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INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

DIAPHRAGM PRIMER

MODEL
46141—053

GORMAN-RUPP PUMPS

www.grpumps.com

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Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

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INTRODUCTION

Thank You for purchasing a Gorman-Rupp Diaphragm Primer. **Read this manual** carefully to learn how to safely install and operate your Diaphragm Primer. Failure to do so could result in personal injury or damage to the pump.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

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

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901-1217
Phone: (419) 755-1011
or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631-2870

HAZARD AND INSTRUCTION DEFINITIONS

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:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

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

SAFETY - SECTION A

This information applies to Gorman-Rupp Diaphragm Primers. Refer to the manual accompanying the pump and power source before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.

WARNING!

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the positive battery cable, or lock out incoming power to the motor and take precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature and make sure the pump is cool before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Death or serious personal injury and damage to the diaphragm primer or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the diaphragm primer or components will not be damaged when lifting. Suction and discharge hoses must be removed from the diaphragm primer before lifting. Lift the diaphragm primer or component only as high as necessary and keep personnel away from suspended objects.

WARNING!

When checking alignment, disconnect the power source to ensure that the pump will remain inoperative. Rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

WARNING!

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

WARNING!

This diaphragm primer may be used to handle materials which could cause illness through direct exposure or emitted fumes. Wear adequate protective clothing when working on the diaphragm primer or piping.

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.

WARNING!

After the pump has been installed, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.

CAUTION

Use **Only Genuine Gorman-Rupp** replacement parts. Failure to do so may create a hazard and damage the diaphragm primer or diminish optimal diaphragm primer performance. Any such hazard, damage or diminished performance is not covered by the warranty.

CAUTION

Pumps and related equipment must be installed and operated according to all national, local and industry standards.

CAUTION

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

CAUTION

It may be possible for a small amount of fluid to be expelled from the discharge port of the diaphragm primer. If any notable amount of fluid is being discharged during operation, it could indicate necessary repairs within the priming chamber assembly. If the discharged fluid is lubricating oil, the diaphragm primer should be inspected and repaired as necessary.

CAUTION

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly equipped shop by qualified personnel.

CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **Do not** spin dry bearings. This may scratch the rollers or races and cause premature bearing failure.

CAUTION

Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

INSTALLATION - SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect and install the Diaphragm Primer. Refer to the literature accompanying the pump or contact the factory for specific pump installation instructions. Refer to **MAINTENANCE AND REPAIR**, Section E in this manual for disassembly and reassembly of the Diaphragm Primer

PREINSTALLATION INSPECTION

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

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

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.

d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.

e. If the pump and/or power source have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

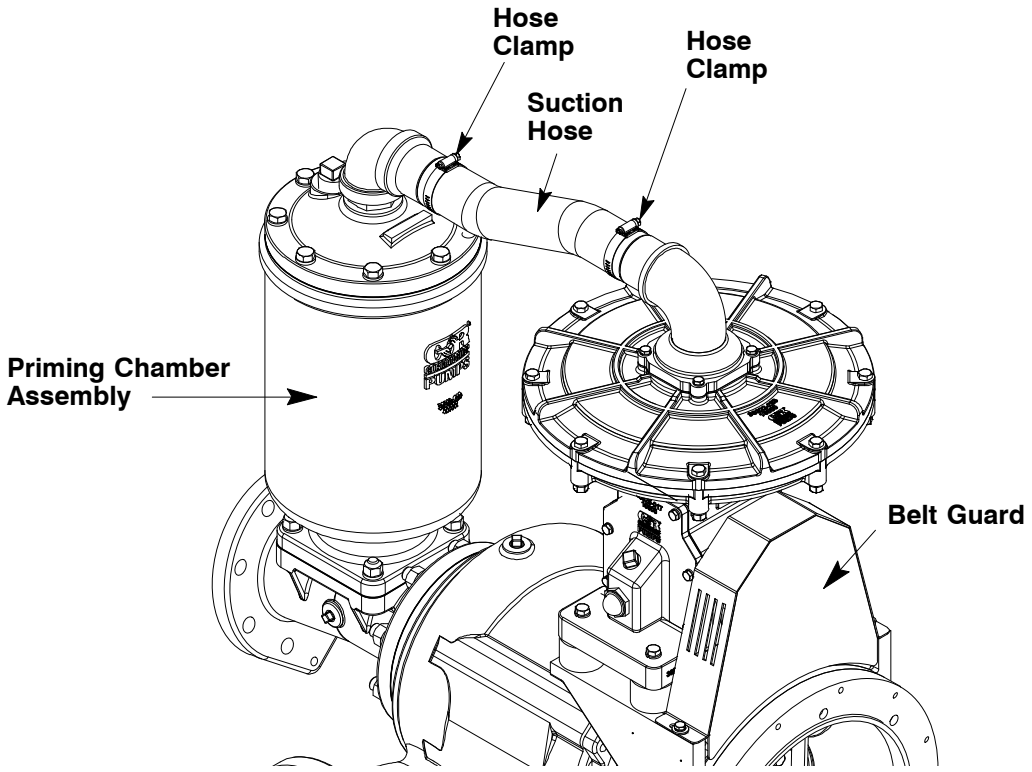

Figure B-1. Diaphragm Primer (Showed Installed on a Gorman-Rupp PA Series Pump)

POSITIONING PUMP

WARNING!

Death or serious personal injury and damage to the diaphragm primer or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the diaphragm primer or components will not be damaged when lifting. Suction and discharge hoses must be removed from the diaphragm primer before lifting. Lift the diaphragm primer or component only as high as necessary and keep personnel away from suspended objects.

Lifting

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses before attempting to lift existing, installed units.

Mounting

Locate the diaphragm primer in an accessible place as close as practical to the priming chamber assembly. Level mounting is essential for proper operation. The diaphragm primer may have to be supported or shimmed to provide for level operation and eliminate vibration.

ALIGNEMENT

WARNING!

When checking alignment, disconnect the power source to ensure that the pump will remain inoperative. Rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

CAUTION

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

The alignment of the diaphragm primer and its power source is critical for trouble−free mechanical operation. In either a flexible coupling or belt driven system, the driver and diaphragm primer must be mounted so that their shafts are aligned with and parallel to each other. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

When mounted at the Gorman−Rupp factory, driver and diaphragm primer are aligned before shipment. Misalignment will occur in transit and handling. Pumps and diaphragm primers must be checked and realigned before operation. Before checking alignment, tighten the foundation bolts. The pump, diaphragm, and power source mounting bolts should also be tightly secured.

Coupled Drives

When using couplings, the axis of the power source 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.

Align spider insert type couplings by using calipers to measure the dimensions on the circumference of the outer ends of the coupling hub every 90°. The coupling is in alignment when the hub ends are the same distance apart at all points (see Figure B-2).

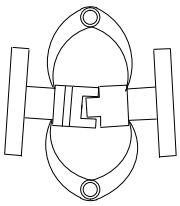

Figure B-2. Spider-type Couplings

Align non-spider type couplings by using a feeler gauge or taper gauge between the coupling halves every 90°. The coupling is in alignment when the hubs are the same distance apart at all points (see Figure B-3).

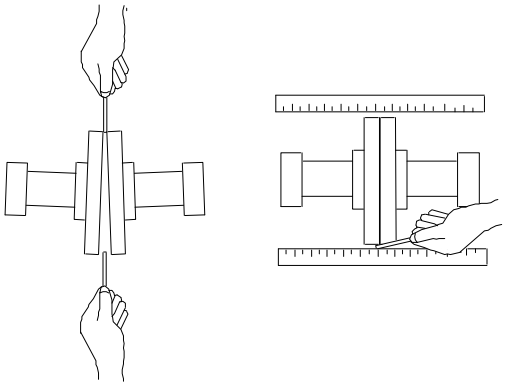

Figure B-3. Aligning Non-Spider Type Coupling

Check parallel adjustment by laying a straightedge across both coupling rims at the top, bottom, and side. When the straightedge rests evenly on both halves of the coupling, the coupling is in horizontal parallel alignment. If the coupling is misaligned, use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

Drive Belts

When using drive belts, the power source and the pump must be parallel. Use a straightedge along the sides of the pulleys to ensure that the pulleys are properly aligned (See Figure Below). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.

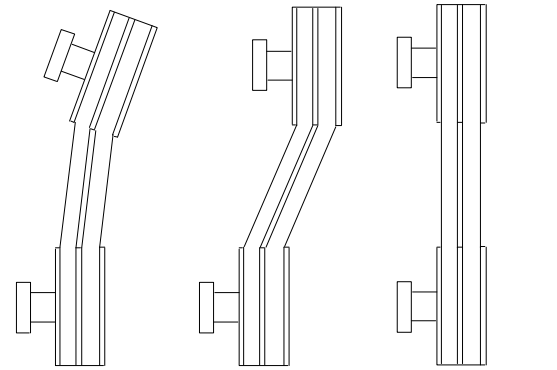

Figure B-4. V-belt Alignment

Tighten the belts in accordance with the belt manufacturer's instructions. If the belts are too loose, they will slip; if the belts are too tight, there will be excessive power loss and possible bearing failure. Select pulleys that will match the proper speed ratio; overspeeding the diaphragm primer may damage both diaphragm primer and power source.

DRIVE BELT TENSIONING

General Rules of Tensioning

For new drive belts, check the tension after 5, 20 and 50 hours of operation and re-tension as required in accordance with the belt manufacturer's instructions. Thereafter, check and re-tension if required monthly or at 500 hour intervals, whichever comes first.

Ideal drive belt tension is the **lowest** tension at which the belt will not slip under peak load conditions. Do not over-tension v-belts. Over-tensioning will shorten both v-belt and bearing life. Under-tensioning will cause belt slippage. Always keep belts free from dirt, grease, oil and other foreign material which may cause slippage.

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

Install the suction hose and secure the hose clamps. Set the belt guard in place and Install the belt guard mounting hardware.

OPERATION - SECTION C

THEORY OF OPERATION

Review all SAFETY information in Section A.

A Prime Assisted (PA Series) centrifugal pump **will not prime** if air is not evacuated from the suction line of the system. This can be achieved by creating vacuum pressure with a diaphragm primer that allows air to move through the priming chamber as it fills with fluid.

WARNING!

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

WARNING!

After the pump has been installed, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.

CAUTION

Pumps and related equipment must be installed and operated according to all national, local and industry standards.

NOTICE

The operating speed of this Diaphragm Primer should be kept between 900 and 1800 RPM.

NOTICE

It is recommended the ambient air temperature remain above 15° F (–9.4° C) during operation of the Diaphragm Primer. Operating below this temperature could cause damage to components or prevent priming.

PRIMING

Install the diaphragm primer and suction hose as described in the **INSTALLATION** section of this manual. Make sure that the hose connections are tight, that the diaphragm primer is securely mounted and that all guards are in place. Check that the diaphragm primer is properly lubricated (see **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual)

During the priming cycle, air from the suction line is vented to atmosphere through the priming chamber assembly and out through the discharge port of the diaphragm primer.

CAUTION

It may be possible for a small amount of fluid to be expelled from the discharge port of the diaphragm primer. If any notable amount of fluid is being discharged during operation, it could indicate necessary repairs within the priming chamber assembly.

Once the system is fully primed the priming chamber will close, blocking the ability for fluid to make its way into the diaphragm primer. Complete priming is indicated by a positive discharge pressure reading on the centrifugal pump.

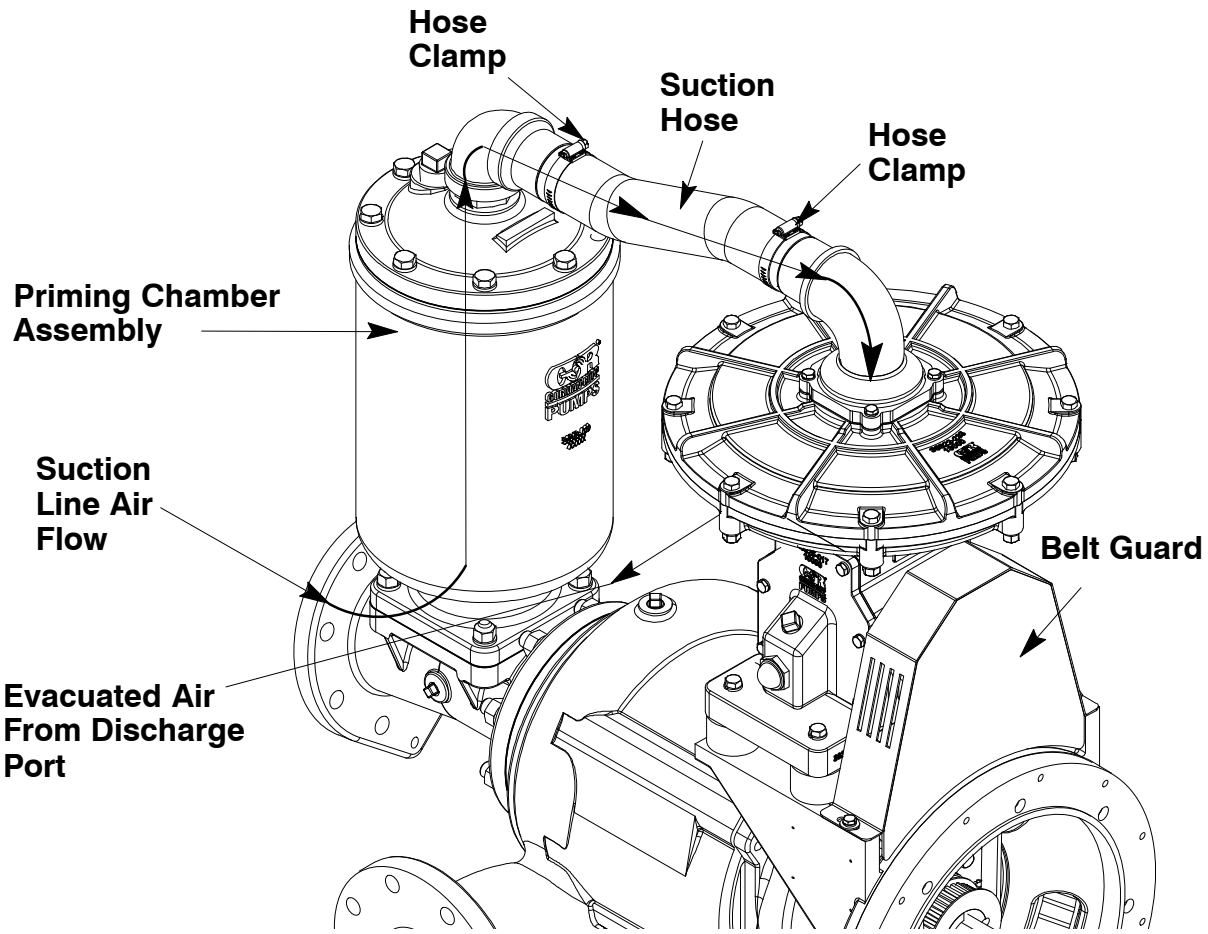

Figure C-1. Diaphragm Primer (Showed Installed on a Gorman-Rupp PA Series Pump)

PERIODIC CHECKS

Bearing Lubrication

The bearing housing was fully lubricated at the factory. Check the lubrication levels before startup, and regularly thereafter as indicated in Section E **MAINTENANCE AND REPAIR**. Maintain bearing housing lubrication at ¾ up the sight gauge when not running and ¼ up the sight gauge when running. When lubrication is required, use **only** SAE No. 30 non-detergent oil.

Other Checks

Other periodic checks should be conducted using the **Preventive Maintenance Schedule** in Section D **TROUBLESHOOTING** as a guideline.

TROUBLESHOOTING - SECTION D

Review all SAFETY information in Section A.

Before attempting to open or service the pump:

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

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	See documentation or manual provided from pump manufacturer.	See documentation or manual provided from pump manufacturer.
DIAPHRAGM PRIMER FAILS TO DISCHARGE AIR / PRIME THE PUMP	Air leak in suction line.	Correct leak. Replace suction hose as required.
	Air leak in suction line at connections to the diaphragm primer or priming chamber.	Check and tighten the hose clamps on both ends. Replace as required.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or diaphragm primer gasket.	Check diaphragm primer vacuum. Replace leaking or worn seal or gasket.
	Diaphragm is damaged.	Check and replace as required.
	Valves are damaged.	Check and replace as required.
	Clogged suction / discharge port.	Remove suction / discharge hoses and clear clog as necessary.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
		Check level of lubrication.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Drive misaligned.	Align drive properly.
	Excessive tension on drive belt.	Check belt tension. Adjust as required.

PREVENTIVE MAINTENANCE

Pump applications are seldom identical, therefore pump wear is directly affected by many different factors. This section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp Diaphragm Primer. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. The appearance of wearing parts should be documented at each inspection for comparison as well. Also, if records indicate that a certain part fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 500 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maintenance Schedule

Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Bearing Lubrication	I				R
Belts		I			
Diaphragm Primer and Driver Alignment			I		
Shaft Deflection					I
Oil Seal					I
Bearings					I
Bearing Housing					I
Hoses					I
Valves					I
Diaphragm Assembly					I
Slingers					I

Legend:
I = Inspect, Clean, Adjust, Repair or Replace as Necessary
C = Clean
R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 500 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

SECTION DRAWING

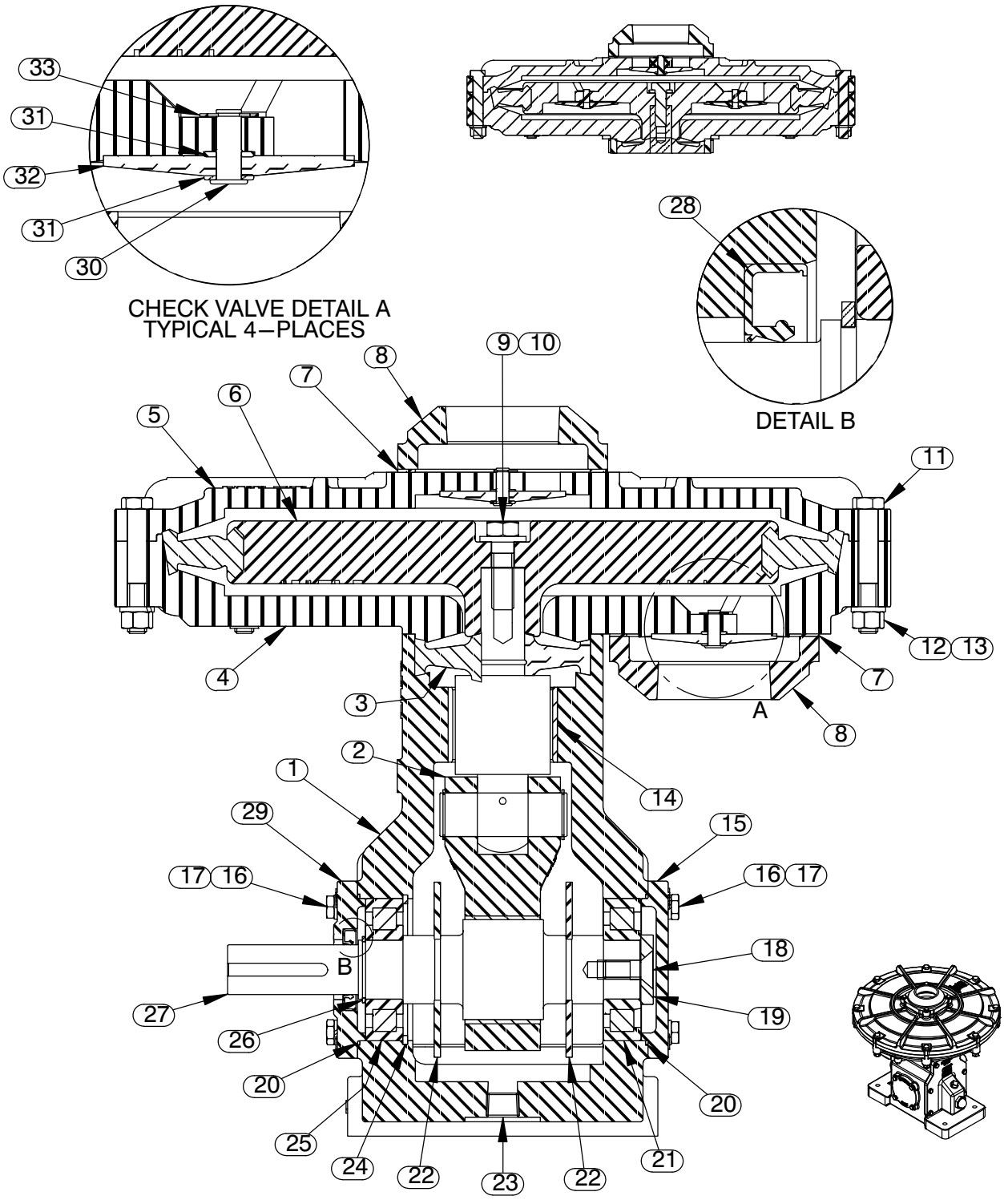

Figure E-1. DIAPHRAGM PRIMER 46141-053

PARTS LIST
Diaphragm Primer
(From S/N 1707842 Up)

ITEM NO.	PART NAME	PART NUMBER	QTY
1	BEARING HOUSING	38251−004 10000	1
2	CONNECTING ROD ASSY	46181−013	1
3	NECK SEAL	38681−413 19060	1
4	LOWER HOUSING	38322−448 13000	1
5	UPPER HOUSING	38322−233 13000	1
6 ✳	DIAPHRAGM ASSEMBLY	42111−453	1
7 ✳	PORT GASKET	38687−602 19060	2
8	FLANGE	38644−210 10000	2
9	HEX HD CAP SCRW	21632−939	1
10	FLAT WASHER	21161−502	1
11	HEX HEAD CAP SCREW	B0610 15991	8
12	HEX NUT	D06 15991	8
13	LOCK WASHER	J06 15991	8
14	BUSHING	23177−087	1
15	BEARING COVER	38324−212 10000	1
16	HEX HEAD CAP SCREW	B0404 15991	22
17	LOCK WASHER	J04 15991	22
18	FLAT HEAD CAP SCREW	F0604 15990	1
19	BEARING RET WASHER	31167−045 1500X	1
20✳	O−RING	25152−039	2
21✳	ROLLER BEARING	23529−007	1
22	SLINGER	31132−090 19060	2
23	SOC HD PIPE PLUG	PC06 15079	1
24	RETAINING RING	S219	1
25✳	ROLLER BEARING	23535−002	1
26✳	SNAP RING	26821−382	1
27	CRANKSHAFT	38551−003 1600X	1
28✳	OIL SEAL	25258−206	1
29	DRIVE END BEARING COVER	38324−213 10000	1
30	RETAINING PIN	38112−004 17000	4
31	WASHER	31131−109 17000	8
32✳	VALVE	31138−003 19060	4
33	RETAINING RING	21756-189	4
34	INSPECTION COVER	38325−017 10000	1
35✳	INSPECTION COVER GASKET	38687−603 19060	1
36	PIPE PLUG	P08 15079	1
37	SIGHT GAUGE	S1471	2
38	STREET ELBOW	AGS08 11999	1
39	REDUCER PIPE BUSHING	AP0802 15079	1
40	AIR VENT	S1530	1
41	ASSEMBLY PLATE	2613GG 13990	1
42	DRIVE SCREW	BM#04−03 17000	2
43	HEX HEAD CAP SCREW	B0604 17000	4
44	FLAT WASHER	KE06 17000	4
45	OIL LEVEL DECAL	38816−274	2
46	SUCTION DECAL	6588AG	1
47	KEY	N047 15990	1
REPAIR KITS:			
	DIAPHRAGM REPAIR KIT	48221-178	1
	DIAPHRAGM PRIMER REPAIR KIT	48221-179	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

48221-178 DIAPHRAGM REPAIR KIT CONSISTS OF THESE ITEM NO: 3,6,7,9,10,30,31,32,33.

48221-179 DIAPHRAGM PRIMER REPAIR KIT CONSISTS OF THESE ITEM NO: 2,3,6,7,9,10,14,18,20,21,24,25,26,27,28,30,31,32,33,35,37,47

DRAWING

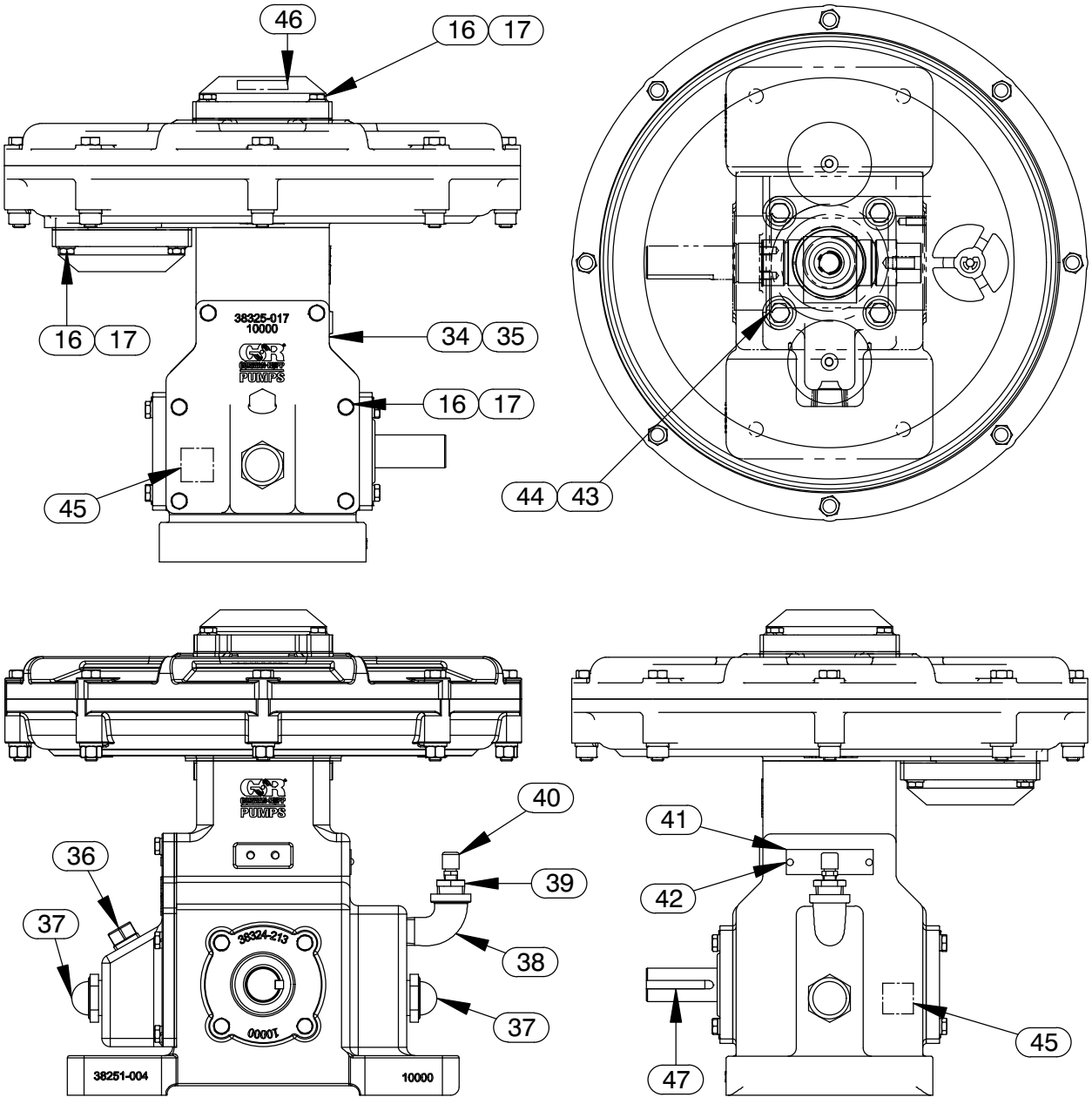

Figure E-2. DIAPHRAGM PRIMER 46141-053

PARTS LIST (CONTINUED)
Diaphragm Primer
(From S/N 1707842 Up)

ITEM NO.	PART NAME	PART NUMBER	QTY
1	BEARING HOUSING	38251−004 10000	1
2	CONNECTING ROD ASSY	46181−013	1
3	NECK SEAL	38681−413 19060	1
4	LOWER HOUSING	38322−448 13000	1
5	UPPER HOUSING	38322−233 13000	1
6 ✳	DIAPHRAGM ASSEMBLY	42111−453	1
7 ✳	PORT GASKET	38687−602 19060	2
8	FLANGE	38644−210 10000	2
9	HEX HD CAP SCRW	21632−939	1
10	FLAT WASHER	21161−502	1
11	HEX HEAD CAP SCREW	B0610 15991	8
12	HEX NUT	D06 15991	8
13	LOCK WASHER	J06 15991	8
14	BUSHING	23177−087	1
15	BEARING COVER	38324−212 10000	1
16	HEX HEAD CAP SCREW	B0404 15991	22
17	LOCK WASHER	J04 15991	22
18	FLAT HEAD CAP SCREW	F0604 17000	1
19	BEARING RET WASHER	31167−045 1500X	1
20✳	O−RING	25152−039	2
21✳	ROLLER BEARING	23529−007	1
22	SLINGER	31132−090 19060	2
23	SOC HD PIPE PLUG	PC06 15079	1
24	RETAINING RING	S219	1
25✳	ROLLER BEARING	23535−002	1
26✳	SNAP RING	26821−382	1
27	CRANKSHAFT	38551−003 1600X	1
28✳	OIL SEAL	25258−206	1
29	DRIVE END BEARING COVER	38324−213 10000	1
30	RETAINING PIN	38112−004 17000	4
31	WASHER	31131−109 17000	8
32✳	VALVE	31138−003 19060	4
33	RETAINING RING	21756−189	4
34	INSPECTION COVER	38325−017 10000	1
35✳	INSPECTION COVER GASKET	38687−603 19060	1
36	PIPE PLUG	P08 15079	1
37	SIGHT GAUGE	S1471	2
38	STREET ELBOW	AGS08 11999	1
39	REDUCER PIPE BUSHING	AP0802 15079	1
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	DIAPHRAGM PRIMER REPAIR KIT	48221-179	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

48221-178 DIAPHRAGM REPAIR KIT CONSISTS OF THESE ITEM NO: 3,6,7,9,10,30,31,32,33.

48221-179 DIAPHRAGM PRIMER REPAIR KIT CONSISTS OF THESE
ITEM NO: 2,3,6,7,9,10,14,18,20,21,24,25,26,27,28,30,31,32,33,35,37,47

MAINTENANCE AND REPAIR

Review all SAFETY information in Section A.

Gorman-Rupp Diaphragm Primers require little service due to their rugged, minimum-maintenance design. However, if it becomes necessary to replace parts, follow these instructions which are keyed to the sectional view (Figure 1) and the accompanying parts lists.

CAUTION

Use **Only Genuine Gorman-Rupp** replacement parts. Failure to do so may create a hazard and damage the diaphragm primer or diminish optimal diaphragm primer performance. Any such hazard, damage or diminished performance is not covered by the warranty.

NOTE

When appropriate recycling facilities are available, the user should recycle components and fluids when doing any routine maintenance / repairs and also at the end of the pump's useful life. All other components and fluids shall be disposed of according to all applicable codes and regulations.

WARNING!

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

WARNING!

Before attempting to service the Diaphragm Primer:

1. **Familiarize yourself with this manual.**
2. **Shut down the engine and disconnect the positive battery cable, or lock out incoming power to the motor and take precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature and make sure the pump is cool before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Death or serious personal injury and damage to the diaphragm primer pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the diaphragm primer or components will not be damaged when lifting. Suction and discharge hoses must be removed from the diaphragm primer before lifting. Lift the diaphragm primer or component only as high as necessary and keep personnel away from suspended objects.

NOTE

Whenever complete disassembly is necessary it is recommended to remove the Diaphragm Primer from the pump. The unit should be moved to a clean working area, such as a workbench, for disassembly and reassembly.

Diaphragm Primer Removal

See documentation or manual provided from pump manufacturer.

Diaphragm Primer Disassembly

(Figure E-1 & E-2)

To inspect the two outer valves, remove the suction port (8). Disengage the cap screws (16) and separate the port and gasket (7) from the upper housing (5). To remove the discharge port (8), disengage the cap screws (16) and separate the port and gasket (7) from the lower housing (4).

Inspect the exposed valves (32) for wear or damage. To remove either valve, further disassembly is necessary as described in the following instructions.

To remove the upper housing (5), disengage the mounting hardware (11, 12 and 13). Remove the upper housing and disengage the retaining ring (33) to remove the valve (32), washers (31) and retaining pin (30) from the housing.

To inspect or replace the inner two valves (32), disengage the diaphragm assembly mounting hardware (9 and 10). Remove the diaphragm assembly (6) from the lower housing (4). If the assembly needs to be gently pried around the edges, use caution not to damage the diaphragm. If the diaphragm assembly (6) is damaged, it is recommended that it be replaced.

To replace the inner two valves (32) disengage the retaining ring (33). Remove the valve (32), washers (31) and retaining pin (30) from the diaphragm assembly. The discharge port valve can now be accessed and replaced if necessary by disengaging the retaining ring (33) and removing the valve (32) and retaining pin (30) from the lower housing (4).

To remove lower housing (4) disengage the 4 cap screws (43) and lift it off of the bearing housing. With the lower housing removed, the neck seal (3) is visible for inspection. If the seal is torn and leaking it should be replaced. When removing the seal, use caution not to damage the machined surfaces of the bearing housing (1).

Before further disassembly is completed, the bearing oil should be drained into an appropriate container. To drain the bearing housing (1) remove the pipe plug (23) from the bottom. Clean and reinstall the pipe plug.

In order to inspect or replace internal components, the inspection cover (34) will need removed. Disengage the cap screws (16) and washers (17) fastening the inspection cover to the bearing housing (1). Remove the inspection cover and gasket (35). It is recommended that the gasket be replaced, not reused, once removed.

With the inspection cover removed it may be possible to see if internal components, such as the slingers (22), connecting rod assembly (2) and crankshaft (27) are damaged or worn.

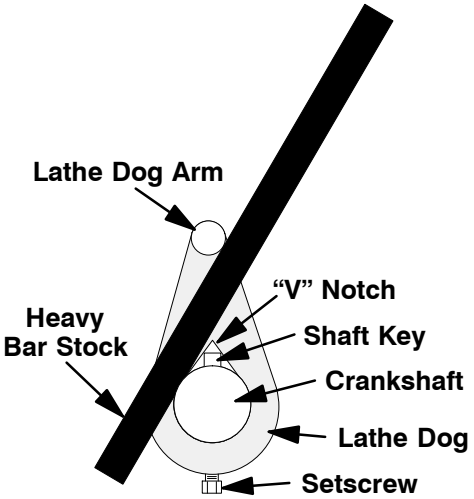
CAUTION

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly equipped shop by qualified personnel.

To remove the drive end bearing cover (29) disengage the cap screws (16). Slide the cover off the end of the shaft using caution not to damage the shaft or oil seal (28). Remove and discard the O-ring (20). It is recommended that the oil seal and O-ring be replaced once removed from the pump.

To remove the opposite bearing cover (15) disengage the cap screws (16). Slide the cover off of the bearing housing (1). Remove and discard the O-ring (20). The O-ring should not be reused.

Figure E-3



Remove the bearing retaining washer (19) by stabilizing the crankshaft (27) at the drive end with the use of a lathe dog, shown in figure E—3, or other means. Disengage the cap screw (18) and remove the two components together.

Carefully slide the crankshaft (27) out towards the drive end of the bearing housing (1) far enough to remove the slinger (22) on the bearing retaining washer end of the shaft. Slide the crankshaft through the bearing housing. It may be necessary to use a small rubber mallet on the bearing cover end of the shaft to start the bearing movement. Use caution not to damage the material should it become necessary to use a flat head screwdriver to manipulate the remaining slinger (22) through the opening in the housing.

Remove the connecting rod assembly (2) by pulling it downward and out through the inspection cover (34) opening. Inspect the neck seal (3) for damage.

After the crankshaft and bearings have been removed, clean and inspect the bearings (21 and 25) **in place** as follows.

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.

Clean the bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **Do not** spin dry bearings. This may scratch the rollers or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing rollers. If rotation is rough or the bearing rollers are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the bearing housing. Replace the bearings, shaft, or bearing housing if the proper bearing fit is not achieved.

If bearing replacement is required, use a pair of snap ring pliers to remove the snap ring (26). Use a bearing puller to remove the bearing (21 or 25) from the shaft.

If the slingers (22) are damaged, they should be replaced. Slide the remaining slinger off the drive end of the shaft. It is recommended that they both be replaced once disassembled to this point.

If the bearing (14) or the retaining ring (24) contained in the bearing housing (1) are damaged, they should be replaced. To replace the bearing, use a flat metal plate or dowel of the appropriate diameter to press the bearing down and out of the opening. Add a lubricant such as a light grease or oil on the O.D. of the new bearing, and press it into the bearing housing in the same manner used to remove the old one. Use care not to damage any machined faces. The top of the new bearing should be lined up with the top of the opening in the

bearing housing lip. To replace a damaged retaining ring, use a pair of snap ring pliers to remove the retaining ring (24), use the pliers to install the new retaining ring.

Diaphragm Primer Reassembly

(Figure E-1 & E-2)

Inspect the bearings (14, 21 and 25) for excessive wear or scoring. If replacement of any of the bearings or internal retaining ring (14) is required, follow the instructions outlined above in **Diaphragm Primer Disassembly**.

Manipulate the connecting rod assembly (2) through the inspection cover (34) opening. Slide the assembly up through the bearing (14) in the center of the bearing housing (1), using care not to scratch or score bearing surfaces. Rotate the assembly to accept the crankshaft in future assembly steps.

Slide the drive end slinger (22) onto the crankshaft (27) until it lines un on the groove closest to the largest diameter.

NOTE

The roller bearings (21 and 25) used in this assembly are unique. Use care to ensure the correct bearing is used on the opposite ends of the crankshaft.

Remove the inner ring of the new drive end (key way end) bearing (25). Lightly lubricate the I.D. of the ring and use an arbor (or hydraulic) press to install it on the crankshaft (27). This should be done with the larger O.D. of the inner ring installed towards the slinger (22) and the smaller O.D. of the ring towards the key way end. Press together until the bearing is fully seated against the shaft shoulder.

Install the outer ring of the bearing over the inner ring. Install the bearing washer over the shaft and against the bearing, with the brand markings visible. Install the snap ring (26) with a pair of snap ring pliers into the groove on the crankshaft (27) to contain the bearing.

Apply a coat of oil to the I.D. of the connecting rod assembly (2) bearing, the largest O.D. of the crankshaft (27) and the machined surface of the bearing housing (1) which the shaft will be guided through. While looking in through the inspection cover opening, it should now be possible to guide the partially assembled crankshaft through the bearing housing (1) opening on the right hand side. Slide the crankshaft through the connecting rod assembly only far enough to leave a gap on the bearing cover end for the next assembly step.

Use caution not to damage the slinger (22) if it is necessary to use a flat head screwdriver or other tool to get the component through the bearing housing opening. Install the slinger (22) on the opposite end of the crankshaft (27) through the inspection cover opening. The slinger should be seated in the groove closest to the largest O.D. of the crankshaft.

Remove the inner ring of the new bearing cover end bearing (21). Lightly lubricate the I.D. of the ring and slide it over the end of the crankshaft (27). This should be done with the larger O.D. of the inner ring installed towards the slinger (22) and the smaller O.D. of the ring towards the bearing housing opening. Tap together with a small rubber mallet until the bearing is fully seated against the shaft shoulder.

Apply a coat of oil to the O.D. of the outer ring and the O.D. of the inner ring of the bearing (21). Slide the outer ring of the bearing into the bearing housing (1) until flush with with the inside of the bearing housing bore. Slide the crankshaft (27) and inner ring out into the outer ring of the bearing.

Insert capscrew (18) through the bearing retaining washer (19). Engage cap screw (18) into the end of the crankshaft (27) and torque to 38 ft—lbs (51.52 N—m) while holding the drive end of the crankshaft with a lathe dog as shown in figure E—3.

Apply a thin layer of grease or oil on the lip of the bearing cover (15). Roll O-ring (20) over the lip of the bearing cover (15) using caution not to damage or rip the material. Place the bearing cover (15) on to the bearing housing (1). Secure with the cap screws and lock washers (16 and 17). Torqure hardware to 9 ft—lbs (12.20 N—m).

It is advisable to ensure that the crankshaft turns and that everything inside the bearing housing is still oriented correctly. Visually inspect the internal assemblies through the inspection cover (34) opening making sure that the slingers (22) are still

in the grooves of the crankshaft (37). Turn the crankshaft on the drive end to operate the diaphragm primer. It should move smoothly by hand and not bind up.

It is recommended that the oil seal be replaced and not reused. The new oil seal (28) will need to be pressed into the drive end bearing cover (29). After removing the used oil seal, place the bearing cover (29) onto a press. Insert the oil seal (28) over its pocket. Place a piece of round metal that is between the diameter of the oil seal and the opening on the cover and press the two pieces together.

Apply a thin layer of grease or oil on the lip of the drive end bearing cover (29). Roll O-ring (20) over the lip of the bearing cover (29) using caution not to damage or rip the material. Place the bearing cover (29) over the crankshaft (27). Use caution not to dislodge the oil seal (28), or damage it on the crankshaft key way edges, while sliding the cover onto the crankshaft (27) and into the bearing housing (1). Secure with the cap screws and lock washers (16 and 17). Torque hardware to 9 ft−lbs (12.20 N−m).

Install the inspection cover (34) and inspection cover gasket (35). Use the cap screws (16) and lock washers (17) to hold them in place. With the gasket (35) between the inspection cover (34) and the bearing housing (1), finger tighten the cap screws all the way around the cover. Torque hardware to 9 ft−lbs (12.20 N−m).

Lubricate the I.D. and O.D. of the neck seal as needed (3) using P80 lubricant or water and slide it over the connecting rod assembly (2) shaft. Carefully press the component by hand into the bearing housing until fully seated. The top of the neck seal (3) outer lip should be flush with, or below, the top face of the bearing housing (1) when seated.

Pre−assemble the lower housing (4) with the valve (32) and discharge port (8). Insert the retaining pin (30) through the washer (31). Insert the retaining pin (30) through a valve (32) and another washer (31). The high side of the valve should be towards the shoulder on the retaining pin (30).

With the bottom of the lower housing (4) facing up and the machined surface laying flat on a work table, install the retaining pin (30) holding the valve (32) into the center hole of the valve opening. While holding the valve in place, flip over the lower housing. Install the retaining ring (33) into the groove on the retaining pin (30) with pliers.

Flip the lower housing (4) back over and lay it flat with the valve opening on the opposite side of the table. Line up the discharge port gasket (7) with the four tapped holes around the installed valve. Line up the discharge port (8) with the four holes of the gasket (7). Orient the discharge port (8) with the opening turned 90° to the right hand side from the center hole in the lower housing (4) (facing the GR logo). Install cap screws (16) and lock washers (17). Torque all four to 9 ft−lbs (12.20 N−m).

Clean mating surfaces of the bearing housing (1) and the lower housing (4). Apply Loctite® 515 gasket maker to the top machined surface of the bearing housing (1). Install two long studs into the tapped holes at opposite corners of the bearing housing (1) top surface. Hand tighten only. Use these studs to line up the pre−assembled lower housing (4) with the bearing housing (1). With the lower housing positioned over the studs, install two of the cap screws (43) and two flat washers (44) into the two remaining holes in the bearing housing (1). Remove the two studs. Insert the two remaining cap screws (43) and lock washers (44). Torque all four to 38 ft−lbs (51.52 N−m).

Install the new valves (32) for the diaphragm assembly (6) as follows. Lay the diaphragm assembly (6) flat with the recessed valve pockets facing up. Insert the retaining pin (30) through the washer (31). Insert the retaining pin (30) through a valve (32) and another washer (31). The high side of the valve should be towards the shoulder on the retaining pin (30). install the retaining pin (30) holding the valve (32) into a center hole of a valve opening. While holding the valve in place, flip over the diaphragm assembly (6). Install the retaining ring (33) into the groove on the retaining pin (30) with pliers. Repeat this process to install the second valve.

Turn the crankshaft until the connecting rod assembly (2) is at the highest point in its travel. With the valves facing down towards the lower housing (4) align the center post of the diaphragm assembly (6) with the top of the of the connecting rod assembly (2) in the center of the lower housing (4). If installed correctly, the diaphragm edge should seat down in the lower housing (4) edge lip at the

same sloped angle. Install the cap screw (9) and the flat washer (10). Torque to 60 ft−lbs (81.35 N−m) and cover screw head with grease (GR P/N 18685−021).

Pre−assemble the upper housing (5) with the valve (32) and suction port (8). Insert the retaining pin (30) through the washer (31). Insert the retaining pin (30) through a valve (32) and another washer (31). The high side of the valve should be towards the shoulder on the retaining pin (30).

With the top of the upper housing (5) facing down and the machined valve pocket facing up, install the retaining pin (30) holding the valve (32) into the center hole of the valve opening. While holding the valve in place, flip over the upper housing. Install the retaining ring (33), with sharp edge of retaining ring is towards the small end of the retaining pin, into the groove on the retaining pin (30) with pliers.

Lay the upper housing (5) flat on the work table with the retaining ring (33) facing up. Line up the suction port gasket (7) with the four tapped holes around the installed valve. With the opening of the port turned 90° to the right hand side from the center hole in the upper housing (4) (with the GR logo of the upper housing closest to you on the table) line up the suction port (8) with the four holes of the gasket (7). Install cap screws (16) and lock washers (17). Torque all four to 9 ft−lbs (12.20 N−m).

Lay the upper housing (5) over the lower housing (4) lining up the holes around the edge. Ensure that the diaphragm lines up with the lip in the upper housing. It functions as the gasket used between the housings and creates the seal. The upper housing should be oriented with the suction port (8) opening being turned 180° from the discharge port (8) on the lower housing (4). Install cap screws (11) from the top of the upper housing (5). Install the washers (13) and nuts (12) from the bottom. Torque all eight to 38 ft−lbs (51.52 N−m).

Once re−assembly is complete ensure that all pipe plugs (23 and 36), sight gages (37), and the vent assembly (38, 39 and 40) are installed and tight on the bearing housing (1). It is okay if the pipe plug (36) is not yet installed if you intend to fill the bearing housing with bearing oil at this time (see the installation section of this manual). A thread sealant should be used when installing the threaded pipe plug (23) into the bottom of the bearing housing (1).

Lubrication
(Figure E-2)

The bearing housing (1) was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauges (37) and maintain it at ¾ full when not running and ¼ full when running. When lubrication is required, remove the pipe plug (36) and add SAE No. 30 non-detergent oil through the opening. When lubricating a dry (overhauled) bearing housing, fill the bearing cavity with approximately 400 ml (13.53 oz.) of oil. Clean and reinstall the pipe plug. **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

Under normal conditions, drain the bearing housing once each year, or every 500 hours of operating time, and refill with clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Diaphragm Primer Installation

See documentation or manual provided from pump manufacturer.

For Warranty Information, Please Visit
www.grpumps.com/warranty
or call:
U.S.: 419-755-1280
Canada: 519-631-2870
International: +1-419-755-1352