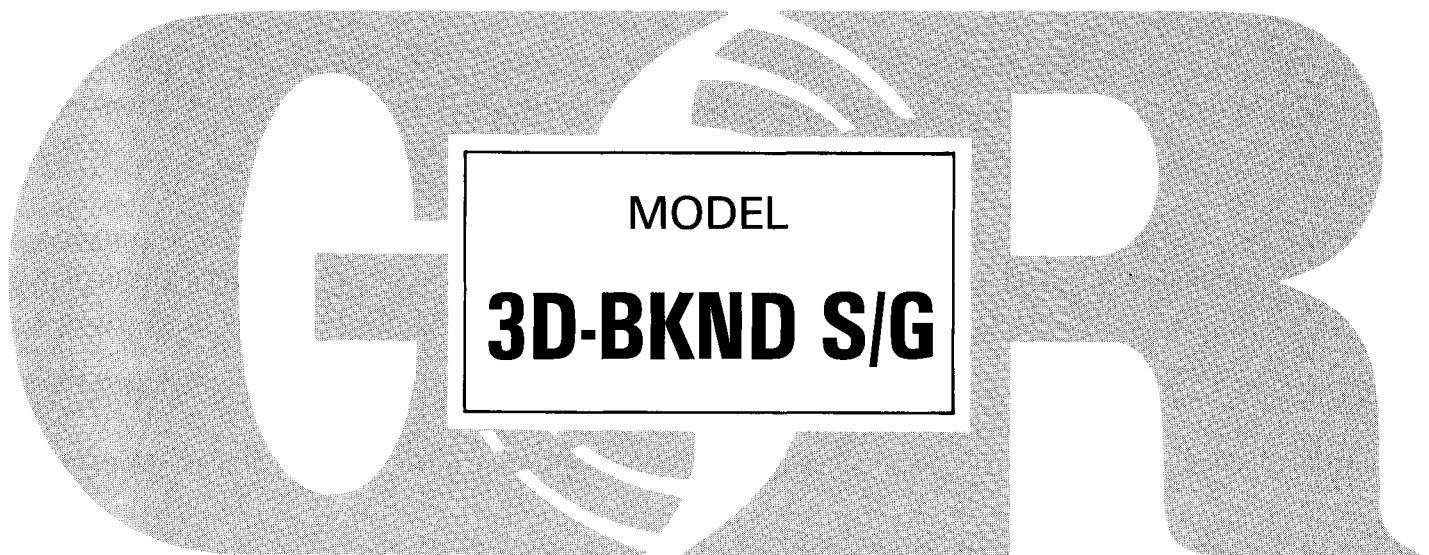


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# **D**SERIES

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



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

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

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# INTRODUCTION

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

This is a positive displacement type pump utilizing a single-action diaphragm to produce a straight-through flow of liquid. Since this pump handles liquids ranging from clear water to construction-site muck, it is ideally suited to industrial and contractors' applications.

If you have any questions regarding the pump which are 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  
P.O. Box 1217  
Mansfield, Ohio 44901

or

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

For information or technical assistance on the engine, contact the 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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TROUBLESHOOTING	Section D
MAINTENANCE AND REPAIR	Section E
WARRANTY	





# WARNINGS

**THESE WARNINGS APPLY TO DIAPHRAGM PUMPS WITH ENGINE DRIVE.**

```

////////////////////////////////////
//
// Before attempting to open or service the pump:
// 1. Familiarize yourself with this manual.
// 2. Disconnect the engine ignition or otherwise ensure that the engine
//    will remain inoperative while the pump is being serviced.
// 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 fit-
// tings or components. Do not operate the pump in an explosive at-
// mosphere.
//
////////////////////////////////////

```

```

////////////////////////////////////
//
// 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 the manual before restarting the pump.
//
////////////////////////////////////

```

```

////////////////////////////////////
//
// Never install a positive shut-off valve in the discharge line; discharge
// restrictions will cause excessive friction loss resulting in overloading and
// destruction of pump and drive components. It is strongly recommended
// that unless absolute necessary, no positive shut-off valve be installed in the
// suction line; excessive restriction will cause incomplete filling of the
// diaphragm chamber and result in short diaphragm life.
//
////////////////////////////////////

```



## 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.

Approximate physical dimensions of this pump are shown in figure 1.

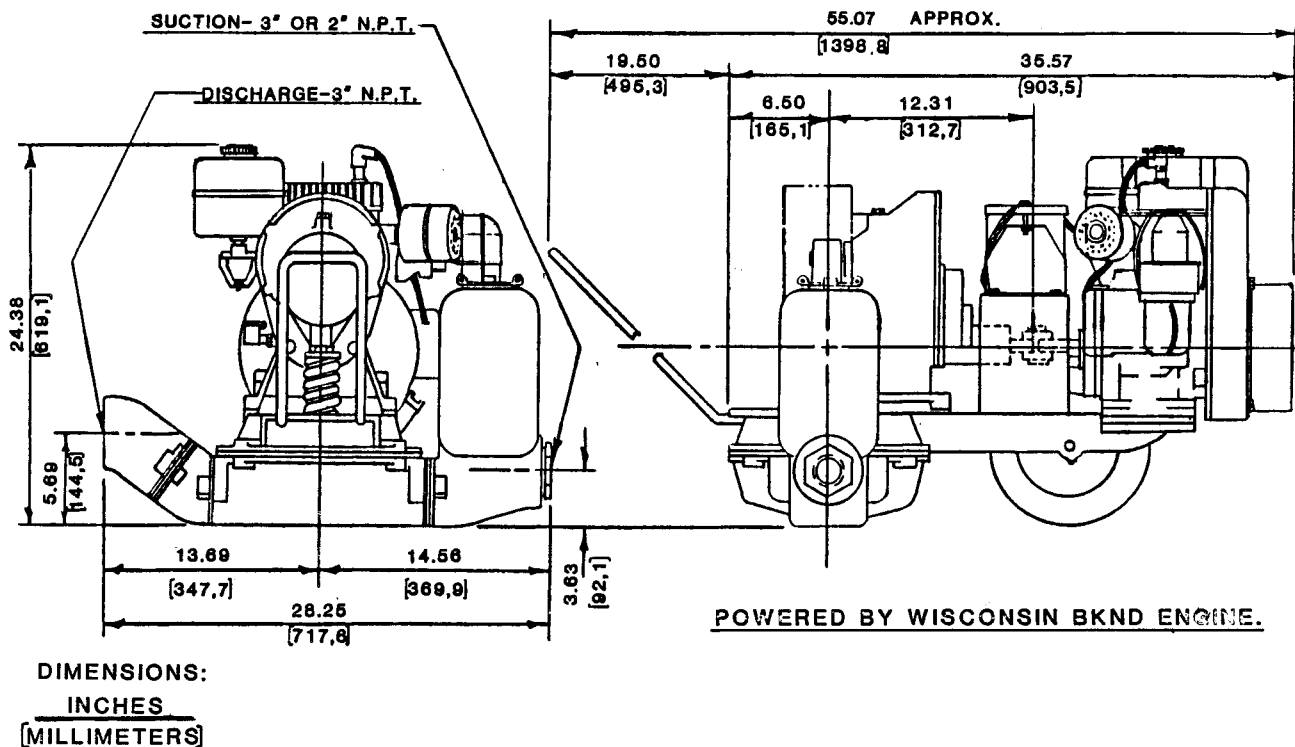


Figure 1. Pump Model 3D-BKND S/G

### 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 end, gear box assembly, and engine 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 Section E).



**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**

```
////////////////////////////////////  
//                               //  
//                               //  
//                               //  
//                               //  
//                               //  
//                               //  
//                               //  
//                               //  
//                               //  
////////////////////////////////////
```

**WARNING**

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

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.

**CAUTION**

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

**SUCTION AND DISCHARGE PIPING**

**Materials**

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

Suction lines should be the same size as the pump inlet.

**CAUTION**

The discharge line should be the same size as, or larger than, the suction line. Never install or operate this pump with a discharge line smaller than the suction line; a restricted discharge line will cause excessive friction loss resulting in overloading and destruction of pump and drive components.







To check coupling alignment, use a feeler gauge or tape 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.

```
////////////////////////////////////  
//  
// WARNING //  
// //  
// Do not operate the pump without the coupling guard //  
// and eccentric guard in place and secured. Exposed //  
// rotating parts can catch clothing, fingers, or tools, //  
// causing sever injury to personnel. //  
// //  
////////////////////////////////////
```





## OPERATION

```
////////////////////////////////////  
//  
// WARNING //  
//  
// This pump is designed to pump only non-flammable //  
// liquids. Do not attempt to pump volatile or explosive //  
// liquids, or liquids which may attack pump fittings. Do //  
// not operate the engine 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.

Refer to **LUBRICATION** in Section E, and check that the gear box is properly lubricated.

<p style="text-align: center;"><b>CAUTION</b></p> <p>The pump end is designed to operate at 60 cycles per minute through a gear box with a 43.36:1 ratio. Set the engine governor at 2600 RPM <b>maximum</b>. Operation at higher governor settings can cause pump components to break down.</p>
--

Consult the manual(s) furnished with the pump engine before starting the pump.

Open any valves installed in the suction and/or discharge lines, and start the pump.

```
////////////////////////////////////  
//  
// WARNING //  
//  
// Make certain that any positive shut-off valve installed //  
// in the suction line is open before operating the pump; //  
// excessive restriction will cause incomplete filling of //  
// the diaphragm chamber and result in short diaphragm //  
// life. No positive shut-off valve should be installed in //  
// the discharge line. //  
//  
////////////////////////////////////
```

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 pump and check the suction line for leaks.

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.

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

Check the strainer regularly during 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 engine ignition to ensure that the engine will remain inoperative.

In below-freezing conditions, drain the water from the pump and the lines 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 liquid containing a large amount of solids, flush it with clean water.





Trouble	Possible Cause	Probable Remedy
continued from page 1	Integral suction or discharge check valve clogged, binding, or not seating properly.	Clean valves. Check that flange nuts are tight.
PUMP REQUIRES TOO MUCH POWER	Liquid solution too thick. Pump speed too high. Integral discharge check valve clogged or binding. Discharge head too high.  Bearings in power source or gear box worn or binding.	Dilute if possible. Reduce engine speed. Clean valve.  Shorten total discharge length or install larger diameter discharge line. Check bearings.
PUMP CLOGS FREQUENTLY	Integral suction or discharge check valve clogged, binding, or not seating properly.	Clean valves. Check that flange nuts are tight.
EXCESSIVE NOISE	Pump, gear box, or engine not securely mounted.  Gear box not properly lubricated.	Check and tighten mounting bolts.  See <b>LUBRICATION</b> , Section E.





## MAINTENANCE AND REPAIR

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

### PERFORMANCE TEST DATA FOR PUMP MODEL 3D-BKND S/G

IN GALLONS PER MINUTE, 60 STROKES PER MINUTE

STATIC LIFT IN FEET	STATIC DISCHARGE HEAD IN FEET			
	5	10	15	20
5	78	67	66	68
10	73	64	66	62
15	68	60	64	59
20	64	59	65	59
25	56	56	60	56

IN LITERS PER MINUTE, 60 STROKES PER MINUTE

STATIC LIFT IN METERS	STATIC DISCHARGE HEAD IN METERS			
	1,5	3,0	4,6	6,1
1,5	295,2	253,6	249,8	257,4
3,0	276,3	242,2	249,8	234,7
4,6	257,4	227,1	242,2	223,3
6,1	242,2	223,3	246,0	223,3
7,6	212,0	212,0	227,1	212,0

### \*STANDARD PERFORMANCE FOR PUMP MODEL 3D-BKND S/G

\*Based on 70°F clear water at sea level with minimum suction lift, using 2-inch (5.08 cm.) suction hose and 3-inch (7.62 cm.) non-collapsible discharge hose.

Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, and temperature.

If your pump serial number is followed by an "N" or if you have a question on performance, contact The Gorman-Rupp Company.

# SECTIONAL DRAWING

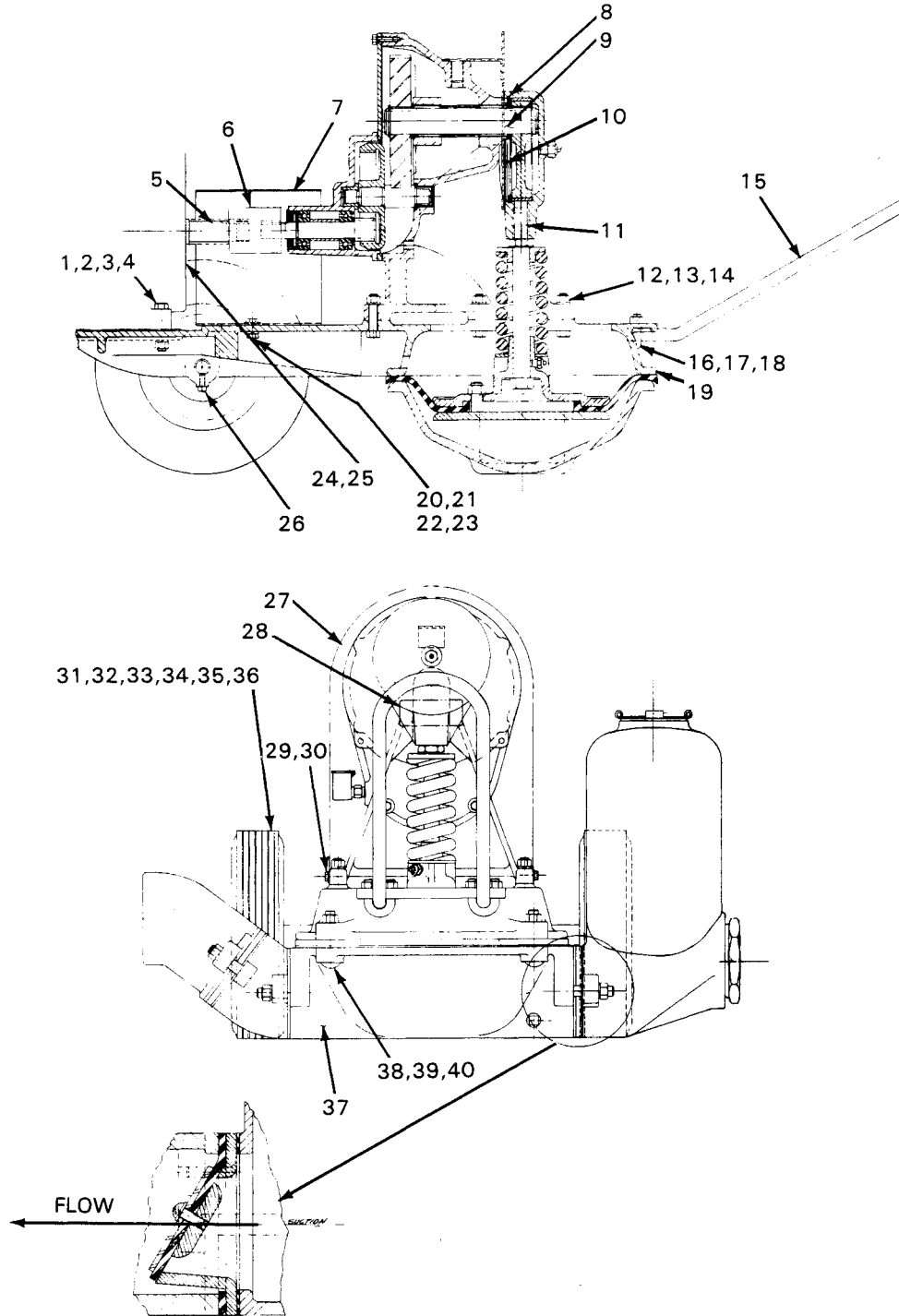


Figure 1. 3D-BKND S/GPump Assembly



### PARTS LIST

#### 3D-BKND S/G PUMP ASSEMBLY

(From S/N 536484 up)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	HEX HEAD CAPSCREW	B-0611	15991	4	34	★COTTER PIN	M-0306	15990	2
2	LOCK WASHER	J-06	15991	4	35	SQUARE HD SETSCREW	G-0604	15990	1
3	HEX NUT	D-06	15991	4	36	PIPE	5657	15070	1
4	FLAT WASHER	K-06	15991	4	37	DIAPH POT ASSY (see fig. 2)	46475-701		1
5	SPACER SLEEVE	2-R	16000	1	38	RIB MACHINE BOLT	BJ-0811	15990	REF
6	★COUPLING	11730	00000	1	39	HEX NUT	D-08	15991	4
7	COUPLING GUARD	34613-005		1	40	FLAT WASHER	K-07	15991	4
8	★SNAP RING	5385	00000	1	NOT SHOWN:				
9	GEAR BOX ASSY (see fig. 4)	44161-008		1		ALLEN HEAD SETSCREW	GA-0602	15990	4
10	ECC CAM WASHER	6531	18040	1		WISC BKND ENGINE	202-B2		1
11	PLNGR ROD ASSY (see fig. 3)	5685		1		NAME PLATE	2613-BP	13990	1
12	HEX HEAD CAPSCREW	B-0608	15991	5		STRAINER	9026	24000	1
13	LOCK WASHER	J-06	15991	5		SPACER	5657-A	15070	1
14	HEX NUT	D-06	15991	5		CABLE ASSEMBLY	5795-AS	24040	2
15	DRAW BAR	5438	15990	1		BATTERY BOX	11281	24000	1
16	U-BOLT	5495	15990	2		BATTERY BOX COVER	11870	24000	1
17	HEX NUT	D-06	15991	4		HEX HEAD CAPSCREW	B-0502	15991	4
18	LOCK WASHER	J-06	15991	4		HEX HEAD CAPSCREW	B-0503	15991	3
19	DIAPHRAGM FRAME	7924-B	13010	1		HEX HEAD CAPSCREW	B-0504	15991	1
20	HEX HEAD CAPSCREW	B-0404	15991	2		HEX NUT	D-05	15991	4
21	FLAT WASHER	K-04	15991	2		LOCK WASHER	J-05	15991	8
22	LOCK WASHER	J-04	15991	2		STUD	C-0809	15991	2
23	HEX NUT	D-04	15991	2		STUD	C-0810	15991	4
24	HEX HEAD CAPSCREW	B-0602	15991	4		STARTER KIT	S-1484		1
25	DYNA-SEAL WASHER	S-1586		4		BATTERY	S-1680		1
26	SQUARE HD SETSCREW	G-0604	15990	1		CARRIAGE BOLT	AB-0403	15991	1
27	ECC GUARD ASSEMBLY	42381-030		1		CARRIAGE BOLT	AB-0503	15991	1
28	LUBE DECAL	38816-085		1		PAN HEAD TAPSCREW	BP#14-02	15991	3
29	HEX HEAD CAPSCREW	B-0402	15991	4		GUARD & BATTERY BOX	42342-023		1
30	LOCK WASHER	J-04	15991	4		BELT GUARD	42353-013		1
31	★PNEUMATIC TIRE	S-0752		2	OPTIONAL:				
32	★AXLE	5645	15990	1		STATIONARY BASE	8105	24000	1
33	SPACER WASHER	5382	15990	7					

★INDICATES PARTS RECOMMENDED FOR STOCK

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

CANADIAN SERIAL NO.....AND UP

# SECTIONAL DRAWING

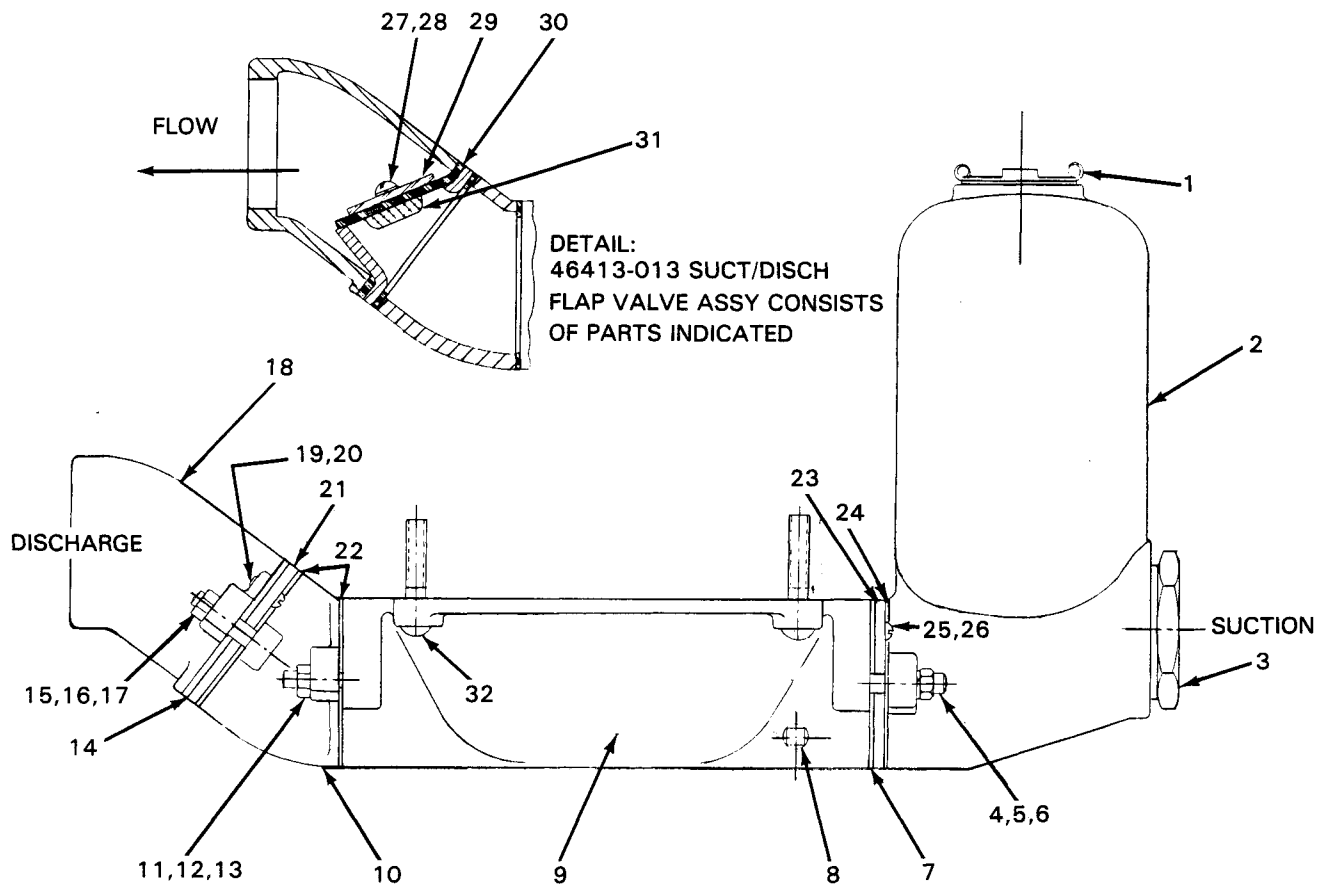


Figure 2. 46475-701 Diaphragm Pot Assembly



## PARTS LIST

### 46475-701 DIAPHRAGM POT ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	SUCTION ACCUMULATOR PLUG & GSKT	S-0591		1
2	SUCTION ACCUMULATOR	5376	13010	1
3	REDUCING PIPE BUSHING	AP-4832	11990	1
4	STUD	C-0810	15991	2
5	HEX NUT	D-08	15991	2
6	FLAT WASHER	K-07	15991	2
7	SUCTION FLAP VALVE ASSEMBLY	46413-013		1
8	DIAPHRAGM POT DRAIN PLUG	P-06	11990	1
9	DIAPHRAGM POT	5375	13010	1
10	INBOARD DISCHARGE FLANGE	5377	13040	1
11	STUD	C-0809	15991	2
12	HEX NUT	D-08	15991	2
13	FLAT WASHER	K-07	15991	2
14	DISCHARGE FLAP VALVE ASSEMBLY	46413-013		1
15	STUD	C-0810	15991	2
16	HEX NUT	D-08	15991	2
17	WASHER	11273	15990	2
18	OUTBOARD DISCHARGE FLANGE	5658	13040	1
19	ROUND HEAD MACHINE SCREW	X-0404	15991	2
20	LOCK WASHER	J-04	15991	2
21	★DISCHARGE FLAP VALVE SEAT	5374	10010	1
22	★GASKET	5374-G	19100	2
23	★SUCTION FLAP VALVE SEAT	5374	10010	1
24	★GASKET	5374-G	19100	1
25	ROUND HEAD MACHINE SCREW	X-0404	15991	2
26	LOCK WASHER	J-04	15991	2
27	ROUND HEAD MACHINE SCREW	X-0403	15991	4
28	LOCK WASHER	J-04	15991	4
29	★FLAP VALVE WEIGHT	5428	15990	2
30	★FLAP VALVE	5427	19100	2
31	★FLAP VALVE WEIGHT	5426	13010	2
32	RIB MACHINE BOLT	BJ-0811	15990	4

★ Indicates Parts Recommended for Stock

## SECTIONAL DRAWING

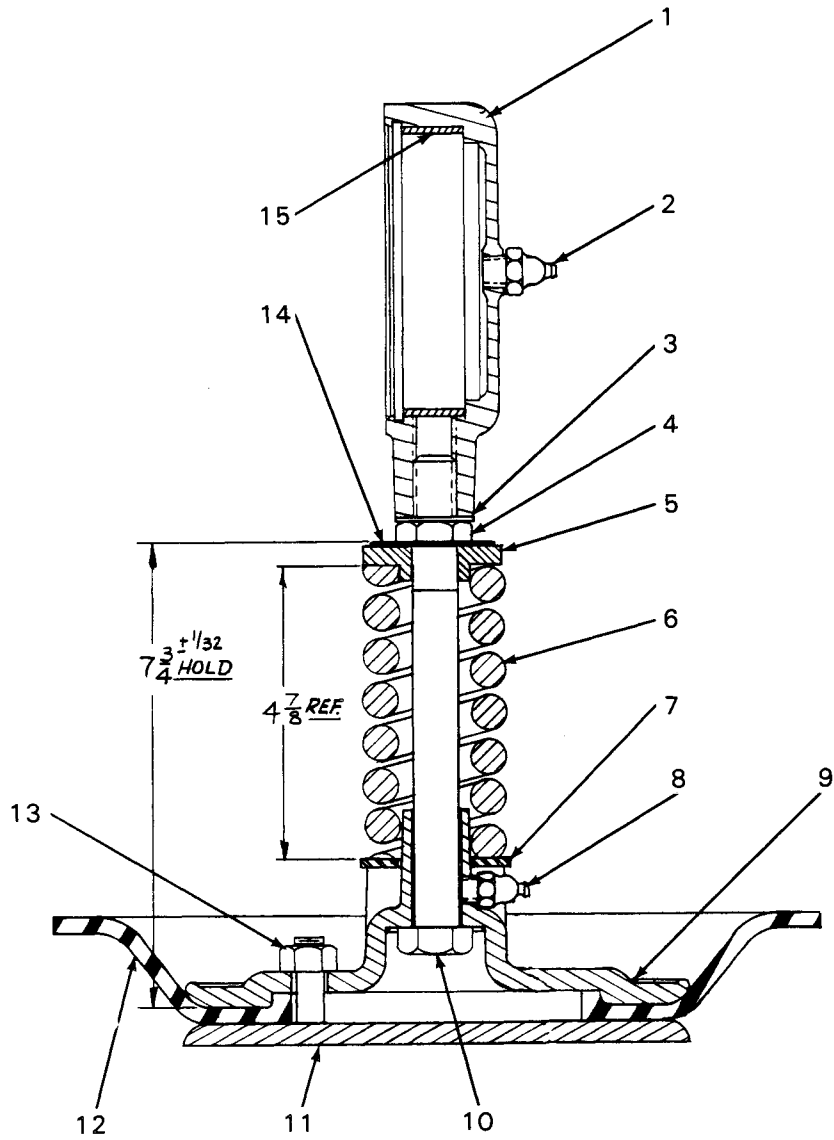


Figure 3. 5685 Plunger Rod Assembly



## PARTS LIST

### 5685 PLUNGER ROD ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	ECCENTRIC CAP	5373	13010	1
2	LUBE FITTING	S-0191		1
3	T-LOCKWASHER	AK-12	15991	1
4	JAM NUT	AT-12	15990	1
5	SPRING WASHER	5384	15990	1
6	★ SPRING	5398	16080	1
7	FLAT WASHER	K-20	15991	1
8	LUBE FITTING	S-0191		1
9	UPPER DIAPHRAGM PLATE	5381	10010	1
10	PLUNGER ROD	5383	15990	1
11	LOWER DIAPHRAGM PLATE ASSEMBLY	5394		1
12	★ DIAPHRAGM	S-0701		1
13	HEX NUT	D-08	15991	3
14	★ ADJUSTING SHIM	11840-B	15990	4
15	★ ECCENTRIC BEARING	5610	14000	1

★ Indicates Parts Recommended for Stock

# SECTIONAL DRAWING

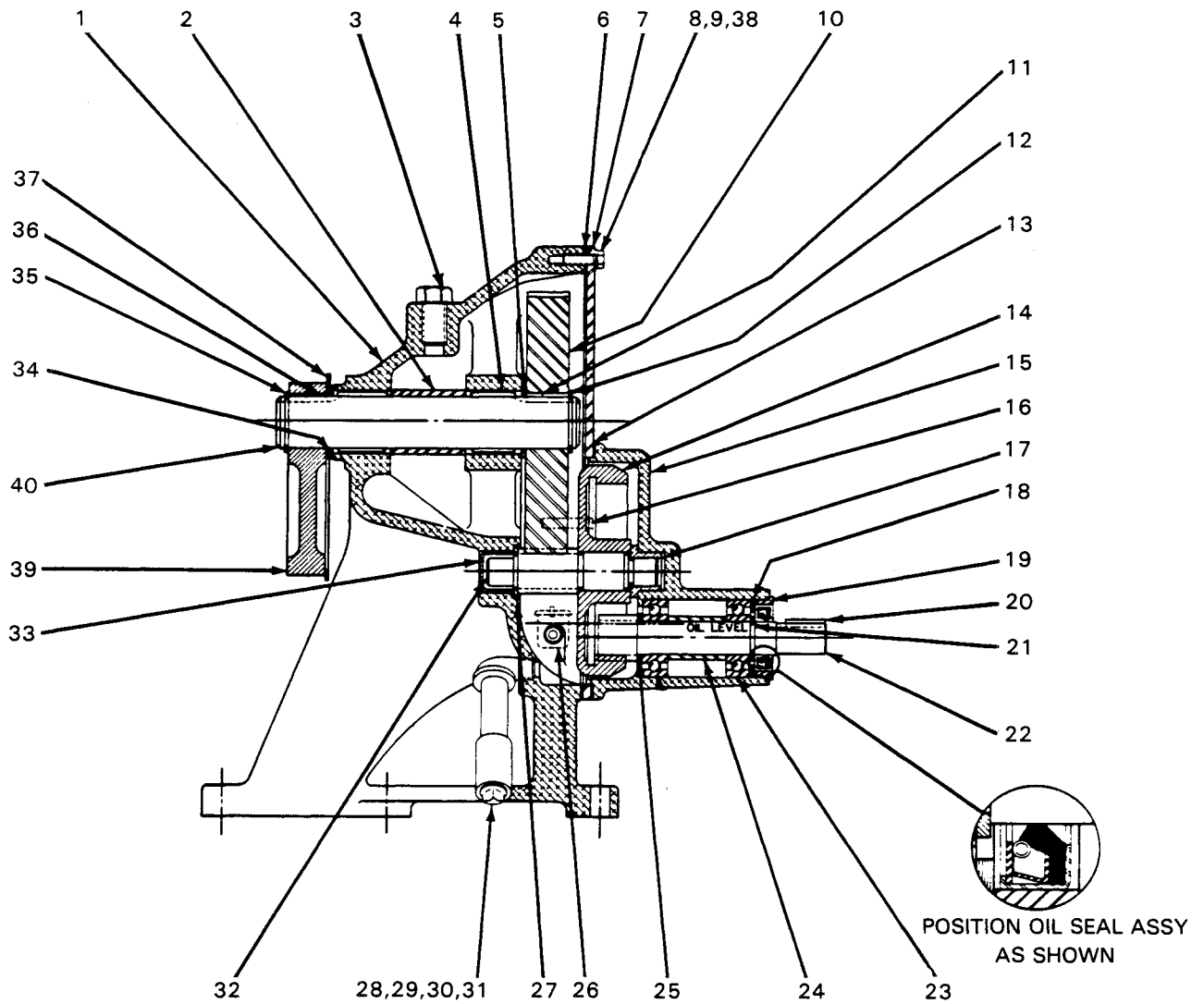


Figure 4. 44161-008 Gear Box Assembly





## PARTS LIST

### 44161-008 GEAR BOX ASSEMBLY

ITEM NO.	PART NAME	PART NUMBER	MATERIAL CODE	QTY
1	GEAR HOUSING	5367	13010	1
2	SPACER SLEEVE	S-0952		1
3	HEX HEAD CAPSCREW	B-1004	15991	1
4	★CAM SHAFT BEARING	S-0702		2
5	SPACER WASHER	5395	15990	1
6	★COVER PLATE GASKET	5367-G	20050	1
7	COVER PLATE	5396	15990	1
8	HEX HEAD CAPSCREW	B-0403	15991	7
9	LOCK WASHER	J-04	15991	9
10	★CAM SHAFT GEAR	5334	16060	1
11	★CAM SHAFT GEAR KEY	31811-040	15990	1
12	★SNAP RING	S-0700		1
13	★BEARING HOUSING GASKET	S-0825		1
14	★PINION GEAR	S-0823		1
15	BEARING HOUSING	5918-A	13010	1
16	DOWEL PIN	AA-0405	15990	2
17	★PINION SHAFT BUSHING	S-0824		1
18	DRIVE SHAFT WASHER	2-M	15990	3
19	★OIL SEAL ASSEMBLY	14408		1
20	★DRIVE SHAFT KEY	N-0304	15990	1
21	SNAP RING	S-0269		1
22	★DRIVE SHAFT	8211	16070	1
23	★DRIVE SHAFT BEARING	S-1044		2
24	SPACER SLEEVE	5922	15070	1
25	SNAP RING	S-0269		1
26	OIL CUP	S-0617		1
27	SPACER WASHER	5382	15990	1
28	STREET ELBOW	RS-04	11990	1
29	PIPE NIPPLE	T-0408	15070	1
30	PIPE COUPLING	AE-04	11990	1
31	GEAR BOX DRAIN PLUG	P-04	11990	1
32	★PINION SHAFT	5333	16020	1
33	★PINION SHAFT BEARING	S-0703		1
34	★ECCENTRIC CAM SHIM SET	13103-A	15990	1
35	SNAP RING	S-0700		1
36	★ECCENTRIC CAM KEY	31811-040		1
37	WASHER	6531	18040	1
38	HEX HEAD CAPSCREW	B-0407	15991	2
39	★ECCENTRIC CAM	5378-A	10080	1
40	★ECCENTRIC CAM SHAFT	5397	15020	1

★ Indicates Items Recommended For Stock



### PUMP ASSEMBLY DISASSEMBLY AND REASSEMBLY

This pump requires little service due to its rugged, minimum-maintenance design. If it becomes necessary to inspect or replace components, however, follow these instructions, which are keyed to the sectional views (see figures 1 through 4) and the accompanying parts lists.

```

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
//
//                               WARNING
//
//   Before performing any maintenance or repair, or
//   disassembling this pump, disconnect the engine igni-
//   tion to ensure that the engine will remain imperative.
//
////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

```

### ENGINE SEPARATION (See figure 1)

#### NOTE

It is not necessary to remove the engine to disassemble the pump end assembly.

Remove the hex head capscrews (20), flat washers (20), lock washers (22), and hex nuts (23) securing the coupling guard (7) to the diaphragm frame (19), and remove the coupling guard.

Remove the hex head capscrews (1), hex nuts (3), lock washers (2), and flat washers (4) securing the engine to the diaphragm frame.

Separate the engine from the pump end, retaining the shaft key securing the gear box drive shaft to the coupling (6).

### PUMP ASSEMBLY DISASSEMBLY (See figure 1)

Close all connecting valves, and drain the pump by removing the drain plug (8, figure 2). Clean and reinstall the drain plug.

Remove the eccentric guard assembly (27) by removing the hex head capscrews (29) and lock washers (30) securing the eccentric guard to the gear box assembly (9).

To remove the diaphragm pot assembly (37), remove the hex nuts (39) and flat washers (40) securing the diaphragm pot to the diaphragm frame.

To remove the plunger rod assembly (11), remove the snap ring (8) securing the assembly to the gear box cam shaft.

To remove the gear box assembly, remove the hex head capscrews (12), lock washers (13), and hex nuts (14) securing the gear box to the diaphragm ring, and remove the gear box drive shaft from the engine coupling. Retain the drive shaft key.

**Diaphragm Pot Disassembly (See figure 2)**

To remove the suction accumulator (1), remove the hex nuts (5) and flat washers (6) securing the accumulator to the diaphragm pot (9).

To remove the suction flap valve assembly (7), remove the round head machine screws (25) and lock washers (26) securing the valve seat (23) and flap valve assembly to the diaphragm pot.

To remove the inboard discharge flange (10), remove the hex nuts (12) and flat washers (17) securing the flange to the diaphragm pot.

To remove the outboard discharge flange (18), remove the hex nuts (16) and washers (17) securing the flange to the inboard discharge flange.

To remove the discharge flap valve assembly (14), remove the round head machine screws (19) and lock washers (20) securing the valve seat (21) and flap valve assembly to the outboard discharge flange.

The suction and discharge flap valve assemblies are identical parts, and operate in the same direction. For removal and/or replacement of flap valve components, remove the round head machine screws (27) and lock washers (28).

**Plunger Rod Disassembly (See figure 3)**

To remove the diaphragm (12), remove the hex nuts (13) securing the lower diaphragm plate assembly (11) to the upper diaphragm plate (9).

To separate the upper diaphragm plate, flat washer (7), spring (6), spring washer (5), adjusting shims (14), jam nut (4), and T-lockwasher (3), unscrew the plunger rod (10) from the eccentric cap (1).

The eccentric bearing (15) is a press fit in the eccentric cap.

**Gear Box Disassembly (See figure 4)**

Drain the gear box by removing the gear box drain plug (31). Clean and reinstall the drain plug.

Remove the two hex head capscrews (38) and lock washers (9) securing the bearing housing (15) and cover plate (7) to the gear housing (1), and the five hex head capscrews (8) and lock washers (9) securing the cover plate to the gear housing.

Disengage the drive shaft (22) from the pinion gear (14), and remove the bearing housing, assembled cover plate, and assembled drive shaft and components.

Remove the two hex head capscrews (8) and lock washers (9) securing the cover plate to the bearing housing.

To disassemble the drive shaft components, remove the oil seal assembly (19) and washers (18), and press the drive shaft and assembled components out of the bearing housing. Remove the outboard snap ring (21), and remove the outboard bearing (23) and spacer sleeve (24). Remove the inboard snap ring (25), and remove the inboard bearing.



Remove the pinion shaft bushing (17), disengage the pinion gear from the cam shaft gear (10), and remove the pinion shaft (32) and assembled pinion gear. Remove the spacer washer (27) from the pinion shaft, and remove the pinion gear. Press the pinion shaft bearing (33) out of the gear housing.

Remove the snap ring (35) securing the eccentric cam (39) on the eccentric cam shaft (40), and remove the eccentric cam, retaining the eccentric cam key (36). Remove the washer (37), and the eccentric cam shim set (34). Drive the eccentric cam shaft and the remainder of the assembled components from the pump end of the gear housing out of the drive end.

To disassemble the cam shaft components, remove the snap ring (12), and remove the cam shaft gear, retaining the gear key (11). Remove the spacer washer (5), cam shaft bearings (4), and spacer (2).

### PUMP END REASSEMBLY

#### Gear Box Reassembly (See figure 4)

Clean all shafts and gears with a soft cloth soaked in cleaning solvent.

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**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.

Clean shaft sleeves, spacers, and the bores of the gear housing and shaft and bearing housing with a soft cloth soaked in cleaning solvent.

Clean all bearings in cleaning solvent free of grit or metallic particles.

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

Install the eccentric cam shaft gear snap ring and the cam shaft gear key. Install the eccentric cam shaft gear, spacer washer, outboard bearing, spacer sleeve, and inboard bearing. Install the eccentric cam shaft and assembled components in the gear housing.

Install the eccentric cam washer and shim set. Install the eccentric cam and eccentric cam snap ring.

Install the pinion shaft bearing in the gear housing. Install the pinion shaft spacer washer. Install the pinion shaft in the shaft bearing, making certain that the shaft engages the eccentric cam shaft gear. Install the pinion gear and the pinion shaft bushing.

Install the inboard snap ring on the drive shaft, and install the drive shaft inboard bearing.

Install the spacer sleeve on the drive shaft, and install the drive shaft outboard bearing and the outboard snap ring.

Install the drive shaft and assembled bearings in the bearing housing.

Install the drive shaft washers. Inspect the oil seal assembly, and replace as necessary. Install the oil seal assembly with the lip positioned as shown in figure 4.

Replace the bearing housing gasket (13), and install the two capscrews and lock washers securing the cover plate to the bearing housing.

Replace the cover plate gasket (6), position the cover plate and the assembled bearing housing and drive shaft components on the dowel pins (17), and secure the cover plate and bearing housing to the gear housing, making certain that the pinion shaft bushing seats squarely in the bore of the bearing housing and that the drive shaft engages the pinion shaft gear.

#### **Plunger Rod Reassembly (See figure 3)**

Clean the plunger rod, and the bores of the eccentric, spacer, spring centering washer, and upper diaphragm plate with a soft cloth soaked in cleaning solvent.

Inspect the eccentric bearing, and replace as necessary. Install the bearing in the eccentric cap.

Inspect the plunger rod, and replace if bent or warped. Install the plunger rod in the upper diaphragm plate. Install the flat washer and spring on the upper diaphragm plate, and install the spring washer, adjusting shims, and jam nut on the plunger rod.

Refer to figure 3, and tighten the jam nut until the spring is compressed to 4-7/8 inches. With the spring properly compressed, the distance between the bottom of the upper diaphragm plate and the top of the adjusting shims should measure 7-3/4 inches. Measure this distance, and add or remove adjusting shims until it is correct.

Install the T-lockwasher on the plunger rod, and screw the plunger rod into the eccentric cap until the cap and T-lockwasher are flush.

Inspect the diaphragm, and replace it if damaged or worn. Install the diaphragm on the lower diaphragm plate, and secure the lower diaphragm plate to the upper diaphragm plate.

#### **Diaphragm Pot Reassembly (See figure 2)**

Replace the inboard discharge flange gasket (22), and secure the inboard discharge flange to the diaphragm pot.

Inspect the discharge flap valve assembly and replace as necessary. Position the discharge flap valve assembly in the outboard discharge flange, install the valve seat, and secure the valve seat and discharge flap valve assembly to the outboard discharge flange.

Replace the outboard discharge flange gasket (22), and secure the outboard discharge flange to the inboard discharge flange.



Inspect the suction flap valve assembly and replace as necessary. Position the suction flap valve assembly in the diaphragm pot, install the valve seat, and secure the valve seat and suction discharge flap valve assembly to the diaphragm pot.

Replace the suction accumulator gasket (24), and secure the accumulator to the diaphragm pot.

**Pump Assembly Reinstallation (See figure 1)**

If the engine has not been removed, install the gear box drive shaft key in the shaft keyway, and install the drive shaft and key in the engine coupling. Secure the gear box to the diaphragm ring.

See figure 1, and secure the coupling guard to the base assembly.

Position the eccentric cap of the plunger rod assembly over the eccentric cam of the gear box assembly, and install the snap ring securing the plunger rod assembly.

Secure the diaphragm pot assembly to the diaphragm ring, making certain that the lip of the diaphragm is seated evenly between the diaphragm pot and the diaphragm ring.

Secure the eccentric guard assembly to the gearbox assembly.

**ENGINE INSTALLATION (See figure 1)**

Install the engine coupling over the gear box drive shaft key and drive shaft, and secure the engine to the base assembly.

Secure the coupling guard to the base assembly.

**LUBRICATION****Plunger Rod Assembly (see figure 3)****CAUTION**

The eccentric bearing (15) should be lubricated thoroughly after each 8 hours of operation. Failure to do so may cause the bearing to overheat and fail.

Lubricate the plunger rod assembly with Citgo #2 or equivalent automotive grease through the lubrication fittings (2 and 8), which are accessible through openings in the eccentric guard.

Apply sufficient grease to the upper lubrication fitting (2), so that grease escapes from the eccentric cap (1). Apply sufficient grease to the lower fitting (8) so that grease escapes from the top of the upper diaphragm plate (9).

**Gear Box**

Refer to figure 5, remove the hex head capscrew (2), lock washer (42), and flat washer (43) at the top of the gear box, and fill the oil cup (42) with a good grade of SAE 20-30 non-detergent motor oil to the midpoint of the oil cup sight gauge. Reinstall the hex head capscrew, lock washer and flat washer.

**OPERATION**

Make certain that all piping connections are secure, and open all connecting valves.

See Section C for operation.

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