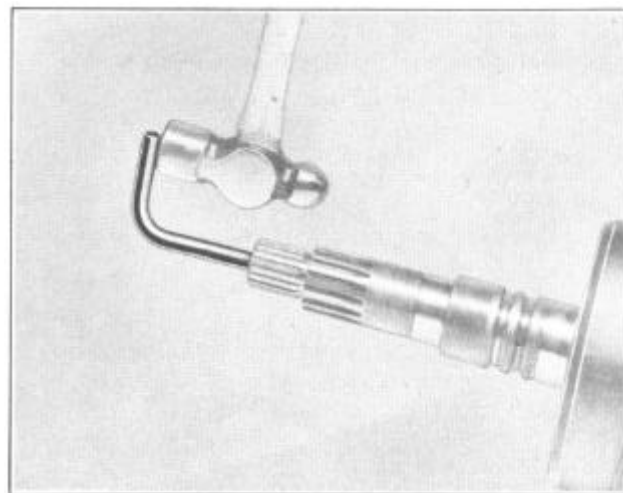


FIGURE 121

**ASSEMBLY**

1. Install a new piston inner seal (31) in the groove of the sun gear, Figure 118.

**NOTE: Apply Automatic Transmission Fluid, Type "A" to the seal to facilitate installation. Stretch the seal only enough to slip over the sun gear. Lip of seal faces towards drum (rear of transmission).**

2. Position the Clutch Piston Installing Pins J-5487 in the grooves of the drum as shown in Figure 122.

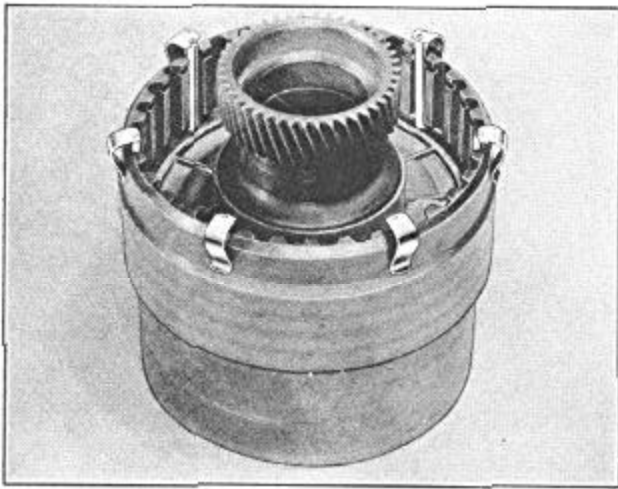


FIGURE 122

3. Install a new piston oil seal ring (30), Figure 118, in the groove of the clutch piston (29) using Snap Ring Pliers KMO-630.
4. Compress the piston oil seal ring in the clutch piston and install the clutch piston assembly into the low brake drum.

**CAUTION: Do not turn lip of piston inner seal when installing clutch piston.**

5. When the clutch piston is to the bottom of the low brake drum cylinder, remove the Piston Installing Pins J-5487.
6. Install the multiple disc clutch retractor spring seat (28), Figure 118, into the drum (32) (spring recesses up)

**NOTE: This plate is the heavier of the two plates and has three notches in the inside diameter.**

7. Dip the clutch discs (26) and clutch plates (25) in Automatic Transmission Fluid and install them into the drum; starting with a steel plate (25) place the plates and friction discs alternately in the drum. (Five steel plates and four friction discs.)

**NOTE: The lugs on the steel discs (25) are not evenly spaced, therefore make sure that the lugs of the steel plates are in the same grooves of the low brake drum (32) as the master lugs of the retractor spring plate (28).**

The steel plates are dished and may be installed with the dish either to the front or rear, however all steel plates must have the dish in the same direction.

8. Install the twelve clutch retractor springs (27) and space them in the grooves indicated by arrows, Figure 123.

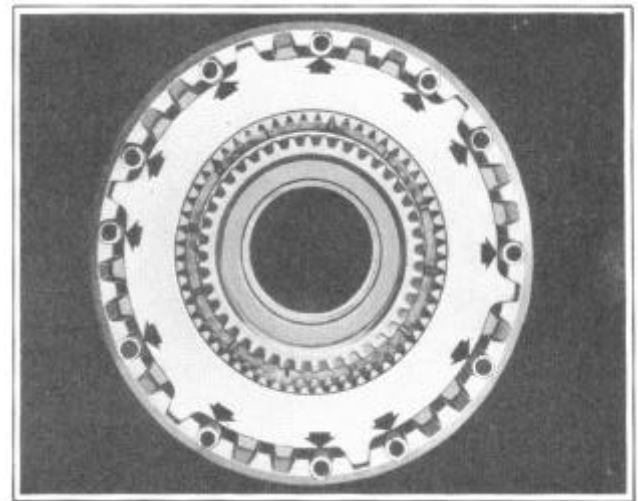


FIGURE 123

9. Place the retractor spring plate over the retractor springs.
10. Place unit in an arbor press and position the Clutch Fixture J-5478 on the retractor spring retainer as shown in Figure 114. Place a steel plate on the Clutch Fixture

and apply just enough pressure to compress the retractor springs and retractor spring plate so that the plate is just below the snap ring groove in the drum and install the snap ring.

**NOTE :** Make sure the snap ring is firmly seated in the groove before releasing the spring pressure.

11. Remove the clutch fixture and transfer the assembly to the work bench.
12. Apply Type "A" Automatic Transmission Fluid to the rear ring gear inner (37), Figure 118, and outer (35) "O" ring seals and install the seals in their respective grooves.

**NOTE :** DO NOT stretch the outer seal (35) more than is necessary to slip the seal over the ring gear shaft.

13. Install the rear ring gear oil seal ring (3), Figure 113.
14. Apply a coat of petroleum jelly to the oil seal ring (3) and the outer "O" ring seal (2) and install the rear ring in the low brake drum.
15. Install the rear planetary sun gear front thrust washer (4), Figure 124, on the mainshaft with the steel face of the washer toward the front of the mainshaft and engage the washer with the splines of the mainshaft.

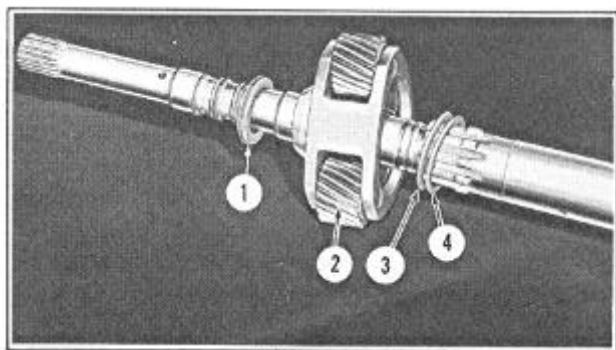


FIGURE 124

**NOTE:** If the planetary carrier has a counter-bore on the inside front face, a steel spacer (3), must be used between the front sun gear thrust washer (4) and the planet carrier.

16. Slide the rear planetary carrier on the front end of the mainshaft engaging the splines and seating the planetary carrier against the shoulder of the splines.
17. Install the planetary carrier oil seal ring (1), Figure 124, in the retainer and slip the retainer on the mainshaft. Press the mainshaft into the seal retainer far enough to allow installation of the snap ring (1), Figure 125.

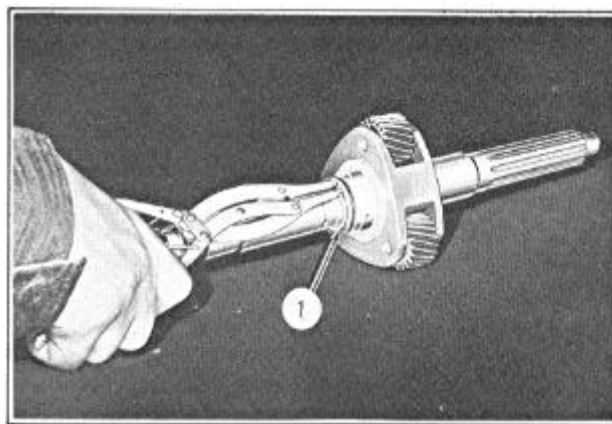


FIGURE 125

**CAUTION:** Press on the inner portion of the retainer only, to prevent damage to the ring lands and prevent binding of the oil seal ring. Check for free movement of the ring.

18. Install the retainer snap ring. If there is any clearance between the retainer and the snap ring, place the mainshaft and planetary carrier in an arbor press and with the retainer supported at its inner edges, press the retainer back against the snap ring by applying pressure on the rear end of the mainshaft.
19. Place the rear planetary carrier front thrust washer over the mainshaft and onto the rear planetary carrier, Figure 126. The steel face of the washer must be towards the planetary carrier. Apply petroleum jelly to keep the washer in place.

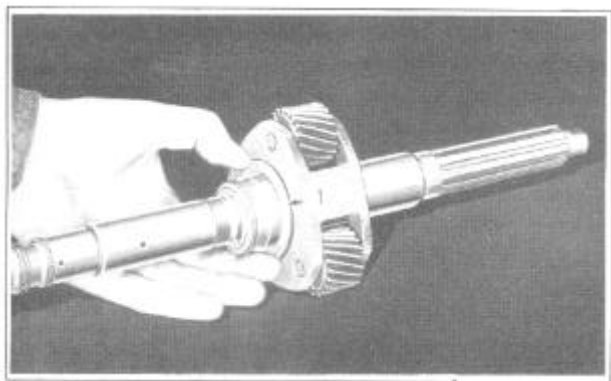


FIGURE 126

20. Install the mainshaft and planetary carrier assembly into the rear ring gear and low brake drum assembly, Figure 107.
  21. Install the reverse free wheel unit in the low brake drum plate. (Shouldered flange of free wheel unit facing towards the assembler).
  22. Install the reverse free wheel unit snap ring in the groove of the low brake drum.
  23. Lubricate the rear sun gear bushings and the outside of the rear sun gear with automatic transmission fluid and install the sun gear on the mainshaft, meshing the pinion gears of the rear planetary carrier with the teeth of the rear sun gear.
  24. Install the low brake drum plate assembly over the end of the sun gear, Figure 106. Place the flat side of the plate toward the low brake drum, tilt the assembly slightly, slipping the free wheel sprags down over the edge of the sun gear on one side and with a small screwdriver, move each sprag outward, slipping it over the edge of the gear while holding the free wheel unit firmly against the sun gear hub.
  25. After all of the sprags are outside the edge of the sun gear hub, rotate the unit counter-clockwise and slide the assembly onto the sun gear and into position on the low brake drum plate.
  26. Align the slots of the plate with the slots in the drum and install the two lock dowels in position in the two circular openings formed by the slots.
- NOTE:** Beginning with Automatic Transmission Serial No. HA-4275, the diameter of the roller drive pin slots was changed from 11/16" to 3/8" and the roller pin diameter was also changed from 11/16" to 3/8". Therefore, any transmission below Serial No. HA-4275 requiring the replacement of either the low drum or the low drum plate assembly, will also require the other two items.
27. Install the snap ring; make sure the snap ring is seated securely in the groove in the drum and the ends of the snap ring are away from the roller dowel pins, Figure 105.
  28. Install the forward free wheel unit (1) in the forward brake drum (2), Figure 127. (Shouldered flange of free wheel unit facing towards assembler.)
  29. Install the snap ring in the groove of the forward brake drum, Figure 103.
  30. Place the forward brake drum assembly over the rear sun gear. Tilt the assembly slightly, slipping the free wheel sprags down over the edge of the sun

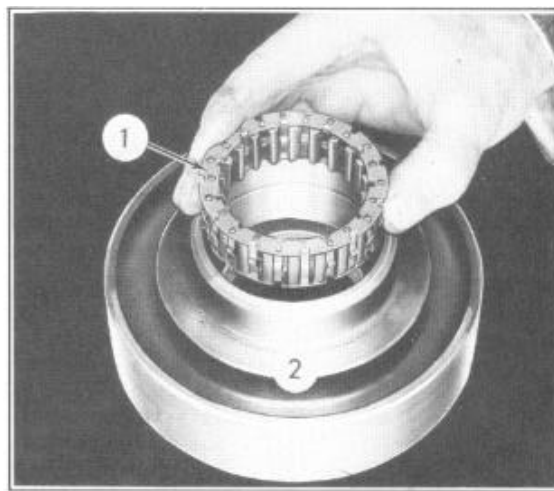


FIGURE 127

gear hub at one side and with a small screw driver, move each sprag outward and slip it over the edge of the gear hub while holding the free wheel unit against the sun gear.

31. After all of the sprags are outside the edge of the sun gear hub, rotate the unit clockwise and slide the assembly down on the sun gear.
32. Install the rear sun gear thrust washer on the shaft with the bronze face of the washer toward the sun gear and place it on the rear face of the gear, Figure 104.
33. Install the spacer washer (1), Figure 104.
34. Insert the free wheel unit spacer dowel (1), Figure 102, into the hub of the forward brake drum and position the spacer plate within the drum.
35. Install the spacer plate snap ring (1) securely in the groove of the forward brake drum, Figure 101.
36. Install the rear bearing spacer (1), Figure 99, on the mainshaft.
37. Install mainshaft rear bearing on mainshaft.
38. If the reverse drum and front planetary carrier were disassembled, align the splines of the front planetary carrier and reverse brake drum and carefully press the carrier into the drum. Install the snap ring (1), Figure 97, being careful not to distort the ring.
39. Coat the front sun gear thrust washer (1), Figure 128, with petroleum jelly and install the washer within the front planetary carrier hub with the steel face of the washer against the machined face of the hub.
40. Install the reverse drum and front planetary carrier assembly, Figure 95, onto the mainshaft, engaging the carrier splines with the ring gear splines and turning the assembly as necessary to engage the clutch friction disc teeth.

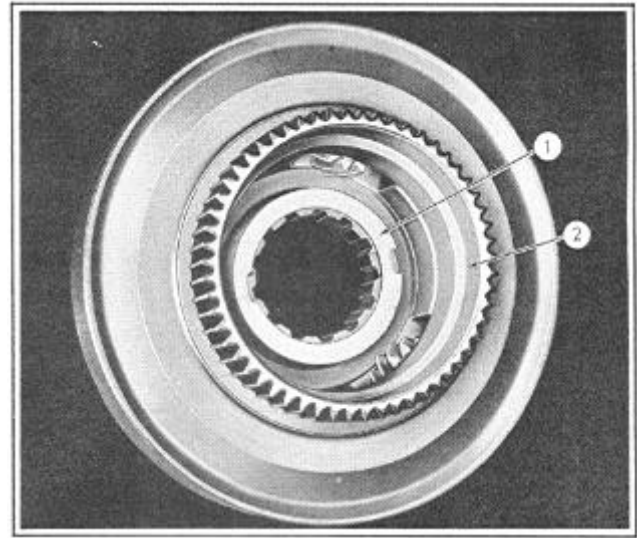


FIGURE 128

**CAUTION:** Do not force the assembly into position as this may result in damage to the disc teeth.

41. Apply petroleum jelly to the front planetary carrier thrust washer and place it in position on the rear ring gear shaft splines, Figure 129, with the steel face of the washer against the front planetary carrier.

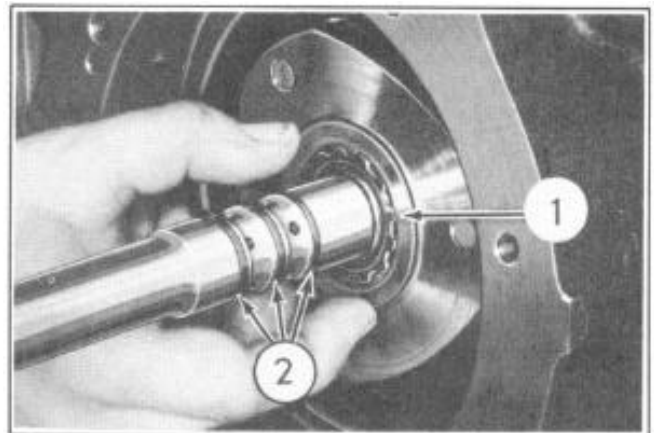


FIGURE 129

42. If the front ring gear, Figure 90, or mainshaft, Figure 129, oil seal rings have been removed, install new rings as outlined under "Oil Seal Rings (Front Ring Gear), Installation", Page 59.

43. petroleum jelly and install the front ring gear, Figure 93.
44. Install Front Ring Gear Retaining Clip J-4668-3 on the front end of the mainshaft to hold the assembly in position for installation of the mainshaft into the transmission case. See "Mainshaft Installation", Page 60.

### SERVO BANDS

#### REMOVAL

1. Remove the transmission as outlined under "Transmission Removal", Page 78.
2. Remove the mainshaft assembly as outlined under "Mainshaft Removal", Page 60.
3. Pull the forward servo band shoe (3), Figure 130, away from the adjustment screw (1); disengage the pin from the notch in the strut and remove the strut from the end of the adjustment screw. Disengage the other end of the band from the piston strut (4), lift the band out of the band guide and move the band to the rear of the transmission case.
6. Disengage the reverse servo band shoe from the strut and remove the strut. Then disengage the band shoe from the piston strut and turn the band 90 degrees, Figure 131.
6. Slip the end of the band out of the transmission case, Figure 132.
7. Remove the low and forward servo bands in the same manner as the reverse servo band.

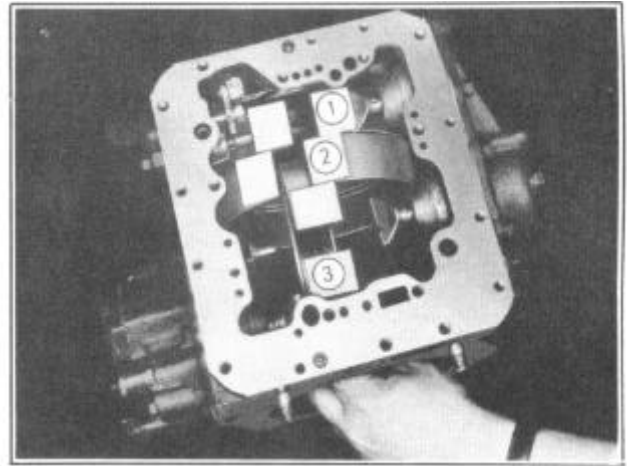


FIGURE 131

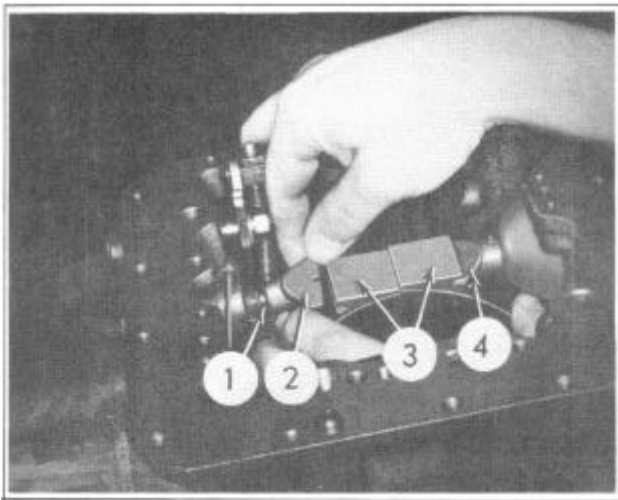


FIGURE 130

4. Disengage the low servo band in the same manner as the forward brake band and also move it toward the rear of the case.

**NOTE:** Do not distort the bands during removal.

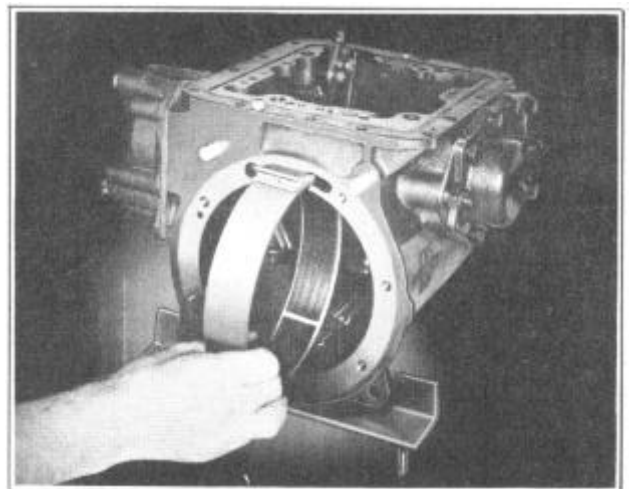


FIGURE 132

### INSPECTION

1. Clean transmission case with a good, CLEAN solvent.
2. Inspect the brake band linings for wear and the servo bands and shoes for damage.
3. Inspect the servo band strut locating pins for tightness in the brake shoes.

### INSTALLATION

**NOTE: The low and forward servo bands are interchangeable. These two bands are a lighter gauge (approximately 1/16" thick) than the reverse servo band (approximately 7/64" thick). Do not interchange the reverse servo band with the low and forward servo band.**

1. Slip one end of the forward servo band over the flange of the transmission and roll the top of the band into the case. Then turn the band so that the end of the band having the strut retaining pin offset is toward the low and forward piston side of the case. With band in this position, move it to the rear of the case.
2. Install the low servo band in the same manner as the forward servo band and also move it to the rear of the case.
3. Install the reverse servo band in the same manner as the forward and low servo bands, however, the reverse band should be turned so that the end of the band having the strut retaining pin offset should be toward the reverse piston side of the case.
4. Position the bands in their respective notches milled in the transmission case and engage the bands on the piston side with the piston struts, making sure the pin is in the notch of the strut.
5. Pull the shoes of each band together without disengaging the piston strut and slip

the anchor side strut on the end of the adjustment screw and engage the strut with the band shoe.

**NOTE: Make sure the bands properly engage the notches of their respective struts and the upper part of each band is properly positioned in the milled channel in the case.**

6. Inspect and install the mainshaft as outlined under "Mainshaft Inspection and Installation", Page 60.
7. Adjust the bands as outlined under "Servo Band Adjustment", Page 89.
8. Install the transmission as outlined under "Transmission Installation", Page 78.

### PARKING BRAKE ACTUATING ROD ASSEMBLY

#### REMOVAL

**NOTE: Before the parking brake actuating rod assembly can be removed from the transmission case, mainshaft assembly must be removed as outlined under "Mainshaft Removal", Page 60.**

1. With the mainshaft assembly removed, remove the snap ring (1), Figure 133, from the toggle shaft sleeve (2), using Snap Ring Pliers J-4880.

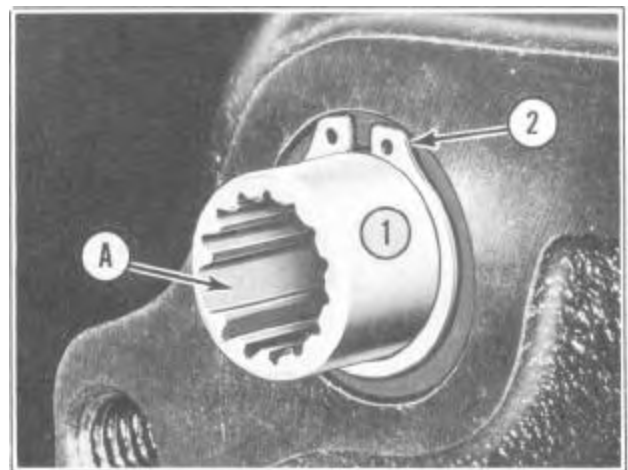


FIGURE 133

2. Remove the selector shaft nut (1), Figure 51, lockwasher (2) and flat washer (3) that hold the selector control shaft inner lever (4) to the selector control shaft (5).
3. Disengage the forward servo band from its struts and move the band forward.
4. Remove the inner lever (4), Figure 51, from the selector control shaft (5) and slip the toggle shaft sleeve out of the case. The complete assembly as shown in Figure 134 can now be removed from the case.

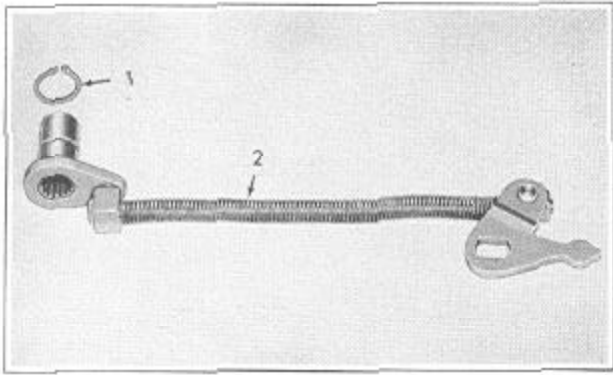


FIGURE 134

1. Insert the toggle shaft sleeve in the transmission case, align and install the inner lever on the selector control shaft.
2. Install the flat washer (3), Figure 51, lock-washer (2) and selector shaft nut (1) and tighten the nut securely.
3. Install the snap ring on the toggle shaft sleeve, Figure 133.
4. Install the forward servo band in position in the band struts.

#### INSTALLATION

5. Install the mainshaft assembly as outlined under "Mainshaft Installation", Page 60.

6. Check the adjustment of the parking brake pawl as outlined under "Parking Brake Pawl and Toggle Assembly, Adjustment", Page 34.

### TRANSMISSION CASE

#### REMOVAL

1. Remove the transmission as outlined under "Transmission Removal", Page 78.
2. Perform the operations as outlined under "Transmission Disassembly, Removing Units From Transmission", Page 80.
3. Remove the front pump and multiple disc clutch pressure take-off plugs.
4. Remove the selector control shaft oil seal.

#### INSPECTION

1. Clean the transmission case thoroughly.
2. Check all oil passages for obstruction, Figure 138.
3. Check all assemblies for damage and excessive wear.

#### INSTALLATION

1. Install the front pump and multiple disc clutch pressure take-off plugs.
2. Install a new selector control shaft oil seal with the numbered face toward the outer selector lever and flush with case.
3. Perform the operations as outlined under "Transmission Assembly, Installing Units In Transmission", Page 81.
4. Perform the operations outlined under "Transmission, Installation", Page 78.

## TRANSMISSION

## REMOVAL

1. Raise car and drain transmission case and converter as outlined under "Draining and Refilling", Page 87.
2. Remove the cotter pin and disconnect the selector rod at the transmission selector lever:
3. Remove the cotter pin and disconnect the governor control rod at the governor control lever.
4. Disconnect the speedometer cable at the speedometer gear housing and remove the speedometer driven gear.
5. Remove the attaching nuts, washers and "U" bolts and disconnect the propeller shaft from the transmission companion flange.

**NOTE:** Wire end of propeller shaft to frame to facilitate transmission removal.

6. Place the hydraulic hoist with the transmission adapter in position under the transmission oil pan and adjust the fixture knobs on the adapter to align the saddle to the transmission oil pan flange so that the weight of the transmission case is supported by the hoist.
7. Remove the two transmission case to converter housing upper bolts (5/8" socket) and install the two Pilot Studs J-4284 into the cap screw holes.
8. Remove the two lower transmission case to converter housing stud nuts (11/16" box wrench).
9. With the hydraulic hoist cradle adjusted so the transmission case is in alignment with the converter housing, pull the transmission with the hydraulic hoist rearward to disengage the transmission from the converter housing and the converter assembly.

**NOTE:** If the J-4287 Saddle is used, the transmission assembly can be removed by sliding the unit rearward on the saddle, while the hydraulic hoist

would remain stationary, greatly facilitating removal and installation of the transmission shafts as follows:

**CAUTION:** If transmission sticks to converter housing, do not rock the transmission case. Use a small pry bar between rear end of oil pan flange and converter housing and carefully pry transmission away from converter housing.

10. The mainshaft oil transfer tube (2), Figure 135, must be removed from the converter if it does not come out when the transmission is removed

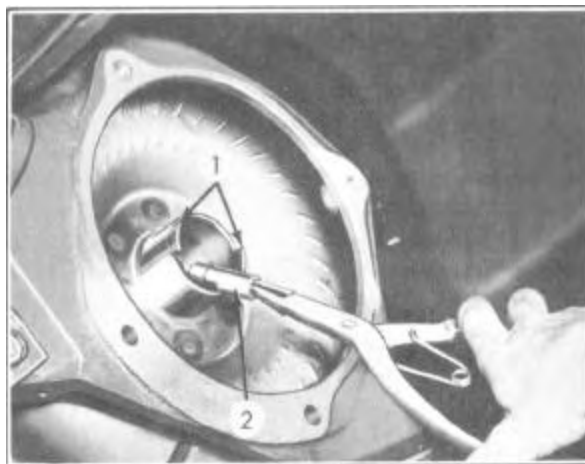


FIGURE 135

## INSTALLATION

1. Install the Spline Aligning Fixture J-4283 in to the transmission, Figure 136, and position the splines

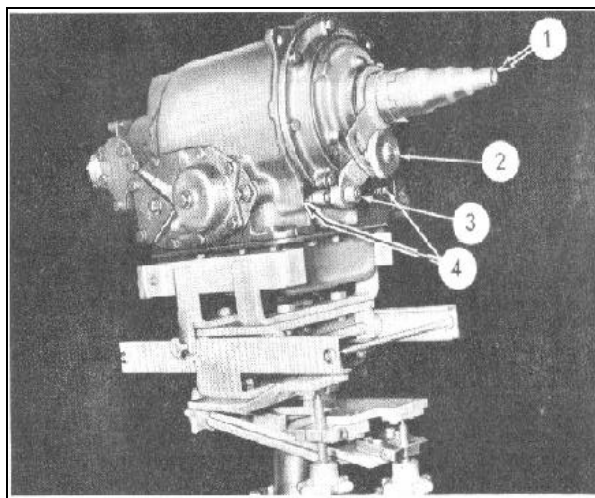


FIGURE 136

on the transmission shafts as follows:

- A. Place the transmission selector lever in the "N" (Neutral) position.
  - B. Loosen the thumb screw (2) and install the fixture over the splines, inserting it into the transmission as far as it will go; make sure that the two prongs on end of fixture are indexed properly in the front pump drive gear, and that the positioning arm sector points toward one of the lower studs (4).
  - C. Move the positioning arm and the transmission companion flange until the positioning pin (3) slips easily over one of the lower studs.
  - D. Tighten the thumb screw (2) to lock the positioning arm in place.
  - E. Carefully remove the aligning fixture to prevent moving the splines and pump gear out of alignment.
2. Install the mainshaft oil transfer tube in the end of the mainshaft (tapered end out).
  3. Install the Spline Alignment Fixture J-4283 in the torque converter assembly and position the internal splines as follows:
    - A. Work the alignment fixture into the torque converter assembly until the splines and pump drive fingers are properly lined up on the fixture, Figure 137.

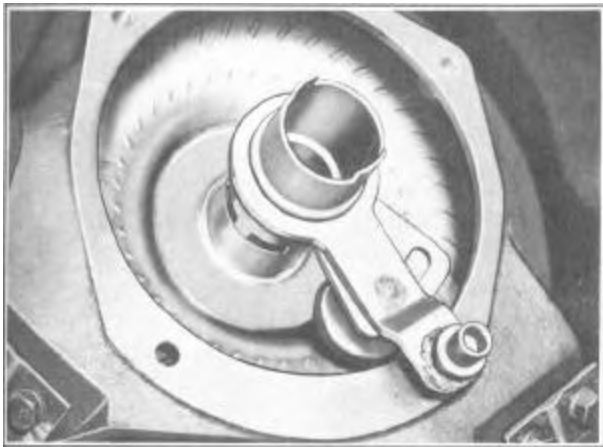


FIGURE 137

- B. Rotate the torque converter assembly and the spline alignment fixture until the positioning pin slips easily into the stud hole in the converter housing corresponding to the stud hole at which the alignment fixture was set.
- C. Remove the fixture carefully to prevent loss of spline alignment.
4. Install the two Transmission Pilot Studs J-4284 into the two transmission to converter housing attaching screw holes (upper).
5. Raise the transmission assembly to the proper height and angle to align the two upper transmission to converter housing screw holes and carefully slide the transmission case onto the pilot studs and enter the front pump drive fingers of the converter assembly into the front pump.

**CAUTION: DO NOT turn the transmission companion flange during installation and DO NOT force the transmission into the converter by drawing the transmission case in with the attaching screws, as this will cause damage to the converter or the front pump.**

**NOTE: Make sure the transmission fits snugly against the converter housing before installing attaching screws and nuts. If the transmission is stopped at a distance of 1/4" or less, turn the companion flange or converter a little in each direction and at the same time, apply pressure at rear of transmission.**

6. With the transmission case in full contact with the converter housing, remove the Pilot Studs J-4284 and install the cap screws, lock washers and stud nuts. Tighten the upper cap screws to 40-50 foot pounds and the lower stud nuts to 35-40 foot pounds.
7. Install speedometer driven gear and speedometer cable.

**NOTE: Cable must be entered over the rear motor support, between the motor support and converter housing.**

## 80 AUTOMATIC TRANSMISSION

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8. Connect selector lever rod at transmission selector lever; install cotter pin.
9. Connect governor control rod at governor control lever and install cotter pin.
10. Move the propeller shaft into position and attach the propeller shaft to the transmission companion flange, installing "U" bolts, lock washers and nuts.
11. Make sure oil pan drain plug has been securely tightened; lower car.
12. Refill transmission as outlined under "Draining and Refilling Transmission" , Page 87.
13. Check selector rod and governor control rod adjustments as outlined under "Adjustments", Page 88.
6. Remove the reverse brake outer cylinder attaching screws (1/2" socket) and the low band adjusting screw lock nut (3/4" socket) and remove the reverse brake outer cylinder and cylinder plate.
7. Install 1-4668-3 Ring Gear Retaining Clip on the front of the mainshaft.
8. Place an oil drain pan under the front pump and collector ring assembly and remove the seven attaching screws (1/2" socket) and remove the front pump and collector ring by sliding the assembly forward off the mainshaft.
9. Remove the oil pan attaching screws and remove the oil pan (1/2" socket).
10. Remove the oil screen retainer and oil screen.
11. Remove the seven attaching bolts (1/2" socket) and remove the valve block assembly.
12. Back out the three band adjusting screws to release the bands.
13. Remove the mainshaft rear bearing, using Puller Plate J-1298, Adapter. Rings J-1298-3 and Universal Puller HM-925.

### TRANSMISSION DISASSEMBLY

#### REMOVING UNITS FROM TRANSMISSION CASE

1. Place transmission on benchholding fixture.
  2. Place selector lever in Park position and remove the transmission companion flange.
  3. Place an oil drain pan under the extension case, remove the six cap screws (9/16" socket) and remove the extension case.
  4. Remove the companion flange spacer (4), Figure 33, governor drive gear (3), parking brake gear (2) and governor drive gear spacer (1).
  5. Remove the low and forward brake outer cylinder attaching screws (1/2" socket) and the band adjusting screw lock nut (3/4" socket) and remove the outer cylinder plate.
  14. Carefully pull the mainshaft assembly forward, Figure 92, and remove the assembly from the transmission case.
- CAUTION:** Care should be taken not to allow the mainshaft to move rearward, which would result in dislocation of the internal parts of the mainshaft assembly.
- NOTE:** Do not disengage the bands from their struts during the mainshaft removal as any cocking of the bands will restrict removal of the mainshaft.
-

16. Remove the band struts, Figure 82, 83 and 84.
17. Remove the band adjusting screws.
18. Remove the servo bands as outlined under "Servo Bands, Removal", Page 75.
19. Remove the snap ring from the toggle shaft sleeve, Figure 32, using Snap Ring Pliers J-4880.
20. Remove the selector shaft nut (1), Figure 51, lockwasher (2) and flat washer (3) and remove the inner lever (4) from the selector control shaft (5) and remove the selector outer lever (6) and parking brake actuating rod assembly from the transmission case.

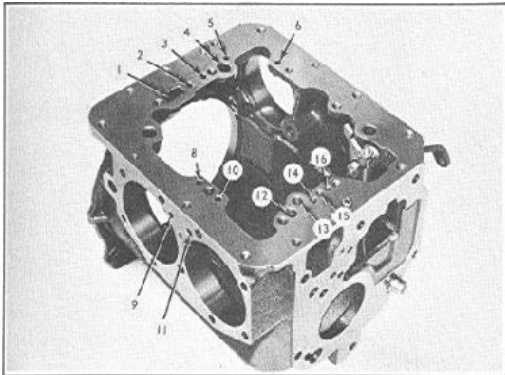


FIGURE 138

**LEGEND**

1. Front pump intake passage
2. Multiple disc clutch passage
3. Direct drive passage
4. Front pump pressure passage
5. Converter pressure passage
6. Reverse pressure passage
8. Low band servo passage
9. Low band servo passage
10. Forward band servo passage
11. Forward band servo passage
12. Rear pump intake passage
13. Rear pump pressure passage
14. Governor feed passage
15. Multiple disc clutch passage
16. Direct drive passage

**INSPECTION**

1. Clean transmission case thoroughly.
2. Inspect brake bands and drums for damage and wear.
3. Make sure that all oil passages are open. See Figure 138.

**TRANSMISSION ASSEMBLY**

**INSTALLING UNITS IN TRANSMISSION**

1. Insert the toggle sleeve in the transmission case and install the snap ring.
2. Install the outer selector lever and shaft into the case and attach the inner lever.
3. Install the band adjusting screws.
4. Install the forward servo band into case, move the band to the rear of case and install the low and reverse servo bands.

**NOTE: The forward and low bands are interchangeable. The reverse band is the heavy band and should not be interchanged with the other two bands.**

5. Install the low, forward and reverse servo pistons in the bores in case. Do not turn the seal over or damage the lips of the seals.
6. Install a new cylinder plate to case gasket.
7. Install the low and forward servo outer cylinder plate, cylinder plate gasket and outer cylinder assembly. Tighten screws to 15-18 foot pounds (1/2" socket).
8. Install the reverse servo outer cylinder plate to case gasket.
9. Install the reverse servo outer cylinder plate, cylinder plate gasket and reverse outer cylinder. Tighten screws to 15-18 foot pounds (1/2" wrench).

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10. Install the reverse band adjusting screw lock nut (3/4" wrench).
11. Install the low and forward band adjusting screw lock nuts (3/4" wrench).
12. Install the band struts, making sure that all band struts are properly engaged with the band shoes and that the pin in the band engages the notch of the strut.
13. Install the mainshaft assembly as outlined under "Mainshaft Installation", Page 60.
14. Install the mainshaft rear bearing snap ring with Snap Ring Pliers KMO-630. Using a piece of pipe with an 1.195" inside diameter and 1.500" outside diameter and 7" inches long, drive against the inner race of the bearing to move the bearing and mainshaft assembly forward and into position in the transmission case.

**CAUTION: DO NOT drive on end of mainshaft to position the bearing.**

15. Adjust the bands as outlined under "Servo Band Adjustment", Page 89.
16. Install the front pump and collector ring as outlined under "Front Pump and Collector Ring, Installation", Page 56.
17. Install the valve block assembly, (seven screws - 1/2" socket).
18. Install the oil screen and oil screen retainer.
19. Install the governor drive gear spacer (1), Figure 46, parking brake gear (2), governor drive gear (3), and companion flange spacer (4).
20. Install the extension case assembly as outlined under "Extension Case Installation", Page 26.
21. Install the oil pan (14 screws - 1/2" socket).
22. Place selector lever in Park position and install the transmission companion flange washer, flat washer and nut. Tighten nut to 80-90 foot pounds.

23. Remove J-4668-3 Ring Gear Retainer Clip from end of mainshaft and install the mainshaft oil transfer tube in the front end of the mainshaft, with the tapered end of tube toward front of transmission.
24. Remove transmission from work bench and install transmission as outlined under "Transmission Installation", Page 78.

### CONVERTER HOUSING

#### REMOVAL

1. Raise hood and disconnect battery negative terminal.
  2. Remove the upper bolt attaching the starter motor to transmission converter housing, (9/16" socket).
  3. Raise car.
  4. Remove lower bolt attaching starter motor to converter housing, (9/16" socket), pull the starter motor forward and remove through hood opening or allow starter to rest on drag link in the event car will not be moved during transmission repair period.
  5. Remove the one bolt at lower left hand side of converter housing (9/16" wrench).
  6. Remove the one bolt attaching the breather pipe to the valve chamber and the one bolt attaching the lower part of the breather to the converter housing clip.
  7. Remove the breather pipe support clip at the right hand side of the engine support plate.
  8. Remove the bolt and nut at the lower right hand side of converter housing (attaching converter housing to engine rear support plate).
  9. Remove the rear motor support bolts at the No. 3 crossmember (2 each side, 5/8" socket).
  10. Remove cotter pin and disconnect selector rod at transmission selector lever.
-

11. Remove cotter pin and disconnect governor control rod at the governor control lever.
12. Disconnect the speedometer cable at the speedometer gear housing and remove speedometer driven gear.
13. Disconnect hand brake lever slide link and pull back spring.
14. Loosen hand brake cable clevis lock nut, remove clevis pin, clevis and lock nut.
15. Remove hand brake cable retainer clip at the No. 3 crossmember and open up cable at side of frame ahead of the No. 3 crossmember and pull cable through the crossmember.
16. Remove the bolts at top of No. 3 cross-member (2 each side, 9/16" wrench) attaching crossmember to frame.
17. Remove the one self-tapping screw attaching the brake control hand brake cable lever pivot hanger to the No. 4 cross-member (9/16" wrench).
18. Remove the bolt attaching the bell crank linkage support rod to the No. 3 cross-member (9/16" socket) and the bolt attaching the support rod to the frame side rail (1/2" socket).
19. Slide hand brake cable lever out of lever guide plate and move linkage to the rear of car allowing linkage to hang freely on brake cables.
20. Remove nuts, washers and "U" bolts attaching the front propeller shaft to the transmission companion flange. Use tape around both bearing cups to hold bearing cups and needle rollers in place and prevent entry of dirt. Wire end of propeller shaft to side rail to facilitate transmission removal.
21. Install Engine Holding Fixture J-4651 by positioning the "U" shape section around the engine oil pan and enter one adjusting hook in open hole in the frame just below the steering housing support and the other hook in the corresponding hole in the opposite frame rail, this will place the

fixture approximately 4" from rear end of engine oil pan.

22. Adjust fixture support hooks so that rear motor supports are raised 1/2" above the brackets on the No. 3 crossmember. Be sure support hooks are positioned properly in frame side rails and that the weight of the engine is supported by the engine holding fixture.
23. Remove the nuts, washers and bolts attaching the No. 3 crossmember to frame (4 each side, 9/16" socket).

CAUTION: Crossmember will drop when these eight screws are removed.

24. With No. 3 crossmember removed, lower engine approximately 1" by backing off engine holding fixture adjusting nuts; this will make the converter housing upper bolts accessible from underneath the car.

**NOTE:** The amount the engine can be moved depends upon the clearance between the engine oil pan and the center steering arm and tie rod ends. Do not allow engine weight to rest on center steering arm.

**NOTE:** These converter housing upper bolts can also be removed at the driver compartment by disconnecting the accelerator pedal and peeling the floor mat to one side to expose the two floor opening covers (held by sheet metal screws) and remove the two converter housing upper screws (A), Figure 139.

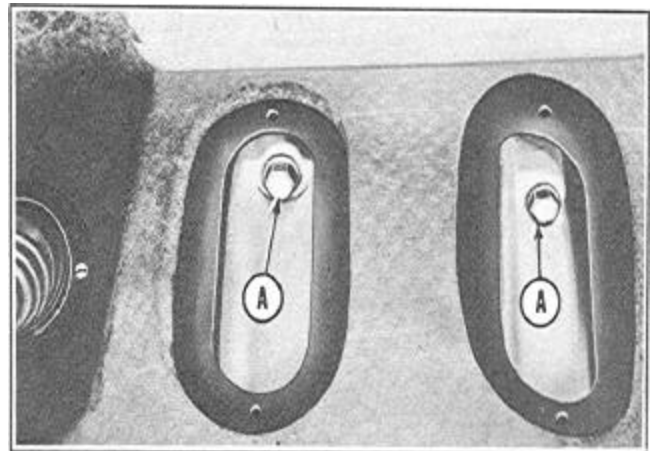


FIGURE 139

25. Remove the two transmission case to converter housing upper bolts (5/8" socket) and insert the two Pilot Studs J-4284 into the cap screw holes.
26. Using a suitable hydraulic hoist equipped with a transmission cradle and tilt table, position the jack so that weight of transmission case is supported by the jack and remove the two lower transmission case to converter housing stud nuts (11/16" box wrench).
27. With hydraulic jack cradle adjusted so transmission case is in alignment with converter housing, pull transmission with hydraulic hoist rearward to disengage the transmission from the converter housing and converter assembly.

**NOTE:** If the J-4287 Saddle is used, the transmission assembly can be removed by sliding it rearward on the saddle, while the hydraulic jack remains stationary, greatly facilitating removal and installation of the transmission.

**CAUTION:** If transmission sticks to converter housing, do not rock the transmission case. Use a small pry bar between rear end of oil pan flange and converter housing and carefully pry transmission away from converter housing.

28. The mainshaft oil transfer tube (2), Figure 135, must be removed from the converter if it does not come out when the transmission is removed. Use Snap. Ring Pliers KMO-630.
29. Remove converter housing right-hand lower bolt first, then with a 5/8" socket and universal with a 10" extension remove the (3) converter to engine upper bolts.

**NOTE:** The converter housing is doweled to the cylinder block and should be pulled rearward carefully to avoid damage to the dowels during removal. The dowels are located at the upper left hand bolt and the lower right hand bolt.

## **CONVERTER HOUSING**

### **INSTALLATION**

1. Clean the cylinder rear support plate and the machined faces of the converter housing.
2. Install the converter housing and engage the dowels using care not to damage the dowels or the converter.
3. Install the right-hand lower cap screw and the left-hand lower cap screw and tighten them finger tight.
4. Position the Converter Aligning Flange J-4286 into the bore of the converter housing and over the converter hub (front pump drive fingers on the converter assembly), Figure 140.

**NOTE:** Loosen the six nuts that attach the converter assembly to the crankshaft to converter drive plate (flywheel) to insure proper housing to converter alignment.

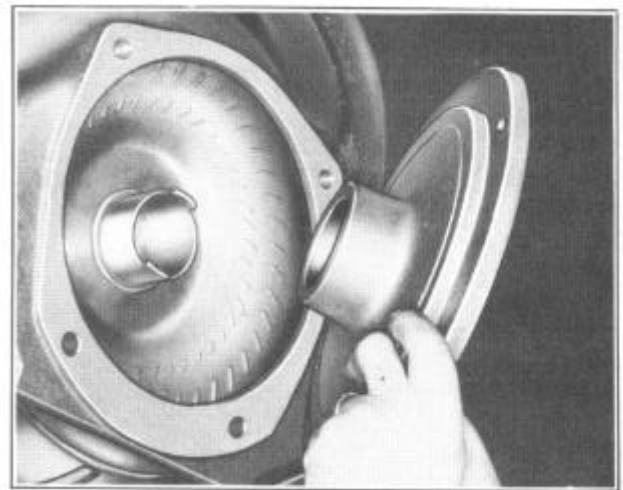


FIGURE 140

5. Install the two transmission bolts (1), Figure 141, to hold the aligning flange (2) in position.
6. Rotate the converter assembly through two complete revolutions to center the converter assembly.

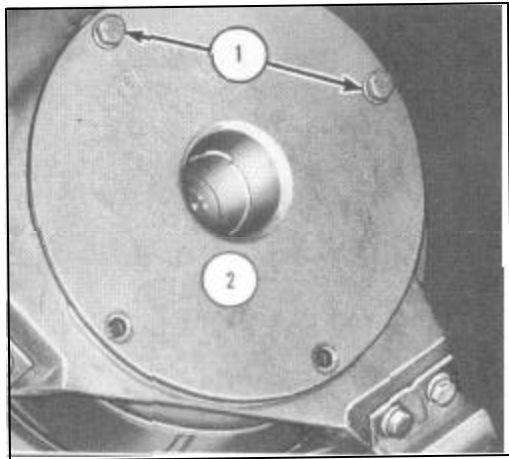


FIGURE 141

7. With the aligning flange in position, tighten the converter to converter drive plate attaching nuts to 23-28 foot pounds.
8. Install the remaining converter housing cap screws and tighten all cap screws.
9. Install the Spline Alignment Fixture J-4283 into the transmission to position the splines on the transmission shaft as outlined under "Transmission Installation", Page 78, Items 1 through 3 and install transmission as outlined under "Transmission Installation," Page 78.
10. Install converter housing dust pan (if previously removed).
11. Raise the engine approximately 1" with Engine Holding Fixture J4651, by adjusting the holding fixture hooks.
12. Position the No. 3 crossmember and install all of the attaching screws before tightening any screws, to assure proper alignment, tighten all screws to 25-30 foot pounds (9/16" socket).
13. Lower engine and install the rear motor support bolts at the No. 3 crossmember (2 each side, 5/8" socket).
14. Remove Engine Holding Fixture J-4651.
15. Install speedometer driven gear and speedometer cable.
16. Connect selector lever rod at transmission selector lever and secure in position with a cotter pin.
17. Connect governor control rod at governor control lever and install cotter pin.
18. Install hand brake cable and conduit at No. 3 crossmember and install cable retaining clip.
19. Move the propeller shaft into position and attach the propeller shaft to the transmission companion flange installing "U" bolts, lock washers and nuts.
20. Swing the brake control linkage forward, placing hand brake lever into lever guide plate and attaching the bell crank linkage support rod at the No. 3 crossmember (9/16" socket) and installing the attaching bolt at the frame side rail (1/2" socket).
21. Install one self-tapping screw attaching the brake control hand brake cable lever pivot hanger to the No. 4 crossmember.
22. Install hand brake cable clevis lock nut and clevis and attach the clevis to the slide link, install clevis pin and cotter pin.
23. Connect hand brake lever pull back spring.
24. Install starter motor, installing lower bolt (5/8" socket) but do not tighten at this time.
25. Install engine side pan (4 screws, 3/8" socket).
26. Install the breather pipe support clip at the right hand side of engine support plate.
27. Install breather pipe at the valve chamber cover and the converter housing clip.
28. Lower car and install the starter motor upper attaching bolt. Tighten the two bolts to 30-35 foot pounds.
29. Check selector rod and governor control rod adjustments. See "Adjustments", Page 88.

**NOTE: Cable must be entered over rear motor support, between motor support and transmission.**



## MAINTENANCE

### CHECKING FLUID LEVEL

1. With car on level floor, firmly apply parking brakes, set selector lever at "L" and run the engine at idling speed until it reaches the normal operating temperature.
2. If front floor carpet has an access opening for the transmission filler, remove two screws and take off cover. If access hole is not in carpet, loosen front floor carpet and mat and disconnect accelerator pedal. Roll away the left side of the carpet until the inspection hole cover (A) is exposed, Figure 142.

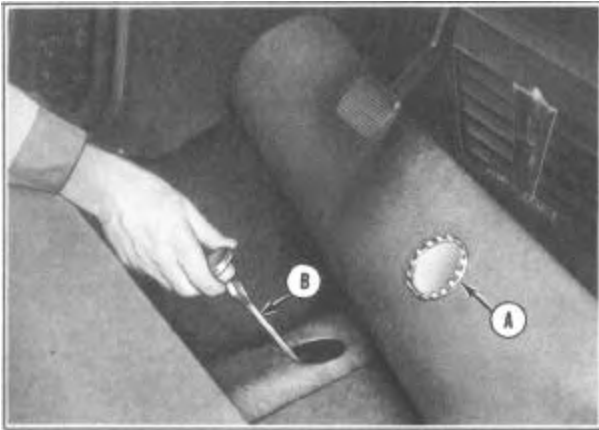


FIGURE 142

3. Remove inspection hole cover, clean the area around oil gauge cap and withdraw the gauge (B).
4. With the engine idling and selector lever in the "L" position, add oil to bring level up to the full mark. Use only Type "A" Automatic Transmission Fluid.

### DRAINING AND REFILLING

1. Apply parking brake firmly, set selector lever at "L" and idle engine until it reaches normal operating temperature.

2. Stop the engine, remove the transmission oil pan drain plug (A), Figure 143, at left side of transmission and drain transmission.

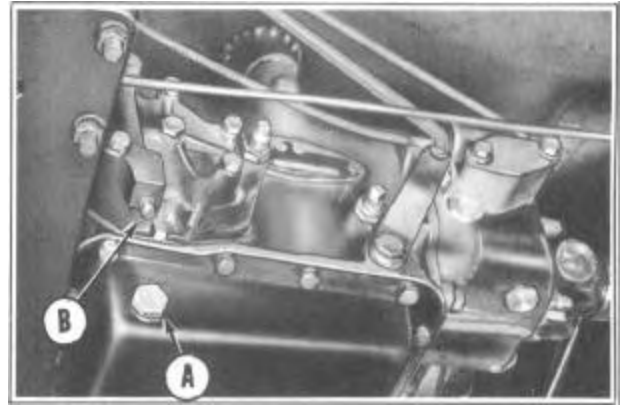


FIGURE 143

3. Rotate flywheel until converter drain plug appears at left hand side opening of converter housing and remove the converter drain plug (5/8" socket).
4. With converter drain plug removed, rotate flywheel until drain plug in converter is at bottom and remove converter pressure take-off plug (B), Figure 143; this plug is at the bottom of the reverse servo cylinder. The fluid will drain through the converter housing dust pan.
5. After the fluid has been drained, rotate the flywheel until the converter drain hole appears in the left side opening in the converter housing and install the converter drain plug. Install oil pan drain plug and converter pressure take-off plug.
6. Remove the inspection hole cover; clean the area around the filler cap and remove the filler cap and gauge.
7. Pour six quarts of Type "A" Automatic Transmission Fluid into the transmission through the transmission filler opening.

8. Start the engine and permit it to idle for one minute with the selector lever in the "L" position to transfer the fluid to the converter from the transmission case.
9. With engine still idling and the selector lever in the "L" position, slowly add enough Type "A" fluid to bring the level up to the full mark on the gauge. Approximately 11 quarts are required to refill the transmission and converter after draining.

### **ADJUSTMENTS**

#### **TRANSMISSION GOVERNOR CONTROL ROD ADJUSTMENT**

1. With the carburetor linkage properly adjusted and with the engine shut off, hold the throttle control bell crank operating rod so that the throttle is in the wide-open position. This is the point where any further movement would only result in operating the throttle rod overtravel spring.
2. Adjust length of governor control rod so when governor lever is held at the detent, the trunnion pin will enter the bell crank freely. (This detent is located at approximately 1-1/2 inches of rod travel from the rear. The resistance felt at 1/4 inch to 1/2 inch of travel is the governor spring pick-up and not the detent.) Tighten lock nuts securely, but do not install cotter pin at this time.

#### **ACCELERATOR PEDAL ROD ADJUSTMENT**

1. Hold accelerator pedal against its stop with pedal jack or other means.
2. With governor control rod pulled forward until the governor lever bottoms against its stop in the transmission, adjust the accelerator pedal rod length until the governor rod trunnion pin can be entered freely in the throttle bell crank.

**NOTE: On some Hornet Models, it may be**

**necessary to release the accelerator to facilitate adjustment; however, final check should be made with accelerator pedal against its stop, at which time the governor control lever should be at maximum travel.**

3. Tighten all lock nuts securely and install cotter pins.

Do not make any readjustment of the governor control rod trunnion to accommodate the accelerator pedal rod adjustment.

#### **SELECTOR LEVER ADJUSTMENT**

1. Check upper and lower control tube brackets and make sure they are securely tightened on the steering column jacket tube and that the selector lever tube is parallel with the jacket tube. Disconnect the transmission shift rod at the selector tube lower lever.
2. Place the selector control lever against the stop in the "D" position on the quadrant and the selector control shaft outer lever at the transmission in the "D" position (No. 3 detent on the selector valve) and adjust the transmission shift rod until the clevis pin freely enters the clevis of the selector rod and the hole in the selector control lower lever.

#### **NEUTRAL SAFETY SWITCH ADJUSTMENT**

1. Place the selector control lever in the "N" position.
2. Loosen the safety adjusting screw (this screw attaches the safety switch to the control shaft lower lever support bracket) and adjust switch so the starter will only operate when the control lever is in either the "P" or "N" detent position, but will not operate when the selector lever is moved from the "N" position to "D", "L", or "R" position.

## SERVO BAND ADJUSTMENTS

### REVERSE BAND (IN CAR OR ON BENCH)

1. Remove the cap screw (9/16" wrench) and copper gasket from the reverse servo cylinder. This is the pressure take-off point opposite the reverse band adjusting screw.

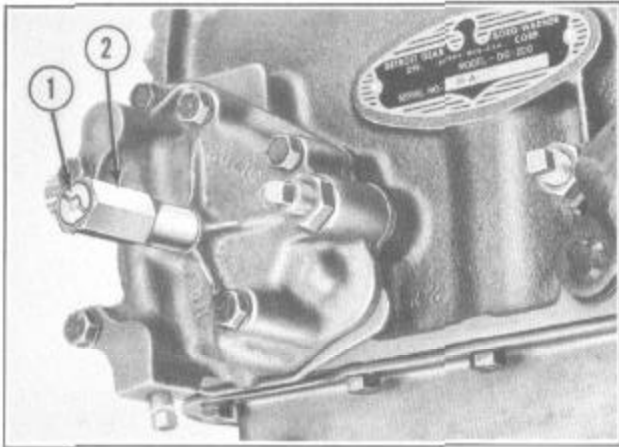


FIGURE 144

2. Carefully screw the Band Adjusting Tool J-4285 (1), Figure 144, into the pressure take-off hole, noting that the indicator plug (2) in the handle of the tool moves outward as the tool is screwed into the pressure take-off hole.

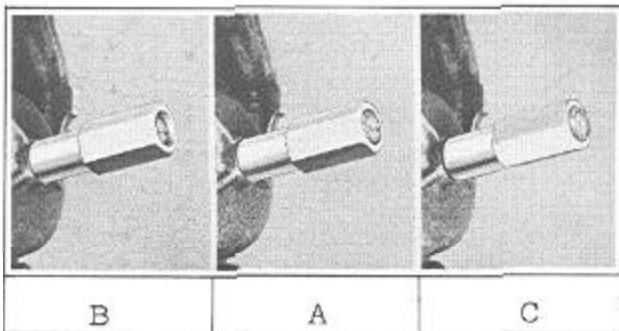


FIGURE 145

3. If, in screwing the tool into position, the indicator plug becomes flush with the end of the tool before the tool shoulder is against the servo cylinder screw boss, (C), Figure 145, the band adjustment is too tight;

backoff the band adjusting screw until the handle can be turned in fully and indicator is flush with indicator handle.

**CAUTION:** Screw the tool in only far enough so that the indicator plug (2), Figure 144, is flush with the end of the tool handle. If the tool is screwed against a tight band to the extent that the indicator plug is forced beyond the end of the tool handle, the tool may be damaged.

4. The band is properly adjusted when the indicator plug is flush with the end of the tool handle and when the tool shoulder rests against the servo cylinder screw boss, (A), Figure 145.
5. If the band adjusting tool is fully in place and the indicator plug is not flush with the end of the tool handle (B), Figure 145, loosen the lock nut on the band adjusting screw and turn the band adjusting screw in until the indicator plug in the tool handle is flush with the end of the handle (A).
6. After making proper adjustment, tighten the band adjusting screw lock nut to 40-50 foot pounds, making sure the adjusting screw does not turn.
7. Remove the band adjustment tool and install the cap screw, using a new copper gasket. Tighten the cap screw to 28-33 foot pounds.

### LOW BAND (TRANSMISSION ON BENCH)

1. Remove the cap screw (9/16" wrench) and copper gasket from the low servo cylinder. This is the pressure take-off point opposite the low servo band adjusting screw.
2. Install the Band Adjusting Tool J-4285 into the pressure take-off hole, Figure 146, and proceed with adjustment as outlined under "Reverse Band Adjustment", Operations 2 through 7.

LOW BAND (TRANSMISSION IN CAR)

- A. Loosen and back off the low band adjusting screw lock nut.
- B. Turn the low band adjusting screw in until the screw is snug.
- C. With the screw snug, back off the screw four complete turns and tighten lock nut to 40-50 foot pounds.

### FORWARD BAND (TRANSMISSION ON BENCH)

1. Remove the pressure take-off cap screw and gasket and install the Band Adjusting Tool J-4285, Figure 147.
2. Proceed with adjustment as outlined under "Reverse Band Adjustment", Page 89, Operations 2 through 7.

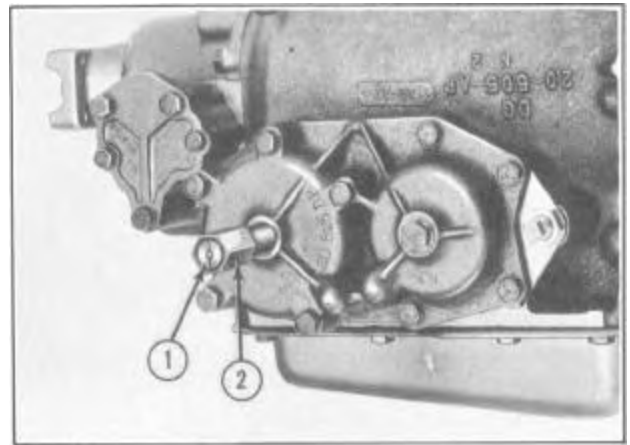


FIGURE 147

FORWARD BAND (TRANSMISSION IN CAR)

Proceed with adjustment as outlined under "Low Band Adjustment (Transmission in Car)", Page 90.

## REFERENCE

[illegible]

## TESTING AND DIAGNOSIS

This section contains procedures to be used when testing a Hudson car equipped with the Automatic Transmission. These checks and tests will determine the operating condition of the Automatic Transmission and any abnormal condition uncovered by these checks can be found with its possible causes and corrections under "Diagnosis", Page 99.

Before attempting any checks or tests, the transmission oil must be at normal operating temperature and at the proper level as outlined under "Draining and Refilling Transmission", Page 87.

**CAUTION:** When testing, with the selector lever in one of the driving positions and the rear wheels held stationary, ALL the energy delivered to the torque converter by the engine is changed to heat; therefore, THE ENGINE MUST NOT BE OPERATED AT HIGH SPEED FOR MORE THAN 10 SECONDS AT A TIME OR FOR A TOTAL TIME GREATER THAN ONE MINUTE IN ANY HALF HOUR PERIOD.

### SERVICE FLOOR CHECKS

#### 1. Check Fluid Level:

a. With car on level floor, firmly apply parking brakes, set selector lever at "L", and run the engine at idling speed until it reaches the normal operating temperatures.

b. If front floor carpet has an access opening for the transmission filler, remove 2 screws and take off cover. If access hole is not in carpet, loosen front floor carpet and mat and disconnect accelerator pedal. Roll away the left side of the carpet until the inspection hole cover is exposed, remove cover, wipe area around level gauge and cap clean and withdraw the oil level gauge. If the level indicated on the stick is below the full mark, add oil to bring it up to the mark. Use only Hudson Approved Automatic Transmission Fluid Type "A".

2. Engine Idle Speed: Adjust the idle speed to 490-510 R.P.M.
3. Neutral and Safety Switch: Operate the starter switch while the hand control selector lever is in each of its positions. The starter should operate only while the selector lever is in "P" or "N" position.
4. Selector Lever: Check position of selector lever on quadrant; when lever on quadrant is in the "D" position, selector lever on transmission must be in the "D" position. Check quadrant for proper indexing for each position. For proper method of adjustment, see "Selector Lever Adjustment", Page 88.

### STALL SPEED TESTS

**NOTE:** Stall test to be made only with the selector lever in the "L" (Low) position.

The stall speed is the maximum speed at which the engine can drive the torque converter impeller while the turbine is held stationary. Because the stall speed is dependent on engine characteristics as well as torque converter characteristics, it will vary with the condition of the engine as well as with the condition of the Automatic Transmission: Hence, it is necessary to determine the condition of the engine in order to interpret correctly a low stall speed.

Because an engine's performance at higher altitudes differs from its performance at lower altitudes, the stall speeds given below cannot be considered representative of stall speeds in regions of high altitudes. In such regions, representative stall speeds can be determined by testing several cars known to be normal.

With an engine in good condition and operating at sea level altitude, the normal stall speeds to be expected are:

232 Engine - 1350-1600 R.P.M.  
 262 Engine - 1450-1700 R.P.M.  
 308 Engine - 1600-1900 R.P.M.

**DRIVING UNITS**

	Park	Neutral	Drive First	Drive Intermediate	Drive Direct	Low	Reverse
Forward Band & Servo			Applied	Applied	Applied	Applied	Applied
Multiple Disc Clutch				Applied	Applied	Applied	
Low Band & Servo							Applied
Reverse Band & Servo					Applied		
Direct Drive Clutch					Locked		
Forward Drum Free Wheel	Free	Free	Locked	Locked	Locked	Locked	Free
Low Drum Free Wheel	Free	Free	Locked	Free	Free	Locked	Locked

**AUTOMATIC TRANSMISSION SHIFT POINTS IN MILES PER HOUR**

	Shift	Mile per hour
Light Throttle Upshift	1 - 2 2 - 3	10 - 12 22 - 24
Full Throttle Upshift (at the detent)	1 - 2 2 - 3	31 - 34 48 - 52
Full Throttle Upshift (through the detent)	1 - 2 2 - 3	43 - 46 70 - 75
Closed Throttle Downshift (coast down)	3 - 2 2 - 1	20 - 19 8 - 7
Downshift (kickdown - maximum)	3 - 2	65 - 60

**STALL TEST TO BE PERFORMED ONLY IN "L" RANGE**

Test Conditions	232 Engine 1340-1600 R.P.M.	Under 1350 Engine R.P.M.	Over 1600 Engine R.P.M.
	262 Engine 1450-1700 R.P.M.	Under 1450 Engine R.P.M.	Over 1700 Engine R.P.M.
	308 Engine 1600-1900 R.P.M.	Under 1600 Engine R.P.M.	Over 1900 Engine R.P.M.
With engine at normal operating temperature, selector lever in "L" position and hand and foot brake fully applied, operate engine at full throttle and note tachometer reading.	Normal.	Poor engine performance, such as need of tune-up, etc., or converter malfunction .	Transmission or converter slippage

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Connect a tachometer to the engine and place it where it can easily be read from the driver's seat. Set the hand brake. Start the engine, then shift the hand control selector lever to the "L" position. Apply the hand brakes so that the car will not move. Allow engine and transmission to warm up to operating temperature. Operate the engine at full throttle and note the tachometer reading.

**CAUTION: Do not operate the engine at high speed, while the selector lever is in one of the driving positions and the rear wheels held stationary, FOR MORE THAN 10 SECONDS AT A TIME OR FOR A TOTAL TIME GREATER THAN ONE MINUTE IN ANY HALF HOUR PERIOD.**

A stall speed of approximately 750-800 R.P.M. for the 232 Engine , 800-850 R.P.M. for the 262 Engine and 1050-1100 R.P.M. for the 308 Engine, if the engines are normal, is caused by slippage of the torque converter stator free wheel unit.

A stall speed higher than the normal speeds shown in the "Stall Test Chart", Page 92, is caused by slippage in the transmission or in the converter.

### FREE RUNNING TEST

Attach a tachometer to the engine and place the hand selector lever in the "P" position. Slowly accelerate the engine. If the tachometer reading reaches 4000 R.P.M. before wide-open throttle is obtained, release the accelerator immediately. (Running an engine under no load at speeds exceeding 4000 R.P.M. may result in damage.) This result indicates the stator is NOT stuck. It is freewheeling. If at wide-open throttle, the speed is 3900 R.P.M. or less, it would indicate the stator IS stuck. This test is not preferred to a thorough road test.

### OPERATION CHECKS

1. Multiple Disc Clutch: With the selector lever in "L" position, depress the accelerator to full throttle position and, when the car speed reaches approximately 15 M.P.H., shift the selector lever to "D" position. A definite upshift and engine slow down should be noticed.
2. Engine Braking: While driving the car at approximately 30 M.P.H. with the selector lever in "D" position, release the accelerator pedal and shift the selector lever from "D" position to "L" position. This should result in a rapid deceleration of the car and an increase in engine speed.
3. Shift Speeds: Make the shift speed checks with the selector lever in "D" position.
  - A. Light Throttle Upshift - From a standstill, accelerate the car gradually and note the speed at which the shifts from first to intermediate (second) and from intermediate drive to direct drive occur.
  - B. Closed Throttle Downshift (Coast Down) - With car speed above 25 M.P.H., release the accelerator pedal and allow the car to decelerate gradually and note the speed at which the downshifts from direct drive to intermediate and from intermediate to first occur.
  - C. Full Throttle Upshift (At the Detent) - From a standstill, depress and hold the accelerator pedal in the full throttle position (not in the kickdown position). Note the speed at which the shifts from first to intermediate and from intermediate to direct drive occur as the car accelerates.
  - D. Full Throttle Upshift (Through the Detent) - From a standstill, depress and hold the accelerator pedal in the full throttle position (through the detent in full kickdown position). Note the speed at which the transmission shifts from first to intermediate and from intermediate to direct drive as the car accelerates.
  - E. Kickdown Downshift - While driving the car at approximately 40 M.P.H., depress and hold the accelerator pedal in kickdown position. The transmission should shift immediately into intermediate drive range.
4. Direct Drive Clutch: While driving the car at approximately 25 M.P.H. with the hand control selector lever in "D" position, release the accelerator pedal and bring the car to a quick stop. As the speed of the

car decreases, the transmission should shift smoothly from direct drive to intermediate drive and the car should stop smoothly with no bucking of the engine or shuddering of the car.

5. Rear Pump and Parking and Reverse Interlocks: While driving the car at approximately 30 M.P.H., shift the hand control selector lever first to "P" position, then to "R" position, and back to "D" position. At this speed, while the selector lever is in "P" or "R" position, the car should roll freely forward and the transmission should seem to be in neutral.
6. "Rocking": With the car standing still, slowly move the hand control selector lever from "L" position to "R" position and back to "L" position several times while pressing lightly on the accelerator pedal. As the shifts are made, the car should "rock" backward and forward.
7. Parking Pawl: While the car is standing still on a grade, shift the hand control selector lever to "P" position. Release the brakes. The parking pawl should prevent the car from moving.

Following completely all of the above check and test procedures will disclose any condition of improper operation that might exist. The condition can then be found under "Diagnosis", Page 99, and causes listed under the condition will indicate the repairs or adjustments necessary.

### PRESSURE TESTS

A pressure test point is provided for testing each of the hydraulic units of the Automatic Transmission. The following procedures should be used when pressure tests are indicated by the "Diagnosis".

**NOTE:** For convenience of making these pressure tests, place the gauge on the floor panel of the driver's compartment and allow the gauge line to go through the oil level inspection opening to the transmission pressure take-off point.

### FRONT PUMP

1. With the engine stopped, remove the Allen head pipe plug at the transmission oil pan front flange, Figure 148, and install the pressure gauge fitting.

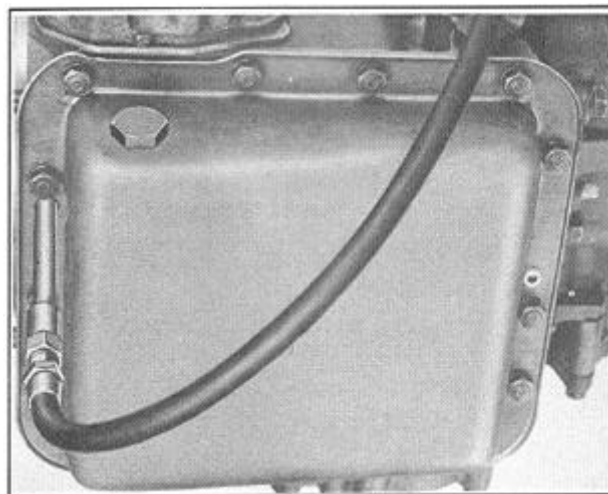


FIGURE 148

2. Connect a tachometer to the engine.
3. With the hand control selector lever in "P" or "N" position, start the engine and bring engine speed to 1800 R.P.M. At this engine speed, the gauge should show a minimum of 80 lbs. per square inch pressure.
4. Stop the engine. Remove the test equipment. Reinstall the Allen head pipe plug. DO NOT use any type of sealing compound when installing this or any other pipe plug in the transmission. Tighten plug to 15 to 18 foot pounds.

### FORWARD BAND SERVO

1. With the engine stopped, use a 9/16" wrench to remove the cap screw and copper washer from the forward servo cylinder, Figure 149. Install the proper pressure gauge fitting at this point.
2. Connect a tachometer to the engine.

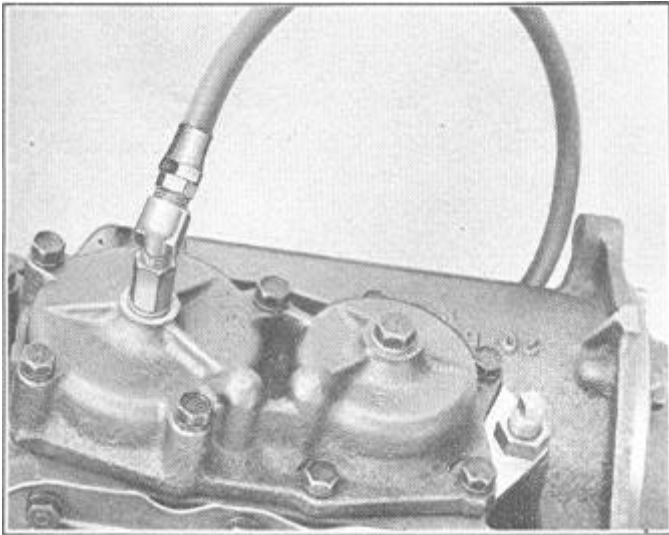


FIGURE 149

3. With the engine running, apply the parking brake and foot brake firmly to prevent movement of the car and move the hand control selector lever to "D" position. Gradually increase engine speed to 1000 R.P.M. At this speed, the gauge should show a minimum of 70 lbs. per square inch.

**CAUTION:** To prevent overheating of the transmission, the engine should not be run at speeds greater than idle speed with the selector lever in the "D", "L" or "R" position and with the rear wheels stationary for more than 30 SECONDS.

4. Stop the engine and remove the test equipment. Reinstall the cap screw in the forward servo cover, using a new copper gasket. DO NOT use any type of sealing compound, when installing this or any other cap screw or gasket in the Automatic Transmission. Tighten the cap screw to 28 to 33 foot pounds.

#### LOW BAND SERVO

1. With the engine stopped, use a 9/16" wrench to remove the cap screw and copper gasket from the low servo cylinder, Figure 150, and install the proper pressure gauge fitting at this point.

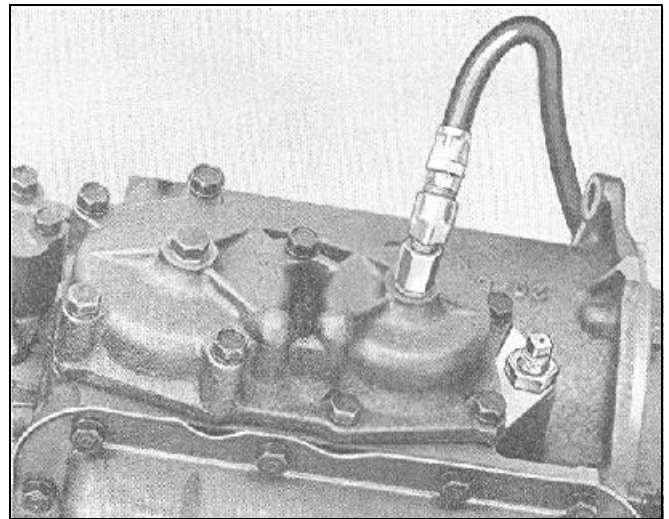


FIGURE 150

2. Connect a tachometer to the engine.
3. With the engine running and the parking brake and the foot brake firmly set to prevent movement of the car, place the hand control selector lever in "L" position. Increase the engine speed to 1000 R.P.M. At this speed, the gauge should show a minimum of 70 lbs. per square inch pressure.

**CAUTION :** To prevent overheating of the transmission, the engine should not be run at speeds greater than idle speed with the selector lever in the "D", "L" or "R" position and with the rear wheels stationary for more than 30 SECONDS.

4. Stop the engine and remove the test equipment. Reinstall the cap screw in the low servo cylinder, using a new copper gasket. Tighten the cap screw to 28 to 33 foot pounds.

#### REVERSE BAND SERVO

1. With the engine stopped, disconnect the transmission selector rod at the transmission selector lever. Move the selector control shaft lever, Figure 151, to "R" position.
2. With a 9/16" wrench, remove the cap screw and copper washer from the reverse servo cylinder and install the pressure gauge

fitting, Figure 151, at this point.

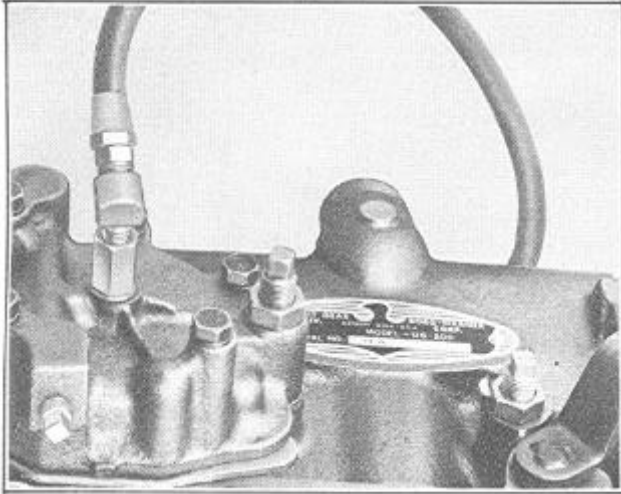


FIGURE 151

3. Connect a tachometer to the engine.
4. Before starting the engine, apply the parking brake and foot brake firmly to prevent movement of the car. Start the engine and increase engine speed to 1000 R.P.M. At this speed, the gauge should show a minimum of 180 lbs. per square inch pressure.

**CAUTION :** To prevent overheating of the transmission, the engine should not be run at speeds greater, than idle speed with the selector lever in the "D", "L" or "R" position and with the rear wheels stationary for more than 30 SECONDS.

5. Stop the engine and remove the test equipment. Re install the cap screw in the servo cylinder, using a copper gasket. Tighten the cap screw to 28 to 33 foot pounds. Install the selector rod at selector lever.

#### **MULTIPLE DISC CLUTCH**

1. With the engine stopped, remove the 1/8" pipe plug from the transmission extension case, Figure 152, and install the pressure gauge fitting.
2. Connect a tachometer to the engine.

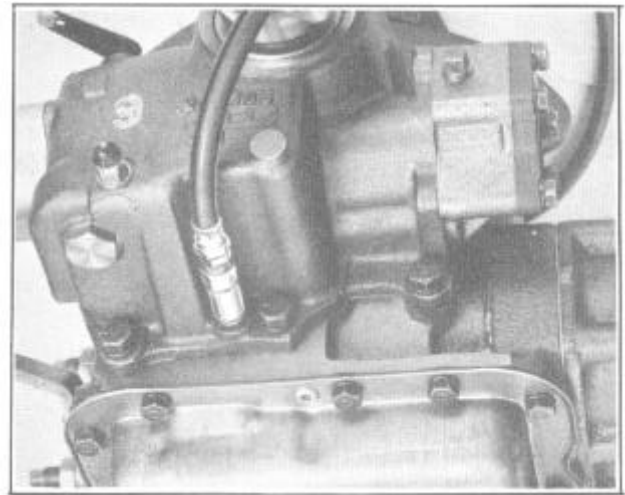


FIGURE 152

1. Place car on jacks and bring rear wheel speed up to 15 M.P.H. At this speed, the pressure gauge should show a minimum of 70 lbs. per square inch.

**CAUTION:** To prevent overheating of the transmission, the engine should not be run at speeds greater than idle speed with the hand control selector lever in the "D", "L" or "R" position and with the rear wheels stationary for more than 30 SECONDS.

2. Stop the engine, remove the test equipment, and reinstall the 1/8" pipe plug. Tighten the pipe plug to 15 to 18 foot pounds.

#### **TORQUE CONVERTER**

1. Remove the 1/8" pipe plug at the torque converter pressure take-off point, Figure 153.
2. Connect a tachometer to the engine.
3. With the selector control shaft lever in "N" position and the engine running at approximately 1000 R.P.M., the pressure reading should be 25 to 35 lbs. per square inch.
4. With the rear wheels jacked up and free to rotate, the selector control shaft lever in "D" position, and the engine running at 1500 R.P.M., the pressure should be 25 to 35 lbs. per square inch.

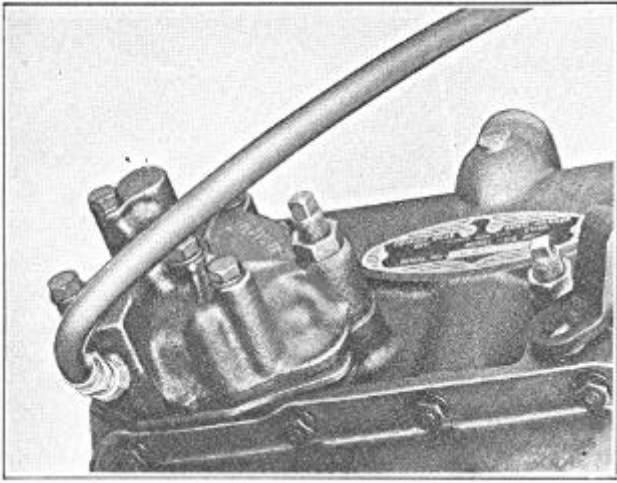


FIGURE 153

5. Stop the engine, remove the test equipment, and re install the 1/8" pipe plug. Tighten the pipe plug to 6 to 7 foot pounds.

#### DIRECT DRIVE CLUTCH

1. With the engine stopped, remove the Allen head pipe plug from the transmission oil pan rear flange, Figure 154, and install the pressure gauge fitting at this point.

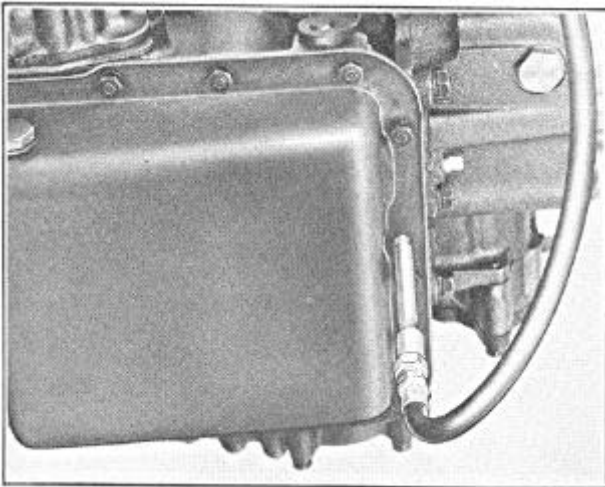


FIGURE 154

2. Connect a tachometer to the engine.
3. With the rear wheels of the car raised off the floor and free to rotate, and with the engine running at idle speed

shift the hand control selector lever to "D" position. The pressure gauge should show 0 lbs. per square inch pressure at the direct drive clutch.

4. Increase engine speed to 1500 R.P.M. At approximately 1200 R.P.M., the transmission should shift to direct drive. This will be indicated by a rapid pressure rise in the direct drive clutch. While in direct drive, the pressure gauge should show a minimum of 70 lbs. per square inch pressure.
5. Check the direct drive clutch pressure during deceleration. When the speedometer indicates approximately 10 to 12 miles per hour, the pressure should drop to zero (0).
6. Remove the test equipment and replace the Allen head pipe plug. Tighten the pipe plug 15 to 18 foot pounds.

#### REAR PUMP

1. With the engine stopped, remove the 1/4" pipe plug from the rear oil pump. Install the pressure gauge fitting in the rear pump (2), Figure 155.

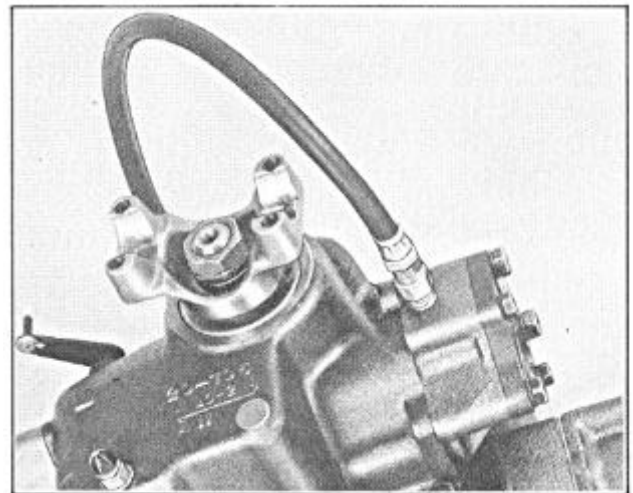


FIGURE 155

2. With the engine running and the rear wheels held stationary, the pressure gauge should show a reading of zero (0) lbs. per square inch pressure.

## 98 AUTOMATIC TRANSMISSION

3. With the engine running at idle, and the rear wheels raised from the floor and free to rotate, shift the hand control selector lever to "D" position. Rear pump pressure should build up as evidenced by a steady increase in pressure reading on the pressure gauge. At 20 miles per hour on the speedometer, the rear pump pressure should be a minimum of 70 lbs. per square inch.
4. Remove the test equipment and reinstall the pipe plug in the rear pump

## REFERENCE

[illegible]

## DIAGNOSIS

This diagnosis section comprises a list of abnormal conditions of operation which might be encountered by the serviceman.

Follow the procedure under "Testing the Car", to isolate the abnormal condition and perform the operations outlined under that specific condition. The description of the causes of the malfunction of the unit will indicate the corrective procedure to follow.

### **I. TRANSMISSION INOPERATIVE OR HAS EXCESSIVE SLIPPAGE AND ENGINE RACE IN ALL RANGES BELOW 25 M.P.H.**

1. Manual Control Linkage Disconnected or Improperly Adjusted.
2. Low Oil Supply - fill to proper level.
3. Converter Valve Sticking - check converter pressure and if pressure is zero or fluctuating between zero and 30 P.S.I., depending upon engine speed, it will be necessary to disassemble valve block and clean thoroughly, freeing up all valves.
4. Low Front Pump Pressure Due To:
  - A. Front pump relief valve or rear pump relief valve stuck open. Check front pump pressure and if this pressure is less than 70 P.S.I. at 500 engine R.P.M., transmission at normal operating temperature, remove valve block, thoroughly clean oil screen and clean and free up all valves.
  - B. Leakage in the valve block assembly.
  - C. Front pump worn excessively. A pressure check in neutral will determine this if valves in valve block are functioning normally.
  - D. Damaged front pump drive fingers on torque converter impeller.
  - E. Rear pump check valve out of position or check valve seat is damaged.

F. Oil leak in passage from front pump to valve block.

G. Valve block to front pump passage blocked.

H. Damaged or missing front pump "O" ring.

5. Free Wheel Assembly Damaged or Worn Excessively.

6. Broken Fins in Converter (Noisy).

7. Check All Band Adjustments and Servo Pressures.

8. Mainshaft Oil Transfer Tube Out of Place - remove transmission from converter and replace tube if necessary.

### **II. TRANSMISSION INOPERATIVE OR HAS EXCESSIVE SLIPPAGE AND ENGINE RACE IN LOW RANGE, DRIVE FIRST AND DRIVE SECOND.**

1. Forward Band Slipping:
  - A. Incorrect adjustment.
  - B. Lining worn excessively or band damaged.
  - C. Forward drive servo piston sticking.
  - D. Low pressure at forward drive servo unit because of a blocked passage.
2. Forward Drive Free Wheel Not Holding.

### **III. TRANSMISSION INOPERATIVE OR HAS EXCESSIVE SLIPPAGE AND ENGINE RACE IN REVERSE AND DRIVE FIRST.**

1. Reverse Band Slipping:
  - A. Incorrect band adjustment.

B. Low reverse servo pressure - check pressure . This pressure should not be less than 180 P.S.I. at 1000 engine R.P.M. with transmission at normal operating temperature, selector lever in reverse position. If pressure is low, disassemble the reverse servo and check for leaks caused by torn seal, blown gasket or cocked piston. If the servo is O.K., disassemble the valve block and check for leaks, sticking front pump relief valve, reverse interlock valve may be stuck in a position to drain the reverse servo, front pump ball check may be leaking or out of place, allowing front pump pressure to open the reverse interlock valve and drain the reverse servo.

C. Excessive wear of the front oil pump.

D. Sand hole in transmission case interconnecting passage to rear servo.

2. Damaged Reverse Free Wheel Unit.

**IV. NORMAL OPERATION IN DRIVE AND LOW RANGES WHEN ACCELERATING AND IN REVERSE, BUT INEFFECTIVE BRAKING AFTER DOWNSHIFTING INTO LOW (DECELERATION).**

1. Low Band Slipping:

A. Incorrect low band adjustment.

B. Low band damaged or excessively worn lining.

C. Low servo pressure (Low Servo). This pressure should be not less than 70 P.S.I. at 500 engine R.P.M., transmission at normal operating temperature, selector lever in Low position. If pressure is low, disassemble low servo and valve block to check for leaks.

D. Stuck low servo piston.

**V. EXCESSIVE SLIPPING DURING ACCELERATION IN INTERMEDIATE DRIVE, SELECTOR LEVER IN "D" RANGE.**

1. Multiple Disc Clutch Slipping:

A. Governor sticking.

B. Blocked oil passage to the multiple disc clutch.

C. Broken ring on rear unit ring gear.

D. Damaged or excessively worn disc facings.

E. Annular piston seal leaking or annular piston sticking.

F. "O" ring seal on rear unit ring gear defective.

G. Broken oil seal ring on front ring gear or on mainshaft.

H. Mainshaft inner oil transfer tube out of position.

**VI. TRANSMISSION FAILS TO SHIFT TO DIRECT DRIVE OR SLIPS AFTER DIRECT DRIVE CLUTCH IS ENGAGED - SELECTOR LEVER IN "D" (DRIVE) RANGE.**

1. Governor Operation Faulty:

A. Damaged governor, nicked governor shaft or nick on governor valve.

B. Governor sticking on the governor shaft.

C. Governor valve sticking.

2. High Converter Pressure Preventing Direct Drive Clutch Engagement:

A. Check direct drive clutch pressure. If direct drive clutch pressure is O.K., check converter pressure. If converter pressure is high, shift selector lever to "N" (neutral), if converter pressure is still high, the converter valve is stuck in the open position - Free up converter valve in valve block assembly.

B. If direct drive pressure comes up to main line pressure and then the pressure drops slowly and converter pressure increases, it indicates an oil leak past the direct drive clutch piston seals or a leaking transfer tube "O" ring seal - Replace converter.

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C. If direct drive pressure comes up quickly and stabilizes and converter pressure increases to line pressure, it indicates that the mainshaft lubricator valve assembly is loose and twisted out of position in the mainshaft - Replace mainshaft.

**3. Improper Direct Drive Clutch Operation:**

A. Sticking or distorted direct drive clutch piston.

B. Clutch wear.

C. Broken oil seal rings, either on main-shaft or front ring gear shaft.

**4. Direct Drive Clutch Hub Sticking On Main-shaft Splines.**

**5. Blocked Direct Drive Oil Passage In Front Oil Pump Collector Ring.**

**VII. ENGINE CANNOT BE CRANKED BY PUSHING CAR, ALSO REVERSE AND PARK INTER-LOCKS DO NOT OPERATE.**

**1. Rear Pump Pressure Low:**

A. Relief valve stuck open.

B. Worn or damaged rear pump.

C. Worn or damaged rear pump drive gear.

D. Rear pump drive gear pin sheared.

E. Incorrectly assembled valve block.

F. Valve block gaskets leaking.

G. Porous valve block castings.

H. Extension case gaskets leaking.

I. Porous extension case castings.

J. Blocked rear pump passage to valve block.

**VIII. CAR ROLLS FREE WHILE SELECTOR LEVER IS IN THE "P" POSITION.**

**1. Parking Pawl Does Not Engage:**

A. Parking interlock piston sticking.

B. Incorrect adjustment of the parking pawl linkage.

C. Parking pawl or linkage binding or broken.

D. Extension case misaligned on transmission case, binding interlock piston.

E. Ball check in valve body leaking - Check pressure at rear pump, car stationary.

**IX. ENGINE LABORS OR STALLS WHEN THE SELECTOR LEVER IS SHIFTED TO THE "D" POSITION FROM "P" OR "N".**

**1. Improper Governor Operation:**

A. Governor valve stuck in the open position, allowing oil to go to the direct clutch. (Governor control detent piston sticking.)

B. Governor binding or sticking on valve shaft.

C. Blocked governor valve drain passage.

D. Governor valve sleeve out of position in the extension case.

**2. Oil Leak From The Converter Pressure Line To The Direct Drive Clutch. (Damaged mainshaft oil seal rings or front planetary set ring gear oil seal rings.)**

**X. TRANSMISSION OPERATES NORMALLY IN LOW AND REVERSE, BUT ENGINE LABORS OR STALLS WHEN SELECTOR LEVER IS PLACED IN THE "D" POSITION.**

**1. Check Direct Drive Clutch Oil Pressure:**

A. With car stationary, move selector lever to "D", pressure should remain at zero.

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B. If any direct clutch oil pressure is noted, inspect the governor valve and bushing for leaks, damage or binding.

C. If the condition still exists, inspect the mainshaft and front ring gear oil seal rings for damage.

D. Check front ring gear's distance from end of mainshaft to insure correct positioning. This should be 1-3/16".

E. If after performing the above operations, the condition still exists, the converter should be replaced.

**XI. TRANSMISSION OPERATES NORMALLY WHEN STARTING IN DRIVE, LOW AND REVERSE, BUT SHUDDERS OR STALLS WHEN COMING TO A STOP IN DRIVE RANGE.**

1. Accelerator Pedal to Governor Lever Linkage Improperly Adjusted.

2. Improper Governor Valve Operation:

A. Damaged governor.

B. Governor sticking on the governor shaft.

C. Governor valve sticking open.

3. Damaged Mainshaft Oil Seal Rings or Damaged Front Ring Gear Oil Seal Rings.

4. No Groove On End Of Mainshaft Oil Transfer Tube.

5. Sticking Direct Drive Clutch Plate - Check mainshaft splines for burrs or damage.

6. Governor Valve Drain Not Open.

7. If Operations 1 Through 6 Does Not Correct The Complaint, Replace The Converter Assembly.

**XII. TRANSMISSION OPERATES NORMALLY IN ALL RANGES, BUT WILL NOT DOWNSHIFT AT KICKDOWN BETWEEN SPEEDS OF 19-60 M.P.H.**

1. Accelerator Linkage Improperly Adjusted.

2. Improper Governor Valve Operation:

A. Damaged governor.

B. Governor assembly sticking on governor shaft splines - Free up governor on splines throughout full governor travel.

C. Governor control detent piston sticking.

D. Blocked governor valve drain passage.

E. Governor control cam stop screw not adjusted properly.

F. Direct Drive control pawl damaged or inoperative.

3. High Oil Level.

**XIII. TRANSMISSION OPERATES NORMALLY STARTING IN DRIVE, LOW AND REVERSE, BUT WILL NOT SHIFT INTO DIRECT, OR SHIFT IS DELAYED.**

1. Accelerator Linkage Improperly Adjusted.

2. Selector Lever Linkage Improperly Adjusted.

3. High Oil Level.

4. Check Converter Pressure - This pressure should not be over 35 P.S.I. If pressure is higher than 35 P.S.I., remove the valve block and free up the converter valve.

5. With Rear Wheels Raised Or With Car On Tacks, Check The Direct Drive Clutch Pressure - If this pressure is lower than 70-75 P.S.I., at 1500 engine R.P.M.:

A. Check valve block and front pump and collector ring gaskets.

B. Check mainshaft oil transfer tube.

C. Check to see that the mainshaft oil transfer tube is in position.

6. If The Pressure Check Is O.K. In Operation No. 4 - Check Converter Pressure.

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- A. If converter pressure increases to 70 P.S.I., the lubricator valve in main-shaft is out of position or loose - Replace main-shaft if this condition exists.
7. If Converter Pressure Increases Gradually In 6 Above - Replace converter.

**XIV. TRANSMISSION OPERATES NORMALLY IN LOW RANGE, DIRECT, AND REVERSE, BUT SLIPS EXCESSIVELY IN DRIVE RANGE ABOVE 12 M.P.H. AND CONTINUES TO DRIVE IN FIRST.**

1. Second Speed Multiple Clutch Pressure Low:

A. Check clutch pressure with selector lever in the "D" position, car on jacks and rear wheels speed above 12 M.P.H. If clutch pressure is lower than line pressure by over 10 P.S.I., disassemble the low brake drum and multiple disc clutch assembly and inspect for leaks and damage to the clutch plates.
2. Check Mainshaft Oil Seals and Oil Seal Rings For Damage.
3. Check Mainshaft Inner Oil Transfer Tube.
4. The Stator Reaction Hub Has Turned In The Front Pump Collector Ring, Blocking Off The Passage To The Multiple Disc Clutch, Preventing This Clutch From Engaging.

**XV. SLIPPING EXCESSIVELY IN DRIVE - FIRST.**

1. Check Fluid Level.
2. Adjust Manual Linkage.
3. Forward Drive Band Slipping:

A. Incorrect adjustment.

B. Damaged or excessively worn lining.

C. Stuck forward servo piston

D. Low pressure at forward servo be - cause of a blocked passage.

E. Forward servo piston seal leaking. Check oil pressure. If pressure is low, check front pump pressure.

F. If front pump operation is low, check front pump relief valve assembly.

4. Forward Drive Free Wheel Unit Slipping.

**XVI. TRANSMISSION SHUDDERS ON ACCELERATION OR DECELERATION WHEN IN DIRECT, BUT THIS CONDITION DISAPPEARS WHEN IN SECOND, LOW, REVERSE, OR NEUTRAL.**

1. Transmission Rear Free Wheel Spacer Is Seizing On The Rear Sun Gear:

A. Check for proper clearance and replace spacer if necessary.
2. Transmission Forward Brake Drum Bushing Is Seizing On The Rear Sun Gear:

A. Check for proper clearance. If clearance is insufficient, replace with new forward brake drum assembly.
3. Check All Bushings For Proper Clearance.

**XVII. WHEN SELECTOR LEVER IS MOVED TO "R" (REVERSE), TRANSMISSION SHIFTS INTO REVERSE IMMEDIATELY AT SPEEDS ABOVE 10 MILES PER HOUR.**

1. Rear Oil Pump Inoperative: A. Check oil pump pressure.
2. Reverse Interlock Valve Inoperative:

A. Interlock valve sticking.

B. Blocked reverse interlock valve oil passage.

**XVIII. PARKING PAWL ENGAGES OR RATCHETS WHEN SELECTOR LEVER IS SHIFTED TO "P" (PARK) AT SPEEDS GREATER THAN 5 M.P.H.**

1. Rear Pump Inoperative:

A. Check oil pump pressure.
  2. Parking Pawl Piston Inoperative:

A. Oil passage to parking pawl interlock piston blocked or not drilled.

B. Parking pawl interlock piston sticking.
-

**XIX. NORMAL REVERSE OPERATION-TRANSMISSION OVERHEATS, POOR ENGINE PERFORMANCE AND ENGINE LABORING IN FORWARD RANGES.****1. Reverse Band Drag:**

- A. Check reverse band oil pressure.
- B. Leaking valve block assembly gasket.
- C. Valve block casting porous.
- D. Check reverse band adjustment.
- E. Reverse servo piston sticking.
- F. Reverse band damaged or distorted.

**XX. NORMAL LOW OPERATION - TRANSMISSION OVERHEATING WITH POOR ENGINE PERFORMANCE AND ENGINE LABORING IN OTHER RANGES.****1. Low Band Drag:**

- A. Check low band pressure.
- B. Leaking valve block assembly gaskets.
- C. Valve block casting porous.
- D. Incorrect band adjustment.
- E. Low servo piston sticking.
- F. Low band damaged or distorted.
- G. Leaks between low and forward servo cylinders (outer).
- H. Leaks between low and forward servo cylinders in transmission case (inner).

**XXI. NORMAL, LOW AND FORWARD OPERATION - POOR ENGINE PERFORMANCE WITH ENGINE LABORING IN REVERSE.****1. Forward Band Drag:**

- A. Incorrect band adjustment.
- B. Check forward band pressure.
- C. Leaking valve block gasket.
- D. Porous valve block casting.
- E. Forward servo piston sticking.
- F. Forward band damaged or distorted.

**XXII. NORMAL OPERATION IN DRIVE RANGE ABOVE 12 M.P.H. - POOR PERFORMANCE, TRANSMISSION OVERHEATING, ENGINE LABORING IN OTHER RANGES.****1. Multiple Disc Clutch Dragging:**

- A. Check multiple disc clutch pressure.
- B. Leaking valve block gaskets.
- C. Porous valve block casting.
- D. Multiple disc clutch piston sticking.
- E. Broken or damaged multiple disc clutch release springs.

**XXIII. NORMAL OPERATION IN DIRECT DRIVE - POOR PERFORMANCE, WITH ENGINE LABORING IN OTHER RANGES - LOW STALL SPEED.**

- 1. Stator Reaction Hub Loose In Front Pump and Collector Ring Assembly - Replace front pump and collector ring assembly.
- 2. Torque Converter Stator Free Wheel Unit Slipping - Replace converter.

**XXIV. NORMAL OPERATION AT LOW SPEEDS-POOR PERFORMANCE, WITH TRANSMISSION OVERHEATING, IN DIRECT DRIVE - STALL SPEED NORMAL. FREE ENGINE SPEED LOW.**

- 1. Torque Converter Stator Free Wheel Unit Sticking - replace converter.

**XXV. CAR OPERATES IN ALL RANGES, BUT HAS LOW STALL SPEED, LOSS OF PERFORMANCE AND LOW TOP SPEED IN DIRECT, EXCESSIVE TRANSMISSION HEATING.**

- 1. Converter Stator Free Wheel Assembled Incorrectly Or Damaged:
  - A. Replace converter.

**XXVI. TRANSMISSION OPERATES NORMALLY IN ALL SPEED RANGES, BUT WHINING NOISE IS NOTICED WHEN CAR IS MOVING AND NOISE INCREASES WITH CAR SPEED. NOISE CANNOT BE HEARD WHEN CAR IS STATIONARY AND SELECTOR LEVER IS IN DRIVE POSITION.**

- 1. Usually Indicates Noisy Rear Pump:
  - A. Replace rear pump assembly if noise is excessive and objectionable. Do not

confuse rear pump noise with rear axle or tire noise . Check pump operation with rear wheels raised. Rear pump noise can be distinguished from axle noise as no variation will be noticed between drive , float or coast operations.

2. Check Oil Level.
3. Check Oil Intake Screen:
  - A. If clogged, clean or replace.
4. Check Rear Pump Cover Gasket For Leaks.

**XXVII. TRANSMISSION HAS BUZZING NOISE AT ANY SPEED AND WITH SELECTOR LEVER ON QUADRANT IN ANY POSITION.**

1. Check Linkage Adjustments.
2. Transmission Low On Oil.
3. Transmission Oil Pump Screen Clogged With Lint and Dirt.
4. Front Oil Pump Sucking Air:
  - A. Check pump gaskets.
  - B. Check porosity in pump castings.
5. On Transmissions Below Serial No. 7118, Replace The Front And Rear Pump Relief Valve Body.

**XXVIII. TRANSMISSION OPERATES NORMALLY IN ALL SPEED RANGES, BUT A WHINING NOISE IS PRESENT AT ALL TIMES AND INCREASES WITH ENGINE SPEED WHEN CAR IS STATIONARY AND SELECTOR LEVER IS IN THE NEUTRAL POSITION.**

1. Usually Indicates A Noisy Front Pump.
2. Check Oil Level.
3. Check Oil Intake Screen:
  - A. May be clogged with lint and dust.

**ABNORMAL EXTERNAL FLUID  
LEAKS**

**XXIX. FLUID LEAK BETWEEN THE TRANSMISSION AND THE TORQUE CONVERTER.**

1. Front pump oil seal damaged by front pump drive fingers.
2. Leaking collector ring gasket.
3. Leaking front pump-and-collector ring assembly.
4. Leaking torque converter.

**XXX. FLUID LEAK AT SERVO CYLINDERS.**

1. Damaged gaskets.
2. Uneven or warped gasket surfaces
3. Sand holes in castings.

**XXXI. FLUID LEAK AT EXTENSION CASE.**

1. Damaged gaskets.
2. Uneven or warped gasket surfaces.
3. Sand holes in castings.
4. Improperly seated governor control shaft bushing.
5. Leak at governor control cam stop screw.

**XXXII. FLUID LEAK AT SELECTOR CONTROL SHAFT.**

1. Damaged selector control shaft "O" ring seal.
2. Bore out-of-round or diameter of bore too large.
3. Damaged selector control shaft oil seal.

**XXXIII. FLUID LEAK AT TRANSMISSION OIL-PAN.**

1. Damaged gasket.
2. Uneven or warped gasket surfaces.

## TORQUE SPECIFICATIONS

LOCATION	SIZE	TORQUE FT. LBS.
Converter Housing to engine Rear Plate Screw	7/16-14 x 4"	40-50
Converter Impeller Assembly Drain Plug	3/8-24	25-35
Converter to Converter Drive Plate (Flywheel) Nut	3/8-24	23-28
Converter Valve Body to Manifold Screw	1/4-20 x 1-1/4"	6-8
Converter Valve Body to Manifold Screw	1/4-20 x 1-1/2"	6-8
Detent Cam Adjustment Nut	1/4-20	14-17
Detent Cam Adjustment Palnut	1/4-20	3-4
Detent Cam to Shaft Set Screw	#10-32 x 3/16"	3-4
Engine Rear Mounting to Frame Screw	7/16-20 x 7/8"	40-45
Engine Rear Mounting to Converter Housing Screw	7/16-14 x 1-1/8"	40-50
Extension Case Detent Cam Adjustment Screw	1/4-20 x 1-1/4"	0
Extension Case Plug	1/8-27	8-10
Extension Case to Transmission Case Screw	3/8-16 x 1"	28-33
Extension Case to Transmission Case Screw	3/8-16 x 2-1/4"	28-33
Extension Case to Transmission Case Screw	3/8-16 x 3"	28-33
Front Pump to Collector Ring Screw	1/4-20 x 1-3/4"	10-12
Front Pump to Collector Ring Screw	5/16-18 x 7/8"	15-18
Front Pump to Collector Ring Screw	5/16-18 x 1-1/2"	15-18
Front Pump and Collector Ring to Case Screw	5/16-18 x 3/4"	15-18
Front Pump and Collector Ring to Case Screw	5/16-18 x 1-1/4"	15-18
Front Relief Valve and Converter Valve to Manifold Screw.	1/4-20 x 2"	6-8
Governor Adjusting Shaft Bushing	9/16-18	25-30
Governor Adjusting Shaft Lever Screw	#10-24 x 1"	3-4
Governor Stop to Extension Case Screw	1/4-20 x 5/8"	6-8
Lever to Selector Control Shaft Nut	5/16-24	6-8
Low and Forward Servo Cylinder to Case Screw	5/16-18 x 1"	15-18
Low and Forward Servo Cylinder to Case Screw	5/16-18 x 2"	15-18
Low and Forward Servo Cylinder to Case Screw (Adjust. and Gauge Ports)	3/8-16 x 1/2"	28-33
Oil Pan Drain Plug	5/8-18 x 3/8"	35-45
Oil Pan to Transmission Case Screws	5/16-18 x 1/2"	10-13
Oil Pan to Transmission Case Screws	5/16-18 x 5/8"	10-13
Parking Brake Actuating Rod Jam Nut	1/4-28	3-4
Pump Cover to Rear Pump Body Screw	1/4-20 x 3/4"	6-8
Rear Pump Body to Extension Case Screw	5/16-18 x 2-1/4"	15-18
Rear Pump Assembly Plug	1/4-18	6-7
Relief Valve Body to Cony. Valve Body Screw (eight)	1/4-20 x 2-3/8"	6-8
Reverse Brake Cylinder Plug	1/8-27	15-18
Reverse Cylinder to Case Screw	5/16-18 x 1"	15-18
Reverse Cylinder to Case Screw	5/16-18 x 2-1/4"	15-18
Reverse Cylinder to Case Screw (two)	5/16-18 x 2"	10-13
Reverse Cylinder to Case Screw (three)	5/16-18 x 2-3/4"	10-13
Reverse Servo Cylinder Screw (Adjust. and Gauge Port)	3/8-16 x 1/2"	28-33
Servo Band Adjusting Screw Nut	1/2-20	40-50
Speed. Housing and Cover to Extension Case Screws (two)	5/16-18 x 2"	10-13
Transmission Case to Converter Housing Stud	7/16-14 & 7/16-20	35-40
Transmission Case Plug	1/8-27	8-10
Transmission to Converter Housing Screw	7/16-14 x 1-1/2"	23-28
Transmission to Converter Housing Nut	7/16-20	23-28
Universal Joint Flange Nut	3/4-16	90-100
Valve Block Assembly to Case Screw	5/16-18 x 1-1/8"	10-13
Valve Block Assembly to Case Screw	5/16-18 x 1-7/8"	10-13

**DECIMAL EQUIVALENTS**

64 <sup>THS</sup>	32 <sup>NDS</sup>	16 <sup>THS</sup>	8 <sup>THS</sup>	
1				.015625
2	1			.03125
3				.046875
4	2	1		.0625
5				.078125
6	3			.09375
7				.109375
8	4	2	1	.125
9				.140625
10	5			.15625
11				.171875
12	6	3		.1875
13				.203125
14	7			.21875
15				.234375
16	8	4	2	.25
17				.265625
18	9			.28125
19				.296875
20	10	5		.3125
21				.328125
22	11			.34375
23				.359375
24	12	6	3	.375
25				.390625
26	13			.40625
27				.421875
28	14	7		.4375
29				.453125
30	15			.46875
31				.484375
32	16	8	4	.5

64 <sup>THS</sup>	32 <sup>NDS</sup>	16 <sup>THS</sup>	8 <sup>THS</sup>	
33				.515625
34	17			.53125
35				.546875
36	18	9		.5625
37				.578125
38	19			.59375
39				.609375
40	20	10	5	.625
41				.640625
42	21			.65625
43				.671875
44	22	11		.6875
45				.703125
46	23			.71875
47				.734375
48	24	12	6	.75
49				.765625
50	25			.78125
51				.796875
52	26	13		.8125
53				.828125
54	27			.84375
55				.859375
56	28	14	7	.875
57				.890625
58	29			.90625
59				.921875
60	30	15		.9375
61				.953125
62	31			.96875
63				.984375
64	32	16	8	1.

[illegible]



