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# INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

## WITH PARTS LIST



## SUBMERSIBLE PUMPS

MODELS
JSV3A60-E2.7 200/230/ 460/3
JSV3B60-E2.7 200/230/460/3
JSV3C60-E2.7 200/230/460/3
JSV3D60-E4 200/230/460/3

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

[www.grpumps.com](http://www.grpumps.com)

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Register your new  
Gorman-Rupp pump online at  
**www.grpumps.com**

Valid serial number and e-mail address required.

**RECORD YOUR PUMP MODEL AND SERIAL NUMBER**

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

Pump Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

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## INTRODUCTION

**Thank You** for purchasing a Gorman-Rupp 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. This Installation, Operation, and Maintenance Manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp J Series submersible pump.

These J Series pumps are driven by a waterproof submersible electric motor. The motor is shipped from the factory wired **only** for the voltage shown on the nameplate. **On dual voltage models, contact the factory before attempting to change to the alternative voltage.**

The pump motor **must** be operated through an appropriate control box matching the voltage and other characteristics of the motor. The control box must also provide for proper operation of the motor protection devices such as the integral moisture and thermal switches. Control boxes and other control devices other than those integral to the pump motor are **not** covered in this manual.

Pump construction is cast iron, with stainless steel shaft and hardware. These pumps are equipped with an integral guide shoe which engages an **optional** base elbow. The pumps are designed to be mounted on guide rails installed in a wet well, and to handle raw, unscreened sewage and effluents. Installation of the guide rail system and other wet well hardware is **not** covered in this manual. Refer to other literature accompanying the pump.

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**  
**P.O. Box 1217**  
**Mansfield, Ohio 44901—1217**  
**Phone: (419) 755—1011**  
 or:  
**Gorman-Rupp of Canada Limited**  
**70 Burwell Road**  
**St. Thomas, Ontario N5P 3R7**  
**Phone: (519) 631—2870**

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.**



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 is specific to the Gorman-Rupp J Series Submersible pumps listed on the cover and in **MAINTENANCE AND REPAIR – SECTION E**. They apply throughout this manual to the instructions contained in the pages which follow.

In addition to this manual, see the separate literature covering the control box, control accessories, guide rails and other installation hardware shipped with this pump. This literature contains essential information on installing and operating the pump, and on making electrical connections.



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



This pump is designed to handle raw sewage and industrial wastes at temperatures of 104°F (70°C); Do not apply at higher temperatures. Do not attempt to pump volatile, flammable, or corrosive liquids which may damage the pump or endanger personnel as a result of pump failure.



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.



230V and 460V versions of this pump are dual-voltage; however, they are wired at the factory only for the voltage shown on the nameplate. Do not attempt to change the voltage in the field. If desired to have the voltage changed, return the pump to the factory or to an authorized Gorman-Rupp repair facility only. Otherwise, damage to the pump and injury or death to personnel can result.



Do not connect the pump motor directly to the incoming power lines. The pump motor is designed to operate through a Gorman-Rupp approved control box which provides overload protection and power control; otherwise, the pump warranty will be voided. Make certain that the pump and control box are properly grounded and that the incoming power matches the requirements of the pump and controls. Install and operate the control box in accordance with the National Electric Code and all local codes. Failure to follow the instructions in this warning could result in injury or death to personnel.



Do not attempt to lift this pump by the motor power cable or the piping. Attach proper lifting equipment to the lifting handle, and make certain that the hook of the lifting device is securely positioned in the apex of the handle. If

chains or cables are wrapped around the pump to lift it, make certain that they are positioned so as not to damage the pump, and so that the load will be balanced.



After the pump has been installed, make certain that the pump and all piping or hose connections are secure before operation. Loose connections can result in damage to equipment and serious injury to personnel.



The following precautions should be taken before attempting to open or service the pump; otherwise, injury or death could result.

1. Lock out the power to the control panel to ensure that the pump will remain inoperative.
2. Allow the pump to cool if over heated.
3. Close the discharge valve (if used).

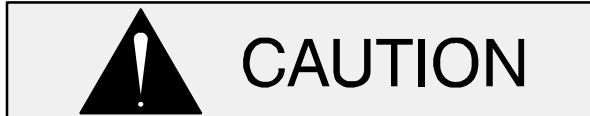


If this pump is used to handle sewage, take necessary precautions during maintenance and repair to prevent personal contamination which could result in illness.

## INSTALLATION – SECTION B

### Review all SAFETY information in Section A.

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



The motor in these pumps is not designed to be operated in air for more than 10 minutes without overheating. The pumps must be operated through liquid level controls to maintain the level of liquid in the wet well so that power to the motor is cut off when liquid falls below the midpoint of the motor housing in single pump operation, and below the level of the discharge flange in duplex pump operation.

Automatic liquid level controls are available from Gorman-Rupp as options. For information on installing and operating these controls, see the technical data accompanying them.

### 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 dry-

ing, check for loose hardware at mating surfaces.

- c. The standard pump is provided with 26 ft. (8 m.) of power cable. Inspect the cable for cuts or damage.
- d. Check that amperes, phase, voltage, and Hertz indicated on the motor name plate match the ratings on the control box.
- e. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.
- f. Check for any oil leaks. If there is any indication of an oil leak, see **LUBRICATION in MAINTENANCE AND REPAIR – SECTION E**.

### LUBRICATION

These pumps are equipped with a mechanical double seal. The lower seal prevents the liquid being pumped from entering the seal housing cavity from the pump end. The upper seal prevents oil from escaping from the seal housing into the motor housing, and acts as backup protection in the event of lower seal failure.

Both ends of the shaft seal are lubricated by oil in the seal housing (see **LUBRICATION in MAINTENANCE AND REPAIR – SECTION E**).

The shaft bearings are permanently lubricated.

There is no other lubrication in the pump.

### Pump Dimensions

See Figure B-1 for the approximate physical dimensions of this pump.



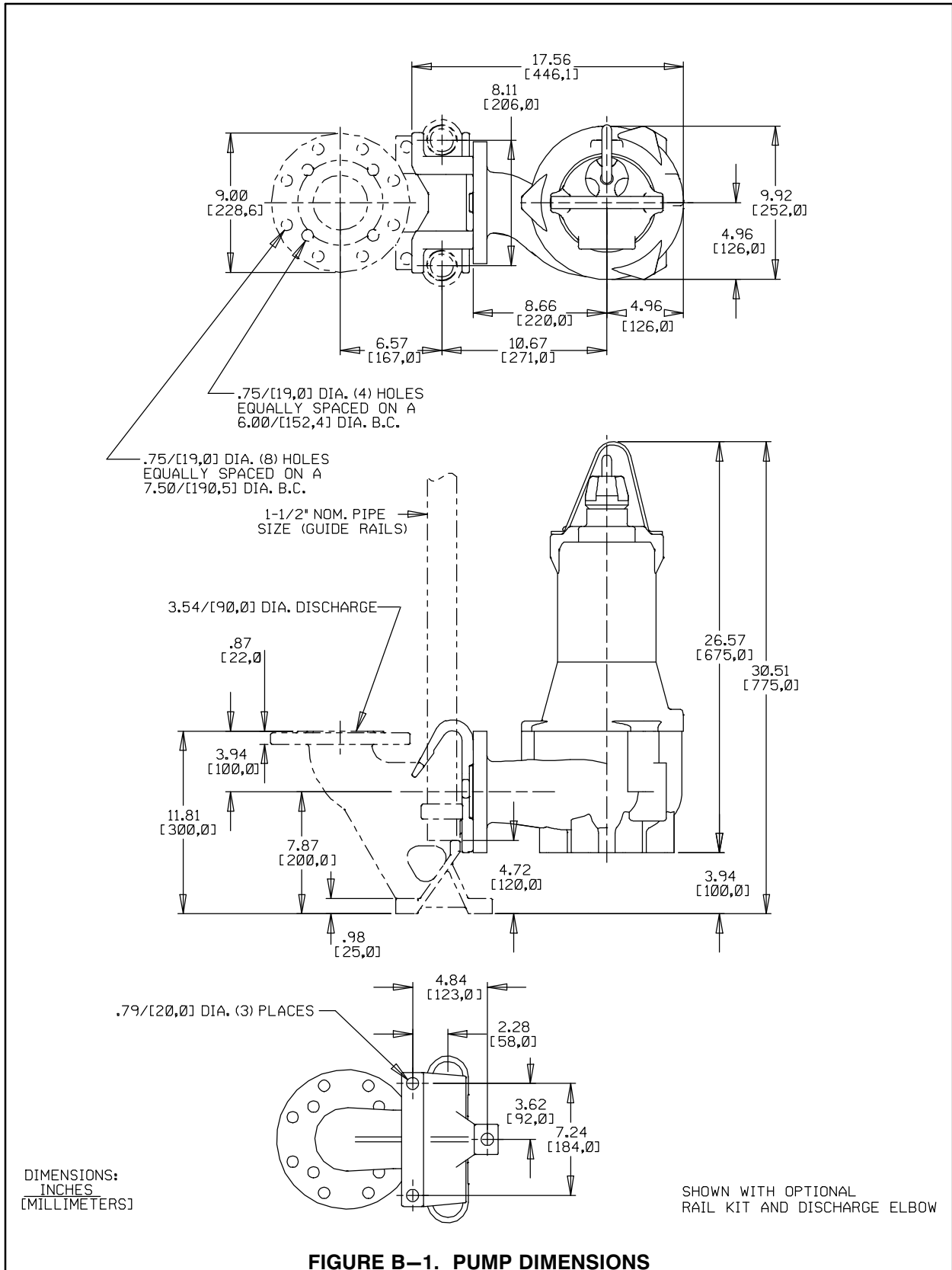


FIGURE B-1. PUMP DIMENSIONS

**Pump Motor Specifications**

The motor furnished with this pump is a 60 Hz., Squirrel Cage, Induction Start, G-R Frame Size No. 1; Class F Insulation Rated 155°C (311°F), 40°C

(104°F) ambient, plus 115°C (239°F) temperature rise.

See Table B-1 for motor specifications.

TABLE B-1. PUMP MOTOR SPECIFICATIONS							
MODEL NUMBER	VOLTAGE /PHASE	SIZE	H.P.	MOTOR RPM	MAX LOAD	NO LOAD	LOCKED ROTOR
JSV3A60-E2.7	200/3	3"	2.7	1750	10.4A	5.5A	64.2A
JSV3A60-E2.7	230/3	3"	2.7	1750	9.0A	4.8A	55.8A
JSV3A60-E2.7	460/3	3"	2.7	1750	4.5A	2.4A	27.9A
JSV3B60-E2.7	200/3	3"	2.7	1750	10.4A	5.5A	64.2A
JSV3B60-E2.7	230/3	3"	2.7	1750	9.0A	4.8A	55.8A
JSV3B60-E2.7	460/3	3"	2.7	1750	4.5A	2.4A	27.9A
JSV3C60-E2.7	200/3	3"	2.7	1750	10.4A	5.5A	64.2A
JSV3C60-E2.7	230/3	3"	2.7	1750	9.0A	4.8A	55.8A
JSV3C60-E2.7	460/3	3"	2.7	1750	4.5A	2.4A	27.9A
JSV3D60-E4	230/3	3"	4.0	1750	14.6A	5.5A	64.3A
JSV3D60-E4	230/3	3"	4.0	1750	12.7A	4.8A	55.9A
JSV3D60-E4	460/3	3"	4.0	1750	6.4A	2.4A	28.2A

**PUMP INSTALLATION**

**Lifting**

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

**Positioning the Pump**

**NOTE**

*Before installing and operating the pump, check*

*the direction of impeller rotation to ensure that the pump is properly wired at the control box. See **IMPELLER ROTATION, SECTION C.***

This pump is designed to be operated mounted on guide rails and a discharge elbow/baseplate offered as an option. See Figure B-1 for a typical elbow/baseplate installation.

The pump is equipped with a rail guide shoe which connects to the discharge optional elbow/baseplate. When lowered into place, the pump is automatically and securely connected to the elbow/baseplate and the piping system. For information on installing the guide rails, see the literature accompanying them.

**NOTE**

*When engaging the guide shoe and elbow/baseplate, make sure that the connection is not impeded by mounting hardware, and that the guide shoe is fully seated in the baseplate.*

Engage the guide shoe at the top of the guide rails, and lower the pump into the sump. When the pump and guide shoe engages the discharge elbow/baseplate, it will form an automatic seal.

Reel in any slack control cable so that it is not dragged into the pump suction.

**Piping**

**NOTE**

*Refer to **PERFORMANCE CURVES** in **OPERATION – SECTION C** when determining the most efficient piping installation.*

No suction piping is required in a standard submerged operation.

The optional elbow/baseplate is drilled for a 3-inch or 4-inch discharge flange connection. Either hose or rigid pipe may be used to make discharge connections. The discharge line must be independently supported to avoid vibration and strain on the pump. For maximum pumping capacity, keep the line as short and straight as possible. Elbows and fittings used in a discharge line increase friction losses; 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)**

Field wiring is **not** provided with this pump, and must be supplied by the user. The field wiring must be of the proper size and type to ensure an adequate voltage supply to the pump. Voltage available at the motor must be within the range indicated in Table B-2.

TABLE B-2. MOTOR VOLTAGE LIMITS			
NOMINAL VOLTAGE	PHASE	MINIMUM VOLTAGE	MAXIMUM VOLTAGE
200	3	180	220
230	3	210	250
460	3	420	500
575	3	520	630

Use conduit cable clamps to secure the incoming field wiring to the control box. Make certain all connections are tight. If necessary, support the cable weight to prevent excessive strain on cable clamps and cable.

**Dual Voltage**



**230V and 460V versions of this pump are dual-voltage; however, they are wired at the factory only for the voltage shown on the nameplate. Do not attempt to change the voltage in the field. If desired to have the voltage changed, return the pump to the factory or to an authorized Gorman-Rupp repair facility only. Otherwise, damage to the pump and injury or death to personnel can result.**

**Motor Cable Grounding Test**



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

Connect one lead of lamp, bell or similar testing device to motor cable green/yellow ground lead. Connect second test lead to an **uninsulated** point on the pump body. The test circuit should close.

If the test circuit does not close there is a defect in the cable or motor which must be corrected.

**Conductor Identification**

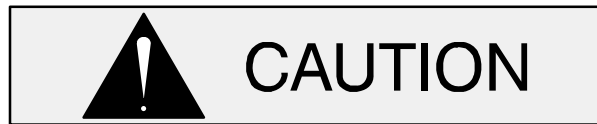
The conductors in the pump cable are labeled when shipped from the factory. If the conductors are shortened in the field, resulting in loss of identification markers, they can still be identified by their location relative to the ground wire.

Refer to FIGURE B-5; as seen from the free end of the cable, the conductor immediately adjacent to and clockwise from ground (green/yellow) is heat-shrink wrapped with the fourth conductor, and assigned number T1. The second clockwise conductor is heat-shrink wrapped with the fifth conductor, and assigned number T2. The third clockwise conductor is heat-shrink wrapped with the sixth conductor, and assigned number T3.

The conductors labeled P1 and P2 are for thermal and moisture sensor connections, respectively.

If the conductors are relabeled, they should be identified with wire markers from the factory.

**Control Box Connections**

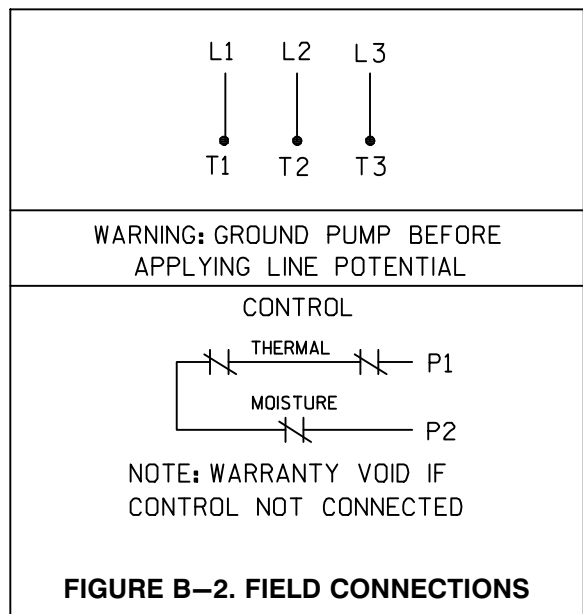


The pump warranty is void if the motor is not operated through a control box approved by Gorman-Rupp.

This pump is shipped completely wired for the voltage shown on the nameplate, and is ready for operation through an approved control box.

Ground the control box in accordance with the instructions accompanying it.

Refer to FIGURE B-2, and connect the pump motor cable to the control box.



Control leads P1 and P2 provide the motor with moisture and thermal protection. Note that thermal protection is supplementary **only**; separate Class 10 overload relays are required for motor running protection.

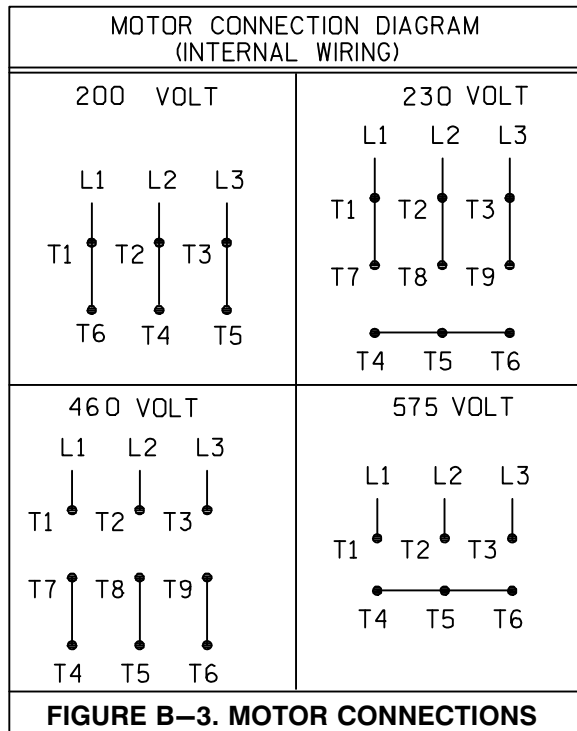


The thermal protection contacts will automatically reclose when the motor cools to

the established safe operating temperature. Whenever automatic restarting is not desirable, connect only to controls which are wired for manual restart.

**Wiring Diagram**

The motor connection diagram is shown in FIGURE B-3.

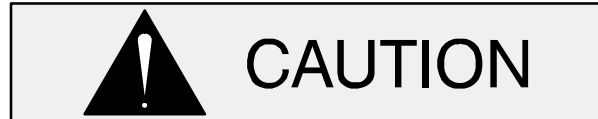


The complete schematic wiring diagrams for the motors are shown in FIGURES B-5, B-6 and B-7.

**Liquid Level Devices**

Optional controls available from Gorman-Rupp may provide a means to automatically regulate the

liquid level. These control boxes may be connected to the following sensing devices which perform **either** filling or dewatering functions (see FIGURE B-4).



The internal wiring of the sensing devices are different for filling and dewatering functions. Be sure to follow the instructions included with the option before making connections.

- **Diaphragm Type:** two fixed-position sensors (upper and lower) each contain a diaphragm which flexes with changes in liquid level, thus activating an enclosed miniature switch.
- **Bulb (Float) Type:** a bulb raises or lowers (floats) with the liquid level, thus activating an enclosed miniature switch.

Other types of liquid level devices may also be used. Consult the factory for the liquid level device best suited for your application.



Liquid level devices **must** be positioned far enough to allow 6 minutes between starts. If the pump motor cycles more than 10 starts per hour, it will over-heat, resulting in damage to the motor windings or control box components.

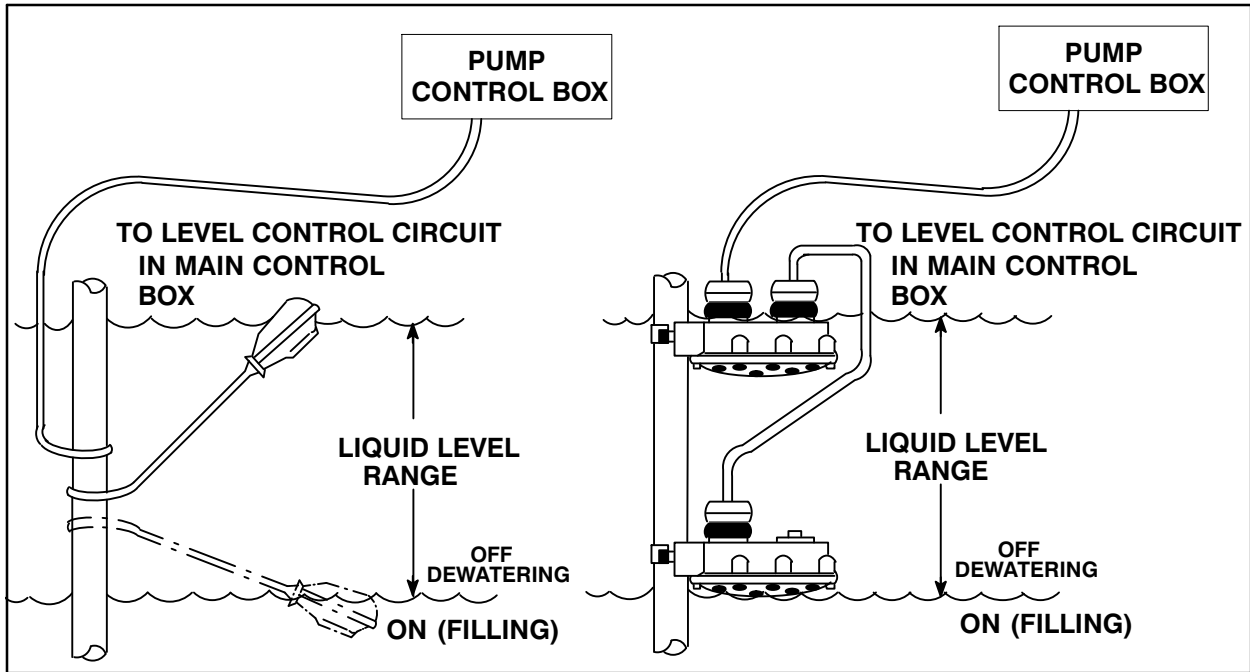


FIGURE B-4. LIQUID LEVEL DEVICES

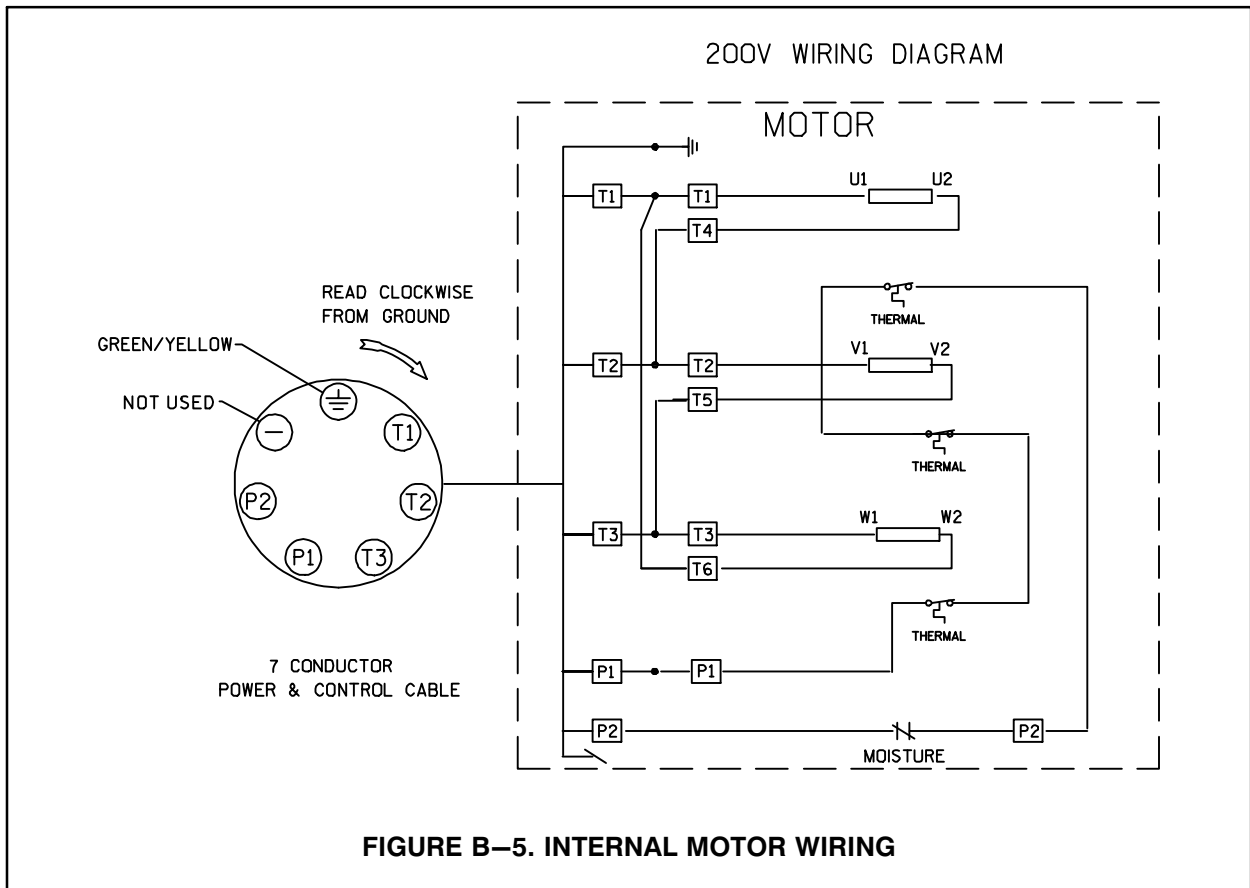
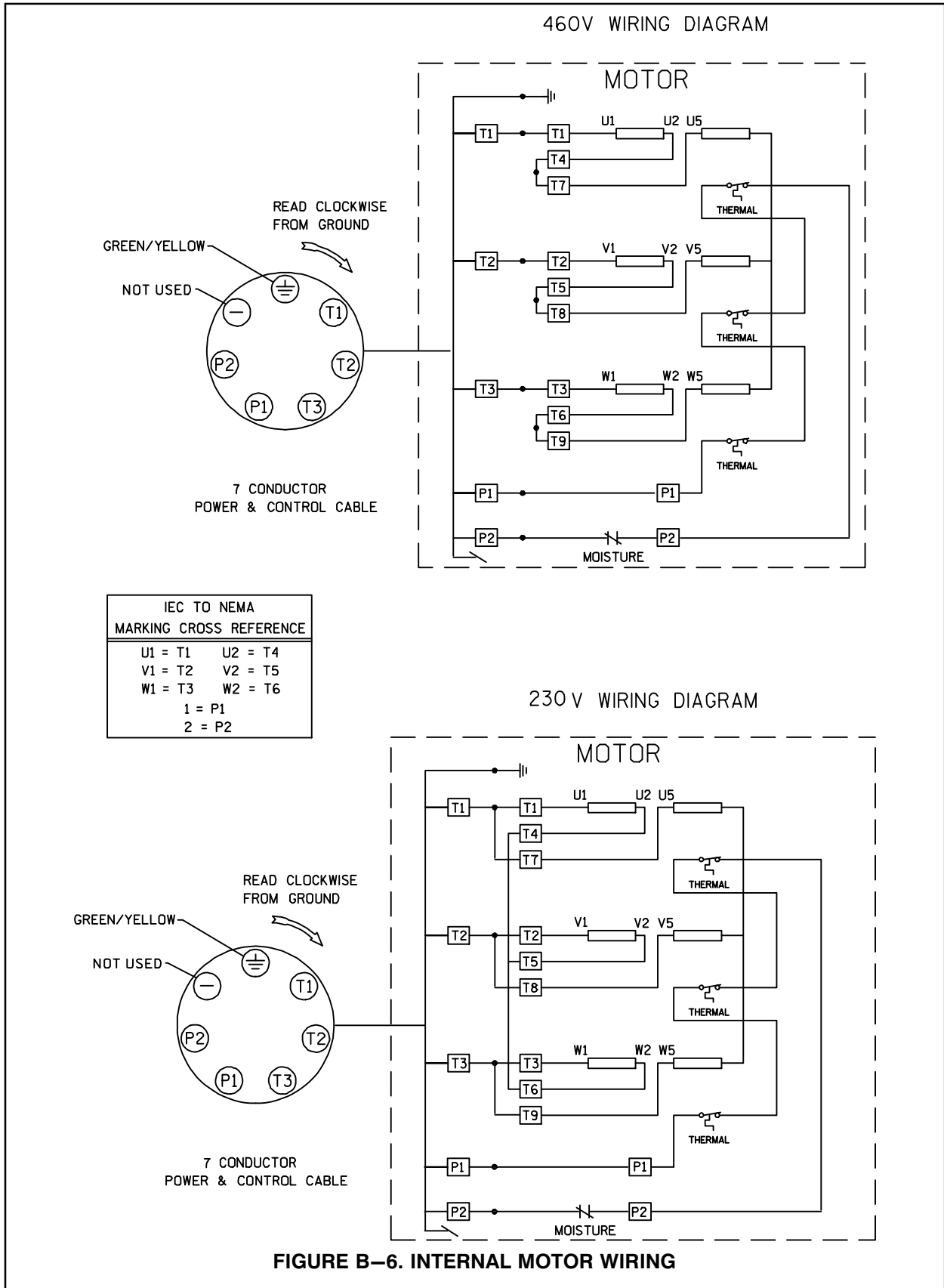
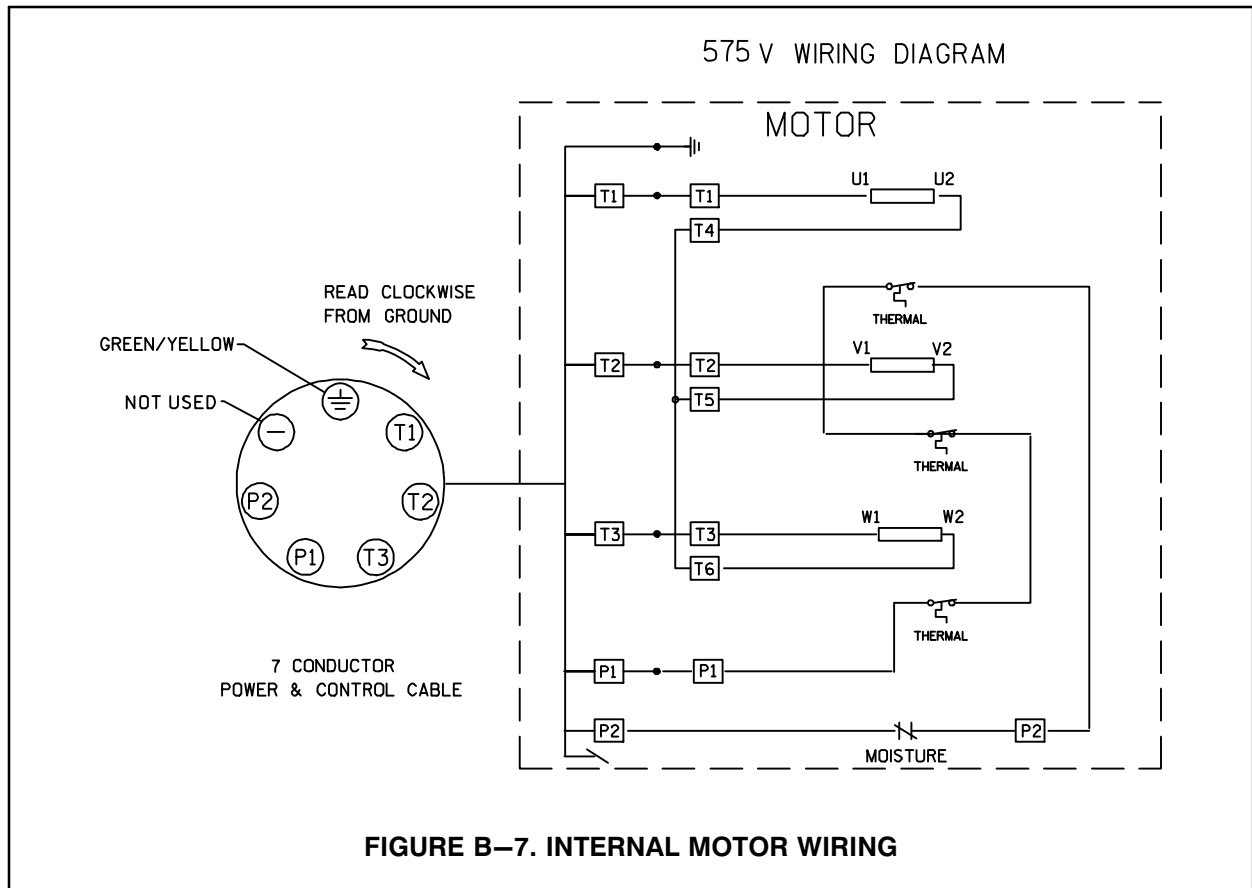


FIGURE B-5. INTERNAL MOTOR WIRING







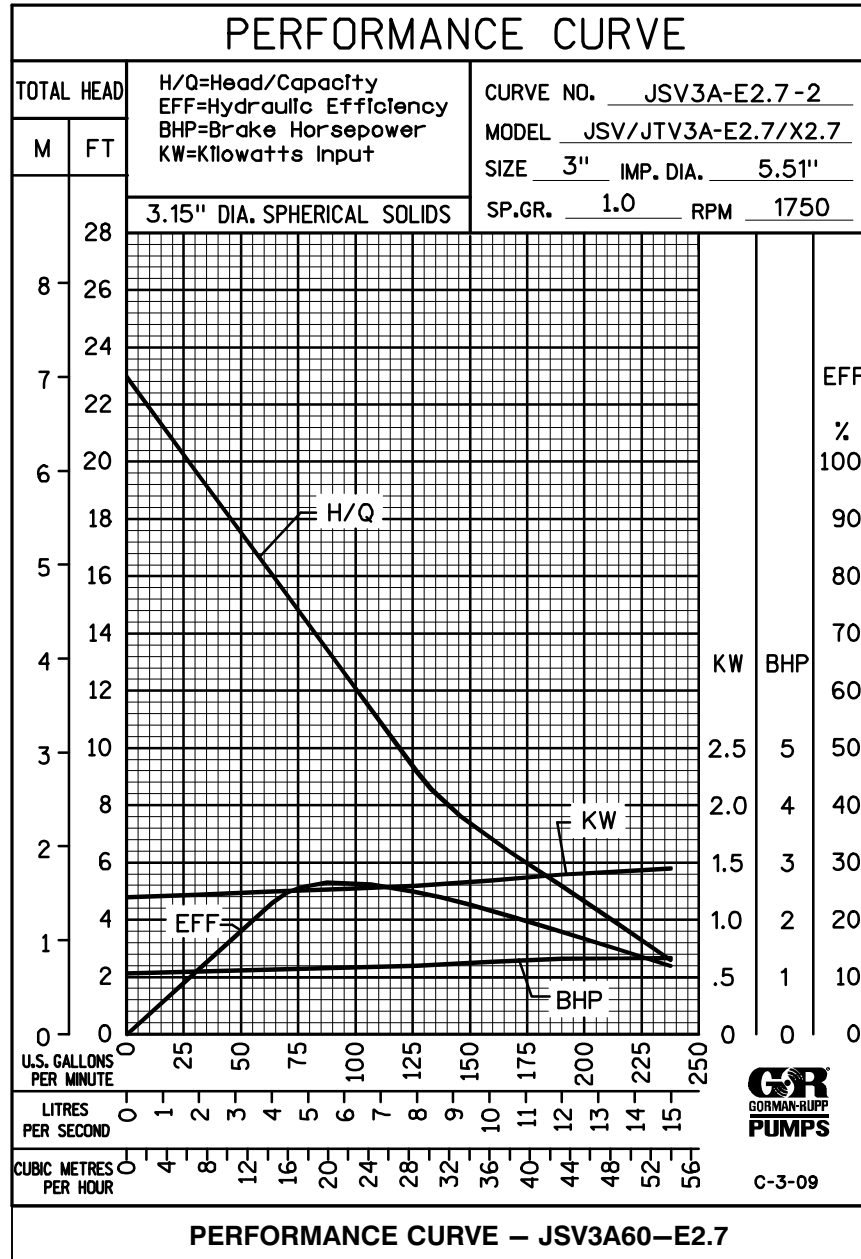
## OPERATION – SECTION C

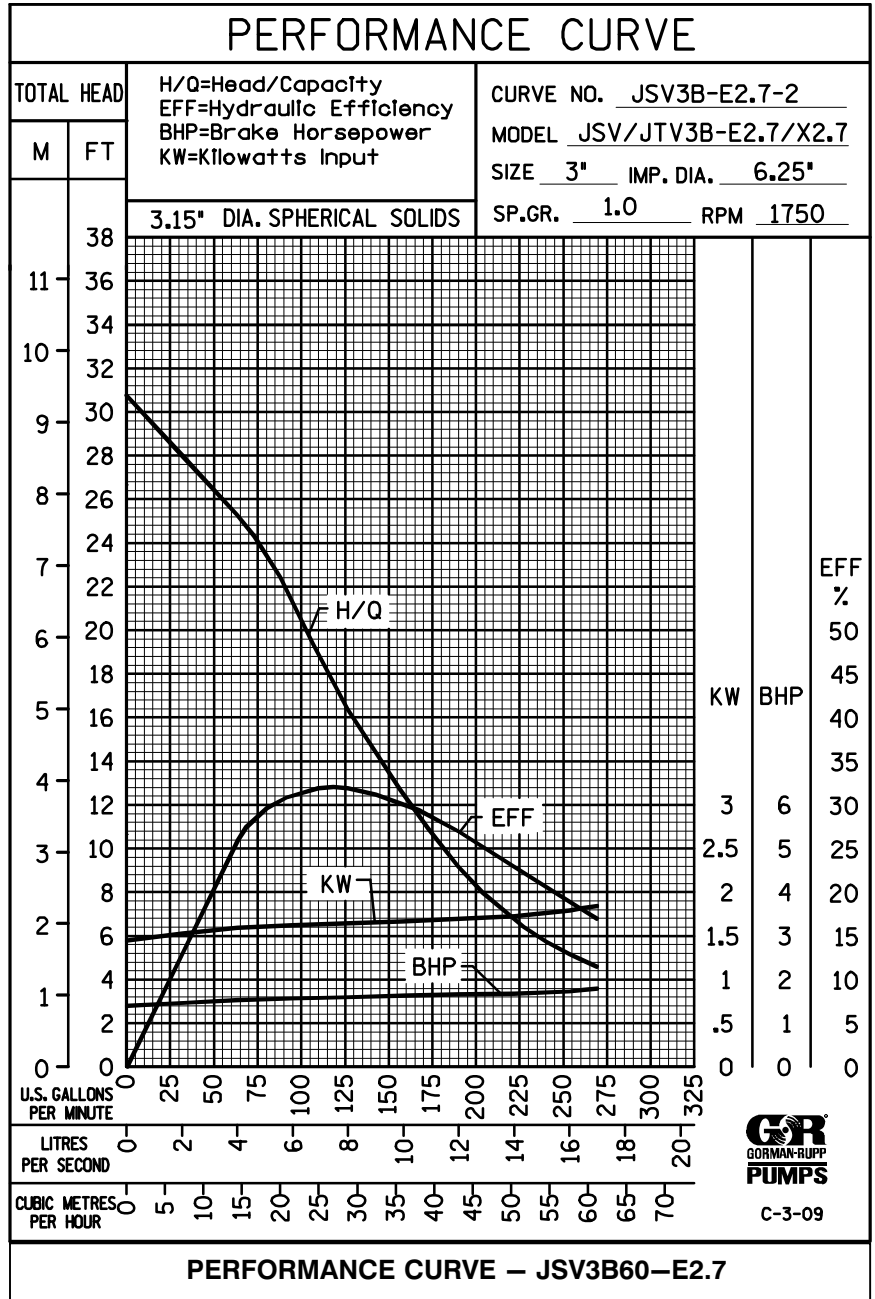
### PERFORMANCE CURVES

In the performance curves which follow, performance is based on 70°F (21°C) clear water at sea level. The performance of your pump may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

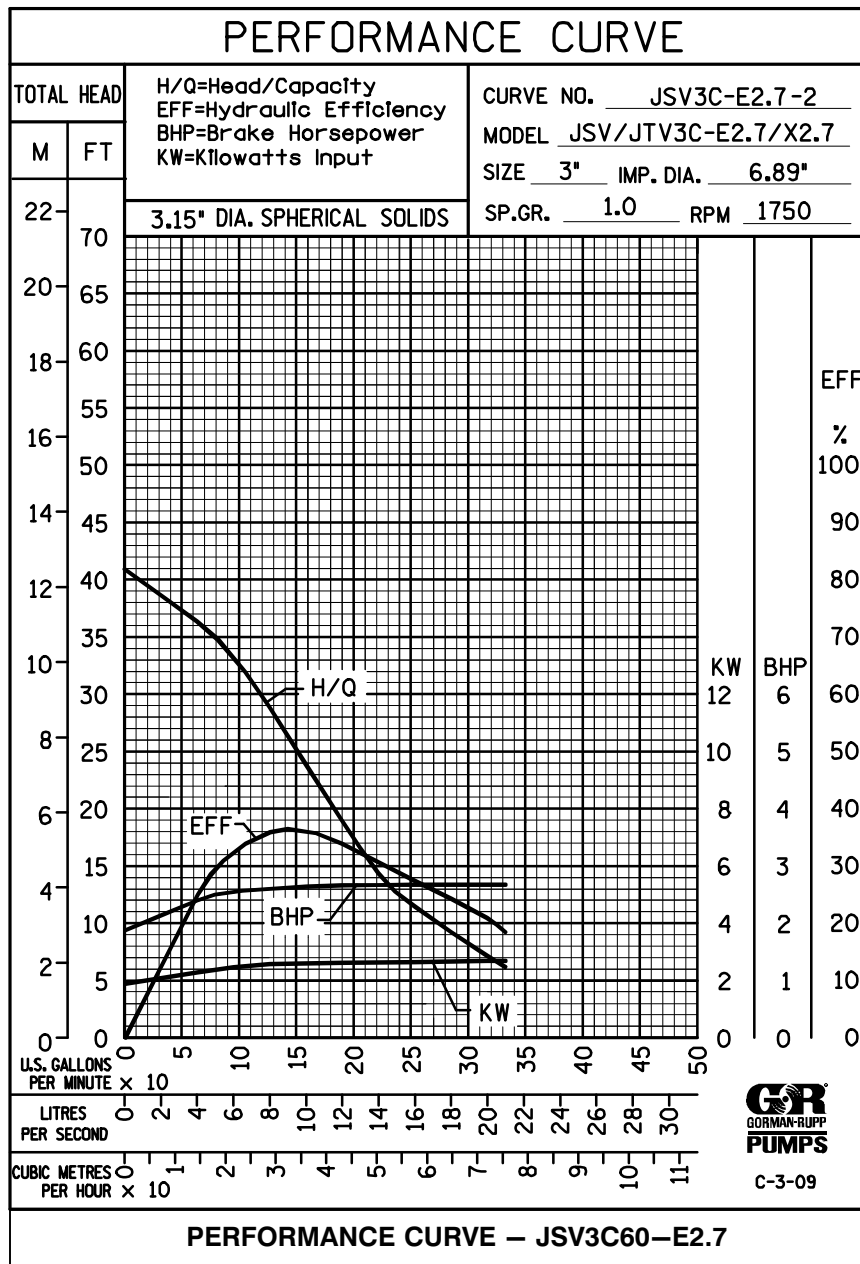
### NOTE

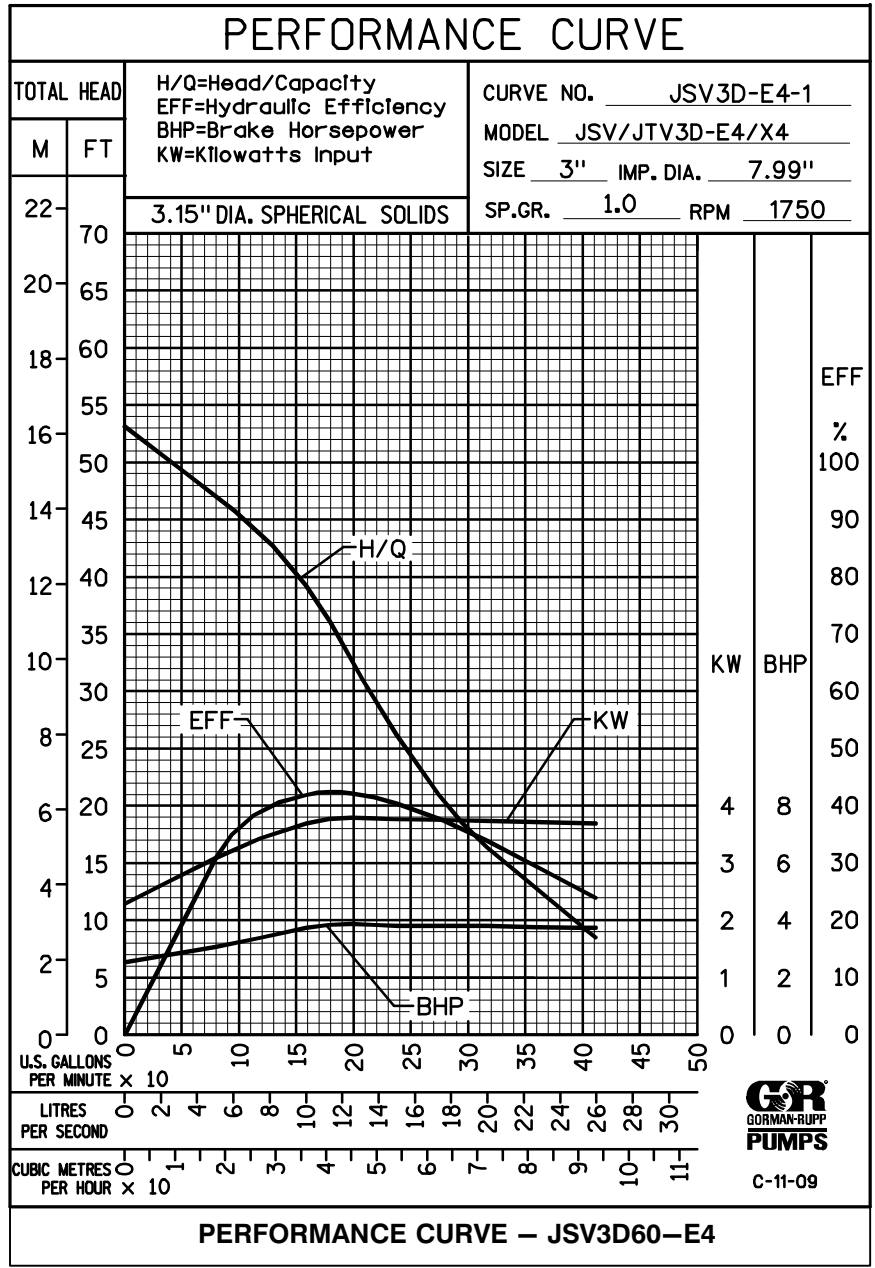
The curves apply to standard production models. If your pump serial number is followed by an "N", your pump is **not** a standard production model. Contact the Gorman-Rupp Company to verify performance.





C-3-09





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

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

#### CONTROL BOX AND OPTIONAL CONTROLS



The pump warranty is void if the motor is not operated through a control box approved by Gorman-Rupp.

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.



Standard versions of this pump will handle liquids with temperatures up to 104°F (40°C) maximum. Do not install in service with higher liquid temperatures; otherwise, pump components and operation may be affected.

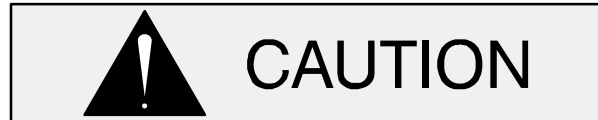


**Overheated pumps can cause severe burns and injury. If the pump becomes overheated:**

1. Stop the pump immediately.
2. Allow the pump to cool.
3. Refer to instructions in this manual before restarting the pump.

Overheating can occur if the control box fails to provide overload or thermal protection, or if the pump is operated against a closed discharge valve for an extended period of time.

The submersible motor is cooled by the liquid being pumped. To minimize the chance of over-heating when installed in a **simplex** application, it is recommended that at least one-third of the motor remain immersed in the liquid.

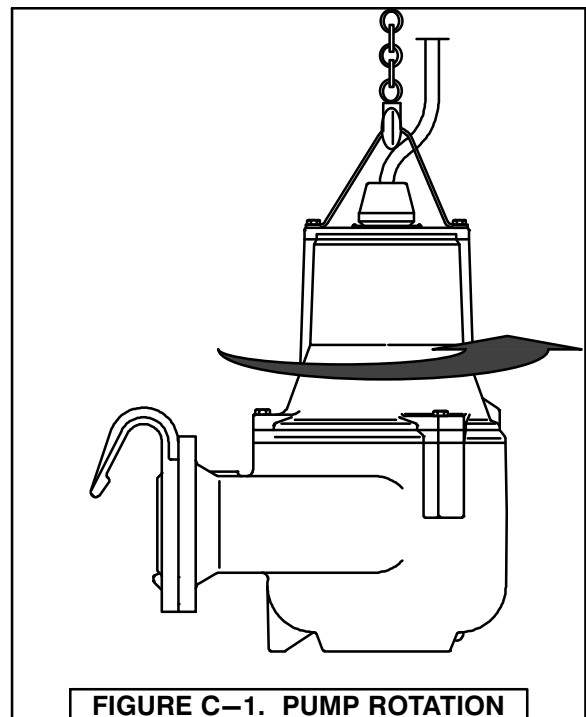


Do not start the pump more than 10 times per hour. If the motor does not cool between starts it will overheat, resulting in damage to the motor windings or control box components.

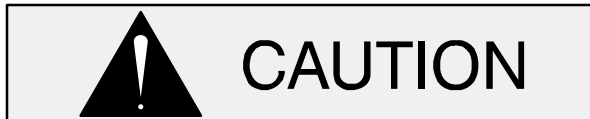
When installed in a standard alternating **duplex** application, where one pump runs while the other is shut down, the pump may be operated continuously until fully exposed. The shut down cycle will provide sufficient time for the motor to cool.

##### Impeller Rotation

Refer to Figure C-1, and check impeller rotation as follows before installing the pump on rails or in a wet well.



**FIGURE C-1. PUMP ROTATION**



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

Suspend the pump by the lifting handle. Apply power **briefly** and note the direction of pump twist. As viewed from the top, the pump should twist in a counterclockwise direction; this will indicate that impeller rotation is correct.

If the pump twists in a clockwise direction, impeller rotation is incorrect. Have qualified personnel interchange the control box connections of any two pump motor power leads. Recheck pump twist; it should now be in a counterclockwise direction.

#### STARTING, STOPPING, AND OPERATIONAL CHECKS

##### Starting



Do not attempt to operate the pump until impeller rotation has been checked; otherwise, the pump will be damaged.

Follow the control box manufacturer's instructions, start the pump, and run any recommended checks.

##### Stopping

Follow the control box manufacturer's instructions for stopping the pump.



The integral thermal overload device will shut off the motor if the temperature rises above design limits. When the pump cools and the temperature falls below these limits, the motor will restart automatically. To avoid the hazards of

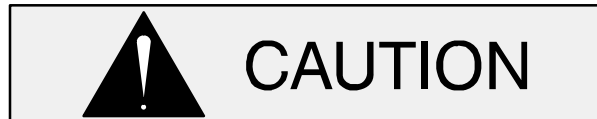
an unexpected motor start-up, do not attempt to handle or service the pump unless all power to the motor has been shut off at the control box; otherwise, serious personal injury could result.

**During motor shutoff by the thermal overload device, control box circuits remain live. Do not attempt to service any control box components unless incoming power has been shut off.**

After stopping the pump, be sure to perform all required maintenance and preservation procedures.

##### Operational Checks

To detect minor problems, check the pump for proper operation when it is first started and at periodic intervals.



To avoid serious damage to the pump, check for unusual noises or excessive vibration while the pump is running. If noise or vibration is excessive, stop operation and refer to the Troubleshooting Chart in Section D.

The suction inlet or impeller may become clogged with debris. In some cases, stopping the pump momentarily may backflush this blockage. If backflushing does not clear the debris, remove the pump from the wet well, **disconnect power**, and clear manually.



**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 backflushing is absolutely necessary, limit liquid pressure input to 50% of the maximum permissible operating pressure shown on the Pump Performance Curves.**

Check the pump for overheating. Overheating can occur if the pump is misapplied, required to start repeatedly, if the control box fails to provide overload or thermal protection, or if the pump is operated against a closed discharge valve for an extended period of time.



Do not start the pump more than 10 times per hour. If the motor does not cool between starts it will overheat, resulting in damage to the motor windings or control box components.

#### Cold Weather Preservation

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 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.



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

## TROUBLESHOOTING – SECTION D

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

### NOTE

*Many of the probable remedies listed in the TROUBLESHOOTING CHART require use of electrical test instruments; for specific procedures, see ELECTRICAL TESTING at the end of the chart.*

### TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO START.	NO POWER TO MOTOR.	CHECK FOR BLOWN FUSE OR OPEN CIRCUIT BREAKER
	IMPELLER JAMMED.	CHECK IMPELLER; DISASSEMBLE AND REPAIR AS NECESSARY.
	MOTOR, VOLTAGE OR CONTROL BOX INCOMPATIBLE; DEFECTIVE CONNECTIONS	CHECK RATINGS ON PUMP NAMEPLATE AND CONTROL BOX; CHECK INCOMING VOLTAGE; CHECK CONNECTIONS.
	MOTOR CABLE DAMAGED	CHECK PER <b>ELECTRICAL TESTING</b> .
	CONTROL BOX CURRENT INTERRUPTING OR MOISTURE-SENSING DEVICES TRIPPED.	CHECK CONTROL BOX; CHECK FOR LEAKING SHAFT SEALS, CUT O-RINGS, OR MOISTURE WICKING THROUGH CABLE.
	OPEN CIRCUIT IN MOTOR WINDINGS OR CABLE.	CHECK CONTINUITY PER <b>ELECTRICAL TESTING</b> .
	MOTOR OVERHEATED, THERMAL SWITCHES TRIPPED.	ALLOW MOTOR TO COOL.
MOTOR RUNS BUT DOES NOT DELIVER RATED DISCHARGE.	PUMP RUNNING BACKWARD.	CHECK IMPELLER ROTATION ( <b>SEE SECTION C</b> ).
	VOLTAGE TOO LOW OR TOO HIGH; EXCESSIVE VOLTAGE DROP BETWEEN PUMP AND CONTROL BOX.	CHECK INCOMING VOLTAGE; CHECK WIRING SIZE, TYPE AND LENGTH. ( <b>SEE INSTALLATION – SECTION B</b> ).
	DISCHARGE HEAD TOO HIGH.	REDUCE DISCHARGE HEAD, OR INSTALL STAGING ADAPTER AND ADDITIONAL PUMP.
	DISCHARGE THROTTLING VALVE PARTIALLY CLOSED; CHECK VALVE IMPROPERLY INSTALLED.	OPEN DISCHARGE VALVE FULLY; CHECK PIPING INSTALLATION.
	IMPELLER OR DISCHARGE LINE CLOGGED.	CLEAR
(CONT.)		



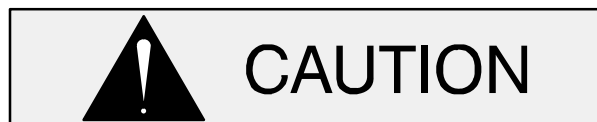
TROUBLESHOOTING CHART		
TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
(CONT.) MOTOR RUNS, BUT DOES NOT DELIVER RATED DISCHARGE.	LIQUID BEING PUMPED TOO THICK.	DILUTE LIQUID IF POSSIBLE.
	IMPELLER WORN OR DAMAGED.	REPLACE.
	INSUFFICIENT LIQUID IN WET WELL.	STOP PUMP UNTIL LIQUID LEVEL RISES.
	IMPELLER ROTATING IN WRONG DIRECTION.	CHECK IMPELLER ROTATION ( <b>SEE SECTION C</b> ).
PUMP STARTS THEN SHUTS OFF.	CLOGGED SUCTION PORT OR IMPELLER CAUSING MOTOR OVERLOAD.	CLEAR BLOCKAGE; RESET OVERLOAD DEVICE IN CONTROL BOX.
	MOTOR OVERHEATED; THERMAL SWITCH TRIPPED.	ALLOW PUMP TO COOL.
	MOISTURE SENSING DEVICE TRIPPED.	DISASSEMBLE PUMP AND LOCATE LEAK.
	MOTOR BEARINGS DEFECTIVE.	DISASSEMBLE PUMP AND CHECK
	MOTOR CABLE DAMAGED.	CHECK PER <b>ELECTRICAL TESTING</b> .
	INSUFFICIENT LIQUID IN WET WELL.	STOP PUMP UNTIL LIQUID LEVEL RISES.
EXCESSIVE NOISE OR VIBRATION.	PUMP OPERATING OUTSIDE DESIGNED OPERATING RANGE.	CHECK DISCHARGE HEAD AND FLOW: ADJUST AS REQUIRED TO MEET PERFORMANCE SPECIFICATIONS.
	IMPELLER CLOGGED.	CLEAR BLOCKAGE
	IMPELLER LOOSE OR DAMAGED.	CHECK IMPELLER; REPLACE IF NECESSARY.
	MOTOR SHAFT OR BEARINGS DEFECTIVE.	REPLACE
	PUMPING ENTRAINED AIR.	CHECK WET WELL LIQUID LEVEL.

**ELECTRICAL TESTING**

Make the electrical checks which follow to determine if pump malfunctions are being caused by problems in the motor or in the motor cable.

**Test Equipment**

A volt/amp/ohmmeter and megohmmeter of adequate range and quality are required to conduct the electrical tests which follow.



Refer to the wiring diagram(s) accompanying the motor and control box before reconnecting any electrical leads which have been disconnected. Connections to the wrong terminals may damage the motor and/or control devices.

Equipment	Use
Ammeter	To check AC Voltage and current (amperage)
Ohmmeter	To measure resistance (ohms) to ground

**Voltage Imbalance**

Use a voltmeter to read each phase of the incoming 3-phase power. Each phase must balance with the other two as closely as can be measured with a commercial instrument. If the phases are out of balance, contact your power company. If the phases are balanced, check out the motor as described in the following steps:

- a. Use a voltmeter, Amprobe, or equivalent instrument to read the voltage of incoming power lines 1 and 2, 2 and 3, and 1 and 3 at the control box. Voltage must match as closely as can be measured. If possible, measure the voltage at the control box with:
  - 1. The pump off.
  - 2. The pump running in air.
  - 3. The pump submerged and running under full load.

The voltage measured under each condition must be the same.

- b. If voltage is balanced when the pump is off but is imbalanced when the pump is running, thoroughly check the power source, all inter-connecting cables, and the pump motor to isolate the defect.
- c. Use an Amprobe or equivalent instrument to measure the current draw (amperage) of each phase while the pump is running under full load, and with no load. In each condition, the amperage readings for all three phases must match as closely as can be measured. Normal amperage values are listed in Table 1,

Section B; these values apply only when the voltage at the site is the normal voltage listed.

**Motor and Power Cable Continuity**

Set the megohmmeter at R x 1 scale and zero-balance it. Test as follows:

- a. Shut off incoming power to the control box, and disconnect the motor power cable leads. Connect the megohmmeter test leads to any two power cable leads, and note the megohm meter reading. A high resistance reading indicates an open or broken circuit in the power cable or motor windings, or a bad connection between the motor and cable.
- b. Repeat Step a. with each set of leads. The three readings shall be as close as can be measured.
- c. If readings indicate that continuity problems exist in the motor or motor cable, the motor must be returned to the factory or to a U/L-approved facility.

**Insulation Resistance**

Set the megohmmeter at R x 100, and zero-balance it. Test as follows:

- a. Shut off incoming power to the control box, and disconnect the motor power cable leads. Connect one megohmmeter test lead to the motor cable green/yellow ground lead. Touch the other test lead to each of the motor cable leads in turn. Note the readings.
- b. Readings will indicate resistance values in both the power cable and motor windings. If resistance reads infinity ( $\infty$ ), insulation is good. If resistance reads between infinity ( $\infty$ ), and 1 megohm, insulation is acceptable but should be rechecked regularly. If resistance reads less than 1 megohm, insulation should be checked more closely and frequently.
- c. If readings indicate that a ground exists, test the stator and motor power cable separately. Replace as required.

## MAINTENANCE AND REPAIR – SECTION E

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

### PUMP MODELS

THE FOLLOWING PUMP MODELS, FROM SERIAL NO. 1441950 UP, ARE COVERED IN THIS SECTION.

**JSV3A60–E2.7 200/230/ 460/3**

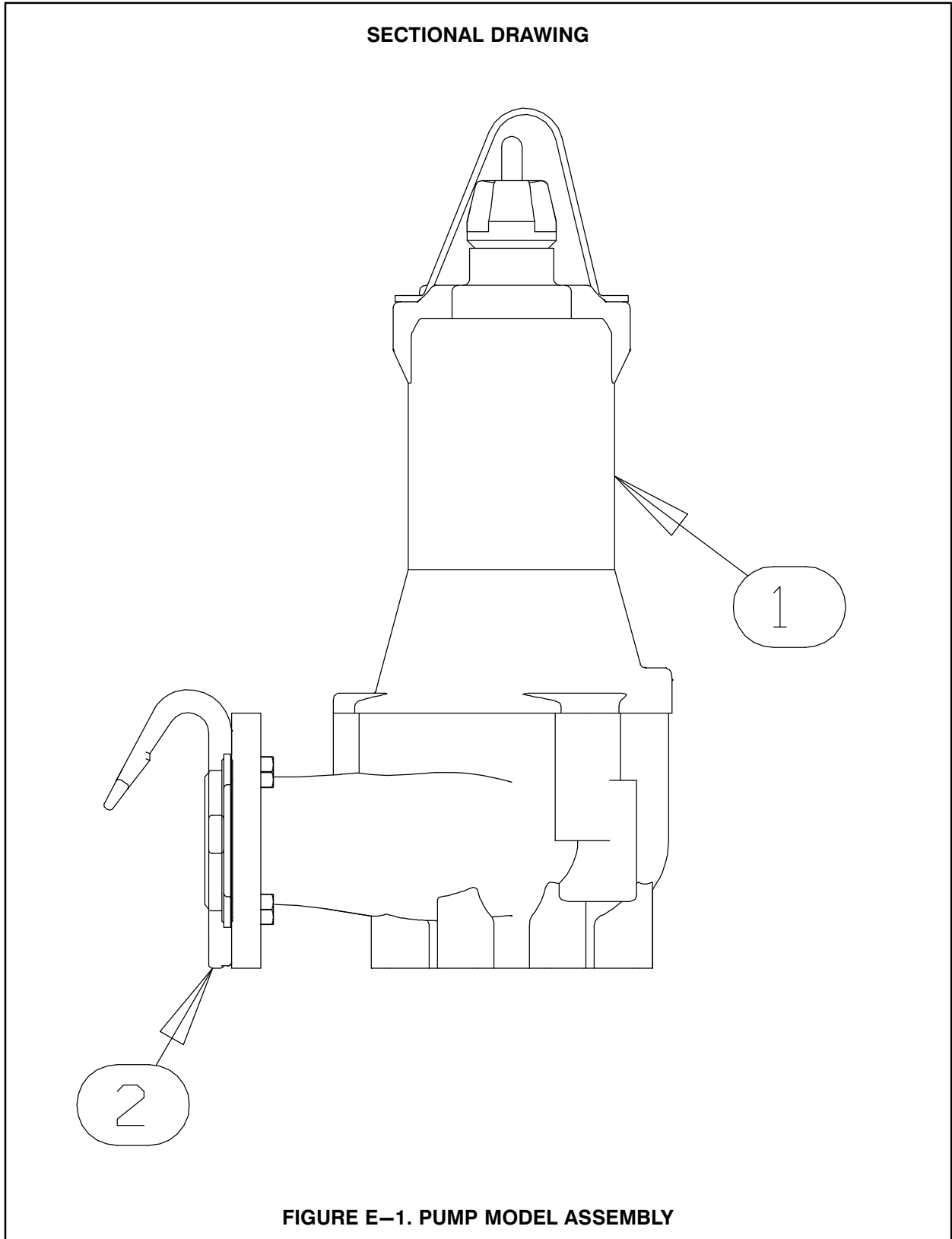
**JSV3B60–E2.7 200/230/460/3**

**JSV3C60–E2.7 200/230/460/3**

**JSV3D60–E4 200/230/460/3**

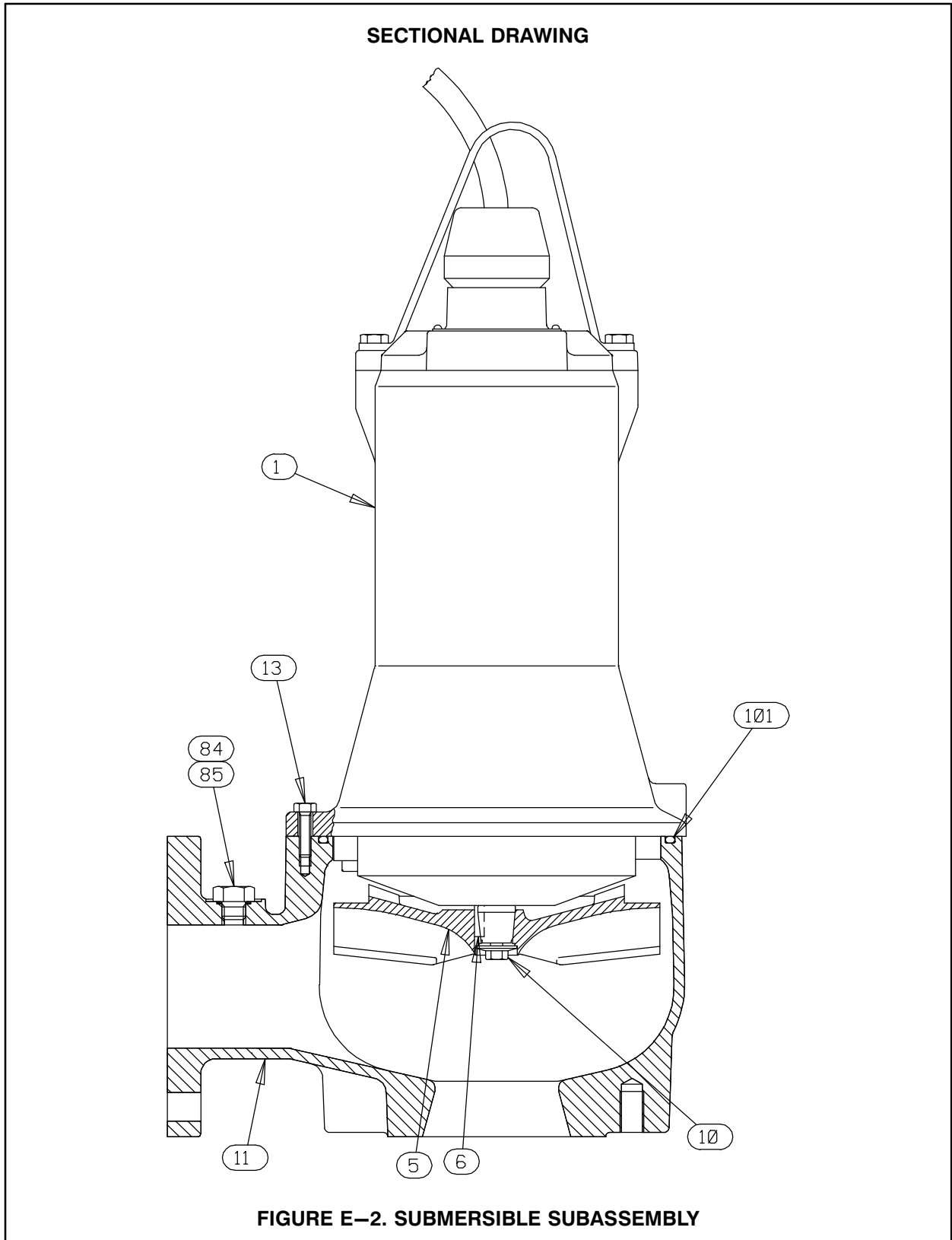
IF YOUR PUMP SERIAL NUMBER IS FOLLOWED BY AN “N”, YOUR PUMP IS **NOT** A STANDARD PRODUCTION MODEL. CONTACT THE GORMAN-RUPP COMPANY TO VERIFY PART NUMBERS.

PERFORMANCE CURVES FOR THESE PUMPS ARE SHOWN AT THE BEGINNING OF **OPERATION** – SECTION C.



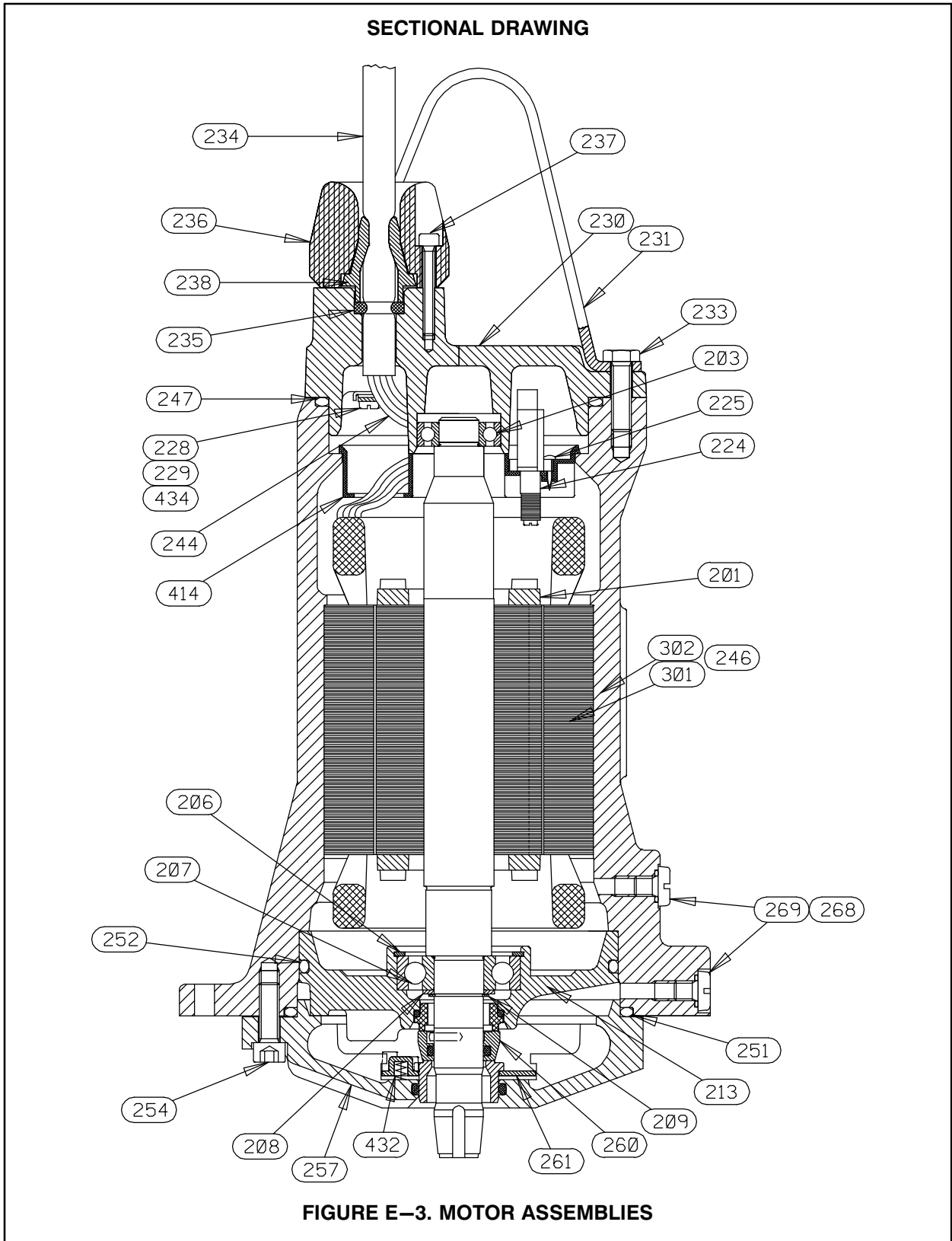
**PUMP MODEL ASSEMBLY  
PARTS LIST**

ITEM NO.	PART NAME	PART NUMBER	QTY
1	SUBMERSIBLE SUBASSEMBLY	SEE FIGURE 2	1
2	INSTALLATION KIT	48156-552	1
	GUIDE SHOE	38236-502 1101X	1
	RUBBER SEAL	26824-784	1
	M16 X 40 X 2 CAPSCREW	22645-877	4
	NOT SHOWN:		
	ROTATION DECAL	38815-023	1
	CAUTION DECAL	38816-182	1
	WARNING DECAL	38816-228	1
	MOTOR VOLTAGE TAG (200V)	38816-200	1
	MOTOR VOLTAGE TAG (230V)	38816-098	1
	MOTOR VOLTAGE TAG (460V)	38816-460	1
	INSTRUCTION TAG	38818-062	1
	NAME PLATE	38818-055 17000	1
	DRIVE SCREW	BM#04-03 17000	4



**SUBMERSIBLE SUBASSEMBLY  
PARTS LIST**

ITEM NO.	PART NAME	PART NUMBER	QTY
1	MOTOR ASSEMBLY (200V)	26825-161	1
	MOTOR ASSEMBLY (230V)	26825-130	1
	MOTOR ASSEMBLY (460V)	26825-129	1
5	* IMPELLER (JSV3A)	38629-503 10000	1
	* IMPELLER (JSV3B)	38629-502 10000	1
	* IMPELLER (JSV3C)	38629-501 10000	1
	* IMPELLER (JSV3D)	26823-944	1
6	* KEY	26824-180	1
10	* IMPELLER SCREW	26824-378	1
11	VOLUTE	26827-306	1
13	HEX HD CAPSCREW	26824-352	3
84	PLUG	26824-261	1
85	* O-RING	26824-122	1
101	* O-RING	26824-130	1
* INDICATES PARTS RECOMMENDED FOR STOCK			





**MOTOR ASSEMBLIES  
PARTS LIST**

ITEM NO.	PART NAME	PART NUMBER	QTY
201	* ROTOR AND SHAFT ASSY	26825-246	1
203	* UPPER BALL BEARING	26823-725	1
206	RETAINING RING	26824-230	1
207	* LOWER BALL BEARING	26823-738	1
208	SUPPORT RING	26824-326	1
209	RETAINING RING	26824-229	1
213	LOWER BEARING HOUSING	26826-621	1
224	MOISTURE SWITCH	26823-301	1
225	SCREW	26824-449	1
228	WASHER	26824-307	1
229	SCREW	26824-369	1
230	MOTOR COVER	26825-937	1
231	LIFTING HANDLE	26823-546	1
233	SCREW	26824-357	2
234	MOTOR CABLE	26823-311	1
235	* RUBBER SEAL	26824-061	1
236	CABLE INLET	26823-341	1
237	ALLEN SCREW	26824-371	3
238	CABLE CLAMP	26823-362	1
244	CONNECTOR SET (200V)	26825-425	1
	CONNECTOR SET (230V)	26825-446	1
	CONNECTOR SET (460V)	26825-445	1
246	STATOR/MOTOR HOUSING (200V)	26825-571	1
301	-STATOR	26825-644	1
302	-MOTOR HOUSING	26825-713	1
246	STATOR/MOTOR HOUSING (230/460V)	26825-559	1
301	-STATOR	26825-635	1
302	-MOTOR HOUSING	26825-713	1
247	* O-RING	26824-144	1
251	* O-RING	26824-127	1
252	* O-RING	26824-123	1
254	SCREW	26824-442	2
257	SEAL HOUSING	26826-551	1
260	* SEAL ASSEMBLY	26824-099	1
261	SEAL CLAMP	26823-587	1
268	SCREW PLUG	26824-441	3
269	* SCREW PLUG O-RING	26824-156	3
414	INSULATION SLEEVE	26823-439	1
432	SPRING	26823-602	3
434	WASHER	26824-309	1
	* INDICATES PARTS RECOMMENDED FOR STOCK		

## PUMP AND MOTOR DISASSEMBLY AND REASSEMBLY

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



**Do not attempt to service the pump end and/or motor assembly unless all power to the motor has been shut off at the control box; otherwise, injury or death could result.**

**Use a lifting device with sufficient capacity (see **INSTALLATION**, Section B). If slings or chains are used to move the pump or components, make sure that the load is balanced. Otherwise serious personal injury or death could result.**

The following maintenance and repair instructions are keyed to the sectional views, FIGURES 1, 2 and 3, and their accompanying parts lists.

Select a suitable location, preferably indoors, to perform required maintenance. All work must be performed by qualified personnel. Recommended spare parts are shown on the parts lists.

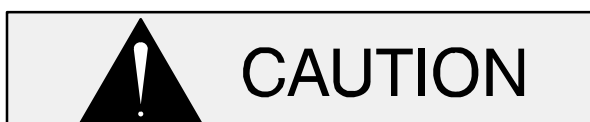
Check **TROUBLESHOOTING**, Section D to determine causes and remedies of pump problems. Disassemble only as far as required.

If a maintenance problem is electrical, see **ELECTRICAL TESTING**, Section D.

### PUMP AND MOTOR DISASSEMBLY

#### NOTE

*The pump end components may be separated from the motor without draining the oil from the motor. See **MOTOR DISASSEMBLY**.*



If necessary to pry components apart to

separate them, use levers on both sides of the component, and apply pressure evenly. Be careful not to mar mating surfaces. When removing parts from the rotor/shaft assembly, be careful not to mar the surface or tapered end of the shaft.

### PUMP END DISASSEMBLY

References are to FIGURE E-2.

#### NOTE

*The volute casing and impeller may be removed without draining the oil from the pump.*

### Removing Volute Casing

1. Lay the pump in a horizontal position on a workbench or other suitable surface.
2. If desired to remove the guide shoe (not shown), remove the screws securing the shoe to the volute casing (11). The rubber seal (not shown) will become a free part.
3. If the impeller (5) is to be removed, the impeller screw (10) should be loosened before removing the volute casing. Insert a wood block through the pump discharge opening and block impeller rotation. Remove the impeller screw through the pump suction opening. Remove the wood block from the discharge opening.
4. Remove the screws (13) securing the volute casing (11) to the motor assembly (1), and separate the assemblies.

### Removing Impeller

1. Remove the impeller screw (10) as described in **Removing Volute Casing**.
2. To remove the impeller, use two wedges to apply equal pressure, 180° apart, to the back of the impeller and strike the end of the impeller shaft sharply with a soft-faced mallet. Repeat

as necessary until the impeller comes free of the shaft. Retain the impeller key (6).

3. If no further disassembly is required, refer to **INSPECTION AND CLEANING**, followed by **PUMP END REASSEMBLY**.

### Removing Seal Assembly

References are to FIGURES E-3 and E-5.



To maintain peak operating efficiency, it is **strongly** recommended that the seal be replaced if the pump is disassembled. In the event that the seal will be reused, handle seal parts with extreme caution to prevent damage. Use care not to contaminate the precision-finished faces; even fingerprints on the faces can shorten seal life.

1. See **LUBRICATION** at the end of this section, and drain the oil from the seal housing (257). Remove the screws (254) securing the seal housing to the motor housing (302).
2. Using a pair of screwdrivers, pry on the back of the seal housing until the seal housing is free of the stator housing. Carefully slide the seal housing and stationary portion of the seal off the shaft as a unit. Remove the seal housing O-ring (251).

### NOTE

*In Step 3, tension on the seal clamp springs will be released.*

3. Turn the seal clamp (261) to free it from the seal housing (257), and remove the clamp and clamp springs (432). Lay the seal housing on a flat surface with the impeller side down and press the stationary element out of the seal housing from the back side. Remove the stationary element O-ring from the groove in the seal housing.

4. Turn the seal rotating element to disengage it from the drive pin and slide it off the shaft.
5. Work a pair of stiff wires with hooked ends between the seal stationary seat and the shaft, and hook the back of the stationary seat. Pull the stationary seat out of the lower bearing housing (213). Remove the stationary seat O-ring from the lower bearing housing.

If no further disassembly is required, refer to **INSPECTION AND CLEANING**, followed by **PUMP END REASSEMBLY**.

### MOTOR DISASSEMBLY

References are to FIGURE E-3.

### Removing Motor Cover

### NOTE

*If desired, the motor cover (230) may be disassembled without draining the oil from the bearing housing.*

1. Remove the screws (233) securing the lifting handle (231) and motor cover (230) to the motor housing (302). Remove the lifting handle.
2. Use a pair of screwdrivers to pry the motor cover (230) out of the motor housing enough to expose the wiring connections to the stator.
3. To remove the motor cover (230), disconnect the motor cable leads at the connector set (244). Remove the screw and washers (228, 229 and 433) securing the ground connector. The insulation sleeve (414) is a free part.
4. To remove the moisture switch (224), remove the screw (225).
5. Remove the motor cover (230). The upper bearing (203) will remain on the shaft.

### NOTE

*Unless absolutely necessary, do not remove the motor cable (234) from the motor cover (230), or move or remove the components in the cable inlet (236). When these components are installed, they*

*deform the cable, and it will have to be trimmed if they are moved.*

6. To remove the motor cable (234), cable inlet (236), cable clamp (238) and rubber seal (235) as a unit, remove the allen screws (237), and pull the assembly out of the motor cover (230).
7. If desired to separate the parts removed in Step 6, lubricate the motor cable (234) to ease removal.

### Removing Rotor and Shaft Assembly

1. See **LUBRICATION** at the end of Section E, and drain the oil from the motor housing (257).
2. With the pump end components and motor cover removed, tap the motor cover end of the rotor and shaft assembly (201) with a soft-faced mallet until the bearing housing (213) comes free of the stator housing (302). Carefully slide the bearing housing and rotor and shaft assembly out of the motor housing as a unit.
3. Remove the O-ring (252) from the groove in the bearing housing.

### NOTE

*The stator (301) is a hot shrink fit in the motor housing (302). No instructions are given in this manual for separating the stator, motor housing, or thermal protectors (307). It is strongly recommended that the stator/motor housing be returned to the factory or an authorized Gorman-Rupp repair facility if any of the components require service.*

### Removing Bearings

1. Remove the retaining ring (206), and slide the shaft and rotor and assembled bearings out of the lower bearing housing.
2. Remove the retaining ring (209), and support ring (208) from the shaft.

### NOTE

*Because bearings can be damaged while being removed, it is recommended that they be inspected in place. The bearings are secured by a press fit onto the shaft.*

*If the bearings will not be replaced, it is also recommended that they be cleaned in place (see **INSPECTION AND CLEANING**).*

3. If the bearings require replacement, use a bearing puller to remove them from the shaft.

### INSPECTION AND CLEANING

Carefully inspect all O-ring seating areas to determine if they formed a proper seal. If sealing was faulty, determine the cause before reassembling the pump. After inspection, remove and discard all O-rings.



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

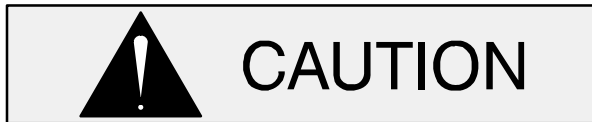
### Bearings

1. It is recommended that bearings be cleaned in place.
2. Clean bearings thoroughly in **fresh** cleaning solvent; dry with filtered compressed air. Rotate the bearings by hand to check for roughness or binding; replace as necessary.
3. Coat external surfaces with light oil to ease reassembly; these bearings are permanently sealed and require no additional lubrication.
4. Cover the bearings with clean cloth to keep external surfaces free of all dirt and foreign material; **failure to do so could damage the bearings or their mating surfaces.**

**Other Reusable Parts (Except Seal Assembly)**

1. Thoroughly clean all reusable parts.
2. Inspect all mating surfaces and the rotor/shaft assembly for nicks or burrs, and restore to original contours with emery cloth or a fine file. If the surface cannot be restored, replace the part.

**Cleaning Seal Assembly**



Seal faces are precision-finished and subject to wear patterns which cannot be realigned during assembly. The seal assembly should be replaced completely at each overhaul to ensure trouble-free operation. If necessary to use an old seal in an emergency, **never** mix old and new seal parts; seal performance will be severely affected.

1. Inspect the seal assembly for wear, scoring, grooves, and other damage that might cause leakage.
2. Wash all seal parts in fresh cleaning solvent and allow to dry thoroughly. Re-inspect the parts after cleaning.
3. If needed, clean the seal faces with a clean, lint-free tissue. Wipe lightly in a concentric pattern to avoid scratching the faces.

**PUMP AND MOTOR REASSEMBLY**

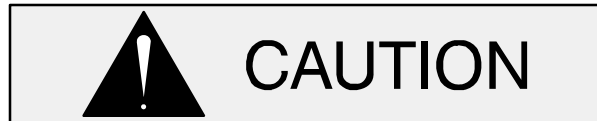
**MOTOR REASSEMBLY**

References are to FIGURE E-3.

**Installing Bearings**

**NOTE**

*The bearings in this pump are permanently lubricated.*



When installing the upper bearing (203) on the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race. A sleeve with the same diameter as the inner race is useful for installing the bearing.

When installing the lower bearing (207) in the bearing housing, **never** press or hit against the inner race, balls, or ball cage. Press **only** on the outer race. A sleeve with the same diameter as the outer race is useful for installing the bearing.

1. Lightly oil the upper and lower ends of the rotor/shaft assembly (201).

**NOTE**

*Heating the bearings will ease installation. **Never heat bearings by direct flame.** An induction heater, hot oil bath or electric oven may be used.*

*If a hot oil bath is used to heat the bearings, both the oil and the container must be absolutely clean, and if the oil has been previously used, it must be thoroughly filtered.*



**Use tongs, insulated gloves, or other protective devices when handling heated bearings.**

**NOTE**

*Do not heat the bearings until ready to install. Heat it to a uniform temperature no higher than 250°F (120°C), and slide the bearings onto the shaft in one continuous motion to prevent cooling and sticking.*

2. Slide the upper bearing (203) onto the shaft until it seats squarely against the shaft shoulder.

- Slide the lower bearing (207) onto the shaft until fully seated, install the support ring (208), and secure with the retaining ring (209).

### NOTE

*If the bearings were heated, allow them to cool and then check to make sure that they has not shrunk away from the shaft shoulders. If the bearings have shifted, use a suitable sleeve and a press to fit the bearings snug against the shoulders.*

- If heating the bearings is not practical, use an arbor (or hydraulic) press and a suitable sized sleeve to press the bearings onto the shaft until fully seated.
- Slide the rotor and shaft and assembled bearings into the lower bearing housing (213) until the lower bearing (207) is fully seated, and secure the bearing with the retaining ring (206).

### Installing Shaft and Rotor Assembly

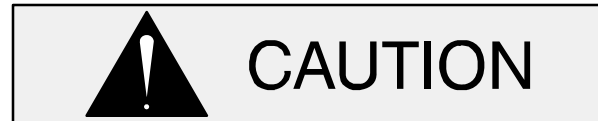
### NOTE

*The stator (301) is a hot shrink fit in the motor housing (302). No instructions are given in this manual for separating the stator, motor housing, or thermal protectors (307). It is strongly recommended that the stator/motor housing be returned to the factory or an authorized Gorman-Rupp repair facility if any of the components require service.*

- Lightly lubricate a new O-ring (252) and install it in the groove in the bearing housing (213).
- Slide the assembled rotor and shaft and lower bearing housing into the motor housing, and use a soft-faced mallet to tap around the lower bearing housing until fully seated in the stator housing (302).
- After the motor is fully assembled, lubricate the motor as indicated in **LUBRICATION** at the end of SECTION E.

### Installing Motor Cover

- Clean the exterior of the motor cable (234) with warm water and mild detergent, and inspect for obvious damage. (If required, see **ELECTRICAL TESTING** in **TROUBLESHOOTING**, SECTION D.)



Do **not** splice the cable. waterproof integrity must be maintained. If repairs are required other than at either end, replace the entire cable.

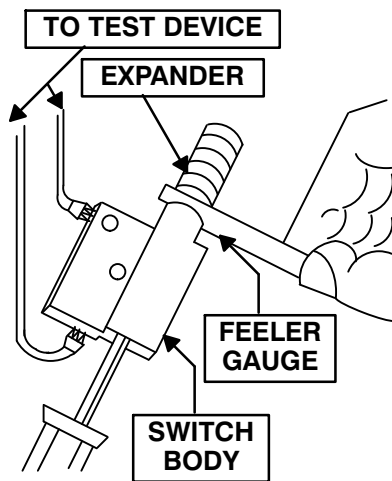
- If the cable inlet (236), cable clamp (238), and rubber seal (235) have been moved or removed, lubricate the motor cable (234) to ease moving the parts during installation.
- Install the cable inlet (236) and cable clamp (238). Discard the old rubber seal (235) and install a new one above the deformation mark left on the motor cable by the old seal.
- Cut the motor cable (234) above the seal deformation mark. Strip the motor cable outer insulation so that the individual leads are long enough to make motor connections; the ground lead must be longer than the others.
- Remove the identification sleeves from the cut power leads, and install on the new wire ends. Install identifying sleeves or markers identical to those on the old leads on the new leads.
- Pull the rubber seal (235) down to within two inches (50,8 mm) of the end of the motor cable sheath (234). Pull the cable clamp (238) down until flush with the rubber seal. Lubricate the outside of the cable clamp, and pull the cable inlet (236) down over the clamp until flush with the cable clamp.
- Insert the motor cable leads into the motor cover (230), making certain that the rubber seal bottoms in the cover, and that the cable clamp (238) and cable inlet (236) are flush with the top of the cover. Secure the cable inlet and installed components with the screws (237).

8. If removed from the connector set (244), thread the leads from the stator (301) through the insulation sleeve (414), and seat the sleeve in the motor housing (302).



Refer to the wiring diagrams in **INSTALLATION, Section B**, when connecting all motor leads. Misconnected leads could severely damage the motor, and cause injury or death to personnel.

9. Install the leads from the stator (301) and motor cable (234) in the connector set (244).
10. Secure the ground connector with the screw and washers (228, 229 and 433).



**FIGURE E-4. MOISTURE SWITCH SETTING**

11. The moisture switch (224) should be checked and, if required, adjusted any time the motor is opened for service.



The switch is extremely sensitive to atmo-

spheric moisture and contamination from handling; therefore, **make sure** hands are clean and dry before touching the switch. When installing a replacement switch, remove it from the air-tight plastic shipping bag prior to installation to allow it to acclimate to local humidity levels **before** checking and adjusting the clearance as follows.

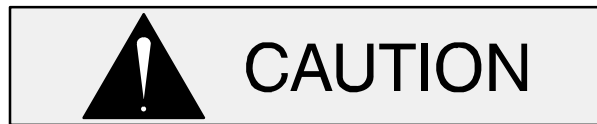
See FIGURE E-4 and install the switch in a simple bell circuit or other test circuit. Use a feeler gauge to check clearance between the expander and switch body; clearance should be 0.100 inch (2,5 mm).

12. After checking, secure the moisture switch (224) with the screw (225).
13. Lubricate a new O-ring (247), and install it in the motor cover (230). Slide the motor cover over the upper bearing (203) and into the stator housing. Secure the lifting handle (231) and motor cover to the motor housing with two screws (233).
14. Lubricate the motor as indicated in **LUBRICATION** at the end of this section.

**PUMP END REASSEMBLY**

**Installing Seal Assembly**

References are to FIGURES E-3 and E-5.

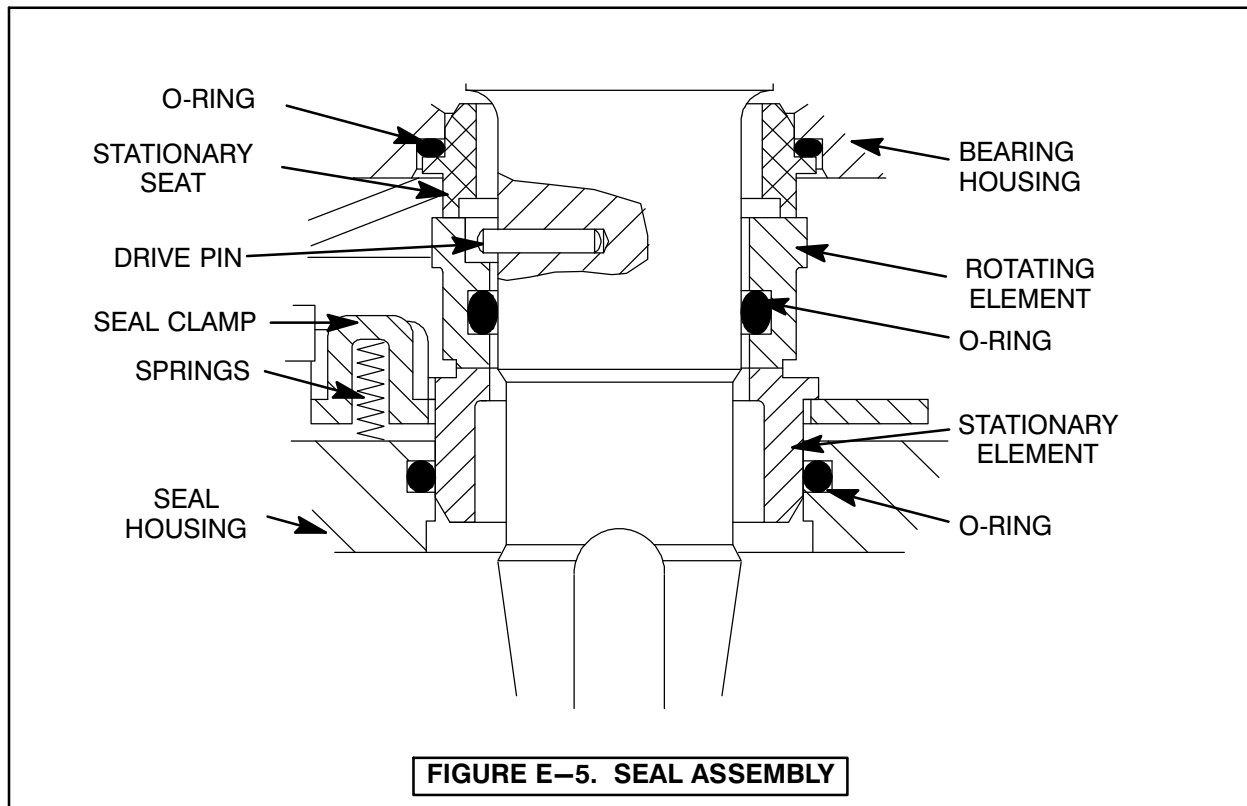


If a new seal is being installed, do not unwrap it until ready to install; seal components **must** be kept clean. Handle seal parts with extreme caution to prevent damage. Use care not to contaminate the precision-finished faces; even fingerprints on the faces can shorten seal life.

**NOTE**

*Use hand pressure only to install seal components. A push tube cut from plastic pipe approximately the same O.D. as the stationary seat is a useful aid when installing these components. It is recom-*

mended that the pump be inverted during seal installation.



**FIGURE E-5. SEAL ASSEMBLY**

1. Lubricate the motor shaft and the seal cavities of the bearing housing (213) and seal housing (257).
2. Unwrap the seal components. Check that the seal faces are clean and undamaged. If necessary to clean, use a clean tissue and wipe in a concentric pattern.
3. Lightly oil the seal stationary seat O-ring and install it in the bearing housing (213). Place a clean tissue over the stationary seat seal face, and press it into the bearing housing with the seal face up.
4. Install the drive pin in the shaft. Lubricate the rotating element O-ring and install it in the rotating element. Slide the rotating element and O-ring onto the shaft, making sure the slot in the element engages the drive pin.
5. Place a drop of grease in the cups of the seal clamp to hold the clamp springs (432) in place, and install the clamp and springs in the seal housing (257); turn the clamp to secure it in the groove in the seal housing.
6. Lubricate the stationary seat O-ring, and install it in the groove in the bore of the seal housing (257). Place a clean tissue over the upper seal face of the stationary element, and press it into the seal housing until fully seated against the seal clamp.
7. Install the seal plate O-ring (251) in the groove in the stator housing (302). Carefully slide the seal plate and assembled seal parts over the shaft so the seal faces contact. Secure the seal plate to the stator housing with the allen screws (254).

#### **NOTE**

See **Seal Testing** before assembling the remaining



*pump end components.*

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### Seal Testing

The seal assembly should be tested under pressure and submerged in water before the pump end is assembled.

#### NOTE

*The compressed air used in testing must be dry. Moist air in the motor housing will cause the moisture switch (224) to trip.*

*There are two screw plugs (268) along the flange of the motor housing (302), and a third in the body of the housing; the third (upper) plug is used in testing only.*

---

#### TEST 1:

1. Remove either of the two screw plugs (268) and O-rings (269) along the flange of the motor housing (302).
2. Thread an air hose adapter into the plug hole; install an air hose.
3. Remove the upper screw plug (268) and O-ring (269) in the motor housing (302).
4. Thread an air hose adapter into the plug hole; install an air hose.
5. Submerge the pump in water and apply 14–15 psi maximum to the **lower** air hose. Check for air bubbles.
6. If air bubbles appear, the seal is leaking. Disassemble the seal, and find and correct the cause of the leak.
7. Re-run the test after corrective action has been taken.

#### TEST 2:

1. Install air hoses as in Test 1.



**This test is conducted with the pump under power. Refer to the wiring diagram and observe all precautions outlined in INSTALLATION – SECTION B when connecting the motor cable to the control box. Otherwise, the pump could be damaged, and personnel exposed to injury or death.**

2. Connect the motor cable leads to the control box. **Do not** apply power to the motor at this time.
3. Submerge the motor assembly so that both hose connections are covered.
4. Apply 14–15 psi pressure maximum to **both** air hoses.



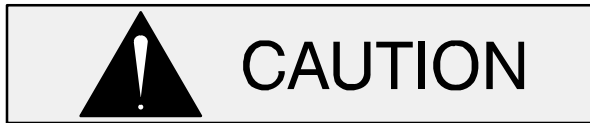
**In the following steps do not apply power for more than 10 seconds.** Otherwise, the unlubricated seal will overheat and may burn.

5. Briefly apply power to the motor, and check for air bubbles.
6. If air bubbles appear, shut off power, then apply again. If air bubbles persist, the seal is leaking.
7. Disassemble the seal, and find and correct the cause of the leak.
8. Re-run the test after corrective action has been taken.
9. After the seals have been tested, remove the air hoses. Lubricate a new O-ring (269), and install and tighten the upper screw plug (268). The lower screw plugs will be used in **LUBRICATION**.

## Installing Impeller

References are to FIGURE E-2.

1. Check the impeller (5) for broken vanes, cracks, or excessive wear. Replace as necessary.
2. Oil the end of the motor shaft and the keyway. Install the impeller key (6) in the shaft keyway. Position the impeller (5) on the shaft, and engage the key in the impeller keyway. Press the impeller onto the shaft until fully seated.



The threads of the impeller screw (10) and its mating surfaces **must** be lubricated to reduce friction and prevent corrosion.

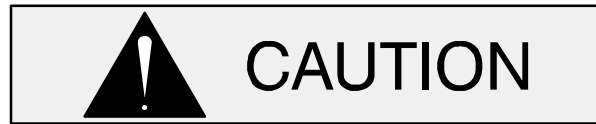
3. Lubricate the threads of the impeller screw (10) and its mating surfaces with SAE 10W 30 oil, and install the screw. Torque the impeller screw as described in **Installing Volute Casing**, after the casing is installed.

## Installing Volute Casing

1. Position the volute casing (11) against the motor flange, and secure it with the screws (13).
2. Insert a wood block through the pump discharge opening and block impeller rotation. Reach through the pump suction opening with a wrench, and torque the impeller screw (10) to 23 ft. lbs. (276 in. lbs. or 3,2 m. kg.). Remove the wood block from the discharge opening.
3. Inspect the guide shoe rubber seal (not shown) for tears or significant wear, and replace as necessary. Position the rubber seal in the guide shoe and secure the guide shoe to the volute casing (11) with the previously removed hardware.
4. See **LUBRICATION** before returning the pump to service.

## LUBRICATION

All references are to FIGURE E-3.



The upper screw plug (268) in the motor housing is used for testing **only**; **do not** add oil through this plug.

Before installing or removing the screw plugs (268), always clean the area around the plugs to prevent contamination of the oil.

Discard the plug O-rings (269) if the plugs are removed. Lubricate the new O-rings with oil - **not grease** - before installing them.

## Draining Oil

1. Lay the pump flat on a work surface with one of the two screw plugs (268) along the flange of the motor housing (302) facing up; slowly open the plug to release any pressure in the seal housing (257).
2. Place a clean container under the lower plug, remove, and roll the pump on its side to drain the seal housing.

## Condition Of Oil

1. Check the condition of the oil drained from the pump.
2. If the oil is clear, it can be reused.
3. If the oil is milky or contains a small amount of water, it must be changed.
4. If the oil contains a large amount of water, it must be changed, and the seal assembly (260) must be checked before the pump is put back in operation.

## Adding Oil

1. Lay the pump flat on a work surface with one of the two screw plugs (268) along the flange of the motor housing (302) facing up; slowly

open the plug to release any pressure in the seal housing (257). With one of the two screw plugs (268) along the flange of the motor housing (302) facing up; slowly open the plug to release any pressure in the seal housing (257).

2. Remove the second (lower) screw plug along

the flange of the motor housing, and through the top plug hole add SAE 10W 30 motor oil until it escapes from the lower plug hole.

3. Lubricate and install new O-rings (269) and install and tighten the plugs (269).

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