

INSTALLATION AND OPERATION MANUAL

WITH PARTS LISTS



SUBMERSIBLE MINE PUMP CONTROL BOXES

MODELS			
47631-064	47631-149	47631-154	47631-162
47631-065	47631-150	47631-155	47631-163
47631-146	47631-151	47631-156	47631-165
47631-147	47631-152	47631-157	47631-166
47631-148	47631-153		

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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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 MSHA schedule 2G regulations.

The control box is a NEMA Type 10, MSHA certified enclosure. **The enclosure is not designed to be watertight, and should not be submerged.** It is designed for use with 460 and 575 volts, depending on your pump. The integral electric motor of the submersible mine pump **must be** operated through the control box. The control box **is** explosion-proof when properly sealed and may 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, and phase in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Control Box: _____

Voltage: _____

Phase: _____

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 and MSHA, 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 during 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.



Do not install and operate a non-explosion proof control box in an explosive atmosphere. Install, connect, and operate the control box in accordance with MSHA Schedule 2G to ensure the explosion-proof integrity. If there is a conflict between the instructions in the manual accompanying the unit and MSHA,

MSHA shall take precedence. All electrical equipment supplied with this control box conformed to MSHA requirements in effect on the date of manufacture. Failure to follow applicable specifications, or substitution of electrical parts not supplied or approved by the manufacturer, can result in severe injury or death.



Do not open the control box in an explosive atmosphere. When sealed, the control box is explosion proof, to prevent the ignition of combustible gases.

Opening the box in an explosive atmosphere could result in fire or explosion.



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 10, MSHA certified enclosure. **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.

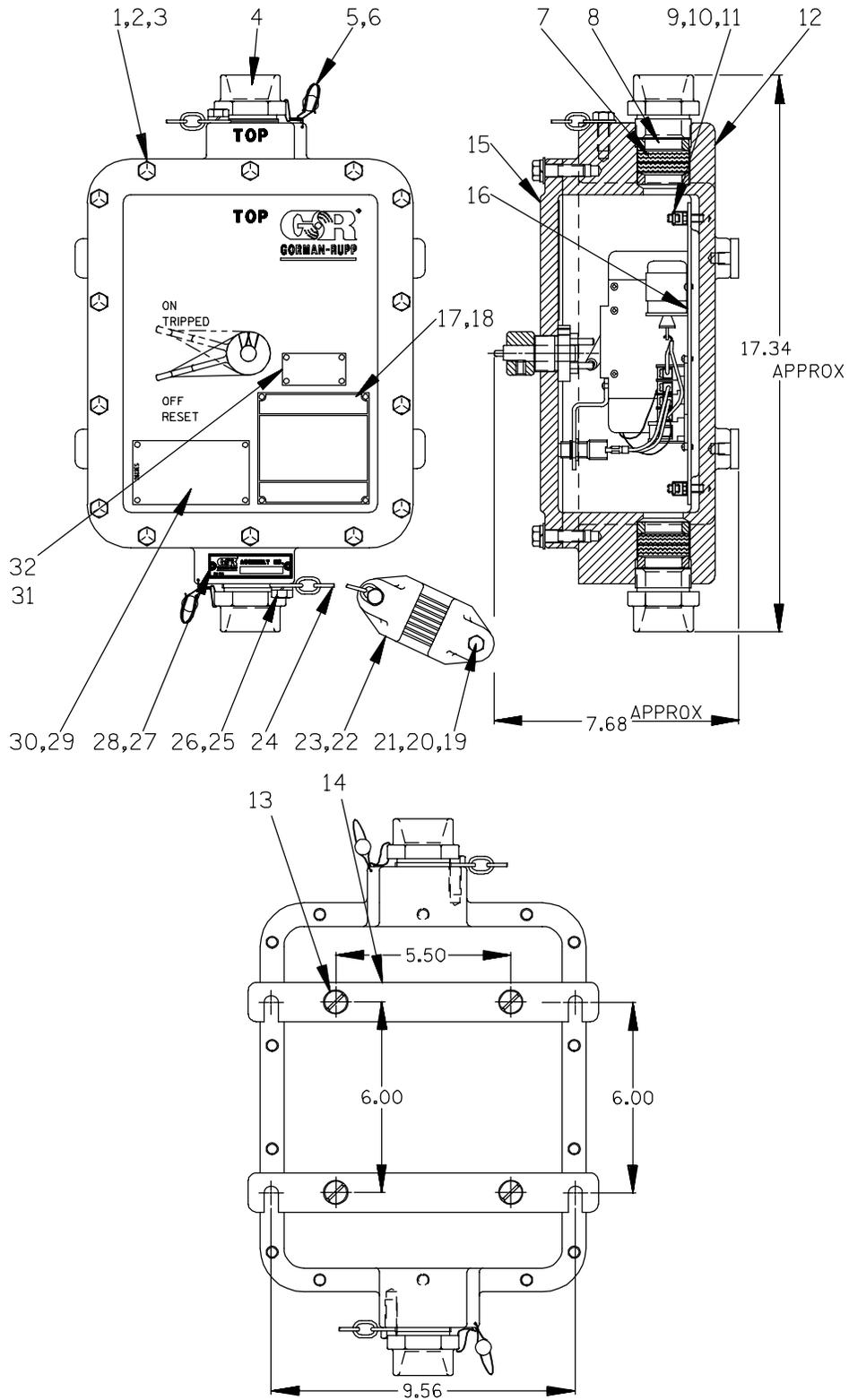


Figure B-1. NEMA Type 10 MSHA Certified Control Box Dimensions

**PARTS LIST – EXTERNAL PARTS
CONTROL BOX**

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	HEX HD CAPSCREW	B0605	15991	14	17	CERTIFICATION PLATE	2613GL	17020	1
2	LOCKWASHER	J06	15991	14	18	DRIVE SCREW	BM#04-03	17000	4
3	FLAT WASHER	KE06	15991	14	19	HEX HEAD CAPSCREW	SEE TABLE B-1		4
4	PACKING GLAND	SEE TABLE B-1		2	20	LOCKWASHER	J06	15991	4
5	LEAD SEAL	21188-002	---	2	21	HEX NUT	D06	15991	4
6	14 IN. WIRE	31311-004	17990	2	22	CABLE CLAMP	38116-603	13040	4
7	ROPE PACKING	31313-010	22120	2	23	RUBBER BRCKT PROT	33573-001	19990	4
8	PACKING WASHER	SEE TABLE B-1		4	24	3/16 X 12 CHAIN	41158-009	15991	2
9	GROUND LUG	27222-004	---	2	25	HEX HD CAPSCREW	B0604	15991	2
10	HEX HD CAPSCREW	B0402	15991	4	26	LOCKWASHER	J06	15991	2
11	LOCKWASHER	J04	15991	4	27	ASSEMBLY PLATE	2613GG	17020	1
12	ENCLOSURE	SEE TABLE B-1		1	28	DRIVE SCREW	BM#04-03	17000	2
13	FLAT HD MACH SCREW	Y0602	15991	4	29	MSHA APPROVAL PLATE	2613ES	17020	1
14	MOUNTING BRACKET	33657-002	13090	2	30	DRIVE SCREW	BM#04-03	17000	4
15	ENCLOSURE CVR ASSY	42114-074	---	1	31	PENN DOER APPRVL PLT	SEE TABLE B-1		1
16	MOUNTING PLATE ASSY	SEE TABLE B-1		1	32	DRIVE SCREW	SEE TABLE B-1		4

Table B-1. Additional Parts

CONTROL BOX PART NO.	ITEM 4 PACKING GLAND NUT	ITEM 8 PACKING WASHER	ITEM 12 ENCLOSURE	ITEM 16 MTG PLATE ASSY.	ITEM 19 HEX HD CAPSCREW	ITEM 31 PENN DOER APPR PLT	ITEM 32 DRIVE SCREW
47631-064	31874-017	31133-109	38383-001	47882-013	B0608	-----	-----
47631-065	31874-017	31133-109	38383-001	47882-014	B0608	-----	-----
47631-146	31874-017	31133-109	38383-001	47882-001	B0608	2613FL	BM#04-03
47631-147	31874-017	31133-109	38383-001	47882-002	B0608	2613FL	BM#04-03
47631-148	31874-017	31133-109	38383-001	47882-005	B0608	2613FL	BM#04-03
47631-149	31874-017	31133-109	38383-001	47882-006	B0608	2613FL	BM#04-03
47631-150	31874-017	31133-109	38383-001	47882-003	B0608	2613FL	BM#04-03
47631-151	31874-017	31133-109	38383-001	47882-004	B0608	2613FL	BM#04-03
47631-152	31874-017	31133-129	38383-001	47882-007	B0609	-----	-----
47631-153	31874-017	31133-129	38383-001	47882-008	B0609	-----	-----
47631-154	31874-017	31133-129	38383-001	47882-009	B0609	-----	-----
47631-155	31874-017	31133-129	38383-001	47882-010	B0609	-----	-----
47631-156	31874-020	31133-130	38383-002	47882-011	B0609	-----	-----
47631-157	31874-020	31133-130	38383-002	47882-012	B0609	-----	-----
47631-162	31874-017	31133-109	38383-001	47882-003	B0608	-----	-----
47631-163	31874-017	31133-109	38383-001	47882-004	B0608	-----	-----
47631-165	31874-017	31133-109	38383-001	47882-015	B0608	-----	-----
47631-166	31874-017	31133-109	38383-001	47882-016	B0608	-----	-----

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 MSHA. Follow all installation requirements of the MSHA, and all applicable codes. See Figure B-2 for some suggested grounding methods.

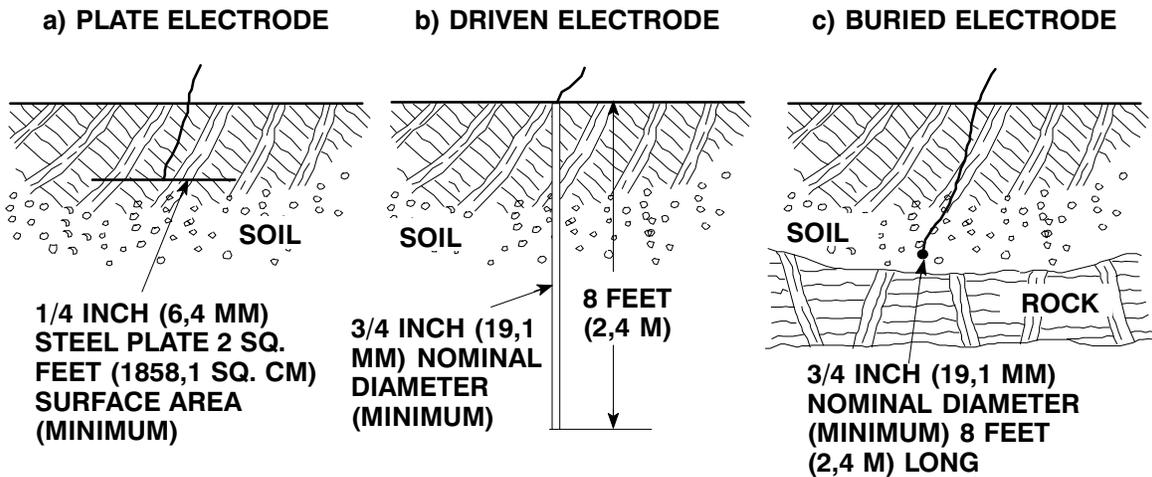


Figure B-2. Suggested Grounding Methods

- a. **Plate Electrode:** An iron or steel plate, 1/4 inch (6,4 mm) thick, completely impeded in the ground. The plate must present a surface area of at least 2 square feet (1858,1 sq. cm).
- b. **Driven Electrode:** A rod or pipe, 3/4 inch (19,1 mm) in diameter minimum, 8 feet (2,4 m) long, completely driven into the ground.
- c. **Buried electrode:** If rock or stone prevents embedding the full 8 foot (2,4 m) length of the ground rod, bury it horizontally in a trench.

Space the ground rod or plates at least 6 feet (1,8 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 B-2. Pump Motor Voltage Limits

Nominal Voltage	Phase	Minimum Voltage	Maximum Voltage
460	3	420	500
575	3	520	630

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.

Connect the pump power cable to the control box as shown in Figure B-3 in this section.

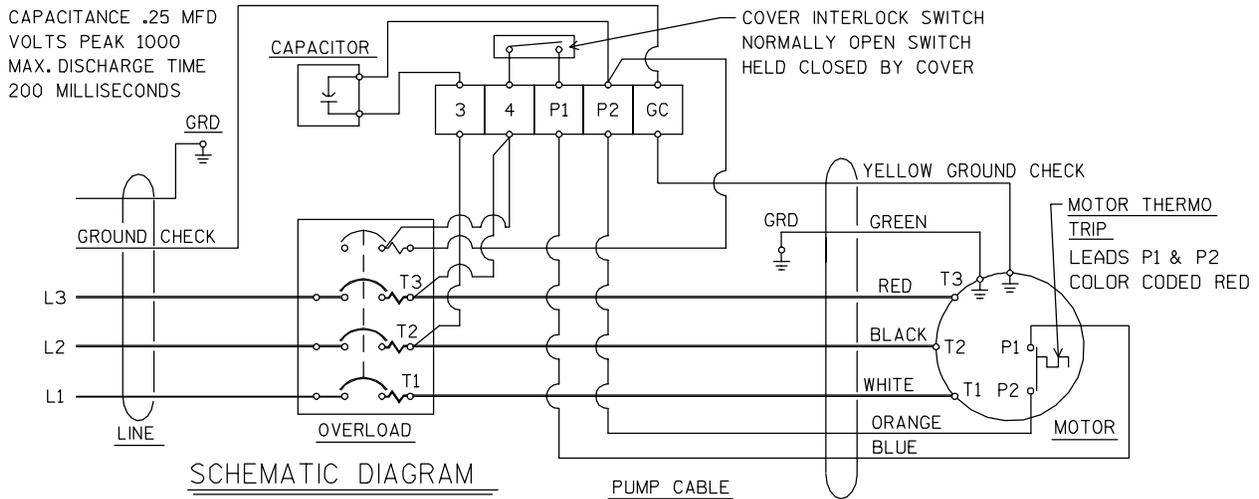


Figure B-3. Pump Power Cable Connection Diagram (All Models)

Power Cable Connection Instructions

1. Run the pump cable through the packing gland nuts and washers (the concave side of the washer should be towards the packing) at the bottom of the control.
2. Connect the white, black and red power leads to the terminals “T1”, “T2”, and “T3”, respectively.
3. Connect the green ground lead to the terminal “GRD”.
4. Connect the yellow ground check lead to the terminal “GC”.
5. Connect the blue control lead to the terminal “P1”.
6. Connect the orange control lead to the terminal “P2”.
7. Install the packing in the gland with the washers on each side, and tighten the packing gland nut. With the nuts tight and the packing

fully compressed, there must be a minimum space of 1/8 inch between the bottom of the nut and the enclosure.

9. Use the seal wire (P/N 31311-004) and lead seal (P/N 21188-002) to secure the packing gland nut to the enclosure. Use the hole in the hex nut and the hole at the top left of the enclosure to prevent loosening of the nut. See **Terminal Housing And Power Cable Reassembly And Installation** in Section E for details.

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

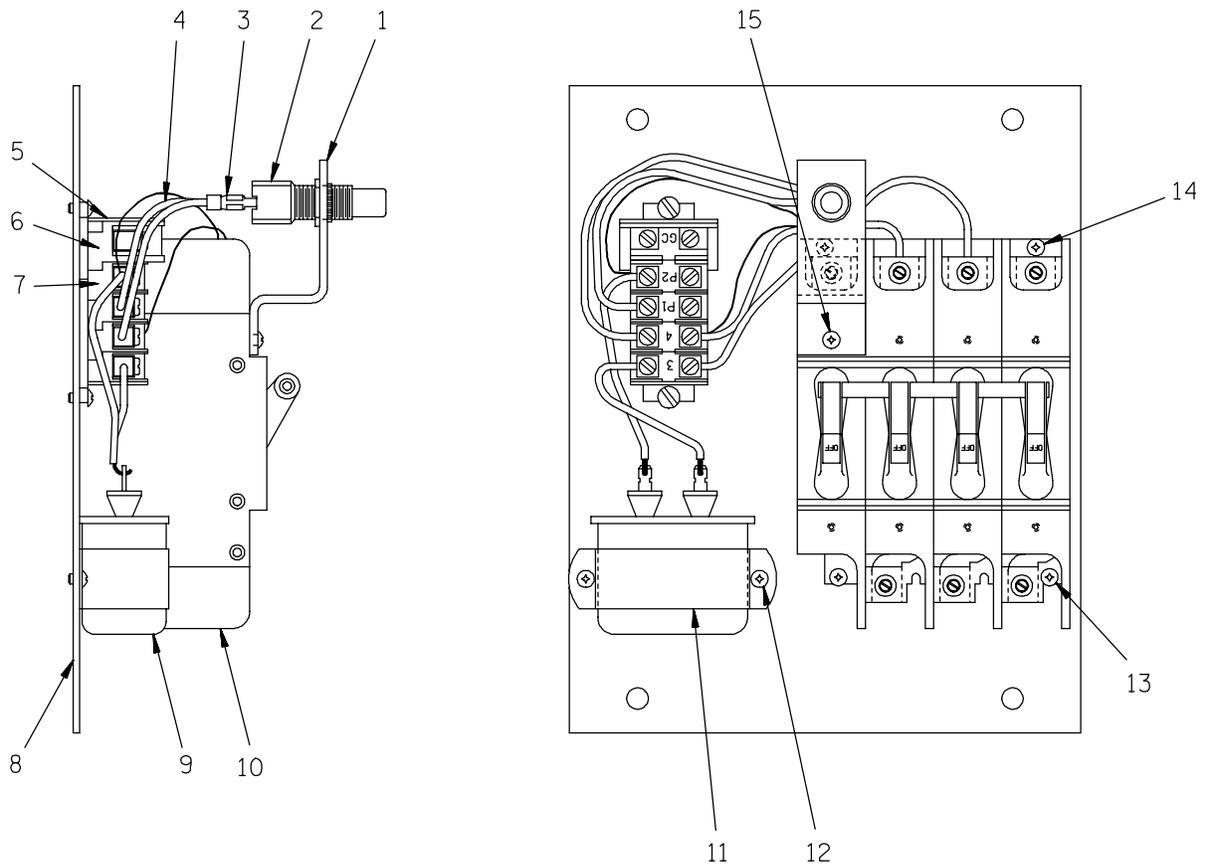


Figure B-4. Electrical Mounting Plate Assembly

For specific control box data information, refer to the Table B-3 at the end of this section.

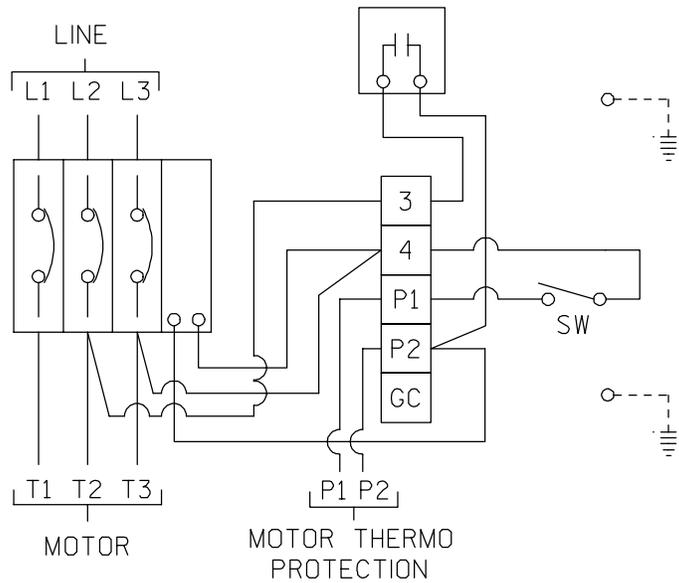


Figure B-5. Mounting Plate Wiring Schematic

PARTS LIST – INTERNAL PARTS

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	SWITCH BRACKET	34512-027	15020	1
2	CUTLER HAMMER SWITCH	27341-211	---	1
3	TERMINAL	S1790	---	2
4	WIRE #14 X 36.50 lg.	38746-027	---	1
5	TERMINAL BLOCK END	SEE TABLE B-3		1
6	TERMINAL BLOCK	SEE TABLE B-3		REF
7	TERMINAL BLOCK	SEE TABLE B-3		REF
8	MOUNTING PLATE	33287-011	13090	1
9	CAPACITOR	27571-332	---	1
10	RELAY/SHUNT TRIP	SEE TABLE B-3		1
11	CAPACITOR BRACKET	27581-904	---	1
12	RD PHILLIP MACHINE SCREW W/WASHER	21771-551	---	2
13	RD PHILLIP MACHINE SCREW W/WASHER	21771-552	---	4
14	RD PHILLIP MACHINE SCREW W/WASHER	21771-553	---	2
15	RD PHILLIP MACHINE SCREW W/WASHER	21771-542	---	1

Table B-3. Control Box Data Chart

CONTROL BOX PART NO.	ELECTRICAL RATING	MOUNTING PLATE ASSY	ITEM 5 TERMINAL BLOCK END	ITEM 6 TERMINAL BLOCK		ITEM 7 TERMINAL BLOCK		ITEM 10 RELAY/SHUNT TRIP
				P/N	QTY	P/N	QTY	
47631-064	460V 3PH 2.2 Amps	47882-013	27233-021	-----	-	27233-203	5	27541-486
47631-065	575V 3PH 1.8 Amps	47882-014	27233-021	-----	-	27233-203	5	27541-496
47631-146	460V 3PH 5.2 Amps	47882-001	27233-021	-----	-	27233-203	5	27541-485
47631-147	575V 3PH 4.2 Amps	47882-002	27233-021	-----	-	27233-203	5	27541-494
47631-148	460V 3PH 13.0 Amps	47882-005	27233-021	-----	-	27233-203	5	27541-483
47631-149	575V 3PH 10.4 Amps	47882-006	27233-021	-----	-	27233-203	5	27541-495
47631-150	460V 3PH 17.0 Amps	47882-003	27233-021	-----	-	27233-203	5	27541-484
47631-151	575V 3PH 13.6 Amps	47882-004	27233-021	-----	-	27233-203	5	27541-493
47631-152	460V 3PH 27.0 Amps	47882-007	27233-026	27233-216	1	27233-203	4	27541-275
47631-153	575V 3PH 22.0 Amps	47882-008	27233-026	27233-216	1	27233-203	4	27541-275
47631-154	460V 3PH 43.0 Amps	47882-009	27233-026	27233-216	1	27233-203	4	27541-321
47631-155	575V 3PH 34.0 Amps	47882-010	27233-026	27233-216	1	27233-203	4	27541-332
47631-156	460V 3PH 74.0 Amps	47882-011	27233-026	27233-216	1	27233-203	4	27541-322
47631-157	575V 3PH 60.0 Amps	47882-012	27233-026	27233-216	1	27233-203	4	27541-333
47631-162	460V 3PH 17.0 Amps	47882-003	27233-021	-----	-	27233-203	5	27541-484
47631-163	575V 3PH 13.6 Amps	47882-004	27233-021	-----	-	27233-203	5	27541-493
47631-165	460V 3PH 20.0 Amps	47882-015	27233-021	-----	1	27233-203	5	27541-324
47631-166	575V 3PH 16.0 Amps	47882-016	27233-021	-----	-	27233-203	5	27541-334

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



Do not open the control box in an explosive atmosphere. When sealed, the control box is explosion proof, to prevent the ignition of combustible gases. Opening the box in an explosive atmosphere could result in fire or explosion.

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 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 **control 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 control handle to OFF and back to ON to reset the circuit breakers.
- The control box contains an integral safety switch which automatically “trips” the circuit breakers when the cover is removed. **Never** remove the cover in an explosive atmosphere. Make certain incoming power is **OFF** and **LOCKED OUT**.
- The motor is thermally protected by a thermostat within the stator. In the event of motor overheating, the thermostat will open and automatically “trip” the control box circuit

breakers. The motor will not restart until the circuit breakers are reset.

NOTE

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

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 control 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.



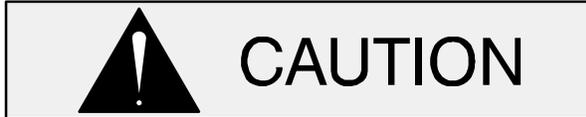
The electrical power used to operate this control box is high enough to cause injury or death. Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components.

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, CIRCUIT BREAKER NOT TRIPPED	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.
CIRCUIT BREAKER 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 Field Wiring Connections , 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.

**For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:
U.S.: 419-755-1280
International: +1-419-755-1352**

**For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:
519-631-2870**