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



0 SERIES PUMP

MODEL
02F1-GL

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

www.grpumps.com

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

©Copyright by the Gorman-Rupp Company

Register your new
Gorman-Rupp pump online at
www.grpumps.com

Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

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

Pump Model: _____

Serial Number: _____

TABLE OF CONTENTS

INTRODUCTION	PAGE I – 1
SAFETY - SECTION A	PAGE A – 1
INSTALLATION – SECTION B	PAGE B – 1
Pump Dimensions	PAGE B – 1
PREINSTALLATION INSPECTION	PAGE B – 2
VEHICLE REQUIREMENTS	PAGE B – 2
Tank Preparation	PAGE B – 2
POSITIONING PUMP	PAGE B – 2
Lifting	PAGE B – 2
ALIGNMENT	PAGE B – 3
SUCTION AND DISCHARGE PIPING	PAGE B – 4
Typical System Installation	PAGE B – 4
Piping	PAGE B – 5
Sealing	PAGE B – 6
Valves	PAGE B – 6
Siphoning	PAGE B – 7
Eductors	PAGE B – 7
OPERATION – SECTION C	PAGE C – 1
PRIMING	PAGE C – 1
GROUNDING	PAGE C – 1
STARTING	PAGE C – 1
Rotation	PAGE C – 1
Drive	PAGE C – 2
OPERATION	PAGE C – 2
Leakage	PAGE C – 2
Liquid Temperature And Overheating	PAGE C – 2
Strainer Check	PAGE C – 2
Pump Vacuum Check	PAGE C – 3
STOPPING	PAGE C – 3
Cold Weather Preservation	PAGE C – 3
GEARBOX TEMPERATURE CHECK	PAGE C – 3
TROUBLESHOOTING – SECTION D	PAGE D – 1
PREVENTIVE MAINTENANCE	PAGE D – 3

TABLE OF CONTENTS
(continued)

PUMP MAINTENANCE AND REPAIR - SECTION E	PAGE E – 1
PERFORMANCE CURVE	PAGE E – 1
PARTS LIST:	
Pump Model	PAGE E – 3
Gear Box Assembly	PAGE E – 5
PUMP AND SEAL DISASSEMBLY	PAGE E – 6
Impeller Removal	PAGE E – 7
Seal Removal and Disassembly	PAGE E – 7
Pump Disassembly	PAGE E – 8
PUMP AND SEAL REASSEMBLY	PAGE E – 8
Pump Reassembly	PAGE E – 8
Seal Reassembly and Installation	PAGE E – 8
Impeller Installation	PAGE E – 7
Impeller and Wear Ring Installation	PAGE E – 10
Securing Pump and Gearbox	PAGE E – 10
Final Pump Assembly	PAGE E – 10
GEARBOX DISASSEMBLY	PAGE E – 11
GEARBOX REASSEMBLY	PAGE E – 12
LUBRICATION	PAGE E – 12
Seal Assembly	PAGE E – 12
Gearbox	PAGE E – 12

INTRODUCTION

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

This 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 an 0 Series, enclosed impeller, centrifugal model, with straight-in suction and without a suction check valve. The basic material of construction for wetted parts is aluminum. The pump is close-coupled to an integral, 1000 RPM gearbox speed increaser with a 5.69:1 ratio. Power is transmitted to the gearbox through a customer-installed universal shaft assembly.

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

If there are any questions regarding the 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
Phone: (419) 755-1011
 or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631-2870

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 0 Series power take-off pumps. Refer to the manual accompanying the power source before attempting to begin operation.

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



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Switch off the vehicle ignition and remove the key 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 for vehicular mounting in petroleum service. Do not attempt to pump corrosive materials which may damage the pump or endanger personnel as a result of pump failure.



If this pump is used with volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.



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



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

**WARNING!**

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!**

If this pump is used with volatile and/or flammable liquids, overheating may produce dangerous fumes. Take precautions to ensure the area surrounding the pump is adequately ventilated. Allow the pump to cool and use extreme caution when venting the pump, or when removing covers, plates, plugs, or fitting.

**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 completely 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!**

After the vehicle is positioned for pump maintenance, block the wheels and set the emergency brake before attempting

to disconnect the drive shaft or remove the pump. Be sure the pump is properly reinstalled and secure before operation.

**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 completely cool before servicing.

**WARNING!**

The gearbox provided on this pump is designed for operation at 1000 RPM maximum input speed. If operated at a higher RPM, pump components may be destroyed.

**WARNING!**

Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.

**CAUTION**

Never run the pump dry of pumping medium. There must be a supply of liquid to the pump at all times to prevent destruction of the shaft seal faces.

**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.



WARNING!

Do not test or operate your pump and integral gearbox before reading the installation and operation instructions in this manual.

This pump is a self-priming centrifugal model with an integral gearbox assembly. It is designed for vehicular mounting in petroleum service, where the liquid is supplied to the pump under pressure. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the in-

coming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve (see Section E, Page 1).

The integral gearbox is designed to be driven through the vehicle transfer case by a customer-supplied universal shaft assembly. The pump casing or gearbox may be rotated in 45° increments to assist with alignment with the vehicle tank; however, if the gearbox is to be rotated, some modifications must be made to the gearbox to ensure adequate lubrication. Consult the factory for details.

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

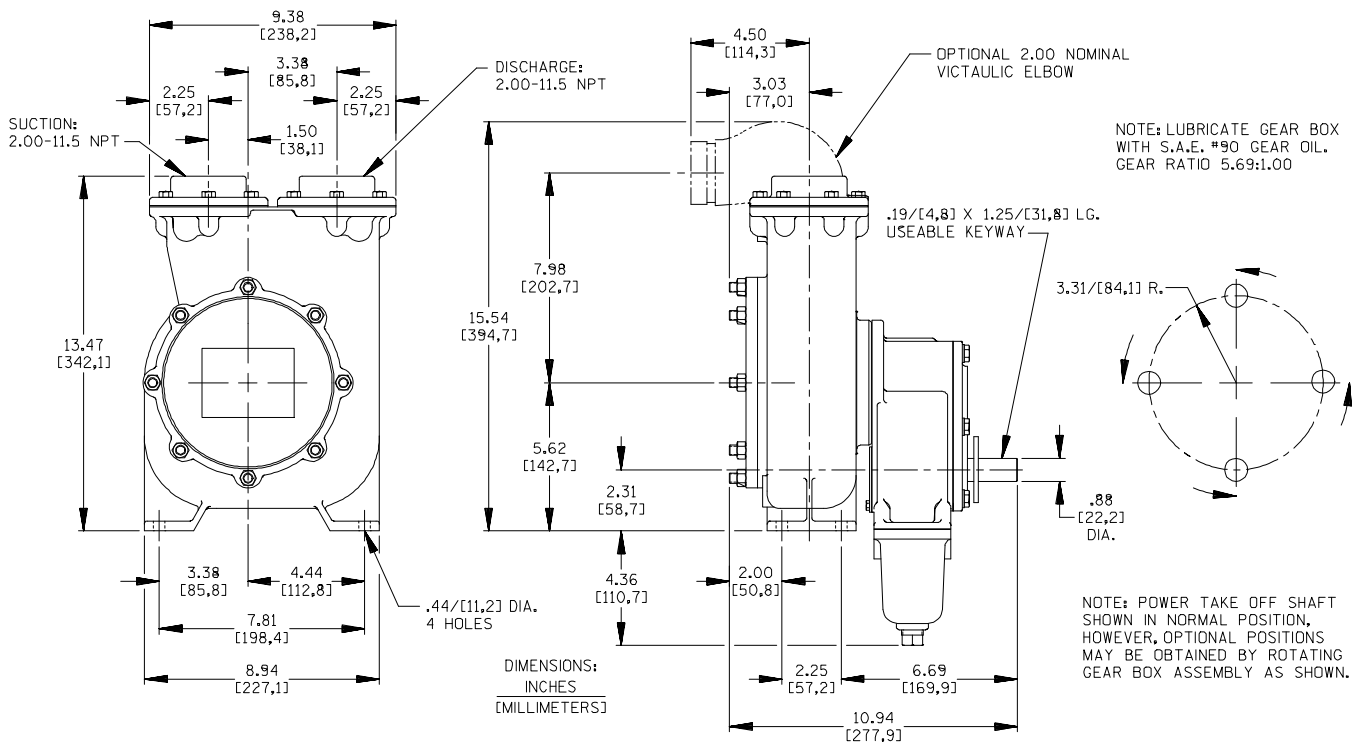


Figure 1. Pump Model 02F1-GL

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 gearbox 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. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates in the required direction.



Only operate this pump in the direction indicated on the pump body and/or the accompanying decal. Reverse rotation of the shaft will adversely effect pump performance, and the pump and/or gearbox could be seriously damaged.

- 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 gearbox 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.

VEHICLE REQUIREMENTS

The following instructions apply equally to new installations, rebuilds or retrofits.

Tank Preparation

It is **essential** that any tank scale, dirt, or other foreign material be removed from the tank and piping prior to pump installation. Failure to do so could result in clogging or damage to the pump.



Damage to the pump resulting from debris in the suction line **will not** be covered by the pump warranty.

Before connecting the suction and discharge piping, carefully check the storage tank and piping for construction debris such as nuts, bolts, wire, weld slag, and other foreign material. Install a commercially available 80 mesh screen in the suction line to prevent debris from entering the pump.

POSITIONING PUMP

Lifting

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



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

Due to the confined mounting location, specialized equipment such as a transmission jack with custom brackets should be used to lift and position the pump and gearbox.

NOTE

If the gearbox is rotated out of the standard position shown in Figure 1, the oil fill and drain plugs must be relocated. The oil vent must be relocated to the highest port. Consult the factory for correct positioning of the fill plug to provide for proper lubrication of the gearbox.

ALIGNMENT



When installing and/or aligning universal shaft assemblies, disconnect the power source to ensure that the pump will remain inoperative.

The alignment of the pump and its power source is critical for trouble-free mechanical operation. Before checking alignment, make sure that the gearbox mounting bolts are tight.

When connecting the universal joint drive shaft assembly to a PTO unit, install, support, and align the drive shaft in accordance with the manufacturer's instructions. The pump and the drive power source are generally positioned so that shaft centerlines are parallel and horizontal. The maximum operating angle should not exceed 15 degrees (see Figure 3).

Check the direction of rotation of the PTO unit before starting the pump. The drive shaft must rotate in the direction shown on the body of the pump, gearbox, and/or decals, tags, and labels.



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.

After the power take-off has been aligned, block the wheels of the external power source, engage the braking system, or take other precautions to ensure that the power source will remain stationary. Block the wheels on the unit to prevent creeping.

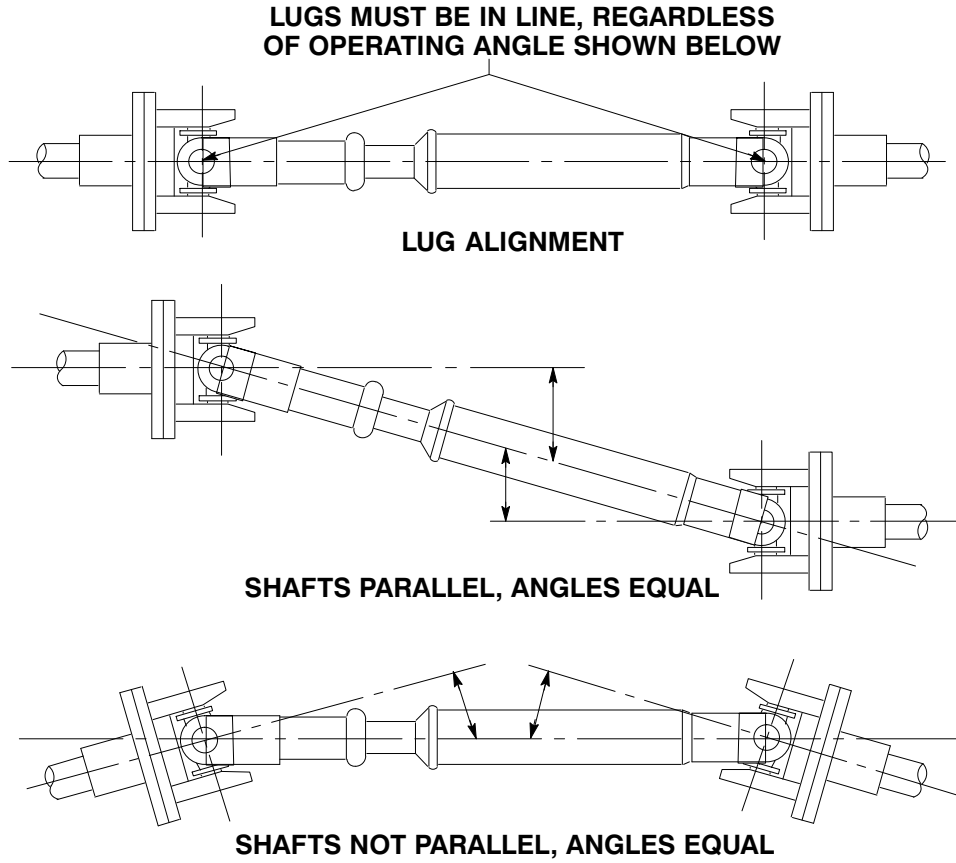


Figure 3. Proper Installation And Alignment of Universal Assembly

SUCTION AND DISCHARGE PIPING

tors, related piping and safety accessories. Some of the accessories are available from Gorman-Rupp as optional equipment.

Typical System Installation

Tank filling and dispensing operations require a system utilizing flow-directing (FDF) valves, educ-

Refer to Figures 3 and 4 for illustrations of typical piping systems for tank filling and dispensing.

SCHEMATIC SYSTEM USING EDUCATOR FOR DISPENSING AND FILLING

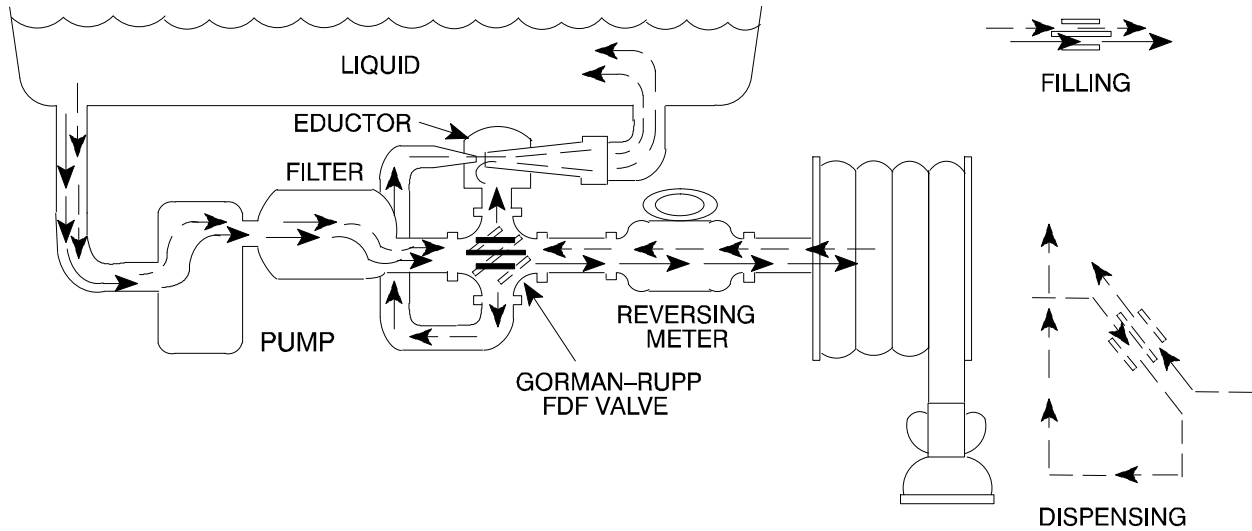
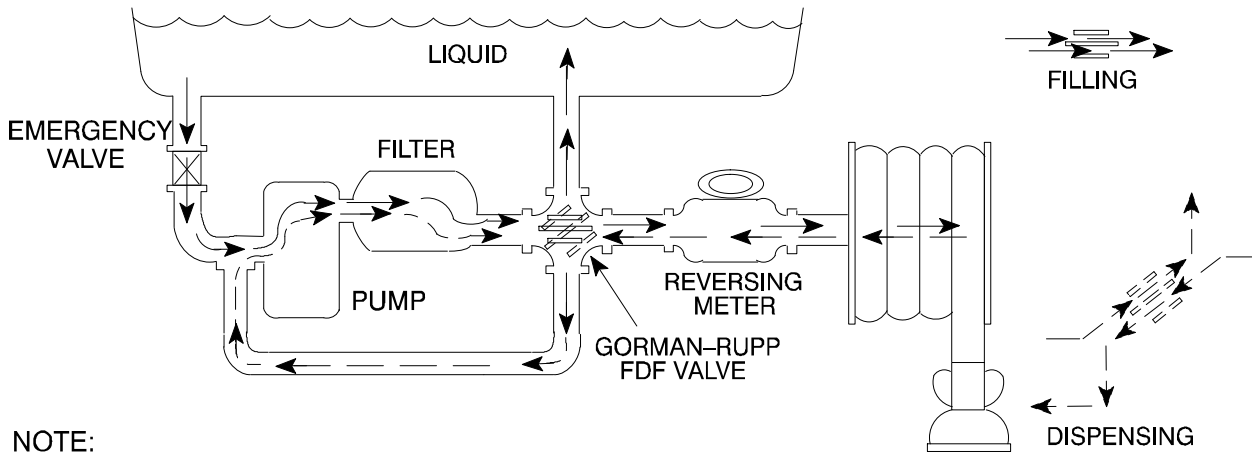


Figure 3. Typical Installation Using Educator For Filling And Dispensing

SCHEMATIC SYSTEM USING PUMP FOR DISPENSING AND FILLING



NOTE:
EMERGENCY VALVE OPEN FOR FILLING
EMERGENCY VALVE CLOSED FOR DISPENSING

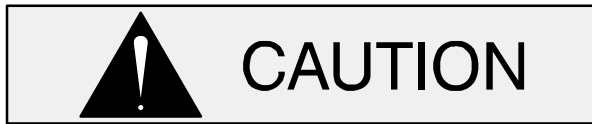
Figure 4. Typical Installation Using Pump For Filling And Dispensing

Piping

All piping material 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.

A suction strainer was not furnished with this pump since it is **not** designed to handle liquids containing solids. However, to protect the pump from accidental damage a commercially available 80 mesh screen should be installed in the suction line. Make certain that the total open area of the screen is at least three or four times the cross section of the

suction line to ensure an adequate supply of liquid to the pump.



Damage To the pump resulting from debris in the suction line **will not** be covered by the pump warranty.

Before connecting the suction and discharge piping, carefully check the storage tank and piping for construction debris such as nuts, bolts, wire, weld slag, and other foreign material. Install a commercially available 80 mesh screen in the suction line to prevent debris from entering the pump.

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.

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 pie dope.

Valves

Gorman-Rupp manufactures several sizes of flow-diverting (FDF) valves for use in truck-mounted pumping applications. The valves are designed to reverse the flow of liquid with only the turn of a handle. This allows the same pump to fill or dispense from the tank.



The FDF valve is designed for directing flow only. it will not serve as a positive shut-off or throttling valve.

See Figure 5 illustrating the theory of operation for a typical FDF valve. Consult the factory for further assistance or other sizes.

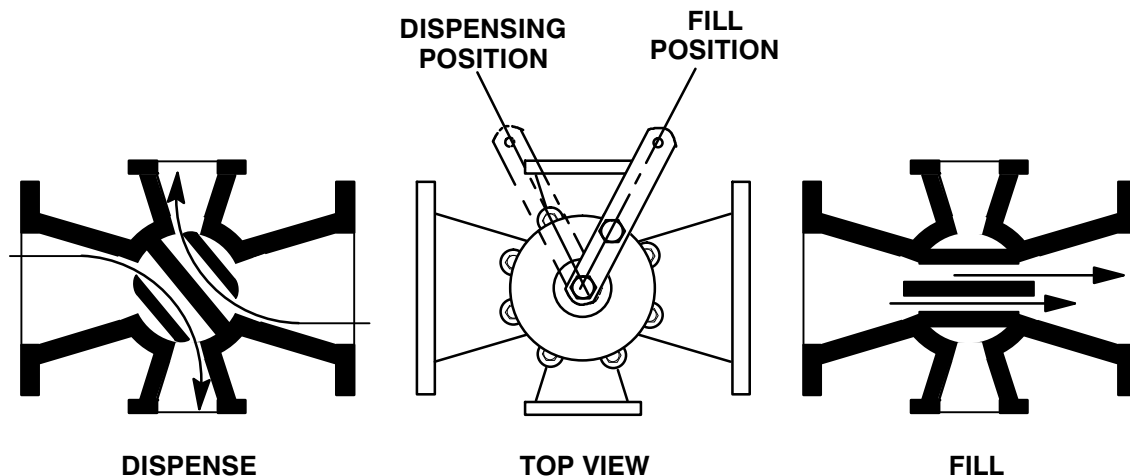


Figure 5. FDF Valve Theory of Operation

When the center web of the valve is aligned with the larger ports (filling position), the flow passes straight through. When the handle is turned to the

dispensing position, the web blocks the straight flow and opens two paths of flow through the larger ports to the smaller ports.

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.

Eductors

An eductor may be used in conjunction with an

FDF valve to increase dispensing rates and improve efficiency. An educator may also be used to collapse the tank service hose after the tank has been filled or emptied.

Contact the Gorman-Rupp Company or an authorized distributor for specifications and performance data on eductors or FDF valves.

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 for vehicular mounting in petroleum service. Do not attempt to pump corrosive materials, or any liquids which may damage the pump or endanger personnel as a result of pump failure.

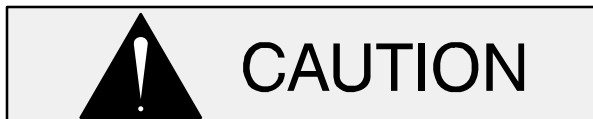


The gearbox provided on this pump is designed for operation at 1000 RPM maximum input speed. If operated at a higher RPM, pump components may be destroyed.

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.



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.

When installed in a flooded suction application, simply open the system valves and permit the incoming liquid to evacuate the air. After the pump and piping system have completely filled, evacuate any remaining air pockets in the pump or suction line by loosening a pipe plug or opening bleeder valves.

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

GROUNDING

To eliminate electrostatic build-up when pumping petroleum products, the pump must be grounded by attaching a ground wire to a ground rod. Install the ground rod in accordance with the National Electric Code and all local codes. Be sure the clamp or fastener has made a tight electrical connection with the rod.



Inspect and test the ground wire assembly for conductivity. Replace broken or frayed wire before resuming operation.

STARTING

Consult the operations manual furnished with the power source.

Rotation

The correct direction of pump rotation is counter-clockwise when facing the input drive shaft. The

pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits (see the curve on Page E-1), check the direction of rotation before further troubleshooting.

Drive

This pump is designed for operation with a power take-off unit coupled to the drive shaft on the gearbox. The gearbox assembly has a ratio of 5.69:1, and is designed for operation at 1000 RPM. **Do not** operate at a higher input speed.



The gearbox provided on this pump is designed for operation at 1000 RPM maximum. If operated at a higher rpm, pump components may be destroyed.

OPERATION



Pump speed and operating condition points must be within the continuous performance range shown on the curve (see Section E, Page 1).

Partially open the discharge throttling valve so that the discharge line fills slowly to prevent damage to piping, gaskets, and other devices in the line which could be affected by shock resulting from rapid filling of the line. When the discharge line is completely filled, adjust the discharge throttling valve to the desired 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 cool before servicing it. Refill the pump casing with cool liquid.



Allow an overheated pump to completely cool before servicing. Do not remove plates, covers, gauges, pipe plugs, 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. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

Strainer Check

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

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

Pump Vacuum Check

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

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (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.

NOTE

Petroleum products are very sensitive to changes in temperature. Warmer temperatures elevate the product vapor pressure, resulting in low vacuum readings. Do not mistake temperature problems for faulty pump installation or performance.

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, remove the engine ignition key to ensure that the pump will remain inoperative.

Cold Weather Preservation

If the application of this pump is limited to petroleum products, normal freezing conditions will not damage the pump. However, during extremely severe conditions care should be exercised during start-up, especially if the pump has been idle for more than a few hours.

GEARBOX TEMPERATURE CHECK

The gearbox runs higher than ambient temperatures because of heat generated by friction. Temperatures of approximately 200°F (93°C) are considered normal, and can operate intermittently at 250°F (121°C).

Checking gearbox temperatures by hand is inaccurate. Place a contact-type thermometer against the housing and record this temperature for future reference.

A sudden increase in gearbox temperature is a warning that the bearings are at the point of failing. 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 within 20 minutes or less.

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 vehicle ignition and remove the key, or take other precautions to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	<p>Not enough liquid in casing.</p> <p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Pump speed too slow.</p> <p>Strainer clogged.</p>	<p>Add liquid to casing. See PRIMING.</p> <p>Correct leak.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check power source output; consult power source operation manual.</p> <p>Check strainer and clean if necessary.</p>
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	<p>Air leak in suction line.</p> <p>Suction intake not submerged at proper level or sump too small.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p>	<p>Correct leak.</p> <p>Check installation and correct submergence as needed.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p>

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	<p>Impeller or other wearing parts worn or damaged.</p> <p>Suction lift or discharge head too high.</p> <p>Pump speed too slow.</p> <p>Discharge line clogged or restricted; hose kinked.</p>	<p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p> <p>Check piping installation and install bypass line if needed. See INSTALLATION.</p> <p>Check power source output; consult power source operation manual.</p> <p>Check discharge lines; straighten hose.</p>
PUMP REQUIRES TOO MUCH POWER	<p>Universal joint drive misaligned.</p> <p>Pump speed too high.</p> <p>Discharge head too low.</p>	<p>Align drive.</p> <p>Check driver output; check that sheaves or couplings are correctly sized.</p> <p>Adjust discharge valve.</p>
EXCESSIVE NOISE	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Universal joint drive misaligned.</p> <p>Low or incorrect lubricant.</p>	<p>Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Align drive.</p> <p>Check for proper type and level of lubricant.</p>
BEARINGS RUN TOO HOT	<p>Bearing temperature is high, but within limits.</p> <p>Low or incorrect lubricant.</p> <p>Suction and discharge lines not properly supported.</p> <p>Drive misaligned; piping improperly installed.</p> <p>Bearings in power source or gearbox worn or binding.</p>	<p>Check bearing temperature regularly to monitor any increase.</p> <p>Check for proper type and level of lubricant.</p> <p>Check piping installation for proper support.</p> <p>Realign drive and piping at operating temperature. Add expansion joints if required.</p> <p>Check bearings.</p>

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so

equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

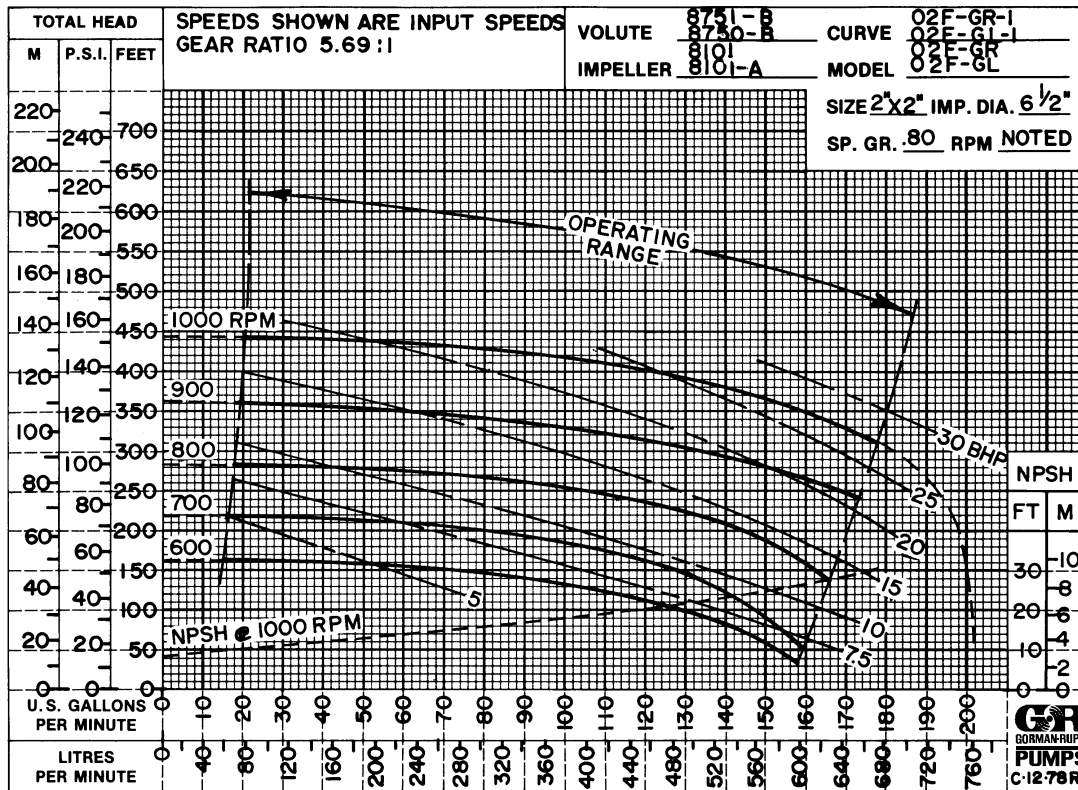
Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication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

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

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR - SECTION E

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



* STANDARD PERFORMANCE FOR PUMP MODEL 02F1-GL

* Based on 70° F (21° C) clear water corrected to 0.8 specific gravity 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.



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

SECTION DRAWING

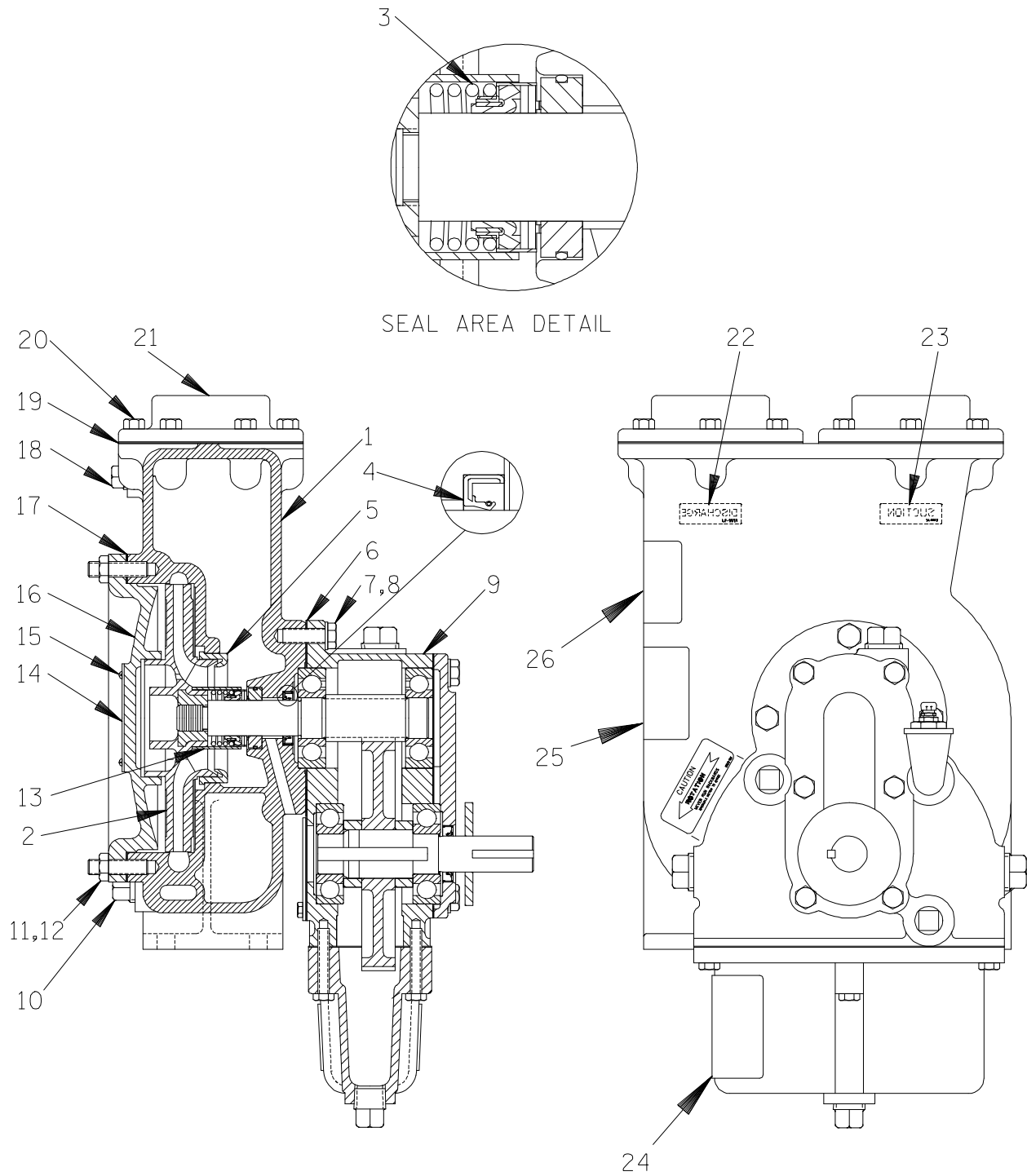


Figure 1. Pump Model 02F1-GL

PARTS LIST
Pump Model 02F1-GL
 (From S/N 654607 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 CASING	8750B	13040	1
2	IMPELLER	8101A	1301F	1
3	* SEAL ASSEMBLY	25271-851	----	1
4	* OIL SEAL	25217-165	----	1
5	* WEAR RING	8099	14000	1
6	* GASKET	8102G	18000	1
7	HEX HEAD CAPSCREW	B0604	15991	3
8	LOCK WASHER	J06	15991	3
9	GEAR BOX ASSEMBLY	44161-019	----	1
10	PIPE PLUG	P06	15079	1
11	STUD	C0606	15991	8
12	HEX NUT	D06	15991	8
13	SEAL GUARD	31143-056	14090	1
14	NAME PLATE	38818-020	13990	1
15	DRIVE SCREW	BM#04-03	17000	4
16	COVER PLATE	11156	10010	1
17	* COVER PLATE GASKET	8098G	20000	1
18	PIPE PLUG	P04	15079	2
19	* FLANGE GASKET	9288A	20000	2
20	HEX HEAD CAPSCREW	B0603	15991	12
21	FLANGE	9586A	10010	2
22	DISCHARGE STICKER	6588BJ	----	1
23	SUCTION STICKER	6588AG	----	1
24	LUBRICATION DECAL	8382B	----	REF
25	GEAR LUBE DECAL	38816-077	----	2
26	G-R DECAL	GR-02	----	1

NOT SHOWN:

INSTRUCTION TAG	38817-039	----	1
INSTRUCTION TAG	6588U	----	1

* INDICATES PARTS RECOMMENDED FOR STOCK

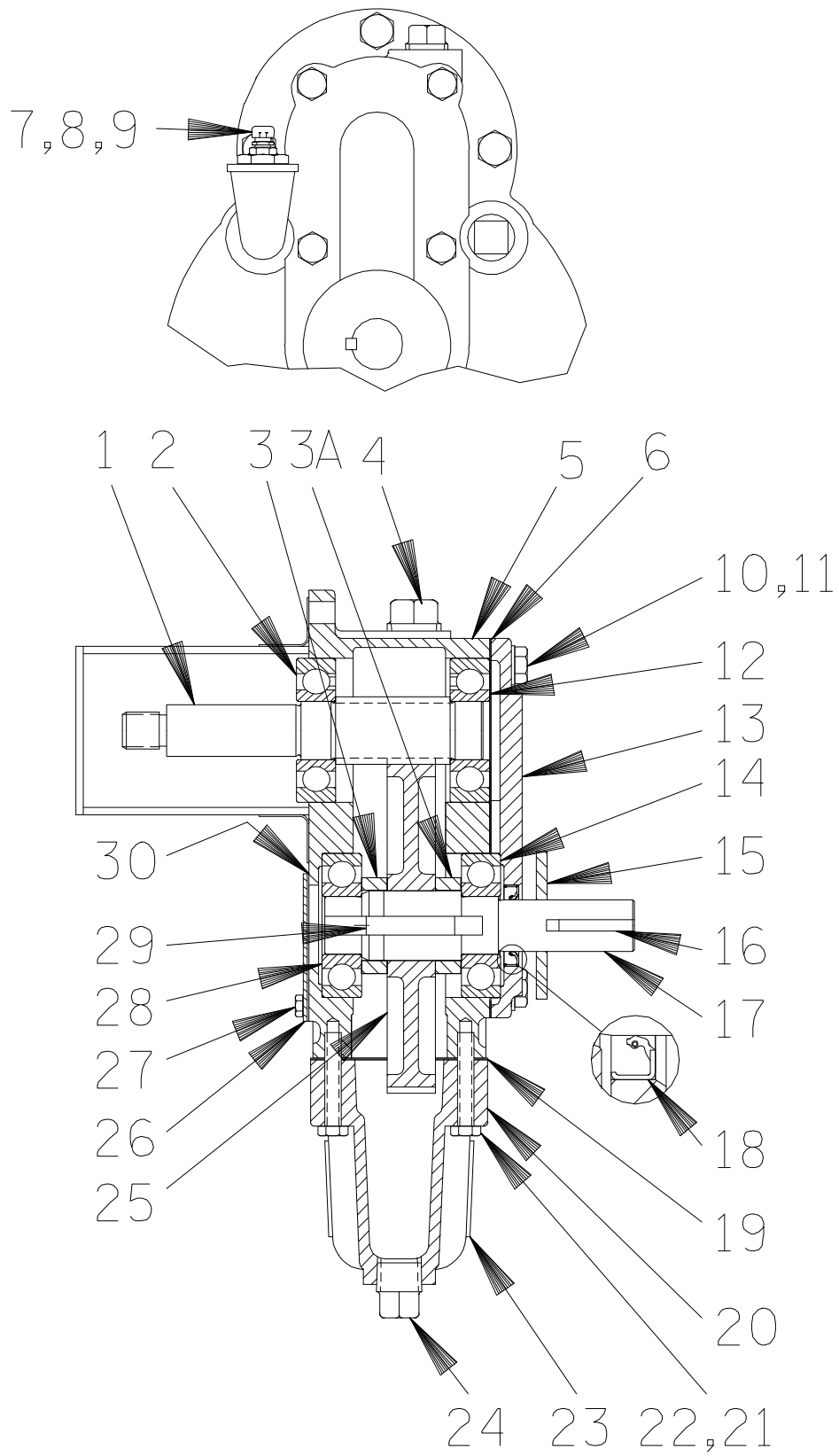


Figure 2. 44161-019 Gear Box Assembly

PARTS LIST
44161-019 Gear Box Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PINION SHAFT	38521-017	16020	1
2	* BALL BEARING	23275-206	---	1
3	SPACER SLEEVE	8104	15160	2
4	PIPE PLUG	P08	15079	1
5	GEAR BOX	8103B	10010	1
6	* GASKET	8097G	18000	1
7	AIR VENT	S1530	---	1
8	REDUCING PIPE BUSHING	AP0802	15079	1
9	STREET ELBOW	RS08	11999	1
10	HEX HEAD CAPSCREW	B0503	15991	6
11	LOCK WASHER	J05	15991	6
12	* BALL BEARING	23275-206	---	1
13	BEARING COVER	8097	10010	1
14	* BALL BEARING	S1120	---	1
15	SLINGER RING	31131-063	19330	1
16	* KEY	N0305	15990	1
17	DRIVE SHAFT	8095	15010	1
18	* OIL SEAL	S1617	---	1
19	* GASKET	10332G	18000	1
20	OIL SUMP	38354-032	13040	1
21	HEX HEAD CAPSCREW	B0406	15991	2
22	HEX HEAD CAPSCREW	B0403	15991	4
23	DECAL	8382B	---	2
24	PIPE PLUG	P08	15079	5
25	DRIVE GEAR	8022	16060	1
26	COVER PLATE	8120	15990	1
27	HEX HEAD CAPSCREW	BW#10-01-1/4S	15990	3
28	* BALL BEARING	S1120	---	1
29	* KEY	N0506	15990	1
30	* COVER GASKET	8120G	20020	1

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY

Review all warnings in Section A.

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

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional view (see Figures 1 and 2) and the accompanying parts list.

Most service functions, such as impeller, wear ring, and seal replacement, may be performed by draining the pump and removing the cover plate. However, due to the confined mounting location of the pump, it is recommended that the pump and gearbox be removed from the vehicle for service. The following instructions assume complete disassembly is required.

If the gearbox requires repair, proceed with **PUMP AND SEAL DISASSEMBLY**, followed by **GEARBOX DISASSEMBLY**.

Before attempting to service the pump, switch off the engine ignition and remove the key, or take other safety precautions to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.



Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off the vehicle ignition and remove the key, or take other precautions to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**

5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**



After the vehicle is positioned for pump maintenance, block the wheels and set the emergency brake before attempting to disconnect the drive shaft or remove the pump. Be sure the pump is properly reinstalled and secured before operation.

Removing Pump and Gearbox from Vehicle

Due to the confined mounting location of the pump, it is recommended that the pump be removed from the vehicle for service.



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.

Due to the confined mounting location, specialized equipment such as a transmission jack with custom brackets should be used to lift and position the pump and gearbox.

Close all valves in the suction and discharge lines. Remove the casing drain plug (34) and drain the pump. Clean and reinstall the drain plug.

Disconnect the P.T.O. shaft from the gearbox drive shaft. Remove all the hardware securing the pump and gearbox to the vehicle chassis. Tie and tag the any leveling shims used under the casing mounting feet to ease reassembly. Move the pump and gearbox to a clean, well-equipped shop for maintenance and repair.

Impeller Removal

(Figure 1)

The impeller (2), wear ring (5) and seal assembly (3) may be serviced by removing the cover plate (16). To remove the cover plate, disengage the nuts (12) securing the cover plate to the pump casing (1). Remove the cover plate gasket (17).

To remove the impeller, see Figure 2 and remove one of the pipe plugs (4) located in the gearbox. Screw the threaded sleeve on the gear jam tool (P/N 48781-002, Figure 3) into the pipe plug hole. Slide the pin through the sleeve until the beveled end of the pin engages the teeth of the drive gear (25). Screw the adjustment nut onto the sleeve until the pin firmly engages the teeth of the drive gear and jams rotation. Check to ensure that the pinion shaft (1) will not turn.

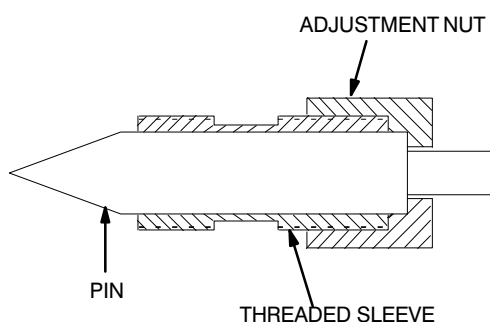


Figure 3. 48781-002 Gear Jam Tool

NOTE

If the gear jam tool does not prevent shaft rotation, the drive gear or key may be damaged. If so, the shaft and pump end must be disassembled to unscrew the impeller.

See Figure 2 and remove the drive shaft key (16) and slinger ring (15) from the drive shaft (17). Remove the lower most drain plug (24) and drain the gearbox lubricant. Clean and reinstall the drain plug. Disengage the hardware (10 and 11) and remove the bearing cover (13), oil seal (18), and gasket (6) from the gearbox housing (5).

*See Figure 1 and remove the hardware (7 and 8) securing the pump casing (1) to the gearbox. Use a 1-inch diameter brass rod (or wooden dowel) and a hammer to tap the shaft and assembled pump parts from the gearbox. **Be careful** not to damage the outboard pinion shaft bearing (12, Figure 2)*

*while driving the shaft out. Once the assemblies have been separated, secure the shaft gear teeth in a **soft-jawed** vice and proceed with the impeller removal.*

An impeller wrench (P/N 8516) or a 1-inch square steel bar may be used to remove the impeller. Insert the tool completely into the square recess provided in the impeller hub, and turn the impeller in a counterclockwise direction (when facing the impeller). Use caution when removing the impeller; tension on the seal spring will be released as the impeller is removed. If used, leave the gear jam tool in place after removing the impeller.

NOTE

*If the steel insert inside the impeller has stripped loose, drill two 3/16-inch (5 mm) diameter by 7/16 inch (12 mm) deep holes 180° apart into the impeller and steel insert. **Be sure** not to damage the shaft threads. Install two pins in the drilled holes to secure the impeller to the insert.*



The pins are used for impeller removal **only**. If the insert has stripped loose from the impeller, **replace the impeller**. **Do not** reinstall an impeller with the insert secured by pins.

After removing the impeller, inspect the seal guard (13) for excessive wear or scoring. The seal guard is secured to the impeller by a press fit. If replacement is required, apply heat before pulling it off the impeller.

Seal Removal and Disassembly

(Figure 1)

Carefully remove the seal spring. Apply oil to the shaft and work it up under the bellows. Remove the rotating portion of the seal from the shaft.

Use a pair of stiff wires with hooked ends to remove the stationary seat and O-ring from the pump casing.

Pump Disassembly

(Figure 1)

If the pump casing, oil seal (4) or gearbox assembly (9) requires replacement, the casing must be separated from the gearbox housing (5, Figure 2).

Remove the hardware (7 and 8) securing the pump casing to the gearbox, and separate the assemblies. Remove the casing gasket (6).

Lay the pump casing on an arbor (or hydraulic) press with the cover plate opening up, and use a suitably sized sleeve to press the oil seal out of the casing.

Inspect the wear ring (5) for excessive wear or scoring. The wear ring is secured in the pump casing by a press fit. If replacement is required, carefully cut through the wear ring in two places, 180° apart, and remove the wear ring parts from the pump casing. **Use caution** not to damage the pump casing when removing the ring.

If no further disassembly is required, proceed with **PUMP AND SEAL REASSEMBLY**. If the gearbox requires disassembly, do not reassemble the pump components at this time. Refer to **GEARBOX DISASSEMBLY** and **GEARBOX REASSEMBLY**, followed by **PUMP AND SEAL REASSEMBLY**.

PUMP AND SEAL REASSEMBLY

If the gearbox requires disassembly, refer to **GEARBOX DISASSEMBLY** and **GEARBOX REASSEMBLY**, followed by **PUMP AND SEAL REASSEMBLY**.

Pump Reassembly

(Figure 1)

Clean the pump casing (1), shaft and all component parts with a soft cloth soaked in fresh cleaning solvent.

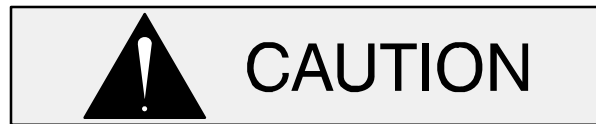


WARNING!

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.

Inspect the shaft for distortion, nicks, scratches or thread damage. Dress small nicks and burrs with a fine file or emery cloth. If the shaft is defective, see **GEARBOX DISASSEMBLY** and **GEARBOX REASSEMBLY**.

If the wear ring (5) was removed, press the replacement wear ring into the pump casing through the cover plate opening until fully seated.



CAUTION

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

Inspect the pump casing for nicks or burrs and remove any that exist. Apply a light coating of oil to the oil seal (4) and press it into the casing with the lip positioned as shown in Figure 1.

Install the casing gasket (6) and slide the casing over the shaft. **Be careful** not to damage the lip of the oil seal (4) on the shaft threads. Secure the casing to the gearbox assembly (9) with the hardware (7 and 8).

Seal Reassembly and Installation

(Figures 1 and 4)

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. 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 shaft, bellows and O-ring 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 4).

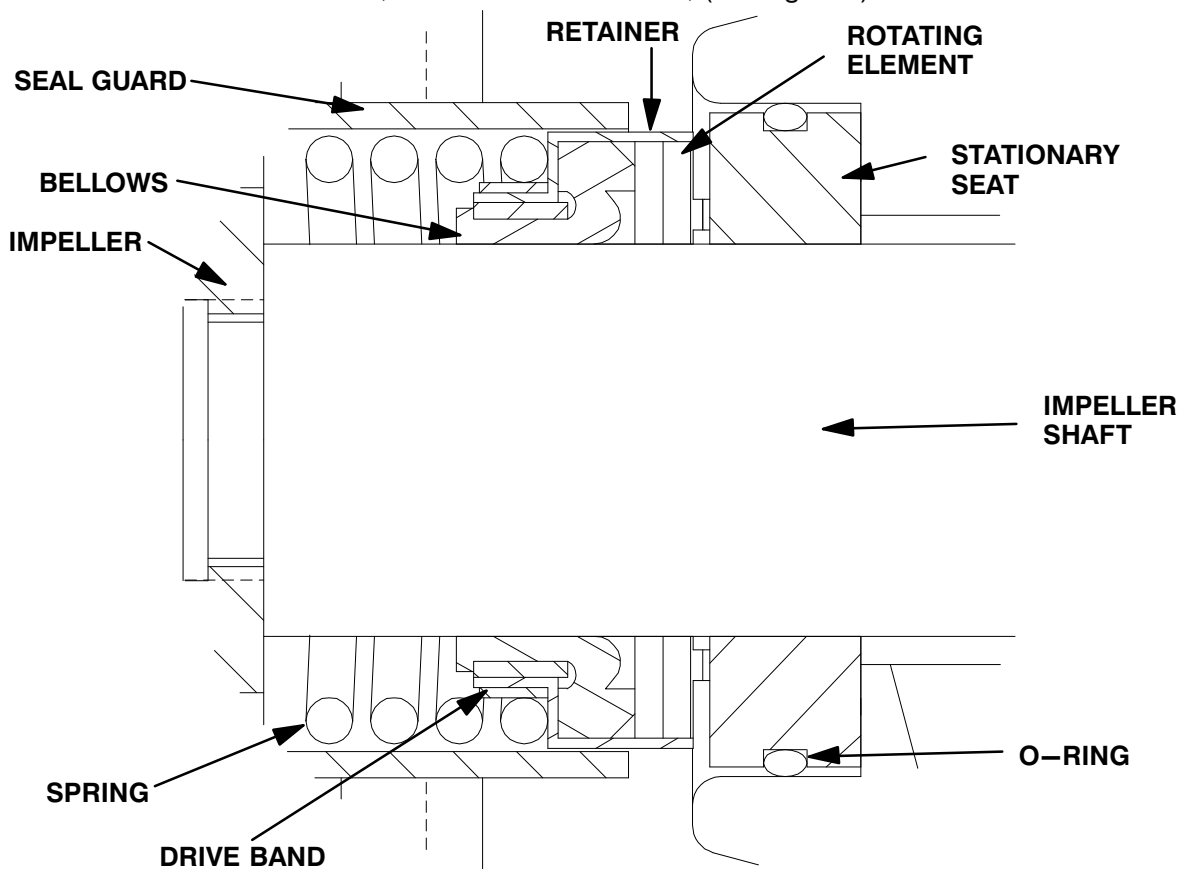


Figure 4. 25271-851 Seal Assembly



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

Inspect the pinion shaft (1, Figure 2) for distortion, nicks, scratches, or damage. Dress small nicks or burrs with a fine file or emery cloth. If excessive wear exists, refer to **GEARBOX DISASSEMBLY** and replace the shaft.

Lubricate the O-ring with light oil and install it in the stationary seat. Place a clean tissue over the seal-

ing face, and press the stationary seat into the pump casing until fully seated. A push tube cut from a length of plastic pipe would aid this installation. The O.D. of the tube should be approximately the same as the O.D. of the seal spring. **Be careful** not to damage the seal face. After installation, wipe the seal face in a concentric pattern with a clean, lint-free cloth to remove any fingerprints.

NOTE

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

Subassemble the rotating element into the retainer and bellows. Slide this subassembly onto the shaft, and use the push tube to press against the shoulder of the seal retainer until the seal faces contact.

Install the seal spring. Make sure that all components of the seal are seated squarely.

Impeller And Wear Ring Installation

(Figure 1)

Inspect the impeller (2), wear ring (5) and seal guard (46), and replace them if cracked or badly worn. If the wear ring and seal guard were removed, press the replacement parts onto the impeller until they are fully seated.



The seal guard **must** seat squarely on the impeller or binding and/or excessive wear will result.

Use the impeller wrench or similar tool to screw the impeller onto the shaft. After the impeller is tight on the shaft, remove the gear jam tool. Turn the shaft to ensure that the impeller rotates freely.

NOTE

*Do not install the pipe plug in the gearbox until the gearbox is properly lubricated as described in **LUBRICATION**.*

Replace the cover plate gasket (50), and secure the cover plate to the pump casing with the nuts (45).

Securing Pump and Gearbox to Vehicle



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.

Due to the confined mounting location, specialized equipment such as a transmission jack with custom brackets should be used to lift and position the pump and gearbox

Secure the pump casing and gearbox to the vehicle frame with the previously removed hardware. Install the P.T.O. coupling and secure it to the vehicle universal shaft. Check shaft alignment as described in **INSTALLATION**, Section B.

Install the suction and discharge piping and open all valves.

Final Pump Assembly

Be sure the pump and gearbox are securely mounted.

Open any valves in the suction and discharge lines. Make certain that all piping connections are tight, properly supported and secure.

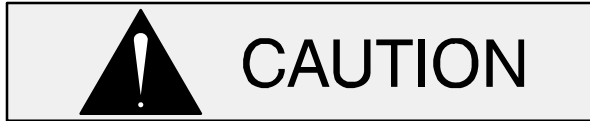
Be sure the pump, gearbox and power source have been properly lubricated, see **LUBRICATION**.

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

GEARBOX DISASSEMBLY

(Figure 2)

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



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

If the gearbox requires disassembly, first disassemble the pump components as indicated in **PUMP AND SEAL DISASSEMBLY**. Protect the exposed pinion shaft (1) and bearing (2) with a cardboard tube or barrier paper taped to hold it in place.

Before attempting to disassemble the gearbox, remove the drain plug (24) and drain the lubricant. Clean and reinstall the drain plug.

After draining the gearbox lubricant, remove the hardware (21 and 22) securing the oil sump (20) and gasket (19) to the gearbox housing (5).

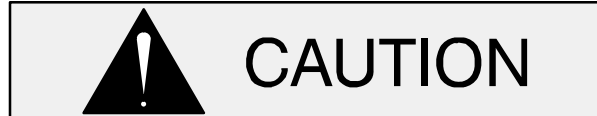
Remove the drive shaft key (16) and slinger ring (15) from the shaft. Disengage the hardware (13 and 14) and remove the bearing cover (13), oil seal (18) and gasket (6) from the gearbox housing. Inspect the oil seal and, if replacement is required, press it from the bearing cover.

Disengage the capscrews (27) and remove the cover plate (26) and gasket (30). Position the gearbox on the bed of an arbor (or hydraulic) press with the pump side up. Press the drive shaft (17) and bearing (14) from the gearbox housing. Pull the spacers (3 and 3A) and drive gear (25) from the housing as the shaft is forced out. Remove the key (29) from the drive shaft.

The inboard bearing (28) will remain in the gearbox housing. Inspect the bearing in place as described in the following paragraphs and, if replacement is required, pull the bearing out of the housing.

Reposition the gearbox housing on the press with the pump side down, and press the pinion shaft (1) and bearings (2 and 12) from the housing.

After removing the shafts 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 gearbox housing, shafts 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 gearbox

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

If the bearings require replacement, use a suitable puller to remove them from the shafts.

GEARBOX REASSEMBLY

(Figures 2 and 5)

Clean and inspect the bearings as indicated in **GEARBOX 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 pinion shaft bearings (2 and 12) may be heated to ease installation. **Do not** heat the drive shaft bearings (14 and 28).

NOTE

In the following steps, install the pinion shaft bearings (2 and 12) with the loading grooves on both bearings facing toward the shaft shoulders.

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.



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 out of position in shrinking. If movement has occurred, use a suitably sized sleeve and a press to reposition the bearings.

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



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

Slide the assembled pinion shaft and bearings into the gearbox housing so that the bearing (2) projects no more than .200 inch (5,08 mm) maximum from the gearbox housing, and the bearing (12) projects no more than .015 inch (0,38 mm). **These dimensions are critical** to prevent bearing preload and to assure proper component alignment when the pump is completely reassembled. If the installation dimensions do not match those shown above, check the mounting of the bearings on the shaft to ensure proper positioning.

Lay the gearbox housing on the bed of an arbor (or hydraulic) press with the drive side facing up. Lubricate the inboard bearing (28) and use a suitably sized sleeve to press it into the housing until fully seated.



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

After installing the inboard bearing, support the inner race with a suitable jig or fixture. See Figure 5 for fixture dimensions, drive gear and shaft installation.

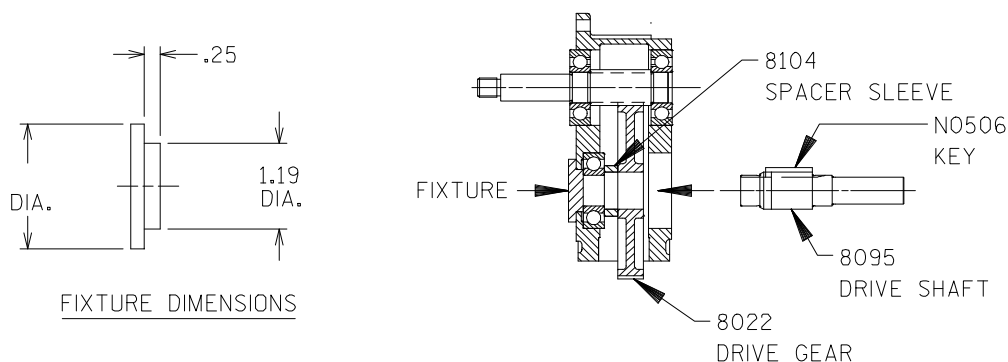


Figure 5. Fixture Dimensions, Drive Gear And Shaft Installation

Center the inboard spacer sleeve (3) on the inner bearing race. Center the drive gear (25) in the gearbox housing and engage the teeth of the pinion shaft. Rest the gear on the spacer sleeve, taking care to align the keyway in the drive gear with the slot in the spacer.

Install the drive gear key (29) in the shaft keyway. Align the key with the keyway in the drive gear and the slot in the spacer, and press the shaft through the drive gear, spacer sleeve and bearing until the shaft shoulder seats firmly against the inner race of the bearing.

Slide the outboard spacer sleeve (3A) onto the drive shaft, aligning the slot in the spacer with the shaft key. Press the outboard drive shaft bearing (14) onto the shaft and into the gearbox housing until fully seated against the shaft shoulder. The outboard bearing should not project more than .129 inch (3,28 mm) from the gearbox housing.



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

Apply a light coating of oil to the lip of the oil seal (18), and press it into the bearing cover with the lip positioned as shown in Figure 1. Replace the bearing cover gasket (6), and secure the bearing cover (13) to the gearbox housing using the hardware (10 and 11). **Be careful** not to damage the oil seal lip on the shaft keyway.



Make sure gasket remains in position and does not become sandwiched between pinion shaft bearing and bearing cover.

Replace the cover plate gasket (30), and secure the cover plate (26) to the gearbox housing with the capscrews (27).

Replace the oil sump gasket (19), and secure the oil sump (20) to the gearbox housing with the capscrews (21 and 22).

Install the slinger ring (15) and the drive shaft key (16) on the drive shaft.

Refer to **PUMP AND SEAL REASSEMBLY** and install the remaining pump components. After the pump components are installed, lubricate the gearbox as indicated in **LUBRICATION**.

LUBRICATION

Seal Assembly

The seal assembly is lubricated by the medium being pumped, and no additional lubrication is required.

Gearbox



Before operation, remove the shipping plug from the street elbow (9) and replace with the reducing bushing (8) and air vent

(7), which are shipped loose. The air vent **must** be installed to prevent the gearbox from overheating during operation.

The gearbox assembly was lubricated and tested before it was shipped from the factory; however, the lubricant level **must be checked** before putting the pump into service.

Change the lubricant in a new gearbox after an initial break-in period of 24 hours, and before 100 hours of operation. The lubricant should be changed while the pump is at operating temperature. Remove the gearbox drain plug to drain the gearbox.

Add 2 ounces (0,1 liter) of Dow Corning 'Molykote® M Gear Guard' to the gearbox, then top off with approximately 20 ounces (591 ml) of premium quality, multi-purpose, extreme pressure gear lubricant with an SAE rating per the ambient temperatures shown below - or until lubricant runs out of the oil

level hole. Always clean the drain plug thoroughly before reinstalling it.

SAE RATING	TEMPERATURE RANGE
80	Below 40 °F/4 °C
90	From 40 °F/4 °C to 100 °F/38 °C
140	From 100 °F/38 °C to 150 °F/66 °C

After the initial change, change the lubricant after every 500 hours of operation or every six months, whichever comes first. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.



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

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

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