

# Overhaul Instructions

## PA Model Transmissions and TPA Model PTO's

Form No.	Section	Issue Date	Rev. Date
F-1031	4311	10/17/95	1/19/18

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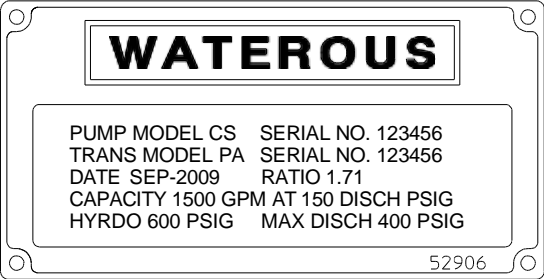
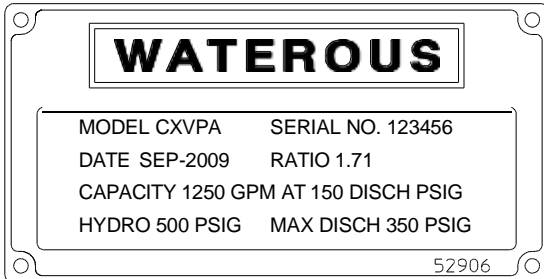
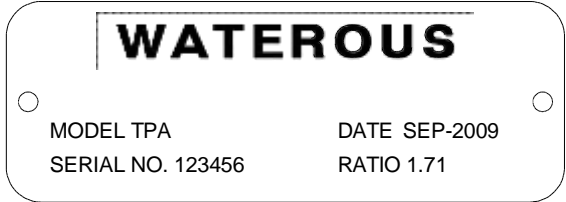
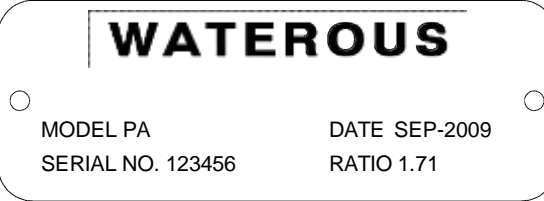
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## Introduction

This instruction provides the necessary steps involved to overhaul PA Series Transmissions and TPA Series P.T.O.'s. Note that the instructions are divided into Disassembly and Reassembly sections.

## Ordering Repair Parts

Refer to PA Series Transmission or TPA Series P.T.O. Service Parts List furnished with your pump or P.T.O. for identification of individual components. When ordering repair parts, furnish the reference number of the component (from Service Parts List) along with the Pump Model/P.T.O. Model and serial number. Note that a gasket and O-ring repair kit is available that includes all the gaskets, shims and O-rings required for a complete overhaul. Order Waterous Part No. K 806-1.

 <p><b>WATEROUS</b></p> <p>PUMP MODEL CS SERIAL NO. 123456          TRANS MODEL PA SERIAL NO. 123456          DATE SEP-2009 RATIO 1.71          CAPACITY 1500 GPM AT 150 DISCH PSIG          HYRDO 600 PSIG MAX DISCH 400 PSIG</p> <p>52906</p> <p>IL3270</p> <p>Serial Plate Located on Operator's Panel</p>	 <p><b>WATEROUS</b></p> <p>MODEL CXVPA SERIAL NO. 123456          DATE SEP-2009 RATIO 1.71          CAPACITY 1250 GPM AT 150 DISCH PSIG          HYDRO 500 PSIG MAX DISCH 350 PSIG</p> <p>52906</p> <p>IL3270</p> <p>Serial Plate Located on Operator's Panel</p>	 <p><b>WATEROUS</b></p> <p>MODEL TPA SERIAL NO. 123456          DATE SEP-2009 RATIO 1.71</p> <p>IL3269</p> <p>Serial Plate Located on P.T.O.</p>
 <p><b>WATEROUS</b></p> <p>MODEL PA SERIAL NO. 123456          DATE SEP-2009 RATIO 1.71</p> <p>IL3269</p> <p>Serial Plate Located on Transmission</p>	<p>Serial Plate Located on Operator's Panel</p>	<p>Serial Plate Located on P.T.O.</p>
<p><b>CM, CMU, CS and CSU Pump Models</b></p>	<p><b>CG, CX and S100 Pump Models</b></p>	<p><b>TPA Model PTO's</b></p>
<p><b>PA Model Transmissions</b></p>		<p><b>TPA Model PTO's</b></p>

## General Overhaul Information



### WARNING

#### **Pressure Hazard. May result in personal injury.**

Prior to connection or removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves. Bleeder valves should also be used while filling a hose connected to an intake with water.



### WARNING

#### **Rotating Parts Hazard or Unexpected Truck Movement. May result in serious personal injury or death.**

Stop the engine, set parking brake and chock the wheels before attempting to remove or repair the transmission.



### WARNING

#### **Pump Body / Transmission Temperature Hazard. May result in serious burns.**

The pump body / transmission may be warm from operation. Make sure that the pump body / transmission has cooled sufficiently prior to removal or repair.

### ***Tools and Equipment***

The following tools and equipment may be needed to overhaul your transmission:

1. Usual automotive mechanic's hand tools.
2. An arbor press for assembling or disassembling components.
3. A suitable hoist and slings.
4. Torque capability up to 325 lb-ft.

### ***Cleaning***

Satisfactory operation depends to a great extent upon the cleanliness of its internal parts. Sand, dirt or other abrasive material will wear gears and related parts. Before disassembling a transmission for repairs, be sure to clean its exterior. Make sure the working space, benches and tools are clean. Use only clean, lint-free cloths to wipe off components. Before reassembling, be sure to clean all components thoroughly.

### ***Bearings, Gaskets, Seals and O-rings***

Parts of this nature are frequently damaged during removal or disassembly. In addition, they sometimes deteriorate or lose their effectiveness because of age or misuse. Replacing these parts whenever overhauling a transmission is a good policy.

### ***Installing Ball Bearings***

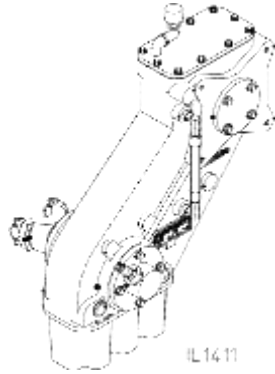
Most Waterous transmissions are designed so that ball bearings fit tightly on their shafts and have relatively loose fits in the bearing housings. When mounting these bearings on shafts, always apply force to the inner races. When bearings have tight fit in the housings, and a heavy force a heavy force is necessary to install them, be sure to apply force only to the outer bearing races. For either type of fit, applying force to the wrong bearing race may damage the balls and race.

### ***End Yoke and Companion Flange Nuts***

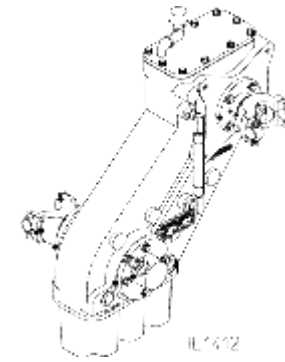
Do not reuse self-locking nuts. Apply lubrication oil to the threads before removing. Apply anti-seize to the threads before installing a new self-locking nut.

# Configurations

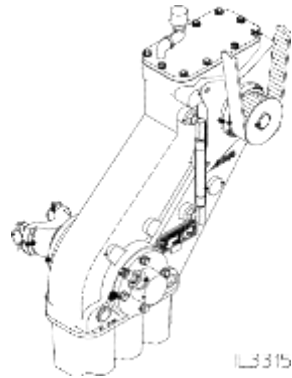
## PA Model Transmissions



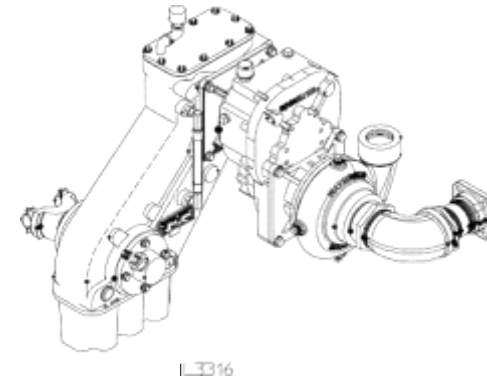
Without Rear Facing Output Shaft



With Rear Facing End Yoke

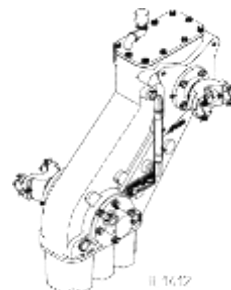


With Rear Facing Compressor (Belt Drive)



With Rear Facing Combination Pump

## TPA Model P.T.O.'s



## Disassembly

### Remove Transmission from Vehicle

#### PA Transmissions:

##### CM and CS Pump Models:

The transmission may be separated from the pump and removed individually.

1. Disconnect the driveline.
2. Remove the (4) mounting fasteners from the pump flange. The transmission may be then be separated from the pump and removed from the vehicle.

##### CG, CX and S100 Pump Models:

The transmission must be removed with the pump.

1. Disconnect the driveline.
2. Disconnect the pump intake the discharge piping and remove pump and transmission as one unit.

#### TPA P.T.O.'s:

1. Disconnect the driveline.
2. Disconnect output and remove PTO from vehicle.

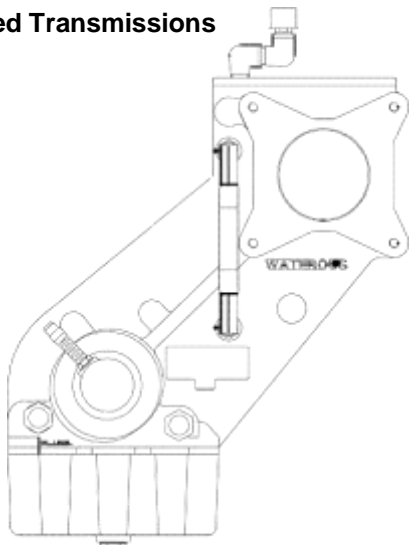
### Remove Pump From Transmission (PA Transmissions Only)

See Pump Overhaul Instructions for details on removing pump from transmission.

# Disassembly

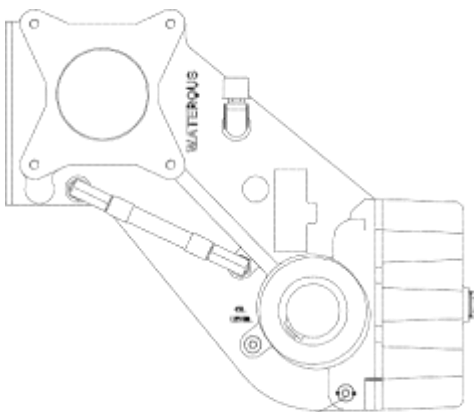
## Drain Fluid From Transmisson

### Vertical Mounted Transmissions



Drain Plug, note that transmission /PTO contains approximately 3 quarts of fluid.

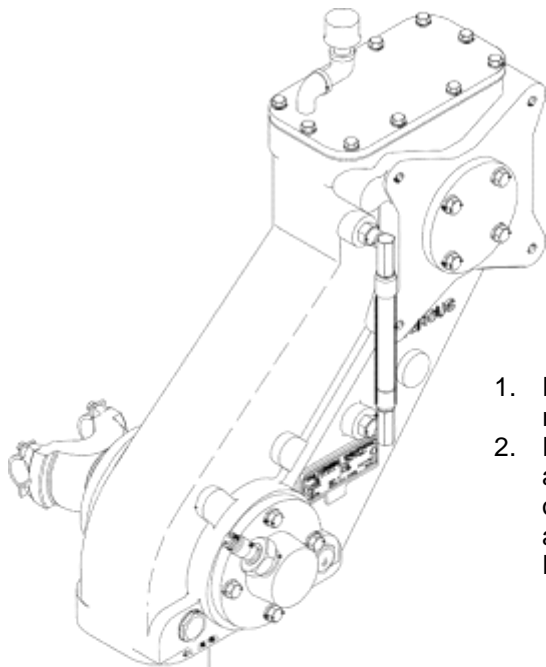
### Horizontal Mounted Transmissions



IL3155

Drain Plug, note that transmission /PTO contains approximately 2 quarts of fluid.

## Lower Case Removal



1. Remove the case bottom by removing the (8) screws.
2. Remove gasket. Note that if a new gasket is required, one is included in gasket and shim kit Waterous Part No. K 806-1.



Bottom Gasket



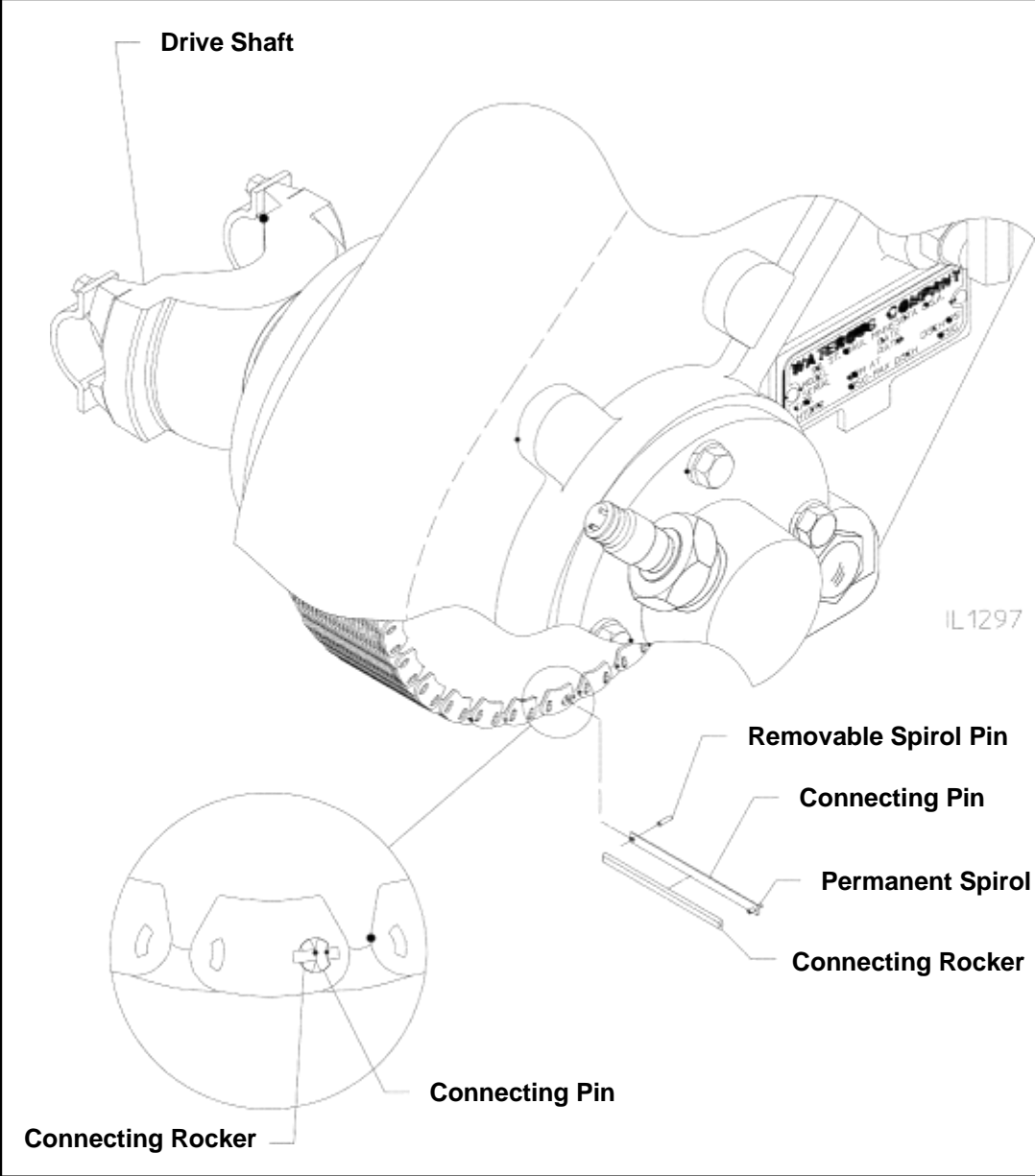
Case Bottom

(8) 5/16-18 x 1 in. Screws and Lockwashers

IL1293

# Disassembly

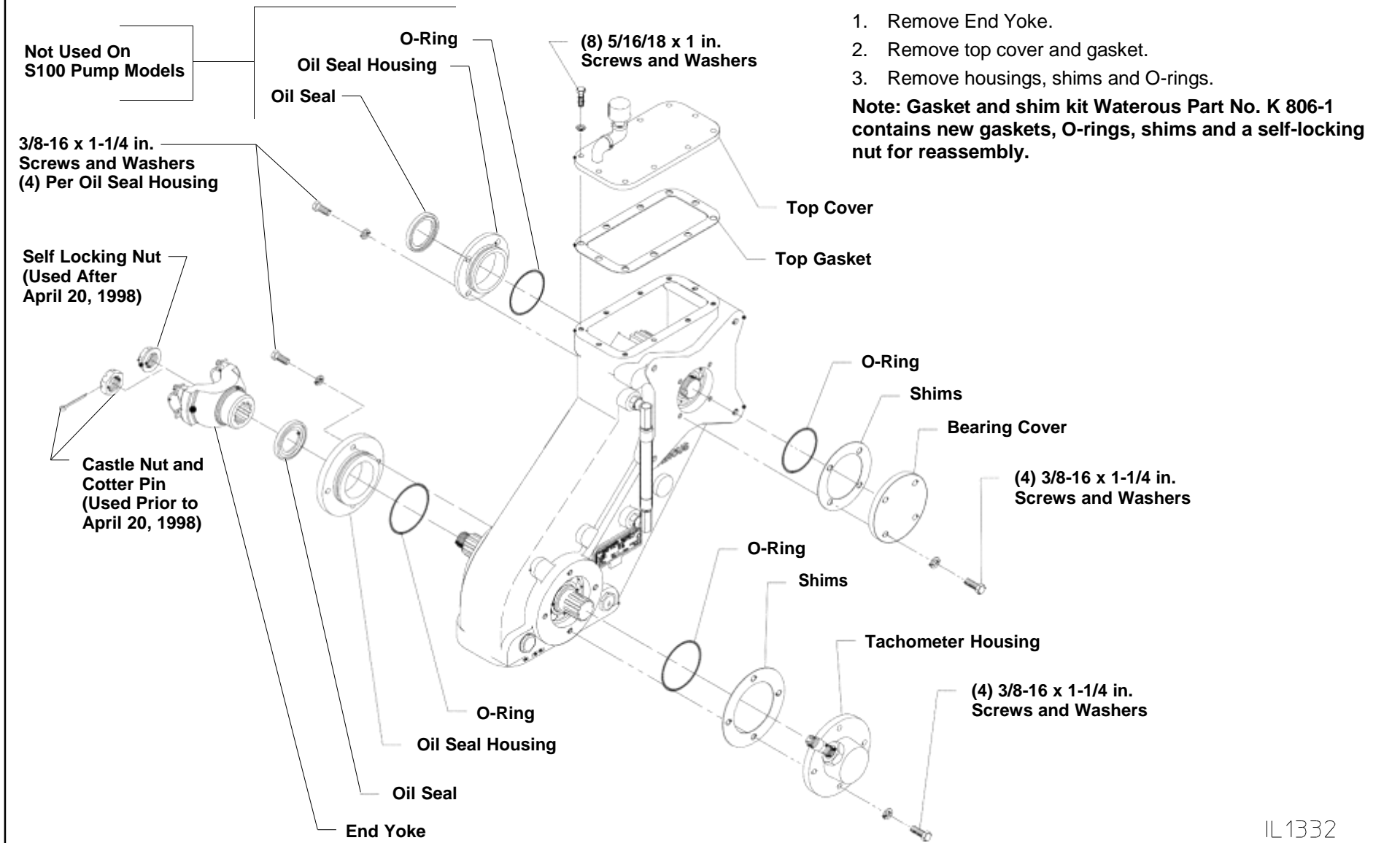
## Chain Removal



1. Rotate drive shaft until connecting pin in chain is visible.
2. Drive out spirol pin in end of connecting pin. (Note that connecting pin has two spirol pins only one of which is removable).
3. Drive the connecting pin and connecting rocker from the chain.
4. Separate ends of chain and pull out of transmissio/PTO.

# Disassembly

## Upper Case Disassembly, PA Models Without Rear Facing Output Shaft

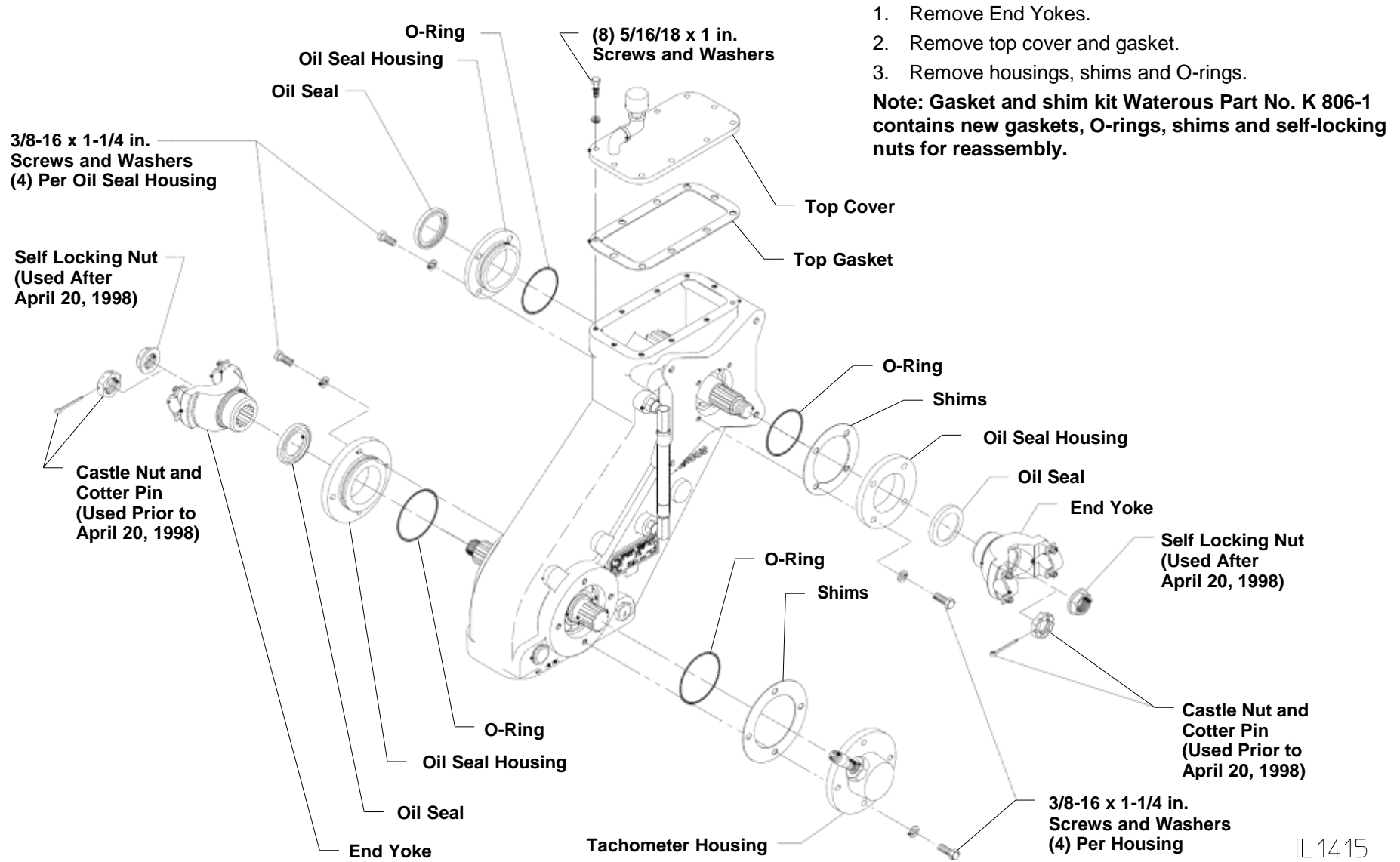


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# Disassembly

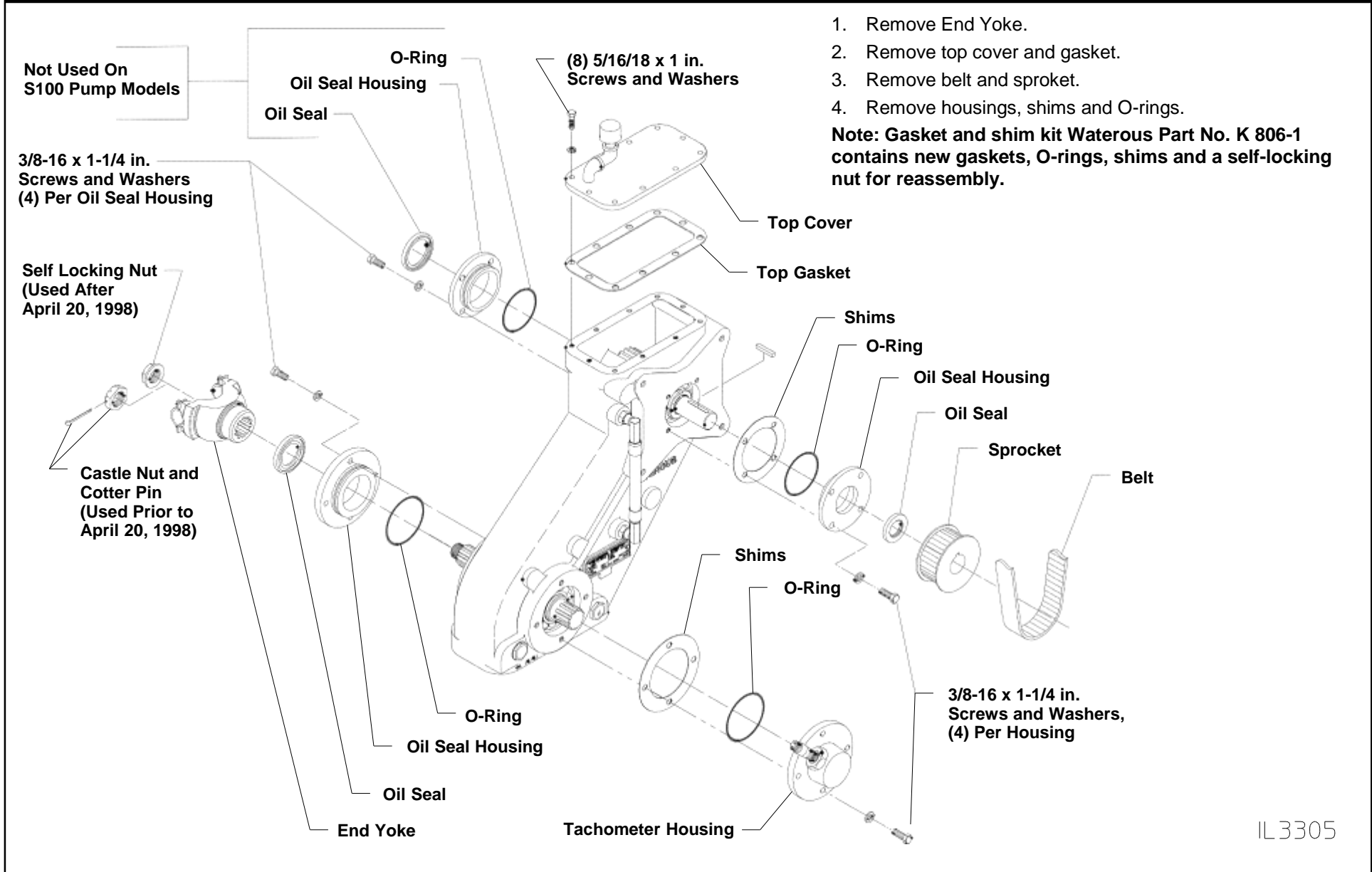
## Upper Case Disassembly, PA Models With Rear Facing Output Shaft



IL 14 15

# Disassembly

## Upper Case Disassembly, PA Models With Rear Facing Compressor (Belt) Drive



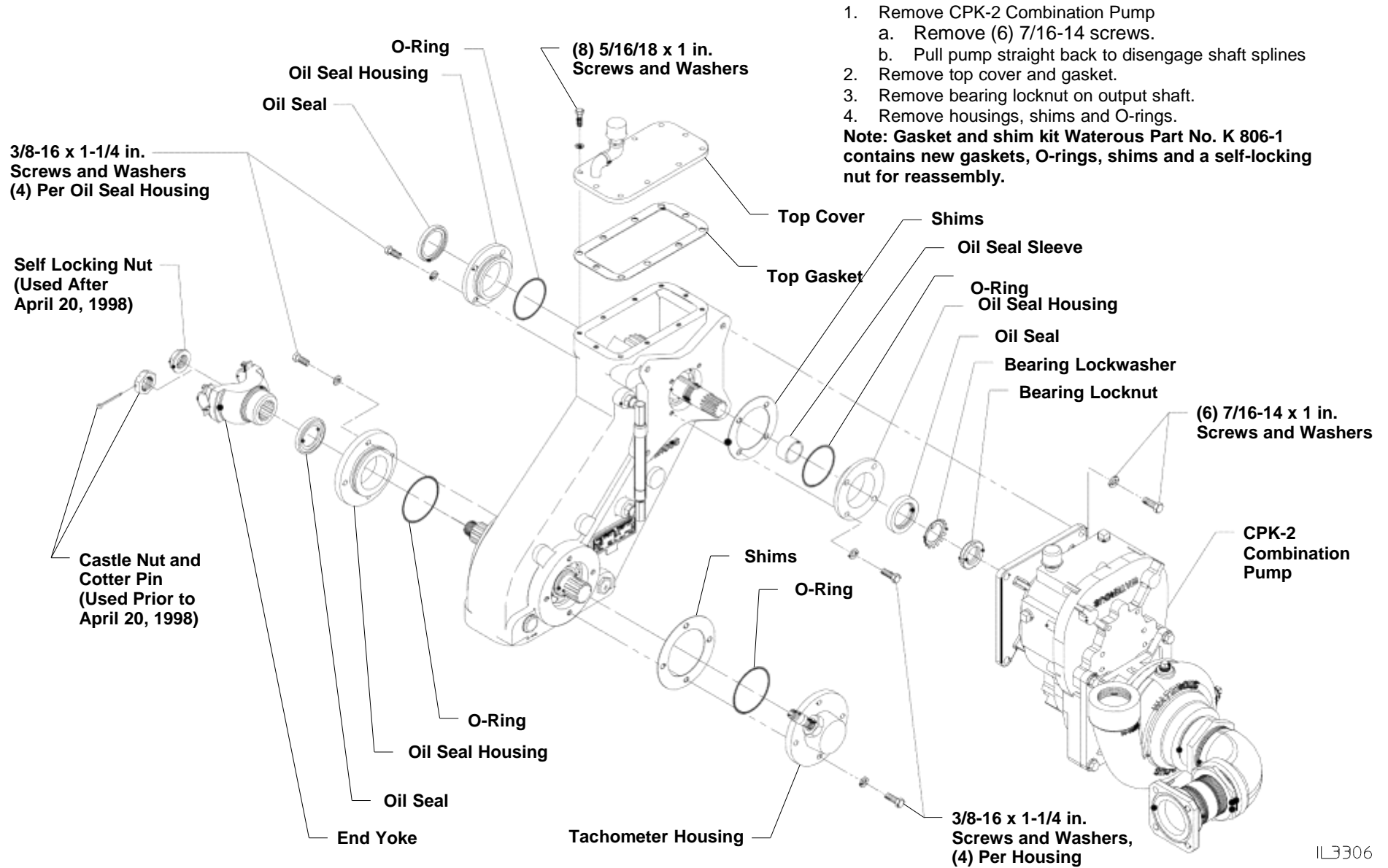
1. Remove End Yoke.
2. Remove top cover and gasket.
3. Remove belt and sprocket.
4. Remove housings, shims and O-rings.

**Note: Gasket and shim kit Waterous Part No. K 806-1 contains new gaskets, O-rings, shims and a self-locking nut for reassembly.**

IL3305

# Disassembly

## Upper Case Disassembly, PA Models With Rear Facing Combination Pump



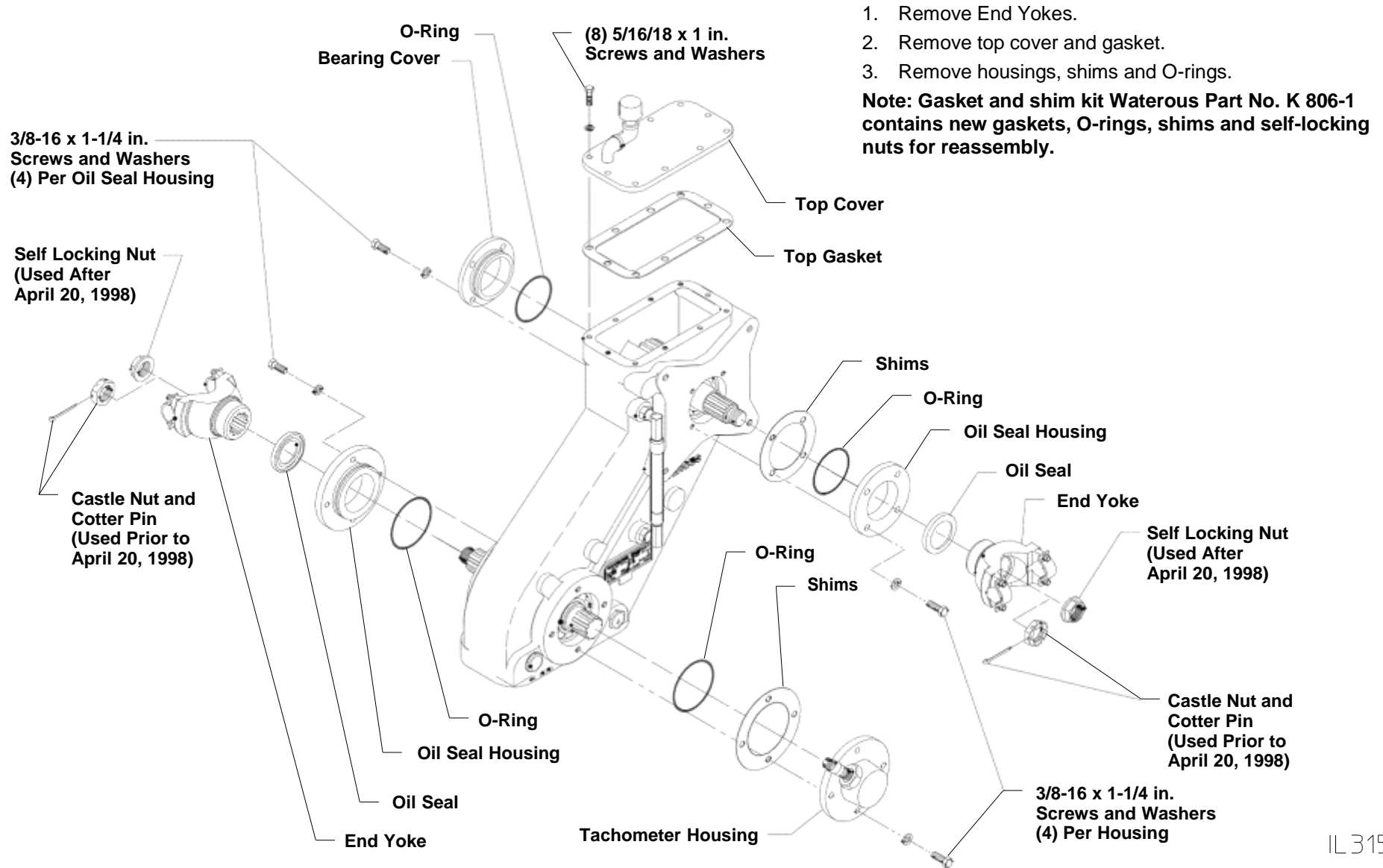
1. Remove CPK-2 Combination Pump
    - a. Remove (6) 7/16-14 screws.
    - b. Pull pump straight back to disengage shaft splines
  2. Remove top cover and gasket.
  3. Remove bearing locknut on output shaft.
  4. Remove housings, shims and O-rings.
- Note: Gasket and shim kit Waterous Part No. K 806-1 contains new gaskets, O-rings, shims and a self-locking nut for reassembly.**

IL3306



# Disassembly

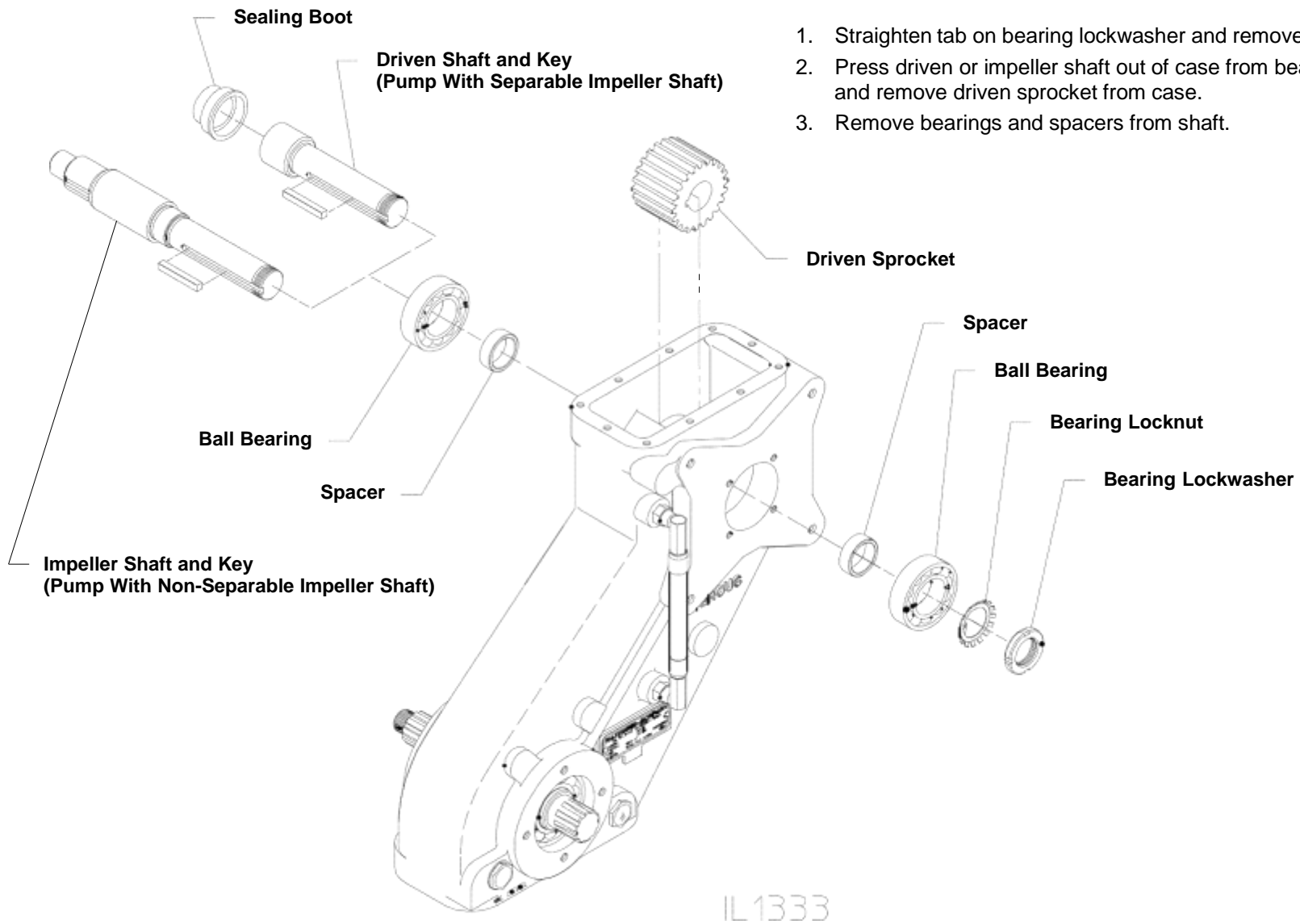
## Upper Case Disassembly, TPA Models



IL3156

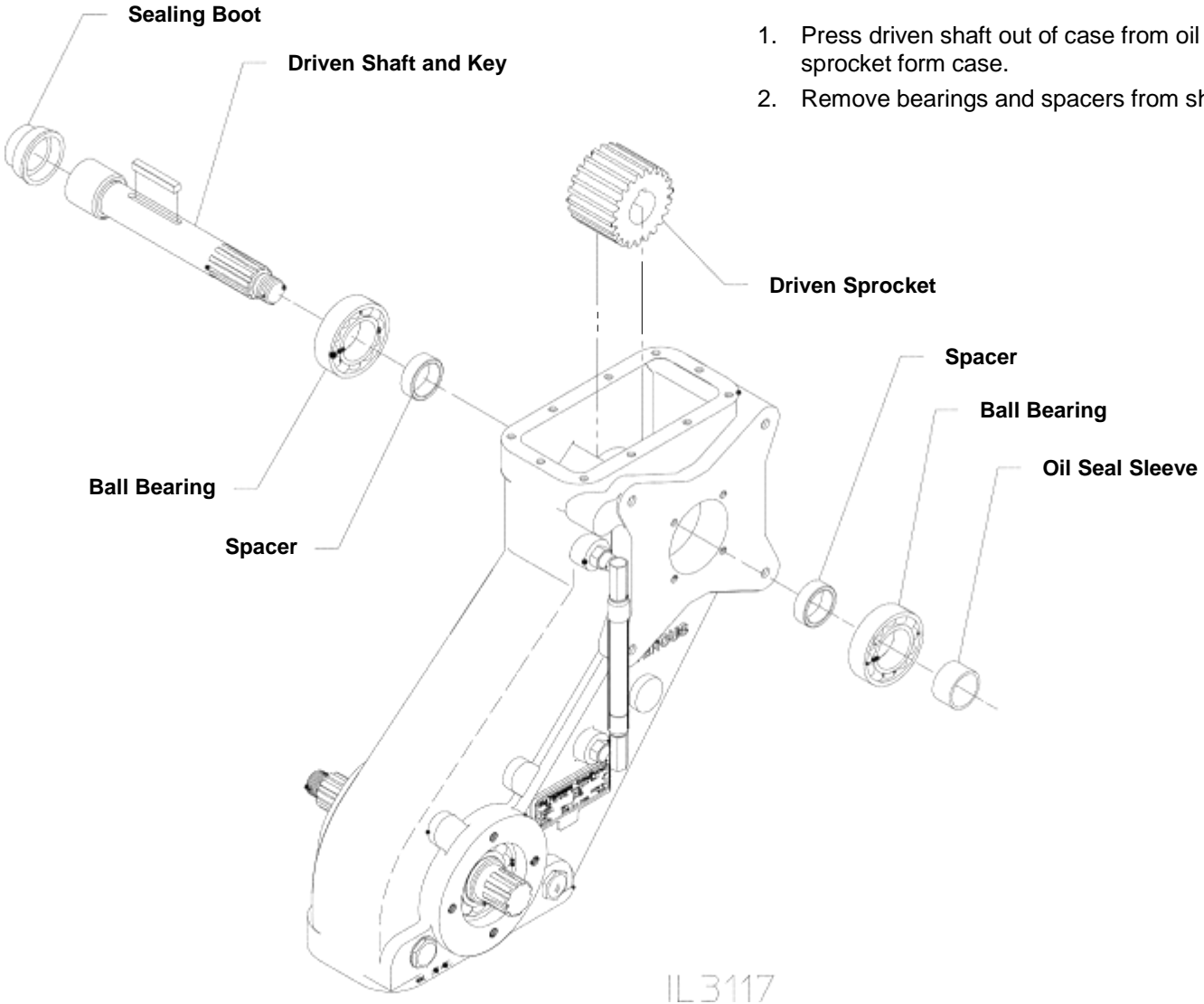
## Disassembly

### Driven or Impeller Shaft Removal, PA Models Without Rear Facing Output Shaft



# Disassembly

## Driven or Impeller Shaft Removal, PA Models With Rear Facing End Yoke

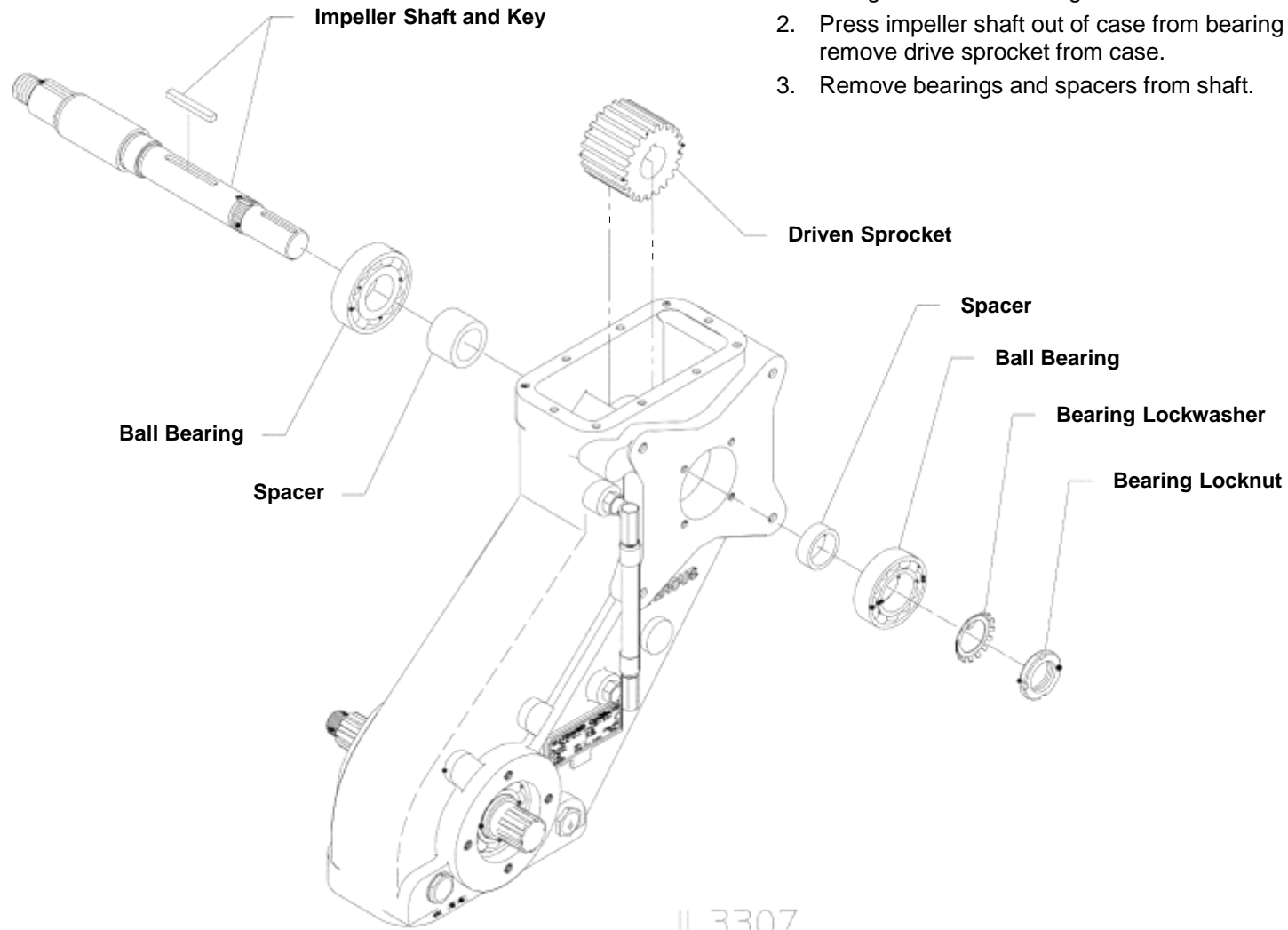


- 1. Press driven shaft out of case from oil seal sleeve end and remove sprocket form case.
- 2. Remove bearings and spacers from shaft.

IL3117

## Disassembly

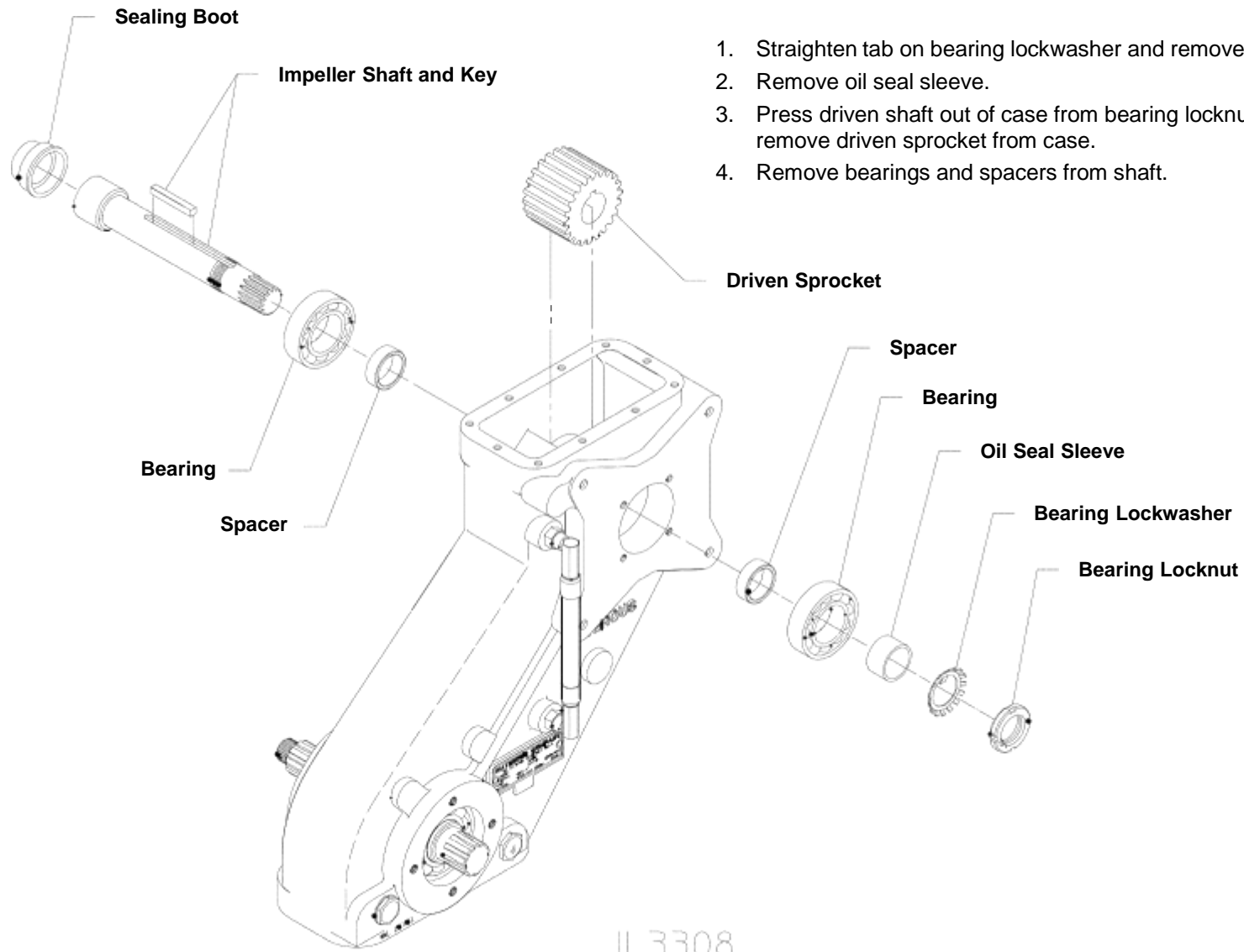
### Driven or Impeller Shaft Removal, PA Models With Rear Facing Compressor (Belt) Drive





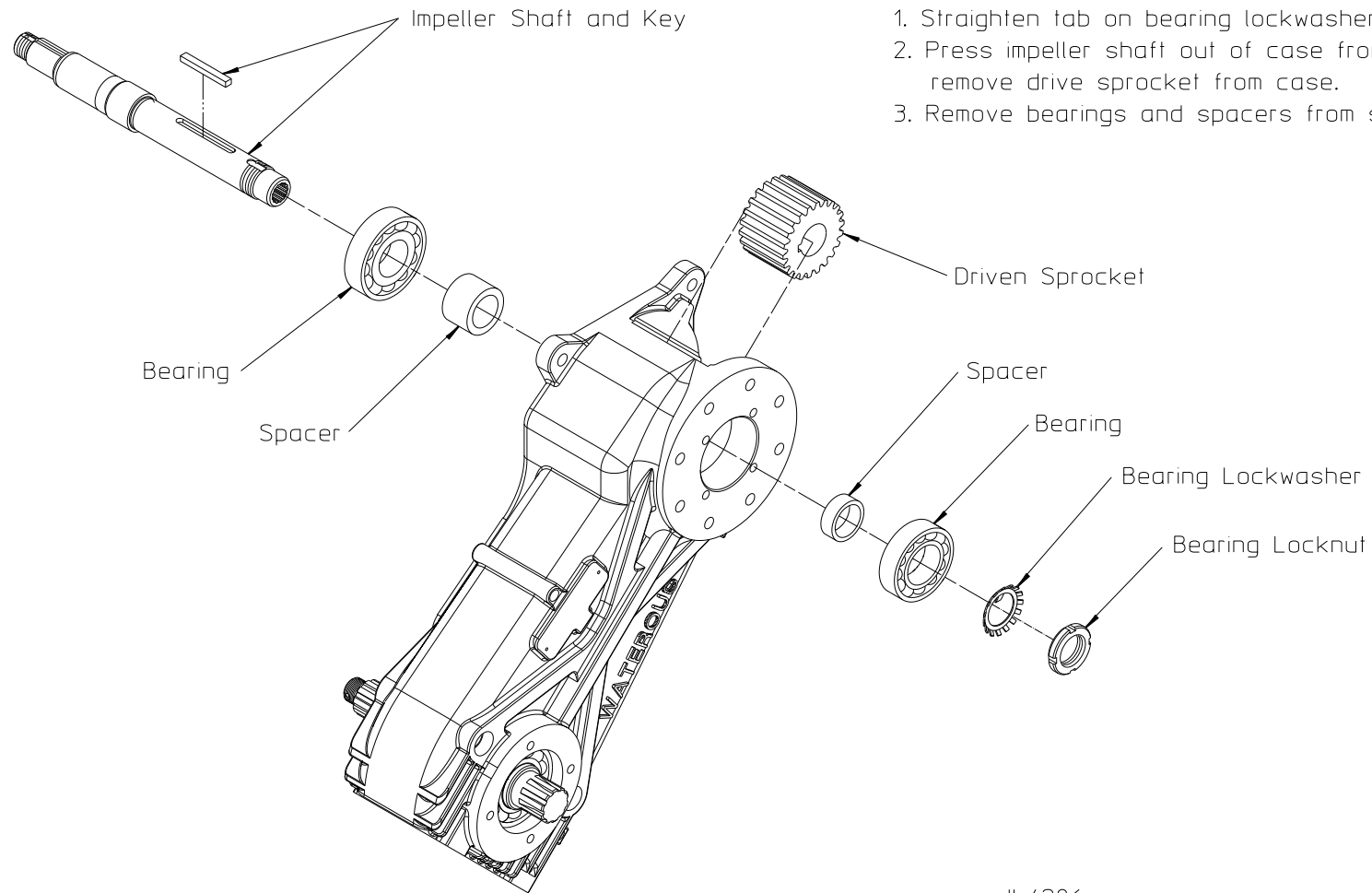
## Disassembly

### Driven or Impeller Shaft Removal, PA Models With Rear Facing Combination Pump



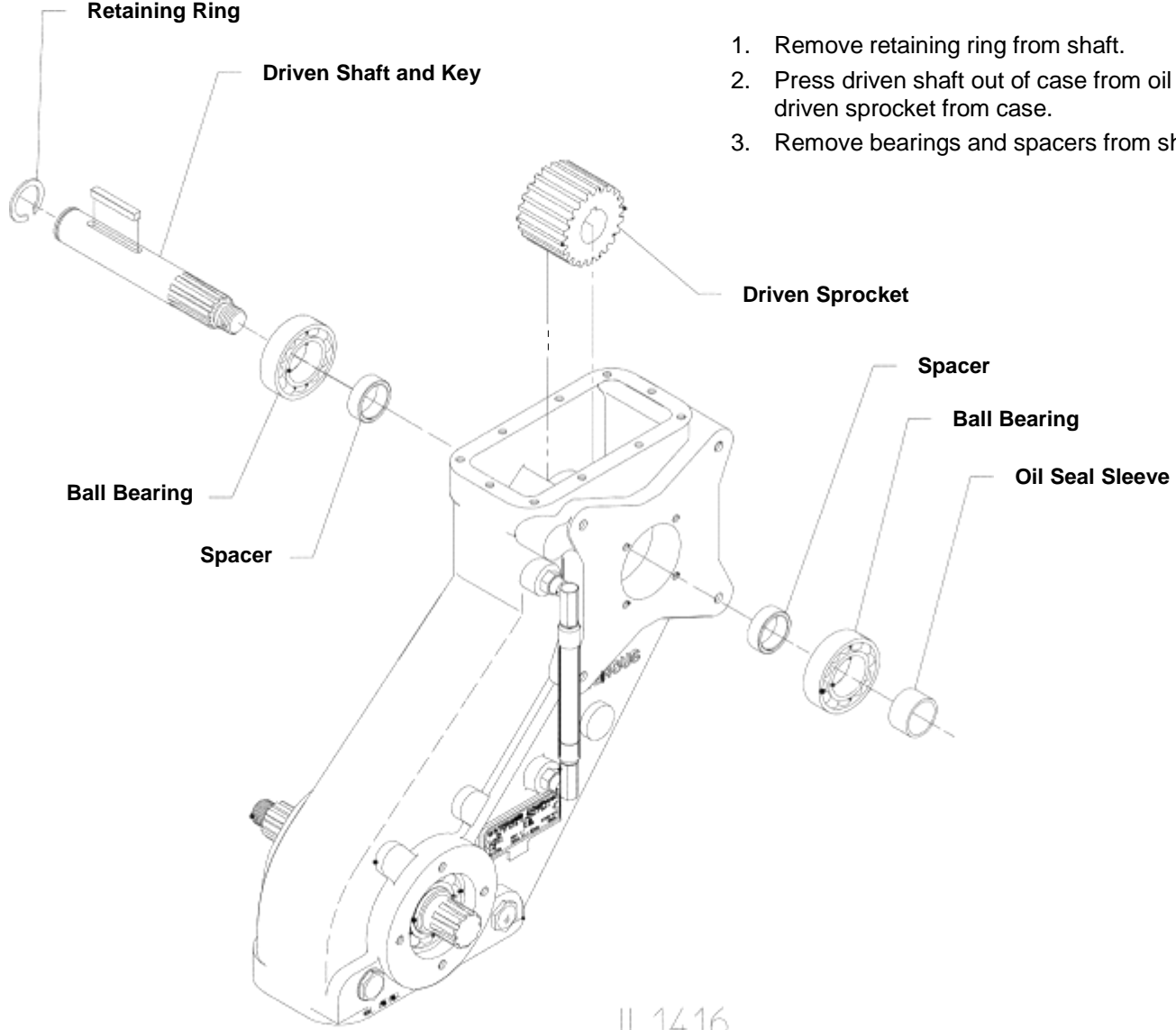
## Disassembly

### Driven or Impeller Shaft Removal, PA Models With Rear Facing Hydraulic Flange



# Disassembly

## Driven or Impeller Shaft Removal, TPA Models

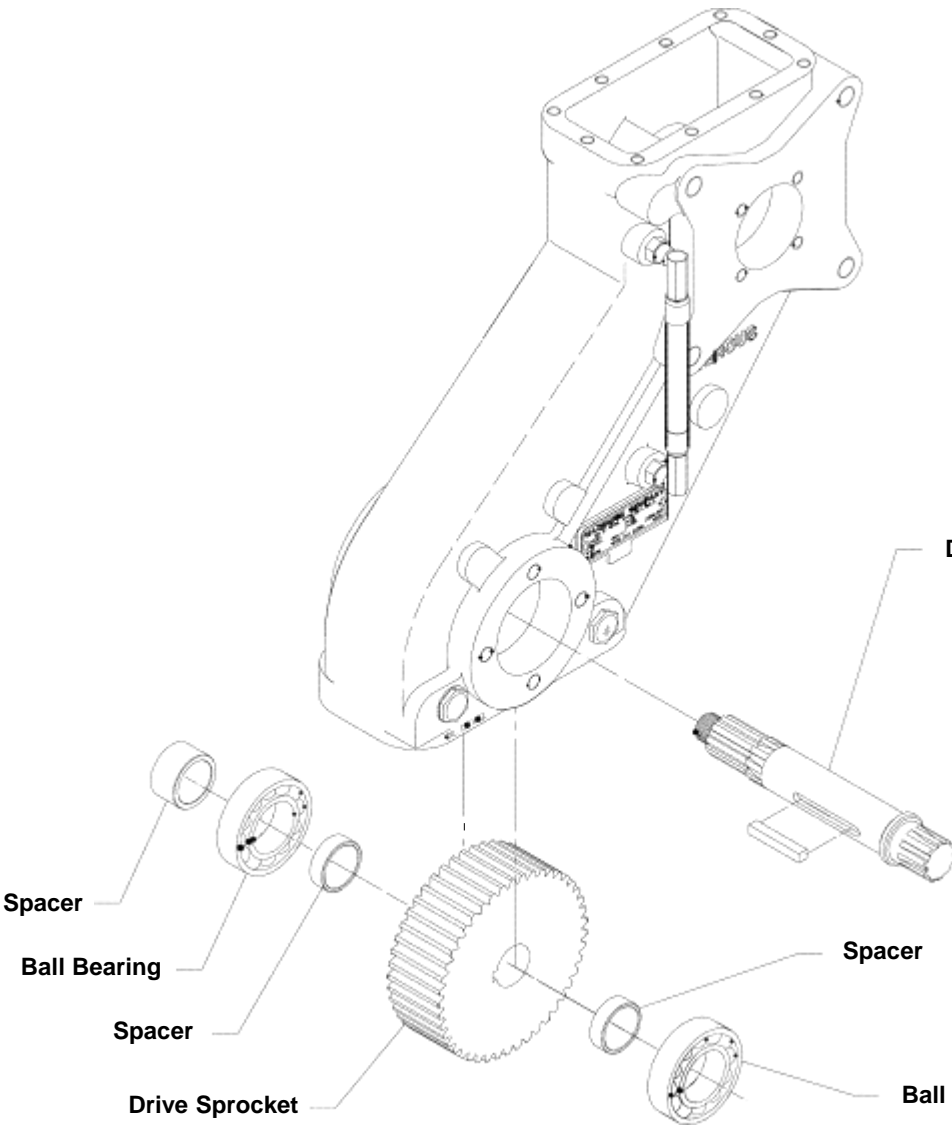


- 1. Remove retaining ring from shaft.
- 2. Press driven shaft out of case from oil seal sleeve end and remove driven sprocket from case.
- 3. Remove bearings and spacers from shaft.

# Disassembly

## Drive Shaft Removal (All Models)

- 1. Press drive shaft out of case from oil seal sleeve end and remove drive sprocket from case.
- 2. Remove bearings and spacers from shaft.



IL1334

## Reassembly

### Inspection and Repair

Check the following:

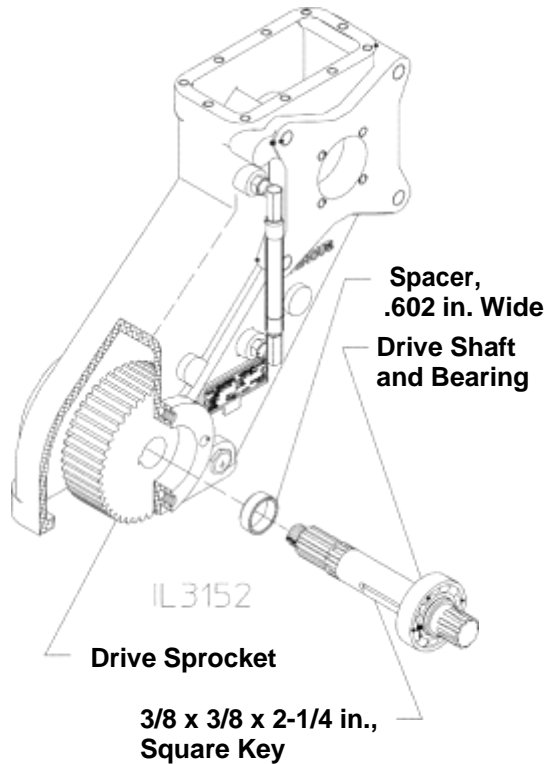
- Condition of oil hose
- Worn sprocket teeth
- Worn flanks on inner chain links
- Outside guide links of chain not retained by “riveted over” pins
- Wear on inner faces of outside guide links of chain
- Damaged splines on shafts

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

# Reassembly

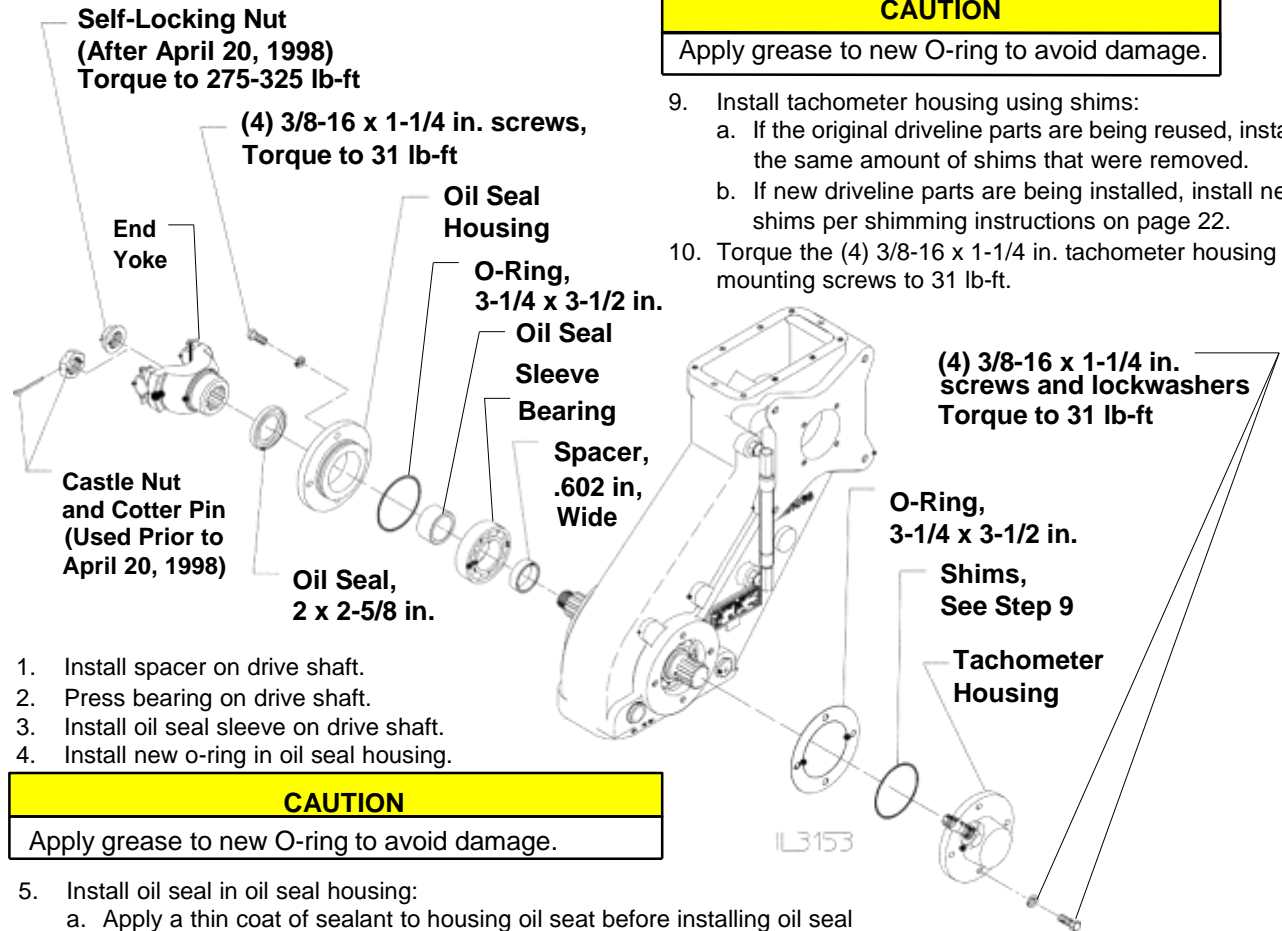
## Drive Shaft Installation (All Models)

### Shaft and Sprockets



1. Install bearing on drive shaft.
2. Place key in drive shaft.
3. Place drive sprocket and spacer in case.
4. Press drive shaft into case through spacer and drive sprocket aligning keyway in sprocket with key in shaft.

### Housings and Oil Seals



1. Install spacer on drive shaft.
2. Press bearing on drive shaft.
3. Install oil seal sleeve on drive shaft.
4. Install new o-ring in oil seal housing.

#### CAUTION

Apply grease to new O-ring to avoid damage.

5. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
6. Install oil seal housing on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.
7. Install end yoke:
  - a. If end yoke was originally attached with a castle nut and cotter pin, re-install these components.
  - b. If end yoke was originally attached with a self-locking nut discard the original nut and install a new nut. Anti-seize should be applied to the threads before installation. Torque self-locking nut to 400-450 lb-ft.

8. Install new o-ring in tachometer housing.

#### CAUTION

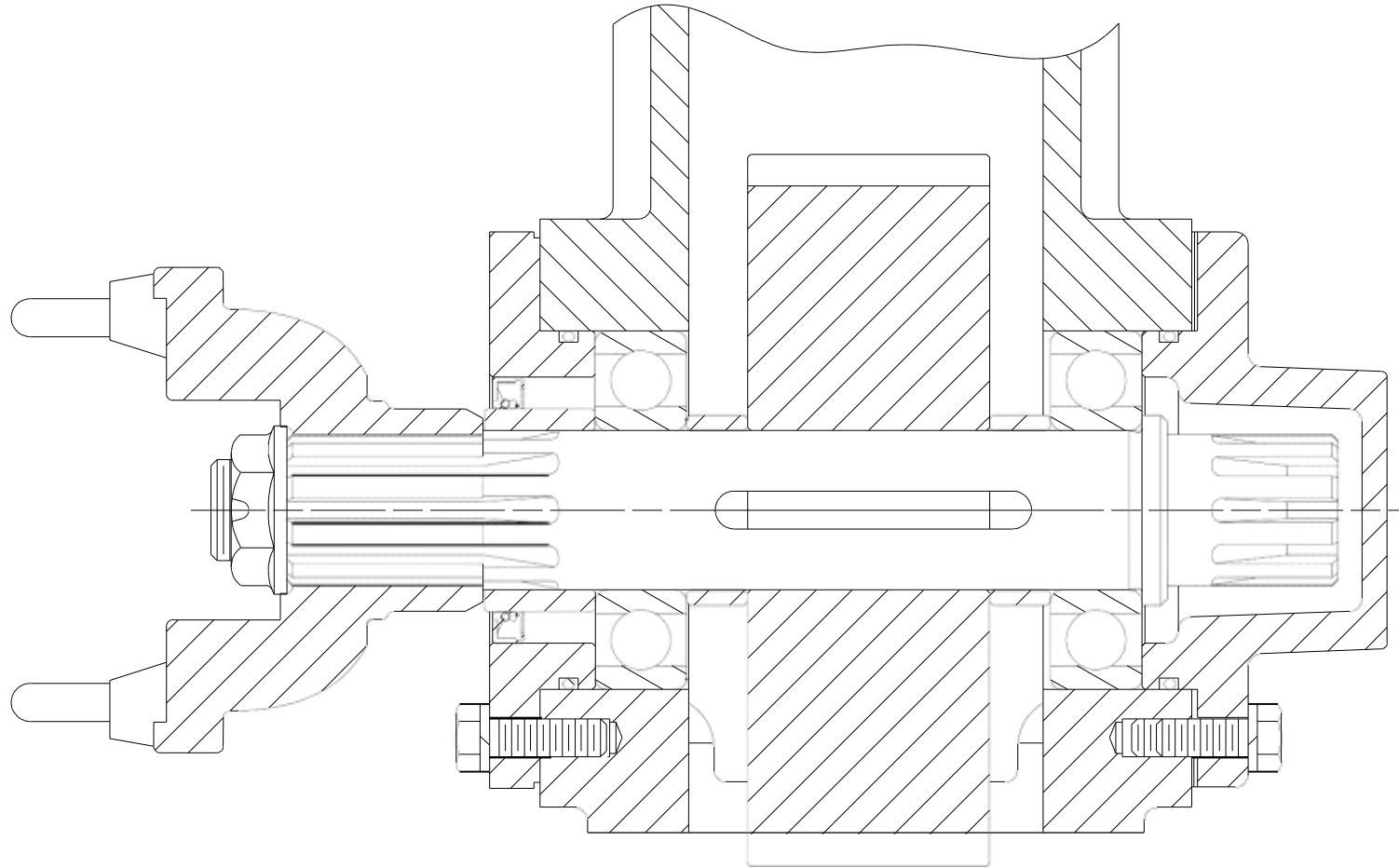
Apply grease to new O-ring to avoid damage.

9. Install tachometer housing using shims:
  - a. If the original driveline parts are being reused, install the same amount of shims that were removed.
  - b. If new driveline parts are being installed, install new shims per shimming instructions on page 22.
10. Torque the (4) 3/8-16 x 1-1/4 in. tachometer housing mounting screws to 31 lb-ft.

# Reassembly

## Drive Shaft Installation (All Models)

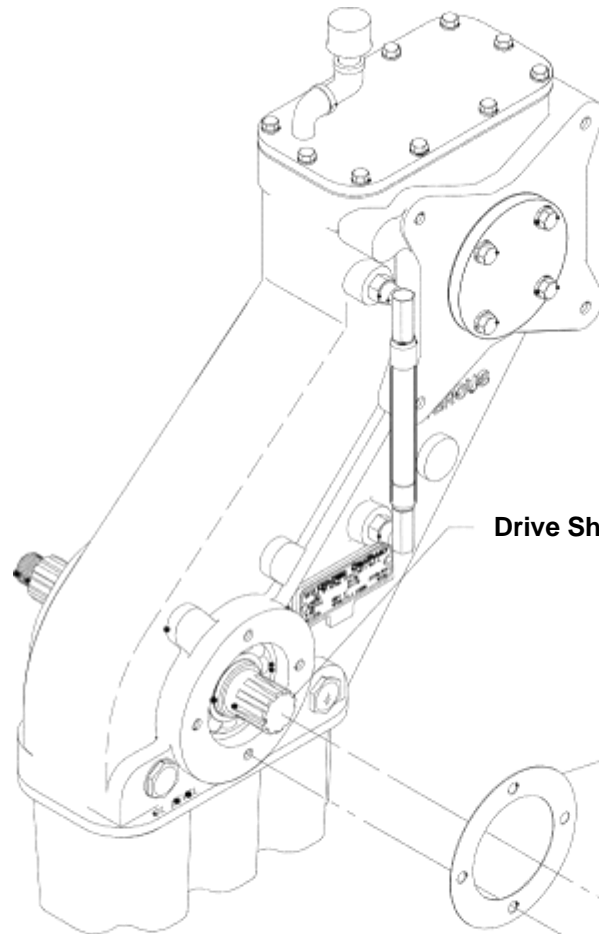
### Cross-Section View



IL3324

## Reassembly

### Drive Shaft Installation (All Models), Shimming Instructions



#### Will Provide .005 to .010 in. Axial Shaft Float

1. Lightly tap on end of driven shaft so that the inner bearing seats in the housing on the opposite side of the case.
2. Fit the cover or seal housing in the case bore until it contacts the outer race of the bearing. Removing the O-ring from the tachometer housing will simplify the shimming procedure.
3. While holding the tachometer housing in position, measure the gap between the face of the housing and the case using a feeler gauge. This gap thickness plus .005 in. is the minimum amount of shims required.
4. Remove the tachometer housing and re-install the O-ring. Install the housing on the case with the necessary shims. Torque the (4) 3/18-16 screws to 31 lb-ft.

IL1407

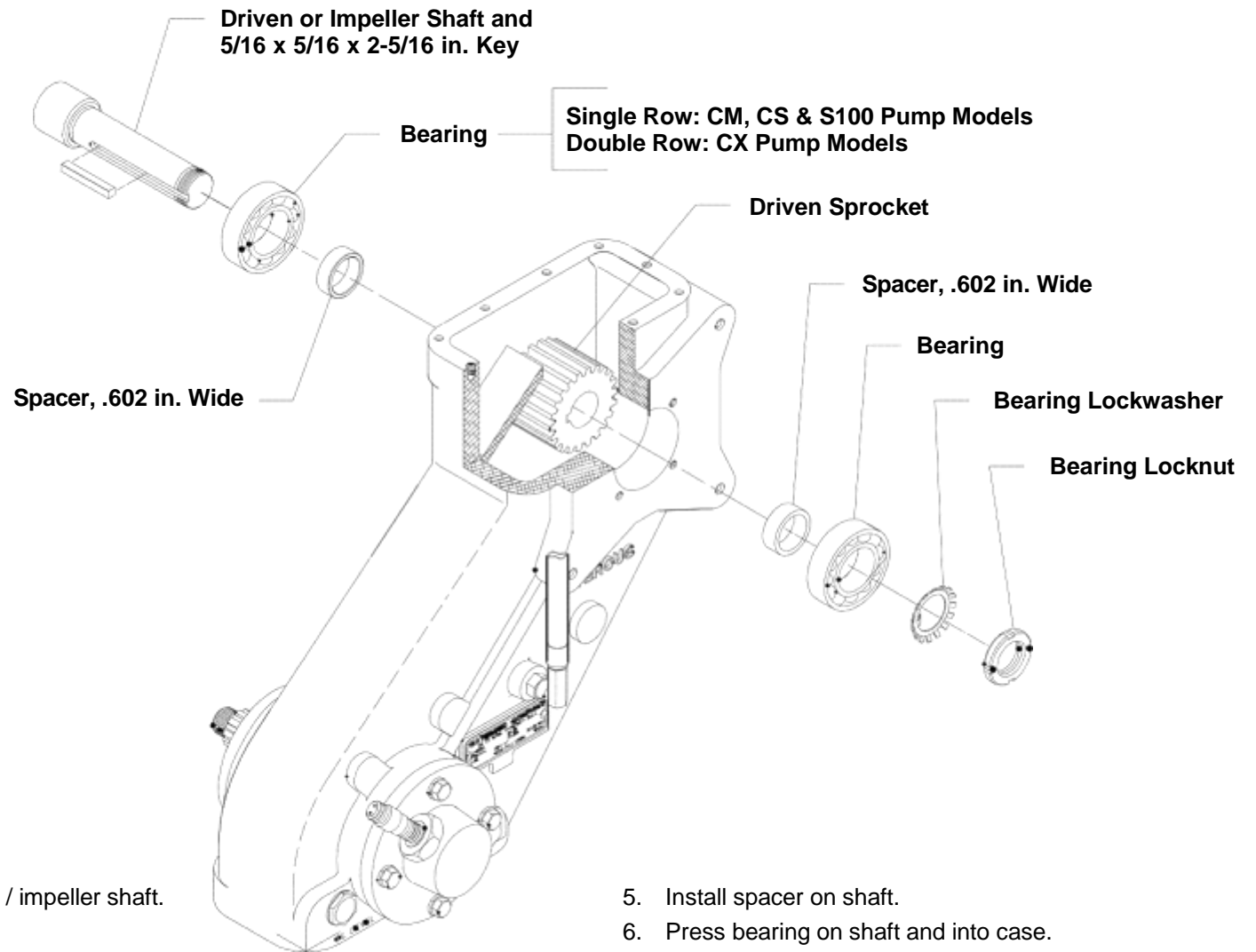
(4) 3/8-16 x 1-1/4 in. Screws and Lockwashers,  
Torque to 31 lb-ft.



## Reassembly

### Driven or Impeller Shaft Installation, PA Models Without Rear Facing Output Shaft

#### Shaft and Sprockets



1. Install bearing and spacer on driven / impeller shaft.
2. Place key in driven shaft.
3. Place driven sprocket in case.
4. Press driven / impeller shaft through driven sprocket aligning sprocket keyway with key in shaft.

5. Install spacer on shaft.
6. Press bearing on shaft and into case.
7. Install bearing lockwasher and locknut on shaft. Bend one tab of lockwasher into slot in locknut.

IL1401

# Reassembly

## Driven or Impeller Shaft Installation, PA Models Without Rear Facing Output Shaft

### Housing and Oil Seals

(4) 3/8-16 x 1-1/4 in. Screws and Lockwashers, Torque to 31 lb-ft.

#### Pump End: CM, CS, CG and CX Pump Models

1. Install new O-ring in oil seal housing.

#### CAUTION

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
3. Install oil seal housing on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.

#### S100 Pump Models:

1. Install pump body on transmission, see pump overhaul instructions.

Sealing Boot, CM and CS Pump Models Only

Oil Seal, 1-7/8 x 2-5/8 in.

Oil Seal Housing

O-ring, 2-7/8 x 3-1/8 in.

Not Used on S100 Pump Models

(4) 3/8-16 x 1-1/4 in. Screws and Lockwashers, Torque to 31 lb-ft.

Bearing Cover

O-ring, 1-7/8 x 2-5/8 in.

Shims, See Step 2

#### End Opposite Pump:

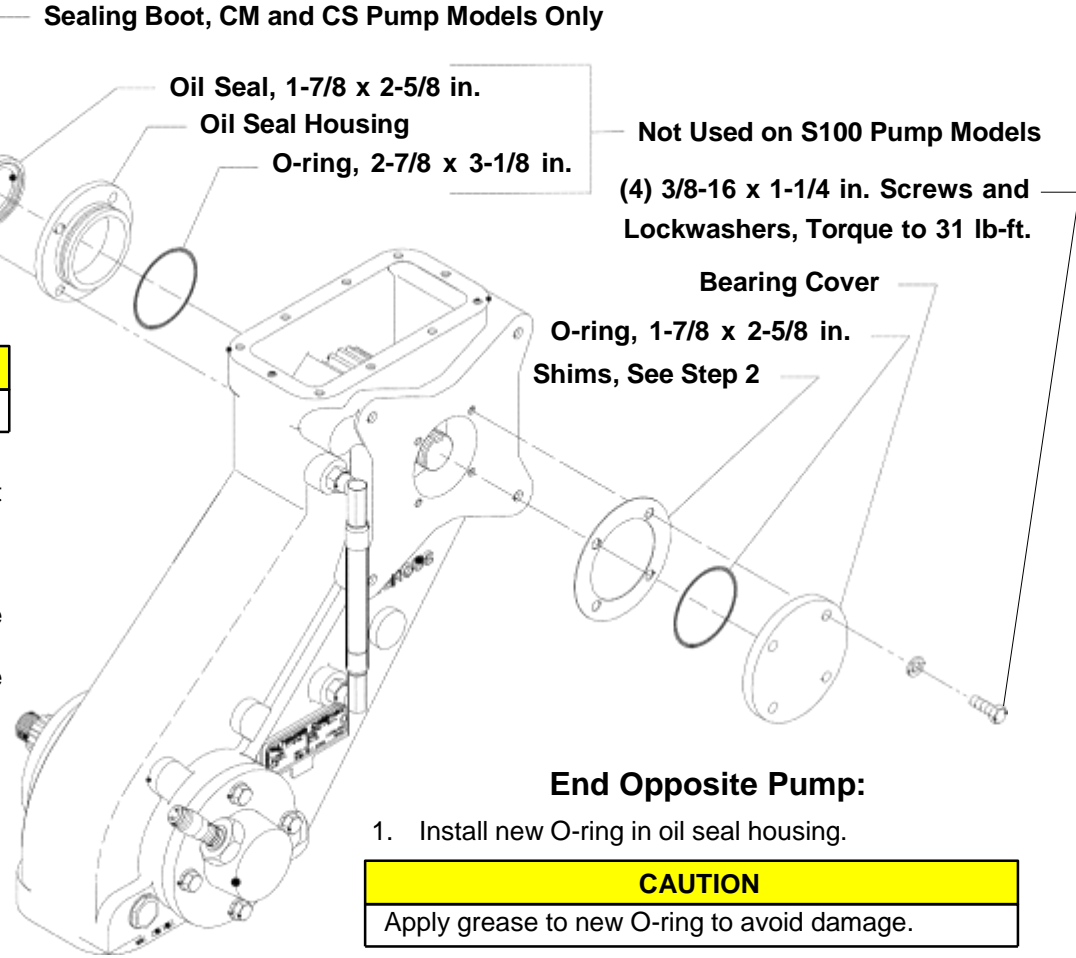
1. Install new O-ring in oil seal housing.

#### CAUTION

Apply grease to new O-ring to avoid damage.

2. Install bearing housing using shims:
  - a. If the original driven shaft parts are being reused, install the same amount of shims that were removed.
  - b. If new driven shaft parts are being installed, install new shims per shimming instructions of page 38.
3. Torque the (4) 3/8-16 x 1-1/4 in tachometer housing mounting screws to 31 lb-ft.

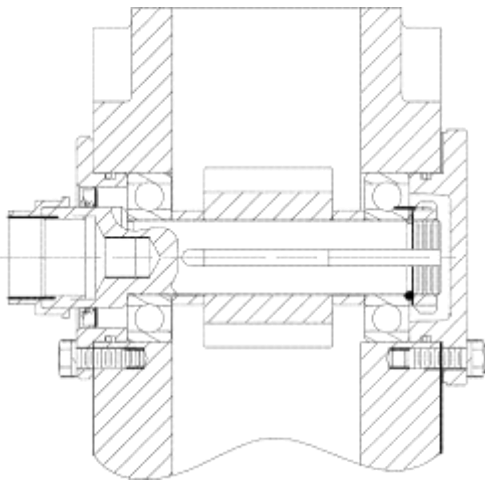
IL1402



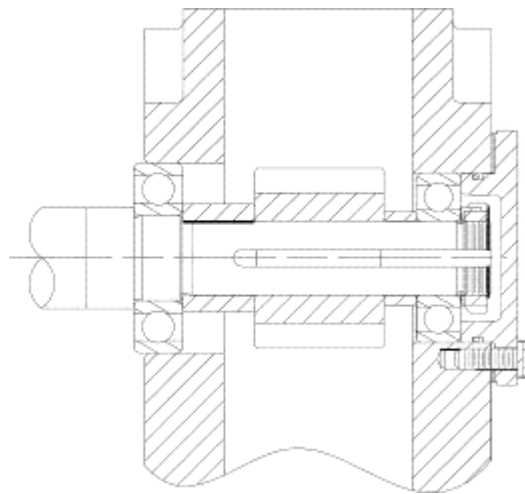
## Reassembly

### Driven or Impeller Shaft Installation, PA Models Without Rear Facing Output Shaft

#### Cross-Section View

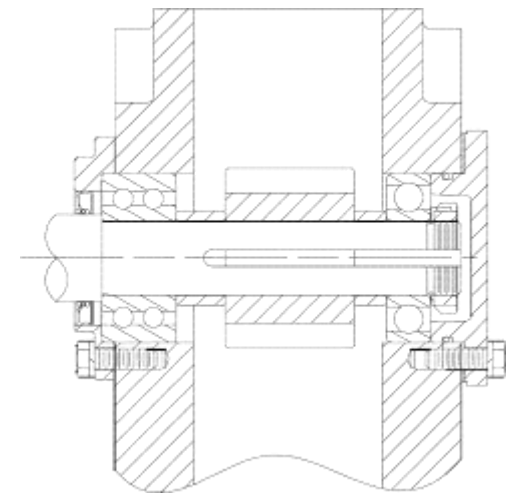


CM and CS Pump Models



S100 Pump Models

1.3325

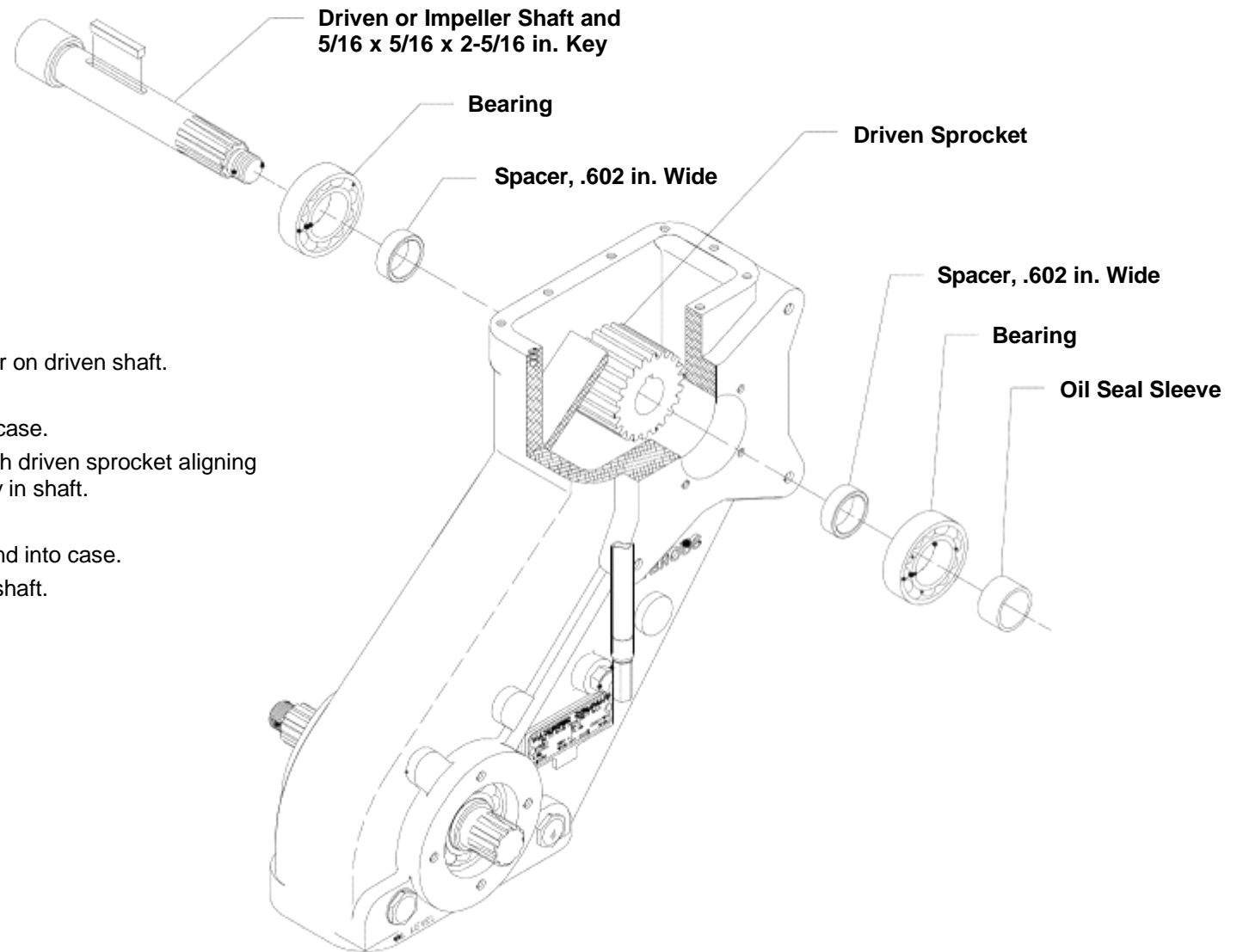


CG, CL and CX Pump Models

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing End Yoke

#### Shaft and Sprockets



1. Install bearing and spacer on driven shaft.
2. Place key in driven shaft.
3. Place driven sprocket in case.
4. Press driven shaft through driven sprocket aligning sprocket keyway with key in shaft.
5. Install spacer on shaft.
6. Press bearing on shaft and into case.
7. Install oil seal sleeve on shaft.

IL 3118

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing End Yoke

#### Housing and Oil Seals

##### End Opposite End Yoke:

1. Install new O-ring in oil seal housing.

**CAUTION**

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
3. Install oil seal housing on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.

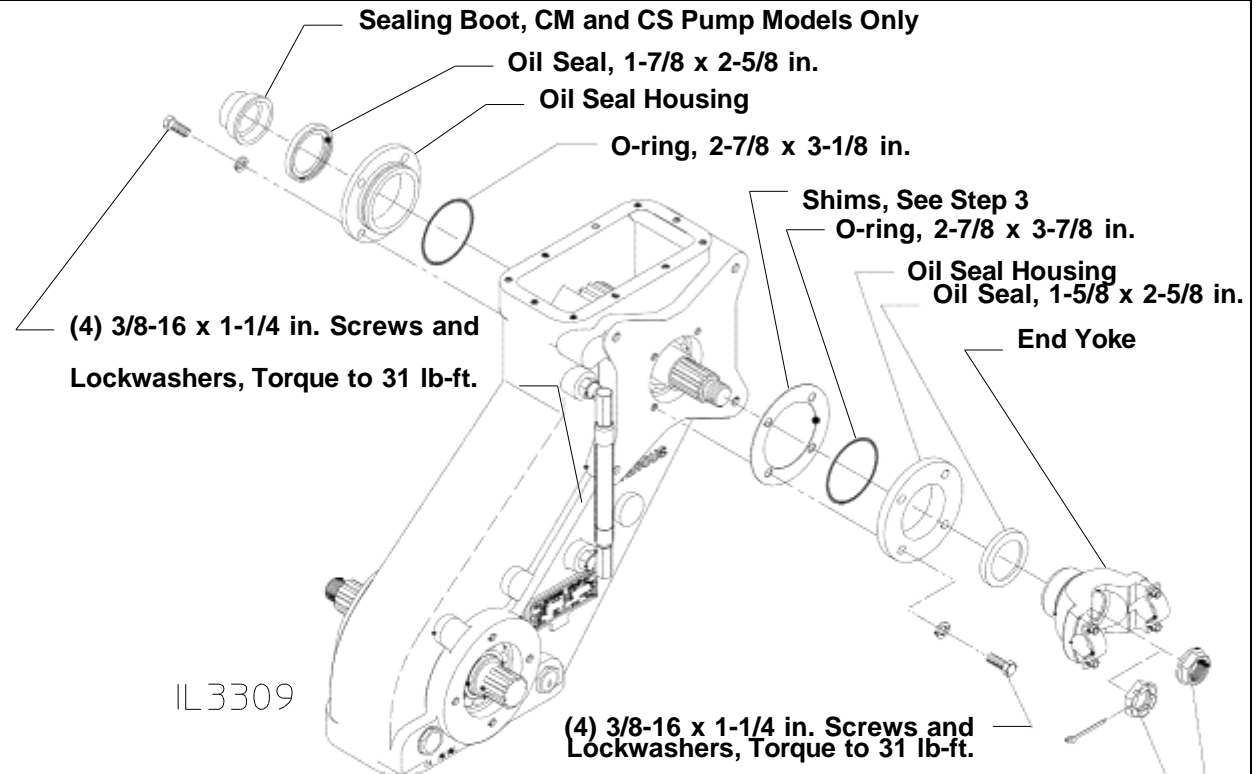
##### End Yoke End:

1. Install new O-ring in oil seal housing.

**CAUTION**

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.

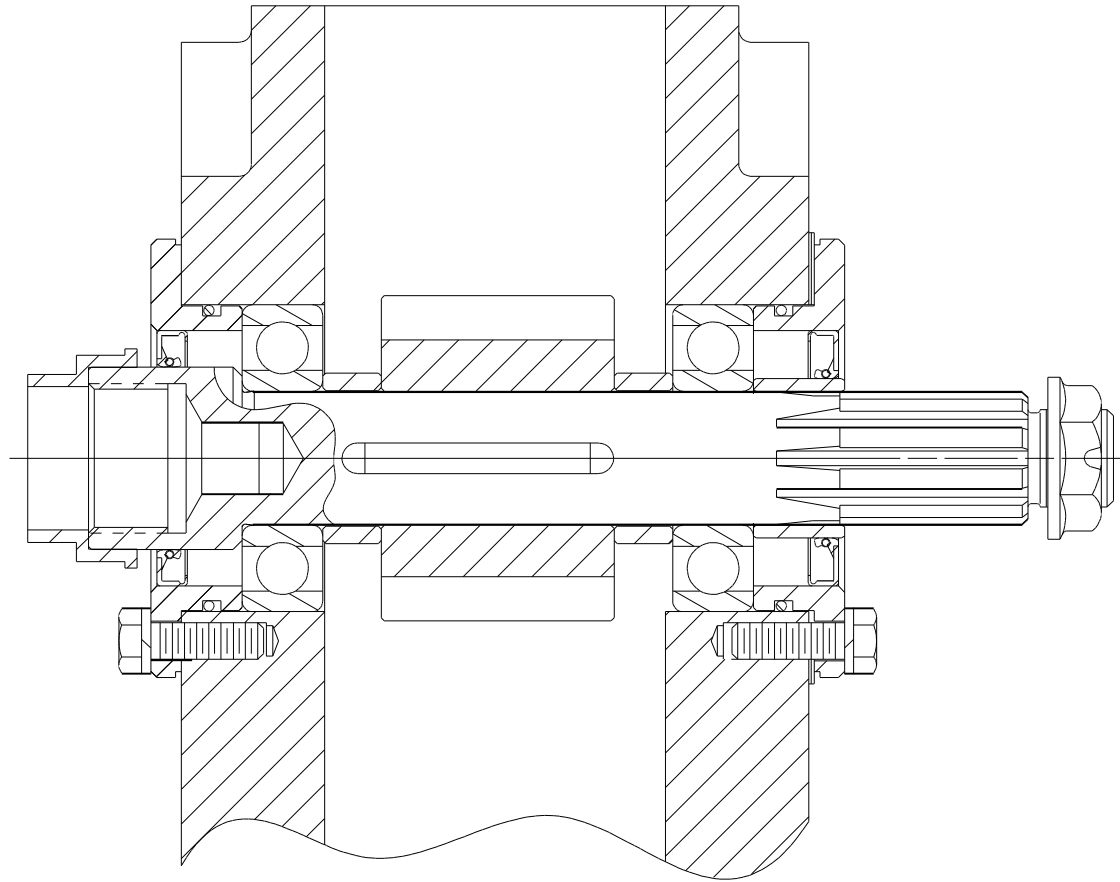


3. Install bearing housing using shims:
  - a. If the original driven shaft parts are being reused, install the same amount of shims that were removed.
  - b. If new driven shaft parts are being installed, install new shims per Shimming instructions of page 38.
4. Torque the (4) 3/8-16 x 1-1/4 in oil seal housing mounting screws to 31 lb-ft.
5. Install end yoke:
  - a. If end yoke was originally attached with a castle nut and cotter pin, re-install these components.
  - b. If end yoke was originally attached with a self-locking nut, discard the original nut and install a new nut. Anti-seize should be applied to the threads before installation. Torque self-locking nut to 400-450 lb-ft.

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing End Yoke

#### Cross-Section View



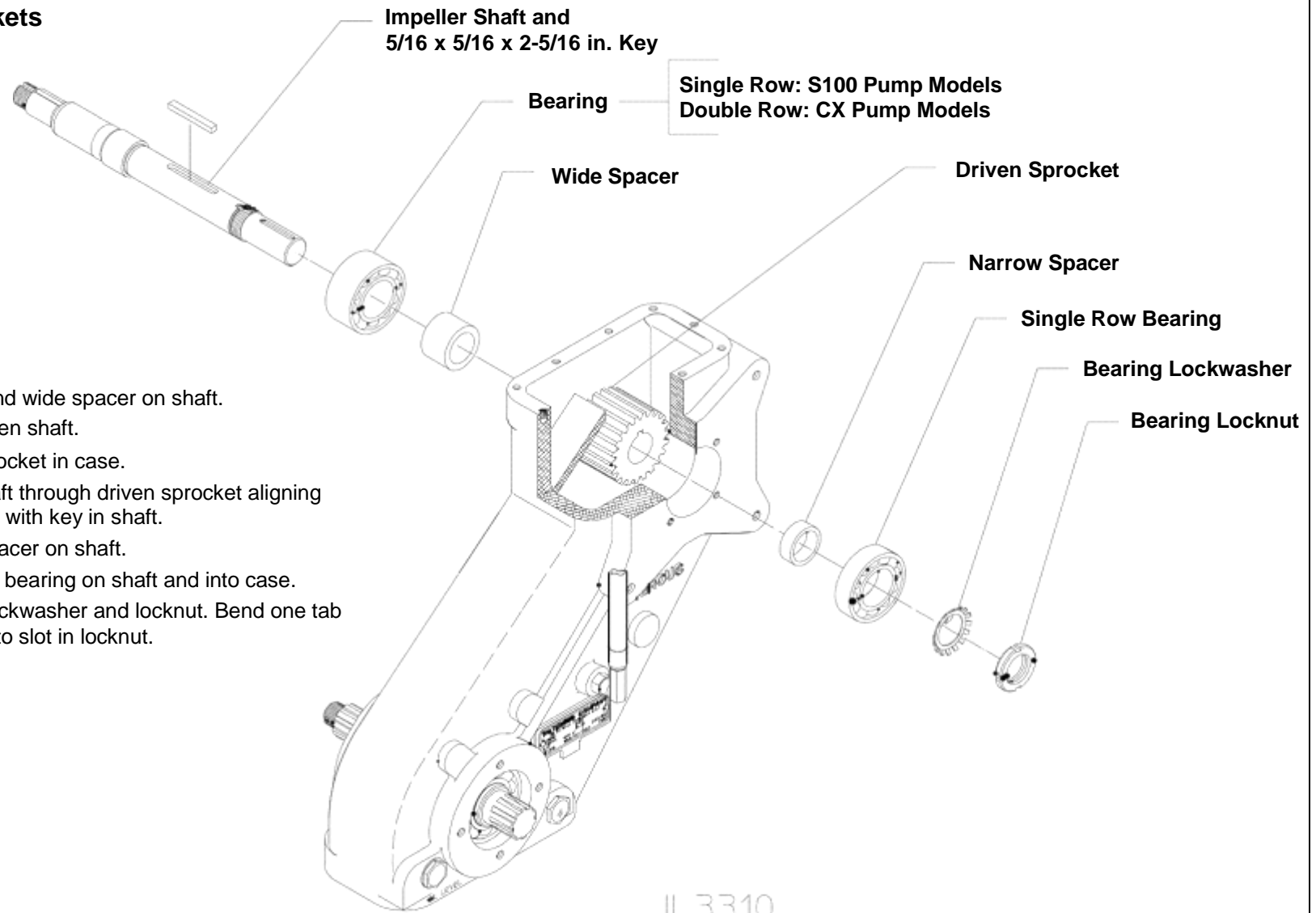
CM and CS Pump Models

IL3326

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing Compressor (Belt) Drive

#### Shaft and Sprockets



1. Install bearing and wide spacer on shaft.
2. Place key in driven shaft.
3. Place driven sprocket in case.
4. Press driven shaft through driven sprocket aligning sprocket keyway with key in shaft.
5. Install narrow spacer on shaft.
6. Press single row bearing on shaft and into case.
7. Install bearing lockwasher and locknut. Bend one tab of lockwasher into slot in locknut.

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing Compressor (Belt) Drive

#### Housings and Oil Seals

##### Pump End: CX Pump Models

1. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
2. Install oil seal housing on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.

##### Pump End: S100 Pump Models:

1. Install pump body on transmission, see pump overhaul instructions.

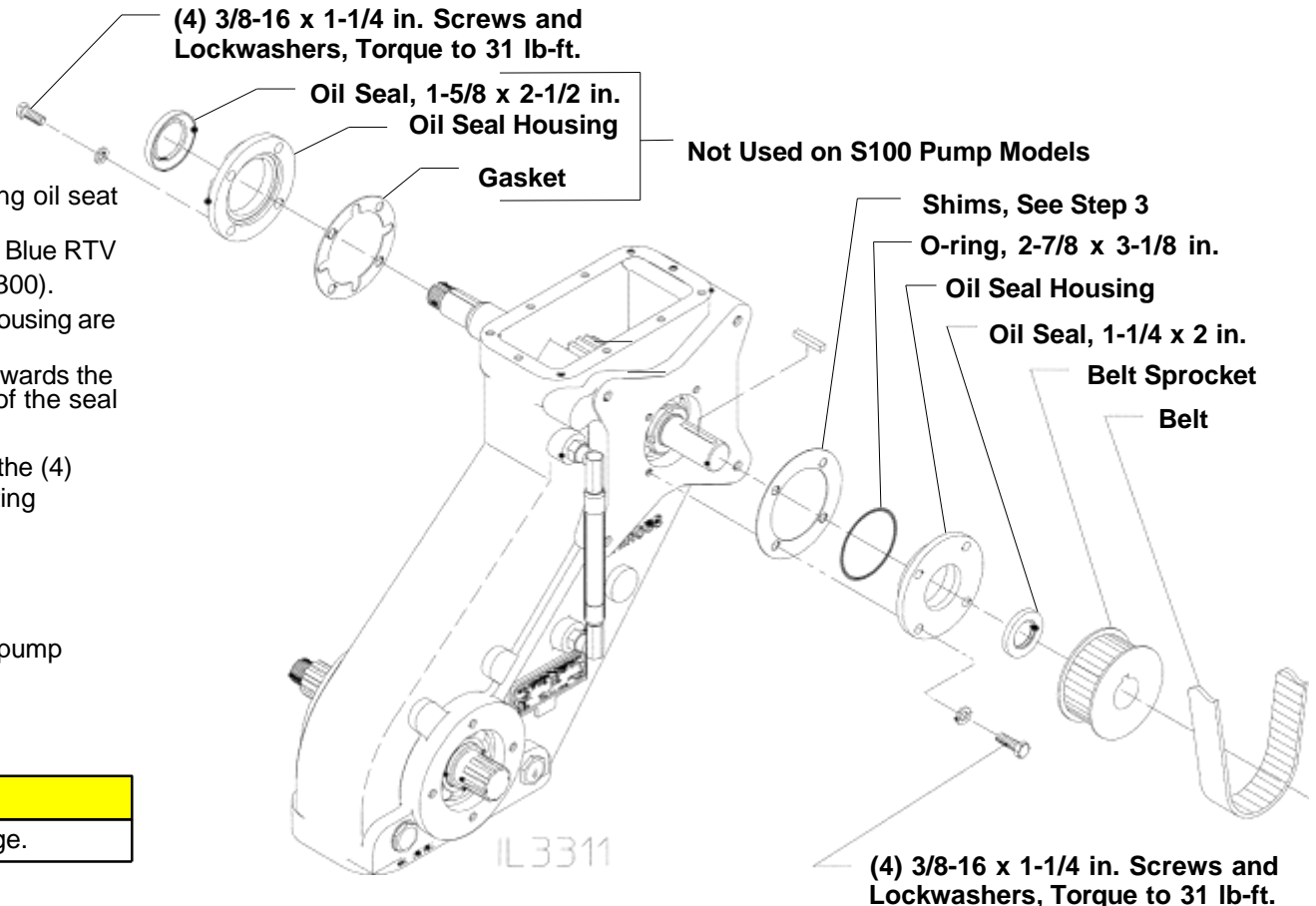
##### Belt End (All Models):

1. Install new O-ring in oil seal housing.

#### CAUTION

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.



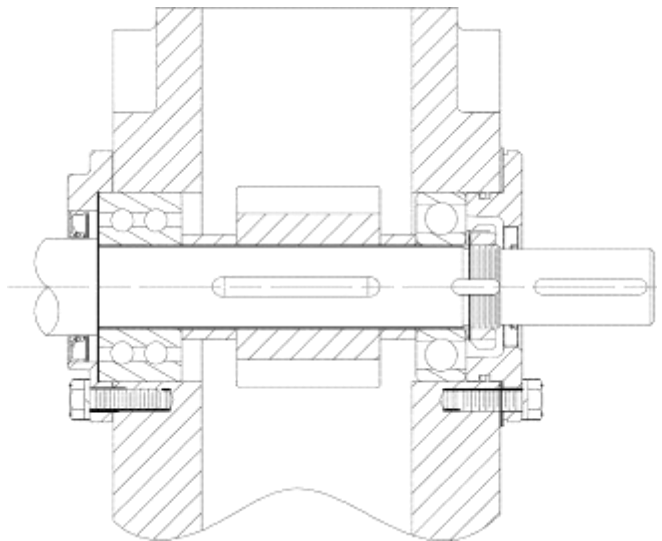
3. Install bearing housing using shims:
  - a. If the original driven shaft parts are being reused, install the same amount of shims that were removed.
  - b. If new driven shaft parts are being installed, install new shims per Shimming instructions of page 38.
4. Torque the (4) 3/8-16 x 1-1/4 in oil seal housing mounting screws to 31 lb-ft.
5. Install belt sprocket.



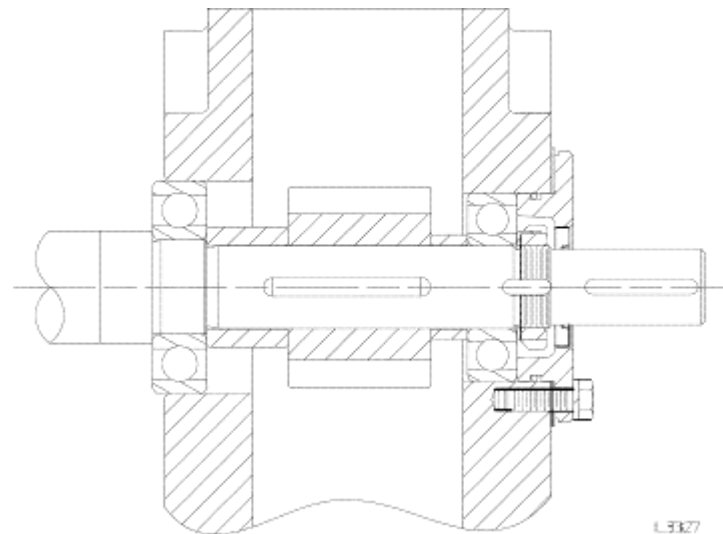
## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing Compressor (Belt) Drive

#### Cross-Section View



**CX Pump Models**

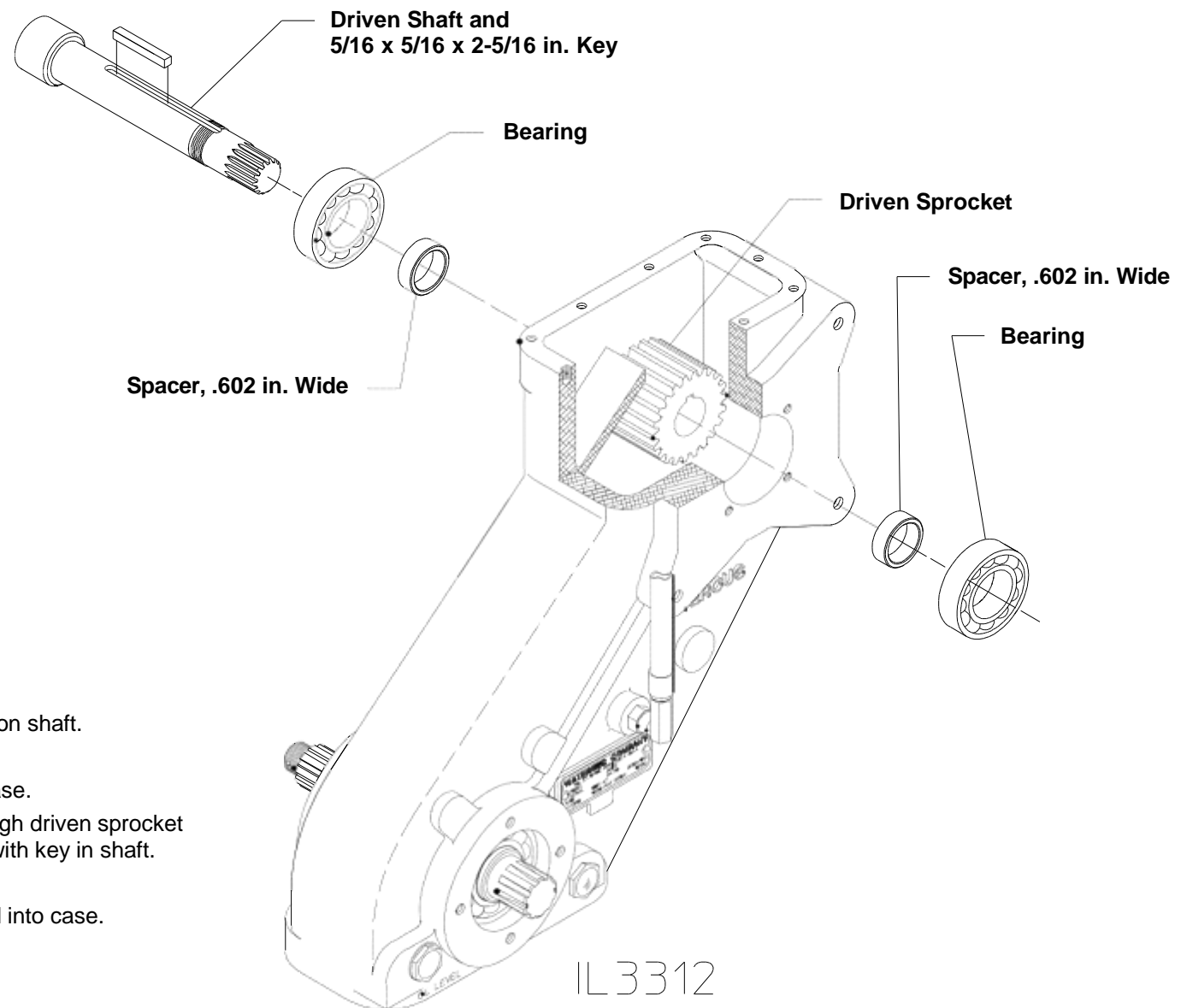


**S100 Pump Models**

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing Combination Pump

#### Shaft and Sprockets



1. Install bearing and spacer on shaft.
2. Place key in shaft.
3. Place driven sprocket in case.
4. Press shaft into case through driven sprocket aligning sprocket keyway with key in shaft.
5. Install spacer on shaft.
6. Press bearing on shaft and into case.

## Reassembly

### Driven or Impeller Shaft Installation, PA Models With Rear Facing Combination Pump

#### Housings and Oil Seals

##### End Opposite of CPK-2 Pump:

1. Install new O-ring in oil seal housing.

**CAUTION**

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
3. Install oil seal housing on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.

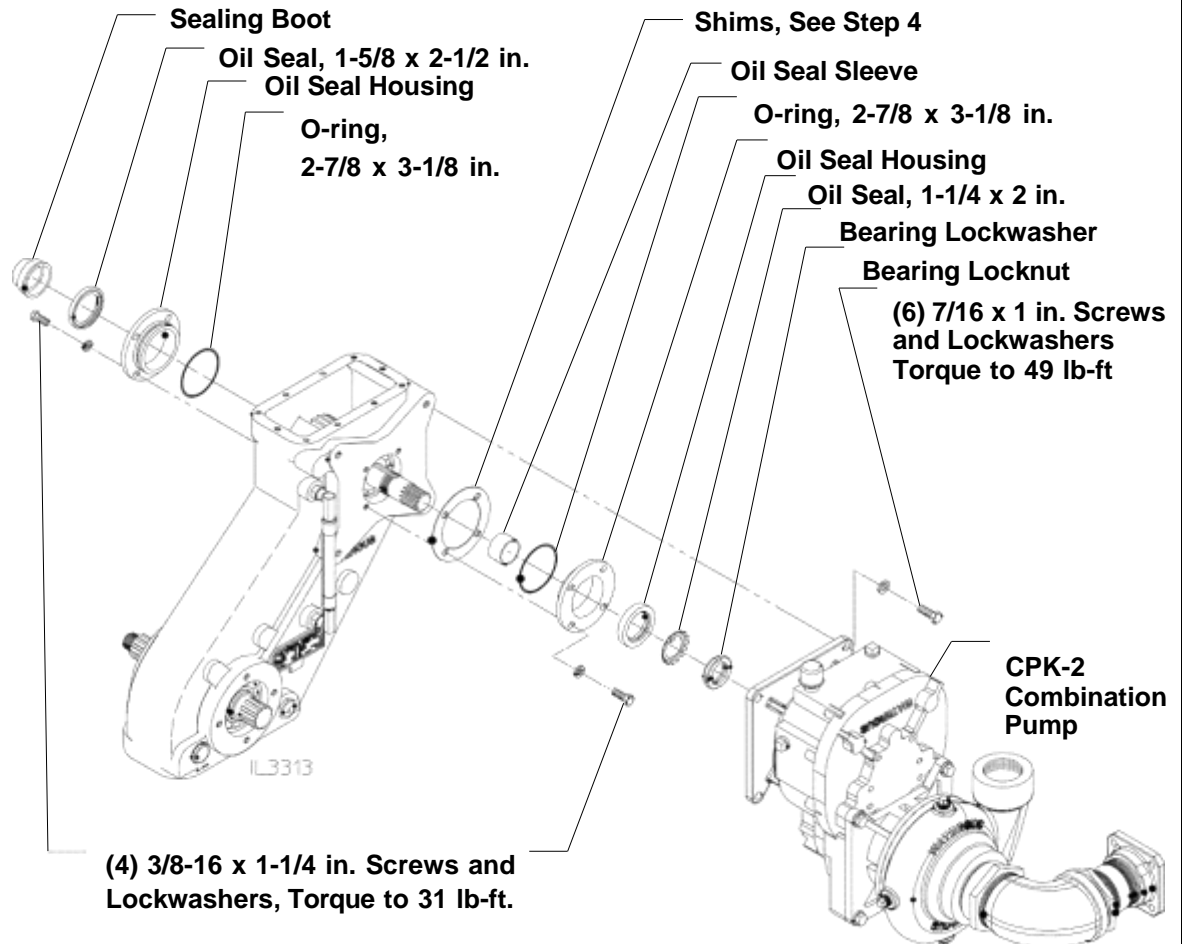
##### CPK-2 Pump End:

1. Install new O-ring in oil seal housing.

**CAUTION**

Apply grease to new O-ring to avoid damage.

2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
3. Install oil seal sleeve on shaft.

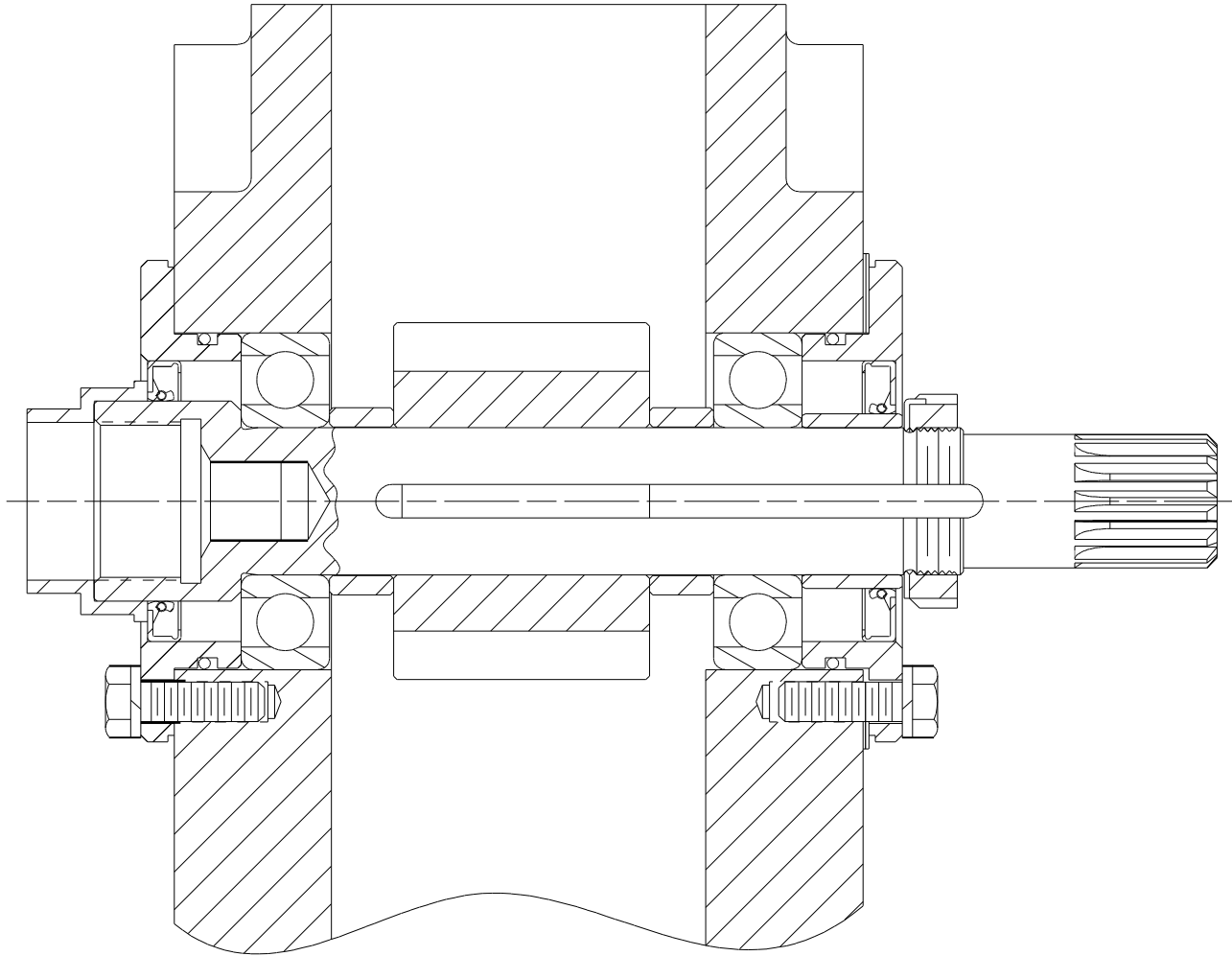


4. Install oil seal housing using shims:
  - a. If the original driven shaft parts are being reused, install the same amount of shims that were removed.
  - b. If new driven shaft parts are being installed, install new shims per Shimming instructions of page 38.
5. Torque the (4) 3/8-16 x 1-1/4 in oil seal housing mounting screws to 31 lb-ft.
6. Install bearing lockwasher and locknut. Bend one tab of lockwasher into a slot in the bearing nut.
7. Install CPK-2 combination pump. Torque (6) 7/16-14 screws to 49 lb-ft.

# Reassembly

## Driven or Impeller Shaft Installation, PA Models With Rear Facing Combination Pump

### Cross-Section View



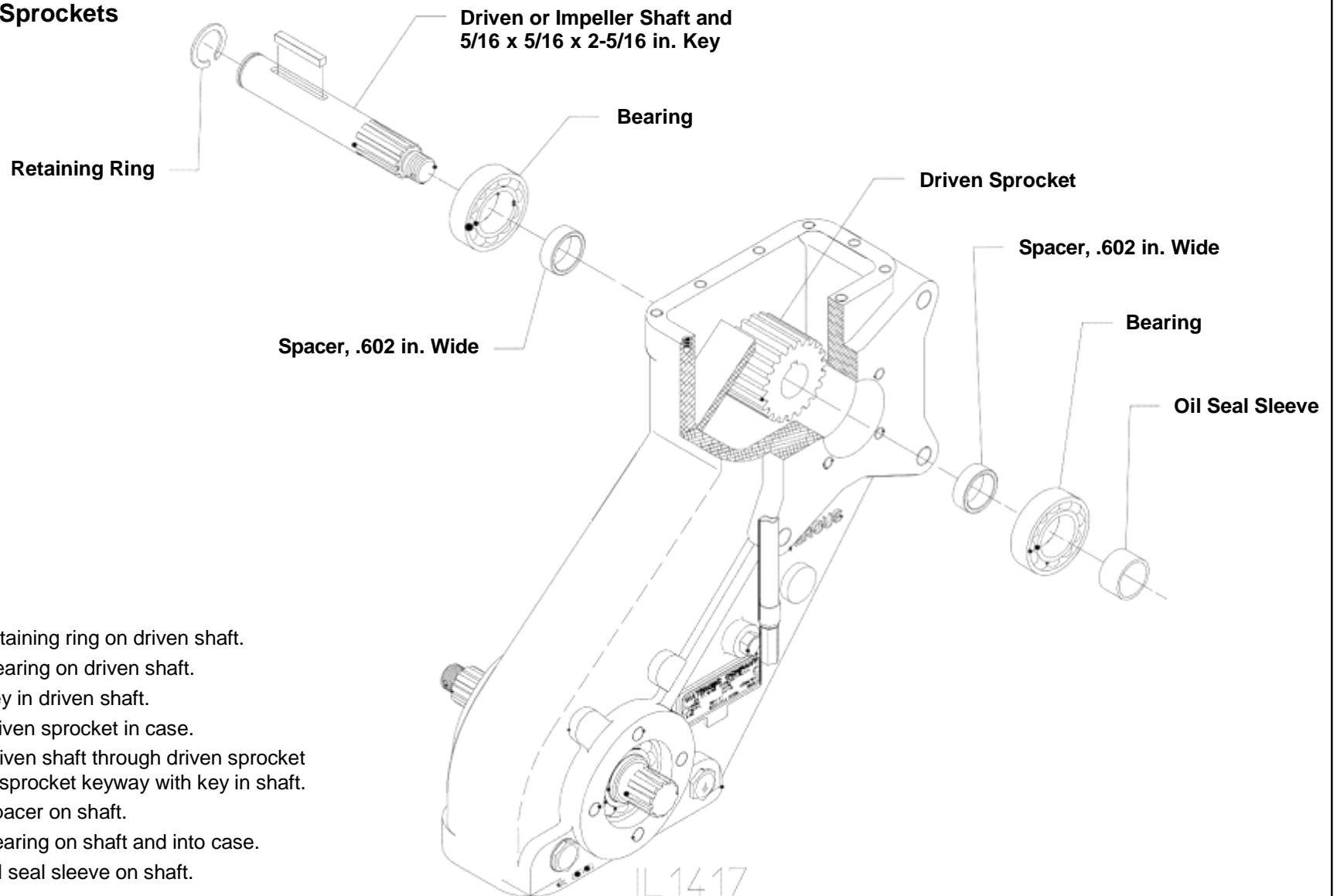
CM and CS Pump Models

IL3328

## Reassembly

### Driven or Impeller Shaft Installation, TPA Models

#### Shaft and Sprockets



1. Install retaining ring on driven shaft.
2. Install bearing on driven shaft.
3. Place key in driven shaft.
4. Place driven sprocket in case.
5. Press driven shaft through driven sprocket aligning sprocket keyway with key in shaft.
6. Install spacer on shaft.
7. Press bearing on shaft and into case.
8. Install oil seal sleeve on shaft.

# Reassembly

## Driven or Impeller Shaft Installation, TPA Models

### Housings and Oil Seals

#### End Opposite End Yoke:

1. Install new O-ring in bearing cover.

**CAUTION**

Apply grease to new O-ring to avoid damage.

2. Install bearing cover on case. Torque the (4) 3/8-16 x 1-1/4 in. oil seal housing mounting screws to 31 lb-ft.

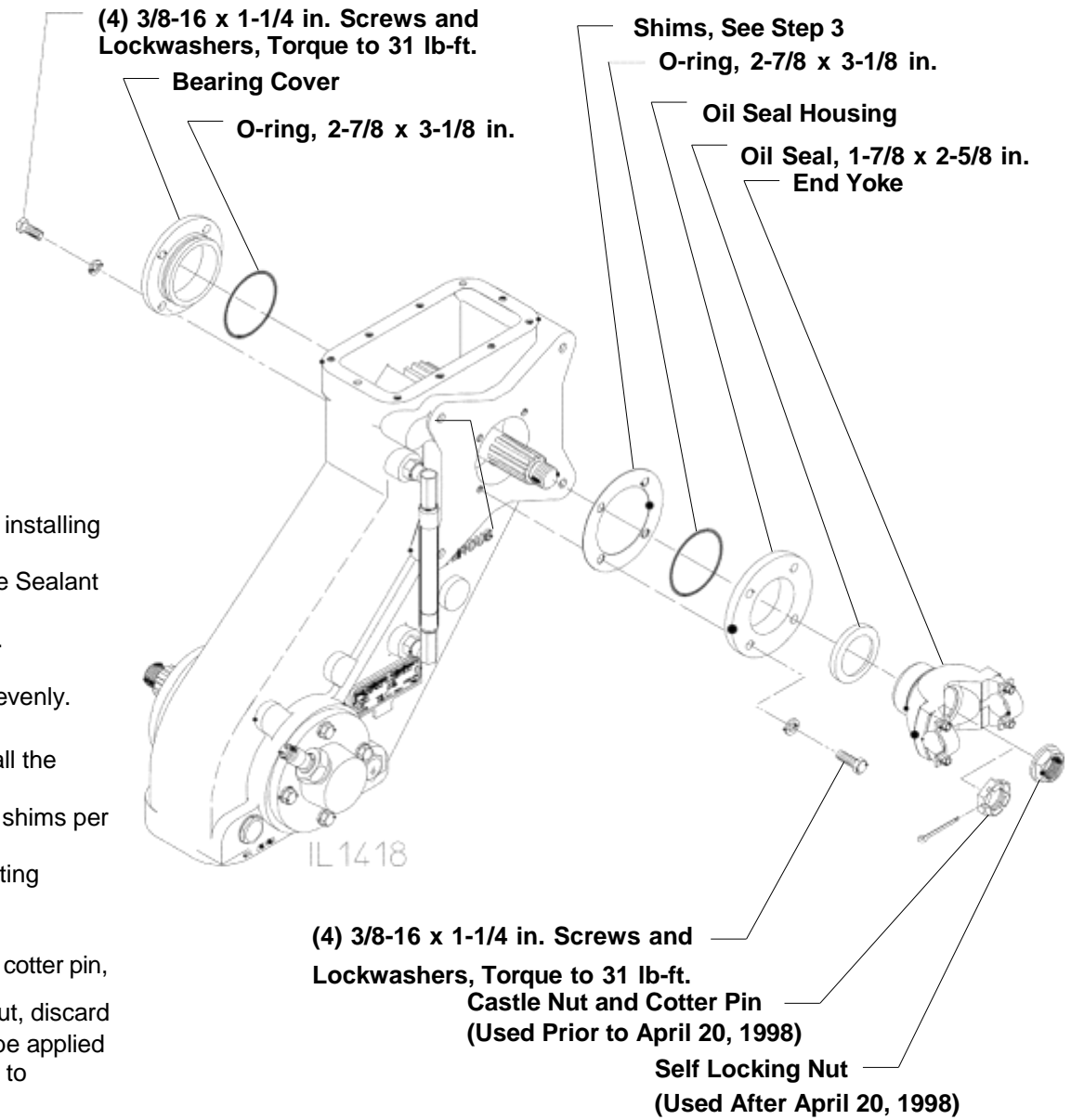
#### End Yoke End:

1. Install new O-ring in oil seal housing.

**CAUTION**

Apply grease to new O-ring to avoid damage.

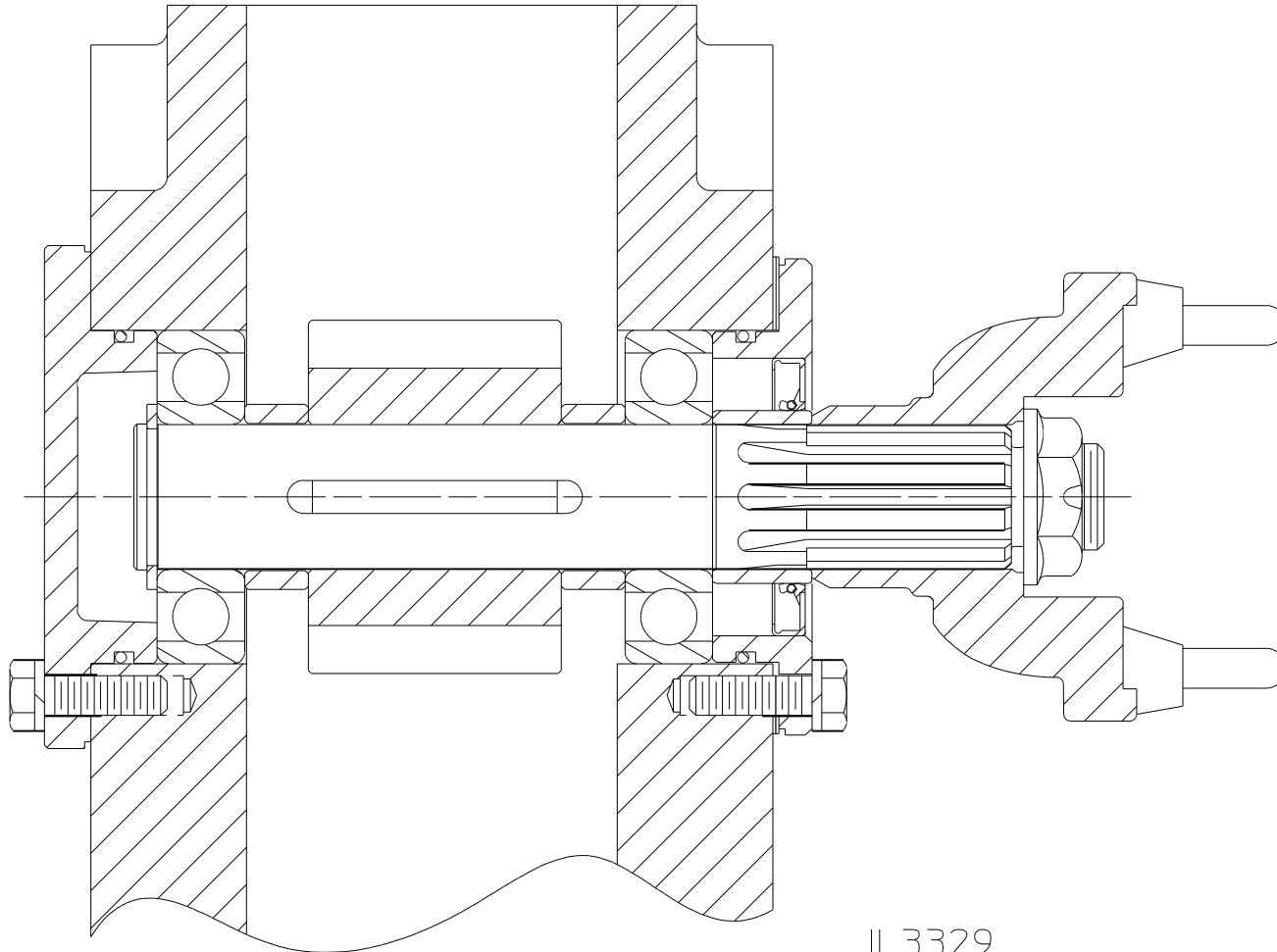
2. Install oil seal in oil seal housing:
  - a. Apply a thin coat of sealant to housing oil seat before installing oil seal (Waterous recommends Loctite Ultra Blue RTV Silicone Sealant or Permatex Super 300).
  - b. Be sure that the seal, shaft and seal housing are clean.
  - c. Install the seal with the lip facing in towards the case. Apply force to the outer edge of the seal and press in evenly.
3. Install oil seal housing using shims:
  - a. If the original driven shaft parts are being reused, install the same amount of shims that were removed.
  - b. If new driven shaft parts are being installed, install new shims per shimming instructions of page 38.
4. Torque the (4) 3/8-16 x 1-1/4 in tachometer housing mounting screws to 31 lb-ft.
5. Install end yoke:
  - a. If end yoke was originally attached with a castle nut and cotter pin, re-install these components.
  - b. If end yoke was originally attached with a self-locking nut, discard the original nut and install a new nut. Anti-seize should be applied to the threads before installation. Torque self-locking nut to 400-450 lb-ft.



# Reassembly

## Driven or Impeller Shaft Installation, TPA Models

### Cross-Section View

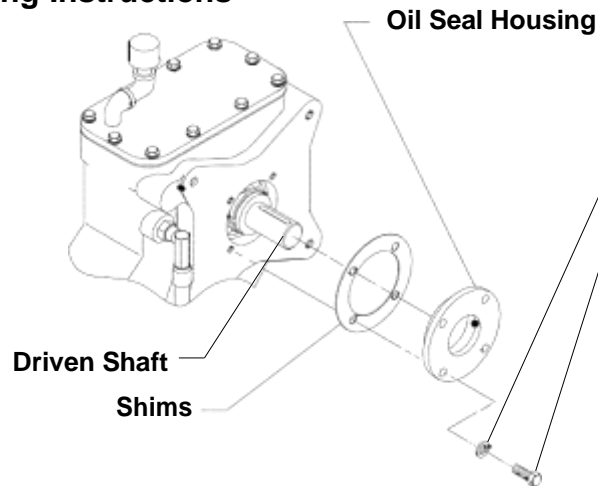


Model TPA P.T.O.'s

## Reassembly

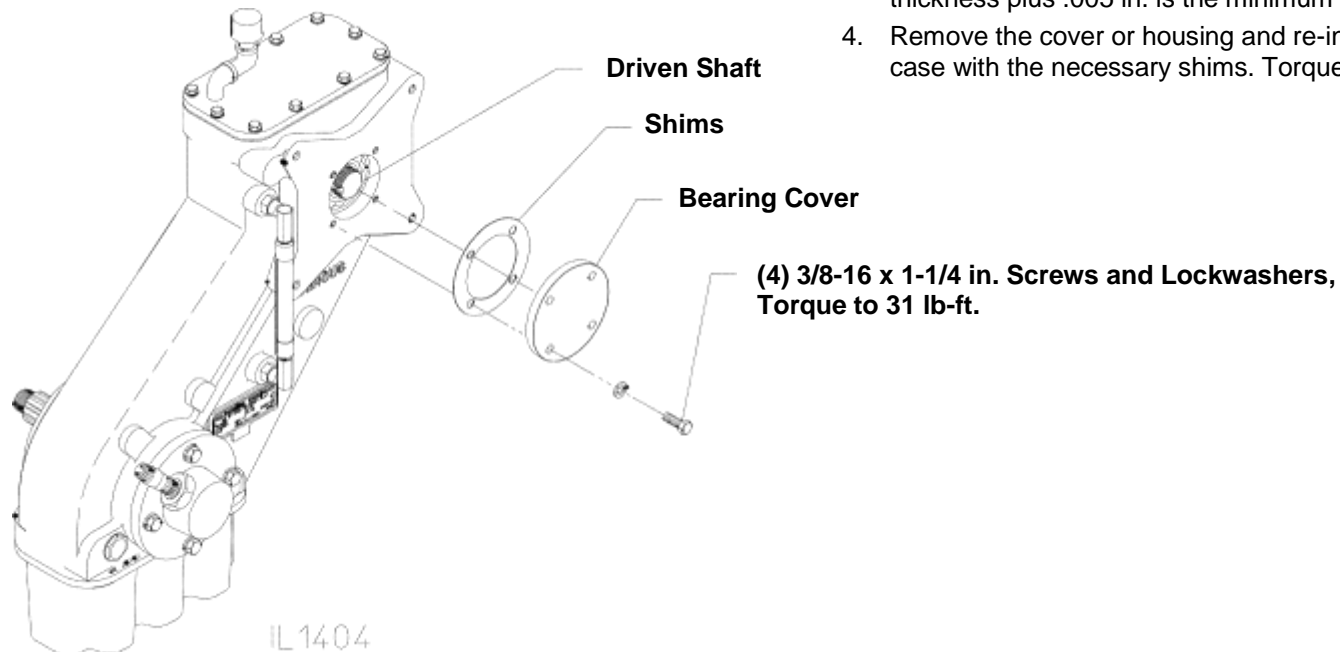
### Driven Shaft Installation (All Models)

#### Shimming Instructions



#### Will Provide .005 to .010 in. Axial Shaft Float

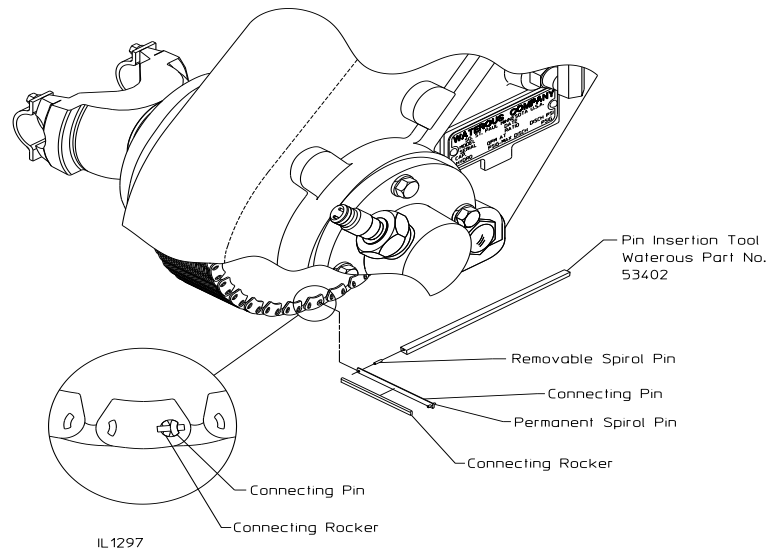
1. Lightly tap on end of driven shaft so that the inner bearing seats in the housing on the opposite side of the case.
2. Fit the cover or seal housing in the case bore until it contacts the outer race of the bearing. Removing the O-ring from the cover or housing will simplify the shimming procedure.
3. While holding the cover or housing in position, measure the gap between the face of the cover or housing and the case using a feeler gauge. This gap thickness plus .005 in. is the minimum amount of shims required.
4. Remove the cover or housing and re-install the O-ring. Install the cover on the case with the necessary shims. Torque the (4) 3/8-16 screws to 31 lb-ft.



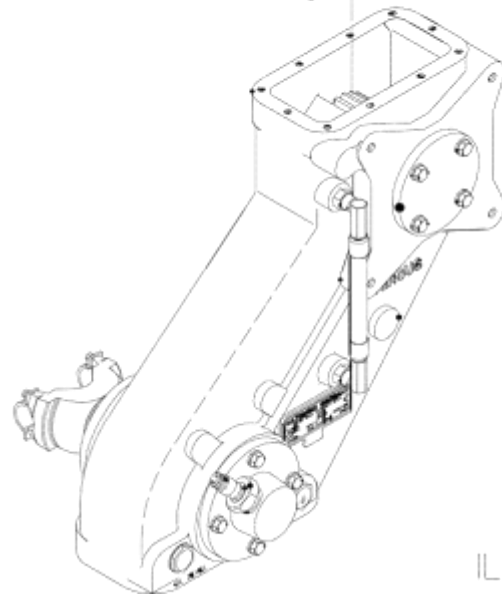


# Reassembly

## Chain Installation



**Wrap Chain  
Around  
Driven  
and Drive  
Sprockets**



1. Wrap the chain around the drive and driven sprockets making sure everything meshes and then lace the joining ends together using the connecting pin set.
2. Insert the connecting pin rocker partway through the holes in the joining end links being careful of orientation. 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 the 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. Make sure the spirol pin overlaps the connecting rocker.

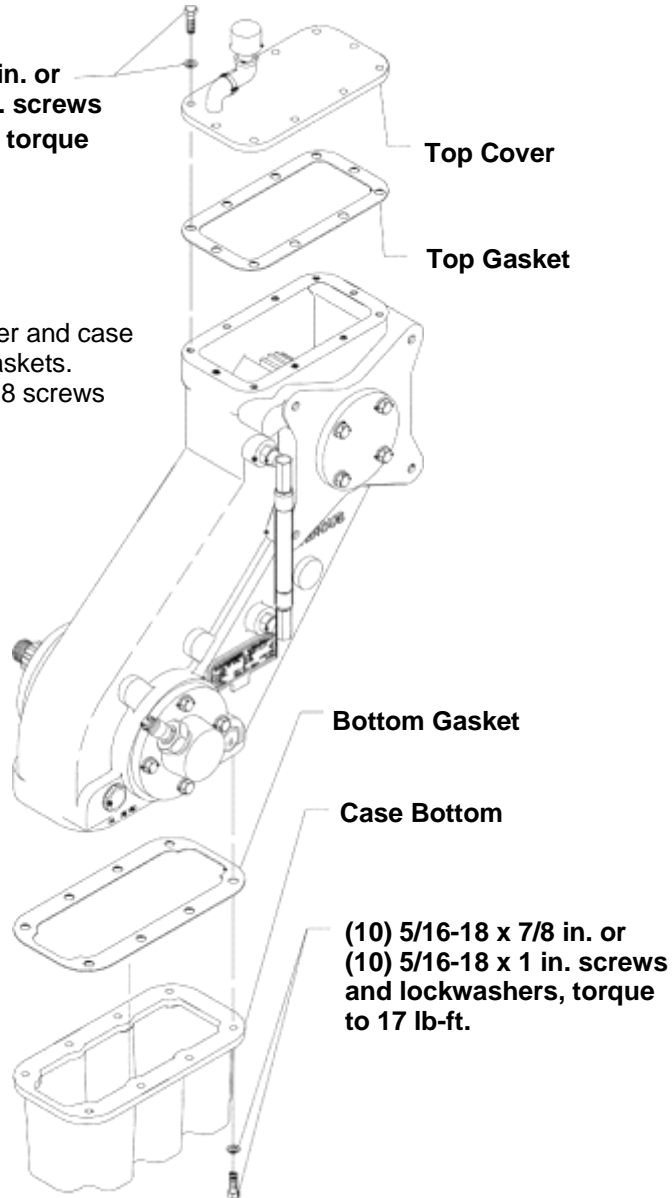
# Reassembly

## Case Reassembly

### Vertical Mounted Transmissions:

(10) 5/16-18 x 7/8 in. or  
(10) 5/16-18 x 1 in. screws  
and lockwashers, torque  
to 17 lb-ft.

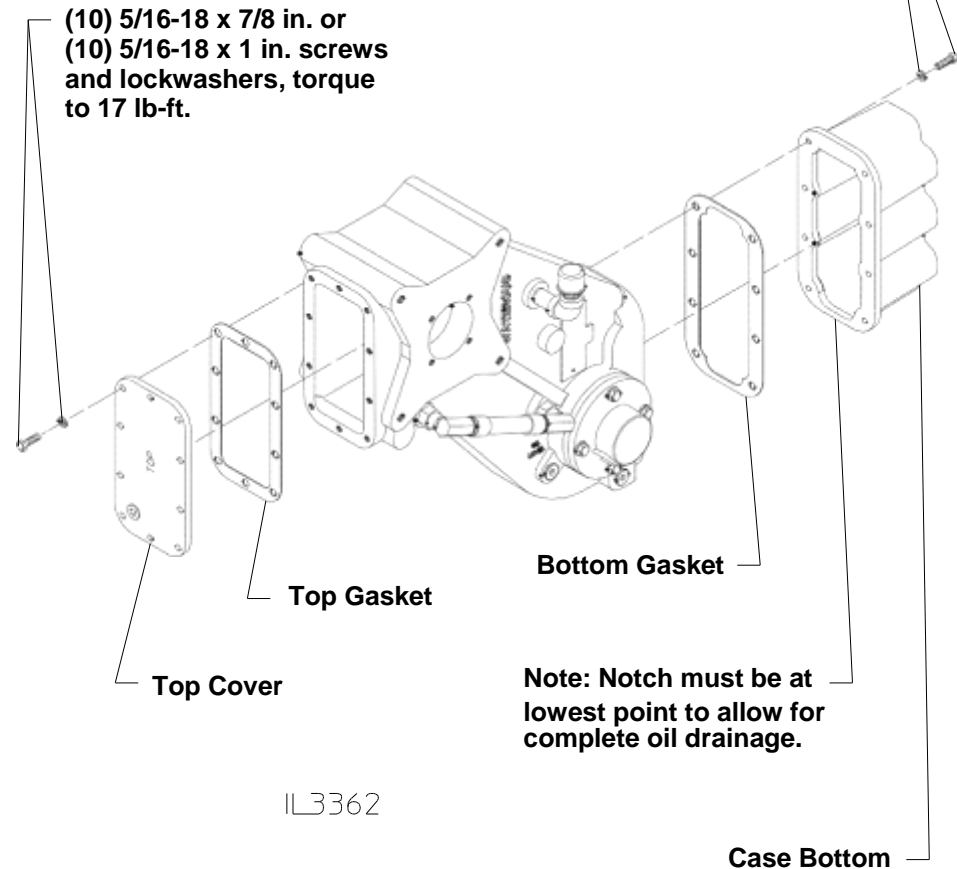
1. Install top cover and case bottom and gaskets.
2. Torque 5/16-18 screws to 17 lb-ft.



### Horizontal Mounted Transmissions:

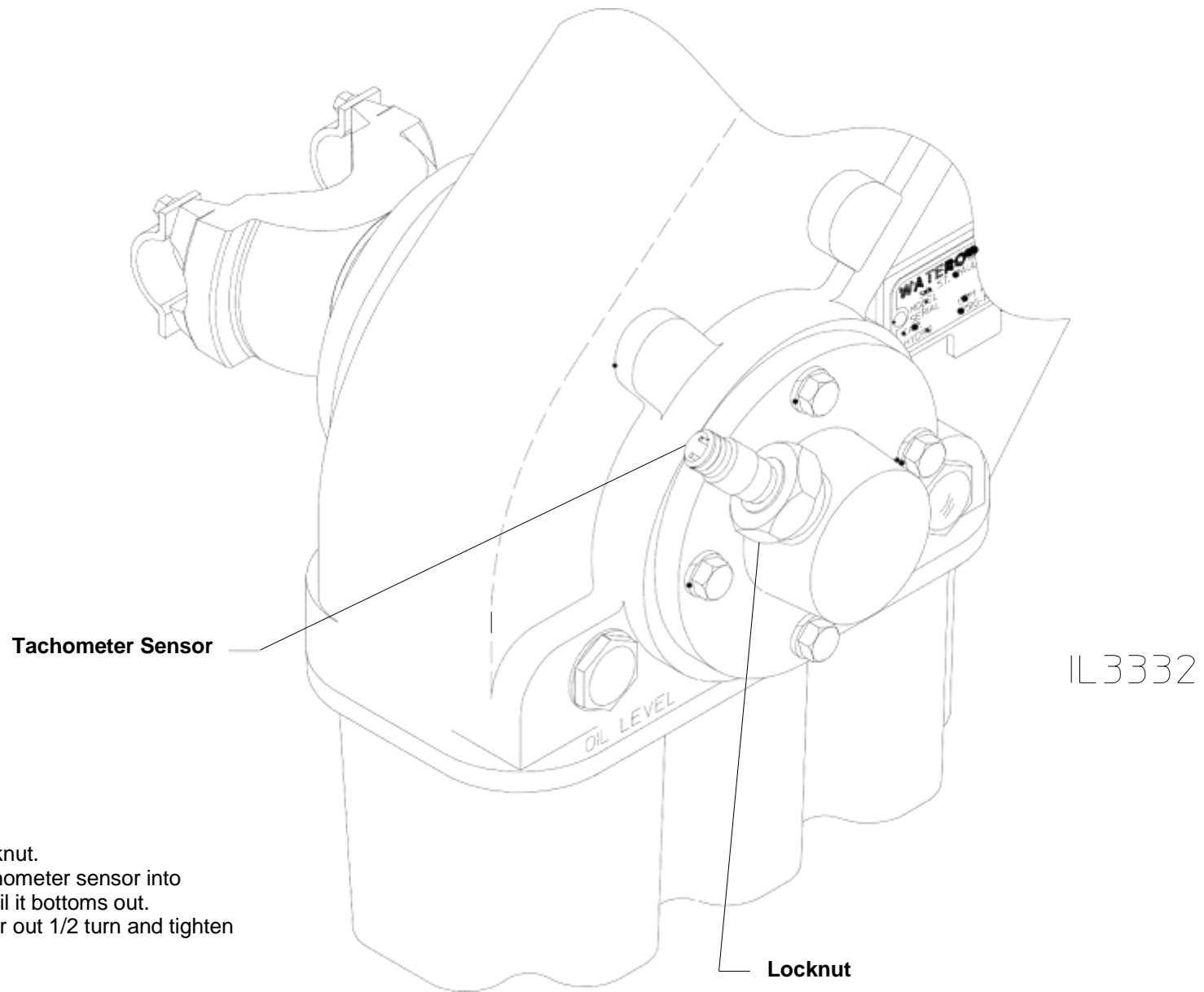
1. Install top cover and case bottom and gaskets.
2. Torque 5/16-18 screws to 17 lb-ft.

(10) 5/16-18 x 7/8 in. or  
(10) 5/16-18 x 1 in. screws  
and lockwashers, torque  
to 17 lb-ft.



## Reassembly

### Tachometer Adjustment

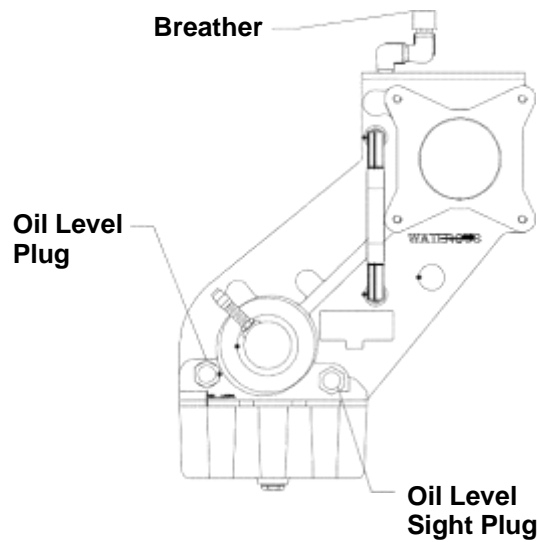


1. Loosen locknut.
2. Thread tachometer sensor into housing until it bottoms out.
3. Back sensor out 1/2 turn and tighten locknut.

## Reassembly

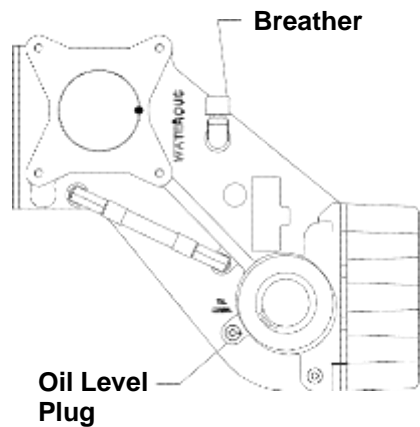
### Lubrication

#### Vertical Mounted Transmissions:



Remove oil level plug and fill case with ATF to bottom of oil level hole. Case holds approximately 3 quarts. Any type of ATF may be used.

#### Horizontal Mounted Transmissions:



Remove oil level plug and fill case with ATF to bottom of oil level hole. Case holds approximately 2 quarts. Any type of ATF may be used.

IL3155

### Final Checks

1. Recheck all fasteners for proper tightness.
2. Check for any fluid leaks.