Section XI

TRANSMISSION TORQUEFLITE

CONTENTS

Section XI

TRANSMISSION
TORQUEFLITE

DATA AND SPECIFICATIONS

MODELS	LC-1, LC-2, LC-3, LY-1
Type	Automatic Three Speed with Torque Converter
Oil Capacity of Transmission and Torque Converter	Refer to Lubrication Section of this manual
Lubrication	Pump (Rotor Type)
Number of Rear Clutch Plates—Discs (each)	5*
Number of Front Clutch Plates	3
Number of Front Clutch Discs	4
GEAR RATIOS	
1—Low	2.45 to 1
2—Second	1.45 to 1
D—Drive	1.00 to 1
R—Reverse	2.20 to 1
N—Neutral	———
FRONT—REAR PUMPS	
Type	Gear (Rotary)
End Clearance (Front Pump)	.001 to .0025 inch
End Clearance (Rear Pump)	.001 to .0025 inch
THRUST WASHERS	
Input Shaft	.115 to .117 inch (Natural) .097 to .099 inch (Black) .078 to .080 inch (Red) .059 to .061 inch (Orange)
Front Clutch and Sun Gear	.062 to .064 inch
Output Shaft	.062 to .064 inch
SNAP RINGS	
Kickdown Annulus Gear	.060 to .062 inch .064 to .066 inch
Rear Clutch	.060 to .062 inch
Low-Reverse Planet Pinion Carrier	.060 to .062 inch .064 to .066 inch .068 to .070 inch
Front Clutch	.060 to .062 inch

*4 on LC-1, LC-2

TORQUE CONVERTER

DATA AND SPECIFICATIONS

Torque Converter Model	Application	Ratio	Size (In.)	Cooling	Stud Size (In.)	Stud Nut Size (In.)
A-522	LY-1 LC-3 LC-3S	2.3	12½	Water—Heat Exchanger	7/16-20 (AM. NAT. THD.) NUT END	7/16-20 UNF (5/8 across flats)
A-521-2*	LC-1 LC-2	2.2	11¾		7/16-14 (AM. NAT. THD.) STUD END	

*Supersedes A-363

TIGHTENING REFERENCE TORQUEFLITE TRANSMISSION

Part Name	Foot-Pounds Torque
Accumulator Cover Screws	14—16
Band Lever Shaft Plug	30—35
Crossmember to Frame Bolts	50—55
Engine Rear Support Insulator Nuts	30—35
Extension to Transmission Case Screws	25—30
Filler Tube Nut	35—40
Front Oil Pump Housing to Transmission Case Screws	14—16
Oil Strainer Elbow Screws	14—16
Front Universal Joint Nut	33—37
Governor Body to Governor Support Screws	6—8
Governor Locating Screw	5—7
Governor Oil Pressure Take-Off Plug	10—12
Intermediate Support Locating Screws	25—30
Kickdown Band Adjusting Screw Nut	30—35
Low-Reverse Band Adjusting Screw Nut	35—40
Manual Valve Control Cable Housing Screws	14—16
Neutral Starter Switch	15—20
Oil Pan Screws	12—17
Oil Pressure Line Take-Off	10—12
Output Shaft Support to Transmission Case Screw	25—30
Transmission Case to Reaction Shaft Screws	30—35

TIGHTENING REFERENCE (Cont'd)

TORQUEFLITE TRANSMISSION

Part Name	Foot-Pounds Torque
Propeller Shaft Flange Nut	175
Rear Oil Pump Housing to Support Screws	10—12
Speedometer Pinion Sleeve Assembly	40—45
Transfer Plate to Transmission Case Screw	14—16
Torque Converter Control Valve Retainer	35—40
Torque Converter Drain Plug	10—12
Torque Converter Housing to Adaptor Screws	25—30
Torque Converter Oil Cooler Line Fitting	10—12
Transmission Case to Torque Converter Housing Screws	45—50
Transmission Regulator Valve Retainer	45—50
Valve Bodies to Transfer Valve Retainer	50—60*

*(Inch Pounds)

TORQUE CONVERTER

TIGHTENING REFERENCE

Item	Thread Size (Inches)	Foot-Pounds Torque
Block to Threaded Aluminum Plate Bolt	3/8—16	30
Block to Threaded Aluminum Plate Bolt	7/16—14	45
Converter Housing and Plate to Threaded Block Bolt	3/8—16	30
Converter Housing and Plate to Threaded Block Bolt	7/16—14	50
Converter Housing to Aluminum Plate Bolt	3/8—16	30
Plate to Threaded Block Bolt	3/8—16	30
Plate to Threaded Converter Housing Bolt	3/8—16	30
Crankshaft Stud Nut	7/16—20	55
Converter Drain Plug	1/8 N.P.T.	10
Housing Dust Cover Bolt	5/16—18	15
Housing Dust Cover Bolt	1/4—20	10
Drive Flange Stud	7/16—14	35

SPECIAL TOOLS

TORQUEFLITE TRANSMISSION

C-452	Puller
C-484	Pliers
C-589	Wrench
C-748	Puller
C-760	Pliers
C-811	Wrench
C-3203A	Jack (includes Adaptor C-3502)
C-3204	Driver
C-3205	Driver
C-3275	Driver
C-3276	Pilots
C-3278	Driver
C-3280	Stand
C-3281	Wrench
C-3283	Pilots
C-3288	Pilots
C-3292	Gauge
C-3293	Gauge
C-3301	Pliers
C-3335	Straight edge
C-3339	Set-Dial Indicator
C-3380	Wrench (Torque)
C-3461	Fixture
C-3487	Support
C-3527	Gauge—Overrunning Clutch Assembly
C-3528	Stand—(pair) Valve Body Holding
C-3529	Fixture—Compressing Servo Reverse and Kickdown Spring (supersedes C-3289 which can be converted to C-3529)
C-3531	Tool—Remover and Installer Reaction Shaft (supersedes C-3297) (If C-3297 is available, use C-3535 Adapters to convert to C-3531)
C-3533	Compressor
DD-1150	Tachometer

SPECIAL TOOLS

TORQUE CONVERTER

Tool Number	Description
C-589	Wrench—5/8" hex nut
C-763	Switch—remote control
C-771	Wrench—flywheel turning*
C-3339	Set-Dial Indicator
C-3487	Fixture—engine support
C-3613	Attachment—dial indicator

*May be used in lieu of Switch C-763.

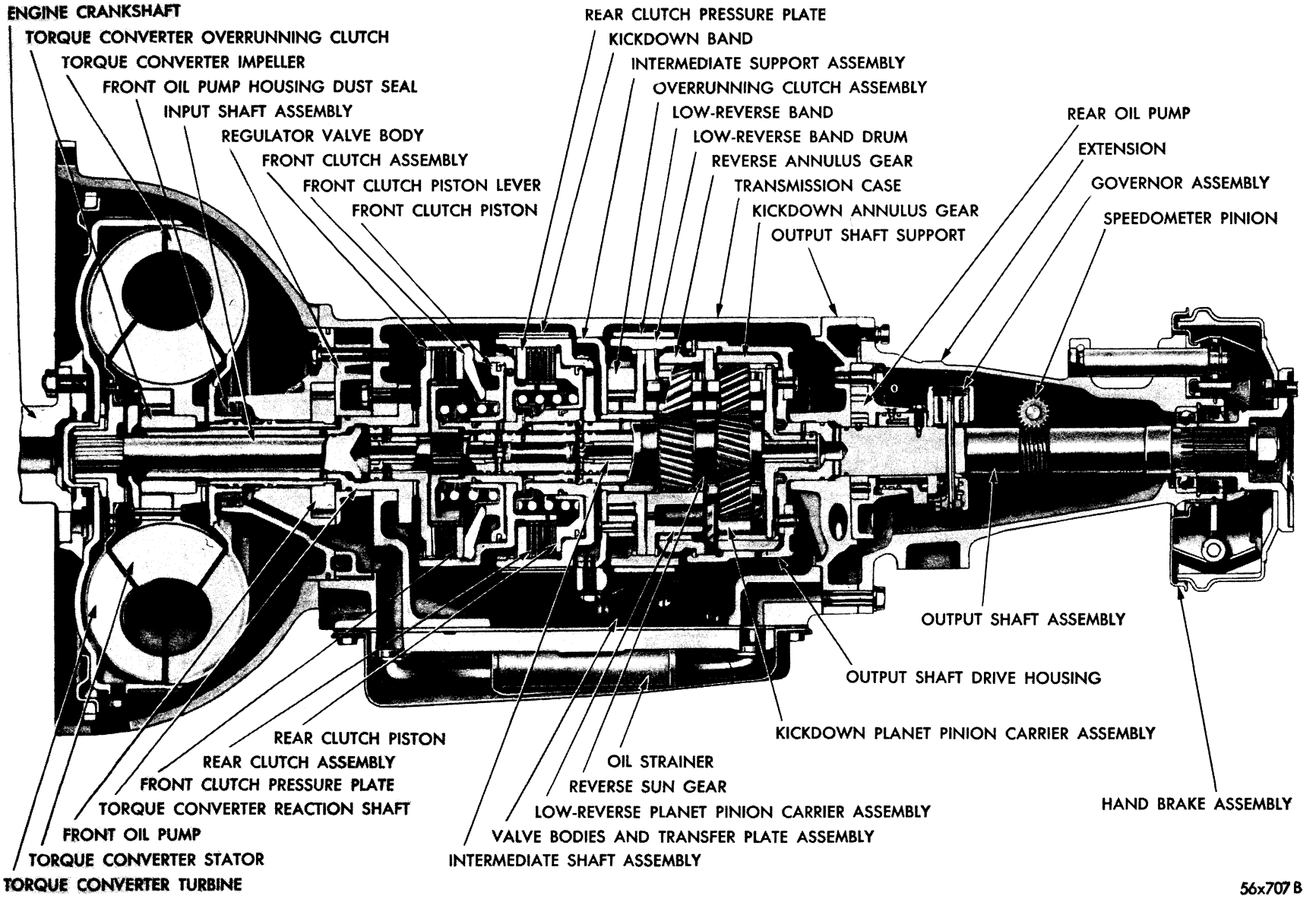


Fig. 1—Typical TorqueFlite Transmission and Torque Converter—
Air Cooled Converter Shown (Sectional View)

Section XI

TORQUEFLITE TRANSMISSION

1. DESCRIPTION OF TRANSMISSION

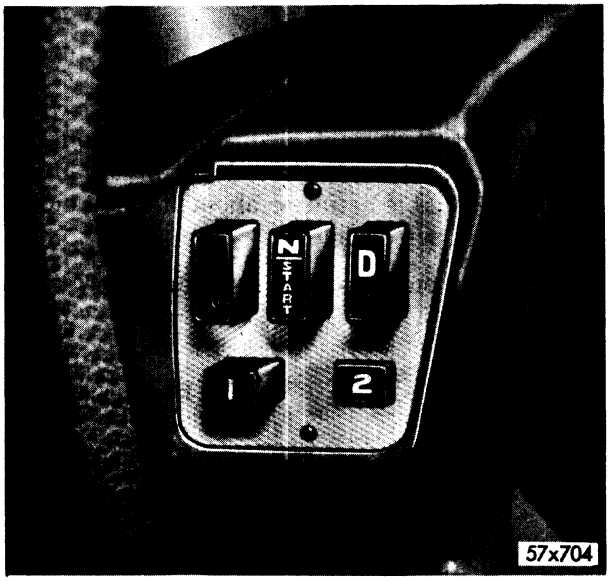
The transmission (Fig. 1) combines a torque converter and an automatic three-speed planetary gear box. The torque converter extends torque mutiplication over a wide range of engine speeds. The transmission consists of two multiple disc clutches, an overrunning clutch, two bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. With the front or forward clutch engaged and low gear reaction, transferred through the transmission overrunning clutch assembly, a low ratio of 2.45 to 1 is obtained. Engagement of the kickdown or second speed band will shift the transmission to second speed ratio (1.45 to 1). Disengagement of the kickdown band and engagement of the rear or direct clutch locks the gear set so that a direct drive ratio of 1 to 1 is obtained. Since the overrunning clutch can transmit torque only on the drive side, it is necessary to apply the low and reverse band when using low for engine braking. Reverse ratio (2.20 to 1) is obtained by application of the rear clutch and rear band. In the drive range, the transmission shifts through all three gear ratios automatically. Shift points are determined by throttle opening and car speed. If additional acceleration is desired while in drive range, the transmission will downshift (depending on vehicle speed) to second gear or breakaway automatically when the accelerator pedal is completely depressed.

The intermediate or second position range is used to operate the transmission in the first two gears only. This range is suitable for heavy city traffic where the driver may desire part throttle second gear operation for more precise speed control. It may also be used on long down grades where additional engine braking is needed. A low or first position range is also available to keep the transmission in first gear only. This position provides added handling ease in mountain driving and exceptional pulling qualities in sand and snow.

2. GEARSHIFT CONTROL UNIT

The transmission is operated by a gearshift control unit consisting of five push buttons, identified by R (reverse), N (neutral), D (drive), 2 (second) and 1 (low). Refer to Figure 2.

The control unit is located on the instrument



Top View)

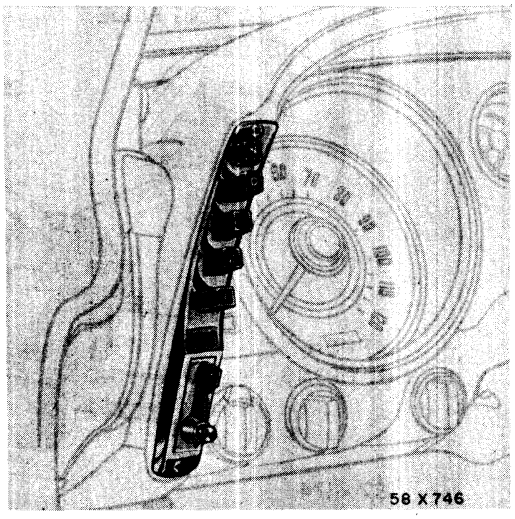


Fig. 2—Arrangement of Push Buttons (Bottom View—Imperial Models)

panel to the left of the steering column. Range selection is made by pushing the proper button.

Should the R (reverse) button be pushed in, above approximately 15 M.P.H., it will move the manual control lever to the neutral position and when car speed drops below 15 M.P.H. it will again be necessary to reposition the R (reverse) push button.

Mechanical connection between the gearshift control housing and the transmission manual control valve is obtained through the use of a single push-pull cable, as shown in Figure 3. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the adapter housing on the transmission case to engage the manual control valve lever assembly.

Operation

When a button is pushed in, the slide contacts the cable actuator, causing it to pivot. Movement of the cable actuator about its axis moves the attached wire cable.

When the button nears its limit of travel, a lock spring on the push button slide engages the actuator shaft. This action allows the lock spring to hold the button in the engaged position. (Refer to Fig. 3).

When the operator pushes another button, to select a different range, the top or bottom portion (depending on which button was pushed) of the slide contacts the actuator, thereby releasing the first button from the restraint of the lock spring. The first button is then free to return (under spring force) to its original position.

A back-up light switch (when so equipped) is incorporated in the gearshift control housing and is operated by the R (reverse) push button slide. A motor starting switch is also incorporated into the gearshift control housing. (Refer to Fig. 3). The car is started by turning the ignition switch to "ON" and pressing the N (neutral) push button beyond the neutral position to engage the motor starting switch.

Should the car stall, it is restarted by fully depressing the N (neutral) push button.

A vacuum switch, on the engine, prevents

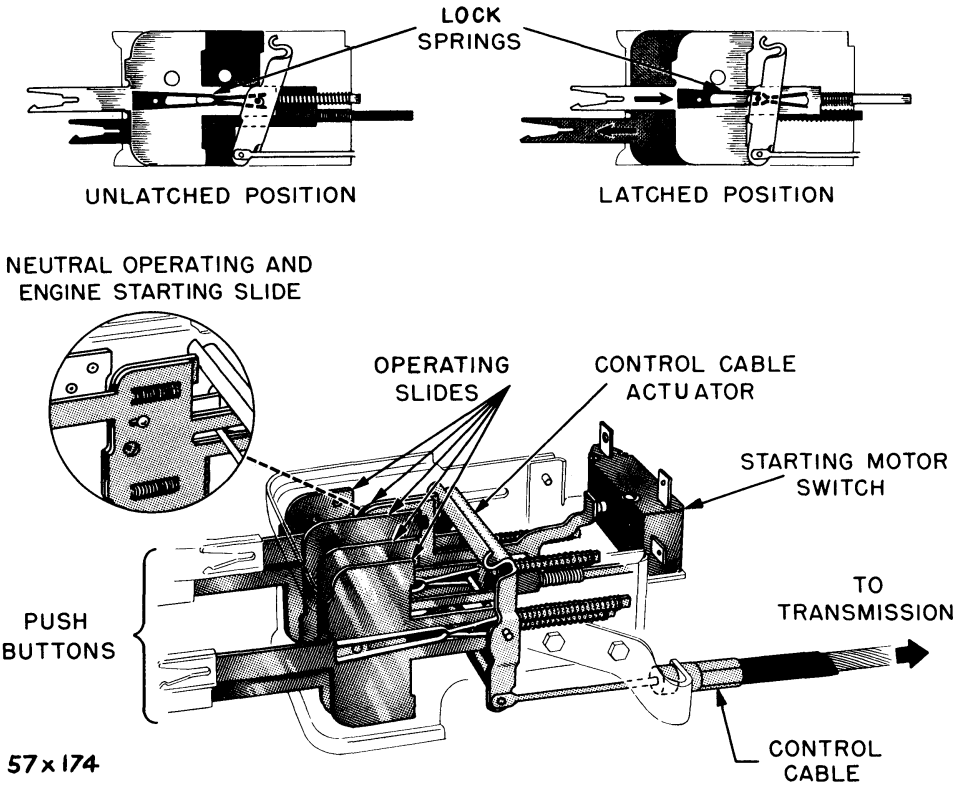


Fig. 3—Gearshift Control Unit (Operational Sketch)

the starter from being operated should the N (neutral) push button be pushed in while the engine is running.

The starting motor is also wired so that the engine cannot be started unless the neutral starting switch (at the transmission) is closed. Engaging the N (neutral) button closes the starting motor circuit at the neutral starting switch (Fig. 22). The purpose of the neutral starting switch (on the transmission) is to prevent starting the engine while the transmission manual valve is in any position other than neutral, as a result of improper control cable adjustment.

3. OPERATING INSTRUCTIONS

a. Starting the Engine

(1) As a safety precaution, apply hand or foot brake.

(2) Turn igintion key to "ON" position. Depress accelerator slightly and push in the N (neutral) push button to limit of its travel.

(3) When engine starts, release pressure on N (neutral) push button.

(4) If engine fails to start, release pressure on N (neutral) push button momentarily before attempting to start engine again.

b. Push Starting

If the engine fails to start in the normal manner, it may be started by pushing. **Towing the car to start is not recommended due to the sudden surge of power when the engine starts.**

Turn the ignition switch on, then push the 1 (low) button in and depress the accelerator pedal slightly. After the vehicle has been pushed to a speed of 15 mph. (approximately), the transmission will drive the engine.

c. How to Drive the Car

NOTE: All speeds referred to in the following paragraphs are to be considered approximate because of variations in production tolerances.

(1) **When starting** in extremely cold weather, allow the engine and transmission to warm up while in N (neutral) position. If the engine is cold (engine on fast idle), apply the foot brake lightly to prevent a tendency of vehicle to creep when making a push button selection.

(2) **D (drive).** Almost all driving is done in the D (drive) position. The transmission in this push button position selects the proper ratio automatically for road, speed, and driving conditions.

A downshift to the breakaway position always occurs below 8 M.P.H. at closed throttle. If road conditions warrant, such as pulling on a steep hill under heavy load, the 3-2 downshift may occur under part throttle, otherwise the transmission normally downshifts from 3 to 1 except during a forced kickdown at speeds below 70 M.P.H., or the condition to be covered in the following paragraphs:

The driver may select a ratio which he feels more applicable to the particular condition such as in heavy traffic, icy roads, or descending a steep hill by using either the 1 or the 2 push buttons.

(3) **2 (second).** If the 2 button is pushed in, the transmission will start in breakaway or low ratio and upshift to 2nd gear normally. There will be no further upshift unless the car is driven to speeds above 75 M.P.H. at which time the transmission will upshift to direct. This protects against unnecessary high engine R.P.M. When the car speed drops below 70 M.P.H. the transmission again downshifts to second.

If the car is being driven above 70 M.P.H. in D (drive) and the 2 button is pushed in, the transmission will not downshift until car speed is below 70 M.P.H.

When car speed is reduced to 8 M.P.H. (with the 2 button in) the transmission downshifts to breakaway. Also, a kickdown may be made to breakaway when car speed is below 30 M.P.H.

(4) **1 (low).** If the 1 button is pushed in, the transmission remains in "Low" gear regardless of car speed.

If the 1 button is pushed in at car speeds above 30 M.P.H. (but below 70 M.P.H.) the transmission will downshift to second gear until car speed decreases below 30 M.P.H., at which time the transmission downshifts to low gear and stays there regardless of car speeds.

If the 1 button is pushed in at car speeds above 75 M.P.H. either in D (drive) or 2, the transmission stays in drive or high gear until car speed decreases below 70 M.P.H., when it downshifts to second gear. When speed de-

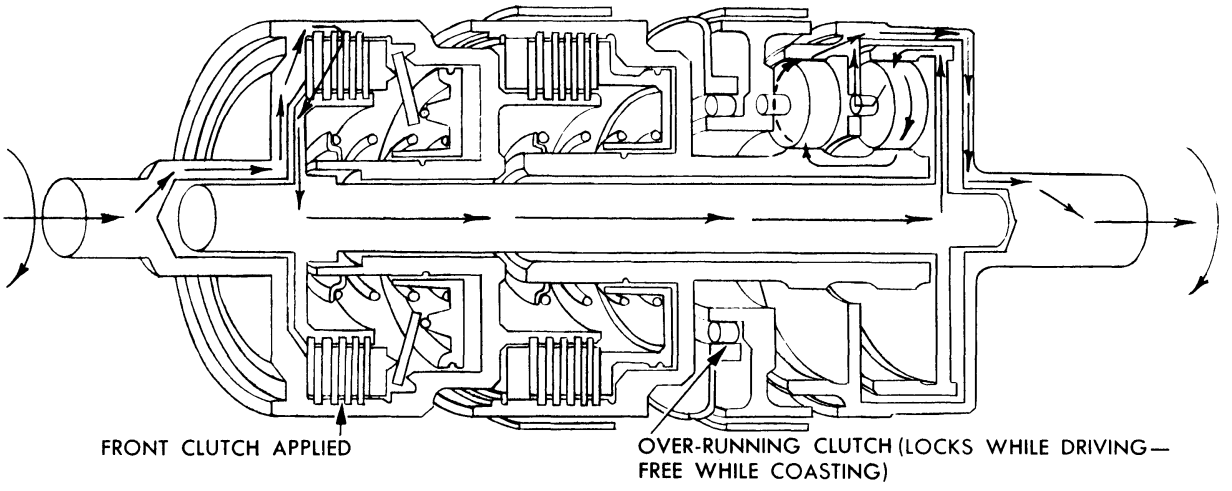


Fig. 4—Power Flow in D (Drive) Position—Breakaway

creases further to below 8 M.P.H., the transmission shifts to low and stays in low regardless of car speed.

(5) **Kickdown (forced downshift).** Below those speeds for the 3-2 and 3-1 kickdown limits shown in Shift Pattern Summary Chart (after the transmission has upshifted into direct or second gear), the transmission will automatically downshift to the next lowest gear when the accelerator is completely depressed; thereby giving maximum acceleration for passing or climbing steep grades. The transmission will automatically upshift to second if the accelerator is released or speeds shown in Shift Pattern Summary Chart (wide open throttle 1-2 upshift) are reached. In D (drive) range from second gear, the transmission will automatically upshift into direct if the accelerator is partially released or if speeds as shown in Shift Pattern Summary Chart (wide open throttle 2-3 upshift) are reached. If the vehicle is accelerated with the 2 (second) button engaged to wide open throttle upshift speed, an upshift to direct will occur thus eliminating over-speeding the engine in second gear.

(6) **R (reverse).** Stop the vehicle and with foot brake lightly applied, push the R (reverse) button in.

d. Mountain Driving

When driving in the mountains with either heavy loads or when pulling trailers, the 2 (second) or 1 (low) position should be selected on upgrades which require heavy throttle for

SHIFT PATTERN SUMMARY CHART

CONDITION	LC-1	LC-2	LC-3	LY-1	LY-1	LY-1
Closed Throttle 1-2 Upshift	8-12	8-12	9-13	8-13	9-14	8-11
Closed Throttle 2-3 Upshift	12-16	12-16	14-18	13-17	14-18	11-15
Wide Open Throttle 1-2 Upshift	29-45	30-46	32-50	31-48	33-51	27-42
Wide Open Throttle 2-3 Upshift	63-76	64-78	71-87	66-81	72-88	59-71
3-2 Kickdown Limit	55-69	56-70	62-78	58-75	63-79	51-64
3-1 Kickdown Limit	26-35	27-36	29-39	27-36	30-39	25-32
Closed Throttle Downshift	7-11	7-11	8-12	7-11	8-13	6-10

NOTE: All shift speeds may vary somewhat due to production tolerances and rear axle ratios—which is not too important, however, the quality of the shifts is very important.

All shifts should be smooth, responsive, and with no noticeable engine runaway.

½ half mile or more. Lower ratios reduces the possibility of overheating the transmission under these conditions. (1) low position is for service operation or to obtain better control.

e. Transmission Inoperative

Tow the vehicle with a rear end pickup or remove the propeller shaft.

f. Transmission Operating Properly

The vehicle may be towed safely in N (neutral) at moderate speeds. For long distance towing (over 100 miles), the propeller shaft should be removed.

4. POWER FLOW IN THE TRANSMISSION

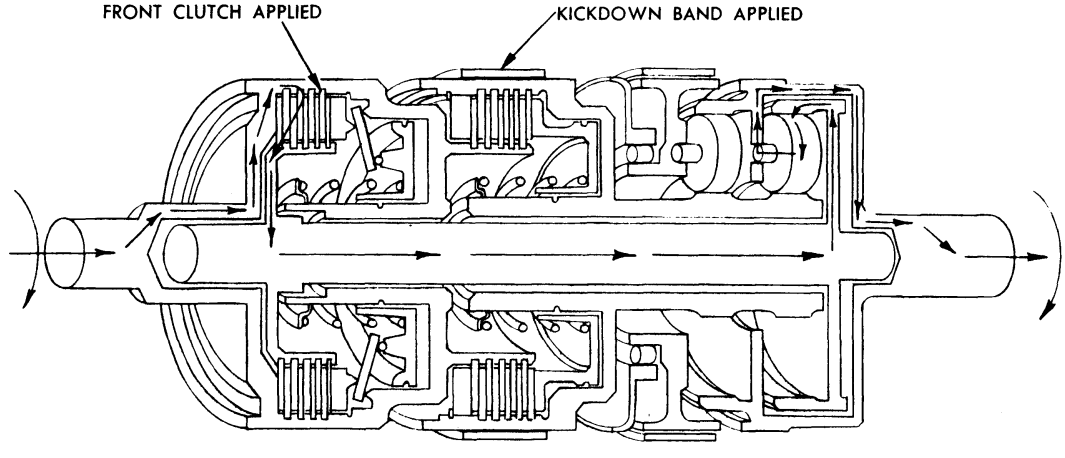
a. (Drive) Position Breakaway (See Fig. 4)

The power flow is from the converter turbine through the input shaft and front clutch retainer (one unit). The front clutch is applied and the drive continues through the clutch hub to the intermediate shaft and kickdown annulus gear (one unit). The kickdown annulus gear drives the kickdown planet pinion gears, rotating them in the same direction. The kickdown planet gears are meshed with the kickdown sun gear which in turn is integral with the reverse sun gear. Both sun gears are forced to rotate in a reverse direction by the reaction of the kickdown planet pinion carrier together with the reverse annulus gear, both of which are splined to the output shaft drive housing. The reverse planet pinion carrier is attached to and prevented from turning backward by an overrunning clutch and becomes stationary in forward drive (overruns on coast). Therefore, the reverse planet carrier pinions are forced to rotate in a forward direction and force the reverse annulus to rotate in the same direction transmitting the power flow to the output shaft with the resulting ratio of the kickdown and reverse planetary gear sets of 2.45 to 1.

b. (Drive) Position—2nd Speed and 2 (Second) Position—2nd Speed (See Fig. 5)

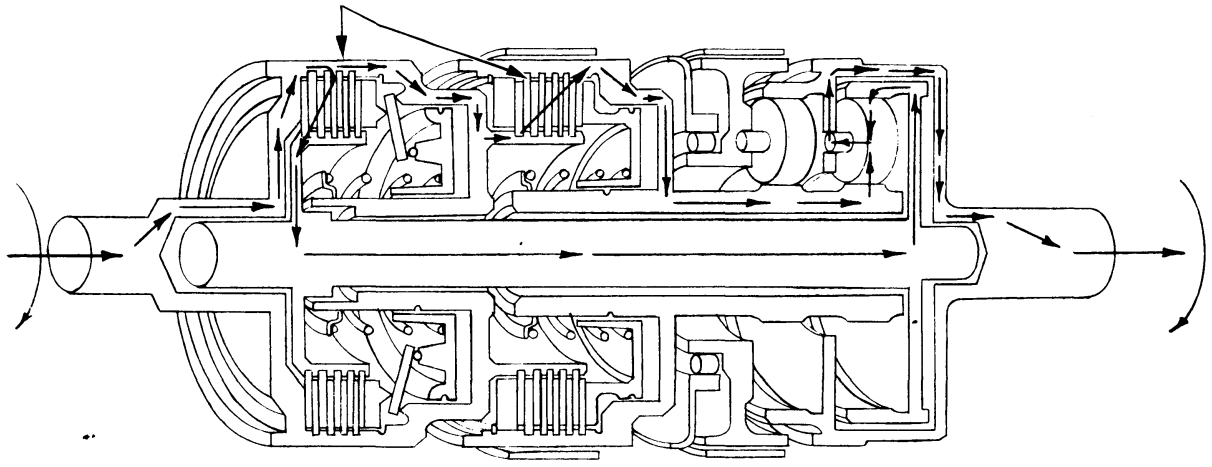
The power flow is from the torque converter turbine through the input shaft to the front clutch (which is applied).

From the front clutch through the intermediate shaft to the annulus gear of the kickdown (rear) planetary gear set. The kickdown band is applied which holds the sun gear stationary. The annulus gear drives the kickdown planet pinions which rotate in the same direction as the input and intermediate shafts. The kickdown planet pinions are meshed with the sun gear; therefore, they walk around this gear and exert force through the kickdown planet pinion shafts to rotate the kickdown planet pinion carrier. The carrier, which is splined to the output shaft drive housing, rotates at a slower speed than the annulus gear, thus providing a gear ratio of 1.45 to 1.



DRIVE POSITION—2ND ALSO 2ND SPEED IN 2ND POSITION 56x690

Fig. 5—Power Flow in D (Drive) Position—2nd Speed and 2 (Second) Position—2nd Speed



DRIVE POSITION—DIRECT DRIVE 56x688

Fig. 6—Power Flow in D (Drive) Position—Direct

c. D (Drive) Position—Direct (See Fig. 6)

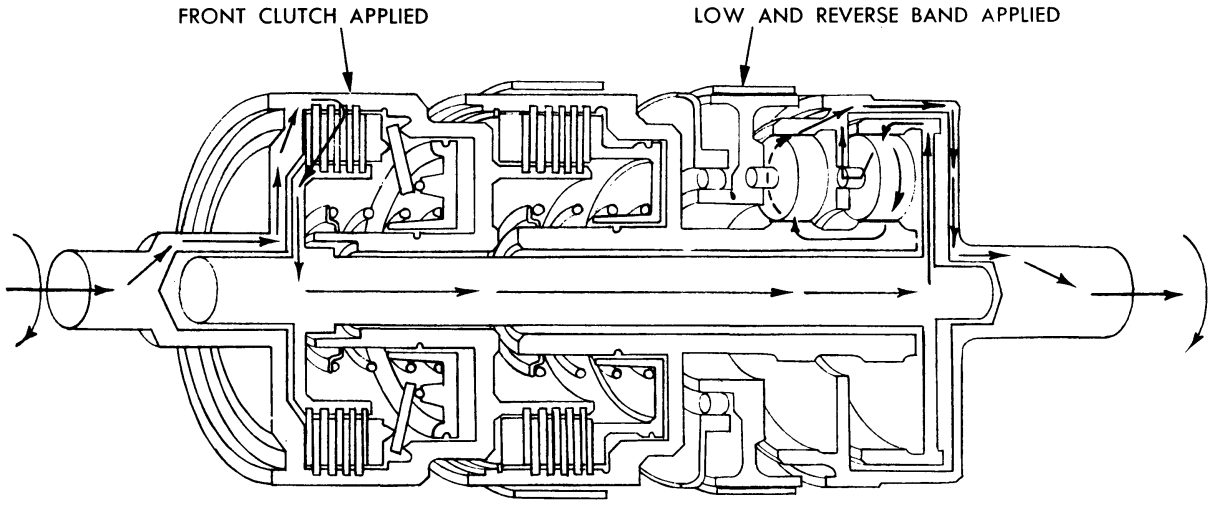
The power flow from the torque converter goes directly through the transmission because the planetary elements of the gear train are locked up by two mutiple disc clutches and both bands are released. The torque converter provides all of the torque multiplication.

Kickdown (Forced Downshift) in D (Drive) Position Below approx. 30 M.P.H. This will force the transmission to downshift and the power flow will be the same as D(drive) position (breakaway).

Kickdown (Forced Downshift) in D (Drive) Position at approx. 30 to 70 M.P.H. This will force the transmission to downshift and the power flow will be the same as D (drive) position 2nd speed.

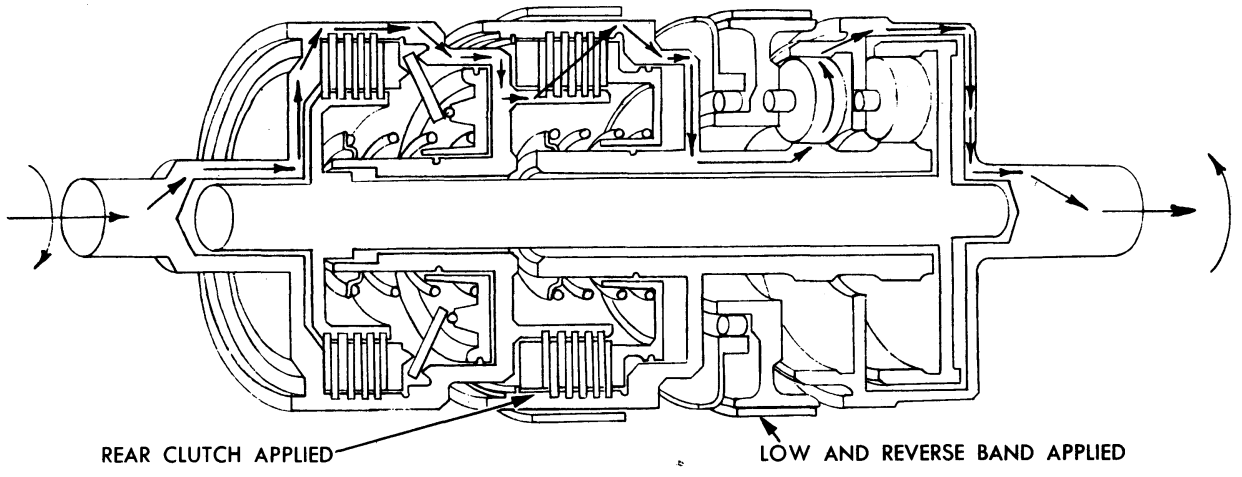
d. 1 (Low) Position—Low Speed (See Fig. 7)

In 1 (low) position the power flow is the same as D (drive) position (breakaway) or 2 (second) position (breakaway) with one exception —the low-reverse band is applied, holding the reverse planet carrier to provide engine braking.



LOW POSITION 1 LOW SPEED 56x691

Fig. 7—Power Flow in 1 (Low) Position—Low Speed



REVERSE POSITION 56x692

Fig. 8—Power Flow in R (Reverse) Position

e. R (Reverse) Position (See Fig. 8)

The rear clutch and the low-reverse band are applied. All other friction elements are released. The power flow is from the torque converter turbine through the input shaft to the rear clutch hub (part of the front clutch retainer). The rear clutch is splined to the reverse sun gear. The carrier of the reverse (front) planetary gear set is held stationary by the low-reverse band; therefore, the set acts as a simple reverse train through the reverse planet pinions to the reverse annulus (which is splined to the output shaft drive housing) and provides a reverse ratio of 2.20 to 1.

f. N (Neutral) Position

All friction elements are released. Hence, there is no drive connection between the engine and the rear wheels.

g. Power Flow Summary

The chart summarizes power flow conditions in the various ranges as regards to gear train elements involved and the ratios obtained.

BAND-CLUTCH APPLICATION CHART

Range	Ratio	Element Applied
D (Drive) position—(breakaway)	2.45	Front Clutch and Overrunning Clutch
D (Drive) position—second speed, 2 (Second) position—second speed	1.45	Front Clutch and Kickdown (Front) Band
D (Drive) position—direct	1.00	Front and Rear Clutches
R (Reverse) position	2.20	Rear Clutch and Low-Reverse (Rear) Band
1 (Low) position—low speed	2.45	Front Clutch and Low-Reverse (Rear) Band
N (Neutral)	—	No Elements Applied

THE HYDRAULIC CONTROL SYSTEM (REFER TO FIGS. 9 THROUGH 15)

The hydraulic control system must furnish oil pressure and route it at the proper time and pressure to the proper piston device for engaging the transmission in the desired gear. This system is composed of several parts whose functions are interrelated.

(Continued on Page 21)

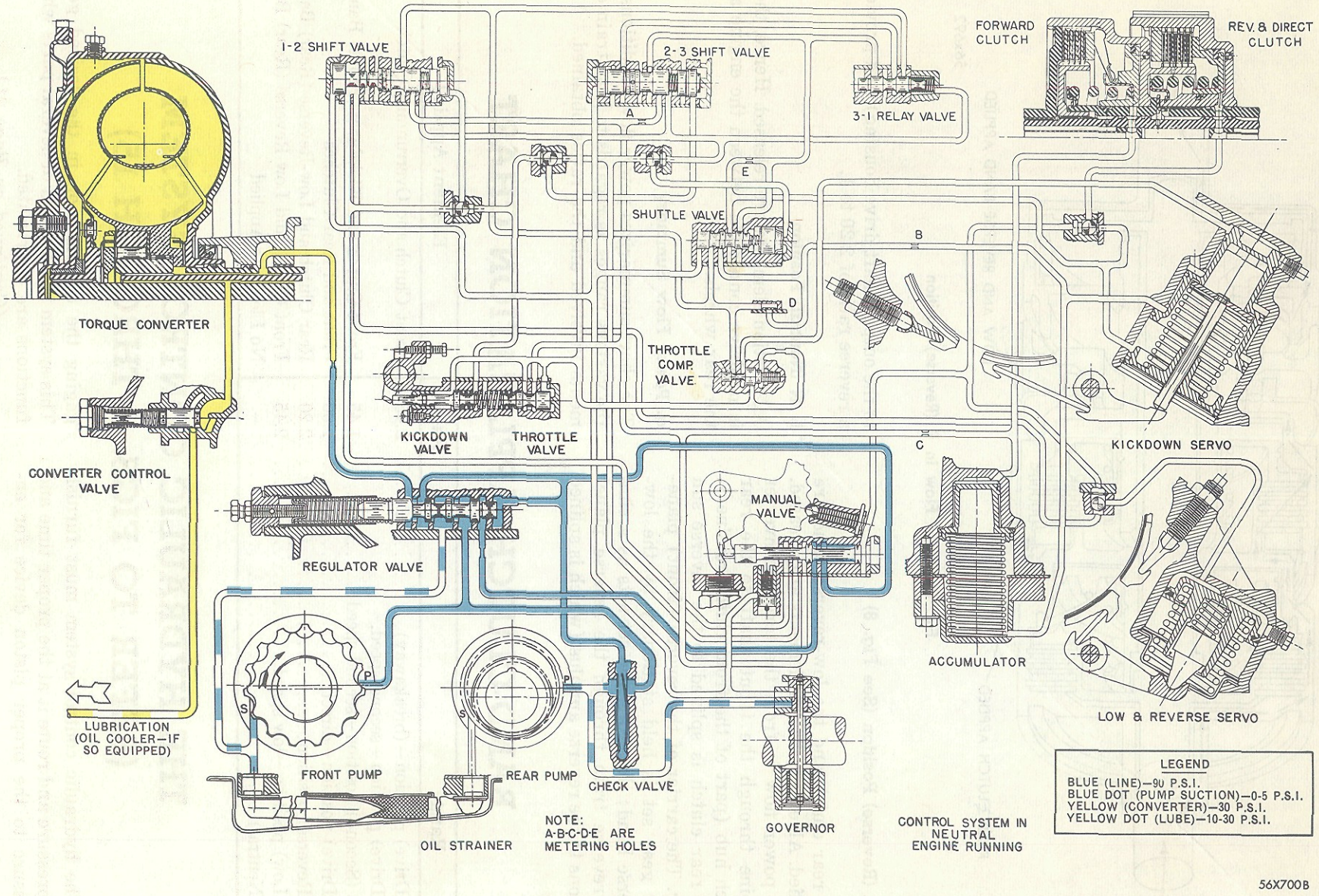


Fig. 9—Hydraulic Circuit—N (Neutral)

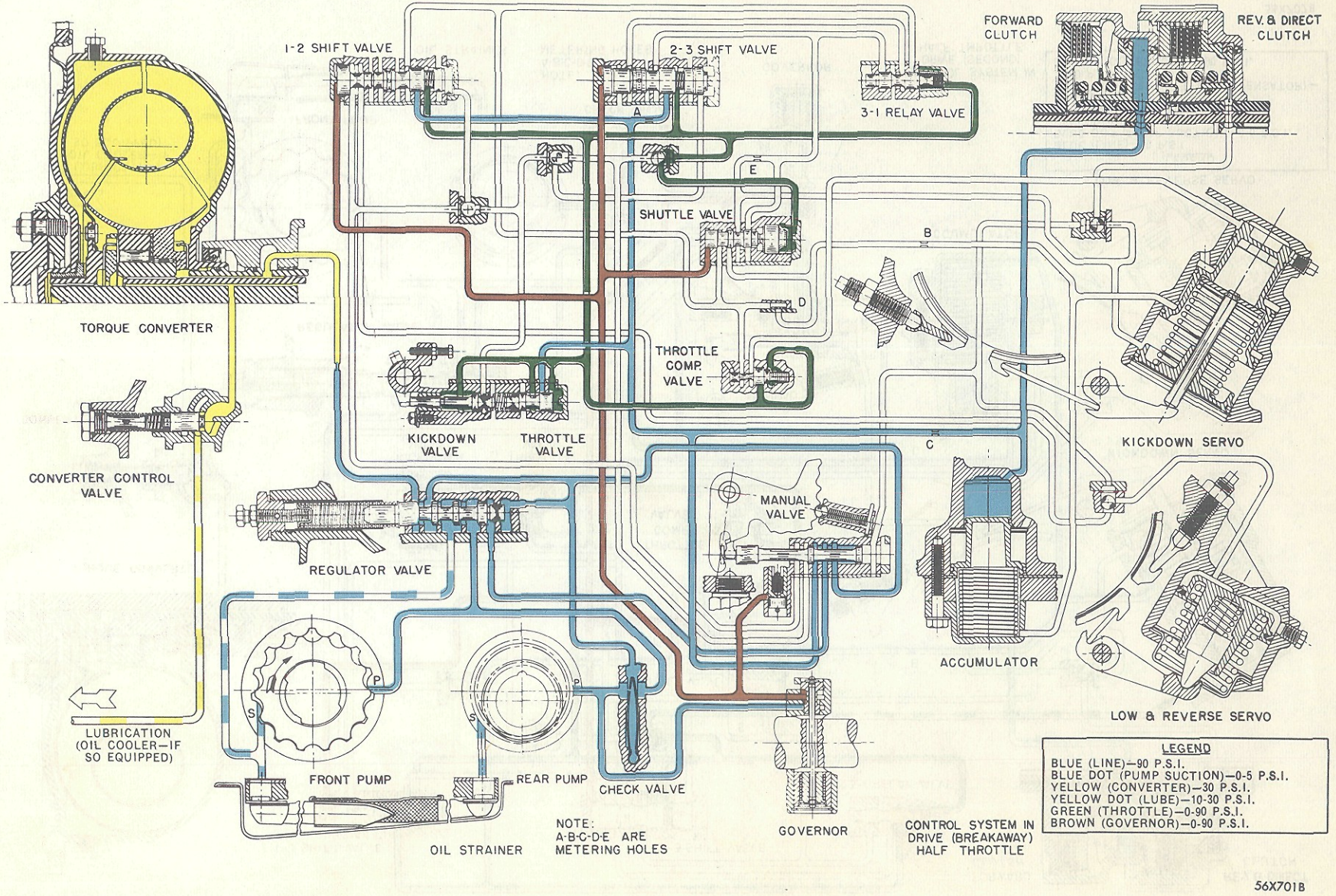


Fig. 10—Hydraulic Circuit—D (Drive)—Breakaway

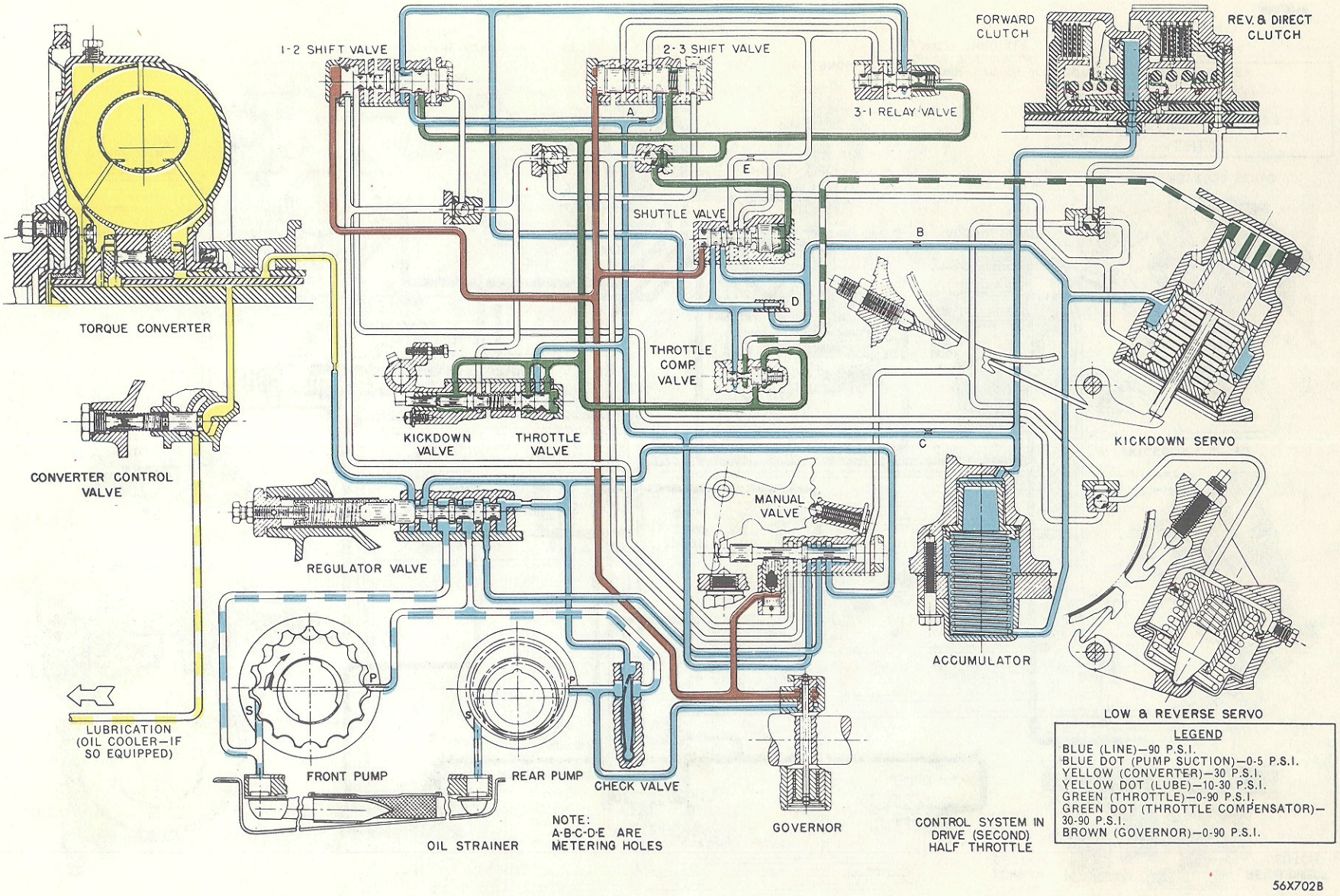


Fig. 11—Hydraulic Circuit—D (Drive)—Second

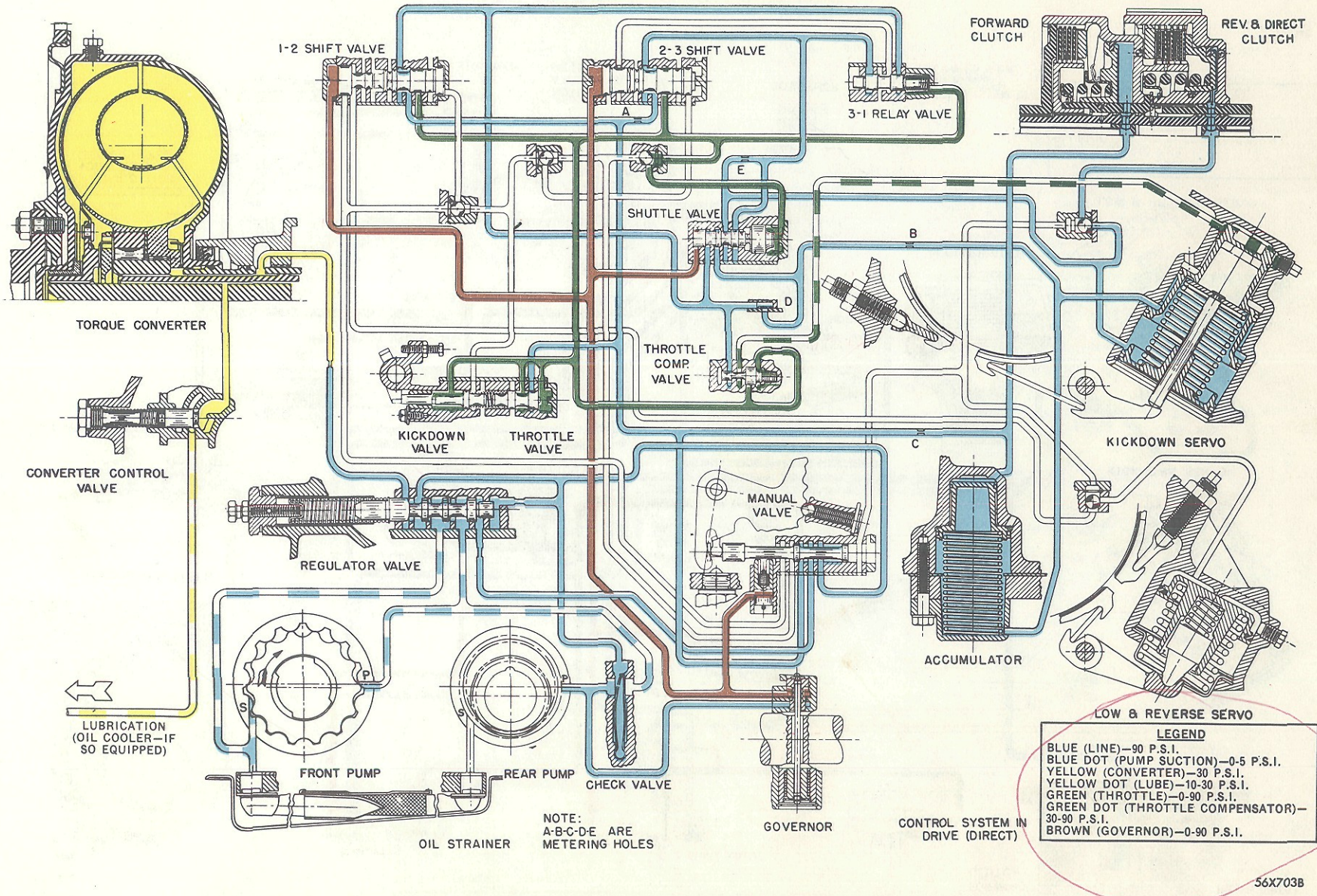


Fig. 12—Hydraulic Circuit—D (Drive)—Direct

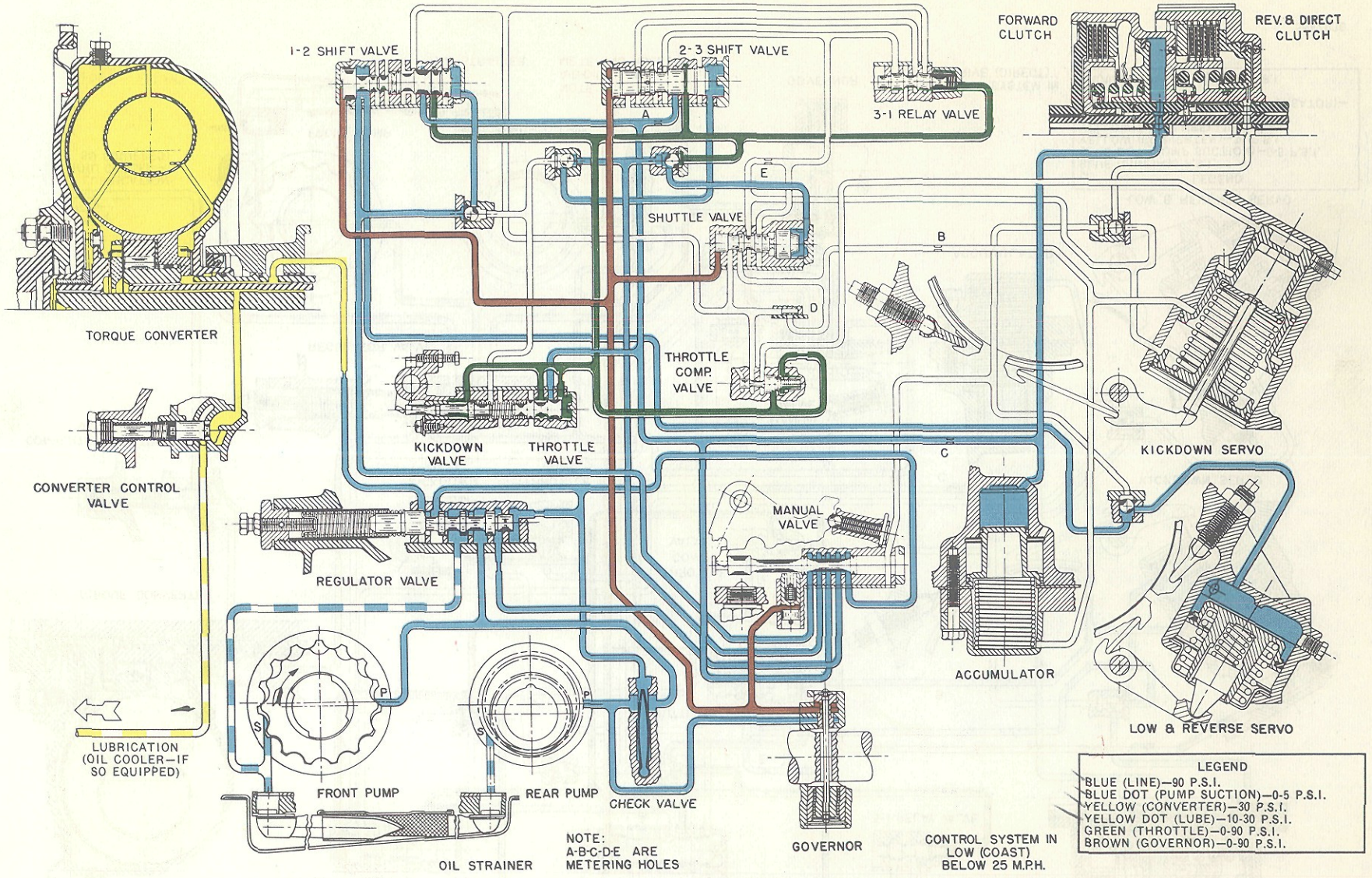


Fig. 13—Hydraulic Circuit—I (Low)—Low

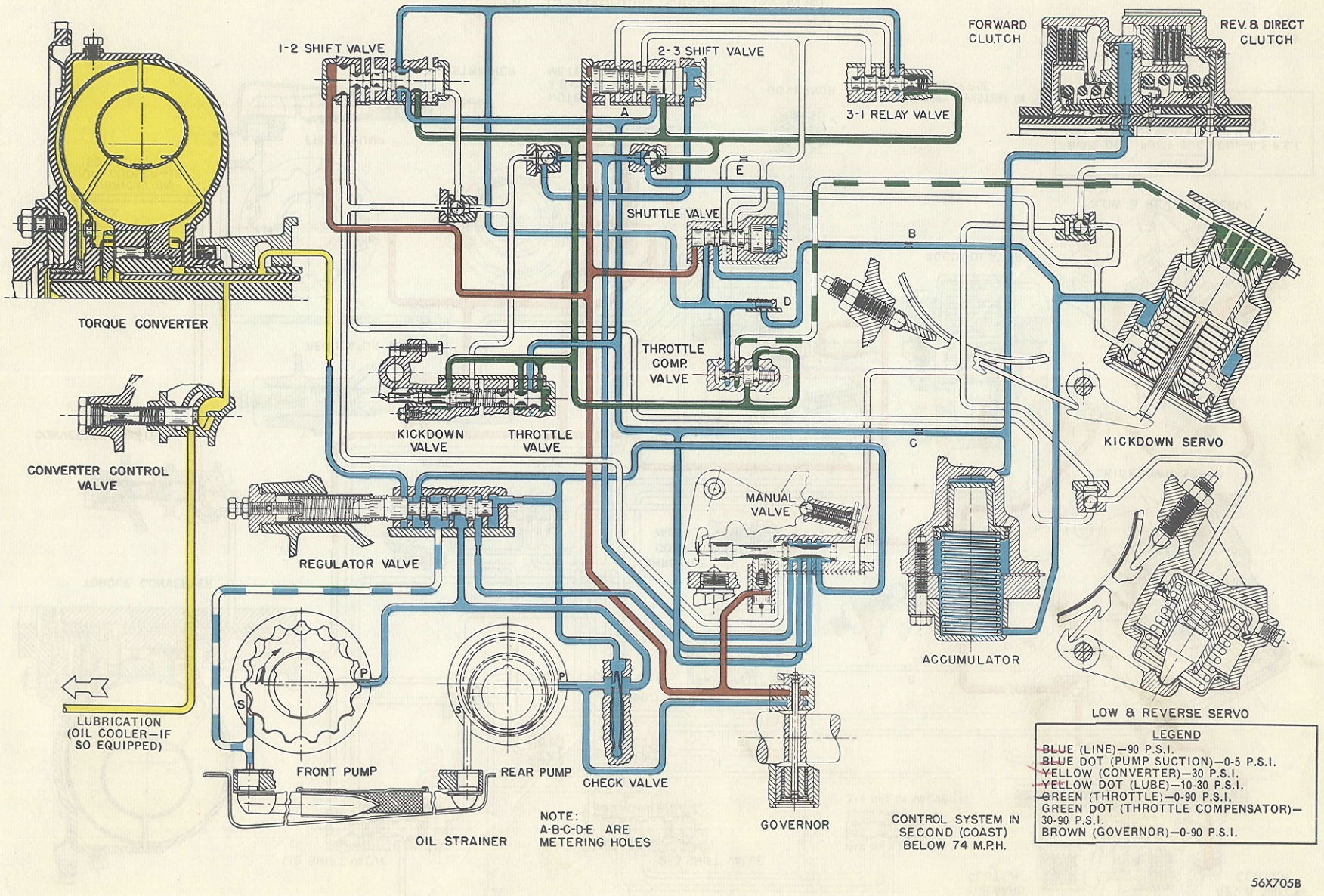


Fig. 14—Hydraulic Circuit—2 (Second)—Second

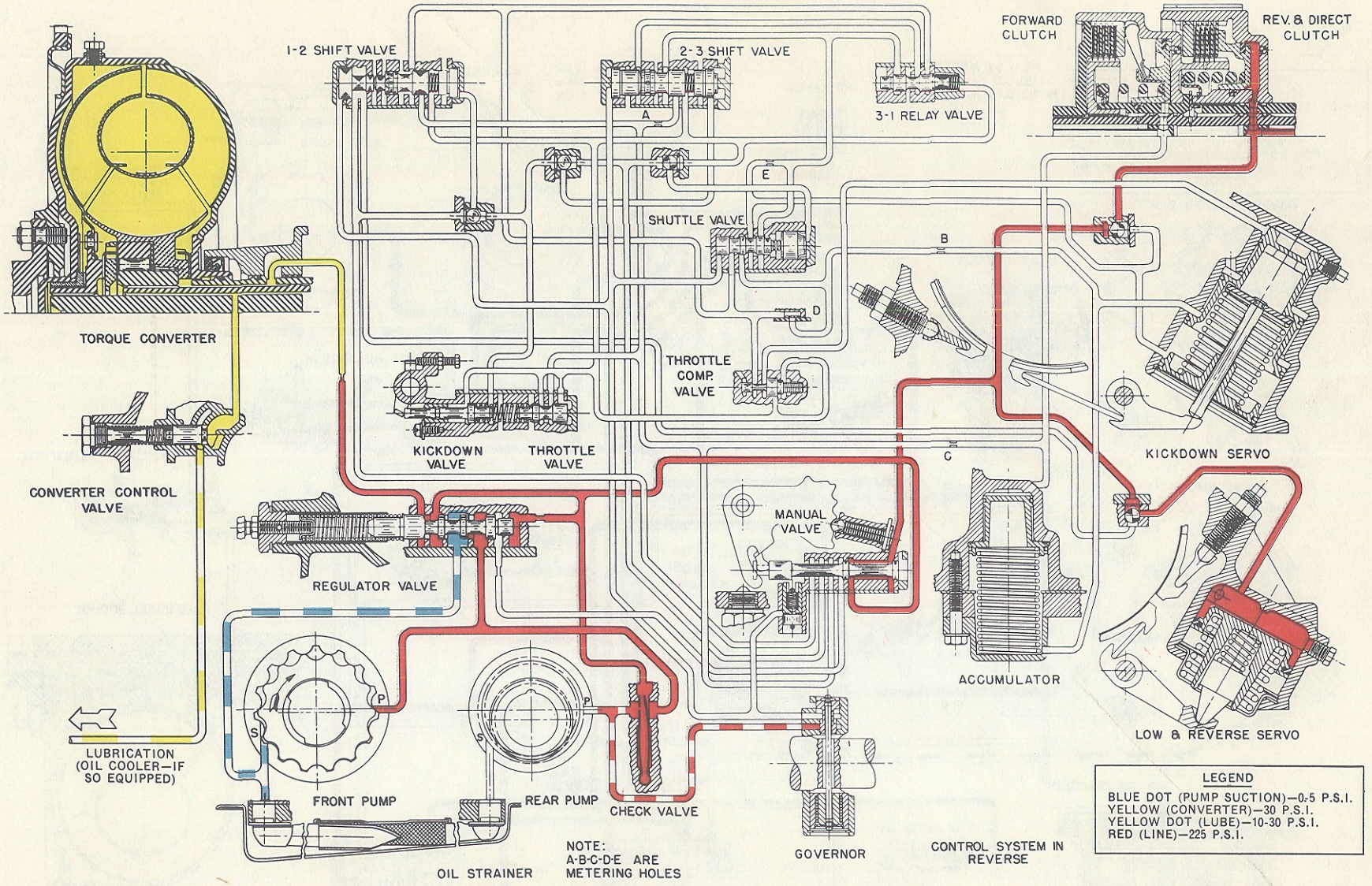


Fig. 15—Hydraulic Circuit—R (Reverse)

In a general way, the components of any automatic control system may be grouped into the following basic components or units:

(1) The pressure supply system.

(2) The clutches and band servos.

(3) The pressure regulating valves.

(4) The flow control valves.

Taking each of these basic components or units in turn, the control system may be described as follows:

5. THE PRESSURE SUPPLY SYSTEM

a. Front Pump

Under all normal operation conditions (up to a forward speed of approximately 35 mph.) the front pump, driven at engine speed, provides oil needed for torque converter pressure, control pressures, and lubrication.

The front pump delivers oil at regulated pressure of approximately 90 psi. to fulfill these conditions and also satisfy the normal amount of internal leakage in the transmission at all engine speeds above approximately 700 rpm. In reverse, the front pump regulated pressure is increased to approximately 225 psi. in order to handle the high torque loads imposed during reverse operation.

b. Rear Pump

The rear pump (smaller than the front pump and driven by the output shaft) furnishes all of the oil required by the transmission in normal driving at all vehicle speeds above approximately 35 mph. Rear pump oil pressure is routed to the regulator valve body through a drilled passage in the transmission case. The front clutch and low-reverse band are applied by the oil pressure developed by the rear pump when the engine is started by pushing.

6. CLUTCHES AND BAND SERVOS

a. Front Clutch

The front clutch transmits full engine and converter torque in all forward drive positions. The front clutch piston is moved hydraulically to engage the multiple disc clutch in all forward speeds. The clutch piston is released by means of the clutch return spring when feed of the control pressure is discontinued.

In order to develop the required capacity, a system of levers is used to actuate the clutch apply plate.

Although no pressure is applied to the front clutch piston in reverse or neutral, oil is present in the clutch piston chamber. With high rotative speeds of the clutch retainer in reverse or neutral, it is possible to build up sufficient centrifugal oil pressure to move the clutch piston. To eliminate the possibility of clutch drag caused by such movement, the clutch check valve ball is unseated by centrifugal force and the oil in the chamber is allowed to escape. For normal application of the clutch, the flow of oil under controlled pressure into the clutch piston chamber is sufficient to seat the clutch check valve ball.

b. Rear Clutch

The rear clutch locks the gear train for direct drive operation in the forward range, and also transmits full input torque to the gear train in reverse operation. Rear clutch operation is similar to that of the front clutch, except that no levers are used. When making the power upshift from second to direct, the engagement of the clutch and disengagement of the kickdown band is accomplished by application of controlled pressure.

c. Kickdown Servo

The kickdown piston actuates the kickdown band through the kickdown lever, strut, and anchor, holding the sun gear of the rear planetary set stationary and resulting in a forward ratio of 1.45 to 1 through the rear planetary gear set. The kickdown piston is hydraulically applied in 2 (second) and D (drive) second (kickdown) by two controlled pressures—line pressure and throttle compensated pressure-acting on separate areas.

In N (neutral), 1 (low), D (drive) breakaway, and R (reverse) the kickdown piston is held released by the kickdown piston spring, there being no pressures applied to the kickdown piston at these times. In the D (drive) range, for the automatic upshift from second to direct drive, the kickdown piston is released by controlled pressure acting on the "off" area

of the kickdown piston. The force of the pressure on the "off" area, assisted by the kickdown piston spring, is sufficient to overcome the forces of line pressure and throttle compensator pressure acting on the apply side of the kickdown piston.

Application of the kickdown piston when shifting from breakaway to second is softened by the accumulator.

d. Low-Reverse Servo

The low-reverse servo has two functions which are performed independently. The low-reverse servo piston is moved hydraulically to apply the low-reverse band through the low-reverse band lever, strut, and anchor. The results are:

(1) To hold the carrier of the front planetary gear set stationary while the rear clutch (applied) drives the sun gear. This provides a reverse ratio of 2.20 to 1 through the front planetary gear set, as shown in Figure 3.

(2) To hold the carrier of the front planetary gear set stationary while the front clutch (applied) drives the intermediate shaft and kickdown annulus. This provides the 1 (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets (see Fig. 7) which may be used for engine braking. Initial engagement of the low-reverse servo (when shifting from neutral to low or reverse) is softened by compression of the low-reverse servo cushion spring.

The servo piston is released by a return spring when the source of apply pressure is discontinued.

e. Accumulator

An accumulator cushions the front clutch engagement when a forward drive button is pushed in, and the application of the kickdown band in the upshift from breakaway to second. It is connected in parallel and to the passage which supplies line pressure to the apply side of the kickdown servo.

In neutral and reverse the accumulator piston is held released by the accumulator spring, there being no pressure applied to the piston at these times.

In the D (drive) range, for the automatic upshift from breakaway to second, the accumulator piston is again moved by line pressure (kickdown servo apply) acting on the large end of the piston. The force of line pressure (assisted by the accumulator spring) is sufficient to overcome the force of line pressure (front clutch) which is acting on the small area of the accumulator piston. This action cushions the application of the kickdown band.

7. PRESSURE REGULATING VALVES

a. Regulator Valve

The regulator valve controls line pressure at a value of approximately 90 psi. for all operating conditions except reverse. Line pressure, which is supplied by the front pump (at car speeds under 35 mph.) is routed directly to a primary reaction area in the regulator valve body. For all conditions except reverse, line pressure is also routed through the front valve body to the secondary reaction area. A line pressure of 90 psi. (acting on the two reaction areas) is sufficient to overcome the force of the regulator valve spring and move the valve to the position that will allow oil to flow through a restricting hole in the regulator valve body to the torque converter.

If the oil flow from the front pump exceeds the amount necessary to feed the torque converter and transmission line, pressure will rise slightly, causing the regulator valve to move to a new position where excess oil from the front pump pressure port is allowed to dump into the front pump suction port.

Above a car speed of approximately 35 mph., the rear pump furnishes the oil needed by the torque converter and transmission at a line pressure of approximately 90 psi. When this condition is reached, the pressure increases slightly and the regulator valve moves over to a new position where the excess flow is dumped from the line pressure port into the front pump suction port. Under this condition the front pump check valve closes and all of the oil pumped from the front pump is dumped back through the large valve opening into the front pump suction port. Thus the front pump turns with reduced effort since it is operating at a low pressure.

For reverse operation, oil must be at a pressure of 225 psi. This is accomplished by shut-

ting off the source of line pressure to the regulator valve secondary reaction area, with the result that a line pressure of 225 psi., applied to the primary reaction area, is required to overcome the force of the regulator valve spring.

b. Torque Converter Control Valve

This valve maintains an oil pressure of approximately 30 psi. within the torque converter. Oil is fed from the regulator valve through a restricting hole in the regulator valve body to the torque converter. The oil flows through the torque converter and returns to the regulator valve body where the converter pressure is regulated by the torque converter control valve. When the torque converter pressure rises to 30 psi., the control valve will move against the spring load and allow oil to flow to the cooler then back to the lubrication circuit. Torque converter pressure acts on the valve's reaction area such that if it exceeds 60 psi., the valve is moved further against the spring load, permitting excess oil from the converter to by-pass into the oil pan. From the torque converter control valve, oil is routed through the transmission lubrication system to lubricate the gear train.

c. Governor Valve

The governor valve assembly transmits a hydraulic pressure to the transmission which is proportional to car speed. This governed pressure, in conjunction with throttle pressure, controls upshift and downshift speeds. The governor is so mounted on the output shaft that when the output shaft rotates, the governor weight assembly exerts a centrifugal force on the governor shaft. The governor shaft transmits this force to the governor valve. Oil is allowed to flow from the line pressure port to the governor pressure port, building up pressure in the governor circuit and against the valve reaction area sufficient to balance the centrifugal force of the weight.

The greater the vehicle speed, the greater is the centrifugal force of the weights, and hence the greater the governor pressure necessary to balance the centrifugal force. If the vehicle speed decreases, the decrease in centrifugal force allows the valve to move out **slightly,** venting excess oil and bringing the governor once more in balance at a lower pressure.

The governor weight assembly is constructed so that for vehicle speeds under approximately 25 mph., both weights act as a unit, with the result that small changes in vehicle speed result in comparatively large changes in centrifugal force and governor pressure. Above approximately 25 mph., the primary weight moves outward against the preload of the spring and bottoms against the snap ring leaving only the secondary weight active. Small variations in vehicle speed above approximately 25 mph., therefore, result in only small variations in governor pressure.

Governor pressure is routed to the governor pressure ports of the reverse blocker valve, shuttle valve, and the 1-2 and 2-3 shift valves governor plugs.

d. Throttle Valve

The throttle valve assembly transmits a hydraulic pressure to the transmission which is proportional to the amount of throttle opening. The throttle valve lever shaft is rotated in proportion to the amount of throttle opening of the carburetor by a linkage connecting the throttle valve lever shaft to the car's throttle linkage. The throttle valve lever shaft positions the kickdown valve and throttle valve spring in accordance with the amount of carburetor throttle opening, the spring being free (no load) at closed throttle and compressed at wide open throttle. Therefore, the throttle valve spring exerts a force on the throttle valve that increases with carburetor throttle opening.

The throttle valve allows oil to flow from the line pressure port to the throttle pressure port, which is connected by a passage to the reaction area of the throttle valve. Throttle pressure will build up in the throttle pressure circuit and against the reaction area until it reaches a value great enough to balance the force of the throttle valve spring. If throttle pressure builds up too high, the throttle valve will move **slightly** to a position such that excess oil is allowed to escape through the vent port.

Throttle pressure will vary with the amount of carburetor throttle opening from a value of 0 (zero) pressure at closed throttle to a value of approximately 90 psi. at wide open throttle. Throttle pressure is routed to the following places:

(1) Throttle pressure port of the kickdown valve.

(2) Throttle pressure port of the throttle compensator valve.

(3) Through check valve to throttle pressure port of the shuttle valve plug.

(4) To the throttle pressure port of the 3-1 relay valve.

(5) To the throttle pressure port of the 2-3 shift valve kickdown plug (W.O. throttle condition).

(6) To the throttle pressure port of the 1-2 shift valve kickdown plug (W.O. throttle condition).

e. Throttle Compensator Valve

The throttle compensator valve amplifies the variations in throttle pressure. Oil flows from the line pressure port of the 1-2 shift valve (in the upshifted position) to the throttle compensator valve pressure port. Throttle compensator pressure is controlled by throttle pressure and spring force acting on one end of the valve against a reaction area fed by compensator pressure. Throttle compensator pressure will vary with the amount of carburetor throttle opening from a value of approximately 30 psi. at closed throttle to a value of 90 psi. at approximately ¾ throttle. This arrangement makes it possible to more closely obtain the variations required for the 1-2 and 2-3 shifts. Throttle compensator pressure is routed to the throttle compensator pressure area of the kickdown servo.

8. FLOW CONTROL VALVES

a. Front and Rear Pump Check Valves

The front pump check valve prevents back flow from the rear pump into the pressure side of the pump when the pump is either stationary or merely circulating oil at a very low pressure. The check valve separates front and rear pump.

NOTE: The pump that has the higher pressure supplies the demands of the transmission.

The rear pump check valves allows oil to flow from the rear pump into the control system of the transmission. The front and rear pump check valves are combined as a leaf spring unit and mounted in the regulator valve body behind the front pump.

b. Manual Valve

The manual valve obtains the different transmission drive ranges as selected by the vehicle operator. The manual valve is moved by a cable which is connected to the push button control unit on the instrument panel. It is held in these positions by the force of a spring-loaded detent ball.

When the N (neutral) button is pushed in, the manual valve is positioned so that line pressure from the regulator valve is routed to the secondary and primary reaction areas of the regulator valve. Line pressure is, therefore, 90 psi. but neither the band nor the clutches are applied.

When the R (reverse) button is pushed in, the manual valve shuts off line pressure to the secondary reaction area of the regulator valve and routes line pressure (at 225 psi.) to the rear clutch and low-reverse servo.

When D (drive) button is pushed in, the manual valve is positioned to route line pressure to the following places:

(1) The secondary reaction area of the regulator valve (making line pressure 90 psi.).

(2) The line pressure port of the throttle valve.

(3) The line pressure port of the 1-2 shift valve and through metering hole "A" to the line pressure port of the 2-3 shift valve.

(4) Through metering hole "C" to the line pressure area of the accumulator and front clutch.

When the 2 (second) button is pushed in, the manual valve routes line pressure to the same places as in D (drive) and to the following additional places:

(1) Through ball check valve to the kickdown pressure port of the 2-3 shift valve kickdown plug.

(2) Through ball check valve to the throttle pressure port of the shuttle valve plug.

When the L (low) button is pushed in, the manual valve routes line pressure to the same places as in 2 (second) and the following additional places:

(1) The low pressure port of the 1-2 shift

valve governor plug and through the ball check valve to the low-reverse servo.

(2) Through ball check valve to the kickdown pressure port of the kickdown pressure port of the 1-2 shift valve kickdown plug.

c. Reverse Blocker Valve

The reverse blocker valve mechanically blocks the manual valve from moving into reverse position to prevent accidental reverse engagement above approximately 10-15 mph. When the reverse button is depressed above this speed the transmission shifts to neutral and remains in neutral until another button is depressed. The reverse blocker valve is activated by governor pressure.

d. 1-2 Shift Valve

This valve determines whether the transmission is either in low gear ratio or second gear ratio, depending upon whether the valve is in the upshifted or down-shifted position. The 1-2 shift valve train (consisting of shift valve kickdown plug, valve spring, shift valve and governor plug) is normally at either extreme of its travel. With the valve train down-shifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the kickdown servo apply area is allowed to escape through the vent port.

When the shift valve train is moved to the opposite extreme of its travel, the vent port is closed off and oil is fed by line pressure to the following places:

(1) 3-1 relay valve.

(2) Line pressure port of the shuttle valve.

(3) Line pressure port of the throttle compensator valve.

(4) Through servo pressure bleed "D" to the kickdown servo apply pressure port of the shuttle valve.

(5) The apply area of the kickdown servo.

(6) The accumulator.

(7) Line pressure port of the 1-2 shift valve kickdown plug.

The kickdown piston and accumulator are so designed that the value of the "balance pressure" is sufficient to complete a smooth band application during the time required to stop the rear clutch retainer. After completion of the 1-2 shift, the servo apply pressure rises further to the value of line pressure, providing a "safety margin" of band load.

At light throttle (low throttle pressure), the shift valve is made to upshift at approximately 10 mph. and "balance pressure" is at a low value corresponding to the small force of throttle compensator pressure on the kickdown piston. The resulting band application load is, therefore, in proportion to the light throttle engine output. At wide open throttle (90 psi. throttle pressure), the shift valve upshifts at approximately 40 mph. and throttle compensator pressure is at a high value, applying the band at a load corresponding to a high engine output.

With the 1-2 shift valve train in the upshifted position, throttle pressure is not allowed to act on the end of the shift valve. Instead, any oil trapped in that area is allowed to vent through the drilled hole in the shift valve. The shift valve spring then exerts the only force on the "throttle pressure end" of the shift valve. At throttle openings less than wide open, the shift valve will downshift to breakaway when vehicle speed drops to a point where the governor pressure can no longer overcome the force of the shift valve spring. This downshift occurs at a vehicle speed of approximately 7-11 mph.

All that is required of the 1-2 shift valve for low range operation is that it must downshift below kickdown limit in response to the movement of the push button to low position and remain downshifted regardless of vehicle speed. The shift valve is forced to downshift by the application of line pressure from the low port of the manual valve around the ball check valve to the kickdown pressure port of the 1-2 shift valve kickdown plug. To insure that the shift valve remains downshifted regardless of car speed, line pressure is also allowed to act on the low reaction area of the 1-2 shift valve governor plug.

It is necessary that whenever the forces of governor pressure and throttle pressure act on the shift valve to cause an upshift, the valve must "snap" from one position to the other without hesitating or "hunting". This is accom-

plished by a differential area which is subjected to supply pressure when the valve is upshifted. When the valve is upshifted, throttle pressure is cut off so that normal downshifts are not throttle sensitive.

e. 2-3 Shift Valve

This shift valve automatically shifts the transmission from intermediate to direct gear. The 2-3 shift valve train is similar in construction and operation to the 1-2 shift valve train, in that it is controlled by governor and throttle pressures and spring force. When the valve train is in the upshifted position, oil is fed by line pressure through metering hole "A" to the following places:

(1) 3-1 relay valve.

(2) Through or around metering hole "E" (depending on shuttle valve position) to the "off" area of the kickdown servo and through the ball check valve to the rear clutch piston.

With the shift valve downshifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the rear clutch chamber and the kickdown servo "off" area is allowed to escape through the vent port.

f. 3-1 Relay Valve

This valve obtains a 3-1 downshift. The 3-1 relay valve is a valve arranged so that the 2-3 shift valve is coupled to the 1-2 shift valve during downshift at light throttle. Under these conditions, line pressure from the 2-3 shift valve acting on the 3-1 relay valve overcomes the forces of throttle and spring pressure moving the valve to the throttle pressure end. In this position, line pressure from the 1-2 shift valve is permitted to act on the governor plug end of the 2-3 shift valve holding the 2-3 shift valve in the upshift position regardless of governor pressure.

As car speed decreases and governor pressure can no longer overcome the force of the 1-2 shift valve spring, the 1-2 shift valve will downshift, cutting off the line pressure to the 3-1 relay valve. This will permit the two shift valves to downshift at the same time resulting in a smooth 3-1 downshift.

g. Kickdown Valve

The kickdown valve makes possible a forced downshift from direct to second—second to breakaway and direct to breakaway by depressing the accelerator pedal past the detent "feel" near wide open throttle.

It is desirable to limit the maximum vehicle speed at which kickdown may be made (approximately 70 mph. from drive to second and approximately 30 mph. from drive or second to breakaway). The throttle pressure actuated kickdown detent plug on the stem of the kickdown valve, supplies the resistance necessary for a detent "feel" at kickdown. With the kickdown valve in the kickdown position, throttle pressure is routed to the following places:

(1) Through ball check valve to the 1-2 shift valve kickdown plug.

(2) Through ball check valve to the 2-3 shift valve kickdown plug.

This pressure, when applied to the end of the kickdown plugs, is great enough to make the shift valves downshift against the force of any governor pressure up to the kickdown limit speeds.

h. Shuttle Valve, Shuttle Valve Plug, and Servo Pressure Bleed Valve

The shuttle valve has two separate functions and performs each independently of the other. The first is that of providing fast release of the kickdown band, and delayed smooth rear clutch engagement when the driver makes a "lift-foot" upshift from second to direct.

The "lift-foot" upshift is made by accelerating the vehicle in breakaway or second gear and then returning the accelerator pedal to closed throttle. Without the shuttle valve, the resulting upshift to direct would consist of a series of lurches, caused first by the braking effect on the vehicle by the second gear ratio and then by the harsh engagement of the rear clutch.

Under conditions of closed throttle (no throttle pressure) and moderate vehicle speed (moderate governor pressure) the shuttle valve and shuttle valve plug are forced to their extreme of travel (toward the throttle pressure end of the shuttle valve plug). In this position, oil is allowed to flow from the kickdown servo apply pressure port to the rear clutch pressure port and kickdown servo "off" area. Because the line pressure apply area of the kickdown servo

is being fed oil only through the hole in the servo pressure bleed valve, pressure on this area drops to a low value while oil from the 2-3 shift valve builds up pressure on the rear clutch and the "off" area of the kickdown servo. The kickdown band load is then reduced sufficiently to allow a smooth band release. In the meantime, pressure in the rear clutch has built up sufficiently to complete a smooth engagement.

The second function of the shuttle valve is to regulate the application of the kickdown piston when making high speed (above approximately 30 mph.) kickdowns. Kickdowns made at low vehicle speeds require very little time in which to complete the shift due to the comparatively small change in engine speed between direct and kickdown gear. The higher the vehicle speed at which the kickdown is made, the longer is the time required to make a smooth shift.

The force of the shuttle valve spring is great enough so that the force of governor pressure (at vehicle speeds under approximately 30 mph.) on the governor pressure area cannot move the shuttle valve toward the shuttle valve plug. Thus, for kickdowns below 30 mph. oil is fed to the line pressure area of the kickdown servo through both the hole in the servo pressure bleed valve and the line pressure and servo pressure ports of the shuttle valve. Speed of kickdown piston application is then at its maximum.

As further insurance against the engine "running away" during low speed kickdowns, rear clutch disengagement is delayed while the kickdown piston is applying the band. This is accomplished by the introduction of a restriction (metering hole "E") placed such that oil is "backed up" into the clutch chamber as the kickdown piston moves on. This "back up" pressure is greatest on low speed kickdowns when the kickdown piston applies rapidly and is sufficient to hold the clutch applied until the kickdown band is applied. At this time, the kickdown piston can no longer force oil into the clutch and the pressure is allowed to fall to zero.

For kickdowns at higher vehicle speeds, governor pressure attains a sufficient value to move the shuttle valve toward the shuttle valve plug, cutting off the feed of line pressure to the shuttle valve. Oil must then flow to the apply pressure area of the kickdown servo only through the hole in the servo pressure bleed valve. Kickdown piston application is, therefore, retarded.

9. OPERATIONAL SUMMARY

With the D (drive) button pushed in, the manual valve is positioned to give the full range of operation of the transmission. With the manual valve in the drive position, the front clutch is engaged and the transmission will transmit drive torque in breakaway.

At a speed which is dependent on throttle position, the transmission automatically upshifts to second gear. The change is initiated by movement of the 1-2 shift valve to the upshifted position so that pressure is directed to the apply side of the kickdown servo. When the kickdown band develops sufficient capacity to slow the rear clutch retainer, the overrunning clutch starts to over-run, so release of the previous reaction member is automatic. The band application during the shift is controlled by action of the accumulator.

At a speed which is again dependent on throttle position, the transmission makes an upshift to direct. This action is initiated by movement of the 2-3 shift valve. The upshift is accomplished by simultaneous disengagement of the kickdown band and engagement of the rear clutch.

Forced 3-2 shift is obtained below speeds shown in Shift Pattern Summary Chart, and forced 3-1 shift is obtainable below speeds shown in Shift Pattern Summary Chart. Normal downshifts are not throttle sensitive and above half-throttle, they occur in sequence 3-2, and 2-1. At throttle openings less than half-throttle the two shift valves are interlocked by means of the 3-1 relay valve and the two shift valves downshift together. The shift occurs as a 3-1 relay sequence at the normal 2-1 downshift speed. This action provides a smooth downshift since the overrunning clutch is overrunning in breakaway.

Pushing in the 2 (second) button of the control unit moves the manual valve so that line pressure is directed to the kickdown circuit of the 2-3 shift valve. When in direct, this results in a downshift to second speed only if the vehicle speed is below 3-2 kickdown limit. If the

vehicle is accelerated in second gear to the wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over-speeding the engine in second gear. Operation of the 1-2 and 2-1 shift occur in the same manner as in the D (drive) position.

Pushing in the 1 (low) button of the control unit positions the manual valve so that line pressure is directed to the kickdown circuit of the 1-2 shift valve. This results in a downshift to low only if the vehicle speed is below the 3-1 kickdown limit. Use of 1 (low) is intended primarily for engine braking so it is also necessary that the low-reverse band be engaged to lock the overrunning clutch. Line pressure from the low speed port of the manual valve body is fed to the low port of the 1-2 shift valve governor plug where it is blocked until governor pressure drops sufficiently so that line pressure at the kickdown plug overcomes it and the complete valve train shifts down. After the downshift, pressure at the low port of the governor plug is permitted to react on an area of the governor plug and also directed to the low-reverse servo. Then, the line pressure, acting on the combined areas of the governor plug and the kickdown plug, prevent an upshift—regardless of vehicle speed.

Pushing in the N (neutral) button moves the manual valve to a position which shuts off oil flow to the valve bodies. The torque converter and lubrication system remains pressurized.

Pushing in the R (reverse) button of the control unit positions the manual valve so that oil pressure is directed to apply the rear clutch and low-reverse band. In order to transmit the high torque loads involved in reverse operation, the system pressure is raised to 225 psi. by cutting off the pressure, and venting of the secondary reaction area of the regulator valve.

MAINTENANCE, ADJUSTMENTS AND TESTS

CAUTION

While in the process of making adjustments and tests, do not stall test the torque converter. For safety reasons and because damage to the transmission may result, wide open throttle stall operation should not be attempted.

10. ROAD TESTING THE TRANSMISSION

First check the transmission fluid level and set engine idle. Good transmission operation depends on good engine operation. Make sure the engine is operating at full efficiency. **If when tuning the engine, the throttle linkage between the carburetor and the transmission is disturbed, it will be necessary to readjust the linkage.** Before attempting to diagnose or correct the transmission operation, the engine and transmission should be warmed up to operating temperature. A short drive, approximately five to ten miles, with frequent starts and stops will create normal operating temperature of the engine and transmission.

All shifts and kickdowns should occur within speed ranges given in the Shift Pattern Summary Chart.

EXPLANATION OF INDEX ITEMS

Never remove a transmission from a car until all the possible "in car" causes have been checked for the operating difficulty and the oil pan has been removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces. Also, check the manual control cable and throttle linkage for adjustment and wear.

A. Oil Level—Refer to Lubrication Section of this manual.

B. Throttle Linkage—Refer to Paragraph 16.

C. Gearshift control cable—Refer to Paragraph 13.

D. Pressure tap check—Hydraulic pressure taps have been provided to check the following pressures: line, lubrication, governor, rear clutch apply, and throttle (compensated). These pressures should fall within the specified limits stated in the Hydraulic Control Pressure Check Charts.

E. Kickdown band adjustment—The kickdown band adjustment screw is found on the left side of the transmission case (Fig. 22). Refer to Paragraph 15.

TROUBLE DIAGNOSIS CHART

The Trouble Diagnosis Chart has the operating difficulties listed in three groups. After road testing, match the trouble found to its particular group and to the specific difficulty under that group. The Index and Item in the "Items to Check" column are next checked against the "Explanation of Index Items." Capital letter items refer to those operations which may be performed without removing the transmission. The small letter items refer to those operations done after removal of transmission from car.

ITEMS TO CHECK — See "Explanation of Index Items" — Perform Items: A, B, C, and G first INDEX ↓ ITEM ↓	OPERATING DIFFICULTY																												
	Shift Abnormalities										Response									Miscellaneous									
	Harsh N to D or N to R	Delayed N to D	Runaway on Upshift and 3-2 K.D.	Harsh Upshift and 3-2 K.D.	No Upshift	No K.D. or Normal Downshift	Shifts Erratically				Slips in Forward Drive Position	Slips in Reverse Only	Slips in All Positions	No Drive in Any Position	No Drive in Forward Ranges	No Drive in R (Reverse)	Drives in N (Neutral)			Drags or Locks	Grating, Scraping, Etc. Noises	Buzzing Noises	Trans. Hard to Fill—Oil Blows Out Fil. Tube	Transmission Overheats	Impossible to Push Start	Starter Won't Energize			
A. Oil Level		●	●		●	●	●				●		●	●								●	●	●	●				
B. Throttle Link Adj.			●	●	●	●	●																						
C. Gearshift Control Cable Adj.						●	●										●									●			
D. Pressure Checks—Line Lube, etc.	●	●	●	●	●	●	●				●	●	●	●	●	●									●				
E. K. D. Band Adj.			●	●	●	●									●					●				●					
F. Low-Reverse Band Adj.	●											●				●				●				●	●				
G. Engine Idle	●						●																						
H. Starting Switches																											●		
I. Handbrake Adj.																				●	●			●					
J. Regulator—Valve Spring							●						●	●								●	●	●					
K. Converter Control Valve																						●	●	●					
L. Breather																							●						
M. Output Shaft Rear Bearing S. R.							●														●								
N. T. C. Cooling																								●					
O. K. D. Servo Band-Linkage			●	●	●	●									●					●									
P. L-R Servo, Band-Linkage	●											●				●				●					●				
Q. Oil Strainer							●							●									●						
R. Valve Body—Bolts—Mating Surfaces		●	●	●	●	●	●				●	●	●	●	●		●								●				
S. Accumulator	●	●	●	●	●	●					●				●														
T. Air Pressure Check		●	●		●	●	●				●	●	●	●	●	●													
U. Governor					●	●	●									●					●								
V. Rear Pump																					●			●	●				
a. Front Pump—Drive Sleeve		●					●						●	●							●		●	●					
b. Regulator Valve Body, Gasket, Surfaces											●	●	●	●								●	●	●					
c. Converter																													
d. Front Clutch	●	●									●				●		●			●	●			●					
e. Rear Clutch	●		●	●	●						●				●	●				●	●			●					
f. Planetary Gear Set																				●	●								
g. Overrunning Clutch						●					●				●					●									

F. Low and reverse band adjustment—The low and reverse band adjustment screw is found on the right side of the transmission case. (Fig. 22). Refer to Paragraph 15.

G. Engine idle—Adjust to 475 to 500 r.p.m.

H. Starting switches—Check wires, connections and switch. Check clearance of N (neutral) push button slide to motor starting switch contact clearance (Paragraph 20).

Difficulty in starting the engine can often be traced to faulty operation of the vacuum safety switch. This switch can be tested by wrapping a piece of soft wire around the bottom of both terminals to by-pass the switch and complete the circuit. If engine starts (with switch by-passed) the switch is faulty. This condition is corrected by incorporating a vent hole ($\frac{1}{32}$ inch) in cap section of switch, just below fiber insulating washers. Punch hole anywhere in outer diameter of cap, using a sharp tool, such as an ice pick.

I. Handbrake—Check for excessive drag. Clearance should be .010-.015 in. Refer to Brakes Section III for method of adjusting handbrake.

J. Regulator valve, spring—The regulator valve may be removed by removing the regulator valve spring retainer which is on the right side of the transmission case (Fig. 22). Check for a stuck or scratched valve and/or buckled spring.

K. Converter control valve, spring—The converter control valve may be removed by removing the converter control valve spring retainer which is on the right side of the transmission case (Fig. 22). Check for a stuck or scratched valve and/or buckled spring.

L. Breather—Check to determine whether breather is free of dirt and undercoating.

M. Output shaft rear bearing, snap ring—Check for rough bearing and/or unseated snap ring and correct thickness snap ring.

N. Torque converter—Check oil cooler lines for being bent, kinked or having loose connections.

O. Kickdown servo, band and linkage—Check for broken seal rings, stuck servo piston or broken linkage.

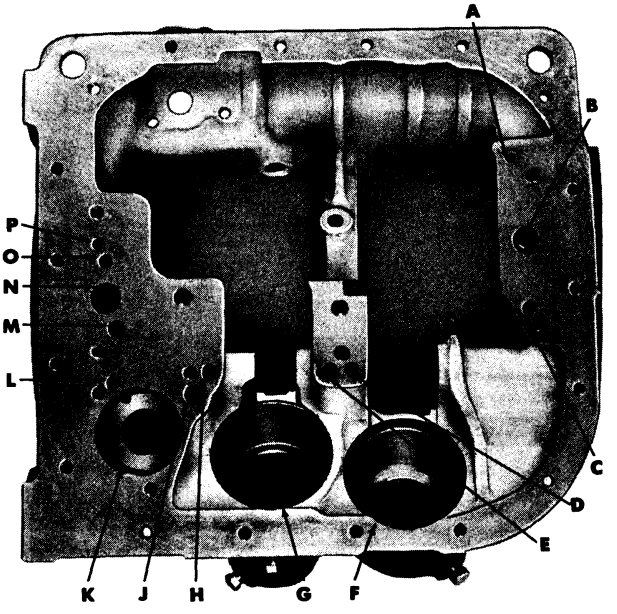
P. Low and reverse servo, band and linkage—Check for torn seal, broken band and/or linkage.

Q. Oil strainer—Check for possible air leakage.

R. Valve body attaching bolts and mating surface—Check for loose bolts, burrs or scratches on mating surfaces. Clean valve body assembly. Check for stuck valves, dirt, scratched valves or body, and burrs on valves. Torque valve body bolts to specifications.

S. Accumulator—Check accumulator cover screw tightness and piston for broken rings. Torque accumulator cover screws to specifications.

T. Air pressure checks—The front clutch, rear clutch, kickdown servo, and low and re-



A—GOVERNOR PRESSURE
B—REAR PUMP INLET
C—REAR CLUTCH 'APPLY' (Line pressure)
D—LOW AND REVERSE SERVO 'APPLY' (Line pressure)
E—KICKDOWN SERVO 'APPLY' (Throttle compensated pressure)
F—LOW AND REVERSE SERVO (Location)
G—KICKDOWN SERVO (Location)
H—KICKDOWN SERVO 'APPLY' (Line pressure)
J—KICKDOWN SERVO 'RELEASE' (Line pressure)
K—ACCUMULATOR (Location)
L—FRONT CLUTCH AND ACCUMULATOR 'APPLY' (Line pressure)
M—LINE PRESSURE
N—FRONT PUMP INLET
O—REVERSE UPSET (Reverse blocker 'Apply') (Line pressure)
P—LINE PRESSURE GAUGE 56x712A

Fig. 16—Oil Passages in Transmission Case

verse servo may be checked by applying air pressure to their respective passages when the valve body is removed. To make the complete air pressure check proceed as follows: (Refer to Fig. 16.)

CAUTION

Compressed air supply must be free of all dirt and moisture.

Raise the vehicle on a hoist, drain the transmission fluid and remove the transmission oil pan. Remove the accumulator cover and valve bodies assembly. Apply air pressure to the front clutch passage, located slightly toward the center of the transmission from the accumulator (be sure to cover accumulator piston bore to prevent piston from being blown out). Protect from oil spray by holding a clean lintless cloth, cardboard, or some other shield against the bottom of the transmission case when applying the air pressure. Listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and observe for excessive oil leaks in the system.

Apply air pressure to the rear clutch passage (near the center rear end of the lower surface of the transmission case). Listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

Apply air pressure to the kickdown "apply" (line) pressure passage (toward the center of the transmission case and to the front of the kickdown servo. Observe the operation of the kickdown servo lever and band when air pressure is applied.

Apply air pressure to the kickdown "apply" (compensated throttle) pressure passage (toward the center of the transmission case and to the rear of the kickdown servo). Observe the operation of the kickdown servo.

Apply air pressure to the low and reverse servo passage (toward the center of the transmission case and to the front of the low and reverse servo). Observe the operation of the low and reverse servo, lever, and band, when air pressure is applied.

If the clutches and servos operate properly, "no drive" conditions as well as erratic or no upshift conditions, indicate that the malfunctioning exists in the control valve body assembly. Disassemble, clean, inspect and service the valve body assembly as described under "Reconditioning of Valve Body and Transfer Plate Assemblies."

Upon completion of the air pressure check, and servicing the valve body assembly, install the valve body assembly, accumulator cover, and transmission oil pan. Fill the transmission to proper level with fluid, and adjust the control cable and throttle linkage.

U. Governor—Clean assembly, and check weight assembly and valve for burrs, scratches or sticky operation. Examine the governor valve shaft, shaft snap rings and seal rings.

V. Rear pump—Clean and inspect assembly for side and diametral clearance. Note whether rear oil pump pinion ball is in place. Examine output shaft support face for scoring.

a. Front pump—Drive sleeve—Clean and inspect assembly for side and diametral clearance. Examine oil pump inner and outer rotor for scoring. Check front pump drive sleeve seal rings.

b. Regulator valve, mating surfaces, gasket—Clean and inspect valve body for scratches and scoring on valve bores and face which bears against the front pump housing. Examine the valve body to determine if the secondary reaction orifice is free of dirt. Check gasket for uniformness of compression by valve body.

c. Converter—Flush out converter and check converter to housing runout. Refer to Torque Converter Section of this manual.

d. Front clutch—Clean and inspect discs, plates, drive hub, return spring, piston levers, cushion spring and retainer. Check the following front clutch circuit leakage possibilities:

(1) Valve body and valve body to case mating surface.

(2) Accumulator small and large piston rings.

(3) Regulator valve body to case mating surface.

(4) Torque converter reaction shaft seal ring.

(5) Input shaft small and large seal rings.

(6) Intermediate shaft No. 1, 2, and 3 seal rings.

(7) Front clutch oil feed tube.

(8) Front clutch piston inner and outer seal ring.

(9) Front clutch check valve ball.

e. Rear clutch—Clean and inspect discs, plates, return spring and piston. Check the following rear clutch circuit leakage possibilities:

(1) Valve body and valve body to case mating surface.

(2) Output shaft support to case mating surface.

(3) Output shaft small and large seal rings.

(4) Intermediate shaft No. 4, 5, and 6 seal rings.

(5) Rear clutch oil feed tube.

(6) Sun gear rear clutch seal rings.

(7) Rear clutch piston inner and outer seal rings.

(8) Rear clutch check valve ball.

(9) Kickdown piston rod guide seal ring and rod guide to kickdown rod fit.

(10) Large kickdown piston seal ring.

f. Planetary gear set—Clean and inspect gear set for worn thrust washers, nicked or rough gear teeth, and excessive pinion end clearance.

g. Low Speed Over-running clutch—Clean and inspect the over-running clutch assembly for brinelled rollers and/or cam and improperly assembled rollers or springs.

11. LUBRICATION

For lubrication requirements of the Torque-Flite Transmission, refer to the Lubrication Section of this manual.

12. OIL LEAKS

a. Leaks Repaired with Transmission in Vehicle

Transmission output shaft rear bearing oil seal. Extension gasket. Speedometer pinion assembly in extension. Oil pan to filler tube connector. Oil pan to transmission case. Regulator valve and torque converter control valve spring retainers. Regulator valve adjusting screw.

Gearshift control cable seal ring and housing gasket. Governor, line, lubrication, rear clutch apply and throttle (compensated) pressure check plugs in transmission case or support (pressure test holes). Neutral starting switch.

If oil is found inside torque converter housing, determine whether it is Automatic Transmission Fluid or engine oil. Check torque converter drain plug for tightness.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws or plugs. Where this does not remedy the situation, replace faulty gaskets, seals or plugs.

b. Leaks Requiring Removal of Transmission from Vehicle

Sand hole in transmission case. Sand hole in front oil pump housing. Front oil pump housing screws or damaged sealing washers. Front oil pump housing seal (located on outside diameter of front oil pump housing) torque converter. Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts.

13. GEARSHIFT CONTROL CABLE ADJUSTMENT

Engage the R (reverse) push button. Raise vehicle on hoist and drain approximately two quarts of fluid from the transmission. Loosen the control cable adjusting clip screw and remove the neutral starting switch (Fig. 17). Insert a screwdriver through the neutral starting switch mounting hold and pry lightly on the lever to hold the lever in the reverse detent position.

Move the control cable in and out while observing the amount of free travel, then position the cable in the center of this free travel. Tighten the adjusting clip screw and install the neutral starting switch as outlined in Paragraph 14.

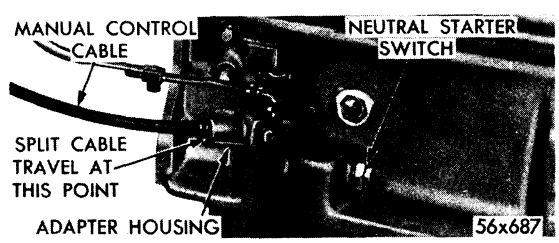


Fig. 17—Manual Control Cable Adjustment

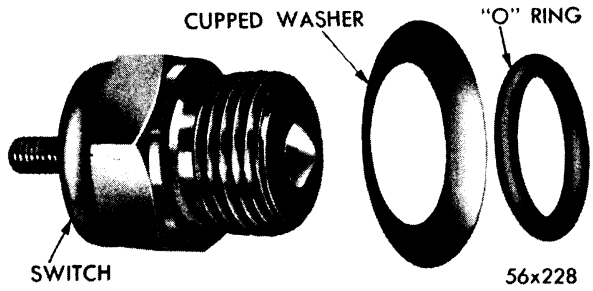


Fig. 18—Neutral Starting Switch (Disassembled)

14. INSTALLING AND TESTING NEUTRAL STARTING SWITCH (FIG. 18)

a. Installation and Tests

Install the concave spring (cupped) washer over the threads of the neutral starting switch so that the concave (cupped) side of the washer is towards the transmission case. Install the "O" ring seal over the threads of the neutral starting switch and up against the washer. Screw the neutral starting switch into the case until the spring washer contacts the transmission case, then tighten one-third of a turn.

Check operation of switch by checking the low (1) and reverse (R) button over-travel (must be equal for proper cable adjustment). Should switch still fail to function, it is recommended that the following modification be performed to the neutral starting switch.

(a) Remove the neutral starting switch and machine $\frac{1}{32}$" from the seating surface of the switch as illustrated in Fig. 19.

(b) Clean the switch, replace the concave (cupped) washer and "O" ring seal, and install the switch.

NOTE: The switch must be tight enough to prevent oil leakage. If it is not, add a thin washer and retighten.

Refill transmission to proper level as outlined in Lubrication Section. Check starter operation by pushing the various push buttons and returning to neutral.

CAUTION

Neutral starting switch failure may occur due to very high amperage current flowing through the switch. This results when a jumper wire or remote control starting switch is improperly connected, when placed in the circuit when taking compression readings.

It is important that the jumper leads be connected to the battery terminal and ignition terminal of the starter relay.

b. Switch Lever Alignment

Remove the neutral starting switch and check the location of the neutral starting switch lever inside the transmission, as illustrated in Figure 20.

The lever should be dead center of the starter switch mounting hold in the transmission (when lever is in neutral **detent**). In instances where it is not aligned properly, install a new valve body.

15. BAND ADJUSTMENTS

a. Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case (Fig. 22). Loosen the locknut and back off approximately 5 turns. **Check for freeness of adjusting screw in transmission case.** Using wrench, Tool

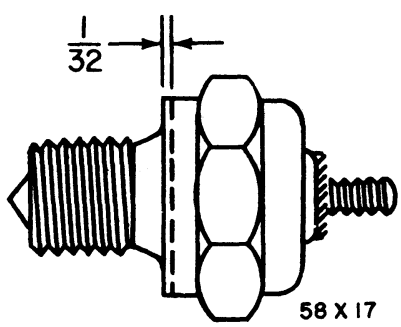


Fig. 19—Neutral Starting Switch

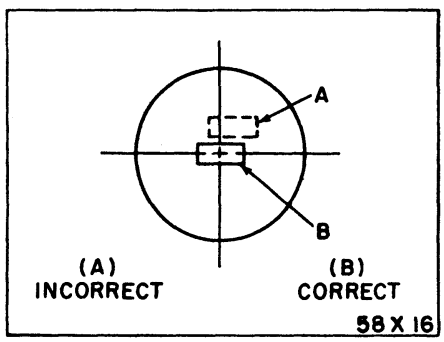


Fig. 20—Lever Alignment

C-3380 with adapter C-3583, tighten to a reading of 47-50 inch-pounds torque.

NOTE: This will be a true torque of 70-75 inch-pounds which reading should be used if torque wrench C-3380 is used without the adapter C-3583 (as may be done if adjustment is made with the transmission removed from the car).

Back off the adjusting screw 2¼ turns.

NOTE: To compensate for initial wear-in, the adjustment of a new band must be ¼ turn tighter than the specification given.

Holding adjusting screw, tighten locknut to 35-40 foot-pounds torque.

b. Low-Reverse Band (Rear)

The low-reverse band adjusting screw is located on the right side of the transmission case (Fig. 22). Loosen the locknut and back off approximately 5 turns. **Check for freeness of adjusting screw in transmission case.**

Using wrench, Tool C-3380 with adapter C-3583, tighten to a reading of 47-50 inch-pounds torque.

NOTE: This will be a true torque of 70-75 inch-pounds which reading should be used if torque wrench C-3380 is used without the adapter C-3580 (as may be done if adjustment is made with transmission removed from vehicle).

Back off adjusting screw 2⅝ turns.

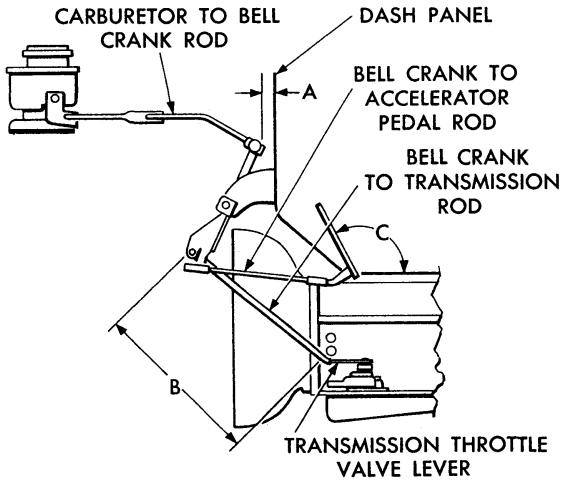
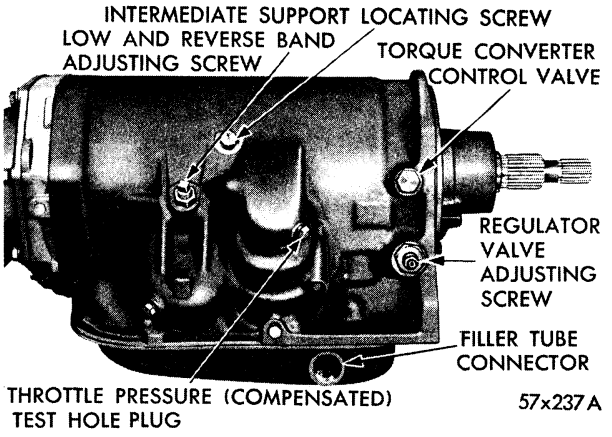


Fig. 21—Throttle Linkage Adjustments



(Right Side of Transmission)

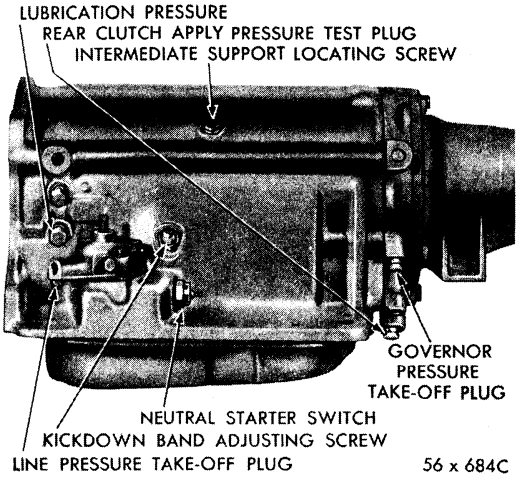


Fig. 22—Transmission Case (Left Side of Transmission)

NOTE: To compensate for initial wear-in, the adjustment of a new band must be ¼ turn tighter than the specification given.

Holding adjusting screw, tighten locknut to 35-40 foot-pounds torque.

16. THROTTLE LINKAGE ADJUSTMENTS (REFER TO FIG. 21)

(FOUR BARREL CARBURETOR)

With the engine at operating temperature and carburetor off the idle cam, adjust idle speed to 475-500 R.P.M. (use tachometer). Loosen the throttle linkage adjusting nuts on the carburetor to bell crank rod, and on the bell crank to transmission rod. Adjust carburetor to bell crank rod to position the lever ½ inch from the cowl dash panel (see "A"

Fig. 23—Checking Line Pressure

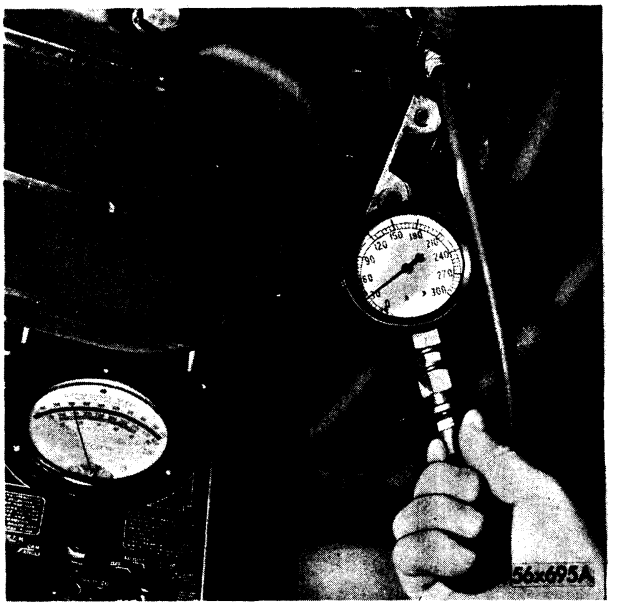


Fig. 24—Checking Governor Pressure

Fig. 21) and tighten adjusting nut. Check that proper bell crank to transmission rod has been installed. Dimension "B" (Fig. 21) should 8½ inches. Hold slight preload rearward on bell crank to transmission rod while holding the transmission throttle valve lever forward against the stop, and tighten adjusting nut.

The accelerator pedal should be at an angle of 115 degrees (see "C" Fig. 21) to the horizontal. If necessary to correct, adjust pedal angle by removing the accelerator pedal end of the bell crank to pedal rod, and shortening or lengthening the rod by loosening the lock nut at the swivel end and rotating swivel. Reinstall the rod and tighten the locknut.

NOTE: Be sure rod is properly aligned to prevent binding.

TWO BARREL CARBURETOR

All operations are the same as the four barrel, except that, since there is no intermediate throttle control assembly, adjustment is made on the bellcrank to carburetor rod.

17. HYDRAULIC CONTROL PRESSURE CHECKS AND ADJUSTMENTS

a. Line Pressure

NOTE: Line pressure adjustment must be made in D (drive) position with engine at 1200 R.P.M. and wheels free to turn. Oil must be at operating temperature (150° F.-200° F.).

Remove the pipe plug from the line pressure take-off hole located on the left side of the transmission case (Fig. 22). Install gauge, Tool C-2393 (300 psi.) at this point (Fig. 23).

If line pressure is not correct, it may be adjusted by loosening the lock nut on the adjusting screw (Fig. 22) and turning screw **clockwise** to increase or **counterclockwise** to decrease

LINE PRESSURE CHART

Push Button Position	Rear Wheels	Engine Speed (RPM)	Line Pressure (PSI)
R	Free to Turn	1600	200—240
N	———	1200	85—95
D	Free to Turn	1200	85—91
2	Free to Turn	1200	85—95
1	Free to Turn	1200	85—95

line pressure. All line pressure adjustments should fall within the limits specified in the table shown for all other push button positions.

b. Governor Pressure (Refer to Fig. 24)

Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Fig. 22). Install gauge, Tool C-3292 (100 psi.).

c. Lubrication Pressure

Remove the pipe plug (or oil cooler fitting) from the lubrication pressure take-off hole located on the left side of the transmission case (Fig. 22). Install gauge, Tool C-3292 (100 psi.) at this point. With engine running at 800 rpm. in neutral, lubrication pressure should be approximately 10 to 30 psi.

If the pressure is extremely high (above 50 psi.), it is a good indication that there is a restriction due to dirt or foreign matter in the lubrication passages.

d. Checking Throttle (Compensated) Pressure

Raise the vehicle off the floor (rear wheels free to turn). Install gauge, Tool C-3292 (100 psi.) at throttle pressure take-off plug. Refer to Fig. 22. Disconnect the bellcrank to transmission throttle linkage at the transmission. Start the engine, and place the transmission in D (drive) position. While holding the transmission throttle lever **toward the closed throttle** position (against the internal stop) increase engine speed slowly (using accelerator pedal or suitable throttle control fixture) to approximately 1500 rpm. to obtain an upshift into direct ratio. After the shift takes place compensated throttle pressure should read 26 to 32 psi. As throttle lever (at transmission) is advanced toward full throttle, compensated throttle pressure should begin to rise after 0° to 5° movement. If compensated throttle pressure rises immediately when the lever is moved, or if the pressure is incorrect or fails to rise after approximately 5° movement, install a new valve body.

Before stopping the engine, advance the throttle control lever (at transmission) slowly and then return to closed throttle. Compensated throttle pressure should rise to approximately 80 to 90 psi. and then fall smoothly without hesitation and should always return to a consistent reading at closed throttle. Failure to do this indicates faulty throttle compensator valve or throttle valve operation.

GOVERNOR PRESSURE CHART

(NOTE: WHEELS MUST BE FREE TO TURN)

Push Button Position	Governor Pressure (PSI)	LC-1, 2, 3	LC-1, 2, 3	LC-1, 2, 3	LY-1	LY-1	LY-1
		AXLE RATIOS					
		2.93-1	3.18-1	3.36-1	2.93-1	3.18-1	3.36-1
1	15	19—21	17—19	16—18	19—21	18—20	17—19
2	45	34—41	32—39	29—36	36—43	33—40	31—37
D	75	71—77	66—71	63—67	74—80	68—74	64—70

SERVICING THE GEARSHIFT CONTROL UNIT

18. REMOVAL AND INSTALLATION

a. Removal

Disconnect one of the cables at the battery. At rear of instrument panel, disconnect back-up light switch, starting motor switch, and illuminating lamp leads. Remove the two small screws from face plate (Fig. 25) to expose two of the bezel retaining screws. Remove the three screws securing bezel to plate and instrument panel (Fig. 25). (Two on front face of bezel—one at bottom edge of bezel.)

CAUTION

Do not attempt to remove face plate and bezel as an assembly as damage to plate casting may occur.

Remove screws (Fig. 25) which retain gearshift housing and plate assembly to instrument panel.

NOTE: Loosening the two trim moulding screws will aid in removal of plate assembly.

Pull gearshift housing and plate assembly straight out and partially downward from instrument panel to expose control cable and cable bracket.

NOTE: If unit is equipped with back-up light switch, use care during removal of unit, to avoid damaging switch.

Withdraw push buttons from their respective slides. Remove nuts (Fig. 25) securing gearshift housing to plate. Withdraw plate from gearshift housing. Remove hairpin clip (Fig. 25) securing control cable to actuator. Remove the two screws holding cable and cable bracket assembly housing (Fig. 25) and remove cable assembly from gearshift housing. Remove back-up light switch by bending the tabs straight with a screwdriver. The starting motor switch is removed by drilling out the rivets. Remove housing to plate support bracket by removing screws at bottom of plate.

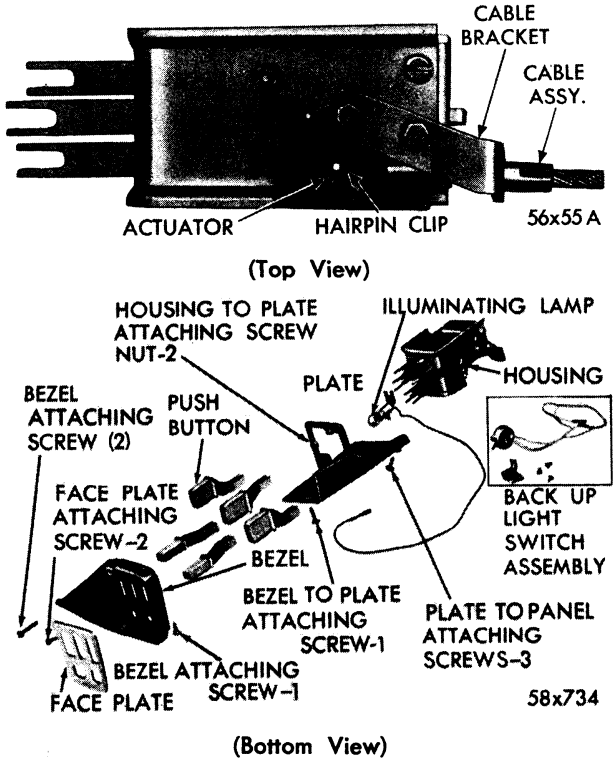


Fig. 25—Gearshift Control Housing and Plate Assembly Control Cable Attached

On Imperial models, remove faceplate to expose the two gearshift housing to support retaining nuts. Remove nuts and pull gearshift housing rearward and down from back of instrument panel. Disconnect back-up light switch and starting motor switch leads.

NOTE: Illuminating lamp bulb and light conductor (Fig. 26) are fastened to the gearshift housing support bracket and need not be removed with the housing.

b. Installation

Reinstall all switches that were removed from the gearshift housing.

Install end of control cable to actuator and install hairpin clip (Fig. 25). Place cable and bracket in position on gearshift housing, install the two screws and tighten securely.

Place gearshift housing in position on plate and secure to plate with the two retaining nuts (Fig. 25). Carefully guide plate and housing assembly into position in instrument panel and secure with screws (Fig. 25). Install push buttons on their respective slides.

NOTE: If gearshift housing is equipped with back-up light switch, exercise care during installation of housing to prevent damage to switch.

Reconnect all switch and lamp leads. Install face plate and bezel (Fig. 25). Test operation of unit.

On Imperial models (after reinstalling back-up light and starting motor switches—if removed) install cable and bracket on gearshift housing. Install push buttons (if removed) and install gearshift housing to support bracket at rear of instrument panel. Secure with the two retaining nuts, then replace face plates. Test operation of unit.

19. REPLACING ILLUMINATING BULB

Remove screws from face plate and remove face plate to expose two of the bezel retaining screws (Fig. 25). Remove bezel, then remove one or more push buttons for clearance.

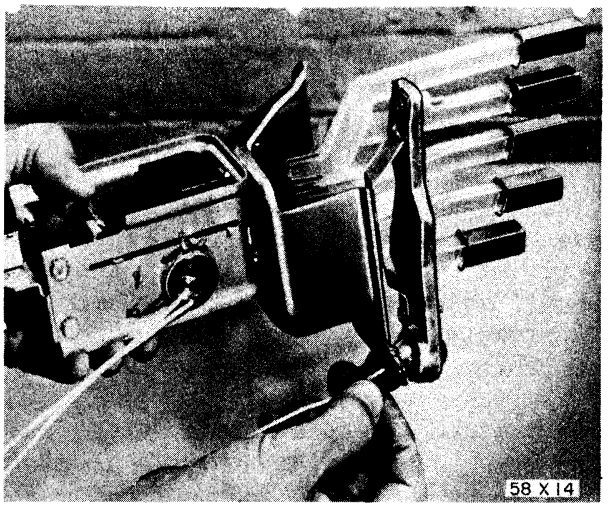


Fig. 26—Illuminating Lamp Bulb Installation—Imperial Models

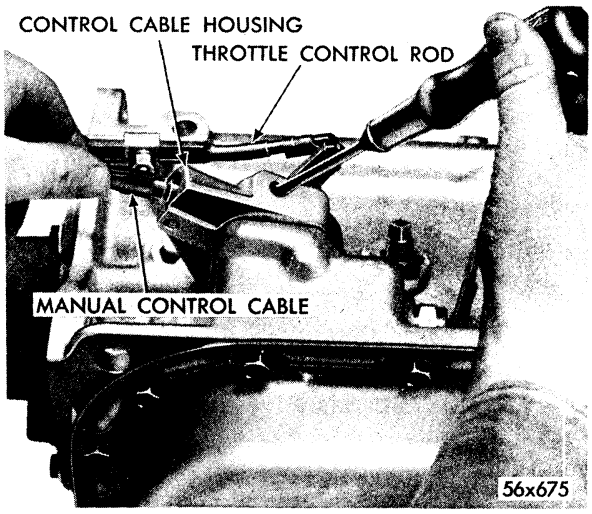


Fig. 27—Releasing Manual Control Cable Spring Lock

Using Tool C-3399, remove bulb.

NOTE: If Tool C-3399 is not available, remove as many push buttons as are necessary for clearance, then, using a piece of cloth (to protect fingers in case of bulb breakage) remove the bulb.

Replace face plate and bezel and test operation of unit.

On Imperial models, the bulb and socket are positioned in the light conductor, as shown in Figure 26. It is necessary, therefore, to reach behind the instrument panel to remove the bulb and socket. After replacing bulb, snap socket into light conductor as shown in Figure 26.

20. REPLACING BACK-UP LIGHT SWITCH AND STARTER SWITCH

The back-up light switch is mounted on the left side of the push button housing. Remove housing, as outlined in Paragraph 18. Use a long, narrow-blade screwdriver to straighten the four tabs that hold the switch. Place replacement switch in position on housing and bend over the four tabs. Replace housing, as outlined in Paragraph 18.

To replace the starter switch, first remove housing, as outlined in Paragraph 18. Drill out the two rivets holding the switch to the flange. The switch replacement kit consists of the switch and two soft tubular rivets. Install switch on flange and check clearance between end of N (neutral) push button slide and end of switch plunger. Bend the flange, on which switch is mounted, to obtain .010 to .015 inch clearance. Reinstall housing as outlined in Paragraph 18.

21. REMOVAL AND INSTALLATION OF CONTROL CABLE (TRANSMISSION END)

a. Removal

Engage the 1 (low) button to place cable adapter spring lock in line with control cable adapter plug hold in transmission case.

Remove cable adjustable mounting bracket on transmission. Remove cable adapter housing plug, insert screwdriver through hole. While exerting pressure against cable lock, spring, withdraw cable as shown in Figure 27.

b. Installation

Remove neutral starting switch (Fig. 22) from transmission case. Place manual valve lever in LOW detent. Hold the R (reverse) push button in at full travel. Insert cable assembly into its adapter in the control cable housing engaging groove in cable end with lock spring. Move cable in and out to make certain cable is securely locked in lock spring. Adjust cable!

SERVICING OF COMPONENT PARTS WITH TRANSMISSION IN VEHICLE

22. SPEEDOMETER PINION

a. Removal

Disconnect speedometer cable and housing from drive pinion and sleeve assembly. Remove speedometer pinion and sleeve assembly from transmission extension. Refer to Page 87 for Speedometer Pinion Usage Chart.

b. Installation

Install speedometer pinion and sleeve assembly in transmission extension and tighten to specifications.

23. NEUTRAL STARTING SWITCH

a. Removal

Drain approximately two quarts of fluid from transmission by disconnecting filler tube at oil pan connector, (may be necessary to loosen filler tube support bracket screw). Remove wire at switch. Remove switch.

b. Installation

Refer to Paragraph 14.

24. TRANSMISSION REGULATOR VALVE ASSEMBLY

a. Removal

Remove transmission regulator valve adjusting screw and lock nut, gasket, cup, spring and sleeve. Using a mechanical retriever or a piece of welding rod ($\frac{5}{32}$") inserted in end of valve, remove valve (Fig. 28).

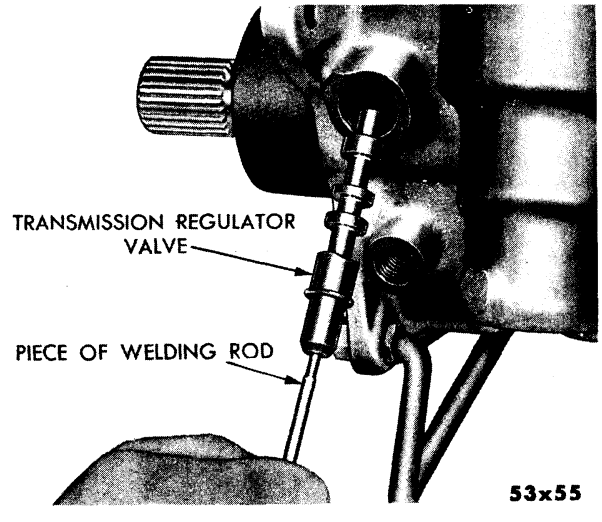


Fig. 28—Typical View—Showing Method of Removing Regulator Valve

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install regulator valve spring, sleeve, cup, gasket, adjusting screw and lock nut and tighten to specifications. Check line pressure and adjust if necessary.

25. TORQUE CONVERTER CONTROL VALVE ASSEMBLY

a. Removal

Remove the torque converter control valve spring retainer (Fig. 22) gasket and spring. Using a mechanical retriever or a piece of welding rod ($\frac{1}{8}$") inserted in end of valve, remove valve.

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install torque converter control valve spring, gasket, and retainer, and tighten to specifications.

26. OIL PAN

a. Removal

Drain transmission by disconnecting filler tube connector at oil pan. (It may be necessary to loosen filler tube support bracket screw.) Remove the oil pan screws and washers, and remove the oil pan and gasket from transmission case.

b. Installation

Using a new oil pan gasket, place oil pan into position on transmission case. Install oil pan screws and washers drawing them down evenly and tighten to specifications. Install oil pan filler tube, and tighten nut connector to specifications. Tighten support bracket screw. Refill transmission with Automatic Transmission Fluid (Type A). Refer to Lubrication Section.

27. VALVE BODIES AND TRANSFER PLATE ASSEMBLY

a. Removal

Place push button control unit in 1 (low) position.

NOTE: It will be necessary for control cable adapter to be in this position (for accessibility) when removing cable from adapter housing on transmission.

Remove oil pan. Disconnect throttle link from throttle lever on transmission. Remove all dirt and foreign material from around control cable housing. Loosen throttle valve lever screw and remove lever assembly. Remove flat washer and lip seal from throttle valve lever shaft. Remove control cable adjustable mounting bracket. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While exerting pressure on control cable spring lock, remove cable (Fig. 27). Using same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten.

Remove the three control cable housing screws and washers. Remove control cable housing and gasket. Loosen manual valve control lever screw and slide lever off shaft. Remove the four oil strainer assembly screws and washers and remove oil strainer assembly. Loosen (to relieve spring load) and remove the three accumulator cover screws with washers.

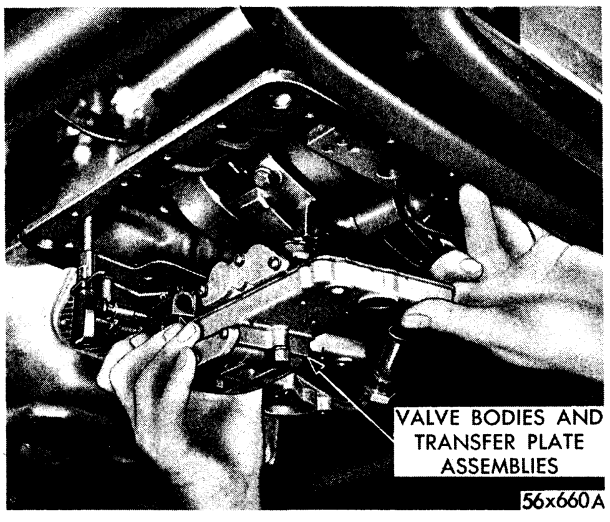


Fig. 29—Removal and Installation of Valve Bodies and Transfer Plate Assembly

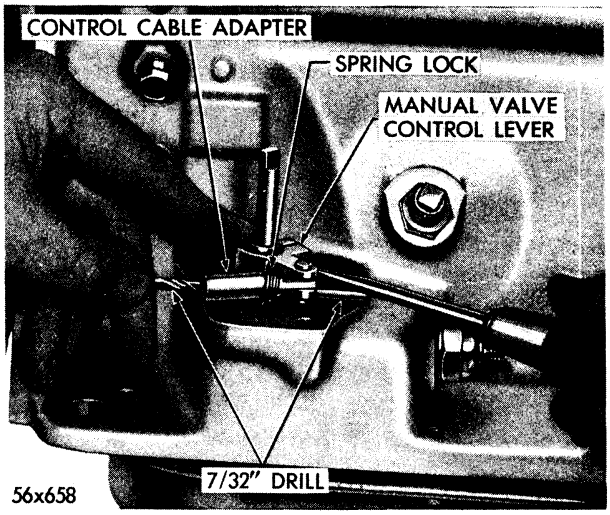


Fig. 30—Setting Manual Valve Control Lever Clearance

Remove cover and spring from transfer plate. Remove the three transfer plate screws and washers and remove valve bodies and transfer plate assembly from transmission case (Fig. 29).

b. Installation

Clean mating surfaces and check for burrs on both the transmission case and valve body transfer plate. Install valve bodies and transfer plate assembly on transmission case. Install the three transfer plate screws and washers (two in center and one on front). Draw down evenly and tighten to specifications.

CAUTION

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on screws with dished portion facing away from head.

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, three screws, and washers; draw down evenly. Place oil strainer in position on transfer plate assembly. Install the four screws and washers. Draw down evenly and tighten strainer and accumulator cover screws to specifications. Install oil pan. Install manual valve control lever (locking screw to rear) on manual valve lever shaft. Position lever on shaft so there is $\frac{7}{32}$" clearance (without gasket) between lever and transmission case.

NOTE: a 7/32" drill bit can be used for obtain-

Fig. 31—Removal and Installation of Kickdown Piston (Typical View)

ing proper clearance (Fig. 30). Tighten locking screw securely.

If control cable adapter has been removed from manual valve control lever, reinstall by positioning in lever (end of spring lock up), and installing pin. Place manual valve control lever in reverse position (last detent to rear) and install gasket, control cable housing, and screws and washers. Draw down evenly and tighten to specifications. Install lip seal, flat washer, and throttle lever control assembly. Tighten clamping bolt.

Connect throttle linkage to throttle lever on transmission. Install control cable in housing and adapter **making sure spring lock engages cable.** Replace cable adjustable mounting bracket. Adjust manual control cable. Refer to 'Maintenance, Adjustments and Tests', Paragraph 13. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage. Refer to "Throttle Linkage Adjustments", Paragraph 16.

28. KICKDOWN PISTON

a. Removal

Remove valve bodies and transfer plate assembly. Loosen kickdown band adjusting screw lock nut and back adjusting screw out sufficiently to remove anchor. Remove kickdown band strut. Install Tool C-3529 or C-3289, (modified as shown in Fig. 60), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring. Loosen compression portion of tool and remove piston rod guide, piston spring, and piston rod. Using C-484 pliers, remove the kickdown piston from transmission case (Fig. 31). Refer to "Kickdown Piston Inspection" Paragraph 92.

b. Installation

Lubricate piston rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so not to damage rings, tap lightly and bottom piston into transmission case. Slide piston spring over kickdown piston rod assembly and install in piston. While holding in position, install the kickdown piston rod guide assembly on kickdown piston rod.

Using Tool C-3529 or C-3289 (modified) compress the kickdown piston spring to the point that piston guide seal ring slightly binds on transmission case. Work seal ring into position and gradually compress spring until seal ring enters case and snap ring can be installed. Install kickdown piston rod guide snap ring, making sure it is properly seated. Loosen compressing portion of tool and remove tool from transmission case. Place kickdown band strut in position in band and lever, and compress band end sufficiently to install anchor over adjusting screw. Adjust kickdown band as outlined under "Maintenance, Adjustments and Tests", Paragraph 15. Install valve bodies and transfer plate assembly.

29. ACCUMULATOR PISTON

a. Removal

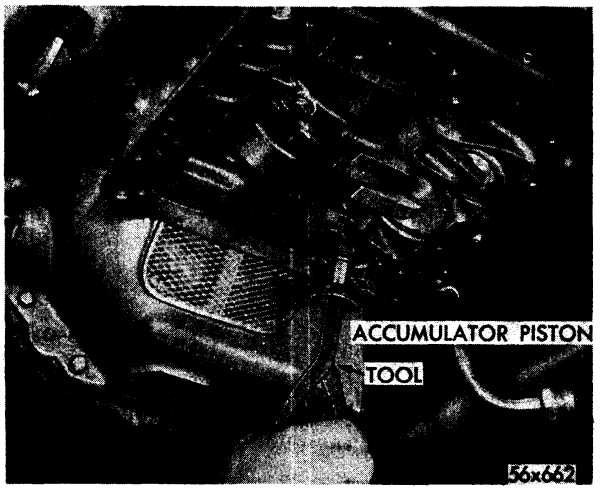


Fig. 32—Removal and Installation of Accumulator Piston (Typical View)

Remove valve bodies and transfer plate assemblies. Using Tool C-484, remove accumulator piston from transmission case, as shown in Figure 32. Refer to "Accumulator Piston—Inspection", as outlined in Paragraph 93.

b. Installation

Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case. Install valve bodies and transfer plate assemblies.

30. TRANSMISSION OUTPUT SHAFT REAR BEARING OIL SEAL

a. Removal

Disconnect the front universal joint and secure propeller shaft out of the way. Apply the hand brake or use wrench Tool C-3281 (Fig. 42) and remove the propeller shaft flange nut and washer. Release hand brake and install puller, Tool C-452 (if necessary). Remove the propeller shaft flange and brake drum assembly. Remove the transmission brake support grease shield spring (small spring). Remove brake support grease shield from extension.

CAUTION

If screw driver or sharp instrument is used in performing this operation, care must be exercised not to damage the neoprene sealing surface at bottom of shield.

Install puller, Tool C-748 and remove the transmission output shaft rear bearing oil seal.

b. Installation

Using driver, Tool C-3205, install output shaft rear bearing oil seal (metal portion of seal facing in) until driver bottoms on extensions, (Fig. 72). Install brake support grease shield on extension housing.

CAUTION

Indent on grease shield must match groove in extension for correct positioning. Also, shield must be located on extension far enough to permit installation of spring.

Install brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Install propeller shaft flange and drum assembly. Install propeller shaft flange washer (convex side towards nut) and nut. Apply hand brake or use wrench Tool C-3281, and tighten propeller shaft flange nut to specifications. Connect front universal joint and tighten nuts to specifications.

Refill transmission (if necessary) with Automatic Transmission Fluid (Type A) to proper level.

31. EXTENSION

a. Removal

Raise vehicle off floor. Drain approximately two quarts of fluid from transmission. Disconnect front universal joint and secure propeller shaft out of the way. Apply hand brake or use Tool C-3281, and remove propeller shaft nut and washer.

Release hand brake and using puller, Tool C-452 (if necessary), remove the propeller shaft flange and drum assembly.

Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension and remove speedometer drive pinion and sleeve assembly. Remove nuts and lockwashers that hold engine rear support insulator to crossmember, leaving insulator attached to extension housing.

Using suitable jack (or engine support fixture Tool C-3487) raise transmission sufficiently to allow output shaft support to clear crossmember. Remove four of the remaining extension to case screws and lockwashers and install guide studs, Tool C-3283. Due to interference of the insulator, it will be necessary to remove the bottom extension to case screw with the extension. That is, back screw out as far as possible and slide extension back and continue loosening of screw.

CAUTION

Do not remove the one output shaft support to transmission case screw.

Remove extension and hand brake as one assembly. **If care is used, it is not necessary to**

remove hand brake support and shoe assemblies from extension to replace output shaft rear bearing.

b. Installation

With guide studs, Tool C-3283 installed in transmission case, install a new extension gasket over guide studs and into position against output shaft support. **Do not use sealing material on gasket.** Using extreme care, place extension and hand brake assembly over output shaft and on guide studs. **Due to interference of the insulator, it will be necessary to start the bottom extension to case screw as the extension is pushed into position against support. Do not use hammer or attempt to pull extension in with the aid of screws: otherwise, damage to extension may result. The propeller shaft flange and drum assembly may be used to force bearing in extension on output shaft.**

Remove guide studs, Tool C-3283 and install six remaining extension to case screws and lockwashers. Draw down evenly and tighten to Data and Specifications. After screws have been properly tightened, turn output shaft to make sure it turns freely. Lower transmission and at the same time align mounting studs in insulator with holes in crossmember. Install nuts and lockwashers and tighten to specifications. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt.

Install propeller shaft flange and drum assembly, washer, and nut. Apply hand brake or using Tool C-3281 to hold flange, tighten nut to Data and Specifications. Install adjusting screw cover plate on hand brake support. Connect front universal joint and tighten to specifications. Install speedometer pinion and sleeve assembly. Tighten to specifications and connect speedometer cable and housing. Lower vehicle and refill transmission to proper level with Automatic Transmission Fluid (Type A). Refer to Lubrication Section.

32. GOVERNOR

a. Removal

Remove governor locating screw from gover- screw driver, remove the governor valve shaft snap ring from the weight assembly end. Remove governor valve shaft and valve from governor body assembly (Fig. 33).

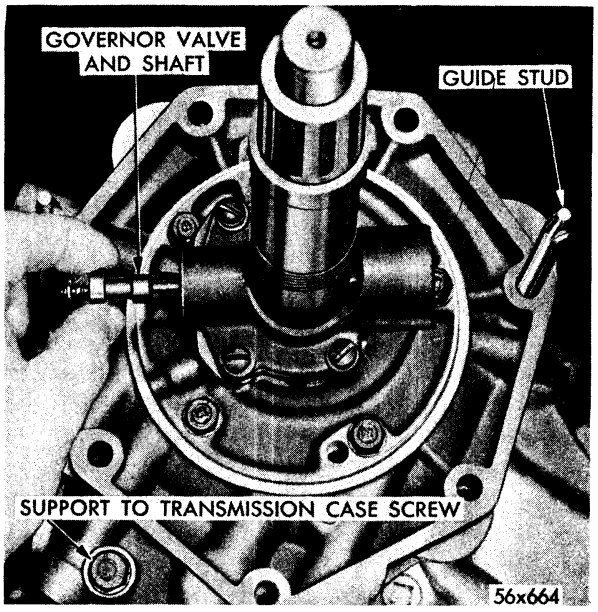


Fig. 33—Removal and Installation of Governor Valve Shaft and Valve

Using Tool C-3229, remove governor weight assembly snap ring (large) and remove governor weight assembly from governor body.

The primary cause of governor operating failures is due to improper operation of governor valve which may be sticking in housing or travel restricted by chips or other foreign matter. If inspection reveals necessity for further governor servicing, then remove governor support locating screw, and remove governor and support assembly from rear oil pump hous-

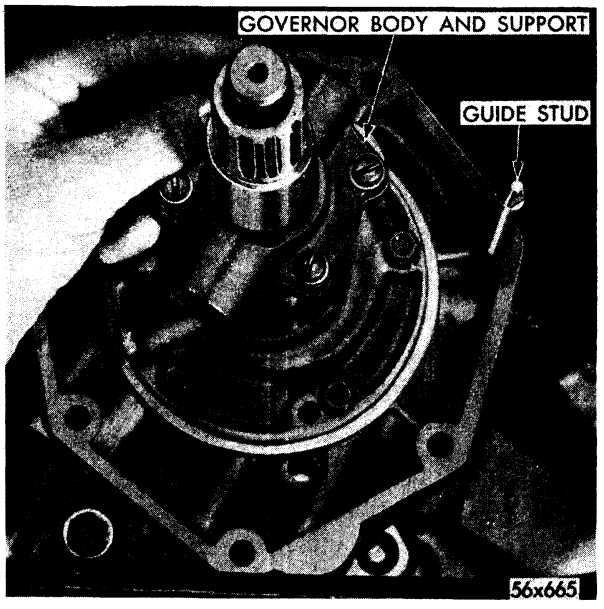


Fig. 34—Removal and Installation of Governor Body and Support Assembly

ing (Fig. 34). Normal servicing does not require removal of the governor body from the governor support. If condition warrants removal of governor body from governor support, when reassembling do not tighten governor body screws until governor body support is located on output shaft.

b. Installation

Slide governor body and support assembly into position in rear oil pump housing. Using extreme care, compress governor support seal rings as support enters oil pump housing. **Do not force.** Align locating hole in output shaft to locating hole in governor support and install screw and tighten to specifications. Holes can be aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled tighten the four governor body screws to specifications. Place governor weight assembly (secondary weight snap ring facing out) into governor body; and using Tool C-3229, install snap ring. **Make sure snap ring seats properly.** With governor valve (small end in) on governor valve shaft, slide shaft into governor body through output shaft and governor weight assembly, at the same time, position valve into body.

Install the governor valve shaft snap ring. Make sure it is locked securely to shaft. Replace snap ring if distorted. After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. (Fig. 100). Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

33. REAR OIL PUMP

a. Removal

Remove transmission extension (Paragraph 31). Refer to "Governor—Removal", Paragraph 32. **Using a screw driver, remove the governor valve shaft snap ring from weight assembly end.** Remove governor valve shaft and valve from governor valve body assembly. Using Tool C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body.

Remove governor locating screw from governor support. Remove the five rear oil pump housing to output shaft support screws and washers and install guide studs, Tool C-3288. Remove pump housing, gear, and governor assembly from output shaft. Use dye and mark pump gears in relation to pump housing face. **Do not use scribe. Oil pump pinion is keyed to output shaft pinion by small ball. Use care when removing pinion so as not to lose ball.** Remove governor assembly from oil pump housing.

NOTE: If output shaft is turned to a position where governor locating screw hole is up, when removing rear pump pinion, pump drive ball will also be up, preventing ball from falling out.

b. Installation

Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings as support enters oil pump housing. Do not force.**

Place rear oil pump pinion ball in ball pocket in output shaft. Place rear oil pump pinion (as marked when removed) over output shaft and into position aligning keyway in pinion with ball in shaft.

With rear oil pump gear properly positioned in pump housing (check marking), slide rear oil pump and governor assemblies over output shaft and guide studs into position against support.

CAUTION

There are two extra holes in housing which are used for vents. Make definitely sure you do not attempt to install screws in these holes.

Remove guide studs and install the five rear oil pump housing to output shaft support screws and washers.

CAUTION

Dished washers are used to prevent cutting of soft metals and should be installed on screws with dished portion facing away from head. Draw down evenly and tighten to specifications. After screws have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, remove pump to determine cause.

Align locating hole in output shaft to locating screw hole in governor support; install locating screw, and tighten to specifications. **Holes can**

be easily aligned by turning output shaft and holding governor body.

Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

34. REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal

Disconnect battery. Engage 1 (low) push button and raise vehicle off floor.

NOTE: It is necessary for control to be in this position to remove cable from adapter housing on transmission.

Drain transmission and torque converter. (Refer to Lubrication Section.) When fluid has drained, replace torque converter drain plug and tighten. Disconnect the front universal joint and secure propeller shaft out of the way. Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from the operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension. Disconnect neutral starting switch wire. Disconnect throttle valve control link from lever on transmission. Remove gearshift control cable as outlined in Paragraph 21.

If adapter housing is to be removed, insert screwdriver through cable opening in adapter housing and push lever rearward to last detent. Remove transmission oil cooling lines from transmission. Remove nuts and lockwashers that hold the engine rear support insulator to the crossmember. Leave insulator attached to transmission.

Install engine support fixture, Tool C-3487 (may be necessary to remove starter to provide clearance for support ends of support fixture). Insert hooks of fixture firmly into holes in side of frame member with support ends up against the underside of oil pan flange. Adjust fixture to support the weight of the engine. Raise engine slightly, remove crossmember to torsion bar bracket bolts and remove crossmember.

CAUTION

When using fixture Tool C-3487, do not lower engine more than three inches from floor pan to avoid disrupting the set position of water hose, and other engine attachments.

Remove the two transmission case to torque converter housing screws and lockwashers from right side of transmission and install guide studs, Tool C-3276. With transmission supported by a suitable jack, remove the two transmission case to torque converter housing screws and lockwashers from left side. Slide transmission straight back to avoid damage to front oil pump driving sleeve before lowering transmission.

b. Installation

Install guide studs, Tool C-3276 in the two transmission mounting holes in right side of torque converter housing. With front oil pump drive sleeve lubricated, install, making sure driving lugs are properly engaged with oil pump pinion. **Main portion of drive sleeve will be flush with front of pump housing when properly installed (Fig. 95).**

Note position of driving lugs inside torque converter hub, then position front oil pump drive sleeve on transmission accordingly, to aid in proper engagement when transmission is installed. Slide transmission over guide studs and into position and against converter housing. Make sure driving lugs on front oil pump drive sleeve properly engage the torque converter. **To avoid damage to front oil pump, do not attempt to use transmission to torque converter housing screws to bring transmission and housing together. If oil pump drive sleeve and input shaft have been properly aligned, the transmission should slide into position relatively easy. DO NOT FORCE.**

Install two transmission case to torque converter housing screws and lockwashers in left side, do not tighten. Remove guide studs and install the two transmission case to housing screws and lockwashers in right side, then draw the four down evenly and tighten to specifications.

Place crossmember into position and install the crossmember to torsion bar bracket bolts. Tighten to specifications. Lower engine and at the same time align mounting studs in insulator with holes in crossmember.

Install nuts and lockwashers that hold en-

gine rear support insulator to crossmember and tighten to specifications. Remove support fixture, Tool C-3487 from side of frame member. Connect oil cooling lines. Connect neutral starting switch wire to switch. Install oil pan filler tube and tighten filler tube nut to specifications. Tighten support bracket screw. Connect speedometer cable in housing etxension. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt. Install adjusting brake screw cover plate on hand brake support. Connect front universal joint and tighten nuts to 37 foot-pounds torque. Install starter (if removed).

Connect throttle control linkage to throttle lever on transmission. Install push button control cable in adapter making sure spring lock engages cable. Adjust manual control cable. Refer to "Maintenance Adjustments and Tests." Paragraph 13. Tighten cable adjustable mounting bracket nut securely. Lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage (Paragraph 16).

RECONDITIONING OF TRANSMISSION

NOTE: In the event that a transmission has failed any part, it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission controls. Refer to Torque Converter section for instructions outlining this operation.

35. PRECAUTIONS TO OBSERVE DURING DISASSEMBLY

The following precautions should be observed during disassembly of transmission: Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned when removed from vehicle, preferably by steam. When disassembling, each part should be placed in a suitable solvent, washed, then dried by compressed air. **Do not wipe parts with shop towels.** All of the mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care so not to round off the sharp edges. The sharp edge portion is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking. When it becomes necessary to recondition the transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage.

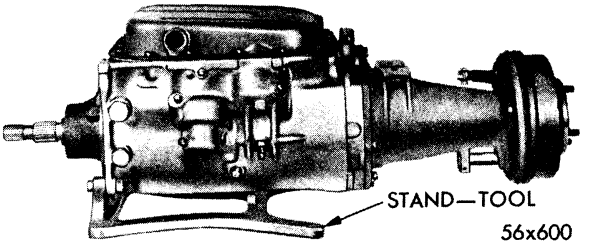


Fig. 35—Transmission Assembly Inverted in Stand

NOTE: The following procedures are based on the assumption that the transmission fluid has been drained, the unit has been removed from vehicle and prepared for disassembly.

36. OIL PAN—REMOVAL

Place transmission assembly in stand, Tool C-3280, and invert, as shown in Figure 35 remove the oil pan bolts and remove the oil pan and gasket, as shown in Figure 36. Note the construction of oil pan bolts, washers used are part of the bolt.

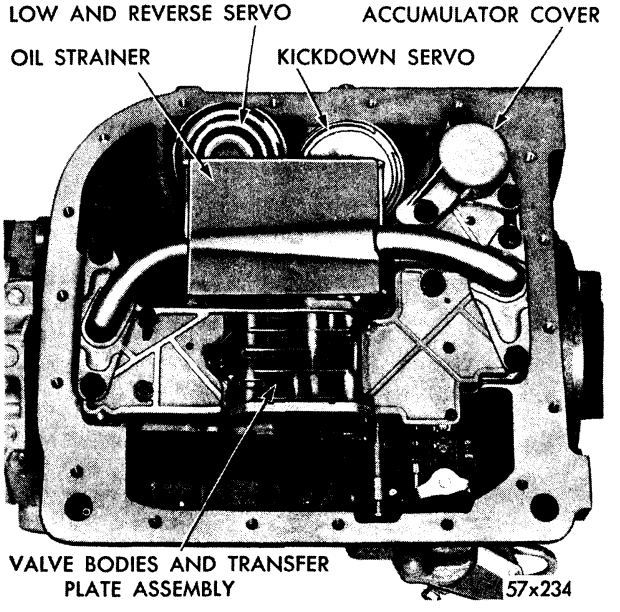


Fig. 36—Transmission Assembly—Oil Pan Removed

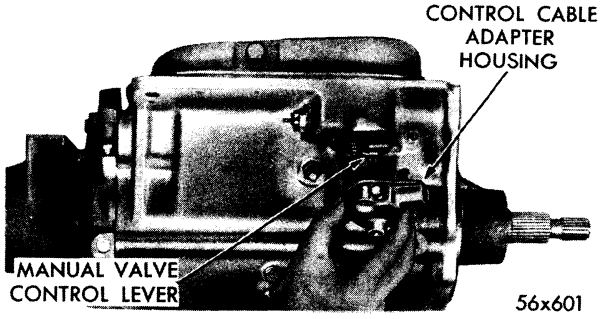


Fig. 37—Removal and Installation of Control Cable Adapter Housing

37. VALVE BODIES AND TRANSFER PLATE—REMOVAL

Remove throttle valve lever, flat washer, and lip seal. Remove the three gearshift control cable adapter housing bolts and washers. Remove housing and gasket from transmission, as shown in Figure 37. **Manual valve control lever must be moved to the reverse position before housing can be removed.** Loosen manual valve control lever bolt. Using caution to prevent loss of cable adapter pin, slide lever and cable adapter off shaft.

Remove four oil strainer assembly bolts and lock washers. Remove oil strainer assembly, as shown in Figure 38. Loosen (to relieve spring load) the three accumulator cover bolts with washers, and remove cover and spring from transfer plate, as shown in Figure 39. Remove three transfer plate bolts and washers. Remove valve bodies and transfer plate assembly from transmission case, as shown in Figure 40. **Mating surfaces are machined: use extreme care so as not to damage these surfaces. Place valve body in stand, Tool C-3528.** Remove the neutral starting switch (with cupped washer and "O" ring) located in left side of transmission case as shown in Figure 22.

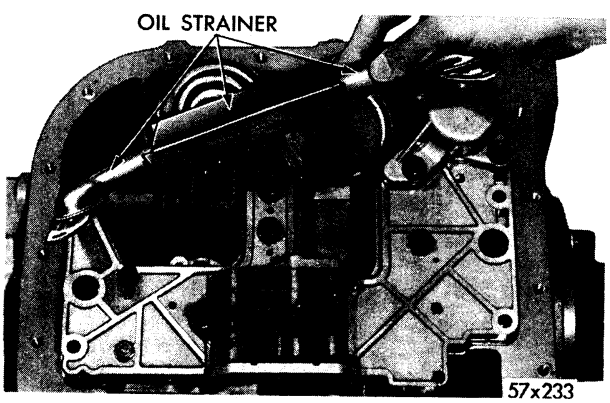


Fig. 38—Removing Oil Strainer Assembly

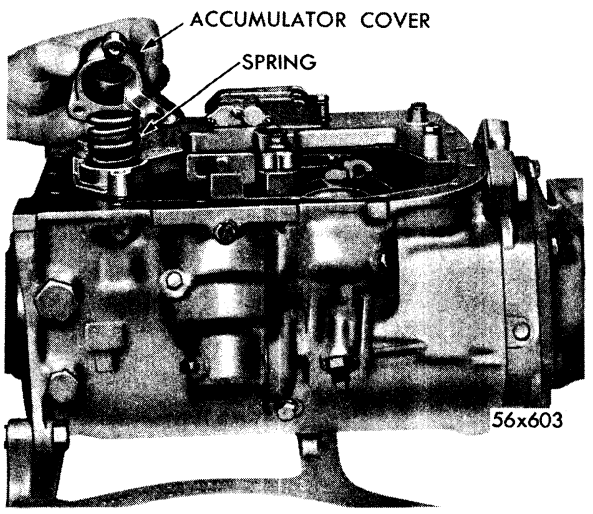


Fig. 39—Removal and Installation of Accumulator Cover

38. CHECKING FRONT CLUTCH END CLEARANCE

Prior to removal of propeller shaft flange and drum assembly, check end clearance of front clutch piston retainer assembly using dial indicator Tool C-3339, as shown in Figure 41.

To make this check, move front clutch forward by pulling on the input shaft, or by carefully inserting screw driver and prying between the front and rear clutches. Remove screw driver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero. Push clutch assembly

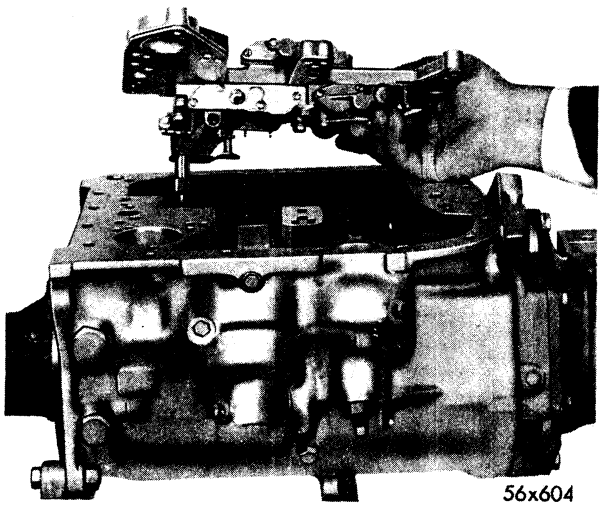


Fig. 40—Removal and Installation of Valve Bodies and Transfer Plate Assembly (Typical View)

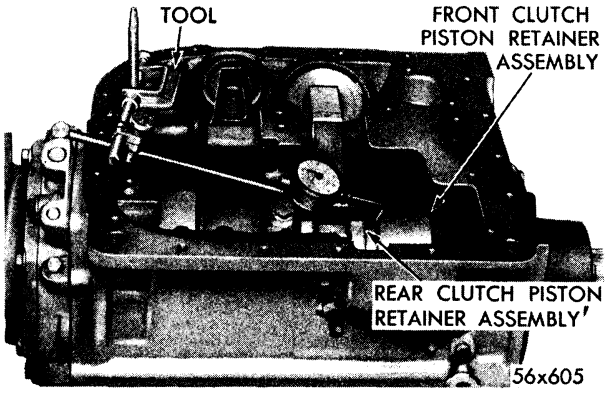


Fig. 41—Checking Front Clutch Piston Retainer Assembly End Clearance

rearward against rear clutch, and take indicator reading. This clearance should be from .020 to .050 inch. If this clearance exceeds the specified limits, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

39. HAND BRAKE ASSEMBLY—REMOVAL

Remove the transmission flange nut and washer. Use wrench, Tool C-3281, to hold brake drum and flange assembly, (Fig. 42). Attach puller, Tool C-452 (if necessary) and remove propeller shaft flange and drum assembly. Inspect oil seal surfaces. Inspect lining contact surfaces on brake drum assembly for scoring and inspect brake lining for wear.

Remove transmission brake support grease shield spring. This spring has two purposes, it acts as a guide for the brake shoes and retains the brake support grease shield to the transmission extension. Remove the brake support grease shield from extension. **If a screw driver or sharp instrument is used in removing this shield, care must be exercised not to damage the neoprene sealing surface at bottom of shield. Note the indent on grease shield for correct positioning on extension.**

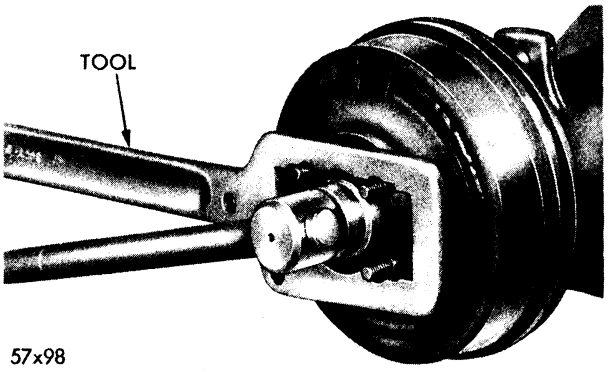


Fig. 42—Removing Handbrake Drum and Flange (Assembly Nut)

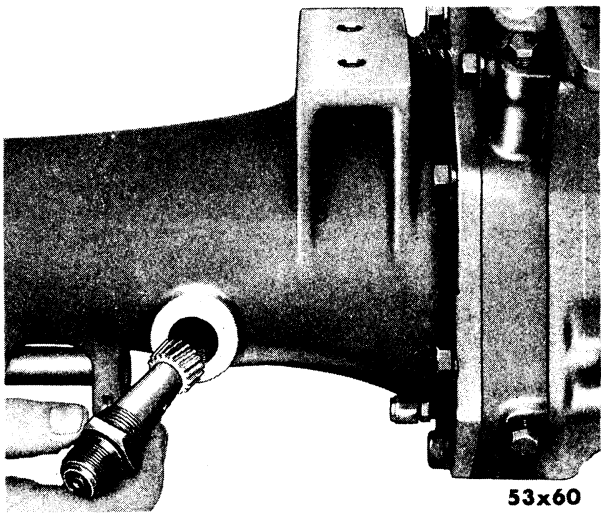


Fig. 43—Removal and Installation of Speedometer Drive Pinion Assembly

Using a suitable drift, remove pin which secures brake shoe anchor in extension housing. Slide balance of handbrake assembly intact from extension housing. Inspect spacer (neoprene) on back of support plate for deterioration and note the steel sleeve used between neoprene spacer and extension.

40. TRANSMISSION EXTENSION—REMOVAL

Remove speedometer drive pinion and sleeve assembly, as shown in Figure 43. **Nylon gear can be easily damaged if extension is removed without first removing the speedometer drive**

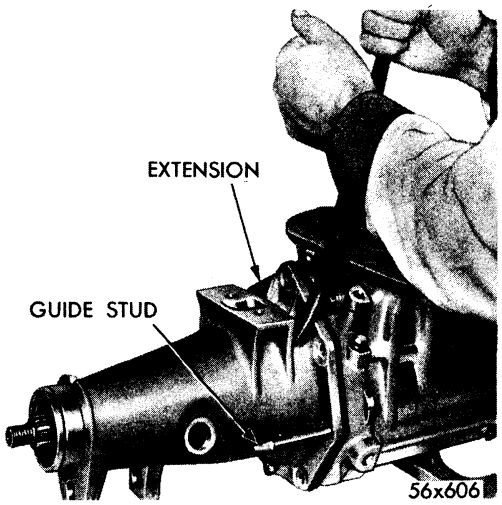


Fig. 44—Removal of Extension

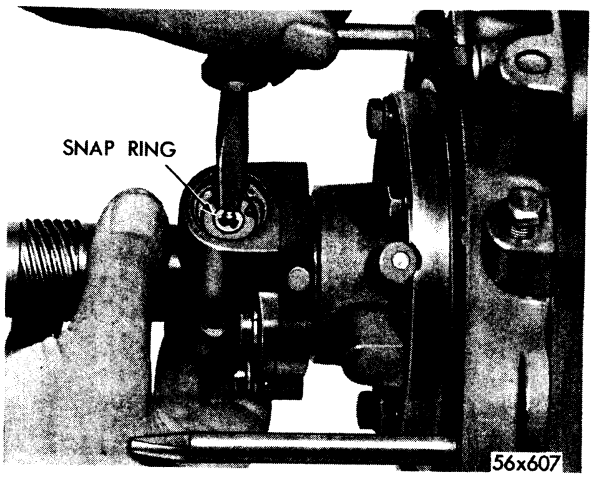


Fig. 45—Removal and Installation of Governor Valve Shaft Snap Ring

pinion and sleeve assembly. Inspect the output shaft rear bearing oil seal and remove (if necessary) using puller, Tool C-748. Remove the seven transmission extension to case bolts and lockwashers. Install guide studs, Tool C-3283 and remove extension from output shaft support assembly by tapping housing lightly with a soft hammer. **Housing may be separated by using a pry bar against support screw, as shown in Figure 44.** Remove extension gasket.

41. GOVERNOR AND REAR OIL PUMP HOUSING—REMOVAL

Using a small screw driver, remove the governor valve shaft snap ring from the weight assembly end as shown in Figure 45.

Remove governor valve shaft and valve from

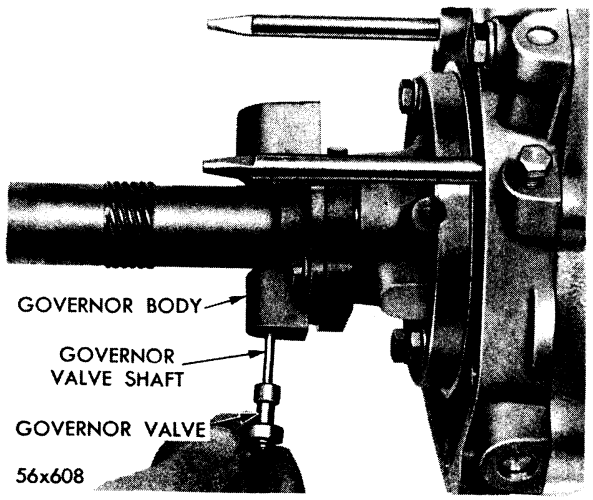


Fig. 46—Removal and Installation of Governor Valve and Shaft

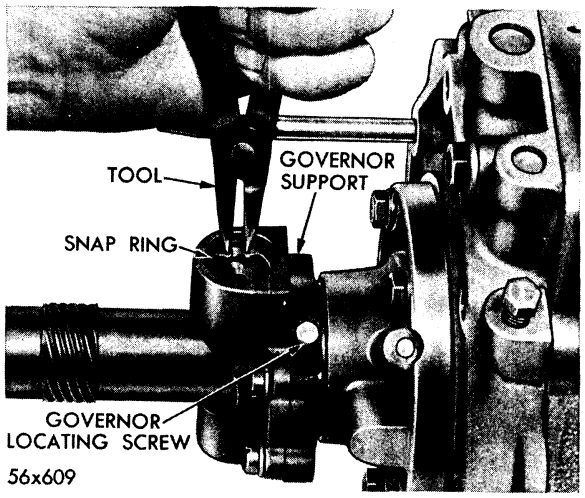


Fig. 47—Removal and Installation of Governor Weight Assembly

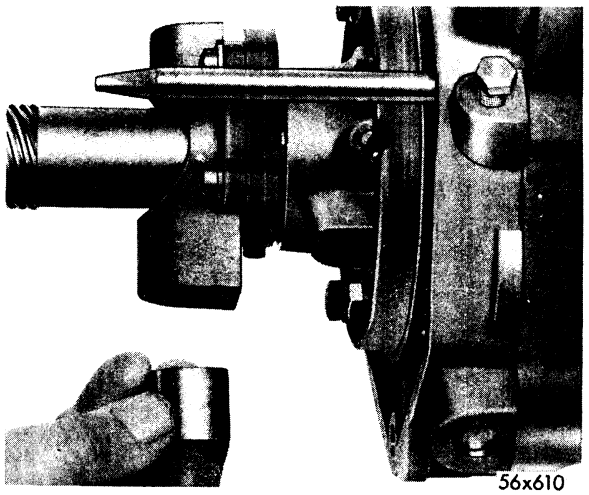


Fig. 48—Removal and Installation of Governor Weight Assembly

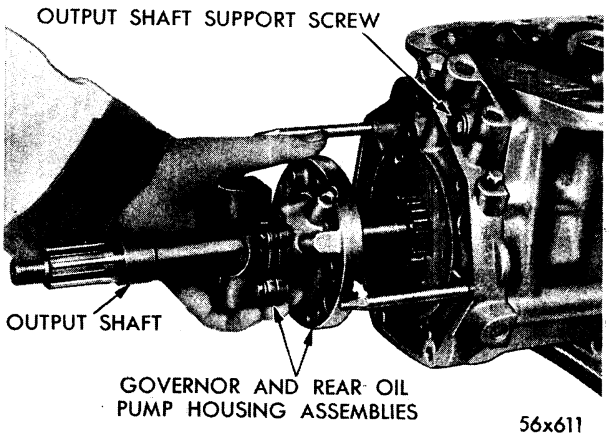


Fig. 49—Removal and Installation of Governor and Rear Oil Pump Housing Assemblies

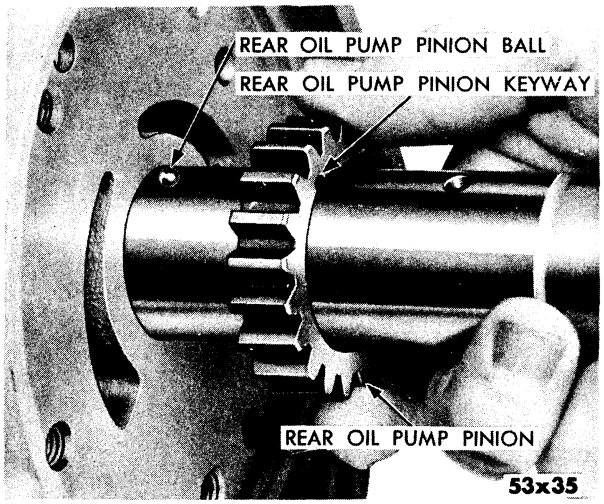


Fig. 50—Removal and Installation of Rear Oil Pump Pinion

governor valve body assembly, as shown in Figure 46. Using pliers, Tool C-3229, remove governor weight assembly snap ring (large), as shown in Figure 47, and remove governor weight assembly from governor body (Fig. 48).

Remove governor locating screw from the governor support. Remove the five rear oil pump housing to output shaft support bolts and washers. Remove pump housing, gear, and governor assembly from output shaft, as shown in Figure 49. Use dye and mark face of pump gear in relation to pump housing.

Do not use scribe. Oil pump pinion is keyed to output shaft by a small ball. Use care when removing pinion so as not to lose ball. Remove rear oil pump pinion from output shaft, as shown in Figure 50. Mark in the same manner as previously described.

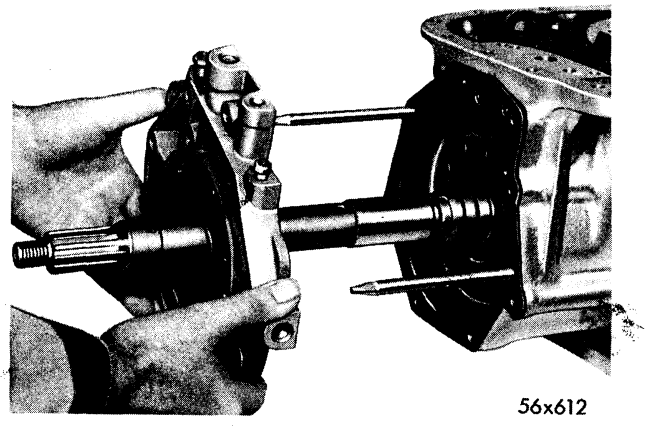


Fig. 51—Removal and Installation of Output Shaft Support

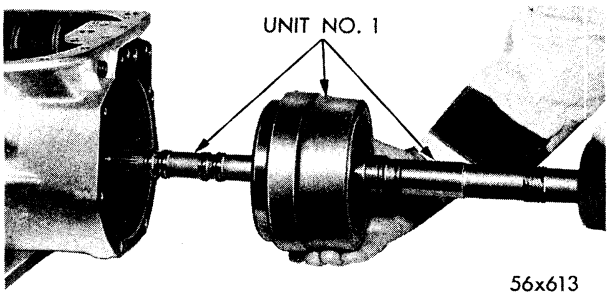


Fig. 52—Removal and Installation of Unit No. 1

42. OUTPUT SHAFT SUPPORT—REMOVAL

Remove output shaft support to transmission case screw and washer (Fig. 49). Slide the output shaft rear support assembly and gasket from transmission case, as shown in Figure 51. If rear support is stuck to transmission case, it can be loosened by tapping lightly with a soft hammer. Remove guide studs, Tool C-3283 from transmission case.

43. REMOVING POWER TRAIN UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)

Remove by sliding unit out rear of transmission case (Fig. 52). **Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.**

44. REMOVING POWER TRAIN UNIT NO. 2 (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES)

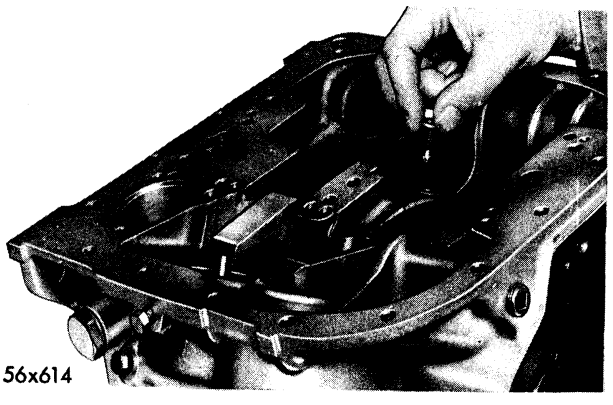


Fig. 53—Removal and Installation of Intermediate Support Locating Screw

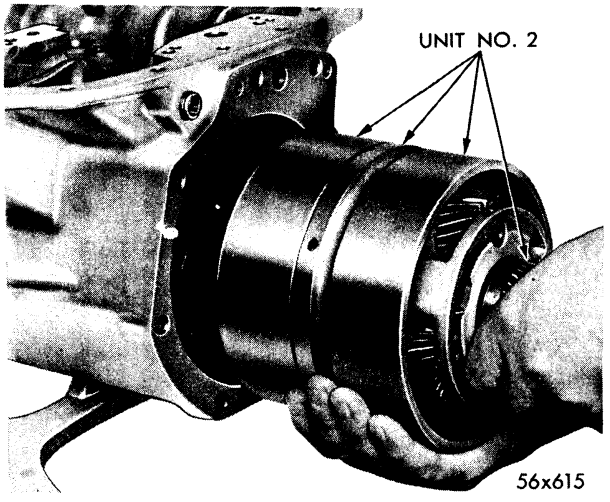


Fig. 54—Removal of Unit No. 2

Loosen lock nuts on low-reverse and kickdown band adjusting screws, and back adjusting screws out 2 to 3 turns. Remove the three intermediate support locating bolts and lockwashers (two outside of case and one inside). (Figs. 22 and 53). **When removing unit, identify locating hole in the intermediate support to correspond with the hole in the case—for installation purposes. (Fig. 99.)**

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as shown in Figure 54. **Make sure front clutch and sun gear thrust washer remains in position in front of unit.**

45. REMOVING UNIT NO. 3 (FRONT CLUTCH PISTON RETAINER AND INPUT SHAFT ASSEMBLIES)

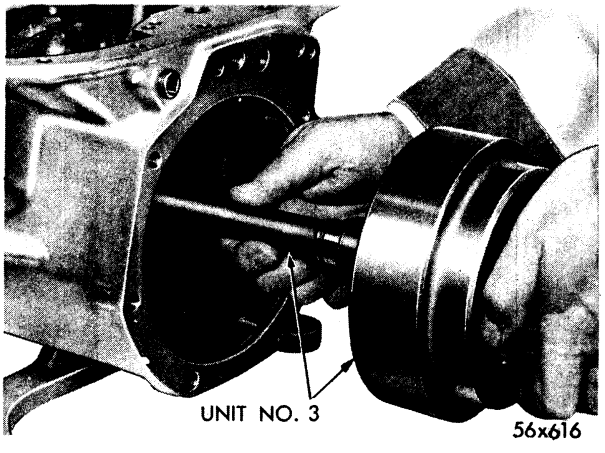


Fig. 55—Removal and Installation of Unit No. 3

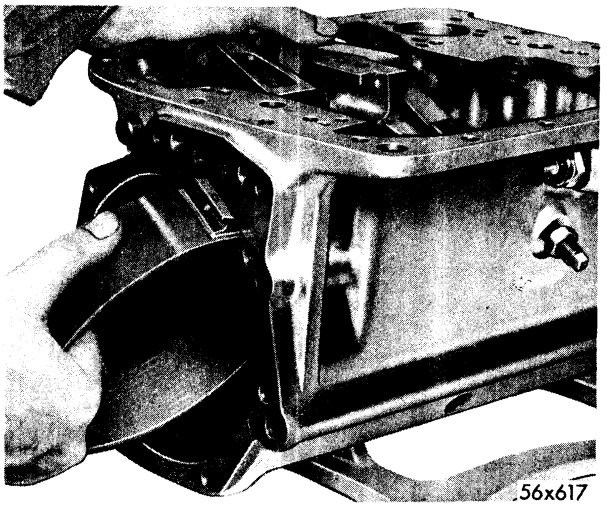


Fig. 56—Removal and Installation of Low-Reverse Band

Keep unit centered as much as possible, and remove from transmission case, as shown in Figure 55. Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft (aluminum).

46. LOW-REVERSE BAND ASSEMBLY—REMOVAL

Mark the low-reverse band assembly for installation purposes; then compress ends of band sufficiently to remove the low-reverse band strut. (Strut grooved at one end to receive band.) Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure

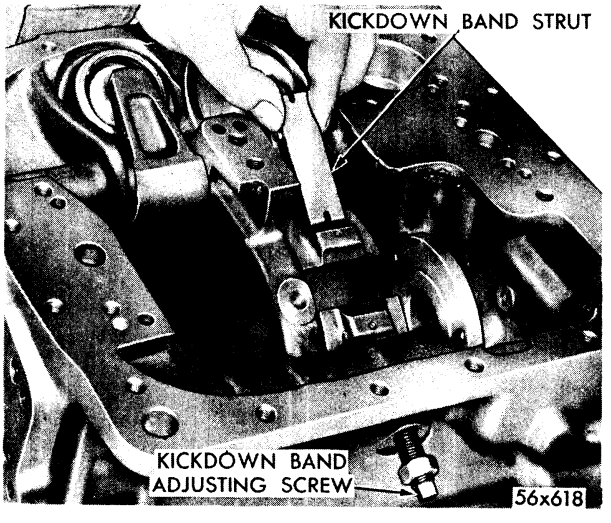


Fig. 57—Removal and Installation of Kickdown Band Strut

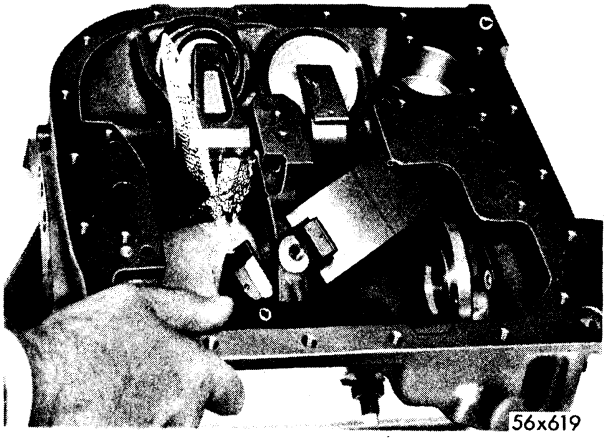


Fig. 58—Removal and Installation of Kickdown Band

56. Remove low-reverse band anchor from adjusting screw.

47. KICKDOWN BAND—REMOVAL

Compress kickdown band ends sufficiently to remove the kickdown band strut. (Fig. 57). (Note that strut is grooved to act as a guide.) Remove the kickdown band anchor from adjusting screw. Remove kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 58. **Use extreme care when removing band so as not to damage lining against edges of transmission case.** Both bands have bonded lining and no attempt should be made to reline them. The kickdown band is **wider** and has **different** lining material.

48. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES—REMOVAL

Remove kickdown and reverse lever shaft stop plug at rear of transmission case. Using pliers,

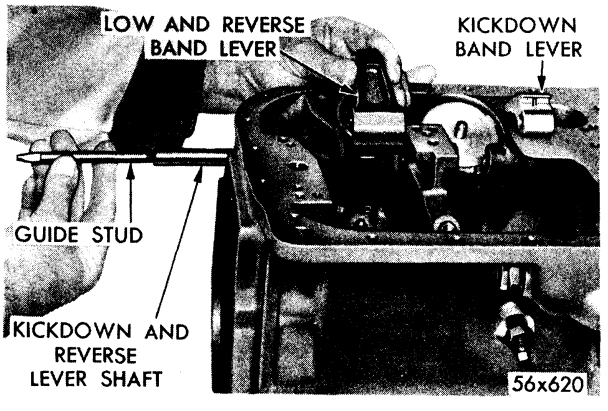


Fig. 59—Removal and Installation of Kickdown and Reverse Lever Shaft

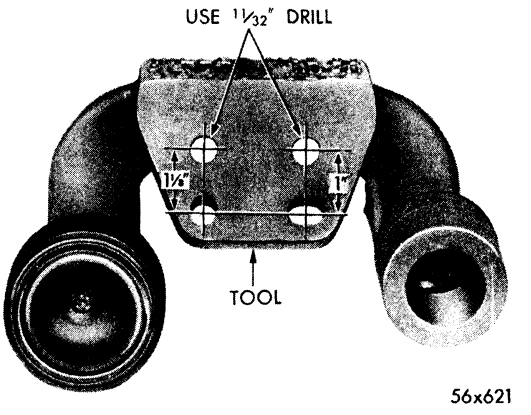


Fig. 60—Modification of Tool C-3289

remove kickdown and low-reverse shaft lever spacer (flat). Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 59. Remove kickdown and low-reverse servo levers.

49. LOW-REVERSE SERVO—REMOVAL

Install Tool C-3529 or C-3289 (modified, as shown in Fig. 60) on transmission case and compress piston spring retainer. **Due to modification of tool, only one attaching bolt can be used.** Using a screw driver, remove the low-reverse servo piston spring retainer snap ring, as shown in Figure 61. Loosen compression portion of tool, and remove. **Spring retainer may require guiding out of transmission case.** Remove the spring retainer, spring and servo piston and plug assembly.

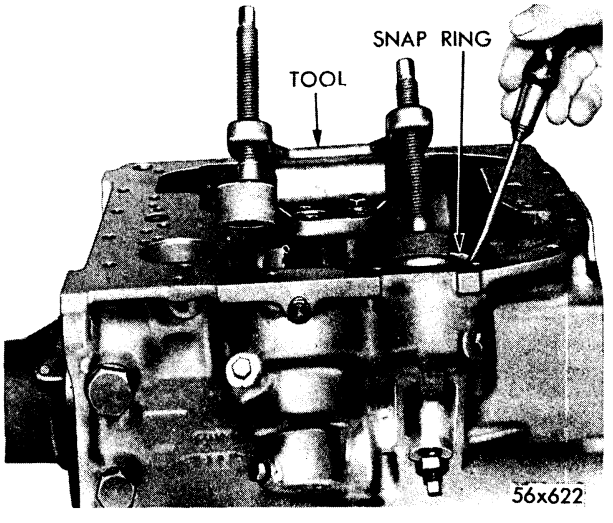


Fig. 61—Removal and Installation of Low-Reverse Servo

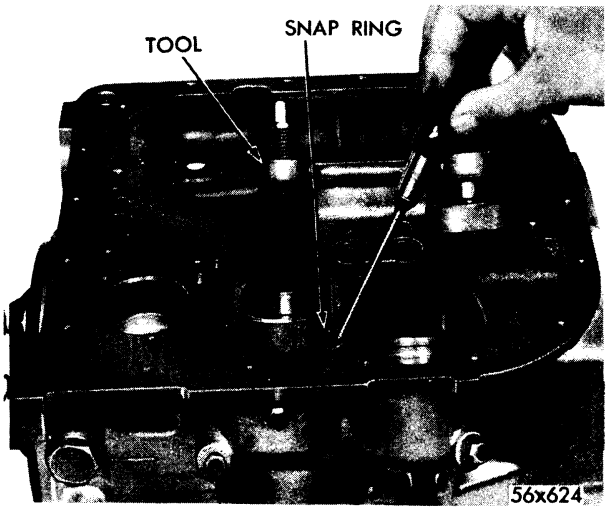


Fig. 62—Removal and Installation of Kickdown Piston Rod Guide Snap Ring

50. KICKDOWN SERVO—REMOVAL

Reinstall Tool C-3529 or C-3289 (modified, as shown in Fig. 60), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring, as shown in Figure 62. Loosen compressing portion of tool and remove from transmission case. Remove piston rod guide, piston spring, and piston rod. Using pliers, Tool C-484, remove the kickdown piston from the transmission case. Using pliers, Tool C-484, remove the accumulator piston from transmission case, as shown in Figure 63.

51. FRONT OIL PUMP—REMOVAL

Remove front oil pump drive sleeve (if installed). Remove the transmission regulator

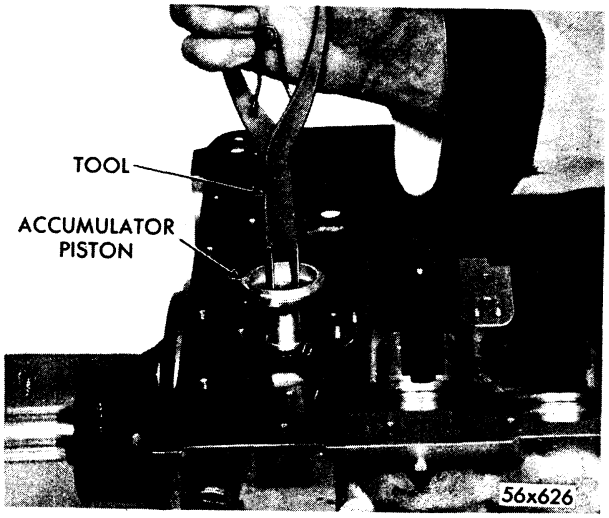


Fig. 63—Removal and Installation of Accumulator Piston

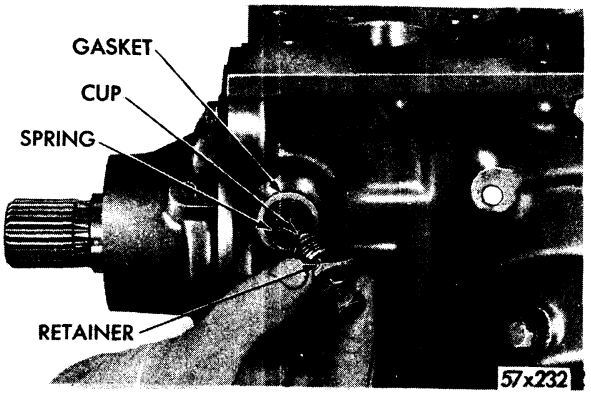


Fig. 64—Removal and Installation of Regulator Valve Retainer

valve spring adjusting screw, locknut, gasket, cup, spring, sleeve and valve. (Figs. 64, 65, and 66). Remove the torque converter valve retainer, gasket, spring, and valve. These valves can be removed with the aid of a mechanical retriever or a piece of welding rod ($\frac{5}{32}$ inch for regulator valve and $\frac{1}{8}$ inch for torque converter valve) inserted in end of valve, as shown in Figure 28. The converter valve is so

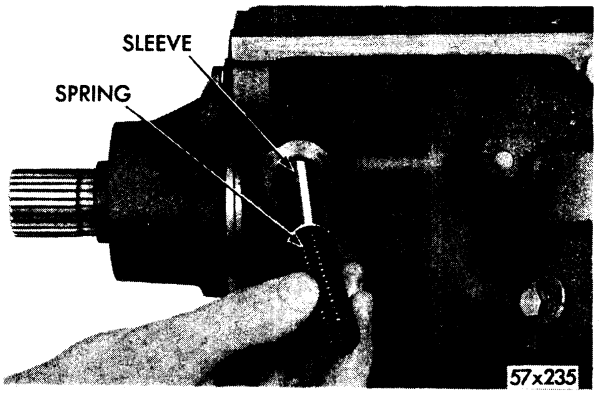


Fig. 65—Removal and Installation of Regulator Valve Spring

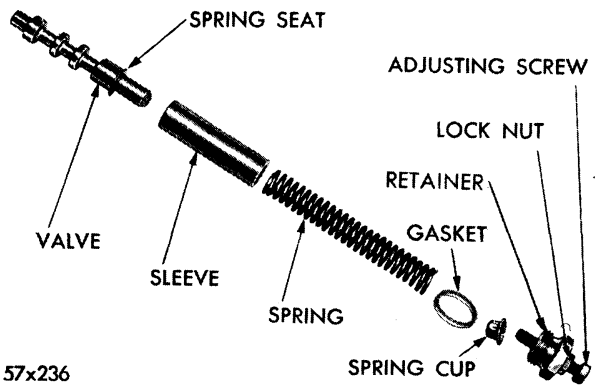


Fig. 66—Regulator Valve Assembly (Disassembled View)

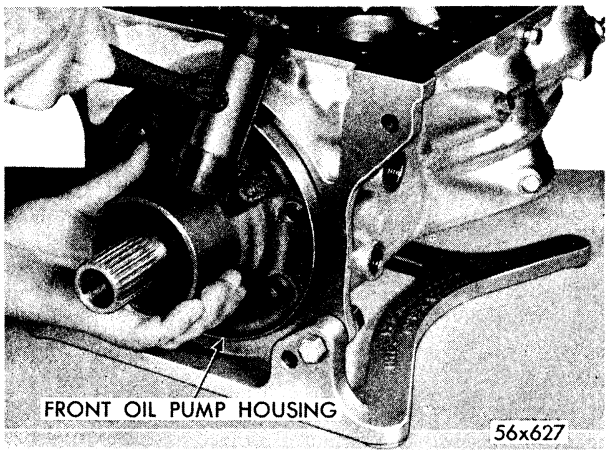


Fig. 67—Removal of Front Oil Pump Housing Assembly

constructed that it will not drop into front housing during removal.

Remove the seven front oil pump housing to transmission case bolts and washers. Sealing washers, used under bolts, are made from aluminum; replace by new washers if damaged. Remove oil pump housing assembly from transmission case by tapping housing lightly with a soft hammer, as shown in Figure 67. **Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. DO NOT SCRIBE.**

52. REGULATOR VALVE BODY—REMOVAL

Install guide studs, Tool C-3288; and using the two threaded holes provided in the regulator valve body, install guide studs, Tool C-3283, as shown in Figure 68. Pull regulator valve body

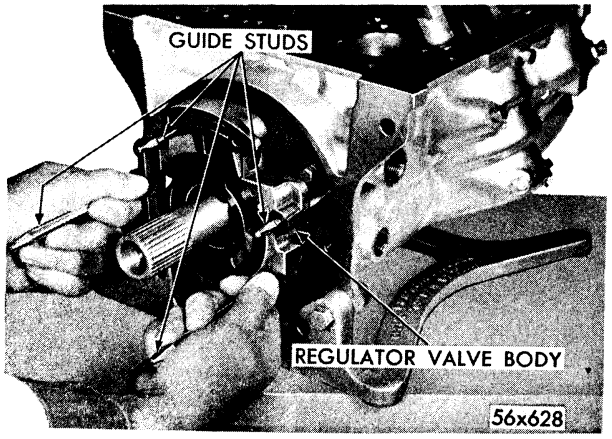


Fig. 68—Removing Regulator Valve Body

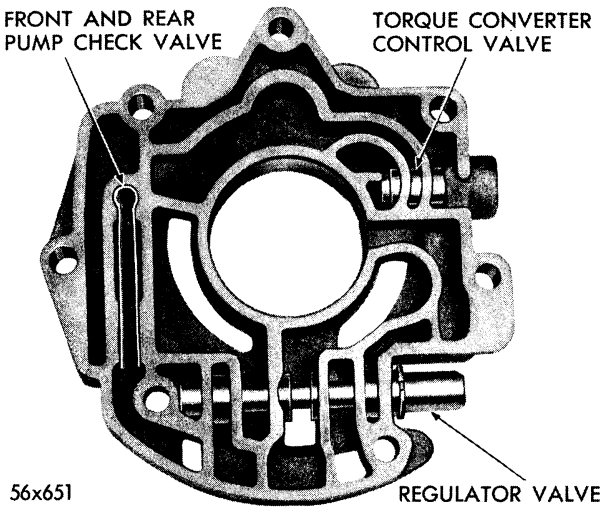


Fig. 69—Regulator Valve Body and Valves

off of torque converter reaction shaft and remove gasket. **Regulator valve body (Fig. 69) is made of aluminum and requires care in handling to avoid damage.**

53. TORQUE CONVERTER REACTION SHAFT—REMOVAL

Refer to "Inspection of Torque Converter Reaction Shaft," Paragraph 55. If inspection reveals it is necessary to remove torque converter reaction shaft, proceed as follows: Remove torque converter reaction shaft seal ring (neoprene). Remove three transmission case to reaction shaft bolts and washers. Using Tool C-3531*, press reaction shaft out of transmission case, as shown in Figure 70.

*Refer to "Special Tools".

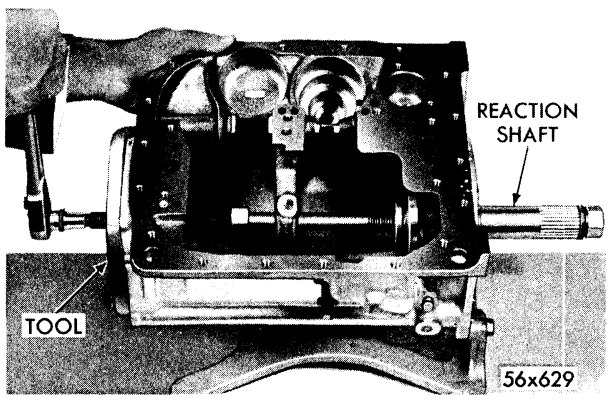


Fig. 70—Removal and Installation of Torque Converter Reaction Shaft

DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

54. PRECAUTIONS TO OBSERVE DURING DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

The following precautions should be observed during assembly of component parts. Where lubrication is required, use Automatic Transmission Fluid (Type A). **Do not use a sealing material on any gasket or mating surface, always use new gaskets.** Torque all bolts and nuts to correct specifications. Where snap rings are used, always make sure they are seated properly. If mating parts do not go together properly, always check reason. **Do not force.**

55. TORQUE CONVERTER REACTION SHAFT—INSPECTION

Inspect inside of torque converter reaction shaft for burrs. Inspect splines on shaft for burrs and wear. Inspect the reaction shaft seal ring (neoprene) for deterioration and hardness. Inspect thrust surface for wear and slight scores. **Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.**

56. TRANSMISSION CASE—INSPECTION

Inspect transmission case for cracks, sand holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages to make sure they are open. Check pressure take-off plugs for tightness.

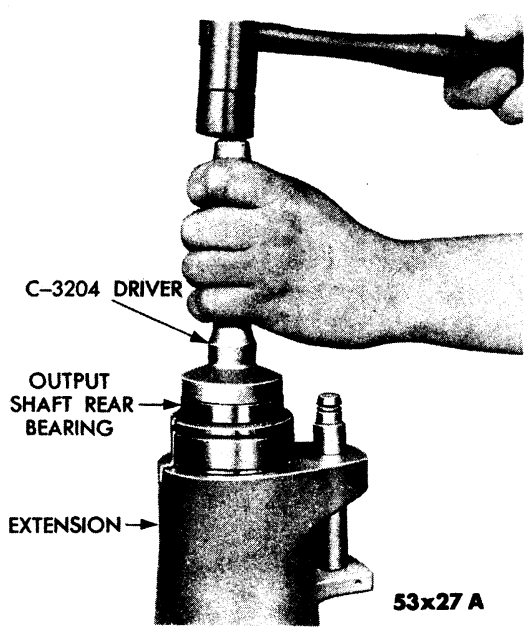


Fig. 71—Installing Output Shaft Rear Bearing

Using straight edge, Tool C-3335, inspect valve body mating surface on transmission case for any burrs or irregularity in surface. Surfaces should be smooth and flat.

Inspect servo and accumulator bores for any scores or scratches. Light scratches may be removed with crocus cloth. Check regulator valve body mating surface in front of case for any irregularities. **Disregard any scratches which may have been caused by torque converter reaction shaft bolt lock washers.**

It is vitally important that band adjusting screws fit freely into transmission case. **When lock nuts are loose, the adjusting screws must be finger free. If not, inspect screws and nuts for pulled threads or foreign material in threads. This is very important in obtaining proper band adjustments.**

57. TRANSMISSION EXTENSION—INSPECTION

Inspect extension for cracks in casting and remove burrs from gasket surface. Inspect vent (drive type) in top of extension and make sure it is open and free from dirt, undercoating, etc. The purpose of this vent is to prevent vacuum from forming in transmission case when it is drained. Vent also releases fumes and expansion of oil caused by heat. Clean output shaft rear bearing and dry with compressed air. **Do not spin bearing with air pressure.** Inspect bearing for rough spots. Do not remove bearing from extension unless inspection reveals it is necessary to do so.

58. OUTPUT SHAFT REAR BEARING—REMOVAL

If necessary to remove rear bearing, proceed as follows: Remove output shaft rear bearing oil seal—if installed. Using pliers, Tool C-760 remove the output shaft rear bearing snap ring. Inspect ring for distortion. Using driver, Tool

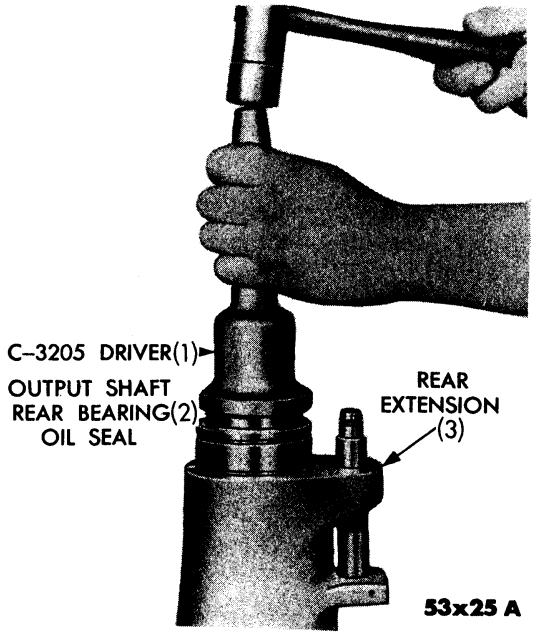


Fig. 72—Installing Output Shaft Rear Bearing Oil Seal

C-3275, drive output shaft rear bearing out of rear extension.

59. OUTPUT SHAFT REAR BEARING AND OIL SEAL—INSTALLATION

Using driver, Tool C-3204, install the output shaft rear bearing in extension, as shown in Figure 71. Make sure bearing is properly seated, lubricate with Automatic Transmission Fluid (Type A). Install output shaft rear bearing snap ring. **Snap rings available in two sizes, select one to give minimum clearance.** Using driver, Tool C-3205, install output shaft rear bearing oil seal (with metal portion of seal facing in) until tool bottoms on extension, as shown in Figure 72.

60. GOVERNOR DISASSEMBLY AND INSPECTION (Fig. 73)

Using pliers, Tool 3229, remove snap ring from governor weight assembly. **Keep thumb pressure against secondary weight when removing snap ring (spring loaded).** Remove governor secondary weight and spring. Inspect all parts for burrs and wear. Check secondary weight for free movement in primary weight by placing secondary weight in primary weight without the spring. Primary weight should fall freely when both parts are clean and dry. Inspect governor weight spring for distortion.

Place secondary weight and spring in primary weight, compress spring and install snap ring. Make sure snap ring is seated properly. Slide governor body and support from rear oil pump housing. Remove the two governor support seal rings and inspect. Remove the four governor body to support bolts and lockwashers. Separate body from support. **Washers are part of bolt and serviced as an assembly. Mating surfaces are machined and can be easily damaged. Inspect oil passages and make sure they are free from dirt or foreign matter. Clean passages with compressed air. Inspect governor valve and body for slight scores. Valve should travel freely in governor body.**

61. REAR OIL PUMP—INSPECTION

Inspect oil pump housing machined surfaces for nicks and burrs and housing ball plug for leaks. Inspect oil pump gears for scoring or pitting. With gears cleaned and installed in pump housing (as marked) and using straight edge, Tool C-3335 (and feeler gauge), check clearance between pump housing face and face of gears, as shown in Figure 74. Clearance limits are from .001" to .0025".

62. GOVERNOR ASSEMBLY—REASSEMBLY

Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type A) and install on the governor support. Make sure rings are free to rotate in grooves. Position governor body on support and install the four

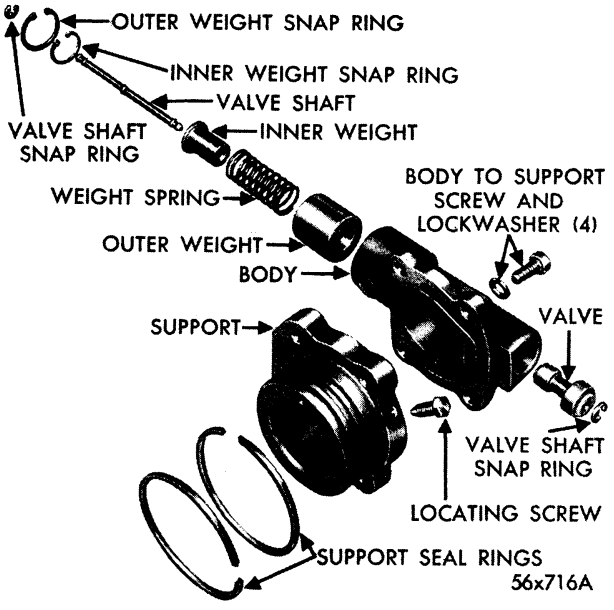


Fig. 73—Governor Assembly (Disassembled View)

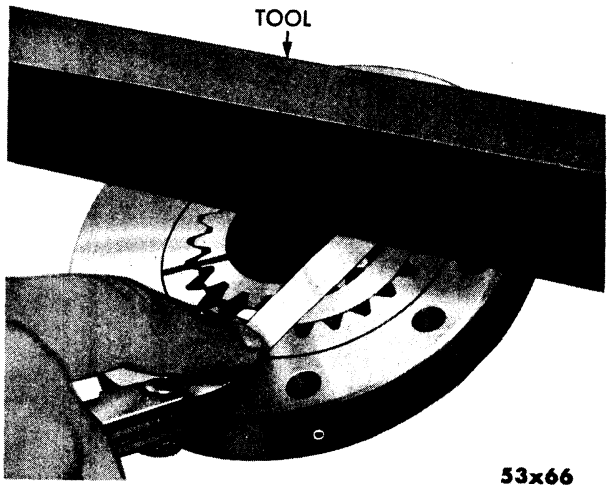


Fig. 74—Checking Clearance Between Rear Pump Body and Gears

bolts with attached lockwashers. **Do not tighten bolts at this time.** Slide governor support and body assembly into position in rear oil pump housing. **Compress governor support seal rings with fingers as support enters oil pump housing. Do not force.**

63. OUTPUT SHAFT SUPPORT—INSPECTION

Inspect all oil passages in output shaft support for any obstructions. Remove pressure take-off plugs and clean passages with compressed air. Check rear oil pump mating surface for burrs and score marks. Check for stripped threads in support. Inspect gasket surfaces for burrs and dirt. Inspect inside bearing surface for wear and scoring.

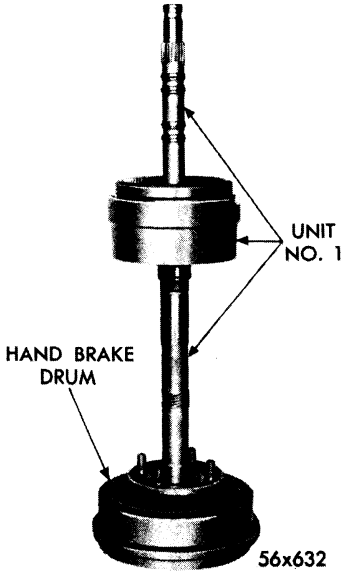


Fig. 75—Using Propeller Shaft Flange and Brake Drum Assembly (As a Holding Fixture for Unit No. 1)

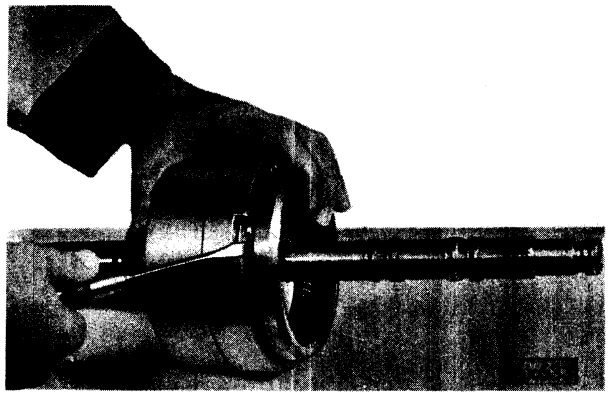


Fig. 76—Removal and Installation of Output Shaft Drive Housing Snap Ring

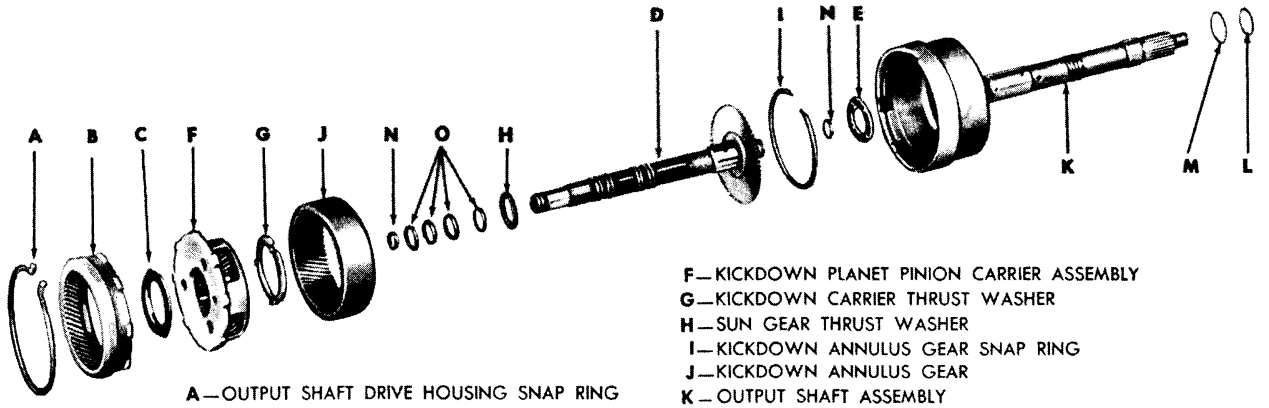
64. DISASSEMBLY, INSPECTION AND ASSEMBLY OF POWER TRAIN UNITS

Unit No. 1 (Output Shaft, Kickdown Planet Pinion Carrier, and Intermediate Shaft Assemblies)—Disassembly.

Unit can be placed in the propeller flange and brake drum assembly to aid in disassembly, as shown in Figure 75. Using a screw driver, remove output shaft drive housing snap ring, as shown in Figure 76. Refer to Figure 77 and complete disassembly of unit as follows: Remove reverse annulus gear (B) from output shaft assembly (K). Remove thrust plate (C) from kickdown planet pinion carrier. Remove intermediate shaft (D) and kickdown carrier assemblies (F) from output shaft assembly. Remove output shaft thrust washer (E) located inside of housing. Remove kickdown planet pinion carrier assembly (F) from intermediate shaft assembly (D). **The kickdown planet pinion carrier assembly used in this unit is identical to the low-reverse planet pinion carrier assembly used in Unit No. 2 but should not be interchanged.** Remove kickdown carrier thrust washer (G) from carrier assembly (F). Remove sun gear roller thrust washer (H) from intermediate shaft assembly. With a screw driver, remove kickdown annulus gear snap ring (I) and separate gear (J) from intermediate shaft assembly (D).

65. OUTPUT SHAFT—INSPECTION

Inspect speedometer drive gear for any nicks or burrs. Nicks or burrs on gear surface can be removed with the use of a sharp edged stone. Inspect thrust surfaces, journals, and inner bushing for scores or excessive wear. Inspect



A—OUTPUT SHAFT DRIVE HOUSING SNAP RING
B—REVERSE ANNULUS GEAR
C—THRUST PLATE
D—INTERMEDIATE SHAFT
E—OUTPUT SHAFT THRUST WASHER
F—KICKDOWN PLANET PINION CARRIER ASSEMBLY
G—KICKDOWN CARRIER THRUST WASHER
H—SUN GEAR THRUST WASHER
I—KICKDOWN ANNULUS GEAR SNAP RING
J—KICKDOWN ANNULUS GEAR
K—OUTPUT SHAFT ASSEMBLY
L—OUTPUT SHAFT SEAL RING—SMALL
M—OUTPUT SHAFT SEAL RING—LARGE
N—INTERMEDIATE SHAFT SEAL RING—SMALL
O—INTERMEDIATE SHAFT SEAL RING—LARGE

56 x 709 A

Fig. 77—Unit No. 1 (Disassembled View)

riveting and housing for any cracks and internal driving lugs for excessive wear. Housing and output shaft is serviced as an assembly.

Inspect interlocking seal rings (L—M) on output shaft (K) for wear or broken locks, and make sure they turn freely in the grooves. Do not remove rings unless condition warrants. When replacing rings, use extreme care so as not to damage interlocking portion of ring. Make sure all oil passages are open by blowing out with compressed air. Inspect output shaft and kickdown carrier thrust washers (E—G) for scratches or excessive wear. Inspect sun gear (roller type) thrust washer (H) for pitted or cracked rollers.

66. INTERMEDIATE SHAFT ASSEMBLY—INSPECTION

Inspect all bearing and thrust surfaces for scoring or scratches. Blow compressed air through all oil passages; make sure they are open and free of foreign matter. Inspect the four large (O) and two small (N) interlocking seal rings for excessive wear, broken ends, and make sure they rotate freely in the grooves. Intermediate shaft and clutch feed tubes are serviced as an assembly.

67. KICKDOWN PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006″ to .017″. Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. (.001 inch max. loose in hole). Make sure pinion shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.** Inspect kickdown carrier thrust washer (G) for scratches or excessive wear.

NOTE: Scuffing of the carrier does not affect its operation and the carrier should not be replaced for this reason alone.

68. REVERSE AND KICKDOWN ANNULUS—GEARS—INSPECTION

Inspect for worn, cracked, or broken gear teeth.

69. UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES)—ASSEMBLY

To aid in the assembly of Unit No. 1, use the propeller shaft flange and brake drum assembly which was removed from the transmission. With output shaft assembly (K) in the upright position, lubricate output shaft thrust washer (E) with Automatic Transmission Fluid (Type A) and place into position in housing. Place kickdown annulus gear (J) in position on intermediate shaft assembly (D) and install snap ring (I) (select fit). Using a feeler gauge, check the clearance under the

Fig. 78—Checking Clearance Between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly

kickdown annulus gear snap ring (Fig. 78). Clearance limits are as close to zero as possible. Snap rings are available in the following two thicknesses:

PT #1636357	.060" to .062"
1636358	.064" to .066"

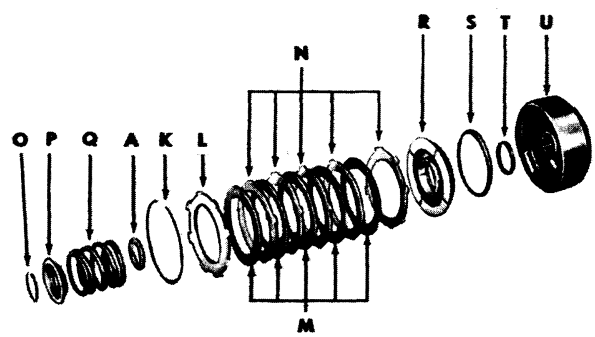
When checking clearance, support annulus gear on edge of bench so intermediate shaft will seat properly in gear. Make sure ring seats properly.

Place intermediate shaft assembly (D) in output shaft housing (K). Lubricate kickdown carrier thrust washer (G) with Automatic Transmission Fluid (Type A) and place in position on kickdown planet pinion carrier assembly (F). Place carrier assembly (F) in position in kickdown annulus gear (J). Make sure thrust washer (G) remains in position. Place thrust plate on carrier. Be sure pilot enters bore in pinion carrier. Place reverse annulus gear (B) in position in housing (K) and install output shaft drive housing snap ring. Make sure snap ring seats properly in housing. Lubricate and install sun gear (roller type) thrust washer (H) over intermediate shaft and into position in carrier assembly.

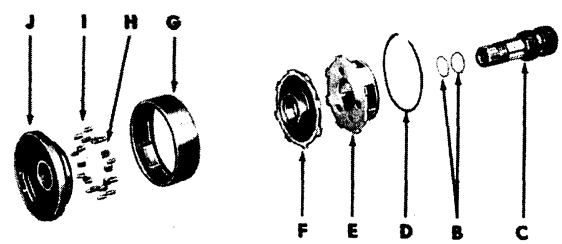
70. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY

The letters referred to in the Disassembly, Inspection, and Assembly of this unit pertain to Figure 79.

With unit setting in upright position, remove sun gear and front clutch thrust washer (A). Using two screw drivers, inserted between clutch and intermediate support, remove rear clutch retainer assembly from sun gear, as



A—SUN GEAR THRUST WASHER (same as output shaft thrust washer)
B—SUN GEAR REAR CLUTCH SEAL RING
C—SUN GEAR ASSEMBLY
D—REVERSE BAND SNAP RING
E—REVERSE PLANET PINION CARRIER ASSEMBLY
F—OVER-RUNNING CLUTCH HUB ASSEMBLY
G—LOW AND REVERSE BAND DRUM



H—OVER-RUNNING CLUTCH CAM ROLLER SPRING
I—OVER-RUNNING CLUTCH CAM ROLLER
J—INTERMEDIATE SUPPORT AND CAM ASSEMBLY
K—REAR CLUTCH SNAP RING
L—PRESSURE PLATE
M—DRIVING DISC
N—CLUTCH PLATE
O—PISTON RETURN SPRING SNAP RING
P—RETURN SPRING RETAINER
Q—RETURN SPRING
R—PISTON
S—PISTON SEAL RING—OUTER
T—PISTON SEAL RING—INNER
U—PISTON RETAINER ASSEMBLY

56 x 710

Fig. 79—Unit No. 2 (Disassembled View)

NOTE: Number of Clutch Plates and Discs is Dependent Upon Vehicle Model.

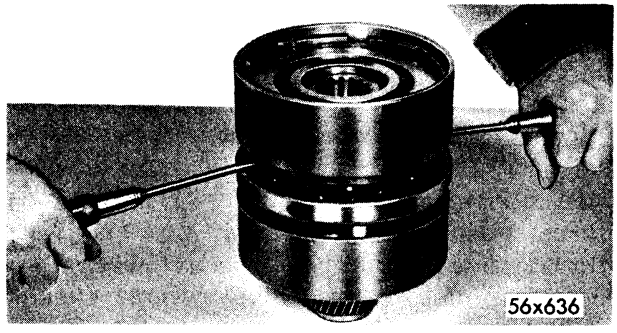


Fig. 80—Removing Rear Clutch Piston Retainer Assembly from Sun Gear

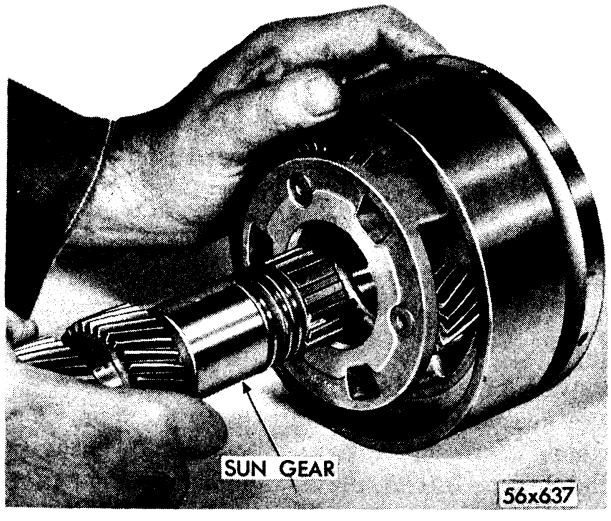


Fig. 81—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)

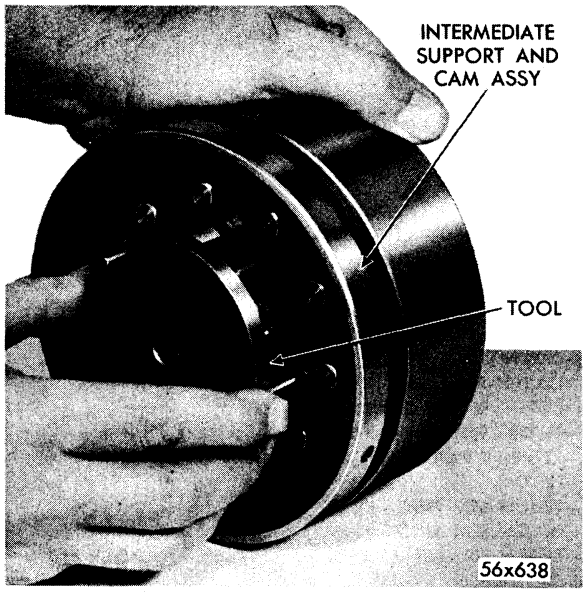


Fig. 82—Installation of Tool C-3527 in Intermediate Support and Cam Assembly

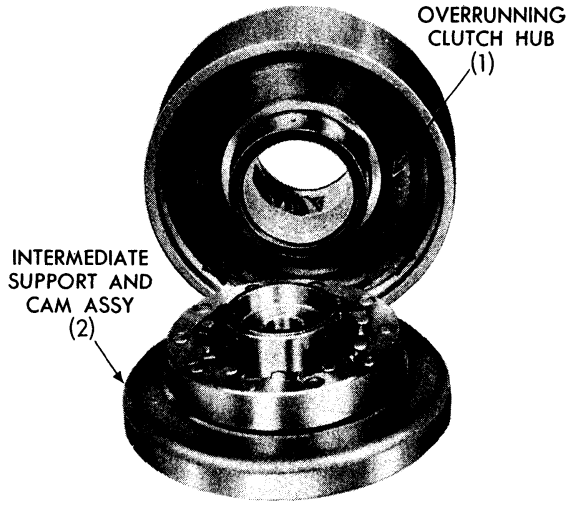


Fig. 83—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch Hub

shown in Figure 80. Remove the two rear clutch seal rings (neoprene) from sun gear. Remove reverse sun gear from overrunning clutch and reverse planet pinion carrier assemblies, as shown in Figure 81.

Install gauge, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 82. Remove intermediate support and cam assembly from overrunning clutch hub (Fig. 83). Using a screw driver, remove snap ring (D) from low and reverse band drum assembly (G). Remove the low and reverse planet pinion carrier assembly (E) from reverse band drum. Remove overrunning clutch hub assembly from reverse band drum, as shown in Figure 84.

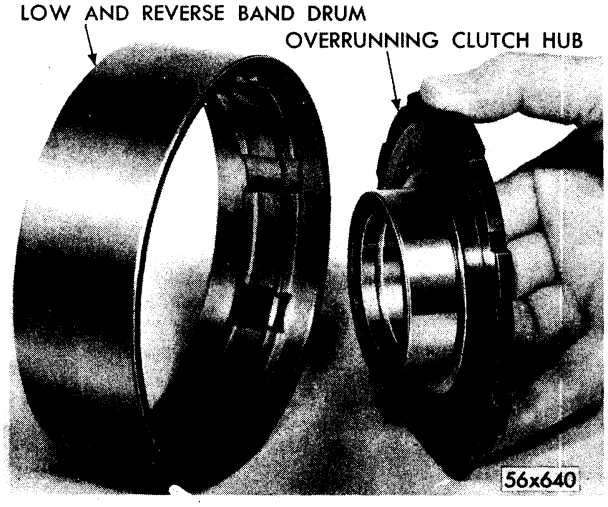


Fig. 84—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum

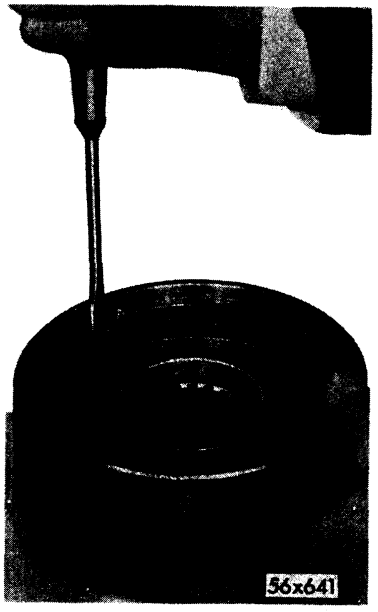


Fig. 85—Removal and Installation of Rear Clutch Piston Retainer Snap Ring

Remove overrunning clutch cam roller springs (H) and rollers (I) (ten each) by removing gauge, Tool C-3527, from intermediate support and cam assembly. **Have assembly over bench when removing tool.**

71. REAR CLUTCH PISTON RETAINER ASSEMBLY—DISASSEMBLY

Using screw driver, remove snap ring (large) from rear clutch piston retainer assembly, as shown in Figure 85. Remove rear clutch pressure plate (L) from retainer assembly. Invert clutch piston retainer assembly and remove the clutch plates (N) for driving disc (M) assemblies. Using compressor, Tool C-3533, slightly compress the rear clutch piston return spring retainer, as shown in Figure 86. **Use extreme care not to damage piston return spring retainer by compressing spring too far.**

Release compressor, Tool C-3533, and remove the clutch return spring retainer (P) and spring (Q) from clutch piston retainer assembly. Spring retainer may require guiding past snap ring groove as tool is released. Using a twisting motion, remove the clutch piston assembly (R) from retainer. Remove rear clutch piston inner and outer seal rings (S and T).

72. CLUTCH DRIVING DISC AND PLATE—INSPECTION

Inspect driving discs for evidence of wear, burning, glazing and flaking off of facing material. If grooves in facing are worn off, or if facing is burned, or flaking off, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates and pressure plate surfaces for evidence of burning, scoring, and damaged driving lugs; replace if necessary.

73. PISTON AND SEAL RINGS—INSPECTION

Inspect seal ring surfaces in piston retainer for nicks or deep scratches. Light scratches will not interfere with sealing of neoprene rings. Inspect inner and outer piston seal rings (neoprene) for deterioration, wear, and hardness. Install new seal rings if necessary. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside bore of the piston for score marks; if light, remove with crocus cloth; if heavy, replace the piston. Inspect piston spring, retainer, and snap ring for distortion.

74. REAR CLUTCH PISTON RETAINER ASSEMBLY—INSPECTION

Note the ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when transmission is in neutral or operating in drive (breakaway) and engine speeds are increased; otherwise clutch may engage. Make sure ball operates freely.

Inspect the band contacting surface for deep scores and burns, especially if the band lining is worn to the point where the steel band has

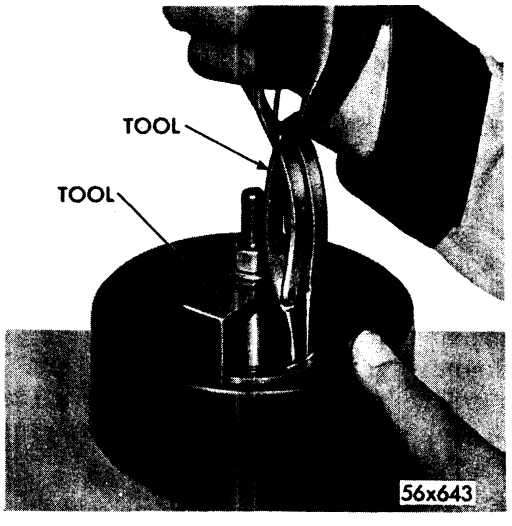


Fig. 86—Removal and Installation of Rear Clutch Spring Retainer Snap Ring

been contacting the rear clutch piston retainer. **Do not machine the piston retainer in a lathe to remove score marks.** Install new retainer if necessary.

Inspect steel clutch plate contacting surfaces for burrs or brinelling. Make sure clutch driving lugs on steel clutch plates travel freely into retainer. Remove any metal pickup on hub of retainer.

75. REAR CLUTCH PISTON RETAINER—ASSEMBLY

Lubricate and install inner piston seal ring (T) on hub of clutch retainer. **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (S) on clutch piston (lip of seal toward piston head). Place piston assembly (R) in clutch retainer (U) and with a twisting motion, seat piston in bottom of retainer. Install piston return spring on hub and position spring retainer and snap ring on spring.

Using compressor, Tool C-3533, compress the clutch spring sufficiently to seat the snap ring. Piston spring retainer may require guiding past the clutch hub. Make sure snap ring is properly seated. Remove compressor, Tool C-3533. Lubricate all clutch plates and drive discs with Automatic Transmission Fluid (Type A). Assemble by placing one of the rear clutch steel plates, in the clutch retainer followed by a driving disc. Repeat this procedure until all discs and plates have been installed. Install pressure plate (L) and snap ring (K). Make sure ring is properly seated.

76. REVERSE SUN GEAR ASSEMBLY—INSPECTION

Inspect gears for cracked or broken teeth. Inspect steel back bronze type bushing for scoring or excessive wear. Bushing and reverse sun gear are serviced as an assembly. Inspect intermediate support bearing surface of gear for wear and slight score. Inspect rear clutch seal ring grooves on gear for nicks or burrs. Inspect inner ring sealing area in bore of sun gear for grooves or scratches.

Inspect thrust area of sun gear for nicks, scratches, or burrs. Inspect seal rings (neoprene) for deterioration, wear nicks, or hardness. Install new seal rings if necessary. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

77. INTERMEDIATE SUPPORT AND CAM ASSEMBLY—INSPECTION

Inspect riveting of cam to intermediate support. Inspect cam roller surface for brinelling. Inspect roller spring retaining tabs for being bent or distorted. Inspect bearing surface on hub for scoring.

Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. Bushing and intermediate support are serviced as an assembly. Inspect overrunning clutch cam rollers for being pitted or scored. Inspect overrunning cam roller springs for distortion. Replace if necessary.

78. LOW AND REVERSE PLANET PINION CARRIER ASSEMBLY—INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006″ to .017″.

Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.**

NOTE: Scuffing of the carrier does not affect its operation and the carrier should not be replaced for this reason alone.

79. LOW AND REVERSE BAND DRUM—INSPECTION

Inspect the band contacting surface for deep scratches and burns, especially if band lining is worn to the point where steel band has been contacting the drum. **Do not attempt to machine the drum in lathe to remove score marks.** Inspect driving lugs inside of drum for excessive wear.

80. OVERRUNNING CLUTCH HUB ASSEMBLY—INSPECTION

Inspect cam roller contacting surface for brin-

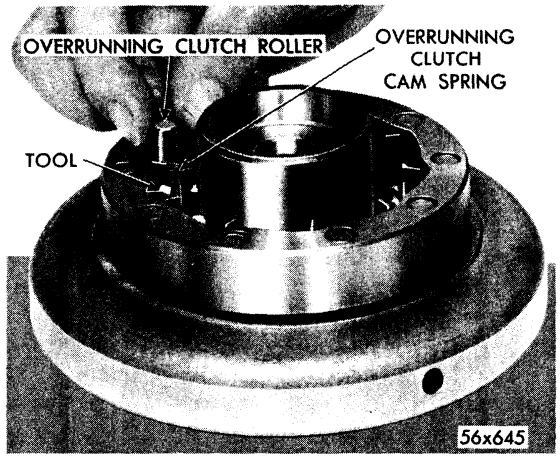


Fig. 87—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

elling. Inspect steel back bronze type bushing in hub for scratching or scoring and excessive wear. Bushing and hub are serviced as an assembly.

Inspect lubricating hole and make sure it is free from foreign matter by cleaning with compressed air. Inspect reverse band drum snap ring (select fit) for being distorted.

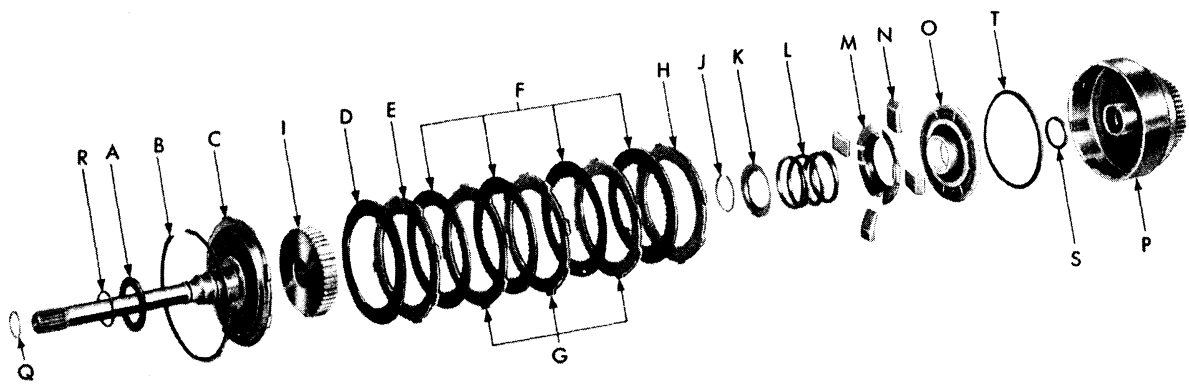
81. UNIT NO. 2—ASSEMBLY

Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, (Fig. 84). Place low and reverse planet pinion carrier assembly (E) in position in low and reverse band drum (G). With drum supported, select snap ring to give minimum clearance. Snap rings are available in the following three thicknesses:

PT #	1636315	.060″ to .062″
	1636316	.064″ to .066″
	1636317	.068″ to .070″

Place gauge Tool C-3527, in position in intermediate support and cam assembly, and install cam springs and rollers, as shown in Figure 87. **Make definitely sure that cam springs and rollers are properly seated against cam; otherwise, damage to springs will result when overrunning clutch hub is installed.** With intermediate support and cam assembly resting on bench, lubricate bushing and install low and reverse band drum assembly over hub. While holding the two assemblies together, remove gauge, Tool C-3527. Lubricate bearing surface on reverse sun gear and install intermediate support and planet pinion carrier assembly.

Lubricate the two sun gear-rear clutch seal rings (neoprene) with Automatic Transmission Fluid (Type A) and install on reverse sun gear. Install rear clutch piston retainer assembly on reverse sun gear. **To prevent personal injury, do not place the fingers under the clutch retainer assembly when installing.** Install the front clutch and sun gear thrust washer (A). **Lubriplate may be used to hold the thrust washer in position.**



A—INPUT SHAFT THRUST WASHER
B—FRONT CLUTCH SNAP RING
C—INPUT SHAFT AND BUSHING ASSEMBLY
D—CUSHION SPRING
E—CUSHION SPRING RETAINING PLATE
F—DRIVING DISCS
G—CLUTCH PLATES
H—CLUTCH PRESSURE PLATE
I—DRIVING DISC HUB
J—PISTON RETURN SPRING RETAINER SNAP RING
K—RETURN SPRING RETAINER
L—PISTON RETURN SPRING
M—PISTON LEVER RETAINER
N—LEVER
O—PISTON
P—PISTON RETAINER ASSEMBLY
Q—OIL SEAL RING—SMALL
R—OIL SEAL RING—LARGE
S—PISTON SEAL RING—INNER
T—PISTON SEAL RING—OUTER

58x61

Fig. 88—Unit No. 3 (Disassembled View)

82. UNIT NO. 3—(INPUT SHAFT AND FRONT CLUTCH PISTON RETAINER ASSEMBLIES) —DISASSEMBLY

The letters referred to in disassembly, inspection and reassembly of this unit, pertain to Figure 88.

Remove the input shaft fibre thrust washer (select fit) (A). **During assembly, the front clutch cushion spring (D) was preloaded to 500 pounds. To remove snap ring (B) and input shaft, the front clutch assembly must be placed in an arbor press. With the rear of retainer resting on a suitable support, press the input shaft only far enough into retainer to permit removal of the snap ring with a screw driver.**

If an arbor press is not available, two large "C" clamps may be used by placing them 180° apart and applying equal pressure. If "C" clamps are used, make sure they are positioned so as not to damage the ball check located in back side of retainer.

Slowly release pressure on input shaft, then remove the retainer and input shaft from the arbor press. Remove the input shaft assembly (C) from the clutch piston retainer (P). Invert the front clutch piston retainer, and remove cushion spring (D), cushion spring retaining plate (E), driving discs and clutch plates (F and G), pressure plate (H) and clutch hub (I). Install compressor Tool C-3533, then compress the front clutch piston return spring retainer (K).

Using pliers, Tool C-3301, remove the piston return spring snap ring (J). Release and remove fixture, Tool C-3533. Remove the clutch piston return spring retainer (K) and spring (L). Remove lever retainer (M) and levers (4) (N) from front clutch piston retainer (P). Using a twisting motion, remove the piston assembly from the retainer.

83. INPUT SHAFT—INSPECTION

Inspect the input shaft thrust washer (A) for cracks or excessive wear. Inspect front clutch snap ring (B) for distortion. Inspect interlocking seal rings (Q and R) for wear or broken locks. Make sure they turn freely in the grooves. **Do not remove rings unless condition warrants.** When replacing rings, use extreme care not to damage interlock portion of ring. Make sure all oil passages are open by blowing out with compressed air.

Check splines and lugs for nicks or burrs. Inspect bearing and thrust surfaces for nicks or scratches. Inspect steel back bronze type bushing for scratches or scoring or excessive wear. Bushing and input shaft are serviced as an assembly.

84. CLUTCH DRIVING DISCS, PLATES, AND HUB—INSPECTION

Inspect driving discs (F) for evidence of wear, burning, glazing, and flaking off of facing material. If grooves in facings are worn off, or if facings are burned, or flaking off, replace all driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates (G), cushion spring retaining plate (E), and pressure plate (H) surface for evidence of burning, scoring, and damaged lugs; replace if necessary. Inspect cushion spring (D) for distortion and evidence of scoring.

Inspect lever contacting surface on pressure plate for evidence of wear. Inspect clutch hub (I) splines for wear and remove any metal pickup which may have accumulated on either side of the hub. (Oil passages in hub are to lubricate clutch plates.) Make sure they are free of foreign matter.

85. FRONT CLUTCH PISTON, SEAL, AND LEVERS—INSPECTION

Inspect levers (N) for wear and scoring. Remove and inspect inner and outer piston seal rings (T and S) (neoprene) for deterioration, wear and hardness. Install new seal rings if necessary. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside portion of piston hub for score marks. If score marks are light, remove with crocus cloth; if scores are deep, replace the piston (O). Inspect lever retainer (M), return spring (L), spring retainer (K) and snap ring (J) for distortion.

86. FRONT CLUTCH RETAINER—INSPECTION

Note ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when clutch is in released position (neutral and reverse) and engine speeds are increased; otherwise, clutch may engage. Make

sure ball operates freely. Inspect seal ring surface in the retainer hub; if intermediate shaft seal rings have excessively worn or grooved this surface, replace the clutch piston retainer (P) assembly. Inspect steel clutch plate contacting surfaces for scores or brinelling. Make sure clutch driving lugs on steel plates travel free in retainer. Inspect splines on rear of retainer for nicks, burrs, or brinelling. Inspect thrust surface on rear of retainer for scratches or scoring. Make sure all clutch feed and lubricating passages are free of foreign matter.

87. UNIT NO. 3—ASSEMBLY

Lubricate and install inner (neoprene) seal ring (S) on hub of clutch retainer (P). **Make definitely sure that lip of seal is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (T) on clutch piston with lip of seal toward head of piston.

Place piston assembly (O) in clutch retainer and with a twisting motion, seat piston in bottom of retainer. Place lever retainer (M) in piston and install the four levers (N). **Make sure levers are free and properly seated in piston slots.**

Install clutch return spring (L) over hub of clutch retainer (P) and position spring retainer (K) and snap ring (J) on spring. Using compressor, Tool C-3533, compress the clutch return spring sufficiently to seat snap ring with pliers, Tool C-3301. **Spring retainer may require guiding past the piston retainer hub. Make sure snap ring is properly seated.** Remove spring compressing portion of Tool C-3533. Install pressure plate (H) (smooth side up) in retainer. Install discs and plates by placing one of the driving discs (F) in the clutch retainer followed by a steel plate (G). Repeat this procedure until all driving discs and steel plates have been installed.

88. CHECKING FOR PROPER TRAVEL OF CLUTCH PRESSURE PLATE

It is very important that the front clutch pressure plate has the proper amount of travel. Insufficient travel may cause the clutch plates to drag. Excessive travel may cause delayed engagement, or may allow slippage of the clutch. To check for proper travel of the clutch pressure plate, proceed as follows: Check clearance by temporarily installing pressure plate (part NO. 1732114) on top of the clutch pack.

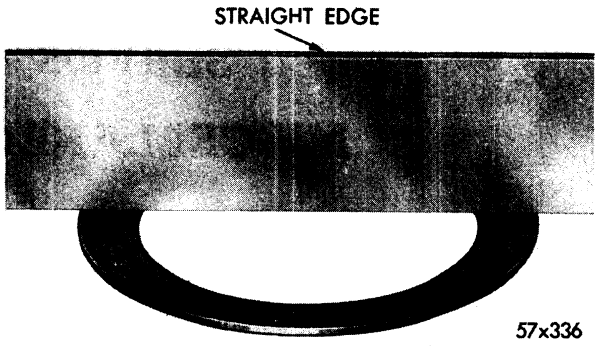


Fig. 89—Identification of Front Clutch Cushion Spring

NOTE: Pressure plate (part NO. 1732114) is the rear clutch pressure plate used in the early model transmissions. If not available, it is suggested that one be obtained and kept with the special TorqueFlite service tools.

Hold this rear pressure plate firmly in place, by hand, and insert a feeler gauge between it and the top disc in the assembly. Total clearance should be .020-.040 inch. If the measured clearance is not within these limits, the discs will have to be replaced with any combination of new discs that will provide the required clearance.

Clutch discs are in three different thicknesses. Sizes and part numbers are as follows:

Part Number	*Thickness*
1636260	.060-.063 inch
1636372	.073-.076 inch
1636373	.087-.090 inch

When right clearance is obtained, remove clutch plate (part # 1732114).

Install the front clutch hub, (I), cushion spring retaining plate (E), and cushion spring (D) (concave side, as shown in Figure 89, toward retaining plate) (E). The front clutch cushion spring must be preloaded to 500 pounds for assembly. Place front clutch and the input shaft assembly in an arbor press with the rear of the piston retainer resting on a suitable support. Press the input shaft into the clutch retainer until snap ring (B) can be installed. **If arbor press is not available use two "C" clamps placed 180° apart as described previously.**

Remove the input shaft and front clutch assemblies from the arbor press (or remove "C" clamps) and install the input shaft thrust washer.

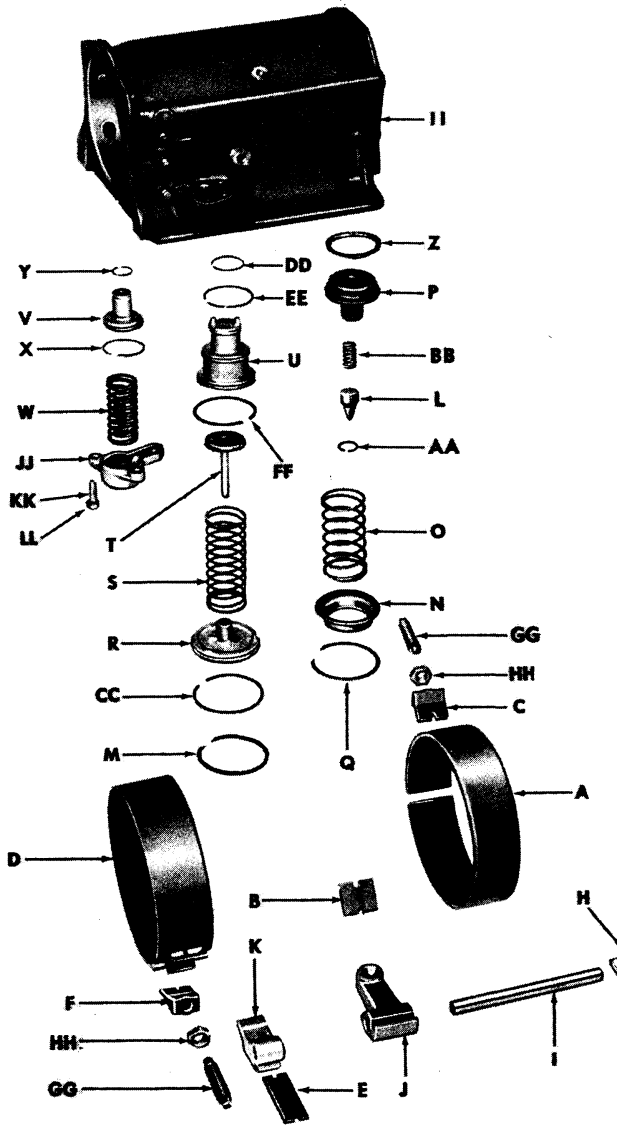
SERVOS, BANDS AND MISCELLANEOUS INSPECTION

89. BAND—INSPECTION

All letters referred to in inspection of these parts pertain to Figure 90. Make visual inspection of bands and lining for wear and bond to metal. If lining is worn to the point that grooves are no longer visible, band assemblies must be replaced. The lining is bonded to the band and no attempt should be made to reline them. Inspect bands for distortion or cracked ends. The reverse band is **narrower** than the kickdown band. Therefore, it should be identified for proper installation.

90. LEVER ASSEMBLIES—INSPECTION

Inspect levers (J and K) for being cracked or worn and make sure they are free to turn on shaft and have side clearance when installed. Inspect lever shaft (I) for excessive wear.



A—LOW AND REVERSE BAND
B—REVERSE BAND STRUT
C—ANCHOR
D—KICKDOWN BAND
E—KICKDOWN BAND STRUT
F—ANCHOR
G—LEVER SHAFT PLUG
H—LEVER SHAFT SPACER
I—LEVER SHAFT
J—LOW AND REVERSE BAND LEVER
K—KICKDOWN BAND LEVER
L—LOW AND REVERSE SERVO PISTON PLUG
M—PISTON ROD GUIDE SNAP RING
N—LOW AND REVERSE SERVO PISTON SPRING RETAINER
O—LOW AND REVERSE SERVO PISTON SPRING
P—LOW AND REVERSE SERVO PISTON
Q—SPRING RETAINER SNAP RING
R—PISTON ROD GUIDE
S—KICKDOWN SERVO PISTON SPRING
T—PISTON ROD
U—KICKDOWN SERVO PISTON
V—ACCUMULATOR PISTON
W—ACCUMULATOR SPRING
X—PISTON RING—LARGE
Y—PISTON RING—SMALL
Z—LOW AND REVERSE SERVO PISTON RING
AA—PLUG RETAINING RING
BB—PISTON PLUG SPRING
CC—PISTON ROD GUIDE SEAL RING
DD—PISTON SEAL RING—SMALL
EE—PISTON SEAL RING—MEDIUM
FF—PISTON SEAL RING—LARGE
GG—BAND ADJUSTING SCREW
HH—ADJUSTING SCREW LOCK NUT

II—TRANSMISSION CASE
JJ—ACCUMULATOR COVER
KK—COVER SCREW
LL—COVER SCREW WASHER

56 x 708 A

Fig. 90—Servos and Bands (Disassembled View)

91. REVERSE SERVO PISTON ASSEMBLY—INSPECTION

Inspect lever contacting surface on plug (L) for excessive wear. Remove and inspect reverse servo piston seal ring (Z) (neoprene) for deterioration and hardness. Inspect seal ring groove for nicks or burrs. Inspect servo piston return spring (O), retainer (N), and snap ring (Q) for being distorted.

92. KICKDOWN PISTON ASSEMBLY—INSPECTION

Inspect riveting of kickdown piston rod (T). Also inspect guide (R) contacting surface for nicks or burrs. Inspect seal ring (CC) on guide for wear and make sure it turns freely in the groove. Check fit of guide (R) on piston rod. Inspect the three rings (GG, EE, DD) (two interlocking) on piston for wear or broken locks. Make sure they turn freely in the groove. It is not necessary to remove rings unless condition warrants. When replacing new rings, use extreme care so as not to damage the interlocking portion of the ring. Inspect kickdown piston (U) for light scores and wear. Inspect kickdown piston spring (S) and rod guide snap ring (M) for being distorted.

93. ACCUMULATOR PISTON AND SPRING—INSPECTION

Inspect the two seal rings (X and Y) (one interlocking) for wear or broken locks and make sure they turn freely in the grooves. It is not necessary to remove rings unless condition warrants. When replacing new interlocking seal rings, use extreme care so as not to damage interlocking portion of ring. Inspect accumulator piston (V) for nicks, burrs, and excessive wear. Inspect the accumulator spring (W) for being distorted.

94. DRIVE SLEEVE

Inspect the front seal ring (neoprene) for nicks, deterioration and hardness. Inspect the interlocking seal ring for wear or broken locks, and make sure it turns freely in the groove. It is not necessary to remove rings unless condition warrants. Inspect driving lugs for excessive wear and bearing surface on outer diameter for nicks, burrs, or scratches.

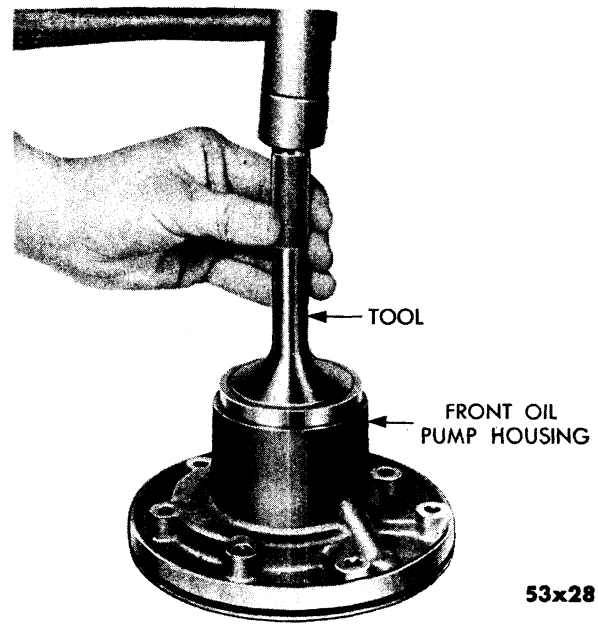


Fig. 91—Installing Front Pump Housing Oil Seal

95. FRONT OIL PUMP

Inspect front oil pump housing outer seal (on circumference of housing) and oil seal for deterioration and hardness. Do not remove oil seal from housing unless inspection reveals that it is necessary. To remove oil seal, use a brass drift and drive seal out of housing. To replace front oil pump housing oil seal, position seal in housing with seal lip toward rotor bore, (metal portion of seal down) and use driver, Tool C-3278 to drive seal until tool bottoms on face of housing, as shown in Figure 91. Inspect drive sleeve seal ring contacting surface in housing for wear and scratches. Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. (Bushing and housing are serviced as an assembly.) Remove oil pump rotors and inspect rotor contacting surfaces for high spots, scratches, burrs, or grooving.

Inspect regulator body contacting surface on pump housing face for nicks or burrs. Inspect housing passages and make definitely sure they are free from dirt and foreign matter. Clean and install oil pump gears in housing. Replace gears, as identified when removed, with counterbore in pinion gear facing down. Using straightedge, Tool C-3335 and feeler gauge, check clearance between pump housing face and face of rotors, as shown in Figure 92. Clearance

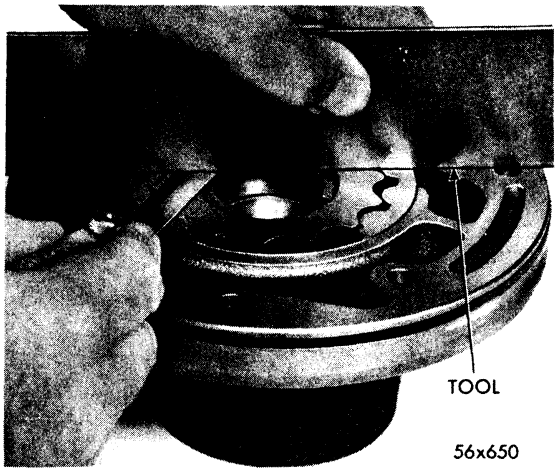


Fig. 92—Checking Clearance Between Front Pump Body and Gears

limits are from .001" to .0025". After checking pump gear clearance, lubricate pump rotors with Automatic Transmission Fluid (Type A).

Measure the tip clearance between the rotor lobes. The manufacturing limits are .005" to .008". Replace the rotors if this clearance exceeds .010".

Measure the diametral clearance between the outer rotor and pump housing bore. The manufacturing limits are .008" maximum. Replace the rotors or pump housing if the clearance exceeds .010".

96. REGULATOR VALVE BODY AND VALVES

Place body and valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect the reaction shaft seal ring surface in bore for scratches, nicks, or burrs. Inspect both valves for free movement in valve body; they should fall in and out of bores when both the valves and body are dry. Crocus cloth may be used to polish valves providing care is exercised not to round the sharp edge portion of the valves. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve body, thus reducing the possibilities of sticking.

Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. If regulator valve body should have a slight nick or raised portion on mating surfaces, it may be removed by using a surface plate and crocus cloth. Inspect front and rear pump check valve for proper seating on both surfaces. If necessary to remove valve, use a pair of long nose pliers. When installing check valve, make definitely sure rear pump check valve (with metering hole) is positioned toward outside of regulator valve body.

Check regulator valve spring seat (snap ring). After the valves and regulator valve body have been thoroughly cleaned and inspected, the valves should be reinstalled in body, (Fig. 69). Place assembly on a clean surface and cover until ready for installation. Inspect regulator valve and torque converter control valve springs for distortion. Check regulator valve spring sleeve and cup for burrs. Check adjusting screw and locknut in retainer, for freeness and pulled threads.

ASSEMBLY OF UNITS IN TRANSMISSION CASE

97. TORQUE CONVERTER REACTION SHAFT—INSTALLATION

Using heat lamps, heat front of transmission case to approximately 170 to 190 degrees F. Install guide studs, Tool C-3283 in front face of reaction shaft flange. Lubricate portion of reaction shaft that presses into case with Automatic Transmission Fluid (Type A). Position torque converter reaction shaft into front of transmission case so that guide studs in shaft align with threaded holes in case.

Using Tool C-3531*, press reaction shaft into place, as shown in Figure 70. Remove the guide studs and start the three transmission case to reaction shaft bolts and washers draw down evenly, and tighten to specifications. Coat torque converter reaction shaft seal (neoprene) with Automatic Transmission Fluid (Type A) and install on shaft.

*Refer to "Special Tools".

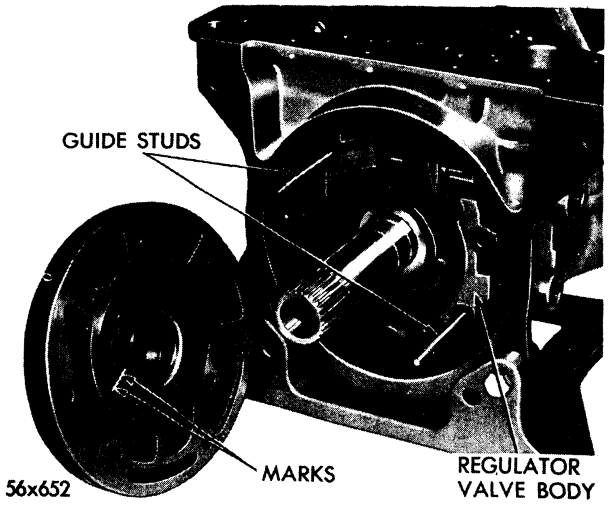


Fig. 93—Installing Front Oil Pump Assembly

98. REGULATOR VALVE BODY

Install guide studs, Tool C-3288, as shown in Figure 68. Install regulator valve body gasket over guide studs and into position on the transmission case. With seal ring (neoprene) in position on reaction shaft, install regulator valve body and valves over guide studs and into position. **Hold valves in place to prevent damage while installing valve body.**

99. FRONT OIL PUMP ASSEMBLY—INSTALLATION

With inner and outer seals lubricated and pump rotors in position in housing (Fig. 93) (counterbore in pinion gear facing down as identified when removed), place oil pump housing over studs and slide into position. Start five of the bolts (with aluminum washers) and draw housing down evenly until it is seated in transmission case. Remove guide studs and install the two remaining bolts and washers, then tighten to specifications. **Improper tightening of these bolts may cause pump gears to bind.** Lubricate and install front pump drive sleeve (bearing into surface first), as shown in Figure 94, then engage the driving lugs of the oil pump inner rotor to determine if oil pump rotors turn freely. Main body of driving sleeve should be flush with oil pump housing when properly installed, (Fig. 95). If gears do not turn freely, remove pump and check for foreign matter between pump rotors and housing.

Install the torque converter control valve spring, retainer and gasket. Tighten to specifications. Reinstall the transmission regulator valve spring, sleeve, cup, gasket and retainer (with adjusting screw and lock nut installed). Tighten to specifications.

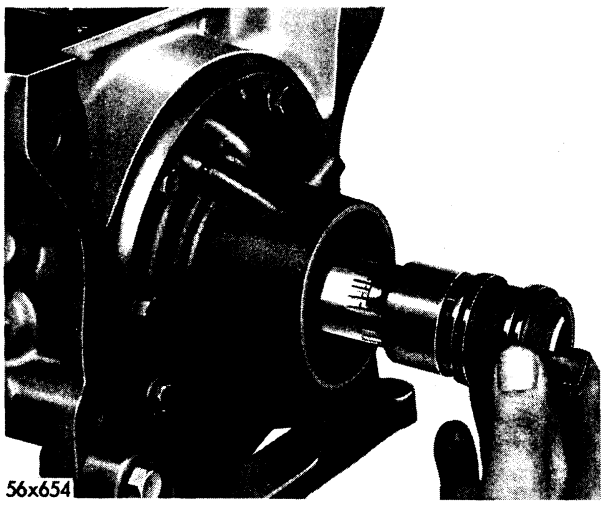


Fig. 94—Installing Front Oil Pump Drive Sleeve

100. KICKDOWN PISTON—INSTALLATION

Lubricate piston seal rings and place on kick-

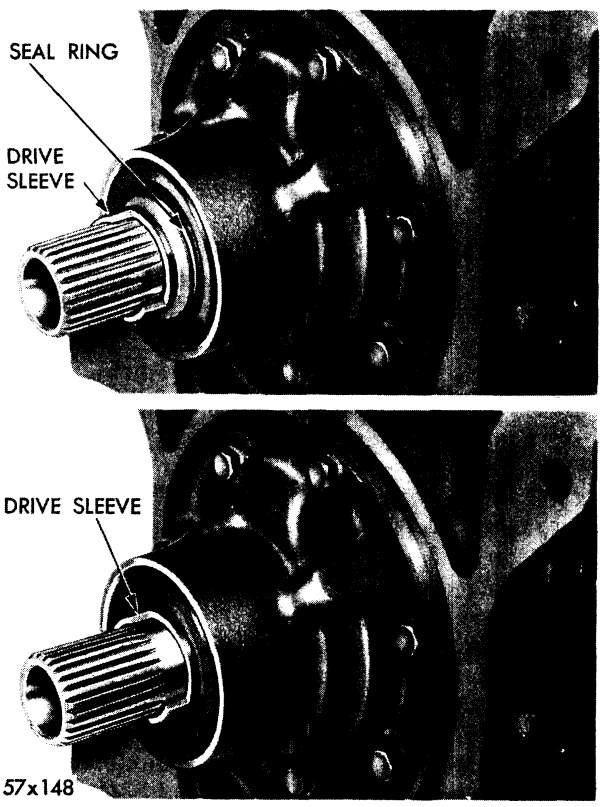


Fig. 95—Front Pump Drive Sleeve—Installation—
Incorrect Installation (Top View)
Correct Installation (Bottom View)

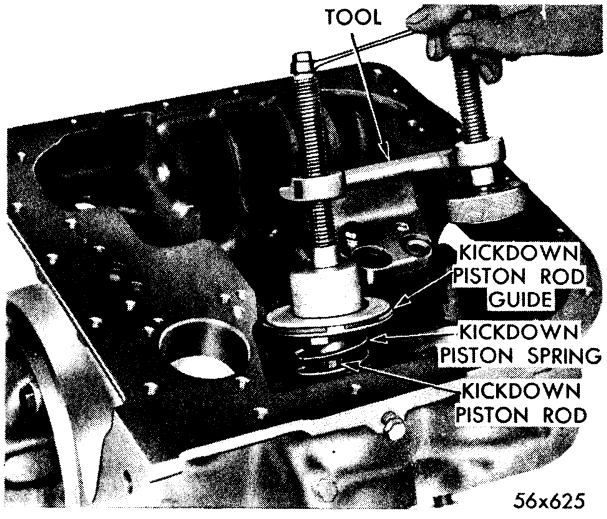


Fig. 96—Removal and Installation of Kickdown Piston Rod Guide and Spring

down piston. Compress outer ring and start assembly into case. With piston properly centered so as not to damage rings, tap lightly and bottom piston into case. Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod. Install Tool C-3529 or C-3289 (modified) to compress piston rod guide spring.

Place the kickdown piston rod guide over spring and compress spring while guiding piston rod through piston rod guide, as shown in Figure 96. Using extreme care, compress the kickdown piston spring to the point that piston rod guide seal ring slightly binds on case. Then work seal ring into position by gradually compressing spring. Install snap ring (Fig. 62) and make sure it is properly seated. Loosen compressing portion of tool and remove.

101. REVERSE SERVO PISTON—INSTALLATION

Lubricate the low-reverse servo piston seal ring and install on piston (lip of seal facing top end of piston). Install cushion spring and plug into servo piston and secure with snap ring. (Make sure snap ring seats properly). Install piston assembly into transmission case.

Place reverse servo piston spring over piston and position spring retainer over spring. Install Tool C-3529 or C-3289 (modified) for reverse servo piston installation. Compress spring (Fig. 97) sufficiently to install snap ring. Spring retainer may require guiding into case. **Make sure snap ring seats properly.** Loosen compressing portion of tool and remove from transmission case.

102. KICKDOWN BAND—INSTALLATION

Install the kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 58. **Use extreme care when installing bands so not to damage lining on edges of transmission case.** Install anchor on kickdown band adjusting screw.

103. LOW-REVERSE BAND—INSTALLATION

Install anchor on reverse band adjusting screw. Install band by rotating band ends through rear opening in transmission case, as shown in Figure 56.

104. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES AND STRUTS—INSTALLATION

Place levers in position in case and slide shaft through levers from rear of transmission case, as shown in Figure 59. Remove guide stud, Tool C-3288 from threaded end of shaft and install shaft lever flat spacer and plug. Tighten plug to specifications. Position kickdown band over anchor and compress band in sufficiently to install kickdown band strut, as shown in Figure 57. Place low-reverse band into position on anchor and compress band end; and with the aid of a screw driver, install strut.

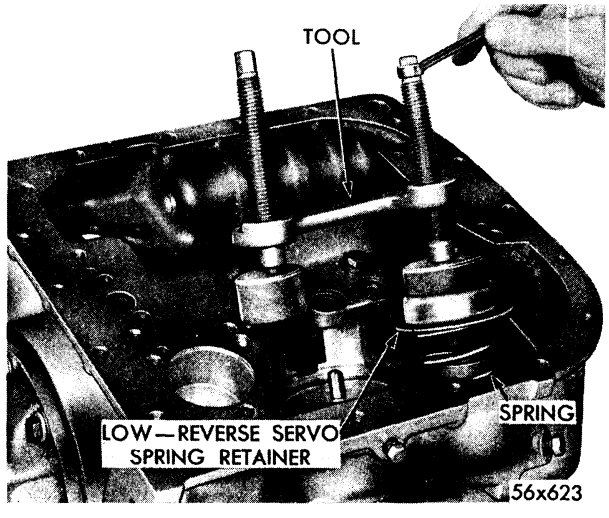


Fig. 97—Compressing Low and Reverse Servo Spring and Retainer

POWER TRAIN UNITS (Fig. 98) – INSTALLATION

105. UNIT NO. 3—(FRONT CLUTCH AND INPUT SHAFT ASSEMBLIES)—INSTALLATION

If when transmission was disassembled, the end clearance was found to be incorrect, correction can be made at this time by selection of proper input shaft thrust washer. To accomplish this, use a micrometer and measure the thickness of the thrust washer which was removed. Then, select a thicker or thinner washer to give proper clearance. Thrust washers are available in the following thicknesses:

Part No.	*Thicknesses*	*Color*
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Black
1638671	.078″ to .080″	Red
1823872	.059″ to .061″	Orange

With input shaft thrust washer in position and input shaft seal rings lubricated, start unit through rear of transmission case, as shown in Figure 55. By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

106. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH AND REAR CLUTCH ASSEMBLIES)—INSTALLATION

Start unit through rear of transmission case. Align identified locating hole in intermediate support with threaded locating hole inside of transmission case, as shown in Figure 99. By supporting and keeping unit centered as much as possible, guide it through bands until it contacts the hub on the front clutch. While pushing in on assembly, rock sun gear to engage clutch plates of rear clutch on hub of front clutch. Be careful thrust washer does not fall out of place.

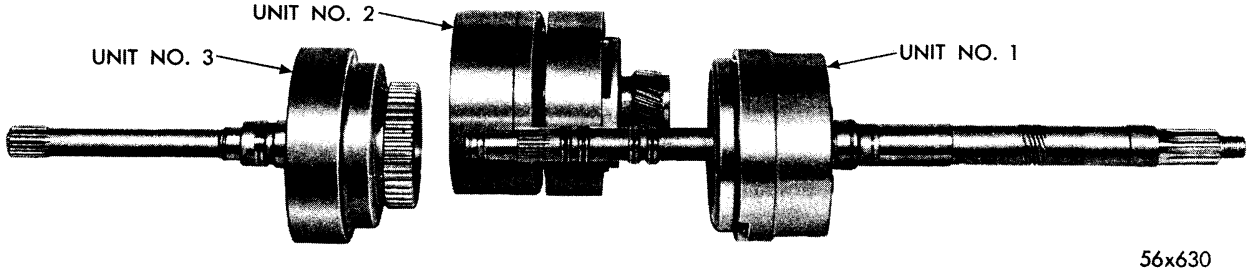


Fig. 98—Power Train Units

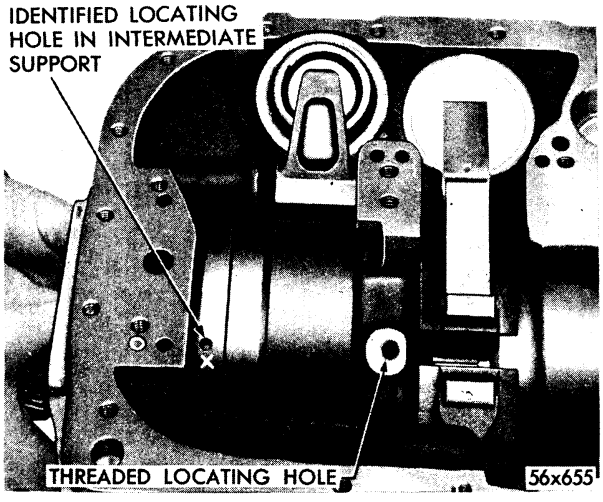


Fig. 99—Installing Unit No. 2

While rocking sun gear, make sure unit does not bind on bands or in intermediate support. Do not use excessive force when installing this unit so as to prevent damage to clutch discs in rear clutch. A drift may be used to assist in alignment of intermediate locating holes.

Install the three intermediate support locating bolts (Fig. 22), lockwashers, and tighten to specifications. Use extreme care when installing the locating bolt (inside of case) to prevent loss of lock washer. Check input shaft and sun gear for free rotation.

107. UNIT NO. 1—(OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)—INSTALLATION

Be sure reverse sun gear thrust washer (roller

type) is in position in planet pinion carrier assembly. Lubricate seal rings and bearing surface on intermediate shaft with Automatic Transmission Fluid (Type A). Install unit by guiding intermediate shaft in sun gear, as shown in Figure 52. Keeping unit centered as much as possible and slowly turning output shaft, slide into position (large seal ring on output shaft flush with rear of transmission case). **Use extreme care when installing to prevent damage to seal rings on intermediate shaft.**

108. OUTPUT SHAFT SUPPORT—INSTALLATION

With guide studs Tool C-3283 installed in rear of transmission case, place output shaft support gasket over guide studs and into position on rear of case. Lubricate output shaft seal rings. Install support over shaft and guide studs, and position against transmission case, as shown in Figure 51. **Use care when installing support so as not to damage ring sealing surfaces.** Install the one (short) output shaft support to transmission case bolt and lockwasher (Fig. 49) and tighten finger tight.

109. REAR OIL PUMP AND GOVERNOR ASSEMBLIES—INSTALLATION

Place rear oil pump pinion ball in ball pocket in output shaft. Lubricate rear oil pump drive pinion. Place over output shaft and slide into position aligning keyway in pinion with ball in shaft, as shown in Figure 50. **Pinion was marked when removed in disassembly. Make sure it is installed correctly.**

Lubricate rear oil pump gear and position in pump housing. Make sure gear is installed correctly; check marking. Slide rear oil pump and governor assemblies over output shaft and position in the support, as shown in Figure 49. **There are two extra holes in housing which are used for vents. Make definitely sure that no attempt is made to install bolts in these holes. Check each threaded hole before installing bolts.** Install the five rear oil pump housing to output shaft support bolts and washers.

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from bolt head. Draw down evenly, tighten to specifications. **After bolts have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.**

110. GOVERNOR WEIGHTS AND VALVE ASSEMBLY—INSTALLATION

Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten to specifications. **Holes can be easily aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled, tighten the four governor body bolts to specifications.**

Dry governor weight assembly and valve with compressed air, but do not lubricate when assembling. Place governor weight assembly (secondary weight snap ring facing out) into governor body (Fig. 48) and using pliers, Tool C-3229, install snap ring (Fig. 47). Make sure snap ring seats properly. With the governor valve (small end up) on governor valve shaft slide into governor body through the output shaft and governor weight assembly (Fig. 46); at the same time positioning valve in body.

Install the governor valve shaft snap ring (weight assembly end). Make sure it is properly locked to shaft, as shown in Figure 39. **After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves (See Fig. 100). Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.**

111. TRANSMISSION EXTENSION—INSTALLATION

Install new transmission extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket. Place extension over output shaft and guide studs and into position against support. **Propeller shaft flange and drum assembly can**

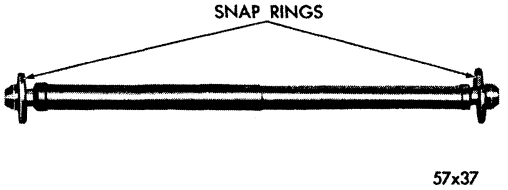


Fig. 100—Positioning Governor Valve Shaft Snap Rings in Grooves

be used if necessary to draw extension bearing on output shaft. DO NOT USE HAMMER.

Start the transmission extension to case bolts and lockwashers then draw down evenly and tighten to specifications. **After these bolts have been properly torqued, turn output shaft to make sure it turns freely.** Install speedometer drive pinion and sleeve assembly in transmission extension, as shown in Figure 44 and tighten to specifications.

112. HAND BRAKE—INSTALLATION

Make sure the brake support spacer (neoprene) is in position on back of brake support and spacer sleeve is in center of support. Slide hand brake assembly (intact) over rear of extension. Make sure spacer sleeve remains in center of support.

Indent in shield is for correct positioning on extension. Also, shield must be located on extension far enough to permit installation of spring.

Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Slide the brake shoe return spring behind the grease shield spring and hook into position, as shown in Figure 101. Reinstall pin through brake anchor and extension. Install propeller shaft flange and drum assembly. Install the propeller shaft flange washer and nut. Tighten to specifications. Use wrench, Tool C-3281 to hold brake drum and flange assembly while tightening nut (Fig. 42).

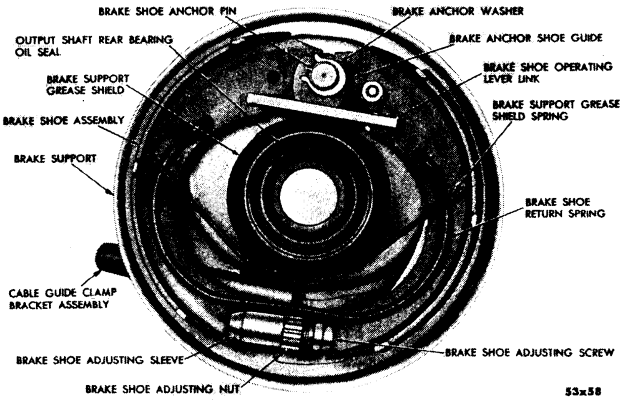


Fig. 101—Internal Expanding Handbrake (Drum Removed)

113. RECHECKING FRONT CLUTCH END CLEARANCE

Prior to installing the valve bodies and transfer plate assembly, recheck front clutch end clearance using dial indicator, Tool C-3339, as shown in Figure 41. To make this check, pull front clutch forward by pulling on the input shaft, or by carefully inserting screw driver between the front and rear clutch. Remove screw driver and with dial indicator, point contacting edge of front clutch retainer set dial indicator to zero. Then push front clutch assembly rearward against rear clutch, and take indicator reading. This clearance should be from .020″ to .050″. If the clearance is not within these limits, then transmission will have to be partially disassembled in the following manner to allow an input shaft thrust washer of proper thickness to be installed:

Remove the seven bolts and lockwashers from the transmission extension and install guide studs, Tool C-3283. Then, remove the one output shaft support to transmission case bolt and washer (Fig. 49) and remove the hand brake assembly, extension, output shaft support, and Unit No. 1 (one assembly) as shown in Figure 102. **Support assemblies as much as possible when removing to prevent damaging seal rings on intermediate shaft. Refer to "Power Train Units—Removal." Unit No. 2 and Unit No. 3.**

Using a micrometer, measure the thickness of the input shaft thrust washer and select a washer to give correct clearance. Thrust wash-

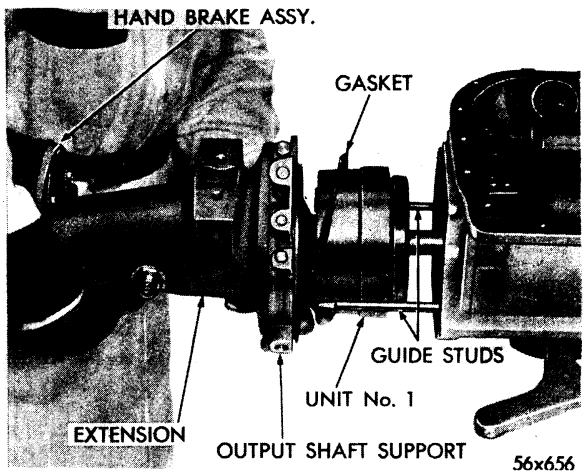


Fig. 102—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an Assembly

ers are available in the following thicknesses:

Part No.	*Thickness*	*Color*
1638669	.115" to .117"	Natural
1638670	.097" to .099"	Red
1638671	.078" to .080"	Black
1823872	.059" to .061"	Orange

Install power train units. Refer to "Power Train Units—Installation"; Unit No. 3, and Unit No. 2.

Install hand brake assembly, extension, output shaft support, and Unit No. 1 in one assembly as removed, following the procedure as described in the installation of Unit No. 1. With assembly in position in transmission case, install the one support to case bolt and lockwasher finger tight. Remove the guide studs and install the seven extension to case bolts and lockwashers, draw down evenly and tighten to specifications. After bolts have been properly torqued, turn output shaft to make sure it turns freely. Recheck front clutch end clearance.

114. BAND ADJUSTMENTS

Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counter-clockwise direction to center bands on retainers prior to making band adjustments.

Low-Reverse (Rear) Band

Refer to "Maintenance, Adjustments and Tests," Paragraph 15.

Kickdown (Front) Band

Refer to "Maintenance, Adjustments and Tests," Paragraph 15.

115. VALVE BODIES AND TRANSFER PLATE ASSEMBLY—INSTALLATION

Check mating surfaces of valve body assembly for cleanliness. Then place the valve bodies and transfer plate assembly into position on transmission case, as shown in Figure 40. Install the three transfer plate bolts (short) and washers, two in center, and one in front. Draw down evenly and tighten to specifications. **Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from head.**

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, as shown in Figure 39, (three bolts with washers) and draw down evenly. Place oil strainer assembly in position on transfer plate assembly. Install the four bolts and washers, draw down evenly, and tighten strainer assembly and accumulator cover bolts to specifications. Install neutral starting switch.

116. OIL PAN—INSTALLATION

Using a new oil pan gasket, place oil pan in position on transmission case. Install the oil pan bolts and washer assemblies; draw down evenly, and tighten to specifications. Position the manual valve operating shaft lever so there is $\frac{7}{32}$ inch clearance (without gasket) between bottom of lever and transmission case. Tighten locking screw securely. **A 7/32 inch drill can be used for obtaining proper clearance (Fig. 30).** Place control cable adapter (with spring lock in position) in lever and install pin. Place manual valve control lever in **reverse** position and install gasket, control cable housing, and three bolts and washers. Draw down evenly and tighten to specifications. Install lip seal flat washer, and throttle valve lever assembly over shaft. Tighten clamping bolt.

RECONDITIONING OF VALVE BODY AND TRANSFER PLATE ASSEMBLIES

117. LOWER VALVE BODY—REMOVAL

Place the valve bodies and transfer plate assembly in stand, Tool C-3528. **Never clamp any portion of any valve body assembly in a vise or use force when removing or installing valves and plugs.** Remove the two valve body bolts (long) from retainer plate located between front and rear valve bodies, (Fig. 103) and remove plate. Invert valve bodies and transfer plate and re-

move the two lower valve body bolts and lockwashers. Remove lower valve body and plate from transfer plate, as shown in Figure 104.

118. REAR VALVE BODY—REMOVAL

Remove the two transfer plate to rear valve body bolts and lockwashers, and remove rear valve body from transfer plate assembly, as shown in Figure 105. **Remove the servo pressure bleed valve to prevent loss.** Invert valve bodies and transfer plate assembly and replace on stand Tool C-3528.

119. FRONT VALVE BODY—REMOVAL

Remove the two front valve body to transfer plate bolts and lockwashers and separate front valve body from transfer plate assembly, as shown in Figure 106. **Remove upper valve body plate from transfer plate.**

120. CLEANING AND INSPECTION

Place all parts in clean solvent, wash thoroughly, and dry with compressed air. Make definitely sure all passages are free from obstructions.

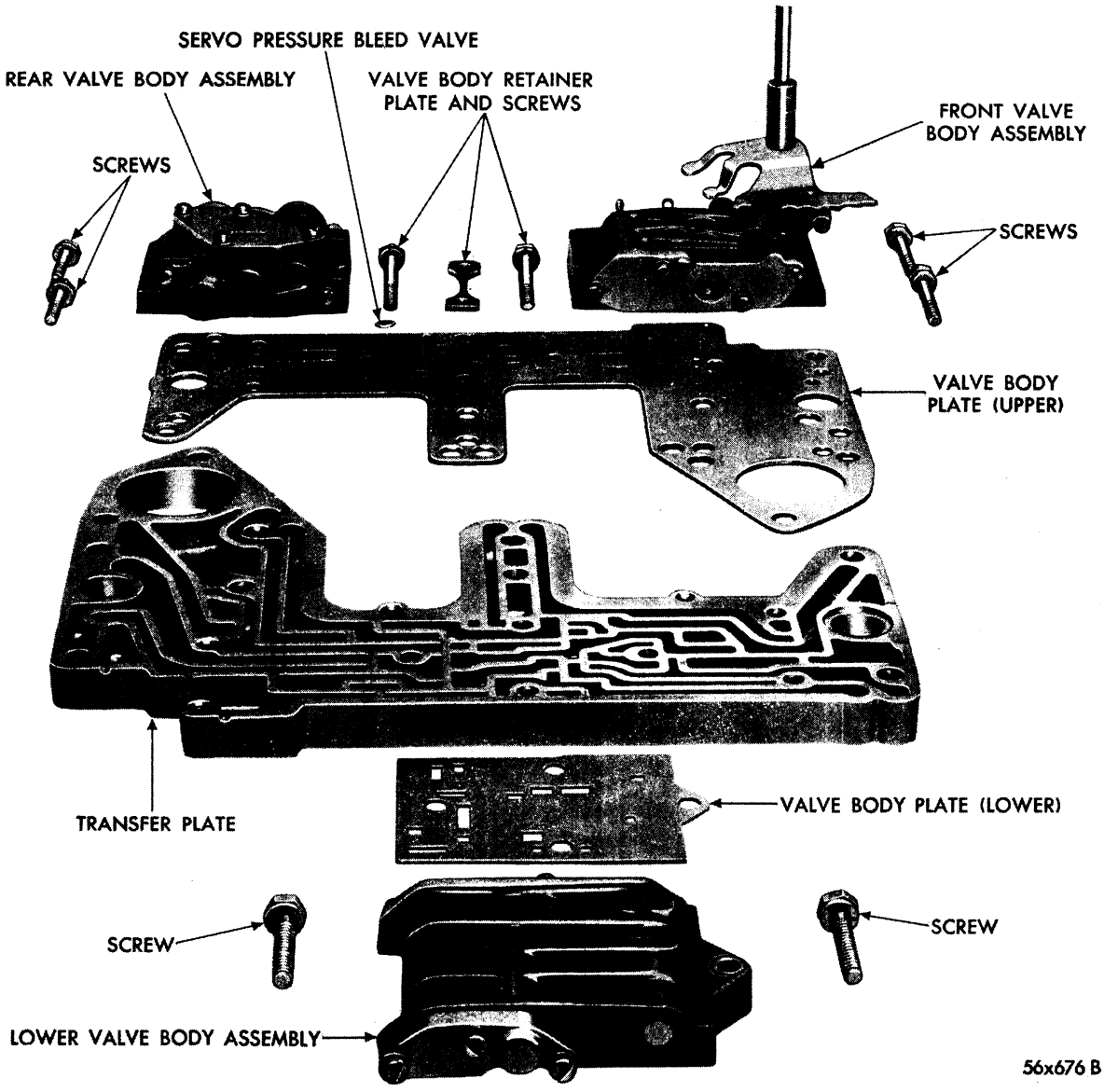


Fig. 103—Valve Bodies and Transfer Plate (Separated)

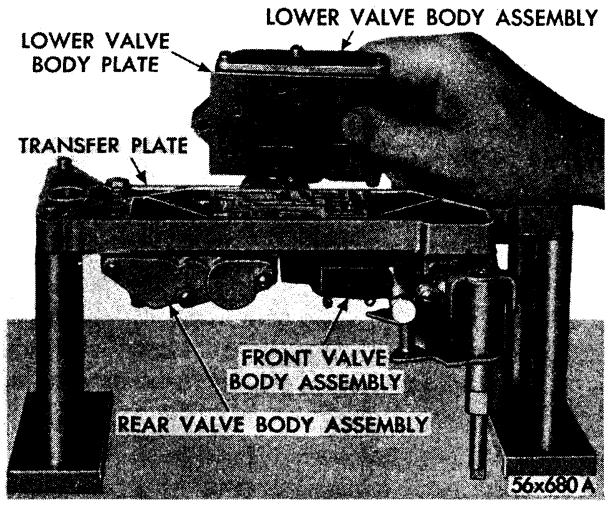


Fig. 104—Removal and Installation of Lower Valve Body Assembly and Plate

When inspecting, also check for porous castings. Inspect all mating surfaces for burrs, nicks and grooves. Small ones may be removed

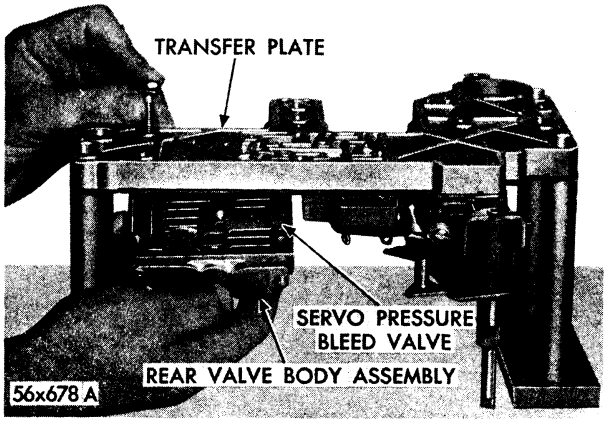


Fig. 105—Removal and Installation of Rear Valve Body Assembly

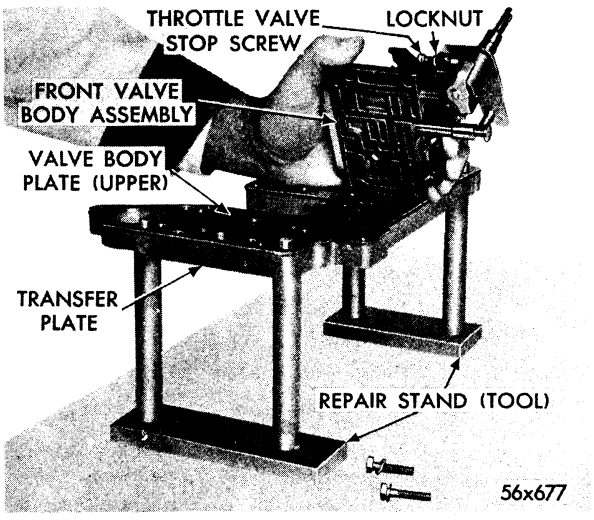


Fig. 106—Removal and Installation of Front Valve Body Assembly

with crocus cloth; otherwise, damaged parts must be replaced. Using straight edge, Tool C-3335, check all mating surface for distortion.

Using a pen light, inspect bores in valve body for score marks, pits, and irregularities. Inspect all springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks, and scores. Small ones may be removed with crocus cloth providing extreme care is used not to round off the sharp edge portion of valve. The sharp edge portion is vitally important to this type valve. The sharp edge helps to prevent dirt and foreign matter from getting between valves and body, thus reducing possibilities of sticking. Check valves and plugs for free operation in bores; they must fall freely in bores when valves, plugs and bores are clean and dry.

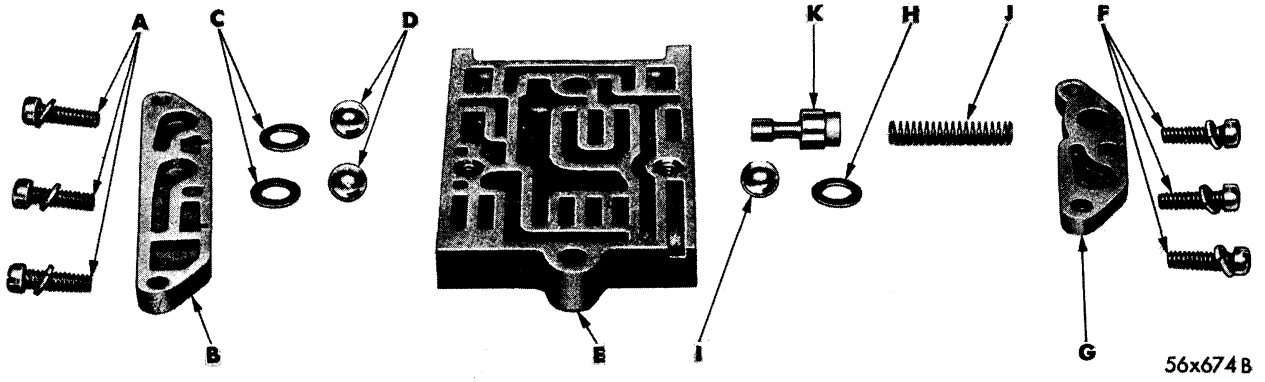


Fig. 107—Lower Valve Body (Disassembled View)

A—Cover Screws and Lockwashers
B—Valve Cover
C—Lower Valve Body Check Valve Ball Seats
D—Lower Valve Body Check Valve Balls
E—Lower Valve Body
F—Throttle Compensator Valve Cover Screws and Lockwashers
G—Throttle Compensator Valve Cover
H—Lower Valve Body Check Valve Ball Seat
I—Lower Valve Body Check Valve Ball
J—Throttle Compensator Valve Spring
K—Throttle Compensator Spring

121. VALVE BODY AND PLATES (UPPER AND LOWER) AND TRANSFER PLATE—INSPECTION

Inspect valve body plates (upper and lower) for nicks, scratches, or burrs; and make sure metering holes are open. Visually inspect transfer plate for porosity. Inspect machined surface for nicks or burrs. Inspect threaded holes for damaged threads.

122. LOWER VALVE BODY—DISASSEMBLY (Fig. 107)

Remove the three screws from cover (B) (large). Using care to prevent loss of the two check valve balls (D) and sets (C), remove cover.

NOTE: If check ball seat washers are staked in place, do not remove.

While holding throttle compensator valve cover (G) in place (spring loaded), remove the three screws and lockwashers (F). **Use care when removing cover to prevent loss of check valve ball (I) and seat (H).** Remove throttle compensator valve spring (J) and valve (K).

123. LOWER VALVE BODY—ADDITIONAL INSPECTION

Inspect check ball contacting surface in valve seats and valve body for nicks or burrs. Inspect covers for flatness and porosity.

124. LOWER VALVE BODY—ASSEMBLY (Fig. 107)

Place valve body in an upright position and install throttle compensator valve (K) and spring (J). Make sure spring is properly seated in valve. Place check ball (I) and ball seat (H) in position in valve body (E).

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

Place throttle compensator valve cover (G) in position over spring and body, and install the three screws and lockwashers. Draw down evenly and tighten.

Place the two check valve balls (D) and seats (C) in position in valve body; and install cover (B), screws, and lockwashers (A). Draw down evenly and tighten.

125. REAR VALVE BODY—DISASSEMBLY (Fig. 108)

Keeping thumb pressure against the kickdown plug cover (B) (spring loaded) remove the three screws and lockwashers.

CAUTION

Use caution when removing cover to prevent loss of the 3-1 relay valve spring (E) 1-2 shift valve kickdown plug (C) and 2-3 shift valve kickdown plug (D).

Remove the 1-2 shift spring (G) and valve (H). Remove the 3-1 relay valve (F). Remove the 2-3 shift valve spring (I) and valve (J). Remove the three governor plug cover screws and lockwashers (K). **Use caution when re-**

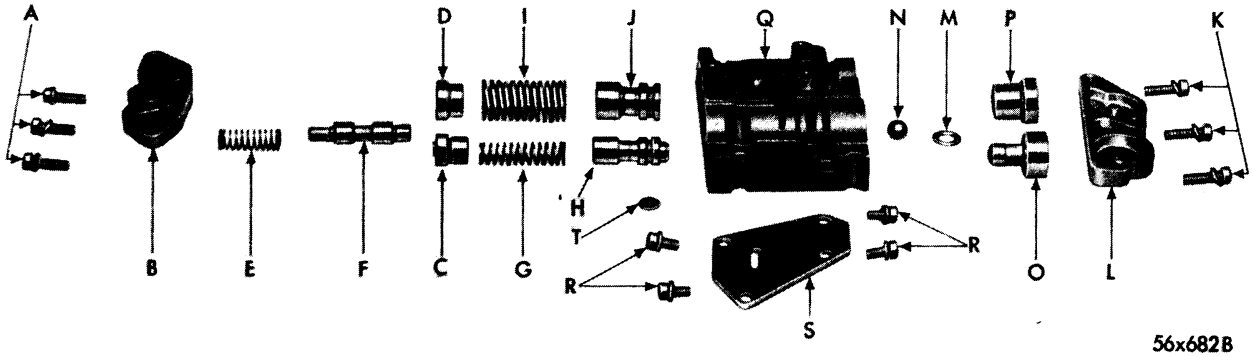


Fig. 108—Rear Valve Body (Disassembled View)

A—Rear Valve Body Kickdown Plug Cover Screws and Lockwashers
B—Rear Valve Body Kickdown Plug Cover
C—1-2 Shift Valve Kickdown Plug
D—2-3 Shift Valve Kickdown Plug
E—3-1 Relay Valve Spring
F—3-1 Relay Valve
G—1-2 Shift Valve Spring
H—1-2 Shift Valve
I—2-3 Shift Valve Spring
J—2-3 Shift Valve
K—Rear Valve Body Governor Plug Cover Screws and Lockwashers
L—Rear Valve Body Governor Plug Cover
M—Check Valve Ball Seat
N—Check Valve Ball
O—1-2 Shift Valve Governor Plug
P—2-3 Shift Valve Governor Plug
Q—Rear Valve Body
R—Rear Valve Body Plate Screws and Lockwashers
S—Rear Valve Body Plate
T—Servo Pressure Bleed Valve

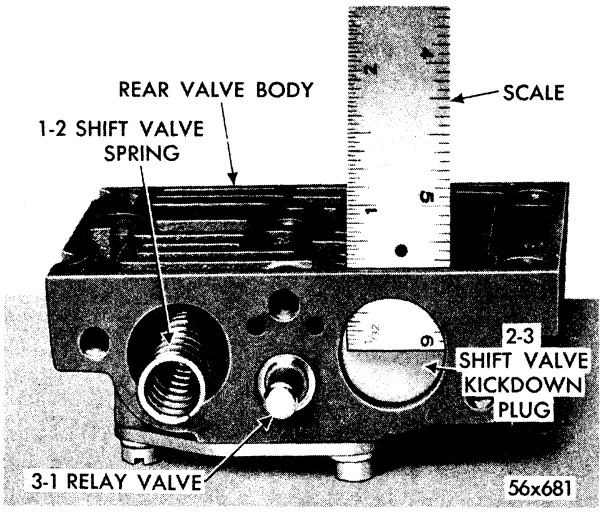


Fig. 109—Using Scale to Hold 2-3 Shift Valve Kickdown Plug in Body During Assembly

moving cover (L) to prevent loss of check valve ball seat (M) and ball (N).

NOTE: If check ball seat washers are staked in place, do not remove.

Remove the 1-2 shift valve governor plug (O) from valve body. Remove the 2-3 shift valve governor plug (P) from valve body. Rear valve body plate (S) can be removed for cleaning purposes by removing the four screws and lockwashers.

CAUTION

Be sure to use same screws when installing the cover.

126. REAR VALVE BODY—ASSEMBLY

With valve body (Q) setting in an upright position, install the 1-2 shift valve (H) (small end first) into valve body. Place the 2-3 shift valve (J) (spring pilot facing out) into position in valve body. Position the 1-2 and 2-3 shift valve springs (G and I) in valves.

Place the 2-3 shift valve kickdown plug (D) (identified by larger pilot) over 2-3 shift valve spring (I). Compress spring sufficiently to seat plug in valve body and secure by placing a thin piece of metal (6″ scale) behind plug, as shown in Figure 109. Install the 3-1 relay valve (F) (large end first) into valve body and place spring (E) on pilot. Place the 1-2 shift valve kickdown plug (C) over the 1-2 shift valve spring (G). Place kickdown plug cover over 3-1 relay valve spring and 1-2 kickdown plug. Compress springs and guide the 1-2 kickdown plug into valve body. Install the three cover screws and lockwashers and draw down evenly and tighten. Remove piece of metal or 6″ scale.

Install rear valve body plate (S) (if removed). Be sure to use correct length screws. Place the 1-2 shift valve governor plug (O) (small end first) in position in valve body. Place the 2-3 shift valve governor plug (P) (small end first) in position in valve body. Install check ball (N) and seat (M).

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

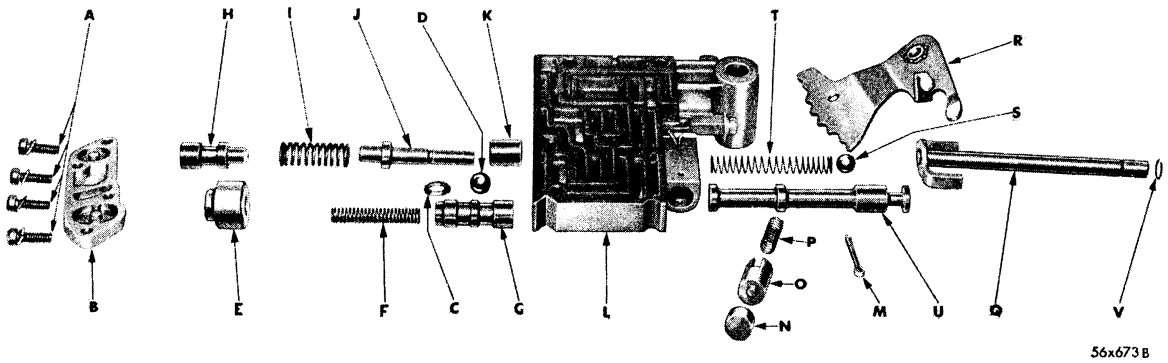


Fig. 110—Front Valve Body (Disassembled View)

A—Shuttle Valve Cover Screws and Lockwashers
B—Shuttle Valve Cover
C—Front Check Valve Ball Seat
D—Front Check Valve Ball
E—Shuttle Valve Plug
F—Shuttle Valve Spring
G—Shuttle Valve
H—Throttle Valve
I—Throttle Valve Spring
J—Kickdown Valve
K—Kickdown Detent Plug
L—Front Valve Body
M—Reverse Blocker Valve Pin
N—Reverse Blocker Valve Plug
O—Reverse Blocker Valve
P—Reverse Blocker Valve Spring
Q—Throttle Valve Lever Shaft
R—Manual Valve Lever Assembly
S—Manual Valve Lever Detent Ball
T—Manual Valve Detent Ball Spring
U—Manual Valve
V—Throttle Valve Lever Shaft Snap Ring

Place governor plug cover (L) in position on valve body and install the three screws and lockwashers. Draw down evenly and tighten.

127. FRONT VALVE BODY—DISASSEMBLY

All letters referred to in disassembly of front valve body pertain to Figure 110.

Keeping thumb pressure against shuttle valve cover (B) (spring loaded) remove the four screws and lockwashers. Use caution when removing cover to prevent loss of front check valve ball seat (C) and ball (D).

NOTE: If check ball seat washers are staked in place, do not remove.

While holding thumb over throttle valve, invert valve body and remove shuttle valve plug, spring and valve, as shown in Figure 111.

Remove throttle valve, spring, kickdown valve, and detent plug, as shown in Figure 112. It is unnecessary to remove detent plug retaining bolt and lockwasher. Remove cotter pin from valve body in outer end of reverse blocker valve. Remove reverse blocker valve plug (N), blocker valve (O), and spring (P). Normally it isn't necessary to remove the throttle valve lever shaft (Q) manual valve lever

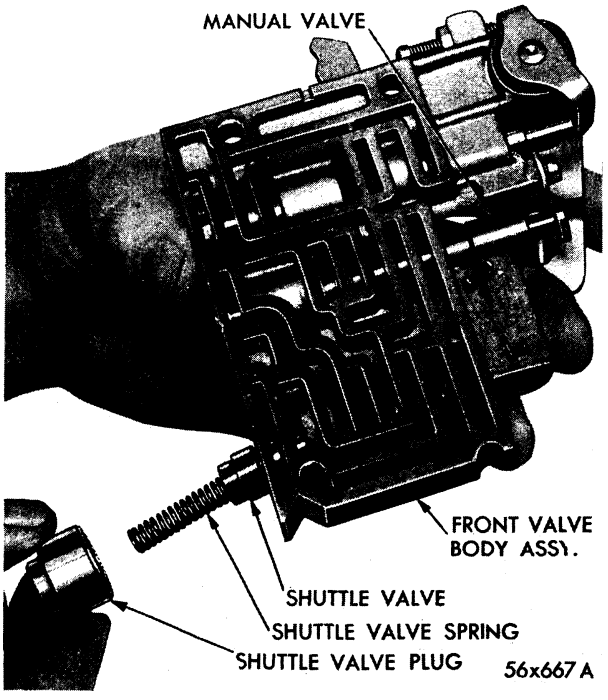


Fig. 111—Removal and Installation of Shuttle Valve, Plug, Spring and Valve

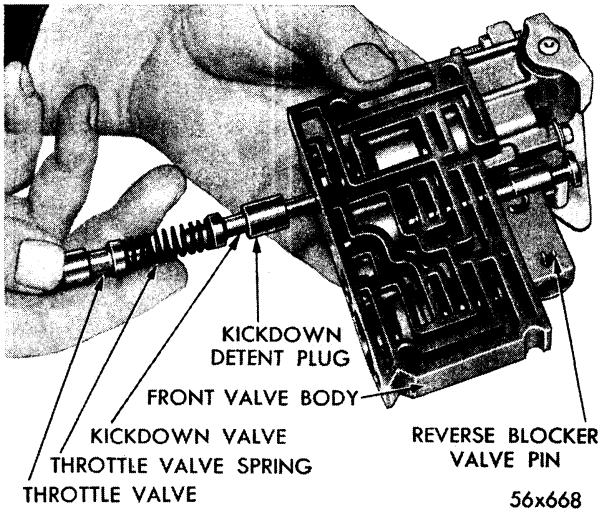


Fig. 112—Removal and Installation of Throttle Valve, Spring, Kickdown Valve and Detent Plug

assembly (R) or manual valve (U). If condition warrants, however, such as damage, proceed as follows:

Remove the throttle valve lever shaft snap ring (V) (Fig. 110). Remove any burrs from throttle valve and manual valve lever shafts and slide them from valve body. Slide throttle valve lever shaft (Q) out of manual lever assembly (R). Using caution to prevent loss of detent ball (S) and spring (T), remove manual valve lever assembly (R) from valve body. Using a twisting motion, remove manual valve (U).

128. FRONT VALVE BODY—ADDITIONAL INSPECTION

Inspect the manual valve detent ball (S) and make sure it slides freely into valve body. Inspect staking of manual lever and throttle cam to their respective shafts. Inspect kickdown valve detent plug to make sure it slides freely on valve. Inspect check valve ball seat in valve body (faulty casting).

While compressing detent ball in position with right index finger, install manual valve control lever by sliding over detent ball placing shaft of manual valve control lever in bore of valve body. **This assembly may be held in position by the use of a rubber band.**

While holding manual lever assembly in position against valve body, install throttle valve lever assembly through manual valve lever assembly, with flat portion on end of shaft fac-

ing away from valve body (to allow maximum travel of lever). While holding levers in position in valve body with rubber band, install shaft snap ring (V). Remove rubber band.

With reverse blocker valve spring in position in valve (O) and with slots in valve aligned with pin, install reverse blocker valve in valve body. Install reverse blocker valve plug (N) and compress spring sufficiently to install pin (M). Lock pin in position. Check kickdown detent plug stop screw for being tight. Install detent plug (larger inner diameter first) on kickdown valve (J) and position kickdown valve (detent plug first) into valve body.

Install throttle valve spring (I) and throttle valve (H) into valve body. Install shuttle valve (G) and spring (F) in the valve body. Install plug (E) into position in valve body. Place front check valve ball (D) and seat (C) in position in valve body.

NOTE: Ball seat must have smooth side (rounded edge) towards ball.

Place shuttle valve cover (B) in position on valve body and install four bolts and lockwashers. Draw down evenly.

129. VALVE BODY PLATE (UPPER)—INSTALLATION

Place valve body transfer plate in an upright position on fixture Tool C-3528. Place steel plate (upper) over pilots on Tool C-3528, and into position on transfer plate.

132. FRONT VALVE BODY—INSTALLATION

Position front valve body on steel plate (upper), as shown in Figure 106, and install two bolts and lockwashers in outer end of valve and draw down finger tight.

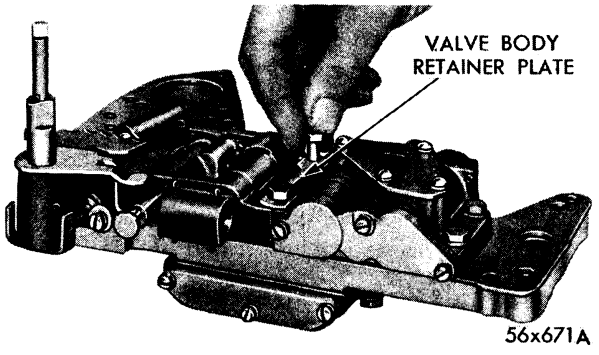


Fig. 113—Installation of Valve Body Retainer Plate

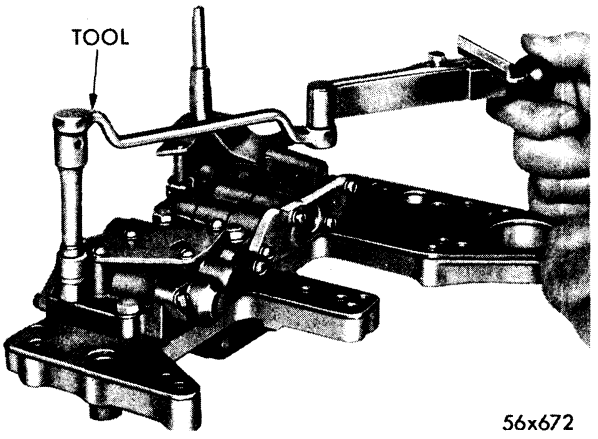


Fig. 114—Tightening Valve Body Screws

130. REAR VALVE BODY—INSTALLATION

Invert transfer plate assembly and replace on fixture, Tool C-3528. With servo pressure bleed valve in place, hold rear valve body up into position against steel plate, as shown in Figure 105, and install the two outer bolts (short) with lockwashers through the transfer plate and into lower valve body. Draw up finger tight.

131. LOWER VALVE BODY—INSTALLATION

Position steel plate (lower) on lower valve body. Place valve body and steel plate into position on transfer plate. Install the two bolts (intermediate length) and lockwashers, and tighten the two lower valve body and two rear valve body bolts to specifications.

Invert valve bodies and transfer plate and replace on fixture Tool C-3528. Install valve

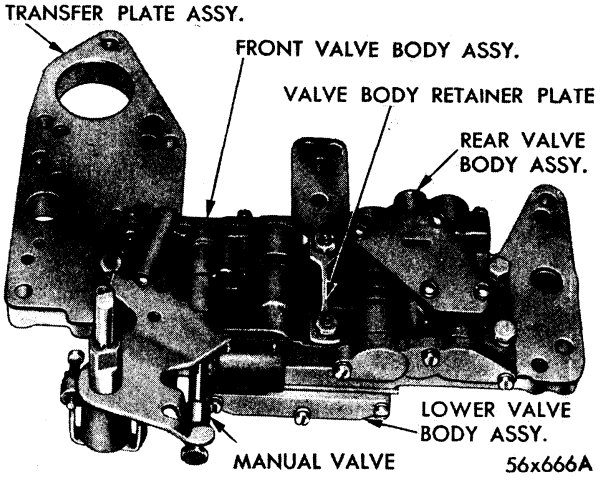


Fig. 115—Valve Bodies and Transfer Plate Assembly (Bottom View)

bodies retainer plate and two bolts (long) with lockwashers (Fig. 113), and tighten the two retainer plate bolts and two front valve body bolts to specifications, as shown in Figure 114. Overtightening will cause distortion to valve body and result in sticky valves. Check manual valve operation to make sure it operates freely. Place transfer plate and valve bodies assembly (Fig. 115) in transmission case. Remove stand, Tool C-3528. Install transmission as outlined under "Removal and Installation of Transmission," Paragraph 34.

TORQUE CONVERTER SERVICE PROCEDURES

132. REMOVAL AND INSTALLATION OF TORQUE CONVERTER AND HOUSING

a. Removal

Remove transmission, as outlined in transmission section. Remove the torque converter housing-to-adapter plate bolts and washers. As the housing is doweled to the adapter plate, care must be exercised during removal. Do not remove adapter plate unless inspection reveals it is necessary to do so. **Do not hammer or pry between the mating surfaces to loosen, as the metal may be distorted which can result in misalignment.**

After removing housing, inspect mating surfaces of housing and adapter plates. Remove all burrs or rough spots with emery cloth. Remove all obstructions, dirt etc. from vent hole screens (when so equipped).

Remove the bolts holding metal dust shield to converter housing adapter plate. Using wrench, Tool C-589, remove stud nuts and lock washers which hold converter unit to the crankshaft. **The torque converter assembly is a welded unit and cannot be serviced, except as an assembly.** If torque converter is being removed for replacement of starter ring gear, refer to Paragraph 133.

b. Installation

If a new torque converter is being installed, make sure all visible foreign matter, such as raised metal around studs, burrs, chips, etc. have been removed from the converter and crankshaft drive flanges.

Check crankshaft flange runout (maximum is .002 inch total indicator reading) by installing dial indicator set, Tool C-3339 at one of the housing-to-adapter bolt holes. Checking crankshaft flange runout will determine whether or not the crankshaft flange may be contributing to torque converter hub runout.

If crankshaft flange runout is within tolerance, proceed to install torque converter and housing as follows:

Position torque converter unit on crankshaft flange. Using wrench, Tool C-589 tighten stud nuts to 55 foot-pounds torque.

Before installing torque converter housing, it is recommended that the torque converter hub runout be checked (and corrected if necessary) as outlined in Paragraph 134. If torque

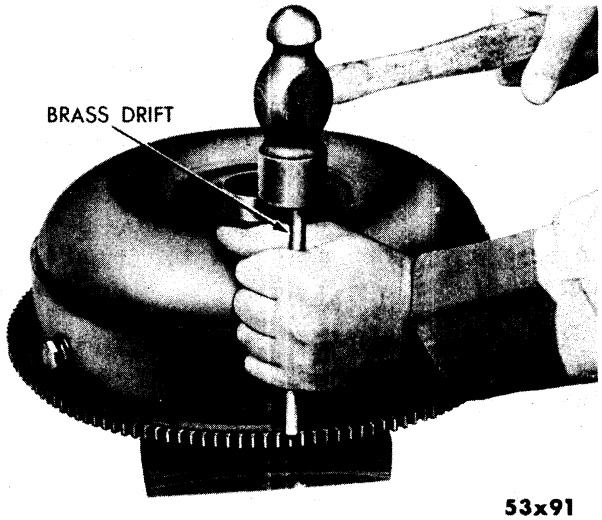


Fig. 116—Removing Starter Ring Gear

converter hub runout is within specifications, continue to install housing in the following manner:

Position housing over dowels and against mating face of adapter plate. Tighten mounting bolts and nuts just snug enough to retain housing in position.

Check (and correct if necessary) torque converter housing bore and face runout as outlined in Paragraph 135. If bore and face runout are within specifications, tighten housing bolts and nuts to 45 foot-pounds torque. Install transmission as outlined in appropriate transmission section.

133. REPLACING STARTER RING GEAR

a. Removing Ring Gear

Remove torque converter and housing as outlined in Paragraph 132. Support the torque converter assembly in a vise. With a file carefully remove the staking lugs which retain the ring gear to the torque converter. Be careful to avoid distortion when supporting torque converter in the vise. Place torque converter on blocks of wood (for support) while removing gear. Using a blunt chisel, or drift. Tap around ring gear until it comes off torque converter (Fig. 116).

NOTE: A small amount of heat, directed on gear, will aid in its removal—if ring gear is to be discarded.

b. Installing Ring Gear

Remove burrs or raised spots (left on the gear contact surface of the torque converter) with a file. Do not remove more metal from the torque converter than is required to remove burrs and rough surfaces.

Any of the following methods may be used to heat the starter ring gear for installation on converter:

Oven—Use Oven C-794 and set temperature at 150 degrees F. Allow ring gear to remain in oven for approximately 15 to 20 minutes.

Boiling Water—Place ring gear in a shallow container, add water, and heat for approximately eight minutes after water has come to a boil.

Steam—Place ring gear on a flat surface and direct the steam flow around the gear for approximately two minutes.

Flame—Place ring gear squarely on a flat surface. Using a medium-size tip, direct a slow flame around the inner rim of the gear, being careful not to direct the flame onto the teeth of the ring gear. Place a few drops of water on the face of the gear at intervals during the heating process. When the gear is hot enough to boil the drops of water, installation of gear to torque converter can be made.

Place starter gear over flange surface of torque converter, making sure that the rear face of gear contacts flange on torque converter evenly around the entire diameter.

Reweld ring gear to torque converter, using extreme care to place, as nearly as possible, the same amount of metal in exactly the same location as original assembly. This is necessary in order to maintain proper balance of the unit. Place welds alternately on opposite sides of the converter to minimize distortion.

The following suggestions are offered as an aid in making the weld:

(a) Use a welding current of 200 amps.

(b) Use a D.C. welder that is set straight polarity or an A. C. welder.

(c) Use $\frac{5}{32}$ inch diameter, No. 47 or a $\frac{5}{32}$ inch diameter No. W2B welding rods (or their equivalent). To prevent burning through the torque converter, the arc should be directed at the intersection of the gear and the housing from an angle of approximately 45 degrees from the face of the gear. **DO NOT GAS WELD.**

Before installing the torque converter, inspect all gear teeth and remove all nicks where metal is raised, welding splatter, etc. as these will cause noisy starter operation.

Reinstall torque converter and housing. Refer to Paragraph 132.

134. TORQUE CONVERTER HUB RUNOUT

a. Checking Hub Runout

It is not necessary to remove the torque converter housing to make this check.

Install attachment, Tool C-3613 to dial indicator set, Tool C-3339. (Refer to Fig. 117.)

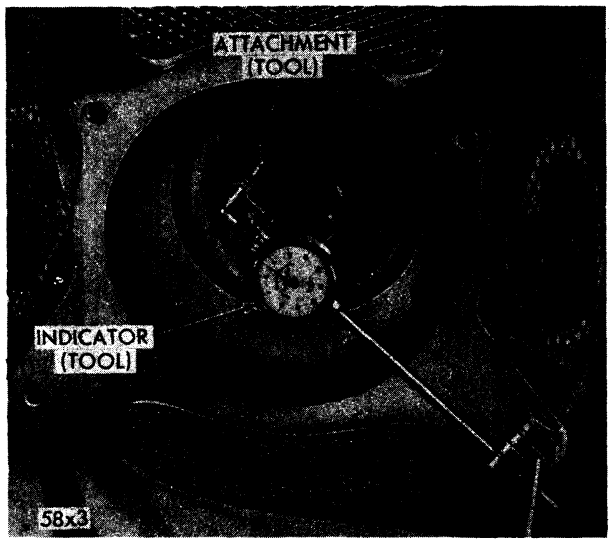


Fig. 117—Checking Torque Converter Hub Runout (Typical View—Housing for Air Cooled Converter Shown)

Install dial indicator support rod in one of the transmission to torque converter mounting bolt holes, as shown in Figure 117.

With remote control starter switch, Tool C-763, properly installed at a convenient "hot" terminal, crank engine while noting indicator needle deflection. Torque converter hub runout must not exceed .004 inch.

b. Correcting Hub Runout

If hub runout exceeds .004 inch total indicator reading, correct by using heat. **Before using heat, make definitely sure that torue converter has been drained.**

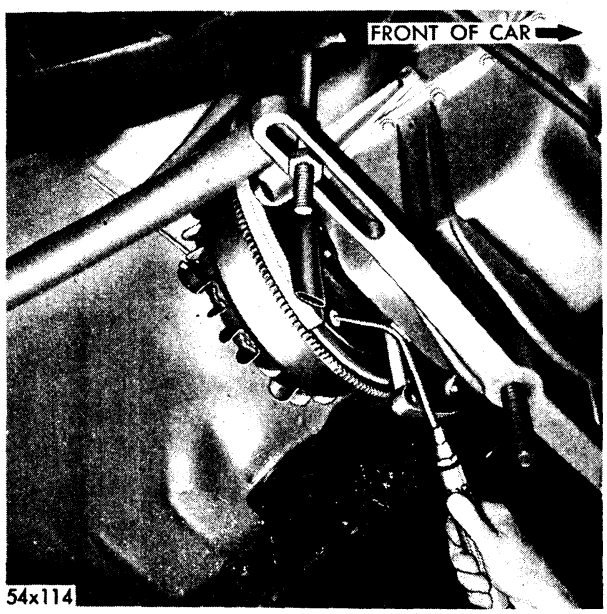


Fig. 118—Heating Torque Converter (Housing Removed to Show Heating Operation)

NOTE: It will not be necessary to remove housing to perform the heating operation.

Mark the position of the hub low spot as accurately as possible on the impeller shell. Rotate the converter so that this mark is directly down.

Remove the dust shield from the front of the adapter plate. Using a piece of chalk, mark the front cover radius directly opposite the hub low spot previously marked on the impeller shell. The subsequent heating operation can now be done through the opening in the adapter plate, as shown in Figure 118.

The size of the spot to be heated is governed by the magnitude of hub runout and is usually about ½ inch diameter for .008 inch total indicator reading. Using an acetylene torch containing a No. 3 tip, and set to maximum heat, apply it to the selected spot until it becomes a dull red. Rapid heating of a local area is essential and if the torch is adjusted properly, the spot will become red within a few seconds. If sparks are noted, it is an indication that torch is too close and metal is starting to burn; move back slightly. **Care should be taken to remove the torch the instant the selected spot becomes a dull red, to avoid over correction or damage to the unit.**

The area is then quenched (as rapidly as possible) with cold water (hose or wet rags). It is suggested this be done by starting around the heated area and working in toward the

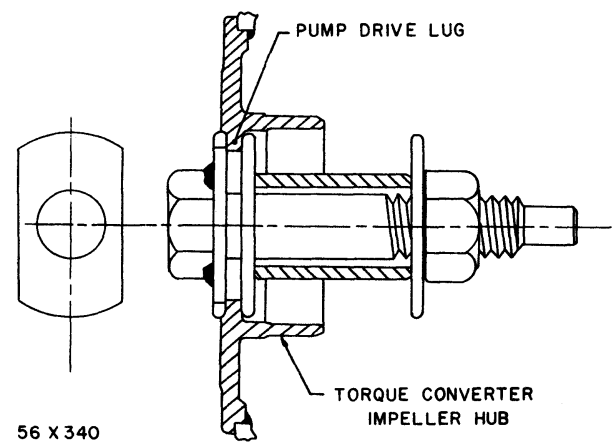


Fig. 119—Tool C-3461 Installed in Torque Converter Hub

spot. This prevents the heat from spreading.

The hub runout should not be rechecked until the converter has returned to a uniform room temperature.

If the converter hub runout exceeds .016 inch total indicator reading, remove the converter and recheck the drive flanges for raised metal chips, etc. Check crankshaft flange runout (maximum .002 inch). If the hub runout remains in excess of .016 inch total indicator reading, install a new converter.

135. CHECKING AND CORRECTING HOUSING FACE AND BORE RUNOUT

a. Bore Runout

Torque converter housing bore and face alignment, as well as converter hub runout, should be checked anytime that the transmission is removed to correct leakage at the front pump oil seal or front pump failure—also whenever an engine replacement is made.

Mount Tool C-3461, as shown in Figure 119, inside the converter with ears of the washer behind the converter pump drive lugs. The square end of the bolt can be held with a wrench as the nut is tightened. Dial indicator set, Tool C-3339, can now be attached, as shown in Figure 120.

Locate the indicator so that it is bearing on the transmission pilot bore of the converter housing and rotate the converter as outlined in Paragraph 134 (a-3).

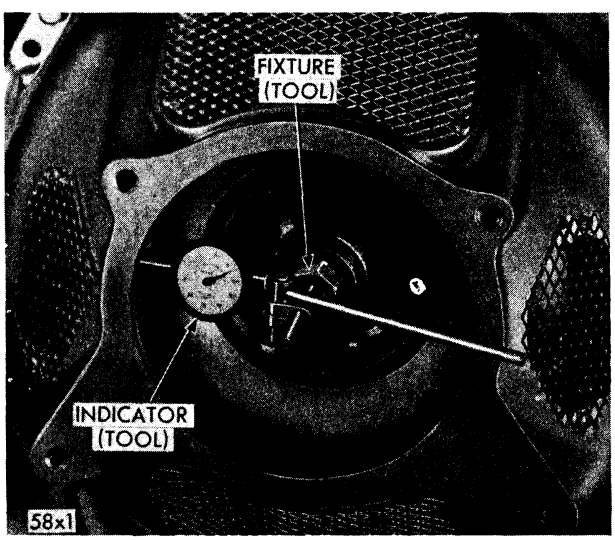


Fig. 120—Checking Housing Bore Runout (Typical View—Housing for Air Cooled Converter Shown)

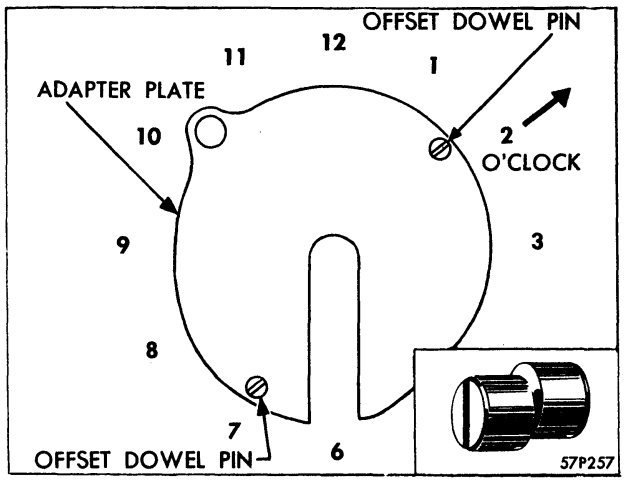


Fig. 121—Eccentric Dowel Orientation Diagram

Runout must not exceed .010 inch total indicator reading. To illustrate the recommended correction procedure, assume that the total indicator reading is .016 inch, in a direction which approximates 2 o'clock, on the adapter plate. (Refer to Figure 121.)

In this case the housing is off crankshaft centerline .008 inch (one-half total indicator reading) which is .003 inch greater than the allowable limit of .005 (one-half total indicator reading).

To correct an off-center condition three offset dowels (Fig. 121) are available in the following sizes:

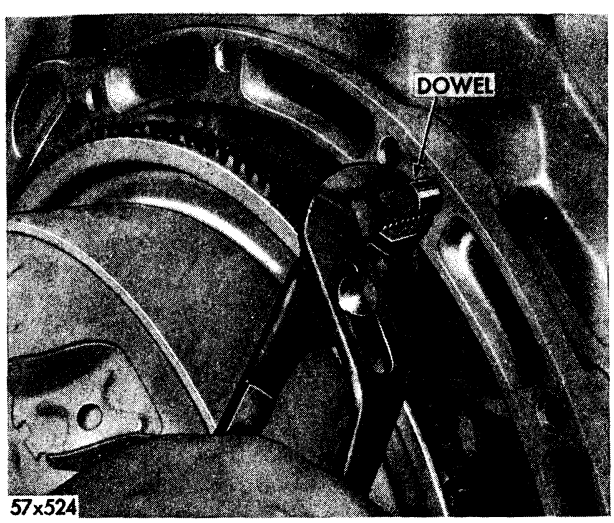


Fig. 122—Removing Dowel Pin

Dowel Offset (inches)	Part Number
.007	1736347
.014	1736348
.021	1736353

In the case, under consideration, use of the .007 inch offset dowels (pair) will bring the runout well within the allowable limit of .005 inch, or: .008 inch minus .007 inch (offset dowels) equals .001 inch runout. **Dowels must be used in pairs (same part number).**

To install the dowel pins (pair), remove the torque converter housing as outlined in Paragraph 132 (a). Remove dowel pins from adapter plate, as shown in Figure 122.

Select eccentric dowels (pair) as indicated in Eccentric Dowel Chart.

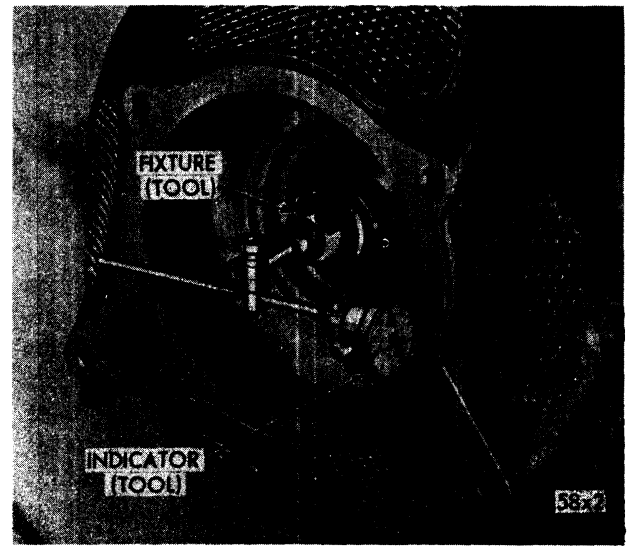


Fig. 123—Checking Face Runout (Typical View—Housing for Air Cooled Converter Shown)

ECCENTRIC DOWEL CHART

Total Indicator Reading	One-Half Total Indicator Reading	Size Dowel to be Used	Dowel Part Number
.012″ to .020″	.006″ to .010″	.007″	1736347
.022″ to .034″	.011″ to .017″	.014″	1736348
.036″ to .052″	.018″ to .026″	.021″	1736353

Install both dowels with the slots parallel and aligned in the direction to correct the bore runout. (Slot indicates the direction of maximum dowel eccentricity.) Majority of corrections will be for one direction only; but it is possible that the housing bore may be out in two directions. In the latter case, it may be necessary to use the next higher step dowels, adjusting these dowels with the housing installed to bring within tolerance. **Care should be taken to back up adapter plate when inserting lower dowel to avoid distortion or breakage of adapter plate. Both dowels should be inserted into adapter plate up to off-set shoulder.**

Install and tighten converter housing bolts to 50 foot-pounds torque. Remount dial indicator and recheck bore runout. Small corrections can be made by loosening housing mounting bolts and turning dowels with a screw driver to shift the housing and bring bore within limits.

b. Face Runout

Relocate dial indicator set, Tool C-3339, as shown in Figure 123. Rotate converter as outlined in Paragraph 3 (a-3). If the total indicator reading is greater than .008 inch note the amount of the total indicator reading and the location of the lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest).

Place the shim or shims on one or more of the transmission to housing bolts in position

Part Number	Thickness
1610442	.002″
1610443	.003″
1610444	.005″

between transmission and housing. Consult the following table for shim thicknesses.

136. FLUSHING THE TORQUE CONVERTER

In the event that a transmission has failed any part, it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission controls. This should be done by slowly pouring 2 qts. of new, clean kerosene into the torque converter hub, using a long spouted can. Before this can be done it is necessary to reach into the torque converter with a screwdriver and turn the torque converter stator hub counter-clockwise (large splined hub) by lifting on the right side of the spline so that one of the 1/8 inch x 3/8 inch rectangular slots on this assembly is visable at the top. Since there is a second slot (directly below), an adequate opening is provided for the kerosene (if poured slowly). After the kerosene is in the torque converter, close the hub opening with masking tape.

Rotate the converter approximately 10 seconds by cranking engine.

NOTE: Disconnect coil wire to prevent engine from starting.

Drain the converter by removing the drain plug and masking tape.

Realign the stator hub and repeat the above procedure at least once more (or if there is excessive contamination, until the kerosene drained out is clear). To complete the flushing procedure, rotate the converter with the drain plug removed. This will remove any residual solvent and trapped dirt. Reinstall the drain plug or plugs. Install transmission as outlined in transmission section.

SHIM THICKNESS TABLE

Location of Housing Face Low Point	Location of Shim	Total Indicator Reading Observed on Housing Face	Total Shim Thickness
Near one of the lower trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .013″ 2) .020″ 3) .026″
Near one of the upper trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .014″ 2) .021″ 3) .029″
Between the two lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .010″ 2) .015″ 3) .020″
Between the two upper trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .003″ 2) .012″ 3) .016″
Between the upper and lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) upper .010″ lower .014″ 2) upper .015″ lower .020″ 3) upper .020″ lower .027″

The above shims, when used in combination, will satisfy any of the required shim thickness listed in the table. **Before reinstalling transmission, check for any transmission leakage or damaged parts (seals and bushings). In most cases, the torque converter hub oil seal should be replaced.**

Tighten housing bolts to 50 foot-pounds torque. Install transmission as outlined in appropriate transmission section.

SPEEDOMETER PINION USAGE CHART

(8-TOOTH GEAR INTEGRAL WITH OUTPUT SHAFT)

AXLE RATIO—SPEEDOMETER PINION OPERATION

(INDICATING NUMBER OF PINION GEAR TEETH AND COLOR)

TIRE SIZE	2.92:1 AND 2.93:1	3.15:1 AND 3.18:1	3.31:1 AND 3.36:1	3.54:1	3.73:1	3.90:1	3.91:1	4.1:1	4.3:1	4.56:1	4.89:1
7.50 x 14	17-Red	19-L.Purple	20-L. Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow				
8.00 x 14	17-Red	19-L.Purple	20-L. Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow				
8.50 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow	21-Yellow	21-Yellow				
9.00 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow	21-Yellow
9.50 x 14	17-Red	18-Black	19-L.Purple	20-L.Blue	21-Yellow						
9.50 x 15				18-Black							