

Figure 18
PTO Shaft Bearing

1. Snap Ring
2. Low Pressure Pump Assembly
3. PTO Shaft Bearing
4. PTO Shaft
5. Snap Ring

8. Remove the output shaft assembly (4), Figure 19, by pulling it straight out. Remove the secondary countershaft (2), from the case. Remove the thin thrust needle bearing from the front of the countershaft by removing the retaining ring.

9. Remove the high/low gearshift sliding coupling (1), Figure 20, from the shift fork fingers (8). Loosen the high/low shift fork lock nut and screw (4). Remove the high/low detent seat (10), Figure 14, and remove the spring and ball. Use a magnet if necessary to remove the ball.

IMPORTANT: *The high/low detent assembly must be removed from the case to avoid damage to the detent spring when the high/low shift rail is installed.*

10. Remove the high/low shift rail (4), Figure 21, from the case and remove the shift fork (3) from the parking brake pawl (2).

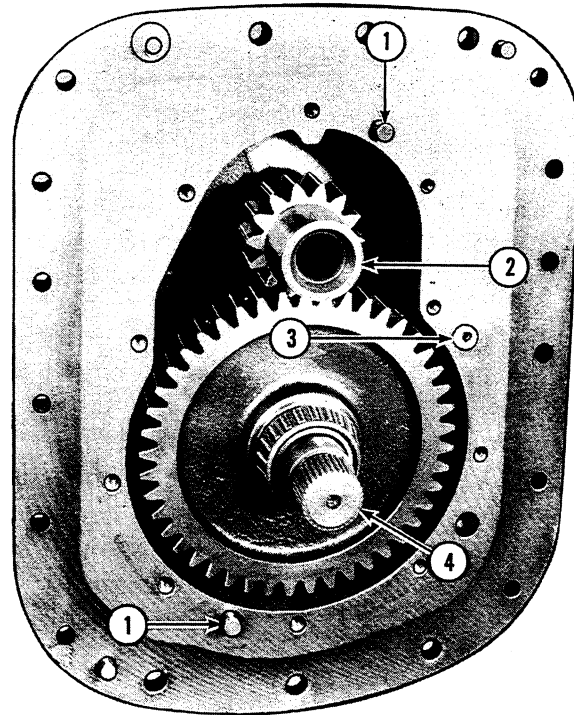


Figure 19
Secondary Countershaft Bearing Retainer Removed

1. Dowel Pins
2. Secondary Countershaft
3. Shift Rail
4. Output Shaft

B. Inspection and Repair

1. Inspect the PTO shaft for excessive wear or damage. Note wear or damage to the splines at the shaft ends. Inspect the area of the PTO shaft where the seal rides. The seal is located at the front of the mainshaft.
2. Inspect the PTO bearing for wear or damage. If necessary, remove the lock ring (1), Figure 18, securing the bearing on the shaft and remove the bearing. Use Tool Number 1002 as shown in Figure 22. Install a new bearing using a sleeve of convenient length and appropriate diameter, and Tool No. 951 as shown in Figure 23. Install both lock rings to secure the bearing.
3. Inspect the secondary countershaft bearing retainer for distortion or damage and replace if necessary. Examine the bearing for excessive wear or damage. Replace if necessary.

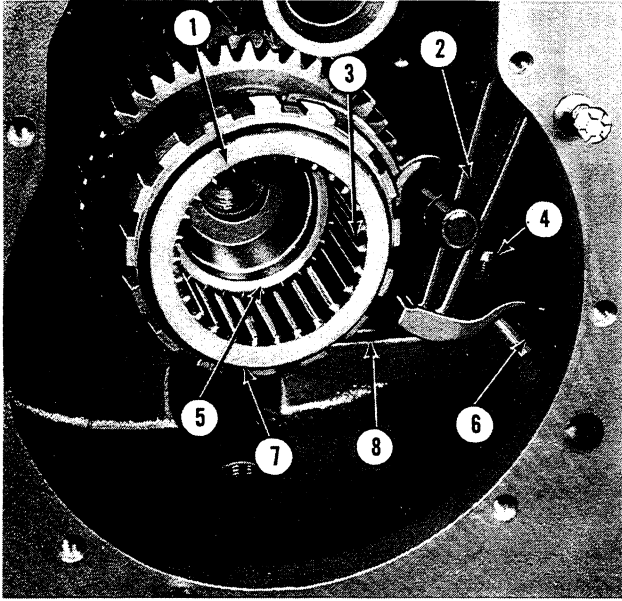


Figure 20
Sliding Coupling and Brake Pawl

1. High/Low Sliding Coupling
2. Parking Brake Pawl
3. Internal Splines
4. Shift Fork Bolt and Nut
5. Dog Teeth
6. High/Low Shift Rail
7. Parking Brake Teeth
8. High/Low Shift Fork

4. Examine the output shaft bearing retainer (3), Figure 24, and shims for damage or distortion. Install a new retainer or shims if necessary. Inspect the output shaft bearing cup for excessive wear or damage. Install a new cup, if needed, using Tool Number 630-17 as shown in Figure 24.
5. Examine the secondary countershaft (1), Figure 25, for excessive wear or damage. Inspect the thrust bearing (2) for excessive wear or damage. If necessary, install a new thrust bearing and secure with the retaining ring.
6. Inspect the output shaft assembly (4), Figure 19, for damage or excessive wear. Check the needle bearing in the gear for wear. If necessary, remove the pilot bearing (4), Figure 26, from the shaft using Tool Numbers 1002, 625-3, and 951 as shown. Install a new bearing using Tool Number 625-4 and a convenient length sleeve of the appropriate diameter as shown in Figure 27.

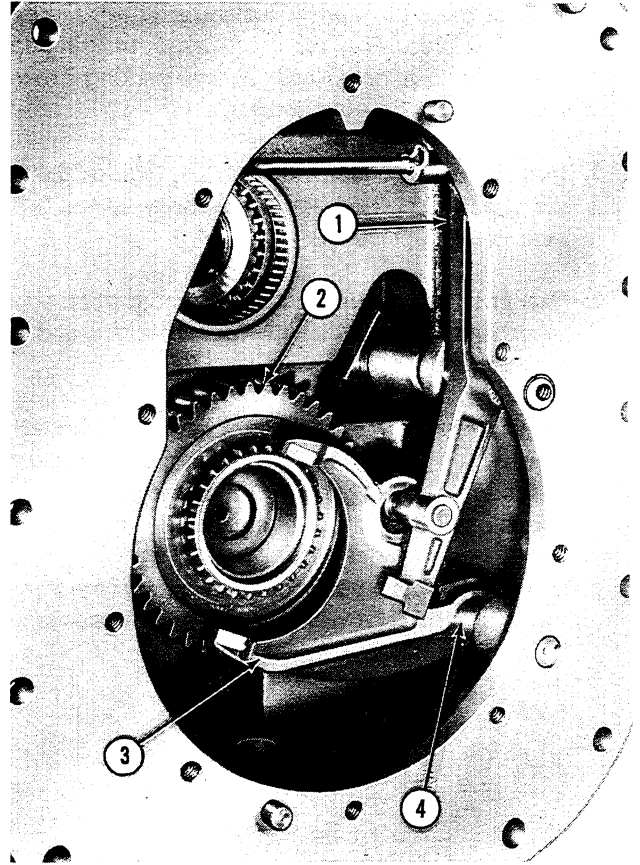


Figure 21
High/Low Shift Fork

1. Parking Brake Pawl
2. Main Countershaft
3. High/Low Shift Fork
4. High/Low Shift Rail

7. Remove the rear bearing (4), Figure 28, from the shaft if necessary. Use Tool Numbers 1003 and 625-1, as shown, to pull the gear, the thrust washer, and the bearing far enough to free the bearing. If the gear is to be removed, continue to pull it off using the same setup as stated above. Install a new rear bearing (4), Figure 29, thrust washer (7), or gear (5) as needed, using Tool Number 625-1 and convenient length sleeve of the proper diameter as shown in Figure 29. Be sure the thrust washer (7) is placed between the gear and the bearing as shown.
8. If a new shaft is needed but the bearings, gear, and the thrust washer are not damaged, install them on the new shaft. Use the reverse procedures for installation outlined in Steps 6 and 7 above.

9. Inspect the high/low sliding coupling (1), Figure 20, for excessive wear or damage to the dog teeth (5), interior splines (3) and parking brake teeth (7). Replace if necessary.
10. Inspect the high/low shift fork (8), Figure 20, for distortion, cracks or excessive wear. If necessary, replace the fork.
11. Examine the high/low shift rail for distortion and wear. Inspect the detent for excessive wear. Replace if necessary.
12. Inspect the detent ball and spring. If worn excessively, replace to maintain proper detent function. The length of the spring is approximately 1-3/32 inch (2.78 cm).
13. Inspect the components of the low pressure pump assembly. If worn replace as an assembly.

lug as shown. Slide the rail through the fork, aligning the blind hole in the rail with the shift fork lock screw (4). Tighten the lock screw and nut to 23-30 lbs. ft. (31-40 Nm).

2. Install the high/low detent ball and spring. Install the detent seat (10), Figure 14, to secure the ball and spring.
3. Place the high/low gearshift sliding coupling (1), Figure 20, in the fingers of the shift fork (8) with the parking brake teeth (7) to the rear. Move the coupling to mesh with the dog teeth on the countershaft. If the fork is held back by the parking brake pawl (2), move the pawl to free the fork.
4. Place the secondary countershaft (2), Figure 19, in the case with the thrust bearing to the front and seat the bearing against the mainshaft.

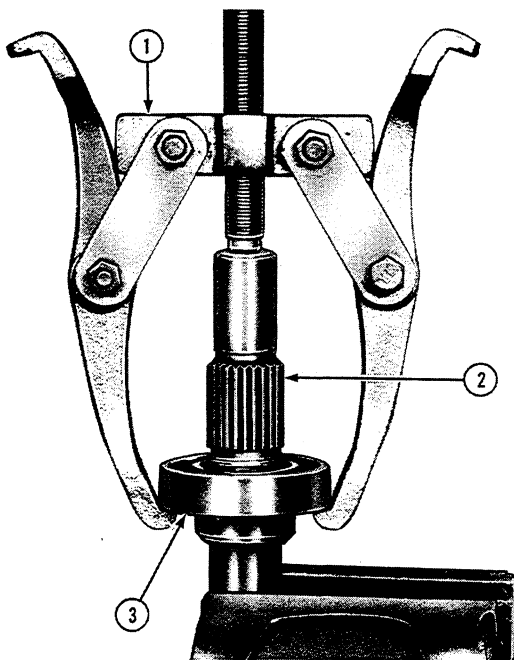


Figure 22
Removing PTO Shaft Bearing

1. Tool No. 1002
2. PTO Shaft
3. PTO Shaft Bearing

C. Assembly and Installation

1. Place the high/low shift rail (6), Figure 20, partially in the case, detent end in first. Place the high/low gearshift fork (8) on the parking brake

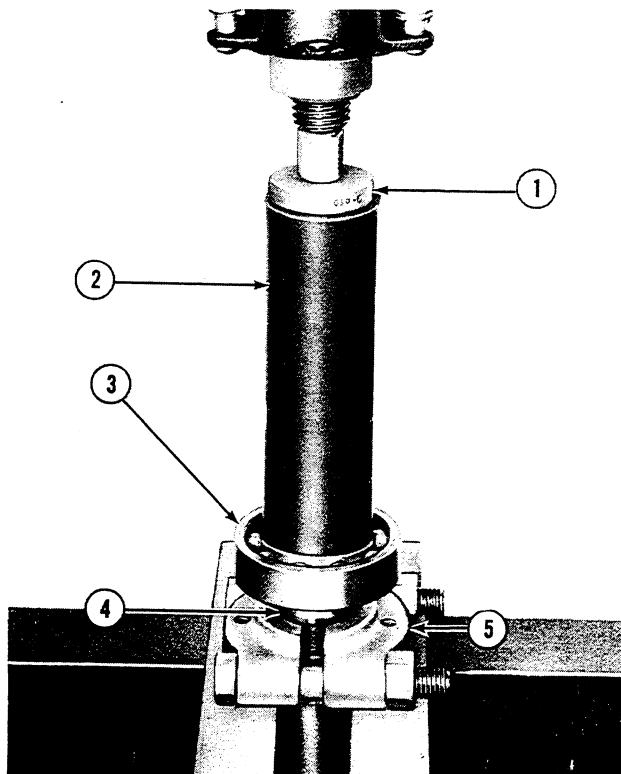


Figure 23
Installing PTO Shaft Bearing

1. Tool No. 630-6
2. Sleeve
3. PTO Shaft Bearing
4. PTO Shaft
5. Tool No. 951

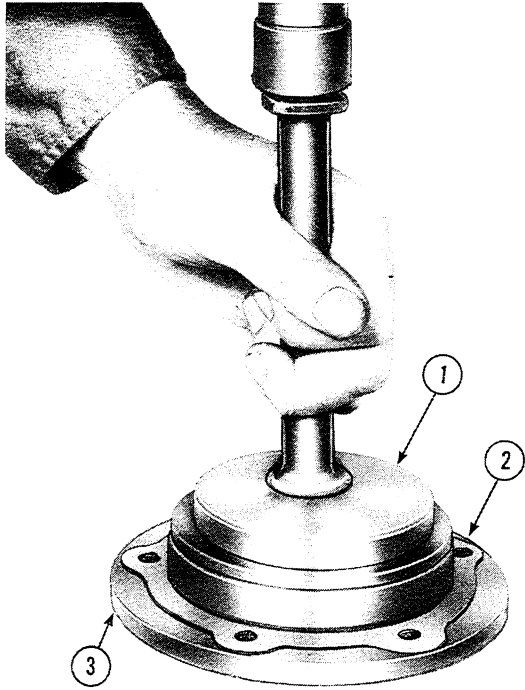


Figure 24

Installing Output Shaft Bearing Cup

1. Tool No. 630-17
2. Shims
3. Output Shaft Bearing Retainer

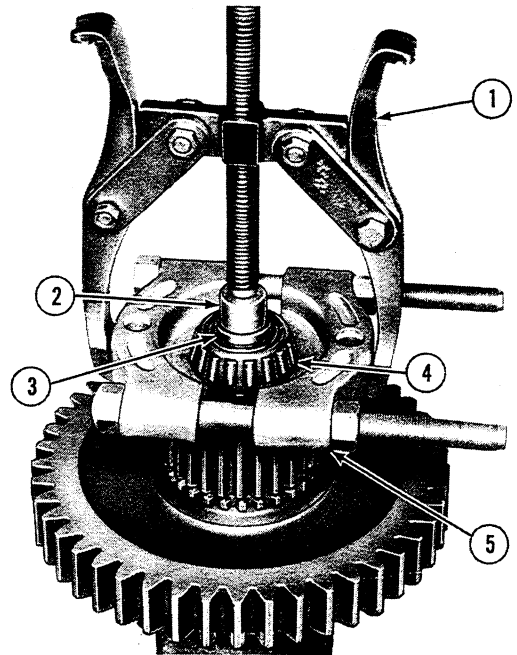


Figure 26

Removing Output Shaft Pilot Bearing

- | | |
|-------------------|------------------|
| 1. Tool No. 1002 | 4. Pilot Bearing |
| 2. Tool No. 625-3 | 5. Tool No. 951 |
| 3. Output Shaft | |

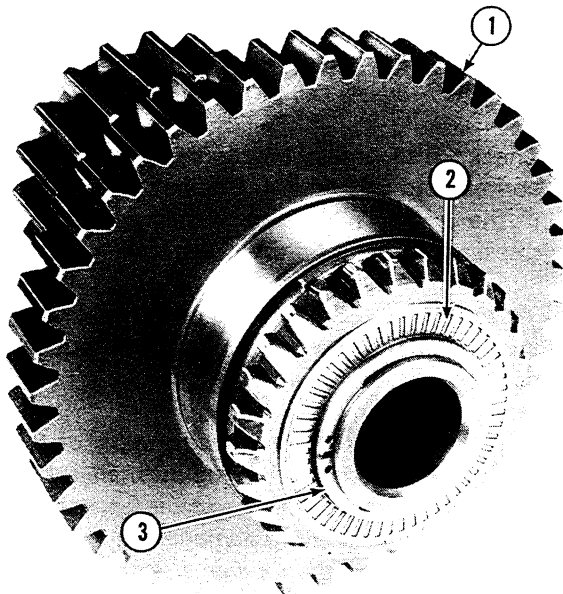


Figure 25

Secondary Countershaft Thrust Bearing

1. Secondary Countershaft
2. Thrust Bearing
3. Snap Ring

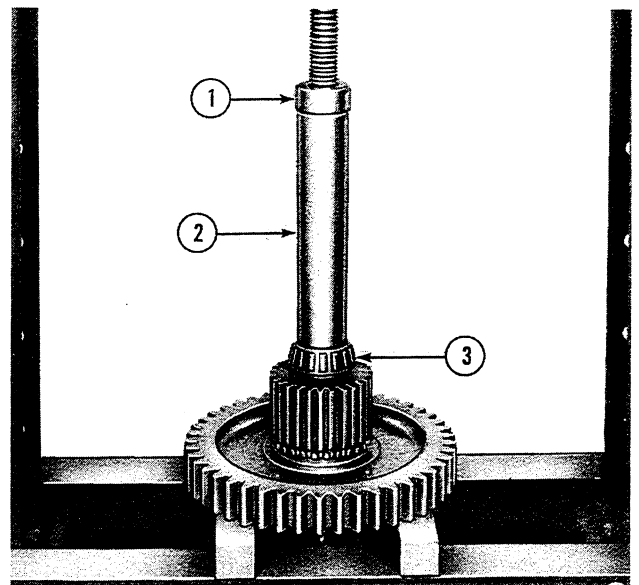


Figure 27

Installing Output Shaft Pilot Bearing

1. Tool No. 625-4
2. Sleeve
3. Pilot Bearing

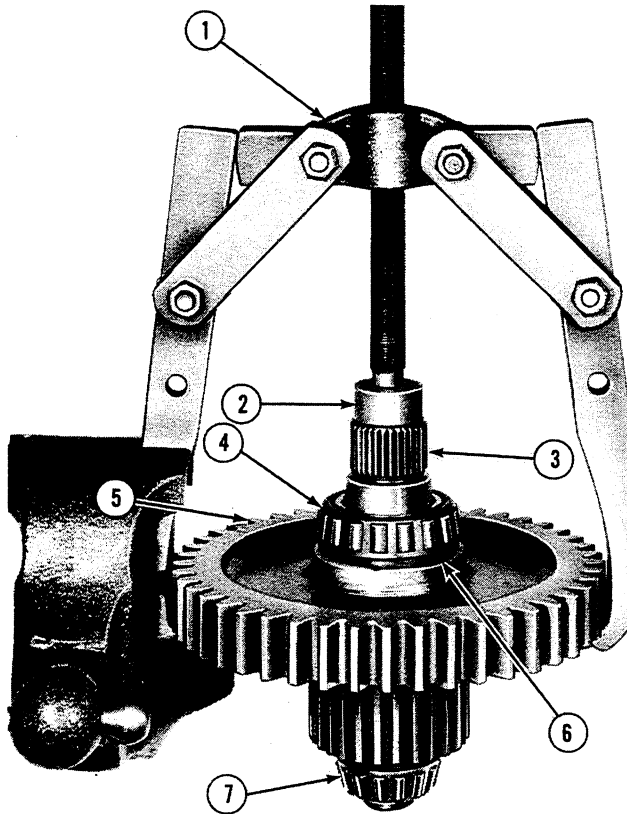


Figure 28

Removing Output Shaft Components

- | | |
|-------------------|------------------|
| 1. Tool No. 1003 | 5. Gear |
| 2. Tool No. 625-1 | 6. Thrust Washer |
| 3. Output Shaft | 7. Pilot Bearing |
| 4. Rear Bearing | |
5. Place the output shaft in the case, putting the smaller cone and roller bearing in first so that the splines on the shaft enter the sliding coupling splines (3), Figure 20.
 6. If the low pressure pump was disassembled install the inner and outer gears in the pump housing and secure with the backing plate and two screws. Make certain that the holes in the backing plate align with the holes in the pump housing.
 7. Install the pump assembly on the PTO shaft and bearing assembly. Secure with the retaining ring when the snap ring groove in the pump housing is visible.
 8. Install a new O-ring on the pump outlet on the front of the secondary countershaft bearing retainer.

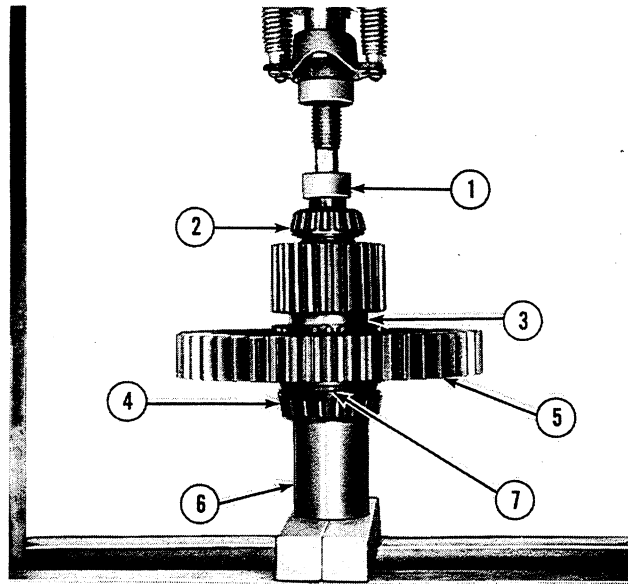


Figure 29

Installing Output Shaft Components

- | | |
|-------------------|------------------|
| 1. Tool No. 625-1 | 5. Gear |
| 2. Pilot Bearing | 6. Sleeve |
| 3. Output Shaft | 7. Thrust Washer |
| 4. Rear Bearing | |

9. Install the secondary countershaft bearing retainer (6), Figure 17, on the rear of the transmission case and secure with the eleven retaining bolts. Tighten the bolts evenly in a diagonal pattern 27-37 lbs. ft. (36-50 Nm).
 10. Check the secondary countershaft end play. The correct end play is .004-.028 inch (.10-.71 mm). If the end play is not within specifications disassemble and find the cause.
 11. Install the output shaft bearing retainer and shims previously removed over the output shaft, aligning mating holes.
- NOTE:** *If output shaft bearings, cups, or thrust bearings were replaced during overhaul the shim thickness on the bearing retainer may not be adequate, thus causing damage to the bearings or retainer when the retainer bolts are torqued. Therefore, under this condition rotate output shaft when tightening retainer bolts. If output shaft binds remove retainer and add shims to avoid unnecessary damage.*
12. Install the six retaining bolts and tighten 27-37 lbs. ft. (36-50 Nm).

13. Coat the splines on the end of the PTO shaft that engage with the engine flywheel with a heavy grease. This will help prevent damage to the seal located in the mainshaft at the front of the transmission.
14. Install the PTO shaft and low pressure pump assembly in the transmission making sure the PTO shaft splines engage the engine flywheel. Align the bolt holes in the pump housing with the mating holes in the secondary countershaft bearing retainer. Install the four bolts and tighten 21-29 lbs. ft. (28-39 Nm).
15. Follow the procedure outlined below to determine the output shaft pre-load.

D. Output Shaft Pre-Load

Pre-load on the output shaft is governed by means of shims located between the mating surfaces of the output shaft bearing retainer (5), Figure 17, and the countershaft bearing retainer (6). Determine the shims required to give a pre-load of 0-12 lbs. (0.544 kgm) with no end play as follows:

1. Place the sliding coupling in neutral by moving the high/low shift lever until play is felt.
2. Turn the output shaft several times to seat the bearings.
3. Tie a piece of heavy string around the output shaft and wrap it around the shaft to prevent slipping.
4. Attach the string to a spring scale. The scale must be readable from zero to beyond 12 lbs. (0-5.44 kgm).
5. Pull outward on the spring scale until the shaft turns at a steady rate. Note the reading when the shaft turns steadily. If the reading is within the specified value, 0-12 lbs. (0.544 kgm), the pre-load is correct.

NOTE: *No end play is permissible on the output shaft. After a correct pre-load value is attained, check the end play with a dial indicator.*

6. If the pre-load reading is more than the specified value, remove the retainer attaching bolts. Gently and evenly pry the retainer off.
7. Place the thinnest shim available, page 00, on the retainer over the original shims. Install the retainer and follow Steps 1 through 5. If this reading is not within the set values, use thicker shims and repeat Steps 1 through 5, until the proper reading is obtained. There should be no end play.
8. Connect the rear axle to the transmission as described in Part 9, "COMPONENT REMOVAL".
9. Install the drain plug and fill the transmission/rear axle with the specified type and quantity of oil, page 84.

6. DUAL POWER PLANETARY GEARSET OVERHAUL

A. Removal

1. Drain the oil from the transmission and rear axle centerhousing by removing the drain plug from the rear axle centerhousing. Be prepared to drain approximately 17 U.S. gallons (14.16 Imp. gallons).
2. Separate the engine from the transmission as described in Part 9, "COMPONENT REMOVAL".
3. On TW-10 and TW-20 tractors, disconnect the lube cooler outlet lines (6), Figure 30, from the tee fitting (3). Disconnect the Dual Power pressure line (5) from the tee fitting (4). Also, unplug the wires leading to the transmission oil pressure switch (1) and remove the switch from the tee fitting. Remove both tee fittings and the lubrication and pressure supply tubes that go through the access plate (2) and into the control valve. Cap or plug all lines and fittings.