

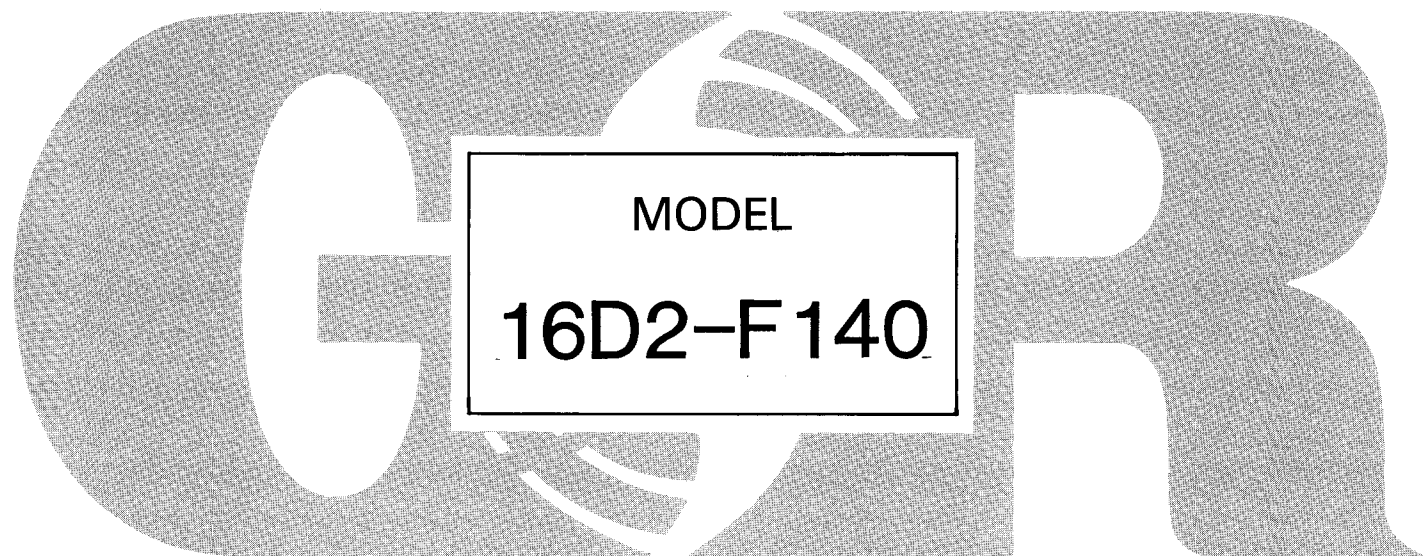
June 5, 1982

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# **10**SERIES™

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



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

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

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# TABLE OF CONTENTS

INTRODUCTION . . . . .	I-1
WARNINGS - SECTION A . . . . .	A-1
INSTALLATION - SECTION B . . . . .	B-1
PUMP DIMENSIONS . . . . .	B-1
PREINSTALLATION INSPECTION . . . . .	B-1
POSITIONING PUMP . . . . .	B-2
Mounting . . . . .	B-2
Lifting . . . . .	B-2
SUCTION AND DISCHARGE PIPING . . . . .	B-3
Materials . . . . .	B-3
Line Configuration . . . . .	B-3
Connections to Pump . . . . .	B-3
Gauges . . . . .	B-3
SUCTION LINES . . . . .	B-3
Fittings . . . . .	B-4
Strainers . . . . .	B-4
Sealing . . . . .	B-4
Suction Lines In Sumps . . . . .	B-4
Suction Line Positioning . . . . .	B-5
DISCHARGE LINES . . . . .	B-5
Siphoning . . . . .	B-5
Valves . . . . .	B-5
Bypass Lines . . . . .	B-6
OPERATION - SECTION C . . . . .	C-1
PRIMING . . . . .	C-1
STARTING . . . . .	C-2
OPERATION . . . . .	C-2
Lines With a Bypass . . . . .	C-2
Lines Without a Bypass . . . . .	C-2
Leakage . . . . .	C-2
Overheating . . . . .	C-3
Strainer Check . . . . .	C-3
Pump Vacuum Check . . . . .	C-3
STOPPING . . . . .	C-3
BEARING TEMPERATURE CHECK . . . . .	C-4
TROUBLESHOOTING - SECTION D . . . . .	D-1
MAINTENANCE AND REPAIR - SECTION E . . . . .	E-1
PERFORMANCE CURVE . . . . .	E-1
PUMP MODEL - PARTS LIST . . . . .	E-3
PUMP END - PARTS LIST . . . . .	E-5
DRIVE ASSY - PARTS LIST . . . . .	E-7
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY . . . . .	E-8
Suction Check Valve Disassembly . . . . .	E-8
Pump Disassembly . . . . .	E-8
Seal Disassembly . . . . .	E-9
Pump Separation From Engine . . . . .	E-9
Impeller Shaft And Bearing Disassembly . . . . .	E-9
Impeller Shaft And Bearing Reassembly . . . . .	E-10
Pump Attachment to Engine . . . . .	E-11
Seal Reassembly . . . . .	E-11
Pump Reassembly . . . . .	E-12
Suction Check Valve Reassembly . . . . .	E-13
LUBRICATION . . . . .	E-13
Seal Assembly . . . . .	E-13
Bearings . . . . .	E-14



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## INTRODUCTION

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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 10 Series, semi-open impeller, self-priming centrifugal model designed for pumping liquids with specified entrained solids.

If there are any questions regarding the pump 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 START THE ENGINE.

## WARNING

```
//////////////////////////////////////  
//  
// Before attempting to open or service the pump: //  
//  
// 1. Familiarize yourself with this manual. //  
// 2. Disconnect the ENGINE 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

```
//////////////////////////////////////  
//  
// Do not attempt to pump volatile, corrosive, or flammable //  
// materials, or any liquids for which this pump has not //  
// been designed. //  
//  
//////////////////////////////////////
```

## WARNING

```
//////////////////////////////////////  
//  
// After the pump has been installed, make certain that the //  
// pump and all piping connections are secure before at- //  
// tempting to operate the pump. //  
//  
//////////////////////////////////////
```

## WARNING

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

## WARNINGS

## 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. //  
//  
////////////////////////////////////
```

## WARNING

```
////////////////////////////////////  
//  
// Overheated pumps can cause severe burns and injury. If //  
// overheating of the pump casing 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

```
////////////////////////////////////  
//  
// 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. //  
//  
////////////////////////////////////
```

---

---

**WARNINGS**

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---

**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. //  
//  
////////////////////////////////////
```

**WARNING**

```
////////////////////////////////////  
//  
// Never tamper with the governor to gain more power. The //  
// governor establishes safe operating limits that should //  
// not be exceeded. //  
//  
////////////////////////////////////
```



## INSTALLATION

## INSTALLATION - SECTION B

Seldom are two pump installations identical. The information presented in this section is a summary of the recommended installation practices related to inspection, pump positioning, hardware, suction and discharge piping, and sumps. For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

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

## OUTLINE DRAWING

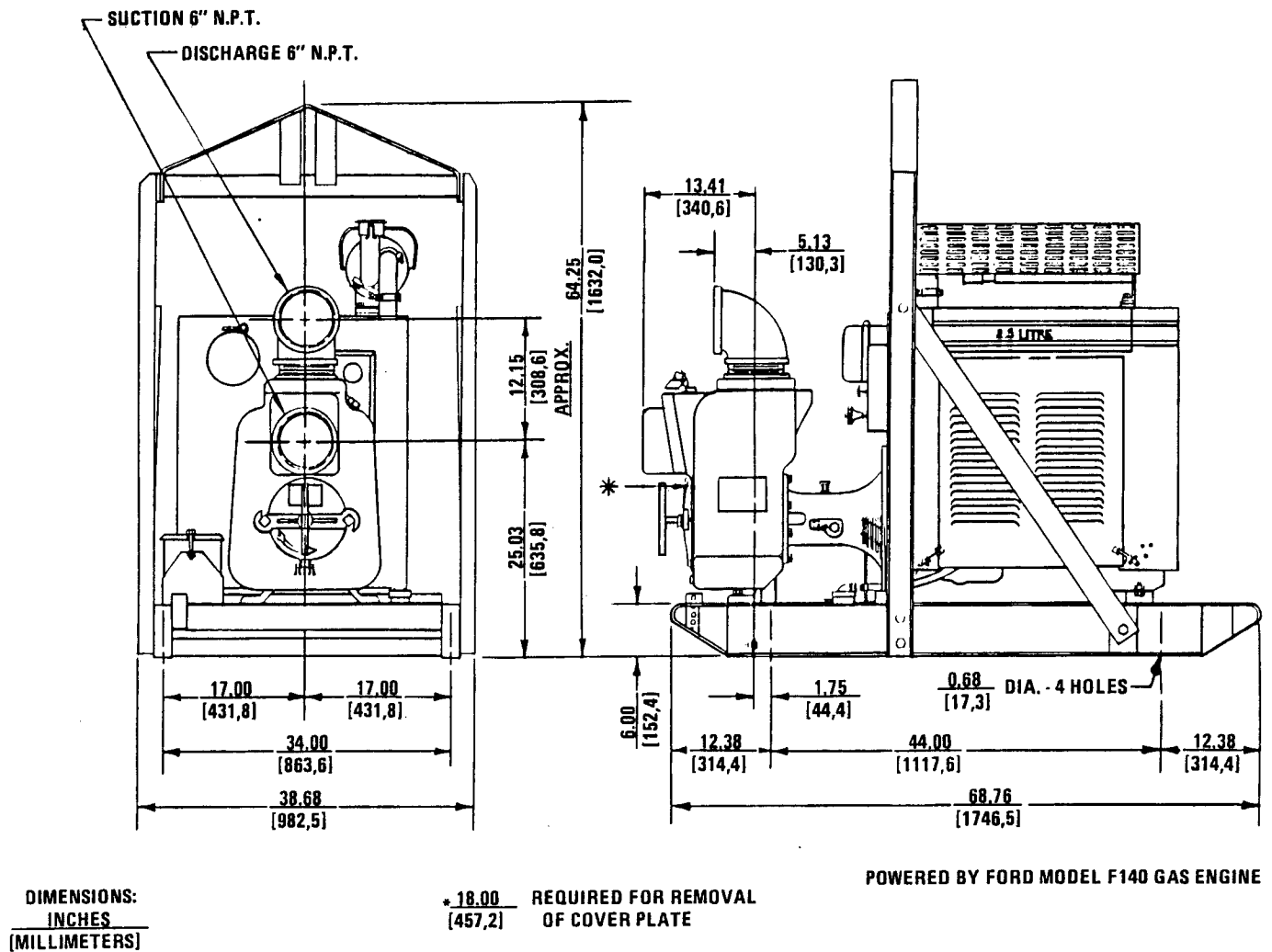


Figure 1. Pump Model 16D2-F140

## 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

## INSTALLATION

shipment. Check as follows:

- a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. 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.
- c. Carefully read all tags, decals, and markings on the pump assembly, and follow the instructions 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.

## POSITIONING 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.

## Lifting

## 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; disconnect suction and //  
// discharge hoses and piping from the pump when lifting //  
// the pump by the bail. //  
//  
////////////////////////////////////
```

Make sure that hoists and other lifting equipment are of sufficient capacity to safely handle the pump assembly. If chains and cables are used, make certain that they are positioned so that they will not damage the pump, and so that the load will be balanced.

## 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.

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## SUCTION AND DISCHARGE PIPING

### Materials

Either pipe or hose may be used for suction and discharge lines. Piping 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 close to the pump before installing the lines.

## SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

---

## Fittings

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

## Strainers

If a strainer is furnished with the pump, be certain to use it; any entrained 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.

## 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. In volatile and/or corrosive service, 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 one and one-half 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 one and one-half 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 three times the diameter of the suction pipe.

## INSTALLATION

## 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.

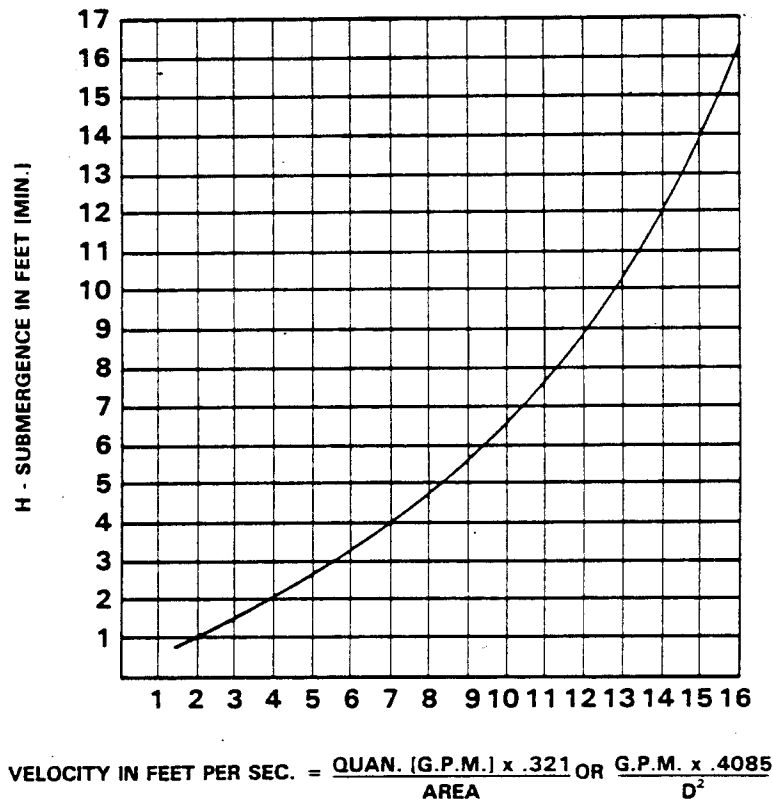


Figure 2. Recommended Minimum Suction Line Submergence Vs. Velocity

## DISCHARGE LINES

## Siphoning

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

## Valves

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

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

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

### 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

## OPERATION - SECTION C

## WARNING

```
////////////////////////////////////  
//  
// Do not attempt to pump volatile, corrosive, or flammable //  
// materials, or any liquids for which this pump has not //  
// been designed. //  
//  
////////////////////////////////////
```

## 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 volute.

## CAUTION

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

Add liquid to the volute housing 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 volute housing has evaporated.

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

## WARNING

```
////////////////////////////////////  
//  
// After filling the volute housing, do not attempt to op- //  
// erate the pump unless all connecting piping is securely //  
// installed. Otherwise, liquid in the pump forced out un- //  
// der pressure could cause injury to personnel. //  
//  
////////////////////////////////////
```

To fill the pump, remove the volute 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.

## OPERATION

### 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.

### 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.

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## OPERATION

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### Overheating

Overheating can occur if the valves in the suction or discharge lines are 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 volute housing 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.

### 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 or more of mercury. If it does not, check for air leaks in the seal or gasket.

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

After stopping the pump, disconnect the power source to ensure that the pump will remain inoperative.

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 approx-

OPERATION

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imately one minute; this will remove any remaining liquid that could freeze the pump rotating parts.

If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

**BEARING TEMPERATURE CHECK**

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F are considered normal for pedestal 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

## TROUBLESHOOTING - SECTION D

## WARNING

```

////////////////////////////////////
//
// Before attempting to open or service the pump:
//
// 1. Familiarize yourself with this manual.
// 2. Disconnect the ENGINE 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	<p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Suction check 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>Correct leak.</p> <p>Replace suction hose.</p> <p>Clean 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 INSTALLATION.</p> <p>Check strainer and clean if necessary.</p>
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRES-SURE	<p>Air leak in suction line.</p> <p>Suction intake not submerged at proper level or sump too small.</p> <p>Lining of suction hose collapsed.</p> <p>Impeller or other wearing parts worn or damaged.</p>	<p>Correct leak.</p> <p>Check installation and correct as needed. Check submergence chart (Section B).</p> <p>Replace suction hose.</p> <p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p>

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE(cont.)	Impeller clogged. Pump speed too slow. Discharge head too high. Suction lift too high. Leaking or worn seal or pump gasket. Strainer clogged.	Free impeller of debris. Check driver output; check belts or couplings for slippage. Install bypass line. Reduce suction lift. Check pump vacuum. Replace leaking or worn seal or gasket. Check strainer and clean if necessary.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high. Discharge head too low. Liquid solution too thick.	Reduce speed of power source. Adjust discharge valve. Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow. Suction check valve clogged or binding.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed. Clean valve.
EXCESSIVE NOISE	Cavitation in pump. Pumping entrained air. Pump or drive not securely mounted. Impeller clogged or damaged.	Reduce suction lift and/or friction losses in suction line. Locate and eliminate source of air bubble. Secure mounting hardware. Clean out debris; replace damaged parts.

## TROUBLESHOOTING

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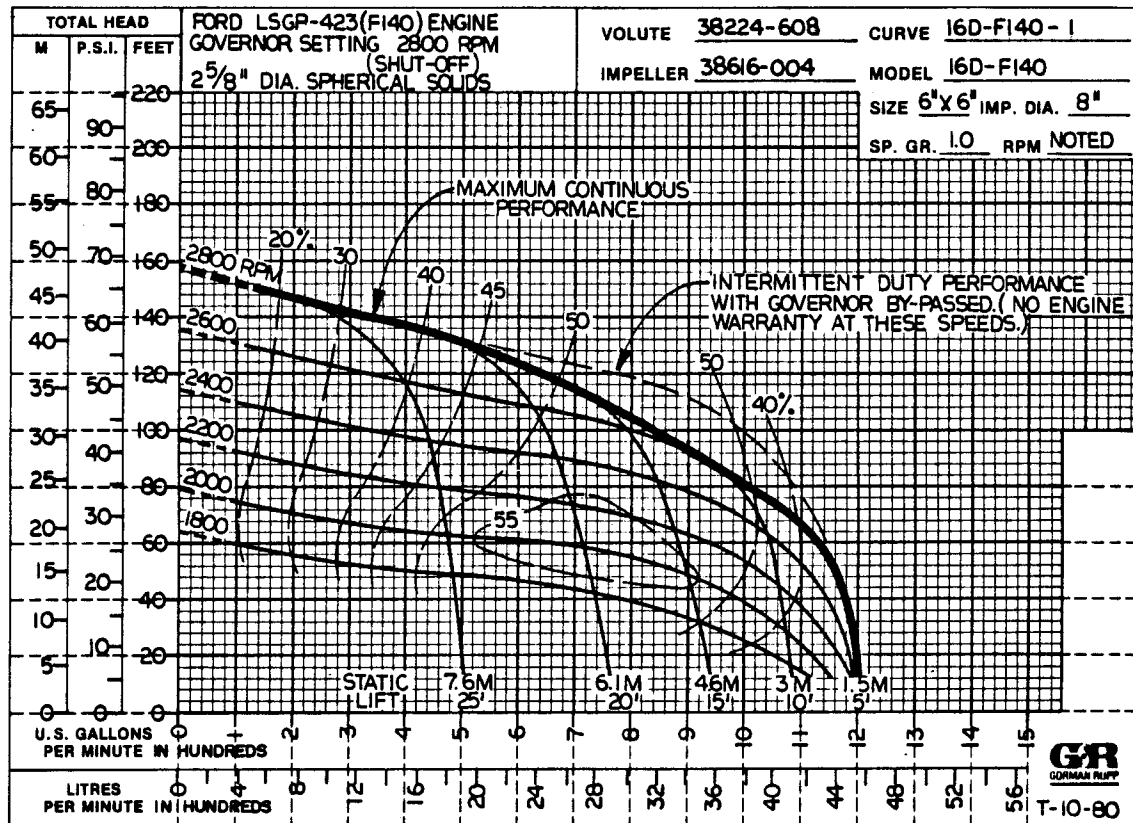
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TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.  Low or incorrect lubricant.  Suction and discharge lines not properly supported.  Drive misaligned.	Check bearing temperature regularly to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



## 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 16D2-F140

\*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" or if you have a question on performance, contact The Gorman-Rupp Company.

## SECTIONAL DRAWING

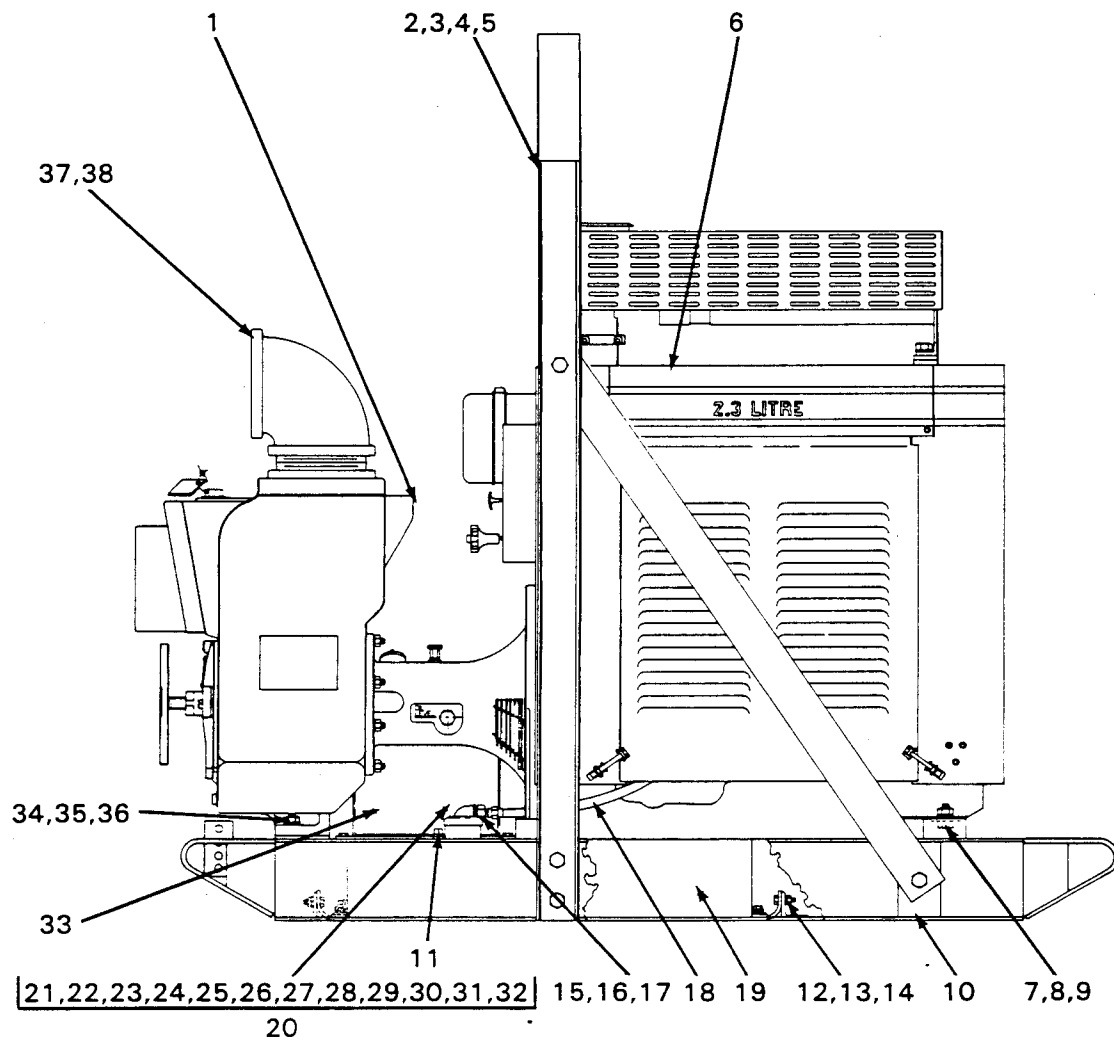


Figure 1. Pump Model 16D2-F140

**PARTS LIST**  
**Pump Model 16D2-F140**  
 (From S/N 770001 up)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP END ASSY (SEE FIGURE 2)	16D2	-----	1	20	FUEL TANK	46711-034	-----	1
2	HOISTING BAIL	13351-K	24000	1	21	BATTERY BOX ASSY	GRP40-02	-----	1
3	HEX HD CAPSCREW	B01006	15991	8	21	GROUND CABLE	5795-AC	24040	1
4	LOCKWASHER	J00010	15991	8		ASSEMBLY			
5	HEX NUT	D00010	15991	8	22	BATTERY FRAME	8355-B	24000	1
6	FORD LSGP-423 ENG	29118-022	-----	1	23	HEX HD CAPSCREW	B00612	15991	2
7	HEX HD CAPSCREW	B00805	15991	4	24	HEX NUT	D00006	15991	2
8	HEX NUT	D00008	15991	4	25	LOCKWASHER	J00006	15991	2
9	LOCKWASHER	J00008	15991	4	26	FLAT WASHER	K00006	15991	2
10	COMBINATION BASE	41566-609	-----	1	27	BATTERY	S01338	-----	1
11	PIPE PLUG	P00008	11990	1	28	BATTERY BOX	8356-B	24000	1
12	HEX HD CAPSCREW	B00604	15991	10	29	HEX HD CAPSCREW	B00604	15991	2
13	HEX NUT	D00006	15991	10	30	HEX NUT	D00006	15991	2
14	LOCKWASHER	J00006	15991	10	31	LOCKWASHER	J00006	15991	2
15	FUEL OUT ASSY	10765	24030	1	32	BATTERY TAG	6588-S	00000	1
16	REDUCING ELBOW	Q00604	11990	1	33	CABLE ASSEMBLY	6926-R	24040	1
17	MALE CONNECTOR	S01344	-----	1	34	HEX HD CAPSCREW	B01005	15991	2
18	FUEL LINE ASSY	12618-F	-----	1	35	HEX NUT	D00010	15991	2
19	FUEL TANK AND GUARD ASSY	46711-033	-----	1	36	LOCKWASHER	J00010	15991	2
					37	PIPE ELBOW	R00096	11990	1
					38	PIPE NIPPLE	T00096	15070	1

\*INDICATES PARTS RECOMMENDED FOR STOCK

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

CANADIAN SERIAL NO ..... AND UP

## SECTIONAL DRAWING

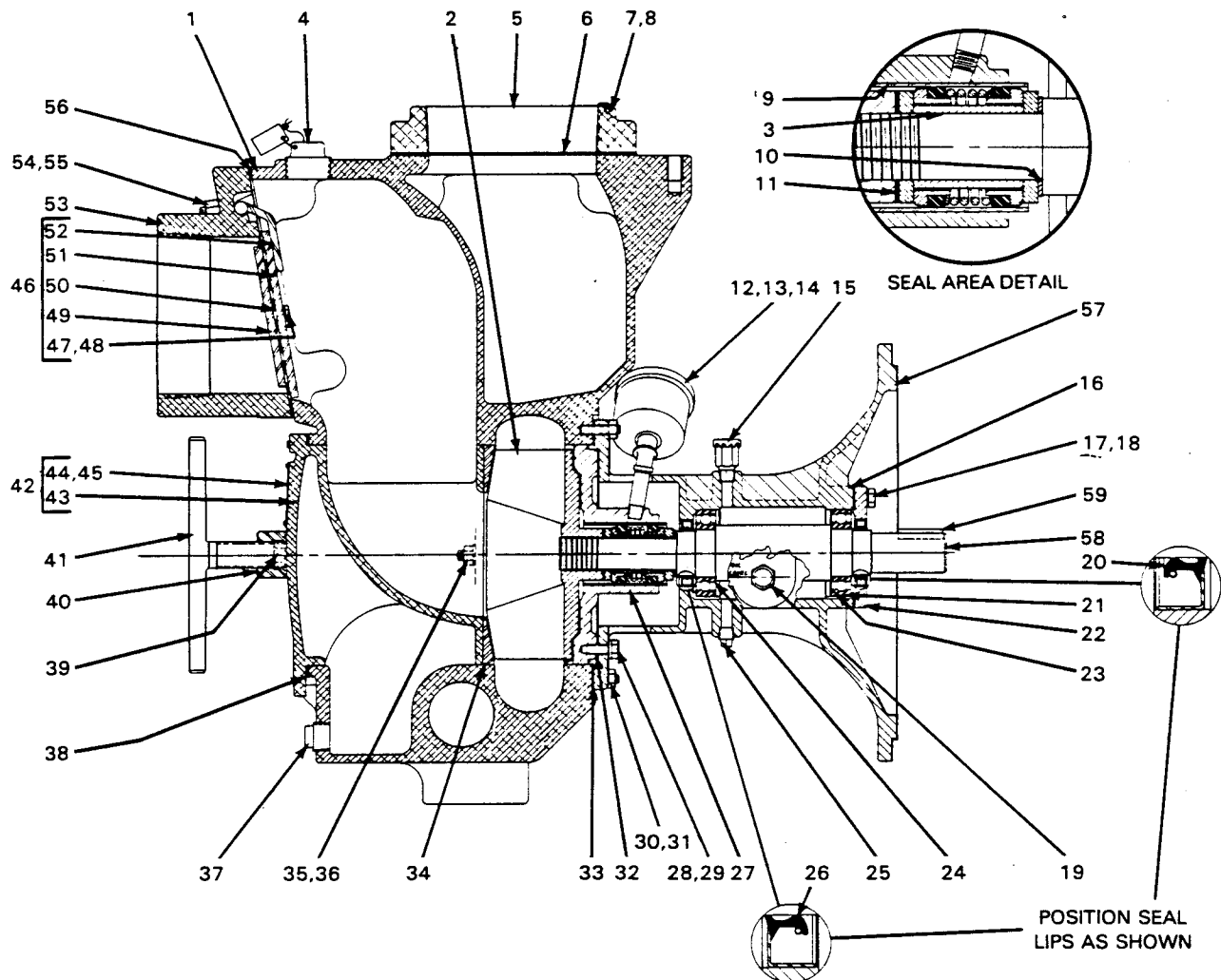


Figure 2. Pump End Assembly 16D2-(F140)

# PARTS LIST Pump End Assembly 16D2-(F140)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	VOLUTE CASING	38224-608	10010	1	34	*WEAR PLATE ASSY	46451-324	-----	1
2	*IMPELLER	38616-004	-----	1	35	HEX NUT	D00006	15991	2
3	*GREASE SEAL ASSY	GS01250	-----	1	36	LOCKWASHER	J00006	15991	2
4	FILL PLUG ASSY	48271-065	-----	1	37	VOL DRAIN PLUG	P00012	11991	1
5	DISCH FLANGE	38641-505	10010	1	38	*COVER PLATE GSKT	38682-215	20000	1
6	*DISCH FLANGE GSKT	38687-010	-----	1	39	MACHINE BOLT	A01009	15991	2
7	STUD	C01011	15991	4	40	COVER PLATE CLAMP	38111-309	11000	1
8	HEX NUT	D00010	15991	4	41	COVER SCREW	2536	24000	1
9	*SEAL LINER	2205-B	14080	1	42	COVER PLATE ASSY	42111-944	-----	1
10	SEAL WASHER	37-H	15990	1	43	COVER PLATE	NOT AVAILABLE		1
11	*IMP SHIM SET	37-J	17090	1	44	WARNING PLATE	2613-EV	13990	1
12	HVY PIPE NIPPLE	THA00406	15070	1	45	DRIVE SCREW	BM#04-03	15990	4
13	PIPE COUPLING	AE00004	11990	1	46	CHECK VALVE ASSY	46411-070	-----	1
14	*GREASE CUP	S01509	-----	1	47	HEX HD CAPSCREW	B00403	17000	2
15	INTER AIR VENT	S01703	-----	1	48	LOCKWASHER	J00004	17000	2
16	*BRG CAP GSKT	6404-G	18000	1	49	* VALVE WEIGHT	7263	15990	1
17	HEX HD CAPSCREW	B00604	15991	4	50	* CHECK VALVE	38671-412	-----	1
18	LOCKWASHER	J00006	15991	4	51	* VALVE WEIGHT	7262	24000	4
19	OIL LEVEL SIGHT GAUGE	S01471	-----	1	52	VALVE ARM	7266	24000	1
20	*OIL SEAL	25258-575	-----	1	53	SUCT FLANGE	38645-802	10010	1
21	*BEARING CAP SHIM SET	48261-037	-----	1	54	STUD	C01011	15991	4
22	BEARING CAP	38324-408	-----	1	55	HEX NUT	D00010	15991	4
23	BALL BEARING	23251-209	-----	1	56	*SUCT FLANGE GSKT	38687-048	-----	1
24	BALL BEARING	23251-209	-----	1	57	INTERMEDIATE	38263-616	-----	1
25	INTER DRAIN PLUG	P00006	11990	1	58	IMP SHAFT	38514-812	15010	1
26	*OIL SEAL	25258-575	-----	1	59	SHAFT KEY	N00607	15990	1
27	SEAL PLATE ASSY	42111-067	-----	1	NOT SHOWN:				
28	HEX HD CAPSCREW	B00604	15991	4		STRAINER	7823	24000	1
29	LOCKWASHER	J00006	15991	4		PIPE ELBOW	R00096	11990	1
30	STUD	C00605 1/2	15991	8		PIPE NIPPLE	T00096	15070	1
31	HEX NUT	D00006	15991	8		NAME PLATE	2613-D	13990	1
32	*SEAL PLATE GSKT	6568	18000	1		DRIVE SCREW	BM#04-03	15990	4
33	*VOL GASKET SET	2474-G	18000	1	OPTIONAL:				
						WHEEL KIT	GRP30-30	-----	1

\*INDICATES PARTS RECOMMENDED FOR STOCK

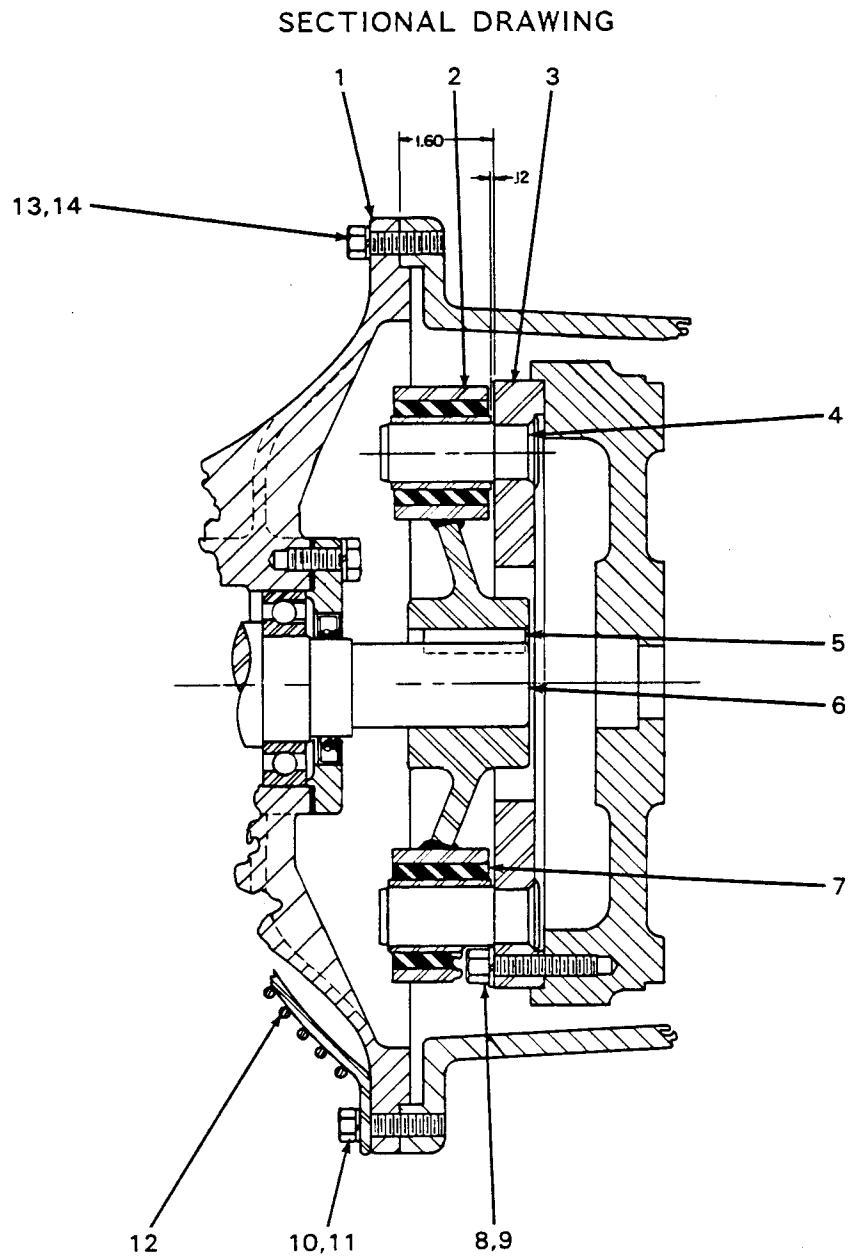


Figure 3. Drive Assembly 44162-074

PARTS LIST  
Drive Assembly 44162-074

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	INTERMEDIATE	38263-616	-----	REF
2	DRIVE ARM ASSEMBLY	13817-C	-----	1
3	DRIVE PLATE ASSEMBLY	44131-007	-----	1
4	DRIVE PIN	13819	15030	2
5	SHAFT KEY	N00607	15990	REF
6	IMPELLER SHAFT	38514-812	15010	REF
7	DYNA FLEX JOINT	S02110	-----	2
8	HEX HD CAPSCREW	B00606	15991	6
9	LOCKWASHER	J00006	15991	6
10	HEX HD CAPSCREW	B00606	15991	4
11	LOCKWASHER	J00006	15991	4
12	INTERMEDIATE GUARD	42381-038	-----	2
13	HEX HD CAPSCREW	B00605	15991	8
14	LOCKWASHER	J00006	15991	8

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## PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

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

Before attempting to service the pump, take precautions to ensure that the engine will remain inoperative while the pump is being serviced and close all connecting valves.

### Suction Check Valve Disassembly

(see figure 2)

Remove the suction piping. Remove the hex nuts (55) securing the suction flange (53) to the volute casing (1). Pull the check valve assembly (46) along with the suction flange gasket (56) from the suction port opening. Remove the capscrews and lockwashers (47 and 48) securing the valve weights to the valve gasket.

### Pump Disassembly

(see figure 2)

Remove the volute drain plug (37) to drain the pump. Clean and reinstall the drain plug.

Support the pump body, and remove the hex nuts (31) securing the volute casing (1) to the intermediate (57). Separate the assemblies. Inspect the wear plate (34), and replace it if scored or worn.

For access to the wear plate, loosen the cover plate screw (41) securing the cover plate clamp (40), and remove the cover plate assembly (42). The wear plate is secured by hex nuts (35) and lockwashers (36).

### NOTE

Before reinstalling the cover plate assembly, replace the cover plate gasket (38) and apply a film of grease or "Never-Seez" on any surface which contacts the volute casing. This action will reduce rust and scale build-up and ease future disassembly.

To loosen the impeller (2) tap the vanes in a counter-clockwise direction with a block of wood or a soft-faced mallet. Unscrew the impeller. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is unscrewed.

Remove the impeller adjusting shims (11). For ease of reassembly, tag and tie the shims.

## MAINTENANCE AND REPAIR

## Seal Disassembly

(see figure 2)

Before removing the seal assembly, turn the cross arm on the seal grease cup (14) clockwise until it rests against the cover (see figure 5). This will prevent the grease in the cup from escaping after the seal is removed.

Carefully remove the shaft sleeve and the stationary and rotating seal elements, using a stiff wire with a hooked end if necessary.

Clean the seal cavity and impeller shaft (58) with a soft cloth soaked in 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. //  
//  
////////////////////////////////////
```

If no further disassembly is required see **Seal Reassembly**.

## Pump Separation From Engine

(see figure 3)

If it is necessary to separate the pump end assembly from the engine, remove the hex head capscrews (10 and 13) and lockwashers (11 and 14) securing the intermediate guards (12) and intermediate (1) to the engine bellhousing, and separate the assemblies.

The drive pins (4) will disengage from the drive arm assembly (2). The drive arm assembly and shaft key (5) are a tight press fit on the shaft (6), and will remain on the shaft. The dyna flex joints (7) are a press fit in the drive arm.

Use a bearing puller to remove the drive arm assembly (2) from the shaft (6).

Unless the drive pins are bent or worn and must be replaced, it is not necessary to remove the drive plate assembly (3). To remove the drive plate assembly, remove the hex head capscrews (8) and lockwashers (9) securing the assembly to the engine flywheel.

## Impeller Shaft And Bearing Disassembly

(see figure 2)

Remove grease cup and piping (12, 13, and 14) from seal plate (27). Remove capscrews and lockwashers (28 and 29) and remove seal plate from the intermediate.

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Drain the bearing lubricant by removing the intermediate drain plug (25). Clean and reinstall the drain plug.

Remove the shaft key (59). Remove the capscrews and lockwashers (17 and 18) securing the bearing cap (22) to the intermediate. Remove the oil seal (20) from the bearing cap. Remove bearing cap gasket (16) and shim set (21). Tie and tag the shim set, or measure and record their thickness.

Place a block of wood against the impeller end of the shaft and drive shaft and bearings out of the intermediate. Remove the inboard oil seal (26) from the intermediate.

Use a bearing puller to remove the inboard bearing (24) and outboard bearing (23) from the impeller shaft.

### Impeller Shaft And Bearing Reassembly

Clean the bore of the intermediate, and all component parts with a 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. //  
// //  
////////////////////////////////////
```

Soak the bearings in cleaning solvent free of grit or metallic particles. Inspect the bearings, and replace if necessary.

Press the inboard and outboard bearings onto the impeller shaft until they seat squarely against the shaft shoulders.

Install the inboard oil seal (26) in the intermediate with the lip positioned as shown in figure 2.

Install the outboard oil seal (20) in the bearing cap with the lip positioned as shown in figure 2.

Press the shaft and assembled bearings into the intermediate bore until the inboard bearing seats squarely against the intermediate shoulder.

Install required number of bearing shims.

#### NOTE

Shaft endplay should be between .002 - .010 inch.

Replace the bearing cap gasket and secure bearing cap to the intermediate using capscrews and lockwashers.

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Position the seal plate over the shaft, and align the lubricator hole with the top access opening in the intermediate. Secure using capscrews and lockwashers. Reinstall the grease cup and piping into seal plate.

Lubricate the intermediate as indicated in LUBRICATION, Section E.

### Pump Attachment to Engine

(see figure 3)

Inspect drive pins and replace if bent or worn. Assemble drive plate assembly to flywheel using capscrews (8) and lockwashers (9).

Press drive arm assembly onto the impeller shaft.

When reassembling the engine and pump end assembly, make certain that the drive arm and drive plate assemblies are mounted in accordance with the dimensions on figure 3.

### CAUTION

If the drive assembly is not properly positioned on the shaft, a preloaded condition can occur and cause premature thrust bearing failure.

Align the drive arm assembly with drive pins and secure the intermediate and guards to the bellhousing using capscrews and lockwashers.

### Seal Reassembly

(see figure 2)

The seal is not normally reused because of the precision finish on its lapped face, but if it is necessary to reuse the old seal, wash all metallic parts in cleaning solvent and dry thoroughly.

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.

Inspect the seal liner (9), which is a press fit in the seal plate, and replace it if worn or grooved. If the seal liner is replaced, a hole must be drilled in it after installation to permit the flow of lubricant from the grease cup to the seal assembly. Deburr the hole after drilling, and clean the seal liner.

**CAUTION**

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

Slide the seal spacer washer (10) onto the shaft until it seat against the shaft shoulder.

Lubricate the packing rings with soft grease or oil, and place a drop of light lubricating oil on the lapped faces of the seal. Assemble the seal as shown in figure 4.

Install the replacement seal as a complete unit.

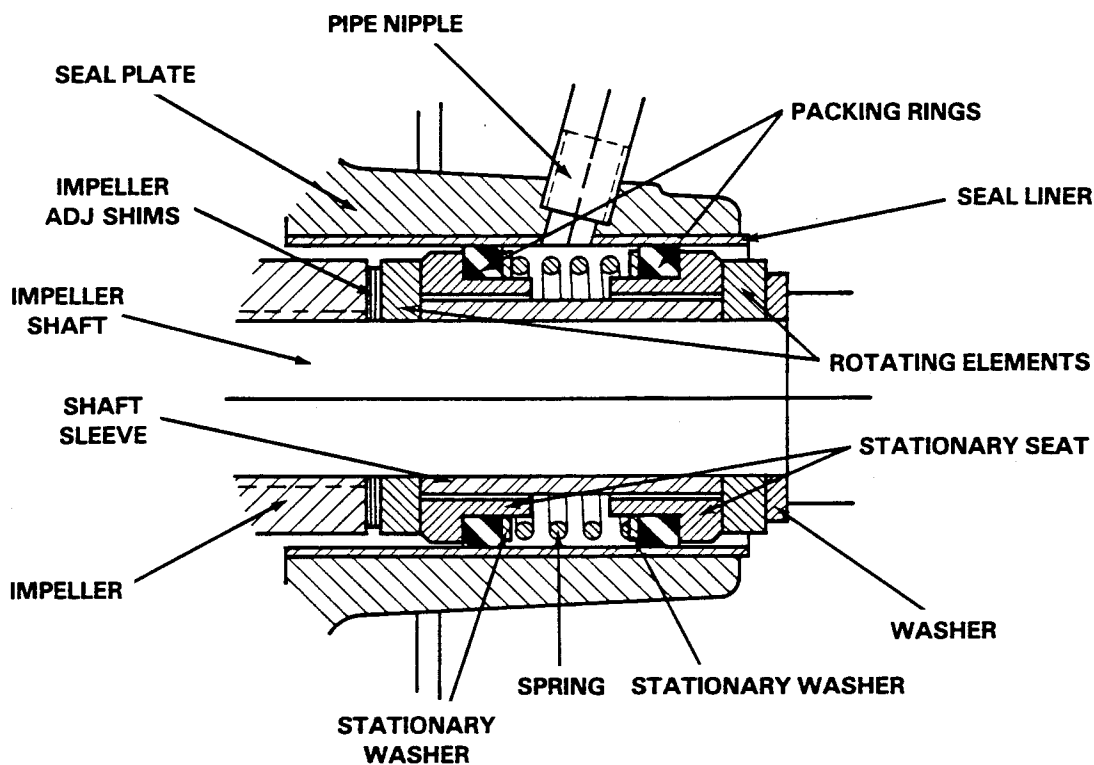


Figure 4. GS-1250 Seal Assembly

### Pump Reassembly

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

Reinstall the impeller adjusting shims and the impeller. A clearance of .020 to .040 inch between the impeller and the seal plate is necessary for maximum pump

MAINTENANCE AND REPAIR

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efficiency. Measure this clearance, and add or remove impeller shims until it is reached.

Reassemble the volute casing to the seal plate and the intermediate, replacing the volute gasket set (33). A clearance of .010 to .020 inch between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be reached by removing gaskets in the volute gasket set until the impeller binds against the wear plate when the shaft is turned. After the impeller binds, add .010 inch of gaskets.

### Suction Check Valve Reassembly

Clean and inspect all components of the check valve assembly. Replace any parts that are worn or damaged.

Secure the valve gasket (50) between the valve weights using the two capscrews and lockwashers.

Position the check valve pivot arm into the suction flange.

Place new gasket (56) on suction flange and install complete assembly into the suction port.

Secure the suction flange using the hex nuts.

Check the operation of the suction check valve to ensure proper seating and free movement. Reinstall suction piping.

Before starting the pump, check that piping is secure, fill the volute with liquid, and open all connecting valves.

## LUBRICATION

### Seal Assembly

Before starting the pump, fill the grease cup through the grease fitting with lithium base No.2 pressure gun 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).

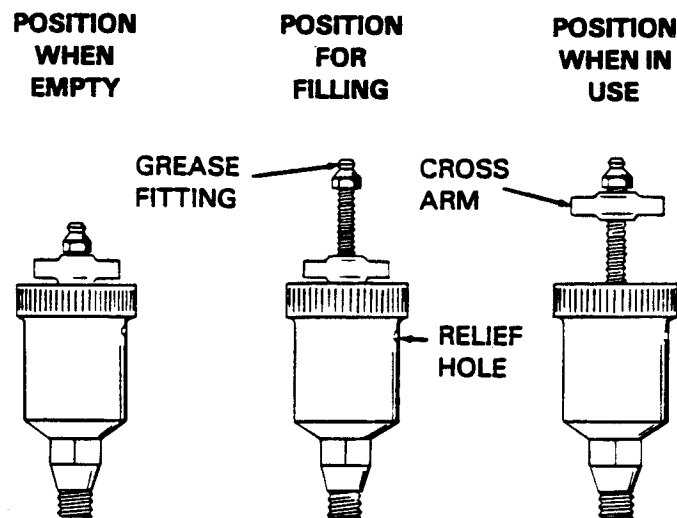


Figure 5. Automatic Lubricating Grease Cup

## Bearings

(see figure 2)

Oil-lubricated bearings should be drained and filled yearly under normal operating conditions, but the oil level should be checked regularly. Do not add oil sooner than required; over-oiling will cause excessive preloading and overheating which will shorten bearing life.

When lubrication is required, remove the pedestal air vent (15) and fill the bearing housing with a good grade of non-detergent SAE No. 30 motor oil to the midpoint of the oil level sight gauge (19).



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