ROBERTS GORDON®
MODULATING CONTROLS

For CORAYVAC® and Unitary Infrared Heating Systems Installation Manual

⚠ WARNING

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

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

c UL US LISTED

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 service technician with necessary information.

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SECTION 1: INTRODUCTION

1.1 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.

The appliance must be applied and operated under the general concepts of reasonable use and installed using best building practices.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

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 LLC at (716) 852-4400, (800) 828-7450 or at www.robertsgordon.com.

1.2 Safety Labels and Their Placement

Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain replacement signs or labels. *See Page 3, Figure 1 through Page 5, Figure 3*.

1.3 California Proposition 65

In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment's serial plate). See label placement drawing *on Page 3, Figure 1* for label location. Avoid placing label on areas with extreme heat, cold, corrosive chemicals or other elements. To order additional labels, please contact Roberts-Gordon LLC LLC or your ROBERTS GORDON® independent distributor.

1.4 What is ROBERTS GORDON® CORAYVAC™ Modulating Heating Control?

The ROBERTS GORDON® CORAYVAC™ Modulating Heating Control 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 two vacuum pump and four heating zones. The controller also features inputs which are used for indoor and outdoor signal condition monitoring.

For the overall view of connected components for ROBERTS GORDON® CORAYVAC™ Modulating Heating Control, *see Page 6, Figure 4*.

System status and settings are viewed and altered from a touchscreen or smart device (not supplied).

1.5 General Requirements

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

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

The ROBERTS GORDON® CORAYVAC™ Modulating Heating Control series of controllers are supplied pre-configured for use with ROBERTS GORDON® CORAYVAC® infrared heating equipment only. Fail-

ure to comply with the installation instructions and configuration may invalidate the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control limited warranty. *See Page 63, Section 11*.

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:

1.6 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.

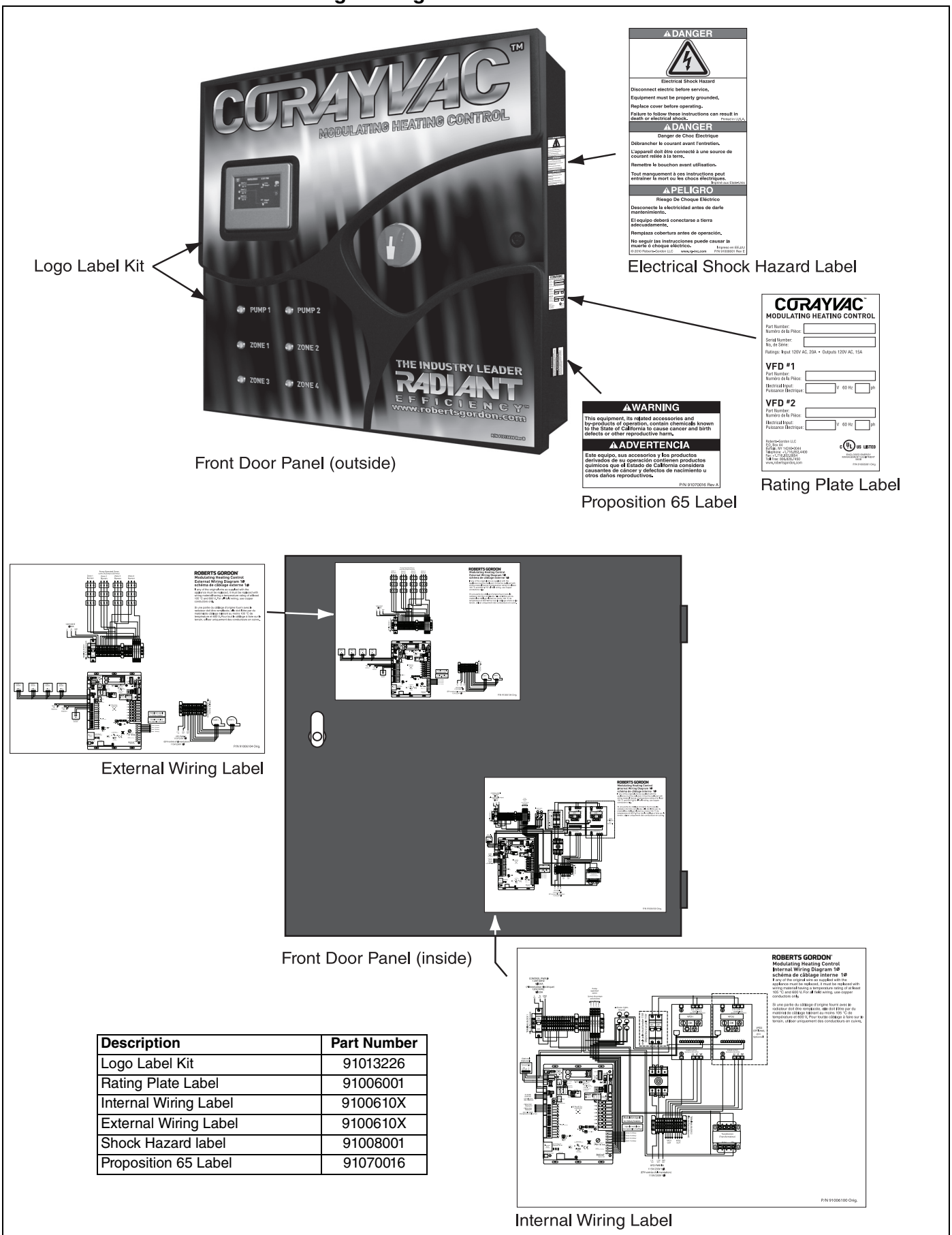
1.7 Example Site Layout

Page 13, Figure 5 is an example layout for a building where ROBERTS GORDON® CORAYVAC™ Modulating Heating Control will be used to control the infrared heating systems shown. The layout consists of four zones of ROBERTS GORDON® CORAYVAC™ Modulating Heating Control.

1.8 Control Board and Sensor Power

The power supply for all sensors is from the “+12 V” terminal on the Rnet port of control board. Power for the control board is 24 V provided by the transformer.

FIGURE 1: CORAYVAC™ Modulating Heating Control Label Placement



Description	Part Number
Logo Label Kit	91013226
Rating Plate Label	91006001
Internal Wiring Label	9100610X
External Wiring Label	9100610X
Shock Hazard label	91008001
Proposition 65 Label	91070016

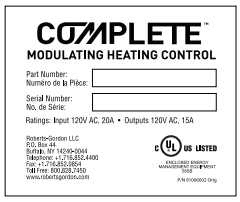
FIGURE 2: COMPLETE™ Modulating Heating Control Label Placement

Front Door Panel (outside)

Logo Label Kit

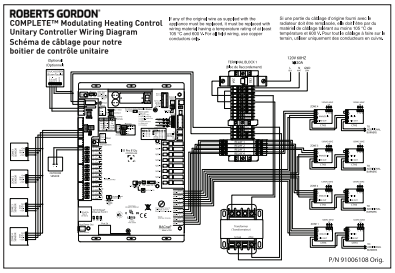
Electrical Shock Hazard Label (on side)

Proposition 65 Label (on side)

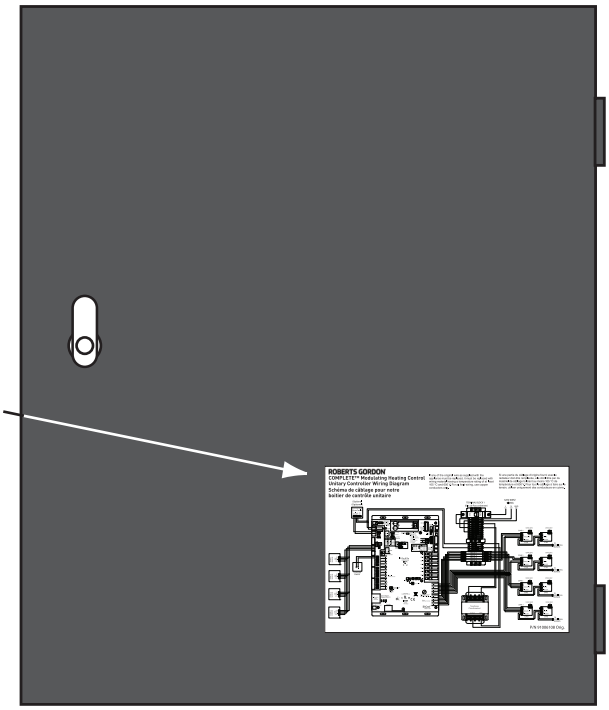


Rating Plate Label (on side)

Description	Part Number
Logo Label	91013228
Rating Plate Label	91006002
Internal and External Wiring Label	91006108
Shock Hazard label	91008001
Proposition 65 Label	91070016

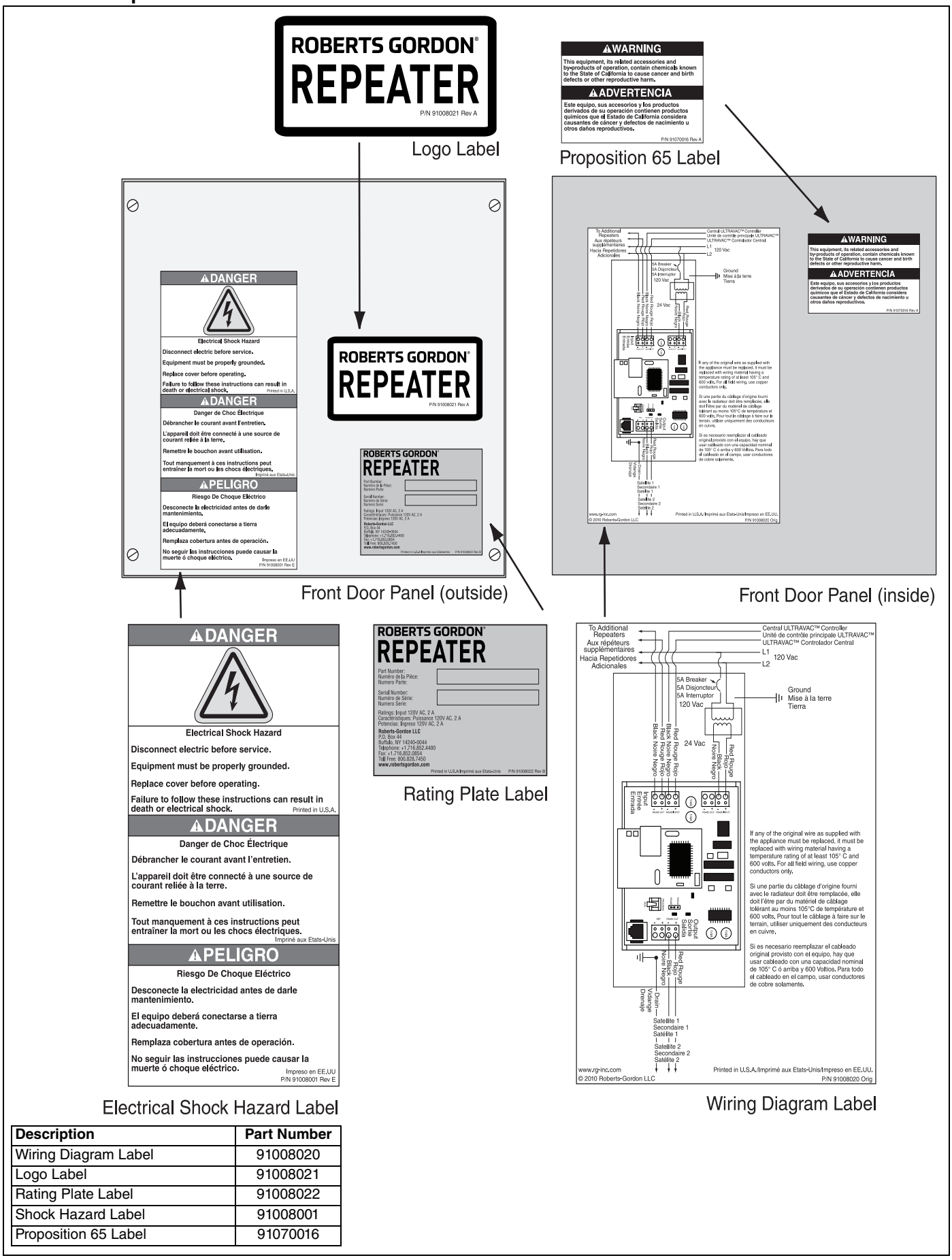


Internal and External Wiring Label



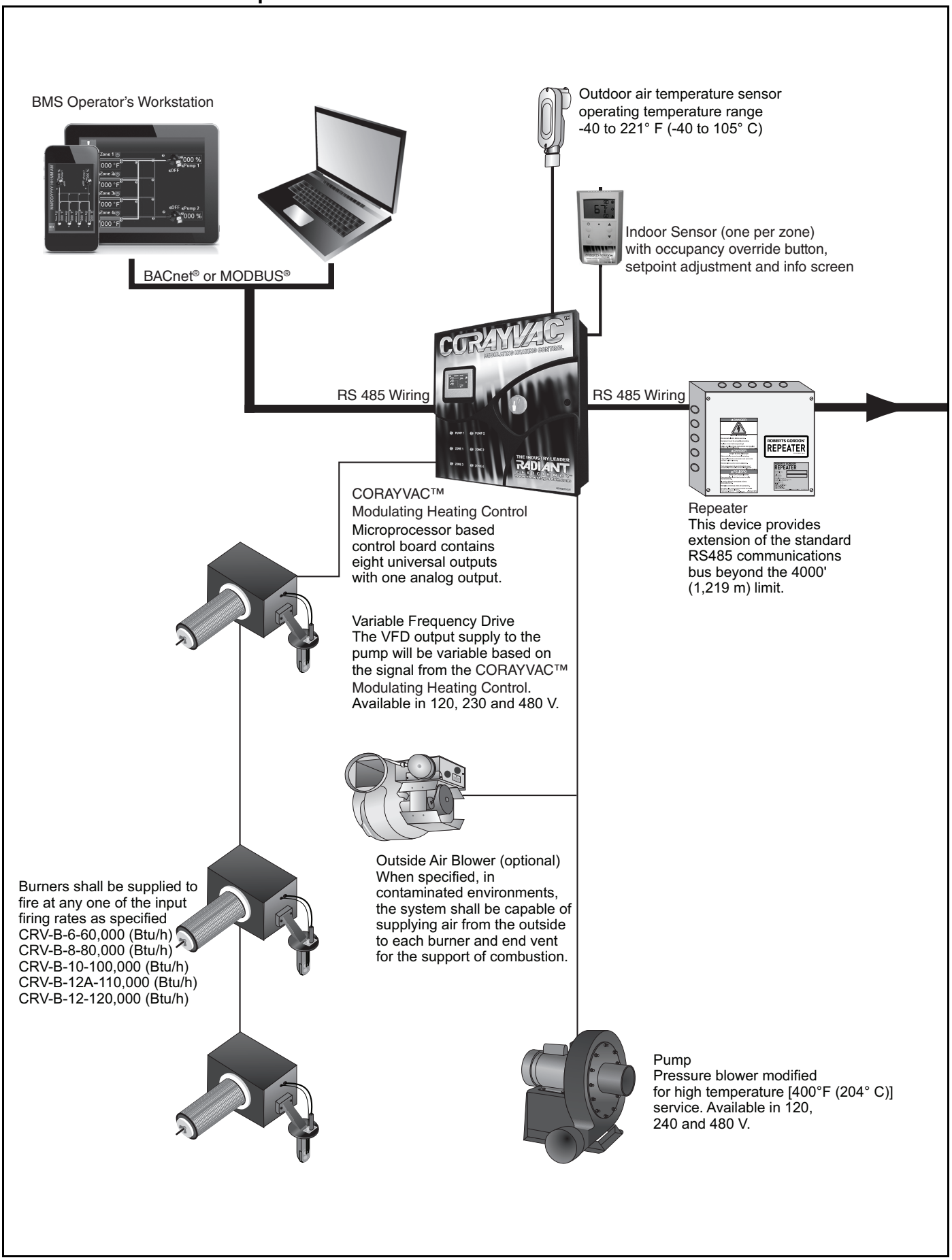
Front Door Panel (inside)

FIGURE 3: Repeater Label Placement

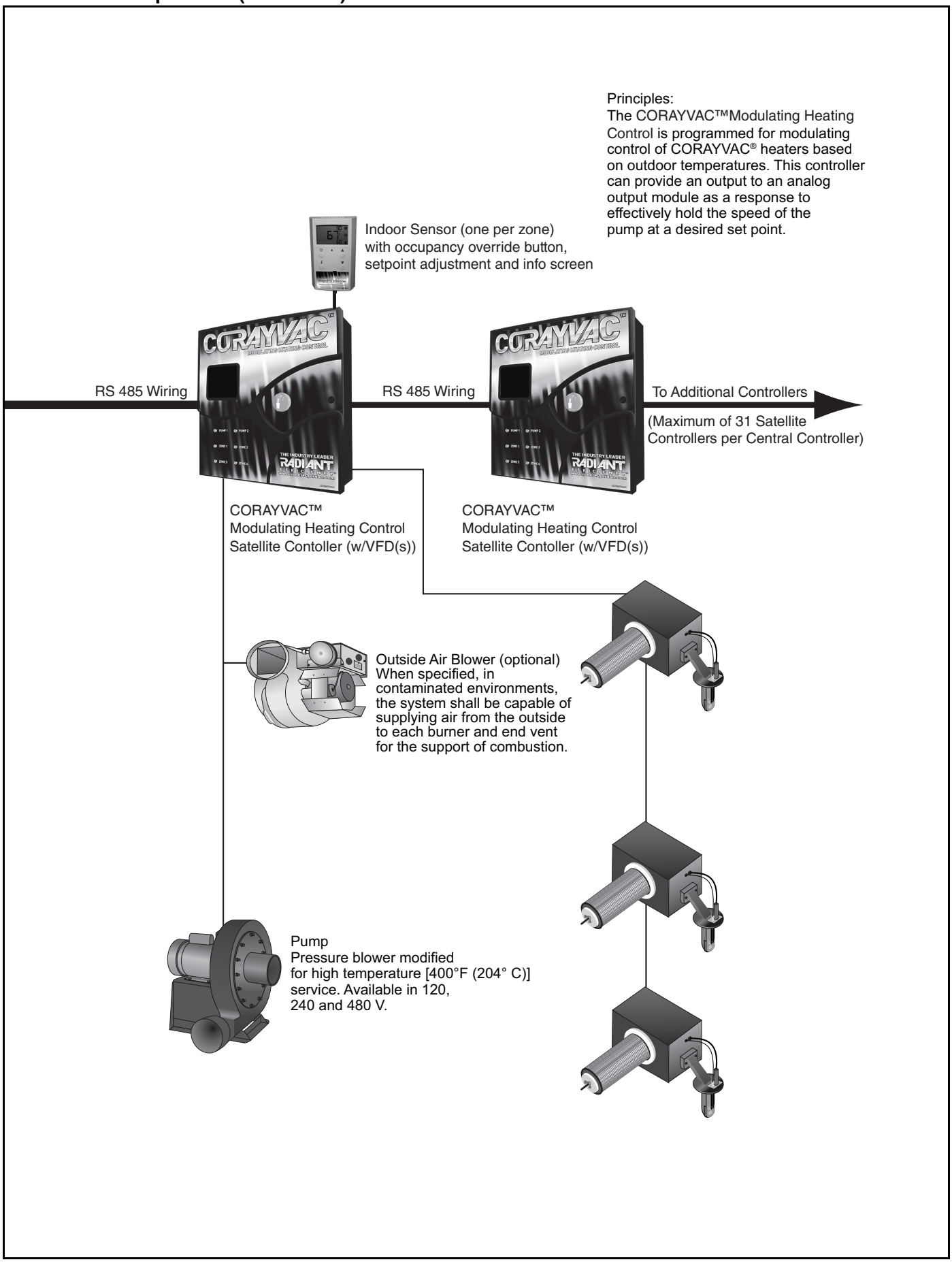


Description	Part Number
Wiring Diagram Label	91008020
Logo Label	91008021
Rating Plate Label	91008022
Shock Hazard Label	91008001
Proposition 65 Label	91070016

FIGURE 4: Connected Components



Connected Components (continued)

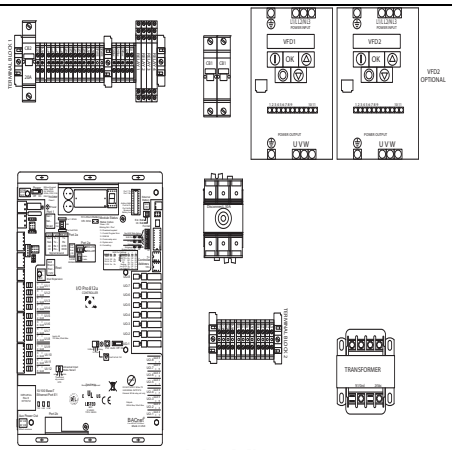


1.9 Carton Contents

10060XX: CORAYVAC™ Modulating Heating Control Central Controller

CORAYVAC™ Modulating Heating Control

CORAYVAC™ Modulating Heating Control Installation Manual (P/N 1006101NA)

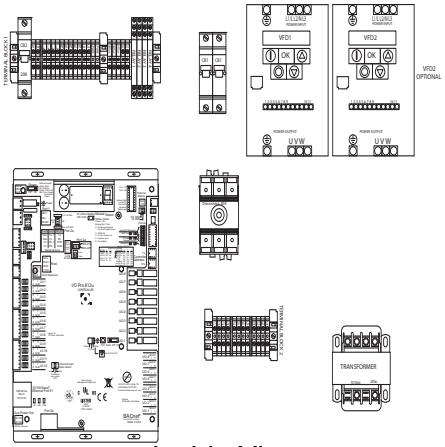


Inside View

100600XXX: CORAYVAC™ Modulating Heating Control Satellite Controller

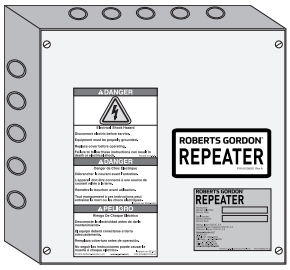
CORAYVAC™ Modulating Heating Control Controller with Modem Installed

CORAYVAC™ Modulating Heating Control Installation Manual (P/N 1006101NA)

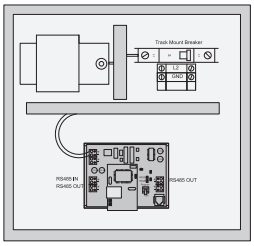


Inside View

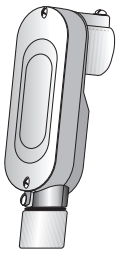
Accessories



Repeater (optional) Supplied w/24 VAC transformer inside NEMA 1 enclosure (P/N URVRP)



Inside View



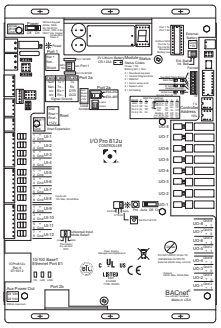
Outdoor Sensor (P/N 10081501)

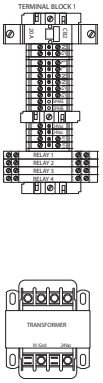
Indoor Sensor (P/N 10061003)

COMPLETE™ Modulating Heating Control (Unitary Controller)

COMPLETE™ Modulating Heating Control (Unitary Controller)

Install Manual (P/N 1006101NA)





Inside View

1.10 Standard Parts List

Table 1: Contents of CORAYVAC™ Modulating Heating Control - Central Controllers

Part No.	Description
	460v 3Ø
10060001	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060002	CRV Modulating Central Controller; 2 - .75 / 1 HP VFD, 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060003	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 1 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060004	CRV Modulating Central Controller; 1 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060005	CRV Modulating Central Controller; 2 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	230v 1Ø
10060011	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060012	CRV Modulating Central Controller; 2 - .75 / 1 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060013	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 1 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060014	CRV Modulating Central Controller; 1 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060015	CRV Modulating Central Controller; 2 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	230v 3Ø
10060021	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060022	CRV Modulating Central Controller; 2 - .75 / 1 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060023	CRV Modulating Central Controller; 1 - .75 / 1 HP, 1 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060024	CRV Modulating Central Controller; 1 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060025	CRV Modulating Central Controller; 2 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	1150v 1Ø
10060031	CRV Modulating Central Controller; 1 - .75 / 1 HP VFD; 115v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060032	CRV Modulating Central Controller; 2 - .75 / 1 HP VFD; 115v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual

Table 2: Contents of CORAYVAC™ Modulating Heating Control - Satellite Controllers

Part No.	Description
	460v 3Ø
10060101	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060102	CRV Modulating Satellite Controller; 2 - .75 / 1 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060103	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 1 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060104	CRV Modulating Satellite Controller; 1 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060105	CRV Modulating Satellite Controller; 2 - 2 HP VFD; 460v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	230v 1Ø
10060111	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060112	CRV Modulating Satellite Controller; 2 - .75 / 1 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060113	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 1 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060114	CRV Modulating Satellite Controller; 1 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060115	CRV Modulating Satellite Controller; 2 - 2 HP VFD; 230v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	230v 3Ø
10060121	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060122	CRV Modulating Satellite Controller; 2 - .75 / 1 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060123	CRV Modulating Satellite Controller; 1 - .75 / 1 HP, 1 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060124	CRV Modulating Satellite Controller; 1 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060125	CRV Modulating Satellite Controller; 2 - 2 HP VFD; 230v 3Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
	115v 1Ø
10060131	CRV Modulating Satellite Controller; 1 - .75 / 1 HP VFD; 115v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060132	CRV Modulating Satellite Controller; 2 - .75 / 1 HP VFD; 115v 1Ph Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual

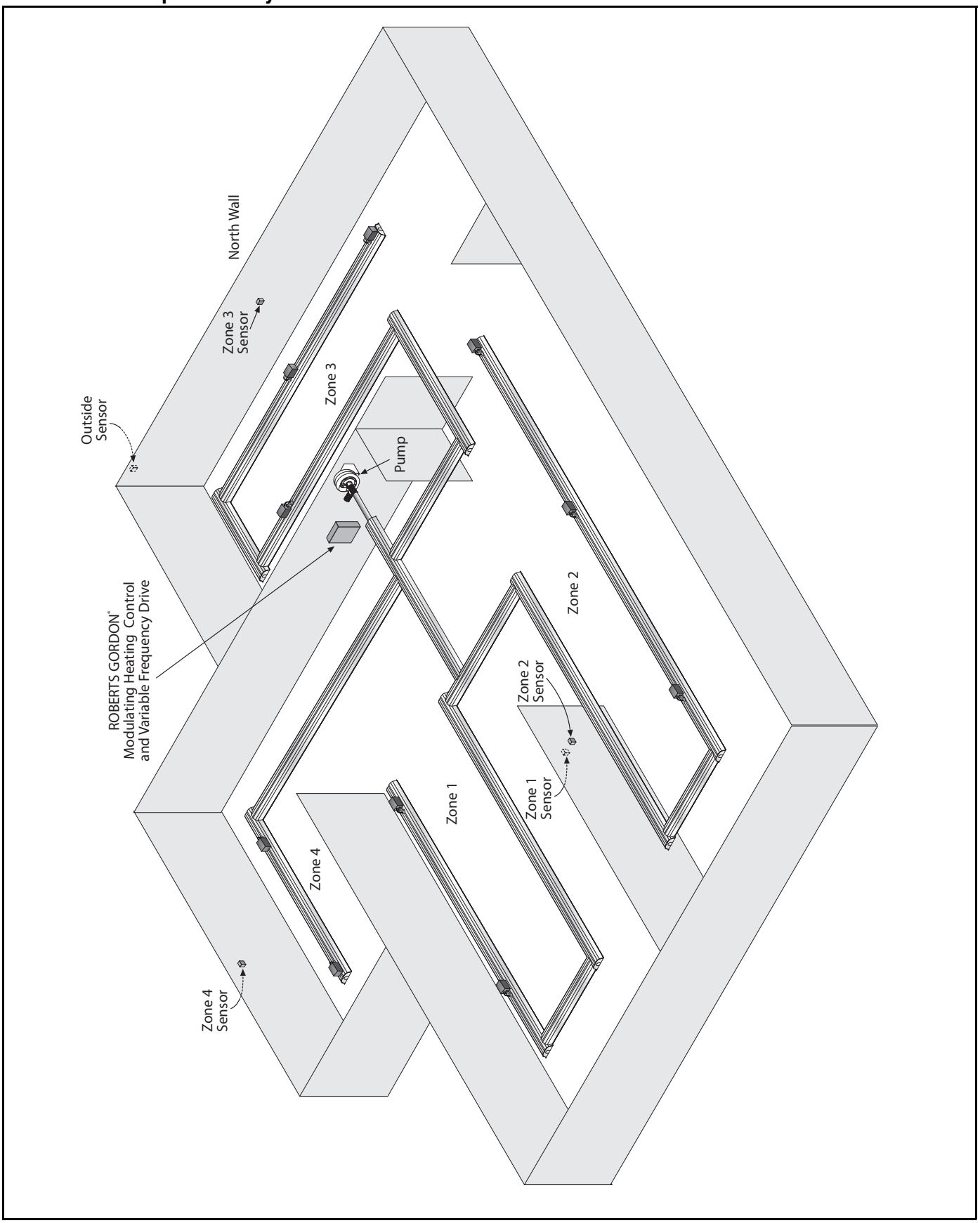
Table 3: Contents of COMPLETE™ Modulating Heating Control - Unitary Controller (For Unitary Heaters Only)

Part No.	Description
10060041	COMPLETE™ Modulating Heating Control - Central Controller (Unitary) Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual
10060141	COMPLETE™ Modulating Heating Control - Satellite Controller (Unitary) Included With Controller: (1) P/N 1006101NA Installation, Operation and Service Manual

Table 4: Related Accessories

Part No.	Description
10061003	Modulating Heating Control Indoor Sensor
10081501	Sensor, Outdoor, Modulating Control
90602460	Line Reactor 480V 3Ø 60Hz 2HP 4A w/ Enclosure (Output)
90602461	Line Reactor 230V 3Ø 60Hz 1HP 1A w/ Enclosure (Output)
90602462	Line Reactor 230V 3Ø 60Hz 2HP 8A w/ Enclosure (Output)
90602470	Line Reactor 480V 3Ø 60Hz 2HP 4A w/ Enclosure (Input)
URVRP	Repeater, Communication

FIGURE 5: Example Site Layout



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

SECTION 2: SPECIFICATIONS

2.1 ROBERTS GORDON® CORAYVAC™ Modulating Heating Control

2.1.1 Standard Enclosure

Construction: 14 gauge painted steel, hinged door, removable knockouts provided.

Dimensions: W x H x D
(in): 24.75 x 24.75 x 8.3
(cm): 62.9 x 62.9 x 21.1

Weight: 70 lbs (31.7 kg)

2.1.2 Electrical

Power Supply: 120 V (+/- 10%) 1 Ø, 60 Hz
UL Standard: 508A, UL Type 1

Universal Inputs:

Twelve Universal Inputs
0-5 Vdc
0-10 Vdc
0-20 mA
Thermister (10k ohm type II)
1K ohm RTD
Dry Contact

Universal Outputs:

0-10 Vdc
0-20 mA
Relay
HOA (hand/off/auto) switches for all outputs

Communication Ports:

Port 1: Configurable for ARC156 or EIA-485 (2-wire). Built-in support for BACnet

(MS/TP or ARC156), N2, and Modbus

Port 2a: Configurable for EIA-232 or EIA-485 (2-wire or 4-wire). Network protocol selectable for BACnet (MS/TP or PTP), Modbus, N2, LonWorks SLTA, or modem.

Rnet port: Interface with a BACview5, BACview6, RS sensors, ZS sensors or local laptop.

Battery: CR123A, 10 yr life, 720 cumulative hours of power outage

NOTE: Battery for time keeping purposes only.

Control Board Listed by: UL-916, CE, FCC Part 15-Subpart B - Class A. BTL (BACnet Test Labs) - BACnet Building Controller (B-BC)

2.2 COMPLETE™ Modulating Heating Control

2.2.1 Standard Enclosure

Construction: 14 gauge painted steel, hinged door, removable knockouts provided.

Dimensions: W x H x D
(in): 16.8 x 20.75 x 8.2
(cm): 42.7 x 62.9 x 20.8

Weight: 40 lbs (18.1 kg)

2.2.2 Electrical

Power Supply: 120 V (+/- 10%) 1 Ø, 60 Hz
UL Standard: 508A, UL Type 1

Universal Inputs:

Twelve Universal Inputs
0-5 Vdc
0-10 Vdc
0-20 mA
Thermister (10k ohm type II)
1K ohm RTD
Dry Contact

Universal Outputs:

0-10 Vdc
0-20 mA
Relay

HOA (hand/off/auto) switches for all ouputs

Communication Ports:

Port 1: Configurable for ARC156 or EIA-485 (2-wire). Built-in support for BACnet

(MS/TP or ARC156), N2, and Modbus

Port 2a: Configurable for EIA-232 or EIA-485 (2-wire or 4-wire). Network protocol

selectable for BACnet (MS/TP or PTP), Modbus, N2, LonWorks SLTA, or modem.

Rnet port: Interface with a BACview5, BACview6, RS sensors, ZS sensors or local laptop.

Battery: CR123A, 10 yr life, 720 cumulative hours of power outage

Control Board Listed by: UL-916, CE, FCC Part 15-Subpart B - Class A. BTL (BACnet Test Labs) - BACnet Building Controller (B-BC)

2.3 Repeater

2.3.1 Standard Enclosure

Construction: Fabricated in accordance with UL specifications from code gauge steel, NEMA 1.

Finish: Austin screw cover boxes standard construction galvanized steel with ANSI 61 gray polyester powder coating.

Dimensions: W x H x D

(in): 12 x 12 x 4

(cm): 30.5 x 30.5 x 10.5

2.3.2 Electrical

Power Supply: 120 V (+/- 10%) 1 Ø, 60 Hz

Ports:

RS-485 Communications Bus

RS-232 Direct Connect Bus

2.4 Temperature Sensors

Indoor Sensor

Dimensions: W x H x D

(in): 4.75 x 3 x 0.75

(cm): 12.1 x 7.6 x 1.9

Power: 12 Vdc

Operating Temperature Range:

32° to 122° F (0° to 50° C)

Features: LCD temp display, setpoint display, setpoint adjustment, override button, information screen, diagnostics screen

Outdoor Sensor (P/N 10081501)

Dimensions: W x H x D

(in): 1.4 x 5.3 x 0.75

(cm): 12.1 x 13.5 x 5.1

Operating Temperature Range:

-40° to 221° F (-40° to 105° C)

Enclosure: NEMA 4 gasketed aluminum LB housing, ½" threaded connection

2.5 Touchscreen:

Dimensions: W x H x D

(in): 5.4 x 4.6 x 1.3

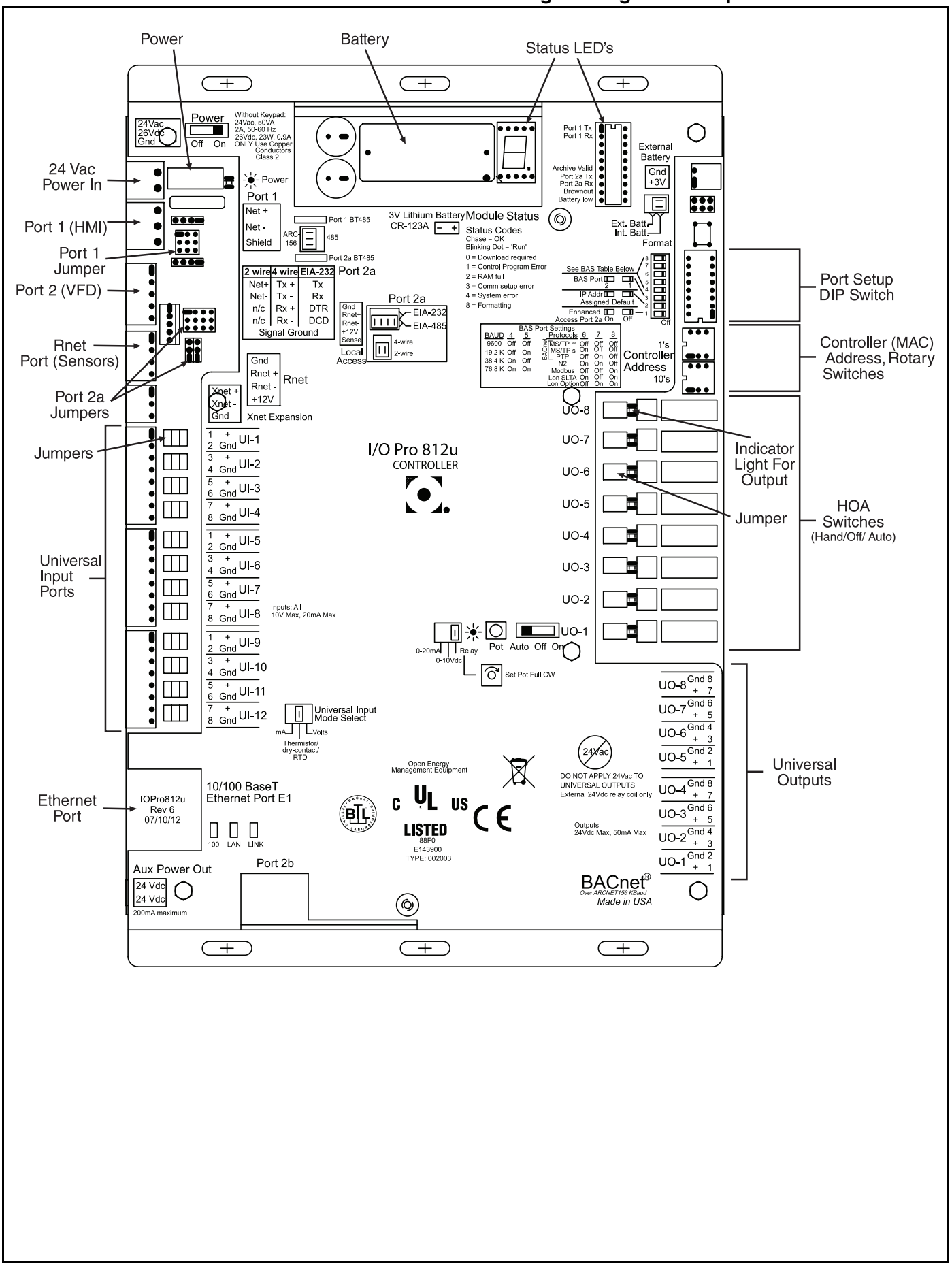
(cm): 13.7 x 11.7 x 13.0

Power: 24 Vac, 50-60 Hz

Operating temp range: -4 to 140 F

Features: 4.3" touchscreen color LCD display, temp sensor, humidity sensor

FIGURE 6: ROBERTS GORDON® CORAYVAC™ Modulating Heating Control Specifications



2.6 Variable Frequency Drive (Located inside ROBERTS GORDON® CORAYVAC™ Modulating Heating Control)

2.6.1 Electrical

Power Output: 230 V, 3 Ø, 0-60 Hz
(for 115 V and 230 V models)
480 V, 3 Ø, 0-60 Hz
(for 480 V models)

Speed Reference Follower: 0-10 Vdc or 4-20 mA

Ambient Operating Temp.:
32° F - 104° F (0° C - 40° C)

1 HP, 115v 1 Ø Drive (used with EP-203 pump)
(P/N 10061201)
Power Input: 115 V, 1 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 4.3

1 HP, 208/230v 1 Ø Drive (used with EP-203 pump)
(P/N 10061202)
Power Input: 208/230 V, 1 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 4.3

2 HP, 208/230v 1 Ø Drive (used with EP-303 pump)
(P/N 10061203)
Power Input: 208/230 V, 1 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 7

1 HP, 460v 3 Ø Drive (used with EP-203 pump)
(P/N 10061204)
Power Input: 460 V, 3 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 2.2

2 HP, 460v 3 Ø Drive (used with EP-303 pump)
(P/N 10061205)
Power Input: 460 V, 3 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 4.1

1 HP, 208/230v 3 Ø Drive (used with EP-203 pump)
(P/N 10061206)
Power Input: 208/230 V, 3 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 4.3

2 HP, 208/230v 3 Ø Drive (used with EP-303 pump)
(P/N 10061207)
Power Input: 208/230 V, 3 Ø, 50-60 Hz
Input Voltage Tolerance: +/- 10%
Amps: 7

SECTION 3: INSTALLATION

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

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

Installation of the CORAYVAC™ Modulating Heating Control 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 16, Figure 6 and Page 59, Figure 10.1*.

Note: The VFD is located inside of the CORAYVAC™ Modulating Heating Control panel. Be sure to plan accordingly.

3.2 Positioning the CORAYVAC™ Modulating Heating Control

3.2.1 Choose a mounting location for the controller. For serviceability, it is convenient to mount the controller at occupant level in the vicinity of the pump. For proper frequency between the VFD and pump, the controller should not be more than 100' (30 m) from the vacuum pump. A load reactor will be required for distances greater than 100' (30m).

Do not mount controller outdoors. Controller 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 directly beneath pump. Avoid installing the controller in mezzanines, direct sunlight, or near external heat sources because these locations usually have unpredictable temperature rises.

Maximum length of sensor daisy chain is 500' (152 m).Note that the maximum distance from the controller to any sensor is 500' (152 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' (1219 m) without the use of a repeater. A repeater is available for wire length greater than 4000' (1219 m). *See Page 37, Section 5.5.1*.

3.2.2 Position the controller at occupant level for ease of service. If the controller is more than 100' (30 m) from the pump a load reactor (P/N 90602460) must be used.

FIGURE 7: Controller Mounting - CORAYVAC™ Modulating Heating Control

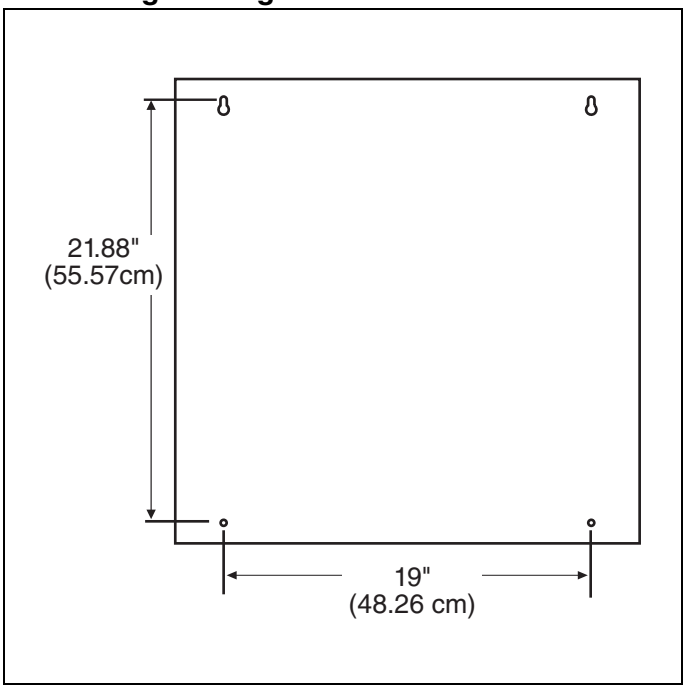
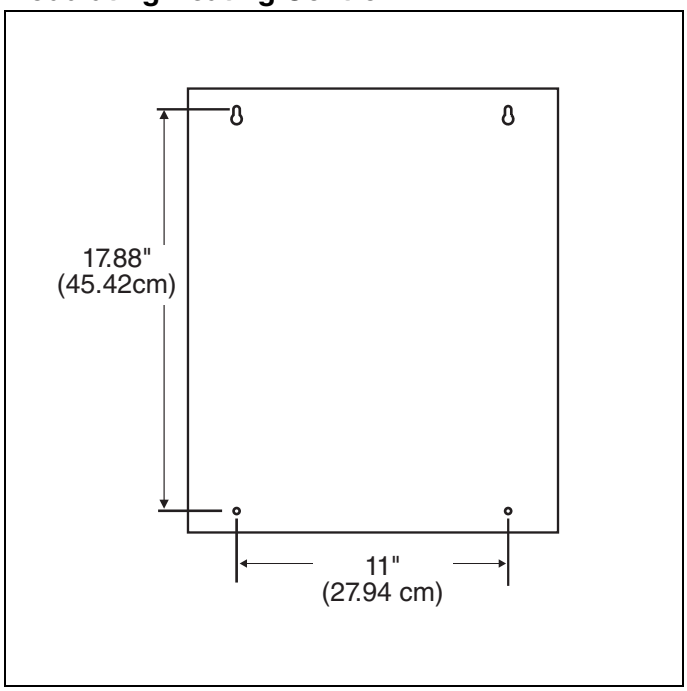


FIGURE 8: Controller Mounting - COMPLETE™ Modulating Heating Control



NOTE: A paper mounting template is included with the CORAYVAC™ Modulating Heating Control and the COMPLETE™ Modulating Heating Control panels. Appropriately position the template on the mounting surface, ensuring the template is level prior to marking each mounting hole shown on template. Pre-drill mounting holes using a 9/32" drill bit. Position control panel over pre-drilled holes and secure control panel using minimum 5/16 - 18 x 2" bolts and washers (not supplied).

3.3 Cable Requirements:

As per individual building specification for class of cable to be used. Use copper conductors only.

3.4 Check Installation Materials

3.4.1 Switchable Loads

The controller relays are rated for switching loads no greater than 6 A. The total added current load for all 4 relays must not exceed 20 A.

3.4.2 Control Wiring

Shielded cable (four wires of stranded 22 AWG minimum wire) is required for use with indoor sensors.

Shielded cable (one twisted pair of stranded 18 AWG minimum wire) is required for the outdoor air sensor, VFD signal wiring and pressure switch.

Shielded cable (one twisted pair of stranded 22 AWG minimum high speed, low capacitance wire) is required for MS/TP communications between controllers.

3.4.3 Programming Details

Controllers are pre-programmed. Can be configured in the field to any combination of one/two pumps, four heating zones, and unitary heaters.

3.4.4 CORAYVAC™ Modulating Heating Control

Below is the recommended cable for the various connections for CORAYVAC™ Modulating Heating Control:

- **Control Power Supply**
  The power connection should be made with cable, size 12 AWG.
- **Four Digital Output (Relays)**
  The control connection for load of each individual relay should be made with cable, size 14 AWG.
- **Digital Input**
  The wiring connection for the pressure switch should be unshielded cable, size 18 AWG.
- **Indoor Sensor Cable**
  a) Shielded cable - 4-wire, stranded, 22 AWG minimum or equivalent.
  b) Unshielded cable - 4-wire, stranded, 22 AWG minimum or equivalent.
- **Outdoor Sensor Cable**
  Shielded cable - One twisted pair of 18 AWG minimum or equivalent Belden #8451, #1503A; General Cable #C2514.
- **Communications between Multiple Controllers (MS/TP)**
  One twisted pair of 22 AWG minimum or equivalent shielded high speed, low capacitance cable. Maximum network length: 4000' (1219 m) at 19.2K Baud Rate (max).

3.4.5 COMPLETE™ Modulating Heating Control

Below is the recommended cable for the various connections for COMPLETE™ Modulating Heating Control:

- **Control Power Supply**
  The power connection should be made with cable, size 12 AWG.
- **Four Relay Outputs**
  The control connection for load of each individual relay should be made with cable, size 18 AWG.
- **Digital Input**
  The wiring connection for the pressure switch should be unshielded cable, size 18 AWG.
- **Indoor Sensor Cable**
  a) Shielded cable - 4-wire, stranded, stranded, 22 AWG minimum or equivalent.
  b) Unshielded cable - 4-wire, stranded, stranded, 22 AWG minimum or equivalent AMP.
- **Outdoor Sensor Cable**
  Shielded cable - One twisted pair of 22 AWG minimum or equivalent.
- **Communications between Multiple Controllers (MS/TP)**
  One twisted pairs of 22 AWG minimum or equivalent shielded high speed, low capacitance cable. Maximum network length: 4000' (1219 m) at 19.2K Baud Rate (max).

3.4.6 Variable Frequency Drive (VFD)

Below is the recommended cable for the various connections for VFD:

- **Line Power Supply**

Input Wire Size Requirements

VFD	Wire Size
.75 HP 115v	10 AWG
.75 HP 230v 1ph	12 AWG
.75 HP 230v 3ph	12 AWG
2 HP 230v 1ph	12 AWG
2 HP 230v 3ph	12 AWG
.75 HP 460v 3ph	12 AWG
2 HP 460v 14 AWG	12 AWG

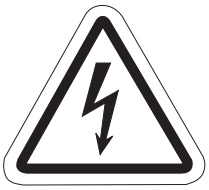
3.4.7 Repeater

Below is the recommended cable for the various connections for the repeater:

- **Line Power Supply**
  The power connection should be made with cable, size 18 AWG.
- **RS485 Communications**
  One twisted pairs of 22 AWG minimum or equivalent shielded cable; Belden #3105A.

3.5 Electrical Installation Requirements of CORAYVAC™ Modulating Heating Control

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

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

- CORAYVAC™ Modulating Heating Control must be feeding from a local fused isolator for a total amperage not exceeding **20 A**.
- Load on each individual relay must not exceed **6 A**.

NOTES:

- **The total added current load for each individual relay must not exceed 6 A.**
- **The total added current load for all 4 relays must not exceed 20 A.**

3.6 Pump Requirements

The pump is powered directly from the Variable Frequency Drive (VFD). The VFD will be energized via a Modbus command from the board.

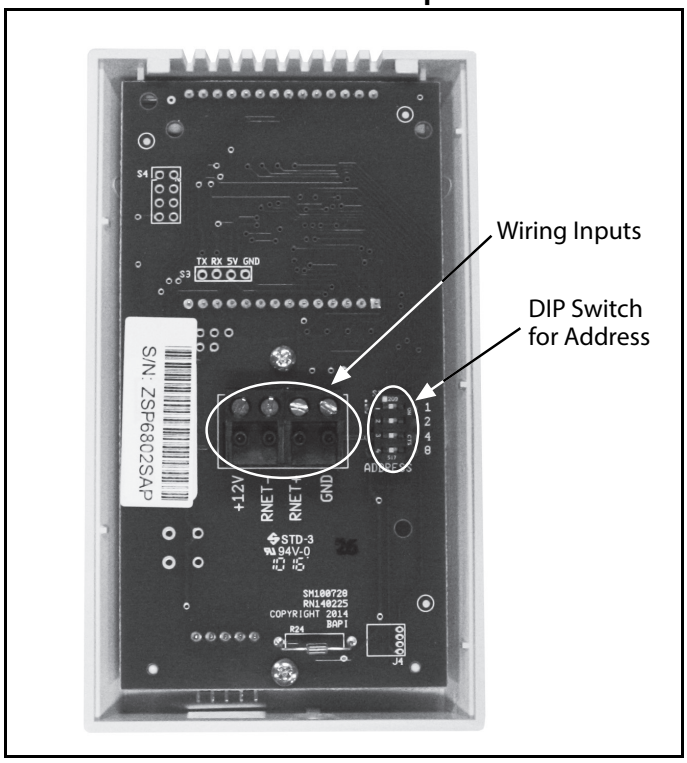
3.7 Variable Frequency Drive Requirements

The VFD must be powered separately. 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. The 480 drive power supply must be 480 V, 50-60 Hz, 3 Ø. See *Page 17, Section 2.6* for additional details. VFD on/off switching and speed command is done via a Modbus control signal. The VFD output supply to the pump is 230 V 3 Ø 0-60 Hz for 115 V and 230 V models and is 480 V, 3 Ø, 0-60 Hz for 480 V models. The frequency of the output supply signal to the pump will be varied based on the Modbus signal from the control board. See *Page 18, Section 3.2* for additional installation requirements.

3.8 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), in direct sunlight or in the path of other sources of radiant heat. The sensors are suitable for direct surface mounting or 4" (10.2 cm) x 2.13" (5.4 cm) junction box mounting. Sensors should be daisy chained together with a maximum length of the chain at 500 ft (152 m). Beyond this, communication issues may arise. The controller can lie at any point along the chain.

FIGURE 9: Indoor Sensor Components



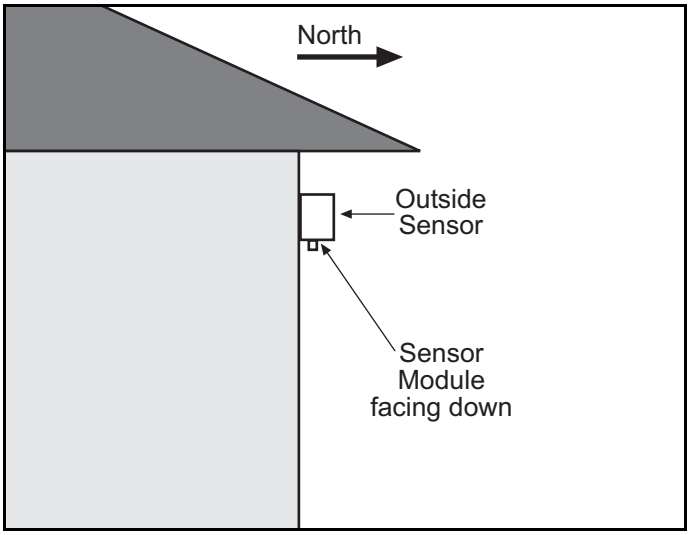
3.8.1 Indoor Sensor Mounting

Remove the cover of the sensor by the screw, located on the bottom. Secure the sensor to the wall or junction box using the screws provided. Secure the cover. Remove sensor cover and adjust dip switch setting 1 thru 4 to match zone number that sensor is allocated for.

3.9 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



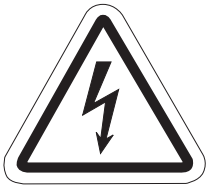
Mount the outside sensor with the sensor module facing down to prevent accumulation of dirt or water.

3.10 Outside Air Supply

If an outside air blower is to be used, see CORAYVAC® Installation, Operation and Service Manual (127102NA).

SECTION 4: TYPICAL EXTERNAL DIAGRAMS

⚠ DANGER



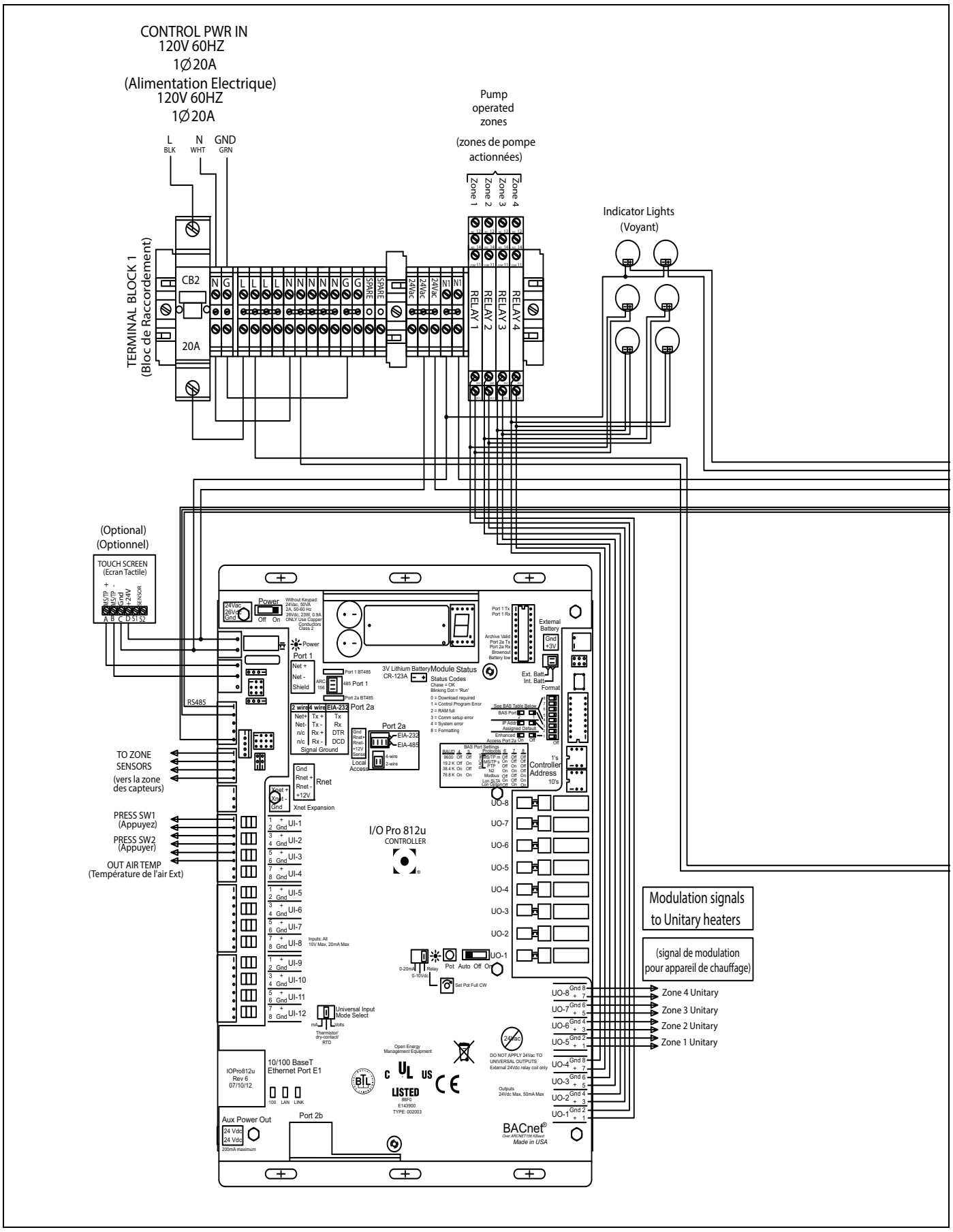
Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

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

FIGURE 11: CORAYVAC™ Modulating Heating Control Central and Satellite Controller Internal Wiring 1 PH



CORAYVAC™ Modulating Heating Control Central and Satellite Controller Internal Wiring 1 PH (continued)

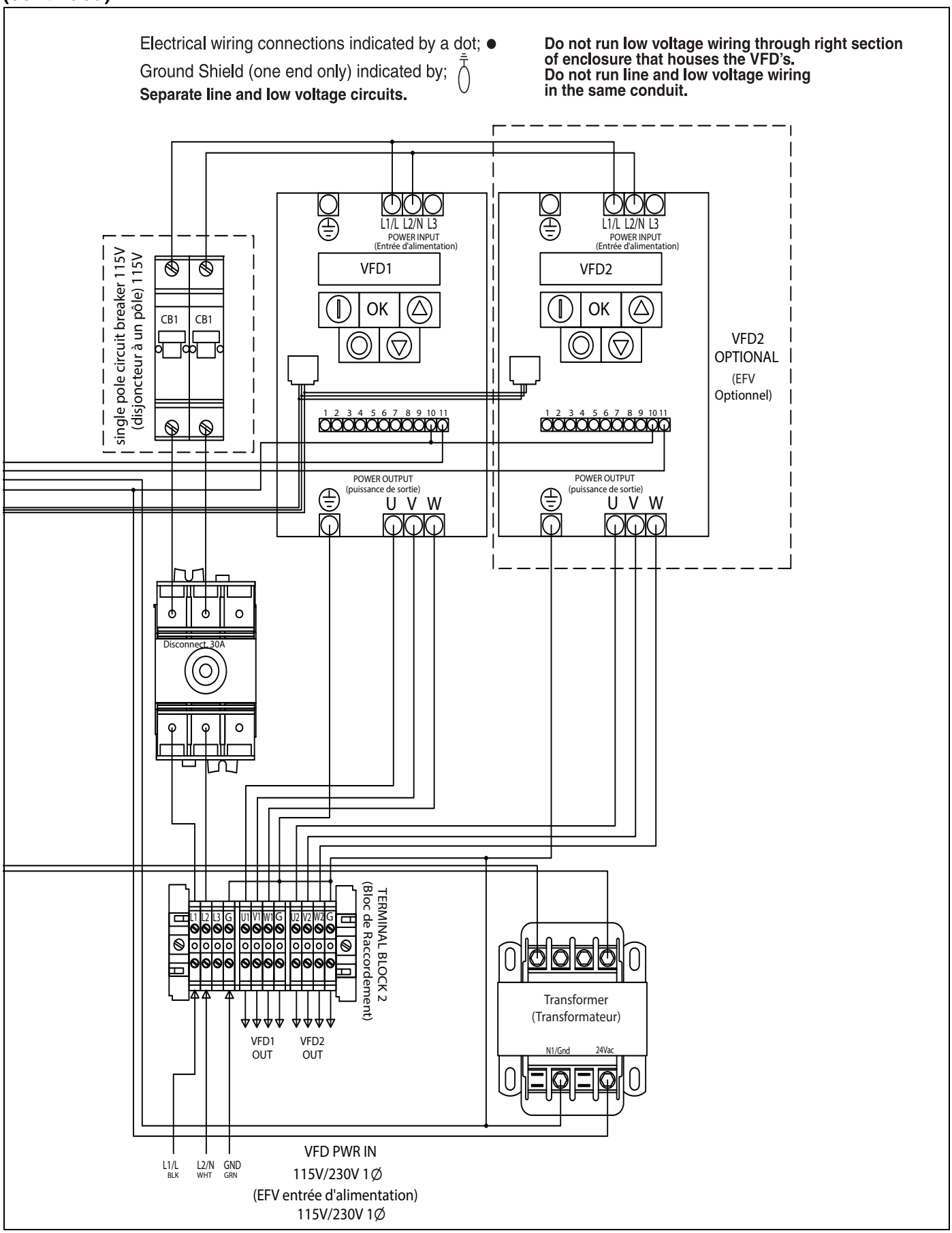
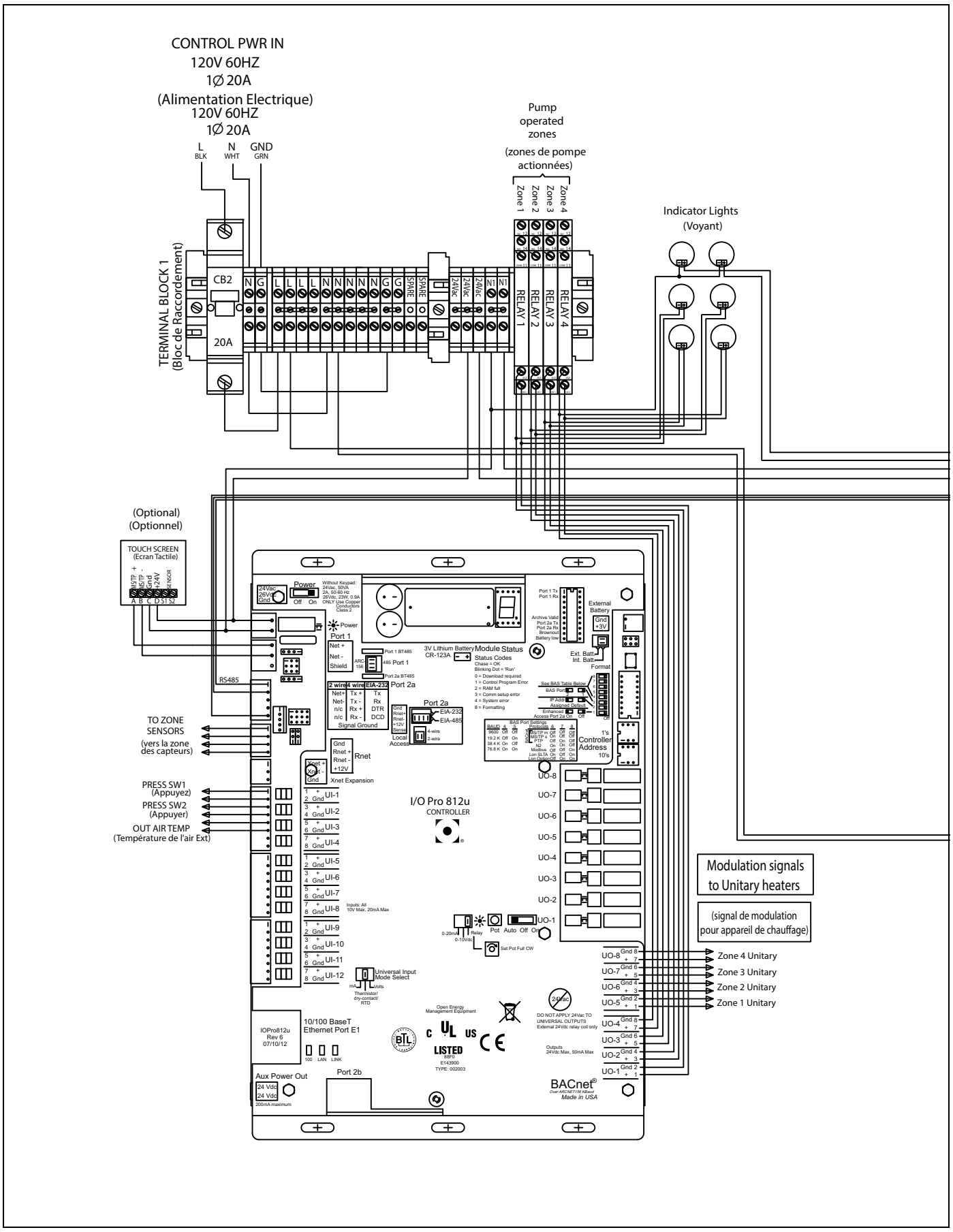


FIGURE 12: CORAYVAC™ Modulating Heating Control Central and Satellite Controller Internal Wiring 3 PH



CORAYVAC™ Modulating Heating Control Central and Satellite Controller Internal Wiring 3 PH (continued)

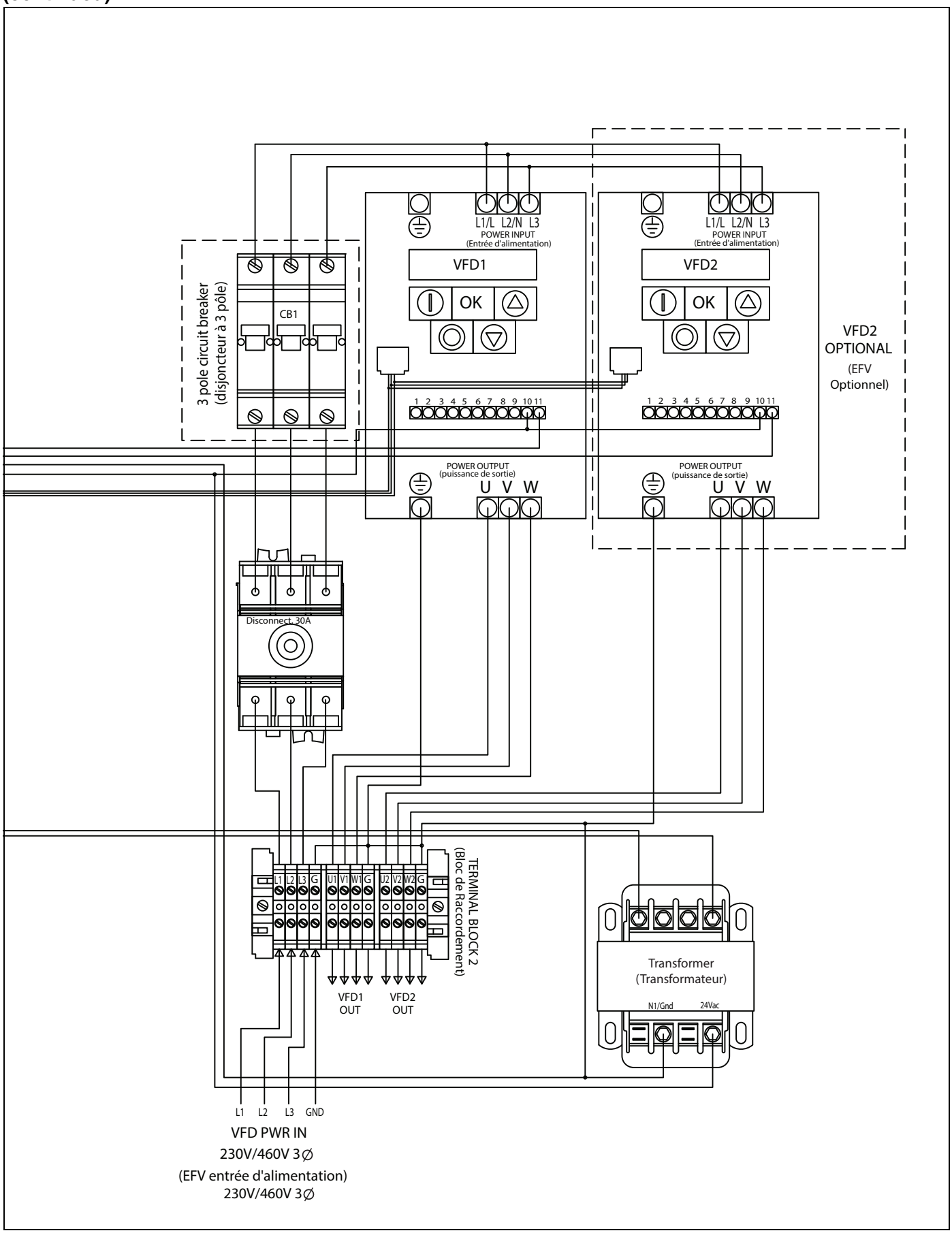
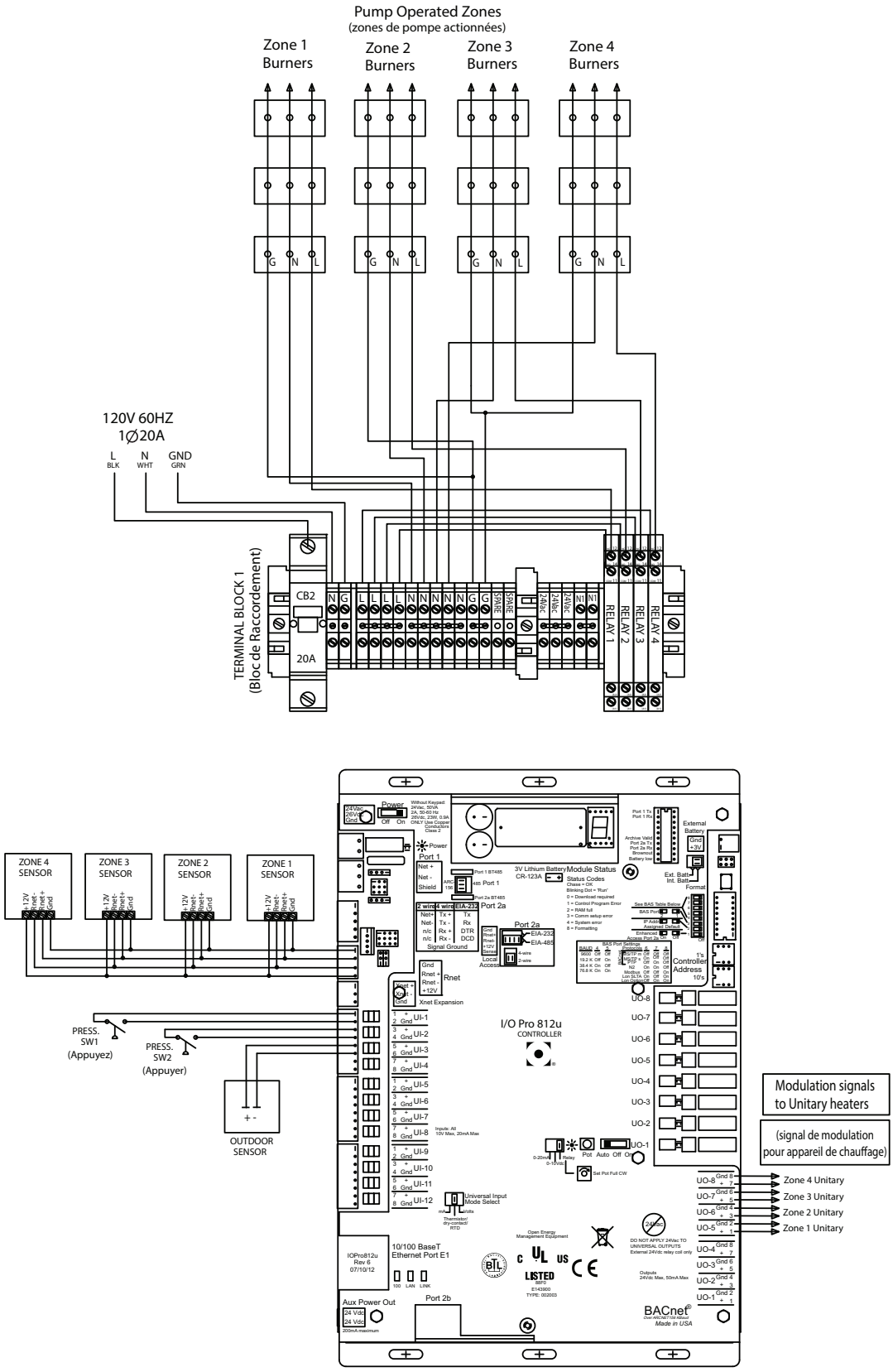


FIGURE 13: CORAYVAC™ Modulating Heating Control Central and Satellite Controller External Wiring 1 PH



CORAYVAC™ Modulating Heating Control Central and Satellite Controller External Wiring 1 PH (continued)

Electrical wiring connections indicated by a dot; ●

Ground Shield (one end only) indicated by;

Separate line and low voltage circuits.

Do not run low voltage wiring through right section of enclosure that houses the VFD's.
Do not run line and low voltage wiring in the same conduit.

NOTE 1: Twist shield wires for both MS/TP communication cables together and ground at central panel only. On controller #1 only, connect these twisted shield wires to ground.

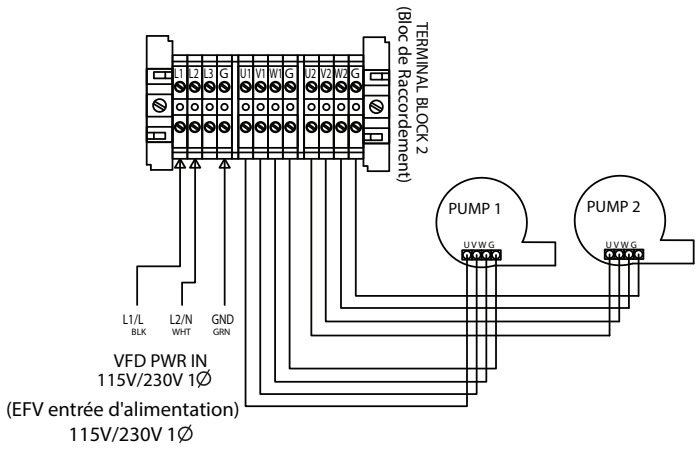
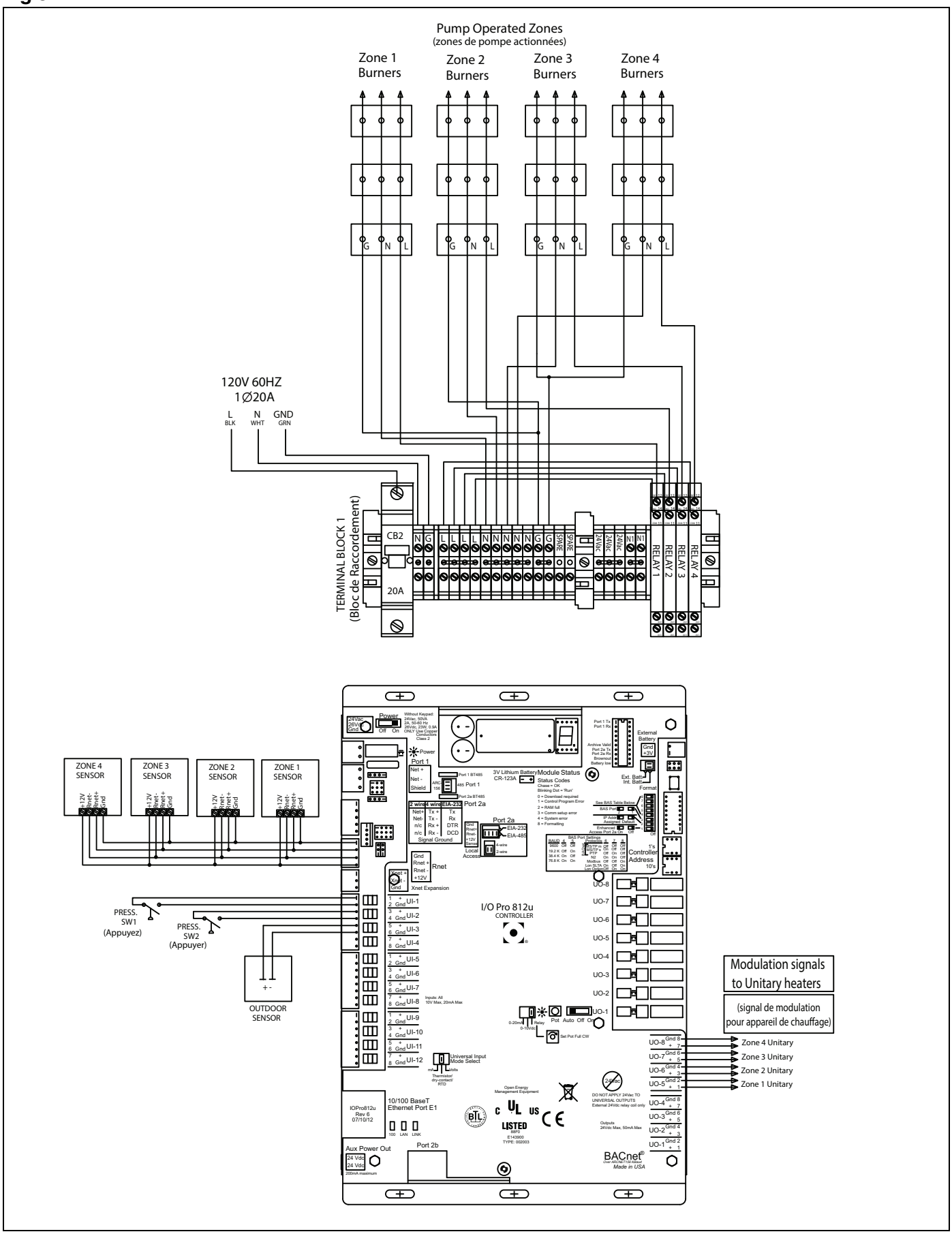


FIGURE 14: CORAYVAC™ Modulating Heating Control Central and Satellite Controller External Wiring 3 PH



CORAYVAC™ Modulating Heating Control Central and Satellite Controller External Wiring 3 PH (continued)

Electrical wiring connections indicated by a dot; ●

Ground Shield (one end only) indicated by;

Separate line and low voltage circuits.

Do not run low voltage wiring through right section of enclosure that houses the VFD's.
Do not run line and low voltage wiring in the same conduit.

NOTE 1: Twist shield wires for both MS/TP communication cables together and ground at central panel only. On controller #1 only, connect these twisted shield wires to ground.

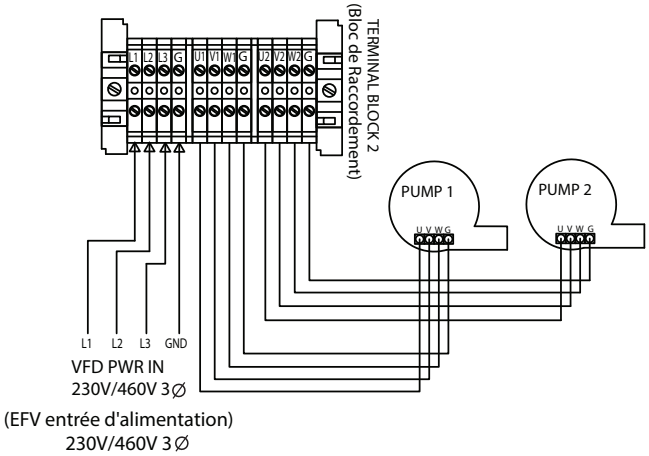
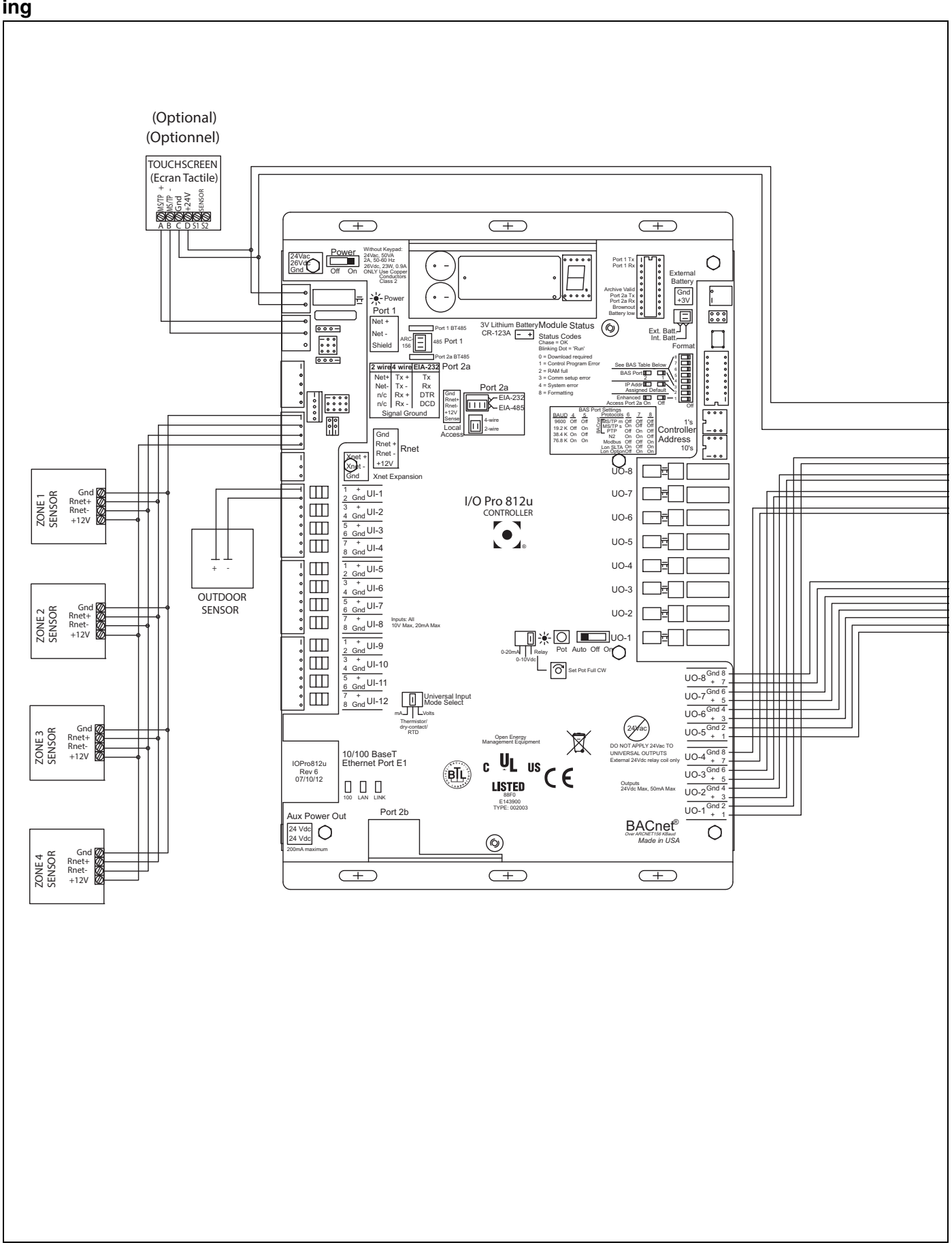
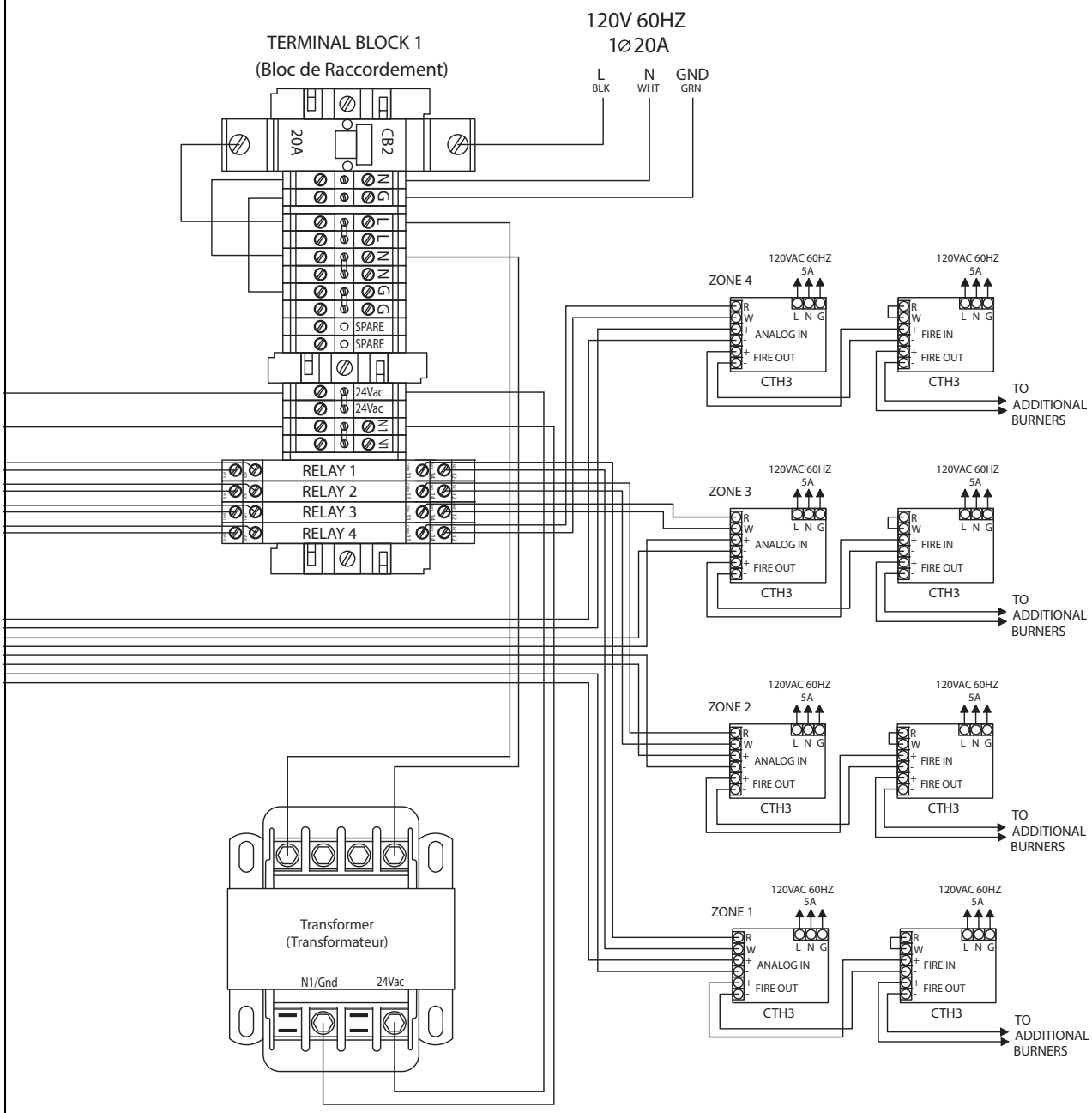


FIGURE 15: COMPLETE™ Modulating Heating Control (Unitary) Central and Satellite Controller Wiring



COMPLETE™ Modulating Heating Control (Unitary) Central and Satellite Controller Wiring (continued)



SECTION 5: COMMUNICATIONS

One ROBERTS GORDON® CORAYVAC™ Modulating Heating Control Controller per building (called the "central controller") comes standard with a touch screen. The central controller communicates with all satellite controllers, and unitary controller when applicable. More than one "central" controller can be used, if desired.

If multiple CORAYVAC™ Modulating Heating Control 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 35, Section 5.2*.

5.1 WebCTRL®

For remote on-site and off-site control, the WebCTRL® package is recommended. Controllers IP address is modified to put them out the local network. A WebCTRL® license is issued and software installed on one computer on network. WebCTRL® packages recommended for buildings with 10 or more control panels. DIP switch on the controller is changed to allow new IP address configuration. Contact Roberts-Gordon LLC or your independent ROBERTS GORDON® distributor for more details.

5.2 Communications Between Multiple CORAYVAC™ Modulating Heating Controls

If more than one CORAYVAC™ Modulating Heating Control is installed in a building, the controllers' MS/TP communications must be wired in series. *See Page 35, Figure 16*. Connect the MS/TP (Port 1) terminal on controller #1 to the MS/TP (Port 1) terminal on controller #2 and so on in a daisy chain fashion.

Shield wires for MS/TP cables should be twisted together, but not grounded, at all satellite controllers in daisy chain. Ground shield wire at central panel only.

Maximum of 31 satellite controllers per central controller. For communication cable requirements, *See Page 20, Section 3.4.2*

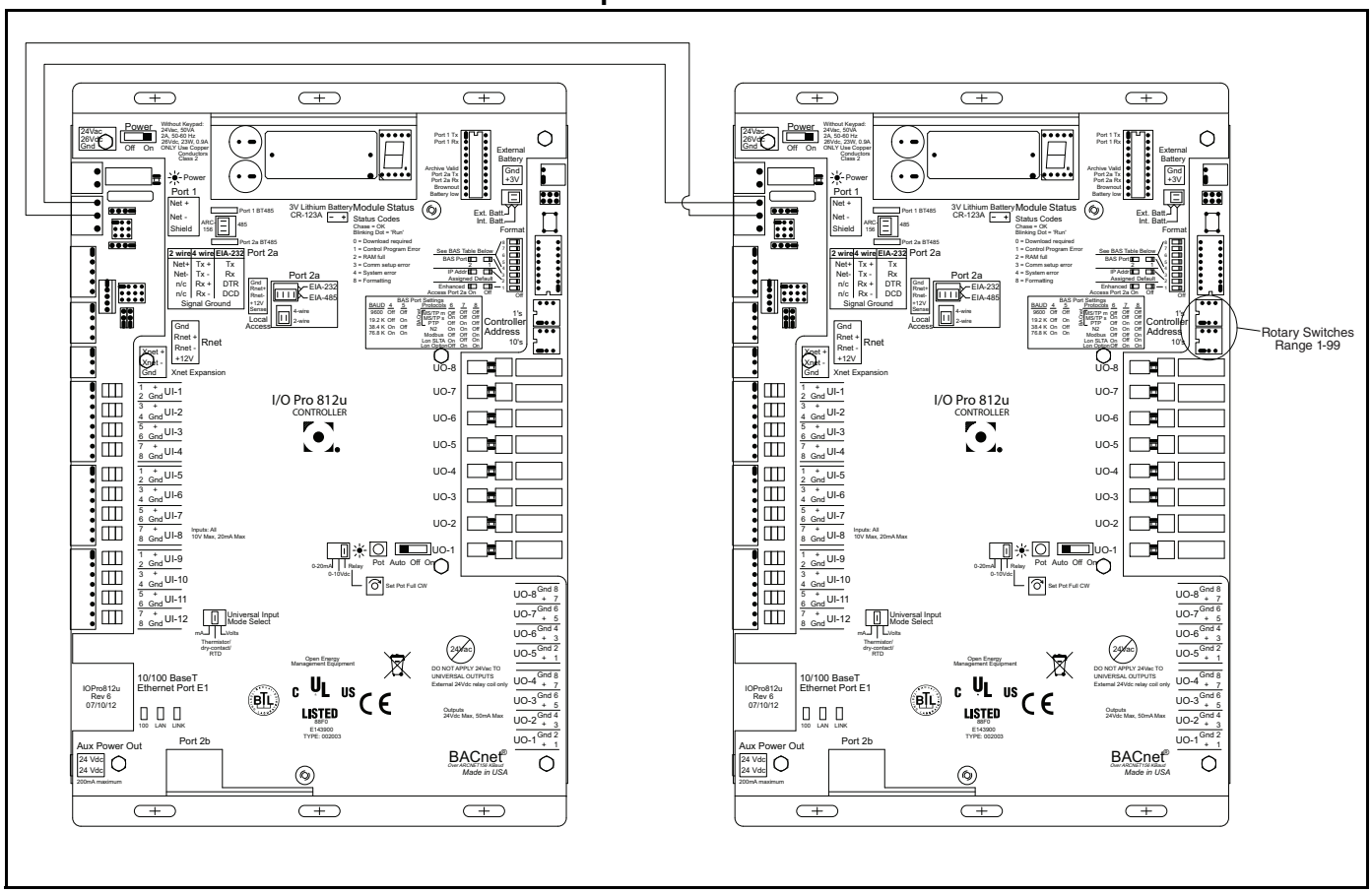
A MAC address is required for each central and satellite controller using the "Rotary Switches" *See Page 16, Figure 6*. There are 2 rotary switches. The upper rotary switch is labeled "1's" and lower rotary switch is labeled "10's". To set the MAC address for the first 10 controllers, the lower rotary switch (10's) is set to "0", the upper rotary switch (1's) is set to the appropriate controller number. To set the MAC address for controller numbers 11 and up, the setting of the lower rotary switch (10's) must be combined with the value of the upper rotary switch (1's).

For example: To set the MAC address to "17", adjust the lower rotary switch (10's) to "1" and adjust the upper rotary switch (1's) to "7".

NOTE: All central controllers should be set to "1". All controllers should have a unique number assigned using the rotary switch dials. Changes to the rotary switches are acknowledged only after the board has been power cycled.

Contact Roberts-Gordon or your ROBERTS GORDON® independent distributor, if more than 31 satellite controllers are required.

FIGURE 16: Communications Between Multiple Controllers



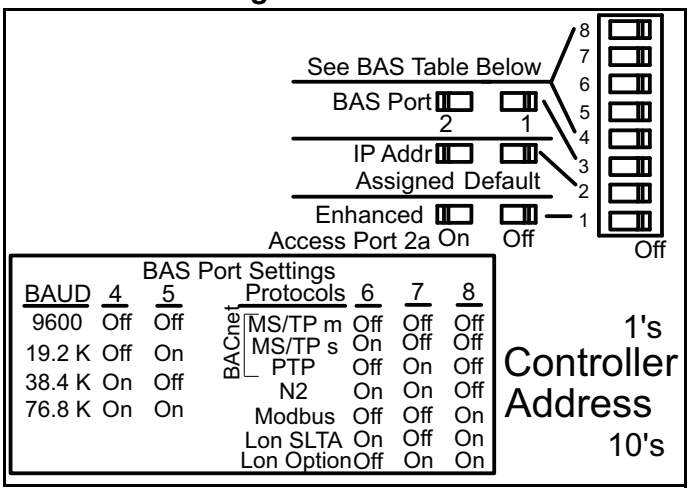
5.3 Setting Baud Rate

To set the baud rate for the MS/TP network on Port 1 configure the board for a baud rate of 19.2K by setting DIP swtich #5 to "ON". See chart in *Figure 17* for baud rate settings.

NOTE: Changes to the DIP switches are acknowledged only after the board has been power cycled.

NOTE: Higher baud rates can be used over shorter distances. The maximum rate of 76.8k can be used for distances up to 2000ft (609m). A terminating resistor is required for 76.8k. A baud rate of 38.4k can be used without terminating resistors.

FIGURE 17: Setting Baud Rate



5.4 Control Board Setup

Universal Inputs and Outputs, Ports, Rotary Switches and DIP switch must all be configured for the board to work properly. Reference the labeled control board, Section 2, Fig 6, for help locating parts on the control board.

Each Input and Output has a configurable jumper. For the Universal Inputs (UI) the jumpers are located next to the input terminals. Only the first 3 UI's will be used. Each of these should have their jumper set to 'Thermistor/dry-contact/RTD'. This is the middle jumper position. A diagram of the jumper configurations is also shown on the board.

For the Universal Outputs (UO) the jumpers are located next to the HOA switches. All 8 UO's are potentially used. Each one should have their jumper set to the 'Relay' position with the POT dial set full clockwise. A diagram consisting of the jumper, the indicator light, the Pot dial and HOA switch is also shown on the board. Each HOA switch should be set to AUTO.

CAUTION NOTE: Setting the HOA switch to MANUALLY ON is potentially hazardous. A MANUALLY ON switch may send power to the burners when the vacuum pump is not on. Only qualified technicians should operate the HOA switches outside of their AUTO position.

Port 1 and Port 2a need to be configured to operate as the BMS port and the device port, respectively. To do this, a combination of the Port jumpers and the DIP switch configuration is required. To ensure Port 1 is operating as the BMS/BAS Port, switch 3 of the DIP switch should be OFF. Switches 6, 7 & 8 should be configured for BACnet MS/TP m(master) as shown in the diagram on the board. Each should be set to OFF. Finally, the Baud Rate for Port 1 is set using switches 4 & 5. It is important to note that the maximum communication distance achievable before a REPEATER is necessary (4000 ft, 1219 m) is dependent on the Baud Rate. A maximum Baud Rate of 19.2 K can be used for distances up to 4000 ft (1219 m). If the maximum Baud Rate of the Port is used, 76.8 K, a REPEATER is required after 2000 ft (609 m). Set switch 4 to OFF and switch 5 to ON for 19.2K. DIP switch set up is complete. Only switch 5 should be ON. Lastly for Port 1, the jumper should be set to 485.

Port 2a is used as a device port to communicate with the VFD's. Port 2a has two jumpers used to set its configuration. These jumpers should be set to EIA-485, 2-wire.

5.5 Initial Touchscreen Setup

Login for setup is **Username: Admin; Password: admin**. The touchscreen runs on 24V power taken from terminal block 1 and is connected to the MS/TP network through Port 1 on the central controller control board. Only 1 touchscreen is required to control up to 31 satellite controllers. Satellite controllers are connected to MS/TP by daisy chaining Port 1 to Port 1 as shown in *Figure 16*. Prior to configuring touchscreen, complete steps described in Section 5.2 and Section 5.3.

Navigate to home screen by pressing the "Home" icon at top left of touchscreen. From **Home** press **Setup → Communications**. Select the 19200 baud rate and press **Save**. This will allow the central control panel to communicate with all satellite controllers on network.

Next, on the Setup screen, hit **Discovery** then **Set Range**. Define a smaller range here or leave at the default values. → **Save**.

Next, on the **Discovery** screen, touch **Discover**. When this is complete, a list of every BACnet controller found on the network will appear.

Edit names of discovered devices if so desired. Check the box for all controllers that you want on the network and click **Create DB**. The **System View** screen shows the new system. Click one of the controllers in the list to go to the local control screen for that controller. Set a home screen by entering touch-screen setup, home screen setup.

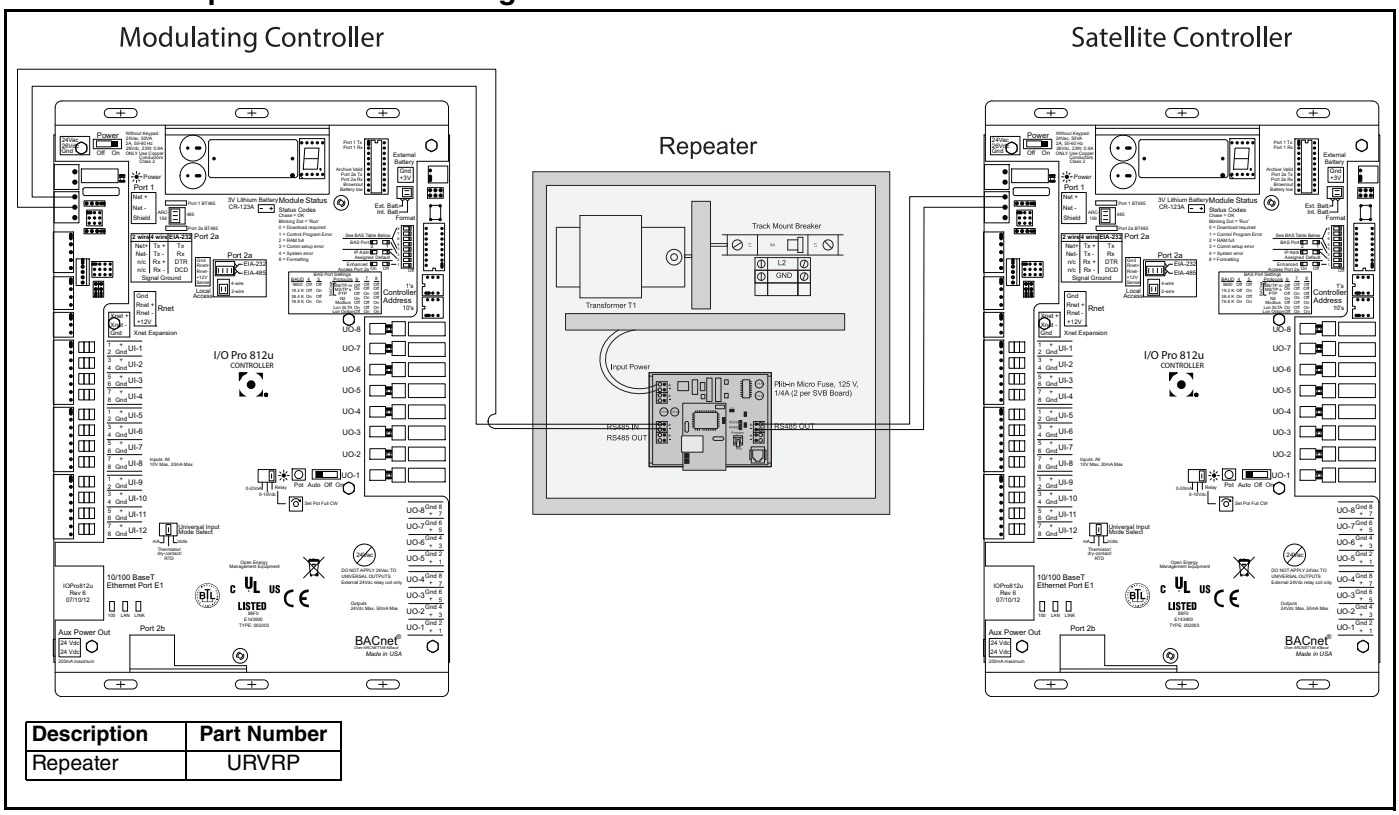
5.5.1 Repeater

If the MS/TP communications wire length is above 4000' (1219 m), a repeater must be used to extend the signal. The repeater can also be used to install in different methods:

- To extend communications beyond the standard 4000' (1219 m) limitation. *See Page 37, Figure 18*.
- To add parallel branches of ROBERTS GORDON® CORAYVAC™ Modulating Heating Control communications bus wiring.
  See Page 38, Figure 19.

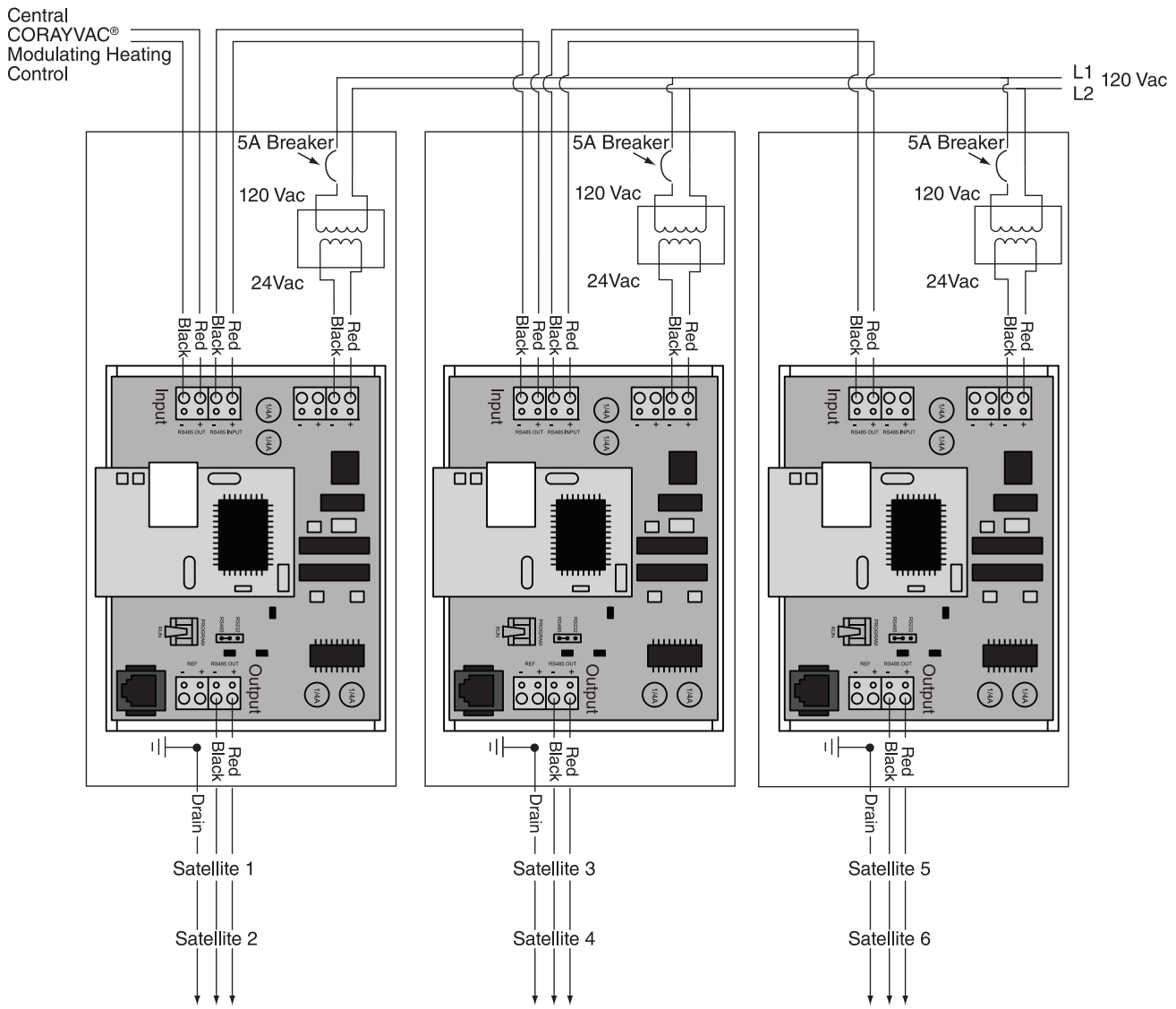
NOTE: The maximum number of ROBERTS GORDON® CORAYVAC™ Modulating Heating Controls that can be installed is 32.

FIGURE 18: Repeater External Wiring



Description	Part Number
Repeater	URVRP

FIGURE 19: Repeater Communication Wiring Between Multiple Controllers



Description	Part Number
Repeater	URVRP

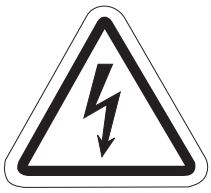
SECTION 6: VARIABLE FREQUENCY DRIVE PROGRAMMING FOR USE WITH ROBERTS GORDON® CORAYVAC™ MODULATING HEATING CONTROL

6.1 VFD Parameter Settings For Use With ROBERTS GORDON® CORAYVAC™ Modulating Heating Control

The VFD parameters come with factory default settings. The following parameter settings must be changed. 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 is set to off.

⚠DANGER



Electrical Shock Hazard

Enclosure contains live electrical components.

Programming must be done by a trained technician only.

Replace cover before operating.

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

To override the rotary disconnect switch inside the VFD enclosure, turn the square rod with a wrench to the ON position. In order to be able to close the cover of the disconnect, the rods need to be turned back to the OFF position.

6.1.1

To enter the PROGRAM mode and access the parameters, hold "OK" until P01 appears.

Display reads "P01"

6.1.2

Use the arrow buttons to scroll to P14 (the factory set password is 0.0).

Press "OK" to enter password (101). This unlocks parameters higher than P14.

6.1.3 Use the arrow buttons to scroll to the desired parameter number. For new parameter settings *See Page 40, Section 6.2*.

6.1.4 Once the desired parameter number is found:

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

Use arrow buttons to change setting.

Press "OK" to store new setting. Continue scrolling through the parameters

6.2 Altering VFD Parameters For Use With ROBERTS GORDON® CORAYVAC™ Modulating Heating Control

Parameter Number	Parameter Name	Factory Default	New Setting
P01	Maximum Frequency (Hz)	50.0	60.0
P02	Minimum Frequency (Hz)	0.0	0.0
P03	Accel. Time (sec)	5	10
P04	Decel. Time (sec)	5	10
P07	Nominal Motor Voltage (V)	230*	(Motor Voltage)
P08	Rated Motor Current (A)	4.8	(Rated Motor Current from Motor Data Plate)
P09	Rated Motor Frequency (Hz)	50.0	(Rated Motor Frequency from Motor Data Plate)
P12	Control Level	0.0	3 - Modbus (internal ramp times)
P14**	VFD Access Code	0.0	101.0
P36	Communication Configuration	-	VFD Slave Address (1) or (2)
		-	Modbus RTU baud Rate (9600)
		-	Time Out (0)

* Depends on the VFD rated power

**Parameter Number P14 set to 101 unlocks parameters P15-P53

SECTION 7: COMMISSIONING THE CORAYVAC® SYSTEM

NOTE: The ROBERTS GORDON® CORAYVAC™ Modulating Heating Control central controller is fitted with a touchscreen for communication to the CORAYVAC® system and all CORAYVAC® Modulating Heating Control satellite controllers (maximum of 31 satellite controllers per central controller). All wiring must be complete prior to commissioning the system.

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 NOTE: The VFD(s) should be programmed using the procedure and parameters described on *on Page 39, Section 6 through Page 40, Section 6.2* prior to this step. At the VFD press and hold "OK" until P-01 appears. This will allow access to the PROGRAM mode to adjust parameters. Using the arrow button, scroll to P-12 and set parameter to "01". Press "OK" to store new setting. Press "START" button on VFD to turn on the CORAYVAC® vacuum pump. Pump should ramp up to value set in P-01. Verify pump rotation. Pump impeller should be rotating in direction of arrow stamped on vacuum pump housing.

On the control board, switch the relevant "HOA" switches to "Manual On" position to turn on the zones connected to the vacuum pump. *See Page 16, Figure 6* for control board layout.

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 42, Figure 20*.
If the lowest end vent vacuum reading is above 3.0" wc, 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" wc. Make note of this frequency setting below. The frequency is found on the VFD's LCD screen.

2.5" wc - 3.0" wc 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" wc. *See Page 42, Figure 20*. 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 43, Figure 21*.

Step 7.1.3 After setting end vent vacuums between 2.5" wc and 3.0" wc, 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" wc - 1.2" wc, Make note of this frequency setting below. The frequency is found on the VFD's LCD screen.

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

Record Frequency Setting Here:

Step 7.1.4 Press the "STOP" button on VFD. Return "HOA" switches to "Auto".

Step 7.1.5 Using the procedure described on *Page 39, Section 6*, alter parameters "P-01" and "P-02" to maximum and minimum frequency settings. Return parameter "P-12" to "03".

FIGURE 20: End Vent Vacuum

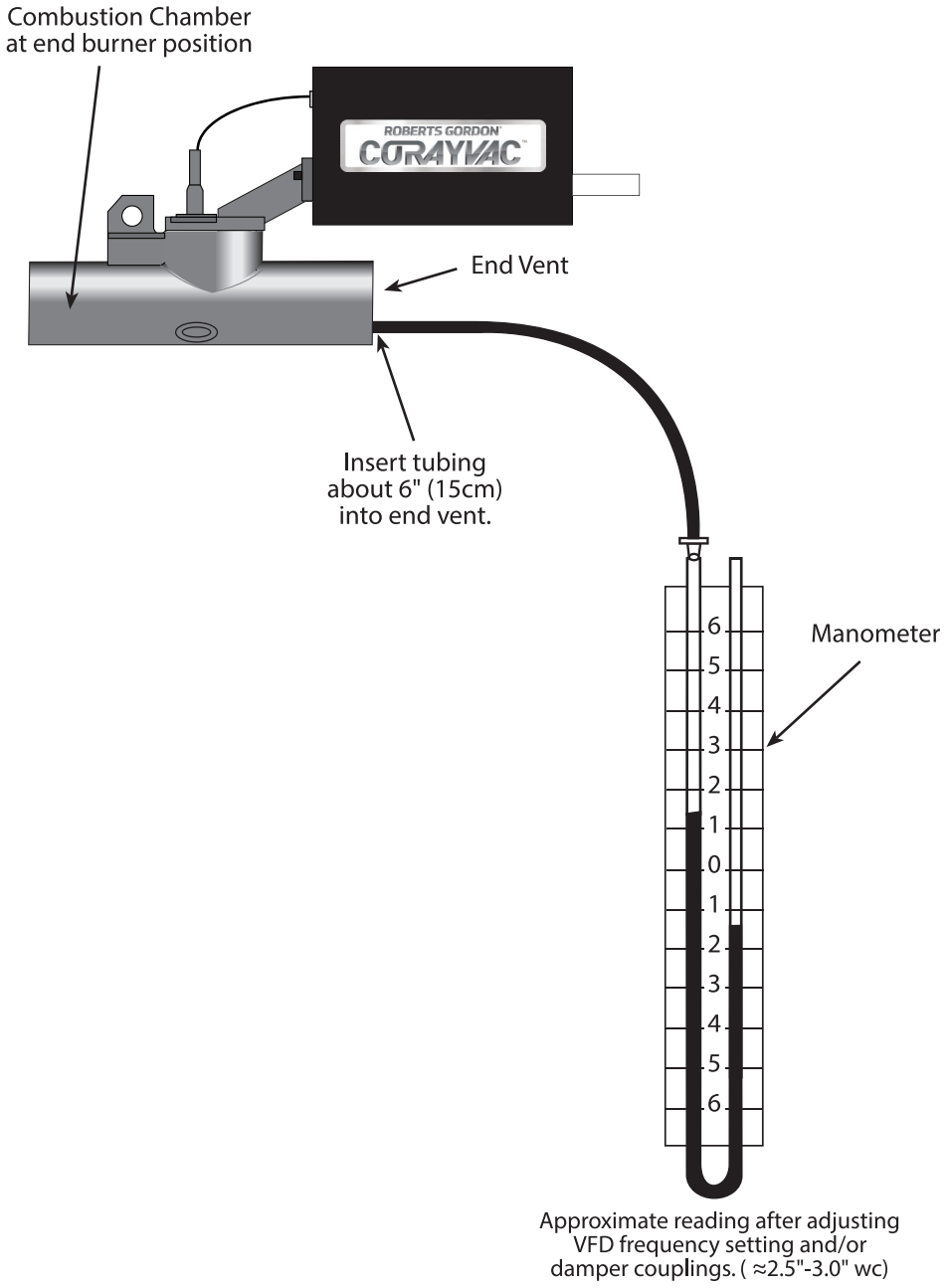
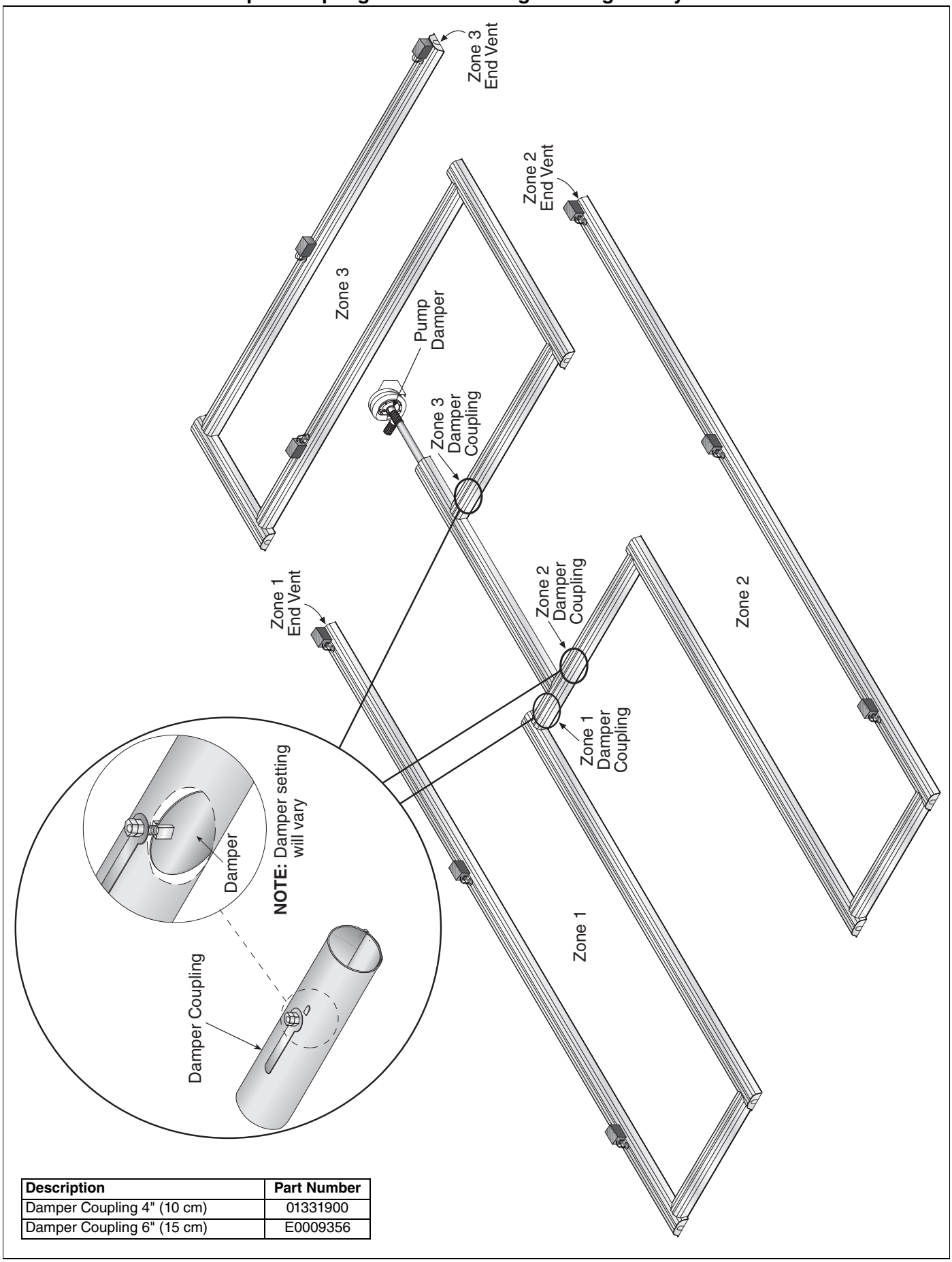


FIGURE 21: Possible Damper Couplings' LocationsProgramming The System



Description	Part Number
Damper Coupling 4" (10 cm)	01331900
Damper Coupling 6" (15 cm)	E0009356

SECTION 8: FACTORY DEFAULT PROGRAMMING AND TROUBLESHOOTING THE SYSTEM

The CORAYVAC® Modulating Heating Control comes standard with Heater and Zone programs to operate Roberts-Gordon heating equipment. The revision of programs is shown on touchscreen under **Menu → Maintenance – Unit.**

Program features important to the user upon startup are described below. This section will provide details on how to modify these settings.

The program defaults to 4 CORAYVAC® heating zones. Zones 1 & 2 are associated with Pump 1 and Zones 3 & 4 associated with Pump 2. It is important that hard wired configuration matches internal programs pump to zone association to avoid power being sent to burners not under vacuum. *See Section 8* for details on how to modify the Type of zone and this association.

The controller comes without any schedule for each of the heating zones. Manual occupancy can be started at the zone sensor for a chosen length of time until the schedule is populated.

The heating setpoint for the Occupied and Unoccupied states defaults to 68° F and 60° F.

Two settings exist to ensure setpoint is reached in various conditions. Modulation Override Temperature Offset is set to 5° F. This feature commands 100% heat if the zone temperature falls 5° F below setpoint. A timeout also exists such that if the zone temperature is not within 1° F of the setpoint within 30 minutes, a 100% heat command is issued. This 30 minutes is not editable.

Limits on the degree to which the setpoint can be adjusted at the zone sensor default to +/- 5° F.

The system modulates on internal and external design temperatures, and the outside air temperature. Adjustments to the external design temperature based on local, seasonal, temperatures are important to ensure the system is modulating properly. Default Internal and External temps are 68° F and 0° F.

For COMPLETE™ Modulating unitary heaters, an initial 100% heat command is issued for 3 minutes. This overlaps the startup procedure programmed into the COMPLETE™ Modulating burner. After this the COMPLETE™ Modulating burner will modulate accordingly. Post-purge operations are also programmed directly into the COMPLETE™ Modulating burner. See COMPLETE™ Modulating installation and operation manual (P/N 134100NA) for further details.

For CORAYVAC® systems, an initial 100% heat command is issued for 2 minutes. After the heat request has been satisfied, a 2-minute post-purge command is issued.

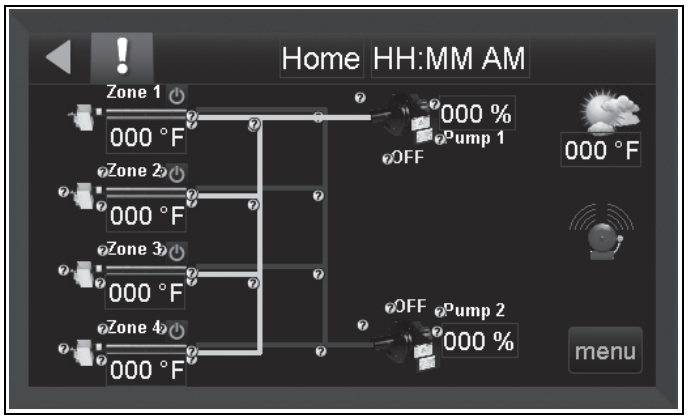
When networking multiple controllers together, the Outside Air Temperature (OAT) sensor can be connected locally to any controller. Once network communications have been established the OAT will be broadcast to each controller.

The controller also comes standard with an Optimum Start feature. This feature reads the OAT, current zone temperature, occupied setpoint, and time left before occupancy, and begins heating the area so that the setpoint is reached when occupancy begins. The feature is set to not start more than 30 minutes before scheduled occupancy.

Notes:

- Ensure Initial Touchscreen Setup has been completed before proceeding, *See Page 36, Section 5.5*.
- A slight delay exists when processing information on the touchscreen. Allow the screen to process information before navigating away from the current screen
- Blue text indicates an editable field. Yellow text cannot be changed

8.1 Home Screen



Home Screen Includes:

Zone Icons:

- Temp display

- Power button indicating occupancy status
- Heater tube indicating heat on/off
- Link to zone screen by clicking on the temperature

Pump Icons:

- On/off status
- Run % status

Zone-to-Pump Association Wiring:

Yellow and Blue wires indicate which pump a CORAYVAC® zone is connected to within the controller's logic. (See Service Configuration) These wires do not necessarily indicate hardwire connections. Ensure the hardwired connections match the connections within the logic

Outside Air Temperature

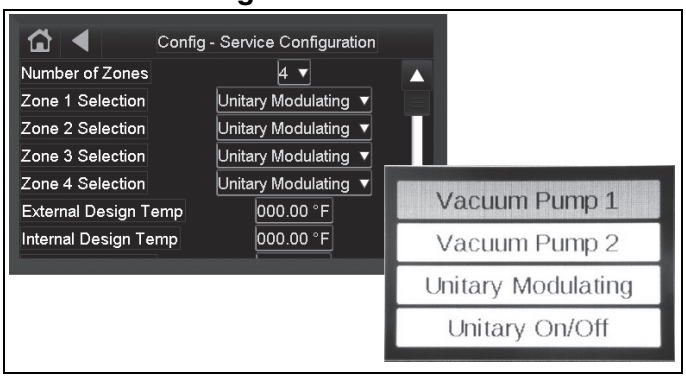
Alarm Icon:

- Active alarms display
- Link to alarm info screen

Menu Button:

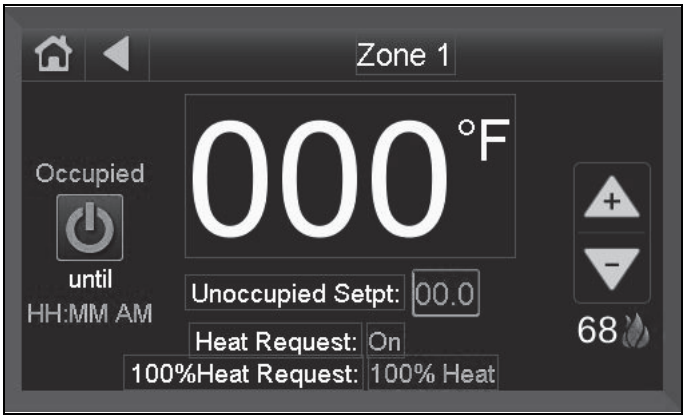
- Link to property menu

8.2 Service Configuration



- Set number of zones by clicking the dropdown menu for the number
- Set type of heater by clicking the dropdown menu for each zone

8.3 Zone Screen

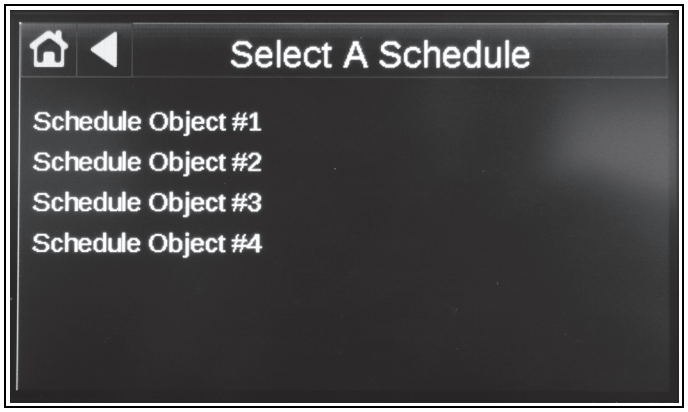


- Temperature display
- Heat request status
- 100% heat request status
- Occupancy status and override button
- Unoccupied Setpoint
- Setpoint adjustment and effective setpoint display.

NOTE: Allow a few seconds after adjusting setpoint for information to process before navigating away from page.

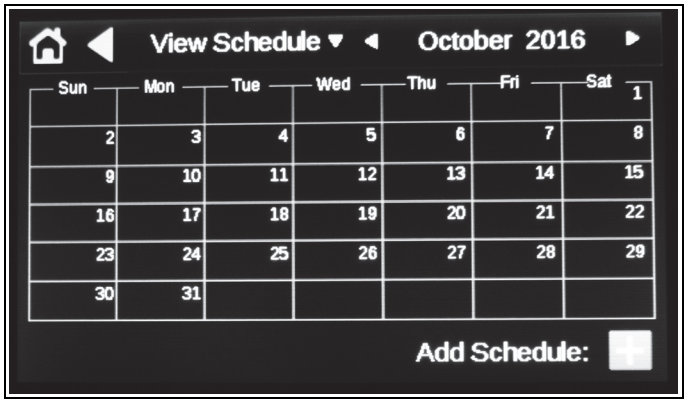
NOTE: Setpoint displayed also reflects any adjustments made at the zone sensor. This is the "Effective Setpoint". For the above example, the setpoint is set at 68° F. If the user adjusts this to 70° F at the zone sensor, 70° F will appear on the zone screen. Adjustments made at the touchscreen will be from the base setpoint (68° F). If user then turns up the temperature 2° more, it will show the adjustment from 68°-70°, and then jump to 72° to reflect the zone sensor adjustment.

8.4 Schedule Creation

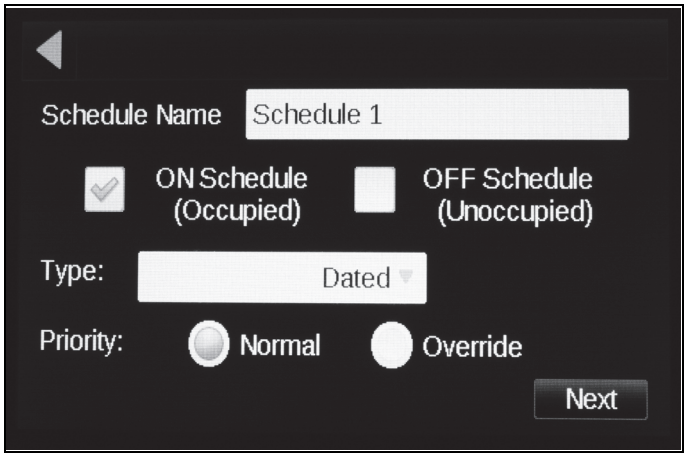


- Schedule objects 1- 4 shown for zones 1 - 4
- Select an Object to change that Zones schedule
- Each zone must be programmed individually unless the WebCTRL® package is purchased.

Calendar View



- Add schedule. Click the (+) at the bottom right of the screen.



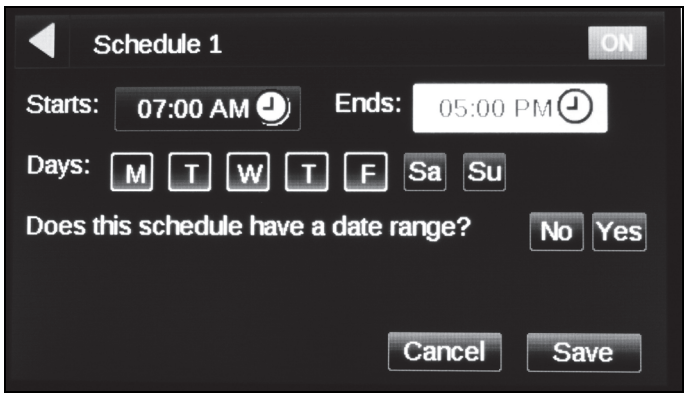
- Enter a name for the schedule

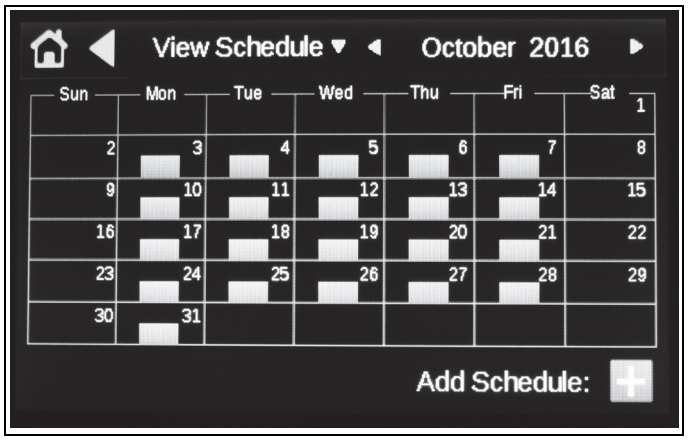
NOTE: When viewing schedules (shown in following screens) only the name of ***one***, priority ***'normal'***, schedule will appear. However, all programmed information is effective.

- Choose whether the schedule is setting occupied or unoccupied time.
- Choose Type of schedule by clicking the dropdown menu. Options include: Dated, weekly, monthly
- Choose Priority: normal or override
- A normal schedule creates an occupied/unoccupied status in the applicable zone, for a certain set time duration, for certain days dependent on the type of schedule selected. Time slot must be vacant for schedule to be effective.
- An override schedule is able to reverse a normal schedule which is in place by turning an occupied time→unoccupied or vice versa.
- Select Next

Weekly Schedule Example

- Enter Start and End times
- Select Days of the week to be active
- (Optional) Input date range
- Select Save

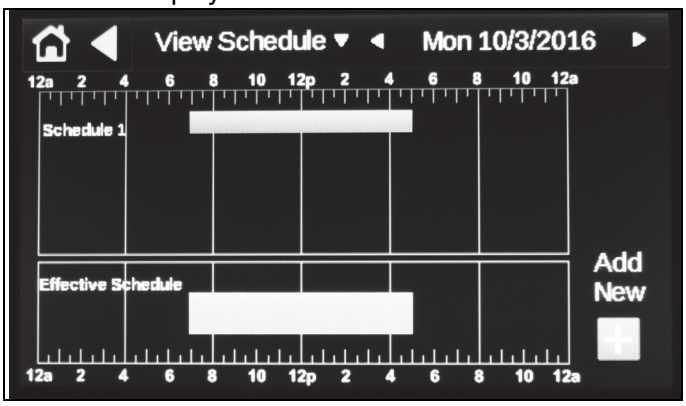




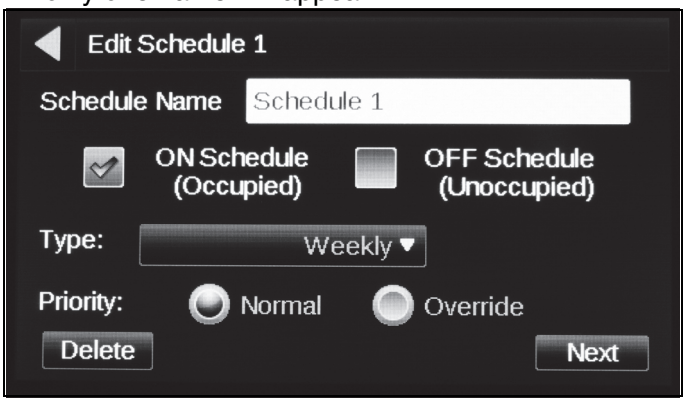
- Calendar populates with schedule

8.5 Edit Existing Schedule

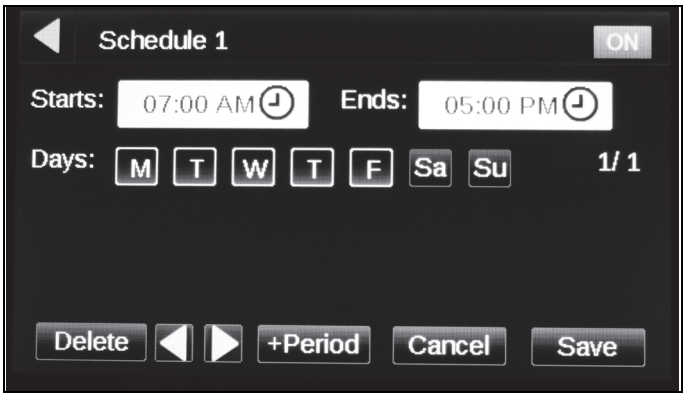
- To open the Schedule editor, Enter the calendar view for the appropriate zone and click on a day of the week the schedule is active.The following screen displays:



- In the daily schedule view, Click on the schedule name or the green occupied bar
- If more than one 'Normal' priority schedule exists, only one name will appear

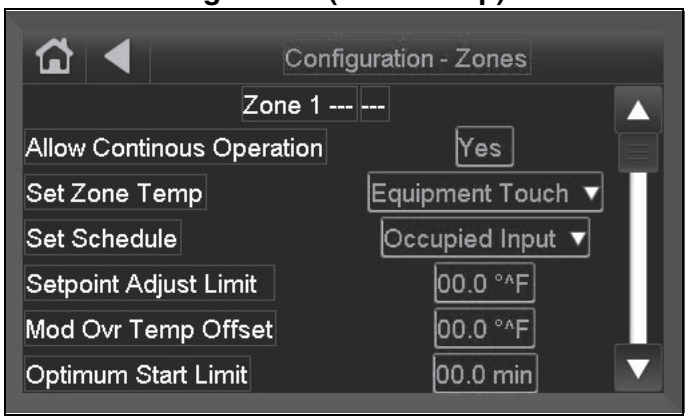


- Information on the schedule comes up
- To change information on this screen, the schedule must be deleted
- Select Next



- Edit schedule information
- Scroll between multiple schedules. If multiple "Normal" priority schedules were created, this is where information for all schedules can be viewed.
- Delete the schedule by choosing delete, then this period only.
- Delete all schedules in zone by selecting delete all.

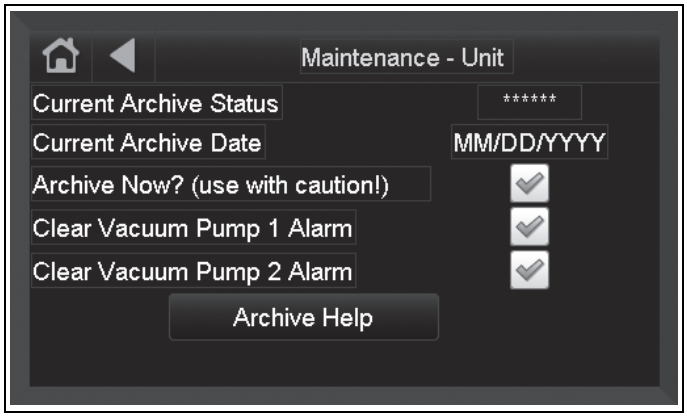
8.6 Zone Configuration (Zone Setup)



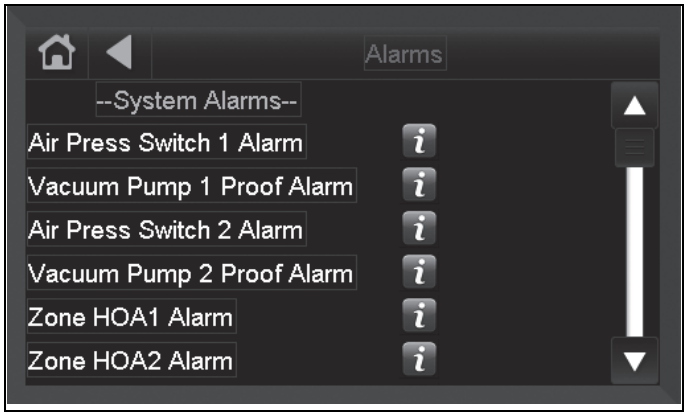
Zone Setup

- Allow continuous operation: Yes
- Set Zone temp: Sensor → to read temperature through the Zone sensor
- Set Schedule: Local Display → to read schedules created using the touchscreen
- Setpoint Adjust Limit: Variable → limits the degree to which the setpoint can be adjusted at the zone sensor
- Mod Ovr Temp Offset: Variable → If the zone temperature falls this many degrees below the setpoint, a 100% Heat Request will be activated
- Optimum Start Limit: maximum time allowed (before scheduled occupancy) for zone to pre-heat, bringing temperature up to occupied setpoint.

8.7 Maintenance

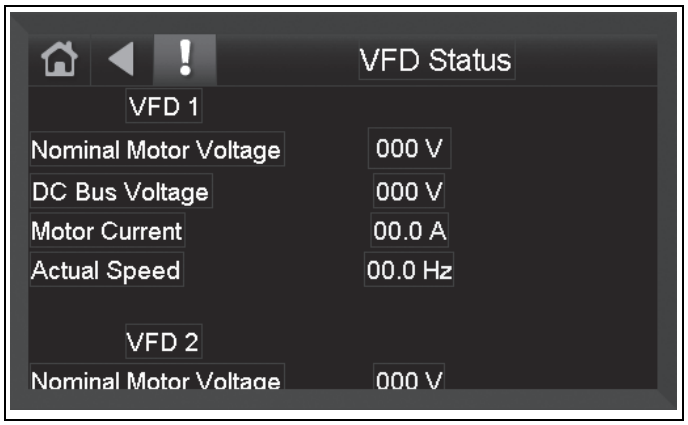


- Use this screen to quickly clear Vacuum Pump Alarms. The Vacuum pump alarm activates when a command is issued to the VFD's to run and the pressure switch is not closed within a certain amount of time.
- Check the box next to the active alarm and wait for the check to clear before navigating away from the screen.



- Alarm screen can be accessed from shortcut on the home screen or through the MENU
- Use this screen to see which alarms are active, if any. Use the info button for more information about the alarm

8.8 VFD Status



- Use this screen to check running parameters of the VFD. Nominal Motor Voltage is programmed into the drive during VFD setup. The remaining parameters are real time values.
- Use this screen to check for successful Modbus connection to the VFD. If the drives are communicating properly via Modbus, the parameters will populate with values accordingly.

SECTION 9: TROUBLESHOOTING

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric to the unit.

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

⚠ WARNING

Explosion Hazard

Turn off gas supply to heater before service.

Failure to follow these instructions can result in death, injury or property damage.

FIGURE 22: Troubleshooting Flow Chart A

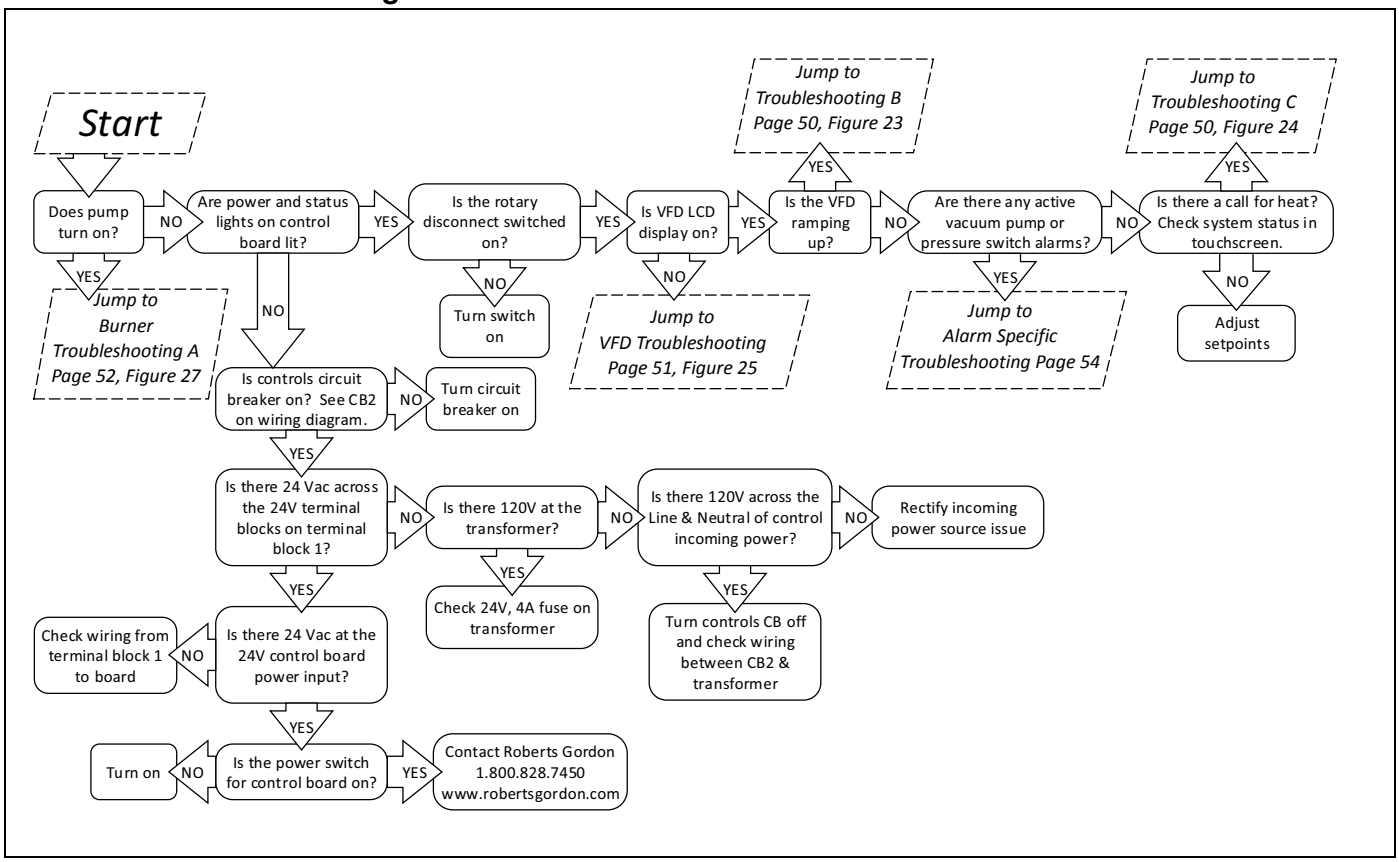


FIGURE 23: Troubleshooting Flow Chart B

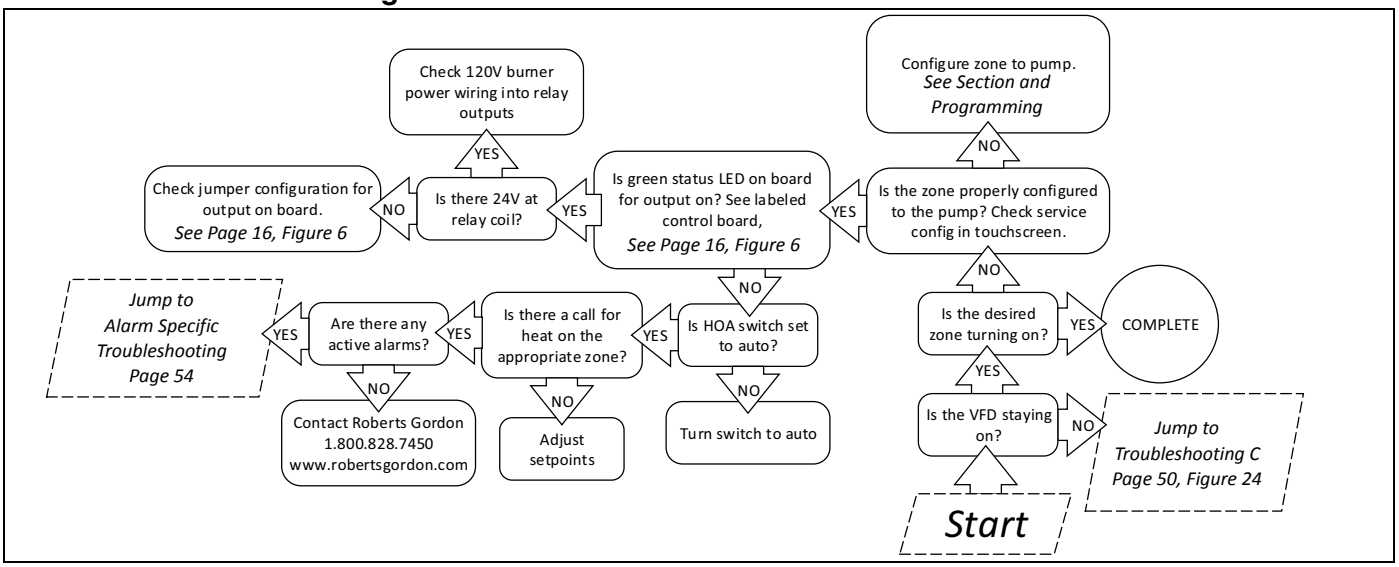


FIGURE 24: Troubleshooting Flow Chart C

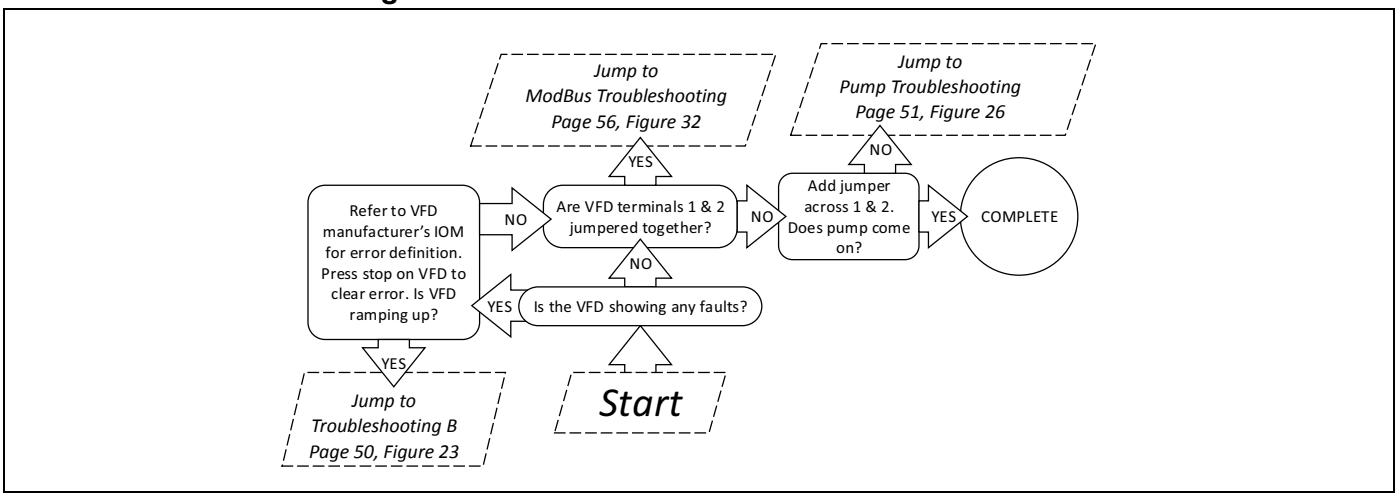


FIGURE 25: VFD Troubleshooting

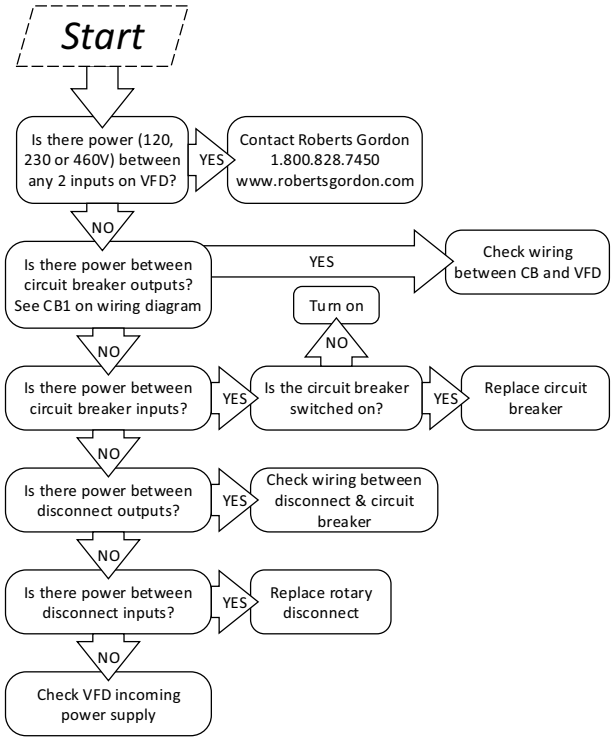


FIGURE 26: Pump Troubleshooting

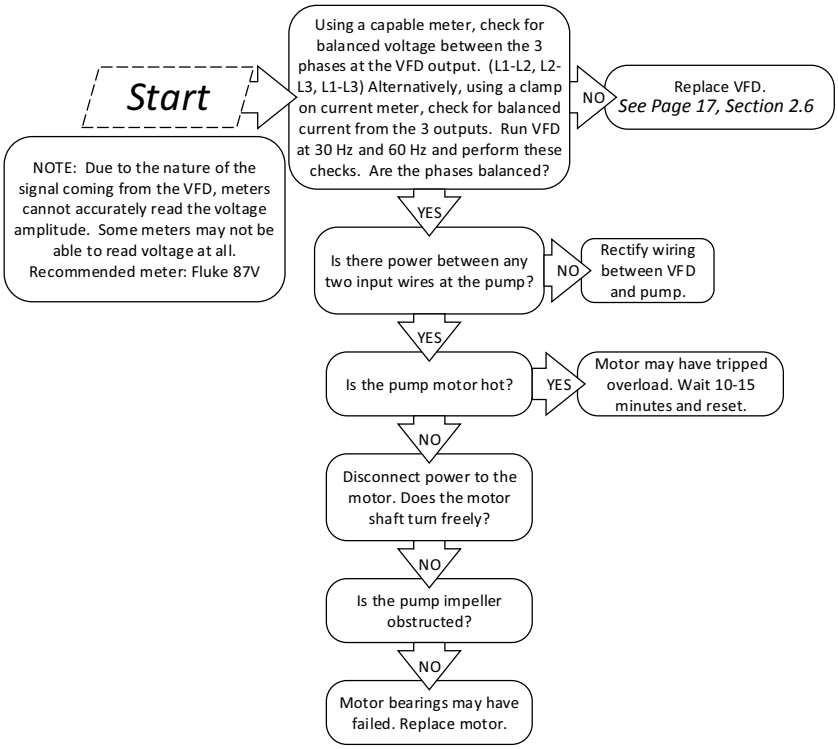


FIGURE 27: Burner Troubleshooting A

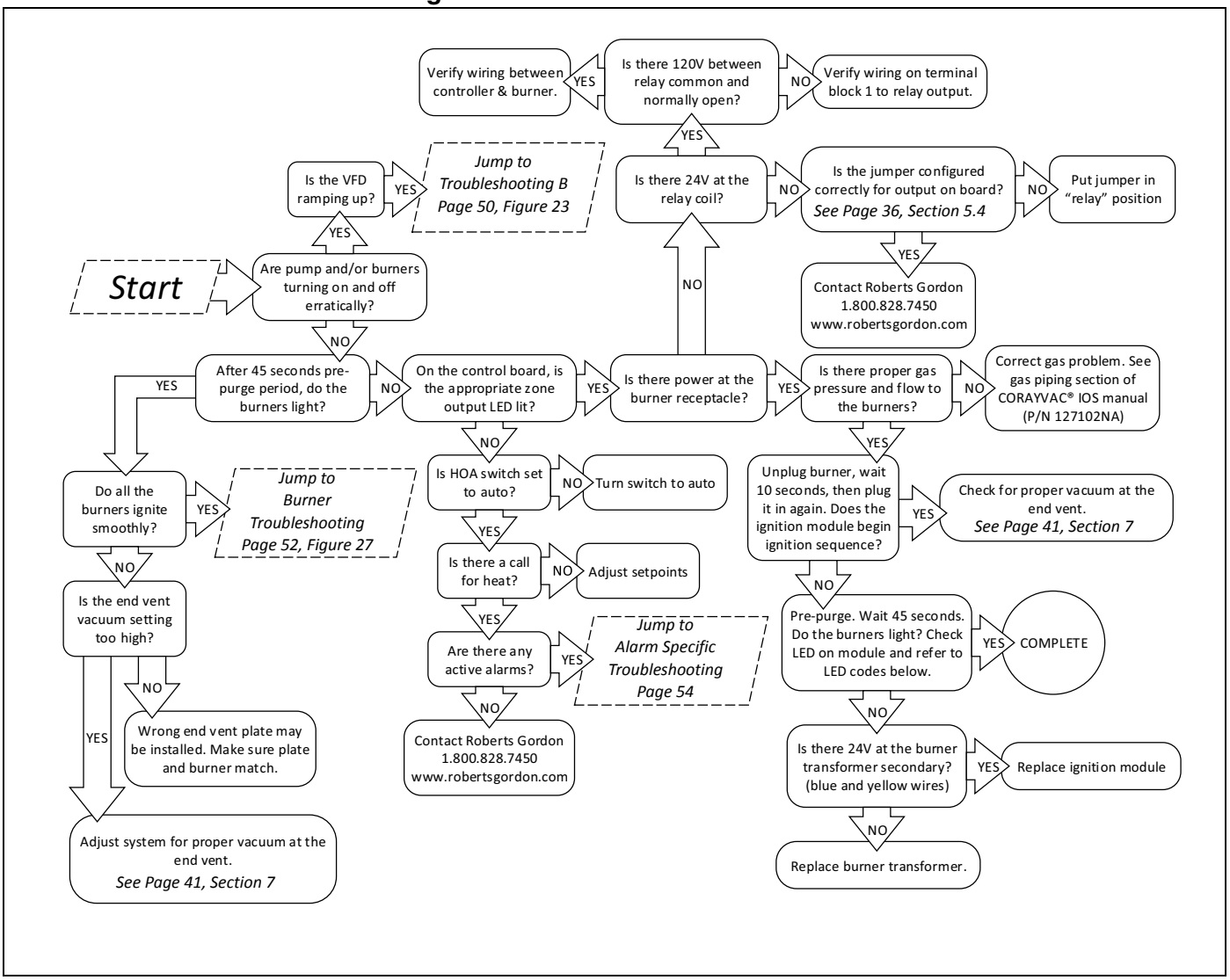


FIGURE 28: Burner Troubleshooting B

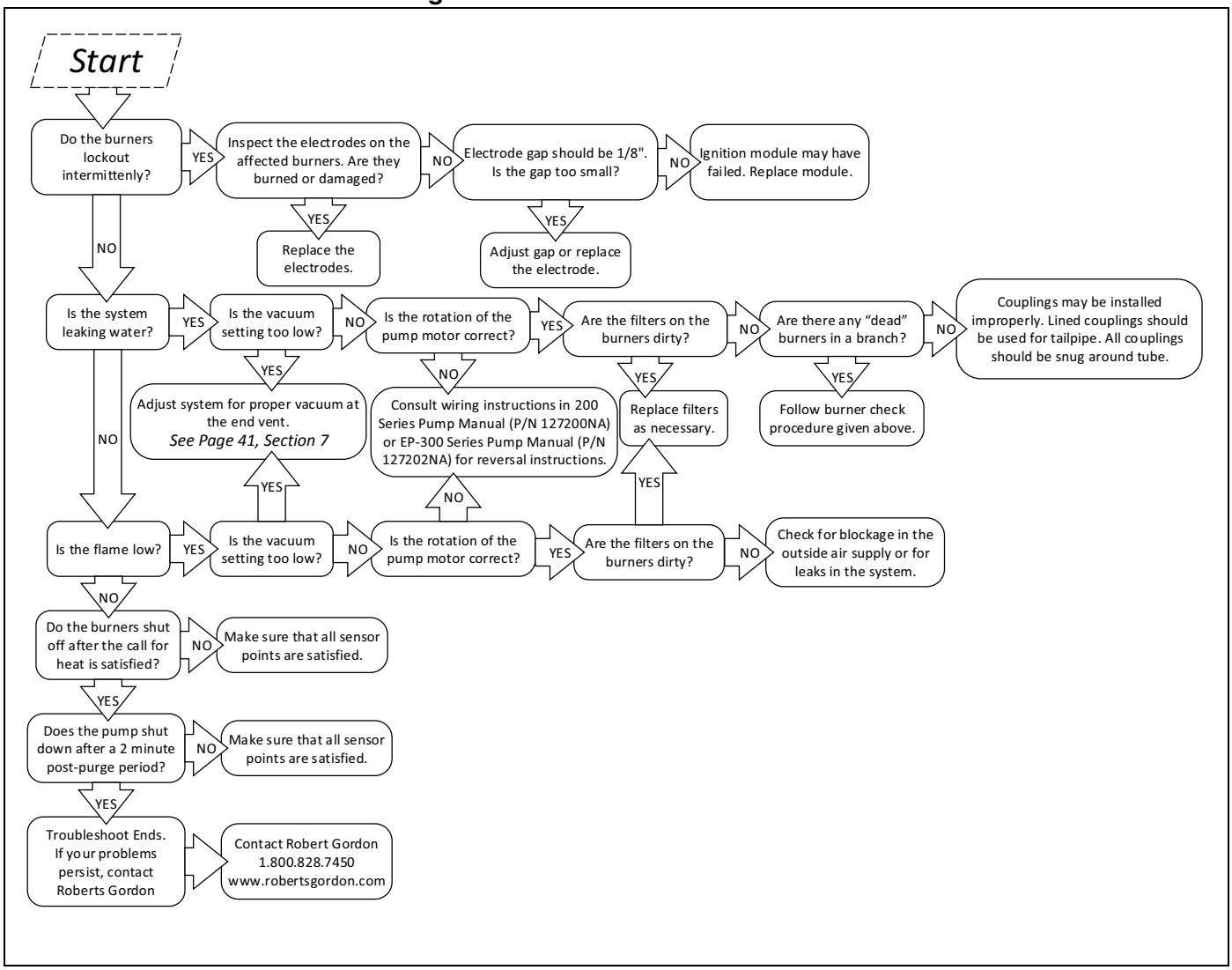


FIGURE 29: Vacuum Pump Proof Alarm Troubleshooting

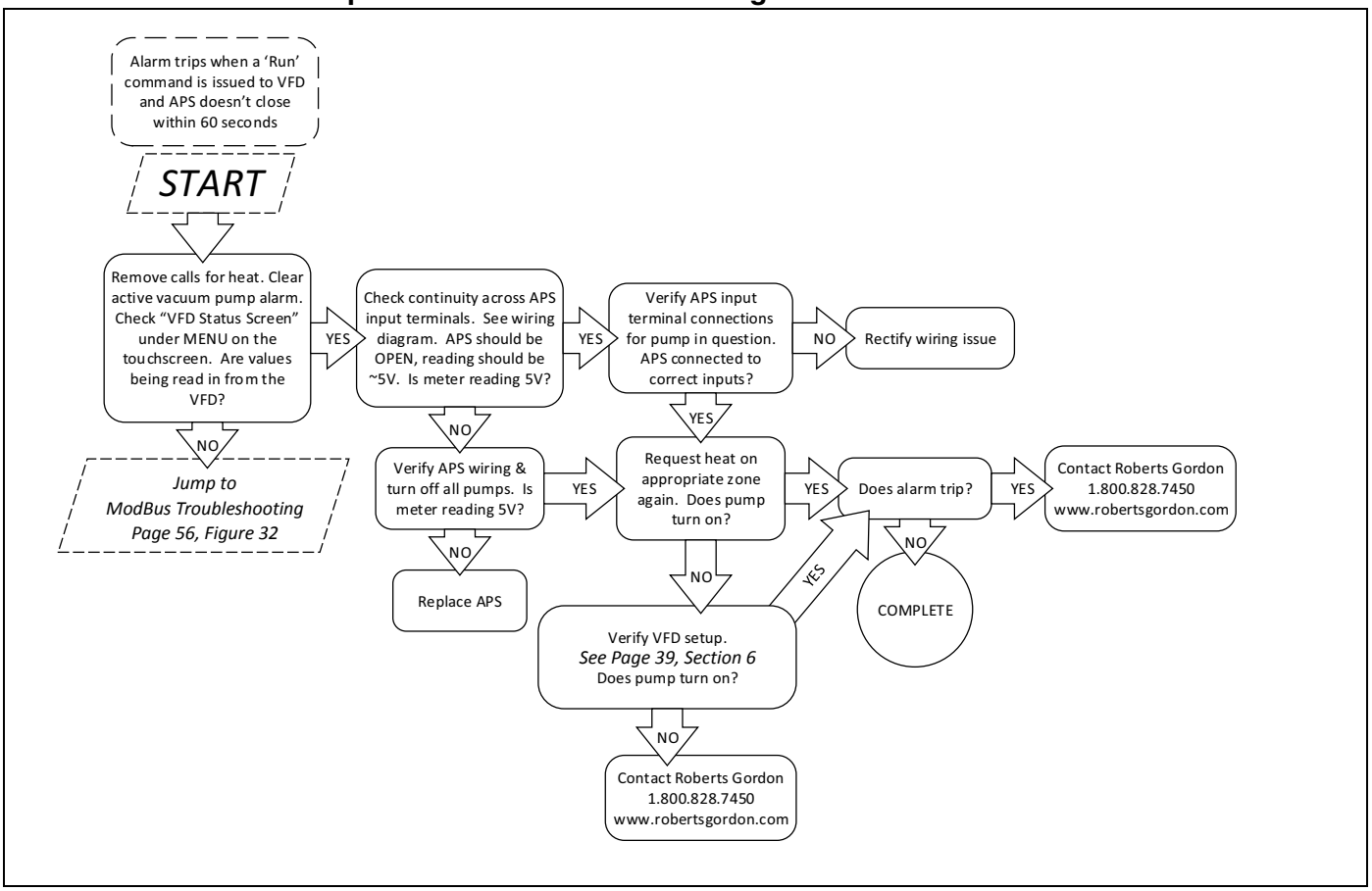


FIGURE 30: Sensor Alarms Troubleshooting

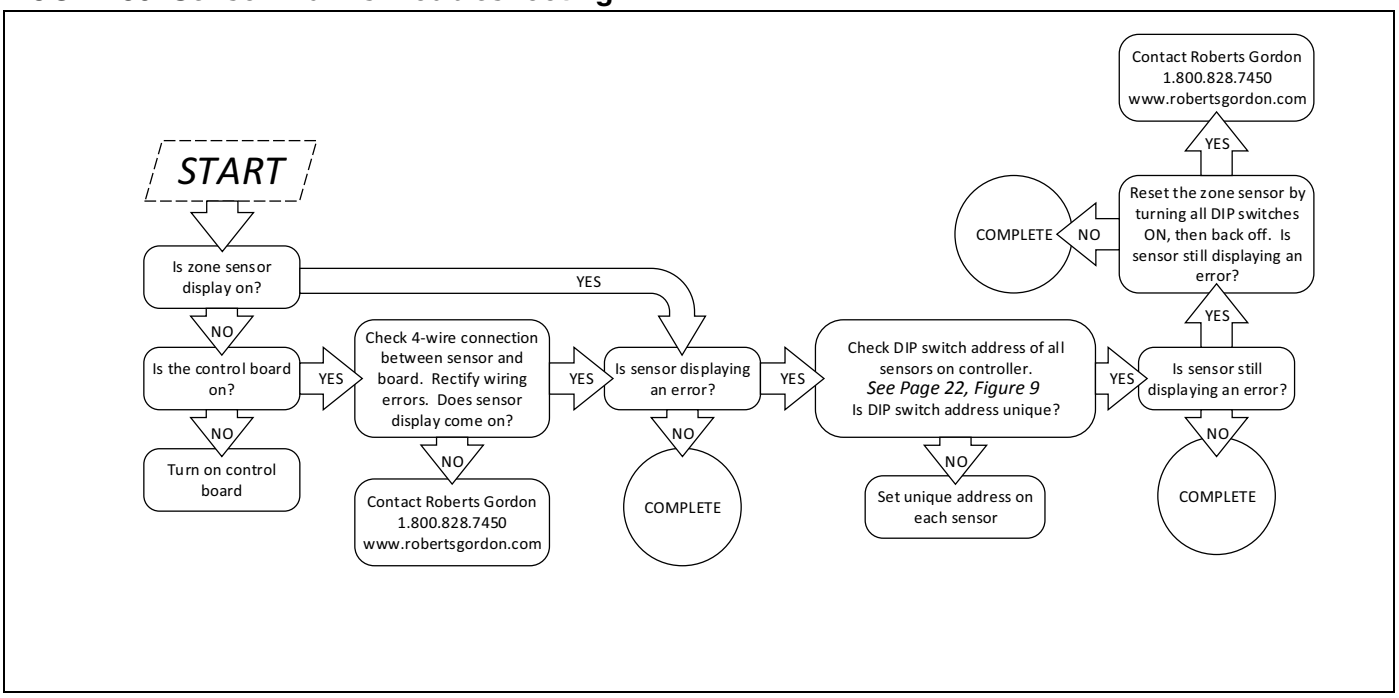


FIGURE 31: Air Pressure Switch (APS) Alarm Troubleshooting

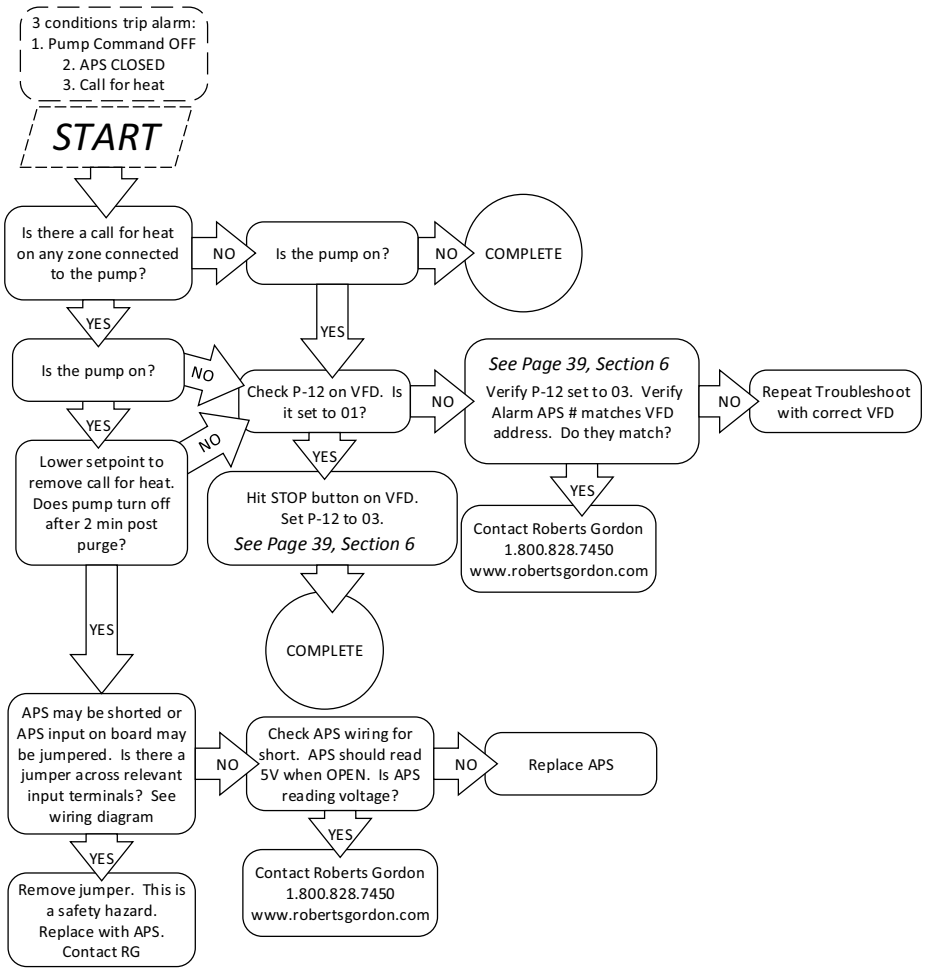


FIGURE 32: ModBus Troubleshooting

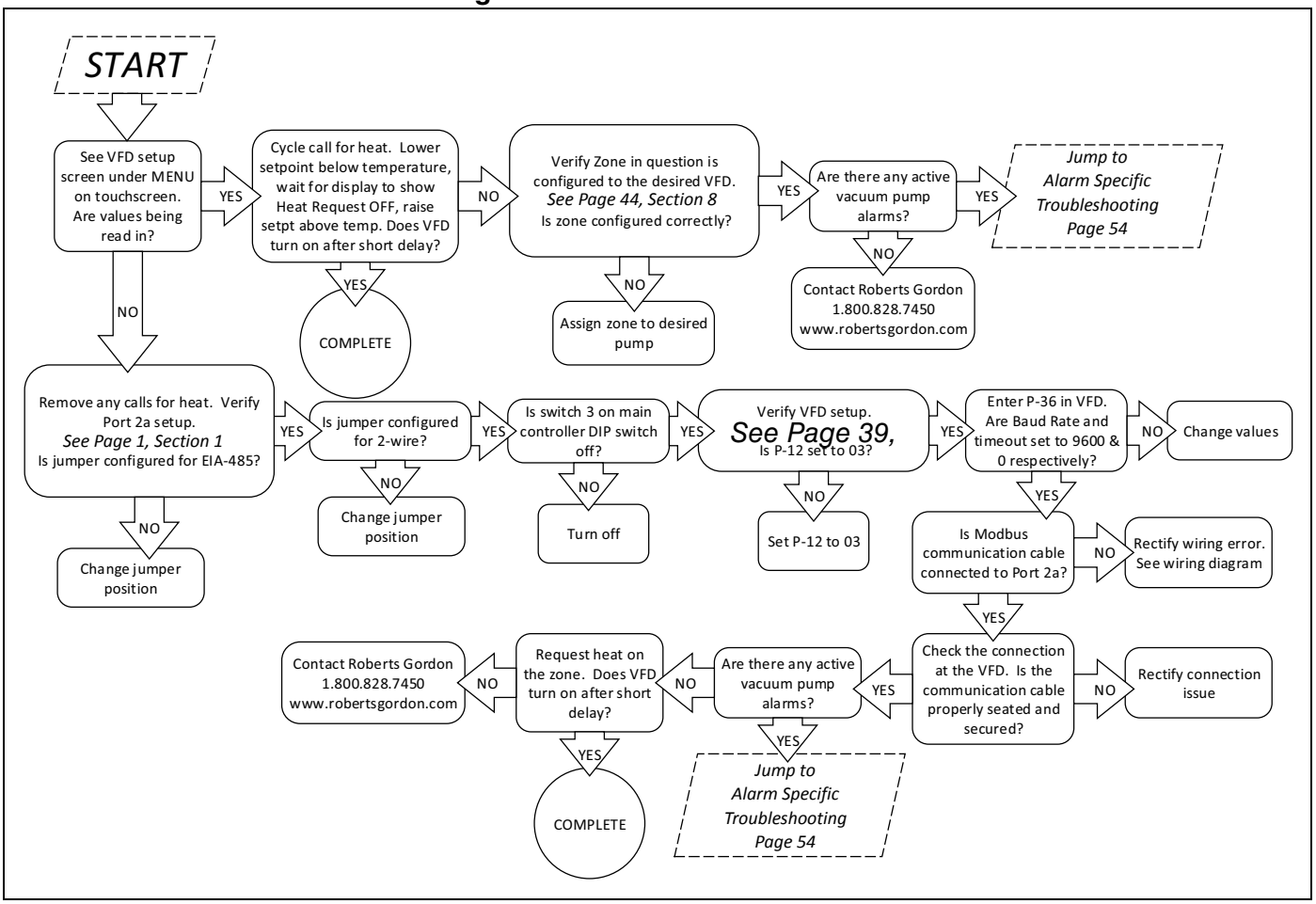


FIGURE 33: Troubleshooting Flow Chart - Repeater

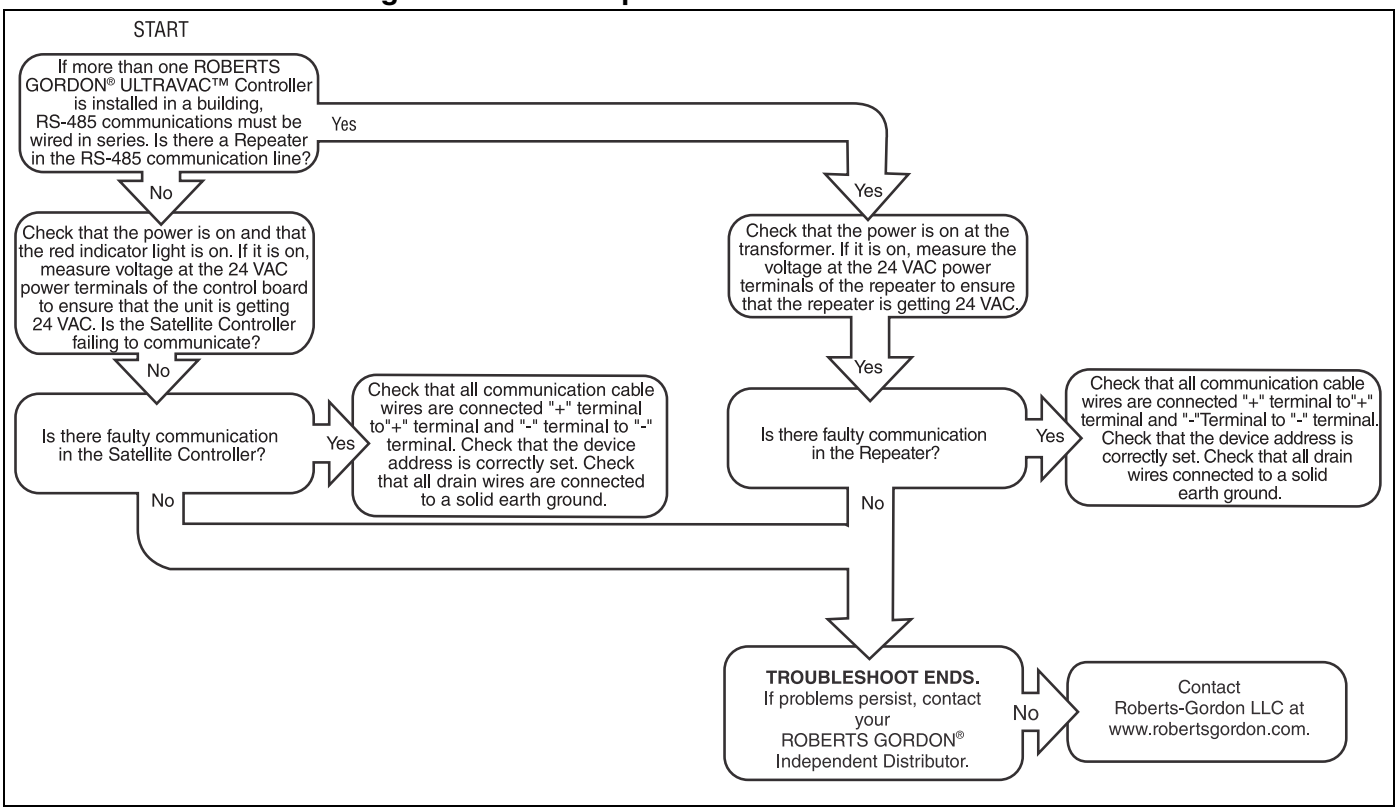
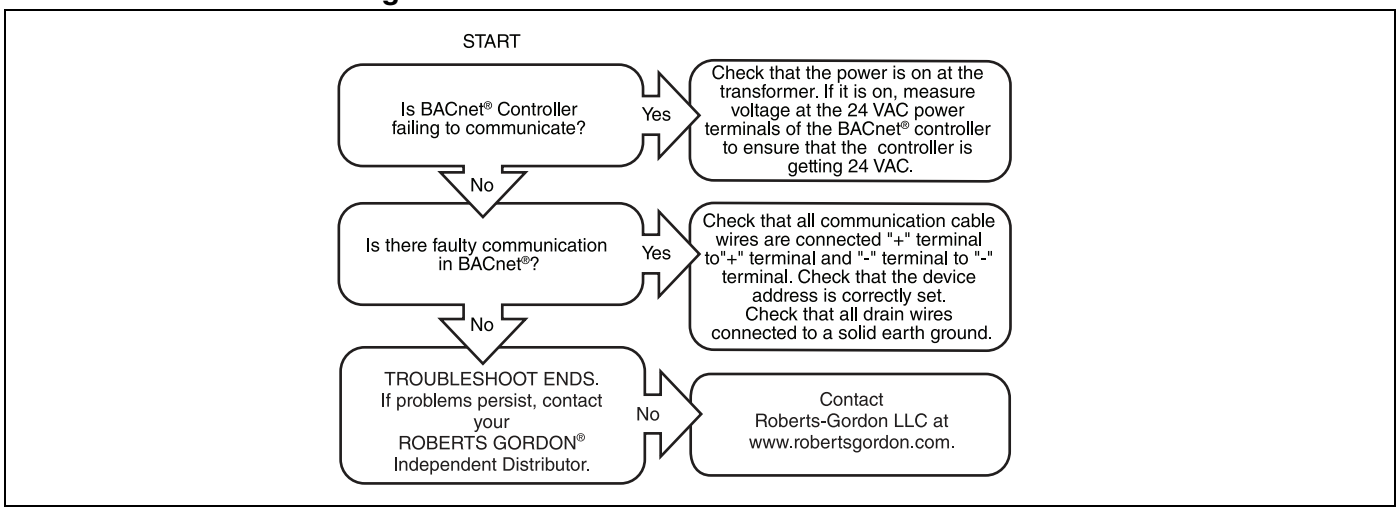


FIGURE 34: Troubleshooting Flow Chart - BACnet®4 MS/TP



SECTION 10: REPLACEMENT PARTS

⚠ DANGER	⚠ WARNING		
Electrical Shock Hazard	**Explosion Hazard**	**Fire Hazard**	**Carbon Monoxide Hazard**

Use only genuine ROBERTS GORDON® replacement parts per this installation, operation and service manual.

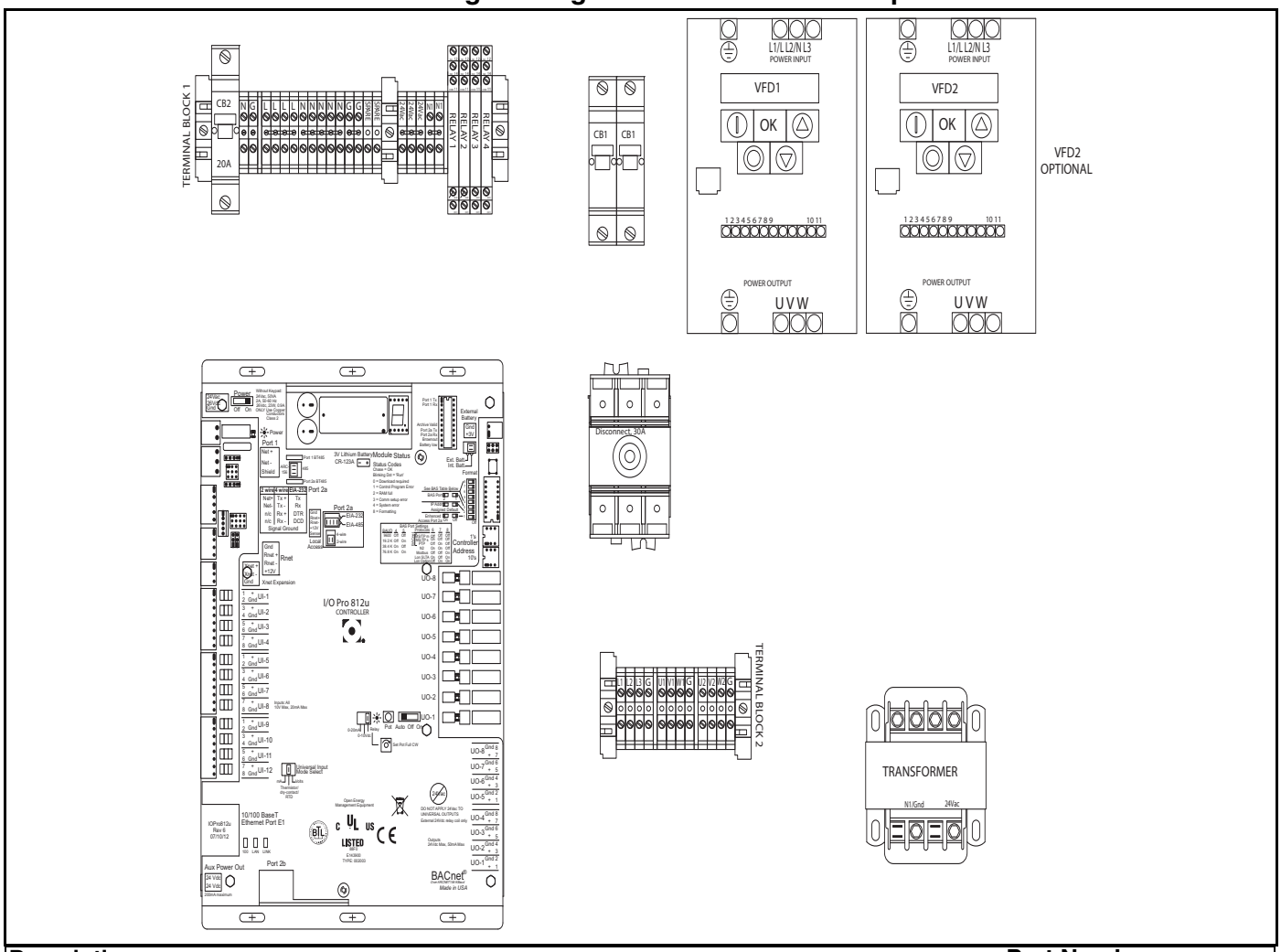
Failure to follow these instructions can result in death, electric shock, injury or property damage.

See warnings and important information before removing or replacing parts. After any maintenance or repair work, always test fire the heater in accordance with the start-up instructions per the heaters current Installation, Operation and Service manual to help ensure all safety systems are in working order before leaving the heater to operate. Minor faults may be traced by using the troubleshooting charts.

10.1 CORAYVAC™ Modulating Heating Control Controller Replacement Parts

Caution: Use only genuine ROBERTS GORDON® replacement parts. Use of parts not specified by Roberts-Gordon voids warranty.

FIGURE 35: CORAYVAC™ Modulating Heating Control Controller Components

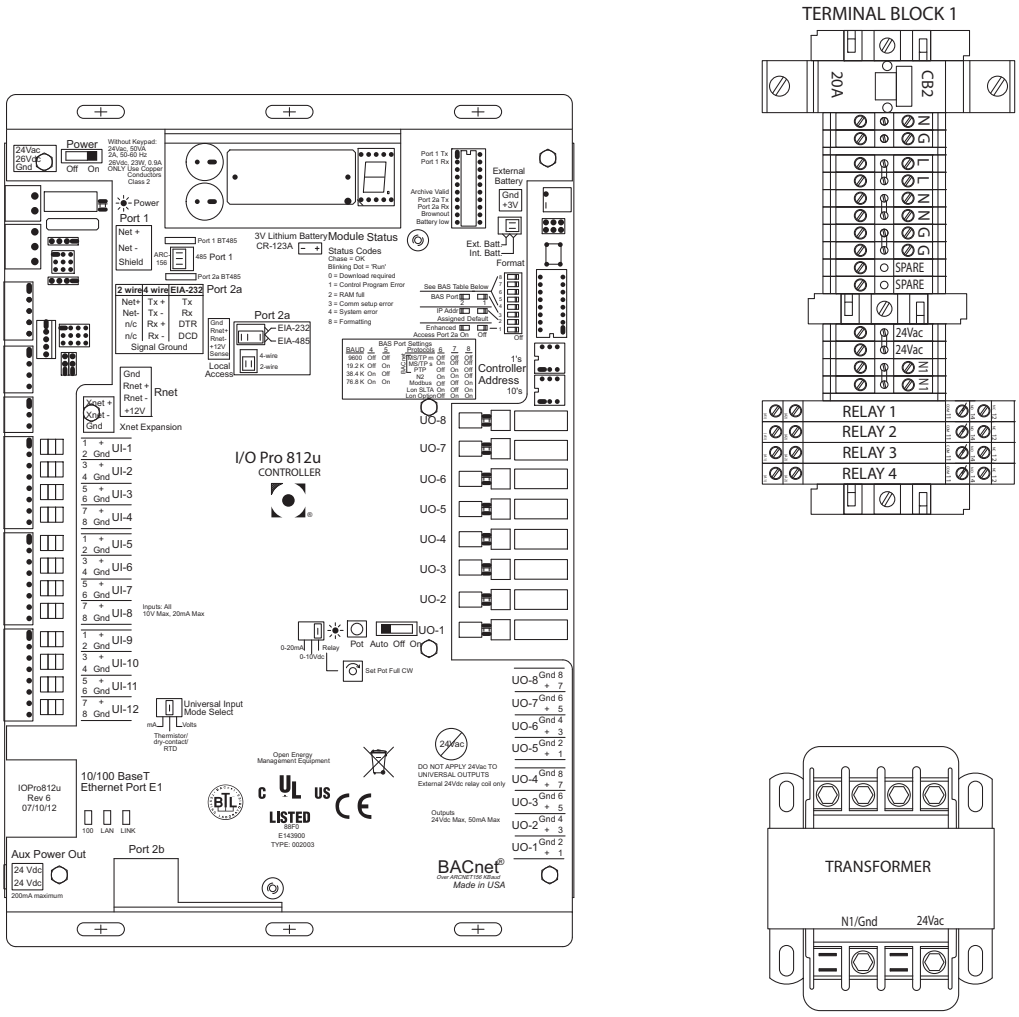


Description	Part Number
Control Board	10061001
Touchscreen (not shown)	10061002
Indoor Sensor (not shown)	10061003
Outdoor Sensor (not shown)	10081501
1 Pole Circuit Breaker	10061004
2 Pole Circuit Breaker	10061005
3 Pole Circuit Breaker	10061006
120v Control Power Circuit Breaker	10061007
30 Amp Disconnect Assembly	10061008
Transformer 24vac to 120vac	10061009
Amber LED Light (not shown)	10061010
SPDT Relay 6A	10061011
1 HP 115v VFD	10061201
1 HP 230v 1PH VFD	10061202
2 HP 230v 1PH VFD	10061203
1 HP 460v 3PH VFD	10061204
2 HP 460v 3PH VFD	10061205
1 HP 230v 3PH VFD	10061206
2 HP 230v 3PH VFD	10061207

10.2 COMPLETE™ Modulating Heating Control Controller Replacement Parts

Caution: Use only genuine ROBERTS GORDON® replacement parts. Use of parts not specified by Roberts-Gordon voids warranty.

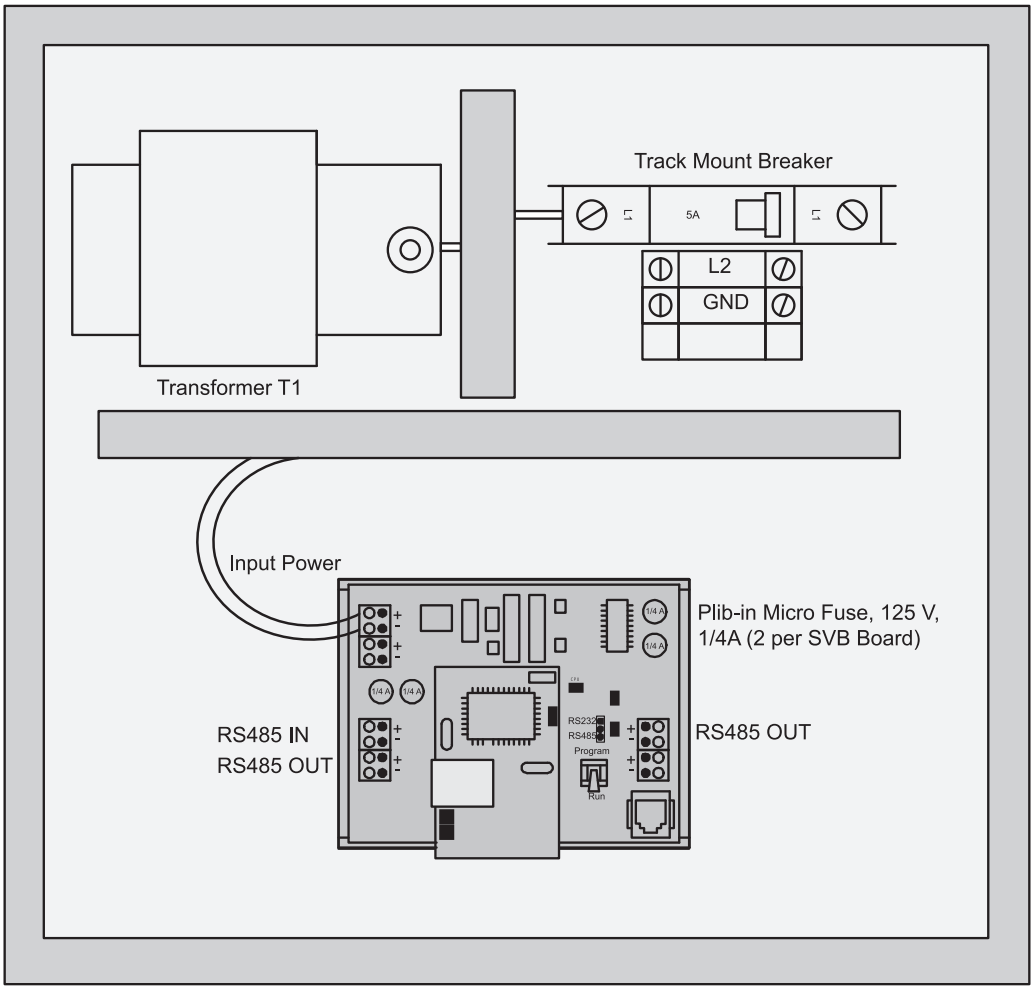
FIGURE 36: COMPLETE™ Modulating Heating Control Controller Components



Description	Part Number
Control Board	10061001
Touchscreen (not shown)	10061002
Indoor Sensor (not shown)	10061003
Outdoor Sensor (not shown)	10081501
1 Pole Circuit Breaker	10061004
2 Pole Circuit Breaker	10061005
3 Pole Circuit Breaker	10061006
120v Control Power Circuit Breaker	10061007
30 Amp Disconnect Assembly	10061008
Transformer 24vac to 120vac	10061009
Amber LED Light	10061010
SPDT Relay 6A	10061011

10.3 Repeater Replacement Parts

FIGURE 37: Repeater Components Diagram



Description	Part Number
Repeater	10080445
Circuit Breaker 5A	10081650
Transformer	10081661
Micro Fuse, 125 V, 1/4A	10081690

10.4 Replacement Parts Instructions

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

Controller must be properly grounded to an electrical source.

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

10.4.1 Plug-In Relay

To replace the plug-in relay, turn off 120 V power to the relay board. Turn off the 120 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 120 V power switch on the relay board. Press the reset button on the control board and close the doors.

10.4.2 Variable Frequency Drive (VFD)

To replace the Variable Frequency Drive, turn off all power to the drive assembly at the disconnect switch.

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.

SECTION 11: THE ROBERTS GORDON® CORAYVAC™ MODULATING HEATING CONTROL LIMITED WARRANTY

Within 36 months from date of purchase by buyer or 42 months from date of shipment by Roberts-Gordon LLC (whichever occurs first), replacement parts will be provided free of charge for any part of the product which fails due to a manufacturing or material defect.

Roberts-Gordon LLC will require the part in question to be returned to the factory. Roberts-Gordon LLC 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 12 months from date of shipment from Roberts-Gordon LLC or the remaining ROBERTS GORDON® System Control 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® CORAYVAC™ Modulating Heating Control in any way.
- Use of the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control 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 LLC.
- Failure to install or maintain the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control as directed in the Installation, Operation and Service Manual.
- Relocation of the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control after initial installation
- The use of the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control in a corrosive atmosphere containing contaminants.
- The use of the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control in the vicinity of a combustible or explosive material.
- Any defect in the ROBERTS GORDON® CORAYVAC™ Modulating Heating Control 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® CORAYVAC™ Modulating Heating Control 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® CORAYVAC™ Modulating Heating Control is moved or transferred. This warranty is nontransferable.

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

Roberts-Gordon LLC

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P.O. Box 44

Buffalo, New York 14240-0044

Telephone: +1.716.852.4400

Fax: +1.716.852.0854

Toll Free: 800.828.7450

www.robertsgordon.com

Roberts-Gordon LLC'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 LLC 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® CORAYVAC™ Modulating Heating Control**.** 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 LLC 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 LLC any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:

No representative of Roberts-Gordon LLC, 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 LLC's duly authorized Executive Officer.