End suction frame mounted pumps

Series F

Instructions

- **Installation**
- **Operation**
- **Maintenance**

Read this entire book

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 book 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.

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 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.

IMPORTANT SAFETY PRECAUTIONS

Pump parts, and the tools and rigging equipment used in installing pumps, are heavy and may easily cause personal injury if dropped or carelessly handled. The normal precautions and safety rules associated with the erection of heavy machinery, in regard to manual lifting, use of power equipment, and handling of tools, must be observed in the installation of this pump.

Petroleum-base cleaning solvents are flammable. Smoking by personnel in the vicinity of these solvents is extremely hazardous and must not be permitted.

Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in event of sling or hoist failure. Disregard of this warning could result in grave personal injury.

Before opening the conduit box of an electric motor, be certain that the current to the motor is shut off. An electrical shock from contact with live motor leads can be fatal.

Before attempting repairs to pump, open the disconnect switch to electric motor. This prevents accidental running of pump motor. Starting motor during pump repair activities could damage pump and may cause personal injury.

Because cap screws have a tendency to loosen on shipment, retighten all cap screws to casing and to motor adapter before installing pump. Refer to reassembly instructions, paragraph 17, for torque values.

Peerless Pump
A Sterling Company

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Rev. 6/84

WARNING

The pumps described by this manual must not be installed in any manner except as specified herein, and must not be operated at a speed or a flow capacity different than those specified at the time of original construction. If you are unsure of originally specified speed or flow capacity, or any changes to speed or flow capacity are being considered, do not proceed without consulting the Peerless Pump factory or serious equipment damage and failure may result. The pump must be operated within the limitations described by the pressure-temperature table reproduced below.

Maximum Working Pressure		Pumped Liquid Temperature
175 PSIG	@	20° - 150°F
165 PSIG	@	200°F maximum allowable for iron fitted construction
150 PSIG	@	250°F maximum allowable for bronze fitted construction

These pumps must not be used to pump any fluid other than that specified for the order. Liquids to be pumped must be non-corrosive and non-abrasive or damage can occur to the pump. The liquid pumped by a mechanical seal version of a pump with bronze fitted construction must not contain hydrocarbons or the mechanical seal will be damaged and pump failure will result. Note: Mechanical seals which will not be damaged by the presence of hydrocarbons are available and may be obtained from the factory. Such seals are standard in mechanical seal versions of pumps with iron fitted construction. Violation of this warning will void the warranty and may result in serious property damage or grave personal injury.

CAUTION **Mechanical design of this pump and bearing frame has been based upon an originally specified speed of operation, flow capacity, and pressure. Make no changes without factory approval or serious equipment damage and failure may result.**

INTRODUCTION

UPON RECEIPT OF PUMP EQUIPMENT –

Check carefully to see that all of the equipment has been received. Report immediately any shortages or damages to the transportation company handling the shipment, noting the extent of the damage or shortage on the freight bill and bill of lading.

Do not leave the unit exposed to weather or construction hazards. The pump may become mechanically damaged. This pump is a well designed and carefully manufactured unit. It should be given the same attention accorded to any precision machine.

The satisfactory operation of a pump depends to a large extent upon proper installation. These instructions cannot answer every question that may arise, as each installation will be different. The installer and the operator of this equipment must use good judgment to adapt these procedures to his installation.

PUMP TYPES

Type F End Suction pumps are furnished in two versions, PACKED and MECHANICAL SEAL. Either version may be furnished in bronze fitted or iron fitted construction in accord with original specification.

INSTALLATION

WARNING **Do not work under a heavy suspended object unless there is a positive support under it to stop its fall in event of sling or hoist failure. Disregard of this warning could result in grave personal injury.**

LOCATION: The pump should be installed in a clean-well-drained and ventilated location, and be accessible for inspection and proper care. Ample room should be provided for installation and removal.

FLOOR MOUNTING: A raised concrete foundation may be provided for convenience of elevation but it is not required if the floor is level. If a concrete foundation is provided, it should be solid and rigid to support the complete unit without deflection or vibration.

PIPING: The suction and discharge piping should not be smaller than the inlet or outlet connections of the pump. The piping should be arranged to avoid an excessive number of elbows, tees and other fittings. Avoid pockets and loops in the suction line. Be sure the suction connections are tight because air leakage can cause a reduction in pump capacity or loss of prime.

CAUTION **Make certain that the pump is free from piping strains which may cause misalignment, resulting in a possible binding of the rotating element. Avoid springing the piping into line and use caution when tightening the connections. Provide a suitable means (other than the pump) to support the weight of the suction and discharge piping. It is important, particularly in new pipe lines, that the piping is properly cleaned of all foreign material. Failure to adhere to these precautions can result in equipment damage and malfunction.**

WIRING AND CONTROLS: For electric motor drives, connect power supply to conform with national and local codes. Line voltage and wire capacity must match the ratings stamped on the motor nameplate. DO NOT USE ANY OTHER VOLTAGE.

PUMP ROTATION: Momentarily operate the motor to check that the pump shaft rotates counterclockwise (looking toward pump inlet) as shown by the arrow on the pump casing. Do not allow motor to run in reverse (opposite to arrow) direction for any length of time.

CAUTION **Prime pump before starting motor or damage can occur to internal pump parts.**

PRIMING: A centrifugal pump must be primed before it can be operated. If run dry, damage can occur to close-clearance rotating parts and will destroy packing and mechanical seal faces. Also, if not primed properly, it will not deliver fluid. Prime in one of the following ways:

a. If the system has suction pressure, bleed all air from the pump casing and suction pipe by opening the pipe plug provided at top of the casing. Rotate the shaft a few times, if possible, to evacuate any air trapped inside the impeller passages.

b. If the system has a suction lift and there is a foot valve in the suction pipe, fill the pump casing and suction pipe with water from an outside source. At the same time, let the trapped air escape through the pipe plug at the top of the casing.

c. If the system has a suction lift but no foot valve, use a vacuum pump or ejector operated by air, steam, water, engine exhaust, etc., to evacuate the air from the pump case and suction pipe by connecting the ejector to the priming connection on the top of the casing.

Note: On packed pumps applied to systems where the suction pressure varies between lift and about 15 psig, a lantern ring with water seal piping is to be used. Order from factory.

OPERATION

BEFORE STARTING THE PUMP:

1. Never operate or spin the pump unless it is fully primed. (See "Priming.")
2. Turn the shaft by hand to see that it rotates freely.
3. Remove coupling guard and check and align flexible coupling halves. Replace coupling guard.
4. Check that the voltage and frequency on the motor nameplate match the current supply.
5. Be sure the motor is wired for correct voltage.
6. Check that all thermal overload relays are of the proper size and "set" for operation.
7. Be sure the valve in the suction line is open. The discharge valve should be closed.
8. Review remainder of these instructions.

AFTER STARTING THE PUMP:

1. Check the pump rotation with the direction of the arrow on the pump casing. If necessary, change direction.
2. Check the pump for evidence of rubbing or binding which may have been caused by piping strains.
3. Slowly open the discharge valve.
4. See that all pipe connections are tight.
5. On packed pumps, make certain that a slight amount of water seeps from the stuffing box at the gland (17). This water is required to lubricate the packing.

LOCATING TROUBLE

IF PUMP AND MOTOR FAIL TO START:

1. Check for blown fuses or a tripped thermal overload relay.
2. Shaft may be stuck or binding due to rubbing of clogged impeller or other mechanical defect. On packed pump, the gland may be too tight, thus binding the shaft.
3. Starter contacts may be corroded, shorted, or terminal connections may be broken somewhere in the circuit.
4. The wiring hookup or voltage provided may be incorrect or switches may not be "set" for operation.

IF INSUFFICIENT OR NO WATER IS DELIVERED:

1. Pump may not be primed. (See "Priming.")
2. The speed may be too slow. Check for low voltage.
3. The required discharge pressure may be higher than anticipated.
4. Suction pressure may be lower than anticipated.
5. The impeller may be clogged or damaged.
6. Wrong rotation. Check direction of shaft rotation with arrow on the pump casing.
7. The suction or discharge lines may be clogged or valves in lines may not be fully open.

IF PUMP LOSES PRIME:

1. The suction line may be leaking.
2. The suction pressure may be too low.
3. The pumped liquid may contain air or gas.

IF PUMP VIBRATES OR IS NOISY:

1. The foundation may be insufficient or not secure.
2. The impeller may be partially clogged causing an unbalanced condition.
3. Mechanical defects may be evident, such as a bent shaft, rotating element binding or worn bearings.
4. Suction or discharge pipes may not be anchored sufficiently.
5. The pump may be vapor bound — not fully primed. (See "Priming.")
6. Insufficient net positive suction head available; cavitation.

MAINTENANCE

To insure the best operation of the pump, make a systematic and periodic inspection to check the following:

1. See that the driver is up to speed. Check driver manufacturer's instructions for periodic maintenance requirements.
2. See that the electrical control equipment is clean and contacts are in good condition.
3. Check operation of the pump. See that it runs smoothly and is reasonably quiet.
4. On packed pump, see that some leakage occurs from the gland (17).

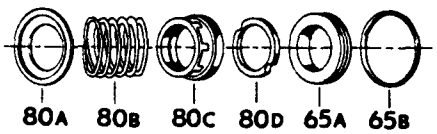
CAUTION **Where the pump is installed in an unheated location, precaution must be taken to protect the pump and pipe lines from freezing. If the unit is to remain idle for long periods during cold weather, the pump must be drained by removing the drain plug in the bottom of the casing (1). Reprime pump when reused.**

LUBRICATION: F1, 2, 3, 4 models only, use grease, Lithium soap base, worked penetration, meeting National Lubricating Grease Institute, Grade 2 specifications. Minimum dropping point 355°F., minimum operating temperature range of −10° to 240°F. Apply as follows:

1. Thoroughly clean grease fittings and outside of bearing housing.
2. Inject clean new grease. ALWAYS GREASE SPARINGLY.
3. Start and run pump for a short time to eject any excess grease.
4. Wipe off all ejected grease.
5. Use the following as a guide for the frequency of lubrication.

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

MECHANICAL SEAL



*80A Spring Retainer
80B Spring
80C Seal Bellows Assy
80D Sealing Washer
65A Floating Seat
65B Seat Ring

*Some pumps have a step turned on the impeller hub to accept the spring and therefore do not have or use a spring retainer.

PUMP REMOVAL

WARNING **Always take adequate precaution to prevent accidental running of pump motor before starting to remove pump from base. Starting motor during pump removal could damage pump and may cause personal injury.**

1. Open the disconnect switch to cut off power to the motor. Temporarily tie switch open and attach note: DO NOT CLOSE SWITCH – PUMP REPAIR IN PROGRESS.
2. Close valves in suction and discharge lines.
3. Remove plug from bottom of casing (1, Figure 1) and drain casing.
4. Disconnect suction and discharge lines.
5. Remove coupling guard and disconnect flexible coupling or remove belts and pulley (if used) and coupling key (46).
6. Remove 2 case bolts holding case support (53) on the 1260A and 1660, if used.
7. Remove the hold-down bolts and move pump to bench for disassembly.

PUMP DISASSEMBLY

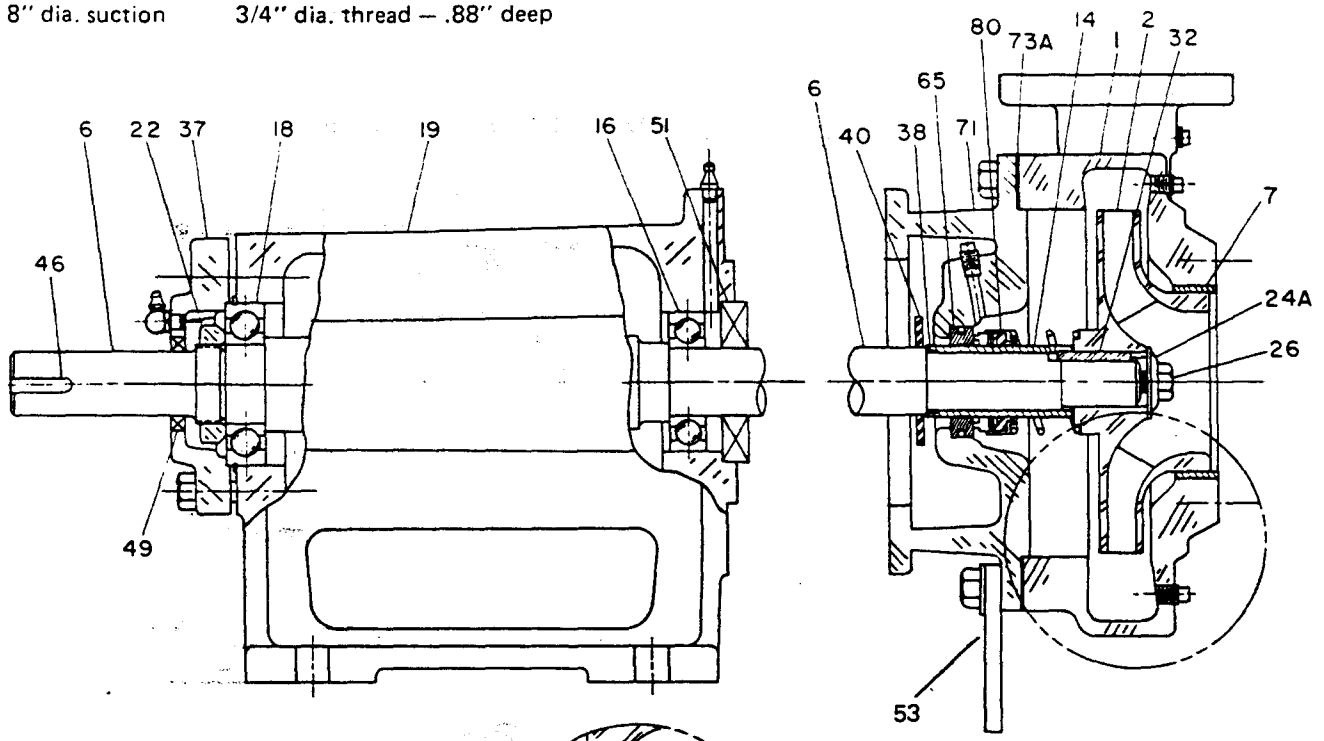
Disassembly pump in the following manner:

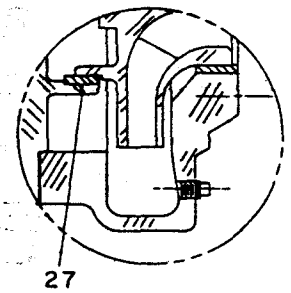
NOTE: The pump may be either packed or with a mechanical seal. Procedures for the two types of sealing differ slightly.

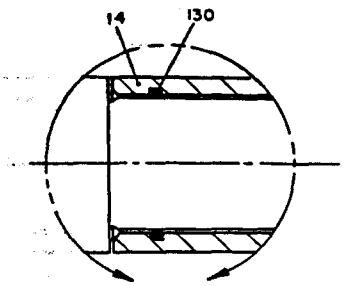
1. Remove any seal piping (tubing) that may be present between pump discharge and stuffing box of adapter (71, Figure 1).
2. Take out all screws and remove casing (1) and casing gasket (73A). If necessary, lightly tap with plastic hammer at several places to loosen casing from adapter.
3. Insert a rod of suitable diameter into a passage of impeller (2) and hold while loosening impeller lock screw (26). Remove lock screw and impeller washer (24A).
4. Slide impeller from end of shaft (6) and remove impeller key (32). If impeller is hard to remove, use a small wood block against adapter and pry carefully at several points around impeller to loosen.
5. For the mechanical seal pump, very carefully remove seal parts (80A thru 80D). Be particularly careful not to scratch or damage lapped surface of sealing washer (80D). Store seal parts in suitable container; lapped surface of sealing washer must be up and covered.
6. For the packed pump, loosen both gland bolts (17B) and pull gland (17) out slightly to relax packing (13).
7. Remove screws and slide adapter (71) off from shaft. Use care not to scratch shaft sleeve (14).
8. Carefully push floating seat (65A) from adapter, avoiding scratching or other damage to lapped surface. Use narrow, flat screwdriver to lift and work O-ring (65B) from seat. Store seat with remaining mechanical seal parts with lapped surface up and covered.
9. Remove gland (17), packing (13) and lantern ring (29) (if furnished) from adapter (for packed pump).
10. Slide shaft sleeve (14) and deflector (40) from shaft. Remove O-ring (130) from shaft sleeve or gasket (38) from shaft.
11. Remove screws and slide outboard bearing cover (37) from shaft. Push outboard bearing cover seal (49) from cover.
12. Push shaft (6) with bearings (16, 18) from frame (19). Push in direction of motor coupling or belt pulley.
13. Carefully push inboard grease retainer (51) from frame (19).
14. If bearings (16, 18) are to be removed from shaft, temporarily install impeller key (32) and impeller (2) on shaft. With rod inserted into impeller passage, restrain shaft while loosening bearing lock nut (22). Remove

Thread depth for suction flanges:

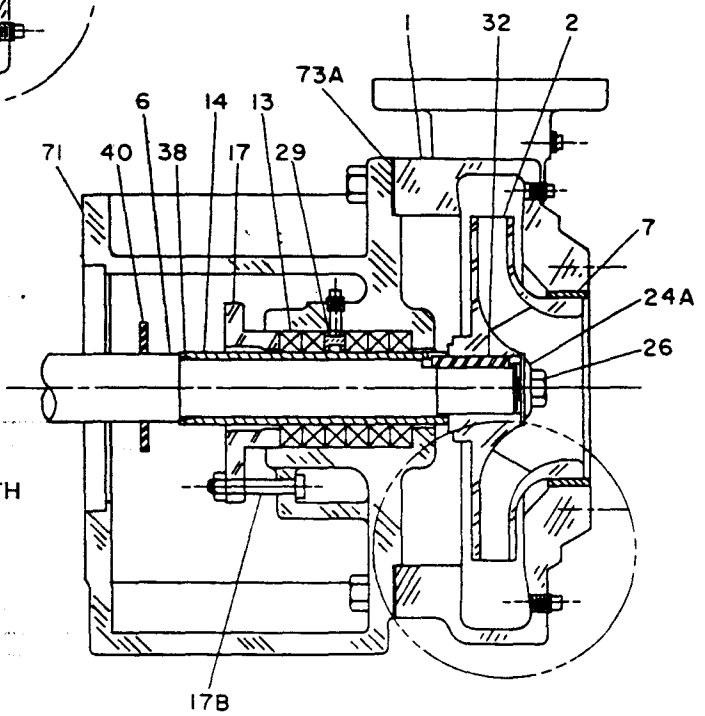
2½" - 4" dia. suction	5/8" dia. thread — .75" deep
5" - 8" dia. suction	3/4" dia. thread — .88" deep







DETAIL OF SLEEVE WITH O-RING INSTEAD OF GASKET.
FIGURE 1A.



1	Casing
2	Impeller
6	Shaft
7	Casing Ring
13	Packing
14	Shaft Sleeve
16	Bearing, Inboard
17	Gland
17B	Gland Bolt
18	Bearing, Outboard
19	Frame
22	Bearing Lock Nut
24A	Impeller Washer
26	Impeller Lock Screw
27	Adapter Ring
29	Lantern Ring (optional)
32	Impeller Key
37	Bearing Cover, Outboard
38	Shaft Sleeve Gasket
40	Deflector
46	Coupling Key
49	Bearing Cover Seal, Outboard
51	Grease Retainer, Inboard
53	Case Support
65	Mechanical Seal, Stationary Element
71	Adapter
73A	Casing Gasket
80	Mechanical Seal, Rotating Element
130	Shaft Sleeve O-Ring

See Fig. 3 for typical construction of F3 and F4 frames.

FIGURE 1. TYPE F1 AND F2 END SUCTION PUMPS

lock nut, impeller and key from shaft. Support bearings on inner races and press shaft out. The bearing retaining ring (18A, Figure 3) on the shaft of the F3 frame in the outboard bearing journal need not be removed unless damaged, loose or worn.

FO FRAME DISASSEMBLY ONLY

Remove snap ring (16A) from groove in bearing bore on pump end of frame (19). Push shaft (6) with bearings from frame. Push in direction of pump end. If bearings (16, 18) are to be removed, support inner races and press shaft out.

NOTE: Bearings are sealed type. There is no need for cleaning or lubrication. (See Figure 2.)

15. Remove casing ring (7) from casing only if damaged or worn to excess (refer to Repair).

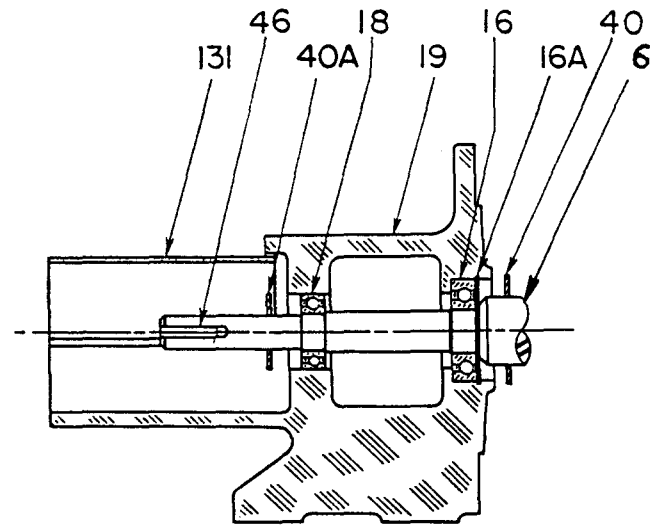


FIGURE 2. TYPE FO END SUCTION FRAME

6	Shaft
16	Bearing, Inboard
16A	Bearing, Retaining Ring
18	Bearing, Outboard
19	Frame
40	Deflector, Inboard
40A	Deflector, Outboard
46	Coupling Key
131	Coupling Guard

CLEANING

WARNING **Petroleum-base cleaning solvents are flammable. Smoking or open flames in the vicinity of these solvents are extremely hazardous and must not be permitted. Disregard of this warning could result in grave personal injury.**

1. Clean all metal parts 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. Blow dry with clean dry compressed air.

CAUTION **Never use hydrocarbon liquids (oil or solvent) to clean mechanical seal parts. Use of oil or solvent will deteriorate material used for manufacture of the seal.**

2. Clean seal parts using a mild soap solution. Rub only with finger to remove dirt. Rinse with clear water and dry with mild air stream. Use care not to damage or scratch lapped surfaces.
3. Clean ball bearings in the following manner:
   a. Place bearings in wire basket – so there is space for cleaner to reach all parts.
   b. Immerse in Stoddard solvent. Agitate basket until grease is thoroughly loosened and can be flushed out.
   c. Place bearing on a screened surface.
   d. Using a spray gun with air filter and clean Stoddard solvent, flush each bearing until all grease and sludge is removed.
   e. Blow solvent out of bearings with dry, filtered air.
   f. Lubricate bearings immediately after cleaning with light spindle oil and place them in a covered container.
   g. Do not spin bearings any time during cleaning.
4. Bearings not removed from the shaft may be cleaned in the following manner:
   a. Flush with Stoddard solvent until all old grease is removed. Rotate bearing slowly (by hand) while flushing. DO NOT use kerosene or fuel oil for flushing.
   b. Relubricate (refer to paragraph 3, step f, above).

INSPECTION

Visually inspect and replace parts that are damaged and affecting the serviceability or sealing. Emphasize inspection of mating parts having relative motion – casing rings for example. Perform detailed inspections as follows:

1. Check O-rings, gaskets and seals for shrinkage, cracks, nicks or tears.
2. Check packing rings for excessive compression, fraying or shredding, embedded particles (dirt or metal). Replace if defective in any way.
3. Examine impeller passages for cracks, dents, gouges or embedded material.
4. Inspect shaft sleeves (14) for excessive wear. Replace sleeves that are worn. Replace gasket, if used.
5. Inspect lapped surfaces of sealing washer and floating seat for chipping, gouges, nicks, scratches or other damage. These surfaces must be free from any defect. If lapped surfaces are damaged, replace the entire seal.

6. Mount the shaft between lathe centers. Check the eccentricity throughout the entire length with a dial indicator to be not more than 0.003 inch total indicator reading. Surfaces on which bearings mount must be smooth, have a finish not less than 32 micro-inches, and the shoulders square and free from nicks.

REPAIR

When ordering repair parts, give the complete pump nameplate data (nameplate on the pump casing) plus the name and item number of the part shown on sectional view.

Remove burrs, nicks and scratches from non-critical areas with a fine stone or crocus cloth.

1. Impeller and Casing Wear. If the pump capacity falls off due to wear on the impeller and casing ring, repair is made by replacing the casing ring. The inside diameter of the casing ring should be 0.008" to 0.012" larger than the impeller skirt diameter.
2. Normally, when the pump is completely disassembled, all gaskets, O-rings and seals (grease retainer) should be replaced at reassembly. If the O-rings for the floating seat of the mechanical seal or shaft sleeve are not damaged, they may be reused with the other satisfactory seal parts.

REASSEMBLY

Reassemble pump in the following manner:

1. If bearings (16, 18) were removed from shaft (6), support shaft and press bearing on, applying force only against the inner race. Be sure that inner races bottom on shaft shoulders. If bearing retaining ring (18A, Fig. 3) was replaced or removed from shaft of the F3 frame, reinstall in proper groove in outboard bearing journal before installing bearing. Press bearing until inner race bottoms on retaining ring.
2. Temporarily install impeller key (32) and impeller (2) on shaft. Use rod inserted in impeller passage to restrain shaft while tightening bearing locknut (22). Remove impeller and key.
3. Install new inboard grease retainer (51) in frame (19). Lip of retainer, which contacts shaft, must face away from inboard bearing (16) cavity.
4. Lightly pack each bearing with a recommended grease from the instruction "Lubrication" in this manual. Maintain absolute cleanliness at all times while packing and handling bearings. No further lubrication is necessary until normal maintenance interval is reached.
5. Coat shaft at inboard bearing (where grease retainer will contact) with light oil or grease. Carefully insert shaft through outboard end of frame, impeller end first. Carefully guide through inboard end and through grease retainer (51) so that lip remains facing away from bearing cavity. Push shaft so that retaining ring in outer race of outboard bearing (18) contacts frame.
6. Install new outboard bearing cover seal (49) in outboard bearing cover (37). Be sure that seal lip will face bearing when cover is installed.
7. Coat outboard end of shaft with light oil or grease up to bearing locknut. Carefully slide cover and seal on shaft, so that lip remains facing bearing; position so that grease fitting is at top and bottom against outer race of bearing. Install screws to hold cover, tightening uniformly (do not tighten so that cover is bowed).

FO FRAME REASSEMBLY ONLY

If bearings (16, 18) were removed from shaft (6), support shaft and press bearings on, applying force only against the inner race. Be sure inner races bottom on shaft shoulders. Carefully insert shaft, coupling end first, through pump end of frame (19). Push shaft so that shoulder of pump end bearing contacts shoulder in frame bore. Install snap ring (16A) in proper groove in frame bore.

8. Install deflector (40), shaft sleeve gasket (38) and shaft sleeve (14) on shaft. Be sure gasket is completely contained by sleeve and that sleeve bottoms on shaft shoulder (see Fig. 1). Install O-ring (130) in sleeve (14). Install deflector and shaft sleeve over shaft, making sure sleeve bottoms on shoulder. (See Fig. 1A). Position deflector midway between end of sleeve and grease retainer. Align sleeve slot with key slot of shaft.
9. For the packed pump, slide the gland (17) and lantern ring (29) over the shaft sleeve to abut the deflector.

CAUTION **Use care not to mar or scratch the lapped surfaces of floating seat and sealing washer when installing mechanical seal. Damage to these surfaces will result in leakage and will require replacement of the entire seal.**

10. For the mechanical seal pump, lubricate the O-ring (65B), groove in floating seat (65A) and seat cavity in adapter (71) with any of MOLYKOTE® DC No. 55 silicone grease, 3% detergent solution, glycerine or ethylene glycol.
11. Install floating seat in the adapter with lapped surface facing away from adapter shoulder. Apply lubricant (step 10 above) to entire surface of shaft sleeve and carefully install adapter. Use care not to cock or scrape floating seat on sleeve. Seat adapter against frame, tapping very lightly with plastic hammer, then install screws and tighten uniformly. Rotate shaft by hand to check that there is no binding or hang-up.
12. In the same manner as in step 11, lubricate the entire surface of shaft sleeve and the bores of sealing washer (80D) and spring bellows assembly (80C). Carefully install sealing washer, lapped surface toward floating seat, and spring bellows assembly on shaft sleeve and slide along to contact floating seat. Install spring (80B) and spring retainer (80A), if used.
13. For the packed pump, install the adapter (71) in the same manner as in step 11 except shaft sleeve need not be lubricated.

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Peerless Pump
A Sterling Company
2005 Martin Luther King, Jr. Street Indianapolis, IN 46206 (317) 925-9661
1200 Sycamore Street Montebello, CA 90640 (213) 726-1232

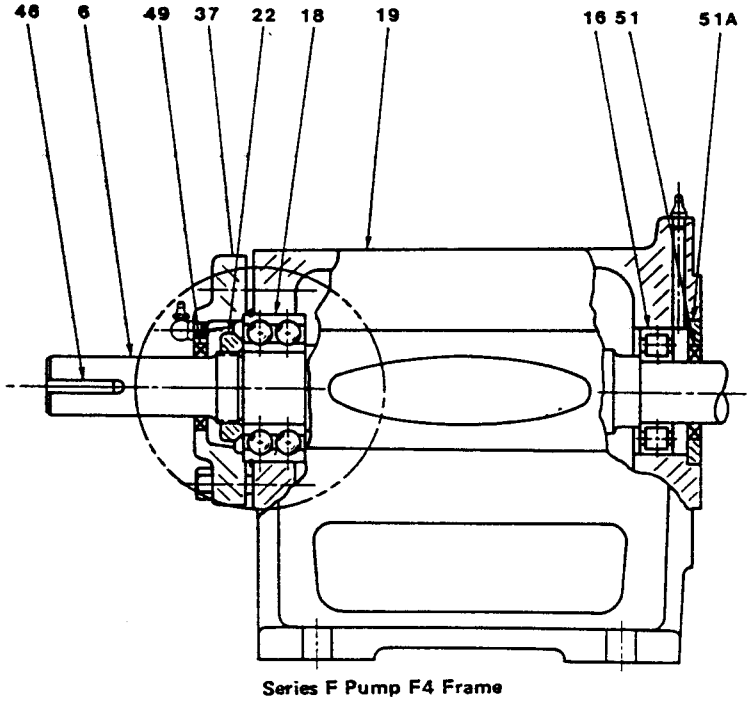
Reassembly (concluded)

CAUTION **Be sure at all times that the gland enters the box square to the shaft so that uniform pressure is exerted around the packing; a tipped gland is an invitation to trouble.**

14. In order, install 3 rings of packing (13), the lantern ring (29) (if furnished) and 2 rings of packing in adapter cavity. When lantern ring is not furnished, install 6 rings of packing. Stagger the joint of each packing ring approximately 180° from adjacent rings. Be sure each ring is square with the shaft. Use a split bushing and the gland (17) to move rings to the bottom of the cavity. When all packing rings are in place, position the gland (17) and loosely seat on packing, using gland bolts (17B). Tighten as required to limit leakage after pump is running.
15. Install impeller key (32) in shaft keyway. Make sure that key enters slot in shaft sleeve. Align impeller (2) with key and install on shaft. Tap impeller hub lightly with plastic hammer to seat against shaft sleeve. For the mechanical seal pump, guide spring to seat on the shoulder as impeller is installed. Be sure spring is correctly seated against bellows assembly.
16. Install impeller washer (24A) and impeller lock screw (26). Restrain impeller with rod inserted in one passage and securely tighten screw. Rotate shaft by hand to check for free movement.
17. Lightly coat both sides of casing gasket (73A) with a non-hardening sealing compound, such as grease and graphite. Position on adapter making sure that holes are aligned. Install casing (1), tapping lightly with plastic hammer to seat on adapter. Install screws and tighten uniformly in a star pattern. The cap screws are SAE Grade 5 and are to be tightened to the following minimum torque values for dry threads.

Size	Torque
3/8	30 ft - lbs
7/16	50 ft - lbs
1/2	75 ft - lbs
5/8	155 ft - lbs
3/4	265 ft - lbs

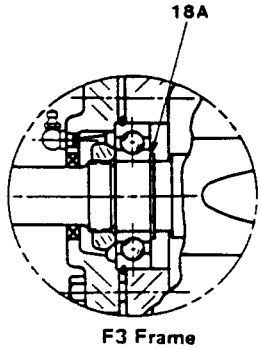
18. Install seal piping (tubing) (if used) between pump discharge and stuffing box of adapter.



Series F Pump F4 Frame

6	Shaft
16	Bearing, Inboard
18	Bearing, Outboard
18A	Bearing Retaining Ring
19	Frame
22	Bearing Lock Nut
37	Bearing Cover, Outboard
46	Coupling Key
49	Bearing Cover Seal, Outboard
51	Grease Retainer, Inboard
51A	Grease Retainer Bushing

See Fig. 1 for typical construction of F1 and F2 frames.



F3 Frame

FIGURE 3. TYPE F3 AND F4 END SUCTION FRAMES

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 at their option.

End suction frame mounted pumps

Series F

Repair Instructions

Peerless Pump Company
A member of the Sterling Group

4845749
Rev. 6/90

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 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 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.

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 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.

PUMP REMOVAL

WARNING Before starting disassembly of the pump, it is recommended that a set of spare parts 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.

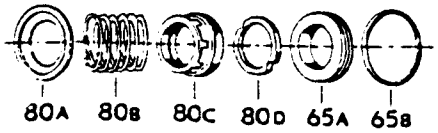
PUMP DISASSEMBLY

Disassembly pump in the following manner:

NOTE: The pump may be either packed or with a mechanical seal. Procedures for the two types of sealing differ slightly.

1. Remove any seal piping (tubing) that may be present between pump discharge and stuffing box of adapter (71, Figure 1).
2. Take out all screws and remove casing (1) and casing gasket (73A). If necessary, lightly tap with plastic hammer at several places to loosen casing from adapter.
3. Insert a rod of suitable diameter into a passage of impeller (2) and hold while loosening impeller lock screw (26). Remove lock screw and impeller washer (24A).
4. Slide impeller from end of shaft (6) and remove impeller key (32). If impeller is hard to remove, use a small wood block against adapter and pry carefully at several points around impeller to loosen.
5. For the mechanical seal pump, very carefully remove seal parts (80A thru 80D). Be particularly careful not to scratch or damage lapped surface of sealing washer (80D). Store seal parts in suitable container; lapped surface of sealing washer must be up and covered.
6. For the packed pump, loosen both gland bolts (17B) and pull gland (17) out slightly to relax packing (13).
7. Remove screws and slide adapter (71) off from shaft. Use care not to scratch shaft sleeve (14).
8. Carefully push floating seat (65A) from adapter, avoiding scratching or other damage to lapped surface. Use narrow, flat screwdriver to lift and work O-ring (65B) from seat. Store seat with remaining mechanical seal parts with lapped surface up and covered.
9. Remove gland (17), packing (13) and lantern ring (29) (if furnished) from adapter (for packed pump).
10. Slide shaft sleeve (14) and deflector (40) from shaft. Remove O-ring (130) from shaft sleeve or gasket (38) from shaft.
11. Remove screws and slide outboard bearing cover (37) from shaft. Push outboard bearing cover seal (49) from cover.
12. Push shaft (6) with bearings (16, 18) from frame (19). Push in direction of motor coupling or belt pulley.
13. Carefully push inboard grease retainer (51) from frame (19).
14. If bearings (16, 18) are to be removed from shaft, temporarily install impeller key (32) and impeller (2) on shaft. With rod inserted into impeller passage, restrain shaft while loosening bearing lock nut (22). Remove lock nut, impeller and key from shaft. Support bearings on inner races and press shaft out. The bearing retaining ring (18A, Figure 3) on the shaft of the F3 frame in the outboard bearing journal need not be removed unless damaged, loose or worn.

MECHANICAL SEAL

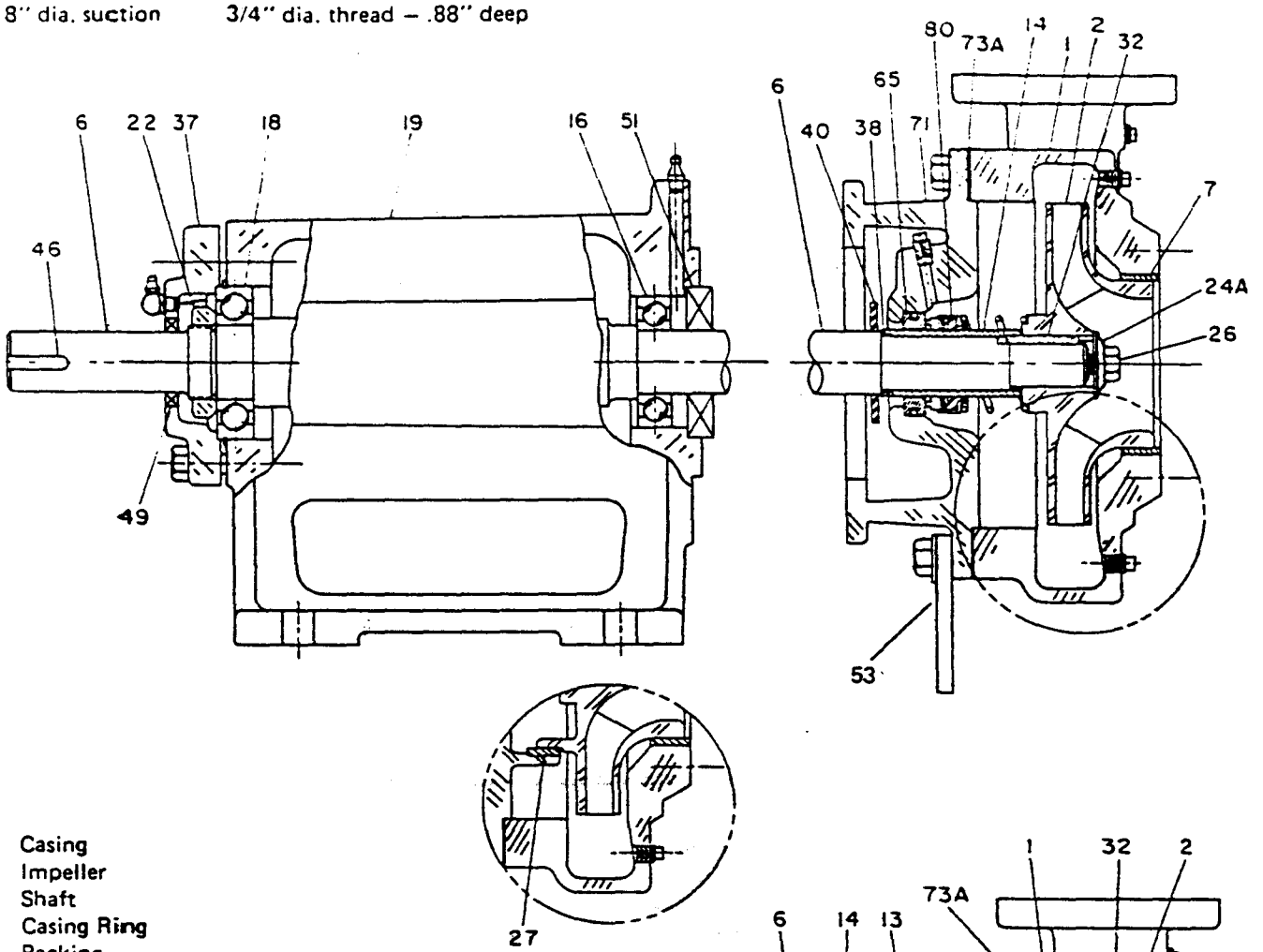


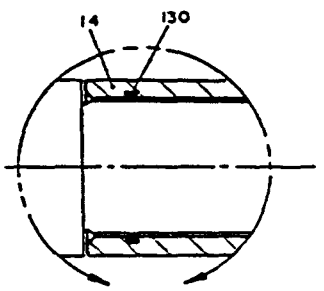
*80A	Spring Retainer	80D	Sealing Washer
80B	Spring	65A	Floating Seat
80C	Seal Bellows Assy	65B	Seat Ring

*Some pumps have a step turned on the impeller hub to accept the spring and therefore do not have or use a spring retainer.

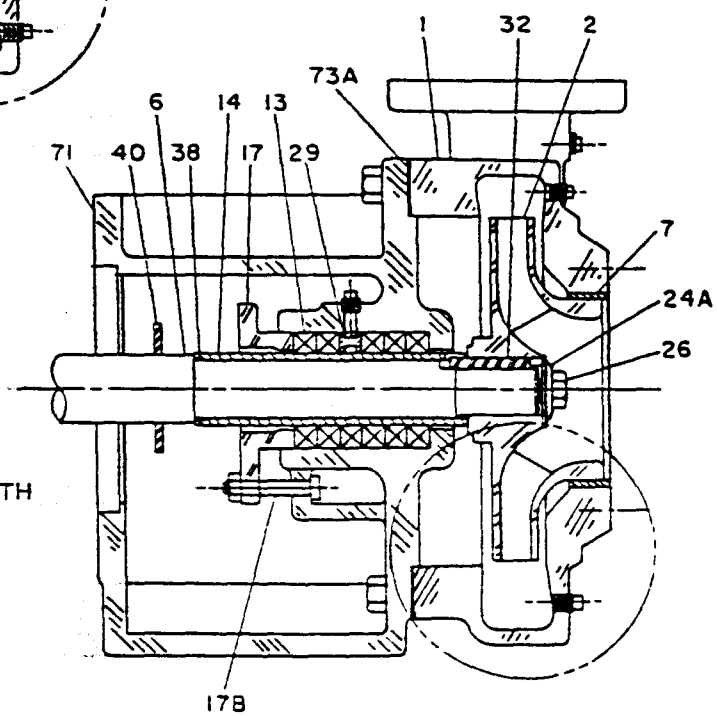
Thread depth for suction flanges:

2½" - 4" dia. suction	5/8" dia. thread – .75" deep
5" - 8" dia. suction	3/4" dia. thread – .88" deep





DETAIL OF SLEEVE WITH O-RING INSTEAD OF GASKET.
FIGURE 1A.



1	Casing
2	Impeller
6	Shaft
7	Casing Ring
13	Packing
14	Shaft Sleeve
16	Bearing, Inboard
17	Gland
17B	Gland Bolt
18	Bearing, Outboard
19	Frame
22	Bearing Lock Nut
24A	Impeller Washer
26	Impeller Lock Screw
27	Adapter Ring
29	Lantern Ring (optional)
32	Impeller Key
37	Bearing Cover, Outboard
38	Shaft Sleeve Gasket
40	Deflector
46	Coupling Key
49	Bearing Cover Seal, Outboard
51	Grease Retainer, Inboard
53	Case Support
65	Mechanical Seal, Stationary Element
71	Adapter
73A	Casing Gasket
80	Mechanical Seal, Rotating Element
130	Shaft Sleeve O-Ring

See Fig. 3 for typical construction of F3 and F4 frame

FIGURE 1. TYPE F1 AND F2 END SUCTION PUMPS

FO FRAME DISASSEMBLY ONLY

Remove snap ring (16A) from groove in bearing bore on pump end of frame (19). Push shaft (6) with bearings from frame. Push in direction of pump end. If bearings (16, 18) are to be removed, support inner races and press shaft out. NOTE: Bearings are sealed type. There is no need for cleaning or lubrication. (See Figure 2.)

15. Remove casing ring (7) from casing only if damaged or worn to excess (refer to Repair).

6	Shaft
16	Bearing, Inboard
16A	Bearing, Retaining Ring
18	Bearing, Outboard
19	Frame
40	Deflector, Inboard
40A	Deflector, Outboard
46	Coupling Key
131	Coupling Guard

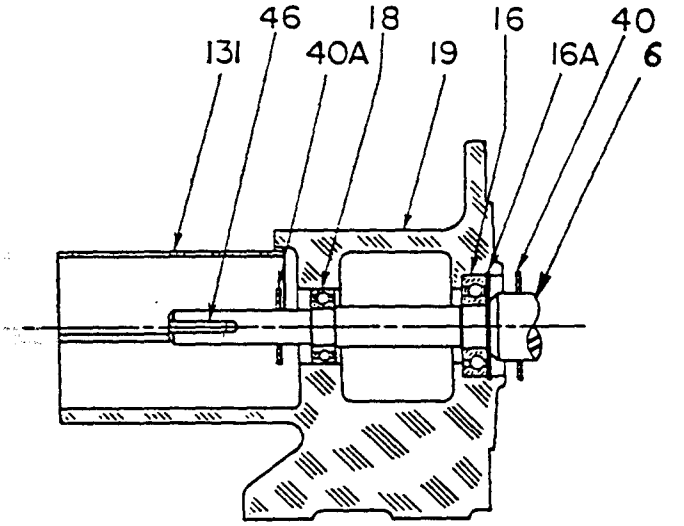


FIGURE 2. TYPE FO END SUCTION FRAME

CLEANING

WARNING **Petroleum-base cleaning solvents are flammable. Smoking or open flames in the vicinity of these solvents are extremely hazardous and must not be permitted. Disregard of this warning could result in grave personal injury.**

1. Clean all metal parts 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. Blow dry with clean dry compressed air.

CAUTION **Never use hydrocarbon liquids (oil or solvent) to clean mechanical seal parts. Use of oil or solvent will deteriorate material used for manufacture of the seal.**

2. Clean seal parts using a mild soap solution. Rub only with finger to remove dirt. Rinse with clear water and dry with mild air stream. Use care not to damage or scratch lapped surfaces.
3. Clean ball bearings in the following manner:
   a. Place bearings in wire basket — so there is space for cleaner to reach all parts.
   b. Immerse in Stoddard solvent. Agitate basket until grease is thoroughly loosened and can be flushed out.
   c. Place bearing on a screened surface.
   d. Using a spray gun with air filter and clean Stoddard solvent, flush each bearing until all grease and sludge is removed.
   e. Blow solvent out of bearings with dry, filtered air.
   f. Lubricate bearings immediately after cleaning with light spindle oil and place them in a covered container.
   g. Do not spin bearings any time during cleaning.
4. Bearings not removed from the shaft may be cleaned in the following manner:
   a. Flush with Stoddard solvent until all old grease is removed. Rotate bearing slowly (by hand) while flushing. DO NOT use kerosene or fuel oil for flushing.
   b. Relubricate (refer to paragraph 3, step f, above).

INSPECTION

Visually inspect and replace parts that are damaged and affecting the serviceability or sealing. Emphasize inspection of mating parts having relative motion — casing rings for example. Perform detailed inspections as follows:

1. Check O-rings, gaskets and seals for shrinkage, cracks, nicks or tears.
2. Check packing rings for excessive compression, fraying or shredding, embedded particles (dirt or metal). Replace if defective in any way.
3. Examine impeller passages for cracks, dents, gouges or embedded material.
4. Inspect shaft sleeves (14) for excessive wear. Replace sleeves that are worn. Replace gasket, if used.
5. Inspect lapped surfaces of sealing washer and floating seat for chipping, gouges, nicks, scratches or other damage. These surfaces must be free from any defect. If lapped surfaces are damaged, replace the entire seal.
6. Mount the shaft between lathe centers. Check the eccentricity throughout the entire length with a dial indicator to be not more than 0.003 inch total indicator reading. Surfaces on which bearings mount must be smooth, have a finish not less than 32 micro-inches, and the shoulders square and free from nicks.

REPAIR

When ordering repair parts, give the complete pump nameplate data (nameplate on the pump casing) plus the name and item number of the part shown on sectional view.

Remove burrs, nicks and scratches from non-critical areas with a fine stone or crocus cloth.

1. Impeller and Casing Wear. If the pump capacity falls off due to wear on the impeller and casing ring, repair is made by replacing the casing ring. The inside diameter of the casing ring should be 0.008" to 0.012" larger than the impeller skirt diameter.
2. Normally, when the pump is completely disassembled, all gaskets, O-rings and seals (grease retainer) should be replaced at reassembly. If the O-rings for the floating seat of the mechanical seal or shaft sleeve are not damaged, they may be reused with the other satisfactory seal parts.

REASSEMBLY

Reassemble pump in the following manner:

1. If bearings (16, 18) were removed from shaft (6), support shaft and press bearing on, applying force only against the inner race. Be sure that inner races bottom on shaft shoulders. If bearing retaining ring (18A, Fig. 3) was replaced or removed from shaft of the F3 frame, reinstall in proper groove in outboard bearing journal before installing bearing. Press bearing until inner race bottoms on retaining ring.
2. Temporarily install impeller key (32) and impeller (2) on shaft. Use rod inserted in impeller passage to restrain shaft while tightening bearing locknut (22). Remove impeller and key.
3. Install new inboard grease retainer (51) in frame (19). Lip of retainer, which contacts shaft, must face away from inboard bearing (16) cavity.
4. Lightly pack each bearing with a recommended grease from the instruction "Lubrication" in this manual. Maintain absolute cleanliness at all times while packing and handling bearings. No further lubrication is necessary until normal maintenance interval is reached.
5. Coat shaft at inboard bearing (where grease retainer will contact) with light oil or grease. Carefully insert shaft through outboard end of frame, impeller end first. Carefully guide through inboard end and through grease retainer (51) so that lip remains facing away from bearing cavity. Push shaft so that retaining ring in outer race of outboard bearing (18) contacts frame.
6. Install new outboard bearing cover seal (49) in outboard bearing cover (37). Be sure that seal lip will face bearing when cover is installed.
7. Coat outboard end of shaft with light oil or grease up to bearing locknut. Carefully slide cover and seal on shaft, so that lip remains facing bearing; position so that grease fitting is at top and bottom against outer race of bearing. Install screws to hold cover, tightening uniformly (do not tighten so that cover is bowed).

FO FRAME REASSEMBLY ONLY

If bearings (16, 18) were removed from shaft (6), support shaft and press bearings on, applying force only against the inner race. Be sure inner races bottom on shaft shoulders. Carefully insert shaft, coupling end first, through pump end of frame (19). Push shaft so that shoulder of pump end bearing contacts shoulder in frame bore. Install snap ring (16A) in proper groove in frame bore.

8. Install deflector (40), shaft sleeve gasket (38) and shaft sleeve (14) on shaft. Be sure gasket is completely contained by sleeve and that sleeve bottoms on shaft shoulder (see Fig. 1). Install O-ring (130) in sleeve (14). Install deflector and shaft sleeve over shaft, making sure sleeve bottoms on shoulder. (See Fig. 1A). Position deflector midway between end of sleeve and grease retainer. Align sleeve slot with key slot of shaft.
9. For the packed pump, slide the gland (17) and lantern ring (29) over the shaft sleeve to abut the deflector.

CAUTION **Use care not to mar or scratch the lapped surfaces of floating seat and sealing washer when installing mechanical seal. Damage to these surfaces will result in leakage and will require replacement of the entire seal.**

10. For the mechanical seal pump, lubricate the O-ring (65B), groove in floating seat (65A) and seat cavity in adapter (71) with any of MOLYKOTE® DC No. 55 silicone grease, 3% detergent solution, glycerine or ethylene glycol.
11. Install floating seat in the adapter with lapped surface facing away from adapter shoulder. Apply lubricant (step 10 above) to entire surface of shaft sleeve and carefully install adapter. Use care not to cock or scrape floating seat on sleeve. Seat adapter against frame, tapping very lightly with plastic hammer, then install screws and tighten uniformly. Rotate shaft by hand to check that there is no binding or hang-up.
12. In the same manner as in step 11, lubricate the entire surface of shaft sleeve and the bores of sealing washer (80D) and spring bellows assembly (80C). Carefully install sealing washer, lapped surface toward floating seat, and spring bellows assembly on shaft sleeve and slide along to contact floating seat. Install spring (80B) and spring retainer (80A), if used.
13. For the packed pump, install the adapter (71) in the same manner as in step 11 except shaft sleeve need not be lubricated.

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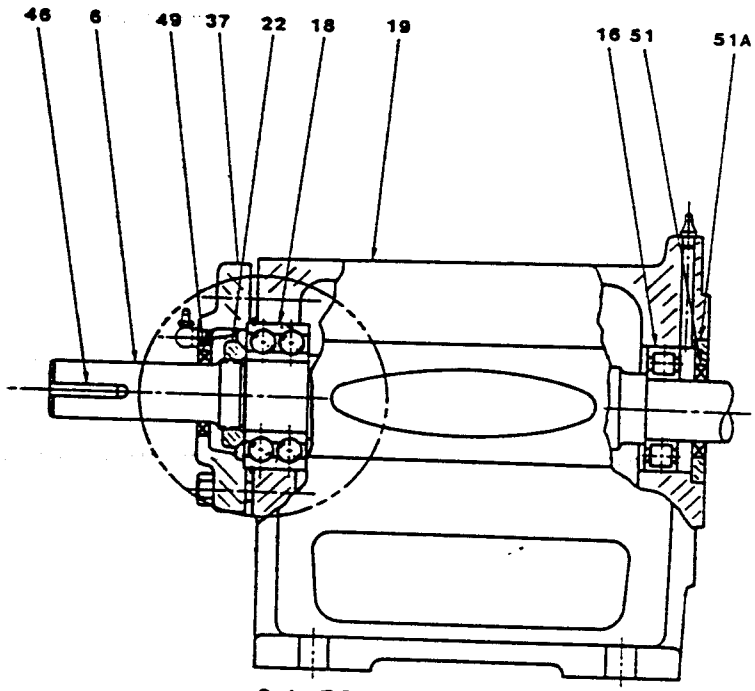
CAUTION **Be sure at all times that the gland enters the box square to the shaft so that uniform pressure is exerted around the packing; a tipped gland is an invitation to trouble.**

14. In order, install 3 rings of packing (13), the lantern ring (29) (if furnished) and 2 rings of packing in adapter cavity. When lantern ring is not furnished, install 6 rings of packing. Stagger the joint of each packing ring approximately 180° from adjacent rings. Be sure each ring is square with the shaft. Use a split bushing and the gland (17) to move rings to the bottom of the cavity. When all packing rings are in place, position the gland (17) and loosely seat on packing, using gland bolts (17B). Tighten as required to limit leakage after pump is running.
15. Install impeller key (32) in shaft keyway. Make sure that key enters slot in shaft sleeve. Align impeller (2) with key and install on shaft. Tap impeller hub lightly with plastic hammer to seat against shaft sleeve. For the mechanical seal pump, guide spring to seat on the shoulder as impeller is installed. Be sure spring is correctly seated against bellows assembly.
16. Install impeller washer (24A) and impeller lock screw (26). Restrain impeller with rod inserted in one passage and securely tighten screw. Rotate shaft by hand to check for free movement.
17. Lightly coat both sides of casing gasket (73A) with a non-hardening sealing compound, such as grease and graphite. Position on adapter making sure that holes are aligned. Install casing (1), tapping lightly with plastic hammer to seat on adapter. Install screws and tighten uniformly in a star pattern. The cap screws are SAE Grade 5 and are to be tightened to the following minimum torque values for dry threads.

Size	Torque
3/8	30 ft - lbs
7/16	50 ft - lbs
1/2	75 ft - lbs
5/8	155 ft - lbs
3/4	265 ft - lbs

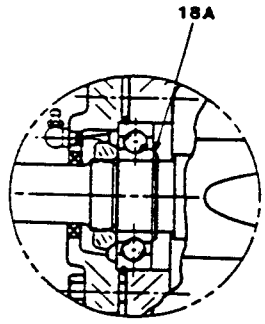
18. Install seal piping (tubing) (if used) between pump discharge and stuffing box of adapter.



Series F Pump F4 Frame

6	Shaft
16	Bearing, Inboard
18	Bearing, Outboard
18A	Bearing Retaining Ring
19	Frame
22	Bearing Lock Nut
37	Bearing Cover, Outboard
46	Coupling Key
49	Bearing Cover Seal, Outboard
51	Grease Retainer, Inboard
51A	Grease Retainer Bushing

See Fig. 1 for typical construction of F1 and F2 frames.



F3 Frame

FIGURE 3. TYPE F3 AND F4 END SUCTION FRAMES

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