

# INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST



## 80 SERIES PUMPS

MODEL
<b>81 1/2P47A-9</b>

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

[www.grpumps.com](http://www.grpumps.com)

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

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

Valid serial number and e-mail address required.



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

### **RECORD YOUR PUMP MODEL AND SERIAL NUMBER**

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

Pump Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

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## INTRODUCTION

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

This 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 80 Series, semi-open impeller, self-priming centrifugal model. The pump is close-coupled to a 3.5 HP Briggs and Stratton gasoline engine. Since the unit is very lightweight and portable, it is ideally suited to many agricultural, construction, and industrial applications.

It can be used to handle water or water-soluble herbicides and pesticides containing small entrained solids. It is not recommended for handling volatile, flammable or highly corrosive liquids. The basic material of construction is fiberglass-reinforced polyester (VALOX grade 420). The mechanical shaft seal is lubricated by the liquid being pumped.

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

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

For information or technical assistance on the engine, contact your local Briggs and Stratton dealer or representative.

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



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



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



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

### NOTE

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

## SAFETY – SECTION A

This information applies to 80 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. Shut down the engine and disconnect the spark plug wire to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



This pump is designed to handle water

and most water-soluble herbicides and pesticides containing small entrained solids. Do not attempt to pump volatile, flammable, or highly corrosive liquids which may damage the pump or endanger personnel as a result of pump failure.



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



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.



This pump is designed to pump materials which could cause serious illness or injury through direct exposure or emitted fumes. Wear protective clothing, such as rubber gloves, face mask and rubber apron as necessary, before disassembling the pump or piping.

**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 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!**

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 3600 RPM (shut off).

## INSTALLATION – SECTION B

### Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

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

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

configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to **50%** of the maximum permissible operating pressure as shown on the pump performance curve.

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

### Pump Dimensions

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

### OUTLINE DRAWING

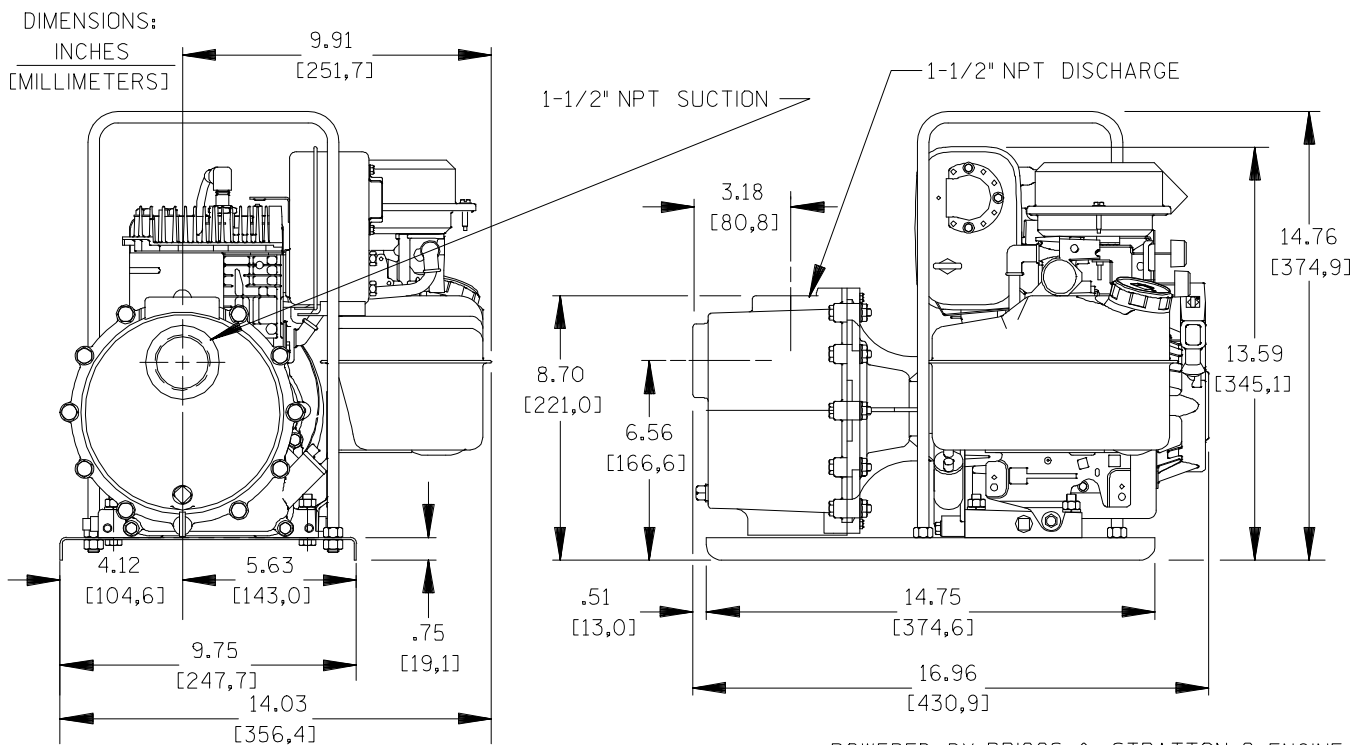


Figure 1. Pump Model 81 1/2P47-9

### PREINSTALLATION INSPECTION

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

- Inspect the pump for cracks, dents, damaged threads, and other obvious damage.
- 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 warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated.
- d. Check all lubricant 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.

## 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.

### 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.

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

The size of the system piping is **not** always determined by the nominal suction and discharge port diameter. Pump performance is adversely affected by factors such as suction lift, discharge elevation, and friction losses due to hose length. See Figure 2 and the performance curve on page E—1 to be sure your application allows the pump to operate within the safe operating range.

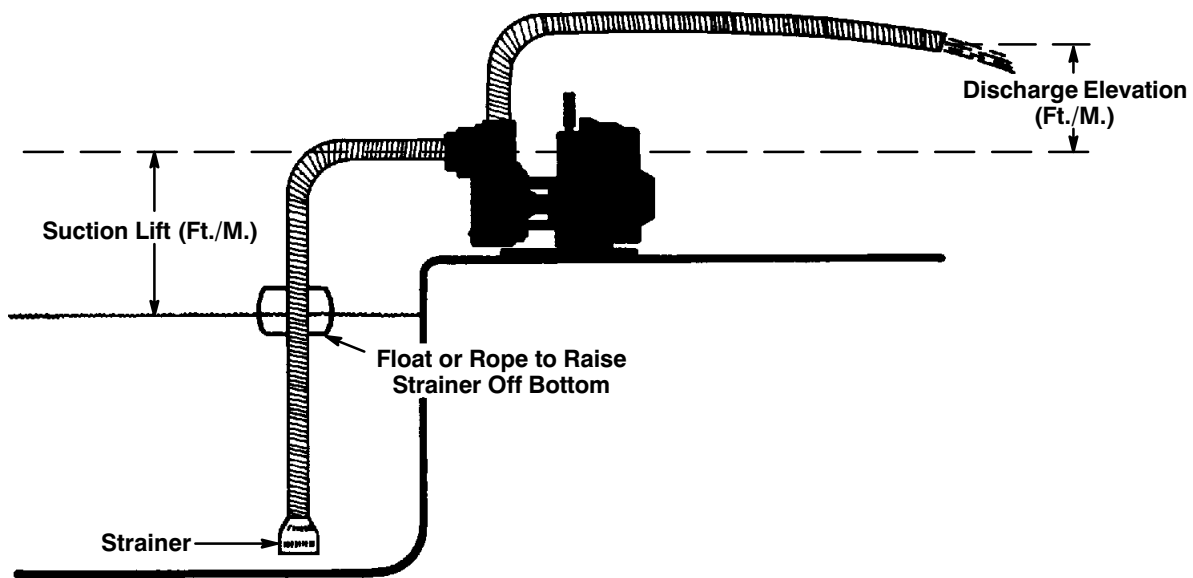


Figure 2. Typical Installation for Pump Model 81 1/2P47A-9

### Materials



In order to prevent piping loads, the suction and discharge lines **must** be supported and connected to the pump with flexible connectors. **If flexible connectors are not used, the pump warranty will be voided.**

Either pipe or hose may be used for suction and discharge lines; however, it is recommended that **hose** be used to prevent piping loads. Piping materials must be compatible with the liquid being pumped. **Flexible connectors must be used** on suction and discharge connections in order to prevent piping loads. If rigid piping is used, the lines must be independently supported. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction.

Using piping couplings in suction lines is not recommended.

### Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substan-

tially 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.

The **maximum** vertical suction lift for this pump is 20 feet (6 m). The pump is not designed to be operated at a higher lift.

### 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 9/16 inch (14 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 3 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 3. Recommended Minimum Suction Line Submergence vs. Velocity

**DISCHARGE LINES**

**Siphoning**

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

**Valves**

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

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

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump

from excessive shock pressure and reverse rotation when it is stopped.



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

**Bypass Lines**

If the pump is used with an open discharge line, trapped air within the pump will be vented through the discharge line during the priming process. However, if a system check valve is used due to high discharge head, it may be necessary to vent trapped air from the top of the pump during the priming process. This may be accomplished by installing a bypass line from the top of the pump, back to the source of liquid. The end of the bypass line must be submerged. The line must be large enough to prevent clogging, but not so large as to affect pump discharge capacity.

## 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 water and most water-soluble herbicides and pesticides containing small entrained solids. Do not attempt to pump volatile, flammable, or highly corrosive 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 3600 RPM (shut off).**

### PRIMING

Position 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.

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



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

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 a bleeder valve.

If the pump is installed in a **suction lift** application, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

### NOTE

*This pump is self-priming, however, it is **not** suited for unattended reprime applications. In the event of suction check valve failure and loss of prime, the pump casing **must** be refilled through the fill cover or fill plug.*

Run the engine at maximum governed speed during the priming cycle. With a suction lift of 5 to 10

feet (1,5 to 3,1 m), the pump should prime within 2 minutes. The maximum suction lift of 25 feet (7,6 m) (at sea level) should require no more than 4 minutes for initial prime. If the pump does not prime within this time, shut off the engine and determine the problem (see **TROUBLESHOOTING**).

## STARTING

Consult the operations manual furnished with the engine.

## OPERATION

### Lines With a Bypass

Close the discharge throttling valve (if so equipped) so that the pump will not have to prime against the weight of the liquid in the discharge line. Air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. When the pump is fully primed and liquid is flowing steadily from the bypass line, open the discharge throttling valve. Liquid will then continue to circulate through the bypass line while the pump is in operation.

### Lines Without a Bypass

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

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



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

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

### 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 cool before servicing. Do not remove plates, covers, gauges, or fittings from an overheated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. 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.

### Pump Vacuum Check

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

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

## STOPPING

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

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



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

After stopping the pump, shut down the engine and disconnect the spark plug wire 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.

## TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.



**Before attempting to open or service the pump:**

1. Familiarize yourself with this manual.
2. Shut down the engine and disconnect the spark plug wire 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>Suction check valve or foot valve clogged or binding.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Suction lift or discharge head too high.</p> <p>Strainer clogged.</p>	<p>Add liquid to casing. See <b>PRIMING</b>. Correct leak.</p> <p>Replace suction hose.</p> <p>Clean or replace valve.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check piping installation and install bypass line if needed. See <b>INSTALLATION</b>.</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>Lining of suction hose collapsed.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p>



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

### PREVENTIVE MAINTENANCE

Routine preventive maintenance of the pump will maintain peak operating performance. 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.

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.

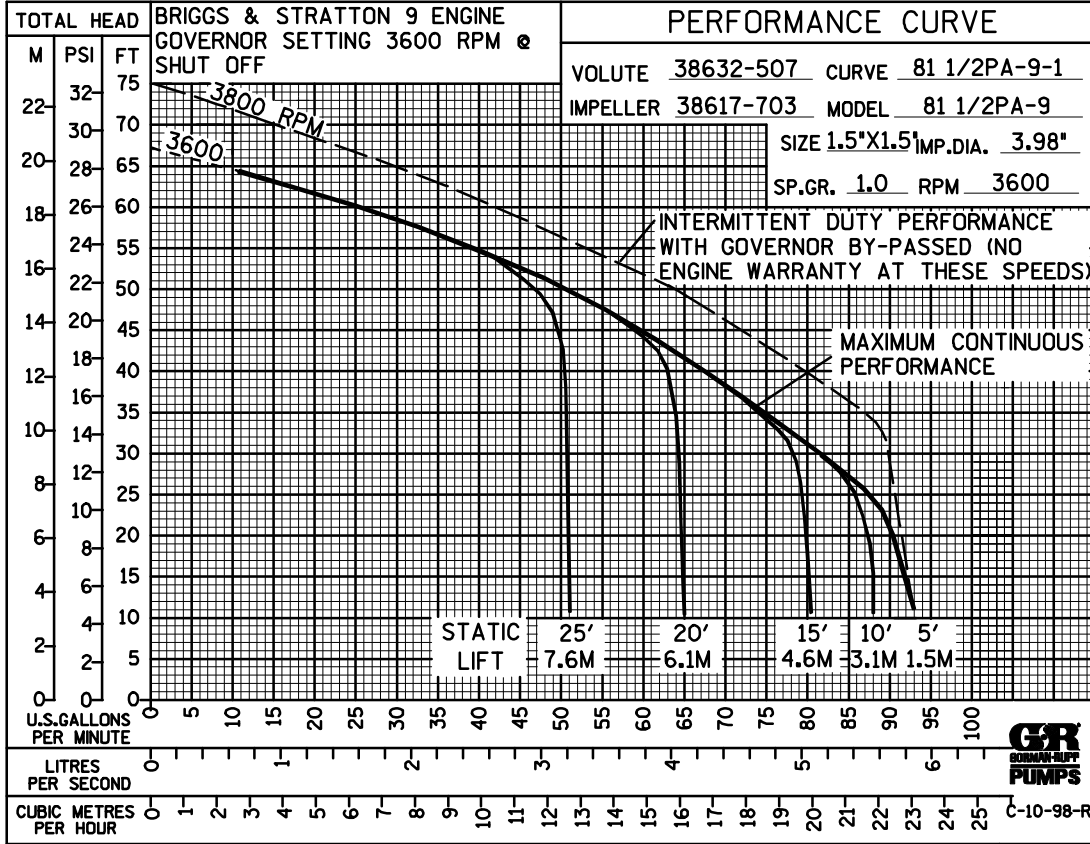
<b>Preventive Maintenance Schedule</b>					
<b>Item</b>	<b>Service Interval*</b>				
	<b>Daily</b>	<b>Weekly</b>	<b>Monthly</b>	<b>Semi-Annually</b>	<b>Annually</b>
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, 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 81 1/2PA-9

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

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



# 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 3600 RPM (shut off).**

SECTIONAL DRAWING

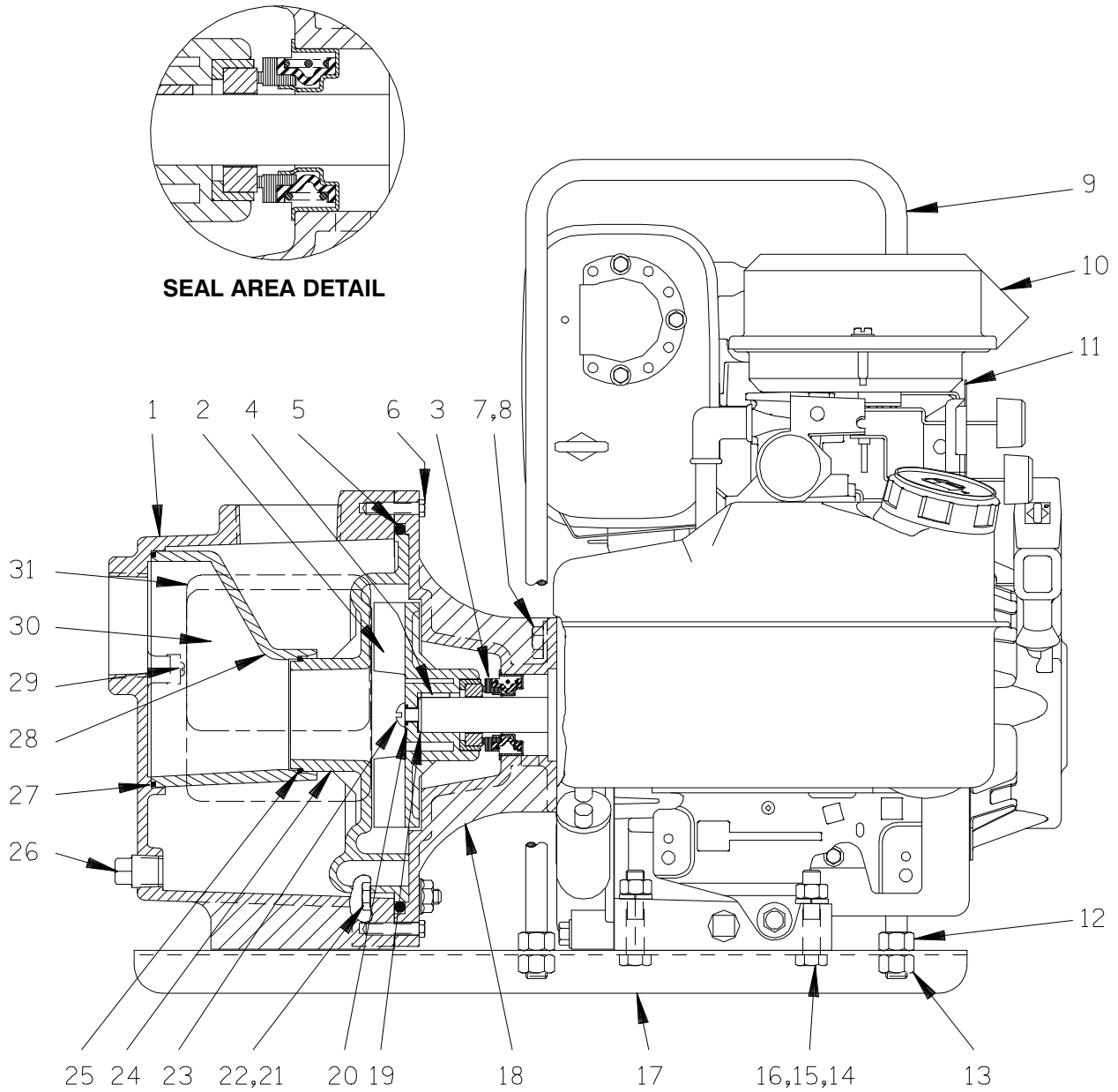


Figure 1. Pump Model 81 1/2P47A-9

**PARTS LIST**  
**Pump Model 81 1/2P47A-9**  
 (From S/N 1069800 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 HOUSING	38231-401	23090	1
2	* IMPELLER	38617-703	23090	1
3	* MECHANICAL SEAL ASSY	25271-412	----	1
4	* SHAFT KEY	N0302-1/2	17000	1
5	* PUMP HOUSING O-RING	25152-363	----	1
6	SELF-TAPPING SCREW	21287-596	----	2
7	HEX HD CAPSCREW	B0503S	17000	4
8	FLAT WASHER	KB05	17000	4
9	HANDLE	31921-020	15992	1
10	WARNING DECAL	2613FE	----	1
11	B & S 90112 ENGINE	29112-504	----	1
12	HEX NUT	D06	15991	2
13	DEFORM LOCKNUT	DD06	15991	2
14	HEX HD CAPSCREW	B0506	15991	4
15	LOCKWASHER	J05	15991	4
16	HEX NUT	D05	15991	4
17	BASE	34451-050	15990	1
18	INTERMEDIATE	38264-213	23090	1
19	* IMPELLER ADJUSTING SHIM SET	48261-032	----	1
20	* IMPELLER SCREW O-RING	25152-010	----	1
21	HEX HD CAPSCREW	B0405	17000	10
22	HEAVY NYLOCK NUT	21765-146	----	10
23	IMPELLER SCREW	X0403S	17000	1
24	VANE PLATE	38632-507	23090	1
25	* VANE PLATE O-RING	25152-134	----	1
26	PIPE PLUG	26471-003	----	1
27	* FLOW GUIDE O-RING	25152-155	----	1
28	FLOW GUIDE	38354-018	23090	1
29	SELF-TAPPING SCREW	21287-584	----	2
30	NAME PLATE	38812-052	----	1
31	WARNING DECAL	38816-091	----	1
NOT SHOWN:				
	STRAINER	26841-007	19220	1
	WARNING DECAL	2613FT	----	1
	ENGINE STARTUP TAG	38816-269	----	1
	G-R DECAL	GR-03	----	1
	OIL CAUTION LABEL	45-011	----	1
OPTIONAL:				
	DISCHARGE NIPPLE	26523-303	----	1
	DISCHARGE ELBOW	26525-202	----	1
	REPAIR KIT	48221-019	----	1
	-INCLUDES ITEMS 2, 3, 5, 19, 20, 25 & 27			
	ROLLOVER BASE	41583-316	24150	1
	RBR FT MTG KIT (USE W/ROLLOVER BASE)	48152-607	----	1

\* INDICATES PARTS RECOMMENDED FOR STOCK

## PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

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

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

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

Before attempting to service the pump, shut down the engine and disconnect the spark plug wire to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

The pump is powered by a Briggs and Stratton gasoline engine. For engine disassembly and repair, consult the literature supplied with the engine, or contact your local Briggs and Stratton representative.



**Before attempting to open or service the pump:**

1. Familiarize yourself with this manual.
2. Shut down the engine and disconnect the spark plug wire 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.

### Pump Disassembly

Remove the suction and discharge piping.

Before attempting to service the pump, remove the housing drain plug (26) and drain the pump. Clean and reinstall the drain plug.

For access to the impeller (2), disengage the hardware (21 and 22) and the self-tapping screws (6), and separate the pump housing from the intermediate (18).

The flow guide (28) rarely requires removal or replacement, but if necessary to do so, disengage the self-tapping screws (29) securing it to the pump housing. Remove the flow guide O-ring (27).

Remove the vane plate O-ring (25). Remove the vane plate (24) from the integral plastic pins on the intermediate. Remove the pump housing O-ring (5).

To remove the impeller, remove the impeller machine screw (23) and O-ring (20) and pull the impeller off the shaft. Retain the impeller key (4) and impeller shim set (19). Tie and tag the shims or measure and record their thickness for ease of reassembly.

### Seal Removal

The rotating portion of the seal assembly (2) is pressed into the back of the impeller. If the seal must be replaced, use a screwdriver to pry the rotating element and rubber seat from the impeller.

### NOTE

*Do not attempt to remove the seal unless replacement is required; seal components may be damaged during removal.*

Remove the hardware (19 and 20) securing the intermediate to the engine, and pull the intermediate and stationary portion of the seal off the shaft.

Lay the intermediate on a clean, flat surface with the impeller side down, and use a screwdriver or other suitable tool to press the stationary portion of the seal out of the intermediate from the back side.

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

### Seal Installation

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 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**. Clean and polish the shaft sleeve, or replace it if there are cuts or nicks on either end.

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 rubber seat 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 2).

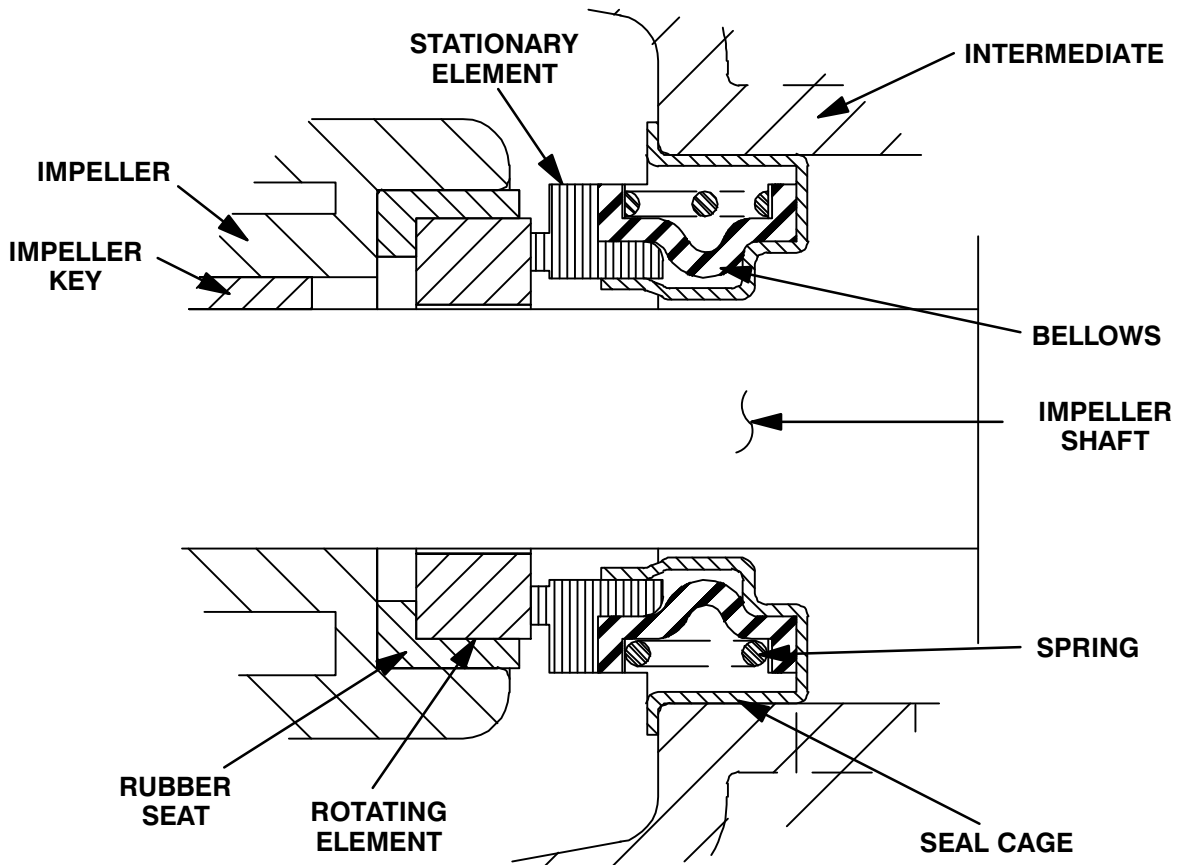


Figure 2. 25271-412 Seal Assembly



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

Secure the intermediate (18) to the engine with the hardware (7 and 8).

### NOTE

*The intermediate is offset and not concentric to the shaft. Be sure to install the intermediate with the drain holes in the neck of the mounting flange directed **down**.*

Apply aviation cement to the O.D. of the seal cage. **Use caution** not to contaminate the seal face.

Use hand pressure **only** to press the stationary portion of the seal into the intermediate. A push tube cut from a length of plastic pipe will aid this installation. The tube must fit against the seal cage flange, **not** against the precision finished seal face. Press the cage into the bore until completely seated. Apply a drop of light lubricating oil on the seal face. **Never** use grease.

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

Subassemble the rotating element into the rubber seat. Apply a **small** amount of water or light oil on the O.D. of the seat, and press this assembly into the back side of the impeller (2) until fully seated.

### Pump Reassembly



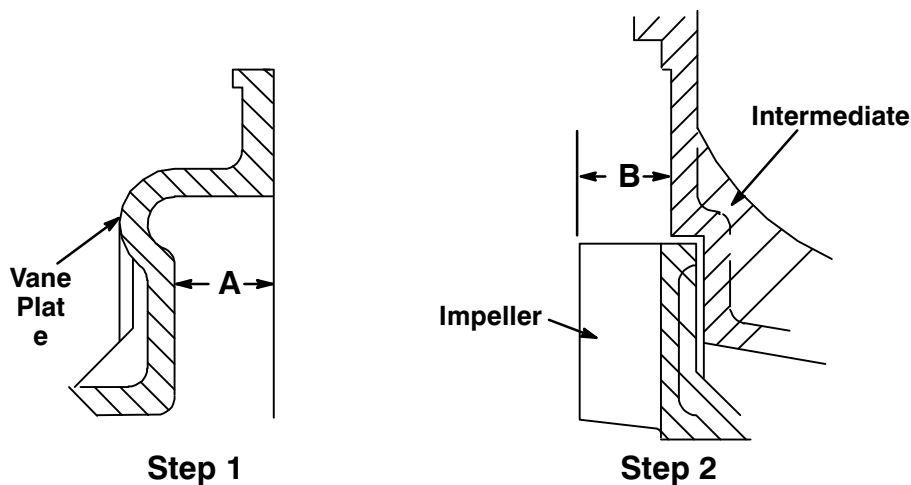
Be sure to follow all torque recommendations when securing pump hardware. Over-tightening could cause threads to strip or plastic parts to crack.

Lightly grease the impeller shims (19) to hold them in place, and install them in the impeller bore. Install the same thickness of shims as previously removed.

Install the impeller key (4) in the impeller keyway, and slide the impeller onto the shaft, taking care not to damage the rotating seal element. Replace the Impeller screw O-ring (20) and secure the impeller with the machine screw (23).

A clearance of .020 to .035 inch (0,18 to 0,38 mm) between the face of the impeller and the inside surface of the vane plate (24) is recommended for maximum pump efficiency. Calculate this clearance by first measuring the depth of the vane plate from the surface that seats against the intermediate to the face opposing the impeller (dimension A). Next, measure from the face of the impeller to the face of the intermediate (dimension B). Now subtract the smaller number from the larger number. If dimension B is **less than** dimension A, **add or subtract** shims from the shim set until the required clearance is obtained. If dimension B is **greater than** dimension A, an interference will occur between the impeller and the vane plate. **Subtract** shims from the shim set until the required thickness is obtained.





**Figure 3. Calculating Impeller Shim Thickness**

After the required thickness of impeller shims has been calculated and the impeller installed, position the vane plate on the integral plastic pins in the intermediate. The vane plate will seat properly **only** in one position; **do not** try to force the vane plate on the plastic pins.

Lubricate the flow guide O-ring (27) and install it on the flow guide (28). Press the flow guide into the pump housing (1) until fully seated. **Be careful** not to pinch or damage the O-ring. Secure the flow guide by torquing the self-tapping screws (29) to 8–10 in. lbs. (0,09–0,11 m. kg.).

Lubricate the O-ring (5) with light oil and install it over the vane plate. Carefully position the pump housing and flow guide over the vane plate until the housing seats against the intermediate. Use caution not to pinch or damage the vane plate O-ring (5).

Secure the pump housing and flow guide to the intermediate by torquing the self-tapping screws (6) equally in an alternating sequence to 15–20 in. lbs.(0,17–0,23 m. kg.).

Instal the hardware (21 and 22) and tighten the nylock nuts equally in an alternating sequence around the bolt circle until they are **just snug**. To prevent possible cracking of the pump housing or intermediate, **do not** over-tighten the nylock nuts.

### Final Pump Reassembly

**Be sure** all hardware and drain plugs are tight.

Check the engine oil and fuel level (see the engine operator's manual).

Install the suction and discharge lines and open all valves. Make certain that all connections are tight, and that the weight of the lines are independently supported.

Fill the pump housing with clean liquid.

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

## LUBRICATION

### Seal Assembly

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

### Engine

Consult the literature supplied with the engine, or contact your local Briggs and Stratton engine representative.

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

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519-631-2870**