

# Eaton Fuller Heavy-Duty Transmissions TRSM0996 EN-US

June 2008

AT-1202 Models



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## Warnings and Precautions



**Before starting a vehicle always be seated in the driver's seat, place the transmission in neutral, set the parking brakes and disengage the clutch.**

**Before working on a vehicle place the transmission in neutral, set the parking brakes and block the wheels.**

**Before towing the vehicle place the transmission in neutral, and lift the rear wheels off the ground, remove the axle shafts, or disconnect the driveline to avoid damage to the transmission during towing.**

The description and specifications contained in this service publication are current at the time of printing.

Eaton Corporation reserves the right to discontinue or modify its models and/or procedures and to change specifications at any time without notice.

Any reference to brand name in this publication is made as an example of the types of tools and materials recommended for use and should not be considered an endorsement. Equivalents may be used.



This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technician or vehicle operator.

**Warning:** Failure to follow indicated procedures creates a high risk of personal injury to the servicing technician.

**Caution:** Failure to follow indicated procedures may cause component damage or malfunction.

**Note:** Additional service information not covered in the service procedures.

**Tip:** Helpful removal and installation procedures to aid in the service of this unit.

**Always use genuine Eaton replacement parts.**

# Introduction

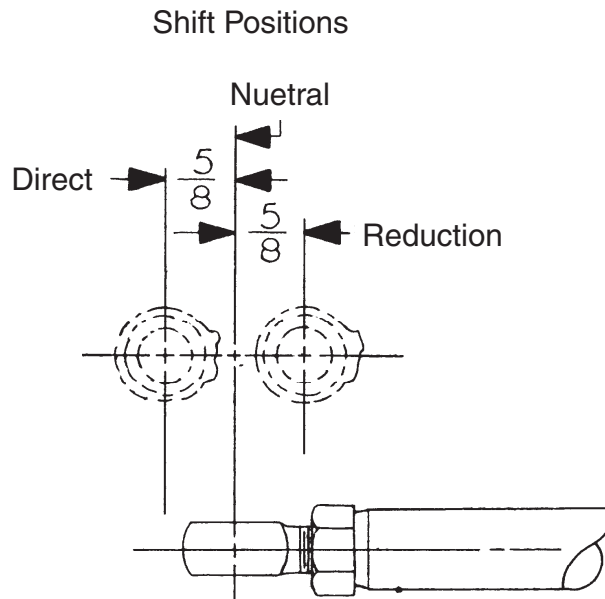
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## **Description**

The AT-1202 model is a two-speed, twin countershaft auxiliary transmission designed primarily for use with heavy-duty transmissions.

This auxiliary transmission contains two sets of gears, thus giving the reduction (low) ratio when power is delivered through these two sets of gears. The other speed is obtained by direct (high) drive through the auxiliary. A single shift bar in the right side of the case controls speed changes.

## Shift Positions and Specifications



## Specifications

### Gear Ratios

Gear Ratios	
Direct	1.00
Reduction	2.036

### Mountings

Front bearing cover machined for trunnion mounting.

Four 5/8" diameter mounting studs, two on each side of case.

Power Take-OFF	
Bottom	SAE Standard 6-bolt, 30 tooth, 5P gear on left countershaft turning at .993 input shaft speed.
Top	SAE Standard 8-bolt, 30 tooth, 5P gear on right countershaft turning at .993 input shaft speed.

Weight	330 pounds
Oil Capacity	12 pints
Installation length	16-3/16 inches

# Lubrication

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## Lubrication Specifications

**Note:** For a list of Eaton Approved Synthetic Lubricants, see TCMT-0021 the list of approved lubricants and TCMT-0021 the list of lube intervals, or call 1-800-826-HELP (4357). Recommended lubricants for the 2-A-92 are currently the E500 and the E250, which list a mileage, a year, and a hour change interval.

**Note:** The use of lubricants not meeting these requirements will affect warranty coverage.

**Note:** Additives and friction modifiers must not be introduced.

**Note:** Never mix engine oils and gear oils in the same transmission.

## Buy from a reputable dealer

For a complete list of approved and reputable dealers, write to: Eaton Corporation, Worldwide Marketing Services, P.O. Box 4013, Kalamazoo, MI 49003

## Transmission Operating Angles

If the transmission operating angle is more than 12 degrees, improper lubrication will occur. The operating angle is the transmission mounting angle in the chassis plus the percent of upgrade (expressed in degrees). For operating angles over 12 degrees, the transmission must be equipped with an oil pump or cooler kit to insure proper lubrication.

## Mixing of Oil Types



**CAUTION:** Never mix engine oils & gear oils in the same transmission.

Engine oils and gear oils may not be compatible; mixing can cause breakdown of the lubricant and affect component performance. When switching between types of lubricants, all areas of each affected component must be thoroughly flushed.

## Operating Temperature

### Oil Coolers

Kit K-1702 includes the pump, cooler and accessories to convert the AT-1202.

## Preventative Maintenance Check List

The following maintenance checks can be made without removing the transmission from the chassis. Items 1 through 5 can be performed without any prior mechanical work; items 6 through 8 require the dropping of the output driveline and the input driveline where possible.

### 1. Oil Leaks

- Make visual checks for oil leakage from mainshaft openings, gaskets at bearing covers, top cover, and from front rear shifting bar bores. Check drain plugs for looseness.

### 2. Gear Lubricant

- Remove filler plug in right side and check oil level at regular service intervals.
- Change oil at specified intervals, using grade and type recommended.

**Note:** See Lubrication section for inspection, oil type, grade, and oil capacity.

### 3. Gear Shift Lever and Linkage

- Check the auxiliary gear shift lever for wear at mounting.
- Check shifting linkage for wear and looseness.
- Check to make sure exact neutral position of auxiliary gear shift lever corresponds to neutral position of auxiliary shifting bar.

### 4. Capscrews and Nuts

- Check capscrews in top cover and bearing covers for looseness which might be the cause of oil leakage.
- Check nuts on rear support bracket or plate for looseness.

### 5. Mountings

- Check mounting bolts and nuts for looseness.

### 6. Universal Joint Companion Flange Retaining Nuts

- With output driveline dropped, and front driveline dropped, where possible, check nuts for looseness. Tighten to recommended torque.

### 7. Splines on Shafts

- Check input and output shafts for wear from movement and chocking action of universal joint companion flange.

### 8. Mainshaft Rear Bearing

- Pry upward against output shaft to check radial clearance of mainshaft rear bearing.

# Tools

## Tool Reference

Some illustrations in this manual show the use of specialized maintenance tools. These tools are recommended for transmission repair as they make repair easier, faster, and prevent costly damage to such critical parts as bearings and sleeves.

Listed below are charts which list these specialized tools, the tool name and how it can be obtained.

### General Tools

Tool	Purpose
0-100 lbs.ft. 1/2" drive Torque Wrench	General torquing of fasteners.
0-600 lbs.ft. 3/4" or 1" drive Torque Wrench	Torquing of output nut.
Snap Ring Pliers - large standard external	To remove snap rings at the auxiliary drive gear, input shaft bearing, and countershaft.
Rolling Head (Crow's foot) prybar	To remove the auxiliary drive gear bearing.

### Aftermarket Tools

Tool	Purpose	Eaton Part Number
Seal Driver Kit	To install seal	K-2413

### Special Tools

Reference Number	Tool	Purpose	G and W Tool Number	Great Lakes Tool Number
	Seal Driver	Used to install the oil seals in the front and rear bearing cover housings.	G-112	
	Bearing Driver	Used to install the input shaft and output shaft bearings.		
	Bearing Driver	Used to install the countershaft bearings.		

### Specialty Tool Manufacturers

Below are the addresses and phone numbers of the companies that make tools specifically for Eaton®Fuller® transmissions:

#### G and W Tool Company

1105 E. Louisville, Broken Arrow, OK 74012-5724, Phone: 800-247-5882, or 918-258-6881

#### Great Lakes Tool

8530 M-89, Richland, MI 49083, Phone: 800-877-9618, or 269-629-9628



## Torque Ratings

Recommended torque ratings, location and thread sizes of capscrews and nuts are listed below. Capscrew lengths are given for reference purposes as a guide for installation at proper locations.

Correct torque application is extremely important to assure long transmission life and dependable performance. Over-tightening or undertightening can result in a loose installation and in many instances, cause damage to transmission gears, shafts and bearings. Do not torque capscrews dry.

### Capscrews

Location	Quantity	Thread Size and Length	Torque Rating Foot-Pounds
PTO cover, large	8	7/16 - 14x 1	50 - 65 lbs. ft.
PTO cover, small	6	3/8 - 16x 3/4	18-23 lbs. ft. (12-15 lbs. ft. with oil filter)
Countershaft Front Bearing Covers	8	3/8 - 16x 1	
Countershaft Rear Bearing Covers	8	3/8 - 16x 3	
Rear Plate to Front Case	16	3/8 - 16x 1 - 1/2	
	1	3/8 - 16x 3	35-45 lbs. ft.
	2	3/8 - 16x 2	
Rear Bearing Housing	5	3/8 - 16x 3	
	1	3/8 - 16x 3 eslock	
Shift Bar Housing	4	3/8 - 16x 1 - 1/4	

### Nuts

Location	Quantity	Thread Size and Length	Torque Rating
Mounting Studs	4	5/8 - 18	170 - 185
Front Bearing Housing	6	1/2 - 20	
Companion Flanges or Yokes	2	2 3/4 - 16	450 - 500

**Note:** Installing the capscrews with more than 23 lbs. ft. of torque will force the corners of the PTO cover away from the case with resultant oil leakage.

# Removal and Disassembly

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## General Instructions for Disassembly

**Important:** Read this section before starting the detailed disassembly procedures.

It is assumed in the detailed disassembly instructions that the transmission has been removed from the chassis, the lubricant has been drained, the parking brake removed, if so equipped, and both universal joint companion flanges have been removed.

Follow each procedure closely in each section, making use of both the text and pictures. Use certain precautions, as listed below, during disassembly.

### Cleanliness

- Provide a clean place to work. It is important that no dirt or foreign material enters the unit during repairs. The outside of the unit should be carefully cleaned before starting the disassembly. Dirt is abrasive and can damage highly polished parts such as bearings, sleeves, and bushings.

### Bearings

- Carefully wash and re-lubricate all bearings as removed and protectively wrap until ready for use. Remove all bearings with pullers designed for this purpose. Do not remove bearings with hammer and punch.



Bearing removed with punch, damaged shield.



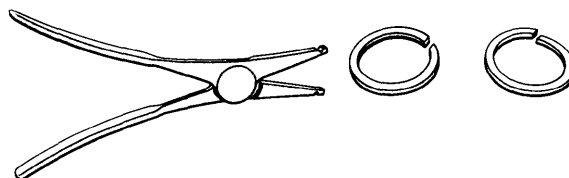
Bearing removed with chisel, damaged outer race.

### When Driving

- Apply force to shafts, bearings, and housings with restraint. Movement of some parts is restricted. Do not apply force after the part being driven stops solidly. Use soft hammers, soft bars, and mauls for all disassembly work.

### Snap Rings

- Remove snap rings with pliers designed for this purpose. Rings removed in this manner may be reused.



## How to Remove the Companion Flanges or Yokes

### Special Instructions

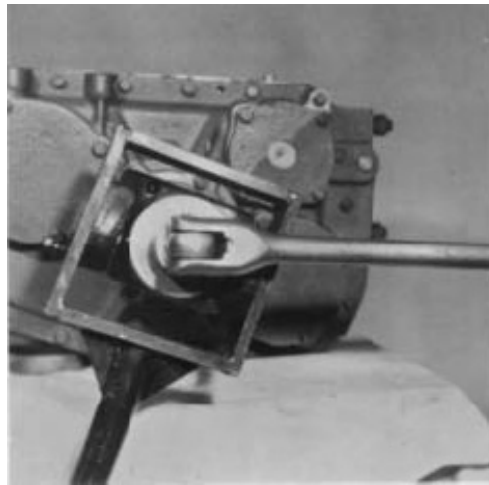
None

### Special Tools

- Typical service tools

### Procedure -

1. Brace against the yoke or flange on each shaft and use a large breaker bar to remove the elastic stop nut from each shaft.



2. Remove the washer and flange or yoke from each shaft.

**Note:** If a special tool is not available, the stop nuts may be removed by putting the transmission in direct gear, installing a breaker bar on the stop nut of both input and output shaft and removing the nuts by bracing them against each other.



# Removal and Disassembly

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## How to Remove the Rear Plate from the Front Case

### Special Instructions

None

### Special Tools

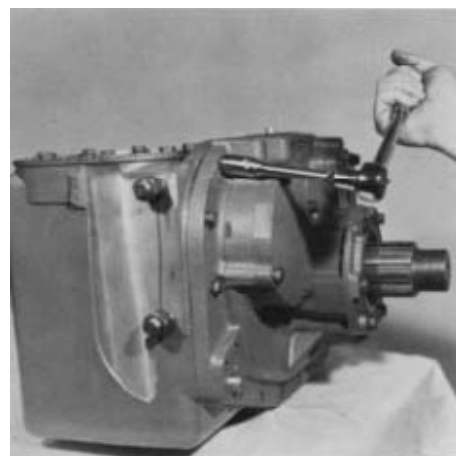
- Typical service tools

### Procedure -

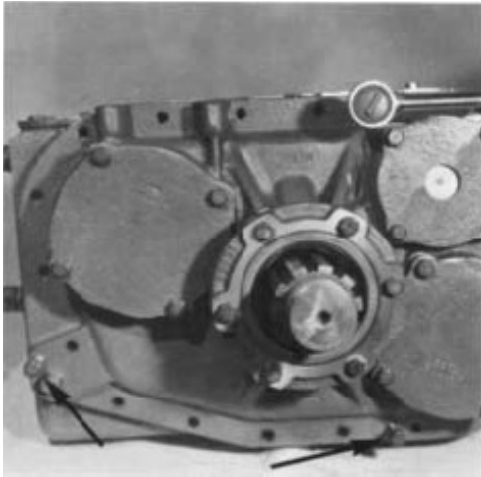
1. Loosen the jam nut and turn the rod end from the end of the shift bar.



2. Turn out the 19 capscrews attaching the rear plate to the front case.

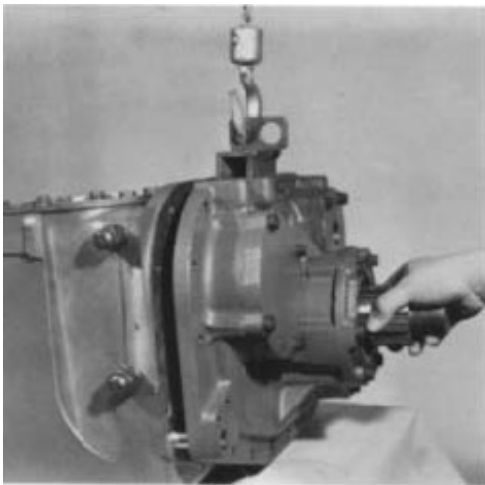


# Removal and Disassembly



3. Insert three puller screws in the three tapped holes in the mounting flange of the rear approximately 1/2 to break the gasket.

4. Attach a chain hoist to the rear plate and move the plate evenly to the rear and off the front case dowel pins. Mount the rear plate in a vise in the upright position.



# Removal and Disassembly

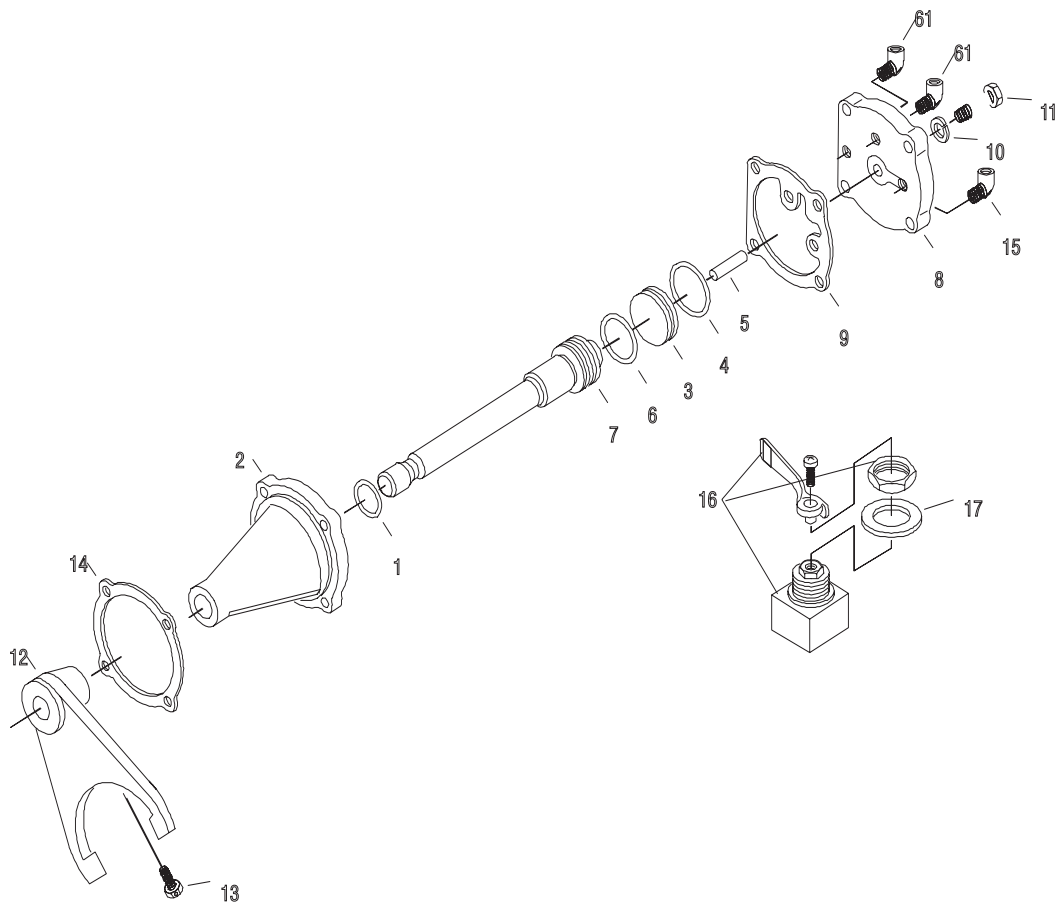
## How to Remove the Shifting Control Assembly With Air

### Special Instructions

None

### Special Tools

- Typical service tools



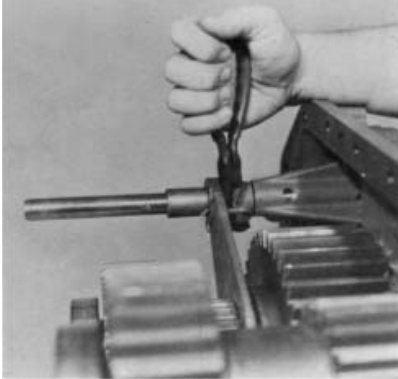
- 1. O-ring
- 2. Shift Cylinder
- 3. Shift Piston Assembly
- 4. O-ring
- 5. Roll Pin
- 6. O-ring
- 7. Yoke Bar
- 8. Cylinder Cover
- 9. Gasket
- 10. Lockwasher

- 11. Capscrew
- 12. Shift Yoke
- 13. Lockscrew
- 14. Gasket
- 15. Elbow
- 16. Air Valve
- 17. Air Valve
- 18. Valve Plate

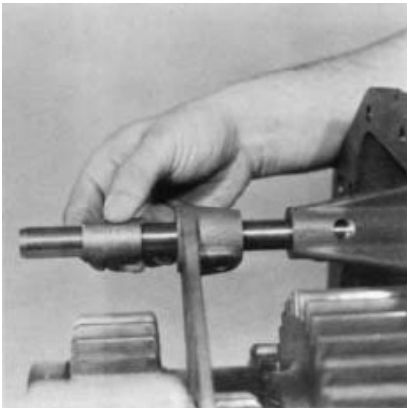
# Removal and Disassembly

## Procedure -

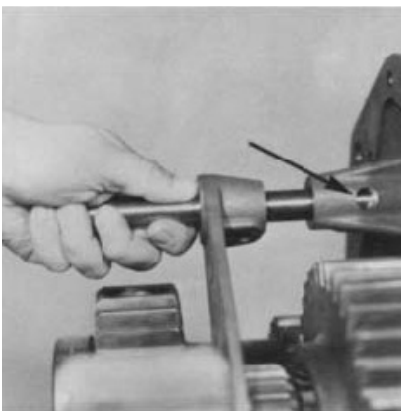
1. Cut the lockwire and remove the yoke lockscrew.



2. Remove the spacer from the front of the shift bar.



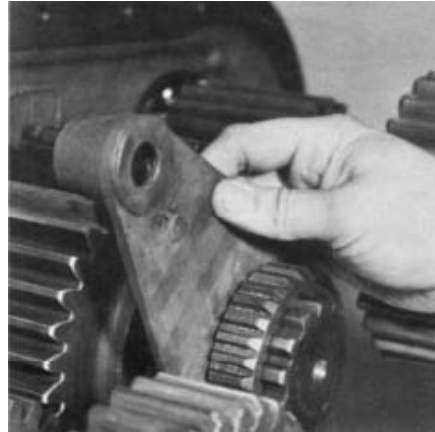
3. Put a rag over the bore in the shift bar housing to prevent loss of the tension spring and ball and pull the shift bar sharply forward and from the housing.



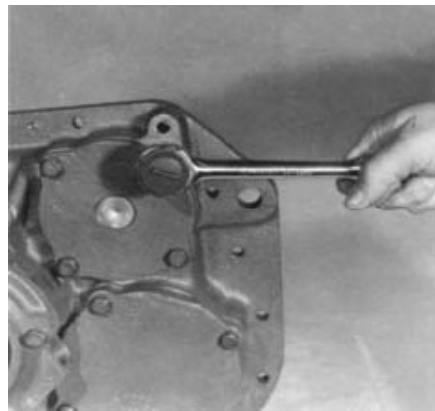
# Removal and Disassembly

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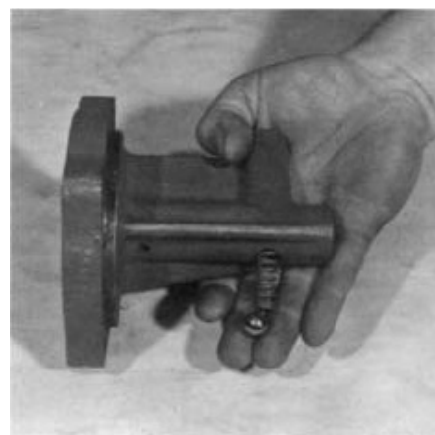
4. Remove the yoke from the sliding clutch and remove the sliding clutch from the splines of the output shaft.



5. Turn out the four capscrews attaching the shift bar housing to the rear plate and remove the housing.



6. Tip the housing to remove the tension spring and ball.





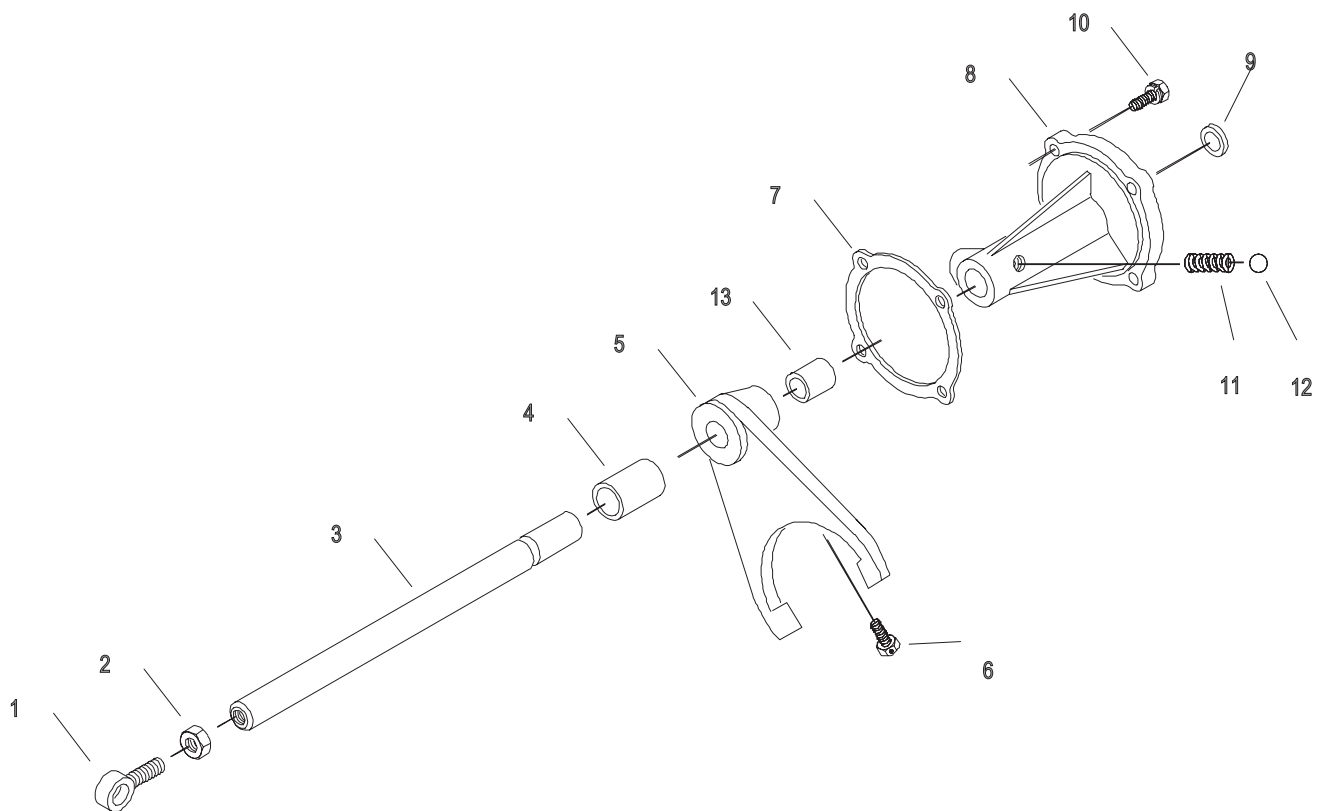
## How to Remove the Shifting Control Assembly Without Air

### Special Instructions

None

### Special Tools

- Typical service tools



1. Eye Rod end
2. Nut
3. Yoke Bar
4. Spacer
5. Shift Yoke
6. Lockscrew
7. Gasket
8. Shift Cylinder

9. Plug
10. Capscrew
11. Spring
12. Steel Ball
13. NLA-Spacer

# Removal and Disassembly

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## **Procedure -**

1. Cut the lockwire and remove the yoke lockscrew.
2. Remove the spacer from the front of the shift bar.
3. Put a rag over the bore in the shift bar housing to prevent loss of the tension spring and ball and pull the shift bar sharply forward and from the housing.
4. Remove the yoke from the sliding clutch and remove the sliding clutch from the splines of the output shaft.

5. Turn out the four capscrews attaching the shift bar housing to the rear plate and remove the housing.l

6. Tip the housing to remove the tension spring and ball.

# Removal and Disassembly

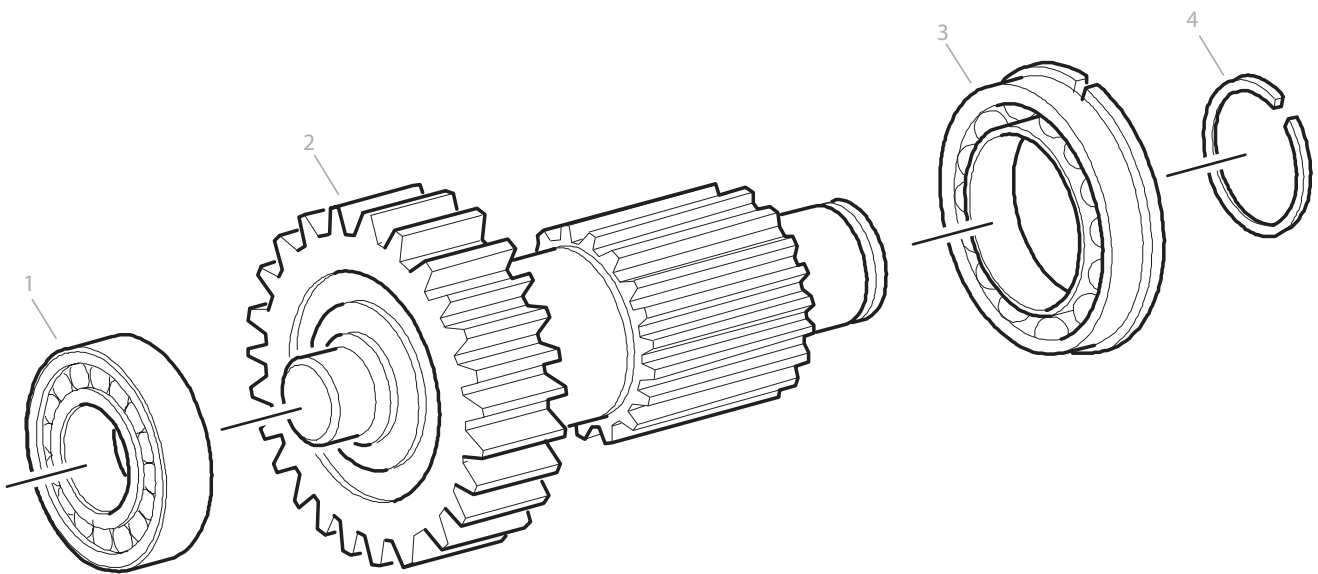
## How to Remove the Countershaft Assemblies

### Special Instructions

None

### Special Tools

- Typical service tools



1. Bearing
2. Welded Countershaft
3. Bearing
4. Snap Ring

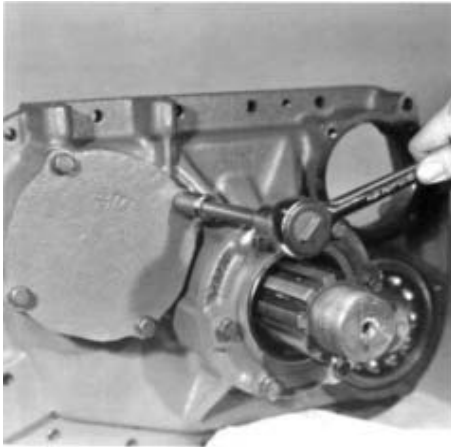
### Procedure -

1. Use a three-jaw puller or equivalent to remove the front bearing from each countershaft.

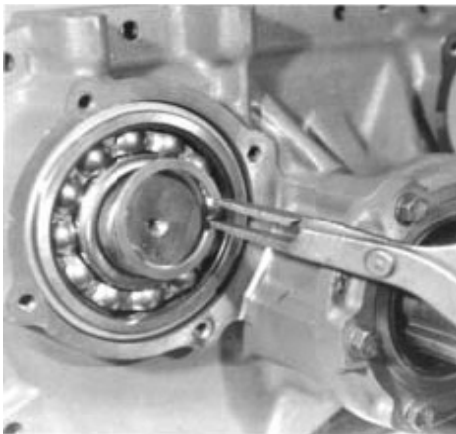


# Removal and Disassembly

2. Remove the two countershaft rear bearing covers.



3. Remove the snap ring from the rear of each countershaft.



4. Use a soft bar and maul to drive the countershaft assemblies forward and from the rear bearings.



# Removal and Disassembly

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5. Use a soft bar to tap the bearings to the rear and from the rear plate bores.



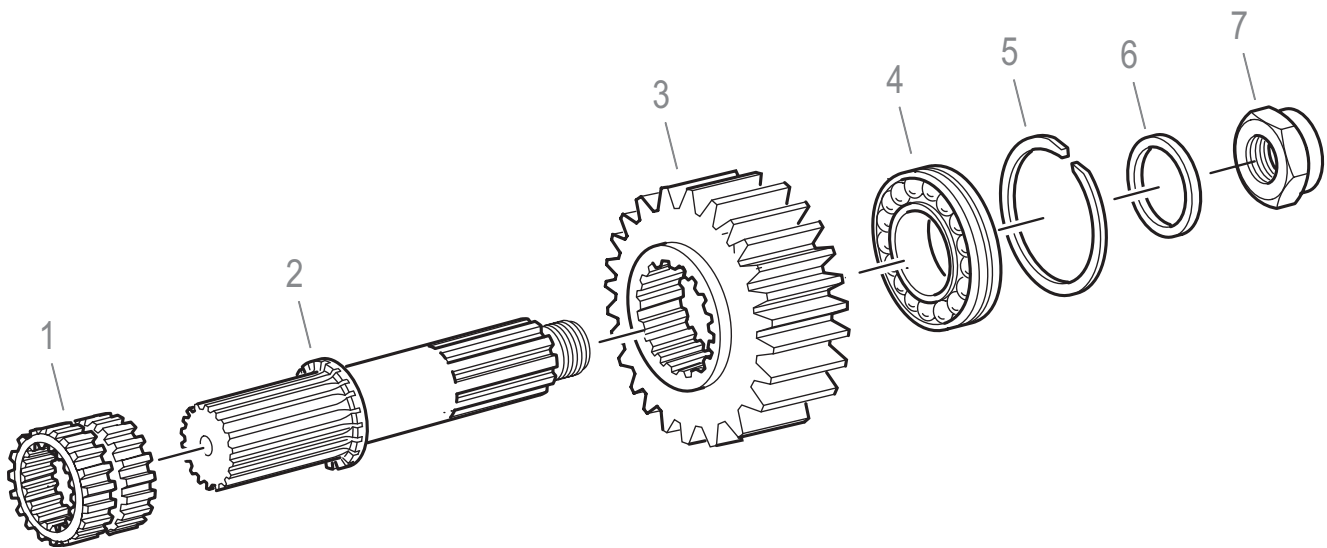
## How to Remove the Output Shaft and Reduction Gear Assembly

### Special Instructions

None

### Special Tools

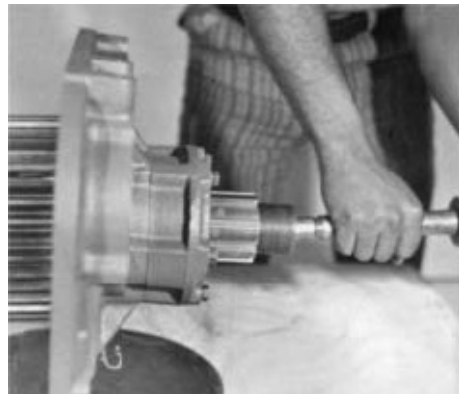
- Typical service tools



1. Sliding Clutch
2. Mainshaft
3. Reduction Gear
4. Bearing
5. Snap Ring
6. Washer
7. Nut

### Procedure -

1. Use a soft bar and maul to drive the output shaft forward and from the rear bearing assembly.



# Removal and Disassembly

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2. Remove the bearing inner spacer from the shaft.



3. Remove the snap ring from the groove in the I.D. of the reduction gear.



4. Use a soft bar to tap the reduction gear from the output shaft.



5. Using the inner race of the reduction gear bearing as a base, press the rear bearing front cone from the output shaft. This will free the reduction gear bearing and washer.



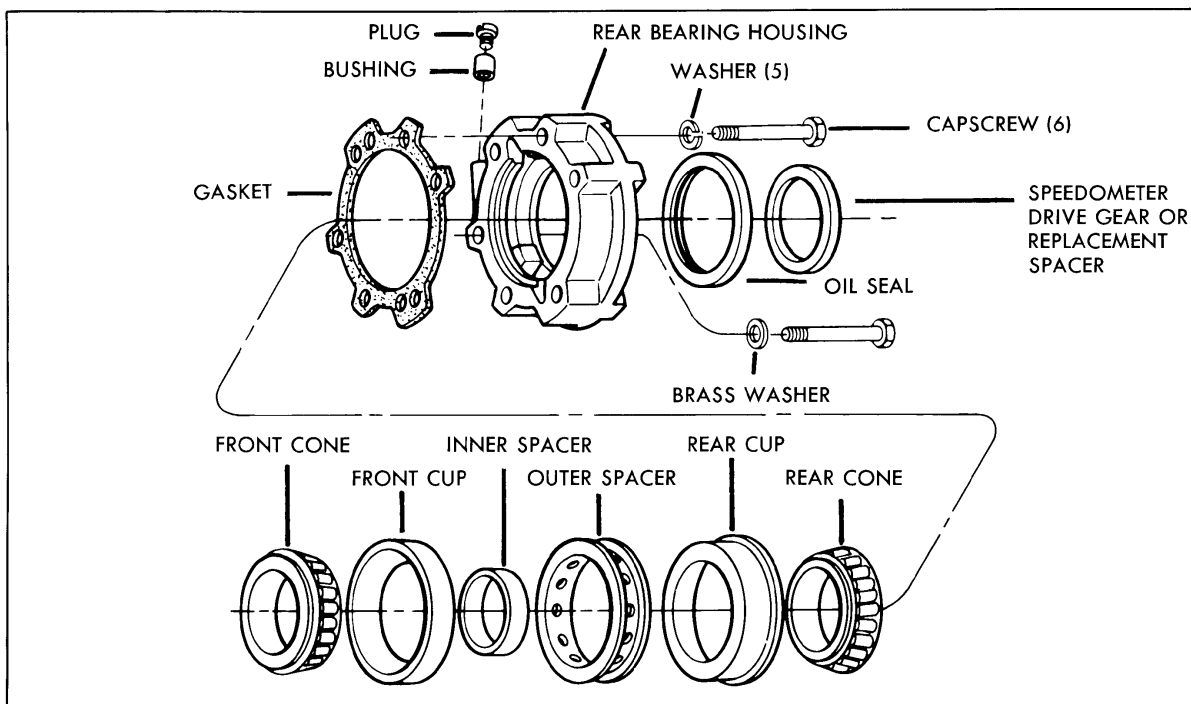
## How to Remove the Rear Bearing Assembly

### Special Instructions

None

### Special Tools

- Typical service tools



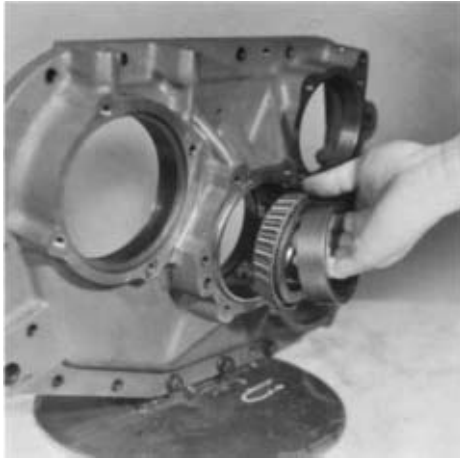
### Procedure -

1. Turn out the six capscrews attaching the rear bearing housing to the rear plate.



# Removal and Disassembly

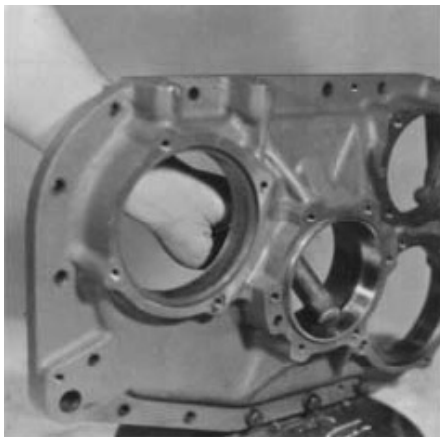
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2. Remove the rear bearing housing, rear bearing cone and speedometer drive gear or replacement spacer from the rear plate.



3. Use a soft bar to tap the front bearing cup and outer spacer forward and from the rear plate bore.



4. From inside the plate, tap the rear bearing cup to the rear and from the rear plate bore.

**Note:** If necessary, remove the oil seal from the rear bearing housing with a hammer and punch. Removal procedure will damage the seal and removal should not be attempted unless replacement of the seal is planned.

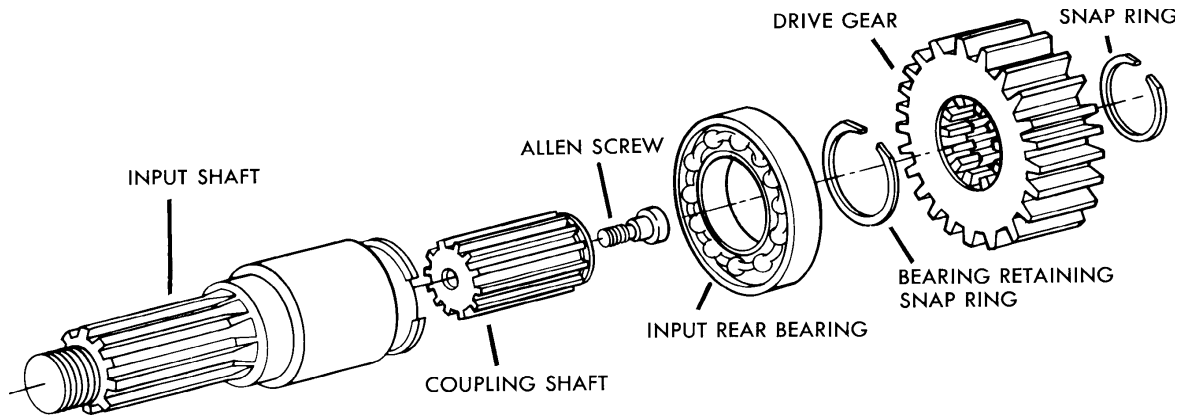
## How to Remove the Input Shaft and Drive Gear Assembly

### Special Instructions

None

### Special Tools

- Typical service tools



### Procedure -

1. Remove the snap ring from the groove in the rear of the coupling shaft.
2. Pull the drive gear to the rear and from the splines of the coupling shaft.



# Removal and Disassembly

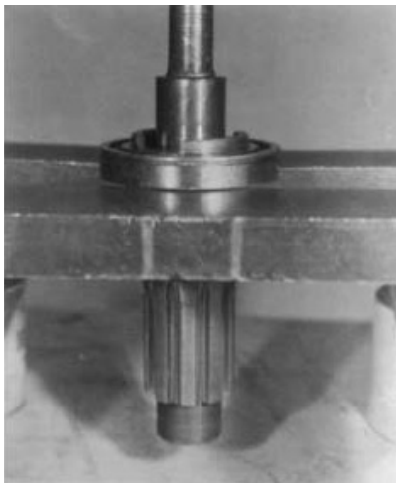
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3. Use a soft bar and maul to drive the input shaft to the rear and from the front bearing assembly.



4. Remove the snap ring from the input shaft.



5. Press the input shaft rear bearing from the shaft.

## Removal and Disassembly

6. Mount the input shaft in a vise with the threaded end down and use a Allen wrench to remove the Allen screw located in the hub of the coupling shaft. It will be necessary to turn the Allen wrench with a crescent or open end wrench.

**Note:** Do not install the input shaft in the vise by the threads.



7. Remove the coupling shaft from the input shaft.



# Removal and Disassembly

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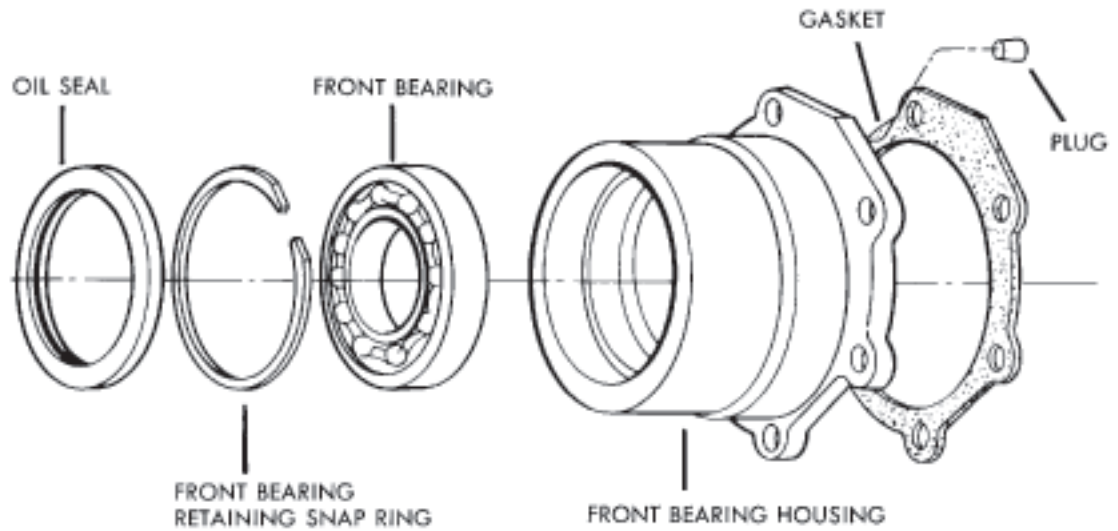
## How to Remove the Front Bearing Housing Assembly

### Special Instructions

None

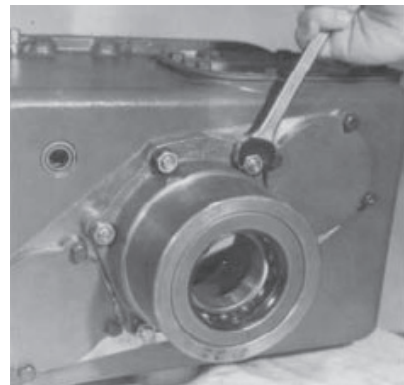
### Special Tools

- Typical service tools



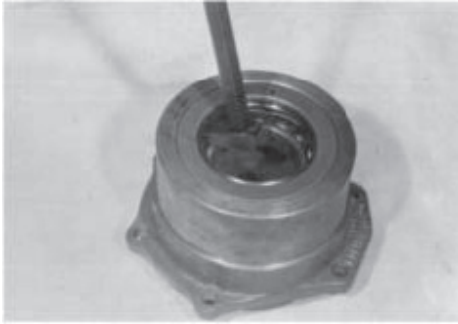
### Procedure -

1. Remove the six nuts attaching the housing to the front case and pull the housing from the studs.



# Removal and Disassembly

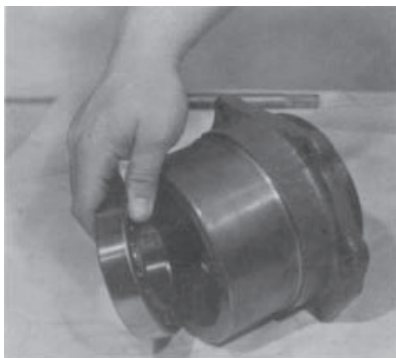
2. If necessary to remove the oil seal or front bearing



3. If necessary, remove the shifting bar packing and packing retainer from the front shifting bar bore in the case and remove the Welch plug from the rear shifting bar bore.



4. If necessary, remove the pipe plug from the bore in the top of the case.



# Removal and Disassembly

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## How to Disassemble the Front Case

### Special Instructions

None

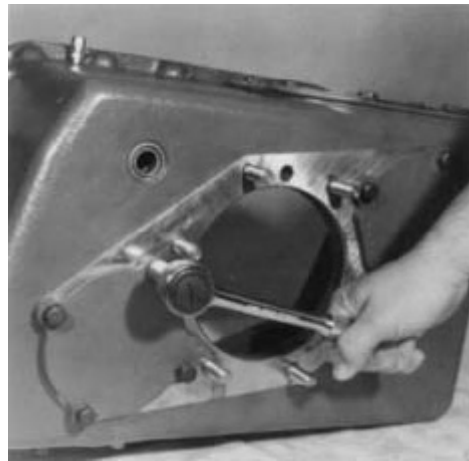
### Special Tools

- Typical service tools

### Procedure -

1. For reassembly purposes, remove the two countershaft front bearing covers.

**Note:** Remove PTO gear covers, filler and drain plugs, breather and miscellaneous items as necessary. Removal of the seal and scraper in the shift bar bore will most likely damage the parts and removal should not be attempted unless replacement of the parts is planned.





## Inspection and General Instructions for Reassembly

Before reassembling the transmission, the individual parts should be carefully checked to eliminate those damaged from previous service. This inspection procedure should be carefully followed to insure the maximum of wear life from the rebuilt unit.

The cost of a new part is generally a small fraction of the total cost of downtime and labor, should the use of a questionable part make additional repairs necessary before the next regularly scheduled overhaul.

Recommended inspection procedures are set forth in the check list which follows:

### Bearings

- Wash all bearings in clean solvent. Check balls, rolls, and races for pits and spalled areas. Check the bearing shields for damage. Replace bearings which are pitted, spalled, or damaged.
- Lubricate bearings and check for axial and radial clearances. Replace the bearings with excessive clearances.
- Check fits of the bearings in the case bores. If the outer races turn freely in the bores, the case should be replaced.



### Gears

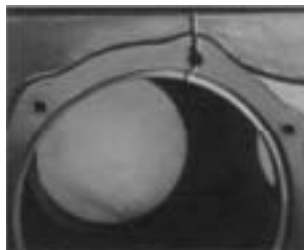
- Check the operating gear teeth for pitting on the tooth faces. Gears with pitted teeth should be replaced.
- Check all engaging gear teeth both internal and external. Gears with teeth worn, tapered, or reduced in length from clashing in shifting should be replaced.
- Check the radial clearance of the bushed gear. If excessive radial clearance is found, replace the bushing.

### Splines

- Check the splines on all the shafts for wear. If sliding gears or companion flanges have worn into the sides of the splines, shafts, or gears they should be replaced.

### Gray Iron Parts

- Check all gray iron parts for cracks and breaks. Replace or repair parts found to be damaged. Heavy castings may be welded or brazed providing the cracks do not extend into the bearing bores or bolting surfaces.



# Assembly and Installation

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## **Washers**

- Check the surfaces of the washers. Washers scored or reduced in thickness should be replaced.

## **Shifting Bar Assembly**

- Check the yoke for alignment and straighten if sprung.
- Check the lockscrew in the yoke and tighten and rewire if found loose.
- Check the neutral notches of the shifting bar for wear from the tension spring ball.
- Check yoke for wear at pads and replace if worn.
- Check yoke for excessive wear and replace if worn.

## **Bearing Covers**

- Check the covers for wear from the thrust of adjacent bearing. Replace the covers that are worn or grooved from the thrust of the bearing outer race.
- Check bores of covers for wear and replace those worn oversize.

## **Oil Seals**

- Check the lip seal in the front and rear for wear, cracks, or breaks. Check the tension of the lip on the sealed surface. Replace seals if the lip is damaged or shows no wiping action from the lip due to a lack of tension.

## General Instructions for Reassembly

Make sure the interior of the case and the other housings are clean. It is important that dirt be kept out of the transmission during reassembly. Dirt is abrasive and can damage polished surfaces of sleeves, bushings, and bearings. Use certain precautions, as listed below, during reassembly.

### Gaskets

- Use new gaskets throughout the transmission as it is being rebuilt. Make sure all gaskets are installed. Omission of gaskets can result in oil leakage or improper stack-up of bearing covers. Seat gasket on part to be installed with adhesive to hold in place during installation.



### Capscrews

- To prevent oil leakage, use adhesive sealant on all capscrews. See Torque Ratings chart on page 6 for recommended torque applications.

### Initial Lubrication

- Coat gear bushings, washers, and splines of mainshaft with Lubriplate during installation to provide initial lubrication, thus preventing scoring and galling.

### Bearings

- Use of flanged-end bearing drivers is recommended for installation of bearings. These drivers apply equal force to both inner and outer races of the bearing, preventing damage to the balls along with maintaining the correct bearing alignment with the shaft and bore. If a tubular or sleeve driver is used, apply force evenly to the inner race and drive through the tubing of the correct diameter.



# Assembly and Installation

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## **Universal Joint Companion Flanges**

- Make sure the companion flanges are pulled tightly into place with the retaining nuts. Failure to tighten the retaining nuts, or omission of parts between flanges and bearings will permit the shafts to move axially, with resultant damage to the pilot bearing, mainshaft, and drive gear.
- When installing the companion flanges, tighten the retaining nuts with 400-450 lbs. ft. of torque if elastic stop nut is used. With slotted type nut, use 250 to 300 lbs. ft. of torque. Make sure the speedometer gear has been installed between the rear flange and the bearing. If the speedometer gear is not used, a replacement spacer of the same width must be used. Make sure the speedometer gear washer is installed between the speedometer gear and bearing.

## **Oil Filling**

- Remember to fill the transmission with the correct amount of lubricant. Refer to TCMT-0021 for lubrication information.

## **Sliding Clutch**

- Check yoke and yoke slot in sliding clutch for extreme wear or discoloration from heat.
- Check engaging teeth of sliding clutch for partial engagement pattern.

## How to Assemble the Input and Coupling Shaft

### Special Instructions

Mount the input shaft in a vise with the threaded end down. Do not secure the input shaft in the vise by the threads.

### Special Tools

- Typical service tools

### Procedure -

1. Apply a drop of Grade AVV Loctite to the threads of the Allen head screw.



2. Install the coupling shaft in the input shaft with the large bore facing up.



3. Secure the coupling shaft to the input shaft with the Allen head screw. It will be necessary to turn the Allen wrench with an open-end or crescent wrench.



# Assembly and Installation

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## How to Assemble the Front Bearing Housing Assembly

### Special Instructions

None

### Special Tools

- Typical service tools

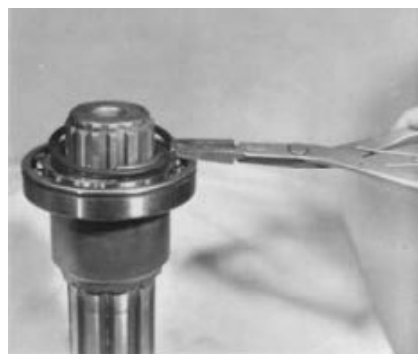
### Procedure -

1. Install the rear bearing on the input shaft against the shoulder on the shaft.

**Note:** Heating of the bearing will facilitate installation. Do not heat the bearing over 275 °F.



2. Install the snap ring in the groove on the input shaft.



3. Install the front bearing in the bearing housing with a bearing driver or by tapping carefully on the bearing inner race with a soft bar.



# Assembly and Installation



4. Install the front bearing retaining snap ring in the groove in the housing. Make sure that the snap is in the groove and not just against the shoulder in the housing bore.



5. Use an oil seal driver to install the front oil seal. The side of the oil seal with the seam should face into the housing, and the front of the seal should be flush with the face of the housing.



6. Install the front bearing housing on the front case studs with the oil feed port on the mounting surface of the bearing housing aligned with the oil port in the front of the case. Secure with the six nuts and lockwashers.

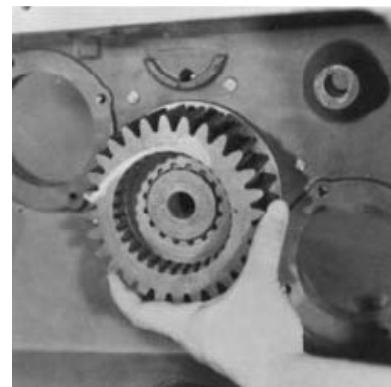
# Assembly and Installation

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7. From inside the case, start the input shaft assembly into the bearing housing bore with a soft bar. Use a soft bar and maul to drive the shaft forward until the rear bearing seats against the shoulder in the bore.

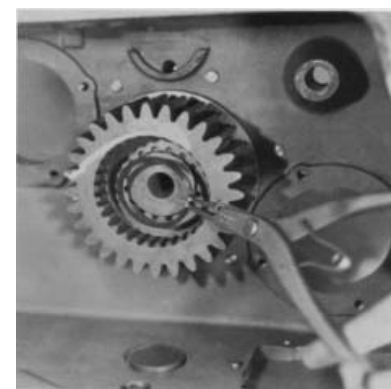


8. Install the drive gear on the shaft with the clutching teeth facing towards the rear of the case.



9. Install the snap ring in the groove on the coupling shaft.

**Note:** If previously removed, reinstall the two PTO covers, all plugs and the shift bar seal and scraper. Do not install the two countershaft front bearing covers at this time.





## How to Assemble the Output Shaft and Reduction Gear

### Special Instructions

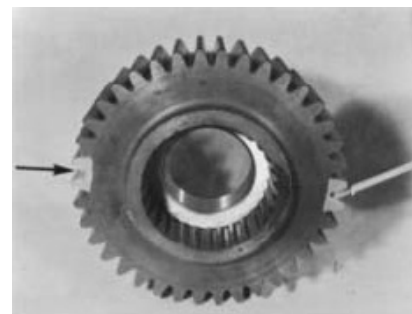
None

### Special Tools

- Typical service tools

### Procedure -

1. Install the reduction gear bearing in the hub of the reduction gear with snap ring in the bearing facing up. Use a bearing driver or tap carefully on the outer race of the bearing with a soft bar.
2. Install the snap ring in the groove in the hub of the reduction gear.
3. Mark any two teeth on the reduction gear and then mark the two teeth directly opposite.



## Assembly and Installation

---



4. Place the output shaft on a bench with the threaded end up and install the reduction gear on the shaft with the clutching teeth of the gear facing down.



5. Install the washer on the shaft and against the gear with the larger bevel on the ID of the washer facing down.



6. Install the bearing front cone on the shaft and against the washer with the taper facing up.

**Note:** Heating of the bearing will facilitate installation. Do not heat the bearing over 275°F.

7. Install the bearing inner spacer on the shaft.



# Assembly and Installation

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## How to Install the Output Shaft and Rear Bearing Assembly

### Special Instructions

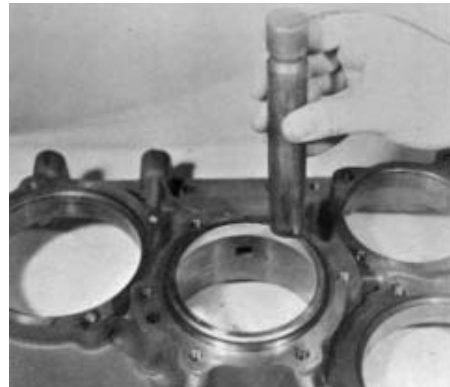
None

### Special Tools

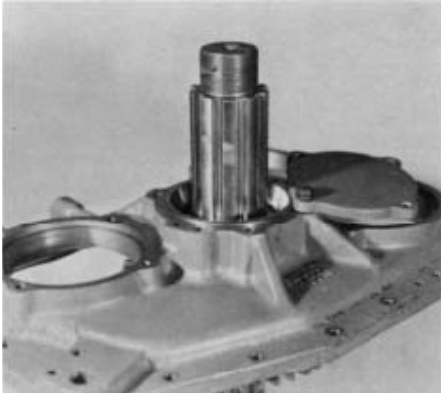
- Typical service tools

### Procedure -

1. Install the bearing front cup in the rear plate bore, taper facing up.
2. Place the bearing outer spacer on the front cup and tap evenly into the rear plate bore.
3. Place the bearing rear cup on the outer spacer and tap evenly into the bore until the rear cup lip seats against the plate.



# Assembly and Installation



4. Place the rear plate over the output shaft assembly.

**Note:** If the rear cup lip moves away from the plate, hold the lip in position against the plate by bolting a counter-shaft bearing cover on the plate mounting surface so that an edge of the cover holds the lip of the bearing cup against the rear plate.



5. Install the bearing rear cone on the shaft, taper facing down.

**Note:** Heating of the bearing will facilitate installation. Do not heat the bearing over 275°F.



6. If previously removed, install the oil seal in the rear bearing housing flush with the surface, seam of the seal facing into the housing.

**Note:** On units equipped with a speedometer driver gear, install the gear on the shaft prior to installation of the rear bearing housing.

## Assembly and Installation

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7. Install the rear bearing housing on the rear plate with the six retaining capscrews. The capscrew with the brass washer is installed in the capscrew bore intersecting the speedometer bore.

**Note:** The rear bearing housing may be installed with the speedometer bore on either the left or right hand side of the plate. Make sure that either notch in the mounting surface of the housing is lined up with the oil port in the mounting surface of the plate.



## How to Time and Install the Countershaft Assemblies

### Special Instructions

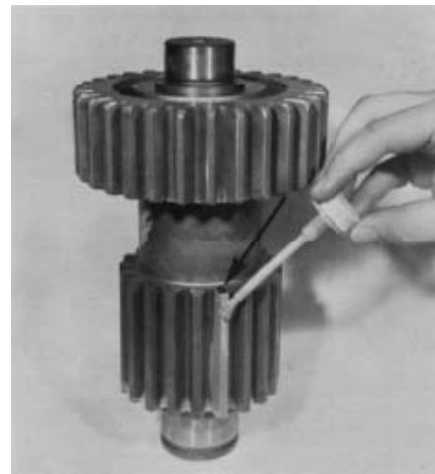
None

### Special Tools

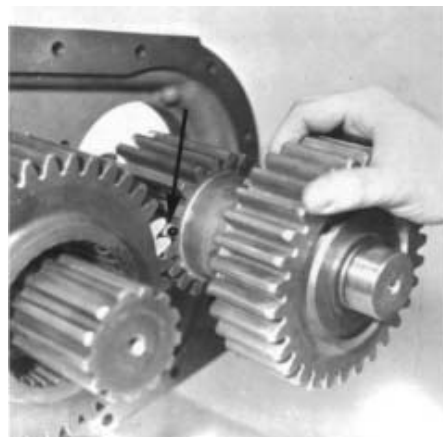
- Typical service tools

### Procedure -

1. Mark the tooth which is stamped with an "O" on the reduction gear of each countershaft.

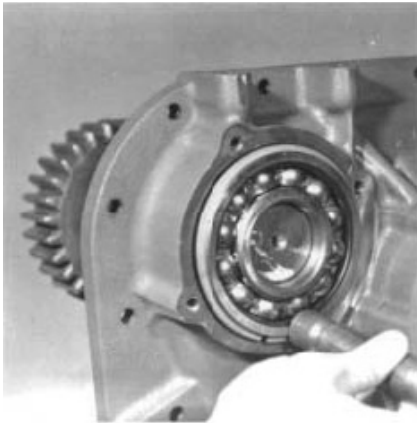


2. Place one of the countershaft assemblies in position inside the plate with the marked tooth meshed between two of the marked teeth on the reduction gear.

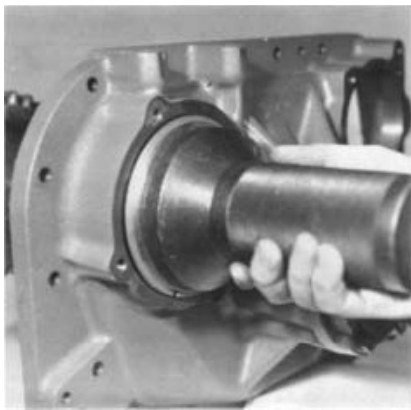


# Assembly and Installation

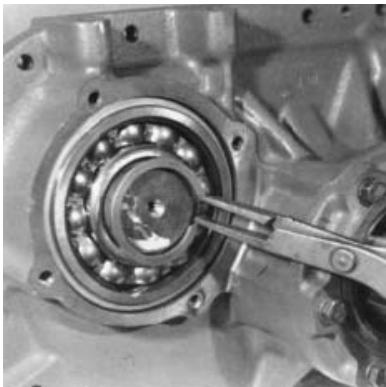
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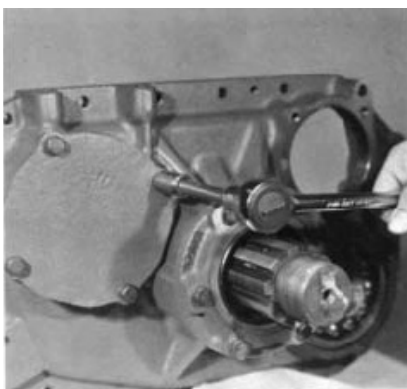
3. Use a soft bar to start the countershaft rear bearing on the shaft and in the case bore.



4. Use a bearing driver and maul to complete installation of the countershaft rear bearing. Repeat the procedure for installation of the remaining countershaft.



5. Install the snap ring in the groove at the rear of each countershaft.



6. Install the two countershaft rear bearing covers.



## How to Install the Shifting Controls

### Special Instructions

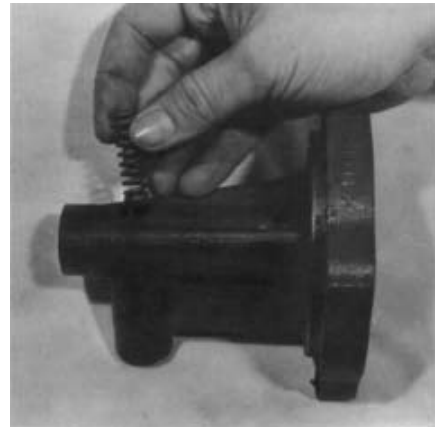
None

### Special Tools

- Typical service tools

### Procedure -

1. Install the tension spring in the bore of the shift bar housing.
2. Install the tension ball over the spring, and use a screwdriver or equivalent to hold the tension ball down and insert the end of the shift bar with the three notches into the housing until the neutral (middle) notch is over the tension spring and ball.

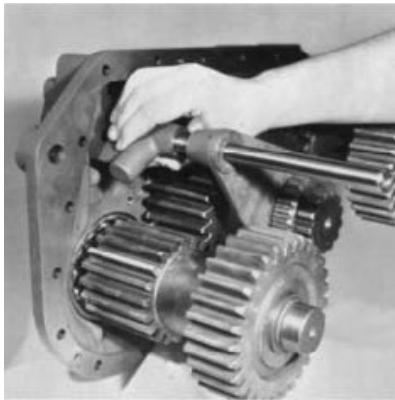


# Assembly and Installation

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3. Install the sliding clutch gear on the output shaft and place the shift yoke in position with the long hub of the yoke facing the rear plate.



4. Place the shift housing and bar in position, passing the shift bar through the yoke hub. Note that the tension spring housing faces to the outside of the plate.



5. Turn the shift bar until the lock screw bore aligns with the lock screw bore of the shift yoke. A click will be heard when the tension ball seats in the neutral notch.

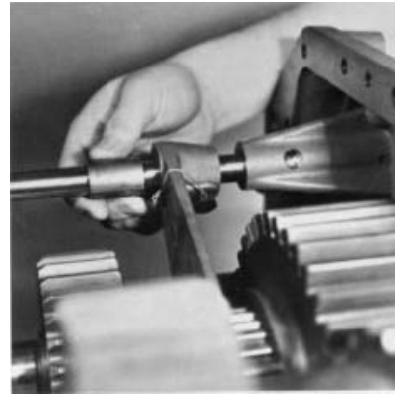
# Assembly and Installation

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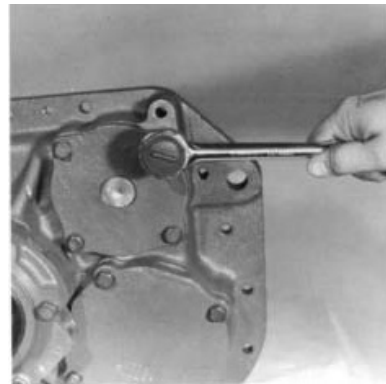
6. Install the yoke lockscrew. Tighten and lockwire securely.



7. Install the spacer on the shift bar and against the yoke with the bevel on the ID of the spacer facing the yoke.



8. Secure the shift bar housing to the rear plate with the four retaining capscrews. If previously removed, install the plug in the end of the shift bar housing.



# Assembly and Installation

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## How to Install the Rear Plate

### Special Instructions

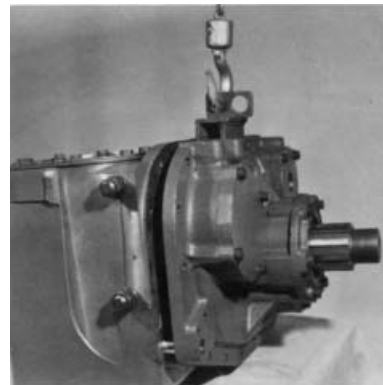
None

### Special Tools

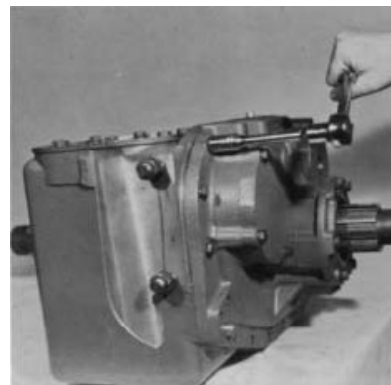
- Typical service tools

### Procedure -

1. Attach a chain hoist to the rear plate and move the plate evenly into the front case, first guiding the shift bar into the front case bore and then installing the rear plate bores on the front case dowel pins. Turn the input shaft as necessary to mesh with the countershaft assemblies.

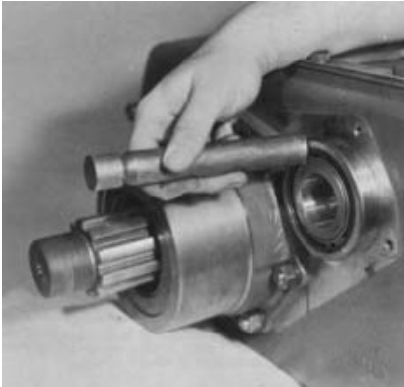


2. Secure the rear plate to the front case with the 19 retaining capscrews.

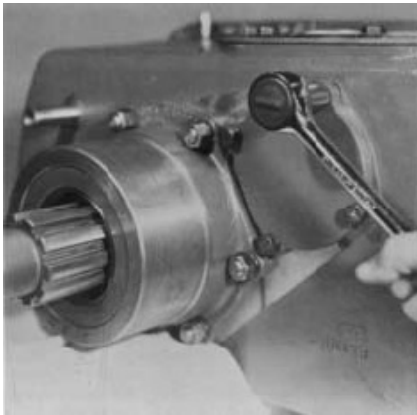


# Assembly and Installation

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3. Use a soft bar to start the countershaft front bearings on the shafts and into the case bores. Use a bearing driver to complete installation. The beveled ID of each bearing faces into the case.



4. Install the two countershaft front bearing covers.

# Assembly and Installation

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## How to Perform Final Installation of the Shifting Controls

### Special Instructions

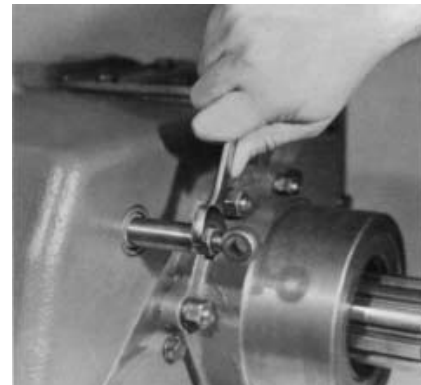
None

### Special Tools

- Typical service tools

### Procedure -

1. If previously removed, install the jam nut on the rod end and turn the rod end into the end of the shift bar.
2. Set the rod end in the desired position and lock in place by tightening the jam nut against the shift bar.



## How to Install the Companion Flange or Yoke

### Special Instructions

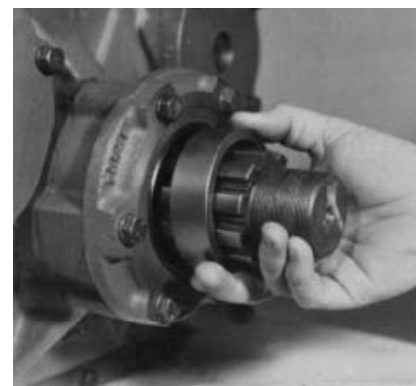
None

### Special Tools

- Typical service tools

### Procedure -

1. Install the yoke or flange on the input shaft and install the washer and elastic stop nut on the threads of the input shaft.
2. On units not equipped with a speedometer drive gear, install the spacer on the output shaft and in the rear bearing housing.
3. Install the yoke or flange on the output shaft and install the washer and elastic stop nut on the threads of the shaft.



## Assembly and Installation

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4. Use the special tool to hold the yoke or flange in position and torque the elastic stop nut on each shaft to 450-500 lbs. ft. torque.

**Note:** If a special tool is not available, the stop nuts may also be installed by putting the transmission in direct gear and bracing against one shaft while torquing the stop nut on the other shaft. Repeat the procedure for torquing the opposite stop nut.



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