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INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

T SERIES PUMPS

MODEL

T8A3–B–F4L

THE GORMAN-RUPP COMPANY D **MANSFIELD, OHIO**

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

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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INTRODUCTION

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

This pump is a T Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is flex-coupled to a gearbox driven by a Deutz F4L diesel engine. It is designed for handling sewage, wastewater, trash and slurries containing large entrained solids. The basic material of construction for wetted parts is gray iron, with ductile iron wearing parts and alloy steel impeller shaft.

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

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901--1217
or
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

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

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.

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 T Series engine driven pumps. Refer to the manual accompanying the engine 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.

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off the engine ignition and disconnect the positive battery cable 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 dirty water 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.

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.

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.

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.

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.

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed dis-

charge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

WARNING!

This pump is designed to handle materials which could cause illness through direct exposure or emitted fumes. Wear adequate protective clothing when working on the pump or piping.

WARNING!

Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.

WARNING!

Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank. Always use the correct type of fuel.

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 2200 RPM.

CAUTION

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

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.

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

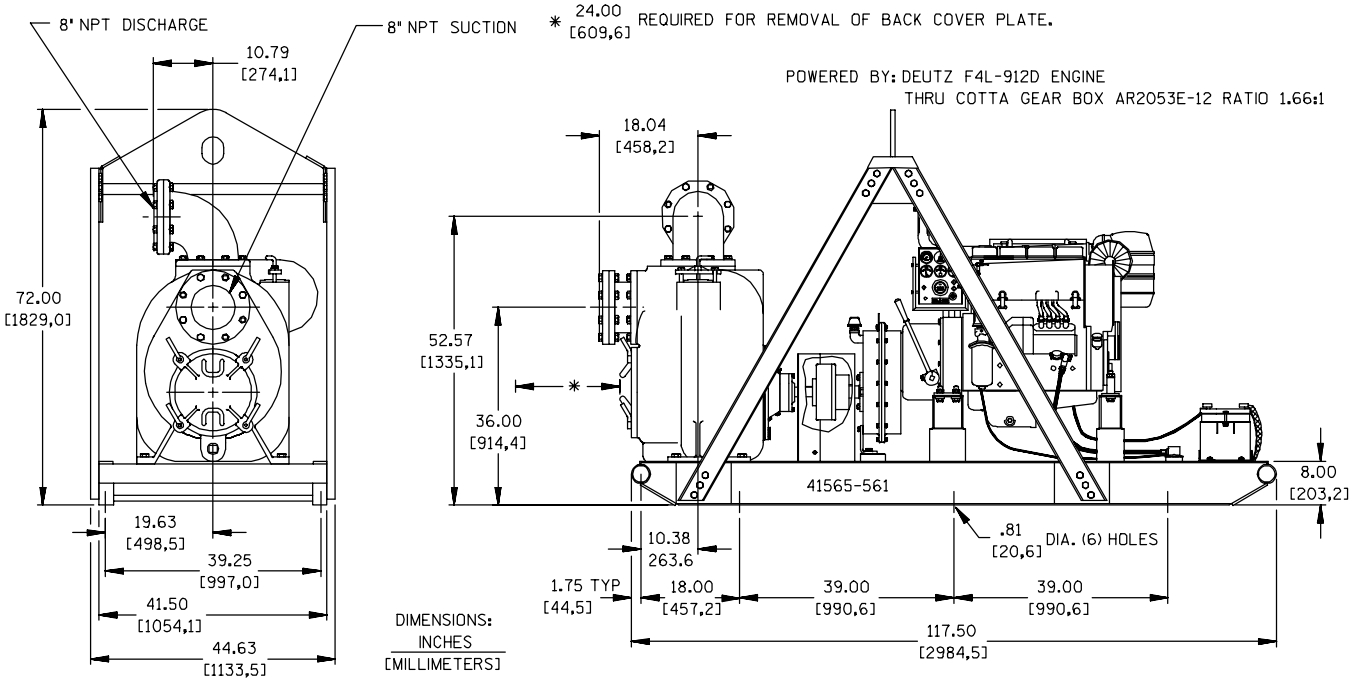


Figure 1. Pump Model T8A3–B–F4L

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:

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

b. 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 and engine 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.

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.

Battery Specifications And Installation

Unless otherwise specified on the pump order, the engine battery was **not** included with the unit. Refer to the following specifications when selecting a battery.

Table 1. Battery Specifications

Voltage	Cold Crank Amps @ 0_F	Reserve Capacity @ 80_F (Minutes)	Amp/ Hr. Rating	Approx. Overall Dims. (Inches)
12 Volts	960–975	365	175	20.5L x 8.75W x 9.75H

Refer to the information accompanying the battery and/or electrolyte solution for activation and charging instructions.

Before installing the battery, clean the positive and negative cable connectors, and the battery terminals. Secure the battery by tightening the holddown brackets. The terminals and clamps may be coated with petroleum jelly to retard corrosion. Connect and tighten the positive cable first, then the negative cable.

POSITIONING PUMP

WARNING!

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

Use lifting equipment with a capacity of at least **20,300 pounds (9208 kg)**. This pump weighs approximately **4,045 pounds (1835 kg)**, not including the weight of accessories and optional wheel kit. Customer installed equipment such as suction and discharge piping **must** be removed before attempting to lift.

CAUTION

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.

If the pump has been mounted on a moveable base, make certain the base is stationary by setting the brake and blocking the wheels before attempting to operate the pump.

To ensure sufficient lubrication and fuel supply to the engine, **do not** position the pump and engine more than 15_ off horizontal for continuous operation. The pump and engine may be positioned up

to 30_ off horizontal for **intermittent operation only**; however, the engine manufacturer should be consulted for continuous operation at angles greater than 15_.

Clearance

When positioning the pump, allow a minimum clearance of **24 inches (609,6 mm)** in front of the back cover to permit removal of the cover and easy access to the pump interior.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve and notes on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

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 furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

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 3-inch (76,2 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 air-tight 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 2 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).

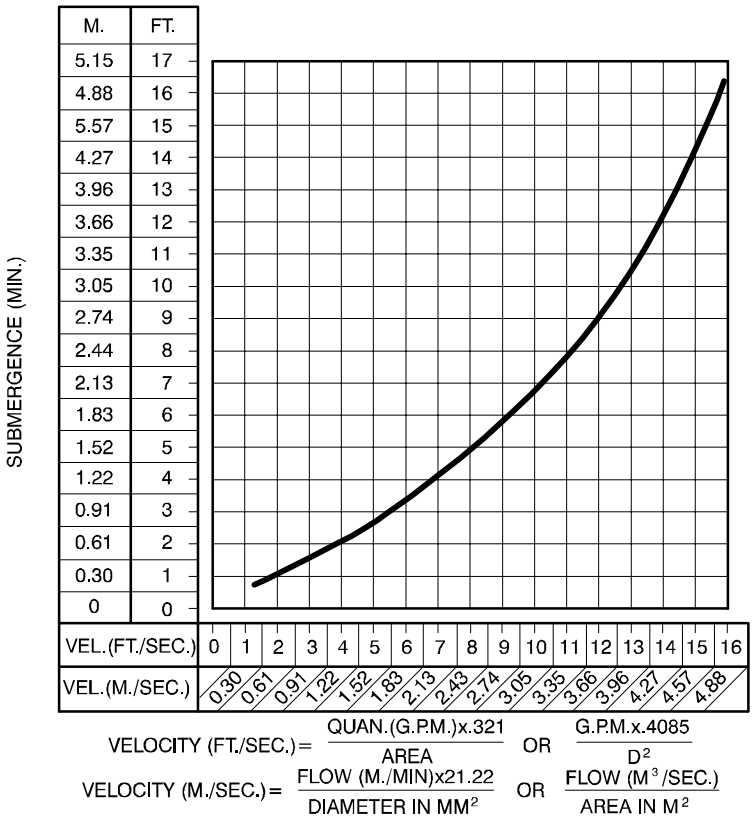


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

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

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

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.

CAUTION

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

Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch (25,4 mm) in diameter to minimize the chance of plugging.

In **low discharge head applications** (less than 30 feet (9,1 m)), it is recommended that the bypass line be run back to the wet well, and located 6 inches below the water level or cut-off point of the low level pump. In some installations, this bypass outline may be terminated with a six-to-eight foot (1,8 to 2,4 m) length of 1-1/4 inch (31,8 mm) I.D. **smooth-bore** hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.

CAUTION

A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

It is also recommended that pipe unions be installed at each 90_ elbow in a bypass line to ease disassembly and maintenance.

In **high discharge head applications** (more than 30 feet (9,1 m), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line.**

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. See **Automatic Air Release Valves** in this section for installation and theory of operation of the Automatic Air Release Valve. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

CAUTION

Except in certain specific applications (to prevent flooding during service of an automatic air release valve in a below-ground lift station), if a manual shut-off valve is installed **anywhere** in a bypass line, it **must**

be a full-opening, **ball-type** valve to prevent plugging by solids.

WARNING!

A manual shut-off valve <u>should not</u> be installed in any bypass line. A manual shut-off valve may inadvertently be left closed during operation. A pump which has lost prime may continue to operate without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

<u>Allow an over-heated pump to cool before servicing.</u> <u>Do not</u> remove plates, covers, gauges, or fittings from an overheated 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. <u>After the pump cools,</u> 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.

AUTOMATIC AIR RELEASE VALVE

When properly installed and correctly adjusted to the specific hydraulic operating conditions of the application, the Gorman-Rupp Automatic Air Release Valve will permit air to escape through the bypass line, and then close automatically when the pump is fully primed and pumping at full capacity.

Theory of Operation

Figures 3 and 4 show a cross-sectional view of the Automatic Air Release Valve, and a corresponding description of operation.

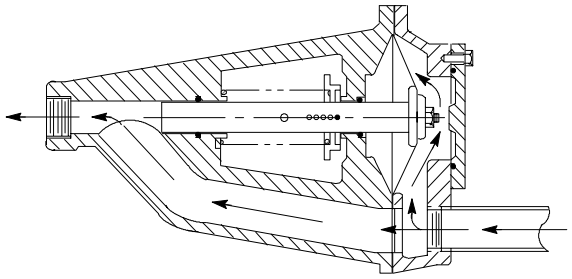


Figure 3. Valve in Open Position

During the priming cycle, air from the pump casing flows through the bypass line, and passes through the Air Release Valve to the wet well (Figure 3).

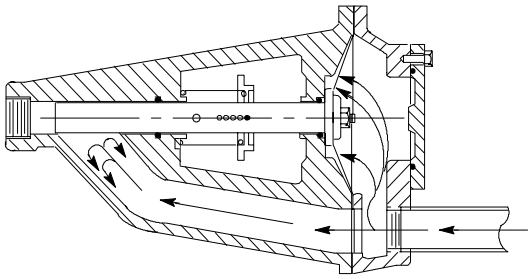


Figure 4. Valve in Closed Position

When the pump is fully primed, pressure resulting from flow against the valve diaphragm compresses the spring and closes the valve (Figure 4). The valve will remain closed, reducing the bypass of liquid to 1 to 5 gallons per minute, until the pump loses its prime or stops.

WARNING!

Some leakage (1 to 5 gallons (3,8 to 18,9 Liters) per minute) will occur when the valve is fully closed. Be sure the bypass line is directed back to the wet well or tank to prevent hazardous spills.

When the pump shuts down, the spring returns the diaphragm to its original position. Any solids that may have accumulated in the diaphragm chamber settle to the bottom and are flushed out during the next priming cycle.

NOTE

The valve will remain open if the pump does not

reach its designed capacity or head. Valve closing pressure is dependent upon the discharge head of the pump at full capacity. The range of the valve closing pressure is established by the tension rate of the spring as ordered from the factory. Valve closing pressure can be further adjusted to the exact system requirements by moving the spring retaining pin up or down the plunger rod to increase or decrease tension on the spring. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about an Automatic Air Release Valve for your specific application.

Air Release Valve Installation

The Automatic Air Release Valve must be independently mounted in a horizontal position and connected to the discharge line of the self-priming centrifugal pump (see Figure 5).

NOTE

*If the Air Release Valve is to be installed on a **staged** pump application, contact the factory for specific installation instructions.*

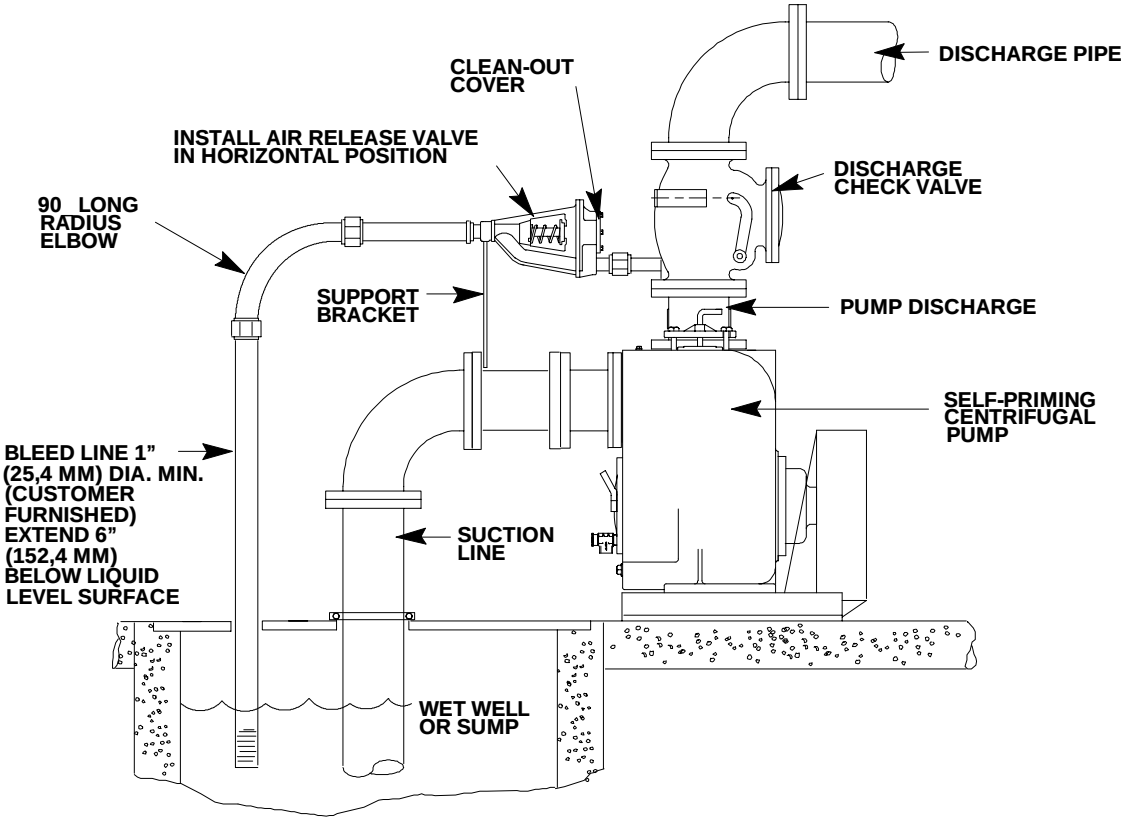


Figure 5. Typical Automatic Air Release Valve Installation

The valve inlet line must be installed between the pump discharge port and the non-pressurized side of the discharge check valve. The valve inlet is at the large end of the valve body, and is provided with standard 1 inch NPT pipe threads.

The valve outlet is located at the opposite end of the valve, and is also equipped with standard 1 inch NPT pipe threads. The outlet should be connected to a bleed line which slopes back to the wet well or sump. The bleed line must be the same size as the inlet piping, or larger. If **piping** is used for the bleed line, avoid the use of elbows whenever possible.

NOTE

It is recommended that each Air Release Valve be fitted with an independent bleeder line directed back to the wet well. However, if multiple Air Release Valves are installed in a system, the bleeder lines may be directed to a common manifold pipe. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about installation of an Automatic Air Release Valve for your specific application.

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. The driver and pump must be mounted so that their shafts are aligned with and parallel to each other.

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment can occur in transit and handling. Pumps should be checked, and realigned if necessary, before being put into operation. Before checking alignment, tighten the hardware securing the pump to the base.

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

This pump is furnished with a flexible coupling. To check alignment, use a feeler gauge or a taper gauge between the coupling halves every 90 degrees. The coupling is in alignment when the hubs are the same distance apart at all points.

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

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

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

Do not operate the pump without the coupling 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.

WARNING!

This pump is designed to handle dirty water 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.

WARNING!

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 2200 RPM.

PRIMING

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

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

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.

Add liquid to the pump casing when:

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

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

WARNING!

After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

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

STARTING

Consult the operations manual furnished with the engine**.**

OPERATION

A Gorman-Rupp automatic air release valve may be installed in a bypass line, or the bypass line may be left open.

WARNING!

A manual shut-off valve <u>should not</u> be installed in any bypass line. A manual shut-off valve may inadvertently be left closed during operation. A pump which has lost prime may continue to operate

without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

Lines With A Bypass

If a Gorman-Rupp Automatic Air Release Valve has been installed, the valve will automatically open to allow the pump to prime, and automatically close after priming is complete (see **INSTALLATION** for Air Release Valve operation).

If the bypass line is open, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without A Bypass

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

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

Leakage

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

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 completely cool before servicing it. Refill the pump casing with cool liquid.

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 completely cool before servicing.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve which will open if vapor pressure within the pump casing reaches a critical point. If over-heating does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any over-heated pump cautiously**. It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing over-heats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

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.

Pump Vacuum Check

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 (508 mm) 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, switch off the engine ignition and disconnect the positive battery cable 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.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off engine ignition and disconnect the positive battery cable 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.**

Table 1. Trouble Shooting Chart

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.

Table 1. Trouble Shooting Chart (cont.)

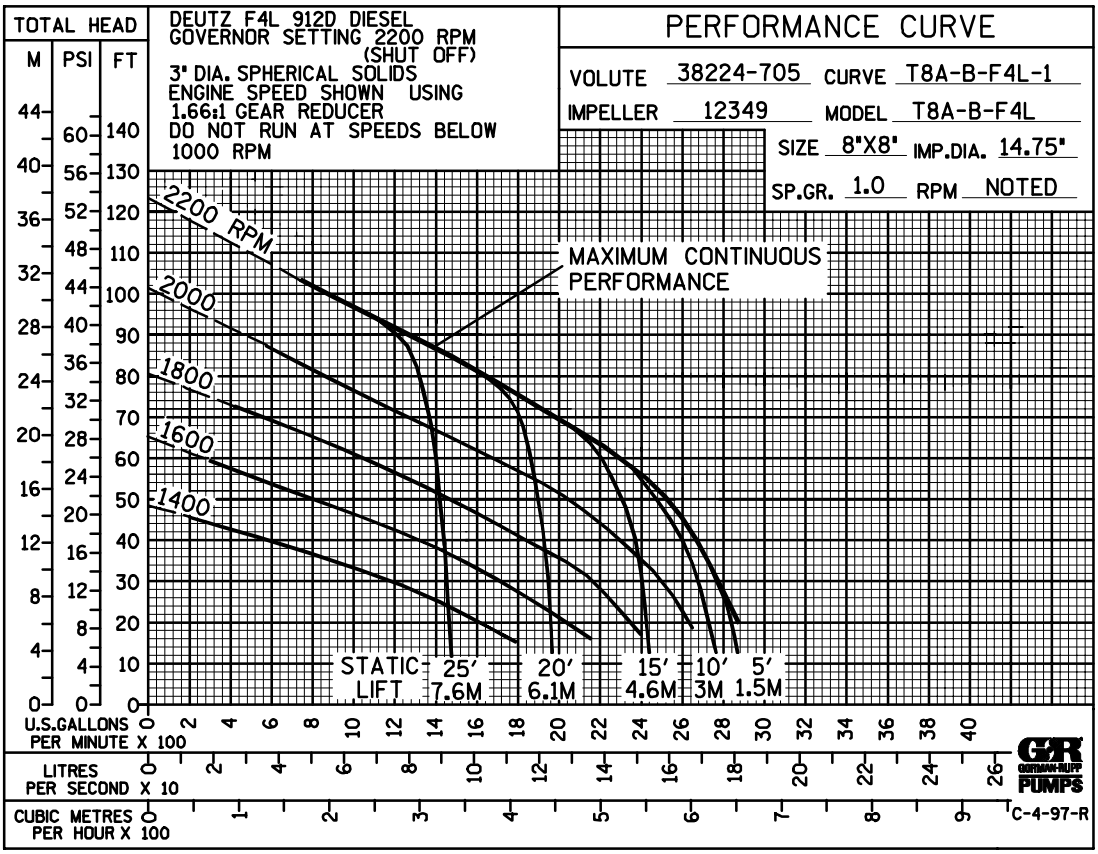
TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Strainer clogged.	Check strainer and clean if necessary.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Impeller clogged.	Free impeller of debris.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
	Pump speed too slow.	Check engine output; consult engine operation manual.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check engine output.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
	Bearing(s) frozen.	Disassemble pump and check bearing(s).
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Liquid solution too thick.	Dilute if possible.
	Discharge line clogged or restricted; hose kinked.	Check discharge lines; straighten hose.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

Table 1. Trouble Shooting Chart (cont.)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

PUMP MAINTENANCE AND REPAIR - SECTION E

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



✳ STANDARD PERFORMANCE FOR PUMP MODEL T8A3–B–F4L

✳ 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 different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

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 performance or part numbers.

CAUTION

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

SECTION DRAWING

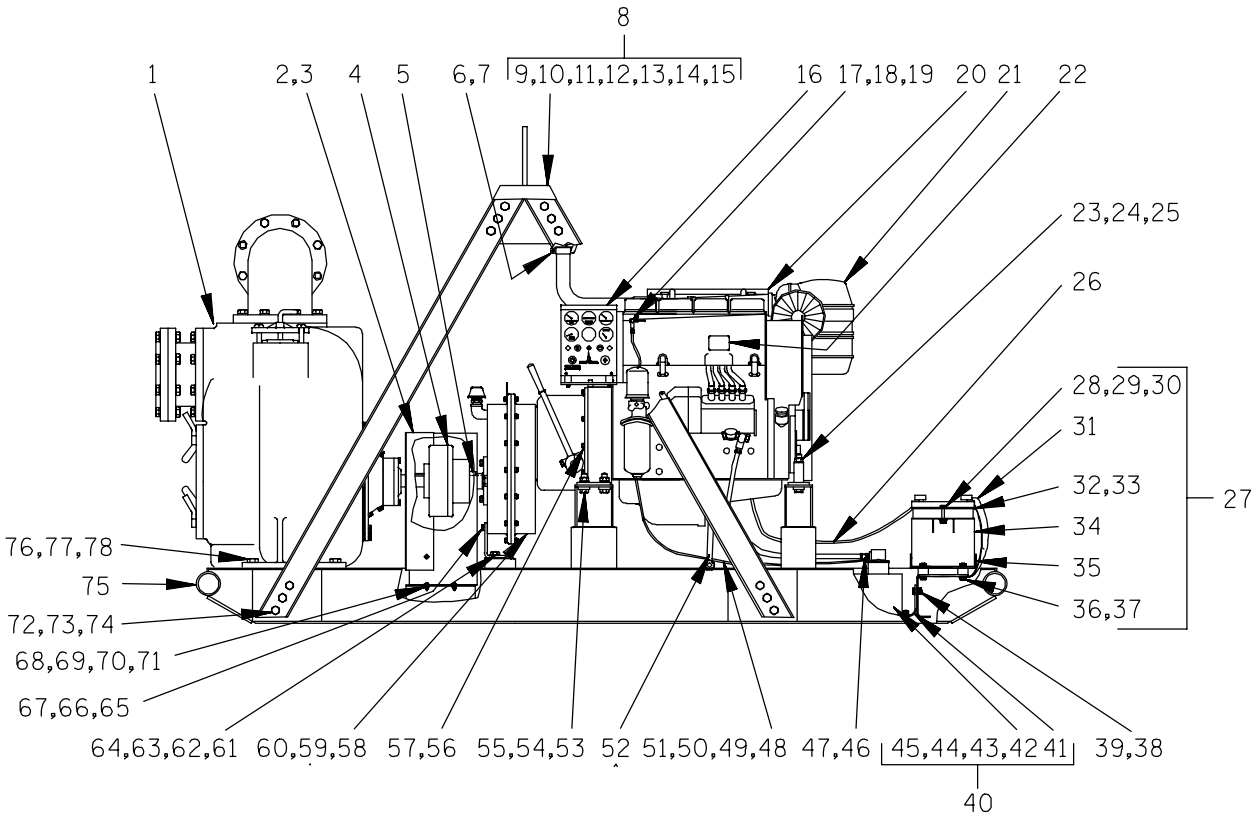


Figure 1. Pump Model T8A3–B–F4L

PARTS LIST
Pump Model T8A3–B–F4L
(From S/N 1131762 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
1	PUMP END ASSY	T8A3–B–(F4L)		1
2	COUPLING GUARD ASSY	42342–210	– – –	1
3	GRD WARNING DECAL	38816–062	– – –	1
4 ✳	1-3/4 X 2-1/4 COUPLING	44165–007	– – –	1
5	KEY	N1016	15990	1
6	EXHAUST ELBOW	31912–023	15990	1
7	WEATHER CAP	S1331	– – –	1
8	HOISTING BAIL	44715–003	– – –	1
9	–SIDE MEMBER	34721–028	15990	2
10	–SIDE MEMBER	34721–029	15990	2
11	–SPACER PLATE	33271–013	15020	4
12	–HEX HD CAPSCREW	B1208	15991	12
13	–LOCKWASHER	J12	15991	12
14	–HEX NUT	D12	15991	12
15	–TOP SECT HO BAIL	44718–014	24150	1
16	CONTROL PANEL	29277–012	– – –	1
17	FUEL LINE	11308F	– – –	1
18	HOSE CLAMP	26518–641	– – –	1
19	HOSE BARB FITTING	26523–443	– – –	1
20	MUFFLER GUARD ASSY	42331–031	– – –	1
21	DEUTZ F4L ENGINE	29217–043	– – –	1
22	CAUTION DECAL	38816–169	– – –	1
23	HEX HD CAPSCREW	B1017	15991	2
24	LOCKWASHER	J10	15991	2
25	HEX NUT	D10	15991	2
26	54" CABLE ASSY	47311–116	– – –	1
27	BATTERY BOX ASSY	GRP40–08C	– – –	1
28	–HEX HD CAPSCREW	B0607	15991	2
29	–FLAT WASHER	K06	15991	2
30	–FLANGED HEX NUT	21765–314	– – –	2
31	–GROUND CABLE ASSY	47311–064	– – –	1
32	–BATTERY BOX LID ASSY	42113–012	24150	1
33	–12V BATTERY	SEE OPTIONS		
34	–BATTERY TAG	38818–506	– – –	1
35	–BATTERY BOX ASSY	42431–030	24150	1
36	–STUD MOUNT	24631–006	– – –	4
37	–FLANGED HEX NUT	21765–314	– – –	8
38	FLANGED HEX NUT	21765–314	– – –	10
39	HEX HD CAPSCREW	B0604	15991	10
40	FUEL TANK/GRD ASSY	46711–041	– – –	1
41	–FUEL TANK GUARD	34851–178	15080	1
42	–FUEL TANK ASSY	46711–042	24150	1
43	–FLANGED HEX NUT	21765–314	– – –	6
44	–CARRIAGE BOLT	AB0604	15991	6
45	–FLAT WASHER	K06	15991	6
46	HOSE ASSY	46341–800	– – –	1
47	MALE CONNECTOR	S1447	– – –	1
48	REDUCING ELBOW	Q0402	11999	1
49	FUEL RETURN ASSY	14294	24030	1
50	HOSE CLAMP	26518–641	– – –	1
51	MALE CONNECTOR	26523–382	– – –	1
52	OIL DRAIN ASSY	46342–007	– – –	1
53	HEX HD CAPSCREW	B1007	15991	4
54	LOCKWASHER	J10	15991	4
55	HEX NUT	D10	15991	4
56	HEX HD CAPSCREW	22645–164	– – –	12
57	LOCKWASHER	21171–511	– – –	12
58	SPEED REDUCER	24572–204	– – –	1
59	HEX HD CAPSCREW	22645–166	– – –	8
60	LOCKWASHER	21171–511	– – –	8
61	HEX HD CAPSCREW	B0810	15991	2
62	LOCKWASHER	J08	15991	2
63	HEX NUT	D08	15991	2
64	FLAT WASHER	K08	15991	2
65	SUPPORT	34264–047	15080	1
66	HEX HD CAPSCREW	B0805	15991	4
67	LOCKWASHER	J08	15991	4
68	HEX HD CAPSCREW	B0405	15991	4
69	FLAT WASHER	K04	15991	4
70	LOCKWASHER	J04	15991	4
71	HEX NUT	D04	15991	4
72	HEX HD CAPSCREW	B1206	15991	12
73	LOCKWASHER	J12	15991	12
74	HEX NUT	D12	15991	12
75	COMBINATION BASE	41565–561	24150	1
76	HEX HD CAPSCREW	B1209	15991	4
77	LOCKWASHER	J12	15991	4
78	HEX NUT	D12	15991	4
NOT SHOWN:				
	WARNING DECAL	2613FE	– – –	1
OPTIONAL:				
	✳12V BATTERY	29331–506	– – –	1
	4-WHEEL AUTO STEER	GRP30–10D	– – –	1
	REP MUFFLER GRD ASSY	42331–048	– – –	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

Above Serial Numbers Do Not Apply To Pumps Made In Canada.
CANADIAN SERIAL NO. ..... AND UP

SECTION DRAWING

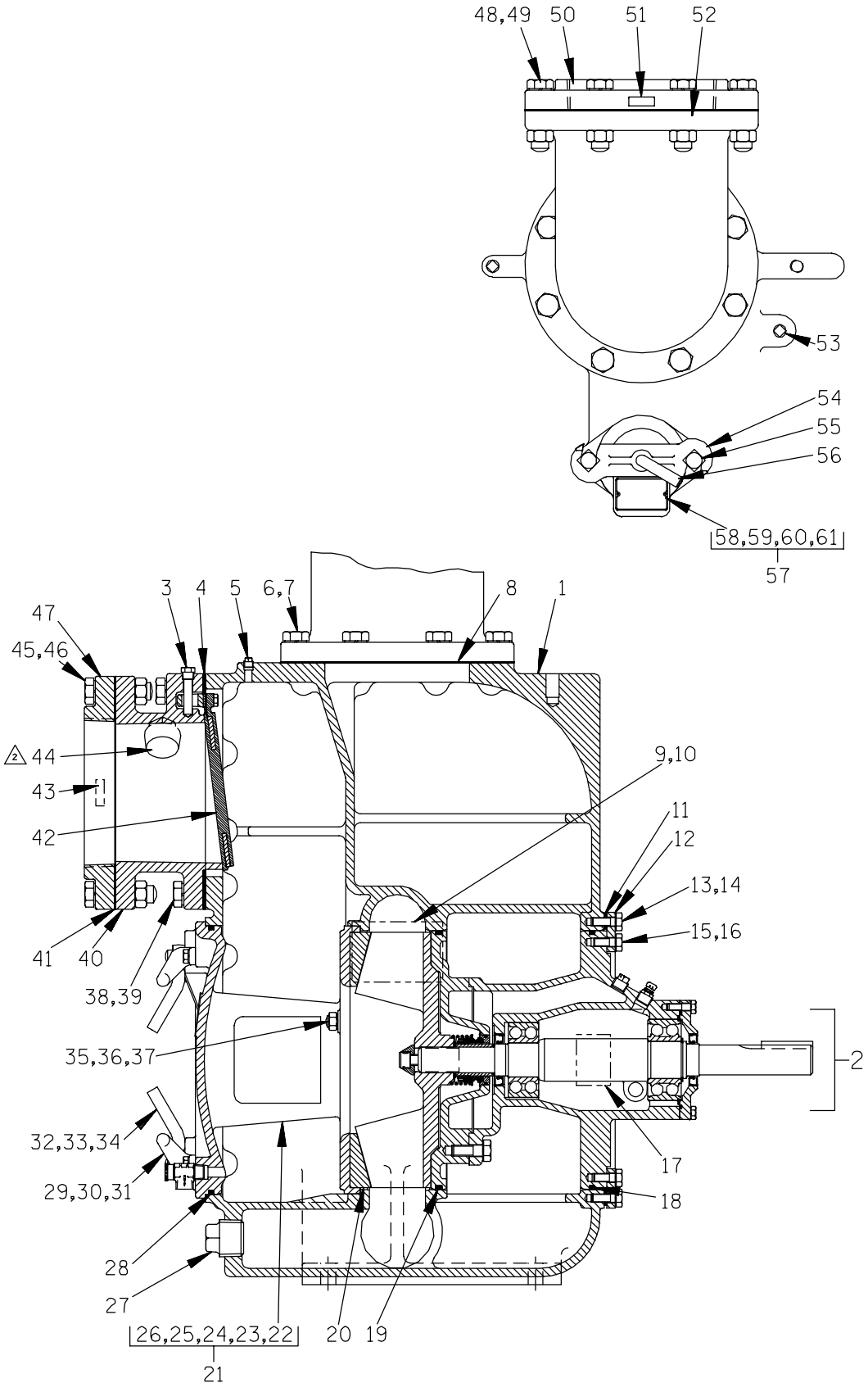


Figure 2. T8A3 – B – (F4L) Pump End Assembly

PARTS LIST
T8A3–B–(F4L) Pump End Assembly

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP CASING	38224–705	10010	1
2		REPAIR ROTATING ASSY	44163–119	– – –	1
3		CHECK VALVE PIN	12357	17010	1
4	✳	SUCTION FLANGE GSKT	12356G	19370	1
5		PIPE PLUG	P04	15079	1
6		HEX HD CAPSCREW	B1209	15991	8
7		LOCKWASHER	J12	15991	8
8	✳	DISCH FLANGE GSKT	25113–038	– – –	2
9		NAME PLATE	38818–025	13990	1
10		DRIVE SCREW	BM#04–03	17000	4
11	✳	ROT ASSY SHIM SET	48261–030	– – –	6
12		CASING RING	31281–016	15990	1
13		HEX HD CAPSCREW	B0806	15991	6
14		LOCKWASHER	J08	15991	6
15		HEX HD CAPSCREW	B0805	15991	6
16		LOCKWASHER	J08	15991	6
17		ROTATION DECAL	2613M	– – –	1
18	✳	INTERMEDIATE O-RING	S1914	– – –	1
19	✳	SEAL PLATE O-RING	S1914	– – –	1
20	✳	WEAR PLATE ASSY	12348A	10010	1
21		BACK COVER ASSY	42111–954	– – –	1
22		–COVER PLATE	NOT AVAILABLE		1
23		–WARNING PLATE	2613EV	13990	1
24		–DRIVE SCREW	BM#04–03	17000	4
25	✳	–PRESS RELIEF VALVE	26662–005	– – –	1
26		–WARNING DECAL	38816–302	– – –	1
27		CASING DRAIN PLUG	P32	10009	1
28	✳	BACK COVER O-RING	S1915	– – –	1
29		COVER PLATE HANDLE	12354	13010	2
30		HEX HD CAPSCREW	B0604	15991	4
31		LOCKWASHER	J06	15991	4
32		STUD	C1212	15991	4
33		HAND NUT	10701A	15040	4
34		INSTRUCTION DECAL	2613DK	– – –	1
35		STUD	C0808	15991	3
36		LOCKWASHER	J08	15991	3
37		HEX NUT	D08	15991	3
38		HEX HD CAPSCREW	B1209	15991	8
39		LOCKWASHER	J12	15991	8
40		SUCTION FLANGE	12356	10010	1
41	✳	SUCTION FLANGE GSKT	25113–038	– – –	1
42	✳	CHECK VALVE ASSY	46411–066	– – –	1
43		SUCTION STICKER	6588AG	– – –	1
44		PIPE PLUG	P04	15079	1
45		HEX HD CAPSCREW	B1214	15991	8
46		HEX NUT	D12	15991	8
47		SUCTION FLANGE	1759	10010	1
48		HEX HD CAPSCREW	B1214	15991	8
49		HEX NUT	D12	15991	8
50		DISCHARGE FLANGE	1759	10010	1
51		DISCHARGE STICKER	6588BJ	– – –	1
52		DISCH FLANGE ELBOW	RF0128	10990	1
53		PIPE PLUG	P04	15079	1
54		CLAMP BAR	38111–004	11010	1
55		MACHINE BOLT	A1014	15991	2
56		CLAMP BAR SCREW	31912–009	15000	1
57		FILL COVER ASSY	42111–344	– – –	1
58		–FILL COVER	NOT AVAILABLE		1
59		–WARNING PLATE	38816–097	13990	1
60		–DRIVE SCREW	BM#04–03	17000	2
61	✳	–FILL COVER GASKET	50G	19210	1
NOT SHOWN:					
		PIPE PLUG	P04	15079	1
		PRIMING STICKER	6588AH	– – –	1
		STRAINER	46641–010	24150	1
		LUB DECAL	11421	– – –	1
		WARNING DECAL	38816–096	– – –	1
OPTIONAL:					
		DISASSEMBLY TOOL	12858	– – –	1
		IMP CLEAN-OUT KIT	48783–004	– – –	1
		SST WEAR PLATE ASSY	12348A	1718H	1
		ADI WEAR PLATE	12348A	1102H	1
		/F FLANGE KIT	48213–042	– – –	1
		/FM METRIC FLANGE KIT	48213–079	– – –	1
		/FM METRIC FLANGE KIT	48213–083	– – –	1
		PRESSURE RELIEF VALVE:			
		–BRASS	46431–628	– – –	1
		–STAINLESS STEEL	26662–101	– – –	1
		CHECK VALVE ASSY:			
		–VITON SOLID	46411–080	– – –	1
		–NEOPRENE SOLID	46411–018	– – –	1
		–VITON BLOW-OUT	46411–090	– – –	1
		SST AIR RELEASE VALVES:			
		–10# COMP SPRING	GRP33–07D	– – –	1
		–25# COMP SPRING	GRP33–07C	– – –	1
		–80# COMP SPRING	GRP33–07E	– – –	1
		CASING HEATERS:			
		–120V	47811–001	– – –	1
		–240V	47811–002	– – –	1
		HPTS KIT SIM:			
		–145_	48313–186	– – –	1
		–130_	48313–256	– – –	1
		–120_	48313–257	– – –	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

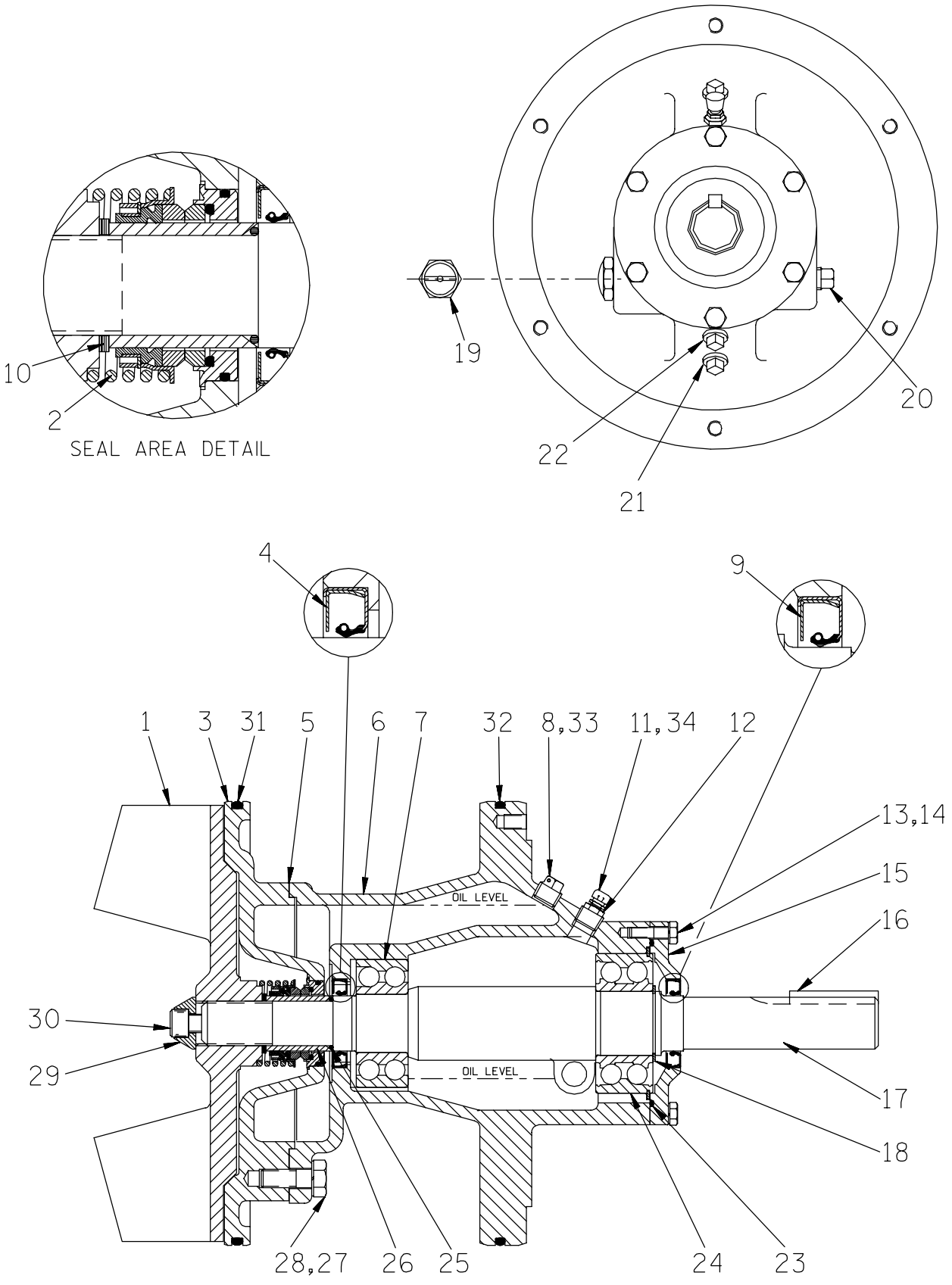


Figure 3. 44163 – 119 Repair Rotating Assembly

PARTS LIST
44163 – 119 Repair Rotating Assembly

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1	✳	IMPELLER	12349	11000	1
2	✳	SEAL ASSEMBLY	12590	– – –	1
3		SEAL PLATE	12350	10010	1
4	✳	OIL SEAL	S1917	– – –	1
5	✳	SEAL PLATE GSKT	12350G	20000	1
6		BEARING HOUSING	38251 – 510	10000	1
7	✳	BALL BEARING	23421 – 461	– – –	1
8		VENTED PLUG	4823A	15079	1
9	✳	OIL SEAL	S1917	– – –	1
10	✳	IMPELLER ADJ SHIM SET	5091	17090	REF
11		AIR VENT	S1530	– – –	1
12		REDUCING BUSHING	AP0802	15079	1
13		HEX HD CAPSCREW	B0605 1/2	15991	6
14		LOCKWASHER	J06	15991	6
15		BEARING CAP	38322 – 415	10010	1
16	✳	SHAFT KEY	N0616	15990	1
17	✳	IMPELLER SHAFT	38515 – 577	16000	1
18		RETAINING RING	S215	– – –	1
19		SIGHT GAUGE	S1471	– – –	1
20		PIPE PLUG	P12	15079	1
21		SEAL CAVITY DRAIN PLUG	P08	15079	1
22		BEARING HOUSING DRAIN PLUG	P08	15079	1
23	✳	BEARING CAP O-RING	S333	– – –	1
24	✳	BALL BEARING	23422 – 412	– – –	1
25	✳	SHAFT SLEEVE O-RING	25152 – 026	– – –	1
26	✳	SHAFT SLEEVE	12359	16000	1
27		HEX HD CAPSCREW	B1006	15991	4
28		LOCKWASHER	J10	15991	4
29	✳	IMPELLER WASHER	10278	15030	1
30	✳	SOCKET HD CAPSCREW	DM1004S	15991	1
31	✳	SEAL PLATE O-RING	S1914	– – –	REF
32	✳	BEARING HOUSING O-RING	S1914	– – –	REF
33		SHIPPING PLUG	11495B	15079	1
34		SHIPPING PLUG	11495B	15079	1
NOT SHOWN:					
		ROTATING ASSY SHIM SET	48261 – 030	– – –	6
OPTIONAL:					
		ADI IMPELLER	12349	1102H	1
		ADI SEAL PLATE	12350	1102H	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, labels 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 views (see Figures 1, 2 and 3) and the accompanying parts lists.

As described on the following pages, 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.

Most service functions may be performed by draining the pump and removing the back cover assembly. If major repair is required, the piping and/or power source must be disconnected. The following instructions assume complete disassembly is required.

Before attempting to service the pump, switch off the engine ignition and disconnect the positive battery cable to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

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

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off the engine ignition and disconnect the positive battery cable 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.**

WARNING!

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.

Back Cover And Wear Plate Removal

(Figure 2)

The wear plate (20) and check valve (42) are easily accessible and may be serviced by removing the back cover assembly (21). Before attempting to service the pump, remove the pump casing drain plug (27) and drain the pump. Clean and reinstall the drain plug.

Remove the hand nuts (33) and pull the back cover and assembled wear plate from the pump casing (1). Inspect the wear plate, and replace it if badly scored and worn. To remove the wear plate, disengage the hardware (36 and 37).

Inspect the back cover O-ring (28) and replace it if damaged or worn.

Suction Check Valve Removal

(Figure 1)

If the check valve assembly (42) is to be serviced, remove the check valve pin (3), reach through the back cover opening, and pull the complete assembly from the suction flange.

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit. Individual parts are not sold separately.

Pump Casing Removal

(Figure 1)

It is recommended that the pump (1) be separated from the base (75) and gearbox (58) to ease removal of the rotating assembly (2, Figure 2). Before attempting to remove the pump, disengage the piping from the suction and discharge flanges (47 and 52, Figure 2).

Disengage the hardware (68, 69, 70 and 71) and remove the coupling guard assembly (2). Loosen the attaching hardware and separate the halves of the coupling (4). Remove the hardware (76, 77 and 78) securing the pump casing to the base.

(Figure 2)

Remove the discharge elbow (52) and gasket (8) and fill cover assembly (57) and gasket (61) from the pump casing. Loop a suitable chain or cable through the discharge port and back out the priming port and attach it to a hoist.

CAUTION

Make certain the chain or cable is positioned so that the pump will not be damaged, and so that the load will be balanced.

Use a hoist of sufficient capacity to safely lift the pump end from the base and move it to a suitable work area for disassembly.

WARNING!

Suction and discharge hoses and piping must be removed from the pump before lifting. Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. The bail is intended for use in lifting the pump assembly only.

After the pump is removed, tie and tag any leveling shims used under the casing mounting feet for ease of reassembly. Remove the coupling half and shaft key (16, Figure 3) from the impeller shaft.

Rotating Assembly Removal

(Figure 3)

The rotating assembly may be removed from either side of the casing; however, it is recommended that it be removed through the back cover opening.

The impeller (1) should be loosened while the rotating assembly is still secured to the pump casing. Before loosening the impeller, remove the seal cavity drain plug (21) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping as the impeller is loosened. Clean and reinstall the seal cavity drain plug.

Immobilize the impeller by wedging a block of wood between the vanes and remove the impeller capscrew and washer (29 and 30). Install the shaft key (16). Install a lathe dog on the drive end of the shaft (17) with the “V” notch positioned over the shaft keyway. Strike the lathe dog sharply in a counterclockwise direction (when facing the drive end of the shaft). When the impeller breaks loose, remove the wood block and lathe dog. Do not fully unscrew the impeller from the shaft at this time.

(Figure 2)

An optional disassembly tool for removing and installing the rotating assembly is available from the factory. If improvised tools are used, be sure they are heavy enough for safe use and will not damage the pump.

Remove the inner hardware (15 and 16) from the casing ring (12). If the removal tool is used, follow

the instructions packaged with it, and pull the rotating assembly from the pump casing (see Figure 4 for removal tool use). If the removal tool is not used, install three of the inner capscrews in the jacking holes in the casing ring, and use them to press the rotating assembly into the pump casing until the bearing housing is free.

Remove the jacking screws from the casing ring. Remove the outer hardware (13 and 14) and shim sets (11). Separate the casing ring from the pump casing. Tie and tag the shim sets for ease of reassembly.

After the rotating assembly is loosened, screw a 5/8-18 UNC X 16 inch long threaded rod into the tapped hole in the impeller shaft. Support the drive end of the shaft with a 1 13/16 ” (46 mm) minimum I.D. piece of pipe or a set of handles as shown in Figure 4, and slide the complete rotating assembly through the back cover opening. Once free, use a suitable hoist and sling to move the rotating assembly to a suitable work area for further disassembly.

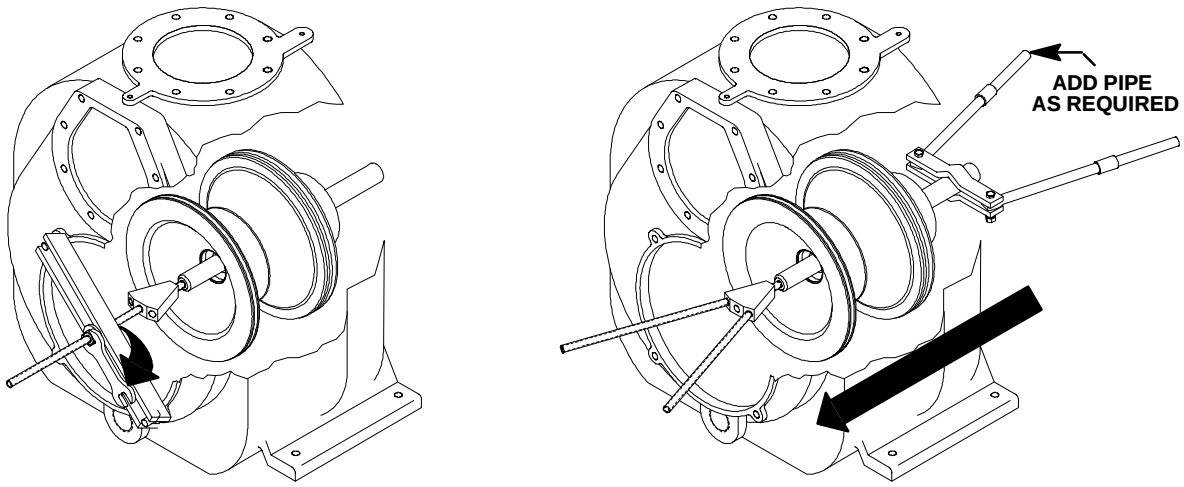


Figure 4. Removing Rotating Assembly With Tool

Impeller Removal

(Figure 3)

Unscrew the impeller from the shaft in a counterclockwise direction (when facing the impeller). Use caution when unscrewing the impeller; tension on the shaft seal spring will be released as the impeller is removed.

Remove the impeller adjusting shims (10). Tie and tag the shims or measure and record their thickness for ease of reassembly.

Seal Removal and Disassembly

(Figure 3)

Remove the seal spring. Slide the shaft sleeve (26) and the rotating portion of the seal off the shaft as a unit. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the sleeve.

Remove the shaft sleeve O-ring (25).

Use a stiff wire with a hooked end to remove the stationary portion of the seal.

An alternate method of removing the stationary portion of the seal is to remove the hardware (27 and 28) and separate the seal plate (3) and gasket (5) from the bearing housing (6). Remove the seal plate O-ring (31). Position the seal plate on a flat surface with the impeller side down. Use a wooden dowel or other suitable tool to press on the back side of the stationary seat until the seat, O-rings and stationary element can be removed.

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

Shaft and Bearing Removal and Disassembly

(Figure 3)

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

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.

Remove the bearing housing drain plug (22) and drain the lubricant. Clean and reinstall the drain plug. Remove the bearing housing O-ring (32).

Disengage the hardware (13 and 14) and remove the bearing cap (15), O-ring (23) and oil seal (9) from the shaft. Remove the O-ring and using an arbor (or hydraulic) press remove the oil seal from the bearing cap.

Place a block of wood against the impeller end of the shaft and tap the shaft and assembled bearings (7 and 24) from the bearing housing.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.

CAUTION

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 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.

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 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 balls or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls 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, remove the bearing retaining ring (18) from the impeller shaft, and use a bearing puller to remove the inboard and outboard bearings from the shaft.

Press the inboard oil seal (4) from the bearing housing bore.

Shaft and Bearing Reassembly and Installation

(Figure 3)

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

Position the inboard oil seal (4) in the bearing housing bore with the lip positioned as shown in Figure

3. Press the oil seal into the housing until it is fully seated.

CAUTION

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.

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 bearings. 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.*

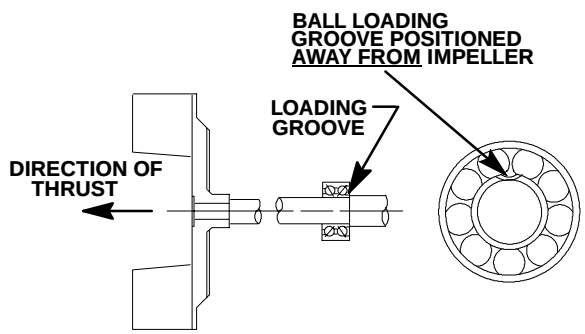
Heat the bearings to a uniform temperature **no higher than** 250_ F (120_ C), and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

WARNING!

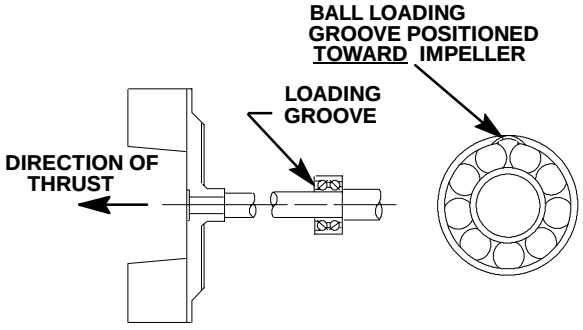
Use caution when handling hot bearings to prevent burns.

NOTE

Position the inboard bearing (7) on the shaft as indicated by the following illustration.



INSTALLATION OF NEW DEPARTURE OR BCA/FEDERAL MOGAL 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)



INSTALLATION OF MRC/SKF 5300M OR FAFNIR 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)

Figure 5. Inboard Bearing Positioning

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitable 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.

Secure the outboard bearing on the shaft with the bearing retaining ring (18).

Slide the shaft and assembled bearings into the bearing housing until the retaining ring on the outboard bearing seats against the bearing housing.

CAUTION

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

Press the outboard oil seal (9) into the bearing cap (15) with the lip positioned as shown in Figure 3. Replace the bearing cap O-ring (23), and secure the bearing cap with the hardware (13 and 14).

Lubricate the bearing housing as indicated in **LUBRICATION**.

Seal Reassembly and Installation

(Figures 3 and 6)

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 leakage. 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 bellows and stationary seat O-rings 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 6).

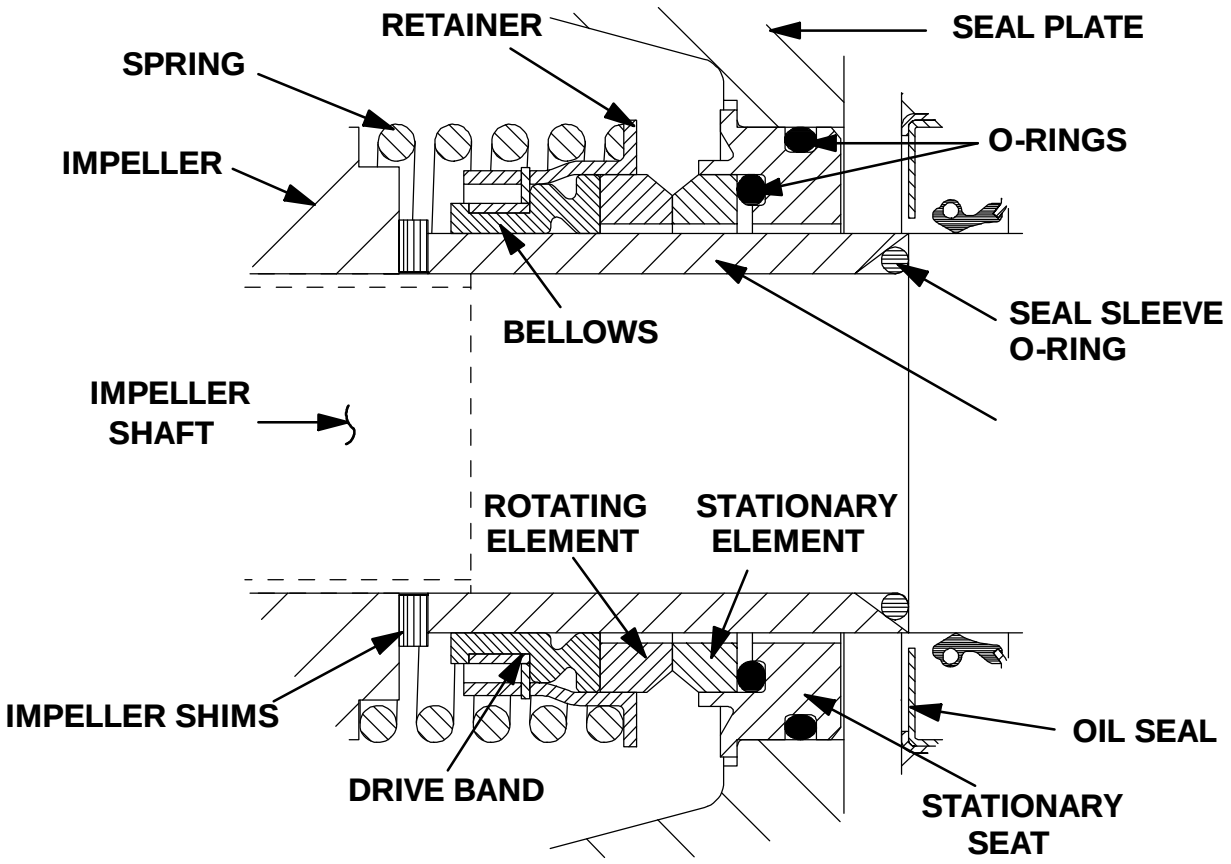


Figure 6. 12590 Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160_F (71_C). Do not use at higher operating temperatures.

Lubricate the stationary seat O-rings with water or light oil, and install them in the stationary seat. Install the stationary seal element in the stationary seat. Press this stationary subassembly into the front of the seal plate until it seats squarely against the bore shoulder.

Install the seal plate gasket (5). Position the seal plate and stationary seat over the shaft, and secure it to the bearing housing with the hardware (27 and 28). **Be careful** not to damage the stationary element on the shaft threads.

NOTE

It is recommended that a tapered sleeve be installed over the threads of the impeller shaft to ease installation of the rotating seal components.

Lubricate the shaft sleeve with a **small** amount of light oil and slide the rotating subassembly (consisting of rotating element, bellows and retainer), onto the sleeve until the rotating element is **just flush** with the **undercut** end of the sleeve.

Install the O-ring (25) which seals the sleeve to the shaft shoulder. Slide the sleeve and subassembled seal onto the shaft until the seal faces contact. Continue to push the sleeve through the seal until the undercut end seats against the O-ring and shaft shoulder.

Install the seal spring. Lubricate the seal as indicated in **LUBRICATION** after the impeller is installed.

Impeller Installation

(Figure 3)

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

for dirt or damage, and clean or dress the threads as required.

CAUTION

The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Install the same thickness of impeller adjusting shims (10) as previously removed, and screw the impeller onto the shaft until tight.

NOTE

At the slightest sign of binding, immediately back the impeller off, and check the threads for dirt. ***Do not*** *try to force the impeller onto the shaft.*

A clearance of .025 to .040 inch (0,64 to 1,02 mm) between the impeller and the seal plate is recommended for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

NOTE

If the rotating assembly has been installed in the pump casing, this clearance may be measured by reaching through the priming port with a feeler gauge.

After the rotating assembly is installed in the pump casing, coat the threads of the impeller capscrew (30) with 'Never – Seez' or equivalent compound, and install the impeller washer (29) and capscrew; torque the capscrew to 90 ft. lbs. (1080 in. lbs. or 12,4 m. kg.).

Rotating Assembly Installation

(Figure 2)

Install the bearing housing and seal plate O-rings (18 and 19), and lubricate them with light grease. Ease the rotating assembly into the pump casing using the installation tool. **Be careful** not to damage the O-rings.

Install the pump casing ring (12), and secure it to the rotating assembly with the inner hardware (15 and 16).

NOTE

The inner capscrews are 1/4 inch (3,2 mm) shorter than the outer capscrews.

Install an equal thickness of rotating assembly shims (11) under the pump casing ring, and secure the ring to the pump casing with the outer hardware (13 and 14).

NOTE

If the pump has been completely disassembled, it is recommended that the suction check valve (42), wear plate (20) and back cover assembly (21) be reinstalled at this point. The back cover and wear plate must be in place to adjust the impeller face clearance.

A clearance of .010 to .020 inch (0,25 to 0,51 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by removing an equal amount of shims from each rotating assembly shim set (11) until the impeller scrapes against the wear plate when the shaft is turned. **Preload the shaft in the direction of the impeller when checking this clearance.** After the impeller scrapes, add approximately .010 inch (0,25 mm) of shims to each shim set.

NOTE

An alternate method of adjusting this clearance is to reach through the priming port with a feeler gauge and measure the gap. Add or subtract rotating assembly shims accordingly.

Pump Casing Installation

(Figure 1)

Using a chain or cable and a suitable hoist, carefully position the pump (1) on the base (75). Install any leveling shims used under the casing mounting feet, and secure the casing to the base with the hardware (76, 77 and 78).

Install the shaft key (16, Figure 3) and the half of the coupling (4) on the impeller shaft, and align the

coupling halves as described in **INSTALLATION**, Section B. Install the coupling guard assembly (2) and secure it with the hardware (68, 69, 70 and 71).

(Figure 2)

Remove the lifting device and install the discharge elbow and gasket (52 and 8).

NOTE

When reinstalling the suction or discharge flanges, replace the respective gaskets and apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent compound to the mating surfaces.

Reinstall the fill cover assembly (57) and gasket (61) after the pump is completely reassembled and primed.

Suction Check Valve Installation

(Figure 2)

Inspect the check valve assembly, and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Reach through the back cover opening with the assembled check valve (42), and position the check valve adaptor in the mounting slot in the suction flange (40). Align the adaptor with the flange hole, and secure the assembly with the check valve pin (3).

NOTE

If the suction or discharge flanges were removed, replace the respective gaskets, apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent compound to the mating surfaces, and secure them to the pump casing with the attaching hardware.

Back Cover Installation

(Figure 2)

If the wear plate (20) was removed for replacement, carefully center it on the back cover and secure it with the hardware (36 and 37). The wear plate **must** be concentric to prevent binding when the back cover is installed.

Replace the back cover O-ring (28), and lubricate it with a generous amount of No. 2 grease. Clean any scale or debris from the contacting surfaces in the pump casing that might interfere or prevent a good seal with the back cover. Slide the back cover assembly into the pump casing. Be sure the wear plate does not scrape against the impeller.

NOTE

To ease future disassembly, apply a film of grease or 'Never-Seez' on the back cover shoulder, or any surface which contacts the pump casing. This action will reduce rust and scale build-up.

Secure the back cover assembly by tightening the hand nuts (33) evenly. **Do not** over-tighten the hand nuts; they should be just tight enough to ensure a good seal at the back cover shoulder. Be sure the wear plate does not bind against the casing.

PRESSURE RELIEF VALVE MAINTENANCE

(Figure 2)

The back cover is equipped with a pressure relief valve (25) to provide additional safety for the pump and operator (refer to **Liquid Temperature And Overheating** in **OPERATION**).

It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Periodically, the valve should be removed for inspection and cleaning. When reinstalling the relief valve, apply 'Loctite Pipe Sealant With Teflon No. 592', or equivalent compound, on the relief valve

threads. Position the valve as shown in Figure 2, with the discharge port pointing down.

Final Pump Assembly

(Figure 1)

Be sure the pump is secure to the base and engine.

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 and engine have been properly lubricated, see **LUBRICATION**.

Fill the pump casing with clean liquid. Reinstall the fill cover and tighten it. Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION

Seal Assembly

(Figure 3)

Before starting the pump, remove the vented plug (8) and fill the seal cavity with approximately 90 ounces (2,7 liters) of SAE No. 30 non-detergent oil. Clean and reinstall the vented plug. Maintain the oil at this level.

Bearings

(Figure 2)

The bearing housing was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (19) and maintain it at the middle of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (11). **Do not** over-lubricate. Over-lubrication can cause the bearings to overheat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the bearing housing once each year and refill with approximately 32 ounces (1 liter) of clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

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.

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

Engine

Consult the literature supplied with the engine, or contact your local Deutz representative.

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