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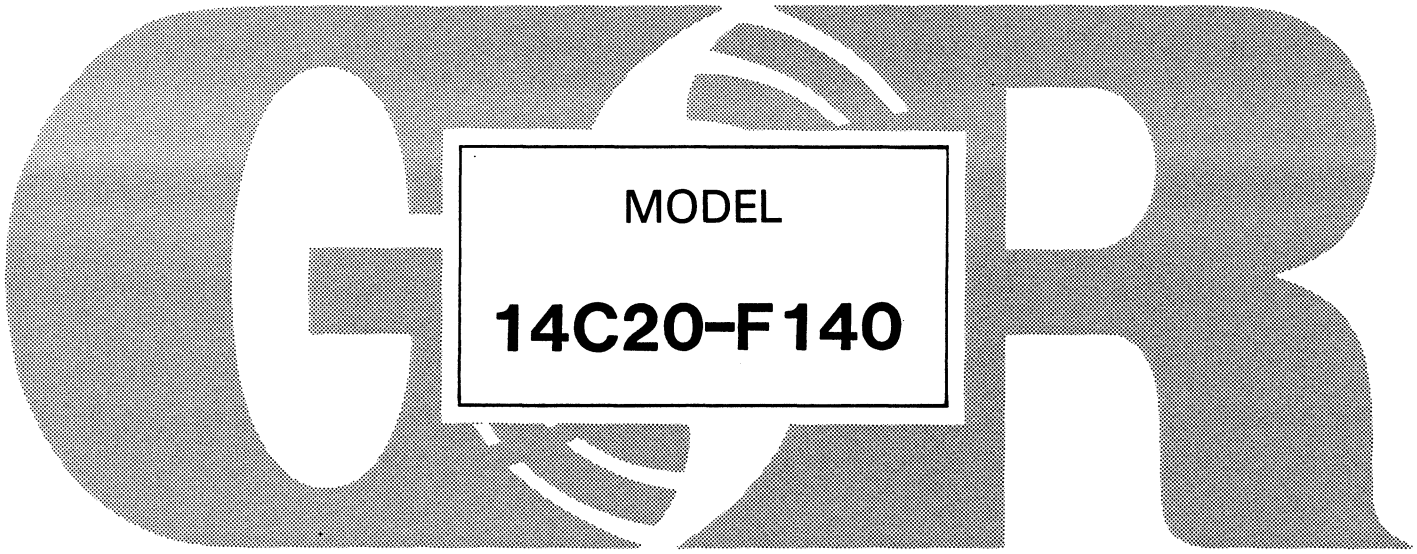
LO SERIES™

INSTALLATION, OPERATION, PARTS LIST, AND MAINTENANCE MANUAL



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INTRODUCTION

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

This pump is a 10 Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is designed for handling most non-volatile, non-flammable liquids containing specified entrained solids. The basic material of construction for wetted parts is gray iron, with ductile iron impeller and steel wearing parts. The pump is powered by a four cylinder, four cycle, Ford gasoline engine, model LSGP-423.

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

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901-1217

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 injury or death to personnel, and describe the procedure required and the injury which could result from failure to follow the procedure.

WARNINGS - SECTION A

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

WARNING

Before attempting to open or service the pump:

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

WARNING

This pump is designed to handle most liquids containing specified entrained solids. Do not attempt to pump volatile, flammable, or corrosive liquids which may damage the pump or endanger personnel as a result of pump failure.

WARNING

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

WARNING

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

WARNING

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

WARNING

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

WARNING

Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.

WARNING

Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank. Always use the correct type of fuel.

WARNING

Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed is 2400 RPM.

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.

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

Pump Dimensions

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

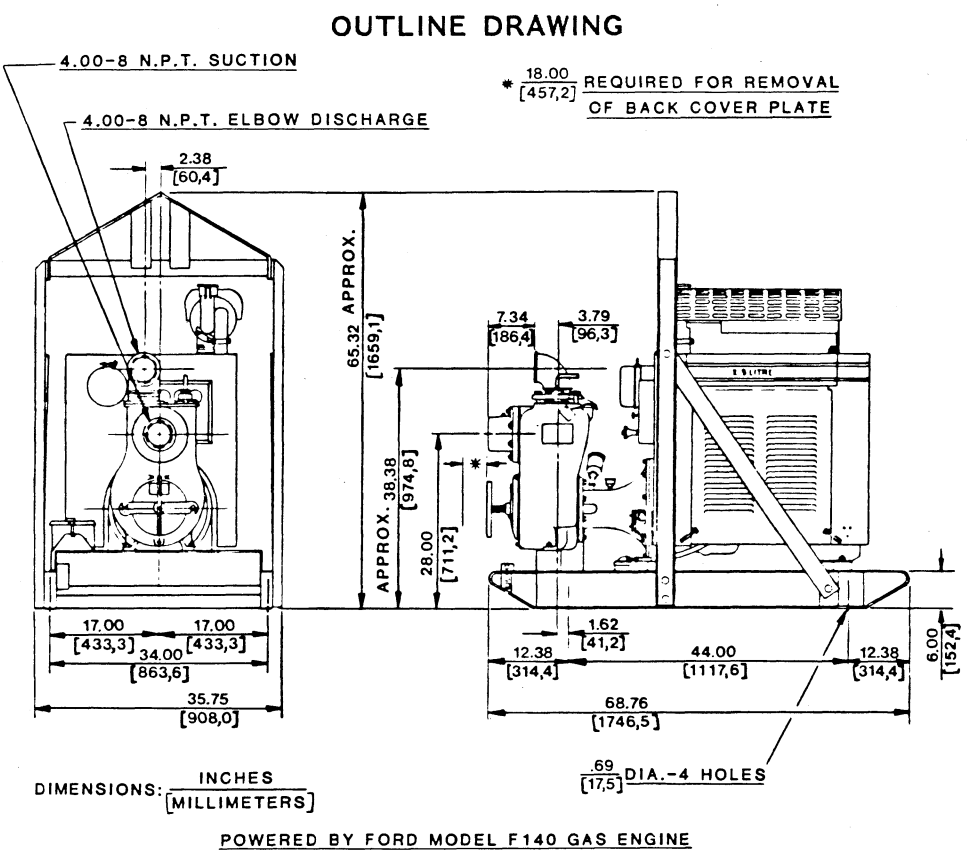


Figure 1. Pump Model 14C20-F140

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 shipment. Check as follows:

a. Inspect the pump and engine for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and 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.

POSITIONING PUMP

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

Lifting

Use lifting equipment with a capacity of at least **7,000 pounds**. This pump weighs approximately **1,400 pounds**, not including the weight of accessories and wheel kit. Customer installed equipment such as suction and discharge hoses **must** be removed before attempting to lift.

CAUTION

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

Mounting

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

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

Clearance

When positioning the pump, allow a clearance of at least **18 inches** in front of the back cover assembly to permit removal of the back cover, and of the rotating assembly, which must be removed through the back of the pump.

SUCTION AND DISCHARGE PIPING

Materials

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

Line Configuration

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

Connections to Pump

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

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

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the 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 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-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 2 shows recommended minimum submergence vs. velocity.

NOTE

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

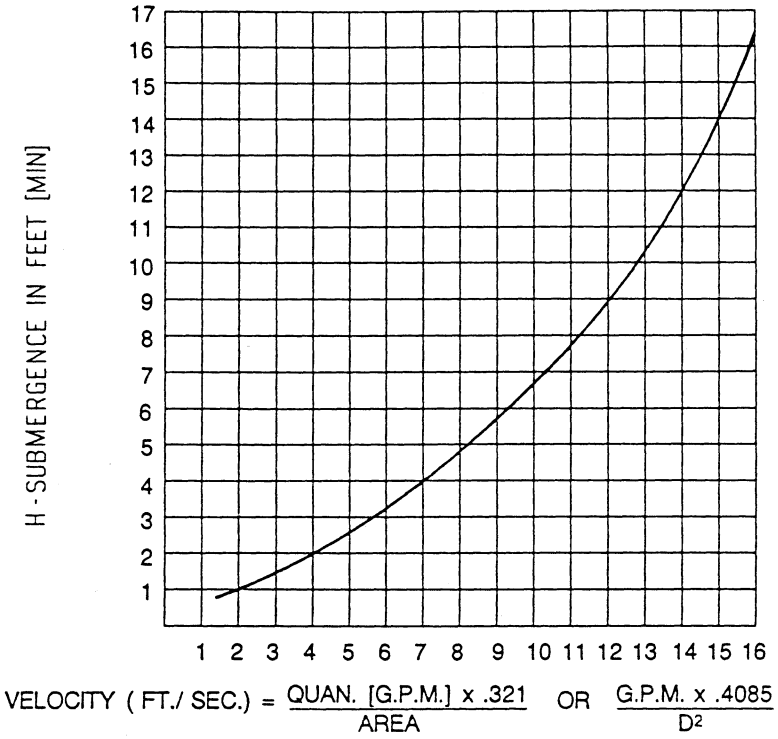


Figure 2. Recommended Minimum Suction Line Submergence Vs. Velocity

DISCHARGE LINES

Siphoning

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

Valves

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

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

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

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.

ALIGNMENT

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

OPERATION - SECTION C

WARNING

This pump is designed to handle most liquids containing specified entrained solids. Do not attempt to pump volatile, flammable, or corrosive liquids 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 2400 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**).

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

CAUTION

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

Add liquid to the pump casing when:

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

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

WARNING

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

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

NOTE

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

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.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160°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 servicing.

Strainer Check

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

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

Pump Vacuum Check

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

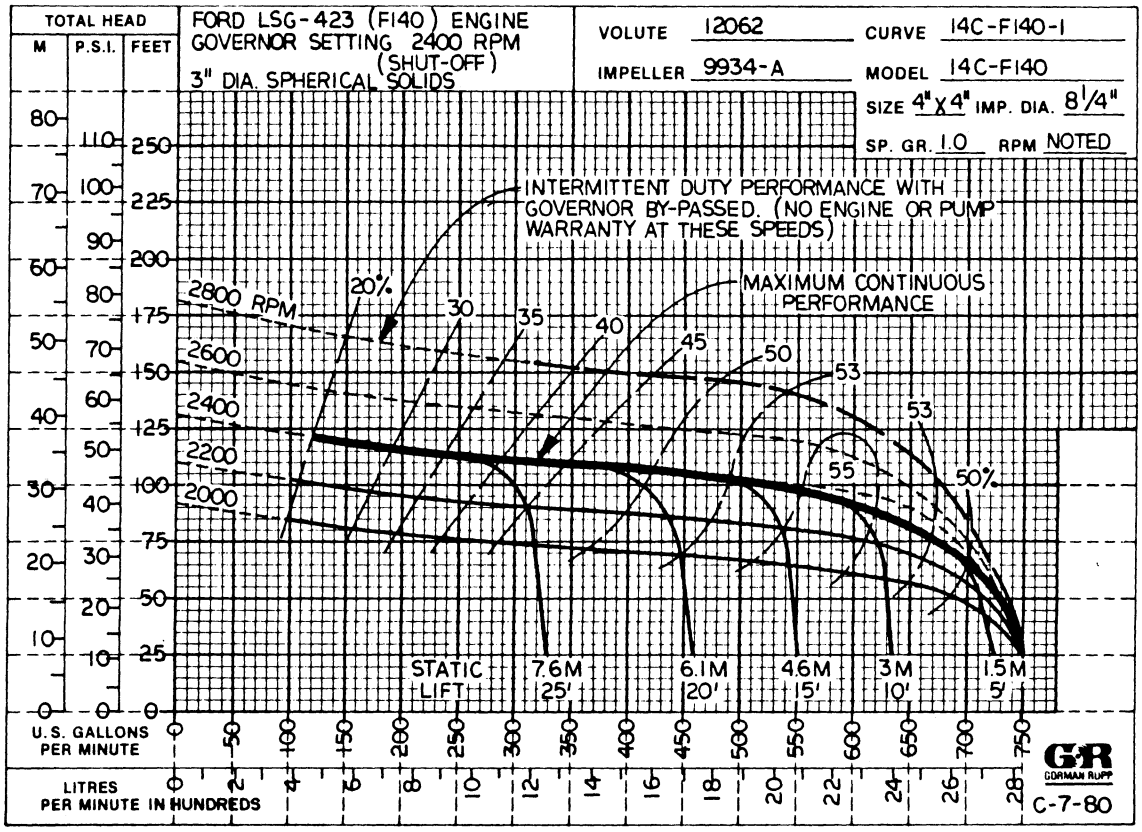
TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See PRIMING.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See INSTALLATION.
	Strainer clogged.	Check strainer and clean if necessary.
	Suction check valve or foot valve clogged or binding.	Clean valve.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE(cont.)	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.
	Impeller clogged.	Free impeller of debris.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See INSTALLATION.
	Strainer clogged.	Check strainer and clean if necessary.
	Pump speed too slow.	Check engine output; consult engine operation manual.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check engine output.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
	Bearing(s) frozen.	Disassemble pump and check bearing(s).
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Liquid solution too thick.	Dilute if possible.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

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 14C20-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", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

CAUTION

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

SECTIONAL DRAWING

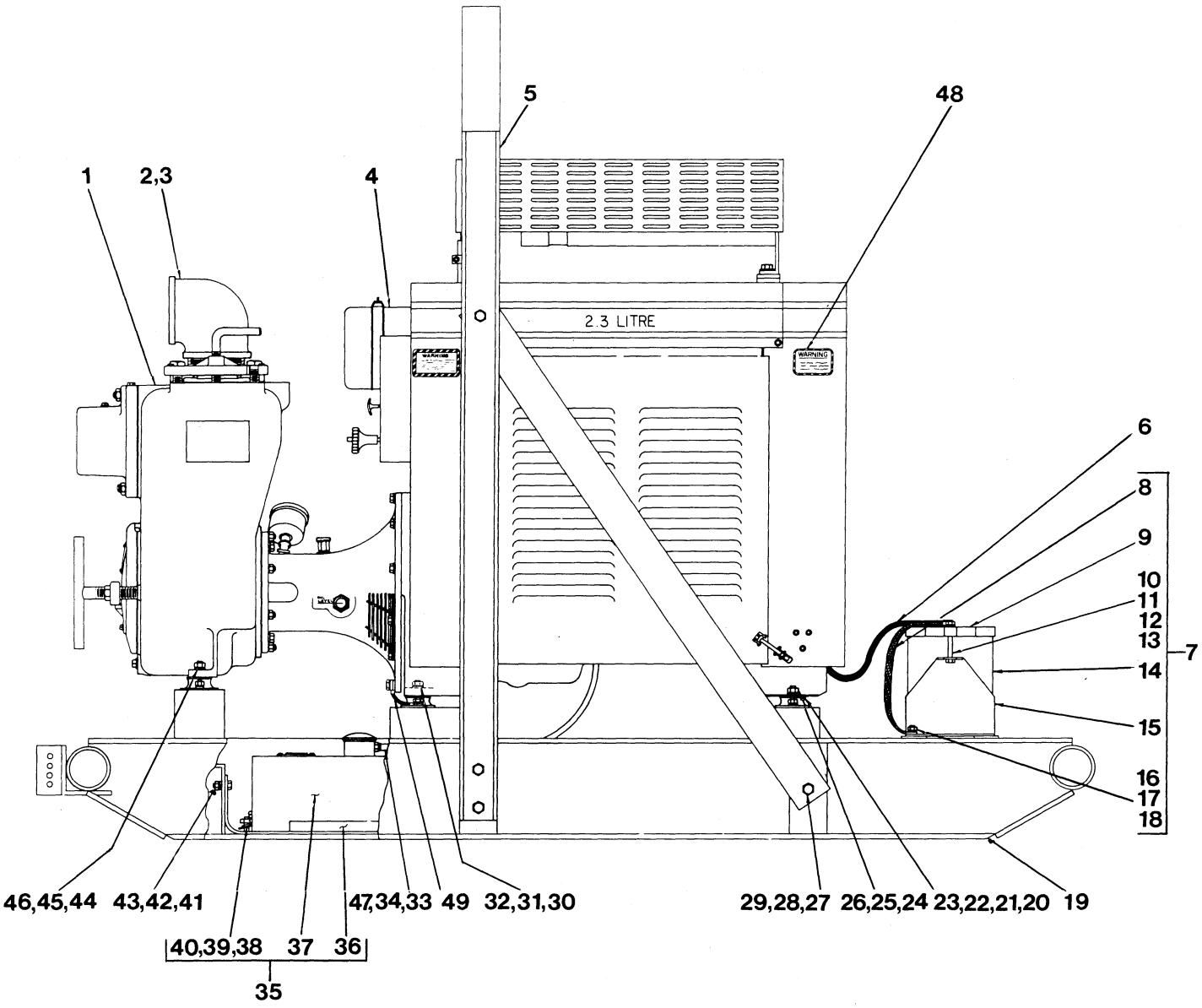


Figure 1. Model 14C20-F140 Pump Assembly

PARTS LIST
Pump Model 14C20-F140
(From S/N **936269** 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
1	PUMP END	14C20-(F140)	-----	1
2	PIPE NIPPLE	T64	15070	REF
3	PIPE ELBOW	R64	11990	REF
4	FORD LSGP-423 ENG	29118-022	-----	1
5	HOIST BAIL	13351-BA	24000	1
6	POS CABLE ASSY	6926-Q	24040	1
7	BATTERY BOX ASSY	GRP40-02	-----	1
8	-GRND CABLE ASSY	5795-AC	24040	1
9	-BATTERY FRAME	8355-B	24000	1
10	-HEX HD CAPSCREW	B0610	15991	2
11	-FLAT WASHER	K06	15991	2
12	-LOCKWASHER	J06	15991	2
13	-HEX NUT	D06	15991	2
14 *	-12V BATTERY	S1338	-----	1
15	-BATTERY BOX	8356-B	24000	1
16	-HEX HD CAPSCREW	B0604	15991	2
17	-LOCKWASHER	J06	15991	2
18	-HEX NUT	D06	15991	2
19	COMBINATION BASE	41566-645	24150	1
20	MOUNTING ISOLATOR	24631-601	-----	6
21	HEX HD CAPSCREW	B0604	15991	12
22	LOCKWASHER	J06	15991	12
23	HEX NUT	D06	15991	12
24	HEX HD CAPSCREW	B0812	15991	2
25	LOCKWASHER	J08	15991	2
26	HEX NUT	D08	15991	2
27	HEX HD CAPSCREW	B1006	15991	8
28	LOCKWASHER	J10	15991	8
29	HEX NUT	D10	15991	8
30	HEX HD CAPSCREW	B0812	15991	2
31	LOCKWASHER	J08	15991	2
32	HEX NUT	D08	15991	2
33	MALE CONNECTOR	S1344	-----	1
34	HOSE ASSY	12618-F	-----	1
35	FUEL TANK AND GUARD ASSEMBLY	46711-041	-----	1
36	-TANK GUARD	42381-046	24150	1
37	-FUEL TANK	46711-042	24150	1
38	-FLAT WASHER	K06	15991	6
39	-LOCKWASHER	J06	15991	6
40	-HEX NUT	D06	15991	6
41	HEX HD CAPSCREW	B0604	15991	10
42	LOCKWASHER	J06	15991	10
43	HEX NUT	D06	15991	10
44	HEX HD CAPSCREW	B0813	15991	2
45	LOCKWASHER	J08	15991	2
46	HEX NUT	D08	15991	2
47	PIPE PLUG	P08	11990	1
48	WARNING DECAL	38816-132	-----	2
49	GRND CABLE ASSY	5795-AS	24040	1

*INDICATES PARTS RECOMMENDED FOR STOCK

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

CANADIAN SERIAL NO ..... AND UP

SECTIONAL DRAWING

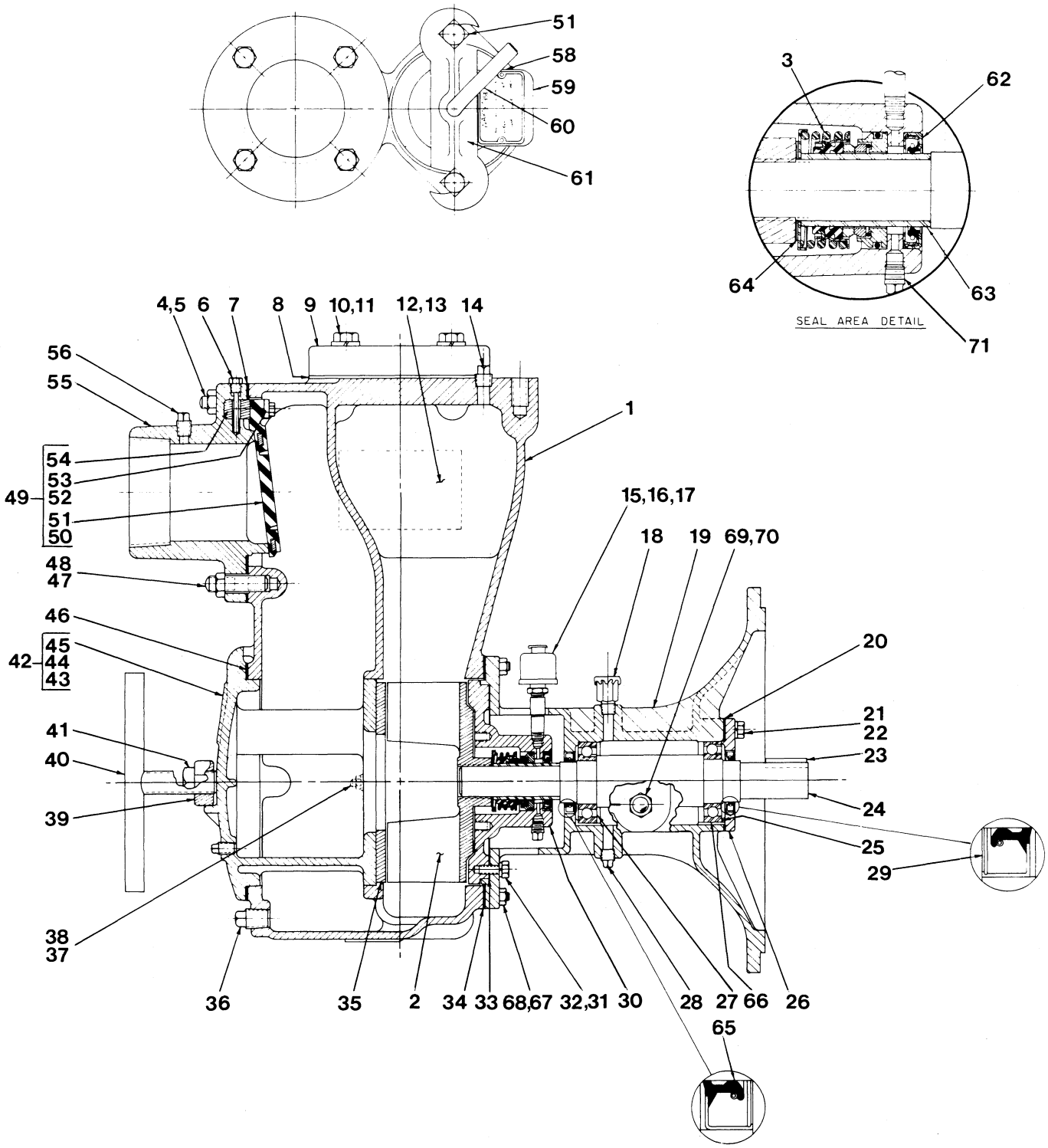


Figure 2. Pump End Assy 14C20-(F140)

PARTS LIST
Pump End Assy 14C20-(F140)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP CASING	12062	10010	1
2	*IMPELLER	9934-A	11060	1
3	*SEAL ASSY	12364-D	-----	1
4	STUD	C1011	15991	2
5	HEX NUT	D10	15991	2
6	CHECK VLV PIN	11557	17010	1
7	*SUCT FLANGE GSKT	11389-G	19370	1
8	*DISCH FLANGE GSKT	1674-G	18000	1
9	DISCH FLANGE	271	10010	1
10	HEX HD CAPSCREW	B1008	15991	4
11	LOCKWASHER	J10	15991	4
12	NAME PLATE	38818-023	13990	1
13	DRIVE SCREW	BM#04-03	15990	4
14	PIPE PLUG	P04	11990	1
15	PIPE NIPPLE	T0206	15070	1
16	PIPE ELBOW	AE02	11990	1
17	BOTTLE OILER	S1933	-----	1
18	AIR VENT	S1703	-----	1
19	INTERMEDIATE	38263-617	10010	1
20	*BRG CAP GSKT	6404-G	18000	2
21	HEX HD CAPSCREW	B0604	15991	4
22	LOCKWASHER	J06	15991	4
23	*IMPELLER SHAFT KEY	N0607	15990	1
24	*IMP SHAFT	38514-809	15010	1
25	*BRG ADJ SHIM SET	48261-037	-----	1
26	BEARING CAP	38324-408	10010	1
27	*INBOARD BEARING	23251-209	-----	1
28	INTERM DRAIN PLUG	P06	11990	1
29	*OIL SEAL	25258-575	-----	1
30	SEAL PLATE	38272-223	-----	1
31	HEX HD CAPSCREW	B0604	15991	4
32	LOCKWASHER	J06	15991	4
33	*SEAL PLATE GSKT	6568	18000	1
34	*CASING GSKT SET	2474-G	18000	1
35	*WEAR PLATE ASSY	12068	15990	1
36	CASING DRAIN PLUG	P08	11990	1
37	LOCKWASHER	J06	15991	2
38	HEX NUT	D06	15991	2
39	COVER PLATE CLAMP	12064	11000	1
40	COVER PLATE SCREW	2536	24000	1
41	MACHINE BOLT	A1012	15991	2
42	*BACK COVER PLATE ASSY	42111-929	-----	1
43	-WARNING PLATE	2613-EV	13990	1
	-DRIVE SCREW	BM#04-03	15990	4
44	* -BACK CVR PLATE	NOT AVAILABLE		1
45	-PIPE PLUG	P04	11990	1
46	*BACK COVER GSKT	2527-G	19090	1
47	STUD	C1010	15991	6
48	HEX NUT	D10	15991	6
49	*4" CHECK VLV ASSY	46411-062	-----	1
50	-CHECK VALVE	NOT AVAILABLE		1
51	-SLEEVE	NOT AVAILABLE		1
52	-BACKUP PLATE	NOT AVAILABLE		1
53	-NYLOCK CAPSCREW	NOT AVAILABLE		1
54	-ADAPTOR	NOT AVAILABLE		1
55	SUCTION FLNG	12065	10010	1
56	PIPE PLUG	P04	11990	1
57	MACHINE BOLT	A1014	15991	2
58	*FILL COVER GSKT	50-G	19210	1
59	*FILL COVER ASSY PLATE ASSY	42111-344	-----	1
60	CLAMP BAR SCREW	31912-009	15000	1
61	CLAMP BAR	38111-004	11000	1
62	*OIL SEAL	S0506	-----	1
63	*SHAFT SLEEVE	5128	17030	1
64	*IMP ADJ SHIM SET	37-J	17090	REF
65	*OIL SEAL	25258-575	-----	1
66	*OUTBOARD BEARING	23251-209	-----	1
67	STUD	C0606	15991	8
68	HEX NUT	D06	15991	8
69	PIPE PLUG	P12	11990	1
70	SIGHT GAUGE	S1471	-----	1
71	SEAL DRAIN PLUG	P02	11990	1
NOT SHOWN:				
	DISCH ELBOW	R64	11990	1
	WARNING DECAL	38816-096	-----	1
	STRAINER	2690-C	24000	1
	DISCH NIPPLE	T64	15070	1
	INTERM GUARD	42381-038	24150	2
	SUCTION STICKER	6588-AG	-----	1
	DISCH STICKER	6588-BJ	-----	1

*INDICATES PARTS RECOMMENDED FOR STOCK

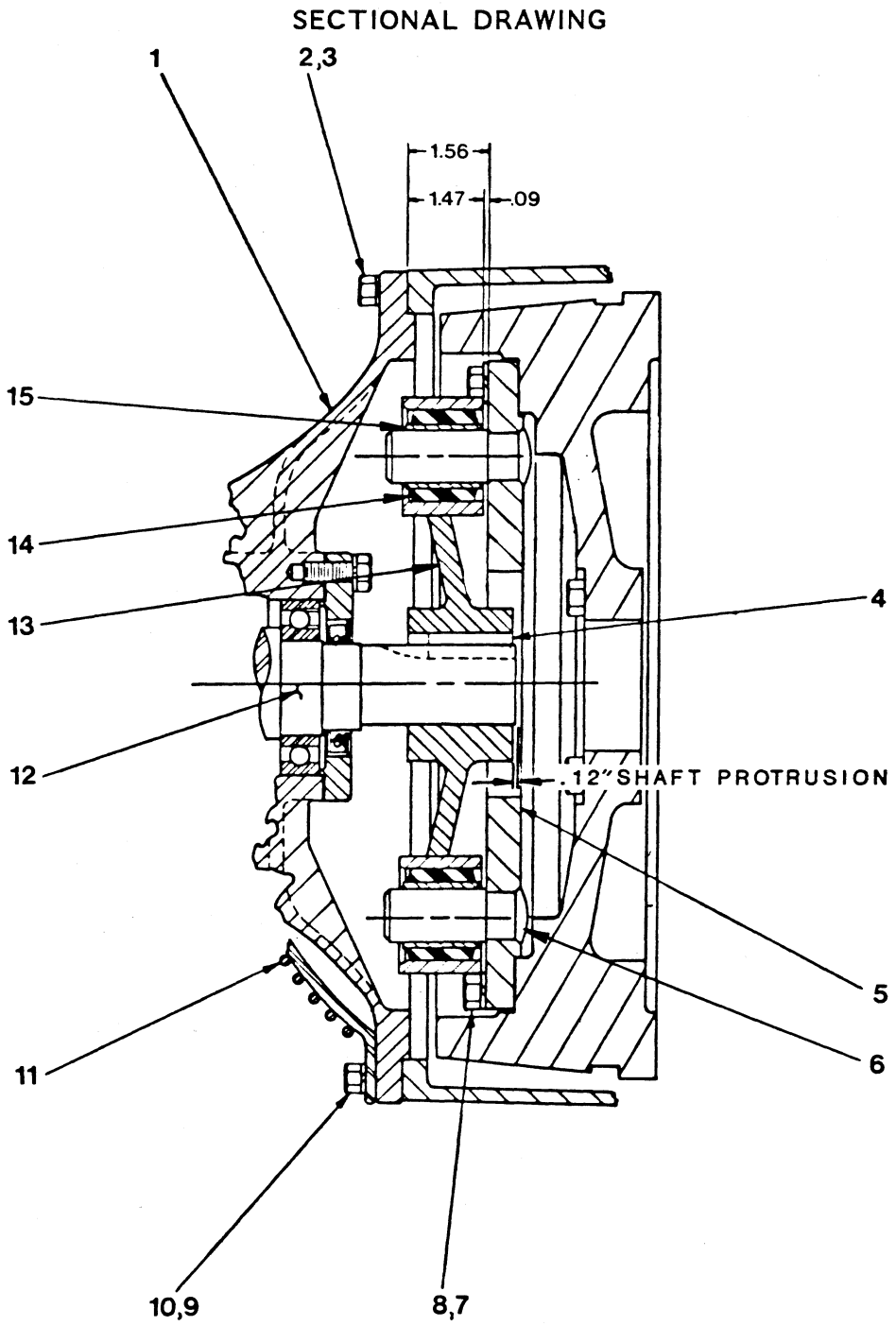


Figure 3. Drive Assembly For Pump Model 14C20-F140

PARTS LIST
Drive Assembly For Pump Model 14C20-F140

ITEM NO.		PART NAME	PART NUMBER	MATL CODE	QTY
1		INTERMEDIATE	38263-617	10010	1
2		DRIVE ARM ASSEMBLY	13817-C	-----	1
3		-DYNA FLEX JOINT	S2110	-----	2
4		-SLEEVE	NOT AVAILABLE	-----	2
5		IMPELLER SHAFT	38514-809	15010	REF
6		DRIVE PLATE ASSY	44131-007	24150	1
7		-DRIVE PIN	13819	15030	2
8		HEX HD CAPSCREW	B0606	15991	6
9		LOCKWASHER	J06	15991	6
10		HEX HD CAPSCREW	B0605	15991	12
11		LOCKWASHER	J06	15991	12
12		INTERMEDIATE GUARD	42381-038	24150	2
13	*	IMPELLER SHAFT KEY	N0607	15990	REF

*INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

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

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

Before attempting to service the pump, take precautions to ensure that the engine will remain inoperative, and close all valves in the suction and discharge lines.

For service information on the engine, consult the literature provided with the engine, or consult your local Ford engine 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. The bail is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping MUST be removed from the pump when lifting the pump by the bail.

Back Cover Removal

(Figure 2)

The impeller, wear plate, and check valve assembly are easily accessible and can be serviced after the back cover assembly (42) has been removed.

Before removing the back cover, remove the casing drain plug (36) and drain the pump. Clean and reinstall the drain plug.

Loosen the cover clamp screw (40) and clamp bar (39) securing the back cover. Pull the back cover and assembled wear plate (35) from the pump casing (1). Remove the back cover gasket (46).

Inspect the wear plate for excessive wear or scoring. If replacement is required, disengage the hardware (37 and 38) securing it to the back cover.

Suction Check Valve Removal

(Figure 2)

After the back cover assembly has been removed, reach through the opening and hold the check valve assembly (49) in place while removing the check valve pin (6). Slide the assembly out of the suction flange and remove it.

NOTE

If the check valve assembly or any components require replacement, the complete assembly must be replaced. Individual parts are not sold separately.

An alternate method of removing the check valve assembly is to disengage the nuts (5 and 48), and remove the suction flange (55) and check valve assembly. Remove the check valve pin and separate the check valve assembly.

Replace the flange gasket (7) as required before reassembly.

Impeller Removal

(Figure 2)

Before removing the impeller, remove the seal cavity drain plug (71) and drain the seal lubricant. Clean and reinstall the plug.

To loosen the impeller (2), tap the vanes in a counterclockwise direction (when facing impeller) with a block of wood or a soft-faced mallet. **Be careful** not to damage the impeller vanes. Unscrew the impeller and replace it if cracked or badly worn. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is unscrewed.

Slide the impeller adjusting shims (64) off the shaft. For ease of reassembly, tie and tag the shims, or measure and record their thickness.

Seal Removal

(Figure 2)

Carefully remove the spring holder and spring. Slide the shaft sleeve (63) and rotating portion of the seal off the shaft as a unit. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the sleeve.

Use a stiff wire with a hooked end to remove the stationary element and stationary seat with O-rings.

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

Pump Disassembly

(Figure 2)

To service the oil seal (62), seal plate, intermediate, bearings or drive assembly, the pump end must be removed from the base. See Figure 1, and remove the hardware (44, 45, and 46) securing the pump casing to the base.

Install a standard 5/8-11 UNC lifting eye in the tapped hole in the top of the pump casing. **Be sure** to screw the eye into the casing until fully engaged.

Remove the nuts (68), and use a hoist and sling of suitable capacity to separate the assemblies by pulling the casing straight away.

WARNING

Do not attempt to lift the complete pump unit using the lifting eye. It is designed to facilitate removal or installation of individual components only. Additional weight may result in damage to the pump or failure of the eye bolt.

Remove the casing gaskets (34). Remove any shims used under the mounting feet to level the pump casing. Tie and tag the shims for ease of reassembly.

Remove the bottle oiler and piping (15, 16 and 17), and slide the seal plate (48) off the shaft. Press the oil seal (62) from the seal plate.

Separating Intermediate And Drive Assembly From Engine

(Figure 3)

If necessary to separate the intermediate (1) and drive assembly from the engine, support the intermediate using a hoist and sling, and remove the hardware (2, 3, 9 and 10) 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 drive pins will disengage from the drive arm assembly (13). The drive arm assembly and the impeller shaft key (4) are a tight press fit on the shaft (12), and will remain on the shaft. Use a suitable puller to remove the drive arm assembly from the impeller shaft. Remove the shaft key.

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

It is not necessary to remove the drive plate assembly (5) from the engine flywheel unless the drive pins are bent or worn and must be replaced. To remove the drive plate assembly, remove the hardware (7 and 8) securing the assembly to the engine flywheel.

The drive pins are secured into the drive plate by a tight press fit and peening. To remove the pins, drill through from the peened end and drive the pins out using a drift pin.

Shaft And Bearing Removal And Disassembly

(Figure 2)

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

CAUTION

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

Drain the bearing lubricant by removing the intermediate drain plug (28). Clean and reinstall the drain plug.

Disengage the hardware (21 and 22), and remove the bearing cap (26), gasket (20), outboard oil seal (29), and bearing adjusting shims (25). Press the oil seal out of the bearing cap.

Place a block of wood against the impeller end of the shaft (24), and tap the shaft and assembled bearings out of the intermediate. Press the inboard oil seal (65) from the intermediate.

Use a bearing puller to remove the inboard and outboard bearings (27 and 66) from the impeller shaft.

Shaft and Bearing Reassembly And Installation

(Figure 2)

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

WARNING

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

Inspect the shaft for distortion, nicks or scratches or damaged threads on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

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

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

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.

Position the inboard bearings on the shaft and, using an arbor press, press the bearings onto the shaft until they seat squarely against the shaft shoulders.

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.

Press the inboard oil seal (65) into the intermediate with the lip positioned as shown in Figure 2.

Slide the shaft and assembled bearings into the intermediate bore until the inboard bearing (27) bottoms against the bore shoulder. **Be careful** not to cut the lip of the oil seal (65) 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.

Press the outboard oil seal (29) into the bearing cap (26) with the lip positioned as shown in Figure 2.

Install the same thickness of bearing adjusting shims (25) as previously removed, and secure the bearing cap and gasket (20) to the intermediate with the hardware (21 and 22). **Be careful** not to damage the lip of the oil seal (29) on the shaft keyway.

NOTE

> Shaft endplay should be between .003 and .005 inch. Add or remove bearing adjusting shims (25) to obtain the correct endplay.

Lubricate the bearings as indicated in **LUBRICATION** at the end of Section E.

Securing Intermediate And Drive Assembly To Engine

(Figure 3)

If the drive pins were removed from the drive plate assembly, install new pins by pressing them into the drive plate and peening the ends. Secure the drive plate assembly to the engine flywheel with the hardware (7 and 8).

If the dyna-flex joints were removed from the drive arm assembly (13), lubricate the replacement joints with rubber lubricant, and press them into the drive arm until approximately 1/16 inch protrudes from the pump side of the drive arm.

Install the impeller shaft key (4), and press the drive arm assembly onto the shaft.

CAUTION

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

The end of the shaft must extend completely through the drive arm and protrude an additional 1/8 of an inch. This will allow a clearance of 0.09 inch between the drive arm assembly and the drive plate after the intermediate is installed on the engine bellhousing.

Align the drive arm assembly so that the drive pins will engage the dyna flex joints, and secure the intermediate and guards to the engine bellhousing with the hardware (2, 3, 9 and 10).

Seal Installation

(Figures 2 and 4)

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING

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

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

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

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the shaft 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 O-rings and shaft sleeve with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 4).

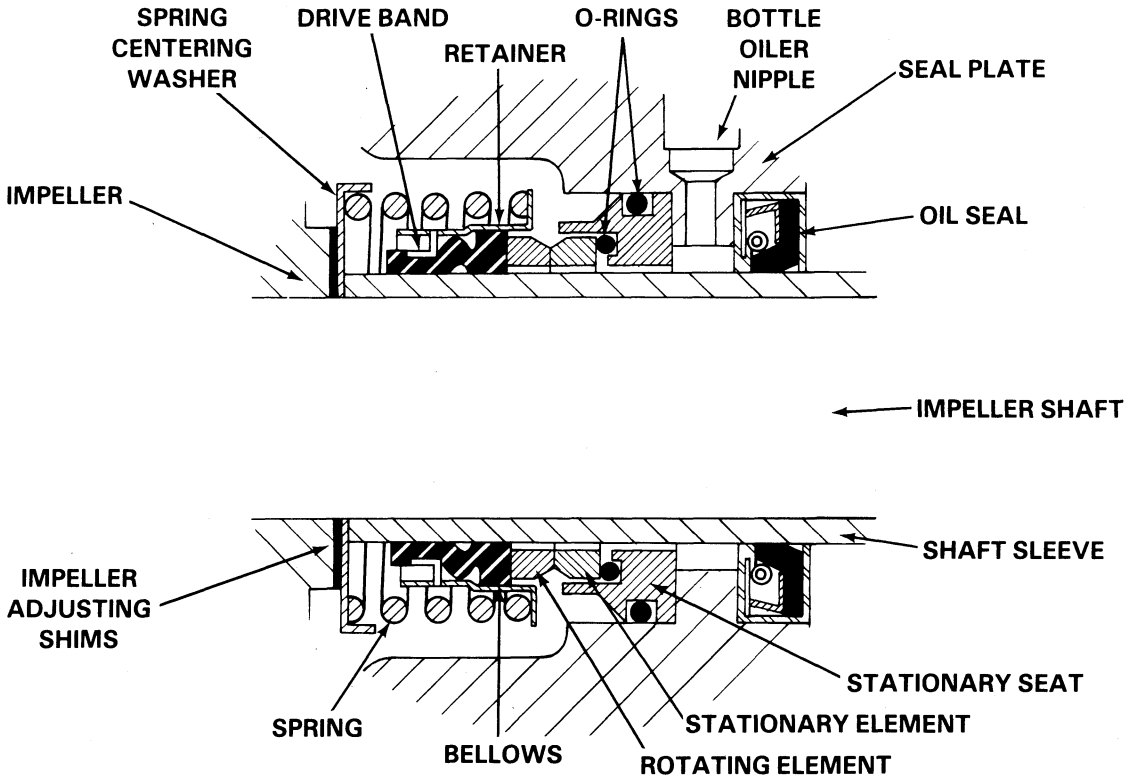


Figure 4. 12364-D Seal Assembly

CAUTION

> This seal is not designed for operation at temperatures above 160°F. Do not use at higher operating temperatures.

Apply a light coat of oil to the oil seal (62), and press the seal into the seal plate with the lip positioned as shown in Figure 2. Slide the seal plate over the shaft until fully seated against the intermediate. **Be careful** not to damage the oil seal lip on the shaft threads.

Align the threaded seal lubricant hole with the intermediate opening, and temporarily secure the seal plate using two capscrews and nuts (1/2 UNC X 1 1/2 inch long, not supplied).

Press the stationary subassembly (consisting of the stationary seat, O-rings and stationary element) into the seal plate until the stationary seat bottoms against the seal plate bore. A push tube cut from a length of plastic pipe would

aid this installation. The I.D. of the tube should be approximately the same as the I.D. of the seal spring.

Slide the rotating subassembly (consisting of the rotating element, retainer and bellows) onto the shaft sleeve until the rotating element is **just flush** with the chamfered end of the sleeve. Slide the sleeve and rotating subassembly onto the shaft until the seal elements contact. Continue to push the sleeve through the seal until it bottoms against the shaft shoulder. Be careful not to damage the seal plate oil seal (46).

Install the seal spring and spring holder.

Reinstall the bottle oiler and piping (15, 16 and 17).

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

Pump Reassembly

(Figure 2)

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

Install the same thickness of impeller adjusting shims (64) as previously removed, and screw the impeller onto the shaft until tight. A clearance of .020 to .040 inch between the impeller and the seal plate is necessary for maximum pump efficiency. Measure this clearance, and add or remove impeller shims until it is reached.

NOTE

The seal plate must be tight against the intermediate when measuring this clearance.

Remove the two capscrews temporarily holding the seal plate and install the same thickness of casing gaskets (34) as previously removed. Secure the seal plate and pump casing to the intermediate with the nuts (68), but do not fully tighten the nuts at this time.

NOTE

If the pump has been completely disassembled, it is recommended that the back cover assembly be reinstalled at this point. The back cover assembly must be in place to adjust the impeller face clearance.

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 obtained by adding or removing gaskets in the pump casing gasket set until the impeller binds against the wear plate when the shaft is turned. After the impeller binds, add approximately .015 inch of gaskets.

NOTE

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

When this clearance has been properly set, tighten the nuts (68), and secure the casing to the base with the hardware (44, 45 and 46, Figure 1). Be sure to reinstall any leveling shims used under the casing mounting feet.

If a lifting eye was used to move the pump casing, **be sure** to remove the eye from the casing before putting the pump back into service.

WARNING

Do not attempt to lift the complete pump unit using the lifting eye. It is designed to facilitate removal or installation of individual components only. Additional weight may result in damage to the pump or failure of the eye bolt.

Suction Check Valve Installation

(Figure 2)

Inspect the check valve assembly (49), and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

Reach through the back cover opening with the assembled check valve, and position the check valve in the mounting slot in the suction flange (55). Align the check valve with the flange hole, and secure the assembly with the check valve pin (6).

NOTE

If the suction flange (55) was removed, replace the gasket (7) and apply "Permatex Aviation No. 3 Form-A-Gasket" or equivalent compound to the mating surfaces.

Back Cover Installation

(Figure 2)

If the wear plate (35) was removed for replacement, carefully center it on the back cover and secure it with the hardware (37 and 38). The wear plate must be concentric to prevent binding when the back cover is installed.

Clean any scale or debris from the contacting surfaces in the pump casing that might prevent a good seal with the back cover. Replace the back cover gasket (46), and slide the back cover assembly into the pump casing. Be sure the wear plate does not bind against the pump casing.

NOTE

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

Secure the back cover assembly by installing the clamp bar (39) and tightening the cover clamp screw (40). **Do not** over tighten the clamp screw; it should be just tight enough to ensure a good seal at the back cover shoulder.

Final Pump Reassembly

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

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

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

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

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

LUBRICATION

Seal Assembly

(Figure 2)

Fill the bottle oiler (17) with SAE No. 30 non-detergent motor oil. Check the oil level regularly and keep the bottle oiler full.

Bearings

(Figure 2)

The intermediate was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge and maintain it at the mid point of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (18). **Do not** over lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the intermediate once each year and refill with clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

CAUTION

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

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

Engine

Refer to the literature accompanying the engine, or contact your local Ford engine representative for the manufacturer's recommendations.

WARRANTY

Pumping units manufactured by The Gorman-Rupp Company, Mansfield, Ohio are guaranteed to be free from defects in material and workmanship for one year from date of shipment from factory in Mansfield, Ohio. The obligation under this Warranty, statutory or otherwise, is limited to replacement or repair at Mansfield, Ohio factory or at a point designated by Gorman-Rupp, of such part as shall appear to us, upon inspection at such point, to have been defective in material or workmanship.

This Warranty does not obligate The Gorman-Rupp Company to bear the cost of labor or transportation charges in connection with replacement or repair of defective parts; nor shall it apply to a pump upon which repairs or alterations have been made unless authorized by Gorman-Rupp.

No warranty is made in respect to engines, motors, or trade accessories, such being subject to warranties of their respective manufacturers.

In Submersible Pumps, pump and motor are integral and Submersibles are warranted as a unit. Since motor is subject to an important degree upon quality and performance of electrical controls, unit warranty is valid only when controls have been specified and provided by Gorman-Rupp.

No express implied or statutory warranty, other than herein set forth is made or authorized to be made by Gorman-Rupp.

In no event shall The Gorman-Rupp Company be liable for consequential damages or contingent liabilities arising out of the failure of any Gorman-Rupp pump or parts thereof to operate properly.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio

NOTE: In Canada, all above references to "The Gorman-Rupp Company, Mansfield, Ohio" is understood to mean "Gorman-Rupp of Canada Limited, St. Thomas, Ontario."

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