

# REPAIR INSTRUCTIONS

## TYPE AE PUMPS PACKED

### ***Read this entire bulletin***

before attempting to repair this pump. For installation and operation refer to instruction bulletin 2880549. Properly installed, your Peerless pump will give you satisfactory, dependable service. We urge that you carefully read 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 pump installation and should be preserved in a convenient location for ready reference. If these instructions should become soiled, obtain a new copy from Peerless Pump. Include pump model and/or serial number with your request.

These instructions are prepared for a pump with grease or oil lubricated bearings and packed stuffing boxes. Optional features are covered by separate instruction sheets which are furnished when the equipment supplied includes these features.

Model numbers used in Table I are for the commercial pumps. Listed and approved fire pumps have the letters "AEF" in place of "AE" in the model number. Many models have suffix letters in the model number. These suffix letters have been intentionally omitted from Table I. However, when ordering repair parts, provide the complete model number including suffix letters and the pump serial number; both are stamped on the pump nameplate.



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**4851938**  
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## 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 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 performance 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 canceling 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 I - DISASSEMBLY

Before starting disassembly of the pump, it is recommended that a set of spare parts as shown on page 8 be obtained. Peerless Pump does not recommend reuse of gaskets, O-rings, packing rings, or ball bearings.

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

## WARNING

1-1. Disengage the coupling halves. Refer to the coupling manufacturers' instructions.

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

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

b. Remove all nuts or cap screws from the upper casing (1B) and from the bearing caps (41 & 43). Match mark bearing caps to lower casing (1A).

c. Use the jack screws (not shown) on the bottom side of the lower casing split flange to separate the upper and lower casings. Turn the jack screws back below the split flange surface to avoid reassembly interference.

d. Attach hoist to customer-furnished eye bolt in upper casing. Use eye bolt to lift upper casing only. Eye bolt must have ½-13 UNC external thread.

e. 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 to separate the housings from the brackets.

f. Place rotating element in a convenient work place.

1-3. ROTATING ELEMENT. Disassemble in the following manner:

a. Loosen set screws and remove the coupling half. Tap from the back of the hub or use a puller. Remove coupling key (46), and outboard deflector (40B).

b. Take out cap screws to remove bearing covers (35,37) and the gaskets (73B). Remove inboard bearing cover seal (47) from cover (35) only if replacement of seal is required.

c. Remove retaining ring (18A) from outboard end of shaft.

d. Remove housings (31 & 33), bearings (16 & 18), and bearing housing seals (169) as units with a bearing puller. Remove deflectors (40A).

e. Remove casing rings (7). On most pump this may be done before removing the coupling half.

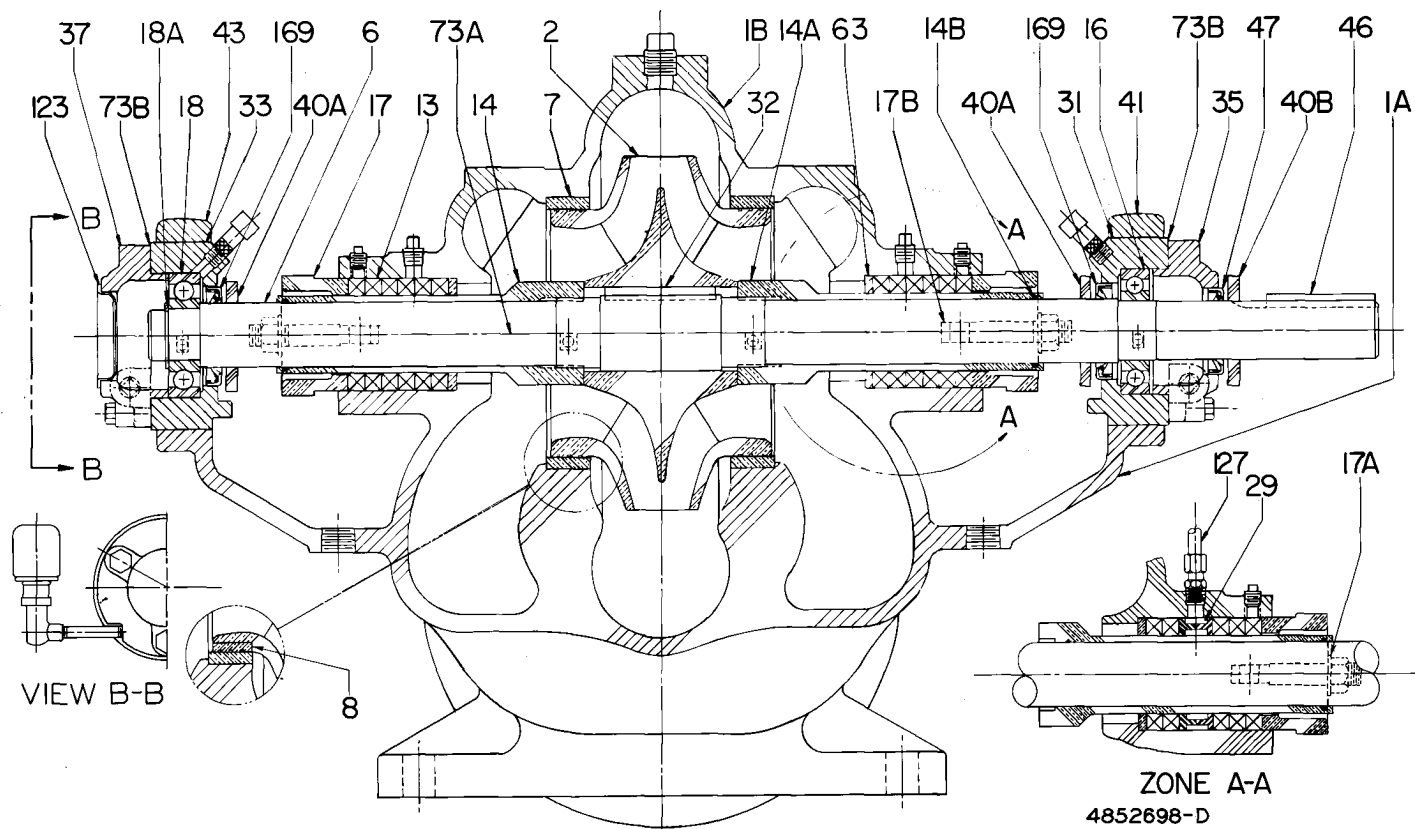


FIGURE 1

Item No.	Description
1A	Lower Casing
1B	Upper Casing
2	Impeller
6	Shaft
7	Casing Ring
8	Impeller Ring (Optional)
13	Packing Ring
14, 14A	Shaft Sleeve
14B	Shaft Sleeve O-Ring
16	Inboard Ball Bearing
17	Packing Gland
17A	Gland Clip (when used)
17B	Gland Bolt
18	Outboard Ball Bearing
18A	Bearing Retaining Ring
29	Lantern Ring (Optional)
31	Inboard Bearing Housing

Item No.	Description
32	Impeller Key
33	Outboard Bearing Housing
35	Inboard Bearing Housing Cover
37	Outboard Bearing Housing Cover
40A	Inboard Deflector
40B	Outboard Deflector
41	Inboard Bearing Housing Cap
43	Outboard Bearing Housing Cap
46	Coupling Key
47	Inboard Bearing Cover Seal
63	Stuffing Box Bushing
73A	Casing Casket (Not Shown)
73B	Bearing Cover Gasket
123	Bearing End Cover
127	Water Seal Piping (Optional)
169	Bearing Housing Seal

\* For oil lubricated construction, bearing end cover (123) is gasketed to the outboard bearing housing cover (37) with a silicone gasket material such as loctite superflex ultra blue.

f. Remove packing rings (13), lantern rings (29) if provided, and stuffing box bushings (63).

g. Loosen shaft sleeve set screws then loosen shaft sleeves (14 & 14A) with a spanner wrench. Sleeve (14) has right-hand thread, sleeve (14A) has left-hand thread. Remove sleeves from shaft.

**NOTE**

A seal between the shaft and sleeve is made with an O-ring (14B) in a groove in the sleeve. Use care not to damage the O-ring.

h. Remove the impeller with an arbor press or a tube and hammer.

**NOTE**

The interference between impeller hub ID and shaft OD meets ANSI B4.1 standards for "Preferred Limits and Fits for Cylindrical Parts" and corresponds to standard fit LC-1.

i. Remove impeller key (32).

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.

**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 centers or on vee blocks. Check for eccentricity throughout entire length with a dial indicator; eccentricity must not exceed 0.003 inch total indicator reading. Check that threads are clean and sharp. Surfaces on which bearings mount must be smooth, have a finish of 32 microinches or better, and the shoulders square and free from nicks.

c. Measure the OD of the impeller wear surface or impeller ring (8) and the ID of the casing ring (7). Compute the diametrical clearance (ID minus OD) and compare with the limits given in Table I. If measured diametrical clearance exceeds two times values in Table I, repair to restore design clearance is recommended. ID surface of casing ring must be smooth and concentric with ring OD.

d. Examine impeller passages for cracks, dents, gouges or embedded material.

Blow dry with clean dry compressed air.

*Peerless Pump does not recommend reuse of ball bearings after removal from the shaft. If you choose to clean and consider reuse, proceed as follows:*

b. To clean ball bearings, remove bearings from housings.

c. Place bearings in wire basket so there is space for cleaner to reach all parts.

d. Immerse in Stoddard solvent. Agitate basket until grease is thoroughly loosened and can be flushed out.

e. Place bearings on a screened surface.

f. Using a spray gun with air filter and clean Stoddard solvent, flush each bearing until all grease and sludge is removed.

g. Blow solvent out of bearings with dry filtered air.

h. Lubricate bearings immediately after cleaning with light spindle oil and place them in a covered container.

i. Do not spin bearings during cleaning.

1-5. REMOVAL OR REPLACEMENT. Refer to the Disassembly Instructions for disassembly to the point of removing bearings from the shaft. Normally, they should be removed only to clean and inspect after operating trouble is traced to the bearings.

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

a. If ID of casing rings (7) is grooved, scored or eccentric, replace the casing rings.

b. If impeller wear surfaces or impeller rings (8) are defective, the impeller must be machined to install new impeller rings. Be sure machining is concentric with impeller bore. Use care NOT to reduce hub OD when machining off old impeller rings.

**TABLE I**

<b>IMPELLER/CASE WEAR RING DIAMETRICAL CLEARANCE</b>	
<b>.015/.019</b>	<b>.018/.022</b>
2AE11 3AE9 3AE14 4AE10 4AE11 4AE12 5AE8 5AE11 5AE12 5AE14 6AE10 6AE11 6AE12 6AE14 6AE16 6AE18 8AE12 8AE13 8AE15 8AE17 8AE20 10AE12 10AE14 10AE20	10AE16

### NOTE

Clearances in Table I are for standard bronze or cast iron fitted pumps. For materials with a tendency to gall, such as stainless steel, increase clearances by .010 inch.

### NOTE

For bronze impellers and rings, the rings are shrunk on the hub according to standard fit FN-4 of ANSI B4.1. Hardened impeller rings are installed according to ANSI B4.1 standard fit FN-1.

c. Install new impeller rings (8) on the impeller (shrink or press depending on material). The impeller ring ID is factory-machined for proper fit.

### NOTE

Standard pumps are furnished without impeller rings; the wear surface is an integral part of the impeller. Impeller wear rings may be field-installed by machining. Refer to note following paragraph 2-2b for standard fits to be produced when making such repair. Replace impellers which cannot be salvaged by such repair.

d. Replace worn shaft sleeves.

e. Straighten or replace shafts having excessive run-out (eccentricity). See paragraph 2-1b.

## SECTION III - REASSEMBLY

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

- a. Coat the shaft (6) lightly with oil.
- b. Place impeller key (32) in shaft keyway.
- c. Align impeller (2) on shaft and install with an arbor press or brass tubular sleeve and hammer. Guard against bending shaft. When assembled, the impeller vanes must rotate in the proper direction. (See Figure 3), and impeller hub must be centered on shaft journal.

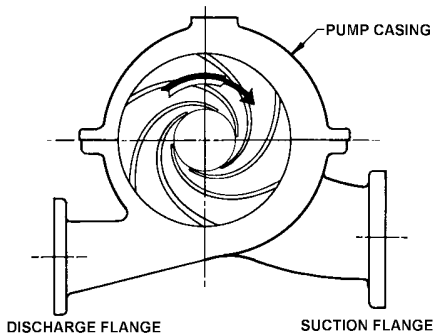


FIGURE 3. VANE POSITION FOR PROPER ROTATION

- d. Coat shaft sleeve O-rings (14B) with oil and install in shaft sleeves (14 & 14A). Install shaft sleeve set screws in shaft sleeves. Assemble shaft sleeves to the shaft and hand tighten against the impeller. Do not tighten shaft sleeve set screws.
- e. Install the stuffing box bushings (63).
- f. Locate casing rings (7) on impeller.

TABLE II

TORQUE VALUE (FT.-LB.)*		
SIZE INCH	MEDIUM CARBON STEEL SAE J429 GRADE 5 105-120,000 PSI TENSILE	MEDIUM CARBON ALLOY STEEL SAE J429 GRADE 8 150,000 PSI TENSILE
1/4	7-8	8-9
3/8	23-25	32-34
1/2	59-62	76-83
5/8	120-125	151-166
3/4	210-225	268-295
7/8	305-325	433-477
1	421-465	648-715
HEAD SYMBOLS		

\*TORQUE VALUES SHOWN ARE FOR CLEAN LUBRICATED THREADS; AND GASEKTED JOINTS.

- g. Place inboard deflectors (40A) on shaft.
- h. If previously removed, install bearing housing seals (169) into housings (31 & 33).
- i. Press housing-bearing-seal assemblies on shaft to seat bearings against shaft shoulders.
- j. Install bearing retaining ring (18A) in groove against the outboard bearing.
- k. Install gaskets (73B) on bearing covers. Use factory supplied parts or cut replacement gaskets from 1/16 inch No. 444 Vellumoid. (SAE P3415A). **EXCEPTION:** For all models using 3306 size outboard bearing, gasket 73B is 1/32 thick.
- l. Attach inboard and outboard bearing covers (35, 37). In the assembled position, the grease drain tap must be located at bottom in a horizontal plane.
- m. Install outboard deflector (40B), and coupling key (46); assemble coupling half on the shaft and tighten the setscrews.

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

- a. Use factory supplied casing gasket (73A) or use the upper casing (1B) as a template to cut a casing gasket (73A) from 1/64 inch Vellumoid (SAE P3313B). It is very important that specified material and thickness be used for casing gasket. Machined surfaces of both casings must be perfectly clean and free from burrs or nicks.

b. Affix the new casing 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) and both bearing housings so that all dowel pins engage in slots in the lower case split surface.

d. Assemble both bearing caps per match marks and tighten the cap screws.

e. Adjust the shaft sleeves (14 & 14A) to center the impeller in the lower casing volute, and tighten both shaft sleeves with a spanner wrench, then tighten shaft sleeve set screws to 130 inch-pounds torque.

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. Install cap screws and tighten working from the center of the casing to each end, to the torque values in Table II. If any cap screws require replacement, use only parts with equal or greater tensile strength. See Table II. Rotate shaft by hand to check that it turns freely.

g. Push the stuffing box bushings (63) to the rear of the stuffing boxes. Insert two packing rings, lantern ring (29) if provided, and three packing rings. Insert each ring separately and stagger the joints of successive rings 90d. Insert the packing glands (17) and set the gland bolt nuts finger tight – DO NOT USE A WRENCH.

h. Rotate shaft by hand to check that it turns freely.

i. Replace all drain plugs if removed during disassembly.

j. Re-lubricate the bearings. Refer to Table IV.

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 environment. Table III should be used only as a guide for re-lubrication.

**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

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

OUNCES	GRAMS	BEARING SIZE
1	28	206/ 305
2	56	207/ 306
2 ¼	63	208/ 307
2 ½	70	210/ 308
3 ½	100	212/ 310
4 ½	128	213/ 311

**GREASE SPECIFICATION:**

Use Lithium soap base, worked penetration, meeting NLGI Grade 2 specifications. Minimum dropping point 355dF., operating temperature range of -10dF to 240dF. Obtain grease from your local supplier.

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

- (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 mad of plastic, and it will be damaged by oil temperature over 170dF or solvents such as alcohol. For these conditions, use a glass bottle.

**LUBRICATING INSTRUCTIONS**

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

l. Consult the driver manufacturer's Maintenance instructions for lubricants and re-lubrication procedure for the driver bearings.

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

**TABLE VI  
TROUBLES**

TROUBLE	PROBABLE CUASE	REMEDY
Overload on driver	<p>Pump speed high.</p> <p>Total head lower than rating.</p> <p>Tight packing.</p> <p>Liquid is of higher specific gravity or Viscosity than rating.</p> <p>Mechanical trouble of pump or driver</p>	<p>Motor voltage higher than name plate 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.**</p> <p>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.**</p> <p>Stop pump – following proper repacking procedure. Check for scored sleeve; and for sleeve run-out if packing wears rapidly. Replace sleeve and packing as required.</p> <p>Check with Peerless distributor to determine if a larger motor is required.</p> <p>See if pump and motor turn freely. Check impeller fit, shaft straightness and ball bearings.</p>
Pump vibrates or is noisy	<p>Driver unbalanced.</p> <p>Misalignment</p> <p>Cracked foundation.</p> <p>Worn ball bearings.</p>	<p>Disconnect driver and operate it alone. Check pump for large pieces of debris, such as wood, rags, etc.</p> <p>Realign pumping unit.</p> <p>Replace foundation.</p> <p>Replace bearings. Check lubricants for proper grade. Check pump alignment. Check for condensation on water cooled bearings.</p>
Failure to deliver liquid or sufficient pressure.	<p>Pump not primed.</p> <p>Pump not up to speed.</p> <p>Discharge head too high.</p> <p>Insufficient available NPSH.</p> <p>Incorrect direction of rotation.</p> <p>Air leaks in suction line or through stuffing boxes.</p> <p>Impeller passages restricted.</p> <p>Worn wearing rings.</p> <p>Damaged impeller.</p> <p>Foot valve too small or restricted by dirt.</p>	<p>Re-prime.</p> <p>Check for low motor voltage or motor over-load. Other drives, increase driver speed when possible.</p> <p>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.</p> <p>Check NPSH requirements of pump and increase system NPSH accordingly.</p> <p>Check the impeller assembly for correct rotation either by removing upper case or through priming connection. Check rotation of driver.</p> <p>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.</p> <p>Disassemble the pump and clean impeller.</p> <p>Replace worn parts.</p> <p>Replace or repair impeller.</p> <p>Replace with adequate size foot valve or clean foot valve.</p>
Pump loses prime after starting	<p>Air leaks in suction line.</p> <p>Insufficient available NPSH.</p>	<p>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.</p> <p>Check NPSH requirements of the pump and increase the system available NPSH accordingly.</p>

\*\* Always obtain new trim diameter from Peerless representative.

SPARE PARTS. To keep delays to a minimum when pump repairs are required, we suggest that the following spare parts be stocked:

- (a) One set of bearings (16) & (18), bearings seals (47) & (169), and bearing cover gaskets (73B).
- (b) One set of shaft sleeves (14) & (14A) and sleeve O-rings (14B).
- (c) One set of casing rings (7).
- (d) One set of impeller rings (8).
- (e) One casing gasket (73A).

For installations where downtime is critical, a complete rotating element should be stocked.

- (f) One set of packing rings (13). Packing can be obtained from your local supplier.

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

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 Pump representative or an authorized distributor for planning an adequate supply of spare parts.



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