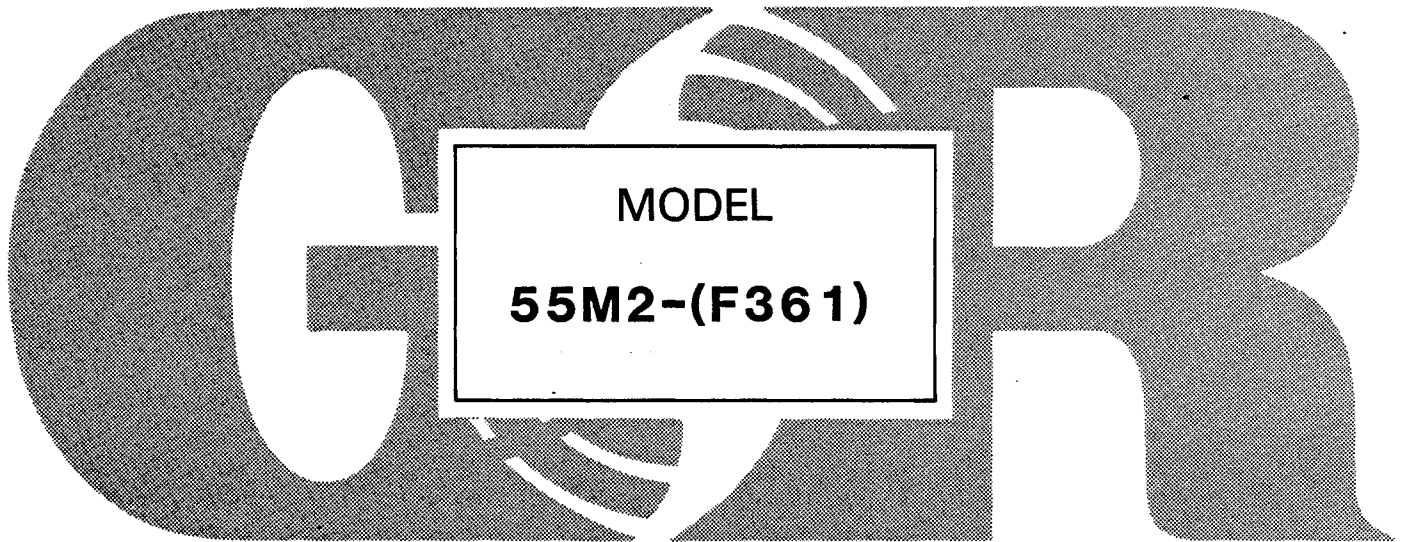


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# 50 SERIES

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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

Printed in U.S.A.

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## TABLE OF CONTENTS

INTRODUCTION . . . . .	I-1
WARNINGS - SECTION A . . . . .	A-1
INSTALLATION - SECTION B . . . . .	B-1
PREINSTALLATION INSPECTION . . . . .	B-1
POSITIONING PUMP . . . . .	B-2
Lifting . . . . .	B-2
Mounting . . . . .	B-2
SUCTION AND DISCHARGE PIPING . . . . .	B-2
Materials . . . . .	B-2
Line Configuration . . . . .	B-3
Connections to Pump . . . . .	B-3
Gauges . . . . .	B-3
SUCTION LINES . . . . .	B-3
Fittings . . . . .	B-3
Strainers . . . . .	B-4
Sealing . . . . .	B-4
Suction Lines In Sumps . . . . .	B-4
Suction Line Positioning . . . . .	B-4
DISCHARGE LINES . . . . .	B-5
Siphoning . . . . .	B-5
Valves . . . . .	B-6
ALIGNMENT . . . . .	B-6
OPERATION - SECTION C . . . . .	C-1
PRIMING . . . . .	C-1
Hand Primers . . . . .	C-1
Exhaust Primers . . . . .	C-2
Auxiliary Ejectors . . . . .	C-2
Vacuum Pumps . . . . .	C-3
STARTING . . . . .	C-3
OPERATION . . . . .	C-3
Leakage . . . . .	C-3
Liquid Temperature And Overheating . . . . .	C-3
Strainer Check . . . . .	C-4
Pump Vacuum Check . . . . .	C-4
STOPPING . . . . .	C-4
Cold Weather Preservation . . . . .	C-5
BEARING TEMPERATURE CHECK . . . . .	C-5
PUMP TROUBLESHOOTING - SECTION D . . . . .	D-1
PUMP MAINTENANCE AND REPAIR - SECTION E . . . . .	E-1
PERFORMANCE CURVE . . . . .	E-1
PUMP MODEL - PARTS LIST . . . . .	E-3
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY . . . . .	E-4
Cover Plate Removal . . . . .	E-4
Impeller And Wear Ring Removal . . . . .	E-5
Seal Removal And Disassembly . . . . .	E-5
Separating Pump And Intermediate From Engine . . . . .	E-6
Shaft And Bearing Removal And Disassembly . . . . .	E-6
Shaft and Bearing Reassembly And Installation . . . . .	E-7
Securing Pump And Intermediate To Engine . . . . .	E-8
Seal Reassembly And Installation . . . . .	E-9
Impeller And Wear Ring Installation . . . . .	E-11
Cover Plate Installation . . . . .	E-12
Final Pump Reassembly . . . . .	E-12
LUBRICATION . . . . .	E-13
Seal Assembly . . . . .	E-13
Bearings . . . . .	E-13
Engine . . . . .	E-14



INTRODUCTION

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

This pump is a 50 Series, centrifugal model with an enclosed impeller. This pump is designed for pumping clean liquids at high heads and high discharge pressures. The basic materials of construction for wetted parts are gray iron, with gray iron impeller and brass wear rings. Be sure the liquid being pumped is compatible with these materials.

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	or	Gorman-Rupp of Canada Limited
P.O. Box 1217		70 Burwell Road
Mansfield, Ohio 44901-1217		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 50 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 handle clean liquids. Do not
// attempt to pump volatile, corrosive, or flammable liq-
// uids which may damage 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 connections are tight, properly sup-
// ported 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.
//
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
// Fuel used by internal combustion engines presents an ex- //
// tremere 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

```

////////////////////////////////////
// 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

```

////////////////////////////////////
// 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. //
// //
////////////////////////////////////

```



WARNINGS

---

---

---

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 2700 RPM. //  
// //  
////////////////////////////////////
```



## 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 permissible operating pressure as shown on the pump performance curve. (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.

## PREINSTALLATION INSPECTION

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

- a. Inspect the pump 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.
- 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.

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## POSITIONING PUMP

### Lifting

Use lifting equipment with a capacity of at least **2,100 pounds**. This pump weighs approximately **420 pounds**, not including the weight of accessories and customer installed options. Customer installed equipment such as suction and discharge 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. The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

To ensure sufficient lubrication and fuel supply to the engine, **do not** position the pump and engine more than 15° off horizontal for continuous operation. The pump and engine may be positioned up to 30° off horizontal for **intermittant operation only**; however, the engine manufacturer should be consulted for continuous operation at angles greater than 15°.

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.

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## INSTALLATION

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### 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 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.

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## Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3/4-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. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

## Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 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.

## Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 1 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).

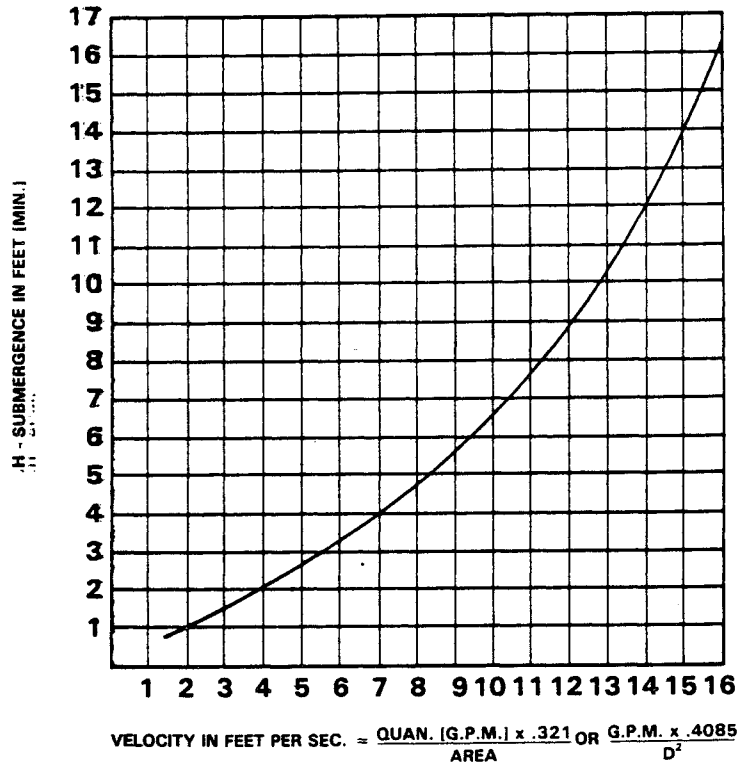


Figure 1. Recommended Minimum Suction Line Submergence Vs. Velocity

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.

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## Valves

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

With high discharge heads, it is recommended that a throttling valve and a system check valve be 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.

## ALIGNMENT

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



OPERATION

OPERATION - SECTION C

WARNING

```

////////////////////////////////////
//
// This pump is designed to handle clean liquids. Do not
// attempt to pump volatile, corrosive, or flammable liq-
// uids which may damage the pump or endanger personnel as
// a result of pump failure.
//
////////////////////////////////////

```

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 2700 RPM.
//
////////////////////////////////////

```

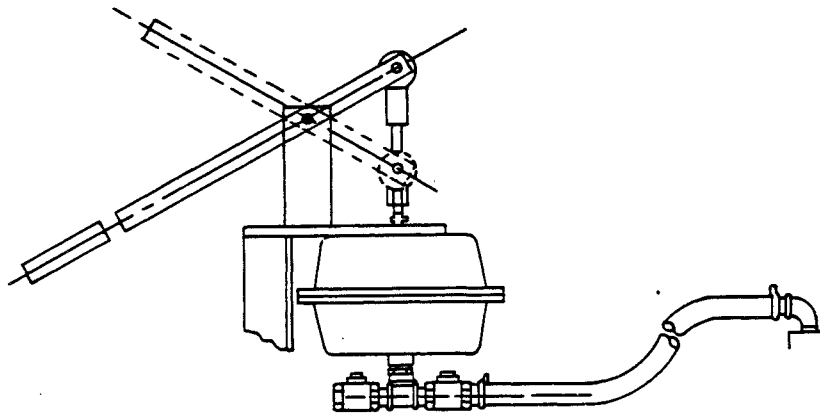
PRIMING

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

Hand Primers

Hand-operated primers are usually mounted on the pump and, when operated, draw air out of the suction line and casing.

To prime a pump with a hand vacuum pump open the cock on the pump priming line. Operate the hand pump until liquid flows out of the check valve on the bottom of the primer pump. Once the pump is primed, close the valve located between the primer and the pump so that the prime will not be lost.

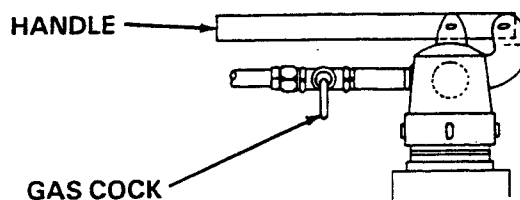


1. Hand Primer Assembly

### Exhaust Primers

Engine driven pumps normally take advantage of the engine exhaust gases by using them to operate an exhaust primer. The exhaust is directed through a venturi which creates a vacuum in the pump casing in order to fill the suction line and casing with liquid.

To prime a pump using an exhaust primer, open the gas cock in the priming line and engage the exhaust primer until liquid is thrown out of the ejector nozzle.



2. Exhaust Primer Assembly

### Auxiliary Ejectors

Ejectors function much like exhaust primers. They may be operated by steam, compressed air, water or exhaust gases. To prime a pump using an ejector, open the gas cock in the priming line and operate the ejector until liquid is thrown out the ejector nozzle.

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## OPERATION

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### Vacuum Pumps

Air can be exhausted to prime a pump by using a vacuum pump. Either a wet type or a dry type vacuum pump may be used; however, a wet type is preferred since it will not be damaged if liquid enters it. If a dry vacuum pump is used, provisions must be made to keep liquid from entering it.

### STARTING

Consult the operations manual furnished with the engine.

### OPERATION

#### CAUTION

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

### 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.

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

### Pump Vacuum Check

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

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches 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 operating speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

### STOPPING

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

---

---

**CAUTION**

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

After stopping the pump, switch off the engine ignition and remove the key to ensure that the pump will remain inoperative.

**Cold Weather Preservation**

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts.

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

**BEARING TEMPERATURE CHECK**

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



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	Auxiliary priming device faulty or improperly installed.	Repair priming device or check installation.
	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 lift or discharge head to high.	Check piping installation and reduce suction lift and/or discharge head.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Pump speed too high.	Check engine output.
	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 too high.</p> <p>Strainer clogged.</p> <p>Discharge throttling valve partially closed; check valve installed improperly.</p> <p>Discharge pressure at or below safety shutdown limit.</p> <p>Discharge check valve locked closed.</p>	<p>Free impeller of debris.</p> <p>Check engine output; consult engine operation manual.</p> <p>Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.</p> <p>Check strainer and clean if necessary.</p> <p>Open discharge valve fully; check piping installation.</p> <p>Check starting instructions; increase pressure.</p> <p>Check position of handle; open valve.</p>
PUMP REQUIRES TOO MUCH POWER	<p>Discharge head too low.</p> <p>Liquid solution too thick.</p> <p>Pump speed too high.</p>	<p>Adjust discharge valve.</p> <p>Dilute if possible.</p> <p>Check engine output.</p>
PUMP CLOGS FREQUENTLY	<p>Discharge flow too slow.</p> <p>Suction check valve or foot valve clogged or binding.</p>	<p>Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.</p> <p>Clean valve.</p>
EXCESSIVE NOISE	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Impeller clogged or damaged.</p>	<p>Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Clean out debris; replace damaged parts.</p>



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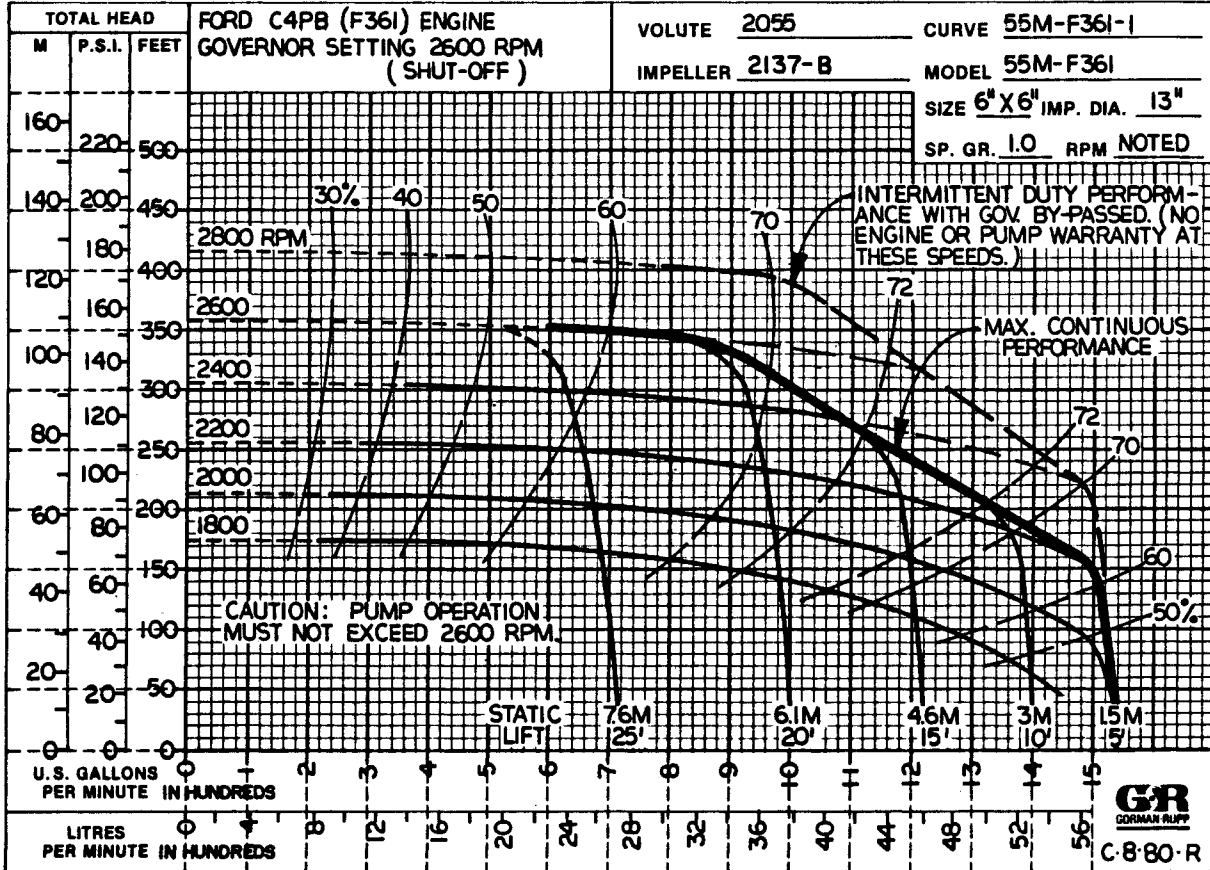
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TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.  Low or incorrect lubricant.  Suction and discharge lines not properly supported.  Drive misaligned.	Check bearing temperature regularly to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



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 55M2-(F361)

\*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.

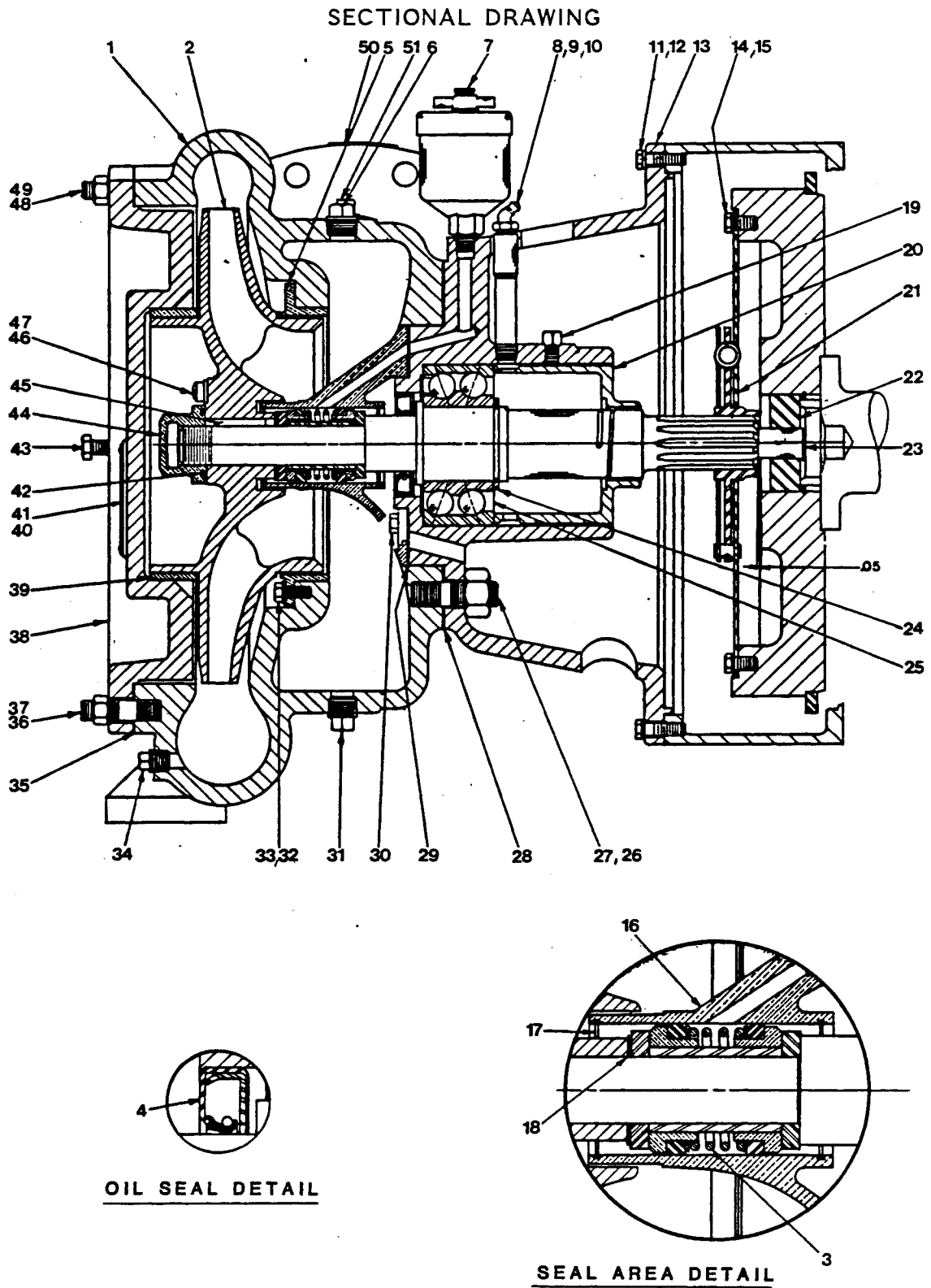


Figure 1. Pump Model Assembly 55M2-(F361)

MAINTENANCE AND REPAIR

**PARTS LIST**  
**Pump Model Assembly 55M2-(F361)**  
 (From S/N 835568 up)

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

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP CASING	2055	10030	1	29	*SEAL HOUSING GSKT	2178-G	18000	1
2	*IMPELLER	2137-B	10010	1	30	HEX HD CAPSCREW	B00603	14990	6
3	*SEAL ASSY	GS01250	-----	1	31	CASING DRAIN PLUG	P00008	11990	1
4	*OIL SEAL	S00079	-----	1	32	HEX HD CAPSCREW	B00503	14990	2
5	*WEAR RING	2057	14000	1	33	LOCKWASHER	J00005	15991	2
6	PIPE PLUG	P00008	11990	1	34	CASING DRAIN PLUG	P00006	11990	1
7	SEAL GREASE CUP	S01509	-----	1	35	*COVER PLATE GSKT	1210-G	18000	1
8	LUBE FITTING	S00194	-----	1	36	STUD	C01009	15991	10
9	PIPE COUPLING	AE00004	11990	1	37	HEX NUT	D00010	15991	10
10	PIPE NIPPLE	T00412	15070	1	38	COVER PLATE	953-E	10010	1
11	HEX HD CAPSCREW	B00605	15991	12	39	*WEAR RING	12095	14000	1
12	LOCKWASHER	J00006	15991	12	40	NAME PLATE	2613-D	13990	1
13	INTERMEDIATE	2175-D	10010	1	41	DRIVE SCREW	BM#04-03	15990	4
14	HEX HD CAPSCREW	B00603	15991	8	42	*O-RING	S00461	-----	1
15	LOCKWASHER	J00006	15991	8	43	HEX HD CAPSCREW	B00605	15991	2
16	SEAL HOUSING	2178	14000	1	44	CAP NUT	2177-A	14000	1
17	LOCK SPRING	947-A	16030	2	45	*IMPELLER KEY	N00407	15990	1
18	*ADJ SHIM SET	37-J	17090	REF	46	FIL HD SCREW	AW00602	14990	1
19	SQ HD SETSCREW	G00604	15990	1	47	LOCKWASHER	J00006	15991	1
20	BRG RETAINING NUT	2196	10010	1	48	STUD	C01010	15991	2
21	DRIVE PLATE ASSY	24521-168	-----	1	49	HEX NUT	D00010	15991	2
22	PILOT BUSHING	8312-A	15010	1	50	SUCTION STICKER	6588-AG	00000	1
23	*IMPELLER SHAFT	12899	16040	1	51	PIPE PLUG	P00006	11990	1
24	BRG RETAINING RING	S00215	10010	1		NOT SHOWN:			
25	*BALL BEARING	S01033	-----	1		STRAINER	S01529	-----	1
26	STUD	C01209	15991	8		PIPE PLUG	P00008	11990	1
27	HEX NUT	D00012	15991	8		DISCH STICKER	6588-BJ	00000	1
28	*CASING GASKET	922-G	18000	1					

\*INDICATES PARTS RECOMMENDED FOR STOCK

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

CANADIAN SERIAL NO ..... AND UP

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 view (see Figure 1) and the accompanying parts list.

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

Before attempting to service the pump, switch off the engine ignition and remove the key to ensure that it will remain inoperative, and close all valves in the suction and discharge lines.

The pump is designed to be powered by an eight cylinder, 361 cubic inch displacement, Ford gasoline engine, model C4PB. For engine disassembly and repair, consult the literature supplied with the engine or contact your local Ford representative.

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.
//
////////////////////////////////////

```

Cover Plate Removal

The impeller, wear rings, and seal assembly can be serviced after the cover plate (38) has been removed. Before removing the cover plate, remove the pump casing drain plugs (31 and 34) and drain the pump. Clean and reinstall the drain plugs.

Loosen the nuts (37), and use the jacking screws (43) to force the cover plate from the pump casing (1). Remove the cover plate gasket (35).

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---

Inspect the outboard wear ring (39) for excessive wear or damage. The wear ring is a press fit in the cover plate. If replacement is required, use a suitable puller to remove the wear ring.

### Impeller And Wear Ring Removal

Turn the cross arm on the automatic lubricating seal grease cup (7) clockwise until it rests against the cover (see Figure 5). This will prevent the grease in the cup from escaping when the impeller is removed.

Remove the fillister head screw and lockwasher (46 and 47), and unscrew the cap nut (44) from the impeller shaft (23). Remove the cap nut O-ring (42).

Install two 3/8-16 UNC x 2 1/2-inch long capscrews (not supplied) in the tapped holes in the impeller and use a wheel puller to remove the impeller from the shaft. Retain the impeller key (45).

Slide the impeller adjusting shims (18) off the shaft. Tie and tag the shims, or measure and record their thickness for ease of reassembly.

Inspect the wear ring (5) for excessive wear or damage. If replacement is required, remove the hardware (32 and 33), and insert two 5/16-18 UNC x 2 1/2-inch jacking screws (not supplied) in the threaded holes in the wear ring. Turn the jacking screws evenly (to prevent binding) until the wear ring separates from the pump casing.

### Seal Removal And Disassembly

The seal assembly (3) may be serviced as a bench operation by removing the seal housing (16) and seal assembly as a single unit. Remove the hardware (30) and install 3/8-16 UNC jacking screws in the threaded holes in the seal housing. Tighten the jacking screws evenly to prevent binding.

When the seal housing separates from the intermediate, slide the seal housing and seal assembly off the shaft as a unit. Remove the seal housing gasket (29).

Remove the outboard seal lock spring (17). Use caution when removing the lock spring; tension on the seal spring will be released when the lock spring is removed.

Carefully remove the stationary and rotating seal elements, packing rings, stationary washers, seal spring and the spacer sleeve from the seal housing. Use a stiff wire with a hooked end if necessary.

### NOTE

It is not necessary to remove the inboard seal lock spring from the seal housing.

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

---

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### Separating Pump And Intermediate From Engine

To service the intermediate, bearings, or drive assembly, the pump and intermediate must be separated from the base. Remove the hardware securing the pump casing to the base.

Support the pump and intermediate using a suitable hoist and sling, and remove the hardware (11 and 12) securing the intermediate to the engine bellhousing. Separate the assemblies by pulling the intermediate straight away from the engine. As the assemblies are separated, the impeller shaft (23) will disengage from the drive plate assembly (21).

Tie and tag any leveling shims used under the pump casing mounting feet.

It is not necessary to remove the drive plate assembly from the engine flywheel unless the assembly or the pilot bushing (22) must be replaced. To remove the drive plate assembly, disengage the hardware (14 and 15).

Inspect the pilot bushing and, if replacement is required, use a suitable puller to remove it from the engine flywheel.

### Shaft And Bearing Removal And Disassembly

When the pump is properly operated and maintained, the shaft and bearing should not require disassembly. Disassemble the shaft and bearing **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.

After separating the pump end from the engine, reach through the back of the intermediate and remove the nuts (27). Separate the pump casing (1) from the intermediate (13) and remove the gasket (28).

Loosen the setscrew (19), and unscrew the bearing retaining nut (20) from the intermediate.

#### NOTE

There are no provisions for draining the grease from the intermediate cavity. Place a drip pan under the intermediate before removing the shaft and bearing.

Place a block of wood against the impeller end of the shaft (23), and tap the shaft and assembled bearing out of the intermediate.

Remove the bearing retaining ring (24), and use a bearing puller to remove the bearing from the shaft.



Inspect the oil seal (4) for wear or damage and, if replacement is required, use an arbor (or hydraulic) press to remove it from the intermediate bore.

### Shaft and Bearing Reassembly And Installation

Clean the intermediate, shaft and all component parts (except the bearing) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage 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 or scratches or thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Clean the bearing thoroughly in **fresh** cleaning solvent. Dry the bearing with filtered compressed air and coat with light oil.

Rotate the bearing by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the 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 balls or races and cause premature bearing failure.

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

Pre-pack the bearing by hand (or use a bearing packer if available) with No. 0 lithium base grease until the bearing balls are thoroughly lubricated.

Position the bearing on the shaft with the loading groove facing **toward** the impeller end of the shaft. Press the bearing onto the shaft until it seats squarely against the shaft shoulder.

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**CAUTION**

When installing the bearings onto the shaft, NEVER press or hit against the outer race, balls, or ball cage. Press ONLY on the inner race.

Install the bearing retaining ring (24).

Press the oil seal (4) into the intermediate bore with the lip positioned as shown in Figure 1.

Slide the shaft and assembled bearing into the intermediate bore until the bearing seats squarely against the intermediate shoulder. **Be careful** not to damage the oil seal lip on the shaft threads.

**CAUTION**

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

Screw the retaining nut (20) into the intermediate and secure it with the setscrew (19).

**NOTE**

Shaft end play should be between .002 and .010 inch. Adjust the retaining nut to establish the correct end play.

Replace the pump casing gasket (28) and secure the casing to the intermediate with the nuts (27).

Lubricate the bearing as indicated in **LUBRICATION**.

**Securing Pump And Intermediate To Engine**

Apply 'Never-Seez' (or equivalent compound) to the inside diameter of the pilot bushing, and press the bushing into the engine flywheel as shown in Figure 1. Be sure the bushing does not protrude and preload the shaft and bearing.

CAUTION

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

Secure the drive plate assembly to the engine flywheel with the attaching hardware (14 and 15).

Slide the shaft splines into the drive plate and secure the intermediate to the engine bellhousing with the hardware (11 and 12).

Be sure to install any leveling shims used under the pump casing mounting feet before installing the pump casing mounting hardware.

Seal Reassembly And Installation

(Figures 1 and 2)

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 housing bore with water or a very small amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 2).

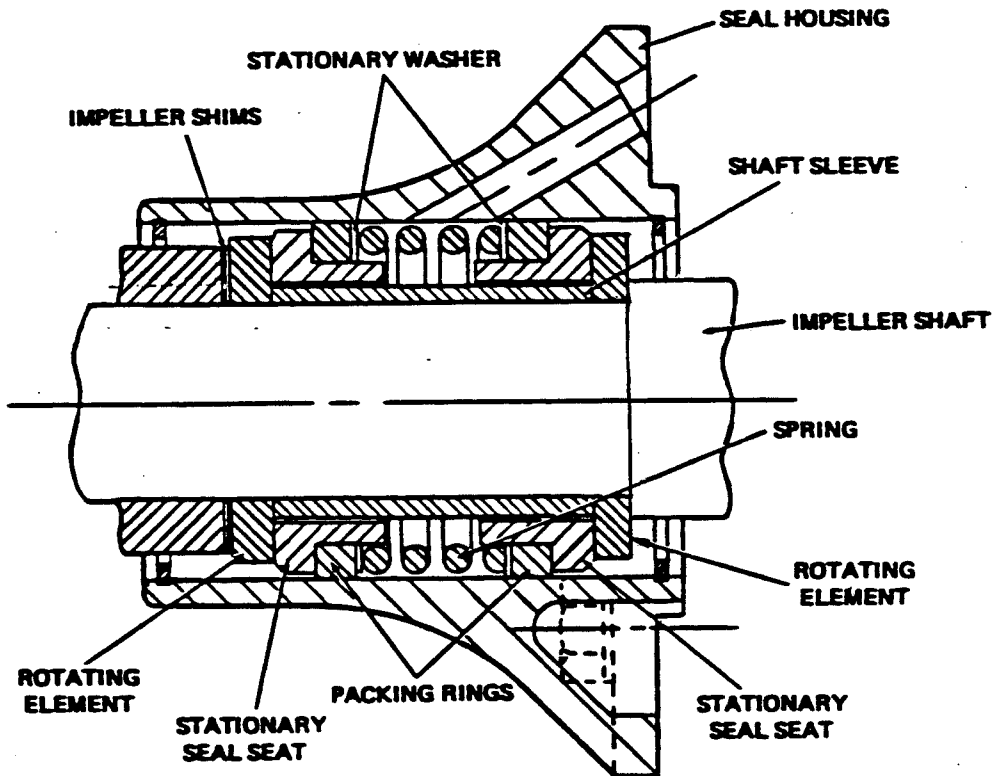


Figure 2. GS01250 Seal Assembly

#### CAUTION

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

Remove the jacking screws from the seal housing.

Slide the inboard rotating element into the seal housing with the chamfered side toward the lock spring.

Subassemble the inboard stationary seat, packing ring and stationary washer. Press this subassembly into the lubricated seal housing. A push tube cut from a length of plastic pipe would aid this installation. The O.D. of the pipe should be approximately the same diameter as the O.D. of the seal spring.

Position the spacer sleeve in the I.D. of the inboard stationary element and install the seal spring.

Subassemble the outboard stationary seat, packing ring and stationary washer. Press this subassembly into the lubricated seal housing.

Install the outboard rotating element with the chamfered side toward the inside of the seal housing. Carefully compress the seal assembly and install the outer lock spring.

Position the seal housing gasket on the seal housing, making sure the slotted hole in the gasket aligns with the grease passage in the housing. Slide the assembled seal housing, seal and gasket onto the shaft. **Be careful** not to damage the rotating elements on the shaft threads.

Align the grease passages in the seal housing and intermediate, and tighten the capscrews (30) evenly (to prevent binding) until the seal housing is fully seated in the intermediate.

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

### Impeller And Wear Ring Installation

If the wear ring (5) was removed, remove the jacking screws from the wear ring, align the mounting holes, and secure it to the pump casing with the hardware (32 and 33).

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

Slide the same number of impeller adjusting shims (18) as previously removed onto the shaft. Install the impeller key (45) and press the impeller onto the shaft until fully seated.

For maximum pump efficiency, the impeller should be centered within the volute scroll of the pump casing. Center the impeller by adding or removing adjusting shims.

To verify the impeller positioning, measure the pump casing and impeller as shown in Figure 3. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims until dimension E is obtained.

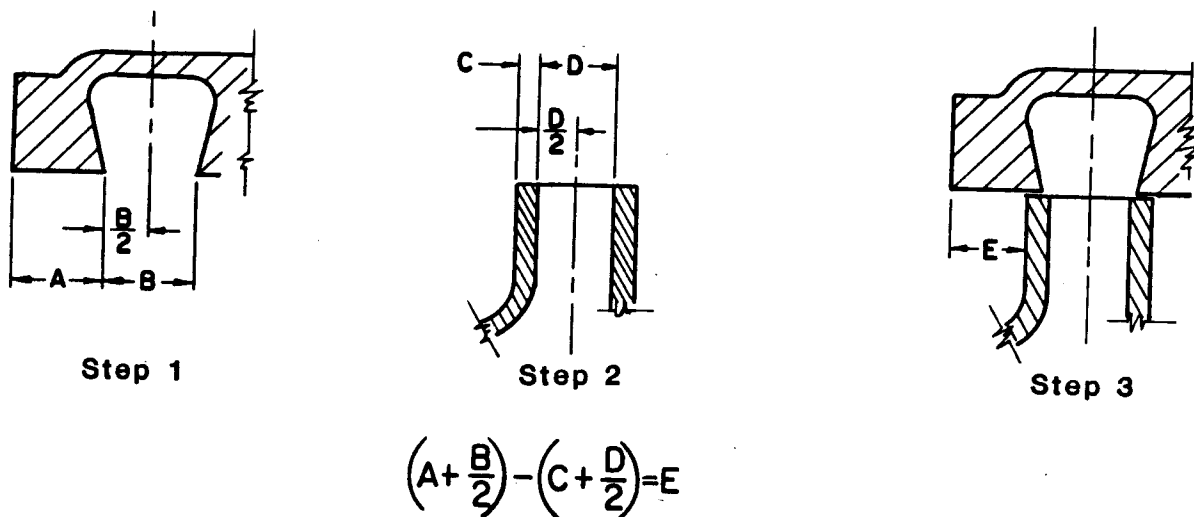


Figure 3. Centering Impeller Within Volute Scroll

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**NOTE**

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

Replace the cap nut O-ring (42), and screw the cap nut (44) onto the shaft until tight. Secure the cap nut with the fillister head screw and lockwasher (46 and 47).

**Cover Plate Installation**

If removed for replacement, press the outboard wear ring (39) into the cover plate until fully seated.

**CAUTION**

When replacing the wear ring, the wear ring **MUST** seat squarely in the suction head. Otherwise, binding and/or excessive wear will occur as the shaft turns.

Clean any scale or debris that might prevent a good seal from the cover plate shoulder and pump casing.

**NOTE**

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

Replace the cover plate gasket (35), and secure the cover plate (38) to the pump casing with the nuts (37). Make sure the jacking screws (43) do not interfere with the cover plate seating.

**Final Pump Reassembly**

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

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

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

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

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## LUBRICATION

### Seal Assembly

Fill the grease cup through the grease fitting with No. 2 lithium base grease until it 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 4).

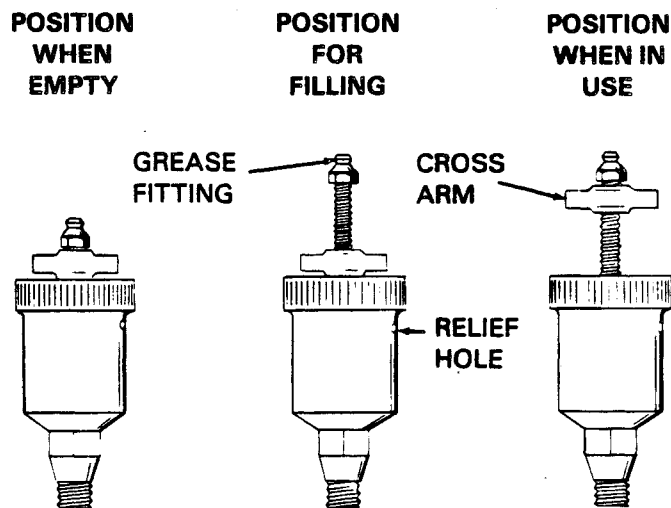


Figure 4. Automatic Lubricating Grease Cup

### Bearings

The intermediate was fully lubricated when shipped from the factory. Under normal conditions, add three shots of No. 0 lithium base grease from a grease gun through the grease fitting (8) after each 250 hours of operation or once each month, whichever comes first. **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

#### CAUTION

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

There are no provisions in the bearing cavity to drain or flush the lubricant. The pump and intermediate must be disassembled to completely clean and maintain this cavity.

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Under normal conditions, change the grease after each 5000 hours of operation, or at 12 month intervals, whichever comes first. Change the grease more frequently if the pump is operated continuously or installed in an environment where variable hot and cold temperatures are common.

When lubricating a dry (overhauled) intermediate, fill the cavity through the lubrication fitting with approximately one-quarter of a pound of grease (approximately one-third full).

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

### Engine

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





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International: +1-419-755-1352**

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or call:  
519-631-2870**