

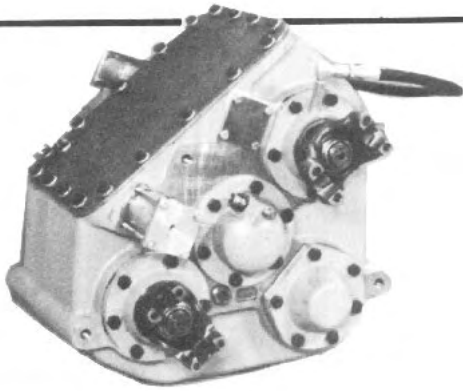
# TC-35 TRANSFER CASE SERVICE MANUAL



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A business unit of **tti**



# TC-35

## TRANSFER CASE

### Service Manual

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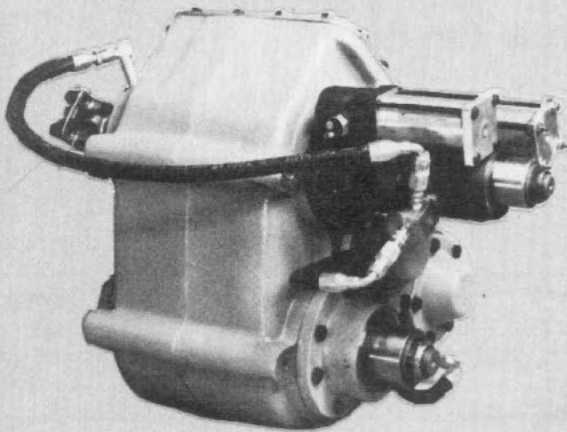
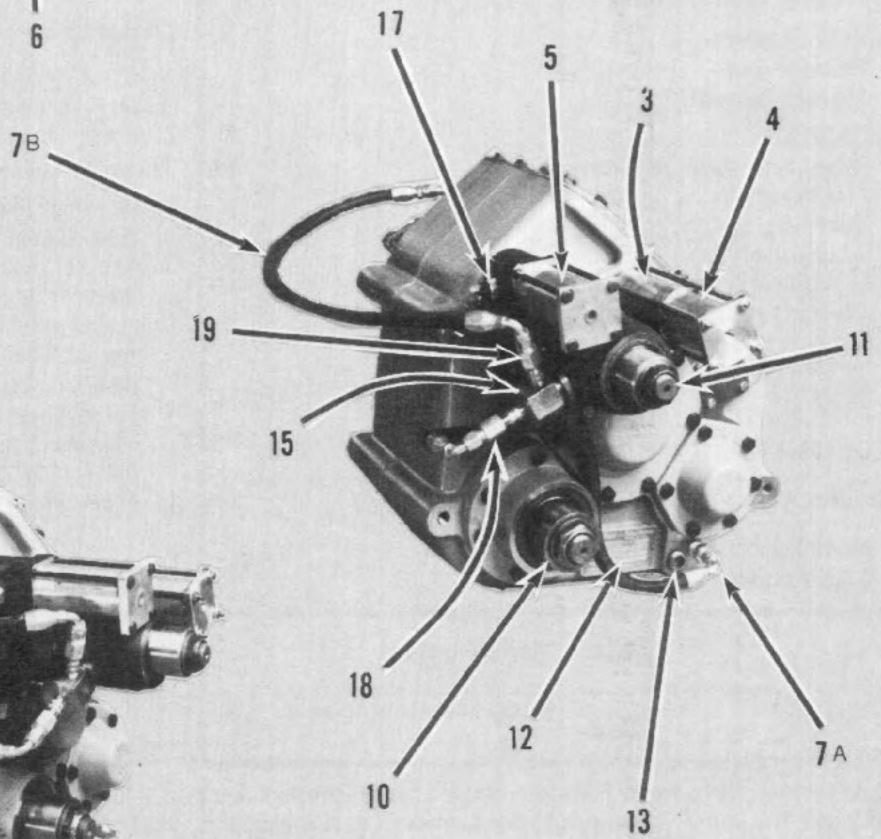
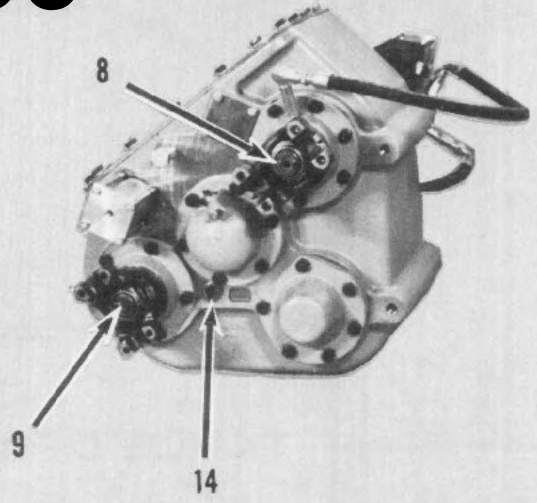
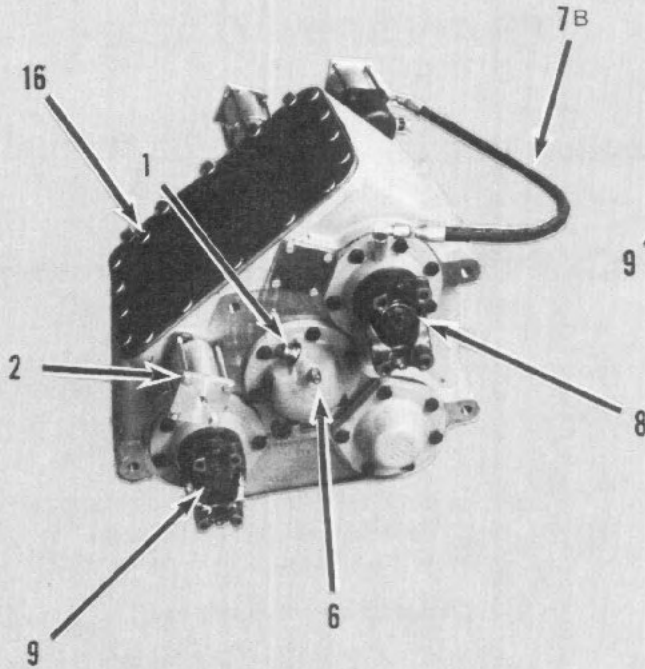
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Before ordering parts for a Fabco transfer case, please refer to the Fabco nameplate located on the transfer case housing. Specify model number, serial number, part number, or other information that is on the nameplate when ordering parts.

Part numbers contained in this manual were in effect at the time the manual was approved for printing and are subject to change without notice or liability. Fabco Automotive Corporation reserves the right to change parts at any time.

# TC 35

## Front Views



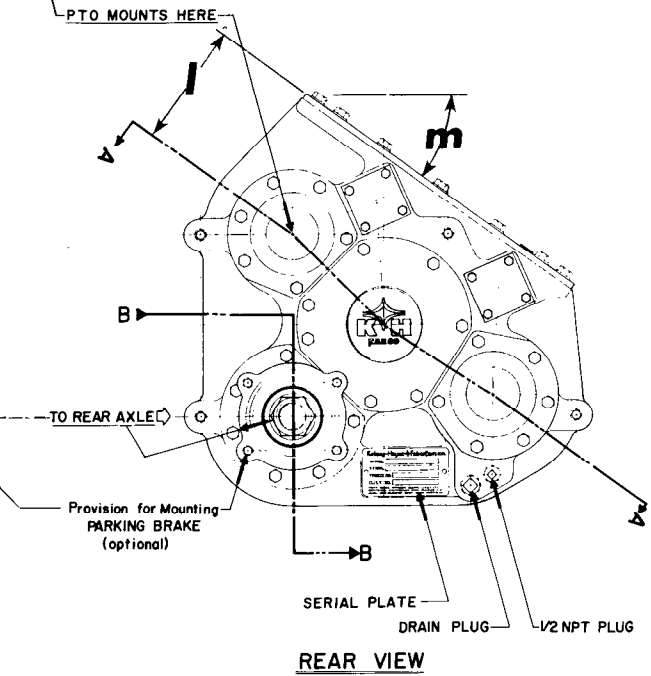
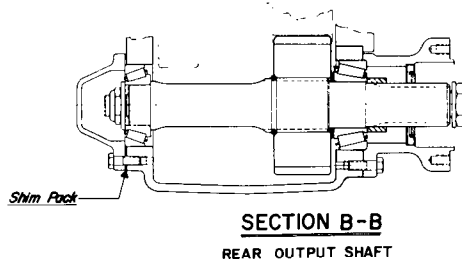
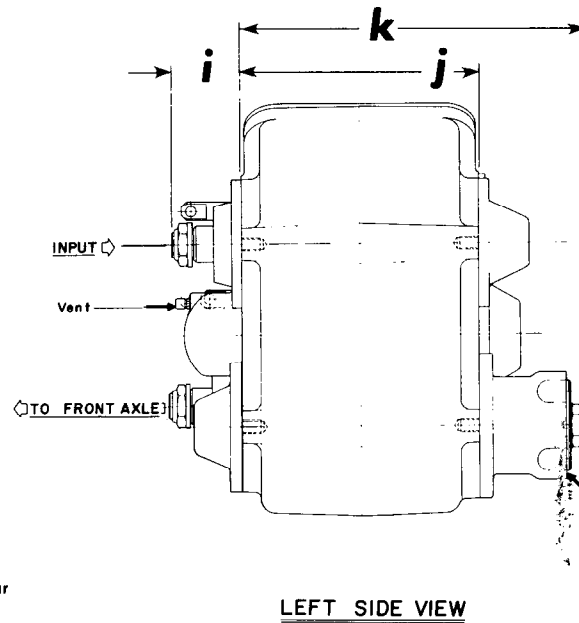
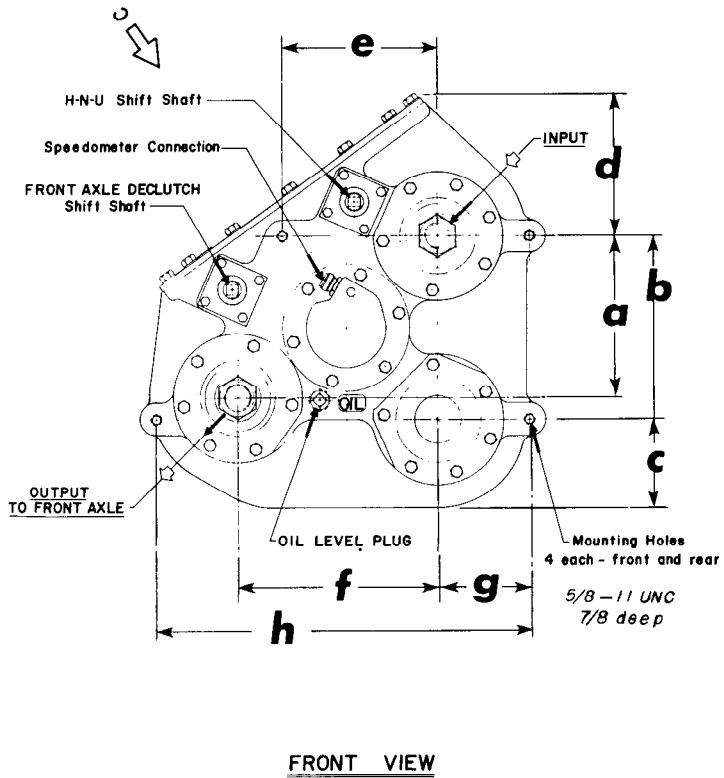
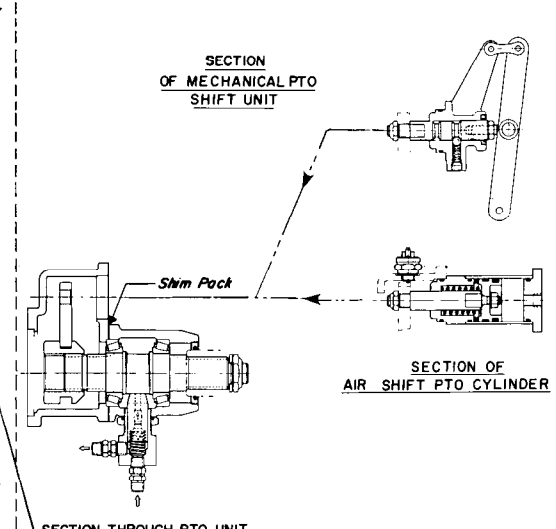
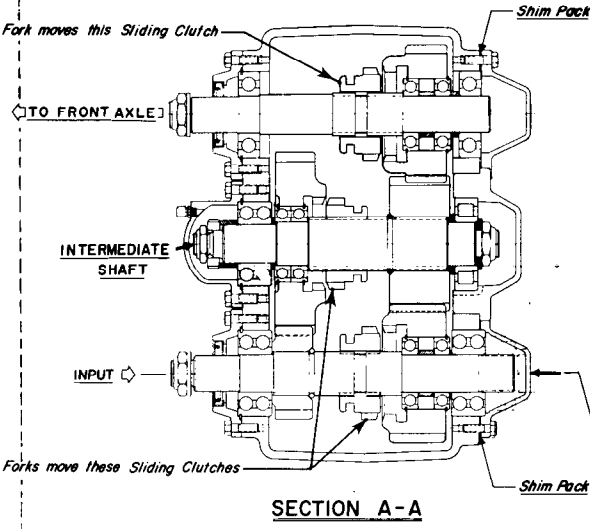
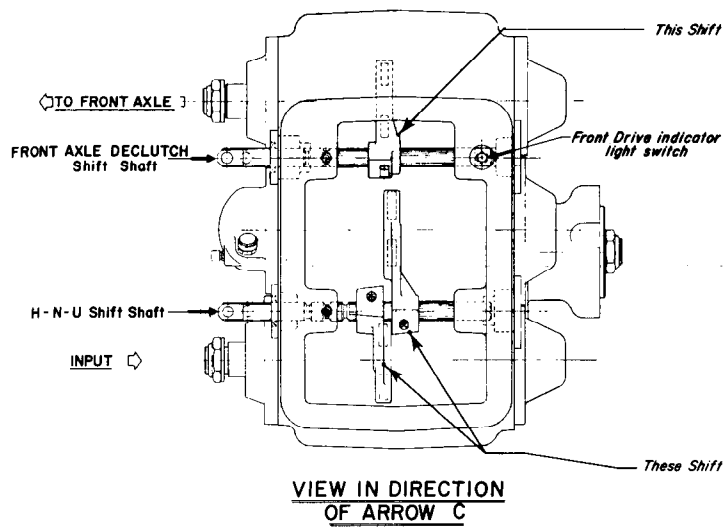
## Rear Views

## GENERAL ARRANGEMENT

Refer To The Photographs On The Facing Page

1. Connection, Speedometer
2. Cylinder, Front Drive Air Shift
3. Cylinder, High-Underdrive Air Shift
4. Cylinder, "Piggy-Back" Neutral Air Shift
5. Cylinder, PTO Air Shift
6. Fitting, Air Vent
- 7a. Hose, Oil Pump Suction Line
- 7b. Hose, Oil Pump Pressure Line
8. Input to Transmission
9. Output to Front Axle
10. Output to Rear Axle
11. PTO Output
12. Plate, Serial and Model No. Identification
13. Plug, Oil Drain
14. Plug, Oil Fill & Level
15. Pump, PTO Oil
16. Switch, Front Drive Engaged Indicator Light
17. Switch, PTO Engaged Indicator Light
18. Valve, PTO Oil Pump Inlet
19. Valve, PTO Oil Pump Outlet

Refer to the parts book section beginning on Page PM1 for complete parts identification.



**TC-35**

Kelsey-Hayes Company, Fabco Division

DESCRIPTION  
Model TC-35  
Transfer Case

**FEATURES**

A four shaft transfer case with the front output off-set from the rear output  
 Single piece housing  
 Constant mesh gearing  
 Options include:  
 Manual Shift  
 Air Shift  
 Parking Brake Mounting Carrier  
 PTO Unit with Oil Pump

AVAILABLE IN THE FOLLOWING STANDARD CONFIGURATIONS				
Part No.	PTO	Shift	Neutral	Provision for Parking Brake
872 165 001	No	Air	No	No
872 165 002	Yes	Air	Yes	No
872 165 003	No	Manual	Yes	Yes
872 165 004	Yes	Manual	Yes	Yes
872 165 005	No	Manual	Yes	No
872 165 006	Yes	Manual	Yes	No

Additional configurations may be made to meet specific requirements.

**DRY WEIGHT:**

(005 Configuration) 400 lbs.  
 (006 Configuration) 439 lbs.

**OIL CAPACITY:**

7 Qts.

**DIMENSIONS:**

The following dimensions apply to the drawing on Page 4.	
a.	7.51
b.	8.49
c.	4.00
d.	6.50
e.	7.24
f.	9.28
g.	4.26
h.	17.38
i.	3.35
j.	11.00
k.	19.35
l.	6.75
m.	36°

Spline and seal sizes are shown on Page PM2

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# I. OPERATING INSTRUCTIONS

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## **A. Front Drive**

When travelling through sand, loose dirt, mud, snow, ice, or when ascending grades where the rear wheels might spin, shift to front wheel drive for better traction. Shift before the truck is in trouble. Engagement and disengagement of the front drive axle can best be made while the engine is pulling lightly. It can be shifted at any speed provided the rear wheels are not spinning. The transfer case is equipped with a switch so that the shift is indicated by a pilot light. The light will come on when front drive is engaged.

## **B. Underdrive**

When slow, positive pulling power is desired, shift to underdrive. Underdrive may be used to obtain a convenient combination with third or direct for climbing some grades. The transfer case should be shifted between high and low range only when the truck is stopped.

## **C. Power Take-Off**

When the transfer case is equipped with a power take-off, the PTO can be operated without moving the vehicle. To engage, shift the automatic transmission into neutral and shift the PTO while the engine is idling. After the PTO has been engaged, shift the transmission to the desired gear. With a manual transmission equipped vehicle, depress the clutch pedal and shift into the desired transmission gear, shift the PTO and release the clutch.

To disengage the PTO, shift the transmission into neutral (manual and automatic), allow the machinery to come to rest, then disengage the PTO.



## II. LUBRICATION

Note: For proper lubricant, refer to "Recommended Lubricants" chart page 9.

### A. Transfer Case Oil Change

Transfer case lubricant should be changed on all new transfer cases after the first 3,000 to 5,000 miles (on-highway), or first 40 hours (off-highway); thereafter, oil changes should be done at the following intervals:

On-Off Highway Service                      10,000-15,000 miles

Off-Highway Service  
(Logging, dirt moving, mining and associated operations)                      500-750 hours, as indicated by operation and contamination of lubricant.

### B. Draining Oil

Draining is best accomplished after the vehicle has been operated briefly, allowing the oil to become warm and flow freely. Remove both drain and fill plugs and allow housing to empty completely. After transfer case has been drained and before it is refilled, the case should be thoroughly flushed with clean flushing oil or kerosene.

### C. Refilling Oil

If the transfer case has been removed from the vehicle for service, it is best to refill the oil after the transfer case has been reinstalled into the vehicle.

Clean and replace drain plug and fill the transfer case with appropriate gear oil with the vehicle on level ground (See recommended lubricant chart). Fill transfer case to the level of the fill plug, metering approximately 7 qts. of gear oil into the transfer case. The exact amount may differ depending upon the inclination of the transfer case. Always fill to the level of the fill plug. Replace fill plug and examine transfer case for leaks around plugs and gasket sealed areas.

Do not overfill the transfer case. Overfilling may cause seepage around bearing caps.

### D. Inspection

Gear oil level is to be maintained at the level of the fill plug at all times. Check at the following intervals:

Highway Service                                      1,000 miles  
Off-Highway Service                                      40 hours

### E. Oil Change and Inspection Recommendations

The above oil change and inspection periods are based on the average use and operating conditions the transfer case may encounter. It is recommended that the individual owner make a periodic lab analysis of the lubricant to determine contamination based on the individual's own operating conditions. With this data the individual owner can better determine their own oil change and inspection periods.

### F. Operating Temperature

The operating temperature of the transfer case should never exceed 250°F (120°C). Extensive operation at temperatures exceeding 250°F will result in rapid breakdown of the oil and shorten the transfer case life.

### G. Shift Cylinder Inspection (Air Shift Cases Only)

With every oil change the air shift cylinder lines and valves should be inspected for leaks and possible malfunctioning. Low pressure conditions can cause partial clutch tooth engagement which may result in "gear jumping" and premature wear.

### H. PTO Oil Pump Inspection

Check oil pump output at: Initial installation; reinstallation; if case overheats during extended PTO operation: at each oil change. Disconnect PTO oil pump output hose from the fitting at the front of the case. Block the truck wheels, set the parking brake, put the transfer case in neutral, engage the PTO. Make sure the output hose is clear of the transfer case input shaft. Use something to catch the oil. Keep hands away from rotating (and hot) parts under the truck. Operate the case at idle speed and observe the oil flow. Flow should be about 10-12 oz. per minute.

If no oil flow is observed, disconnect output hose at the output check valve (Refer to Page PM15 and to Fig. 39), remove the output check valve, prime pump with transfer case lubricant added through the hole exposed in the side of the oil pump. Reconnect the fittings at the PTO end of the case and repeat the test described above.

Refer to section VI J if difficulties are encountered.

## Recommended Lubricants

### On Highway Vehicles

Type	Grade	Temperature
MIL-L-2104B Heavy-Duty Engine Oil	SAE 50 SAE 30	Above + 10°F. Below +10°F.
Mineral Gear Oil	SAE 90 SAE 80	Above + 10°F. Below + 10°F.
MIL-L-2105B E.P. Oil, except Sulfur-chlorine-lead type.	SAE 90 SAE 80	Above + 10°F. Below + 10°F.

**Heavy-duty engine oil.** Make sure to specify heavy-duty type meeting MIL-L-2104B specifications.

**Mineral gear oil** inhibited against corrosion, oxidation and foam.

**Extreme pressure oils** under some conditions might form carbon deposits on gears, shafts, and bearings which will result in transfer case malfunctions and premature failure. It is suggested that if these conditions exist, and E.P. oil is being used, a change should be made to mineral gear oil or heavy-duty engine oil as recommended.

### Off Highway & Mining Equipment

Type	Grade	Temperature
MIL-L-2104B Heavy-Duty Engine Oil	SAE 50 SAE 30	Above + 10°F. Below + 10°F.

#### Special Recommendation

For extreme cold weather where temperature is consistently below 0°F.

MIL-L-21048 Heavy-Duty Engine Oil	SAE 20W	Below 0°F.
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### III. TRANSFER CASE REMOVAL & INSTALLATION

#### A. Removal from Vehicle

1. Remove fill and drain plugs and drain lubricant from transfer case.
2. Tag wires leading to monitor light and disconnect wires from transfer case.
3. Disconnect the air shift lines. Be sure to tag the lines for future identification (air shift cases only).
4. Disconnect mechanical linkage and tag for future identification (manual shift cases only).
5. Disconnect the speedometer cable if so equipped.
6. Disconnect drivelines at flanges or yokes.
7. Position a transmission jack of suitable capacity beneath the transfer case (4001b. transfer case). Be sure that the transfer case is seated safely on the jack.
8. Disconnect transfer case mountings at rubber insulators. Since mountings vary, consult the vehicle service manual.
9. Check to ensure that all mountings and connections to the transfer case have been disconnected. Lower the transfer case to the floor and remove from under the vehicle.

#### B. Installation into Vehicle

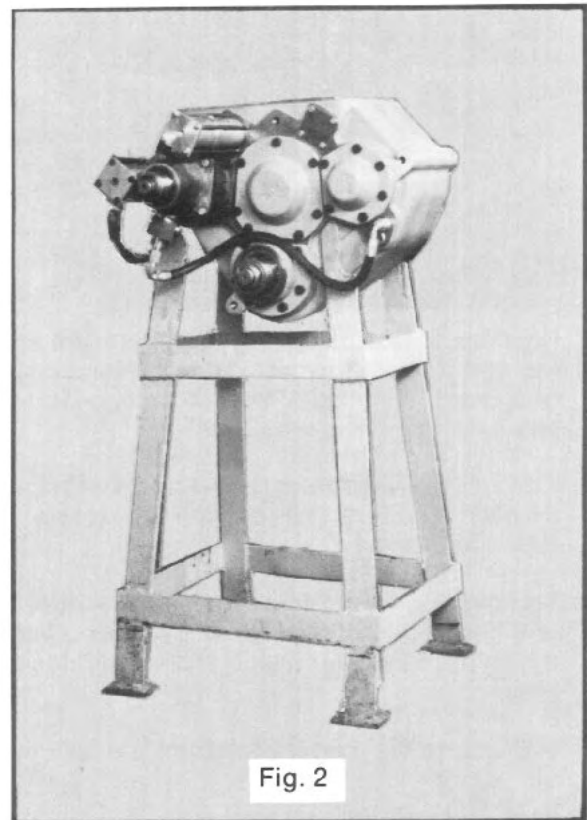
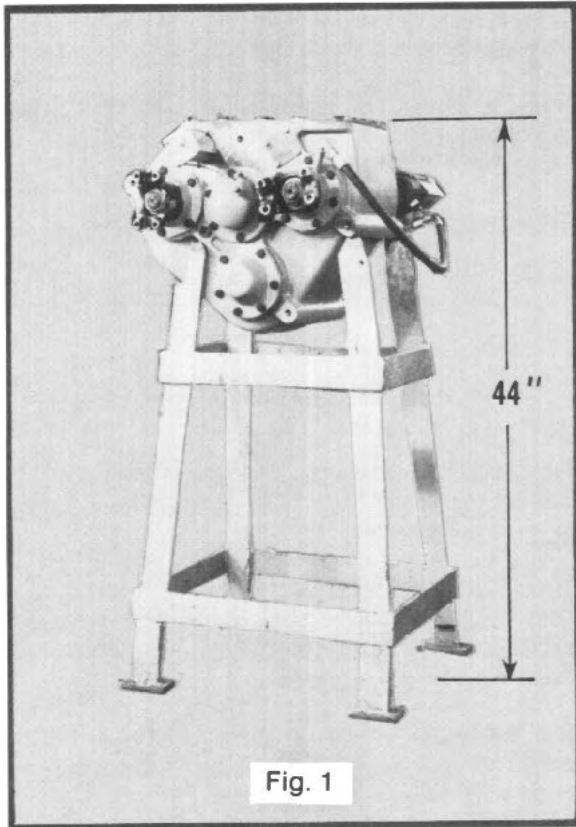
1. Place transfer case on transmission jack and position jack and transfer case under the vehicle.
2. Raise transmission jack and position transfer case.
3. Connect transfer case mountings. Since mountings vary, consult the vehicle service manual.
4. Connect drivelines.
5. Connect shift cylinder air lines to air cylinders.
6. Connect mechanical shift linkage to shift shafts.
7. Connect monitor light lead wires to terminals.
8. Fill transfer case housing with appropriate lubricant to the correct level and install fill plug. If case is equipped with a PTO, prime the PTO oil pump. (Refer to Lubrication Section II — especially paragraphs C and H).
9. Road test the vehicle by driving slowly with no load for the first few moments, then test at a higher speed listening for any problems.
10. Check transfer case for leaks around gaskets and seals.

## IV. TRANSFER CASE DISASSEMBLY

Important: Read this section before starting the disassembly procedures.

### A. General Precautions for Disassembly

1. After removing the transfer case from the vehicle, remove any mounting brackets still attached to the transfer case.
2. The outside of the unit should be cleaned before starting the disassembly. If steam cleaning, ensure that breather and air fittings are covered to prevent water from entering assembly.
3. Cleanliness — provide a clean place to work. It is important that no dirt or foreign material enters the unit during repairs.
4. Position the transfer case horizontally, with the cover plate facing upwards. A specially fabricated stand is desirable.



5. Assemblies — When disassembling the various assemblies, lay all parts on a clean bench in the same sequence as removed. This procedure will simplify reassembly and reduce the possibility of lost parts.
6. When necessary to apply a force to remove a part, use of a puller or press would be preferred. However, sometimes it may be necessary to use a soft hammer or mallet.
7. Bearings — Carefully wash and relubricate all bearings as removed and protectively wrap until ready for use. Remove bearings with pullers designed for this purpose, or in a manner which will not damage those bearings that will be re-used.
6. Follow each procedure closely in each section, making use of both text and pictures. Refer to exploded views located in Section VIII.

### B. Preparation for Disassembly

1. Remove locknut and washer from each yoke or companion flange on the upper and lower shafts. Remove each companion flange or yoke from its shaft. A gear puller may be required for yoke or flange removal. Discard the used locknuts and replace with new nuts at assembly.
2. Remove bolts and lockwashers from cover plate. Tap cover plate to loosen and remove.
3. Remove hand brake assembly from lower shaft if case is so equipped.

## C. Shift Shaft Disassembly

### Air Shift Cases

1. Remove bolts and lockwashers from cover plate. Tap cover plate to loosen and remove.

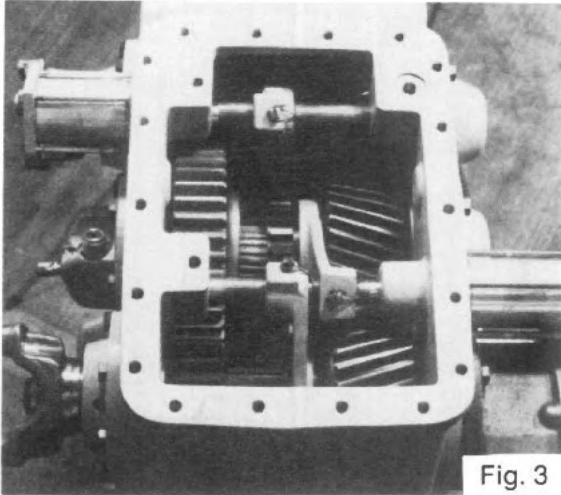


Fig. 3

2. Unscrew indicator light switch from the housing and remove spacer washers (Note amount of spacers removed). Remove plunger from inside housing using a magnet.
3. Cut the lockwires from the shift fork set screws on each shift fork. Remove the set screws from each shift fork.
4. Remove four bolts from the shift cylinder cap and remove cap from shift cylinder. Discard o-ring from cylinder cap, if replacement is necessary.
5. Remove shift cylinder tube from the shift cylinder adapter tube located in the housing, exposing piston (See fig. 4).

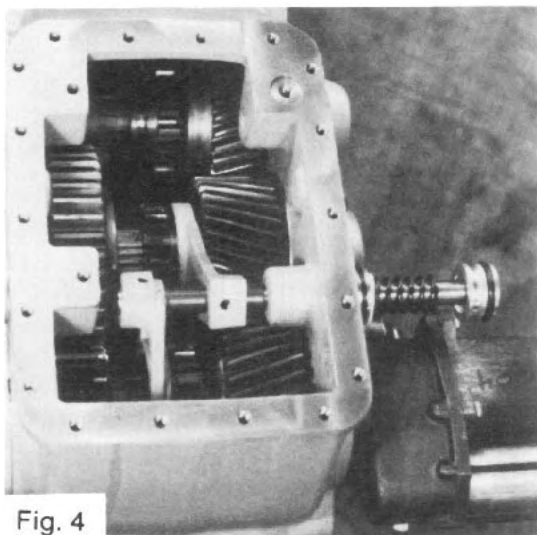


Fig. 4

6. Withdraw shift piston and shift shaft housing. As the shift shaft is withdrawn from the housing, remove each shift fork from the shaft.
7. Remove shift shaft spring and plastic stop ring from the shift shaft or from the shift cylinder adapter tube located in the housing.
8. Disassemble shift piston from the shift shaft (if necessary) and discard o-ring and felt wiper, if replacement is necessary.
9. Remove shift cylinder adapter tube from housing. Discard o-rings from the adapter, if replacement is necessary.
10. Remove shift forks from inside of housing.

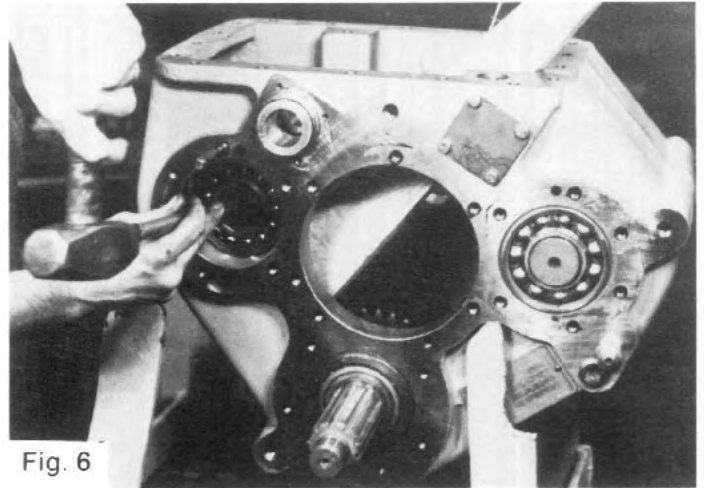
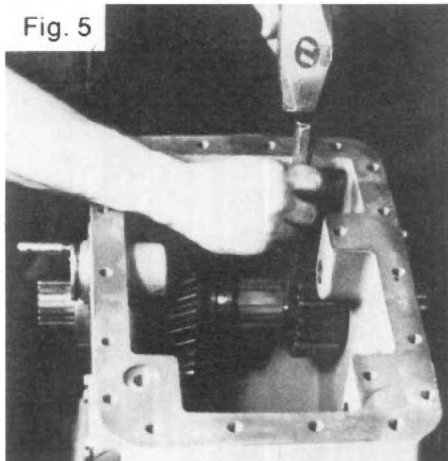
### Manual Shift Cases

1. Remove bolts and lockwashers from cover plate. Tap cover plate to loosen and remove (See fig. 3).
2. Unscrew indicator light switch from housing and remove spacer washers (Note the amount of spacers removed). Remove plunger from inside housing using a magnet.
3. Cut the lockwires from the shift fork set screws on each shift fork. Remove the set screws from each shift fork.
4. Remove each detent set screw from housing. Discard set screws and replace for reassembly. Remove each detent spring and each detent ball. Detent balls are removed by using a magnet.
5. Remove four bolts from each shift shaft seal carrier and remove seal carriers from housing.
6. Withdraw each shift shaft from housing. As the shift shaft is withdrawn from the housing, remove each shift fork from the shaft.
7. Remove seal from each seal carrier, if replacement is necessary.
8. Remove shift forks from inside of housing (Labeling the shift forks according to their position in the transfer case will aid in reassembly).

## D. Input Shaft Disassembly

— Refer to Page PM2 and PM6

1. Remove the rear cover (item 25) or, if so equipped, the PTO assembly.
2. Remove the front seal carrier (Item 5 or 6).
3. Use a brass rod or aluminum bar to protect the end of the shaft, tap threaded end enough to place the direct drive gear (Item 22) just against the inside back wall of the transfer case housing. Slide the underdrive pinion gear (Item 19) toward the front of the case. This will expose the split retaining ring (Item 20 — See Fig. 5). Use a drift to drive the retaining ring from the shaft.
4. Tap on the rear end of the shaft (See Fig. 6) and remove the shaft and the front bearing (Item 18) at the front of the case. Since the bearings (Item 11 and Item 24) are press fitted on the shaft, the shaft will not “just slip out”.
5. Items 19, 10, 22, 23 and 24 can now be removed from inside the case.



## E. Intermediate Shaft Removal

— Refer to Page PM2 and PM5.

1. Remove the capscrews from the front (Item 29) and rear (Item 45) caps. Remove the front (speedo) cap. Remove nut, speedo drive gear and spacer (Items 31, 32, and 33). Screw alignment tool (See Fig. 20 and 21) on to the end of the shaft. Place alignment studs (Fig. 28) in two holes of the rear cap (Item 45).
  2. Drive on end of alignment tool until the rear cap is clear of the case housing. Remove the cap
- along with the outer race and roller assembly of Item 42.
3. Block between the underdrive gear (Item 36) and the rear of the case, continue driving the alignment tool until the shaft is free of the gear and the transfer case. Remove the gear (Item 36 with Item 35 still in place) and the spacer ring (Item 34) from the inside of the case.

## F. Rear Output Shaft Removal

— Refer to Page PM2 and PM4

1. Remove the front (Item 17) and rear (Item 56 or 57) covers. Tap the output (rear) end of the shaft with a suitable tool. Remove bearing cup (Item 47) from the front of the case. Block between the gear (Item 50) and the case while continuing to drive the shaft out the front of the case.
2. Remove the gear, spacer ring (Item 51), bearing cone (Item 52) from inside the case.
3. Remove the split ring (Item 39) from the shaft only if it is being replaced.

## G. Front Output Shaft Removal

— Refer to Page PM2 and PM3

1. Remove the seal carrier (Item 5) from the front of the case and the cap (Item 17) from the rear of the case.
2. Drive the shaft from the rear of the case until the front bearing (Item 8) is clear of the housing. Use a bearing puller or blocking between the bearing and the case to remove the bearing from the shaft.
3. The shaft and gear assembly may then be removed as shown in Fig. 7.
4. Remove the shaft from the gear in an arbor press.

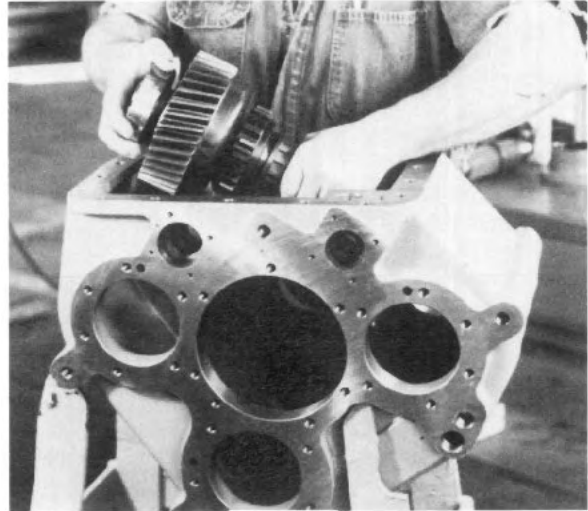


Fig. 7

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## V. CLEANING AND INSPECTION

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### A. Choice of Cleaning Methods

1. Steam may be used for external cleaning of completely assembled units. Care must be taken to ensure that water is kept out of the assembly by tightly closing breather caps and other openings.
2. Rough parts such as the housing, which are too large to conveniently clean with solvents, may be immersed in a hot solution tank containing a mild alkaline solution. Parts cleaned in hot solution tanks must be rinsed thoroughly to prevent damage by traces of alkaline material.
3. Parts with ground or polished surfaces, such as bearings, gears, and shafts, should be cleaned with emulsion cleaners or petroleum solvents. Alkaline hot solution tanks may damage the machined surfaces and such cleaning methods should be avoided.

### B. Drying and Corrosion Inhibition

Soft, clean shop towels should be used to dry parts after cleaning. Compressed air may be used to clean inaccessible areas of large parts such as the housing. Bearings should not be spun dry with compressed air, as the lack of lubrication may cause damage to the mating surfaces.

Dried parts should be immediately coated with a light oil or corrosion inhibitor to prevent corrosion damage. Parts which are to be stored should also be wrapped in heavy waxed paper.

### C. Inspection

Prior to reassembly, parts which are to be reused must be carefully inspected for signs of wear or damage. Replacement of such parts can prevent costly downtime at a future date.

All bearing surfaces, including ball bearing assemblies and roller bearing cups and cones, should be examined for pitting, wear, or overheating. Gears also may show pits, as well as scoring and broken teeth. Shafts may be nicked and marred, or may have damaged threads. Parts which show any signs of damage should be repaired or replaced.

Check all shift forks and slots in sliding clutches for extreme wear or discoloration from heat. Check engaging teeth of sliding clutches for partial engagement pattern.



## VI. TRANSFER CASE ASSEMBLY

### A. General Precautions

1. Read these instructions completely before starting reassembly. Refer to the appropriate exploded view (at the back of the manual). Assemble, adjust and check in the order shown.
2. Parts must be clean. Gasket surfaces must be free of old gasket material.
3. Select a work area that will maintain the cleanliness of the parts and the assembly. Mount the case housing with the cover on top, cover surface in a horizontal plane. The cover side, the front and rear of the case should be accessible. The housing must be restrained. The cover should be approximately 44" above the floor. A sturdy work bench (preferably between 24" and 28" high) or a special stand should be used. The components of this transmission are heavy and positioning and installing them will be easier if the case is supported in the position indicated, refer to Fig. 1 and Fig. 2.
4. Lubricate housing bores, shaft spline and bearing mounting surfaces, sealing lips on oil seals with Lubriplate or equal. This is necessary to reduce the chances of galling or scoring and to provide initial lubrication for the oil seals. Use flanged end bearing drivers that apply equal force to both inner and outer races of bearings when installing bearings.
5. If tubular or sleeve type drivers are used, apply force to either inner or outer race or both as needed, depending on which will put the bearing in place without pushing through the bearing balls.
6. Installation of gaskets, bearing carriers, seal carriers and caps will be simplified if two guide studs are utilized (See Fig. 17). Guide studs may be made by cutting the head off a  $\frac{7}{16}$ -14 bolt of about 3 inches in length. Point the non-threaded end and also slot the end to allow a screwdriver to be used, if necessary, for guide removal.
7. Universal joint yokes or companion flanges should be coated with Lubriplate on the seal operating area before installation. They should be tightened into place with the locknuts tightened to the proper torque before the cover is installed on the case and before the shim thickness is determined for both the input shaft and the rear output shaft. Universal joint yoke or companion flange retaining nuts can be tightened or loosened most easily when all components except shift forks are in place. At that time it is possible to engage both the direct drive and the underdrive clutch gears and effectively lock all the shafts against rotation.
8. Use Permatex Form-A-Gasket #2 or equal pliable setting sealant on bolt threads. If bolt threads are not sealed they will leak oil.

### B. Seal Carrier Assemblies

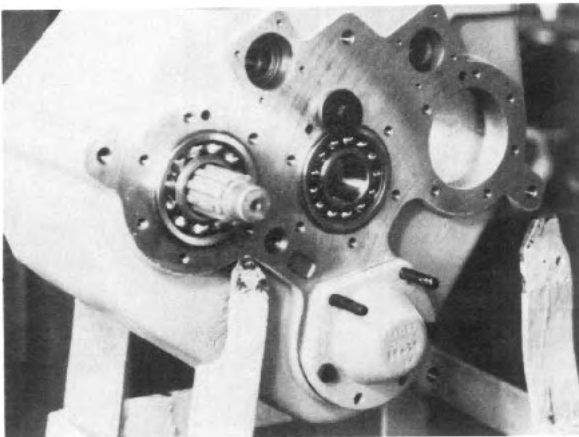


Fig. 8

Seals supplied by Fabco are coated on the outside and should not be coated with Permatex before installation in their carriers. They should be coated on the sealing lip with Lubriplate. Installation can best be made with an arbor press. There are three or four input/output shaft seals and, if a mechanically shifted case, two or three shifter shaft seals, the quantity depending on whether the case does or does not have a PTO assembly installed.

### C. Clutch Gear and Bearing Assemblies

Apply Lubriplate to the bearing bores of each of the three clutching gears. Press the bearings into place by applying force to the outer bearing race. Be sure to put the spacer ring in place before installing the second bearing in 35 tooth clutching gears (Item 22 on input shaft and Item 12 on front output shaft).

## D. Assembly of Front Output Shaft

(See Page PM2 and Page PM3).

1. Insert plain end of front output shaft (Item 15) into the clutch gear assembly (Items 11, 12, and 13). Install the spacer ring (Item 14) and the rear bearing (Item 15) on the shaft. Slide the clutch (Item 10) onto the splined end of the shaft and engage its teeth with those in the clutch gear.
2. Lower this assembly into the cover opening of the case housing with the gear at the opposite side of the housing from the front output opening (See Fig. 9). Guide the threaded shaft end into the front output (See Fig. 10) opening and swing the gear end partially into the intermediate shaft rear opening. This will allow the other end of the shaft to enter the front output opening. Advance the shaft through the front output opening enough to permit backing the bearing into the rear case bearing bore (See Fig. 11).
3. Slip the front bearing (Item 8) over the end of the shaft and into the housing bore. The snap ring on the bearing should be on the out-board side of the bearing. Tap bearing into place (See Fig. 12).

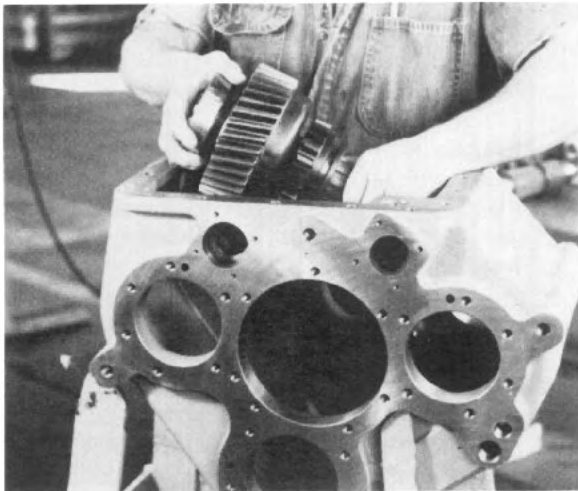


Fig. 9

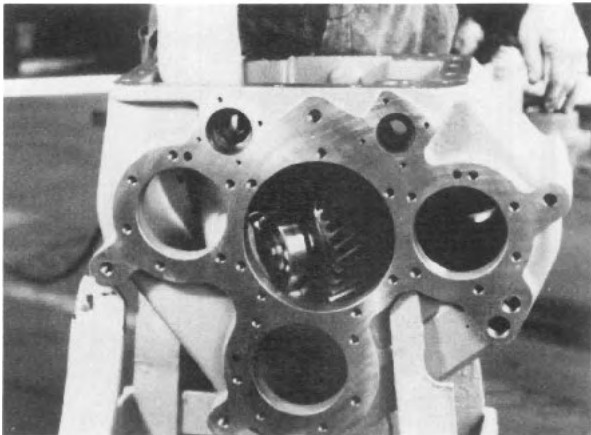


Fig. 10

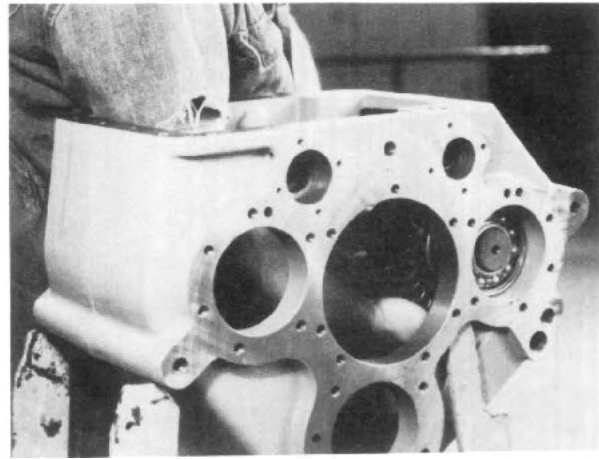


Fig. 11

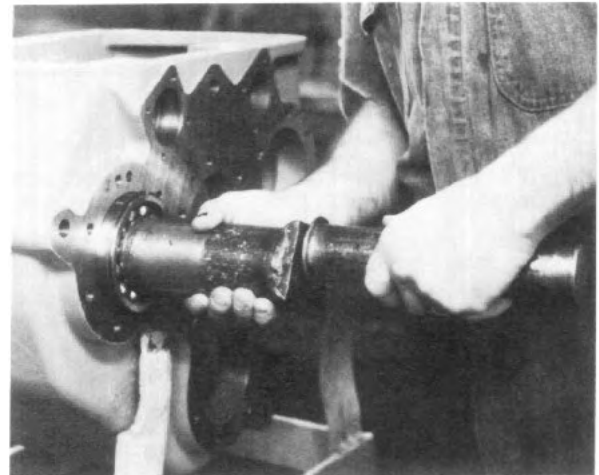


Fig. 12

4. Install the front output seal carrier gasket (Item 7) and the seal carrier (Item 5 with Item 4 in place). Permatex the bolt threads, tighten the bolts (Item 3) to the specified torque.
5. Coat the seal surface and splined hole of the front output yoke with Lubriplate.
6. Align the yoke on the shaft, tap into place. Install yoke retaining washer lightly coated with Permatex. Coated face next to the yoke. Install the locknut and tighten to specified torque.
7. Temporarily install the rear cap (See Fig. 13) in place with all six bolts, but with bolts tightened to 25 lbs. ft. torque. Measure gap between the case housing and the flange of the cap. Select a shim stack that is .010 to .015 larger than this dimension. Remove bolts and cap.
8. Install shims and cap, coat bolt threads with Permatex, install and tighten bolts to the specified torque.
9. Look inside the case and make certain the bearings are pulled tight against the shaft shoulders. Spin the shaft to be sure it rotates freely.

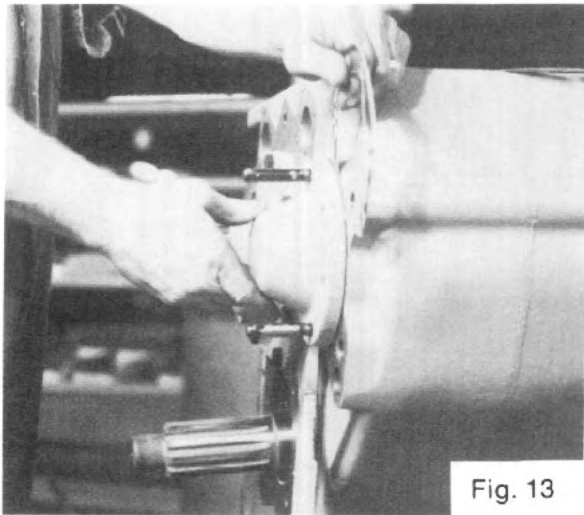


Fig. 13

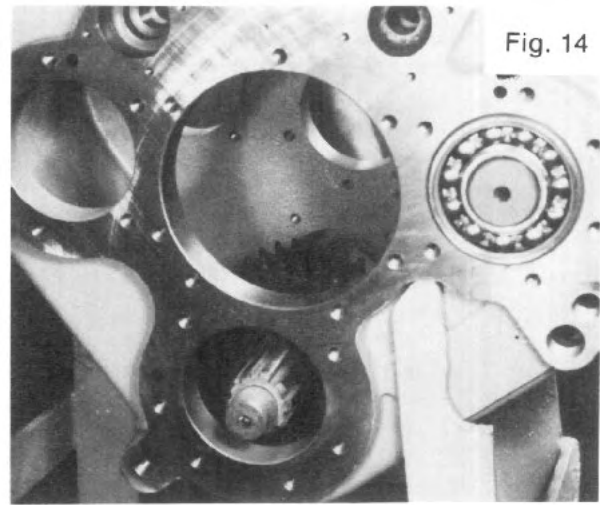


Fig. 14

## E. Installation of Rear Output Shaft

(See Page PM2 and Page PM4).

1. Install split retaining ring (Item 39) on shaft (Item 49).
2. Press front bearing cone (Item 48) into place tight against shaft shoulder, install washer (Item 96) and locknut (Item 31). Torque locknut to specifications.
3. Coat the splined bore of the gear (Item 50) with Lubriplate.
4. Lower rear output gear (Item 50) into the case with flat face against the back wall of the case, the chamfered side toward the front of the case.
5. Coat the shaft splines with Lubriplate.
6. Insert the rear output shaft (Item 49 with Items 31, 46 and 39) through the proper hole in the front of the case and align the shaft splines with the gear splines (See Fig. 14). Use a brass or aluminum rod to protect the threaded shaft end and tap the shaft into the gear until the retaining ring (See Fig. 15) seats in the chamfer of the gear.
7. Install the spacer ring (Item 51). Heat the rear bearing cone (Item 52) to approximately 250°. Use heat resistant gloves to handle the bearing (See Fig. 16). Install quickly tapping into place if necessary. Install the spacer tube (Item 54) on the shaft. The shaft can be moved toward the front of the case to allow a visual inspection of the mating parts.
8. Install both front (Item 47) and rear (Item 53) bearing cups allowing the rear cup to remain projecting from the case between  $\frac{3}{8}$  and  $\frac{1}{4}$  inch.
9. Install the rear output carrier gasket (Item 55) and the rear output carrier (Item 40 or 57) including seal (Item 58). Dip the threaded portion of the 6 retaining bolts in Permatex before inserting and tightening them. Tighten the bolts to the specified torque.
10. Coat the seal surface and splined hole of the rear output companion flange with Lubriplate. Install the flange. Lightly coat one side of the retaining washer (Item 2) with Permatex. Place the washer on the shaft with the coated side next to the companion flange. Install the locknut. Tighten nut to the specified torque.

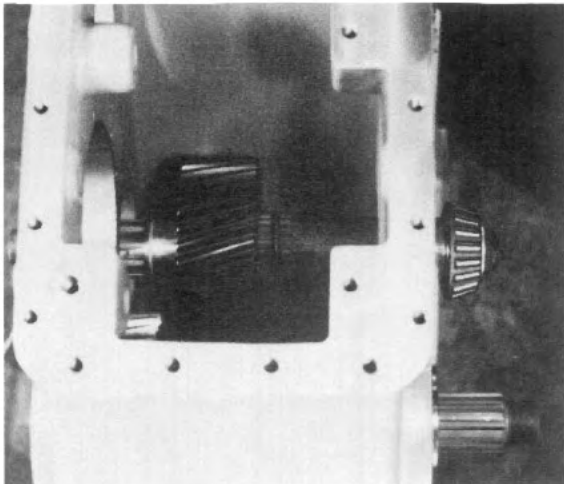


Fig. 15

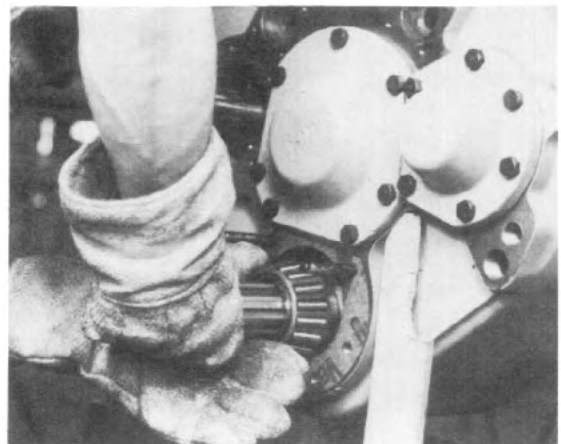


Fig. 16

- Temporarily install the rear output shaft front cover (See Fig. 17). Do not install shims. Tighten the mounting bolts to approximately 25 lb. ft. torque. Measure the gap between the rear output shaft front cover and the case housing with feeler gauges. Add .010 to this figure and then select a shim pack that is equal to this calculated figure or up to .005 larger. Install shim pack, Permatex threads of retaining bolts and tighten to the specified torque.

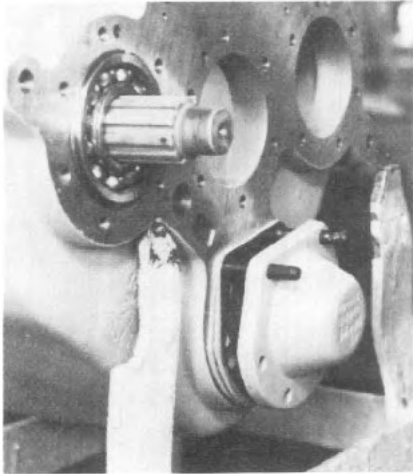


Fig. 17

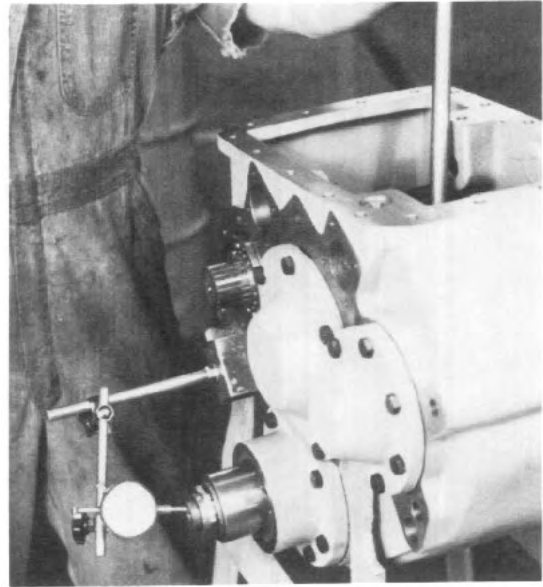


Fig. 18

- Check rear output shaft end float between shaft and housing. End float should be between .010 and .015 inches (See Fig. 18).

## F. Installation of the Intermediate Shaft

Refer to Page PM2 and Page PM5

- Install the double row ball bearing in the housing bore opposite the large opening at the rear of the case. Retain the bearing with a bolt and washers as shown in Fig. 8.
- Insert the alignment tool (866 271) which is shown in the accompanying sketch, Fig. 20, through the bearing with the tapped end toward the center of the case (See Fig. 21).

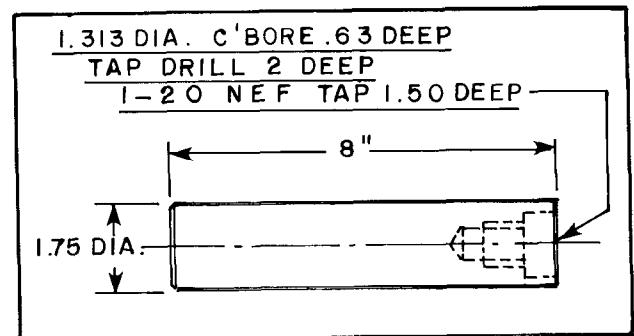


Fig. 20

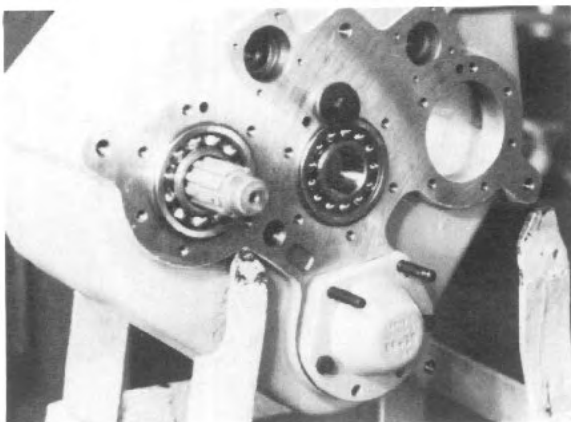


Fig. 19

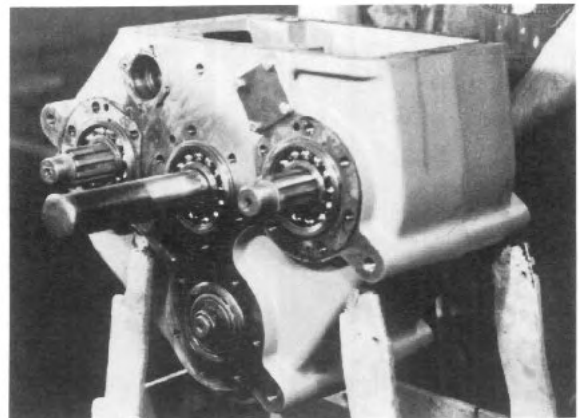


Fig. 21

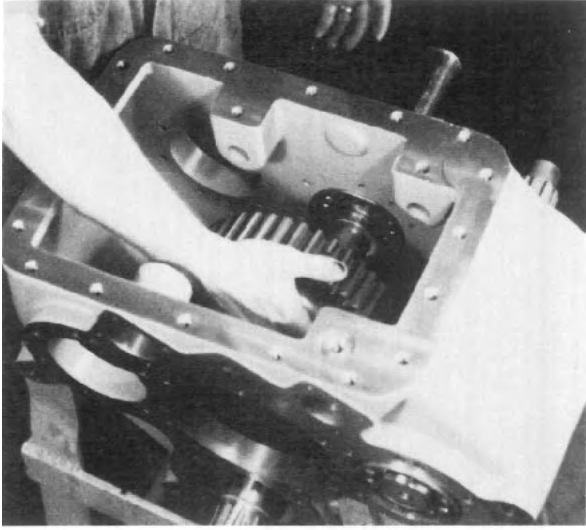


Fig. 22

3. Put the spacer washer (Item 34) in place on the alignment tool on the inside of the case. Put the underdrive driven gear and bearing assembly (Items 35 and 36) on the alignment tool (See Fig. 22). Insert the sliding clutch (Item 37) into the engaged position inside the underdrive driven gear.
4. Install the split retaining ring (Item 39) into the groove on the intermediate shaft (Item 38).
5. Insert the shaft through the large opening on the back of the case. Align with clutch splines and engage end of shaft in alignment tool. Screw tool and shaft together (See Fig. 23 and 24). Pull shaft through bearings. Remove alignment tool.
6. Install the spacer tube (Item 33), speedo gear (Item 32) and locknut (Item 31) on the end where the alignment tool was removed.

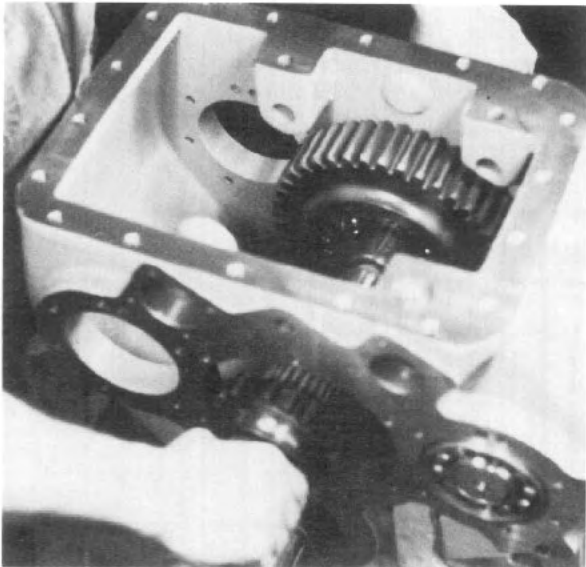


Fig. 23

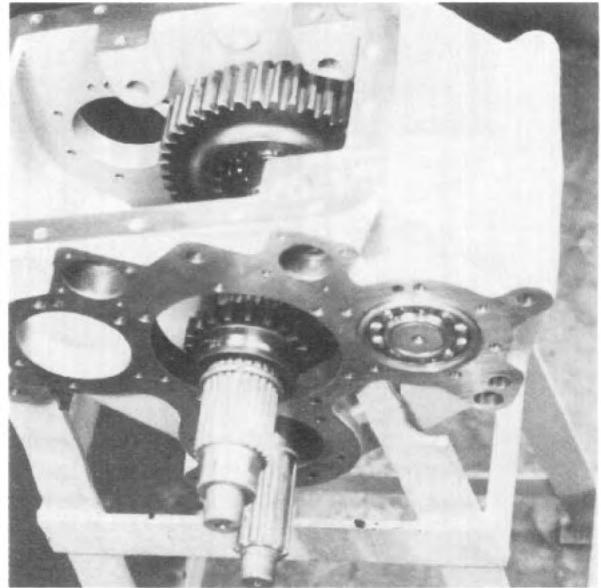


Fig. 24

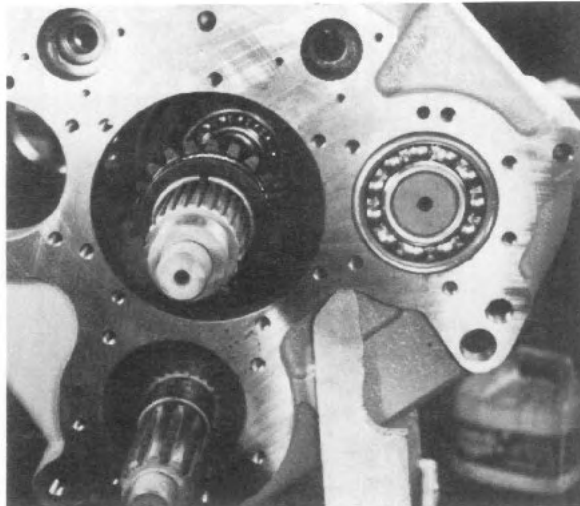


Fig. 25

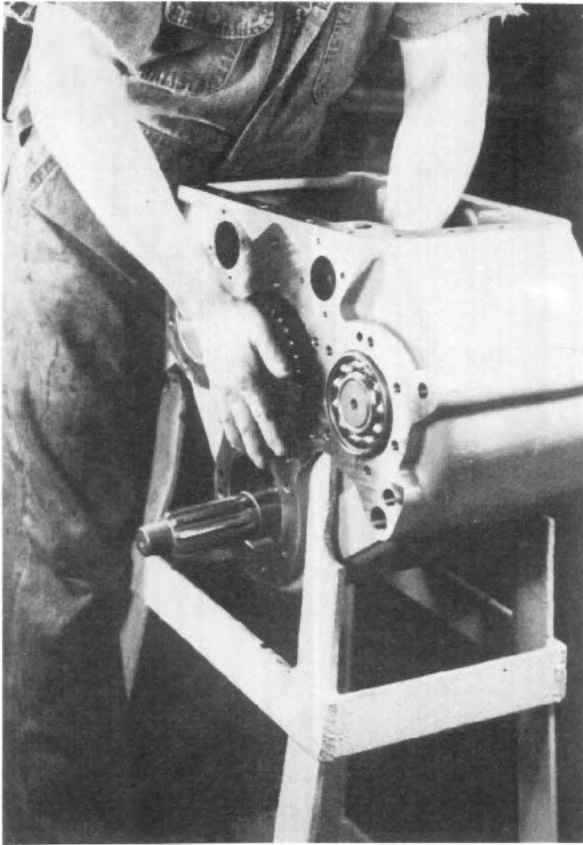


Fig. 26

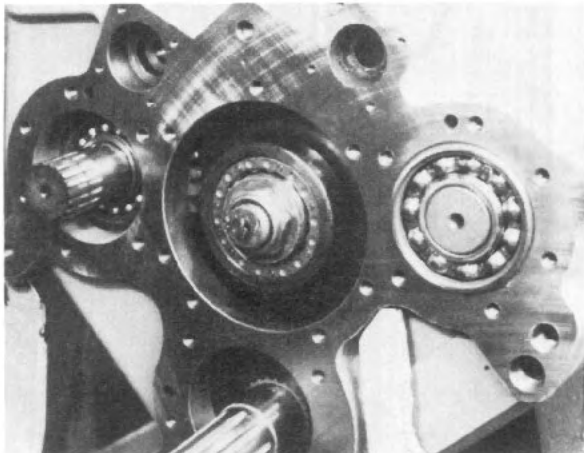


Fig. 27

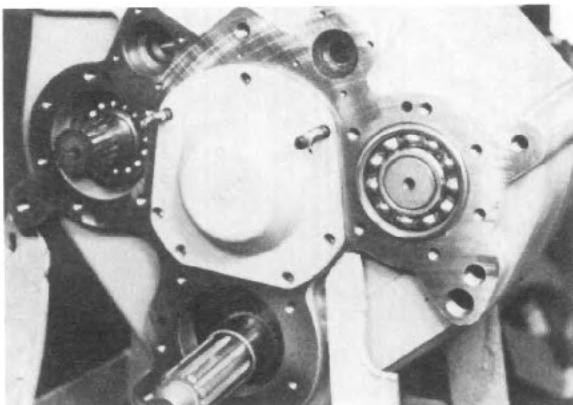


Fig. 28

7. Fit direct drive gear (Item 40) onto shaft with chamfered spline side toward the front of the case so the chamfer will fit up onto the split retaining ring (See Fig. 25 and Fig. 26).
8. Install the spacer washer (Item 41) and the roller bearing inner race (Item 42) on the shaft. The shoulder on the race should be toward the gear; this will allow the cover and the roller bearing outer race and roller assembly to fit over the inner race (See Fig. 27).
9. Install the retaining washer (Item 43) and locknut (Item 1) on the shaft (also shown in Fig. 27).
10. Tighten the nut on the speedometer gear end of the shaft to specifications while restraining the nut on the roller bearing end of the shaft.
11. The rear nut should be tightened to specifications while the front output yoke is restrained from turning.
12. Install the alignment studs in preparation for installation of the intermediate shaft rear cover.
13. Install cover gasket and cover pulling into place with Permatexed bolts. Tighten the bolts to the specified torque. Note: No end play adjustment is required.
14. Remove washers and bolt that were installed in step F1. Position the speedometer cap gasket (Item 30) over the front of the intermediate shaft with the oil return hole in the gasket and the case aligned.
15. Put the speedometer cap (Item 29) in place with the speedometer cable connection pointing in the same direction as it was when it was removed from the case. Attach with bolts that have been coated on their threads with Permatex; tighten bolts to correct torque.
16. Install the speedometer driven gear (Item 27) and speedometer driven gear sleeve (Item 26) in speedometer cap (See Fig. 29).
17. Install vent (Item 28) in speedometer cap.



Fig. 29

## G. Input Shaft Assembly

Refer to Page PM2 and Page PB6

1. Place the direct drive gear (Item 22), with bearings (Item 11) and spacer (Item 13) previously installed, in the housing against the back wall. The gear will mesh with the gear on the intermediate shaft and rest against the side wall of the case housing.
2. Insert the direct drive gear clutch (Item 10) in the direct drive gear (Item 22).
3. Insert the non-threaded end of the input shaft (Item 21) into the case housing from the front of the case. The shaft should project into the case between  $\frac{3}{4}$ " and 2" and the shaft may rest against the bottom of the input bearing bore of the housing.
4. Slip the underdrive pinion gear (Item 19), with projecting face toward the shaft, onto the end of the shaft.
5. Slide input shaft through the underdrive pinion gear and into the direct drive sliding clutch (Item 10). When splines come into contact with the pinion gear, align splines, continue shaft installation, align splines with splines in underdrive gear sliding clutch (See Fig. 30), and again continue sliding shaft into place through the bearings (Item 11) and gear (Item 22). Slip spacer washer (Item 23) (.06 thick) over rear end of input shaft.
6. Slide input shaft front (Item 18) and rear (Item 24) bearings onto the input shaft. Tap into the case housing bores and into place on the shaft with a suitable driver.
7. Push the input shaft as far to the rear of the case housing as it will go. Push the underdrive pinion gear toward the front of the case.
8. Install the split retaining ring (Item 20) in place in the half round groove that should now be exposed (See Fig. 31).
9. Install the input seal carrier gasket in place on the front of the case housing and install the input seal carrier assembly in place. Permatex the mounting screws and tighten to the specified torque (See Fig. 32).
10. Apply Lubriplate to the seal area and the splines of the input yoke. Install the yoke on the front of the input shaft. Put yoke retaining washer (Item 2) onto the shaft with the side that faces the input yoke lightly coated with Permatex. Install the input yoke retaining nut (Item 1) and tighten to specifications.

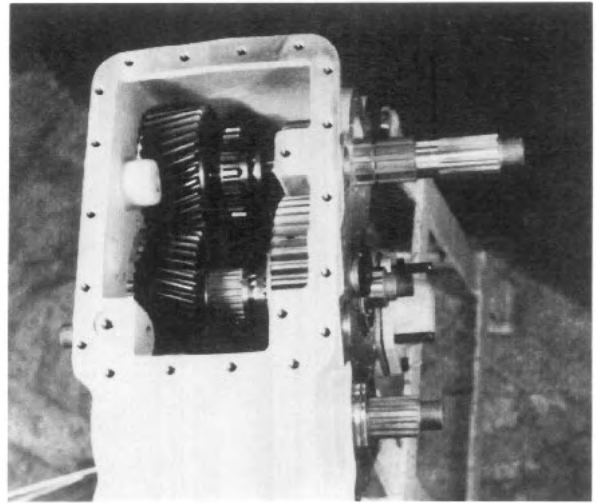


Fig. 30

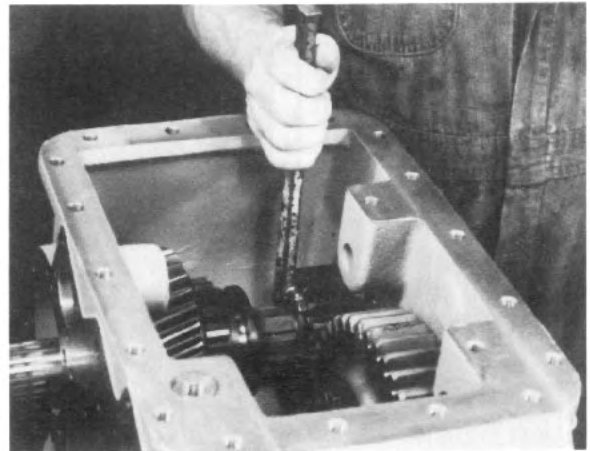


Fig. 31

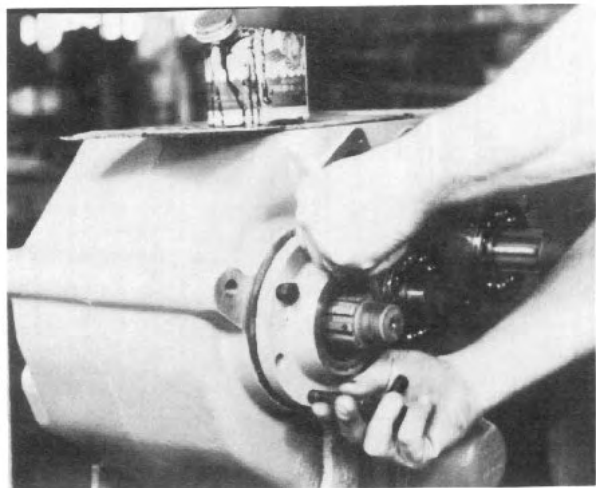


Fig. 32

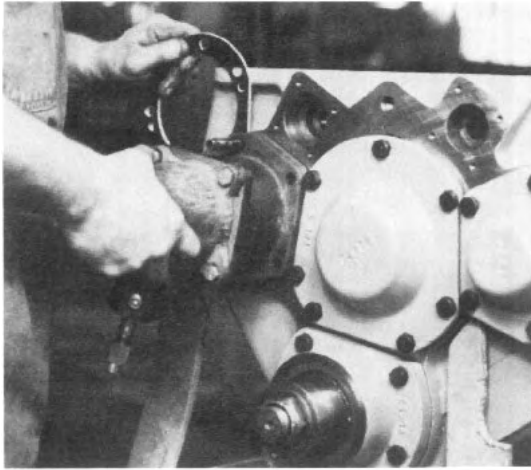


Fig. 33

11. Check fit between the split ring, underdrive pinion gear and the input shaft split ring groove.
12. Temporarily fasten the input shaft rear cover (Item 25) or the PTO assembly (See Section J for instructions on proper assembly of the PTO unit) in place with the mounting bolts torqued to 25 lb. in.
13. Use feeler gauges to measure the distance between the input shaft rear cap (or PTO assembly) and the case housing (See Fig. 33). Add .005" to this dimension and make a shim pack (Item 16) equal to the dimension thus calculated, or at a maximum, .005" larger than the calculated dimension.
14. Remove cap (or PTO), position shims, install cap (or PTO) attaching with screws that have been coated on the threads with Permatex. When installing the PTO unit, lightly coat under the heads of the two long cap screws.

## H. Air Shifter Shaft Installation

Refer to Page PM7 and Page PM10

1. Install two o-rings (Item 3) into the grooves on the outside of the shift cylinder adaptor tubes (Item 15). Coat adaptors with gear lubricant or Lubriplate and install in the counterbored shift shaft holes, on the front of the case housing for the front drive shift and on the rear of the case housing for the high-underdrive or high neutral-underdrive-shift.

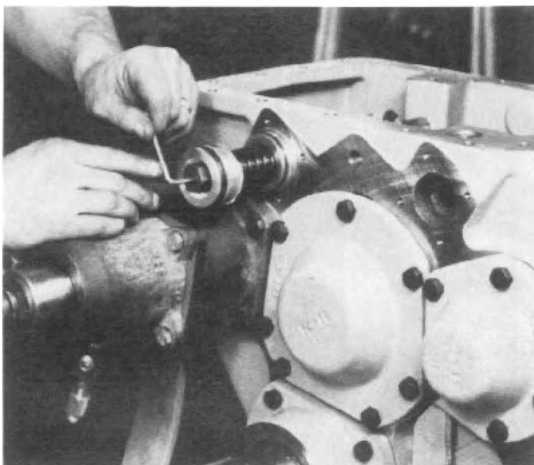


Fig. 34

2. Place a small (piston-to-shift-shaft sealing) o-ring (Item 11) over the threaded end of each shift shaft. The shallow counterbore in the piston (Item 9) should be toward the shoulder on the shift shaft; the deep counterbore provides room for the retaining nut. Install the piston retaining washers (Item 7) in the deep counterbore of the piston over the end of the shift shaft. Install piston retaining nut (Item 6 or 39). The nut used on the two groove shift shaft will be a special oversized nut (Item 39) if the transfer case is equipped with a PTO unit. Tighten nut to specification and tighten the nut locking set screw (Item 40) into the end of the special nut (Item 39 — if case has a PTO unit). See Fig. 34.
3. Install a spring on the two main or longer shift shafts (Item 12 and 36) against the piston. Place a nylon stop ring (Item 13) over the end of each shift shaft.
4. Start the set screws into the shift forks. Put them in as far as possible and still allow the shift shaft to slide through the hole.



5. Install the 7 $\frac{5}{8}$ " overall length underdrive shift fork (Item 35); it should fit into the groove of the underdrive shift clutch (on the intermediate shaft) the long hub section should be facing the rear of the case. Insert the two-groove shift shaft (Item 36) into the adaptor tube (Item 15) at the rear of the case housing (see 1 of this section). Slide end of shift shaft into underdrive shift fork (Item 35). Put 5 $\frac{7}{8}$ " overall length shift fork (direct drive shift fork— Item 34) long hub toward front of the case, into the case with the forks in the groove in the direct drive clutch on the input shaft. Push shift shaft through this fork (See Fig. 35) and into the hole in the front wall of the case housing. Push on the end of the piston and compress the spring until the piston butts against the nylon stop ring and the adaptor. This will allow the set screw in the underdrive shift fork (Item 35) to be tightened into the proper groove on the shift shaft. Rotate both shift forks in either direction but *in the same* direction and, with the second fork in the proper place longitudinally, tighten set screws to specified torque and install the lockwire.

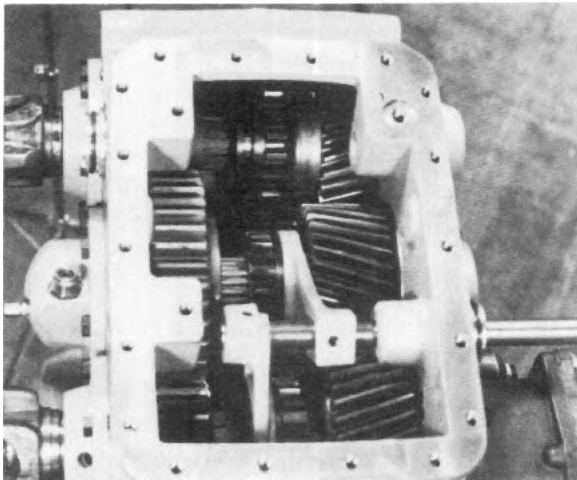


Fig. 35

6. Place the forks of the front drive shift fork (6 $\frac{3}{4}$ " long overall—Item 16) in the groove in the front drive clutch. Insert the front drive shift shaft (shaft with a single groove for the single shift fork — Item 12), spring (Item 14) and nylon stop ring (Item 13) into the shift cylinder adaptor previously installed in the front of the case housing. Pass the shaft (Item 12) through the shift fork and into the hole at the back of the case. Rotate the shaft to position the longitudinal groove away from the indicator light switch hole. Push on the piston enough to put the groove in the shaft under the set screw in the shift fork. Tighten the set screw to specifications and lockwire.
7. Soak the air shift piston felt washers (Item 10) with gear oil and install in the shallow groove of the piston (shift shaft side of piston). Install the shift piston o-ring (Item 8) in the deeper groove on the pistons (Item 9). Oil the rings.

8. The shift cylinder tubes are of differing lengths. The shortest tube (Item 4 which is 3- $\frac{1}{16}$ " long) should be slipped over the front axle shift piston on the front of the case. The longest shift cylinder tube (Item 37 which is 3- $\frac{13}{16}$ " long) should be fitted over the high-underdrive shift piston on the rear of the case.
9. If the transfer case is equipped with a PTO unit, the case must have a neutral position. Neutral is obtained through the use of a "piggy-back" cylinder mounted on the high-neutral cylinder (see Page PM7). This "piggy-back" cylinder, when actuated by properly connected air valves, provides this neutral position. The "piggy-back" cylinder consists of an adaptor (Item 41) into the grooves of which are installed oiled o-rings the adaptor may be put either end first (it is symmetrical) into the end of the high-neutral shift cylinder tube (See Fig. 36). The air inlet connection should point in the same direction as when removed. The "piggy-back" shift shaft piston assembly (with nylon stop ring over the end of the shaft) should now be inserted into the "piggy-back" adaptor. Slip the "piggy-back" shift cylinder tube (Item 43 which is 3 $\frac{1}{8}$ " long) over this piston.
10. Insert o-rings in cylinder caps, install cylinder caps on cylinder tube open ends. Fasten to case housing with the appropriate bolts (Item 5 or 38) or studs (Item 44) and nuts (Item 45).
11. Install plunger (Item 22) into the front drive switch hole with the rounded end toward the shaft. Install the shift indicator switch (Item 20) with one copper washer (Item 21). Test switch operation with a circuit tester while shifting into and out of front drive. Add washers as necessary to make the switch operate properly.
12. Cover exposed end of shifter shafts with the gaskets (Item 23) and covers (Item 24) provided. Secure with 4 bolts (Item 25) each tightened to specifications.

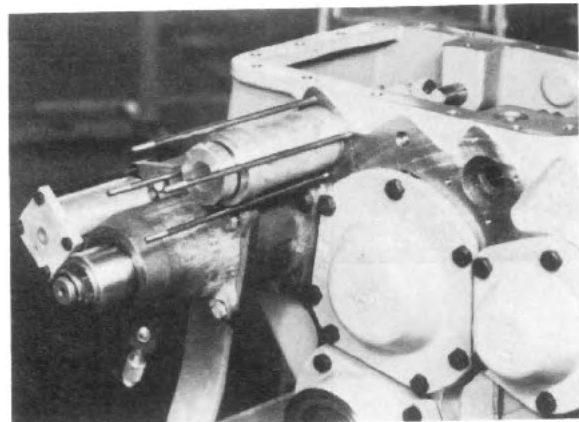
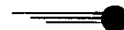


Fig. 36

## I. Manual Shifter Shaft Installation

Refer to Page PM9 and Page PM11

1. There are three (each a different length) shift forks used in the TC-35 transfer case. Their lengths are indicated and their positions explained in the following paragraphs.
2. The shift shafts and shift forks must be installed after the drive shafts and gears are in place.
3. Insert the H-N-U shift shaft (Item 46 with 5 grooves) into the shift shaft hole next to the input shaft. Once the end of the shift shaft is visible through the cover opening, position the direct drive clutch shift fork (Item 34, which is  $5\frac{7}{8}$  over-all in length) into the groove in the clutch on the input shaft with the long hub portion of the shift fork toward the shift shaft (front of the case). Slide the shift shaft through the shift fork just enough to clear the underdrive shift fork (Item 35, which is  $7\frac{5}{8}$  long) that is to be installed at this time with hub end facing the rear of the case and with the forked end in the groove in the clutch on the intermediate shaft. Slide the shifter shaft through this fork and into the hole on the back of the case.
4. Align the underdrive shift fork (Item 35) retaining screw hole with the rear-most groove in the shift shaft. Install a shift fork set screw (Item 17) into this fork, position the flat face of the eye end of the shift shaft parallel to a line through the input and rear output shaft centerlines. This will put flat side in a vertical plane on the installed case. Tighten the set screw to specifications.
5. Slide the direct drive fork (Item 34) and clutch to position the fork's set screw hole over the next shifter shaft groove, install the set screw (Item 17). As the set screw is tightened, hold the two shift forks (both either clockwise or counter clockwise) to insure maintenance of fork-to-clutch clearance. Tighten both set screws to specification and safety wire.
6. Insert the front drive shift shaft (Item 29, or three-groove shaft) into the hole closest to the front drive output.
7. Slip the shift travel limiting tube (Item 33) onto the end of the front drive shift shaft as it emerges on the inside of the case.
8. Place the forks of the front drive shift fork (Item 16, which is  $6\frac{3}{4}$ " overall in length) in the groove in the front drive clutch.
9. Align hub end of shift fork with the front drive shift shaft which should be inserted through the fork and into the hole in the back of the case housing inner wall.
10. Rotate shaft so flat face of the eye end of the shaft is parallel to a line connecting the centerline of the input shaft with the rear output shaft centerline *and* with the flat or longitudinally grooved portion (on the rear end of the shift shaft) away from the front drive indicator switch hole. Failure to do this may result in improper switch operation.
11. Align the shift shaft rear most circumferential groove under the shift fork set screw hole. Install set screw (Item 17), tighten to specifications and lockwire.
12. Insert seal (Item 27) in cylinder caps (Item 28) with lip facing down. Install cylinder caps on front of case (over shift shaft ends) with the seal to the outside. Fasten to case housing with the appropriate bolts (Item 26).
13. Install plunger (Item 22) into the front drive switch hole with the rounded end toward the shaft. Install the shift indicator switch (Item 20) with one copper washer (Item 21). Test switch operation with a circuit tester while shifting into and out of front drive. Add washers as necessary to make the switch operate properly.
14. Cover exposed end of shifter shafts with the gaskets (Item 23) and covers (Item 24) provided. Secure with 4 bolts (Item 25) each tightened to specifications.
15. Insert each detent ball and detent spring into proper bore in top of housing. Install each detent set screw and tighten until it takes a force of 25-40 lbs. to push the shift shaft out of detent.



## J. Assembly of PTO Unit

(On Cases so Equipped)

Refer to Illustration on Page PM12

1. Put shift fork (Item 59) into housing (Item 61) with the chamfered side of the shift shaft hole toward the two opening ends of the housing, put clutch collar (Item 60) into the housing (with the chamfered end pointing as indicated and into the forked section of the shift fork).
2. Install the shift shaft (Item 49 on Page PM13) or (Item 53 on Page PM14). Install locknut (Item 47 on Page PM13 or PM14). Restrain nut with a box wrench and turn the shaft with an open end wrench.
3. Press bearing cones (Item 64) onto shaft (Item 65). Press seal (Item 69) into bearing carrier (Item 67). Press one cup (Item 63) into carrier.
4. Install shaft (Item 65) with bearing cones into the carrier sub-assembly and install the second bearing cup (Item 63).
5. Install the bearing carrier — shaft assembly onto the housing (Item 61) with the shaft passing into the shift collar. Temporarily bolt the carrier to the housing. With bolts (Item 68) tightened to 15 ft. lbs., measure gap between the parts. Select a shim stack that measures .005 to .010 larger than the gap measurement.

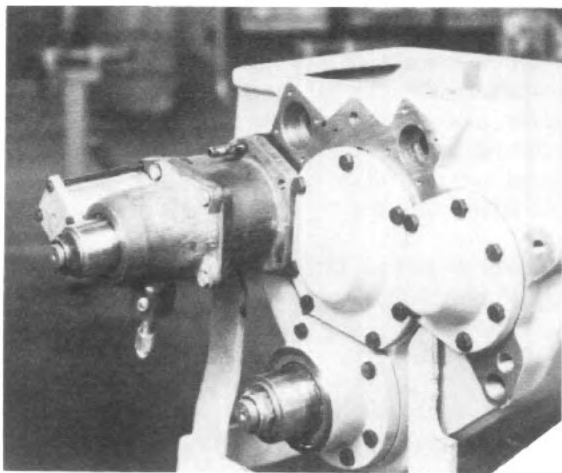
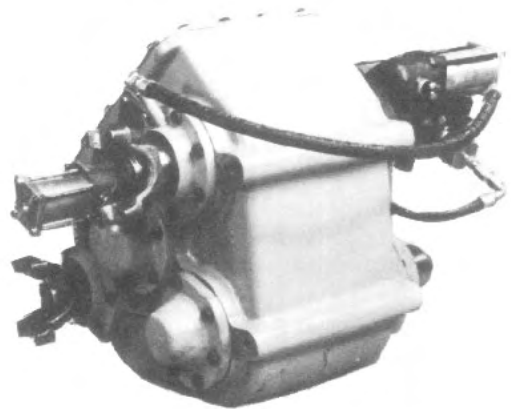


Fig. 37



6. Remove bolts (Item 68), install shim, reinstall bolts with Permatex on their threads. Tighten to the specified torque. *Skip to J8 if case is equipped with an air operated PTO shift.*
7. Refer to Page PM14. Install the manual shift linkage as follows:
  - a. Oil and install o-ring (Item 3) on seal carrier (Item 52). Install seal (Item 27). Lubricate inside of seal carrier and the seal with Lubriplate or transfer case oil.
  - b. Fit seal carrier onto the shift shaft and into the shift opening on the PTO housing. The detent ball opening should be facing in the same general direction as the indicator light switch hole. Install the four bolts (Item 54), tightening to specifications.
  - c. Put nut (Item 56) on eye (Item 57). Install (Item 57) onto end of shift shaft (Item 53). Install detent ball (Item 32), detent spring (Item 31) and set screw (Item 30). Tighten set screw until it takes a force of 25-40 lbs. to push the shift shaft out of detent.
  - d. Position lever (Item 58) on eye (Item 57) with pin (Item 59) washers (Item 60) and cotter pin installed as illustrated on the oil line and fitting illustration (Page PM15). Install link (Item 55) as illustrated. Check shift action before tightening lock nut (Item 56). The eye should be adjusted as necessary to make the lever angles approximately even in the engaged and disengaged positions. *Skip section J8 and proceed with step J9.*

8. Refer to Page PM13, install the Air Operated PTO Shift as follows: Oil o-rings (Item 3), install on adaptor (Item 50). Place adaptor over shift shaft and into the PTO housing with the counterbored end outboard. Place o-ring (Item 11) carefully over the end of the shift shaft. Position spring (Item 51) over the shift shaft and into the adaptor (Item 50). Place bump ring (Item 13) over spring (Item 51). Move shift collar and restrain to make shift shaft project as far as possible. Install piston (Item 9), washer (Item 7) and nut (Item 6). Tighten nut to specified torque. Install felt ring (Item 10) (after soaking in transfer case lubricant) in wide groove of piston. Oil o-ring (Item 8) and install in the outboard groove of the piston. Install cylinder cap. Slip the shift cylinder tube (Item 43) (3 $\frac{1}{8}$ " long) over the piston, onto the adaptor. Fit the shift cylinder cap into place and install the four capscrews that retain the assembly to the PTO unit, tighten to the specified torque.

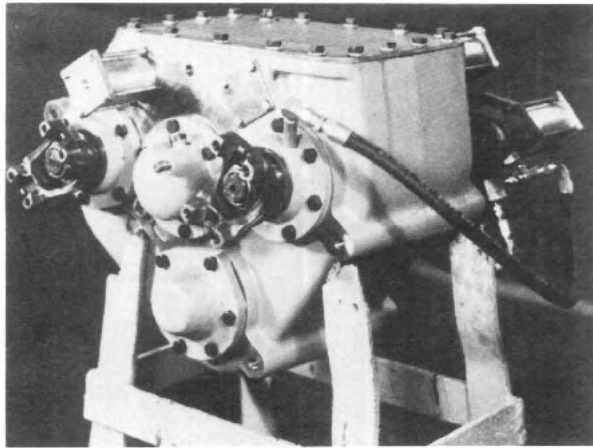


Fig. 38

9. Install the indicator light switch (Item 20) with same washers (Item 21) as were removed during disassembly. Check switch operation with a continuity tester (and air pressure applied to the shift cylinder, if so equipped).
10. Install the blanking sleeve (Item 70) on the PTO output to seal the output shaft section of the PTO, if a yoke is not to be installed immediately.
11. The PTO unit includes an oil pump that consists of items 73 through item 80 on Page PM12. Also refer to Fig. 39. The piston (Item 73) is driven by the eccentric section of shaft (Item 65). A check valve (Item 74) is retained within the piston by a spring type retaining ring (Item 75). This check valve must be installed with the free flow direction and arrow direction pointing toward the PTO shaft. This allows a small portion of the oil pump output to be directed onto the shaft's eccentric surface. Screw nut (Item 77) onto cylinder (Item 79) with nylon portion pointing away from the hexagon section of the cylinder. Coat

the piston, check valve and retaining ring assembly with transfer case lubricant. Put the spring (Item 76) into the counterbore of the piston and then put the cylinder over the spring and piston. Push the piston into the cylinder until the end of the cylinder is just even with the port in the side of the cylinder. The piston should move freely without binding. Screw the cylinder into the PTO bearing carrier (See Fig. 39). Rotate the PTO shaft to place the high point

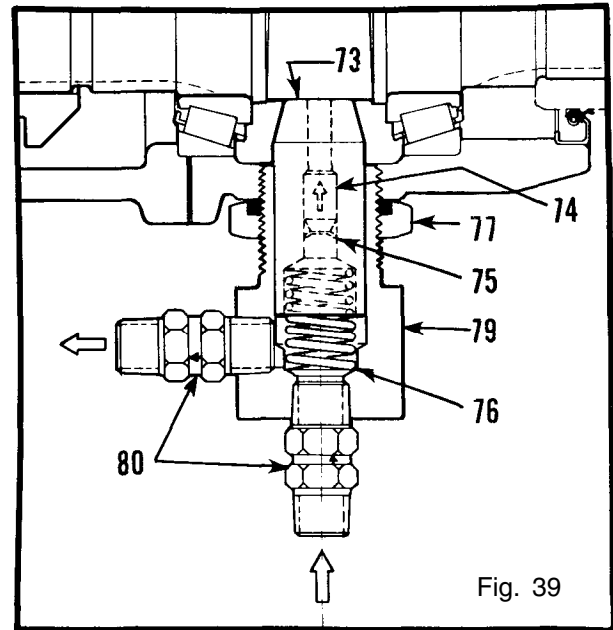


Fig. 39

of the cam under the piston, screw the cylinder in until the outer end of piston is visible short of the cylinder side port. Rotate the PTO shaft to verify that it is indeed on the high point of the cam. Screw the cylinder in until the outer end of the piston is just even with the side port; unscrew cylinder at least one turn, but not more than one and one half turns; tighten lock nut against the PTO bearing carrier with one side port of the cylinder pointing in the direction shown on Page PM15. *Use pipe dope on all pipe threaded fittings.* Screw check valves (Item 80) into place in the cylinder. The inlet check valve should be installed (with the arrow pointing into cylinder) in the end of the cylinder. The outlet valve should have the arrow pointing away from the cylinder and should be in the position shown on Page PM15 to allow the hose (Item 4) to be used to connect the pump to fitting (Item 5) at the front of the case.

8. Refer to section VI G, paragraph 12 for installation of the PTO unit on the transfer case. Also See Fig. 33 and Fig. 37.
9. Refer to Page 2 and Page PM15 for the proper installation of the oil lines. Also see Fig. 1, 2, and 38.
10. Check oil flow out of oil pump upon installation. Refer to Section III B of this manual.

## K. Final Assembly

Refer to Page PM16

1. Rotate all shafts with shift shafts shifted to all positions. Observe through cover opening. Make sure there are no loose tools, bolts or other foreign objects in the assembly.
2. Install cover gasket and cover, coat bolt threads with Permatex, use a lockwasher on each bolt and tighten to the specified torque.
3. If the transfer case was equipped with a parking brake, remove output flange (installed in step E10) and reinstall brake assembly, output flange and drum.
4. Install drain and fill plugs.
5. Refer to Section "J" if case is equipped with a PTO unit.
6. Attach all mounting brackets before reinstalling case in the truck. *Refer to Section III B of this manual for installation instructions, to Section II for lubricant instructions.*

## VII. TORQUE SPECIFICATIONS

DESCRIPTION	LOCATION	FT. LBS. TORQUE	SIZE
A. FRONT OUTPUT SHAFT			
Front Seal Carrier Bolts } Rear Cap Bolts } Front Output Yoke Locknut		45 300	7/16-14 1 1/4-18
B. REAR OUTPUT SHAFT			
Front Cap Bolts } Rear Carrier Bolts } Parking Brake Carrier Bolts } Front Bearing Retaining Nut Rear Yoke or Flange Locknut		45 175 300	7/16-14 1-20 1 1/4-18
C. INTERMEDIATE SHAFT			
Speedo Cap Mounting Bolts } Roller Bearing Carrier Bolts } Front Bearing and Speedo Gear Locknut Rear Bearing Locknut		45 175 300	7/16-14 1-20 1 1/4-18
D. INPUT SHAFT			
Front Seal Carrier Bolts } Rear Cap Bolts } PTO Mounting Bolts } Input Yoke Retaining Locknut		45 300	7/16-14 1 1/4-18
E. PTO UNIT			
Mounting Bolts to Case Housing Bearing & Seal Carrier to PTO Housing PTO Shift Shaft Fork Retaining Nut Manual Shift Seal Carrier Mounting } Air Shift Cylinder Mounting } Set Screw, Detent Ball Output Yoke Locknut		45 30 30 15 175	7/16-14 3/8-16 3/8-24 1/4-20 1-20
See Section VI-J Paragraph 7			
F. SHIFT SHAFTS			
Shift Fork Set Screws Set Screw, Detent Balls Seal Carrier & Cap Mounting Bolts Air Cylinder Bolts, Studs or Nuts Air Shift Piston Retainer Nut		25 30 15 15 30	3/8-24 1 1/4-20 1/4-20 3/8-24
See Section VI-I Paragraph 15			
G. COVER			
Cover Mounting Bolts		45	7/16-14