

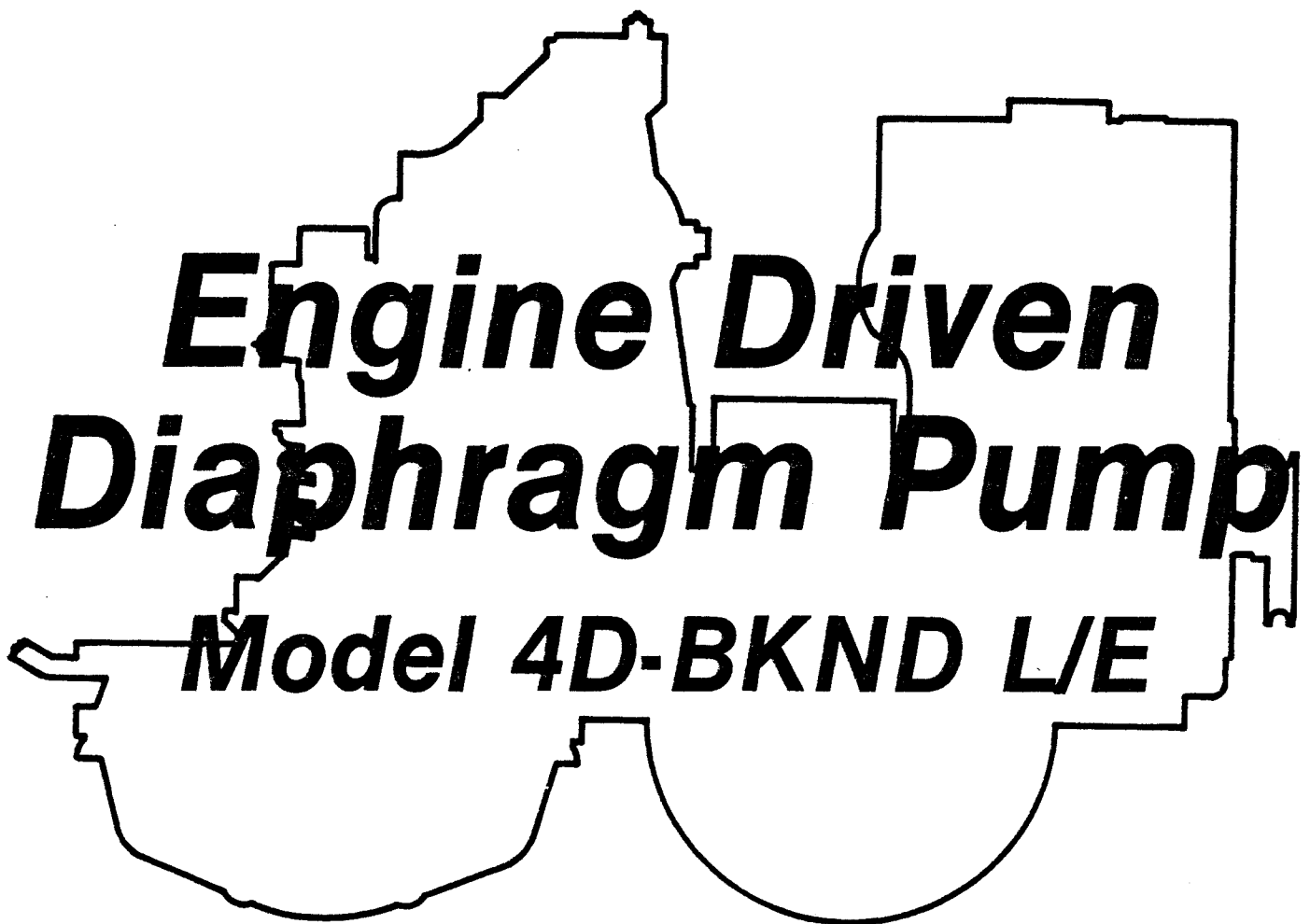
INSTALLATION, OPERATION, PARTS LIST,
AND MAINTENANCE MANUAL

A C D H



OM-01507-0E01

June 29, 1981

A large, stylized outline of an engine driven diaphragm pump, serving as a background for the title text. The outline shows the main body of the pump, including the diaphragm housing and the engine mounting area.

***Engine Driven
Diaphragm Pump
Model 4D-BKND L/E***

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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INTRODUCTION

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

If you have any questions regarding the pump which is not covered in this manual or in other literature furnished with the 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 44902		St. Thomas, Ontario N5P 3R7

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

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, or 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 describe the procedure required and the damage which could result from failure to follow the procedure.

WARNING

Instructions which must be followed to avoid causing injury or death to personnel. These describe the procedure required and the injury which could result from failure to follow the procedure.

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WARNINGS

THESE WARNINGS APPLY TO ENGINE DRIVEN DIAPHRAGM PUMPS.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the spark plug to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Close all connecting valves, and drain the pump.

This pump is designed to pump only non-flammable liquids. Do not attempt to pump volatile or corrosive liquids, or liquids which may attack pump fittings or components. Do not operate the pump in an explosive atmosphere.

Overheated pumps can cause severe burns and injury. If overheating of the pump casing occurs:

1. Stop the pump immediately.
2. Allow the pump to cool.
3. Refer to instructions in this manual before restarting the pump.

Do not attempt to disengage any parts of an overheated pump unit. Vapor pressure within the volute casing can eject these parts with great force when they are disengaged. Allow the pump to cool before servicing it.

Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.



When operating this pump, make certain that the discharge throttling valve is open. If this pump is operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump to rupture.

Do not operate the pump without the coupling guard assembly in place. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

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.

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.

The engine governor setting is critical for efficient pump operation. See the recommended governor setting in OPERATION.

INSTALLATION

Pump installations are seldom identical. This section summarizes recommended installation practice relative to inspection, pump positioning, and suction and discharge piping. For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Preinstallation Inspection

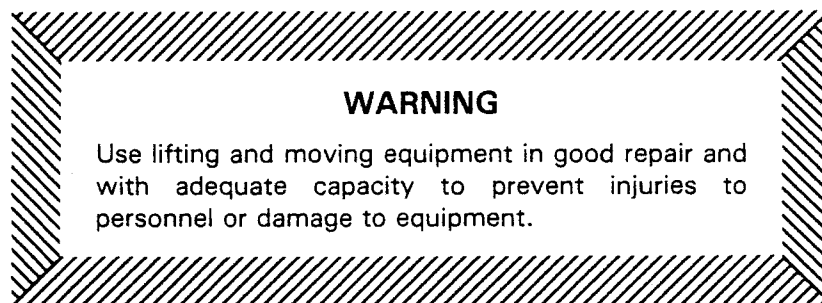
The pump assembly was inspected and tested before it was shipped from the factory. Before installation, check the pump for damage which may have occurred during shipment. Check as follows:

- a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware.
- 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 (see LUBRICATION in MAINTENANCE AND REPAIR).

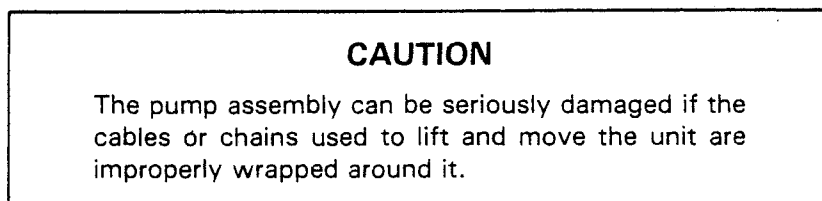
Positioning the Pump

Locate the pump as close as possible to the liquid to be pumped. Level mounting is essential for proper operation. Block the wheels to prevent creeping.

Lifting



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





Suction and Discharge Piping

CAUTION

If this pump is mounted in a system with rigid piping, a flexible joint should be installed at the suction and discharge flanges to minimize vibration.

Materials

Either pipe or hose may be used for suction and discharge lines, but hose used in suction lines must be the rigid-wall, reinforced type to prevent collapse under suction. Using pipe 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

Never pull a pipe line into place by tightening flanges or couplings. Connections must be aligned exactly with the pump port. Lines near the pump must be independently supported to avoid strain on the pump which could cause serious vibration, decreased bearing life, and increased shaft and seal wear. Hose-type lines should have supports strong enough to secure the line when it is filled with liquid and under pressure.

Gauges

If discharge pressure and vacuum suction gauges are desired, drill and tap the suction and discharge lines close to the pump before installing the lines.

SUCTION LINES

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

Fittings

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

Strainers

If a strainer is used with this pump, clean the strainer regularly during operation.

Sealing

All threaded connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift. After installation, inspect the suction line carefully for potential leaks.

DISCHARGE LINES

Throttling Valves

With high discharge heads, install a throttling valve in the discharge line to protect the pump from excessive shock pressure and reverse rotation when the pump is stopped. Use a valve as large as the largest pipe in the line to minimize friction losses. Never install a throttling valve in the suction line.

Check Valves

This pump is provided with integral suction and discharge check valves.

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 could result, causing damage to the pump.

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.

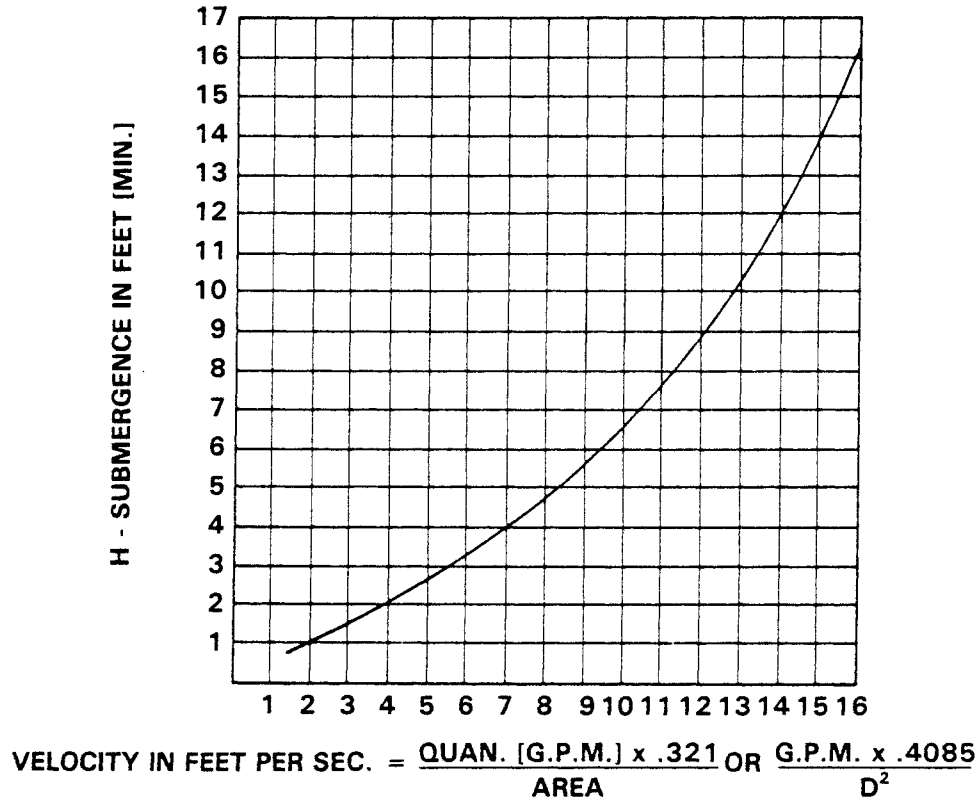
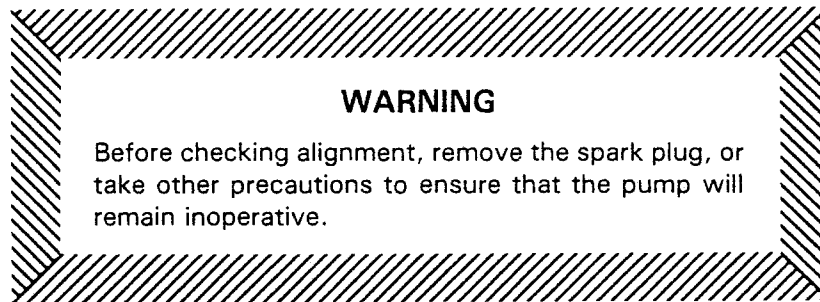


Figure 1. Recommended Minimum Suction Line Submergence Vs. Velocity

ALIGNMENT

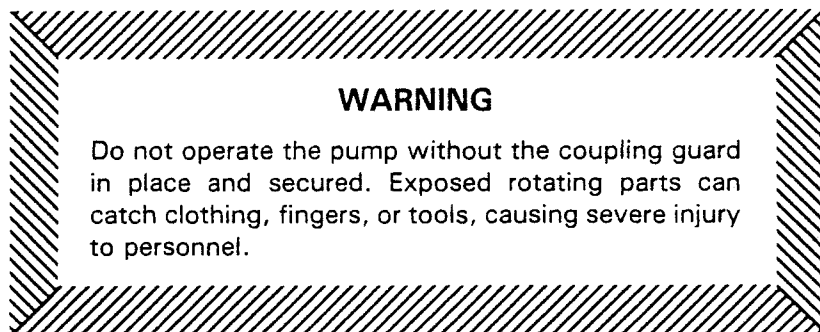
The pump and engine were aligned and secured at the factory, but fastening hardware may have been loosened during shipment. Check alignment before starting the pump.



This pump is furnished with a flexible coupling. To check coupling alignment, use a feeler gauge or taper gauge between the coupling halves every 90 degrees. The coupling is in alignment when the hubs are the same distance apart at all points.

To check parallel adjustment, lay a straightedge across both coupling halves at the top, bottom, and side. The coupling is in horizontal parallel adjustment when the straightedge rests evenly on both halves of the coupling. Use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

Alignment adjustments may be made by loosening the securing hardware, and shifting the pump and/or engine, or by shimming as required.



OPERATION

WARNING

Do not attempt to pump volatile or corrosive materials for which this pump has not been designed. Do not operate the pump in an explosive atmosphere.

The particular service in which this pump is used will affect pump performance, especially discharge velocities. Consult the Gorman-Rupp factory for actual performance levels of this pump.

Consult the manuals furnished with the pump engine unit before starting the pump.

CAUTION

Set the engine governor at 2385 RPM **maximum**. Operation at higher governor settings can cause pump components to deteriorate.

WARNING

Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.

Open all valves and start the engine. 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 the engine and check the suction line for leaks.

If the discharge line is fitted with a throttling valve, partially close the valve to guard against excessive shock pressure after the pump has been primed. When the discharge line is completely filled, adjust the throttling valve to the required discharge flow rate.

WARNING

When operating this pump, make certain that the discharge throttling valve is open. If this pump is operated against a closed discharge throttling valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump to rupture.

Check the pump for unusual noises or excessive vibration while it is operating.

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.

Overheating can occur if the valves in the discharge or suction lines are closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture. If overheating occurs, stop the pump and allow it to cool before servicing it.

WARNING

Do not attempt to disengage any parts of an overheated pump unit. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing it.

If a strainer is used, check it regularly during pump operation, or if the flow rate begins to drop, and clean it as necessary. Be especially alert for unusual noises when pumping liquids containing solids.

After stopping the pump, disconnect the spark plug to ensure that the engine will remain inoperative.

In below freezing conditions, drain the water from the pump and the hoses when the pump is not in operation. Also, clean out any solids by flushing with a hose.

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, flush it with clean water.

TROUBLESHOOTING

WARNING

Before attempting to open or service the pump:

1. Consult pump service manual.
2. Disconnect the spark plug to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.

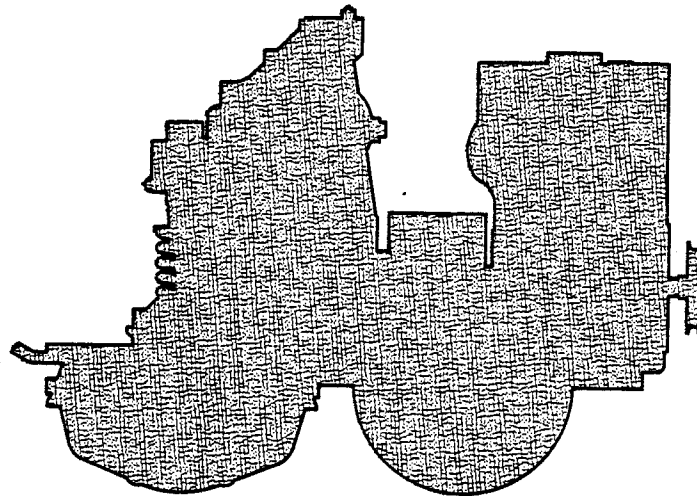
Trouble	Possible Cause	Probable Remedy
<p>PUMP FAILS TO PRIME</p>	<p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Suction valve clogged, binding, or not seating properly.</p> <p>Cracked or broken diaphragm.</p> <p>Diaphragm not securely in place.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p> <p>Clean suction valve. Check that suction flange nuts are tight.</p> <p>Replace diaphragm.</p> <p>Tighten diaphragm.</p> <p>Clean strainer.</p>
<p>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE</p>	<p>Air leak in suction line.</p> <p>Suction intake not properly submerged.</p> <p>Strainer clogged.</p> <p>Lining of suction hose collapsed.</p> <p>Driven speed too slow.</p> <p>Cracked or broken diaphragm.</p>	<p>Correct leak.</p> <p>Check installation.</p> <p>Clean strainer.</p> <p>Replace suction hose.</p> <p>Operate engine at maximum governed speed.</p> <p>Replace diaphragm.</p>



Trouble	Possible Cause	Probable Remedy
<p>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont)</p>	<p>Diaphragm not securely tightened.</p> <p>Suction lift or discharge head too high.</p> <p>Suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>Tighten diaphragm.</p> <p>Check installation and correct as required.</p> <p>Clean valves. Check that suction and discharge flange nuts are tight.</p>
<p>PUMP REQUIRES TOO MUCH POWER</p>	<p>Liquid solution too thick.</p> <p>Discharge check valve clogged or binding.</p> <p>Pump speed too high.</p>	<p>Dilute if possible.</p> <p>Clean valve.</p> <p>Reduce drive unit speed.</p>
<p>PUMP CLOGS FREQUENTLY</p>	<p>Discharge flow too slow.</p> <p>Suction or discharge check valve clogged, binding, or not seating properly.</p>	<p>If throttling valve used in discharge line, open valve fully to increase flow rate, and run drive unit at maximum governed speed.</p> <p>Clean valves. Check that suction and discharge flange nuts are tight.</p>
<p>EXCESSIVE NOISE</p>	<p>Pump or engine unit not securely mounted.</p> <p>Pumping entrained air.</p>	<p>Check and tighten mounting bolts.</p> <p>Locate and eliminate source of air bubble.</p>

Engine Driven Diaphragm Pump

Model 4D-BKND L/E



MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING EFFICIENCY.

SECTIONAL DRAWING

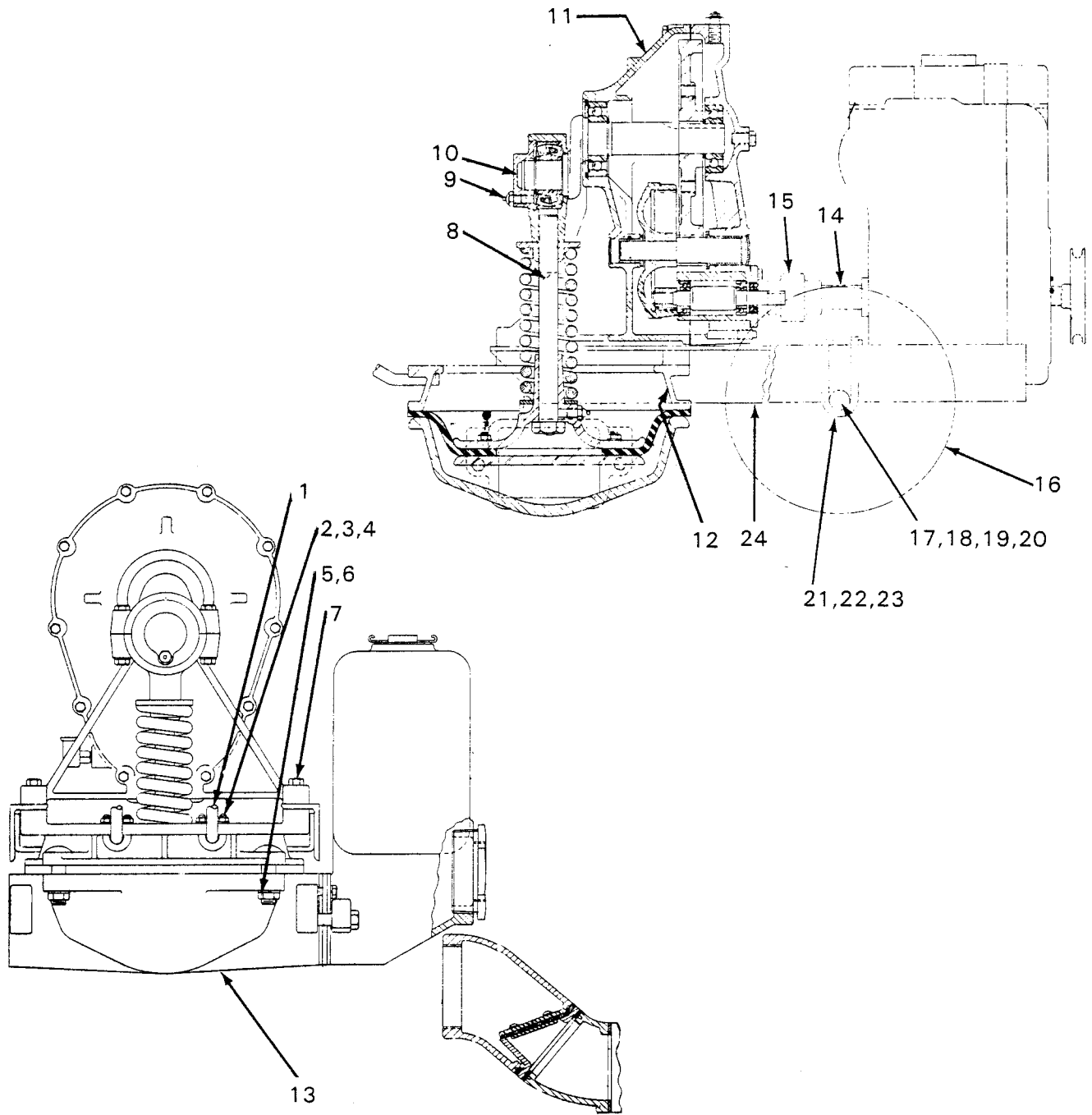


Figure 1. Pump Model 4D-BKND L/E



PARTS LIST

PUMP MODEL 4D-BKND L/E

(From S/N 575144 up)

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

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	DRAW BAR	5438	15990	1
2	U-BOLT	5495	15990	2
3	HEX NUT	D-06	15991	4
4	LOCKWASHER	J-06	15991	4
5	HEX NUT	D-12	15991	4
6	LOCKWASHER	J-12	15991	4
7	HEX HEAD CAPSCREW	B-1010	15991	4
8	PLUNGER ROD ASSEMBLY	6959	—	1
9	LUBRICATION FITTING	S-0191	—	1
10	END CAP	6643	10010	1
11	GEARBOX ASSEMBLY	44161-010	—	1
12	DIAPHRAGM RING ASSEMBLY	41881-061	—	1
13	DIAPHRAGM POT ASSEMBLY	46475-702	—	1
14	SLEEVE	2-R	16000	1
15	★ COUPLING	11730	00000	1
16	PNEUMATIC WHEEL	S-0263	—	2
17	AXLE	6619	15990	1
18	SPACER	6619-A	15070	2
19	FLAT WASHER	S-1532	—	4
20	★ COTTER PIN	M-0306	15990	2
21	U-BOLT	6945	15000	2
22	HEX NUT	D-06	15991	4
23	LOCKWASHER	J-06	15991	4
24	BASE	11148	24000	1
NOT SHOWN:				
	HEX HEAD CAPSCREW	B-0404	15991	2
	FLAT WASHER	K-04	15991	2
	LOCKWASHER	J-04	15991	2
	HEX NUT	D-04	15991	2
	COUPLING GUARD	34613-005	—	1
	STRAINER	4917	24000	1
	SUCTION STICKER	6588-AG	00000	1
	GUARD WARNING STICKER	38816-063	—	1
	NAME PLATE	2613-BP	13990	1
OPTIONAL:				
	BASE	8283	—	1

★ INDICATES PARTS RECOMMENDED FOR STOCK

CANADIAN SERIAL NO. AND UP

SECTIONAL DRAWING

6959 Plunger Rod Assembly

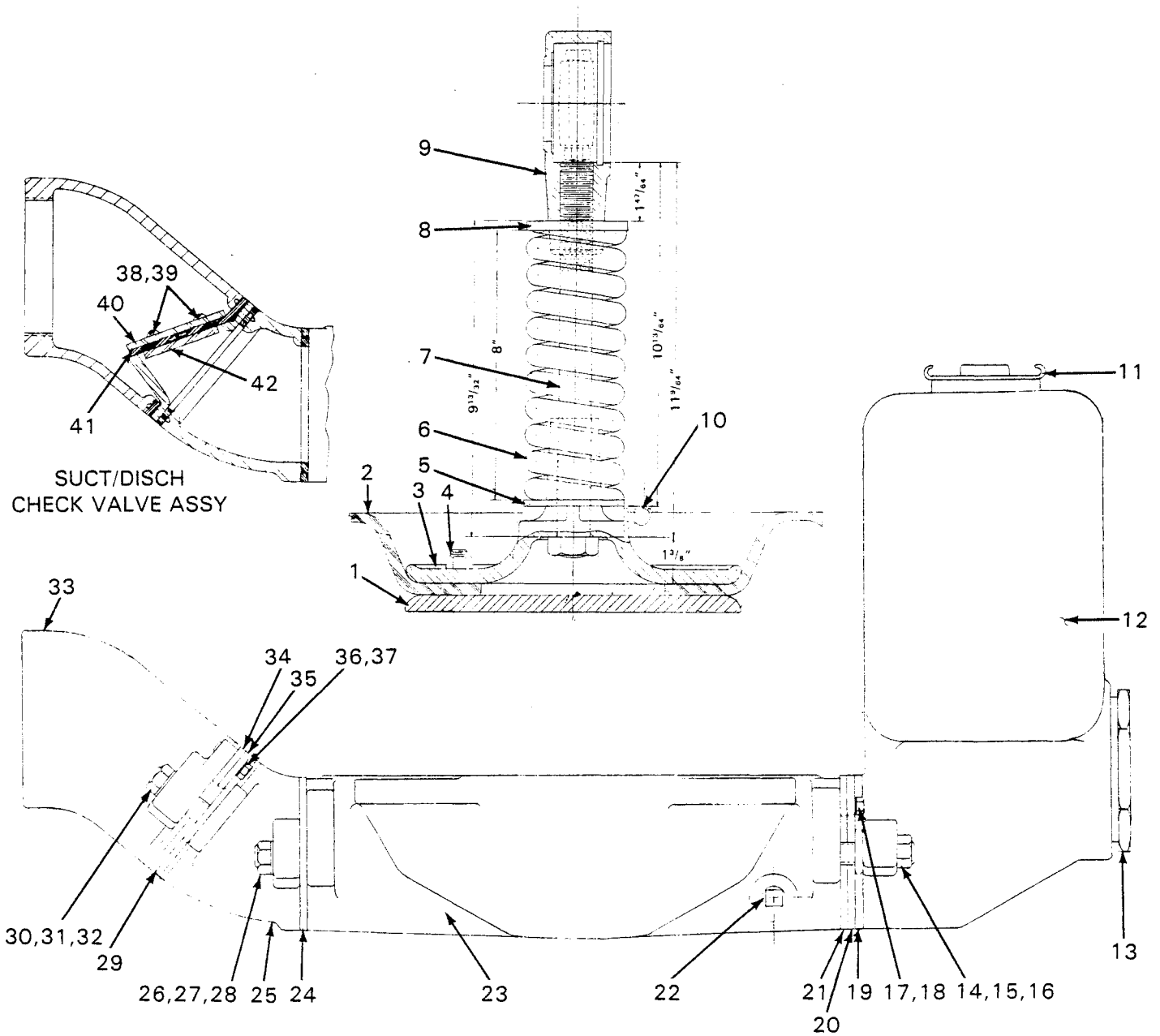


Figure 2. 46475-702 Diaphragm Pot Assembly



PARTS LIST

6959 PLUNGER ROD ASSEMBLY

46475-702 DIAPHRAGM POT ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	DIAPHRAGM PLATE, LOWER	6629	15990	1
2	★ DIAPHRAGM	S-1017	—	1
3	DIAPHRAGM PLATE, UPPER	6628	10010	1
4	HEX NUT	D-08	15991	4
5	SPRING WASHER	6639	15000	1
6	★ PLUNGER SPRING	6547	16080	1
7	PLUNGER ROD ASSEMBLY	6633	15990	1
8	SPRING RETURN NUT	6638	11000	1
9	BEARING CAP	6560	10010	1
10	LUBRICATION FITTING	S-0194	—	1
11	★ SUCTION STUB PLUG & GASKET	S-0591	—	1
12	SUCTION STUB	6625	13010	1
13	REDUCING PIPE BUSHING	AP-6448	11990	1
14	STUD	C-1013	15991	2
15	HEX NUT	D-10	15991	2
16	FLAT WASHER	KE-10	15991	2
17	HEX HEAD CAPSCREW	B-0504	15991	2
18	LOCKWASHER	J-05	15991	2
19	★ SUCTION FLANGE GASKET	6625-G	19100	1
20	SUCTION CHECK VALVE SEAT	6635	10010	1
21	★ SUCTION CHECK VALVE ASSEMBLY	46413-007	—	1
22	DIAPHRAGM POT DRAIN PLUG	P-06	11990	1
23	DIAPHRAGM POT	6622	13010	1
24	★ DIAPHRAGM POT GASKET	6625-G	19100	1
25	DISCHARGE FLANGE	6627	13040	1
26	STUD	C-1010	15991	2
27	HEX NUT	D-10	15991	2
28	FLAT WASHER	KE-10	15991	2
29	★ DISCHARGE FLANGE GASKET	6625-G	19100	1
30	STUD	C-1013	15991	2
31	HEX NUT	D-10	15991	2
32	FLAT WASHER	KE-10	15991	2
33	DISCHARGE ELBOW	6626	13040	1
34	★ DISCHARGE CHECK VALVE ASSEMBLY	46413-007	—	1
35	DISCHARGE CHECK VALVE SEAT	6635	10010	1
36	HEX HEAD CAPSCREW	B-0504	15991	2
37	LOCKWASHER	J-05	15991	2
38	ROUND HEAD MACHINE SCREW	X-0402½	17090	4
39	LOCKWASHER	J-04	17090	4
40	★ VALVE WEIGHT	6642	15990	1
41	★ CHECK VALVE	6925	19100	1
42	★ VALVE WEIGHT	6801	15990	1

★ INDICATES PARTS RECOMMENDED FOR STOCK

SECTIONAL DRAWING

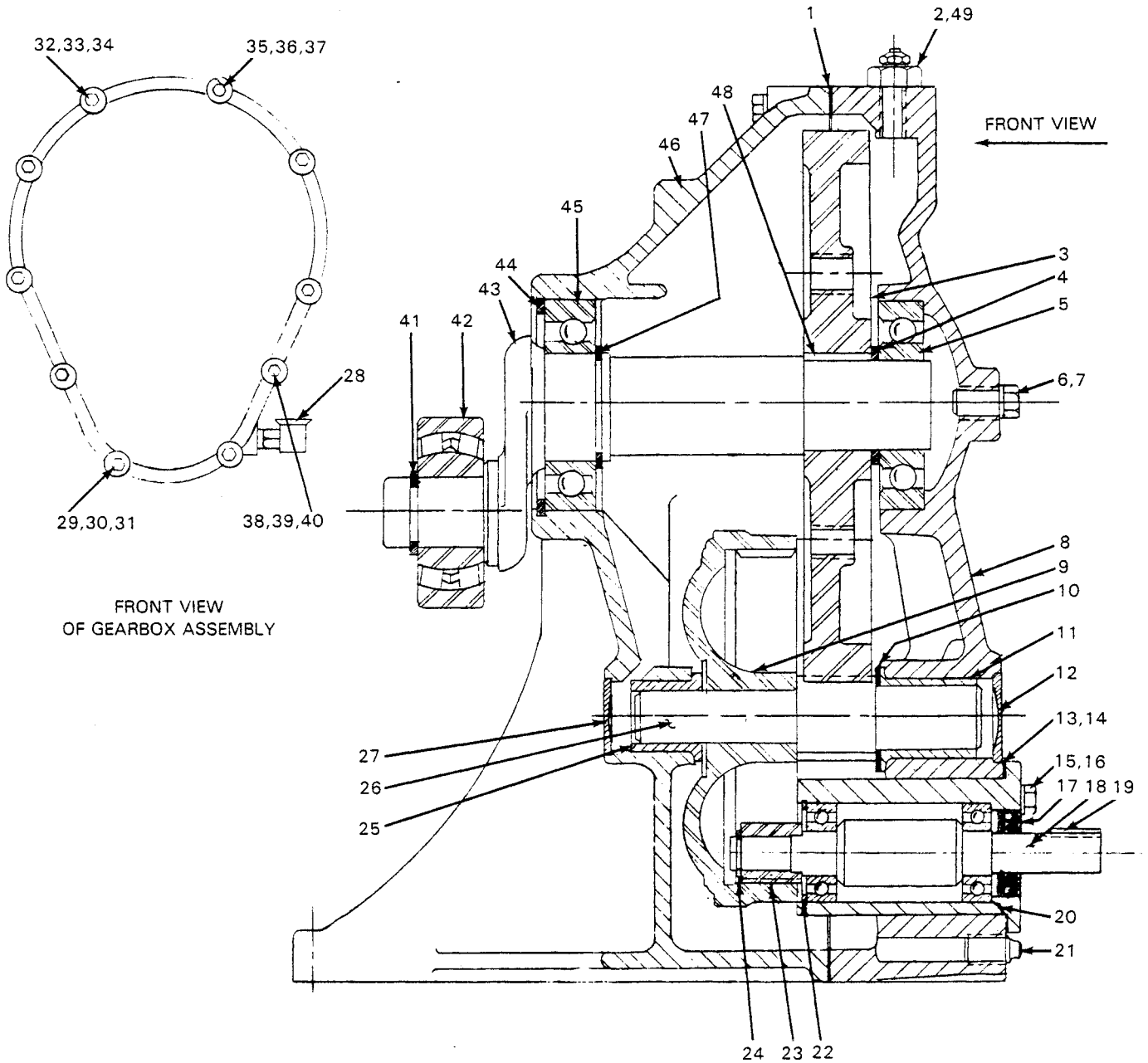


Figure 3. Gearbox Assembly 44161-010



PARTS LIST

GEARBOX ASSEMBLY 44161-010

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	★ GASKET	6624-G	18000	1	26	★ PINION SHAFT	6634	16070	1
2	VENT BOLT	31871-038	—	1	27	★ PLUG	S-1054	—	1
3	★ GEAR	6641	15060	1	28	OIL CUP	S-0617	—	1
4	WASHER	6636	15990	1	29	SHOULDER BOLT	S-1019	—	1
5	★ BALL BEARING	S-1080	—	1	30	HEX NUT	D-05	15991	1
6	HEX HEAD CAPSCREW	B-1004	15991	1	31	LOCKWASHER	J-05	15991	1
7	FLAT WASHER	KE-10	15991	1	32	HEX HEAD CAPSCREW	B-0511	15991	5
8	GEAR COVER	6623	13010	1	33	HEX NUT	D-05	15991	5
9	★ INTERNAL GEAR	S-1014	—	1	34	LOCKWASHER	J-05	15991	5
10	WASHER	6637	15000	1	35	SHOULDER BOLT	S-1018	—	1
11	BUSHING	S-1016	—	1	36	HEX NUT	D-05	15991	1
12	★ PLUG	S-1053	—	1	37	LOCKWASHER	J-05	15991	1
13	DRIVE SHAFT HOUSING	6632	10010	1	38	HEX HEAD CAPSCREW	B-0518	15991	3
14	★ DRIVE SHAFT HSNB GSKT	6632-G	18000	1	39	HEX NUT	D-05	15991	3
15	HEX HEAD CAPSCREW	B-0504	15991	4	40	LOCKWASHER	J-05	15991	3
16	LOCKWASHER	J-05	15991	4	41	SNAP RING	S-0244	—	1
17	★ OIL SEAL	S-1012	—	1	42	★ ROLLER BEARING	S-1011	—	1
18	★ DRIVE SHAFT	6631	15010	1	43	★ CRANK SHAFT	6550	11000	1
19	KEY	N-0304	15990	1	44	SNAP RING	S-1010	—	1
20	★ BALL BEARING	S-1044	—	2	45	★ BALL BEARING	S-0374	—	1
21	PIPE PLUG	P-04	11990	1	46	GEARBOX HOUSING	6624	13040	1
22	RETAINING RING	S-0204	—	1	47	RETAINING RING	S-0442	—	1
23	★ HELICAL GEAR	6488-A	16040	1	48	KEY	N-0605	15990	1
24	SNAP RING	S-1004	—	1	49	PRESSURE RELIEF FITTING	S-1523	—	1
25	BUSHING	S-1015	—	1					

★ INDICATES PARTS RECOMMENDED FOR STOCK

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

ENGINE SEPARATION (See figures 1 and 3)

Disconnect the spark plug, or take other precautions to ensure that the engine will remain inoperative.

Remove the engine, disengaging the coupling (15, figure 1) from the gearbox drive shaft (18, figure 3). Retain the drive shaft key (19).

PUMP DISASSEMBLY (See figures 1 and 2)

Close all connecting valves, and drain the pump by removing the diaphragm pot drain plug (22, figure 2). Clean and reinstall the drain plug.

To remove the diaphragm pot assembly (13, figure 1), disengage the hex nuts (5) securing the diaphragm pot to the diaphragm ring assembly (12).

To remove the plunger rod assembly (8), disengage the bearing cap (9, figure 2) securing the assembly, retaining the end cap (10, figure 1).

To remove the gearbox assembly (11), disengage the hex head capscrews (7) securing the assembly to the diaphragm ring assembly.

Diaphragm Pot Disassembly (See figure 2)

To remove the suction stub (12), remove the hex nuts (15) securing the stub to the diaphragm pot (23).

To remove the suction check valve assembly (21), remove the hex head capscrews (17) securing the assembly to the diaphragm pot.

To remove the inboard discharge flange (25), remove the hex nuts (27) securing the flange to the diaphragm pot.

To remove the outboard discharge flange (33), remove the hex nuts (31) securing the flange to the inboard discharge flange.

To remove the discharge check valve assembly (34), remove the hex head capscrews (36) securing the assembly.

Plunger Rod Disassembly (See figure 2)

To remove the diaphragm (2), remove the hex nuts (4) securing the lower diaphragm plate (1) to the upper diaphragm plate (3).

To remove the upper diaphragm plate, spring washer (5), plunger spring (6), and spring return nut (8), disengage the plunger rod assembly (7) from the bearing cap (9).

Gearbox Disassembly (See figure 3)

Drain the gearbox by removing the pipe plug (21). Clean and reinstall the plug.

Remove the snap ring (41) and the roller bearing (42) from the crank shaft (43).

Remove the hex head capscrews (15) securing the drive shaft housing (13) to the gear cover (8). Remove the drive gear housing together with the drive shaft (18), ball bearings (20), oil seal (17) and helical gear (23). The helical gear is secured by the snap ring (24).

Remove the hex head capscrews (32 and 38), shoulder bolts (29 and 35), and hex nuts (30, 33, 36, and 39) securing the gear cover to the gear housing (46). Remove the gear cover and components.

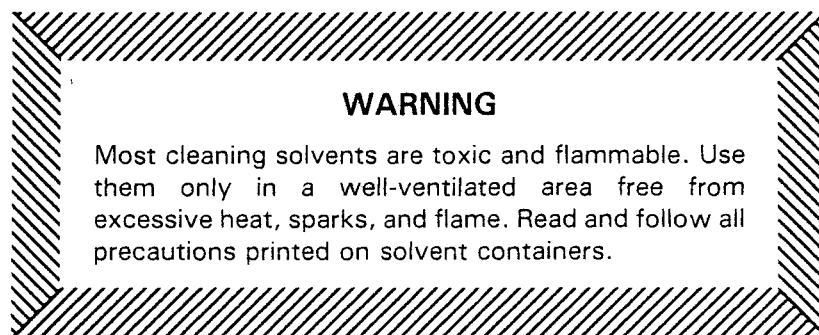
Remove the ball bearing (5) and washer (4) and gear (3) from the crank shaft, retaining the gear key (48).

Disengage the retaining ring (47) and remove the crank shaft from the ball bearing (45) and gear housing. Remove the ball bearing and snap ring (44) from the gear housing.

Remove the internal gear (9) and pinion shaft from the gear housing.

PUMP REASSEMBLY**Gearbox Reassembly (See figure 3)**

Clean all shafts, bearings, gears, and other components with a soft cloth soaked in cleaning solvent.





Inspect all shafts, bearings, gears, and components, and replace as necessary.

Install the crank shaft snap ring and outboard bearing in the gear housing.

Install the oil seal, which is a press fit, in the drive shaft housing. Install the bearings on the drive shaft and install this assembly in the drive shaft housing, making sure the assembly seats squarely. Install the retaining ring (22), securing the bearings and drive shaft within the drive shaft housing. Install the helical gear, which is a press fit, on the drive shaft and secure with the snap ring (24).

Reassemble the pinion shaft assembly by mounting the internal gear and both bushings, which are press fits, and the washer on the pinion shaft. Install this assembly in the housing.

Replace the drive shaft housing gasket (14) and introduce the drive assembly in the housing, making certain the helical gear engages the internal gear. Secure the hex head capscrews.

Introduce the crank shaft in the gear housing bore and engage the outboard bearing and secure on the shaft with the retaining ring. Position the crank shaft gear on the shaft, making certain it engages the pinion shaft. Install the spacer washer and inboard bearing on the crank shaft.

Replace the gear housing gasket (1) and reinstall the gear cover and secure with the shoulder bolts, hex head capscrews and hex nuts.

Reinstall the crank shaft roller bearing on the crank and secure with the snap ring.

Replace the plugs (12 and 27) at opposite ends of the pinion shaft in the gearbox housing, if they were removed.

Plunger Rod Reassembly (See figure 2)

Clean the plunger rod, the bearing cap, and components with a soft cloth soaked in cleaning solvent.

Position the upper diaphragm plate, spring washer, plunger spring, and spring return nut on the plunger rod, and install the plunger rod in the bearing cap and tighten.

For maximum pump efficiency, the distance between the top of the spring return nut and the bore of the upper diaphragm plate should measure 9-13/32 inches (see figure 2). Measure this distance, and adjust as required with the plunger rod.

Inspect the diaphragm, and replace it if cracked or badly worn. Position the diaphragm on the lower diaphragm plate, and secure the lower plate to the upper diaphragm plate.

Diaphragm Pot Reassembly (See figure 2)

Replace the inboard discharge flange gasket (24), and secure the flange to the diaphragm pot.

Inspect the discharge check valve assembly, and replace as necessary. Install the valve seat (35), and secure the valve assembly.

Replace the outboard discharge flange gasket (29), and secure the flange to the inboard discharge flange.

Inspect the suction check valve assembly, and replace as necessary. Install the valve seat (20), and secure the valve assembly.

Replace the suction flange gasket (19), and secure the suction stub flange to the diaphragm pot.

Pump Installation (See figure 1)

Secure the gearbox assembly to the diaphragm frame.

Position the plunger bearing cap over the crank shaft roller bearing, and install the end cap. Secure the bearing cap to the roller bearing.

Secure the diaphragm pot assembly to the diaphragm frame, making certain that the outer lip of the diaphragm seats evenly between the pot and the plate.

ENGINE INSTALLATION

Position the engine so that the coupling engages the drive shaft and key. Secure the engine to the base.

Secure the coupling guard to the base.

Reinstall the spark plug.

PUMP OPERATION

Open all connecting valves and check that all piping is secure.

Remove the suction plug and gasket (11, figure 1), and fill the suction stub. Clean and reinstall the suction stub and gasket.

See LUBRICATION before starting the pump.

LUBRICATION

Plunger Rod Assembly

Apply No. 2 pressure gun grease through the plunger assembly lubrication fittings (9, figure 1, and 10, figure 2).

Gearbox Assembly

Fill the bearing housing through the gearbox oil cup (28, figure 3) with a good grade of SAE No. 30 non-detergent motor oil until the oil cup is full.

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