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**TorqueFlite A466**

**TorqueFlite A904 (6-cylinder)**

**PowerFlite**

**Automatic Transmission  
Factory Service Manual**

**1959 - 1961**

**Chrysler, DeSoto, Dodge,  
Imperial, Plymouth**

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# TorqueFlite A466

## SPECIFICATIONS

TYPE.....	Automatic Three Speed with Torque Converter
TORQUE CONVERTER DIAMETER (INCHES).....	1 13/4 12 1/2 Hi Perf.
OIL CAPACITY OF TRANSMISSION AND TORQUE CONVERTER....	18 pts. Automatic Transmission 21 pts. with 12 1/2" Converter Fluid Type "A" Suffix "A" Water
METHOD OF COOLING.....	
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

## SPEEDOMETER PINION USAGE CHART

TIRE SIZE	AXLE RATIO—SPEEDOMETER PINION OPERATION (INDICATING NUMBER OF PINION GEAR TEETH AND COLOR)			
	2.93:1	3.31:1	3.54:1	3.73:1
7.50 x 14.....	17—Red	20—L. Blue	21—Yellow	21—Yellow
8.00 x 14.....	17—Red	20—L. Blue	21—Yellow	21—Yellow
8.50 x 14.....	17—Red	19—L. Purple	20—L. Blue	21—Yellow

(SPECIFICATIONS — Continued)

Transmission Assembly Number	Engine (Cu. In.)	Kickdown Band (Back Off)	Front Clutch Cushion Spring	Number of Discs	Accumulator Spring *	Rear Clutch Discs	Clutch Spring *	Governor (Type)	High Temperature Seals
1949902	318	2 1/2 turns	Yes	4	29	4	180	A	No
(1949905)	318	2 1/2 turns	No	4	16	5	280	A	Yes
(Heavy Duty)									
1949906	361	2 turns	No	4	16	5	180	A	Yes
(Heavy Duty)									
(1949907)	361	2 turns	Yes	4	16	5	280	B	Yes
(High Perfor.)									
(1949808)	361	2 turns	Yes	4	None	5	180	C	Yes
(Ram Eng.)									

\*Lbs. Spring Tension

Governor Assemblies "A" Type—Standard  
 "B" Type—Hi-Performance  
 "C" Type—Ram

**TORQUEFLITE TRANSMISSION  
 SPECIAL TOOLS**

C-452..... Puller	C-3380..... Wrench
C-484..... Pliers	C-3461..... Fixture
C-589..... Wrench	C-3487..... Support
C-760..... Pliers	C-3527..... Gauge
C-811..... Wrench	C-3528..... Stand—(pr.) Valve Body Holding
C-3203A..... Jack	C-3529..... Compressor Fixture
C-3276..... Pilots	C-3531..... Tool
C-3280..... Stand	C-3533..... Compressor
C-3281..... Wrench	C-3575..... Compressor
C-3283..... Pilots	C-3583..... Adapter—for C-3380 Torque Wrench
C-3288..... Pilots	C-3689..... Bushing Remover
C-3292..... Gauge	C-3690..... Remover
C-3293..... Gauge	C-3691..... Oil Seal Driver
C-3301..... Pliers	C-3692..... Installer
C-3339..... Set Dial Indicator	DD1150..... Tachometer
C-3355..... Straightedge	

**TORQUE REFERENCE  
 TORQUEFLITE TRANSMISSION**

	Foot-Pounds	Inch-Pounds
Accumulator Cover Screws.....		180
Band Lever Shaft Plug.....	35	
Case to Converter Housing.....	40	
Compensated Throttle Pressure Tap.....		120
Extension to Transmission Case.....	25	
Filler Tube Nut.....	40	
Front Pump Housing to Transmission Case.....		180
Governor Body to Support.....		90
Locating Screw.....		70
Oil Pressure Take-Off Plug.....		120

**(TORQUE REFERENCE — Continued)**

	Foot-Pounds	Inch-Pounds
Intermediate Support Locating Screw .....	25	
Kickdown Band Adjusting Screw Nut .....	35	
Line Pressure Regulator Valve Retainer .....	50	
Line Pressure Take-Off Plug .....		120
Low-Reverse Band Adjusting Screw Nut .....	35	
Manual Valve Control Cable Housing .....		200
Neutral Starter Switch-Initial Electrical Contact plus 1/3 to 1/2 Turn .....	20 Max.	
Oil Pan Bolts .....		175
Output Shaft Support to Case .....	25	
Propeller Flange Nut .....	175	
Reaction Shaft to Case .....	25	
Rear Clutch Pressure Tap .....		120
Pump Housing to Support .....		120
Oil Pressure Tap .....		180
Suction Pressure Tap .....		180
Servo Apply Pressure Tap .....		120
Torque Converter Cooler Line Fitting .....		120
Control Valve Retainer .....	40	
Transfer Plate to Transmission Case .....		180
Valve Bodies to Transfer Plate .....		55
<b>TORQUE CONVERTER HOUSING</b>		
Housing to Engine Block— $\frac{3}{8}$ inch Screws .....	30	
$\frac{7}{16}$ inch Screws .....	50	
Dust Cover .....		200
Dust Plate .....		130
<b>TORQUE CONVERTER</b>		
Crankshaft Nut or Bolt .....	55	
Pan Drain Plug .....	50	
Converter Drain Plug .....		130
Drive Flange Stud .....	35	

# SERVICE DIAGNOSIS CHART

ITEMS TO CHECK See "Explanation of Index Items"  Perform Items: A, B, C, and G first	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 Positions	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. Tb.	Trans. Overheats	Impossible to Push Start
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. Neutral Str. Sw.																				●
I. Handbrake Adj.														●	●			●		
J. Regulator—Valve Spring							●		●	●						●	●	●		
K. Converter Control Valve																●	●	●		
L. Breather																	●			
M. Output Shaft Rear Bushing							●								●					
N. T.C. Cooling																		●		
O. K.D. Servo Band-Linkage			●	●	●	●					●			●						
P. L-R Servo Band-Linkage	●							●				●		●						●
Q. Oil Strainer							●			●							●			
R. Valve Body—Bolts—Mating Surface		●	●	●	●	●	●	●	●	●	●		●							●
S. Accumulator	●	●	●	●	●	●	●				●									
T. Air Pressure Check		●	●		●	●	●	●	●	●	●	●								
U. Governor					●	●	●					●			●					
V. Rear Pump															●			●	●	
a. Front Pump—Drive Sleeve		●					●		●	●					●		●	●		
b. Regulator Valve Body, Gasket, Surface								●	●	●	●					●	●	●		
c. Front Clutch	●	●						●			●		●	●	●				●	
d. Rear Clutch	●		●	●	●			●			●	●		●	●				●	
e. Planetary Gear Set														●	●					
f. Overrunning Clutch						●		●			●			●						
g. Manual Valve Lever	●	●	●	●	●		●			●			●							

\*Always Check Items A, B, C & G before performing any other operation.

# TorqueFlite A466

## SERVICE DIAGNOSIS

### 1. SERVICE DIAGNOSIS CHART

The Service 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 the car.

### 2. EXPLANATION OF INDEX ITEMS

Never remove a transmission from a car until all of 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.

#### Checking Fluid Level

(A) With engine running and parking brake applied, all five push buttons should be operated slowly, returning to the neutral button each time. The fluid level on the indicator should be between  $\frac{1}{2}$  inch **below** the "Add 1 Pint" mark and the "Add 1 Pint" mark, **if the fluid is cold**. After the truck has been driven approximately ten miles (fluid hot) and the fluid level is checked, the level will have risen to between the "Add 1 Pint" mark and the full mark. **The addition of special compounds to transmission fluids for**

**which improved performance, elimination of sludge, or reduction of fluid leakage may be claimed, is not recommended.**

(B) **Throttle linkage** — Refer to Paragraph 9.

(C) **Gearshift Control Cable** — Refer to Paragraph 6.

(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 Chart.

(E) **Kickdown Band Adjustment** — The kickdown band adjustment screw is found on the left side of the transmission case (Fig. 1). Refer to Paragraph 8-A.

(F) **Low and Reverse Band Adjustment** — The low and reverse band adjustment screw is found on the right side of the transmission case. (Fig. 2). Refer to Paragraph 8-B.

(G) **Engine Idle** — Adjust to 475 to 500 r.p.m. in Neutral.

(H) **Neutral Starter Switch** — If the starter will not energize the neutral starter switch and connections should be tested.

(I) **Parking Brake** — Check for excessive drag. Refer to Brake Section for method of adjusting hand brake.

(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. 2). Check for a stuck or badly scratched valve and/or buckled spring. Be sure spring cup is correctly positioned and not binding in valve body bore.

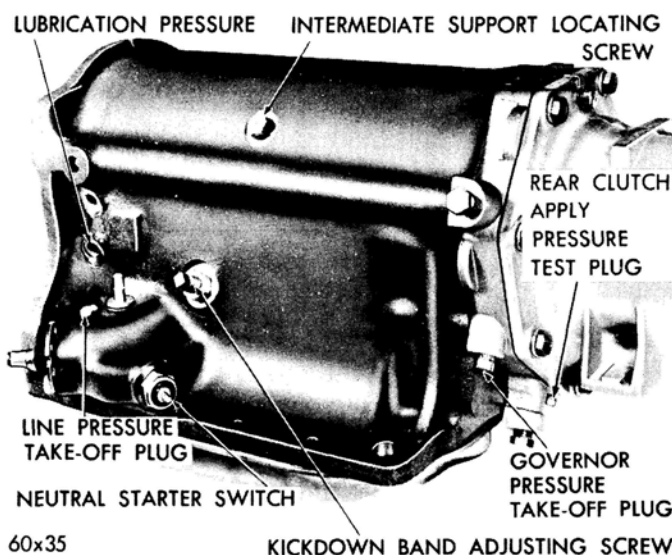


Fig. 1—Transmission Case (Left Side)

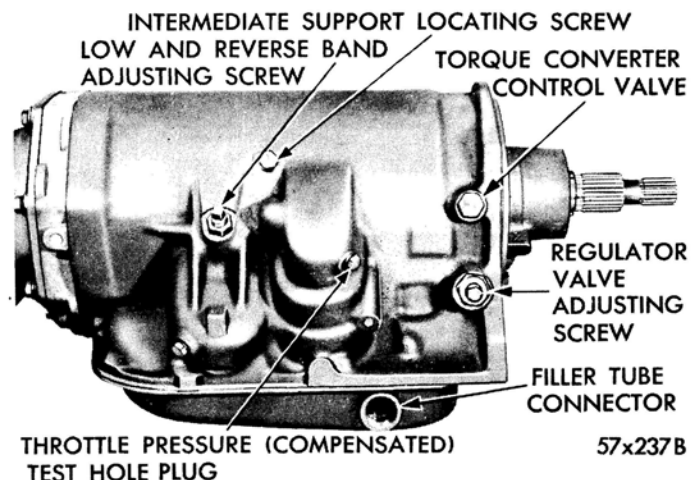
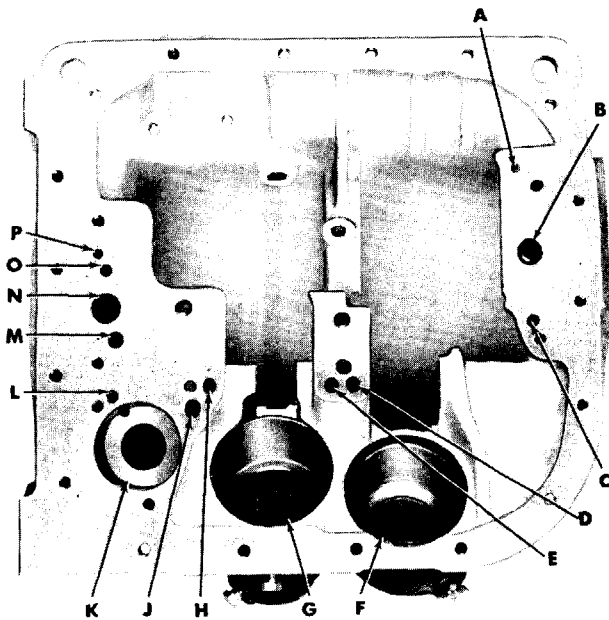


Fig. 2—Transmission Case (Right Side)



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. 3—Oil Passages in Transmission Case**

(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. 2). 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 Bushing** — Check for rough, scored or worn bushing.

(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 pistons 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 or clogged screen.

(R) **Valve Body Attaching Bolts and Mat-**

**ing 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 piston for sticking, rough bore in case, and/or rings.

(T) **Air Pressure Checks** — The front clutch, rear clutch, kickdown servo, and low reverse servo may be checked by applying air pressure to their respective passage when the valve body is removed. To make the complete air pressure check proceed as follows: (Refer to Figs. 1, 2 and 3). **CAUTION: Compressed air supply must be free of all dirt and moisture.**

(1) Raise the vehicle on a hoist, drain the transmission fluid and remove the transmission oil pan. Remove the accumulator cover and valve bodies assembly.

(2) Apply air pressure to the front clutch passage, (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.

(3) Apply air pressure to the rear clutch passage. Listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

(4) Apply air pressure to the kickdown "apply" (line) pressure passage. Observe the operation of the kickdown servo, lever and band when air pressure is applied.

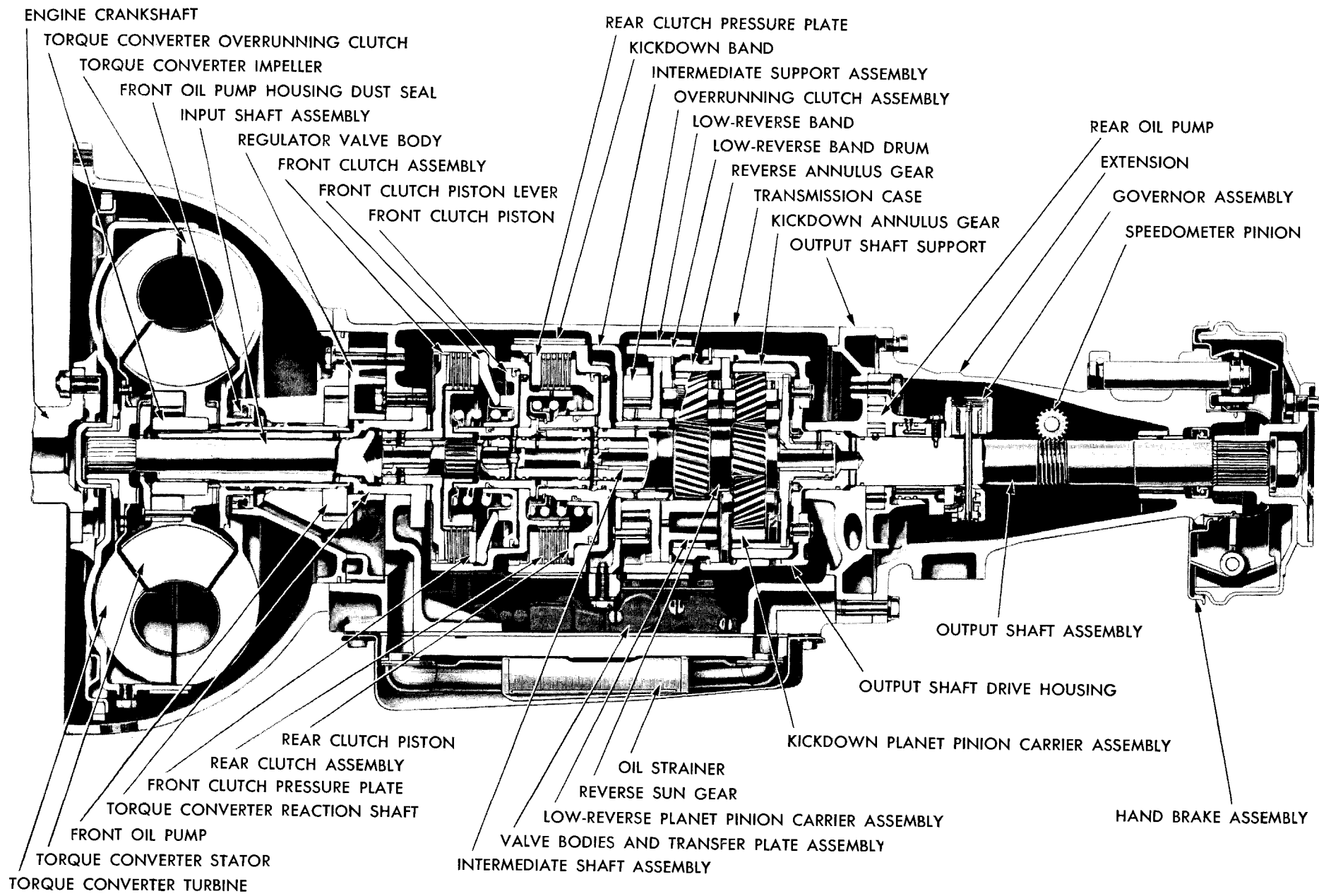
(5) Apply air pressure to the kickdown "apply" (compensated throttle) pressure passage. Observe the operation of the kickdown servo.

(6) Apply air pressure to the low and reverse servo passage. Observe the operation of the low and reverse servo, lever, and band when air pressure is applied.

If an erratic or no upshift condition exists and the clutches and servos operate properly, it indicates a possible malfunctioning in the control valve body assembly. Disassemble, clean, inspect and service the valve body assembly as described in the "Reconditioning of Valve Body and Transfer Plate Assemblies," section of this Service Manual.

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

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



TRANSMISSION

Fig. 4—Typical TorqueFlite Transmission and Torque Converter

56x707 C



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** — Inspect assembly for side and diametral clearance. Examine oil pump inner and outer rotor for heavy scoring. Check front pump drive sleeve seal rings.

(b) **Regulator Valve Body, Mating Surfaces and Gasket** — Clean and inspect valve body for heavy 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 the valve body.

(c) **Front Clutch** — Clean and inspect discs, plates, drive hub, return spring, piston levers 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 retainer ball check.

(d) **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 retainer ball check.
- (9) Kickdown piston rod guide seal ring and rod guide to kickdown rod fit.
- (10) Large kickdown piston seal ring.

(e) **Planetary Gear Set** — Clean and inspect gear set for worn thrust washers, nicked or rough gear teeth, and excessive pinion end clearance.

(f) **Low Speed Over-Running Clutch** — Clean and inspect the overrunning clutch assembly for brinnelled rollers and/or cam and improperly assembled rollers or springs. Check cam roller ramps for being worn.

(g) **Manual Valve Lever** — A loose or badly

worn manual valve lever cam should be replaced. If loose, it may be silver soldered only so as not to require high temperatures that could destroy its hardness, otherwise it should be replaced.

## TORQUEFLITE TRANSMISSION

### 3. TORQUEFLITE OPERATING PRINCIPLES

The transmission, as shown in Figure 4, combines a torque converter and an automatic planetary gear box. The torque converter extends torque multiplication 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.

### 4. 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).

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 5. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the transmission case to engage the manual control valve lever assembly.

Should the R (reverse) button be pushed in, above approximately 10 M.P.H., it will move the manual control lever to the neutral position and when car speed drops below 10 M.P.H. it will again be necessary to re-engage the R (reverse) push button.

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.

### 5. OPERATING INSTRUCTIONS

#### *Starting the Engine*

As a safety precaution always apply parking or foot brake. The transmission N (neutral) control button must always be pushed in before the car can be started. This is necessary since the starter electrical circuit is only completed when the neutral safety switch on the transmission is closed, thus preventing the car to be accidentally started while in gear.

#### *Push Starting*

Should the need arise, the engine can be started as follows by having the car pushed:

- (1) Push in the N (neutral) button.
- (2) Turn on the ignition switch.
- (3) When a speed of approximately 20 M.P.H. has been attained, push in the 1 (low) button and the engine should start.

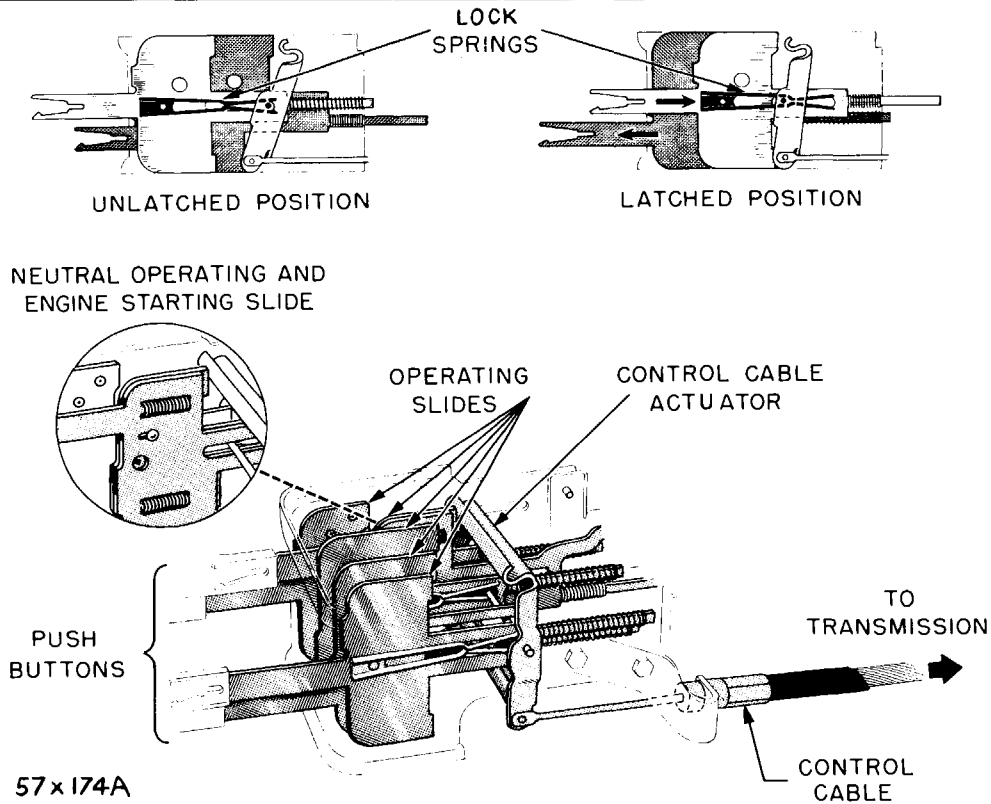


Fig. 5—Typical Gearshift Control Unit  
(Operational Sketch)

Towing the car to start is not recommended due to the sudden surge of power when the engine starts.

### How to Drive the Car

(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 so as to prevent a tendency of vehicle to creep when making a push button selection.

(2) **D (drive)**. All normal forward driving will be done in this range. The vehicle will have a slight tendency to creep after pushing the button from N (neutral) to D (drive) at idle. This can be prevented by applying the foot brake lightly. As soon as the accelerator is depressed the vehicle will move forward in the drive (breakaway) range. Depending on the amount the accelerator is depressed, the transmission will automatically upshift to second. As the vehicle speed increases, the transmission will automatically upshift from second to direct. When slowing the vehicle down (at closed throttle) the transmission will automatically downshift to breakaway at approximately 10 mph.

(3) **2 (second)** position provides driving characteristics similar to D (drive) except that the transmission will remain in second until the wide open throttle 2-3 upshift speed is attained, as indicated in the summary chart. As soon as accelerator is depressed, the

vehicle will move forward in the drive (breakaway) range. Depending on the amount the accelerator is depressed and car speed, the transmission will automatically upshift into second. If vehicle speed falls below 8 mph. or if the accelerator is completely depressed provided vehicle speed is below 30 mph., transmission will automatically downshift to breakaway. It is possible to push the buttons from 2 (second) to D (drive) at any speed. Shifts D (drive) to 2 (second) may be made at any speed and the transmission will downshift to second gear when speeds below 3-2 kickdown limit are obtained.

**NOTE: All shift speeds vary somewhat due to production tolerances, tire sizes and rear axle ratios. Small variations are not too important. However, the quality of the shifts is very important. All shifts should be smooth, responsive, and with no noticeable engine runaway.**

(4) **1 (low)** provides driving characteristics similar to D (drive-breakaway) except that the transmission will not upshift into any other range regardless of vehicle speed and throttle opening. **To prevent overspeeding of engine, do not operate vehicle above 40 mph. in (low) position.** It is possible to push the buttons from D (drive) to 1 (low) at any speed; however, the transmission will not downshift

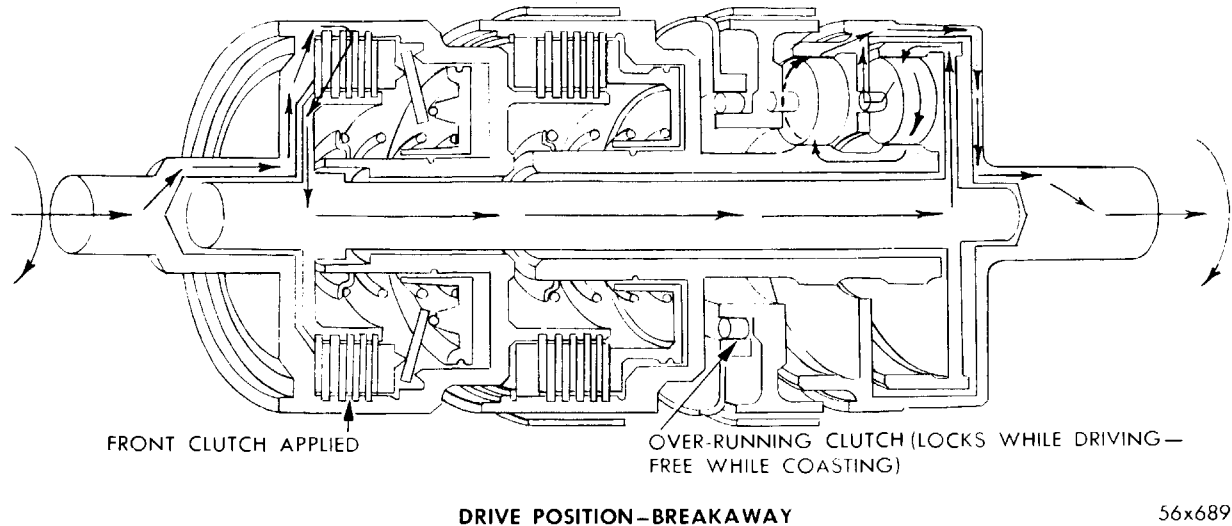


Fig. 6—Power Flow in D (Drive) Position — Breakaway

56x689

to low if vehicle is above speeds shown in Shift Pattern Summary Chart (above 3-1 Kickdown limit).

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

(6) **Kickdown (forced downshift)**. At speeds below the 3-2 or 3-1 kickdown speed limits shown in Shift Pattern Summary Chart, after the transmission has upshifted into D (drive) or 2 (second) the transmission will automatically downshift to the next lowest gear by completely depressing the accelerator; 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.

**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 1/2 mile or more. Lower ratios reduces the possibility of overheating the transmission under these conditions. 1 (low) position is for severe operation or to obtain better control when ascending or descending steep grades.

**Transmission Inoperative**

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

**Transmission Operating Properly**

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

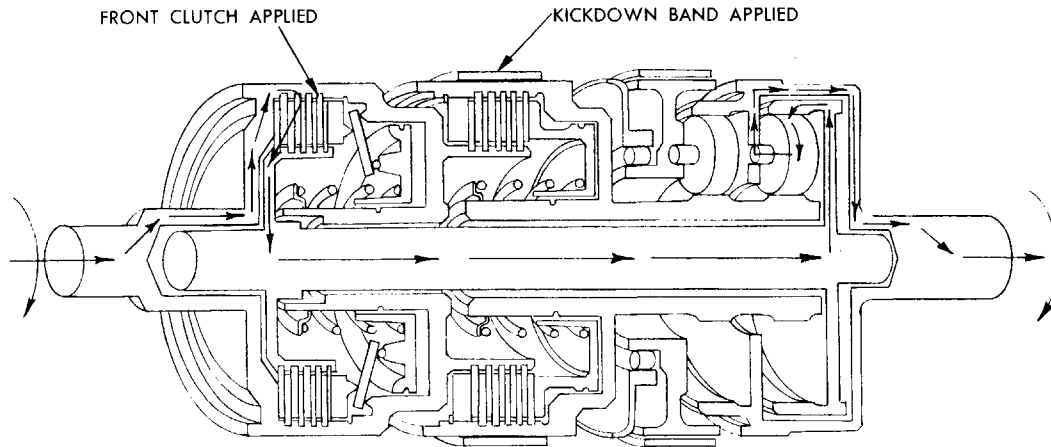
**6. POWER FLOW IN THE TRANSMISSION**

**D (Drive) Position Breakaway (See Fig. 6)**

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

**SHIFT PATTERN SUMMARY CHART**

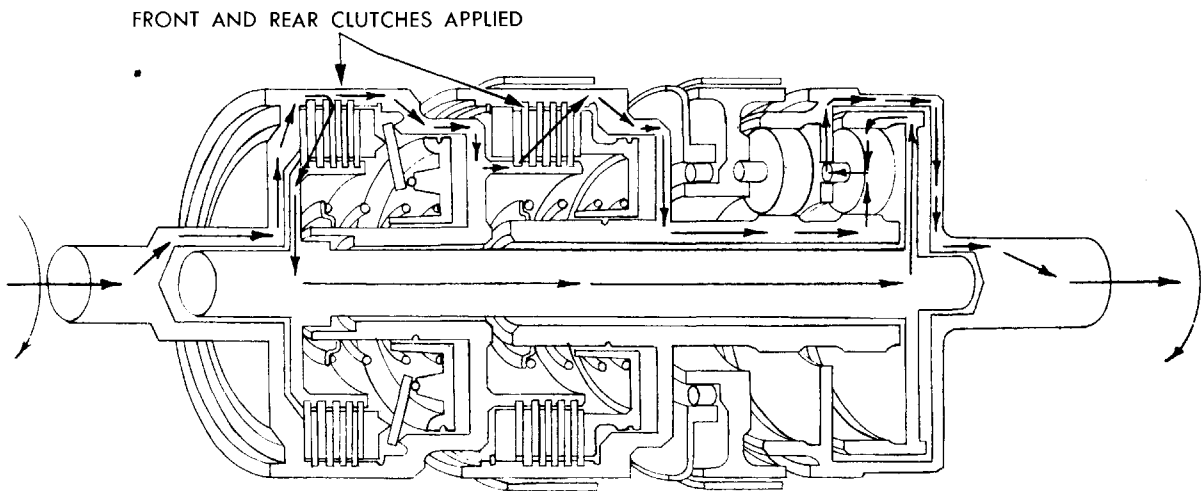
Condition	2.93 Axle Ratio 7.50 x 15 tires	PP2	PP2 Hi Perf.	PP2 Ram Man.
Closed Throttle 1-2 Upshift	.....	9--13	9--13	11--16
Closed Throttle 2-3 Upshift	.....	13--17	13--17	16--21
Wide Open Throttle 1-2 Upshift	.....	31--44	44--54	40--47
Wide Open Throttle 2-3 Upshift	.....	66--80	73--88	67--81
3-2 Kickdown Limit	.....	63--78	71--85	62--72
3-1 Kickdown Limit	.....	31--42	36--52	39--46
Closed Throttle Downshift	.....	7--12	7--12	7--12



DRIVE POSITION - 2ND ALSO 2ND SPEED IN 2ND POSITION

56x690

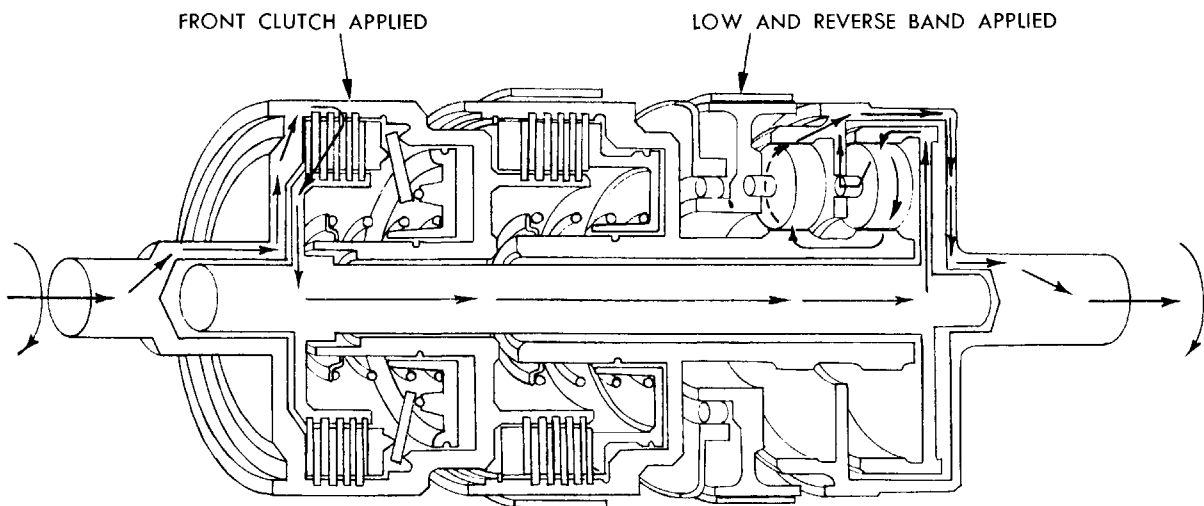
**Fig. 7—Power Flow in D (Drive) Position — 2nd Speed and 2 (Second) Position 2nd Speed**



DRIVE POSITION - DIRECT DRIVE

56x688

**Fig. 8—Power Flow in D (Drive) Position — Direct**



LOW POSITION 1 LOW SPEED

56x691

**Fig. 9—Power Flow in L (Low) Position — Low Speed**

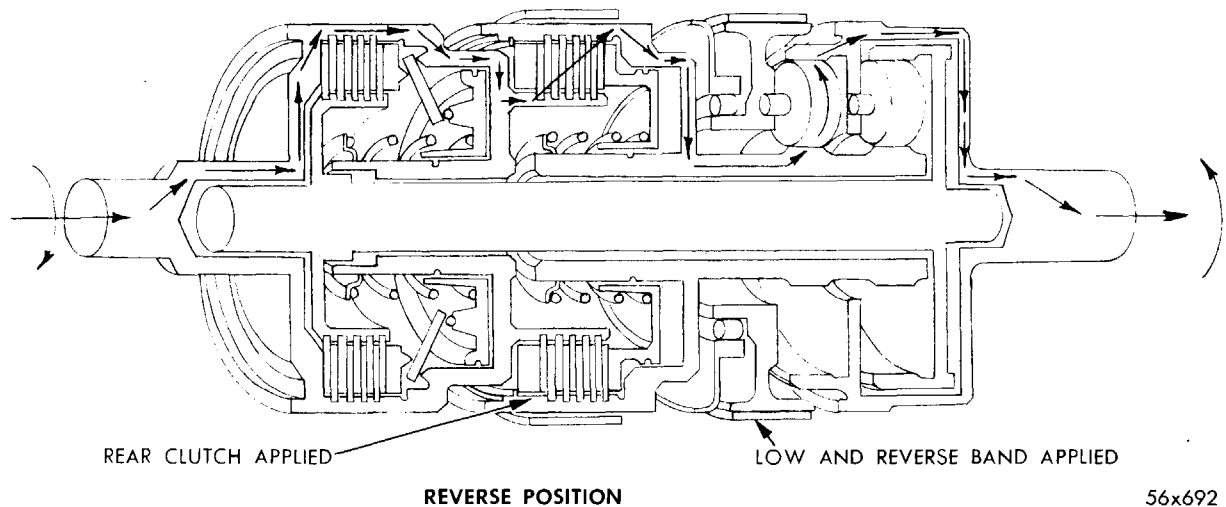


Fig. 10—Power Flow in R (Reverse) Position

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 driving 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.

#### **D (Drive Position — 2nd Speed and 2 (Second) Position — 2nd Speed (See Fig. 7)**

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.

#### **D (Drive Position) — Direct (See Fig. 8)**

The power flow from the torque converter goes direct-

ly through the transmission because the planetary elements of the gear train are locked up by two multiple disc clutches and both bands are released. The torque converter provides all of the torque multiplication.

#### **Kickdown (Forced Downshift) in D (Drive) Position Below 25 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 3-2 Downshift in D (Drive) Position 25 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.

#### **L (low Position) — Low Speed (see Fig. 9) —**

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, locking the overrunning clutch to provide engine braking.

#### **R (Reverse) Position (See Fig. 10)**

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 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.

#### **N (Neutral Position)**

All friction elements are released. Hence, there is no

## CLUTCH ENGAGEMENT AND BAND APPLICATION CHART

BUTTON POSITION AND DRIVE CONDITION	FRONT CLUTCH	REAR CLUTCH	OVER RUNNING CLUTCH	FRONT (KICKDOWN) BAND	REAR (LOW & REV.) BAND
Neutral	Disengaged	Disengaged	Over Runs	Released	Released
'Drive' 'D' 'Breakaway' 2.45 to 1	Engaged	Disengaged	Holds	Released	Released
'Drive' 'D' 'Second' 1.45 to 1	Engaged	Disengaged	Over Runs	Applied	Released
'Drive' 'D' Direct 1.00 to 1	Engaged	Engaged	Over Runs	Released	Released
Second '2' 1.45 to 1	Engaged	Disengaged	Over Runs	Applied	Released
Low '1' 2.45 to 1	Engaged	Disengaged	No Movement	Released	Applied
Reverse 'R' 2.20 to 1	Disengaged	Engaged	No Movement	Released	Applied

drive connection between the engine and the rear wheels.

### Power Flow Summary

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

## MAINTENANCE, ADJUSTMENTS AND TESTS

**CAUTION: For Safety Reasons and to prevent possible damage to the transmission . . . . . wide open throttle stall test operations should not be attempted.**

### Road Testing the Transmission

Good transmission operation depends directly upon good engine performance. Therefore, it is of utmost importance that the engine is operating at full efficiency and at proper idle speed, before attempting to diagnose or correct any transmission operation. The engine and transmission should be warmed up to operating temperature. A short drive, approximately five to ten miles, with frequent stops and starts will produce normal operating temperatures to the transmission and engine. Check the oil level, as outlined in Paragraph 2.

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

## 7. THE HYDRAULIC CONTROL SYSTEM

The hydraulic control system has four important functions to perform.

The pressure supply system, the clutches and band servos, the pressure regulating valves and the flow control valves.

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

## 8. THE PRESSURE SUPPLY SYSTEM

### Front Pump

Under all normal operating 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 approximately 90 psi to fulfill these conditions at all engine speeds above approximately 700 rpm. In reverse, the front pump pressure is increased to approximately 225 psi in order to handle the high torque loads imposed during reverse operation.

### 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.

## 9. CLUTCHES AND BAND SERVOS

### *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.

### *Rear Clutch*

The rear clutch locks the gear train for direct drive operation in the forward range and 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.

### *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 compensator pressure - acting on separate areas.

In N (neutral), 1 (low), D (drive) break-away, 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.

### *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:

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 10.

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 I (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets which may be used for engine braking. Initial engagement for 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.

### *Accumulator*

An accumulator helps to cushion 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.

## 10. PRESSURE REGULATING VALVES

### *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 on the regulator valve body. For all conditions except reverse, line pressure is also routed through the 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 shutting 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.

### **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 through 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. Oil is routed from the torque converter control valve, through the transmission lubrication system to lubricate the gear train at approximately 10 to 30 psi pressure.

### **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 smaller 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.

### **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 2-3 shift valve (spring end).

(5) To the throttle pressure port of the 1-2 shift valve (spring end).

### **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 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 10 to 16 psi at closed throttle to a value of 90 psi at approximately  $\frac{3}{4}$  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.

## **11. FLOW CONTROL VALVES**

### **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.

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

The rear pump check valves allow 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.

### **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 (105 psi on Ram Manifold units) but neither the band or the clutches are applied.

When the R (reverse) button is pushed in, the man-

ual valve shuts off line pressure to the secondary reaction area of the regulator valve and routes line pressure (at 225 psi) (260 psi on Ram Manifold units) to the rear clutch and low-reverse servo.

When the 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 a metering hole to the line pressure port of the 2-3 shift valve.

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

(5) Through a metering hole to the line pressure ports of the 1-2 relay valve and the shuttle valve.

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.

(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 1-2 shift valve.

### **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 manual valve is stopped at neutral and the transmission remains in neutral until another button is depressed. The reverse blocker valve is activated by governor pressure.

### **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 up-shifted or down-shifted position. The 1-2 shift valve train (consisting of valve spring, shift valve and governor plug) is normally at either extreme of travel toward the governor pressure end of the rear valve body) any pressure in the kickdown servo apply area is allowed to bleed back through the vent port of the 1-2 shift valve.

When the shift valve train is moved to the opposite extreme of its travel into the up-shift position, the vent

port is closed off and oil is fed by line pressure to the following places:

- (1) The line pressure port of the 2-3 shift valve.
- (2) The line pressure port of the throttle compensator valve.
- (3) Through a metering hole to the line pressure ports of the shuttle valve and the 1-2 relay valve.
- (4) Through a metering hole to the kickdown servo apply area and the accumulator.

The kickdown piston and accumulator are so designed that the value of the "apply 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.

A light throttle (low throttle pressure), the 1-2 shift valve is made to upshift at approximately 10 mph and "apply 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 low (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. 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. 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 accomplished 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.

### **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 a metering hole to the following places:

- (1) To a port between the governor plug and the 2-3 shift valve where it keeps the valve upshifted until the 1-2 shift valve downshifts.
- (2) Past the shuttle valve to the 1-2 relay valve.
- (3) To the rear clutch apply area.
- (4) To the kickdown servo "off" area.

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.

### **1-2 Relay Valve**

This valve provides for a quick application and release of the kickdown band and rear clutch at low speeds while smoothing out their apply and release at high speeds.

### **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 of 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 spring end of the shift valves, is great enough to make the shift valves downshift against the force of any governor pressure up to the kickdown limit speeds.

### **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 placed so 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.

## 12. OPERATION 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 that 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 and forced 3-1 shift is obtainable below speeds shown in Shift Pattern Summary Chart. Normal downshifts are not throttle sensitive. The two shift valves are hydraulically interlocked and downshift together 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 L (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 L (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 body. 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.

## TORQUEFLITE TRANSMISSION SERVICE INFORMATION MAINTENANCE, ADJUSTMENTS AND TESTS

### 13. OIL LEAKS

#### *Leaks Repaired With Transmission in Vehicle*

Transmission output shaft rear bushing oil seal. Extension gasket. Speedometer drive pinion assembly. 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. Oil cooler connections.

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.

#### *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.

### 14. GEARSHIFT CONTROL CABLE ADJUSTMENT

#### *Gearshift Control Cable Adjustment (Fig. 11)*

- (1) Engage the R (reverse) push button and drain

approximately three quarts of fluid from the transmission.

- (2) Remove control cable adjustment wheel lock screw.

- (3) Remove neutral starting switch, cupped washer and seal.

- (4) Have an assistant firmly hold the R (reverse) button until the transmission end of cable adjustment has been completed.

- (5) Back the adjustment wheel off on cable housing (counter-clockwise) until only two or three threads are showing behind the wheel on the housing (Fig. 12).

- (6) Push the control cable housing into the case with just enough force to overcome the "O" ring friction and to bottom the assembly. While holding the cable with light pressure in the bottomed position, rotate the adjusting wheel to just contact the case squarely.

- (7) Releasing the inward pressure on the cable, re-

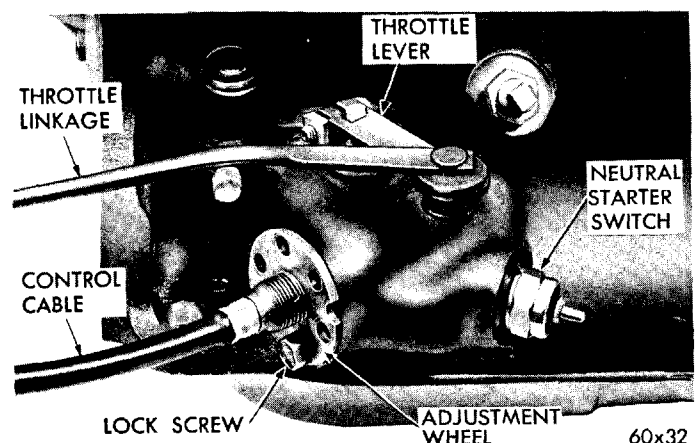


Fig. 11—Gearshift Control Cable Adjustment

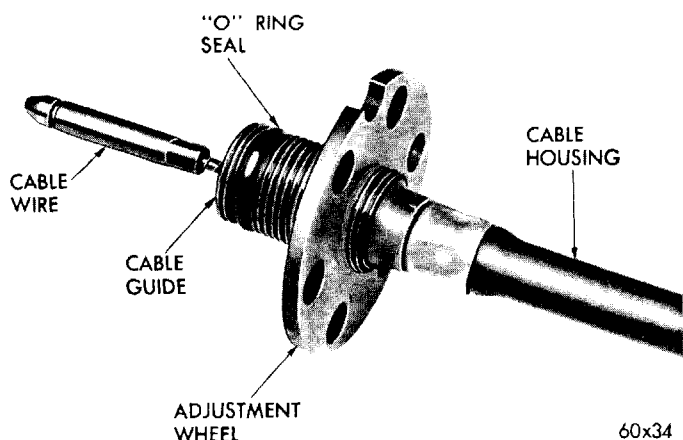


Fig. 12—Gearshift Control Cable and Adjustment Wheel

tate the wheel (clockwise) to the next hole that will line up with the case hole, then turn wheel an additional 4 holes clockwise. Install the lockscrew, tightening to 30 - 50 inch-pounds.

(8) Install the neutral starting switch as outlined in Paragraph 7. Refill transmission with automatic transmission fluid (Type "A" - Suffix "A") to proper level (Paragraph 2).

### 15. NEUTRAL STARTING SWITCH INSTALLING AND TESTING (Fig. 13)

#### 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.

With proper cable adjustment assured and N (neutral) button depressed, make certain that switch lever is properly aligned in center of neutral starting switch hole (Fig. 14). With test leads connected to battery current and terminal of the switch, screw switch into transmission case until test light lights, then turn switch

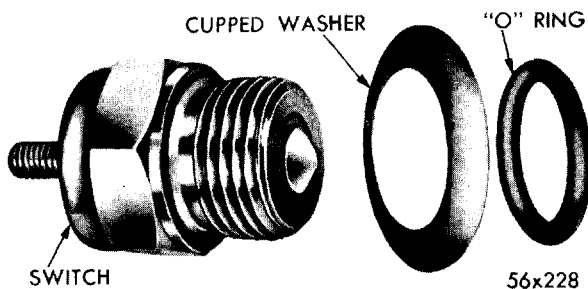


Fig. 13—Neutral Starting Switch and Seal

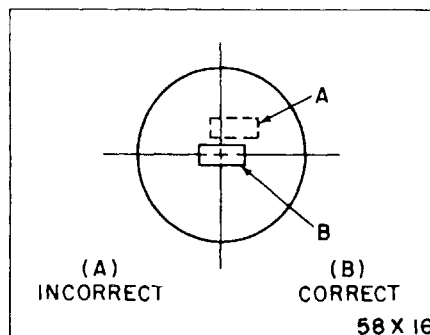


Fig. 14—Lever Alignment

an additional  $\frac{1}{3}$  to  $\frac{1}{2}$  turn.

Should the test light still fail to light and the seating surfaces have been cleaned to obtain a good ground, it is recommended that the following modification be performed to the neutral starting switch.

(1) Remove the neutral starting switch and machine  $\frac{1}{32}$ " from the seating surface of the switch as illustrated in Fig. 15.

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

#### Switch Lever Alignment

(1) Remove the neutral starting switch and check the location of the neutral starting switch lever inside the transmission, as illustrated in Figure 14.

The lever should be dead center of the neutral starting switch mounting hole (when the lever is in the neutral detent). Grounding of the circuit is completed through the contacting plunger of the switch and the manual lever. In instances where the lever is not aligned properly, it is recommended that the lever be bent with a screw driver, or other suitable tool, to the proper location. Install the switch.

(2) Tighten the switch until the test light just lights, then tighten another  $\frac{1}{3}$  to  $\frac{1}{2}$  turn. **NOTE: The switch must be tight enough to prevent oil leakage. If it is not, add a thin washer and re-tighten.**

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

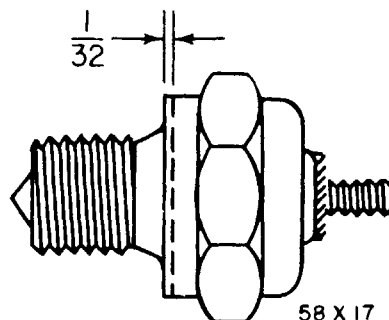


Fig. 15—Neutral Starting Switch

**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 to the starter switch terminal (towards rear of car).**

## 16. BAND ADJUSTMENTS

### Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case (Fig. 1).

(1) Loosen the locknut and back off approximately 5 turns and **check freeness of adjusting screw in transmission case.**

(2) Using inch-pound torque wrench Tool C-3380 with adapter C-3583 or C-3705 (depending upon the accessibility due to type of engine and exhaust equipment) tighten adjusting screw to a reading of 47-50 inch pounds torque. **NOTE: This will be a true torque of 70-75 inch pounds, which should be used if the torque wrench C-3380 is used without the adapter C-3583 or C-3705 (as may be done if adjustment is made with the transmission removed from the car.)**

(3) Back off the adjusting screw according to the specifications applicable to the car model.

(4) Holding the adjusting screw, tighten the locknut and torque to 30-35 foot-pounds.

### Low-Reverse Band (Rear)

The low-reverse band adjusting screw is located on

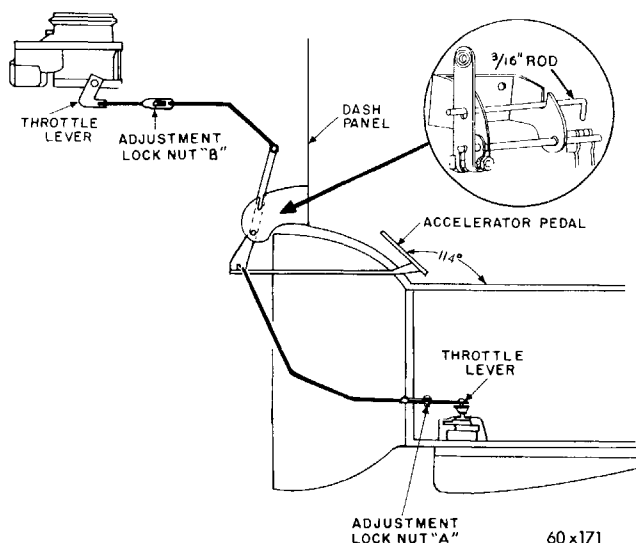


Fig. 16—Throttle Linkage Adjustments

the right side of the transmission case (Fig. 2).

(1) Loosen the locknut and back off approximately 5 turns and check for freeness of adjusting screw in transmission case.

(2) Using wrench Tool C-3380 with adapter C-3583, or C-3705 tighten to a reading of 47-50 inch pounds torque. **This will be a true torque of 70-75 inch-pounds, which should be used if the 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).**

(3) Back off the adjusting screw, exactly 2½ turns (all models).

(4) Holding the adjusting screw, tighten the locknut to specifications 30-35 foot-pounds torque.

## 17. THROTTLE LINKAGE ADJUSTMENTS

(Refer to Fig. 16)

(1) With the engine at operating temperature, carburetor off the fast idle cam and transmission in neutral, adjust idle speed to 475-500 R.P.M. (use tachometer).

(2) Loosen the throttle linkage adjustment lock nuts on both the carburetor rod and the transmission throttle rod.

(3) Insert a 3/16" rod or drill bit in the hole and open slot of the accelerator shaft bracket and into the elongated hole of the throttle lever.

(4) With the rod in position, hold the transmission throttle valve lever all the way forward (closed position), and tighten transmission to accelerator lever assembly rod adjusting locknut "A".

(5) Remove rod from accelerator lever, shaft and bracket assembly.

(6) With the carburetor throttle lever off the fast idle cam and against the idle stop screw, move the rear half of the carburetor rod rearward until the stop in the transmission is felt, tighten lock nut "B".

(7) The accelerator pedal should be at an angle of 115 degrees to the horizontal. If necessary to correct, adjust pedal angle by removing the accelerator pedal end of the bellcrank to pedal rod, and shortening or lengthening the rod by loosening the lock nut at the swivel end and rotating the swivel. Reinstall the rod and tighten the locknut. **Be sure the rod is properly aligned to prevent binding. Poor engine performance due to carburetor throttle not opening fully or lack of kickdown may result if accelerator pedal angle is incorrect.**

\*For cars equipped with "Ram Manifold" engines refer to Service Information at the end of this section.

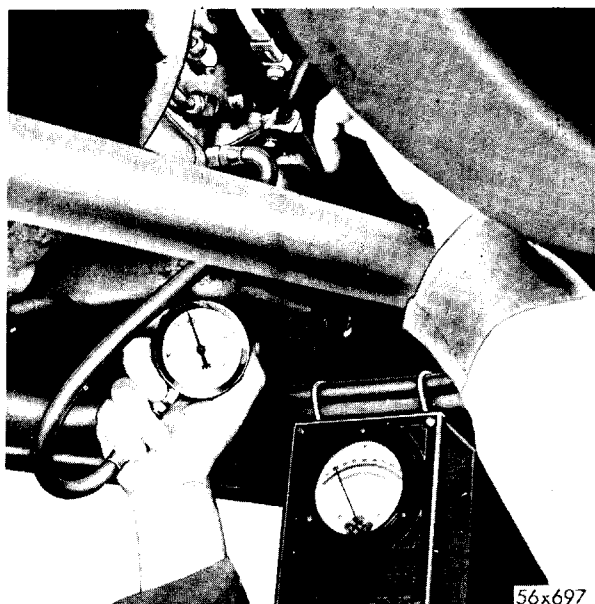


Fig. 17—Checking Line Pressure

## 18. HYDRAULIC CONTROL PRESSURE CHECKS AND ADJUSTMENTS

### Line Pressure

**Line Pressure adjustment must be made in D (drive) position with engine at 1200 rpm and wheels free to turn. Oil must be at normal operating temperature (150°F. to 200°F.).**

(1) Remove the pipe plug from the line pressure take-off hole located on the left side of the transmission case (Fig. 1). Install gauge, Tool C-2393 (300 psi) at this point (Fig. 17).

### \*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 (Shifted into Direct)	Free To Turn	1200	89 - 91
2	Free To Turn	1200	85 - 95
I	Free To Turn	1200	85 - 95
D	Free To Turn	3500	93 - 100

\*NOTE: For cars equipped with "Ram Manifold" engines refer to Line Pressure Chart under Service Information at the end of this section.

If line pressure is not correct, adjust as follows:

(2) Loosen the lock nut on the regulator valve adjusting screw (Fig. 2).

(3) Turn the adjusting screw **clockwise** to increase or **counter-clockwise** to decrease line pressure. Line pressure adjustment must be made in D (drive) position with engine at 1200 R.P.M., with wheel turning and transmission upshifted into direct speed.

All line pressure adjustments should fall within the

limits specified in the table shown for all other push button positions.

If line pressure cannot be satisfactorily adjusted, check "Service Diagnosis Chart."

### Governor Pressure (See Fig. 18)

(1) Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Fig. 1).

(2) Install gauge, Tool C-3292 (100 psi).

### \*GOVERNOR PRESSURE CHART

Push Button Position	Rear Wheels	Engine RPM		Governor Pressure
		Std Governor	Hi Perf. Governor	
D	Free to Turn	690-790	690-790	15 psi
D	Free to Turn	1250-1510	1680-1860	45 psi
D	Free to Turn	2560-2790	2850-3070	75 psi

**For cars equipped with "Ram Manifold" engines refer to Governor Pressure Chart under Service Information at the end of this section.**

If governor pressure doesn't correspond to engine rpm, check line pressure and the "Service Diagnosis Chart."

### Lubrication Pressure

(1) Remove the oil cooler line and fitting from the lubrication pressure hole located on the left side of the transmission case (Fig. 1).

(2) Install gauge, Tool C-3292 (100 psi). 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) remove the Torque Converter Control valve (Fig. 2) and inspect for a dirty or sticking valve, or a distorted spring or regulator valve body.

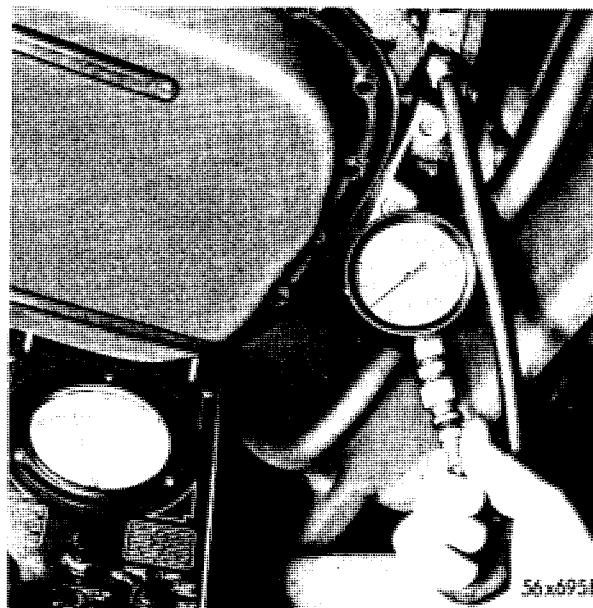


Fig. 18—Checking Governor Pressure

### Throttle Compensated Pressure

- (1) Raise vehicle off floor (wheels free to turn).
- (2) Install gauge, Tool C-3292 (100 psi) at throttle compensated pressure take-off plug. Refer to Figure 2.
- (3) Disconnect the bell crank to transmission throttle linkage at the transmission.
- (4) Start engine and place the transmission in "2" (second) position.
- (5) While holding the transmission throttle lever towards the closed throttle position (against the internal stop) increase engine speed slowly (using accelerator pedal or suitable throttle control fixture) to approximately 850 rpm to obtain an upshift into 2nd speed.

After the shift takes place, compensated throttle pressure should read 10 to 16 psi.

- (6) Move throttle lever (at transmission) slowly towards full throttle. Compensated throttle pressure should begin to rise after approximately 5 degrees movement of the throttle lever. If compensated throttle pressure rises immediately when the lever is moved, or if the pressure is above 16 psi but fails to rise after approximately 5 degrees movement, the throttle pressure should be adjusted.

- (7) Before stopping the engine, advance the throttle control lever (at transmission) slowly and then return it 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 compensated valve or throttle valve operation. The valve body assembly should then be thoroughly cleaned and these steps repeated before continuing with a throttle pressure adjustment.

### Adjusting Throttle Pressure

- (1) Shut off the engine.
- (2) Drain transmission and remove oil pan.
- (3) Loosen the throttle valve lever stop screw nut and back off the screw approximately 5 turns.
- (4) It will be necessary to fabricate a tool to be used as a gauge to properly reset throttle valve lever stop screw. Use a piece of drill rod or other similar stock approximately  $\frac{5}{16}$  or  $\frac{3}{8}$  inch in diameter. Cut it off very accurately to a length of .646 inch. Insert this gauge between the throttle valve lever tang and the kickdown valve, as shown in Figure 19.

- (5) Push in on the kickdown valve, compressing it against its spring, until it is completely bottomed inside the valve body.

- (6) While force is being exerted to hold valve in bottomed position, **tighten the throttle lever screw finger tight (do not use wrench) to remove all free play of the throttle valve lever.**

**Be sure the adjustment is made with the spring fully compressed and the gauge pin held squarely in line with the kickdown valve.**

Before removing Tool tighten the throttle valve lever stop screw nut securely.

- (7) Reinstall oil pan and fill transmission to the proper level.

- (8) Repeat throttle compensated pressure check (Step 4 thru 7) to insure that difficulty has been corrected.

- (9) Reinstall throttle linkage and adjust as outlined under Throttle Linkage Adjustments.

## 19. SERVICING THE GEARSHIFT CONTROL UNIT

### Removal

- (1) Disconnect one battery cable.
- (2) Disconnect the back up light switch wire at the push button control (at rear of instrument panel) and the illuminating lamp leads.
- (3) Remove the screws of push button face plate and remove the push buttons by pulling it off push button slide. Remove lamp bulb.
- (4) Remove the control housing stud nuts that are now accessible and remove control and cable from rear of instrument panel.
- (5) Remove hairpin securing control cable to actuator and the screws holding the cable bracket to the control housing.

### Installation

- (1) Insert end of cable on actuator and reassemble hairpin clip. Place cable bracket on control unit and install screws securely.

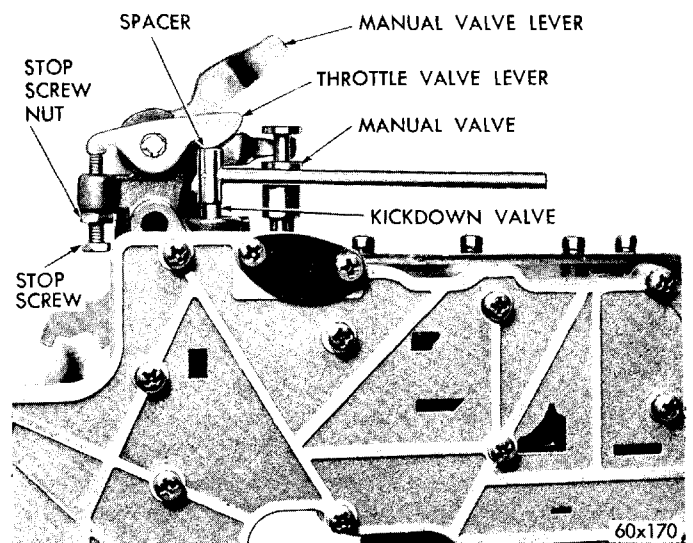


Fig. 19—Throttle Pressure Adjustment — Valve Bodies and Transfer Plate Assemblies Removed to Show Operation



(2) Carefully guide the unit into position from the rear of the instrument panel and install the attaching stud nuts from the front side of instrument panel.

(3) Install lamp bulb in push button control and reinstall push buttons onto control actuator slides. Replace face plate.

(4) Connect back-up switch and push button illuminating lamp wires.

## 20. BACK-UP LIGHT SWITCH REPLACEMENT (When So Equipped)

Remove the gearshift control housing assembly. The back-up light switch is fastened to control by four tabs. Straighten tabs to remove switch. Install replacement switch and secure to control housing by bending tabs. Install gearshift control housing and reconnect switch and lamp wires.

## 21. PUSH BUTTON UNIT LAMP BULB REPLACEMENT

The push button illuminating bulb can easily be replaced by removing the push button face plate and removing one or more of the center push buttons.

## 22. GEARSHIFT CONTROL CABLE (TRANSMISSION END)

### Removal (Fig. 20)

(1) Raise vehicle on hoist and drain two quarts (approximately) of oil from transmission. **CAUTION: Oil may be hot!**

(2) Engage the 1 (low) push button.

(3) Remove control cable adjustment wheel lock screw.

(4) Remove neutral starter switch, cupped washer and seal.

(5) With a screw driver, inserted through switch hole, push gently against upward projecting portion of

control cable adapter spring and pull outward on cable and remove cable assembly from transmission case.

### Installation (Fig. 12)

(1) Have an assistant engage the (R) button and hold it firmly engaged until the cable attachment operation is completed.

(2) Back the adjustment wheel off on the cable housing (counter-clockwise) until only two or three threads are showing behind the wheel on the guide.

(3) Lubricate the cable housing with transmission fluid, insert the cable wire in the adapter, and slide the cable housing into the case with just enough force to overcome "O" ring friction and the manual lever assembly bottoms against the reverse detent. Pull out on the cable to make sure that the adapter spring has engaged the cable end.

(4) While holding the cable firmly in the bottomed position, rotate the adjusting wheel to just contact the case squarely.

(5) Releasing the inward pressure on the cable, rotate the wheel (clockwise) to the hole that will line up with the case hole, then turn wheel an additional 4 holes clockwise. Install the lockscrew, tightening to 30-50 inch-pounds.

(6) Install the neutral starting switch as outlined in paragraph 7. Refill transmission with Automatic Transmission Fluid (Type "A" Suffix "A") to proper level.

## SERVICING OF COMPONENT PARTS WITH TRANSMISSION IN VEHICLE

### 23. SPEEDOMETER PINION

#### Removal

Disconnect speedometer cable and housing from drive pinion and sleeve assembly. Remove speedometer pinion and sleeve assembly from transmission extension. Refer to chart (page 4).

#### Installation

Install speedometer pinion and sleeve assembly in transmission extension and tighten to 40 to 45 foot-pounds torque.

### 24. NEUTRAL STARTING SWITCH

#### Removal

Drain approximately three 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 and remove switch.

#### Installation

Refer to Paragraph 7.

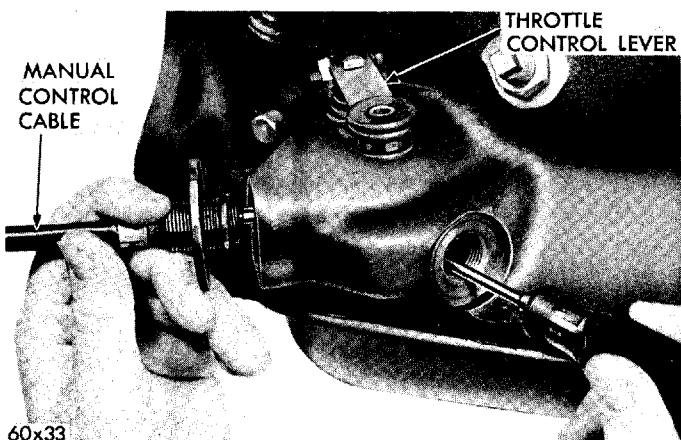


Fig. 20—Removal of the Gearshift Control Cable

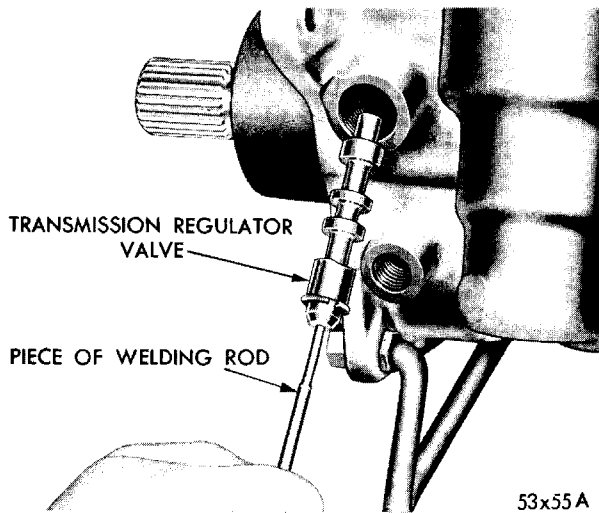


Fig. 21—Removing Regulator Valve

## 25. REGULATOR VALVE ASSEMBLY

### Removal

Remove transmission regulator valve spring retainer, 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. 21).

### Installation

With assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install regulator valve spring, sleeve, cup, gasket and retainer and tighten to 50 foot-pounds torque. Check line pressure and adjust if necessary.

## 26. TORQUE CONVERTER CONTROL VALVE ASSEMBLY

### Removal

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

### 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 40 foot-pounds torque.

## 27. OIL PAN

### Removal

The oil pan may be removed by disconnecting the filler tube and draining the oil from the transmission. Remove screws and drop the oil pan.

### Installation

Using a new gasket, install the oil pan and tighten

bolts to 12 to 17 foot-pounds torque. Reconnect filler tube and refill transmission with Automatic Transmission Fluid (Type "A" — Suffix "A"). Refer to Lubrication Section.

## 28. VALVE BODY AND TRANSFER PLATE ASSEMBLY OR ACCUMULATOR PISTON

### Removal

- (1) Engage R (reverse) push button and remove oil pan.
- (2) Disconnect throttle linkage and remove throttle valve lever and washer.
- (3) Remove manual control lever to cable adapter stud nut.
- (4) Remove oil strainer and transfer plate bolts and lower valve body and transfer plate assembly. Be careful not to lose the accumulator piston spring and cable adapter.

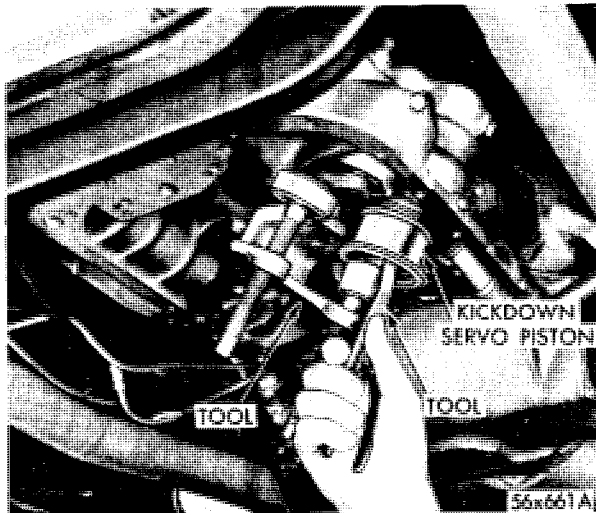
### Installation

- (1) Clean mating surfaces and check for burrs on both transmission case and valve body transfer plate.
- (2) Place manual lever in the reverse position (all the way in).
- (3) Install accumulator piston spring into recess in top of transfer plate and carefully guide the spring up into the accumulator piston as the transfer plate and valve body are placed up against the transmission case. At the same time index the cable adapter stud into the manual control lever. Install the transfer plate bolts and washers (leaving four holes vacant to attach oil strainer) draw down evenly and torque to 14-16 foot-pounds. Install and tighten the stud nut securely. Install oil strainer and torque the remaining bolts to 14 to 16 foot-pounds torque.
- (4) Install the throttle valve lever and washer and reconnect throttle linkage.
- (5) Install oil pan and refill the transmission with Automatic Transmission Fluid (Type "A" — Suffix "A") to proper level.

## 29. KICKDOWN PISTON

### Removal

- (1) Remove oil pan and valve body assembly.
- (2) Loosen kickdown band adjusting screw lock nut and back out screw sufficiently to remove anchor and strut.
- (3) Install compressing Tool C-3529 or C-3289 (modified), apply sufficient pressure on kickdown piston rod guide and remove snap ring.
- (4) Remove tool, piston rod guide, piston spring and rod. Using C-484 pliers, remove the kickdown piston from transmission case ( Fig. 22). Refer to Kickdown Piston Inspection, Paragraph 82.



**Fig. 22—Removal and Installation of Kickdown Piston**

### Installation

(1) Lubricate piston seal rings and place piston in position, compress outer ring and start assembly into case. With piston properly centered so as not to damage rings, tap lightly until piston bottoms in case.

(2) Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod.

(3) Install Tool C-3529 or C-3289 (modified) on case and place kickdown piston rod guide over spring, compress spring and install snap ring. Remove compressing tool.

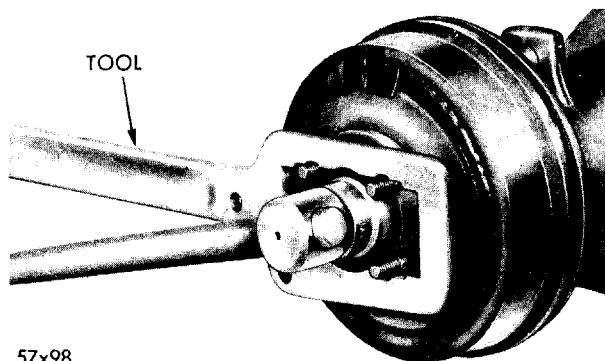
(4) Place kickdown band strut into position in band and lever and compress band end sufficiently to install anchor over adjusting screw.

(5) Adjust kickdown band as outlined under "Maintenance, Adjustments and Tests, Paragraph 8."

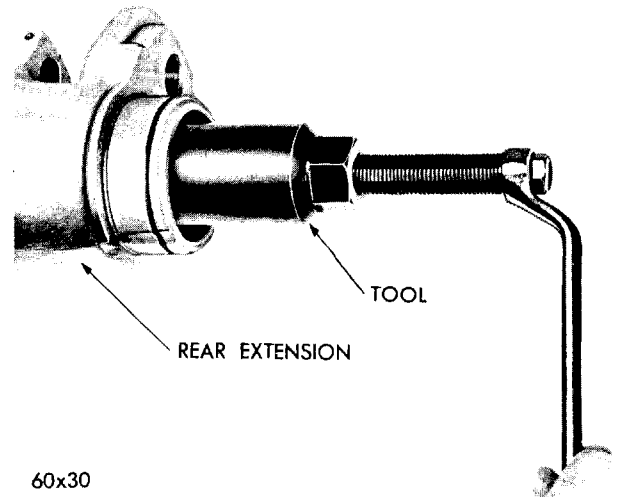
(6) Install valve body assembly and oil pan.

## 30. OUTPUT SHAFT REAR OIL SEAL

### Removal



**Fig. 23—Removing Handbrake Drum and Flange Assembly**



**Fig. 24—Removing Output Shaft Rear Bearing Oil Seal**

(1) Disconnect front universal joint.

(2) Apply hand brake or use wrench Tool C-3281 (Fig. 23) and remove flange nut. Release parking brake (if applied) and remove hand brake flange and drum assembly. Use puller Tool C-452, if necessary.

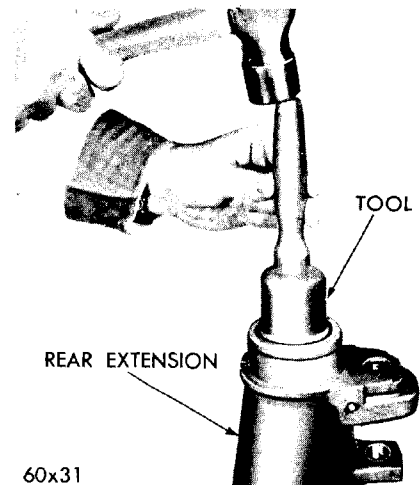
(3) Remove brake support grease shield spring and grease shield.

(4) 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-3690 and remove the transmission output shaft rear bushing oil seal. Fig. 24.

### Installation

(1) Using driver, Tool C-3691, install output shaft rear oil seal (with metal portion of seal facing down in housing bore) until tool bottoms on extension, as shown in Fig. 25.



**Fig. 25—Installing Output Shaft Rear Bearing Oil Seal**

(2) Install parking support grease shield on extension housing. 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 grease shield spring with opening in spring toward adjusting sleeve.

(3) Reinstall hand brake flange and drum assembly, washer (convex side toward nut), and nut. Apply hand brake or use wrench, Tool C-3281, and tighten nut to 175 foot-pounds torque.

(4) Reconnect front universal joint and torque bolts to 33-37 foot-pounds torque. Check transmission fluid level and refill if necessary.

### 31. EXTENSION HOUSING OR BUSHING

#### Removal

(1) Drain approximately two quarts of fluid from transmission.

(2) Disconnect front universal joint.

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

(4) Disconnect hand brake and speedometer cables. Remove speedometer drive pinion sleeve assembly.

**If output shaft rear bushing is to be replaced, the oil seal must be removed at this point; otherwise, step #5 should not be performed.**

(5) Install puller, Tool C-3690, and remove output shaft oil seal.

(6) Install engine support fixture, Tool C-3487. Refer to Paragraph 26 (10). Adjust fixture to support the weight of the engine. Raise engine slightly, remove crossmember to torsion bar bracket bolts. (Rear motor support and bracket may be left on transmission extension for transmission repairs or transferred to new parts after extension housing has been removed).

Remove two screws holding the extension housing

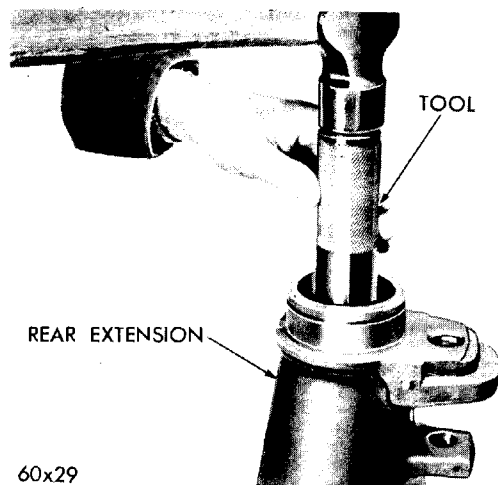


Fig. 26—Removing Output Shaft Rear Bushing

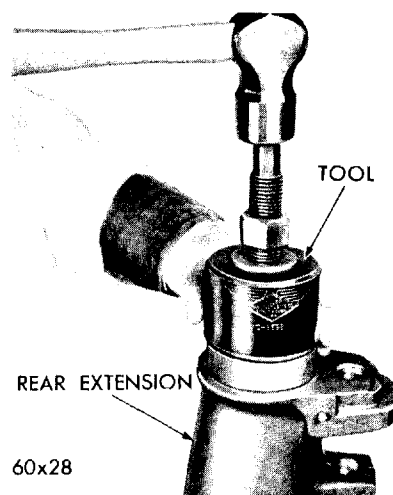


Fig. 27—Installing Output Shaft Rear Bushing

to support plate and install guide studs, Tool C-3283 and then remove the balance of the screws. Due to interference at the insulator, it will be necessary to back the lower screw out as the extension is removed. **Do not allow the output shaft support to slide away from transmission case while extension is being removed.**

Remove extension and brake as one assembly. If care is used, it is not necessary to remove the brake support and shoe assemblies from extension to replace output shaft rear bushing.

(7) With the larger end of the extension housing on a flat surface, use bushing removing driver, Tool C-3689, and drive bushing out of housing. Refer to Figure 26.

#### Installation

(1) Place new bushing on driver burnisher, Tool C-3692, with lubrication hole in bushing toward end of tool. Align hole in bushing with lubrication hole in housing and drive bushing into housing until tool bottoms. Refer to Figure 27.

(2) While holding screw of tool (Fig. 28) to prevent turning, turn nut on tool until burnisher is pulled back out of bushing to correctly size bushing. Recheck indexing of lubrication hole in bushing with housing.

(3) Use driver, Tool C-3691, and install output shaft oil seal (with metal portion of seal facing down in housing bore) until tool bottoms on extension.

(4) Using a new gasket, slide extension assembly over guide studs in transmission case up against output shaft support. **Do not use sealing material on gasket.**

(5) Start extension to case screws. **Due to interference of the insulator, it will be necessary to start the bottom extension housing to case screw as the extension is pushed into position against the support.** Remove guide studs and in-

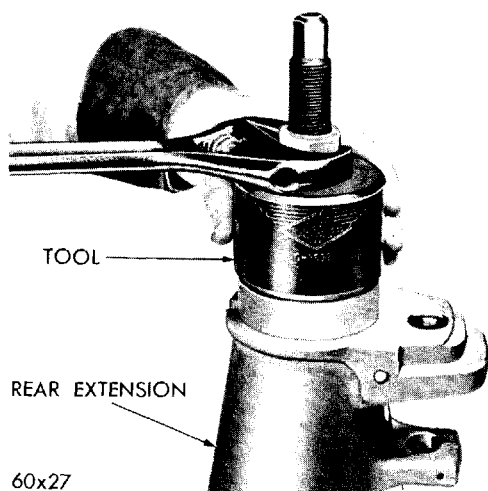


Fig. 28—Burnishing Output Shaft Bushing

stall remaining screws and tighten to 25-30 foot-pounds torque. Turn output shaft to make sure it turns freely.

(6) Lower transmission and install crossmember bolts. Remove engine support fixture.

(7) Reconnect parking brake cable. Install speedometer pinion sleeve and tighten to 40-45 foot-pounds torque and connect cable.

(8) Install propeller shaft flange and drum assembly, washer and nut and tighten to 175 foot-pounds torque. Connect front universal joint and tighten nuts to 33-37 foot-pounds torque.

(9) Refill transmission to proper fluid level.

## 32. GOVERNOR

### Removal

(1) Remove extension assembly as described in previous section.

(2) Remove governor valve shaft snap ring from weight end of shaft, and remove shaft and valve (Fig.

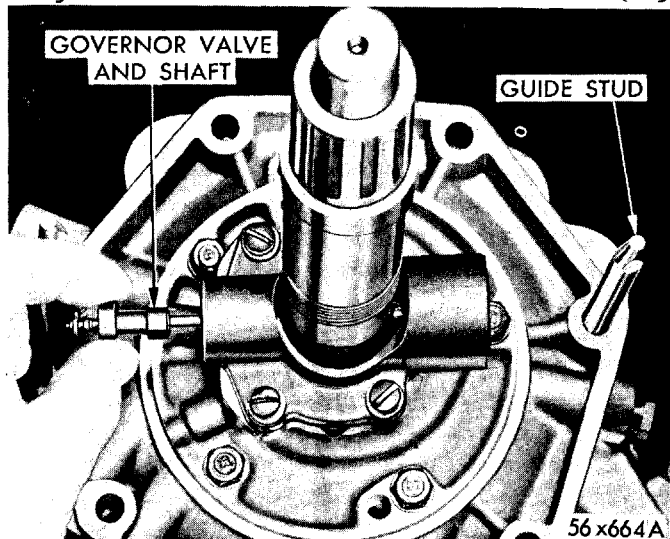


Fig. 29—Removal and Installation of Governor Valve Shaft and Valve

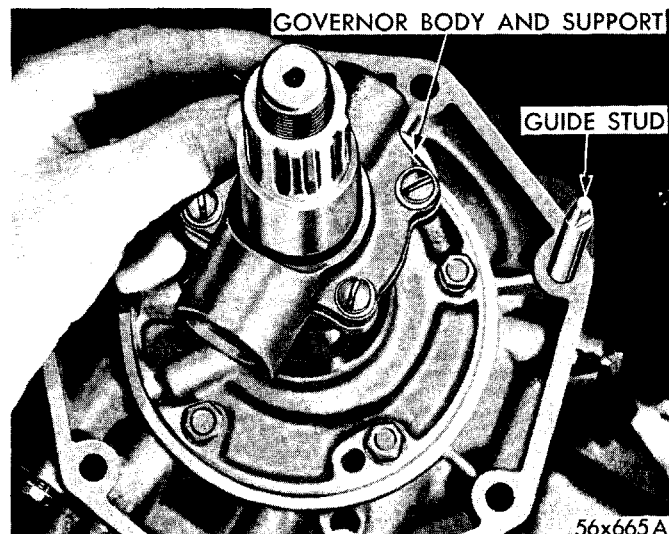


Fig. 30—Removal and Installation of Governor Body and Support Assembly

(3) Using Tool C-3229, remove governor weight assembly snap ring (large) and remove governor weight. 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 housing (Fig. 30). Normal servicing does not require removal of the governor body from the governor support. **If condition warrants removal of governor body from governor support, do not tighten governor body screws when reassembling until governor body support is located on output shaft.**

### Installation

(1) Slide governor body and support assembly into oil pump housing. It will be necessary to compress seal rings on governor support. **Do not force.**

(2) Align locating hole in output shaft with hole in governor support, install set screw and tighten to 60-80 inch-pounds. If governor body had been removed from support, the four governor body screws should now be tightened.

(3) Place governor weight assembly (secondary weight snap ring facing out) into governor body, use pliers, Tool C-3229, and install snap ring, convex side facing out.

(4) Slide governor valve over governor valve shaft, insert shaft and weight into governor weight and install snap ring securely, (Fig. 31). Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body.

(5) Install transmission extension.

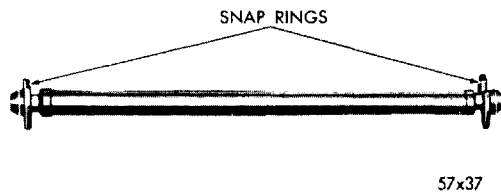


Fig. 31—Positioning Governor Valve Shaft Snap Rings in Grooves

### 33. REAR OIL PUMP

#### Removal

(1) Remove transmission extension and governor assembly as outlined in paragraph 24.

(2) Remove oil pump housing to output shaft support screws and install guide studs, Tool C-3288. Remove pump housing and gear from output shaft. Use dye (or other suitable material) to mark pump gears in relation to pump housing face. **Do not use scribe. Oil pump pinion is keyed to output shaft pinion by a small ball. Use care when removing pinion so as not to lose ball.**

#### Installation

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

(2) Place 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.

(3) 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. **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.**

(4) Remove guide studs, install oil pump housing to output shaft support screws and tighten to 10-12 foot-pounds torque. Turn output shaft to make sure pump gears are free to rotate. If not, remove pump to determine cause of binding.

(5) Align locating hole in output shaft to locating screw hole in governor support; install locating screw and tighten.

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

(6) Install transmission extension.

## DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

### 34. REMOVAL OF TRANSMISSION FROM VEHICLE

(1) Disconnect battery.

(2) Engage R (reverse) push button. **It will be necessary for the control cable adapter to be in this position (for accessibility) when removing cable from transmission.**

(3) Drain transmission and torque converter. When fluid has drained, replace torque converter drain plug and tighten.

(4) Disconnect the front universal joint and secure propeller shaft out of the way.

(5) 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.

(6) Disconnect speedometer cable and housing at transmission extension, neutral starter switch wire and throttle control linkage from throttle lever at transmission.

(7) Remove the push button control cable adjustment wheel locking screw and neutral starter switch.

(8) Insert a screw driver through the neutral switch hole, contact the top end of the cable-to-adapter locking spring, and while releasing the lock, pull out the cable (Fig. 20).

(9) Disconnect oil cooling lines from transmission.

(10) Install engine support fixture, Tool C-3487. (On some models it may be necessary to remove the starter to provide clearance for fixture support ends). Insert hooks of fixture firmly into holes in side of frame member with support ends up against the underside of oil pan flange.

(11) Adjust fixture to support the weight of the engine. Raise engine slightly, remove crossmember to torsion bar bracket bolts. **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.** Rear motor

support and bracket may be left on transmission extension during transmission repairs. When it is necessary to replace extension housing, it can then be transferred on the bench.

(12) Remove the two transmission case to torque converter housing screws and lockwashers from right side and install guide studs, Tool C-3276. With transmission supported, remove the two transmission case to torque converter housing screws and lockwashers from left side. Slide transmission straight back to avoid damage to the front oil pump driving sleeve, then lower to the floor.

### 35. FLUSHING TORQUE CONVERTER

In the event that any part of the transmission has failed, it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission controls.

(1) Using a long spouted can, slowly pour 2 quarts of new, clean kerosene into the torque converter hub. Before this can be done, it will be necessary to reach into the torque converter with a screw driver 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  $\frac{1}{8}$ " x  $\frac{3}{8}$ " rectangular slots on this assembly is visible 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.

(2) Disconnect coil wire to prevent engine from starting and rotate the converter approximately 10 seconds by cranking the engine.

(3) Drain the converter by removing the drain plug and masking tape. Realign the stator hub and repeat the above procedure at least once (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.

### 36. 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

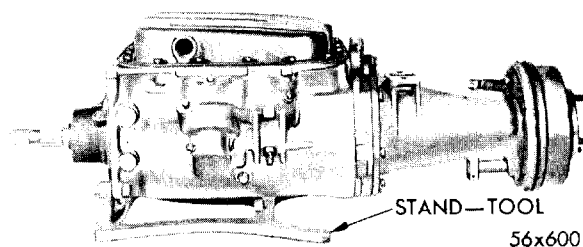


Fig. 32—Transmission Assembly Inverted in Stand

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 a vehicle has accumulated considerable mileage and it becomes necessary to recondition the transmission, install new seal rings on parts requiring their usage. **The following procedures are based on the assumption that the unit has been removed from vehicle and prepared for disassembly.**

### 37. OIL PAN REMOVAL

Attach stand, Tool C-3280, to transmission and invert, as shown in Figure 32. Remove the oil pan.

### 38. VALVE BODY AND TRANSFER PLATE - REMOVAL

- (1) Remove throttle valve lever and flat washer.
- (2) Remove cable adaptor stud nut.
- (3) Remove oil strainer.
- (4) Remove attachment nut from cable adaptor stud at manual lever and remove adaptor.

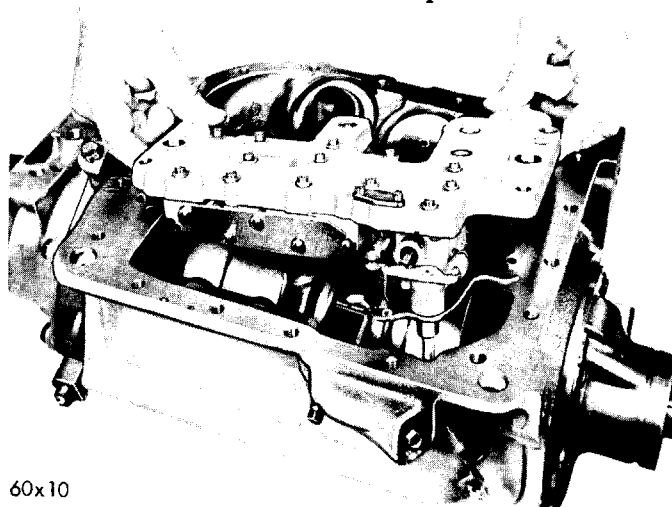
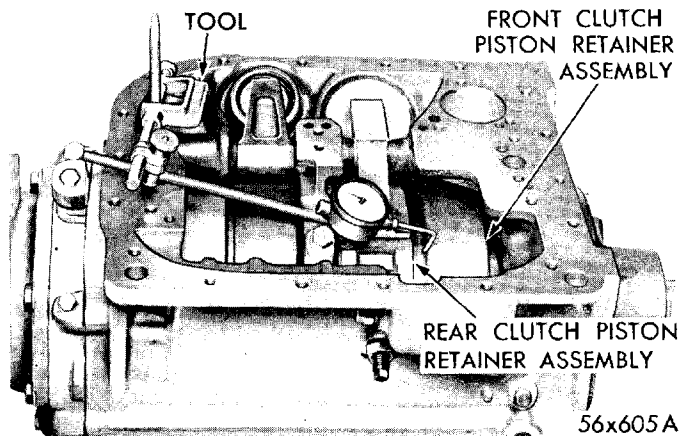


Fig. 33—Removal of the Valve Body Assembly



**Fig. 34—Checking Front Clutch Piston Retainer Assembly End Clearance**

(5) Remove the transfer plate bolts and remove the valve body assembly from the transmission Figure 33. Mating surfaces are machined: Use extreme care so as not to damage these surfaces. Place valve body in stand, Tool C-3528.

(6) Remove the accumulator piston spring.

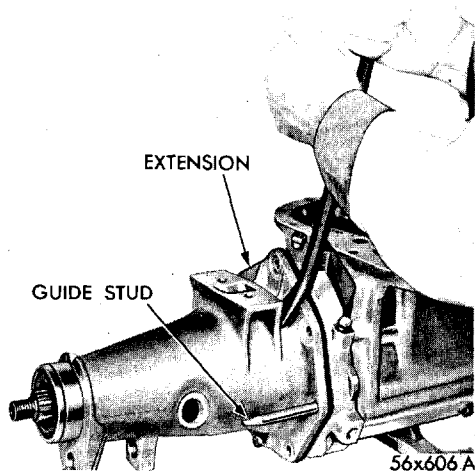
### 39. CHECKING FRONT CLUTCH END CLEARANCE

Prior to removal of propeller shaft flange and drum assembly, check end clearance of front clutch piston retainer assembly.

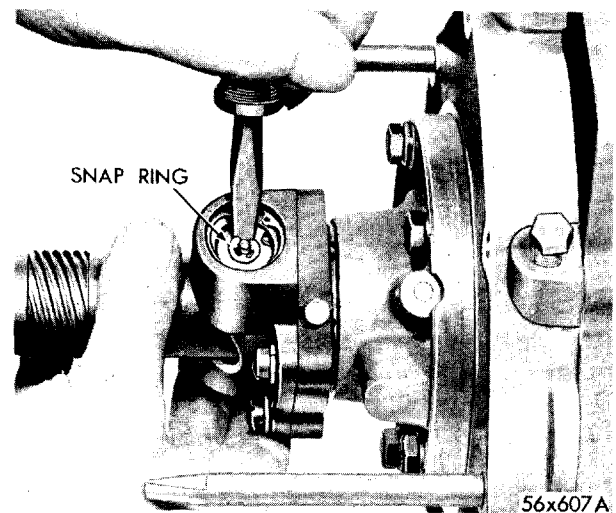
(1) Install dial indicator, Tool C-3339 as shown in Figure 34.

(2) To make this check, pry front clutch forward by carefully inserting screw driver between the front and rear clutch piston retainers.

(3) Remove screw driver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero.



**Fig. 35—Removal of Extension**



**Fig. 36—Removal and Installation of Governor Valve Shaft Snap Ring**

(4) Now, pry front clutch piston retainer assembly rearward against rear clutch, remove screw driver, and take indicator reading. This clearance should be from .020" to .050". If clearance exceeds the specified limit, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

### 40. PARKING BRAKE ASSEMBLY REMOVAL

(1) Remove the transmission flange nut and washer. Use wrench Tool C-3281, to hold brake drum and flange assembly, see Figure 23.

(2) Attach puller, Tool C-452, if necessary, and remove propeller shaft flange and drum assembly. Inspect lining contact surfaces on brake drum assembly for scoring and inspect brake lining for wear.

(3) Remove the transmission brake support grease shield spring.

(4) Remove "C" type retainer.

(5) 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.

(6) Using a suitable drift, remove pin which secures brake shoe anchor in extension housing. Slide balance of hand brake 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.

### 41. EXTENSION HOUSING - REMOVAL

(1) Remove speedometer drive pinion and sleeve



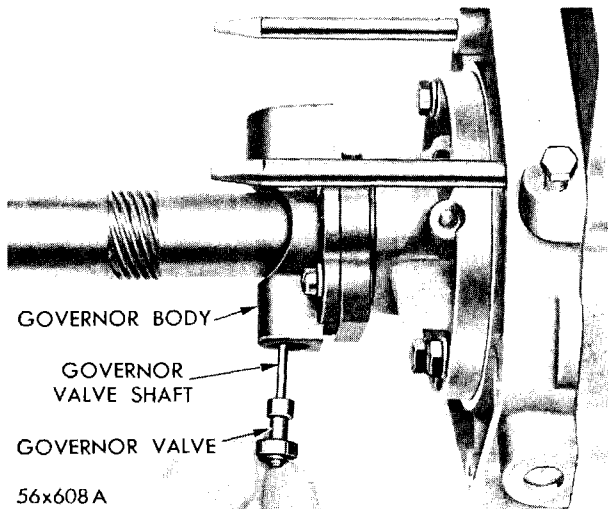


Fig. 37—Removal and Installation of Governor Valve and Shaft

assembly. **Nylon gear can be easily damaged if extension is removed without first removing the speedometer drive pinion and sleeve assembly.**

(2) Inspect the output shaft rear oil seal and remove (if necessary) using puller Tool C-3690. **If transmission extension housing oil seal or bushing are to be replaced, the seal must be removed at this time before extension housing is removed from transmission case.**

(3) Remove the 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 35.** Remove extension gasket.

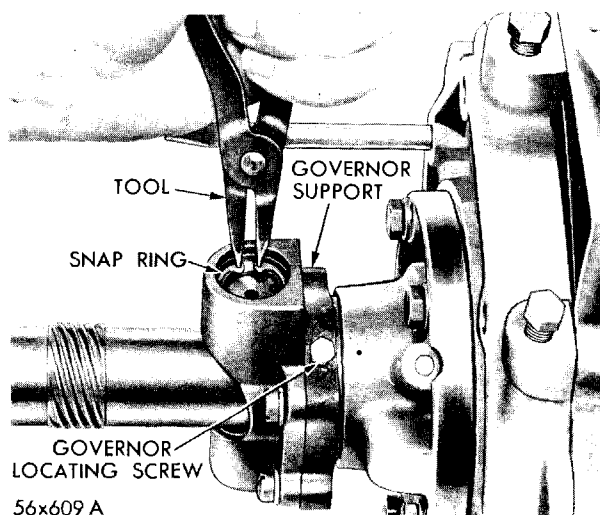


Fig. 38—Removal and Installation of Governor Weight Assembly

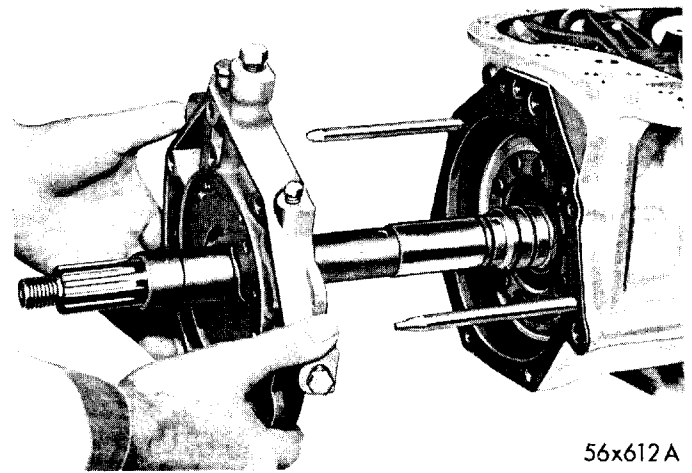


Fig. 39—Removal and Installation of Output Shaft Support

#### 42. GOVERNOR AND REAR OIL PUMP HOUSING - REMOVAL

(1) Using a small screw driver, remove the governor valve shaft snap ring from the weight assembly end as shown in Figure 36.

(2) Remove governor valve shaft and valve, Figure 37.

(3) Using pliers, Tool C-3229, remove governor snap ring (large), as shown in Figure 38, and remove governor weight assembly.

(4) Remove governor locating screw from the governor support.

(5) Remove oil pump housing, gear, pinion and governor assembly from output shaft. **Use dye and mark face of pump gear in relation to pump housing, for reassembly purposes. DO NOT SCRIBE.** Remove oil pump pinion ball.

#### 43. OUTPUT SHAFT SUPPORT - REMOVAL

(1) Slide the output shaft rear support assembly and gasket from transmission case, as shown in Figure 39. If rear support is stuck to transmission case, it can be loosened by tapping lightly with a soft hammer.

(2) Remove thrust washer from front end of support plate or output shaft.

(3) Remove guide studs, Tool C-3283 from transmission case.

#### 44. 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, Figure 40. Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.

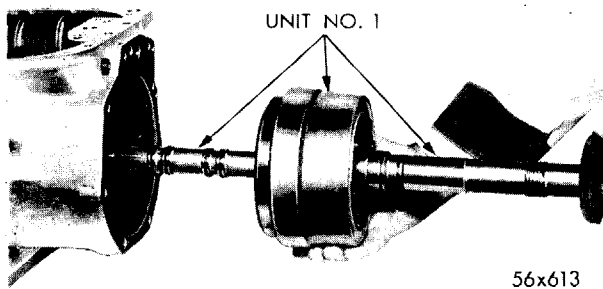


Fig. 40—Removal and Installation of Unit No. 1

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

(1) Loosen lock nuts on low-reverse and kickdown band adjusting screws, and back adjusting screws out 2 to 3 turns.

(2) Remove the three intermediate support locating bolts and lockwashers (two outside of case and one inside). When removing unit, identify locating hole in the intermediate support to correspond with the threaded locating hole inside of case for installation purposes. Figure 41.

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as shown in Figure 42. Remove front clutch and sun gear thrust washer.

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

Keep unit centered as much as possible, and remove

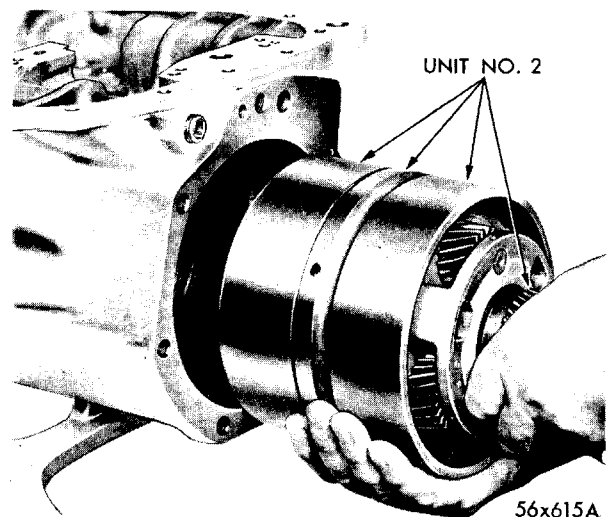


Fig. 42—Removal of Unit No. 2

from transmission case, as shown in Figure 43. Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft.

#### 47. LOW-REVERSE BAND - REMOVAL

(1) Mark the low-reverse band assembly for installation purposes: then compress ends of band sufficiently to remove the low-reverse band strut.

(2) Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure 44, and remove low-reverse band anchor from adjusting screw.

#### 48. KICKDOWN BAND - REMOVAL

(1) Mark band for reassembly purposes. Compress kickdown band ends sufficiently to remove the kickdown band strut, see Figure 45 and remove the kickdown band anchor from adjusting screw.

(2) Remove the kickdown band assembly by rotat-

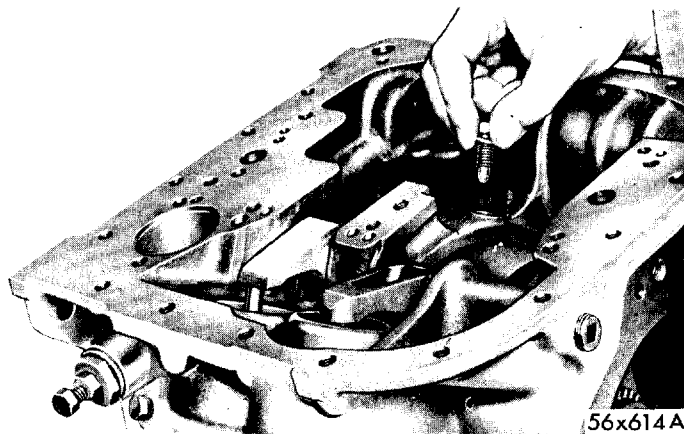


Fig. 41—Removal and Installation of Intermediate Support Locating Screw

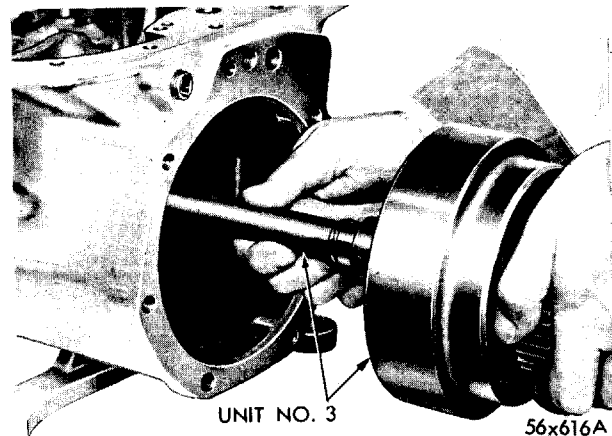


Fig. 43—Removal and Installation of Unit No. 3

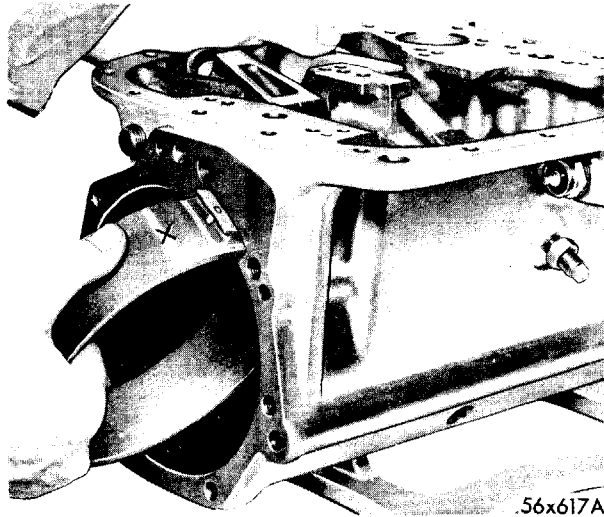


Fig. 44—Removal and Installation of Low-Reverse Band

ing band ends over center support in transmission case, as shown in Figure 46. **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 than the low-reverse band.

#### 49. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES - REMOVAL

- (1) Remove kickdown and reverse lever shaft stop plug at rear of transmission case.
- (2) Using pliers, remove kickdown and low-reverse shaft lever spacer (flat).
- (3) Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 47 and remove kickdown and low-reverse servo levers.

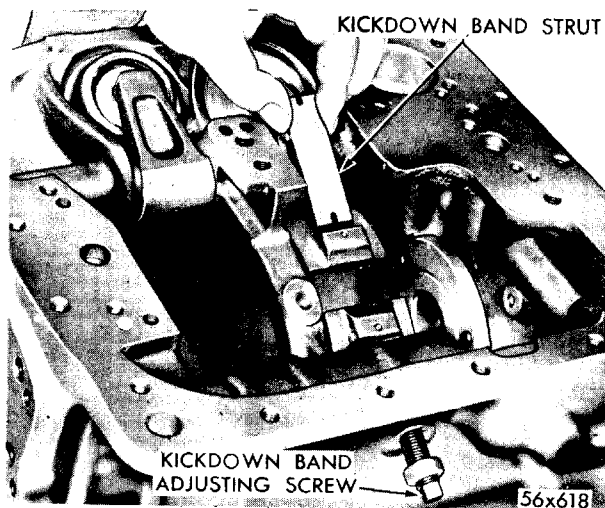


Fig. 45—Removal and Installation of Kickdown Band Strut

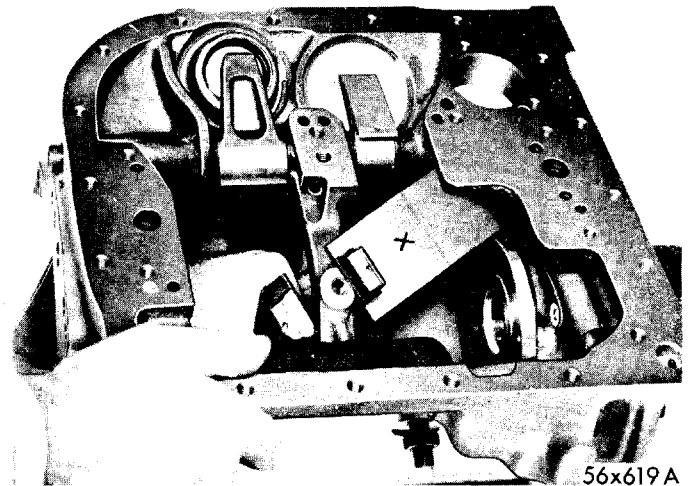


Fig. 46—Removal and Installation of Kickdown Band

#### 50. LOW-REVERSE SERVO - REMOVAL

- (1) Install Tool C-3529 or C-3289 (modified) and depress the reverse servo piston retainer to permit the removal of the snap ring with a screwdriver. (Fig. 48). Remove the snap ring.
- (2) Remove tool from case.
- (3) Remove retainer spring, and piston assy.

#### 51. KICKDOWN SERVO - REMOVAL

- (1) Install Tool C-3529 or C-3289 (modified) and apply sufficient pressure on the kickdown piston rod guide to permit the removal of the snap ring. (Fig. 49). Remove the snap ring.
- (2) Remove tool from case.
- (3) Remove piston rod guide, piston spring and piston rod.
- (4) Using pliers, Tool C-484, remove the kickdown piston from transmission case.

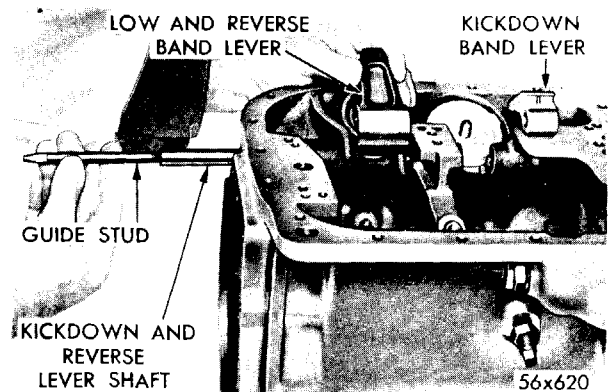
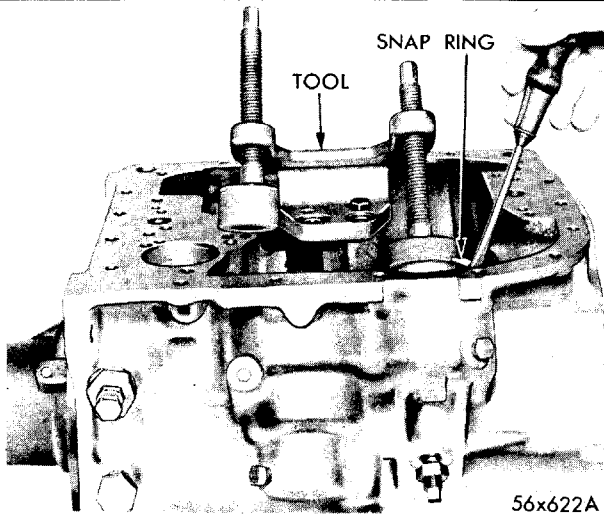
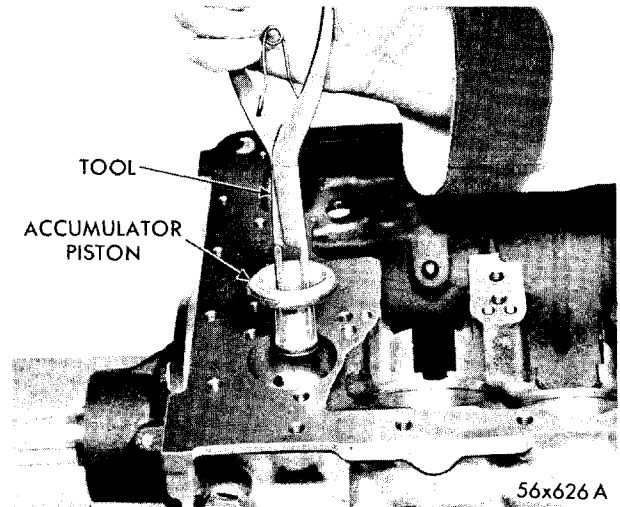


Fig. 47—Removal and Installation of Kickdown and Reverse Lever Shaft



**Fig. 48—Removal and Installation of Low-Reverse Servo Piston Spring Retainer Snap Ring**



**Fig. 50—Removal and Installation of Accumulator Piston**

## 52. ACCUMULATOR PISTON - REMOVAL

Using the same pliers, remove the accumulator piston from transmission case, Figure 50.

## 53. FRONT OIL PUMP - REMOVAL

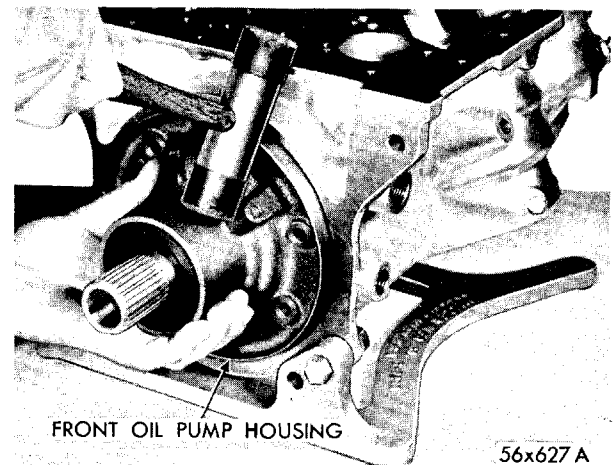
(1) Remove front oil pump drive sleeve (if installed).

(2) Remove the front oil pump screws and washers, (sealing washers, used under bolts, are made from aluminum; discard if damaged).

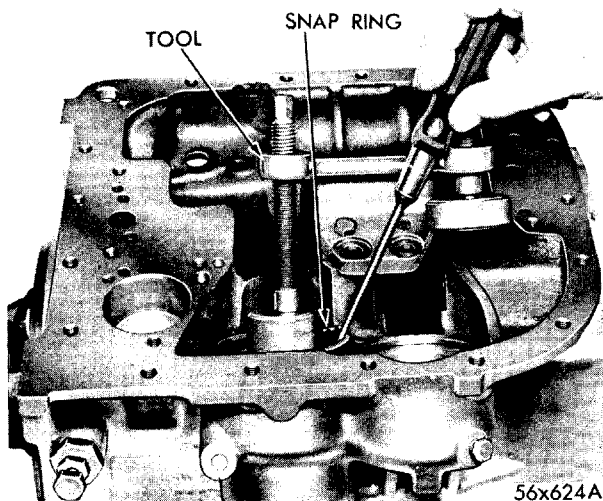
(3) Remove oil pump housing from transmission case by tapping housing lightly with a soft hammer. Figure 51. **Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. DO NOT SCRIBE.**

## 54. REGULATOR VALVE BODY - REMOVAL

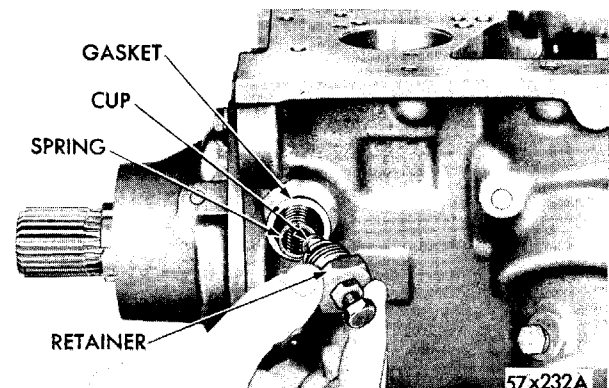
(1) Remove the transmission regulator valve spring retainer, gasket, cup, spring, sleeve and valve. (Figs.



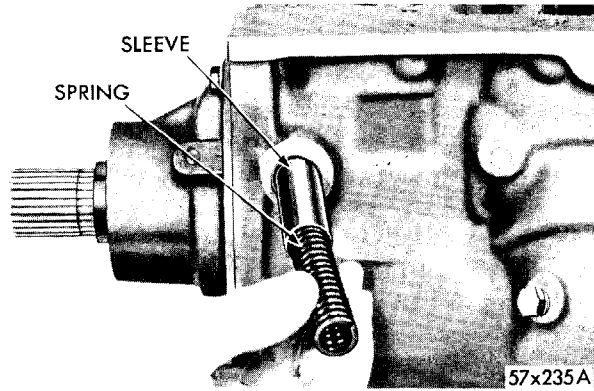
**Fig. 51—Removal of Front Oil Pump Housing Assembly**



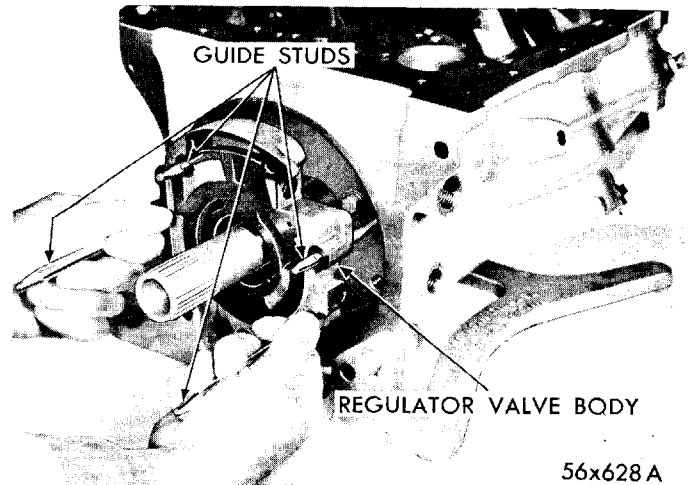
**Fig. 49—Removal and Installation of Kickdown Piston Rod Guide Snap Ring**



**Fig. 52—Removal and Installation of Regulator Valve Retainer**



**Fig. 53—Removal and Installation of Regulator Valve Spring**



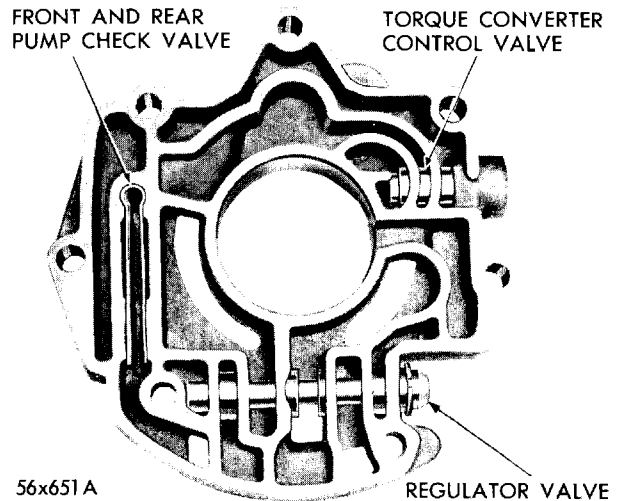
**Fig. 55—Removing Regulator Valve Body**

52, 53 and 54).

(2) Remove the torque converter valve retainer, gasket, spring and valve. A mechanical retriever, such as a piece of welding rod, will aid in removing these valves by inserting it in the end of the valve.

(3) 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 55.

(4) Pull regulator valve body off of torque converter reaction shaft and remove gasket. **Regulator valve body (Fig. 56) is made of aluminum and requires care in handling to avoid damage.**



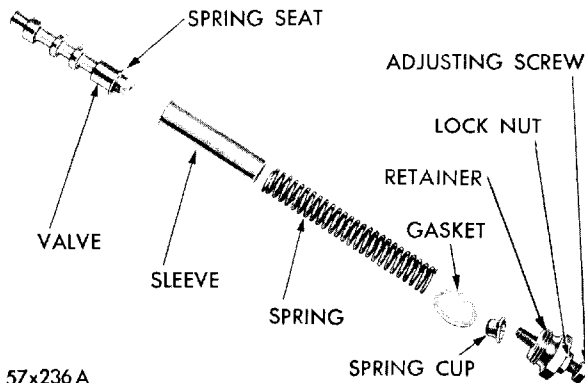
**Fig. 56—Regulator Valve Body and Valves**

**55. TORQUE CONVERTER REACTION SHAFT REMOVAL**

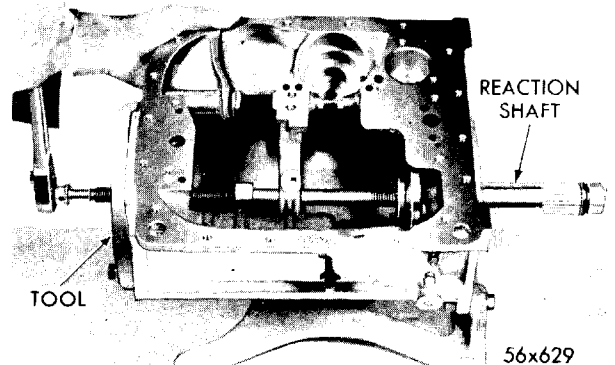
Refer to "Inspection of torque Converter Reaction Shaft," Paragraph 49. If inspection reveals it is necessary to remove torque converter reaction shaft, proceed in the following manner.

(1) Remove torque converter reaction shaft seal ring (neoprene).

(2) Remove transmission case to reaction shaft bolts and washers.



**Fig. 54—Regulator Valve Assembly (Disassembled View)**



**Fig. 57—Removal and Installation of Torque Converter Reaction Shaft**

(3) Using Tool C-3531 press reaction shaft out of transmission case Figure 57.

## 56. 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" — Suffix "A"). **Do not use sealing materials 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 parts unnecessarily.**

## 57. 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. Check inner bronze bushing for excessive scoring. Bushing is serviced with reaction shaft assembly. **Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.**

## 58. 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.

Using straight edge, Tool C-3335, inspect valve body mating surface on transmission case for any burrs on 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 on 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.**

## 59. TRANSMISSION EXTENSION HOUSING 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 facilitate filling and draining. Vent also releases fumes and air pressure build-up caused by expansion of oil due to heat. Clean output shaft rear bushing and dry with compressed air. Inspect bushing for rough spots. Do not remove bushing from extension unless inspection reveals it is necessary to do so.

## 60. OUTPUT SHAFT REAR BUSHING — REMOVAL

If it is necessary to remove rear bushing, the output shaft rear oil seal should have been removed during disassembly. Refer to Paragraph 33.

(1) With the larger end of the extension housing on a flat surface, use bushing removing driver, Tool C-3689, and drive bushing out of housing as shown in Figure 26.

## 61. OUTPUT SHAFT REAR BUSHING AND OIL SEAL INSTALLATION

(1) Place new bushing on driver-burnisher, Tool C-3692, with lubrication hole in bushing towards end of tool.

(2) Align hole in bushing with lubrication hole in top side of extension housing and drive bushing until tool bottoms, Figure 27.

(3) While holding screw of tool with a wrench to prevent turning, use another wrench and turn nut on tool until burnisher of tool is pulled back out of bushing. This operation correctly sizes bushing. Recheck indexing of lubrication hole in bushing with housing (Fig. 28).

(4) Using driver, Tool C-3691, install output shaft rear oil seal (with metal portion of seal facing down in housing bore) until tool bottoms on extension, as shown in Figure 25.

## 62. GOVERNOR DISASSEMBLY AND INSPECTION

(1) Remove governor shaft snap ring.

(2) Remove governor secondary weight and spring. Inspect all parts for burrs and wear. Check secondary weight for free movement in primary weight by placing 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, Figure 58.

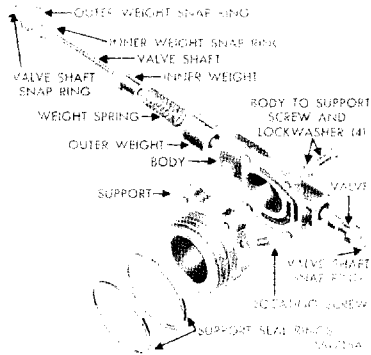


Fig. 58—Governor Assembly (Disassembled View)

(3) Place secondary weight and spring in primary weight, compress spring and install snap ring, flat side facing downward against weight. Make sure snap ring is seated properly.

(4) Remove and inspect the two governor support seal rings.

(5) Remove the governor body to support bolts and separate body from support. (Washers are part of the 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.**

### 63. REAR OIL PUMP - INSPECTION

Inspect oil pump housing machined surfaces for nicks and burrs and housing 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 59. Clearance limits are from .001" to .0025". The clearance between the outer rotor and pump housing should be from .004" to .006".

### 64. GOVERNOR ASSEMBLY - REASSEMBLY

(1) Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type "A" — Suffix "A"), and install on the governor support. Make sure rings are free to rotate in grooves.

(2) Position governor body and support and install the four bolts with attached lockwashers. **Do not tighten bolts at this time.**

(3) 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.**

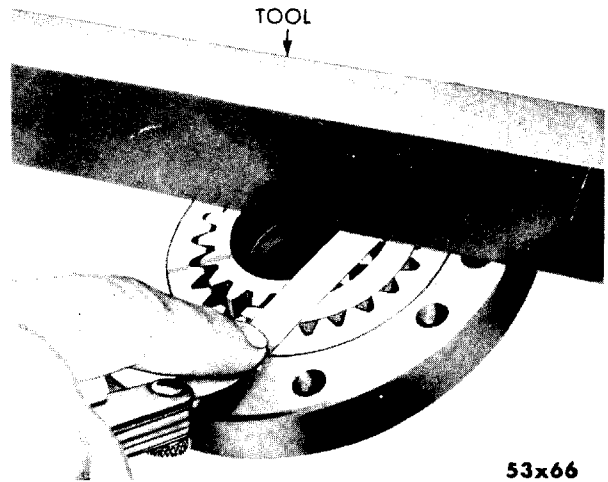


Fig. 59—Checking Clearance between Rear Pump Body and Gears

53x66

### 65. 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. Inspect output shaft to support plate thrust washer for tangs being bent or broken. Replace washer when bronze is worn to the extent that grooves in face of washer are worn off.

### 66. DISASSEMBLY, INSPECTION AND ASSEMBLY OF POWER TRAIN UNITS, UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES)

Unit can be placed in the propeller flange and brake

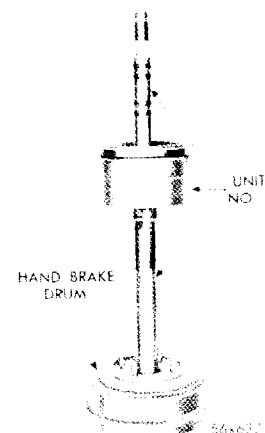


Fig. 60—Using Propeller Shaft Flange and Brake Drum Assembly (on a Holding Fixture for Unit No. 1)

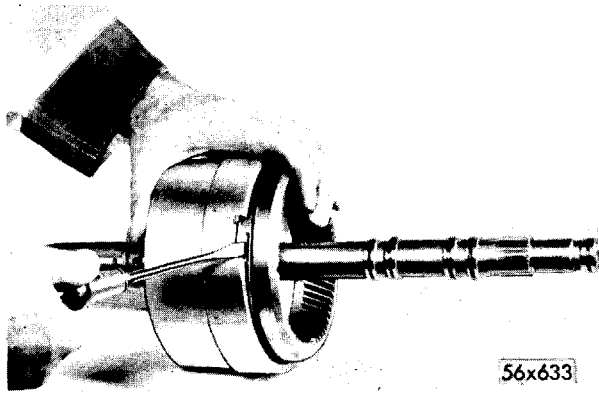


Fig. 61—Removal and Installation of Output Shaft Drive Housing Snap Ring

drum assembly to aid in disassembly, as shown in Figure 60.

(1) Using a screw driver, remove output shaft drive housing snap ring, Figure 61. Refer to Figure 62 and complete disassembly of unit as follows:

(2) Remove reverse annulus gear (B) from output shaft assembly (K).

(3) Remove thrust plate (C) from kickdown planet pinion carrier (F).

(4) Remove intermediate shaft (D) and kickdown planet pinion carrier assembly (F) from output shaft assembly (K).

(5) Remove output shaft thrust washer (E) located inside housing.

(6) 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 due to wear patterns.**

(7) Remove bronze K/D carrier thrust washer (G).

(8) Remove sun gear roller type thrust washer (H) from intermediate shaft assembly (D).

(9) With a screw driver, remove kickdown annulus gear snap ring (I) and separate gear (J) from intermediate shaft assembly (D).

## 67. 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 sharp edged stone. Inspect thrust surfaces, journals, and inner bushing for scores or excessive wear. Inspect riveting and housing for any cracks and internal driving lugs for excessive wear or brinelling. Housing and output shaft are 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.

## 68. 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.

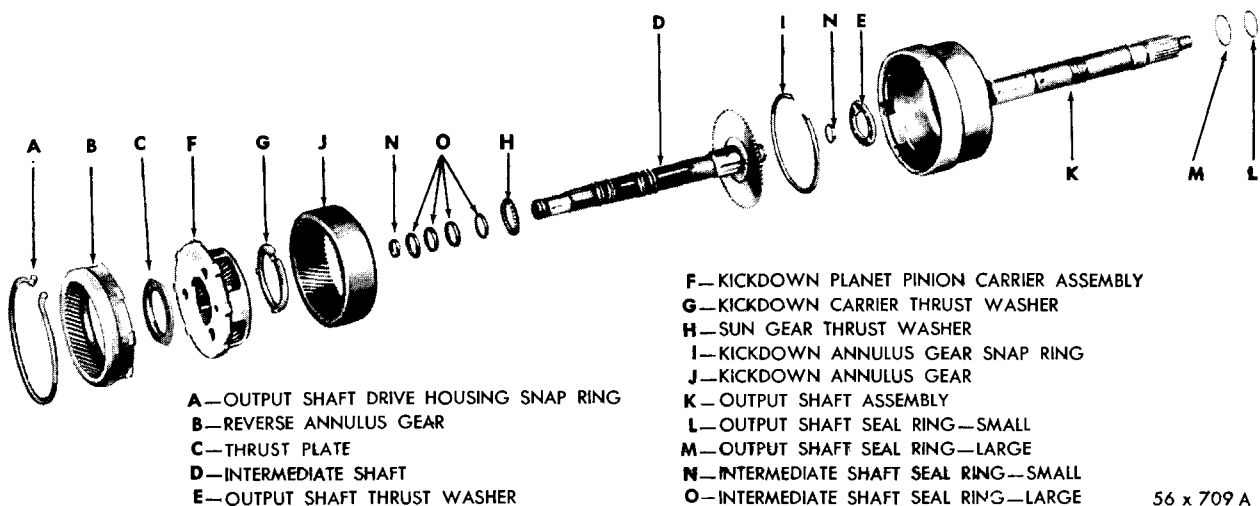
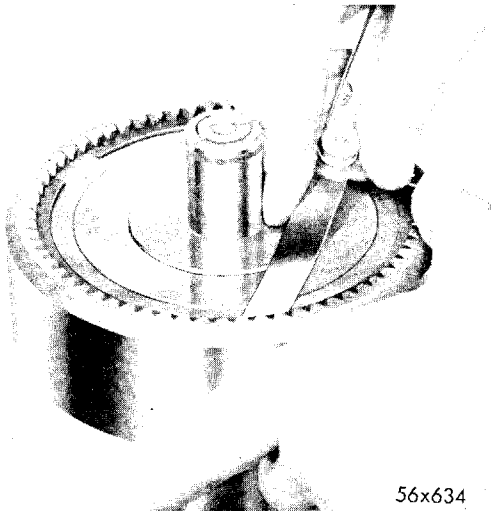


Fig. 62—Unit No. 1 (Disassembled View)

56 x 709 A





56x634  
**Fig. 63—Checking Clearance between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly**

## 69. 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. looseness in hole). Make sure pinion shaft lock pins are installed and tight. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only**

**as a complete assembly. Scuffing of the carrier does not affect it's operation and the carrier should not be replaced for this reason alone.** Inspect kickdown carrier thrust washer (G) for scratches or excessive wear.

## 70. REVERSE AND KICKDOWN ANNULUS GEAR - INSPECTION

Inspect for worn, cracked, or broken gear teeth.

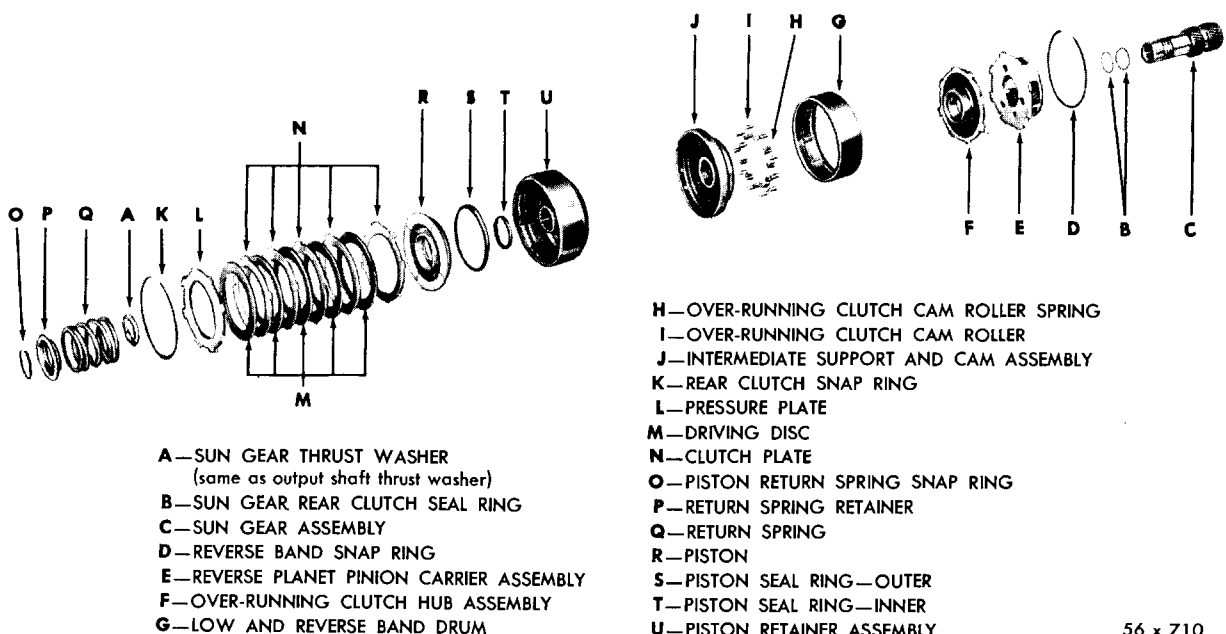
## 71. UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES — ASSEMBLY

To aid in the assembly of Unit No. 1, use the propeller shaft flange and brake drum assembly as a stand.

(1) With output shaft assembly (K) in the upright position, lubricate output shaft thrust washer (E) with Automatic Transmission Fluid (Type "A" — Suffix "A") and place into position in the housing.

(2) 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 kickdown annulus gear snap ring (Fig. 63). Clearance limits are as close to zero as possible. Snap rings are available in the following thicknesses: — .060" to .062" and .064" to .066". **When checking clearance, support annulus gear on edge of bench so intermediate shaft will seat properly in gear. Make sure snap ring seats properly.**

(3) Place intermediate shaft assembly (D) in output shaft housing (K).

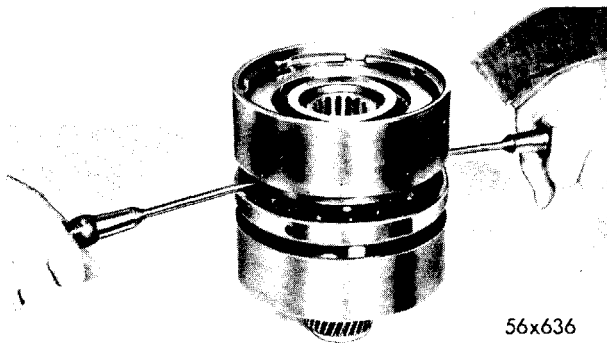


A—SUN GEAR THRUST WASHER  
 (same as output shaft thrust washer)  
 B—SUN GEAR REAR CLUTCH SEAL RING  
 C—SUN GEAR ASSEMBLY  
 D—REVERSE BAND SNAP RING  
 E—REVERSE PLANET PINION CARRIER ASSEMBLY  
 F—OVER-RUNNING CLUTCH HUB ASSEMBLY  
 G—LOW AND REVERSE BAND DRUM

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. 64—Unit No. 2 Disassembled View**



**Fig. 65—Removing Rear Clutch Piston Retainer Assembly from Sun Gear**

56x636

(4) Place carrier assembly (F) in position in kick-down annulus gear (J). Make sure thrust washer (G) remains in position.

(5) Place thrust plate (C) on carrier. Be sure thrust plate pilot enters bore in pinion carrier.

(6) 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.

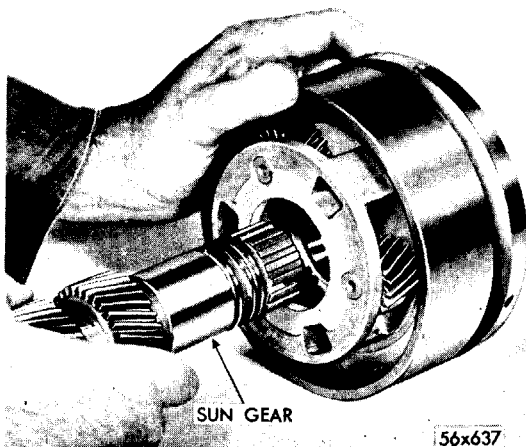
(7) Lubricate and install roller type sun gear thrust washer (H) over the intermediate shaft and into position against the upset flange of the shaft.

**72. 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 the unit pertain to Figure 64.

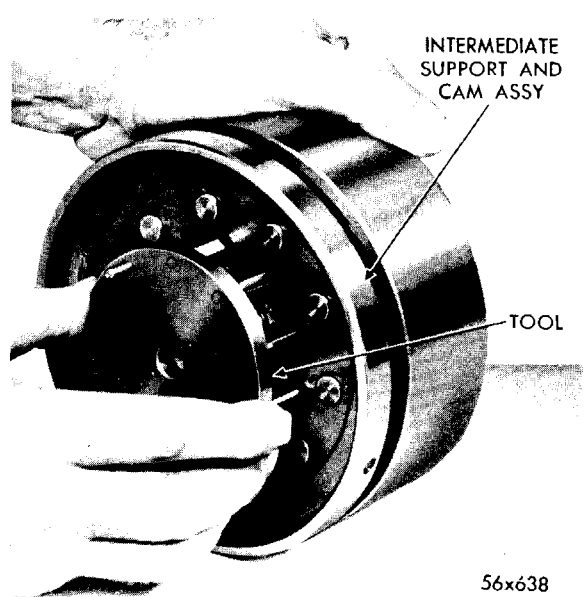
(1) With unit setting in upright position, remove sun gear and front clutch thrust washer (A).

(2) Using two screw drivers, inserted between clutch and intermediate support, remove rear clutch retainer



**Fig. 66—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)**

56x637



**Fig. 67—Installation of Tool C-3527 in Intermediate Support and Cam Assembly**

56x638

assembly from sun gear, as shown in Figure 65.

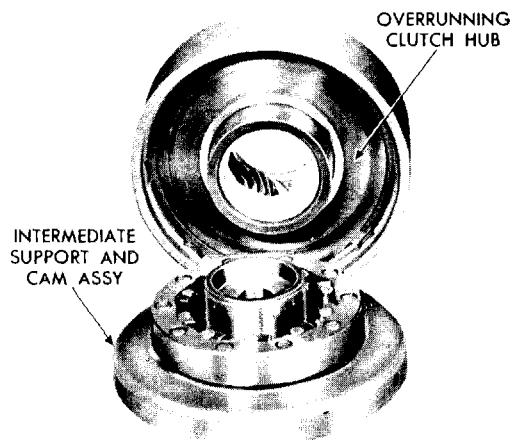
(3) Remove the two rear clutch seal rings (neo prene) from sun gear and remove the reverse sun gear from overrunning clutch and reverse planet pinion carrier assemblies, Figure 66.

(4) Install gauge, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 67. Remove intermediate support and cam assembly from overrunning clutch hub, Figure 68.

(5) Using a screw driver, remove snap ring (D) from low and reverse band drum assembly (G).

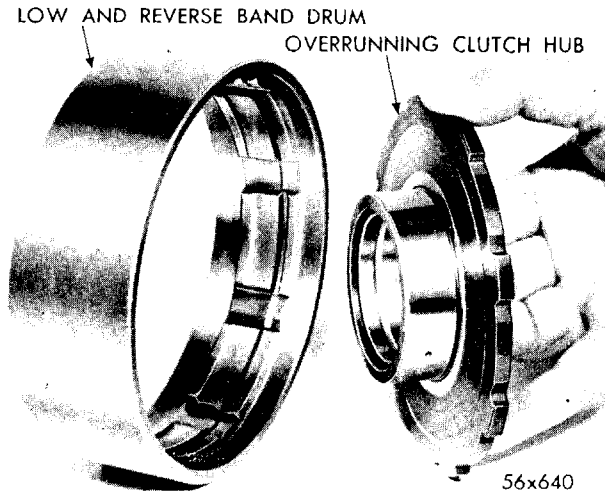
(6) Remove the low and reverse planet pinion carrier assembly (E) from reverse band drum.

(7) Remove overrunning clutch hub assembly from

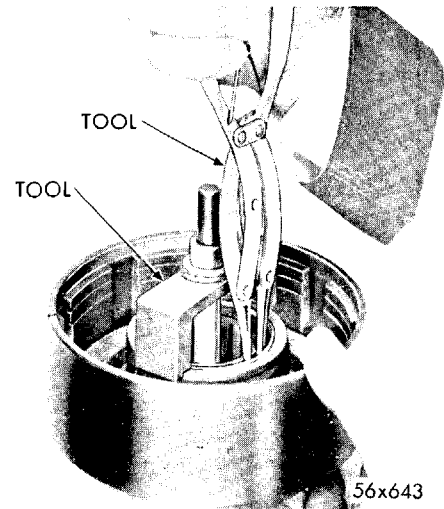


**Fig. 68—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch**

56x639



**Fig. 69—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum**



**Fig. 71—Removal and Installation of Rear Clutch Spring Retainer Snap Ring**

reverse band drum, Figure 69.

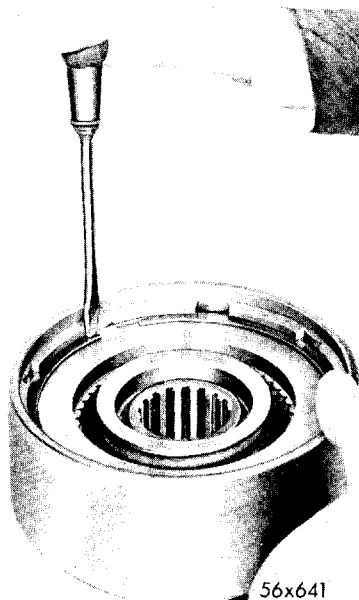
(8) Remove overrunning clutch cam roller springs (H) and rollers (I) (ten each) by removing gauge, Tool C-3527, from intermediate support and cam assembly. **Have assembly over bench when removing tool.**

### 73. REAR CLUTCH PISTON RETAINER ASSEMBLY - DISASSEMBLY

(1) Using screw driver, remove snap ring (large) from rear clutch piston retainer assembly, (Fig. 70).

(2) Remove rear clutch pressure plate (L) from retainer assembly.

(3) Invert clutch piston retainer assembly and re-



**Fig. 70—Removal and Installation of Rear Clutch Piston Retainer Snap Ring**

move the clutch plates (H) and driving discs (M) from assembly.

(4) Using compressor, Tool C-3575, slightly compress the rear clutch piston return spring retainer, as shown in Figure 71. **Use extreme care not to damage piston return spring retainer by compressing the spring too far.**

(5) Remove piston return spring retainer snap ring with parallel jawed snap ring pliers, Tool C-3301.

(6) Release compressor carefully, Tool C-3575, and remove 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.**

(7) Using a twisting motion, remove the clutch piston assembly (R) from retainer. Remove the inner and outer (S. & T.) seal rings from piston.

### 74. CLUTCH DRIVING DISC AND PLATE INSPECTION

Inspect driving disc for evidence of burning, glazing and flaking off of facing material. Check discs by scratching facings with finger nail; if material collects under nail, 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, or damaged driving lugs; replace if necessary.

### 75. 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. 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.

### 76. 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 (break-away) 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 been contacting the rear clutch piston retainer. **Do not machine the piston retainer in a lathe to remove score marks.**

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

### 77. REAR CLUTCH PISTON RETAINER ASSEMBLY

(1) Lubricate and install inner piston seal ring (T) on hub of clutch retainer. **Make sure that lip of seal is facing down and seal is properly seated in groove.**

(2) Lubricate and install outer seal ring (S) on clutch piston (lip of seal toward piston head).

(3) Place piston assembly (R) in clutch retainer (U) and with a twisting motion, seat piston in bottom of retainer.

(4) Install piston return spring on hub and position spring retainer and snap ring on spring.

(5) Using compressor, Tool C-3575, compress the clutch spring sufficiently to permit the snap ring to enter the groove in the hub and snap the ring in place as shown in Figure 71. Piston spring retainer may require guiding past the clutch hub. **Make very sure the snap ring is properly seated.**

(6) Remove compressor, Tool C-3575.

(7) Lubricate all clutch plates and drive discs with Automatic Fluid (Type "A" — Suffix "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.

**The number of discs and plates vary according to the engine and transmission equipment. The rear clutch pistons are of various thicknesses. Therefore, the correct piston must always be used with the number of discs and plates.** As an example, if a five plate piston is

used with a four pack disc and plate combination excessive slippage of the clutch will result.

(8) Install pressure plate (L) and snap ring (K). Make sure ring is properly seated.

### 78. 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 scores. Inspect rear clutch seal ring groove 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. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

### 79. INTERMEDIATE SUPPORT AND CAM ASSEMBLY - INSPECTION

Inspect riveting of cam to intermediate support. Inspect cam roller surface for brinnelling. 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, scoring or 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.

### 80. 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 carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed and tight. **Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly. Scuffing of the carrier does not affect its operation and the carrier should not be replaced for this reason alone.**

### 81. LOW AND REVERSE BAND DRUM INSPECTION

Inspect the band contacting surface for deep scratch-

es 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.

## 82. OVERRUNNING CLUTCH HUB ASSEMBLY INSPECTION

Inspect cam roller contacting surface for brinelling. 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.

## 83. UNIT NO. 2 — (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH AND REAR CLUTCH RETAINER) ASSEMBLY (FIG. 64)

(1) Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, Figure 69.

(2) Place low and reverse planet pinion carrier assembly (E) in position in low and reverse band drum (G).

(3) With drum supported, select snap ring to give minimum clearance. Snap rings are available in three thickness: .060 - .062, .064 - .066, and .068 - .070 inch.

(4) Place Tool C-3527, in position in intermediate support and cam assembly, and install cam spring and rollers, as shown in Figure 72. **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.**

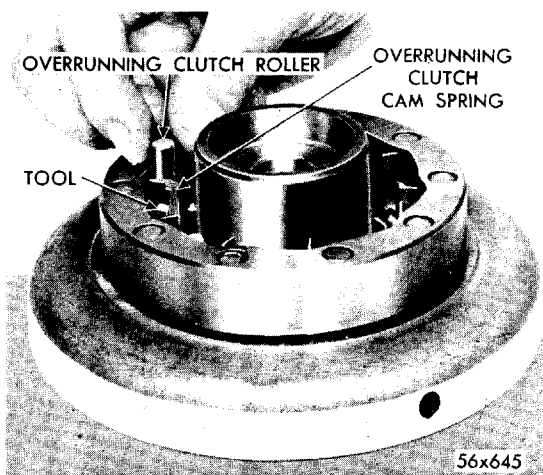


Fig. 72—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

(5) With intermediate support and cam assembly resting on bench, lubricate bushing and install low and reverse band drum assembly over hub.

(6) While holding the two assemblies together, remove Tool C-3527. Lubricate bearing surface on reverse sun gear and install intermediate support and planet pinion carrier assembly.

(7) Lubricate the two sun gear rear clutch seal rings (neoprene) and install on reverse sun gear.

(8) Install rear clutch piston retainer assembly on reverse sun gear. **To prevent personal injury, do not place fingers under the clutch retainer assembly when installing.**

(9) Install the front clutch and sun gear thrust washer (A). Lubriplate may be used to hold the thrust washer in position.

## 84. 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 73.

(1) Remove input shaft fiber thrust washer (A).

(2) Remove snap ring (B) and lift input shaft (C) from retainer (R).

(3) Invert retainer (R), remove driving discs (D), plates (E), pressure plate (F), and hub (G).

(4) Install compressor, Tool C-3575 and compress spring retainer (I).

(5) Use pliers, Tool C-3301 to remove spring retainer snap ring (H).

(6) Slowly release spring pressure and remove compressor.

(7) Remove spring retainer (I), spring (J), levers (L), lever retainer (K), and cushion spring washer (M), and cushion spring (N) from retainer (R).

(8) With a twisting motion, remove piston (Q) from retainer (R).

## 85. INPUT SHAFT REACTION SHAFT AND FRONT CLUTCH - INSPECTION

### Cleaning and Inspection

Clean clutch discs with clean, damp wiping cloths. Clean metal parts in kerosene, mineral spirits or similar solvents. Blow solvent through oil passages with compressed air until clean.

(1) Inspect input shaft thrust washer (A) for cracks or excessive wear. Inspect shaft (C) lugs for nicks and burrs. Splines should be smooth, without scratches, nicks, or burrs. Bushing should be smooth, free from scratches and excessive wear. **Do not unlock or remove rings except for replacement unless condition warrants.** Seal rings should have sharp, un-

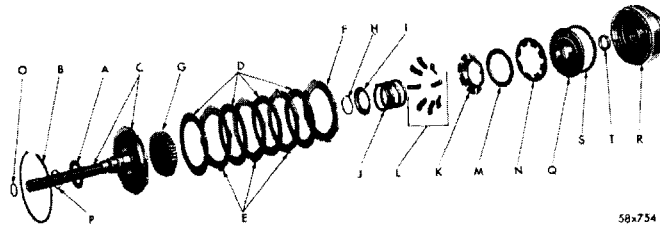


Fig. 73—Front Clutch (Disassembled View)

broken edges and unbroken lock ends. Side clearance should not exceed .005 inch. The outer surface should show no evidence of wear.

(2) Do not remove the reaction shaft for inspection. Inspect splines for nicks, burrs and uneven excessive wear. Inspect inner bore. Input shaft seal ring contact area should not be worn. Thrust washer contact area on end of shaft should be smooth and unmarked.

(3) Inspect driving discs (D) for flaking, glazing, burning and excessive wear (grooves not evident). Spline teeth should slide freely on driving disc hub splines (G).

(4) Steel clutch plates (E) and pressure plate (F) should be smooth and lugs should slide freely in piston retainer (R).

(5) Inspect snap ring (H), spring retainer (I), and return spring (J) and lever retainer (K) for distortion, breakage and cracks.

(6) Inspect levers (L), cushion spring (N) and cushion spring washer (M) for wear, distortion or evidence of scoring.

(7) Inspect piston (Q) and piston retainer (R). Remove any nicks, burrs or light score marks with crocus cloth. Check ball in retainer must operate freely. Inspect piston seal rings (S and T) for deterioration, nicks, distortion, or excessive wear.

## 86. INPUT SHAFT AND FRONT CLUTCH (UNIT NO. 3) - ASSEMBLY (FIG. 73)

(1) Lubricate and install new rubber seal ring (T) in hub groove of retainer (R) with lip of seal toward rear of retainer.

(2) Lubricate and install new outer seal ring (S) on piston (Q) with lip of seal toward rear of piston.

(3) Using a twisting motion, seat the piston in bottom of retainer.

(4) Place cushion spring (N) on piston with cupped (concave) side toward piston.

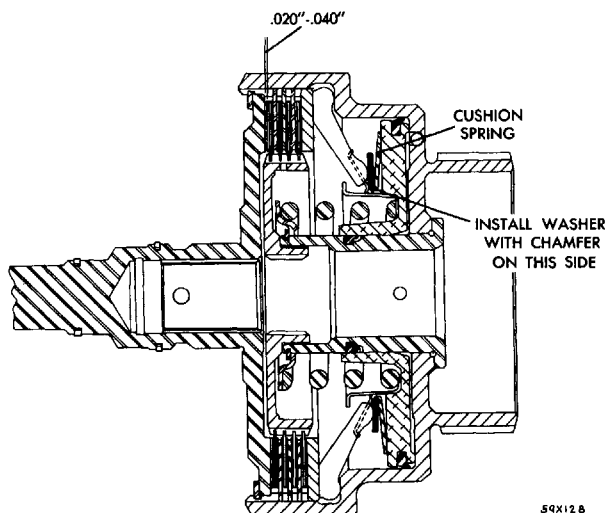


Fig. 74—Cushion Spring Washer Position

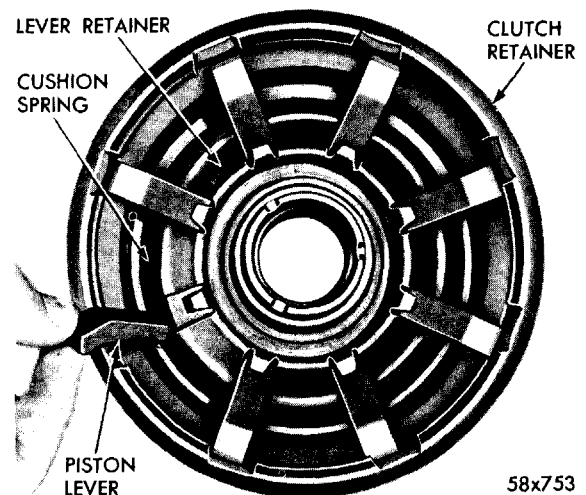


Fig. 75—Installing Piston Levers

(5) Place cushion spring washer (M) on cushion spring with chamfer up, toward front on assembly (Fig. 74).

(6) Place lever retainer (K) on piston hub and install levers (Fig. 75).

(7) Position return spring (J), retainer (I) and snap ring (H) on retainer hub. Use Tool C-3575 to compress spring sufficiently to seat snap ring in groove with pliers C-3301 and then remove compressor. **Be very sure snap ring is properly seated.**

(8) Install plate (F) (smooth side up) in retainer and then install discs (D) and plates (E) alternately.

(9) Check clutch travel (free play for complete disengagement). Using the truck transmission front clutch spacer plate, Part Number 1824319, as a special tool, place the spacer against shoulder in retainer above the top clutch disc. Clearance between tool and top disc should be .020" to .040".

Clutch discs are available in three thicknesses: .060 - .063, .073 - .076, and .087 - .090 inch. Usually, it will only be necessary to replace the top plate to provide clearance within this range. When proper clearance is obtained, remove tool.

(10) Install clutch hub (G) and input shaft (C) in retainer and install snap ring (B).

(11) Install thrust washer (A) over input shaft, against flange of shaft.

## SERVOS, BANDS AND MISCELLANEOUS INSPECTION

### 87. BAND - INSPECTION

All letters referred to in inspection of these parts pertain to Figure 76. 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 and the lining is of a different composition. Therefore, it should be identified to prevent improper installation.

### 88. LEVER ASSEMBLIES - INSPECTION (FIG. 76)

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.

### 89. REVERSE SERVO PISTON ASSEMBLY — INSPECTION (FIG. 76)

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.

### 90. KICKDOWN PISTON ASSEMBLY — INSPECTION (FIG. 76)

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 (FF, 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.

### 91. ACCUMULATOR PISTON AND SPRING — INSPECTION (FIG. 76)

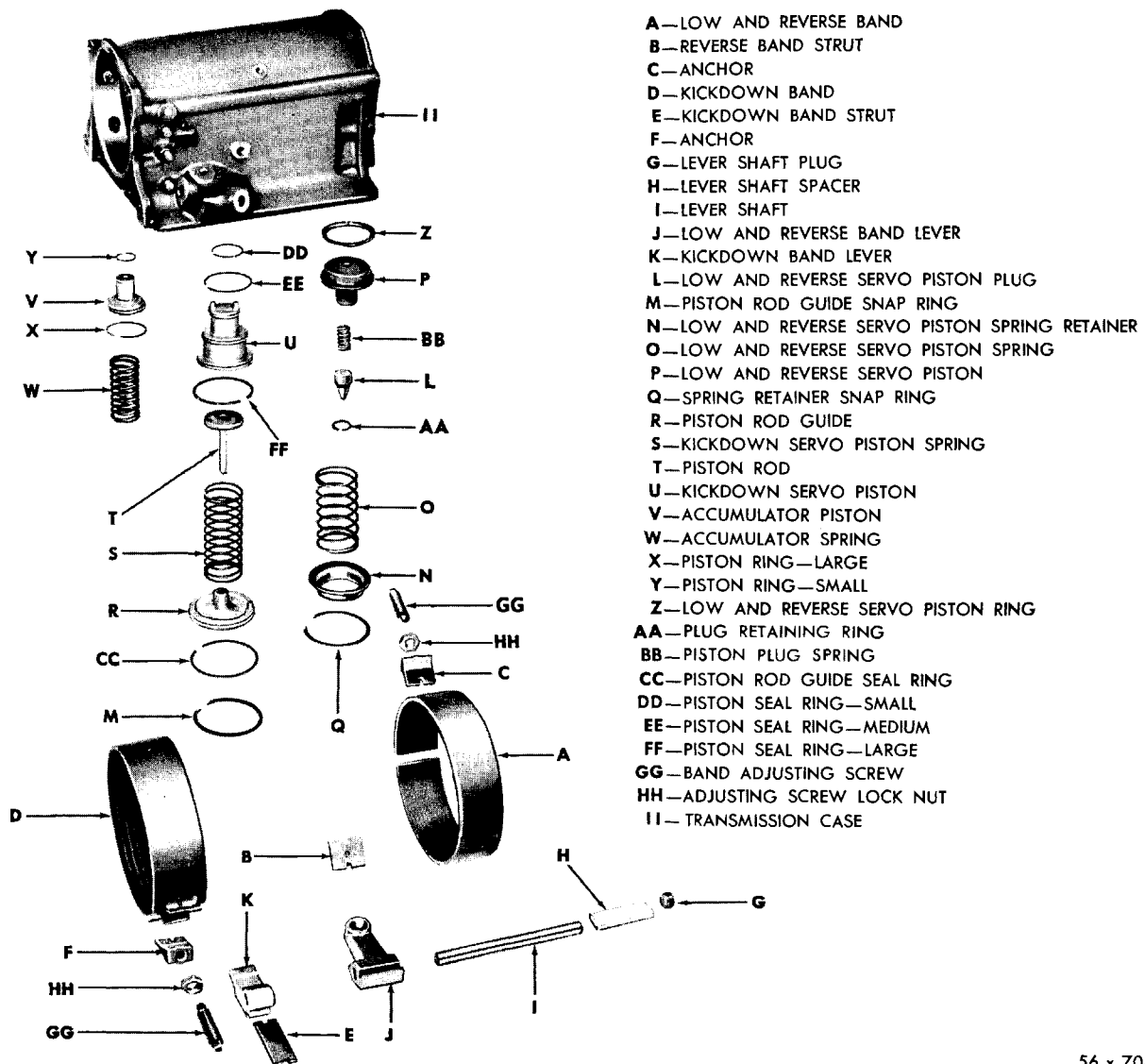
Inspect the two seal rings (X and Y) (one interlocking) for wear or broken locks and make sure they turn freely in the grooves. It is not necessary to remove rings unless condition warrants. When replacing new interlocking seal rings, use extreme care so as not to damage interlocking portion of ring.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

### 92. DRIVE SLEEVE - INSPECTION

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 groove. It is not necessary to remove rings unless conditions warrant their replacement. Inspect driving lugs for excessive wear and bearing surface on outer diameter for nicks, burrs, or deep scratches.

### 93. FRONT OIL PUMP - INSPECTION AND OIL SEAL REPLACEMENT

Inspect front oil pump housing outer seal (on circumference of housing) and front oil seal for deterioration and hardness. Do not remove front oil seal from housing unless inspection reveals that it is necessary.



56 x 708 B

Fig. 76—Servos and Bands (Disassembled View)

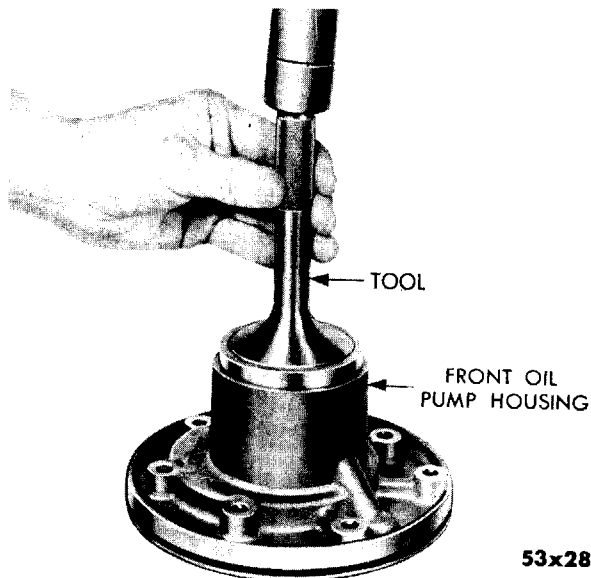
To remove oil seal, use a brass drift and drive seal out of housing. With new seal lip towards rotor bore (metal portion of seal down), use driver, Tool C-3278 and drive seal until tool bottoms on face of housing, as shown in Figure 77. Inspect drive sleeve seal ring contacting surface in housing for wear and scratches. Inspect steel back bronze type bushing in bore for deep scratches or scoring and excessive wear. (Bushing and housing are serviced as an assembly). Remove oil pump rotors and inspect rotor contacting surfaces for scratches, burrs, or grooving.

Inspect regulator valve 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 straight edge, Tool C-3335 and feeler gauge check clearance between pump housing face and face of rotors, as shown in Figure 78. Clearance limits are from .001" to .0025". After checking pump gear clearance, lubricate pump rotors with Automatic Transmission Fluid (Type "A" - Suffix "A").

Measure the tip clearance between the rotor lobes. The manufacturing limits are .005 to .010 inch. Replace the rotors if this clearance exceeds .012 inch. Measure





**Fig. 77—Installing Front Pump Housing Oil Seal**

the clearance between the outer rotor and pump housing bore. The manufacturing limits are .008 inch (maximum). Replace the rotors or pump housing if this clearance exceeds .010 inch.

#### 94. REGULATOR VALVE BODY AND VALVES INSPECTION

Place body and valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect the reaction 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 and 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 No. 400 or finer, grit wet or dry sand paper. 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.

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. 56). Place assembly on a clean surface and cover with a paper towel (lint free) 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 freedom and pulled threads.

### ASSEMBLY OF UNITS IN TRANSMISSION CASE

#### 95. TORQUE CONVERTER REACTION SHAFT — INSTALLATION

If the torque converter reaction shaft was removed, reinstall it as follows:

(1) Using heat lamps, steam or hot water, heat front of transmission case to approximately 170 to 190 degrees F. (very hot when touched by fingers). If steam or hot water are used, be sure case and passage ways are all thoroughly dried out with compressed air.

(2) Install guide studs, Tool C-3283, in front face of reaction shaft flange. Lubricate portion of reaction shaft that presses into case and then position into front of transmission case so that guide studs in shaft align with threaded holes in case.

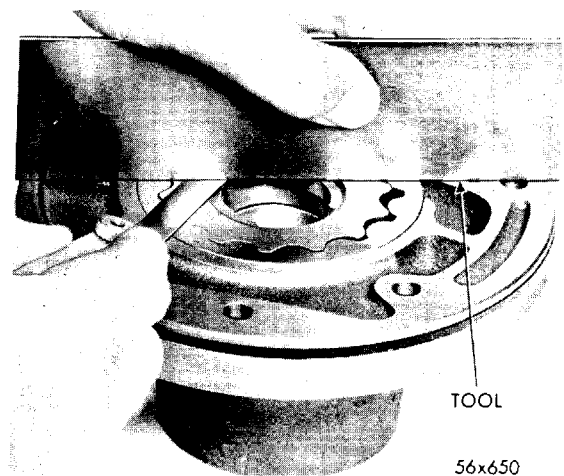
(3) Using Tool C-3531, press reaction shaft into place, as shown in Figure 57. Remove the guide studs and install the bolts and washers. Draw bolts down evenly to prevent any possible misalignment of shaft in case and tighten to 30-35 foot-pounds torque.

(4) Lubricate torque converter reaction shaft seal (neoprene) and install on shaft.

#### 96. REGULATOR VALVE BODY — INSTALLATION

(1) Install guide studs, Tool C-3288, as shown in Figure 55.

(2) Install regulator valve body gasket over guide studs into position on transmission case and with a



**Fig. 78—Checking Clearance between Front Pump Body and Gears**

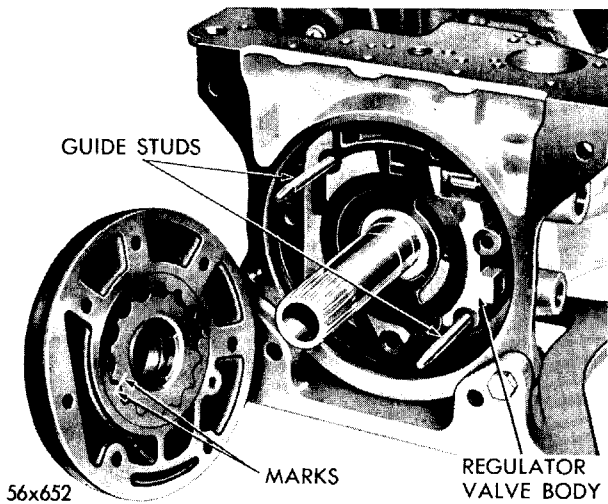


Fig. 79—Installing Front Oil Pump Assembly

rotating motion install torque converter and regulator valves into the regulator valve body (centering tool hole in ends of valves goes towards outside). Be sure front and rear pump check valve is in proper position in regulator valve body. Fig. 56.

(3) With (neoprene) seal ring in position on reaction shaft slide regulator valve body over shaft and guide studs into position against case.

### 97. FRONT OIL PUMP ASSEMBLY INSTALLATION

(1) With inner and outer seals lubricated and pump rotors in position in housing (Fig. 79) (counterbore in pinion gear facing down as identified when removed), place oil pump housing over studs and slide into position.

(2) Start the bolts and aluminum sealing washers and draw down evenly until housing is seated into

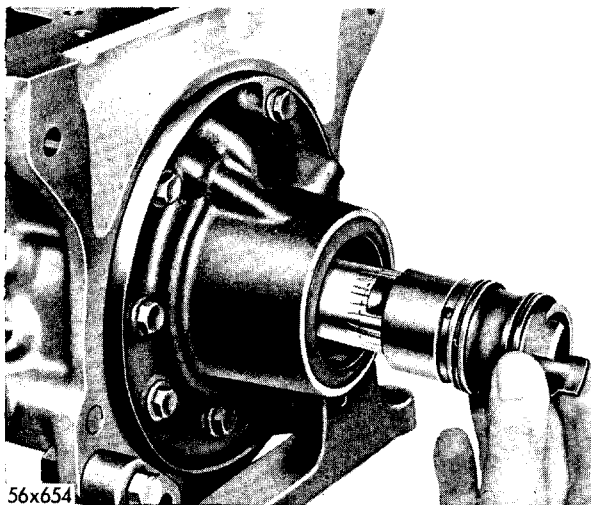


Fig. 80—Installing Front Oil Pump Drive Sleeve

transmission case. Remove the guide studs and install the remaining bolts and washers and tighten to 14-16 foot-pounds or torque. **Improper tightening of these bolts may cause pump gears to bind.**

(3) Lubricate front pump drive sleeve. With a slight rotating back and forth motion install sleeve (smooth bearing surface first) being sure the drive lugs engage in the oil pump inner rotor and can be rotated freely, Fig. 80. **The main body of driving sleeve should be flush with oil pump housing when properly installed and the neoprene seal ring will not be visible. If rotors do not turn freely, remove the pump and check for foreign matter between pump rotors and housing. Fig. 81.**

(4) Install the torque converter control valve spring, retainer and gasket and tighten to 35-40 foot-pounds torque.

(5) Reinstall regulator valve spring, sleeve, cup, gasket and retainer (with adjusting screw and lock nut installed) and torque to 45-50 foot-pounds.

### 98. KICKDOWN PISTON - INSTALLATION

(1) Lubricate piston seal rings and install on kick-down piston.

(2) Compress outer ring and start assembly into

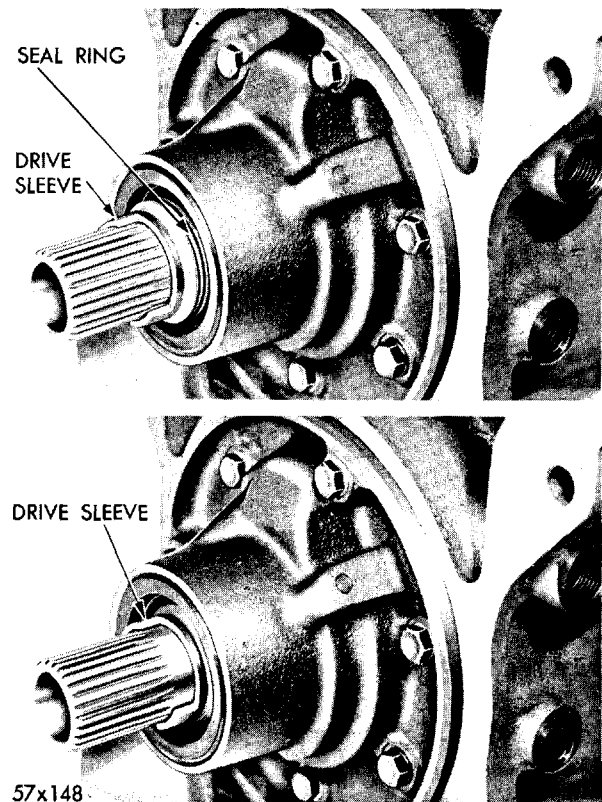


Fig. 81—Front Pump Drive Sleeve Installation — Incorrect Installation (Top View) — Correct Installation (Bottom View)

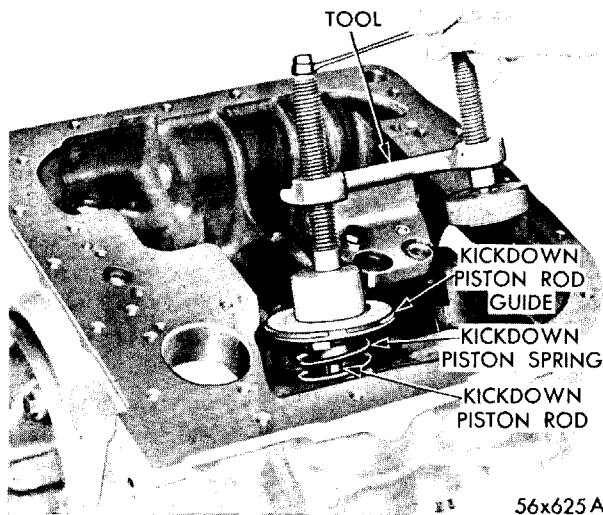


Fig. 82—Removal and Installation of Kickdown Piston Rod Guide and Spring

case. With piston properly centered so as not to damage rings, tap lightly until piston bottoms in case.

(3) Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod.

(4) Install Tool C-3529 or C-3289 (modified) on case and place kickdown piston rod guide over spring while guiding piston rod guide, as shown in Figure 82.

(5) Using extreme care, compress the kickdown piston spring to the point that the piston rod guide seal ring slightly binds on case and then work seal ring into position by gradually compressing spring, install snap ring and loosen compression portion of tool.

### 99. LOW - REVERSE SERVO PISTON — INSTALLATION

(1) 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 piston and secure with snap ring.

(2) Install piston assembly into transmission case then place reverse servo piston spring over piston and position spring retainer over spring. Using compressing tool for reverse servo piston installation, compress spring sufficiently to install snap ring. Spring retainer may require guiding into case, Fig. 83.

(3) Remove compressing tool.

### 100. KICKDOWN BAND — INSTALLATION

(1) Install the kickdown band assembly in same position as marked upon disassembly, by rotating band ends over center support in transmission case, as shown in Figure 46. **Use extreme care when installing bands to prevent damage to lining on edges of transmission case.**

(2) Install anchor on kickdown band adjusting screw.

### 101. LOW - REVERSE BAND - INSTALLATION

(1) Install anchor on reverse band adjusting screw.  
(2) Install band by rotating ends through rear opening in case, in same position as marked upon disassembly, as shown in Figure 44.

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

(1) Place levers in position in case as shown in Figure 47.

(2) Remove guide stud, Tool C-3288 from threaded end of shaft and install in case to hold levers, followed by spacer (flat) and plug. Tighten plug securely.

(3) Position kickdown band anchor over adjusting screw, compress band and install kickdown band strut.

(4) Position low-reverse band anchor over adjusting screw, compress band and with the aid of a screwdriver, install strut.

### 103. UNIT NO. 3 - (FRONT CLUTCH & 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:

Thickness	Color
.115" to .117"	Natural
.097" to .099"	Red
.078" to .080"	Black
.059" to .061"	Orange

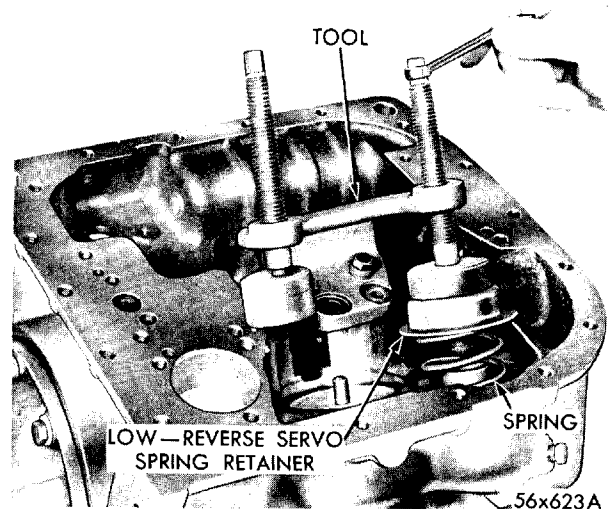


Fig. 83—Compressing Low and Reverse Servo Spring and Retainer

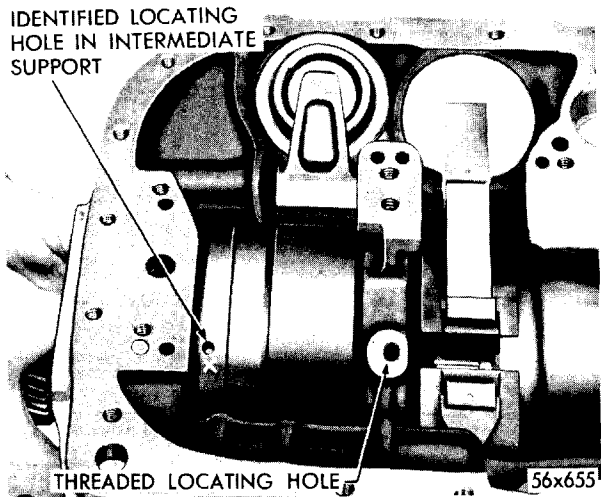


Fig. 84—Installing Unit No. 2

(1) Select the proper thickness thrust washer and position it on input shaft.

(2) With input shaft seal rings lubricated, start unit through rear of transmission case, as shown in Figure 43. By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

#### 104. UNIT NO. 2 - (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH AND REAR CLUTCH ASSEMBLIES) INSTALLATION

(1) Start unit through rear of transmission case.

(2) Align identified locating hole in intermediate support with threaded locating hole inside of transmission case, Fig. 84.

(3) By supporting and keeping unit centered as much as possible, guide it through bands until it contacts the hub of the front clutch. While pushing in on assembly, rock sun gear to engage clutch plates or rear clutch on hub of front clutch.

**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.**

(4) Install the intermediate support locating bolts and lockwashers and tighten to 25-30 foot-pounds torque. Check input shaft and sun gear for free rotation.

#### 105. 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 on the intermediate shaft.

(1) Install planet pinion carrier anti-scuff plate into position (pilot flange goes into inside bore of kickdown planet pinion carrier) against planet pinion housing and lubricate plate, seal rings and bearing surface on intermediate shaft.

(2) Place intermediate shaft in sun gear, as shown in Figure 40. Keeping unit centered as much as possible and while slowly turning output shaft, slide into position (large seal ring on output shaft must be flush with rear of transmission case).

**Use extreme care when installing to prevent damage to seal rings on intermediate shaft.** The application of lubricate on the rings, will aid in assembly.

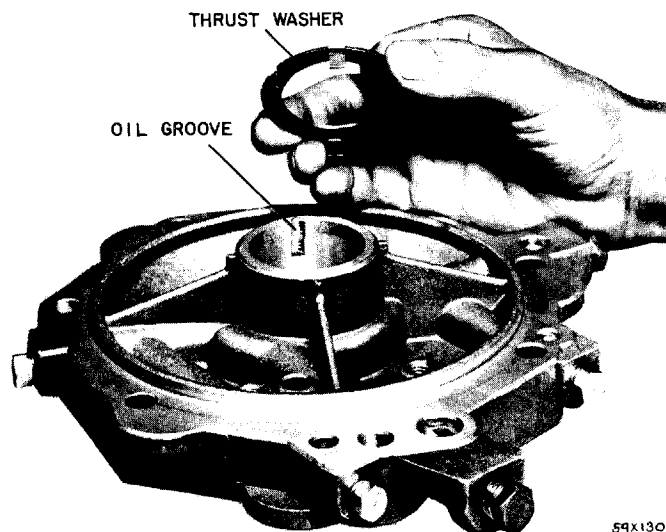


Fig. 85—Installing Thrust Washer on Output Shaft Support

## 106. OUTPUT SHAFT SUPPORT — INSTALLATION

(1) Position output shaft support thrust washer with the four tabs spaced between the webs on the front side of the output shaft support. Rotate the washer to find the location that will provide a minimum amount of rotation, Fig. 85. Lubriplate may be used to hold washer in place.

(2) 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.

(3) Lubricate output shaft seal rings. Install support over shaft and guide studs and position against transmission case, Fig. 39. Install one screw finger tight to hold the support in place. **Use care when installing support so as not to damage ring sealing surfaces.**

## 107. REAR OIL PUMP AND GOVERNOR ASSEMBLIES - INSTALLATION

**The oil pump gears were marked upon disassembly for ease of identification and should be reassembled in the same manner.**

(1) Place rear oil pump pinion ball in ball pocket in output shaft.

(2) 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 86.

(3) Lubricate rear oil pump gear and position in pump housing, rounded edge down.

(4) Slide rear oil pump and governor assemblies over output shaft and position against support, as shown in Figure 87. **There are two extra holes in housing which are used for vents. Make def-**

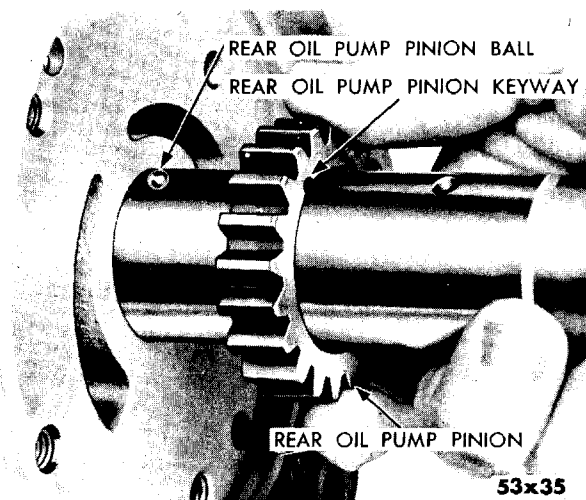


Fig. 86—Removal and Installation of  
Rear Oil Pump Pinion

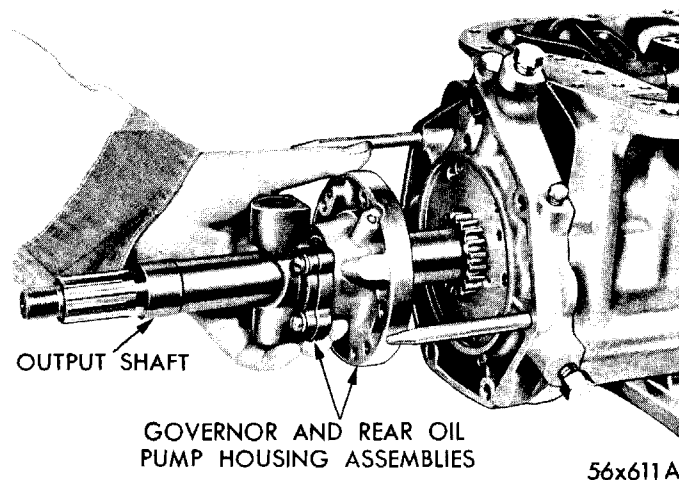


Fig. 87—Removal and Installation of  
Governor and Rear Oil Pump  
Housing Assemblies

**initely sure that no attempt is made to install bolts in these holes. Check each threaded hole before installing bolts.**

(5) Install the rear oil pump housing to output shaft support bolts. **These special bolts do not require washers.** Draw bolts down evenly and torque to 10-12 foot-pounds torque. **After bolts have been properly torqued, turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.**

## 108. GOVERNOR WEIGHTS AND VALVE ASSEMBLY - INSTALLATION

(1) Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten to 60-80 inch-pounds torque. If governor body has been removed, tighten the four governor body screws.

(2) 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. 88). and using pliers, Tool C-3229, install snap ring (Fig. 38) beveled side outward.

(3) Place the governor valve (small end up) on governor shaft, slide assembly into governor body through the output shaft and governor weight assembly (Fig. 37); at the same time positioning valve in body and then install the governor valve shaft snap ring (weight assembly end), (Fig. 36). **Make very sure snap rings on both ends of the governor valve shaft fit securely. 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. Check operation of**

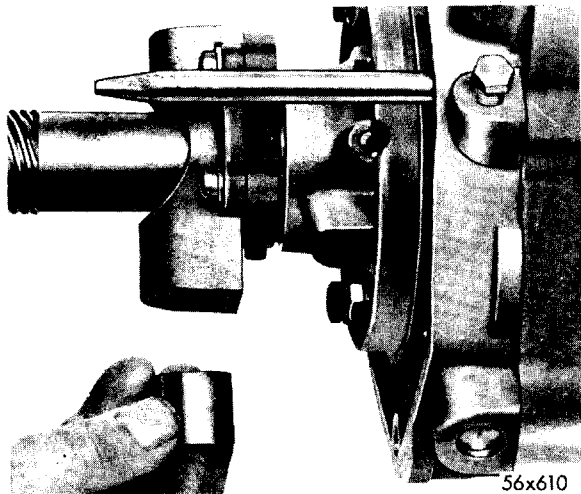


Fig. 88—Removal and Installation of Governor Weight Assembly

**governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.**

### 109. TRANSMISSION EXTENSION INSTALLATION

(1) Install new transmission extension gasket over guide studs and into position against output shaft support. **Do not use any sealing material on gaskets.**

(2) Place extension housing over output shaft and guide studs and slide into position against support being careful not to damage rear oil seal or bushing. Install the extension to case bolts and lockwashers and tighten to 25-30 foot-pounds torque. **After these bolts have been properly torqued, turn output shaft to make sure it turns freely.**

(3) Install speedometer drive pinion and sleeve assembly in transmission extension and tighten to 40-45 foot-pounds torque.

### 110. PARKING BRAKE - INSTALLATION

(1) Install anchor and retaining pin in the extension housing.

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

(3) Install brake support grease shield on extension housing.

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

(4) Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove.

(5) Slide the brake shoe return spring behind the grease shield spring and hook into position, as shown in Figure 89.

(6) Install "C" type brake anchor washer.

(7) Install propeller shaft flange and drum assembly, washer and nut. While holding flange with Tool C-3281, tighten to 175 foot-pounds torque.

### 111. 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 34.

(1) Install dial indicator and pry clutch forward by carefully inserting screwdriver between the front and rear clutch.

(2) Remove screwdriver and with point of dial indicator, contacting edge of front clutch retainer, set indicator to zero.

(3) Pry 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 to allow an input shaft thrust washer of proper thickness to be installed by the following additional steps:

(4) Remove the bolts from transmission extension and install guide studs, Tool C-3283.

(5) As a complete assembly, remove the hand brake, extension, output shaft support and Unit No. 1, as shown in Figure 90. **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.**

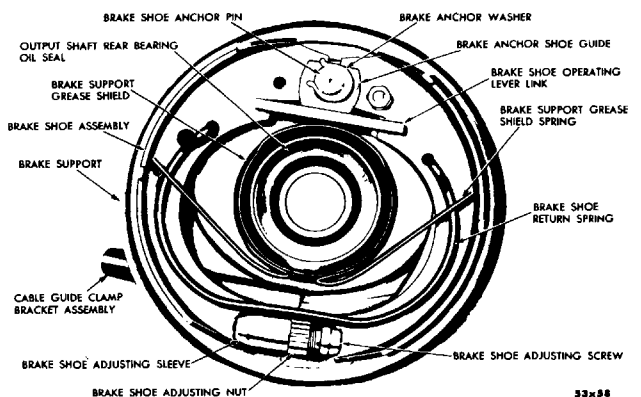
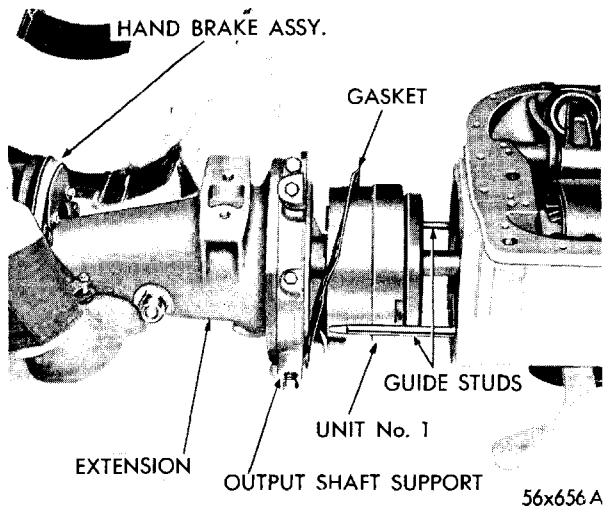


Fig. 89—Internal Expanding Hand Brake (Drum Removed)



**Fig. 90—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an assembly**

(6) Using a micrometer, measure the thickness of the input shaft thrust washer and select a washer that will provide correct clearance. Thrust washers are available in the following thicknesses:

Thickness	Color
.115" to .117"	Natural
.097" to .099"	Red
.078" to .080"	Black
.059" to .061"	Orange

(7) Reinstall power train units. Refer to "Power Train Units — Installation"; Unit No. 3 and Unit No. 2.

(8) 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.

(9) Install the extension housing bolts and lockwashers (remove guide studs and replace with remaining bolts and lockwashers) and then tighten all extension housing bolts to 25-30 foot-pounds torque.

(10) Rotate output shaft to make sure it turns freely and then recheck front clutch end clearance.

## 112. BAND ADJUSTMENTS

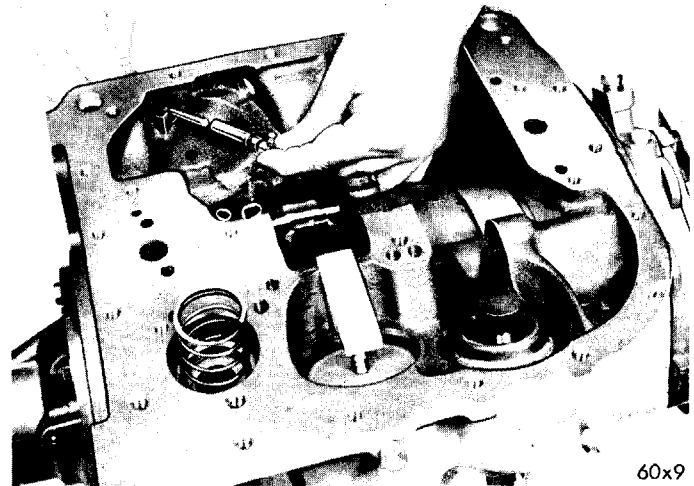
Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counter-clockwise direction to center bands on retainers prior to making band adjustments.

### Low-Reverse (Rear) Band

Refer to "Maintenance Adjustments Test", Paragraph 8.

### Kickdown (Front) Band

Refer to "Maintenance, Adjustments and Tests"; Paragraph 8.



**Fig. 91—Installing Cable Adapter**

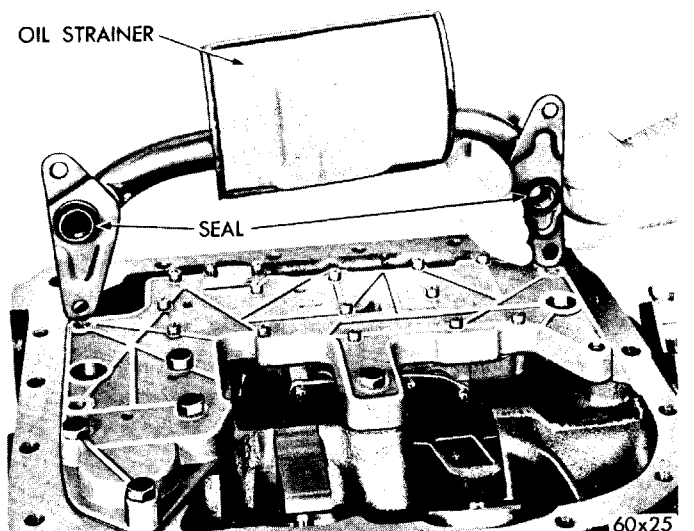
## 113. ACCUMULATOR PISTON - INSTALLATION

(1) Lubricate piston seal rings and place accumulator into position in transmission case. Compress outer seal ring and tap lightly into transmission case and then place accumulator piston spring down into accumulator piston.

## 114. VALVE BODY AND TRANSFER PLATE ASSEMBLY - INSTALLATION

(1) Check mating surfaces of valve body assembly for cleanliness. Place manual lever in the reverse position (all the way in).

(2) Using a suitable guide, such as a piece of welding rod, inserted through the push button cable opening in the transmission case, slide the cable adapter over the end of the guide, as shown in Figure 91, with



**Fig. 92—Installing Oil Strainer on Valve Body and Transfer Plate Assembly**

the adapter attaching stud facing toward the bottom of the transmission case.

(3) Place the valve body and transfer plate assembly into position on transmission case, and at the same time guiding the cable adapter stud into the hole in the manual control lever. Fig. 33.

(4) Install the cable adapter stud nut and tighten securely.

(5) Install the transfer plate bolts (leaving four holes vacant to attach oil strainer), draw down evenly and torque to 14-16 foot-pounds.

(6) With the sealing washers on ends of strainer tubes, place strainer in position on the transfer plate, install remaining bolts and torque to 14-16 foot-pounds, Fig. 92.

(7) Install neutral starter switch and sealing washer and torque to 15-20 foot-pounds. Make sure manual lever contacts switch plunger when in neutral position.

### 115. OIL PAN - INSTALLATION

Use a new gasket, install the oil pan and tighten bolts to 12-17 foot-pounds torque. Do not overtighten as a leak at the gasket may result due to possible distortion of flange of pan.

### 116. INSTALLING TRANSMISSION IN VEHICLE

(1) Install guide studs, Tool C-3276 in the two transmission mounting holes in right side of torque converter housing.

(2) 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. 81).**

(3) 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.

(4) 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.**

(5) 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.

(6) 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 bolts in insulator bracket with the holes in the rear spring mount plate. Install nuts and lockwashers, tighten to specifications.

(7) Remove support fixture, Tool C-3487 from side of frame member.

(8) Install radiator oil cooling lines. Connect neutral starting switch wire to switch. Install oil pan filler tube nut and tighten to specifications. Connect speedometer cable in housing extension. 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).

(9) 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 Paragraph 6. Tighten cable adjustable mounting bracket nut securely. Lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type 'A' Suffix 'A'). Adjust throttle linkage (Paragraph 9).

## RECONDITIONED VALVE BODY AND TRANSFER PLATE ASSEMBLIES

### 117. VALVE BODY - REMOVAL FROM TRANSFER PLATE AND DISASSEMBLY

To facilitate the reassembly of the valve body it is suggested that the valves, springs and plugs removed from one side of the valve body be kept separate from the parts removed from the other portion of the valve body. The parts used in this new one piece valve body are not interchangeable with those formerly used in the three-piece valve body.

(1) Place valve body and transfer plate assembly in stand, Tool C-3528, with the operating lever shafts in the downward position, as shown in Figure 93. **Never clamp any portion of any valve body assembly in a vise or use force when removing or installing valves and plugs.**

(2) Remove the blocker valve retainer, plate blocker valve and spring, Fig. 94.

(3) Remove the cross recess screws that hold the transfer plate, valve body and valve body cover together. All screws are of equal length. **When the last screw is removed, the valve body should be**



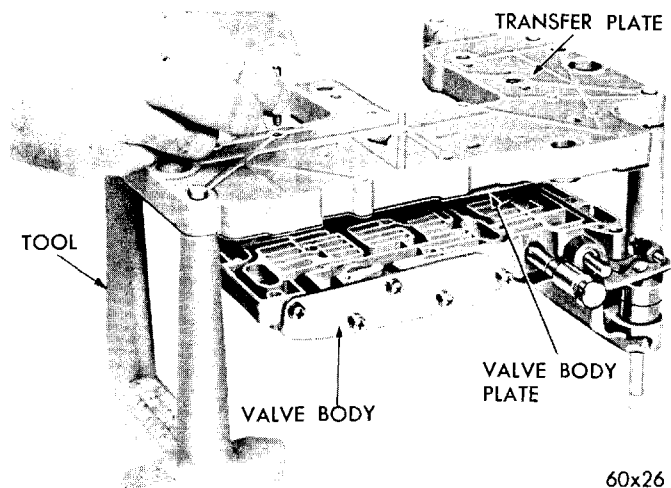


Fig. 93—Valve Body and Transfer Plate Assembly in Stand

held and lowered cautiously to prevent loss of any of the six ball check valves. Observe the location of these balls and then remove the balls. All check valve balls are the same size. Fig. 95.

(4) Remove the shuttle valve and governor plug cover plate (A) (larger of the two covers). Refer to Fig. 96.

(5) Remove the shuttle valve plug (B) and shuttle valve spring (C). Remove the snap ring (J) and slide out shuttle valve (I).

(6) Remove the 1-2 relay valve spring (D) and 1-2 relay valve (E).

(7) Remove 1-2 (F) and 2-3 (G) shift valve governor plugs.

(8) Remove the shift valve cover plate (L). **Hold cover plate while releasing the spring tension to prevent possible loss of springs while cover is removed.** Refer to Fig. 97.

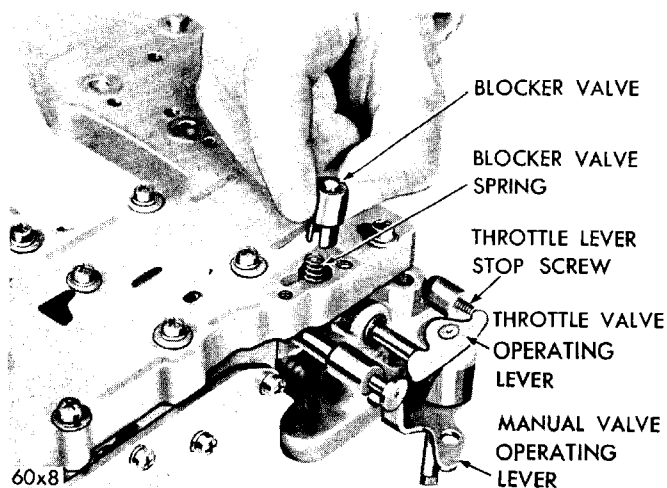


Fig. 94—Removal and Installation of Bleaker Valve

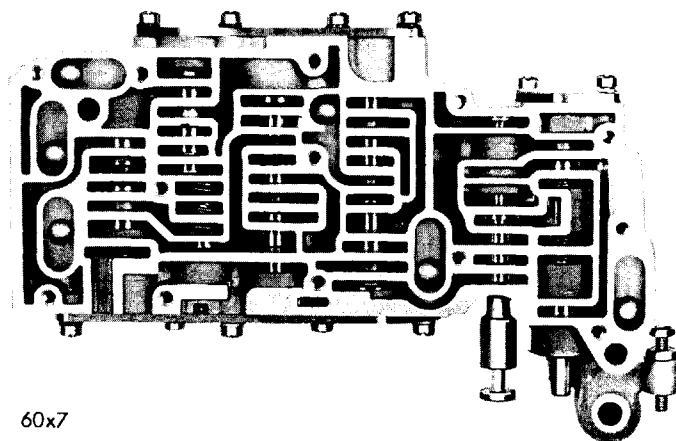


Fig. 95—Location of Check Valve Balls In Valve Body

(9) Remove 1-2 (M) and 2-3 (N) shift valve springs and valves (O-P).

(10) Remove the throttle compensating spring (O) and valve (R).

(11) Remove throttle valve cover plate (S), throttle valve (T), throttle valve spring (U), kickdown valve (V) and detent (W).

For general cleaning purposes it is not usually necessary to disassemble and remove the manual valve, manual valve lever, throttle operating lever, or the manual valve lever detent ball and spring. However, if it is deemed advisable to remove these parts, perform the following additional steps:

(12) Remove the throttle control lever shaft snap ring and while holding the manual valve operating lever detent ball against the spring to prevent loss of ball and spring, slide out throttle and manual valve levers. Remove detent ball and spring, Fig. 94.

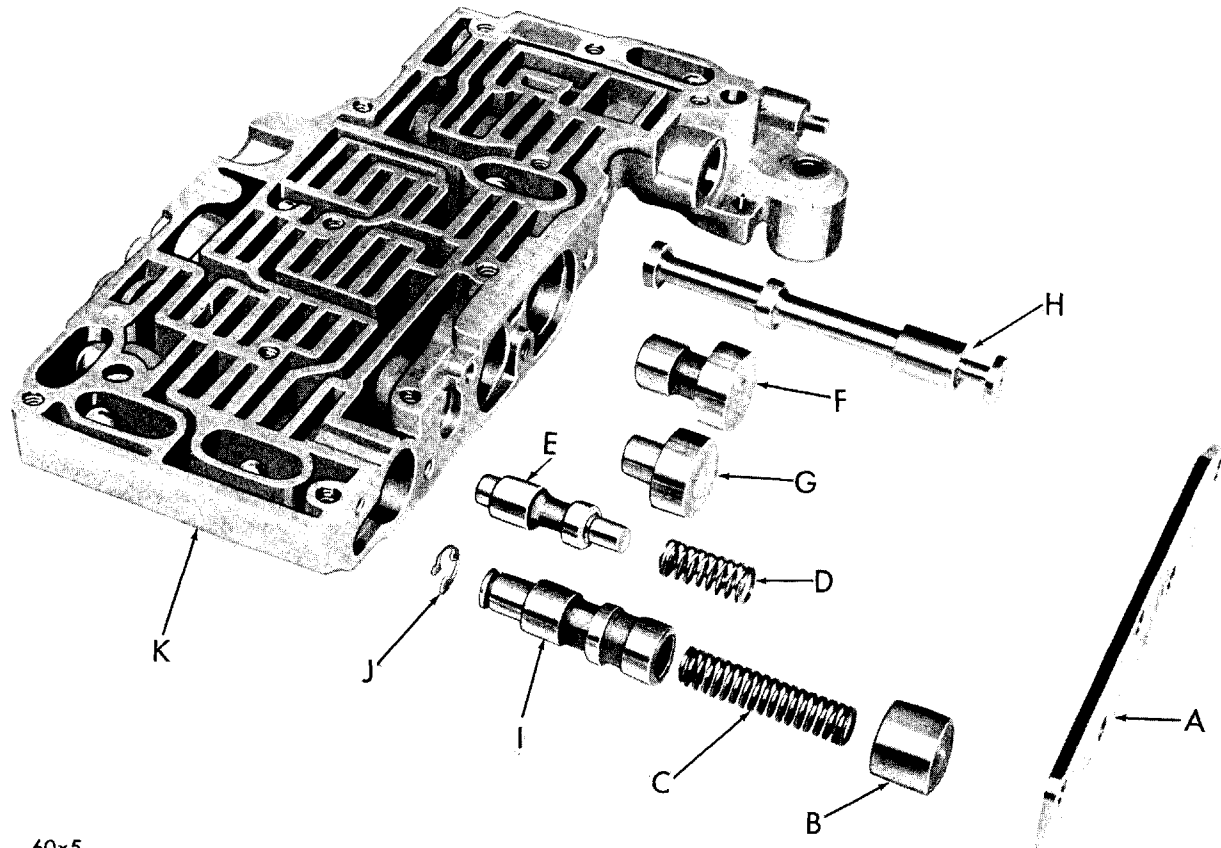
(13) Carefully slide manual valve out of valve body.

(14) Remove blocker valve plate, spring and valve Fig. 94.

### 118. VALVE BODY, VALVE BODY PLATE AND TRANSFER PLATE - 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. When inspecting, also check for porous castings. Inspect all mating surfaces for burrs, nicks and grooves. Small ones may be removed with very fine wet or dry sand paper (400 grit); otherwise, damaged parts must be replaced. Using straight edge, Tool C-3335, check all mating surfaces for distortion.

Using a pen light, inspect bores in valve body for score marks, pits, and irregularities. Inspect all springs



60x5

Fig. 96—Shuttle and Relay Valve Side of Valve Body

A. Shuttle Valve and Governor Plug Cover  
 B. Shuttle Valve Plug  
 C. Shuttle Valve Spring  
 D. 1-2 Relay Valve Spring  
 E. 1-2 Relay Valve

F. 1-2 Shift Valve Governor Plug  
 G. 2-3 Shift Valve Governor Plug  
 H. Manual Valve  
 I. Shuttle Valve  
 J. Shuttle Valve Snap Ring  
 K. Valve Body

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 as it 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 clean and dry.

Inspect the valve body plate for nicks, scratches, or burrs; and make sure metering holes are open. Inspect transfer plate for porosity. Inspect machined surfaces for nicks and burrs.

The throttle operating lever stop screw should be inspected for being loose or worn. Be sure lock nut is tight. **This screw should never be removed or its position changed. It is pre-set and controls the base throttle pressure setting. Should it become loose it will require readjustment with a special service tool.** Refer to Paragraph of this manual for adjustment procedure.

Inspect the manual and throttle valve operating lev-

ers and shafts for being bent, worn, or the levers loose on their shafts. If bent or worn they should be replaced. If levers are loose on shafts, they may be silver soldered **only**, otherwise replaced.

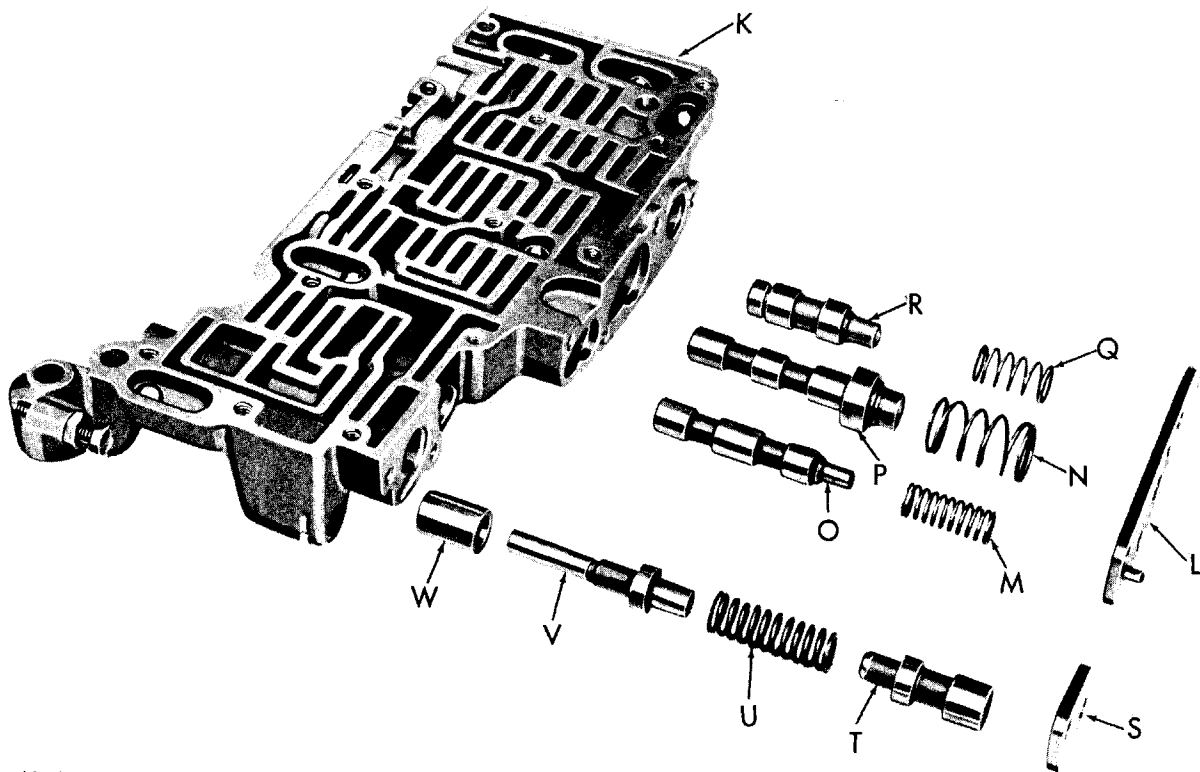
All valves should be installed dry and with a rotating motion.

### 119. VALVE BODY, VALVE BODY PLATE AND TRANSFER PLATE - ASSEMBLY

(1) While holding the valve body, with the oil passage ways facing downward, insert the manual valve operating lever detent spring into the valve body recess followed by the detent ball. Hold ball against the spring with fingers to prevent loss.

(2) Slide throttle lever shaft up through valve body with smallest cam contacting the end of throttle lever stop screw, as shown in Figure 94.

(3) While continuing to hold detent ball against spring, slide manual operating lever down over throttle valve shaft at the same time index the arm on the lever into the end groove of the manual valve. The detent notches in lever should slide down against the detent ball.



60x6

**Fig. 97—Shift and Throttle Valve Side of Valve Body**

L. Shift Valve Cover Plate  
 M. 1-2 Shift Valve Spring  
 N. 2-3 Shift Valve Spring  
 O. 1-2 Shift Valve  
 P. 2-3 Shift Valve  
 Q. Throttle Compensating Valve Spring

R. Throttle Compensating Valve  
 S. Throttle Valve Cover  
 T. Throttle Valve  
 U. Throttle Valve Spring  
 V. Kickdown Valve  
 W. Kickdown Valve Detent

(4) Reinstall snap ring over throttle lever shaft. Rotate manual lever to see that detent and valve operate freely.

(5) Refer to Figure 97. Slide kickdown detent (W) (counterbored end first) over machined end of kickdown valve (V), and then slide assembly (W-V), detent end first, into valve body. Install throttle valve spring (U) into valve body followed by throttle valve (T), spring pilot end first. Install throttle valve cover plate (S) and torque screws to 25-30 inch pounds.

(6) Install the 1-2 and 2-3 shift valves (O-P) with the spring pilot ends pointed outward followed by springs (M-N).

(7) Install throttle compensating valve (R) with spring pilot end outward followed by throttle compensating pressure spring (Q).

(8) Install shift valve cover plate (L) and tighten screws to 25-30 inch pounds torque.

(9) Turn valve body over and refer to Fig. 96. Install shuttle valve (I), small end first into valve body and install snap ring (J). Snap ring should be replaced if it does not fit securely.

(10) Install shuttle valve spring (SC) followed by shuttle valve plug (B).

(11) Insert 1-2 relay valve (E), spring pilot end outward, followed by relay valve spring (D) into valve body.

(12) Install 1-2 and 2-3 shift valve governor plugs (F-G).

(13) Place shuttle valve and governor plug plate cover (A) on valve body and tighten screws 25-30 inch pounds torque.

(14) Place the six ball checks in their respective positions in the valve body, as shown in Figure 95.

(15) Set transfer plate cover (thin steel plate) over stand pilots, Tool C-3528, as shown in Figure 93, followed by the transfer plate so that all screw holes line up.

(16) With all ball check valves in place, position the valve body up against the transfer plate and cover, aligning the screw holes and install the attaching screws and washers. Tighten all screws evenly to 25-30 inch pounds torque.

(17) Insert reverse blocker valve spring into top of transfer plate, as shown in Figure 94, followed by blocker valve. Slot in lower portion of blocker valve must index with bar of transfer plate cover so that valve can be depressed flush with top of transfer plate.

(18) Position blocker valve cover plate over blocker valve so that all openings in the transfer plate are completely covered and tighten screws to 25-30 inch

pounds. **If this plate is incorrectly positioned leakage at the one passage way will result in a loss in governor pressure. A higher speed reverse blocker valve locknut or no blocker action at all would then be encountered. This leakage could also cause a higher speed up-shift pattern.**

### Torque-Flite Transmission—Ram Manifold Engines

#### General Information

The following information will acquaint the service technician with the procedures that differ from the standard Torque-Flite transmission and the one used on cars equipped with the ram manifold.

Disassembly, inspection, and assembly procedures are the same. However there is a difference in line pressure, governor pressure, planet pinion carrier, and throttle linkage adjustment.

#### Line Pressure

The line pressure is increased from 90 to 105 psi (Refer to ram manifold line pressure chart). In order to achieve this change a heavier regulator valve spring is used.

#### LINE PRESSURE CHART (Ram Manifold Cars Only)

Push Button Position	Rear Wheels	Engine Speed (rpm)	Line Pressure (psi)
R	Free to Turn	1600	235 - 275
N	—	1200	100 - 110
D (Shifted into Direct)	Free to Turn	1200	104 - 106
2	Free to Turn	1200	100 - 110
1	Free to Turn	1200	100 - 110
D	Free to Turn	3500	108 - 115

#### Governor Pressure

Governor pressure is also changed. (Refer to ram manifold governor pressure chart). In this case, the governor weight assembly incorporates a heavier spring along with a lighter outer weight.

#### GOVERNOR PRESSURE CHART (Ram Manifold Cars Only)

Push Button Position	Rear Wheels	Engine RPM	Governor Pressure
D	Free to Turn	860 - 970	15
D	Free to Turn	1830 - 2100	65
D	Free to Turn	2550 - 2800	85

#### Kickdown and Reverse Planet Pinion Carriers

Due to the increased torque provided by ram induction, the kickdown and reverse planet pinion carrier assemblies differ, they embody a planet pinion carrier that is made of stronger aluminum alloy.

#### Throttle Linkage

The throttle linkage is designed to conform with the ram manifold equipped engine. (Refer to Figure 98).

It is very important that the throttle linkage be set in the following order:

#### Positioning the Accelerator Shaft

(1) Loosen the adjusting nuts "A" and "B" (accelerator shaft to transmission rod and accelerator shaft to throttle shaft lever rod).

(2) Insert a piece of  $\frac{3}{16}$  inch drill rod, 10 inches long into the accelerator shaft bracket and through hole in lever.

(3) Now, move the transmission throttle control lever forward until it stops. Tighten the locknut "A" securely. This positions the accelerator shaft.

#### Positioning the Accelerator Pedal

(1) Unsnap the accelerator pedal to shaft rod.

(2) Turn the threaded end of rod either in or out until a measurement of 115 degrees is obtained between the floor of car and the flat face of the accelerator pedal.

(3) This measurement can be made with a protractor.

(4) After correct measurement has been obtained, reconnect rod. Remove pin from accelerator shaft bracket.

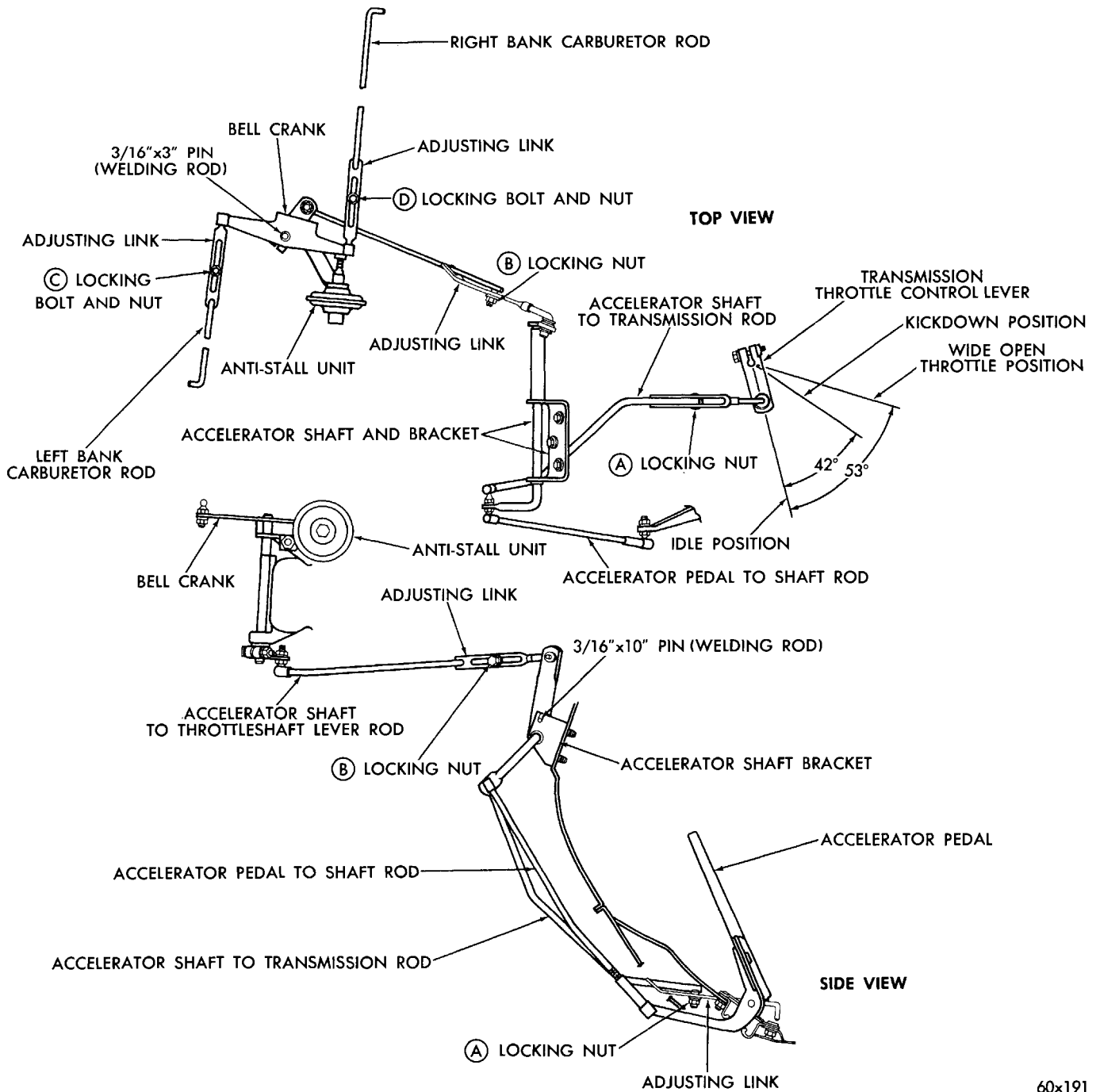
#### Setting the Bellcrank

(1) Loosen locking nuts "C" and "D" (left and right bank carburetor rods).

(2) Back off the anti-stall adjusting plunger far enough to allow the bellcrank to be pivoted.

(3) Pivot the bellcrank until a  $\frac{3}{16}$  inch piece of drill rod 3 inches long can be inserted through the bellcrank hole and down into the intake manifold.

(4) Check each carburetor to be sure the choke valves are open; that the fast idle cams are released and the throttle valves are closed.



60x191

Fig. 98—Throttle Linkage — Ram Manifold (Schematic View)

- (5) Now, tighten locking nuts "C" and "D" securely. Remove pin from bellcrank.
- (6) Push rearward on the accelerator shaft to throt-

tle shaft lever rod adjusting link, until stop is obtained. Tighten locking nut securely.

## GROUP 21

## 1960 - 1961 "TorqueFlite 6" A904 6-cylinder

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**SPECIFICATIONS**

TYPE.....	Automatic Three Speed with Torque Converter
TORQUE CONVERTER DIAMETER.....	10 $\frac{3}{4}$ inches
OIL CAPACITY—TRANSMISSION AND TORQUE CONVERTER.....	14 pts. Automatic Transmission Fluid Type "A", Suffix "A"
COOLING METHOD.....	Water—Heat Exchanger
LUBRICATION.....	Pump (Rotor Type)
<b>CLUTCHES</b>	
Number of Front Clutch Plates.....	4
Number of Front Clutch Discs.....	4
Number of Rear Clutch Plates.....	2
Number of Rear Clutch Discs.....	3
<b>GEAR RATIOS</b>	
1—Low.....	2.45 to 1
2—Second.....	1.45 to 1
D—Drive.....	1 to 1
R—Reverse.....	2.20 to 1
N—Neutral.....	
<b>FRONT-REAR PUMPS</b>	
Type.....	Gear (Rotary)
End Clearance.....	.001 to .0025 inch
DRIVE TRAIN END PLAY.....	.024 to .062 inch
<b>CLUTCH PLATE CLEARANCE</b>	
Front Clutch.....	.056 to .104 inch
Rear Clutch.....	.018 to .036 inch
<b>SNAP RINGS</b>	
Front and Rear Clutches.....	.060 to .062 inch
Rear Snap Ring (Selective).....	.068 to .070 inch .076 to .078 inch
<b>THRUST WASHERS</b>	
Output Shaft to Input Shaft (Selective).....	.052 to .054 inch (Natural) .068 to .070 inch (Red) .083 to .085 inch (Black)
Sun Gear Driving Shell.....	.060 to .062 inch
Driving Shell (Steel).....	.034 to .036 inch
Overrunning Clutch Race.....	.060 to .062 inch
Kickdown Annulus Support.....	.121 to .125 inch
Front Clutch to Rear Clutch.....	.043 to .045 inch

**SPECIAL TOOLS**

C-452 . . . . .	Puller—Companion Flange	C-3753 . . . . .	Remover—Output Shaft Oil Seal
C-484 . . . . .	Pliers—Snap Ring	C-3754 . . . . .	Driver—Output Shaft Oil Seal
C-3203-A . . . . .	Jack—Transmission	C-3755 . . . . .	Remover—Extension Housing Bushing
C-3229 . . . . .	Pliers—Snap Ring	C-3756 . . . . .	Aligning Tool—Front Oil Pump
C-3281 . . . . .	Wrench—Companion Flange Holding	C-3757 . . . . .	Installer—Front Pump Oil Seal
C-3283 . . . . .	Studs—Pilot	C-3758 . . . . .	Remover—Front Pump Oil Seal
C-3288 . . . . .	Studs—Pilot	C-3759 . . . . .	Assembly Tool—Front Oil Pump to Reaction Shaft Support
C-3292 . . . . .	Gauge—Low Pressure	C-3760 . . . . .	Compressor—Rear Clutch Piston Spring
C-3293 . . . . .	Gauge—High Pressure	C-3762 . . . . .	Aligning Sleeve—Rear Oil Pump Cover
C-3335 . . . . .	Straight Edge	C-3763 . . . . .	Gauge—Throttle Pressure Setting
C-3339 . . . . .	Dial Indicator	C-3768 . . . . .	Protector—Output Shaft Oil Seal
C-3575 . . . . .	Compressor—Front Clutch Piston Spring	C-3790 . . . . .	Adapter—Transmission Band Adjuster (Use with C-3380 Torque Wrench)
C-3749 . . . . .	Stand—Valve Body	C-3806 . . . . .	Fixture—Engine Support
C-3750 . . . . .	Stand—Transmission		
C-3751 . . . . .	Installer and Burnisher— (Extension Housing Bushing)		
C-3752 . . . . .	Remover—Front Oil Pump and Reaction Shaft Support		

**TORQUE REFERENCE**

	Foot-Pounds
Band Adjusting Screw Lock Nut . . . . .	20-25
Cooler Line Fitting . . . . .	10-12
Converter Drain Plug . . . . .	10-12
Converter Drive Plate to Crankshaft Bolt . . . . .	40-70
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Extension to Transmission Case Bolt . . . . .	25-30
Extension to Mounting Bolt . . . . .	25-30
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Front Oil Pump Housing to Transmission Case Bolt . . . . .	14-16
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Neutral Starter Switch . . . . .	15-20
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Oil Pan Drain Plug . . . . .	10-15
Output Shaft Flange Nut . . . . .	175
Pressure Test Take-Off Plug . . . . .	10-12
Reaction Shaft Support to Front Oil Pump Bolt . . . . .	14-16
Rear Oil Pump Cover Bolt . . . . .	14-16
Transmission to Engine Bolt . . . . .	25-30
Valve Body Screw . . . . .	25*
Valve Body Bolt . . . . .	55*
Speedometer Pinion Retainer Screw . . . . .	35-45*

\*Inch-Pounds



**TROUBLE DIAGNOSIS CHART**

ITEMS TO CHECK		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 Positions	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 Noises	Buzzing Noises	Hard to Fill—Oil Blows Out Filler Tube	Trans. Overheats	Impossible to Push Start
INDEX	ITEM																				
A.	Fluid Level		●	●		●	●	●	●	●							●	●	●	●	
B.	Throttle Link Adj.			●	●	●	●	●													
C.	Gearshift Control Cable Adj.						●	●						●							●
D.	Engine Idle	●						●													
E.	Pressure Checks Line, Lube, etc.	●	●	●	●	●	●	●	●	●	●	●	●								
F.	Governor					●	●	●					●								
G.	K. D. Band Adj.			●	●	●	●					●			●	●			●		
H.	Low-Reverse Band Adj.	●							●				●		●	●			●	●	
I.	Neutral Start. Sw.																				●
J.	Breather																	●			
K.	Cooling																		●		
L.	Parking Brake Adj.														●	●			●		
M.	Oil Strainer							●			●							●			
N.	Valve Body Asb.	●	●	●	●	●	●	●	●	●	●	●	●	●			●			●	
O.	Accumulator	●	●	●	●	●	●	●	●		●										
P.	Air Pressure Checks		●	●		●	●	●	●	●	●	●									
Q.	K. D. Servo-Band-Linkage			●	●	●	●					●			●	●					
R.	L. R. Servo-Band-Linkage	●							●				●		●	●				●	
S.	Rear Pump																		●	●	
a.	Front Pump		●				●			●	●								●	●	
b.	Front Clutch	●	●					●				●		●	●	●			●		
c.	Rear Clutch	●		●	●	●		●				●	●		●	●			●		
d.	Planetary Gear Sets														●	●					
e.	Overrunning Clutch						●		●			●			●	●					
f.	Converter									●									●		

## SERVICE DIAGNOSIS

Trouble diagnosis charts have proved to be beneficial in linking operating conditions to their causes. The chart will enable service personnel to pin point the transmission component causing the problem.

Before proceeding with any diagnosis checks, make certain the transmission fluid is up to correct level and the engine is properly tuned. Also, check the gearshift control cable and throttle linkage for proper adjustment and possible wear. Never remove a transmission from a car until all the possible "in car" causes have been checked for the operating difficulty. In some cases, the oil pan should be removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces.

The chart has the operating difficulties listed in three groups. After road testing, match the trouble to its par-

ticular group and to the specific difficulty under that group. The "Items to Check" are arranged in a logical diagnosis sequence which should be followed for quickest results. 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 vehicle.

Corrective procedures for the item listed under "Items to Check" column are covered in detail later in this manual. Use the "Index" column as a guide and refer to one of the following sections of this transmission group.

1. Maintenance, Adjustments and Tests.
2. Servicing Operations — Transmission in Vehicle.
3. Recondition Transmission — Unit out of Vehicle.

## TORQUEFLITE SIX TRANSMISSION

### 1. DESCRIPTION

The TorqueFlite Six Transmission combines a torque converter with a fully-automatic 3-speed gear system (Fig. 1). The torque converter housing and transmission case are an integral aluminum casting. The transmission consists of two multiple disc clutches, an over-running clutch, two servos and bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. The common sun gear of the planetary gear sets is connected to the front clutch by a driving shell which is splined to the sun gear and to the front clutch retainer. The hydraulic system consists of a front and rear pump, and a single valve body which contains all of the valves except the governor valve.

The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in the radiator lower tank. The torque converter assembly is a sealed unit which requires no servicing other than cleaning.

### 2. OPERATION

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 L (low).

In the drive range, the transmission shifts through all three gear ratios automatically. Shift points are determined by throttle opening and car speed. If addi-

tional 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 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.

### 3. POWER FLOW

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple disc clutches in the transmission. The power flow depends on the application of the clutches and bands. Refer to Clutch Engagement and Band Application Chart. A compound planetary gear system provides neutral, low, second, drive, and reverse ranges. **NOTE: All reference to direction of rotation in the following items is described as viewed from the front of transmission.**

#### *Neutral*

When control unit is in the N (neutral) position, none of the clutches are engaged or bands applied. Therefore, no power is transmitted to the output shaft.

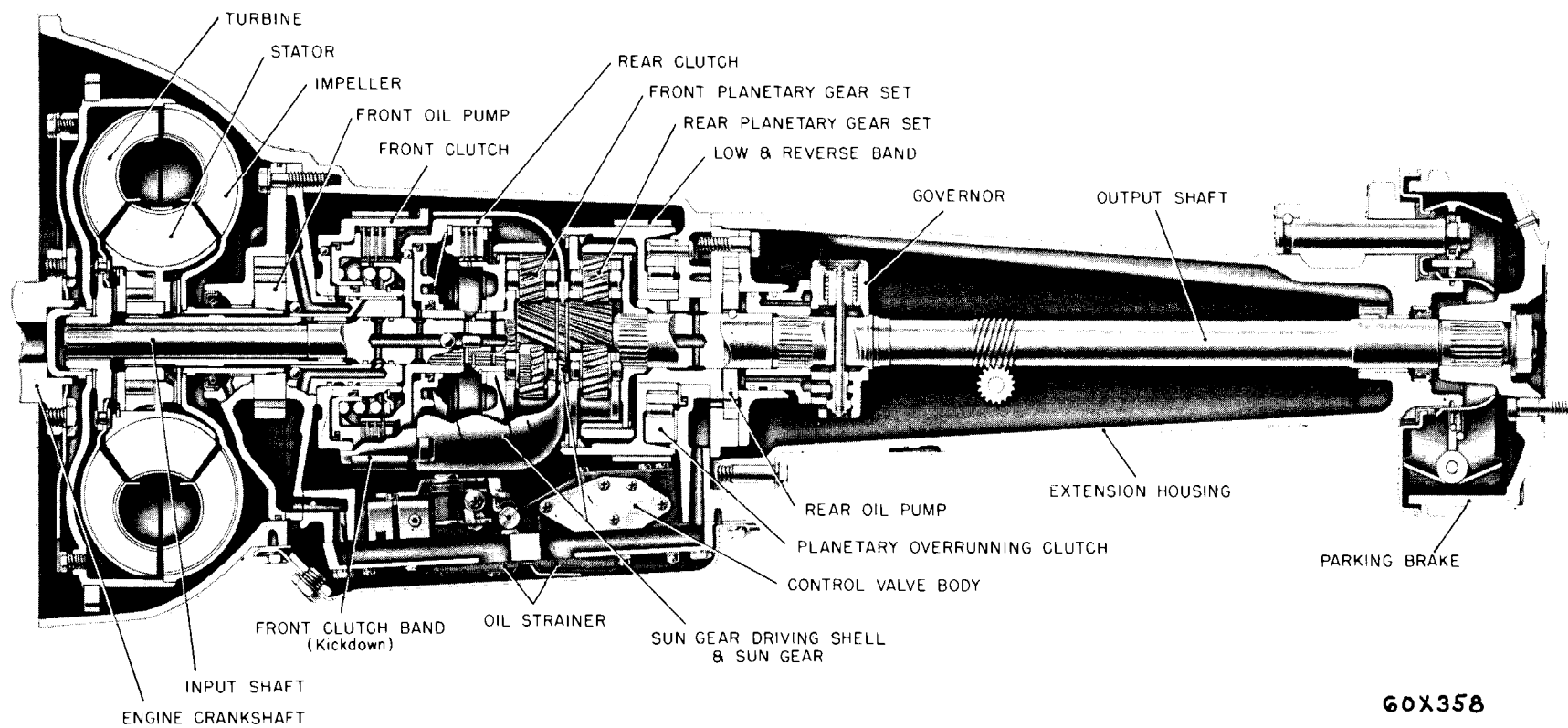


Fig. 1—Torqueflite Six Transmission and Torque Converter

### CLUTCH ENGAGEMENT AND BAND APPLICATION CHART

BUTTON POSITION AND DRIVE CONDITION	FRONT CLUTCH	REAR CLUTCH	FRONT (KICKDOWN) BAND	REAR (LOW & REV.) BAND	OVERRUNNING CLUTCH
N NEUTRAL	DISENGAGED	DISENGAGED	RELEASED	RELEASED	OVER RUNS
D DRIVE (DIRECT) 1.00 to 1	ENGAGED	ENGAGED	RELEASED	RELEASED	OVER RUNS
D DRIVE (BREAKAWAY) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
D DRIVE (KICKDOWN) 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
2 SECOND 1.45 to 1	DISENGAGED	ENGAGED	APPLIED	RELEASED	OVER RUNS
2 SECOND (KICKDOWN) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	RELEASED	HOLDS
1 LOW 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	APPLIED	PARTIAL HOLD
1 LOW (RETARDING) 2.45 to 1	DISENGAGED	ENGAGED	RELEASED	APPLIED	OVER RUNS
R REVERSE 2.20 to 1	ENGAGED	DISENGAGED	RELEASED	APPLIED	OVER RUNS

#### Drive

In D (drive) position, the front and rear clutches are engaged, while front and rear bands are released (Fig. 2).

With both clutches engaged and both bands released, the front planetary pinions cannot rotate. Therefore, the front planetary cage (splined to output shaft) rotates the output shaft at the same speed as the input shaft thus obtaining direct drive.

#### Second

In 2 (second) position, the rear clutch is engaged, to drive the front annulus gear, pinions and sun gear. At the same time, the front band is applied, holding the front clutch, driving shell and sun gear stationary (Fig. 3).

With rear clutch engaged, the clutch, front annulus gear and front planetary pinions all rotate clockwise. The applied front band holds the driving shell and sun

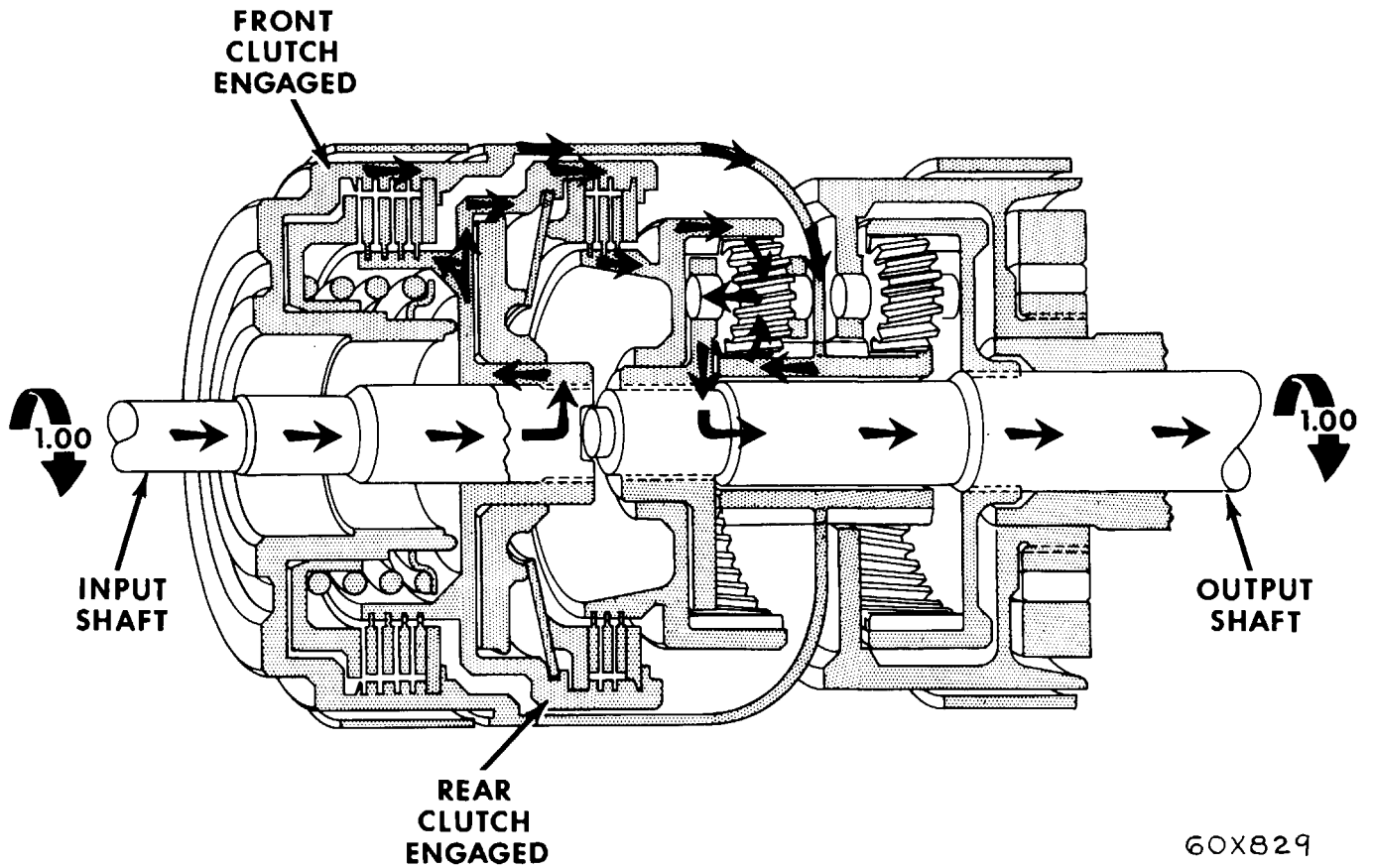


Fig. 2—Power Flow in D (Drive) Position — Direct

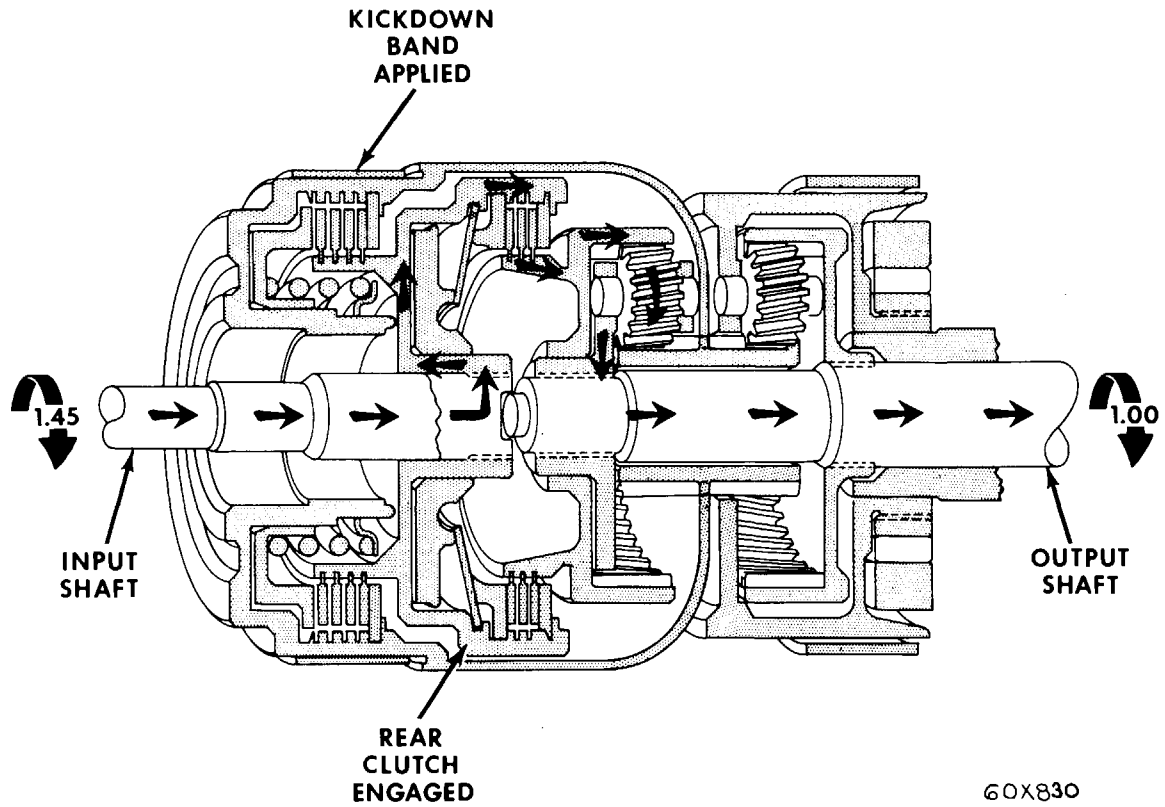


Fig. 3—Power Flow in D (Drive) Position — Second or Kickdown

gear from turning. Therefore, with sun gear held stationary, the planet pinions roll (clockwise) around the sun gear turning the front planetary cage (splined to output shaft) in the same direction at a reduced speed.

### Low

In L (low) position, the rear clutch is engaged and drives the front annulus gear, front planetary pinions and the sun gear. The low and reverse drum and rear planetary cage are held stationary by the rear band (Fig. 4).

With rear clutch engaged; the clutch, front annulus gear, and front planetary pinions all rotate clockwise, which turns the sun gear counterclockwise. With the rear planetary cage held stationary, the sun gear (rotating counterclockwise), rotates the rear planet pinions clockwise which turns rear annulus gear (splined to output shaft) in the same direction at a reduced speed.

### Reverse

In R (reverse) position, the front clutch is engaged to drive the driving shell and the sun gear. The low and reverse drum and rear planetary cage are held stationary by the rear band. (Fig. 5).

With front clutch engaged, the clutch, driving shell and sun gear all rotate clockwise. With the rear plane-

tary cage held stationary, the sun gear (rotating clockwise) rotates rear planet pinions counterclockwise, which turns the rear annulus gear (splined to output shaft) in the reverse direction at a reduced speed.

### Breakaway

With car standing, engine operating, and the D (Drive) button depressed, the phase of operation is known as "breakaway". Breakaway simply means that to get the vehicle moving from a standstill, the lowest forward ratio must be used. Therefore, at this time, the rear clutch is engaged which drives the front annulus gear, front planetary pinions and the sun gear. The rear planetary cage is prevented from turning counterclockwise by the overrunning clutch (Fig. 6).

**NOTE: The operation of the overrunning clutch can be compared to the coaster brake on a bicycle. When reverse torque is applied to the rear planetary cage, low and reverse drum, and clutch hub, the clutch rollers are forced into a wedged contact by the ramps in the cam thus, holding the planetary cage stationary. When the reverse torque is removed, the rollers are released from their wedging contacts on the ramps, and the overrunning clutch will coast.**

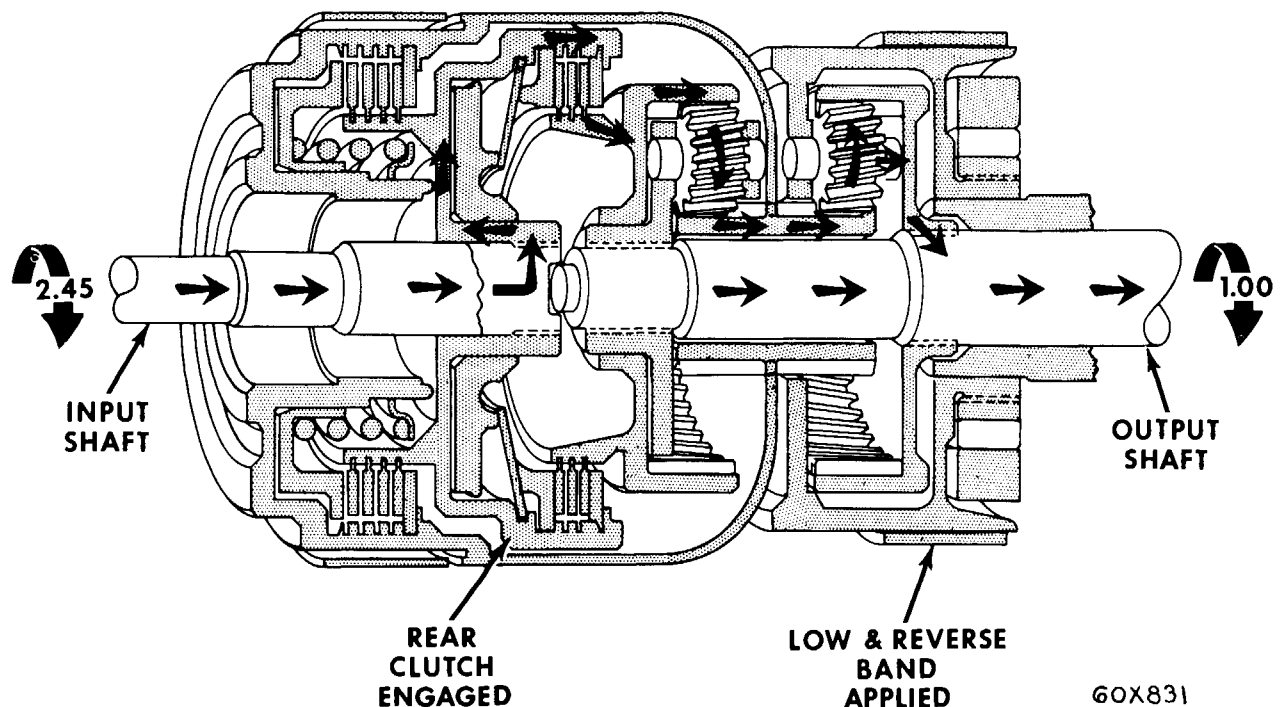


Fig. 4—Power Flow in L (Low) Position — Low and Retarding

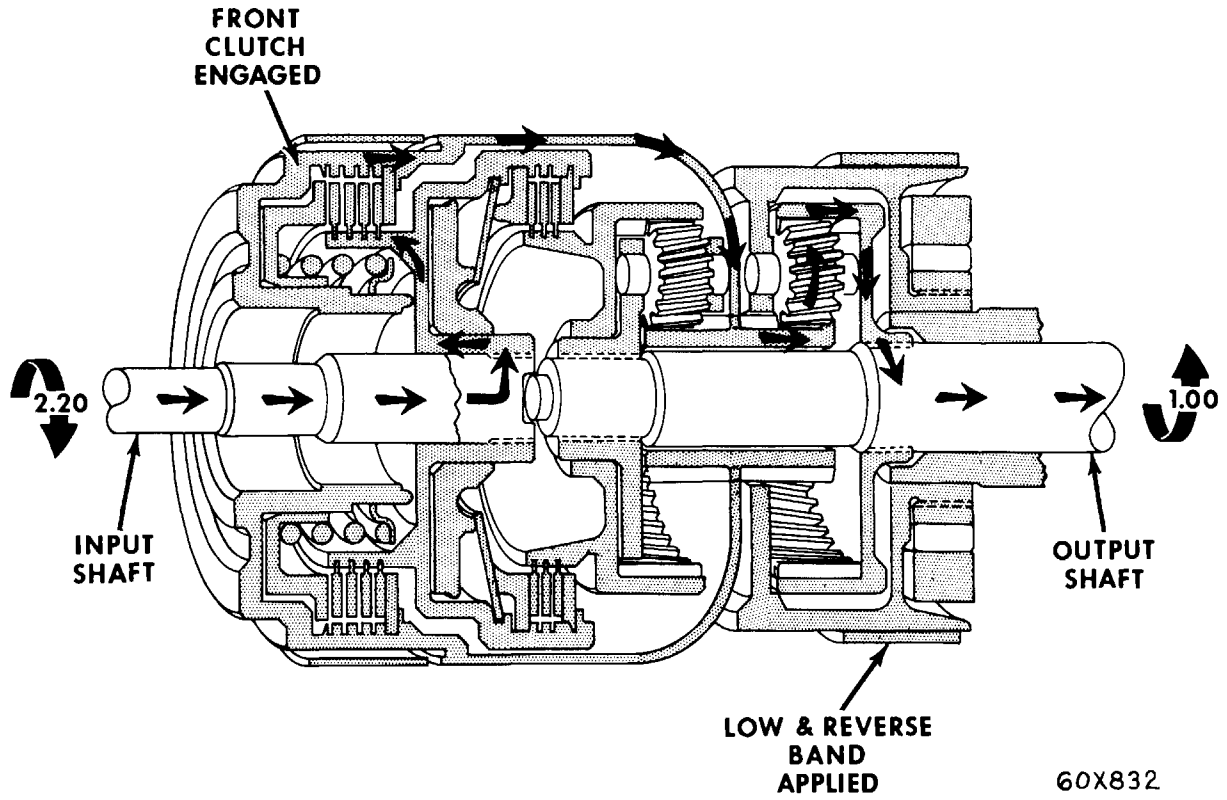


Fig. 5—Power Flow in (Reverse) Position

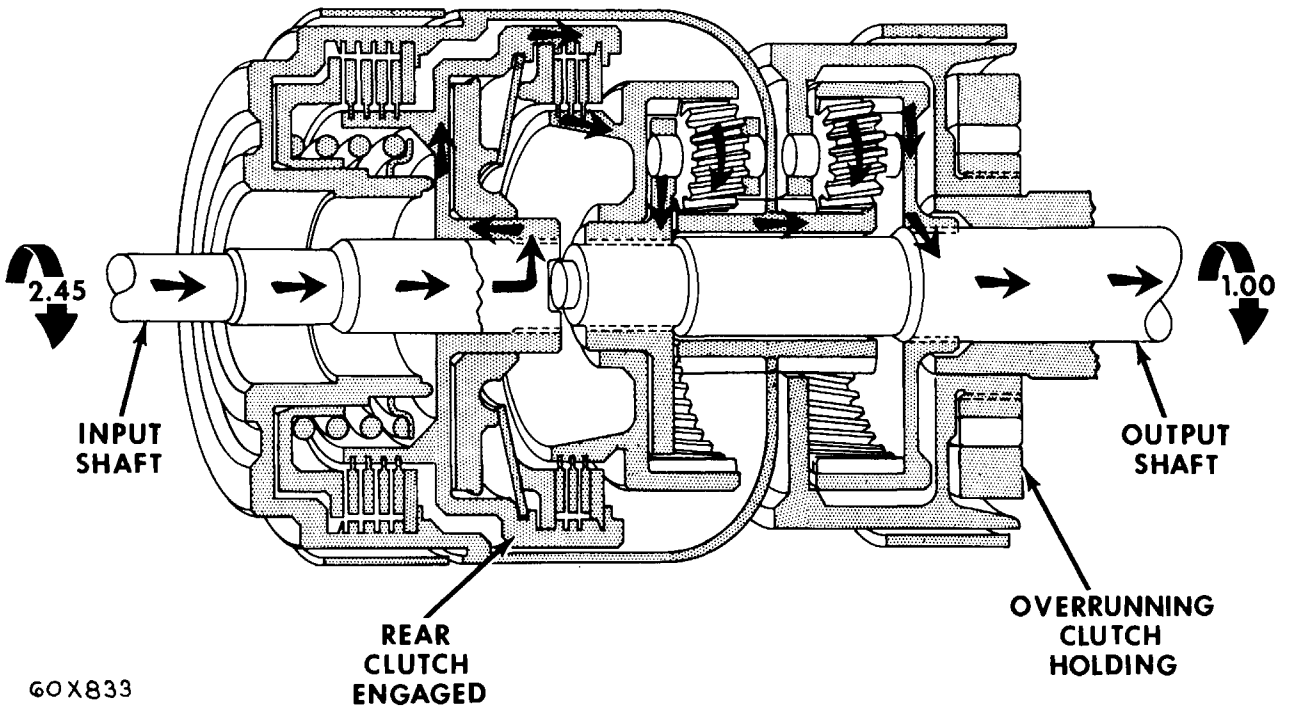


Fig. 6—Power Flow in D (Drive) Position — Breakaway

With the rear clutch engaged; the clutch, front annulus gear and front planetary pinions all rotate clockwise, which turns the sun gear counterclockwise. The sun gear tends to rotate the rear planetary cage and drum counterclockwise, which is immediately locked by the overrunning clutch. With the rear planetary cage held stationary, the sun gear (rotating counterclockwise) rotates the rear planet pinions clockwise which turns rear annulus gear (splined to output shaft) in the same direction at low range ratio.

### **Kickdown (Direct Drive to Second)**

In kickdown from direct drive "D" (drive) position, the transmission shifts back to the same power flow as outlined for "C. Second." (Fig. 3).

### **Kickdown (Second to Low)**

In kickdown from 2 (second) position, the transmission shifts back to the same power flow as outlined for "D. Low." However, at this time, the low and reverse drum, and rear planetary cage are held stationary by the overrunning clutch instead of the rear band (Fig. 6).

### **Retarding**

When retarding in L (low) position, the low and reverse drum, rear planetary cage are held stationary by the low and reverse band to provide engine braking (Fig. 4).

## **4. HYDRAULIC CONTROL SYSTEM**

The hydraulic control system has four important functions to perform.

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

The pressure supply system, the clutches and band servos, the pressure regulating valves and the flow control valves.

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

### **Pressure Supply System (Fig. 7)**

#### **Front Pump**

Under all normal operating 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 pressures ranging from 55 psi at closed throttle to 90 psi at wide open throttle. In reverse, the front pump pressure is increased to approximately 250 psi in order to handle the high torque loads imposed during reverse operation.

#### **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. The rear clutch and low-reverse band are applied by the oil pressure developed by the rear pump when the engine is started by pushing.

### **Clutches and Band Servos (Fig. 7)**

#### **Front Clutch**

The front clutch contains four steel plates and four discs in order to develop the required capacity. Both front and rear clutches are engaged to transmit full engine and converter torque in direct drive. The front clutch is also engaged to drive the car in reverse.

The front clutch piston is moved hydraulically to engage the multiple clutch plates and discs, and is released by means of the clutch piston return spring when hydraulic pressure is released.

#### **Rear Clutch**

The rear clutch contains two steel plates and three discs and a spring washer type return spring and is engaged in all forward driving ranges. The rear clutch is disengaged during reverse operation.

Hydraulic pressure against the rear clutch piston moves the piston into contact with the spring washer which multiplies the force to lock the clutch plates together. The spring washer returns the clutch to "disengaged" position when hydraulic pressure is released.

#### **Kickdown Servo**

The kickdown piston actuates the kickdown band through the kickdown lever, strut and anchor holding the front clutch piston retainer, driving shell and sun gear stationary. The result is a reduced forward ratio through the front planetary gear set.

The kickdown piston is hydraulically applied by a variable pressure which is a function of line pressure. The kickdown piston is released by spring tension or spring tension with hydraulic pressure depending upon the operation.

#### **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:

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



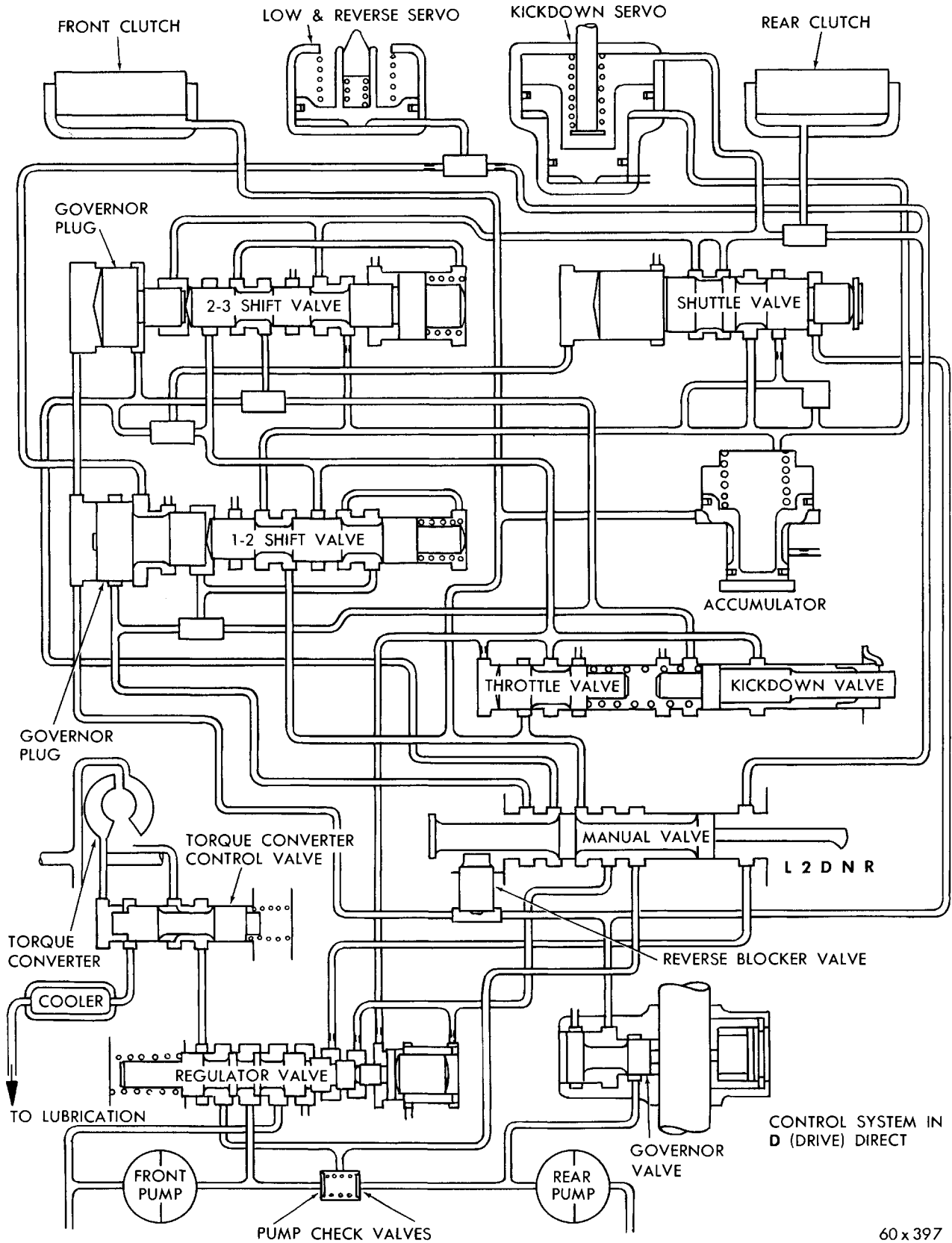


Fig. 7—Hydraulic Control System

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To hold the carrier of the rear planetary gear set stationary while the rear clutch (applied) drives the sun gear. This provides the 1 (low) range operation at a ratio of 2.45 to 1 through the front planetary gear set which may be used for engine braking. Initial engagement for 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.

### **Accumulator**

An accumulator cushions the 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 to the piston at these times.

## **Pressure Regulating Valves (Fig. 7)**

### **Regulator Valve**

The regulator valve controls line pressure at a value dependent on throttle opening, and it ranges from 55 psi at closed throttle to 90 psi at wide open throttle.

For reverse operation, oil must be at a pressure of 230-285 psi. This is accomplished by switching the effective reaction area of the regulator valve, with the result that a line pressure of 230-280 psi, applied to the smaller reaction area, is required to overcome the force of the regulator valve spring.

### **Torque Converter Control Valve**

This valve maintains an oil pressure of approximately 30 psi within the torque converter. When the torque converter pressure rises to 30 psi, the control valve will move against the spring load and allow oil to flow through the cooler then back to the lubrication circuit. From the cooler, oil is routed through the transmission lubrication system to lubricate the gear train at approximately 5 to 25 psi pressure.

### **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.

### **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.

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.

## **Flow Control Valves (Fig. 7)**

### **Front and Rear Pump Check Valves**

The front pump check valve is located in the valve body. The valve is opened when front pump is supplying operating pressure and is closed when rear pump is supplying the pressure.

The rear pump check valve is located in the transfer plate. The valve is opened when rear pump is supplying operating pressure and is closed when front pump is supplying the pressure.

### **Manual Valve**

The manual valve obtains the different transmission drive ranges as selected by the vehicle operator. The

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 on the valve body.

The manual valve distributes fluid pressure to various clutches, servos, and other valves to apply clutches and servos automatically, dependent on car speed and throttle opening.

### **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 manual valve is stopped at neutral and the transmission remains in neutral until another button is depressed. The reverse blocker valve is activated by governor pressure.

### **1-2 Shift Valve**

The 1-2 shift valve determines whether the transmission is either in low gear ratio or second gear ratio depending upon whether the valve is in the up-shifted or down-shifted position. The 1-2 shift valve train consists of a shift valve, valve spring and a governor plug.

The factors controlling the upshift and downshift of the 1-2 shift valve are determined by vehicle speed, governor pressure and throttle pressure.

The 1-2 shift valve is moved to upshift position by governor pressure acting on the governor plug, when the governor pressure is high enough to overcome shift valve spring tension and throttle pressure. The 1-2 shift valve is moved to downshift position by shift valve spring tension alone at normal closed throttle stops or by spring and kickdown pressure which overcomes governor pressure during a forced downshift.

### **2-3 Shift Valve**

The 2-3 shift valve automatically shifts the transmission from second to direct or from direct to second depending on the vehicle operation. This 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.

### **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 60 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.

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

### **Shuttle Valve and Shuttle Valve Plug**

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 front 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 front clutch.

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.

## **5. OPERATING INSTRUCTIONS**

### **Starting the Engine**

- (1) As a safety precaution, apply parking or foot brake.
- (2) Push the N (neutral) push button all the way in.
- (3) Depress accelerator pedal one-third of travel to insure proper choke operation.
- (4) Turn ignition key all the way to the right to START position. When engine starts, release key and it will return to ON position.

### **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 on, then push the l (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.

### **How to Drive the Car**

- (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). All normal forward driving will be done in this range. The vehicle will have a slight tendency to creep after pushing the button from N (neutral) to D (drive) at idle. This can be prevented by applying the foot brake lightly. As soon as the accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. Depending on the amount the accelerator is depressed and vehicle speed, the transmission will automatically upshift to second. Depending upon the amount the accelerator is depressed and vehicle speed, the transmission will automatically upshift from second to direct. When slowing down the vehicle (at closed throttle), the transmission will automatically downshift to breakaway at approximately 10 mph.

(3) The 2 (second) position provides driving characteristics similar to D (drive) - second speed, except that the transmission will not upshift into direct. As soon as accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. Depending on amount the accelerator is depressed and car speed, the transmission will automatically upshift into second. No upshift to direct is possible with the 2 button depressed. **The vehicle should not be driven at speeds exceeding 70 mph with the "2" button depressed, nor should the "2" button be depressed at speeds above 70 mph.** If vehicle speed falls below 8 mph or if the accelerator is completely depressed, provided vehicle speed is below 30 mph, the transmission will automatically downshift to breakaway. **NOTE: All shift speeds may vary somewhat due to production tolerances and rear axle ratios. This 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.**

(4) L (low) provides driving characteristics similar to D (drive-breakaway) except that the transmission will not upshift into any other range regardless of vehicle speed and throttle opening. **To prevent overspeeding of engine, do not operate vehicle above 40 mph in (low) position. Do not depress 1 (low) or 2 (second) buttons above 70 mph as immediate downshift into second gear will result. The transmission will not however shift into low gear if vehicle speed is above the 3-1 kickdown limit.**

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

(6) Kickdown (forced downshift). At speeds below

3-2, 3-1 kickdown limits shown in Shift Pattern Summary Chart, after the transmission has upshifted, into D (drive) or 2 (second), the transmission will automatically downshift to the next lowest gear by completely depressing the accelerator; 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.

### SHIFT PATTERN SUMMARY CHART (WITH STANDARD 3.31-1 AXLE)

CONDITION		TIRE SIZE	
		750x14	800x14
Closed Throttle	1-2 Upshift	8-11	8-11
Closed Throttle	2-3 Upshift	12-14	12-15
Wide Open Throttle	1-2 Upshift	28-42	29-43
Wide Open Throttle	2-3 Upshift	60-72	61-74
3-2 Kickdown Limit		57-69	58-70
3-1 Kickdown Limit		27-39	27-40
Closed Throttle Downshift		7-10	7-10

#### 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 requires heavy throttle for ½ 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.

#### Transmission Inoperative

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

#### 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.

### 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).

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 8. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the transmission case to engage the manual control valve lever assembly.

Should the R (reverse) button be pushed in, above approximately 10 mph, it will move the manual control lever to the neutral position and when car speed drops below 10 mph, it will again be necessary to re-engage the R (reverse) push button.

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.

### Removal

- (1) Disconnect one battery cable.
- (2) Disconnect back up light switch wire connectors at push button control at the rear of instrument panel and illuminating lamp leads.
- (3) Remove the screws of push button face plate and remove the push buttons by pulling them off push button slides. Remove lamp bulb.
- (4) Remove the control housing stud nuts that are now accessible and remove control and cable from rear of instrument panel.
- (5) Remove hairpin lock securing control cable to actuator and the screws holding the cable bracket to the control housing.

### Installation

- (1) Insert end of cable on actuator and reassemble hairpin clip. Place cable bracket on control unit and install screws securely.
- (2) Carefully guide the unit into position from the rear of the instrument panel and install the attaching stud nuts from the front side of instrument panel.
- (3) Install lamp bulb in push button control and reinstall push buttons onto control actuator slides. Replace face plate.
- (4) Connect back-up switch and push button illuminating lamp wires.

### 6. BACK-UP LIGHT SWITCH REPLACEMENT (WHEN SO EQUIPPED)

Remove the gearshift control housing assembly. The back-up light switch is fastened to control by four tabs. Straighten tabs to remove switch. Install replacement switch and secure to control housing by bending tabs. Install gearshift control housing and reconnect switch and lamp wires.

### 7. PUSH BUTTON UNIT LAMP REPLACEMENT

The push button illuminating bulb can easily be replaced by removing the push button face plate and removing one or more of the center push buttons.

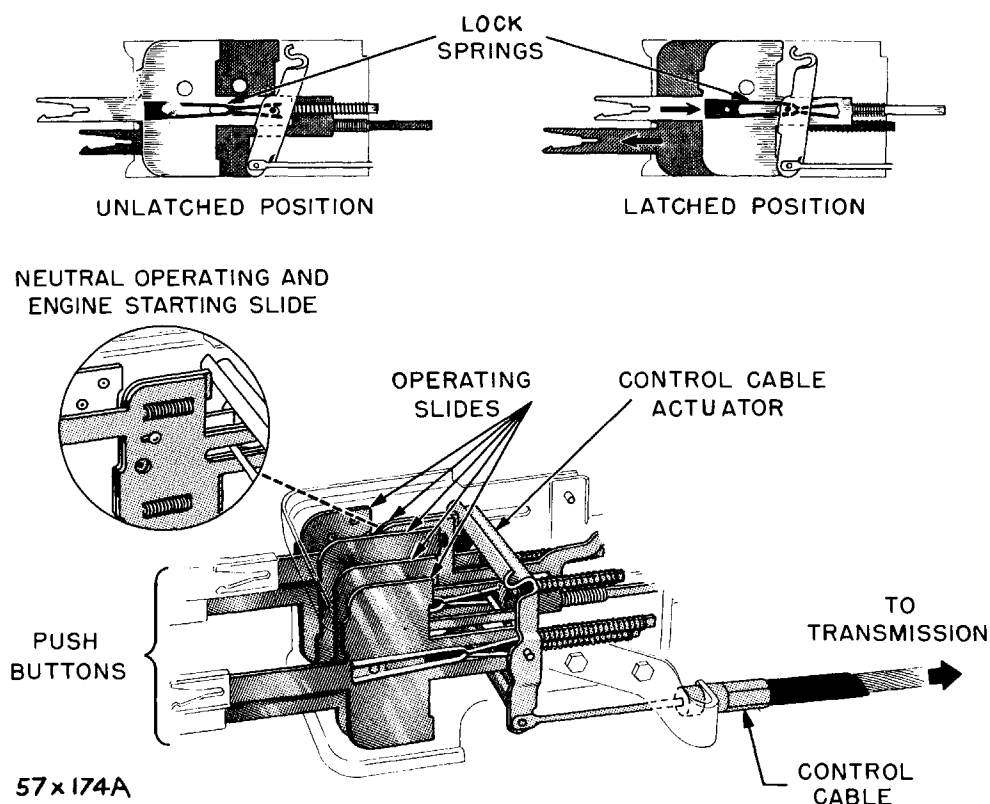


Fig. 8—Typical Gearshift Control Unit (Operation Sketch)

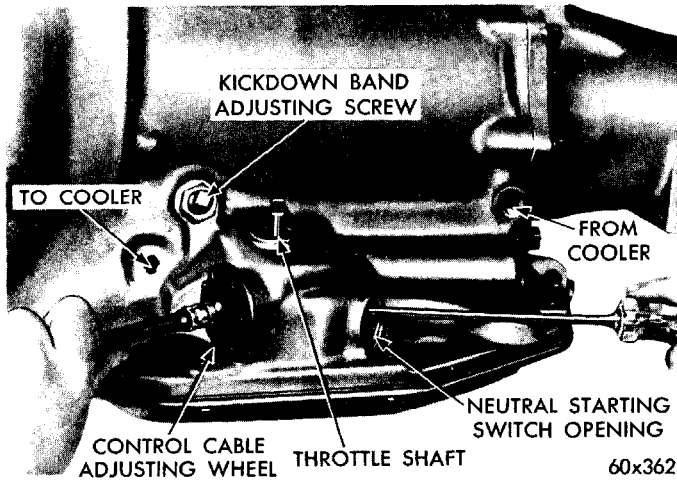


Fig. 9—Removing Gearshift Control Cable

## 8. CONTROL CABLE (TRANSMISSION END) REMOVAL AND INSTALLATION

- (1) Raise vehicle on hoist and drain approximately two quarts of fluid from transmission.
- (2) Depress 1 (low) push button to position cable

for removal from transmission.

(3) Disconnect wire from neutral starting switch and remove switch.

(4) Remove push button control cable to transmission adjusting wheel lock screw.

(5) Insert screw driver through neutral starting switch opening (Fig. 9). Push screw driver gently against upper projecting portion of cable lock-spring, and pull outward on cable to remove cable from adapter and transmission case.

(6) To install the cable, have an assistant engage the (R) button and hold it firmly engaged until the cable attachment operation is completed.

(7) Back the adjustment wheel off on the cable housing (counter-clockwise) until only two or three threads are showing behind the wheel on the guide.

(8) Lubricate the cable housing with transmission fluid, insert cable in transmission case, push inward on cable making sure lock-spring engages cable. Adjust control cable as outlined in "Maintenance, Adjustments and Tests," Paragraph 11.

(9) Refill transmission with Automatic Transmission Fluid (Type "A" Suffix "A") to proper level.

## MAINTENANCE, ADJUSTMENTS AND TESTS

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 occur, wide open throttle stall operation should be avoided.

### 9. LUBRICATION

For lubrication requirements of the TorqueFlite Six Transmission, refer to Lubrication Group of this manual.

### 10. FLUID LEAKS

#### Leaks Repaired With Transmission in Vehicle

Transmission output shaft oil seal. Extension housing gasket. Speedometer pinion seal and cable seal. Oil filler tube seal. Oil pan gasket and drain plug gasket. Gearshift control cable sealed. Throttle shaft seal. Neutral starting switch seal. Oil cooler line fittings and pressure take-off plugs.

If oil is found inside torque converter housing, determine whether it is transmission fluid or engine oil. Check converter drain plugs for tightness.

Leaks at these locations should be corrected, re-

gardless of how slight. Correct by tightening loose screws, nuts or plugs. Where this does not remedy the situation, replace faulty gaskets, seals, plugs or other parts as required.

#### Leaks Requiring Removal of Transmission

Porous transmission case. Sand hole in front oil pump housing. Front oil pump housing retaining screws or damaged sealing washers. Front oil pump housing seal (located on outside diameter of pump housing). Torque converter assembly and converter impeller shaft oil seal (located in front pump housing).

Leaks at these locations may be corrected by tightening loose bolts or replacing damaged or faulty parts.

### 11. GEARSHIFT CONTROL CABLE ADJUSTMENT

(1) Raise car on hoist. Have an assistant hold the R (reverse) button firmly depressed.

(2) Remove the push button control cable adjustment wheel lock screw at the left side of transmission (Fig. 9).

(3) Back the adjustment wheel off on the cable guide (turn counter clockwise) until only two or three threads are showing behind the wheel on the guide.

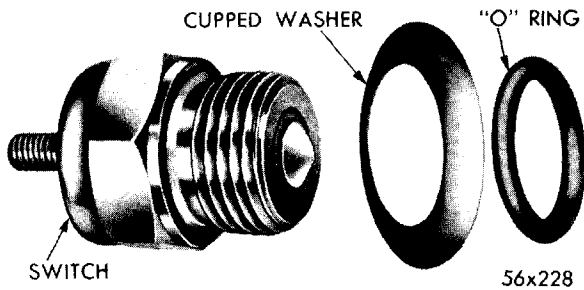


Fig. 10—Neutral Starting Switch (Disassembled)

**IMPORTANT:** Check the wheel for free turning on the guide; remove any dirt or burrs in the threads of the cable guide that may interfere. Lubricate the cable guide threads with a few drops of transmission fluid.

(4) Hold the control cable guide centered in the hole of the transmission case and apply only enough inward force (approximately two to three pounds) to bottom the assembly at the reverse detent. While holding the cable bottomed, rotate the adjustment wheel clockwise until it just contacts the case squarely.

(5) Turn the wheel clockwise just enough to make the next adjustment hole in the wheel line up with the screw hole in the case.

(6) Counting this hole as number one, continue turning the wheel clockwise until the fifth hole lines up with the screw hole in the case.

(7) Install the lock screw, tighten to 30-50 inch-pounds torque.

## 12. NEUTRAL STARTING SWITCH

### Adjustment and Test

(1) With proper control cable adjustment assured, depress the N (neutral) push button.

(2) Raise vehicle and drain approximately two quarts of fluid from transmission.

(3) Unscrew neutral starting switch from transmission case and check to see that switch operating lever is aligned in center of switch opening in the case.

(4) Place cupped washer and "O" ring over threads of the switch (Fig. 10), then screw switch into transmission case a few turns.

(5) Connect one lead of a test lamp to battery current and the other lead to the switch terminal. Screw switch into transmission case until the lamp lights, then tighten switch an additional  $\frac{1}{3}$  to  $\frac{1}{2}$  turn.

**NOTE:** The switch must be tight enough to prevent oil leakage. If not, add a thin washer and readjust the switch.

(6) Remove test lamp and connect wire to the switch.

(7) Add fluid to transmission to bring up to proper level.

## 13. BAND ADJUSTMENTS

### Kickdown Band

The kickdown band adjusting screw is located on the left side of the transmission case near the throttle lever shaft (Fig. 9).

(1) Loosen the lock nut and back off approximately five turns. Check adjusting screw for free turning in the transmission case.

(2) Using wrench, Tool C-3380 with adapter C-3790, tighten band adjusting screw to a reading of 47-50 inch-pounds torque.

(3) Back off adjusting screw  $2\frac{1}{8}$  turns. Hold adjusting screw in this position and tighten lock nut to 20-25 foot-pounds torque.

### Low and Reverse Band

(1) Raise vehicle, drain transmission fluid and remove the oil pan.

(2) Loosen the adjusting screw lock nut and back off nut approximately five turns (Fig. 11). Check adjusting screw for free turning in the lever.

(3) Using Wrench, Tool C-3380 with adapter C-3790, tighten band adjusting screw to a reading of 47-50 inch-pounds torque.

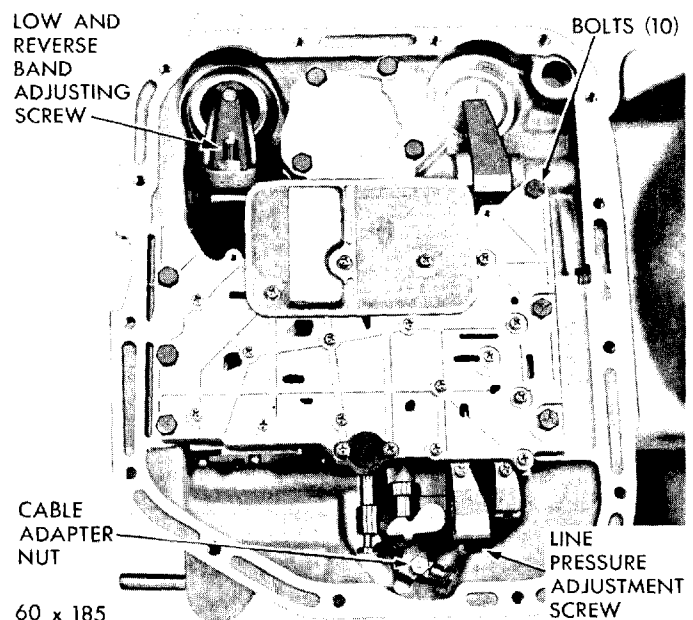


Fig. 11—Bottom View of Transmission (Pan Removed)

(4) Back off adjusting screw 5/4 turns. Hold adjusting screw in this position and tighten lock nut to 20-25 foot-pounds torque.

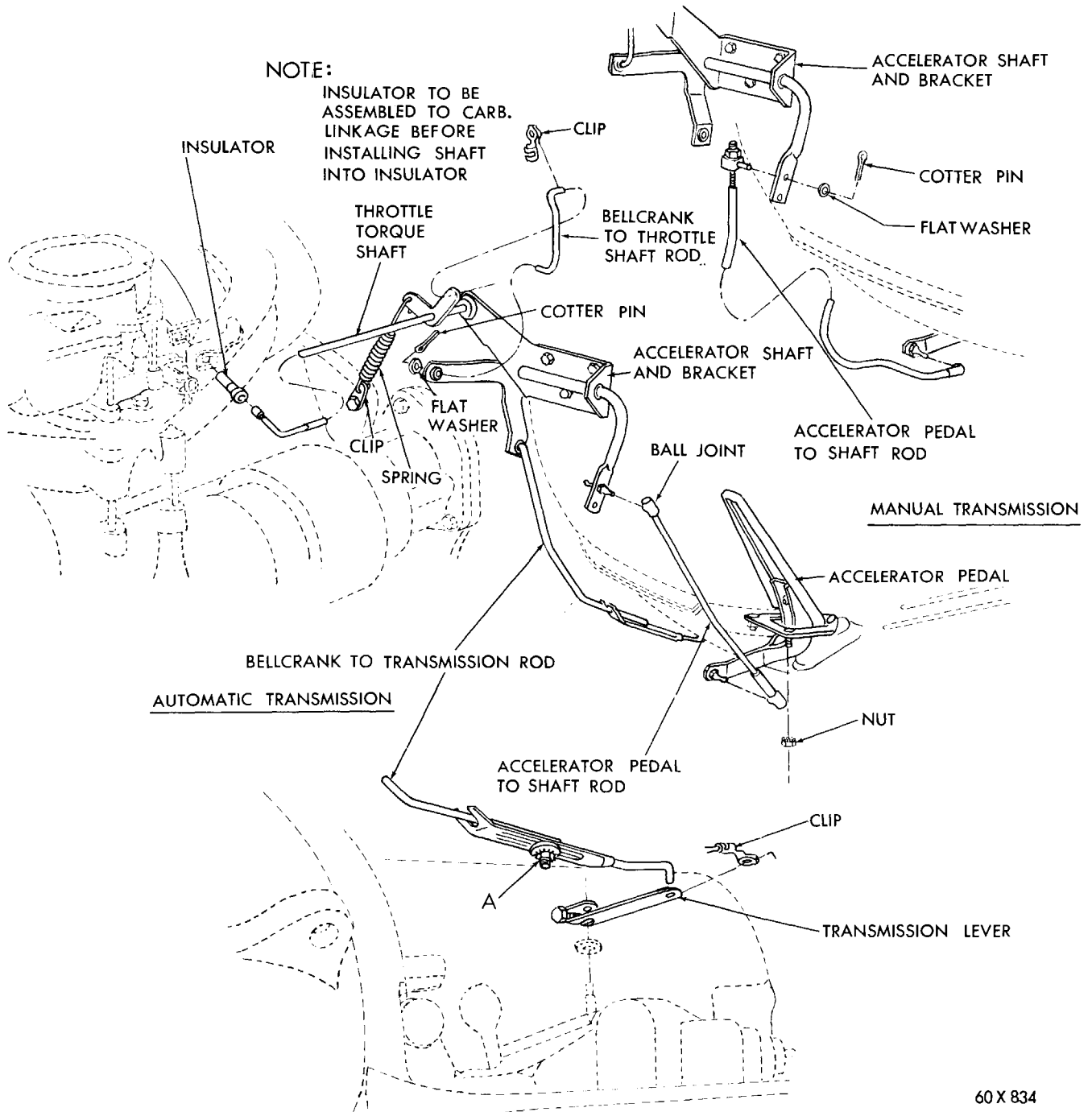
(5) Reinstall oil pan using new gasket. Tighten oil pan bolts to 13-17 foot-pounds torque.

(6) Fill transmission with Automatic Transmission Fluid. Refer to Lubrication Group in this manual.

**14. THROTTLE LINKAGE ADJUSTMENT**

(1) With the engine at operating temperature and carburetor off the fast idle cam, adjust idle speed to 500 rpm, (use tachometer).

(2) Loosen lock nut "A" (Fig. 12), and move the transmission throttle control lever forward until it stops. Then tighten lock nut "A" securely.



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Fig. 12—Throttle Linkage Adjustments



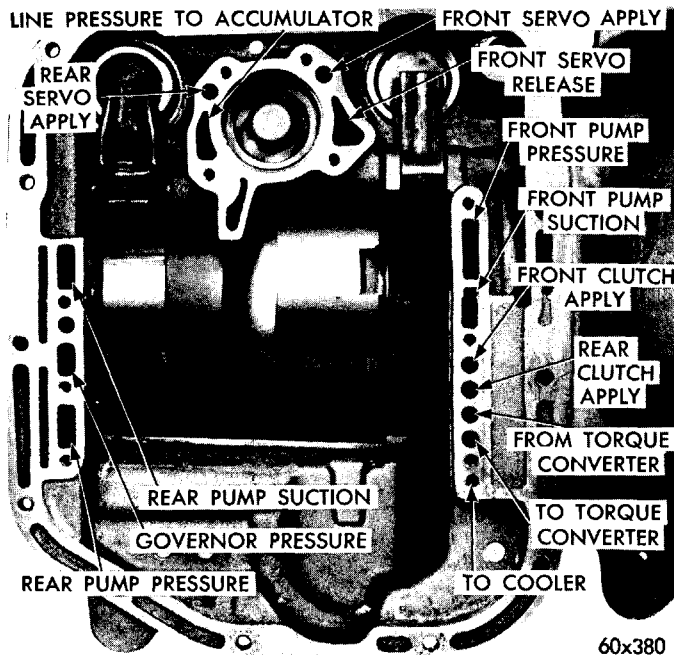


Fig. 13—Air Pressure Checks

(3) Adjust a spirit level protractor to 115 degrees, then place protractor lengthwise on flat face of the accelerator pedal.

(4) With car on level floor, disconnect the accelerator pedal rod and adjust length of rod to center the bubble in spirit level. After correct pedal angle is obtained, reconnect the pedal rod.

## 15. AIR PRESSURE CHECKS

The front clutch, rear clutch, kickdown servo, and low and reverse servo may be checked by applying air pressure to their respective passage after the valve body assembly is removed (Fig. 13). To make the complete air pressure checks proceed as follows:

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

### Front Clutch

Apply air pressure to front clutch passage (Fig. 13) and listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and check system for excessive oil leaks.

### Rear Clutch

Apply air pressure to the rear clutch passage and listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

**NOTE: If a dull "thud" cannot be heard in the clutches, place the finger tips on clutch housing and again apply air pressure. Move-**

**ment of the piston can be felt as the clutch is applied.**

### Kickdown Servo

Direct air pressure into the kickdown servo "apply" passage. Operation of the servo is indicated by a tightening of the front band. Spring tension on the servo piston should release the band.

### Low and Reverse Servo

Direct air pressure into the low and reverse servo "apply" passage. Operation of the servo is indicated by a tightening of the rear band. Spring tension on the servo piston should release the band.

If the clutches and servos operate properly; no up-shift or erratic shift conditions, indicate that the malfunction exists in the control valve body assembly.

### Governor

Governor operating failures can generally be diagnosed by a road test or hydraulic pressure tests.

## 16. HYDRAULIC CONTROL PRESSURE CHECKS

### Line Pressure and Front Servo Release Pressure

**NOTE: Line pressure and front servo release pressure checks must be made in D (drive) position with rear wheels free to turn. The transmission fluid must be at operating temperature (150°F to 200°F).**

(1) Install an engine tachometer, raise car on a hoist and position tachometer so it can be read under the car.

(2) Connect two 0-100 psi pressure gauges, Tool C-3292 to pressure take-off-points at top of the accumulator and at the front servo release (Fig. 14).

(3) With control in D (drive) position, speed up engine slightly until transmission shifts into direct. Re-

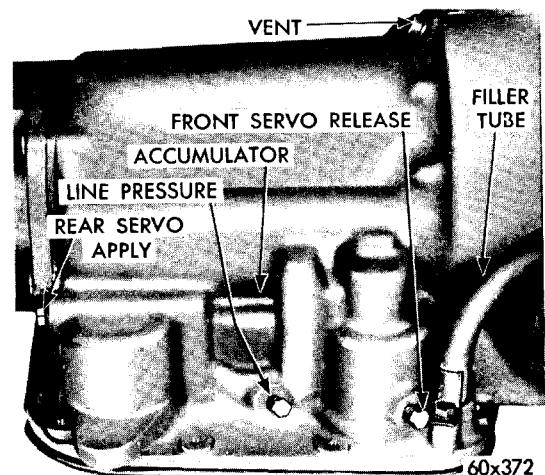


Fig. 14—Pressure Test Locations (Right Side of Case)

duce engine speed slowly to 800 rpm. Line pressure at this time (800 rpm) must be 52-60 psi, and front servo release pressure should be 45 psi or greater.

(4) Disconnect throttle linkage from transmission throttle lever and hold transmission throttle lever at the detent position. Increase engine speed to 3500 rpm with transmission in direct, line pressure should be 90-96 psi and front servo release pressure should be 80 psi or greater. **NOTE: The transmission should not be operated with engine speeds in excess of 1500 rpm without opening the transmission throttle lever.** If line pressure is not 52-60 psi at 800 rpm, adjust the pressure as outlined in Paragraph 17. **Do not adjust the line pressure to correct reading at 3500 rpm.**

**NOTE: If front servo release pressures are less than pressures specified and line pressures are within limits, there is excessive leakage in the front clutch and/or front servo circuits.**

#### Lubrication Pressures

The lubrication pressure check should be made at the same time that line pressure and front servo release pressure are checked.

(1) Install a "tee" fitting between the cooler return line fitting and fitting hole in transmission case at rear of left side of transmission (Fig. 15). Connect a 0-100 psi pressure gauge, Tool C-3292 to the "tee" fitting.

(2) At 800 engine rpm, with throttle closed and transmission in direct, lubrication pressure should be 5-25 psi.

#### Rear Servo Apply Pressure

(1) Connect a 0-300 psi pressure gauge, Tool C-3293 to apply pressure take-off point at rear servo (Fig. 14).

(2) With transmission control in R (reverse) position and the engine speed set at 1600 rpm, the reverse

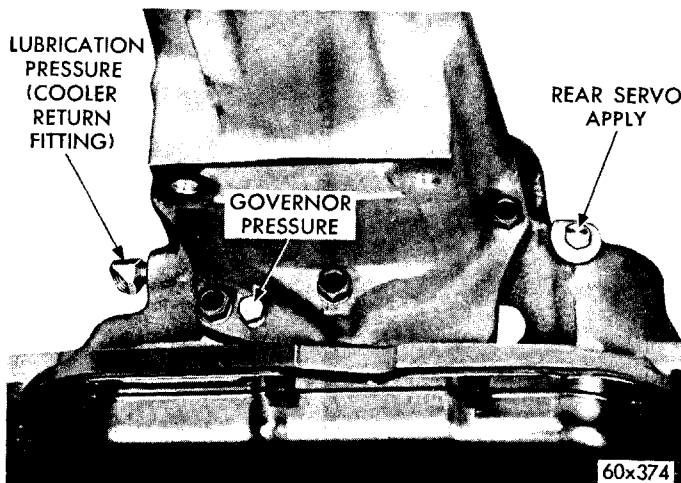


Fig. 15—Pressure Test Locations (Rear End of Case)

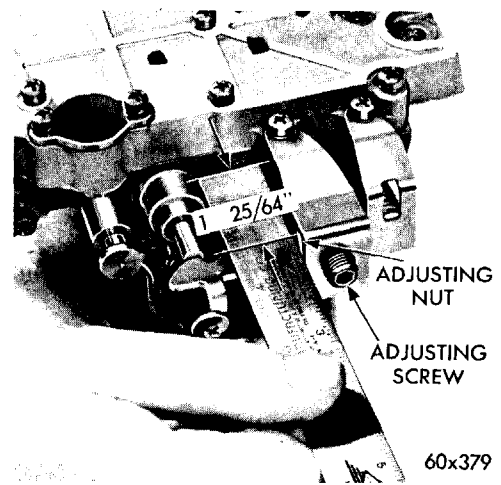


Fig. 16—Line Pressure Adjustment

servo apply pressure should be 230-280 psi.

#### Governor Pressure

(1) Connect a 0-100 psi pressure gauge, Tool C-3292 to the governor pressure take-off point, located at lower left rear corner of extension mounting flange (Fig. 15).

(2) Governor pressures should fall within the limits given in the following chart:

### GOVERNOR PRESSURE CHART

Engine Speed	Pressure Limits
320 RPM	2-4 PSI
1000 RPM	28-32 PSI
1400 RPM	40-45 PSI
2800 RPM	73-83 PSI

If governor pressures are incorrect at the given engine speeds, the governor valve and/or weights are probably sticking.

#### Throttle Pressure

No provisions are made to check throttle pressure. However, if throttle pressure adjustment is made properly as outlined in Paragraph 17, the pressure is assumed to be correct.

## 17. HYDRAULIC CONTROL PRESSURE ADJUSTMENTS

#### Line Pressure

If line pressure is not correct, it will be necessary to remove the valve body assembly to perform the adjustment. Refer to Paragraph 25.

The standard adjustment is  $1\frac{25}{64}$  inches, measured from the valve body to inner edge of the adjusting nut (Fig. 16). However, due to manufacturing tolerances, the adjustment can be varied to obtain the specified line pressure.

The adjusting screw may be turned with an Allen

drum flange.

(2) Hold brake drum flange with Tool C-3281, and remove retaining nut and washer (Fig. 19).

(3) Attach puller, Tool C-452 (if necessary) and remove drum and flange assembly.

(4) Remove brake shoe adjusting nut cover plate and loosen cable guide clamp bolt on brake support (Fig. 20). Disengage ball end of cable from operating lever and remove cable from the brake support.

(5) Remove the brake support grease shield spring, and remove grease shield (Fig. 20). Be careful not to damage the neoprene sealing surface at bottom of shield during removal.

(6) Using a suitable drift, remove lock pin that secures brake shoe anchor pin in front lug of extension housing.

(7) Slide balance of brake assembly with anchor pin from the extension housing.

(8) Remove neoprene spacer and steel sleeve from back of brake support plate.

**Installation**

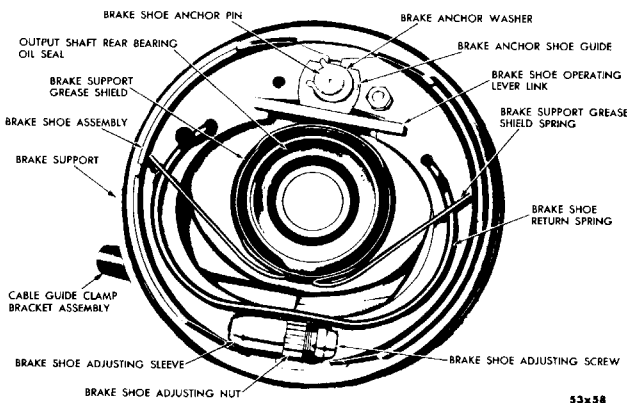
(1) Place the neoprene spacer in position on back of brake support plate with steel sleeve in center of support.

(2) Position brake assembly and anchor pin on end of extension, make sure spacer sleeve remains in center of support. Align anchor pin hole with hole in front lug and install lock pin.

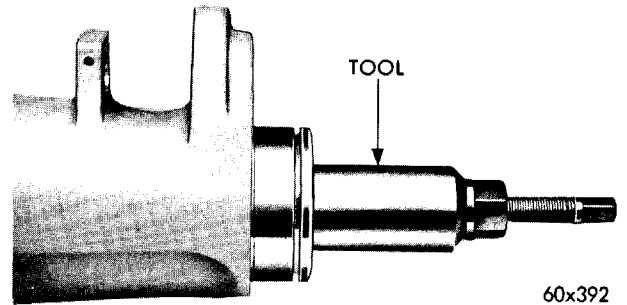
(3) Install grease shield, with flat on shield aligned with flat on extension housing. Install grease shield retainer spring with opening of spring toward brake shoe adjusting nut. Make sure spring is properly seated in groove.

(4) Slide the brake shoe return spring behind the grease shield spring and hook into position (Fig. 20).

(5) Engage ball end of parking cable in brake shoe



**Fig. 20—Internal Expanding Parking Brake (Drum Removed)**



**Fig. 21—Removing Output Shaft Oil Seal**

operating lever and tighten cable clamp bolt.

(6) Install cover plate on back side of parking brake support plate.

(7) Install brake drum and flange assembly, washer and nut. Tighten nut to 175 foot-pounds torque.

(8) Connect propeller shaft to the brake drum flange.

**20. OUTPUT SHAFT OIL SEAL**

**Removal and Installation**

(1) Remove the parking brake assembly. See Paragraph 19.

(2) Screw taper threaded end of Tool C-3753 into the seal, then tighten screw of tool to remove the seal (Fig. 21).

(3) To install new seal, slide protector sleeve, Tool C-3768 over output shaft splines, then drive in seal (lip side facing in) with Tool C-3754 (Fig.22).

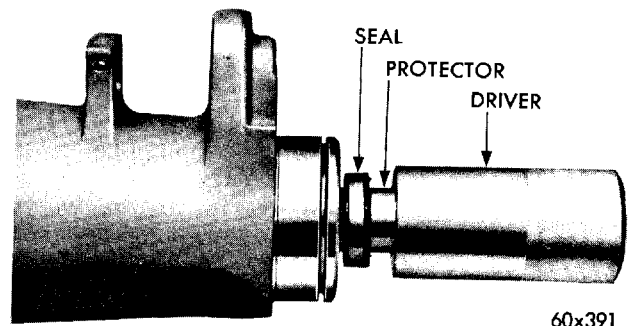
(4) Install the parking brake assembly and connect the propeller shaft.

**21. EXTENSION HOUSING**

**Removal**

(1) Remove the speedometer drive pinion and sleeve assembly. See Paragraph 18.

(2) Disconnect front universal joint from companion flange. Disconnect parking brake cable. See Paragraph 19, Step (4).



**Fig. 22—Installing Output Shaft Oil Seal**

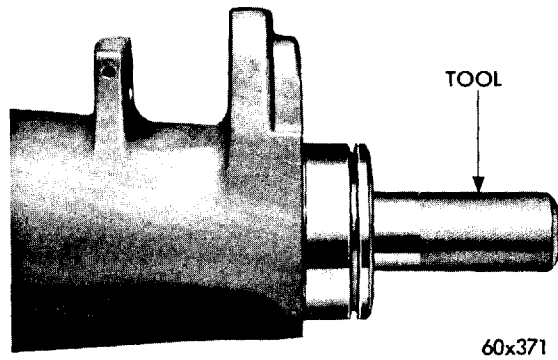


Fig. 23—Removing Output Shaft Bushing

(3) Drain approximately two quarts of fluid from the transmission.

(4) Remove nut and washers securing transmission extension housing insulator to crossmember.

(5) Using transmission service jack, Tool C-3203-A, raise transmission slightly to clear the crossmember. Remove crossmember attaching bolts and remove the crossmember.

(6) Remove extension housing to transmission bolts, tap the housing lightly with a soft mallet to break it loose from the transmission, then remove the housing.

(7) Remove parking brake assembly. See Paragraph 19.

### Bushing Replacement

(1) Press or drive out bushing with Tool C-3755 (Fig. 23).

(2) Slide a new bushing over ground end of Tool C-3751, then drive the bushing into housing with the tool. Make sure oil hole in bushing aligns with oil slot in the housing.

(3) Install the cup on the tool followed by the nut. While holding the screw from turning, tighten the tool nut to draw the burnisher through the bushing (Fig. 24).

### Installation

(1) Install parking brake assembly on the extension

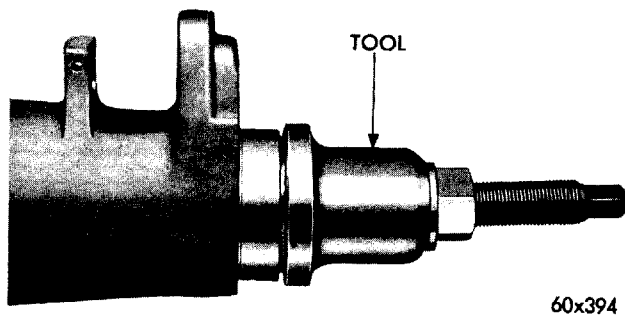


Fig. 24—Installing Output Shaft Bushing

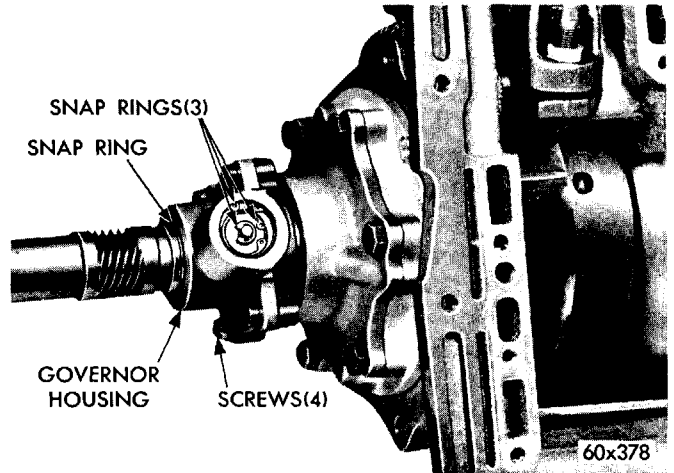


Fig. 25—Governor and Weight Snap Rings

housing. See Paragraph 19 (Installation) Steps (1) through (4).

(2) Using a new gasket, carefully slide the housing into place. Install the retaining bolts and washers, tighten bolts to 25-30 foot-pounds torque.

(3) Install the crossmember and tighten bolts securely.

(4) Lower the transmission to rest on the crossmember, install the mounting washers and nut, tighten the nut to 30-35 foot-pounds torque.

(5) Connect propeller shaft to companion flange. Connect parking brake cable. See Paragraph 19 (Installation) Steps (5) and (6).

(6) Install the speedometer drive pinion and sleeve.

(7) Add fluid to transmission to bring up to proper level.

## 22. GOVERNOR

### Removal

(1) Remove the extension housing. See Paragraph 21.

(2) Using a screw driver, carefully pry the snap ring from the weight end of governor valve shaft (Fig. 25). Slide the valve and shaft assembly out of governor housing.

(3) Remove large snap ring from weight end of governor housing, lift out governor weight assembly.

(4) Remove snap ring from inside governor weight, remove inner weight and spring from the outer weight. Figure 26 shows an exploded view of the governor assembly.

(5) Remove the snap ring from behind the governor housing, then slide the governor housing and support assembly off the output shaft. If necessary, remove four screws and separate governor housing from the support.

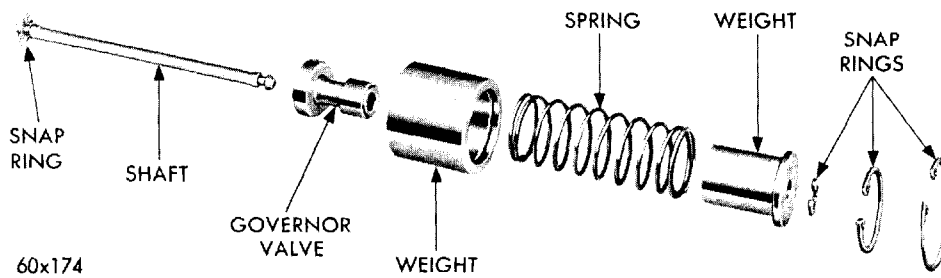


Fig. 26—Governor Valve, Weights, Spring and Shaft (Exploded View)

### Cleaning and Inspection

The primary cause of governor operating failure is due to a sticking governor valve or weights. Rough surfaces may be removed with crocus cloth. Thoroughly clean all parts in clean solvent and check for free movement before assembly.

### Installation

(1) Assemble the governor housing to the support (if disassembled) and tighten screws finger tight. Make sure oil passage of governor housing aligns with passage in support.

(2) Align master spline of support with master spline on output shaft and slide the assembly into place. Install snap ring behind the governor housing. Tighten housing to support screws to 6-8 foot-pounds torque.

(3) Assemble the governor weights and spring, and secure with snap ring inside of large governor weight. Place the weight assembly in governor housing and install snap ring.

(4) Place the governor valve on valve shaft, insert the assembly into housing and through the governor weights. Install the shaft retaining snap ring.

(5) Install the extension housing, parking brake

and connect propeller shaft.

(6) Connect the parking brake cable.

## 23. REAR OIL PUMP

### Removal

(1) Remove the extension housing. See Paragraph 21.

(2) Remove the governor and support. See Paragraph 22.

(3) Unscrew the rear oil pump cover retaining bolts and remove cover.

(4) Mark a line across the face of inner and outer pump rotors with dye so that they may be reinstalled in the same relation to each other.

(5) The oil pump inner rotor is keyed to output shaft by a small ball. Therefore, use care in sliding out inner rotor so as not to lose the ball (Fig. 27). Remove outer rotor from the pump body.

**NOTE: If rear oil pump body requires replacement, it will be necessary to disassemble the transmission as the pump body must be driven rearward out of the case with a wood block.**

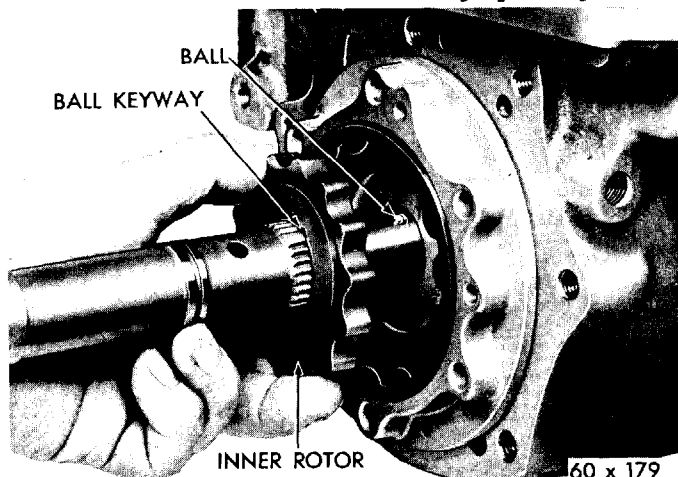


Fig. 27—Removing or Installing Rear Oil Pump Inner Rotor

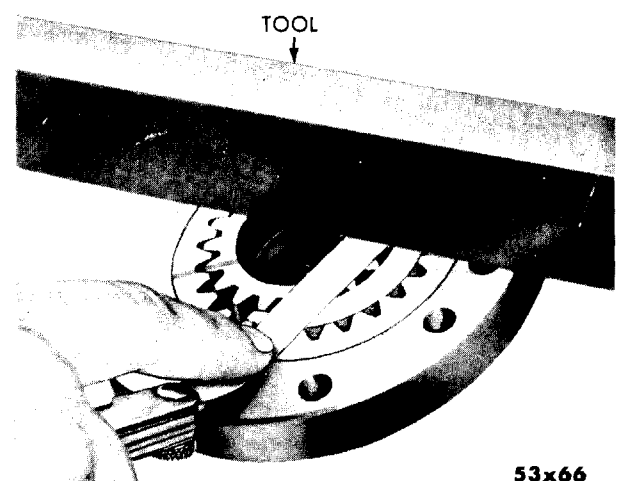


Fig. 28—Checking Oil Pump Rotor Clearance (Typical)

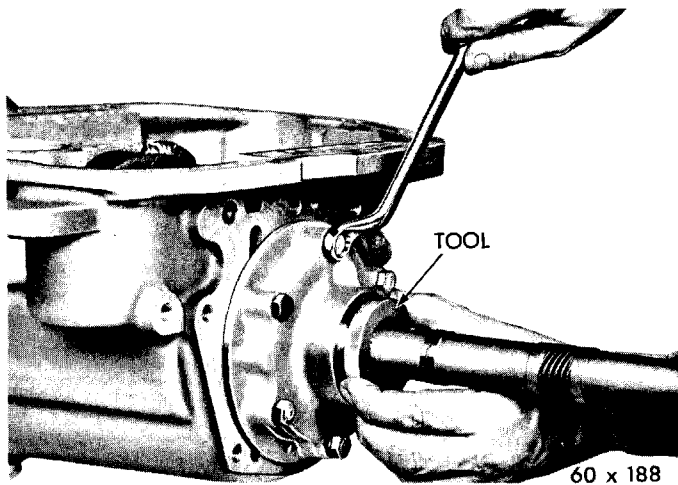


Fig. 29—Aligning Oil Pump Cover

### Inspection

Inspect oil pump body and cover machined surfaces for nicks and burrs. Inspect rotors for scoring or pitting. With gears cleaned and installed in pump body, place straight edge, Tool C-3335 across face of rotors and pump body (Fig. 28). Using a feeler gauge, check clearance between straight edge and face of rotors. Clearance limits are from .001 to .0025 inch.

### Installation

- (1) Place outer rotor in the pump body.
- (2) Turn output shaft so inner rotor driving ball pocket is up. Install the ball and slide inner rotor on the output shaft in alignment with the ball (Fig. 27).
- (3) Position outer rotor to align dye marks with inner rotor, then push inner rotor in mesh with outer rotor.
- (4) Install the oil pump cover with the retaining bolts threaded a few turns. Slide the aligning fixture, Tool C-3762 all the way in until it bottoms against rotor (Fig. 29), then retighten the cover bolts evenly to 14-16 foot-pounds torque.
- (5) Install the governor and support.
- (6) Install the extension housing, brake assembly and connect the propeller shaft.
- (7) Connect the parking brake cable.

## 24. NEUTRAL STARTING SWITCH

### Removal

- (1) Drain approximately two quarts of fluid from the transmission.
- (2) Disconnect wire from switch and unscrew switch from transmission case.

### Installation and Tests

- (1) With proper control cable adjustment assured and N (neutral) button depressed, check to see that switch operating lever is aligned in center of switch opening of the case.
- (2) Place cupped washer and "O" ring over threads

of switch (Fig. 10), then screw switch into transmission case a few turns.

(3) Connect one lead of a test lamp to battery current and the other lead to the switch terminal. Screw switch into transmission case until the lamp lights, then tighten switch an additional  $\frac{1}{8}$  to  $\frac{1}{2}$  turn. **NOTE: The switch must be tight enough to prevent oil leakage. If not, add a thin washer and readjust the switch.**

(4) Remove test lamp and connect wire to the switch.

(5) Add fluid to transmission to bring up to proper level.

## 25. VALVE BODY ASSEMBLY AND ACCUMULATOR PISTON

### Removal

- (1) Remove the drain plug from transmission oil pan and drain the transmission fluid.
- (2) Remove the oil pan and gasket.
- (3) Loosen clamp bolt and lift the throttle lever, washer and seal off the transmission throttle lever shaft.
- (4) Shift the manual control into the L (low) position to expose the nut securing the cable adapter to the manual lever (Fig. 11). Remove nut and disengage cable adapter from the manual lever.
- (5) Place drain pan under transmission, then remove the ten hex-head valve body to transmission case bolts. Hold valve body in position while removing bolts.
- (6) Lower the valve body assembly down out of the transmission, being careful not to cock the throttle lever shaft in the case hole or lose the accumulator spring.
- (7) Insert Tool C-434 inside accumulator piston and remove piston from transmission case. Inspect piston for scoring, check rings for wear or breakage. Replace as required.

**NOTE: Servicing the valve body assembly is outlined in Paragraph 30.**

### Installation

- (1) Clean mating surfaces and check for burrs on both the transmission case and valve body transfer plate.
- (2) Install accumulator piston in the transmission case.
- (3) Position accumulator spring on the valve body.
- (4) Carefully position the valve body assembly into place in transmission case and start all the retaining bolts.
- (5) Snug the bolts down evenly, then tighten to 55 inch-pound torque.
- (6) Connect the control cable adapter to manual

lever and install retaining nut.

(7) Install seal, flat washer and throttle lever on throttle shaft. Tighten clamping bolt.

(8) Install the oil pan, using new gasket.

(9) Add fluid to transmission to bring up to proper level.

## 26. TRANSMISSION ASSEMBLY

### Removal

(1) Disconnect negative (ground) cable from the battery.

(2) Depress L (low) push button to position control cable for removal from the transmission.

(3) Remove the starting motor assembly.

(4) Raise vehicle on a hoist or support with stands.

(5) Remove cover plate from in front of the converter assembly to provide access to the converter drain plugs and mounting bolts.

(6) Drain the torque converter and transmission.

(7) Disconnect wire from neutral starting switch and remove the switch.

(8) Remove push button control cable to transmission adjusting plate screw.

(9) Insert screw driver through neutral starting switch opening (Fig. 9). Push screw driver gently against upper projecting portion of cable lock-spring, and pull outward on cable to remove cable from adapter and transmission case.

(10) Loosen clamp screw and remove throttle link and lever assembly from the throttle shaft.

(11) Disconnect oil cooler lines at the transmission and remove oil filler tube.

(12) Remove speedometer pinion and sleeve assembly from the transmission (Fig. 18).

(13) Disconnect the front universal joint and secure out of the way.

(14) Remove parking brake adjusting nut cover plate and loosen cable clamp bolt on brake support (Fig. 20). Disengage the ball end of the cable from the operating lever and remove cable from the brake support.

(15) Remove nut and washers securing transmission extension housing insulator to the crossmember.

(16) Install engine support fixture, Tool C-3806 and raise the engine slightly.

(17) Remove crossmember attaching bolts and remove the crossmember.

(18) Place transmission service jack under the transmission to support the assembly.

(19) Mark the converter and flex driving plate so they can be assembled in the same relative position. Remove the converter to flex plate mounting screws. Attach a small "C" clamp to edge of bell housing to

hold converter in place during removal of transmission.

(20) Remove the bell housing retaining bolts. Carefully work the transmission rearward off the engine block dowels and to disengage converter hub from the end of crankshaft.

(21) Lower the transmission jack and remove the transmission and converter assembly.

### Installation

(1) Place transmission and converter assembly on service jack and position assembly under vehicle for installation. Raise or tilt as necessary until the transmission is aligned with the engine.

(2) Rotate the converter so alignment marks (made during removal) are in register. Carefully work the assembly forward over the engine block dowels with the converter hub entering the crankshaft opening.

(3) After the assembly is positioned properly, install the bell housing bolts, then tighten the bolts to 25-30 foot-pounds torque.

(4) Install the flex plate to converter bolts and tighten to 15-19 foot-pounds torque.

(5) Install the crossmember and tighten attaching bolts securely. Lower the transmission so the insulator mounting rests, and is properly aligned on the crossmember. Install mounting washers and nut, tighten nut to 30-35 foot-pounds torque.

(6) Engage ball end of parking brake cable in brake shoe operating lever and tighten cable clamp bolt.

(7) Install cover plate on back side of parking brake support plate.

(8) Connect the propeller shaft to the front companion flange.

(9) Install the speedometer drive pinion and sleeve.

(10) Connect oil cooler lines to the transmission and install oil filler tube.

(11) Position throttle lever on transmission throttle shaft and tighten clamp screw. To adjust throttle linkage, refer to "Maintenance, Adjustments and Tests" Paragraph 14.

(12) Insert push button control cable in transmission case, push inward on cable making sure spring lock engages cable. Install control cable adjusting wheel retaining screw. To adjust control cable, refer to "Maintenance, Adjustments and Tests," Paragraph 11.

(13) Install neutral starting switch and connect wire. To adjust switch, refer to "Maintenance, Adjustments and Tests," Paragraph 12.

(14) Install cover plate in front of the converter assembly.

(15) Install the starting motor assembly and connect battery ground cable.

(16) Refill transmission with Automatic Transmission Fluid. Refer to Lubrication Group in this Manual.

## RECONDITION TRANSMISSION UNIT OUT OF VEHICLE

The following reconditioning paragraphs cover the removal, disassembly, inspection, repair, assembly and installation procedures for each sub-assembly in detail.

In the event that any part has failed in the transmission, the torque converter should be flushed to insure that fine metal particles are not later transferred back into the reconditioned transmission.

### 27. FLUSHING TORQUE CONVERTER

(1) Reinstall converter assembly, remove drain plug and drain out transmission fluid.

(2) Insert screw driver into torque converter and turn stator hub (large splined hub) counterclockwise so that one of the  $\frac{1}{8} \times \frac{3}{8}$  inch slots of this assembly is visible at the top. A second opening directly below provides an adequate opening for kerosene (if poured slowly).

(3) Slowly pour two quarts of new clean kerosene into the torque converter, using a long spouted can. Close the hub opening with masking tape.

(4) Disconnect the coil wire to prevent engine from starting, then rotate converter approximately 10 seconds by cranking engine.

(5) Drain the converter and repeat the operation at least once, or as many times as required until the kerosene drained out is clear.

(6) After flushing, rotate the converter several revolutions with drain plugs removed. This will remove any residual solvent and trapped dirt. Reinstall the drain plugs.

### 28. REMOVAL OF SUB-ASSEMBLIES

Prior to removing any of the transmission sub-assemblies, thoroughly clean the exterior of the unit, preferably by steam. Cleanliness through the entire disassembly and assembly cannot be over-emphasized. When disassembling, each part should be washed in a suitable solvent, 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.

#### Oil Pan

(1) Place transmission assembly in repair stand, Tool C-3750.

(2) Unscrew oil pan bolts and remove oil pan and gasket.

#### Valve Body Assembly

(1) Unscrew nut and remove control cable adapter from valve body manual lever (Fig. 11).

(2) Remove the ten hex-head valve body assembly to transmission case bolts (Fig. 11). Hold the valve body in position while removing bolts.

(3) Lift the valve body assembly out of transmission case, being careful not to cock the throttle lever shaft.

#### Accumulator Piston and Spring

(1) Lift the spring off the accumulator piston and withdraw piston from the case.

#### Parking Brake Assembly

(1) Hold brake drum flange with Tool C-3281 and remove retaining nut and washer (Fig. 19).

(2) Attach puller, Tool C-452 (if necessary) and remove drum and flange assembly.

(3) Remove the brake support grease shield spring, and remove grease shield (Fig. 20). Be careful not to damage the neoprene sealing surface at bottom of shield during removal.

(4) Using a suitable drift, remove lock pin that secures brake shoe anchor pin in front lug of extension housing.

(5) Slide balance of brake assembly with anchor pin from the extension housing.

(6) Remove neoprene spacer and steel sleeve from back of brake support plate.

#### Checking Drive Train End Play

Check the drive train end play before removal of the output shaft extension housing. This will indicate the spacer required between input and output shafts to properly adjust end play during reassembly (except when major parts are replaced).

(1) Attach a dial indicator to the extension housing with its plunger seated against end of output shaft (Fig. 30).

(2) Check the output shaft in and out to obtain end play reading. If necessary, tap the shaft inward with a mallet, and pry outward with a screw driver to obtain the reading.

(3) Record the indicator reading for reference when reassembling the transmission. End play specifications are .024 — .062 inch.

#### Extension Housing

(1) Remove extension housing to transmission bolts, tap the housing lightly with a soft mallet to break it loose from the transmission, then carefully remove the housing.



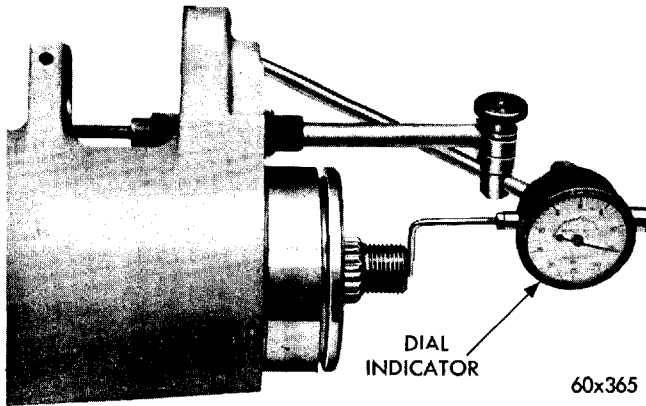


Fig. 30—Checking Drive Train End Play

### Governor and Support

(1) Using a screw driver, carefully pry snap ring from the weight end of governor valve shaft (Fig. 25). Slide the valve and shaft assembly out of governor housing.

(2) Remove snap ring from behind the governor housing, then slide the governor housing and support assembly off the output shaft.

### Rear Oil Pump

(1) Unscrew the rear oil pump cover retaining bolts and remove cover.

(2) Mark the face of inner end outer pump rotor with dye so they may be reinstalled in the same relation to each other.

(3) The oil pump inner rotor is keyed to output shaft by a small ball. Therefore, use care in sliding out inner rotor so as not to lose the ball (Fig. 27). Remove outer rotor from the pump body. **NOTE: If replacement of rear oil pump is required, drive it rearward out of the case with a wood block after the transmission has been disassembled.**

### Front Oil Pump and Reaction Shaft Support

(1) Remove the front oil pump housing retaining bolts.

(2) Attach Tool C-3752 to pump housing flange as shown in Figure 31, thread the screws of the tool into the flange holes at 11 and 4 o'clock locations.

(3) Bump outward evenly on the two "knocker weights" to withdraw oil pump and reaction shaft support assembly from the case.

### Front Band and Front Clutch

(1) Loosen the front band adjuster, remove the band strut and slide the band out of the case.

(2) Slide the front clutch assembly out of the case.

### Input Shaft and Rear Clutch

(1) Grasp the input shaft, and slide input shaft and rear clutch assembly out of the case.

**CAUTION: Be careful not to lose the thrust washer located between rear end of input shaft and forward end of output shaft.**

### Planetary Gear Assemblies, Sun Gear, Driving Shell, Low and Reverse Drum

(1) While supporting the output shaft and driving shell, carefully slide the assembly forward and out through the case.

**CAUTION. Be very careful not to damage ground surfaces on the output shaft during removal.**

### Rear Band

(1) Loosen the rear band adjuster, remove the band strut and remove band from the case.

### Overrunning Clutch

(1) Note the position of the overrunning clutch rollers and springs before disassembly to assist in re-assembly.

(2) Carefully slide out clutch hub and remove rollers and springs.

(3) Remove low and reverse drum thrust washer from inside the overrunning clutch case.

### Kickdown Servo

(1) Remove snap ring securing piston rod guide in the case.

(2) Remove the rod guide, spring and piston rod from the case. Be careful not to damage piston rod or guide during removal.

(3) Insert Tool C-484 inside piston and withdraw piston from transmission case.

### Low and Reverse Servo

(1) Using the screw portion of the "Power Steering Worm Housing Bearing Cup Remover Tool C-3322" or

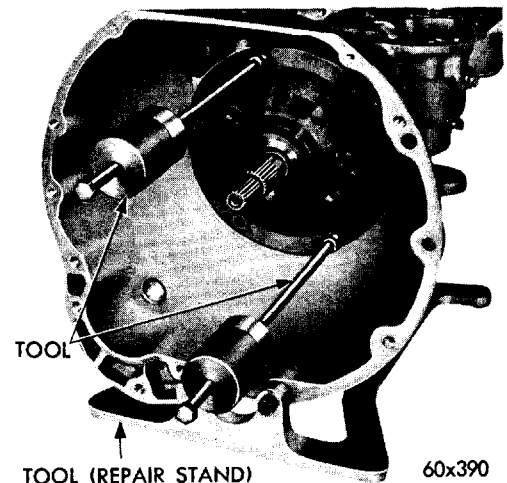


Fig. 31—Removing Front Oil Pump and Reaction Shaft Support Assembly

suitable substitute, depress the piston spring retainer and remove the snap ring.

(2) Remove spring retainer, spring and servo piston and plug assembly from the case.

## 29. RECONDITION SUB-ASSEMBLIES

The following procedures cover the disassembly, inspection, repair, and assembly of each sub-assembly as removed from the transmission.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care to avoid rounding off the sharp edges. The sharp edge 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.

**NOTE: Coat each part with Automatic Transmission Fluid — Type "A", Suffix "A" during assembly.**

## 30. VALVE BODY ASSEMBLY

### Disassembly

**CAUTION: Never clamp any portion of the valve body or transfer plate in a vise. Any slight distortion of the aluminum body or the transfer plate will result in sticking valves, excessive leakage or both. When removing or installing valves or plugs, slide them in or out carefully. Do not use force.**

(1) Place the valve body assembly on repair stand, Tool C-3749 (Fig. 32). Remove three screws from oil screen and lift off the screen.

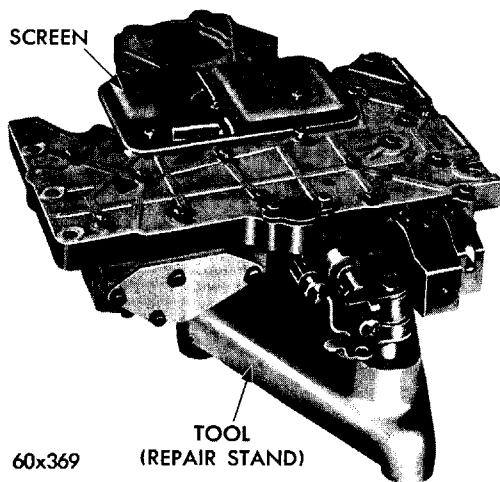


Fig. 32—Removing or Installing Oil Screen

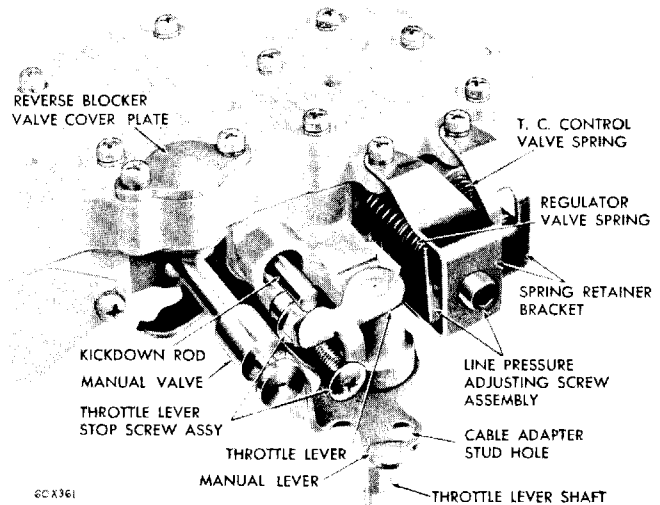


Fig. 33—Spring Bracket, Springs, Regulator Valve, and Converter Control Valve (Assembled View)

(2) While holding the spring retainer bracket firmly against the spring force, remove the three bracket retaining screws (Fig. 33).

(3) Remove spring bracket, torque converter control valve spring, and the regulator valve spring with line pressure adjusting screw assembly. **NOTE: Do not alter the setting of the line pressure adjusting screw and nut. The nut has an interference thread and does not turn easily on the screw.**

(4) Slide regulator valve and spring retainer ring out of the valve body. Slide torque converter control valve out of the valve body.

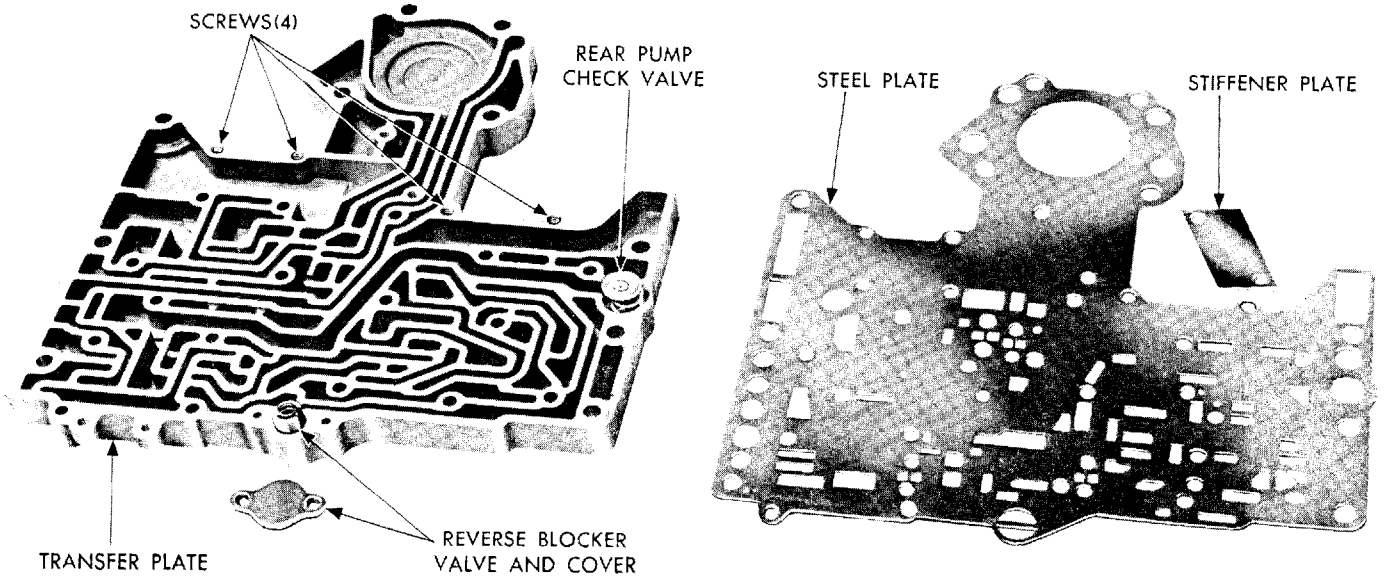
(5) Remove the 14 transfer plate retaining screws. Carefully lift the transfer plate and steel plate assembly off the valve body.

(6) Invert transfer plate assembly and remove the stiffener plate. Remove remaining screws securing steel plate to transfer plate, and carefully lift off steel plate (Fig. 34). Remove the rear pump check valve and spring.

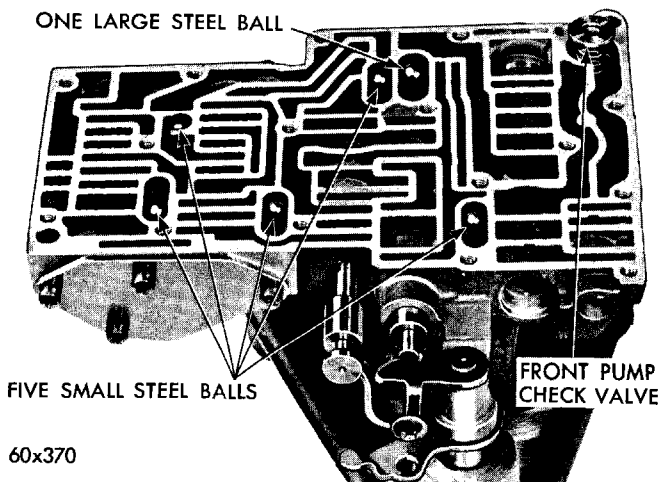
(7) Remove reverse blocker valve cover and lift out spring and valve.

(8) Note location of the six steel balls in the valve body, one of them is larger than the other five and is in the larger chamber (Fig. 35). Remove the steel balls, front pump check valve and spring.

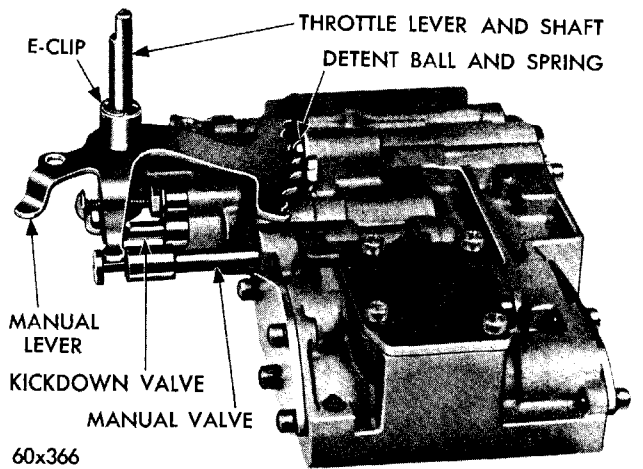
(9) Invert valve body and lay it on a clean cloth or paper. Remove E-clip from the throttle lever shaft (Fig. 36). Remove any burrs from the shaft, then while holding manual lever detent ball and spring in their bore with Tool C-3765 or similar tool, slide manual lever off the throttle shaft. Remove detent ball and spring.



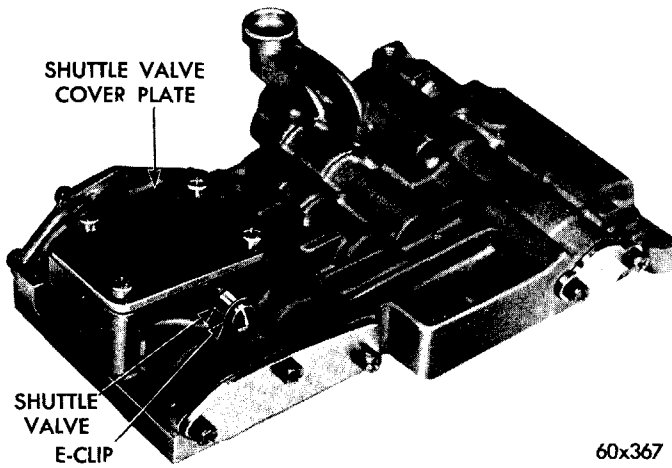
**Fig. 34—Transfer Plate, Steel Plate Stiffener Plate, Reverse Blocker Valve, and Rear Pump Check Valve (Disassembled View)**



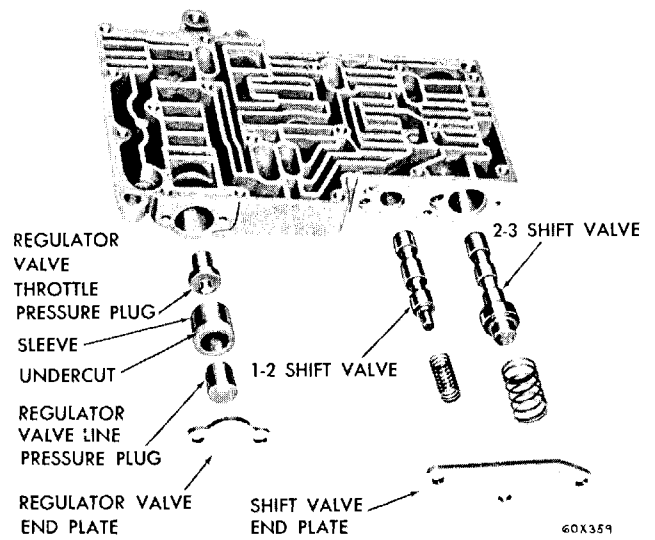
**Fig. 35—Front Pump Check Valve and Steel Ball Locations**



**Fig. 36—Manual Lever, Detent Ball and Spring, Throttle Lever and Shaft, Manual Valve, and Kickdown Valve (Assembled View)**



**Fig. 37—Shuttle Valve Cover, Shuttle Valve and Retaining E-Clip (Assembled View)**



**Fig. 39—Valve Body — Shift Valve Side (Exploded View)**

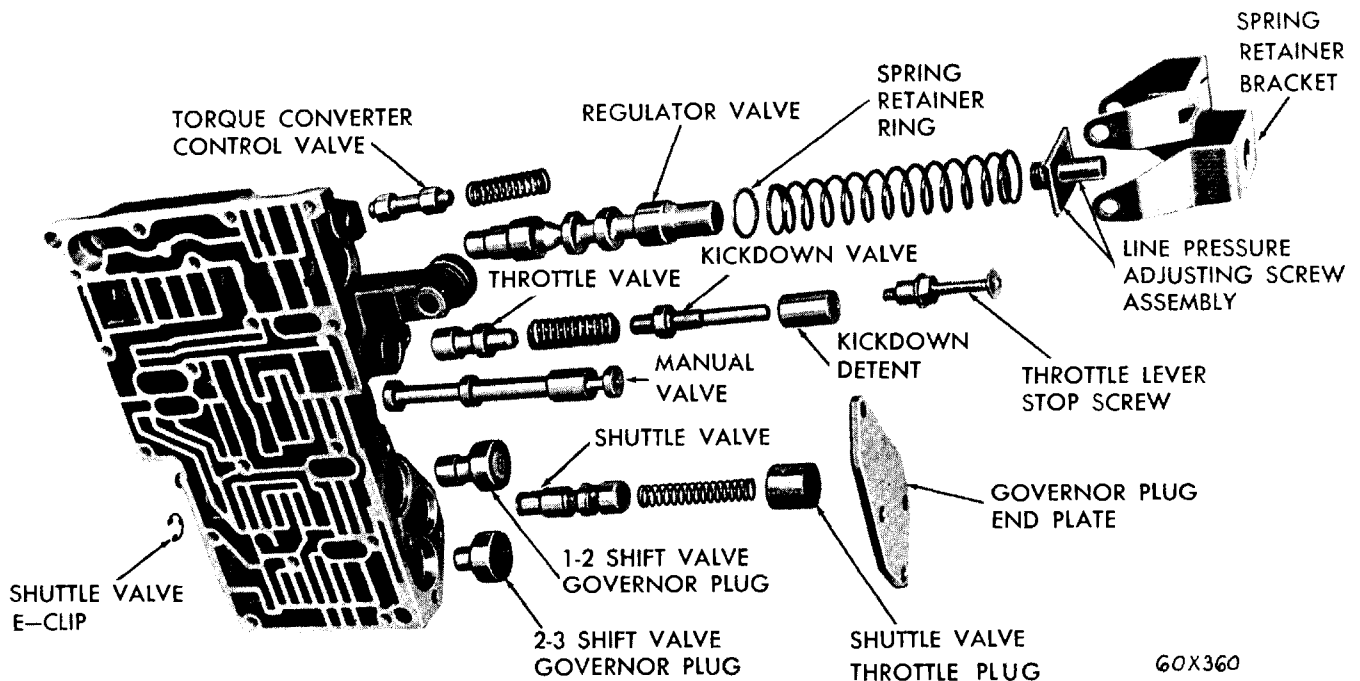
- (10) Remove the manual valve, carefully slide it out of valve body with a rotating motion.
- (11) Remove throttle lever and shaft from the valve body.
- (12) Remove shuttle valve cover plate (Fig. 37). Remove E-clip from the exposed end of shuttle valve.
- (13) Remove throttle lever stop screw assembly (Fig. 38), be careful not to disturb the setting any more than is necessary.
- (14) Remove kickdown detent, kickdown valve, throttle valve spring and the throttle valve (Fig. 38).
- (15) Remove governor plug end plate (Fig. 38).

Tip up the valve body to allow the shuttle valve throttle plug, spring, shuttle valve, and the shift valve governor plugs to slide out into your hand.

Note the longer stem on the 1-2 shift valve plug as a means for identification.

(16) Remove shift valve end plate (Fig. 39) and slide out the two springs and valves.

(17) Remove the regulator valve end plate. Slide regulator valve line pressure plug, sleeve, and the regulator valve throttle pressure plug out of the valve body.



**Fig. 38—Valve Body — Lever Side (Exploded View)**

### Cleaning and Inspection

Allow all parts to soak a few minutes in a suitable clean solvent. Wash thoroughly and blow dry with compressed air. Make sure all passages are clean and free from obstructions.

Inspect the manual and throttle valve operating levers and shafts for being bent, worn or loose. If a lever is loose on its shaft, it may be **silver soldered** only, or the lever and shaft assembly should be replaced.

**CAUTION: Do not attempt to straighten bent levers.**

Inspect all mating surfaces for burrs, nicks and scratches. Minor blemishes may be removed with crocus cloth, using only a very light pressure. Using straightedge, Tool C-3335, check all mating surfaces for warpage or distortion. Slight distortion may be corrected, using a surface plate. Make sure all metering holes in the steel plate are open. Using a pen light, inspect bores in the valve body for scores, scratches, pits and irregularities.

Check all valve springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks and scores. Small nicks and scores may be removed with crocus cloth, providing extreme care is taken not to round off sharp edges. The sharpness of these edges is vitally important because it prevents foreign matter from lodging between the valve and the valve body, thus reducing the possibility of sticking. Check all valves and plugs for freedom of operation in the valve body bores. When bores, valves and plugs are clean and dry, the valves and plugs should fall freely in the bores.

The front and rear pump check valves are provided with a controlled leakage path, to assure that the rear pump remains primed.

### Assembly

(1) Place rear pump check valve and spring in the transfer plate (Fig. 34). Position steel plate on the transfer plate, hold rear pump check valve in its bore with a thin steel scale, and install four steel plates to transfer plate retaining screws. Make sure bolt holes in steel plate and transfer plate are aligned, then tighten screws evenly to 25 inch-pounds torque. Check rear pump check valve for free movement in the transfer plate. Install stiffener plate and tighten retaining screws to 25 inch-pounds torque.

(2) Turn transfer plate over and install reverse blocker valve spring and valve. Rotate valve until it seats through the steel plate. Hold the valve down and install blocker valve cover plate. Tighten the two retaining screws to 25 inch-pounds torque.

(3) Place the 1-2 and 2-3 shift valve governor plugs in their respective bores (Fig. 38). Install shuttle valve, spring and shuttle valve throttle plug. Install governor plug end plate and tighten the four retaining screws to 25 inch-pounds torque.

(4) Install E-clip on end of shuttle valve (Fig. 37). Install shuttle valve cover plate and tighten the four retaining screws to 25 inch-pounds torque.

(5) Install the 1-2 and 2-3 shift valves and springs (Fig. 39). Install shift valve end plate and tighten the three retaining screws to 25 inch-pounds torque.

(6) Install regulator valve throttle pressure plug, sleeve (under cut on sleeve toward end plate), and line pressure plug (Fig. 39). Install regulator valve end plate and tighten the two retaining screws to 25 inch-pounds torque.

(7) Install the throttle valve and spring (Fig. 38). Slide the kickdown detent on kickdown valve (counter-bore side of detent toward valve), then install the assembly in the valve body.

(8) Install throttle lever stop screw (Fig. 38) and tighten lock nut finger tight.

(9) Install manual valve in the valve body (Fig. 36).

(10) Install throttle lever and shaft on the valve body (Fig. 40). Insert detent spring and ball in its bore in the valve body (Fig. 40). Depress ball and spring with Tool C-3765 or similar tool and slide manual lever over throttle shaft so that it engages manual valve and detent ball. Install the retaining E-clip on the throttle shaft.

(11) Position the valve body assembly on the holding stand.

(12) Place the six steel balls in the valve body chambers with large ball in the large chamber (Fig. 35). Place the front pump check valve and spring in valve body.

(13) Position transfer plate assembly on the valve body. Hold front pump check valve in its bore with a thin steel scale. Install the 14 retaining screws, starting

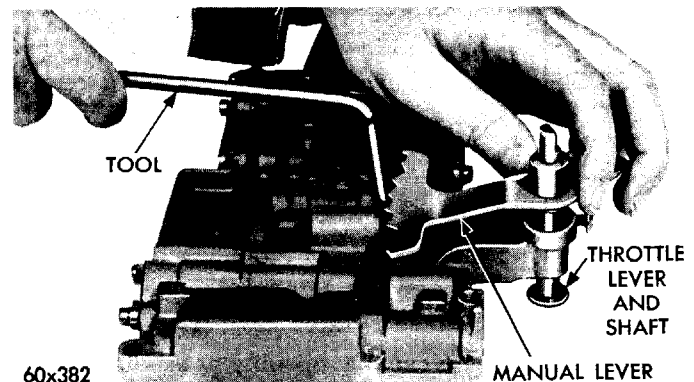


Fig. 40—Installing Detent Ball, Spring, and Manual Lever

at the center and working outward, tighten screws to 25 inch-pounds torque.

(14) Install the torque converter valve and the regulator valve and spring retainer ring (Fig. 38).

(15) Position torque converter valve spring and regulator valve spring over ends of their respective valves. Place line pressure adjusting screw assembly on end of regulator valve spring with long dimension of nut at right angles to the valve body (Fig. 38).

(16) Install spring retainer bracket, making sure converter valve spring is engaged on tang in the bracket. Tighten the three bracket retaining screws to 25 inch-pounds torque (Fig. 33).

(17) Install oil strainer and tighten the three retaining screws to 25 inch-pounds torque.

**IMPORTANT: After the valve body has been serviced and completely assembled, adjust the throttle and line pressures as outlined in Paragraph 17. However, if line pressure was satisfactory prior to disassembly, do not alter this adjustment.**

### 31. ACCUMULATOR PISTON AND SPRING

#### Inspection

Inspect the two seal rings for wear and make sure they turn freely in the piston grooves. It is not necessary to remove rings unless condition warrants. Inspect the piston for nicks, burrs, scores and wear. Check the piston bore in the case for scores or other damage. Check piston spring for distortion. Replace parts as required.

### 32. EXTENSION HOUSING BUSHING AND OIL SEAL

#### Replacement

(1) Press or drive out bushing with Tool C-3755 (Fig. 23).

(2) Drive oil seal out of extension with a long blunt drift.

(3) Slide a new bushing over the ground end of Tool C-3751, then press the bushing into place with the tool. Make sure oil hole of bushing aligns with slot in the bushing.

(4) Install cup on the tool followed by the nut. While holding the screw from turning, tighten the tool nut to draw the burnisher through the bushing (Fig. 24).

(5) Place new oil seal in opening of extension housing (lip of seal facing inward). Using Tool C-3754, drive seal into housing until tool bottoms (Fig. 22).

### 33. GOVERNOR

#### Disassembly

(1) Remove large snap ring from weight end of governor housing, lift out governor weight assembly.

(2) Remove snap ring from inside governor weight, remove inner weight and spring from the outer weight.

#### Cleaning and Inspection

Figure 26 shows an exploded view of the governor assembly.

Inspect all parts for burrs and wear. Check inner weight for free movement in outer weight, and outer weight for free movement in governor housing. Check valve for free movement in the governor housing. The weights and valve should fall freely when clean and dry. Rough surfaces may be removed with crocus cloth. Check governor weight spring for distortion. Thoroughly clean all parts in clean solvent and check for free movement before assembly.

#### Assembly

(1) Assemble the governor weights and springs, and secure with snap ring inside of large governor weight.

(2) Place the weight assembly in governor housing and install snap ring.

### 34. REAR OIL PUMP

#### Inspection

Inspect oil pump body and cover machined surfaces for nicks and burrs. Inspect rotors for scoring or pitting. With rotors cleaned and installed in pump body, place straight edge, Tool C-3335 across face of rotors and pump body (Fig. 28). Using a feeler gauge, check clearance between straight edge and face of rotors. Clearance limits are from .001 to .0025 inch.

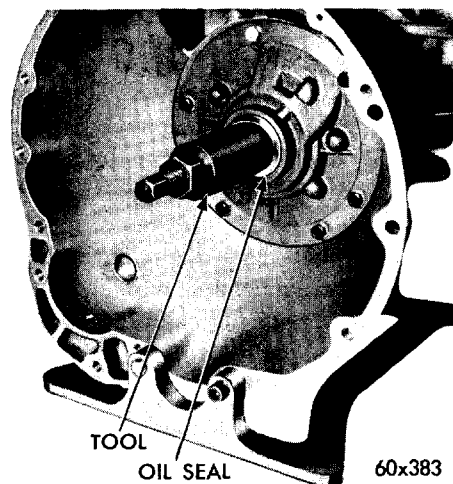


Fig. 41—Removing Front Pump Oil Seal

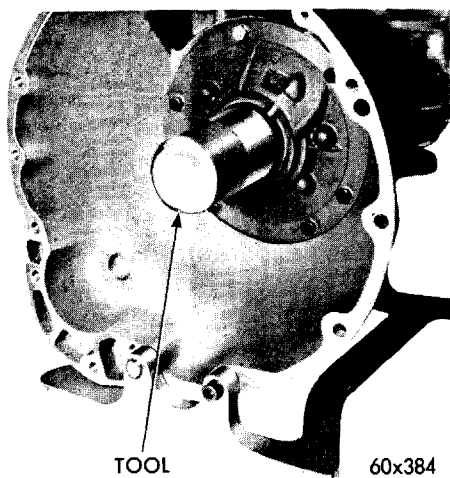


Fig. 42—Installing Front Pump Oil Seal

### 35. FRONT PUMP OIL SEAL

#### Replacement

The front pump oil seal can be replaced without removing front pump and reaction shaft support assembly from the transmission case.

(1) Screw seal remover, Tool C-3758 into the seal (Fig. 41). Tighten screw portion of tool to withdraw the seal.

(2) To install new seal, place seal in opening of pump housing (lip side facing inward). Using Tool C-3757, drive seal into housing until tool bottoms (Fig. 42).

### 36. FRONT OIL PUMP AND REACTION SHAFT SUPPORT

#### Disassembly

Figure 43 shows the front oil pump and reaction shaft support disassembled.

(1) Remove bolts from rear side of reaction shaft support and lift support off the oil pump.

(2) Mark the face of inner and outer pump rotors with dye so they may be reinstalled in the same relation to each other, then remove the rotors.

(3) Remove rubber seal ring from front pump body flange.

(4) Drive out oil seal with a blunt punch.

#### Inspection

Inspect interlocking seal rings (Fig. 43) on reaction shaft support for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant. Inspect machined surfaces on oil pump body and reaction shaft support for nicks and burrs. Inspect oil pump rotors for scoring or pitting. With rotors cleaned and installed in pump body, place straight edge, Tool C-3335 across face of rotors and pump body (Fig. 28). Using a feeler gauge, check clearance between straight edge and face of rotors. Clearance limits are from .001 to .0025 inch.

#### Assembly

(1) Place reaction shaft support in assembling Tool C-3759 with hub of support resting on bench (Fig. 44). Screw two pilot studs, Tool C-3283 into threaded holes of reaction shaft support flange.

(2) Assemble rotors with dye marks aligned, place rotors in center of the support (Fig. 44). **The two driving lugs inside rotor must be next to the face of reaction shaft support.**

(3) Lower pump body over pilot studs, insert Tool C-3756 through pump body and engage with pump inner rotor. Rotate rotors with the tool to enter rotors in the pump body, then with pump body firmly against the reaction shaft support, tighten clamping tool securely.

(4) Invert the front pump and reaction shaft support assembly with clamping tool intact. Install support to pump body bolts and tighten to 14-16 foot-pounds

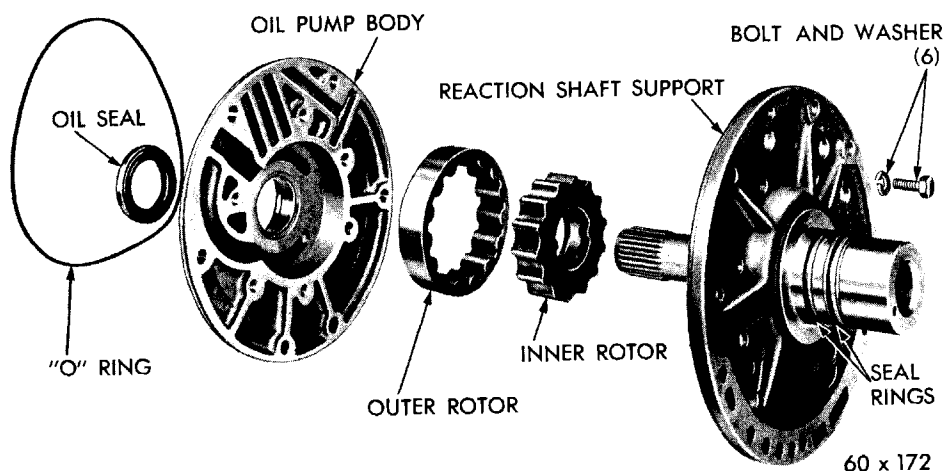
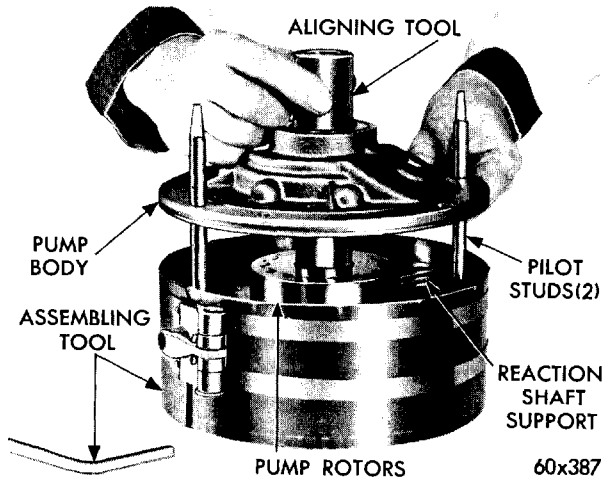
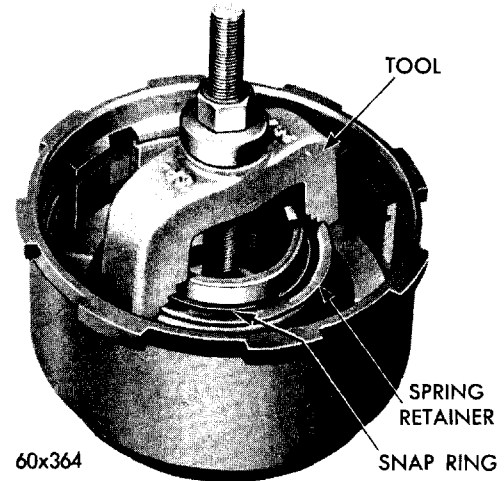


Fig. 43—Front Oil Pump and Reaction Shaft Support (Exploded View)



**Fig. 44—Assembling Front Pump and Reaction Shaft Support**



**Fig. 46—Removing or Installing Front Clutch Spring Retainer Snap Ring**

torque. Remove clamping tool, pilot studs and rotor alignment tool.

(5) Place new oil seal in opening of front oil pump housing (lip of seal facing inward). Using Tool C-3757, drive seal into housing until tool bottoms.

### 37. FRONT CLUTCH

#### Disassembly

Figure 45 shows an exploded view of the front clutch assembly.

(1) Using a screw driver, remove large snap ring that secures the pressure plate in clutch piston retainer. Lift the pressure plate and clutch plates out of the retainer.

(2) Install compressor, Tool C-3575 over piston spring retainer as shown in Figure 46. Compress spring

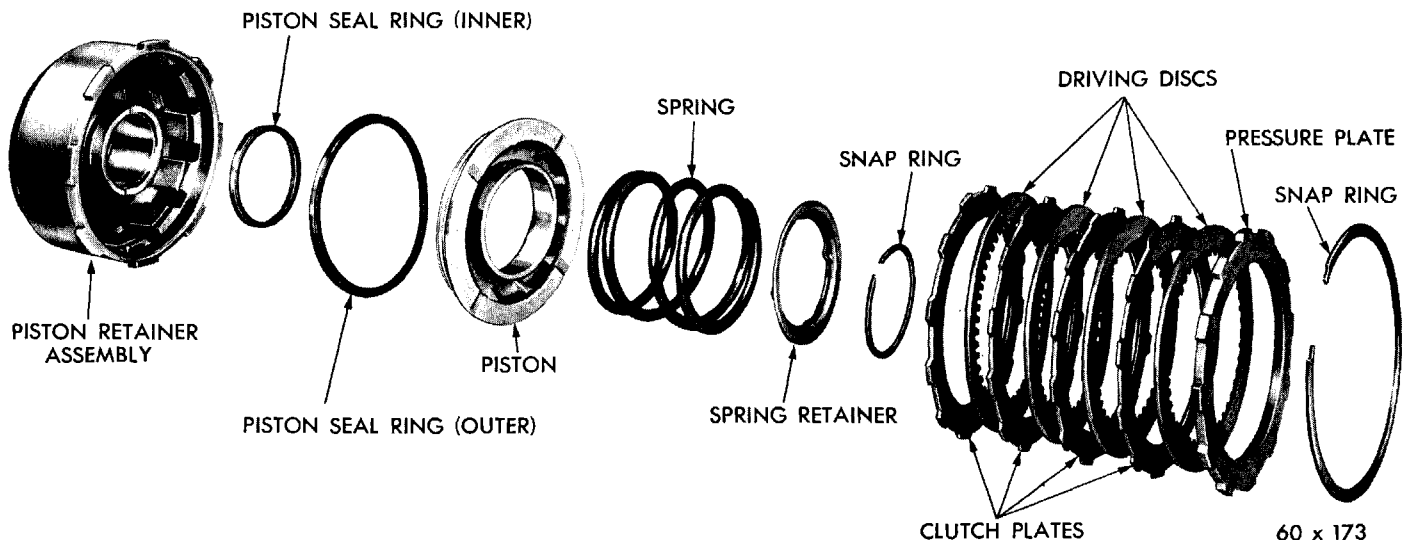
and remove snap ring, then slowly release tool until spring retainer is free of the hub. Remove the tool, retainer and spring.

(3) Invert clutch retainer assembly and bump on a wood block to remove the piston. Remove seal rings from the piston and clutch retainer hub.

#### Inspection

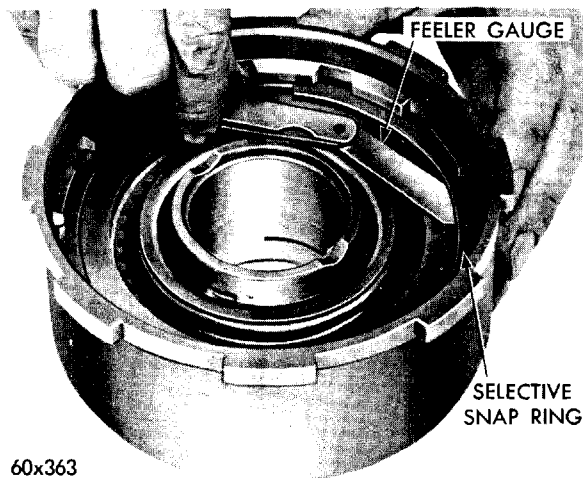
Inspect driving discs for evidence of burning, glazing and flaking off of facing material. Scratch facings with finger nail, if material collects under nail, replace all driving discs. Check disc driving splines for wear or other damage. Inspect steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs, replace if necessary.

Check steel plate lug grooves in clutch retainer for smooth surfaces, plates must travel freely in grooves.



**Fig. 45—Front Clutch Assembly (Exploded View)**





60x363

**Fig. 47—Checking Front Clutch Plate Clearance**

Inspect band contacting surface on clutch retainer for scores. Note the ball check in clutch retainer, make sure the ball moves freely. Inspect seal ring surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of neoprene rings.

Inspect inside bore of piston for score marks, if light, remove with crocus cloth. Check seal ring grooves for nicks and burrs. Inspect neoprene seal rings for deterioration, wear, and hardness. Check piston spring, retainer and snap ring for distortion.

#### Assembly

- (1) Lubricate and install inner seal ring on hub of

clutch retainer. Make sure lip of seal faces down and is properly seated in the groove.

- (2) Lubricate and install outer seal ring on clutch piston, with lip of seal toward bottom of clutch retainer. Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of retainer.

- (3) Place spring on piston hub and position spring retainer and snap ring on spring. Compress spring with Tool C-3575 (Fig. 46), and seat snap ring in the hub groove. Remove compressor tool.

- (4) Lubricate all clutch plates, install one steel plate followed by a lined plate until all plates are installed. Install the pressure plate and snap ring. Make sure snap ring is properly seated.

- (5) With front clutch completely assembled, insert feeler gauge between pressure plate and snap ring (Fig. 47). The clearance should be .056 to .104 inch. If not, install a snap ring of proper thickness to obtain the specified clearance.

**NOTE: Snap rings are the same as that used in the rear clutch and are available in .060 thickness.**

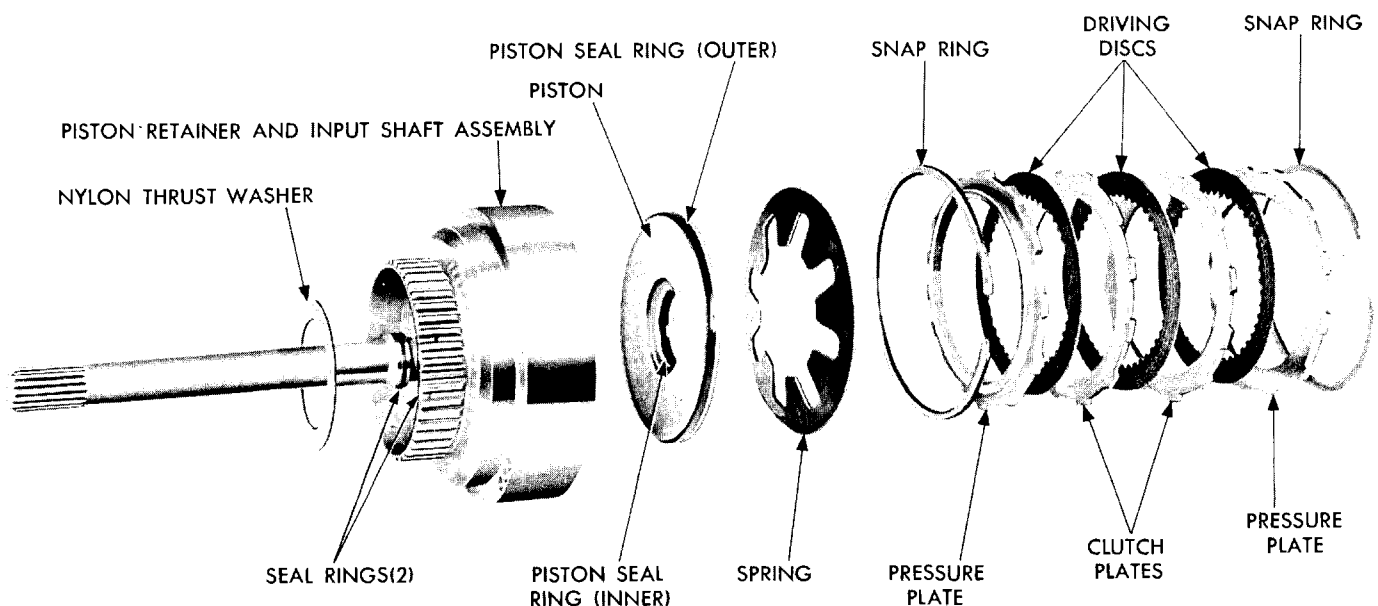
— .062, .068 — .070 and .076 — .078 inch

## 38. REAR CLUTCH

### Disassembly

Figure 48 shows an exploded view of the rear clutch assembly.

- (1) Using a screw driver, remove large snap ring



60x385

**Fig. 48—Rear Clutch Assembly (Exploded View)**

that secures the pressure plate in clutch piston retainer. Lift pressure plate, clutch plates, and inner pressure plate out of the retainer.

(2) Install compressor, Tool C-3760 over piston spring as shown in Figure 49. Compress spring just enough to clear snap ring, then remove snap ring.

(3) Remove compressor tool and piston spring. Invert clutch retainer assembly and bump on a wood block to remove the piston. Remove seal rings from the piston.

### Inspection

Inspect driving discs for evidence of burning, glazing and flaking off of facing material. Scratch facings with finger nail, if material collects under nail, replace all driving discs. Check disc driving splines for wear or other damage. Inspect steel plate and pressure plate surfaces for burning, scoring or damaged driving lugs, replace if necessary.

Check steel plate lug grooves in clutch retainer for smooth surfaces, plates must travel freely in grooves. Note the ball check in clutch retainer, make sure the ball moves freely. Inspect seal ring surfaces in clutch retainer for nicks or deep scratches, light scratches will not interfere with sealing of neoprene rings. Inspect neoprene seal rings for deterioration, wear, and hardness. Check piston spring and snap rings for distortion.

Inspect interlocking seal rings (Fig. 48) on input shaft for wear or broken locks, make sure they turn freely in the grooves. Do not remove rings unless conditions warrant.

### Assembly

(1) Lubricate and install inner and outer seal rings on the clutch piston. Make sure lip of seals face toward head of clutch retainer, and are properly seated in the piston grooves.

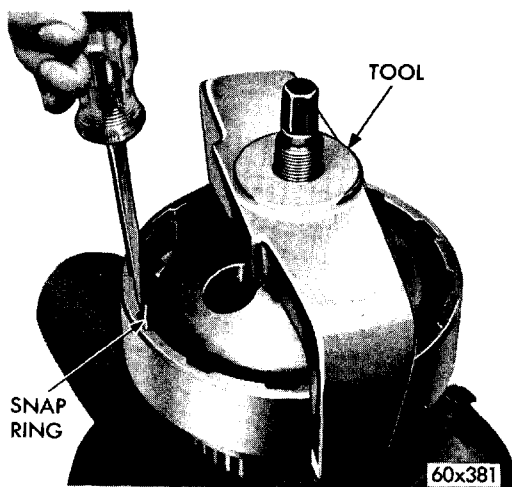


Fig. 49—Removing or Installing Rear Clutch Spring Retaining Snap Ring

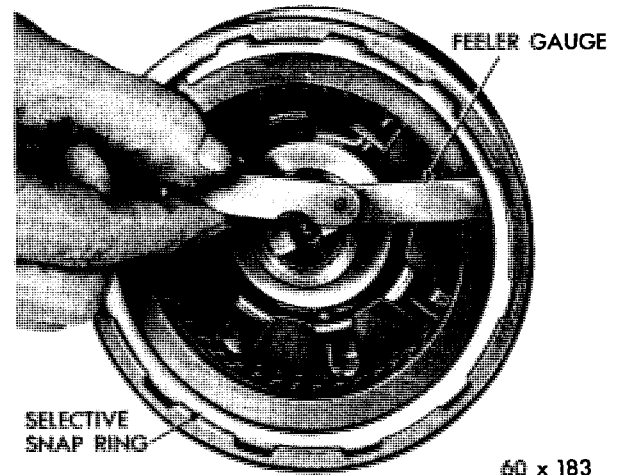


Fig. 50—Checking Rear Clutch Plate Clearance

(2) Place piston assembly in retainer and, with a twisting motion, seat piston in bottom of retainer.

(3) Place spring over piston with outer edge of spring positioned below snap ring grooves. Install compressor, Tool C-3760 over spring (Fig. 49), compress spring just enough to install snap ring. Remove compressor tool.

(4) Install inner pressure plate in clutch retainer with raised portion of plate resting on the spring.

(5) Lubricate all clutch plates, install one lined plate followed by a steel plate until all plates are installed. Install outer pressure plate and snap ring.

(6) With rear clutch completely assembled, insert feeler gauge between pressure plate and snap ring (Fig. 50). The clearance should be between .018 to .036 inch. If not, install a snap ring of proper thickness to obtain the specified clearance.

**NOTE: Rear clutch plate clearance is very important in obtaining proper clutch operation. The clearance can be adjusted by the use of various thickness outer snap rings. Snap rings are available in .060 — .062, .068 — .070 and .076 — .078 inch thickness.**

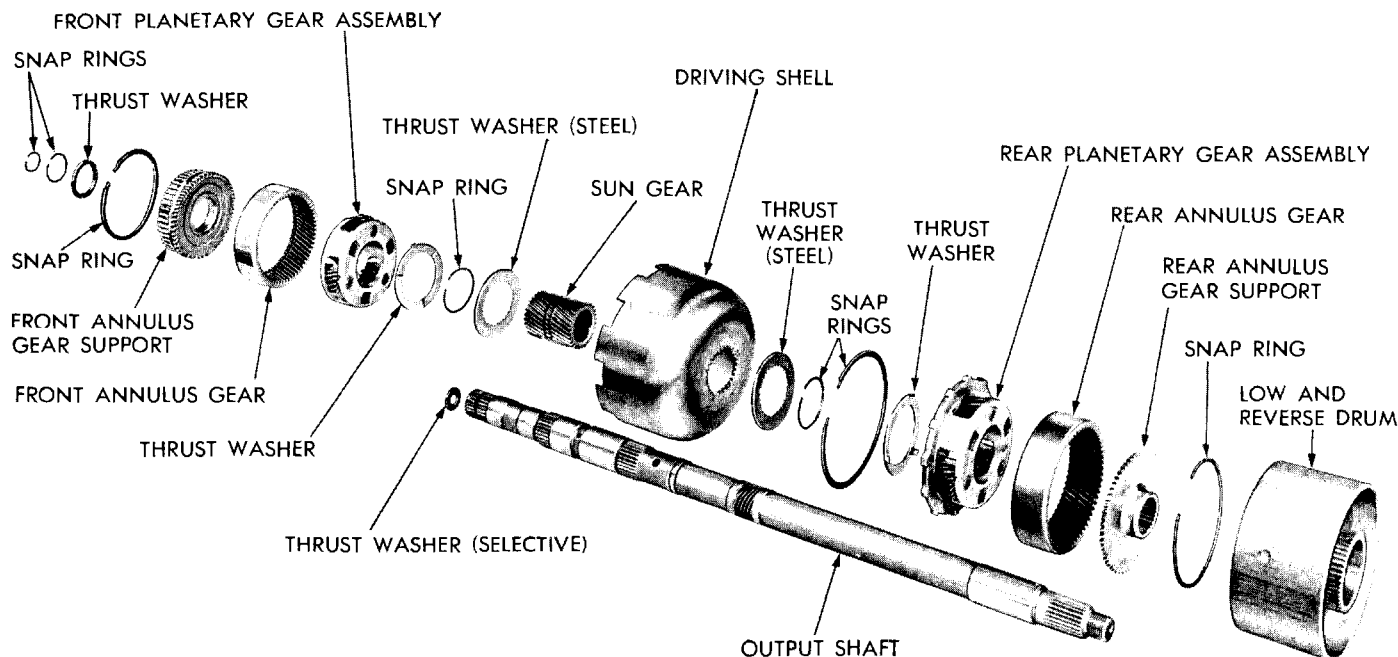
## 39. PLANETARY GEAR ASSEMBLIES, SUN GEAR, DRIVING SHELL, LOW AND REVERSE DRUM

### Disassembly

(1) Remove thrust washer from forward end of output shaft (Fig. 51).

(2) Remove snap ring from forward end of output shaft, then slide front planetary assembly off the shaft.

(3) Remove snap ring and thrust washer from forward hub of front planetary gear assembly, slide front annulus gear and support off the the planetary gear set (Fig. 51). Remove thrust washer from rear side of planetary gear set. If necessary, remove snap ring



60 x 176

**Fig. 51—Planetary Gear Assemblies, Sun Gear, Driving Shell, Low and Reverse Drum, and Output Shaft (Exploded View)**

from front of annulus gear to separate the support from annulus gear.

(4) Slide sun gear, driving shell, rear planetary assembly with low and reverse drum off the output shaft.

(5) Lift sun gear and driving shell of the rear planetary assembly. Remove snap ring and steel washer from sun gear (rear side of driving shell). Slide sun gear out of driving shell, and remove snap ring and steel washer from opposite end of sun gear if necessary.

(6) Remove thrust washer from forward side of rear planetary assembly. Remove snap ring from front side of low and reverse drum, then slide rear planetary assembly out of the drum. If necessary, remove snap ring from rear of annulus gear to separate the support from annulus gear.

### Inspection

Inspect bearing surfaces on output shaft for nicks, burrs, scores or other damage. Light scratches, small nicks or burrs can be removed with crocus cloth or a fine stone. Check speedometer drive gear for any nicks or burrs, and remove with a sharp edged stone. Make sure all oil passages in the shaft are open and clean.

Check bushings in sun gear for wear or scores, replace sun gear assembly if bushings are damaged. Inspect all thrust washers for wear and scores, replace as required. Check all lock rings for distortion. Inspect annulus gear and driving gear teeth for damage. In-

spect planetary gear carrier for cracks and pinions for broken or worn gear teeth.

### Assembly

Refer to Figure 51 for parts reference.

(1) Place rear annulus gear support in annulus gear and install snap ring.

(2) Position rear planetary gear assembly in rear annulus gear, slide the assembly into low and reverse drum, and secure with snap ring in edge of drum. Position thrust washer on front side of planetary gear assembly.

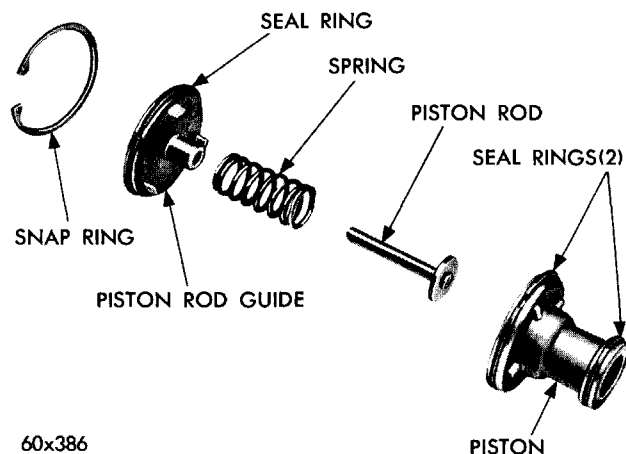
(3) Insert output shaft in rear opening of the drum. Carefully work the shaft through the annulus gear support and planetary gear assembly. Make sure shaft splines are fully engaged in splines of annulus gear support.

(4) Install steel washer and snap ring on one end of sun gear. Insert sun gear through front side of driving shell, install rear steel washer and snap ring.

(5) Carefully slide the driving shell and sun gear assembly on output shaft, engaging sun gear teeth with the rear planetary pinion teeth.

(6) Place front annulus gear support in annulus gear and install snap ring.

(7) Position front planetary gear assembly in front annulus gear, place thrust washer over planetary gear assembly hub and install snap ring. Position thrust washer on rear side of planetary gear assembly.



60x386

Fig. 52—Kickdown Servo (Exploded View)

(8) Carefully work the front planetary and annulus gear assembly on the output shaft, meshing planetary pinions with the sun gear teeth.

(9) With all components properly positioned, install retaining snap ring on front end of output shaft.

#### 40. OVERRUNNING CLUTCH

##### Inspection

Inspect clutch rollers for smooth round surfaces, they must be free of flat spots and chipped edges. Inspect roller contacting surfaces in the cam and race for brinelling. Check roller spring for distortion, wear or other damage. Inspect low and reverse drum thrust washer (behind overrunning clutch hub) for wear of scores.

#### 41. KICKDOWN SERVO AND BAND

##### Inspection

Figure 52 shows an exploded view of the kickdown servo assembly.

Inspect piston and guide seal rings for wear, and make sure they turn freely in the grooves. It is not necessary to remove seal rings unless conditions warrant. Inspect piston for nicks, burrs, scores and wear. Check the piston bore in the case for scores or other damage. Check fit of guide on the piston rod. Check piston spring for distortion.

Check band lining for wear and bond of lining to the band. If lining is worn so grooves are not visible at the ends or any portion of the band, replace the band. Inspect band for distorting or cracked ends.

#### 42. LOW AND REVERSE SERVO AND BAND

##### Disassembly

(1) Remove snap ring from piston and remove the piston plug and spring (Fig. 53).

##### Inspection

Inspect neoprene seal ring for deterioration, wear and hardness. Check piston and piston plug for nicks, burrs, scores and wear; piston plug must operate freely in the piston. Check the piston bore in the case for scores or other damage. Check springs for distortion.

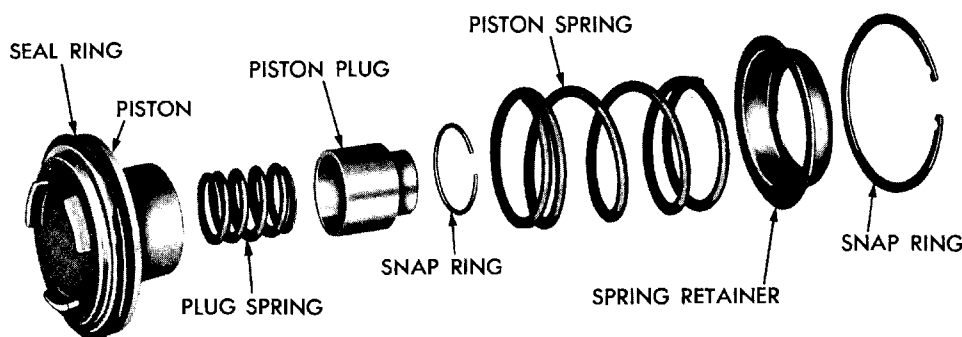
Check band lining for wear and band of lining to the band. If lining is worn so grooves are not visible at the ends or any portion of the band, replace the band. Inspect the band for distortion or cracked ends.

##### Assembly

(1) Lubricate and insert piston plug and spring in the piston, and secure with the snap ring.

#### 43. INSTALLATION OF SUB-ASSEMBLIES

The assembly procedures given here include the installation of sub-assemblies in the transmission case and adjusting drive train end play. Do not use force to assemble mating parts. If the parts do not assemble freely, investigate the cause, and correct the trouble before proceeding with the assembly procedures. Al-



60 x,175

Fig. 53—Low and Reverse Servo (Exploded View)

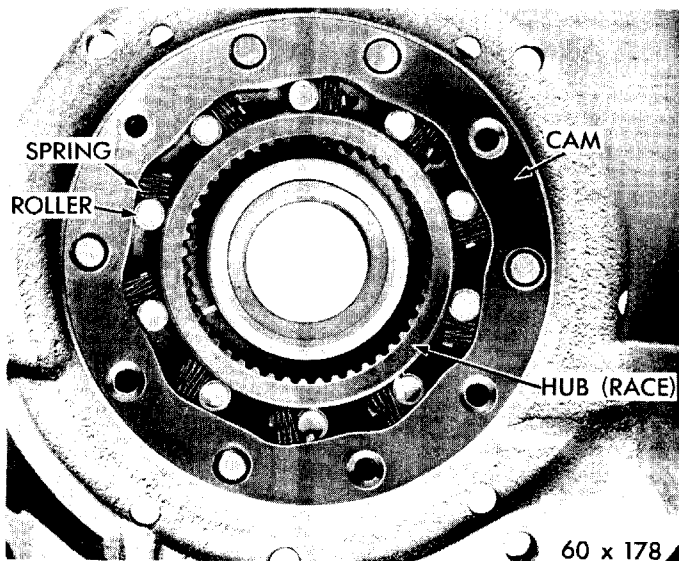


Fig. 54—Overrunning Clutch Assembled

ways use new gaskets during the assembly operations. **IMPORTANT: Use only Automatic Transmission Fluid Type "A", Suffix "A" to lubricate transmission parts during assembly.**

#### Rear Oil Pump Body

The following procedures must be followed when installing a new rear oil pump body or reinstalling original pump body to prevent pump body distortion.

(1) Cut a piece of .002 to .003 inch thick wrapping paper slightly smaller than the outer diameter of outer rotor to use as a shim during installation.

(2) Chill the pump body to approximately zero temperature in a deep freeze or with dry ice.

(3) Quickly place pump body in the case, and install inner and outer rotors. Place a daub or two of grease on face of rotors and center paper shim on face of rotors, then install pump cover and tighten retaining bolts firmly.

(4) After the pump body has warmed to room temperature, remove the pump cover, paper shim and rotors.

#### Overrunning Clutch

(1) With transmission case positioned upright, place low and reverse drum thrust washer in overrunning clutch housing, then place clutch hub (race) on the thrust washer.

(2) Install springs and rollers exactly as shown in Figure 54.

#### Low and Reverse Servo and Band

(1) Carefully work servo piston assembly into case with a twisting motion. Place spring, retainer and snap ring over piston (Fig. 53).

(2) Using the screw portion of the "Power Steering Worm Housing Bearing Cup Remover, Tool C-3322" or suitable substitute, depress the piston spring and install the snap ring.

(3) Position rear band in the case, install the short strut, then connect the long lever and strut to the band. Screw in band adjuster just enough to hold struts in place.

#### Kickdown Servo

(1) Carefully push servo piston into case bore. Install piston rod, spring and guide (Fig. 52). Depress the guide and install snap ring.

#### Planetary Gear Assemblies, Sun Gear, Driving Shell, Low and Reverse Drum

(1) While supporting the assembly in the case, insert output shaft through the overrunning clutch hub. Carefully work the assembly rearward, engaging drum splines with splines of the overrunning clutch hub. **CAUTION: Be very careful not to damage ground surfaces on the output shaft during installation.**

(2) Apply a coat of grease to selective thrust washer (Fig. 51) and install washer on front end of output shaft.

**NOTE: If the drive train end play was not within specifications (.024 — .062 inch), when checked in Paragraph 28, replace the thrust washer with one of proper thickness.**

The following selective washers are available:

Thickness	Color
.052 — .054 inch	Natural
.068 — .070 inch	Red
.083 — .085 inch	Black

#### Input Shaft and Rear Clutch

(1) Invert transmission and support in an upright position with output shaft downward.

(2) Align the rear clutch plate inner splines, lower the input shaft and clutch assembly into position in the case.

(3) Carefully work the clutch assembly in a circular motion to engage clutch splines over splines of the kickdown annulus gear support.

Coat one side of the fiber thrust washer with heavy grease, then position washer in the recess on front face of rear clutch retainer.

#### Front Clutch

(1) Align the front clutch plate inner splines, lower the clutch assembly into position in the case.

(2) Carefully work the clutch assembly in a circular motion to engage clutch splines over splines of the rear

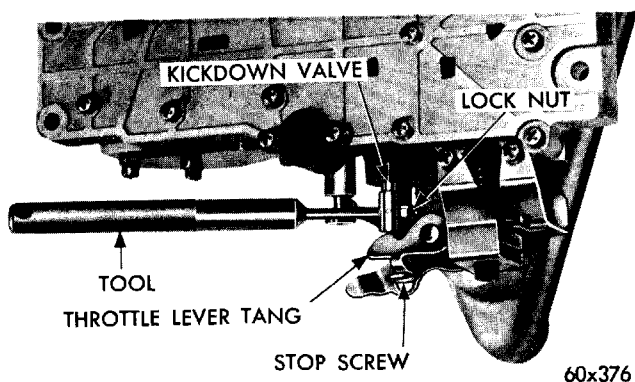


Fig. 17—Throttle Pressure Adjustment

wrench. One complete turn of the adjusting screw changes closed throttle line pressure approximately  $1\frac{1}{2}$  psi. Turning adjusting screw counterclockwise increases pressure, and clockwise decreases the pressure.

### Throttle Pressure

Throttle pressures cannot be checked; therefore, the adjustment should be checked and corrected if necessary, whenever the valve body is serviced or conditions warrant.

- (1) Remove valve body assembly from the transmission to perform the adjustment. Refer to Paragraph 25.
- (2) Loosen throttle lever stop screw lock nut and back off screw approximately five turns (Fig. 17).
- (3) Insert gauge pin of Tool C-3763 between the throttle lever cam and the kickdown valve.
- (4) By pushing in on the tool, compress the kickdown valve against its spring so the throttle valve is completely bottomed inside the valve body.
- (5) As force is being exerted to compress the spring, tighten throttle lever stop screw finger tight against the

throttle lever tang with the throttle lever cam touching the tool and the throttle valve bottomed. **Be sure the adjustment is made with the spring fully compressed and the valve bottomed in the valve body.**

- (6) Remove the tool and tighten the stop screw lock nut securely.

## SERVICING OPERATIONS WITH TRANSMISSION IN VEHICLE

Various transmission sub-assemblies can be removed for repairs without removing the transmission from vehicle. The removal and installation procedures only are covered here. To recondition these sub-assemblies, refer to "Recondition Transmission, Unit out of Vehicle". Paragraph 29 through 42.

### 18. SPEEDOMETER PINION

#### Removal and Installation

- (1) Remove screw and retainer securing speedometer cable to the extension housing. Carefully work the pinion and sleeve assembly out of the housing (Fig. 18).
- (2) To replace the pinion and/or oil seal, pry the clip off the pinion and slide pinion and seal assembly off the cable.
- (3) If transmission fluid is found in the cable housing, replace seal inside the pinion bore, then slide pinion over end of cable and secure with the spring clip.
- (4) To install, push the pinion and sleeve assembly into the extension housing so the sleeve flange is tight against the housing, then install the retainer and screw. Tighten screw to 35-45 inch-pounds torque.

### 19. PARKING BRAKE ASSEMBLY

#### Removal

- (1) Disconnect propeller shaft at parking brake

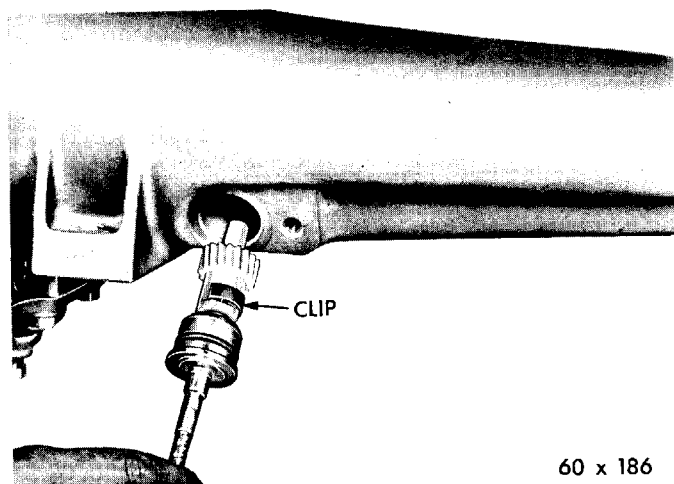


Fig. 18—Removing or Installing Speedometer Pinion

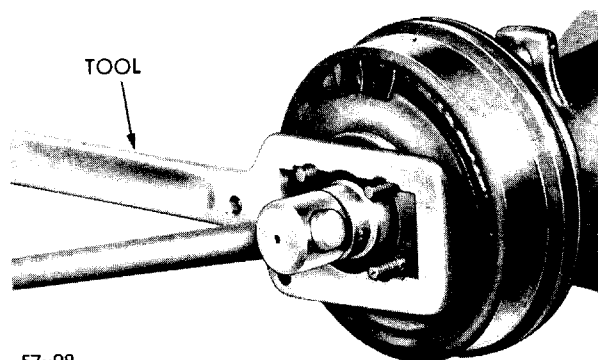


Fig. 19—Removing or Installing Brake Drum Flange Nut

clutch piston retainer. Make sure front clutch driving lugs are fully engaged in the slots in driving shell.

### Front Band

- (1) Slide the band over the front clutch assembly.
- (2) Install the band strut, screw in adjuster just enough to hold strut in place.

### Front Oil Pump and Reaction Shaft Support

- (1) Screw two pilot studs, Tool C-3288 in front oil pump opening in the case (Fig. 55).
- (2) Place a new rubber seal ring in groove on outer flange of oil pump. Make sure seal ring is not twisted.
- (3) Insert aligning Tool C-3756 through pump body and engage with inner rotor.
- (4) Install the assembly in the case, tap lightly with a soft mallet if necessary. Install four bolts, remove pilot studs and install remaining bolts and pull down evenly, then tighten bolts to 14-16 foot-pounds torque.
- (5) Rotate the pump rotors with Tool C-3759 until the two small holes in the handle of tool are vertical (Fig. 56). This will locate the inner rotor so the converter impeller shaft will engage the inner rotor lugs during installation.

### Rear Oil Pump

- (1) Place outer rotor in the pump body.
- (2) Turn output shaft so the inner rotor driving shaft in alignment with the ball (Fig. 27).
- (3) Position outer rotor so dye marks will be aligned, then push inner rotor in mesh with outer rotor.
- (4) Install the oil pump cover with the retaining bolts threaded in a few turns. Slide aligning sleeve, Tool C-3762 all the way in until it bottoms against rotors (Fig. 29), then tighten the cover bolts evenly to 14-16 foot-pounds torque.

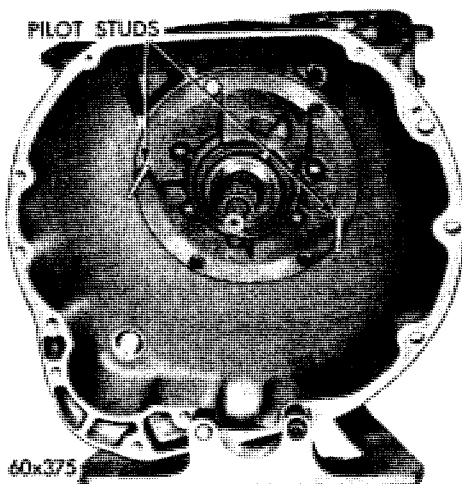


Fig. 55—Installing Front Pump and Reaction Shaft Support Assembly

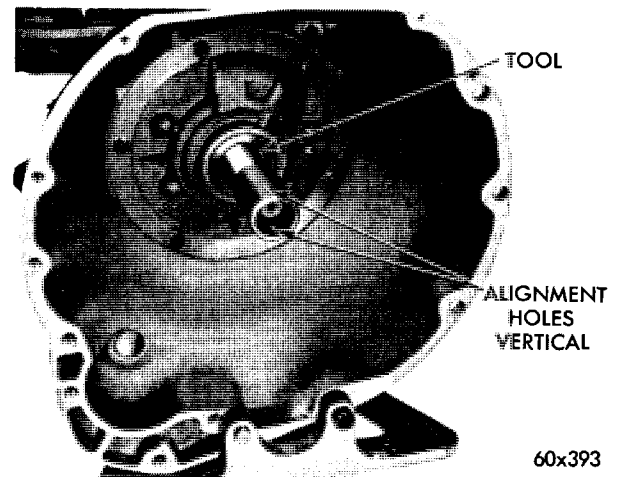


Fig. 56—Aligning Front Pump Rotors

### Governor

- (1) Align master spline of governor support with master spline on output shaft and slide the assembly into place. Install snap ring behind the governor housing (Fig. 25). Tighten housing to support screws to 6-8 foot-pounds torque.
- (2) Place the governor valve on valve shaft, insert the assembly into housing and through the governor weights. Install the valve shaft retaining snap ring.

### Extension Housing and Parking Brake

- (1) Using a new gasket, carefully slide the extension housing into place. Install the retaining bolts and washers, tighten bolts to 25-30 foot-pounds torque.

**IMPORTANT: Recheck the drive train end play as described in Paragraph 28-E. Correct if necessary.**

- (2) Place the neoprene spacer in position on back of brake support plate with steel sleeve in center of support.
- (3) Position brake assembly and anchor pin on end of extension, make sure spacer sleeve remains in center of support. Align anchor pin hole with hole in front lug and install lock pin.
- (4) Install grease shield, with flat on shield aligned with flat on extension housing. Install grease shield retainer spring with opening of spring toward brake shoe adjusting nut. Make sure spring is properly seated in groove.
- (5) Slide the brake shoe return spring behind the grease shield spring and hook into position (Fig. 20).
- (6) Install the brake drum and flange assembly, washer and nut. Tighten nut to 175 foot-pounds torque.

**POWERFLITE TRANSMISSION  
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**SPECIFICATIONS**

Type.....	Automatic Two Speed with Torque Converter
Torque Converter Diameter (inches).....	1 13/4
Oil Capacity of Transmission and Torque Converter.....	20 pt. (Automatic Transmission) Fluid—Type "A" Suffix "A"
Method of Cooling.....	Water
Lubrication.....	Pumps (Rotor Type)
Number of Clutch Plates.....	6
GEAR RATIOS.....	
Low.....	1.72 to 1
Drive—Breakaway.....	1.72 to 1
Drive—Direct.....	1 to 1
Reverse.....	2.39 to 1



(SPECIFICATIONS — Continued)

FRONT-REAR PUMPS

Type .....	Gear (Rotary)
End Clearance (Front Pump) .....	.0012 to .0022"
End Clearance (Rear Pump) .....	.001 to .003"

GOVERNOR (3-STAGE)

Type .....	Centrifugal
Clearance Between Governor Valve and Body .....	.002 to .005"

THRUST WASHERS

Direct Clutch Piston Retainer (Fibre) .....	.078 to .080"
	.095 to .097"
	.112 to .114"
Kickdown Planet Pinion Carrier .....	.062 to .064"
Kickdown Annulus Gear .....	.062 to .064"
Planet Pinion Carrier Housing .....	.078 to .080"

SNAP RINGS

Planet Pinion Carrier Housing .....	*.062 to .064"
	*.072 to .074"
	*.082 to .084"
Kickdown Sun Gear .....	.058 to .060"
	.062 to .064"
Reverse Annulus Gear .....	.078 to .080"
	.082 to .084"
	.086 to .088"

\*If this selection of snap rings fails to provide minimum clearance, use kickdown sun gear snap ring (.058-.060").

SPECIAL TOOLS

C-452 .....	Puller	C-3287 .....	Puller
C-484 .....	Pliers	C-3288 .....	Pilots
C-589 .....	Wrench	C-3289 .....	Fixture
C-748 .....	Puller	C-3292 .....	Gauge
C-760 .....	Pliers	C-3293 .....	Gauge
C-811 .....	Wrench	C-3294 .....	Stand
C-3201A .....	Jack	C-3295 .....	Pilots
C-3202A .....	Jack	C-3297 .....	Remover-Installer
C-3204 .....	Driver	C-3301 .....	Pliers
C-3205 .....	Driver	C-3335 .....	Straightedge
C-3275 .....	Driver	C-3339 .....	Set-Dial Indicator
C-3276 .....	Pilots	C-3380 .....	Wrench
C-3278 .....	Driver	C-3461 .....	Fixture
C-3279A .....	Wrench	C-3487 .....	Support
C-3280 .....	Stand	C-3575 .....	Compressor
C-3281 .....	Wrench	C-3583 .....	Extension
C-3283 .....	Pilots	DD1150 .....	Tachometer

## TORQUE REFERENCE

	Foot-Pounds	Inch-Pounds
Case to Converter Housing Bolt . . . . .	45	
Case Oil Line Plug . . . . .		120
Case to Reaction Shaft Bolt . . . . .	15	
Direct Clutch Shift Valve Plug Bolt . . . . .		30
Extension to Case Bolt . . . . .	25	
Front Oil Pump Housing Bolt . . . . .		180
Governor Body Bolt . . . . .		90
Governor Locating Bolt . . . . .		45
Governor Oil Pressure Take-Off Plug . . . . .		120
Kickdown Band Adjusting Bolt Nut . . . . .	40	
Kickdown Band Lever Shaft Plug . . . . .	25	
Kickdown Strainer Support Bolt . . . . .		180
Manual Control Lever Nut . . . . .	7	
Neutral Starter Switch—Initial Electrical Contact plus 1/3 to 1/2 turn . . . . .	75 Max.	
Oil Pan Bolt and Lock Washer . . . . .		180
Oil Pan Filler Tube Bracket Bolt Nut . . . . .	20	
Oil Pan Filler Tube Nut . . . . .	40	
Output Shaft Support Bolt . . . . .	25	
Output Shaft Support Pipe Plug . . . . .		120
Rear Oil Pump Housing Bolt . . . . .		180
Regulator Valve Spring Retainer . . . . .	50	
Reverse Band Lever Adjusting Bolt Nut . . . . .	35	
Shaft Flange Nut . . . . .	175	
Speedometer Pinion Sleeve . . . . .	45	
Throttle Control Lever Nut . . . . .	7	
Throttle Oil Pressure Take-Off Plug . . . . .		120
Throttle Valve Adjusting Bolt Plug . . . . .	25	
Torque Converter Control Valve Spring Retainer . . . . .	40	
Transfer Plate Cover Bolt—Long . . . . .		45
Transfer Plate Cover Bolt—Short . . . . .		45
Transfer Plate Bolt—Long . . . . .		180
Transfer Plate Bolt—Short . . . . .		180
Valve Body End Cover Long Bolt . . . . .		25
Valve Body End Cover Bolt . . . . .		25
Valve Body End Cover Short Bolt . . . . .		25
Cable Control . . . . .		
Cable Clip to Column Jacket Bolt . . . . .		70
Push Button Box to Instrument Panel, Plate or Bracket Assembly Nut . . . . .		20
Transmission Cable Bracket Bolt . . . . .		15

# SERVICE DIAGNOSIS CHART

## OPERATING DIFFICULTY

ITEMS TO CHECK See "Explanation of Index Items"		OPERATING DIFFICULTY																					
		Shift Abnormalities						Response						Miscellaneous									
INDEX	ITEM	Harsh N to R or N to D	Delayed N to D	Runaway on Upshift and K.D.	Harsh Upshift and K.D.	No Upshift	No K.D. or Normal Downshift	Shifts Erratically	Slips in Drive Position	Slips in All Ranges	No Drive in D-1	Reverse Band Slips	Moves Forward in Neutral	No Drive in Any Range	Moves Backward in Neutral	Drags or Locks	Grating, Scraping, Growling Noises	Buzzing Noise	Trans. Hard to Fill—Oil Blows Out Fill Tube	Trans. Overheats	Impossible to Push Start Engine	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.	Reverse Band Adj.	●								●		●				●					●	●	
G.	Engine Idle	●						●															
H.	Neutral Start SW.																						●
I.	Handbrake Adj.															●	●				●		
J.	Regulator Valves—Springs							●		●			●					●	●	●			
K.	Converter Control Valve																	●	●	●			
L.	Breather																		●				
M.	Output Shaft Rear Bearing S.R.							●									●						
N.	T.C.																				●		
O.	K.D. Servo-Band Linkage	●		●	●		●			●	●					●						●	
P.	R. Servo Band Linkage	●			●					●		●			●	●							
Q.	Oil Strainer							●							●			●	●				
R.	Valve Body—Bolts—Mating Surfaces		●	●	●	●	●	●	●	●	●	●	●	●	●							●	
S.	Speedometer Pinion																						
T.	Governor					●	●	●										●				●	
U.	Rear Pump																	●			●		
a.	Front Pump—Drive Sleeve		●					●	●	●			●				●		●	●			
b.	Reg. Valve Body, Gasket, Surfaces	●			●					●		●		●				●	●	●			
c.	Converter-Housing																					●	
d.	Direct Clutch			●	●	●			●		●		●			●	●				●		
e.	Planetary Gear Set															●	●						
f.	Seal Rings		●	●		●		●			●	●											

## 1. EXPLANATION OF INDEX ITEMS ON TROUBLE DIAGNOSIS CHART

A. Oil level—Refer to Lubrication Group of this manual.

B. Throttle linkage—Refer to Paragraph 5.

C. Gearshift control cable—Refer to Paragraph 5.

D. Pressure tap check—Hydraulic Pressure taps have been provided to check the following pressures: line, lubrication, direct clutch, governor, and throttle (Refer to Figure 2). These pressures should fall within specified limits stated in Hydraulic Control Pressure Check Charts.

E. Kickdown band adjustment—The kickdown band adjustment screw is located on the left side of transmission case (Figure 3). Refer to Paragraph 5.

F. Reverse band adjustment—The oil pan must be removed to make this adjustment. The adjustment is made by backing off adjusting screw lock nut. Torque the adjusting screw to 20 to 25 **inch**-pounds torque then back adjusting set screw out 12 turns. Tighten lock nut from 30 to 35 foot-pounds torque.

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

H. Neutral starting switch—Check wire connections and switch.

**NOTE: If jumper wire is used for cranking engine (when taking pressure readings etc.) it is important that jumper leads be connected to battery terminals and to starter switch terminal (located toward rear of car) of the solenoid.**

I. Parking—Check for excessive drag. Adjust as outlined in Brakes Section of this manual.

J. Regulator valve spring—The regulator valve may be removed by removing the regulator valve spring retainer which is on the right side of transmission case (Figure 2). Check for a stuck or severely 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 right side of transmission case (Figure 2). Check for a stuck or severely scratched valve and/or buckled spring.

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

M. Output shaft rear bearing, snap ring—Check for rough bearing and/or unseated snap ring. Snap rings are available in two sizes.

N. Torque converter housing cooling air passages—Check for dirt, mud, or other foreign material on screens or torque converter cooling fins.

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

P. Reverse servo, band and linkage—Check for torn seal, stuck, broken band and/or linkage.

Q. Oil strainer and suction tubes—Check for possible air leakage at front pump suction tube, or rear pump suction tube.

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. Speedometer pinion—Check nylon teeth for wear, shredding.

T. 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.

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

a. Front pump and 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 ring.

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

c. Converter—Flush out converter and check converter bore, face, and hub runout. (Refer to Torque Converter Section.)

d. Direct clutch—Clean and inspect discs, plates, drive hub, return spring and piston.

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

f. Seal rings—Check for burrs, broken ends.

**NOTE: Refer to Figure 35 for illustration showing location of the various drilled passages in transmission case.**

## SERVICE INFORMATION

### GENERAL INFORMATION

#### Transmission

PowerFlite combines a highly efficient torque converter and a simple automatic two-speed transmission which provides exceptionally smooth performance throughout the entire speed range. The transmission is equipped with a neutral starting safety switch which prevents starting the car in gear.

All normal driving can be done in the drive (D) range, which accelerates the car in low range and then automatically upshifts the transmission into direct drive at the proper time, depending upon the degree of acceleration desired by the driver. The shift is fully automatic, allowing the driver to keep constant pressure on the accelerator at all times. Instantaneous acceleration, with the D (Drive) push button engaged, is accomplished by pressing the accelerator pedal to the floor. This action downshifts the transmission to low gear.

A L (low) range is provided to keep the transmission in low gear at all speeds for unusual driving conditions such as climbing or descending mountains or driving through sand.

"Rocking" the car, when mired in mud or snow, is easily accomplished by alternately engaging the R (reverse) and L (low) push buttons.

#### Torque Converter

The torque converter receives its oil supply at a constant pressure from the front oil pump in the transmission.

The unit is bolted to and supported by the crankshaft

flange. It consists of three basic parts: an impeller, a turbine, and a stator. The impeller, which forms the outer shell of the converter unit, is driven by the engine. The turbine is driven by the force of oil from the impeller vanes. The turbine is splined to the input shaft of the transmission. The stator, located between the impeller and turbine, serves to redirect the flow of oil in the unit, thus multiplying engine torque. The stator is mounted on an over-running clutch which permits it to rotate only in the direction of impeller and turbine rotation.

The torque converter is serviced only as a complete assembly.

#### Gearshift Control Push Buttons

PowerFlite Transmission equipped cars have four gearshift control buttons located to the left of the steering column on the instrument panel. The buttons, which control the transmission, are identified by the letters R (reverse), N (neutral), D (drive), and L (low). The buttons are illuminated for night driving.

When operating the gearshift control, the button selected must be pushed to the full extent of its travel. This will automatically release a previously selected button for return to its normal position.

A hydraulic interlock prevents the driver from inadvertently pushing the R (reverse) button to the reverse position when the vehicle is traveling in the D (drive) position above 15 mph.

Should the reverse button be pushed "in" at a speed in excess of 15 mph., the manual valve lever will move to the neutral position. The driver is then required to again select the proper gear range.

#### Gearshift Control Housing (Refer to Figure 1)

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

When a button is pushed in, an operating 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 button slide engages the actuator shaft. This action holds the button in the engaged position.

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

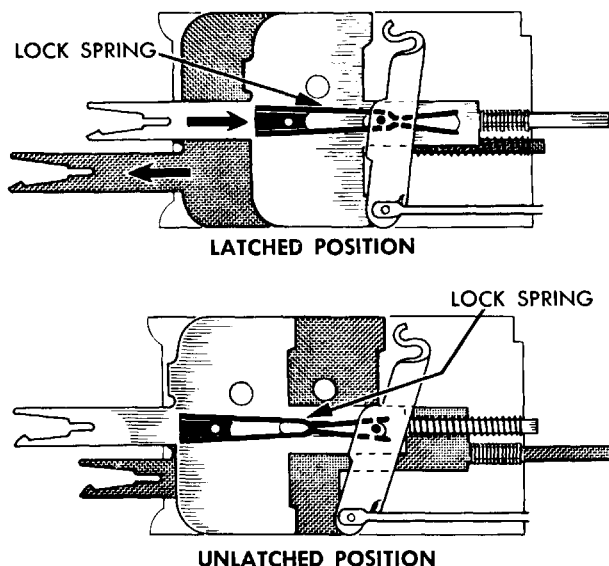


Fig. 1—Gearshift Control Unit (Operational Sketch)

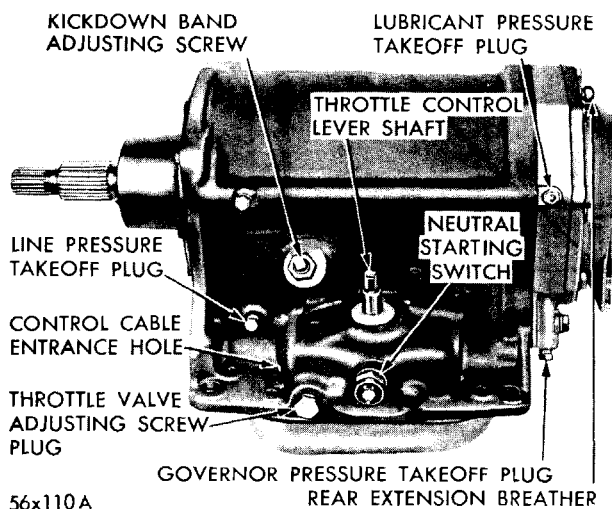
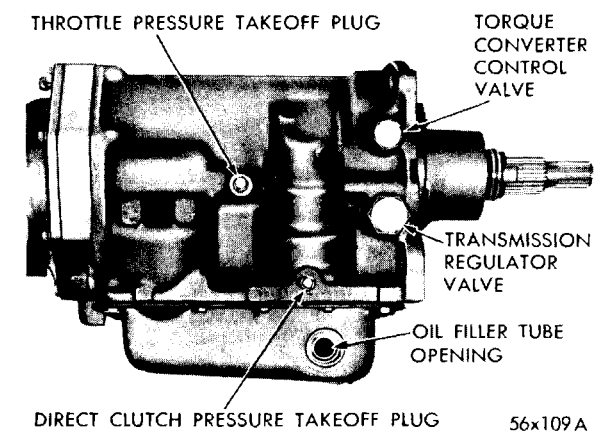


Fig. 2—Exterior Views of Transmission

actuator, thereby releasing the first button from the restraint of the slide lock. 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.

### Neutral Starting Switch

The starting motor is wired in such a way that the engine cannot be started unless the N (neutral) button is engaged. Engaging the N (neutral) button closes the starting motor circuit at the neutral starting switch, located on the transmission case (Figure 2).

### Starting the Engine

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

(2) Push in the N (neutral) button.

(3) Depress accelerator pedal slightly.

(4) Turn ignition key to extreme clockwise position.

(5) When engine starts, release pressure on ignition key.

### Push Starting

If the engine fails to start in the normal manner, because of a discharged battery, it may be started by pushing the car. 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 "in" on the N (neutral) button. After the car has been pushed to a speed of 25 m.p.h. (approximately), push in on the L (low) button. This will allow the transmission to drive the engine by power transmitted from the rear wheels.

### How to Drive the Car

(1) When starting in extremely cold weather, allow the engine to warm up while in N (neutral) position. If the engine is cold (engine on fast idle) apply the foot brake to prevent a creep tendency when pushing the buttons in D (drive) or R (reverse) positions.

(2) All normal driving will be done in D (drive) range. The vehicle will have a slight tendency to creep after pushing the button from N (neutral) to D (drive) at idle, due to slight torque output from the torque converter. This can be prevented by applying the foot brake. As soon as the accelerator is depressed, the vehicle will move forward in the drive (breakaway) range.

At speed of between 15 and 61 mph (depending on car model and the amount the accelerator is depressed) the transmission will upshift to direct. When slowing the car down at throttle openings short of wide open, the transmission will automatically downshift from 9 to 11 mph. (approximately) depending on car model.

(3) L (low) provides driving characteristics similar to D (drive) except the transmission will not upshift (into direct) at any car speed. This position provides excellent handling ease in mountain driving and superior pulling qualities in sand and snow. It is possible to push the buttons from L (low) to D (drive) and D (drive) to L (low) at any normal speed. Damage may result if a shift from D (drive) to L (low) is made above 65 mph.

(4) Reverse—Stop the vehicle and with foot brake applied, push the R (reverse) button to full limit of travel. Upon depressing the accelerator the vehicle will move in reverse. Do not depress the R (reverse) button when the car is moving forward at a speed above 5 mph.

(5) Kickdown or forced downshift. At speeds between 15 to approximately 55 mph. in D (drive), after the transmission has upshifted to direct, maximum acceleration can be obtained for passing or climbing a

steep grade by pressing the accelerator wide open. This will cause the transmission to downshift. It will automatically upshift to direct if the accelerator is released or a speed of about 61 mph. is reached. Any variation in downshift speed limits may be due to permissible operating fluid leakage within the transmission.

### Towing

(1) Transmission Inoperative—Tow the car with a rear end pickup or remove the propeller shaft.

(2) Transmission Operating Properly—The car may be towed safely in N (neutral) at moderate speeds. However, for long distance towing (over 100 miles), the propeller shaft should be removed.

### Checking Fluid Level

Refer to Lubrication Section of this manual.

## 2. HYDRAULIC CONTROL PRESSURE CHECKS

### Line Pressure

Remove the pipe plug from the line pressure take-off hole located on the front left side of the transmission case (Figure 2). Install pressure gauge, Tool C-3293 (300 psi) at this point.

### Throttle Pressure

Remove the plug from the throttle pressure take-off hole located on the right-hand side of the transmission case (Figure 2). Install pressure gauge, Tool-3292 (100 psi) at this point.

When checking throttle pressure, always follow up by checking throttle linkage adjustment (Paragraph 5). If throttle pressure does not conform to specifications refer to Paragraph 5.

### Governor Pressure

Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Figure 2). Install pressure gauge, Tool C-3292 (100 psi) at this point.

### Direct Clutch Pressure

Remove the pipe plug fitting from the pressure take-off hole tapped in the kickdown servo (Figure 2) and install pressure gauge, Tool C-3292 (100 psi). With the rear wheels free to turn, accelerate the engine slowly until an upshift occurs. During the upshift, the pressure gauge attached to the kickdown servo will dwell twice but should show a very rapid pressure rise from 0 to final clutch or line pressure. This rise should not take more than 1½ to 2 seconds.

With an engine speed of not less than 650 rpm. (transmission upshifted) the direct clutch pressure should read not lower than 10 psi below line pressure.

Should a slow rise in clutch pressure be observed,

or a clutch pressure of more than 10 psi lower than line pressure be obtained, it is an indication of abnormal leakage.

### Lubrication Pressure

Remove the oil cooler fitting from the lubrication pressure takeoff hole located on the left side of the transmission case (Figure 2). Install gauge, Tool C-3292 (100 psi). With engine running at 800 rpm in neutral, lubrication pressure should read not below 10 psi minimum. If the pressure is incorrect, check line pressure and Trouble Diagnosis Chart.

### LINE PRESSURE CHART

Gearshift Position	Rear Wheels	Engine Speed	Line Pressure
R*	Free to Turn	1400	225 to 275
N	.....	800	85 to 95
D*	Brakes Applied	800	85 to 95

\*Engine must be at operating temperature.

### THROTTLE PRESSURE CHART

Gearshift Position	Brakes Throttle	Engine Speed	Throttle Pressure
D	Applied Closed	Idle	13 to 15
D	Applied Wide Open*	1400 to 1500	80 to 90

\*Do not hold throttle wide open for longer than a few seconds.

### GOVERNOR PRESSURE CHART

Gearshift Position	Wheels	Car Speed	Governor Pressure
D	Free to turn	13 to 15	15
D	Free to turn	24 to 32	45
D	Free to turn	51 to 60	60

## 3. CHECKING FOR OIL LEAKS

If the transmission is leaking oil, check the following points:

### Leaks not Requiring Removal of Transmission from car

- (1) Transmission output shaft rear oil seal.
- (2) Speedometer pinion assembly.
- (3) Oil filler tube to oil pan connector.
- (4) Oil pan to transmission case.

(5) Regulator valve and torque converter control valve retainers.

(6) Test pressure hole plugs.

(7) If oil is found inside converter housing, check torque converter drain plug.

Leaks at these locations should be corrected regardless of how slight.

### Leaks Requiring Removal of Transmission from Car

(1) Sand hole in transmission case.

(2) Sand hole in front oil pump housing.

(3) Front oil pump housing bolts loose or sealing washers damaged.

(4) Torque converter impeller hub seal (located on forward end of front oil pump housing). When correcting make sure torque converter hub, bore and face run-out is within limits. (Refer to Torque Converter Section).

(5) Front oil pump housing oil seal (located on outside diameter of front oil pump housing).

When replacement of the front oil pump housing is made or whenever it is necessary to correct a leak due to this "O" seal ring, the following precautions should be taken:

(a) Install a new "O" ring seal in its groove in the front oil pump housing.

(b) Make sure that the seal has not been twisted during this installation, as this alone will cause a leak.

(c) Measure the amount the seal protrudes above the front oil pump housing completely around the O.D. If, at any point, the seal protrudes less than .010 inch, or if considerable variation exists in the amount the seal protrudes, a new front pump housing should be selected.

Leaks at these points may be remedied by tightening loose bolts or replacing damaged or faulty parts.

## 4. SERVICING GEARSHIFT CONTROL UNIT

### Removing Gearshift Control Unit

(1) Disconnect one battery cable.

(2) Disconnect back-up light switch (if so equipped) and illuminating lamp lead wires, at the rear of the instrument panel.

(3) Remove the push button face plate screws, then remove the push buttons by pulling them off the push button slide. Remove lamp bolt.

(4) Remove the control housing stud nuts that are now accessible and remove control and cable from rear of instrument panel.

(5) Remove hairpin securing control cable to actuator and the screws holding the cable bracket to the control housing.

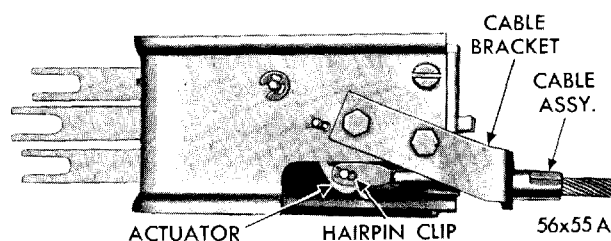


Fig. 3—Exterior View of Gearshift Control Housing (Typical)

### Installing Gearshift Control Unit

(1) Insert end of cable on actuator and reassemble hairpin clip. Place cable bracket on control unit and install screws securely. (Figure 3).

(2) Carefully guide the unit into position from the rear of the instrument panel and install the attaching stud nuts from the front side of the instrument panel.

(3) Install lamp bulb in push button control and reinstall push buttons onto control actuator slides. Replace face plate.

(4) Connect back-up switch and push button illuminating lamp wires.

### Removing Gearshift Control Cable

(1) Remove gearshift control cable from transmission assembly, as outlined under "Removal and Inspection of Cable Assembly—Transmission End" steps 1 and 2.

(2) Remove gearshift control housing and cable as outlined under "Servicing Gearshift Control Unit," Removal.

(3) From inside of vehicle, pull cable assembly through rubber grommet (or remove grommet) in dash panel.

### Installing Gearshift Control Cable

(1) From inside of vehicle, install transmission end of cable through rubber grommet in dash panel.

(2) Install cable at gearshift control housing as outlined under "Servicing Gearshift Control Unit," Installation.

(3) Install cable assembly into transmission case. (Refer to "Adjusting The Gearshift Control Cable"—Paragraph 5).

### Replacing the Back-Up Light Switch (when so equipped)

(1) Remove gearshift control housing and plate assembly as outlined under "Servicing Gearshift Control Unit," Removal.

(2) Back-up light switch is fastened to the control unit by four tabs. Straighten tabs to remove switch.

(3) Install repaired or replacement switch and bend tabs to secure switch to gearshift control housing.



- (4) Install gearshift control housing assembly.

### Replacing Push Button Unit Lamp Bulb

- (1) Remove the face plate retaining screws.
- (2) Remove one or more push buttons for clearance.
- (3) Replace defective or burned out bulb, using Tool C-3399.
- (4) Replace face plate. Test operation of unit.

### Removal and Inspection of Cable Assembly (Transmission End)

(1) Push in the R (reverse) push button to position cable adapter for removal of cable lock spring, and placing cable adapter in close proximity to cable entrance hole in transmission case, (for reinstallation of cable). Raise car on hoist and remove neutral starting switch from transmission case. Some fluid will drain out. Transmission fluid may be hot!!

(2) Loosen cable to transmission adjustable mounting bracket screw. Place screwdriver blade through neutral starting switch hole, and push against cable lock spring. With the other hand, withdraw cable assembly from transmission case.

(3) Examine "O" ring seal on cable ferrule. Replace seal if it shows signs of roughness, shredding or deterioration. Inspect fit of bracket slot and cable ferrule groove. The bracket should fit just freely into ferrule groove to full depth of bracket slot. If cable bracket slotted section does not meet this requirement, remove excess metal with a file.

## 5. TRANSMISSION AND CONTROLS—ADJUSTMENTS

### Throttle Pressure and Throttle Linkage Adjustment

Accurate adjustment of the transmission throttle linkage and setting of the throttle oil pressure is very important for proper operation of the PowerFlite transmission. Therefore, the following procedures should be very carefully performed:

#### Throttle Linkage Adjustments (Refer to Fig. 4)

- (1) With the engine at operating temperature, carburetor off the fast idle cam and transmission in neutral, adjust idle speed to 475-500 R.P.M. (use tachometer).
- (2) Loosen the throttle linkage adjustment lock nuts on both the carburetor rod and the transmission throttle rod.
- (3) Insert a  $\frac{3}{16}$ " rod or drill bit in the hole and open slot of the accelerator shaft bracket end into the elongated hole of the throttle lever.
- (4) With the rod in position, hold the transmission throttle valve lever all the way forward (closed position), and tighten transmission to accelerate lever as-

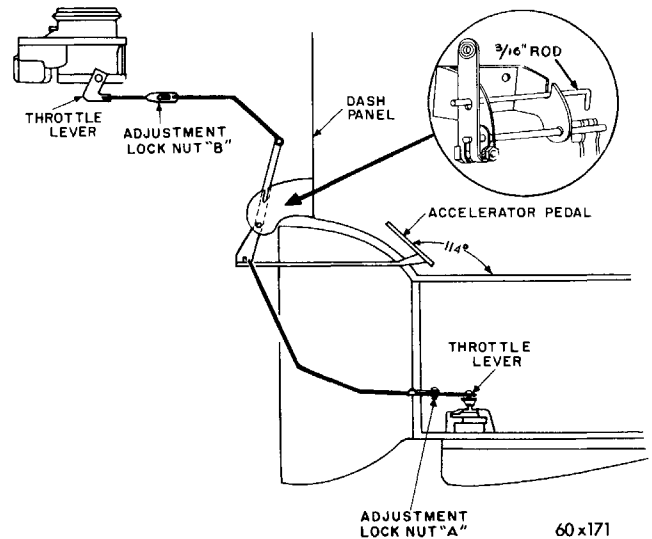


Fig. 4—Throttle Linkage Adjustment

sembly rod adjusting locknut "A" Figure 4.

(5) Remove rod from accelerator lever, shaft and bracket assembly.

(6) With the carburetor throttle lever off the fast idle cam and against the idle stop screw, move the rear half of the carburetor rod rearward until the stop in the transmission is felt, tighten locknut "B". Figure 4.

(7) The accelerator pedal should be at an angle of 113 to 114 degrees 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 the swivel. Reinstall the rod and tighten the locknut. **Be sure the rod is properly aligned to prevent binding. Poor engine performance due to carburetor throttle not opening fully or lack of kickdown may result if accelerator pedal angle is incorrect.**

### Throttle Pressure Adjustment

(1) With throttle linkage properly adjusted and tachometer attached, start engine and recheck idle setting (475-500 rpm) with transmission in neutral and hand brake set. Raise vehicle on hoist.

(2) Remove the throttle oil pressure take off plug located between reverse and kickdown servos on right side of transmission. (Refer to Figure 2). Connect 100 psi pressure gauge, Tool C-3292.

(3) Push in the D (drive) push button. (When the manual control lever is moved into drive range engine speed will drop approximately 50 rpm.) Check throttle pressure.

Oil pressure should read 13 to 15 psi. If the pressure is not within specifications, adjust as follows:

- (4) Remove the throttle valve adjusting screw plug

(Figure 2). About 1 quart of transmission fluid will drain out.

(5) Insert adjusting screw wrench, Tool C-3279A and adjust throttle pressure to 13-15 psi, as shown in Figure 5. Turn screw OUT to increase pressure and IN to decrease pressure.

(6) Replace the throttle valve adjusting screw plug and torque from 20 to 25 foot-pounds.

(7) With the accelerator pedal fully released, and engine at 475 to 500 rpm, the pressure should read 13 to 15 psi.

(8) Move the accelerator pedal or lever from underneath, very slowly.

With throttle pressure and linkage properly adjusted, the throttle pressure will rise (approximately 6-8 psi) the instant engine rpm is increased. Do not use throttle rod. When making this check, use accelerator pedal lever located on underside of floor pan.

(9) Remove oil pressure gauge and install plug. Torque from 10 to 12 foot-pounds.

(10) If the throttle pressure was adjusted, replace the fluid that drained out, with (Type "A" Suffix "A") Automatic Transmission Fluid.

(11) Check accelerator pedal height—at wide open throttle. There should be sufficient clearance between the tip of the pedal and the floor mat. Adjust pedal to accelerator shaft rod assembly.

### Adjustment of Kickdown (Front) Band

(1) Using a  $\frac{3}{4}$  inch open end wrench loosen the locknut (Figure 2). Check the freeness of the adjusting screw in the transmission case. If free, use inch-pound torque wrench, Tool C-3380 (with extension C-3583) and tighten the adjusting screw from 40-43 inch-pounds\* torque. Disregard multiplication factor on Extension, C-3583. Use a reference mark of chalk or col-

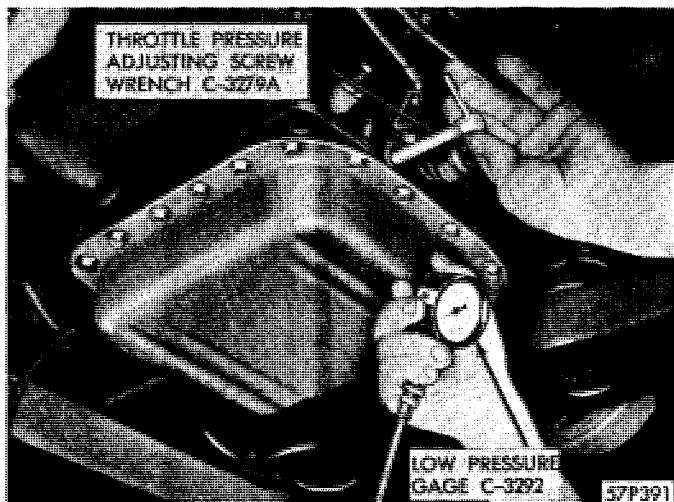


Fig. 5—Adjusting Throttle Pressure (Typical)

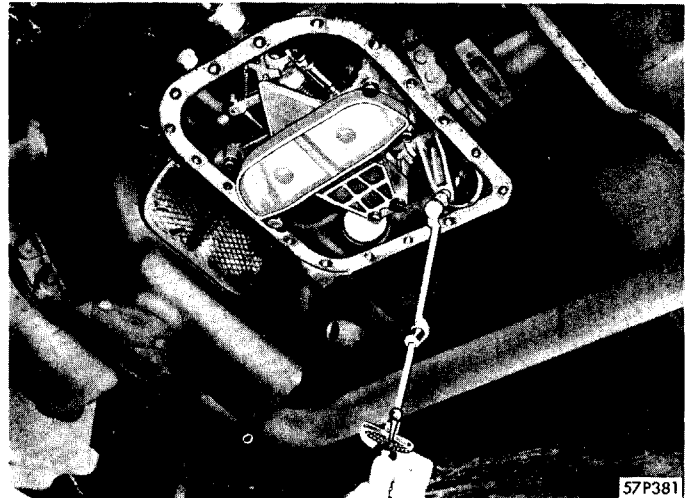


Fig. 6—Adjusting the Reverse Band (Typical)

ored pencil on the corner of the adjusting screw square and the transmission case. Using extreme care, back the adjusting screw out exactly  $2\frac{3}{4}$  turns. Now, hold the adjusting screw stationary with wrench and tighten the locknut securely. Extreme care must be exercised in performing this operation to insure correct adjustment otherwise serious damage will occur when transmission is operated.

\*If Tool C-3380 (with extension C-3583) is not used, then, use wrench, Tool C-3380 and tighten adjusting screw to 72 inch-pounds torque.

### Reverse (Rear) Band Adjustment

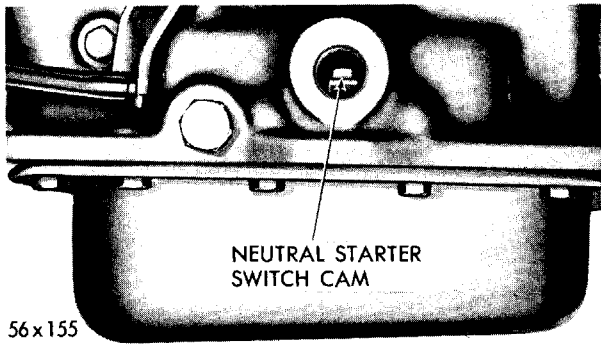
(1) Drain transmission and remove transmission oil pan.

(2) Loosen reverse band adjusting screw locknut and tighten adjusting screw from 20 to 25 inch-pounds, as shown in Figure 6. Back out adjusting screw 12 turns. Holding adjusting screw in this location, tighten locknut securely (30-35 foot-pounds torque).

(3) Replace the transmission oil pan, using a new gasket and refill transmission with Automatic Transmission fluid (Type "A" Suffix "A").

### Adjusting the Gearshift Control Cable

Push in L (low) push button. Place transmission manual valve lever in reverse detent by moving neutral switch contact part of lever full travel towards rear of car manually, by using screw driver (or other suitable tool) in neutral starting switch hole. With L (low) push button held tightly in (full travel), insert cable assembly into transmission case engaging cable ferrule groove with lock spring in cable adapter. Push and pull the cable, using light pressure, to be sure groove in cable ferrule has engaged lock spring. Replace adjustable mounting bracket and tighten cap screw finger tight.



56 x 155

Fig. 7—Neutral Starting Switch Cam Centered In Switch Mounting Hole

### Cable and Neutral Starting Switch Adjustment

Move the cable and bracket assembly (manually) at the transmission, as required, to position the manual valve lever into neutral detent. Hold the N (neutral) button tightly "in" at full travel. The neutral starting switch cam should then be centered in the neutral starting switch hole, as shown in Figure 7.

Use a free-fitting flat-faced shaft, inserted through the neutral switch mounting hole (Figure 8), and apply light pressure against the manual valve lever to maintain the neutral detent position of the manual lever. If tool is not available, lever may be held by finger pressure.

Carefully move cable assembly "in" and "out" without **moving** the manual lever, to determine total free-play travel of cable. Locate the cable in mid-position of the free-play, release the pressure against the manual lever and tighten the mounting bracket securely.

### Do not allow the cable to move when tightening the bracket.

Replace the neutral starting switch. 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.

With proper cable adjustment assured and N (neutral) button depressed make certain that switch is properly aligned in center of neutral starting switch hole. With test loads connected to battery current and terminal of the switch, screw switch into transmission case until test light lights, then turn switch an additional  $\frac{1}{3}$  to  $\frac{1}{2}$  turn. Do not exceed 75 ft. lbs. torque. **Excessive tightening may damage case and interfere with push button control.**

Check transmission fluid level as outlined in lubrication Section of this manual.

### Road Testing

When faulty operation of the transmission is re-

ported, transmission fluid level and engine idle should be checked before anything else. Good transmission operation also depends on good engine operation. Therefore, before blaming any rough shifting on the transmission it is necessary to 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. Refer to "Throttle Pressure and Throttle Linkage Adjustment" Paragraph 5.**

After all the adjustments and pressures checks are completed, road test the car under varying road conditions. The transmission should respond according to the following shift patterns:

### SHIFT PATTERN SUMMARY (M.P.H.)

Upshift		Downshift		
Light Throttle	Wide Open Throttle	Light Throttle	Wide Open Throttle	Kick-down Limit
14 to 19	51 to 61	9 to 11	9 to 17	41 to 57

**All shift speeds may vary somewhat due to production tolerances, however, the quality of the shifts should be smooth, responsive, and without noticeable engine runaway.**

## 6. REMOVING TRANSMISSION FROM VEHICLE

(1) Drain transmission by disconnecting oil filler tube connector at oil pan. Remove torque converter

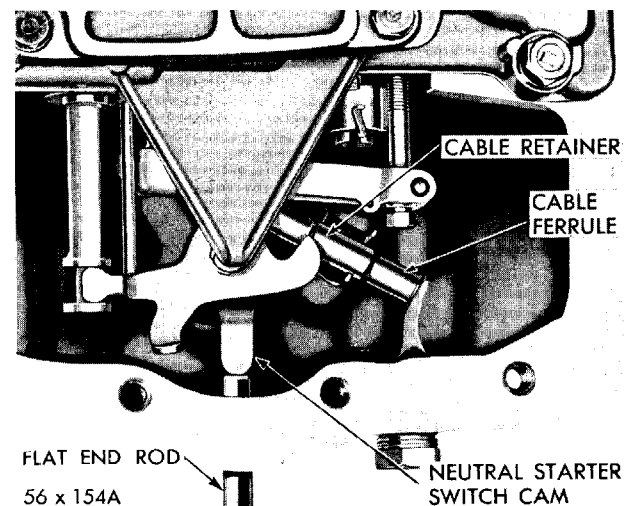


Fig. 8—"Locking" Manual Valve Lever in Neutral Position (Oil Pan Removed to show Operation)

housing cover. Then, remove the torque converter drain plug. After draining, replace plug and tighten securely. Replace torque converter housing cover. Remove oil cooler lines from transmission.

(2) Disconnect front propeller shaft universal joint and secure shaft to frame.

(3) Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake cable support. Disengage ball end of handbrake cable from operating lever and remove cable from handbrake cable support.

(4) Disconnect speedometer cable and housing. **To avoid damage to neutral starting switch, remove switch from transmission case before removing transmission from vehicle.**

(5) Disconnect throttle linkage from lever at transmission. Remove gearshift control cable.

(6) Remove engine rear support insulator bolts from crossmember.

(7) Install engine support fixture, Tool C-3487. Adjust fixture to support weight of engine and raise engine slightly.

(8) Remove crossmember to torsion bar support bracket bolts. Remove the rear motor support insulator bolts to support bracket, then remove the complete support assembly from the crossmember. When using Fixture, Tool C-3487, do not lower engine more than three inches from floor pan to avoid disturbing the set position of water hoses and other engine attachments.

(9) Support transmission with a suitable jack. Remove the two upper transmission case to converter housing screws and lockwasher. Install guide studs, Tool C-3276.

(10) Remove the two lower transmission case to converter housing screws and lockwashers. Now, slide jack and transmission straight back to avoid damaging front pump drive sleeve. After removing transmission from car, attach fixture, Tool C-3280, and invert transmission assembly as shown in Figure 9.

## 7. DISASSEMBLY AND INSPECTION

(1) Remove the front oil pump drive sleeve and inspect. Check the drive lugs and machined surfaces for

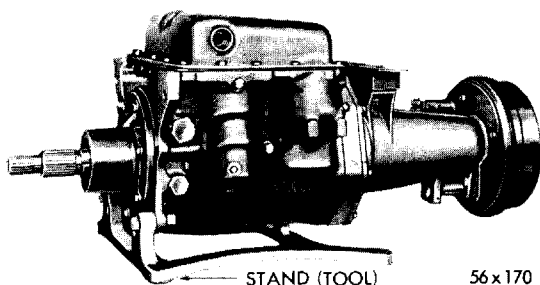


Fig. 9—Transmission Inverted in Repair Stand

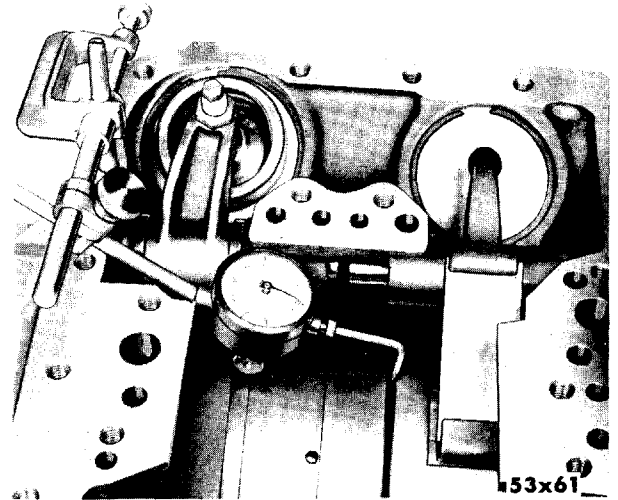


Fig. 10—Checking Transmission End Clearance

burrs and wear. Inspect rubber seal ring for brittleness and shredding.

(2) Remove the bolts and lockwashers which hold the engine rear support adapter to extension housing.

(3) Loosen the throttle control lever assembly locking screw. Slide the throttle control lever assembly off the shaft and remove the felt retainer and felt. Inspect throttle control lever for wear.

(4) Remove the oil pan bolts, oil pan, and gasket.

(5) Remove the oil strainer support bolts and washers. Inspect seal rings located at both outlets of strainer.

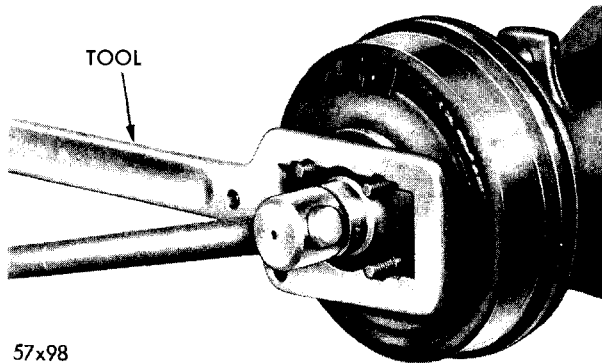
(6) Remove the five transfer plate bolts and lockwashers. Remove the valve body and transfer plate assembly from transmission case. Remove throttle valve camshaft sleeve "O" ring seal. Discard seal if torn or shredded. The valve body mating surfaces are machined. Work carefully to avoid damaging these surfaces. Place valve body in stand, Tool C-3294.

### Checking Transmission End Play

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 10.

(1) Pry front clutch forward by inserting screw driver between the direct clutch assembly and pinion carrier housing.

(2) Remove screw driver; and with dial indicator point contacting edge of direct clutch retainer, set dial indicator to zero. Pry direct clutch assembly rearward against pinion carrier housing, remove screw driver, and take indicator reading. Clearance should be from .026 to .052 inch. If this clearance exceeds the specified limit, particular attention should be shown to the condition of all thrust washers and surfaces when disassembling transmission. Record the amount of end clearance so that the proper thickness fiber thrust washer



57x98

Fig. 11—Holding Output Shaft While Removing Nut

can be installed at assembly.

If clearance exceeds .052 inch, install a thicker direct clutch piston retainer thrust washer (fiber). If clearance is less than .026 inch, install a thinner washer. The thrust washer is selectively fit and is available in the following thicknesses: .078-.080, .095-.097, and .112-.114 inch.

### Removal of Hand Brake Assembly

(1) Use wrench, Tool C-3281, to hold the mainshaft, as shown in Figure 11. Then, remove the transmission flange nut and washer.

(2) Install puller, Tool C-452, to remove brake drum and flange assembly.

(3) Using a suitable drift, remove pin which secures brake shoe anchor in extension. Remove the brake support grease shield spring and remove shield. If a screw driver or sharp instrument is used in removing shield, care must be exercised to avoid damaging the neoprene sealing surface at the bottom of the shield.

(4) Slide the hand brake assembly intact from extension housing.

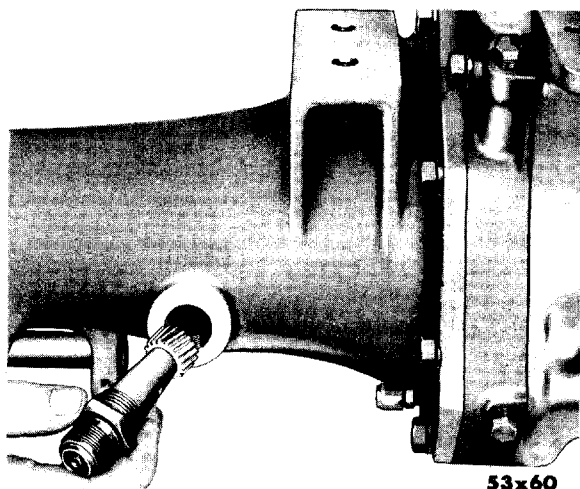


Fig. 12—Removal and Installation of Speedometer Drive Pinion

### Removal, Disassembly and Inspection of Transmission Extension

(1) Remove the speedometer drive pinion and sleeve assembly, as shown in Figure 12. **The nylon gear can be easily damaged if extension housing is removed without first removing the speedometer drive pinion.**

(2) Inspect the output shaft rear bearing oil seal and remove, if necessary, by using puller, Tool C-748. Remove any burrs from counter-bore of extension housing.

(3) Remove the seven transmission extension to case screws and lockwashers.

(4) Install guide studs, Tool C-3283, and remove extension assembly by carefully tapping assembly rearward, using a soft hammer. Remove transmission extension gasket and discard.

(5) Do not remove extension bearing unless inspection reveals it is necessary. Never reuse a bearing which has been removed. If necessary to remove bearing, remove the output shaft rear bearing snap ring. Inspect ring for distortion. Use driver, Tool C-3275, and drive bearing out of extension housing.

### Removal, Disassembly and Inspection of Governor

(1) Loosen governor body to support screws to aid in removal of governor assembly.

(2) Using a sharp instrument, such as an ice pick, remove the governor valve shaft snap ring (weight end) and remove the governor valve shaft and valve from governor valve body assembly (Figure 13).

(3) Using pliers, Tool C-760, remove the governor weight assembly snap ring (large one), and remove the governor weight assembly from the governor body (Figure 14). Remove governor secondary weight snap ring (Figure 15) using pliers, Tool C-3229.

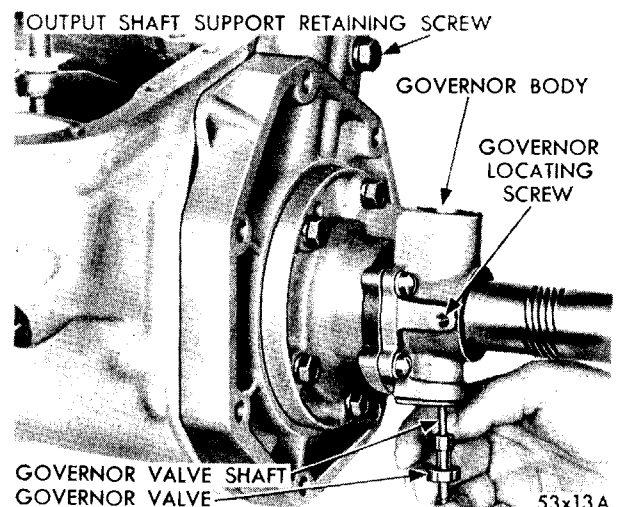
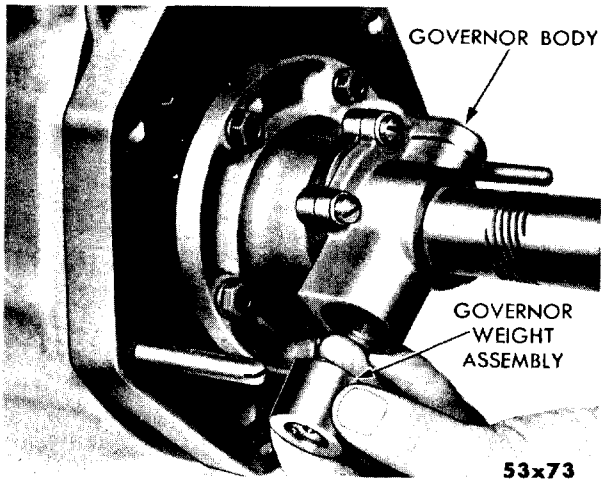
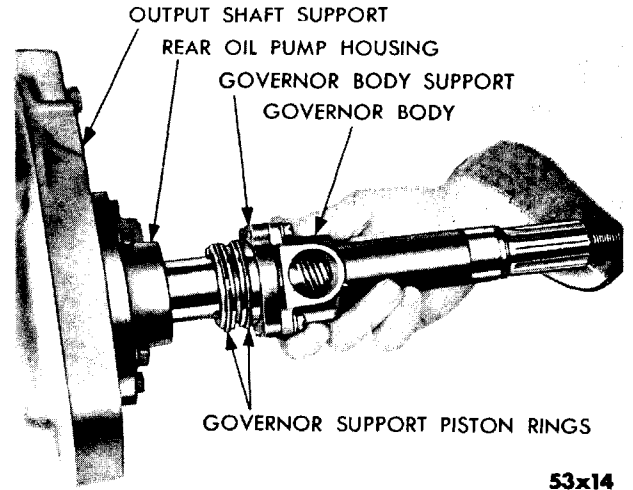


Fig. 13—Removal and Installation of Governor Valve and Shaft



**Fig. 14—Removal and Installation of Governor Weight Assembly**



**Fig. 16—Removal and Installation of Governor Body and Support**

(4) Remove governor secondary weight and spring and the intermediate weight. Inspect all parts (Figure 15) for burrs and wear. Check intermediate weight for free movement in primary weight by placing intermediate weight in primary weight. Intermediate weight should fall freely when both parts are clean and dry. Inspect spring for distortion and inspect secondary weight.

(5) Remove governor locating screw from the governor body and output shaft.

(6) Slide governor body and support from output shaft (Figure 16). Remove and inspect the two governor support piston rings.

(7) Remove the four governor body to support screws and lockwashers and separate body from support. Mating surfaces are machined and can be easily damaged. Inspect oil passages. Clean passages thoroughly with compressed air. Inspect valve and gover-

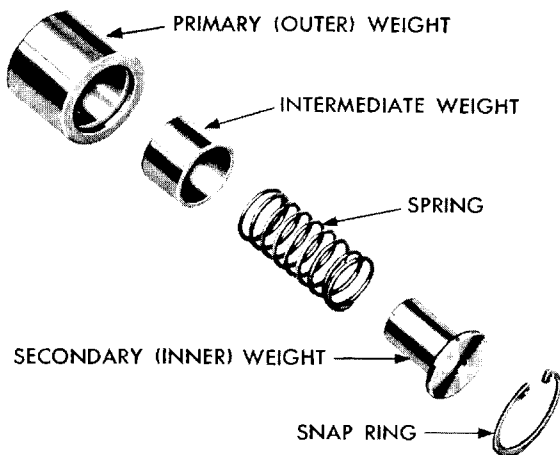
nor body for scores. Check ball plug in face of governor.

**Removal, Disassembly and Inspection of Rear Oil Pump**

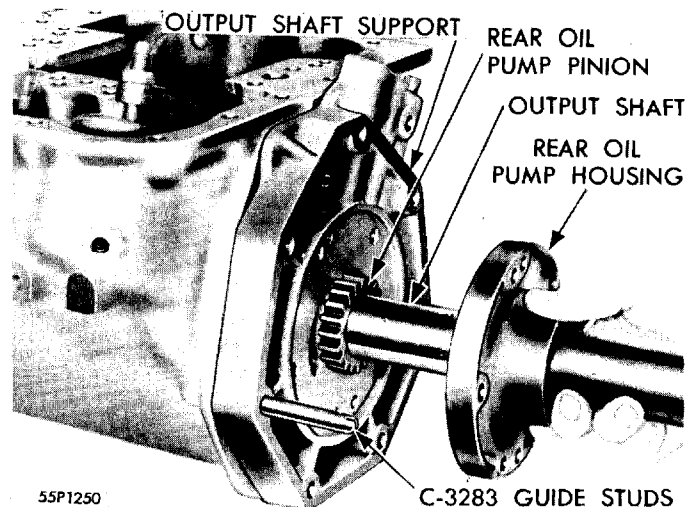
(1) Remove the five rear oil pump housing to output shaft support screws and lockwashers. Remove rear oil pump housing, as shown in Figure 17. Use dye to mark front side of gear in housing. **Do not use scribe.** Inspect machined surfaces for nicks and burrs, the oil pump gear and housing for heavy scoring or pitting and pump housing plug for leaks.

(2) Remove rear oil pump pinion from output shaft and mark front side with dye.

The oil pump pinion is keyed to output shaft by a small ball. When removing pinion, do not lose the ball. Inspect keyway in pinion and ball pocket in output



**Fig. 15—Governor Weight Assembly (Exploded View)**



**Fig. 17—Removal and Installation of Rear Oil Pump Housing**

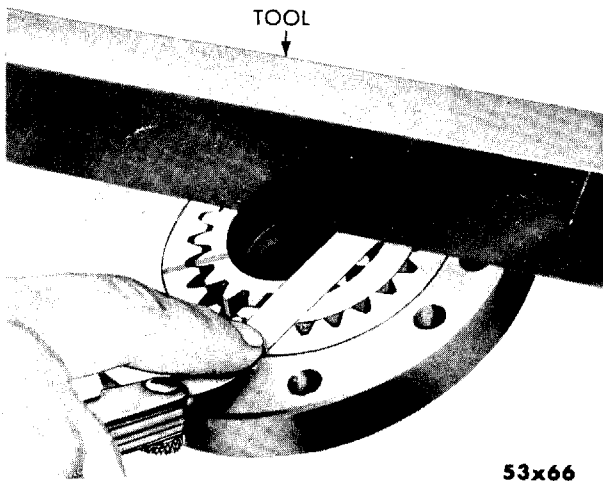


Fig. 18—Checking Clearance Between Pump Body and Gears

shaft for wear, and also the gear for pitting or heavy scoring.

(3) Using straightedge, Tool C-3335, and feeler gauge, check clearance between pump housing face and face of gears as shown in Figure 18. Clearance limits are from .001 to .003 inch.

#### **Removal of Output Shaft Support, Planet Pinion Carriers, and Direct Clutch Assemblies**

(1) Remove output shaft support to transmission case screw and washer (Figure 13). Loosen reverse band adjusting screw and locknut to release any tension of reverse band on carrier housing. Grasping output shaft in both hands, carefully work shaft, planet pinion carrier assemblies, housing and support, out of transmission case, as shown in Figure 19. If support is stuck to transmission case and cannot be removed as described, lightly tap support with a soft hammer.

(2) Remove the large (tabbed) kickdown planet pinion carrier thrust washer from direct clutch piston

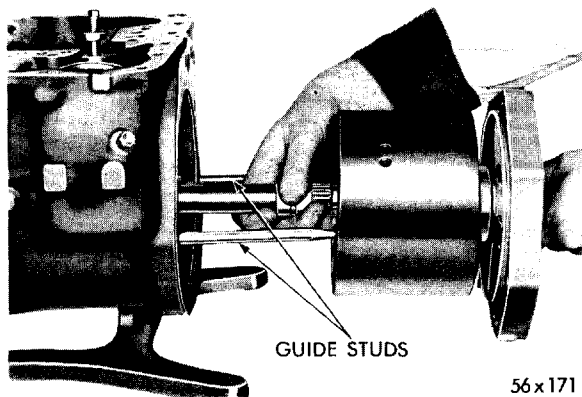


Fig. 19—Removing Output Shaft, Carrier Housing and Input Shaft Assemblies

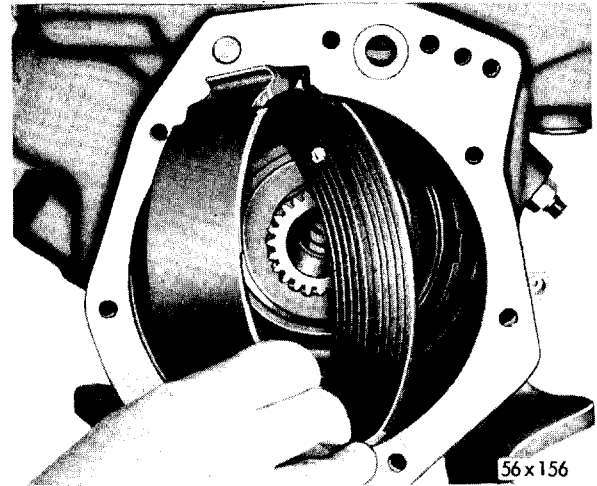


Fig. 20—Removing or Installing Reverse Band

retainer assembly (if not removed with gear train). Inspect for cracks, burrs and wear.

(3) Because the diameter of the direct clutch retainer is greater than the diameter of the reverse band, it is necessary to first remove the reverse band before the direct clutch assembly can be withdrawn from the transmission case.

To remove the reverse band, loosen the band adjusting screw and locknut and compress band sufficiently to remove band strut. Unhook reverse band from link assembly. Remove band by rotating it through the relieved area in transmission case, as shown in Figure 20.

(4) To remove the direct clutch assembly, loosen kickdown band adjusting screw locknut and back off adjusting screw sufficiently to provide clearance for removal of clutch retainer. Remove the direct clutch assembly from the reaction shaft, as shown in Figure 21. Wrap towel around sun gear to protect hand. Be

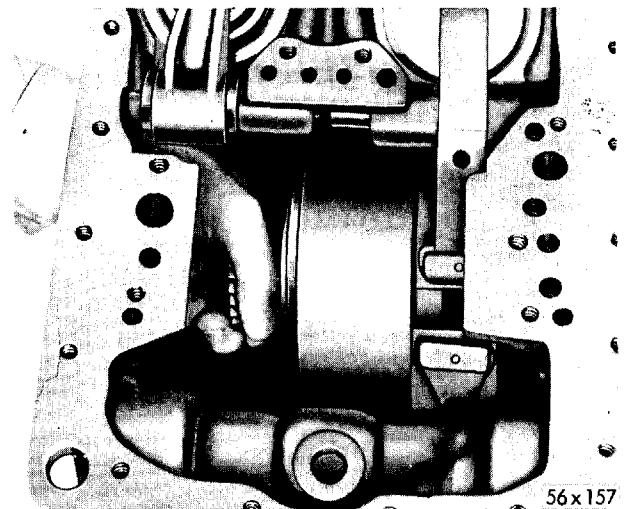


Fig. 21—Removing or Installing Direct Clutch Assembly



Fig. 22—Transmission Gear Train (Exploded View)

sure to remove direct clutch retainer thrust washer (fiber) from reaction shaft.

### Removal and Inspection of Planet Carriers (Refer to Figure 22)

(1) Using a feeler gauge, check clearance between the planet pinion carrier housing snap ring and kickdown planet pinion carrier assembly. This clearance should be from .010 to .021 inch. Snap rings are available in the following thicknesses: .062-.064, .072-.074, and .082-.084 inch. If this selection of snap rings fails to provide the necessary clearance, use one of the kickdown sun gear snap rings (part number 1327729) which will permit a minimum of .058-.060 inch.

(2) Using a screw driver, remove the planet pinion carrier housing snap ring (Figure 23). Identify snap ring to aid in reassembly.

(3) Remove the input shaft, kickdown planet pinion carrier assembly and kickdown annulus gear from carrier housing, as shown in Figure 24.

(4) Remove the kickdown annulus gear after removing snap ring (Figure 25) from input shaft. Inspect gear for pitted, cracked, and broken teeth. Remove the small (tabbed) thrust washer and inspect for cracks, burrs and wear.

(5) Remove kickdown planet pinion carrier assem-

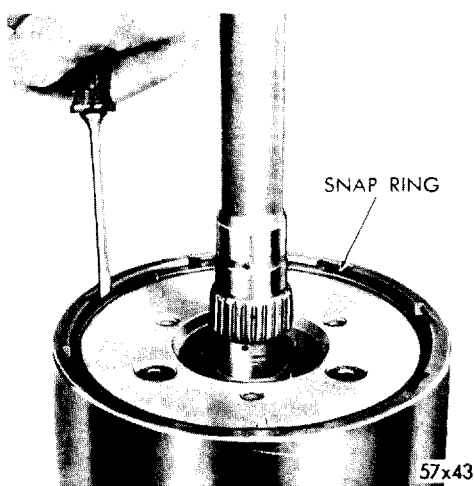


Fig. 23—Removing Kickdown Planet Pinion Carrier Housing Snap Ring

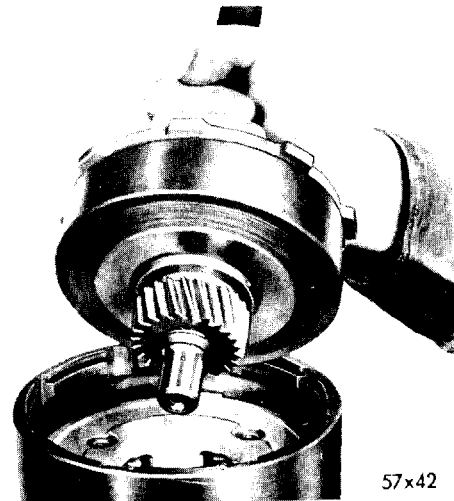


Fig. 24—Removing or Installing Input Shaft and Kickdown Planet Pinion Carrier Assembly

bly from input shaft. Check all oil passages in both the gear and shaft for obstructions. Inspect splines and bearing surface on input shaft for burrs and wear. Inspect snap ring groove (Figure 26).

Inspect kickdown planet pinion carrier for wear or heavy scoring on the aluminum thrust surface and broken or pitted gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears. Clearance should be .006 to .017 inch. Inspect pinion shafts for snug fit in the carrier and make sure pinions are free to rotate. Inspect retaining pins in pinion shaft. Inspect planet pinion washers for scoring. Do not replace carrier unless inspection reveals it is necessary. The kickdown planet pinion carrier assembly is serviced only as a complete assembly.

(6) Remove the reverse planet pinion carrier from the carrier housing, as shown in Figure 27. Remove the

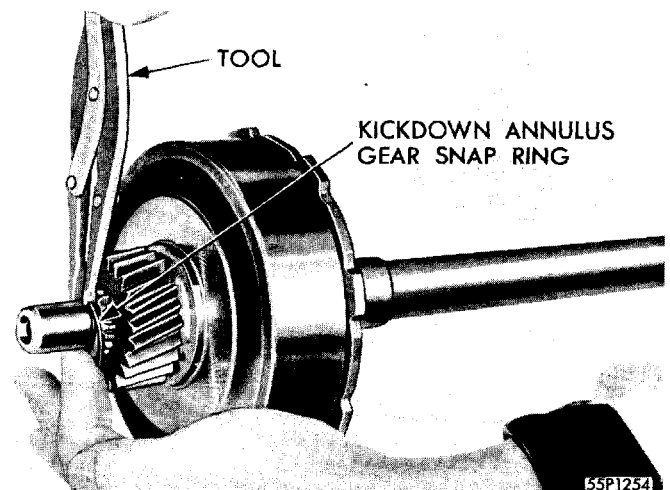
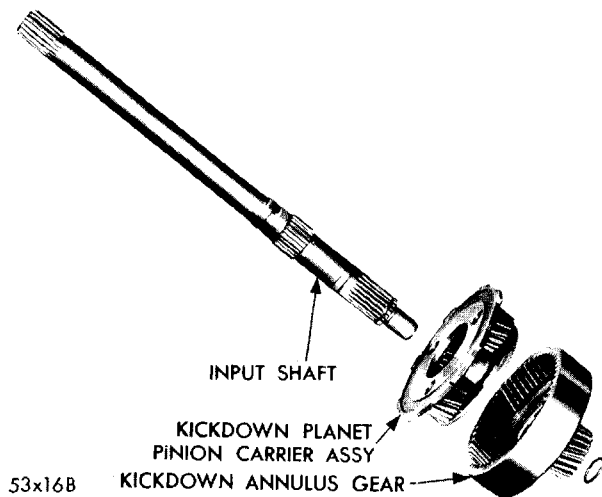


Fig. 25—Removing or Installing Kickdown Annulus Gear Snap Ring

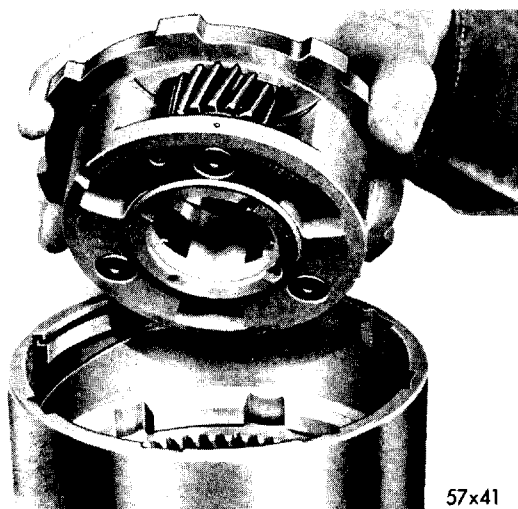




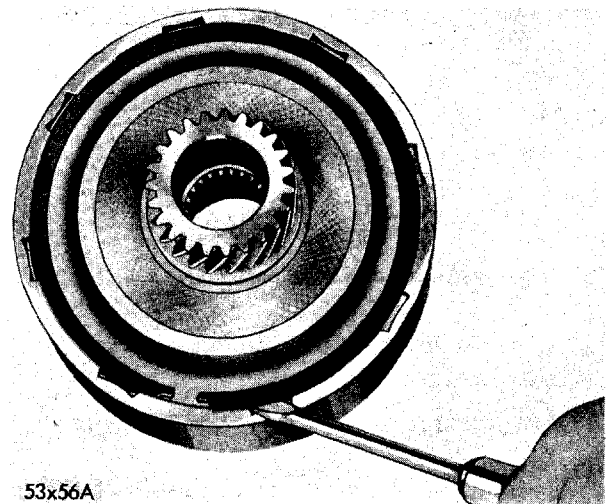
**Fig. 26—Input Shaft, Kickdown Planet Pinion Carrier and Annulus Gear (Disassembled View)**

output shaft and reverse annulus gear assembly and fiber thrust washer from the carrier housing. Using pliers, Tool C-3301, remove the reverse annulus gear snap ring and remove annulus gear from output shaft. Inspect annulus gear for pitted or broken teeth. Inspect output shaft ring grooves (seal and snap) for burrs and inspect rings for broken ends. Inspect splines on both shaft and annulus gear for burrs and wear. Check speedometer gear for burrs. Check output shaft bronze pilot bushing for wear, scoring. The output shaft is serviced only as an assembly.

**NOTE: Output shaft bushing I.D. (after machining) should be .752 to .753 with maximum service limit of .0065 greater.**



**Fig. 27—Removal and Installation of Reverse Planet Pinion Carrier Assembly**



**Fig. 28—Removing Kickdown Sun Gear Snap Ring**

Inspect reverse planet pinion carrier housing fiber thrust washer for cracks and wear. Inspect planet pinion carrier housing and driving lug slots inside housing for wear. Closely inspect band contacting surface for burned spots and scoring, especially if reverse band lining has become excessively worn. Inspect reverse planet pinion carrier assembly in same manner as kickdown planet pinion carrier assembly.

Inspect all oil passages in output shaft support for obstructions. 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 both inside and outside bearing surfaces for wear and scoring.

### **Disassembly and Inspection of the Direct Clutch Piston Retainer**

(1) Using a screwdriver, remove the kickdown sun gear snap ring as shown in Figure 28. The ring is a select fit. Identify to aid in reassembly.

(2) Lift out kickdown sun gear assembly (Figure 29). Remove foreign material which may have accumulated on either side. Inspect driving disc contact surface for evidence of burning or scoring.

Inspect sun gear for pitted or broken teeth. Lift out direct clutch hub from center of direct clutch piston retainer. Oil passages in hub are to lubricate the clutch plates and driving discs when clutch is in released position. Inspect clutch hub driving lugs for brinnelling and remove metal pickup which may have accumulated on either side of the hub. Inspect hub splines for burrs and brinnelling.

(3) Invert the direct clutch piston retainer and remove the clutch plates (steel) and driving disc assemblies. Inspect driving discs for evidence of burning, glazing, and flaking off of facing material. Check discs

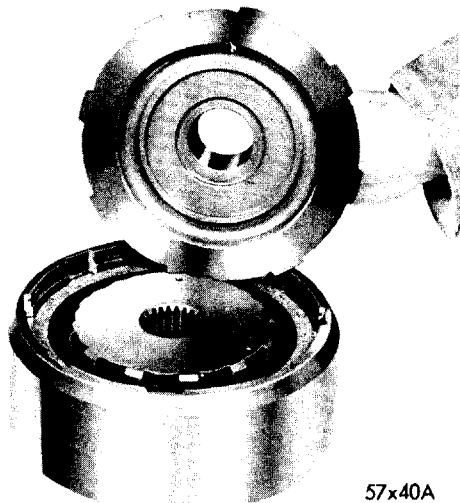


Fig. 29—Removal and Installation of Kickdown Sun Gear

by scratching facings with finger nail; if material collects under nail, replace all driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates for evidence of burning, scoring, and damaged splines.

(4) Using Compressor, Tool C-3575 (or C-3533) compress the direct clutch spring sufficiently to unseat the direct clutch spring retainer snap ring with pliers, Tool C-3301, as shown in Figure 30. Release compressor, Tool C-3575 (or C-3533), and remove the direct clutch spring retainer snap ring, spring retainer and spring from the clutch retainer. Check spring, retainer and snap ring for distortion.

(5) Using a twisting motion, remove the direct clutch piston from retainer. Note the ball check in clutch retainer housing. The ball check relieves centrifugal oil pressure when transmission is in neutral and prevents clutch engagement when engine speeds are increased. Make sure ball operates freely and seats properly. The bronze bushing used in the direct clutch piston retainer is not replaceable.

**NOTE: Particular attention should be paid to the inside diameter of the direct clutch retainer bushing. Excessive clearance between the direct clutch retainer bushing and the reaction shaft, can permit the retainer to wobble and reduce the effectiveness of the reaction shaft seal. Accordingly, if this seal is ineffective, clutch slippage may result due to loss of clutch application pressure. Normal direct clutch bushing inside diameter dimensions (after machining) are 1.8125 inches to 1.1835 inches. Maximum useable service limit is .004 greater.**

Inspect reaction shaft seal ring contacting areas, on

retainer, for grooving. Inspect the band contacting surface for deep scores and burns, especially if the kickdown band lining is worn to the point where the steel band has been contacting the direct clutch piston retainer. **Do not turn the direct clutch piston retainer in a lathe to remove score marks.**

(6) Inspect steel clutch plate contacting surfaces for deep scores and burrs. Make sure clutch driving lugs will slide freely into retainer. Remove any metal pick-up on hub of retainer. Inspect bore of the piston for score marks. If score marks are light, remove with crocus cloth. If they are heavy, replace the piston. Remove the direct clutch piston retainer seal ring (lip type neoprene) from retainer hub, using a suitable piece of wire. Remove the direct clutch piston seal ring (neoprene) from outer circumference of piston.

### Removal and Inspection of Kickdown Band

(1) Compress kickdown band ends sufficiently to remove the kickdown band strut. Note that strut is grooved to act as a guide to the kickdown band strut pin on band end. Remove adjusting screw blade.

(2) Remove the kickdown band assembly by rotating band ends through rear opening in transmission case. Both reverse and kickdown bands have bonded lining and no attempt should be made to reline them. The kickdown band is narrower, larger in diameter, and has a different lining material. Make visual inspection of lining for wear and bond. If lining is worn so that grooves are no longer visible, the band assembly must be replaced. Inspect band for distortion and cracked ends.

### Removal of the Reverse and Kickdown Band Levers

Inspect reverse band link assembly for wear and

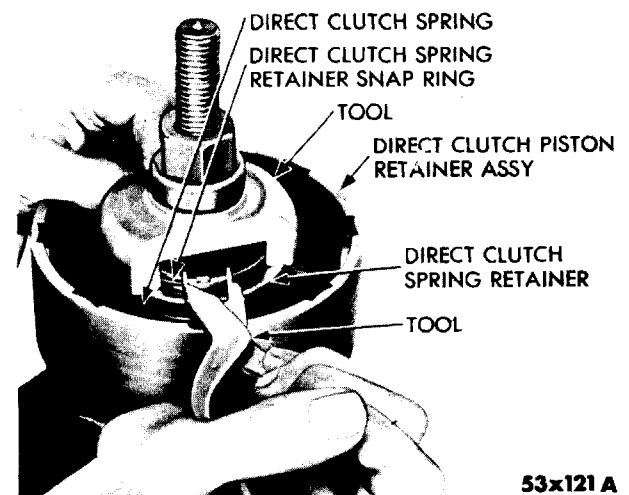
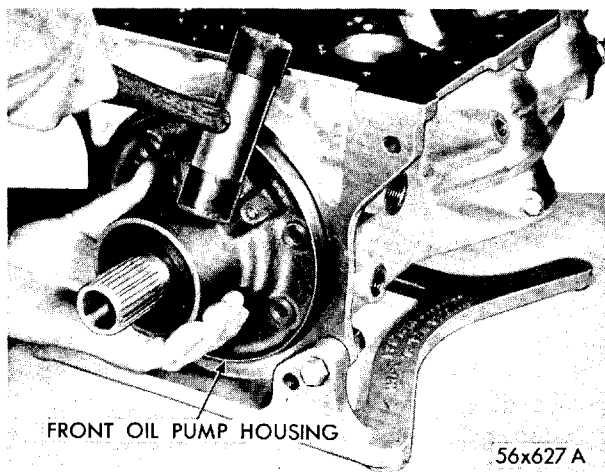


Fig. 30—Removal and Installation of Direct Clutch Spring Retainer Snap Ring



**Fig. 31—Removal of Front Oil Pump Housing  
(Typical View)**

riveting of assembly. Inspect levers for cracks and wear. Make sure they have side clearance and are free to turn on shafts. Do not remove these assemblies unless inspection reveals it is necessary to do so.

If necessary, remove levers as follows:

(1) Insert fingers in back of reverse band and link assembly lever shaft. Holding the reverse band lever and link assembly with the other hand, push shaft out of rear opening in case.

(2) Remove kickdown band lever shaft plug in front of transmission case. Remove kickdown lever by inserting finger in back of kickdown lever shaft and, holding the band lever with the other hand, push shaft out front of transmission case.

### Removal of the Front Oil Pump

(1) Remove the transmission regulator valve spring retainer, gasket and spring.

(2) Remove the torque converter control valve spring retainer, gasket and spring. Do not remove valves. To remove these valves when transmission is installed in vehicle, use a mechanical retriever or a piece of welding rod inserted in end of valve. Valves are so constructed that they will not drop into front housing when removing.

(3) Remove the front oil pump housing to transmission case bolts and washers.

(4) Using a soft hammer, tap on the circumference of the housing to loosen. Pull oil pump housing assembly and gears from the transmission case (Figure 31). Using dye, mark front side of gears. **Do not use scribe marks.**

(5) Remove oil pump gear from front oil pump housing. Remove the front oil pump housing seal (large neoprene) from circumference of housing.

(6) Using a brass drift, drive the front oil pump housing oil seal from front of housing. Inspect front oil pump housing bushing for scores (bushing is not

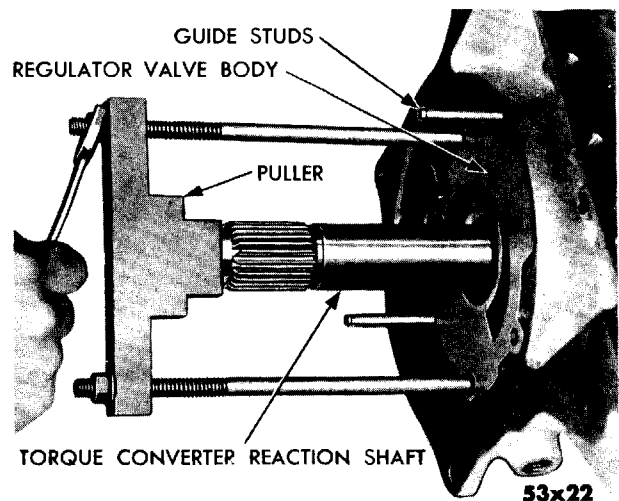
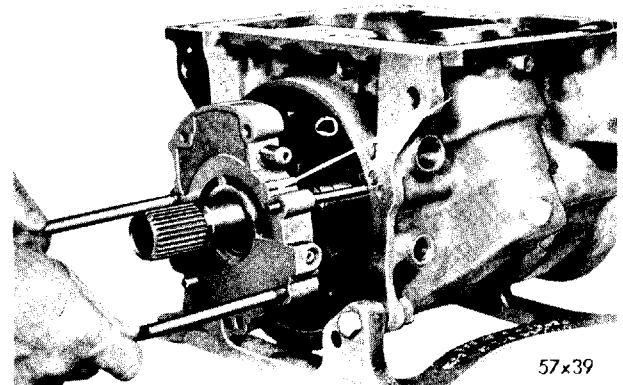
replaceable). Bushing I.D. (after machining) should be 1.878 to 1.879 inches with maximum service limit of .002 inch greater. This bushing supports the front oil pump drive sleeve. Slight scores may be removed with crocus cloth. Inspect pump housing and gear for heavy scoring and wear.

(7) Using straightedge, Tool C-3335, and feeler gauge, check clearance between pump housing face and face of gears. Clearance limits are .0012 to .0022 inch. Make sure all oil passages are open by blowing them out with compressed air.

### Removal of Regulator Valve Body

(1) If regulator valve body cannot be removed by installing guide studs, Tool C-3283, in tapped holes in body (and pulling outward with the hands, as shown in Figure 32) use the two threaded holes provided in the regulator valve body to attach puller, Tool C-3287, and install (if removed) guide studs, Tool C-3288 (Figure 32).

(2) Pull regulator valve body from torque converter reaction shaft and discard the gasket. Handle the



**Fig. 32—Removing Regulator Valve Body**

regulator valve body carefully.

(3) Place body and both valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. 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 prevents dirt and foreign matter from getting between the valve and body, reducing the possibility 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.

(4) Check regulator valve spring seat (snap ring). After both valves and regulator valve body have been thoroughly cleaned and inspected, place them on clean paper and cover with clean paper until ready for installation. Leave valves in regulator body bores.

#### Removal of Reverse Servo Piston

(1) Install compressor, Tool C-3289 or C-3529, on transmission case (use oil pan screws) and compress reverse servo piston spring retainer.

(2) Using a screw driver, remove the reverse servo piston spring retainer snap ring, as shown in Figure 33. Loosen compressing portion of tool. Spring retainer may require guiding out of transmission case.

(3) Remove the spring retainer, spring and servo piston and plug assembly.

(4) Remove the servo piston seal (lip type neoprene) from piston.

(5) Remove reverse servo piston plug snap ring.

(6) Remove plug and cushion spring from piston. Inspect servo bore for scoring. Light scores may be

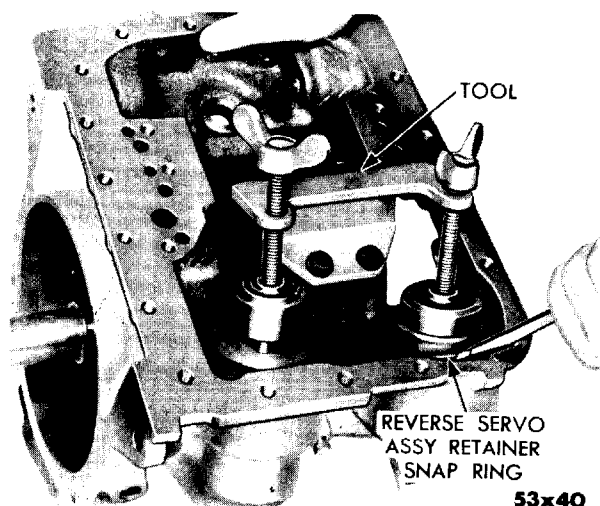


Fig. 33—Removal and Installation of Reverse Servo Assembly Retainer Snap Ring

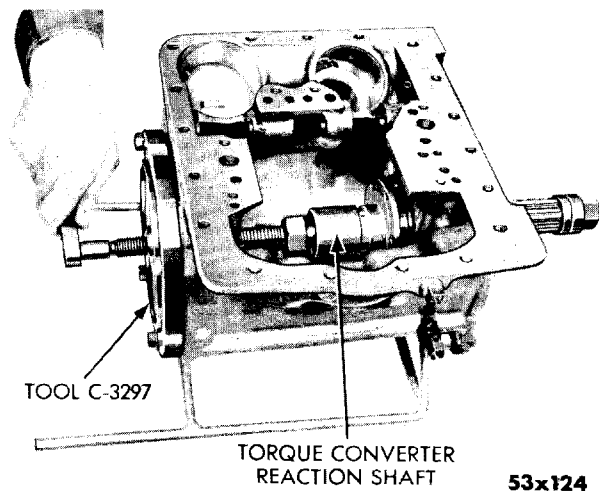


Fig. 34—Removal of Torque Converter Reaction Shaft

removed with crocus cloth. Check plug for scoring and wear at lever contact point. Check plug snap ring and groove for burrs, wear.

#### Removal of Kickdown Piston

(1) Using compressor, Tool C-3289 or C-3529, apply sufficient pressure on the kickdown piston rod guide to remove the piston rod guide retaining snap ring.

(2) Loosen compressing portion of tool and remove tool from transmission case. Remove piston rod guide, piston spring, and kickdown piston rod assembly. Inspect riveting of the kickdown piston rod to kickdown spring retainer.

(3) Remove seal ring from guide. Inspect for light scores and wear on piston rod and guide.

(4) Using lock ring pliers, Tool C-484, remove the kickdown piston from the transmission case.

(5) Remove the three cast iron seal rings from the kickdown piston. Inspect piston for light scores and wear. Inspect rings for broken ends.

#### Removal of Torque Converter Reaction Shaft

Inspect torque converter reaction shaft steel seal rings (interlocking type) for broken ends. Make sure they are free to rotate in the lands. Inspect neoprene seal ring for brittleness. Inspect splines on shaft for burrs and wear. Inspect thrust surfaces for wear and slight scores. Remove the reaction shaft seal (neoprene). Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.

If necessary to remove reaction shaft, follow these steps:

(1) Remove neoprene seal ring.

(2) Remove the three transmission case to reaction shaft screws and washers.

(3) Using Tool C-3297 or C-3531 press reaction shaft out of transmission case as shown in Figure 34.

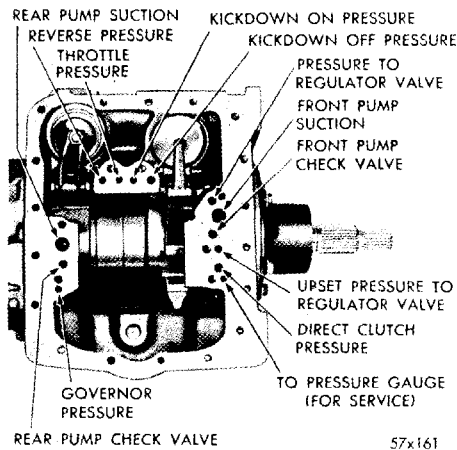


Fig. 35—Transmission Oil Passages

(4) Remove the two torque converter reaction shaft seal rings (interlocking).

**NOTE: Reaction shaft bushing I.D. (after machining) should be 1.063 to 1.064 inches with a maximum of .0035 greater.**

#### Removal of Kickdown Band Adjusting Screw

Loosen locking nut and remove kickdown band adjustment screw and locknut. When locknut is loosened, the adjusting screw must be finger free. If it is not, inspect screw and nut for pulled threads or foreign material in threads.

The transmission and its components have been disassembled for inspection, cleaning and the replacement of worn or damaged parts.

Inspect transmission case for cracks, sand holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages (Refer to Figure 35) to make sure they are open. Check oil pressure take-off plugs for tightness. Check drive type breather in extension housing for being plugged (under coating) and looseness.

## 8. ASSEMBLING THE TRANSMISSION

Before assembling the transmission, lubricate each part with **clean** Automatic Transmission Fluid (Type "A" Suffix "A").

#### Installing Kickdown Band Adjusting Screw

It is vitally important that the adjusting screw fit freely into the transmission case. Install adjusting screw, with locking nut attached, into transmission case until there is approximately 1 inch of screw left on outside of case. Do not lock screw into position at this time.

#### Installing the Torque Converter Reaction Shaft

(1) Coat the two steel torque converter reaction

shaft seal rings with transmission fluid.

(2) Install rings on shaft. Make sure they are interlocked and rotate freely in the ring lands.

(3) Coat portion of reaction shaft (that presses into case) with transmission fluid. Position torque converter reaction shaft into transmission case so that holes in shaft align with bolt holes in case. Install Tool C-3297 (or Tool C-3531).

(4) Place two front oil pump to transmission case screws (coarse thread) through reaction shaft screw holes in transmission case until threads contact the machine threads of reaction shaft flange screw holes (fine thread). Use very light finger pressure to tighten (approximately one turn).

In this position, the bolts will serve as guides in aligning the reaction shaft flange dowel hole with the dowel in the transmission case.

(5) Press reaction shaft into transmission case. Remove Tool C-3297 (or Tool C-3531).

(6) Remove the two front pump screws (guide). Start the three transmission case to reaction shaft bolts and washers and tighten from 10 to 15 foot-pounds torque. Coat new torque converter reaction shaft seal ring (neoprene) with transmission fluid and install on shaft.

#### Installing the Kickdown Piston

(1) Coat the three kickdown piston rings with transmission fluid and install on piston. Interlock the rings and make sure they are free to rotate in lands.

(2) Place kickdown piston assembly into transmission case. Compress bottom ring (large) with a piece of brass rod. After bottom ring has entered, piston will seem to hang at two different locations while being pushed into case. This is due to rings entering cylinder.

#### **DO NOT HAMMER.**

(3) Place kickdown piston rod in piston and slide spring over kickdown piston rod.

(4) Coat a new kickdown piston rod guide seal ring with transmission fluid and install on kickdown piston rod guide. Make sure ring rotates freely in land.

(5) Install compressor, Tool C-3289 (or Tool C-3529), on transmission case. Using extreme care, compress the kickdown piston spring to the point that piston guide seal ring slightly binds on case. Using a piece of brass rod flattened on end, work seal ring into position, gradually compressing spring until seal ring enters case.

(6) Install the kickdown piston rod guide retaining snap ring. Make sure snap ring is properly seated.

#### Installing the Reverse Servo Piston

(1) Install cushion spring and plug in servo piston.

(2) Install the reverse servo piston plug snap ring. Make sure snap ring is properly seated.

(3) Coat a new reverse servo piston ring (neo-

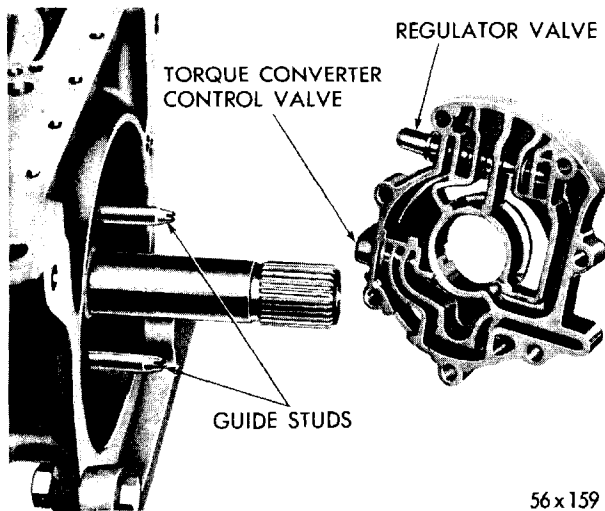


Fig. 36—Installing Regulator Valve Body

prene) with transmission fluid and install (lip facing down) on piston. Insert reverse servo piston and plug assembly into transmission case in a cocked position. Then, by rotating piston, the piston ring will enter case without being damaged.

(4) Place reverse servo piston spring over piston and position spring retainer over spring. Compress spring with compressor, Tool C-3289 (or C-3529), sufficiently to install snap ring. The spring retainer may require guiding into case. Make sure snap ring seats properly. Remove installing tool from transmission case.

### Installing the Regulator Valve Body

Inspect regulator valve body and valves to make sure that no damage has occurred since first inspection and cleaning. Blow out passages with compressed air. Make sure torque converter reaction shaft seal (neoprene) is coated with transmission fluid.

(1) Place the transmission regulator valve and torque converter control valve in the regulator valve body. (Refer to Figure 36).

(2) Install guide studs, Tool C-3288 (if removed) in front of transmission case, position new regulator valve body gasket and valve body assembly (with oil passages to rear) over torque converter reaction shaft. Seat firmly against gasket on front of transmission case. Use extreme care when placing regulator body in position to prevent reaction shaft screws from damaging passages in regulator body.

### Installing the Front Oil Pump

(1) Position front oil pump housing oil seal in front of oil pump housing (metal portion of seal down). Using driver, Tool C-3278, bottom seal into housing, as shown in Figure 37.

(2) Coat new front oil pump housing seal (neo-

prene) with transmission fluid and install on housing. Make sure seal is properly seated in groove (lip facing down) and that it protrudes .010 inch above circumference of housing.

(3) Place transmission front oil pump gear and pinion (driving lugs of pinion facing up) in oil pump housing and check the marking. Unless oil pump pinion is installed correctly, considerable damage will result when transmission is installed in vehicle. Lubricate oil pump gears with Automatic Transmission Fluid (Type "A", Suffix "A").

(4) Place front oil pump housing assembly (with oil drain facing up) over torque converter reaction shaft and slide into position over guide studs and up against regulator valve body. Start five of the bolts and draw housing down evenly until it is seated into transmission case.

(5) Remove guide studs and install the two remaining bolts and washers. Tighten to 17 foot-pounds torque. After all bolts have been installed and properly torqued, engage the driving lugs of the oil pump pinion to determine if oil pump pinion turns freely. Use the oil pump drive sleeve for this check. If pinion does not turn freely, remove pump and check for foreign matter between pump gears and housing. Lugs of drive sleeve should extend not more than from  $\frac{1}{2}$  to  $\frac{5}{8}$  inch beyond face of oil pump housing.

(6) Using a new gasket, install the torque converter control valve spring and retainer. Tighten from 35 to 40 foot-pounds torque.

(7) Using a new gasket, install the transmission regulator valve spring and retainer. Tighten from 45 to 50 foot-pounds torque.

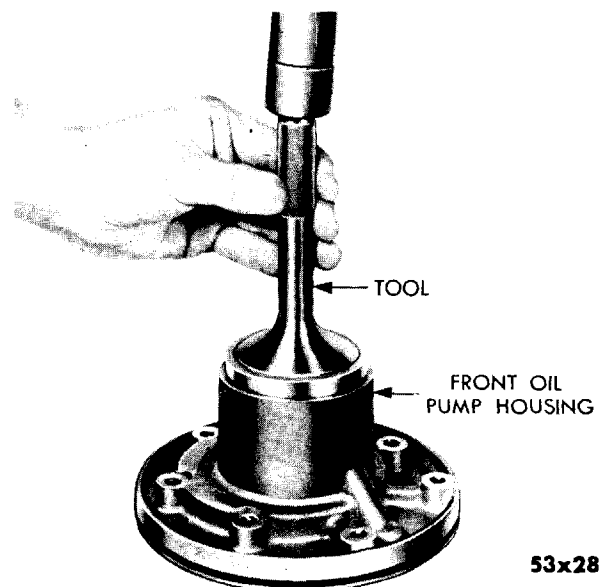


Fig. 37—Installing Front Pump Oil Seal

### Installing the Kickdown Band and Levers

(1) Place the kickdown band lever assembly into transmission case and slide the kickdown band lever shaft into position from front of transmission case. The lever should operate freely on shaft.

(2) Install kickdown band lever shaft plug in front of transmission case and tighten from 30 to 35 foot-pounds torque.

(3) Place kickdown band assembly into transmission case by rotating ends of band through rear opening in case. Fit either end of the kickdown band over adjusting screw blade and compress the band lever. **Make sure the kickdown band strut slot engages with kickdown strut pin in the band end.**

### Assembling the Direct Clutch Piston Retainer

(1) Coat a new direct clutch piston seal ring with transmission fluid and install on piston, with lip of seal facing away from the flange.

(2) Coat a new direct clutch piston retainer seal ring with transmission fluid and install (lip of seal down) on retainer hub.

(3) Place piston assembly in the direct clutch retainer and, with a twisting motion, seat piston in bottom of retainer. Work carefully to avoid damaging lip of seals.

(4) Seat the direct clutch spring into the direct clutch piston retainer. Place spring retainer on spring and snap ring on spring retainer.

(5) Using compressor, Tool C-3575 (or C-3533), compress the direct clutch spring sufficiently to seat the snap ring in its groove. Make sure snap ring is properly seated.

(6) Remove compressor, Tool C-3575 (or C-3533). Place the direct clutch hub in the center of the direct clutch piston retainer.

(7) Lubricate the clutch plates and driving discs with Automatic Transmission Fluid (Type "A" Suffix "A"). Place one of the clutch plates (steel) in the direct clutch piston retainer, followed by a driving disc.

(8) Place the kickdown sun gear assembly in the direct clutch piston retainer.

(9) Using a feeler gauge, check the clearance under the kickdown sun gear snap ring. Select a snap to give minimum clearance (close to zero as possible). Make sure snap ring seats properly. Snap rings are available in the following two thicknesses: .058 to .060 inch and .062 to .064 inch.

(10) Place fiber thrust washer (select fit, see "Checking Transmission End Play") on reaction shaft and install direct clutch assembly in transmission case as shown in Figure 21.

### Installing Reverse Band and Levers Assembly

(1) Place the reverse band lever assembly in the reverse band link assembly and place in transmission case.

(2) Align the holes in the lever and link assemblies to shaft hole in transmission case. Slide the reverse band lever shaft into position from rear of transmission case.

(3) Place reverse band assembly into transmission case by rotating ends of band through relieved area in transmission case (Fig. 20). Hook end of band in link assembly. Compress band sufficiently to install the strut in the slots of the band and lever assembly. (Figure 38 illustrates assembly of reverse band linkage after installation in transmission case).

### Installing the Planet Pinion Carriers in Housing (Refer to Figure 22)

(1) Lubricate bearing surface of planet pinion carrier housing, and place bearing surface of housing over output shaft support bearing surface.

(2) Place the reverse annulus gear on the output shaft and install snap ring. Output shaft may be placed in a vise, providing it is clean and equipped with soft jaws. **Reverse annulus gear must fit reasonably tight on output shaft. End clearance is controlled by various snap rings which are available in the following thicknesses: .078 to .080 inch; .082 to .084 inch, and .086 to .088 inch.** Make sure snap ring seats properly.

(3) Coat output shaft seal ring with transmission fluid and install on shaft. Interlock the seal ring into position and make sure ring rotates freely in land.

(4) Coat the planet pinion carrier housing fiber thrust washer with lubricate, slide washer over output shaft and against thrust surface on reverse annulus gear.

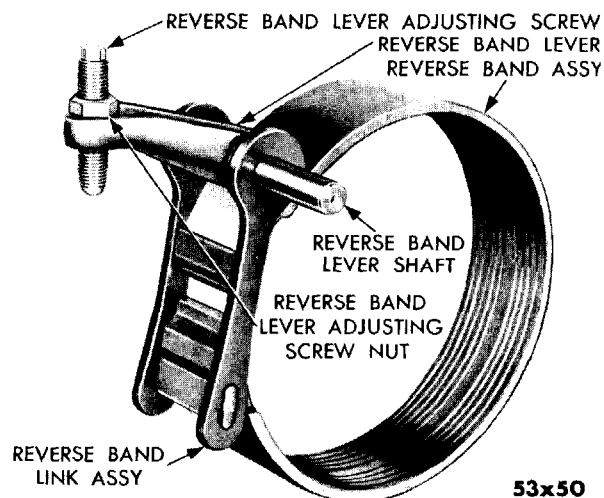


Fig. 38—Reverse Band Linkage

53x50

(5) Place output shaft and reverse annulus gear into position in the planet carrier housing.

Be careful not to damage the output shaft seal ring as it enters the output shaft support. Make sure the fiber thrust washer seats properly between the reverse annulus gear and the planet pinion carrier housing.

(6) Coat reverse annulus gear teeth with transmission fluid.

(7) Lubricate thrust surfaces and gear teeth of the reverse planet pinion gears and carrier assembly. Place carrier assembly (Figure 27) in the reverse annulus gear. Make sure driving lugs on carrier assembly properly engage the slots in the planet pinion carrier housing.

(8) Coat input shaft bearing surfaces and gear teeth on the kickdown planet pinion gears and carrier assembly with transmission fluid. Slide kickdown planet pinion carrier assembly carefully down on rear end of input shaft.

(9) Lubricate teeth and thrust surfaces, then slide kickdown annulus gear over input shaft. Install kickdown annulus gear snap ring and make sure it is seated properly (Figure 25). Input shaft may be placed in a vise, providing vise is clean and equipped with soft jaws.

(10) Lubricate the large kickdown planet pinion carrier thrust washer (tabbed) with lubriplate and install on kickdown planet pinion carrier assembly.

(11) Place the kickdown planet pinion carrier assembly, kickdown annulus gear and input shaft into position in planet pinion carrier housing. Make sure lugs on kickdown carrier assembly properly engage the slots in the planet pinion carrier housing.

(12) Install planet pinion carrier housing snap ring (raise housing slightly to aid in installing snap ring). Make sure snap ring is positioned and seated properly.

(13) Using feeler gauge, check the clearance between the kickdown planet carrier housing snap ring and the kickdown pinion carrier assembly. Limits are .010 to .021 inch. If the clearance is not within these limits, select a new snap ring. Snap rings are available in the following thicknesses: .062 to .064 inch; .072 to .074 inch, and .082 to .084 inch. If this selection of snap rings fails to provide sufficient clearance, use a kickdown sun gear snap ring (part number 1327729) which will permit a minimum of .058-.060 inch.

### **Installing the Output Shaft Support, Planet Pinion Carriers and Housing Assembly**

(1) Install guide studs, Tool C-3283, in rear of transmission case. Position new output shaft support gasket over guide studs and against case.

(2) Insert input shaft, planet pinion carrier housing, output shaft support and output shaft through the rear

of transmission case. Make sure large kickdown planet pinion carrier thrust washer (tabbed) is positioned correctly against thrust surface of direct clutch retainer assembly.

(3) Install the one output shaft support to transmission case screw and lockwasher and tighten **finger tight**.

### **Installing the Rear Oil Pump**

(1) Coat transmission rear oil pump pinion ball with transmission fluid and insert in ball pocket in output shaft.

(2) Lubricate rear oil pump drive pinion with transmission fluid, place over output shaft and slide into position. Align keyway in pinion with ball shaft. Pinion was marked when removed in disassembly, so make sure it is installed correctly. Check the marking.

(3) Slide rear oil pump housing assembly over output shaft support bolts and lockwashers. Draw down evenly and tighten from 10 to 12 foot-pounds torque. **After bolts have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If they are not, remove pump to determine cause.**

### **Installing the Governor on the Output Shaft**

(1) Coat the two governor support piston rings with transmission fluid and install on the governor support. Stagger ring gaps and make sure they are free to rotate in lands. Position governor on support and install the four screws and lockwashers. **Do not tighten screws at this time.**

(2) Slide governor support and body assembly over output shaft, as shown in Figure 16, and into position in rear oil pump housing. Compress governor support piston rings with fingers as support enters oil pump housing.

(3) Align locating hole in output shaft to locating screw hole in governor body and install governor locating screw. Tighten from 3½ to 4 foot-pounds torque. Holes can be easily aligned by turning output shaft and holding governor body.

(4) Tighten the four governor body screws from 5 to 10 foot-pounds torque.

(5) Dry governor parts with compressed air, but do not lubricate when assembling. Place governor intermediate weight in primary weight.

(6) Install the secondary weight spring and weight. Compress spring sufficiently to install snap ring. Make sure the spring seats properly and that snap ring is seated properly.

(7) Place the governor weight assembly (secondary weight snap ring up) into governor body (Figure 14) and install snap ring. Make sure the snap ring



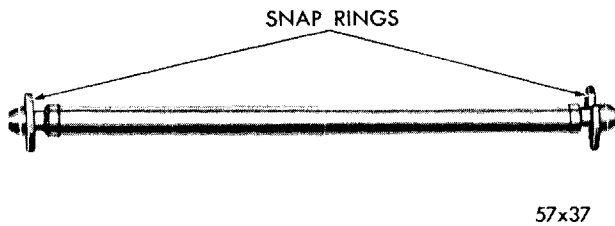


Fig. 39—Positioning Governor Valve Snap Ring

seats properly.

(8) Slide the governor valve shaft into the governor body (Figure 13) through the output shaft and governor weight assembly. At the same time, position valve into body.

(9) Install the governor valve shaft snap ring. Make sure snap ring is positioned at outer end of groove. (Refer to Figure 39). If positioned at inner end of groove it may limit travel of governor valve. Make sure ring is properly locked to shaft.

(10) Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body.

### Installing the Transmission Extension, Oil Seal and Bearing

(1) Install the new output shaft rear bearing in extension housing with driver, Tool C-3204. Make sure bearing is properly seated and then lubricate with Automatic Transmission Fluid Type "A" Suffix "A".

(2) Install output shaft rear bearing snap ring. Snap rings are available in two sizes. Select one to eliminate all end play at bearing.

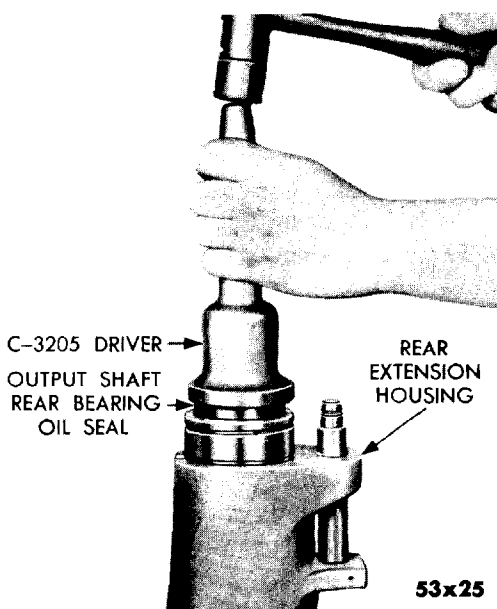


Fig. 40—Installation of Output Shaft Rear Bearing Oil Seal

(3) Install extension oil seal with driver, Tool C-3205, as shown in Figure 40.

(4) Place new transmission extension gasket over guide studs, Tool C-3283, and into position against output shaft support. Do not use sealing material on gasket. Avoid damaging the governor housing when placing the rear extension housing over the output shaft and onto the guide studs.

(5) Position housing by tapping with soft hammer. Remove guide studs and install the seven transmission extension to case bolts and lockwashers. Draw down evenly and tighten from 25 to 30 foot-pounds torque.

### Checking Transmission End Play

Before transmission end play is checked, it is necessary that the hand brake drum be installed and tightened to required torque specifications (175 foot-pounds). This operation is necessary to aid in proper seating on the extension rear bearing.

If end play does not fall within specifications, the transmission will have to be partially disassembled to allow a direct clutch retainer thrust washer (fiber) of proper thickness to be installed. Thrust washers are available in the following three thicknesses: .078-.080 inch; .095-.097 inch, and .112-.114 inch.

(1) Remove the screws and lockwashers from the transmission extension and install guide studs, Tool C-3283.

(2) Remove the output shaft support to case screw and washer and remove the extension housing (with brake assembly), output shaft support and planet pinion carrier housing as one assembly as shown in Figure 41.

(3) Slide the direct clutch piston retainer from torque converter reaction shaft (it is unnecessary to remove it from transmission case) and remove the direct clutch retainer thrust washer.

(4) Using a micrometer, measure the thickness of

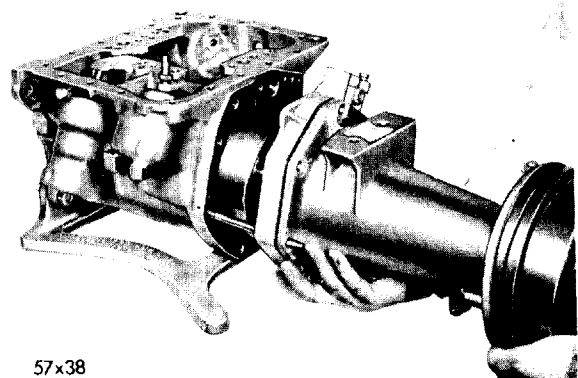


Fig. 41—Removal of Output Shaft Support, Extension, Handbrake Assembly and Pinion Carrier Housing as an assembly

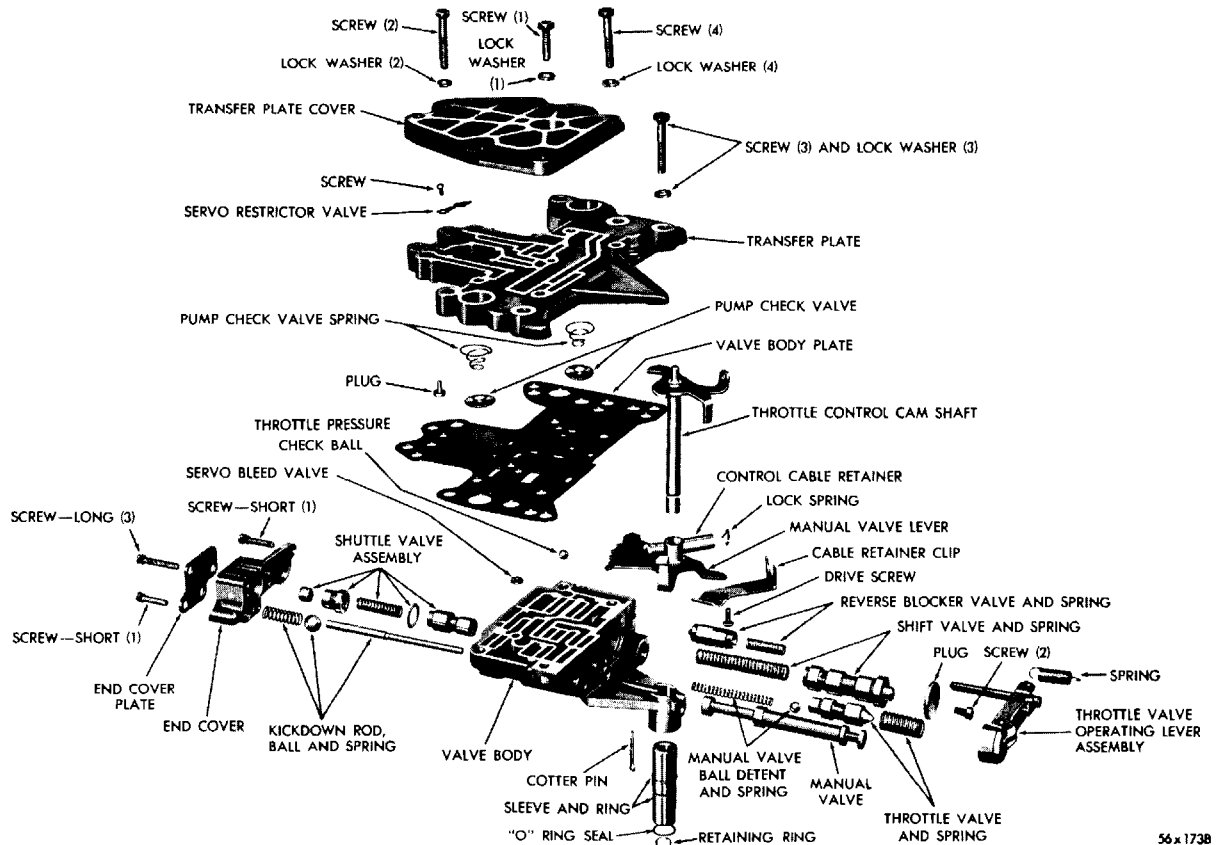


Fig. 42—Valve Body and Transfer Plate Assembly (Exploded View)

the washer and select washer to give correct clearance. Assemble as previously instructed.

### Adjustment of Bands (Bench)

#### Kickdown (Front Band)

(1) Using a  $\frac{3}{4}$  inch open end wrench, loosen the locknut.

(2) Check the freeness of the adjusting screw in the transmission. Refer to "Transmission and Controls — Adjustments," Paragraph 5.

#### Reverse (Rear Band)

(1) Loosen reverse band adjusting screw locknut and tighten adjusting screw from 20 to 25 inch-pounds torque.

(2) Back out adjusting screw 12 turns.

(3) Holding the adjusting screw in this location, tighten the adjusting screw locknut to 30 to 35 foot-pounds torque.

## 9. SERVICING THE VALVE BODY AND TRANSFER PLATE

### Disassembling the Valve Body and Transfer Plate

To disassemble the valve body and transfer plate for cleaning, inspection, and overhaul, refer to Figure 42, and proceed as follows:

(1) Place valve body and transfer plate assembly

in stand, Tool C-3294 (if not previously done so) (Figure 43). **Do not use vise to hold valve body and transfer plate.**

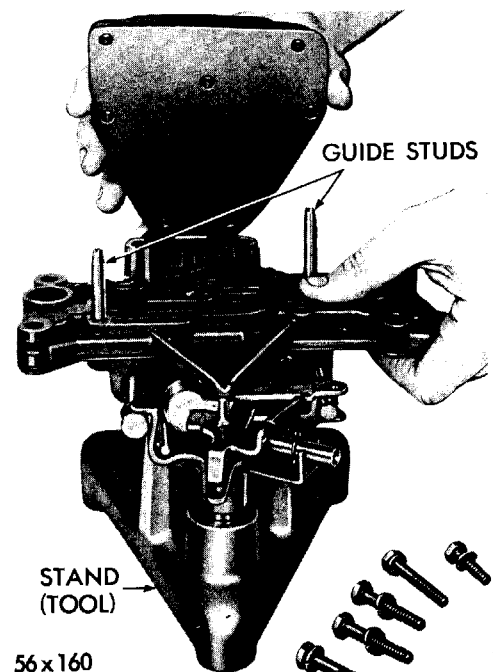
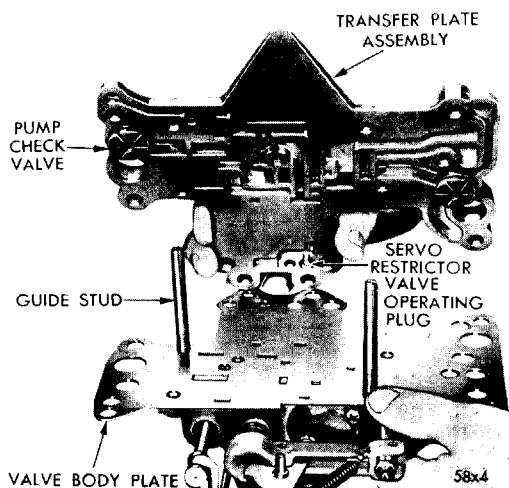


Fig. 43—Valve Body and Transfer Plate Assembly in Stand



**Fig. 44—Removing Transfer Plate Assembly**

(2) Remove two of the long transfer plate cover bolts and lockwashers and install guide studs, Tool C-3295.

(3) Keeping finger pressure against transfer plate, remove the remaining three (2 long and 1 short) transfer plate cover bolts, and remove transfer plate cover as shown in Figure 43.

Do not lose the servo restrictor valve operating plug from transfer plate when removing transfer plate from valve body plate (Figure 44).

(4) Remove valve body plate from valve body. The servo pressure bleed valve may stick to valve body plate when it is removed. Note position of servo pressure bleed valve and pressure check valve ball. Refer to figure 45.

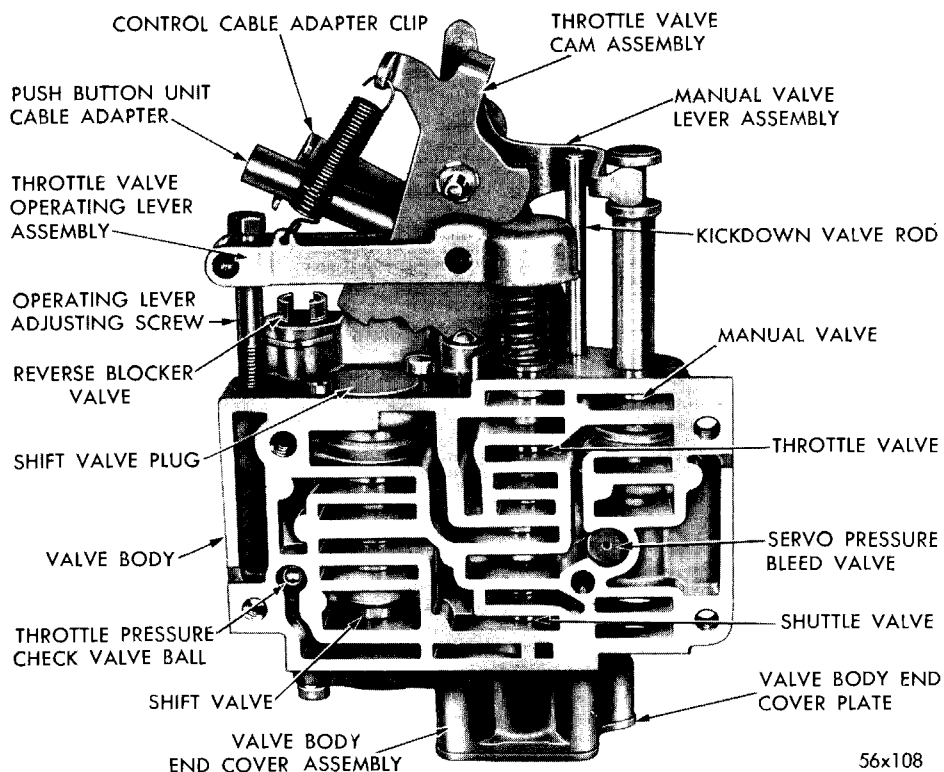
(5) Remove valve body from stand, Tool C-3294, and remove guide studs. Remove servo pressure bleed valve and pressure check valve ball, and place in clean container.

(6) Remove the throttle valve cam return spring from cam and throttle operating lever.

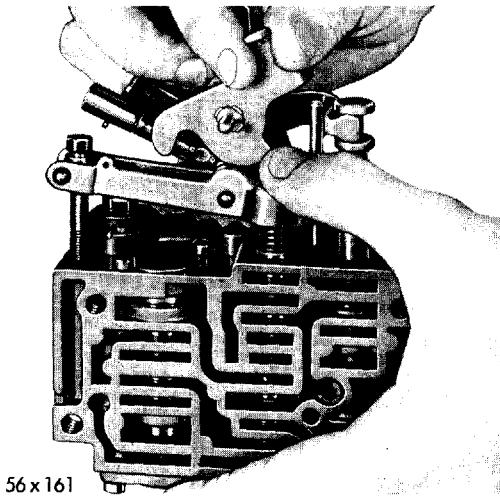
(7) Compressing the throttle valve operating lever assembly against throttle valve spring, as shown in Figure 46, rotate the throttle valve operating assembly outward from the throttle valve cam. Swing throttle valve operating lever out of the way remove the throttle valve spring from throttle valve. Remove the throttle valve from the valve bore.

(8) Check the distance from valve body to end of throttle valve operating adjusting screw. Using wrench, Tool C-3279B, remove the throttle valve adjusting screw lever assembly. Normally, it is not necessary to remove this assembly unless damaged parts are to be replaced.

(9) Holding the manual valve lever detent plate



**Fig. 45—Valve Body Assembly (Valve Body Plate Removed)**



56x161

**Fig. 46—Compressing Throttle Valve Operating Lever**

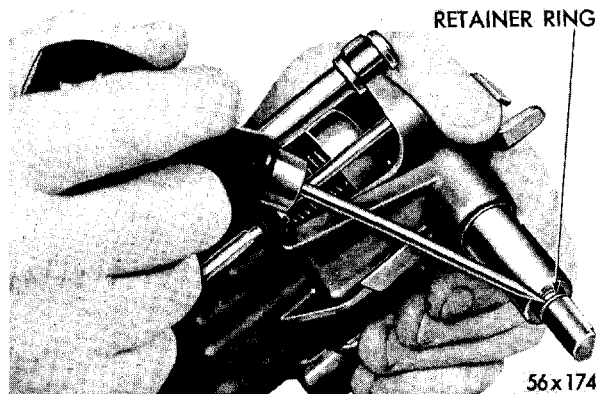
and sleeve securely, remove small retainer ring which locks throttle camshaft in sleeve (Figure 47). While maintaining constant thumb pressure on detent plate, carefully withdraw sleeve from valve body. Remove throttle valve cam assembly and manual valve lever assembly. Detent plate ball is spring loaded. **Do not lose the detent ball.**

(10) Remove detent ball and spring from valve body. Remove the manual valve by slowly rotating it out of its bore.

(11) Remove reverse blocker valve cotter pin, spring and valve. Remove valve by rotating it out of the bore. Do not remove push button unit control cable adapter, lock spring or cable adapter clip, unless inspection reveals it is necessary to do so (Figure 45).

(12) Remove the four (three long and one short) valve body and cover plate bolts and lockwashers and remove valve body end cover plate.

(13) Remove valve body end cover screw and lockwasher (oval fillister). Keep pressure against valve body end cover when removing screws as there are three springs behind cover. **Do not disturb the setting.**



RETAINER RING

56x174

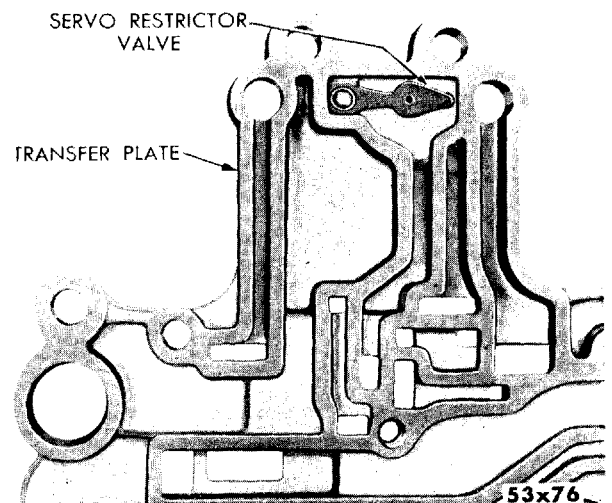
**Fig. 47—Removing Throttle Camshaft Retaining Ring**

### **Cleaning and Inspecting the Valve Body and Transfer Plate**

After each part has been thoroughly cleaned and inspected, place on clean paper until ready for assembly. Make sure all parts are free from obstructions, and inspect all mating surfaces for burrs, nicks and grooves. Small nicks, etc. may be removed with crocus cloth; otherwise, damaged parts must be replaced. Using straightedge, Tool C-3335, check all mating surfaces for distortion. Inspect fores 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 burrs, nicks etc., may be removed with crocus cloth, providing extreme care is taken to avoid rounding off the sharp edge portion of the valve which helps to prevent dirt and foreign matter from getting between valves and body, reducing the possibility of sticking. Check valves and plugs (dry) for free operation in bores. All must fall freely in the bores when the valves, plugs and bores are clean and dry. Inspect detent ball for wear and make sure it slides freely into valve body.

Inspect staking of control cable adapter to detent plate and cable adapter clip to valve body. Inspect the staking of valve lever and throttle valve cam to their respective shafts. Inspect the throttle valve operating lever roller to make sure it rolls freely. Inspect throttle valve operating lever adjusting screw and pin for wear. Make sure adjusting screw rotates freely in the throttle valve operating lever. Inspect kickdown valve rod for wear and scoring, and also inspect for wear at entering point in valve body. Inspect servo restrictor valve (Figure 48) in the transfer plate to make sure valve is seating properly. If valve is distorted, carefully remove the drive screw. Install new valve and new drive screw.



53x76

**Fig. 48—Servo Restrictor Valve**

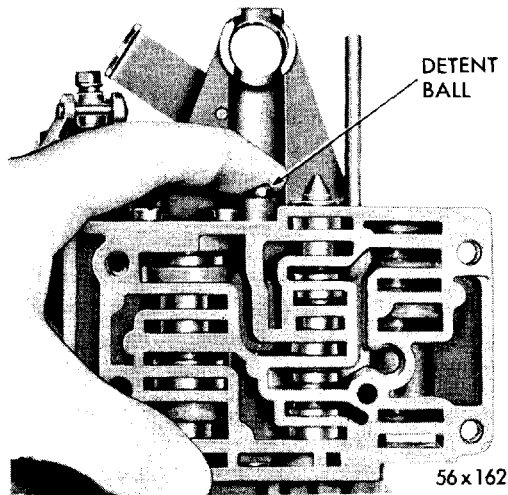


Fig. 49—Holding Manual Valve Lever Detent Ball

Make sure the drive screw is tight. Avoid distorting transfer plate when performing this operation. Inspect valve body plate for burrs and make sure the five small metering holes are open. Visually inspect pump check valve springs in the transfer plate. Make sure radial grooves in check valves are free of obstructions.

#### Assembling the Valve Body and Transfer Plate

**Three steel balls are used in the valve body and each must be installed in its correct position. Each is identified by its size as follows:**

**Kickdown rod ball—large**

**Manual valve lever detent ball—medium**

**Throttle pressure check ball—small.**

(1) Install reverse blocker valve and spring. Use new cotter pin.

(2) Place manual valve in its bore.

(3) Install shift valve. Install shift valve plug and tighten screws securely.

(4) Place manual valve lever detent spring and ball in valve body and hold in position, as shown in Figure 49. While holding the detent ball, position the manual

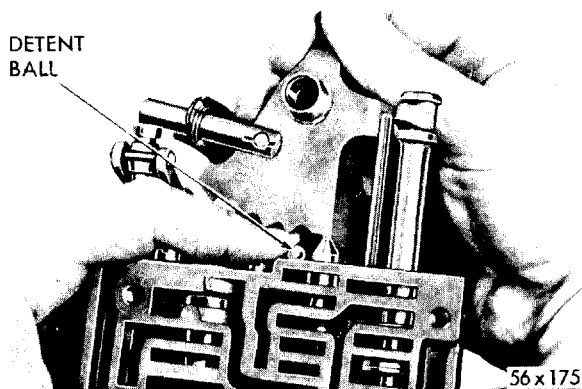


Fig. 50—Aligning Manual Valve Lever Assembly

valve lever assembly so that the lever arm engages the manual valve (manual valve may be positioned to assist in this alignment) and the push button control cable adapter in direct alignment with the control cable adapter clip. (Refer to Figure 50). At the same time, align the shoulder on the manual valve lever with the sleeve bore in the valve body so that the detent ball will engage the detent plate when finger pressure on detent ball is released.

(5) With finger pressure holding manual valve shoulder in bore, insert sleeve (short end) in bore, (up to stop ring).

(6) Position throttle valve cam in sleeve, as shown in Figure 51, and lock in place with retainer. If retainer is not placed in position at this time, the detent plate may move out of position, allowing the detent ball to escape from its bore.

(7) Place valve body in stand, Tool C-3294.

(8) Place kickdown rod into position in valve body.

(9) Install the shift valve spring in valve body.

(10) Install the shuttle valve in valve body. Coat stop ring lightly with transmission fluid and place into recess in valve body.

(11) Place shuttle valve spring in valve body.

(12) Place kickdown valve ball into valve body.

(13) Place valve body end cover plate on end cover. Install the one short screw and lockwasher and tighten snugly.

(14) Place adjustable shuttle valve plug into position in valve body end cover. Plug must fit to full depth of bore.

(15) Install the kickdown valve spring in place in end cover.

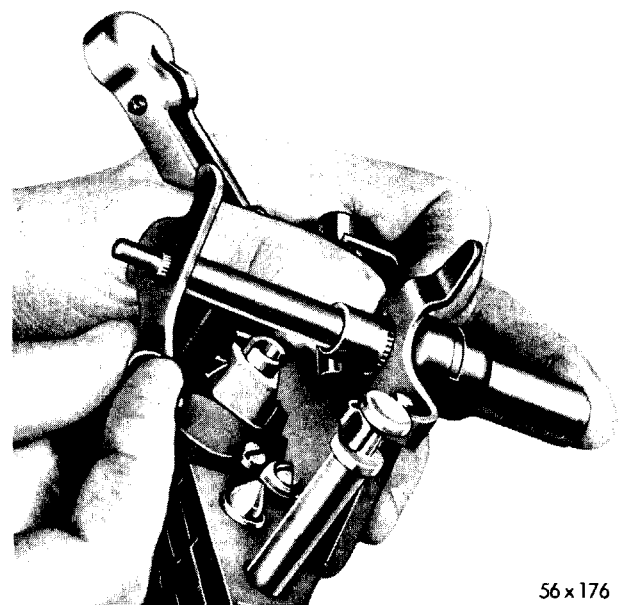
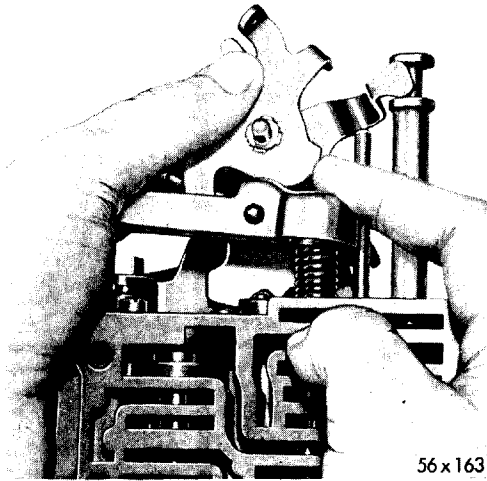


Fig. 51—Placing Throttle Valve Cam Shaft in Sleeve



**Fig. 52—Indexing Throttle Valve Cam Shaft With Throttle Valve Operating Lever**

(16) Install valve body end cover to valve body. Make sure the shift valve, shuttle valve and kickdown valve springs are properly seated in position when cover is being installed.

(17) Install the valve body end cover screw and lockwasher but do not torque.

(18) Install the three (long) valve body end cover plate screws and lockwashers. Draw down evenly and tighten to 24 to 30 inch-pounds torque.

(19) Remove valve body from repair stand. Using wrench, Tool C-3279B, install throttle valve adjusting screw, and throttle valve operating lever assembly. Adjust to approximately 1- $\frac{1}{16}$ " distance between the valve body and end of throttle valve adjusting screw.

(20) Install throttle valve (point outward) in valve body. Place throttle valve spring over throttle valve. Swing throttle valve operating lever over spring. Compressing the throttle operating lever assembly against the throttle valve spring, slide the throttle valve cam assembly into throttle valve operating lever, indexing the cam portion in slot of operating lever, as shown in Figure 52. Replace throttle valve cam assembly return spring and replace valve body in stand.

(21) Install servo bleed valve and throttle pressure check valve ball into position in valve body, and install guide studs, Tool C-3295.

(22) Install the servo restrictor valve operating plug (long end first) into transfer plate (Figure 53.) Make sure the pump check valves and springs are properly positioned in transfer plate. The pump check valve with the metering hole should be positioned, in end of transfer plate, that lies next to the manual valve.

(23) Place the valve body plate flush into position on valve plate by compressing pump check valve springs. Make sure pump check valves enter transfer

plate; otherwise, the valve body plate will be damaged when assembly is drawn down onto valve body.

(24) Keep sufficient pressure on transfer plate and valve body plate to hold them together. Place them over the guide studs and into position on valve body.

(25) Place transfer plate cover into position and install two of the transfer plate cover screws and lockwashers (one each side) finger tight. Make sure pump check valves remain in position in body plate.

(26) Remove guide studs and install the remaining transfer plate cover bolts and lockwashers. Tighten the bolts from 45 to 50 inch-pounds torque. Avoid over-tightening as this will distort valve body, resulting in sticky valves. Operate pump check valves to make sure they can be unseated before final tightening.

### **Installing the Valve Body and Transfer Plate**

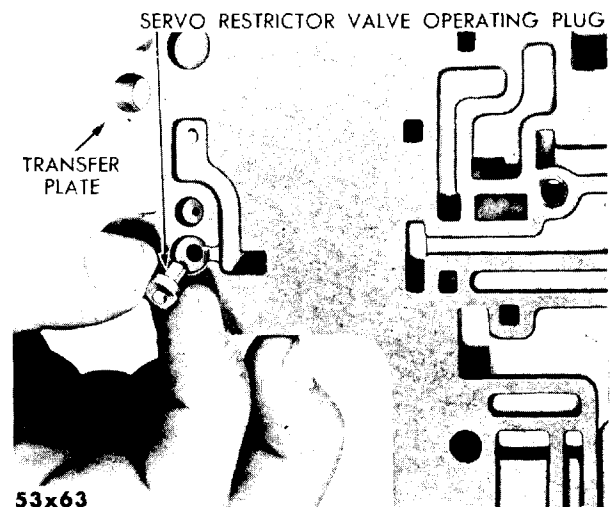
(1) Place "O" ring seal on throttle camshaft sleeve, then place valve body and transfer plate into position on transmission case. Install the five transfer plate bolts and lockwashers. Two bolts are 1  $\frac{5}{8}$  inches long and go through the transfer plate cover on valve body. The other three are 1  $\frac{1}{8}$  inches long. Draw bolts down evenly and tighten to 12 to 17 foot-pounds torque.

(2) Make sure the two oil strainer tube seals are in position on oil strainer, and place oil strainer assembly into position on valve body. Install the two oil strainer support bolts (1  $\frac{1}{4}$  inches long) and lockwashers. Tighten to 12 to 17 foot-pounds torque.

(3) Replace oil pan and gasket (new). Tighten oil pan bolts to 12 to 17 foot-pounds torque.

(4) Replace felt and felt retainer on throttle camshaft, then install throttle control lever assembly. Tighten lock screw securely.

(5) Place engine rear support adapter into position on extension housing and install bolts and lockwashers. Tighten to 50 foot-pounds torque.



**Fig. 53—Installing Servo Restrictor Plug**

(6) Remove transmission assembly from stand, Tool C-3280.

**10. INSTALLING THE TRANSMISSION IN VEHICLE**

**Before installing transmission in vehicle, check torque converter hub runout and housing alignment as outlined in the Torque Converter Section that follows the Transmission Section.**

(1) Install guide studs, Tool C-3276, in the two upper transmission case to converter housing bolt holes.

(2) Lubricate front oil pump drive sleeve seal ring and bearing surface with transmission fluid.

(3) Install drive sleeve in front oil pump housing (if not previously installed) **making sure driving lugs are properly engaged in front oil pump pinion gear.** Note position of driving lugs on front oil pump drive sleeve, and position accordingly, to aid in proper engagement with torque converter hub, when transmission is installed.

(4) Mount transmission on suitable jack. Raise and align transmission with pilot bore in torque converter housing. Slide transmission over guide studs and into position against torque converter housing. To avoid damage to front oil pump, the transmission must be properly aligned. **Do not attempt to use transmission to converter housing bolts to bring transmission and converter housing together.** If oil pump drive sleeve and input shaft have been proper-

ly aligned, transmission should slide into position relatively easy. **Do not force** it into position.

(5) Install the two lower transmission case to converter housing bolts and lockwashers, but do not tighten. Remove guide studs and install the two upper transmission case to converter housing bolts and lockwashers. Draw all bolts down evenly and tighten 45 to 50 foot-pounds torque.

(6) Place crossmember into position and install crossmember to torsion bar spring bracket bolts. Tighten bolts securely.

(7) Lower engine, and align mounting holes in adapter with holes in crossmember. Install the two bolts and lockwashers that hold engine rear support to crossmember. Tighten bolts from 30 to 55 foot-pounds torque. Remove engine holding fixture, Tool C-3487.

(8) Connect throttle linkage to throttle lever, insert gearshift control cable into transmission, and adjust as outlined in "Transmission and Controls-Adjustments" Paragraph 4. Install neutral starting switch. Connect speedometer cable housing to drive pinion.

Engage ball end of brake cable with brake operating lever, secure cable to support and tighten support screw securely (refer to Brake Section of this manual for method of adjusting handbrake). Connect propeller shaft and tighten nuts from 33 to 37 foot-pounds torque.

Connect oil pan filler tube and refill transmission to proper level (refer to Lubrication Section of this manual). Connect battery and make all necessary adjustments and tests, as outlined in "Transmission and Controls-Adjustments" Paragraph 5.

**TORQUE CONVERTER AND HOUSING**

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## SERVICE INFORMATION

### PROCEDURES

#### 1. REMOVAL AND INSTALLATION OF TORQUE CONVERTER AND HOUSING

##### Removal

(1) Remove transmission as outlined in appropriate transmission section.

(2) Remove converter housing dust shield and starting motor. Remove the torque converter housing-to-engine block (or adapter plate) bolts and washers. As the housing is doweled to the engine block, (or adapter plate) care must be exercised during removal. **Do not hammer or pry between the mating surfaces to loosen, as the metal may be distorted which can result in misalignment.**

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

(4) 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 2.

##### Installation

(1) 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.

(2) Check crankshaft flange runout (maximum is .002 inch total indicator reading) by installing dial indicator set, Tool C-3339 at one of the engine block to housing 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:

(3) Position torque converter unit on crankshaft flange. Using wrench, Tool C-589 tighten stud nuts to specifications.

Before installing torque converter housing, it is recommended that the torque converter hub runout be checked (and corrected if necessary) as outlined in Paragraph 3. If torque converter hub runout is within specifications, continue to install housing in the following manner:

(4) Position housing over dowels and against mating face of engine block (or adapter plate). Tighten

mounting bolts just snug enough to retain housing in position.

(5) Check (and correct if necessary) torque converter housing bore and face runout as outlined in Paragraph 4. If bore and face runout are within specifications, tighten housing bolts to specifications. Install metal dust shield and starting motor. Install transmission as outlined in appropriate transmission section.

#### 2. REPLACING STARTER RING GEAR

##### Removing Ring Gear

(1) Remove torque converter and housing as outlined in Paragraph 1.

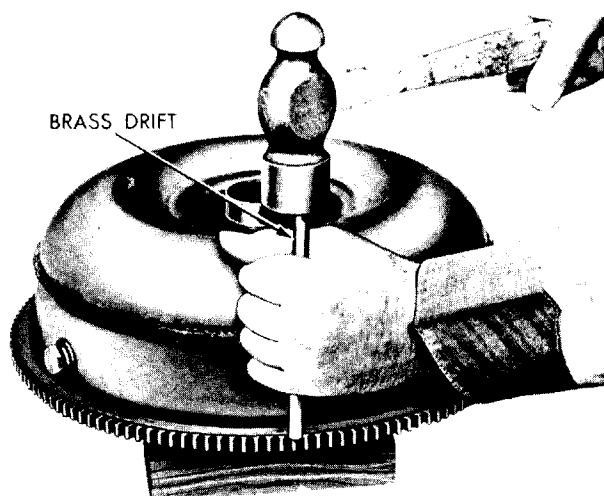
(2) Place converter on bench and carefully remove staking lugs. This can be done by filing or by carefully knocking the head off the lug with a hammer and chisel.

(3) 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 as shown in Figure 1. **Note: A small amount of heat, directed on gear, will aid in its removal—if ring gear is to be discarded.**

##### 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.



53x91

1—Removing Starter Ring Gear



**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.

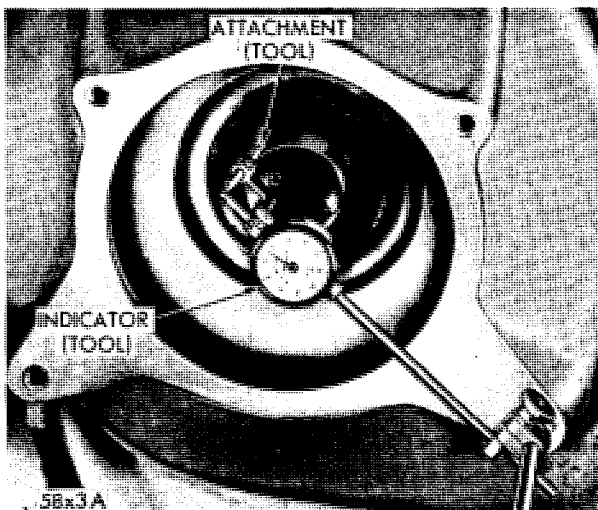
**Flame**—Place ring gear squarely on a flat surface. Using a medium-size tip, direct a slow flame around the inner rim of the gear, being careful not to direct the flame onto the teeth of the ring gear. Place a few drops of water on the face of the gear at intervals during the heating process. When 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 5/32 inch diameter, No. 47 or a 5/32 inch diameter No. W2B welding rods (or their equivalent).



2—Checking Torque Converter Hub Runout

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 1.

### 3. TORQUE CONVERTER HUB RUNOUT

#### Checking Hub Runout

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

(1) Install attachment, Tool C-3613 to dial indicator set, Tool C-3339, as shown in Figure 2.

(2) Install dial indicator support rod in one of the transmission to torque converter housing mounting bolt holes, as shown in Figure 2.

(3) 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.

#### Correcting Hub Runout

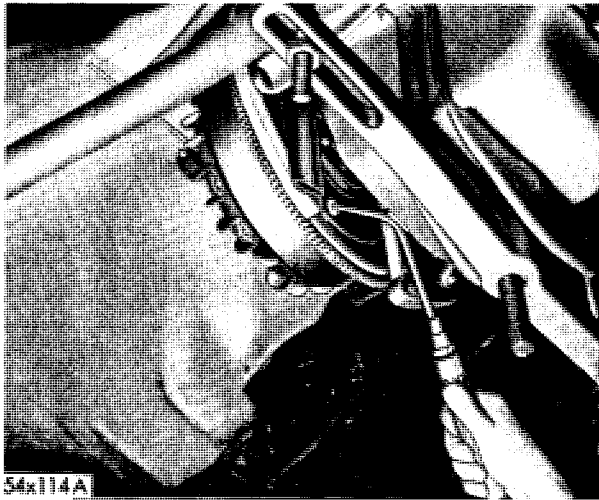
If hub runout exceeds .004 inch total indicator reading, correct by using heat. **Before using heat, make definitely sure that torque converter has been drained.**

(1) It is not necessary to remove the housing to correct runout with heat application as shown in Figure 3.

(2) 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.

(3) 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 at this location as shown in Figure 3.

The size of the spot to be heated is governed by the magnitude of hub runout and is usually about 1/2 inch diameter for .008 inch total indicator reading. Using an acetylene torch containing a No. 3 tip, and set to minimum 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.**



3—Heating the Torque Converter

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 spot. This prevents the heat from spreading.

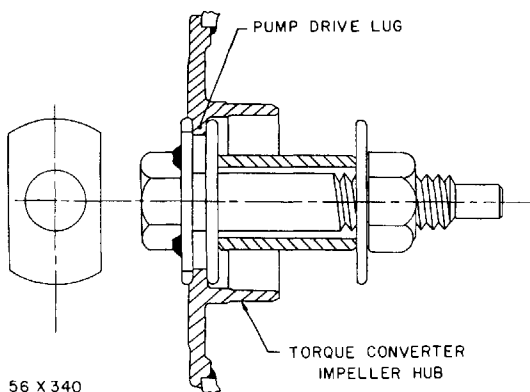
The hub runout should not be rechecked until the converter has returned to a uniform room temperature.

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.

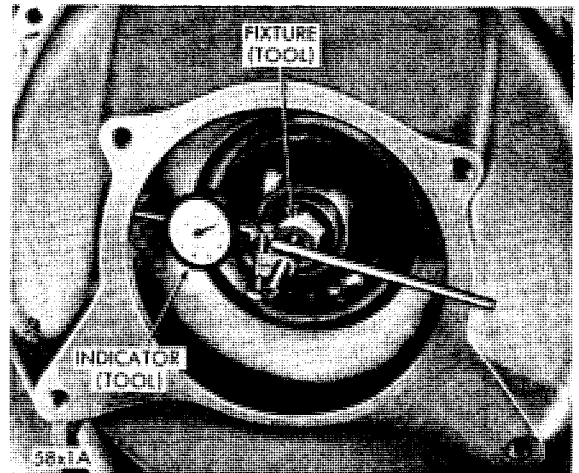
#### 4. CHECKING AND CORRECTING HOUSING FACE AND BORE RUNOUT

##### Bore Runout

**Torque converter housing bore and face alignment, as well as converter hub runout, should be checked anytime that a PowerFlite**



4—Tool C-3461 Installed



5—Checking Housing Bore Runout

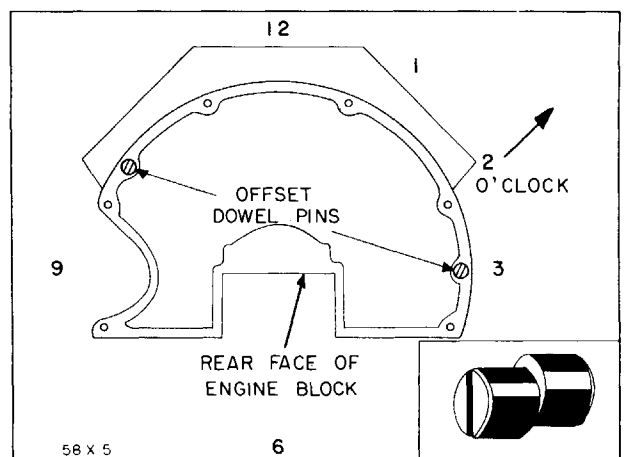
**or TorqueFlite transmission is removed to correct leakage at the front pump oil seal or front pump failure—also whenever an engine replacement is made.**

(1) Mount Tool C-3461, shown in Figure 4, 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 5.

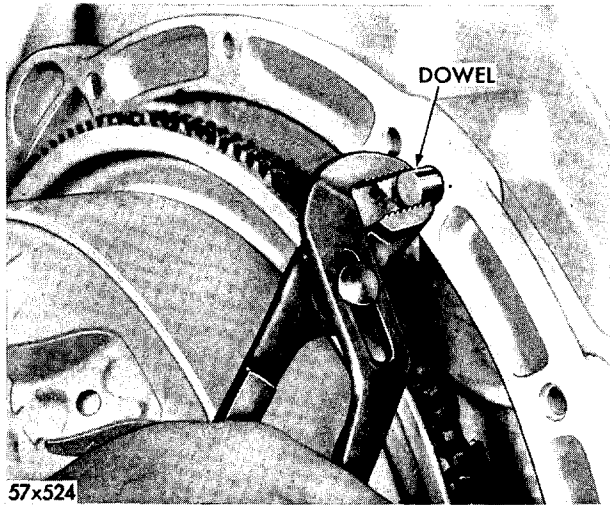
(2) Locate the indicator so that it is bearing on the transmission pilot bore of the converter housing and rotate the converter.

(3) 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 engine block. Refer to Figure 6. 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



6—Eccentric Dowel Orientation Diagram



7—Removing Dowel Pins

**must be used in pairs (same part number).**

To install the dowel pins (pair), remove the torque converter housing as outlined in Paragraph 1. Remove dowel pins from engine block (or adapter plate), as shown in Figure 7.

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

**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

of .005 (one-half total indicator reading).

To correct an off-center condition, three off-set dowels are available.

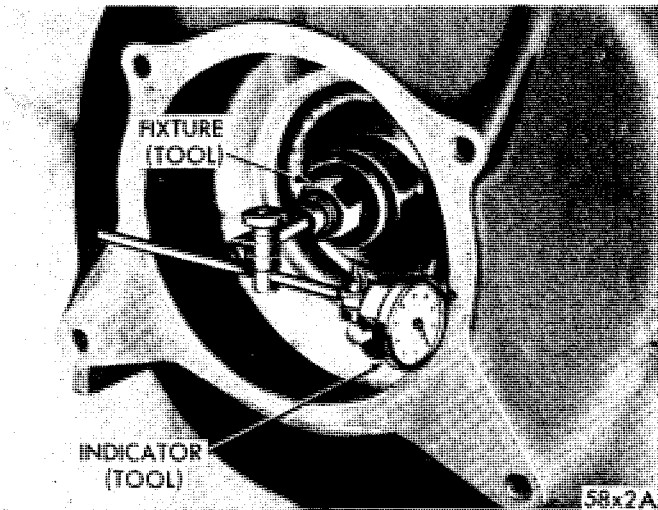
When selecting dowels to be used for a particular job, take the dowel closest to one-half the total indicator reading. Refer to chart.

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**

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. **Both dowels should be inserted into engine block (or adapter plate), up to off-set shoulder.**

**SHIM THICKNESS—LOCATION TABLE**

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



8—Checking Face Runout

Install and tighten converter housing bolts to specifications. Remount dial indicator and recheck bore runout. Small corrections can be made by loosening hous-

ing mounting bolts and turning dowels with a screw driver to shift the housing and bring bore within limits.

#### Face Runout

(1) Relocate dial indicator set, Tool C-3339, as shown in Figure 8.

(2) Rotate converter.

(3) If the total indicator reading is greater than .008" 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).

(4) Place the shim or shims on one or more of the transmission to housing bolts in position between transmission and housing.

**CONSULT "SHIM THICKNESS—LOCATION TABLE" FOR SELECTION OF CORRECT SHIM OR SHIMS TO BE USED IN CORRECTION PROCEDURES.**

(5) Tighten housing bolts to specifications.

(6) Reinstall transmission as outlined in appropriate transmission section.