

FRANKLIN Service Manual

**THE FRANKLIN POWERSHIFT SYSTEM
FRANKLIN — P4-350 TRANSMISSION
FRANKLIN — P4-300 TRANSMISSION
ROCKFORD TORQUE CONVERTER — 12" & 14"**



**Franklin Equipment Company
Transmission and Axle Division**

FOREWORD

This manual has been prepared to provide the customer and maintenance personnel with information and instructions on the operation, maintenance, and repair of the Franklin P4-300, P4-350 Series Powershift Transmission and Rockford Torque Converter included in the Powershift System.

In order to become familiar with the various parts of the transmission and torque converter as well as its operation, adjustments and troubleshooting, it is recommended that this manual be read before performing any type of maintenance.

All exterior parts of the transmission and torque converter should be thoroughly cleaned before attempting any repairs to prevent contamination of inner components.

Since repair procedures are basically the same for both the P4-300 and P4-350 transmission, this manual covers the P4-350 in detail.

When repairing a transmission or converter, because the two units are so closely related, both should be removed along with hoses, filters and coolers and cleaned thoroughly before reinstalling in machine.

INDEX

Page No.

POWERSHIFT TRANSMISSION

Specifications.	4
Operation	5
Lubrication and Maintenance	6
P4-350 Cross Section	7
Troubleshooting	8
Main Disassembly	14
Input Shaft Disassembly	18
P.T.O. Shaft Disassembly	19
Hollow Shaft Disassembly.	20
Reverse Shaft Disassembly	20
Intermediate Shaft Disassembly	20
Output Shaft Disassembly	20
Clutch Disassembly.	21
Clutch Assembly.	23
Regulator & Selector Valves Disassembly & Assembly	24
Input Shaft Assembly	25
P.T.O. Shaft Assembly	27
Hollow Shaft Assembly	27
Reverse Shaft Assembly	27
Intermediate Shaft Assembly.	28
Output Shaft Assembly	28
Main Assembly	28
Installation of Valve Bodies.	32
Shimming Procedures for Output Shaft	33
Shimming Procedures for P.T.O. Shaft.	34
Powershift Transmission Brake Assembly	34A
Special Tools	35
Parts List.	36

ROCKFORD TORQUE CONVERTER

Parts Breakdown	42
Parts List.	43
Main Disassembly	44
Removal of Converter Assembly	44
Removal of Output Shaft	45
Removal of Charging Pump	46
Removal of Accessory Drive Gear	48
Removal of Ground Sleeve Hub	48
Disassembly of Converter Assembly	49
Installation of Charging Pump	50
Installation of Output Shaft.	52
Installation of Accessory Drive Gear	54
Converter Assembly.	55
Assembly of Torque Converter	57
Installation of Ground Sleeve Hub	57
Installation of Converter Assembly	58

APPENDIX

Bolt and Nut Torque Specifications
Metric Conversion

1. Recommended Engine RPM at high idle:
 - a. Detroit 3-53 Series 2750-2800 maximum
 - b. Detroit 4-53 Series 2750-2800 maximum
 - c. Detroit 4-71 Series 2200
 - d. Detroit 6-V53 Series 2750-2800 maximum
 - e. Detroit 6-71 Series 2200
2. Engine Stall Speeds:
 - a. Detroit 3-53 Series 2100 RPM
 - b. Detroit 4-53 Series 2200 RPM
 - c. Detroit 4-71 Series 2050 RPM
 - d. Detroit 6-V53 Series 2170 RPM
 - e. Detroit 6-71 Series 1750 RPM
3. Transmission Clutch Pressure:
 - a. 350-385 PSI at Engine idle speed — Check made at Port “A” on regulator valve and all pressure ports on oil inlet caps.
4. Converter Pressure:
 - a. 100-125 PSI at 1000 RPM; Check made at Port “B” on regulator valve.

Note: Pressure may vary with other torque converters.

5. Oil Capacity:
 - a. P4-300 with 12” Converter 28 US Qts.
 - b. P4-350 with 12” Converter 36 US Qts.
 - c. P4-300 with 14” Converter 33 US Qts.
 - d. P4-350 with 14” Converter 41 US Qts.
6. Oil Type:
 - a. C-2 torque fluid or equivalent
 - b. Dextron automatic transmission fluid may be used if C-2 is not available, however, C-2 is preferred.

*Do not mix the two types of fluid since this could cause a chemical reaction that could cause internal damage to the transmission or converter.

OPERATION — POWERSHIFT

The **FRANKLIN** Powershift Transmission has been designed for dependable operation with a minimum of maintenance and allows maximum engine performance.

Directional control is provided by four speeds in forward and two speeds in reverse. The two control handles are conveniently located to the operator.

To obtain maximum efficiency from the powershift transmission always operate engine at or near maximum RPM (engine governed speed).

CAUTION

Neutral must be used when starting the engine and when parking with the engine running. The range selector should always be placed in the No. 1 position when moving forward or reverse and shifted one position at a time. Speeds can be increased or decreased by shifting the range selector lever. This shift can be made under full engine power. **WHEN CHANGING FROM FORWARD TO REVERSE OR REVERSE TO FORWARD POSITION, ALWAYS COME TO A COMPLETE STOP.**

Normal operating temperature for the Powershift System is 180° to 230°F. Heavy duty operation can produce higher temperatures (such as an unusually long pull with a heavy load). This is permissible providing the temperature returns to normal after heavy load is removed.

The temperature gauge should be monitored as it provides the operator a means of determining proper operation or system malfunction.

Some points to remember:

1. Start machine movement with range selector in No. 1 position.
2. To obtain desired ground speed shift range selector lever up or down (one position at a time).
3. Downhill operation in a lower gear with high engine rpm allows engine power for braking. This will eliminate excessive use and wear on the foot brake.
4. Always come to a full stop before changing direction of travel.

LUBRICATION AND MAINTENANCE

System Capacity —

1. P4-300 with 12" Rockford Converter, Approximately 28 US Qts.
2. P4-350 with 12" Rockford Converter, Approximately 36 US Qts.
3. P4-350 with 14" Rockford Converter, Approximately 41 US Qts.

Type of Oil:

1. Type C-2 Torque fluid.
2. Dextron Automatic Transmission fluid or equivalent may be used if type C-2 is not available, however, C-2 is preferred.

*Do not mix the two types of fluid since this could cause a chemical reaction that could cause internal damage to the transmission or converter.

Filtration:

Full flow high pressure 10 micron element.

*Do not substitute filter element.

Oil Level Check:

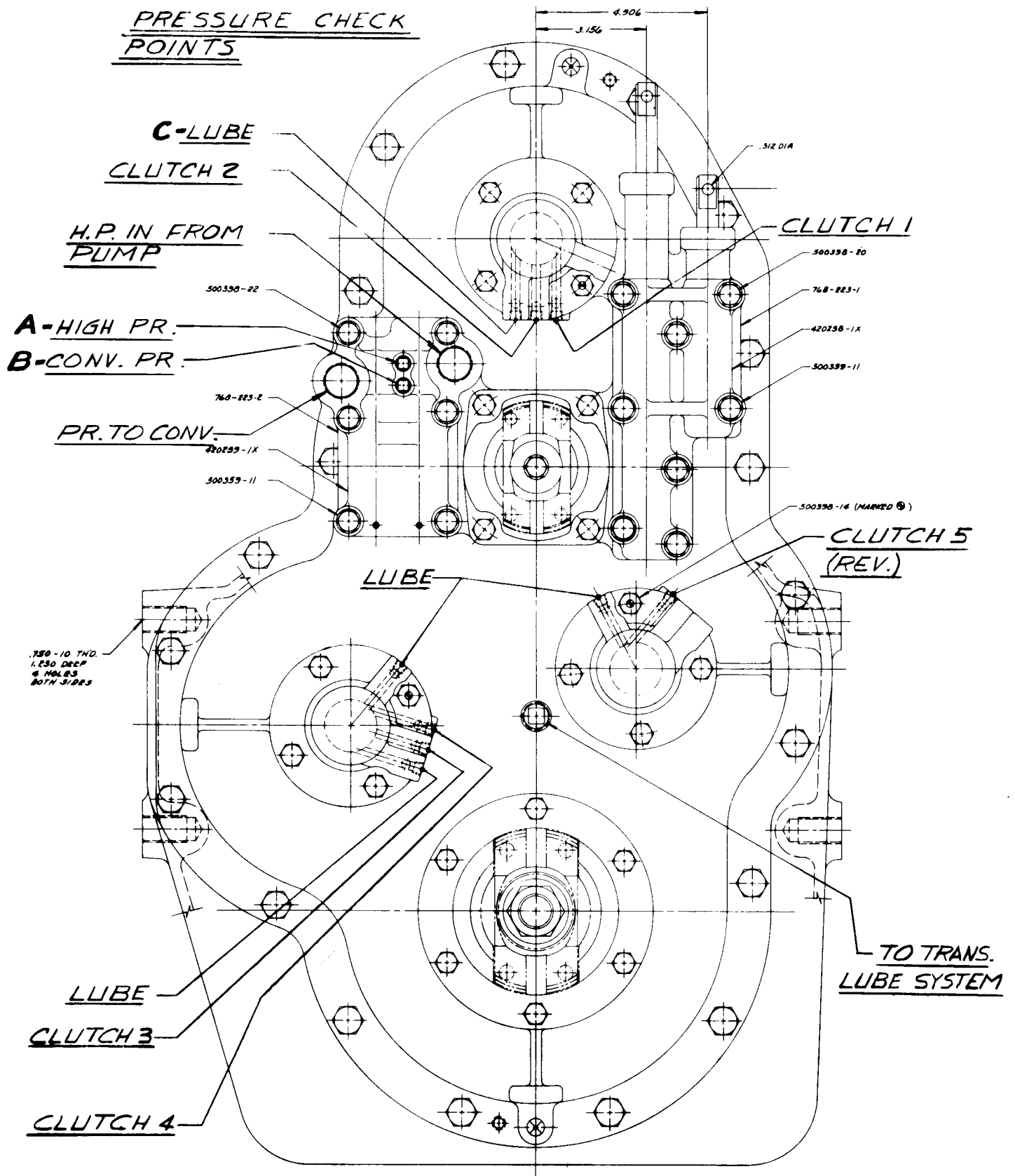
- 6** Check daily with engine idling (transmission in neutral) and oil at operating temperature.

Maintenance Recommendations:

1. After first 100 hours operation change oil, replace high pressure filter element and clean suction strainer in transmission (oil should be at normal operating temperature before draining).
2. After initial servicing, change high pressure filter element every 3 months or 250 hours.
3. Semi-annually change oil filter element and clean suction strainer. When draining oil check the magnetic drain plug for accumulation of metal particles. Excessive accumulation of metal particles indicate abnormal wear and system should be checked to determine cause.

NOTE: It is not uncommon for fine particles to show up at first oil change.

PRESSURE CHECK
POINTS



TROUBLESHOOTING

It is necessary to consider all parts of the Powershift system and their function as related to the complete system when determining the source of any problem that may occur.

A. Transmission:

1. Houses oil for the system (sump).
2. Houses clutch packs and gearing.
3. Main relief/converter relief valve mounted on rear.
4. Main control valve mounted on rear.
5. Houses main suction oil strainer.

B. Converter:

1. Provides transmission with engine power and cushions shifts.
2. Drives combination charge/scavenger pump.
3. Provides source for Powershift system temperature gauge reading.
4. Provides accessory drive for hydraulic pumps for machine systems.

8 C. Charge/Scavenger Pump (Two Section Pump):

1. Provides charge pressure for clutches, converter, lubrication for the entire Powershift system. (Front Section)
2. Scavenges oil from the converter and returns it to the transmission.

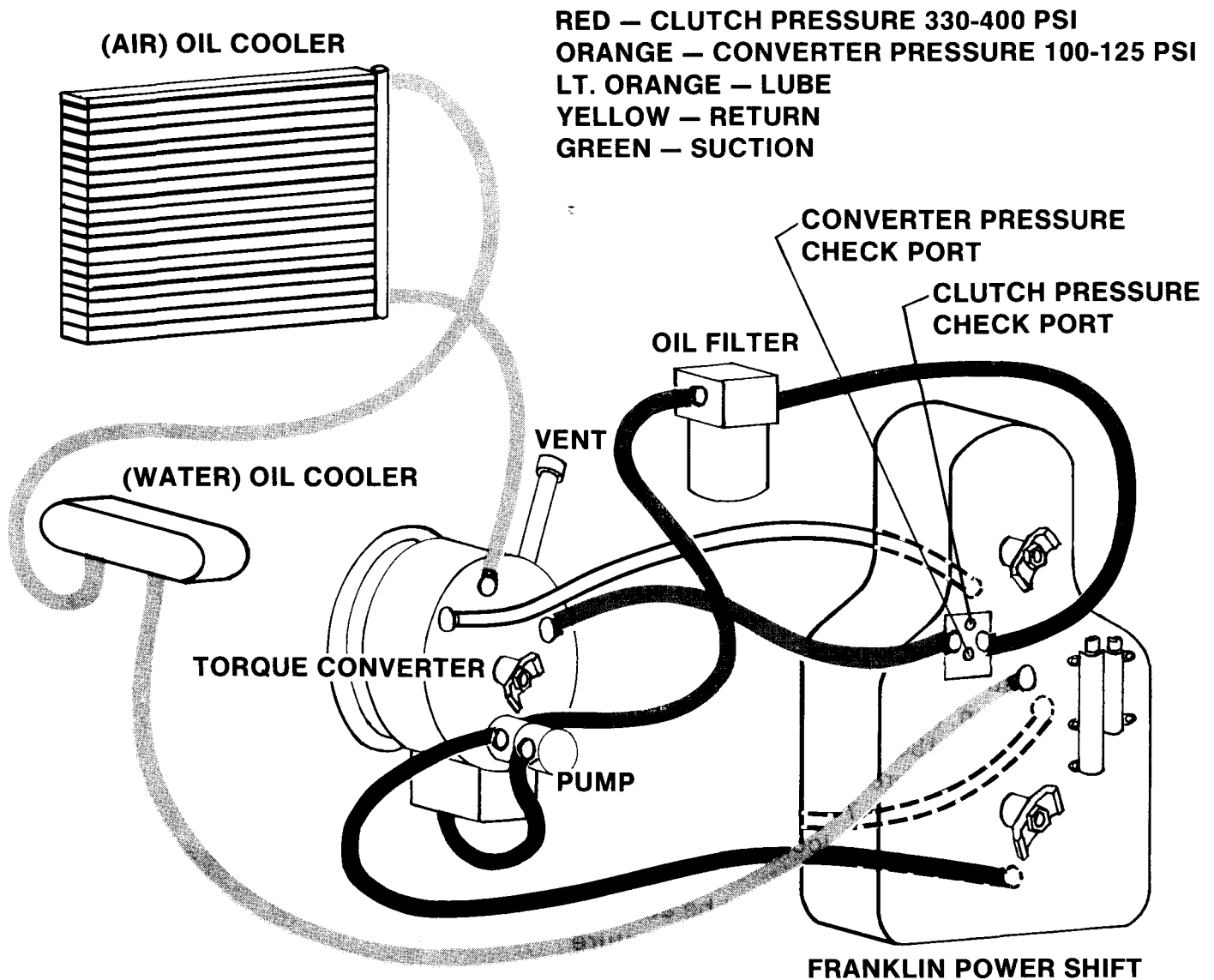
D. Filters, High Pressure:

1. Filters high pressure oil that enters the transmission for distribution to clutch packs and converter.

E. Oil Coolers:

1. Cools oil coming from the converter and returns it to the transmission lube oil inlet port at rear of transmission case.
2. Prior to tractor serial number 7790 the only oil cooler used was the heat exchanger located on the side of the engine.
3. After tractor serial number 7789 a second cooler located in front of the radiator was added.

F. **FRANKLIN POWERSHIFT SYSTEM
PLUMBING DIAGRAM**



Operating Pressure checked at pressure regulator valve Ports "A" and "B". Transmission in neutral.

High Pressure check Port "A", 330-400 PSI (see page 7)

Converter Pressure check Port "B", 100-125 PSI (see page 7)

Lubricating Pressure check Port "C", 10- 30 PSI (see page 7)

G. Temperature Gauge:

1. Mounted on dash for operator convenience.
2. Sensing element at converter outlet which is the source of highest temperature in the system.

H. Pressure Checks:

1. When troubleshooting, a flow meter can be used when installed in the circuit at the high pressure filter with engine at 1000 rpm and transmission in neutral the GPM meter should read:

12" Converter	10 GPM at 450 PSI
14" Converter	10 GPM at 450 PSI

Scavenger pump capacity on both 12" and 14" converter pumps is rated at 8 GPM (2000 RPM).
2. Clutch pressure at regular valve body "A" port 330-400 PSI — Engine at idle speed.
 - a. Individual clutch pressures 330-400 PSI
Note: See page 7 for location of check ports.
 - b. Pressure checks should not be attempted when oil is cold. Oil temperatures should be 180°-220°F.
3. Converter pressure 100-125 PSI located at "B" port. See page 7
Lube pressure check located at "C" port. See page 7
 - a. Pressure checks should not be attempted when oil is cold. Oil temperature should be 180° to 220°F. Engine at 1000 RPM.

1. The following charts will aid in solving problems:

OVERHEATING

CAUSE	CORRECTION
a. Radiator core stopped up externally	a. Steam clean radiator
b. Cooler stopped up externally	b. Steam clean cooler
c. Engine RPM too low at full throttle	c. Set engine RPM as recommended on page
d. Engine overheating	d. Clean radiator, check fan for damage, check for damaged radiator shroud, check for loose fan belts.
e. Transmission low in oil	e. Fill to proper level
f. Transmission oil level too high	f. Drain oil to proper level
g. Low converter pressure	g. See converter pressure chart
h. Low clutch pressure	h. See clutch pressure chart
i. One or more transmission clutch packs dragging	i. Check for broken or damaged rings on clutch shafts, warped clutch disc.
j. Charging pump suction hose collapse	j. Replace suction hose
k. Charging pump suction hose picking up air	k. Tighten hose clamps and fittings or replace hose
l. Engine stall speed too high, causing overheating and poor performance	l. Set engine RPM at recommended specification; check converter low pressure; Check engine for loss of power
m. Improper operation of machine	m. Instruct operator on correct operating procedures
n. Worn converter parts	n. Replace parts as needed

OUTPUT SHAFT WILL NOT TURN

CAUSE	CORRECTION
a. Low high pressure	a. See chart for clutch pressure
b. Low converter pressure	b. See chart for converter pressure
c. Broken input shaft	c. Disassemble transmission and replace shaft
d. Broken output shaft	d. Disassemble transmission and replace shaft
e. Broken seal rings on input or intermediate shaft	e. Remove caps and replace sealing rings
f. Broken spool in selector valve body	f. Replace spool

OUTPUT SHAFT TURNS IN REVERSE DIRECTION ONLY

12

CAUSE	CORRECTION
a. Broken intermediate shaft	a. Disassemble and replace shaft

LOW CLUTCH PRESSURE

CAUSE	CORRECTION
a. Low oil level	a. Fill to proper level
b. Clutch pressure regulator spool stuck in open position.	b. Remove spool from valve body; Clean spool and valve body bore.
c. Clutch pressure regulator spring broken	c. Replace spring
d. Broken or worn sealing ring on shaft	d. Replace three sealing rings
e. Broken or worn sealing ring on clutch piston	e. Replace sealing ring
f. Excessively worn oil inlet cap	f. Replace oil inlet cap
g. Broken or worn sealing ring on clutch housing hub	g. Replace sealing ring

- | | |
|--|--|
| h. Bleeder valve in clutch housing or piston stuck in open position or plugged | h. Clean bleeder valve. Check holes in clutch housing or piston to see if they are plugged |
| i. Internal leakage in valve body | i. Replace gaskets |
| j. Internal leakage from sealing plate | j. Remove main cover. Check for loose or missing bolts in plate. |
| k. Loose valve body bolts | k. Tighten bolts |
| l. Damaged pump | l. Replace pump |
| m. Stopped up suction strainer | m. Clean strainer |

LOW CONVERTER PRESSURE

- | CAUSE | CORRECTION |
|---|---|
| a. Low oil level | a. Fill to proper level |
| b. Converter pressure regulator spool stuck in open position. | b. Remove spool from body. Clean spool and valve body bore. |
| c. Converter pressure regulator spring broken. | c. Replace spring |
| d. Internal leakage in valve body | d. Replace gaskets |
| e. Loose valve body bolts | e. Tighten bolts |
| f. Internal leakage from sealing plate | f. Remove main cover — Check for loose or missing bolts in plate. |
| g. Low volume on charging pump damaged or worn out pump | g. Replace pump |
| h. Suction hose collapsed | h. Replace suction hose |
| i. Suction strainer stopped up | i. Clean strainer |
| j. Suction hose picking up air | j. Tighten clamps and fittings |
| k. Converter seals damaged or worn out | k. Replace seals |
| l. Internal damage in converter | l. Remove converter disassembly and replace parts as needed. |

SPOOL POSITION	CLUTCHES ENERGIZED
Forward — 1st	1-4
Forward — 2nd	2-4
Forward — 3rd	1-3
Forward — 4th	2-3
Reverse — Low	1-5
Reverse — High	2-5

MAIN DISASSEMBLY

1. Remove drain plug (M-5) and drain transmission fluid. (Figure 2)
2. Remove all drive lines, yokes, flanges and u-joints. (Figure 1)
3. Remove front and rear brake assembly. (Figure 1)

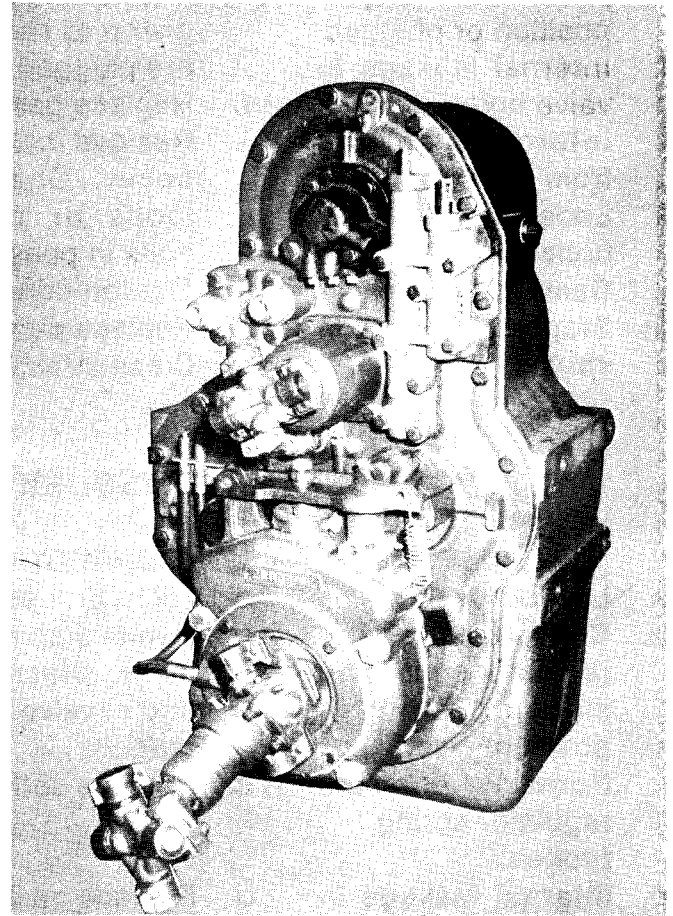


Figure 1

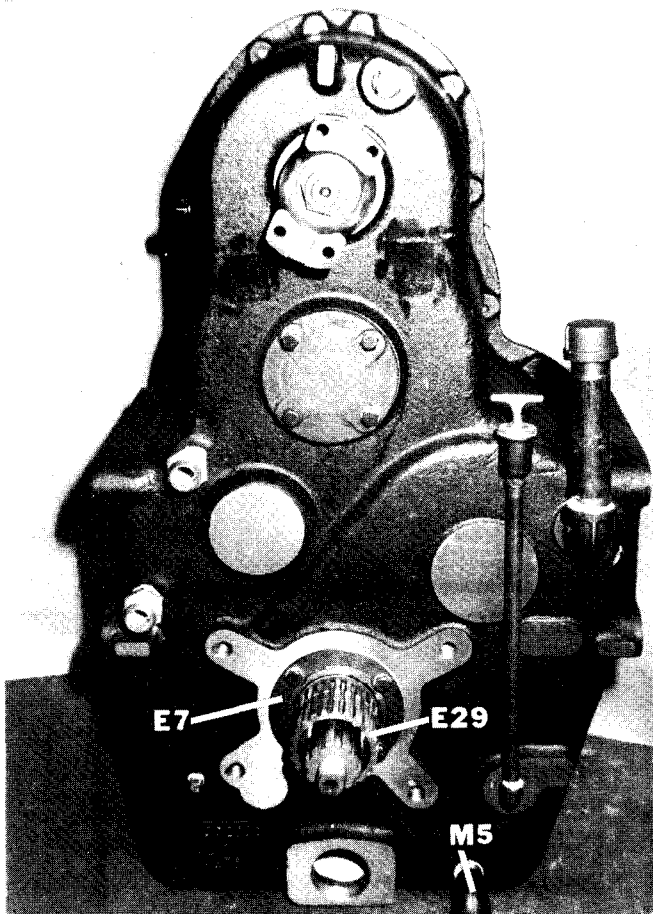


Figure 2

4. Remove cover (E-7) containing oil seal (Figure 2)
5. Unit should now be placed with main cover (M-1) facing upward (Figure 5).

6. Remove cover (A-20) gasket and shims. (Figure 3)
7. Remove cover (B-8) containing O ring and oil seal. (Figure 3)
8. Remove cover (C-13) gasket and shims (Figure 3)
9. Remove cover (D-15) gasket and shims (Figure 3)

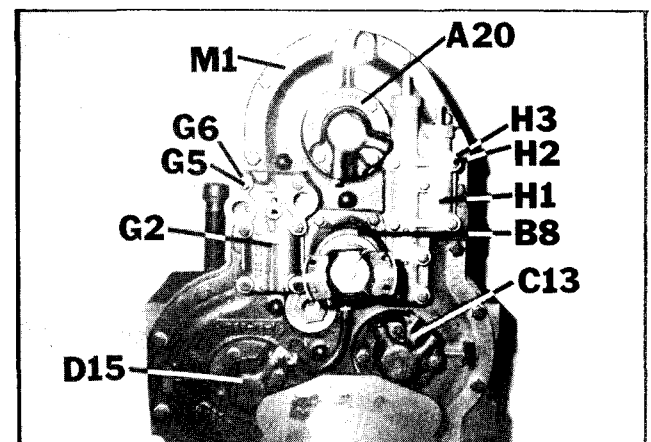


Figure 3

10. Remove cover (E-21) containing O ring and oil seal (Figure 5)
11. Remove 6 capscrews (G-5) and lockwashers (G-6) to release the regulator valve body (G-2) and gasket (G-1) from the main cover (M-1) (Figure 1).
12. Remove 8 capscrews (H-2) and lockwashers (H-3) to release selector valve body (H-1) and gasket (H-11) noting the 2 poppet balls (H-8), 2 pins (H-9), and 2 springs (H-10) behind the valve assembly (Figure 3 and 4).

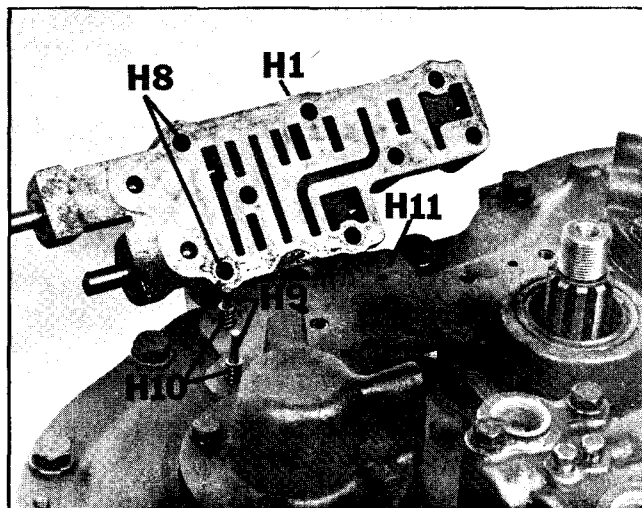


Figure 4

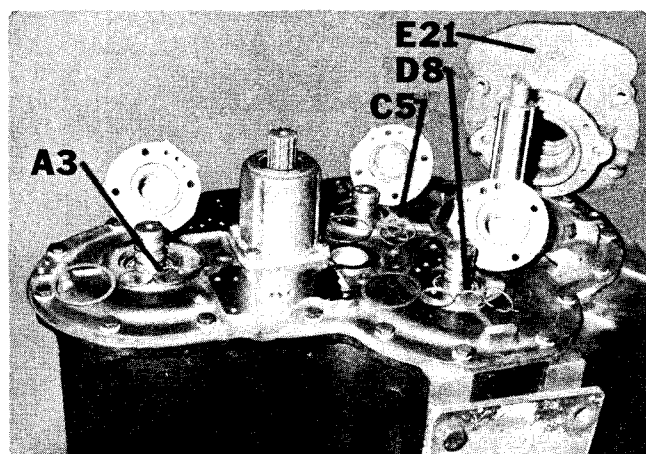


Figure 5

13. Remove sealing rings (A-13, C-5 and D-8) (Figure 5)

14. Remove 19 main cover capscrews (M-4) and lockwashers (M-3) (Figure 6).

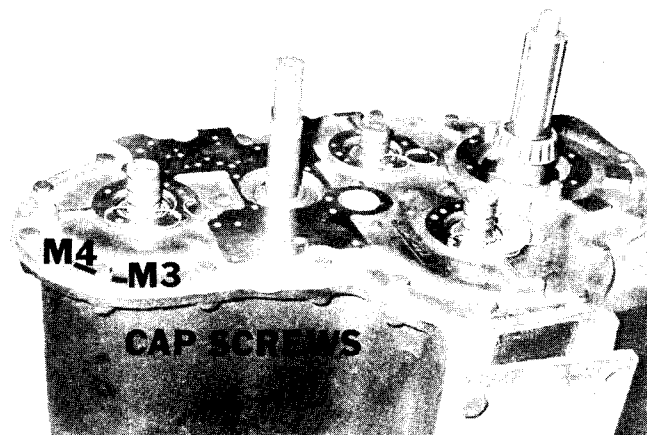


Figure 6

15. Remove snap rings (B-5 and B-20) from PTO and hollow shaft assembly (Figure 7).
16. Remove main cover (M-1) by:
 - a. Utilizing two $\frac{3}{8}$ " jack screws, raise the main cover $\frac{1}{8}$ inch.
 - b. Place driver over PTO shaft (B-4) and onto the end of hollow shaft (B-17). Tap lightly on driver until hollow shaft "bottoms out".
 - c. Raise cover (M-1) another $\frac{1}{8}$ inch and tap driver again until hollow shaft "bottoms out".
 - d. Repeat until ball bearing (B-19) is free of hollow shaft (B-17).
 - e. Remove main cover (M-1) and gasket (M-2).

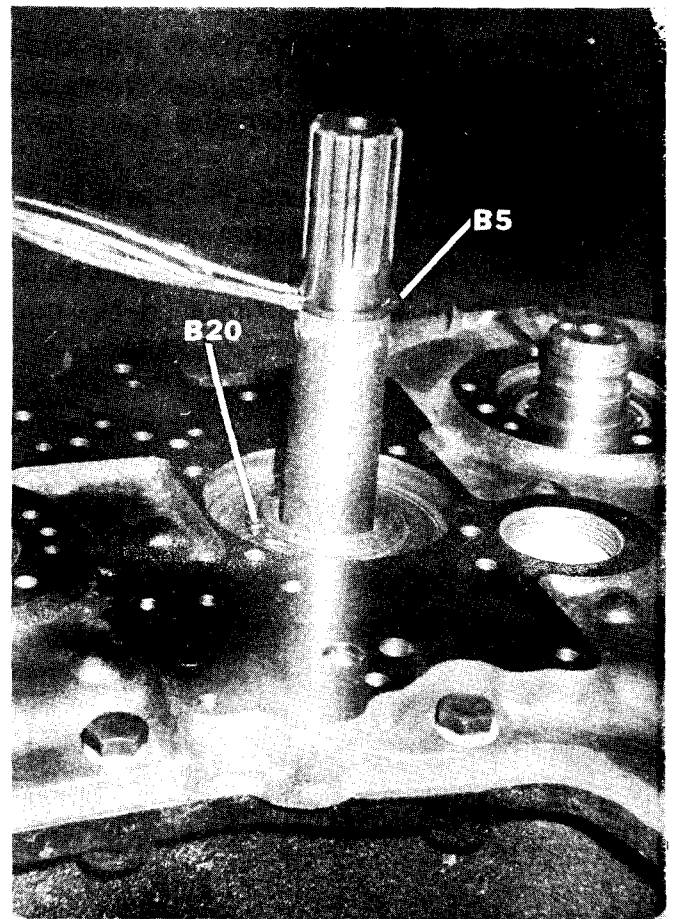


Figure 7

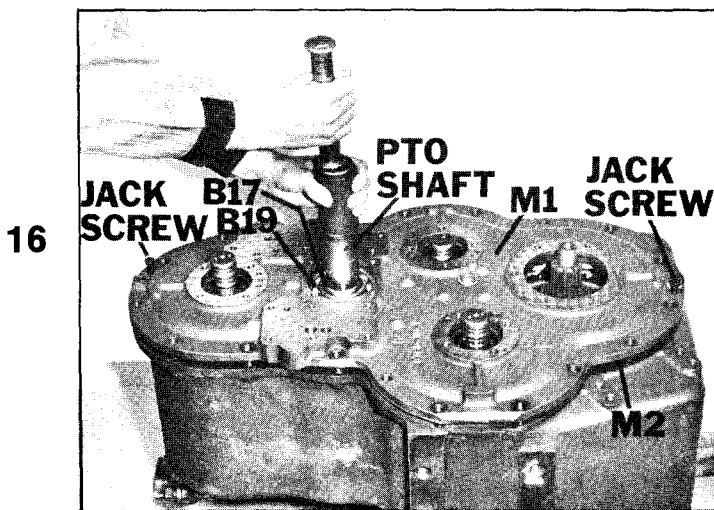


Figure 8

17. Remove 24 capscrews (M-6) from plate (M-7) on rear of main cover (M-1) (Figure 9).

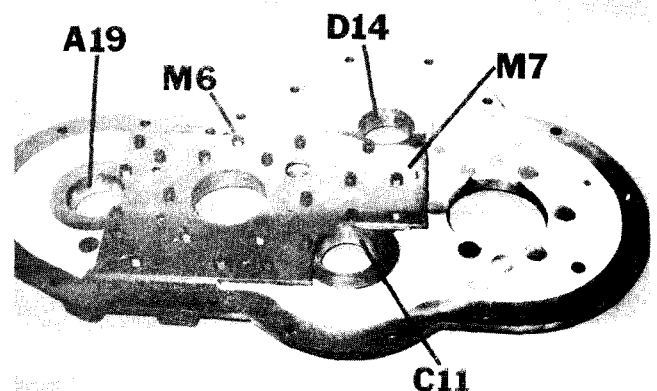


Figure 9

18. Check cored passages on cover (M-1) for cleanliness and damage (Figure 10).
19. Check plate (M-7) for damage and unevenness. (Figure 10)

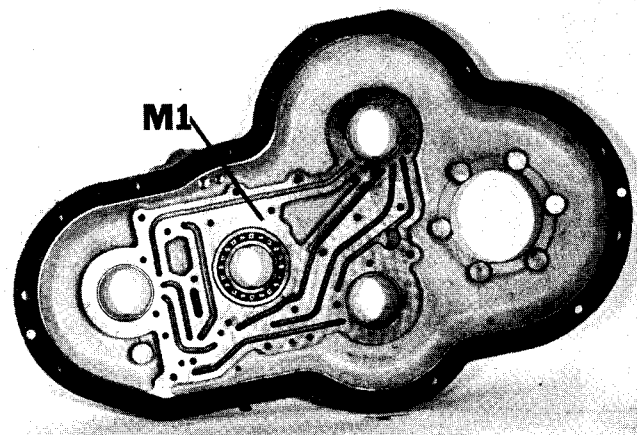


Figure 10

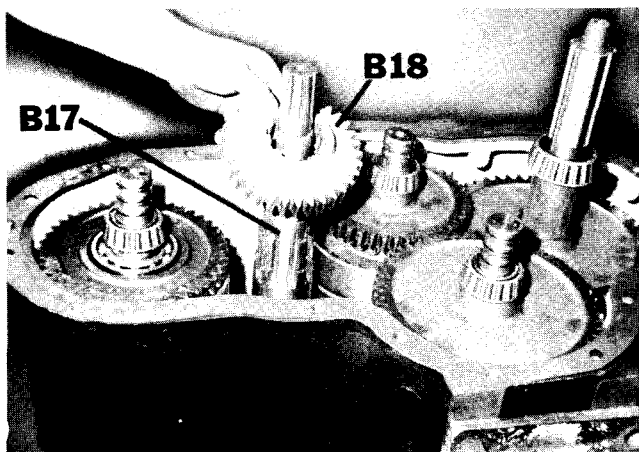


Figure 11

20. Slide gear (B-18) from hollow shaft (B-17) (Figure 11).

21. Remove complete input shaft assembly "A" by lifting straight up. (Figure 12)

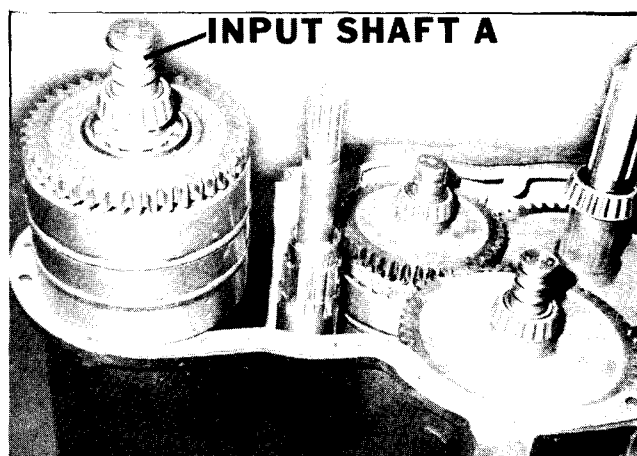


Figure 12

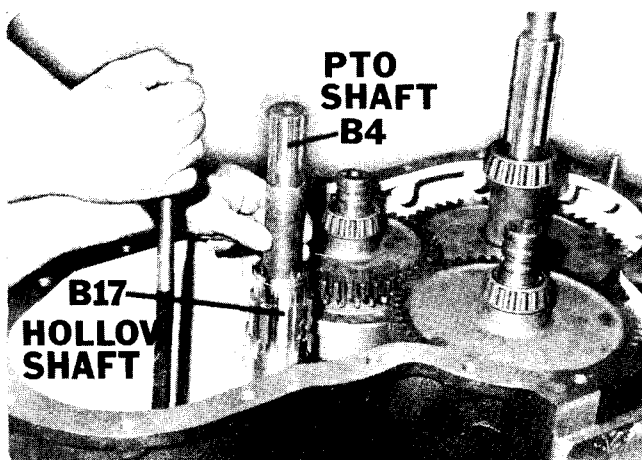


Figure 13

22. Using a pry bar, remove hollow shaft and PTO shaft assembly (B) (Figure 13).

23. Push on reverse shaft (C) and pull on output shaft (E) simultaneously to separate. (Figure 14)
24. Lift two remaining shafts (D & E) straight up and separate when clearance is adequate. (Figure 13).

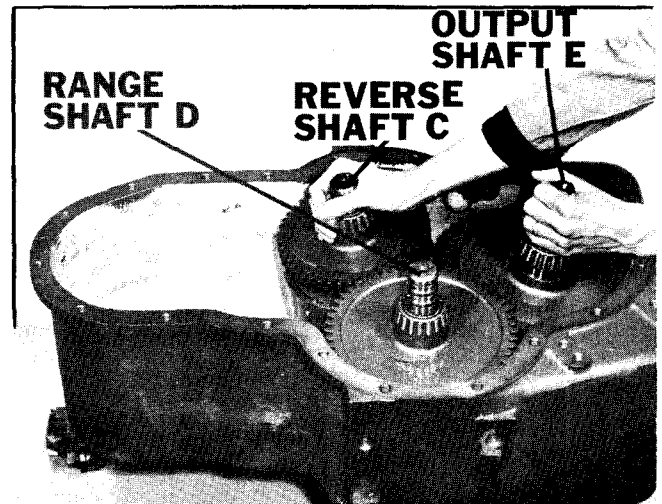


Figure 14

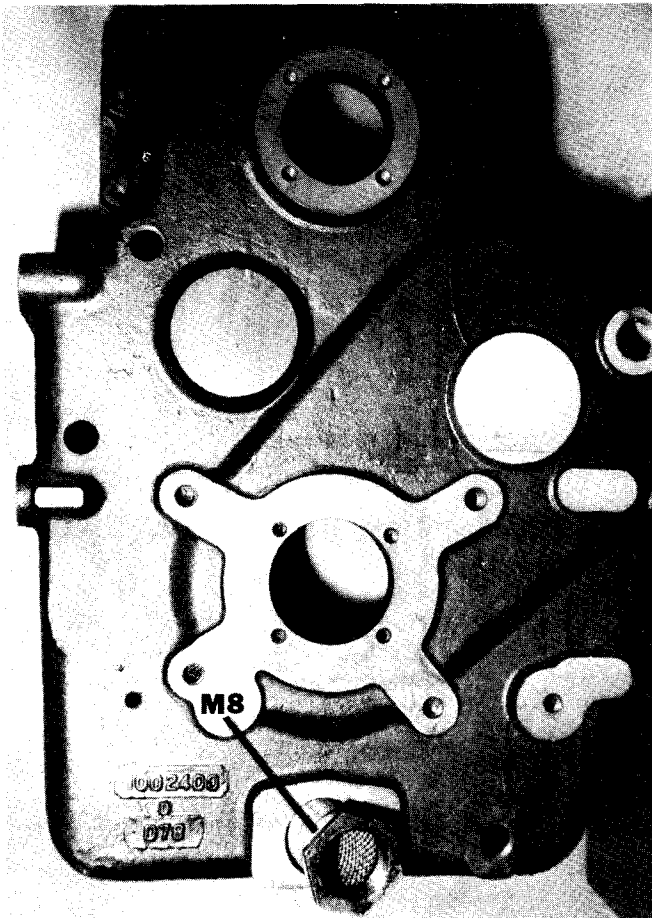


Figure 15

25. Remove sump screen (M-8) and clean thoroughly (Figure 15).

INPUT SHAFT DISASSEMBLY

1. Using a suitable puller, remove bearing cone (A-18) from input shaft (A-11) (Figure 16).

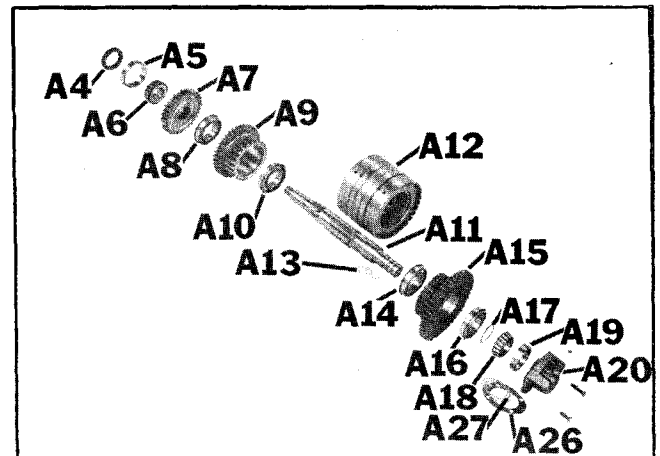


Figure 16

2. Remove snap ring (A-17) (Figure 17).

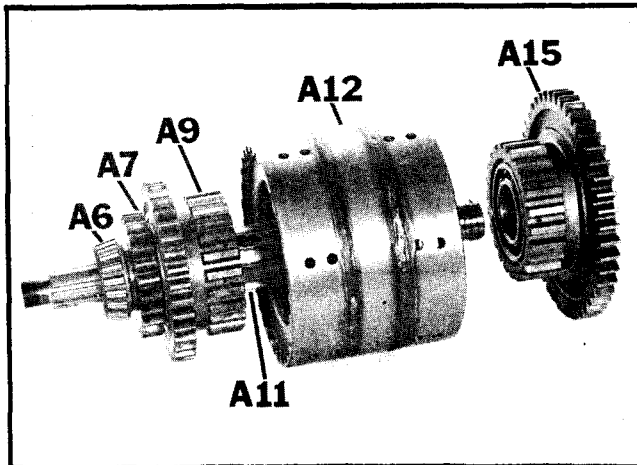


Figure 18

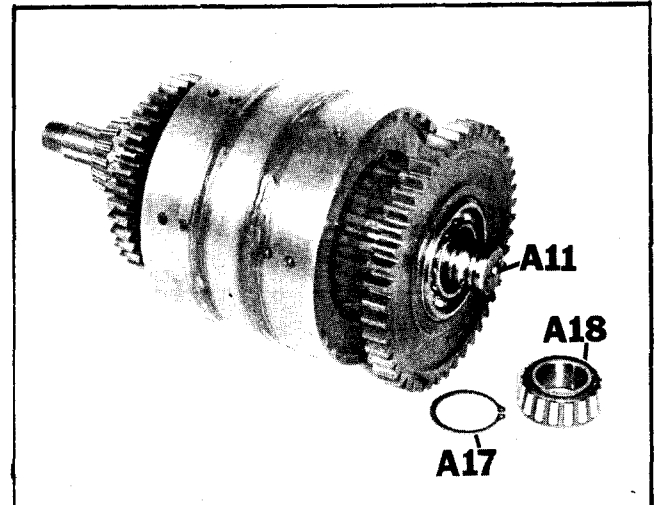


Figure 17

3. Press shaft (A-11) from clutch pak (A-12) freeing clutch gear (A-15) (Figure 18).
4. Press shaft (A-11) from remaining gears (A-7 and A-9) and bearing (A-6) (Figure 18).

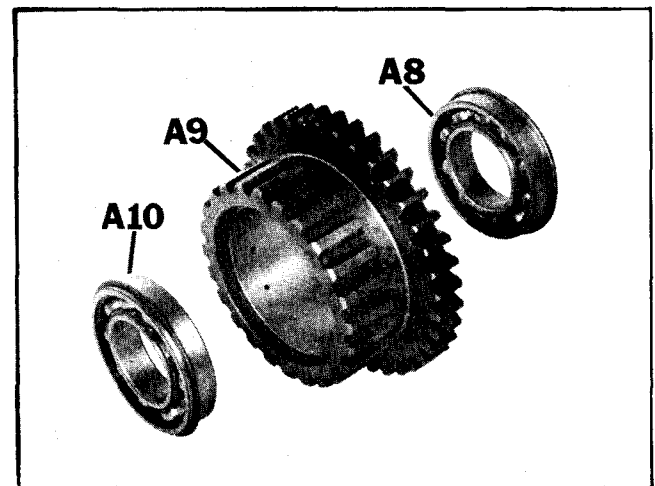


Figure 19

5. Remove bearings (A-8 and A-10) from clutch gear (A-9) (Figure 19) and bearings (A-14 and A-16) from clutch gear (Figure 16).

PTO SHAFT DISASSEMBLY

1. Slide the hollow shaft assembly from the PTO shaft assembly.
2. Using a suitable puller, remove bearing (B-1) from PTO shaft (B-4).
3. Remove PTO driven gear (B-2) and snap ring (B-3) from PTO shaft (B-4) (Figure 20).

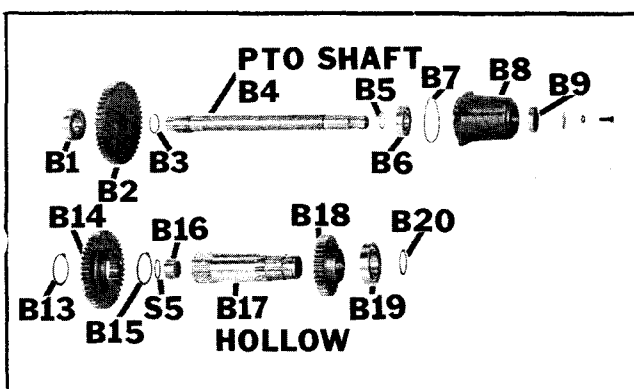


Figure 20

HOLLOW SHAFT DISASSEMBLY

1. Remove snap rings (B-13 and B-15) and gear (B-14) from hollow shaft (B-17).
2. Remove snap ring (S-5) holding caged needle bearing (Figure 21).

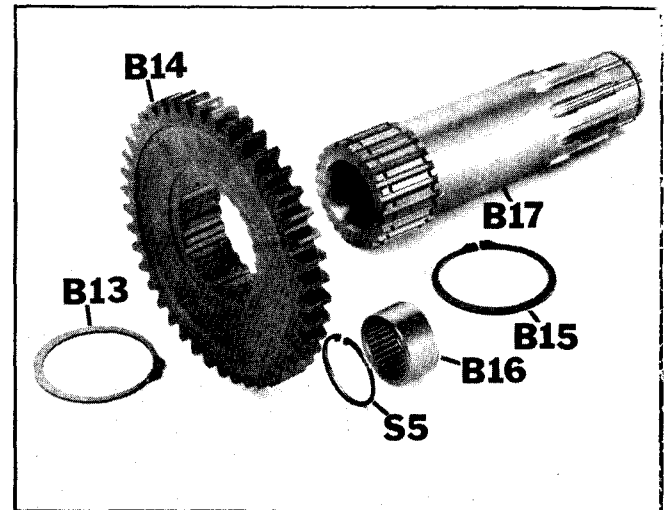


Figure 21

REVERSE SHAFT DISASSEMBLY

1. Remove bearing cone (C-2) from shaft (C-3) using a suitable puller.
2. Press shaft (C-3) from clutch assembly (C-4) (Figure 22).

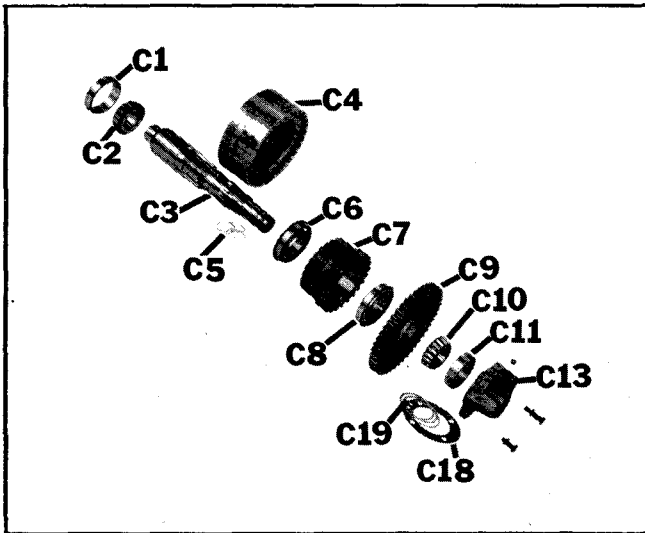


Figure 22

INTERMEDIATE SHAFT DISASSEMBLY

1. Using a suitable puller, remove bearing cone (D-13) and slide gear (D-12) from shaft (D-6) (Figure 23).
2. Press shaft (D-6) from clutch assembly (D-7) freeing clutch gear (D-10).
3. Using a suitable puller, remove bearing cone (D-2) from shaft (D-6).
4. Remove clutch gear (D-4) along with bearings (D-3 and D-5) from shaft (D-6).
5. Remove bearings (D-3 and D-5) from clutch gear (D-4) and remove bearings (D-9 and D-11) from clutch gear (D-10) (Figure 23).

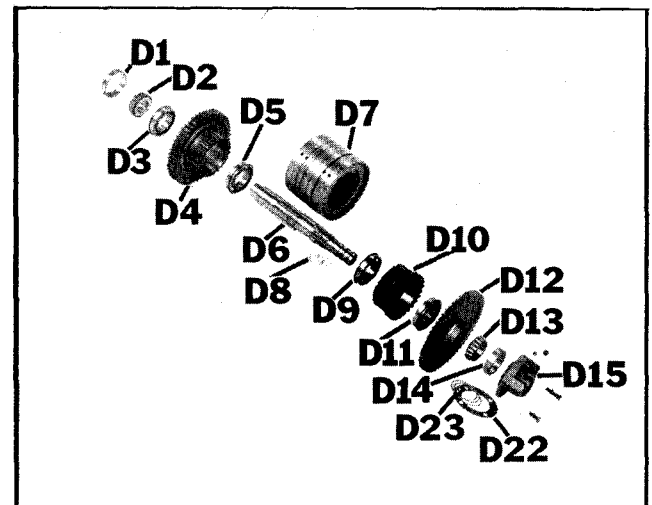


Figure 23

OUTPUT SHAFT DISASSEMBLY

1. Using a suitable puller, remove bearing cones (E-11 and E-16) from output shaft (E-13).
2. Slide gear (E-12) spacer (E-15) and gear (E-14) from output shaft (E-13) (Figure 24).

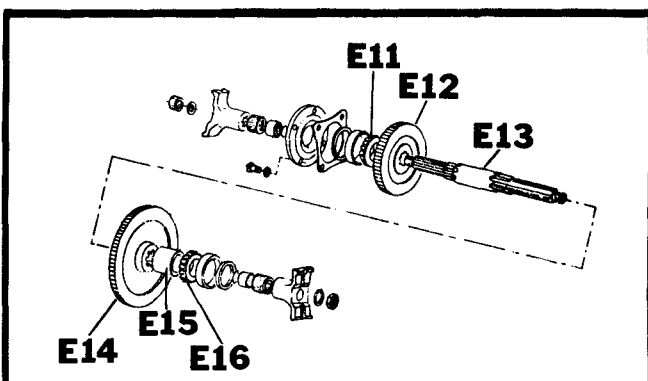


Figure 24

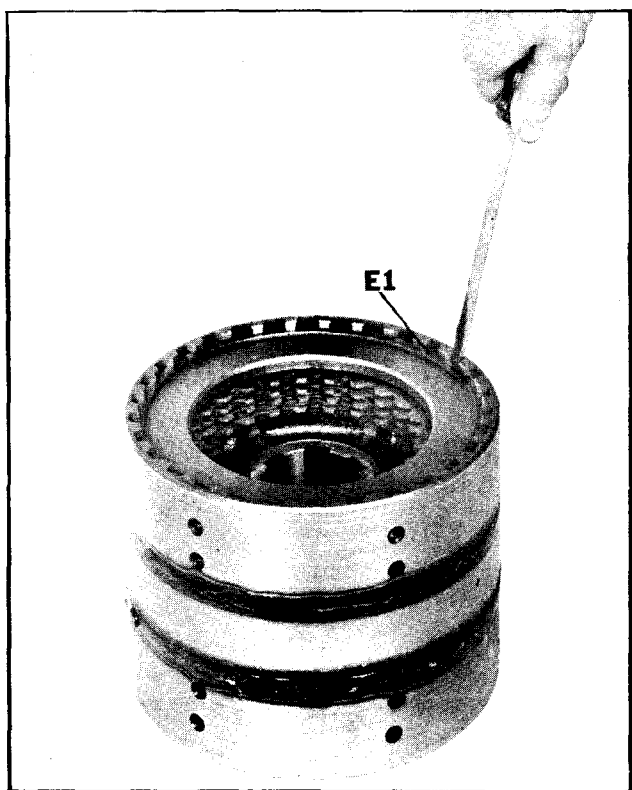


Figure 26

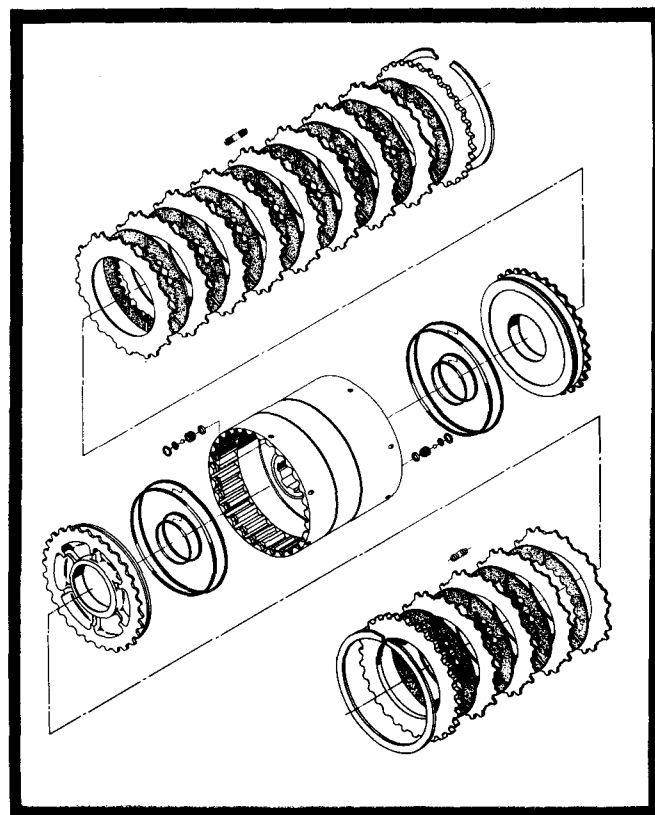


Figure 25

21

CLUTCH DISASSEMBLY

NOTE — The number of clutch discs and drive plates differ with models.

1. Remove snap ring (F-1) (Figure 26).

1. Remove pressure plate (F-2), springs (F-3), clutch disc (F-4) and driving plates (F-5) from clutch housing (F-16) (Figure 27).

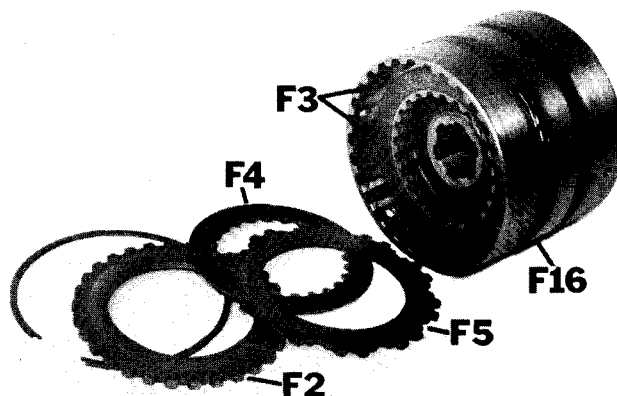


Figure 27

1. Remove piston (F-6) by turning clutch housing (F-16) upside down and tapping housing (Figure 28).

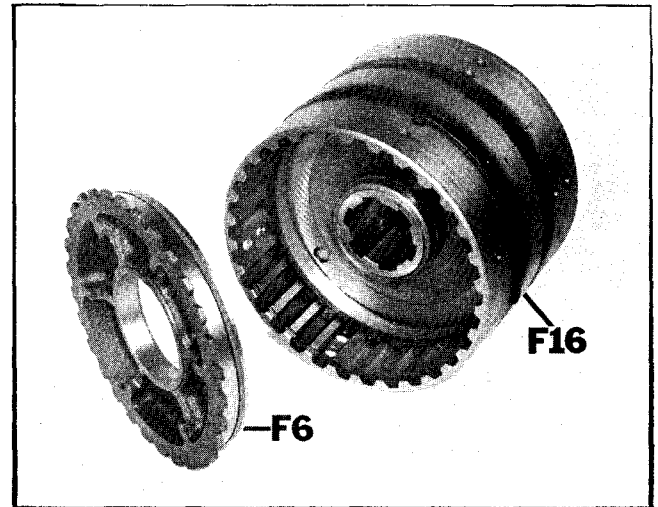


Figure 28

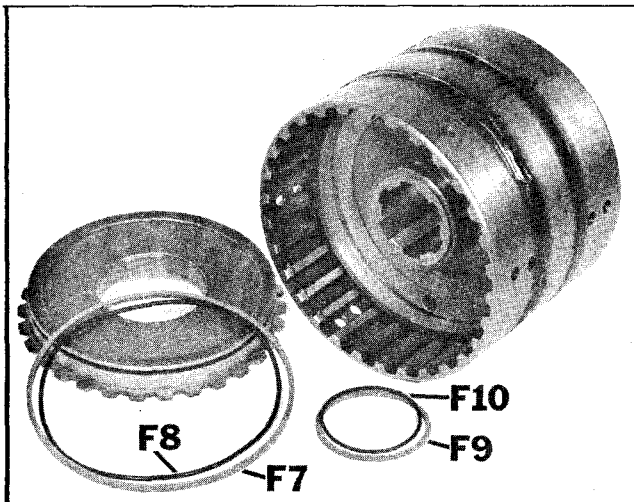


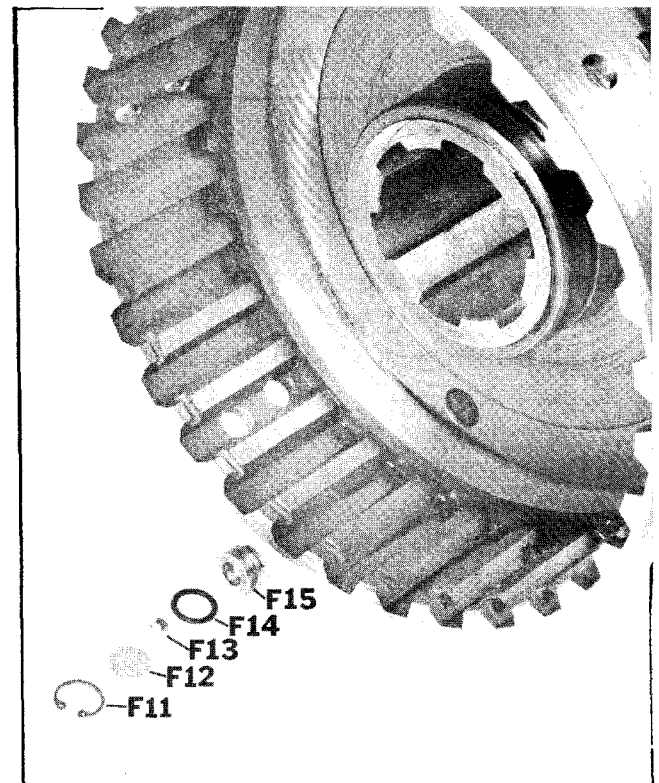
Figure 29

1. Remove sealing ring (F-7) and O ring (F-8) from piston.
2. Remove sealing ring (F-9) and O ring (F-10) from hub of clutch housing (Figure 29).

22

1. On transmission prior to serial no. 1071, remove bleeder assembly by removing snap ring (F-11), screw (F-12), ball (F-13) and retainer (F-15) with O ring (F-14).

NOTE — After transmission S/N 1071, P4-350, items F-11 thru F-15, were discontinued. Bleeder valve is now located in piston (F-6) (Figure 31).



Figures 30

CLUTCH ASSEMBLY

All clutches are assembled by same procedure:

1. Install retainer (F-15) with O ring (F-14), ball (F-13), screen (F-12) and snap ring (F-11) in clutch housing or clutch piston (Figures 30 and 31).
2. Install O ring (F-10) and then sealing ring (F-9) on hub of clutch housing (Figure 29).
3. Install O ring (F-8) and sealing ring (F-7) on piston (F-6) (Figure 29).
4. Install piston (F-6) into clutch housing (Figure 29).

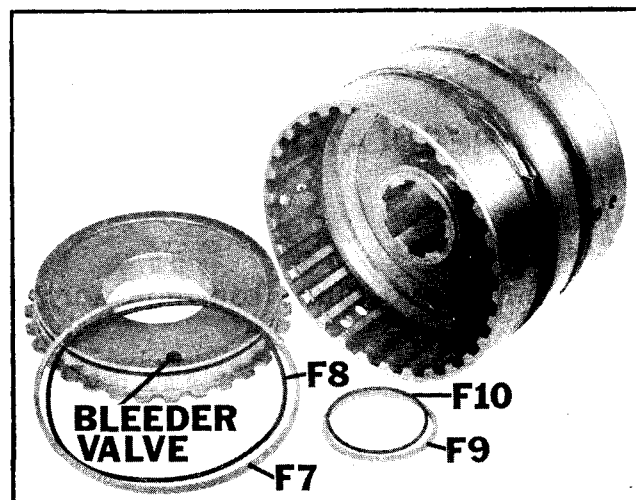


Figure 31

5. Install driving plate (F-5) and then disc (F-4) into clutch housing (Figure 32).

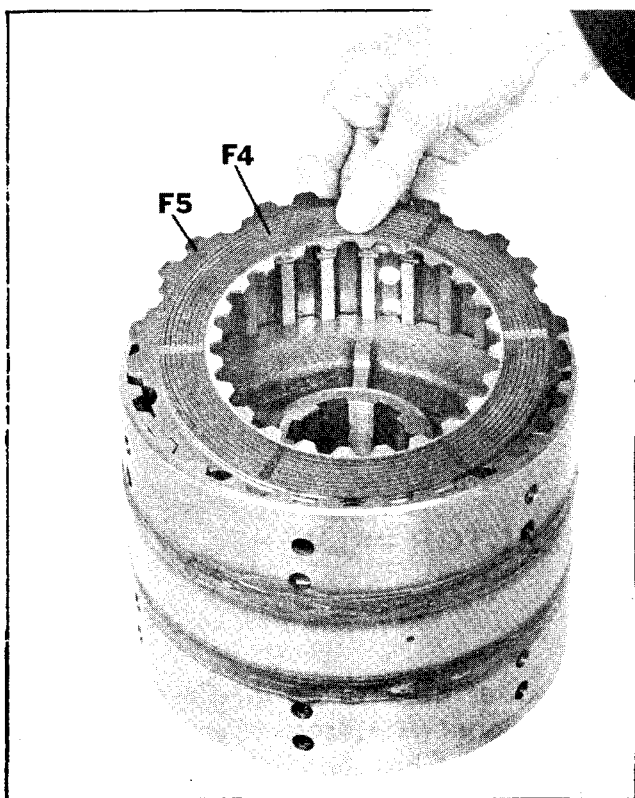


Figure 32

6. Install 10 release springs (F-3) and then continue to alternate driving plates (F-5) and clutch discs (F-4) until four of each are assembled into clutch housing (Figure 33).

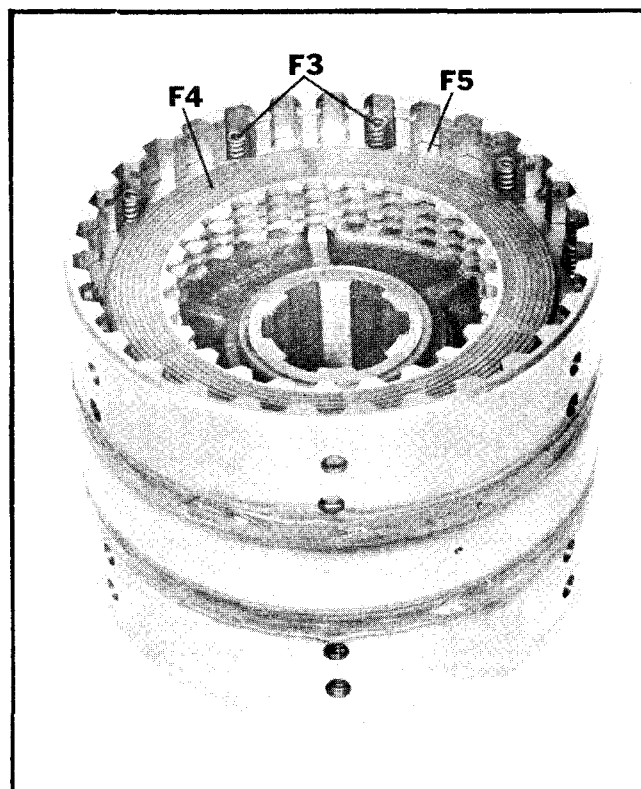


Figure 33

REGULATOR & SELECTOR VALVES DISASSEMBLY & ASSEMBLY

REGULATOR VALVE

DISASSEMBLY:

1. Remove two plugs from regulator valve body (G-2).
2. Face regulator valve assembly downward as roll pins (G-7 and G-8) are removed since springs will force retaining plugs (G-11 and G-15) out.
3. Remove springs (G-10 and G-14).
4. Remove regulator spools (G-9 and G-13).
5. Remove O rings (G-12 and G-16) from retaining plugs (G-11 and G-15).

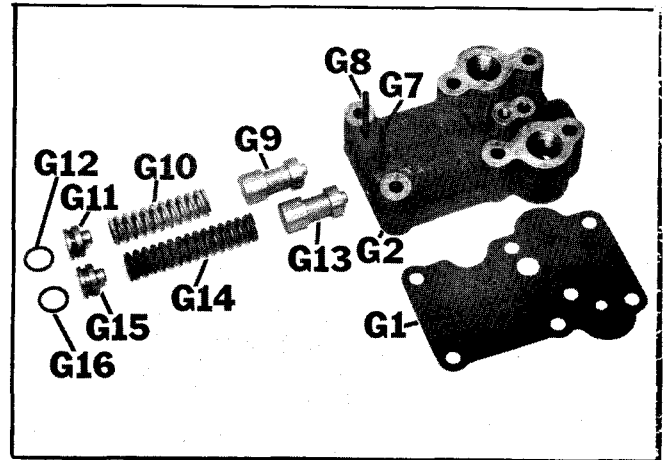


Figure 34

ASSEMBLY:

1. After thoroughly cleaning all parts, coat regulator valve body (G-2) bores with fluid to be used in transmission.
2. Install regulator spool (G-9) in bore and work in and out to insure free operation.
3. Insert spring (G-10) and retainer plug (G-11) with O ring (G-12).
4. Use arbor press to hold retainer plug (G-11) in position while roll pin (G-8) is inserted.
5. Repeat above steps for second regulator.
6. Insert plugs

SELECTOR VALVE

DISASSEMBLY:

Pull directional control spool (H-7) and speed range spool (H-4) from selector valve body (H-1) along with oil seals (H-6 and H-5).

ASSEMBLY:

1. After thoroughly cleaning all parts, coat selector valve body (H-1) bores with same fluid to be used in transmission.
2. Replace spools (H-4 and H-7) in selector valve body (H-1) and work both spools in and out to insure free operation. Small nicks can be removed by using fine emory cloth.
3. Replace oil seals (H-5 and H-6).

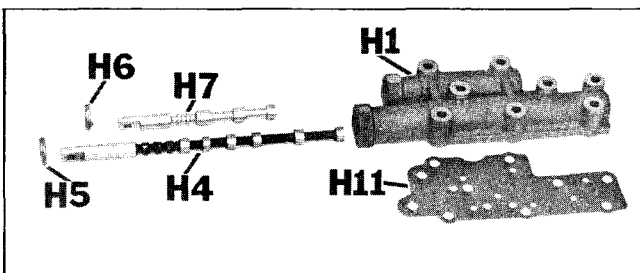


Figure 35

INPUT SHAFT ASSEMBLY

1. Place clutch gear (A-15) with bearings (A-14 and A-16) into either end of assembled clutch pack (A-12) by turning the clutch gear from side to side until the four clutch discs have mated with the clutch hub (Figure 36).

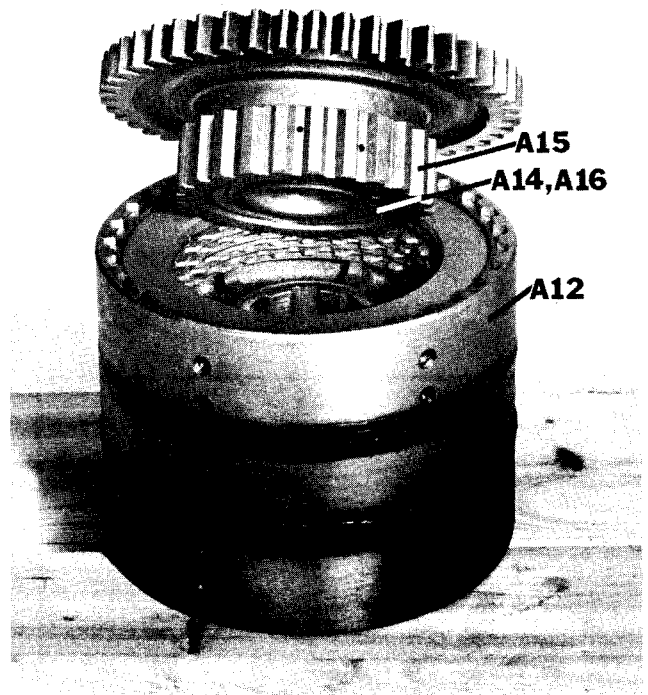


Figure 36

2. Press input shaft (A-11) into clutch pack (A-12) and clutch gear (A-15), assemble carefully noting the alignment of the two oil holes in the shaft to the two holes in the clutch pack (Figure 37).

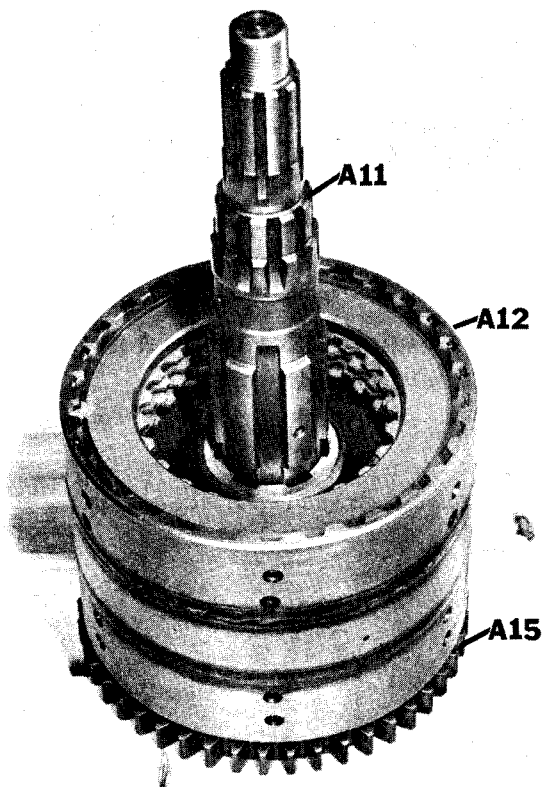


Figure 37

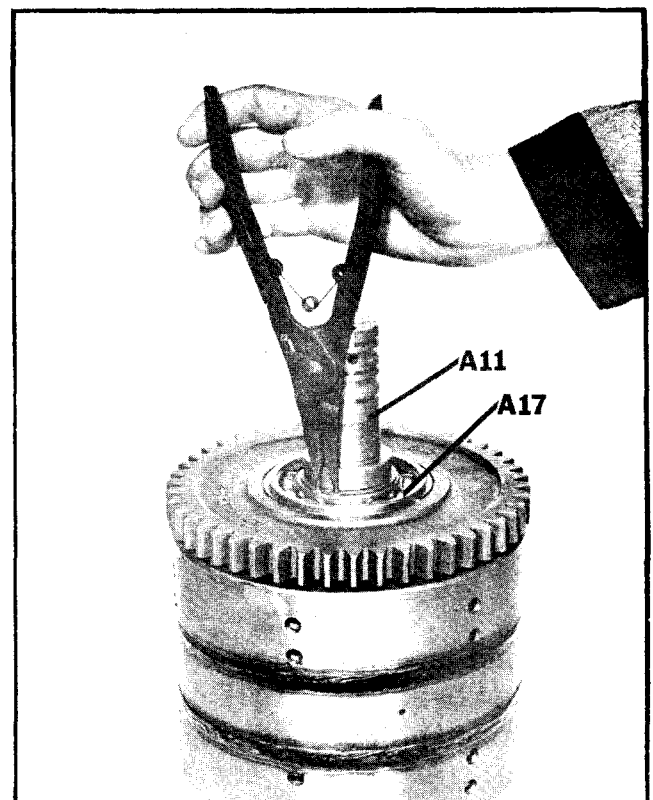


Figure 38

3. Install snap ring (A-17) onto shaft (A-11) (Figure 38).

4. Press bearing (A-10) onto opposite end of the bearings snap ring (Figure 38A).

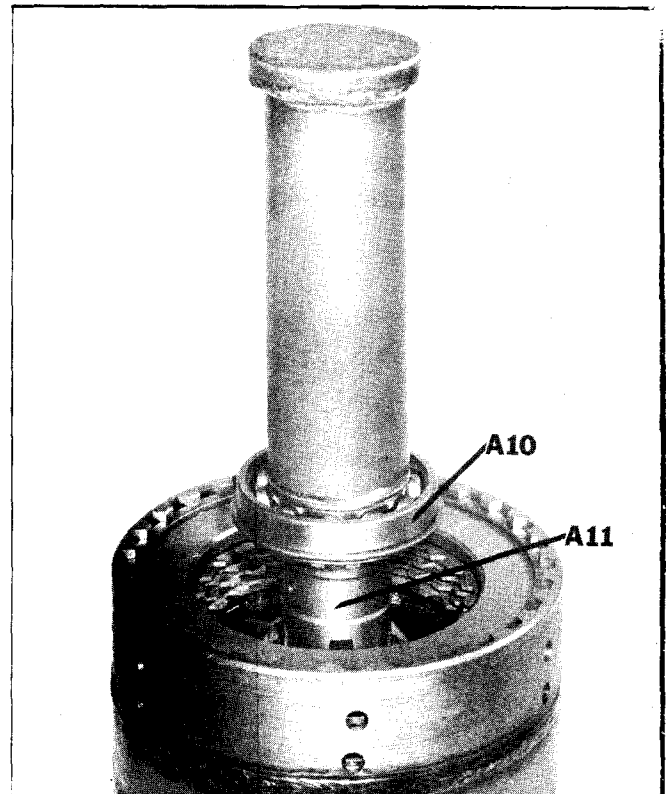


Figure 38A

5. Center and align clutch discs using a pencil or suitable straight edge (Figure 39).

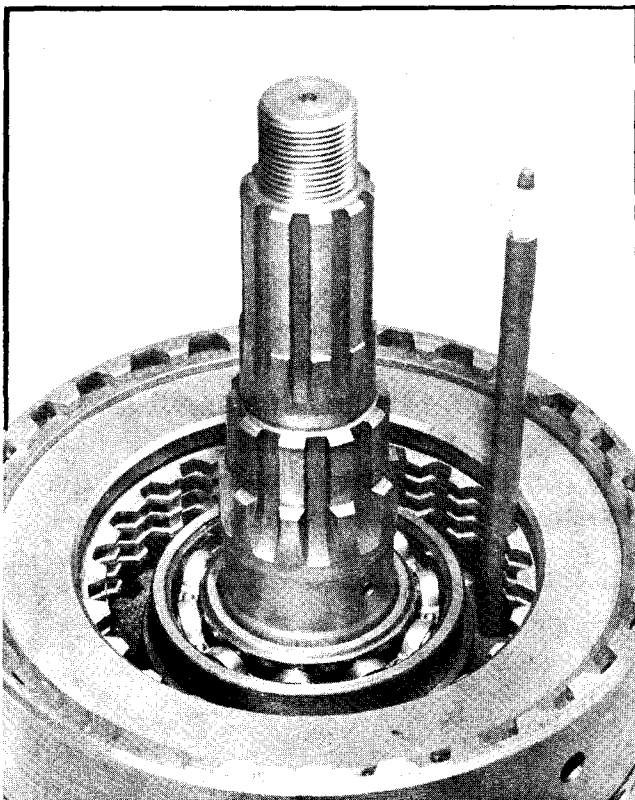


Figure 39

6. Insert and tap clutch gear (A-9) until properly seated on bearing (A-10) (Figure 40).
7. If assembled properly the space between clutch pack (A-12) and clutch gear (A-9) will be $\frac{1}{8}$ inch (Figure 40).

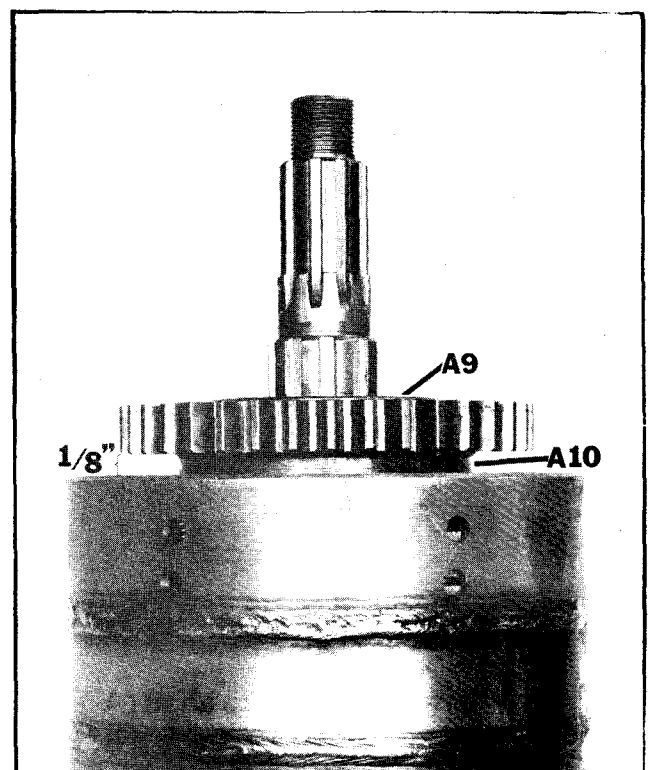


Figure 40

8. Air test (30 psi min) both clutches utilizing the oil inlet holes. Actuation of the clutches may be observed at the lube outlet holes in the clutch housing. Engage each clutch 4 or 5 times to assure proper actuation and release of clutches (Figure 41).

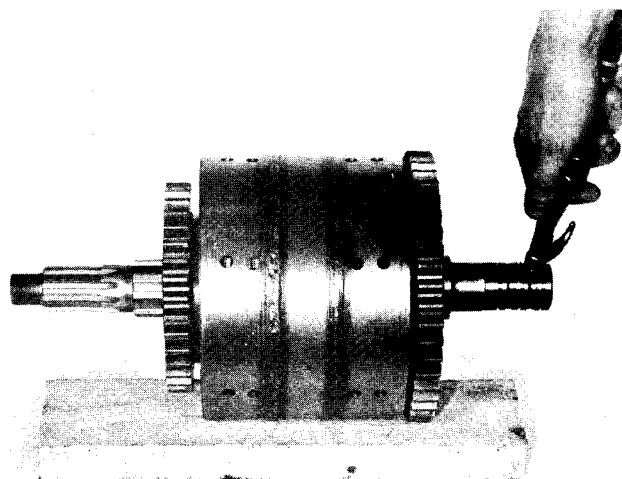


Figure 41

PTO SHAFT ASSEMBLY

1. Install snap ring (B-3) and driven gear (B-2) onto PTO shaft (B-4).

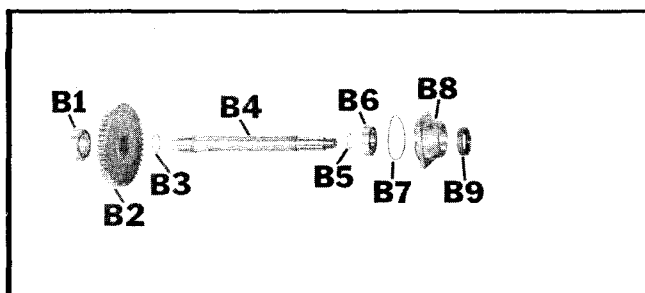


Figure 42

HOLLOW SHAFT ASSEMBLY

1. Replace caged needle bearing (B-16) if removed.
2. Install snap ring (S-5) to retain bearing.
3. Install snap ring (B-15).
4. Install gear (B-14) onto hollow shaft (B-17).
5. Install snap ring (B-13).

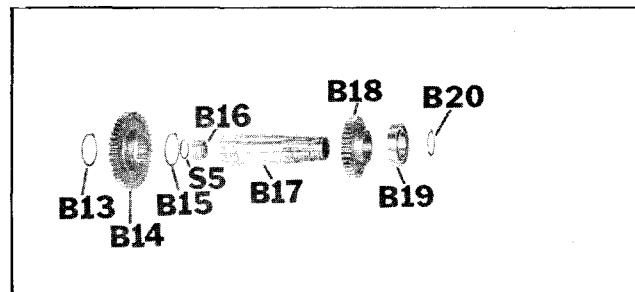


Figure 43

REVERSE SHAFT ASSEMBLY

1. Assemble reverse shaft into clutch assembly (C-4) noting the alignment of the oil hole on shaft to the mating hole on the clutch housing spline.
2. Press bearing (C-6) onto shaft (C-3). Snap ring on bearing must be in downward position.
3. Center and align clutch discs using a pencil or suitable straight edge as shown in Figure 39.
4. Insert and tap clutch gear (C-7) until properly seated on bearing (C-6) and install bearing (C-8).
5. Install gear (C-9) onto shaft (C-3) with long hub end facing away from clutch pack (C-4).
6. Press bearing cone (C-10 and C-2) onto shaft (C-4).

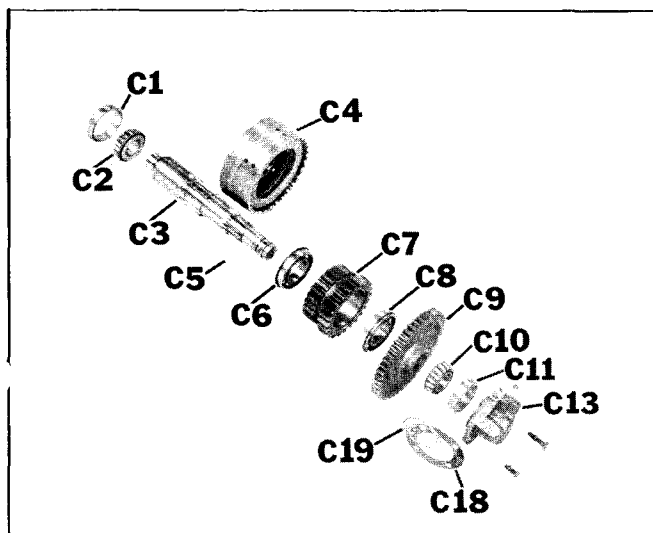


Figure 44

INTERMEDIATE SHAFT ASSEMBLY

Follow assembly procedure for the Input Shaft.

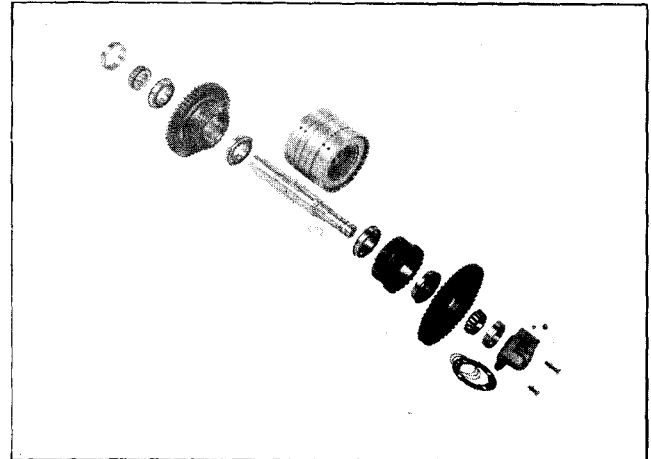


Figure 45

OUTPUT SHAFT ASSEMBLY

1. Press gears (E-12 and E-14) onto output shaft (E-13) making sure that the long hub ends of both gears are facing their respective ends of the shaft.
2. Slide spacer (E-15) onto shaft next to gear (E-14).
3. Press bearing cones (E-11 and E-16) onto their respective ends of output shafts (E-13) (Figure 46).

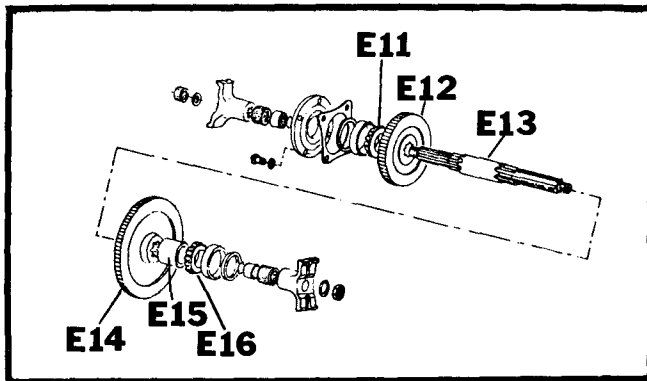


Figure 46

MAIN ASSEMBLY

After assembly of shaft components as covered in previous section:

1. Press bearing caps (A-5, C-1, D-1 and E-10) into proper bores in main case (M-9) (Figure 47).

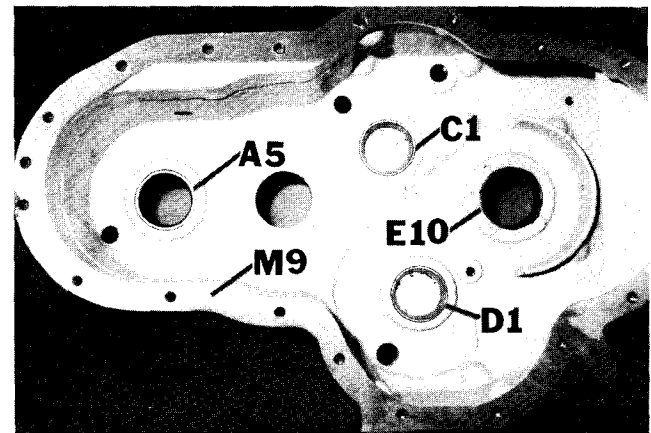


Figure 47

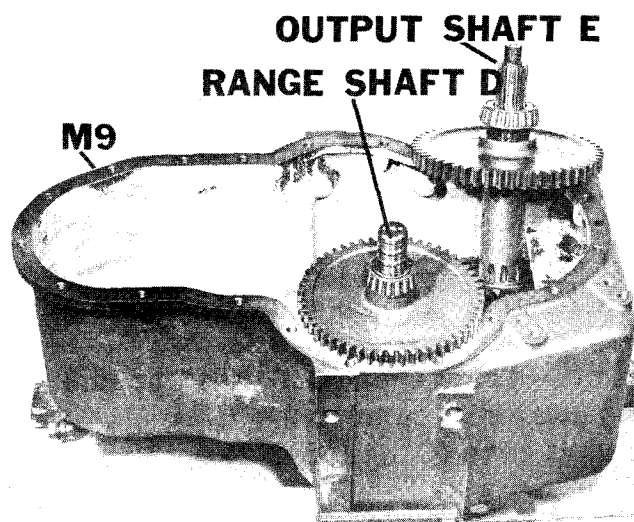


Figure 48

2. Press PTO ball bearing into remaining bore in main case (M-9).
3. Hang range shaft assembly (D) on lip of case (M-9) (Figure 48).
4. Insert output assembly (E) and mesh with bottom gear of range shaft assembly (D). Leave output shaft cocked toward bottom of main case (M-9).

5. Insert reverse shaft assembly (C) and mesh top and bottom gears with corresponding gears on range shaft assembly (D) (Figure 49).
6. Lower three shaft assemblies into bearing cups; pull on reverse shaft assembly (C) and push on output shaft assembly (E) to bring remainder of gears into proper mesh (Figure 49).

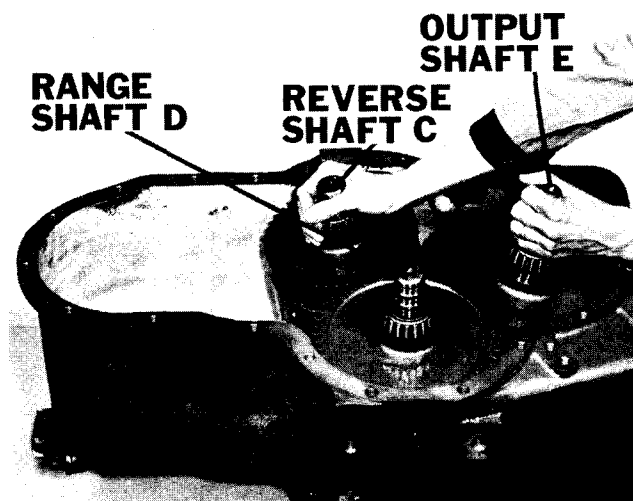


Figure 49

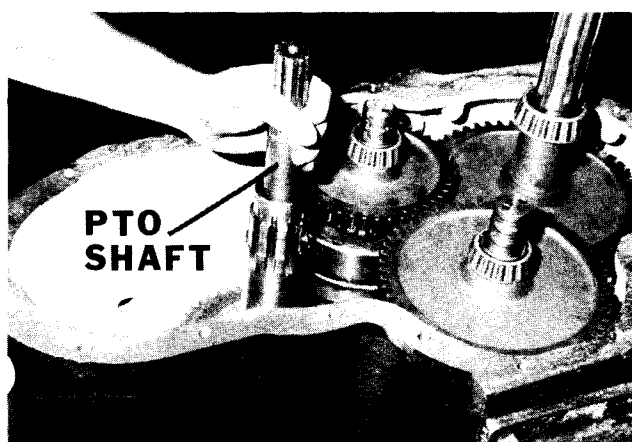


Figure 50

7. Install PTO shaft assembly into ball bearing in case (Figure 50).
8. Slide hollow shaft assembly over PTO shaft.

29

9. Lower input shaft assembly (A) into case (Figure 51).

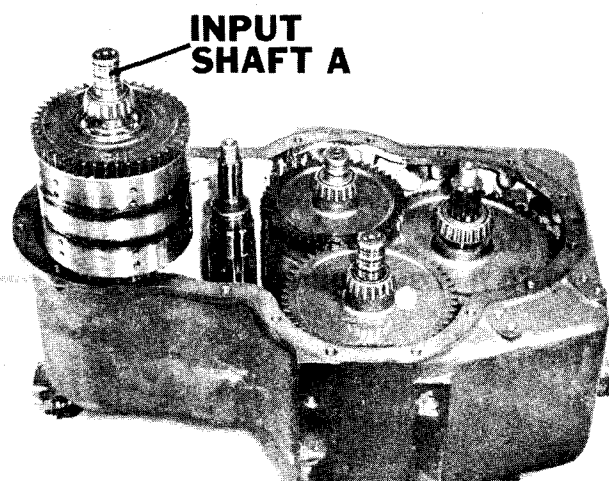


Figure 51

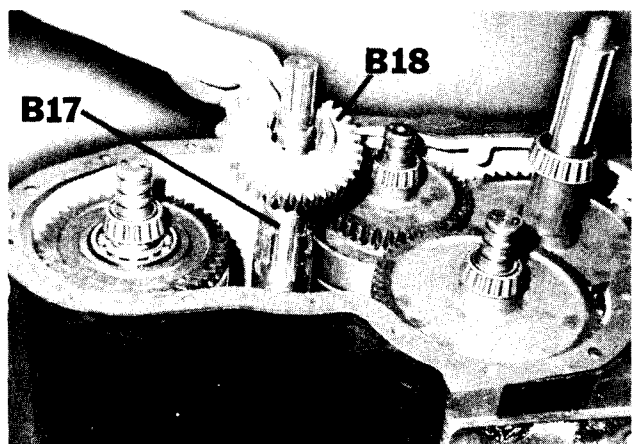


Figure 51A

10. Slide gear (B-18) onto hollow shaft (B-17).
11. Replace main gasket (M-2) (Figure 51A).

12. Install bearing cups (A-19, C-11 and D-14) in main case. Make sure cups are flush with outer machined surface of cover.
13. Install sealing plate (M-7) with capscrews. Tighten from center outward and torque 28-32 ft. lbs. (Figure 52).

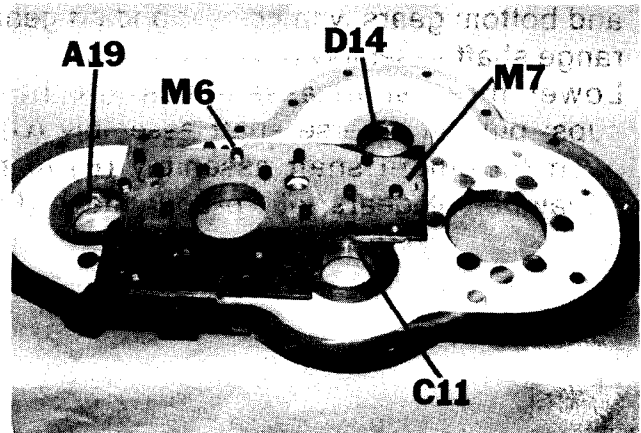


Figure 52

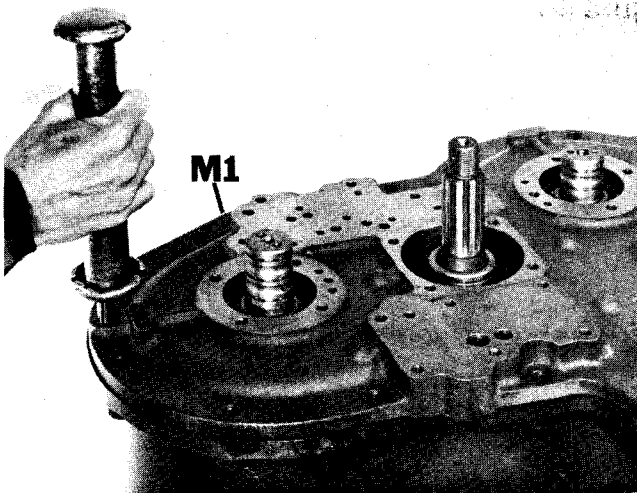


Figure 53

14. Dowel main cover (M-1) in two places using two dowel pins (Figure 53).

15. Assemble main cover (M-1) to case (M-9) using 19 lockwashers and 19 capscrews. Torque to 70-75 ft. lbs. (Figure 54).

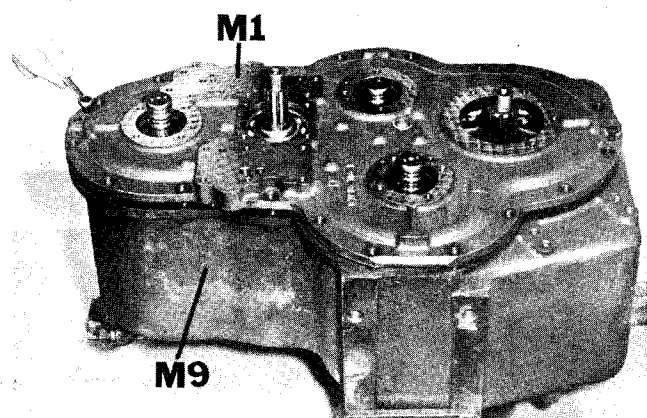


Figure 54

16. Press bearing (B-19) into place making sure snap ring groove on shaft is fully exposed (Figure 55).

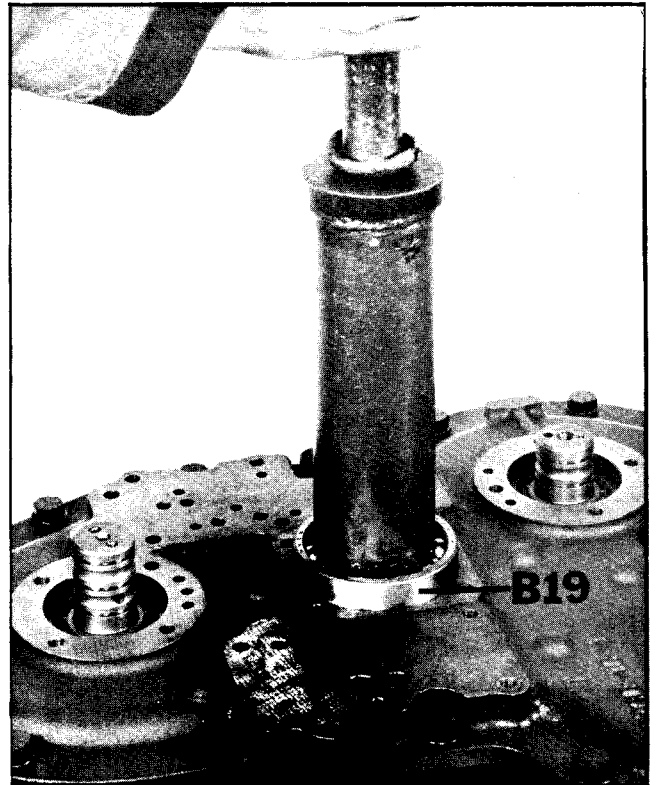


Figure 55

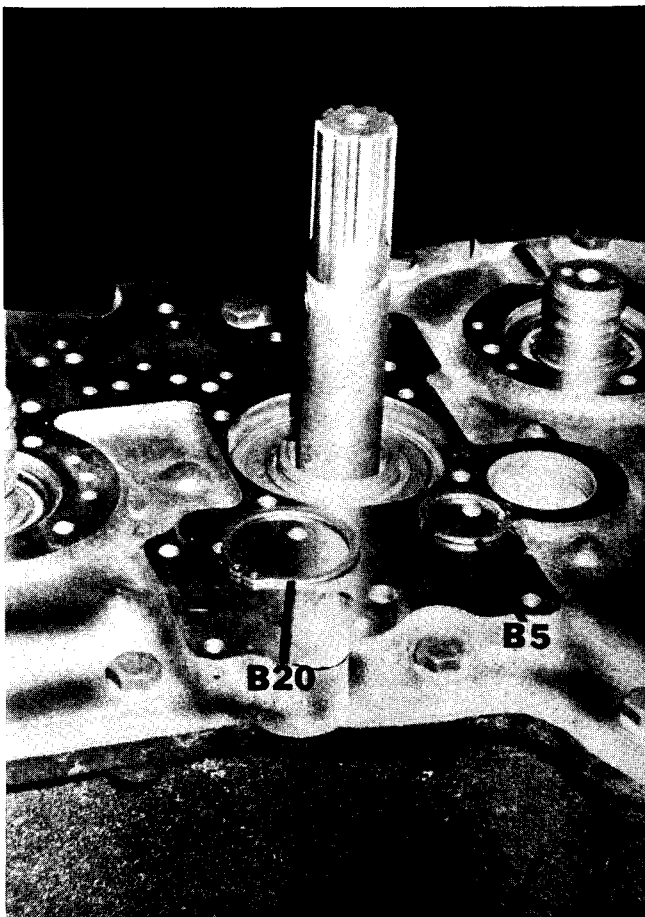


Figure 56

17. Install snap rings (B-20 and B-5) (Figure 56).

18. Install cover (B-8) with O ring, ball bearing and oil seal using four lockwashers and four capscrews (B-22). (Figure 57).

NOTE — On later model transmissions a hollow shaft bearing lube line has been added. Bearings (B-6 and B-19) must be shielded bearings.

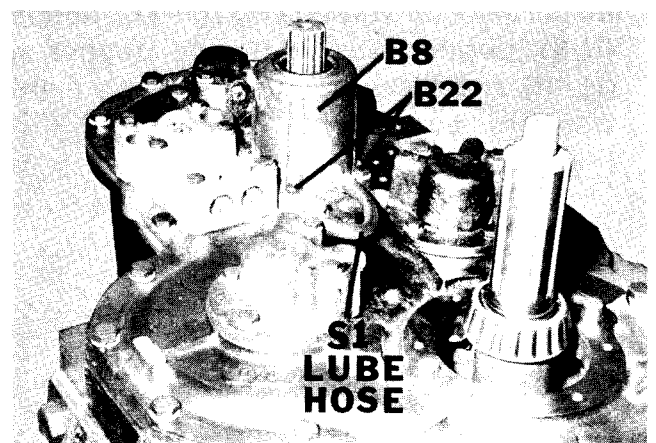


Figure 57

19. With gasket (A-26) in place bolt cover (A-20) in place using two lockwashers and two bolts.
20. Loosen bolts and remove cover. (Figure 58).

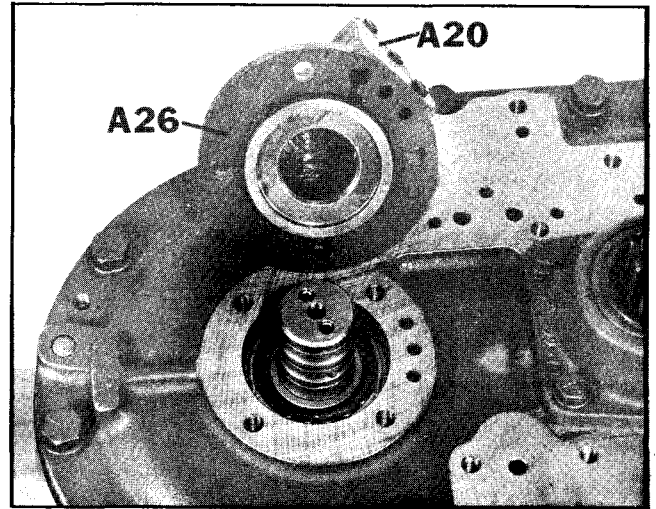


Figure 58

32

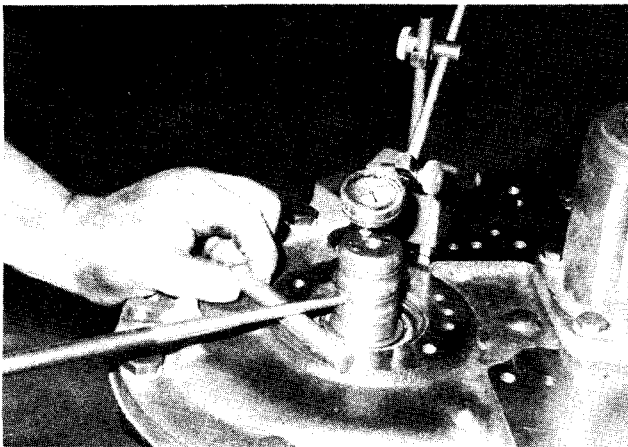


Figure 59

21. Begin shimming input shaft (A) with dial indicator to measure free play (Figure 59.)
22. Shim as necessary to obtain .002-.003 thousands end play.
23. Install new sealing rings on shaft. Sealing rings should be lightly lubricated before installing.
24. Replace cover and gasket with capscrews. Torque 27-32 ft. lbs.
25. Repeat steps 19 thru 24 to shim shafts (C) and (D).

INSTALLATION OF VALVE BODIES

1. Install selector valve gasket (H-11), poppet balls (H-8), poppet pins (H-9) and poppet springs (H-10) and valve body (H-1) using eight lockwashers, eight bolts. Torque to 27-32 ft. lbs. (Figure 60).

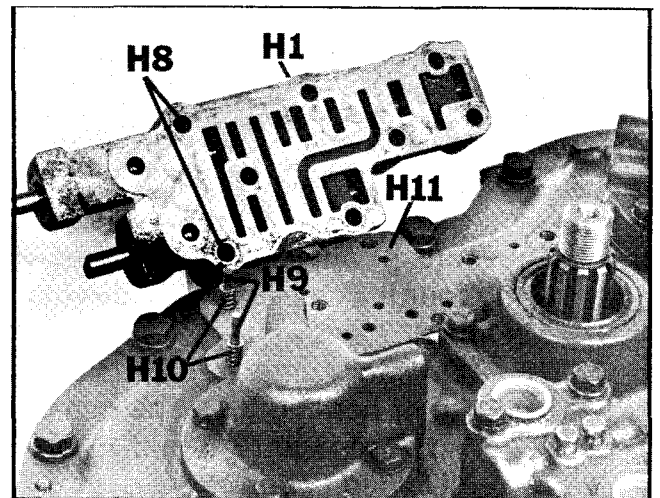


Figure 60

1. Install pressure regulator valve assembly (G-2) and gasket (G-1) using six lockwashers and six bolts (Figure 61).

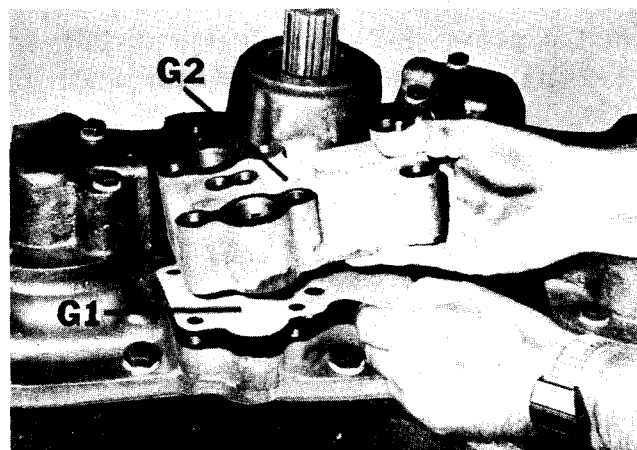


Figure 61

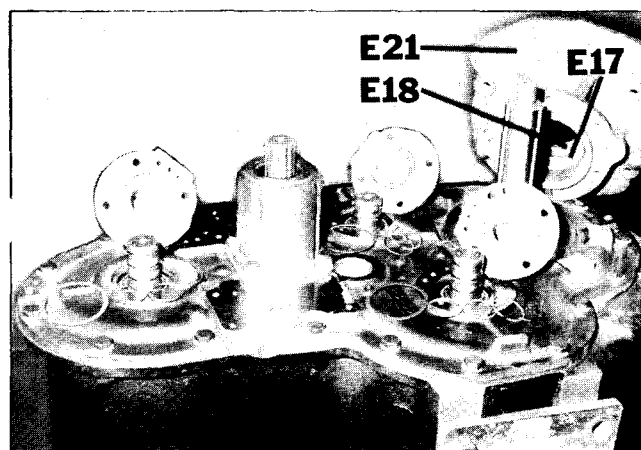


Figure 62

SHIMMING PROCEDURES FOR OUTPUT SHAFT

1. Install new oil seal (E-18) in cover (E-21).
2. Install bearing cup (E-17) in cover (E-21).
3. Install O ring in cover (E-21).
4. Install cover (E-21) on transmission housing.
5. Install O ring (E-28) with spacer (E-4) with taped edge inward on shaft. (Figure 62).

NOTE —When repairing transmissions with open disc brakes, delete shims (E-18)

33

1. Turn transmission over with front side up.
2. Add shims (E-19) as required to obtain .002-.003 thousands end play in shaft. Note: Dial indicator should be used to measure end play (Figure 62A).



Figure 62A

1. Install cover (E-7) and O ring (E-28), spacer (E-24)(tapered edge inward) on shaft (Figure 63).

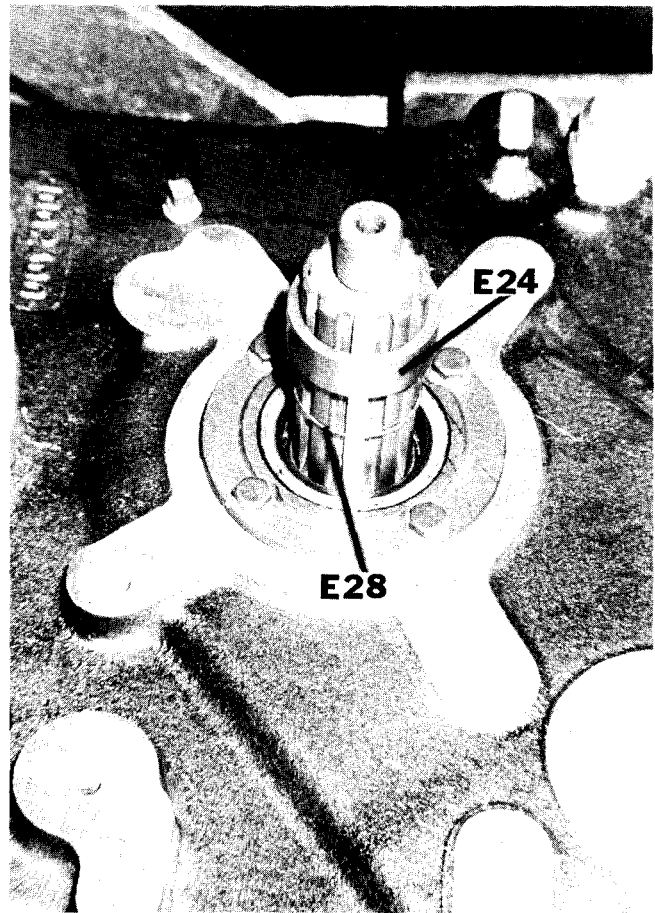


Figure 63

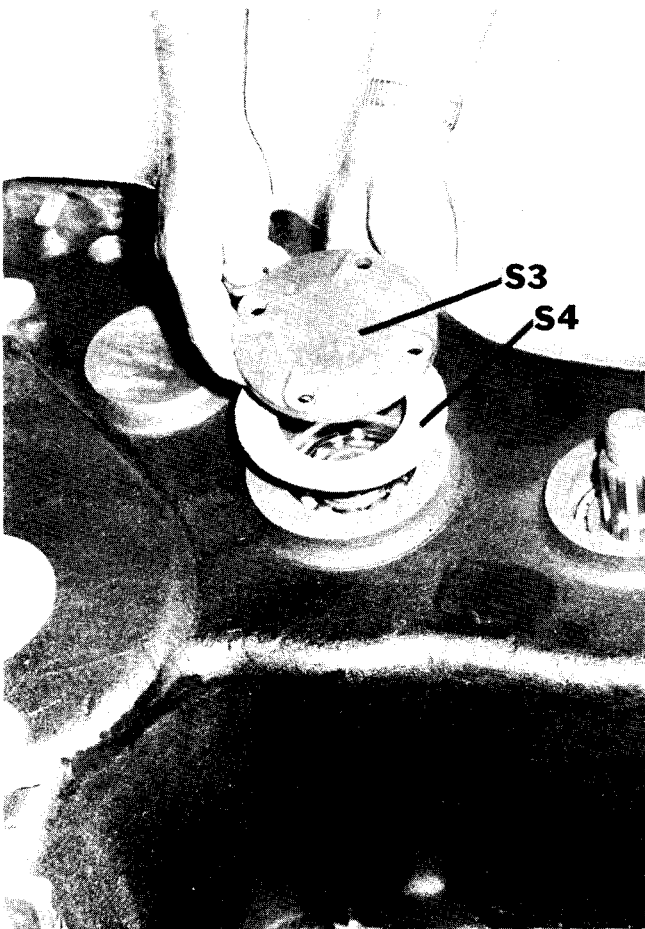


Figure 64

SHIMMING PROCEDURES FOR PTO SHAFT

1. On later model transmissions a cover and shims were added to allow the PTO shaft to be shimmed.
2. Add shims as required to obtain .002-.003 thousands end play. NOTE: Dial indicator should be used to check end play (Figure 64).

POWERSHIFT TRANSMISSION BRAKE ASSEMBLY

1. Install brake mount on transmission housing.
Use silicone sealer on sealing surfaces of
mount. (Figure 1)

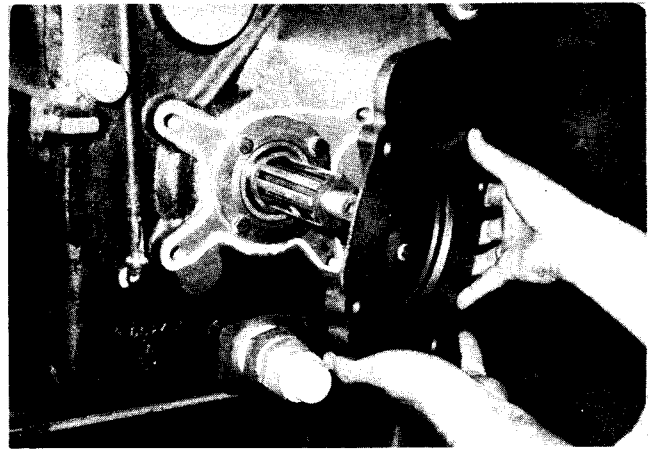


Figure 1

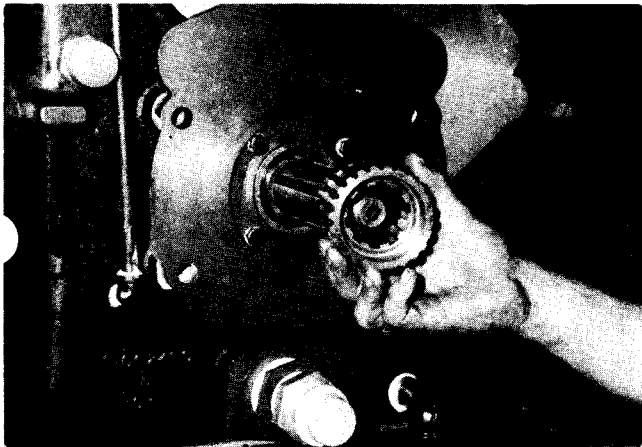


Figure 2

2. Install splined sleeve on transmission output
shaft. (Figure 2)

34
A

3. Slide one disc over splined sleeve. (Figure 3)

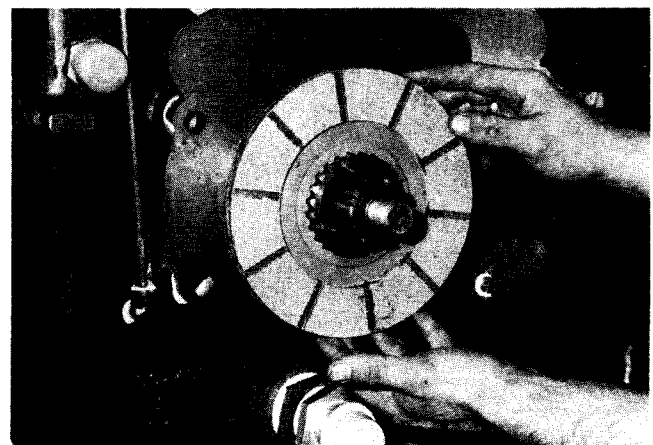


Figure 3

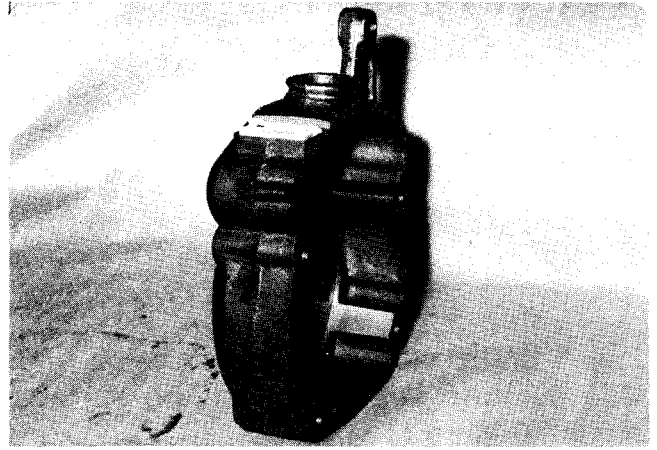


Figure 4

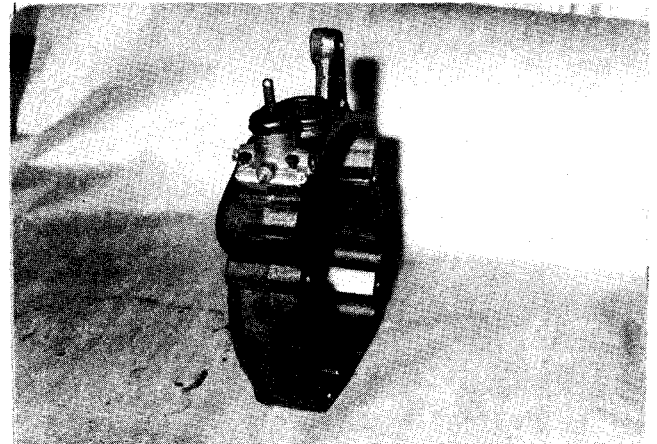


Figure 5

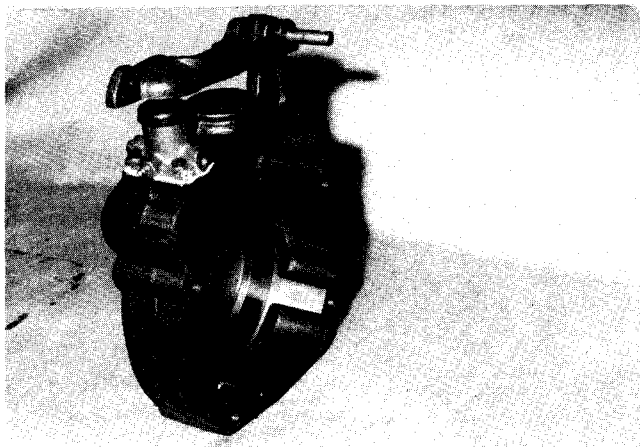


Figure 6

5. Install pin in leverage arm. (Figure 6)

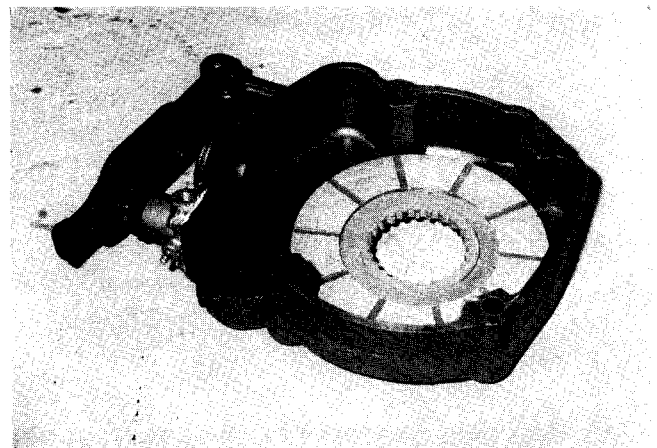


Figure 7

6. Install disc in housing. (Figure 7)

4. Install brake slave cylinder and seal with silicone sealer. (Figures 4&5)

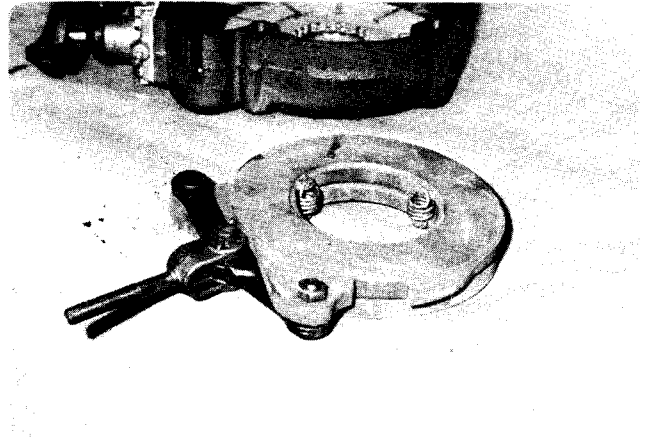


Figure 8

7. Install brake actuator in housing. (Figures 8&9)
 Note: Be sure that actuator is thoroughly cleaned and the balls that have been lubricated.

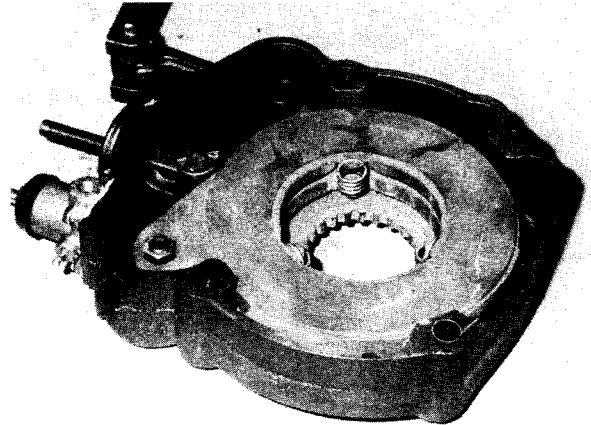


Figure 9

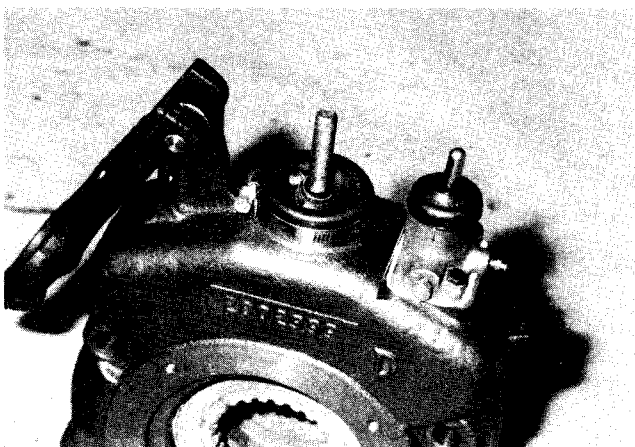


Figure 10

8. Install brake yoke dust cover using two hose clamps. (Figure 10)

9. Install spring (Figure 11)

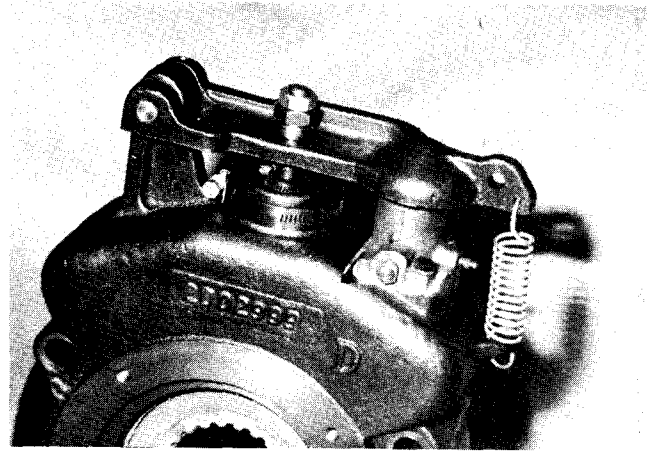


Figure 11

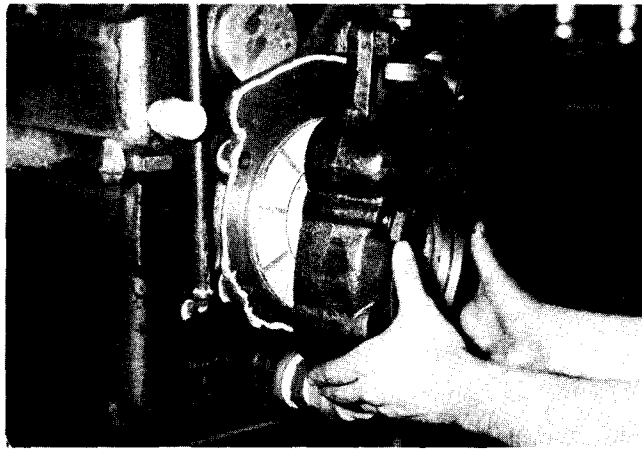


Figure 12

10. Install brake housing, actuator and disc as an assembly and bolt down. Use silicone sealer to seal housing to mounting plate. (Figures 12&13)

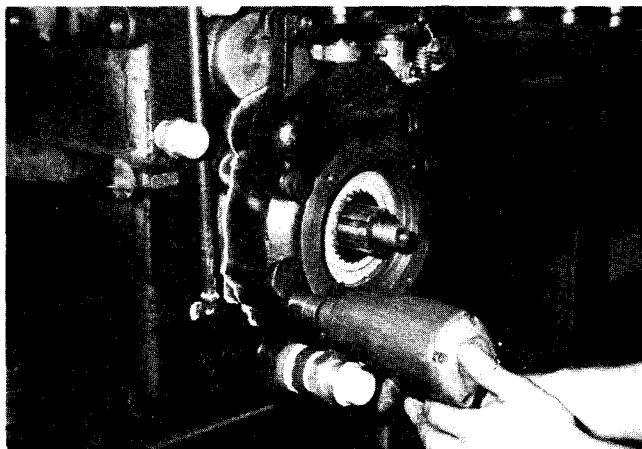


Figure 13

11. Install both drive line yoke seals with the lip facing outward. Leave approximately $\frac{1}{8}$ " between the two seals to allow room for lubrication. (Figures 14,15&16)



Figure 14

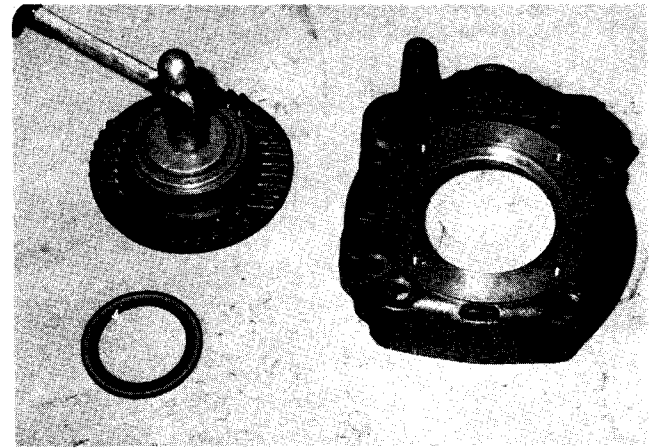


Figure 15

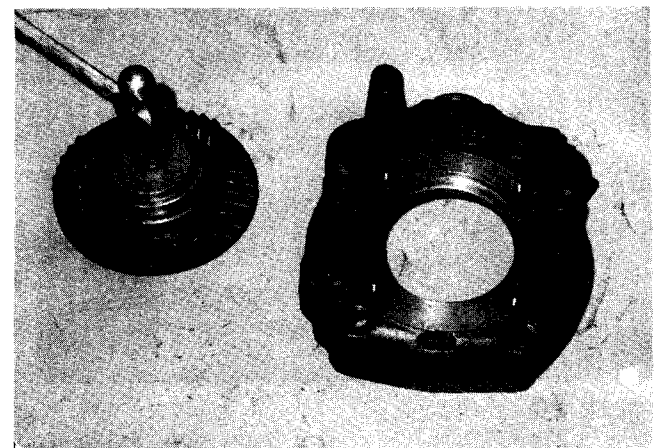


Figure 16



Figure 17

12. Insert drive line yoke through both seals, making sure not to damage seals. (Figure 17)



Figure 18

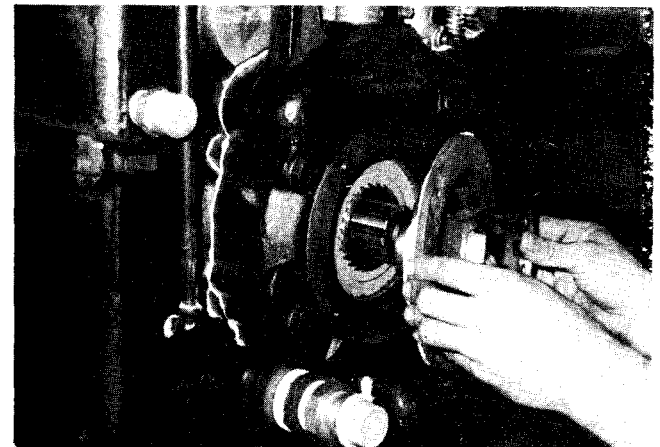


Figure 19

13. Apply silicone sealer to sealing surfaces of front cover and install cover and yoke as an assembly on shaft and housing. (Figures 18&19)

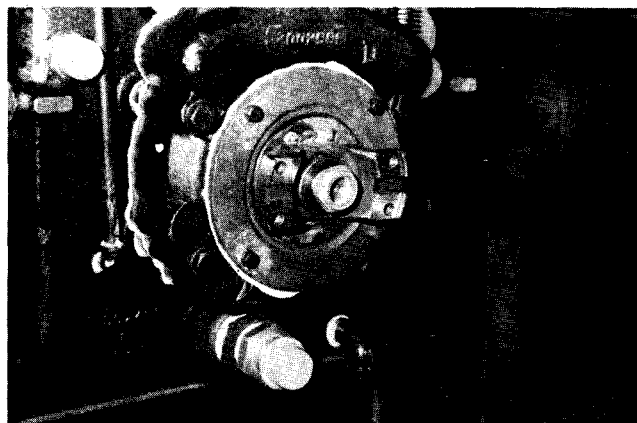


Figure 20

14. Install washer and nut on shaft. Torque to 450 ft. lbs. (Figure 20)



Figure 21

15. Adjust leverage arm to obtain $\frac{3}{8}$ " to $\frac{1}{2}$ " movement on the slave cylinder when brake is applied (Figure 21). Make sure lock nut is secure to prevent brake from losing its adjustment.

16. Screw grease line into brake housing cover.
(Figure 22)

Note: Installation procedures for the front and rear brake are the same.

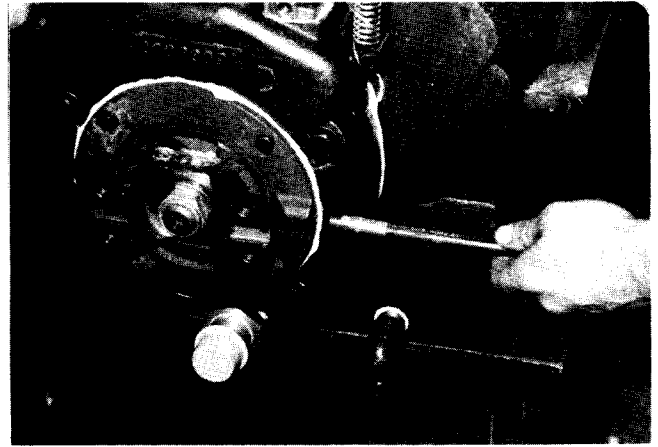
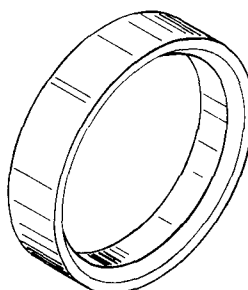
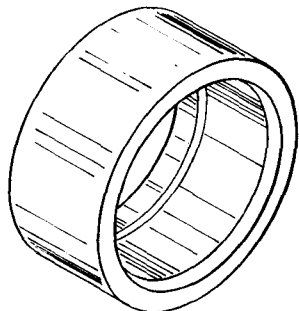


Figure 22

SPECIAL TOOLS

PISTON SEAL RING INSTALLER (SMALL)

PART NO. T-543-B



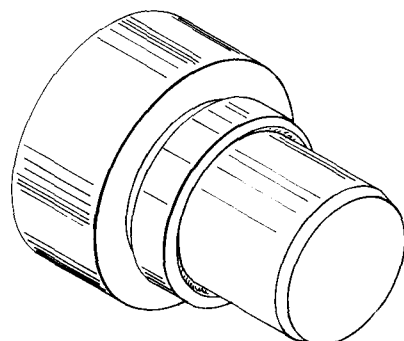
PISTON SEAL RING INSTALLER (LARGE)

PART NO. T-545-C



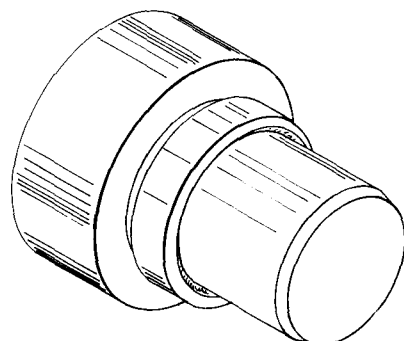
NEEDLE BEARING REMOVER

PART NO. T-546-C



NEEDLE BEARING INSTALLER

PART NO. T-544-B



ITEM	PART NAME
------	-----------

INTPUT SHAFT ASSEMBLY

A-1	LOCKNUT (1.000-14)
A-2	WASHER (1.000 Dia.)
A-3	END YOKE, INPUT
A-4	OIL SEAL, INPUT SHAFT
A-5	TAPER BEARING CUP
A-6	TAPER BEARING CONE
A-7	GEAR, INPUT
A-8	BALL BEARING
A-9	CLUTCH GEAR, Low & 3rd
A-10	BALL BEARING
A-11	SHAFT, INPUT
A-12	DUAL HYDRAULIC CLUTCH ASSEMBLY (Complete)
A-13	SEALING RING
A-14	BALL BEARING
A-15	CLUTCH GEAR, 2nd & High
A-16	BALL BEARING
A-17	SNAP RING, INPUT SHAFT
A-18	TAPER BEARING CONE
A-19	TAPER BEARING CUP
A-20	COVER, OIL INLET — INPUT
A-21	PLUG, HEX (.125-27)
36 A-22	LOCKWASHER (.375 Dia.)
A-23	CAPSCREW, HEX HEAD (.375-16 x 1.500)
A-24	CAPSCREW, HEX HEAD (.375-16 x 1.000)
A-25	LOCKWASHER (.375 Dia.)
A-26	GASKET, OIL INLET COVER
A-27	SHIM, OIL INLET COVER (.005") (.007") (.020")
A-28	PLUG, C'SUNK HEX (.062-27)

P.T.O. & HOLLOW SHAFT ASSEMBLY

B-1	BALL BEARING
B-2	GEAR, P.T.O. DRIVE
B-3	SNAP RING, P.T.O. SHAFT
B-4	SHAFT, P.T.O.
B-5	SNAP RING, P.T.O. SHAFT
B-6	BALL BEARING
B-7	O-RING, P.T.O. COVER
B-8	COVER, P.T.O. OUTPUT
B-9	OIL SEAL, P.T.O. SHAFT
B-10	END YOKE (P.T.O.)
B-11	WASHER, P.T.O. YOKE
B-12	CAPSCREW, HEX HEAD (.375-24 x 1.000)

B-12	LOCKNUT (1.000-14)
B-13	SNAP RING, IDLER GEAR
B-14	GEAR, IDLER
B-15	SNAP RING, IDLER GEAR
B-16	ROLLER BEARING
B-17	SHAFT, IDLER-HOLLOW
B-18	GEAR, IDLER
B-19	BALL BEARING
B-20	SNAP RING, IDLER GEAR
B-21	LOCKWASHER (.375 D.)
B-22	CAPSCREW, HEX HEAD (.375-16 x 1.250)
B-23	KEY
B-24	LOCKWASHER (.375 Dia.)

REVERSE SHAFT ASSEMBLY

C-1	TAPER BEARING CUP
C-2	TAPER BEARING CONE
C-3	SHAFT, REVERSE IDLER
C-4	SINGLE HYDRAULIC CLUTCH ASSEMBLY (Complete)
C-5	SEALING RING
C-6	BALL BEARING
C-7	CLUTCH GEAR, Low & 2nd Rev.
C-8	BALL BEARING
C-9	GEAR, REVERSE IDLER
C-10	TAPER BEARING CONE
C-11	TAPER BEARING CUP
C-12	PLUG, HEX (.125-27)
C-13	COVER, OIL INLET — REVERSE
C-14	LOCKWASHER (.375 Dia.)
C-15	CAPSCREW, HEX HEAD (.375-16 x 1.500)
C-16	CAPSCREW, HEX HEAD (.375-16 x 1.000)
C-17	LOCKWASHER (.375 Dia.)
C-18	GASKET, OIL, INLET COVER
C-19	SHIM, OIL INLET COVER (.005") (.007") (.020")
C-20	PLUG, C'SUNK HEX (.062-27)

RANGE SHAFT ASSEMBLY

D-1	TAPER BEARING CUP
D-2	TAPER BEARING CONE
D-3	BALL BEARING
D-4	CLUTCH GEAR, 3rd & High
D-5	BALL BEARING
D-6	SHAFT, RANGE
D-7	DUAL HYDRAULIC CLUTCH ASSEMBLY (Complete)

D-8	SEALING RING
D-9	BALL BEARING
D-10	CLUTCH GEAR, Low & 2nd Reverse
D-11	BALL BEARING
D-12	GEAR, INTERMEDIATE
D-13	TAPER BEARING CONE
D-14	TAPER BEARING CUP
D-15	COVER, OIL INLET — RANGE
D-16	PLUG, HEX (.125-27)
D-17	PLUG, C'SUNK HEX (.250-18)
D-18	LOCKWASHER (.375 Dia.)
D-19	CAPSCREW, HEX HEAD (.375-16 x 1.500)
D-20	CAPSCREW, HEX HEAD (.375-16 x 1.000)
D-21	LOCKWASHER (.375 Dia.)
D-22	GASKET, OIL INLET COVER
D-23	SHIM, OIL INLET COVER (.005") (.007") (.020")
D-24	PLUG, C'SUNK HEX (.062-27)

OUTPUT SHAFT ASSEMBLY

38

E-1	LOCKNUT (1.000-14)
E-2	WASHER (1.000 Dia.)
E-3	END YOKE, FRONT OUTPUT
E-3	COMPANION FLANGE, FRONT OUTPUT
E-4	SPACER
E-5	CAPSCREW, HEXHEAD (.375-16 x 1.250)
E-6	LOCKWASHER (.375 Dia.)
E-7	COVER, FRONT OUTPUT
E-8	GASKET, FRONT OUTPUT COVER
E-9	OIL SEAL, FRONT OUTPUT
E-10	TAPER BEARING CUP
E-11	TAPER BEARING CONE
E-12	GEAR, OUTPUT — 3rd & High
E-13	SHAFT, OUTPUT
E-14	GEAR, OUTPUT — Low & 2nd
E-15	SPACER
E-16	TAPER BEARING CONE
E-17	TAPER BEARING CUP
E-18	OIL SEAL, REAR OUTPUT
E-19	SHIM, REAR OUTPUT COVER (.005") (.007") (.020")
E-20	O-RING, REAR OUTPUT COVER
E-21	COVER, REAR OUTPUT
E-22	LOCKWASHER (.375 Dia.)

- E-23 CAPSCREW, HEX HEAD
(.375-16 x 1.250)
- E-24 SPACER
- E-25 COMPANION FLANGE,
REAR OUTPUT
- E-25 END YOKE, REAR OUTPUT
- E-26 WASHER (1.000 Dia.)
- E-27 LOCKNUT (1.000-14)
- E-28 O RING

HYDRAULIC CLUTCH ASSEMBLY

- F-1 SNAP RING, PRESSURE PLATE
- F-2 PLATE, CLUTCH PRESSURE
- F-3 SPRING, CLUTCH RETURN
- F-4 CLUTCH DISC
- F-5 PLATE, CLUTCH DRIVE
- F-6 PISTON, CLUTCH
- F-7 SEALING RING, CLUTCH PISTON
- F-8 O-RING, CLUTCH PISTON
- F-9 SEALING RING, CLUTCH PISTON
- F-10 O-RING, CLUTCH PISTON
- F-11 SNAP-RING, CLUTCH VALVE
- F-12 SCREEN, CLUTCH VALVE
- F-13 BALL, CLUTCH VALVE
- F-14 O-RING, CLUTCH VALVE
- F-15 RETAINER, CLUTCH VALVE
- F-16 CLUTCH HOUSING ASSEMBLY
(DUAL)
CLUTCH HOUSING ASSEMBLY
(SINGLE)

PRESSURE REGULATOR VALVE ASSEMBLY (Includes G-1 thru G-16)

- G-1 GASKET, REGULATOR VALVE
BODY
- G-2 BODY, REGULATOR VALVE
- G-3 PLUG (.125-27)
- G-4 PLUG (.127-27)
- G-5 CAPSCREW, HEX HEAD
(.375-16 x 2.500)
- G-6 LOCKWASHER (.375 Dia.)
- G-7 ROLL PIN, REGULATOR PLUG
- G-8 ROLL PIN, REGULATOR PLUG
- G-9 PISTON, PRESSURE REGULATOR
- G-10 SPRING, PRESSURE REGULATOR
- G-11 PLUG, PRESSURE REGULATOR
- G-12 O-RING, PRESSURE REGULATOR
PLUG
- G-13 PISTON, PRESSURE REGULATOR
- G-14 SPRING, PRESSURE REGULATOR
- G-15 PLUG, PRESSURE REGULATOR

G-16 O-RING, PRESSURE REGULATOR
PLUG

CONTROL VALVE ASSEMBLY

(Includes H-1 thru H-11)

H-1 BODY, CONTROL VALVE
H-2 CAPSCREW, HEX HEAD
(.375-16 x 2.250)
H-3 LOCKWASHER (.375 Dia.)
H-4 PISTON, SPEED SELECTOR
H-5 OIL SEAL
H-6 OIL SEAL
H-7 PISTON, F-N-R- SELECTOR
H-8 BALL, POPPET
H-9 PIN, POPPET STOP
H-10 SPRING, POPPET
H-11 GASKET, CONTROL VALVE BODY

MAIN PARTS GROUP

M-1 MAIN COVER
M-2 GASKET, MAIN HOUSING
M-3 LOCKWASHER (.500 Dia.)
M-4 CAPSCREW, HEX HEAD
(.500-13 x 1.500)
M-5 DRAIN PLUG, MAGNETIC
(.750-14)
M-6 CAPSCREW, SELF-LOCKING
(.375-16 x .750)
M-7 PLATE, VALVE COVER
M-8 SUCTION SCREEN
M-9 MAIN HOUSING
M-10 DOWEL PIN (.500 x 1.750)
M-11 BREATHER
M-12 STREET ELBOW, BREATHER
(90° x .750-14)
M-13 STREET ELBOW, OIL FILL
(90° x .750-14)
M-14 BREATHER STEM
M-15 PLUG, OIL FILL (.750-14)

SPECIAL ITEMS

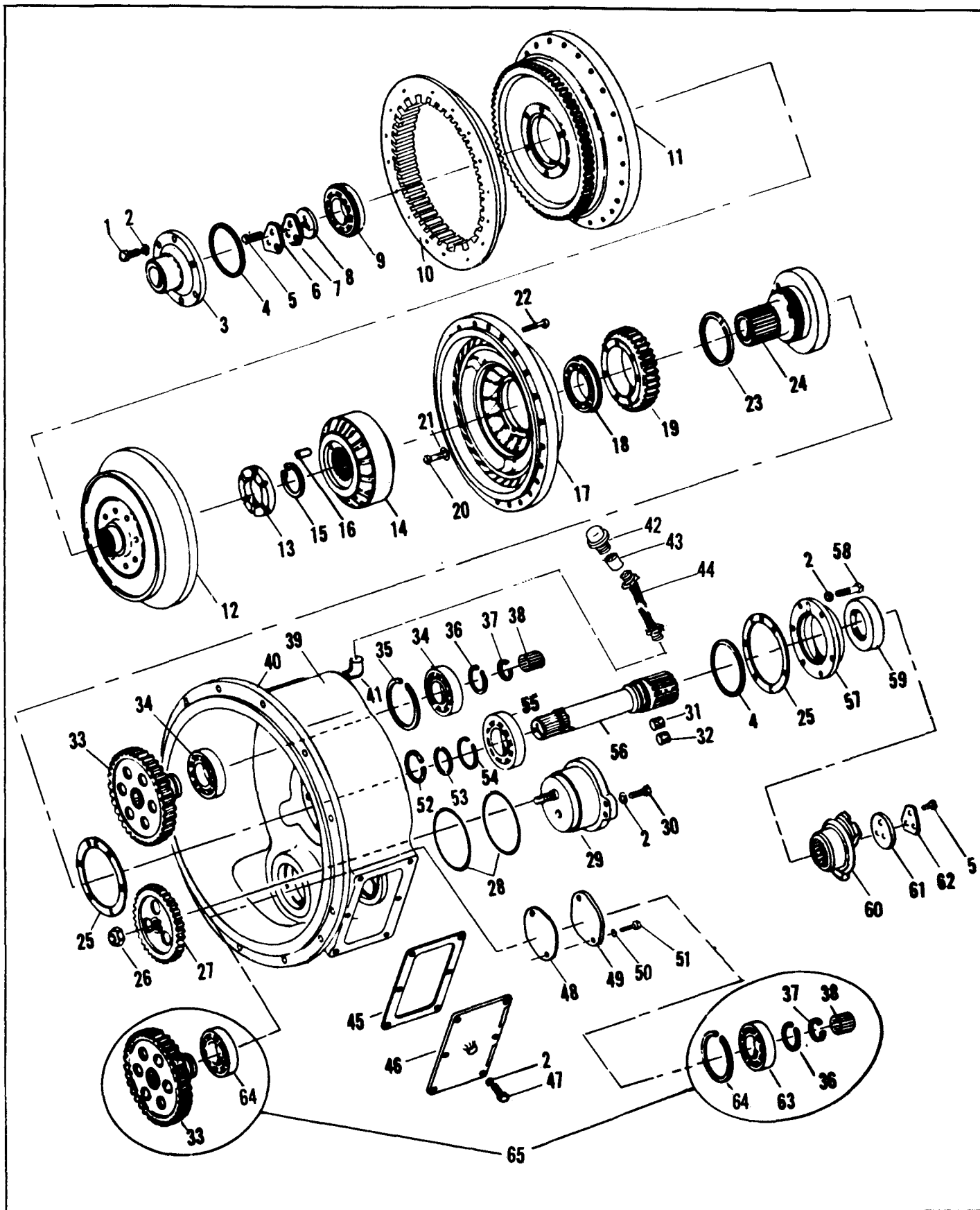
S-1 P.T.O. LUBE LINE
S-2 LUBE PRESSURE REGULATOR
S-3 P.T.O. FRONT COVER
S-4 P.T.O. SLIMS
S-5 HOLLOW SHAFT SNAP RING

ROCKFORD TORQUE CONVERTER — 12" & 14"

41



**Franklin Equipment Company
Transmission and Axle Division**



POWER TRANSFER
B/M D-316030
12" ROCKFORD TORQUE CONVERTER

REF. NUMBER	DESCRIPTION	NUMBER REQ'D
	TORQUE CONVERTER ASSEMBLY	1
1	BOLT, 3/8 x 1" NC	6
2	LOCKWASHER, 3/8"	18
3	HUB, Drive, Input	1
4	SHIM, Annular	AR
4A	SHIM, Annular	AR
4B	SHIM, Annular	AR
4C	SHIM, Annular	AR
5	BOLT, 5/16 x 3/4" NC	6
6	PLATE, Lock	1
7	SHIM	1
8	WASHER, Flange Retainer	1
9	*BEARING, Ball	1
10	RING, Drive	1
11	HOUSING, Drive	1
12	TURBINE	1
13	SPACER, Stator	1
14	STATOR ASSEMBLY	1
15	RING, Snap, Internal	1
16	PIN, Spring	1
17	IMPELLER ASSEMBLY	1
18	* BEARING, Ball	1
19	GEAR	1
20	BOLT, 7/16 x 1-14" NF	7
21	FLATWASHER, 7/16	7
22	BOLT, 5/16 x 1-18" NC, Type AA, Lock	24
23	RING, Seal Piston Hook	1
24	HUB, Ground Sleeve	1
25	GASKET, Bearing Retainer	2
26	NUT, Elastic Stop	1
27	GEAR, Pump Drive	1
28	O RING	2
29	PUMP, "Piggy Back"	1
30	BOLT, 3/8 x 1-3/4" NC	2
31	PLUG, Pipe, 1-5/16"	1
32	PLUG, Pipe, 1-5/8"	1
33	GEAR, Accessory Drive	1
34	*BEARING, Ball	2
35	RING, Snap, Internal	1
36	RING, Snap	1
37	RING, Snap, Internal	1
38	SLEEVE, Splined	1
39	HOUSING, Converter	1
40	GASKET, Converter to Engine	1
41	ELBOW, Street, 3/4" NPT x 90°	1
42	BREATHER-FILTER	1
43	COUPLING, 3/4"	1
44	HOSE ASSEMBLY	1
45	GASKET, Inspection Cover	1
46	INSPECTION COVER	1
47	BOLT, 3/8 x 1-1/4" NC	6
48	GASKET	1
49	COVER	1
50	LOCKWASHER, 1/2"	2
51	BOLT, 1/2 x 3/4" NC	2
52	RING, Snap	1
53	RING, Seal, Piston Hook	1
54	RING, Snap	1
55	* BEARING, Ball	1
56	SHAFT, Output	1
57	RETAINER, Bearing	1
58	BOLT, 3/8 x 1-7/8" NC	6
59	SEAL, Oil	1
60	YOKE ASSEMBLY, Output	1
60A	SLINGER	1
61	WASHER, Retainer	1
62	PLATE, Lock	1
63	BEARING, Ball	2
64	RING, Snap, Internal	1
65	P.T.O. KIT (Includes Items 33, 36, 37, 38, 63, and 64)	1
*	BEARING KIT (Includes All * Marked Items)	
	SEAL & GASKET KIT	

DISASSEMBLY OF ROCKFORD TORQUE CONVERTER

Remove torque converter from tractor. Clean thoroughly and remove all external hoses and fittings. Stand converter on work bench and bend locking plate (Item 62) away from bolt heads (Item 5). Remove bolts, locking plate and flange retainer washer (Item 61) and lift off output flange (Item 60) (Figure 1). Lay converter down with input hub facing up (Figure 2). Brace converter with two 4 x 4 wood blocks.

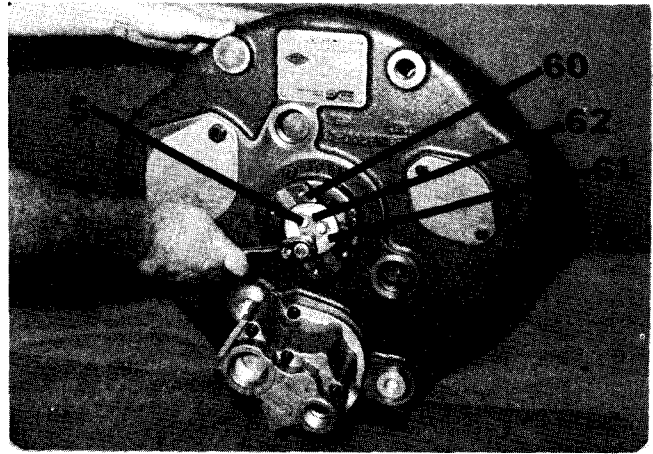


Figure 1

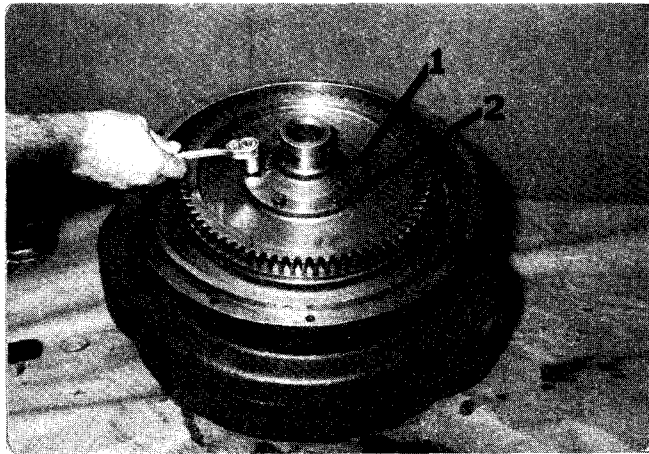


Figure 2

REMOVAL OF CONVERTER ASSEMBLY

Remove six bolts (Item 1) and lockwashers (Item 2) and lift off input drive hub (Item 3) (Figure 2).

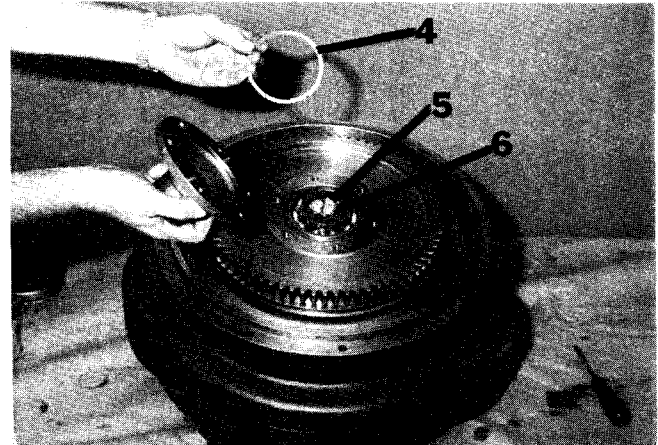


Figure 3

CAUTION

Lift out annular shims (Item 4) on top of outer race of bearing assembly (Item 8), tag, and place where they won't be damaged or lost (Figure 3).

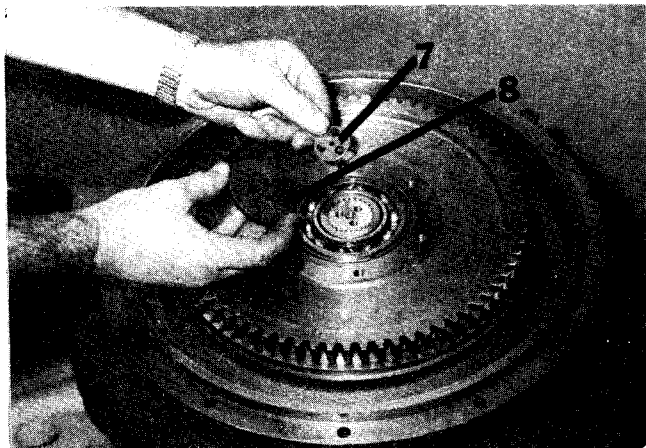


Figure 4

Bend locking plate (Item 6) away from bolt heads (Item 5) and remove bolts (Figure 3) along with locking plate, shims (Item 7) and retainer washer (Item 8) (Figure 4).

Install two lifting bolts in bolt holes and slowly lift converter assembly out of the housing (Figure 5). Remove lifting bolts and place converter assembly on bench with bolt holes down on the bench to one

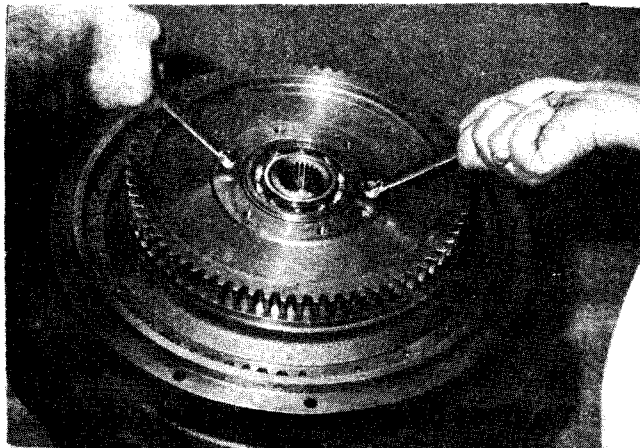


Figure 5

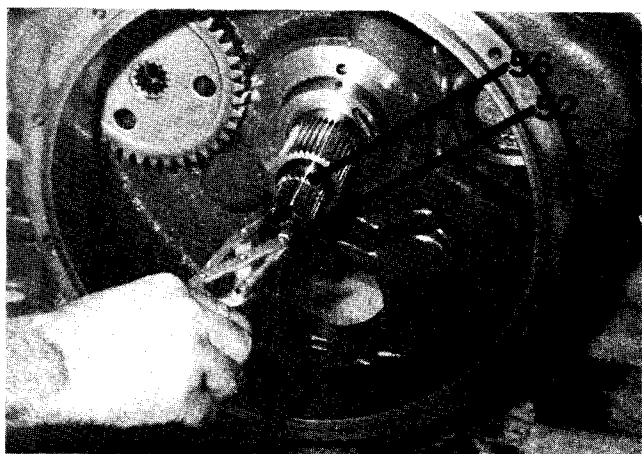


Figure 6

REMOVAL OF OUTPUT SHAFT

Return to the converter housing and remove snap ring (Item 52) from output shaft (Item 56) (Figure 6).

Stand converter housing on work bench and remove six bolts (Item 58) and lockwashers and lift off bearing retainer (Item 57) and bearing retainer gasket (Item 25) (Figure 7).

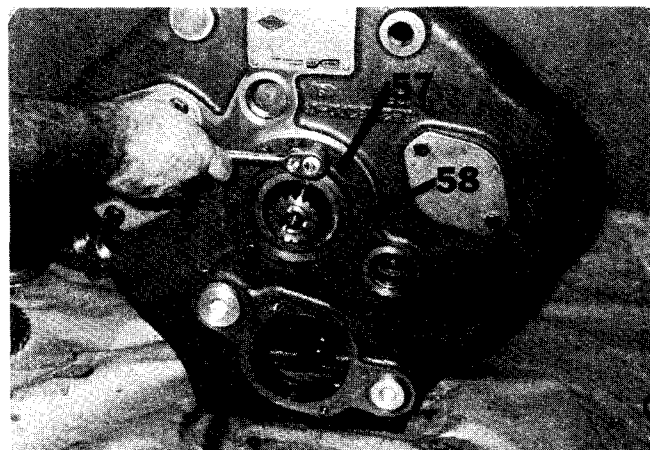


Figure 7

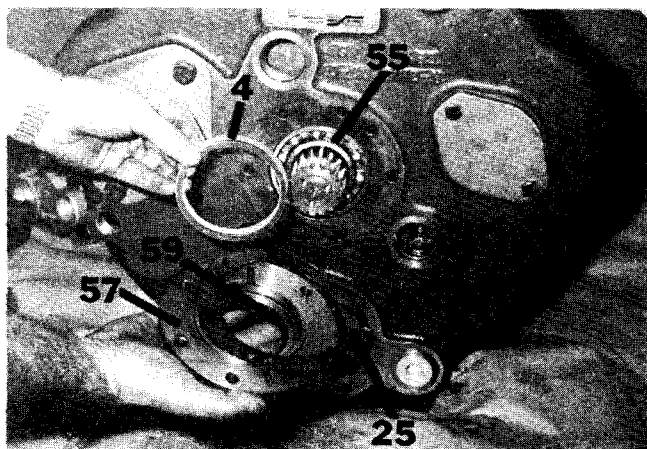


Figure 8

CAUTION

Annular shims (Item 4) are underneath bearing retainer (Item 57) and outer race of bearing assembly (Item 55). Remove annular shims and place where they won't be damaged or lost. Press oil seal (Item 59) out of bearing retainer (Item 57) (Figure 8).

Use a rubber head mallet to drive out output shaft assembly (Item 56) (Figure 9) and remove snap ring (Item 52) and seal ring (Item 53). Press off bearing assembly (Item 55) (Figure 10).

CAUTION

Press on inner race of bearing assembly.

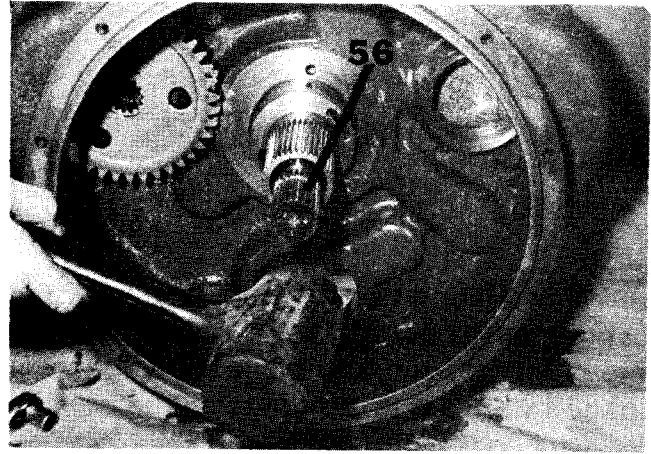


Figure 9

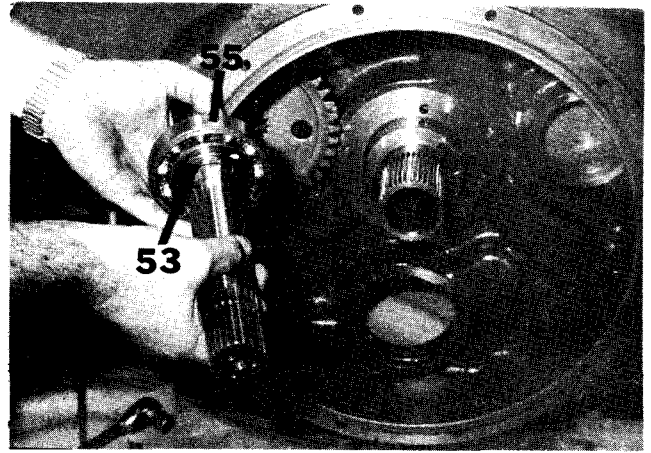


Figure 10

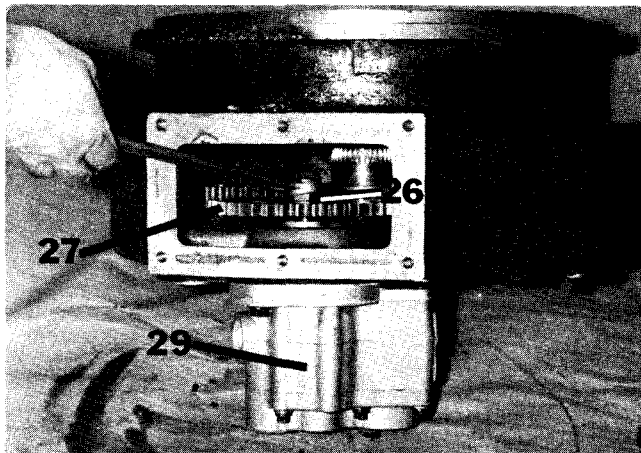


Figure 11

Remove two bolts (Item 30) and lockwashers (Item 2) (Figure 12). Install two jackscrews at least two and one-half inches long of same size and thread into two tapped holes in flange of hydraulic pump (Item 29).

REMOVAL OF CHARGING PUMP

Remove flexlock nut (Item 26) and pump drive gear (Item 27) (Figure 11).

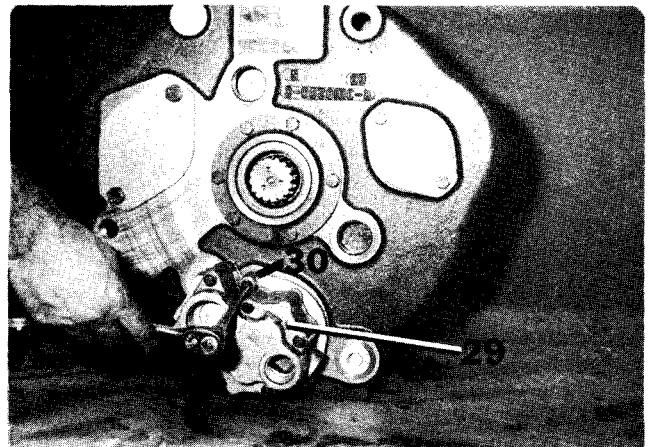


Figure 12

CAUTION

Be sure pump drive gear has been removed.

By turning the bolts in the tapped holes in the flange of hydraulic pump (Item 29), back out hydraulic pump from converter housing (Figure 13).

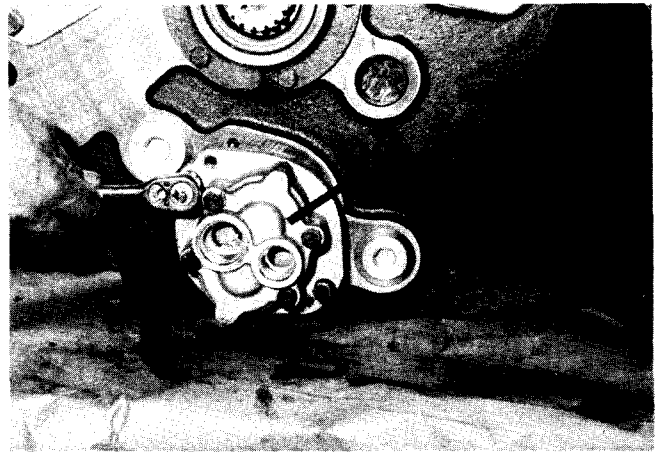


Figure 13

CAUTION

Exert equal force on both bolts to prevent cocking of hydraulic pump in converter housing bore. DO NOT PRY BETWEEN HYDRAULIC PUMP FLANGE AND CONVERTER HOUSING AS SEALING SURFACE OF HYDRAULIC PUMP WILL BE DAMAGED. DO NOT POUND ON HYDRAULIC PUMP SHAFT OR HOUSING.

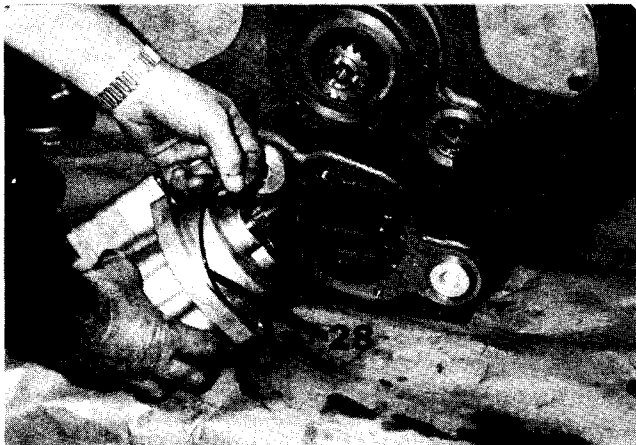


Figure 14

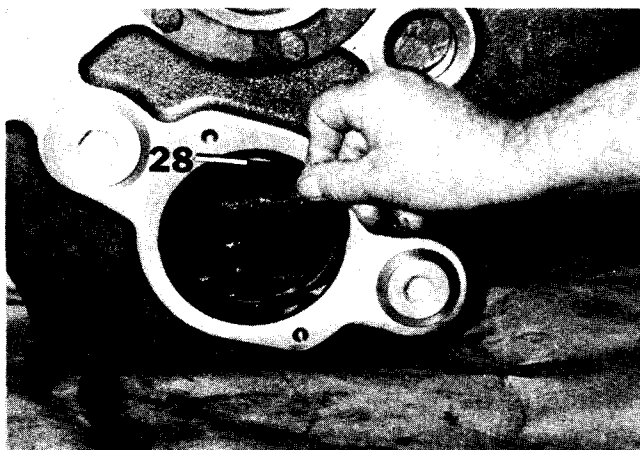


Figure 15

NOTE

On later model converters with externally ported pumps, it is necessary only to remove the two capscrews holding pump in place.

Remove "O" ring seal (Item 28) from hydraulic pump (Item 29) and "O" ring seal (Item 28) from seal ring groove inside converter housing. On externally ported pumps the converter housing does not use an "O" ring (Figures 14 & 15).

If hydraulic or heating problems have occurred, disassemble the hydraulic pump and inspect. The pump can be disassembled by removing the four bolts holding pump together. If contamination, wear, or air erosion is evident, replace the pump.

REMOVAL OF ACCESSORY DRIVE GEAR

Remove snap ring (Item 36) and with a soft mallet, tap out accessory drive gear assembly (Figure 16). If bearing bore in converter housing or snap ring groove is damaged, remove snap ring (Item 35). If not, do not remove snap ring (Figure 17).

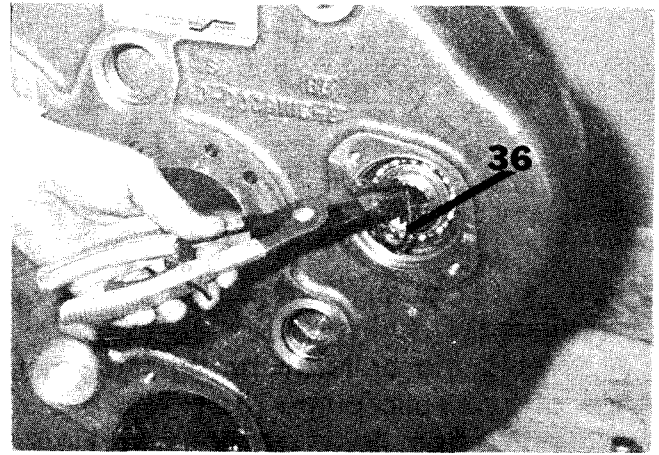


Figure 16

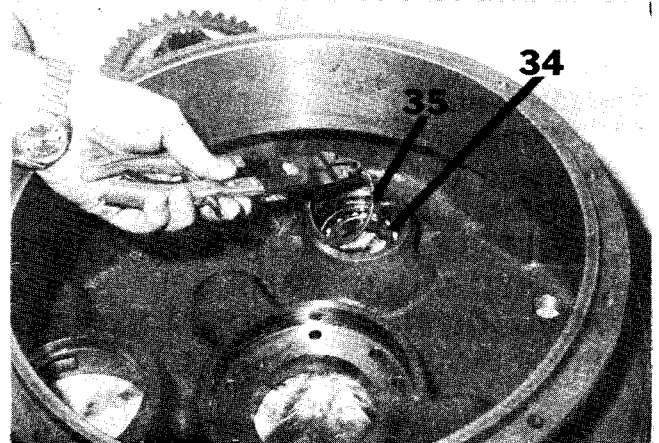


Figure 17

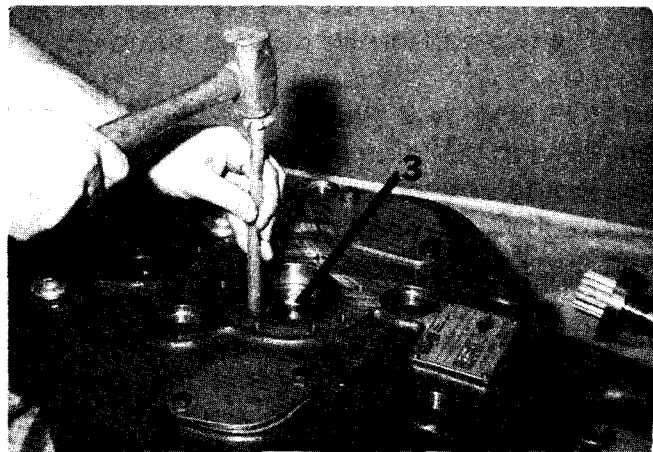


Figure 18

REMOVAL OF GROUND SLEEVE HUB

If converter housing or ground sleeve hub is damaged or hub is to be removed, place the assembly under a press with hub facing down. Brace converter housing in the area of the hub bore (Figure 18). Insert a plug against ground sleeve hub and press it out of converter housing. Remove retainer bearing gasket. If a press is not available, drive hub out using a brass punch.

CAUTION

Do not brace the converter housing on outer diameter of flange. The force exerted pressing out ground sleeve could damage housing.

DISASSEMBLY OF CONVERTER ASSEMBLY

Remove 24 lock bolts (Item 22) and lift off impeller assembly (Item 17) (Figure 19). If impeller assembly (Item 7) or accessory drive gear is damaged, remove seven lock bolts (Item 20) and washers (Item 21) and separate drive gear (Item 19) from the impeller assembly. Remove bearing assembly (Item 18) (Figure 20). If neither part is damaged nor needs replacement, do not disassemble.

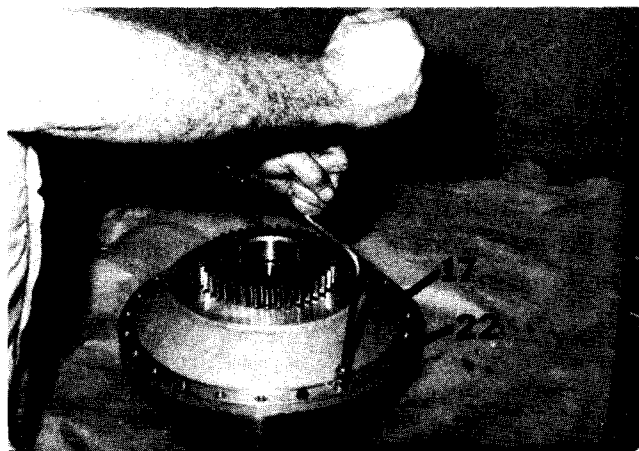


Figure 19

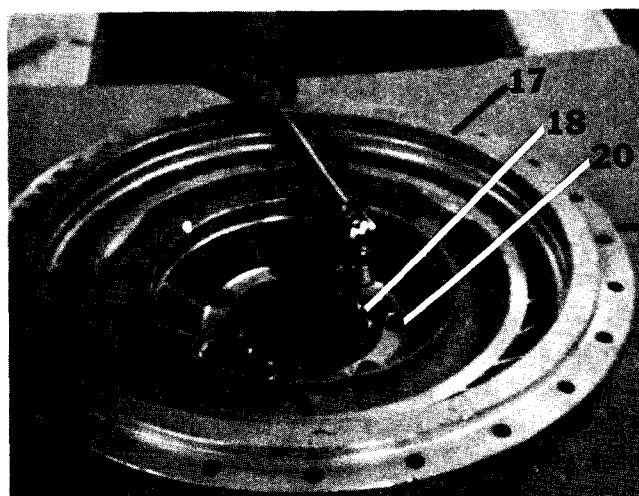


Figure 20

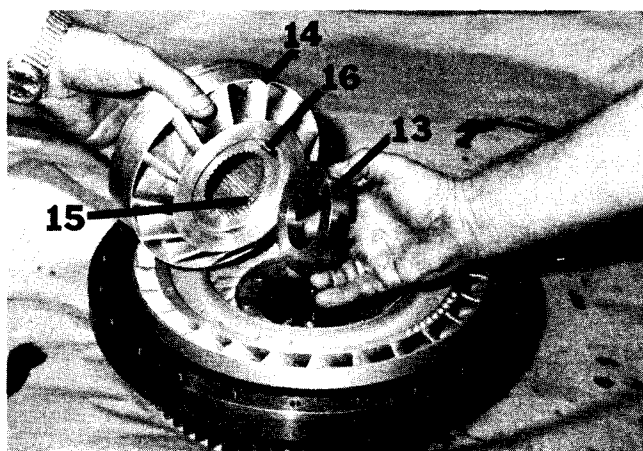


Figure 21

Lift out stator assembly (Item 14). DO NOT REMOVE snap ring (Item 15) unless snap ring or its groove is damaged. Also DO NOT REMOVE spring pin (Item 16), unless damaged. Lift out converter spacer (Item 13) (Figure 21).

Lift out turbine (Item 12) and inspect bearing (Item 9) (Figure 21A).

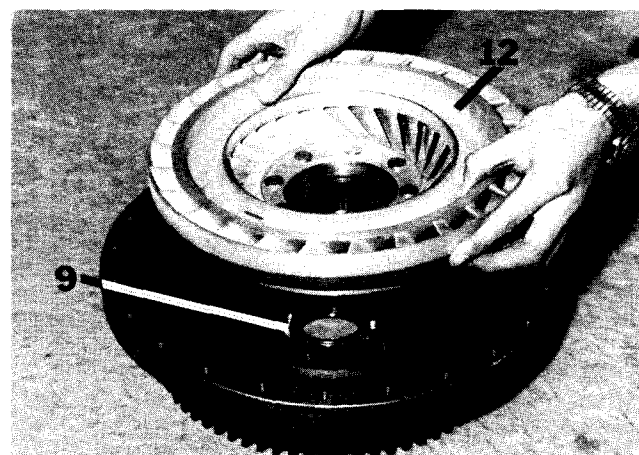


Figure 21A

CAUTION

Be sure ground sleeve hub is completely sealed in bore against rear of converter housing and bearing retainer gasket.

If hub cannot be thoroughly chilled, it must be pressed into bore in converter housing. Place converter housing in a press with converter nameplate down.

CAUTION

Brace under converter housing across output shaft bore to prevent damage to the housing.

Follow previous ground sleeve hub installation instructions and cautions.

Place a solid plug over end of ground sleeve hub and press against bottom of bore. If a press is not available, drive hub into housing with a rubber mallet. (Figure 22).

Install seal ring (Item 23) into groove in hub. Apply crystalline type grease around seal and in groove to hold seal in position.

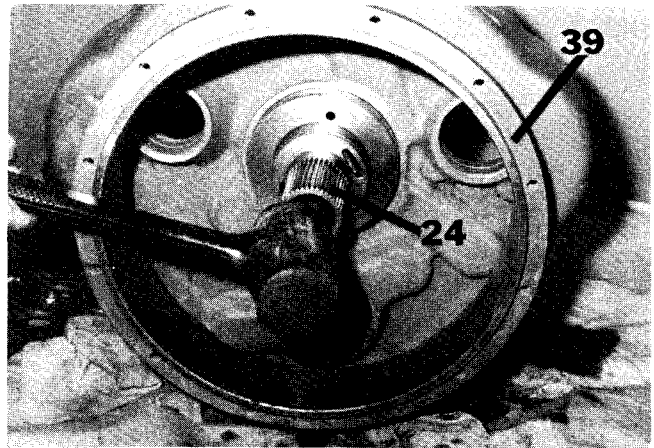


Figure 22

INSTALLATION OF CHARGING PUMP

If dry ice or freezer is available, freeze hydraulic pump (Item 29). Place "O" ring seal (Item 28) into seal ring groove in converter housing (Item 39). Coat exposed surface of "O" ring seal (Item 28) and oil pump bore with a crystalline type grease (Figure 23). (NOTE: This "O" ring is omitted in externally ported pumps). Place two headless guide bolts into pump bolt holes in converter housing and use as guides during pump installation. Remove frozen pump from freezer and install "O" ring (Item 28) flush against flange. Place pump over guide bolts and push into converter housing bore.

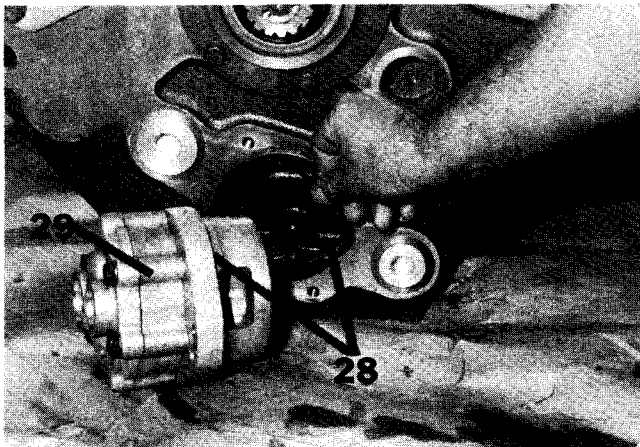


Figure 23

CAUTION

Input splined shaft of hydraulic pump must be positioned towards ground sleeve hub. If not positioned in this manner, pump drive gear will interfere and not mesh with accessory drive gear.

If pump cannot be frozen, install "O" ring flush with flange. Apply thin coat of crystalline type grease to pump body. Install two three-inch long guide bolts in the untapped holes in the pump flange and guide pump into housing bore. Screw guide bolts into tapped holes in housing and pull pump into place.

Do not tap on rear cover of pump. Pull pump into bore slowly and **EVENLY** until bolts bottom out. Replace with shorter bolts and continue until flange of hydraulic pump is flush with converter housing.

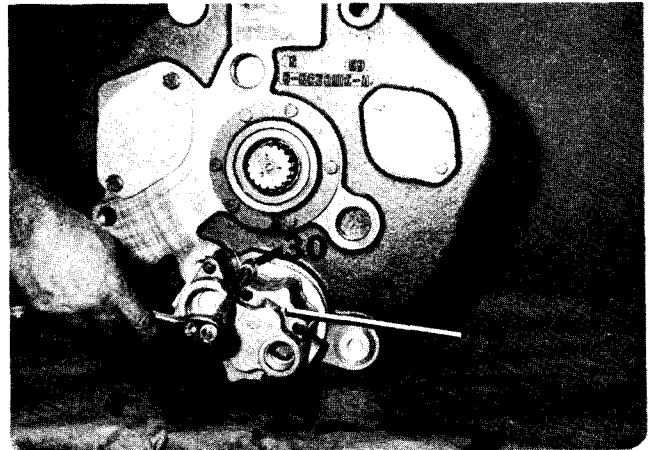


Figure 24

CAUTION

Pull pump in evenly on both sides. Uneven movement of pump will cause cocking and damage to pump and pump bore.

Install two bolts (Item 30) and lockwashers (Item 2) and torque to 30-40 ft. lbs. (Figure 24). Install pump drive gear (Item 27) onto pump drive shaft with long hub of gear next to pump (Figure 25). Install flexlock nut (Item 26) and torque 45-55 ft. lbs. (Figure 26).

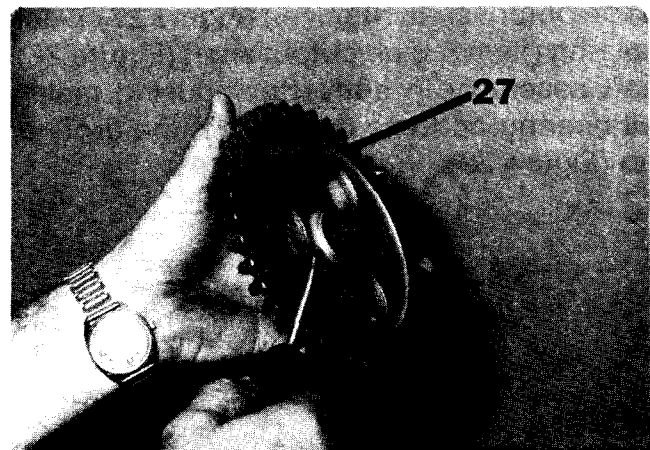


Figure 25

CAUTION

Do not rotate drive gear if pump was frozen for installation until pump has returned to room temperature. Damage to inside of pump will result.

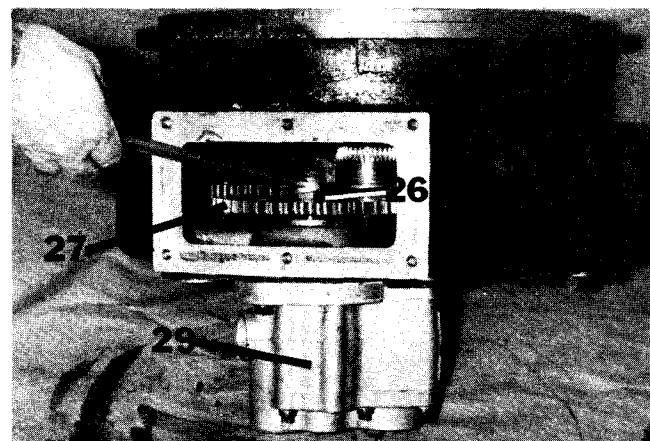


Figure 26

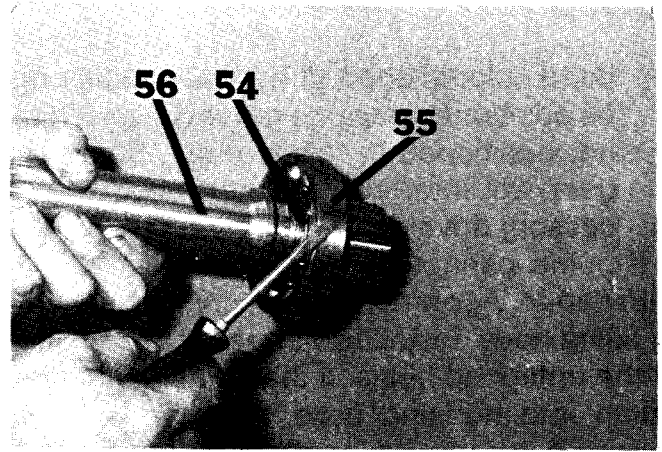


Figure 27

INSTALLATION OF OUTPUT SHAFT

52 Install ball bearing (Item 55) and snap ring (Item 54) on output shaft (Item 56) (Figure 27). Then install seal ring (Item 53) on output shaft (Figure 28). Install shaft assembly in converter housing making sure ball bearing bottoms out against the ground sleeve hub (Figure 29).

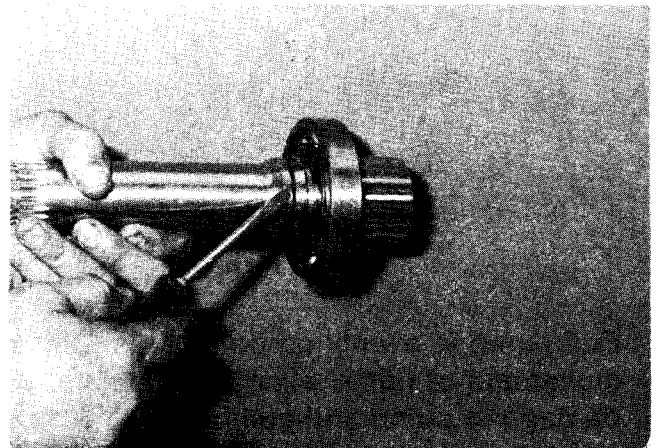


Figure 28

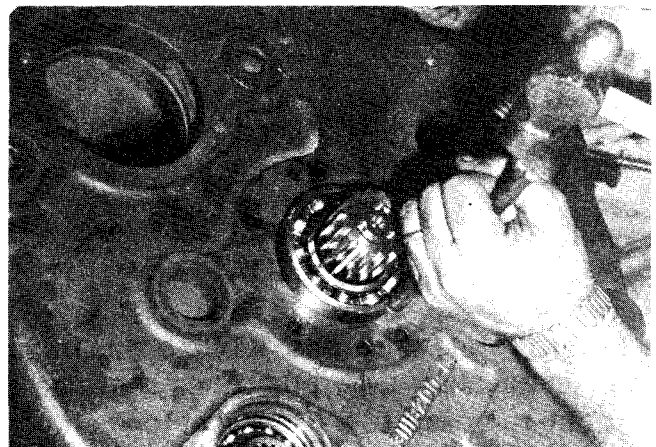


Figure 29

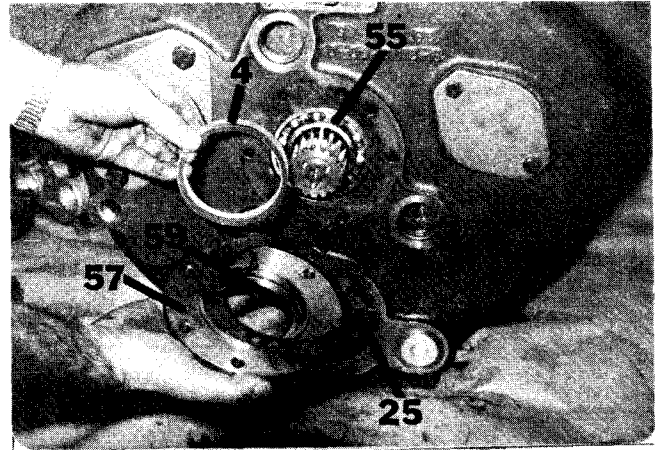


Figure 30

Press oil seal (Item 59) into bearing retainer (Item 57) and place on top of gasket (Item 25) using lubricant to hold gasket in place. Install six bolts (Item 58) and lockwashers (Item 2) and torque all bolts to 26-32 ft. lbs. (Figure 30).

Use annular shims (Item 4) (Figure 30) as required to obtain .002 to .004 end play on output shaft. Use dial indicator to measure end play (Figure 31).

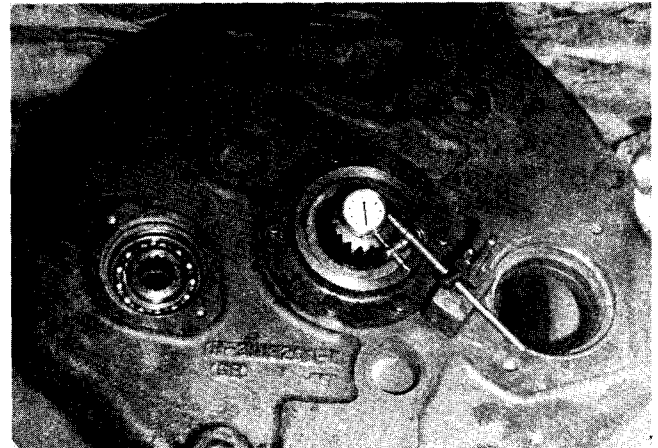


Figure 31

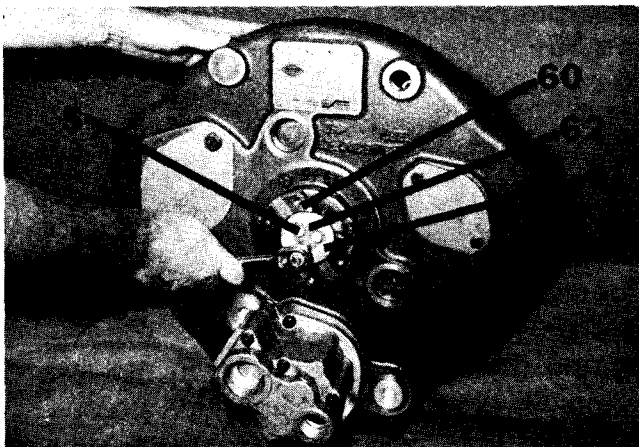


Figure 32

Apply a coat of crystalline type grease on seal area of output flange (Item 60) and install. Place output flange washer (Item 61), WITH CHAMFER UP, then the locking plate (Item 62) and secure with three bolts (Item 5). Torque bolts to 15-18 ft. lbs. and bend locking plate against two flats of each of the three bolt heads (Figure 32).

INSTALLATION OF ACCESSORY DRIVE GEAR

Place converter housing on its side. Install snap ring (Item 35) into PTO bore (Figure 33). Press ball bearing (Item 34) onto accessory drive gear (Item 33) and place flush against snap ring. Maintain pressure on drive gear, install second ball bearing on gear hub (Figure 34) and secure with a snap ring (Item 36) (Figure 35).

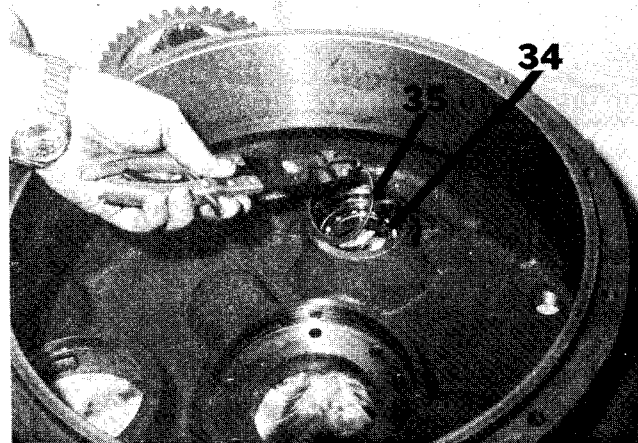


Figure 33

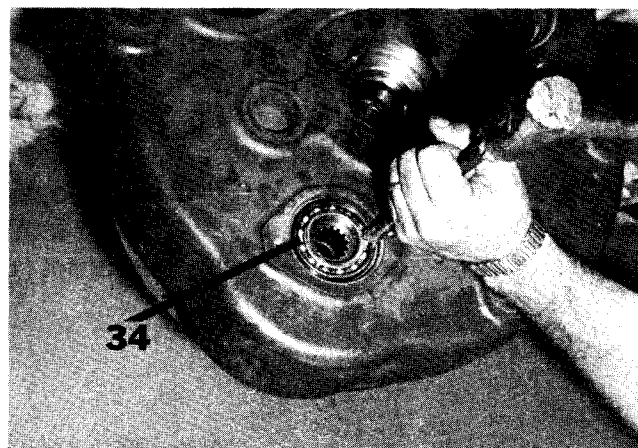


Figure 34

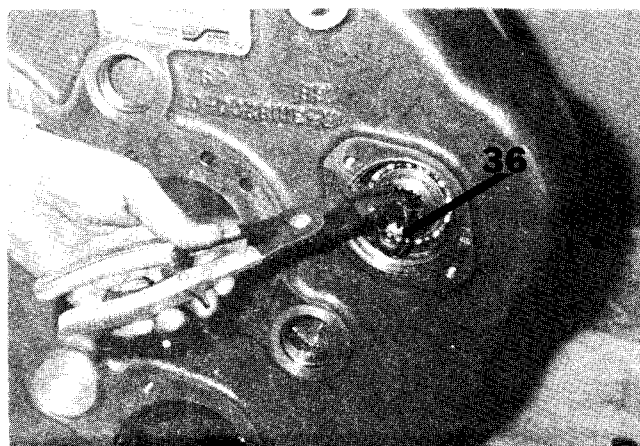


Figure 35

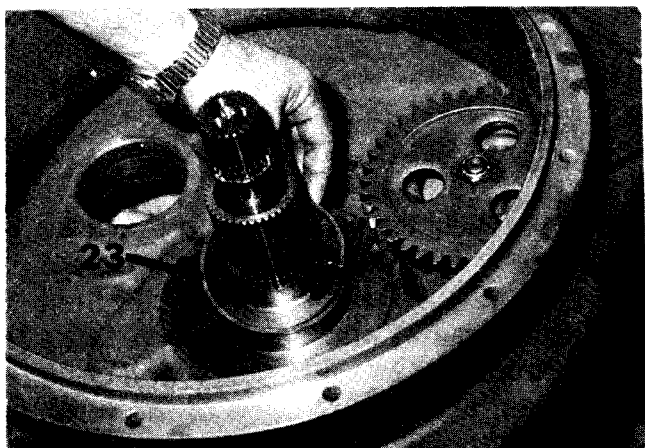


Figure 36

Place the converter on the bench with the output flange facing down.

Install seal ring (Item 23) into groove in ground sleeve hub. Apply a coat of crystalline type grease around seal (Figure 36).

CAUTION

DO NOT USE FIBROUS OR NON-MELTING TYPES OF GREASE ON ANY PARTS IN TORQUE CONVERTER. Always use lubricating motor oil or crystalline type grease of a low melting point.

Install snap ring (Item 52) onto output shaft (Item 56) (Figure 37).

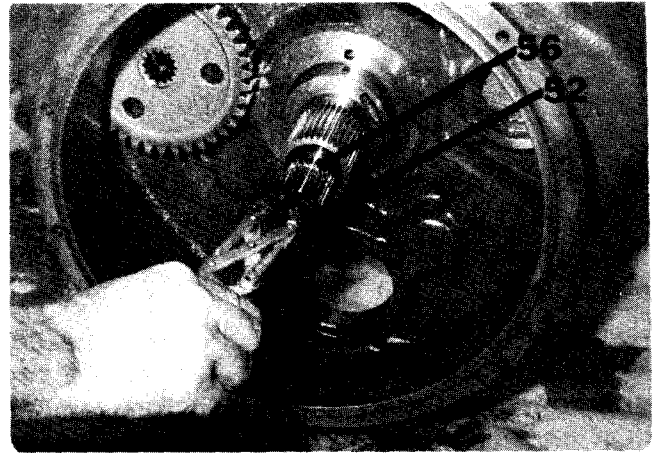


Figure 37

CAUTION

Failure to install snap ring will result in converter element interference.

After this, move converter housing to one side and begin converter assembly.

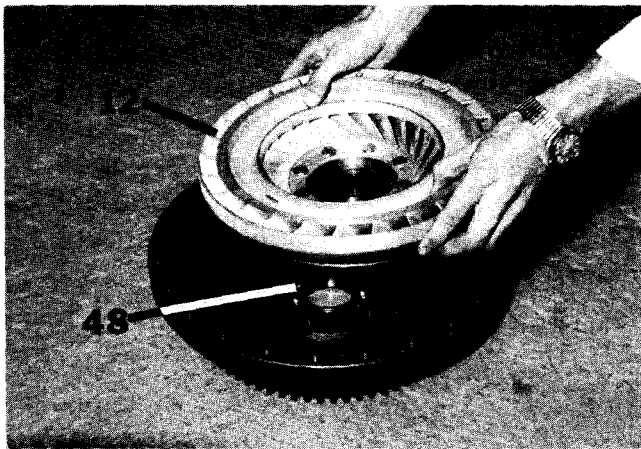


Figure 37A

CONVERTER ASSEMBLY

Install snap ring on bearing assembly (Item 48) and place into converter drive housing. Turn housing over with bearing facing down and press in turbine assembly (Item 12) (Figure 37A).

Inspect stator assembly (Item 14) to make sure snap ring (Item 15) is installed in groove in stator spline and roll pin (Item 16) is installed in hole in stator hub. Also check for excessive wear or damage to stator assembly.

Inspect and install converter spacer (Item 13) onto stator (Item 14) properly aligned with hole in converter spacer over roll pin (Item 15). Crystalline type grease may be used to hold converter spacer in place (Figure 38).

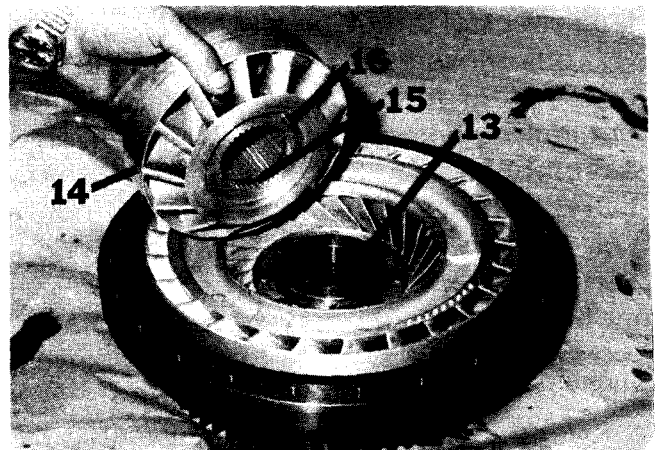


Figure 38

Using CAUTION, place stator assembly (Item 14) into turbine assembly (Item 12) with converter spacer against thrust surface of turbine hub and THICK edge of stator blade down (Figure 39).

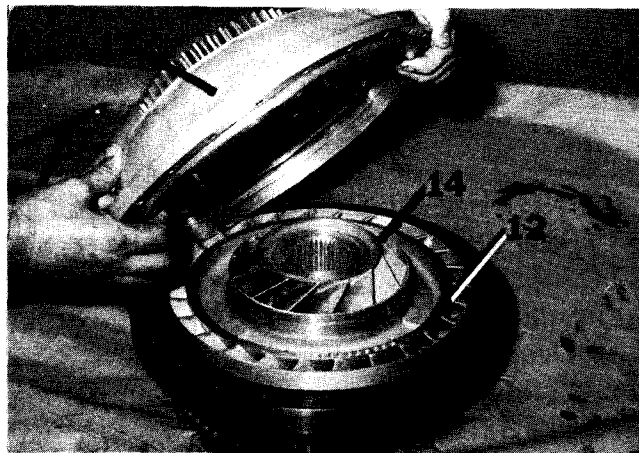


Figure 39

CAUTION

Ink mark placed on THIN edge of stator blade during disassembly should be visible and facing up. If not, stator is assembled incorrectly.

Install impeller assembly (Item 17) over turbine assembly on bench with impeller bolt holes aligned with bolt holes in converter drive housing (Figure 39). Install twenty-four lock bolts (Item 22) and torque to 20-25 ft. lbs. Torque bolts in this sequence: one bolt at 0°, one bolt 180°, one bolt 90°, one bolt 270°. Repeat sequence moving clockwise around bolt circle (Figure 40).

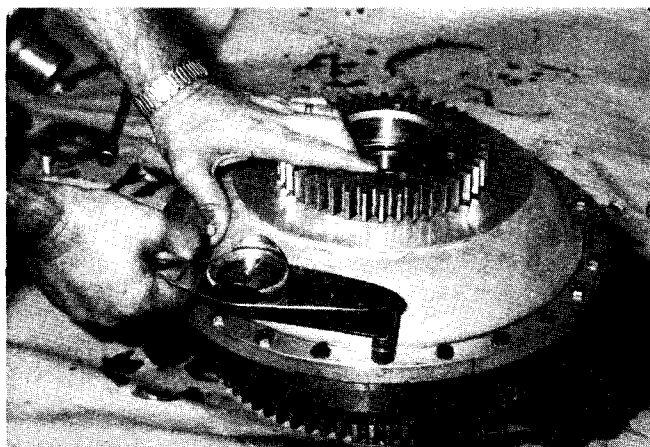


Figure 40

CAUTION

Torque all bolts equally and evenly. Make final check of torque on all bolts by continuous movement clockwise around bolt circle from first bolt torqued. Use only original equipment bolts in the converter assembly. NO SUBSTITUTIONS ALLOWED. Bolts of inferior grade and not of self locking design will cause early converter failure.

Impeller assemblies may have bolt flanges of varying thicknesses. Be sure to use the correct bolt length.

Remove any aluminum shavings created by lock bolts biting into aluminum impeller assembly.

ASSEMBLY OF TORQUE CONVERTER

Before assembling torque converter:

- (1) Wash and clean all parts thoroughly.
- (2) Wash, flush, and inspect all oil passages in converter housing for contamination. Assembly of the torque converter must be done in a clean area.

CAUTION

A torque converter assembled with foreign contaminants (dirt, grit, filings, metal particles etc.) will fail after a few hours of operation.

INSTALLATION OF GROUND SLEEVE HUB

If ground sleeve hub (Item 24) has been removed from converter housing (Item 35), place hub in dry ice or a freezer and allow to freeze.

Before removing ground sleeve hub, prepare two guide bolts for use during installation. Saw the heads off of two bolts approximately four inches long of the same size and thread as the bolts that hold hub in place.

Place converter housing on clean bench with converter nameplate down. Install bearing retainer gasket in ground sleeve hub bore.

CAUTION

Align holes in bearing retainer gasket (Item 25) to correspond with holes in ground sleeve hub bore in converter housing (Item 39). Improperly aligned gasket will result in improper ground sleeve hub installation, improper converter oil flow, and inability to install all six bolts (Item 51). Converter failure will result.

Remove ground sleeve hub (Item 24) from dry ice or freezer. Place two guide bolts into hub and align with holes in retainer bearing gasket already installed in hub bore. Install hub and let it warm to room temperature.

INSTALLATION OF CONVERTER ASSEMBLY

CAUTION

Be sure ground sleeve seal ring (Item 23) is in place and coated with crystalline type grease.

Turn assembly over and install two lifting bolts in converter drive housing. Lift converter element assembly and center over output shaft protruding from converter assembly.

Lower assembly cautiously (Figure 41) until splines of the ground sleeve hub and converter stator are aligned. Continue lowering assembly until output shaft and turbine splines are aligned. Slow right or left hand movement will help align splines. Continue lowering slowly, and accessory drive gear will pilot over ground sleeve hub (Item 24) and compress seal ring. Accessory drive gear (Item 33) will now contact pump drive gear (Item 27) and accessory drive gear. Slight movement of the gears will assist in their alignment and the converter assembly will drop in place.

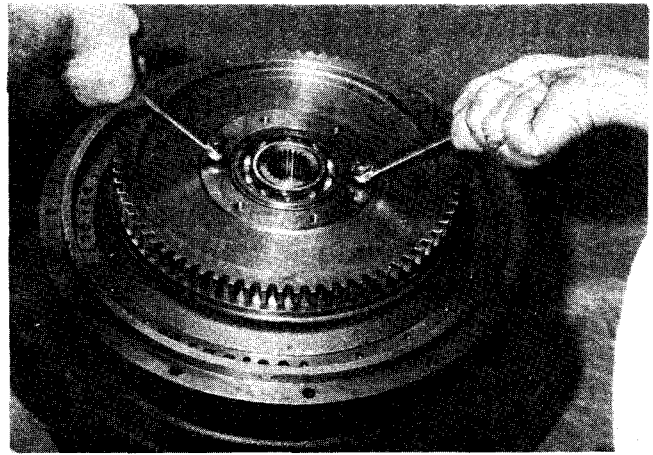


Figure 41

CAUTION

If any resistance is met during lowering of converter assembly, lift out and start again. DO NOT FORCE OR TRY TO POUND ASSEMBLY INTO PLACE.

NOTE

Check to see if output shaft is flush with edge of bearing. If not, install shim (Item 7). DO NOT USE SHIM UNLESS REQUIRED (Figure 42).



Figure 42

Install retainer washer (Item 8), locking plate (Item 6) and three (3) bolts (Item 5) onto output shaft and torque bolts to 15-20 ft. lbs. (Figure 43). Bend locking plate against two flat surfaces of each bolt head.



Figure 43

Using pry bar, lift converter assembly upward to make sure bearing snap ring on bearing is bottomed out in groove of drive housing. Place input drive hub (Item 3) onto assembly. DO NOT BOLT DOWN. Using a feeler gauge, measure gap between converter drive housing and input drive hub in four equally spaced places around diameter. Insert annular shims as required on outer race of bearing assembly, and between input drive hub to obtain .005 to .015 gap between input drive hub and converter drive housing (Figure 44). Install six (6) bolts (Item 1) and torque to 30-40 ft. lbs.

The torque converter drive housing (Item 10) and output flange (Item 60) should turn free and independent of each other.

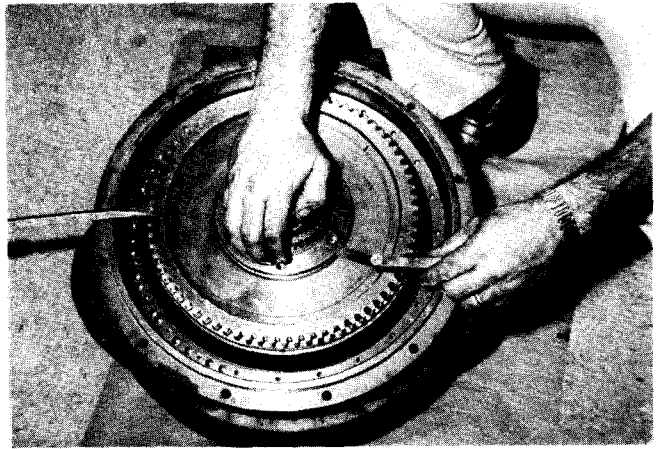


Figure 44

TORQUE IN (LBS.—FT.) **BOLTS, CAPSCREWS, STUDS AND NUTS**

Grade 5 Identification, 3 Radial
Dashes 120° Apart on Head of Bolt

Grade 8 Identification, 6 Radial
Dashes 60° Apart on Head of Bolt

Grade 5			Grade 8		
COARSE THREADS	Dry	Lubricated or Plated	Dry	Lubricated or Plated	
3/8 — 16	31 — 34	23 — 25	44 — 48	33 — 36	
7/16 — 14	49 — 54	37 — 41	70 — 77	52 — 57	
1/2 — 13	75 — 83	57 — 63	106 — 117	80 — 88	
9/16 — 12	109 — 120	82 — 90	153 — 168	115 — 127	
5/8 — 11	150 — 165	113 — 124	212 — 233	159 — 175	
3/4 — 10	266 — 293	200 — 220	376 — 414	282 — 310	
7/8 — 9	394 — 433	296 — 326	606 — 667	455 — 501	
1 — 8	591 — 649	443 — 489	909 — 1000	682 — 750	
1 1/8 — 7	794 — 873	596 — 656	1288 — 1417	966 — 1063	
1 1/4 — 7	1120 — 1232	840 — 924	1817 — 1999	1360 — 1496	
FINE THREADS	Dry	Lubricated or Plated	Dry	Lubricated or Plated	
3/8 — 24	35 — 39	26 — 29	49 — 54	37 — 41	
7/16 — 20	55 — 61	41 — 45	78 — 86	58 — 64	
1/2 — 20	85 — 94	64 — 70	120 — 132	90 — 99	
9/16 — 18	121 — 133	91 — 100	171 — 188	128 — 141	
5/8 — 18	170 — 187	128 — 141	240 — 264	180 — 198	
3/4 — 16	297 — 327	223 — 245	420 — 462	315 — 347	
7/8 — 14	434 — 477	326 — 359	68 — 735	501 — 550	
1 — 12	646 — 711	485 —	995 — 1096	746 — 821	
1 1/8 — 12	891 — 980	668 — 735	1445 — 1590	1083 — 1191	
1 1/4 — 12	1240 — 1364	931 — 1024	2012 — 2213	1509 — 1660	

ENGLISH TO METRIC CONVERSIONS

Multiply	by	to get equivalent number of:
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LENGTH

Inch	25.4	millimetres (mm)
Foot	0.304 8	metres (m)
Yard	0.914 4	metres
Mile	1.609	kilometres (km)

AREA

Inch ²	645.2	millimetres ² (mm ²)
	6.45	centimetres ² (cm ²)
Foot ²	0.092 9	metres ² (m ²)
Yard ²	0.836 1	metres ²

VOLUME

Inch ³	16 387.	mm ³
	16.387	cm ³
	0.016 4	litres (l)
Quart	0.946 4	litres
Gallon	3.785 4	litres
Yard ³	0.764 6	metres ³ (m ³)

MASS

Pound	0.453 6	kilograms (kg)
Ton	907.18	kilograms
Ton	0.907	tonne (t)

FORCE

Kilogram	9.807	newtons (N)
Ounce	0.278 0	newtons
Pound	4.448	newtons

ACCELERATION

Foot/sec ²	0.304 8	metre/sec ² (m/s ²)
Inch/sec ²	0.025 4	metre/sec ²

TORQUE

Pound-inch	0.112 98	newton-metres (N·m)
Pound-foot	1.355 8	newton-metres

ENGLISH TO METRIC CONVERSIONS

POWER

Horsepower	0.746	kilowatts (kW)
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PRESSURE OR STRESS

Inches of mercury	3.377	kilopascals (k Pa)
Inches of water	0.249 1	kilopascals
Pounds/sq. in.	6.895	kilopascals

ENERGY OR WORK

BTU	1 055.	joules (J)
Foot-pound	1.355 8	joules
Kilowatt-hour	3.6×10^6 or 3 600 000	joules (J—one W•s)

LIGHT

Footcandle	1.076 4	lumens/metre ² (lm/m ²)
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FUEL PERFORMANCE

Miles/gal	0.425 1	kilometres/litre (km/l)
Gal/mile	2.352 7	litres/kilometre (l/km)

VELOCITY

Miles/hour	1.609 3	kilometres/hr (km/h)
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TEMPERATURE

$$^{\circ}\text{F} = 9(^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = 5(^{\circ}\text{F} - 32)$$
