ROBERTS GORDON®

UltraVac™

Controls for Modulating CORAYVAC® Infrared Heating Systems

Installation Manual



⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the installation and operation manuals thoroughly before installing or servicing this equipment.

Installation must be done by an electrician qualified in the installation of control systems for heating equipment.

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your serviceman with necessary information.

c UL US LISTED

Roberts-Gordon
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
Telephone: 716.852.4400
Fax: 716.852.0854
Toll Free: 800.828.7450

Roberts-Gordon
76 Main Street West
Unit 10
Grimsby, Ontario L3M 1R6 Canada
Telephone: 905.945.5403
Fax: 905.945.0511

www.rg-inc.com

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SECTION 1: INTRODUCTION

1.1 What is ROBERTS GORDON® ULTRAVAC™?

The ROBERTS GORDON® ULTRAVAC™ is a micro processor based control package designed for modulating control of CORAYVAC® heaters based on outdoor temperatures.

This controller is capable of giving control outputs to one vacuum pump and three heating zones. The controller also features inputs which are used for indoor and outdoor signal condition monitoring.

System status and settings are viewed and altered from a PC (not supplied) running ROBERTS GORDON® ULTRAVAC™ Software.

1.2 CORAYVAC® Design Requirements

CORAYVAC® burners shall be CRV B-6, B-8, B-9, B-10 or B-12 burners.

CORAYVAC® systems designed shall have **minimum** radiant pipe length and 1.5 - 2.0 feet per flow unit of tailpipe length.

-OR-

CORAYVAC® systems designed shall have **recommended** radiant pipe length and 1.2 - 1.5 feet per flow unit of tailpipe length. See the CORAYVAC® Design manual (P/N 127500NA) for minimum and recommended radiant pipe length.

1.3 General Requirements

The ROBERTS GORDON® ULTRAVAC™ series of controllers are supplied pre-configured for use with ROBERTS GORDON® CORAYVAC® infrared heating equipment only. Failure to comply with the installation instructions and configuration may invalidate the ROBERTS GORDON® ULTRAVAC™ limited warranty (*See Page 39, Section 10*.)

ROBERTS GORDON® ULTRAVAC™ Software requires a PC(not supplied) running Windows® 95 or higher, with a Pentium® class processor and at least 64k of RAM.

The controller, variable frequency drive, burners, pump and outside air blower must be electrically grounded in accordance with the National Electrical Code® ANSI/NFPA 70 - latest revision.

Before proceeding with the installation of the controller, it will be necessary to check that the following points have been considered.

1.4 Check Installation Materials

1.4.1 Switchable Loads

The controller relays are rated for switching loads no greater than 3 A. The total added current load for all 8 relays must not exceed 25 A.

1.4.2 Control Wiring

Shielded cable (four twisted pairs of stranded 24 AWG minimum wire) is required for use with indoor sensors.

Shielded cable (one twisted pair of stranded 22 AWG minimum wire) is required for the outdoor air sensor, VFD signal wiring, pressure switch and wiring from controller #1 to the PC.

Shielded cable (one twisted triad of stranded 22 AWG minimum wire) is required for RS-485 communications between controllers.

1.4.3 Control Board and Sensor Power

The power supply for all sensors is from the “+16 V” terminal to be found on the board of the controller. Power for the control board is 24 V provided by the relay board.

1.4.4 Programming Details

Every controller is pre-programmed for one vacuum pump and up to three heating zones. Use a site layout drawing to identify the heating zones.

1.5 Carton Contents

URVSC: UltraVac™ Satellite Controller



UltraVac™ Controller

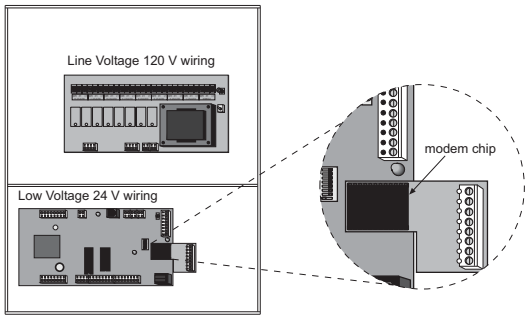
UltraVac™ Installation Manual (P/N 10081601NA)

URVCCL: UltraVac™ Central Controller with TCP/IP Communication Module



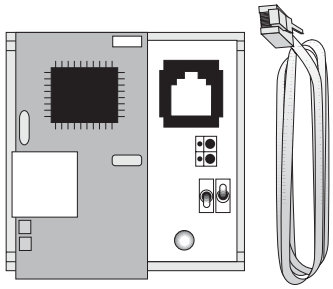
UltraVac™ Controller
with Modem Installed

Controller Enclosure

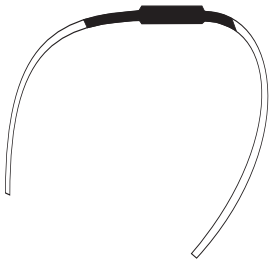




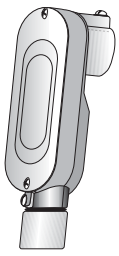
UltraVac™ Software (P/N 10080421)
UltraVac™ Software Manual (P/N 10081600NA)
UltraVac™ Installation Manual (P/N 10081601NA)



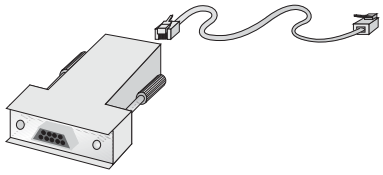
TCP/IP (LAN) Communication Module
(w/ 7’ phone wire) (P/N 10080440)



Comms Equalization Cable
(P/N 10080450)



Outdoor Sensor
(P/N 10081501)

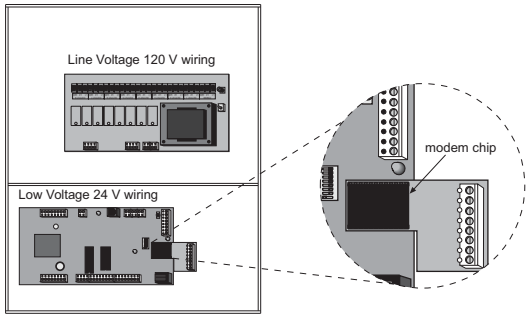


PC Connection Cable Package
(P/N 10080410)

URVCCM: UltraVac™ Central Controller with Modem



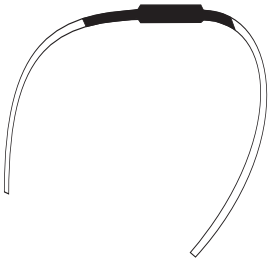
Controller Enclosure



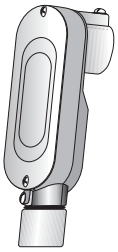
UltraVac™ Controller
with Modem Installed



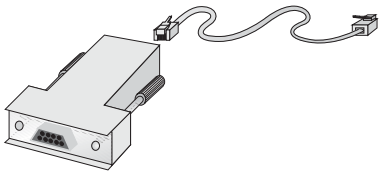
UltraVac™ Software (P/N 10080421)
UltraVac™ Software Manual (P/N 10081600NA)
UltraVac™ Installation Manual (P/N 10081601NA)



Comms Equalization Cable
(P/N 10080450)



Outdoor Sensor
(P/N 10081501)

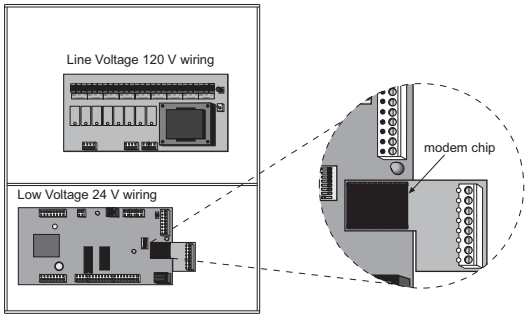


PC Connection Cable Package
(P/N 10080410)

URVCCR: UltraVac™ Central Controller with RS-485 Converter



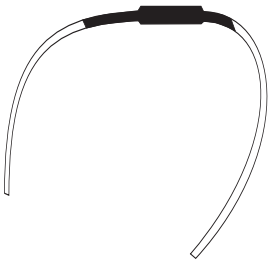
Controller Enclosure



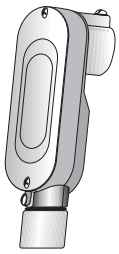
UltraVac™ Controller
with Modem Installed



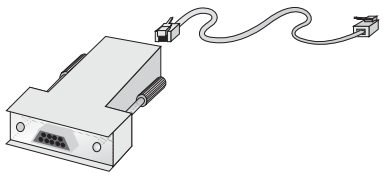
UltraVac™ Software (P/N 10080421)
UltraVac™ Software Manual (P/N 10081600NA)
UltraVac™ Installation Manual (P/N 10081601NA)



Comms Equalization Cable
(P/N 10080450)

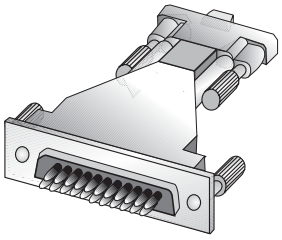


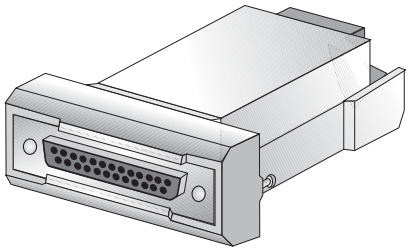
Outdoor Sensor
(P/N 10081501)



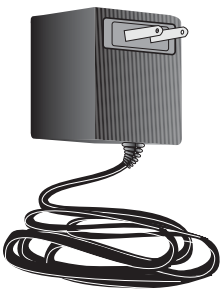
PC Connection Cable Package
(P/N 10080410)

RS-485 Converter Package (P/N 10080430)





RS-485 Converter



Power Supply

1.6 Safety



Your Safety is Important to Us! This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections.

Installation, service and annual inspection of controller must be done by an electrician qualified in the installation and service of control systems for heating equipment.

Installation, service and annual inspection of heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation, or service of this equipment.

For optimum heater performance and safe heating conditions, inspect and maintain heater(s) before every heating season and as necessary. Also, know and maintain heater clearances to combustibles, see heater Installation, Operation and Service manual for further details. If you require additional manuals, contact your ROBERTS GORDON® independent distributor or Roberts-Gordon at (716) 852-4400 or (800) 828-7450 in the U.S., (905) 945-5403 in Canada or at www.rg-inc.com.

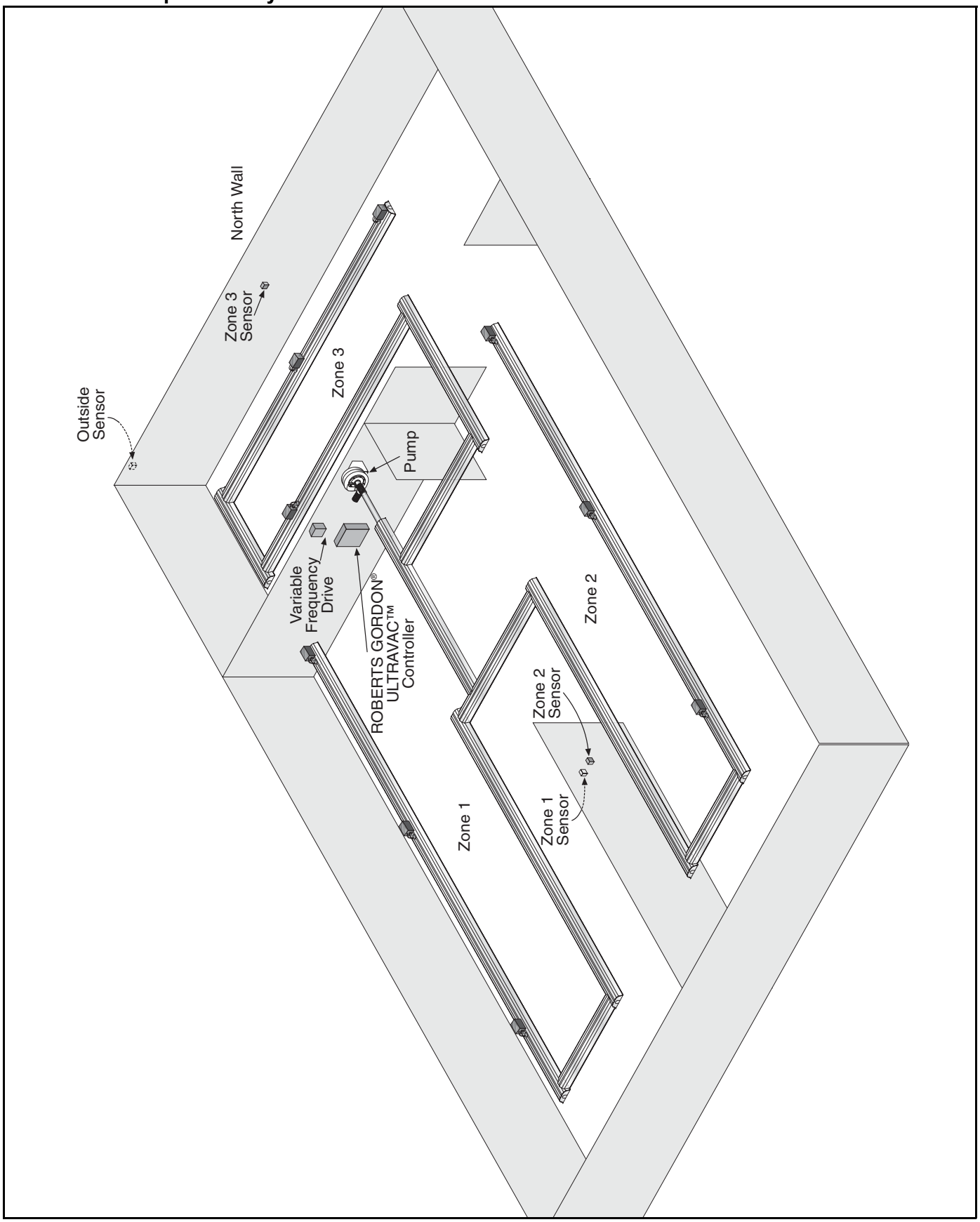
1.6.1 Manpower Requirements

To prevent personal injury and damage to the controls, two persons will be required for installation.

1.7 Example Site Layout

Page 6, Figure 1 is an example layout for a building where ROBERTS GORDON® ULTRAVAC™ will be used to control the infrared heating systems shown. The layout consists of three zones of ROBERTS GORDON® ULTRAVAC™.

FIGURE 1: Example Site Layout



NOTE: Conceptual drawing, not to scale. Venting not shown.

SECTION 2: SPECIFICATIONS

2.1 ROBERTS GORDON® ULTRAVAC™ Controller

2.1.1 Enclosure

Construction:	16 gauge painted steel, hinged door, removable knockouts provided.
Dimensions:	14.7" w x 17.7" h x 3.5" d

2.1.2 Electrical - Control Board

Power Supply:	24 V 60 Hz (from relay board)
Analog Inputs:	Sensor (thermistor), BMS enable (dry contact)
Relay Outputs:	24 Vac
Analog Outputs:	0-10 Vdc
Digital Inputs:	Timed, dry contact
Network Ports:	RS-485, RS-232
UL Standard:	UL 916 / C22.2 No. 205-M1983

2.1.3 Electrical - Relay Board

Power Supply:	120 V (+/- 10%) 1 Ø, 60 Hz
Inputs:	24V AC
Relay Outputs:	Single Pole 3 A 120 Vac
UL Standard:	UL 916 / C22.2 No. 205-M1983

2.2 Temperature Sensors

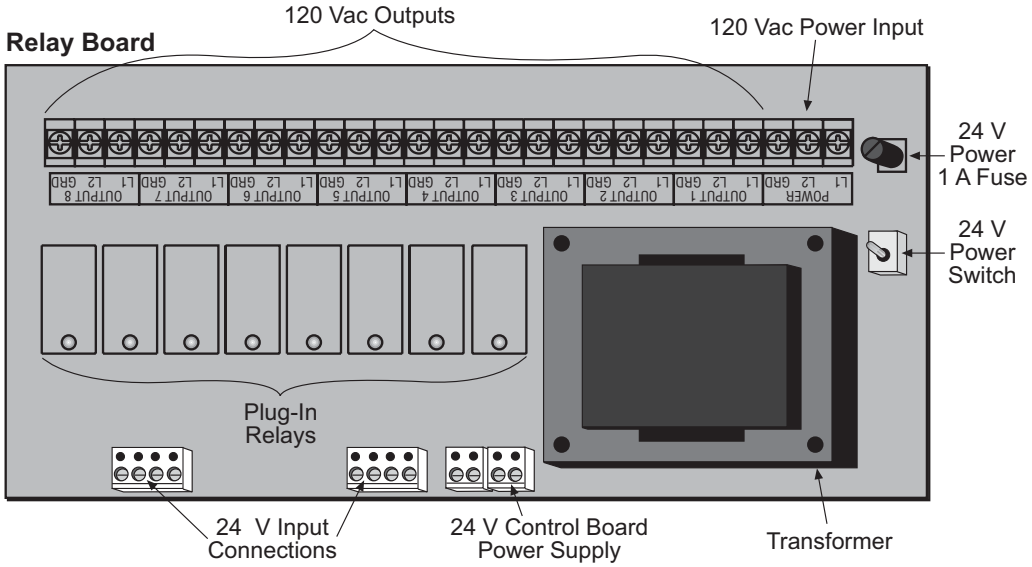
Indoor Sensor

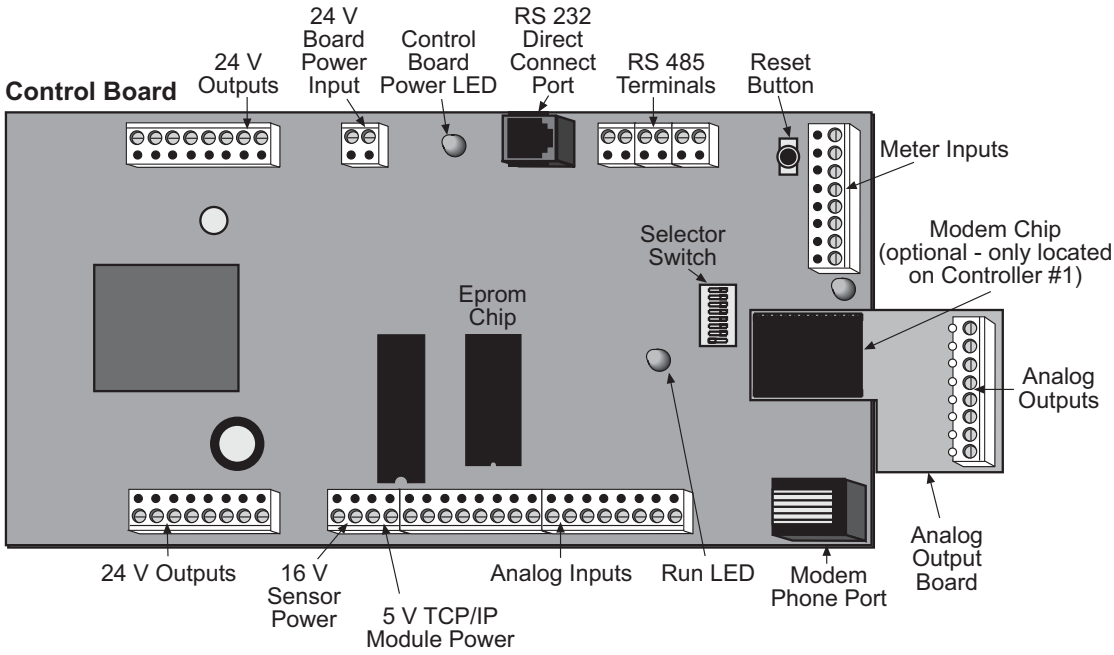
Dimensions:	2.75" w x 4.5" h x 1.15" d
Power:	16 V
Features:	LCD temperature display, setpoint adjustment, override button
Wiring:	Shielded Cable, four twisted pairs, 24 AWG min.

Outdoor Sensor

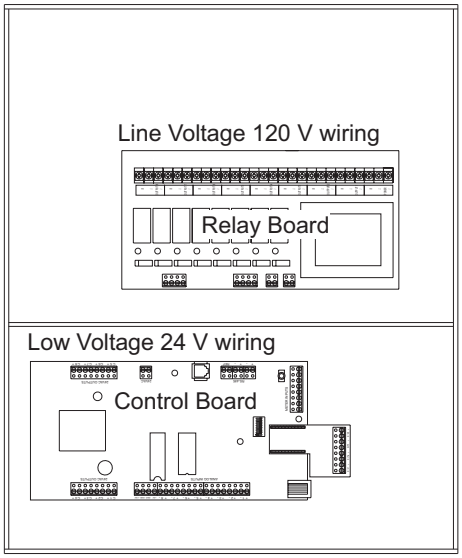
Dimensions:	5.3" x 1.4" x 2"
Enclosure:	NEMA 4 gasketed aluminum LB housing, ½" threaded connection
Wiring:	Shielded Cable, one twisted pair, 22 AWG min.

FIGURE 2: ROBERTS GORDON® ULTRAVAC™ Controller Specifications





Controller Enclosure



Note:

To ensure robust control signaling;
Do not run line voltage wiring through bottom section of enclosure that houses the control board.

Do not run low voltage wiring through top section of enclosure that houses the relay board.

2.3 Variable Frequency Drive (VFD)

2.3.1 Enclosure

Construction:	14-gauge painted steel, mounting panel included, left-hinged door, vented.
Dimensions:	8" w x 10" h x 8" d
Protection:	UL 50 Type 1, NEMA Type 1

2.3.2 Electrical

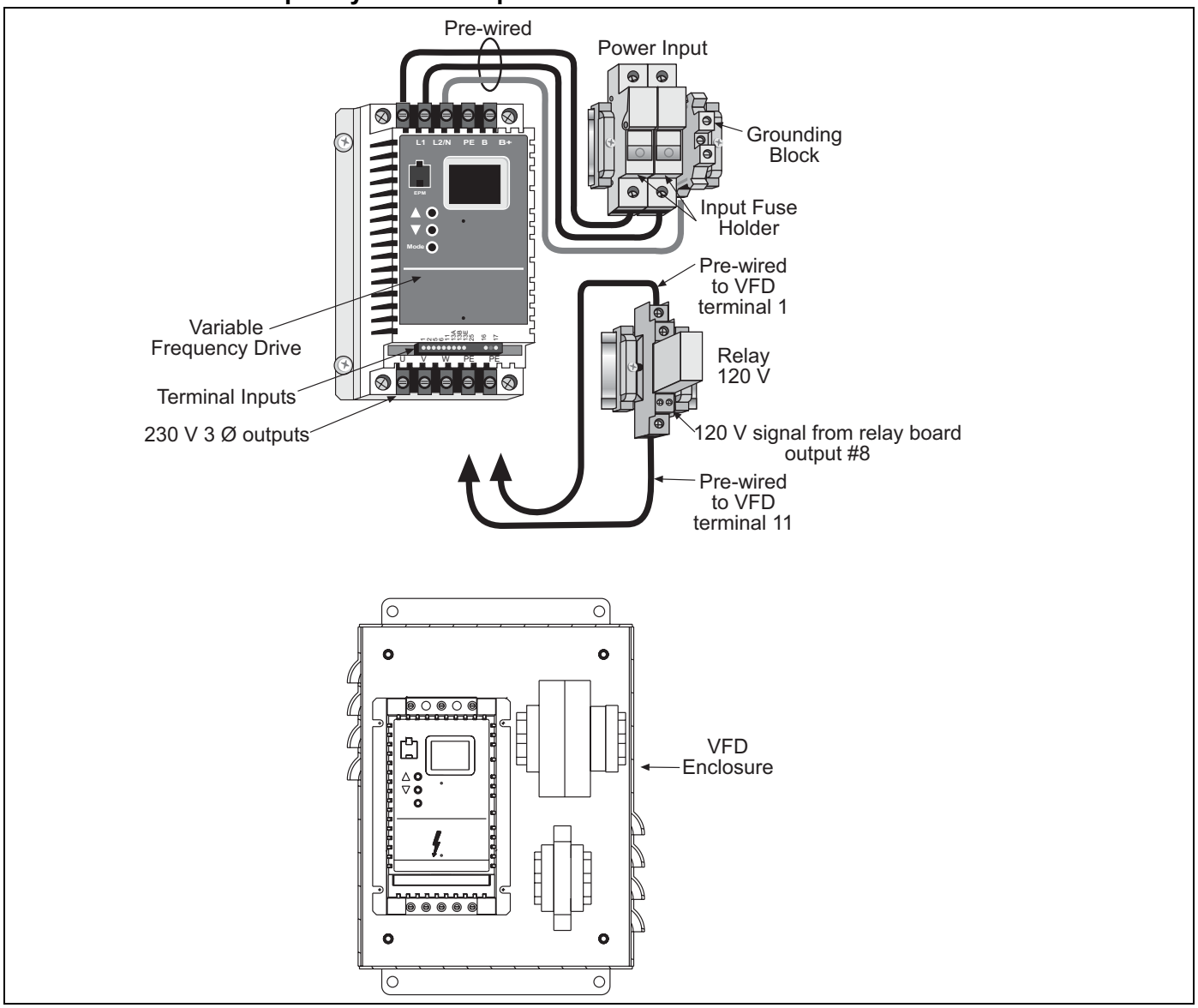
Power Output:	230 V 3 Ø 0-60 Hz
Speed Reference Follower:	0-10 Vdc
UL Standard:	Industrial Controls Equipment
Ambient Operating Temp.:	32°F - 104°F (0°C-40°C)

.75 HP, 230 V Drive (used with EP-203 pump)
Power Input: 208/240 V 1 Ø 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 6.9/6.0 A

1 HP, 120 V Drive (used with EP-203 pump)
Power Input: 120 V 1 Ø 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 16.6 A

2 HP, 230 V Drive (used with EP-303 pump)
Power Input: 208/240 V 1 Ø 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 18.4/16.0 A

FIGURE 3: Variable Frequency Drive Components



SECTION 3: INSTALLATION

⚠ WARNING



Mounting Hazard

Mount controls with materials with a minimum working load of 75 lbs (33 kg).

Failure of the supports can result in death, injury or property damage.

Installation of the ROBERTS GORDON® ULTRAVAC™ Controller and the associated external electrical wiring must be done by an electrician qualified in the installation of control systems for heating equipment.

3.1 Preparation

Before installing the controller, observe the following:

3.1.1 Ensure that you have a copy of the site layout for the project that clearly identifies the separate zones.

3.1.2 Familiarize yourself with the Controller and Variable Frequency Drive component names and locations. *See Page 8, Figure 2 and Page 9, Figure 3*.

3.2 Positioning the ROBERTS GORDON® ULTRAVAC™ Controller and Variable Frequency Drive

3.2.1 Choose a mounting location for the controller. Generally near the pump, a dedicated phone connection (optional) and the variable frequency drive. For serviceability, it is convenient to mount the controller and variable frequency drive in the vicinity of the pump.

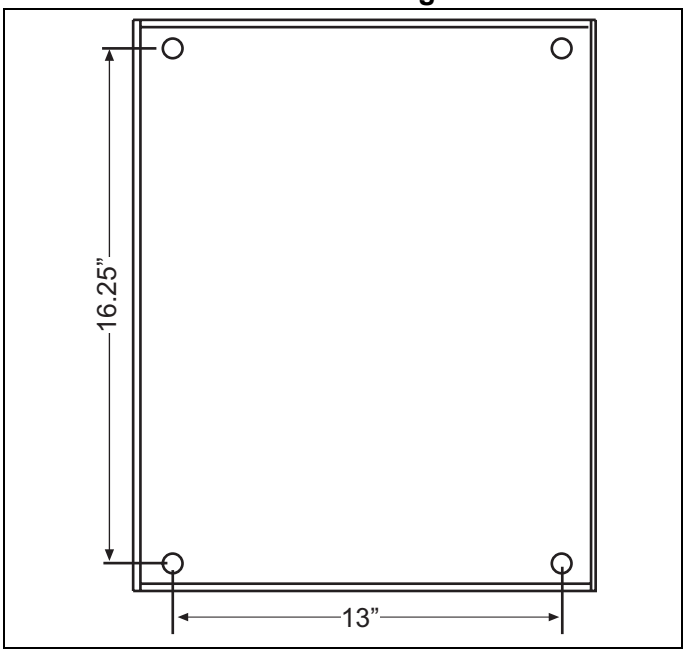
Do not mount controller or VFD outdoors. VFD must not be installed where subjected to adverse conditions such as: combustible, oily, or hazardous vapors or dust; excessive moisture or dirt; vibration. To avoid damage from possible drips, do not mount controller or VFD directly beneath pump.

VFD should be mounted in locations where the maximum ambient temperature does not exceed 104°F (40°C). Avoid installing the VFD in mezzanines, direct sunlight, or near external heat sources because these locations usually have unpredictable temperature rises.

Note that the maximum distance from the controller to any sensor is 300' (120 m). For longer distances, larger gauge wire may be needed.
(Consult your local distributor) For multiple controllers, maximum length of communication wire from the first controller to the last is 4000' (1219m).

3.2.2 Position the controller and VFD at occupant level for ease of service. To avoid electrical interferences with communications bus, do not mount VFD directly next to controller. Allow 2' (.6 m) between controller and VFD.

FIGURE 4: Controller Mounting



3.3 Cable Requirements:

3.3.1 Line Power Supply:

As per individual building specification for class of cable to be used. Use copper conductors only. To size the cable, use the amperages of the burners given on *Page 12, Section 3.4.1*, for each individual zone.

3.3.2 Control Wiring

All control wiring (sensor, VFD control, pressure switch and RS-485 communication wiring) may be plenum or non-plenum rated depending on installation requirements, consult the National Electric Code® (NEC). Regardless of the code or its interpretation, the local Fire Marshall makes the final decision, contact the local Fire Marshall if you have questions.

Do not run control (low voltage) wiring together with power (line voltage) wiring in the same conduit. Electrical signal interference or induced current could occur and cause communication problems.

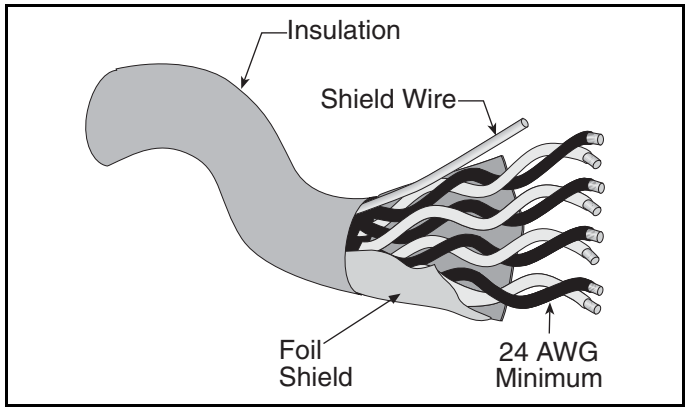
VFD (0-10 V) control wiring and all RS-485 communication wiring must be shielded. Shielded wire provides noise and interference isolation and reduces the possibility of communication problems. **Sensor and pressure switch wiring is not required to be shielded.** If electrical interference from machinery or other sources cannot be avoided, shielded wire must be used. All control cable specification diagrams shown will refer to shielded cable.

3.3.3 Indoor Sensor Cable:

Shielded cable (four twisted pairs of stranded 24 AWG min. wire) is required for use with indoor sensors. *See Page 11, Figure 5* for an illustration of the shielded cable specification to be used. *See Page 11, Section 3.3.2* to see if unshielded cable may be used.

Unshielded Cable: AMP #57248, #219538, #219513; Belden # 1585A, #1583A;
General Cable #C6015 or equivalent.
Shielded Cable:
Madison Cable #08CFJ10001, #08CFJ00004;
Belden #9681;
General Cable #2131673, #C1676 or equivalent.

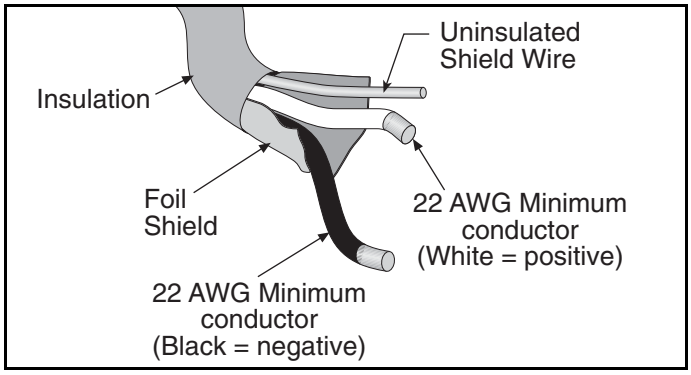
FIGURE 5: Indoor Sensor Cable Detail



3.3.4 Outdoor Air Sensor VFD (0-10 V) signal, Pressure Switch Cable and PC RS-485 converter wiring:

Shielded cable (one twisted pair of 22 AWG min. wire) is required for the outdoor air sensor, VFD signal wiring, pressure switch wiring and RS-485 converter wiring between controller #1 and PC (RS-485 converter wiring to PC is only used if controller is using an RS-485 Converter Communication Package). *See Page 11, Figure 6* for an illustration of the cable specification to be used. Shielded Cable: Belden #8451, #1503A, #8760; General Cable #C2514 or equivalent.

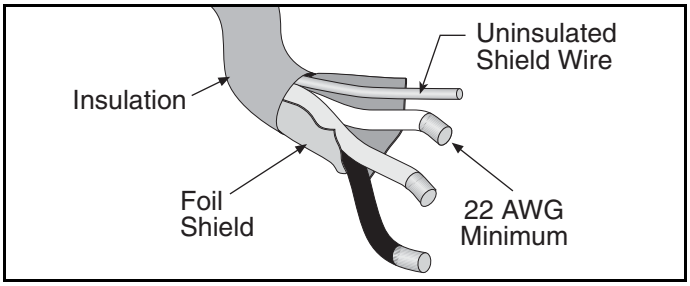
FIGURE 6: Outdoor Sensor, VFD (0-10 V) Signal and Pressure Switch Cable Detail



3.3.5 RS-485 Communication Wire Between Controllers:

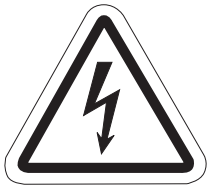
Shielded cable (one twisted triad or two twisted pairs of 22 AWG min. wire) is required for RS-485 communications between controllers. *See Figure 7* for an illustration of the shielded cable specification to be used. Shielded Cable: Belden #1902, #8770 General Cable #C1670 or equivalent.

FIGURE 7: RS-485 Communications Cable Detail



3.4 Electrical Installation Requirements

⚠ DANGER



Electrical Shock Hazard

Disconnect electrical power before servicing.

This appliance must be connected to a properly grounded electrical source.

Failure to follow these instructions can result in death or electrical shock.

3.4.1 The panel must be supplied from a local fused isolator rated for a total amperage not exceeding 25 A.

The method for calculating the current loading is as follows:

CORAYVAC® Burner 0.3 A/burner

Multiply the current for the individual burners above by the number of burners supplied from the panel to give the total current required.

The full load amps for the optional outside air blower (P/N 90707500) are: 1.6 A

The total added current load for each individual relay must not exceed 3 A.

The total added current load for all 8 relays must not exceed 25 A.

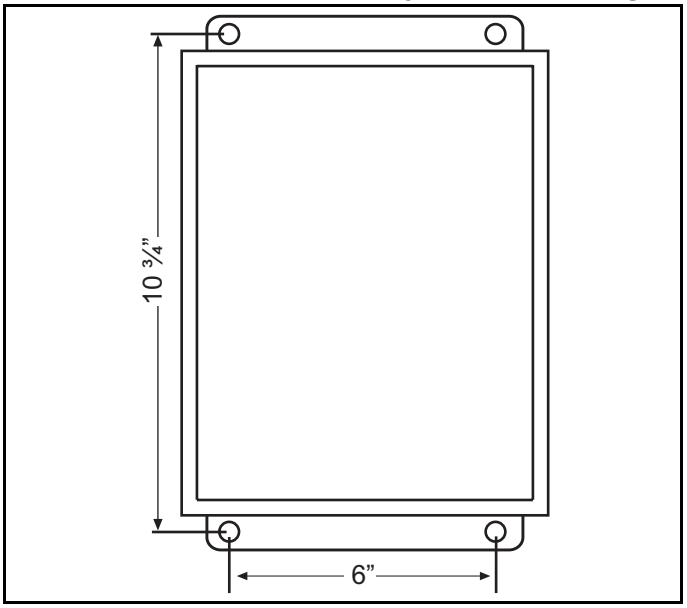
3.5 Pump Requirements

The pump is powered directly from the Variable Frequency Drive (VFD). The VFD will be energized via an output from the relay board switched through a designated relay.

3.6 Variable Frequency Drive Requirements

The VFD must be powered separately from the control panel. The 230 V drive power supply must be 230 V, 50-60 Hz, 1 Ø. The 120V drive power supply must be 120 V, 50-60 Hz, 1 Ø. See *Page 9, Section 2.3* for additional details. The VFD on/off switching is done by an output on the relay board. The 0-10 V signal from the control panel wired into VFD input relays 5 and 2 (*see Page 16, Figure 12 through Page 19, Figure 15*) will dictate the speed of the vacuum pump. The VFD output supply to the pump is 230 V 3 Ø 0-60 Hz. The frequency of the output supply signal to the pump will be varied based on the 0-10 V signal from the control panel. See *Page 10, Section 3.2* for additional installation requirements.

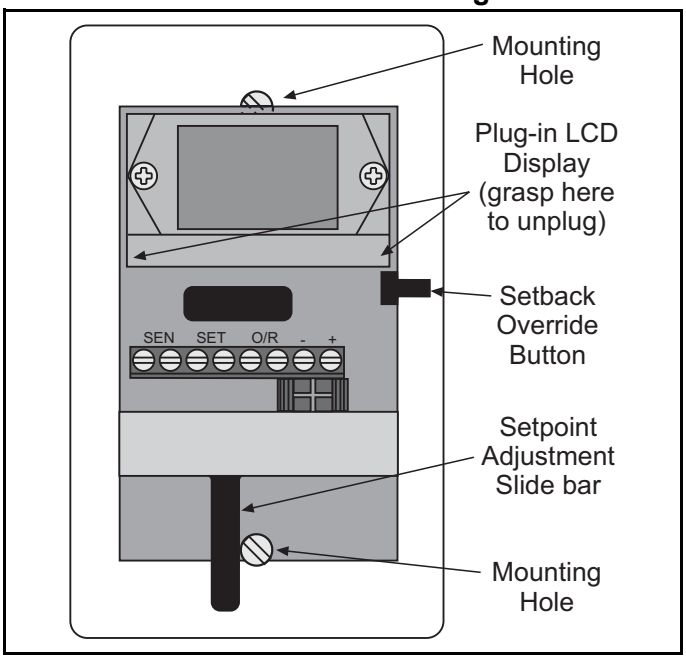
FIGURE 8: Variable Frequency Drive Mounting



3.7 Indoor Sensor Placement

The sensor measures the air temperature in the building. It is important that the sensor is located in an area within the heated zone at occupant level. For the most accurate results, sensors should be mounted on an inside wall, away from any air vents or other sources of heat and cold. In order to avoid short system cycles and inaccurate temperature readings, do not mount sensors under the first section of radiant tube (first 10' (3 m) section of tube after the burner). The sensors are suitable for direct surface mounting or 4" x 2 1/8" junction box mounting.

FIGURE 9: Indoor Sensor Mounting



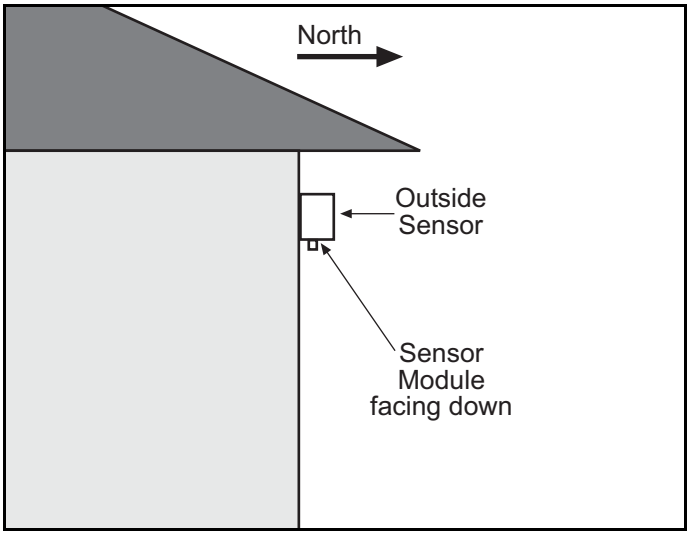
3.7.1 Indoor Sensor Mounting

Remove the cover of the sensor by the two 1/16" allen screws, located in the lower corners of the cover. To gain access to the top mounting hole remove the plug-in LCD display. To remove the LCD display, grasp the green plug-in board at the lower corners and gently pull the board away from the sensor back plate. *See Figure 9*. After removing the plug-in LCD display from its socket, secure the sensor to the wall or junction box using the screws provided. Replace the plug-in LCD display and secure the cover with the two 1/16" allen screws.

3.8 Outdoor Sensor Placement

The outdoor sensor measures air temperature outside the building. It is important that the sensor is located on the outside of the building on the north facing wall. Failure to mount the sensor on the north facing wall will result in artificially high temperature readings. If possible, locate the sensor high under an eve to prevent incorrect readings from direct sunlight and damage due to the elements.

FIGURE 10: Outdoor Sensor Placement



Mount the outside sensor with the sensor module facing down to prevent accumulation of dirt or water.

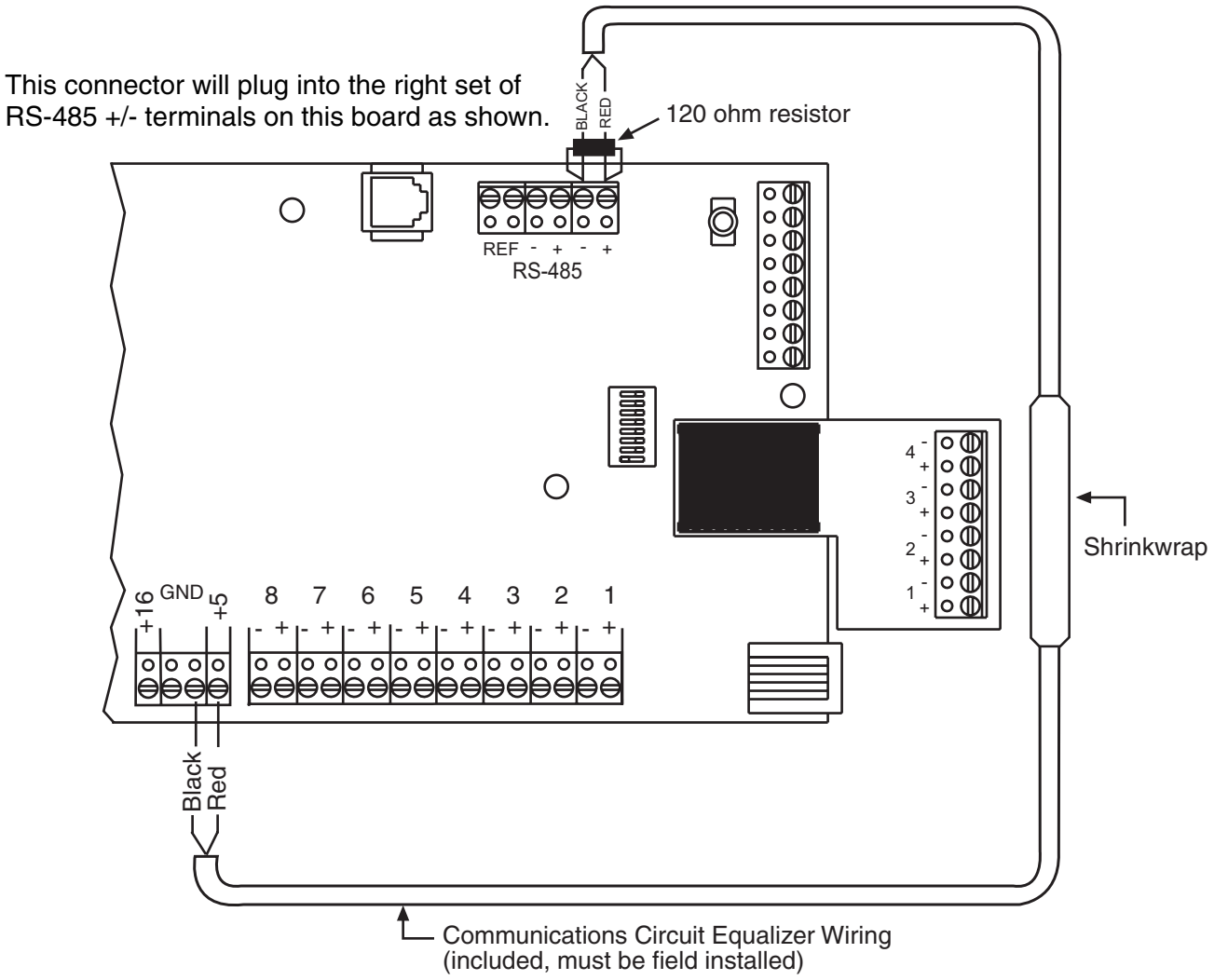
3.9 Outside Air Supply

If an outside air blower is to be used, *See Page 17, Figure 13* for external wiring diagrams. *See Page 12, Section 3.4.1* for current load.

SECTION 4: TYPICAL EXTERNAL DIAGRAMS

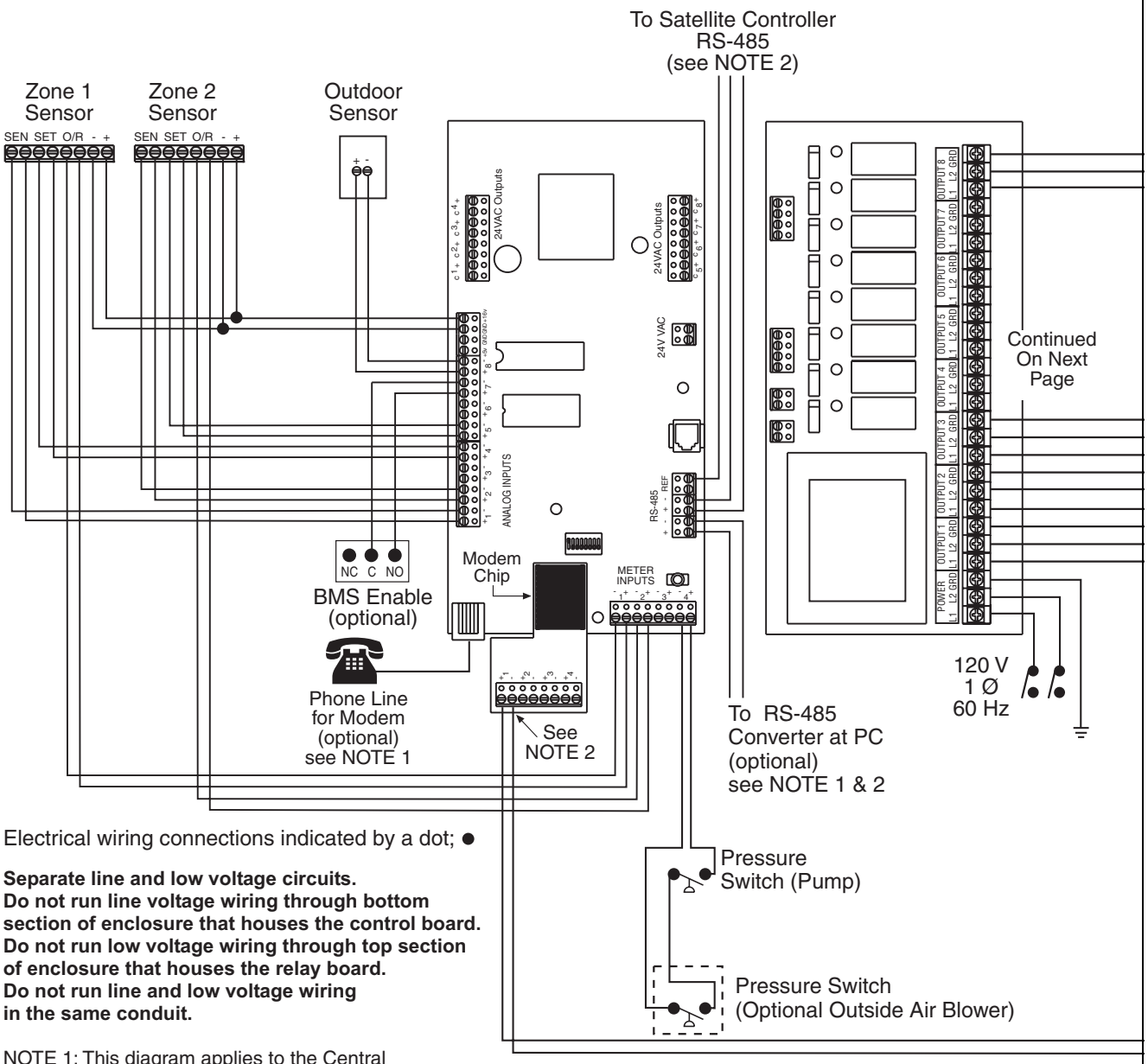
FIGURE 11: Central Controller Communication Equalization Wiring

All UltraVac™ Central Controllers are shipped with a communication equalization cable (P/N 10080450), satellite controllers do not use the cable. The cable is supplied to equalize and balance the circuitry of the communications on the controller network that may be experiencing noise or transient voltage levels. Connect the communication equalization cable as shown below.



Description	Part Number
Comms Equalization Cable	10080450

FIGURE 12: ROBERTS GORDON® ULTRAVAC™ Central Controller External Wiring



Electrical wiring connections indicated by a dot; ●

Separate line and low voltage circuits.
Do not run line voltage wiring through bottom section of enclosure that houses the control board.
Do not run low voltage wiring through top section of enclosure that houses the relay board.
Do not run line and low voltage wiring in the same conduit.

NOTE 1: This diagram applies to the Central Controller (controller #1) only. For all Satellite Controllers see Satellite Controller External Wiring Diagram. Central Controller (controller #1) requires outdoor sensor wiring and either modem, RS-485 converter wiring, or TCP/IP module wiring.

NOTE 2: Twist shield wires for both RS-485 communication cables together. On controller #1 only, connect these twisted shield wires to ground. For VFD 0-10 V signal wiring, connect shield wire to ground at the controller only.

NOTE 3: 120 V 1 Ø 50-60 Hz supply for 120 V VFD model. 230V 1 Ø 50-60 Hz supply for 230 V VFD model. See VFD rating plate for required input. **Repetitive cycling of a disconnect or input contactor (more than once every two minutes) may cause damage to the drive.**

NOTE 4: Zone 3 Sensor(not shown) wiring is as follows: SEN output to analog input 3; SET output to analog input 6; O/R output to meter input 3; +/- outputs to +16 V/GND inputs.

NOTE 5: Internal pre-wiring not shown.

NOTE 6: All three power output wires from terminals U, V, and W to the pump motor must be kept tightly bundled and run in a separate conduit away from all other power and control wiring.

FIGURE 13: ROBERTS GORDON® ULTRAVAC™ Central Controller External Wiring (continued)

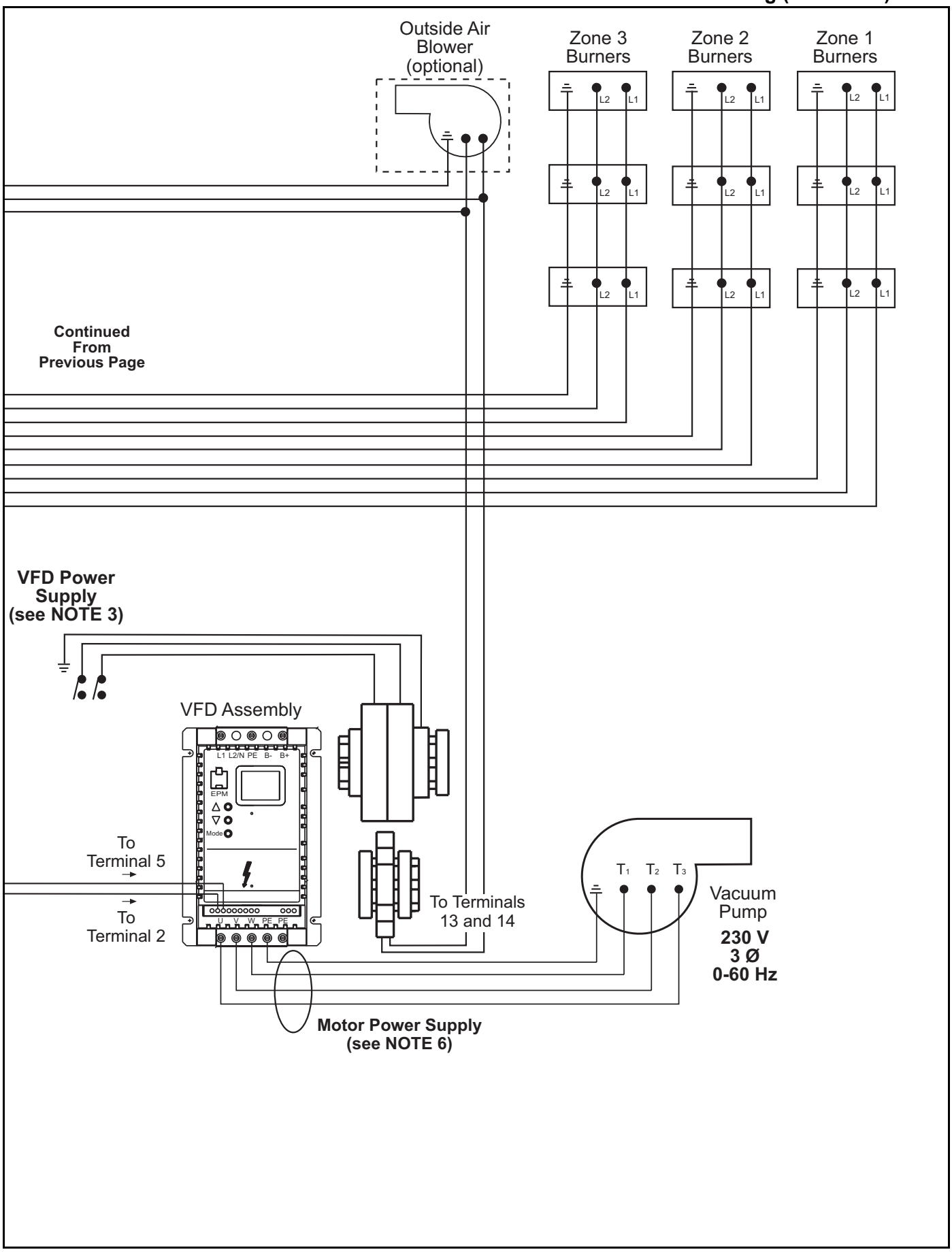
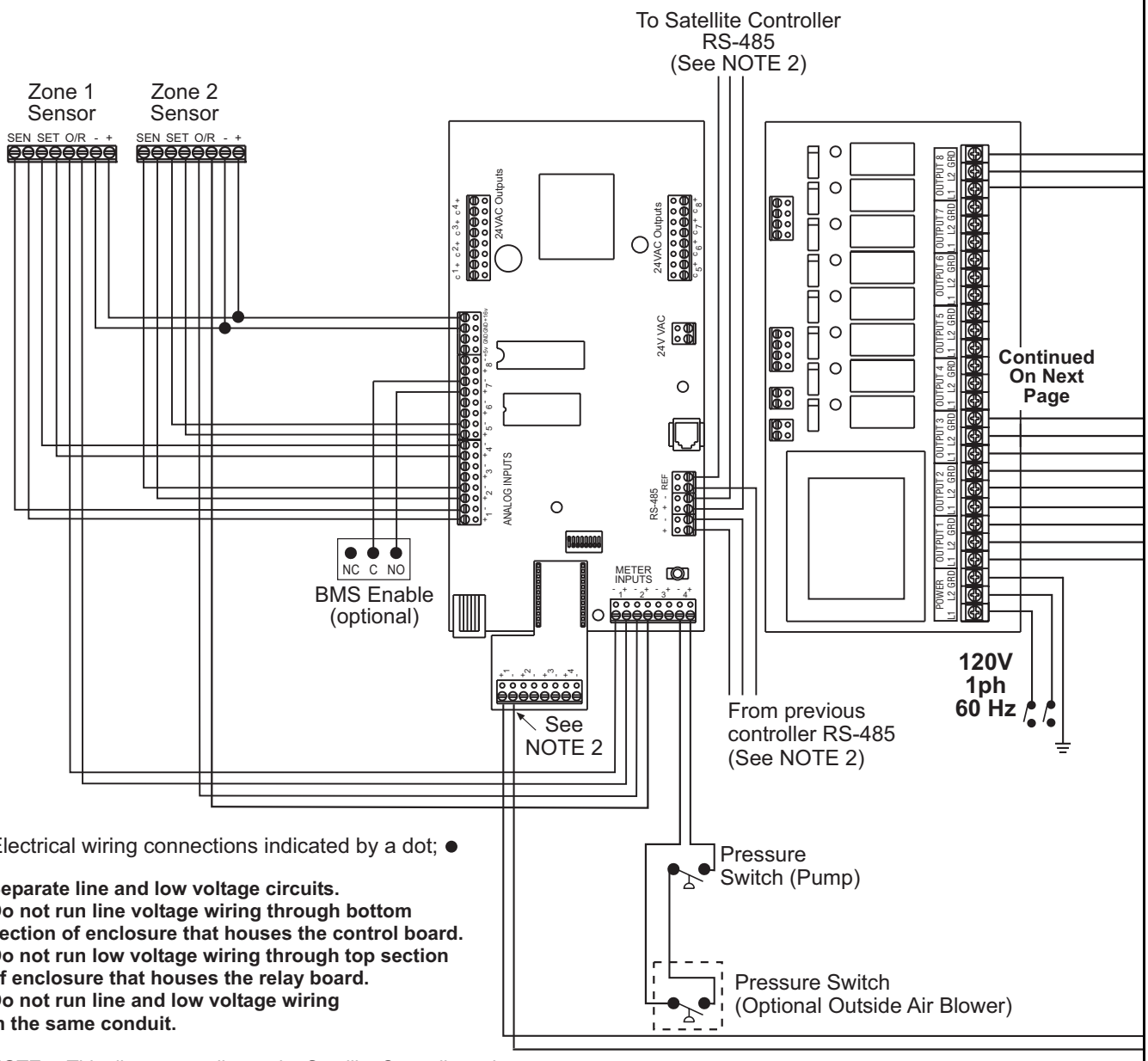


FIGURE 14: ROBERTS GORDON® ULTRAVAC™ Satellite Controller External Wiring



Electrical wiring connections indicated by a dot; ●

Separate line and low voltage circuits.
Do not run line voltage wiring through bottom section of enclosure that houses the control board.
Do not run low voltage wiring through top section of enclosure that houses the relay board.
Do not run line and low voltage wiring in the same conduit.

NOTE 1: This diagram applies to the Satellite Controller only.
The Satellite Controller does not require modem, RS-485 converter wiring to the PC, TCP/IP module wiring, or outdoor sensor wiring. For Central Controller see Central Controller External Wiring Diagram.

NOTE 2: Twist shield wires for both RS-485 communication cables together. On controller #1 only, connect these twisted shield wires to ground. For VFD 0-10 V signal wiring, connect shield wire to ground at the controller only.

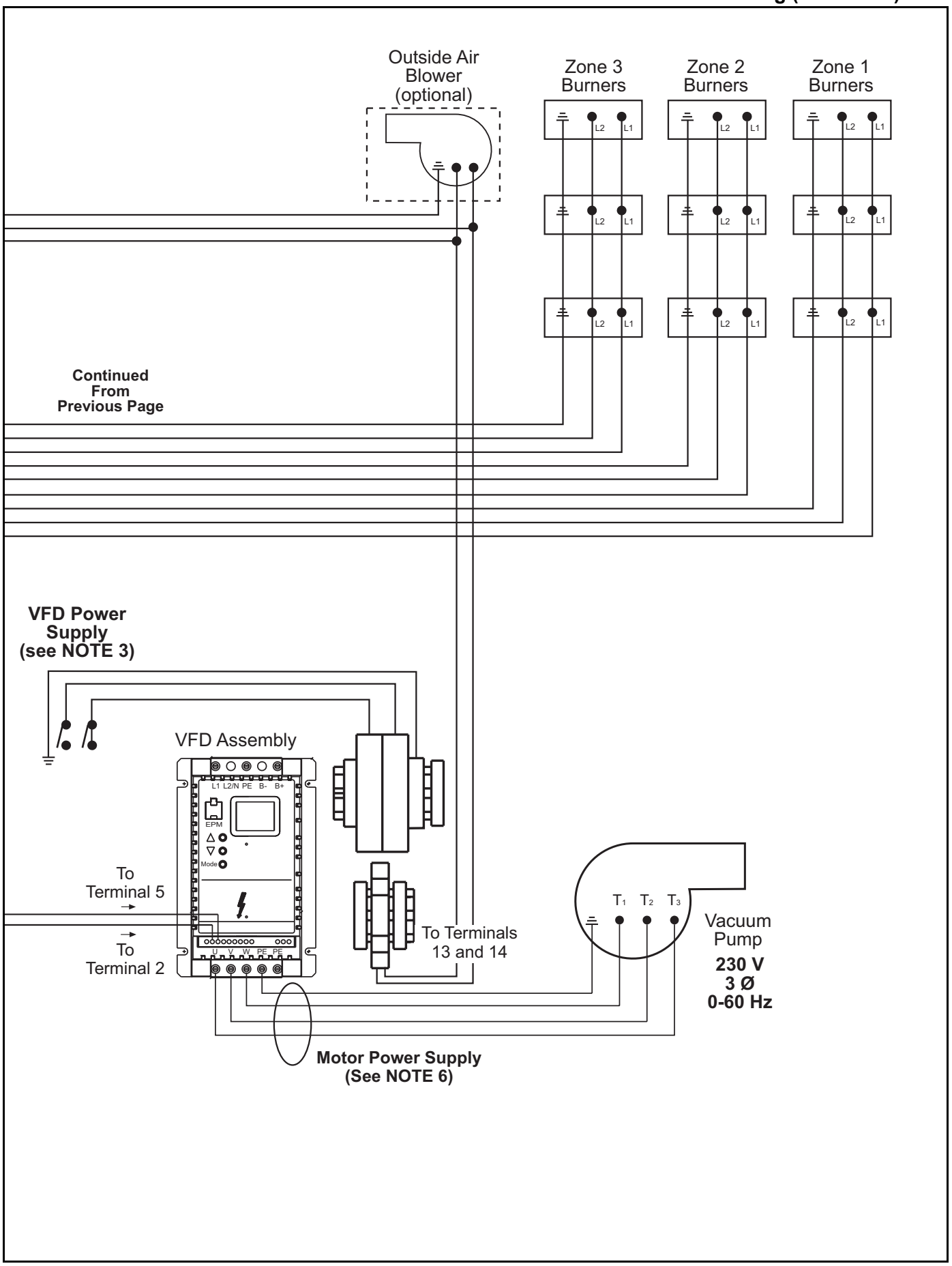
NOTE 3: 120 V 1 Ø 50-60 Hz supply for 120 V VFD model. 230V 1 Ø 50-60 Hz supply for 230 V VFD model. See VFD rating plate for required input. **Repetitive cycling of a disconnect or input contactor (more than once every two minutes) may cause damage to the drive.**

NOTE 4: Zone 3 Sensor(not shown) wiring is as follows: SEN output to analog input 3; SET output to analog input 6; O/R output to meter input 3; +/- outputs to +16 V/GND inputs.

NOTE 5: Internal pre-wiring not shown.

NOTE 6: All three power output wires from terminals U, V, and W to the pump motor must be kept tightly bundled and run in a separate conduit away from all other power and control wiring.

FIGURE 15: ROBERTS GORDON® ULTRAVAC™ Satellite Controller External Wiring (continued)



SECTION 5: COMMUNICATIONS

One ROBERTS GORDON® ULTRAVAC™ Controller per building must have equipment for remote communications to a PC. This equipment consists of either a modem chip, an RS-485 converter, or a TCP/IP communications module.

For remote **on-site and off-site** control and system status viewing the central controller (controller #1) is fitted with a **modem chip**. *See Page 20, Section 5.1*.

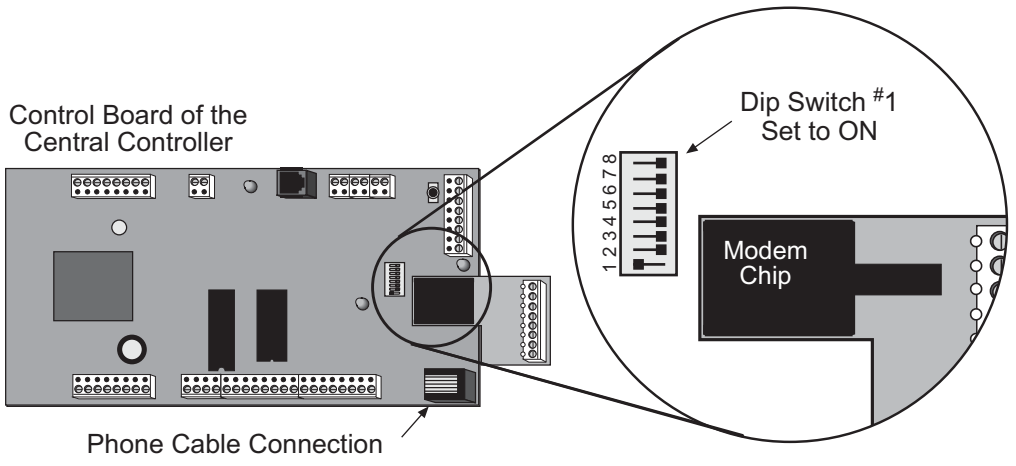
If only remote **on-site** control and system status viewing, two controller communications interface devices are available: an **RS-485 converter** or a **TCP/IP communication module.**

An RS-485 converter is installed at a single PC, this PC can interface with any controller on the network of ULTRAVAC™ controllers. The RS-485 converter at the PC is wired directly to controller #1 using shielded twisted pair communication wiring. *See Page 21, Figure 17*.

To interface with ULTRAVAC™ controllers through a Local Area Network (LAN), a TCP/IP Communication module is installed at controller #1. Controller #1 is wired to the LAN by an Ethernet cable. *See Page 22, Section 5.3.* Any computer on the LAN that has ULTRAVAC™ software installed can communicate with the controllers. Appropriate precautions must be taken to protect the Ethernet wiring from any possible electrical interference (noise) caused by surrounding machinery or equipment.

If multiple ULTRAVAC™ controllers are being used, the additional controllers communicate to controller #1 through communication wiring arranged in-series from one controller to the next. *See Page 25, Section 5.5*.

FIGURE 16: Modem Location



Description	Part Number
Modem Chip	10080142

5.1 Dedicated Phone Line for Central Controller Modem

The Central Controller is fitted with a modem chip. To use the modem, the controller must have a phone line for modem communications. Install a phone line near the location of the Central Controller. The phone cable is plugged into the phone connection in the corner of the control board. *See Figure 16*. If the modem option is not used for everyday communication to the controller(s), it can still be plugged into a phone line for troubleshooting or programming assistance. Contact your local Roberts Gordon independent distributor for details.

If multiple ULTRAVAC™ controllers are being used, the additional controllers communicate to controller #1 through RS-485 communication wiring arranged in-series from one controller to the next. *See Page 25, Section 5.5*. This allows multiple controllers to be controlled from a PC through a single communication package at the central controller.

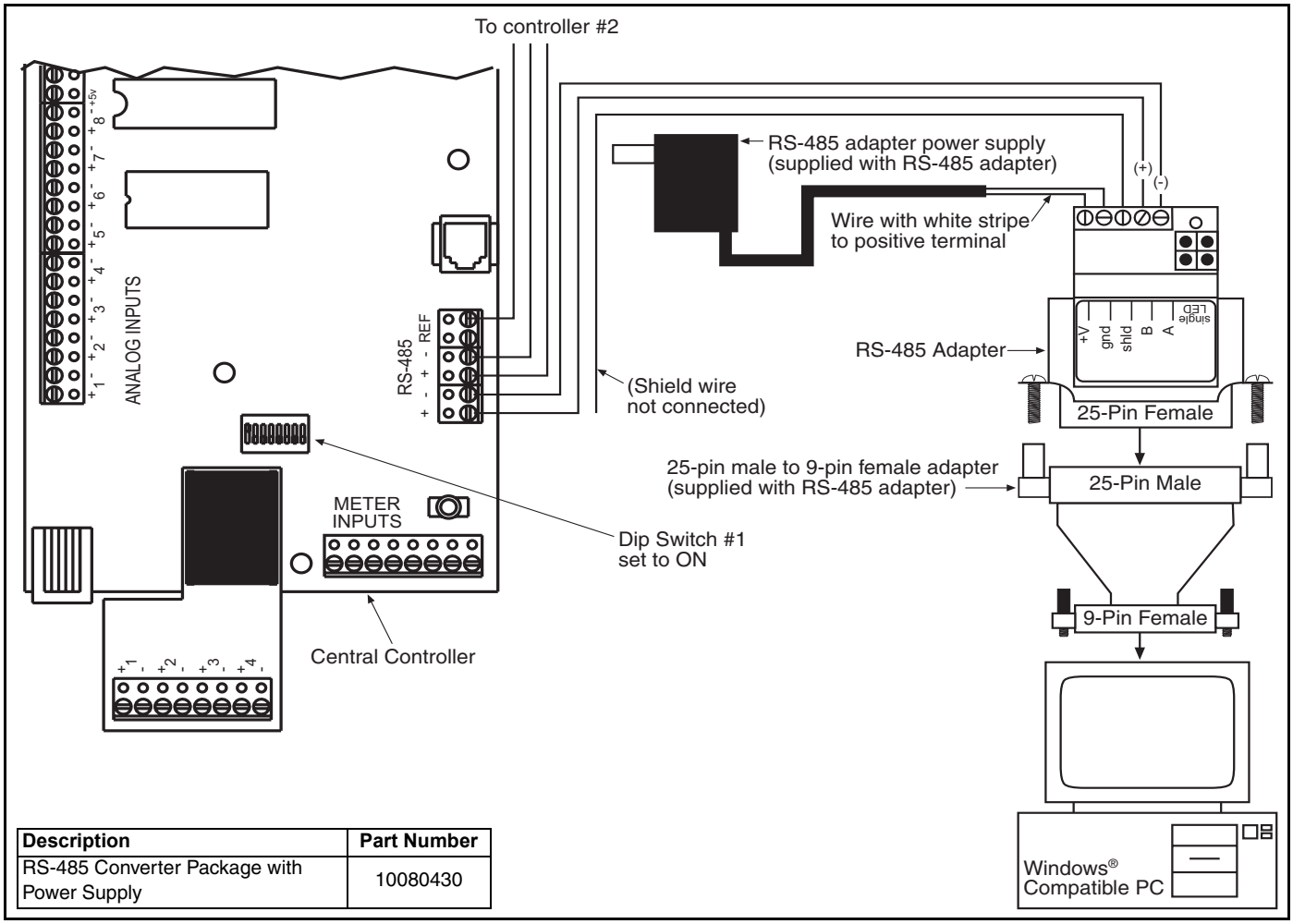
5.2 RS-485 Converter for Central Controller

For remote on-site viewing of system status and settings of any controller, use the RS-485 converter to connect a single PC (9 pin serial port) to the RS-485 terminals on the Central Controller. This will allow communication between one PC and any of the ULTRAVAC™ controllers on the network. For RS-485 converter wiring details *see Page 21, Figure 17* and *see Page 25, Section 5.5*

For communication cable requirements *see Page 11, Section 3.3.5*.

If multiple ULTRAVAC™ controllers are being used, the additional controllers communicate to controller #1 through RS-485 communication wiring arranged in-series from one controller to the next. *See Page 25, Section 5.5*. This allows multiple controllers to be controlled from a PC through a single communication package at the central controller.

FIGURE 17: RS-485 PC Connection



Description	Part Number
RS-485 Converter Package with Power Supply	10080430

5.3 TCP/IP Communication Module

For remote on-site viewing of system status and settings of any controller, use the TCP/IP communication module to connect the controllers to a Local Area Network (LAN) via Ethernet cable. Any computer on the LAN that has ULTRAVAC™ software installed can be used to communicate with the controllers.

The module must be mounted inside the ULTRAVAC™ central controller (controller #1) enclosure next to the control board. The power (5V) for the module will come from the ULTRAVAC™ control board. The module will communicate to the controller via regular phone wire from the RJ11 jack on the module to the RS-232 direct connect port on the control board. The module will relay the data from the controller to computers on the LAN via Ethernet cable plugged into the RJ45 jack on the module. A setup procedure must be performed on the module upon installation to create its IP address on the LAN. The setup instructions can be found in the ROBERTS GORDON® Software Manual.

For TCP/IP communication module wiring details, *see Page 23, Figure 19.*

If multiple ULTRAVAC™ controllers are being used, the additional controllers communicate to controller #1 through RS-485 communication wiring arranged in-series from one controller to the next. *See Page 25, Section 5.5*. This allows multiple controllers to be controlled from a PC through a single communication package at the central controller.

FIGURE 18: TCP/IP Communication Module Mounting

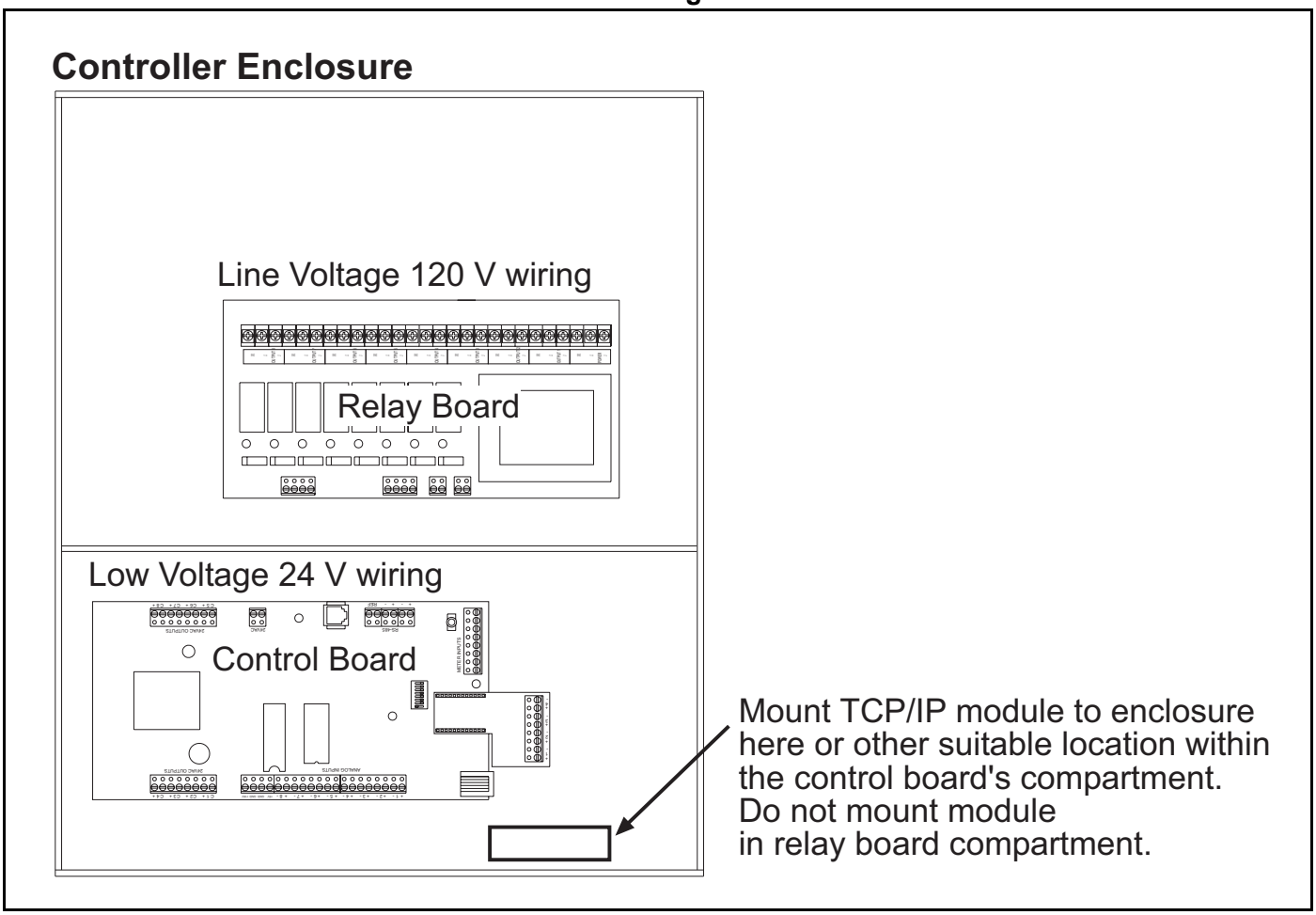
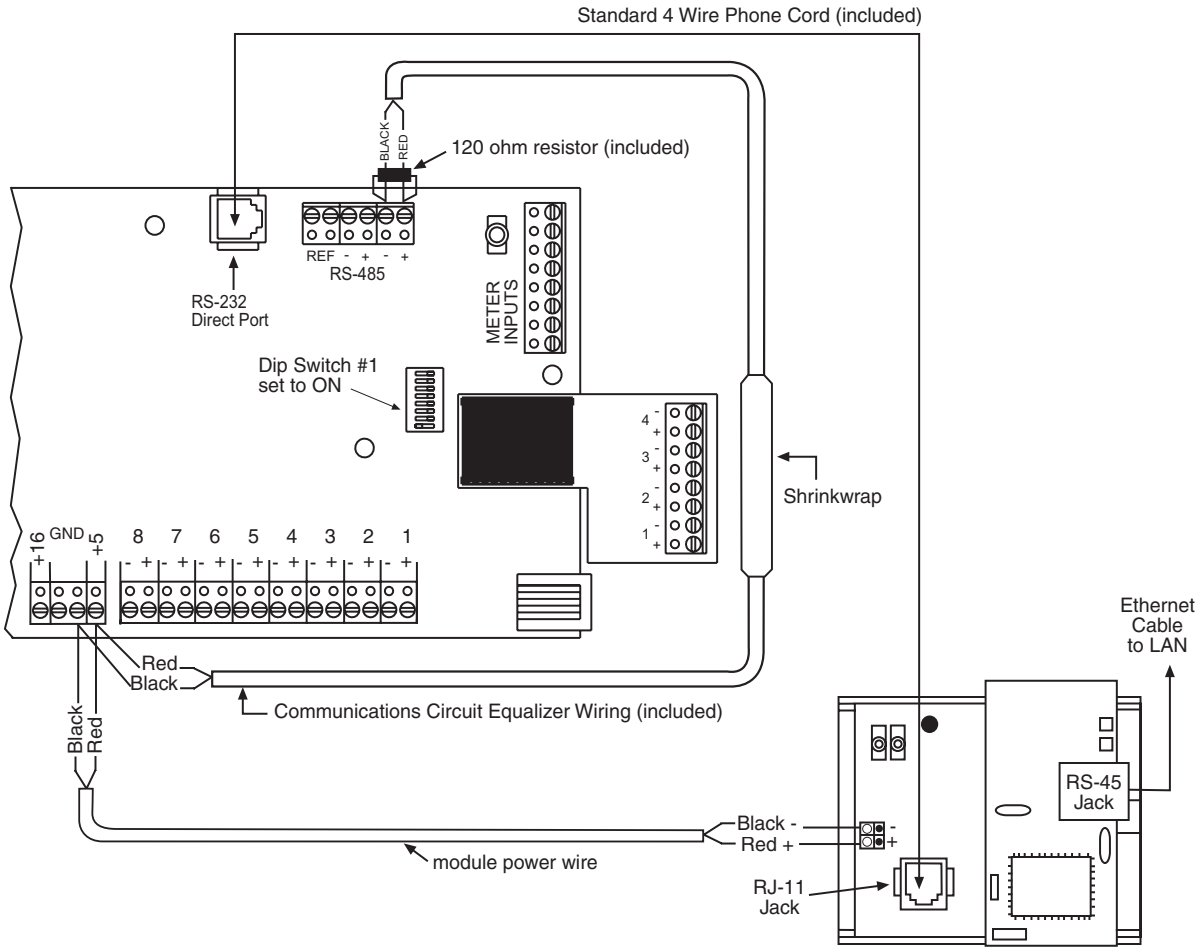


FIGURE 19: TCP/IP Communication Module Wiring



It is important that the module power wire is connected as shown (black=5 V- / red= 5 V+) wire orientation. Make sure to verify connection before connecting to the control board.

Description	Part Number
TCP/IP Communication Module	10080440

5.4 Direct Connect

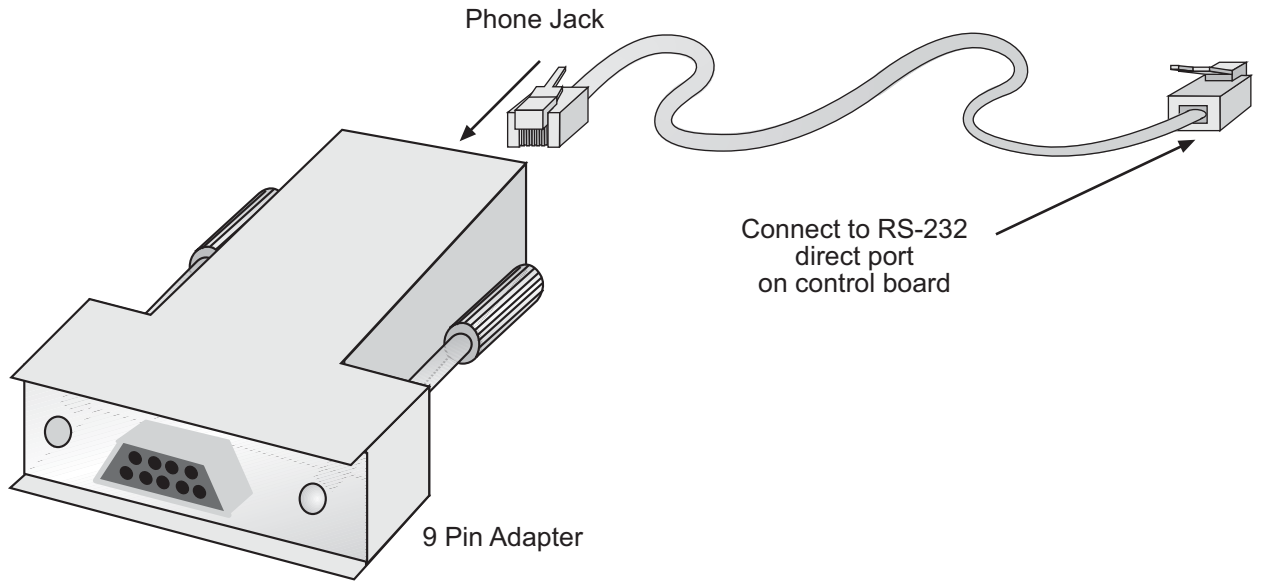
For local viewing of system status and settings of any controller, a portable PC can be connected. Using the 9 pin adapter provided, (*See Page 24, Figure 20*), you may wire from your computer serial port to the RS-232 direct connect port on the control board via standard 4-wire phone cable. For identification of the RS-232 direct connect port, *see Page 8, Figure 2*. This can be useful when a PC is in close proximity to any ROBERTS GORDON® ULTRAVAC™ Controller or while troubleshooting at the controller using a laptop PC. This type of connector should not be used if the phone wire is more than 50' (15m) in length.

Plug one end of the phone cable into the RS-232 direct port, plug the other end into the adapter shown in *Figure 20*. Plug the adapter into a 9-pin serial port on your computer.

If a PC does not have a serial port, but does have a USB port, purchase of a USB Serial Converter is required.

A USB to 9-pin Serial Cable will allow connection between the RS-232 device (ULTRAVAC™ Control Board) and the USB port on the PC. The USB to serial RS232 DB9 Cable Adapter will be used in conjunction with the PC Connection Cable Package (P/N 10080410). USB to Serial RS232 DB9 Cable Adapters can be purchased at a local computer store or on the internet for $20.00 or less. The converter should come with drivers and should draw power directly from USB, requiring no additional power adapter.

FIGURE 20: 9 Pin Adapter for PC



Description	Part Number
PC Connection Cable Package	10080410

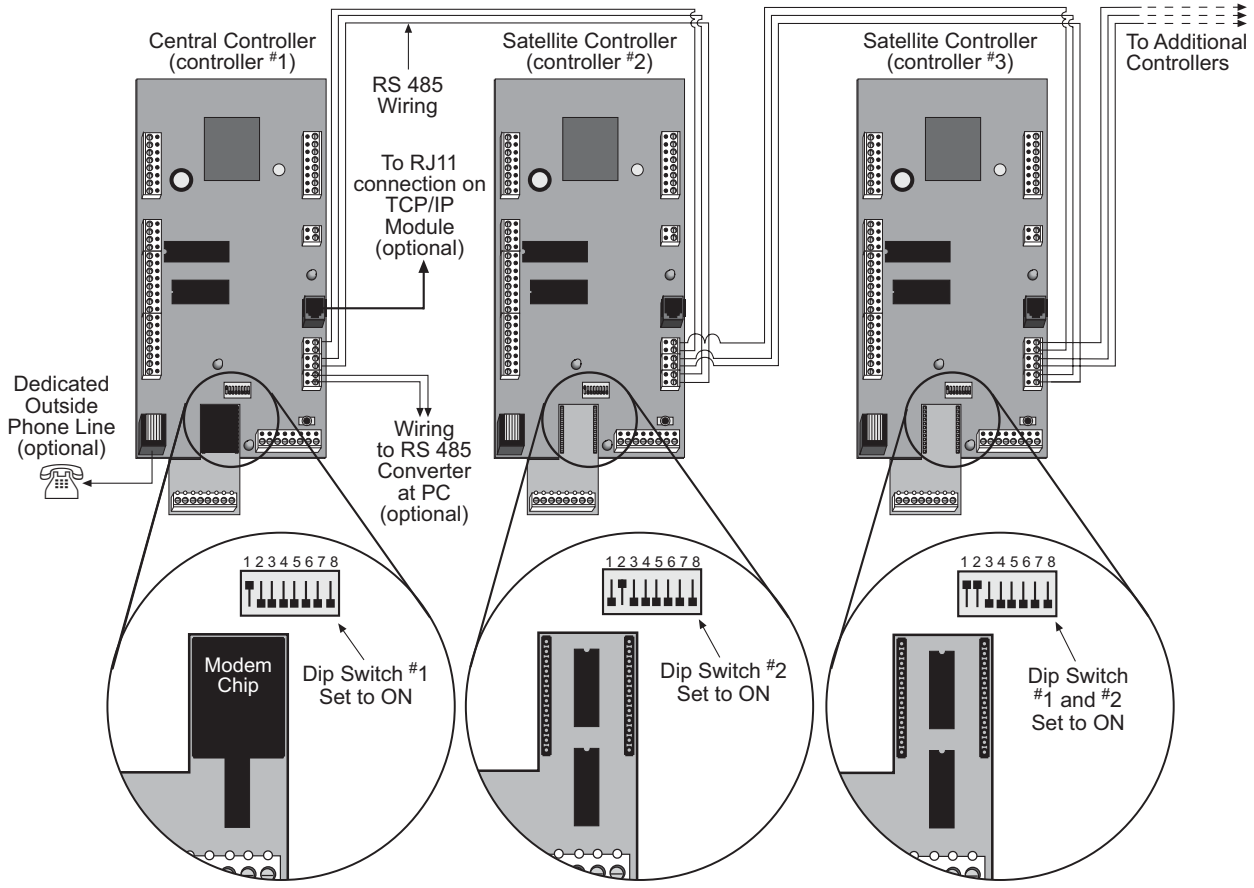
5.5 Communications Between Multiple ROBERTS GORDON® ULTRAVAC™ Controllers

If more than one ROBERTS GORDON® ULTRAVAC™ Controller is installed in a building, the controllers' RS-485 communications must be wired in series. *See Page 25, Figure 21*. Connect the RS-485 terminal on controller #1 to the RS-485 terminal on controller #2 and so on in a daisy chain fashion. For communication cable requirements, *See Page 11, Section 3.3.5*

From a PC, by dialing into the modem on controller #1 or by connecting to controller #1 via RS-485 converter or TCP/IP communication module, the system status and settings can be viewed for any of the controllers on the network.

The control board identification dip switch must be set on each ROBERTS GORDON® ULTRAVAC™ Controller. *See Page 25, Figure 21* for dip switch settings. The dip switch allows for up to 32 controllers to be connected together on the same network. For dip switch settings on controller #12 - #32, contact Roberts-Gordon or your local independent Roberts-Gordon distributor.

FIGURE 21: Communications Between Multiple Controllers



Controller Number	Dip Switch Order (1,2,3,4,5,6,7,8) Values (1=ON, 0=OFF)
1 (Central Controller)	10000000
2	01000000
3	11000000
4	00100000
5	10100000
6	01100000
7	11100000
8	00010000
9	10010000
10	01010000

Controller Number	Dip Switch Order (1,2,3,4,5,6,7,8) Values (1=ON, 0=OFF)
11	11010000
12	00110000
13	10110000
14	01110000
15	11110000
16	00001000
17	10001000
18	01001000
19	11001000
20	00101000

SECTION 6: VARIABLE FREQUENCY DRIVE PROGRAMMING

6.1 VFD Parameter Settings For Use With ROBERTS GORDON® ULTRAVAC™

The VFD parameters come with factory default settings. The following parameter settings must be changed for ROBERTS GORDON® ULTRAVAC™. Settings can only be altered when the pump motor is stopped.

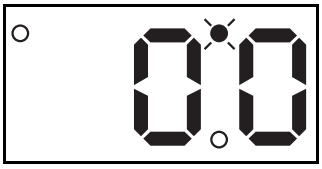
Verify that there is power to the VFD (LCD display will be on) and power to the 24 V power switch on the relay board of the ROBERTS GORDON® ULTRAVAC™ controller is off.

6.1.1

To enter the PROGRAM mode and access the parameters, press the Mode button. This will activate the PASSWORD prompt (if the password has not been disabled).

Display reads "00"

Upper right decimal point blinks



6.1.2

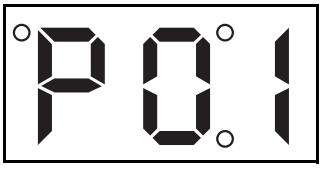
Use the arrow buttons to scroll to the password value (the factory set password is 225)

Press Mode to enter password

Once the correct password value is entered, the display will read "P01", which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu
(P01 is the first parameter)

.





NOTE: If the display flashes "Er", the password was incorrect, and the process to enter the password must be repeated.

6.1.3 Use the arrow buttons to scroll to the desired parameter number. For new parameter settings *See Page 26, Section 6.2*.

6.1.4 Once the desired parameter number is found:

Press Mode to display present parameter setting (example setting is 20.0).

Upper right decimal point blinks.



Use arrow buttons to change setting

Press Mode to store new setting and exit the program mode.

6.1.5 To change another parameter, press the Mode key again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting).

If the Mode key is pressed within two minutes of exiting the PROGRAM mode, the password is not required to access the parameters. After two minutes, the password must be entered in order to access the parameters again.

6.2 Altering VFD Parameters

Using the procedure described in *Section 6.1.1 through Section 6.1.5*, alter the following parameters:

Parameter Number	Parameter Name	Factory Default	New Setting
P16	Units Ending	02	01
P44	Password	225	Any # 000-999
P03	Start Method	01	05

SECTION 7: COMMISSIONING THE CORAYVAC® SYSTEM

NOTE: The ROBERTS GORDON® ULTRA-VAC™software must be installed on the PC, the communication connection must be made to the controller and all wiring of the ROBERTS GORDON® ULTRAVAC™ control boards, relay boards, burners, pumps and VFD must be completed before starting the commissioning procedure.

7.1 Setting The CORAYVAC® End Burner Vacuum

It is important to understand that the frequency that the VFD runs the motor at, determines the speed of the impeller in the pump. Variation of the impeller speed will increase or decrease vacuum in the system. The following procedure will help you set minimum and maximum VFD frequency settings to achieve proper vacuum in the system.

Step 7.1.1 At the controller, turn on the 24 V power switch on the relay board. At the PC, "connect" to the controller (see the ROBERTS GORDON® ULTRA-VAC™Software Installation and Operation Manual, P/N 10081600NA for details) and then open the **manual override screen(Alt + M)**. On the screen, click the "ON" button for the vacuum pump. Wait 30 seconds then click the ON button for zones 1-3.

Step 7.1.2 The pump should be running and the burners should light within 60 seconds. At the VFD, verify that the number displayed on the LCD screen is "60.0" If it is lower than 60.0, hit the "up" arrow button on the VFD until the number reads 60.0 Let the burners fire for approximately 20-30 minutes to warm up the system. Using a manometer, check the end vent vacuum in each zone (each branch of burners). *See Page 28, Figure 22*.

If the lowest end vent vacuum reading is above 3.0" w.c., reduce the vacuum pump speed. Generally the lowest end vent vacuum reading is on the longest branch of the system. Use the down arrow button on the VFD to reduce the frequency of the output signal to the pump, thus reducing the pump speed and lowering the end vent vacuum reading. Continue to reduce the frequency until the end vent vacuum reading is between 2.5" - 3.0" w.c. Make note of this frequency setting below. The frequency is found on the VFD's LCD screen.

2.5" w.c. - 3.0" w.c. VFD Frequency Setting

Record Frequency Setting Here:

To avoid damage to the pump motor, do not adjust the frequency above 60.0 Hz. Verify that the end vent vacuum readings in the remaining branches are proper. If necessary, adjust the proper damper coupling to achieve an end vent vacuum of 2.5" - 3.0" w.c. *See Page 28, Figure 22*. Damper couplings should be found near the end of the radiant portion of the pipe in each branch or where a branch connects to other branches at a cross or tee. *See Page 29, Figure 23*.

FIGURE 22: End Vent Vacuum

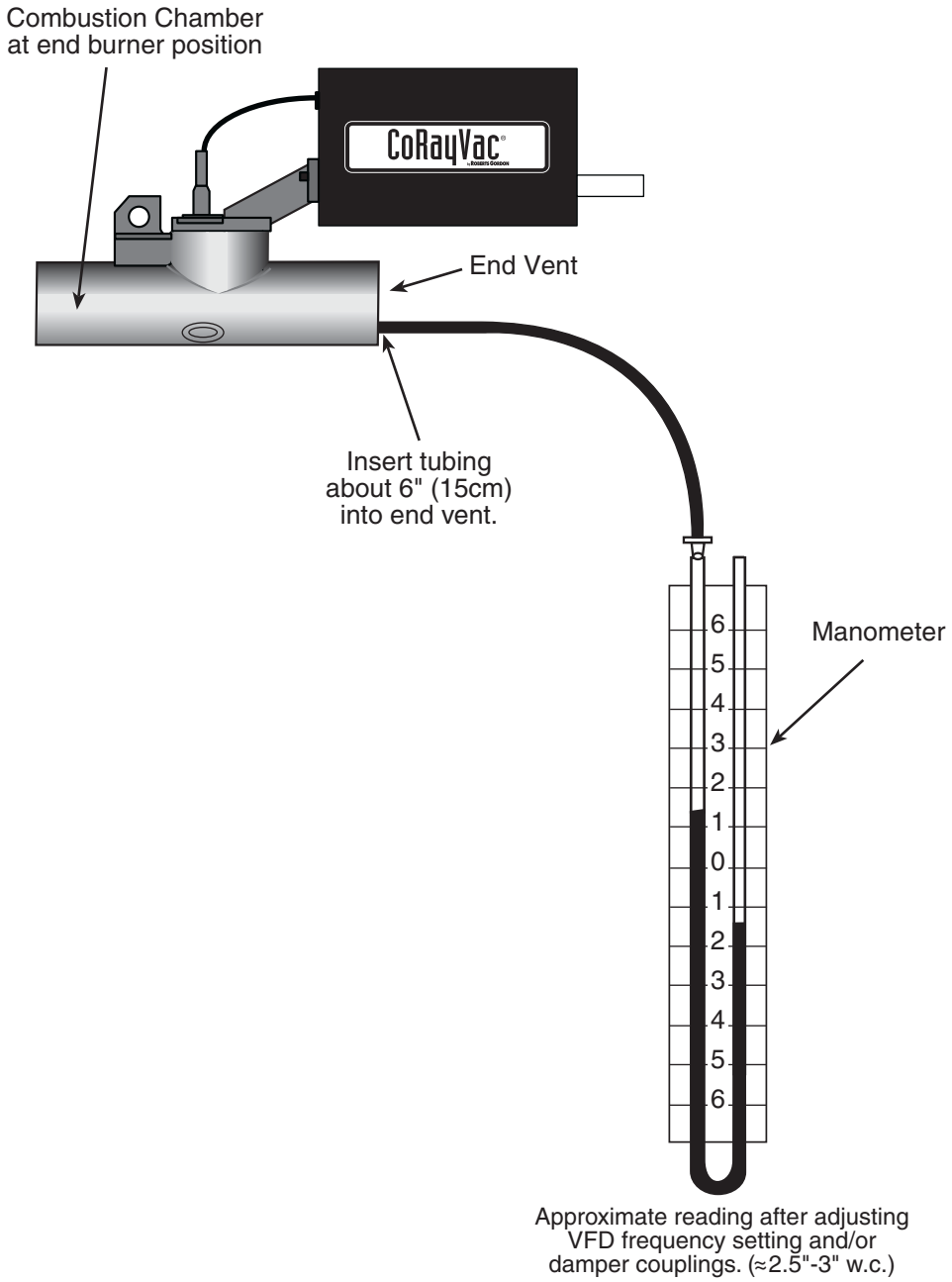
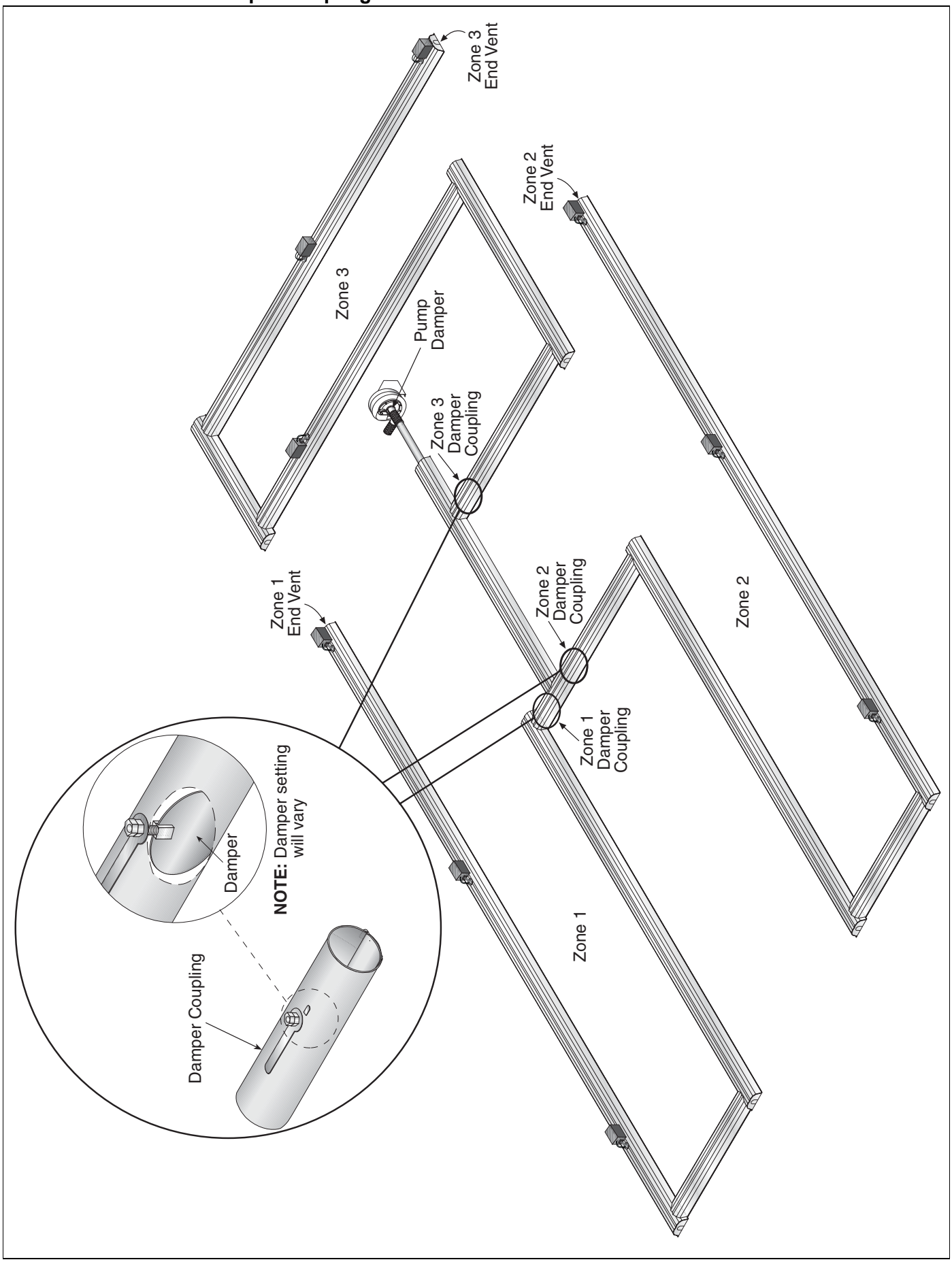


FIGURE 23: Possible Damper Couplings Locations



Step 7.1.3 After setting end vent vacuums between 2.5" w.c. and 3.0" w.c., while all the burners are still operating, use the down arrow button on the VFD to reduce the frequency of the output signal to the pump. Reduce the frequency of the VFD until the manometer at each of the end vents reads 1.0" w.c. - 1.2" w.c. Make note of this frequency setting below. The frequency is found on the VFD's LCD screen.

1.0" w.c. - 1.2" w.c. VFD Frequency Setting

Record Frequency Setting Here:

Step 7.1.4 Return to the PC and click the vacuum pump and zones to "OFF".

Step 7.1.5 Using the procedure described in *Section 6.1.1 through Section 6.1.5*, alter the following parameters on the VFD:

Parameter Number	Parameter Name	Factory Default	New Setting
P05	Standard Speed Source	01	03
P45	Speed at Minimum Signal	0.0Hz	Frequency Setting noted in *Section 7.1.3*
P46	Speed at Maximum Signal	60.0Hz	Frequency Setting noted in *Section 7.1.2*

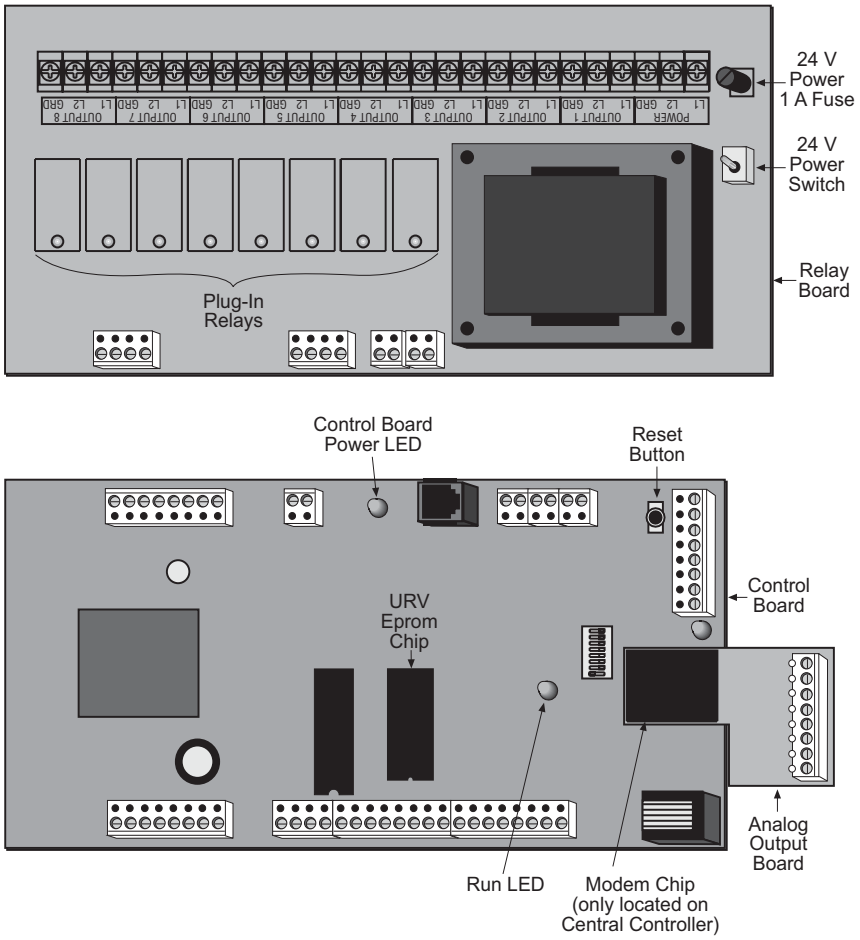
Step 7.1.6 Return to the PC and click the vacuum pump and three zones to "AUTO", then click exit.

SECTION 8: REPLACEMENT PARTS

8.1 ROBERTS GORDON® ULTRAVAC™ Controller Replacement Parts

Use only genuine ROBERTS GORDON® replacement parts.
Use of parts not specified by Roberts-Gordon voids warranty.
Failure to follow these instructions can result in property damage.

FIGURE 24: ROBERTS GORDON® ULTRAVAC™ Controller Components Diagram



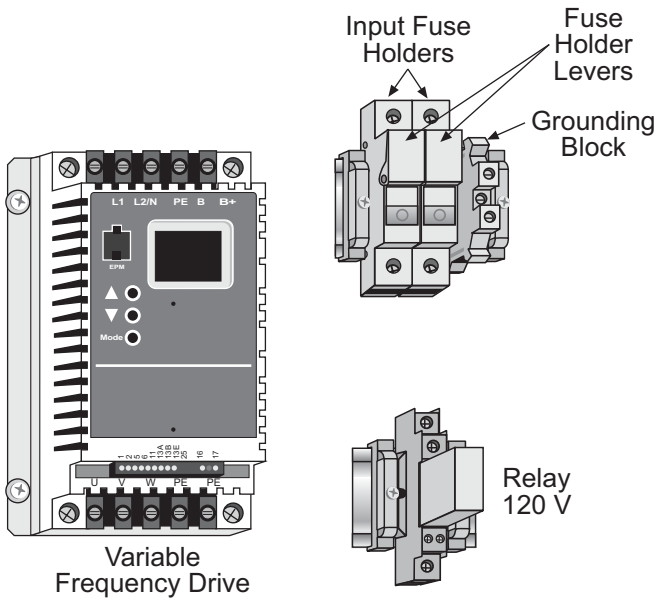
Description	Part Number
Control Board	10080101
Relay Board	10080200
Analog Output Board	10080141
URV Eprom Chip	10080121
Plug-In Relay	10080212
Modem Chip (located only on central controller)	10080142
1 A Fuse (Relay Board)	10080211
ROBERTS GORDON® ULTRAVAC™ Indoor Sensor °F (not shown)	10081500
ROBERTS GORDON® ULTRAVAC™ Outdoor Sensor (not shown)	10081501
ROBERTS GORDON® ULTRAVAC™ Indoor Sensor °C (not shown)	10081502
PC Connection Cable Package (not shown)	10080410
RS-485 Converter Package (not shown)	10080430
TCP/IP Communication Module (not shown)	10080440
Comms Equalization Cable (not shown, located only on Central Controller)	10080450
Telephone Sharing Device, 4 port	10080600
Lamp Socket (for enclosure door, not shown)	91321610
Lamp 24 Vac (for enclosure door, not shown)	91321611
Lens, Red (for enclosure door, not shown)	91321612

Description	Part Number
Lens, Green (for enclosure door, not shown)	91321613

8.2 Variable Frequency Drive Replacement Parts

Use only genuine ROBERTS GORDON® replacement parts.
Use of parts not specified by Roberts-Gordon voids warranty.
Failure to follow these instructions can result in property damage.

FIGURE 25: Variable Frequency Drive Components Diagram



Description	Part Number
Variable Frequency Drive, 1 HP, 120 V 1 Ø Input (for use with EP-203)	10081201
Variable Frequency Drive, 3/4 HP, 230 V 1 Ø Input (for use with EP-203)	10081202
Variable Frequency Drive, 2 HP, 230 V, 1 Ø Input (for use with EP-303)	10081203
Relay, 120 V	90429100
Fuse 10 A (for .75 HP 230 V VFD)	91321410
Fuse 25 A (for 1 HP 120 V VFD and 2 HP 230 V VFD)	91321425
Grounding Block	91321300
Fuse Holder	91321400

8.3 Replacement Parts Instructions

⚠ WARNING

Electrical Shock Hazard



Disconnect electrical power before servicing.

Replace cover before operating.

Failure to follow these instructions can result in death or electrical shock.

8.3.1 Plug-In Relay

To replace the plug-in relay, turn off 120 V power to the relay board. Turn off the 24 V power switch on the relay board. Locate the malfunctioning relay and pull the relay from its socket.

Fit a new relay in the socket. Return 120 V power to the relay board and turn on the 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

8.3.2 Control Board Power LED

The LED is linked to the 24 Vac input which supplies the control board with power. If the LED is not lit, there is no power to the board. If this is the case, check the 120 V power wiring to the relay board, the 24 Vac power wiring from the relay board to the control board and the 24 V power 1 A fuse.

8.3.3 10080121 Eprom Chip

The Eprom is where the controller's program (not settings) is stored. To take out the Eprom. The following steps must be taken:

Turn off the power to the control board by turning off the 24 V power switch on the relay board.

Locate the Eprom and with a small terminal screw driver placed underneath the device, pry the Eprom out of the socket.

To fit a new Eprom, look for the notch on one end of the Eprom.There is a notch on the socket and a notch on the Eprom. The Eprom should be fit so that the notch on the socket and the Eprom are aligned.

Turn on the 24 V power switch on the relay board, press the reset button on the control board and close the doors.

8.3.4 24V Power 1 A Fuse

To replace the 1 A fuse, turn off power to the relay board and turn off the 24 V power switch on the relay board.

Locate the 1A fuse and remove it from its socket using a flathead screwdriver. Twist the fuse a 1/4 turn counter-clockwise until the fuse pops out of the socket. Replace it with a new fuse.

Slide the fuse back into the socket, press down and turn the fuse a 1/4 turn clockwise until secure.

Return 120 V power to the relay board and turn on the 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

8.3.5 Variable Frequency Drive (VFD)

To replace the Variable Frequency Drive, turn off all power to the drive assembly at the breaker or disconnect switch. Turn off 120 V power to the relay board inside the ROBERTS GORDON® ULTRAVAC™ Controller. Turn off the 24 V power switch on the relay board.

Mark all wires connected to the VFD, noting the terminals that they are secured to. Remove all wires from the VFD terminals.

Remove the VFD from its mounting plate by removing the four securing screws.

Verify that the input voltage noted on the rating plate of the VFD matches the input voltage of the old VFD. Secure the new VFD to the mounting plate with the four screws. Return all wires to the correct VFD terminals. If possible, it may be easier to partially rewire the new VFD before mounting it to the mounting plate.

Close the door and return power to the VFD. Return 120 V power to the relay board. Turn on the 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

8.3.6 Variable Frequency Drive 25 A or 10 A Fuse

To replace a fuse, turn off input power to the variable frequency drive assembly at the breaker or disconnect switch.

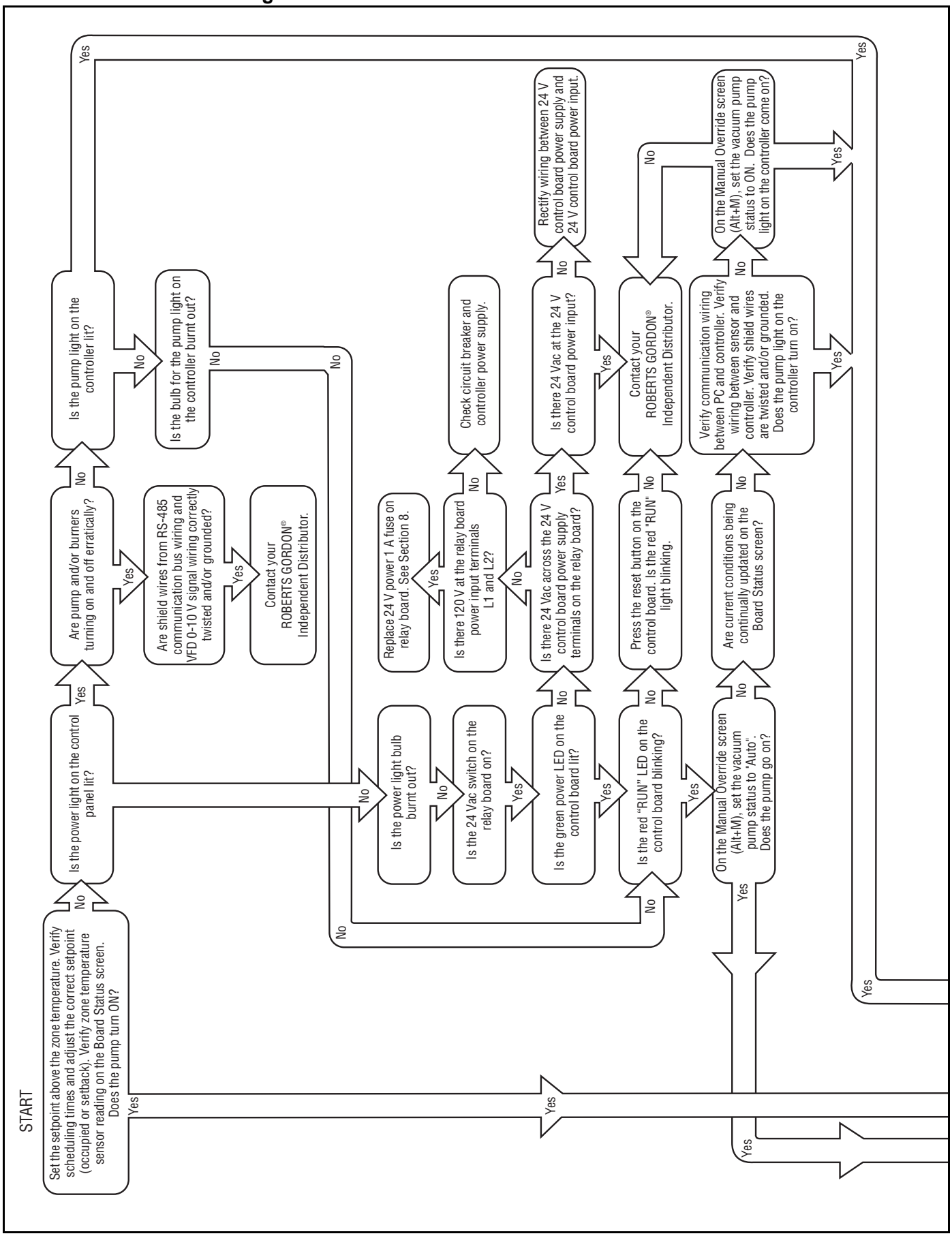
Turn off 120 V power to the relay board inside the ROBERTS GORDON® ULTRAVAC™ Controller. Turn off the 24 V power switch on the relay board.

Inside the VFD assembly, open the fuse holder by pulling down the lever to expose the fuse. Remove the old fuse and insert a new fuse. Verify the correct fuse rating, 25 A for 1 HP 120 V VFD or 2 HP 230 V VFD, 10 A for the .75 HP 230 V VFD. Close the fuse holder. Return power to the VFD assembly and verify that the VFD LCD screen is on. (dashes displayed). Close the VFD assembly door.

Return 120V power to the relay board. Turn on 24 V power switch on the relay board. Press the reset button on the control board and close the doors.

SECTION 9: TROUBLESHOOTING

FIGURE 26: Troubleshooting Flow Chart



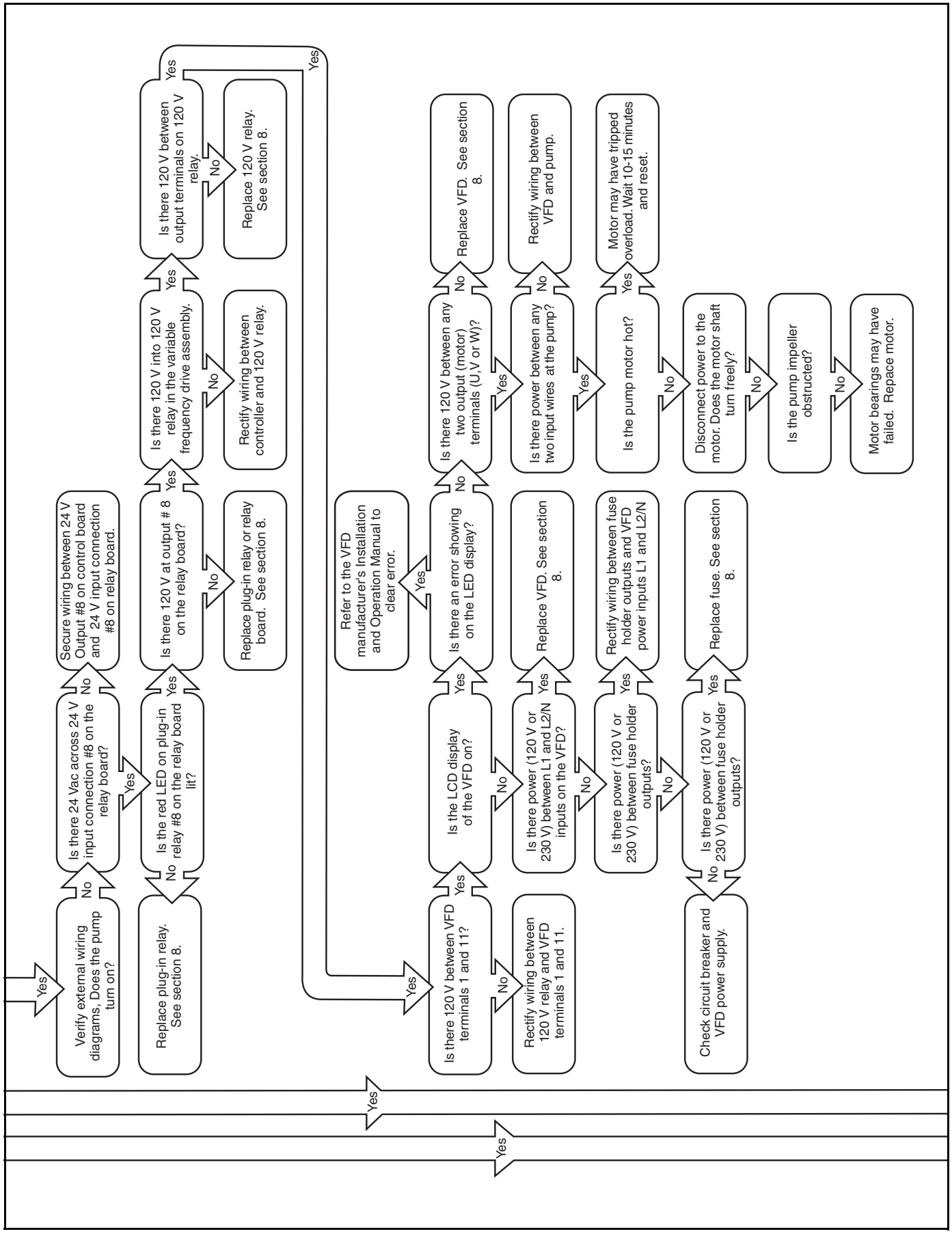
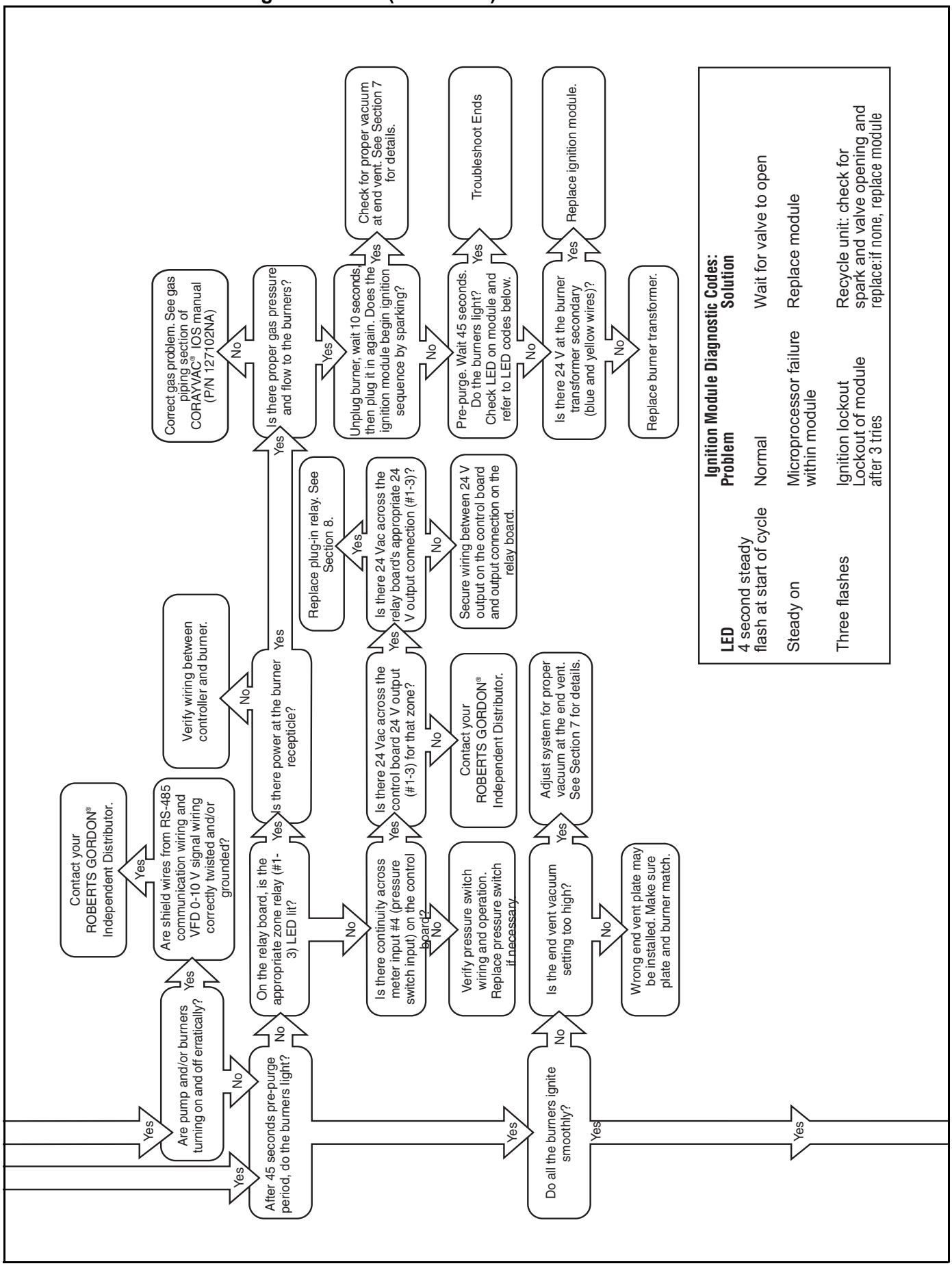
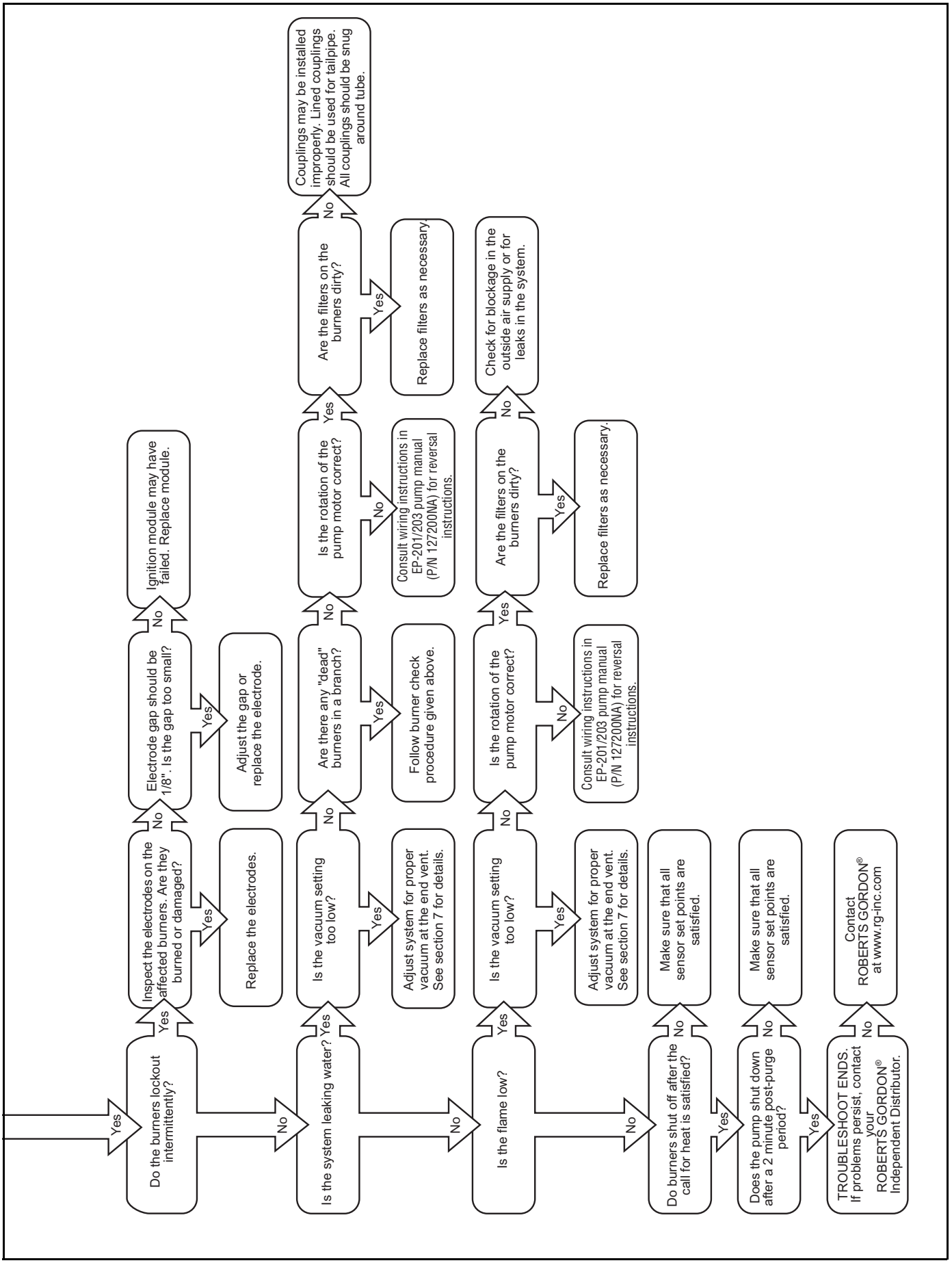

Yes
Verify external wiring diagrams, Does the pump turn on?
No
Is there 24 Vac across 24 V input connection #8 on the relay board?
No
Secure wiring between 24 V Output #8 on control board and 24 V input connection #8 on relay board.
Yes
Is the red LED on plug-in relay #8 on the relay board lit?
No
Replace plug-in relay. See section 8.
Yes
Is there 120 V at output # 8 on the relay board?
No
Replace plug-in relay or relay board. See section 8.
Yes
Is there 120 V into 120 V relay in the variable frequency drive assembly.
No
Rectify wiring between controller and 120 V relay.
Yes
Is there 120 V between output terminals on 120 V relay.
No
Replace 120 V relay. See section 8.
Yes
Refer to the VFD manufacturer's Installation and Operation Manual to clear error.
Yes
Is there an error showing on the LED display?
No
Is there 120 V between any two output (motor) terminals (U,V or W)?
No
Replace VFD. See section 8.
Yes
Is the LCD display of the VFD on?
No
Replace VFD. See section 8.
Yes
Is there power between any two input wires at the pump?
No
Rectify wiring between VFD and pump.
Yes
Is the pump motor hot?
Yes
Motor may have tripped overload. Wait 10-15 minutes and reset.
No
Disconnect power to the motor. Does the motor shaft turn freely?
No
Is the pump impeller obstructed?
No
Motor bearings may have failed. Repace motor.
Yes
Is there 120 V between VFD terminals 1 and 11?
No
Rectify wiring between 120 V relay and VFD terminals 1 and 11.
Yes
Is there power (120 V or 230 V) between L1 and L2/N inputs on the VFD?
No
Rectify wiring between fuse holder outputs and VFD power inputs L1 and L2/N
Yes
Is there power (120 V or 230 V) between fuse holder outputs?
No
Replace fuse. See section 8.
Yes
Is there power (120 V or 230 V) between fuse holder outputs?
No
Check circuit breaker and VFD power supply.
Yes
Yes
Yes

FIGURE 27: Troubleshooting Flow Chart (continued)




Yes
Do the burners lockout intermittently?
Yes
Inspect the electrodes on the affected burners. Are they burned or damaged?
Yes
Replace the electrodes.
No
Electrode gap should be 1/8". Is the gap too small?
Yes
Adjust the gap or replace the electrode.
No
Ignition module may have failed. Replace module.
No
Is the system leaking water?
Yes
Is the vacuum setting too low?
Yes
Adjust system for proper vacuum at the end vent. See section 7 for details.
No
Are there any "dead" burners in a branch?
Yes
Follow burner check procedure given above.
No
Is the rotation of the pump motor correct?
No
Consult wiring instructions in EP-201/203 pump manual (P/N 127200NA) for reversal instructions.
Yes
Are the filters on the burners dirty?
Yes
Replace filters as necessary
No
Couplings may be installed improperly. Lined couplings should be used for tailpipe. All couplings should be snug around tube.
No
Is the flame low?
Yes
Is the vacuum setting too low?
Yes
Adjust system for proper vacuum at the end vent. See section 7 for details.
No
Is the rotation of the pump motor correct?
No
Consult wiring instructions in EP-201/203 pump manual (P/N 127200NA) for reversal instructions.
Yes
Are the filters on the burners dirty?
Yes
Replace filters as necessary.
No
Check for blockage in the outside air supply or for leaks in the system.
No
Do burners shut off after the call for heat is satisfied?
No
Make sure that all sensor set points are satisfied.
Yes
Does the pump shut down after a 2 minute post-purge period?
No
Make sure that all sensor set points are satisfied.
Yes
TROUBLESHOOT ENDS.
If problems persist, contact your ROBERTS GORDON® Independent Distributor.
No
Contact ROBERTS GORDON® at www.rg-inc.com

SECTION 10: THE ROBERTS GORDON® ULTRAVAC™ LIMITED WARRANTY

ROBERTS-GORDON WILL PAY FOR:

Within 42 months from date of shipment from Roberts-Gordon, replacement parts will be provided free of charge for any part of the controller which fails due to a manufacturing or material defect.

Roberts-Gordon will require the part in question to be returned to the factory. Roberts-Gordon will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

ROBERTS GORDON® Replacement Parts are warranted for a period of 18 months from date of shipment from Roberts-Gordon or the remaining ROBERTS GORDON® ULTRAVAC™ warranty.

ROBERTS-GORDON WILL NOT PAY FOR:

Service trips, service calls and labor charges.

Shipment of replacement parts.

Claims where the total price of the goods have not been paid.

Damage due to:

- Improper installation, operation or maintenance.
- Misuse, abuse, neglect, or modification of the ROBERTS GORDON® ULTRAVAC™ in any way.
- Use of the ROBERTS GORDON® ULTRAVAC™ for other than its intended purpose.
- Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty.
- Improper service, use of replacement parts or accessories not specified by Roberts-Gordon.
- Failure to install or maintain the ROBERTS GORDON® ULTRAVAC™ as directed in the Installation, Operation and Service manual.
- Relocation of the ROBERTS GORDON® ULTRAVAC™ after initial installation
- The use of the ROBERTS GORDON® ULTRAVAC™ in a corrosive atmosphere containing contaminants.
- The use of the ROBERTS GORDON® ULTRAVAC™ in the vicinity of a combustible or explosive material.
- Any defect in the ROBERTS GORDON® ULTRAVAC™ arising from a drawing, design, or specification supplied by or on behalf of the consumer.
- Damage incurred during shipment. Claim must be filed with carrier.

WARRANTY IS VOID IF:

The ROBERTS GORDON® ULTRAVAC™ is not installed by an electrician qualified in the installation and service of control systems for heating equipment.

You cannot prove original purchase date and required annual maintenance history.

The data plate and/or serial number are removed, defaced, modified or altered in any way.

The ownership of the ROBERTS GORDON® ULTRAVAC™ is moved or transferred. This warranty is nontransferable.

Roberts-Gordon is not permitted to inspect the damaged controller and/or component parts.

READ YOUR INSTALLATION, OPERATION AND SERVICE MANUAL

If you have questions about your controller, contact your installing professional. Should you need Replacement Parts or have additional questions, call or write Roberts-Gordon:

U.S.A.
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
716.852.4400

Canada
76 Main Street West, Unit 10
Grimsby, Ontario L3M 1R6
905.945.5403

On the web at: www.rg-inc.com

Roberts-Gordon's liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Roberts-Gordon shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the ROBERTS GORDON® ULTRAVAC™. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

Roberts-Gordon shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts or power. No person is authorized to assume for Roberts-Gordon any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:

No representative of Roberts-Gordon, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Roberts-Gordon's duly authorized Executive Officer.