DYNAFLOW & POWERGLIDE TRANSMISSIONS

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Dynaflow and Powerglide Transmissions

DIAGNOSIS

REPAIR

ADJUSTMENT

Prepared by the

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INSTRUCTIONAL STAFF

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DYNAFLOW TRANSMISSION

Noises | Slippage | Not Move | Faulty Shifting | Conditions

DYNAFLOW INDEX

HOW TO USE THIS MANUAL

1. COMPLAINTS AND CORRECTIONS — Indicated by the red index tabs at the bottom of the Manual. This section describes the general nature of the complaint and the recommended procedure for correcting the condition.

2. TESTING — Indicated by the green index tab at the right of the Manual. This section describes the approved methods for road testing, checking oil level, testing oil pressures, performing a stall test, etc. and for testing individual units of the transmission (References are made to this section in the Complaint Section).

3. ADJUSTMENTS — Indicated by green index tab at the right of the Manual. This section describes the approved procedures for adjusting the Dynaflow and Powerglide transmissions (References are made to this section in the Complaint Section).

4. LATE MODEL CHANGES — Indicated by green index tab at the right of the Manual. This section has been included to keep the repairman's knowledge current with recent developments on Dynaflow and Powerglide transmissions. The recommended procedures for overhauling the more complex components are also included in this section.

5. SPECIFICATIONS—Indicated by a green index tab at the right of the Manual. This section provides a ready reference to the specifications for all Dynaflow and Powerglide transmissions.

In order to gain maximum benefit from the Manual, the following procedures should be performed in the sequence given:

1. ROAD TEST VEHICLE: Don't accept the customer's description of the complaint. Many conditions will show more than one sympton. Road test the vehicle as described in the Manual and note all possible symptoms relative to the complaint.

2. CHECK OIL LEVEL: Oil level must be checked in every instance as described in the Manual. Proper diagnosis cannot be made unless the oil level is within the recommended limits.

3. SET ENGINE IDLE SPEED in accordance with the manufacturer's recommendations. Many seemingly unrelated conditions are caused by incorrect engine idle speed.

4. After determining the nature of the complaint, select the tab title in the Complaint Section of the Manual which describes the specific trouble. Turn to this Section.

5. Compare the symptoms noted during road test with the symptoms described in the Complaint Section. Select the one which corresponds to the sympton you have noted. The recommended correction for the complaint follows the description of the trouble. If further tests are required to pin-point the trouble, reference will be made to the test section. Perform the recommended tests, then make the repairs as indicated.

6. After making the recommended correction, road test the vehicle. If the trouble still exists, proceed to the next correction.

If the above procedure is followed in sequence, the cause of the trouble will be found and corrected.

Always follow the given sequence.

Transmission Noises

To determine the cause of noises in the transmission, it is necessary to know which parts are in operation at the time and under what conditions the noise occurs. The vehicle should be road-tested and the presence or absence of noises noted so that through the process of elimination the trouble will be pin-pointed.

Slight Whine

A slight whine in Neutral or Park may be considered normal since all planetary gears are free to rotate without the steadying effect of a load. A slight hum or whine in Low or Reverse is also permissable.

Low Growling Noise

A low growl, occuring only on starting and after the vehicle has been parked for a lengthy period during extremely cold weather, may be considered normal. This condition is caused by the weight of the oil. As the transmission warms up and the oil thins out the noise will disappear.

Buzzing Noise

A buzzing noise can be caused by low oil level or the front pump delivery check valve being held off its seat by the gasket between the valve and servo bodies. A similar noise in Park or Neutral may be caused by excessive clearance of the pressure regulator valve in the valve body or an oversized orifice in the pressure regulator valve land. This condition requires replacement of the pressure regulator valve.

Clicking Noise

A clicking noise may be caused by a foreign particle or object passing through the converter. This will occur in all ranges.

A clicking noise which occurs only when the vehicle is in motion may be caused by the parking pawl touching the parking ratchet wheel due to the manual linkage being out of adjustment.

Hum or Whine

A hum or whine which occurs whenever the engine is running, in all ranges, both when the vehicle is moving or standing still is normally caused by a faulty front pump. Front pump noise will increase in Low and diminish at speeds over 45 MPH in Direct Drive. This noise will increase or decrease in accordance with engine RPM, since the condition is caused by excessive clearances of the front pump. A pressure test will normally indicate low pressure.

A hum or whine in all ranges but Direct Drive is caused by the planetary gear train. In Direct Drive the planetary gear train is locked up. In all other ranges it is either idling or transmitting power.

Screeching or Squealing Noise

A screeching or squealing noise which occurs after overhauling the transmission or installing the front pump is caused by the front pump drive gear being installed backwards. This must be corrected immediately or serious damage will result.

Whistling Noise

A whistling noise occuring during low speed acceleration in Drive, Low and Reverse, along with unsatisfactory transmission performance, is caused by the torque converter being incompletely filled. To correct this condition, remove the valve and servo body and check for restrictions in the torque converter passages. If these passages are clear, check the passage in the reaction flange.

A whistle which is apparent under low speed acceleration in Drive, Low and Reverse, with satisfactory transmission performance, can be caused by thin, weak or cracked turbine vanes or vanes which are bent over at the exit edges causing the vanes to vibrate under load. To correct this condition, replace the converter turbine.

Slippage

EXCESSIVE SLIP IN ALL RANGES

CAUSE

1. If condition exists after operation in reverse, check the front pump oil pressure after having allowed the car to stand for several hours. A zero pressure reading indicates that the front pump loses its prime due to excessive clearances.
2. If the car will not move after extended operation in Reverse, air leakage into the pump suction line is indicated. This may be caused by leakage at the rear pump gasket or excessive clearances at the front pump.
3. Low oil level.
4. Manual control linkage out of adjustment.
5. Low oil pressure.

CORRECTION

1. *Replace the front pump.*
2. *Replace rear pump gasket. Replace front pump.*
3. *Check oil level. Add oil to bring level up to "FULL" mark on dipstick.*
4. *Adjust the manual control linkage as outlined on pages 26-27.*
5. *Check front pump oil pressure. If pressure is low, remove and inspect the pressure regulator and all servo gaskets. If trouble is not found, remove and inspect the front pump, front pump cover gasket and the reaction flange gasket.*

EXCESSIVE SLIP IN DIRECT DRIVE ONLY

CAUSE

1. Manual control linkage out of adjustment.
2. High accumulator gasket leak.
3. Worn clutch discs, worn or broken sealing rings, leaking seals or stuck ball in clutch piston.

CORRECTION

1. *Adjust the manual control linkage as outlined on pages 26-27.*
2. *Check oil pressure. If the front pump pressure is considerably higher than high accumulator pressure, remove and inspect the high accumulator gasket.*
3. *Remove the direct drive clutch assembly and carefully inspect oil seal rings, clutch discs, piston seal and ball check.*

EXCESSIVE SLIP IN LOW ONLY

CAUSE	CORRECTION
1. Manual control linkage out of adjustment.	*1. Adjust manual control linkage as outlined on pages 26-27.*
2. Low band out of adjustment.	*2. Adjust low band as outlined on page 31.*
3. Low oil pressure at low accumulator.	*3. Check low accumulator gasket. If the gasket is satisfactory, remove the valve and servo body. Check valve and servo body gaskets. Check low servo piston seal.*
4. Low band worn or badly scored.	*4. Inspect the low band. Replace if necessary. Readjust band as outlined on page 31.*

EXCESSIVE SLIP IN REVERSE ONLY

CAUSE	CORRECTION
1. Manual control linkage out of adjustment.	*1. Adjust manual control linkage as outlined on pages 26-27.*
2. Reverse band out of adjustment.	*2. Adjust reverse band as outlined on page 31.*
3. Broken reverse anchor. Strut not in place.	*3. Inspect reverse anchor. Check to see that the reverse strut is positioned correctly.*
4. Low front oil pressure due to leakage at the valve and servo body or at the reverse servo piston seal.	*4. Check oil pressure. If pressure is low in Reverse position, remove the valve and servo body and inspect gaskets and the seal on the reverse piston.*
5. Worn or scored reverse band and ring gear.	*5. Check the condition of the reverse band and ring gear. Replace if necessary. Readjust reverse band.*

Car Will Not Move

CAR WILL NOT MOVE IN REVERSE ONLY

CAUSE

1. Reverse band improperly adjusted.
2. Reverse servo inoperative.
3. Reverse band operating strut has dropped out of position.

CORRECTION

1. *Adjust reverse band as outlined on page 31.*
2. *Remove servo body and check the reverse servo.*
3. *Replace reverse band operating strut.*

CAR WILL NOT MOVE IN ANY RANGE REAR WHEELS FREE TO TURN

CAUSE

1. Faulty front pump. If the car will not move after standing overnight, but will move after the engine has run for several minutes, check the front pump oil pressure after having allowed the car to stand for several hours. A zero pressure reading indicates that the front pump loses its prime due to excessive clearances.
2. If the car will not move after extended operation in Reverse, air leakage into the pump suction line is indicated. This may be caused by leakage at the rear pump gasket or excessive clearances at the front pump.

CORRECTION

1. *Replace the front pump.*
2. *Replace rear pump gasket. Replace front pump.*

CAR WILL NOT MOVE IN ANY RANGE REAR WHEELS LOCKED

CAUSE

1. Parking pawl engaged to parking ratchet wheel. May be caused by broken or faulty linkage in the rear bearing retainer housing.
2. Parking brake not releasing.
3. Broken part in rear axle or transmission.

CORRECTION

1. *Check linkage. Repair or replace linkage as required.*
2. *Check parking brake linkage cables, etc. Check rear wheel brake shoes.*
3. *Check for broken part which will prevent either the transmission or the differential from rotating.*

CAR WILL NOT MOVE — DIRECT DRIVE ONLY

CAUSE

1. Caused by faulty direct drive clutch or internal oil leakage.

CORRECTION

1. Check the following conditions:

a. Check front pump and high accumulator oil pressures.

b. If front pump and high accumulator pressures are normal, remove and disassemble the transmission. Inspect the direct drive clutch assembly.

c. If an oil pressure check shows that the front pump pressure is considerably higher than high accumulator pressure, check the following items in the sequence shown:

(1) High accumulator and gasket.

(2) Reaction flange gasket.

(3) Clutch piston outer seal and check ball.

(4) Oil seal rings on hub of the reaction flange.

(5) Oil seal ring on low drum hub.

Faulty Shifting

EXCESSIVE CLATTER OR "CLUNK" WHEN SHIFTING INTO LOW OR REVERSE

NOTE: *A slight chatter which is noticeable in Reverse, and disappears as soon as the vehicle is in motion, may be considered normal. A light "clunk" noticeable as the selective lever is moved to Low or Reverse may also be considered normal.*

CAUSE

1. Caused by loose transmission or engine mounts.
2. Caused by Low or Reverse band improperly adjusted or bands out of adjustment.
3. Caused by warped, sticking or improperly assembled direct drive clutch discs.
4. Caused by excessive wear of the reverse ring gear bushing or by foreign particles in the planet needle bearings.

CORRECTION

1. *Check engine mounts. Check for broken transmission rubber thrust pad at transmission mounting.*
2. *Adjust Low and Reverse bands as outlined on page 31.*
3. *If items (1) and (2) do not remedy condition, remove the direct drive clutch and check for warped clutch discs, sticking clutch discs or clutch discs assembled so that the "dish" of the steel discs are not all in the same direction.*
4. *Remove the planetary gear assembly and check the reverse ring gear bushing for wear and scores. Rotate each pinion gear and note if there is any tendency to bind. Replace parts as required.*

HARD SHIFTING OUT OF PARK POSITION

CAUSE

1. Caused by binding of the transmission shift rod in the shift idler lever.

CORRECTION

1. *Check for burr on shift rod where it enters the idler lever. Remove burr with a file. Check the idler lever for distortion. Replace if necessary.*

LOW TO DIRECT DRIVE SHIFT ABNORMALLY ROUGH OR SLIPPAGE OCCURS

CAUSE

1. Caused by high accumulator gasket leaking or high accumulator piston sticking down.
2. Caused by leaking valve and servo body gaskets.
3. Low band out of adjustment.
4. Binding or worn clutch plates.

CORRECTION

1. *Check oil pressure at high accumulator. If pressure is low, remove the high accumulator and check the gasket and position of the accumulator piston. The top land of the piston must be fully visible through the top port in the accumulator body.*
2. *Remove the valve and servo body and check condition of gaskets.*
3. *Adjust low band as outlined on page 31.*
4. *Remove the direct drive clutch. Inspect for wear and free movement.*

Miscellaneous Conditions

ENGINE STALLS WHEN COMING TO A STOP

CAUSE	CORRECTION
1. Engine not properly tuned.	*1. Tune engine.*
2. Throttle dash pot out of adjustment.	*2. Adjust throttle dash pot.*

CAR CREEPS FORWARD IN NEUTRAL

CAUSE	CORRECTION
1. Manual control linkage out of adjustment.	*1. Adjust manual control linkage as outlined on pages 26-27.*
2. Low servo piston stuck in the extended position.	*2. Remove the valve and servo body and check the low servo piston.*
3. Clutch discs not assembled correctly, warped or sticking.	*3. Remove direct drive clutch and inspect the clutch discs. The "dish" must be in the same direction on all steel plates.*
4. If creeping occurs only at high engine RPM, the condition may be caused by sticking check balls at either the clutch piston or the reaction shaft flange.	*4. Check the direct drive clutch piston ball check and the reaction shaft ball check for sticking. Free up or replace parts as required.*

CAR CREEPS FORWARD IN REVERSE OR BACKWARD IN LOW

CAUSE	CORRECTION
1. Manual linkage out of adjustment.	*1. Adjust manual linkage as outlined on pages 26-27.*

TRANSMISSION OIL FOAMS OUT OF THE BREATHER

CAUSE

1. Transmission overfilled. Check color of transmission oil. A blackened condition indicates leakage of differential lubricant into transmission due to defective propeller shaft seals. Check the lubricant level in rear axle housing.
2. Check color of transmission oil. A caramel-colored condition indicates leakage of water into the oil usually caused by a leaking oil cooler. Check the radiator for an accumulation of oil.
3. Rear oil pump is drawing air into the hydraulic system due to a defective gasket.
4. Excessive clearance between the output shaft and the rear bearing retainer bushing.

CORRECTION

1. *Replace propeller shaft seals. Drain and refill the transmission and rear axle housing.*
2. *Replace the oil cooler. Drain and refill the transmission. Drain and refill the radiator.*
3. *Replace rear oil pump gasket.*
4. *Replace the rear bearing retainer bushing.*

TESTING

Road Test

Before making any tests, warm up the engine and transmission thoroughly. Then proceed to make the following tests:

1. Drive the car in Direct Drive, Low and Reverse. Note any faulty condition.
2. Check the transmission when shifting from Low to Direct Drive under load.
3. Check transmission operation in Direct Drive after extended operation in Reverse.
4. Check for slippage of the transmission when flooring the accelerator pedal at low speed.
5. Stop the vehicle on a level road. Place the selective lever in Neutral. Accelerate the engine and note any tendency to creep.
6. Allow the engine to idle. Move the selective lever to each driving position and note any abnormal creeping condition.
7. Move the selective lever to Direct Drive. Apply the brakes. Quickly step down on the accelerator pedal to allow engine speed to reach approximately 1400 RPM. Immediately release the gas pedal and note whether the engine returns to the idle speed too slowly or has a tendency to roll or stall. If the engine drops back to idle too slowly, rolls or stalls, adjustment of the throttle linkage and the dash pot is indicated. Rough engine idle after slow deceleration indicates the need for an engine tune up, carburetor adjustment or carburetor overhaul.

While road testing the car, be particularly alert for any unusual noises. If a noise is present, carefully note the driving range, speed and condition under which the noise is audible. Other unusual or abnormal conditions, such as slippage, rough shift from Low to Direct Drive etc., should be noted in the same manner.

Checking Transmission Oil Level

The engine must be at normal operating temperature. Move the selective lever to the "Park" position. Allow the engine to idle. Remove the oil level gauge rod from underneath the right side of the hood on 1951-1957 models. Earlier model Dynaflow transmission oil level is checked by removing the floor mat and floorboard access cover. Wipe the gauge rod dry and reinstall. Remove the gauge rod and note oil level. If the oil level is low, add enough oil to bring the level up to the "FULL" mark. The distance between the "ADD OIL" and the "FULL" mark is one inch and represents approximately one pint of oil.

CAUTION: *Do not overfill the transmission.*

Testing Hydraulic Oil Pressures

Before any oil pressure tests are made the transmission must be at operating temperature. Raise the wheels of the vehicle off the ground so that the rear wheels are free to turn. A free wheel lift is suggested although it is possible to do the job by supporting the rear wheels on car stands.

Check the oil level. Add or drain oil as required.

Rear oil pump pressure is tested by removing the ⅛" pipe plug from the lower flange on the front end of the rear bearing retainer and installing an oil pressure gauge (Fig. 1).

High or Low accumulator pressure is tested by first removing ⅛" pipe plugs from the front side of the accumulator bodies. Connect a pressure gauge (Fig.1).

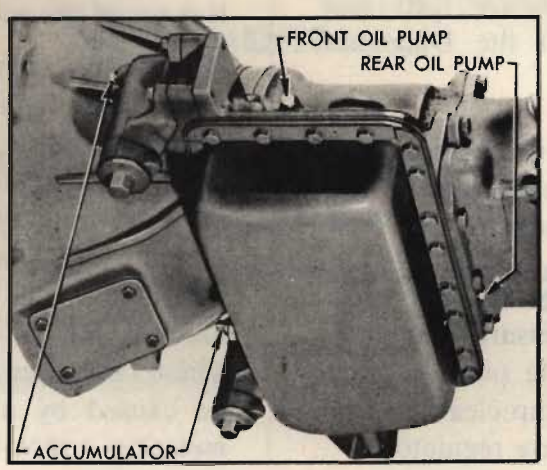

Fig. 1. Gauge connections for oil pressure tests

Front oil pump pressure is tested by first removing the ⅛" pipe plug on the left side of the transmission case. Then install an oil pressure gauge (Fig. 1).

Set engine speed at 500 RPM. Test the front and rear pumps and low accumulator in Low Range. Compare pressure gauge readings with the chart shown in

ENGINE R.P.M.	PRESSURES SHOULD CHECK				PRESSURES ACTUALLY CHECK			
		FRONT PUMP	REAR PUMP	ACCUMULATOR	FRONT PUMP	REAR PUMP	ACCUMULATOR	
500	LOW	100	75	90				ACCUMULATOR PRESSURE IN DRIVE RANGE MUST NOT BE MORE THAN 10 LBS. UNDER FRONT PUMP PRESSURE
	DRIVE	90	90	80				
	REVERSE	100						
1000	LOW	160	125	150				ACCUMULATOR PRESSURE IN LOW RANGE MUST NOT BE MORE THAN 10 LBS. UNDER FRONT PUMP PRESSURE
	DRIVE	90	90	85				
1800	LOW	180	175	170				
	DRIVE	90	90	85				

FRONT PUMP SHOULD CUT OUT UNDER 2500 R.P.M. ACTUALLY CUTS OUT_____R.P.M.
(FRONT PUMP PRESSURE DROPS TO APPROXIMATELY 20 LBS. WHEN REAR PUMP TAKES OVER)

Fig. 2. Pump and accumulator pressures—wheels free to turn

Fig. 2. Move the selective lever to Direct Drive. Check front and rear pump pressures and high accumulator pressure. Compare pressure readings with the chart (Fig. 2). Move the selective lever to Reverse. Check front pump pressure. Compare pressure readings with Diagnosis Chart (Fig. 2).

Set engine speed at 1000 RPM. Repeat the above tests and compare readings with the diagnosis chart (Fig. 2).

Raise engine speed to 1800 RPM. Once again perform the pressure tests and compare readings with the Diagnosis Chart (Fig. 2).

Accumulator pressures in Drive or Low Range should not be more than 10 lbs. below front pump pressure.

A low or erratic gauge reading when testing front pump pressure may indicate an air leak into the pump suction line, excessive front pump clearances or a sticky or faulty pressure regulator.

Low rear oil pump pressure indicates a leak in the valve and servo body passage which connects the rear oil pump with the pressure regulator.

If the oil pressure of one pump is satisfactory while the pressure of the other pump is low, air leaks in the suction line and faulty pressure regulator operation may be eliminated as the cause since both pumps use a common suction line and pressure regulator.

Accumulator pressures which are low may be caused by external or internal leakage of the accumulator body gasket.

When front pump oil pressure is more than 10 psi higher than the high accumulator pressure, a leak between the accumulator and clutch is indicated. When the front pump pressure is more than 10 psi higher than the low accumulator pressure, a leak between the low accumulator and the low servo is indicated. These same pressure differences can also be caused by a plugged or restricted metering orifice in the accumulators.

ADJUSTMENTS

Manual Control Linkage Adjustment

Manual Control Linkage Adjustment

1. *Engine must be at normal operating temperature*. Drive the car to a steep grade. Move the selective lever to the Park position to determine if the parking lock holds the vehicle securely. Move the selective lever to the Neutral position and allow the vehicle to roll. Listen for a ratcheting or clicking noise which would indicate that the parking pawl is contacting the parking ratchet wheel.
2. If a noise is audible or if the parking lock will not keep the vehicle from rolling, the shift rod must be adjusted as described in steps 3, 4 and 5. If the parking lock holds and a noise is not present, proceed to step 6.
3. Move the selective lever to the Park position. Remove the clevis pin which attaches the lower shift rod to the shift idler lever. Press the shift rod forward while moving car slightly to be certain that the pawl is fully engaged with the ratchet wheel. *Do not exert undue strain on the rod* or you may damage the linkage in the rear bearing retainer.
4. Check the spring travel at the lower end of the shift lever by pressing the shift lever forward until a definite stop is felt. This movement should be 1/8" to 3/16" beyond the Park position (Fig. 3). If the movement is not within the specified limits, the control valve operating rod must be adjusted.
5. When the spring travel is within the specified limits (1/8" to 3/16"), pull the shift rod forward until the stop is felt. Adjust the shift rod clevis so that the clevis pin can be inserted into the hole of the shift idler lever when the control detent is firmly engaged in the Park position. Next, lengthen the shift rod by unscrewing the clevis three complete turns. Temporarily connect the shift rod to the idler lever with the clevis pin.

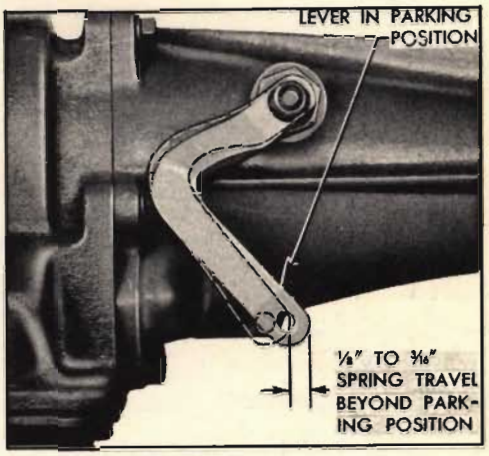

Fig. 3. Spring travel at shift lever

6. Set engine speed at 600 RPM. Slowly move the selective lever from Neutral to Drive. When the tip of the dial pointer is midway between N and D, engine speed should decrease as the direct drive clutch applies.
7. Move the selective lever slowly from D to N position. When the tip of the dial pointer is midway between D and N, engine speed should increase as the clutch disengages.
8. When the points of clutch engagement are not as specified, the shift rod clevis must be adjusted. Be extremely careful to see that after you make the adjustment the parking lock holds the vehicle or that the parking pawl does not contact the ratchet wheel when the selective lever is in Neutral.

Therefore, carefully make the following check.

a. Disconnect the lower shift rod from the idler lever. Make certain that the transmission shift lever is in the Direct Drive position and is held there firmly by the detent.

b. Move the selective lever on the steering column to the Direct Drive position. Push upward on the idler lever to hold the stop screw in contact with the stop plate. Adjust the length of the shift rod so that the clevis pin will freely enter the clevis and the lever.

c. Remove the clevis pin and *shorten* the rod by turning the clevis ½ turn. Install the clevis pin and anti-rattle washers. Tighten the clevis lock nut.

NOTE: *The ½ turn of the clevis provides for the specified clearance at the stop pin.*

3. Drive the car to a grade where is will roll freely. Move the selective lever to the Park position. Note whether parking lock holds the vehicle securely. Move the selective lever to Neutral and allow the vehicle to roll. Listen for a ratcheting or clicking noise indicating that the parking pawl is contacting the ratchet wheel.
4. If a noise is audible or the parking lock fails to hold securely, jack the car up so that a rear wheel can be turned to rotate the propeller shaft.
5. Back off the linkage adjusting lever lock bolt on the side of the transmission rear bearing retainer (Fig. 5). Move the selective lever to Neutral. Lightly tap the rear end of the lever up while turning the propeller shaft until a slight ratchet noise is heard. Tap the lever down just far enough to eliminate this noise. Securely tighten the lock bolt. Remove the car from the jacks.
6. Start the engine and allow to come to normal operating temperature. Set engine speed at 600 RPM. Slowly move the selective lever from Neutral to Direct Drive. The direct drive clutch should engage when the center of the dial pointer is midway between the N and D position as indicated by an immediate *decrease* in engine RPM.

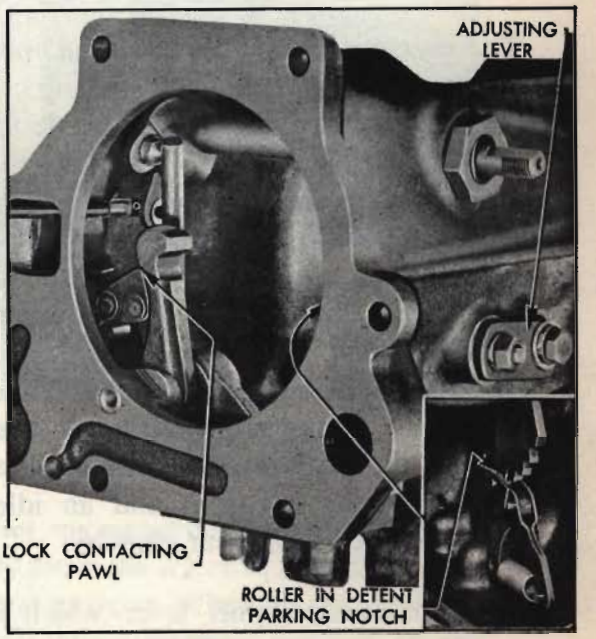

Fig. 5. Shift detent adjustment

7. Move the selective lever slowly from the D position to the N position. The clutch should disengage when the pointer is midway between the D and the N as indicated by an immediate *increase* in engine RPM.
8. If the points of clutch engagement and disengagement do not conform to the preceding instructions, carefully go back over the adjustments. If after checking each adjustment the points are still off, it will be necessary to drop the bottom oil pan to adjust the position of the manual control valve.

Throttle Linkage Adjustment Variable Pitch Transmission

Depressing the accelerator pedal moves the throttle linkage which actuates linkage connected to the stator control valve. The stator control valve is located in the high accumulator. A spring loaded stretch link is contained in the throttle operating rod. The stretch link may be optionally adjusted to provide "overtravel" to delay the operation of the variable pitch stator.

All cars delivered from the factory are set so that the stretch link is locked solid to eliminate overtravel. The throttle linkage is adjusted so that the stator shifts to high angle "performance" position just as wide open throttle is reached. To a car owner who habitually drives at wide open throttle, this position is not advisable. To fit this driver's requirements, the high angle shift can be adjusted to occur after wide open throttle is reached. To fit this driver's needs "overtravel" may be obtained by using the alternate step 8 given for the stretch link adjustment in the adjusting procedure which follows.

1. Check the condition of the accelerator pedal making certain there is no interference from the floor mat. Tighten the accelerator pedal mounting screws.
2. Check to see that the accelerator pedal does not bind, the throttle linkage moves freely and is properly lubricated. Make sure the pedal rod does not bind in its seal and the carburetor return spring is strong enough to fully close the throttle valve.
3. Adjust engine throttle stop screw for correct hot idling speed of 450 RPM.
4. While holding the carburetor choke valve closed, move the throttle to the full open position to check the operation of the choke unloader.
5. Disconnect the throttle return spring. Disconnect the throttle operating rod from the equalizer shaft lever (Fig. 6).
6. Back off the stator pick-up lever adjusting screw until the screw end is just flush with the surface of the lever.

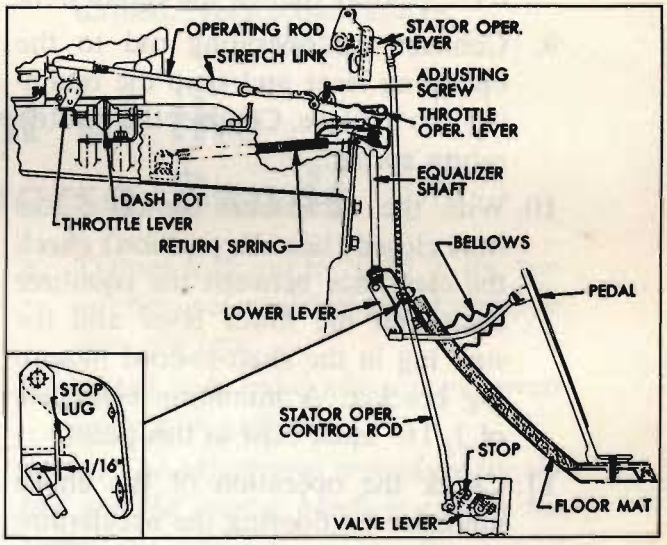

Fig. 6. Throttle and stator control linkage

7. To adjust linkage *without* overtravel, turn the rear end of the throttle operating rod until the stretch link is locked. Have another man floor the accelerator pedal. Hold the throttle lever fully open while holding the rear end of the operating rod at the hole in the throttle operating lever. The end of the operating rod should now be approximately 1/16" short of entering the hole in the lever.

8. To adjust linkage *with* overtravel, turn the rear end of the throttle operating rod until the rod can be stretched approximately 7/16″ against the tension of the stretch link spring, measured at the forward end of the stretch link. Have another man hold the accelerator pedal up as far as possible. Hold the throttle lever closed to the hot idle position while holding the rear end of the operating rod at the hole in the throttle operating lever. The end of the rod should now extend 1/16″ beyond the hole in the lever. If the position of the rod end, as determined by the hole in the lever, is off, change the position of the lever on the shaft, then securely tighten the clamp bolt.
9. Connect the operating rod to the operating lever and snap the retaining clip in place. Connect the throttle return spring.
10. With the carburetor throttle valve fully closed (hot idle position) check the clearance between the equalizer shaft and the lower lever and the stop lug in the shaft-to-cowl mounting bracket. A minimum clearance of 1/16″ must exist at this point.
11. Check the operation of the choke unloader by flooring the accelerator pedal while holding the choke valve closed.
12. The clearance between the lower lever and the stop lug should be at least 1/16″. If the clearance is less or the unloader does not operate correctly, readjust the operating rod length at the rod end on the throttle lever or change the position of the upper lever on the equalizer shaft one serration at a time until the correct settings are obtained.
13. Depress the accelerator pedal firmly against the floor mat. Turn the stator operating lever, raising the lever until all vertical play is removed from the stator operating control rod. Back off the screw ½ turn to provide a slight clearance between the stator operating lever and its stop on the high accumulator.
14. Check the linkage for smooth operation and free movement. Check to see that the carburetor throttle closes firmly against the stop screw. On cars *without overtravel* the correct wide open throttle condition is to have full opening of the carburetor throttle valve when the accelerator pedal strikes the floor mat, rather than having the stop on the throttle lever strike hard against the boss on the throttle body. On cars set *for overtravel,* the stop on throttle lever must contact the boss on the throttle body before the accelerator pedal can be pressed to the floor mat against the tension of the stretch link spring.

Dashpot Adjustment

The dashpot adjustment can be made with the engine at normal operating temperature and the throttle linkage adjusted as herein outlined.

1. Hold the choke valve *closed*. Insert a .030 feeler blade between the stop screw and the highest step of the fast idle cam (Fig. 7).

2. Adjust the position of the dashpot so that it just clears the throttle lever arm.

NOTE: *This is not a final setting. Further adjustments may be necessary.*

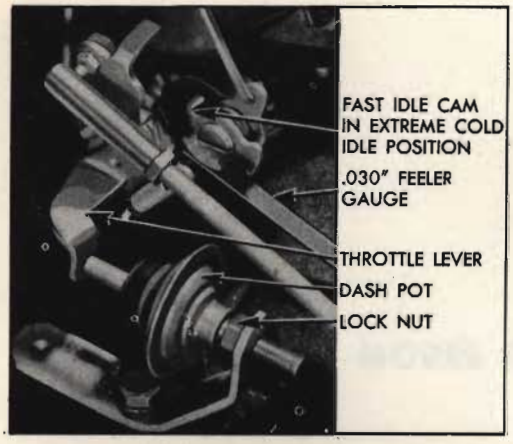

Fig. 7. Dashpot adjustment

3. Apply the brakes and move the selective lever to the Direct Drive position. Depress the accelerator until engine RPM is approximately 1500 RPM. Quickly release the accelerator pedal and note engine operation as the carburetor throttle valve closes.

4. If the engine tends to stall, move the dashpot forward until the tendency to stall from too rapid closing of the throttle valve is eliminated.

   If the interval for the carburetor throttle valve closing is too long, move the dashpot rearward. Tighten the lock nut after each adjustment.

5. If proper control cannot be obtained after making the adjustments described, replace the dashpot.

Adjustment of the Low and Reverse Bands

NOTE: *This adjustment must be performed accurately. It is not possible to readjust bands after the transmission is installed in the car except on the earliest models.*

1. Using a ¾" socket, break the adjusting screw lock nut loose. Using a screw driver, tighten the adjusting screw until considerable resistance is felt. This indicates that the band is in full contact with the drum.

2. Back off on the adjusting screw until a very small amount of play can be felt when prying up on the adjusting screw as shown in Fig. 8.

3. Back off the adjusting screw exactly six complete turns. Snug up the lock nut. Note position of adjusting screw slot.

4. Tighten lock nut to 20-25 ft. lbs. torque being careful that adjusting screw does not turn.

5. Install both band adjustment covers using new gaskets.

NOTE: *The adjustment procedure for the low and the reverse bands is exactly the same.*

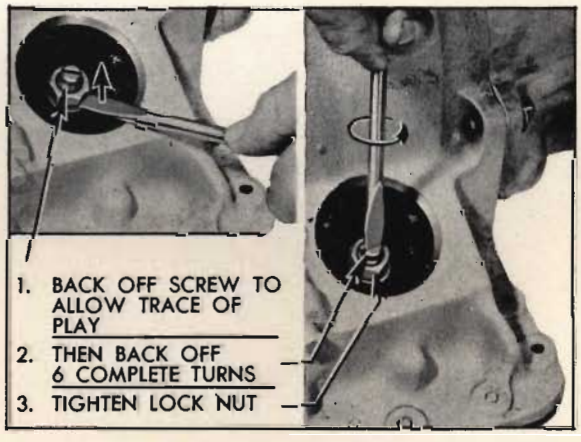

Fig. 8. Band adjustment

LATE MODEL CHANGES

The Variable Pitch Torque Converter

Removal of Torque Converter from Transmission

1. Remove both drain plugs from converter cover. Allow remaining oil to drain out.
2. Using a ½" socket, loosen and remove all nuts, washers and bolts attaching cover to converter pump. Remove cover. Check for evidence of oil leakage.
3. Move transmission operating lever to Park position. Remove reverse band adjusting screw cover. Pry up on reverse band to lock input shaft while removing the bolt, lockwasher, retaining washer and thrust washer from front end of input shaft (Fig. 1).

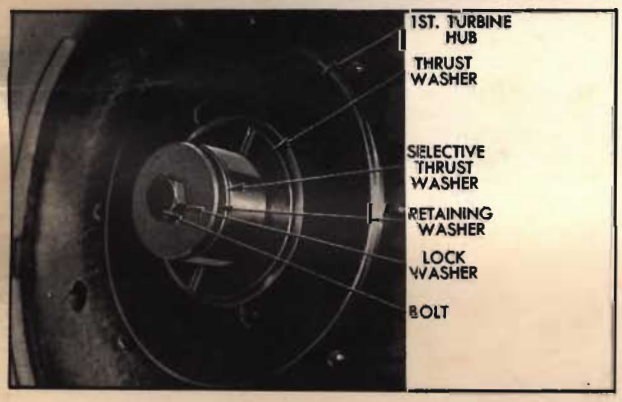

Fig. 1. Turbine retaining washer and thrust washer

4. Insert screw driver into hole in first turbine disc to facilitate removal of twin turbine assembly from input shaft. Remove bronze thrust washer from turbine hub.
5. Check the sun gear by turning it in a clockwise direction to see that it free wheels. Rotate the sun gear in a counter-clockwise direction to make certain that it locks in this direction. Remove the sun gear assembly and thrust washer from reaction shaft (Fig. 2).

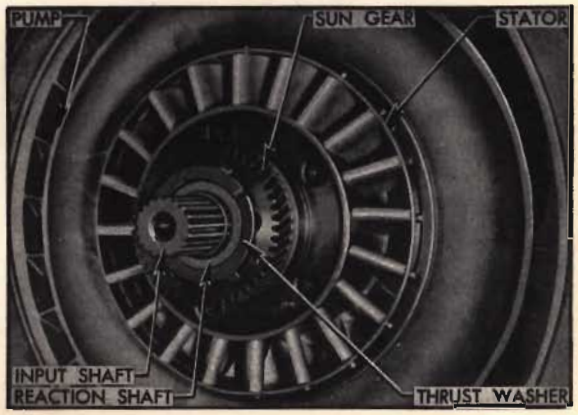

Fig. 2. Sun gear, stator and converter pump

6. Install stator tool over input shaft, beveled end out. Pull stator outward. To retain free wheeling parts in the stator, grasp thrust washer located behind the stator as the stator is moved outward on tool. Remove stator from input shaft (Fig. 3).

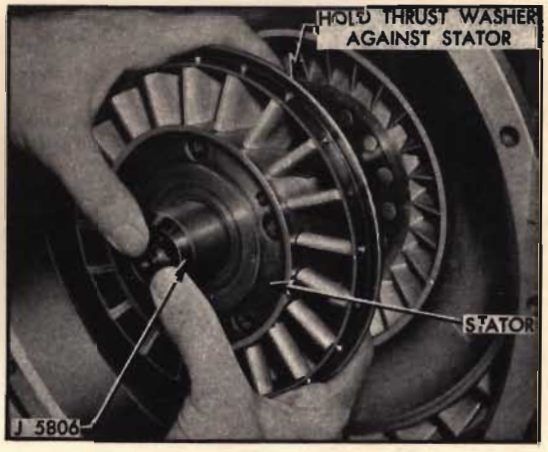

Fig. 3. Removing stator assembly

7. Grasp converter pump firmly and pull forward from the reaction shaft. Check immediately for evidence of oil leakage.

Disassembly of the Torque Converter

1. Using a screw driver, pry the retaining ring out of the groove in the first turbine. Insert a screw driver in hole in disc and lift disc out of first turbine (Fig. 4).
2. Remove the second turbine and carrier assembly from first turbine.

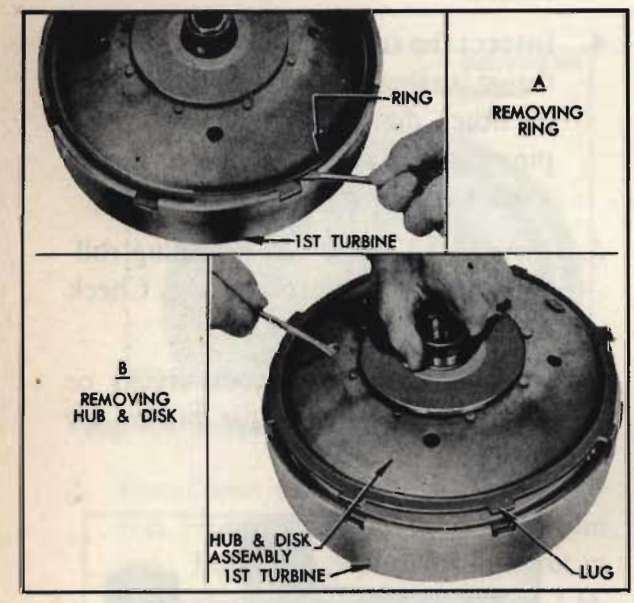

Fig. 4. Removing disc and hub assembly

3. Remove the four bolts and lock washers and the pinion pin lock plate from second turbine.
4. Remove planet pinion gear pins, then planet pinion gears and thrust washers from turbine carrier. Remove the 22 needle bearing rollers from each pinion gear (Fig. 5).
5. Remove the thrust washer, with tangs, from front face of sun gear. Tap the cupped thrust washer from other end.
6. Remove the free wheeling clutch (sprag) from the inside of the sun gear (Fig. 6).

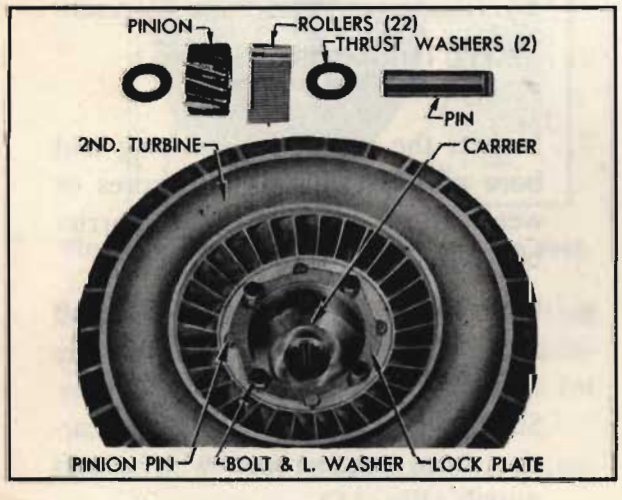

Fig. 5. Second turbine parts

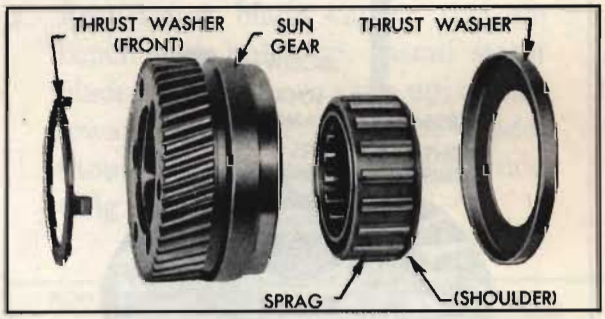

Fig. 6. Sun gear parts

Disassembly of Variable Pitch Stator

1. Remove the stator thrust washer and selective spacers from the rear side of the stator. Remove stator tool, free wheel rollers and springs from cam.

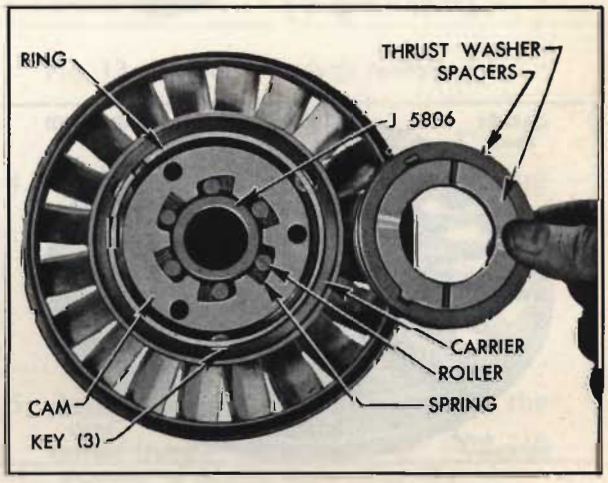

Fig. 7. Parts in rear side of stator

2. Pry the retaining ring from the groove in the stator blade rear carrier. Remove free wheel cam and three driving keys (Fig. 7).

3. Using special screw driver, loosen and remove the stator blade front carrier screws and lockwashers. Remove front carrier. The front carrier is held to the rear carrier by two dowels (Fig. 8).

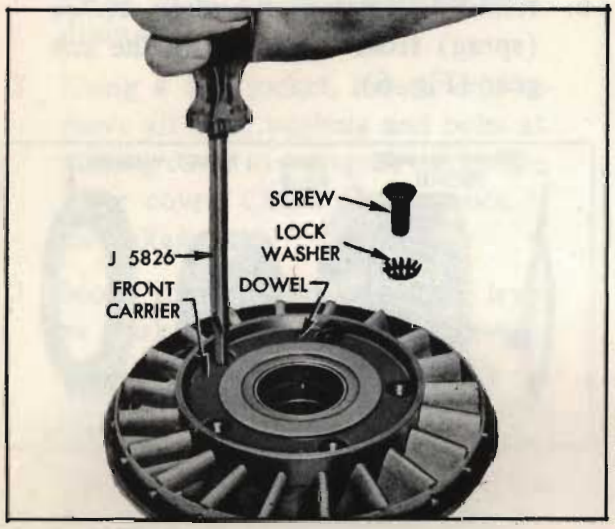

Fig. 8. Removing front carrier screws

4. Remove the retaining ring and thrust washer from hub of the stator piston. Remove stator blade carrier ring and stator blades from the rear carrier (Fig. 9).

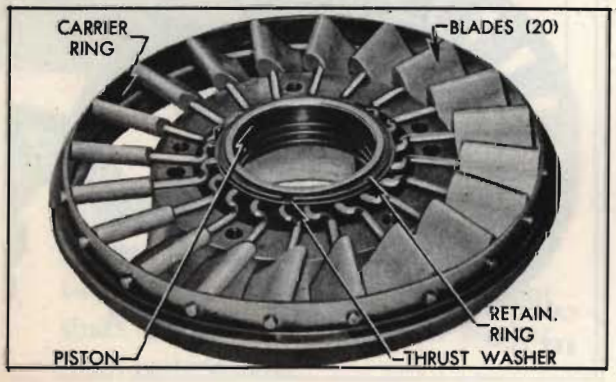

Fig. 9. Front side of stator, with carrier removed

5. Remove the stator piston with the sealing ring from the rear carrier.

Inspection of Torque Converter Parts

1. Wash all parts in clean solvent. Blow them off with compressed air.
2. Inspect front pump hub for scores or wear.
3. Carefully inspect converter pump and turbines for cracked or damaged blades.
4. Inspect the turbine carrier, bushings, thrust washers, etc. for wear, scores, or other damage. Check planetary pinion gear teeth for worn or flaked tooth surfaces.
5. Inspect the stator free wheeling rollers and cam for burrs or nicks. Check springs for distortion.
6. Inspect stator blades for cracks or distortion. Check stator blades for looseness on cranks.

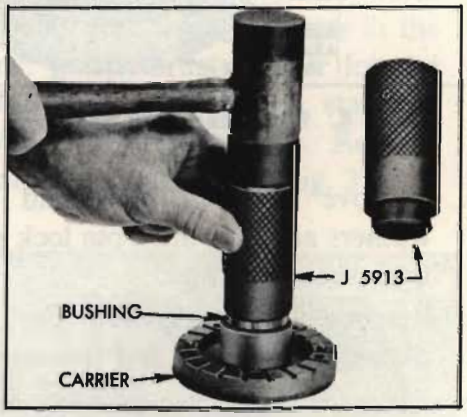

Fig. 10. Installing bushing in blade carrier

7. Inspect the piston oil seal ring and bore of blade carrier for scores or wear. If necessary, replace carrier bushings as shown in Fig. 10.
8. Use care in separating the second turbine from the carrier if it becomes necessary to replace one of the units. Support second turbine and tap carrier from counterbore with a soft punch (Fig. 11).

Testing Converter Pump for Leakage

1. To close the converter pump hub opening, make a fixture as shown in Fig. 12.
2. Install fixture inside converter pump as shown in Fig. 13. Install pump cover and seal. Tighten to 25-30 ft.-lbs. torque in the correct sequence.

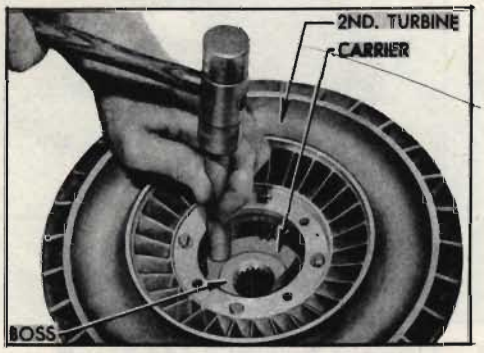

Fig. 11. Removing carrier from turbine

3. Install one drain plug and one Barrett fitting No. 365 in other drain hole. Install large plug with gasket in converter pump cover hub (Fig. 13).

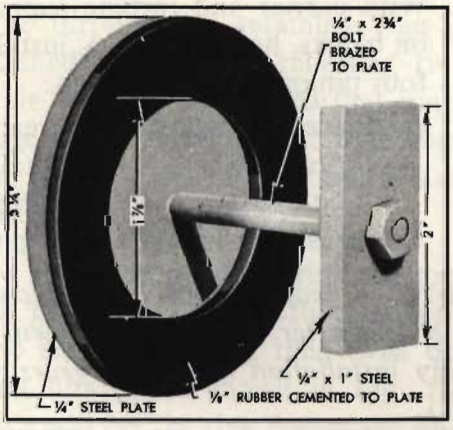

Fig. 12. Plate and washer for pump test

4. Apply air pressure to Barrett fitting and fill to 80-100 psi. Submerge converter in water tank and check for escaping air bubbles.

CAUTION: *Do not re-use converter pump cover seal.*

Assembly of Variable Pitch Stator

1. Install oil seal ring in stator piston. Tilt piston slightly to install in the bore of the rear carrier with hub extending through flanged end of carrier.
2. Mount the carrier and the piston on a support so that piston is held up against flange of carrier.
3. Rest stator blade carrier ring on bench with holes up. Install stator blades with concave sides up, cranks toward center of ring. The blades should be in a nearly closed position (Fig. 9).

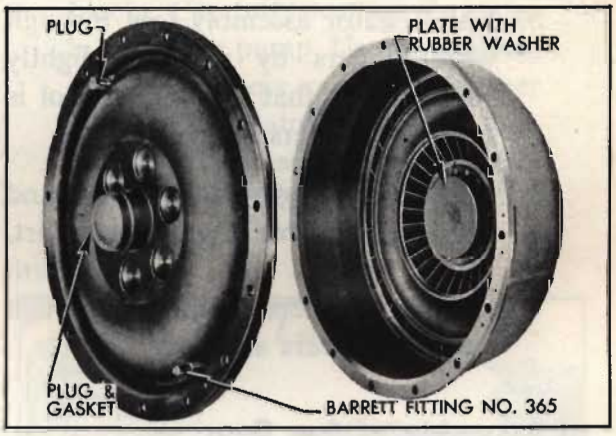

Fig. 13. Plate and plugs installed in pump and cover

4. Carefully pick up the carrier ring with the blades in position and place on the rear carrier. All cranks must engage the grooves in the carrier (Fig. 9).
5. Install the thrust washer over the cranks. Install retaining ring in groove of piston hub (Fig. 9).
6. Place front carrier over rear carrier with screw holes lined up when dowels enter holes. Install screws and lockwashers (Fig. 8).

7. Pull up on screws but do not tighten. Check movement of stator blades for free operation. Blades should move throughout full range without bind. If binding is noted, check for misalignment of cranks in carrier grooves. Tighten screws and recheck movement of blades.

8. Install the free wheeling cam with the three drive keys and retaining ring in the rear carrier (Fig. 7).

9. Check length of free wheel springs. Spring length may be altered so that all spring lengths are equal. Install free wheel rollers and springs in cam with rollers at rounded ends of cam recesses (Fig. 7).

10. Install stator assembly tool through wheel rollers by rotating slightly clockwise so that flat end of tool is flush with rollers and cam.

11. With surfaces of cam, spacers and thrust washer free of grease and dirt, install spacers and washers with tangs of washers extending through holes in spacers and cam.

Assembly of Sun Gear and Twin Turbine

1. Install the sprag in the bore of the sun gear with the shouldered end outward (Fig. 6). Press the cupped thrust washer over the end of the sun gear. Do not distort thrust washer.

2. Install the tanged thrust washer on the opposite end of the sun gear.

3. If the carrier and second turbine are separated, check the counter-bored recess of the turbine and the mating surfaces of the carrier for nicks or burrs. Clean surfaces and apply a film of oil.

4. Support the carrier as shown in Fig. 14. Install pinion gear pins to act as pilots. Start carrier squarely in recess in turbine.

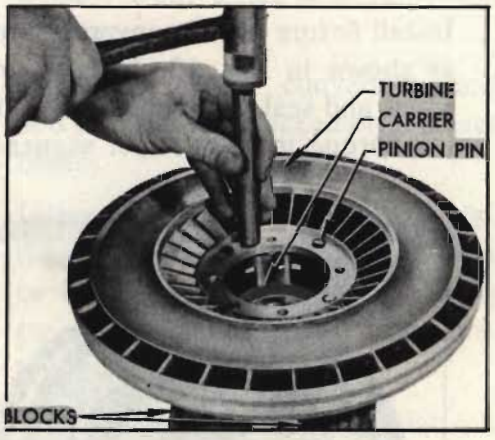

Fig. 14. Installing turbine on carrier

5. Using a hammer and a soft punch, gently tap turbine down over carrier (Fig. 14).

NOTE: *If turbine cannot be assembled to carrier unless considerable force is used, check parts for burrs and nicks in counterbore recess.*

6. With carrier and turbine supported on blocks, hub side down, install the four pinion gears as follows:

   a. Place planet pinion gear on thrust washer, then install 22 needle bearing rollers. Place a thrust washer on top of pinion.

NOTE: *A loading tool 11/16" long by 3/8" diameter, made locally, will simplify installation of pinion gears (Fig. 15).*

   b. Place assembled pinion gear in carrier and install a pin, notched end up. After loading pin is pushed from carrier, pinion pin may be held in position by placing a block under it. All notched ends of pinion pins must face center of carrier (Fig. 15).

7. Install the pinion pin lock plate so that it enters notches of all pins. Install turbine-to-carrier bolts and lockwashers (Fig. 5).

8. Install second turbine and carrier assembly into first turbine. Install the first turbine disc and hub assembly over the second turbine (Fig. 4).

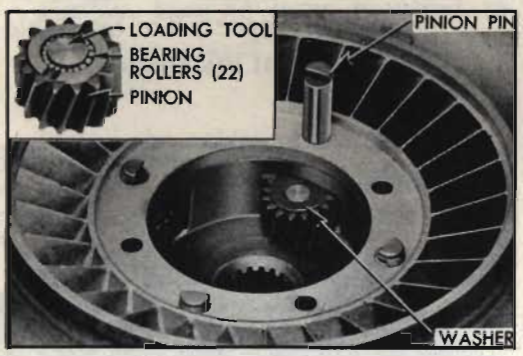

Fig. 15. Installing pinion in carrier

9. Mesh ring gear with carrier pinions by rotating disc. Align driving lugs on disc with notches in first turbine. Push assembly all the way down in turbine.

10. The turbine disc retaining ring is "dished". Install the retaining ring with "dished" side up so that inner edge will bear against the disc when the ring is installed in groove of first turbine (Fig. 4).

11. To allow the retaining ring to enter the groove in the first turbine, start one end of the ring, then twist the ring upward as shown in Fig. 16. This will lay the ring flat on the disc to permit the ring to be progressively entered all the way around.

12. Be certain that ring is fully seated in the groove and that the inner edge of the ring bears against the turbine disc. Tap inner edge down against disc if it has raised up.

Installation of the Variable Pitch Type Converter

1. Position the front oil pump seal "O" ring around the front pump body against the pump cover.

2. Position the bell housing on the transmission and install the bolts and stud nut with lockwashers. Lightly coat the threads of the lower right side bolt with Aviation Cement No. 3. This bolt hole opens into the transmission case. Using a torque wrench, evenly tighten all bolts and stud nut to 35-40 ft.-lbs. torque.

3. Support the converter pump on blocks. Carefully position the stator in converter pump. Use the original selective spacers and thrust washer between the stator and pump hub. Do not use grease or other adhesive to hold the spacers in position.

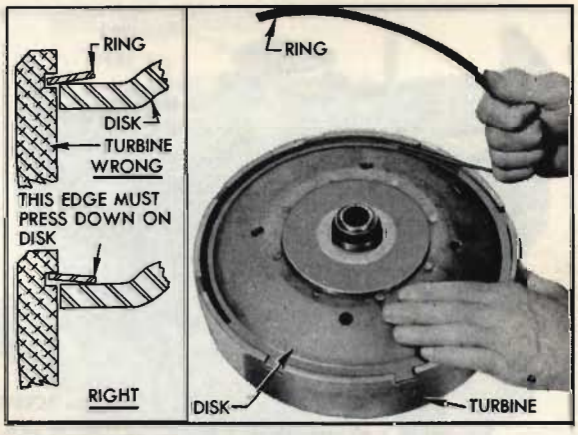

Fig. 16. Installing disc retaining ring

4. Position the sun gear on the stator assembly with the tanged thrust washer up. Position the twin turbine assembly, making certain that the planet pinion gears mesh with the sun gear.

5. Position the converter clearance gauge on the converter pump flange (Fig. 17) making certain that the indicator post does not contact the turbine. Loosen the gauge wing screw. Firmly press the gauge plunger down against the first turbine hub and tighten the wing screw.

6. Place the converter cover on blocks, inner side up. Place the bronze thrust washer in the pump cover recess. Remove the gauge from the converter pump, *turn it over* and center it on the pump cover so that it rests squarely on the gasket surface (Fig. 18).

7. Using the dial indicator sleeve, mount the dial indicator on the adjustable post of the clearance gauge (Fig. 18). The indicator button must bear squarely against the upper end of the clearance gauge plunger. Set the indicator dial at zero.

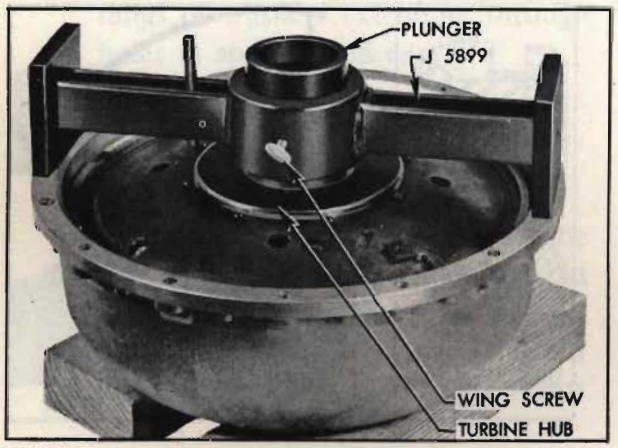

Fig. 17. Gauge J-5899 on pump and turbine

8. Loosen the plunger wing screw. Press the gauge plunger firmly down against the thrust washer. Note the dial indicator reading. The reading is the clearance that will exist between the turbine and the pump cover when parts are assembled. This reading should be not less than .018 or more than .029.

9. If the dial reading is not within .018-.029, the total thickness of the selective spacers located under the stator must be changed. By *increasing* the total thickness, the clearance will be *decreased*. Decreasing the total thickness will increase the clearance. Spacers are available in three different thicknesses.

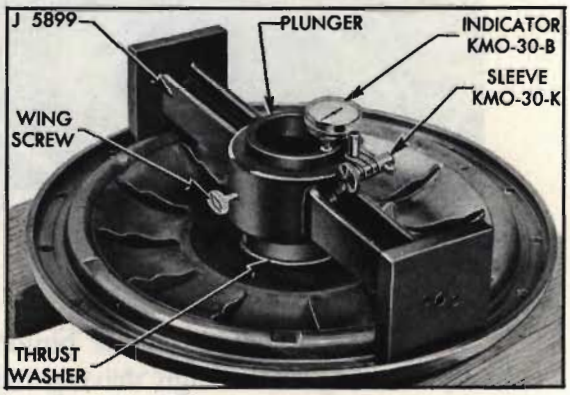

Fig. 18. Gauge J 5899 on pump cover

10. Position the converter pump over the reaction shaft. Turn the pump until the lugs of the pump engage the slots of the front pump drive gear.

11. Lightly coat the thrust and selective washers with vaseline or grease so that they will adhere to the stator during the assembly operation. Make sure all rollers and springs are in the stator and held in place with the special tool.

12. Hold the thrust washer and spacers to the rear side of the stator. Slide the stator off the installing tool upon the reaction shaft. Be sure that the washer and spacers remain in position as the stator is pushed back against the converter pump.

13. Install the converter sun gear with the tanged thrust washer out. Check to see if the sprag is correctly installed by turning the sun gear in a clockwise direction. The sun gear should lock up when pressure is applied in the opposite direction.

14. Make certain that the retaining ring is fully seated in the input shaft groove. Install the twin turbine assembly, turning it as required to mesh the planet pinions with the sun gear.

15. Install the selective thrust washer, retainer washer, and the bolt with the external tooth lock washer on the front end of the input shaft (Fig. 19). Shift to "Park". Pry up on the reverse band operating lever with a screw driver to lock the input shaft. Using a torque wrench, tighten the bolt to 30-35 ft.-lbs. torque.

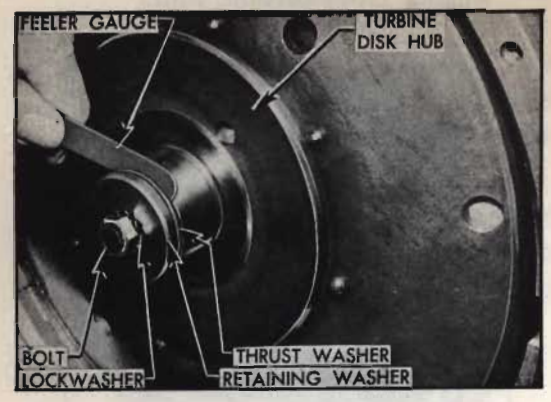

Fig. 19. Checking turbine clearance

16. Using feeler blades, check the clearance between the selective thrust washer and the first turbine hub. (Fig. 19). This clearance should be .002 to .009.

17. If the clearance is not correct, substitute another thrust washer of the proper thickness. Washers are available in two different thicknesses.

18. Refer to Fig. 20. Looking at the front face of the converter pump cover, select three bolt holes (X) that are aligned with the center of the hub and one of the counterbored recesses adjacent to the hub. Put a mark at each hole for later installation of the flywheel to the converter pump driving bolts.

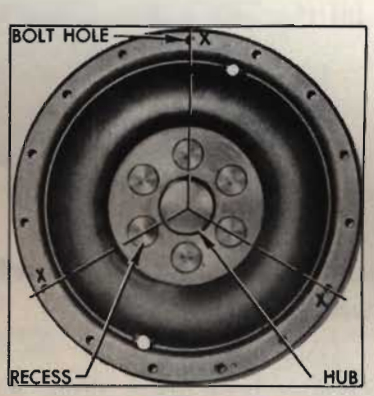

Fig. 20. Location of driving bolt holes

19. Install a new "O" ring seal on the converter pump cover. Make sure that surfaces are clean, the seal is not twisted and that it has even tension all around.

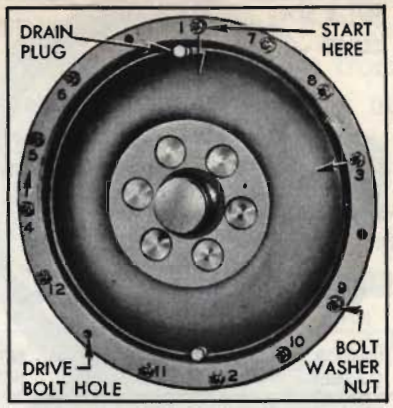

Fig. 21. Bolt tightening sequence

20. Lightly coat the selected thrust washer with grease so that it will remain in place in the recess in the pump cover. Position the pump cover on the converter pump so that

the three marked driving bolt holes are not aligned with any bolt hole in the converter rim in which a balance hole is located.

21. Install the bolts with plain washers and special nuts in all but the three marked driving bolt holes. Insert the shank of an 11/32″ drill in one of the driving bolt holes to align all the bolt holes. Using a torque wrench, tighten all bolts to 5 ft.-lbs. torque in the numerical sequence shown in Fig. 21. Retighten all bolts in the same numerical sequence to 25-30 ft.-lbs.

Insert the blade of a screw driver between the converter pump and the bolt head to prevent the bolt heads from digging into the converter pump while tightening.

Twin Turbine Converter

Removal of Torque Converter from Transmission

1. Remove both drain plugs. Allow any remaining oil to drain.
2. Remove the hex plug and gasket from hub of converter pump cover (Fig. 22). Using a 5/16″ socket, remove the set screw and lockwasher located in pump cover hub.

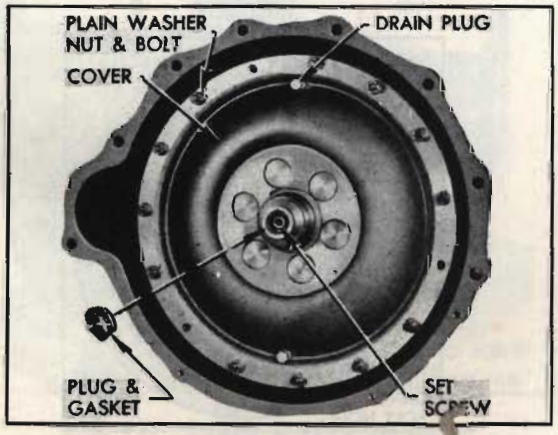

Fig. 22. Converter pump cover

3. Using ½″ socket, remove all nuts, washers and bolts which attach pump cover to pump. A punch may be used to prevent converter from turning by inserting through drive bolt hole and hand hole in bell housing.
4. Remove pump cover from pump by gently tapping outer edge of cover with a mallet. Check cover seal for evidence of oil leakage.
5. Insert a screw driver in the first turbine assembly from input shaft. Do not remove input shaft at this time (Fig. 23). Remove bronze thrust washer from turbine hub.

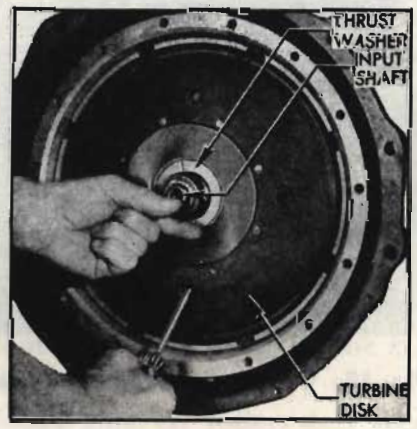

Fig. 23. Removing twin turbine assembly

6. Using snap ring pliers, remove retaining ring from input shaft. Remove bronze thrust washer, sun gear and sun gear yoke (Fig. 24).
7. Using snap ring pliers, remove retaining ring from reaction shaft. Slide

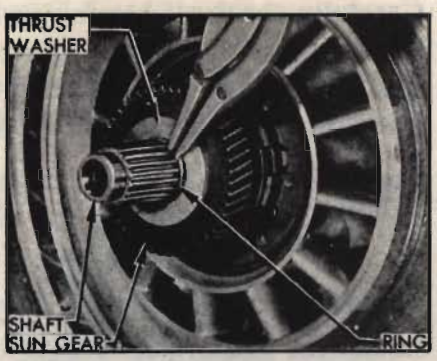

Fig. 24. Retaining ring, washer and sun gear

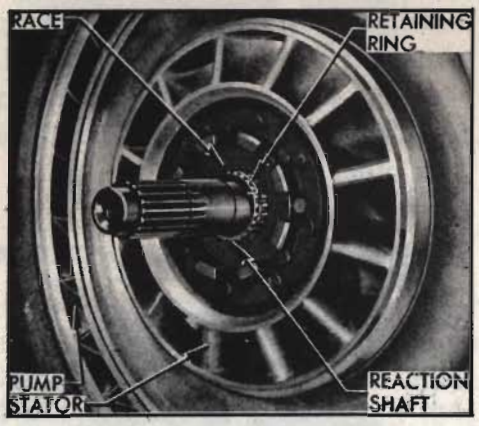

Fig. 25. Converter stator mounting

stator and free wheeling roller race off reaction shaft (Fig. 25). If stator bearing does not come out with stator, remove it from the reaction shaft.

8. Grasp converter pump firmly and pull straight out (Fig. 26). Examine immediately for evidence of oil leakage.

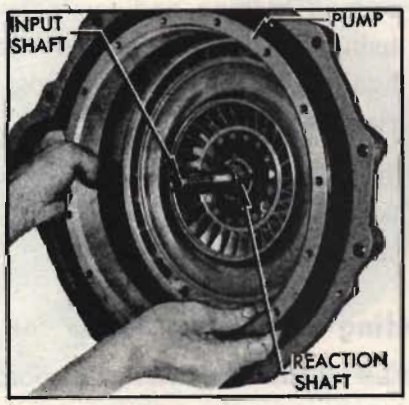

Fig. 26. Removing converter pump

Disassembly of Torque Converter

1. Using a screw driver, pry retaining ring from groove of first turbine. Insert screw driver in hole in disc and raise disc and hub assembly from first turbine (Fig. 27).

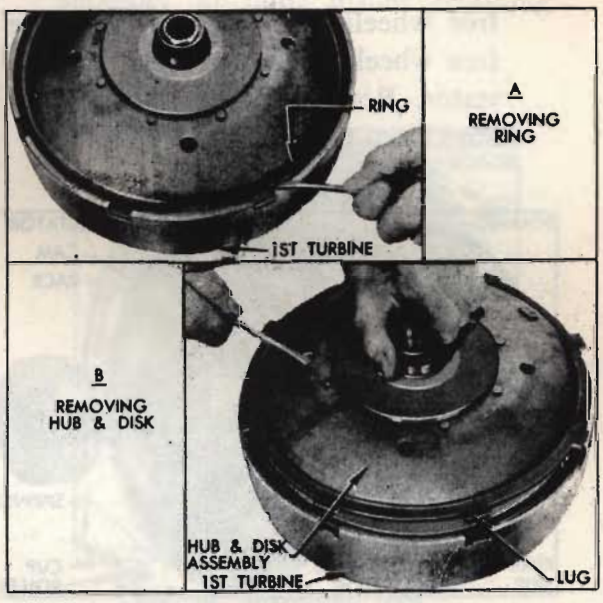

Fig. 27. Removing disc and hub assembly

2. Remove second turbine and carrier assembly from first turbine.
3. Remove the four bolts, lockwashers and pinion pin lock plate from second turbine (Fig. 28). Do not remove turbine from carrier at this time.

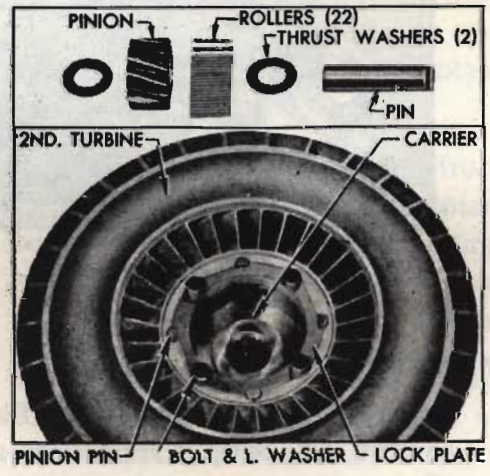

Fig. 28. Second turbine parts

4. Remove the four planet pins, four planet pinions and thrust washers from carrier. Remove 22 needle bearing rollers from each pinion (Fig. 28).
5. Remove the ball bearing from the rear of converter stator. Force the free wheeling roller race from the free wheeling cam in front side of stator. Remove rollers springs and cups from the cam (Fig. 29).

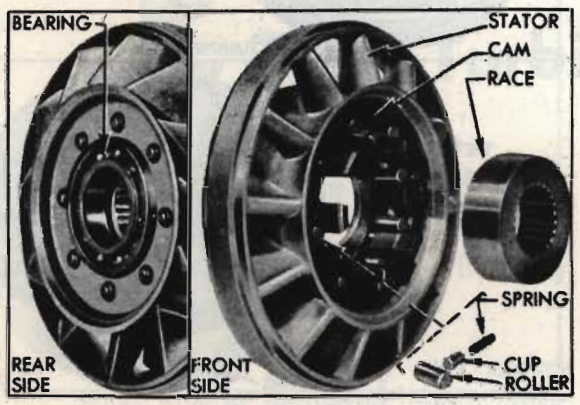

Fig. 29. Stator and free wheeling parts

6. Remove the pilot bearing retaining ring from the groove in the hub of the converter pump cover. Force the pilot bearing and bearing retainer from hub (Fig. 30).

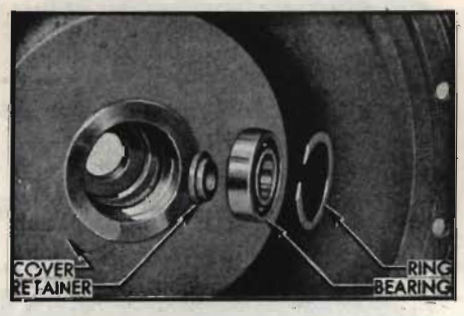

Fig. 30. Pilot bearing and retainers

Inspection of Torque Converter

1. Wash all parts in clean solvent. Blow solvent off with compressed air. Clean and inspect ball bearings.
2. Carefully check all bearing surfaces for excessive wear or scoring. Inspect planetary pinion gear teeth thrust surfaces for wear or flaking.
3. Inspect rollers and races for nicks or burrs. Check springs for distortion.
4. Inspect the pump turbines and the stator for distorted, damaged or cracked vanes.
5. Carefully inspect the rear edge of the first turbine hub at the ring gear and the mating thrust surface of the second turbine at the carrier. Check the turbine carrier for wear, scoring or other damage.

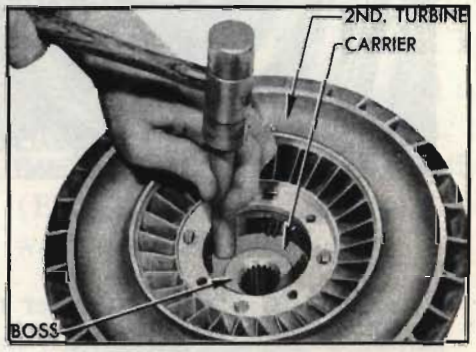

Fig. 31. Removing carrier from turbine

6. When necessary to replace the second turbine or the carrier, use extreme care when separating them so as to protect the usable part. Support second turbine and tap carrier free using a soft punch. Do not drive against surface of thrust boss in carrier (Fig. 31).
7. Inspect converter pump hub for scores, wear, grooves, etc. Replace if necessary.

Testing Converter Pump for Leaks

1. To close the converter pump hub opening, make a fixture as shown in Fig. 32.

2. Install fixture inside converter pump as shown in Fig. 33. Install pump cover and seal. Tighten to 25-30 ft.-lbs. torque in correct sequence.

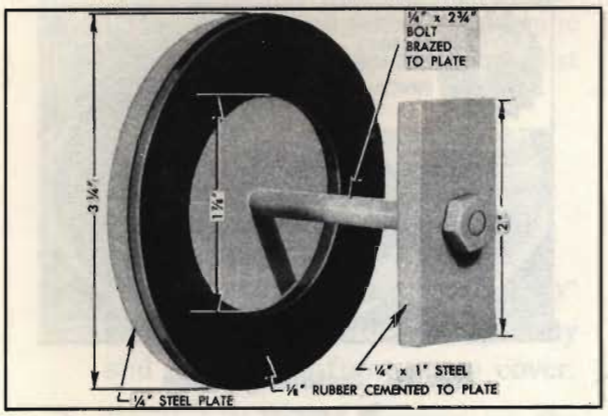

Fig. 32. Plate and washer for pump test

3. Install one drain plug and one Barrett fitting No. 365 in other drain hole. Install large plug with gasket in converter pump cover hub (Fig. 33).

4. Apply air pressure to Barrett fitting and fill to 80-100 psi. Submerge converter in water tank and check for escaping air bubbles.

CAUTION: Do not re-use converter pump *cover seal.*

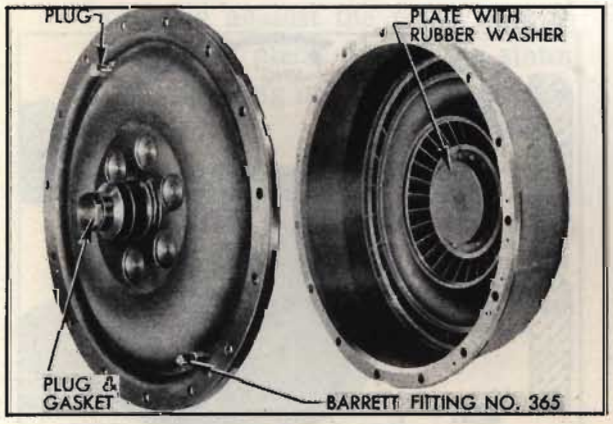

Fig. 33. Plate and plugs installed in pump and cover

Assembly of Torque Converter

1. Install the input shaft pilot bearing retainer in hub of converter pump cover, with shouldered side up. Press the pilot bearing into hub of cover so that outer race bears against the shoulder in hub. Install retaining ring (Fig. 30).

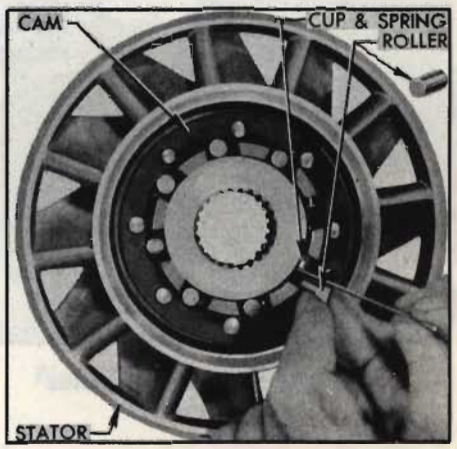

Fig. 34. Installing free wheel roller

2. Install the springs and cups and the free wheeling roller race in the cam on the front side of the stator. Using a thin narrow blade, depress the springs and install the free wheeling rollers (Figs. 29 and 34).

3. Install the ball bearing in rear side of stator. The bearing must be fully seated in the counterbore recess and outer race must be free to rotate (Fig. 29).

4. If second turbine is separated from the carrier, be certain that counterbored recess in turbine and mating surfaces of carrier are clean and free from burrs. Oil the mating surfaces.

5. Support the carrier as shown in Fig. 35. Install pinion gear pins to act as pilots. Start carrier squarely in recess in turbine.

6. Using a hammer and a soft punch, gently tap turbine down over carrier (Fig. 35).

NOTE: *If turbine cannot be assembled to carrier unless considerable force is used, check parts for burrs and nicks in counterbore recess.*

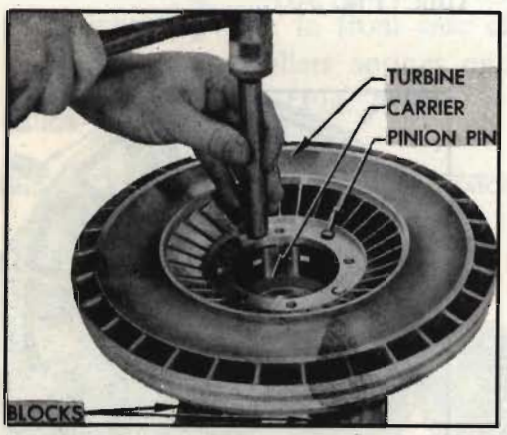

Fig. 35. Installing turbine on carrier

7. With carrier and turbine supported on blocks, hub side down, install the four pinion gears as follows:

   a. Place planet pinion gear on thrust washer, then install 22 needle bearing rollers. Place a thrust washer on top of pinion.

NOTE: *A loading tool 11/16" long by 3/8" diameter, made locally, will simplify installation of pinion gears (Fig. 36).*

   b. Place assembled pinion gear in carrier and install a pin, notched end up. After loading pin is pushed from carrier, pinion pin may be held in position by placing a block under it. All notched ends of pinion pins must face center of carrier (Fig. 36).

8. Install the pinion pin lock plate so that it enters notches of all pins. Install four turbine to carrier bolts and lockwashers (Fig. 28).

9. Install second turbine and carrier assembly into first turbine. Install the first turbine disc and hub assembly over the second turbine (Fig. 27).

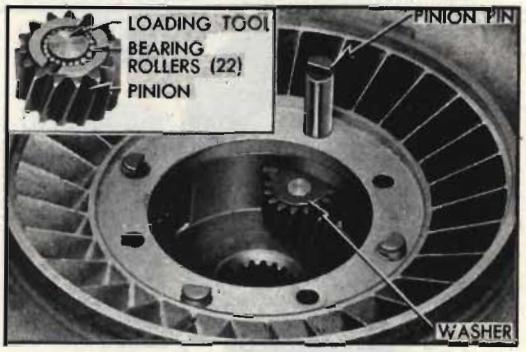

Fig. 36. Installing pinion in carrier

10. Mesh ring gear with carrier pinions by rotating disc. Align driving lugs on disc with notches in first turbine. Push assembly all the way down into turbine.

11. The turbine disc retaining ring is "dished". Install the retaining ring "dished" side up so that inner edge will bear against the disc when the ring is installed in groove of first turbine (Fig. 37).

12. To allow the retaining ring to enter the groove in the first turbine, start one end of the ring, then twist the ring upward as shown in (Fig. 37).

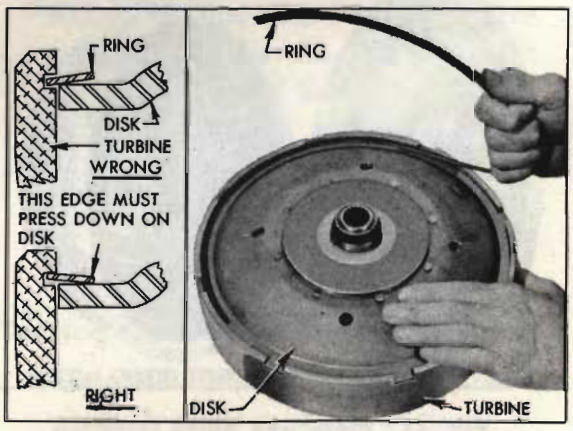

Fig. 37. Installing disc retaining ring

This will lay the ring flat on the disc to permit the ring to be progressively entered all the way around.

13. Make certain that ring is fully seated in the groove and that the inner edge of the ring bears against the turbine disc. Tap inner edge down against disc if it has raised up.

Installation of Twin Turbine Type Converter

1. Install the front pump oil seal "O" ring around the front pump body and against the front pump cover.
2. Position the bell housing on the transmission and install the attaching bolts and nut. Lightly coat the threads of the lower right side bolt with Aviation Cement No. 3. This bolt hole opens into the transmission case. Using a torque wrench, tighten bolts and stud nut to 35-40 ft.-lbs. torque.
3. Position the converter pump over the reaction shaft. Turn pump until the lugs on the pump hub engage the slots in the front pump.
4. Check the ball bearing in the converter stator to make sure it is properly seated. Install the converter stator on the reaction shaft while pressing against the roller race to keep it in place. Install the stator retaining ring in groove in reaction shaft.
5. Install the sun gear yoke in the stator cam, beveled side out. Install the sun gear to engage the yoke. Install the bronze thrust washer on the shaft.
6. Position the tapered expander on the end of the input shaft. Use the driver to press the second turbine retaining ring over the expander and shaft to seat it in groove in the shaft (Fig. 38).
7. Support the twin turbine assembly so that the weight is against a block positioned under the second turbine.

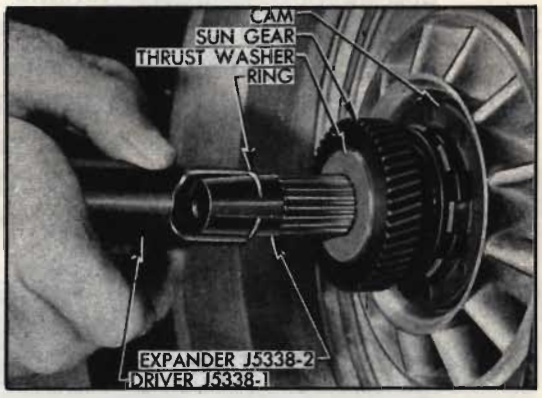

Fig. 38. Installing turbine retaining ring

8. Attach the dial indicator plunger to the dial indicator. Mount the indicator to the support with the sleeve. Place the indicator support on the protruding hub of the turbine carrier and adjust the dial indicator so that the extension bears at 90 degrees against the ground surface on the first turbine hub (Fig. 39). Set the dial indicator to zero.

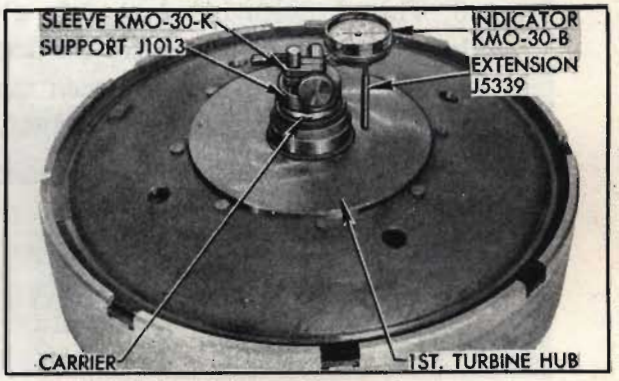

Fig. 39. Dial indicator on turbine assembly

9. Support the converter pump cover in a horizontal position. Tap the input shaft pilot bearing down against the shoulder in the hub of the pump cover. Position a bronze thrust washer in the recess in the center of the pump cover.

10. Carefully remove the dial indicator and support from the turbine assembly. Place it firmly on the thrust washer on the pump cover with indicator plunger extension bearing against the inner race of the pilot bearing (Fig. 40). *Avoid changing the zero setting of the dial indicator.*

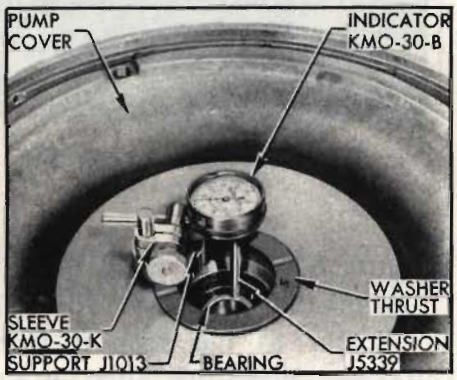

Fig. 40. Dial indicator on pump cover

11. The dial indicator reading should now be .002 to .010 moving clockwise from the zero mark because the distance measured in paragraph 10 must be .002 to .010 *less* than the distance measured in paragraph 8. This distance is required to allow operating clearance for the first turbine in its position between the pump cover and the second turbine.

12. If the dial indicator reading is not within .002 to .010, another washer must be substituted. Washers are available in the following sizes:

THICKNESS	MARKED
.052-.055	5
.060-.063	6
.068-.071	7

13. Install the twin turbine assembly on the input shaft. Turn the input shaft to mesh the planet pinions with the sun gear.

14. Select the three bolt holes on the front face of the converter (X) that are aligned with the center of the hub and one of the counterbore recesses adjacent to the hub. Mark these holes (Fig. 41). They are to be used for the flywheel to pump driving bolts.

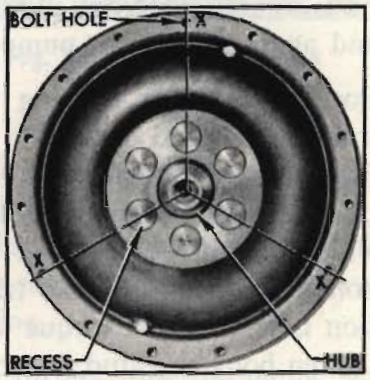

Fig. 41. Location of driving bolt holes

15. Install a new "O" ring seal on the converter pump cover. Check to see that the seal is not twisted, has even tension all around and that surfaces are clean.

16. Coat the selected thrust washer with grease so that it will adhere in place in the recess of the pump cover. Position the cover on the pump so that the three marked driving bolt holes are not aligned with any bolt hole in the pump cover rim where a balance weight is located.

17. Install the bolts, plain washers and nuts in all bolt holes except the three driving bolt holes. Insert the shank of an 11/32" drill through a drive bolt hole to align all holes. Tighten all bolts to 5 ft.-lbs. torque

in the numerical sequence shown in Fig. 42. Retighten all bolts in the same sequence to 25-30 ft.-lbs. torque. Insert the blade of a screw driver between the bolt head and the pump to prevent the corner of the bolt head from digging into the pump.

18. Screw the socket set screw and lockwasher into the input shaft through the opening in the pump cover hub.

19. Remove the reverse band adjustment cover. Move the shift lever to the Park position. Using a screw driver, pry up on the reverse band operating lever to lock the input shaft. Using a torque wrench, tighten the socket set screw to 25-30 ft.-lbs. torque (Fig. 43).

20. Install the large hex plug and gasket in the hub of the pump cover and tighten securely. Install the adjustment cover and gasket.

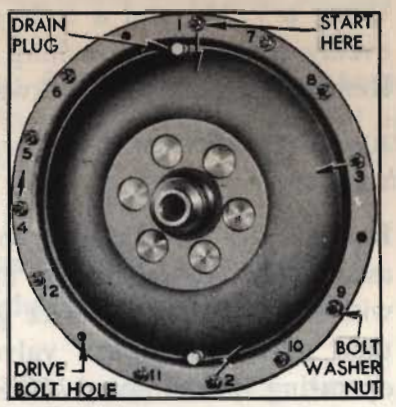

Fig. 42. Bolt tightening sequence

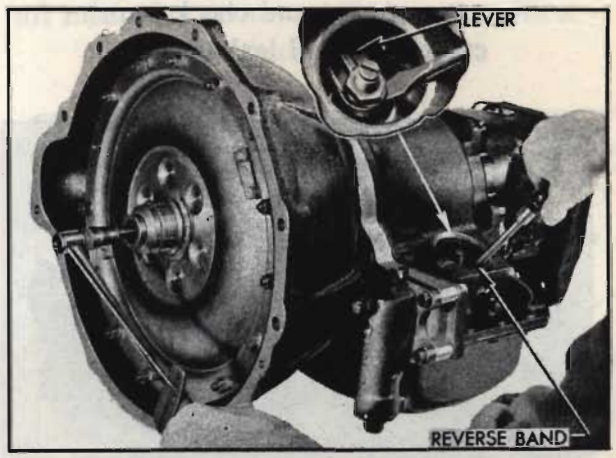

Fig. 43. Tightening set screw

Valve and Servo Body Overhaul

Removal of Valve and Servo Body Assembly

1. Using a ½″ socket and speed handle, remove the bottom oil pan attaching bolts. Remove the oil pan and gasket.
2. Remove the oil screen. Remove the following:
   a. Suction pipe spring support.
   b. Retaining spring.
   c. Suction pipe.
   d. Suction pipe gasket from recess in valve body.
3. Using a long screwdriver, press down on operating rod to disconnect it from the valve operating lever (Fig. 44). (A spring loaded socket engages a ball stud on lever.)

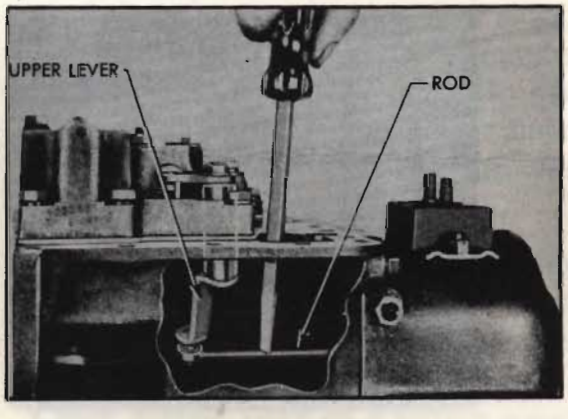

Fig. 44. Disconnecting valve operating rod from upper lever

4. Using a 7/16″ and a 1/2″ socket evenly loosen all attaching bolts. Remove all bolts and lockwashers.

CAUTION: *Do not loosen the slotted nuts which attach servo body to valve body.*

5. Remove the valve and servo body assembly by prying lightly upward with a screw driver to free gasket, then push the control valve and operating lever inward. Grasp the assembly and remove from the transmission case (Fig. 45). Remove gasket and check imprint for evidence of oil leakage.

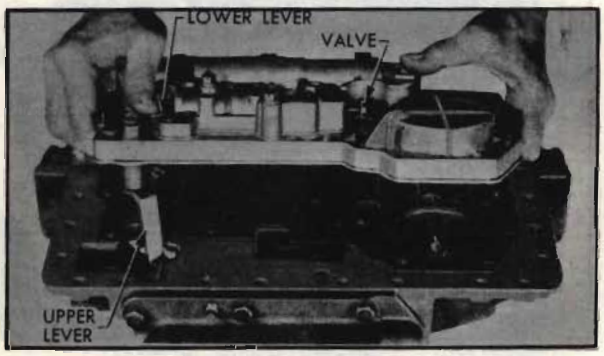

Fig. 45. Removing valve and servo body assembly

6. Remove the reverse band operating strut by first extending your fingers through the adjustment hole to prevent strut from falling into the case and then raising the operating lever and removing the strut (Fig. 46).

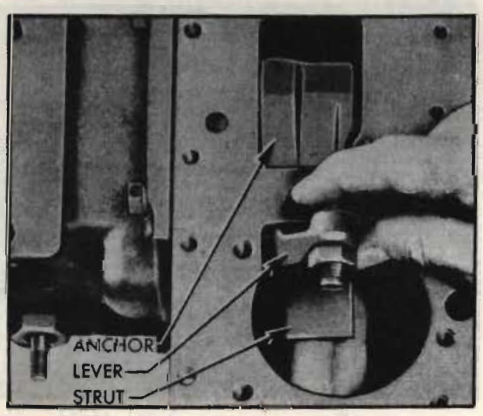

Fig. 46. Removing reverse band operating strut

Disassembly of the Valve Body

CAUTION: *Do not allow valves to contact each other. Burrs and nicks may result. Wrap each valve separately. Be careful that sharp edges of valves do not cut your fingers.*

1. Using a 7/16″ socket, remove the safety nuts and washers. Then separate valve body from servo body. Slide the shift control valve from the valve body. Carefully check the gasket for evidence of oil leakage.
2. To avoid losing the rear pump delivery check valve and spring, remove them from the servo body.
3. Remove the large pressure regulator valve plug from valve body. This plug is spring loaded, so extreme care must be exercised. Remove both springs and the spring seat (Fig. 47).

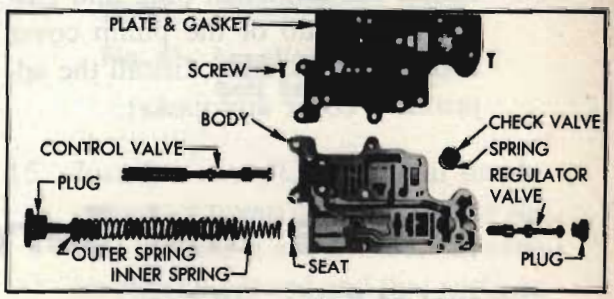

Fig. 47. Valve body disassembled

4. Remove the small pressure regulator plug. Remove the pressure regulator valve.
5. Remove the valve body plate and gasket. Immediately examine gasket for evidence of oil leakage. Remove the front pump delivery check valve and spring.

Disassembly of Servo Body

1. Using a ½″ box wrench, remove the nut which attaches the lower operating lever to the upper lever and shaft. Remove both levers (Fig. 48).

2. Remove the servo body spacer plate attaching screw from servo body at reverse servo. This screw is directly in line with the low servo. Place a 1" x 1" x 13" wooden block across the reverse and low servo spring seats (Fig. 49).

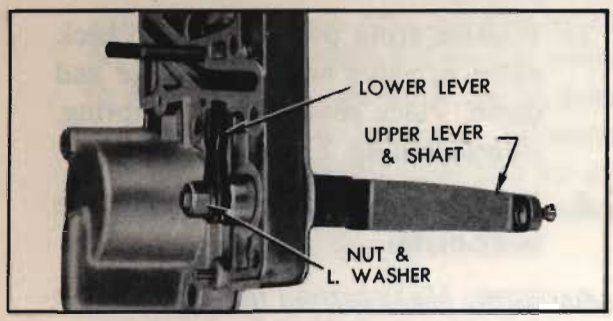

Fig. 48. Installation of valve operating levers

3. While pressing the block down firmly, loosen and remove all spacer plate attaching screws. Slowly release pressure on block allowing springs to expand. This procedure must be followed with care to avoid springing the spacer plate and to prevent the springs from flying out. Remove the spacer plate and gasket. Immediately inspect gasket for evidence of oil leakage.
4. Remove both the low and reverse piston spring seats, springs and pistons. Remove the ball check from the reverse servo feed passage (Fig. 50).

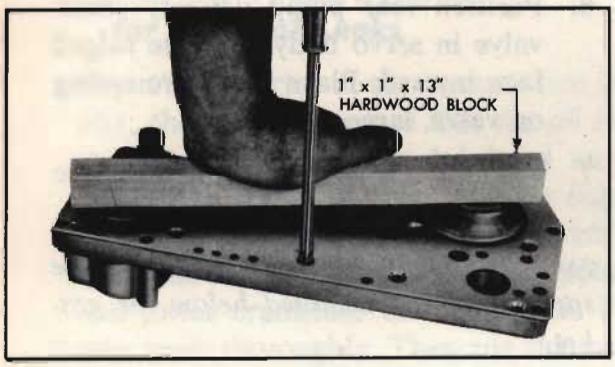

Fig. 49. Removing servo body spacer plate

NOTE: *Earlier model valve bodies did not have the ball check but did have an anchor piston.*

Cleaning and Inspection of Valve and Servo Bodies

1. Allow parts to remain in a soaking solution until all gum, varnish, etc. deposits are loosened. Brush each part to remove all deposits. Blow parts off with compressed air.

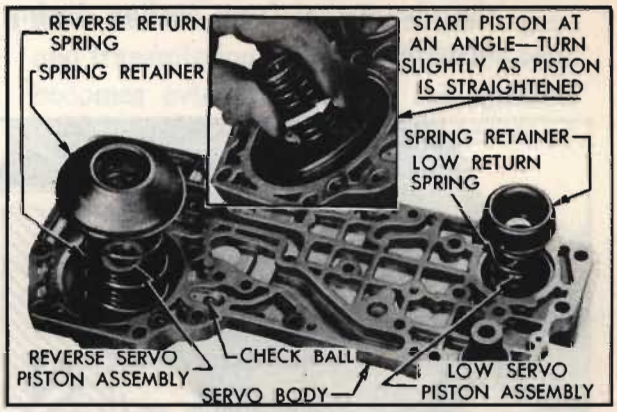

Fig. 50. Parts installed in servo body

2. Inspect each individual part *carefully* for cracks, scores, damage to gasket surfaces, scored valve cylinders, etc.
3. Inspect the shift control valve and the pressure regulator valve for nicks, scores or scratches. A valve may be polished with crocus cloth. Do not use emery cloth or sandpaper since foreign particles can become embedded in valves.

CAUTION: *Do not round off sharp edges of valves. This will permit particles of foreign matter to work in between valves and bodies causing a sticking condition. Check manual valve on a surface plate. Replace if it is bent.*

4. Replace worn, damaged or dried out piston seals. When replacing piston seals, be sure that the seal lip fits over the smaller diameter land (Fig. 51).
5. Clean oil screen. Check for holes which might allow small foreign particles to pass through screen.

Assembly of Servo Body

1. Lubricate the low and reverse servo pistons. Install in servo body by tilting piston as it is inserted then rotating slightly as it is straightened (Fig. 50). This method will prevent the piston seal from curling during installation.

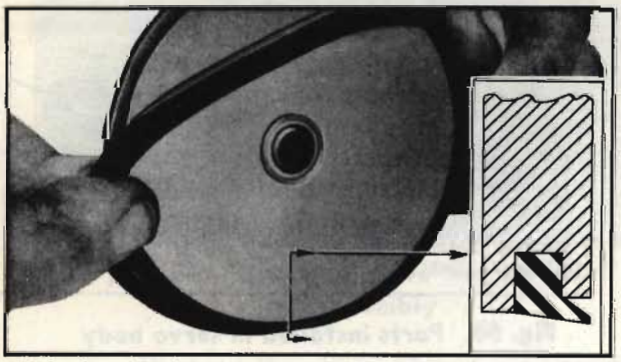

Fig. 51. Installation of servo piston seal

2. Install the low servo return spring with the small end against the low servo piston.
3. Install the reverse servo return spring with the large end against the reverse servo piston. Install the spring seats on the upper ends of both springs (Fig. 50).
4. Place the ball check in the reverse servo feed channel (Fig. 50).
5. Install a new spacer plate gasket. Position spacer plate over spring seats. Using 1″ x 1″ x 13″ wooden block, compress servo springs and install the spacer plate screws (Fig. 49).
6. Install valve operating upper lever shaft through bearing in valve body. Position the upper lever so that it points away from the low servo. Install the lower lever on shaft (Fig. 48).

Assembly of Valve Body

1. Position front pump delivery check valve in valve body with large end down. Place check valve on spring, ridged side up. (Fig. 47).
2. Using a new gasket, install valve body plate.

CAUTION: *Make certain that check valve is seated against the plate and is not caught under the gasket.*

3. Position the pressure regulator spring seat on the inner spring. Install the spring seat and inner and outer springs. Install the large valve body plug and tighten to 20-25 ft.-lbs. torque.
4. Check the pressure regulator valve end land to be sure that orifice is clear. Install in valve body with this land outward. Install plug and tighten to 20-25 ft.-lbs. torque.
5. Install the shift control valve. Slotted end of valve must be at the same end as the large pressure regulator plug.
6. Position rear pump delivery check valve in servo body with the ridged face inward. Place the valve spring on valve, large end up.
7. Using a new gasket, install the valve body on the servo body.

CAUTION: *The pump delivery check valve spring must be installed below the gasket.*

Install the plain washers and safety nuts. Tighten to 11-15 ft.-lbs. torque.

Oil Leaks

When attempting to cure an oil leak, always make every possible effort to diagnose the trouble while the transmission is still in the car.

When a transmission is found to be consistently more than one pint low on oil per 1000 miles, make a thorough check to determine the reason. If an oil pressure check shows operating pressures low, it is also advisable to inspect for external leaks. External leaking of some gaskets will cause low oil pressure.

If no external oil leaks are visible after thorough examination, check the lubricant level in the rear axle housing. An overfilled rear axle housing indicates that transmission fluid is getting by the propeller shaft spline seal. If this is true, disconnect the rear end at the torque ball flange and replace the propeller shaft seal.

CAUTION: *Drain the rear axle housing and discard the diluted lubricant. Replace with lubricant of the recommended specification.*

When it becomes necessary to remove and disassemble a Dynaflow, pay particular attention to the imprint on each gasket for indications of oil leakage.

Inspection of the Dynaflow for External Leaks

When the exterior of the transmission is oily, check to make sure that the oil in question is transmission lubricant and not engine oil. It is quite possible that engine oil caught in the airstream will cover the transmission. Check the upper and lower crankcase of the engine. If oily, wash thoroughly. Then run the engine and inspect for leaks. Correct such leaks as required.

When checking for transmission leaks, it is best to raise the car on a free wheel lift so that the engine can be run with the wheels free to turn. If a lift is not available, car stands can be used for this purpose. Remove the bell housing cover. Using a non-inflammable cleaner, such as carbon-tetrachloride, wash the inside of the bell housing, flywheel and primary pump as far as possible. This is necessary since it is impossible to locate a leak unless the surfaces are clean and dry.

Start the engine and place the selective lever in Direct Drive. Allow the engine and transmission to warm up until a leak becomes evident. Shut off the ignition and carefully inspect for evidence of fresh oil at the following points:

1. The Low or Reverse band adjusting screw hole covers.
2. The transmission oil gauge rod filler pipe.
3. The rear bearing retainer at the flanges, the cross shaft bearing seal and the torque ball assembly.
4. The transmission oil pan and drain plug.
5. The high and low accumulators, caps and gaskets.
6. The reaction shaft flange to the front oil pump cover and the reaction shaft flange to the transmission case.
7. The front face of the flywheel and the interior of the bell housing.

Although evidence of oil leakage may not show on the interior of the bell housing, the following check should be made. Hold a piece of white paper or cardboard between the flywheel and the bell

housing. Start the engine and allow it to run for several minutes. Remove the paper or cardboard and note if any oil spray is visible. An oil spray indicates that the primary pump is leaking. Make a similar test to check for front pump leakage. Insert a long roll of paper toward the pump, start the engine and allow it to run for several minutes. Remove the roll of paper and note if there is any oil spray on it.

Since the operating oil pressures of Low range are considerably higher than Direct Drive, make the same tests outlined above in Low Range with engine speed set at approximately 1000 RPM.

Oil Leaks at Adjusting Screw Hole Covers

To correct an oil leak at this point, remove the cover and replace the gasket. In rare instances the cover may also have to be replaced with a new one.

Oil Leaks at Oil Gauge Rod Base

An oil leak at the connector hose of the filler pipe may be corrected by tightening the hose clamps or replacing the hose. A leak at the junction of the filler pipe and the oil pan can be rectified by silver soldering the joint or by replacing the oil pan.

Oil Leaks at Rear Bearing Retainer

An oil leak at the cross shaft bearing seal can be corrected by removing the bearing and replacing the seal. Installation of the new seal must be made with the grooved side facing inwards.

An oil leak between the rear bearing retainer housing and the transmission case can be corrected by tightening the seven 3/8" bolts to 35-40 ft.-lbs. torque while the transmission is at normal operating temperature. If tightening these bolts fails to cure the leak, the rear bearing retainer must be removed for inspection and the gasket replaced.

If there is an oil leak at the torque ball, carefully examine the rubber boot for cracks and proper installation at either end. Using a torque wrench, tighten the retainer bolts to 30-35 ft.-lbs. If the leak persists, it will be necessary to remove the torque ball assembly for inspection of parts and gaskets. Replace parts or gaskets as required.

Oil Leaks at Oil Pan Gasket

To correct an oil leak at this point, tighten all attaching nuts and bolts to 15-18 ft.-lbs. torque with the transmission warm. If tightening the nuts and bolts fails to cure the oil leak, remove the oil pan for inspection and replacement of the oil pan gasket.

Remove the old gasket and inspect the pan carefully. Check the mounting flanges with a straight edge. If the flanges are not true or the pan is cracked or distorted, replace the pan.

Install the pan using new gaskets and tighten to 15-18 ft.-lbs. Allow the transmission to come to normal operating temperature and re-torque all attaching nuts and bolts.

Oil Leaks at Accumulators

To remedy a leak at the accumulator cap, remove the cap and coat the threads with Aviation Cement No. 3. Install the cap using a new gasket and tighten to 40-50 ft.-lbs. torque.

An oil leak at the accumulator body gasket may be cured by tightening the attaching nuts and bolts to 20-25 ft.-lbs.

torque after inspecting for broken flanges. If a flange is broken, the accumulator must be replaced. If the leak persists, remove the accumulator for inspection and replace the gasket. An indication of the cause of the leak may be found by checking the imprint on the gasket. Use a straight edge to check the body surface. If it is not absolutely true, disassemble the accumulator and use emery cloth to true up the body surface on a face plate. A cracked or porous accumulator body requires replacement of the complete accumulator assembly. Reinstall the accumulator with a new gasket positioned so that the small drain hole lines up with the drain hole in the reaction shaft flange. Tighten all nuts and bolts to 20-25 ft.-lbs. torque while the transmission is at operating temperature.

Oil Leaks at Reaction Shaft Flange on Front Oil Pump Cover

If the oil leak is between the reaction shaft flange and the transmission case, tighten the accumulator bolts to 40-50 ft.-lbs. torque. If the leak is between the reaction shaft flange and the front oil pump cover, tighten the bolts and nut at the outer lower corners of the pump cover. If the leak persists after tightening, it will be necessary to remove and disassemble the transmission to determine the cause of the leak. It is extremely important that an inspection of the old gaskets be made at this time.

Oil Leaks in the Interior of the Bell Housing

Fresh oil on the front face of the flywheel is probably caused by loose converter drain plugs. If the plugs are not leaking, the engine rear main bearing may be allowing engine oil to get on the face of the flywheel.

If a leak at the primary pump cover is indicated by the test described, tighten all primary pump cover bolts to 30-35 ft.-lbs. torque following the correct sequence. If leakage persists, it will be necessary to remove and disassemble the transmission for further inspection.

If a leak at the front oil pump is indicated, it will be necessary to remove and disassemble the transmission for further inspection and correction of the complaint.

Before removing the transmission it is advisable to clean and dry the interior of the unit. Run the engine for several minutes. This procedure will leave a marking of oil on the parts which will help localize the trouble.

Internal Oil Leaks

An internal oil leak affecting transmission performance may be indicated by oil pressure tests. Low oil pump or accumulator pressures may be caused by a faulty pressure regulator or by leakage between the servo and valve bodies or between the valve body and the case. Since the pressure regulator or gaskets may be at fault, it is advisable to remove the valve body assembly for inspection at this time. This can be done without removing the transmission from the car. If inspection of the valve body and gaskets fails to show the cause for internal leakage, remove the accumulators and gaskets for inspection.

If the cause of the internal leakage is not disclosed at this point, remove and disassemble the transmission paying particular attention to all parts and gaskets which might cause this condition.

SPECIFICATIONS

Torque Specifications

The use of a reliable torque wrench is strongly recommended. The following specifications are for clean and lightly lubricated threads only, since dry or dirty threads cause increased friction which does not allow a true torque measurement.

When tightening certain nuts and bolts it is necessary that they be tightened in the correct sequence. Failure to use the recommended torque and tightening sequence may cause broken bolts, distortion of the parts or oil leakage.

The following specifications are specifically for a 1952 Dynaflow but can be generally used for all models.

Part	Location	Thread Size	Torque Ft.-Lbs.
Bolt	Accumulator body to case	5/16-18	20-25
Nut	Accumulator body to flange stud	5/16-24	20-25
Cap	Accumulator body	1-3/8-12	40-50
Nut	Band adjusting screw, lock	1/2-20	20-25
Bolt	Bell housing to case	3/8-16	35-40
Bolt	Bell housing to flywheel housing	7/16-14	45-55
Bolt	Bell housing and hand hole covers	5/16-18	15-18
Nut	Bell housing to reaction shaft flange stud	5/16-24	24-30
Bolt	Control detent to steering gear	5/16-18	15-20
Bolt	Control lever housing to shaft	5/16-18	10-15
Bolt	Converter primary pump to cover	5/16-24	25-30
Nut	Front oil pump to reaction shaft flange bolt	5/16-24	25-30
Screw	Front to rear planet carrier	5/16-24	25-30
Seat	Lubrication oil pressure regulator valve	1-1/8-12	20-25
Bolt	Mounting pad to rear bearing retainer	3/8-16	30-35
Bolt	Oil cooler to transmission case	5/16-18	15-18
Bolt	Oil pan to case	5/16-24	15-18
Plug	Oil pan drain	18 MM	30-35
Nut	Oil pan to reaction shaft flange stud	5/16-24	15-18
Bolt	Oil pump cover to reaction shaft flange	3/8-16	35-40
Nut	Oil pump cover to reaction shaft flange stud	5/16-24	25-30
Plug	Pressure regulator hole, right	1-1/8-12	20-25
Plug	Pressure regulator hole, left	5/8-18	20-25
Bolt	Rear bearing retainer to case	3/8-16	35-40
Bolt	Rear oil pump to case	5/16-18	25-30
Bolt	Servo body to case	5/16-18	15-20
Nut	Shift idler lever pin	3/8-24	10-15
Sleeve	Speedometer, driven gear	15/16-16	45-50
Bolt	Torque ball retainer to rear bearing retainer	3/8-16	30-35
Bolt	Torque converter to flywheel	5/16-24	25-30
Bolt	Universal joint to planet carrier	1/2-20	30-35
Bolt	Valve body and servo body to case	1/4-20	11-15
Nut	Valve body to servo body stud	1/4-28	11-15
Nut	Valve operating cross shaft to lever	7/16-20	15-20
Nut	Valve operating lever shaft	1/4-28	10-15

General Specifications

Car speed when front pump cuts out, approximate MPH	45-50
Converter pumps	2
Secondary pump mounting	Free-wheel Clutch
Converter turbine	1
Converter stators	2
Stator mountings	Free-wheel Clutches
Drain and refill mileage recommendation	25,000
Front oil pump drive	Engine
Lubrication feed pressure, psi	15-20
Number of direct drive clutch plates	
Driving (int. splined, faced)	5
Driven (ext. splined, steel)	5
Number of low planet pinions	3
Number of oil pumps	2
Number of reverse planet pinions	3
Oil capacity — qts.	
Series 40-50 converter only	6
Series 40-50 total	*8-½
Series 70 converter only	8
Series 70 total	*10

* NOTE: *A completely dry transmission requires 1¾ pints more than amounts given above.*

Oil quantity indicated between marks on gauge rod	1 pt.
Oil specification—	
Factory	Special Buick oil for Dynaflow drive
Petroleum suppliers	*Automatic Transmission fluid, Type A*

* *Must be identified by "AQ-ATF" number embossed on can.*

Planetary gear set type	Dual pinion
Pump pressure regulation in P, N and D, psi	80-90
Pump pressure regulation in L and R, psi	160-190
Rear oil pump drive	Output shaft
Torque multiplication	
Converter at stall	2.25 to 1
Planetary gears, Low and Reverse (ratio)	1.82 to 1
Converter at stall and gears in Low or Reverse	4.07 to 1

Test and Assembly Specifications

Band adjustment, L and R—tighten screw, back off to obtain slight play, then back off	6 turns
Bell housing—Max. allowable runout of pilot hole	.004"
Bell housing—Max. allowable runout of rear face at 3¾" radius	.005"
Control detent and dial pointer adjustment	As described in Text
Converter primary pump—Max. allowable runout of hub, when installed on flywheel	.012"
Flywheel—Max. allowable runout of rear face	.008"
Primary pump test for leakage with cover installed, air pressure-psi	80-100
Shift control valve—clearance to stop pin in parking position	.030" - .040"
Shift lever—spring travel of lower end in parking position	1/8" - 3/16"

Dynaflow Production Limits and Fit of New Parts

NOTE: *The specifications that follow apply to new parts only. Used parts will show a degree of wear and should not be replaced simply because they slightly exceed the dimensions shown.*

Accumulators

Piston—diameter	1.2485" - 1.2490"
Clearance of piston in body	.0005" - .0020"
Metering orifice, low accumulator	.0625"
Check ball retaining pin, diam., high accumulator	.123" - .125"
Pin hole in high accumulator body, drill size	.147"

Clutch

Clearance between low drum and bushing	.002" - .005"
Piston inner oil sealing ring—width	.092" - .093"
Piston inner oil sealing ring clearance in groove	.002" - .006"
Low drum hub—outside diameter	2.433" - 2.435"
Clearance between hub of piston and drum	.002" - .006"
Clutch plates, steel—thickness	.068" - .070"
Clutch plate, steel—cone or "dish"	.010" - .014"
Thrust washers—thickness	.060" - .063"

Converter Assembly

Converter spacer—thickness	.060"
Converter shim washer—thickness	.018"
Pump and stator free wheel rollers—diameter	.3123" - .3125"
Stator free wheel race—diameter	
Series 40-50	2.1870" - 2.1875"
Series 70	2.4995" - 2.5000"
Primary pump hub at rollers—diameter	
Series 40-50	2.1870" - 2.1875"
Series 70	2.4995" - 2.5000"
Primary pump hub at oil pump bushing—diameter	1.747" - 1.748"
Clearance between primary pump hub and front oil pump bushing	.0015" - .0035"

Front Oil Pump

Clearance between drive gear and crescent, with gear held away from crescent	.010" - .016"
Clearance between driven gear and crescent, with gear held away from crescent	.005" - .009"
Drive and driven gear lash	.003" - .006"
Gear pocket depth in pump body	.5625" - .5635"
Drive and driven gear—thickness	.5610" - .5615"
Gear end clearance in body	.001" - .0025"

Planetary Gear Set and Reverse Ring Gear

Planet carrier—outside diameter	4.769" - 4.771"
Clearance between ring gear bushing and planet carrier	.008" - .012"
Planet carrier journal at transmission case bushing—diameter	2.3715" - 2.3725"
Clearance between planet carrier and transmission case bushing	.002" - .004"
Planet carrier output shaft journal—diameter	1.163" - 1.168"
Clearance between output shaft and rear bearing retainer bushing	.001" - .006"
Input shaft rear journal—diameter	.810" - .811"
Clearance between input shaft and planet carrier bushing	.001" - .003"
Thrust washer thickness	
Bronze washers	.060" - .063"
Planet carrier, steel	.060" - .064"
Planet pinion, steel	.0235" - .0265"

Reaction Shaft Flange

Oil sealing ring—width	.092" - .093"
Oil sealing ring clearance in groove	.002" - .006"
Low drum bushing—diameter	1.933" - 1.935"
Clearance between bushing and drum	.002" - .005"

Rear Oil Pump

Clearance between drive gear and crescent, with gear held away from crescent	.006" - .012"
Clearance between driven gear and crescent, with gear held away from crescent	.0045" - .007"
Drive and driven gear lash	.003" - .006"
Pump body gear pocket—depth	.376" - .377"
Drive and driven gear—thickness	.3745" - .3750"
Gear end clearance in body	.001" - .002"

Valve and Servo Body Assembly

Oil pressure regulator valve—diameter, large end	.5610" - .5615"
Oil pressure regulator valve—diameter, small end	.3980" - .3985"
Clearance between regulator valve and body—both ends	.001" - .002"
Shift control valve—diameter	.5610" - .5615"
Clearance between shift control valve and body	.0005" - .0020"

ENGINE AND TRANSMISSION RELATIONSHIP

Peak engine performance and proper automatic transmission operation are dependent on each other. The following explanation will serve to demonstrate the extremely close relationship that exists between the engine and the 1953-1957 Powerglide transmission.

Engine power output must be in accordance with transmission gear ratio and vehicle speed. When these factors are maintained in exact relationship, performance and economy are at a peak.

Engine power output is controlled by carburetor throttle opening which in turn is determined by the position of the accelerator pedal. Transmission shift timing is controlled by the position of the transmission throttle pressure valve which is motivated by the accelerator pedal. Since both the carburetor throttle valve and the transmission throttle pressure valve are motivated by movement of the accelerator pedal, it is apparent the two are inter-related.

In order to understand the relationship, it is necessary to know the function of the governor and the throttle pressure valve.

A centrifugal weight governor, driven by the output shaft of the transmission, delivers "governor pressure" to one end of the shifter valve located in the control valve body. The shifter valve will move when vehicle speed has rotated the governor fast enough to furnish sufficient governor pressure.

If the governor alone controlled the speed at which the transmission shifted, the shift would always take place at the same vehicle speed. This would not be desirable since a higher or lower shift point must be determined by both speed and power requirements. When climbing a steep grade the shift point must be higher than it is when driving on a level road.

In order to provide a shift at variable vehicle speeds "throttle pressure" is directed to the other end of the shifter valve to oppose "governor pressure" and retard the upshift. "Throttle pressure" is provided by movement of the throttle pressure valve which in turn is governed by accelerator pedal position. "Throttle pressure" is variable with carburetor throttle opening.

If the above relationship is not maintained, several undesirable conditions will result. If "throttle pressure" is below normal at a particular throttle opening, the shifts will occur at too low a vehicle speed. This places an undue burden on the engine since gear ratio at the transmission is too high and not in accordance with power requirements.

When "throttle pressure" is too high at a particular throttle opening, the shifts will not take place until a high vehicle speed is reached. This causes the engine to race excessively, resulting in poor engine economy.

A number of engine conditions radically affect proper relationship between engine and transmission. When carburetor mixture, engine timing, or ignition parts including secondary wiring, contacts, condenser, bakelite parts and coil, are not up to specifications, wider throttle opening is necessary to increase engine performance. This in turn moves the throttle pressure valve to a more open position, thus delaying the upshift.

Although the foregoing explanation points out a general relationship between the engine and transmission, many other conditions may be caused at the transmission by not maintaining the critical adjustments necessary when performing an engine tune-up. Rough shifting, momentary slippage, erratic shifting, etc., can also be traced to improper engine tune-up.

Slippage

Slippage can be caused by many conditions. Burned clutches, leaking seals, low oil level, improperly adjusted bands, etc. can be the reason why the condition exists. To pinpoint the trouble a definite procedure should be followed. This will eliminate wasted time and effort.

The procedure for checking out a slippage condition follows:

1. Check the transmission oil level as outlined on page 77.

NOTE: *Checking the oil level is always the first step in the diagnosis procedure. If the oil level is not within the limits established by the car manufacturer a proper diagnosis cannot be made.*

2. Adjust the linkage as outlined on pages 89-90-91-92-94-95.
3. Perform a stall test as outlined on page 78.
4. Road test the vehicle as described on page 77. The road test will pin-point the driving range, speed and conditions under which the slippage occurs.
5. Perform an oil pressure test as outlined on pages 81-85. The oil pressure test is helpful in determining the cause of the slippage condition.

Excessive Slip in All Ranges

CAUSE

1. Low oil level.

CORRECTION

1. Check oil level as outlined on page 77. Add oil to bring the level up to the "FULL" mark.

CAUSE

1. Low oil pressure.

CORRECTION

1. Check front pump oil pressure. If pressure is low, remove and inspect the pressure regulator valve. If the pressure regulator valve moves freely in its bore, remove the transmission and inspect the front pump.

CAUSE

1. Dirt or foreign particles under the pump check valve.

CORRECTION

1. Remove and disassemble the transmission. Remove the main valve body and inspect the pump check valve.

Excessive Slip in Direct Drive Only

CAUSE

1. Worn clutch discs, worn or broken sealing rings, leaking clutch seals or stuck clutch relief ball check.

CORRECTION

1. Remove and disassemble the transmission. Inspect the direct drive clutch discs, sealing rings, seals and ball check.

Excessive Slip in Low Only

CAUSE

1. Low band slipping due to adjustment, broken low servo ring, worn brake band lining, or worn or defective low band linkage.

CORRECTION

1. Perform Stall Test as outlined on page 78. Adjust low band as outlined on page 95. Remove and disassemble the transmission. Check the low servo piston and ring. Check the condition of the low band and linkage.

Excessive Slip in Reverse Only

CAUSE

1. Reverse band slipping due to adjustment, broken reverse servo ring, worn reverse brake band lining or worn or defective reverse band linkage.

CORRECTION

1. Perform Stall Test as outlined on page 78. Adjust Reverse band as

outlined on page 95. Remove and disassemble the transmission. Check the reverse servo piston and ring. Check the condition of the reverse band and linkage.

High Clutch Failure (Burned Clutches)

It is important that the transmission be checked thoroughly both before and after disassembly to ascertain the cause of clutch failure.

Connect oil pressure gauges to the low servo apply, high clutch and reverse servo test points.

Proceed to make the following tests:

1. 1953-1957
   With the selective lever in Drive range, the high clutch gauge should build up rapidly after the shift takes place. A slow build up of pressure indicates a restriction in the high clutch apply orifice in the low drive valve body, or oil passages which are not completely drilled.
2. 1950-1952
   With the selective lever in Drive Range, the high clutch gauge should build up rapidly. A slow build up of pressure indicates a restriction in the high clutch apply orifice.
3. 1950-1957
   Move the selective lever to Low Range. Check the high clutch pressure gauge. If pressure is shown, leakage past the low servo piston ring is indicated. This will result in partial application of the clutch causing the clutch plates to burn or wear.
4. 1950-1957
   Move the selective lever to Reverse. Check the high clutch pressure gauge. If pressure is shown, leakage between the converter out and low servo release channels, in the valve body, or a damaged housing to valve body gasket is indicated. This condition can cause the clutch to drag. When the transmission is in Reverse the clutch discs are rotating in opposite directions. The drive discs are rotating 2.43 times the driven discs. A very slight drag can burn out the clutch.

NOTE: *The valve body should be carefully checked for porosity or sand holes. Carefully check the gasket between the valve body and the transmission housing.*

Slippage in Low Range (Chatter) 1953-1957

Adjust the low band as outlined on page 95. If this does not cure the condition oil may be leaking past the low servo piston ring due to a broken piston ring or scored piston bore and ring. This allows oil to leak into the clutch apply circuit in greater volume than the high clutch orifice can handle. This results in sufficient pressure built up to partially apply the clutch at the same time that the low band is being applied.

Diagnosis of the above condition can be made by connecting pressure gauges to the low servo apply and the high clutch (release side of the low servo) test points.

Place the selective lever in Low Range, apply brakes and fully depress the accelerator pedal (Stall Test). Check the pressure on both gauges. If conditions are normal the low servo apply gauge will register:

MODEL	
1953-57	85 to 95 lbs.
1950-52	160 to 200 lbs.

The high clutch gauge should register zero.

If the high clutch gauge registers pressure, oil is leaking into the clutch apply circuit.

Noises

Before removing the transmission from the vehicle it is absolutely essential that a complete road test be made and the trouble pin-pointed accurately. Drive the vehicle through all ranges and operating conditions and carefully note the driving range, speed and operating conditions under which the noise is audible. Visual inspection may not show up the difficulty when the transmission is disassembled.

Some slight noises are characteristic of any planetary gear train when it is in neutral without the steadying effect of a load.

Noisy Front Pump

CAUSE

1. A front pump noise may be audible in any Drive range, Neutral and Park with the engine running. This noise is usually recognized as a whine which increases in pitch with higher engine RPM.

   To test for a front pump noise, drive the vehicle at approximately 40 MPH in Drive Range. Move the selective lever to Neutral, turn off the ignition and allow the vehicle to coast. Since the front pump is driven by the engine, when the ignition is turned off the front pump will cease to operate. If the noise disappears the trouble is caused by the front pump.

CORRECTION

1. *Remove and disassemble the transmission. Replace the front pump.*

Noisy Rear Pump

CAUSE

1. A rear pump noise is audible only when the vehicle is moving since it is driven by the transmission output shaft. This noise is usually recognized as a whine which increases in pitch with vehicle speed.

   To test for a rear pump noise, drive the vehicle at approximately 40 MPH in Drive Range. Move the selective lever to Neutral, turn off the ignition and allow the vehicle to coast. Since the rear pump is driven by the transmission output shaft when the ignition is turned off, the rear pump will continue to operate. If the noise is still audible the trouble is caused by a faulty rear pump.

   Under the above conditions a faulty universal joint, driveshaft or differential will be audible.

CORRECTION

1. *Remove and disassemble the transmission. Replace the rear pump.*

Noisy Planetary Gear Train

CAUSE

1. A planetary gear noise may be audible in Neutral, Park, Low or Reverse but will not be audible in Direct Drive. With the transmission in Direct Drive the gear train is locked up as a coupling and the complete assembly rotates.

CORRECTION

1. *Remove and disassemble the transmission. Repair or replace the planetary gear train.*

Noisy Converter

CAUSE

1. A converter noise is usually recognized as a scraping sound which may be audible in any range with the engine running. Raise the vehicle on a lift or stands and listen for noise at the front of the transmission. This noise is rather easy to detect.

CORRECTION

1. *Remove and disassemble the converter as outlined on page 119. Repair or replace parts as required.*

Shifting Difficulties 1950-1957

DIFFICULTY IN SHIFTING FROM LOW TO DRIVE OR FROM DRIVE TO LOW

An improperly drilled high clutch feed orifice in the valve body can cause this difficulty. A restriction at this point results in slow application of the clutch with the selective lever in Drive Range.

An oil pressure test can be made to pin-point this condition. Connect pressure gauges to the low servo apply and high clutch (release side of the low servo) test points.

CAUSE

1. With the engine running at idle speed, move the selective lever from Neutral to Drive. Note the action of the two pressure gauges.

   If the low servo apply gauge shows a much more rapid pressure build-up than the high clutch gauge, a restriction in the high clutch feed orifice is indicated. This may be caused by an incompletely drilled orifice.

CORRECTION

1. *Remove and disassemble the transmission. Check for an incompletely drilled or obstructed high clutch feed orifice. Repair or replace parts as required.*

CAUSE

2. Move the selective lever from Drive to Low Range. Note the action of the high clutch gauge.

   If the oil pressure drops slowly, a restriction is preventing the draining of the oil from the high clutch and release side of the low servo. Clutch drag and slow application of the low band results.

CORRECTION

2. *Remove and disassemble the transmission. Check for a restriction in the high clutch (release side of the low servo) line. Repair or replace parts as required.*

UNABLE TO SHIFT INTO REVERSE WHEN THE ENGINE IS RUNNING (1950-1952)

CAUSE

1. If the selective lever cannot be moved into the reverse position with the engine running, shut off the engine and try to move the selective lever into Reverse. If the selective lever will move to reverse with the engine shut off, the accumulator snap ring is out of position. This permits the accumulator valve and valve body to be forced against the clamp nut on the parking lock lever shaft, by hydraulic pressure, when the engine is running. This prevents the shift to Reverse.

   It is possible to shift to Low Range because the clamp nut is not aligned with the accumulator valve and valve body.

CORRECTION

1. *Remove and disassemble the transmission. Install the accumulator snap ring into the accumulator. Replace the snap ring if necessary.*

Oil Leaks

Oil leakage may be evidenced by oil underneath the vehicle, on the transmission or on adjacent parts. The necessity to add oil at frequent intervals is another indication of oil leakage.

CAUSE

1. Leak at the transmission housing side cover gasket.
2. Leak at the low drive valve body housing cover and the transmission case gasket.
3. Leak at the servo cover and transmission case gasket.
4. Leak between the transmission housing and the transmission case.
5. Leak at the transmission case extension and the transmission case (1955-1957).
6. Leak at the oil cooler pipe connections.
7. Leak at the transmission case extension oil seal.
8. If oil leakage is in evidence at the front of the flywheel housing, remove the plug from the bottom of the flywheel housing. If oil has accumulated at this point, leakage is indicated. The following points should be checked:
   a. The "O" ring seal between the converter cover and the pump assembly.
   b. The front pump "O" ring seal.
   c. The front pump oil seal.
   d. The oil drain in the front pump (may be plugged).
   e. A sand hole in the transmission housing allowing leakage between the oil sump and the converter cavity.

CORRECTION

1. *Replace the transmission housing side cover gasket and tighten attaching bolts to the torque specified on page 123.*
2. *Replace the low drive valve body housing cover and transmission case gasket. Tighten the attaching bolts to the torque specified on page 123.*
3. *Replace the servo cover and transmission case gasket. Tighten the attaching bolts to the torque specified on page 123.*
4. *Tighten the attaching screws. If leak persists, remove and disassemble the transmission. Replace the gasket between the case and housing.*
5. *Replace the case extension gasket. Tighten the attaching bolts to the torque specified on page 123.*
6. *Tighten the oil cooler pipe connections. If leak persists, replace defective parts.*
7. *Replace the transmission case extension oil seal.*
8. *Remove and disassemble the transmission if necessary.*
   a. *Replace the "O" ring seal between the converter cover and the pump assembly.*
   b. *Replace the front pump "O" ring seal.*
   c. *Replace the front pump oil seal.*
   d. *Clear the oil drain in the front pump.*
   e. *Check the transmission housing for leakage.*

Rough Shifts 1953-1957

Closed Throttle Downshift

CAUSE

1. This condition can be caused by high engine idle speed.
2. The closed throttle downshift cushion valve may be stuck in the open position (1955-1957).

CORRECTION

1. *Set engine idle speed to 425 RPM.*
2. *Free up the cushion valve.*

Rough Upshift Above 25 MPH

CAUSE

1. The forced downshift cushion valve may be stuck in the closed position (1955-1957).

CORRECTION

1. *Free up the downshift cushion valve.*

Oil Foaming Out of the Filler Tube

This difficulty may be caused by any one of the following conditions:

CAUSE

1. Oil level too high. The planet carrier is rotating in oil which causes aeration and foaming.
2. A split in the suction pipe. This allows air to be picked up with the oil and aeration of the oil results.
3. A damaged or faulty suction pipe seal. Air is drawn into the hydraulic system which causes aeration of the oil.
4. Bent ears on the suction pipe seal retainer allows air to be drawn into the hydraulic system. Aeration of the oil results.
5. The bore of the suction pipe in the housing is too deep. This prevents compression of the suction pipe seal allowing air to be taken into the hydraulic system. Aeration of the oil results.

CORRECTION

1. *Check the oil level as outlined on page 77.*
2. *Replace the suction pipe.*
3. *Replace the suction pipe.*
4. *Replace the suction pipe and seal retainer.*
5. *Check the housing bore. Replace parts as required.*

CAUSE	CORRECTION
6. A sand hole in the suction bore of the case or the housing. This permits air to be taken into the hydraulic system. Aeration of the oil will result.	*6. Repair or replace parts as required.*
7. A sand hole in the suction cavity in the valve body permits air to be drawn into the system resulting in aeration of the oil.	*7. Replace valve body.*
8. Water in the oil caused by a leak in the oil cooler.	*8. Replace water cooler.*

Transmission Oil in the Cooling System or Water in the Transmission Oil

CAUSE	CORRECTION
1. A faulty transmission oil cooler will cause this condition. Remove the engine radiator cap and check the condition of the coolant. If an oil scum is apparent on the surface of the coolant and clings to the sides of the radiator tank, leakage of oil out of the transmission oil cooler into the engine radiator is indicated.	*1. Repair or replace the oil cooler. Thoroughly flush the engine radiator to remove all of the transmission oil.* *Remove the transmission oil level gauge rod. Examine the rod for evidence of water in the transmission. If water is present, leakage of the transmission oil cooler is indicated.* *Drain the transmission and replace the transmission oil with the grade of fluid specified.*

TESTING

Checking Oil Level

The engine and the transmission must be at normal operating temperature before checking the oil level (Figs. 1 and 2).

Fig. 1. Location of dip sticks

1. Start the engine and allow it to idle.
2. Place the selective lever in the Neutral position.
3. Raise the hood and remove the transmission oil level gauge rod.
4. Wipe the gauge rod dry with a clean wiper and re-insert in the transmission.

Fig. 2. Filling transmission

5. Remove the gauge rod and note the oil level.
6. Add or remove oil to bring the oil level to "FULL" mark on the gauge rod.

CAUTION: *Do not overfill the transmission. If the fluid level is too high, the planetary gear train will aerate the oil causing it to foam. This will result in a loss of power.*

Road Test

Before an attempt is made to diagnose a faulty condition on the road, the transmission and engine must be at normal operating temperature. The manufacturer recommends that the vehicle be driven at least five miles. Then proceed as follows:

1. Drive the car in each range and note any faulty, unusual or abnormal condition.
2. Start the vehicle in Low range and shift to Drive range at about 20 MPH and note any tendency toward slippage during the shift.

3. Check the transmission operation in Drive range after extended operation in Reverse.

4. With the selective lever in Drive, check for slippage of the transmission when flooring the accelerator pedal at low vehicle speeds.

5. Stop the vehicle on a level road. Place the selective lever in Neutral. Accelerate the engine and note any tendency to creep.

6. Allow the engine to idle. Move the selective lever to each driving position, note any abnormal creeping condition.

While road testing the car, be particularly alert for any unusual noises. If a noise is present, carefully note the driving range, speed and condition under which the noise is audible. Other unusual or abnormal conditions such as slippage, rough shifting from reduction to direct drive, etc. should be noted in the same manner.

Do not hurry to finish the road test. A great deal of unnecessary time and effort may be wasted through faulty diagnosis.

Stall Test

1. Check the coolant in the radiator. Heat is built up rapidly during this test. *Do not allow the engine to overheat.*
2. Connect an electrical tachometer to the engine.
3. Start the engine and apply the parking brake and foot brake.
4. Place the selective lever in Drive range and floor the accelerator pedal. Note the highest tachometer reading.
5. Place the selective lever in Low range, floor the accelerator pedal and note the highest tachometer reading.
6. Move the selective lever to Reverse and repeat as above.

CAUTION: *Do not keep the accelerator floored for more than ten seconds because of the rapid rise in temperature. Allow about two minutes between tests to prevent overheating.*

The stall speeds should be almost identical in all ranges. A stall speed between 1560 and 1610 RPM is considered normal for 1950-1954 models and 1955-1957 six cylinder models. The stall speed for 1955-1957 eight cylinder models is 1600 to 1700 RPM.

A tachometer reading slightly under the manufacturers recommended figure may be caused by faulty engine performance. Check the engine before proceeding further.

A tachometer reading several hundred RPM under the manufacturer's recommended figure may be caused by a secondary pump frozen on its hub (1950-1952) or stators slipping on the stator hub (1950-1957).

A variance of more than 100 RPM between ranges indicates slippage in the particular range which reads the highest. A high tachometer reading in all ranges may be caused by insufficient oil pressure.

Representative Pressures

NOTE: All pressures may vary approximately 5% (higher or lower) from the mean pressures shown. Locations of pressure check plugs are shown in Figs. 3 and 4.

1953-1954 MODELS

LOW (Manual)

Idle 450 RPM — 140# Front Pump (Main Line Pressures, Fig. 4).

30 MPH

Location	Part Throttle Road Load	Full Throttle Thru Detent
Low Apply (Fig. 4)	160#	190#
Governor (Fig. 3)	60#	60#

DRIVE (Automatic)

Transmission in Low Range Light Throttle 10 MPH	Transmission in Low Range Thru Detent 30 MPH	Location	Transmission in High Range Light Throttle 30 MPH	Transmission in High Range To Detent 40 MPH
70#	115#	Low Apply (Fig. 4)	55#	120#
0	0	Clutch Apply (Fig. 4)	55#	120#
10#	60#	Governor** (Fig. 3)	68#	75#
	45#	Throttle Valve (Fig. 3)	45#	58#

** *When governor pressure only is being checked, the vacuum line to the modulator must be disconnected to get a proper reading.*

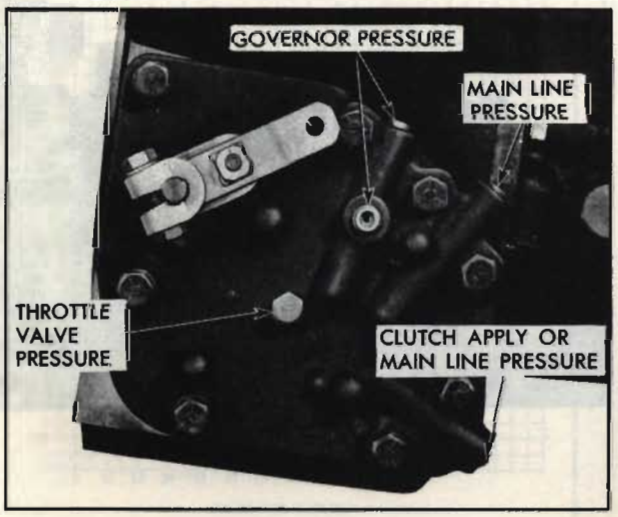

Fig. 3. Check points

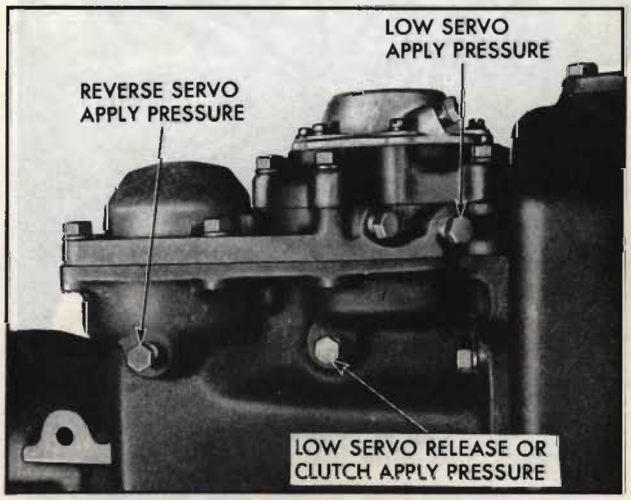

Fig. 4. Check points

NOTE: All pressures may vary approximately 5% (higher or lower) from the mean pressures shown. Locations of pressure check plugs are shown in Figs. 5, 6 and 7.

1955-1957 MODELS

FRONT PUMP PRESSURE

Idle 425 RPM	50# - 60#
Above Idle	85# - 95#
Reverse — Idle 425 RPM	50# - 60#
Reverse — Above Idle	165# - 195#

DRIVE (Automatic)

Transmission in Low Range			Transmission in High Range	
Light Throttle 10 MPH	Thru Detent 45 MPH	Location	Light Throttle 30 MPH	To Detent 45 MPH
85# - 95#	85# - 95#	Low Apply (Fig. 5)	85# - 95#	85# - 95#
0	0	Clutch Apply (Fig. 6)	85# - 95#	85# - 95#
*	*	Governor (Fig. 7)	*	*
**	**	Throttle Valve (Fig. 7)	**	**

* *Refer to Governor Curve (Fig. 8).*

** *Throttle valve pressure will vary from 0 to 62 psi dependent on throttle position. At wide open throttle (thru detent) pressure should read 61 to 63 psi on acceleration.*

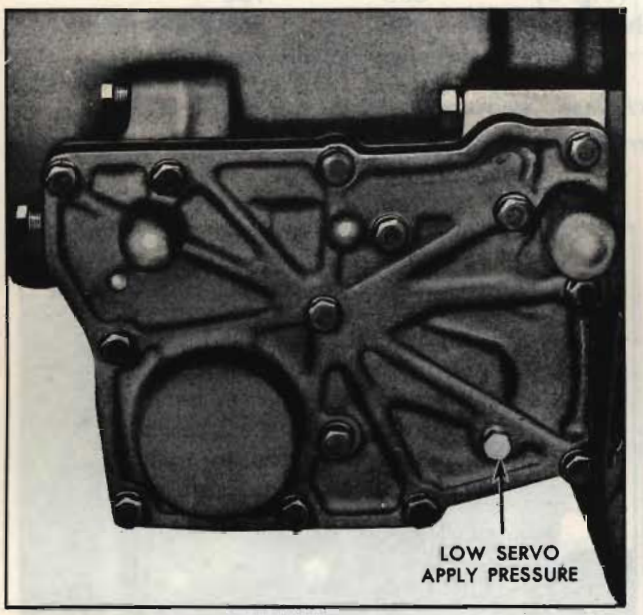

Fig. 5. Check points

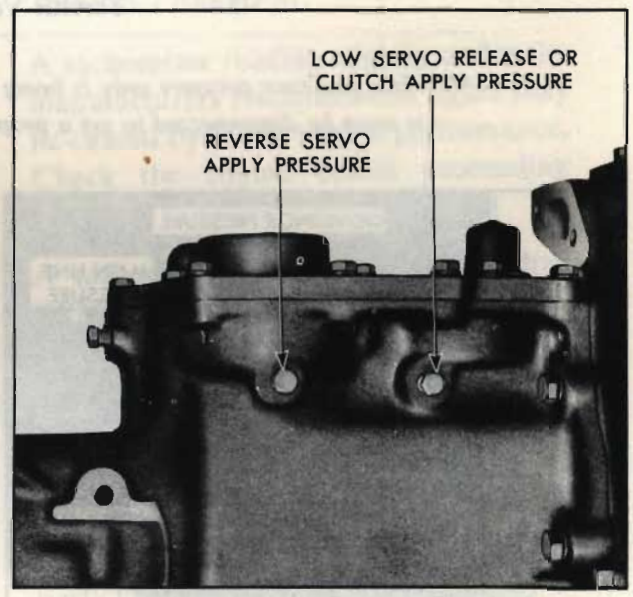

Fig. 6. Check points

Oil Pressure Testing
1950-1952

Unless the oil pressures are within the limits established by the car manufacturer faulty transmission operation will result. The following procedure is typical of the method used on the 1950-1952 models.

1. Raise the vehicle and support it solidly on car stands so that the rear wheels are free to turn.

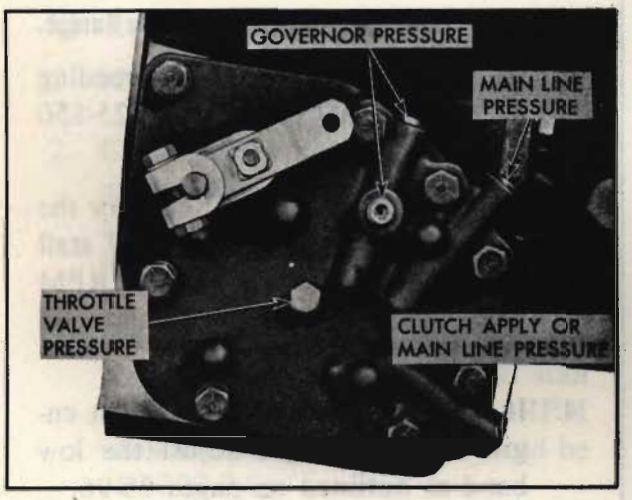

Fig. 7. Check points

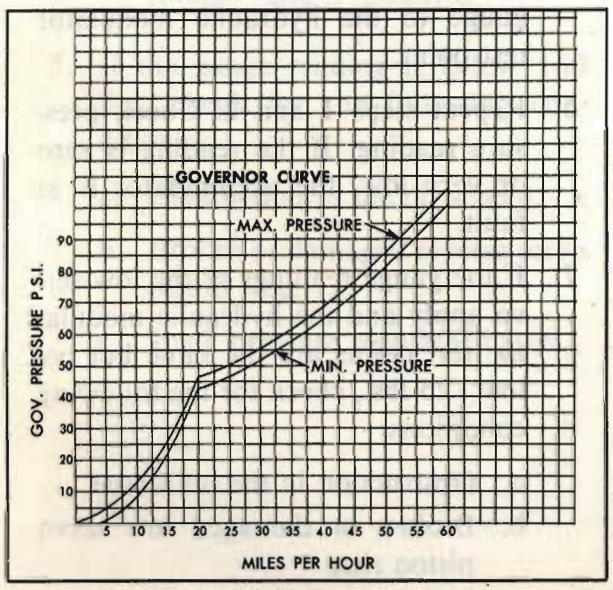

Fig. 8. Governor curve graph

Fig. 9. Connecting pressure gauges

2. A pressure gauge can be connected to each of the following test points: (Fig. 9).
   a. Low servo apply.
   b. Direct Drive clutch (Release side of the low servo).
   c. Reverse servo.
   d. Rear pump.

Connect four gauges, if available and proceed as outlined. It is possible to make a complete pressure test with one gauge by changing test points and comparing the gauge readings.

I. Drive Range

1. Connect an electrical tachometer and set engine idle speed at 430 to 450 RPM.
2. Move the selective lever to "Drive," release the brakes and check idle oil pressure. Gauge should read 40-45 lbs.
3. Depress the accelerator until the speedometer reads 30 MPH. Load the engine by applying the brakes and depressing the accelerator simultaneously while maintaining speed of 30 MPH. If the vacuum modulator is operating correctly the oil pressure will rise each time the test is performed. If the gauge reading does not rise, the vacuum modulator is not working. Check the vacuum line to the modulator for leaks. Recheck. If the gauge reading still does not rise the vacuum modulator is faulty.

   NOTE: *Check the gauges connected to the low servo apply and the high clutch test points while making the modulator test. The gauge readings should be the same with the selective lever in Drive range.*
4. Depress the foot brake and floor the accelerator pedal to check the stall speed. The tachometer should read 1560-1610 RPM. Record oil pressure. Pressure gauge should read 75-100 lbs. If the gauge pressure is normal but the tachometer reading is high, clutch slippage is indicated.

If the oil pressure reading is below the minimum limit with the accelerator pedal fully depressed and the brakes locked, the following items may cause the trouble:

a. Obstructed oil screen.
b. Air leak in the oil suction line.
c. Stuck pressure regulator valve.
d. Leaking clutch piston seals.
e. Leaking clutch drum oil seal rings.
f. Leaking gasket between the valve body and case.
g. Leak between the valve body and the housing.
h. Faulty front pump (excessive clearances).

II. Low Range

1. Move the selective lever to low range.
2. Check the oil pressure gauge reading at idle. Normal pressure is 125-150 lbs. at idle speed.
3. Depress the foot brake and floor the accelerator pedal. The normal stall speed should be 1560-1610 RPM while the pressure gauge should read 160-200 lbs.
4. If the oil pressure is normal but engine RPM is high, adjust the low band as outlined on pages 95-96.
5. If the oil pressure is low, the accumulator or the hydraulic modulator may be faulty. Connect the pressure gauge to the hydraulic modulator test point.
6. Repeat steps 1 and 2. Check pressure reading. If the reading is zero or very low, the accumulator is at fault.
7. If the gauge readings of the low servo apply and the hydraulic modulator test points are the same but below 125 lbs., check for the following conditions:

   a. Obstruction in the oil screen.
   b. Broken or damaged low servo piston ring.
   c. Stuck pressure regulator valve.

d. Leaking gasket between the valve body and the case.

e. Leak between the valve body and the housing.

f. Leak at the servo cover.

g. Faulty front pump (excessive clearances).

h. Modulator control lever or piston stuck.

i. Leakage between the modulator and servo cover.

III. Reverse

1. Move the selective lever to Reverse.

2. Check the oil pressure reading of the gauge attached to the Reverse servo check point at idle speed. Normal pressure is 125-150 lbs.

3. Depress the foot brake and floor the accelerator pedal. The normal stall speed should be 1560-1610 RPM while the pressure reading should be 160-200 lbs.

4. If the oil pressure is normal but engine RPM is high, an adjustment of the reverse band is indicated.

5. If the gauge reading is below 160 lbs., check for the following conditions:

   a. Obstruction in the oil screen.

   b. Broken or damaged reverse servo piston ring.

   c. Stuck pressure regulator valve.

   d. Leaking gasket between the valve body and the case.

   e. Leak between the valve body and the housing.

   f. Faulty front pump (excessive clearances).

   g. Modulator control lever or piston stuck.

   h. Leakage between the modulator and servo cover.

IV. Rear Pump

1. Move the selective lever to the Drive position. Release the parking brake.

2. Depress the accelerator pedal until the speedometer registers 30 MPH.

3. Check the oil pressure at 30 MPH. Normal pressure is 50-75 lbs.

4. Position the selective lever in Low Range and check the oil pressure at 30 MPH. Normal reading is 140-180 lbs.

5. If the oil gauge reading is less than 140 lbs. check for the following conditions:

   a. Leakage at the servo cover.

   b. Leakage at the valve body to case gasket.

   c. Leakage between the valve body and the housing.

   d. Faulty rear pump (excessive clearances).

Oil Pressure Test 1953-1957

Before any attempt is made to diagnose a faulty condition on the road the transmission and engine must be at normal operating temperature. The manufacturer recommends that the vehicle be driven at least five miles. This does not apply when the condition exists only when the engine and transmission are cold.

I. Clutch Slippage

Connect oil pressure gauges to the low servo apply test point and the clutch apply (low servo release) test point as shown in Figs. 5 and 6, see page 80.

1. Move the selective lever to Drive position.
2. Depress the accelerator. As the vehicle starts to move carefully note the low servo apply pressure. Normal pressure is 85 to 95 lbs.
3. After the upshift takes place both gauges should read 85 to 95 lbs.
4. If the clutch apply gauge records 85 to 95 lbs. and the clutch slips, mechanical failure of the clutch is indicated.
5. Allow the engine to idle at 425 RPM. Both gauges should read between 50 and 60 lbs.
6. If the gauges do not read 50 to 60 lbs. at idle and 85 to 95 lbs. when accelerating, leakage in the oil circuits is indicated. Check for the following conditions:
   a. Stuck pressure regulator valve.
   b. Leakage at the low servo piston ring (between the ring and the bore).
   c. Leakage at low servo piston rod (between the rod and the bore).
   d. Leakage at valve body to case gasket.
   e. Leakage between valve body and housing.
   f. Excessive front pump clearances.
   g. Leakage at low drive valve body (check the gasket and shifter valve).
   h. Check for leakage in transmission housing oil passages.
   i. Loose connection at the oil screen.

II. Closed Throttle Downshift "Clunk"

1. Engine idle speed set too high. (Place selective lever in Drive position and adjust idle speed to 425 RPM).
2. Closed throttle downshift cushion valve stuck open. (1955-1957)

III. Rough Upshift Above 25 MPH

1. Forced downshift cushion valve stuck closed. (1955-1957)

IV. Faulty Upshifts and Downshifts

1. Refer to shift patterns on page 121.
2. Connect oil pressure gauges to the throttle valve and governor test points as shown in Fig. 7, see page 81.
3. Throttle pressure varies from 0 to 62 lbs. as determined by carburetor throttle opening. Governor pressure is governed by vehicle speed. Refer to the graph shown in Fig. 8, see page 81.

4. If the transmission shift pattern is incorrect, governor pressure should be checked first. If governor pressure is not within limits, check the governor.
5. If governor pressure is correct, the low drive valve body may be at fault. First, check the selector linkage as outlined on page 94. Next check the throttle linkage as outlined on pages 90-91. If trouble still persists after completing linkage adjustments, overhaul the low drive valve body as outlined on pages 106-111.

While road testing the car be particularly alert for any unusual noises. If noise is present, carefully note the driving range, speed and condition under which the noise is audible. Other unusual or abnormal conditions should be noted in the same manner.

Bench Test 1950-1952

The Powerglide transmission can be bench tested after the unit is overhauled and before the transmission is reinstalled in the vehicle. This testing procedure is particularly useful in cases where oil pressures or leakage made the overhaul or repair necessary.

When the primary pump is rotated at sufficient speed the transmission will develop oil pressures similar to those experienced under operating conditions. The repairman can then note whether the transmission oil pressures are normal and also be able to determine if oil leaks exist.

The primary pump may be rotated using a ½" drill that rotates at 300 or more RPM and an adapter securely bolted to the primary pump cover as shown in Fig. 10. A 1952 transmission is used for illustrative purposes.

1. Support the assembled transmission in the operating position on the work bench.
2. Remove the specially drilled universal joint front yoke attaching bolt. Install a standard bolt.

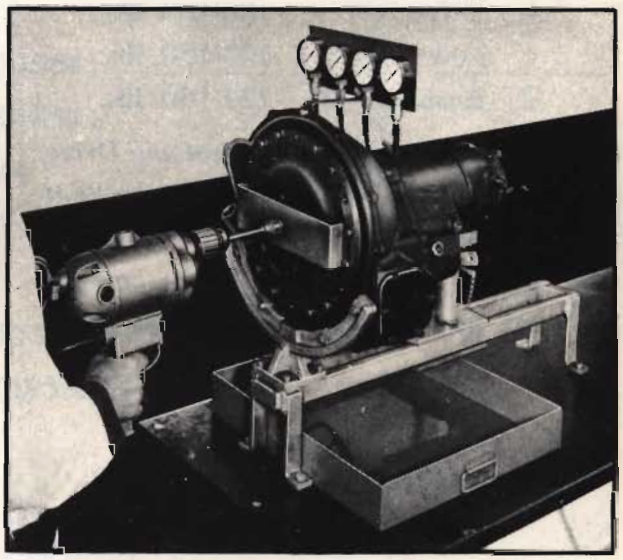

Fig. 10. Revolving primary pump

3. Remove the oil cooler line fittings. Install pipe plugs.
4. Install pressure gauges at the following test points:
   a. Front pump (located on right side of the converter housing above the side cover).
   b. Low servo apply.
   c. High Clutch (the release side of the low servo).
   d. Reverse servo.

5. Secure the primary pump rotating adapter to the torque converter as shown in Fig. 10.

6. Fill the transmission with 8 quarts of Type "A" Automatic Transmission fluid as outlined:

   a. Pour three quarts of fluid into the transmission.

   b. Add the last 5 quarts of oil while rotating the converter with the drill and adapter.

7. Using the drill and adapter, rotate the converter and note the oil pressures in each range. Normal pressure readings should be as follows:

a.	Neutral	150-160 lbs.
b.	Drive	80-100 lbs.
c.	Low	125-150 lbs.
d.	Reverse	125-150 lbs.

NOTE: *Oil pressures in Neutral and Drive are higher than normal since no vacuum is imposed on the vacuum modulator.*

8. Check for oil leakage at the converter housing. Leakage at this point indicates a faulty primary pump hub "O" ring seal, a defective front pump oil seal, a faulty front pump "O" ring seal or a sand hole in the converter housing. Check for leakage between the converter cover and the primary pump. A leak at this point indicates a faulty "O" ring seal between the cover and primary pump.

9. Inspect the servo cover and side covers for evidence of leakage. Check the opening to which the vacuum line is attached at the vacuum modulator. Leakage at this point indicates a defective diaphragm.

10. Drain the transmission. Remove the adapter from the primary pump cover. Remove the pressure gauges and reinstall the pipe plugs at the test points.

11. Remove the standard bolt and reinstall the special drilled bolt at the universal joint.

12. Remove the pipe plugs and reinstall the oil cooler line fittings.

ADJUSTMENTS

Throttle Linkage Adjustment
1955-1957 6 Cylinder Models

The relationship between the accelerator pedal, carburetor and throttle valve in the low drive valve body is of extreme importance to the proper operation of the engine and transmission. Mechanical linkage connects the transmission throttle valve to the carburetor and accelerator pedal. Movement of the throttle valve is therefore dependent upon and variable with carburetor throttle opening. Oil pressure is controlled by the position of the throttle valve which varies the shift points of the transmission in accordance with operating conditions and power requirements.

1. Start the engine. Set the hand brake. Move the selector lever to Drive position. With the engine and transmission at normal operating temperature, adjust engine idle speed to 425 RPM. Stop engine.

NOTE: *The automatic choke must be completely off and the throttle stop screw must be against the low step of the fast idle cam.*

2. Disconnect rod "C" from the throttle lever "E" (Fig. 1).

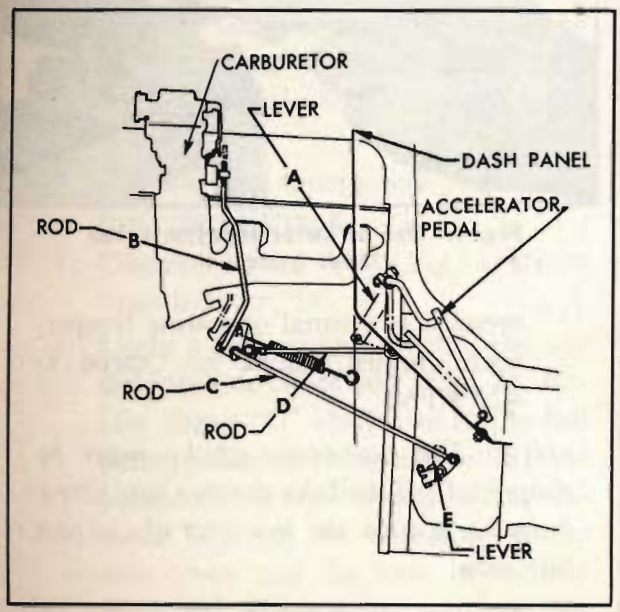

Fig. 1. Adjusting throttle linkage six cylinder

3. Using a ½" socket, remove the lower rear low and drive body cover bolt (Fig. 2) (6 cylinder only).

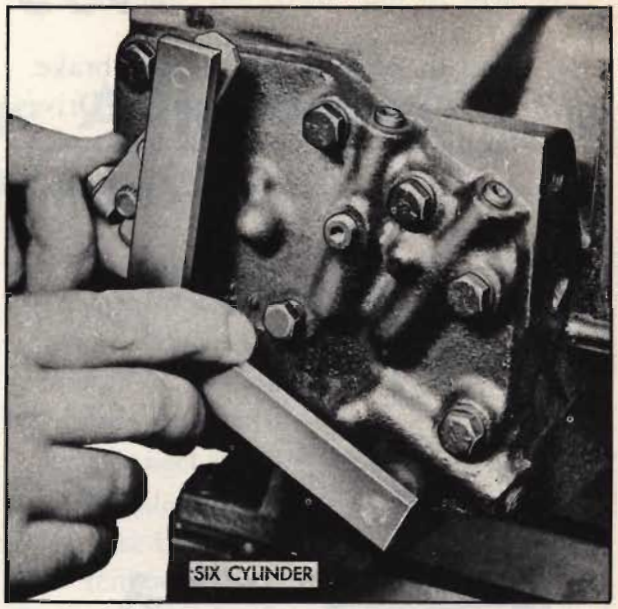

Fig. 2. Use of outer throttle valve lever gauge six cylinder

4. Rotate the throttle valve outer lever to the open position until the stop can be felt. Maintain the outer lever in this position for checking the adjustment. Set the throttle lever positioning gauge for 6⅜". Check the distance between the hole in the throttle lever and the bolt hole in the side cover. If the positioning gauge pins will enter both holes freely, the position of the outer lever is correct.

If the pins will not enter, loosen the lever to clamp attaching bolt and reposition the lever. After tightening the clamp attaching bolt, recheck the position of the outer throttle lever with the positioning gauge.

5. Connect rod "C" to lever "E".
6. Disconnect rod "B" from the carburetor. Disconect rod "D" from the accelerator and throttle valve lever on the cylinder block.
7. With engine idle speed set, force rod "C" forward against the stop in the transmission (open throttle). Adjust rod "B" so that the swivel pin will freely enter the carburetor throttle valve lever while holding the carburetor throttle valve in the wide open position.
8. While holding the carburetor throttle valve in the wide open position and the accelerator pedal fully depressed, adjust rod "D" so that the swivel pin freely enters the bellcrank.

Throttle Linkage Adjustment 1953 Model

1. Start the engine. Set the hand brake. Move the selective lever to Drive position. With the engine and transmission at normal operating temperature, adjust engine idle speed to 425 RPM.

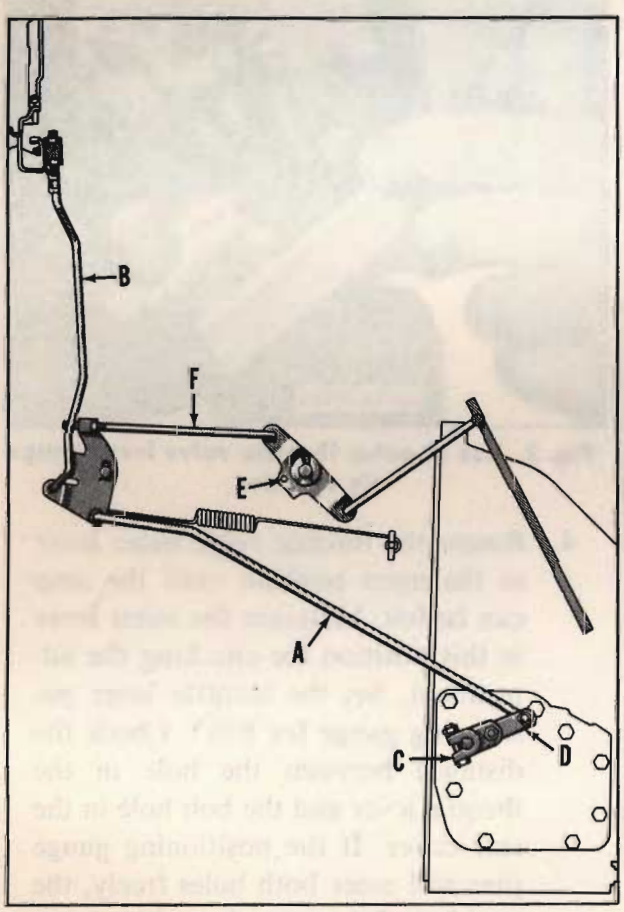

Fig. 3. Throttle valve linkage

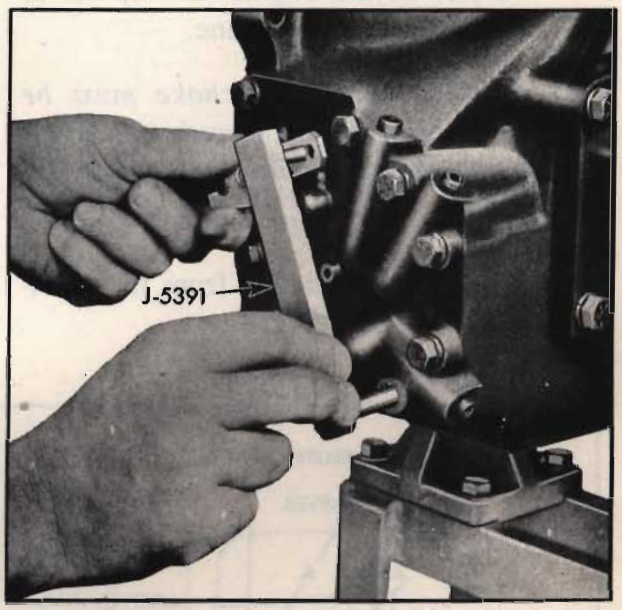

Fig. 4. Use of outer throttle valve lever gauge

NOTE: *The automatic choke must be completely off and the throttle stop screw must be against the low step of the fast idle cam.*

2. Disconnect rod "A" (Fig. 3) from the throttle lever "D".

3. Using a ½″ socket, remove the lower rear low and drive body cover bolt. Hold clamp "C" back against the stop. Using the correct positioning gauge, measure the distance between the bolt hole in the cover and the hole in the throttle lever (Fig. 4). The gauge pins must enter both holes freely. If the gauge does not enter the holes, loosen the lever to clamp attaching bolt and re-position the lever.

NOTE: *Clamp "C" must be held against the stop when checking or making an adjustment.*

4. Connect rod "A" to lever "D".
5. With the throttle stop screw against the low step of the fast idle cam, force rod "A" lightly backward against the stop in the transmission (closed throttle). Adjust rod "B" so that the swivel pin will freely enter the throttle lever. Shorten rod "B" three full turns by backing off the upper check nut three turns and tightening the lower check nut while holding the swivel from turning.
6. Install a 3/16″ pin or drill bit through the bellcrank and bracket at "E".
7. While holding the idle stop screw against the low step of the fast idle cam adjust rod "F" to required length for free entry of the swivel into the bellcrank. While holding the swivel from turning, tighten the lock nut.
8. Remove the 3/16″ pin or drill bit.

Throttle Linkage Adjustment 1954 Model

1. Start the engine. Set the hand brake. Move the selector lever to Drive position. With the engine and transmission at normal operating temperature adjust engine idle speed to 425 RPM.

NOTE: *The automatic choke must be completely off and the throttle stop screw must be against the low step of the fast idle cam.*

2. Remove the emergency brake rod from the bellcrank.
3. Disconnect rod "A" (Fig. 3) from throttle lever "D".
4. Using a ½″ socket, remove the upper rear side cover bolt (Fig. 3). Rotate clamp "C" clockwise to the full detent position. Using a throttle lever positioning gauge, measure the distance between the bolt hole in the side cover and the hole in throttle lever "D". If the gauge pins will not enter the holes freely, loosen the lever to clamp attaching bolt and adjust lever as required.

NOTE: *When making the adjustment, clamp "C" must be rotated clockwise to the full detent position.*

5. Connect rod "A" to lever "D".
6. Rotate the engine bellcrank clockwise to hold lever "D" at the full detent position. Adjust rod "B" to length required for free entry of the swivel pin into the throttle lever while the throttle lever is held in the wide open position. Install the clip which holds the swivel pin to the carburetor lever.
7. Install a 3/16″ pin through bellcrank "G" and bracket at "E".
8. With rod "B" against the idle step in the carburetor, adjust rod "F" so that the swivel pin will freely enter the throttle valve control bellcrank. While holding the swivel from turning, tighten the lock nut.

Throttle Linkage Adjustment 1955-1957 8-Cylinder Models

1. Start the engine. Set the hand brake. Move the selective lever to Drive position. With the engine and transmission at normal operating temperature, adjust engine idle speed to 425 RPM. Stop the engine.

NOTE: *The automatic choke must be completely off and the throttle stop screw must be against the low step of the fast idle cam.*

2. Disconnect rod "F" from the throttle lever "E" (Fig. 5).

3. Using a ½" socket, remove the lower rear low and drive body cover bolt (Fig. 6).

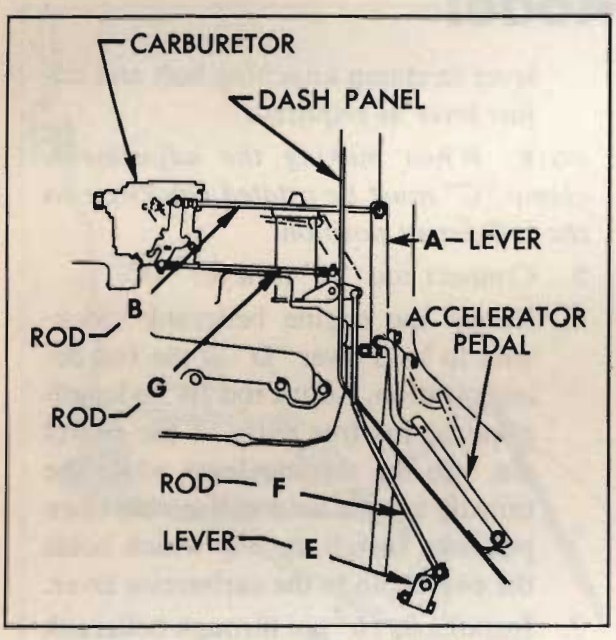

Fig. 5. Adjusting throttle linkage eight cylinder

4. Rotate the throttle valve outer lever to the open position until the stop can be felt. Maintain the outer lever in this position for checking the adjustment. Set the throttle lever positioning gauge for 2⅞". Check the distance between the hole in the throttle lever and the bolt hole in the side cover. If the positioning gauge pins will enter both holes freely, the position of the outer lever is correct. If the pins will not enter, loosen the lever to clamp attaching bolt and reposition the lever.

5. Connect rod "F" to lever "E".

Fig. 6. Use of outer throttle valve lever gauge eight cylinder

6. Disconnect rods "B" and "G" from the carburetor throttle valve lever.

7. With engine idle speed set, force rod "F" forward against the stop in the transmission (open throttle). Adjust length of rod "G" so that the swivel pin will freely enter the carburetor throttle valve lever with the carburetor throttle valve in the wide open position.

Neutral Safety Switch Adjustment 1950-1954

On all cars equipped with the Powerglide transmission a Neutral Safety Switch is provided to prevent starting of the engine when the transmission selective lever is in any drive position. This safety feature prevents the car from moving when the engine is started.

1. Loosen the two switch mounting screws.
2. Move the selective lever to the Neutral position. With the clip over the flats on the end of the shifter shaft, insert the pin into both the switch mounting bracket and the locating plate (Fig. 7).
3. Tighten both screws. Remove the locating pin.

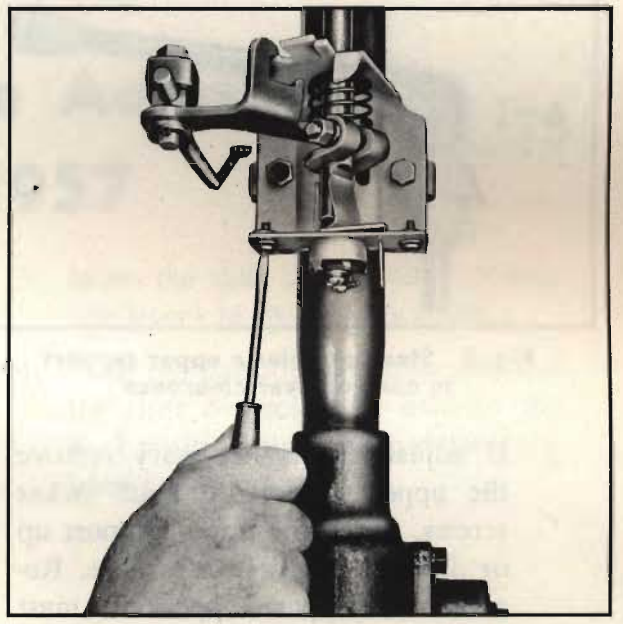

Fig. 7. Adjusting safety switch

Neutral Safety Switch Adjustment 1955-1957

The Neutral Safety Switch on 1955-1957 models is located on the mast jacket between the dash and instrument panel.

1. Loosen one safety switch mounting screw. Remove the other one.
2. Move the selective lever to the Neutral position.
3. Center the elongated slot in the mounting switch with the tapped hole in the mast jacket. Tighten the loosened screw and replace the screw which was removed.

Check operation. If the starter does not engage, loosen the screws and rotate the switch, as required. Tighten securely. Make certain that the selective lever is in the Neutral position when performing this adjustment.

Selector Linkage Adjustment 1950-1954

1. Measure the distance between the upper support cover and the control lever. The correct distance is 3/32" to 1/8" (Fig. 8).

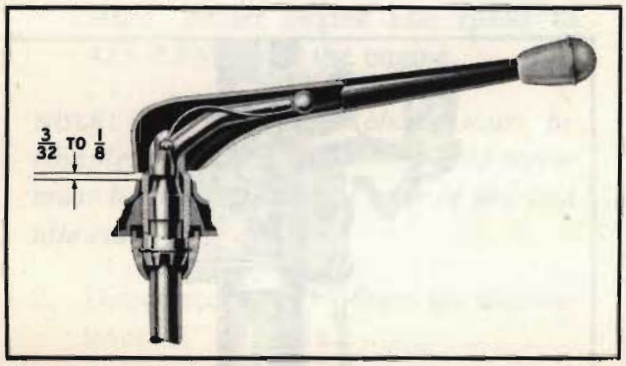

Fig. 8. Steering column upper support to control lever clearance

2. If adjustment is necessary remove the upper support to mast jacket screws. Screw the upper support up or down to required clearance. Replace the upper support to mast jacket screws.

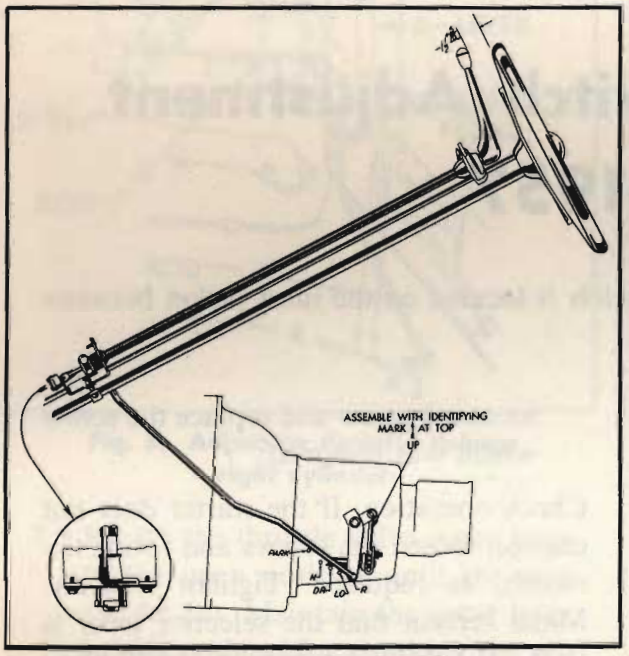

Fig. 9. Control lever to steering wheel clearance

3. Move the selective lever to the Reverse position. Using a scale, check the clearance between the selective lever and the steering wheel rim. The clearance should be 1-1/2" plus or minus 5/16" (Fig. 9). If the clearance is not within specifications, loosen the lower support clamp bolts and raise or lower as required. Tighten the clamp bolts evenly. Check to be certain that the dowel in the support is located in the slot in the mast jacket.

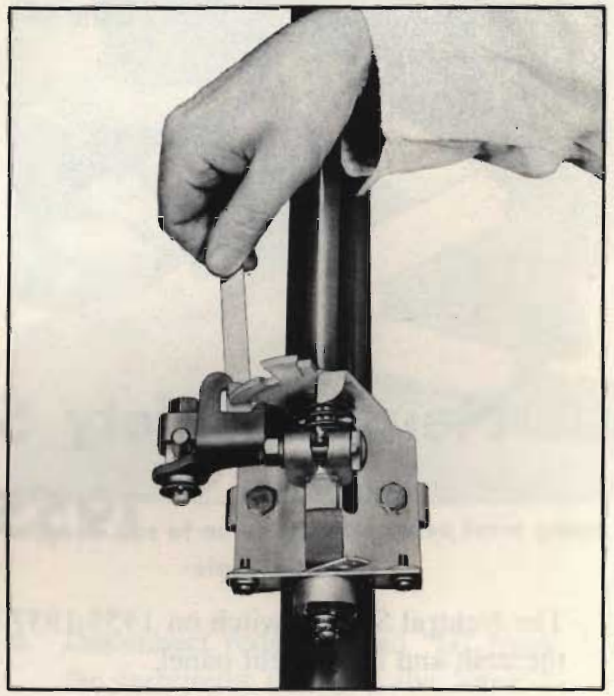

Fig. 10. Reverse stop to lower lever clearance

4. With the selective lever in the Reverse position, check the clearance between the reverse stop on the control shaft lower support and the lower lever. The clearance should be .090". (Fig. 10).

5. To adjust the clearance between the reverse stop and the lower lever proceed as follows:
   a. Loosen the transmission control rod swivel.
   b. Move the transmission manual valve to the top detent position.
   c. Place the selective lever in Reverse.
   d. Position the selective lever as required to obtain .090" clearance. Retighten the swivel.
   e. Check for proper installation of the bellcrank to parking lock lever connector rod. The arrow must point up.

Selector Linkage Adjustment 1955-1957

1. Loosen the shifter tube lever clamp nut to permit the upper control rod to move freely in the swivel.
2. Force the control rod bellcrank, located on the left side of the transmission, forward as far as it will move. This places the transmission in the Park position.
3. Move the shift control lever (selective lever) to the Park position.
4. With the control rod bellcrank and the shift control lever held in the Park position, tighten the shifter tube lever clamp nut.

Adjustment of Bands

An adjustment of the Powerglide transmission low and reverse bands may be performed with the transmission in the car or on the work-bench. An adjustment of the low band is required more frequently than the adjustment of the reverse band since the low band is applied whenever the vehicle starts to move (1953 and subsequent models).

LOW BAND Adjustment 1950-1952

1. Remove the low band adjusting screw cover.
2. Using an adjusting tool, break the lock nut loose.
3. Tighten the adjusting screw down solidly.
4. Back off adjusting screw exactly three complete turns.
5. Securely tighten lock nut and replace the adjusting screw cover.

LOW BAND Adjustment 1953-1957

1. Remove the low band adjusting screw cover.
2. Using an adjusting tool, break the lock nut loose.
3. Tighten the adjusting screw down solidly.

4. Back off the adjusting screw exactly four complete turns.
5. Securely tighten the lock nut and replace the adjusting screw cover.

REVERSE BAND Adjustment 1950-1954

1. Remove servo cover.
2. Using an adjusting tool, break the lock nut loose.
3. Grasp the servo return spring in one hand. Tighten the adjusting screw while checking the end play by push-pull on the piston assembly.
4. When all end play is just taken out, back off the adjusting screw ⅛ to ¼ turn and tighten the lock nut securely.
5. Replace the servo cover.

CAUTION: *This is an extremely sensitive adjustment. When the end play movement is just taken out of the piston, before backing off the adjusting screw, the drum must be free to rotate.*

REVERSE BAND Adjustment 1955-1957

1. Remove the servo cover.
2. Using an adjusting tool, break the lock nut loose.
3. Tighten the adjusting screw until all of the end play between the linkage and the band is removed without compressing the band.
4. The reverse drum must be free to rotate after the end play has been removed. If the reverse drum will not turn easily, back off the adjusting screw ¼ turn at a time until the drum will rotate freely.
5. Securely tighten the lock nut and replace the servo cover.

CAUTION: *Use extreme care when making the above adjustment.*

Throttle Valve Inner Lever Adjustment 1953-1954

When it becomes necessary to install new throttle valve parts, readjustment of the throttle valve is advisable. Two separate settings are necessary.

First Adjustment

1. Rotate the inner lever until it just contacts the detent valve. With the lever held in this position, turn adjusting screw "A" (Fig. 11) until it just touches the flat surface of the step in the lever. Back the adjusting screw off one complete turn and tighten the lock nut.

Second Adjustment

Insert a throttle valve inner lever positioning gauge between the face

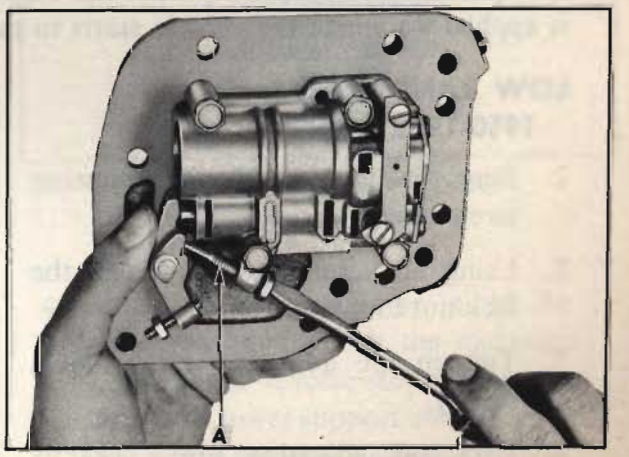

Fig. 11. Setting (1) of throttle valve inner lever adjustment

of the detent valve and the throttle valve inner lever. (Fig. 12). While held in this position, turn adjusting screw "B" until it contacts the threads of adjusting screw "A". Tighten the adjusting screw lock nut.

NOTE: *Only the first adjustment is required for 1954 models. Both adjustments are required for 1953 models.*

Throttle Valve Inner Lever Adjustment 1955-1957

When it becomes necessary to install a new detent valve, throttle valve or throttle valve spring, readjustment of the throttle valve is advisable.

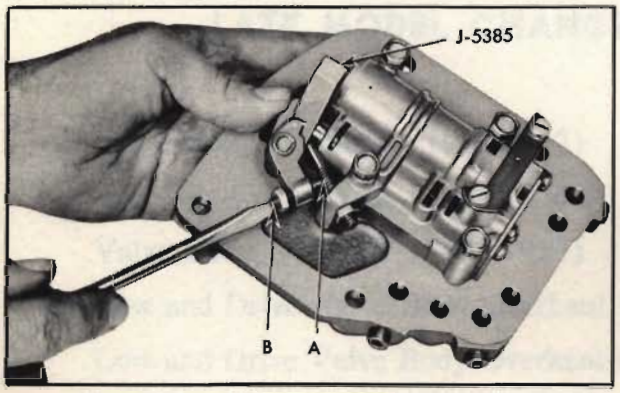

Fig. 12. Setting (2) of throttle valve inner lever adjustment

Adjustment

Rotate the inner lever until it just contacts the detent valve. With the lever held in this position, turn adjusting screw "A" until it just touches the flat surface of the step in the lever (Fig. 13). Back the adjusting screw off one complete turn and tighten the lock nut.

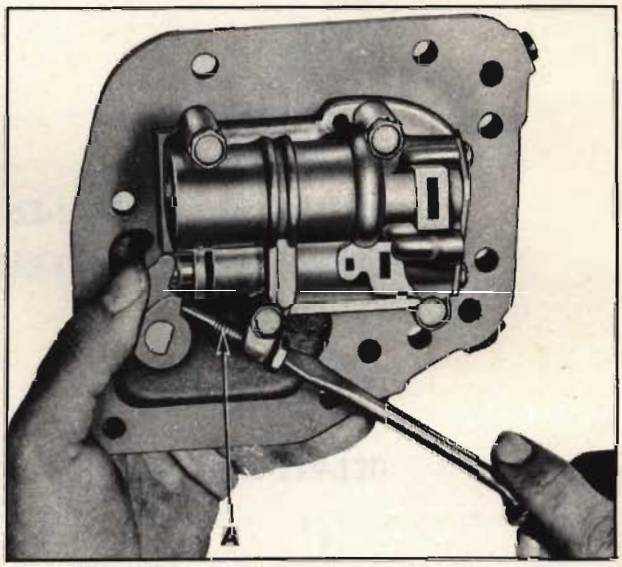

Fig. 13. Setting of throttle valve inner lever adjustment

LATE MODEL CHANGES AND OVERHAUL

Valve Body Overhaul
1950-1952

Disassembly

Fig. 1 illustrates a disassembled valve body.

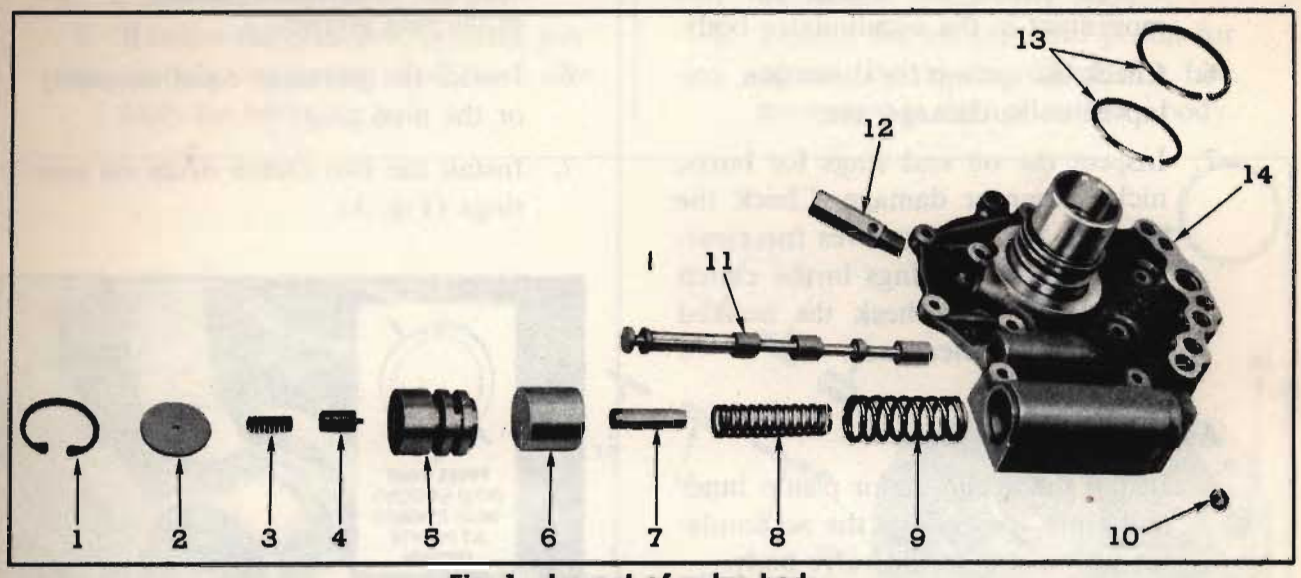

Fig. 1. Layout of valve body

1. Snap Ring
2. Accumulator Valve Spring Washer
3. Accumulator Valve Spring
4. Accumulator Valve
5. Accumulator Valve Body Assembly
6. Accumulator Piston
7. Accumulator Piston Stop
8. Accumulator Piston Inner Spring
9. Accumulator Piston Outer Spring
10. Plug
11. Transmission Manual Valve
12. Pressure Relief Valve
13. Clutch Drum Oil Seal Rings
14. Transmission Valve Body

1. Using special pliers, remove the accumulator retainer ring (Fig. 2).
2. Remove the accumulator valve spring washer, the valve spring and the accumulator valve.
3. Remove the accumulator valve body assembly and the accumulator piston from the bore.
4. Remove the accumulator inner and outer springs and the accumulator piston stop from the bore.
5. Remove the two clutch drum oil seal rings.
6. Remove the pressure relief valve assembly.

NOTE: *The pressure relief valve was replaced in the late 1951 and subsequent models with a pipe plug.*

Inspection of Parts

1. Thoroughly wash all parts in solvent. Blow out all passages with compressed air.
2. Inspect the accumulator body for scores, wear or damage. Check the operation of the small fibre valve.

Fig. 2. Removing accumulator special snap ring

3. Check the accumulator body in the valve body bore for free movement.
4. Check the accumulator piston for scores, burrs, etc. Check for free movement in the valve body.
5. Inspect the accumulator valve for scores, burrs, etc. Check for free movement in the accumulator body.
6. Check the springs for distortion, collapsed coils, damage, etc.
7. Inspect the oil seal rings for burrs, nicks, wear or damage. Check the rings in the ring grooves for clearance. Install the rings in the clutch drum bore and check the hooked ring ends for clearance.

Assembly

1. Install the accumulator piston inner and outer springs and the accumulator piston stop in the valve body.
2. Install the accumulator piston. The accumulator piston must seat over the inner and outer springs.
3. Install the accumulator valve body assembly into the bore.
4. Install the accumulator valve into the accumulator valve body. Install the accumulator valve spring.
5. Install the accumulator valve spring washer. Compress the spring and install the snap ring retainer. Be sure that the snap ring retainer is seated in the ring groove.
6. Install the pressure relief assembly or the pipe plug.
7. Install the two clutch drum oil seal rings (Fig. 3).

Fig. 3. Installing oil seal rings

Valve Body Overhaul

1953-1954

Disassembly

Fig. 4 illustrates a disassembled valve body.

1. Using special pliers, remove the accumulator retainer ring.
2. Remove the accumulator valve spring washer, the valve spring and the accumulator valve.
3. Remove the accumulator valve body assembly and the accumulator piston from the bore.
4. Remove the accumulator inner and outer springs and the accumulator piston stop from the bore.
5. Remove the clutch low servo valve assembly from the valve body.

6. Position the valve body, face down, on two wooden blocks of the same thickness. Using a small punch, drive the pressure regulator governor valve retaining pin out of the valve body.

NOTE: *Position the wooden blocks so as not to obstruct removal of the pin.*

7. Remove the pressure regulator governor valve spring and the valve from the bore.

2. Inspect the accumulator body for scores, wear or damage. Check the operation of the small fibre valve.
3. Check the accumulator body in the valve body bore for free movement.
4. Check the accumulator piston for scores, burrs, etc. Check for free movement in the valve body.
5. Inspect the accumulator piston for scores, burrs, etc. Check for free movement in the accumulator body.

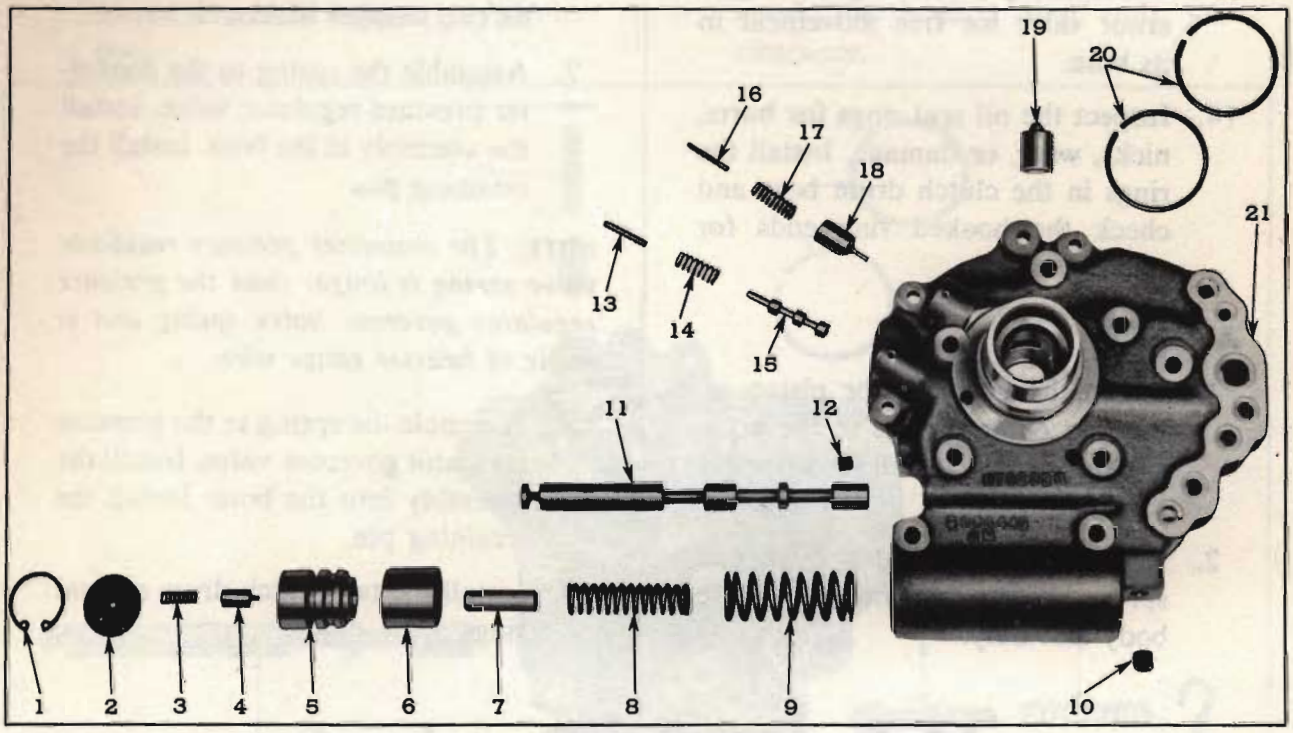

Fig. 4. Layout of valve body

1. Snap Ring
2. Accumulator Valve Spring Washer
3. Accumulator Valve Spring
4. Accumulator Valve
5. Accumulator Valve Body Assembly
6. Accumulator Piston
7. Accumulator Piston Stop
8. Accumulator Piston Inner Spring
9. Accumulator Piston Outer Spring
10. Plug
11. Transmission Manual Valve
12. Plug
13. Pressure Regulator Governor Valve Spring Stop Pin
14. Pressure Regulator Governor Spring
15. Pressure Regulator Governor Valve
16. Converter Pressure Regulator Valve Spring Stop Pin
17. Converter Pressure Regulator Valve Spring
18. Converter Pressure Regulator Valve
19. Clutch Low Servo Valve Assembly
20. Clutch Drum Oil Seal Rings
21. Transmission Valve Body

8. Using a small punch, remove the converter pressure regulator valve retaining pin. Remove the converter pressure regulator valve spring and valve from the bore.
9. Remove the two clutch drum oil seal rings.

Inspection of Parts

1. Thoroughly wash all parts in solvent. Blow out all passages with compressed air.

6. Check the springs for distortion, collapsed coils, damage, etc.
7. Inspect the clutch low servo valve assembly. Be sure that the bakelite valve operates freely.
8. Check the converter pressure regulator valve springs for damage, collapsed coils, etc.
9. Inspect the converter pressure regulator valve for scores, burrs, damage, etc.

10. Check the converter pressure regulator valve for free movement in its bore.
11. Check the pressure regulator governor valve spring for distortion, collapsed coils, damage, etc.
12. Inspect the pressure regulator governor valve for nicks, burrs, damage, etc.
13. Check the pressure regulator governor valve for free movement in its bore.
14. Inspect the oil seal rings for burrs, nicks, wear, or damage. Install the rings in the clutch drum bore and check the hooked ring ends for clearance.

Assembly

1. Install the accumulator piston inner and outer springs in the accumulator piston. Install the assembly in the valve body.
2. Install the accumulator valve and spring in the accumulator valve body assembly.
3. Install the accumulator valve body assembly into the valve body bore.
4. Install the accumulator valve spring washer. Compress the spring and install the snap ring retainer. Be sure that the snap ring retainer is seated in the ring groove.
5. Install the clutch low servo valve assembly.
6. Position the valve body face down on two wooden blocks.
7. Assemble the spring to the converter pressure regulator valve. Install the assembly in the bore. Install the retaining pin.

NOTE: *The converter pressure regulator valve spring is longer than the pressure regulator governor valve spring and is made of heavier gauge wire.*

8. Assemble the spring to the pressure regulator governor valve. Install the assembly into the bore. Install the retaining pin.
9. Install the two clutch drum oil seal rings.

Valve Body Overhaul 1955-1957

Disassembly

Fig. 5 illustrates a disassembled valve body.

1. Using long nosed pliers, remove the forced downshift cushion valve retainer.
2. Remove the forced downshift cushion valve spring and valve.
3. Using long nosed pliers, remove the closed throttle downshift cushion valve retainer. Remove the spring and valve.
4. Position the valve body face down on two wooden blocks of equal thickness. Using a small punch remove the converter pressure regulator valve retaining pin. Remove the spring and valve.
5. Remove the two clutch drum oil seal rings.
6. Remove the front and rear oil pump check valve from the valve body.

Inspection of Parts

1. Thoroughly clean all parts in solvent. Blow out passages with compressed air.
2. Check the forced downshift cushion valve spring for distortion, collapsed coils, damage, etc.
3. Inspect the forced downshift cushion valve for nicks, burrs, scores, etc. Check for free operation of the forced downshift cushion valve in its bore.
6. Check the converter pressure regulator valve spring for distortion, collapsed coils, damage, etc.
7. Inspect the converter pressure regulator valve for nicks, burrs, scores, etc. Check for free operation of the converter pressure regulator valve in its bore.
8. Inspect the oil seal rings for burrs, nicks, wear or damage. Install the rings in the clutch drum bore and check the hooked ring ends for clearance.

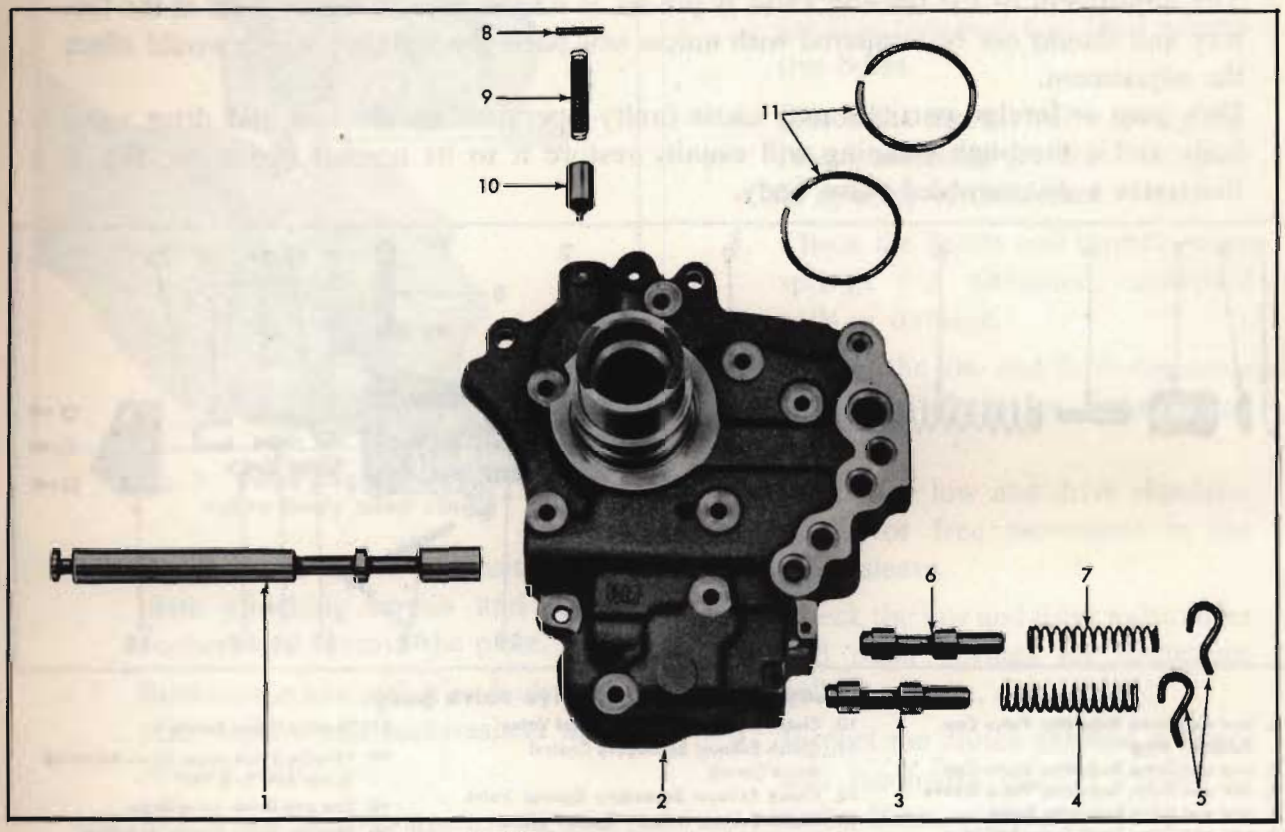

Fig. 5. Layout of valve body assembly

1. Transmission Manual Valve
2. Transmission Valve Body
3. Closed Throttle Downshift Cushion Valve
4. Closed Throttle Downshift Cushion Valve Spring
5. Closed Throttle Downshift and Forced Downshift Cushion Valve Retainers
6. Forced Cushion Downshift Valve
7. Forced Cushion Downshift Valve Spring
8. Converter Pressure Regulator Valve Retaining Pin
9. Converter Pressure Regulator Valve Spring
10. Converter Pressure Regulator Valve
11. Clutch Drum Oil Seal Rings

4. Check the closed downshift cushion valve spring for distortion, collapsed coils, damage, etc.
5. Inspect the closed throttle downshift cushion valve for nicks, burrs, scores, etc. Check for free operation of the closed throttle downshift cushion valve in its bore.

Assembly

1. Position the valve body on blocks, face down.
2. Assemble the converter pressure regulator valve spring in the valve. Install the assembly in the valve body. Install the retaining pin.

3. Assemble the forced downshift cushion valve spring to the valve. Install the assembly in the valve body. Install the retainer.

NOTE: *Do not confuse the forced downshift cushion valve spring with the closed throttle downshift cushion valve spring. The forced downshift cushion valve spring is longer and is made of heavier gauge wire.*

4. Assemble the closed throttle downshift cushion valve spring to the valve. Install the assembly in the valve body bore. Install the retainer.
5. Install the front and rear oil pump check valve in the valve body. Be sure that it is flush with or below the valve body face.
6. Install the two clutch drum oil seal rings.

Low and Drive Valve Body Overhaul 1953-1954

The adjustment of the throttle valve is pre-set at 62 lbs. plus or minus 1 lb. at the factory and should not be tampered with unless new parts are installed which would affect the adjustment.

Dirt, gum or foreign particles may cause faulty operation of the low and drive valve body and a thorough cleaning will usually restore it to its normal operation. Fig. 6 illustrates a disassembled valve body.

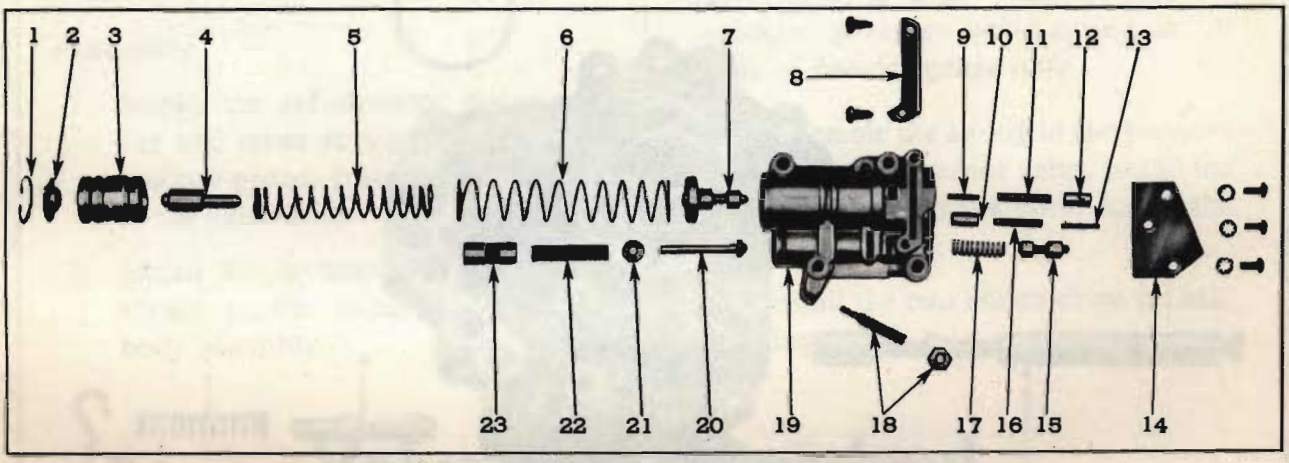

Fig. 6. Layout of low and drive valve body

1. Low and Drive Regulator Valve Cap Retainer Ring
2. Low and Drive Regulator Valve Cap
3. Low and Drive Regulator Valve Sleeve
4. Low and Drive Regulator Valve
5. Low and Drive Valve Inner Spring
6. Low and Drive Valve Outer Spring
7. Low and Drive Valve
8. Clutch Exhaust Cover Plate
9. Clutch Exhaust Secondary Control Valve Stop
10. Clutch Exhaust Primary Control Valve
11. Clutch Exhaust Secondary Control Valve Spring
12. Clutch Exhaust Secondary Control Valve
13. Clutch Exhaust Primary Control Valve Stop
14. Low and Drive Valve Body End Plate
15. Throttle Valve
16. Clutch Exhaust Primary Control Valve Spring
17. Throttle Valve Spring
18. Throttle Valve Inner Lever Adjusting Screw and Lock Nut
19. Low and Drive Valve Body
20. Throttle Valve Spring Regulator Assembly
21. Detent Valve Spring Seeat
22. Detent Valve Spring
23. Detent Valve

Disassembly

1. Remove the low and drive valve body bolts which secure it to the side cover.
2. Grasp the valve body in one hand and lightly tap the inner side of the cover with a soft mallet to separate it from the locating pins.

CAUTION: *To prevent loss or damage to the parts, exert pressure on the detent valve. A clip can be made to retain the detent valve in its bore during assembly and disassembly.*

3. Remove the detent valve, the detent valve spring, the detent valve spring seat and the throttle valve spring regulator assembly.

4. Remove the throttle valve and the throttle valve spring.
5. Using a Tru-arc pliers, remove the low and drive regulator cap retainer ring (Fig. 7). Remove the low and drive regulator valve cap, sleeve and valve, low and drive valve inner and outer springs and the low and drive valve.

Fig. 7. Removing low and drive valve body snap ring

6. Remove the clutch exhaust cover plate attaching screws and lockwashers and remove the plate.
7. Remove the low and drive body end plate screws and lockwashers and remove plate.

CAUTION: *Exert pressure against the end plate while removing screws to prevent loss of parts.*

8. Remove the clutch exhaust secondary control valve, spring and stop.
9. Remove the clutch exhaust primary control valve spring, stop and valve.
10. Remove the throttle valve control outer lever assembly. Remove the throttle valve lever shaft seal and the throttle valve inner lever assembly.

Inspection of Parts

1. Wash parts thoroughly in solvent. Use compressed air to blow out passages.
2. Carefully inspect the detent valve, the detent valve spring seat, the throttle valve spring regulator assembly and the throttle valve for scores, nicks, burrs, etc.

NOTE: *Crocus cloth may be used to remove slight burrs.*

3. Check the detent and throttle valves for free movement in their respective bores.
4. Check the throttle valve spring regulator assembly for free operation in opening of the detent valve.
5. Check the detent and throttle valve springs for distortion, collapsed coils or damage.
6. Inspect the low and drive regulator valve and sleeve for nicks, burrs, etc.
7. Check the low and drive regulator valve for free movement in the valve sleeve.
8. Check the low and drive valve inner and outer springs for distortion, collapsed coils, damage, etc.
9. Inspect the clutch exhaust primary and secondary control valves for nicks, burrs, scores, etc.
10. Check the clutch exhaust primary and secondary control valves for free movement in their bores.
11. Check the clutch exhaust primary and secondary control valve springs for distortion, collapsed coils or damage.
12. Check the throttle valve inner lever assembly shaft for scores and free movement. Check the lever for tightness on the shaft.

13. Check the throttle valve inner lever assembly shaft for free movement in its bore in the side cover.
14. Inspect the detent valve stop in the side cover for distortion, damage, etc. Replace if necessary.
15. Check the locating pins in the side cover and the valve body for damage. Replace if necessary.

NOTE: *One locating pin should be in the side cover, the other in the valve body.*

16. Check the mating surfaces of the side cover and the valve body for nicks, burrs, etc.

Assembly

1. Install the low and drive valve in its bore.

NOTE: *This valve must be carefully guided into position to prevent damage to the bore.*

2. Install the low and drive regulator inner and outer springs in the valve body bore.
3. Assemble the low and drive regulator valve and cap to the low and drive regulator valve sleeve. Install this assembly into the valve body bore being certain that the inner spring is seated on the seat of the low and drive regulator sleeve.
4. Compress the assembly into the bore and install the retainer ring. Check to be sure that the ring is seated in the groove in the bore.
5. Install the clutch exhaust primary control valve into the valve body bore. Install the spring and stop in the clutch exhaust primary control valve.

CAUTION: *Do not confuse the clutch exhaust primary control stop and spring with the clutch exhaust secondary control valve stop and spring. The clutch exhaust primary control valve stop is the longer of the two stops and the clutch exhaust primary control valve spring is the shorter of the two springs.*

6. Assemble the clutch exhaust secondary control valve spring and stop to the piston. Install the assembly in the bore.
7. Install the throttle valve spring and the throttle valve in the bore.
8. Position the low and drive body end plate on the valve body and install the screws and lockwashers. Tighten to 1½ to 2½ ft. lbs.

NOTE: *Pressure must be exerted on the low and drive valve body end plate to hold parts in position while installing the screws.*

9. Install the clutch exhaust cover plate. Tighten the screws to 2½ to 3½ ft. lbs.
10. Install the throttle valve spring regulator assembly into the bore. Check to be sure that it is seated on the throttle valve spring.
11. Install the detent valve spring seat, threading the pin of the throttle valve spring regulator assembly through the opening in the detent valve spring seat.
12. Install the detent valve spring and detent valve, threading the pin of the throttle valve spring regulator assembly through the opening in the detent valve.
13. Position the side cover in a vise, face up. Align the locating pin hole in the valve body with the locating pin in the side cover. Exert pressure on the valve body to keep the locating pin in the locating hole while compressing the detent valve

into the valve body bore. Rotate the valve body counter clockwise until the locating pin in the valve body enters the locating hole in the side cover.

NOTE: *The face of the detent valve must rest against the detent valve stop pin in the side cover.*

14. Install the attaching bolts and lockwashers. Tighten to 3½ to 5 ft. lbs.
15. Install the throttle valve inner lever assembly to the side cover. Install a new seal into the counterbore. Install the shield.
16. Install the throttle valve control outer lever assembly on the inner lever shaft.
17. From the underside, install the outer lever attaching bolt. Install the lockwasher and nut and securely tighten.

Low and Drive Valve Body Overhaul 1955-1957

The adjustment of the throttle valve inner lever is pre-set at 62 lbs. plus or minus 1 lb. at the factory and should not be tampered with unless new parts are installed which would affect the adjustment.

Dirt, gum, or foreign particles may cause faulty operation of the low and drive valve body and a thorough cleaning will usually restore it to its normal operation. Fig. 8 illustrates a disassembled valve body.

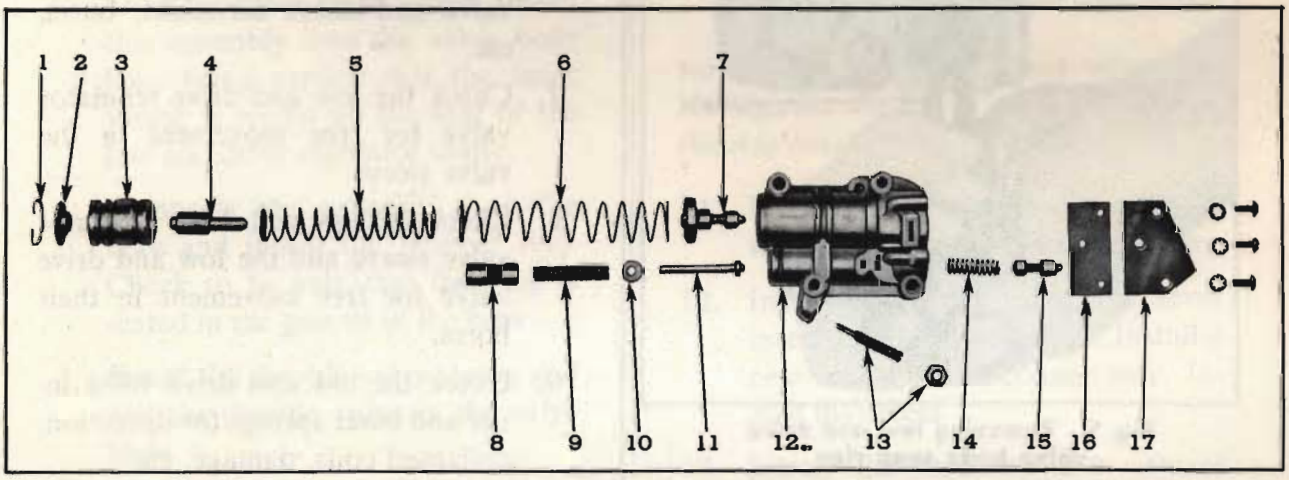

Fig. 8. Layout of low and drive valve body

1. Low and Drive Regulator Valve Cap Retainer Ring
2. Low and Drive Regulator Valve Cap
3. Low and Drive Regulator Valve Sleeve
4. Low and Drive Regulator Valve
5. Low and Drive Valve Inner Spring
6. Low and Drive Valve Outer Spring
7. Low and Drive Valve
8. Detent Valve
9. Detent Valve Spring
10. Detent Valve Spring Seat
11. Throttle Valve Spring Regulator Assembly
12. Low and Drive Valve Body
13. Throttle Valve Inner Lever Adjusting Screw and Lock Nut
14. Throttle Valve Spring
15. Throttle Valve
16. Low and Drive Body End Plate Gasket
17. Low and Drive Valve Body End Plate

Disassembly

1. Remove the low and drive valve body bolts which secure it to the side cover.
2. Grasp the valve body in one hand and lightly tap the inner side of the cover with a soft mallet to separate it from the locating pins.

CAUTION: *To prevent loss or damage to the parts, exert pressure on the detent valve. A clip can be made to retain the detent valve in its bore during assembly and disassembly.*

3. Remove the detent valve, the detent valve spring, the detent valve spring seat, and the throttle valve spring regulator assembly.
4. Remove the throttle valve and the throttle valve spring.
5. Using a Tru-arc pliers, remove the low and drive regulator cap retainer ring (Fig. 9). Remove the low and drive regulator valve cap, sleeve and valve, low and drive valve inner and outer springs and the low and drive valve.

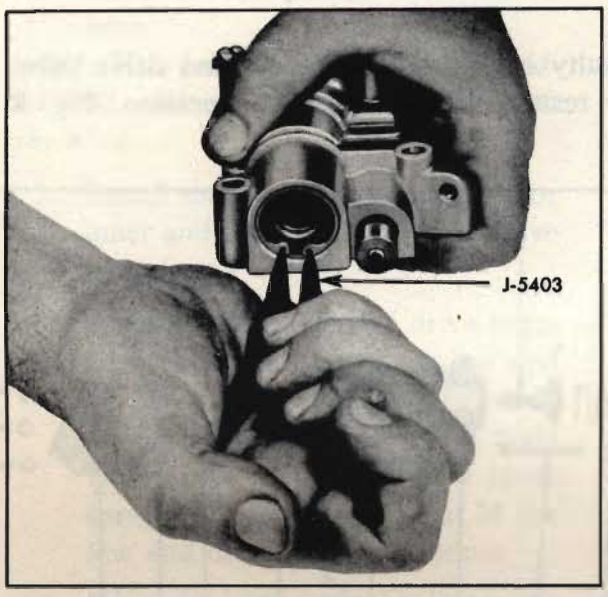

Fig. 9. Removing low and drive valve body snap ring

6. Remove the end plate attaching screws and lockwashers and remove the end plate.
7. Remove the throttle valve control outer lever assembly. Remove the throttle valve lever shaft shield and throttle valve inner lever assembly. Remove the throttle valve lever shaft seal from the counterbore in the cover.

Inspection of Parts

1. Wash parts thoroughly in solvent. Use compressed air to blow out passages.
2. Carefully inspect the detent valve, the detent valve spring seat, the throttle valve spring regulator assembly and the throttle valve for scores, nicks, burrs, etc.

NOTE: *Crocus cloth may be used to remove slight burrs.*

3. Check the detent and throttle valves for free movement in their respective bores.
4. Check the throttle valve spring regulator assembly for free operation in opening of the detent valve.
5. Check the detent and throttle valve springs for distortion, collapsed coils or damage.
6. Inspect the low and drive regulator valve and sleeve for nicks, burrs, etc.
7. Check the low and drive regulator valve for free movement in the valve sleeve.
8. Check the low and drive regulator valve sleeve and the low and drive valve for free movement in their bores.
9. Check the low and drive valve inner and outer springs for distortion, collapsed coils, damage, etc.
10. Check the throttle valve inner lever assembly shaft for free movement and scores. Check the lever for tightness on the shaft.
11. Check the throttle valve inner lever assembly shaft for free movement in its bore in the side cover.
12. Inspect the detent valve stop in the side cover for distortion, damage, etc. Replace if necessary.

13. Check the locating pins in the side cover and the valve body for damage. Replace if necessary.

NOTE: *One locating pin should be in the side cover, the other in the valve body.*

14. Check the mating surfaces of the side cover and the valve body for nicks, burrs, etc.

Assembly

1. Install the low and drive valve in its bore.

NOTE: *This valve must be carefully guided into position to prevent damage to the bore.*

2. Install the low and drive regulator inner and outer springs in the valve body bore.
3. Assemble the low and drive regulator valve and cap to the low and drive regulator valve sleeve. Install this assembly into the valve body bore being certain that the inner spring is seated on the seat of the low and drive regulator sleeve.
4. Compress the assembly into the bore and install the retainer ring. Check to be sure that the ring is seated in the groove in the bore.
5. Install the throttle valve spring and and the throttle valve in the valve body.
6. Position the valve body end plate and gasket on the valve body and install the screws and lockwashers. Tighten to 1½ to 2½ ft. lbs.
7. Install the throttle valve spring regulator assembly. Make certain that it is seated on the throttle valve spring.
8. Install the detent valve spring seat, threading the pin of the throttle valve spring regulator assembly through the opening in the detent valve spring seat.
9. Install the detent valve spring and detent valve, threading the pin of the throttle valve spring regulator assembly through the opening in the detent valve.
10. Position the side cover in a vise, face up. Align the locating pin hole in the valve body with the locating pin in the side cover. Exert pressure on the valve body to keep the pin in the locating hole while compressing the detent valve into the valve body bore. Rotate the valve body counter-clockwise until the locating pin in the valve body enters the locating hole in the side cover.

NOTE: *The face of the detent valve must rest against the detent valve stop pin in the side cover.*

11. Install the attaching bolts and lockwashers. Tighten to 3½ to 5 ft. lbs.
12. Install the throttle valve inner lever assembly to the side cover. Install a new seal into the counterbore. Install the shield.
13. Install the throttle valve control outer lever assembly on the inner lever shaft.
14. From the underside install the outer lever attaching bolt. Install the lockwasher and nut and securely tighten.

The Governor Assembly 1953-1954

Governor parts, with the exception of the oil seal rings and the driven gear, cannot be purchased separately since all parts are calibrated and fitted as a unit.

It may be necessary to disassemble the governor for removal of dirt, foreign particles, etc. which can cause faulty operation. Fig. 10 illustrates a disassembled view of the governor assembly.

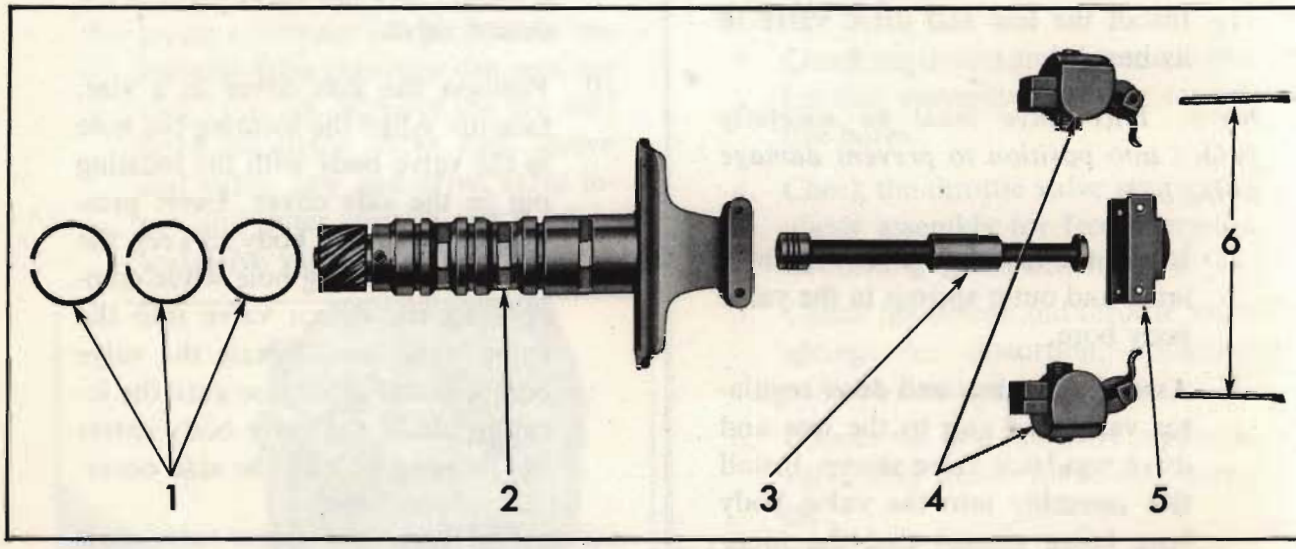

Fig. 10. Layout of governor assembly

1. Sleeve Oil Seal Rings
2. Sleeve
3. Valve
4. Weight Assemblies
5. Thrust Cap
6. Weight Pins

Disassembly

1. Grind off one end of each governor weight pin. Remove the pins, thrust cap, weight assemblies and the valve from the sleeve.

NOTE: *It is important to use the same diameter gauge pin when assembling the governor. Therefore, measure the diameter of the pins with a micrometer and replace with the same diameter piano wire.*

2. Remove the oil seal rings from the sleeve.

Inspection of Parts

1. Thoroughly clean all parts. Blow out passages with compressed air.
2. Inspect the sleeve for wear, burrs, nicks or scores.
3. Check the sleeve for free operation in the bore of the case.
4. Inspect the governor valve for wear, burrs, nicks or scores.
5. Insert the valve into the bore in the sleeve and check for free operation.
6. Inspect the governor driven gear for nicks, burrs, wear or damage.
7. Check the governor driven gear for looseness on the sleeve.
8. Check the weight springs for distortion or damage. *Do not disassemble the governor weights.*

9. Check the weights for free operation in their retainers.
10. Inspect the sleeve rings for scores, wear or damage. Insert the rings in the bore to see that the hooked ends have clearance.

Replacement of the Governor Drive Gear

Part No. 3705357 is available to facilitate governor repair. This kit contains one brass drive gear, two weight retaining pins and a governor gear retainer split pin. Use extreme care when replacing the governor gear. The following method is recommended:

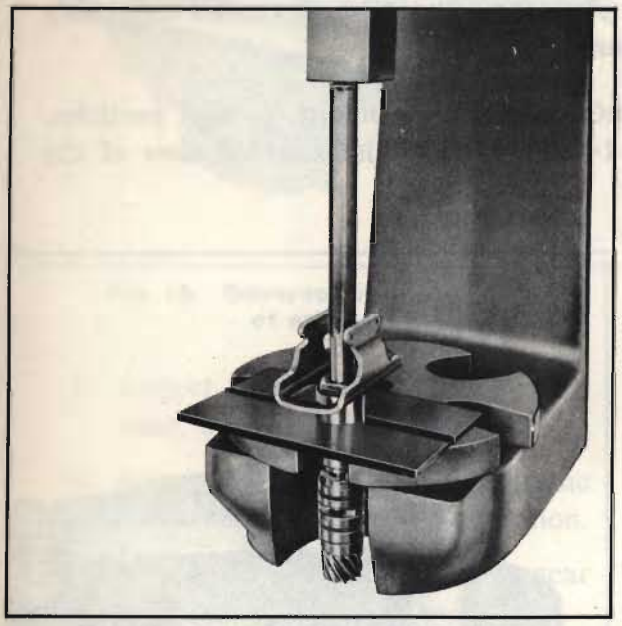

Fig. 11. Pressing gear out of sleeve

1. Using a small punch, drive out the gear retaining pin.
2. Install two 3/16″ plates in the exhaust slots of the governor. Place the assembly in a press. Using a long punch, force the gear out of the sleeve (Fig. 11).
3. Remove all metal particles from the sleeve. Position the governor as shown in Fig. 12. Place the new gear in the sleeve. Using a suitable socket, press the gear down until it is nearly bottomed. Remove metal particles which may have shaved off the gear hub and press the gear down until it is bottomed on the shoulder.

Fig. 12. Pressing gear into sleeve

NOTE: *A socket is used to protect the thrust button on the end of the gear.*

4. To install the split pin retainer, carefully locate hole position 90° from the existing hole and prick punch. Using a #24 (.152) drill, bore a hole through the sleeve and gear (Fig. 13).

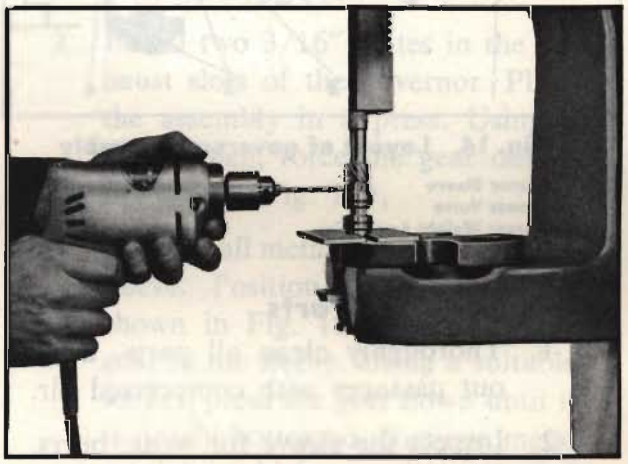

Fig. 13. Drilling new pin hole

off the gear hub and press the gear down until it is bottomed on the shoulder.

NOTE: *A socket is used to protect the thrust button on the end of the gear.*

4. To install the split pin retainer, carefully locate hole position 90° from the existing hole and prick punch. Using a #24 (.152) drill, bore a hole through the sleeve and gear (Fig. 19).
5. Install the split pin retainer.
6. Carefully wash the governor assembly to remove any chips.

Assembly

1. Install the governor valve in its bore and check for free operation.
2. Align the weight pin holes in the thrust cap, weight assemblies and sleeve and install new pins. Crimp both ends of the pins to prevent them from coming out.

NOTE: *Governor weights are interchangeable.*

3. Check the operation of the governor weights for freedom of movement on their pins.

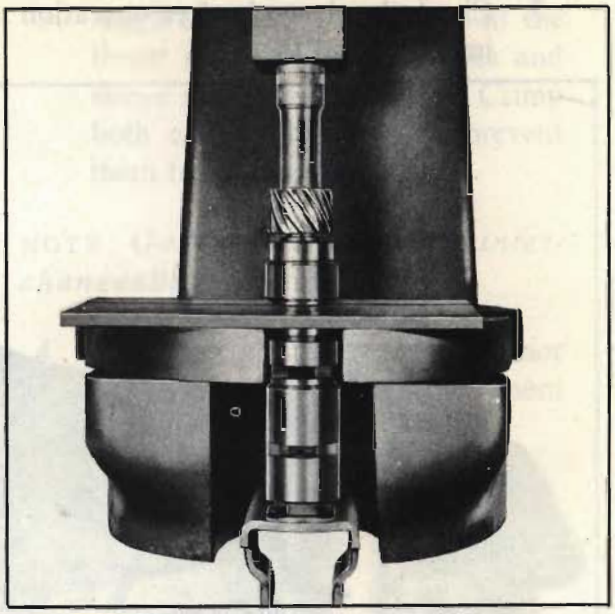

Fig. 18. Pressing gear into sleeve

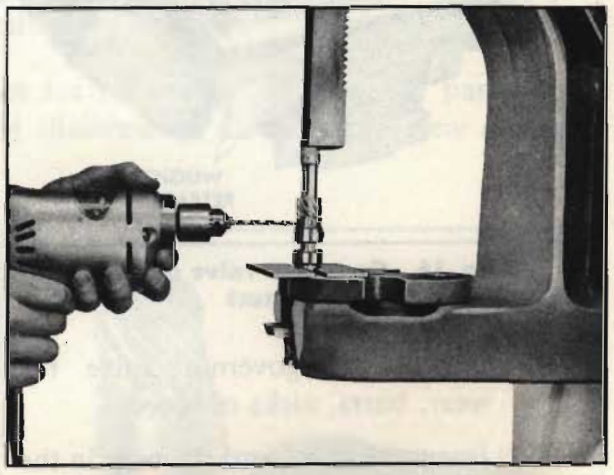

Fig. 19. Drilling new pin hole

Overhauling the Torque Converter 1953-1957

Disassembly

Fig. 20 illustrates a disassembled converter.

1. Position the torque converter on the workbench. Remove the converter cover attaching lock nuts and bolts. Using a small punch drive the split dowel pin out of the converter cover.
2. Remove the converter cover, the turbine assembly, the stator assembly, the stator thrust washers and the converter pump thrust washer.

CAUTION: *Do not pry the cover off with a screw driver.*

3. Remove the thrust washer from the turbine hub.

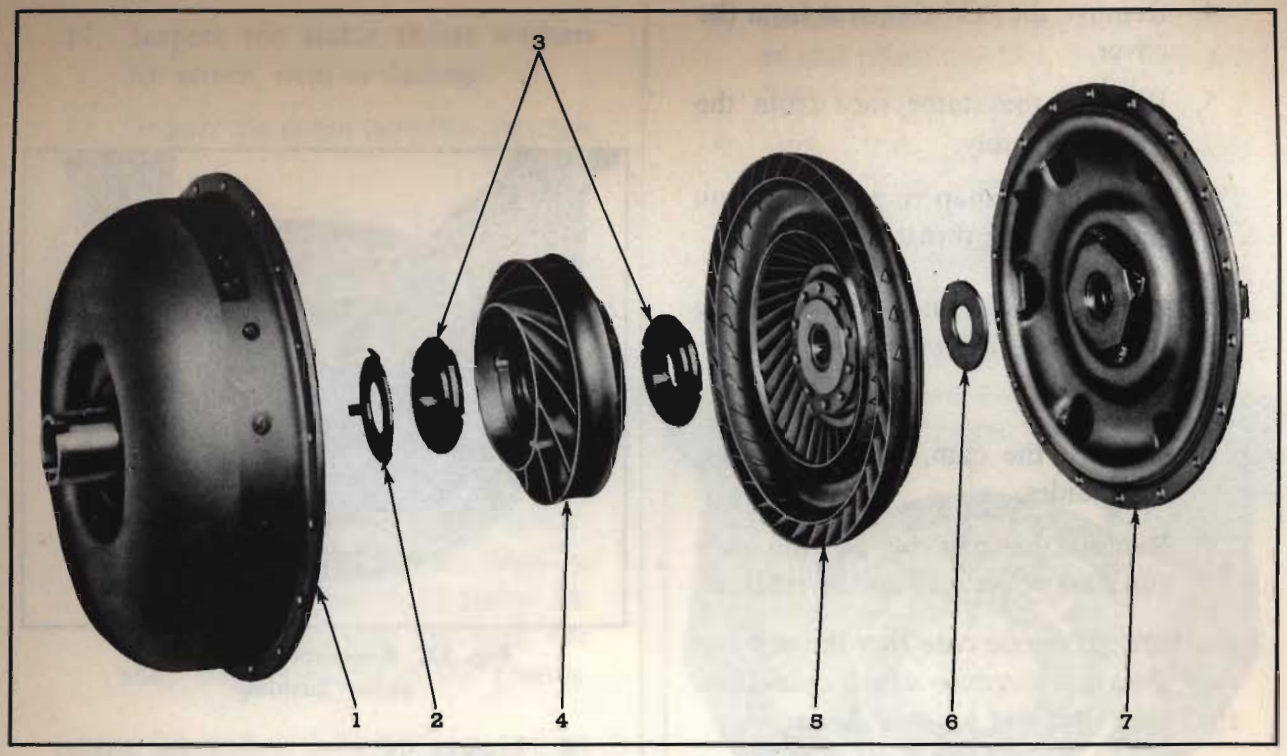

Fig. 20. Layout of converter parts

1. Converter Housing & Pump Assembly
2. Converter Pump Thrust Washer
3. Stator Thrust Washers
4. Stator Assembly
5. Turbine Assembly
6. Turbine Thrust Washer
7. Converter Cover Assembly

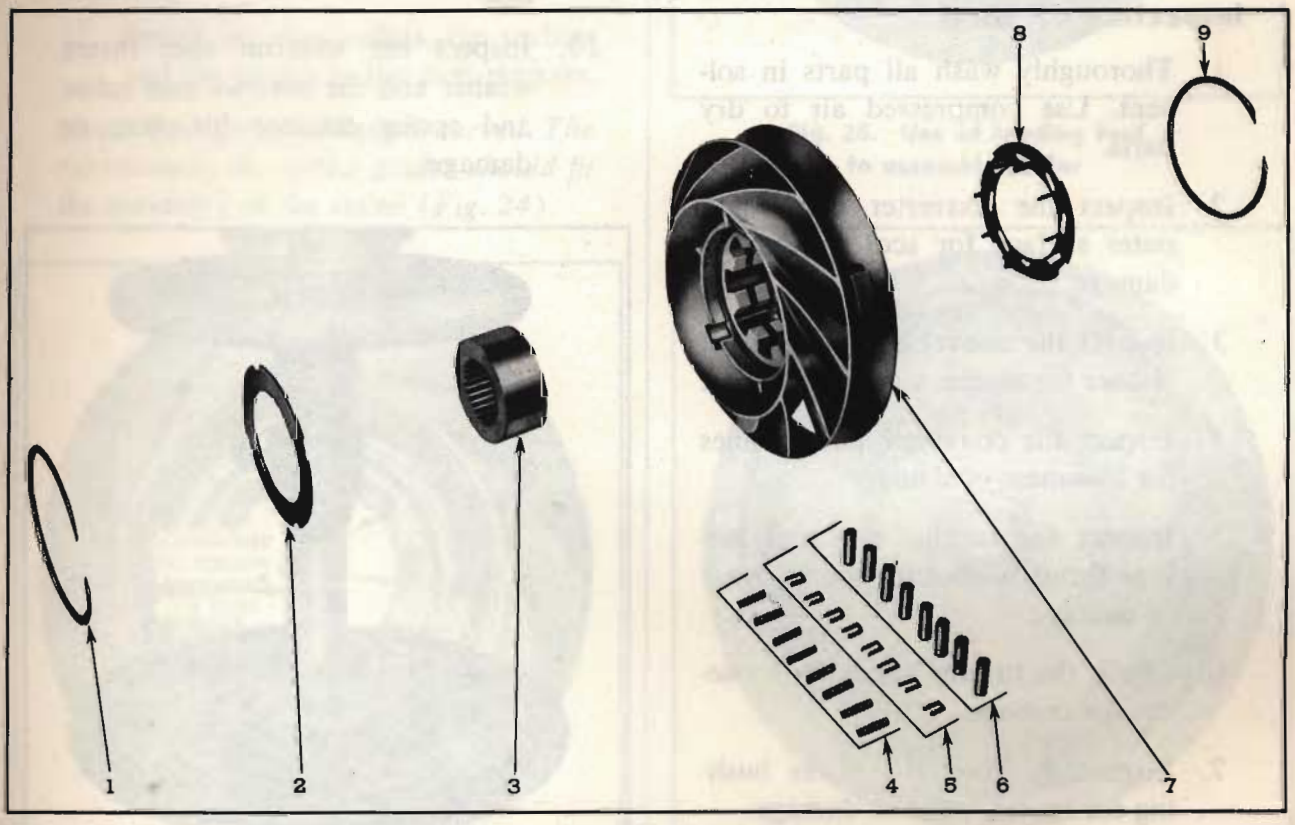

Fig. 21. Layout of stator parts

1. Over-Run Cam Retaining Ring
2. Over-Run Cam Thrust Washer
3. Stator Race
4. Over-Run Cam Springs
5. Over-Run Cam Roller Guides
6. Over-Run Cam Raller
7. Stator
8. Over-Run Cam Roller and Spring Retainer
9. Over-Run Cam Retaining Ring

4. Remove the "O" ring seal from the cover.
5. Remove the stator race from the stator assembly.
6. Remove the snap ring and overrun cam retaining thrust washer.

CAUTION: *Use care when disassembling parts to prevent loss of rollers, springs, and guides.*

7. Remove the cam, rollers, springs, and guides.
8. Remove the snap ring and the overrun cam roller and spring retainer.

CAUTION: *Exercise care that the overrun cam does not become disengaged from the stator hub and become damaged.*

Fig. 21 illustrates stator parts.

Inspection of Parts

1. Thoroughly wash all parts in solvent. Use compressed air to dry parts.
2. Inspect the converter pump hub outer surface for scores, wear or damage.
3. Inspect the converter pump thrust washer for scores, wear or damage.
4. Inspect the converter pump vanes for looseness or damage.
5. Inspect the turbine hub and turbine thrust washer for scores, wear or damage.
6. Check the turbine vanes for looseness or damage.
7. Inspect the converter cover bushing for scores, wear or damage.
8. Inspect the stator race and cam rollers for scores or roughness.

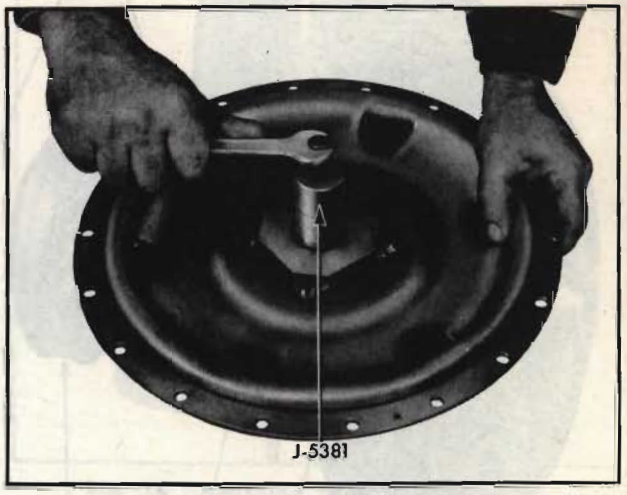

Fig. 22. Removing converter cover bushing

9. Inspect the cam springs for distortion and collapsed coils. Inspect the spring guides for wear or damage.
10. Inspect the overrun cam thrust washer and the overrun cam roller and spring retainer for wear or damage.

Fig. 23. Replacing converter cover bushing

11. Inspect the stator thrust washers for scores, wear or damage.
12. Inspect the stator vanes for damage.

Assembly

A converter cover replacement bushing is available for field service. Removal of the old bushing is shown in Fig. 22. Installation of the replacement bushing is shown in Fig. 23.

1. Assemble the overrun cam roller and spring retainer to the stator. The prongs of the retainer must be pointed to the rear of the stator. Install the snap ring. Be sure the snap ring is seated in the groove.

NOTE: *The letters "FRONT" are cast on the stator to identify the front from the rear. Also, the front of the vanes are thicker.*

2. Install the cam rollers, the springs and the guides in the cam pockets.

NOTE: *The spring guides are curved. The curvature of the spring guides should fit the curvature of the stator (Fig. 24).*

Fig. 24. Curvature of spring retainers

3. Install the overrun cam thrust washer and retaining snap ring. Be sure that the snap ring is seated.
4. Lightly coat the special stator race loading tool with oil. Place the stator race on the loading end of the tool. Carefully rotate stator over the tapered end of the loading tool and the stator race. Be careful

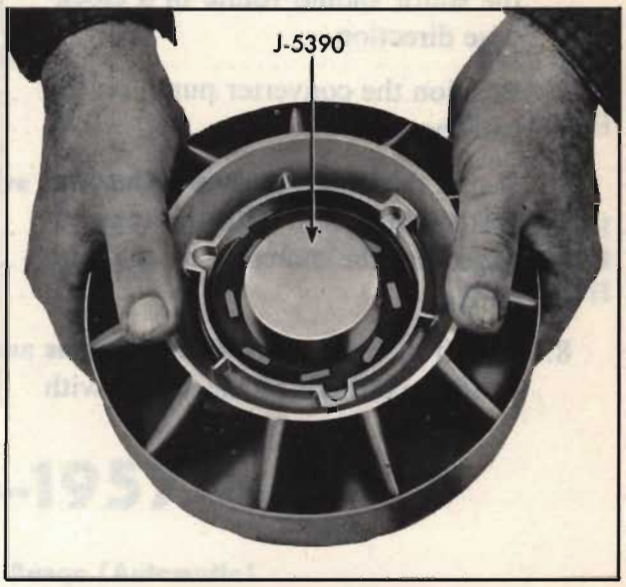

Fig. 25. Use of loading tool to assemble stator

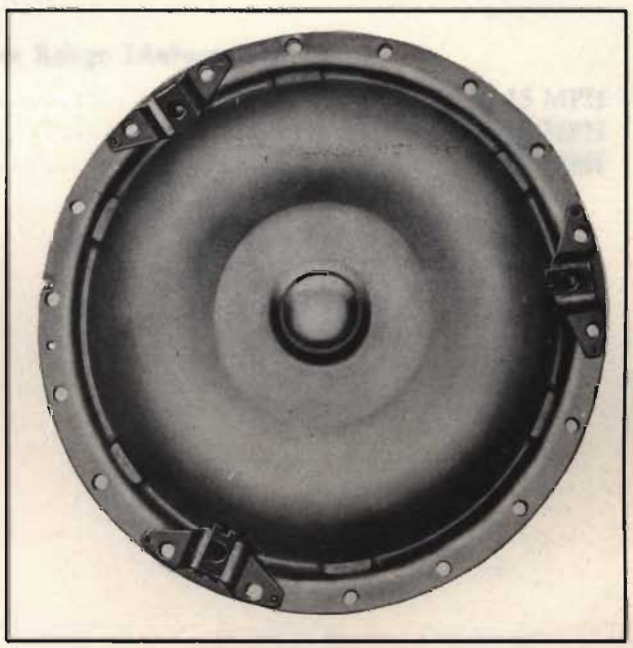

Fig. 26. Installing converter cover to pump

that the rollers are not forced out of position (Fig. 25).

NOTE: *The stator should be rotated in the free wheel direction (clockwise) to eliminate the possibility of dislodging the cam rollers.*

5. Note operation of the stator. When viewing the stator from the front, the stator should rotate in a clockwise direction.
6. Position the converter pump on the workbench.
7. Install the thrust washer to the converter pump hub with the tabs engaged in the notches of the hub flange.
8. Install the rear stator thrust washer in the rear bore of the stator with the splines of the washer toward the stator. Assemble the aluminum front stator thrust washer in the front bore of the stator.

CAUTION: *The cut-outs in the overrun cam roller and spring retainer must face upwards or towards the turbine.*

9. Install the thrust washer on the turbine hub. Assemble the turbine assembly to the converter pump.
10. Install a new "O" ring seal on the converter cover.
11. Align the dowel pin hole in the converter cover with the dowel pin in the converter pump. Install the converter cover (Fig. 26).
12. Install the converter pump to converter cover. Install bolts and locknuts. Tighten to 15-20 ft. lbs.

The following information is presented as a guide to assist in making a correct diagnosis.

Shift Patterns

1953-1954

UPSHIFT — Drive Range (Automatic)

Throttle Position	Range
Light Throttle	10-20 MPH
To Detent	23-33 MPH
Thru Detent	*37-44 MPH

DOWNSHIFT — Drive Range (Automatic)

Light Throttle	8-10 MPH
To Detent	13-16.5 MPH
Thru Detent	*32-37 MPH

* *This may be somewhat higher on early production units.*

1955-1957

UPSHIFT — Drive Range (Automatic)

Light Throttle	12-14 MPH
To Detent	30-45 MPH
Thru Detent	48-53 MPH

DOWNSHIFT — Drive Range (Automatic)

Closed Throttle	10-13 MPH
To Detent	14-18 MPH
Thru Detent	45-50 MPH

Torque Specifications

	1950-52	1953-54 (Foot Pounds)	1955-57
Converter Cover Assembly to Primary Pump	15-20		
Converter Cover Assembly to Converter Pump		15-20	15-20
Turbine Assembly to Converter Cover Assembly	12½ min.		
Drive Flange to Turbine Assembly	12½-15		
Transmission Case to Housing	25-30	25-30	25-30
Modulator Housing and Cover Assembly to Case	12½-15	12½-15	
Low and Drive Valve Body to Cover		3½-5	3½-5
Low and Drive Body Assembly to Housing		12½-15	12½-15
Servo Cover to Case	12½-15	12½-15	12½-15
Valve Body Bolts	7½-10	7½-10	7½-10
Rear Pump Assembly to Case	12½-15	12½-15	12½-15
Primary Pump to Hub	4½		
Flywheel to Converter Bolts			25-30
Governor Cover to Case		6½-8½	6½-8½
Universal Joint Assembly to Planet Carrier	25-30	25-30	
Ball Joint Collar to Case	8-12	8-12	
Speedometer Driven Gear Fitting	45-50	45-50	
Brake Band Adjusting Screw Lock Nut	20-25	20-25	20-25
Transmission Extension to Case			12-15