INSTALLATION, OPERATION, PARTS LIST, AND MAINTENANCE MANUAL

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GORMAN-RUPP

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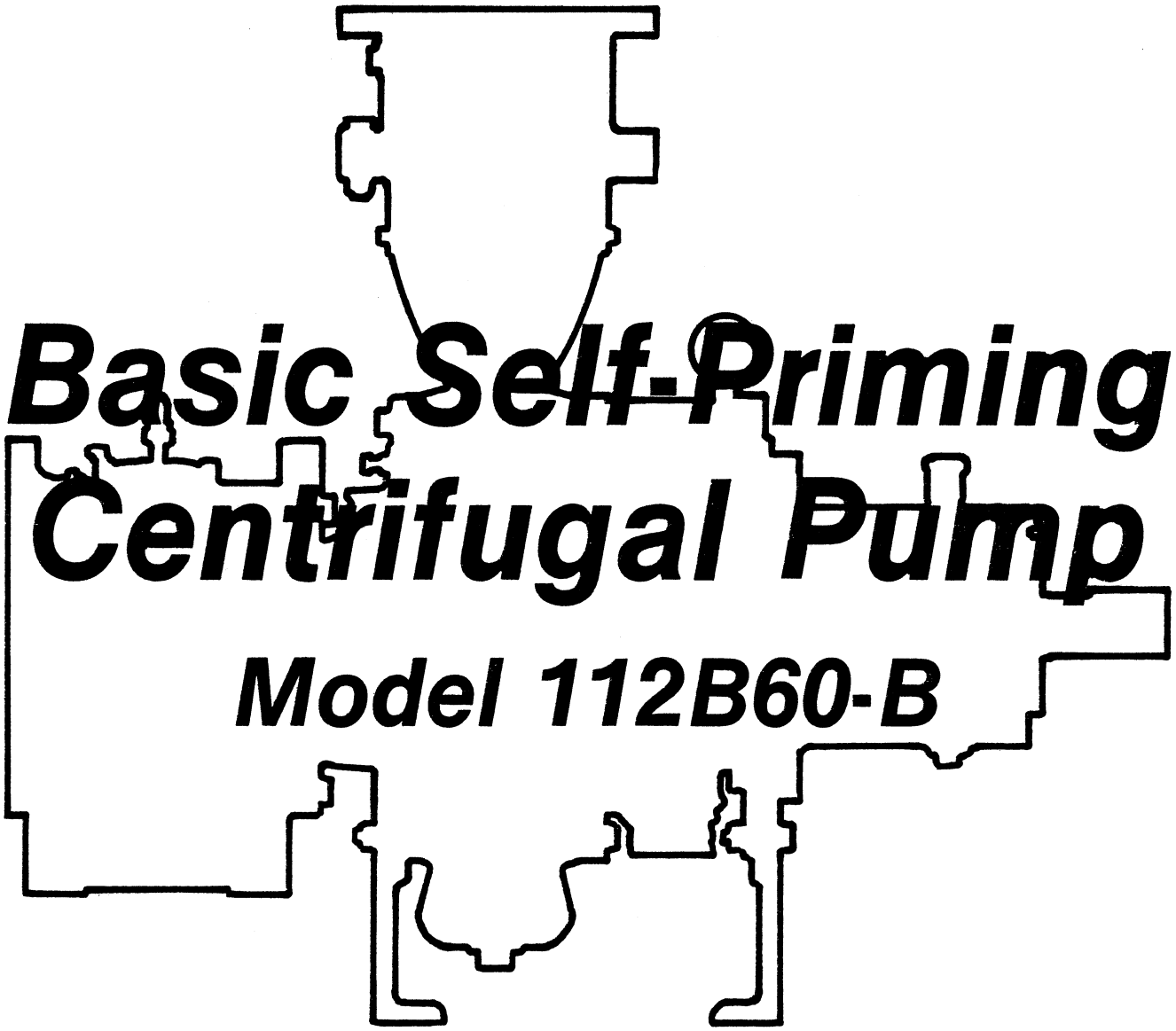

Basic Self-Priming Centrifugal Pump

Model 112B60-B

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

This Installation, Operation, and Maintenance Manual is designed specifically to help you get the best performance and longest life from your Gorman-Rupp pump.

This pump is a 10 Series, semi-open impeller, self-priming centrifugal model designed for pumping liquids with specified entrained solids.

If there are any questions regarding the pump which are not covered in this manual or in other literature accompanying the unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901

or

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

NOTE

Instructions to aid in installation, operation, or maintenance or which clarify a procedure.

CAUTION

Instructions which must be followed to avoid causing damage to the product or other equipment incidental to the installation. These describe the procedure required and the damage which could result from failure to follow the procedure.

WARNING

Instructions which must be followed to avoid causing injury or death to personnel. These describe the procedure required and the injury which could result from failure to follow the procedure.

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WARNINGS

THESE WARNINGS APPLY TO BASIC PUMPS. GORMAN-RUPP HAS NO CONTROL OVER OR PARTICULAR KNOWLEDGE OF THE POWER SOURCE WHICH WILL BE USED. REFER TO THE MANUAL ACCOMPANYING THE POWER SOURCE BEFORE ATTEMPTING TO START THE POWER SOURCE.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the power source to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Vent the pump slowly and cautiously.
5. Close the suction and discharge valves.
6. Check the temperature before opening any covers, plates, or plugs.
7. Drain the pump.

Do not attempt to pump volatile or corrosive materials for which this pump has not been designed.

After the pump has been located in its operating position, make certain that the pump has been secured before attempting to operate it.

Do not operate the pump without shields and/or guards in place over drive shafts, belts and/or couplings, or other rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

Do not operate the pump against a closed discharge valve for long periods of time. This could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode.

Overheated pumps can cause severe burns and injury. If overheating of the pump casing occurs:

1. Stop the pump immediately.
2. Allow the pump to cool.
3. Refer to instructions in this manual before restarting the pump.

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

INSTALLATION

Seldom are two pump installations identical. The information presented in this section is a summary of the recommended installation practices related to inspection, pump positioning, hardware, suction and discharge piping, and sumps. For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before it was shipped from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware. Since gaskets tend to shrink after drying, check for and tighten loose nuts and capscrews securing mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates in the required direction.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

d. Check all lubricant levels and lubricate as necessary. Refer to the MAINTENANCE AND REPAIR section of this manual.

POSITIONING THE PUMP

Mounting

Locate the pump in an accessible place as close as practical to the liquid to be pumped. Level mounting is essential for proper operation. The pump may have to be supported to provide for level operation or to eliminate vibration.

Lifting

WARNING

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment.

Make sure that hoists and other lifting equipment are of sufficient capacity to safely handle the pump assembly. If chains and cables are used, make certain that they are positioned so that they will not damage the pump, and so that the load will be balanced.

CAUTION

The pump assembly can be seriously damaged if the cables or chains used to lift and move the unit are improperly wrapped around it.

SUCTION AND DISCHARGE PIPING

Materials

Either pipe or hose may be used for suction and discharge lines, but hose used in suction lines must be the rigid-wall, reinforced type to prevent collapse under suction. Using pipe couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Never pull a pipe line into place by tightening the flange bolts. The connecting flange must be aligned exactly with the pump port. Lines near the pump must be independently supported to avoid strain on the pump which could cause serious vibration, decreased bearing life, and increased shaft and seal wear. Hose-type lines should have supports strong enough to secure the line when it is filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines close to the pump before installing the lines.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem down or to either side to avoid air pockets.

Strainers

Install a strainer at the end of the suction line to avoid possible clogging or damage to the pump. The total area of the openings in the strainer should be at least three or four times the cross section of the suction line, but no opening should be larger than the solids handling capability of the pump. Clean the strainer regularly during operation.

Sealing

All connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift. After installation, inspect the suction line carefully for potential leaks.

DISCHARGE LINES

Throttling Valves

If a throttling valve is desired, install it in the discharge line. Use a valve as large as the largest pipe in the line to minimize friction losses. Never install a throttling valve in the suction line.

Check Valves

A check valve in the discharge line is normally recommended, but is not necessary in low discharge head applications.

With high discharge heads, install a throttling valve and a check valve in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.

Bypass Lines

If it is necessary to permit the escape of air to atmosphere during initial priming or in the repriming cycle, install a bypass line between the pump and the discharge check valve. The bypass line should be sized so that it does not affect pump discharge capacity.

Either a Gorman-Rupp automatic air release valve—which will automatically open to allow the pump to prime, and automatically close when priming is accomplished—or a hand-operated shutoff valve should be installed in the bypass line.

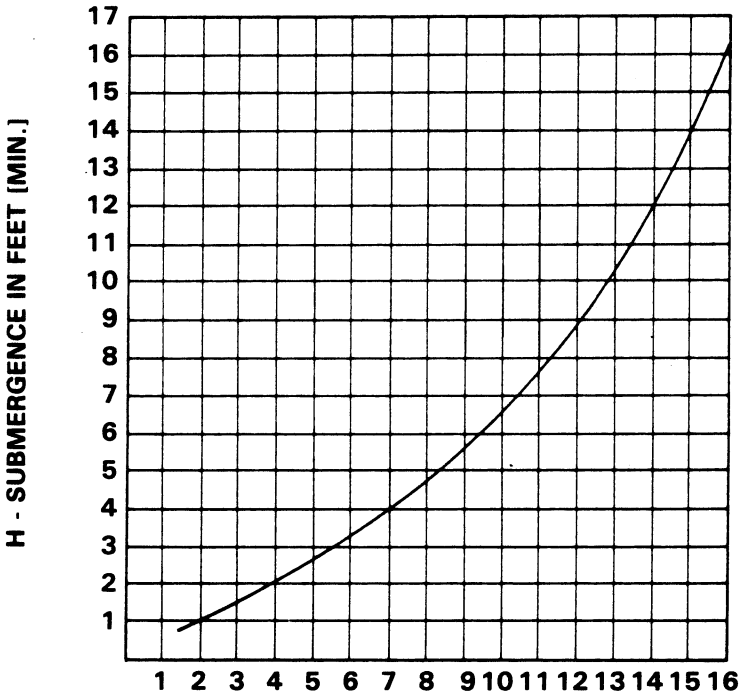
NOTE

The bypass line may clog frequently, particularly if the valve remains closed. If this condition occurs, either use a larger bypass line or leave the shutoff valve open during the pumping operation.

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action could result, causing damage to the pump.

SUCTION LINE POSITIONING

The depth of submergence of the suction line is critical to efficient pump operation. Figure 1 shows recommended minimum submergence vs. velocity.



$$\text{VELOCITY IN FEET PER SEC.} = \frac{\text{QUAN. [G.P.M.]} \times .321}{\text{AREA}} \text{ OR } \frac{\text{G.P.M.} \times .4085}{D^2}$$

Figure 1. Recommended Minimum Suction Line Submergence Vs. Velocity

Single Suction Lines

Install a single suction line a distance from the wall of the sump equal to one and one-half times the diameter of the suction pipe. Liquid flow into a sump should never enter near the pump suction inlet because inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position an inflow pipe close to the suction inlet, install a baffle a distance from the suction inlet equal to one and one-half times the diameter of the suction pipe (see figure 2). This baffle will allow entrained air to escape before the liquid is drawn into the suction line.

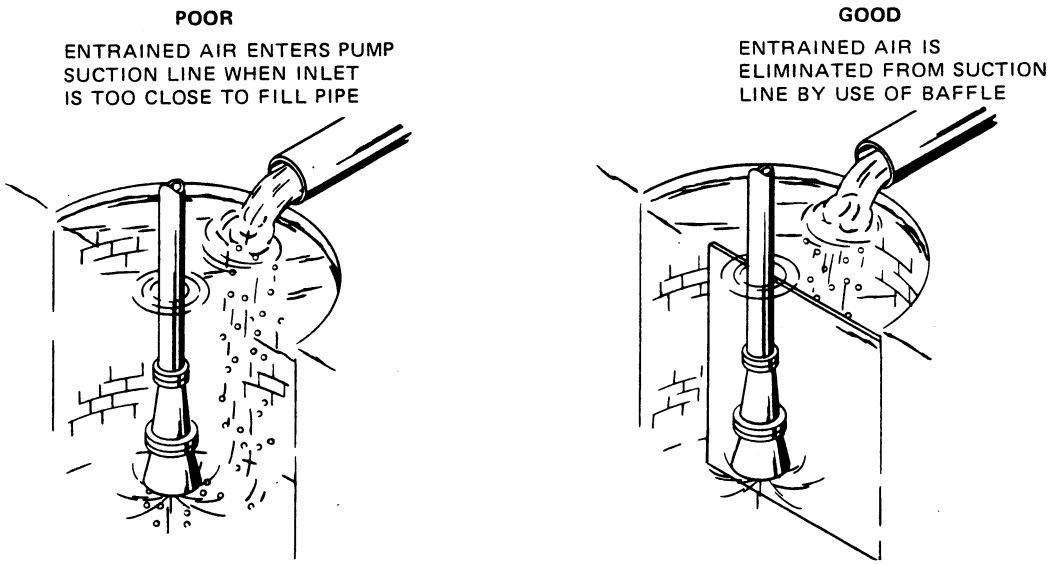


Figure 2. Eliminating Entrained Air Caused by a Fill Pipe

Multiple Suction Lines

When two suction lines are installed in one sump, separate the inlets by a distance equal to at least three times the diameter of the suction pipe. If the suction inlets are too close together, the flow paths may interact, reducing the efficiency of one or both pumps (see figure 3).

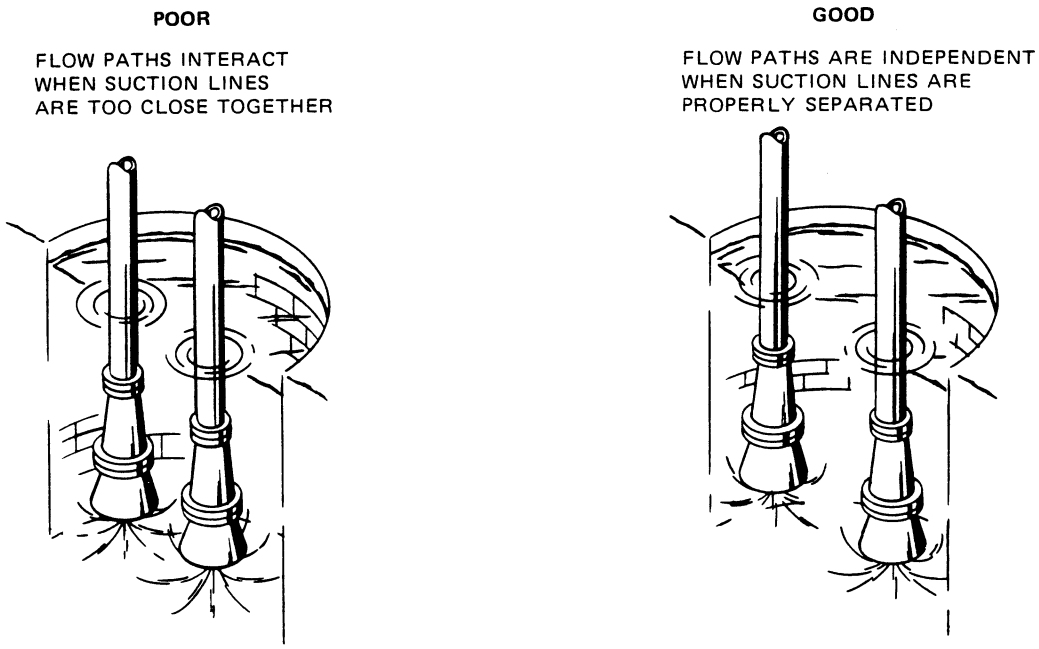


Figure 3. Using Two Pumps in the Same Sump

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. In either a flexible coupling or V-belt driven system, the driver and pump must be mounted so that their shafts are aligned with and parallel to each other.

NOTE

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment can occur in transit and handling, however, and pumps must be checked, and realigned if necessary, before being put into operation.

Before checking alignment, tighten the foundation bolts. The pump casing feet and/or pedestal feet, and the driver mounting bolts must also be tightly secured.

WARNING

When checking alignment, disconnect the power source to ensure that the pump will remain inoperative.

Aligning Coupling Driven Pumps

In coupling applications, the axis of the drive unit must be aligned to the axis of the pump shaft in both the horizontal and vertical planes. Most couplings require a specific gap or clearance between the driving and the driven shafts. Refer to the coupling manufacturer's service literature for information.

To check non-spider type couplings, use a feeler gauge or a taper gauge between the coupling halves every 90 degrees. The coupling is in alignment when the hubs are the same distance apart at all points (see figure 5A).

To check spider insert type couplings, use calipers to measure the dimensions on the circumference of the outer ends of the coupling hub every 90 degrees. The coupling is in alignment when the hub ends are the same distance apart at all points (see figure 5B).

Figure 5A. Aligning Non-Spider Type Couplings

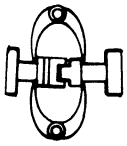


Figure 5B. Aligning Spider-Type Couplings

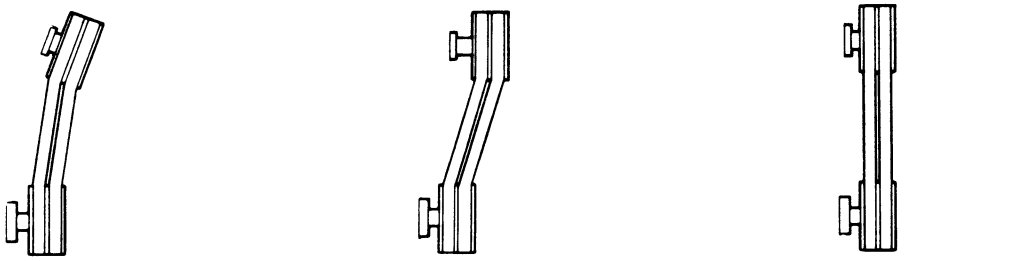
To check parallel adjustment, lay a straightedge across both coupling rims at the top, bottom, and side. The coupling is in horizontal parallel alignment when the straightedge rests evenly on both halves of the coupling. Use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

Coupling and alignment adjustments may be made by loosening the hold-down bolts and shifting the driver and pump, or by shimming as required.

> **CAUTION**
>
> Adjusting the alignment in one direction may alter the alignment in another direction. Check each procedure after altering alignment.

Aligning V-Belt Driven Pumps

If V-belts and pulleys connect the drive unit to the pump, the unit and the pump must be parallel and the pulleys properly aligned. Use a straightedge along the sides of the pulleys to ensure alignment. For drive systems that employ two or more belts, make sure that the belts are a matched set; unmatched sets will result in accelerated belt wear (see figure 5C).



MISALIGNED: SHAFTS NOT PARALLEL

MISALIGNED: SHEAVES NOT IN LINE

ALIGNED: SHAFTS PARALLEL AND SHEAVES IN LINE

Figure 5C. Alignment of V-Belt Driven Pumps

Tighten the belts in accordance with the belt manufacturer's instructions. The belts will slip if they are too loose; there will be excessive power loss and possible bearing failure if they are too tight. Select pulleys that will provide the proper speed ratio. Overspeeding the pump may damage both pump and driver.

Drive Shaft Guards

Driver and shaft assemblies, couplings, and belts and sheaves mounted at the Gorman-Rupp factory are supplied with a guard for protection of personnel. Do not operate the pump without a guard.

WARNING

Do not operate the pump without a guard over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

OPERATION

WARNING

Do not attempt to pump volatile or corrosive materials for which this pump has not been designed.

PRIMING

Install the pump and piping as described in INSTALLATION. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see LUBRICATION in MAINTENANCE AND REPAIR).

This pump is self-priming, but the pump volute casing must first be filled with liquid if:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the volute casing has evaporated.

Once the volute casing has been filled, the pump will prime and reprime as necessary.

CAUTION

Never operate a self-priming pump unless the volute is filled with liquid. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

To fill the pump, remove the volute fill cover or fill plug at the top of the casing and add clean liquid until the pump is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operating manual furnished with the power source.

Rotation

The correct direction of pump rotation is indicated by an arrow on the pump body and on the accompanying decal. If the pump is operated in the wrong direction, the impeller could become loosened and the pump damaged.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

When checking the rotation of a pump driven by a three-phase electric motor, start the pump for a moment to see if the rotation is correct. If the shaft, coupling, or V-belt is not visible, rotation can usually be determined by observing the motor cooling fan. If the rotation is incorrect, have qualified personnel interchange any two of the three-phase wires to change direction.

Lines With a Bypass

Either a Gorman-Rupp automatic air release valve or a hand operated shutoff valve may be installed in a bypass line.

If a Gorman-Rupp automatic air release valve has been installed, close the throttling valve in the discharge line. The Gorman-Rupp valve will automatically open to allow the pump to prime, and automatically close when priming has been accomplished. After the pump has been primed, and liquid is flowing steadily from the bypass line, open the discharge throttling valve.

If a hand operated shutoff valve has been installed, close the throttling valve in the discharge line, and open the bypass shutoff valve so that the pump will not have to prime against the weight of the liquid in the discharge line. When the pump has been primed, and liquid is flowing steadily from the bypass line, close the bypass shutoff valve and open the discharge throttling valve.

Lines Without a Bypass

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required discharge flow rate.

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Overheating

Overheating can occur if the valves in the suction and discharge lines are closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the volute casing with cool liquid.

WARNING

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

Strainer Check

Check the suction strainer regularly during pump operation, or if the pump flow rate begins to drop, and clean it as necessary. Be especially alert for unusual noises when pumping liquids containing solids.

Pump Vacuum Check

Install a vacuum gauge in the system, using pipe dope on the threads.

The pump should pull a vacuum of 20 inches or more of mercury at operating speed with the suction line blocked. If it does not, check for air leaks in the seal or gaskets.

Open the suction line, and read the vacuum gauge with the pump primed and at operating speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionately to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilizing, an air leak exists. Before checking the lines for the source of the air leak, check the point of installation of the vacuum gauge.

STOPPING

After stopping the pump, disconnect the power source to ensure that the pump will remain inoperative.

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts.

If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from draining completely, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F are considered normal for pedestal bearings, and they can operate safely to at least 180°F.

Checking bearing temperatures by hand is inaccurate. They can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperatures is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see LUBRICATION in MAINTENANCE AND REPAIR). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Dynamic operation will bring the temperatures down to normal levels.

TROUBLESHOOTING

WARNING

Before attempting to open or service the pump:

1. Consult pump service manual.
2. Disconnect the power source to ensure that the pump will remain inoperative.
3. Allow pump to cool if overheated.
4. Close suction and discharge valves.
5. Drain pump.

Trouble	Possible Cause	Probable Remedy
PUMP FAILS TO PRIME	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Suction check valve clogged or binding.	Clean valve.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See INSTALLATION.
	Suction strainer clogged.	Clean suction strainer.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct as needed. Check submergence chart (Section B, page 4).
	Lining of suction hose collapsed.	Replace suction hose.
	Impeller or other wearing parts worn or damaged.	Check impeller clearance. Replace worn parts as needed.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check driver output; check belts or couplings for slippage.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Reduce suction lift.

Trouble	Possible Cause	Probable Remedy
PUMP STOPS OR FAILS TO DE-LIVER RATED FLOW OR PRESSURE (cont)	Leaking or worn seal or pump gaskets.	Check pump vacuum. Replace leaking or worn seal or pump gaskets.
	Suction strainer clogged.	Clean suction strainer.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver output; check that sheaves or couplings are correctly sized.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve clogged or binding.	Free valve, and clean or replace it.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

MAINTENANCE AND REPAIR

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.

Performance Curve Not Furnished

*** STANDARD PERFORMANCE FOR PUMP MODEL 112B60-B**

* Based on 70°F clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.
If your pump serial number is followed by an "N" or if you have a question on performance, contact The Gorman-Rupp Company.

SECTIONAL DRAWING

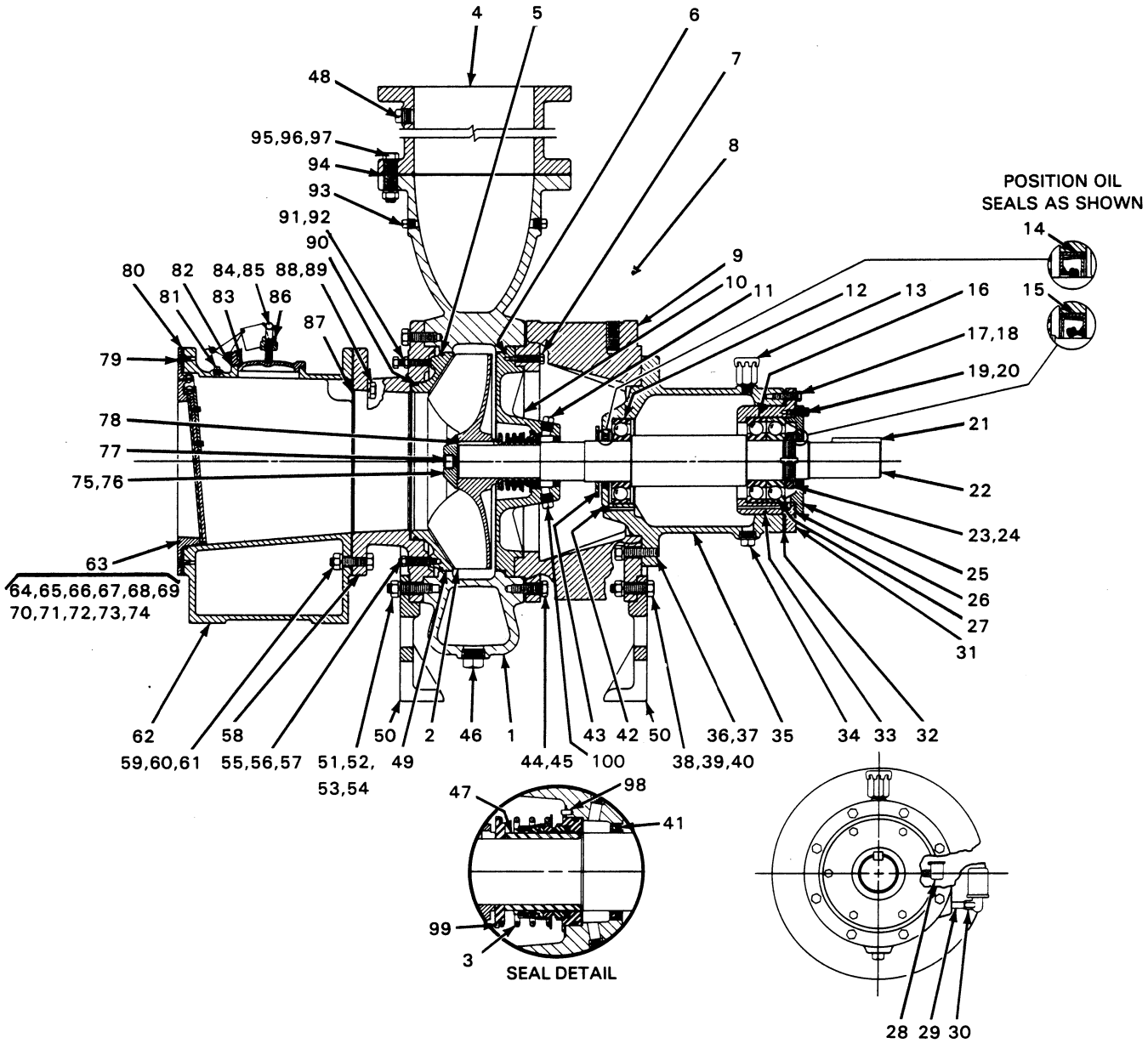


Figure 1. Pump Model 112B60-B

PARTS LIST

PUMP MODEL 112B60-B

(From S/N 725610 up)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	VOLUTE CASING	38222-702	10010	1
2	★IMPELLER	38615-702	11010	1
3	★SEAL ASSEMBLY	46512-062		1
4	SPOOL FLANGE	38642-605	10010	1
5	★O-RING	25152-283		1
6	★O-RING	25152-283		1
7	HEX HEAD CAPSCREW	B-0610	15991	2
8	DOES NOT APPLY			
9	INTERMEDIATE	38264-701	10010	1
10	★SEAL PLATE	38272-702	10010	1
11	SEAL CAVITY PLUG	4823	11991	2
12	★BALL BEARING	23275-018		1
13	★PEDESTAL AIR VENT	S-1703		1
14	★OIL SEAL	25227-931		1
15	★OIL SEAL	25258-880		1
16	★BALL BEARING	23413-418		1
17	HEX HEAD CAPSCREW	B-0808	15991	8
18	LOCKWASHER	J-08	15991	8
19	HEX HEAD CAPSCREW	B-0605	15991	6
20	LOCKWASHER	J-06	15991	6
21	★SHAFT KEY	N-1216	15990	1
22	★IMPELLER SHAFT	38512-513	15010	1
23	BEARING LOCKNUT	23962-018		1
24	LOCKWASHER	23962-518		1
25	★BEARING CAP	38322-416	10010	1
26	★BEARING CAP GSKT SET	48211-041		1
27	★BALL BEARING	23413-418		1
28	SEAL OIL CUP	S-0617		1
29	NIPPLE	T-0408	15070	1
30	★PEDESTAL BOTTLE OILER	26713-025		1
31	BEARING HOUSING	38331-603	10010	1
32	★BEARING SHIM SET	48261-030		1
33	★O-RING	25152-266		1
34	PEDESTAL DRAIN PLUG	P-12	11990	1
35	PEDESTAL	38251-507		1
36	HEX HEAD CAPSCREW	B-1211	15991	4
37	LOCKWASHER	J-12	15991	4
38	HEX HEAD CAPSCREW	B-1212	15991	4
39	LOCKWASHER	J-12	15991	4
40	HEX NUT	D-12	15991	4
41	★OIL SEAL	25227-911		1
42	PIPE PLUG	25258-002	11990	1
43	★SLINGER RING	31134-047	19080	1
44	HEX HEAD CAPSCREW	B-1210	15991	12
45	LOCKWASHER	J-12	15991	12
46	VOLUTE DRAIN PLUG	P-24	11990	1
47	★SHAFT SLEEVE	31572-002	17200	1
48	ACCESSORY PIPE PLUG	P-16	11990	1
49	★WEAR PLATE	38691-851	11030	2
50	PEDESTAL FOOT	38151-002	10010	1
51	HEX HEAD CAPSCREW	B-1209	15991	8
52	LOCKWASHER	J-12	15991	12
53	STUD	C-1215	15991	4
54	HEX NUT	D-12	15991	4
55	STUD	C-0814	15991	4
56	LOCKWASHER	J-08	15991	4
57	HEX NUT	D-08	15991	4
58	SUCTION HEAD	38246-610	10010	1
59	HEX HEAD CAPSCREW	B-1413	15991	10
60	LOCKWASHER	J-14	15991	10
61	HEX NUT	D-14	15991	10
62	CHECK VALVE FLANGE	14270-A	10010	1
63	★CHECK VALVE ASSEMBLY	14284		1
64	CHECK VALVE SHAFT	14282	17010	2
65	BEARING PIVOT	14274	17070	2
66	DRY SLEEVE BEARING	S-2282		4
67	GROOVED PIN	21142-433		4
68	FLANGED SEAT	14273-A	10010	1
69	BUTTON HD CAPSCREW	CM-0404	15990	2
70	BUTTON HD CAPSCREW	CM-0403	15990	2
71	HEX HEAD CAPSCREW	B-0402	15991	4
72	LOCKWASHER	J-04	15991	4
73	VALVE PLATE	14283	15990	1
74	VALVE ASSY MOLD	14281	24010	1
75	★IMPELLER WASHER	31167-012	15030	1
76	★IMPELLER ROLL PIN	S-2197		1
77	★IMPELLER CAPSCREW	BD-1206	15990	1
78	★IMPELLER KEY	N-1012	15990	1
79	FLT SCH CAPSCREW	F-0404	15990	2
80	★CHECK VLV FLNG GSKT	14273-G	20000	1
81	ACCESSORY PLUG	P-04	11990	1
82	★FILL COVER GASKET	12369-G	20000	1
83	FILL COVER PLATE ASSY	48271-020		1
84	HEX HEAD CAPSCREW	B-0808	15991	2
85	FILL CVR CLAMP SCREW	8618	24000	1
86	FILL COVER CLAMP BAR	12370	11000	1
87	SUCTION HEAD GASKET	14273-G	20000	1
88	HEX HEAD CAPSCREW	B-1410	15991	2
89	LOCKWASHER	J-14	15991	2
90	★O-RING	25152-278		1
91	WEAR PLATE ADJ SCREW	31871-040		4
92	WEAR PLATE JAM NUT	AT-08	15991	4
93	PIPE PLUG	P-08	11990	2
94	★SPOOL FLANGE GASKET	2751-G	18000	1
95	HEX HEAD CAPSCREW	B-1415	15991	12
96	LOCKWASHER	J-14	15991	12
97	HEX NUT	D-14	15991	12
98	GROOVED PIN	21142-268		1
99	SPRING CNTRNG WASHER	31512-025	15991	1
100	SEAL CAV DRN PLUG	P-04	11990	1
NOT SHOWN:				
	STRAINER	4990-A		1
	ROTATION DECAL	2613-CU	00000	1
	NAME PLATE	2613-D	13990	1
	DRIVE SCREW	BM#04-03	15990	4

★INDICATES PARTS RECOMMENDED FOR STOCK

CANADIAN SERIAL NO.....AND UP

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

This pump requires little service due to its rugged, minimum-maintenance design. If it becomes necessary to inspect and/or replace the wearing parts, however, follow these instructions, which are keyed to the sectional view (see figure 1) and the accompanying parts list.

Pump Disassembly

WARNING

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the power source to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Vent the pump slowly and cautiously.
5. Close the suction and discharge valves.
6. Check the temperature before opening any covers, plates, or plugs.
7. Drain the pump.

Close all connecting valves, and remove the volute housing drain plug (46) to drain the pump. Clean and reinstall the plug after the pump has been drained.

For access to the impeller (2), disengage the hex head capscrews (44) securing the volute casing (1) and intermediate (9). The rotating assembly, intermediate, and pedestal body (35) will separate from the volute casing as a unit.

Block the impeller, and disengage the socket head capscrew (77). Remove the impeller washer (75) and roll pin (76), and slide the impeller off the shaft (22), retaining the impeller key (78). Use caution when sliding the impeller off the shaft; tension on the seal spring will be released as the impeller is removed.

Seal Disassembly

Remove the lower seal cavity plug (100) to drain the seal cavity. Clean and reinstall the plug.

Remove the spring centering washer (99) and the seal spring. Using a stiff wire with a hooked end if necessary, remove the remainder of the seal components and the shaft sleeve (47).

Bearing Disassembly

Remove the pedestal body drain plug (34) to drain the pedestal body. Clean and reinstall the plug.

Disengage the hex head capscrews (36) securing the pedestal body to the intermediate, and remove the pedestal body and the impeller shaft. Remove the slinger ring (43).

Disengage the hex head capscrews (17) securing the bearing housing (31) to the pedestal body, and remove the bearing housing, bearing housing shims (32), impeller shaft, and bearings from the pedestal body. Tie the bearing housing shims. Disengage the hex head capscrews (19) securing the bearing cap (25) to the bearing housing, and remove the bearing cap, oil seal (15), and bearing cap gasket set (26).

Remove the inboard bearing (12) from the shaft, and remove the bearing housing. Disengage the tabs of the lockwasher (24) from the locknut (23), and disengage the locknut from the shaft. Remove the outboard bearings (16).

Clean the seal cavity, the impeller shaft, and the I.D. of the bearings with a soft cloth soaked in cleaning solvent.

WARNING

Most cleaning solvents are toxic and flammable. Use them only in a well-ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Bearing Reassembly

If a Thermo Bearing Mounter is available, use it to heat the inner races of the outboard bearings to 300°F for a minimum of 6 minutes. If a Thermo Bearing Mounter is not available, use a heat lamp or other suitable device to heat the inner races.

Mount the heated outboard bearings on the impeller shaft, making certain that they are installed with the loading opening sides facing each other and the ball contact angles converging toward the center (see figure 2).

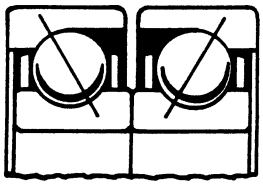


Figure 2. Correct Bearing Mounting

Also make certain that the inner bearing is seated squarely against the shaft shoulder, and that the inner races of the bearings are totally bottomed against each other.

While the bearings are still hot, promptly install the bearing lockwasher and locknut. Tighten the locknut, and bend the tabs of the lockwasher over the locknut.

Make certain that there are no burrs or dirt on the interior surfaces of the bearing housing, and use a heat lamp or other suitable device to heat the bearing housing to 300°F for a minimum of 10 minutes. Slip the cooled shaft and mounted outboard bearings into the heated bearing housing, making certain that the bearings are squarely seated against the step of the housing.

Inspect the bearing cap oil seal and replace it if worn. Install the oil seal in the bearing cap with the lip of the seal toward the bearings as shown in figure 1.

Position the bearing cap on the bearing housing, engage the hex head capscrews, and secure the bearing cap to the bearing housing. Use a feeler gauge to measure the gap between the outboard surface of the bearing housing and the inboard surface of the bearing cap. (This gap can also be measured by positioning pieces of solder wire between the two surfaces before the capscrews are fully tightened; tighten the screws, back them off, and measure the thickness of the crushed solder wire.) Add .002 inch to the measurement taken, remove the bearing cap, and add a corresponding thickness of bearing cap gaskets between the bearing cap and the bearing housing. Since the bearing cap must clamp the outer ring of the outboard bearing to preload the bearings, measurement of the gap and installation of the correct thickness of bearing cap gaskets is critical.

Install the bearing cap gaskets, lockwashers (20), and hex head capscrews, and secure the bearing cap to the bearing housing. Check the shaft for end play; if end play exists, remove bearing cap gaskets until the end play is corrected.

Use a Thermo Bearing Mounter, heat lamp, or other suitable device to heat the inner race of the inboard bearing to 300°F for a minimum of 6 minutes. Mount the bearing on the shaft, making certain that it seats squarely against the shaft shoulder.

Replace the bearing housing O-ring. Reinstall the bearing housing shims, and position the shaft, assembled bearings, and bearing housing in the pedestal body. Reinstall the lockwashers and hex head capscrews, and secure the bearing housing to the pedestal body.

Inspect the pedestal body oil seal (14) and replace it if worn. Install the oil seal in the pedestal body with the lip of the seal toward the bearing as shown in figure 1. Install the slinger ring on the shaft.

Seal Reassembly

The seal is not normally reused because of the high polish on its lapped faces, but if it is necessary to reuse the old seal, wash all metallic parts in cleaning solvent and dry thoroughly.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. If any components are worn, replace the complete seal; never mix old and new seal parts.

CAUTION

This seal is not designed for operation at temperatures above 160°F. Do not use at higher operating temperatures.

See figure 3 for the correct order of installation of seal components.

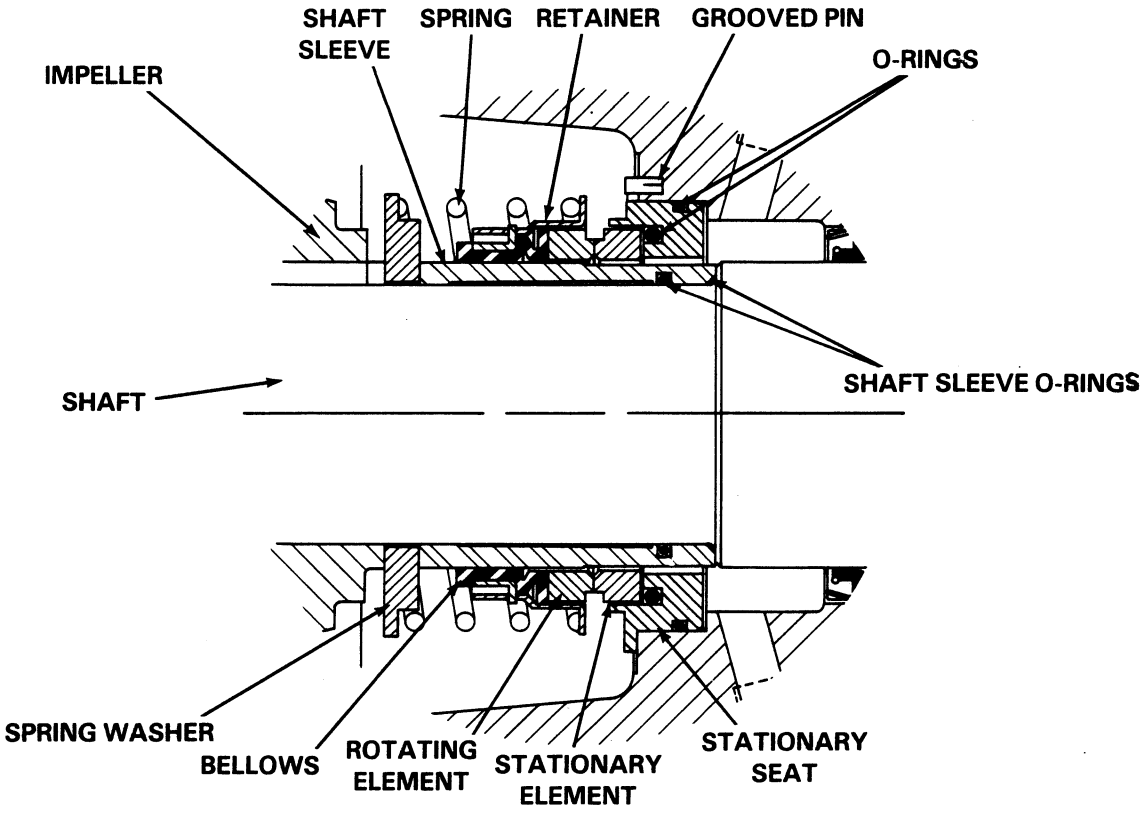


Figure 3. 46512-062 Seal Assembly

Clean and polish the shaft sleeve, or replace it if there are nicks or cuts on the end.

Install the shaft sleeve O-ring, and install the shaft sleeve with the chamfer facing the pedestal end of the pump.

Lubricate the O-rings and bellows with soft grease or oil and place a drop of light lubricating oil on the lapped faces of the seal. Assemble the seal as shown in figure 3.

Pump Reassembly

Inspect the impeller, and replace it if cracked or badly worn. Make certain that the seal components are seated squarely on the shaft sleeve, reinstall the impeller key, and slip the impeller on the shaft. Reinstall the impeller washer and roll pin, block the impeller, and reinstall and tighten the impeller socket head capscrew.

For maximum pump efficiency, there should be a clearance of .015 inch between the impeller and the seal plate. Measure this clearance, and adjust it by adding or removing bearing housing shims.

Inspect the adjustable wear plate (49), and replace it if worn or grooved. To remove the wear plate, disengage the hex nuts (57) securing it to the suction head (58). If the wear plate is removed or replaced, replace the O-rings (5 and 90) before securing it to the suction head.

Reassemble the pedestal body and the intermediate. Replace the seal plate O-ring (6), and reassemble the intermediate and the volute casing.

For maximum pump efficiency, there should be a clearance of .015 inch between the impeller and the wear plate. To arrive at this clearance, loosen the hex nuts securing the wear plate to the suction head. Back off the jam nuts (92) to the heads of the adjusting screws (91), and tighten the adjusting screws evenly no more than a half turn at a time while rotating the impeller shaft by hand. When the wear plate makes contact with the impeller at all points, back off each of the adjusting screws a half turn, and tighten the jam nuts until they are snug against the suction head. Tighten the hex nuts securing the wear plate to the suction head. The impeller clearance should now be correct.

Add clean liquid to the volute, make certain that all piping is securely tightened, and open all connecting valves before starting the pump.

LUBRICATION

Seal Assembly

Fill the seal cavity through the oil cup (28) with a good grade of SAE 30 non-detergent motor oil.

Bearings

Remove the pedestal body air vent (13). Remove the bottle oiler (30) by pulling straight up, and fill the pedestal body with a good grade of SAE 30 non-detergent motor oil. Do not fill beyond the level of the oil cup pipe nipple (29).

Clean and reinstall the pedestal body air vent. Invert the bottle oiler, depress the plunger, and fill the oiler. Reinstall the oiler, making certain that it is seated securely. Maintain the proper oil level by checking and filling the oiler regularly.

In normal service, drain and fill the pedestal body with clean oil yearly.

Press the shaft, assembled bearings and bearing housing into the pedestal body until the inboard bearing seats squarely in the pedestal body. Reinstall the lockwashers and capscrews, and secure the bearing housing to the pedestal body.

NOTE

Align the oil return grooves under the inboard and outboard bearings. Assemble the bearing housing "TOP" at 12 o'clock and the groove plug (39) at 6 o'clock position.

Install the oil seal (106) in the pedestal body with the lip positioned as shown in Figure 2. Install the slinger ring on the shaft. Secure the pedestal assembly to the intermediate, with "TOP" in proper position.

Install the bottle oiler and pipe nipple (30 and 31) in the side of the pedestal body.

Press the oil seal (100) into the seal plate with the lip positioned as shown in Figure 2. Install the seal plate in the intermediate.

NOTE

It is recommended that the seal assembly and impeller be reassembled at this point. Refer to the Seal Reassembly and Pump Reassembly sections.

Reinstall the shaft key and connect the rotating assembly to the power source. Be sure the pump and power source are properly aligned, (see alignment in Installation section) before installing the leveling shims and base mounting hardware.

Replace the volute housing O-ring (13) and secure the volute to the intermediate assembly.

Replace the discharge flange gasket and connect the discharge adaptor, and discharge piping.

Lubricate the bearings and pedestal as indicated in the LUBRICATION section.

Impeller Back Clearance

A clearance of .008 to .010 inch is required between the impeller and seal plate to achieve maximum pump efficiency. Before the seal assembly is installed, temporarily assemble the sleeve (68), centering washer (70), and impeller (2) onto the shaft. Adjust the back clearance by adding bearing housing shims (36) until the impeller binds against the seal plate when the shaft is turned. After the impeller binds, subtract .010 of shims to the bearing housing. Disassemble the impeller, washer and sleeve and proceed to Seal Reassembly.

Seal Reassembly

The seal is not normally reused because damage to the precision finished faces could result in premature failure. If it is necessary to reuse an old seal in an

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