

# HUDSON

## *Service Merchandiser*

Dedicated to the interest of



field service, parts and accessory merchandising

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*Supplement to . . .*

### **1951 MECHANICAL PROCEDURE MANUAL**

AND

### **HYDRA-MATIC SERVICE INFORMATION BOOK**

*Covering*

**H-51 HYDRA-MATIC TRANSMISSION**

WITH

**FRICTION TYPE REVERSE**

RETAIN AND USE WITH ABOVE PUBLICATIONS FOR COMPLETE  
HYDRA-MATIC TRANSMISSION SERVICE INSTRUCTIONS

HUDSON MOTOR CAR COMPANY.. DETROIT 14, MICHIGAN

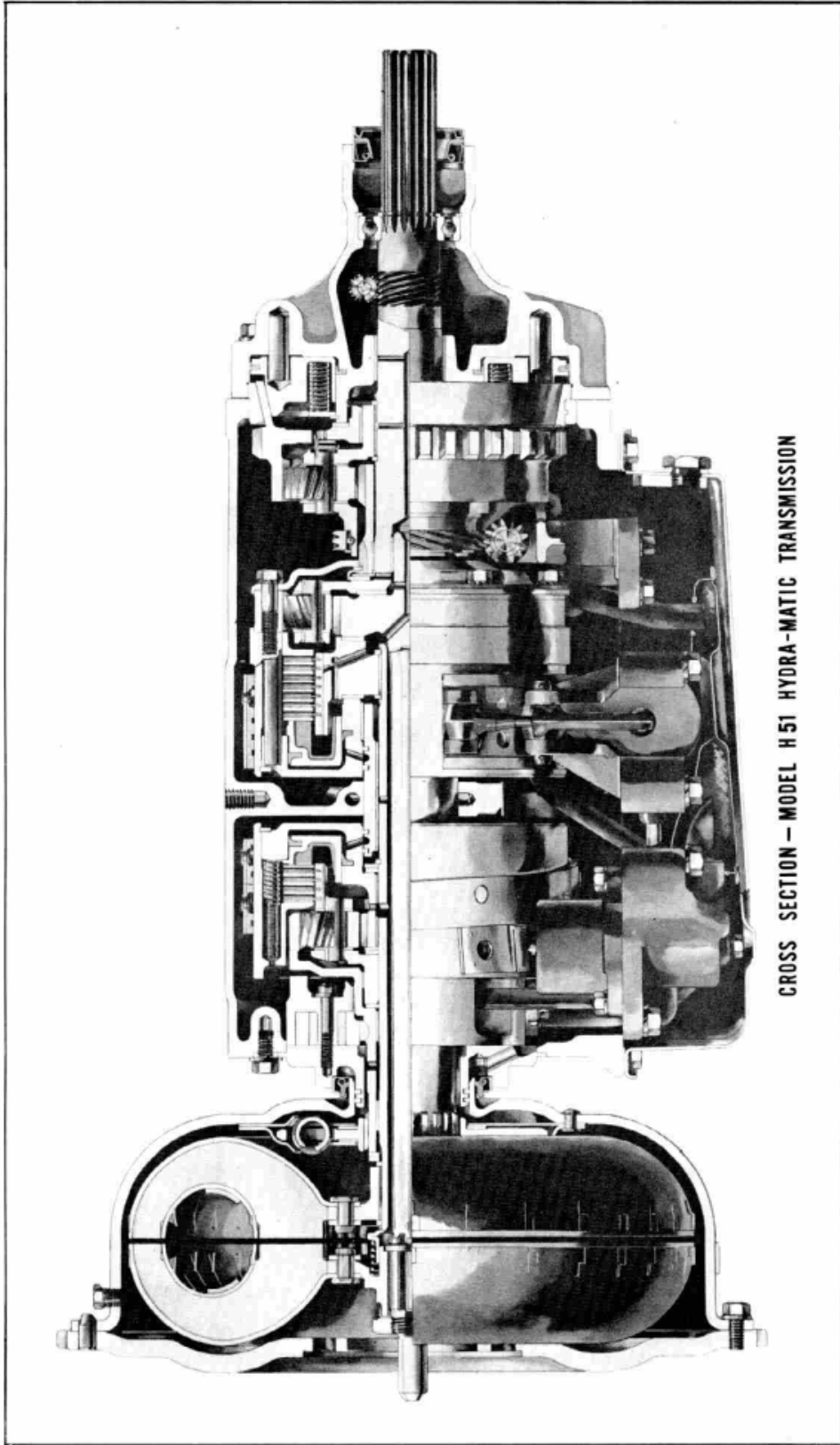


Figure 1

## REPAIR PROCEDURES FOR THE H-51 (1951) HYDRA-MATIC TRANSMISSION REVERSE SYSTEM

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### GENERAL DESCRIPTION

The major differences in the H-51 Hydra-Matic Transmissions from the H-50 Hydra-Matic Transmissions are in the interior construction and function. Exterior changes are in the design of the rear bearing retainer and the modification of the flywheel housing rear bore to accommodate the new, larger capacity front pump.

The model number appears on the name plate located on the right hand side of the transmission, H-50 for the first 1951 transmissions and H-51 for the second type.

All procedures set forth in the 1951 "A" Series Mechanical Procedure Manual covering removal,

disassembly, inspection, assembly, installation and adjustments will also apply to the H-51 Hydra-Matic transmissions unless noted otherwise.

### FRONT PUMP

The difference between the front pump used in the H-51 transmission and that used on the H-50 transmissions is that the front pump in the H-51 transmission has a greater volume and has better pressure regulation. The new pump has thicker gears, requiring a new deeper front pump cover. The new pump cover will extend out of the transmission case much further than the pumps used in the H-50 transmissions. The flywheel housing has

been changed to accommodate the new pump cover.

**NOTE:** The H-50 pumps must NOT be used on the H-51 transmissions.

### REAR SERVO

The reverse blocker piston oil passages in the rear servo accumulator body on the H-50 model transmissions is not used on the H-51 transmissions. Oil pressure previously used to activate this piston when the rear unit clutch was applied came from the main line pressure circuit.

On the H-51 transmission, governor pressure is used to hold the reverse blocker piston (now located in the parking brake bracket assembly) forward (outward) when car speed is above approximately 10 miles per hour.

### GOVERNOR ASSEMBLY

The governor oil delivery sleeve for the H-51 transmission is a component part of the parking bracket assembly and cannot be interchanged with the governor oil delivery sleeve used with the H-50 transmission.

### PRESSURE REGULATOR

The pressure regulator assembly used on the H-51 transmission can be identified by the two oil passages drilled in the plug. One passage (the "TV" passage) is located above the groove machined on the plug for the neoprene seal. The other passage located below the groove is for the reverse booster pressure. The regulator for the H-50 transmission has only one drilled passage. The two pressure regulators are not interchangeable.

### CONTROL VALVE ASSEMBLY

The control valve assembly used in the H-51 transmission can be identified from the H-50 control valve assembly as follows:

a) A front servo exhaust valve assembly and spacer has been added at the front of the outer valve body. A passage has been drilled in the front servo exhaust valve body for the pressure regulator reverse pipe (A), Figure 4.

b) The detent plunger is of the round nose bullet-type instead of a round ball, Figure 7.

c) The manual control valve is new.

d) The detent plunger retainer is also new.

**NOTE:** The H-51 control valve assembly **MUST**

**NOT** be interchanged with the control valve assembly used in the H-50 transmissions.

The side cover and gasket for the H-51 transmission cannot be interchanged with those used on the H-50 transmission.

### TRANSMISSION CASE

The H-51 transmission case has two passages added. One passage, located at the front upper left hand of the case, is for the pressure regulator reverse oil pipe, Figure 4. The other passage at the rear lower end of the case is for the reverse clutch oil pipe Figure 5.

### REAR BEARING RETAINER

The rear bearing retainer has been completely redesigned to incorporate the new reverse friction clutch cone and case unit. See "Disassembly and Assembly Procedure," Page 197, for operation of the reverse cone.

### OPERATING INSTRUCTIONS

Operating instructions for the H-51 Hydra-Matic Transmissions are the same as H-50 instructions contained in your 1951 "A" Series Mechanical Procedure Manual, except for operation in reverse.

#### REVERSE:

On the 1951 Hudsons equipped with the H-51 Hydra-Matic Transmission, it is not necessary to come to a complete stop before engaging reverse.

**NOTE:** When the car is stuck in deep snow, mud or sand, the car can be rocked backward and forward by alternately placing the manual selector lever in the "R" (Reverse) position and "LO" (Low) position. The selector lever can not be moved to the "R" position at speeds above 10 MPH.

#### PARKING:

For additional safety while parking, turn the ignition key to the off position and move the hand selector lever to the "R" position. This will permit engaging of transmission parts, thereby providing "in gear" parking ability.

**IMPORTANT:** When parking on an incline, hold the car with the foot brake for a few seconds to permit proper engagement of transmission parts.

### PRESSURE REGULATOR ASSEMBLY

#### DISASSEMBLY:

1. Remove pressure regulator spring from pressure regulator plug assembly.

2. Remove reverse booster plug and "TV" pressure plug from pressure regulator plug assembly.
3. Remove pressure regulator valve from pressure regulator spring.

**NOTE:** The larger plug (reverse booster plug) is new. In reverse, oil pressure enters the hole (in the threads) of the pressure regulator plug and forces against the reverse booster plug, forcing the booster plug against the pressure regulator valve, Figure 2. The additional pressure is required to insure positive reverse clutch action. During forward operation of the car, oil is cut off at this point and the reverse booster plug acts as a spacer having no effect in the assembly.

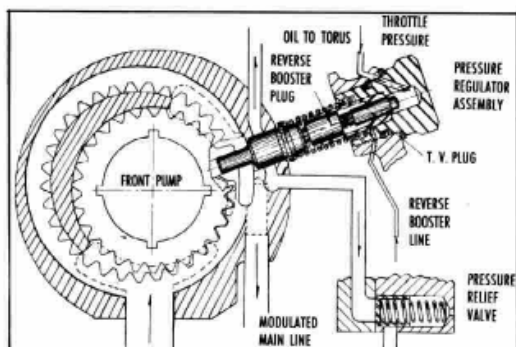


Figure 2

#### ASSEMBLY:

1. Install the pressure regulator valve in the pressure regulator spring. (Small end of spring must fit in groove on regulator valve.)
2. Install the "TV" pressure plug (small) in pressure regulator plug assembly.
3. Install the reverse booster plug in bore of the pressure regulator plug assembly.

**NOTE:** Use care in the replacement of these two plugs.

**CAUTION:** If the neoprene seal on the pressure regulator plug is omitted or damaged, a transmission lock-up or a scoring of the reverse piston could result.

4. Install pressure spring in the pressure regulator plug. Install a new gasket and install the regulator plug into transmission, entering regulator valve into bore of front pump.

**NOTE:** Apply pressure to plug to start threads and tighten plug in transmission case to approximately 40 foot pounds torque. Check transmission oil pressure according to instructions on page 115 of your 1951 "A" Series Procedure Manual covering the H-50 transmission and on page 205 of this supplement covering oil pressure checking of the reverse unit for the H-51 transmissions.

#### CONTROL VALVE ASSEMBLY AND PARKING BRAKE BRACKET ASSEMBLY REMOVAL:

1. Drain torus cover and transmission case.
2. Remove transmission oil pan and side cover.
3. Back off front and rear band adjusting screws at least 5 turns.
4. Remove parking brake pawl support bolt (A) from rear of case and position parking pawl (B) down in case as far as it will go, Figure 3. (Pawl cannot be removed at this time.)

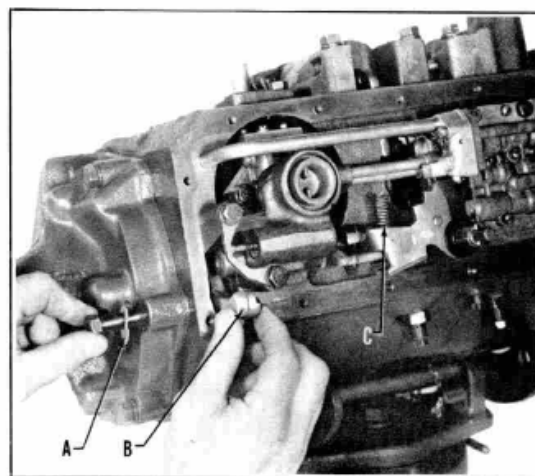


Figure 3

5. Using a screwdriver, remove the pressure regulator reverse oil pipe (A), Figure 4. (Do not bend pipe during this operation.)
6. Loosen the two bolts holding the parking brake bracket assembly to the transmission case.
7. Place detent control lever in "LO" position.
8. Unhook the parking brake release spring (C) from the pin assembly, Figure 3.

9. Remove the four bolts attaching the control valve assembly to the transmission case.
10. Work control valve assembly toward the front of the case sufficiently to remove the governor pipes and the reverse clutch pipe, Figure 5.

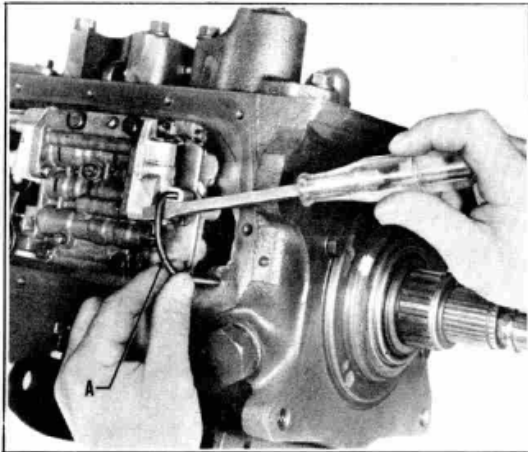


Figure 4

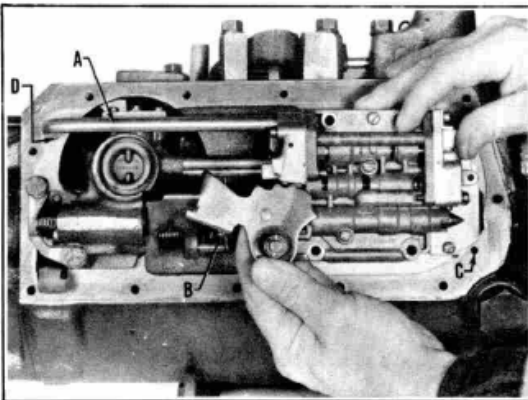


Figure 5

**NOTE:** Governor pipes may remain with either the control valve assembly or the parking bracket assembly.

**CAUTION:** After removing the control valve assembly, wrap the valve assembly in a clean rag and place valve where it cannot be damaged.

11. Remove the reverse clutch oil pipe from the transmission case. See Figure 5.
12. Remove the bolts attaching the parking brake bracket assembly to the case and remove the

piston release spring stop and spring. Carefully remove the sleeve from the governor to avoid damage to the oil rings, Figure 6.

13. Remove the parking pawl from the transmission case.

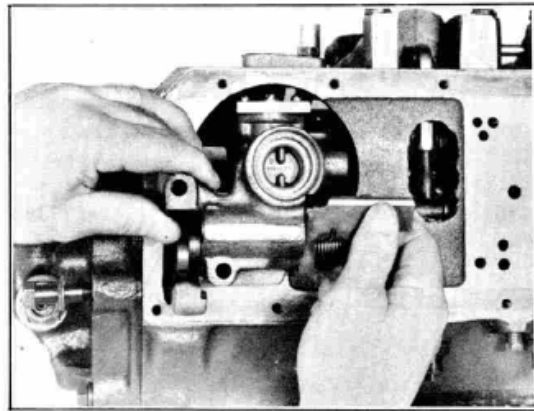


Figure 6

### CONTROL VALVE ASSEMBLY

#### DISASSEMBLY:

1. Pick out a clean area on your work bench and remember that cleanliness is important in the disassembly and assembly of the control valve assembly.
2. Move the inside detent control lever slowly counter-clockwise and remove the detent tension spring and plunger, Figure 7.

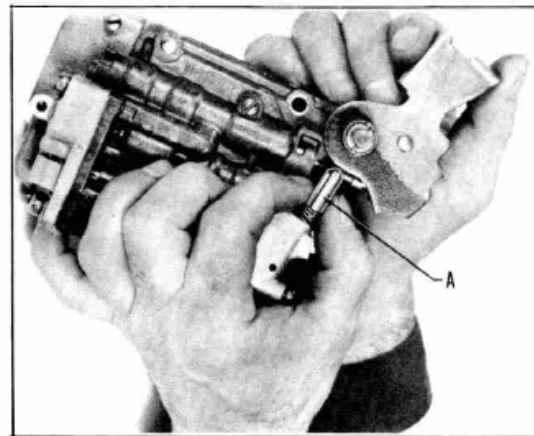


Figure 7



3. Remove the manual shaft rubber seal and outer and inner manual shaft shield washers from the manual shaft, Figure 8.
4. Remove the three screws that hold the inner and outer valve bodies together. Separate valve bodies and remove the valve body spacer plate.

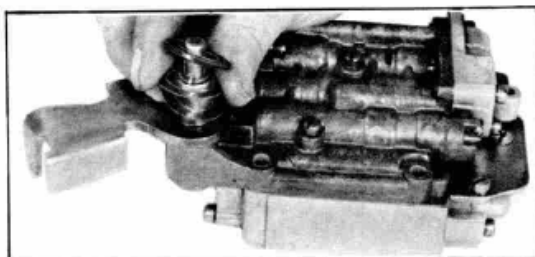


Figure 8

**CAUTION:** Keep screws with the correct part and in the proper hole of the part removed.

5. Remove the three screws that hold the valve body rear cover to the valve body and remove the rear cover and inner valve body rear plate.
6. Remove the three governor plugs from the inner valve body.
7. Remove the three screws that attach the front valve body plate to the front valve body and remove the plate.
8. Remove the three screws that hold the front valve body to the inner valve body and remove the front valve body.

**NOTE:** Hold the front valve body and inner valve body together while removing the screws to keep the springs from jumping out of place.

9. Remove the 1-2 regulator plug spring, 2-3 valve spring, 2-3 regulator plug spring and 3-4 valve spring.
10. Remove the three shifter valves.

**NOTE:** The valves should be free to move from body by pushing from opposite ends with a  $\frac{1}{8}$ " brass rod.

11. Remove the three regulator plugs by bumping front valve body on palm of hand.
12. Remove the three screws from the detent plunger retainer (A) and remove the retainer and plate, Figure 9.
13. Remove the "T" valve (A), the throttle valve spring (B) and the throttle valve (C), Figure 10.

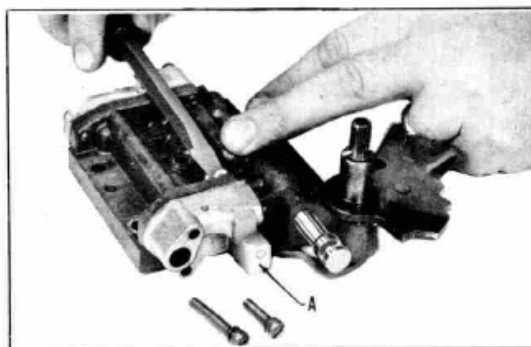


Figure 9

14. Remove the double transition valve and spring (D), Figure 10.

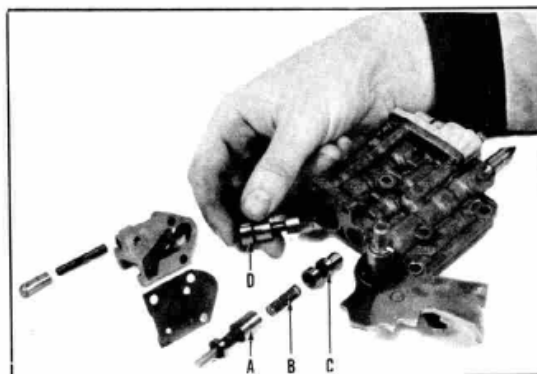


Figure 10

15. Remove the three screws holding the front servo exhaust valve assembly over the compensator valve and detent plug in outer valve body, Figure 11, and remove the front servo exhaust valve assembly.

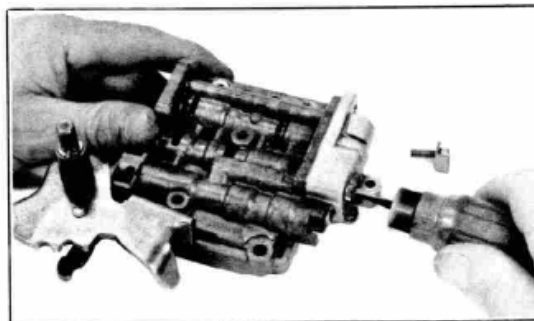


Figure 11

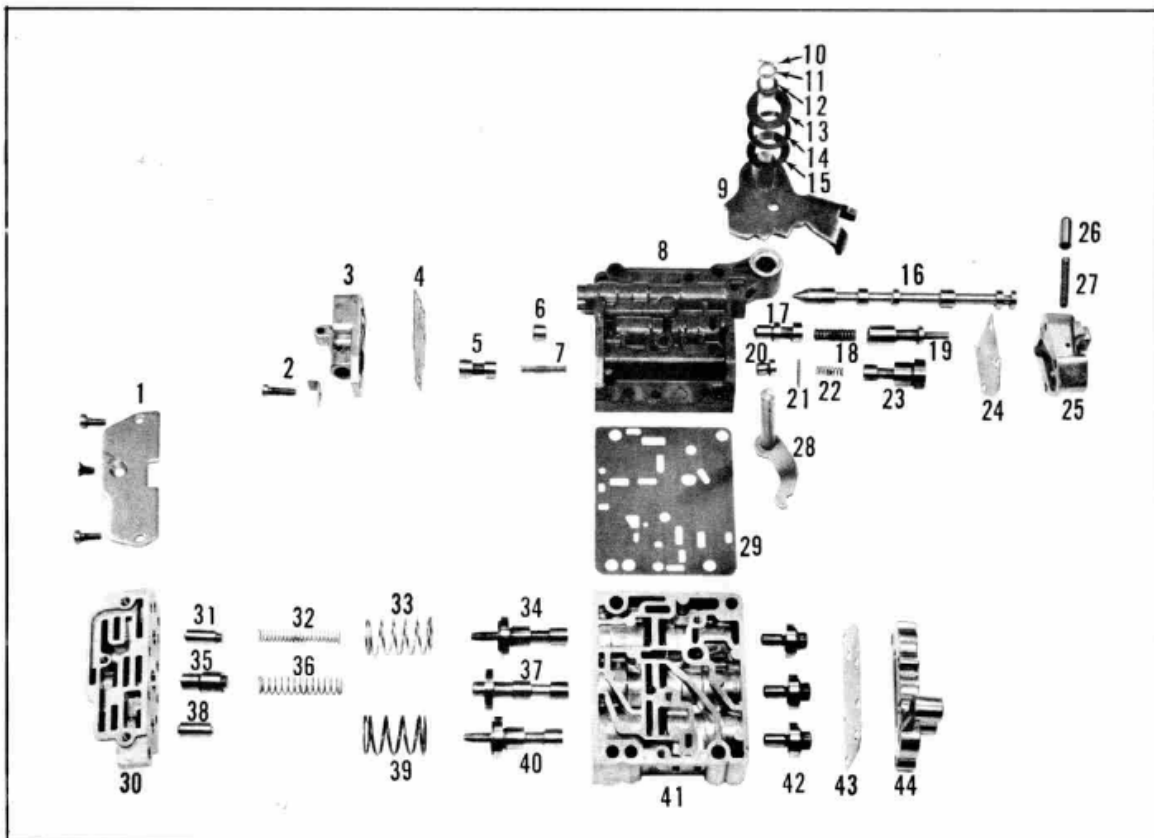


Figure 12

- |  |                                    |                               |
|--|------------------------------------|-------------------------------|
| 1. Front Valve Body Plate and Screws.    | 16. Manual Control Valve           | 31. 2-3 Regulator Plug        |
| 2. Servo Release Plug Lock and Screw     | 17. Throttle Valve                 | 32. 2-3 Regulator Plug Spring |
| 3. Front Servo Exhaust Valve Body        | 18. Throttle Valve Spring          | 33. 2-3 Shifter Valve Spring  |
| 4. Front Servo Exhaust Valve Body Spacer | 19. "T" Valve                      | 34. 2-3 Shifter Valve         |
| 5. Compensator Valve                     | 20. Compensator Auxiliary Plug     | 35. 1-2 Regulator Plug        |
| 6. Detent Plug                           | 21. Compensator Auxiliary Plug Pin | 36. 1-2 Regulator Plug Spring |
| 7. Compensator Valve Spring              | 22. Transition Valve Spring        | 37. 1-2 Shifter Valve         |
| 8. Outer Valve Body                      | 23. Double Transition Valve        | 38. 3-4 Regulator Plug        |
| 9. Manual Shaft                          | 24. Detent Plunger Spacer          | 39. 3-4 Shifter Valve Spring  |
| 10. Inner Control Lever Pin              | 25. Detent Plunger Retainer        | 40. 3-4 Shifter Valve         |
| 11. Inner Control Lever Washer           | 26. Detent Plunger                 | 41. Inner Valve Body          |
| 12. Inner Control Lever Seal             | 27. Manual Valve Detent Spring     | 42. Governor Plugs            |
| 13. Manual Shaft Seal                    | 28. Inner Throttle Lever           | 43. Inner Valve Body Plate    |
| 14. Manual Shaft Seal Outer Washer       | 29. Valve Body Spacer Plate        | 44. Valve Body Rear Cover     |
| 15. Manual Shaft Seal Inner Washer       | 30. Front Valve Body               |                               |

16. Remove the compensator valve (5), spring (7) and detent plug (6) from the outer valve body (8), Figure 12.
17. Remove the stop pin (21) that holds the compensator auxiliary plug (20) in place.
18. Remove the compensator auxiliary plug (20) by inserting a  $\frac{1}{8}$ " welding rod in hole in plug and use another small punch to push the plug from the outer body.

**CAUTION:** Since this plug is short, do not let it drop from the rod to become lodged in the valve body.

### Cleaning and Inspection

Thoroughly clean valve bodies and valves in a CLEAN solvent and inspect all parts of the valve bodies as outlined on pages 11-92 and 11-93 of your 1951 "A" Series Mechanical Procedure Manual.

### ASSEMBLY OF CONTROL VALVE ASSEMBLY

1. Carefully assemble compensator auxiliary plug (20) into the outer valve body (8), using a punch or  $\frac{1}{8}$ " welding rod to hold plug. Install auxiliary plug pin (needle bearing roller) (21) in outer valve body locating compensator auxiliary plug.



2. Install throttle valve (17), throttle valve spring (18), "T" valve (19) and check valves for freeness in bore.
  3. Install double transition valve spring and valve, (22) and (23).
  4. Install detent plunger retainer spacer (24) and retainer (25) to outer valve body. Be sure to use the three correct screws and have inner throttle lever (28) inside of stop in detent retainer.
  5. Install compensator valve (5) with spring (7).
  6. Install throttle valve detent plug (6).
  7. Install front servo exhaust body (3) with spacer (4) to outer valve body. Install servo release plug lock (2) and screw at small end of servo exhaust valve body. Install two screws at other end of servo exhaust valve body, and tighten the three screws.
  8. Install the manual control valve (16) making sure manual valve operating pin engages valve correctly:
    - a. Rotate inside detent control lever counter-clockwise past the reverse position.
    - b. Insert manual valve detent spring (27) in bore of detent plunger retainer.
    - c. Insert detent plunger (26) over spring.
    - d. Push plunger and spring into bore with finger while rotating manual control lever clockwise into "LO" position.
  9. Install manual shaft seal inner washer (15) with small inside diameter over manual control shaft dish up.
  10. Install manual shaft seal outer washer (14) with large inside diameter over manual control shaft dish down.
  11. Install the rubber manual shaft seal (13) over the shaft with lip extending into the inside diameter of outer washer.
  12. Install the three governor plugs (42) in the inner valve body.
  13. Position inner valve body plate (43) and valve body rear cover (44) on body. Install and tighten the three screws.
  14. Install the three regulator plugs (31), (35) and (38) in front valve body and check for freeness in valve bores.
  15. Install shifter valves 1-2 (37), 2-3 (34), and 3-4 (40) in inner valve body and check for freeness in valve bores.
  16. Install 1-2 regulator plug spring (36) in valve body.
  17. Install 2-3 valve spring (33) and 2-3 regulator plug spring (32) in valve body.
  18. Install 3-4 valve spring (39) in valve body.
  19. Lay front valve body (30) and inner valve body (41) on clean surface, line up regulator plug springs in inner body with regulator plugs in front body.
  20. Compress springs with front body (30) and install three attaching screws.
  21. Position front valve body plate (1) on front valve body and install three attaching screws. Be sure plate does not extend over face of inner body.
  22. Position the valve body spacer plate (29) on the inner valve body.
- NOTE: The spacer plate can only be installed in one way.*
23. Position outer valve body on spacer plate and insert the four valve body to transmission case attaching bolts through valve bodies and spacer plate to hold spacer plate in position while starting and tightening the three inner and outer valve body attaching screws.
- NOTE: Make sure all assembly screws are tight and in right location in valve body by double checking, using a small screwdriver.*

## PARKING BRAKE BRACKET ASSEMBLY

### DISASSEMBLY:

1. Remove the parking blocker piston (1) Figure 13. It may be necessary to tap the bracket assembly on the palm of the hand to remove the piston.
2. Round off head of stop pin (4) with file and pull pin out of bracket.
3. Remove the reverse blocker piston (5) and spring (6) from bracket.

### INSPECTION:

1. Inspect the bracket and crank assembly (7) to determine that crank operates freely in the bracket without binding and does not show signs of unusual wear.

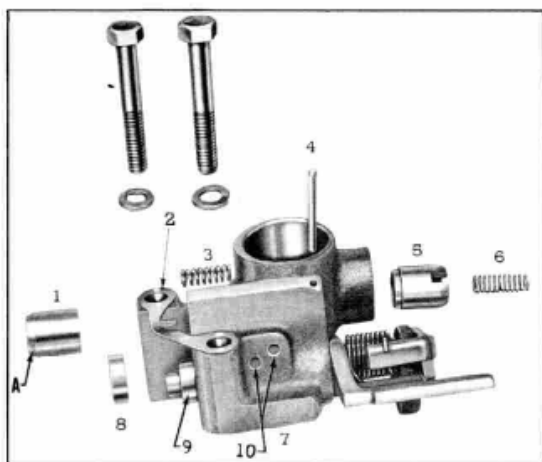


Figure 13

**NOTE:** If the bracket, crank assembly, or piston bores are unusually worn, the bracket assembly should be replaced as a complete unit.

2. Check the crank roller (8) for wear; replace if unusually worn.
3. Inspect the crank pin (9) to see that there are no visible cracks at the point where the pin joins the crank.
4. Clean and inspect the oil passages to the two blocker pistons.
5. Inspect the two blocker pistons and bores in the bracket to see that both are free of scores and burrs. Check the fit of the two blocker pistons in their respective bores to insure a non-binding, non-leaking fit. This can readily be checked by placing one finger over the oil hole in the sleeve, pulling the piston outward, and observing if a slight vacuum is created. Excessive leak may be caused by plugs (10) omitted from bracket.
6. Inspect the parking pawl for cracks or signs of unusual wear.
7. Check oil delivery sleeve (7) for score marks or excessive wear.

**NOTE:** The three possible factors contributing to governor ring land wear are:

- a. Sloppy fit between the rear pump shaft and bushings.
- b. Loose governor flange on rear pump shaft.
- c. Misaligned governor flange.

8. The following checks can be made with the rear oil pump secured in the case, but with the governor removed from the flange:

- a. Check the shaft fit by trying to tip the shaft back and forth in the rear pump housing. If the shaft rattles freely, the rear pump should be repaired or replaced.
- b. Check the flange to shaft fit by trying to wobble the flange on the shaft. If any free play is observed, repairs are required.

**NOTE:** It is possible to obtain springing movement by forcing the flange. This should not be confused with flange play.

- c. Check drive flange runout by locating dial indicator on the transmission case so that spindle of the indicator rests against face of flange on the outer edge of the face. Rotate output shaft several revolutions by turning a rear wheel. If runout of drive flange exceeds .002", correct condition by replacing one or both of the following parts—governor drive flange, or complete rear oil pump assembly.
9. After performing operation 8, check governor runout as follows:
  - a. Install a dial indicator and check governor runout at governor tower about 1/4" from the end of the governor tower. Runout should not exceed .005".
  - b. If runout still exceeds .005", rotate governor 180° on flange and recheck. If runout still exceeds .005", and governor flange runout did not exceed .002", replace governor tower assembly.

#### ASSEMBLY:

1. Clean all parts thoroughly.
2. Install the parking blocker piston (1), Figure 13, into rear of parking bracket assembly (7), (chamfered end (A) of piston exposed.)
3. Install the reverse blocker piston (5) with slotted end out. Install the reverse blocker piston spring (6) in the reverse blocker piston. Hold piston in with a screw driver when installing the stop pin (4).
4. Peen both ends of pin to retain pin in place.

#### CONTROL VALVE AND PARKING BRAKE BRACKET ASSEMBLIES

##### INSTALLATION

1. Install the parking pawl into position in transmission case, BUT DO NOT INSTALL parking brake pawl support bolt.

2. Place the chamfered side of the governor oil delivery sleeve (A) over the end of the governor and install carefully guiding rings into the oil delivery sleeve, Figure 14.

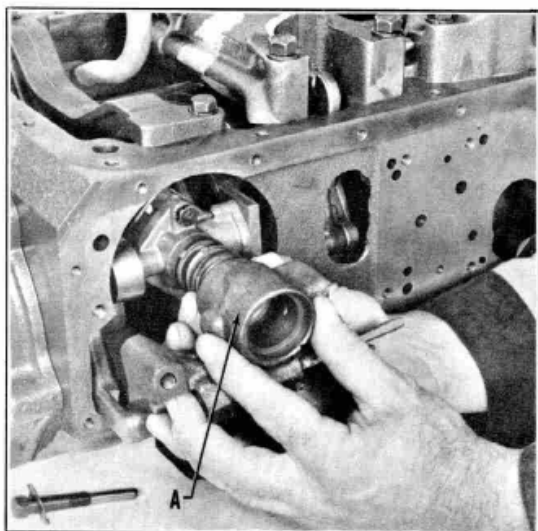


Figure 14

3. Install three oil delivery pipes into the parking brake bracket assembly.
4. Install the parking blocker piston spring (C), Figure 15, piston release spring stop (B) and start brake bracket to case bolts into transmission case. Loosen rear pump attaching bolts.

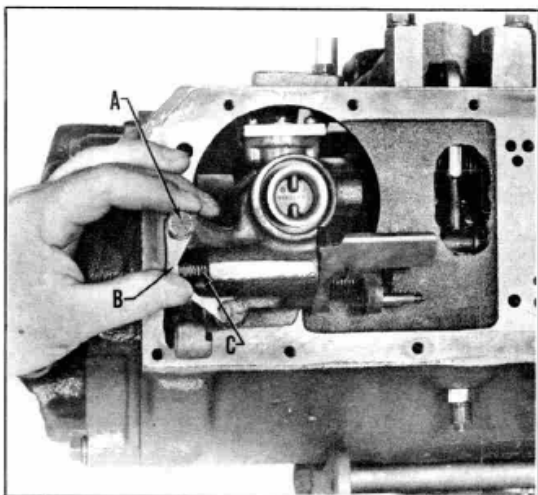


Figure 15

5. Install crank roller on parking brake pawl crank; raise pawl to position and install parking brake pawl support bolt. Tighten pawl bolt to 23-28 ft. lbs. torque. Bend lock plate over flat of bolt.

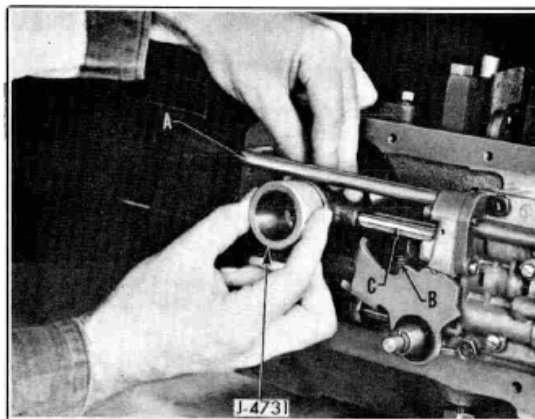


Figure 16

6. Install the parking pawl return spring (B) over the inside oil delivery pipe (open end of hook out) and hook other end over the parking brake lever pin groove, Figure 16.
7. Install the reverse clutch pipe (A), Figure 16, with "L" end in rear of transmission case.
8. Install the control valve assembly over the three oil delivery pipes (C) and reverse clutch pipe (A), and start control valve attaching bolts. Place detent control lever in "LO" position and press valve body and parking brake bracket assembly against transmission case and tighten valve body bolts evenly to 6-8 ft. lbs.

**NOTE:** The governor oil delivery sleeve alignment is largely controlled by the position of the valve body rear cover, because the two parts are connected by the oil delivery pipes. For this reason, the valve body rear cover alignment should be carefully checked as follows:

With the rear pump bolts and parking bracket bolts loose, install the governor to sleeve aligning tool J-4731 over the governor, Figure 16. With alignment tool in place, tighten the rear pump bolts and parking bracket bolts. Tool should rotate freely, and governor should rotate freely as much as gear backlash allows. Rotate output shaft to turn governor  $\frac{1}{4}$  turn and check governor and

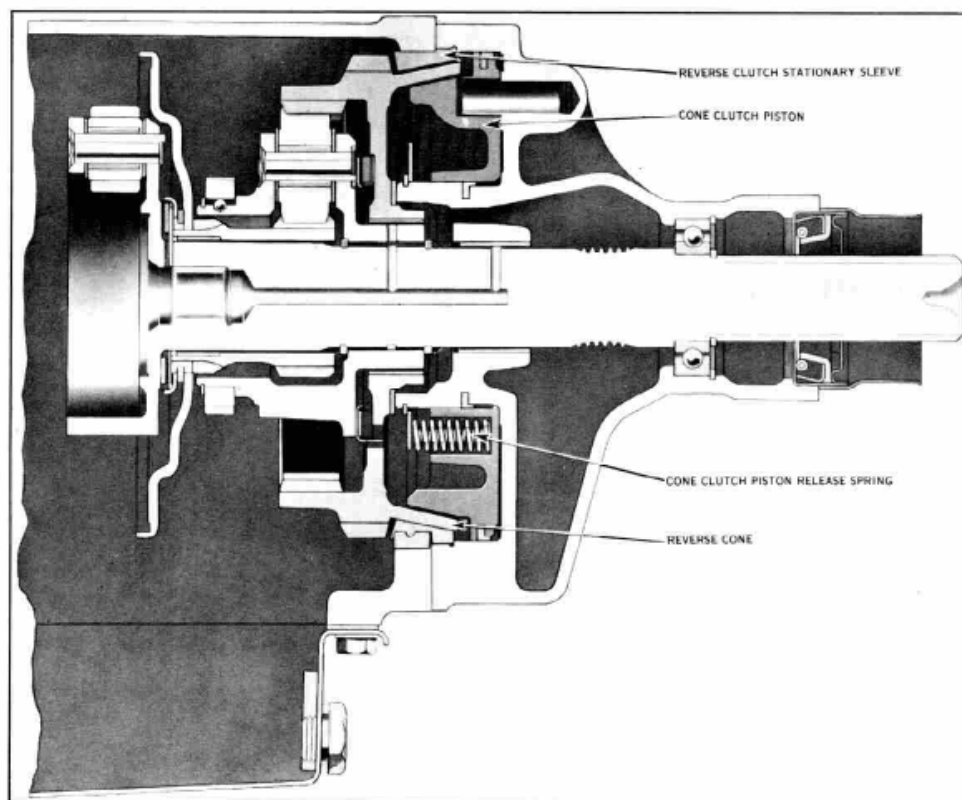


Figure 17

tool again for freeness. If the governor or tool bind at any point, loosen bracket and/or rear pump and adjust as required to give governor free movement. After rechecking governor for freeness, each  $\frac{1}{4}$  turn for a complete revolution, remove aligning tool J-4731.

### REVERSE ASSEMBLY

#### OPERATION OF THE REVERSE CONE:

When the selector lever is moved to the reverse position, oil is directed from the valve body through the reverse clutch oil pipe, through the case, and then into the reverse assembly. Oil is retained in the reverse assembly with two seals; an inner seal on the rear bearing retainer and an outer seal on the cone clutch piston, see Figure 17.

While under pressure, oil pushes the cone clutch piston forward engaging the internal surface of the reverse cone. This action forces the entire reverse cone forward causing the outside surface of the reverse cone to contact the stationary cone, thereby holding the reverse internal gear by friction.

When the selector lever is moved to any other position, the cone clutch piston releases. When pressure is cut off, the six cone clutch piston release springs disengage the piston. When the reverse clutch piston is applied, there is some float in the reverse internal gear. To get a release, the reverse internal gear must be centralized. This is obtained through the action of the reverse clutch release spring installed on the inside of the reverse internal gear.

Teeth cut on the outside of internal gear are used only for parking.

#### REMOVAL:

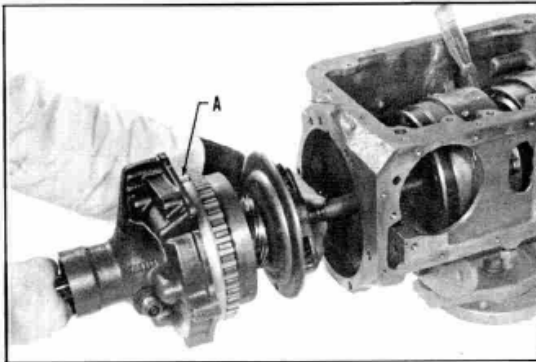
**NOTE:** The removal operation of the reverse bearing retainer and reverse unit can be done with the transmission installed in the car.

1. With the oil pan, front and rear servos and rear oil pump governor and control valve assemblies removed, remove the six reverse center gear and drive flange attaching bolts.

*NOTE: Insert a screwdriver between the front clutch and center bearing cap, holding the front planet unit forward.*

2. Remove the rear bearing retainer to transmission attaching bolts and the parking brake pawl support bolt.

*NOTE: When replacing the front and rear servos and rear oil pump into the transmission case, leave the rear oil pump bolts loose to permit alignment of the parking brake bracket assembly to the governor. See "Governor Aligning with Parking Brake Bracket," Page 195.*



**Figure 18**

*NOTE: If the assembly sticks in transmission case, do not rock the unit up and down, but pull straight out. Also do not lose locating key (A), Figure 18.*



**Figure 19**

#### DISASSEMBLY:

1. Remove the speedometer driven gear and sleeve assembly and oil seal assembly from the rear bearing retainer.
2. Remove the snap ring on output shaft inside of the rear bearing retainer at ball bearing, Figure 19.

*NOTE: This snap ring is smaller than other snap rings used in the transmission.*

3. Remove bearing retainer from output shaft by tapping the output shaft with a rawhide hammer while holding the rear bearing retainer, Figure 20.



**Figure 20**

4. Remove the reverse internal gear (B) and the reverse stationary cone (A) from the rear bearing retainer by compressing the stationary cone by hand, Figure 21.
5. Remove the ball bearing locating snap ring from the rear bearing retainer by prying the snap ring out with a screw driver.
6. Remove the bearing from the rear bearing retainer. (It may be necessary to tap bearing out with a hard wood block toward rear of bearing retainer.)
7. Using Clutch Spring Compressor Tool J-4670, compress reverse cone clutch release coil springs and remove the large snap ring, Figure 22.

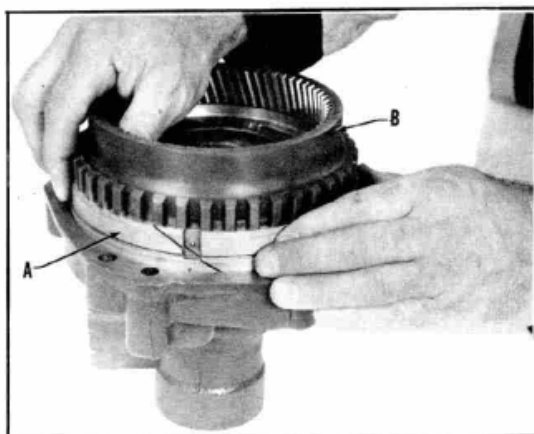


Figure 21

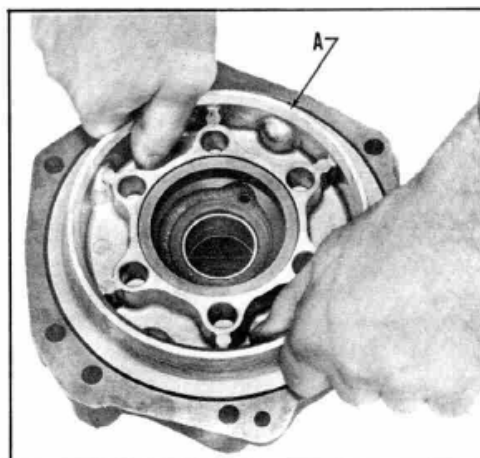


Figure 23

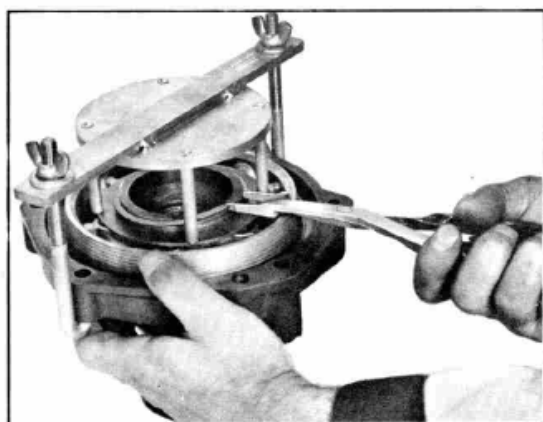


Figure 22

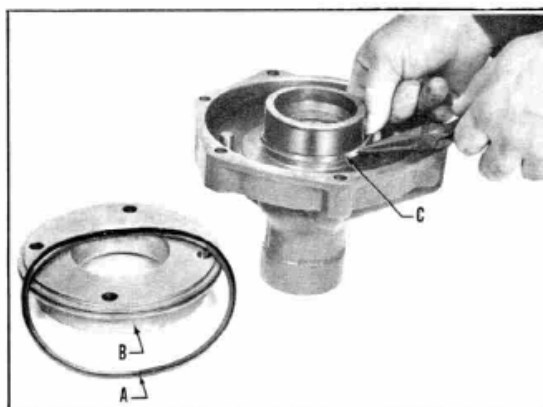


Figure 24

8. Slowly release wing nuts of the Spring Compressor Tool J-4670 until spring tension has been relieved and remove tool and coil spring retainer.
9. Remove the six coil release springs.
10. Remove the reverse piston (A) by pulling piston straight out, Figure 23. (The piston is located by four dowels and cannot be turned.)

*NOTE: It may be necessary to apply air pressure behind the piston, through the small hole in the face of the rear bearing retainer to assist removal. If air pressure is used, apply air very carefully.*

11. Remove the reverse piston outer oil seal (A) from reverse piston (B), Figure 24.

12. Remove the reverse piston inner oil seal (C) from the hub on the rear bearing retainer.
13. Remove the large bronze thrust washer (A) from the reverse internal gear, Figure 25.

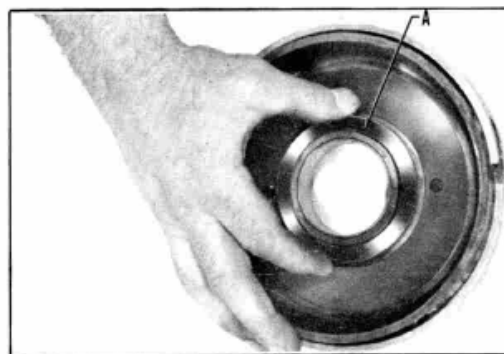


Figure 25



14. Remove the reverse stationary cone (A) from the reverse internal gear cone (B) by using snap ring pliers to expand the reverse stationary cone, Figure 26.
15. Remove the reverse clutch release flat spring retainer and wave spring (A), Figure 27, from the reverse internal gear by lifting straight out, Figure 27. (Retainer has two tangs.)

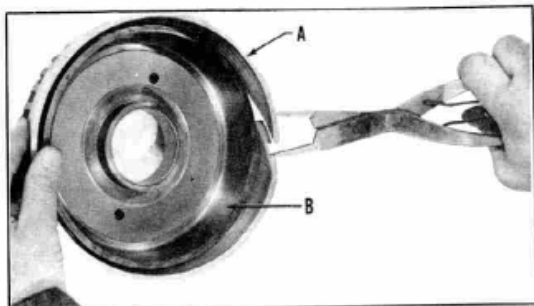


Figure 26

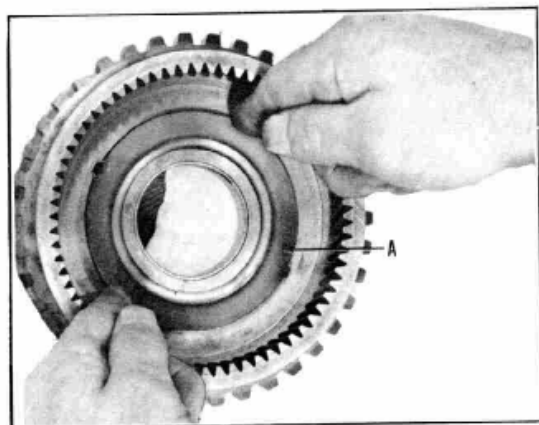


Figure 27

16. Remove snap ring that holds the reverse planet carrier to the output shaft.

*NOTE: Speedometer drive gear is integral with the output shaft. (Teeth are cut into the output shaft.)*

17. Remove the reverse planet carrier from the output shaft.
18. Remove the reverse planet carrier locating snap ring from the output shaft, sun gear and drive flange assembly from output shaft, and steel and bronze thrust washers from output shaft.

## CLEANING AND INSPECTION OF THE REVERSE ASSEMBLY

Clean all parts with a good clean solvent and thoroughly inspect each part to determine what parts should be replaced. It is very important to distinguish between parts that are simply "worn-in" and those parts worn to the extent that they affect operation of the unit. Only worn, broken or damaged parts should be replaced.

1. Inspect ball bearings by first thoroughly cleaning and oiling, then rotate slowly by hand, feeling for roughness. Do not spin bearing with air.
2. Inspect reverse internal gear for damaged parking teeth and scored, burned or damaged surfaces.
3. Inspect reverse planet carrier for worn or damaged teeth and worn roller bearings.
4. Inspect splines of reverse planet carrier for damage.
5. Inspect bronze oil pump drive gear for damage or excessive wear. See that bronze gear is tight on carrier and that pump drive gear ball is in place.

*NOTE: If the gap in the ring is not over the ball, move the ring around until the ball can be seen.*

6. Inspect reverse center gear and flange assembly for damaged teeth or worn bushing. If replacement is necessary, replace assembly. The center gear is not furnished separately.
7. Inspect output shaft assembly for scored thrust and bearing surfaces.
8. Inspect output shaft splines for nicks and burrs.
9. Inspect output shaft speedometer drive gear surface for wear or damage.
10. Inspect steel and bronze thrust washers for excessive wear.
11. Inspect internal gear thrust washer (12), Figure 28, for wear or scoring.
12. Inspect reverse clutch release spring (10) and retainer (9) for signs of damage or burning.

*NOTE: Spring (10) is used to centralize reverse internal gear cone when clutch is released.*

*The reverse stationary cone is held stationary by a key (2) which indexes with a slot in the case.*



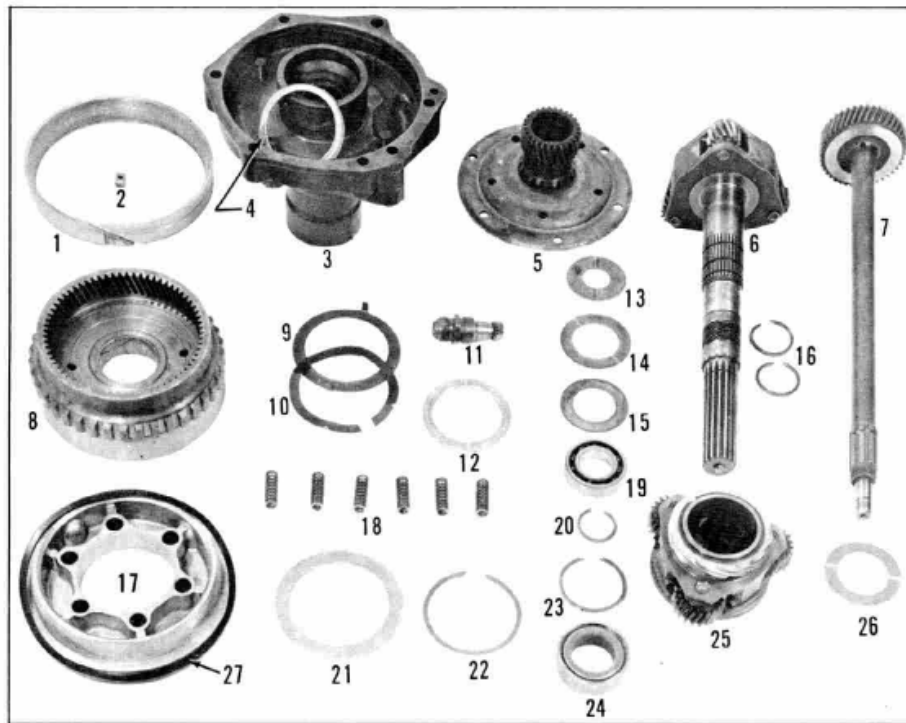


Figure 28

- |   |  |   |
|---|--|---|
| 1. Reverse Clutch Stationary Cone         | 10. Reverse Clutch Release Spring              | 19. Rear Bearing                              |
| 2. Reverse Stationary Cone Key            | 11. Speedometer Drive Gear                     | 20. Rear Bearing to Shaft Snap Ring           |
| 3. Rear Bearing Retainer                  | 12. Reverse Internal Gear Thrust Washer        | 21. Spring Retainer Washer                    |
| 4. Reverse Piston Inner Seal              | 13. Selective Thrust Washer                    | 22. Piston to Rear Bearing Retainer Snap Ring |
| 5. Reverse Drive Flange Assembly          | 14. Reverse Center Gear Thrust Washer          | 23. Bearing to Retainer Snap Ring             |
| 6. Output Shaft Assembly                  | 15. Reverse Center Gear Backing Thrust Washer  | 24. Rear Oil Seal                             |
| 7. Main Shaft                             | 16. Reverse Carrier to Output Shaft Snap Rings | 25. Reverse Carrier Assembly                  |
| 8. Reverse Internal Gear Assembly         | 17. Reverse Piston                             | 26. Rear Clutch Hub Thrust Washer             |
| 9. Reverse Clutch Release Spring Retainer | 18. Reverse Piston Release Springs             | 27. Reverse Piston Outer Seal                 |

**NOTE:** There is a dimple in the key (2) and a corresponding pimple on the stationary cone (1).

13. Inspect reverse clutch stationary cone (1) for burning or excessive wear.
14. Inspect reverse piston coil release springs (18) for distorted or collapsed coils. Free length of these springs is  $1\frac{11}{32}$ ".
15. Inspect reverse piston (17) for burning on cone surface.
16. Inspect reverse piston (17) for scores on piston. Be sure oil seal grooves are thoroughly clean.
17. Inspect four reverse piston dowel pins for scoring, looseness or distortion.
18. Inspect inner and outer piston seal operating surfaces for scoring or roughness.

19. Inspect rear bearing retainer bushing for excessive wear and see that oil holes in retainer are open.
20. Inspect main shaft (7) for damaged gear teeth, thrust and bearing surfaces.
21. Clean all parts again after inspections just prior to assembly.

#### ASSEMBLY:

1. Hold the reverse center gear (5) in the left hand with the drive flange up; install the steel thrust washer (15), and then the bronze thrust washer (14) in the recess of the drive flange.
2. Still holding the reverse center gear in the left hand, pick up the output shaft (6) with the right hand; insert the output shaft end through drive flange and center gear until carrier bottoms on the two thrust washers.

3. Holding the drive flange and center gear tightly against the planet carrier to keep the thrust washers from moving out of position, set the output shaft and planet carrier on the repair bench on the planet carrier end.
4. Install the reverse planet carrier locating snap ring.

**CAUTION:** DO NOT pick up this unit until assembly has been completed, to prevent washers from slipping out of position.

5. Install the reverse planet carrier (25) over the output shaft with the bronze drive gear down, meshing pinions with the sun gear. (Determine that the unit is bottomed against the reverse planet carrier snap ring.)
6. Install the snap ring on the output shaft to position the reverse planet carrier.
7. Install the reverse clutch release flat (wave) spring (10) and spring retainer (9) on the reverse internal gear (8) on the internal gear side, Figure 29.

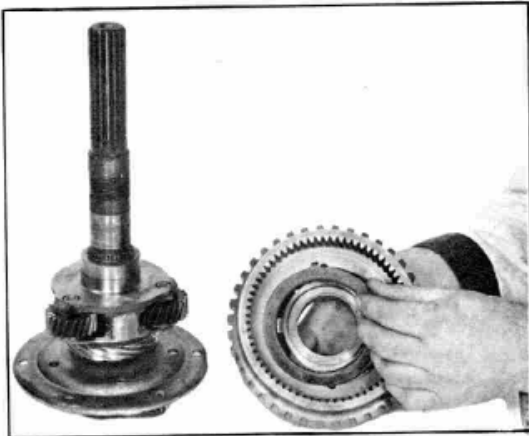


Figure 29

**NOTE:** Retainer tangs should enter holes in gear. If retainer does not center, it should be replaced.

8. Install the reverse stationary cone (1) on the reverse internal gear cone (8). See Figure 26.

**CAUTION:** The stationary cone should not be spread more than is necessary to make the installation.

9. Install the large bronze thrust washer (A) over collar of the reverse internal gear and retain with petrolatum, Figure 25.

10. Apply a light coat of Hydra-Matic fluid over the outer surface of the reverse cone piston inner seal (A) and install the seal with the lip down on rear bearing retainer hub, Figure 30. Work seal well into groove.

**NOTE:** After the seal has been installed, install the piston (less the outer seal) over the inner seal to determine if the seal is properly seated. Remove the piston and inspect the inner seal.

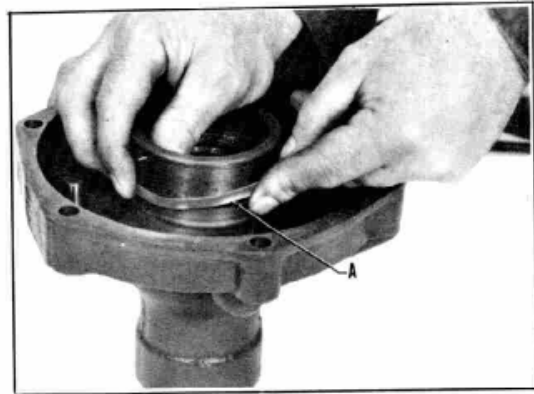


Figure 30

11. Install the outer seal (A) on the reverse cone piston with the seal lip toward flat side of piston and work the seal well into the piston flange groove, Figure 31.

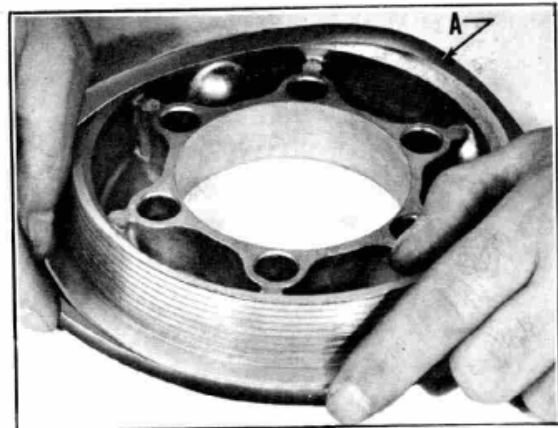


Figure 31

12. Apply Hydra-Matic fluid to the surface of the outer seal and place the reverse cone piston on the rear bearing retainer so that the dowel pin holes are on underside of piston. Do not align with the four dowel pins in the rear bearing retainer.

13. Install Positioning Tool J-4752 in the rear bearing retainer between the piston outer seal and the inner surface of the bearing retainer. DO NOT permit tool to slip below ledge on inner surface of the bearing retainer. Firmly seat the feeler stock against the ledge in the rear bearing retainer, Figure 32. Hold ends of installing blade to keep blade from snapping up.

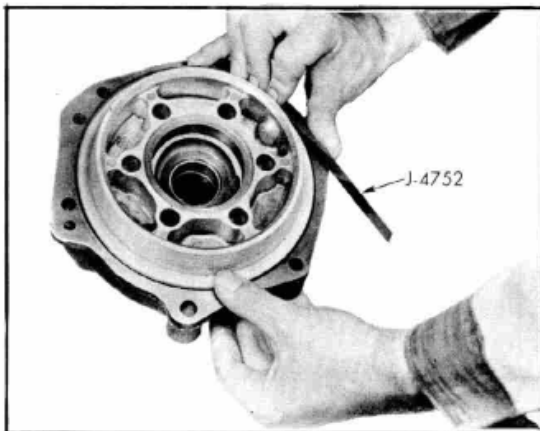


Figure 32

**CAUTION:** Use extreme care when installing to prevent damage to the seal. Rotate piston until dowel pin holes on underside of piston align with dowel pins in the rear bearing retainer. Push piston into place until bottom seats in retainer.

**NOTE:** To make sure the piston is fully seated, lay a straight edge across the face of the piston and measure from the straight edge to face of rear bearing retainer. This measurement should be  $\frac{3}{8}$ " to  $\frac{13}{32}$ ".

14. Install the six reverse clutch release coil springs.
15. Install the reverse clutch coil spring retainer and compress the springs with the Clutch Spring Compressor Tool J-4670. See Figure 22.
16. Install the large snap ring holding the spring retainer in place and after ring is properly seated remove the Compressor Tool.
17. Install ball bearing in the rear bearing retainer using Jacket Tube Bearing Replacer Tool J-2952. (Tap bearing gently to be sure that bearing is fully and squarely seated.)
18. Install the large type snap ring in rear bearing retainer. Use a NEW snap ring. This snap ring locates the ball bearing in the bearing retainer.
19. Install the reverse internal gear and stationary cone into the rear bearing retainer, compressing the stationary cone by hand, Figure 33. Position key-way of stationary cone so it will line up with key-way in transmission case when installed

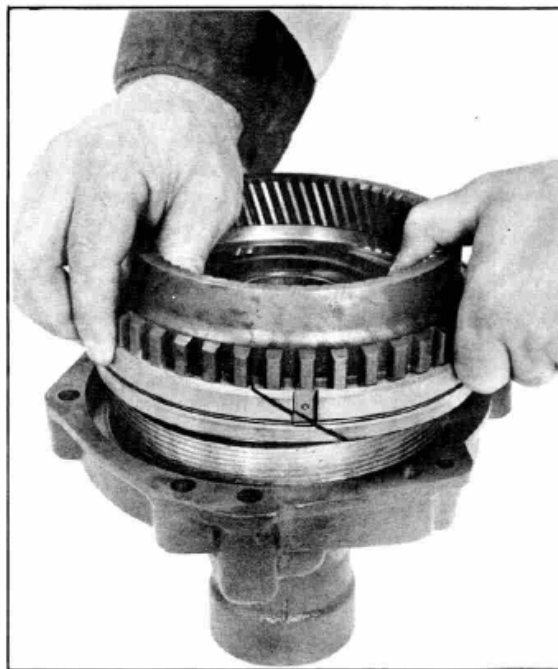


Figure 33

20. With the output shaft standing on planet carrier end, place the rear bearing retainer over the output shaft and mesh carrier gears with the internal gears.

**NOTE:** Use extreme care to prevent damage to the bushing and ball bearing in the rear bearing retainer.

21. Install snap ring on output shaft, locking the rear bearing retainer to the output shaft.
22. Install the speedometer drive gear in the rear bearing retainer.
23. Install the rear bearing retainer gasket on the rear bearing retainer.
24. Install the stationary cone to case lock key, Figure 34. Use petrolatum to hold key in place.
25. Install main shaft and reverse assembly into the rear end of the transmission case, aligning

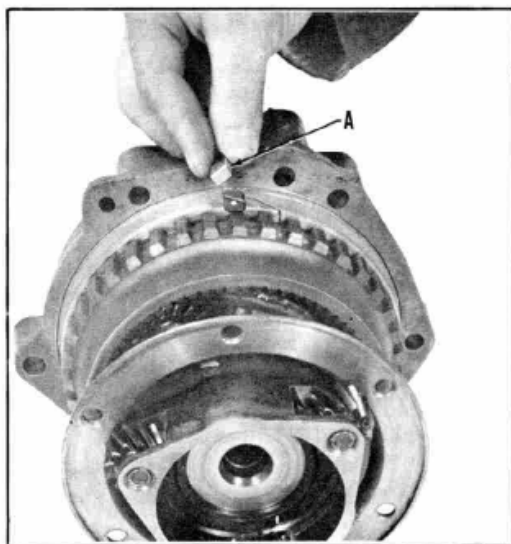


Figure 34

stationary cone lock key (A) into machined key-way in case, Figure 35. Then align rear bearing retainer bolt holes to case and install attaching bolts and lockwashers.

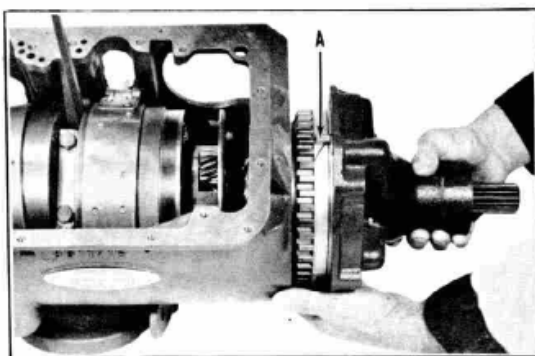


Figure 35

**NOTE:** For balance of assembly, reverse procedure of removal. For installation of the rear pump, front and rear servos and control valve assembly, refer to the index in this supplement for page numbers covering the installation. For complete assembly procedure refer to your 1951 "A" Series Mechanical Procedure Manual, Section 11, covering the procedure.

## HYDRA-MATIC DIAGNOSIS AND TESTING REVERSE UNIT

### SELECTOR LEVER STICKS IN REVERSE POSITION

#### Causes:

- If the selector lever sticks in the "R" (Reverse) position when the car is parked and the selector lever cannot be moved to "DR" (Drive) or "N" (Neutral), the trouble may be due to a bent or damaged parking brake pawl crank. Rock car back and forward manually until selector lever can be moved.
- Rough detent plunger.

#### Corrections:

- Replace parking brake bracket assembly (7), Figure 13.
- Free-up detent plunger.

### SELECTOR LEVER WILL NOT GO INTO REVERSE POSITION (WITH ENGINE RUNNING)

#### Causes:

- Governor G-1 valve sticking open.
- Linkage
- Reverse blocker piston sticking in bore of parking brake bracket assembly.

#### Corrections:

- Clean governor with a clean solvent to free up valve.
- Set linkage adjustment to specifications.
- Free-up blocker piston in bore or replace parking brake bracket assembly.

### SELECTOR LEVER HARD TO MOVE

#### Causes:

- Binding manual control linkage.
- Front servo exhaust valve body set too close to the manual valve at assy.
- Front servo exhaust valve spring retainer may be pressed in too far, not permitting the valve enough travel when manual lever is in the reverse position.
- A distorted outer valve body.

#### Corrections:

- Disconnect manual control rod from transmission outer shift lever and test linkage for free

operation and adjust as necessary, also check for lever binding at the transmission side cover, shaft binding at hole in side cover. Seal on inside of cover could be improperly installed.

- b) Loosen front servo exhaust valve body attaching screws and reposition the front servo exhaust valve body.
- c) Remove the front servo exhaust valve body. Tap end of exhaust valve until lip of plug is positioned just flush with the body, then check for free operation of the exhaust valve in valve body. Replace with a new exhaust valve body assembly if necessary. Also check for free operation of manual valve. Free-up manual valve in bore of control valve outer valve body if possible, if not, replace complete control valve assembly.

*NOTE: Also see conditions under "Selector Lever Sticks in Reverse."*

#### **NO DRIVE IN REVERSE (SLIPPING)**

##### **Causes:**

- a) Pressure regulator reverse oil pipe missing.
- b) Reverse clutch pipe missing.
- c) Reverse booster plug missing from pressure regulator plug assembly.
- d) Low line pressure.
- e) Hole in transmission case to pressure regulator not drilled through.
- f) Front servo exhaust body spacer installed backward.
- g) Reverse oil line in valve body not drilled.
- h) Hole in front servo exhaust valve body to pressure regulator pipe not drilled.

##### **Corrections:**

- a) Install regulator reverse oil pipe.
- b) Install reverse clutch pipe.
- c) Install a new pressure regulator assembly.
- d) Check for leaks in circuit and possible low pump output.
- e) Replace transmission case.
- f) Install spacer correctly.
- g) Replace control valve assembly.
- h) Replace front servo exhaust valve and body.

#### **NO DRIVE IN REVERSE (LOCK-UP) WHEN SHIFTING FROM "DR" OR "LO" TO "R"**

##### **Causes:**

- a) Rear band not releasing in reverse.

- b) Rear servo release hole (.062") in outer valve body not drilled.

##### **Corrections:**

- a) Clean valve body assembly replace if necessary.
- b) Replace the control valve assembly.

#### **REVERSE APPLICATION DURING FORWARD MOVEMENT IN "DR" (DRIVE) OR "LO" (LOW) RANGE**

##### **Causes:**

- a) Damaged neoprene seal ring on pressure regulator allowing "TV" pressure to leak into the reverse booster passage.
- b) "TV" oil leaking past an improper fit "TV" plug in the pressure regulator.
- c) Front servo apply oil leaking past an improper fit front servo exhaust valve or a damaged front servo exhaust body plate.
- d) Two to three shift oil leaking from the end of the double transition valve past a damaged detent retainer spacer.

##### **Corrections:**

- a) Replace neoprene seal.
- b) Replace complete pressure regulator.
- c) Replace front servo exhaust valve body assembly and/or plate.
- d) Replace detent spacer retainer and/or plate.

#### **RATCHETING NOISE WHEN PUTTING SELECTOR LEVER IN "R" POSITION WITH CAR MOVING**

##### **Causes:**

- a) Rough or low engine idle.
- b) Reverse check valve inoperative.
- c) Low main line pressure.
- d) Parking blocker piston stuck.

##### **Corrections:**

- a) Set idle to 480-520 R.P.M.
- b) Bend check valve at base so free end extends 1/4" above outside face of detent plunger housing, and make sure face of valve is flat against detent housing spacer when installed.
- c) Check for leak in oil circuit or low pump output; repair as necessary.
- d) Clean and Free-up blocker piston in bore.

### NO PARKING PAWL ENGAGEMENT WHEN ENGINE IS SHUT OFF WITH TRANSMISSION IN REVERSE

#### Causes:

- a) Parking pawl binding on anchor bolt.
- b) Damaged parking brake pawl crank.
- c) Binding parking brake blocker piston.
- d) Broken parking brake lever spring.

#### Corrections:

- a) Free up parking pawl.
- b) Replace parking brake bracket assembly.
- c) Free up blocker piston in bore.
- d) Replace parking brake bracket assembly.

### CHECKING OIL PRESSURE IN REVERSE

If there is any indication of excessive slippage in reverse, use the following method to determine whether reverse pressure regulation is normal:

1. Drive car until transmission oil has attained normal driving temperature of approximately 200° F. (It is not necessary to check exact temperature.)
2. Remove pressure check plug and install pressure gauge.
3. Make regular check to determine if pressure regulation in Drive and Low range is normal.
4. With engine running at approximately 480-520 RPM, note pressure indicated on the pressure gauge with the selector lever in the "DR" (Drive) and "LO" (Low) positions. Move the selector lever to the "R" (Reverse) position. The gauge should indicate a pressure as high as, or higher than either of the two previous readings.
5. If the pressure checks satisfactorily as indicated in step four, place the selector lever in the reverse position and apply the foot brake. Accelerate the engine to approximately half throttle. The pressure should gradually increase to 125 lbs. per square inch minimum.

If the pressure does not check satisfactorily, as outlined in steps four and five, a leak in the reverse oil system or a malfunctioning pressure regulator is indicated.

### CHECKING FOR LEAKS IN THE TRANSMISSION REVERSE SYSTEM

1. Check the reverse booster oil circuit in the

pressure regulator by removing and disassembling the pressure regulator and:

- a) Inspect the reverse booster plug for nicks, scores and for free movement in bore of regulator plug.
  - b) Reverse booster plug and "TV" pressure plug should not be too loose, allowing excessive oil to dump out past them.
  - c) Check the oil passages in regulator with air, for obstructions and leaks.
  - d) Check neoprene seal and copper gasket for damage or wear.
2. Check connecting passages between the control valve assembly and pressure regulator as follows:
    - a) Remove the side cover, inspect the pressure regulator reverse oil pipe for leaks. Pipe should fit fairly tight into valve body and transmission case.
    - b) Apply air to the pressure regulator reverse oil passage (C) Figure 36 on the outside of the case while blocking the opening in the pressure regulator hole to be certain the passage is not leaking. Also check the passage for an obstruction.
  3. Check control valve assembly as follows:
    - a) Remove the pressure regulator reverse oil pipe and remove the four valve body to case attaching bolts.
    - b) Slide the valve body forward far enough to allow removal of the reverse clutch pipe (A), Figure 36.

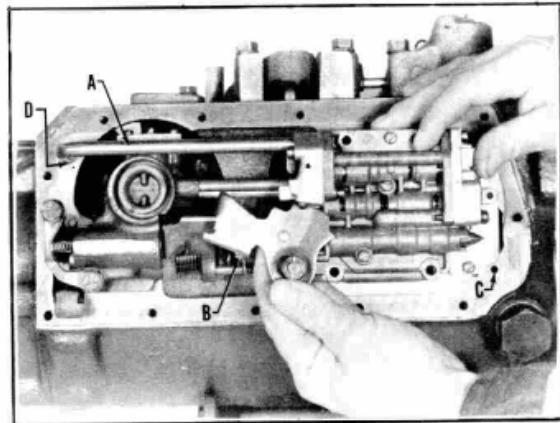


Figure 36

*NOTE: The reverse clutch pipe must be a slide fit in the transmission case and control valve body and must not leak.*

- c) If clutch pipe is O.K. apply air pressure (80 lb. minimum) at hole (D) in transmission case.

*NOTE: Apply sufficient air to actuate the reverse friction clutch cone to engage the reverse internal gear.*

When the reverse friction clutch cone has been applied there will be a slight forward movement of the reverse gear. If the reverse unit is satisfactory there will be very slight leakage of air into the transmission from the reverse unit.

**CAUTION:** Check to determine that rear bearing retainer to transmission case attaching bolts are tight and that there is no air leakage between retainer and transmission faces.

- d) If the reverse unit engages properly in "Check C" above, the trouble would be in the control valve assembly, however, if there was an excessive leak in the reverse unit or the friction clutch cone did not apply properly, remove and completely disassemble the reverse unit. Inspect the oil passages and the inner and outer clutch piston seals and sealing surfaces.
- e) Repair and replace parts as necessary.

## REFERENCE

[illegible]