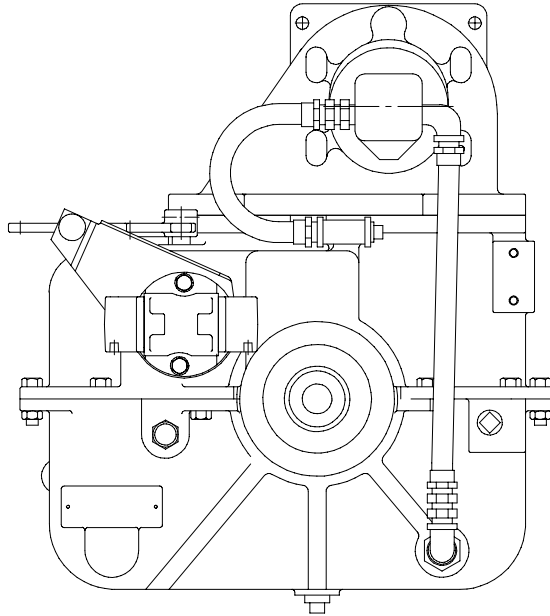


Y Series Transmission

Overhaul Instructions

Form No.	Section	Issue Date	Rev. Date
F-1031	4307	10/86	1/9/18



WATEROUS

Fire Pumps – Since 1886

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Introduction

This instruction provides the necessary steps required to overhaul the Y Series transmission with separable spline joint between the transmission and the pump impeller shaft.

Remove all accessories (priming pump assembly, manifold drain valve) prior to removing the transmission from the pump.

The text below frequently uses “references numbers” when discussing specific parts. These numbers refer to the parts called out on the Service Parts List included with the pump manual.

Disassembly

Note that these instructions apply for out of chassis overhaul of the transmission.

Propeller Shaft Disconnect and Accessory Removal

1. Disconnect the propeller shafts from the drive and coupling shafts. The companion flanges or end yokes attached to the transmission shafts can be left attached to the transmission and removed later.
2. Disconnect the tachometer cable, shift override linkage and shift wiring.
3. Remove parking brake, if equipped, as follows:
 - a. Remove the cotter pin (T12) and lock nut (T43) on units built prior to 4/20/98 or self-locking nut on units built after 4/20/98.
 - b. Pull companion flange and drum assembly off spline of coupling shaft. Disconnect linkage to brake operating arm.
 - c. Remove bolts fastening brake assembly to coupling shaft housing and remove brake assembly.
4. Disconnect primer motor wiring and hose and remove priming pump if it is mounted on the transmission, or if it is separately mounted and would interfere with removal of the transmission. As various types of priming pumps are available, see separate instructions covering the type furnished with the transmission.

5. Disconnect manifold drain valve.
6. Drain oil from the transmission.

Electric Shift

7. Remove shift assembly, bracket and manual shift linkage (if equipped).

Pneumatic Shift

8. Remove air lines and manual shift linkage (if equipped) from the shift unit. Shift unit can be left in place until the case is removed from the pump if desired.

NOTE: If shift unit is removed, do not disturb adjusting screws (T86). Take care not to lose adjusting screw retainers (T87) which are exposed when the bracket is removed.

Removal of Transmission from the Pump

1. Remove all but two fasteners holding the chain case to the pump body.
NOTE: Quantity removed could be two or six depending on when the case was built.
2. Loosen remaining two fasteners to keep the transmission attached until ready for removal.
3. Support the transmission via a support from the floor, transmission jack or sling from above.
4. Remove the two remaining cap screws.

5. To assist with separating the transmission from the pump, install at least two (2) cap screws in the tapped holes in the flange of the pump and use these screws to push the transmission off its spline fit with the impeller shaft until it is free. Lower the transmission and remove from under the chassis.

CAUTION

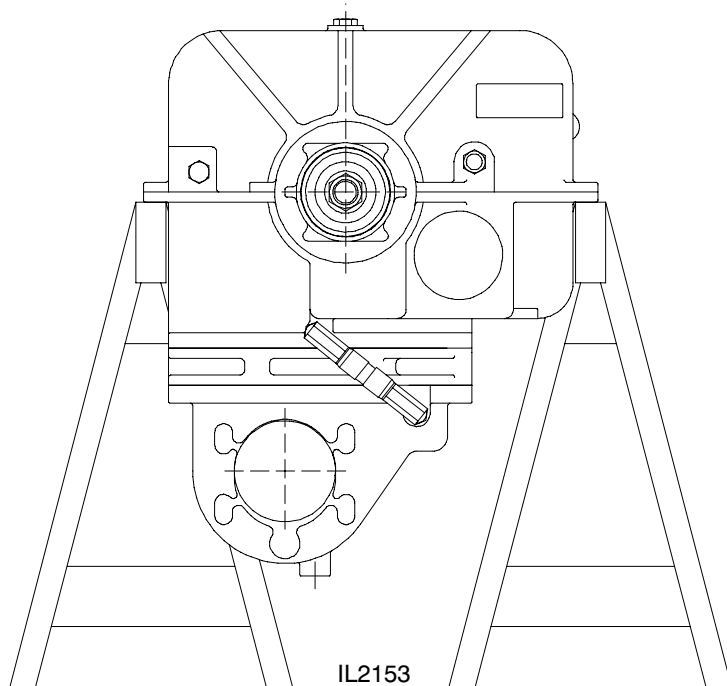
The pump impeller shaft is retained from axial movement by the bearing in the housing at the far end of the pump. This bearing could be damaged if the spline joint requires unreasonable force to separate.

Disassembly of the Transmission

The transmission consists of three sections; the cap, the mid-section and the bottom section. The order of disassembly is bottom section, mid-section and cap.

NOTE: Out of chassis overhaul will require supporting the transmission initially in an upside down position, possibly attaching it directly to an engine overhaul stand at the face of the cap that bolts to the pump or making up an adapter to allow this connection to an overhaul stand. Another consideration would be to support on the underside of the flange of the mid-section, first removing the flange bolts at the support areas (see Figure 1).

Figure 1. Transmission Supports



1. Remove companion flanges or end yokes from drive and coupling shafts.
2. Remove lube systems hoses by disconnecting hoses (T67) and (T64) at swivel fittings (T66), tee (T102) and elbow (T57). Remove sump oil strainer (T132) from bottom section of case (T28).

3. Remove cap screws (T8 prior to 5/06/04 or T241 after 5/06/04) and lock washers (T9) attaching drive shaft housing to bottom section. Loosen cap screws (T8 and T241) attaching housing to mid-section.
4. Remove cap screws (T8 on 2" or 2.35" before 5/06/04 - T241 after 5/06/04) attaching the coupling shaft housing (T42) to mid-section and case bottom.
5. Remove coupling shaft housing (T42), shims (T41) and O-ring (T182 after 4/25/93).

NOTE: Remove coupling shaft, components and housing as a unit from case by pulling on the shaft while tapping side to side on the housing.

6. Remove cap screws (T52), bolts (T93) nuts (T69) and lock washers (T53) attaching bottom section to mid-section. Drive dowels (T131) from bottom section. Separate bottom section and mid-section.
7. Rotate drive sprocket (T5) and chain (T18) until removable connection pin set (T83) of the chain is visible. The pin set has a spring pin (T108) in each end holding it in place (see Figure 8).
8. Remove spring pin (T108) from drive shaft housing side of long connecting pin, tap both connecting pins from the chain. Disengage chain (T18) from the drive (T5) and driven (T26) sprockets and remove from case.

Mechanical Tachometer

9. Remove tachometer driven gear sleeve (T90) and driven gear (T89) from drive shaft housing (T11).

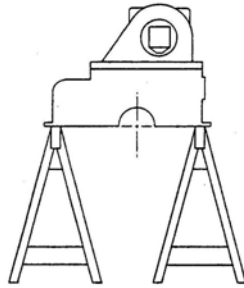
Electronic Tachometer

10. Remove magnetic pick-up (T180) from drive shaft housing (T11).
11. Remove the remaining cap screws attaching the drive shaft housing (T11) to the mid-section. The housing (T11), drive shaft (T13), drive sprocket (T35), shift collar (T4), shift fork (T80) and associated parts can be lifted out of the mid-section. The shift fork (T80) will slip off the shaft (T46) as the parts are lifted up as an assembly. Remove shifter shoe (T40) from locking arm (T38).
12. Remove locking arm (T38) from pivot pin (T37). Note that the pivot pin (T37) and shift shaft bushings (T112) need only be removed if bent or otherwise damaged.
13. **Electric Shift Cases:** Remove pin (T54 - prior to 12/20/02) or shoulder bolt (T237) and self-locking nut (T238 - after 12/20/02) from sector gear (T47). Remove sector gear from shift shaft. The removal of the pin (T54) or shoulder bolt (T237) will release the tension on the shift arm spring (T61). Remove shift shaft spring (T61). Remove sector gear (T47) from shift shaft.

Pneumatic Shift Cases: Remove pin (T54 - prior to 9/25/98) or shoulder bolt (T237) and self-locking nut (T238 - after 9/25/98) from sector gear (T47) and actuating shift lever (T173). The removal of the pin (T54) or shoulder bolt (T237) will release the tension on the shift arm spring (T61). Remove shift shaft spring (T61). Remove sector gear (T47) and actuating shift lever (T237).

14. Remove shift shaft (T46) and shift arm (T62) from mid-section. Remove spring (T61).
15. Reposition mid and cap section assembly on the supports so that the cap portion is on top as shown in Figure 2 or set the assembly on a bench.

Figure 2. Transmission Stand - Midsection & Cap



16. Remove four screws (T97) that fasten oil pump (T34) to pump support housing (T31) and remove the oil pump. Do not remove the two (2) small screws that fasten the pump together.
17. Press shift shaft bushings (T50) from mid-section. O-ring (T49) will come out when bushings are removed.
18. Removal of cap from mid-section only required if either component needs to be replaced. **Note that removal will make it easier to handle the assembly during driven shaft removal and reassembly.** Remove cap screws, bolts and nuts that attach the cap (T65) to mid-section.
19. Remove cap (T65) and its driven shaft assembly from mid-section or spacer(s) (T100). Rapping the cap with a dead blow hammer will break the adhesion between the cap and mid-section or spacer(s) (T100).

NOTE: Do not drive dowel pins (T103) into mid-section or spacer(s).

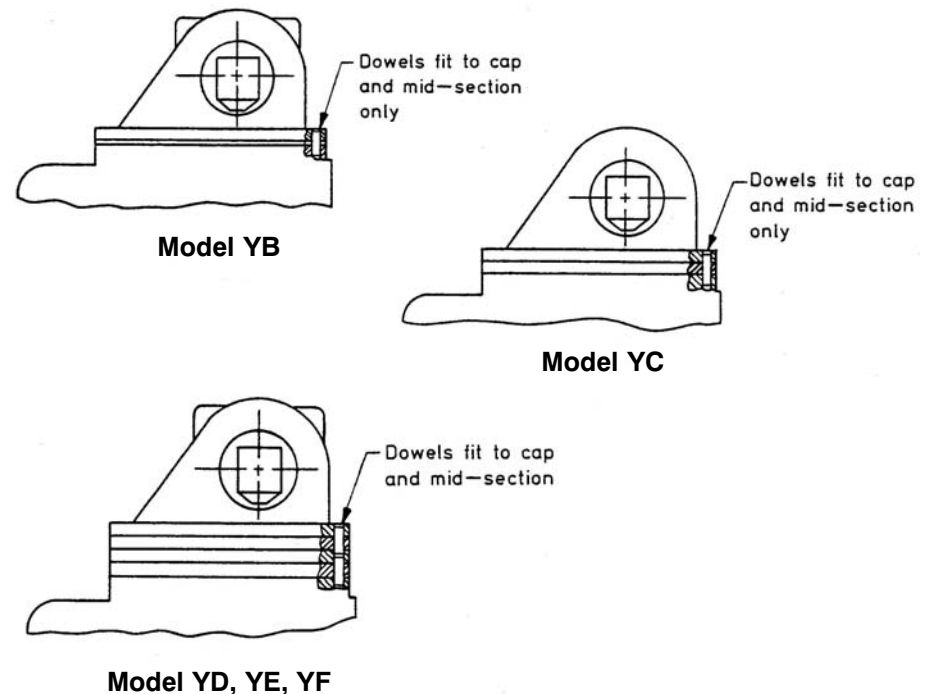
20. Remove any shims (T99) or spacer(s) (T100) between cap and mid-section. Protect shims from damage; they will be reused during reassembly unless they are replaced.

NOTE: The quantity and thickness of shims and spacers depends on case model and ratio.

NOTE: Before 8/05/96, models YB and YC, the dowels between the cap and mid-section pass freely through the shims and spacers. On models YD, YE, YF, the spacers are doweled to each other and also to the cap and mid-section.

After 8/05/96, single cast spacers are used for the YD, YE and YF drops.

Figure 3. Transmission Drops



Disassembly and Removal of the Driven Shaft from the Chain Case Cap

1. Remove four (4) cap screws (T133) that fasten housing (T31) to cap (T65) and remove housing (T31).
2. Straighten tab of lock washer (T32) from slot in lock nut (T33) and then remove the locknut (T33). A punch and hammer or lock nut socket required.
3. Before 9/87, remove flinger ring (T138) and its driving grommet (T137) from the end of the driven shaft (T135). Between 9/87 and 8/93, remove V-style flinger (T138). After 8/93, remove boot (T138).
4. Remove four (4) cap screws (T133) that fasten housing (T23) to cap (T65) but do not remove the housing (T23).
5. Under a press, support the assembly on the face of housing (T23) and apply a press load to the slot end of the driven shaft (T135) and press shaft out of bearings (T25), spacers (T95) (T29) and sprocket (T26). Remove spacers and sprockets.
6. Remove housing (T23) and bearings (T25) from cap (T26). Remove and discard oil seal (T19) from housing (T23).

Disassembly of Coupling Shaft Assembly

1. Remove housing (T42) from shaft assembly if not previously removed.
2. Pull outer bearing (T1 or T15) from shaft (T44); oil seal sleeve (T14) will come off with the bearing. Remove spacer (T2), pull inner bearings (T1 or T15) from shaft.
3. Tap out pilot bearing (T3) if still in coupling shaft (T44) by using a punch through the two access holes in the coupling shaft for this purpose.

Due to closeness of this bearing to hub end of shaft (T44), a split plate type puller may be necessary.

Disassembly of Drive Shaft Assembly

1. Slide shift collar (T4) from teeth on drive shaft (T13).
2. Remove housing (T11) from bearing (T15) and press oil seal (T45) from housing (T11). Discard oil seal.
3. With suitable puller, remove tachometer gear (T10) and sleeve (T14).
4. This step applicable only to units with 2.35", 46T, 20/40 involute spline end.

Units Built After 2/10/00

- a. Remove spacer (T239).
5. Place shaft and sprocket assembly in an arbor press in a vertical position with the spline end up and supported on the bottom face of sprocket (T5). Press shaft out of bearing (T15) and sprocket assembly. Catch shaft to avoid damage.
 6. Remove needle bearings (T6) from sprocket (T5).

Units Built Prior to 2/10/00

- a. Remove spacer (T104).
- b. Remove snap ring (T105).

Miscellaneous

1. Remove any remaining fittings or hardware.

Inspection and Repair

Refer to general instructions concerning inspection of bearings and their cleaning; in addition, check for the following:

- Bent shift shaft
- Bent shift fork
- Worn shifter shoes
- Loose shifter shoe studs (prior to 4/21/06)
- Damaged locking arm assembly, sector gear or bent pivot pin
- Condition of oil hoses
- Oil seals, if not discarded
- Worn sprocket teeth
- Worn flanks on inner chain links
- Outside guide links of chain not retained by "riveted over" pins
- Wear on inner faces of outside guide links of chain
- Badly worn pointing on teeth of shift collar, and similar wear on teeth of drive shaft and coupling shafts
- Worn or damaged oil seal sleeves
- Damaged or dirty sump oil strainer
- Worn oil pump - If oil pump does not operate properly or shows signs of damage, it must be replaced. Check to make sure pump turns freely and drive tang is not damaged. If in doubt, contact factory for instructions.
- Damaged splines on drive, coupling and driven shafts.

Reassembly

Before reassembly, make sure all reusable parts have been cleaned and are kept free of dirt during reassembly.

Guidelines for Installing Ball Bearings, Oil Seals and O-Rings

Installing Ball Bearings

Keep new ball bearings wrapped until they are to be installed. When pressing the ball bearing on a shaft or into a bore, coat appropriate surfaces with grease.

Shaft - grease shaft and ball bearing bore.

Bore - grease bore and outside of diameter of ball bearing.

Always apply force to the inner race of a ball bearing when pressing it on a shaft and to the outer race if pressing into a bore. Press evenly with a piece of pipe or tube which just clears the shaft or bore.

Installing Oil Seals

Before installing a new oil seal in its housing, apply a thin coat of sealant to housing oil seal seat. Be sure that the seal, shaft and housing are clean. Always install a seal with the seal lip facing in. Lubricate seal lip with light oil before installing shaft. Apply force to the outer edge of the seal and press in evenly.

Installing Gaskets

If a gasket is awkward to hold in place while assembling component, coat one of the mating flanges with grease and press the gasket into position against the flange. The grease will hold the gasket in place during reassembly.

Cap and Driven Shaft Assembly

- Grease oil pump side bearing bore on the chain case cap and install bearing (T25). Press bearing completely into the bore until approximately 3/8" (depth of shoulder on oil pump support housing) of the bore is exposed.
- Install oil pump support housing without shims. This will seat the installed bearing.
- Press bearing (T25) against shoulder on the driven shaft (T135). Slide spacer (T95) on the driven shaft.
- Install key (T136) in the driven shaft keyway.
- Position the cap (with or without midsection) into a press with the oil pump support housing (T31) resting on the press base. Ensure housing and cap are properly supported. Position spacer (T29) and driven sprocket (T26) inside of the cap and line up with bearing (T25) bore.
- Press previously assembled driven shaft assembly down into the cap, lining up the key with the driven sprocket keyway. Press until driven shaft assembly seats against bearing (T25) previously installed in the cap.
- Apply a bead of silicone in the oil seal seat area of the oil seal housing (T23). Install oil seal (T19) into oil seal housing (T23). Install gasket (T24) on oil seal housing and fasten to chain case cap. Care must be taken not to roll the oil seal lip when sliding oil seal over driven shaft.
- Install lock washer (T32) and lock nut (T33) on driven shaft (T135). Make sure the tang on the lock washer (T32) is in the driven shaft keyway. Tighten lock nut (T33) one half turn past finger tight.
- The driven shaft assembly was factory shimmed to limit axial float. If any of the parts have been changed, it may be necessary to change the total thickness of shims between the cap and oil pump support housing. The correct thickness of shims can be determined as follows:

Apply axial force to end of the driven shaft so it is moved forward against housing (T23) as far as it can go. Install oil pump support housing (T31), less shims (T30), until the nose end of the adapter (T31) contacts the outer driven shaft bearing (T25). Measure clearance between the oil pump support housing (T31) and the face of the cap (T65). Add to this measurement .005 to .010 in. This total is the thickness of shims (T30) to install between the oil pump support housing (T31) and cap. Remove the housing and apply a bead of silicone to shoulder of oil support housing (T31) and install the shims and fasten the housing to the cap with cap screws (T133) and lockwashers (T9).

NOTE: Shims are color coded for thickness as follows:

.005" = blue

.010 = brown
- Place this assembly aside for later installation.

Drive Shaft Assembly

1. Press needle bearings (T6) into each end of bore of drive sprocket (T5) (see note below), setting them back from each face 1/8 in. Press sprocket, coupling teeth end first, onto drive shaft (T13).

NOTE: One end of the O.D. of the cup of the needle bearings (T6) is rounded. These bearings should be installed in the bore of the drive sprocket (T5) rounded end first.

2. Press spacer (T7) and bearing (T15) on shaft against shoulder at drive sprocket (drive sprocket should rotate freely on shaft after installation of the bearing).
3. On case with 2.35" drive line built prior to 2/10/00, install snap ring (T105) and spacer (T104). On cases built after 2/10/00, install spacer (T239).

NOTE: It is recommended if rebuilding cases older than 2/10/00, to replace snap ring (T105) and spacer (T014) with spacer (T239).

4. Press appropriate tachometer gear (T10) or spacer (T230) and oil seal sleeve (T14) on drive shaft. Press bearing (T3) on coupling shaft end of drive shaft.
5. Apply bead of silicone to oil seal seat area of drive shaft housing and install oil seal.
6. Apply a light coat of grease to face of drive shaft housing (T11). Position gasket (T17) in place on the housing (T11).
7. Press the drive shaft housing (T11) on bearing (T15) on the drive shaft assembly.
8. Place this assembly aside for later installation.

Coupling Shaft Assembly

1. Stand coupling shaft (T44) on press table with spline end up.
2. Press on inner bearing (T1 - prior to 4/25/1993) or (T15 - after 4/25/1993) tight against shoulder on coupling shaft.
3. Slip spacer (T2) over shaft (T44) and seat it against bearing (T1) or (T15).
4. Press on outer bearing (T1 - before 4/25/93), (T184 - 1/04/94 to 4/01/95) or (T15 - after 4/25/95) tight against spacer (T2).

5. For 2" drivelines and heavy duty cases built before 4/01/95, press oil seal sleeve (T14) tight against inner race of bearing (T1) or (T15). For 2.35" drivelines built after 4/01/95, no oil seal sleeve is used.
6. Apply bead of silicone to oil seal seat in (T42) and install oil seal (T45).
7. Lubricate lip area of the oil seal (T45) and install the coupling shaft housing (T42) onto bearings (T1) on the coupling shaft assembly.
8. Place this assembly aside for later installation.

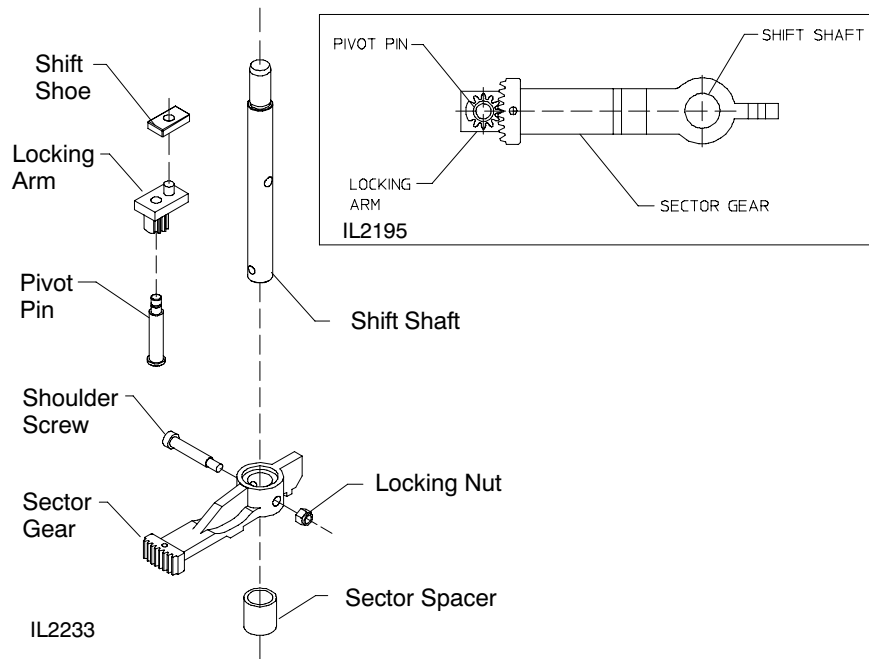
Case Mid-Section Assembly

1. Press bushings (T50 before 7/01/96) or (T50 and T190 after 7/01/96) into the mid-section shift shaft hole with top bushing flush with pad on the mid-section and with 1/8" space between the bushings (T50). Install O-ring (T49) in the space between the bushings.
2. Install pins (T60) in shift arm (T62) and in the case mid-section if previously removed. Install pivot pin (T37) if previously removed.
3. Invert mid-section. Install O-ring (T39) in groove on pivot pin (T37). Install locking arm assembly (T38) on pivot pin (T37). Install with pin facing up and position as shown in Figure 4.
4. Position spacer (T48) over shift shaft opening.

5. **Electric or Manual Shift** - Position sector gear (T47) on spacer (T48) with teeth meshed with locking arm as noted in Figure 4.

Pneumatic Shift - Install actuating shift lever (T173) in sector gear (T47). Ensure holes in shift lever and sector gear are aligned. Position sector gear (T47) on spacer (T48). Shift lever (T173) will protrude from the rear of the case. Mesh teeth with locking arm as noted in Figure 5.

Figure 4. Electric or Manual Shift Assembly



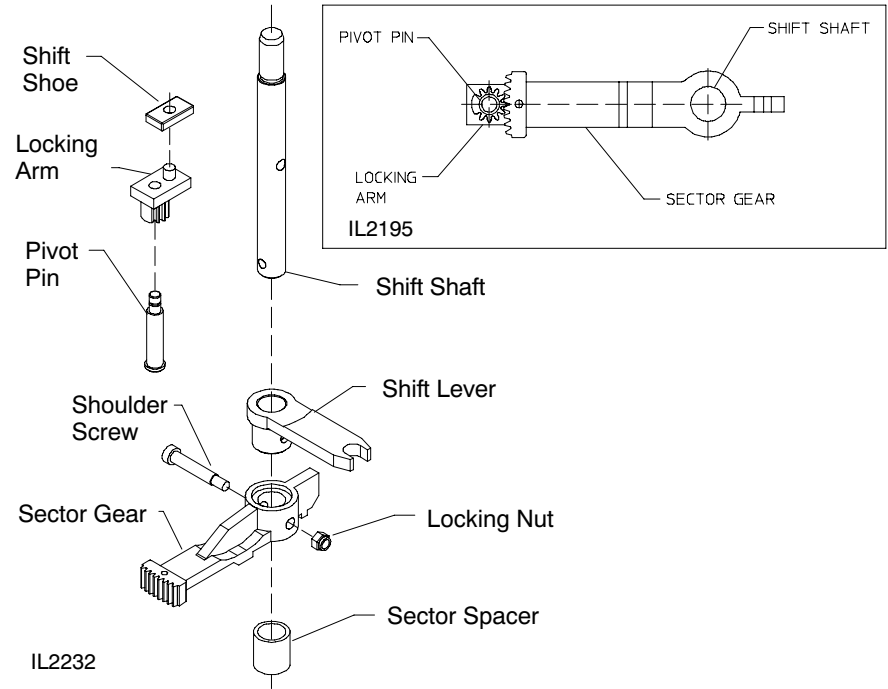
NOTE: Center locking arm assembly on sector gear. Improper alignment or positioning of locking arm (T38) and sector gear (T47) will cause shift issues.

6. Install shift shoe (T40) on the locking arm pin (T38).

NOTE: Shift shoe can be installed with counter bore hole up or down.

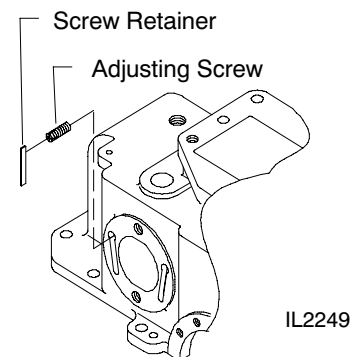
7. Install shift collar (T4) on previously assembled drive shaft housing. On cases built prior to 2/17/03, if reusing the original shift collar, install with outside diameter 45° chamfer towards the drive sprocket.
8. Loosely install drive shaft housing onto mid-section. Mount housing with the flat edge towards primer pads. Install shift shoes for (T80) onto the shift collar (T4). Rotate fork until the shaft opening is lined up with the opening in the sector gear (T47) or sector gear / shift lever.
9. Install shift arm spring housing (T59) and shift arm spring (T61).
10. Install shift arm (T62) on shift shaft (T46) using spirol pin (T51).
11. Slide shift shaft up through bushings (T50 / T190), spacer (T48) and sector gear (T47) or sector gear / shift lever (T47 / T173) and fork (T80).
12. Rotate shift arm until shift arm pin (T60) compresses the shift spring (T61). When the hole in the shift shaft (T46) lines up with the hole(s) in the sector gear (T47) or sector gear / locking arm (T47 / T173) install spirol pin (T54) or shoulder screw (T237) and lock nut (T238).

Figure 5. Pneumatic Shift Assembly



13. If shift adjusting screws (T86) have been removed, reinstall and adjust to limit travel of shift fork (see Figure 6). Install adjusting screw retainers (T87) dab with grease to hold them in place. Final adjustment will be completed after bottom cover has been installed.

Figure 6. Adjusting Screws - Retainers



14. If cap has been removed from mid-section support the mid-section / drive shaft assembly on suitable blocking so the flange that the cap (T65) will bolt to is facing up.

NOTE: If the cap was not removed, go to "Installing the Chain."

Cap and Driven Shaft Assembly

1. Make sure faces of flanges are clean and free of nicks and burrs.
 2. If applicable, clean shims (T99) and / or spacer(s) (T100).
 3. Install applicable dowel pins into mid-section (see appropriate SPL drawings). Apply a bead of silicone to mid-section flange inside of bolt holes. If shims and spacers are required, install at this time. (For extended drop cases built before 8/05/96, apply a bead of silicone between each spacer inside of bolt pattern.)
 4. Apply a bead of silicone to the top surface of the last shim (T99) and spacer (T100).
 5. Position previously assembled cap and driven shaft on dowels in the top flange of the mid-section or spacer and tap down into contact with shims. Install fasteners with lockwashers and tighten evenly.
- NOTE: Fasteners used vary between models. Refer to the table in the appropriate service parts lists for location and correct fasteners.**
6. Invert mid-section and cap.

Installing the Chain

1. Wrap the chain (T18) around the drive (T5) and driven (T26) sprockets making sure everything meshes and then lace the joining ends together using the connecting pin set (see Figure 7).
2. Insert the connecting pin rocker partway through the holes in the joining end links being careful of orientation (see Figure 9). The connecting rocker must be on the side of the guide link opposite the joining end with the connecting rockers wide curved surface towards the center of the hole.
3. Insert the connecting pin assembly along side the connecting rocker. The two wide curved surfaces of the connecting pin and connecting rocker must face each other.
4. After the connecting pin assembly and connecting rocker have been pushed all the way through the joining ends of the chain, insert the spirol pin into the open hole at the end of the connecting pin assembly (see Figure 9). Make sure the spirol pin overlaps the connecting rocker.
5. Tighten cap screws connecting the driveshaft housing to the chain case mid-section. Check chain for proper tension. Check deflection half-way between the drive sprocket and driven sprocket (see chart below for maximum deflection). Replace chain if deflection is greater than those displayed in the chart below.

Drop	Max Deflection (In.) (Both Directions)
B	1.75
C	1.75
D	1.75
E	2.0
F	2.0

6. Loosen drive shaft housing cap screws for installation of lower case.

Figure 7. Installing the Chain

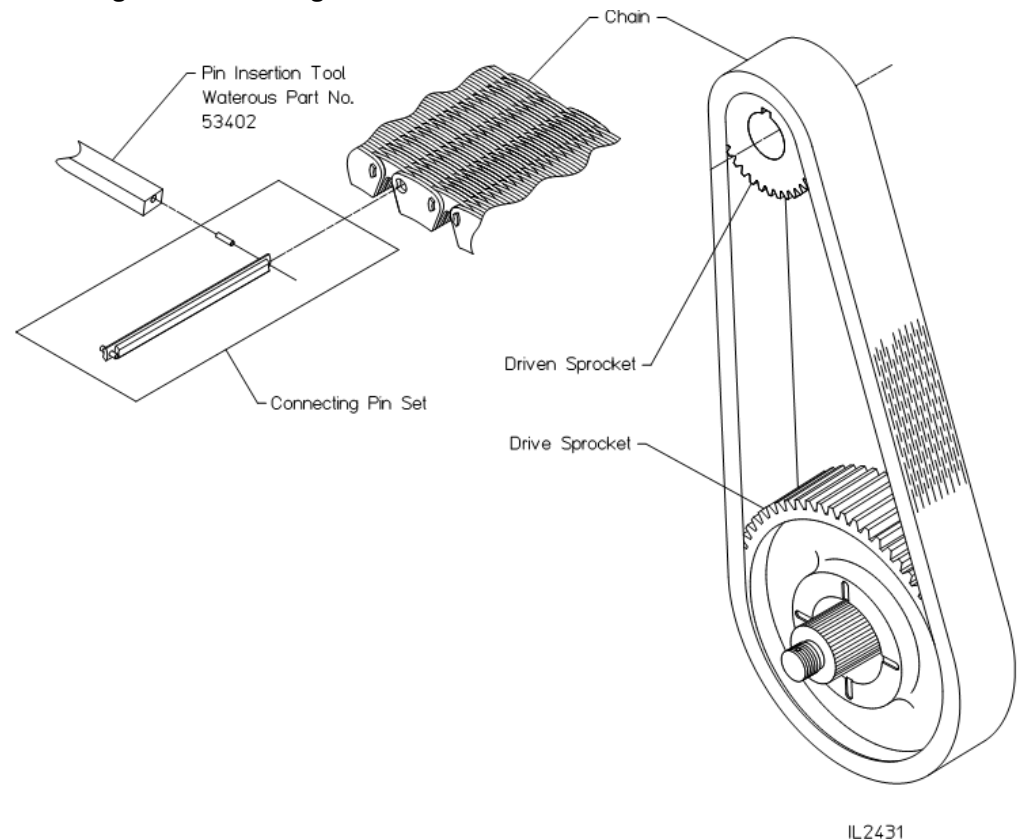
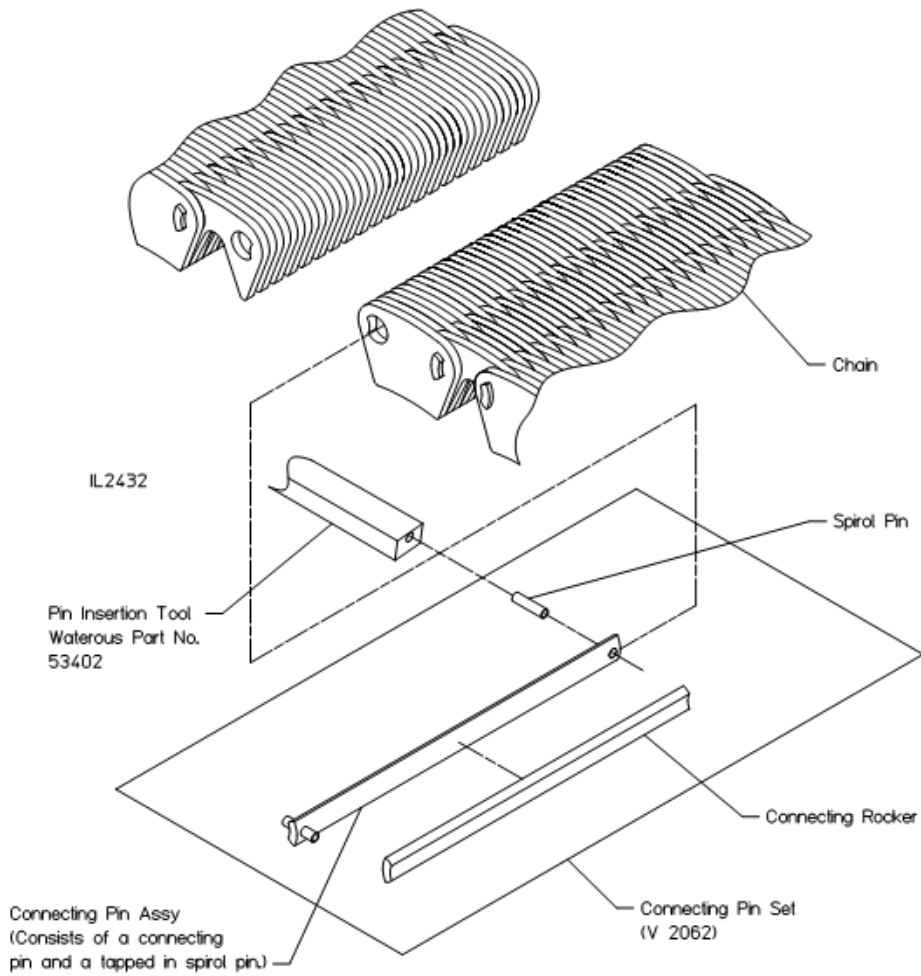
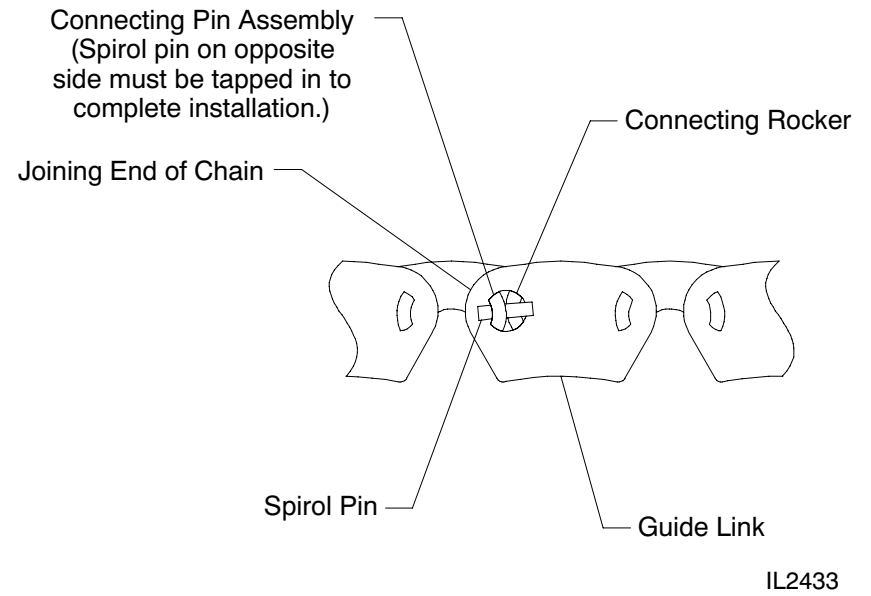


Figure 8. Connecting Pin Set



The connecting pin set contains one connecting pin assembly,
one connecting rocker and one spiro pin.

Figure 9. Connecting Pin Orientation



Installing the Lower Section of Case to Mid-Section

1. Install lower shift shaft bushing (T112) into lower portion of case assembly (T28).
2. Install dowels (T31) in flange of the mid-section portion of the case (T28).
3. Apply a bead of silicone inside the bolt pattern of the mid-section flange (T28).
4. Position lower section of the case (T28) to the mid-section of the case, align shift shaft and lower shift shaft bushing and set into place. Align with dowels (T31) and tap into position until flanges of the mid-section and lower section meet. Install cap screws (T93), bolts (T52), lockwashers (T53) and nuts (T69) and tighten securely. See table in service parts list for location of fasteners.
5. Install lower cap screws (T8 - before 5/06/04) or (T241 - after 5/06/04) and lockwashers (T9) in drive shaft housing (T11) and tighten these fasteners and previously installed fasteners.

Shift Collar Travel Adjustment

1. If shift collar adjustment is required, remove previously installed adjustment screw retainers (T87).

ROAD Adjustment

2. Put case into ROAD position. Measure the distance from the face of the collar (T4) to the flange that the coupling shaft housing bolts to. Adjust ROAD adjustment screw (T86) to set measurement at 3/4".

PUMP Adjustment

3. Put the case into PUMP position. Measure the distance from the face of the collar (T4) to the flange that the coupling shaft housing bolts to. Adjust PUMP adjustment screw (T86) to set measurement at 2-1/16".
4. Apply a dab of grease to slots in the shaft adjustment screws (T86) and install adjustment screw retainers (T87). If equipped with a manual pump shift, install shift cover gasket (T56) and shift cover (T55).

NOTE: Grease on adjustment screw (T86) will help keep the adjustment screw retainers in place until an appropriate cover or shift unit is installed.

Installing the Coupling Shaft and Housing Assembly to the Case

NOTE: The drive line assembly was factory shimmed to limit the axial float of the drive line. If any of the drive line parts have been changed, it may be necessary to change the total thickness of shims (T41) between the coupling shaft housing (T42) and the transmission case. Shims are color coded for thickness as follows:

.005" = blue

.007" = natural

.010" = brown

The correct thickness of shims can be determined as follows:

1. Install previously assembled coupling shaft and housing assembly (T42) with no shims between the housing and case. Tighten cap screws evenly and tap the end of the coupling shaft with a soft mallet to force drive line all the way forward.

NOTE: Do not overtighten cap screws. Doing so could cause inaccurate float measurement or damage to components.

2. Measure gap between housing and case in several places to assure a uniform gap and add .005 - .010 in. This will be the total thickness of shims needed to provide the recommended axial float of 0.005 in - 0.010 in.
3. Remove coupling shaft assembly from case after measuring gap.

NOTE: Field conditions may make it difficult to determine the correct amount of shims. If in doubt, add another 0.005 in shims. No harm will result from a small amount of additional axial float but bearing life will be shortened if bearings are excessively preloaded.

4. Install correct amount of shims on the coupling shaft housing (T42) or if all original parts are being reused, reinstall original shims (T41) (if not reusable, replace with new shims). Install the coupling shaft assembly. If the unit is equipped with a parking brake, make sure the coupling shaft housing (T42) is properly orientated so that the drain tube (T85) will point down when the case is reattached to the pump. Tighten housing to case (T74) with cap screws (T8 - before 5/05/05) or (T241 - after 5/06/04).

Reassembly of Miscellaneous Parts

Tachometer Drive

1. Install tachometer driven gear (T89) in drive shaft housing (T11) making sure it fits into bushing (T88) previously installed in the housing.
2. Install sleeve (T90) over end of gear (T89) and thread into housing (T11).

Miscellaneous Hardware

1. Install magnetic drain plug (T27).
2. Install breather (T134).
3. Install oil level plug (T73) and site plug (T134).
4. Install breather (T27) if removed.
5. Install sump oil strainer (T132).
6. If reusing flinger grommet (T137) and flinger disc (T138), install on impeller shaft.

NOTE: Tapered end of grommet should face the pump.

7. For cases built between 9/87 and 8/93, install V-style flinger (T138) with flap towards the oil seal on the driven shaft. For cases built after 8/93 or not re-using older flinger, install sealing boot.

Oil Pump

1. Install gasket (T96) over pilot diameter on oil pump (T34).
2. Position pump (T34) on adapter (T31).
3. Line up drive tang of oil pump shaft with slot in driven shaft.
4. Fit pilot diameter of oil pump (T34) into adapter (T31) making sure tang on oil pump shaft and slot in driven shaft line up and engage. Fasten pump (T34) to adapter (T31) with screws (T97) which pass through pump into the adapter.

Oil Hoses

1. Install nipple (T101), tee (T102), hose (T64 or T67) if previously removed and adapter union (T66) between discharge side of pump and spray tube assembly.
2. Install street elbows (T57) at sump strainer (T132) and inlet of oil pump (T34).
3. Install adapter union (T66) in elbow (T57) at sump strainer (T132).
4. Install hose (T67).
5. Install plug (T98) (a pressure gauge may have been installed) in tee (T102) and case (T28).

Reassembly of Accessories to the Transmission

Electric Shift Assembly

1. Make sure adjusting screws (T86) are in place and adjusted. Adjusting screw retainer (T87) should be installed in slot end of each screw.
2. Position and bolt electric shift assembly into place making sure gasket (T56) is installed between shift assembly and face of the case (T74). Fasten in place with cap screws (T52).
3. Fasten pivot plate (T62) and cover (T75) to shift arm (T62) if these were removed.
4. Reconnect wiring and check for proper adjustment of indicator light switch if shift unit is so equipped.

NOTE: If chassis is equipped with an automatic transmission, indicator lights must be used.

Refer to separate operation and maintenance instructions for adjustment of the shift switch. For details of electric shift assembly, refer to separate service parts list.

Pneumatic Shift Assembly

1. Make sure adjusting screws (T86) are in place and adjusted and adjusting screw retainer (T87) installed in slot end of each screw.
2. Position and bolt pneumatic shift assembly into place making sure gasket (T56) is installed between shift assembly and face of the case (T74). Fasten in place with cap screws (T52).
3. Connect power supply and truck transmission interfaces.
4. SAE J1402 air brake hose recommended, 1/4" to 3/8". Connect air lines from main truck supply.

Brake Assembly

1. If previously removed, reinstall the drain tube (T85) in hole in bottom of coupling shaft housing (T42).
2. Install and fasten brake assembly to coupling shaft housing (T42). Install related linkage and brake drum, and adjust brake. For detailed instructions on brake installation and adjustment, refer to separate instructions.

Priming Pump

1. Reinstall the priming pump and reconnect primer wiring, hose to priming valve and tube to priming tank. As various types of priming pumps are available, see separate instructions covering the type furnished with your transmission.

Companion Flanges

1. Slide companion flange or end yoke on the drive shaft (T13) up against the oil seal sleeve (T14) on pumps prior to 4/01/95. After 4/01/95, slide up against the coupling shaft bearing (T15).

2. Install washer (T94) and lock nut (T43) (on 2" drivelines, no washers are used); tighten nut securely. **Cases built prior to 4/20/98:** If reusing castellated lock nut (tighten as much as possible), make sure one slot in the nut lines up with hole in end of the drive shaft (T13). Install cotter pin (T12) and spread open split end of pin. **Cases built after 4/20/98:** Anti-seize should be applied to the threads before installing a self-locking nut. Do not reuse self-locking nuts. Install self-locking nut and torque to 475 - 525 ft.-lbs.

NOTE: It is recommended that cases being rebuilt or repaired to replace the castellated lock nut with a self-locking nut (T43) and torque to 475 - 525 ft.-lbs.

3. Repeat same installation procedure at coupling shaft end unless companion flange was previously installed at the time the brake assembly was installed.

Propeller Shaft Reconnect

1. Reconnect drive line to companion flanges or end yoke. Tighten all connecting bolts securely.

Lubrication and Final Check

Fill transmission to oil level plug hole with automatic transmission fluid (approximately 12-1/4 quarts required). The exact capacity will vary depending on transmission ratio.

1. Recheck fasteners for tightness.

2. Check for oil leaks.
3. Recheck for proper operation of shift mechanism and that shift indicator light system (if so equipped) is functioning properly.

Assembly of Case to Pump

CAUTION

Incorrect installation of the case to the pump could result in damage to chain case and/or pump components.

1. Properly support the case and align splines on the case driven shaft and pump impeller shaft.
2. Push case towards the pump.

3. Ensure pilot on the end of the impeller shaft aligns with the pilot hole in the driven shaft. Also ensure the oil seal housing aligns with the bore in the pump body.
4. Case and pump should be able to be assembled without the use of bolts and nuts to draw them together.

