

# REPAIR INSTRUCTIONS

## TYPE TU-2 STAGE AND TUT-3 STAGE PUMPS



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**2883820**

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before attempting to install, operate or repair this pump. Properly installed, your Peerless pump will give you satisfactory, dependable service. We urge that you read carefully these step-by-step instructions to simplify any problems of installation, operation or repair.

Failure to read and comply with installation and operating instructions will void the responsibility

of the manufacturer and may also result in bodily injury as well as property damage.

This bulletin is intended to be a permanent part of your installation and should be preserved in a convenient location for ready reference. If these instructions should become soiled, obtain a new copy from Peerless. Include pump model and/or serial number with your request.

## WARRANTY

New equipment manufactured by Seller is warranted to be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment; Seller's obligation under this warranty being limited to repairing or replacing at its option any part found to its satisfaction to be so defective provided that such part is, upon request, returned to Seller's factory from which it was shipped, transportation prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operation, maintenance, installation, modification or adjustment. This warranty does not cover parts repaired outside the Seller's factory without prior written approval. Seller makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture, since the same are usually covered by warranties of the respective manufacturers thereof.

In the event, notwithstanding the terms of this agreement, it is determined by a court of competent jurisdiction that an express warranty has been given by Seller to Purchaser with respect to the head, capacity or other like perfor-

mance characteristics of said equipment, Seller's liability for breach of the same shall be limited to accepting return of such equipment F.O.B. plant of manufacture, refunding any amount paid thereon by Purchaser (less depreciation at the rate of 15% per year if Purchaser has used the equipment for more than thirty (30) days) and cancelling any balance still owing on the equipment.

**THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SELLER SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

### WARNING

Do not operate this pump at any pressure, flow rate, or liquid temperature other than those for which the pump was originally purchased. Do not pump any other liquid than the one for which the pump was originally purchased without the consent of Peerless Pump or its authorized representatives. Disregard of this warning can result in pump failure and serious personal injury or death.

## SECTION — DISASSEMBLY

### WARNING

Shut down pump. Disconnect power to the pump driver before starting any repairs. Refer to Bulletin No. 2880549 for the procedure to follow.

1-1. Disengage the coupling halves. If pin and rubber bushing type, remove the pins; if other type, refer to the coupling manufacturer's instructions. Disconnect plumbing from water-cooled bearings.

1-2. PUMP. (See figure 1 or 2). Disassemble pump (to the extent required) as follows:

#### NOTE

Disassembly and reassembly instructions for both type pumps are included in this bulletin. Disregard the instructions which do not apply to the specific pump being repaired.

a. Remove the nuts from the gland bolts (17B) and remove glands (17) from the shaft (6). The gland halves are separable.

b. Remove all nuts or cap screws from the upper casing (1B) and from the bearing caps (41). Match mark and remove both bearing caps.

c. Screw down the jack screws alternately and evenly to separate the upper and lower casings. Turn the jack screws back after the case halves have separated to avoid interference at reassembly.

e. Attach a hoist to the eye bolt(s) (customer-furnished), or to a sling through external cross-over, to lift upper casing (1B). Do not use eye bolts to lift pump.

f. Place slings around the shaft near the bearing housings and lift rotating element from lower casing (1A). Tap lightly on the underside of the bearing housings (31 and 33) to separate the housing from the brackets.

g. Place rotating element in a convenient work place.

1-3. ROTATING ELEMENT. Remove the plugs and drain oil from the oil lubricated bearings. Remove constant-level oilers (125) and pipe nipples. (Not required for grease

lubricated bearings.) Proceed as follows:

- a. Loosen set screw and remove the coupling half. Tap from the back of the hub or use a puller. Remove coupling key (46).
- b. Loosen set screws on the water deflector (40A).
- c. Remove cap screws or stud nuts from bearing covers (35) and separate covers from housings (31) and (33). (Use care not to damage the oil seal (107)) used with oil lubricated bearings.)
- d. Lightly tap around housings (31, 33) to remove. Do not cock or force housings off, as to do so may damage the bearings (16, 18), or the oil seal (107).
- e. Loosen and remove bearing locknut (22) and lockwasher (69A).
- f. Remove bearings as described in Figure No. 3.
- g. Carefully remove shaft collars (68) (if present) and bearing covers (35). Use care not to damage cover gasket (73B) or oil seal (107).

#### NOTE

Clearance between collar and shaft is approximately 0.002 inch. Use care when removing not to cock or force, as this will score the shaft.

- h. Withdraw casing rings (7, 7A). On most pumps these may be withdrawn before removing the coupling half.
- i. Remove water deflector (40), packing (13), lantern rings (29) and stuffing box bushings (63). Make note of the number of packing rings on each side of the lantern rings.
- j. Loosen the shaft sleeve (14) set screws near impeller hub. With a spanner wrench, turn the inboard sleeve in the same direction as shaft rotation to remove (shaft has right-and left-hand threads on opposite sides of impeller).

#### NOTE

A seal between the shaft and sleeves is made with a rubber O-ring in a groove in the sleeve. Use care not to damage the O-ring.

## SECTION II INSPECTION AND REPAIR

2-1. **INSPECTION.** Visually inspect parts for damage affecting serviceability or sealing. Emphasize inspection of mating parts having relative motion — wear rings, for example. Perform detail inspection as follows:

- a. Check O-rings and bearing cover gaskets for cracks, nicks or tears; packing rings for excessive compression, fraying or shredding, embedded particles (dirt or metal). Replace if defective in any way.
- b. Mount the shaft between lathe centers. Check the eccentricity throughout entire length with a dial indicator to be not more than 0.003 inch total indicator reading. Check that the threads are clean and sharp. Surfaces on which bearings mount must be smooth, have a finish not less than 32 microinches, and have shoulders square and free from nicks.
- c. Measure the OD of the integral impeller wear surfaces

- k. Support the back side of first stage impeller (2) with a split ring on the base of a suitable arbor press. Shift the interstage bushing (113) toward second (third) stage impeller (2) so that support ring bears on impeller close to shaft (6). Carefully press shaft through impeller (2).
- l. Take off interstage bushing (113) and remove impeller key (32).
- m. Similarly support second stage impeller (2) with split ring, press shaft through impeller and remove key (32). Remove casing ring (7).
- n. Support third stage impeller (2) in same manner, press shaft through interstage sleeve (58A) and impeller, then remove key (32).
- o. Press shaft through interstage sleeve (58).

1-4. **CLEANING.** Clean all metal parts (except bearings) with a solvent. Use a bristle brush (NOT metal or wire) to remove tightly adhering deposits. A fiber scraper may be used to remove the gasket and shellac from casing flanges.

- a. Blow dry with clean dry compressed air.
- b. Clean bearings as described in 1-5.

#### 1-5. CLEANING BEARINGS.

- a. Remove bearings from the housings, referring to disassembly instructions.
- b. Place bearings in a wire basket so there is space for the cleaning solvent to reach all parts.
- c. Immerse the basket in Stoddard solvent, agitating the basket until grease is thoroughly loosened and can be flushed out.
- d. Place bearing on a screened surface.
- e. Using a spray gun with air filter and clean Stoddard solvent, flush each bearing until all grease and sludge is removed.
- f. Blow solvent out of bearings with dry filtered air.
- g. Lubricate bearings immediately after cleaning with light spindle oil and place them in a covered container.
- h. Do not spin bearings any time during cleaning.

and the ID of the casing rings (7 and 7A). Compute the diametrical clearance (ID minus OD) and compare with the limits given in Figure 5. ID surface of casing ring must be smooth and concentric. For pumps equipped with impeller rings, clearances should not exceed two times the maximum amount shown for pump type in Figure No. 5.

- d. Measure OD of interstage sleeve (58) and ID of interstage bushing (113). Compute diametrical clearance and compare with limits given in Figure 6. ID surface of interstage bushing must be smooth and concentric. Sleeve lands must be free from burrs and flat spots.
- e. Examine impeller passages for cracks, dents, gouges or embedded material.
- f. Check upper and lower casing machined surfaces to be free of burrs or nicks.

g. Inspect shaft sleeves (14) for excessive wear.

h. Inspect bearings per Table I.

2-2. REPAIR. Make needed repairs in the following manner:

a. If ID of casing ring (7, 7A) is grooved, scored or eccentric, bore to produce a smooth, concentric surface. Do not bore casing ring more than 1/8 inch larger than original ID. If larger bore is required to produce a smooth surface, replacement of casing ring and impeller ring is recommended. Measure and record the new ID.

b. If impeller rings are defective, or mating casing rings require boring, remove the old rings by turning in a lathe — be sure machining is concentric with impeller ID. Use care NOT to reduce hub OD.

#### NOTE

For bronze impellers and rings, the ring is shrunk on the hub according to standard fit FN-4 of ANSI B4.1 standards.

For pumps of 10-inch discharge and larger, the rings are also tack welded to the hub at 3 places 120° apart. Hardened impeller rings are installed according to ANSI B4.1 standard fit FN-1.

c. Install new rings on the impeller (shrink or press depending on material) and tack weld if old rings were tacked. The ID is factory-machined for proper fit.

d. Turn the OD of the new rings to provide the proper diametrical clearance and to be smooth and concentric with hub bore. Use clearance limit from Figure 5, and ID of casing ring from paragraph 2-2 a. to compute OD of impeller rings.

e. Replace worn shaft sleeves.

f. Straighten or replace shafts having excessive runout (eccentricity).

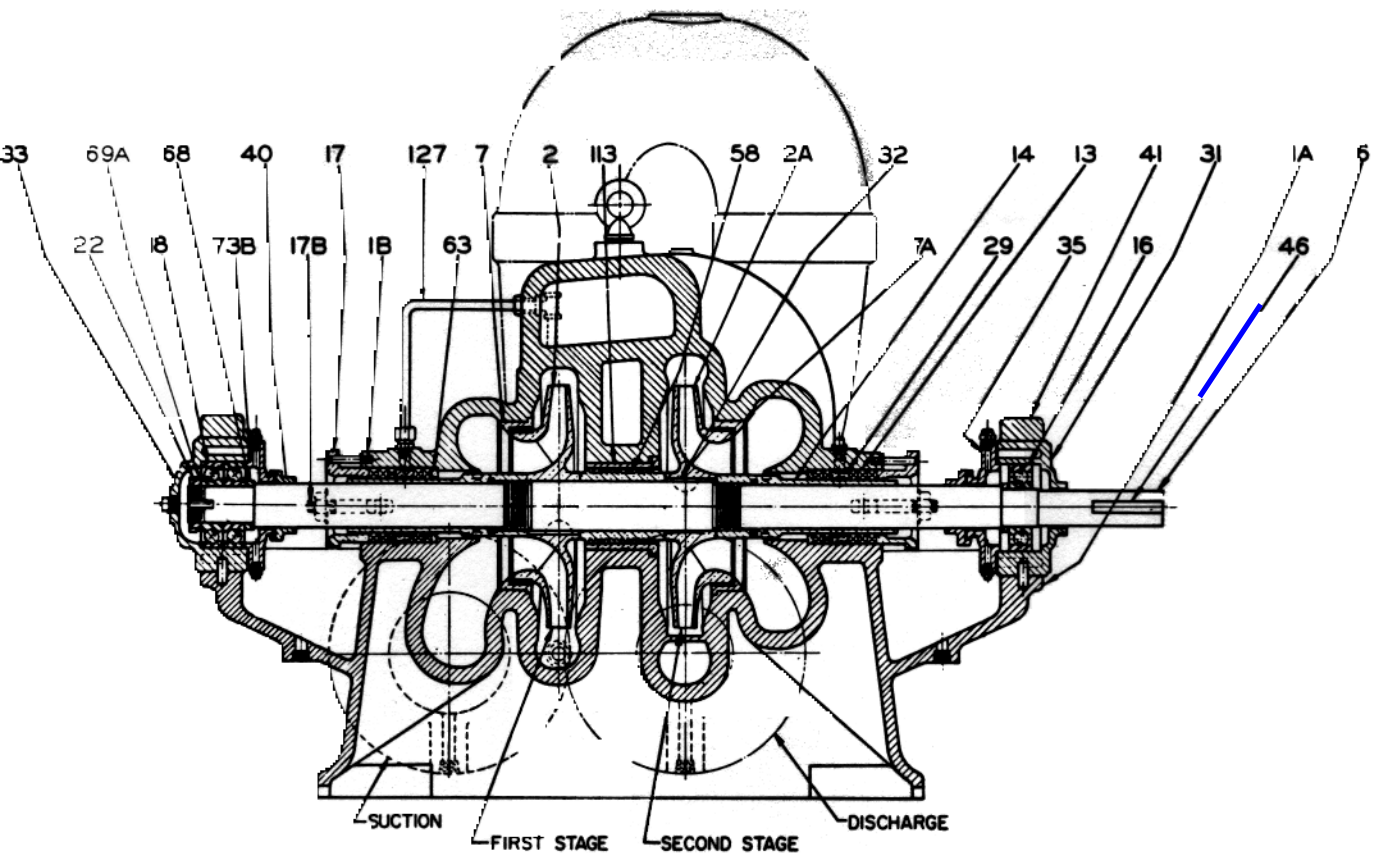


FIGURE 1. TYPE TU 2-STAGE PUMPS WITH INTERNAL OR EXTERNAL CROSS-OVER GREASE LUBRICATED BEARINGS

1A	LOWER CASING	31	INBOARD BEARING HOUSING
1B	UPPER CASING	32	IMPELLER KEY
2	RIGHT HAND IMPELLER	33	OUTBOARD BEARING HOUSING
2A	LEFT HAND IMPELLER	35	BEARING COVER
6	SHAFT	40	WATER DEFLECTOR
7	RIGHT HAND CASING RING	41	BEARING CAP
7A	LEFT HAND CASING RING	46	COUPLING KEY
13	PACKING	58	INTERSTAGE SLEEVE
14	SHAFT SLEEVE	63	STUFFING BOX BUSHING
16	INBOARD BEARING	68	SHAFT COLLAR
17	GLAND	69A	BEARING LOCKWASHER
17B	GLAND BOLT	73A	CASE GASKET (NOT SHOWN)
18	OUTBOARD BEARING	73B	BEARING COVER GASKET
22	BEARING LOCK NUT	113	INTERSTAGE BUSHING
19	LANTERN RING	127	SEAL PIPING

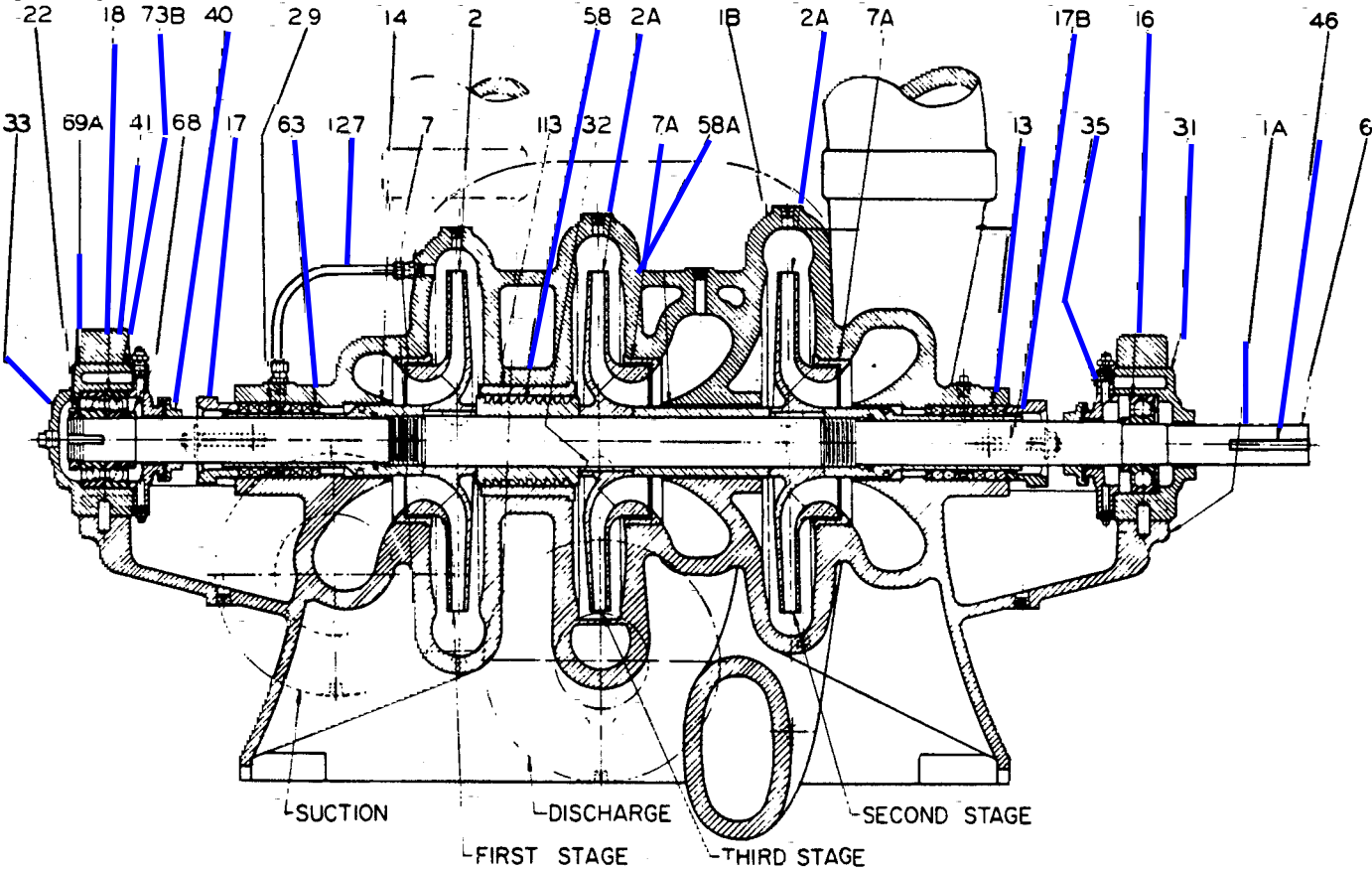


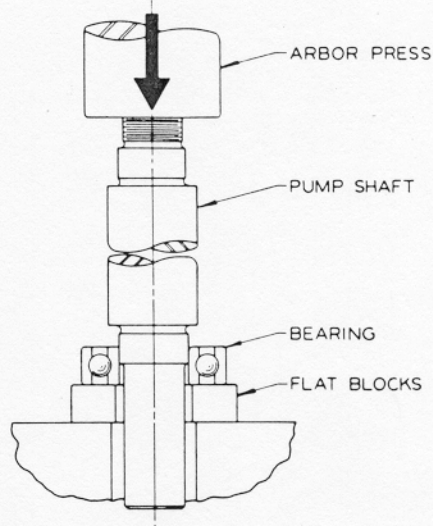
FIGURE 2. TYPE TUT 3-STAGE PUMPS  
GREASE LUBRICATED BEARINGS

- |     |                         |     |                          |
|-----|-------------------------|-----|--------------------------|
| 1A  | LOWER CASING            | 32  | IMPELLER KEY             |
| 1B  | UPPER CASING            | 33  | OUTBOARD BEARING HOUSING |
| 2   | RIGHT HAND IMPELLER     | 35  | BEARING COVER            |
| 2A  | LEFT HAND IMPELLER      | 40  | WATER DEFLECTOR          |
| 6   | SHAFT                   | 41  | BEARING CAP              |
| 7   | RIGHT HAND CASING RING  | 46  | COUPLING KEY             |
| 7A  | LEFT HAND CASING RING   | 58  | INTERSTAGE SLEEVE        |
| 13  | PACKING                 | 58A | INTERSTAGE SLEEVE - A    |
| 14  | SHAFT SLEEVE            | 63  | STUFFING BOX BUSHING     |
| 16  | INBOARD BEARING         | 68  | SHAFT COLLAR             |
| 17  | GLAND                   | 69A | BEARING LOCKWASHER       |
| 17B | GLAND BOLT              | 73A | CASE GASKET (NOT SHOWN)  |
| 18  | OUTBOARD BEARING        | 73B | BEARING COVER GASKET     |
| 22  | BEARING LOCK NUT        | 113 | INTERSTAGE BUSHING       |
| 29  | LANTERN RING            | 127 | SEAL PIPING              |
| 31  | INBOARD BEARING HOUSING |     | (optional)               |



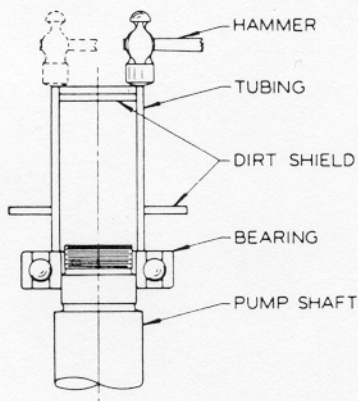
### USING AN ARBOR PRESS

1. PLACE THE BEARING ON TWO FLAT BLOCKS SO THAT THEY CONTACT THE INNER RING OR BOTH RINGS OF THE BEARING.
2. HOLD SHAFT STRAIGHT - FORCE THE SHAFT BY A STEADY PRESSURE, UNTIL THE BEARING IS SEATED AGAINST THE SHAFT SHOULDER.



### USING TUBING

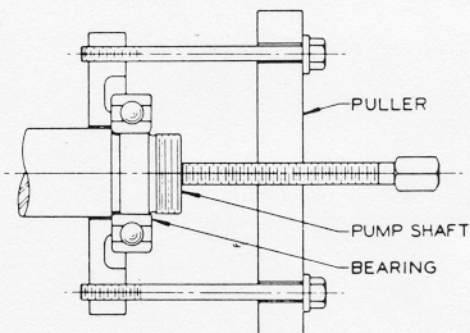
1. PLACE THE BEARING ON SHAFT.
2. PLACE TUBING OVER SHAFT IN CONTACT WITH THE INNER RING OF THE BEARING.
3. APPLY HAMMER ALTERNATELY AT OPPOSITE POINTS - AVOID COCKING.



## BEARING MOUNTING

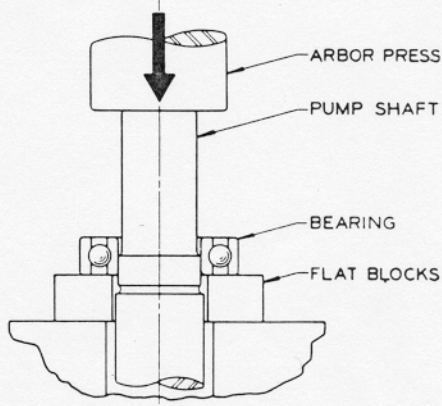
### USING A BEARING PULLER

1. PLACE BEARING PULLER BEHIND BEARING INNER RING. SET PULLER JAWS SO THAT THEY WILL NOT SLIP OVER THE INNER RING AND DAMAGE SEPARATOR OR SHIELD WHEN PRESSURE IS APPLIED.
2. FORCE BEARING OFF SHAFT BY A STRAIGHT PULL. DO NOT COCK BEARINGS.



### USING AN ARBOR PRESS

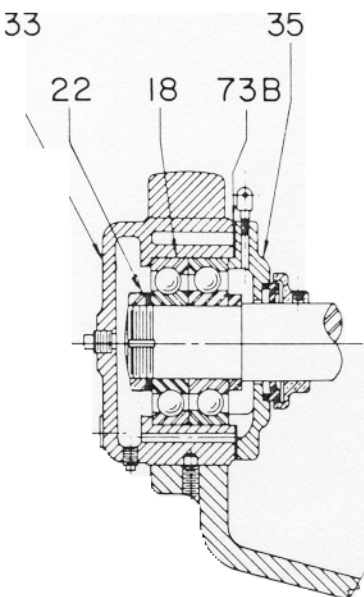
1. REST THE BEARING INNER RING OR BOTH RINGS (NEVER THE OUTER RING ONLY) AGAINST A PAIR OF FLAT BLOCKS.
2. FORCE THE SHAFT OUT BY A STEADY PRESSURE - KEEP SHAFT STRAIGHT - DO NOT ALLOW SHAFT TO COCK OR DROP.



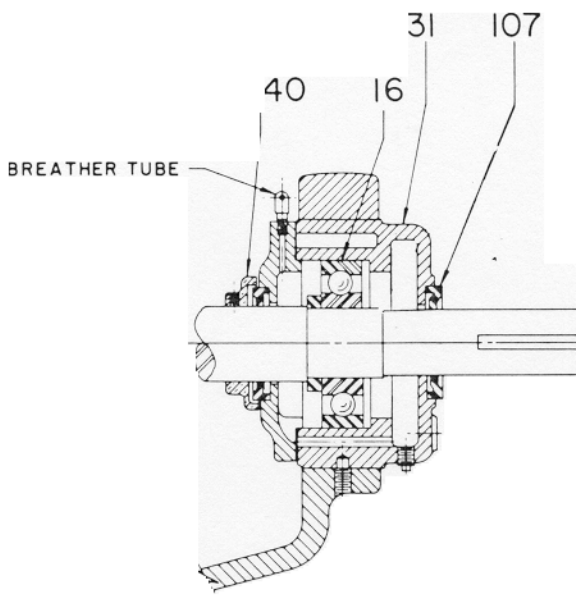
## BEARING REMOVAL

Figure 3. Bearing Removal and Mounting

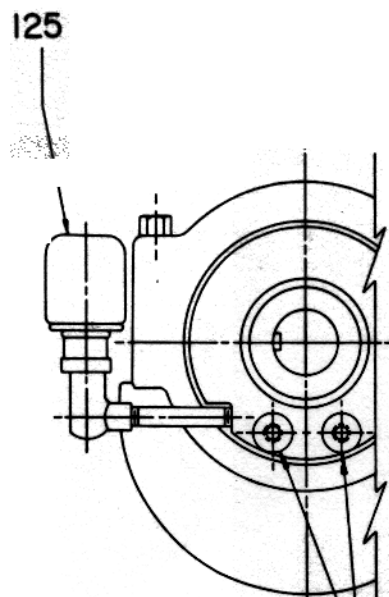
WATER COOLED BEARING HOUSINGS  
OIL LUBRICATED BEARINGS



OUTBOARD BEARING HOUSING CONSTRUCTION



INBOARD BEARING HOUSING CONSTRUCTION



IN & OUT WATER COOLING CONNECTIONS.

- 16 - INBOARD BEARING
- 18 - OUTBOARD BEARING
- 22 - BEARING LOCKNUT
- 31 - INBOARD BEARING HOUSING

- 33 - OUTBOARD BEARING HOUSING
- 35 - BEARING COVER
- 40 - DEFLECTOR

- 73B - BEARING COVER GASKET
- 107 - OIL RETAINING SHIELD
- 125 - CONSTANT LEVEL OILER RESERVOIR

IMPELLER/CASE WEAR RING DIAMETRICAL CLEARANCES	
.010	1½ TU7, 2TU8, 2TU10, 2TU12, 3TU10, 3TU13, 3TU13½, 1½TUT7-3, 3TUT13
.012	
.016	4TU10, 4TU14, 5TU13, 5TU15, 4TUT14-3, 5TUT16-3
.014	
.018	6TU16
.018	
.022	8TU16, 8TU17, 10TU22B
.022	
.026	10TU22C

FIGURE 5

INTERSTAGE SLEEVE/BUSHING DIAMETRICAL CLEARANCES	
.008	1½TU7, 2TU8, 2TU10, 2TU12, 3TU10, 3TU13, 3TU13½, 4TU10
.012	4TU14, 5TU13, 5TU15, 6TU16, 1½TUT7-3, 3TUT13-3, 5TUT16-3
	4TUT14-3
.010	
.014	8TU16, 8TU17, 10TU22B
.020	
.024	10TU22C

FIGURE 6

NOTE

Clearances are for standard bronze or cast iron fitted pumps. For materials with a tendency to gall, such as stainless steel, increase clearance approximately .010 inch.

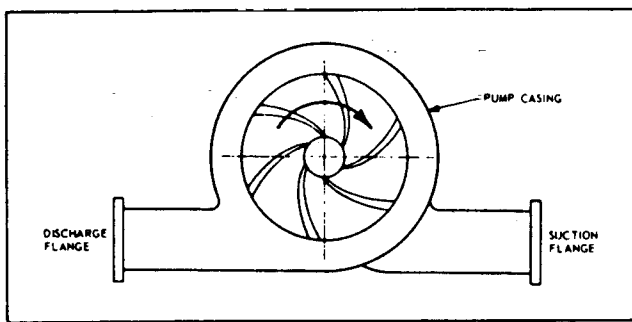


Figure 7. Vane Position for Proper Rotation

3-1. ROTATING ELEMENT. (See Figure 7 or 8). Reassemble as follows:

- a. Coat shaft (6) lightly with oil. Re-oil as necessary while pressing on impellers and sleeves.
- b. With grooves, square shoulder side, facing toward the highest number stage, press interstage sleeve (58) on outboard end of shaft, locating centrally between first two key slots. Slide interstage bushing (113) over sleeve.

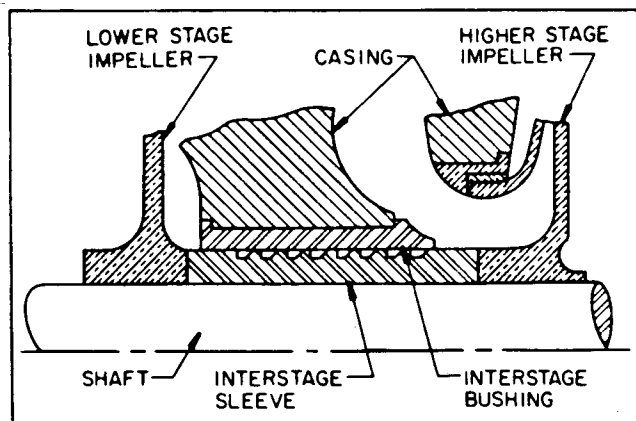


Figure 8. Assembly Relationship of Interstage Sleeve (58)

- c. Insert key (32), align third (or second) stage impeller (2B) and press on inboard end of shaft to contact interstage sleeve.
- d. Press on interstage sleeve (58A) to contact third stage impeller. Locate casing ring (7) on third stage impeller ring (8).
- e. In turn, insert remaining keys (32), align second and/or first stage impellers (2A, 2) and press on shaft. Carefully bump parts to remove all clearance and so that first and second stage impeller hubs extend equally beyond central portion of shaft (slightly into threaded portions).
- f. Install O-rings in shaft sleeves (14), coat ring and shaft with oil and screw sleeves on shaft against impeller hubs.
- g. Install the stuffing box bushing (63) and lantern ring (29) on the shaft.
- h. Locate casing rings (7) on impeller.
- i. Place water deflectors (40) on shaft.
- j. Slide bearing covers (35) (with oil seals (107) installed for oil lubricated bearings) on the shaft.
- k. Place shaft collars (68) on the shaft.

- l. Mount the bearings (16) and (18) as described in Figure 4. The outboard bearings are two single row angular contact bearings mounted in the duplex DF mounting.
- m. Install bearing lockwasher (69A) and locknut (22) (oil thrower) and tighten against the outboard bearing.
- n. Install gaskets (73B) on bearing covers. Cut replacement gaskets from 1/16 inch No. 444 Vellumoid. Apply cement (i.e. Permatex No. 2) to bearing cover gaskets when bearings are water cooled.
- o. Slide the housings (31, 33) over the bearings. Tap lightly and evenly around the end as necessary. Do not force.
- p. Attach the bearing covers (35). In the assembled position, the grease fittings or breather tubes must be located on top.
- q. Locate water deflector (40) and tighten the setscrews. Install oil seal (107) in the inboard bearing housing (31) (for oil lubricated bearings).
- r. Install coupling key; assemble coupling half on the shaft and tighten the setscrew.
- s. Check runout of the interstage sleeves on assembled rotor. Maximum runout must not exceed .006 TIR.

3-2. PUMP. Complete the assembly of pump as follows:

- a. Use the upper casing (1B) as a template to cut a gasket (73A) from 1/64 inch Vellumoid. Machined surfaces of both casings must be perfectly clean and free from burrs and nicks.
- b. Affix the new gasket to lower casing (1A) with shellac.
- c. Use slings around the shaft near bearings to set rotating element into lower casing. Position the casing rings (7, 7A), and both bearing housings so that all dowel pins engage. If necessary, loosen setscrews of water and grease deflectors to shift bearing housings slightly. Retighten screws.
- d. Assemble both bearing caps (41) and tighten the cap screws.
- e. If impellers are not (approximately) centered in volute or impellers are not allowing case rings to seat in casing, adjust shaft sleeves by loosening one and tightening the other in direction required. Tighten setscrews in sleeve after final adjustment is made. Recheck runout of interstage sleeves. **If runout exceeds .006 TIR, do not proceed until problem is corrected.**
- f. Cover the top side of the casing gasket with a mixture of graphite and oil. Install the gland bolts (17B). Carefully locate the upper casing on the lower, making certain the dowel pins engage. Attach case nuts and alternately tighten at diagonally opposite positions. See Torque Chart, Table II. Rotate shaft by hand to check that it runs free.
- g. Withdraw the lantern rings (29) and push the busings (63) to the rear of the stuffing boxes. Insert the same number of packing rings as were found during disassembly on each side of the lantern ring. Insert each ring separately and stagger the joints of successive rings 90°. Insert the glands (17) and set the nuts tight — **DO NOT USE A WRENCH.**
- h. Rotate shaft by hand to check that it runs free.
- i. Replace all drain plugs removed during disassembly.

3-3. Reinstall plumbing (if used) for water-cooled bearings.

- a. Relubricate the bearings. Refer to Bulletin No. 2880549 for grease type recommendation. It is most important to provide proper lubrication and keep bearings clean. Frequency of lubrication must be determined by experience as it depends upon bearing size, speed, operating conditions and location (environment). Table III should be used as



**TABLE I**  
**BEARING DEFECTS**  
(Failures – Replace if found)

DEFECT (Failure)	APPEARANCE	PROBABLE CAUSE
Flaking and cracking	In the early stages, the surface of the inner and outer races develop small cracks, which flake. The cracks and flaking ultimately spread over the entire race surface.	<ol style="list-style-type: none"> <li>1. Normal fatigue failure.</li> <li>2. Bearing loads in excess of bearing capacity caused by misalignment.</li> </ol>
Indentations	Indentations or cavities in the inner and outer races.	<ol style="list-style-type: none"> <li>1. Dirt in the bearings.</li> <li>2. Excessive impact loading of the bearings such as improper mounting or removal.</li> </ol>
Broken separator (cage)	Cracked separator or separator in pieces.	<ol style="list-style-type: none"> <li>1. Poor Lubrication.</li> <li>2. Misalignment of shaft.</li> <li>3. Excessive shaft deflection.</li> </ol>
Wear	Bore and OD of outer ring of bearing galled or braided.	<ol style="list-style-type: none"> <li>1. Fit on shaft or in housing too loose.</li> <li>2. Bearing locked by dirt and turning on shaft or in housing.</li> </ol>
Fractured ring	Hairline cracks or complete ring fracture.	<ol style="list-style-type: none"> <li>1. Forcing a cocked bearing on or off a shaft.</li> <li>2. Too heavy a press fit.</li> </ol>
Discoloration	Rolling elements and races darker than normal appearance of bearing metal. (Moderate discoloration of rolling elements and races not a reason for discard.)	<ol style="list-style-type: none"> <li>1. Inadequate lubrication.</li> </ol>
Corrosion	Rolling elements and raceways rusted.	<ol style="list-style-type: none"> <li>1. Water entering the housing.</li> <li>2. Condensation inside the housing.</li> <li>3. Lubricant breaks down into acid. (Wrong lubricant.)</li> </ol>

**TABLE II**

TORQUE VALUE CHART	
TORQUE VALUE (FT-LB)	
SIZE INCH	MEDIUM CARBON STEEL, SAE 5 105-120,000 PSI MAT'L CODE 509
3/4	210-225
7/8	305-325
1	450-475
1-1/8	605-635
1-1/4	850-890
1-1/2	1465-1525

**TABLE III**  
**GREASING FREQUENCY**  
(See Table IV for amounts)

SERVICE	GREASE EACH
Normal, 8-hour day operation. Room free of dust and damaging atmosphere.	6 Months
Severe, 24-hour day operation. Room with moderate dust and/or damaging atmosphere, or outdoor service.	1 Month
Light, approximately 10-hour week. Room relatively free of dust and damaging atmosphere.	1 Year

TORQUE VALUES SHOWN ARE FOR CLEAN AND LUBRICATED THREADS: GASKETED JOINTS. STUDS MUST BE DRIVEN TIGHT IN LOWER WHEN USED.

INSTALL UPPER CASE, TIGHTEN CENTER NUT (OR CAP SCREWS) THEN WORK OUT FROM CENTER TO EACH SIDE, TIGHTENING WITH TORQUE WRENCH TO VALUES SHOWN ON CHART.

**TABLE IV**  
**AMOUNT OF GREASE FOR BALL BEARINGS**

OUNCES	GRAMS	MODEL
1.3	36.4	1½TU7, 1½TUT7-3
1.4	39.2	2TU8, 2TU10, 2TU12, 3TU10
2.0	56	3TU13, 3TU13½, 4TU10
3.0	84	4TU14, 3TUT13½, 4TUT14
4.5	126	5TU15
5.8	162.4	5TU13, 6TU16, 5TUT16
9.5	266	8TU16, 8TU17
17.0	476	10TU22 B&C

a guide for grease re-lubrication.

b. Oil. (Pumps are shipped without oil in the bearing housings.) Be sure to fill and adjust constant level oilers before initial start of pump (see Figure 9).

- (1) Adjust dust cap to lowest possible position on base fittings.
- (2) The pipe nipple and base fitting must be level; check with spirit level. If pipe nipple is bent, replace it. A constant level oiler that is not level will not provide proper lubrication to the bearings.
- (3) Fill bottle, screw it into the dust cap as far as it will go — do not force. Allow the oil to flow into the bearing housing. Repeat this procedure until there remains a supply of oil in the bottle. Never fill bearing housing through base fitting.
- (4) Check the breather tube for cleanliness. The breather tube must be used with the oil lubrication system.
- (5) The bottle on the constant level oilers is made of plastic — the oil temperature must never exceed 170°F,

or solvents such as alcohol be put in it. For such applications, use a glass bottle.

- c. Consult the driver manufacturer's Maintenance instructions for lubricants and relubrication procedures for the driver bearings.
- d. Replace coupling guard.

3-4. TEST. Follow instructions in Bulletin No. 2880549 to check out the pump after repair.

3-5. TROUBLES. To reliably establish the malfunctioning of either the pump or driver, instruments such as tachometers, pressure gauges and electric meters must be in proper working condition and preferably of recent calibration. In many cases, much time and expense have been expended with faulty instruments. Table V lists a number of troubles commonly occurring. If unable to determine the cause, and remedy the trouble, from this list, refer the problem to the Peerless representative.

**LUBRICATING INSTRUCTIONS**

Lubricating Instructions	Lubricating Oils
1. The pump is shipped without oil in the bearing housings.	Type: High quality non-detergent straight H. V. I. mineral oil.
2. Change first oil after operating 1000 hrs. or 60 days, whichever occurs sooner.	Weight: Brg. Operating Range (°F)                      Weight
3. Frequency of oil change thereafter is dictated by service conditions. It is suggested, however, that oil changes occur at least every 3000 hrs. of operation.	0 - 150                                      150 SSU at 100°F
4. In order to keep the bearing housings vented, the breather tubes and filters must be kept clean.	150 - 200*                                  300 SSU at 100°F
	200 - 250*                                  500 SSU at 100°F
	*Maximum oil temperature in plastic oiler bottle 170°F

**FIGURE 9**

**TABLE V — TROUBLES**

TROUBLE	PROBABLE CAUSE	REMEDY
Failure to deliver liquid or sufficient pressure	Pump not primed.	Reprime.
	Pump not up to speed.	Check for low motor voltage or motor overload. Other drives, increase driver speed when possible.
	Discharge head too high.	Check to see that all discharge valves are opened and the discharge line is free from obstructions. In some cases, the installation has to be altered or a pump of suitable rating must be provided.
	Insufficient available NPSH.	Check NPSH requirements of pump and increase system NPSH accordingly.
	Incorrect direction of rotation.	Check rotation of driver.
	Air leaks in suction line or through suction end stuffing box, suction pressure below atmospheric.	Tighten packing. Check for air leaks past O-ring under sleeve. Passage from eye side shroud of first stage impeller to suction stuffing box must be open to deliver sealing fluid to packing. Check suction line joints for air leakage. Check mechanical seal if installed.
	Impeller passages restricted.	Disassemble the pump and clean impeller.
	Worn impeller sealing diameters or mating stationary part bores.	Repair or replace impeller and/or stationary parts.
	Damaged impeller.	Repair or replace impeller.
	Foot valve too small or restricted by dirt.	Replace with adequate size foot valve or clean foot valve.
	Leaking discharge check valve on stand-by pump.	Repair or replace.
	Recirculation valve open or leaking	Close, repair or replace.

**TABLE III – TROUBLES (continued)**

TROUBLE	PROBABLE CAUSE	REMEDY
Pump loses prime after starting	Air leaks in suction line.  Insufficient available NPSH.	Tighten packing. Check for air leaks between sleeve and shaft and replace O-ring if there is an air leak. Check all suction line joints for bad gaskets and loose joints.  Check NPSH requirements of the pump and increase the system available NPSH accordingly.
Overload on driver	Pump speed high.  Total head lower than rating.  Tight packing.  Liquid is of higher specific gravity or viscosity than rating.  Mechanical trouble of pump or driver..	Motor voltage higher than nameplate rating will cause the motor to run faster. Either reduce motor voltage or trim impeller diameter. On other drives, reduce speed if possible. If speed reduction not realized, trim impeller diameter.**  Check suction and discharge pressures and determine the total dynamic head. If TDH lower than ratings, throttle discharge to rated TDH or, if this is not possible, reduce impeller diameter.**  Stop pump – follow proper repacking procedure. Check for scored sleeve; and for sleeve run-out if packing wears rapidly. Replace sleeve and packing as required.  Check with Peerless distributor to determine if a larger motor is required.  See if pump and motor turn freely. Check impeller fit, shaft straightness and bearings.
Pump vibrates or is noisy	Driver unbalanced, pump clogged.  Misalignment. Cracked foundation. Worn bearings.  Unbalanced impeller.  Bent shaft.	Disconnect driver and operate it alone. Check pump for large pieces of debris, such as wood, rags, etc.  Realign pumping unit.  Replace foundation.  Replace bearings. Check lubricants for proper grade. Check pump alignment.  Rebalance.  Replace.

\*Always obtain new trim diameter from Peerless representative.

3-6. SPARE PARTS. To keep delays to a minimum when pump repairs are required, we suggest that the following spare parts be stocked. The number of each part required depends upon the application. For a minimum, we recommend:

- (A) One inboard bearing.
- (B) One outboard bearing.
- (C) One set of shaft sleeves for packed pumps.
- (D) 2-4 sets of packing for packed pumps or a set of mechanical seals for pumps so equipped.
- (E) One set of case wear rings when fitted.
- (F) In some cases, an entire rotating element should be stocked.

3-7. To obtain quick and accurate service when ordering spare parts, provide the following information:

- (A) Pump size and type as noted on nameplate.
- (B) Pump serial number as noted on nameplate.
- (C) The name and number of the parts as shown on the sectional drawings.
- (D) Quantity required of each item.

Aid may be obtained from the Peerless representative, or an authorized distributor, for planning an adequate supply of spare parts.

NOTICE: Materials of construction, specifications, dimensions, design features, and application information, where shown in this bulletin, are subject to change and/or modification without notice by Peerless Pump Division at their option.