



S SERIES SUBMERSIBLE PUMPS

**MANUAL
PART 1 of 3**

INSTALLATION AND OPERATION

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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

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INTRODUCTION

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

A set of three manuals accompanies your pump. Each set consists of three parts; the Installation/Operation Manual contains essential information on installing and operating the pump, and on making electrical connections. However, since pump installations are seldom identical, some of the information only summarizes general recommendations and practices required to inspect, position, and arrange the pump and piping.

The Parts List Manual provides performance curve(s), a pump model cross-section drawing, and parts list for your pump.

The Maintenance and Repair Manual provides troubleshooting and maintenance instructions required to properly diagnose operational problems, and to service the pump hydraulic components. Pump motor maintenance may be performed **only** by a Gorman-Rupp authorized repair facility, or the factory. Otherwise, the pump warranty will be negated, and damage to the pump, and injury or death to personnel can result. Contact the factory for the authorized repair facility closest to you.

Pump construction is cast iron with stainless steel hardware and fittings. Some models are equipped with built-in liquid level sensing devices which automatically regulate pump operation. The pump is light weight and portable making it 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. The pump may be operated fully or partially submerged. The pump should not be operated in a hazardous atmosphere.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. 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 motor frame size in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

Voltage: _____

Phase: _____

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:



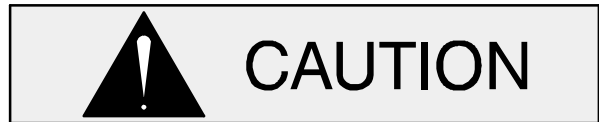
Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



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.

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.



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 the S Series submersible motor driven pumps.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Lock out incoming power to the control box to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
5. Close the discharge valve (if used).



This pump is not designed to pump volatile, explosive, or flammable materials. Do not attempt to pump any liquids for which you pump is not approved, or which may damage the pump or endanger personnel as a result of pump failure. Consult the factory for specific application data.



Make certain that the pump power cable

is fitted with the 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 Section B for recommended grounds.



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. Be sure that the incoming power matches the voltage and phase of the pump and control before connecting the power source. Do not run the pump if the voltage is not within the limits.



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 connections.



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.



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 and void warranty.



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



Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.



Do not attempt to lift the pump by the motor power cable or discharge hose. Attach proper lifting equipment to the lifting device fitted to the pump.



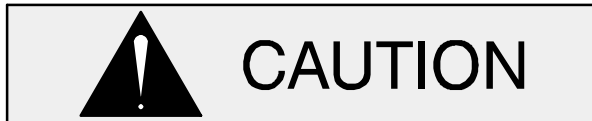
Pumps and related equipment must be installed and operated according to all national, local and industry standards.

INSTALLATION – SECTION B

GENERAL INFORMATION

Review all **SAFETY** information in Section A.

Since pump installations are seldom identical, this section is intended only to summarize general recommendations and practices required to inspect, position, and arrange the pump and piping. If there are any questions concerning your specific installation, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.



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

Pump Model Designation

Following is a description of the model numbering system for S Series pumps. These submersible pumps are available in a small range of sizes. Refer to the following chart to identify the size for your specific pump model.

Pump Model						
S	2	C	3	A	115V	1P
Series	Discharge Size	Pump Hydraulics	Pump Construction	Autostart (If Equipped)	Voltage	Phase

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. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for and tighten loose hardware at the mating surfaces.
- c. Inspect the power cable for cuts or any other obvious damage.
- d. Check that amperes, phase, voltage and hertz indicated on the name plate match the ratings on the control box and incoming power.
- e. Carefully read all tags, decals, and markings on the pump, and perform all duties indicated.
- f. Check for oil leaks. If there is any indication of an oil leak, see **LUBRICATION** at the end of this manual.
- g. 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.

PUMP SEAL

These S Series pumps utilize one of the following sealing methods.

1. S1 1/2A and S2C Models – The pump is equipped with one double-faced seal assembly. It is designed to prevent the liquid being pumped from entering the lubrication cavity at the impeller end, and to prevent moisture or lubrication oil from entering the motor housing cavity at the motor end.
2. S2D Models – The pump is equipped with a single faced seal assembly. 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.

Regardless of which sealing method is used, the seal is lubricated by premium quality submersible pump oil.

LUBRICATION

The pump utilizes one lubrication cavity, located between the pump casing and the motor housing. It is filled with premium quality submersible pump oil which lubricates the pump seal. The motor operates in and is cooled by air, therefore it requires no lubrication.

All S Series pumps are fully lubricated when shipped from the factory. However, lubrication levels **must be checked** before installing the pump (see **LUBRICATION** in the **MAINTENANCE AND REPAIR MANUAL**). If the oil level is abnormally low, determine the cause before putting the pump into service.

Refer to Table B-2 for oil capacities and positions for filling the seal cavity in each pump. Refer to **LUBRICATION**, Section C for lubrication specifications and intervals.

PUMP INSTALLATION

Pump Motor Specifications

See Table B-1 for pump specifications.

Table B-1. Pump Specifications

Model	Voltage/ Phase	Liquid Level Control	Pump HP/ KW	Motor Speed (RPM)	Full Load Amperes	No Load Amperes	Locked Rotor Amperes	Discharge Size (NPT)
S1 1/2A	115/1	NO	1/3 HP	3420	5.4	4.0	29.5	1 1/2 INCH w/BARBED ADAPTOR
S2C	115/1	NO	1/2 HP	3470	6.8	4.3	22.7	2 INCH w/BARBED ADAPTOR
S2D	115/1	NO	1 HP	3450	8.6	1.0	50.6	2 INCH w/BARBED ADAPTOR
S2DA	115/1	YES	1 HP	3450	8.6	1.0	50.6	2 INCH w/BARBED ADAPTOR

Table B-2. Additional Specifications

Pump Model	Voltage/Phase	Approximate Weight -- Lbs. (kg)		Oil Capacity Ounces (Liters)		Seal Cavity Filling Position (H)orizontal
		Pump	50 Ft. Cable	Seal Cavity	Motor Cavity	
S1 1/2A	115/1	50 (23)	6 (3)	7 (0,2)	---	H
S2C	115/1	52 (24)	6 (3)	7 (0,2)	---	H
S2D	115/1	78 (42)	6 (3)	7 (0,2)	---	H

Pump Dimensions

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

PUMP INSTALLATION



When installing or servicing the pump or controls, follow all requirements for the installation of wiring or electrical equipment as outlined in the National Electric Code. Follow all safety requirements. Failure to observe these requirements could result in injury or death to personnel.

NOTE

Refer to the performance curve in the Parts List Manual when determining the most efficient piping installation. The recommended maximum submergence depth is 23 feet. Greater depths could result in damage to the pump

Lifting

Use lifting equipment with a capacity of **at least five times the weight of the pump**, including the weight of the cable, if applicable, and any options

or customer-installed accessories. Discharge hose or piping **must** be removed before attempting to lift the pump.

Refer to Table B-2 for the approximate maximum weight for each pump.



Do not attempt to lift the pump by the motor power cable or the piping. Attach proper lifting equipment or a rope to the lifting device fitted to the pump.

Positioning the Pump

The pump is designed to operate fully or partially submerged. The rotating parts are oil lubricated, and the motor is cooled by a constant flow of liquid or air discharged through internal passages.

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 lifting device fitted on the pump. 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 B-1 for typical pump installations.

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

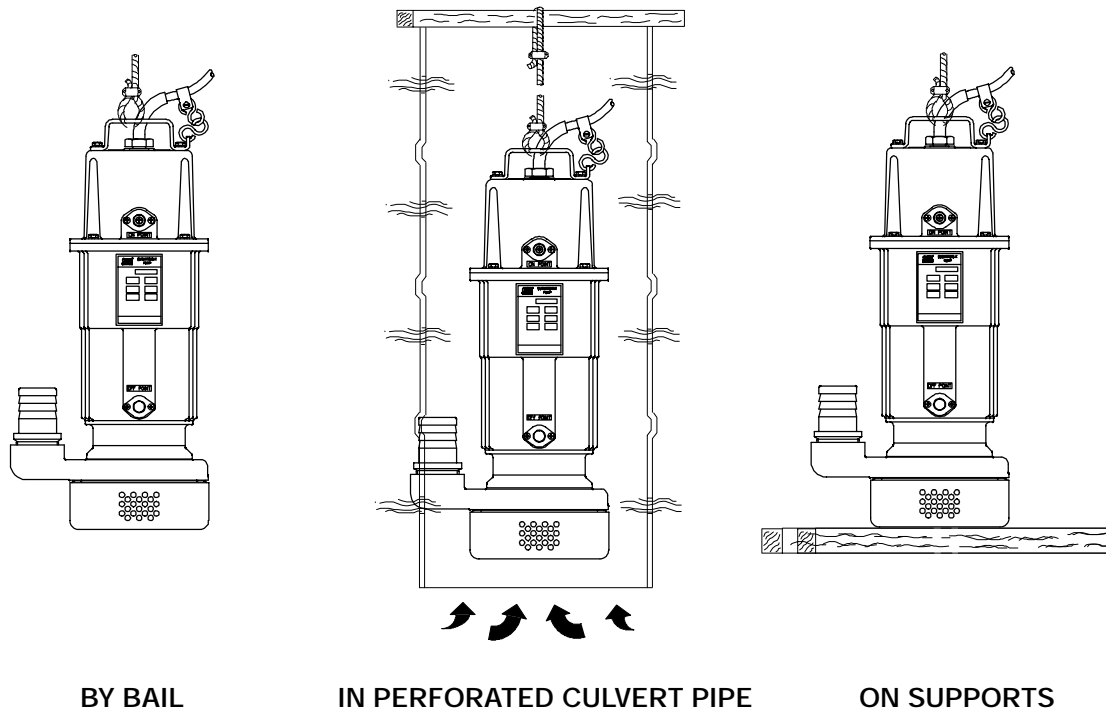


Figure B--1. Typical Pump Installations

Piping

No suction piping is required in a standard installation.

S Series pumps are provided with a suction strainer to prevent large solids from clogging the impeller.

To determine the size of the discharge connection, see **Table B--1, Pump Specifications**. Either hose or rigid pipe may be used. To facilitate mobility and maintenance, it is recommended that the discharge line be fitted with a quick disconnect fitting near the pump. The discharge line must be independently supported to avoid strain and vibration on the pump.

Either hose or rigid pipe may be used to make discharge connections. For maximum pumping capacity, keep the line as short and straight as possible. Elbows and fittings used in discharge lines increase friction loss, minimize their use.

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.

ELECTRICAL CONNECTIONS



Install and operate this pump in accordance with the National Electrical Code and all local codes. Have a qualified electrician perform all checks and connections in this section.

Never attempt to alter the length of the pump motor cable or to repair it with a splice. The power cable and pump motor must be kept completely waterproof. Serious damage to the pump and injury or death to personnel can result from any alteration to the cable.

Field Wiring Connections (Incoming Power)

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 indicated in Table B-3.

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

- a. Measure the voltage **while the pump is operating at full capacity**. See wiring diagrams at the end of this section.
- b. Next, subtract the motor cable voltage drop (see Table B-5, **Pump Power 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 B-3. Pump Voltage Requirements

NOMINAL VOLTAGE	PHASE	MINIMUM VOLTAGE	MAXIMUM VOLTAGE
115	1	110	120

Grounding Methods

If the pump 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 B-3 for some suggested grounding methods.

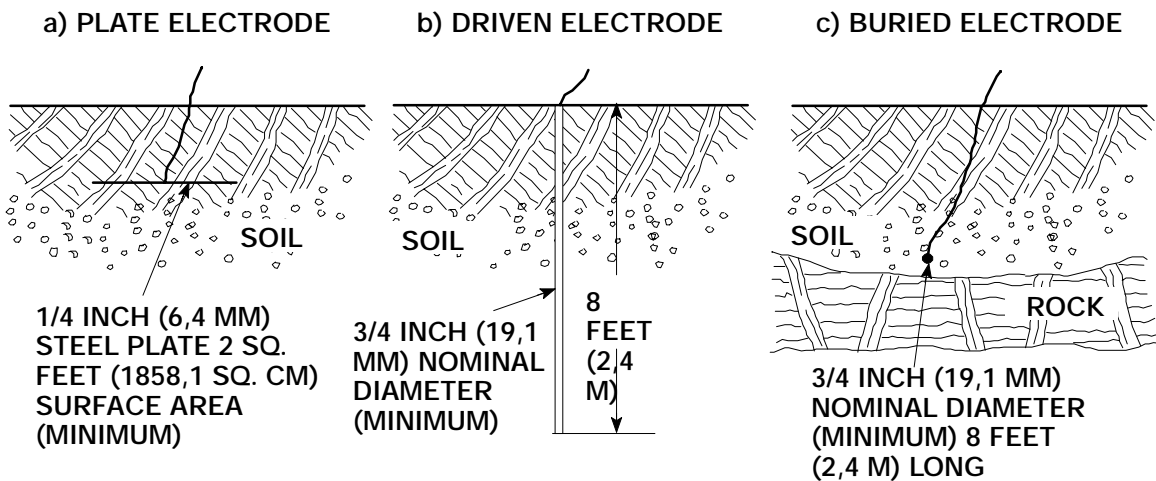


Figure B--3. Suggested Grounding Methods

- a. **Plate Electrode:** An iron or steel plate, 1/4 inch (6,4 mm) thick, completely impeded in the ground. The plate must present a surface area of at least 2 square feet (1858,1 sq. cm.).
- b. **Driven Electrode:** A rod or pipe, 3/4 inch (19,1 mm) in diameter minimum, 8 feet (2,4 m) long, completely driven into the ground.

- c. **Buried electrode:** If rock or stone prevents embedding the full 8 foot (2,4 m) length of the ground rod, bury it horizontally in a trench.

Space the ground rod or plates at least 6 feet (1,8) 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 connections.



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.

Pump Power Cable Connections



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 connections. Make certain that the pump and receptacle or optional enclosure are properly grounded.

The pump is provided with a 50 ft. (15,2 m) power cable (see Table B-5 for standard power cable

specifications) with one end wired into the pump head. The other end terminates in a grounded power plug (autostart models) or separate leads which must be connected to a control box or switch box (non-autostart models).

If connected to a grounded electrical plug (auto-start models), power to the receptacle must be directed through a fused circuit, and the receptacle must be controlled by a positive ON/OFF switch.

Optional rainproof starting switches are available from the factory (see the Parts List manual).

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 continuous length and should replace the existing cable. Any replacement cable **must** be to Gorman-Rupp standards, and **must** be approved by Gorman-Rupp.



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 alternations.

Table B-5. Pump Power Cable Specifications

Pump Model	Voltage/Phase	A.W.G Cable Size	Cable O.D. Inches (mm)	Conductor Dia. Inches (mm)	Amp Rating (See Note Below)	Cable Type	DC Resistance (ohms) at 225°C (77°F) per 1000 ft. (305 m)	Voltage Drop per 100 ft. (30,5m) at Max. Load
S1 1/2A	115/1	16	0.43 (11)	0.06 (1,5)	13*	SO	4.49	5.12
S2C	115/1	16	0.43 (11)	0.06 (1,5)	13*	SO	4.49	6.29
S2D	115/1	16	0.43 (11)	0.06 (1,5)	13*	SO	4.49	7.72

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

When necessary to change or connect the pump power cable to a control box, make certain the incoming power is **OFF** and **LOCKED OUT**, Make certain the control box is **PROPERLY GROUNDED** and that the electrical data on the control matches the motor name plate data.

Connect the pump power cable to the control switch as shown in the wiring diagrams at the end of this section. Make certain that all connections are tight and that cable entry points are rainproof.

Control Box



Any control box used to operate the pump must be approved by the Gorman-Rupp Company for the application.

Motor Cable Grounding Test



Do not connect the pump control cable incoming voltage before verifying the pump ground; otherwise, personnel will be exposed to serious injury or death.

Liquid Level Devices

The pump may be furnished with built-in devices to automatically regulate liquid level by filling and dewatering.

If the pump is **not** furnished with a means to automatically regulate liquid level, it may be controlled to perform filling and dewatering by using the float switch and liquid level control offered as options (see Figure B-5).



Overheating will occur if the liquid level falls below the level required to cool the pump motor (see **LIQUID LEVEL** in **Operation**, Section C).

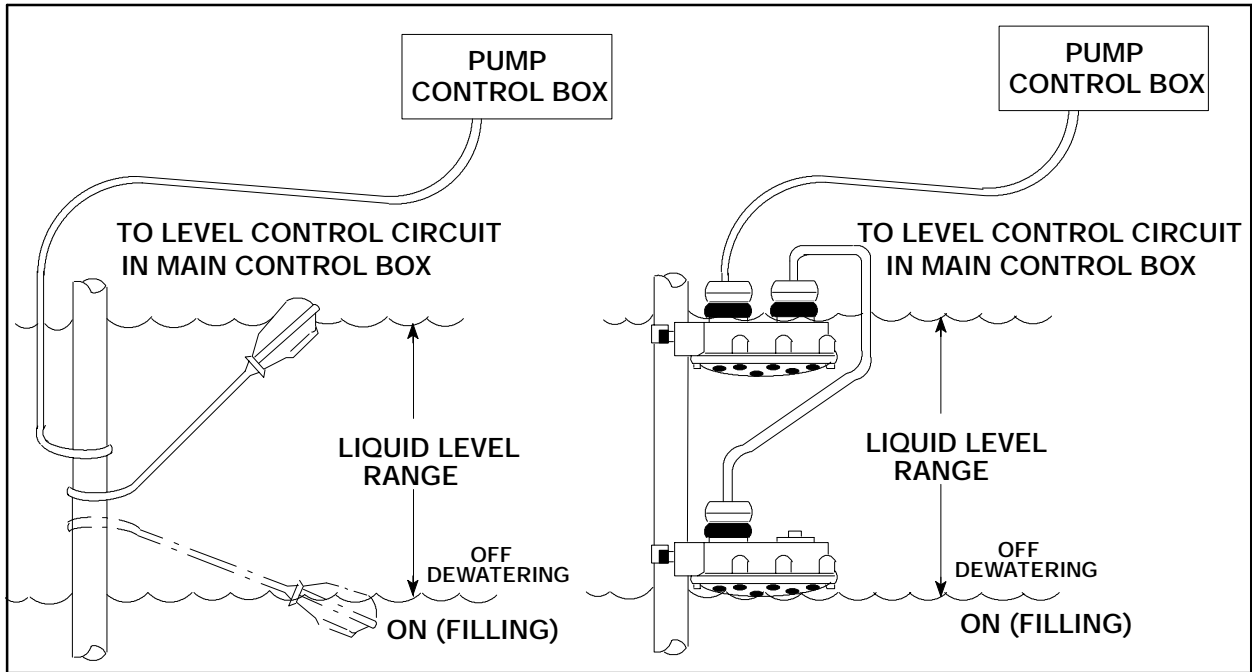
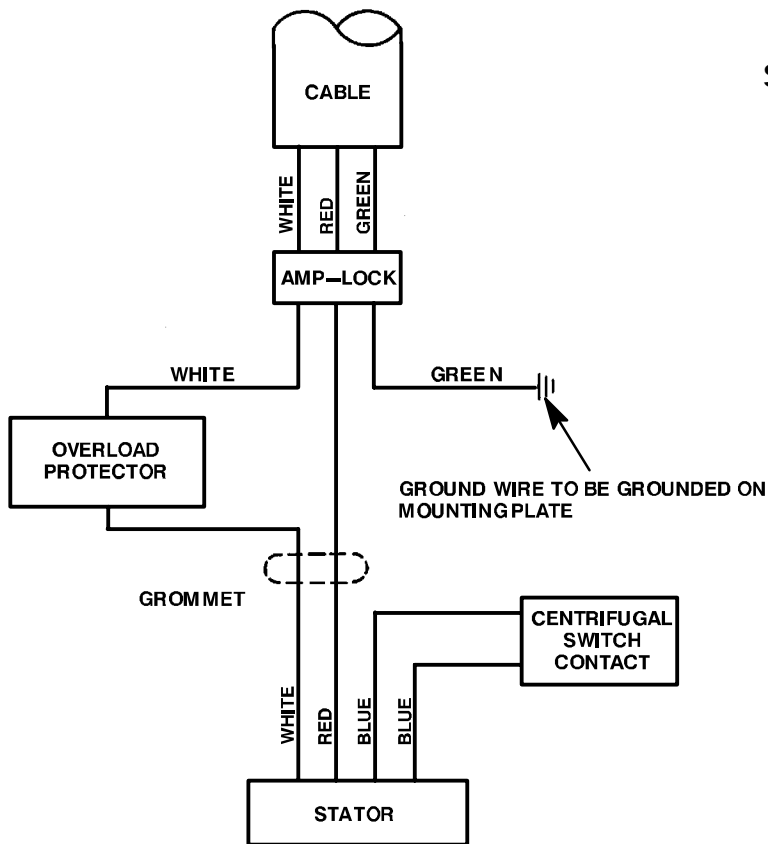


Figure B--5. Typical Float Switch Installation

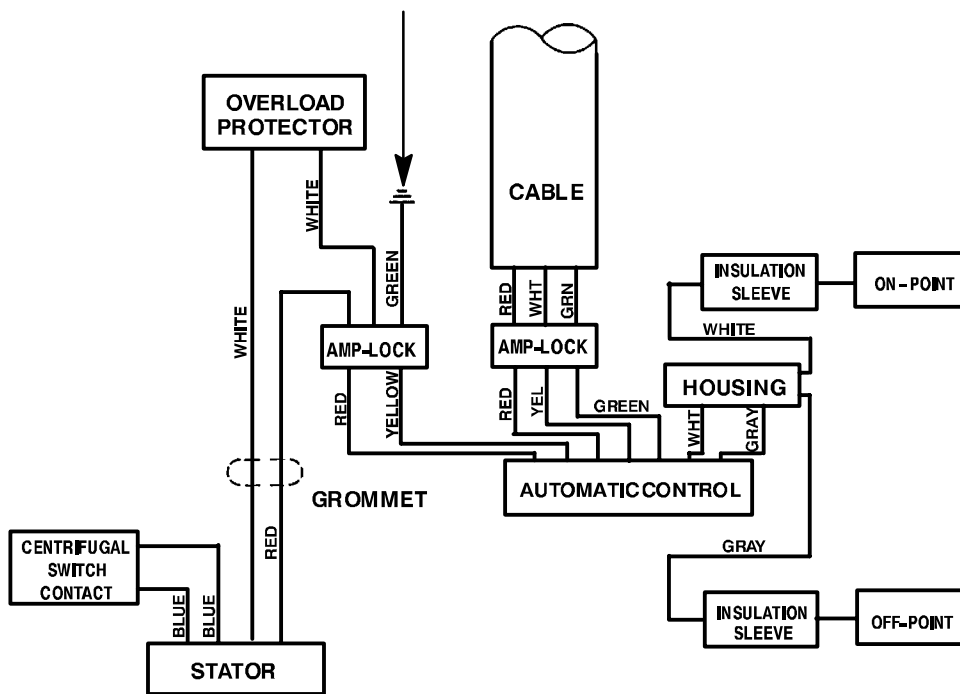
WIRING DIAGRAMS

S1 1/2A3 115V 1P



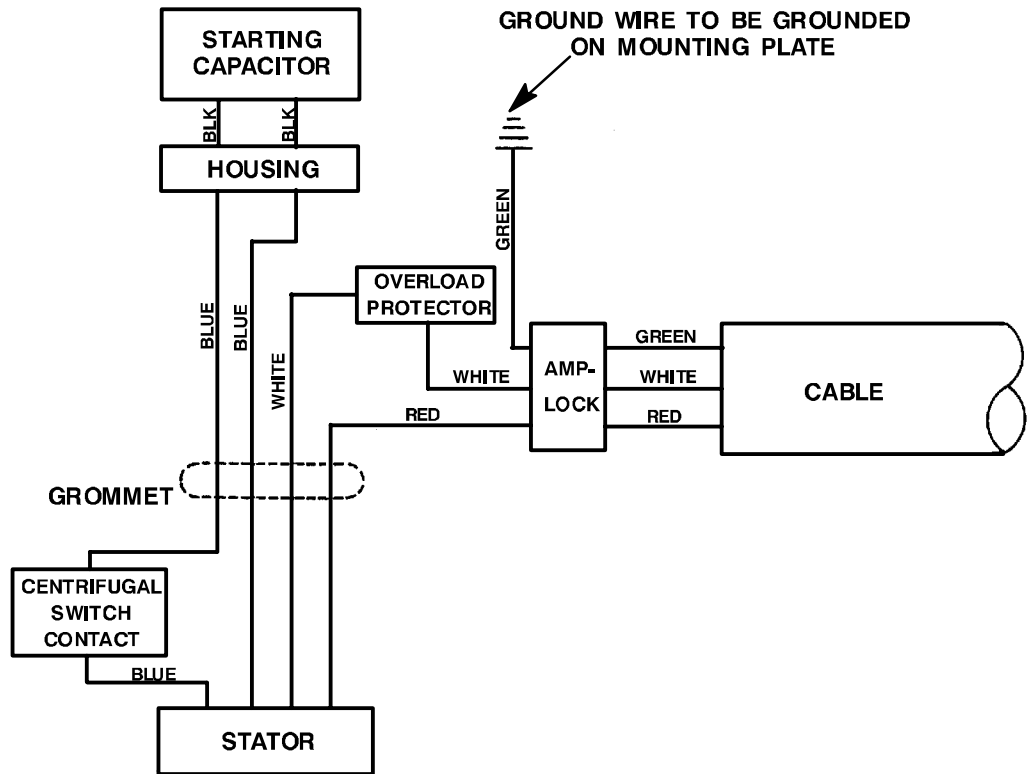
GROUND WIRE TO BE GROUNDED ON MOUNTING PLATE

S1-1/2A3A 115V 1P

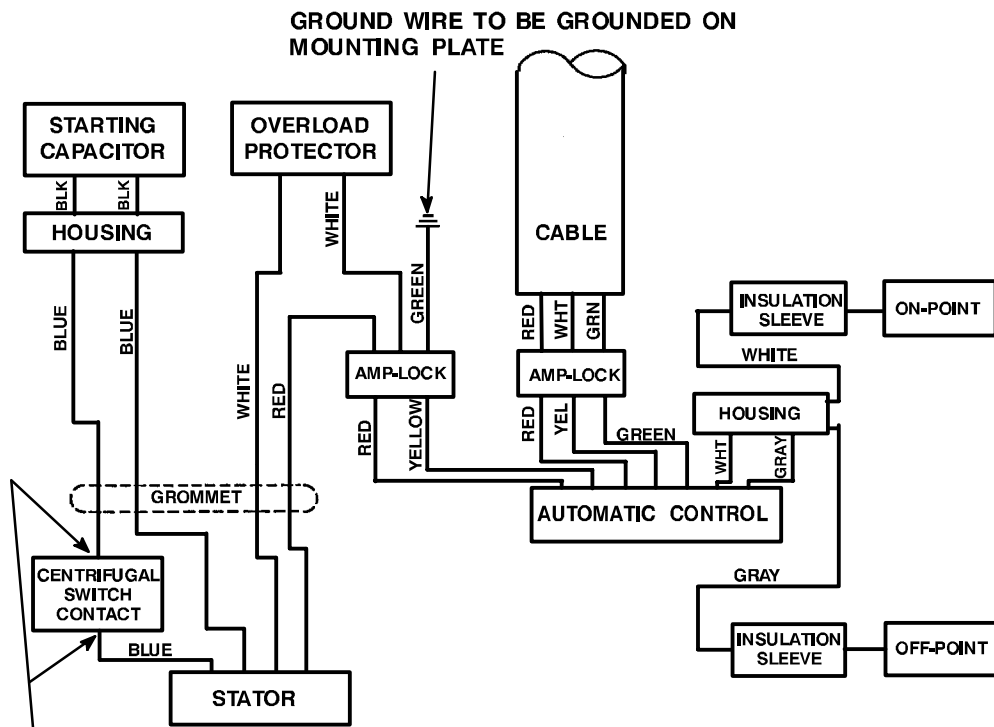


WIRING DIAGRAMS

S2C3-115V 1P

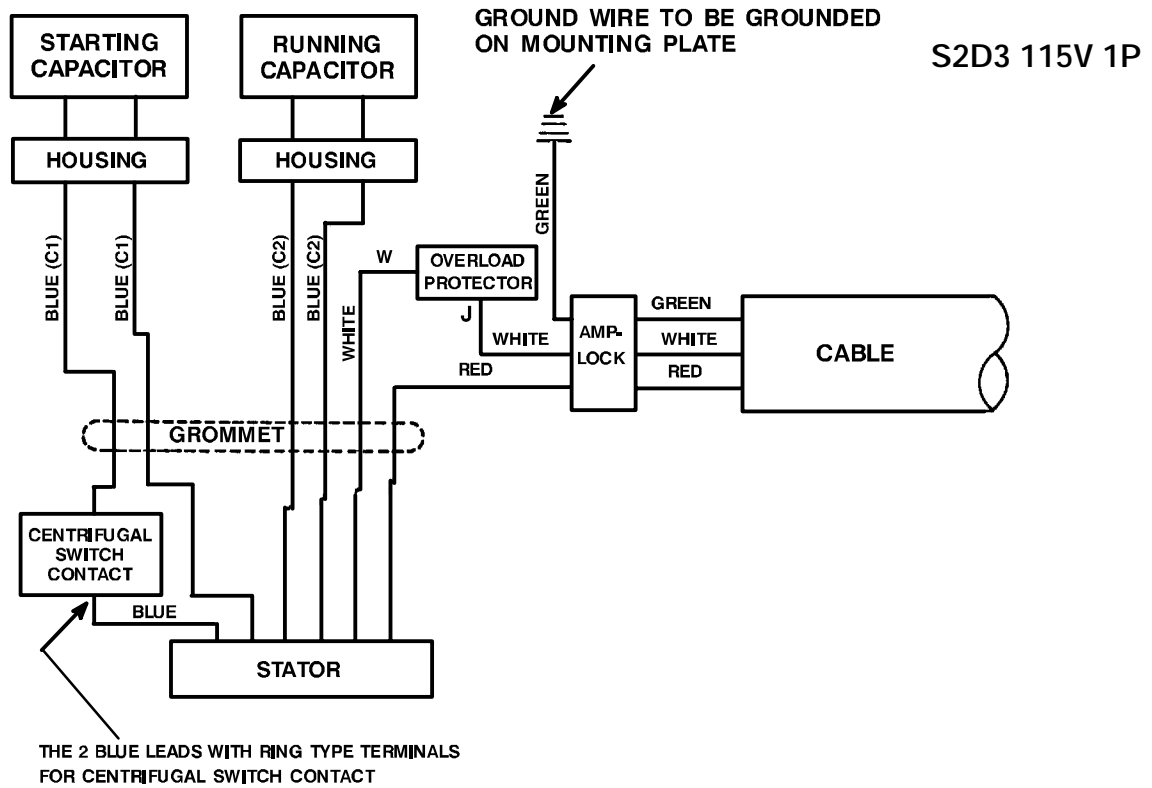


S2C3A 115V 1P



THE 2 BLUE LEADS WITH RING TYPE TERMINALS FOR CENTRIFUGAL SWITCH CONTACT.

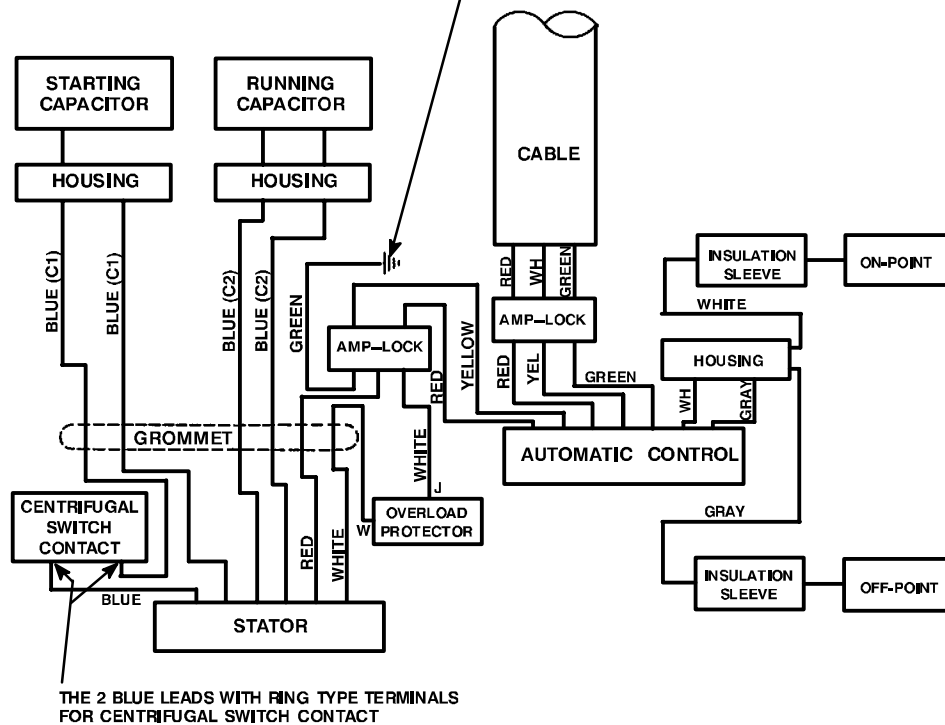
WIRING DIAGRAMS



THE 2 BLUE LEADS WITH RING TYPE TERMINALS FOR CENTRIFUGAL SWITCH CONTACT

GROUND WIRE TO BE GROUNDED ON MOUNTING PLATE

S2D3A 115V 1P



THE 2 BLUE LEADS WITH RING TYPE TERMINALS FOR CENTRIFUGAL SWITCH CONTACT

OPERATION – SECTION C

GENERAL INFORMATION

Review all SAFETY information in Section A.



This pump is designed to handle most non-volatile, non-flammable liquids. **Do not** attempt to pump any liquids for which your pump is not approved, or which may damage the pump or endanger personnel as a result of pump failure. Consult the factory for specific application data.



The pump motor and optional accessories are not designed to be explosion-proof. Do not operate in an explosive atmosphere.

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

Pump Performance



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.

Refer to the pump Specification Data Sheet or the accompanying Parts List Manual for the specific performance for your pump.

Pump Controls

The pump is driven by an integral 115 VAC, 60 hertz, 1 phase motor equipped with thermal motor overheat protection.

If the pump power cable is plugged into an electrical receptacle, (auto-start models, see **Power Cable Connections**, Section B), the pump will start and stop automatically as the liquid level rises and falls.

If wired to an optional manual starting switch (non-auto-start models), 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/or 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** in the Maintenance And Repair Manual.



The pump motor and control box are not designed to be explosion-proof. Do not operate in an explosive atmosphere. Improper location of a non-explosion proof control box could result in destruction of equipment, injury or death to personnel.

See the operating instructions furnished with the control box, and with other optional accessories and controls, before attempting to start the pump.

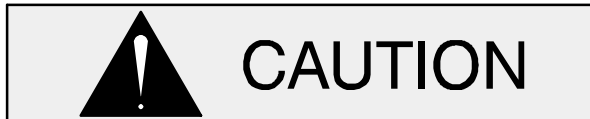
PUMP OPERATION

Liquid Temperature and Overheating.



Overheated pumps can cause severe burns and injury. If the pump becomes overheated:

1. Stop the pump immediately.
2. Unplug the power cable or switch off the power at the control box and lock it out to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Close the discharge valve (if used).
5. Refer to instructions in this manual before restarting the pump.



Do not start the pump more than 6 times per hour. If the motor does not cool between starts it will overheat, resulting in damage to the motor windings.

The **maximum** liquid temperature for this pump is 120°F (490°C). Do not apply it at a higher operating temperature.

Overheating can occur if the pump is made to start and stop repeatedly without time to cool off between starts, the liquid level is allowed to fall too low to sufficiently cool the motor, or if the circuit breaker or fuse fails to provide adequate protection. Operating the pump against a closed discharge valve for an extended period will also cause the pump to overheat.



Approach the pump cautiously after it

has been running. Although the motor is cooled by the liquid being pumped, normal operating temperatures can be high enough to cause burns. The temperature will be especially high if operated against a closed discharge valve. Never operate against a closed discharge valve for long periods of time.

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



Overheated pumps can cause severe burns and injuries. If overheating of the pump occurs:

1. Stop the pump immediately.
2. Ventilate the area.
3. Allow the pump to completely cool.
4. Check the temperature before servicing.
5. Vent the pump slowly and cautiously
6. Refer to instructions in this manual before restarting the pump.

Impeller Rotation

Check impeller rotation as follows before operation to ensure that the impeller is rotating in the correct direction.



While checking impeller rotation, secure the pump to prevent the power cable from coiling.

Suspend the pump from the lifting device fitted on the pump.

NOTE

For Autostart models, place a jumper wire across the on-point and off-point sensing devices before

applying power to check pump rotation.

As viewed from the top, the pump should kick in a **counterclockwise** direction; this will indicate that impeller rotation is correct.

If the pump kicks in a **clockwise** direction, impeller rotation is incorrect and the pump must be returned to the factory or a Gorman-Rupp authorized Submersible Repair Center. If attached, remove the jumper wire. Since the pump is powered by a single-phase motor, the direction of rotation **can not** be altered by interchanging motor leads at the control box.

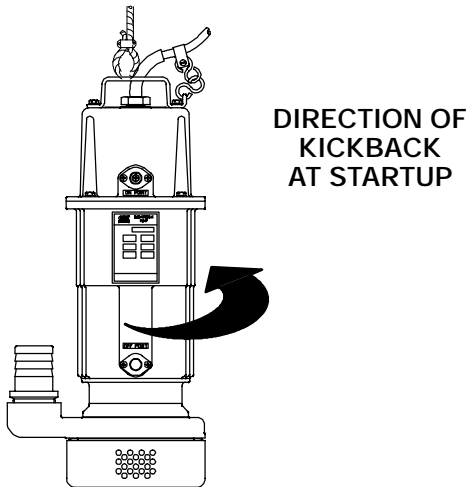
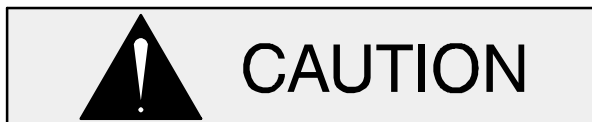


Figure C--1. Checking Pump Rotation

STARTING, STOPPING, AND OPERATIONAL CHECKS

Starting And Stopping



Do not attempt to operate the pump until impeller rotation has been checked; im-

proper rotation will affect pump performance and may damage the pump.

If an optional control box is used, follow the instructions accompanying the control box, start the pump, and run any recommended checks.

After the pump and options have been installed in a wet well so that it is fully submerged, start the pump as follows.

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

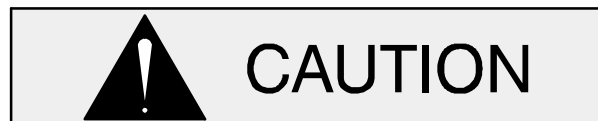
If the pump is an auto-start model, pump operation will be controlled by the built-in liquid sensing devices. When liquid level reaches the on-point (upper) device, the pump will switch on and continue to run until liquid level falls below the off-point (lower) device.

NOTE

Distilled water or uncontaminated rain water may fail to provide conductivity necessary to trigger the automatic liquid level sensing devices built into the pump. If this occurs, ground the on-point assembly to convert the pump to manual operation, and install a float level control system.

If the pump is wired into an optional automatic liquid level control box, set the control box selector switch to **MAN**; the pump will continue to run until the switch 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**.



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.

Operational Checks

Check the pump for proper operation when 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** in the Maintenance And Repair manual.



Never introduce air or steam pressure into the pump casing to remove a blockage. This could result in personal injury or damage to the equipment. If back-flushing is absolutely necessary, limit liquid pressure input to 50% of the maximum permissible operating pressure shown in the pump performance curve (refer to the accompanying Parts List Manual).

Check the pump for overheating. Overheating can occur if the pump is made to start and stop repeatedly without time to cool off between starts, the liquid level is allowed to fall too low to sufficiently cool the motor, or if the circuit breaker or fuse fails to provide adequate protection. Operating the pump against a closed discharge valve for an extended period will also cause the pump to overheat.

Check the oil level(s) as indicated in the following **LUBRICATION** section.

LIQUID LEVEL



Overheating will occur if the liquid falls below the level required to cool the pump motor.

The pump will operate fully or partially submerged. However, since the motor is cooled by the liquid being pumped, overheating will occur if the liquid is pumped below the required to cool the motor.

Auto-start models will shut down before the liquid level falls too low. Non-auto-start models operated manually or with an optional liquid level device must remain sufficiently submerged. **Do not** allow the liquid level to fall below the top of the barbed discharge adaptor in order to provide sufficient cooling to the motor.

COLD WEATHER PRESERVATION



Do not attempt to thaw the pump by using a torch or other source of flame. This could damage gaskets, O-rings or heat the oil in the seal housing above critical temperatures, causing the pump to rupture or explode.

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

If the pump does freeze while it is out of the liquid, submerge it until thawed; if the liquid is near freezing, the pump must be submerged for an extended period of time. Check thawing by starting the pump

and checking that the shaft rotates freely. If the pump remains frozen, allow additional thawing time before attempting to restart.

If submerging does not thaw the pump, move it into a warm area until completely thawed.

LUBRICATION



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 completely cool before servicing.

On a new pump, check the oil level in the seal cavity before initial startup. Drain and replace the oil after the first 200 hours of operation. Following this, check the oil level in the seal cavity after the first two weeks of operation, and every month thereafter.

Before installing or removing the lubrication plug, always clean the area around the plug to prevent contamination.

Draining Oil

Refer to the Parts List Manual for drain plug location.

It is not necessary to drain the oil from the seal cavity unless the pump casing will be separated from the motor housing.

Lay the pump horizontal on a flat work surface with the seal cavity drain plug facing up. Remove the drain plug slowly to release any pressure. Install a short pipe nipple in the hole. Place a **clean** container under the plug and roll the pump on its side to drain the seal housing.

Condition Of Oil

Check the condition of the oil drained from the pump. Clear oil indicates that the pump seal is functioning properly. If the oil is milky or contains a small amount of water, it must be changed.

If the oil contains a large amount of water, it must be changed, and the seal must be checked before the pump is put back in operation (refer to the Maintenance and Repair Manual).

Adding Oil

Refer to Table B–2 in **INSTALLATION** for pump oil capacities.

The grade of lubricant used is critical to the operation of this pump. Use SAE No. 10 non-detergent oil. Oil must be stored in a clean, tightly closed container in a reasonably dry environment.

When lubricating the seal cavity, remove the lubrication plug as indicated in **Draining Oil**. Add the non-detergent oil through this plug hole. With the pump positioned horizontally, sight down the plug hole and check that the oil level is high enough to cover the seal spring.

Install and tighten the lubrication plug.

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