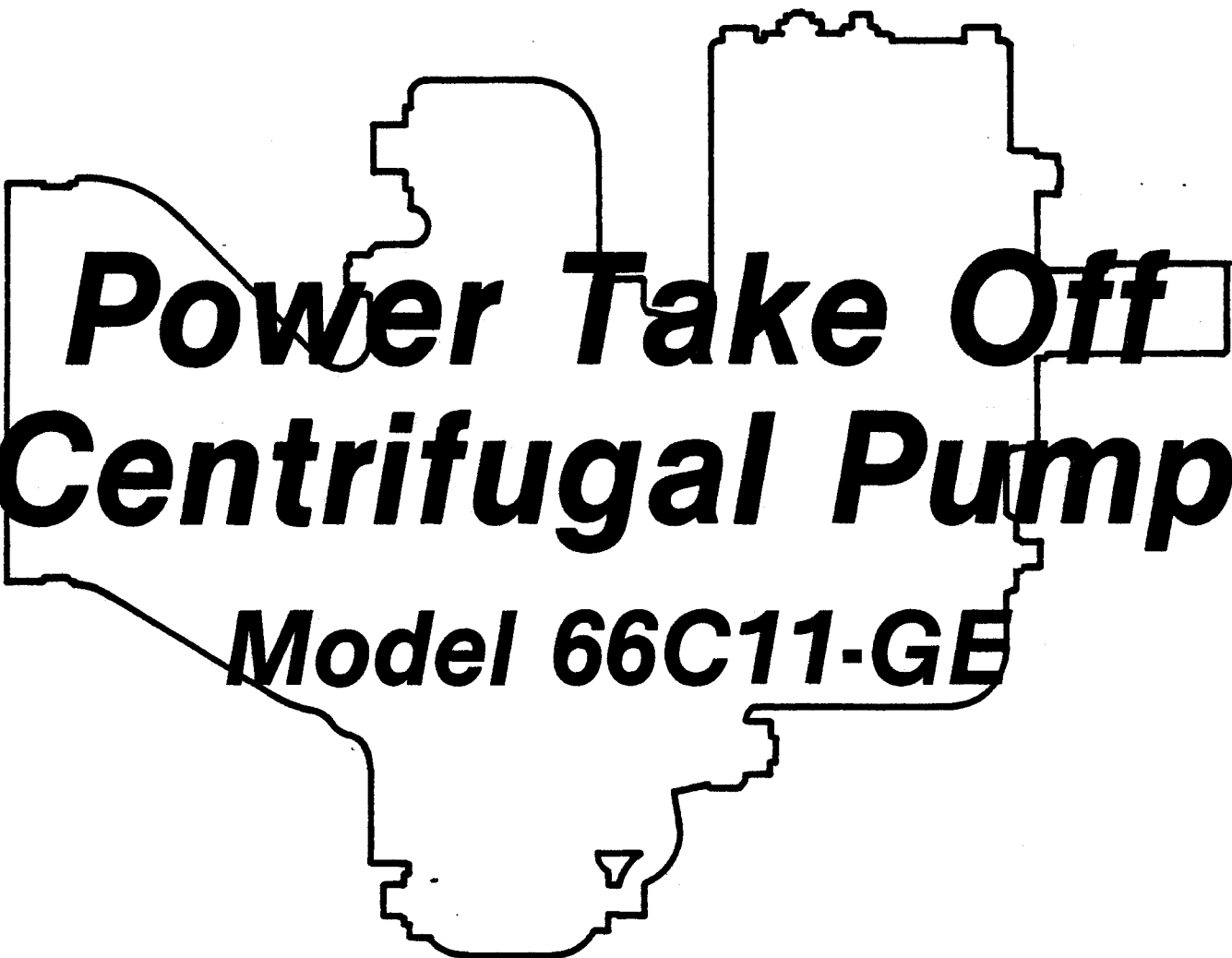


**INSTALLATION, OPERATION, PARTS LIST,
AND MAINTENANCE MANUAL**

Q



January 21, 1981



***Power Take Off
Centrifugal Pump
Model 66C11-GE***

The title is centered within a large, black outline of a centrifugal pump housing. The text is in a bold, italicized, sans-serif font.

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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

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

This pump is a 60 Series, semi-enclosed impeller, centrifugal model with straight-in suction without a suction check valve. This pump is suitable for pumping liquids which do not contain large entrained solids. For specific service, consult your Gorman-Rupp distributor or the Gorman-Rupp Company.

If there are any questions regarding the pump which are not covered in this manual or in other literature accompanying 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

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 60 SERIES PUMPS WITH POWER TAKE OFF DRIVE.

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the power source 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.

Do not attempt to pump any liquids for which this pump has not been designed.

After the pump has been installed, make certain that the pump and all piping connections are secure before attempting to operate it.

Do not operate the pump without a guard over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

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.



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 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.

INSTALLATION

Since pump installations vary, this section is intended only to summarize recommended installation practice. If there are any questions concerning a specific installation, 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, inspect the pump for damage which may have occurred during shipment.

- a. Check the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware. Since gaskets tend to shrink after drying, check for and tighten loose nuts and capscrews securing mating surfaces.
- c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates in the required direction.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

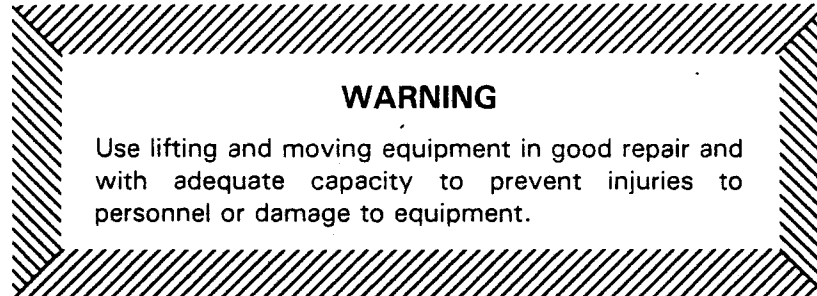
- d. Check all lubricant levels and lubricate as necessary. Refer to the MAINTENANCE AND REPAIR section of this manual.

POSITIONING THE PUMP

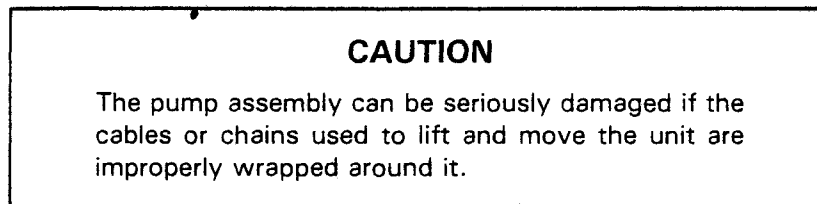
Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation. It may be necessary to support or shim the pump for level operation.

Lifting



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



SUCTION AND DISCHARGE PIPING

Materials

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

Line Configuration

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

Connections to Pump

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

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.

SUCTION LINES

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

Fittings

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

Strainers

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

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

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all threaded connections in the suction line should be sealed with pipe dope to ensure an airtight seal. In volatile and/or corrosive service, the pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to one and one-half times the diameter of the suction pipe.

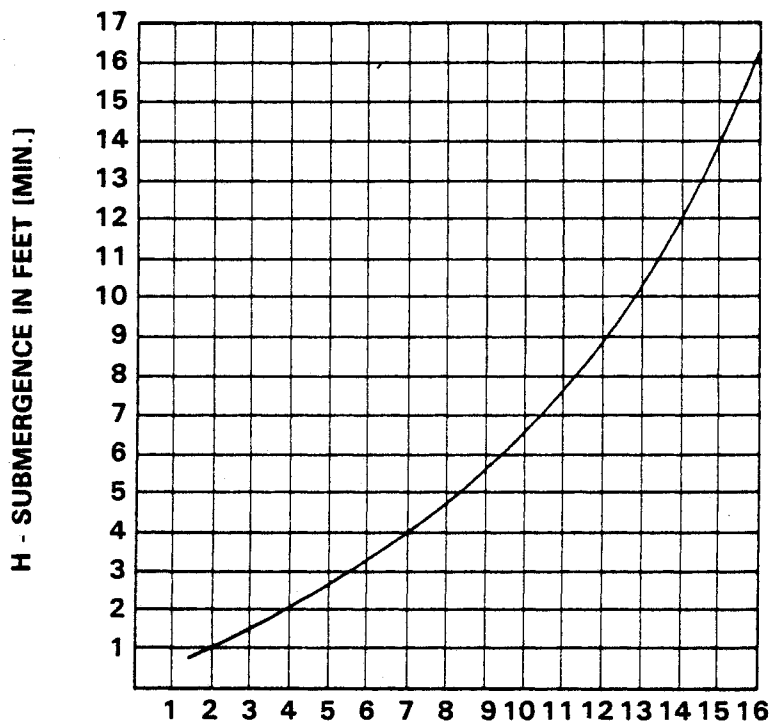
If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance one and one-half times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least three times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure 1 shows recommended minimum submergence vs. velocity.



$$\text{VELOCITY IN FEET PER SEC.} = \frac{\text{QUAN. [G.P.M.] x .321}}{\text{AREA}} \text{ OR } \frac{\text{G.P.M. x .4085}}{D^2}$$

Figure 1. Recommended Minimum Suction Line Submergence Vs. Velocity

DISCHARGE LINES

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

Valves

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

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

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

**WARNING**

When installing and/or aligning universal shaft assemblies, disconnect the power source to ensure that the pump will remain inoperative.

The alignment of the pump and its power source is critical for trouble-free mechanical operation. Before checking alignment, make sure that the gearbox mounting bolts are tight.

When using a universal joint drive shaft assembly to connect the pump to a PTO, install, support, and align the drive shaft in accordance with the manufacturer's instructions. The pump and the drive power source are generally positioned so that shaft centerlines are parallel and horizontal. The maximum operating angle should not exceed 15 degrees (see figure 1).

Check the direction of PTO rotation before starting the pump. The drive shaft must rotate in the direction shown on the body of the pump, gearbox, and/or decals, tags, and labels.

**WARNING**

Do not operate the pump without a guard over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

LUGS MUST BE IN LINE, REGARDLESS
OF OPERATING ANGLE SHOWN BELOW

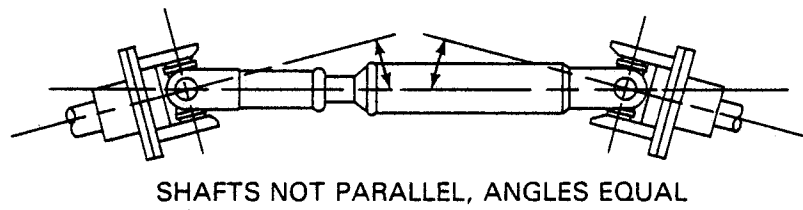
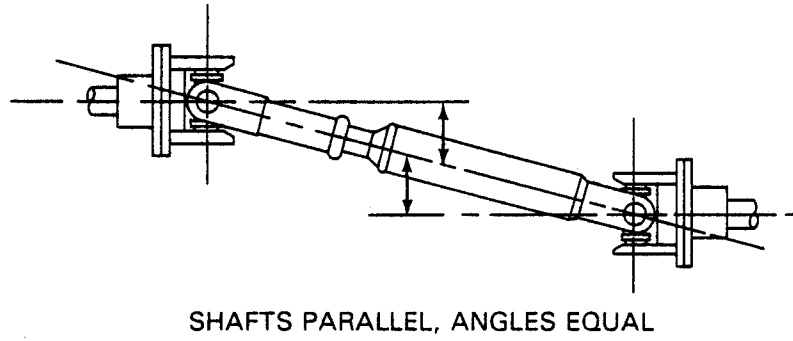
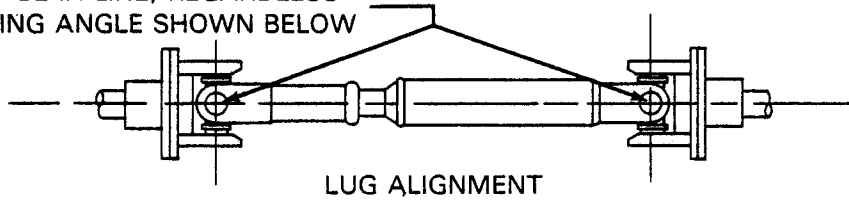


Figure 2. Proper Installation and Alignment of Universal Assembly

OPERATION

WARNING

Do not attempt to pump any liquids for which this pump has not been designed.

PRIMING

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

This pump should never be operated unless there is liquid in the volute.

CAUTION

Never operate this pump unless the volute is filled with liquid. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Add liquid to the volute housing:

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

WARNING

After filling the volute housing, 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.



STARTING

Rotation

The correct direction of pump rotation is indicated by an arrow on the pump body, and on the accompanying decal. If the pump is operated in the wrong direction, the impeller could become loosened from the shaft and seriously damage the pump.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

Consult the operating manual furnished with the power source before attempting to start the power source.

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.

Overheating

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

Pump Vacuum Check

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

With the pump inoperative, install a vacuum gauge in the suction side of the pump, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches or more of mercury. If it does not, check for air leaks in the seal or gasket.

Open the suction line, and read the vacuum gauge with the pump primed and at operating speed. Shut off the pump, and read the gauge again to determine if the vacuum remains at the maximum developed by the pump. If the vacuum falls off rapidly, an air leak exists; check to make certain that the air leak is not from the vacuum gauge connection.

Stopping

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

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze 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, operate the pump 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 gearbox 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 gearbox 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 or universal joint misalignment, or by excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.



TROUBLESHOOTING

WARNING

Before attempting to open or service the pump:

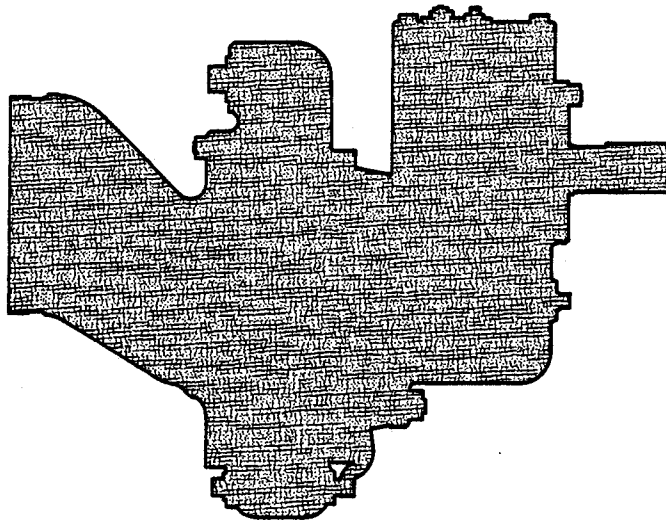
1. Consult pump service manual.
2. Disconnect the power source to ensure that the pump will remain inoperative.
3. Allow pump to cool if overheated.
4. Close suction and discharge valves.
5. Drain pump.

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>Leaking or worn seal or pump gasket.</p> <p>Suction lift or discharge head too high.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check piping installation.</p> <p>Check strainer and clean if necessary.</p>
<p>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE</p>	<p>Air leak in suction line.</p> <p>Suction intake not submerged at proper level or sump too small.</p> <p>Lining of suction hose collapsed.</p> <p>Impeller or other wearing parts worn or damaged.</p> <p>Impeller clogged.</p> <p>Pump speed too slow.</p> <p>Discharge head too high.</p> <p>Suction lift too high.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Check installation and correct as needed. Check submergence chart, Section B.</p> <p>Replace suction hose.</p> <p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p> <p>Free impeller of debris.</p> <p>Check driver output. Check universal joint drive for slippage.</p> <p>Reduce head.</p> <p>Reduce suction lift.</p> <p>Check strainer and clean if necessary.</p>

Trouble	Possible Cause	Probable Remedy
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont)	Leaking or worn seal or pump gaskets.	Check pump vacuum. Replace leaking or worn seal or pump gaskets.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high. Discharge head too low. Liquid solution too thick.	Check driver output; check that the universal joint drive is properly installed. Adjust discharge valve. Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run power source at maximum governed speed.
EXCESSIVE NOISE	Cavitation in pump. Pumping entrained air. Pump or drive not securely mounted. Impeller clogged or damaged.	Reduce suction lift and/or friction losses in suction line. Locate and eliminate source of air bubble. Secure mounting hardware. Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits. Low or incorrect lubricant. Suction and discharge lines not properly supported. Universal joint drive misaligned.	Check bearing temperature frequently to monitor any increase. Check for proper type and level of lubricant. Check piping installation for proper support. Align drive.

Power Take Off Centrifugal Pump

Model 66C11-GE



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

SECTIONAL DRAWING

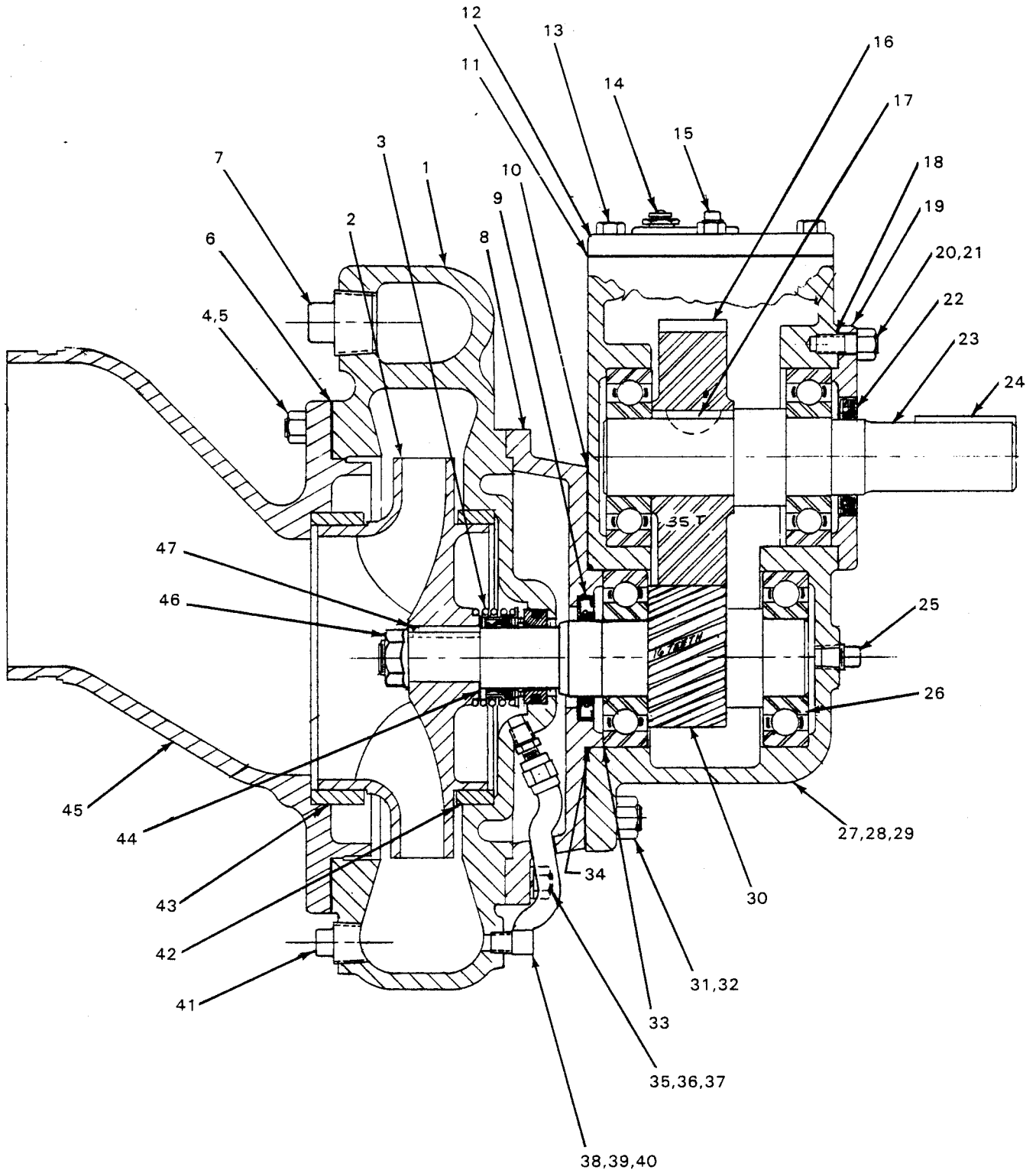


Figure 1. Pump Model 66C11-GE



PARTS LIST

PUMP MODEL 66C11-GE

(From S/N 467346 up)

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

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	VOLUTE HOUSING	9007-B	11000	1	31	STUD	C-0807	15991	6
2	★IMPELLER	8967-B	14000	1	32	HEX NUT	D-08	15991	6
3	★SEAL ASSEMBLY	25271-886	—	1	33	★BEARING SHIM SET	8543	15990	1
4	STUD	C-0606	15991	12			8543-A	15990	1
5	HEX NUT	D-06	15991	12			8543-B	15990	1
6	★SUCTION FLANGE GSKT	8376-G	20000	1	34	★ADAPTER O-RING	S-2085	—	1
7	PIPE PLUG	P-16	11991	1	35	STUD	C-0606	15991	8
8	ADAPTER	10880	10010	1	36	HEX NUT	D-06	15991	8
9	★OIL SEAL	S-2007	—	1	37	LOCKWASHER	J-06	15991	8
10	★ADAPTER GASKET	8377-G	18000	1	38	STREET ELBOW	S-0514	—	1
11	★COVER PLATE GASKET	10210-G	18000	1	39	HOSE END	S-1669	—	1
12	COVER PLATE ASSEMBLY	10210-A	24020	1	40	HOSE END SWIVEL	S-1670	—	1
13	HEX HEAD CAPSCREW	B-0503	15991	8	41	VOLUTE DRAIN PLUG	P-08	11991	1
14	PRESSURE RELIEF FITTING	S-1530	—	1	42	VOLUTE WEAR RING	8969	14000	1
15	PIPE PLUG	P-04	11990	2	43	★SUCTION HD WEAR RING	8968	14000	1
16	★DRIVE GEAR	10203	16070	1	44	★IMPELLER SHIM SET	2-X	17090	1
17	DRIVE GEAR KEY	AV-1009	15990	1	45	SUCTION HEAD	9356	11000	1
18	★BEARING CAP GASKET	10213-G	18000	1	46	IMPELLER LOCK NUT	S-2202	—	1
19	BEARING CAP	10213	10010	1	47	IMPELLER KEY	N-0405¼	15990	1
20	STUD	C-0605	15991	4	NOT SHOWN:				
21	HEX NUT	D-06	15991	4		NAME PLATE	2613-R	13990	1
22	★OIL SEAL	S-0506	—	1		NAME PLATE	2613-BL	13990	1
23	★DRIVE SHAFT	10209	16040	1		DIRECTION PLATE	2613-BM	00000	1
24	SHAFT KEY	N-0508	15990	1		STUD	C-1008	15991	4
25	PIPE PLUG	P-06	11990	1		HEX NUT	D-10	15991	4
26	★BALL BEARING	S-1080	—	4		KEY	N-0405½	15990	1
27	GEARBOX HOUSING	10200	10010	1		ELBOW	S-1061	—	1
28	PIPE PLUG not shown	P-06	11990	1		★HOSE	31411-068	—	1
29	MAG PIPE PLUG not shown	PM-06	11990	1		★GASKET	8945-G	20000	1
30	★PINION SHAFT	10202-A	16074	1		DRIVE SCREW	BM#04-03	15990	8

★INDICATES PARTS RECOMMENDED FOR STOCK

CANADIAN SERIAL NO. AND UP

PUMP, SEAL, AND GEARBOX DISASSEMBLY AND REASSEMBLY

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

Pump Disassembly

WARNING

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect the power source 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.

Disconnect the power source, making certain that the pump will remain inoperative while it is being serviced, and close all connecting valves.

Remove the volute housing drain plug (41) to drain the pump. Clean and reinstall the drain plug.

For access to the impeller (2) and the seal assembly (3), disconnect the hex nuts (5) securing the suction head (45) to the volute housing (1), and separate the assemblies.

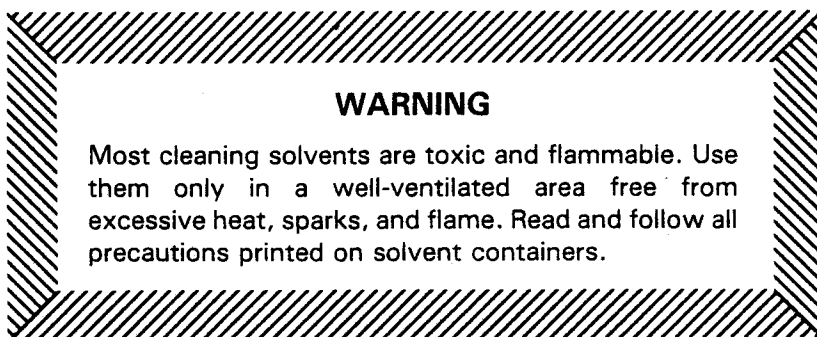
To remove the impeller, remove the impeller lock nut (46). Slide the impeller off the shaft, retaining the impeller key (47). Use caution when sliding the impeller off the shaft; pressure on the seal spring will be released as the impeller is removed.

Remove the impeller shims (44). For ease of reassembly, tag and tie the shims, or measure and record their thickness.

Seal Disassembly

Using a stiff wire with a hooked end if necessary, remove the seal components.

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

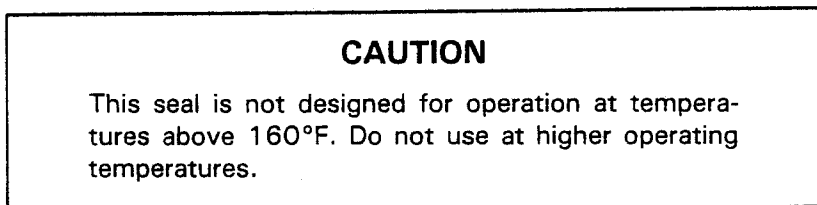


Seal Reassembly

If the gearbox is to be serviced or disassembled, do not reassemble the seal or the pump at this time.

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

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. If any components are worn, replace the complete seal; never mix old and new seal parts.



See figure 2 for the correct order of installation of seal components.

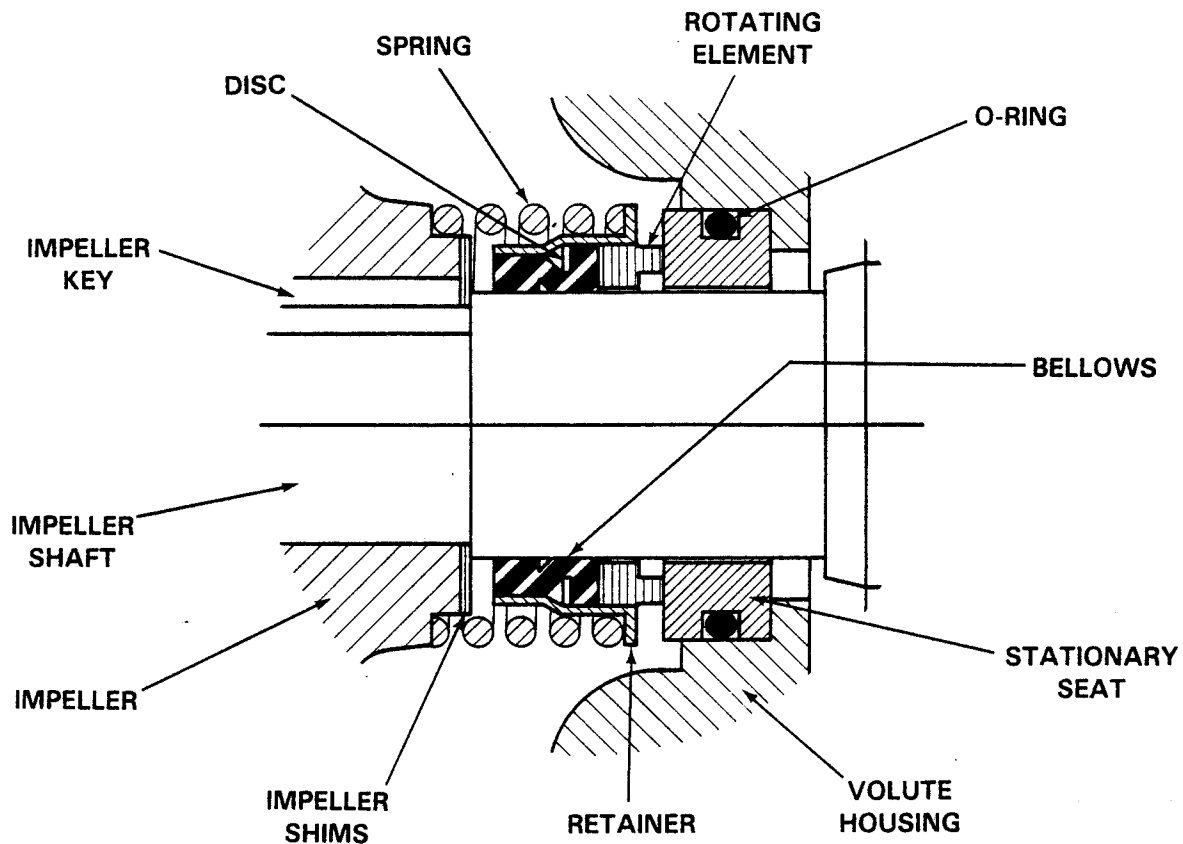


Figure 2. 25271-886 Seal Assembly

Place a drop of light lubricating oil on the lapped faces of the seal and lubricate the bellows with soft grease or oil. Install the seal as a complete unit.

Pump Reassembly

Inspect the volute wear ring (42) and the suction head wear ring (43), both of which are press fits, and replace them if scored or worn.

Install the impeller shims. For maximum pump efficiency, the impeller must be centered with the volute scroll. If the same number and thickness of shims are reinstalled as were removed, the impeller should be centered.

Inspect the impeller, and replace it if cracked or worn. Reinstall the impeller key, and position the impeller on the shaft. Reinstall the impeller lock nut.

Replace the suction head gasket (6). Reassemble the volute housing and the suction head, and secure the retaining hex nuts.

Turn the shaft to check that the impeller rotates freely. If the impeller binds, remove impeller shims until the impeller turns freely when the pump is assembled.

If the pump is to be put into service at this time, fill the volute and open all connecting valves. Make certain that all piping connections are tight before starting the pump. (See LUBRICATION at the end of this section.)

Gearbox Disassembly

Refer to **Pump Disassembly** and **Seal Disassembly** sections for instructions on draining the pump and removing the impeller and seal assembly.

Drain the gearbox by removing the magnetic pipe plug (29). Clean and reinstall the plug.

Disengage the hex nuts (32) securing the gearbox assembly to the adapter (8), and separate the pump and gearbox assemblies.

Disengage the hex head capscrews (13) and remove the cover plate assembly (12).

Disengage the hex nuts (21) securing the drive shaft bearing cap (19) to the gearbox housing (27), and remove the bearing cap and oil seal (22). Pull the drive shaft (23) and outboard ball bearing (26) from the gearbox housing, retaining ball bearing, drive gear (16), and drive gear key (17) as they come free.

Remove the bearing shims (33) from the inboard end of the pinion shaft. Remove the pipe plug (25) from the outboard end of the gearbox housing, and use an arbor press to force the pinion shaft (30) and ball bearings from the gearbox housing.

Gearbox Reassembly

Inspect the drive and pinion shafts, the drive gear, the ball bearings, and oil seal for wear, and replace as necessary.

Reinstall the pinion shaft outboard bearing, making certain that it seats squarely against the shaft shoulder. Reinstall the pinion shaft inboard bearing, making certain that it seats squarely against the pinion gear. Reinstall the shaft in the gearbox housing so that the outboard bearing seats squarely in the bore. Reinstall the pipe plug at the outboard end.



Position the drive shaft inboard ball bearing in the gearbox housing, making certain that it seats squarely. Position the drive gear in the housing, making certain that it engages the pinion gear. Install the drive gear key, and seat the drive shaft in the drive gear inboard bearing. Install the outboard bearing, making certain that it seats against the shaft shoulder. Position the oil seal as shown in figure 1, replace the bearing cap gasket (18), and secure the bearing cap to the gearbox housing.

Inspect the adapter oil seal (9), and replace as necessary. Reinstall the oil seal as shown in figure 1. Reinstall the bearing shims.

Replace the adapter gasket (10) and engage and tighten the hex nuts securing the gearbox assembly to the adapter.

Measure shaft end play, and add or remove bearing shims to arrive at the recommended shaft end play of .005 to .012 inch.

Replace the cover plate gasket (11) and secure the cover plate assembly to the gearbox housing.

See **Seal Reassembly** and **Pump Reassembly**, and reassemble the seal, impeller, and the pump.

Lubricate the gearbox (see LUBRICATION), fill the volute through the volute fill plug (7), and open all connecting valves. Make certain that all piping connections are tight before starting the pump.

LUBRICATION

Seal Assembly

The seal is lubricated by the medium being pumped.

Gearbox

Remove the pipe plug (15) and add 2 ounces of Molykote 'M' Gear Guard, and 23 ounces of SAE No. 90 non-detergent motor oil, or sufficient oil to reach the midpoint on the shaft. Reinstall the pipe plug.

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