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



**S SERIES PUMPS**

MODEL
<b>S2D3-115V 1P</b>

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

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

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# TABLE OF CONTENTS

INTRODUCTION . . . . .	I-1
WARNINGS - SECTION A . . . . .	A-1
INSTALLATION - SECTION B . . . . .	B-1
PREINSTALLATION INSPECTION . . . . .	B-1
Lubrication . . . . .	B-2
PUMP INSTALLATION . . . . .	B-2
Pump Specifications . . . . .	B-2
Pump Dimensions . . . . .	B-2
Lifting . . . . .	B-3
Positioning The Pump . . . . .	B-4
Piping . . . . .	B-5
Grounding Methods . . . . .	B-5
Field Wiring Connections (Incoming Power) . . . . .	B-8
Pump Power Cable Connections . . . . .	B-8
Liquid Level Devices . . . . .	B-10
OPERATION - SECTION C . . . . .	C-1
PUMP CONTROLS . . . . .	C-1
PUMP OPERATION . . . . .	C-2
Liquid Temperature And Overheating . . . . .	C-2
Checking Pump Rotation . . . . .	C-2
STARTING AND STOPPING THE PUMP . . . . .	C-3
Standard Pump (No Liquid Level Device) . . . . .	C-4
With Automatic Liquid Level Devices . . . . .	C-4
Operation Checks . . . . .	C-4
Cold Weather Preservation . . . . .	C-5
TROUBLESHOOTING - SECTION D . . . . .	D-1
TROUBLESHOOTING CHART . . . . .	D-1
ELECTRICAL TESTING . . . . .	D-4
Test Equipment . . . . .	D-4
Motor And Motor Power Cable Continuity . . . . .	D-4
Insulation Resistance . . . . .	D-5
Capacitor . . . . .	D-6
MAINTENANCE AND REPAIR - SECTION E . . . . .	E-1
PERFORMANCE CURVE . . . . .	E-1
PUMP MODEL - PARTS LIST . . . . .	E-3
PUMP AND MOTOR DISASSEMBLY AND REASSEMBLY . . . . .	E-4
PUMP END DISASSEMBLY . . . . .	E-5
Draining Oil From Pump . . . . .	E-5
Strainer And Impeller Cover Disassembly . . . . .	E-5
Impeller Disassembly . . . . .	E-6
Seal Disassembly . . . . .	E-6
PUMP END REASSEMBLY . . . . .	E-7
Seal Reassembly . . . . .	E-7
Impeller Reassembly . . . . .	E-10
Strainer Reassembly . . . . .	E-10
MOTOR DISASSEMBLY . . . . .	E-10
Head And Power Cable Disassembly . . . . .	E-11
Rotor Disassembly . . . . .	E-13
Stator Disassembly . . . . .	E-13
MOTOR REASSEMBLY . . . . .	E-14
Stator Reassembly . . . . .	E-14
Rotor Reassembly . . . . .	E-15
Head And Power Cable Reassembly . . . . .	E-15
FINAL CHECK . . . . .	E-17
MOTOR LEAK TEST . . . . .	E-17
LUBRICATION . . . . .	E-17



INTRODUCTION

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

This pump is designed to operate fully or partially submerged. It is capable of handling most nonvolatile and nonflammable liquids which are mildly corrosive and abrasive. The basic material of construction is gray iron with stainless steel hardware and fittings. Since the pump is very light weight and portable, it is ideally suited to many domestic and industrial applications where low capacity dewatering or irrigation is required. The pump is powered by an integral thermally protected electric motor which is not explosion proof and should not be operated in an explosive atmosphere.

If there are any questions regarding the pump or motor which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor or the Gorman-Rupp Company:

The Gorman-Rupp Company	or	Gorman-Rupp of Canada Limited
P.O. Box 1217		70 Burwell Road
Mansfield, Ohio 44901-1217		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, and 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 instructions describe the requirements and the possible damage which could result from failure to follow the procedures.

WARNING

```

////////////////////////////////////
//
// These instructions must be followed to avoid causing in- //
// jury or death to personnel, and describe the procedure //
// required and the injury which could result from failure //
// to follow the procedure. //
// //
////////////////////////////////////

```



WARNINGS

WARNINGS - SECTION A

THESE WARNINGS APPLY TO THE "S-SERIES" SUBMERSIBLE MOTOR OPERATED PUMPS.

WARNING

```

////////////////////////////////////
//                                                                    //
// Before attempting to open or service the pump:                    //
//                                                                    //
//   1. Familiarize yourself with this manual.                       //
//   2. Lock out the power supply to the control panel to           //
//      ensure that the pump will remain inoperative.              //
//   3. Allow the pump to cool if overheated.                      //
//   4. Close the discharge valve (if used).                       //
//                                                                    //
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//                                                                    //
// Do not attempt to pump volatile or flammable liquids for         //
// which this pump has not been designed.                          //
//                                                                    //
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//                                                                    //
// After the pump has been installed, make certain that the       //
// pump and all piping or hose connections are secure before     //
// operation.                                                       //
//                                                                    //
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//                                                                    //
// Make certain that the pump power cable is fitted with          //
// proper type of grounded plug (see Section B), and that         //
// the plug receptacle is grounded. If the power cable is         //
// wired into an optional manual starting switch or control       //
// box, make sure that the enclosure is grounded. See Sec-      //
// tion B for recommended grounds.                                  //
//                                                                    //
////////////////////////////////////

```

WARNINGS

WARNING

```

////////////////////////////////////
//
// All electrical connections must be in accordance with //
// the National Electric Code and all local codes. If //
// there is a conflict between the instructions provided //
// and N.E.C. specifications, N.E.C. specifications shall //
// take precedence. All electrical equipment supplied with //
// this pump was in conformance with N.E.C. requirements in //
// effect on the date of manufacture. Failure to follow //
// applicable specifications, or substitution of electrical //
// parts not supplied or approved by the manufacturer, can //
// result in severe injury or death. //
//
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// The electrical power used to operate this pump is high //
// enough to cause injury or death. Make certain that the //
// pump power cable plug is disconnected from the power //
// supply before performing any service or maintenance on //
// the pump. If the power cable is wired into an optional //
// manual starting switch or control box, make sure that //
// these devices are OFF and the power LOCKED OUT. //
//
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// The electrical power used to operate this pump is high //
// enough to cause injury or death. Obtain the services of //
// a qualified electrician to make all electrical con- //
// nections. //
//
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// Do not attempt to lift the pump by the motor power cable //
// or discharge hose. Lift the pump by a rope attached to //
// the carrying handle. //
//
////////////////////////////////////

```

## INSTALLATION

## INSTALLATION - SECTION B

This section is intended only to summarize recommended installation practices for the pump. If there are any questions concerning your specific installation, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

A float switch, manual starting switch, and liquid level control box are offered as options with this pump. For information on installing and operating this optional equipment, see the technical data accompanying the option.

## CAUTION

Nuts, bolts and screws used on this pump are metric and do not match standard English-measurement threads. If any threaded hardware is replaced, it must be replaced with metric type. Attempting to force in a fastener with English threads will damage the mating threads. An optional discharge adaptor is available to convert the English pipe threads in the discharge flange to American pipe threads.

## PREINSTALLATION INSPECTION

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

- 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 hardware securing all mating surfaces.
- c. The standard pump is furnished with 50 ft. of power cable wired in the pump head. Inspect the cable for cuts or damage.
- d. Carefully read all tags, decals, and markings on the pump assembly and perform all duties indicated.
- e. Check the pump and motor for any oil leaks. An oil leak may indicate a cut O-ring or other damage.
- f. If the pump has been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

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## Lubrication

This pump utilizes one lubrication cavity, located between the volute and the motor housing. It is filled with a premium quality hydraulic oil and provides lubrication to the shaft seal. The motor operates in air and requires no lubrication.

The seal assembly is single faced. It is designed to prevent the liquid being pumped from entering the lubrication cavity at the impeller end. A lip seal is used to prevent moisture or lubrication oil from entering the motor housing cavity at the motor end.

The lubrication cavity was fully lubricated when shipped from the factory. Check the oil level before installing the pump (see **LUBRICATION** in **MAINTENANCE AND REPAIR**). If the oil level is abnormally low, determine the cause before putting the pump into service.

## PUMP INSTALLATION

### Pump Specifications

See Table 1 for the typical pump specifications and motor data.

**Table 1. Pump Specifications**

Model Number	Voltage /Phase	Motor Horsepower	Motor Speed (RPM)	Full Load Amps	No Load Amps	Locked Rotor Amps	Discharge Size BSP Threads
S2D3	115/1	1	3450	8.6	1.0	50.6	2" with barbed adaptor

### Pump Dimensions

The standard pump is provided with a suction strainer to prevent large solids from clogging the impeller.

See Figure 1 on page B-3 for the approximate physical dimensions of the pump.

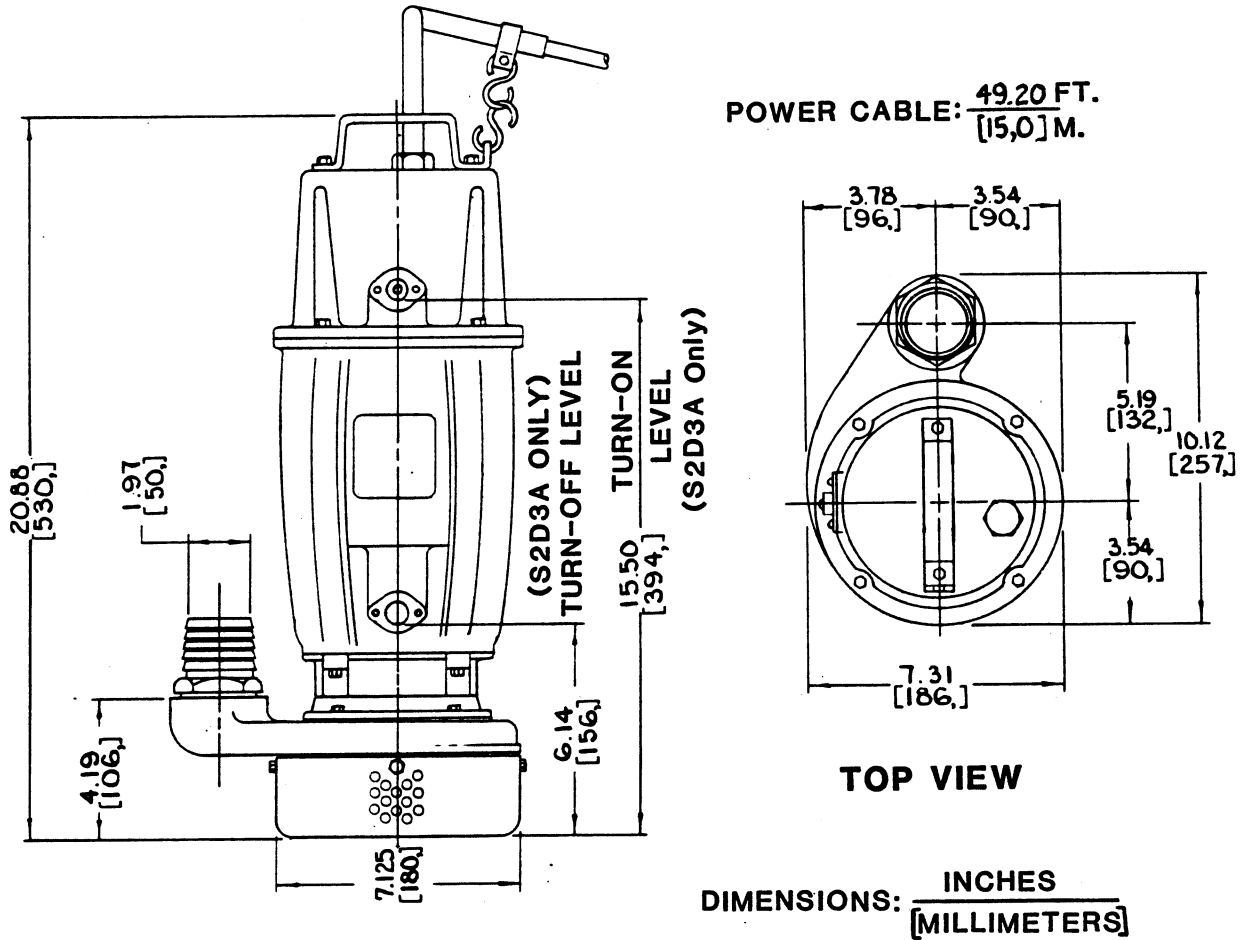


Figure 1. Pump Model S2D3-115V 1P

Lifting

This pump weights approximately 78 pounds, not including the weight of accessories and options. Customer installed equipment such as rigid piping **must** be removed before attempting to lift.

WARNING

```

////////////////////////////////////
// Do not attempt to lift the pump by the motor power cable //
// or discharge hose. Lift the pump by a rope attached to //
// the carrying handle. //
////////////////////////////////////

```

## Positioning The Pump

### CAUTION

The **MAXIMUM** submergence depth for this pump is 23 feet. Placing it at a greater depth could result in damage to the pump.

This pump is designed to operate fully or partially submerged. **Do not** operate in the air for extended periods of time; this will cause overheating of the motor and possible burnout.

The pump will operate if positioned on its side, but this is not recommended because the motor torque could cause the pump to roll during operation.

The pump should be independently secured and supported by the carrying handle. If the application involves a lot of debris, protect the pump from excessive wear and clogging by suspending it in a perforated barrel or culvert pipe. If the bottom is heavily sludge-covered, rest the pump on support blocks or suspend it from a raft or similar device near the surface of the liquid. See Figure 2 for typical pump installations.

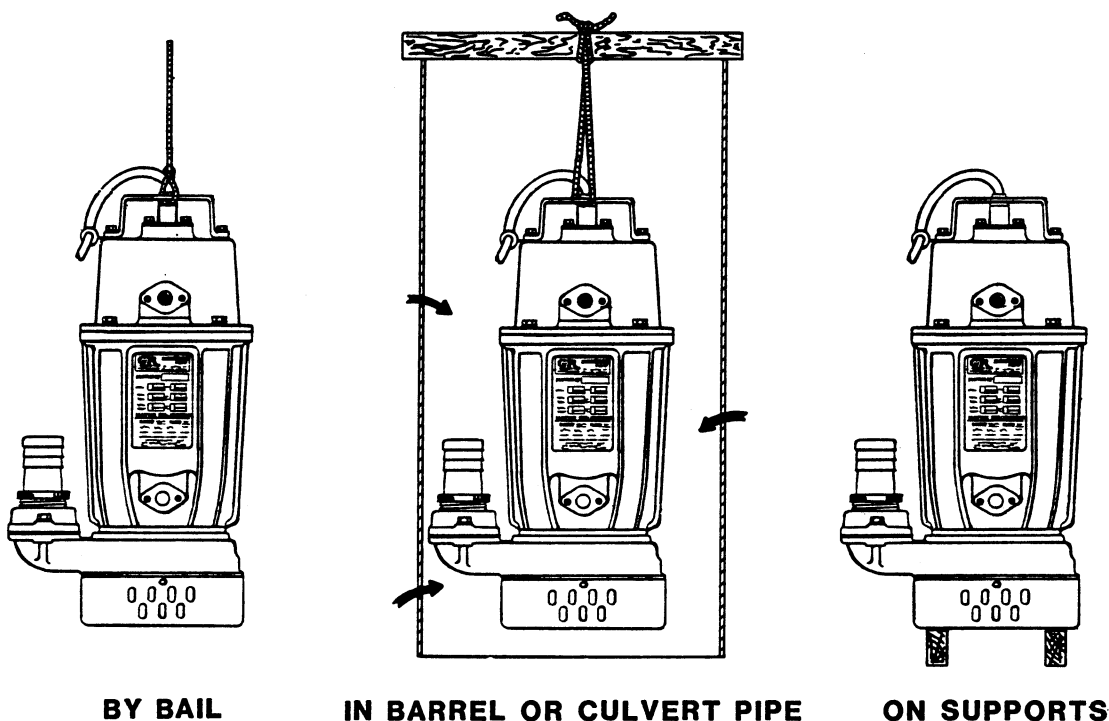


Figure 2. Typical Pump Installations.

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## INSTALLATION

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All liquid entering the pump must pass through a strainer screen. Any spherical solids which pass through the screen will pass through the pump.

### Piping

No suction piping is required in a standard submersed application.

To determine the size of the discharge connection, see Table 1, **Pump Specifications**. The standard pump may be fitted with a hose adaptor threaded into the discharge flange. This hose adaptor may be removed and rigid piping installed.

The discharge flange is tapped for British Standard Pipe Thread (BSP) fittings. If American Standard Pipe Thread (NPT) fittings or pipe is to be used, an adaptor or flange available as optional equipment must be used. (See Parts List in Section E).

If rigid pipe is used on the discharge it is recommended that a quick disconnect fitting be used near the pump to facilitate mobility and maintenance.

For maximum pumping capacity, keep the discharge as short and straight as possible. Minimize the use of elbows and fittings which increase friction losses through the discharge piping system.

It is recommended that a check valve or throttling valve be installed in the discharge line to control siphoning or back flow when the pump is shut off.

### Grounding Methods

If the pump power cable is fitted with an electrical plug, ground the receptacle before inserting the plug. If the power cable will be wired into an optional manual switch or control box, ground the enclosure before installing the wiring. In any of these cases, the electrical circuit must be grounded to a properly imbedded electrode.

The material used for the electrode **must** be an excellent conductor of electricity, such as copper. If iron or steel is used, it must be galvanized or otherwise metal plated to resist corrosion. **Do not** coat the electrode with any material of poor conductivity such as paint or plastic.

The electrode must conform to the recommendations of N. E. C. Article 250. Follow all installation requirements of the N.E.C., and all applicable local codes. See Figure 3 on page B-6 for some suggested grounding methods.

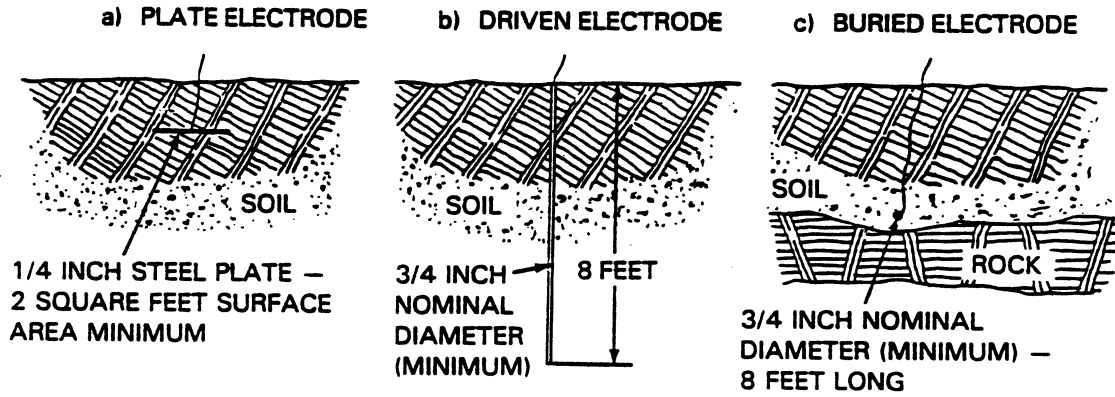


Figure 3. Suggested Grounding Methods

- a. **Plate Electrode:** An iron or steel plate, 1/4 inch thick, completely imbedded in the ground. The plate must present a surface of a least 2 square feet.
- b. **Driven Electrode:** A rod or pipe, 3/4 inch diameter minimum, 8 feet long, completely driven into the ground.
- c. **Buried Electrode:** If rock or stone prevents imbedding the full 8 foot length of the ground rod, bury it in a horizontal trench.

Space the ground rod or plates at least 6 feet from any other electrode or ground rod, such as those used for signal circuits, radio grounds, lightning rods, etc.

The earth surrounding the ground rod or plate **must** contain enough moisture to make a good electrical connection. In dry or sandy areas, pour water around the rod or consult qualified personnel to devise a method of improving the connection.

**WARNING**

```

////////////////////////////////////
//                               //
// The electrical power used to operate this pump is high //
// enough to cause injury or death. Make certain that the //
// receptacle or optional enclosure is properly grounded //
// after installation. //
//                               //
////////////////////////////////////

```

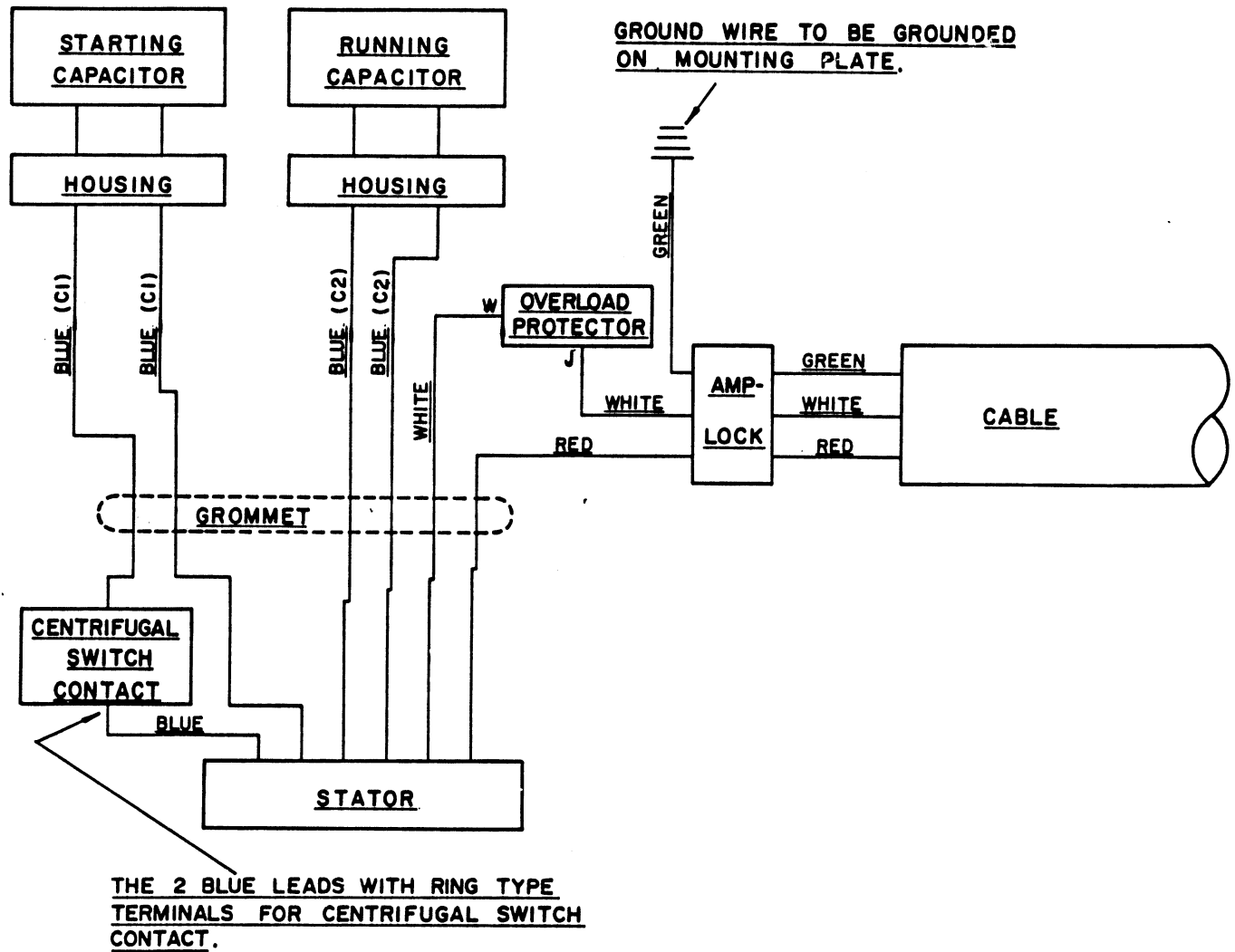


Figure 4. Pump Wiring Diagram

INSTALLATION

Field Wiring Connections (Incoming Power)

WARNING

```

////////////////////////////////////
//
// The electrical power used to operate this pump is high //
// enough to cause injury or death. Obtain the services of //
// a qualified electrician to make all electrical con- //
// nections. Make certain that the pump and receptacle or //
// optional enclosure are properly grounded, and that the //
// incoming power matches the requirements of the pump and //
// control. //
// //
////////////////////////////////////

```

The pump is designed to operate with a 115 volt, 1 phase, 60 hertz power supply. The voltage available at the motor must be within the range indicated in Table 2.

To calculate the voltage available at the motor proceed as follows:

- a. Measure the incoming voltage while the pump is **operating at full capacity**. See Figure 4 on page B-7.
- b. Next, subtract the motor cable voltage drop (see Table 3, Motor Cable Specifications).
- c. Do not continue to operate the pump if this voltage is not within the recommended limits. Obtain the services of a qualified electrician to determine the correct field wiring size and other details to ensure an adequate voltage supply to the pump.

Table 2. Pump Motor Voltage Limits

Nominal Voltage	Phase	Minimum Voltage	Maximum Voltage
115	1	105	125

Pump Power Cable Connections

WARNING

```

////////////////////////////////////
//
// The electrical power used to operate this pump is high //
// enough to cause injury or death. Make certain that the //
// pump and receptacle or optional enclosure are properly //
// grounded after installation. //
// //
////////////////////////////////////

```

The standard pump is provided with 50 foot of power cable with one end wired into the pump head. The other end terminates into separate leads which must be connected to a grounded receptacle or switch box.

If connected to a receptacle, use a grounded electrical plug as shown in Figure 5. Power to the receptacle must be directed through a fused circuit, and the receptacle must be controlled by a positive on/off switch.

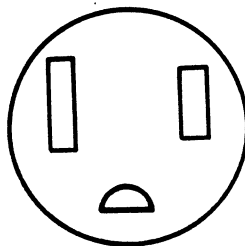


Figure 5. 115 Volt Single Phase Power Plug.

Optional rainproof starting switches (with or without automatic liquid level controls) are listed on the Parts List in Section E.

**NOTE**

The optional rainproof starting switch listed in the Parts List is **not** designed to be watertight and must not be used in submerged applications.

The use of extension cords is not recommended. If extension cords are used, they must have three-wire single phase construction and have adequate carrying capacity for their length.

Splicing of the power cable is **not** recommended by the Gorman-Rupp Company due to safety and warranty considerations. If a longer power cable is required, it should be of continuous length and should replace the existing cable. Any replacement cable **must** be to Gorman-Rupp standards, and **must** be approved by Gorman-Rupp.

**WARNING**

```

////////////////////////////////////
//
// Never attempt to alter the length or repair any power //
// cable with a splice. The pump motor and cable must be //
// completely waterproof. Injury or death may result from //
// alterations. //
// //
////////////////////////////////////
```

Table 3. Cable Requirements for Pump Electrical Connections,  
Model S2D3

Voltage/ Phase	A.W.G. Cable Size	Cable OD (inches)	Conductor Dia. (inches)	Amp Rating* at 30°C (amperes)	DC Resist- ance at 25°C (ohms/ 1000 ft)	Voltage Drop at Max. Load per 100 ft
115/1	16	0.43	0.06	13	4.49	7.72

\*Applies only to S0 type cable. Refer to manufacturer's specifications for other cable.

### Liquid Level Devices

The standard pump is **not** furnished with a means to automatically regulate liquid level. However, the pump may be controlled to perform filling and dewatering by using the float switch and liquid level control offered as options (see Figure 6).

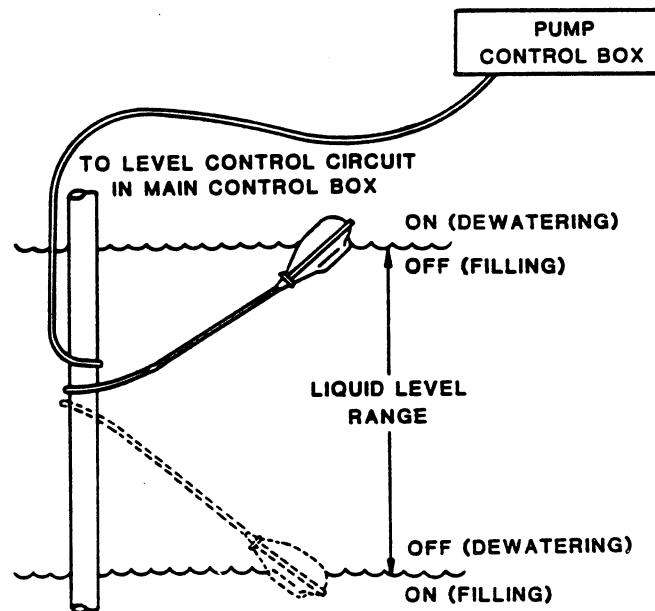


Figure 6. Typical Float Switch Installation

OPERATION - SECTION C

PUMP CONTROLS

WARNING

```

////////////////////////////////////
//
// This pump motor and optional accessories are not de- //
// signed to be explosion proof. Do not operate in an ex- //
// plosive atmosphere. //
// //
////////////////////////////////////

```

CAUTION

<p>Since operation of the pump motor is dependent upon the quality and performance of the electrical controls, the pump warranty is valid only when controls have been specified or provided by the Gorman-Rupp Company.</p>
--

This pump is driven by an integral 115 VAC, 60 hertz, 1 phase, 1 HP motor equipped with a thermal motor overheat protector.

If the pump power cable is plugged into an electrical receptacle, (see **Power Cable Connections** in Section B), the receptacle on/off switch will start and stop the pump.

If wired to an optional manual starting switch, the toggle switch within the rainproof enclosure will start and stop the pump.

If the pump power cable is wired into an optional automatic liquid level control box, pump operation is controlled by a selector switch. In the **OFF** position the switch prevents all operations of the pump. In the **MAN** position, it allows the pump to run continuously. In the **AUTO** position, it allows the pump to be controlled automatically by an optional liquid level device installed in the sump or wet well (see **Liquid Level Devices** in Section B).

Short circuit protection for the electrical receptacle and optional control box is provided by a customer-furnished fuse or breaker within the circuit. If the breaker trips repeatedly, operational problems exist. See **TROUBLESHOOTING**.

PUMP OPERATION

WARNING

```

////////////////////////////////////
// This pump is designed to handle most nonvolatile and //
// nonflammable liquids which may be mildly corrosive or //
// abrasive. Do not attempt to pump liquids which may //
// damage the pump or endanger personnel as a result of //
// pump failure. //
// //
////////////////////////////////////

```

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 120° F. Do not apply it at a higher operating temperature.

Overheating can occur if the pump is misapplied, or if the circuit breaker or fuse fails to provide adequate protection. Operating the pump against a closed discharge for an extended period will also cause the pump to overheat.

If overheating occurs, stop the pump immediately and allow it to cool before servicing it. **Approach any overheated pump cautiously.**

WARNING

```

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

```

Checking Pump Rotation

Check the direction of pump rotation before operation to ensure that the impeller is rotating in the correct direction.

Suspend the pump from the carrying handle. Turn it on momentarily and note the direction of twist. For correct rotation and operation, the twist must be in the **counterclockwise** direction when viewed from the **top**.

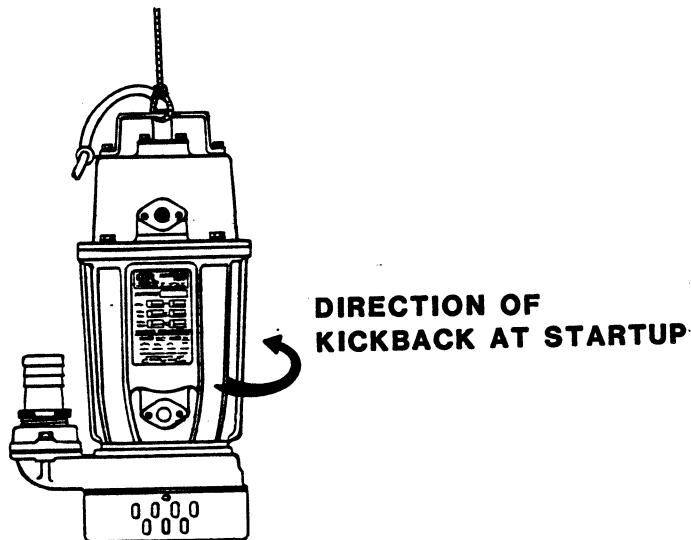
---

---

**CAUTION**

Secure the pump during rotation check to prevent coiling of the power cable.

If the pump twists clockwise on start, the pump must be returned to the factory or a Gorman-Rupp authorized Submersible Repair Center. Since this pump is driven by a single phase motor, the direction of rotation **can not** be altered by interchanging motor leads at the control box.



**Figure 1. Checking Pump Rotation**

### STARTING AND STOPPING THE PUMP

After the pump and options have been installed, start the pump as follows.

#### NOTE

Before actual operation, check the direction of impeller rotation to ensure that the pump is properly wired. See **Checking Pump Rotation** in **OPERATION** section.

## OPERATION

---

---

**Standard Pump (No Liquid Level Device)**

If fitted with an electrical plug, trip the receptacle ON/OFF switch to control pump operation.

If wired into an optional manual switch, trip the switch within the rainproof enclosure to start or stop the pump.

**With Automatic Liquid Level Devices**

If the pump power cable is wired into an optional automatic liquid level control control box, set the control box selector switch to **MAN**; the pump will continue to run until the switch is returned to **OFF**, or reset to **AUTO**.

If desired to operate the pump in the automatic mode, set the selector switch to **AUTO**; pump operation will be controlled by the optional float switch. To terminate automatic mode, move the selector switch to **OFF** or **HAND**.

**CAUTION**

Moving the control box selector switch to OFF DOES NOT terminate incoming power through the field wiring connected to the control box.

It is recommended that a check valve or throttling valve be installed in the discharge line if there is any possibility of siphoning or back flow when the pump is shut off.

**Operation Checks**

Check the pump for proper operation when it is first started and periodically thereafter to identify minor problems.

Check the pump for unusual noises or excessive vibration while it is operating. If noise or vibration is excessive, stop the pump and refer to the troubleshooting chart for possible causes.

Check the pump strainer screen for clogging caused by stones, sticks, or other debris. Clean the strainer screen when required. In some cases, stopping the pump momentarily may back flush the strainer screen, purging most of the debris from it. If this fails to clean the screen, remove the pump from the sump and remove the debris manually. See **PUMP DISASSEMBLY**.

**Never** introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Check the pump for overheating. The pump could overheat if operated for an extended period with a closed valve in the discharge line.

Cold Weather Preservation

In freezing temperatures, the pump will not freeze as long as it is submerged in liquid. If the pump casing is not submerged, or if the liquid begins to freeze, remove the pump from the sump or wet well and allow it to dry thoroughly. Run the pump for two or three minutes to dry the inner walls.

If the pump freezes, move it into a warm area until completely thawed, or submerge it into the liquid. If the liquid is near freezing, the pump must be submerged for an extended period of time. Start the pump and check for shaft rotation. If still frozen, allow additional thawing time before attempting to restart.

WARNING

////////////////////////////////////  
//  
// Do not attempt to thaw the pump by using a torch or oth- //  
// er source of flame. This could damage gaskets or heat //  
// the oil within the pump above the critical point and //  
// cause the pump to rupture or explode. //  
// //  
////////////////////////////////////



TROUBLESHOOTING - SECTION D

WARNING

```

////////////////////////////////////
//
// 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. //
//
////////////////////////////////////
    
```

Many of the probable remedies listed in the troubleshooting chart below require use of electrical test instruments; for specific procedures, see **Electrical Testing** at the end of the troubleshooting chart.

TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO START, OVERLOAD UNIT NOT TRIPPED (MANUAL MODE)  (AUTOMATIC MODE)	Power source incompatible with pump motor.	Correct power source.
	No voltage at line side of power cable connection.	Check power source for blown fuse, open breaker, broken lead, or loose connection.
	Open circuit in motor windings or power cable.	Check continuity.
	Defective motor power cable.	Replace cable.
	Motor defective.	Check for and replace defective unit.
	Liquid level device or control circuits improperly connected to main control box.	Check wiring diagrams; correct or tighten connections.
Level sensing device(s) improperly positioned.	Position device(s) at proper level.	
Level sensing device(s) fouled with mud or foreign material.	Clean sensing device(s).	

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO START, OVERLOAD UNIT NOT TRIPPED (AUTOMATIC MODE) (cont.)	<p>Float type sensing device(s) tangled or obstructed.</p> <p>Defective liquid level sensing device(s) or control panel.</p>	<p>Check installation for free movement of float.</p> <p>Repair or replace defective unit(s).</p>
OVERLOAD UNIT TRIPS	<p>Low or high voltage, or excessive voltage drop between pump and control box.</p> <p>Defective insulation in motor windings or power cable; defective windings.</p> <p>Impeller jammed due to debris or insufficient clearance.</p> <p>Bearing(s) frozen.</p>	<p>Measure voltage at control box. Check that wiring is correct type, size, and length. (See Field Wiring Connection, Section B).</p> <p>Check insulation resistance; check continuity.</p> <p>Disassemble pump and check impeller.</p> <p>Disassemble pump and check bearing(s).</p>
MOTOR RUNS, BUT PUMP FAILS TO DELIVER RATED DISCHARGE	<p>Discharge head too high.</p> <p>Low or incorrect voltage.</p> <p>Discharge throttling valve partially closed; check valve installed improperly.</p> <p>Discharge line clogged or restricted; hose kinked.</p> <p>Liquid being pumped too thick.</p> <p>Strainer screen or impeller clogged.</p>	<p>Reduce head.</p> <p>Measure control box voltage, both when pump is running and when shut off.</p> <p>Open discharge valve fully; check piping installation.</p> <p>Check discharge lines; straighten hose.</p> <p>Dilute liquid if possible.</p> <p>Clear clog(s). Stop pump; back flow may flush away debris.</p>

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
MOTOR RUNS, BUT PUMP FAILS TO DELIVER RATED DISCHARGE (cont.)	Insufficient liquid in sump or tank.  Worn impeller vanes; excessive impeller clear- ance.	Stop pump until liquid level rises.  Check impeller and clearance. See PUMP END REASSEMBLY.
PUMP RUNS WITH EXCES- SIVE NOISE OR VIBRATION	Pumping entrained air.  Damaged or unbalanced impeller.  Discharge piping not properly supported.  Impeller jammed or loose.  Motor shaft or bearings defective.  Pump cavitation.	Check liquid level in sump; check position of pump and liquid level sensing device(s).  Replace impeller.  Check piping installation.  Check impeller.  Disassemble pump and check motor and bearings.  Reduce discharge head, or restrict flow on low head appli- cations.

ELECTRICAL TESTING

If you suspect that pump malfunctions are caused by defects in the motor, power cable or control box, perform the following checks to help isolate the defective part.

WARNING

```

////////////////////////////////////
//                               //
// 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. //
//                               //
////////////////////////////////////

```

CAUTION

<p>Be certain to refer to the wiring diagram(s) in the INSTALLATION section of this manual before reconnecting any electrical components which have been disconnected.</p>
--

Test Equipment

A megohmmeter of adequate range and quality will be required to conduct the following electrical tests. The suggested equipment indicated below is commercially available, or an equivalent substitute may be used.

Equipment	Manufacturer	Use
Megohmmer	Herman H. Sticht Co. 25 Bark Place New York, N.Y.	To measure resistance (ohms) to ground

Motor And Motor Power Cable Continuity

- a. Disconnect the power cable plug from its receptacle, or lock out incoming power and disconnect the power cable leads to the optional manual switch or automatic control box.
- b. Connect the test leads to any two of the three power cable leads (not to the green ground lead). If there is a high resistance reading on the ohmmeter, there is an open or broken circuit caused by a break in the power cable or motor windings, or by a bad connection between the motor and the power cable. Switch one test lead to the third power lead, and test again.

## TROUBLESHOOTING

- 
- 
- c. If an open or broken circuit is indicated, check the power cable for obvious damage, and replace as necessary (see **Head And Power Cable Disassembly/Reassembly** in **MAINTENANCE AND REPAIR**). The entire motor power cable must be replaced; splicing or other means of repair are not recommended.
  - d. If the power cable appears undamaged, see **Head And Power Cable Disassembly**, separate the pump head from the motor housing, and disconnect the power cable Amp-lock cap from the Amp-lock plug. Separately test each of the cable leads, (including the green ground lead) for continuity through the Amp-lock cap. If any of the power cable leads do not check out for continuity, replace the entire power cable.
  - e. If no break is found in the power cable, connect the test leads to the power contacts (not to the ground wire contact) of the Amp-lock plug. If the test reading indicates an open or broken circuit, there is an open circuit in the motor.

## NOTE

It is recommended that a pump with a defective motor be returned to Gorman-Rupp, or to one of the Gorman-Rupp authorized Submersible Repair Centers.

- f. Be certain to reconnect the Amp-lock plug and cap before reassembling the pump head to the motor housing.

If insulation resistance is to be checked, do not assemble the pump head to the motor housing at this time.

## Insulation Resistance

- a. Disconnect the power cable plug from its receptacle, or lock out incoming power and disconnect the power cable leads to the optional manual switch or automatic control box.
- b. Connect one test lead to the power cable plug grounding prong (or to the green ground lead), and touch the other test lead to each of the two power prongs (or power leads) in turn.
- c. The reading obtained will indicate resistance values in both the power cable and the motor windings. If the resistance is infinity ( $\infty$ ), the insulation is in good condition. If the reading is between infinity ( $\infty$ ) and 1 megohm, the insulation is acceptable but should be rechecked periodically. If the reading is less than 1 megohm, the insulation should be checked more closely. A reading of zero indicates that the power cable or the motor is grounded.
- d. To determine whether the power cable or the motor is grounded, separate the pump head from the motor housing (see **Head And Power Cable Disassembly/Reassembly** in **MAINTENANCE AND REPAIR**) and disconnect the Amp-lock plug and cap. Test the power cable leads and motor leads separately.
- e. Be certain to reconnect the Amp-lock plug and cap before reassembling the pump head on the motor housing.

---

---

## Capacitor

The start capacitor, located in the head of the pump, is designed to split the electrical phase during the initial power surge at motor startup. When the motor reaches load speed the run capacitor maintains operation.

### CAUTION

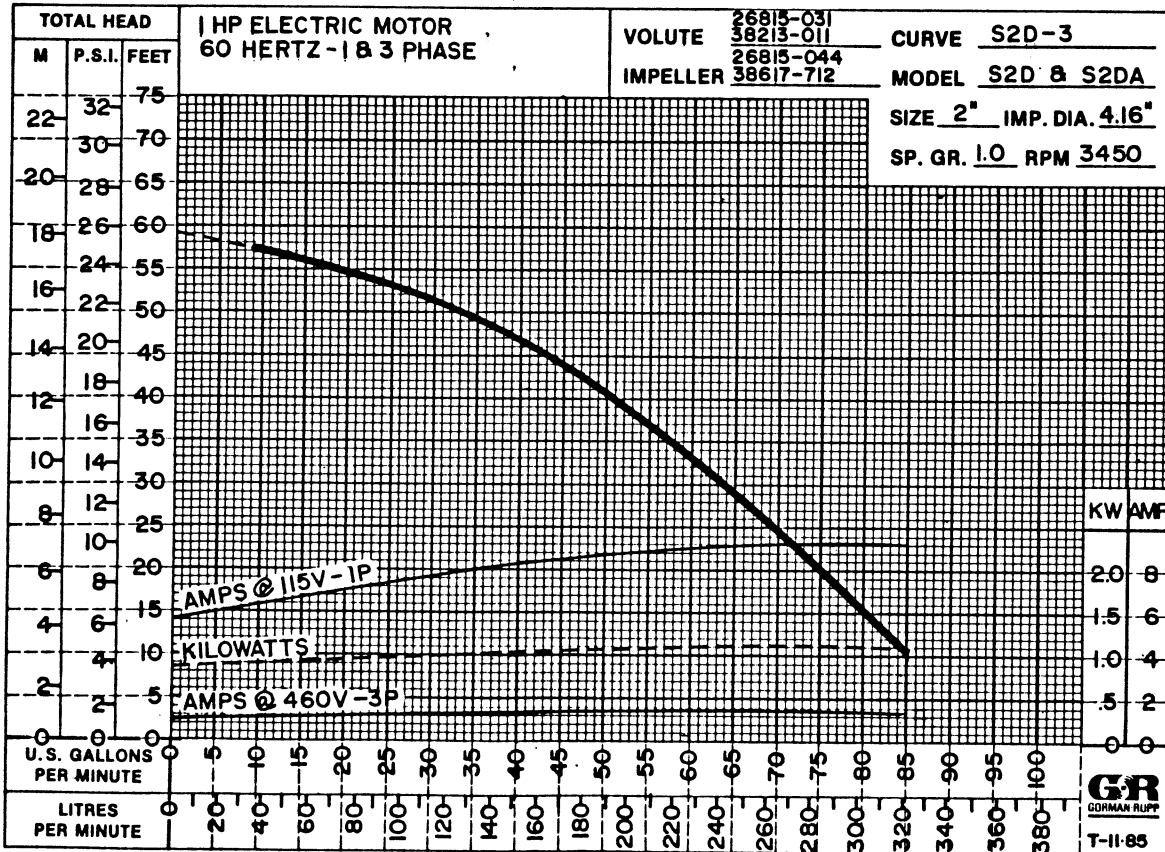
Before disconnecting the capacitor leads, discharge the capacitor; use a screwdriver with an insulated handle, and place the blade across the two terminals of each capacitor to short the terminals.

Zero-balance the ohmmeter set to read RX100K, and test the capacitor as follows:

- a. See Figure 1 in Section E, and disconnect the pin housing and socket housing (31 and 32) to disconnect the leads to the capacitor, and disconnect the pin and socket housings (38 and 39) to disconnect the leads to the run capacitor.
- b. Place a test lead against each of the capacitor terminals for a few seconds. If the ohmmeter needle moves toward zero, then slowly drifts back to the left, the capacitor is good. If the needle remains at infinity (∞) the capacitor is open; if the needle remains at zero, the capacitor is shorted. In either case, the capacitor must be replaced.
- c. Check for grounding by touching one test lead to the capacitor cases and the other lead to each of the capacitor terminals in turn. The ohmmeter should read infinity (∞); if it does not, the capacitor is grounded and must be replaced.
- d. After the capacitor has been checked, reconnected the pin and socket housings.

MAINTENANCE AND REPAIR - SECTION E

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



\*STANDARD PERFORMANCE FOR PUMP MODEL S2D3-115V 1P

\*Based on 70°F clear water at sea level. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N", your pump is NOT a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

SECTIONAL DRAWING

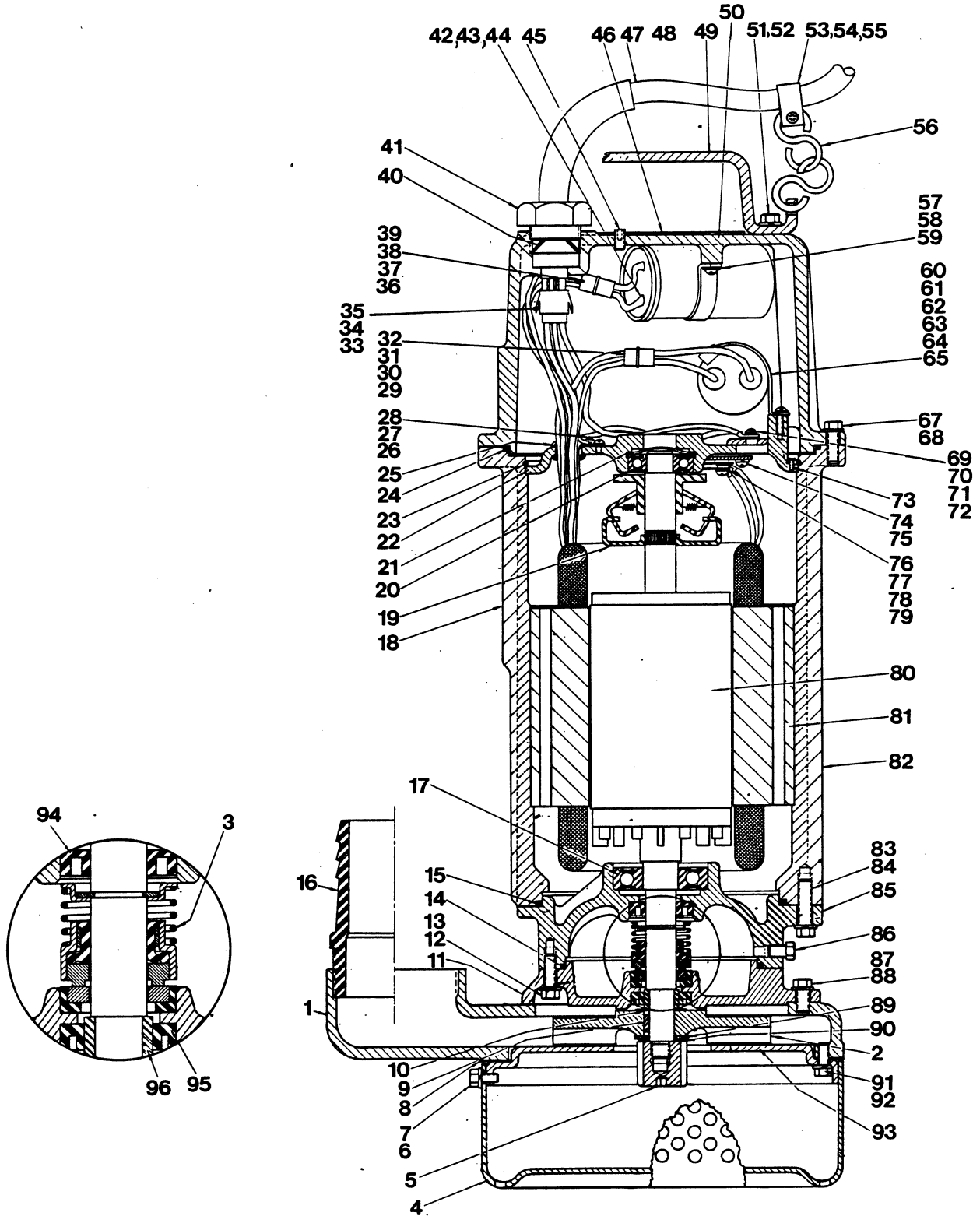


Figure 1. Pump Model S2D3-115V 1P

**PARTS LIST**  
**Pump Model S2D3-115V 1P**  
 (From S/N 796769 up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	*VOLUTE O-RING	26815-031	-----	1	55	HEX NUT	26815-380	-----	1
2	*IMPELLER	26815-044	-----	1	56	CABLE CHAIN	26815-257	-----	1
3	SEAL ASSY	26815-110	-----	1	57	RD HD PHLP SCREW	26815-340	-----	2
4	*STRAINER	26815-070	-----	1	58	W/LOCKWASHER			
5	IMPELLER LOCKNUT	26815-051	-----	1	59	CAPACITOR HOLDER	26815-726	-----	1
6	HEX HD CAPSCREW	26815-355	-----	4	60	START CAPACITOR	26815-172	-----	1
7	W/LOCKWASHER				61	W/LEAD WIRE	-----	-----	2
8	*IMP COVER GSKT	26815-150	-----	1	62	W/RUBBER CAP	-----	-----	2
9	*IMPELLER KEY	26815-050	-----	1	63	CAPACITOR HOLDER	26815-722	-----	1
10	*IMP SHIM SET	13131	-----	1	64	RD HD PHLP SCREW	26815-340	-----	1
11	SEAL CHAMBER	26815-021	-----	1	65	W/LOCKWASHER			
12	HEX HD CAPSCREW	26815-306	-----	4	66	DOES NOT APPLY	-----	-----	-
13	W/LOCKWASHER				67	HEX HD CAPSCREW	26815-306	-----	4
14	*SEAL CHAMBER O-RING	26815-142	-----	1	68	W/LOCKWASHER			
15	*LWR MTG PLT O-RING	26815-145	-----	1	69	RD HD PHLP SCREW	26815-341	-----	2
16	DISCH HOSE ADAPTOR	26815-422	-----	1	70	W/LOCKWASHER			
17	*LOWER BALL BEARING	23282-004	-----	1	71	FLAT WASHER	26815-374	-----	2
18	SPEC DECAL	38814-030	-----	1	72	OVERLOAD PROTECT	26815-201	-----	1
19	CENTRIF SW ACTUATOR	26815-183	-----	1	73	FLAT MACH SCREW	26815-335	-----	2
20	*UPPER BALL BEARING	23257-003	-----	1	74	RD HD PHLP SCREW	26815-340	-----	2
21	*BEARING SHIM	26815-133	-----	1	75	W/LOCKWASHER			
22	MOUNTING PLATE	26815-162	-----	1	76	CENTRIF SWITCH	26815-193	-----	1
23	RING CLAMP	26815-166	-----	1		CONTACT			
24	*HEAD O-RING	26815-144	-----	1	77	TERMINAL	26815-560	-----	2
25	WIRE PROTECTION	26815-292	-----	1	78	SPRING WASHER	26815-362	-----	2
26	RD HD PHLP SCREW	26815-341	-----	1	79	RD HD PHLP SCREW	26815-337	-----	2
27	W/LOCKWASHER				80	*ROTOR W/SHAFT	26815-095	-----	1
28	FLAT WASHER	26815-374	-----	1	81	STATOR	26815-105	-----	1
29	LOCK SOCKET	26815-540	-----	2	82	MOTOR HOUSING	26815-013	-----	1
30	LOCK PIN	26815-550	-----	2	83	HEX HD CAPSCREW	26815-307	-----	4
31	PIN HOUSING	27245-004	-----	1	84	W/LOCKWASHER			
32	SOCKET HOUSING	27245-014	-----	1	85	LWR MOUNTING PLT	26815-701	-----	1
33	CONTACT	26815-199	-----	6	86	SEAL CAVITY	26815-400	-----	1
34	AMP-LOCK PLUG	27245-023	-----	1		DRAIN/FILL PLUG			
35	AMP-LOCK CAP	27245-033	-----	1	87	HEX HD CAPSCREW	26815-306	-----	4
36	LOCK SOCKET	26815-540	-----	2	88	W/LOCKWASHER			
37	LOCK PIN	26815-550	-----	2	89	FLAT WASHER	26815-052	-----	1
38	PIN HOUSING	27245-004	-----	1	90	SPRING WASHER	26815-368	-----	1
39	SOCKET HOUSING	27245-014	-----	1	91	HEX HD CAPSCREW	26815-355	-----	4
40	BEVELED WASHER	26815-254	-----	1	92	W/LOCKWASHER			
41	CABLE LOCKNUT	26815-250	-----	1	93	IMPELLER COVER	26815-060	-----	1
42	RUN CAPACITOR	26815-174	-----	1	94	*OIL SEAL	26815-122	-----	1
43	W/LEAD WIRE	-----	-----	2	95	*LIP SEAL	26815-121	-----	1
44	W/RUBBER CAP	-----	-----	2	96	SHAFT SLEEVE	26815-280	-----	1
45	PRESSURE TEST PLUG	26815-405	-----	1		OPTIONS:			
46	IDENT PLATE	2613-EF	-----	1		FLOAT SWITCH	27471-155	-----	1
47	*POWER CABLE	26815-240	-----	1		115V CONTROL BOX	27511-071	-----	1
48	ROPE (NOT SHOWN)	26815-650	-----	1		MAN START SWITCH	27511-053	-----	1
49	CARRY HANDLE	26815-080	-----	1		W/ENCLOSURE			
50	HEAD	26815-005	-----	1		DISCH ADAPTOR	9022-D	-----	1
51	HEX HD CAPSCREW	26815-306	-----	2		(BSP TO NPT THREADS)			
52	W/LOCKWASHER					MINIMUM PUMP-DOWN	48224-001	-----	1
53	CABLE BAND	26815-260	-----	1		CONVERSION KIT			
54	RD HD PHLP SCREW	26815-342	-----	1					

\*INDICATES PARTS RECOMMENDED FOR STOCK

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

CANADIAN SERIAL NO ..... AND UP

PUMP AND MOTOR DISASSEMBLY AND REASSEMBLY

CAUTION

Nuts, bolts and screws used on this pump are metric and do not match standard English-measurement threads. If any threaded hardware is replaced, it must be replaced with metric type. Attempting to force in a fastener with English threads will damage the mating threads. An optional discharge adaptor is available to convert the English pipe threads in the discharge flange to American pipe threads.

WARNING

```

////////////////////////////////////
//
// The electrical power to operate this pump is high enough //
// to cause injury or death. Before attempting to open or //
// service the pump assembly, make certain that the plug on //
// the pump power cable is disconnected from its //
// receptacle. If the pump power cable is wired into an //
// optional control box, make certain the switch is in the //
// OFF or STOP position, or that the power supply to the //
// control box has been otherwise cut off and locked out. //
// Tag electrical circuits to prevent accidental start-up. //
//
////////////////////////////////////

```

Before attempting to service the pump or optional control box, cut off the power supply to the pump and close any valves in the discharge line.

WARNING

```

////////////////////////////////////
//
// Do not attempt to lift the pump by the motor power cable //
// or the hose. The pump is provided with a carrying han- //
// dle and a rope. Use the rope to lift the pump. //
//
////////////////////////////////////

```

Use the rope to lift the pump from the wet well or sump and move it to a location where the discharge hose can be removed. It is not necessary to disconnect the hose before removing the pump from the sump or wet well.

Select a suitable location, preferably indoors, to perform the degree of maintenance required. If the motor housing is to be opened, the work must be done in a clean well-equipped shop. All maintenance functions must be performed by qualified personnel.

Check the chart in TROUBLESHOOTING to determine the nature of the pump problem. If the problem is mechanical in nature, such as worn pump parts, seal replacement, lubrication, etc., refer to PUMP END DISASSEMBLY for instructions.

## MAINTENANCE AND REPAIR

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---

If the problem is electrical, complete disassembly may not be required. Refer to **Electrical Testing** and have a qualified electrician check out control box (optional), power cable, and electrical components within head (50) and motor housing (82). If the problem is determined to be in the rotor (80), the pump end must be disassembled (see **PUMP END DISASSEMBLY**). Otherwise see **HEAD AND POWER CABLE DISASSEMBLY**.

All gaskets and O-rings **must** be replaced if disturbed. Recommended spare parts are indicated in the parts lists.

## PUMP END DISASSEMBLY

### Draining Oil From Pump

It is not necessary to drain the oil from the seal cavity unless the seal chamber (11) will be separated from the lower mounting plate (85).

#### CAUTION

Let the pump cool before removing the seal cavity drain/fill plug. Pressure built up within a hot pump could cause the oil to spray out when the plug is removed. Remove the plug slowly and permit pressure to vent to atmosphere.

To drain the oil, lay the pump on its side with the seal cavity drain/fill plug (86) facing up. Remove the plug and drain the oil into a **clean** container. Inspect it for water, dirt or cloudy condition which could indicate seal failure or poor gasket seal.

### Strainer And Impeller Cover Disassembly

To remove the strainer (4), remove the hardware (6 and 7) securing it to the impeller cover.

To remove the impeller cover (93), remove the hardware (91 and 92) securing it to the volute.

#### NOTE

Carefully inspect any O-rings or gaskets before removal and cleaning to determine if a proper seal and compression existed prior to disassembly. If sealing was faulty or questionable, the cause must be determined and corrected before reassembly. Replace any parts as required.

Remove the impeller cover gasket (8).

---

---

If the impeller is clogged, the debris can usually be removed now without further pump disassembly.

### Impeller Disassembly

Wedge a piece of wood between the vanes of the impeller (2) and the volute (1) to prevent shaft rotation.

Remove the hardware (5, 89, and 90) securing the impeller on the rotor shaft.

Pull the impeller from the shaft. Retain the impeller key (9).

Remove the impeller shims (10); for ease of reassembly, tag and tie the shims.

If pump end will be further disassembled, remove the shaft sleeve (96). Pry the lip seal (95) from the seal chamber bore if worn or damaged.

### Seal Disassembly

#### See Figure 1 and 2

Remove the hardware (87 and 88) securing the volute (1) to the seal chamber (11), and remove the volute.

After draining the oil from the seal cavity, remove the hardware (12 and 13) securing the seal chamber (11) to the lower mounting plate (85). Remove the seal chamber with caution; tension on the seal spring will be released.

Remove the seal chamber O-ring (14).

The stationary seal seat and stationary element will remain in the seal chamber bore when removed. To remove the stationary seat and element, place the seal chamber on a **clean** cloth with the seal bore side down, and use a dowel or drift pin to force the seat and element out of the bore.

Lubricate the rotor shaft adjacent to the bellows assembly, and use a stiff wire with a hooked end to pull the bellows and rotating seal element from the shaft.

Remove the seal spring and the spring retaining ring.

Remove the snap ring on the rotor shaft, and inspect the oil seal (94) in the bore of the lower mounting plate (85). Replace the seal if damaged.

The mating faces of the rotating and stationary elements are precision finished and subject to wear. The complete seal should be replaced with each overhaul to ensure trouble-free operation. However, if the old seal must be reused, wrap the seal faces individually in tissue paper to prevent damage to the sealing faces.

It is not necessary to remove the lower mounting plate (85) unless the motor will be disassembled.

NOTE

Do not disassemble the motor unless it is necessary and clean well-equipped shop is available. If the motor housing components are to be serviced, see **MOTOR DISASSEMBLY** in this section, and do not reassemble the pump end components at this time.

If no further disassembly is required, proceed to appropriate areas in **PUMP END REASSEMBLY**.

**PUMP END REASSEMBLY**

NOTE

Reuse of old O-rings, gaskets, or shaft seal parts may result in premature leakage or reduced pump performance. It is strongly recommended that new gaskets, O-rings, and seal assembly be used during reassembly. (See parts recommended for stock in parts list.)

With the pump inverted, stuff a clean tissue into the stationary seat bore of the lower mounting plate (85) - or wrap a small rag around the rotor shaft - to prevent foreign material from entering the motor cavity.

Seal Reassembly

Figure 1 and 2

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 prec- //  
// autions printed on solvent containers. //  
// //  
////////////////////////////////////

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 seal leakage. If any components are worn, replace the complete seal; **never mix old and new seal parts.**

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 stationary seat, with water or a very **small** amount of oil, and apply a drop of lubricating oil on the finished faces. Assemble the seal as follows (see Figure 2).

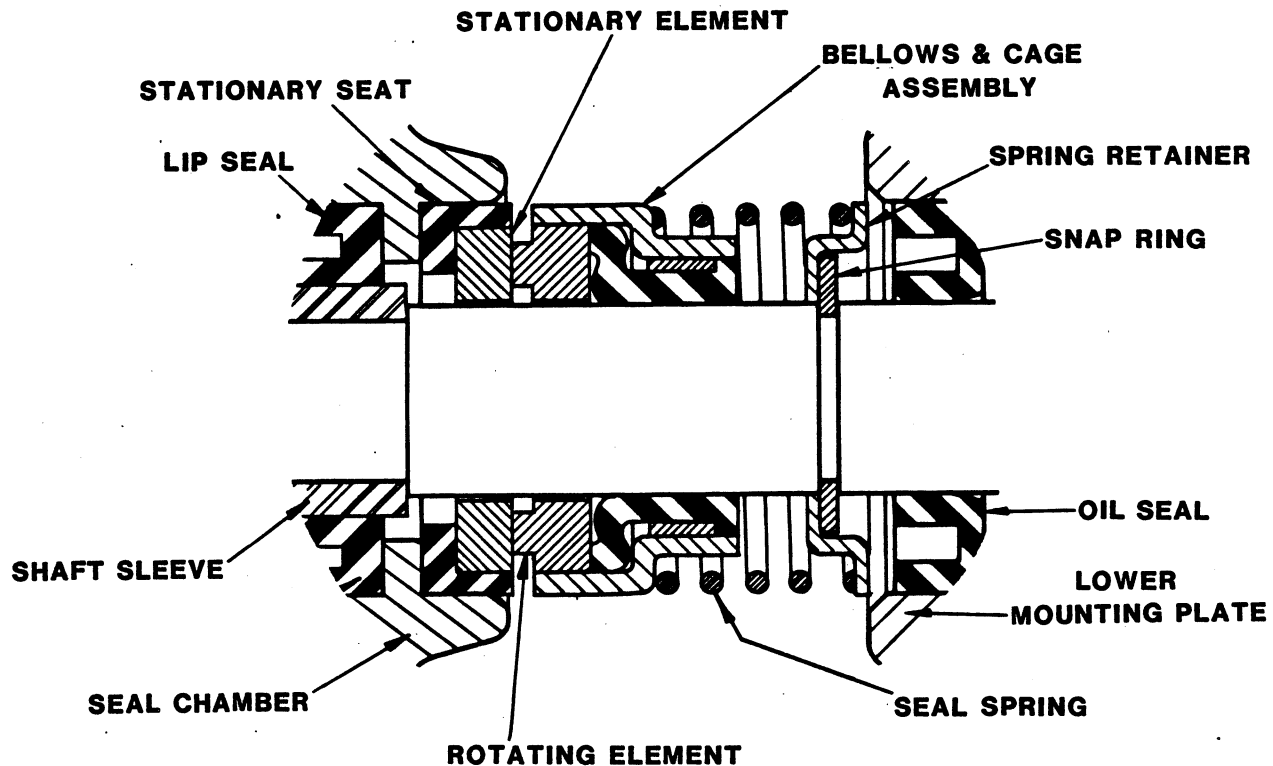


Figure 2. Seal Assembly 26815-110

#### CAUTION

This seal is not designed for operation at temperatures above 120° F. Do not use at higher operating temperatures.

Inspect the end of the shaft for damaged threads, scoring, and nicked or damaged keyway. Remove nicks and burrs with a fine file or hand honing stone to restore original contours. If the shaft is bent or damaged, the complete shaft and rotor (80) must be replaced as an assembly (see **MOTOR DISASSEMBLY**).

---

---

Carefully remove the material stuffed into the seat bore (or unwrap the shaft). **Be sure** no debris stopped by the material falls into the motor cavity.

If removed, replace the lower mounting plate O-ring (15) and secure the lower mounting plate (85) to the motor housing (82) with hardware (83 and 84).

Install the oil seal (94) in the mounting plate with the lip positioned as shown in Figures 2 and 3.

#### NOTE

When pressing seal components on the impeller shaft, use hand pressure only. A push tube cut from a length of plastic pipe will aid in installing seal components. The I.D. of the push tube should be approximately the same as the I.D. of the seal spring.

Install the snap ring on the rotor shaft just below the oil seal.

Unpack the stationary seat and stationary element. Place a clean tissue over the sealing face of the stationary element and subassemble the stationary seat so that the lugs in the seat engage the grooves in the element.

Apply a **light** coating of oil to the seal seat bore in the seal chamber (11). Position the subassembled seat and element in the bore with the sealing face out. Use your thumbs to press the seat and element into the bore. Apply equal pressure to opposite sides of the seat until it contacts the bore shoulder. Remove the tissue and inspect the seal face to ensure that it is clean. If cleaning is necessary, use clean tissue to wipe **lightly** in a concentric pattern. After cleaning, apply a drop light oil to the seal face.

Unpack the seal spring retaining ring, seal spring, bellows, and rotating element. Be certain the seal face of the rotating element is free of grit or surface damage. Subassemble the drive grooves of the rotating element into the drive lugs of the bellows retainer.

Position the seal spring retaining ring over the snap ring on the rotor shaft.

Install the seal spring over the retaining ring.

Apply a light coating of oil to the I.D. of the bellows, and slide the bellows and assembled rotating element on the shaft so that the bellows cage slips into the seal spring. (The seal spring cannot be compressed and held in place until the seal chamber (11) is installed.)

Inspect the faces of the stationary and rotating seal elements to make certain that they are clean. If cleaning is necessary, use a clean tissue to wipe **lightly** in a concentric pattern. After cleaning, apply a drop of light oil to the seal faces.

Replace the seal chamber O-ring (14).

Install the seal chamber (11) and assembled seal stationary seat and element on the shaft and secure the chamber to the lower mounting plate (85) with hardware (12 and 13).

---

---

### Impeller Reassembly

Install the shaft sleeve (96) and the lip seal (95) with the lip positioned as shown in Figure 2.

Install the same number and thicknesses of shims (10) as were removed.

Inspect the impeller (2), and replace it if cracked or worn.

Install the impeller key (9) in the rotor shaft keyway, and press the impeller on the shaft until it seats firmly against the impeller shims.

Install the flat washer (89), spring washer (90), and impeller locknut (5). Wedge a block of wood between the impeller vanes to prevent shaft rotation, and tighten the impeller locknut.

Secure the volute (1) to the seal chamber (11) with hardware (87 and 88).

Replace the impeller cover gasket (8) and position the impeller cover (93) on the volute (1). Secure the cover with lockwashers (92) and capscrews (91).

There should be a clearance of between .010 and .020 inches between the impeller cover and the face of the impeller. Reach in and measure this clearance with a feeler gauge.

If the impeller clearance is not within limits, remove the impeller cover and impeller, then add or remove impeller adjusting shims (10) as required. Reinstall the impeller and impeller cover, and recheck clearance.

### Strainer Reassembly

Install the strainer (4) on the impeller cover (93), and secure it with lockwashers (7) and capscrews (6).

See LUBRICATION and FINAL ASSEMBLY before putting the pump back into operation.

### MOTOR DISASSEMBLY

Disassembly of the motor is rarely required except to replace the rotor, stator, bearings, or motor housing. The shaft and rotor assembly (80) may be serviced after disassembling only the pump end, however to service the stator (81) the pump end and motor components must be completely disassembled. The following instructions are written assuming complete disassembly is required.

#### NOTE

It is recommended that a pump with a defective motor be returned to Gorman-Rupp, or to one of the Gorman-Rupp authorized Submersible Repair Centers.

**WARNING**

```

////////////////////////////////////
//
// The electrical power to operate this pump is high enough //
// to cause injury or death. Before attempting to open or //
// service the pump assembly, make certain that the plug on //
// the pump power cable is disconnected from its //
// receptacle. If the pump power cable is wired into an //
// optional control box, make certain the switch is in the //
// OFF or STOP position, or that the power supply to the //
// control box has been otherwise cut off and locked out. //
// Tag electrical circuits to prevent accidental start-up. //
//
//
////////////////////////////////////

```

**NOTE**

Carefully inspect any O-rings or gaskets before removal and cleaning to determine if a proper seal and compression existed prior to disassembly. If sealing was faulty or questionable, the cause must be determined and corrected before reassembly. Replace any parts as required.

**Head And Power Cable Disassembly**

**WARNING**

```

////////////////////////////////////
//
// All electrical connections and disconnections must be //
// made by qualified personnel. Refer to Figure 1 in this //
// section, and to the Electrical Wiring Diagram in Section //
// B (INSTALLATION). //
//
//
////////////////////////////////////

```

**NOTE**

Refer to the wiring diagram in Section B (INSTALLATION) while disconnecting electrical leads.

To remove the head (50), remove the hardware (67 and 68) securing the head to the motor housing (82). Raise the head for access to the electrical connections. Disconnect the Amp-lock cap (35) from the Amp-lock plug (34). Disconnect the pin housing (38) from the socket housing (39).

Remove the head (50) and assembled power cable (47) and run capacitor (32).

To separate the power cable (47) from the head, remove the hardware (54 and 55) securing the cable band (53) to the cable. Unscrew the cable locknut (41), remove the beveled washer (40), and pull the power cable and attached Amp-lock cap (35) through the bore of the head. To remove and/or replace the Amp-lock cap,

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disconnect the power cable leads from the cap contacts (33), and pull the cap off the cable.

To remove the run capacitor and attached socket housing (39), remove the hardware (57 and 58) securing the capacitor holder (59) to the head. To remove and/or replace the socket housing, disconnect the socket locks (36) from the housing,

If desired to remove the carry handle (49), remove the hardware (51 and 52) securing the handle to the head.

Remove the head O-ring (24).

Disconnect the start capacitor socket housing (32) from the pin housing (31). Remove the pin locks (30) of the C1 blue leads from the pin housing.

Remove the C2 blue leads pin locks (37) from the run capacitor pin housing (38).

Unsolder the stator white lead at its point of connection to the overload protector (72).

Disconnect the stator red lead from the Amp-lock plug (34) at the plug contact (33).

Using caution not to strain any electrical leads, slowly lift the mounting plate (22) from the shaft while guiding the leads through the wire protection (25).

If the rotor (80) is installed in the motor housing (82), and the upper ball bearing (20) remains on the rotor shaft, the bearing shim (21) will become a free part. If the bearing and shim remain in the bore of the mounting plate (22), remove them after the mounting plate has been completely freed from the motor housing.

Turn over the mounting plate (22), and remove the hardware (78 and 79) securing the terminal (77) of the short blue lead from the stator (81) to the centrifugal switch contact (76). (It is not necessary to remove the C1 blue lead to the pin housing of the starting capacitor.)

Remove the machine screws (73) securing the ring clamp (23) to the mounting plate (22).

The mounting plate should now be free; remove it while guiding the electrical leads through the wire protection (25).

If desired to remove the green ground wire, remove the hardware (26, 27 and 28) securing the wire to the mounting plate.

If desired to remove the overload protector (72), remove the hardware (69 and 70) and flat washers (71) securing the protector to the mounting plate.

If desired to remove the centrifugal switch contact (76), remove the hardware (74 and 75) securing the contact to the mounting plate.

If desired to remove the start capacitor (60), remove the hardware (64 and 65) securing the capacitor holder (63) to the mounting plate.

## MAINTENANCE AND REPAIR

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### Rotor Disassembly

See **Pump End Disassembly**, and remove all pump end components.

With the head (50) removed and mounting plate (22) separated from the motor housing, remove the bearing shim (21). (If the shim and the upper ball bearing (20) remain in the bore of the head mounting plate (22), remove both from the bore.)

From the impeller end of the shaft, use a soft-faced mallet or block of wood to tap the rotor, centrifugal switch actuator, and assembled ball bearing(s) out of the lower mounting plate (85) and through the stator (81). Use caution to prevent the rotor (80) from falling on the stator windings.

Wrap the rotor and parts in a clean cloth and put them aside until ready to reinstall in the motor housing (see **Rotor Reassembly**).

### Stator Disassembly

It is recommended that the stator (81) be left in place unless it is defective.

If the stator must be removed, position an expandable tool, such as split disc, at the midpoint of the stator, and expand it tightly and squarely on the I.D. Attach a lifting device to the lifting eye of the expandable tool, and raise the stator and assembled motor housing (82) one inch off the work surface. Take care not to damage the stator end turns, lead, or the centrifugal switch actuator. Use a soft-faced mallet to rap alternate edges of the motor housing, and "walk" the stator and attached actuator out. Continue this process until the stator clears the motor housing.

#### NOTE

It may be necessary to heat the motor housing to permit stator removal.

After the stator has been removed, wrap it in clean dry rags or other suitable material. The stator **must** be kept clean and dry. When handling the stator, do not set it on the end windings; lay it on its side.

#### CAUTION

Do not attempt to rewind the stator. Winding tolerances and materials are closely controlled by the manufacturer, and any deviation can cause damage or operating problems. Replace the stator, or return it to one of The Gorman-Rupp Authorized Submersible Repair Centers or The Gorman-Rupp factory, if defective.

MOTOR REASSEMBLY

NOTE

Reuse of old O-rings, gaskets, or shaft seal parts may result in premature leakage or reduced pump performance. It is strongly recommended that new gaskets, O-rings, and seal assembly be used during reassembly. (See parts recommended for stock in parts list.)

Clean all gasket and O-ring surfaces completely, removing any old gasket and cement material. Inspect the sealing surfaces for burrs, nicks, and pits which could cause a poor seal. Replace parts as required.

Thoroughly clean the inside of the motor housing (82) with fresh solvent. The interior **must** be dry and free of dirt or lint.

WARNING

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//
// 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 prec- //
// autions printed on solvent containers. //
//
////////////////////////////////////

```

Stator Reassembly

Do not unwrap the stator (81) until the motor housing has been prepared for stator installation. The stator **must** be kept clean and dry. When handling stator, do not set it on its end windings. Lay it on its side.

Test the new stator as indicated in **Electrical Testing** in TROUBLESHOOTING to ensure that no damage has occurred during handling.

Stand the motor housing (82) upright. Position an expandable tool, such as a split disc, at the midpoint of the stator, and expand it tightly and squarely on the I.D. Attach a lifting device to the lifting eye of the expandable tool. Lift the stator and carefully lower it into the motor housing until seats squarely on the motor housing shoulder. If the stator "cocks" in the motor housing, remove it and try again.

If necessary, heat the motor housing with a torch to expand it enough for the stator to be installed; when heating the motor housing, **make certain** the stator, stator leads, and switch actuator are clear to avoid damage to these parts. Apply heat evenly to the inside of the motor housing; excessive heat is not required. Be careful not to damage the stator leads to the switch actuator during reassembly.

After the stator has been installed, cover the motor housing with a clean, lint-free cloth while the rotor is being reassembled.

## MAINTENANCE AND REPAIR

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## Rotor Reassembly

Inspect the seal and bearing areas of the rotor shaft. Inspect the shaft for damaged threads, scoring, and a nicked or damaged keyway. Remove nicks and burrs with a fine file or honing stone. If the shaft is bent or damaged, replace the shaft and rotor (a single assembly).

Inspect the ball bearings (17 and 20). If rotation is rough or the bearings are discolored, replace them.

### CAUTION

When installing the bearings onto the shaft, NEVER press or hit against the outer race, balls, or ball cage. Press ONLY on the inner race.

Install the lower ball bearing (17) on the rotor shaft; make certain that it seats squarely against the shaft shoulder. Clean the ball bearing bores of the head mounting plate (22) and lower mounting plate (85).

Before installing the upper ball bearing (20) on the rotor shaft, check that the centrifugal switch actuator (19) is functioning properly. The switch actuator is a press fit onto the rotor shaft. If desired to remove it, use a felt tip ink marker to scribe the location of the actuator on the impeller side of the shaft. Hook two screwdrivers under the actuator and pull it carefully from the shaft.

To reinstall the centrifugal switch actuator (19), press it on the rotor shaft so that the lower side of the actuator aligns with the scribed mark on the shaft.

Install the upper ball bearing (20) on the rotor shaft. Make certain that the bearing seats squarely against the shaft shoulder.

Replace the O-ring (15), and position the lower mounting plate (85) on the rotor shaft. Secure the plate to the motor housing (82) with hardware (83 and 84).

With the centrifugal switch actuator (19) and bearings (17 and 20) installed on the rotor shaft, carefully slide the impeller end of the shaft through the stator so that the lower ball bearing (17) seats squarely in the bore of the lower mounting plate (22).

Install the bearing shim (21) at the time the head mounting plate (22) is installed.

After the head (50) and power cable (47) have been completely installed and secured, see **PUMP END REASSEMBLY**, and reassemble the pump end components.

After the pump end components have been reassembled, see **LUBRICATION**.

## Head And Power Cable Reassembly

If the centrifugal switch contact (76) has been removed, secure it to the mounting plate (22) with round head screws (74) and lockwashers (75). Secure the

## MAINTENANCE AND REPAIR

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terminal (77) of the short blue lead from the stator (81) to the centrifugal switch contact with the round head screw (79) and spring washer (78). (The C1 blue lead from the contact to the start capacitor pin housing (31) should already be installed on the contact.)

Inspect the mounting plate wiring protector (25), and replace if badly worn.

Feed the C1 blue lead from the centrifugal switch contact (76), and the C1 blue, two C2 blue, white, and red leads from the stator (81) through the wiring protector and mounting plate.

Position the bearing shim (21) on the upper ball bearing (20), and press the bore of the mounting plate (22) over the shim and bearing. Make certain that the bearing seats squarely in the bore.

Install the ring clamp (23) on the mounting plate (22), and secure it with flat head screws (73).

If removed, position the starting capacitor (60) in the capacitor holder (63), and secure the holder to the mounting plate with hardware (64 and 65).

Install the two C1 blue pin locks (30) in the pin housing (31). Connect the pin housing to the starting capacitor socket housing (32).

Connect the two C2 blue lead pin locks (37) to the pin housing (38).

If removed, secure the overload protector (72) to the mounting plate with hardware (69, 70 and 71). Solder the white lead from the stator to the protector. (The white lead from the Amp-lock plug should be already soldered to the protector.)

Install the red lead from the stator in the Amp-lock plug (34).

**NOTE**

Check wiring to make certain that all the leads from the motor housing area are now installed.

If removed, secure the green ground lead from the Amp-lock plug (34) to the mounting plate (22) with hardware (26, 27, and 28).

Replace the head O-ring (24).

If removed, install the run capacitor (42) and attach socket housing (39) in the capacitor holder (59), and secure the holder to the head (50) with hardware (57 and 58).

Test the two capacitors for shorts and grounding (see **Electrical Testing in TROUBLESHOOTING**).

Install the power cable locknut (41) and beveled washer (40) on the power cable. Lubricate the head bore, and install the power cable (and Amp-lock cap (35) if attached). Secure the cable with the locknut.

If the Amp-lock cap (35) has been removed from the power cable, connect the leads to the contacts (33) in the cap to match the color coding in the Amp-lock plug (34). Connect the cap to the plug.

Connect the run capacitor socket housing (39) to the pin housing (38).

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**CAUTION**

Check the wiring diagram in Section B (INSTALLATION) to make certain that all electrical leads are correctly installed, and that the Amp-lock cap and socket and both pin and socket housings, are connected.

Position the head (50) on the motor housing (82) and secure it with hardware (67 and 68).

If removed, secure the carry handle (49) to the head (50) with hardware (51 and 52).

Secure the cable band (53) and chain (56) to the cable with hardware (54 and 55).

**FINAL CHECK**

After motor reassembly has been completed, see **PUMP END REASSEMBLY** and reinstall the pump end components.

**MOTOR LEAK TEST**

After the pump has been completely reassembled, remove the pressure test plug (45), and apply a vacuum of 20 inches of mercury to the head and motor cavity. Hold for five minutes. If vacuum does not hold, check the head O-ring (44) for leaks, and check that the cable locknut (41) is secure.

Reinstall and tighten the pressure test plug.

Before starting the pump, see **LUBRICATION**.

**LUBRICATION**

The seal cavity is the only area of this pump that requires lubrication. Check the oil level before initial startup, after the first two weeks of operation, and every month thereafter.

**NOTE**

To accurately check the oil level the pump must be cool.

Lay the pump on its side with the seal cavity drain/fill plug (86) up. Sight down the plug hole and check that the oil level is high enough to cover the seal spring. The seal cavity requires approximately 7 ounces of SAE No. 10 non-detergent oil.

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