

# INSTALLATION AND OPERATION MANUAL

WITH PARTS LISTS



## SINGLE PHASE CONTROL BOXES

MODELS	
27511-101	27511-105
27511-102	27511-106
27511-103	27511-107
27511-104	

**GORMAN-RUPP PUMPS**

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# INTRODUCTION

**Read this manual** carefully to learn how to safely install and operate your control box. Failure to do so could result in personal injury or damage to the control box or the pump.

This manual does not include maintenance instructions. Have a qualified electrician perform all maintenance. **Be sure** to follow all safety precautions as outlined by the National Electric Code and all local codes.

These control boxes are Nema Type 3R rainproof enclosures with padlockable front covers. **The enclosures are not designed to be watertight, and should not be submerged.** They are designed for use with 110, 115, 220 and 230 volt, single phase Gorman-Rupp submersible pumps. The integral electric motor of the submersible pump **must** be operated through the control box. The control box is **not** explosion-proof and 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 control box 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

## RECORD CONTROL BOX NUMBER

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

Control Box: \_\_\_\_\_  
Voltage: \_\_\_\_\_  
Phase: \_\_\_\_\_  
Pump Model: \_\_\_\_\_

## WARRANTY INFORMATION

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

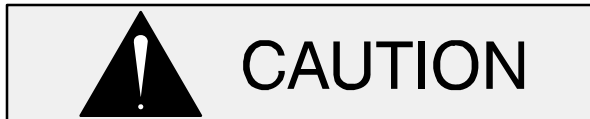
The following are used to alert personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:



**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.*

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## SAFETY – SECTION A

The following information applies throughout this manual to Gorman-Rupp Control Boxes.

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 install, operate, or wire this control box, familiarize yourself with this manual, and with all other literature shipped with the control box. Unfamiliarity with all aspects of control operation covered in this manual could lead to destruction of equipment, injury, or death to personnel.



Before connecting any cable to the control box, be sure to ground the control box. See Section B for suggested grounding methods.



The control box provides overload protection and power control. Do not connect the pump motor directly to the incoming power lines. If the power circuit breaker or overload relay is tripped dur-

ing operation, correct the problem before resetting or replacing.



The electrical power used to operate this control box is high enough to cause injury or death. Obtain the services of a qualified electrician to make all electrical connections. Make certain that the enclosure is properly grounded; never use gas pipe as an electrical ground. Be sure that the incoming power matches the voltage and phase of the control before connecting the power source. Do not make electrical connections if the voltage is not within the limits. If the overload unit is tripped during operation, correct the problem before restarting.



The electrical power used to operate this control box is high enough to cause injury or death. Make certain that the control handle on the control box is in the OFF position and locked out, or that the power supply to the control box has been otherwise cut off and locked out, before attempting to open or service the control box. Tag electrical circuits to prevent accidental start-up.



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



**Do not attempt to repair individual components of the control box. Any component which fails should be replaced.**

## INSTALLATION – SECTION B

### GENERAL INFORMATION

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

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

### PREINSTALLATION INSPECTION

The control box was inspected before shipment from the factory. Before installation, inspect the control for damage which may have occurred during shipment. Check as follows:

- a. Inspect the control box for cracks, dents, and other obvious damage.
- b. Check that all control box components are securely attached to their mounting surfaces, and that the electrical connections are tight and free of corrosion.
- c. Compare the amperes, phase, voltage and hertz indicated on the pump motor nameplate to the ratings indicated for the control box.
- d. Carefully read all tags, decals, and markings on the control box.

If anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair policy. **Do not** put the control box into service until appropriate action has been taken.

### CONTROL BOX INSTALLATION



**The control box furnished with the pump is designed to operate the pump. The control box provides overload protection and power control. Do not connect the pump motor directly to the incoming power lines.**

### Enclosure

The control box is a NEMA Type 3R rainproof enclosure with a padlockable front cover. **The enclosure is not designed to be watertight, and should not be submerged.**

No mounting hardware is furnished with the control box. Secure the control box vertically on a level surface, above flood level. The control should be mounted on a flat surface. If the mounting surface is not perfectly flat, it may be necessary to use shims (not supplied) with the enclosure. The box should be easily accessible to the operator, and located close enough to the pump to avoid excessive voltage drop due to cable length.



Failure to mount the control box vertically on a level surface may affect operation of the pump controls.

After the box is securely installed, make certain the front cover latches properly before installing any electrical lines.

### CONTROL BOX DIMENSIONS

For the approximate physical dimensions of your control box, refer to Figure B-1.

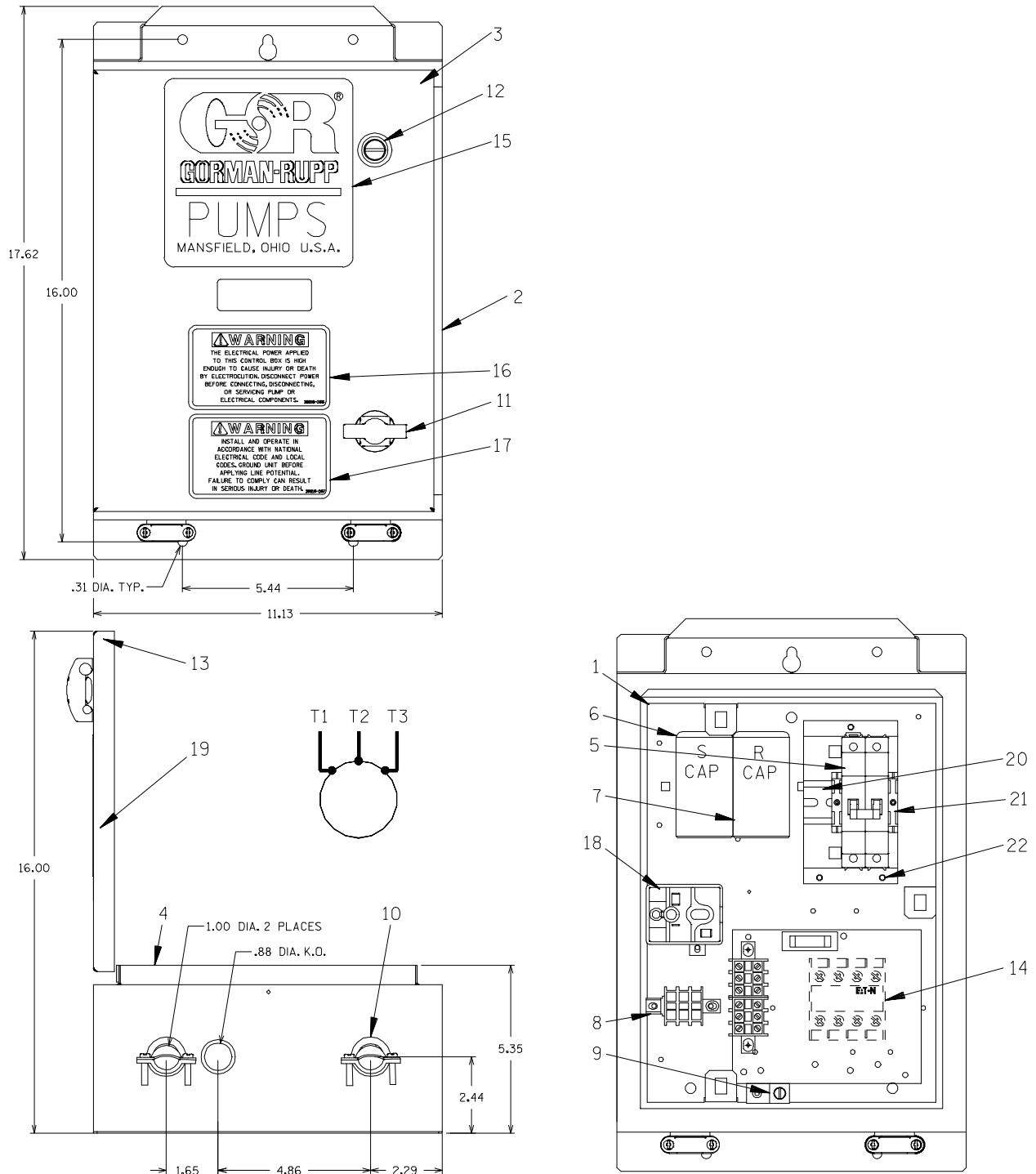


Figure 1. 27511-101, 27511-102, 27511-103, 27511-104, 27511-106 And 27511-107 NEMA Type 3R Control Box Dimension



**27511-101, 27511-102, 27511-103, 27511-104, 27511-106 And 27511-107  
CONTROL BOX PARTS LIST**

ITEM NO.	PART NAME	G-R PART NUMBER	C-H PART NUMBER	QTY
1	PANEL	---	81-26110	1
2	ENCLOSURE WELDMENT	---	39-45727	1
3	EXTERIOR DOOR ASM	---	47-47184	1
4	INTERIOR COVER PLATE	---	47-47186	1
5	MAIN BREAKER	SEE TABLE 1	---	1
6	START CAPACITOR	SEE TABLE 1	---	1
7	RUN CAPACITOR	SEE TABLE 1	---	1
8	TERMINAL BLOCK	---	80-5821	2
9	GROUND LUG	---	80-3132	2
10	CABLE GRIPS	---	3303TBCF	2
11	PAD LOCKING LATCH	---	52-3182-4	1
12	1/4 TURN LATCH	---	2092A24G05	1
13	GASKET	---	45301AFBR3	
14	LIQUID LEVEL CONTROL	SEE TABLE 1	---	1
15	G-R LOGO DECAL	GR06	---	1
16	G-R WARNING LABEL	38816-066	---	1
17	G-R WARNING DECAL	38816-067	---	1
18	START RELAY	SEE TABLE 1	---	1
19	PUB SHEET 1 PH	---	52924	1
20	DIN RAIL	---	800612-113-19	1
21	END STOP FOR DIN RAIL	---	C383ES35	2
22	BREAKER BRACKET	---	47-47188	1

**Table 1. Repair Parts**

G-R Control Box	G-R Pump Model	Volts	Hz	Start Relay G-R P/N	Start Capacitor G-R P/N	Run Capacitor G-R P/N	Circuit Breaker C-H P/N	Liq. Level Control G-R P/N
27511-101	S2F	115	60	9483A	9482B	27571-303	FAZ-D15/2-NA	27521-323
27511-101	S2F	110	50	9483A	9482B	27571-303	FAZ-D15/2-NA	27521-323
27511-102	S2F	230	60	9483	9482A	27571-302	FAZ-D7/2-NA	-----
27511-102	S2F	220	50	9483	9482A	27571-302	FAZ-D7/2-NA	-----
27511-103	S2A	230	60	9483	9482A	27571-323	FAZ-D15/2-NA	-----
27511-104	S2A/S2B	115	60	9483A	9482B	27571-304	FAZ-D30/2-NA	27521-323
27511-106	S3A/S3D	230	60	9483	11343	27571-304	FAZ-D30/2-NA	-----
27511-107	S3B/S3C	230	60	9483	11343	27571-306	FAZ-D35/2-NA	-----

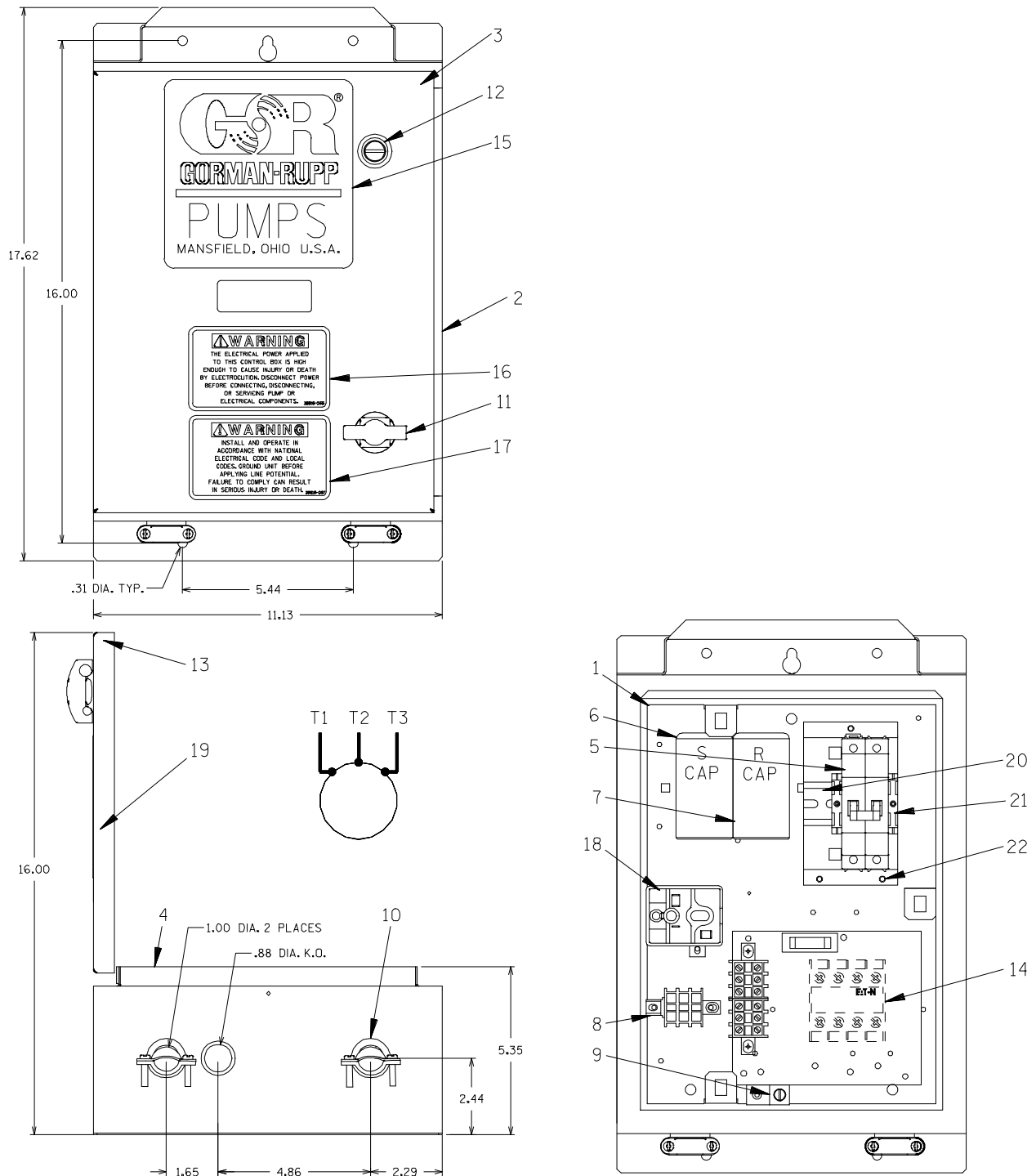


Figure 2. 27511-105 NEMA Type 3R Control Box Dimension

## 27511-105 CONTROL BOX PARTS LIST

ITEM NO.	PART NAME	G-R PART NUMBER	C-H PART NUMBER	QTY
1	PANEL	----	81-26110	1
2	ENCLOSURE WELDMENT	----	39-45727	1
3	EXTERIOR DOOR ASM	----	47-47184	1
4	INTERIOR COVER PLATE	----	47-47186	1
5	MAIN BREAKER	----	FAZ-D15/2-NA	1
6	STARTER CAPACITOR	27581-015	----	1
7	RUN CAPACITOR	47883-002	----	1
8	TERMINAL BLOCK	----	80-5820	2
9	GROUND LUG	----	80-3132	2
10	CABLE GRIPS	----	3303TBCF	2
11	PAD LOCKING LATCH	----	52-3182-4	1
12	1/4 TURN LATCH	----	2092A24G05	1
13	GASKET	----	45301AFBR3	
14	LIQUID LEVEL CONTROL	----	----	1
15	G-R LOGO DECAL	GR06	----	1
16	G-R WARNING LABEL	38816-066	----	1
17	G-R WARNING DECAL	38816-067	----	1
18	START RELAY	27547-015	----	1
19	PUB SHEET 1 PH (SP RELAY)		25885	1
20	DIN RAIL	----	800612-113-1	1
21	END STOP FOR DIN RAIL	----	C383ES35	2
22	BREAKER BRACKET	----	47-47188	1

## ELECTRICAL CONNECTIONS



Obtain the services of a qualified electrician to make all electrical connections and to service the control box.



The electrical power used in this control box is high enough to cause injury or death. Make certain that the control box is properly grounded after installation. Make certain that the power source phase and voltage matches the data on the control box. Complete all electrical connections before connecting the power supply to the control box. Make certain to ground the appropriate lead

of the power source before connecting power to the control. Make certain that the control box is properly grounded after installation.

## Grounding Methods

Electrically ground the installation before connecting the field wiring to the control box. Install a grounding terminal to the enclosure and connect it to a properly embedded 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 codes. See Figure B-2 for some suggested grounding methods.

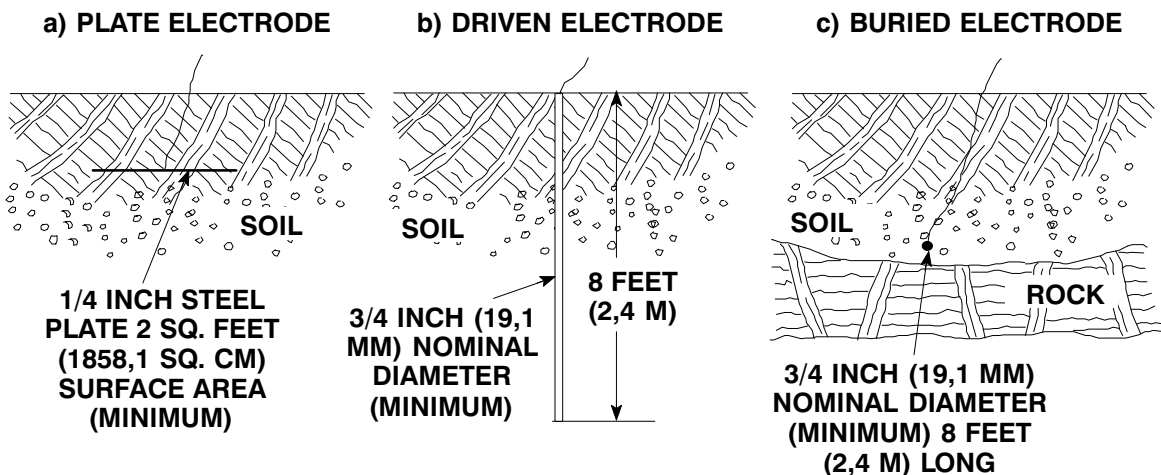


Figure B-2. Suggested Grounding Methods

- 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).
- 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.
- 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 m) from any other electrode or ground rod, such as those used for signal circuits, radio grounds, lightning rods, etc.

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

Field Wiring Connections (Incoming Power)



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 enclosure are properly grounded; never use gas pipe as an electrical ground. 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 control is designed to regulate the power supply. The field wiring must be properly sized to ensure an adequate voltage supply. The voltage available at the pump motor must be within the indicated range.

Table 3. Pump Motor Voltage Limits

Nominal Voltage	Phase	Minimum Voltage	Maximum Voltage
115	1	110	120
200	1	190	210
220 (50 Hz)	1	209	230
230	1	220	240

If the 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.

Make certain all connections are tight and that cable entry points are rainproof. Support the cable weight, if required, to prevent excessive strain on cable clamps and cable.

**NOTE**

*After the power cables have been connected to the control box, make certain the connection is water-proof.*

Power Cable Connections



The electrical power used to operate the control box is high enough to cause injury or death. Obtain the services of a qualified electrician to make all electrical connections. Make certain that incoming power to the control box is in the off position and locked out, or that the power supply to the control box has been otherwise cut off and locked out, before connecting power or accessory cables.

When necessary to change or connect power cables to the 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 pump motor name plate data.

Connect the power cable to the control box as shown in the wiring diagrams in this section. Use conduit or cable clamps to secure the power and accessory cables to the control box. Make certain that all connections are tight and that cable entry points are rainproof.

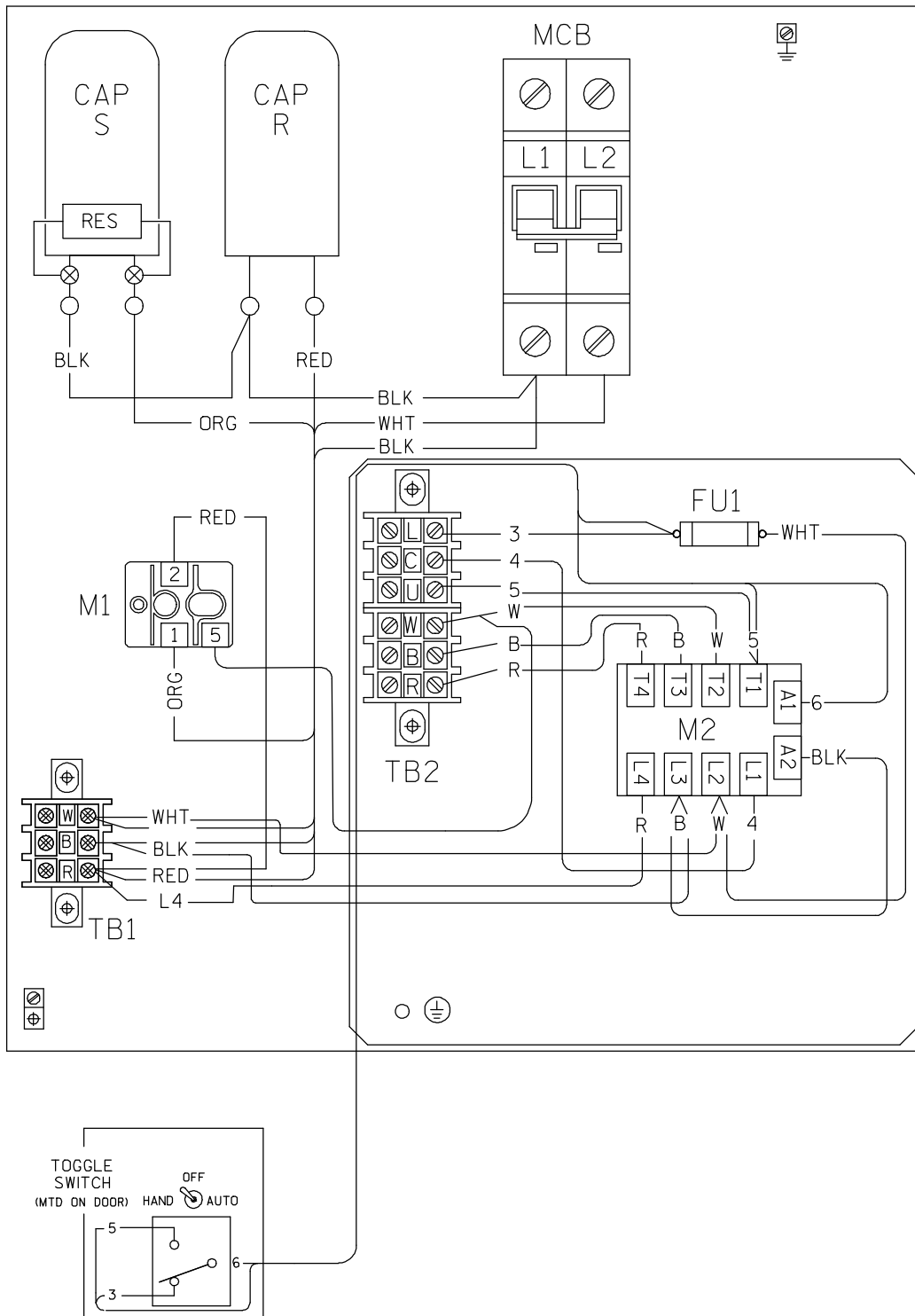
**Control Box Specifications**

Overload relays are provided to protect the pump motor.



**If burnout of the overload protection occurs, the complete overload protection must be replaced.**

**WIRING DIAGRAM**  
FRONT VIEW OF PANEL



**Figure B-3. Control Boxes 27511-101, 27511-102, 27511-103, 27511-104, 27511-106 And 27511-107 Pictorial Wiring Diagram**

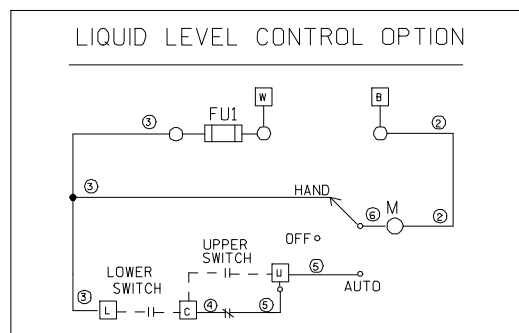
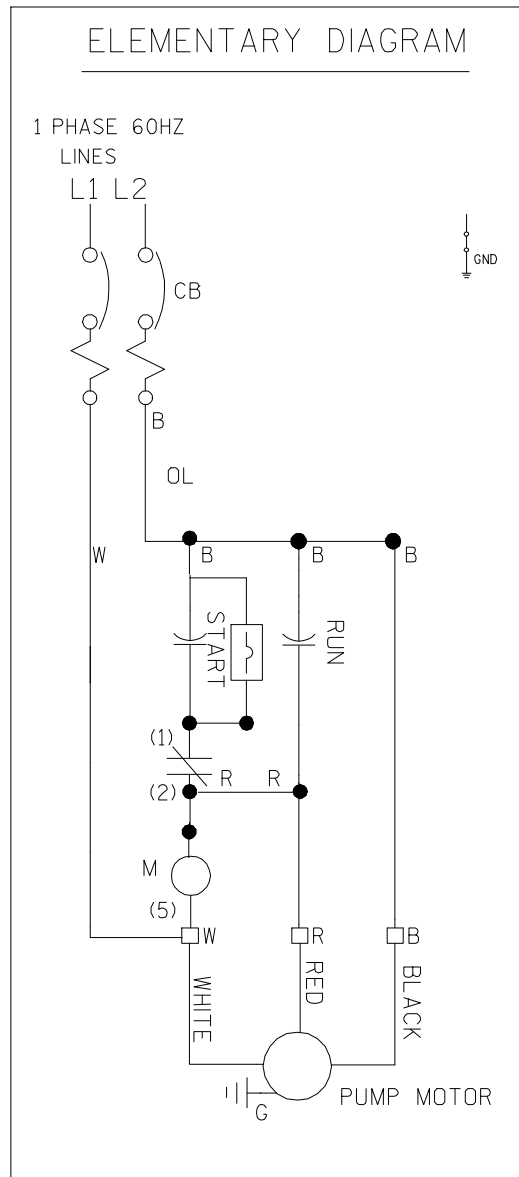


Figure B-4. Control Boxes 27511-101, 27511-102, 27511-103, 27511-104, 27511-106  
And 27511-107 Elementary Wiring Diagram

WIRING DIAGRAM

FRONT VIEW OF PANEL

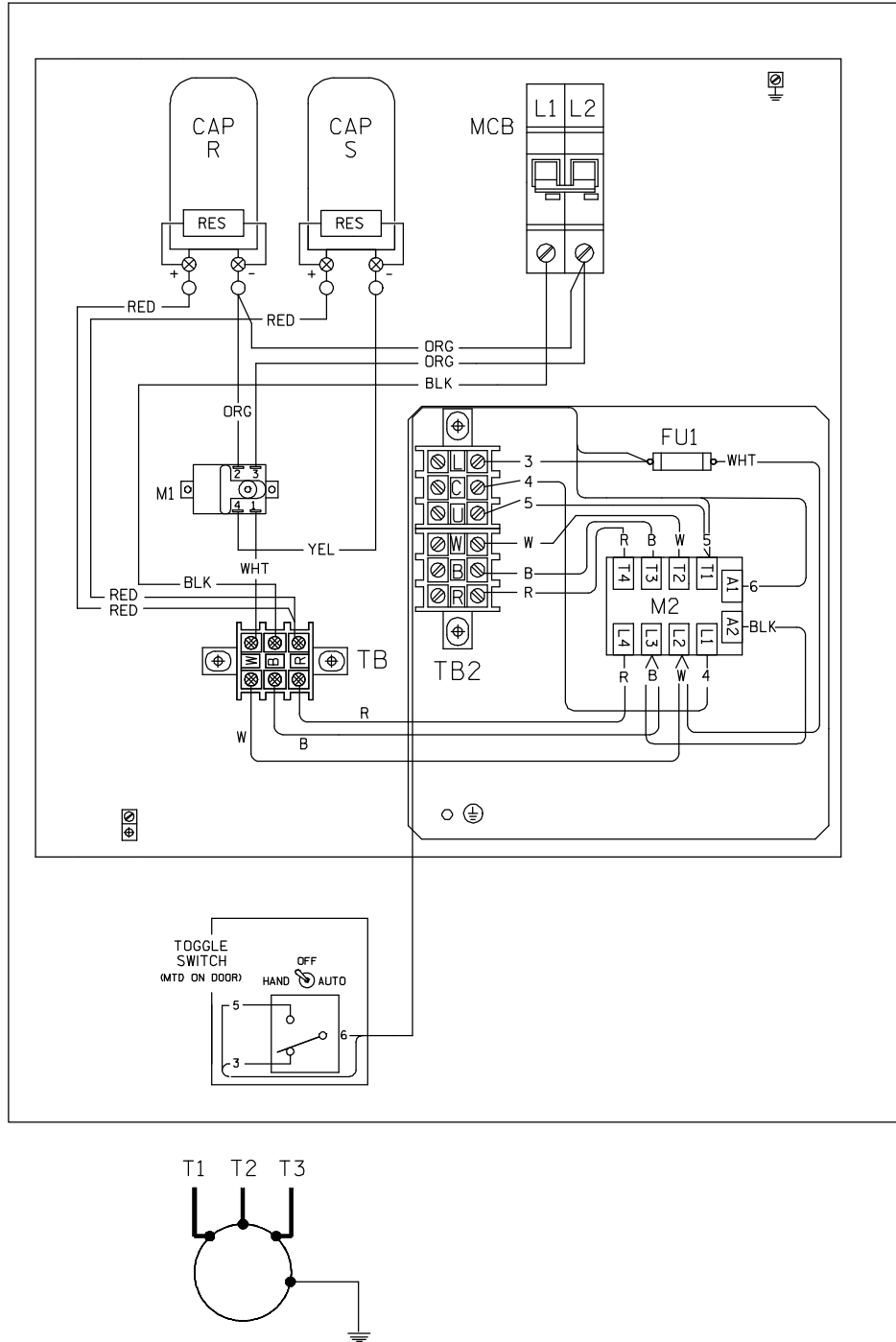
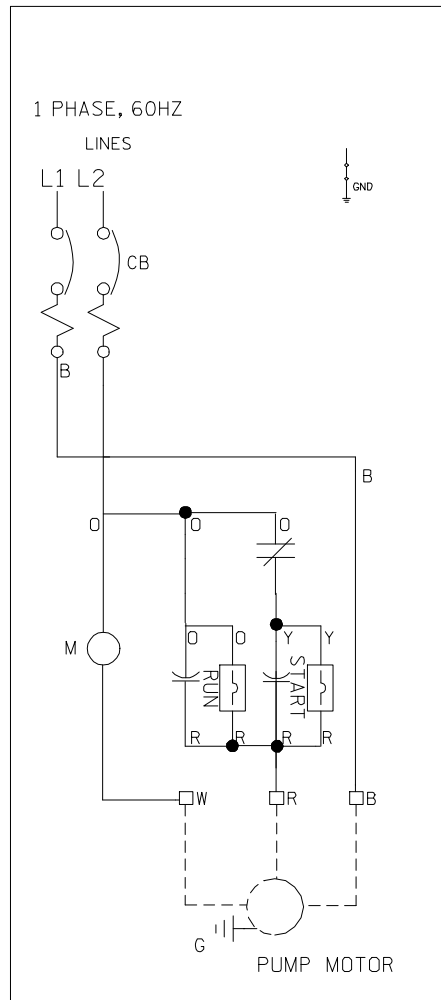


Figure B-5. Control Box 27511-105 Pictorial Wiring Diagram



ELEMENTARY DIAGRAM



LIQUID LEVEL CONTROL OPTION

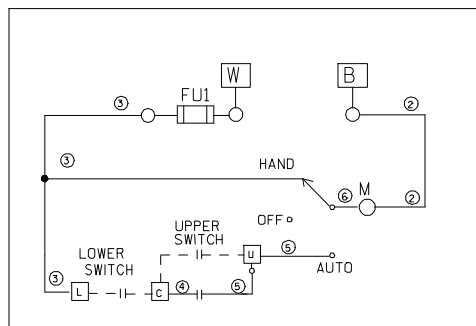


Figure B-6. Control Box 27511-105 Elementary Wiring Diagram

## OPERATION – SECTION C

Review all SAFETY information in Section A.

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



The electrical power used to operate this control box is high enough to cause injury or death. Make certain that the tie handle in the control box is in the OFF position and locked out, or that the power supply to the control box has been otherwise cut off and locked out, before attempting to open or service the control box. Tag electrical circuits to prevent accidental start-up.



Obtain the services of a qualified electrician to make all electrical connections, and to troubleshoot, test and/or service the electrical components of the control box.

### CONTROL BOX FUNCTION



The control box is not designed to be explosion-proof. Do not operate in an explosive atmosphere.

The control box is provided to facilitate operation of the pump. It contains controls for starting and stopping the pump, and provides overload protection for the pump motor. The pump control is equipped with an automatic liquid level sensing device, also contained within the control box.



The control box provides overload protection and power control. Do not connect the pump motor directly to the incoming power lines.



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.

### Component Function

The control box contains the following hand-operated switches and controls:

- The **tie handle** operates the control box circuit breakers. In the OFF position, the tie handle opens the circuit breakers to interrupt incoming power through the control box and prevent pump operation. In the ON position, it closes the circuit breakers to permit pump operation. The circuit breakers will open or “trip” automatically in the event of a short circuit overload current. When tripped, move the tie handle to OFF and back to ON to reset the circuit breakers.
- The **circuit breaker** also provides over-current protection. The breaker will trip automatically if the current drawn by the motor exceeds design specifications. Allow 10 seconds for the unit to cool after tripping before resetting.

### NOTE

*If the circuit breaker trips, do not reset it immediately. Wait at least ten minutes before resetting the tie handle back to the ON position. If the overload unit continues to trip, operational problems exist.*

- A **Hand-Off-Auto** switch is provided as part of the liquid level device. This switch is to be used as follows. In the HAND position, the switch closes the circuit to permit pump operation until the switch is moved to the OFF position. In the OFF position, the switch interrupts incoming power through the control box and prevents pump operation. In the AUTO position, sensors will automatically turn the pump on or off depending on the level of the liquid being pumped. Use only the Hand-Off-Auto switch to turn pump on and off. Do not use the circuit breaker toggle switch to manually turn the pump on and off.

Always terminate incoming power to the control

box before investigating control box circuitry problems.



**Always terminate power to the control box before performing service functions.**

Power through the control box may be terminated by moving the tie handle to the OFF position, thereby opening the circuit breakers. This stops the pump, but **does not** terminate incoming power through the field wiring connected to the control box.

## TROUBLESHOOTING – SECTION D

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



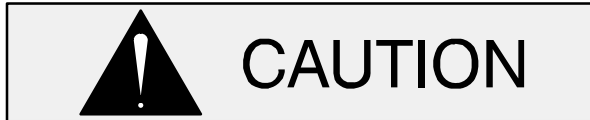
**The electrical power used to operate this control box is high enough to cause injury or death. Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components.**

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

When troubleshooting, also refer to the technical information accompanying the pump and optional equipment.

### TROUBLESHOOTING CHART

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO START, OVERLOAD UNIT NOT TRIPPED (MANUAL MODE)	Power source incompatible with control box.	Correct power source.
	No voltage at line side of circuit breaker.	Check power source for blown fuse, open overload unit, broken lead, or loose connection.
	No voltage at line terminals on bottom of overload unit in control box.	Check power source for blown fuse, open disconnect, broken wire, or loose connection.
OVERLOAD UNIT TRIPS	Low or high voltage, or excessive voltage drop between pump and control box.	Measure voltage at control box. Check that wiring is correct type, size, and length. (See <b>Field Wiring Connections</b> , Section B).
	Power input phases not balanced.	If imbalance exceeds 1 percent, notify power company.
	Control box not compatible with pump.	Electrical data on control box and pump name plate must agree. Replace control box if not in agreement.
	Foreign object locking impeller or bearing frozen.	Remove foreign material or replace damaged bearing. If bearing is damaged, check for water in motor housing.
	Motor windings short-circuited.	Check motor windings with ohmmeter.

**ELECTRICAL TESTING**

Be certain to refer to the wiring diagram(s) in the Installation Section of this manual before reconnecting any electrical components which have been disconnected.

**Test Equipment**

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

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

**Voltage Imbalance**

Each phase of the incoming three-phase power must be balanced with the other two as accurately as a commercial voltmeter will read. If the phases are out of balance, contact your power company and request that they correct the condition.

**Capacitors**

The start capacitor is designed to split the electrical phase during the initial power surge at motor start-up. The start capacitor is controlled by the start relay at motor startup. When the motor reaches load speed, the start relay cuts out and permits the run capacitor to maintain operation. Both the start and run capacitors are located in the control box.



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

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

- a. Disconnect the capacitor leads, and remove the resistor from the start capacitor.
- b. Place a test lead against each of the terminals of the start capacitor for a few seconds. If the ohmmeter needle moves toward zero then slowly drifts back to the left, the capacitor is good. If the needle remains at infinity ( $\infty$ ) the capacitor is open; if the needle remains at zero, the capacitor is shorted. In either case, the capacitor must be replaced.
- c. Test the run capacitor as in b. In addition, test the metal run capacitor for shorts to ground by touching one test lead to the capacitor case and the other lead to each of the capacitor terminals in turn. The ohmmeter should read infinity ( $\infty$ ); if it does not, the capacitor is grounded and must be replaced.

**Start Relay**

The start relay is located in the control box.

Disconnect the two wires from relay terminal 2. Use a zero-balanced ohmmeter set to read RX100K, and touch one lead to relay terminal 2 and the other to relay terminal 5. The resistance reading should be between 4000 to 6000 ohms; if the reading is not in this range, the start relay is defective and should be replaced.

**NOTE**

Repair of individual electrical components is not recommended. Replace defective and/or malfunctioning components.

