

**INSTALLATION, OPERATION,
AND MAINTENANCE MANUAL**
WITH PARTS LIST



60 SERIES PUMP

MODEL
610M20-B

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

www.grpumps.com

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

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Register your new
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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 pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

This pump is a 60 Series, centrifugal model with an enclosed impeller. The pump is designed for pumping most non-volatile, non-flammable liquids that contain large entrained solids. The basic material of construction for wetted parts is gray iron, with a ductile iron impeller, brass and cast iron wear rings and steel impeller shaft.

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 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.

If there are any questions regarding the 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

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:



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.



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.



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 60 Series 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 begin operation.

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.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Lock out or disconnect the power source or take other 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.



This pump is designed to handle most non-volatile, non-flammable liquids containing specified entrained solids. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.



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



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



Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.



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 casing to rupture or explode.



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 – 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, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift** application where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the

specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve (see Section E, Page 1).

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure 1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING

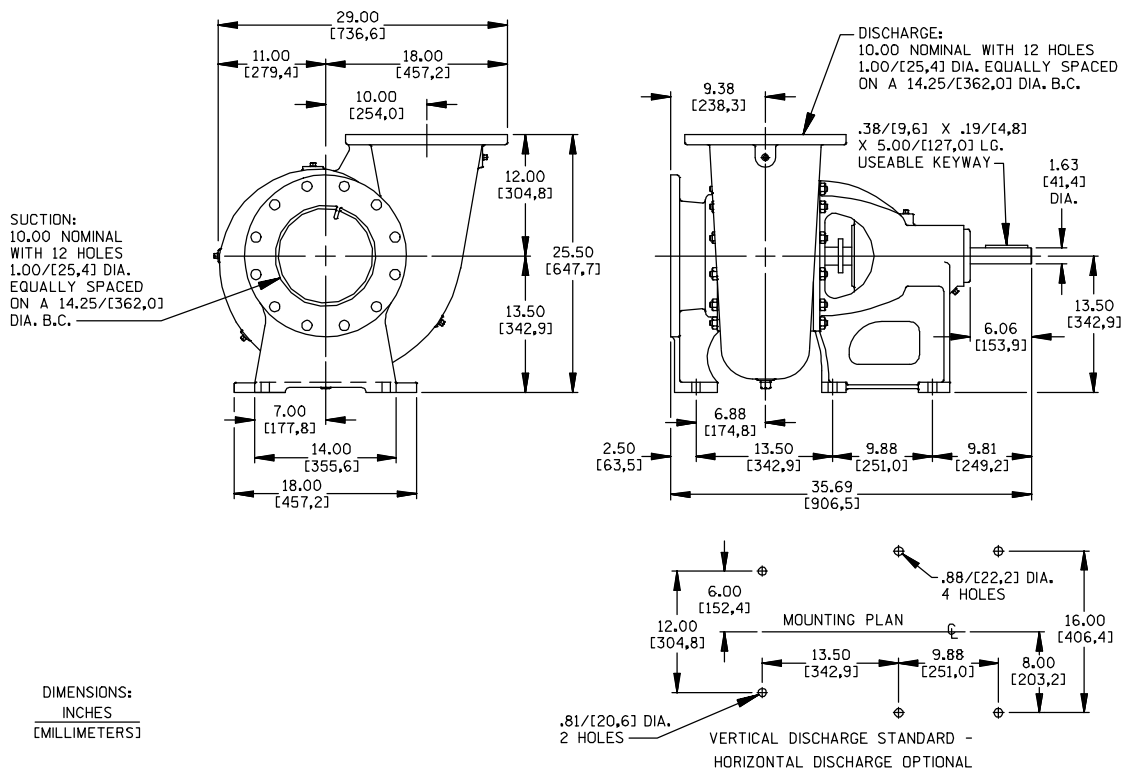


Figure 1. Pump Model 610M20-B

PREINSTALLATION INSPECTION

The pump assembly 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:

- Inspect the pump and engine for cracks, dents, damaged threads, and other obvious damage.
- Check for and tighten loose attaching hardware. Since gaskets tend to shrink after dry-

ing, 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 has 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.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

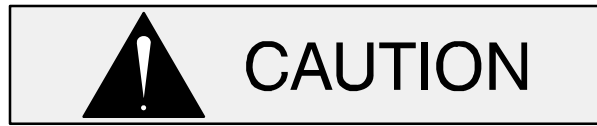
POSITIONING PUMP



Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.

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 or piping before attempting to lift existing, installed units.



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

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

SUCTION AND DISCHARGE PIPING

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping 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

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support

to secure them when 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 not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

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 horizontal to avoid air pockets.

Strainers

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 1-1/2 inch (38,1 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a

high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1 1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1-1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

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.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

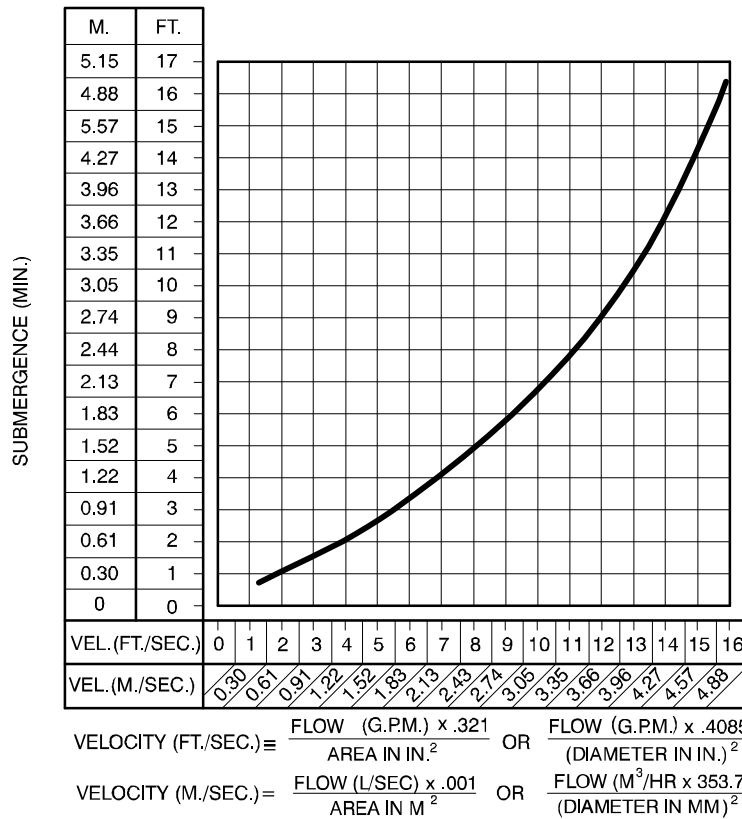


Figure 1. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

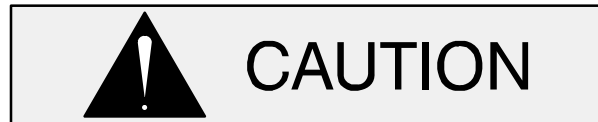
Siphoning

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 causing damage to the pump could result.

Valves

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

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



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

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. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

NOTE

Check Rotation, Section C, before final alignment of the pump.

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment will occur in transit and handling. Pumps

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



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



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

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 3A).

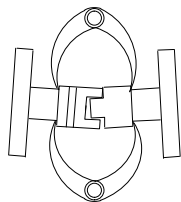


Figure 3A. Aligning Spider-Type Couplings

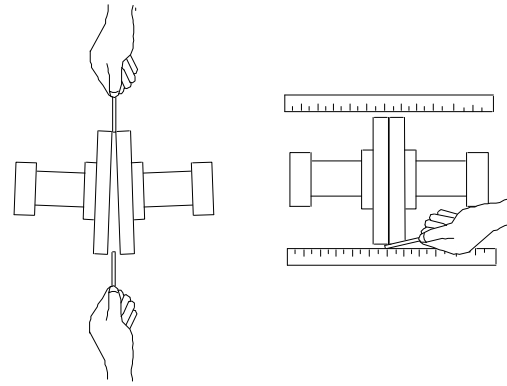


Figure 3B. Aligning Non-Spider Type Couplings

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 3B).

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.

V-Belt Drives

When using V-belt drives, 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 3C). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.

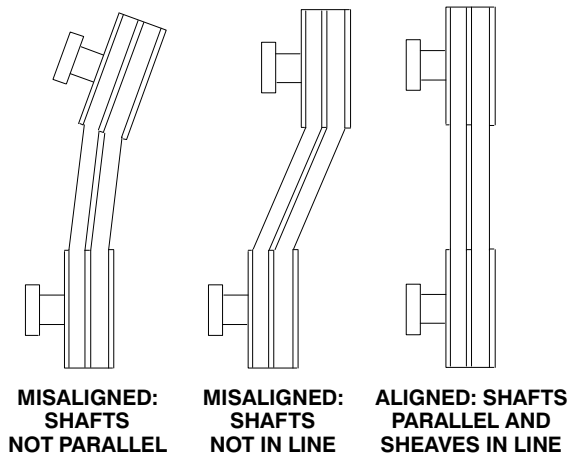


Figure 3C. Alignment of V-Belt Driven Pumps

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 pump may damage both pump and power source.



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

OPERATION – SECTION C

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.



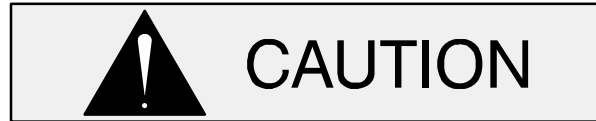
This pump is designed to handle clean liquids containing specified entrained solids. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

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 is not a self-priming pump, so an external priming device must be used if the pump is installed on a **suction lift**. A foot valve may be installed at the end of the suction pipe to maintain the prime; however, this may adversely affect pump performance due to friction loss. Many standard centrifugal models are equipped with a hand-operated vacuum pump, exhaust primer, or ejector for this purpose. If a priming device was not furnished with the pump, it may be ordered from the factory as an option.

Before attempting to operate the priming device, close the discharge throttling valve. (Installation of a spring-loaded check valve is also recommended to facilitate priming.) Once the pump is fully primed, close the valve between the priming device and pump to preserve the prime. Start the pump and open the discharge valve slowly to fill the discharge line.



Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Hand Primers

Hand-operated primers are usually mounted on the pump and, when operated, draw air out of the suction line and pump casing. To prime a pump with a hand vacuum pump, open the cock on the pump priming line. Operate the hand pump until liquid flows out of the check valve on the bottom of the primer pump. Once the pump is primed, close the valve located between the primer and the pump so that the prime will not be lost.

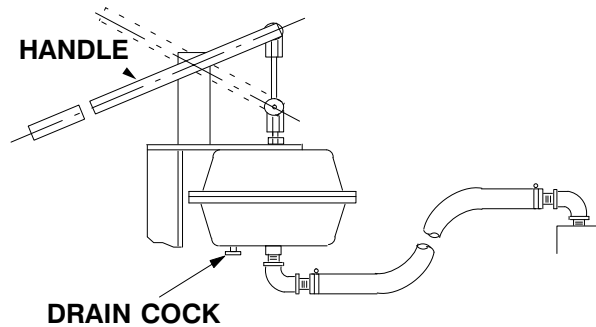


Figure 1. Hand Primer Assembly

STARTING

Consult the operations manual furnished with the power source.

OPERATION

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.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71° C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines 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 pump casing with cool liquid.



Allow an over-heated pump to cool before servicing. Do not remove plates, covers, gauges, or fittings from an over-heated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve (see Section E, Page 1).

Pump Vacuum Check

Since this pump does not have a suction check valve, the discharge line must be fitted with a check valve if a pump vacuum reading is to be taken.

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

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

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

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

Cold Weather Preservation

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 completely draining, 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 (71°C) are considered normal for bearings, and they can operate safely to at least 180°F (82°C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures 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 Section E). 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. Continued operation should bring the temperatures down to normal levels.

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. Lock out or disconnect the power source 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	Air leak in suction line. Lining of suction hose collapsed. Leaking or worn seal or pump gasket. Suction lift or discharge head too high. Strainer clogged. Suction check valve or foot valve clogged or binding.	Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Check piping installation and install bypass line if needed. See INSTALLATION . Check strainer and clean if necessary. Clean valve.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line. Lining of suction hose collapsed. Pump speed too high. Impeller or other wearing parts worn or damaged. Strainer clogged.	Correct leak. Replace suction hose. Check driver output. Replace worn or damaged parts. Check that impeller is properly centered and rotates freely. Check strainer and clean if necessary.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Pump speed too slow. Impeller clogged. Suction lift too high. Leaking or worn seal or pump gasket. Discharge head too high. Suction intake not submerged at proper level or sump too small.	Check driver output; consult the operation manual. Free impeller of debris. Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line. Check pump vacuum. Replace leaking or worn seal or gasket. Install bypass line. Check installation and correct submergence as needed.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high. Discharge head too low. Liquid solution too thick.	Check driver output. Adjust discharge valve. Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow. Suction check valve or foot valve clogged or binding.	Open discharge valve fully to increase flow rate, and run driver at maximum governed speed. Clean valve.
EXCESSIVE NOISE	Cavitation in pump. Pumping entrained air. Pump or drive not securely mounted. Impeller clogged or damaged.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory. Locate and eliminate source of air bubble. Secure mounting hardware. Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits. Low or incorrect lubricant. Suction and discharge lines not properly supported. Drive misaligned.	Check bearing temperature regularly to monitor any increase. Check for proper type and level of lubricant. Check piping installation for proper support. Align drive properly.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, 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 pump. 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. Changes in suction and discharge gauge readings (if so

equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) 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 250 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.

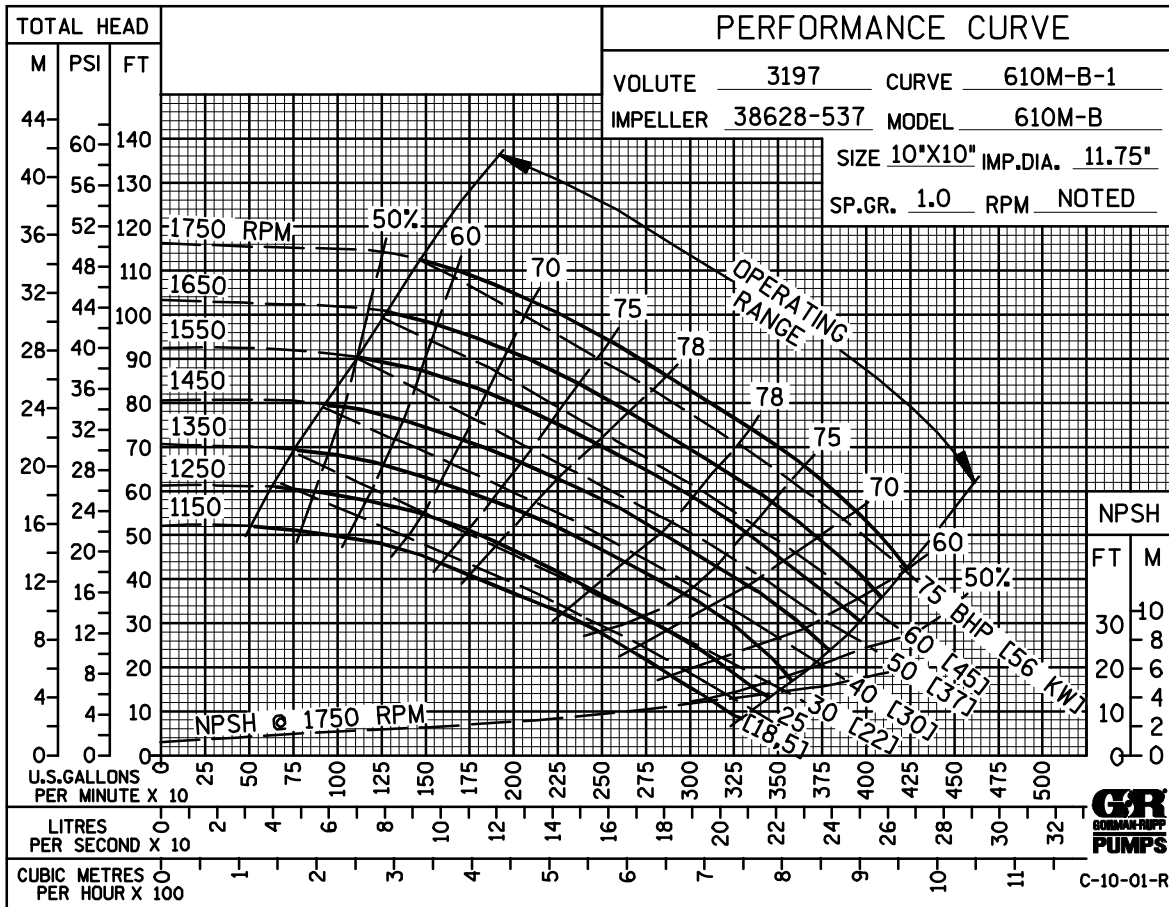
Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					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 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR - SECTION E

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



*** STANDARD PERFORMANCES FOR PUMP MODEL 610M20-B**

* Based on 70° F (21° C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be difference due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

Contact the Gorman-Rupp Company to verify performance or part numbers.

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model.



Pump speed and operating condition points must be within the continuous performance range shown on the curve.

SECTION DRAWING

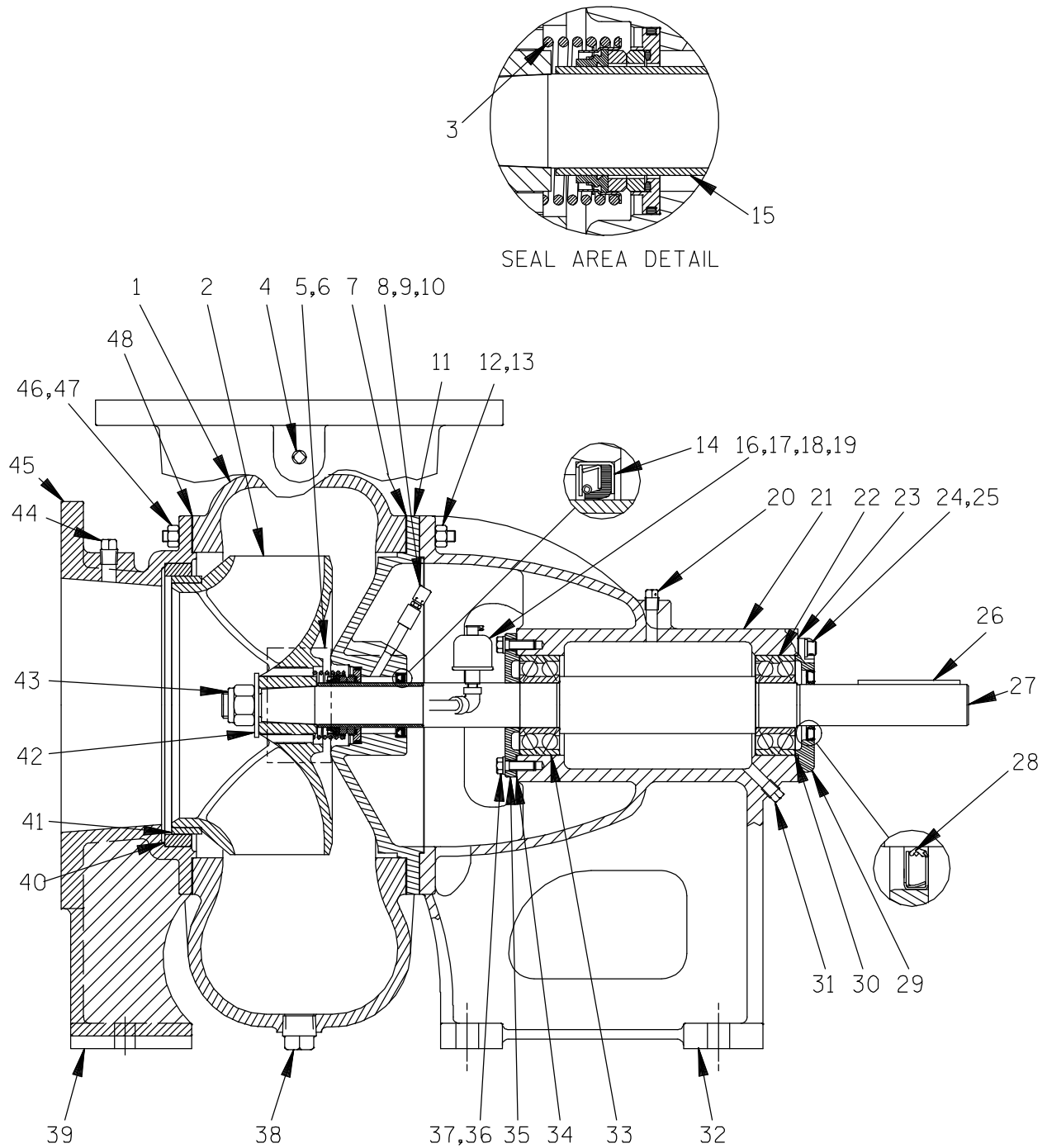


Figure 1. Pump Assembly 610M20-B

PARTS LIST
Pump Assembly 610M20-B
 (From S/N 688324 Up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	3197	10010	1	30 *	BEARING SHIM SET	8545	15990	1
2 *	IMPELLER	38628-537	11000	1	31	PIPE PLUG	P04	15079	1
3 *	SEAL ASSY	12461A	----	1	32	PEDESTAL BODY	38257-521	10000	1
4	PIPE PLUG	P04	15079	1	33 *	INBOARD BALL BEARING	S1034	----	1
5	NAME PLATE	2613C	13990	1	34 *	BEARING CAP GSKT	3236G	18000	1
6	DRIVE SCREW	BM#04-03	17000	4	35	BEARING CAP	3236	10010	1
7 *	PUMP CASING GSKT	3200G	18000	1	36	HEX HD CAPSCREW	B0605	15991	6
8	AIR VENT	S2162	----	1	37	LOCKWASHER	J06	15991	6
9	PIPE COUPLING	AE02	15079	1	38	PIPE PLUG	P16	10009	5
10	PIPE NIPPLE	T0206	15079	1	39	SUCTION HEAD	3201	10010	1
11	SEAL PLATE	38272-511	10010	1	40 *	SUCT HD WEAR RING	3203	10010	1
12	STUD	C0810	15991	12	41 *	IMPELLER WEAR RING	3204	14000	1
13	HEX NUT	D08	15991	12	42	FLAT WASHER	K16	15991	1
14 *	OIL SEAL	S1935	----	1	43	NYLON LOCK NUT	BC16S	15991	1
15	SHAFT SLEEVE	11908A	16000	1	44	PIPE PLUG	P06	15079	1
16	BOTTLE OILER	S1933	----	1	45	SUCTION STICKER	6588AG	----	1
17	STREET ELBOW	AGS02	11999	2	46	STUD	C0807	15991	12
18	PIPE ELBOW	R02	11999	1	47	HEX NUT	D08	15991	12
19	PIPE NIPPLE	T0212	15079	1	48 *	SUCTION HEAD GSKT	3200G	18000	1
20	VENTED PIPE PLUG	4823	15079	1		NOT SHOWN:			
21	ROTATION DECAL	2613M	----	1		STRAINER	3756	----	1
22 *	OUTBRD BALL BEARING	S1034	----	1		DISCHARGE STICKER	6588BJ	----	1
23 *	BEARING CAP GSKT	3237G	18000	1		LUBE DECAL	38816-075	----	1
24	SOC HD CAPSCREW	BD0604	15990	4		OPTIONAL:			
25	LOCKWASHER	J06	15991	4		SUTCION FLANGE	2751	10010	1
26	SHAFT KEY	N0616	15990	1		SUCTION FLANGE GSKT	2751G	18000	1
27 *	IMPELLER SHAFT	3241A	16040	1		DISCHARGE FLANGE	2751	10010	1
28 *	OIL SEAL	S268	----	1		DISCH FLANGE GSKT	2751G	18000	1
29	BEARING CAP	3237	10010	1					

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all Safety information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

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

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 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.

Before attempting to service the pump, disconnect the power source or take other precautions to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local power source representative.



Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source 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.**



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

Suction Head Removal

Remove the suction and discharge piping. Before attempting to service the pump, remove the pump casing drain plug (38) and drain the pump. Clean and reinstall the drain plug.

For access to the impeller (2) and seal assembly (3), the suction head (39) must be separated from the pump casing (1). Remove the nuts (47), and pull the suction head and wear ring (40) from the pump casing. Remove the suction head gasket (48).

Tie and tag any leveling shims used under the suction head and pedestal mounting feet to ease reassembly.



Use caution not to damage the suction head when removing the wear ring.

Inspect the wear ring (40) for excessive wear or damage. The wear ring is secured in the suction head by a press fit. If replacement is required, use a small bit to drill three holes horizontally through the ring, 120° apart. Use a chisel or other suitable tool to complete the cuts through the ring and remove the ring from the suction head. **Be careful** not to damage the bore when removing the ring.

Impeller And Pump Casing Removal

Before attempting to remove the impeller (2) remove the bottle oiler and piping (16, 17, 18 and 19). This will prevent oil from escaping when the impeller is removed.

Immobilize the impeller by wedging a block wood between the vanes and the pump casing, and remove the impeller capscrew and washer (42 and 43). Remove the wood block.

Install two 3/8-16 UNC capscrews (not supplied) in the tapped holes in the impeller. Attach a suitable puller to the capscrews and tighten the puller screw to pre-load the impeller. Strike the puller screw sharply with a hammer until the impeller breaks loose from the shaft. Remove the puller and the screws from the impeller.

Inspect the wear ring (41) for excessive wear or damage. The wear ring is secured on the impeller (2) by a press fit. If replacement is required, use a small bit to drill three holes horizontally through the ring, 120° apart. Use a chisel or other suitable tool to complete the cuts through the ring and remove the ring from the impeller. **Be careful** not to damage the impeller when removing the ring.

Use a hoist and sling to support the pump casing (1) and remove the nuts (13). Separate the casing and casing gasket (7) from the pedestal (32).

Seal Removal

Carefully remove the seal spring. Apply oil to the shaft sleeve (12) and work it up under the rubber bellows. Slide the rotating portion of the seal assembly off the shaft as a single unit.

Carefully slide the seal plate (11) and stationary portion of the seal off the shaft as a unit. Inspect the oil seal (11) and, if replacement is required, press it from the seal plate. Press the stationary portion of the seal out of the seal plate from the back side.

Inspect the shaft sleeve (15) for excessive scoring or wear. The shaft sleeve is secured to the shaft by a heat shrink fit. If replacement is required, use a torch to heat the sleeve evenly until it can be pulled off of the shaft.

If no further disassembly is required, refer to **Seal Reassembly And Installation**.

Shaft And Bearing Removal And Disassembly

When the pump is properly operated and maintained, the shaft and bearings should not require disassembly. Disassemble the shaft and bearings **only** when there is evidence of wear or damage.



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

NOTE

There are no provisions for draining the lubricant from the pedestal. Place a drip pan under the pedestal before disassembly.

Disengage the hardware (24 and 25) and remove the bearing cap (29), gasket (23) and bearing shims (30). Press the oil seal (28) from the bearing cap.

Place a block of wood against the impeller end of the shaft (27), and tap the shaft and assembled bearings from the pedestal.

If replacement is required, disengage the hardware (36 and 37) and remove the inboard bearing cap (35) and gasket (34).

After removing the shaft and bearings, clean and inspect the bearings (21 and 32) **in place** as follows.



To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the pedestal, shaft and all component parts with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.



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.

Rotate the bearings by hand to check for roughness or binding. If rotation is rough, replace the bearings.

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



Do not attempt to remove the bearings from the shaft unless replacement is required. Bearings will be damaged during removal.

If bearing replacement is required, use a bearing puller or an arbor (or hydraulic) press to remove the bearings from the shaft.

Shaft and Bearing Reassembly and Installation

Clean and inspect the bearings as indicated in **Shaft and Bearing Removal and Disassembly**.



To prevent damage during removal from

the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Inspect the shaft (27) for distortion, nicks or scratches or thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearing. The bearings should **never** be heated with a direct flame or directly on a hot plate.

NOTE

*If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** clean. If the oil has been previously used, it must be **thoroughly** filtered.*

Heat the bearings to a uniform temperature **no higher than 250°F (120°C)**, and slide them one at a time onto the shaft until fully seated against the shaft shoulder. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.



Use caution when handling hot bearings to prevent burns.

The outboard bearing (22) may be installed in either direction.

NOTE

Position the inboard bearing (33) on the shaft with the loading groove positioned as indicated in the following illustration.

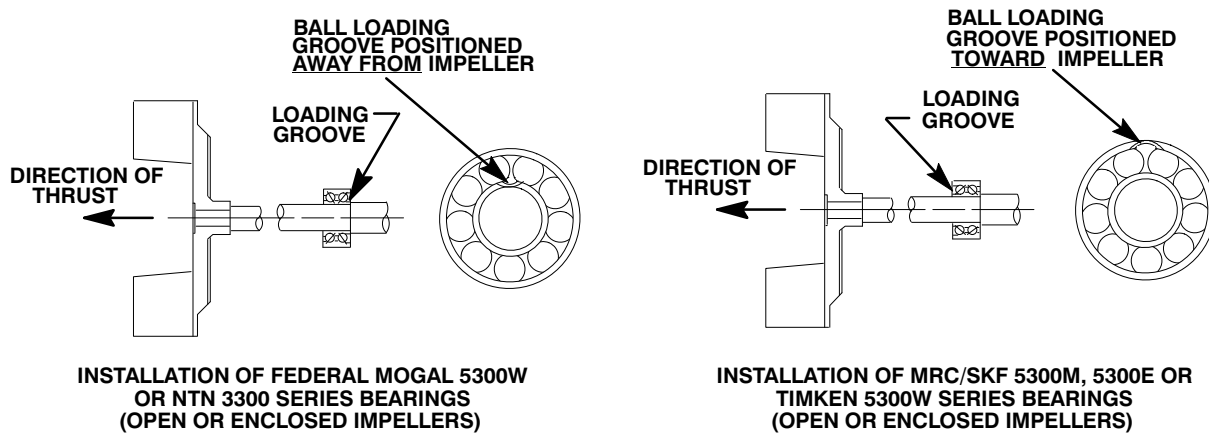


Figure 2. Inboard Bearing Position

After the bearings have been installed and allowed to cool, check to ensure that they have not moved out of position in shrinking. If movement has occurred, use a suitably sized sleeve and a press to reposition the bearings.

If heating the bearings is not practical, use a suitably sized sleeve and an arbor (or hydraulic) press to install the bearings on the shaft.



CAUTION

When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

After installation on the shaft, pack the bearings by hand with No. 0 lithium based grease.

If removed secure the bearing cap gasket (34) and bearing cap (35) to the pedestal (31) with the hardware (36 and 37).

Slide the shaft and assembled bearings into the pedestal bore until the inboard bearing (33) seats squarely against the bearing cap (35).



CAUTION

When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Apply a light coating of oil to the lip of the oil seal (28) and press it into the bearing cap (29) with the lip positioned as shown in Figure 1. The face of the oil seal should be just flush with the outer face of the bearing cap.

Install the same thickness of bearing shims (30) as previously remove. Install the bearing cap gasket (23) and secure them to the pedestal with the hardware (24 and 25). **Be careful** not to damage the lip of the oil seal on the shaft keyway.

NOTE

Impeller shaft endplay should be between .002 and .010 inch (0,05 to 0,25 mm). Add or subtract shims to establish the correct endplay.

Seal Reassembly and Installation

(Figures 1 and 3)

Clean the seal cavity and shaft with a cloth soaked in fresh 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.

The seal is not normally reused because wear patterns on the finished faces cannot be realigned

during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leak-

age. Clean and polish the shaft sleeve, or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts.**

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the O-rings and bellows with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 3).

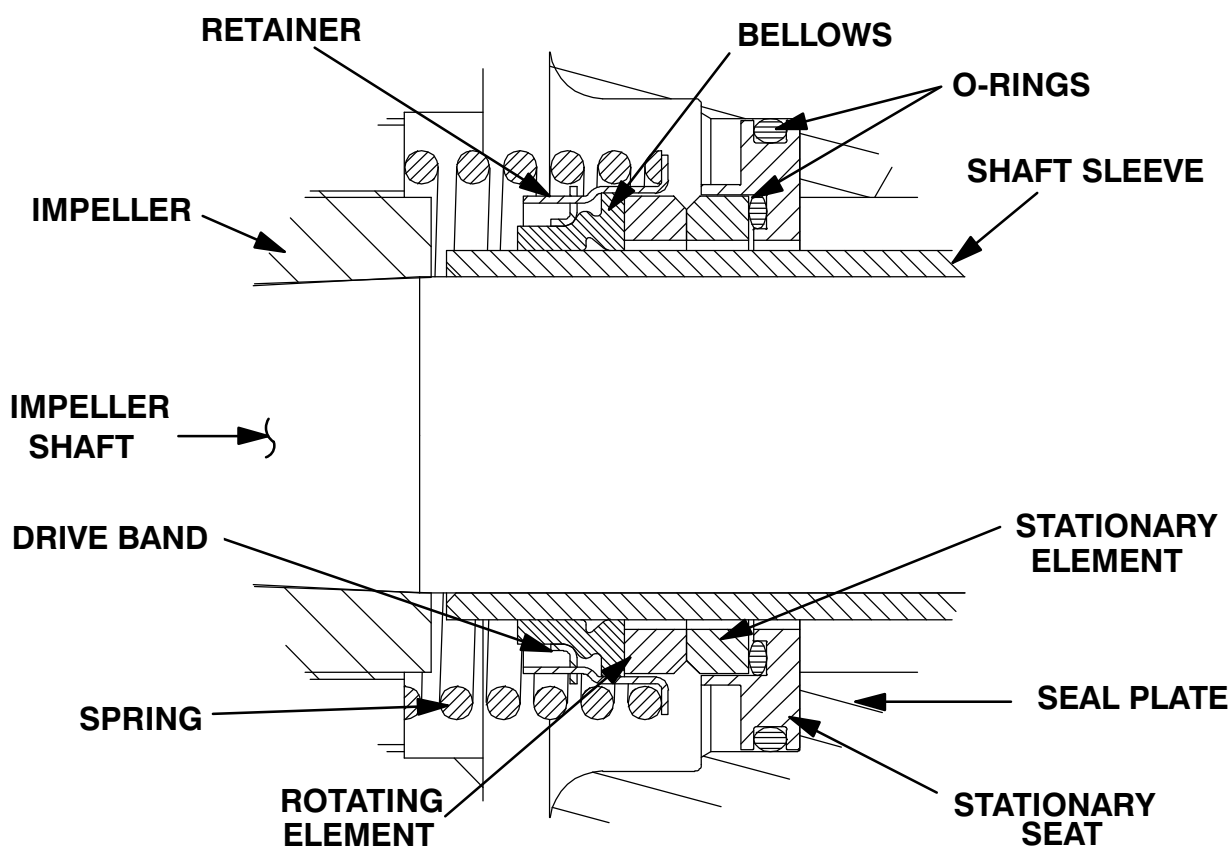
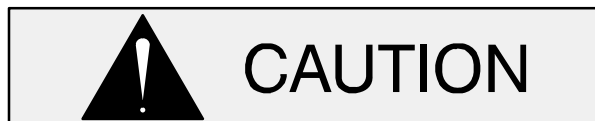


Figure 3. 12461A Seal Assembly



This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

Inspect the seal plate, shaft sleeve and the impeller shaft for burrs or sharp corners, and remove any that exist.

If the shaft sleeve (15) was removed for replacement, heat the replacement sleeve to a uniform temperature **no higher than** 250°F (120°C). Position the sleeve on the shaft with the chamfered end

toward the pedestal and slide it onto the shaft until fully seated against the shaft shoulder. This should be done quickly, in one continuous motion, to prevent the sleeve from cooling and sticking on the shaft.

Install the oil seal (14) in the seal plate (11) with the lip positioned as shown in Figure 1. Make sure the oil seal is fully seated.

Position the seal plate against the pedestal. **Be careful** not to damage the oil seal lip on the shaft threads. Align the bottle oiler hole with the opening in the pedestal, and temporarily secure the seal plate to the pedestal using four 1/2-16 by 1-1/2 long capscrews and nuts (not supplied).

Assemble the O-rings into the stationary seat. Press the stationary element into the stationary seat. Press this subassembly into the seal plate bore until fully seated. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the tube should be approximately the same as the I.D. of the seal spring.

Subassemble the rotating element into the rotating portion of the seal assembly. Lubricate the shaft sleeve with water or light oil and slide the rotating portion of the seal assembly onto the sleeve until the seal faces contact.

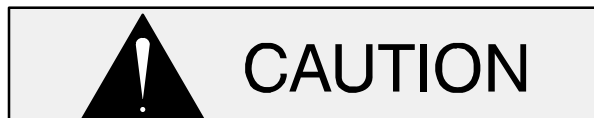
Install the seal spring.

After the impeller has been installed, lubricate the seal as indicated in **LUBRICATION**.

Impeller Installation

Inspect the impeller, and replace it if cracked or badly worn.

If the wear ring (41) was removed, press the replacement ring onto the impeller until the outer edge of the wear ring is **just flush** with the machined face of the impeller.



The wear ring **must** seat squarely on the

impeller; otherwise binding and/or excessive wear will occur as the shaft turns.

Be sure the impeller bore and the shaft are free of oily film and completely dry. **Do not** apply lubricants of any kind to the impeller bore or the tapered section of the shaft. Install the impeller (2) and impeller washer (42) on the shaft (26). Make sure the seal spring seats squarely over the impeller hub.

Coat the threads of the impeller shaft with 'Never-Seez' or equivalent compound. Secure the impeller by torquing the nut (43) to 200 ft. lbs. (2400 in. lbs or 27,7 m. kg.).

Pump Casing Installation

Remove the four capscrews temporarily holding the seal plate to the pedestal.

Install the pump casing gasket (7) and pump casing over the impeller. Secure the seal plate and casing to the pedestal with the nuts (13).

Suction Head Installation

If removed at disassembly, position the wear ring (40) in the suction head (39) with the chamfered end toward the suction head bore. Press the wear ring into the suction head until it seats squarely against the bore shoulder.



The wear ring **must** seat squarely in the suction head or binding and/or excessive wear will result.

Install the suction head gasket (48) and secure the suction head to the pump casing with the nuts (47). **Be careful** not to damage either of the wear rings when positioning the suction head.

Replace any leveling shims used under the suction head mounting feet.

Final Pump Assembly

Reinstall the bottle oiler and piping (16, 17, 18 and 19) in the seal plate.

Install the suction and discharge lines and open all valves. Make certain that all piping connections are tight, properly supported and secure.

Be sure the pump has been properly lubricated, see **LUBRICATION**.

Before starting the pump, be sure the pump is fully primed.

LUBRICATION

Seal Assembly

Fill the bottle oiler (16) with SAE No. 30 non-detergent motor oil. Check the oil level regularly and keep the bottle oiler full.

Bearings

The pedestal was fully lubricated when shipped from the factory. Under normal conditions, remove the vented plug (20) and add one shot of No. 0 lithium base grease from a grease gun after each 250 hours of operation or once each month, whichever comes first. **Do not** over lubricate. Over lubrication can cause the bearings to over heat, resulting in premature bearing failure.

There are no provisions in the bearing cavity to drain or flush the lubricant. The pump and pedestal must be disassembled to completely clean and maintain this cavity.

Under normal conditions, change the grease after each 5000 hours of operation, or at 12 month intervals, whichever comes first. Change the grease more frequently if the pump is operated continuously or installed in an environment where variable hot and cold temperatures are common.

When lubricating a dry (overhauled) pedestal, fill the cavity with approximately 1-1/4 pound (0,57 kg) of grease.



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.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

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

**For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:
519-631-2870**