



10 SERIES PUMPS

13D, 14A, 14C, 14D And 16D Closed Coupled
Electric Motor Or Engine Driven Pumps

with Self Lubricated Seal or Grease Seal

**MANUAL
PART 3 of 3**

**MAINTENANCE
AND
REPAIR
WITH
TROUBLESHOOTING**

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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

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The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

INTRODUCTION

Thank You for purchasing a Gorman-Rupp 10 Series Pump. **Read this manual** carefully to learn how to safely maintain and service your pump. Failure to do so could result in personal injury or damage to the pump.

A set of three manuals accompanies your pump. The Installation/Operation Manual contains essential information on installing and operating the pump. The Parts List Manual provides a performance curve, a pump model cross-section drawing, and parts list for your pump.

This Maintenance and Repair Manual provides troubleshooting and maintenance instructions required to properly diagnose operational problems, and to service the pump components.

As described on the following page, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during

maintenance of the pump. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

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 the Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901--1217
 or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

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RECORDING MODEL AND SERIAL NUMBERS

Please record the pump model, serial number, voltage, and phase in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

Motor:

Voltage: _____

Phase: _____

Engine:

Model: _____

Serial Number: _____

WARRANTY INFORMATION

The warranty provided with your pump is part of Gorman-Rupp's support program for customers who operate and maintain their equipment as described in this and the other accompanying literature. Please note that should the equipment be abused or modified to change its performance beyond the original factory specifications, the warranty will become void and any claim will be denied.

The following are used to alert personnel to procedures which require special attention, to those

which could damage equipment, and to those which could be dangerous to personnel:



DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.



CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY - SECTION A

This information applies to 10 Series electric motor or engine driven pumps. Refer to the manual accompanying the power source before attempting to begin operation.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.

This manual contains essential information on troubleshooting and maintaining the pump. In addition to this manual, see the separate literature covering installation and operation, pump parts, and any optional equipment shipped with the pump.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.

4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



Do not attempt to pump any liquids the pump has not been designed for, and which may damage the pump or endanger personnel as a result of pump failure. Consult the factory to determine compatibility between the pump and liquid.



Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.



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



Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will

deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.



WARNING!

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



WARNING!

These pumps may be used to handle products which if overheated could produce dangerous fumes. Use extreme caution when venting the pump, or when removing covers, plates, plugs, or fittings.



WARNING!

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



WARNING!

If the pump is used to pump materials which could cause serious illness or injury through direct exposure or emitted fumes, wear protective clothing, such as rubber gloves, face mask, and rubber apron, as necessary before disassembling the pump or piping.



WARNING!

Do not operate the pump without shields and/or guards in place over the drive shafts, belts, and/or couplings, or

other rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.



WARNING!

If the pump is powered by an electric motor, do not operate a non-explosion proof motor in an explosive atmosphere. An explosion, which may cause severe personal injury or death, could result. Install, connect and operate the motor in accordance with the National Electric Code and all local codes. If there is a conflict between the instructions in the manual accompanying the unit and the National Electric Code or applicable local code, the National or Local code shall take precedence. All electrical equipment supplied with the pump conforms to applicable federal regulations and national codes in effect on the date of manufacture.



WARNING!

If the pump is electric motor driven, the electrical power used to operate this pump is high enough to cause injury or death. Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.



DANGER!

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

**WARNING!**

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

**WARNING!**

Never tamper with the engine governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for the pump is shown on the performance curve (see the Parts List Manual).

**CAUTION**

Pumps and related equipment must be installed and operated according to all national, local and industry standards.

TROUBLESHOOTING – SECTION B

Review all SAFETY information in Section A.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.

Table B-1 Troubleshooting Chart

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

Table B-1 Troubleshooting Chart (continued)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check driver output (engine driven models).
	Pump running backwards (electric motor driven models).	Check direction of rotation. Correct 3-phase wiring by interchanging any two motor leads at control box. (See Pump Rotation in the Installation and Operations Manual.)
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See INSTALLATION in the Installation and Operations manual.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check governor setting (engine driven models).
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	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.
	Suction check valve or foot valve clogged or binding.	Clean valve.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so

equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					
Legend: I = Inspect, Clean, Adjust, Repair or Replace as Necessary C = Clean R = Replace * Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.					

PUMP MAINTENANCE AND REPAIR – SECTION C

GENERAL INFORMATION

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.



Before attempting to install, operate, or service this pump, familiarize yourself with this manual, and with all other literature shipped with the pump. Unfamiliarity with all aspects of operation or maintenance could lead to destruction of equipment, injury or death to personnel.



Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. If slings or chains are used to move the pump or components, make sure that the load is balanced; otherwise serious personal injury or death could result. Suction and discharge hoses and piping must be removed from the pump before lifting.

The maintenance and repair instructions in this manual are keyed to the sectional views (Figure C–1 or C–2), and the corresponding parts identification list. Refer to the separate Parts List Manual for replacement parts.

Select a suitable location, preferably indoors, to perform required maintenance.

This Maintenance and Repair Manual provides troubleshooting and maintenance instructions required to properly diagnose operational problems, and to service the pump components. Maintenance instructions within this manual are limited to the pump hydraulic, priming and drive components only.

Check **TROUBLESHOOTING**, Section B to determine causes and remedies of pump problems. Disassemble the pump only as far as required.

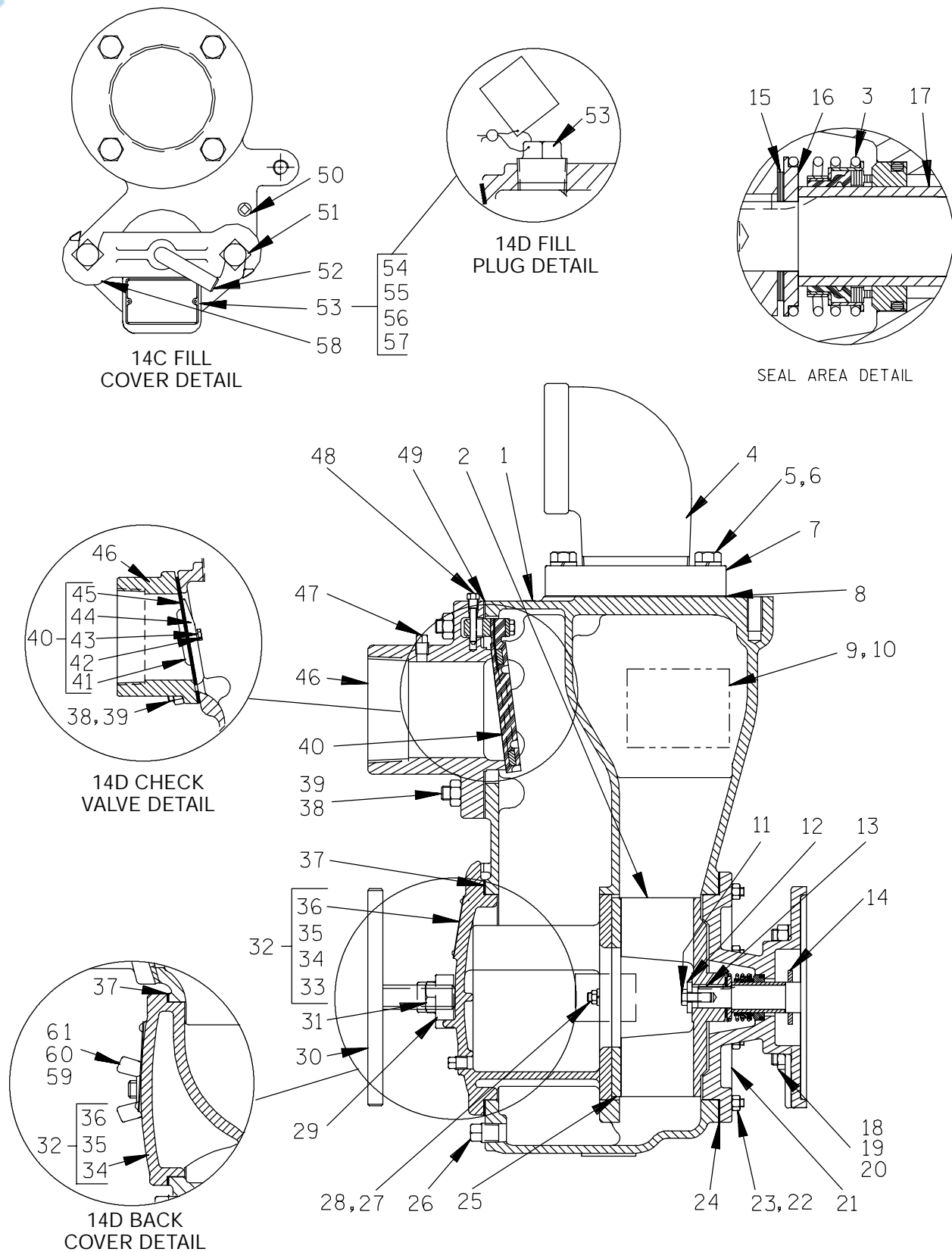
As described in the **SAFETY** Section, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established shop procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Lifting

Use lifting equipment with a capacity of **at least five times the weight of the pump**, including the weight of any options or customer-installed accessories. Discharge hose or piping **must** be removed before attempting to lift the pump.

For the approximate weight of your pump, refer to the pump specification data sheet or contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

SECTION DRAWING



**Figure C-1. Typical 14C And 14D Pump End Assembly
w/Self Lubricated Mechanical Seal**

Typical 14C And 14D Pump End Assembly w/Self Lubricated Mechanical Seal Parts Identification List

Refer to the separate Parts List Manual for serviceable parts, part numbers and quantities.

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1	PUMP CASING	32	BACK COVER PLATE ASSEMBLY
2	IMPELLER	33	– PIPE PLUG (IF REQUIRED)
3	SEAL ASSEMBLY	34	– BACK COVER
4	STREET ELBOW (IF REQUIRED)	35	– WARNING PLATE
5	HEX HEAD CAPSCREW	36	– DRIVE SCREW
6	LOCKWASHER OR FLAT WASHER (IF REQUIRED)	37	BACK COVER GASKET
7	DISCHARGE FLANGE	38	STUD
8	DISCHARGE FLANGE GASKET	39	HEX NUT
9	NAME PLATE	40	CHECK VALVE ASSEMBLY
10	DRIVE SCREW	41	– SMALL VALVE WEIGHT
11	HEX HD CAPSCREW (IF REQUIRED)	42	– HEX HEAD CAPSCREW
12	IMPELLER WASHER (IF REQUIRED)	43	– LOCKWASHER
13	IMP SHAFT KEY (IF REQUIRED)	44	– LARGE VALVE WEIGHT
14	SLINGER RING (IF REQUIRED)	45	– CHECK VALVE GASKET
15	IMPELLER SHIM SET	46	SUCTION FLANGE
16	SPRING CNTR WASHER (IF REQ.)	47	PIPE PLUG (IF REQUIRED)
17	SHAFT SLEEVE	48	CHECK VALVE PIN (IF REQUIRED)
18	STUD	49	SUCT FLANGE GSKT (IF REQUIRED)
19	LOCKWASHER OR FLAT WASHER	50	PIPE PLUG
20	HEX NUT	51	MACHINE BOLT
21	INTERMEDIATE	52	CLAMP BAR SCREW
22	STUD OR LOCKWASHER	53	FILL PLUG ASSEMBLY OR FILL COVER PLATE ASSY
23	HEX NUT OR HEX HD CAPSCREW	54	– COVER PLATE
24	CASING GSKT SET OR O-RING	55	– WARNING PLATE
25	WEAR PLATE ASSEMBLY	56	– DRIVE SCREW
26	CASING DRAIN PLUG	57	– COVER PLATE GASKET
27	LOCKWASHER	58	CLAMP BAR
28	HEX NUT	59	STUD
29	CLAMP BAR (IF REQUIRED)	60	FLAT WASHER
30	CLAMP BAR SCREW (IF REQUIRED)	61	WING NUT
31	MACHINE BOLT (IF REQUIRED)		

SECTION DRAWING

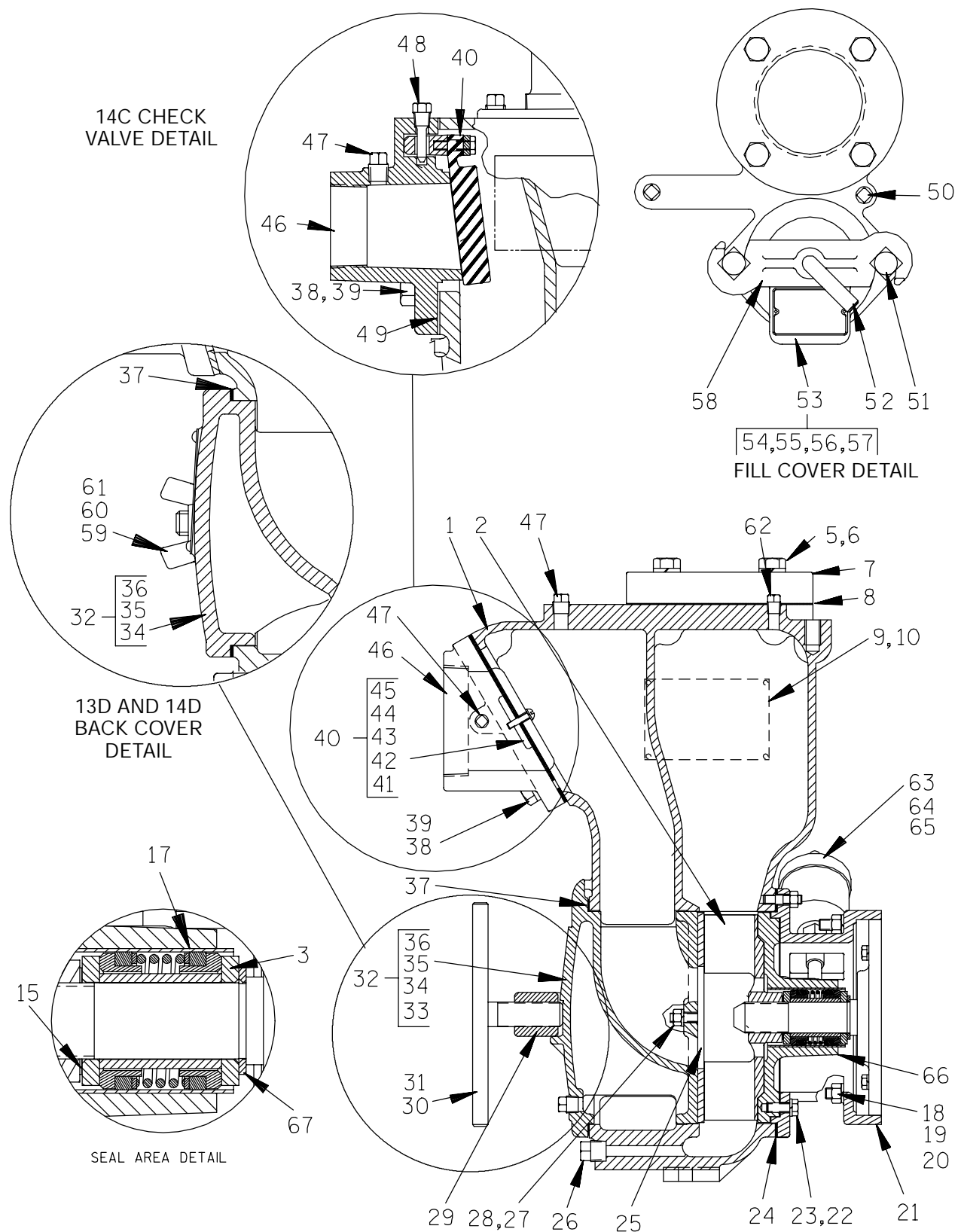


Figure C-2. Typical 13D, 14A, 14C, 14D And 16D Pump End Assembly
w/Grease Seal

Typical 13D, 14A, 14C, 14D and 16D Pump End Assembly w/Grease Seal Parts Identification List

Refer to the separate Parts List Manual for serviceable parts, part numbers and quantities.

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1	PUMP CASING	35	– WARNING PLATE
2	IMPELLER	36	– DRIVE SCREW
3	SEAL ASSEMBLY	37	BACK COVER GASKET
4	STREET ELBOW (IF REQUIRED)	38	STUD
5	HEX HEAD CAPSCREW	39	HEX NUT
6	LOCKWASHER OR FLAT WASHER (IF REQUIRED)	40	CHECK VALVE ASSEMBLY
7	DISCHARGE FLANGE	41	– SMALL VALVE WEIGHT
8	DISCHARGE FLANGE GASKET	42	– HEX HEAD CAPSCREW
9	NAME PLATE	43	– LOCKWASHER
10	DRIVE SCREW	44	– LARGE VALVE WEIGHT
11	HEX HD CAPSCREW (NOT REQ.)	45	– CHECK VALVE GASKET
12	IMPELLER WASHER (NOT REQ.)	46	SUCTION FLANGE
13	IMP SHAFT KEY (NOT REQ.)	47	PIPE PLUG (IF REQUIRED)
14	SLINGER RING (NOT REQ.)	48	CHECK VALVE PIN (IF REQUIRED)
15	IMPELLER SHIM SET	49	SUCT FLANGE GSKT (IF REQUIRED)
16	SHAFT SLEEVE (IF REQUIRED)	50	PIPE PLUG
17	SEAL LINER	51	MACHINE BOLT
18	STUD	52	CLAMP BAR SCREW
19	LOCKWASHER OR FLAT WASHER	53	FILL PLUG ASSEMBLY OR FILL COVER PLATE ASSY
20	HEX NUT	54	– COVER PLATE
21	INTERMEDIATE	55	– WARNING PLATE
22	STUD OR LOCKWASHER	56	– DRIVE SCREW
23	HEX NUT OR HEX HD CAPSCREW	57	– COVER PLATE GASKET
24	CASING GSKT SET OR O-RING	58	CLAMP BAR
25	WEAR PLATE ASSEMBLY	59	STUD
26	CASING DRAIN PLUG	60	FLAT WASHER
27	LOCKWASHER	61	WING NUT
28	HEX NUT	62	PIPE PLUG (IF REQUIRED)
29	CLAMP BAR (IF REQUIRED)	63	GREASE CUP
30	CLAMP BAR SCREW (IF REQUIRED)	64	PIPE NIPPLE
31	MACHINE BOLT (IF REQUIRED)	65	PIPE COUPLING
32	BACK COVER PLATE ASSEMBLY	66	SEAL PLATE
33	– PIPE PLUG (IF REQUIRED)	67	SEAL WASHER (IF REQUIRED)
34	– BACK COVER		

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (see Figure C-1 or C-2) and the accompanying parts list. Unless otherwise specified, the instructions apply to either Figure C-1 or Figure C-2.

Before attempting to service the pump, disconnect or lock out the power source and take the necessary precautions to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local source representative.



This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed instructions and precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that only safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed only after establishing that neither personal safety nor pump integrity are compromised by such practices.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or shut down the power source and take the necessary precautions to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



If the pump is designed to pump materials which could cause serious illness or injury through direct exposure or emitted fumes, wear protective clothing, such as rubber gloves, face mask, and rubber apron, as necessary before disassembling the pump or piping.

Suction Check Valve Removal and Disassembly (Figure C--1 or Figure C--2)

Before attempting to service the pump, remove the pump casing drain plug (26) and drain the pump. Clean and reinstall the drain plug.

(Models 13D, 14A, 14D And 16D)

To service the suction check valve assembly (40), remove the suction piping. Remove the hardware (38 and 39) securing the suction flange (46) and check valve assembly to the pump casing (1). Separate the check valve assembly from the suction flange.

Inspect the check valve parts for wear or damage. If replacement is required, remove the hardware

(42 and 43), and separate the check valve gasket (45) and weights (41 and 44), or remove the check valve pin (48) and pull the complete assembly from the suction flange. Remove the suction flange gasket (49).

(Model 14C)

If the check valve assembly (40) is to be serviced, reach through the back cover opening (32) and hold the assembly in place while removing the check valve pin (48). Slide the assembly from the suction flange (46) and remove it from the pump.

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit. Individual parts are not sold separately.

The check valve assembly may also be serviced by removing the suction flange. To remove the flange, disengage the nuts (39) and pull the flange and assembled check valve from the suction port. Remove the check valve pin, and pull the check valve assembly out of the seat.

If no further disassembly is required, see **Suction Check Valve Installation**.

Back Cover Removal

(Models 14A, 14C And 16D)

The wear plate assembly (25) is easily accessible and may be serviced by removing the back cover (32). Loosen the clamp bar screw (30) and remove the clamp bar (29). Pull the back cover and wear plate from the pump casing. Remove the back cover gasket (37). Clean the mating surfaces of the back cover plate and pump casing.

Inspect the wear plate and replace it if badly scored or worn. To remove the wear plate, disengage the hardware (27 and 28) securing it to the back cover.

(Models 13D And 14D)

Remove the wing nuts and washers (60 and 61) securing the back cover to the casing. Pull the back cover and wear plate from the pump casing (1).

Inspect the wear plate for excessive wear or scoring. If replacement is required, remove the hardware (27 and 28) securing it to the back cover.

Remove the cover plate gasket (37) and clean the mating surfaces.

If no further disassembly is required, see **Back Cover Installation**.

Pump Casing Removal

To service the impeller or seal assembly, disconnect the discharge piping. Remove the hardware securing the pump casing to the base. Tie and tag any leveling shims used under the pump mounting feet to ease reassembly.

If so equipped, disengage the hardware securing the pump casing to the hoisting bail. Support the pump casing using a suitable hoist and sling, and remove the hardware (22 and 23) securing the pump casing to the intermediate (21). Separate the pump casing and gasket set (24) from the intermediate by pulling the casing straight away. Clean the mating surfaces of the intermediate and pump casing. Tie and tag the gaskets, or measure and record their thickness for ease of reassembly.

(Model 13D)

Support the pump casing (1) using a suitable hoist and sling and remove the hardware (19 and 20) securing the pump casing to the intermediate. Separate the parts by pulling the casing straight away from the intermediate. Remove the intermediate O-ring (24) and clean the mating surfaces.

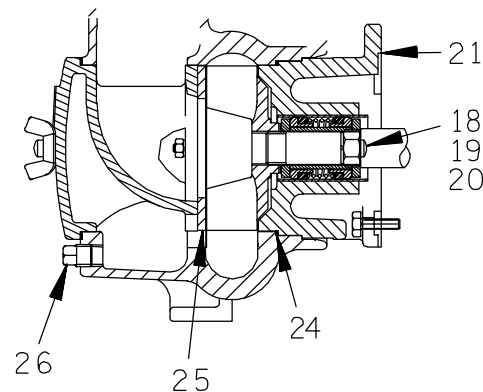


Figure C--3. Pump Model 13D

Impeller Removal

If the pump is equipped with a grease seal, turn the cross arm on the automatic lubricating grease cup (63, Figure C-2) clockwise until it rests against the cover (see Figure C-7) before attempting to remove the impeller (2). This will prevent the grease

in the cup from escaping when the impeller is removed.

NOTE

For close-coupled electric motor driven models, use a screwdriver or other suitable tool to immobilize the motor shaft before attempting to remove the impeller.

(Models 13D, 14A, 14D And 16D)

To loosen the impeller (2), tap the vanes of the impeller in a counterclockwise direction (when facing the impeller) with a block of wood or a soft-faced mallet. Unscrew the impeller using caution; tension on the seal spring will be released as the impeller is unscrewed.

Inspect the impeller and replace it if cracked or badly worn. Slide the impeller adjusting shims (15) off the impeller shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly.

(Model 14C and 14D)

Remove the impeller hardware (11 and 12) and use a suitable puller to remove the impeller from the shaft. Save the impeller shaft key (13).

Inspect the impeller and replace it if cracked or badly worn. Slide the impeller adjusting shims (15) off the impeller shaft. Tie and tag the shims or measure and record their thickness for ease of reassembly.

Self Lubricated Seal Removal And Disassembly

(Figures C--1 and C--4)

Remove the spring centering washer (16) and seal spring. Slide the shaft sleeve (17) and rotating portion of the seal off the shaft as a single unit. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the shaft. Use a pair of stiff wires with hooked ends to remove the stationary seat and O-rings from the intermediate (21).

NOTE

An alternate method of removing the seal assembly

is to remove the hardware securing the intermediate to the power source and slide the intermediate and seal assembly off the shaft as a single unit. Place the intermediate on a flat surface with the impeller side down. Use a suitable sized dowel to press the seal components from the intermediate.

Remove the slinger ring (14, if so equipped). If required, remove the intermediate as described above.

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

Grease Seal Removal and Disassembly

(Figures C--2 and C--5)

To remove the seal assembly (3), remove the grease cup and piping (63, 64 and 65) from the intermediate (21) or the seal plate (66).

Carefully remove the outer stationary and rotating seal elements, packing ring, stationary washer, seal spring, and spacer sleeve from the intermediate. Using two stiff wires with hooked ends, remove the inboard stationary washer, packing ring and stationary and rotating seal elements.

NOTE

The seal assembly may also be removed by disengaging the hardware securing the intermediate to the power source and sliding the intermediate and seal assembly off the shaft as a single unit. Use a dowel of suitable size to press the seal components from the intermediate.

Inspect the seal liner for wear or grooves which could cause leakage or damage to the seal packing rings. The seal liner is a press fit in the intermediate or seal plate and does not normally require replacement. If replacement is necessary, separate the intermediate from the power source as described above. Remove the seal washer (67).

If the seal liner needs replaced, see **Grease Seal Reassembly and Installation**.

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

Seal Installation

(Figures C-1 C--4 and C--5)

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



WARNING!

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

Inspect the shaft for damage. Small scratches or nicks may be removed with a fine file or emery cloth. If excessive wear exists, the shaft will have to be replaced. (Refer to the power source service manual).

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

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

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

Self Lubricated Seal Reassembly And Installation

(Figures C--1 and C--4)

Clean and polish the shaft sleeve (17), or replace it if there are nicks or cuts on either end. If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the O-rings and shaft sleeve with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure C--4).

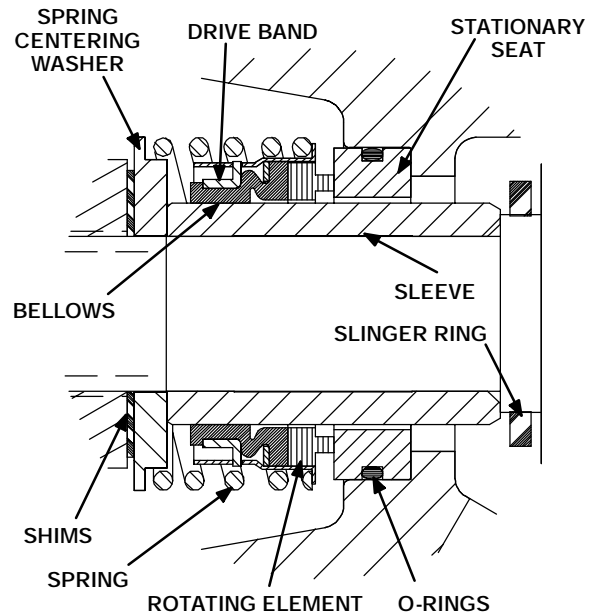
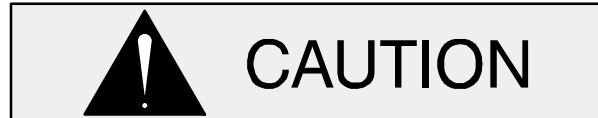


Figure C--4. Self Lubricated Seal Assembly



CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the intermediate (21) was removed, position the intermediate over the shaft and secure it to the power source with the previously removed hardware.

If used, install the slinger ring (14) on the shaft.

Press the stationary subassembly (consisting of the stationary seat and O-ring) into the intermediate until the stationary seat bottoms against the intermediate bore. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the pipe should be approximately the same diameter as the I.D. of the seal spring.

Slide the rotating subassembly (consisting of the rotating element, retainer and bellows) onto the lubricated shaft sleeve until the rotating element is **just flush** with the end of the sleeve with the chamfered I.D. Slide the sleeve and rotating subassembly onto the shaft until the seal faces contact. Con-

tinue to push the sleeve through the seal until it bottoms against the shaft shoulder.

Install the seal spring and spring centering washer (16).

Grease Seal Reassembly And Installation

(Figures C--2 and C--5)

Before installing the seal, inspect the bore of the seal liner (17) for wear or grooves which might cause leakage or damage to the seal packing rings. If the seal liner must be replaced, position the intermediate or seal plate (21) on the bed of an arbor (or hydraulic) press. Use a new sleeve to force the old one out. After the new liner is properly installed, drill a 1/4-inch diameter hole through the liner to permit the flow of lubricant to the seal assembly. **Be careful** to center the drill in the threaded grease piping hole and not damage the threads. Deburr the hole from the inside of the seal liner after drilling.

To ease installation of the seal, lubricate the packing rings and seal liner with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure C--5).

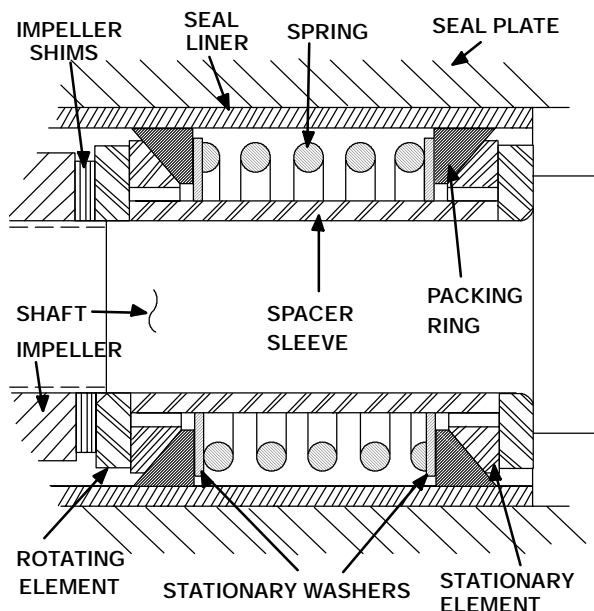


Figure C--5. Grease Seal Assembly



This seal is not designed for operation at

temperatures above 110°F (43°C). Do not use at higher operating temperatures.

If so equipped, install the seal plate (66) on the intermediate. Install the seal washer (67, if required).

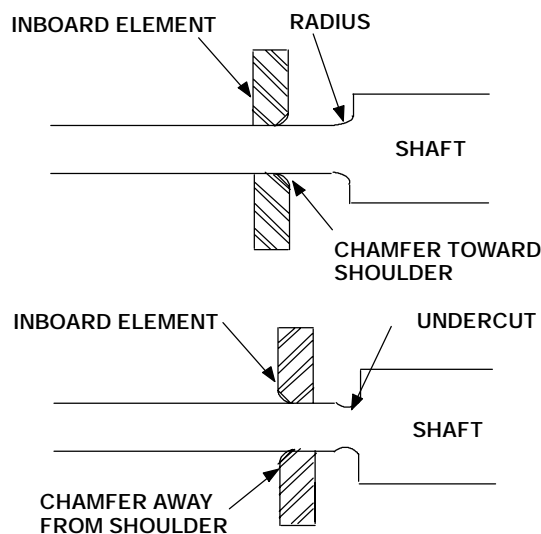


Figure C--6. Positioning of Inboard Element

The position for the inboard rotating element is determined by the machining of the impeller shaft at the shoulder where the element seats. See Figure C--6, if there is a radius on the shaft, position the inboard element with the I.D. chamfer **toward** the shaft shoulder. If the shaft is undercut at the shoulder, position the inboard element with the I.D. chamfer **away** from the shoulder.

Subassemble the inboard stationary element, packing ring and seal washer. Press this unit into the lubricated seal liner until the seal faces contact. A push tube cut from a length of plastic pipe would aid this installation. The I.D. of the tube should be approximately the same as the the I.D. of the seal spring.

Install the spacer sleeve and seal spring.

Subassemble the outboard stationary element, packing ring and seal washer. Press this unit into the lubricated seal liner.

Install the outboard rotating element with the chamfered side **toward the impeller end of the shaft**.

Install the grease cup and the piping (63, 64 and 65) in the intermediate.

After the impeller has been installed, lubricate the seal as indicated in **LUBRICATION** at the end of this section.

NOTE

Some smoking and leakage may occur after installing a new seal assembly. This should stop after the pump has run a while and the lapped seal faces have seated in.

Impeller Installation And Adjustment

Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller adjusting shims (15) as previously removed, and screw the impeller onto the shaft until tight.

For maximum pump efficiency, a specific clearance is required between the impeller and the intermediate or seal plate (see Table C--1). This back clearance can be achieved by adding or removing impeller shims.

NOTE

Be sure the intermediate or seal plate is secured while measuring this clearance.

Table C--1. Impeller Clearances

Pump Model	Clearance	
	Back Clearance	Front Clearance
13D	-----	.008 to .015
14A	.020 to .040	.008 to .015
14C	.020 to .040	.010 to .020
14D	.020 to .040	.008 to .015
16D	.020 to .040	.008 to .015

Pump Casing Installation**(Model 13D)**

See Figure C--3 and lubricate the intermediate O-ring (24) with light oil and install it on the intermediate. Slide the pump casing over the intermediate until the casing bottoms against the locating shoulder on the intermediate. **Be careful** not to damage the O-ring when installing the pump casing. Secure the casing to the intermediate with the previously removed hardware (19 and 20).

(Models 14A, 14C, 14D And 16D)

Install the same thickness of pump casing gaskets (24) as previously removed, and secure the pump

casing (1) to the intermediate (21) with the nuts (23). **Do not** fully tighten the nuts at this time.

NOTE

The back cover assembly must be in place to adjust the impeller face clearance.

For maximum pump efficiency, a specific clearance is required between the wear plate (25) and the impeller (see Table C--1). Install the back cover assembly (32) and set the front clearance by adding or removing gaskets in the pump casing gasket set (24).

NOTE

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

After the face clearance has been set, tighten the nuts (23) securing the pump casing to the intermediate.

Back Cover Installation**(Figure C--1 or C--2)**

If the wear plate (25) was removed for replacement, center the wear plate against the cover plate (34) and secure it using the attaching hardware (27 and 28). The wear plate **must** be concentric to prevent binding when the back cover is installed.

NOTE

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

Clean any scale or debris from the contacting surfaces on the pump casing that might prevent a good seal with the back cover. Replace the back cover gasket (37) and slide the back cover assembly (32) into the pump casing. Be sure the wear plate does not bind against the impeller.

(Models 14A, 14C And 16D)

Secure the back cover assembly by installing the clamp bar (29) and tightening the clamp bar screw (30). **Do not** over-tighten the clamp bar screw; it

should be just tight enough to ensure a good seal at the back cover shoulder.

(Models 13D And 14D)

Secure the back cover assembly with the hardware (60 and 61). **Do not** over tighten the wing nuts; they should be just tight enough to ensure a good seal at the back cover shoulder.

Suction Check Valve Installation

(Figure C-- 1 or C--2)

Inspect the check valve components and replace as required. Subassemble the check valve weights (41 and 44) and check valve gasket (45) using the attaching hardware (42 and 43).

Position the check valve assembly (40) in the suction port with the large weight toward the inside of the pump casing. Install the suction flange (46) and secure with the hardware (38 and 39). Check the operation of the check valve to ensure proper seating and free movement.

(Model 14C)

NOTE

The check valve assembly (40) for Model 14C must be replaced as a complete unit. Individual parts are not sold separately.

Position the check valve adaptor in the mounting slot of the suction flange (46). Align the adaptor with the flange hole, and secure the assembly with the check valve pin (48). Install the suction flange and suction flange gasket (49), and secure with the hardware (38 and 39). Check the operation of the check valve to ensure proper seating and free movement.

Final Pump Assembly

Secure the pump to the base with the previously removed hardware. Be sure to reinstall any leveling shims used under the pump mounting feet.

Be sure the pump and power source are securely mounted to the base.

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

Be sure the pump and power source have been properly lubricated, see **LUBRICATION**.

Remove the fill plug assembly/fill cover plate assembly (53) and fill the pump casing with clean liquid. Reinstall the fill plug and tighten it.

Refer to **OPERATION** in the Installation And Operation manual before putting the pump back into service.

LUBRICATION

Self Lubricated Seal Assembly

(Figure C-- 1)

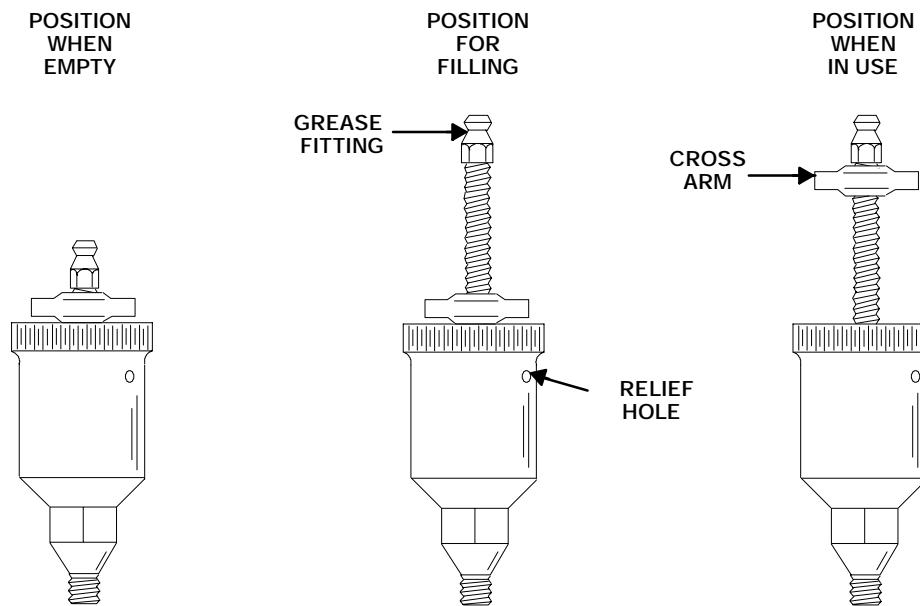
The seal assembly is lubricated by the medium being pumped, or by a flow of fresh liquid from an external source. Flushing liquid may be taken from the pump discharge and supplied through auxiliary piping.

When handling abrasive or tacky liquids, supply fresh lubricating liquid from an external source. Be sure the liquid supplied to the seal is compatible with the liquid being pumped, and that its flow is controlled to prevent dilution. If flushing is required, contact the factory.

Grease Lubricated Seal Assembly

(Figure C-- 2)

Fill the grease cup (63) through the grease fitting with No. 2 lithium base 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 C-- 7).

**NOTE:**

When installing a new grease cup, lubricate the cup as indicated on the installation tag furnished with the grease cup.

Figure C--7. Automatic Lubricating Grease Cup

NOTE

Some smoking and leakage may occur after installing a new seal assembly. This should stop after the pump has run a while and the lapped seal faces have seated in.

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

WARRANTY

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

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

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

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

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

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

THE GORMAN-RUPP COMPANY
Mansfield, Ohio

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

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