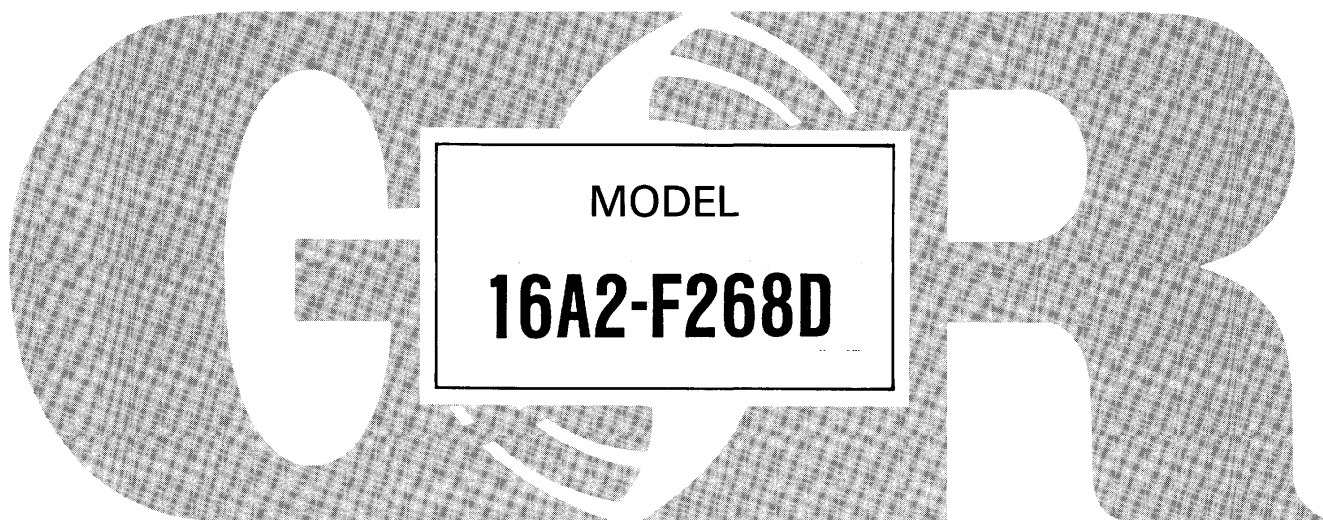




# INSTALLATION, OPERATION, PARTS LIST, AND MAINTENANCE MANUAL



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

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

Printed in U.S.A.

Copyright by the Gorman-Rupp Company

## TABLE OF CONTENTS

<b>INTRODUCTION</b>	<b>I-1</b>
<b>WARNINGS - SECTION A</b>	<b>A-1</b>
<b>INSTALLATION - SECTION B</b>	<b>B-1</b>
Pump Dimensions	B-1
PREINSTALLATION INSPECTION	B-2
POSITIONING PUMP	B-3
Lifting	B-3
Mounting	B-3
SUCTION AND DISCHARGE PIPING	B-4
Materials	B-4
Line Configuration	B-4
Connections to Pump	B-4
Gauges	B-4
SUCTION LINES	B-4
Fittings	B-5
Sealing	B-5
Suction Line Positioning	B-5
DISCHARGE LINES	B-6
Siphoning	B-6
Valves	B-6
Bypass Lines	B-7
<b>OPERATION - SECTION C</b>	<b>C-1</b>
PRIMING	C-1
STARTING	C-2
OPERATION	C-2
Lines With a Bypass	C-2
Lines Without a Bypass	C-3
Leakage	C-3
Liquid Temperature And Overheating	C-3
Strainer Check	C-3
Pump Vacuum Check	C-4
STOPPING	C-4
Cold Weather Preservation	C-4
BEARING TEMPERATURE CHECK	C-5
<b>PUMP TROUBLESHOOTING - SECTION D</b>	<b>D-1</b>
<b>PUMP MAINTENANCE AND REPAIR - SECTION E</b>	<b>E-1</b>
PERFORMANCE CURVE	E-1
PUMP MODEL - PARTS LIST	E-3
PUMP END ASSY - PARTS LIST	E-5
DRIVE ASSY - PARTS LIST	E-7
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY	E-8
Back Cover Removal	E-8
Suction Check Valve Removal	E-9
Impeller Removal	E-9
Seal Disassembly	E-9
Pump Disassembly	E-10
Separating Intermediate And Drive Assembly From Engine	E-10
Impeller Shaft And Bearing Disassembly	E-10
Impeller Shaft And Bearing Reassembly	E-11
Securing Intermediate And Drive Assembly To Engine	E-13
Pump Reassembly	E-13
Seal Reassembly	E-14
Impeller Reassembly And Adjustment	E-16
Suction Check Valve Installation	E-16
Back Cover Installation	E-17
Final Pump Reassembly	E-17

LUBRICATION	E-18
Seal Assembly	E-18
Bearings	E-18
Engine	E-18

## INTRODUCTION

---

---

---

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

This pump is a 10 Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is designed for pumping liquids that contain specified entrained solids. The basic materials of construction for wetted parts is gray iron, with a ductile iron impeller and steel wearing parts.

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

or Gorman-Rupp of Canada Limited  
70 Burwell Road  
St. Thomas, Ontario N5P 3R7

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

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:

### NOTE

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

### CAUTION

Instructions which must be followed to avoid causing damage to the product or other equipment incidental to the installation. These instructions describe the requirements and the possible damage which could result from failure to follow the procedures.

### WARNING

```
////////////////////////////////////  
//  
// These instructions must be followed to avoid causing in-  
// jury or death to personnel, and describe the procedure  
// required and the injury which could result from failure  
// to follow the procedure.  
//  
////////////////////////////////////
```



## WARNINGS

## WARNINGS - SECTION A

THESE WARNINGS APPLY TO 10 SERIES ENGINE DRIVEN PUMPS. REFER TO THE MANUAL ACCOMPANYING THE ENGINE BEFORE ATTEMPTING TO BEGIN OPERATION.

## WARNING

```
////////////////////////////////////
//
// Before attempting to open or service the pump:
//
// 1. Familiarize yourself with this manual.
// 2. Switch off the engine ignition and remove the key
//    to ensure that the pump will remain inoperative.
// 3. Allow the pump to cool if overheated.
// 4. Vent the pump slowly and cautiously.
// 5. Close the suction and discharge valves.
// 6. Check the temperature before opening any covers,
//    plates, or plugs.
// 7. Drain the pump.
//
////////////////////////////////////
```

## WARNING

```
////////////////////////////////////
//
// This pump is designed to pump liquids that contain spec-
// ified entrained solids. Do not attempt to pump
// volatile, corrosive, or flammable liquids which may dam-
// age the pump or endanger personnel as a result of pump
// failure.
//
////////////////////////////////////
```

## WARNING

```
////////////////////////////////////
//
// After the pump has been installed, make certain that the
// pump and all piping or hose connections are tight, prop-
// erly supported and secure before operation.
//
////////////////////////////////////
```

## WARNING

```
////////////////////////////////////
//
// Do not operate the pump against a closed discharge valve
// for long periods of time. This could bring the liquid
// to a boil, build pressure, and cause the pump to rupture
// or explode.
//
////////////////////////////////////
```

---

**WARNINGS**

---

**WARNING**

```
////////////////////////////////////  
//  
// Overheated pumps can cause severe burns and injury. If //  
// overheating of the pump occurs: //  
// //  
// 1. Stop the pump immediately. //  
// 2. Allow the pump to cool. //  
// 3. Refer to instructions in this manual before re- //  
// starting the pump. //  
// //  
////////////////////////////////////
```

**WARNING**

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

**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 //  
// is 2100 RPM. //  
// //  
////////////////////////////////////
```

**WARNING**

```
////////////////////////////////////  
//  
// Fuel used by internal combustion engines presents an ex- //  
// treme 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. //  
// //  
////////////////////////////////////
```

---

---

**WARNINGS**

---

---

**WARNING**

```
////////////////////////////////////  
//  
// Do not operate an internal combustion engine in an ex- //  
// plosive 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**

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



## INSTALLATION

## INSTALLATION - SECTION B

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 pressure developed by the pump. (See Section E, Page 1). If the pump is fitted with a Gorman-Rupp double grease lubricated seal, the maximum incoming pressure must be reduced to 10 p.s.i..

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 and engine.

## OUTLINE DRAWING

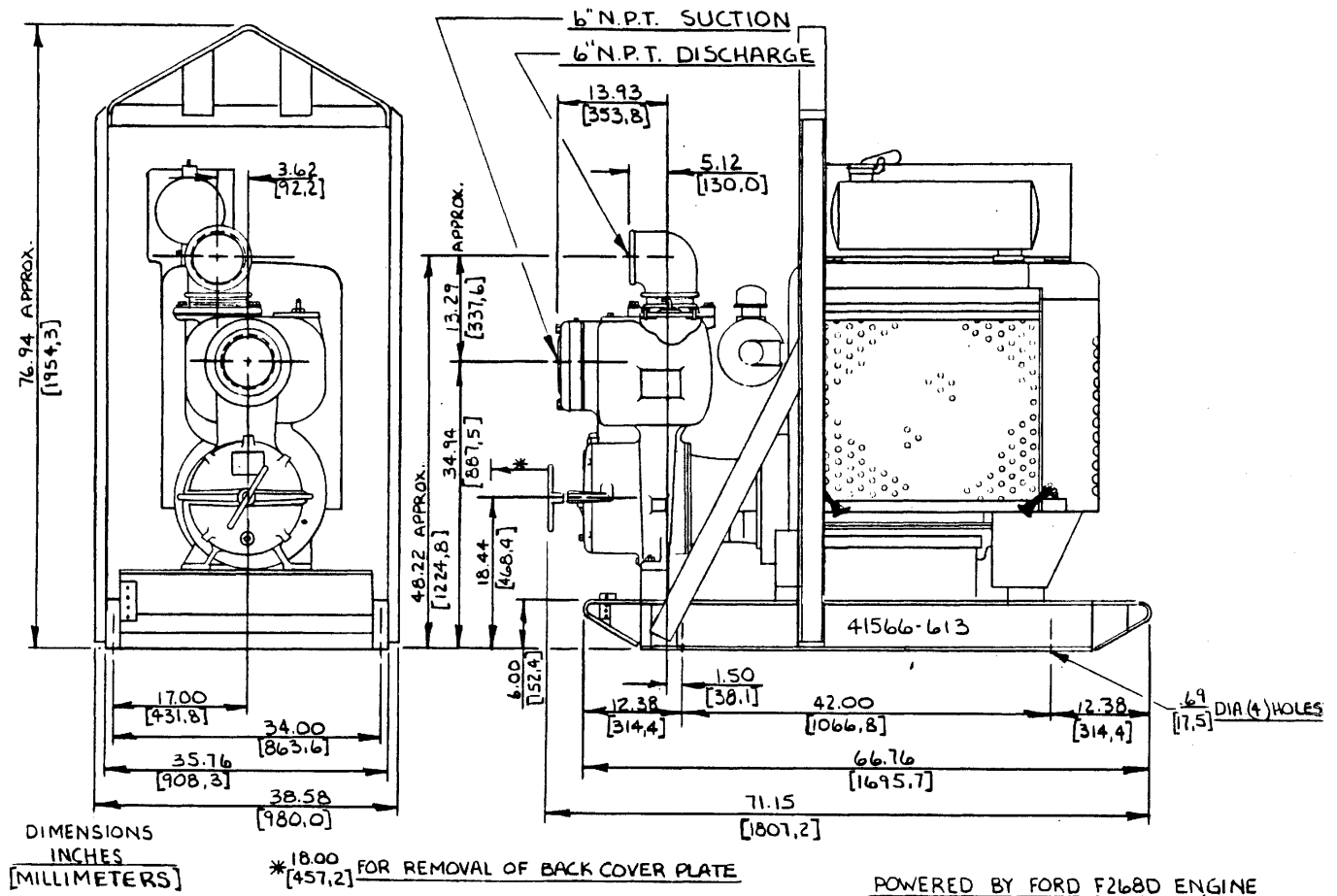


Figure 1. Pump Model 16A2-F268D

## PREINSTALLATION INSPECTION

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

- Inspect the pump and engine for cracks, dents, damaged threads, and other obvious damage.
- Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware. Since gaskets tend to shrink after drying, check for and tighten loose nuts and capscrews securing mating surfaces.
- Carefully read all tags, decals, and markings on the pump assembly, and follow the instructions indicated.

## INSTALLATION

- 
- 
- 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

## WARNING

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

## Lifting

Use lifting equipment with a capacity of at least **11,500 pounds**. This pump weighs approximately **2,260 pounds**, not including the weight of accessories and the optional wheel kit. Customer installed equipment such as hoses and piping **must** be removed before attempting to lift.

## CAUTION

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

## Mounting

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

---

---

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

## SUCTION AND DISCHARGE PIPING

### Materials

Either pipe or hose may be used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

### Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

### Connections to Pump

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

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

### Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches 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

---

## INSTALLATION

---

line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

### Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

This pump is designed to handle up to 2 1/2 inch 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. The pipe dope should be compatible with the liquid being pumped.

### Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 2 shows recommended minimum submergence vs. velocity.

### NOTE

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

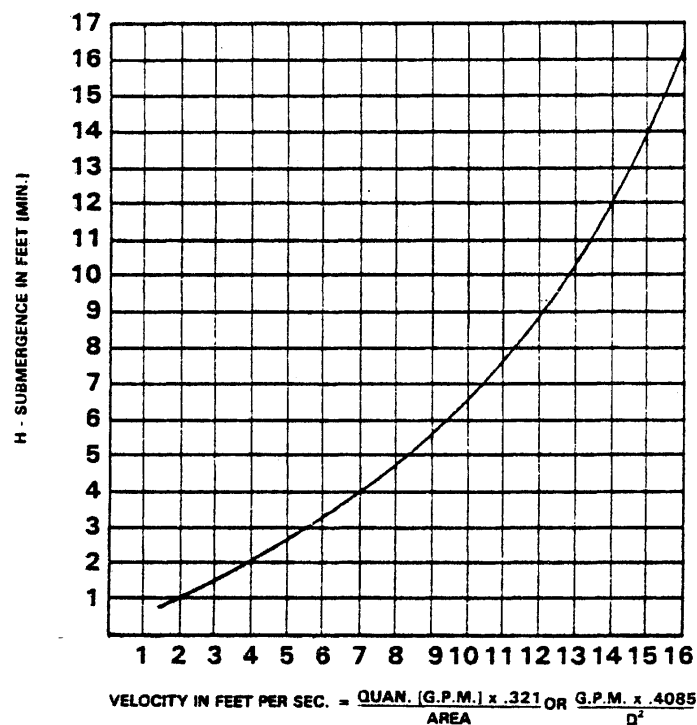


Figure 2. Recommended Minimum Suction Line Submergence Vs. Velocity

## DISCHARGE LINES

### Siphoning

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

### Valves

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

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

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

---

---

**CAUTION**

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

**Bypass Lines**

If it is necessary to permit the escape of air to atmosphere during initial priming or in the repriming cycle, install a bypass line between the pump and the discharge check valve. The bypass line should be sized so that it does not affect pump discharge capacity.

Either a Gorman-Rupp automatic air release valve - which will automatically open to allow the pump to prime, and automatically close when priming is accomplished - or a hand-operated shutoff valve should be installed in the bypass line.

**NOTE**

The bypass line may clog frequently, particularly if the valve remains closed. If this condition occurs, either use a larger bypass line or leave the shutoff valve open during the pumping operation.

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 could result, causing damage to the pump.



## OPERATION - SECTION C

## WARNING

```
////////////////////////////////////  
//  
// This pump is designed to pump liquids that contain spec- //  
// ified entrained solids. Do not attempt to pump //  
// volatile, corrosive, or flammable liquids which may dam- //  
// age the pump or endanger personnel as a result of pump //  
// failure. //  
//  
////////////////////////////////////
```

## PRIMING

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

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

## CAUTION

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

Add liquid to the pump casing when:

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

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

## WARNING

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

---

---

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

## STARTING

Consult the operations manual furnished with the engine.

### NOTE

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

## OPERATION

### CAUTION

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

### Lines With a Bypass

Either a Gorman-Rupp automatic air release valve or a hand operated shutoff valve may be installed in a bypass line.

If a Gorman-Rupp automatic air release valve has been installed, close the throttling valve in the discharge line. The Gorman-Rupp valve will automatically open to allow the pump to prime, and automatically close when priming has been accomplished. After the pump has been primed, and liquid is flowing steadily from the bypass line, open the discharge throttling valve.

If a hand operated shutoff valve has been installed, close the throttling valve in the discharge line, and open the bypass shutoff valve so that the pump will not have to prime against the weight of the liquid in the discharge line. When the pump has been primed, and liquid is flowing steadily from the bypass line, close the bypass shutoff valve and open the discharge throttling valve.

## OPERATION

---

---

### Lines Without a Bypass

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

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

### Leakage

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

### Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 110°F. 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.

#### 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 servic- //  
// ing. //  
//  
////////////////////////////////////
```

### Strainer Check

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

---

### Pump Vacuum Check

This pump is equipped with a vacuum suction gauge; however, more accurate readings may be obtained by installing a vacuum gauge away from the pump in the suction piping.

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

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

### STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly. If the pump is driven by an engine, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

### CAUTION

If 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 or take other action 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.

---

---

## OPERATION

---

---

### BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F are considered normal for bearings, and they can operate safely to at least 180°F.

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperatures is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see LUBRICATION in MAINTENANCE AND REPAIR). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.



## TROUBLESHOOTING

## PUMP TROUBLESHOOTING - SECTION D

## WARNING

```

////////////////////////////////////
//
// Before attempting to open or service the pump:
//
// 1. Familiarize yourself with this manual.
// 2. Switch off the engine ignition and remove the key
//    to ensure that the pump will remain inoperative.
// 3. Allow the pump to cool if overheated.
// 4. Vent the pump slowly and cautiously.
// 5. Close the suction and discharge valves.
// 6. Check the temperature before opening any covers,
//    plates, or plugs.
// 7. Drain the pump.
//
////////////////////////////////////

```

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See INSTALLATION.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRES-SURE	Air leak in suction line.	Correct leak.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct as needed. Check submergence chart (Section B).
	Lining of suction hose collapsed.	Replace suction hose.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE(cont.)	<p>Impeller clogged.</p> <p>Pump speed too slow.</p> <p>Suction lift or discharge head too high.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Strainer clogged.</p>	<p>Free impeller of debris.</p> <p>Check engine output; consult engine operation manual.</p> <p>Check piping installation and install bypass line if needed. See INSTALLATION.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check strainer and clean if necessary.</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.</p> <p>Adjust discharge valve.</p> <p>Dilute if possible.</p>
PUMP CLOGS FREQUENTLY	<p>Discharge flow too slow.</p> <p>Suction check valve or foot valve clogged or binding.</p> <p>Discharge line clogged or restricted; hose kinked.</p>	<p>Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.</p> <p>Clean valve.</p> <p>Check discharge lines; straighten hose.</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>

## TROUBLESHOOTING

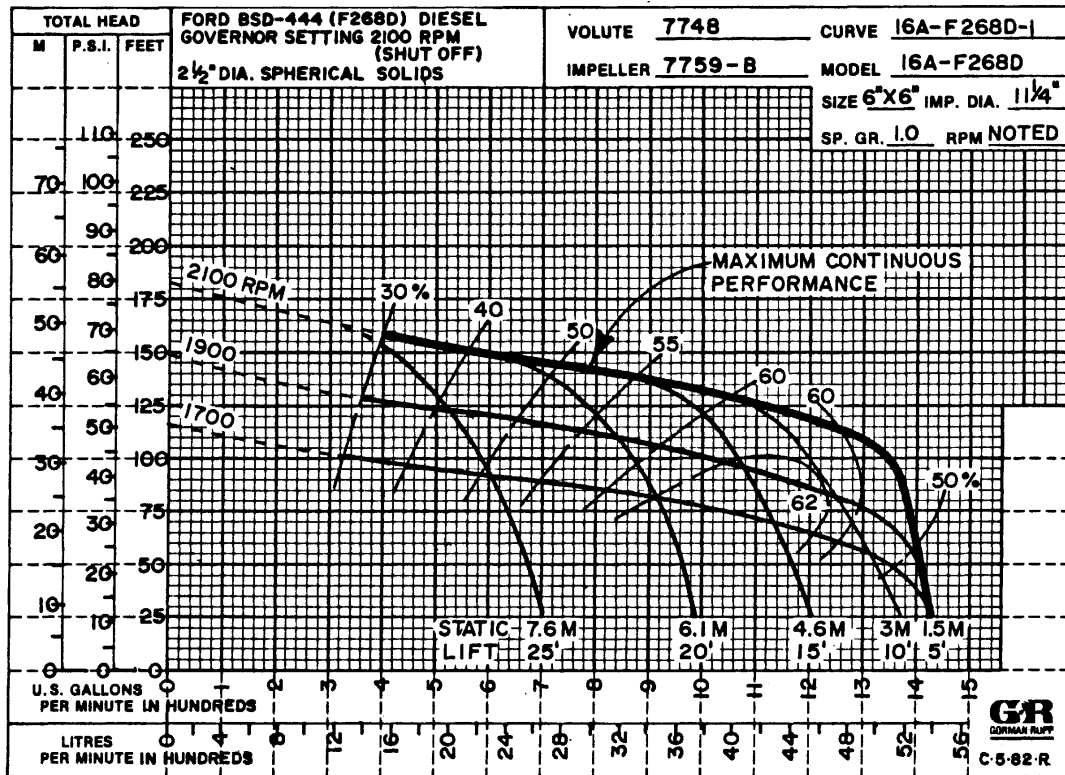
TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check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



## MAINTENANCE AND REPAIR

## 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 16A2-F268D

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

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

## CAUTION

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

## SECTIONAL DRAWING

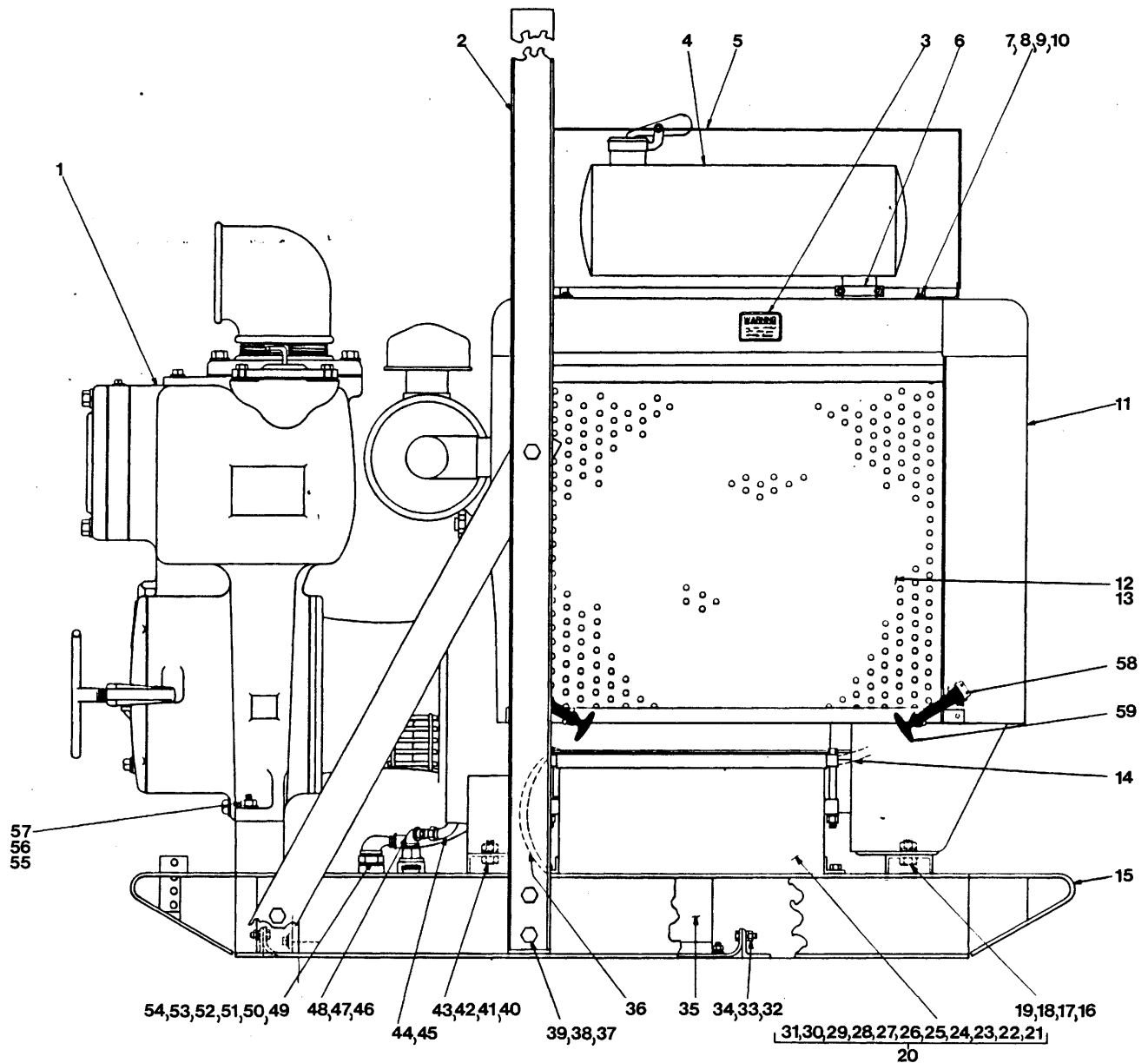


Figure 1. Pump Model 16A2-F268D

## MAINTENANCE AND REPAIR

**PARTS LIST**  
**Pump Model 16A2-F268D**  
 (From S/N 803333 up)

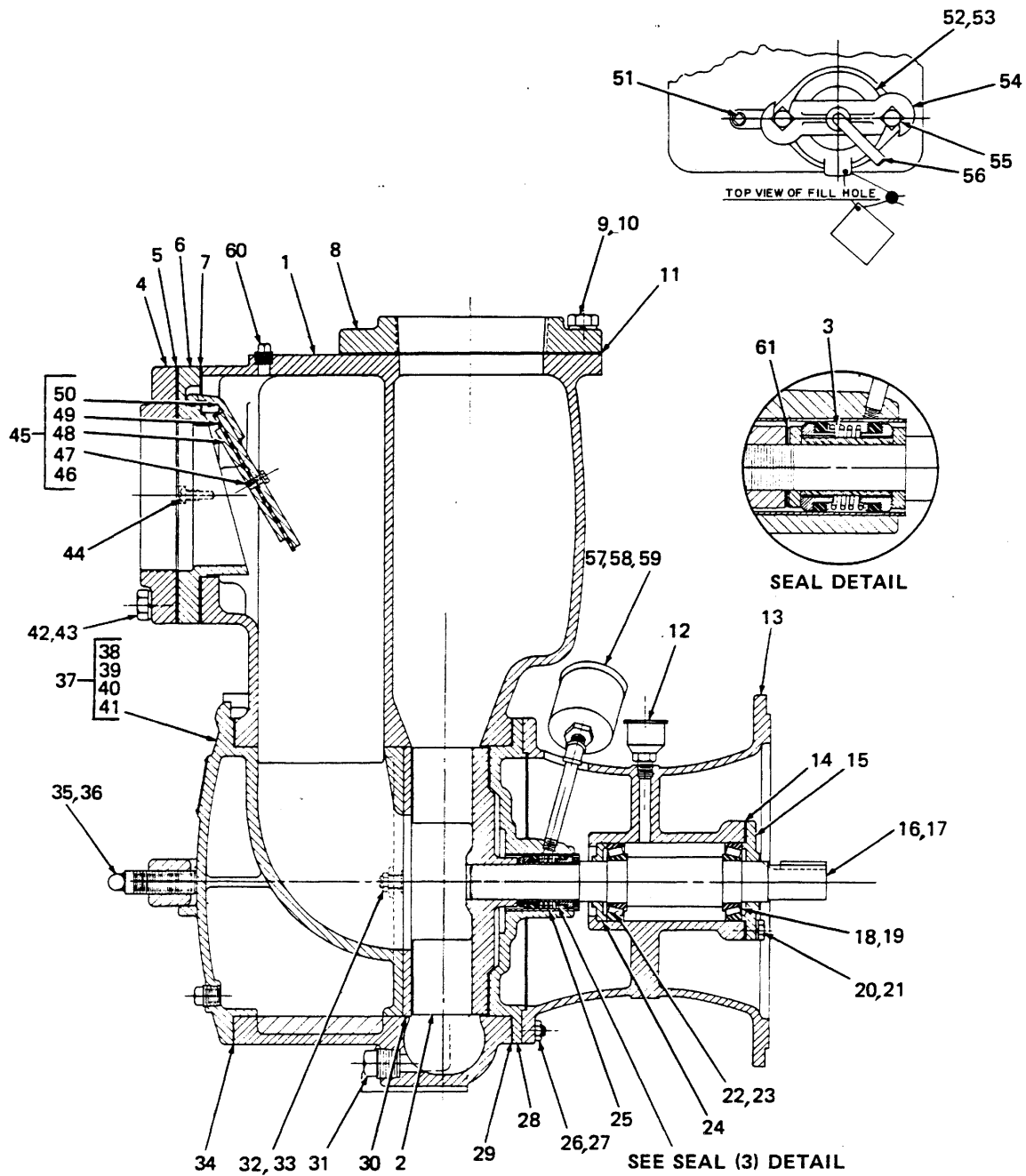
ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP END ASSY	16A	-----	1	36	*GRD CABLE ASSY	5795-AC	24040	1
2	HOIST BAIL	13351-AX	24000	1	37	HEX HD CAPSCREW	B01006	15991	8
3	WARNING DECAL	38816-132	-----	2	38	HEX NUT	D00010	15991	8
4	MUFFLER	29334-122	-----	1	39	LOCKWASHER	J00010	15991	8
5	MUFFLER GUARD ASSY	42331-022	24150	1	40	HEX HD CAPSCREW	B01007	15991	2
6	MUFFLER CLAMP	29334-260	-----	1	41	LOCKWASHER	J00010	15991	2
7	HEX HD CAPSCREW	B00504	15991	2	42	HEX NUT	D00010	15991	2
8	FLAT WASHER	K00005	15991	2	43	FLAT WASHER	K00010	15991	2
9	LOCKWASHER	J00005	15991	2	44	FUEL HOSE ASSY	46341-747	-----	1
10	NUT RETAINER	21768-703	-----	2	45	STREET ELBOW	25812-804	-----	1
11	FORD 268DF ENGINE	29218-101	-----	1	46	FUEL OUT ASSY	10765	24030	1
12	SIDE PANEL ASSY	42142-061	24150	1	47	REDUCER ELBOW	Q00604	11990	1
13	SIDE PANEL ASSY	42142-060	24150	1	48	CONNECTOR	S01344	-----	1
14	*POS CABLE ASSY	6926-AA	24040	1	49	FUEL RETURN ASSY	14294	24030	1
15	COMBINATION BASE	41566-613	24150	1	50	FUEL LINE	11308-A	-----	1
16	HEX HD CAPSCREW	B01006	15991	2	51	MALE CONNECTOR	26523-402	-----	1
17	HEX NUT	D00010	15991	2	52	REDUCER ELBOW	Q00402	11990	1
18	LOCKWASHER	J00010	15991	2	53	HOSE CLAMP	S00855	-----	1
19	FLAT WASHER	K00010	15991	2	54	HOSE CLAMP	S01788	-----	2
20	BATTERY BOX ASSY	GRP40-04	-----	1	55	HEX HD CAPSCREW	B01009	15991	2
21	-BATTERY BOX CVR	4896-X	24000	1	56	HEX NUT	D00010	15991	2
22	*-CNNT CABLE ASSY	5795-CR	24040	1	57	LOCKWASHER	J00010	15991	2
23	-BATTERY TAG	6588-S	00000	1	58	POP RIVET	21122-022	-----	12
24	-BATTERY BOX	10478	24000	1	59	HOOD FASTENER	29338-043	-----	4
25	-HEX HD CAPSCREW	B00604	15991	1	NOT SHOWN:				
26	-HEX HD CAPSCREW	B00605	15991	1		POP RIVET	21122-023	-----	8
27	-HEX HD CAPSCREW	B00624	15991	1		CONNECTOR	S01670	-----	2
28	-HEX NUT	D00006	15991	4		CONNECTOR	S00468	-----	1
29	-LOCKWASHER	J00006	15991	4		SERVICE TEE	US00004	11990	1
30	-FLAT WASHER	K00006	15991	6		HOSE	31411-044	19360	1
31	*-BATTERY	S00978	-----	2		SAFETY GAUGE	S01445	-----	1
32	HEX HD CAPSCREW	B00604	15991	10		GROMMET	S00807	-----	1
33	HEX NUT	D00006	15991	10		WIRE ASSY	5795-DY	-----	1
34	LOCKWASHER	J00006	15991	10		90° ELBOW	S00698	-----	1
35	FUEL TANK AND GUARD ASSY	46711-033	-----	1		STAR WASHER	BL00005	15991	2

\*INDICATES PARTS RECOMMENDED FOR STOCK

Above Serial Numbers Do Not Apply To Pumps Made In Canada.

CANADIAN SERIAL NO ..... AND UP

## SECTIONAL DRAWING



**PARTS LIST**  
**Pump End Assy 16A2-F268D**

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP CASING	7748	10010	1	36	COVER CLAMP BAR	2547	11000	1
2	*IMPELLER	7759-B	11000	1	37	*BACK COVER	42111-932	-----	1
3	*SEAL ASSY	GS01500	-----	1		PLATE ASSY			
4	SUCTION FLANGE	1758	10010	1	38	-WARNING PLATE	2613-EV	13990	1
5	*SUCT FLANGE GSKT	1679-G	18000	1	39	-BACK COVER PLT	NOT AVAILABLE		1
6	CHECK VALVE SEAT	7261	10010	1	40	-DRIVE SCREW	BM#04-03	15990	4
7	*VALVE SEAT GSKT	7261-G	18000	1	41	-DRAIN PLUG	P00008	11990	1
8	DISCHARGE FLANGE	1758	10010	1	42	HEX HD CAPSCREW	B01212	15991	8
9	HEX HD CAPSCREW	B01208	15991	8	43	LOCKWASHER	J00012	15991	8
10	LOCKWASHER	J00012	15991	8	44	RD HD MACH SCREW	X00404	17090	1
11	*DISCH FLANGE GSKT	1679-G	18000	1	45	*CHECK VALVE ASSY	7265	-----	1
12	*INTERM GREASE CUP	S00035	-----	1	46	-HEX HD CAPSCREW	B00403	17000	2
13	INTERMEDIATE	36	10010	1	47	-LOCKWASHER	J00004	17090	2
14	*BEARING SHIM SET	48261-031	24150	1	48	*-VALVE WEIGHT	7263	15990	1
15	BEARING CAP	43-X	10010	1	49	*-CHECK VALVE	7264	19070	1
16	*IMP SHAFT	13486	16040	REF	50	*-VALVE WEIGHT	7262	24000	1
17	*IMP SHAFT KEY	N00607	15990	REF	51	PIPE PLUG	P00004	11990	1
18	*BEARING CUP	S01086	-----	1	52	*FILL COVER	42111-344	-----	1
19	*BEARING CONE	S01087	-----	1		PLATE ASSY			
20	HEX HD CAPSCREW	B00604	15991	4	53	*FILL COVER GSKT	50-G	19210	1
21	LOCKWASHER	J00006	15991	4	54	CLAMP BAR	38111-004	11000	1
22	*BEARING CUP	S01086	-----	1	55	MACHINE BOLT	A01014	15991	2
23	*BEARING CONE	S01087	-----	1	56	CLAMP BAR SCREW	31912-009	15000	1
24	BEARING CLOSURE	44	10010	1	57	HVY PIPE NIPPLE	THA00416	15070	1
25	*SEAL LINER	7408	14010	REF	58	PIPE ELBOW	AG00004	11990	1
26	STUD	C00809	15991	8	59	*SEAL GREASE CUP	S01509	-----	1
27	HEX NUT	D00008	15991	8	60	PIPE PLUG	P00004	11990	1
28	SEAL PLATE	11895-A	10010	1	61	*IMP ADJ SHIM SET	5091	17090	REF
29	*CASING GSKT SET	34-G	18000	1	NOT SHOWN:				
30	*WEAR PLATE ASSY	2545	15990	1		WARNING DECAL	38816-096	-----	1
31	CASING DRAIN PLUG	P00016	11990	1		PIPE ELBOW	R00096	11990	1
32	HEX NUT	D00008	15991	2		PIPE NIPPLE	T00096	11990	1
33	LOCKWASHER	J00008	15991	2		NAME PLATE	2613-D	13990	1
34	*BACK CVR PLATE GSKT	7668-G	20000	1		DRIVE SCREW	BM#04-03	15990	4
35	COVER CLAMP SCREW	2536	24000	1		STRAINER	7823	24000	1

\*INDICATES PARTS RECOMMENDED FOR STOCK

## SECTIONAL DRAWING

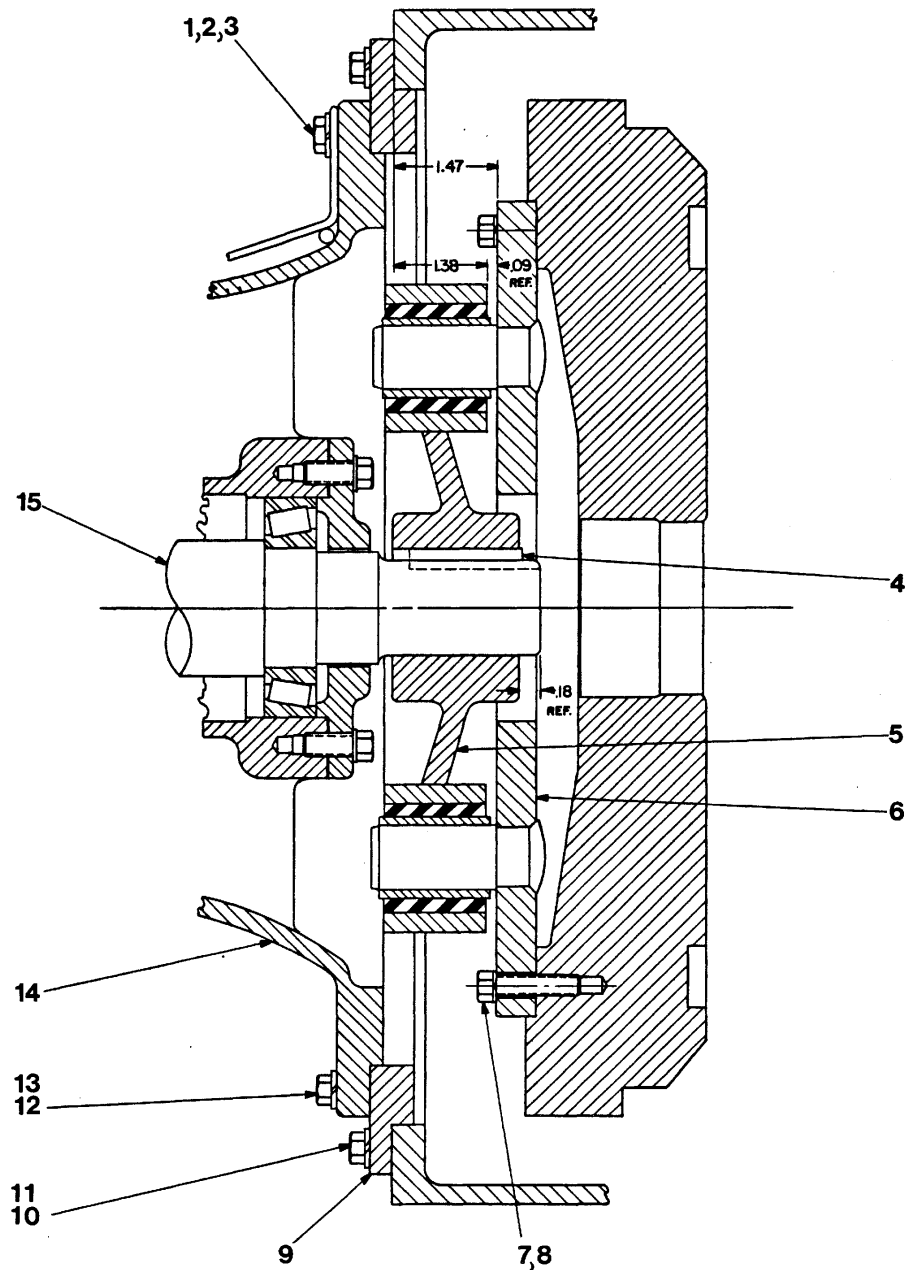


Figure 3. Drive Assembly For Pump Model 16A2-F268D

PARTS LIST  
Drive Assembly For Pump Model 16A2-F268D

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	INTERMEDIATE GUARD	42381-031	-----	2
2	HEX HD CAPSCREW	B00606	15991	4
3	LOCKWASHER	J00006	15991	4
4	* KEY	N00607	-----	1
5	DRIVE ARM ASSEMBLY	13817-C	-----	1
6	SLEEVE	NOT AVAILABLE	-----	2
7	* DYNA FLEX JOINT	S02110	-----	2
8	DRIVE PLATE ASSEMBLY	44131-004	-----	1
9	* DRIVE PIN	13819	15030	2
10	HEX HD CAPSCREW	B00606	15991	8
11	LOCKWASHER	J00006	15991	8
12	ADAPTOR RING	3093	15020	1
13	HEX HD CAPSCREW	B00604	15991	12
14	LOCKWASHER	J00006	15991	12
15	HEX HD CAPSCREW	B00605	15991	8
16	LOCKWASHER	J00006	15991	8
17	INTERMEDIATE	36	10010	1
18	IMPELLER SHAFT	13486	16040	1

\*INDICATES PARTS RECOMMENDED FOR STOCK

---

---

## PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (see figure 1, 2 and 3) and the accompanying parts lists.

Most service functions may be performed by draining the pump and removing the back cover assembly. If major repair is required, the piping and/or engine must be disconnected.

Before attempting to service the pump, take precautions to ensure that the engine will remain inoperative. Close all connecting valves.

### WARNING

```
////////////////////////////////////  
// Before attempting to open or service the pump: //  
// 1. Familiarize yourself with this manual. //  
// 2. Switch off the engine ignition and remove the key //  
// to ensure that the pump will remain inoperative. //  
// 3. Allow the pump to cool if overheated. //  
// 4. Vent the pump slowly and cautiously. //  
// 5. Close the suction and discharge valves. //  
// 6. Check the temperature before opening any covers, //  
// plates, or plugs. //  
// 7. Drain the pump. //  
// //////////////////////////////////////
```

### WARNING

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

## Back Cover Removal

### (Figure 2)

The impeller, wear plate, check valve, and seal assembly can be serviced after the back cover assembly (37) has been removed.

Before removing the assembly, remove the pump casing drain plug (31) and the cover drain plug (41) and drain the pump. Clean and reinstall the drain plugs.

Loosen the cover clamp screw (35) and clamp bar (36) securing the back cover. Pull the back cover and assembled wear plate (30) from the pump casing (1).

---

## Suction Check Valve Removal

### (Figure 2)

For access to the check valve, remove the suction piping. Remove the hardware (42 and 43) securing the suction flange and gasket (4 and 5) to the pump casing (1).

Inspect the suction flange gasket (5) for wear or damage, and replace as required.

Disengage the machine screw (44) and pull the check valve seat (6), gasket (7), and check valve assembly (45) from the suction port.

Remove the hardware (46 and 47) securing the check valve (49) and weights (48 and 50) and inspect all parts for wear or damage.

## Impeller Removal

### (Figure 2)

Turn the cross arm on the automatic lubricating seal grease cup (59) clockwise until it rests against the cover (see Figure 5). This will prevent the grease from escaping when the impeller is removed.

To loosen the impeller (2), tap the vanes in a counterclockwise direction (when facing impeller) with a block of wood or a soft-faced mallet. Unscrew the impeller and replace it if cracked or badly worn. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is unscrewed.

Slide the impeller adjusting shims (61) from the impeller shaft. For ease of reassembly, tag and tie the shims, or measure and record their thickness.

## Seal Disassembly

### (Figure 2)

Remove the outer rotating element, stationary seat, packing rings, stationary washer and the seal spring. Remove the shaft sleeve. Remove the inner stationary washer, packing ring, stationary seat and rotating element using a stiff wire with a hooked end if necessary.

Inspect the seal liner (25) for wear or grooves which could cause leakage or damage to the seal packing rings. The seal liner is a press fit in the seal plate (28), and does not normally require replacement. If replacement is necessary, the seal plate must be removed. (See **Pump Disassembly**).

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

---

## Pump Disassembly

### (Figure 2)

To service the seal plate, intermediate, bearings, or drive assembly, the pump end must be removed from the base. See Figure 1, and remove the hardware (55, 56, and 57) securing the pump casing to the base.

Remove the nuts (27) securing the pump casing (1) and the seal plate (28) to the intermediate (13), and remove the pump casing. If shims have been used under the mounting feet to level the pump casing, tag and tie these shims. Before attempting to remove the seal plate, remove the grease cup and piping (57, 58, and 59). Slide the seal plate from the shaft.

## Separating Intermediate And Drive Assembly From Engine

### (Figure 3)

If necessary to separate the intermediate and drive assemblies from the engine, support the intermediate using a hoist and sling, and remove the hardware (13 and 14) securing the intermediate (17) and adaptor (12) to the engine bellhousing. Separate the assemblies by pulling the intermediate straight away from the engine.

As the assemblies are separated, the drive pins (9) will disengage from the drive arm assembly (5). The drive arm assembly and the impeller shaft key (4) are a tight press fit on the shaft (18), and will remain on the shaft.

It is not necessary to remove the drive plate assembly (8) from the engine flywheel unless the drive pins are bent or worn and must be replaced. To remove the drive plate assembly, remove the hardware (10 and 11) securing the assembly to the engine flywheel, and remove the drive plate.

Use a bearing puller to remove the drive arm assembly from the impeller shaft. Remove the shaft key.

Inspect the dyna flex joints (7), and replace them if worn. The dyna flex joints are a press fit in the drive arm.

## Impeller Shaft And Bearing Disassembly

### (Figure 2)

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

---

---

**CAUTION**

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

Remove the hardware (20 and 21) securing the bearing cap (15) to the intermediate (13), and remove the bearing cap and bearing shim set (14). Tag and tie the bearing shims, or measure and record their thickness.

Place a block of wood against the impeller end of the shaft (16), and tap the shaft and assembled bearings out of the intermediate. Remove the outboard bearing cup (18) from the bearing cone (19).

**NOTE**

There is no provision for draining the grease from the intermediate cavity. Place a drip pan under the intermediate before removing the bearing.

Place the intermediate on a level surface with the drive side down, and press the bearing closure (24) and inboard bearing cup (22) from the intermediate bore.

Use a bearing puller to remove the inboard bearing cone (23) and outboard bearing cone (19) from the impeller shaft.

**Impeller Shaft And Bearing Reassembly****(Figure 2)**

Clean the bore of the intermediate, the impeller shaft and all component parts, (except the bearings), with a soft cloth soaked in cleaning solvent. Inspect the parts for wear, and replace as necessary.

**WARNING**

```
////////////////////////////////////  
//  
// Most cleaning solvents are toxic and flammable. Use //  
// them only in a well-ventilated area free from excessive //  
// heat, sparks, and flame. Read and follow all prec- //  
// autions printed on solvent containers. //  
//  
////////////////////////////////////
```

Inspect the shaft for distortion, nicks and scratches on the oil seal seating surfaces, and for thread damage on the impeller end. Dress the threads, nicks and burrs on the shaft with a fine file or honing stone. Replace the impeller shaft if defective.

---

---

To prevent contamination, wash the bearings thoroughly in **fresh** cleaning solvent, agitating to remove all old lubricant. Dry the bearings with filtered compressed air and coat with a light oil.

Inspect the bearings and rotate by hand to check for roughness or binding. If the bearing rotation is rough or damage is apparent, replace the bearing.

#### CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. DO NOT spin dry bearings. This may scratch the rollers or roller cage and cause premature bearing failure.

Pre-pack the bearings by hand with #0 grease until the bearings are thoroughly lubricated.

The bearings are a tight press fit onto the impeller shaft and snug push fit into the intermediate. If the shaft is worn so that the bearings slip on and off easily, the shaft must be replaced. The intermediate housing must be replaced if the bearings do not fit snugly.

Install the inboard and outboard bearing cones on the impeller shaft. Be sure to position the high side of the tapered roller bearings toward the lubrication cavity.

#### CAUTION

When installing the bearings onto the shaft, NEVER press or hit against the roller or roll cage. Press ONLY on the inner race.

Press the cones on the shaft until they seat squarely against the shaft shoulders.

Press the bearing closure (24) and inboard bearing cup (22) into the intermediate until they seat squarely against the intermediate shoulder.

#### CAUTION

When installing the bearing cups into the bearing bore, push against the outer race. NEVER hit the rollers or roll cage.

Slide the shaft and assembled bearing cones into the intermediate bore until the inboard bearing cone (23) fully engages the inboard bearing cup.

MAINTENANCE AND REPAIR

---

---

Install the outboard bearing cup (18) over the outboard bearing cone (19), and install the bearing shims.

**NOTE**

Shaft endplay should be between .002 and .010 inch. Add or remove bearing shims to establish the correct endplay.

Secure the bearing cap to the intermediate.

Lubricate the bearings as indicated in LUBRICATION.

**Securing Intermediate And Drive Assembly To Engine****(Figure 3)**

If the drive plate assembly was removed, secure it to the engine flywheel with the attaching hardware.

Install the impeller shaft key and press the drive arm assembly on the impeller shaft.

**CAUTION**

Make certain that the drive plate and drive arm assemblies are mounted in accordance with the dimensions shown in Figure 3. If the drive assembly is not properly positioned on the impeller shaft, a preload condition can occur and cause premature thrust bearing failure.

Align the drive arm assembly so that the drive pins will engage the dyna flex joints, and secure the intermediate and intermediate guards to the engine bellhousing.

**Pump Reassembly****(Figure 2)**

Before installing the seal plate, inspect the bore of the seal liner (25) for wear or grooves which might cause leakage or damage to the seal packing rings. If the seal liner must be replaced, position the seal plate on the bed of an arbor (or hydraulic) press and use a new sleeve to force the old one out. After the new liner is properly installed, a 1/4 inch diameter hole must be drilled through it to permit the flow of lubricant to the seal assembly. **Be careful** to center the drill in the threaded grease pipe hole and not damage the threads. Deburr the hole from the inside of the seal liner after drilling.

Position the seal plate on the impeller shaft, and reinstall the automatic grease cup and piping (57, 58, and 59).

---

---

### NOTE

It is recommended that the seal and impeller be reassembled at this time. It is best to adjust the back impeller clearance before installing the pump casing. See **Impeller Reassembly And Adjustment**.

Install the same thickness of pump casing gaskets (29) as previously removed from the pump casing studs and secure the pump casing to the intermediate. Be sure to reinstall any leveling shims used under the pump casing mounting feet before installing the base mounting hardware.

### NOTE

The front impeller clearance must be adjusted after pump casing and back cover are fully reassembled by adding or subtracting pump casing gaskets (29). Do not secure the pump casing to the base until this operation is done.

## Seal Reassembly

### (Figure 2 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 prec- //  
// autions printed on solvent containers. //  
//  
////////////////////////////////////
```

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

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

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the seal spacer sleeve, or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

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

To ease installation of the seal, lubricate the packing rings and seal liner 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).

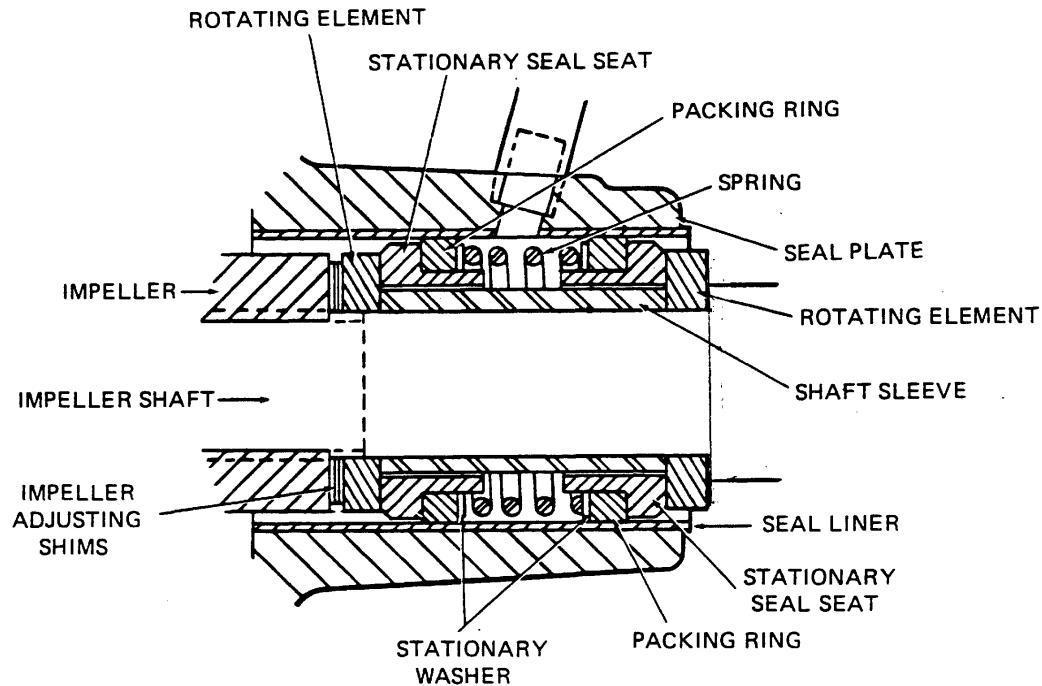


Figure 4. GS01500 Seal Assembly

#### CAUTION

This seal is not designed for operation at temperatures above 110°F. Do not use at higher operating temperatures.

Inspect the seal plate, the seal liner, and the impeller shaft for burrs or sharp corners, and remove any that exist. Replace the seal liner (25) if wear or grooves exist which could cause leakage or damage to the seal packing rings.

#### NOTE

The seal plate must be removed to install a new seal liner. See **Pump Reassembly** for specific instructions on seal liner installation.

Position the inboard rotating element onto the shaft with the chamfered side facing the spacer washer and slide it on until fully seated.

---

---

Subassemble the inboard stationary seat, packing ring, and spring washer and press the unit into the lubricated seal liner.

Install the spacer sleeve and spring.

Subassemble the outboard stationary seat, packing ring, and spring washer. Press this unit into the lubricated seal liner.

Install the outboard rotating element with chamfered side facing the impeller.

Lubricate the seal as indicated in LUBRICATION, after the impeller has been installed.

### Impeller Reassembly And Adjustment

#### (Figure 2)

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

Slide the same number of impeller adjusting shims (61) as previously removed onto the shaft and screw the impeller on until tight.

A clearance of .020 to .040 inch between the impeller and the seal plate is necessary for maximum pump efficiency. Measure this clearance, and add or remove impeller shims until it is reached.

#### NOTE

If the pump has been completely disassembled, install a new pump casing gasket set and secure the pump casing to the intermediate at this time.

A clearance of .010 to .020 inch between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance must be set after installing the back cover, by adding or removing gaskets in the pump casing gasket set until the impeller binds against the wear plate when the shaft is turned. After the impeller binds, add .015 inch of gaskets.

#### NOTE

An alternate method of adjusting this clearance is to reach through the discharge port with a feeler gauge and measure the gap. Add or subtract pump casing gaskets accordingly.

### Suction Check Valve Installation

#### (Figure 2)

Inspect the check valve components, and replace as required. Subassemble the check valve weights and check valve rubber using the attaching hardware.

---

---

Install the check valve in the valve seat. Replace the seat gasket and secure the valve seat to the suction port using the round head machine screws. Replace the suction flange gasket and secure the suction flange. Check operation of the check valve to ensure proper seating and free movement.

#### NOTE

If the suction or discharge flange was removed, replace the respective gaskets and apply "Permatex Aviation #3 Form-A-Gasket" or equivalent to the mating surfaces.

### Back Cover Installation

#### (Figure 2)

Inspect the wear plate (30) and replace it if badly worn or grooved. To remove the wear plate, disengage the hardware (32 and 33).

Clean any scale or debris (which might prevent a good seal) from the back cover shoulder and pump casing. Replace the back cover gasket (34) and slide the back cover assembly into the pump casing. Be sure the wear plate does not bind against the pump casing.

#### NOTE

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

Secure the back cover assembly by installing the clamp bar and tightening the cover clamp screw. **Do not** over tighten the clamp screw; it should be just tight enough to ensure a good seal at the back cover shoulder.

### Final Pump Reassembly

#### (Figure 1)

**Be sure** the pump is secured to the base and engine.

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

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

Fill the pump casing with clean liquid. Reinstall the fill cover plate and tighten it.

Refer to **OPERATION**, Section C, and start the pump.

## LUBRICATION

### Seal Assembly

Fill the grease cup through the grease fitting with a good grade of No. 2 lithium base grease until grease escapes from the relief hole. Turn the grease cup arm counterclockwise until it is at the top of the stem; this will release the spring to apply grease to the seal (see Figure 5).

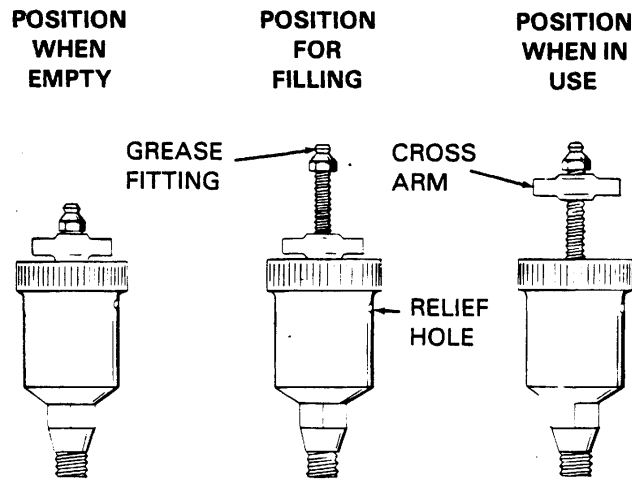


Figure 5. Automatic Lubricating Grease Cup

### Bearings

When shipped from the factory, this pump contained sufficient grease to lubricate the bearings for approximately 5,000 operating hours. When additional lubrication is required, fill the intermediate through the grease cup (12, Figure 2) with approximately one-sixth of a pound of No. 0 lithium base grease, or until the intermediate is approximately one-third full (just below the shaft).

### Engine

Refer to the engine manufacturer's recommendations.

**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**

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