
INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST



50 SERIES PUMP

MODEL
54J20-BF6L

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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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 50 Series, closed impeller, engine driven centrifugal model. The pump is close-

coupled to a Deutz BF6L913D diesel engine and is designed for pumping clean liquids at high heads and high discharge pressures. The basic material of construction for wetted parts is gray iron with gray iron impeller and wear ring, and steel impeller shaft.

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 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

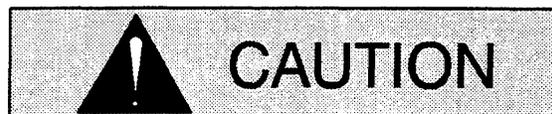
The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:



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.

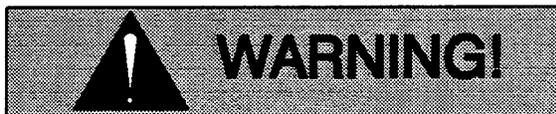
NOTE

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

SAFETY - SECTION A

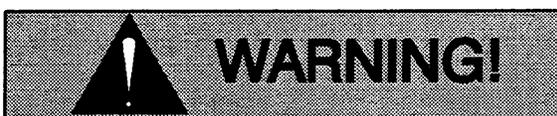
These warnings apply to 50 Series engine driven pumps. Refer to the manual accompanying the engine before attempting to begin operation.

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.



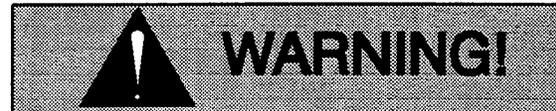
Before attempting to open or service the pump:

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 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 clear

water. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.



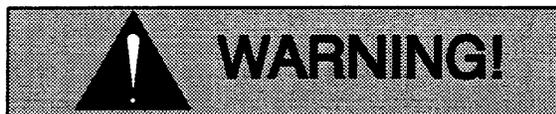
Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. The bail is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.



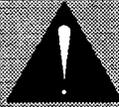
After the pump has been installed, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.



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

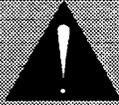


Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

**WARNING!**

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

1. Stop the pump immediately.
2. Ventilate the area.
3. Allow the pump to cool.
4. Check the temperature before opening any covers, plates, gauges, or plugs.
5. Vent the pump slowly and cautiously.
6. Refer to instructions in this manual before restarting the pump.

**WARNING!**

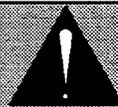
Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

**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 2300 RPM.

INSTALLATION – SECTION B

Review all SAFETY 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

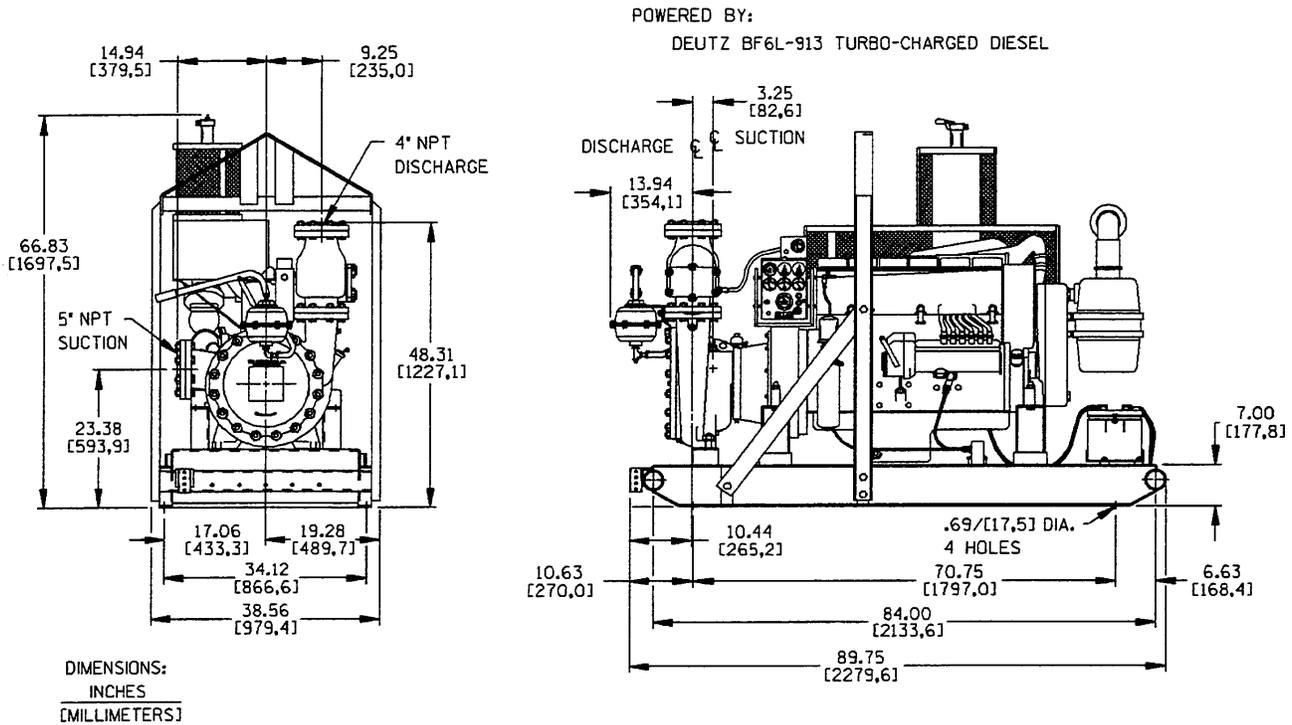


Figure 1. Pump Model 54J20-BF6L

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 and engine for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.
- d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.
- e. If the pump and 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.

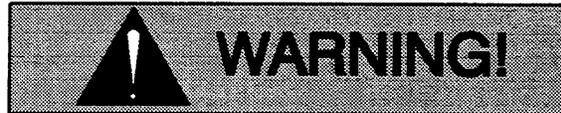
Table 1. Battery Specifications

Voltage	Cold Crank Amps @ 0°F	Reserve Capacity @80°F (Minutes)	Amp/Hr. Rating	Approx. Overall Dims. (Inches)
12 Volts	980-975	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 hold-down 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.

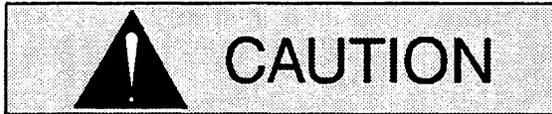
POSITIONING PUMP



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. Suction and discharge hoses and piping must be removed from the pump before lifting.

Lifting

Use lifting equipment with a capacity of at least **11,900 pounds (5397,7 kg)**. This pump weighs approximately **2,375 pounds (1077,3 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.



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°.

SUCTION AND DISCHARGE PIPING

Materials

Either pipe or hose may be 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 mini-

mum 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 1/2-inch (12,70 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 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).

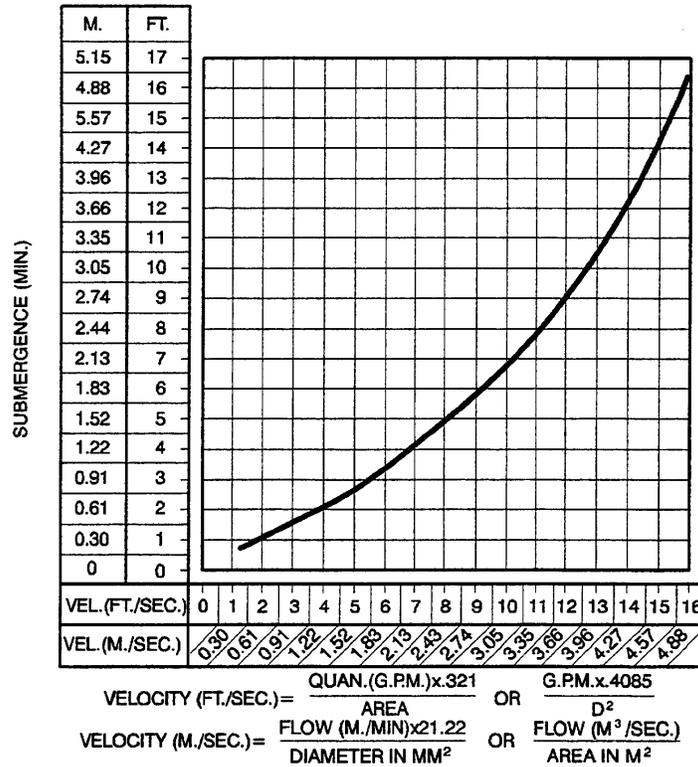


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

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

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 in-

stalled 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.

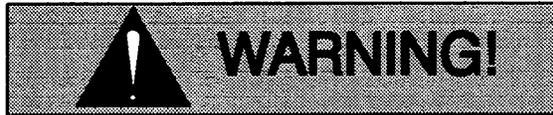
ALIGNMENT

The alignment of the pump and the engine is critical for trouble-free mechanical operation. See Section E, **Securing Pump And Intermediate To Engine** for detailed information.

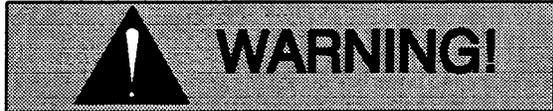
OPERATION – SECTION C

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 clear water. Do not attempt to pump volatile, corrosive, or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.



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 2300 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**).

Hand-Operated Priming Pump

The hand-operated priming pump (see Figure 1) is designed to prime the pump by evacuating air from the pump casing and suction line. It can be used while the pump is either stopped or operating. To prime the pump, close the discharge line throttling valve, and close the spring-loaded check valve (if so equipped) before engaging the priming device. Open the ball valve in the priming line and operate the handle until liquid flows into the priming line sight gauge.

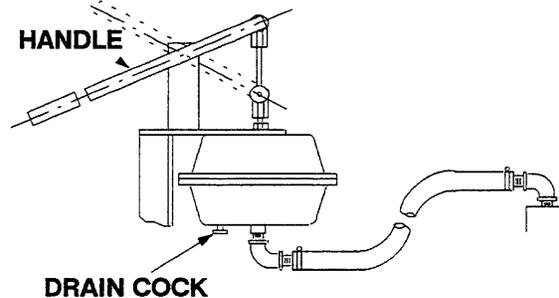


Figure 1. Hand Primer Assembly

Once the pump is fully primed, close the ball valve in the priming line, and open the discharge line throttling valve.

STARTING

Consult the operations manual furnished with the engine.

NOTE

This pump is equipped with a safety shut down device to terminate engine operation if pump discharge pressure falls below 30 PSI. During engine start up, the button on the discharge pressure gauge must be depressed to over-ride this safety feature.

OPERATION

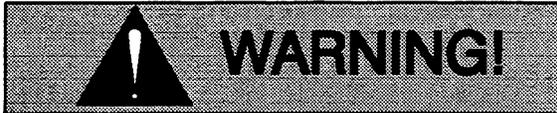
Leakage

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.



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

Strainer Check

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.

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 (508,0 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

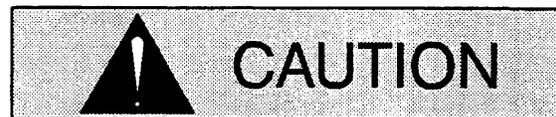
Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists.

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 remove the key 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:

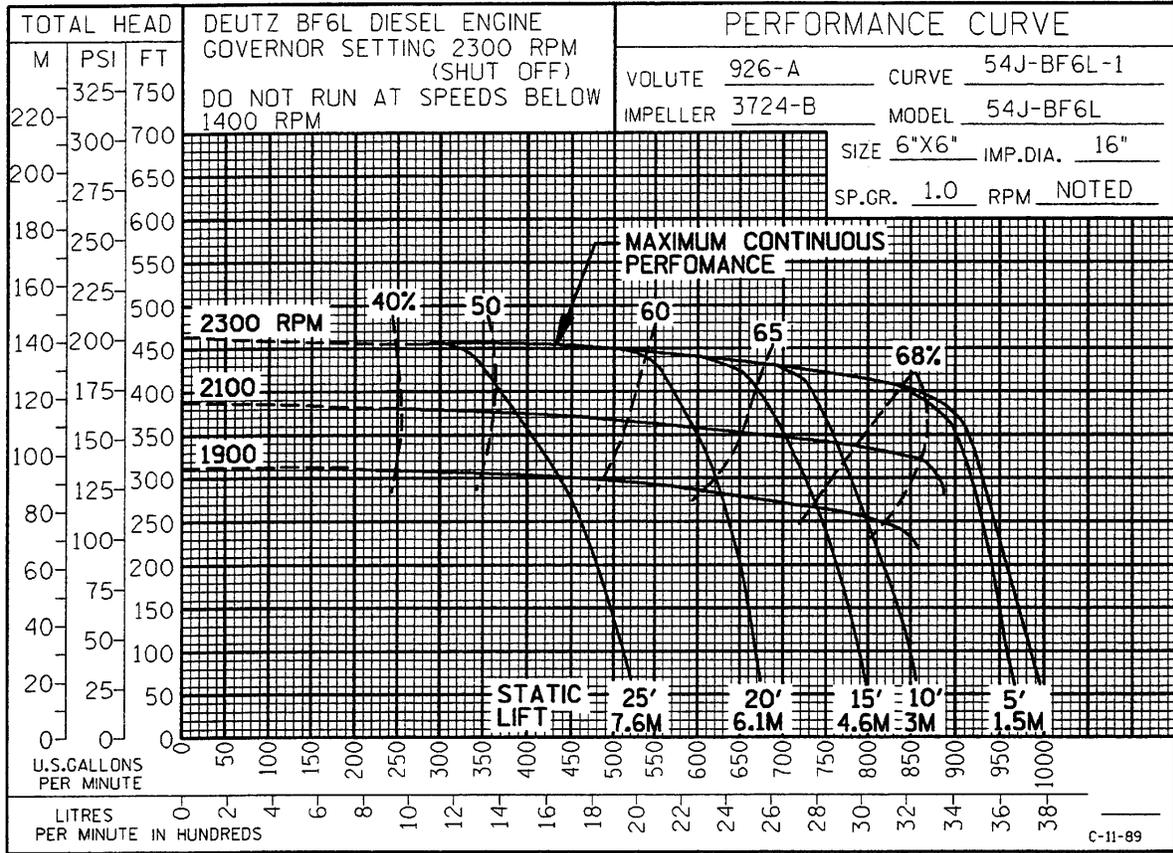
1. Familiarize yourself with this manual.
2. Switch off the engine ignition and disconnect the positive battery cable to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and 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 check valve or foot valve clogged or binding. Suction lift or discharge head too high. Strainer clogged.	Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Clean valve. Check piping installation and install bypass line if needed. See INSTALLATION . Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line. Lining of suction hose collapsed. Suction intake not submerged at proper level or sump too small. Impeller or other wearing parts worn or damaged.	Correct leak. Replace suction hose. Check installation and correct submergence as needed. Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Strainer clogged. Impeller clogged. Discharge head too high. Suction lift too high. Leaking or worn seal or pump gasket. Pump speed too slow.	Check strainer and clean if necessary. Free impeller of debris. Install bypass line. Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line. Check pump vacuum. Replace leaking or worn seal or gasket. Check engine output; consult engine operation manual.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high. Discharge head too low. Liquid solution too thick.	Check driver output; check that sheaves or couplings are correctly sized. 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 engine 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.

PUMP MAINTENANCE AND REPAIR - SECTION E

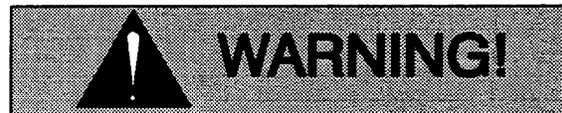
MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



*** STANDARD PERFORMANCE FOR PUMP MODEL 54J20-BF6L**

* 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.

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.



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 2300 RPM.

SECTION DRAWING

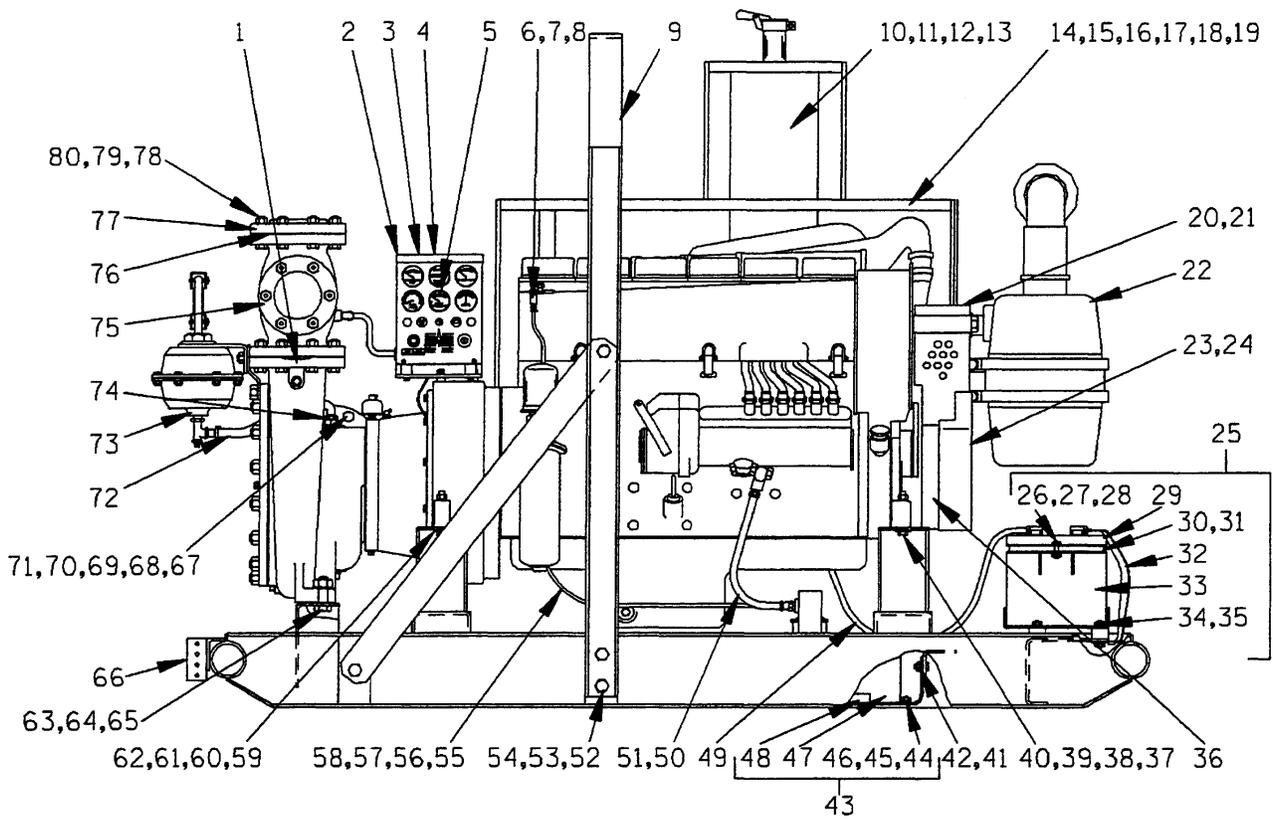


Figure 1. Pump Model 54J20-BF6L

SECTION DRAWING

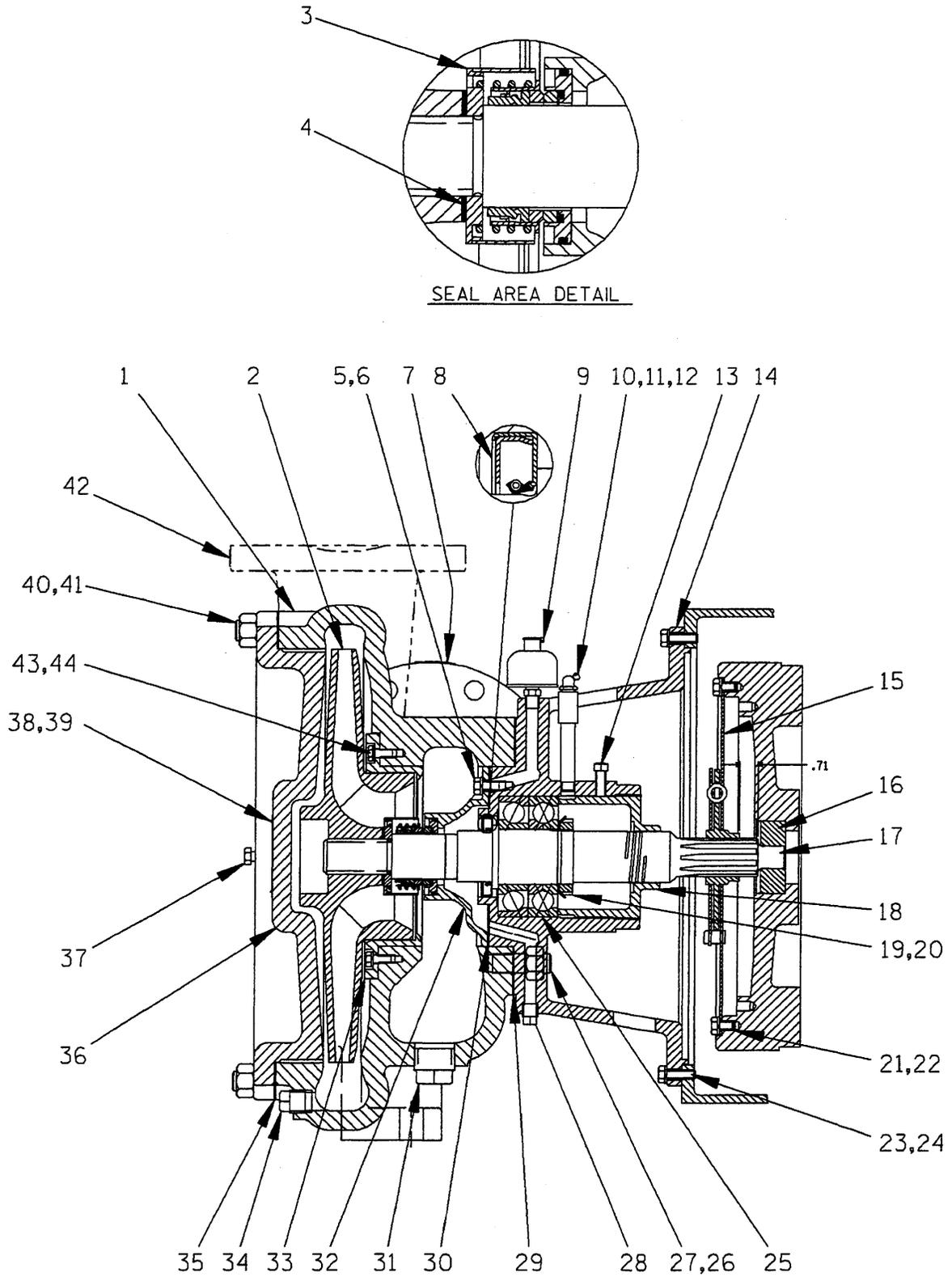


Figure 2. Pump End Assembly 54J20-(BF6L)

PARTS LIST
Pump End Assembly 54J20--(BF6L)

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	926A	10020	1	25 *	BALL BEARING (SET)	23413-901	---	1
2 *	IMPELLER	3724B	10010	1	26	STUD	C1209	15991	8
3 *	SEAL ASSY	12461C	---	1	27	HEX NUT	D12	15991	8
4 *	IMP ADJ SHIM SET	13537	17000	REF	28	SEAL DRAIN PLUG	P04	15079	1
5	HEX HD CAPSCREW	B0603	14990	6	29 *	CASING GSKT	922G	18000	1
6	LOCKWASHER	J06	15991	6	30 *	SEAL HOUSING GSKT	38683-431	18000	1
7	SUCTION STICKER	6588AG	---	1	31	PIPE PLUG	P20	11990	1
8 *	OIL SEAL	25228-468	---	1	32	SEAL HOUSING	38333-612	10010	1
9	BOTTLE OILER	46711-505	---	1	33 *	WEAR RING	6597	10010	1
10	LUBE FITTING	S194	---	1	34	CASING DRAIN PLUG	P08	15090	3
11	PIPE COUPLING	AE04	15079	1	35 *	COVER PLATE GSKT	926G	18000	1
12	PIPE NIPPLE	T0412	15079	1	36	COVER PLATE	13021	10010	1
13	SQ HD SET SCREW	G0604	15991	1	37	HEX HD CAPSCREW	B0604	15991	2
14	INTERMEDIATE	2175E	10010	1	38	NAME PLATE	2613D	13990	1
15	DRIVE PLATE ASSY	24521-168	---	1	39	DRIVE SCREW	BM#04-03	17000	4
16	PILOT BUSHING	6491	15010	1	40	STUD	C1210	15991	16
17 *	IMPELLER SHAFT	38525-031	1604D	1	41	HEX NUT	D12	15991	16
18	BRG RETAINING NUT	2196B	10010	1	42	DISCHARGE STICKER	6588BJ	---	1
19	BRG LOCK NUT	23962-012	---	1	43	HEX HD CAPSCREW	B0503	17090	4
20	LOCKWASHER	23962-512	---	1	44	LOCKWASHER	J05	17000	4
21	HEX HD CAPSCREW	22645-160	---	8	NOT SHOWN:				
22	LOCKWASHER	21171-511	---	8		PIPE PLUG	P16	10009	1
23	HEX HD CAPSCREW	22645-164	---	12		STRAINER	46641-005	24151	1
24	LOCKWASHER	21171-511	---	12		RED PIPE BUSHING	AP9680	11990	1

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY Information in Section A.

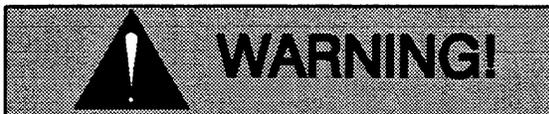
Follow the instructions on all tags, label and decals attached to the pump.

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 views (see Figures 1 and 2) 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.

Before attempting to service the pump, switch off the engine ignition and remove the key to ensure that it 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.



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 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.

Cover Plate Removal

(Figure 2)

The impeller, wear ring and seal assembly may be serviced by removing the cover plate (36).

Remove the casing drain plugs (34) and drain the pump. Clean and reinstall the drain plugs.

Remove the hardware securing the hand priming pump and bracket (73, Figure 1) to the pump casing. Disengage the piping at the pump and remove the hand priming pump assembly.

Remove the remaining nuts (41) and use the jacking screws (37) to break the cover plate loose from the pump casing. Remove the cover plate and gasket (35).

Impeller And Wear Ring Removal

(Figure 2)

Before attempting to remove the impeller, remove the seal cavity drain plug (28) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping when the impeller is removed. Clean and reinstall the drain plug.

The impeller bore is designed to accept a 2 inch (50,8 mm) square block of wood or steel bar to aid in removal of the impeller. Use an impeller wrench if one is available. Turn the impeller counterclockwise (when facing the impeller) to remove it from the impeller shaft. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is removed.

Slide the impeller adjusting shims (4) off the shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly.

Inspect the wear ring (33) for excessive wear or damage. If replacement is required, remove the hardware (43 and 44) and install 5/16-18 X UNC

X2-1/2 inch long jacking screws in the threaded holes in the wear ring. Tighten the jacking screws evenly (to prevent binding) until the wear ring separates from the pump casing.

Seal Removal and Disassembly

(Figure 2)

Carefully remove the assembled spring centering washer and seal guard. Remove the seal spring.

Apply oil to the shaft and work it up under the bellows. Slide the rotating portion of the seal off the shaft.

Use two stiff wires with a hooked ends to remove the stationary subassembly (consisting of the stationary element, seat and O-rings).

An alternate method of removing the stationary subassembly is to remove the seal housing (32) and stationary subassembly from the pump casing as a single unit.

To remove the seal housing, disengage the hardware (5 and 6) and install 3/8-16 UNC jacking screw (not supplied) in the threaded holes in the seal housing. Tighten the jacking screws evenly to prevent binding and separate the seal housing from the intermediate (14).

Slide the seal housing and stationary portion of the seal off the shaft as a single unit. Lay the seal housing on a flat surface with the impeller side down and use a suitable sized dowel to press the stationary subassembly from the seal housing.

Remove the seal housing gasket (30).

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

Separating Pump And Intermediate From Engine

(Figure 2)

To service the impeller shaft (17), bearing set (25) or drive assembly (15), the intermediate (14) must be separated from the engine. Disconnect the suction and discharge piping and remove the hard-

ware (63, 64, and 65, Figure 1) securing the pump assembly to the base.

Support the intermediate using a suitable sling, and remove the hardware (23 and 24) securing it to the engine bellhousing. Separate the assemblies by pulling the intermediate straight away from the engine. As the assemblies separate, the impeller shaft (17) will disengage from the drive plate assembly (15).

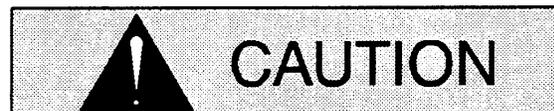
It is not necessary to remove the drive plate assembly from the engine flywheel unless the assembly or pilot bushing (16) must be replaced. To remove the drive plate assembly, disengage the hardware (21 and 22).

Inspect the pilot bushing for excessive wear or damage. If replacement is required, use a suitable puller to remove the pilot bushing from the flywheel.

Shaft and Bearing Removal and Disassembly

(Figure 2)

When the pump is properly operated and maintained, the shaft and bearing 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.

After separating the intermediate from the engine, reach through the back of the intermediate and remove the nuts (27). Separate the intermediate from the pump casing (1). Remove the pump casing gasket (29) and replace as required.

Loosen the square head set screw (13) and unscrew the bearing retaining nut (18) from the intermediate.

NOTE

There are no provisions for draining the grease from the intermediate cavity. Place a drip pan under the intermediate before removing the retaining nut.

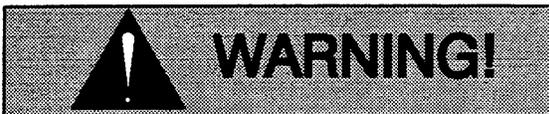
Place a block of wood against the impeller end of the shaft (17), and tap the shaft and assembled bearing (25) from the intermediate. **Be careful** not to damage the shaft threads.

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



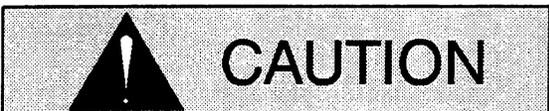
To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the intermediate, 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.



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.



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 intermediate. Replace the bearings, shaft, or intermediate if the proper bearing fit is not achieved.

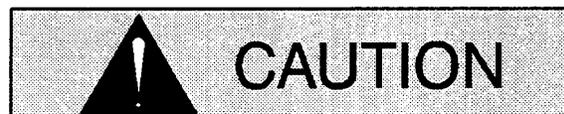
If bearings are to be replaced, straighten the tabs on the lockwasher (20) and remove the bearing locknut (19) and lockwasher. Use an arbor (or hydraulic) press to remove the bearings from the impeller shaft.

Inspect the oil seal (8) for wear or damage. If replacement is required, press it from the intermediate bore.

Shaft and Bearing Reassembly And Installation

(Figure 2)

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



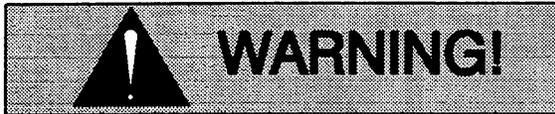
To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

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.

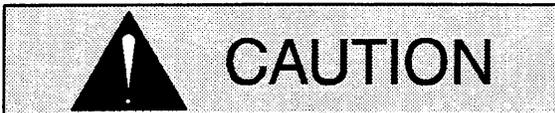
**WARNING!**

Use caution when handling hot bearings to prevent burns.

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 suitably sized sleeve and a press to reposition the bearings against the shaft shoulders.

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.

Position the inboard bearing on the shaft with the words "THRUST HERE" on the **inner** ring facing toward the **impeller end** of the shaft; or if the words "THRUST HERE" appears on the **outer** ring position the bearing with the words toward the **drive end** of the shaft. Press the bearing onto the shaft until it seats squarely against the shaft shoulder.

**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.

Press the outboard bearing onto the shaft until it seats squarely against the inboard bearing.

NOTE

The outboard bearing consists of four parts; a one piece outer ring, the cage (into which the balls are secured), and a two piece inner ring. These parts must be held together when unpacking, handling, and installing the bearing.

Secure the outboard bearing on the shaft with the lockwasher (20) and lock nut (19) and secure with the tabs on the lockwasher.

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

Install the oil seal (8) into the intermediate bore with the lip positioned as shown in Figure 2.

Slide the shaft and assembled bearings into the intermediate bore until the inboard bearing is fully seated against the intermediate shoulder.

**CAUTION**

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

Install the bearing retaining nut (18) into the intermediate and secure it with the square head set-screw (13).

NOTE

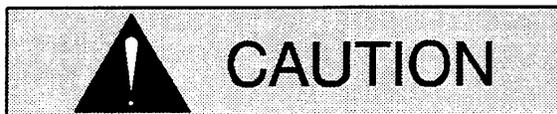
Impeller shaft endplay should be between .002 and .010 inch (0,05 mm to 0,25 mm). Adjust the bearing retaining nut to obtain the correct endplay. Secure the bearing retaining nut with setscrew (13).

Replace the casing gasket (29) and secure the intermediate to the pump casing using the nuts (27).

Lubricate the bearing cavity as indicated in LUBRICATION at the end of this section.

Securing Pump And Intermediate To Engine (Figure 2)

Apply a thin coating of 'Never-Seez' lubricant or equivalent to the inside diameter of the pilot bushing (16) and press it into the flywheel until it seats squarely against the shoulder. Make certain the bushing does not protrude and preload the shaft and bearings.

**CAUTION**

If the flywheel bushing and drive plate are not properly positioned on the shaft, excessive wear and a preload condition could cause premature bearing failure.

Secure the drive plate assembly (15) to the flywheel with the hardware (21 and 22).

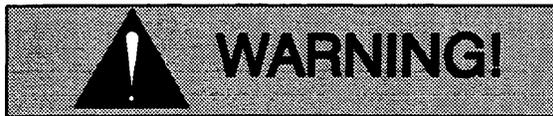
Slide the shaft splines into the drive plate and secure the intermediate assembly to the engine bell-housing with the hardware (23 and 24).

Install any leveling shims used under the pump mounting feet and secure the pump casing to the base with the previously removed hardware (63, 64 and 65).

Seal Reassembly and Installation

(Figures 2 and 3)

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



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 circular pattern to avoid scratching the faces.

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

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

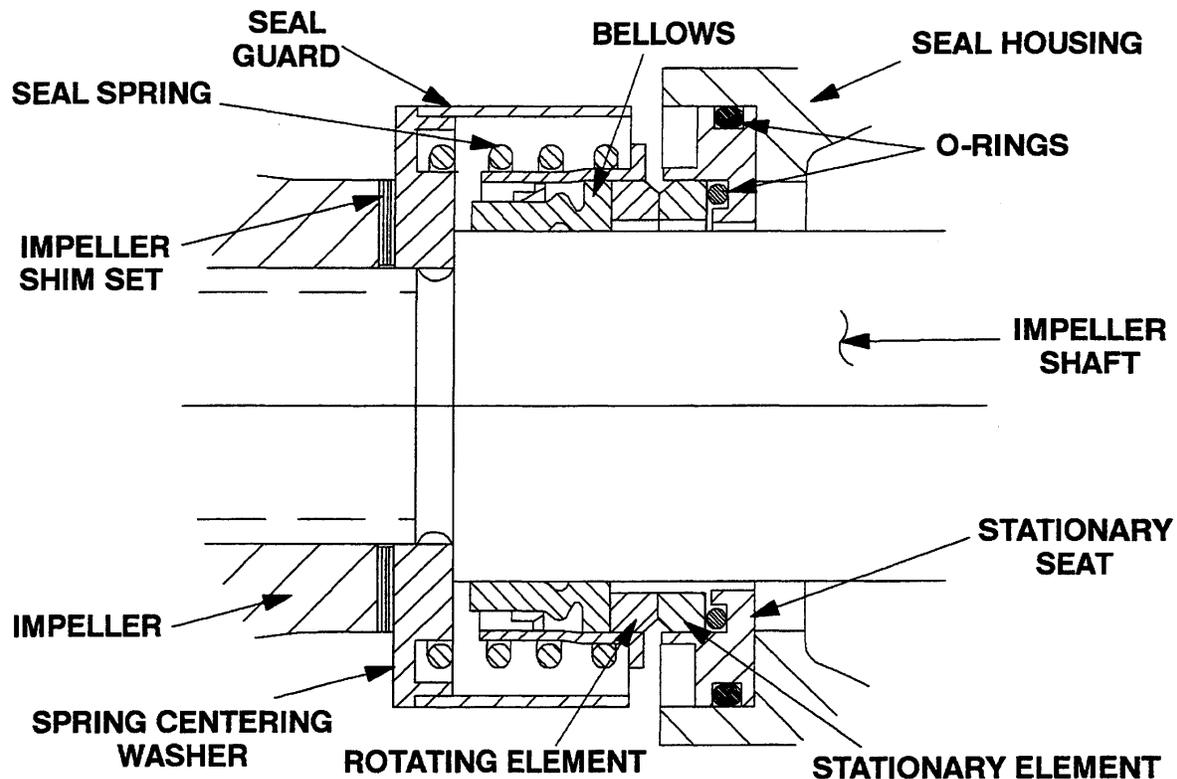
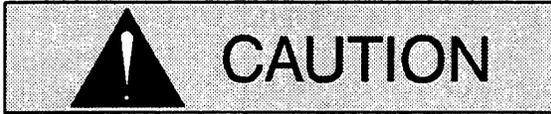


Figure 4. 12461C Seal Assembly



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

Position the seal housing (32) on a flat surface with the impeller side facing up. Install the stationary seat O-rings on the stationary seat. Subassemble the stationary element in the stationary seat. Press this subassembly squarely into the seal housing bore.

Replace the seal housing gasket (30). Be sure to align the lubrication ports in the intermediate with holes in the gasket.

Slide the assembled seal housing and stationary seal elements onto the impeller shaft and secure to the intermediate with the hardware (5 and 6). Be careful not to damage the seal face.

Subassemble the rotating element into the retainer and bellows and slide this subassembly onto the shaft until the seal elements contact. Install the spring and the seal guard assembly.

Lubricate the seal assembly as described in **LUBRICATION** after the impeller is installed.

Impeller And Wear Ring Installation

(Figure 2)

If the wear ring assembly was removed for replacement, align the mounting holes and press the wear ring assembly into the pump casing. Secure it with the attaching hardware (43 and 44).



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

Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller shims (4) as previously removed and screw the impeller onto the shaft until tight.

For maximum pump efficiency, the impeller should be centered within the volute scroll.

To verify the impeller positioning, measure the pump casing and impeller as shown in Figure 4. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims until dimension E is obtained.

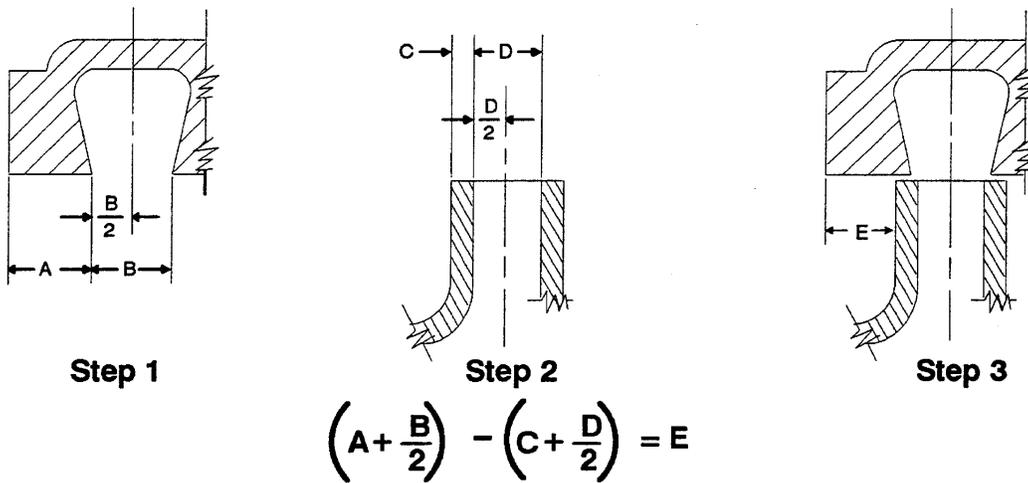


Figure 4. Centering Impeller Within Volute Scroll

NOTE

After the impeller has been properly positioned, check for free rotation. Correct any scraping binding before further reassembly.

Install the casing gasket (29) and secure the casing to the seal plate and intermediate with the hardware (27). Reinstall any leveling shims under the casing mounting feet and secure the casing to the base with the hardware (63, 64 and 65, Figure 1).

Replace the cover plate gasket (35) and attach the cover plate to the pump casing. Make sure the jacking screws (37) do not interfere with the cover plate seating.

NOTE

Apply 'Loctite Thread Sealant' or equivalent compound to the studs before securing.

Final Pump Assembly

(Figure 1)

Be sure the pump and engine are securely mounted to the base.

Install the check valve (73), suction and discharge lines and open all valves. Make certain that all piping connections are tight, properly supported and secure.

Be sure the pump, intermediate and engine have been properly lubricated, see **LUBRICATION**.

Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION**Seal Assembly**

(Figure 2)

Fill the seal bottle oiler (9) with SAE No. 30 non-detergent oil. Check the oil level regularly and keep the bottle full.

Bearings

(Figure 2)

The intermediate was fully lubricated when shipped from the factory. Under normal conditions, add three shots of No. 0 lithium base grease from a grease gun through the grease fitting (10) 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.



If grease is forced out around the shaft as new grease is added, the bearing cavity is full and should be disassembled and cleaned immediately.

There are no provisions in the bearing cavity to drain or flush the lubricant. The pump and intermediate 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) intermediate, fill the cavity through the lubrication fitting with approximately one-quarter of a pound of grease (approximately one-third full).

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

Engine

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

**THE GORMAN-RUPP COMPANY AND
GORMAN-RUPP OF CANADA LIMITED
12 MONTH LIMITED WARRANTY**

EXTENT AND DURATION OF WARRANTY

Coverage: The Gorman-Rupp Company or Gorman-Rupp of Canada Limited (herein individually referred to as "GR") each individually warrant that its products and parts shall be free from defects in material and workmanship for twelve (12) months from the date of purchase by the original end user.

Exceptions: This Limited Warranty shall not apply to the following products and parts: engines, motors, trade accessories and other products, components or materials not manufactured by GR. With respect to submersible pumps, the pump and motor are an integral unit and are therefore warranted as a unit. However, with respect to the electrical components in submersible pumps, this warranty is valid **only** when electrical controls for the pump have been specified and/or provided by GR. Wear and tear on any product resulting from normal use is not covered by this Limited Warranty.

LIMITATIONS

GR'S SOLE AND EXCLUSIVE WARRANTY WITH RESPECT TO ITS PRODUCTS AND PARTS IS THIS LIMITED WARRANTY. THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER EXPRESS AND/OR IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

EXCLUSIVE REMEDY AND DAMAGES

The sole and exclusive remedy for breach of this Limited Warranty by GR, and the entire extent of its liability for such breach or for damages arising and/or resulting from the use of the products and parts covered by this Limited Warranty shall be as follows:

1. **Repair or replacement:** If inspection shows that any GR product or part covered under this Limited Warranty is defective in materials or workmanship, GR shall repair or replace the defective product or part at its option, without charge. You must have properly installed, maintained and used the product or part claimed to be defective in accordance with the maintenance schedule and/or manual which comes with the product. *No allowance will be made for labor, transportation or other charges incurred by you in connection with such repair or replacement.*
2. **To obtain the above remedy:**
 - a) Immediately notify GR at the address below of the claimed defect in materials or workmanship and provide the serial number or date code of the product and/or part and provide a copy of the invoice or bill of sale referencing the product and/or part by no later than the expiration date of the Limited Warranty period.
 - b) GR will advise whether inspection of the product and/or part will be necessary and whether and how repair or replacement will be effected. If inspection by GR is necessary, the product or part must be sent freight prepaid to GR at the address stated below. Return shipment of the repaired product or part will be F.O.B. the address stated below.
3. **Damages:** GR's liability for damages for breach of this Limited Warranty shall not exceed the amount of the purchase price of the product or part in respect to which damages are claimed. **IN NO EVENT SHALL GR BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES FOR BREACH OF THIS LIMITED WARRANTY OTHER THAN AS STATED HEREIN.**

Some states do not allow the exclusion or limitation of incidental or consequential damages. Accordingly, the above may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state and province to province.

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