

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

A E



January 26, 1981



***Power Take Off
Centrifugal Pump
Model 68A2-G***

The title text is centered within a large, black-outlined shape that represents the profile of a centrifugal pump housing. The shape is irregular, with a wide top section, a narrower middle section, and a bottom section that tapers to a point on the left and has a vertical section on the right.

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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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.

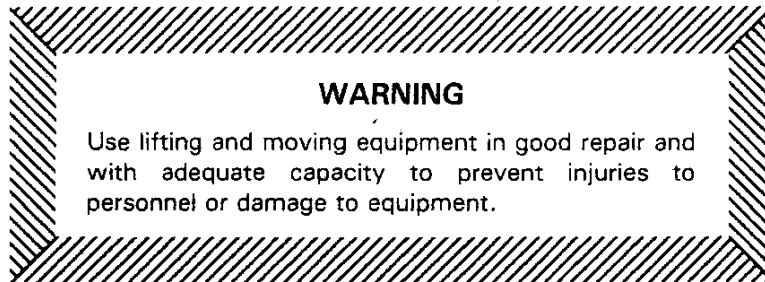
POSITIONING THE PUMP

Mounting

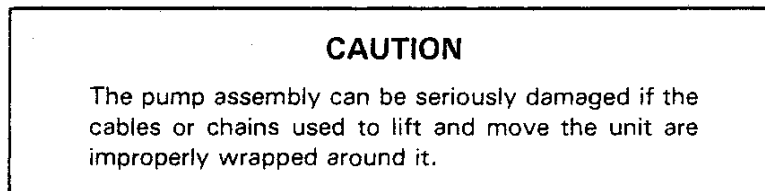
Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation. It may be necessary to support or shim the pump for level operation.



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.

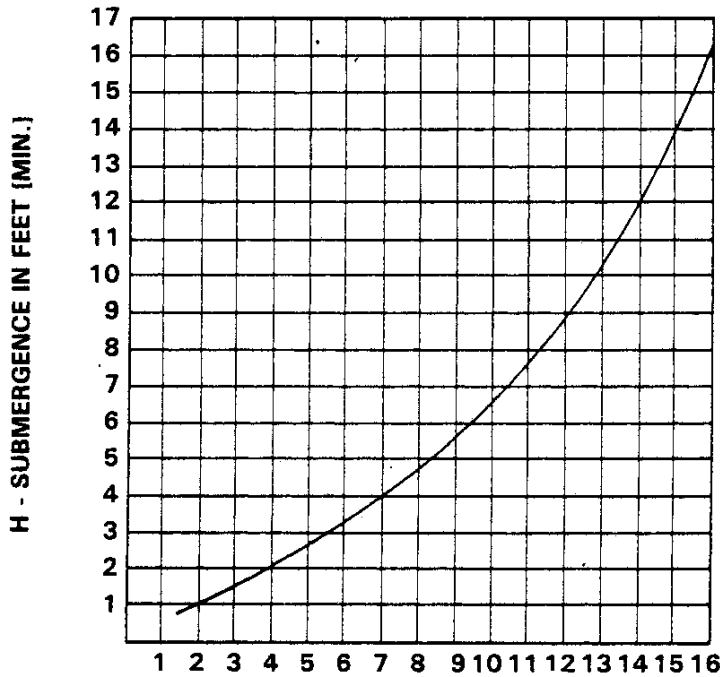
If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance one and one-half times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

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

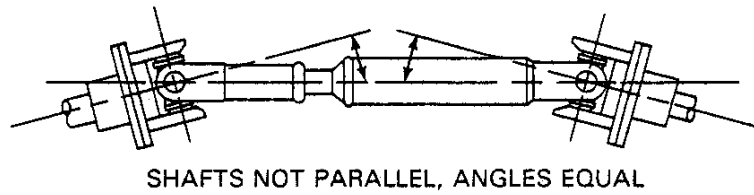
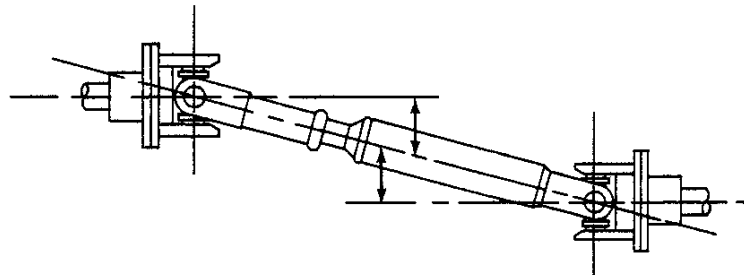
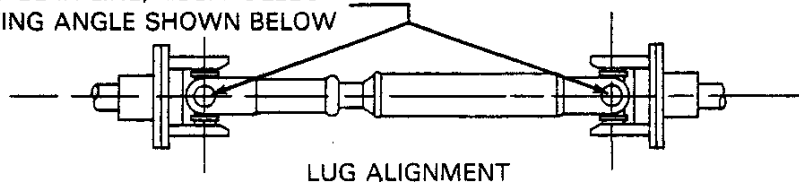


Figure 2. Proper Installation and Alignment of Universal Assembly

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.

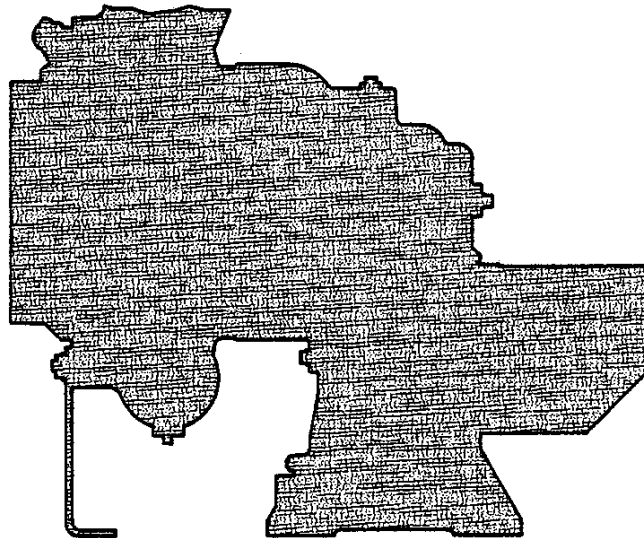
Trouble	Possible Cause	Probable Remedy
PUMP FAILS TO PRIME	<p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Suction lift or discharge head too high.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p> <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>
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	<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 68A2-G



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

SECTIONAL DRAWING

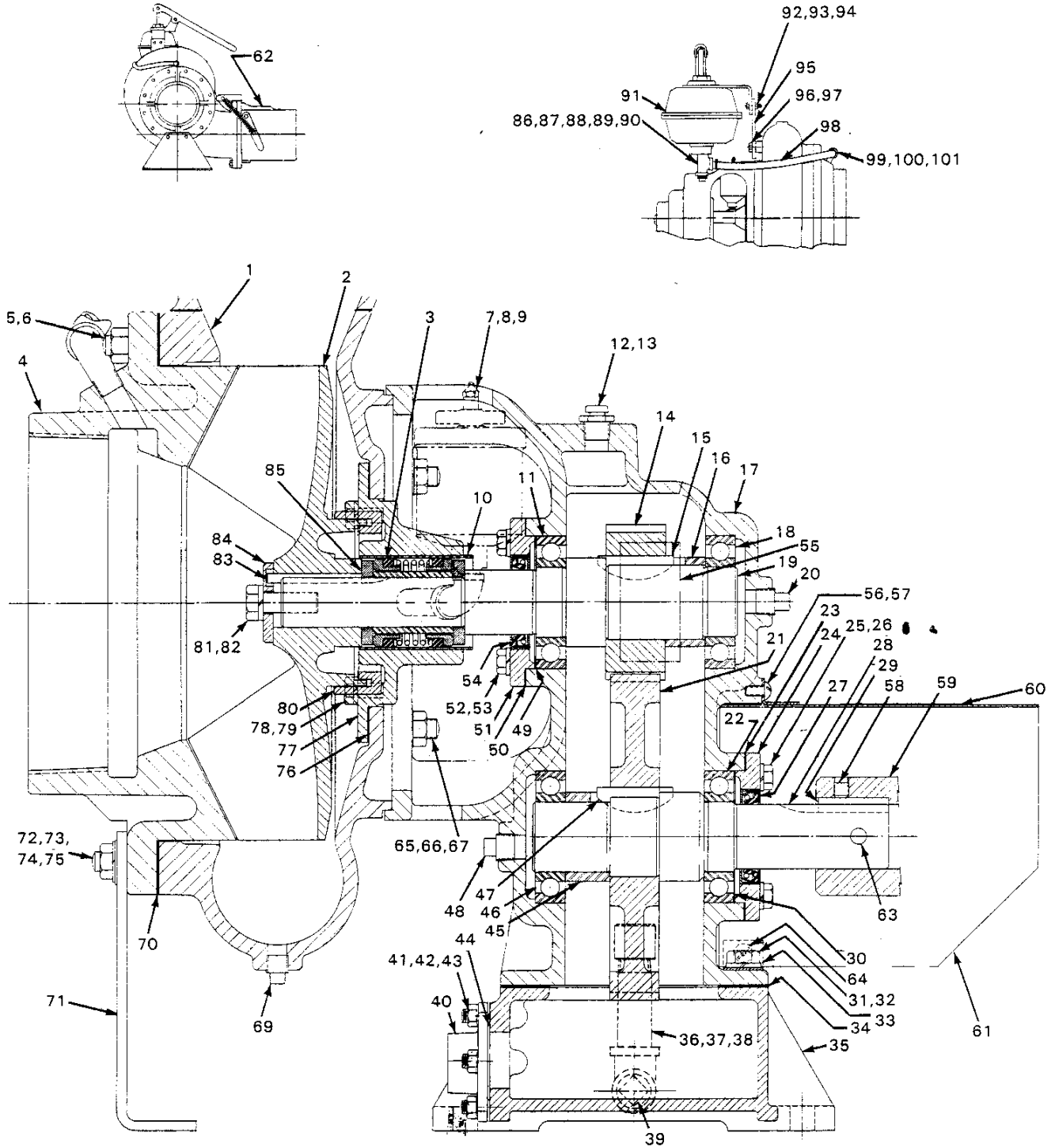


Figure 1. Pump Model 68A2-G



PARTS LIST

PUMP MODEL 68A2-G

(From S/N 363010 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	7298-B	10010	1		HEX HEAD CAPSCREW	B-0606	15991	2
2	*IMPELLER	7297	10010	1		HEX HEAD CAPSCREW	B-1211	15991	6
3	*SEAL ASSEMBLY	GS-1250	-	1		STUD	C-1211	15991	2
4	SUCTION HEAD	7296	10010	1		HEX NUT	D-06	15991	1
5	STUD	C-0808	15991	10		HEX NUT	D-12	15991	8
6	HEX NUT	D-08	15991	10		LOCKWASHER	J-06	15991	4
7	HEAVY PIPE NIPPLE	THA-0416	15070	1		FLAT WASHER	K-06	15991	2
8	PIPE ELBOW	R-04	11990	1		FLAT WASHER	K-08	15991	1
9	GREASE CUP	S-1509	-	1		KEY	N-0208	15990	1
10	*SEAL LINER	2205-A	14080	1		PIPE PLUG	P-04	11990	1
	GEARBOX ASSEMBLY	GRP44-06	-	1		PIPE PLUG	P-04	11990	1
11	* BALL BEARING	S-1096	-	1	*	PACKING RING	S-0378	-	2
12	AIR VENT FITTING	S-2162	-	1		KEY	AV-0404	15990	1
13	REDUCING PIPE BUSHING	AP-0602	15990	1		ALLEN HEAD SETSCREW	GA-0401	15990	2
14	* PINION GEAR	7311	16070	1		ALLEN HEAD SETSCREW	GA-0401½	15990	1
15	PINION GEAR KEY	AV-1622	15990	1	63	COTTER PIN	M-0616	15990	1
16	SPACER	7518	15990	1	64	PAN HEAD TAPSCREW	BP#14-02	15990	2
17	GEARBOX HOUSING	6412	10010	1	65	LOCKWASHER	J-08	15991	4
18	* BALL BEARING	S-1096	-	1	66	HEX NUT	D-08	15991	4
19	* PINION SHAFT	7312	16040	1	67	STUD	C-0808	15991	4
20	PIPE PLUG	P-06	11990	1	68	DOES NOT APPLY			
21	* DRIVE GEAR	7684	16040	1	69	VOLUTE DRAIN PLUG	P-06	11900	1
22	* BALL BEARING	S-1096	-	1	70	*SUCTION HEAD GASKET	1215-G	18000	1
23	* BEARING CAP GASKET	6404-G	18000	1	71	VOLUTE SUPPORT	7453	15990	1
24	DRIVE BEARING CAP	6404	10010	1	72	FLAT WASHER	K-08	15991	2
25	HEX HEAD CAPSCREW	B-0604	15991	4	73	LOCKWASHER	J-08	15991	2
26	LOCKWASHER	J-08	15991	4	74	HEX NUT	D-08	15991	2
27	* OIL SEAL	S-959	-	1	75	STUD	C-0810	15991	2
28	* DRIVE SHAFT	6405	16040	1	76	*SEAL PLATE GASKET	9479-G	18000	1
29	SHAFT KEY	N-0608	15990	1	77	SEAL PLATE	9479	10010	1
30	* BEARING SHIM SET	8544	15990	1	78	LOCKWASHER	J-06	15991	4
31	HEX HEAD CAPSCREW	B-0804	15991	8	79	HEX HEAD CAPSCREW	B-0603	14990	4
32	LOCKWASHER	J-08	15991	8	80	*WEAR RING	6520	14000	1
33	BRACKET	6408-C	15990	1	81	IMPELLER LOCKWASHER	J-08	15991	1
34	* GEARBOX GASKET	6409-G	18000	1	82	IMPELLER CAPSCREW	BT-0806	15991	1
35	BASE	6409	10010	1	83	IMPELLER KEY	N-0409½	15990	1
36	SERVICE TEE	US-08	11990	1	84	IMPELLER WASHER	6403	15991	1
37	DIPSTICK	42111-319	-	1	85	*IMPELLER SHIM SET	37-J	17090	1
38	PIPE NIPPLE	T-0812	15070	1	86	HOSE CLAMP	S-887	-	1
39	GEARBOX DRAIN PLUG	P-08	11990	1	87	PIPE NIPPLE	2434	15070	1
40	COVER PLATE	6518-A	15020	1	88	REDUCING PIPE BUSHING	AP-0806	11990	1
41	HEX NUT	D-06	15991	6	89	PIPE PLUG	P-08	11990	1
42	LOCKWASHER	J-06	15991	6	90	SERVICE TEE	US-08	11990	1
43	STUD	C-0505	15991	6	91	PRIMING PUMP	S-1249	-	1
44	* COVER GASKET	6518-G	18000	1	92	HEX HEAD CAPSCREW	B-1005	15991	2
45	SPACER SLEEVE	6414	15990	1	93	LOCKWASHER	J-10	15991	2
46	* BALL BEARING	S-1096	-	1	94	HEX NUT	D-10	15991	2
47	DRIVE GEAR KEY	AV-1622	15990	1	95	PRIMER BRACKET	12387	15990	1
48	PIPE PLUG	P-06	11990	1	96	HEX HEAD CAPSCREW	B-0603	15991	2
49	* BEARING SHIM SET	8544	15990	1	97	LOCKWASHER	J-06	15991	2
50	* BEARING CAP GASKET	6404-G	18000	1	98	*HOSE	31412-113	-	1
51	BEARING CAP	6404	10010	1	99	STREET ELBOW	RS-06	11990	1
52	LOCKWASHER	J-06	15991	4	100	PIPE NIPPLE	2434	15070	1
53	HEX HEAD CAPSCREW	B-0604	15991	4	101	HOSE CLAMP	S-887	-	1
54	* OIL SEAL	S-959	-	1		NOT SHOWN:			
55	GUARD WARNING STICKER	38816-063	-	1		NAME PLATE	2613-R	13990	1
56	ROUND HEAD MACHINE SCREW	X-0402	15991	1		AXLE PLATE	7451-A	15990	1
57	LOCKWASHER	J-04	15991	1		AXLE PLATE	7451-B	15990	1
58	ALLEN HEAD SETSCREW	GA-0601½	15990	1		AXLE	7452	15000	1
59	UNIVERSAL ASSEMBLY	S-1413-A	-	1		BASE	7454	24000	1
60	GUARD WARNING STICKER	38816-062	-	1		MOUNTING HARDWARE			
61	UNIVERSAL GUARD	6408	15990	1		HEX HEAD CAPSCREW	B-0807	15991	4
62	CHECK VALVE ASSEMBLY	GRP14-08-B	-	1		HEX NUT	D-08	15991	4
	* ADJUSTING SHIM SET	513-A	17090	1		LOCKWASHER	J-08	15991	4
	PACKING NUT	3847	14100	1		FLAT WASHER	K-08	15991	4
	SHAFT	3848-B	17010	1		STRAINER	7531	-	1
	* EXTENSION SPRING	3849	16030	1		PRESSURE GAUGE	S-0180	-	1
	SPACER	3865	15070	2		FLAT WASHER	S-1532	-	4
	HANDLE	5364	11000	1		PNEU WHEEL	S-2005	-	2
	BODY	7306-A	10010	1		COTTER PIN	M-0306	15990	2
	ARM	7458-A	15990	1		HEX HEAD CAPSCREW	B-0805	15991	6
	* BUSHING	11573	15030	1		HEX NUT	D-08	15991	6
	WEIGHT	11588	10010	1		SQUARE HEAD SETSCREW	G-0604	15990	2
	* COVER GASKET	11802-G	18000	1		PIPE PLUG	P-04	11990	2
	MOLD	12166	24010	1		HEX HEAD CAPSCREW	B-0604	15991	12
	NYLOCK CAPSCREW	BT-0806	15991	1		LOCKWASHER	J-06	15991	2
	SPRING BRACKET	13706	15990	1		LOCKWASHER	J-08	15991	4
	HEX HEAD CAPSCREW	B-0603	14990	2		FLAT WASHER	K-08	15991	2
						PIPE PLUG	P-08	11990	2

*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 universal joint guard (61) by removing the machine screw (56) and tapscrews (64). Disengage the universal assembly (59) by removing the cotter pin (63) and loosening the setscrew (58), retaining the shaft key as the units come free.

Remove the volute housing drain plug (69) to drain the pump. Clean and reinstall the drain plug.

For access to the impeller (2) and seal assembly (3), disconnect the hex nuts (6) securing the suction head (4) to the volute housing (1), and separate the assemblies. If desired, disconnect the suction line and hand primer line from the suction head.

To remove the impeller, remove the impeller capscrew (82), and impeller washers (81 and 84). Slide the impeller off the shaft, retaining the key (83). Use caution when sliding the impeller off the shaft; tension on the seal spring will be released as the impeller is removed.

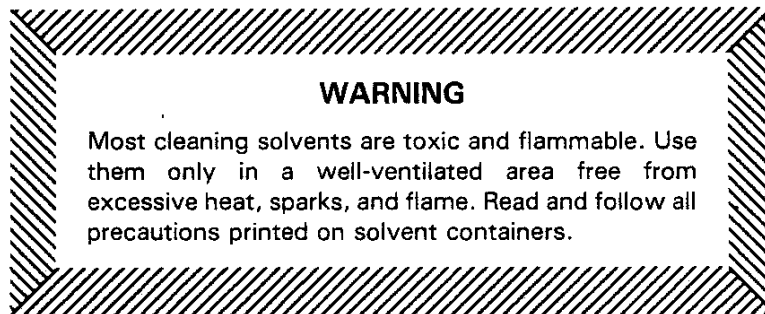
Remove the impeller shims (85). For ease of reassembly, tag and tie the shims, or measure and record their thickness.

Seal Disassembly

Before removing the seal assembly, turn the cross arm on the seal grease cup (9) clockwise until it rests against the cover (see figure 3), to prevent the grease in the cup from escaping after the seal is removed.

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.

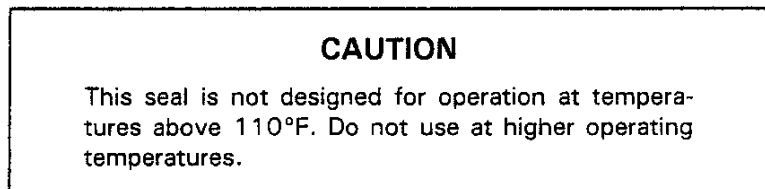


Seal Reassembly

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.



Pump Reassembly

Inspect the volute wear ring (80), which is a press fit, and replace it if scored or worn.

Reinstall 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 replaced 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 washers; reinstall and tighten the impeller locknut.

Replace the suction head gasket (70). 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. Reconnect the universal assembly, and reinstall the universal guard. 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 drain plug (39). Clean and reinstall the plug.

Disengage the hex nuts (66) securing the gearbox assembly to the volute housing, and separate the pump and gearbox assemblies.

Disengage the hex head capscrews (31) securing the gearbox housing (17) to the gearbox base (35).

Disengage the hex head capscrews (25) securing the drive shaft bearing cap (24) to the gearbox housing, and remove the bearing cap, oil seal (27), and bearing shim set (30). Remove the pipe plug (48) at the inboard end of the gearbox, and use an arbor press to force the drive shaft (28) and ball bearings (22 and 46) from the gearbox housing, retaining the drive gear (21), spacer sleeve (45) and gear key (47) as they come free.

Disengage the hex head capscrews (53) securing the pinion shaft bearing cap (51) to the gearbox housing, and remove the bearing cap, oil seal (54), and bearing shim set (49). Remove the pipe plug (20) at the outboard end of the gearbox, and use an arbor press to force the pinion shaft (19), and ball bearings (11 and 18) from the gearbox housing, retaining the pinion gear (14), gear key (15), ball bearing, and spacer (16) as they come free.



Gearbox Reassembly

Inspect the drive and pinion shafts, the drive and pinion gears, the ball bearings, both oil seals, and the shim sets for wear, and replace as necessary.

Reinstall the pinion shaft outboard ball bearing in the gearbox housing bore, making certain that it seats squarely. Position the gear key on the pinion shaft, and position the shaft in the gearbox housing. Reinstall the pinion gear and spacer, seat the shaft in the outboard bearing, and reinstall the inboard bearing, making certain that it seats squarely against the shaft shoulder. Replace the pipe plug at the outboard end. Reinstall the bearing shim set; and replace the bearing cap gasket (50). Position the oil seal in the bearing cap as shown in figure 1, and secure the bearing cap to the gearbox housing. Check shaft end play, and add or remove bearing shims to arrive at the recommended end play of .005 to .012 inch.

Reinstall the drive shaft inboard ball bearing in the gearbox housing bore, making certain that it seats squarely, and install the inboard pipe plug. Install the drive gear key on the drive shaft. Position the shaft in the gearbox housing, and install the drive gear, making certain that it engages the pinion gear. Install the spacer and seat the shaft in the inboard bearing, making certain that the bearing, spacer, gear and shaft are seated squarely. Reinstall the outboard bearing, making certain that it seats squarely against the shaft shoulder. Reinstall the bearing shim set, and replace the bearing cap gasket (23). Position the oil seal in the bearing cap as shown in figure 1, and secure the bearing cap to the gearbox housing. Check shaft end play, and add or remove bearing shims to arrive at the recommended end play of .005 to .012 inch.

Replace the gearbox gasket (34) and secure the gearbox to the base.

Engage and tighten the hex nuts securing the gearbox assembly to the volute housing.

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

Lubricate the gearbox (see LUBRICATION), fill the volute, and open all connecting valves. Make certain that all piping connections are tight. Reconnect the universal assembly, and reinstall the universal guard. Before starting the pump, see LUBRICATION.

LUBRICATION**Seal Assembly**

Before starting the pump, fill the seal grease cup through the grease fitting with a good grade of No. 2 pressure gun grease until grease escapes from the relief hole. Turn the grease cup arm counterclockwise until it is at the top of the stem; this will release the spring to apply grease to the seal (see figure 3).

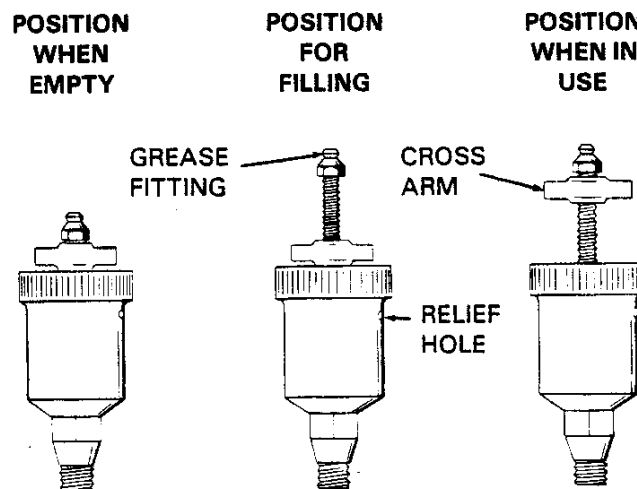


Figure 3. Automatic Lubricating Grease Cup

Gearbox

Remove the air vent fitting (12) and reducing pipe bushing (13). Add 4 ounces of Molykote 'M' Gear Guard, and fill the gearbox with SAE No.90 non-detergent motor oil to the proper level as indicated on the dipstick (37), approximately 1 gallon and 12 ounces. Reinstall the air vent fitting and pipe bushing. Check the oil level regularly.

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