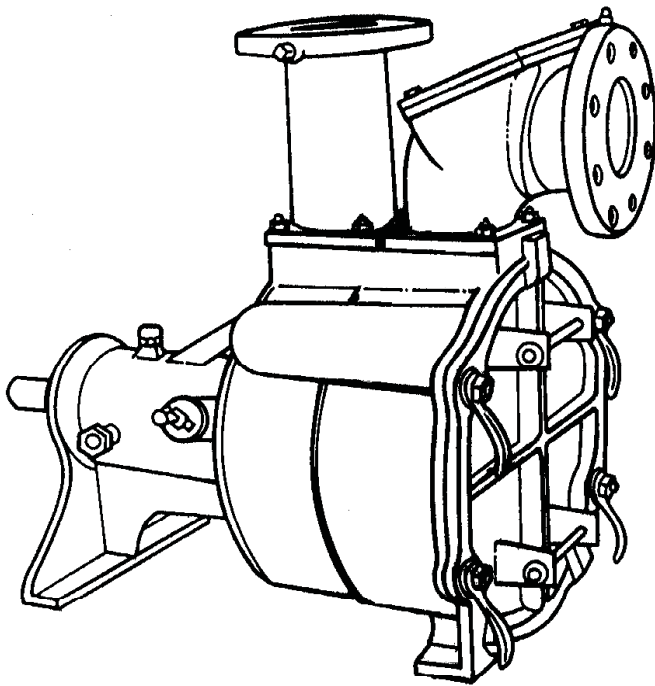


INSTALLATION and OPERATION MANUAL Self-Priming Centrifugal Pumps

Series: POLA
POLB
POLC
2" thru 6"



IMPORTANT!

*Read all instructions in this manual before operating pump.
As a result of Crane Pumps & Systems, Inc., constant product improvement program,
product changes may occur. As such Crane Pumps & Systems reserves the right to
change product without prior written notification.*

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SAFETY FIRST!

Please Read This Before Installing Or Operating Pump.
This information is provided for **SAFETY and to PREVENT EQUIPMENT PROBLEMS**. To help recognize this information, observe the following symbols:



IMPORTANT! Warns about hazards that can result in personal injury or Indicates factors concerned with assembly, installation, operation, or maintenance which could result in damage to the machine or equipment if ignored.

CAUTION ! Warns about hazards that can or will cause minor personal injury or property damage if ignored. Used with symbols below.

WARNING ! Warns about hazards that can or will cause serious personal injury, death, or major property damage if ignored. Used with symbols below.



Hazardous fluids can cause fire or explosions, burnes or death could result.



Extremely hot - Severe burnes can occur on contact.



Biohazard can cause serious personal injury.



Hazardous fluids can Hazardous pressure, eruptions or explosions could cause personal injury or property damage.



Rotating machinery Amputation or severe laceration can result.



Hazardous voltage can shock, burn or cause death.



Toxic Fumes - Breathing can cause nausea, fainting or death



Eye protectiong required

Only qualified personnel should install, operate and repair pump. Any wiring of pumps should be performed by a qualified electrician.



WARNING ! - To reduce risk of electrical shock, pumps and control panels must be properly grounded in accordance with the National Electric Code (NEC) or the Canadian Electrical Code (CEC) and all applicable state, province, local codes and ordinances. Improper grounding voids warranty.



WARNING! - To reduce risk of electrical shock, always disconnect the pump from the power source before handling or servicing. Lock out power and tag.



WARNING! Operation against a closed discharge valve will cause premature bearing and seal failure on any pump, and on end suction and self priming pump the heat build may cause the generation of steam with resulting dangerous pressures. It is recommended that a high case temperature switch or pressure relief valve be installed on the pump body.



CAUTION! Pumps build up heat and pressure during operation-allow time for pumps to cool before handling or servicing.



WARNING! - **DO NOT** pump hazardous materials (flammable, caustic, etc.) unless the pump is specifically designed and designated to handle them.



CAUTION! - Do not block or restrict discharge hose, as discharge hose may whip under pressure.



WARNING! - **DO NOT** wear loose clothing that may become entangled in the impeller or other moving parts. Always wear appropriate safety gear, such as safety glasses, when working on the pump or piping.



WARNING! - Keep clear of suction and discharge openings. **DO NOT** insert fingers in pump with power connected.



Always wear eye protection when working on pumps.



Make sure lifting handles are securely fastened each time before lifting. **DO NOT** operate pump without safety devices in place. Always replace safety devices that have been removed during service or repair. Secure the pump in its operating position so it can not tip over, fall or slide.



DO NOT exceed manufacturers recommendation for maximum performance, as this could cause the motor to overheat.



WARNING! If Engine driven, never operate in an enclosed building or area where exhaust gases can accumulate. Never operate near a building where exhaust gases can seep inside. Never operate in a pit or sump without making provisions for adequate ventilation.



WARNING! Do not breathe exhaust fumes when working in the area of the engine. (Exhaust gases are odorless and deadly poison.)



WARNING! Allow exhaust system to cool before touching.



Never add fuel to the tank while the engine is running. Stop engine and allow to cool. Do not smoke while refueling the engine Do not refuel near open flame



Carefully read instruction manuals supplied by engine manufacture before attempting to assemble, operate or service the engine or any part. The "WARNING" statements indicate potentially hazardous conditions for operator or equipment.



WARNING! Products Returned Must Be Cleaned, Sanitized, Or Decontaminated As Necessary Prior To Shipment, To Insure That Employees Will Not Be Exposed To Health Hazards In Handling Said Material. All Applicable Laws And Regulations Shall Apply.



Bronze/brass and bronze/brass fitted pumps may contain lead levels higher than considered safe for potable water systems. Lead is known to cause cancer and birth defects or other reproductive harm. Various government agencies have determined that leaded copper alloys should not be used in potable water applications. For non-leaded copper alloy materials of construction, please contact factory.



IMPORTANT! - Crane Pumps & Systems, Inc. is not responsible for losses, injury, or death resulting from a failure to observe these safety precautions, misuse or abuse of pumps or equipment.

SECTION A: GENERAL INFORMATION

A-1) To the Purchaser:

Congratulations! You are the owner of one of the finest pumps on the market today. CROWN® Pumps are products engineered and manufactured of high quality components. Over one hundred years of pump building experience along with a continuing quality assurance program combine to produce a pump which will stand up to the toughest pumping projects.

This manual will provide helpful information concerning installation, maintenance, and proper service guidelines.

A-2) Receiving:

Upon receiving the pump, it should be inspected for damage or shortages. If damage has occurred, file a claim immediately with the company that delivered the pump. If the manual is removed from the crating, do not lose or misplace.

A-3) Storage:

Short Term - Crown pumps are manufactured for efficient performance following long inoperative periods in storage. For best results, pumps can be retained in storage, as factory assembled, in a dry atmosphere with constant temperatures for up to six (6) months.

Long Term - Any length of time exceeding six (6) months, but not more than twenty four (24) months. The units should be stored in a temperature controlled area, a roofed over walled enclosure that provides protection from the elements (rain, snow, wind blown dust, etc.), and whose temperature can be maintained between +40 deg. F and +120 deg. F.

If extended high humidity is expected to be a problem, all exposed parts should be inspected before storage and all surfaces that have the paint scratched, damaged, or worn should be recoated with a water base, air dry enamel paint. All surfaces should then be sprayed with a rust-inhibiting oil.

A-4) Service Centers:

For the location of the nearest Service Center, check your Crown pumps representative or Crane Pumps & Systems in Piqua, Ohio, telephone (937) 778-8947 or Crane Pumps & Systems Canada Inc., Brampton, Ontario (905) 457-6223.

SECTION B: INSTALLATION RECOMMENDATIONS

(See Figure 1 For Typical Installation)

B-1) Clearances:

Allow a minimum of 18 inches in front of the pump case cover or hatch cover to permit easy removal and access to the interior of pump. On belt-drive units, allow a minimum of 10 inches at the shaft end to permit easy removal of the pedestal or rotating cartridge.

B-2) Pump Suction:

1. Locate the pump as close to the wet well as possible. The closer the pump can be located to the high water level, the faster the pump will prime and the greater the capacity that can be obtained.
2. All horizontal suction lines (item 3) should slope up to the pump to avoid trapped air pockets.

3. When horizontal suction line (item 3) exceeds 10 feet, or less than 1 foot or when total horizontal and vertical length exceeds 30 feet, consult factory for operation limits.
4. An adjustable stand, pipe clamp (item 16) or floor flange must be installed to support the weight of the suction line.
5. Suction line must be air tight.
6. Maximum performance is obtained when suction line and pump size are matched (with a 3 inch pump use a 3 inch suction line).
7. The velocities of 8 to 11 feet per second are obtained when the suction line is sized to the pump suction. This tends to keep solids in suspension and the suction line cleaner.
8. The use of oversized suction line will increase priming time and could cause clogging at the reducers.
9. Do not use a suction strainer on the suction line. Solids handling pumps are designed to handle the solids normally found in a wet well. Should an extreme case exist (such as a large amount of undissolved paper material), the possible use of a trash basket to screen the influent should be considered.
10. A suction end-bell (item 6) is required only when a minimum submergence and velocity demand. Allow at least 6 inches clearance between bottom of wet well and the bottom of the suction end-bell and 12 inches between the bottom of the suction end-bell and the low level pump cutoff to prevent vortexing on all 3, 4 and 6 inch pumps.
11. A long radius elbow (item 4) is preferred especially if it is needed to help reduce friction.
12. The vertical portion (item 5) of the suction line should be in one piece to eliminate joint leaks.
13. The easy-access elbow (item 2) can be turned 90° right or left to facilitate installation and accessibility to the pump case cover.

B-3) Base Mounted Units:

All flexible coupled and V-Belt drive pump units should be permanently grouted onto concrete foundation. The pumps should be level to provide favorable operating conditions. Check and realign the flexible coupling in order to eliminate excessive wear on the coupling. The standard couplings that are furnished can be adequately aligned with a straight edge. On other types it will be necessary to read their instructions. In no case should there be any problems with flexible couplings if alignment is proper.

All pump units rotate clockwise when looking from the motor end (driven end) of the pump. Also, rotation arrows are located on the pump.

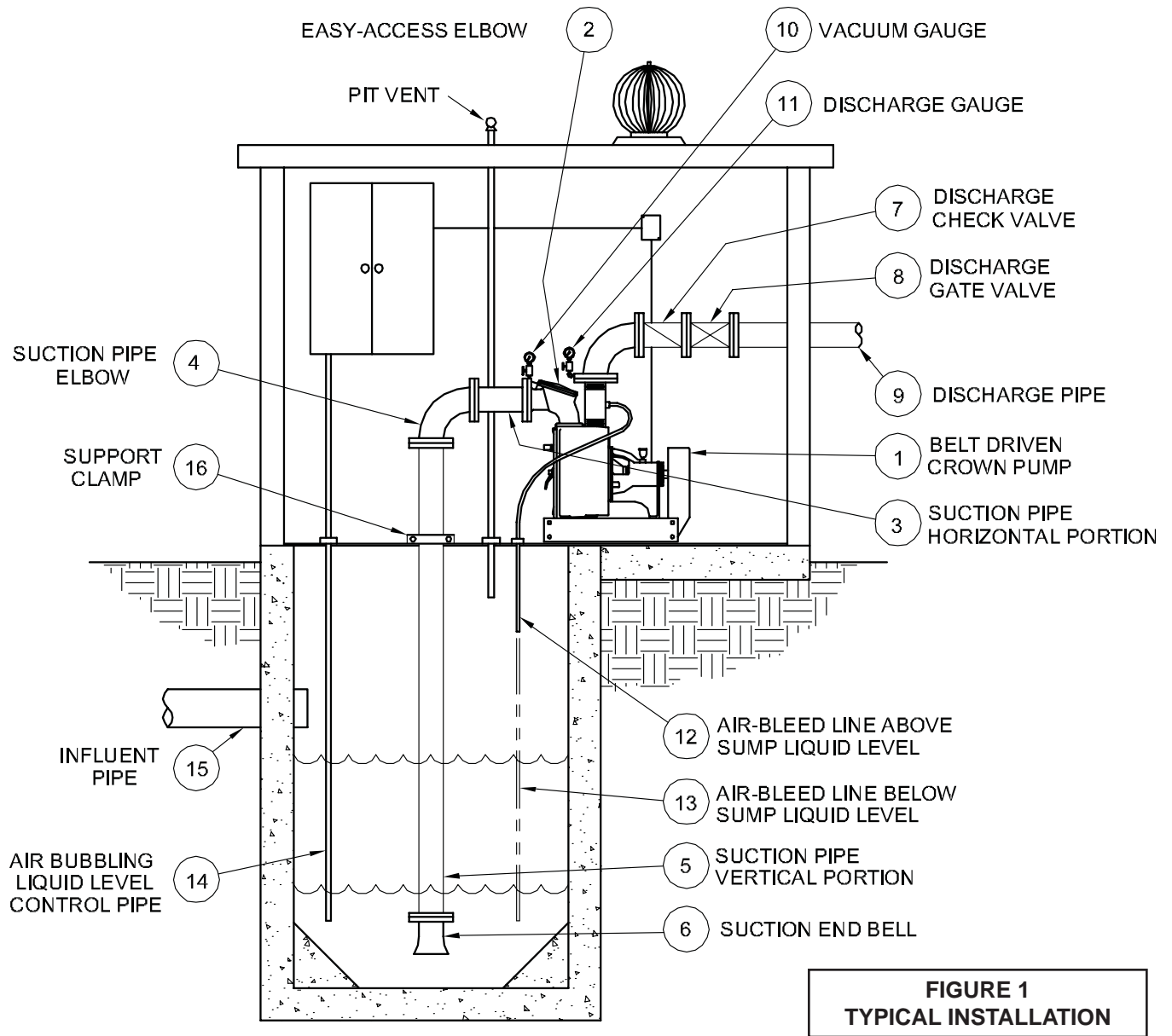


FIGURE 1
TYPICAL INSTALLATION

B-4) Pump Discharge:

1. The air bleed line (item 12 & 13) should be 3/4 inch on 3 inch pumps, one inch on 4 and 6 inch pumps in order to reduce the priming time to a minimum. This is mandatory on force main installations.
2. To eliminate recirculation, a flow control device on the bleed line may be considered.
3. An optional air-bleed valve may be placed in this line, but it is not necessary, See Figure 2. A clear plastic line is excellent, allowing the operator to detect any clogging.
4. There are two ways (item 12) & (item 13) of returning this line to the pit: (a) The line discharging above the liquid level (item 12). (b) The line discharging below the low liquid level (item 13). The (a) condition is generally accepted, but has the disadvantage of losing its prime if the suction check valve is held open by debris. This is generally no problem at higher speeds (1600 rpm or higher).

The (b) condition works well for slower speeds where considerable debris is encountered. However, the pipe should not project more than one foot below the low liquid level. If there are no leaks in the system, the pump never loses prime.

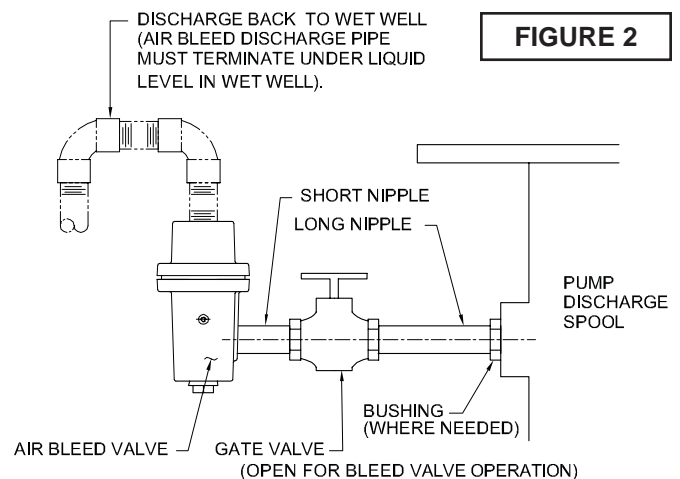


FIGURE 2

5. The return of the air bleed line to the pit must be separated from the suction pipe as far as possible in order to eliminate churning air into the sump liquid.
6. The discharge check valve (item 7), required by standard of design, should be installed in the horizontal position to avoid deposits between the disc and the body. This check valve should have a spring loaded or externally weighted arm.
7. Standards of design require a gate valve (item 8) downstream from the check valve and is necessary when cleaning or repairing the check valve.
8. Support the discharge line to prevent strain on the pump case.

B-5) Influent Pipe:

If the influent pipe (item 15) is located where falling water churns air into the sump liquid causing air to enter the suction pipe, a baffle may be necessary to keep pumping and priming from being affected.

B-6) Sump Liquid Level Controls:

Because priming will be severely affected, air bubbling liquid level control pipes (item 14) must not be located near or attached to the suction inlet pipe (item 5).

SECTION C: PARTS & FUNCTIONAL INFORMATION

See Figure 3 For Typical Pump Cut-away, Actual cross sections at back of manual.

(item 20) Easy access clean out & fill hole. The cover serves as a fill hole for initial priming of the pump, for easy examination or replacement of check valve, and as a quick clean out hatch for unlogging the impeller.

(item 21) Easily replaceable check valve.

(item 22) The gaskets at the suction and discharge flanges are of a high quality and not likely to leak, but the suction gasket should not be overlooked if trouble exists.

(item 23) If this o-ring leaks (even only a few drops), a priming problem will exist. Make sure the chamfer which the o-ring seats against is clean and smooth with no nicks in the o-ring. Always grease the o-ring and the area where it seats when installing.

(item 24) The large hatch cover can be easily removed for inspection or replacement of internal parts on 2" through 6" pump models only.

(item 25) This o-ring is not as critical as (item 23). However, it must never leak around the top half of the case or suction problems can exist. Always grease this o-ring and the complete area this o-ring slides in before inserting case cover (item 24).

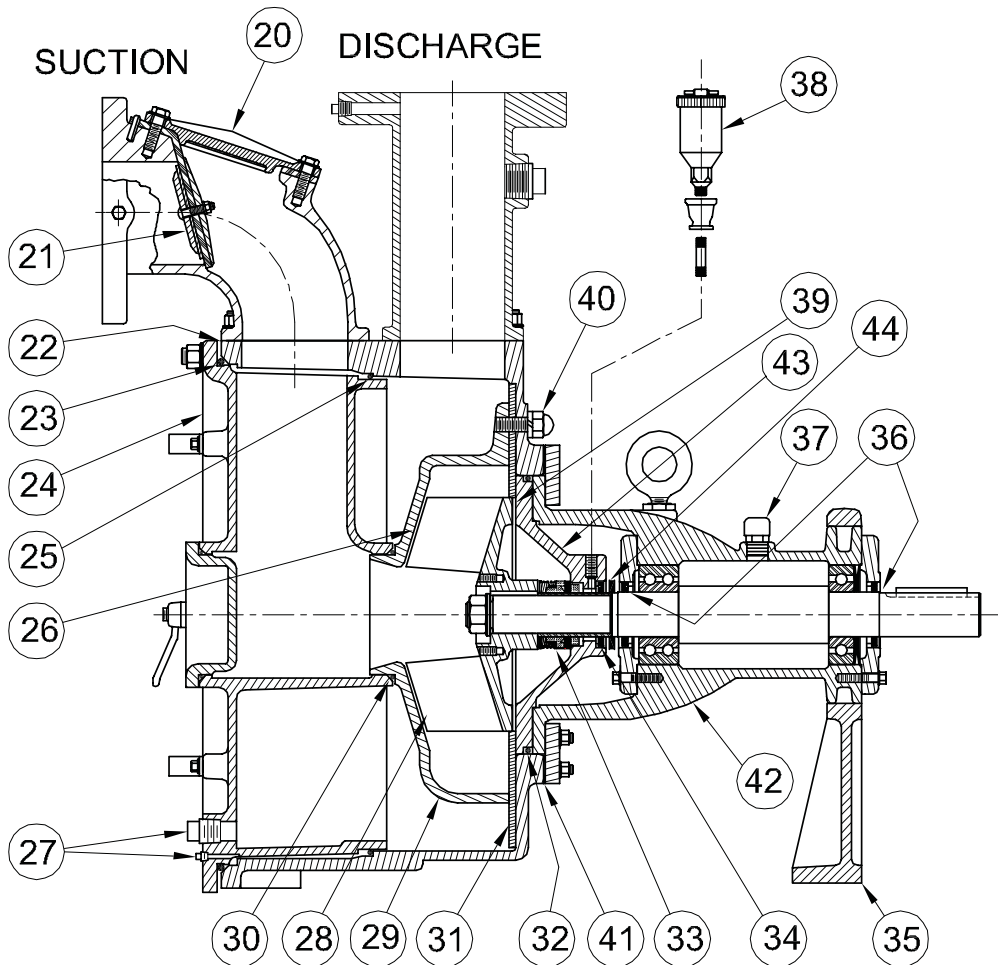


FIGURE 3

(item 26) The clearance between the impeller and the volute is set at approximately .015 inches at the factory. As wear clearance increases, the pump head pressure is reduced and priming ability is severely affected. Readjust by removing shims (item 41).

(item 27) Both drain plugs must be removed to properly drain the pump. When draining for winter storage or for severe cold weather, remove the complete hatch cover (item 24).

(item 28) Impeller.

(item 29) Volute.

(item 30) This o-ring is not critical in regard to leaks. It normally is covered with water.

(item 31) Seal plate.

(item 32) It becomes critical if this o-ring should leak on high suction lifts. The situation becomes more critical if the clearance at (item 39) becomes great due to severe impeller - seal plate wear. A clearance of 1/8 inch at (item 39) is approaching critical.

(item 33) This is the mechanical seal.

(item 34) This lip type seal retains the grease provided by the spring loaded grease cup (item 38) and normally should be replaced when the mechanical seal is replaced.

(item 35) The pedestal assembly complete with impeller attached can be removed through the pump case opening on the following models: PO2LA-6C, PO3LA-7B, PO3LB-7B, PO4LA-8D, PO4LB-8D, PO4LC all sizes, PO3LC-8L, PO6LB & PO6LC all sizes. Those models requiring the impeller to be removed by first removing the hatch cover (item 24) and volute (item 29) are as follows: PO3LA-8D and PO4LA-9D. All impellers are keyed on, and two threaded holes are provided so a common puller can be used.

(item 36) Lip-type seals are used at these locations to retain the oil and exclude dirt from the pedestal bearings. A damaged lip seal, a plugged breather, or too high an oil level can cause oil to leak from the seals.

(item 37) This is a breather cap that allows expansion and contraction of the air in the pedestal.

(item 38) This spring loaded grease cup is described in Section F-1. Never remove the grease cup and insert a zerk fitting for lubricating this seal or the seal will be permanently damaged.

(item 39) A new pump has a 1/32 inch clearance at this point, and when this wears to 1/8 inch or more, priming is affected considerably. This is especially true on high suction lifts.

(item 40) The volute is normally held in the case by three stainless steel studs and cap screws. The volute can be removed only after the hatch or case cover (item 24) has been removed.

(item 41) Horse shoe shims are used between the case and the pedestal permitting external adjustment of clearance between impeller and volute wear surface (item 26) without dismantling the pump. Loosen 6 nuts, remove or add shims in equal amounts at each location, and retighten the 6 nuts until the proper clearance is obtained. The thinnest shims are approximately .015 inches thick. O-ring (item 32) provides the necessary sealing at all times.

SECTION D: OPERATION RECOMMENDATIONS

1. Before starting the pump:
 - A.) Check the pedestal (item 42) for the proper amount of SAE No. 30 non-detergent oil.
 - B.) Place the self feeding grease lubricator (item 38) in operation by turning the wing nut on the threaded plunger shaft counter clockwise as far as it will go. Do not force the plunger into the grease cup as this can cause a seal failure. See Section F, Paragraph. 1 and 2 for instructions on filling the grease cup
 - C.) For priming purposes, fill the pump case with water.
2. The pump case will not freeze during cold weather operation as long as the pump is running. To avoid freezing during idle periods:
 - A.) Drain the pump case by removing the one or two drain plugs (item 27) at the bottom of the pump case.
 - B.) Heat the room, the pump or the water in the pump. An electrical pump case heater is available from the factory as an option.
3. To obtain more capacity, increase the speed of the pump. To reduce capacity, lower the speed of the pump or restrict the discharge line by means of a valve. Increasing the speed will require more horsepower.
4. The discharge (item 8) (See Figure 1) of a self-priming centrifugal pump may be closed without damaging the pump. However, it is undesirable to run the unit for a long period of time with a closed discharge as the liquid in the pump case may heat up and reach the boiling point after a short period of time.
5. The pump should not be run without liquid in the pump case as the rotary shaft seal may be damaged.
6. If the pump has been idle for some time between uses, it may appear to be stuck or locked in place. This sticking may be caused by a film of rust or dirt lodging between the impeller (item 28) and the pump volute (item 29). All that is necessary is to give the shaft a quick jerk.
7. Sometimes it is desirable to run a pump at a higher speed to improve priming without increasing capacity. This is done by increasing the speed of the pump, which increases the capacity and head, and then spring load or weight the discharge check valve (item 7) lever arm. This puts an imitation head on the pump. A powerful spring is needed if the speed is increased considerably. The spring or weight on the check valve will allow debris to pass through if necessary.

SECTION E: PREVENTATIVE MAINTENANCE

Once a year, or whenever the suction line will not hold a column of water, remove the Easy-access elbow cover (item 20) on the pump suction and inspect the check valve (item 21). The rubber check valve may become torn or may deteriorate with use. Deposits may also build up between the rubber and the seat. When replacing, use a little grease on the rubber for proper sealing.

There are times when it would seem proper to check the internal parts, the volute (item 29), seal plate (item 31), impeller (28), shaft and o-rings for wear and deterioration. However as long as the pump works well, do not disturb. If the shaft seal (item 33) ever needs replacement, these parts can be inspected.

If the impeller is ever removed for any reason when the mechanical seal (item 33) is in good condition, do not disturb the seal other than removing or replacing the seal spring, otherwise the seal will leak and require replacing.

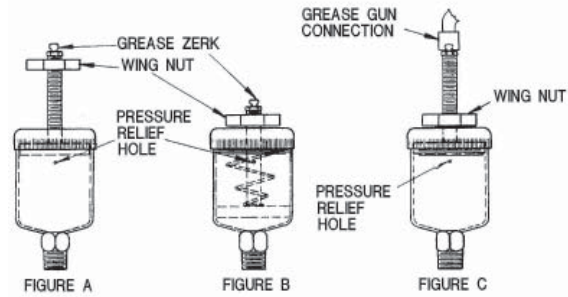
SECTION F: LUBRICATION MAINTENANCE:

F-1) Single Mechanical Seal - Grease Lube: See Figure 4.

A self-feeding lubricator (item 38) is provided to supply grease to the shaft seal of the pump on pumps with single seals. The grease cup is empty when the wing nut, positioned at the outer end of the threaded plunger shaft, recedes to the cap of the grease cup. To refill the grease cup, rotate the wing nut clockwise as far as it will go; attach a zerk gun to the zerk fitting; then fill until grease oozes from the relief hole on the side of the cup. For operation, return the wing nut to the end of the plunger. **Never force the plunger into the grease cup as this can cause seal failures.**

A #1 grease is normally recommended. However, where high ambient temperatures are encountered, such as direct sunlight, a #2 grease can be used. Use a water resistant, nonfibrous grease. Lithium base greases are excellent and

FIGURE 4



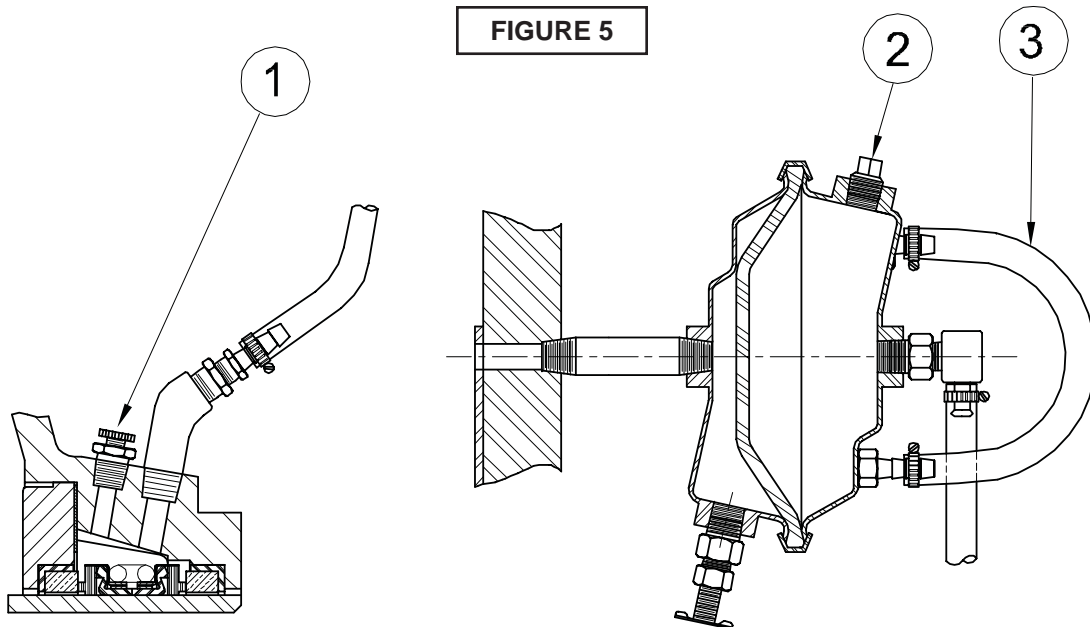
molydisulfide is acceptable. Normally, the sodium soap base greases are the only non-water resistant types that are not acceptable for mechanical seal lubrication. If the pump is inoperative for a long period of time, or appears not to use any grease, remove and clean the cup thoroughly. Caked grease in the cup can create a problem of non-lubrication to the seal. Under normal conditions, a grease cup full of grease will last three to four months. If a grease seal requires grease every day, and it is not leaking past the outer lip seal it indicates that the seal is wearing out. The internal pressure of the pump will often force the cup plunger out when the seal leaks badly.

F-2) Double Mechanical Seal - Oiler (See Figure 5)

1. Observe oil level in the oil reservoir. Do this only while pump is off and not under pressure (reading the oil level while pump is under pressure could give a false reading). The level can be read through the clear plastic tube (item 3). If air is visible through the tube then oil needs to be added.

2. To add oil to the reservoir, follow these instructions: First, be certain that the pump is not running and the case is not under pressure. Then remove the 3/8" pipe plug (item 2) from the oil fill port. Through the oil fill port add SAE 30 non-detergent oil until the chamber is full to the top. Replace the 3/8" pipe plug. If the plug does not seal tightly it may be necessary to add pipe thread sealant to the plug. The plug must not leak in order for the oiler to operate properly.

FIGURE 5



3. After adding oil it is a good idea to bleed off any air that is in the seal cavity. To do this first make sure that the pump is running. Second, use a flat head screwdriver to turn the air bleed valve head (item 1) counterclockwise. This will open the air bleed valve and at this point any air in the seal cavity will be purged (bubbled) out through this valve. When nothing but oil is coming out, then close the valve. This can only be done when the pump is running (i.e. when there is pressure in the oiler reservoir).

4. **DO NOT** loosen or open any other part of the pump or oiler reservoir while the pump is running or under pressure. Oil can spray out if under pressure.



IMPORTANT! - Always Wear Safety Glasses While Working On The Pump Or Oiler Reservoir. Use Caution When Working Around Pumps Or Other Rotating Machinery.

F-3) Bearing Lubrication - Oil:

Bullseye Glass (See Figure 6)- Observe pump shaft bearing oil level through ©bullseye^a glass plug (item 1) located on the right hand side of the bearing pedestal (when looking from the motor side). The oil level should be up to the center of the bullseye. It should be noted that in order for both bearings to be lubricated properly, the pump must be mounted level. If the oil level is low, remove vent plug (item 2) and add SAE 30 non-detergent oil. Replace vent plug (item 2) when finished refilling.

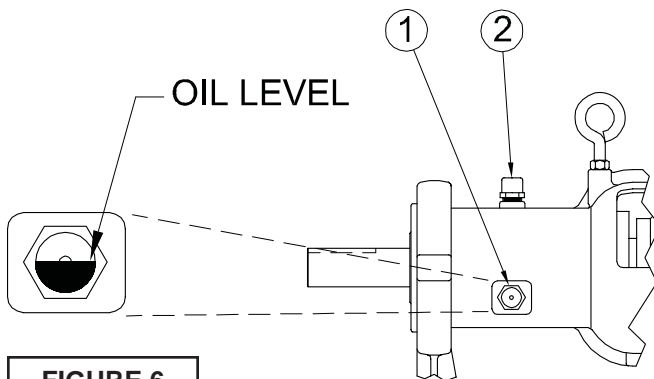


FIGURE 6

Opto-Matic Oiler (See Figures 7 & 8)-On pumps where the Opto-matic constant level oiler is used, the oiler will provide an oil level to the center of the lower ball of the bearings, if the pump is sitting level and the oiler is properly filled. Refill with SAE 30 non-detergent oil. Replace vent plug (item 2) when finished refilling.

Fill bottle as shown in Figure 8, then invert and quickly screw into lower reservoir. Several fillings of the bottle may be required before the oil level in the bearing reservoir is equal to the level for which the oiler is set. Never fill through the lower reservoir because there is danger of over filling and oil being thrown from the seals. If there is ever any question about the oil level, drain the reservoir and start over.

If for various reasons, conditions require a higher oil level, loosen the screws as shown in Figure 8, adjust to the desired level and tighten screws.

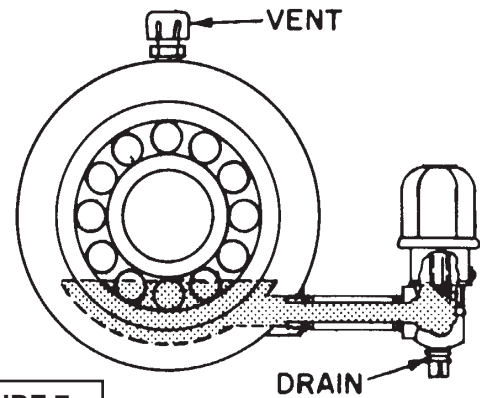


FIGURE 7

Note: A vent is furnished on the top of the bearing housing and this must be clean and open so the oiler can maintain its proper oil level.

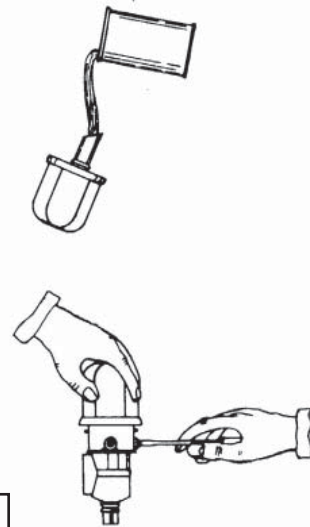


FIGURE 8

DO NOT clean the plastic bottle with solvents such as alcohol or lacquer thinners. They will attack and destroy the plastic.

SECTION G: SHAFT SEAL REPLACEMENT:

G-1) Replacement Through Hatch Cover:

G-1.1) Disassembly:

All parts of the pump are easily dismantled by simply removing nuts and screws. Rotating parts of the shaft seal grip the shaft by friction and may be frozen to the shaft through long usage. If the mechanical shaft seal is not leaking and it is necessary to dismantle part of the pump for inspection or cleaning, **DO NOT** disturb the shaft seal other than its spring if the impeller is removed. Once a shaft seal has been in operation it cannot be reused without leaking.

Remove hatch cover (24), by removing wing nuts and prying the cover off. Now remove capnuts (40) and pull the volute (29) and seal Plate (31) out of the pump case, (See Figure 3). Remove the impeller nut, it is a standard right hand thread, remove impeller washer, and then remove the impeller (28). The impeller has been provided with two drilled and tapped holes for a wheel puller, if necessary use a wheel puller to remove the impeller.

Remove the seal spring and spring holder. At this time the rotating portion and the seat can be removed without further disassembling of the pump. However, it is generally easier to remove the four (4) nuts that hold the pump side in place and by using two pry bars, force the pump side with the old seal off the shaft. The grease cup (38) must first be removed. By using this method the lip seal (34) can be replaced and the seal seat can be easily removed and cleaned. Use care in cleaning the shaft because nicks can allow the new seal to leak. At this time the shaft slinger used on single seal applications, should be examined and replaced if necessary. Inspect o-ring (32) carefully for cuts or nicks. Clean the groove in the pump side and the mating bore in the pump case carefully and grease at reassembly. See Section G-3 for Single seal installation or G-4 for Double seal installation.

G-1.2) Reassembly:

After the seals have been replaced and the impeller secured on the shaft (see Table 1), Place the seal plate (31) over the studs of the volute (29) and insert this assembly over the impeller with the volute studs projecting through the case. Replace the cap or self locking nuts and tighten them (only finger tight at this time). NOTE: On models PO6LB and PO6LC it is necessary to insert the seal plate over the impeller then insert the volute.

Replace o-ring (30) on the volute, and o-rings (23) and (25) on the hatch cover, grease these o-rings and the areas they contact thoroughly. Now insert the hatch cover (24) and securely tighten the wing nuts. Normally these wing nuts can be tightened sufficiently by hand. This method of securing the hatch cover first, centers the volute properly over the impeller. Tighten the cap nuts (40) that hold the volute in place.

The clearance between an open faced impeller and its wear surface in the volute is set at the factory to approximately .015 inches on PO2 to PO6 pumps. This clearance is readjustable on all pumps by adding or removing of horseshoe shims (33) located at the bearing adapter flange, or on small units by relocating the shaft at the clamping arrangement. Add or remove shims until the impeller rubs slightly, then add one thin shim (.015 thick) on 2" to 6" pumps at each location and tighten the nuts securely.

G-2) Replacement By Removing Pedestal:

On belt drive units the belt tension must be relieved and the guard and the belts removed. On flexible coupled units the motor base bolts must be removed and the motor detached from the coupling. Then remove the pedestal bolts attaching the pedestal to the base.

The only models that have impellers too large to be removed through the case pump side opening are PO3LA-8D and PO4LA-9D.

After removing the pedestal assembly, the impeller, the old seal, and pump side parts are removed. First remove the impeller nut, it is a standard right hand thread, then remove the impeller (28). The impeller has been provided with two drilled and tapped holes for a wheel puller, if necessary use a wheel puller to remove the impeller. Remove the the four (4) nuts that hold the pump side in place and by using two pry bars, force the pump side with the old seal off the shaft. The grease cup (38) must first be removed. The lip seal (34) can be replaced and the seal seat can be easily removed and cleaned. Use care in cleaning the shaft because nicks can al-

low the new seal to leak. At this time the shaft slinger used on single seal applications, should be examined and replaced if necessary. Inspect o-ring (32) carefully for cuts or nicks. Clean the groove in the pump side and the mating bore in the pump case carefully and grease at reassembly. See Section G-3 for Single seal installation or G-4 for Double seal installation.

Reassemble pedestal assembly into pump and set the clearance by adding or removing shims (33) until the impeller rubs slightly, then add one thin shim (.015 thick) on PO2 to PO6 pump at each location and tighten the nuts securely.

G-3) Single Seal Installation:

Carefully identify all the parts in Figures 9 and 10, and familiarize yourself with their part names.

The mating ring (7) and seat (1) have been precision lapped and must not be scratched or cracked during assembly. Also, cleanliness is of utmost importance.

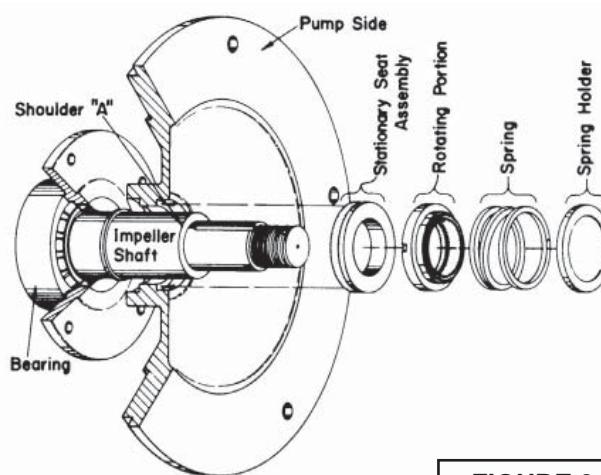


FIGURE 9

STEP 1:

Make sure that the shaft and seat areas in the pump side are as clean as possible. Shoulder "A" on the shaft must not be sharp, but neatly rounded and polished to a 1/32" radius. This radius and the shaft, on which the rubber bellows grips, must be polished with 180 to 240 grit emery cloth. The seal will install relatively easy if the shaft is properly polished.

STEP 2:

Install the seat assembly (1 and 2 or 1A and 2A, see Figure 10) (see section G-4), in the bottom of the pump side using P-80 rubber lubricant emulsion (from International Products Corp.) or SAE 10 non-detergent oil can be used, on the rubber parts. They may install easier by first inserting the rubber part and then sliding the seat part into the rubber. All of this must be done with the fingers only.

STEP 3:

We are now ready to install the rotating portion of the seal without the spring (see section G-4). Lubricate the shaft and the inside of the bellows (8) each with 2 or 3 drops of P-80 rubber lubricant emulsion (from International Products Corp.) or SAE 10 non-detergent oil can be used. Now with dry clean hands, grasp this rotating portion in one or both hands (one hand for small seals - two hands for large sizes) and use a circular and rocking motion to push this portion onto the shaft,

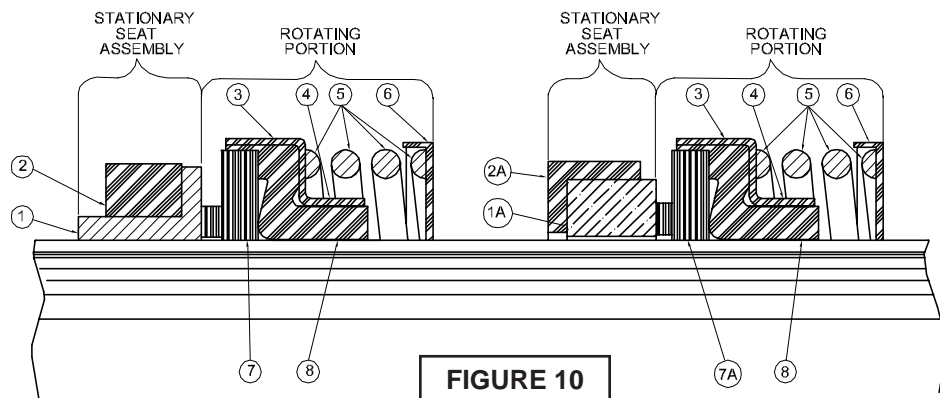


FIGURE 10

- 1 - Ni-Resist Stationary Seat
- 1A - Ceramic Stationary Seat
- 2 - Buna-N Seat Ring
- 2A - Buna-N Seat Cup
- 3 - Stainless Retainer
- 4 - Stainless Drive Band
- 5 - Stainless Spring
- 6 - Stainless Springholder
- 7 - Crane-Carb® Mating Ring
- 7A - Carbon Mating Ring
- 8 - Buna-N Bellows

**Cross Section of Seals.
Two Styles Shown.**

sliding it all the way down against the bottom stationary seat. If a seal installing tool or piece of tubing is used to push this portion on, it must push against the heel of the rubber bellows (8) and drive band (4). Once the seal is in place install the spring (5) and the spring holder (6) if one has been furnished with your particular seal.

The spring holder (6) is furnished specifically for installations where the impeller hub is not large enough and is needed to properly space the spring. If the spring does not go over the hub of the impeller the spring holder (6) can be left out.

STEP 4:

Replace the impeller, torque impeller nut per Table 1, and your seal installation is complete.

STEP 5:

Seals of this type are generally lubricated by a spring loaded automatic grease cup. For grease lubrication, use a good quality non-fibrous #1 or #2 lithium base grease. The #1 is best, except when high ambient temperatures are encountered.

TABLE 1 - Impeller Nut Torque Values		
PUMP MODEL	NUT P/N	TORQUE VALUE
PO2LA	M-7246	55 ft. lbs
PO3LA	M-7883	100 ft. lbs
PO3LB	M-7883	100 ft. lbs
PO3LC	M-7884	240 ft. lbs
PO4LA	M-7884	240 ft. lbs
PO4LB	M-7884	240 ft. lbs
PO4LC	M-7884	240 ft. lbs
PO6LB	525-00263	300 ft. lbs
PO6LC	525-00263	300 ft. lbs

G-4) Double Seal Installation:

Carefully identify all the parts in figures 10 and 11, and familiarize yourself with their name parts. You will note that inner and outer stationary seats are identical. The rotating portion is held together with four clips (12) and masking tape. **DO NOT REMOVE THIS TAPE AND CLIPS** until the proper time of assembly. Cleanliness is of utmost importance. The carbon mating rings (10), (3), and ceramic seats (1) have been precision lapped and must not be scratched nor cracked during assembly. See Figure 12.

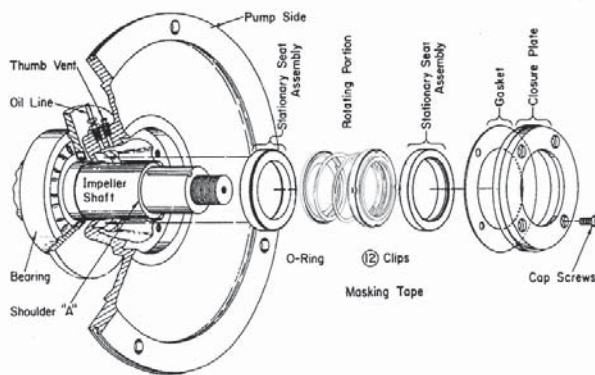


FIGURE 11

STEP 1:

Make sure that the shaft and seat areas in the pump side and closure plate are as clean as possible. Shoulder "A" on the shaft must not be sharp, but neatly rounded and polished to a 1/32" radius. If this radius and the first 1/4" past the shoulder is highly polished with crocus cloth, the rotating portion of the seal will install relatively easy. The rest of the shaft on which the rotating portion of the seal will grip, should be cleaned with 180-grit emery cloth.

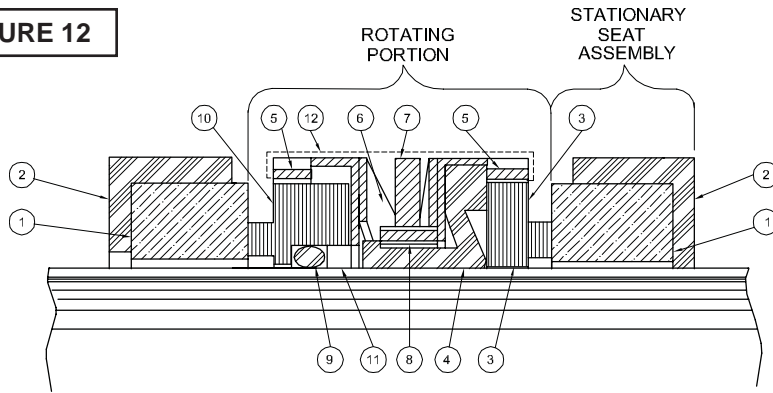
STEP 2:

Install the seat assembly (1 & 2), see Figure 12 and section G-4, in the bottom of the pump side and closure plate using P-80 rubber lubricant emulsion (from International Products Corp.) or SAE 10 non-detergent oil can be used on the rubber parts. They may install easier by first inserting the rubber cup (2) and then sliding the ceramic seat (1) into the rubber cup. This all must be done with the fingers only.

STEP 3:

We are now ready to install the rotating portion of the seal (see section G-4) with CLIPS AND TAPE STILL IN PLACE. Lubricate the shaft and internal rubber parts of the rotating portion of the seal with P-80 rubber lubricant emulsion (from International Products Corp.) or SAE 10 non-detergent oil can be used. Note where the o-ring (9) is in the seal. This o-ring must be the first rubber part to go onto the shaft. Grasp the complete rotating assembly in both hands and then by using a circular and rocking motion, push this portion onto the shaft, sliding it all the way down against the bottom stationary seat.

FIGURE 12



- 1 - Ceramic Stationary Seat
- 2 - Buna-N Cup
- 3 - Carbon Mating Ring
- 4 - Buna-N Bellows
- 5 - Stainless Retainer
- 6 - Two Springs
- 7 - Stainless Disc
- 8 - Stainless Drive Band
- 9 - Buna-N O-ring
- 10 - Carbon Mating Ring
- 11 - Teflon Back-Up Ring
- 12 - Holding Clips (4)

STEP 4:

Now with a tweezers or a small long nose pliers, remove the masking tape and the four clips (12). Immediately place the closure plate with its gasket in place onto the pump side and insert the capscrews. This completes the seal installation.

STEP 5:

Double seals of this type are generally lubricated through the use of a pressure balanced oil cylinder or a spring loaded automatic grease cup. In either case, the air must be bled from this seal cavity while it is being filled with oil or grease. Where oil is used, a thumb vent screw is furnished for venting and where grease is used, a 1/8" pipe plug is furnished. Be sure to vent all the air out of this cavity. It is best to use an SAE 30 non-detergent oil for the oil lubrication.

G-4) Seal Installation Tool:

G-4.1) Installing stationary element:

A seal installation tool must be used. The seal must be seated securely in the seat ring with the lapped face out. The unlapped face is marked and correctly assembled when shipped. Oil the seat ring with light oil and seat it firmly and squarely. If this cannot be done with the fingers, use a sleeve as shown in Figure 13, inserting the cardboard shipping disc between the sleeve and the lapped face to prevent scratching sealing face.

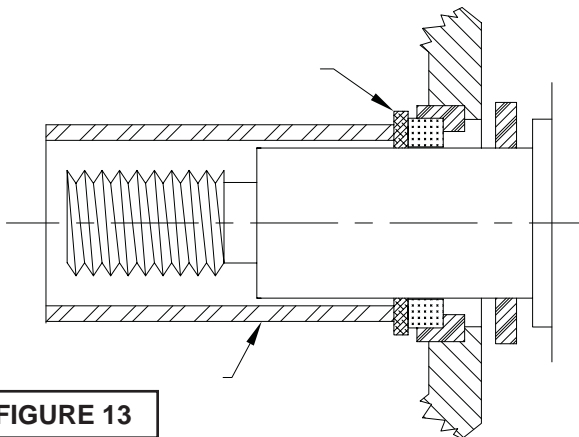


FIGURE 13

G-4.2) Installing rotating element:

Oil shaft with light oil. Shaft should be clean and polished smooth. Slide seal body on shaft (washer end first) and seat firmly. A sleeve as shown in Figure 14 will facilitate this operation and prevent the rubber driving ring from pulling out of place as the seal body is slid along the shaft.

Assembly of impeller automatically sets the seal in the proper position. **MAKE SURE AT ALL TIMES, AND PARTICULARLY BEFORE FINAL ASSEMBLY, THAT BOTH SEALING FACES ARE ABSOLUTELY CLEAN.**

NOTE: Do not use petroleum based products to lubricate EPT or EPDM elastomers - use only water based lubricants.

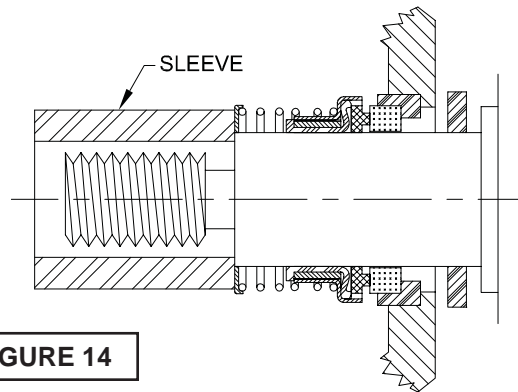


FIGURE 14

SECTION H: Belleville Washer Installation:

The bearing support bracket pedestals use belleville spring washers between the bearing and closure plate at the shaft extension end. These eliminate the shaft end play and must be installed correctly as shown in Figures 15 and 16.

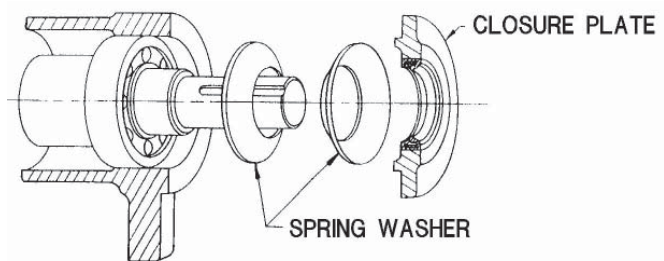


FIGURE 15

The normal installation consists of 2 washers as shown

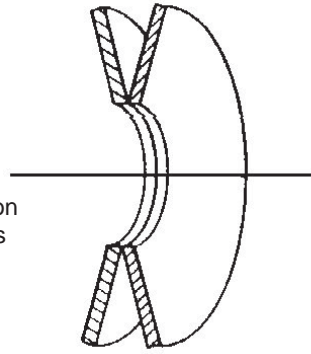
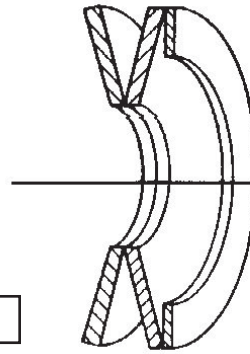


FIGURE 16

On some models more spring loading is required and an extra flat washer is added as shown



SECTION I: OPTIONAL EQUIPMENT:

I-1) Pump Case Heater:

The pump case heater is located on the bottom right hand side of the pump as viewed from the shaft end on 3" through 6" models and the thermostat will replace the bottom pipe plug on the front of the pump case. For 2" pumps, the heater will replace the bottom pipe plug on the front of the pump case and the thermostat is located in the fill hole cover. The heater is rated for 250 or 350 watt, 115 or 230 volts AC. The thermostat is rated for 10 Amp @ 115 volt or 5 Amp @ 230 Volt, On 37°F Off at 40 - 1/10°F. See Figure 17 for wiring connection.

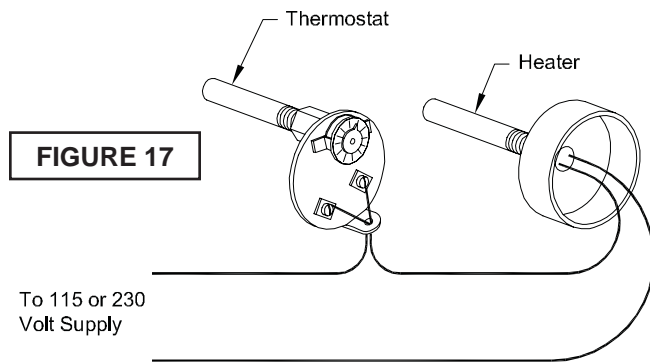


FIGURE 17

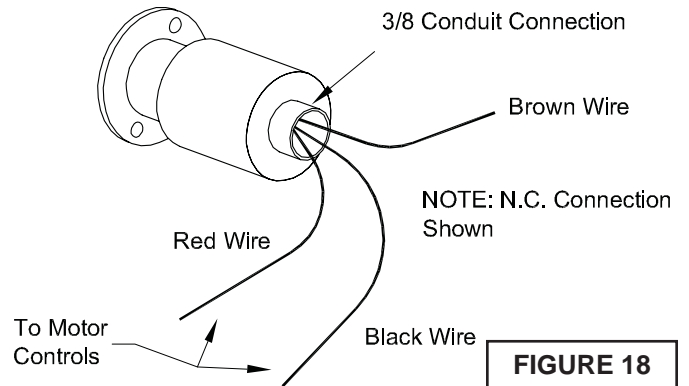


FIGURE 18

Wiring Instructions: - (See Figure 18)

1. For N.C. (Normally Open) Connection - Contact opens at 130°F, closes at 100°F.
Use RED wire and BLACK wire to motor controls.
2. For N.O. (Normally Closed) Connection - Contact closes at 130°F, opens at 100°F.
Use RED wire and BROWN wire to motor controls.



IMPORTANT ! - USE ONLY TWO WIRES, BLANK OFF WIRE NOT NEEDED.

I-2) Temperature Control:

The pump temperature control is attached to pump case so that the bimetal disc sensing element is firmly against the pump's surface, thereby sensing the pump's surface temperature.

SECTION J: TROUBLE SHOOTING:

Locating a failure in a malfunctioning pump can be most frustrating and even futile if not approached in a systematic manner. To aid in locating the problem we recommend the permanent installation of both of the following:

1. A vacuum gauge (10), See Figure 1, to provide information from the suction side of the pump. A drilled and tapped hole has been provided in the suction flange for such a gauge.
2. A low-pressure, pressure gauge (11), See Figure 1, to supply information from the discharge side of the pump. A drilled and tapped hole has been provided on the discharge flange for such a gauge.

Always use a small valve for attaching the gauges and keep them shut off when not in use. A vacuum gauge left to flutter with pulsations will develop a crack in the internal tube causing it to leak unknowingly and give priming problems. By using the vacuum and pressure gauges, one will be able to locate most of the problems that will occur.

Most of the problems encountered in self-priming pumps are due to air leaks on the suction side. Keeping this in mind, the following chart should help locate the trouble.

If every check fails to identify where the leak is located, it may be necessary to connect a pressure water supply to the drain hole of the pump and hydrostatically test it. Keeping the water pressure low, 5 to 10lbs. is ideal. Higher pressures may not show an o-ring leak. Also remove the cover from the grease cup to permit water to escape should the seal be leaking.

If the above shows no leaks, remove some bolts from the suction flange, insert a solid steel backing plate and tighten the flange. If, with the pump running, the vacuum gauge reads as much or more than during normal operation, then the problem is most likely in the suction pipe or sump area. Don't overlook the possibility of air entering the suction line, air that could be coming from the air bubbler control pipe.

TROUBLE SHOOTING		
CAUTION ! Always disconnect the pump from the electrical power source before handling. If the system fails to operate properly, carefully read instructions and perform maintenance recommendations.		
SYMPTOM	POSSIBLE CAUSE(S)	CHECK
A. Pump not primed - Vacuum gauge reading less than normal	1. Air leak in suction side of system.	a. Threaded joints in suction line for tight fit b. Gasket in suction line for tight fit c. O-rings in case cover for nicks or cuts d. Mechanical seal for air leaks e. Bottom drain plug for air leaks f. O-rings in pump side for nicks or cuts g. Vacuum gauge may be leaking internally
	2. Air bleed line blocked, or Air bleed valve closed.	a. Check line or valve
	3. Insufficient liquid in case	a. Pump case for water level b. Suction check valve for obstructions or deterioration
	4. Operating speed too low	a. Belts for proper tension b. Motor for low voltage
	5. Plugged pump	a. Impeller for lodge foreign material b. Vent line for stoppage
	6. Mechanical defects	a. Impeller - volute for proper clearance b. Impeller and volute for damage c. Pump for worn parts
B. Pump not priming - Vacuum gauge reads more than normal	1. Suction side of system clogged	a. End of suction line for obstructions b. Suction pipe for obstructions c. Suction check valve for obstructions
C. Pump primes - Vacuum gauge reads normal, discharge gauge reads lower than normal	1. Small air leak in suction side of system	a. For excessive air in discharge line b. Refer to A-1, a through g
	2. Pump speed too slow	a. Belts for proper tension b. Motor for low voltage
	3. Mechanical defects	a. Impeller - volute for proper clearance b. Impeller and volute for damage c. Pump for worn parts
D. Pump primes - Vacuum gauge reads near normal, Discharge gauge reads higher than normal	1. Plugged discharge	a. Discharge line for obstructions b. Discharge valves to insure proper operation
E. Pump loses prime when shut off - Vacuum gauge recedes to zero	1. Check valve leaking	a. Check valve for obstructions or deterioration b. Leak in suction pipe threads or flanges c. Water level bubbler control line too close to suction pipe d. The influent liquid for churning air into the sump and entering the suction pipe

TROUBLE SHOOTING

CAUTION ! Always disconnect the pump from the electrical power source before handling.
If the system fails to operate properly, carefully read instructions and perform maintenance recommendations.


SYMPTOM	POSSIBLE CAUSE(S)	CHECK
F. Pump loose prime during operation - vacuum gauge recedes to zero	1. Drawdown too great	a. Automatic cut-off control for failure
	2. Pump taking air	a. Suction line for leak between cut-out and cut-off b. End of suction line for vortexing to suction pipe c. Water level bubbler control line too close to suction pipe d. The influent liquid for churning air into the sump and entering the suction pipe
G. Pump primed and pumping, but too noisy	1. Loose foundation	a. Foundation bolts for looseness b. Grouting c. For cracks
	2. Air leaks	a. Refer to A-1, a through g
	3. Cavitation	a. Drawdown too great b. Capacity too great c. Unit not operating in proper NPSH range d. If reducing capacity quiets pump, then (c) above is cause, close discharge valve partially
	4. Bearings	a. Balls for wear b. Oil reservoir for lubrication
	5. Misalignment	a. Coupling for proper alignment b. Check base, not properly bolted down
	6. Vibration	a. Impeller for partial obstruction b. Operating in cavitation range c. Misalignment of coupling
H. Motor running too hot	1. Low voltage	a. Voltage at motor terminals when loaded
	2. Overload	a. Amps at motor terminals when loaded b. Trash lodged in pump impeller c. Motor not large enough
I. Motor will not run	1. Overload relay kicked out	a. For one or more blown fuses b. Fuses for proper size c. For low voltage
	2. Three phase motor hums but will not rotate	a. For one of 3 blown fuses
	3. Automatic sump control failure	a. Float rod for corrosion b. Air bubbling pump not working c. Air line for stoppage

SECTION K: REPLACEMENT PARTS

K-1 ORDERING REPLACEMENT PARTS:

When ordering replacement parts, ALWAYS furnish the following information:


1. Pump serial number and date code.
2. Pump model number.
3. Pump part number.
4. Part description.
5. Item part number.
6. Quantity required.
7. Shipping instructions.
8. Billing Instructions.



CRANE

PUMPS & SYSTEMS

Piqua, Ohio



CROWN

SERIAL NO. 1

MODEL NO. 2

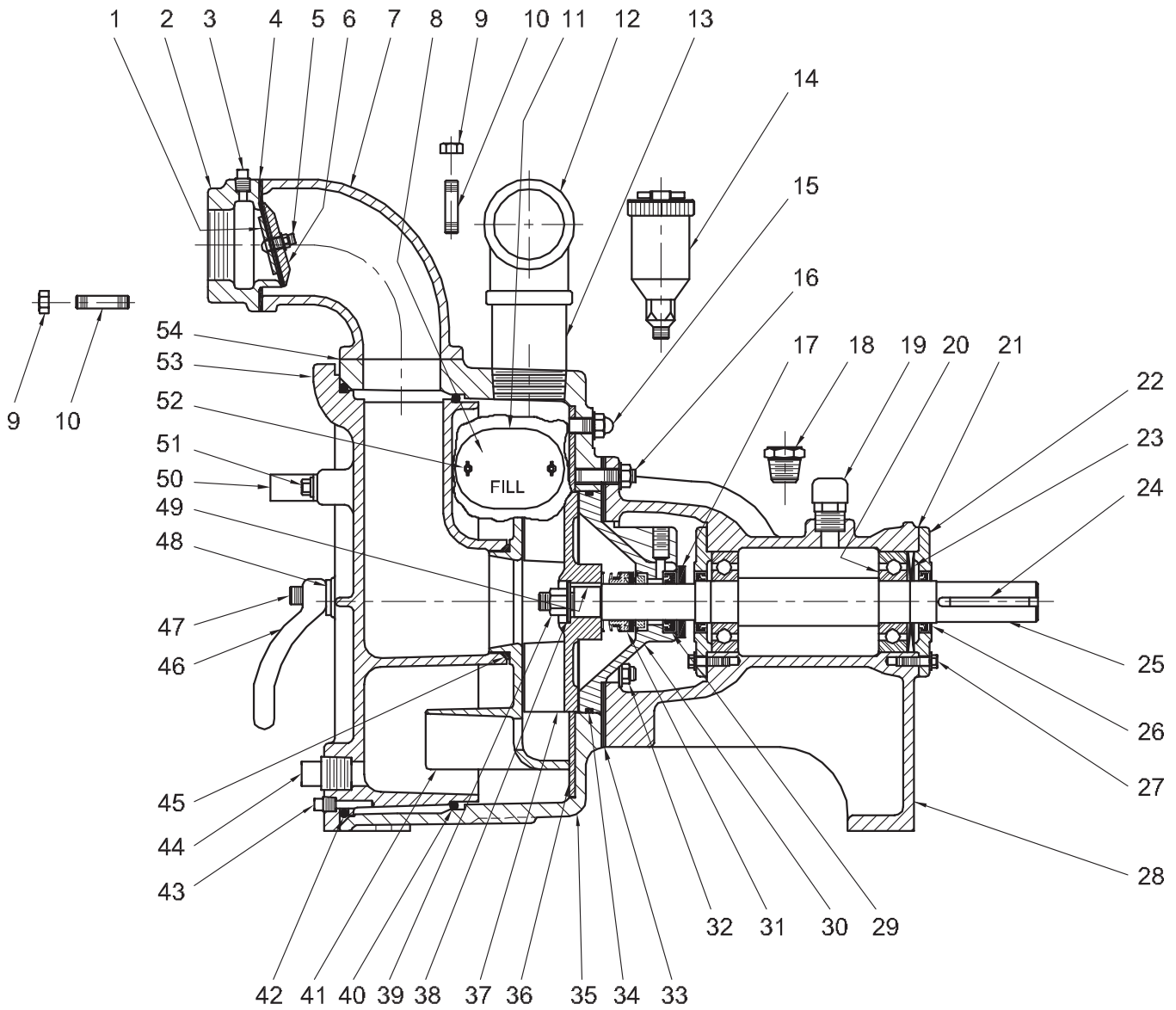
PART NO. 3

IMPELLER DIA.

M-9517

IMPORTANT ! When Ordering Parts, ALWAYS Provide The Complete Part Number, Serial Number and Model Number. Information Subject To Change Without Notice.

PUMP MODEL: PO2LA, 2C00D-0006C-001



PUMP MODEL: PO2LA, 2C00D-0006C-001

PARTS KIT

Seal Kit.....P/N: 089076 (+) 4, 11, 14, 29, 31, 34, 40, 42, 45, 54

Overhaul Kit, PO2LA.....P/N: 089087 (◆) 4, 11, 14, 17, 18, 19, 20, 21, 26, 29, 31, 33, 34, 40, 42, 45, 54

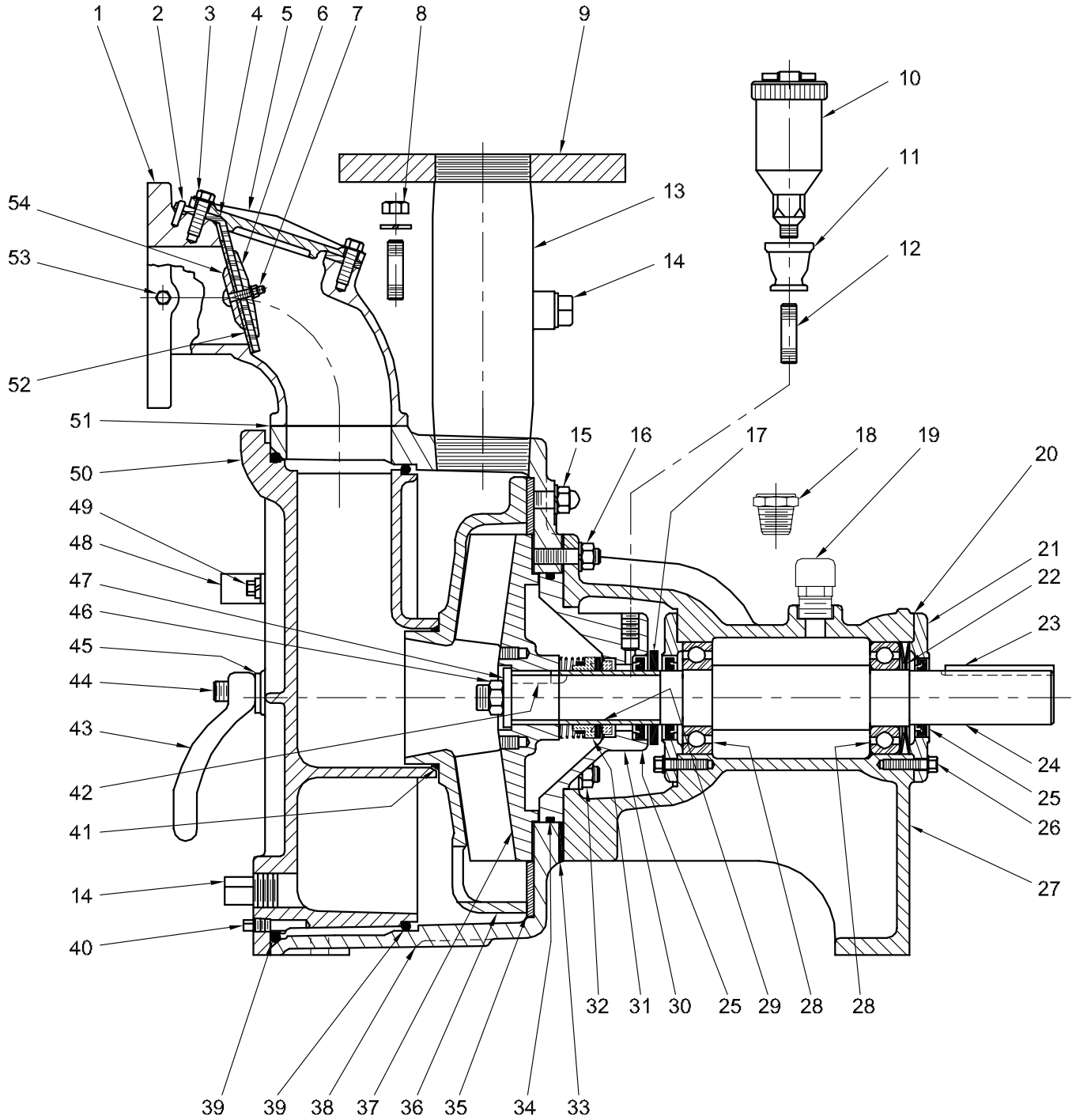
PARTS LIST

ITEM	QTY.	PART NO	DESCRIPTION	
1	1	T-26624	Plate, Valve, Check	
2	1	FP-3685-A	Flange, Suction	2" NPT
3	1	4757	Plug, Pipe, Hex	1/4" NPT, Brass
4	1	T-15907	Valve, Check	Neoprene
5	1	1-7-1	Screw, Hex Hd.	1/4-20 x 1.00 LG, Stainless
	1	20-13-1	Washer, Lock, Split	1/4"
	1	15-5-16	Nut, Hex	1/4-20, Stainless
	1	P-3688	Valve, Check	Neoprene
7	1	FP-4309	Elbow, Valve, Check	
8	1	FP-4310	Cover, Fill	
9	8	15-23-6	Nut, Hex	3/8-16, Zinc Pltd.
10	8	M-2635	Stud	3/8-16 X 1.50 Lg, Steel
11	1	T-26640	Gasket, Cover, Fill	Buna-N
12	1	625-02802	Elbow,	2" NPT
13	1	625-02810	Nipple, Pipe	2" NPT x 3.50" Lg
14	1	M-3415	Cup, Grease	
15	3	M-5479	Stud	3/8-16 x 1.75" Lg, Stainless
	3	20-6-7	Washer, Flat	3/8", Brass
	3	M-6046	Nut, Cap, Hex	3/8-16, Steel/nylock
16	6	M-2635	Stud	3/8-16 X 1.50" Lg., Steel
	6	20-14-6	Washer, Lock, Split	3/8", Zinc Pltd.
	6	15-23-6	Nut, Hex	3/8-16, Zinc Pltd.
17	1	M-6370	Spinner, Shaft	Neoprene
18	1	089257	Glass, Sight	
19	1	089258	Plug, Vent	
20	2	625-00719	Bearing, Ball	
21	2	T-27115	Gasket, Plate, Closure	Vellumoid
22	2	FP-4342	Plate, Closure	
23	2	M-6611	Spring, Disc	
24	1	M-3169	Key	1/4" Sq X 1.50" Lg, Steel
25	1	T-27117	Shaft, Impeller	
26	2	M-4799	Seal, Shaft	
27	8	1-5-6	Screw, Hex Hd	1/4-20 X .75" Lg, Zinc Pltd.
	8	20-13-6	Washer, Lock, Split	1/4", Zinc Pltd.
28	1	FP-4341	Bracket, Support, Bearing	
29	1	M-5625	Seal, Lip	
30	1	FP-4343	Side, Pump	
31	1	M-4292-F	Seal, Mechanical, 1.00"	
32	4	M-2635	Stud	3/8-16 X 1.50" Lg, Steel
	4	20-14-6	Washer, Lock, Split	3/8" Zinc Pltd.
	4	15-23-6	Nut, Hex	3/8-16, Zinc Pltd.
33	6	T-27116	Shim, Plastic, .015"	
	6	T-27116-A	Shim, Plastic, .030"	
34	1	M-6522	O-ring, Buna-N	
35	1	FP-4305	Case, Pump	
36	1	T-27337	Plate, Seal	
37	1	FP-4348-B	Impeller	
38	1	TS-27114	Washer, Impeller,	Stainless
39	1	M-7246	Nut, Lock	1/2-20, Stainless/Nylock
40	1	M-6457	O-ring	Buna-N
41	1	FP-4307-B	Volute	
42	1	M-6458	O-ring	Buna-N
43	1	625-00860	Plug, Pipe, Sq	1/8" NPT, Black
44	1	625-01247	Plug, Pipe	3/4" NPT, Galvanized

PUMP MODEL: PO2LA, 2C00D-0006C-001

45	1	M-6456	★ ◆	O-ring	Buna-N
46	2	M-6499		Nut, Handle	
47	2	M-2614		Stud	1/2-13 x 2.00" Lg, Steel
48	2	625-01104		Washer	1/2" Zinc Pltd.
49	1	M-4504		Key	3/16" Sq X .69" Lg, Steel
50	1	510-00521		Handle, Cover	
51	2	2-114-6		Screw, Round Hd	1/4-20 X .50" Lg, Zinc Pltd.
	2	20-13-6		Washer, Lock, Split	1/4", Zinc Pltd.
52	2	M-5286		Stud	5/16-18 X 1.50" Lg, Steel
	2	20-21-6		Washer, Flat	5/16", Zinc Pltd.
	2	M-3501		Nut, Wing	5/16-18, Zinc Pltd.
53	1	FP-4306		Cover, Case	
54	1	T-26639	★ ◆	Gasket, Elbow	Vellumoid

PUMP MODEL: PO3LA & PO3LB
PO3LA-7B, 3CO1D-0007B-031
PO3LA-8D, 3CO1D-0008D-031
PO3LB-7B, 3CO3D-0007B-031



**PUMP MODEL: PO3LA & PO3LB
PO3LA-7B, 3CO1D-0007B-031
PO3LA-8D, 3CO1D-0008D-031
PO3LB-7B, 3CO3D-0007B-031**

PARTS KIT

Seal Kit, P03LA/P03LB.....P/N: 089077 (†) 4, 6, 10, 25, 31, 34, 39, 41, 51, 52, 54
Overhaul Kit, P03LA/P03LB.....P/N: 089088 (◆) 4, 6, 10, 17, 18, 19, 20, 25, 28, 31, 33, 34, 39, 41, 51, 52, 54

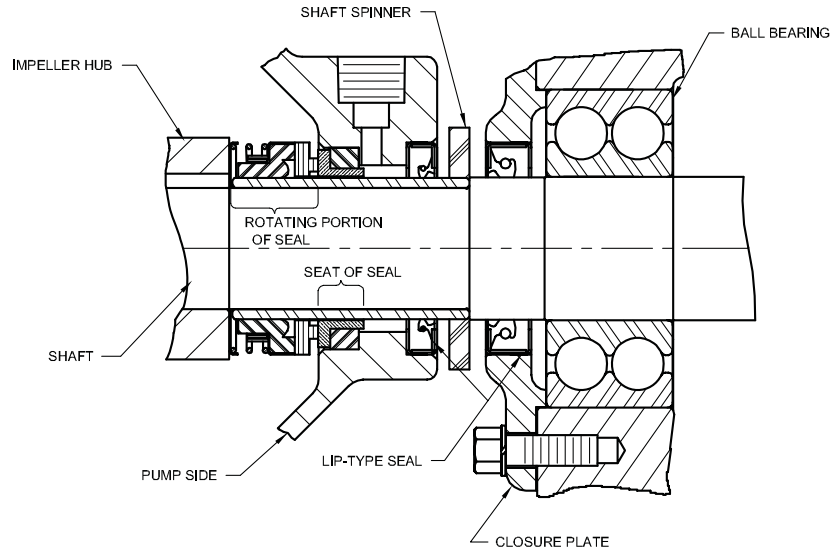
PARTS LIST

ITEM	QTY.	PART NO.		DESCRIPTION	
1	1	FP-4531		Elbow, Suction	3"
2	1	625-02841		Pin, Spring	1/4" Dia x 1.00" Lg
3	2	1-149-6		Screw, Hex Hd	7/16-14 x 1.25", Z.P.
	2	20-27-6		Washer, Flat	7/16", Zinc Pltd
4	1	MT-9037	† ◆	Gasket, Valve	Neoprene
5	1	P-45306		Cover, Hatch	
6	1	P-3767	† ◆	Weight, Valve	
	1	002161	† ◆	Bolt, Carriage	1/4-20 x 1.25", Steel
	1	20-13-1	† ◆	Washer, Lock, Split	1/4", Stainless
	1	15-5-1	† ◆	Nut, Hex	1/4-20, Stainless
8	4	M-2614		Stud	1/2-13 x 2.00" Lg, Steel
	4	20-15-6		Washer, Lock, Split	1/2", Zinc Pltd
	4	15-6-6		Nut, Hex	1/2-13, Zinc Pltd
9	1	625-02121		Flange, Companion	3"
10	1	M-2655	† ◆	Cup, Grease	
11	1	625-02828		Coupling, Reducer	3/8" x 1/4" NPT, Stl
12	1	625-01147		Nipple, Pipe	1/4" NPT x 1.50" Lg Galv.
13	1	A-6694		Fitting, Discharge 3"	
14	3	625-01247		Plug, Pipe	3/4" NPT, Galv.
15	3	M-5479		Stud	3/8-16 x 1.75" Lg, Steel
	3	20-6-7		Washer, Flat	3/8", Brass
	3	M-6046		Nut, Cap, Hex	3/8"-16, Steel/Nylock
16	6	M-2771		Stud	1/2-13 x 1.75" Lg, Steel
	6	20-15-6		Washer, Lock, Split	1/2", Zinc Pltd
	6	15-6-6		Nut, Hex	1/2-13, Zinc Pltd
17	1	M-4313	◆	Spinner, Shaft	Neoprene
18	1	089257	◆	Glass, Sight	
19	1	089258	◆	Plug, Vent	
20	2	T-24886	◆	Gasket, Plate, Closure	Vellumoid
21	2	FP-4261		Plate, Closure	
22	2	M-4489		Spring, Disc	
23	1	M-2222		Key	5/16" Sq x 2.00" Lg, Steel
24	1	T-24888-C		Shaft, Impeller	
25	3	M-4080	† ◆	Seal, Lip	
26	8	1-5-6		Screw, Hex Hd	1/4-20 x .75" Lg, Z.P.
	8	20-13-6		Washer, Lock, Split	1/4", Zinc Pltd
27	1	FP-4263		Bracket, Support	
28	2	M-6142	◆	Bearing, Ball	
29	1	512-00007		Sleeve, Shaft, Stainless	
30	1	FP-4262-B		Side, Pump	
31	1	M-3983-F	† ◆	Seal, Mechanical, 1.375"	
32	4	M-2635		Stud	3/8-16 x 1.50" Lg, Steel
	4	20-14-6		Washer, Lock, Split	3/8, Zinc Pltd
	4	15-23-6		Nut, Hex	3/8-16, Zinc Pltd
33	6	T-27239	◆	Shim, Plastic, .025"	
	6	T-27239-A	◆	Shim, Plastic, .015"	
34	1	M-7965	† ◆	O-Ring, Buna-N	

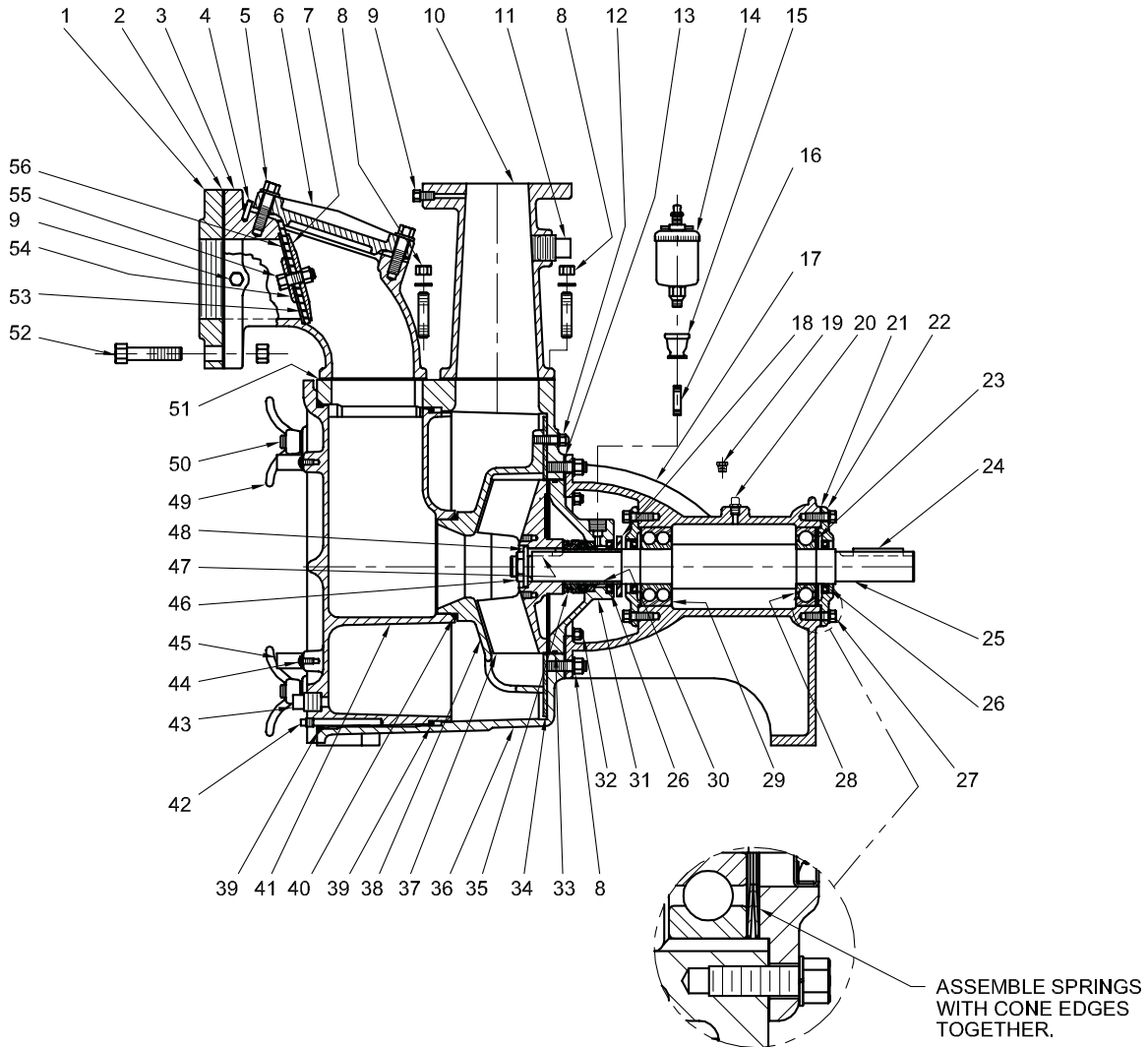
**PUMP MODEL: PO3LA & PO3LB
 PO3LA-7B, 3CO1D-0007B-031
 PO3LA-8D, 3CO1D-0008D-031
 PO3LB-7B, 3CO3D-0007B-031**

35	1	T-25459		Seal Plate	PO3LA-7B
	1	T-24989			PO3LA-8D
	1	T-25459			PO3LB-7B
36	1	FP-4185-F		Volute	PO3LA-7B
	1	FP-4184-F			PO3LA-8D
	1	FP-4296			PO3LB-7B
37	1	FP-4264-A		Impeller	PO3LA-7B
	1	FP-4188-C			PO3LA-8D
	1	FP-4297-C			PO3LB-7B
38	1	FP-4186-H		Case, Pump	
39	2	M-5691	† ◆	O-Ring Buna-N	
40	1	625-00860		Plug, Pipe, Sq	1/8" NPT, Black
41	1	M-5690	† ◆	O-Ring Buna-N	
42	1	M-2650		Key	1/4" Sq x 1.00" Lg, Steel
43	2	M-5800		Handle, Nut	
44	2	TS-29413		Stud	5/8-11 x 2.50" Lg, Stainless
45	2	625-01103		Washer, Flat	5/8", Zinc Pltd
46	1	M-7883		Nut, Lock, Hex	5/8-18, SST/Nylock
47	1	TS-24887		Washer, Impeller	
48	1	510-00521		Handle, Cover	
49	2	2-114-6		Screw, Round Hd	1/4-20 x .50"Lg, ZP
	2	20-13-6		Washer, Lock, Split	1/4", Zinc Pltd
50	1	FP-4187-A		Cover, Case	
51	1	M-9589	† ◆	Gasket, Elbow	
52	1	089113	† ◆	Gasket, Valve, Check	Neoprene
53	1	4757		Plug, Pipe, Hex	1/4" NPT, Brass
54	1	P-3748	† ◆	Weight, Valve, Check	

PUMP MODELS: PO3LC, PO4LA & PO4LB
PO3LC-8L, 3CO6D-0008L-031; PO4LA-8D, 4CO2D-0008D-031;
PO4LA-9D, 4CO2D-0009D-031; PO4LB-8D, 4CO4D-0008D-031



ENLARGED SEAL DETAIL



PUMP MODELS: PO3LC, PO4LA & PO4LB
PO3LC-8L, 3CO6D-0008L-031; PO4LA-8D, 4CO2D-0008D-031;
PO4LA-9D, 4CO2D-0009D-031; PO4LB-8D, 4CO4D-0008D-031

PARTS KITS

Seal Kit, P03LC/4LA/4LB.....P/N: 089078 (+) 7, 14, 26, 33, 35, 39, 40, 51, 53, 54, 55, 56
Overhaul Kit, P03LC/4LA/4LB.....P/N: 089089 (◆) 7, 13, 14, 19, 20, 21, 26, 28, 29, 33, 35, 39, 40, 51, 53, 54,
55, 56

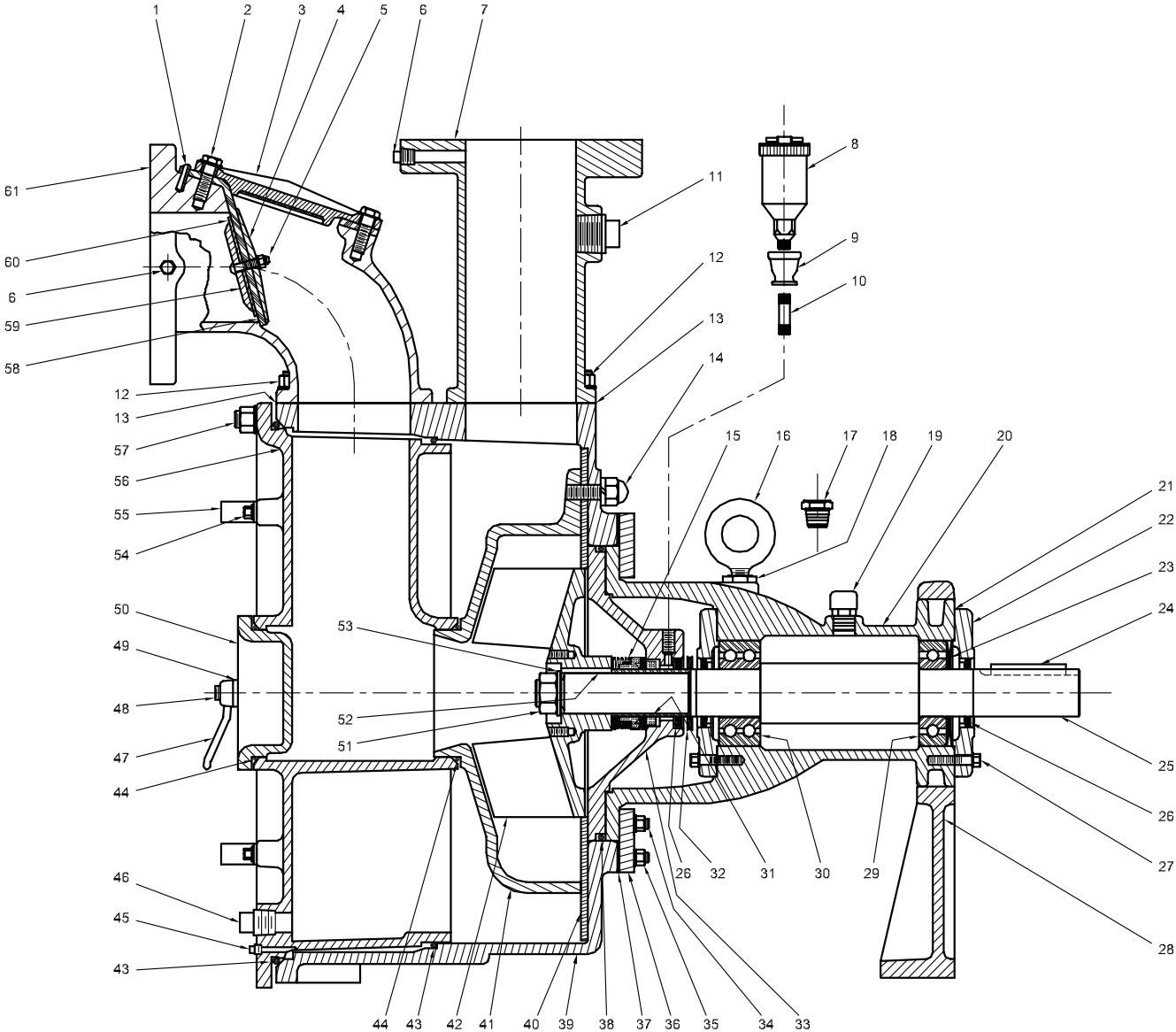
PARTS LIST

ITEM	QTY.	PART NO		DESCRIPTION	
1	1	625-02838		Flange, Companion	3" (PO3LC ONLY)
2	1	T-9502		Gasket, Flange	4" (PO3LC ONLY)
3	1	FP-4514		Elbow, Suction	4"
4	1	625-02841		Pin, Spring	1/4" Dia x 1.00" Lg
5	2	1-71-6		Screw, Hex Hd	1/2-13 x 1.75" Lg, Z.P
	2	625-01104		Washer, Flat	1/2", Zinc Pltd
6	1	P-4515		Cover, Hatch	
7	1	P-3757	+ ◆	Weight, Valve	
8	14	M-2614		Stud	1/2-13 x 2.00" Lg, Steel
	14	20-15-6		Washer, Lock, Split	1/2", Zinc Pltd
	14	15-6-6		Nut, Hex	1/2-13, Zinc Pltd
9	2	4757		Plug, Pipe, Hex	1/4" NPT, Brass
10	1	FP-4496		Connection, Flanged	3" (PO3LC)
	1	FP-4376		Connection, Flanged	4" (PO4LA, LB)
11	1	625-01652		Plug, Pipe, Sq	1" NPT, Cast Iron
12	3	M-5479		Stud	3/8-16 x 1.75" Lg, Stainless
	3	20-6-7		Washer, Flat	3/8", Brass
	3	M-6046		Nut, Cap, Hex	3/8-16, Steel/Nylock
13	6	T-27240	◆	Shim, Plastic, .035"	
	6	T-27240-A	◆	Shim, Plastic, .015"	
14	1	M-2655	+ ◆	Cup, Grease	
15	1	625-02828		Coupling, Reducer	3/8" x 1/4" NPT, Stl
16	1	625-01148		Nipple, Pipe, Close	1/4" NPT
17	1	FP-4272		Bracket, Support	
18	1	M-4249		Spinner, Shaft	Neoprene
19	1	089257	◆	Glass, Sight	
20	1	089258	◆	Plug, Vent	
21	2	T-25358	◆	Gasket, Plate, Closure	Vellumoid
22	2	FP-2763-D		Plate, Closure	
23	2	M-6570		Spring, Disc	Steel
24	1	M-4341		Key	3/8" Sq x 2.50" Lg, Steel
25	1	T-25043-C		Shaft, Impeller	
26	3	M-2783	+ ◆	Seal, Lip	
27	8	1-34-6		Screw, Hex Hd	3/8-16 x 1.00" Lg, Z.P
	8	20-14-6		Washer, Lock, Split	3/8", Zinc Pltd
28	1	M-5436	◆	Bearing, Ball	
29	1	M-2654	◆	Bearing, Ball	
30	1	512-00004		Sleeve, Shaft	Stainless
31	1	FP-4273-A		Side, Pump	
32	4	M-2635		Stud	3/8-16 x 1.50" Lg, Steel
	4	20-14-6		Washer, Lock, Split	3/8", Zinc Pltd
	4	15-23-6		Nut, Hex	3/8-16, Zinc Pltd
33	1	M-6568	+ ◆	O-Ring Buna-N	
34	1	T-32643		Plate, Seal	PO3LC-8L
	1	T-24993		Plate, Seal	PO4LA-8D
	1	T-24992		Plate, Seal	PO4LA-9D
	1	T-24993		Plate, Seal	PO4LB-8D
35	1	M-3842-F	+ ◆	Seal, Mechanical, 1.75"	

PUMP MODELS: PO3LC, PO4LA & PO4LB
PO3LC-8L, 3CO6D-0008L-031; PO4LA-8D, 4CO2D-0008D-031;
PO4LA-9D, 4CO2D-0009D-031; PO4LB-8D, 4CO4D-0008D-031

36	1	FP-4570-A		Case, Pump	
37	1	FP-4494		Impeller	PO3LC-8L
	1	P-4271-A		Impeller	PO4LA-8D
	1	FP-4271		Impeller	PO4LA-9D
	1	FP-4285-A		Impeller	PO4LB-8D
38	1	FP-4493-A		Volute	PO3LC-8L
	1	FP-4198-K		Volute	PO4LA-8D
	1	FP-4198-L		Volute	PO4LA-9D
	1	FP-4284-D		Volute	PO4LB-8D
39	2	M-5728	+ ◆	O-Ring	Buna-N
40	1	M-5727	+ ◆	O-Ring	Buna-N
41	1	FP-4571-A		Cover, Case	
42	1	625-00860		Plug, Pipe, Sq	1/8" NPT, Black
43	2	625-01247		Plug, Pipe	3/4" NPT, Galvanized
44	4	2-114-6		Screw, Round Hd	1/4-20 x .50"Lg, Z.P
	4	20-13-6		Washer, Lock, Split	1/4", Zinc Pltd
45	2	510-00521		Handle, Cover	
46	1	M-7884		Nut, Lock, Hex	1-14, Stainless/Nylock
47	1	525-00357		Key	3/8" Sq x 1.375" Lg, Steel
48	1	TS-13919		Washer, Impeller	Stainless
49	4	FP-4574		Nut, Wing	5/8-11, Cast Iron
50	4	TS-29413		Stud	5/8-11 x 2.50" Lg, Stainless
51	2	M-9590	+ ◆	Gasket, Elbow	
52	8	1-97-6		Screw, Hex Hd	5/8-11 x 2.75"Lg, Z.P
	8	15-21-6		Nut, Hex	5/8-11, Zinc Pltd
53	1	MT-8840	+ ◆	Rubber, Valve	Neoprene
54	1	P-3115	+ ◆	Weight, Valve	
55	1	25-111-6	+ ◆	Bolt, Carriage	1/2-13 x 1.25"Lg, Z.P
	1	15-6-1	+ ◆	Nut, Hex	1/2-13, Stainless
56	1	525-00004	+ ◆	Gasket, Valve, Check	Neoprene

PUMP MODEL: PO4LC
PO4LC-9D, 4CO7D-0009D-031; PO4LC-9L, 4CO7D-0009L-031;
PO4LC-10D, 4CO7D-0010D-031; PO4LC-10L, 4CO7D-0010L-031



PUMP MODEL: PO4LC
PO4LC-9D, 4CO7D-0009D-031; PO4LC-9L, 4CO7D-0009L-031;
PO4LC-10D, 4CO7D-0010D-031; PO4LC-10L, 4CO7D-0010L-031

PARTS KITS

Seal Kit, P04LC.....P/N: 089079 (➕) 4, 5, 8, 13, 15, 26, 38, 43, 44, 58, 59, 60
Overhaul Kit, P04LC.....P/N: 089090 (◆) 4, 5, 8, 13, 15, 17, 19, 21, 26, 29, 30, 37, 38, 43, 44, 58, 59, 60

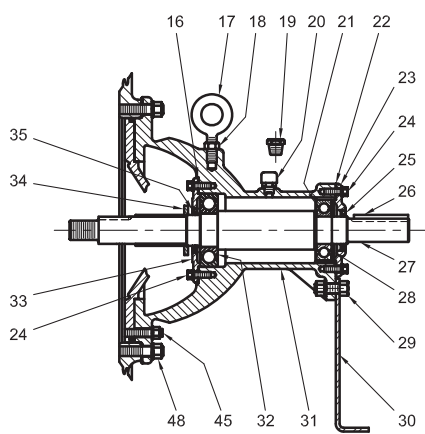
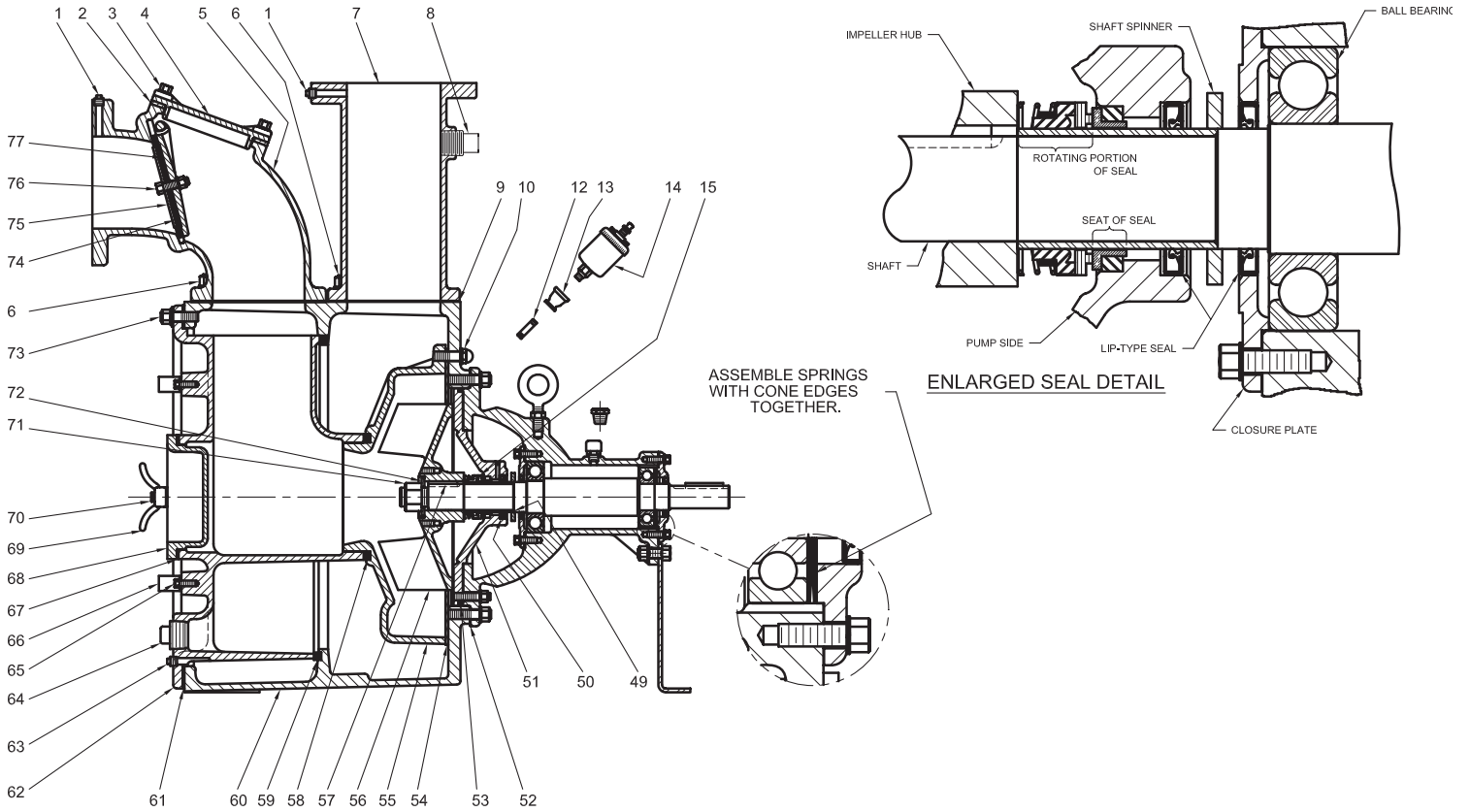
PARTS LIST

ITEM	QTY.	PART NO	DESCRIPTION	
1	1	625-02841	Pin, Spring	1/4" Dia x 1.00" Lg
2	2	1-71-6	Screw, Hex Hd	1/2-13 x 1.75" Lg, Z.P.
	2	625-01104	Washer	1/2", Zinc Pltd
3	1	P-4515	Cover, Hatch	
4	1	P-3757	➕ ◆ Weight, Valve, Flap	
5	1	25-111-6	➕ ◆ Bolt, Carraige	1/2-13 x 1.25" Lg, Z.P.
	1	15-6-1	➕ ◆ Nut, Hex	1/2-13, Stainless
6	2	4757	Plug, Pipe, Hex	1/4" NPT, Brass
7	1	FP-4376	Connection, Flange	4"
8	1	M-2655	➕ ◆ Cup, Grease	
9	1	625-02828	Coupling, Reducer	3/8" x 1/4" NPT, Steel
10	1	625-01148	Nipple, Pipe, Close	1/4" NPT, Galv.
11	1	625-01652	Plug, Pipe, Sq	1" NPT
12	8	M-2614	Stud	1/2-13 x 2.00" Lg, Steel
	8	20-15-6	Washer, Lock, Split	1/2", Zinc Pltd
	8	15-6-6	Nut, Hex	1/2-13, Zinc Pltd
13	2	M-9590	➕ ◆ Gasket, Elbow	
14	3	M-5542	Stud	1/2-13 x 2.00", Stainless
	3	M-3543	Washer	1/2", Brass
	3	16-6-6	Nut, Acorn	1/2-13, Zinc Pltd/Nylock
15	1	M-3842-F	➕ ◆ Seal, Mechanical, 1.75"	
16	1	M-5087	Bolt, Eye	5/8-11, Steel
17	1	089257	◆ Glass, Sight	
18	1	15-22-6	Nut, Hex, Jam	5/8-11, Zinc Pltd
19	1	089258	◆ Plug, Vent	
20	1	FP-4358	Bracket, Support, Pump	
21	2	T-25358	◆ Gasket, Plate, Closure	Vellumoid
22	2	FP-2763-D	Plate, Closure	
23	2	M-6570	Spring, Disc	Steel
24	1	M-4341	Key	3/8" Sq x 2.50" Lg, Steel
25	1	T-27382-D	Shaft, Impeller	
26	3	M-2783	➕ ◆ Seal, Lip	
27	8	1-34-6	Screw, Hex Hd	3/8-16 x 1.00" Lg Z.P.
	8	20-14-6	Washer, Lock, Split	3/8", Zinc Pltd
28	1	FP-4359	Foot, Support	
	2	1-96-6	Screw, Hex Hd	5/8-11 x 2.50" Lg, Z.P.
	2	20-24-6	Washer, Lock, Split	5/8", Zinc Pltd
	2	15-21-6	Nut, Hex	5/8-11, Zinc Pltd
29	1	M-5436	◆ Bearing, Ball	
30	1	M-2654	◆ Bearing, Ball	
31	1	512-00004	Sleeve, Shaft	Stainless
32	1	M-4249	Spinner, Shaft	Neoprene
33	1	FP-4356	Side, Pump	
34	6	M-2659	Stud	1/2-13 x 2.50" Lg, Steel
	6	20-15-6	Washer, Lock, Split	1/2", Zinc Pltd
	6	15-6-6	Nut, Hex	1/2-13, Zinc Pltd
35	6	M-2614	Stud	1/2-13 x 2.00" Lg, Steel
	6	20-15-6	Washer, Lock, Split	1/2", Zinc Pltd
	6	15-6-6	Nut, Hex	1/2-13, Zinc Pltd
36	1	FP-4357	Ring, Mounting	

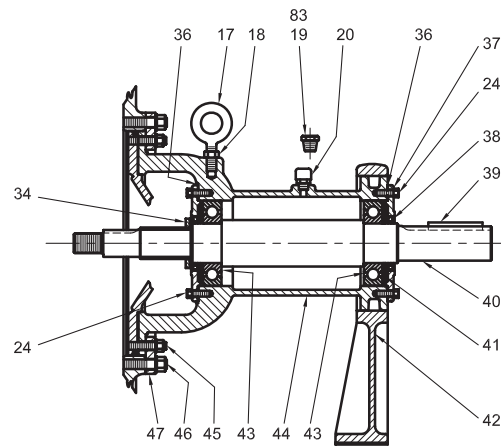
PUMP MODEL: PO4LC
PO4LC-9D, 4CO7D-0009D-031; PO4LC-9L, 4CO7D-0009L-031;
PO4LC-10D, 4CO7D-0010D-031; PO4LC-10L, 4CO7D-0010L-031

37	6	T-27383	◆	Shim, Plastic, .030"	
	6	T-27383-A	◆	Shim, Plastic, .015"	
38	1	M-6613	★ ◆	O-Ring Buna-N	
39	1	FP-4352-A		Case, Pump	
40	1	T-27584		Plate, Seal	PO4LC-9D
	1	T-27583		Plate, Seal	PO4LC-9L
	1	T-27582		Plate, Seal	PO4LC-10D
	1	T-27384		Plate, Seal	PO4LC-10L
41	1	FP-4443-G		Volute	PO4LC-9D
	1	FP-4443-E		Volute	PO4LC-9L
	1	FP-4443-C		Volute	PO4LC-10D
	1	FP-4443-A		Volute	PO4LC-10L
42	1	FP-4364-A		Impeller	PO4LC-9D
	1	FP-4444-E		Impeller	PO4LC-9L
	1	FP-4444-C		Impeller	PO4LC-10D
	1	FP-4444-A		Impeller	PO4LC-10L
43	2	M-6614	★ ◆	O-Ring	Buna-N
44	2	M-5727	★ ◆	O-Ring	Buna-N
45	1	625-00860		Plug, Pipe, Sq	1/8" NPT, Black
46	2	625-01247		Plug, Pipe	3/4" NPT, Galvanized
47	2	M-6499		Nut, Handle	1/2-13
48	2	M-2614		Stud	1/2-13 x 2.00" Lg, Steel
49	2	625-01104		Washer	1/2", Zinc Pltd
50	1	FP-4354		Hatch, Quick Opening	
51	1	M-7884		Nut, Lock, Hex	1-14, Stainless/Nylock
52	1	M-1891		Key	3/8" Sq x 1.50" Lg, Steel
53	1	TS-13919		Washer, Impeller	Stainless
54	4	2-114-6		Screw, Round Hd	1/4-20 x .50"Lg,Z.P.
	4	20-13-6		Washer, Lock, Split	1/4", Zinc Pltd
55	2	510-00521		Handle, Cover	
56	1	FP-4353		Cover, Case	
57	8	M-2333		Stud	5/8-11 x 2.25" Lg, Steel
	8	20-24-6		Washer, Lock, Split	5/8", Zinc Pltd
	8	15-21-6		Nut, Hex	5/8-11, Zinc Pltd
58	1	MT-8840		Rubber, Valve	Neoprene
59	1	P-3115	★ ◆	Weight, Valve	
60	1	525-00004	★ ◆	Gasket, Valve, Check	Neoprene
61	1	FP-4514	★ ◆	Elbow, Suction	4"

PUMP MODELS: PO6LB & PO6LC
PO6LB-10N, 6C05D-0010N-031; PO6LB-11J, 6C05D-0011J-031;
PO6LB-12F, 6C05D-0012F-031; PO6LC-13B, 6C08D-0013B-031;
PO6LC-14X, 6C08D-0014X-031



PO6LB PEDESTAL ASSEMBLY



PO6LC PEDESTAL ASSEMBLY

PUMP MODELS: PO6LB & PO6LC

**PO6LB-10N, 6C05D-0010N-031; PO6LB-11J, 6C05D-0011J-031; PO6LB-12F, 6C05D-0012F-031;
PO6LC-13B, 6C08D-0013B-031; PO6LC-14X, 6C08D-0014X-031**

PARTS KITS

Seal Kit, PO6LB/LC	P/N: 089080	(+) 2, 9, 14, 15, 35, 53, 58, 59, 61, 67, 74
Overhaul Kit, PO6LB	P/N: 089091	(◆) 2, 9, 14, 15, 16, 19, 20, 21, 22, 25, 32, 34, 35, 52, 53, 58, 59, 61, 67, 74
Overhaul Kit, PO6LC	P/N: 089092	(▲) 2, 9, 14, 15, 19, 20, 34, 35, 36, 38, 43, 52, 53, 58, 59, 61, 67, 74

PARTS LIST

ITEM	QTY.	PART NO	DESCRIPTION	
1	2	4757	Plug, Pipe, Hex	1/4" NPT, Brass
2	1	MT-9220	Gasket, Cover, Hatch	Neoprene
3	4	1-71-6	Screw, Hex Hd	1/2-13 x 1.75" Lg, Z.P.
	4	20-7-6	Washer, Flat	1/2", Zinc Pltd.
4	1	P-4533	Cover, Hatch	
5	1	FP-4532-A	Elbow, Suction	
6	8	M-9711	Stud	3/4-10 x 2.75" Lg, Steel
	8	20-16-6	Washer, Lock, Split	3/4", Zinc Pltd.
	8	15-7-6	Nut, Hex	3/4-10, Zinc Pltd.
7	1	FP-4374-A	Connection, Flanged	6"
8	1	003205	Plug, Pipe, Sq	1" NPT, Black
9	2	M-9591	Gasket, Flange	Nitrile
10	5	TS-29413	Stud	5/8-11 x 2.50" Lg, Stainless
	5	20-23-7	Washer, Flat	5/8", Brass
	5	625-02847	Nut, Lock	5/8-11, Stainless/Nylock
12	1	625-01148	Nipple, Pipe, Close	1/4" NPT, Galv.
13	1	625-02828	Coupling, Reducer	3/8" x 1/4" NPT
14	1	M-2655	Cup, Grease	3/8" NPT
15	1	M-4414-F	Seal, Mechanical, 2.00"	
16	1	M-9241	Gasket, Plate, Closure	Vellumoid
17	1	M-5087	Bolt, Eye	5/8-11, Steel
18	1	15-22-6	Nut, Hex, Jam	5/8-11, Zinc Pltd.
19	1	089257	Glass, Sight	
20	1	089258	Plug, Vent	
21	1	M-2575	Bearing, Ball	
22	1	T-25358	Gasket, Plate, Closure	Vellumoid
23	1	FP-2763-D	Plate, Closure	
24	8	1-529-6	Screw, Hex Hd	3/8-16 x 1.00" Lg, Z.P.
	8	20-14-6	Washer, Lock, Split	3/8", Zinc Pltd.
25	1	M-2783	Seal, Lip	
26	1	M-4341	Key	3/8" Sq x 2.50" Lg, Steel
27	1	510-00483-004	Shaft, Impeller	
28	2	M-6570	Spring, Disc	
29	2	1-93-6	Screw, Hex Hd	5/8-11 x 1.75" Lg, Z.P.
	2	20-24-6	Washer, Lock, Split	5/8", Zinc Pltd.
	2	15-21-6	Nut, Hex	5/8-11, Zinc Pltd.
30	1	T-35658	Support, Foot	
31	1	FP-4547	Bracket, Support, Pump	
32	1	M-4342	Bearing, Ball	
33	1	FP-3071-E	Plate, Closure	
34	1	068747	Ring, Slinger	Buna-N
35	1	M-4413	Seal, Lip	
36	2	T-25357	Gasket, Plate, Closure	Vellumoid
37	2	FP-4159-B	Plate, Closure	
38	2	M-6252	Seal, Lip	
39	1	M-2664	Key	1/2" Sq x 3.50" Lg, Steel
40	1	510-00480-003	Shaft, Impeller	
41	2	M-5766	Spring, Disc	
42	1	FP-4372	Foot, Support, Pump	
	2	1-96-6	Screw Hex Hd,	5/8-11 x 2.50" Lg, Z.P.
	2	20-24-6	Washer, Lock, Split	5/8", Zinc Pltd.
	2	15-21-6	Nut, Hex	5/8-11, Zinc Pltd.
43	2	M-5767	Bearing, Ball	
44	1	FP-4371	Bracket, Support, Pump	
45	6	T-28840	Stud	1/2-13 X 2.38" Lg, Steel

PUMP MODELS: PO6LB & PO6LC

**PO6LB-10N, 6C05D-0010N-031; PO6LB-11J, 6C05D-0011J-031; PO6LB-12F, 6C05D-0012F-031;
PO6LC-13B, 6C08D-0013B-031; PO6LC-14X, 6C08D-0014X-031**

	6	21-13-6		Washer, Lock, Internal Tooth	1/2", Z.P.
	6	15-6-6		Nut, Hex	1/2-13, Zinc Pltd.
46	6	M-1784		Stud	5/8-11 x 2.50" Lg, Steel
	6	20-24-6		Washer, Lock, Split	5/8", Zinc Pltd.
	6	15-21-6		Nut, Hex	5/8-11, Zinc Pltd.
47	1	FP-4373		Ring, Mounting	
48	6	M-1784		Stud	5/8-11 x 2.50" Lg, Steel
	6	20-24-6		Washer, Lock, Split	5/8" Zinc Pltd.
	6	15-21-6		Nut, Hex	5/8-11, Zinc Pltd.
49	1	512-00005		Sleeve, Shaft, Stainless	
50	1	M-4413		Seal, Lip	
51	1	FP-4370		Side, Pump	
52	6-12	T-27750	◆▲	Shim, Plastic, .030"	
	9	T-27750-A	◆▲	Shim, Plastic, .015"	
53	1	M-6680	◆▲	O-Ring Buna-N	
54	1	T-27741-A	◆▲	Plate, Seal	PO6LB-10N, PO6LC-10N
	1	T-27743-A		Plate, Seal	PO6LB-11J,
	1	T-27744-A		Plate, Seal	PO6LB-12X
	1	T-28060-A		Plate, Seal	PO6LB-12F
	1	T-28058-A		Plate, Seal	PO6LC-13B
	1	T-27716-A		Plate, Seal	PO6LC-14X
55	1	FP-4377-A		Volute	PO6LC-10N
	1	FP-4368-H		Volute	PO6LB-11J
	1	FP-4368-B		Volute	PO6LB-12F
	1	FP-4368-E		Volute	PO6LC-13B
	1	FP-4368-G		Volute	PO6LC-14X
	1	FP-4368-C		Volute	PO6LB-12X
56	1	FP-4250		Impeller	PO6LB-12X
	1	FP-4250-A		Impeller	PO6LB-11J
	1	FP-4250-B		Impeller	PO6LC-10N
	1	FP-4369-D		Impeller	PO6LB-12F
	1	FP-4369-B		Impeller	PO6LC-13B
	1	FP-4369		Impeller	PO6LC-14X
57	1	M-4341		Key	3/8" Sq x 2.50" Lg (PO6LB ONLY)
	1	525-00358		Key	3/8" Sq x 2.13" Lg (PO6LC ONLY)
58	1	M-5633-D	◆▲	Rubber Strip	1/2" Sq x 72" Lg.
59	1	M-5633-E	◆▲	Rubber Strip	1/2" Sq x 36" Lg.
60	1	FP-4367-C		Case, Pump	
61	1	T-24844	◆▲	Gasket, Cover, Case	Neoprene
62	1	FP-4252		Cover, Case	
63	1	625-00971		Plug, Pipe, Sq	1/4" NPT, Galvanized
64	1	625-01175		Plug, Pipe, Sq	1-1/2" NPT, Black
65	4	1-529-6		Screw, Hex Hd	3/8-16 x 1.00" Lg, Z.P., 1-529-6
	4	20-14-6		Washer, Lock, Split	3/8", Zinc Pltd.
66	2	510-00587		Handle, Cover, Case	
67	1	T-24845	◆▲	Gasket, Hatch	Neoprene
68	1	FP-4253		Hatch, Quick Opening	
69	2	FP-4574		Nut, Wing	5/8-11
70	2	M-1784		Stud	5/8-11 x 2.50" Lg, Steel
	2	625-01103		Washer, Flat	5/8", Zinc Pltd.
71	1	525-00263		Nut, Lock	1-1/4-12, Stainless/Nylock
72	1	512-00018		Washer, Impeller	Stainless
73	8	M-1784		Stud	5/8-11 x 2.50" Lg, Steel
	8	M-2333		Stud	5/8-11, 2.25" Steel (PO6LC ONLY)
	8	20-24-6		Washer, Lock, Split	5/8", Zinc Pltd.
	8	15-21-6		Nut, Hex	5/8-11, Zinc Pltd.
	8	070320		Flat Washer	5/8" Stainless
74	1	M-9403-A	◆▲	Gasket, Valve, Check	Rubber
75	1	067502D		Weight, Valve, Check	
76	1	1-71-1		Screw, Hex Hd	1/2-13 x 1.75" Lg, SST
	1	20-15-1		Washer, Lock, Split	1/2", Stainless
	1	15-6-1		Nut, Hex	1/2-13, Stainless
77	1	FP-4534-B		Valve, Check	
NS	1	003204		Plug, Pipe	3/4" NPT, Galvanized

BARNES®

BARNES®
PRESSURE **PS** SYSTEMS



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Limited 24 Month Warranty

Crane Pumps & Systems warrants that products of our manufacture will be free of defects in material and workmanship under normal use and service for twenty-four (24) months after manufacture date, when installed and maintained in accordance with our instructions. This warranty gives you specific legal rights, and there may also be other rights which vary from state to state. In the event the product is covered by the Federal Consumer Product Warranties Law (1) the duration of any implied warranties associated with the product by virtue of said law is limited to the same duration as stated herein, (2) this warranty is a LIMITED WARRANTY, and (3) no claims of any nature whatsoever shall be made against us, until the ultimate consumer, his successor, or assigns, notifies us in writing of the defect, and delivers the product and/or defective part(s) freight prepaid to our factory or nearest authorized service station. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply. **THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY AND ALL WARRANTIES WITH RESPECT TO ANY PRODUCT SHALL BE TO REPLACE OR REPAIR AT OUR ELECTION, F.O.B. POINT OF MANUFACTURE OR AUTHORIZED REPAIR STATION, SUCH PRODUCTS AND/OR PARTS AS PROVEN DEFECTIVE. THERE SHALL BE NO FURTHER LIABILITY, WHETHER BASED ON WARRANTY, NEGLIGENCE OR OTHERWISE.** Unless expressly stated otherwise, guarantees in the nature of performance specifications furnished in addition to the foregoing material and workmanship warranties on a product manufactured by us, if any, are subject to laboratory tests corrected for field performance. Any additional guarantees, in the nature of performance specifications must be in writing and such writing must be signed by our authorized representative. Due to inaccuracies in field testing if a conflict arises between the results of field testing conducted by or for user, and laboratory tests corrected for field performance, the latter shall control. **RECOMMENDATIONS FOR SPECIAL APPLICATIONS OR THOSE RESULTING FROM SYSTEMS ANALYSES AND EVALUATIONS WE CONDUCT WILL BE BASED ON OUR BEST AVAILABLE EXPERIENCE AND PUBLISHED INDUSTRY INFORMATION. SUCH RECOMMENDATIONS DO NOT CONSTITUTE A WARRANTY OF SATISFACTORY PERFORMANCE AND NO SUCH WARRANTY IS GIVEN.**

This warranty shall not apply when damage is caused by (a) improper installation, (b) improper voltage (c) lightning (d) excessive sand or other abrasive material (e) scale or corrosion build-up due to excessive chemical content. Any modification of the original equipment will also void the warranty. We will not be responsible for loss, damage or labor cost due to interruption of service caused by defective parts. Neither will we accept charges incurred by others without our prior written approval.

This warranty is void if our inspection reveals the product was used in a manner inconsistent with normal industry practice and/or our specific recommendations. The purchaser is responsible for communication of all necessary information regarding the application and use of the product. **UNDER NO CIRCUMSTANCES WILL WE BE RESPONSIBLE FOR ANY OTHER DIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO TRAVEL EXPENSES, RENTED EQUIPMENT, OUTSIDE CONTRACTOR FEES, UNAUTHORIZED REPAIR SHOP EXPENSES, LOST PROFITS, LOST INCOME, LABOR CHARGES, DELAYS IN PRODUCTION, IDLE PRODUCTION, WHICH DAMAGES ARE CAUSED BY ANY DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DAMAGE OR DELAYS IN SHIPMENT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

No rights extended under this warranty shall be assigned to any other person, whether by operation of law or otherwise, without our prior written approval.

CRANE®

A Crane Co. Company

PUMPS & SYSTEMS

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www.cranepumps.com

83 West Drive, Brampton
Ontario, Canada L6T 2J6
Phone: (905) 457-6223
Fax: (905) 457-2650

**IMPORTANT!
WARRANTY REGISTRATION**

Your product is covered by the enclosed Warranty.
To complete the Warranty Registration Form go to:

<http://www.cranepumps.com/ProductRegistration/>

If you have a claim under the provision of the warranty, contact your local
Crane Pumps & Systems, Inc. Distributor.

RETURNED GOODS

**RETURN OF MERCHANDISE REQUIRES A "RETURNED GOODS AUTHORIZATION".
CONTACT YOUR LOCAL CRANE PUMPS & SYSTEMS, INC. DISTRIBUTOR.**



**Products Returned Must Be Cleaned, Sanitized,
Or Decontaminated As Necessary Prior To Shipment,
To Insure That Employees Will Not Be Exposed To Health
Hazards In Handling Said Material. All Applicable Laws
And Regulations Shall Apply.**



START-UP REPORT

General Information

Pump Owner's Name: _____
Address: _____
Location of Installation: _____
Contact Person: _____ Phone: _____
Purchased From: _____

Nameplate Data

Pump Model #: _____ Serial #: _____
Part #: _____ Impeller Diameter: _____
Voltage: _____ Phase: _____ Ø Hertz: _____ Horsepower: _____
Full Load Amps: _____ Service Factor Amps: _____
Motor Manufacturer: _____

Controls

Control panel manufacturer: _____
Model/Part number: _____
Number of pumps operated by control panel: _____
Short circuit protection? YES___ NO___ Type: _____
Number and size of short circuit device(s): _____ Amp rating: _____
Overload Type: _____ Size: _____ Amp rating: _____
Do protection devices comply with pump and motor Amp rating? YES___ NO___
Are all electrical and panel entry connections tight? YES___ NO___
Is the interior of the panel dry? YES___ NO___
Liquid level Control Brand and Model: _____

Pre-Startup

All Pumps

Type of equipment: NEW___ REBUILT___ USED___
Condition of equipment at Start-Up: DRY___ WET___ MUDDY___
Was Equipment Stored? YES___ NO___ Length of Storage: _____
Liquid being pumped: _____ Liquid Temperature: _____
Supply Voltage/Phase/Frequency matches nameplate? YES___ NO___
Shaft turns freely? YES___ NO___
Direction of rotation verified for 3Ø motors? YES___ NO___
Debris in piping or wet well? YES___ NO___
Debris removed in your presence? YES___ NO___
Pump case/wet well filled with liquid before startup? YES___ NO___
Is piping properly supported? YES___ NO___

Non-Submersible Pumps

Is base plate properly installed / grouted? YES___ NO___ N/A___
Coupling Alignment Verified per I&O Manual? YES___ NO___ N/A___
Grease Cup/Oil Reservoir Level checked? YES___ NO___ N/A___

Submersible Pumps

Resistance of cable and pump motor (measured at pump control):

Red-Black: _____ Ohms(Ω) Red-White: _____ Ohms(Ω) White-Black: _____ Ohms(Ω)

Resistance of Ground Circuit between Control Panel and outside of pump: _____ Ohms(Ω)

MEG Ohms check of insulation:

Red to Ground: _____ White to Ground: _____ Black to Ground: _____

Operational Checks

Is there noise or vibration present? YES___ NO___ Source of noise/vibration: _____

Does check valve operate properly? YES___ NO___ N/A___

Is system free of leaks? YES___ NO___ Leaks at: _____

Does system appear to operate at design flow rate? YES___ NO___

Nominal Voltage: _____ Phase: 1Ø 3Ø (select one)

Voltage Reading at panel connection, Pump OFF: L1, L2 _____ L2, L3 _____ L1, L3 _____

Voltage Reading at panel connection, Pump ON: L1, L2 _____ L2, L3 _____ L1, L3 _____

Amperage Draw, Pump ON: L1 _____ L2 _____ L3 _____

Submersible Pumps

Are BAF and guide rails level / plumb? YES___ NO___

Is pump seated on discharge properly? YES___ NO___

Are level controls installed away from turbulence? YES___ NO___

Is level control operating properly? YES___ NO___

Is pump fully submerged during operation? YES___ NO___

Follow up/Corrective Action Required

YES___ NO___

Additional Comments:

Startup performed by: _____ Date: _____

Present at Start-Up

() Engineer: _____ () Operator: _____

() Contactor: _____ () Other: _____

All parties should retain a copy of this report for future trouble shooting/reference



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