

COMMANDSENSE™

Installation Guide



READ AND SAVE THESE INSTRUCTIONS



Important Safety Instructions	1
Pre-Installation Checklist.....	2
Control System Overview	3
Installation Overview	4
Parts and Hardware Provided.....	5
Network Device Installation.....	7
Wall-Mounted Tablet Installation	8
Fan Control Connections	11
Sensor Installation.....	13
Heater Connections	14
Exhaust Fan Connections	26
Controls Checklist.....	28
Contact Us.....	29



Installation Guide
Rev. A
08/29/2024



Original English Instructions

www.bigassfans.com/support

Improper installation, delivery, or maintenance, including, but not limited to, any of the following actions by the customer or agent of the customer will constitute a breach of and will void all warranties:

- Failure to follow the required installation procedures specified in this Installation Guide and in all other documentation supplied with the fans and related equipment including documentation provided by the manufacturers of the individual fan and control components;
- Failure to follow all relevant codes and ordinances, including, but not limited to, the National Electrical Code (United States), applicable national and local electrical codes, and state and local building codes;
- Failure to follow electrical engineering industry standards regarding the approved method of installing solid-state electrical equipment having the characteristics of the fans, the fan controls, and their related components, even if such standards are not specifically referenced in any instructions or literature supplied by Big Ass Fans or provided by manufacturers.

All trademarks used herein are the properties of their respective owners. No part of this document may be reproduced or translated into a different language without the prior written consent of Big Ass Fans. The information contained in this document is subject to change without notice. For the most up-to-date information, see the online printable installation guide at www.bigassfans.com

Patent: www.bigassfans.com/patents • www.bigassfans.com/product-warranties

IMPORTANT SAFETY INSTRUCTIONS

WARNING—TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

WARNING: Power must be disconnected before installation and servicing, cleaning, and other user maintenance. Failure to disconnect power creates risk of fire, electric shock, and serious bodily injury.

CAUTION: This guide is intended to provide instructions for installing the CommandSense™ control system and configuring it to control Big Ass HVLS fans and other devices. Consult the installation guide included with the fan or device for additional installation, operation, and safety/regulatory instructions.

WARNING: Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction. Incorrect assembly can cause electric shock or damage the control system components.

WARNING: Installation must be in accordance with the requirements set forth by the National Electrical Code (NEC), ANSI/NFPA 70, and all national and local codes.

CAUTION: The installation of this control system requires the use of some power tools. Follow the safety procedures found in the owner's manual for each of these tools and do not use them for purposes other than those intended by the manufacturer.

WARNING: When cutting or drilling into a wall or ceiling, do not damage electrical wiring and other hidden utilities.

WARNING: The fan VFD contains high voltage capacitors which take time to discharge after removal of mains supply. Before working on the VFD, ensure isolation of main supply from line inputs at the VFD or fan controller's disconnect. Wait three minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication of safe voltage levels.

WARNING: Risk of fire, electric shock, or injury to persons during cleaning and user maintenance. Disconnect the control system component from the power supply before servicing.

WARNING: Before servicing or cleaning a control system component, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

WARNING: When service or replacement of a control system component requires the removal or disconnection of a safety device, the safety device is to be reinstalled or remounted as previously installed.

CAUTION: The Big Ass Fans product warranty will not cover equipment damage or failure that is caused by improper installation or use.

CAUTION: The following information is merely a guide for proper installation. Big Ass Fans cannot assume responsibility for the compliance or non-compliance to any code, national, local, or otherwise for the proper installation of these fan controllers, fans, or associated equipment.

PRE-INSTALLATION CHECKLIST

Complete this checklist during the initial pre-installation site visit/inspection.

General

- ☐ Contact name
- ☐ IT contact name
- ☐ Equipment layout with all equipment locations, including wiring diagrams and estimated distances of wire runs

Exhaust fans

- ☐ Confirm all exhaust fan locations
- ☐ Confirm all exhaust fan voltages and motor specifications
- ☐ Confirm existing exhaust fan control methods (switch, motor starter, etc.) and their locations

Heaters

- ☐ Confirm all heater locations
- ☐ Confirm all heater voltages
- ☐ Confirm all heater control methods and their locations

Fans and BAFCon fan controllers

- ☐ Confirm locations of all fans (existing and new) and BAFCon controllers on the equipment layout
- ☐ Note end-of-line (EOL) BAFCon controllers and routes to connect them back to the IT room
- ☐ If installing new fans, determine required lift height

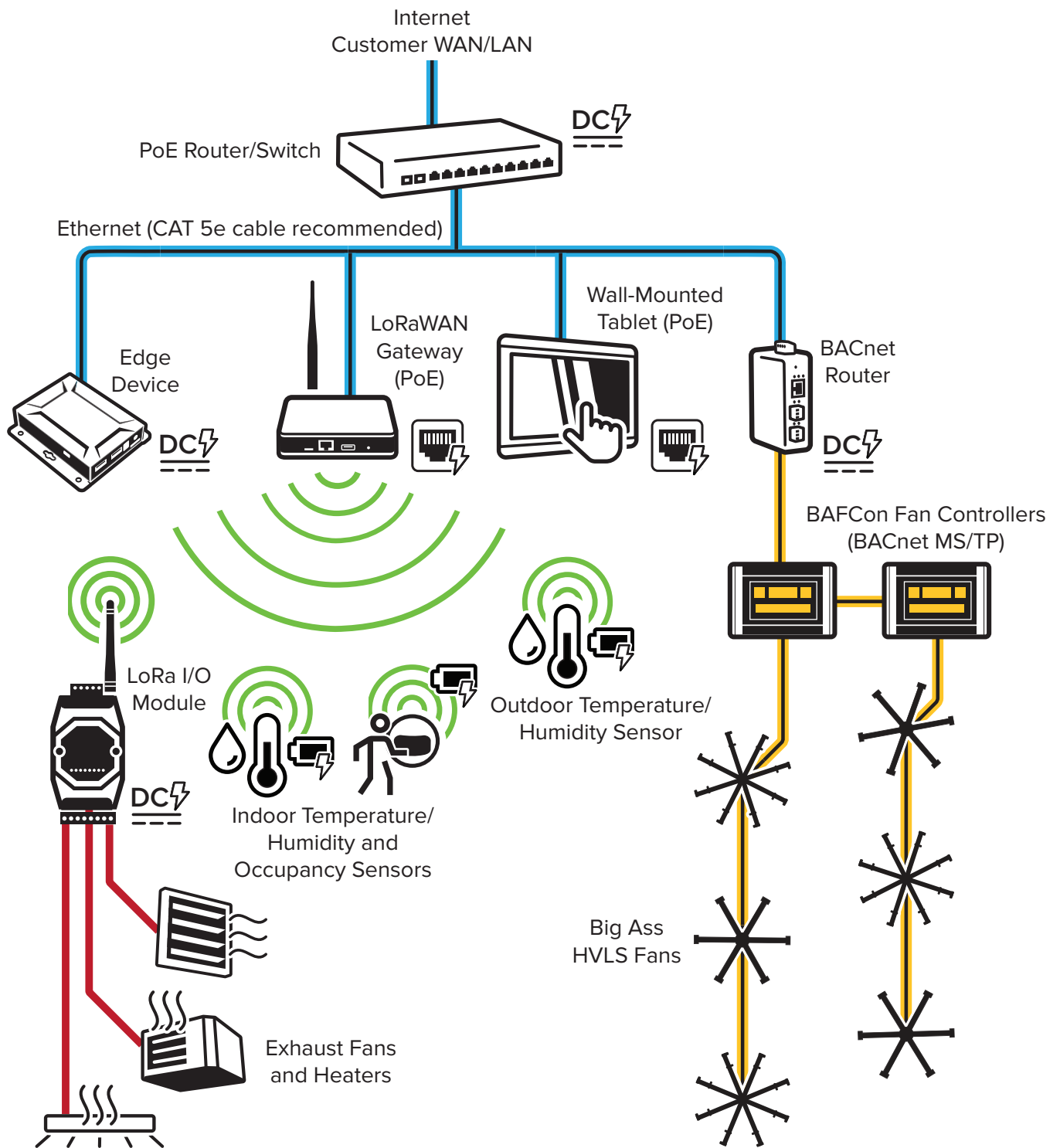
Control/IT room

- ☐ Note IT room location where PoE router/switch will be installed
- ☐ Confirm internet connectivity availability with IT contact
- ☐ Determine any wall penetrations and distances required to run cables from the hardwired components within the facility (LoRaWAN gateway, wall-mounted tablet, and EOL BAFCon controllers) back to the IT room
- ☐ Note suitable locations within the IT room for network equipment (PoE router/switch, edge device, and BACnet router)

Sensors

- ☐ Note all locations for temperature and occupancy sensors on the equipment layout and determine lift required to install them

CONTROL SYSTEM OVERVIEW



Compatible products

- Big Ass HVLS fans
- Radiant tube heaters
- Unitary forced-air heaters
- Mechanical exhaust fans and intake louvers

INSTALLATION OVERVIEW

Stage 1

Network Device Installation

See page 7



Stage 2

Wall-Mounted Tablet Installation

See page 8



Stage 3

Fan Control Connections

See page 11



Stage 4

Sensor Installation

See page 13



Stage 5

Heater Connections

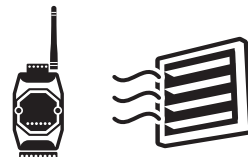
See page 14



Stage 6

Exhaust Fan Connections

See page 26



PARTS AND HARDWARE PROVIDED

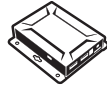
The following parts and hardware are provided by Big Ass Fans. The exact parts and quantities included depends on the zone configuration of the facility in which the control system is being installed. **All other materials, parts, hardware, cables/wiring, connectors, and equipment required for installation must be provided by the installer.**

Core system components

These components are included with all control systems.



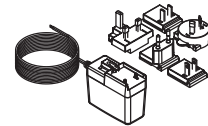
PoE Router/
Switch



Edge Device



BACnet Router



BACnet Router
Power Supply



LoRaWAN Gateway*



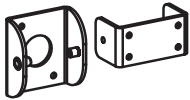
10.1 in. (257 mm)
Wall-Mounted Tablet**



Outdoor Temperature/
Humidity Sensor

Tablet mounting hardware

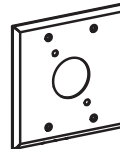
These components are included with all control systems.



(2) Mounting Brackets



2 x 4 in. (51 x 102 mm)
Outlet Box Cover



4 x 4 in. (102 x 102 mm)
Outlet Box Cover



Grommet



(4) 10-32 x 5/8" Pan
Head Phillips Screws



(2) 10-32 Lock Nuts
with Lock Washers



(4) 6-32 x 3/4" Slotted
Oval Head Screws***



(4) M4x0.7 mm x 8 mm
Pan Head Screws

*If sensors or other LoRa devices will not connect to the system due to interference, additional gateways may be needed. Contact Big Ass Fans.

**A power cable, power adapter, and two small screws for securing the tablet's back panel cover are included with the tablet. The power cable and power adapter are not needed if the tablet is powered via Power over Ethernet (PoE).

***Two screws are needed for 2 x 4 in. (51 x 102 mm) outlet box cover installations. Four screws are needed for 4 x 4 in. (102 x 102 mm) outlet box cover installations.

PARTS AND HARDWARE PROVIDED

Fan zone components

These components are included for each zone that contains Big Ass HVLS fans only.



Indoor Temperature/
Humidity Sensors



Indoor Occupancy
Sensors



1,000 ft (305 m)
RS-485 Cable

Fan and heater zone components

These components are included for each zone that contains both Big Ass HVLS fans and heaters.



Indoor Temperature/
Humidity Sensors



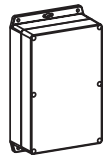
Indoor Occupancy
Sensors



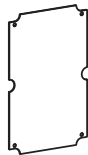
LoRa I/O Module



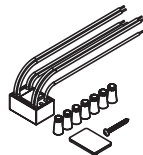
18 W, 24 VDC Junction
Box Mount I/O Module
Power Supply



8-3/4" x 5-3/4" x 3"
(222 x 146 x 76 mm)
I/O Module Enclosure



8-3/4" x 5-3/4"
(222 x 146 mm)
Enclosure Backplate



20-32 VDC
Encapsulated Relay



1,000 ft (305 m)
RS-485 Cable

Ventilation/exhaust components

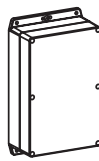
These components are included for facilities that have ventilation/exhaust fans.



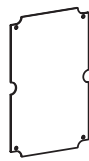
LoRa I/O Module



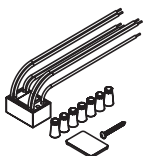
18 W, 24 VDC Junction
Box Mount I/O Module
Power Supply



8-3/4" x 5-3/4" x 3"
(222 x 146 x 76 mm)
I/O Module Enclosure



8-3/4" x 5-3/4"
(222 x 146 mm)
Enclosure Backplate



20-32 VDC
Encapsulated Relay



1,000 ft (305 m)
RS-485 Cable

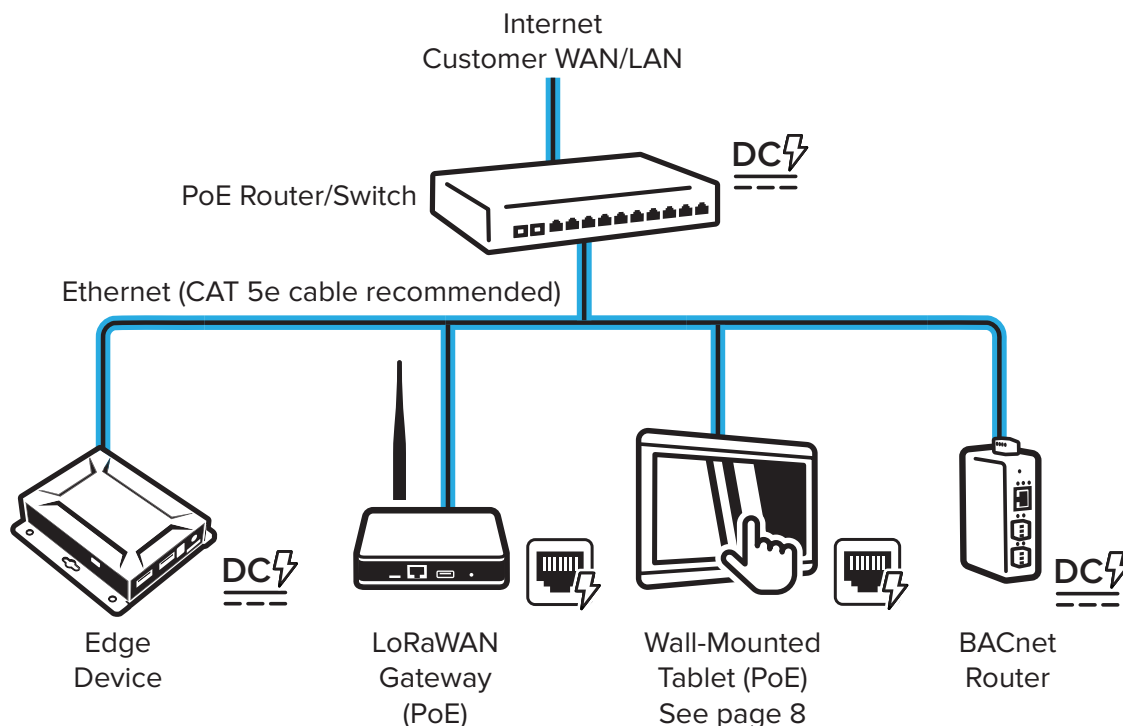
NETWORK DEVICE INSTALLATION

Install the following network devices **according to the manufacturer's installation guide provided with each device**. Refer to the device manufacturer's documentation for all installation, setup, operation, troubleshooting, and safety/regulatory information.

1. **PoE Router/Switch**—Used for device Ethernet connections and connection to the internet. The router/switch also provides Power over Ethernet (PoE) power for the wall-mounted tablet and LoRaWAN gateway.
2. **Edge Device**—Manages communications between the system components and the cloud server. The device should be located out of sight, preferably with other customer network gear.
3. **BACnet Router**—Serves as an MS/TP gateway between the edge device and the BAFCon fan controllers. The router should be located out of sight, preferably with other customer network gear.
4. **LoRaWAN Gateway**—Serves as a gateway between the edge device and the array of wireless sensors throughout the system. The gateway should be as centrally located as possible within the facility to maximize clear communications with the wireless sensor array. *Note: If sensors or other LoRa devices will not connect to the system due to interference, additional gateways may be needed. Contact Big Ass Fans.*

Connection requirements

- The installation of this hardware **MUST** be coordinated with the customer's IT or network management personnel.
- An internet connection **MUST** be provided.
- Network connections shown in this installation guide assume the use of EIA/TIA 568A or 568B Ethernet wiring.



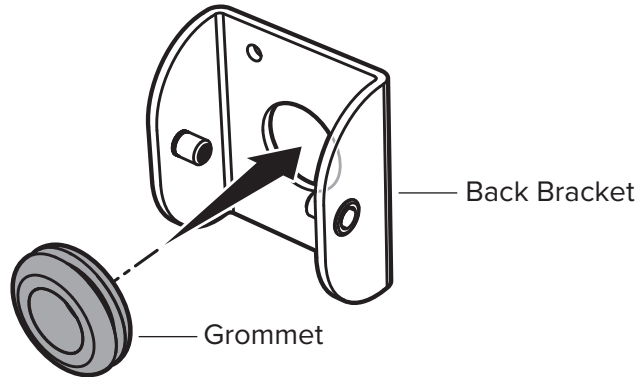
WALL-MOUNTED TABLET INSTALLATION

The wall-mounted tablet serves as the local user interface for the system. Install the tablet in the location specified by the customer.

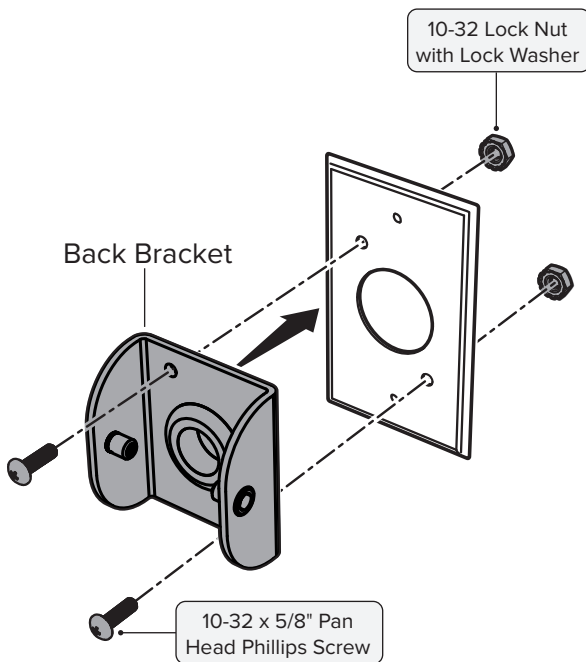
1. Mount back bracket to outlet box cover

Seat grommet in center hole of back bracket (*Fig. 1.1*), and then secure back bracket to outlet box cover (*Fig. 1.2a, Fig. 1.2b*).

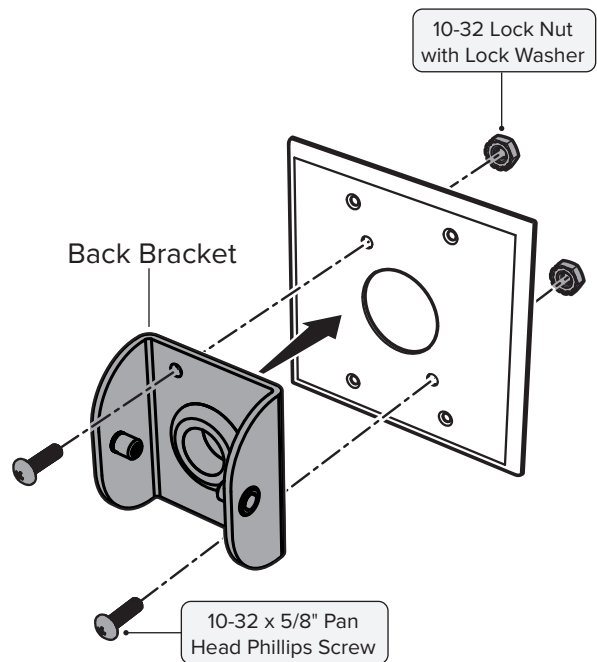
Fig. 1.1



**Fig. 1.2a: 2 x 4 in. (51 x 102 mm)
Outlet Box Cover**



**Fig. 1.2b: 4 x 4 in. (102 x 102 mm)
Outlet Box Cover**



2. Mount outlet box cover to outlet box

Route Ethernet cable through grommet and secure outlet box cover and back bracket to outlet box (Fig. 2a, Fig. 2b).

Fig. 2a: 2 x 4 in. (51 x 102 mm) Outlet Box

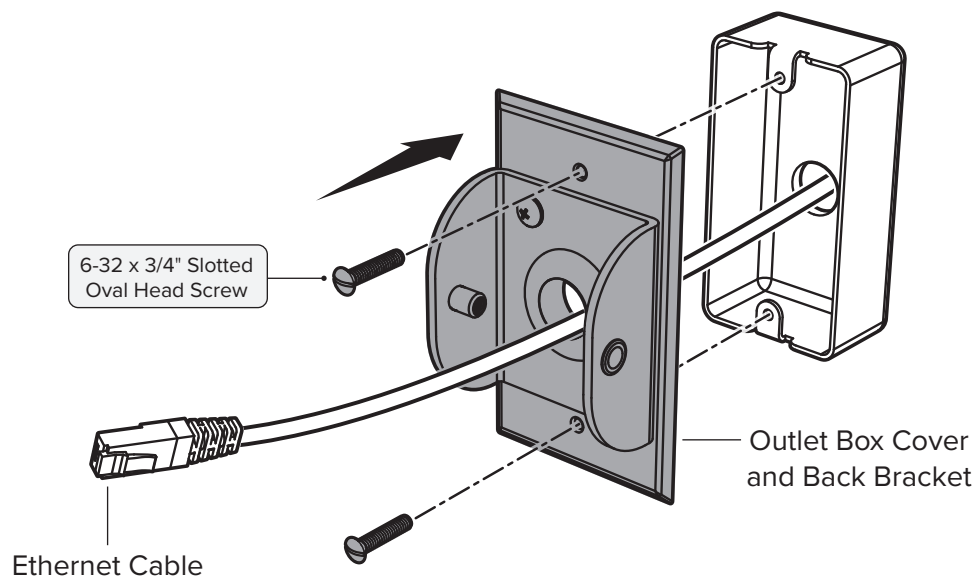
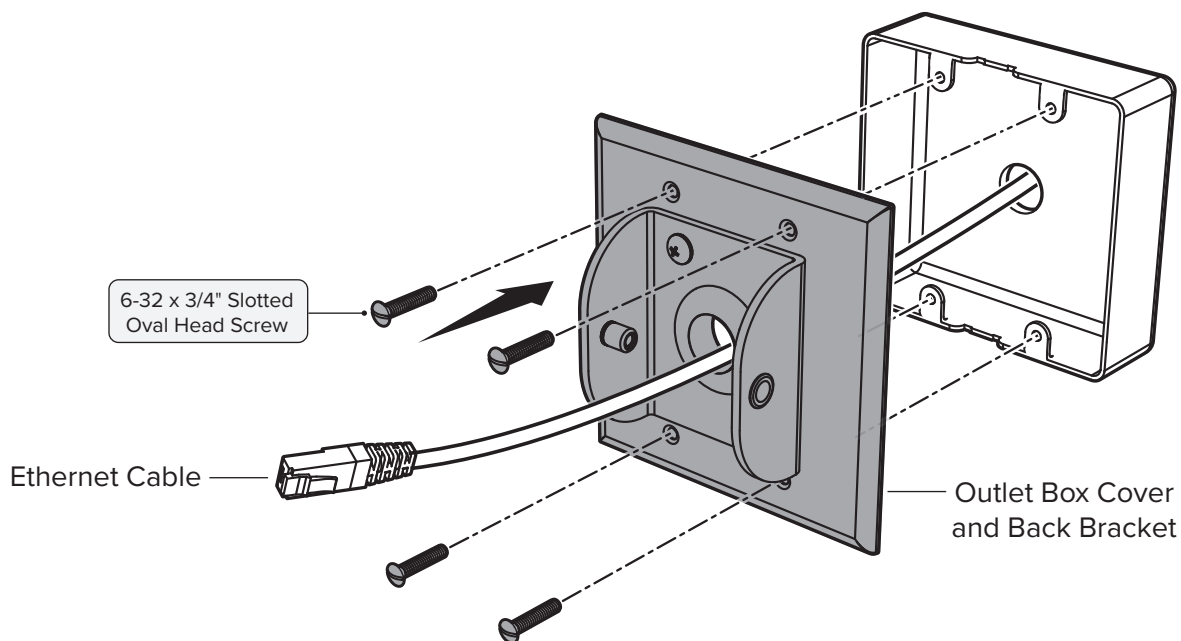


Fig. 2b: 4 x 4 in. (102 x 102 mm) Outlet Box



WALL-MOUNTED TABLET INSTALLATION

3. Mount tablet

Secure front bracket to back of tablet (*Fig. 3.1*), and then secure front bracket to back bracket (*Fig. 3.2*). Adjust tablet to desired angle before tightening screws.

Fig. 3.1

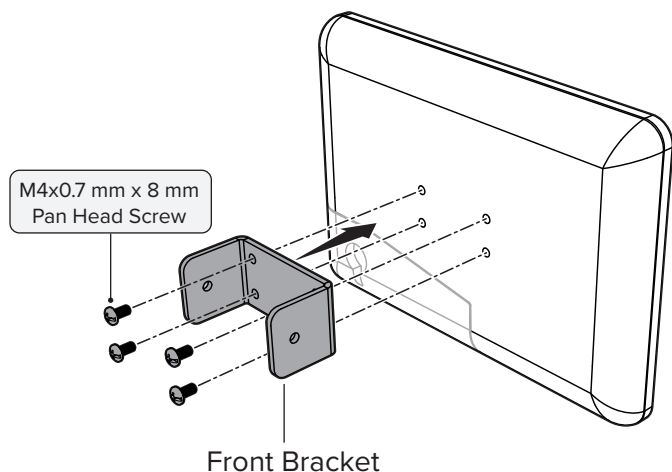
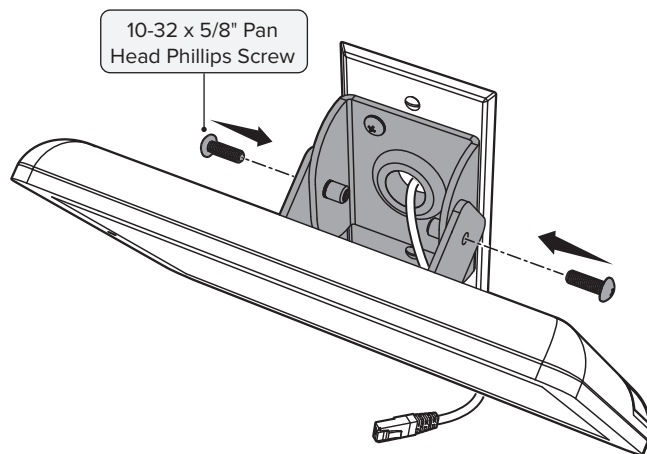


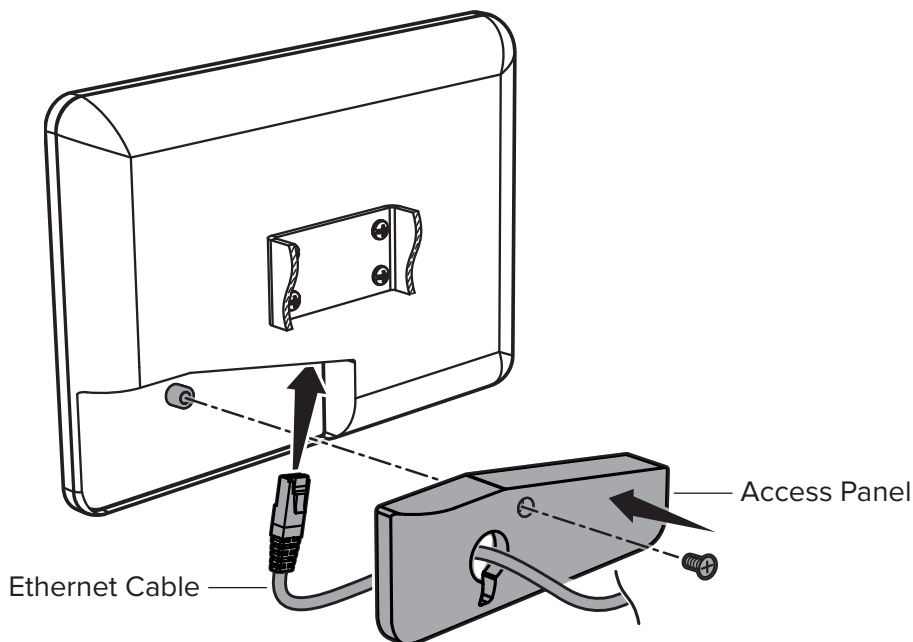
Fig. 3.2



4. Connect tablet

Remove access panel from back of tablet and connect Ethernet cable to tablet through hole in panel (*Fig. 4*). Reattach panel and secure with screw provided with tablet (*Fig. 4*).

Fig. 4



FAN CONTROL CONNECTIONS

If applicable, install fan(s) according to fan installation guide. After fan installation, install the following according to RS-485 wiring practices:

1. Wire the BACnet MS/TP trunk from the BACnet router to the BAFCon fan controller(s) according to EIA-485 signaling standard.
2. Install the Modbus RTU trunk from the BAFCon controller(s) to the fan(s) according to the [BAFCon Installation Guide](#).



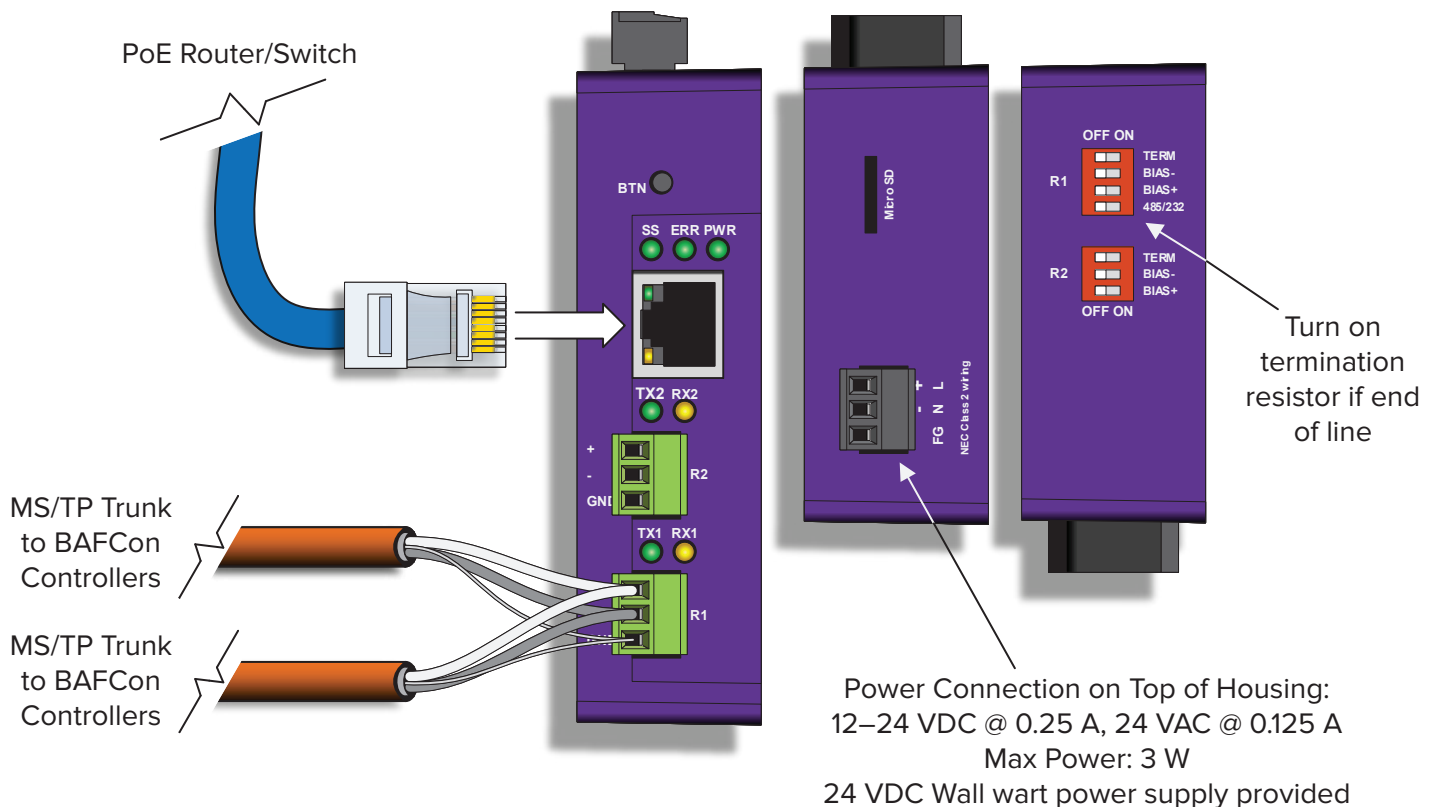
bigassfans.com/docs/bafcon/bafcon-install-guide.pdf

As shown on the following page, the fans and BAFCon controllers can be installed in either multi-fan clusters or as multiple one-to-one BAFCon/fan pairs. Install as specified by the customer.

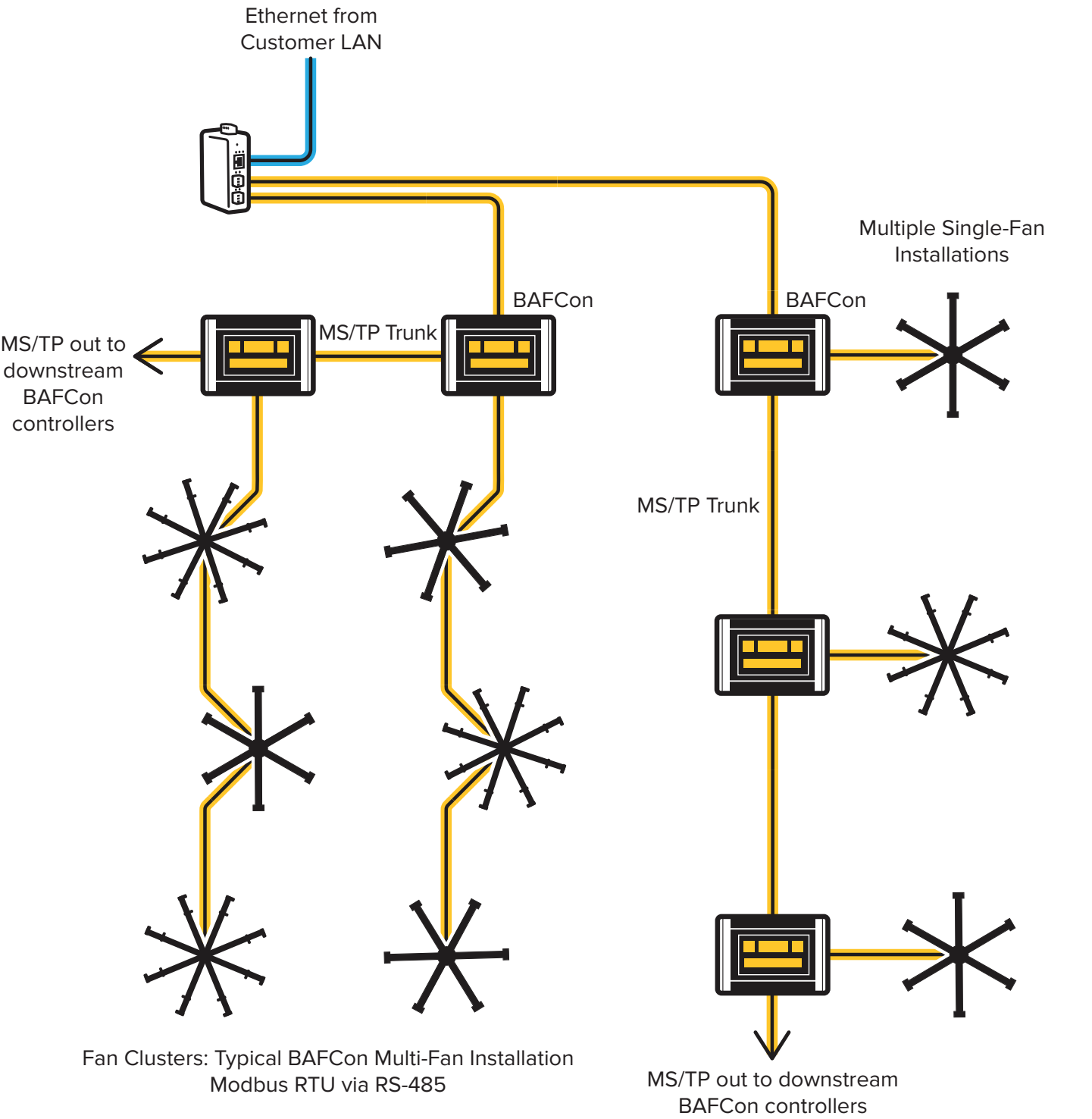
Both MS/TP and Modbus RTU trunks are limited to 4,000 ft (1,219 m) or less in total length. Big Ass Fans recommends the following manufacturers and part numbers for cabling:

- Belden part number 82760
- Windy City Wire part number 052000LC
- Windy City Wire part number 043000AL
- Big Ass Fans part number 008817
- CAT 5e (for use with the BAFCon Multi-Fan Kit only)

BACnet router connections



FAN CONTROL CONNECTIONS



SENSOR INSTALLATION

Install the following sensors **according to the manufacturer's installation guide provided with each sensor**. Refer to the sensor manufacturer's documentation for all installation, setup, operation, troubleshooting, and safety/regulatory information.

The number of indoor sensors to be installed depends on the number of zones in the facility and the configuration of each zone. Place the sensors in the locations specified in the system diagram/map. Locate the sensor label and make sure each sensor is placed in the appropriate location.

- **Outdoor Temperature/Humidity Sensor**—Big Ass Fans recommends installing this sensor on the north side of the building in an area that is not in direct sunlight.
- **Indoor Temperature/Humidity Sensors**
- **Indoor Occupancy Sensors**

HEATER CONNECTIONS

Install the following heater components according to the diagrams on the following pages and **according to the manufacturer's installation guide provided with each component**. Refer to the appropriate wiring diagrams in this section for your heater type(s) and configuration. Refer to the component manufacturer's documentation for all other installation, setup, operation, troubleshooting, and safety/regulatory information.

- LoRa I/O Module
- 18 W, 24 VDC Junction Box Mount I/O Module Power Supply
- 20–32 VDC Encapsulated Relay

Unit heaters with RO-1 module output channel

Power connections

Each I/O module must be powered by 12–24 VDC.

The provided power supply accepts 120–240 VAC input and is capable of delivering 24 VDC @ 0.75 A (18 W). It mounts as a cover to a standard 4 x 4 in. (102 x 102 mm) junction box and meets requirements for UL Class II low voltage wiring. Alternately, any 12–24 VDC power supply capable of delivering at least 50 mA of current may be used to power the module.

- Apply 24 VDC to the “VIN” terminal.
- Apply 0 VDC to the “GND” terminal.

Load connections

The module has two dry contact relay outputs rated up to 5 A @ 250 VAC or 30 VDC. **NOTE: The relay contacts may not be suitable for all use cases. Verify voltage and current ratings of the load being controlled.** A relay or contactor can be used to increase switching capacity as needed.

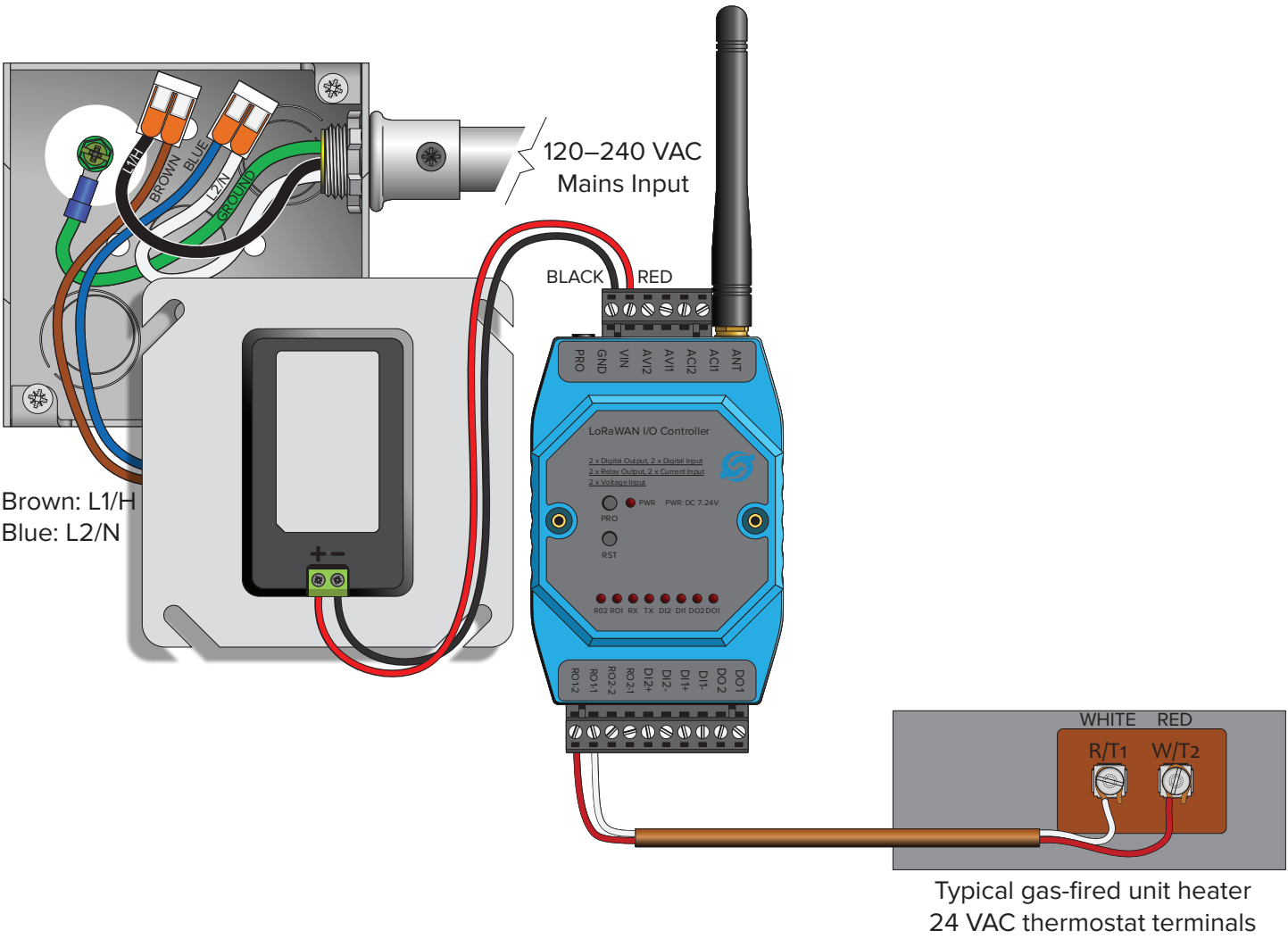
RO1 as shown is connected to a typical 24 VAC thermostat input for a gas-fired unit heater. If there is an existing two-wire thermostat connected to the heater, it can be left connected in parallel with this module with the thermostat set to the minimum set point, or it can be disconnected.

To connect a single I/O module to multiple gas-fired unit heaters, see page 16.

Environmental

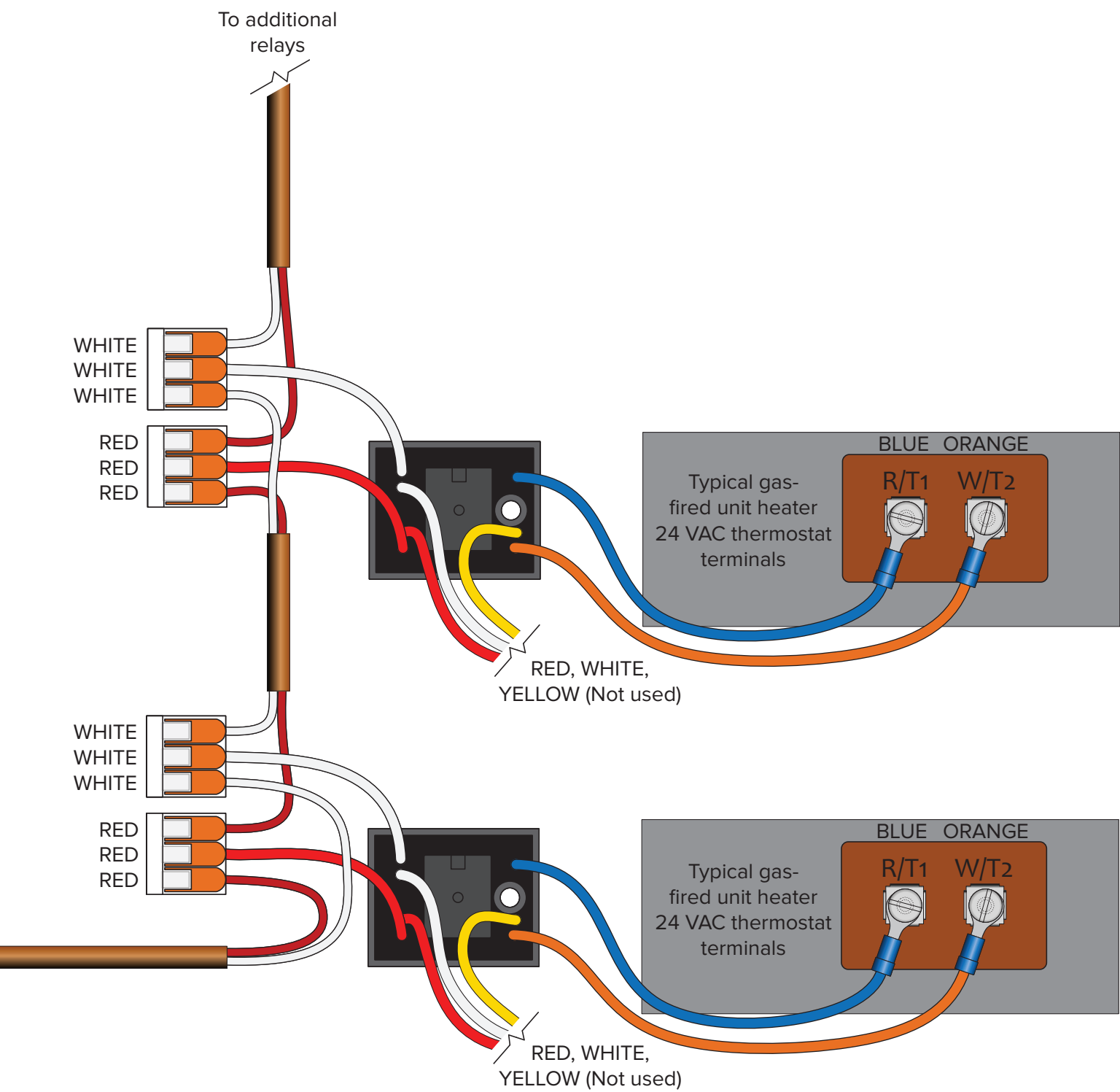
The module has no environmental rating. The environment and any customer requirements must be considered prior to installation. If the module must be placed in an enclosure, the enclosure **MUST be non-metallic**. ABS, polycarbonate, or fiberglass enclosures are acceptable. The module's antenna can be remotely mounted on a bulkhead connector.

HEATER CONNECTIONS



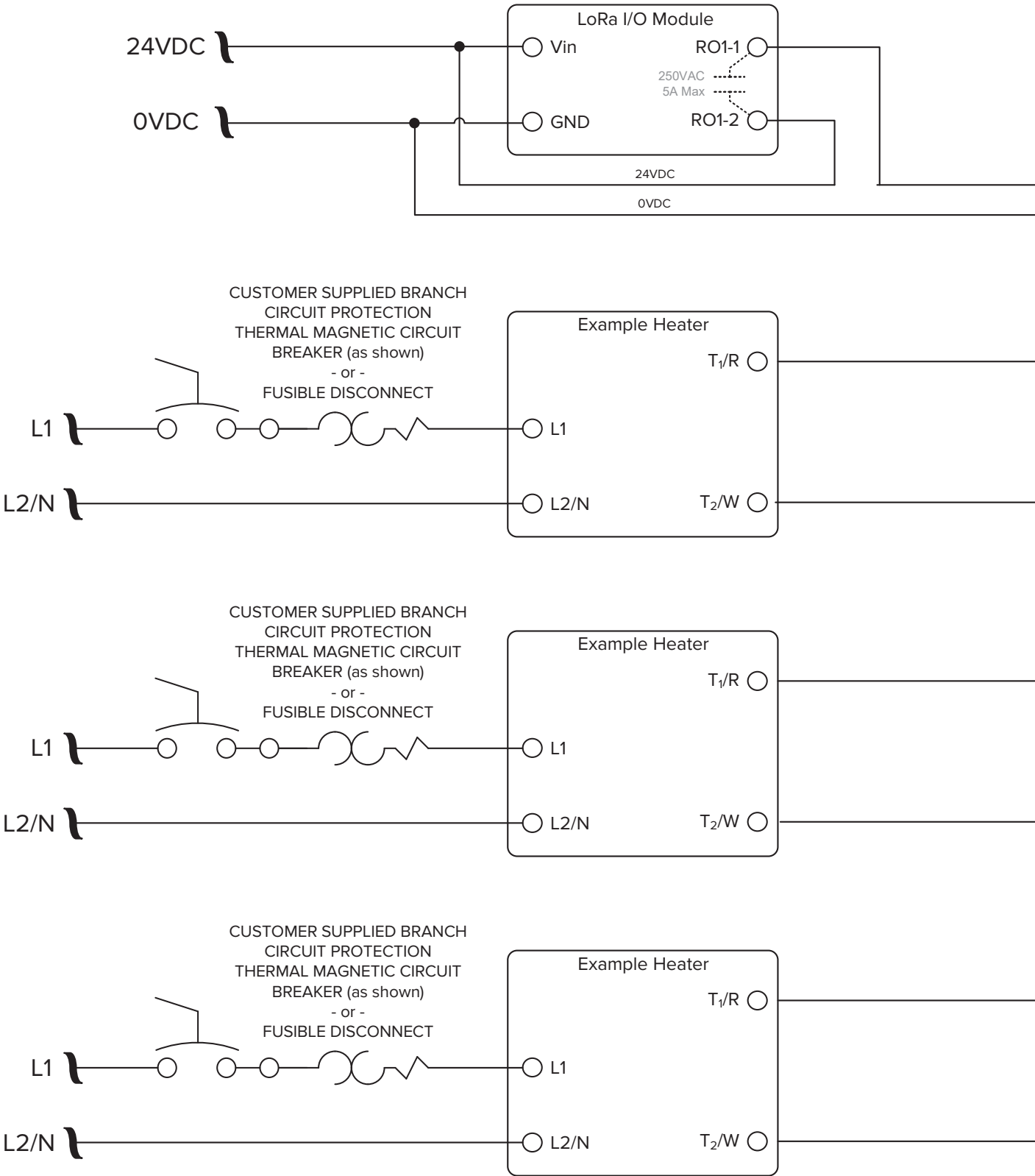
Multiple unit heaters with RO-1 module output channel

HEATER CONNECTIONS

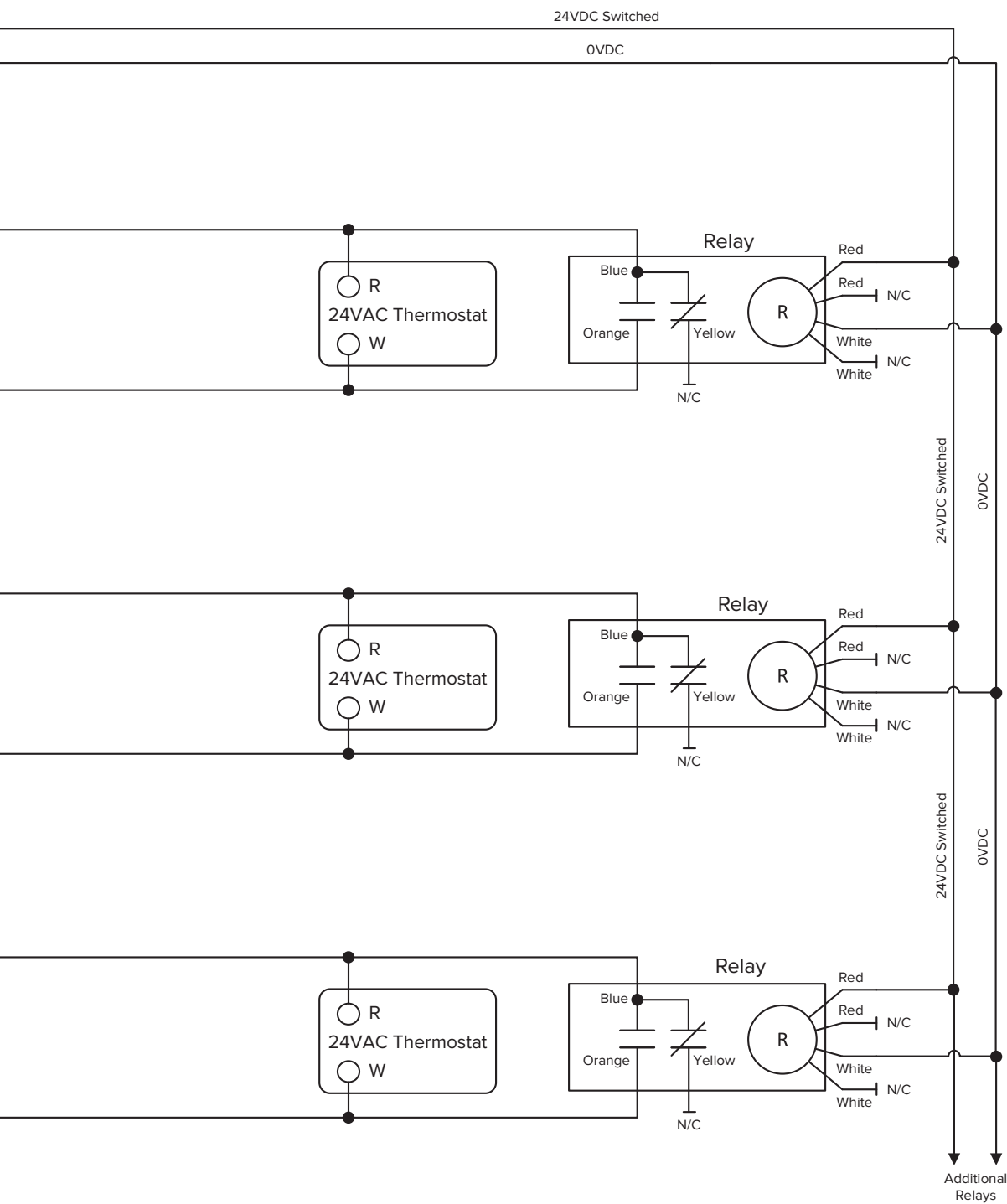


HEATER CONNECTIONS

Multiple unit heaters with RO-1 module output channel



The relay contact can connect parallel to the existing thermostat or can replace the thermostat depending on customer preference. **Consult the manufacturer’s documentation for the heater and thermostat as needed.**



HEATER CONNECTIONS

Radiant infrared heaters with RO-1 module output channel

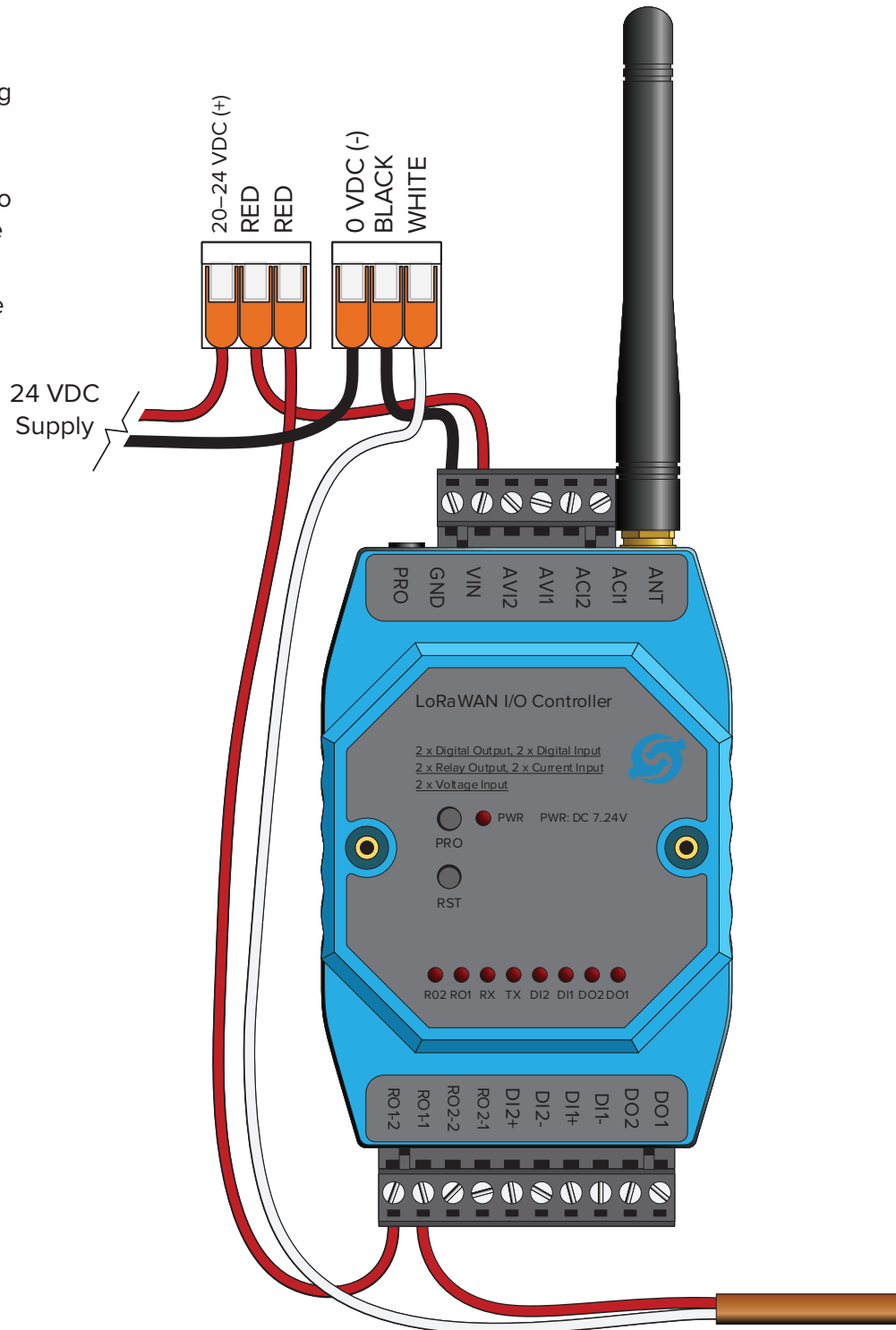
Radiant infrared heaters are typically controlled via manual switch or AC load rated thermostats. Big Ass Fans recommends removing and replacing the existing thermostat or switch (if installed) with a suitably rated relay or contactor.

The power relay used in this example has a coil voltage of 24 VDC @ 75 mA (1.8 W). Its contacts are rated as follows:

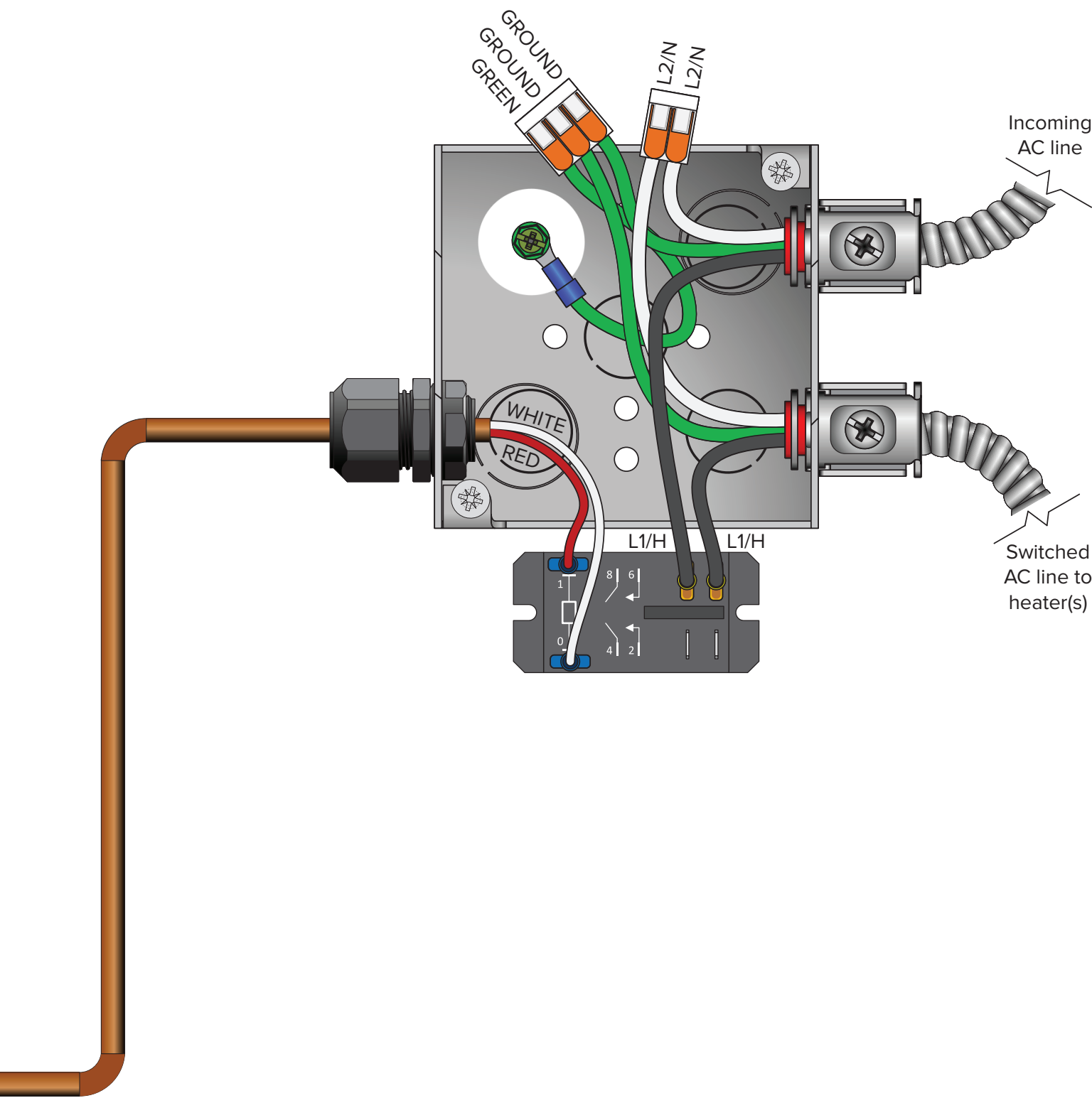
- 30 A, 277 VAC, resistive
- 20 A, 506 VAC, resistive
- 1.5 hp, 120 VAC, 2 pole making/breaking

NOTE: Insulated 1/4 in. (6 mm) spade connectors MUST be used for relay connections. A single relay can be used to control multiple heaters depending on the total load.

To connect a single I/O module to multiple radiant heaters, see page 22.

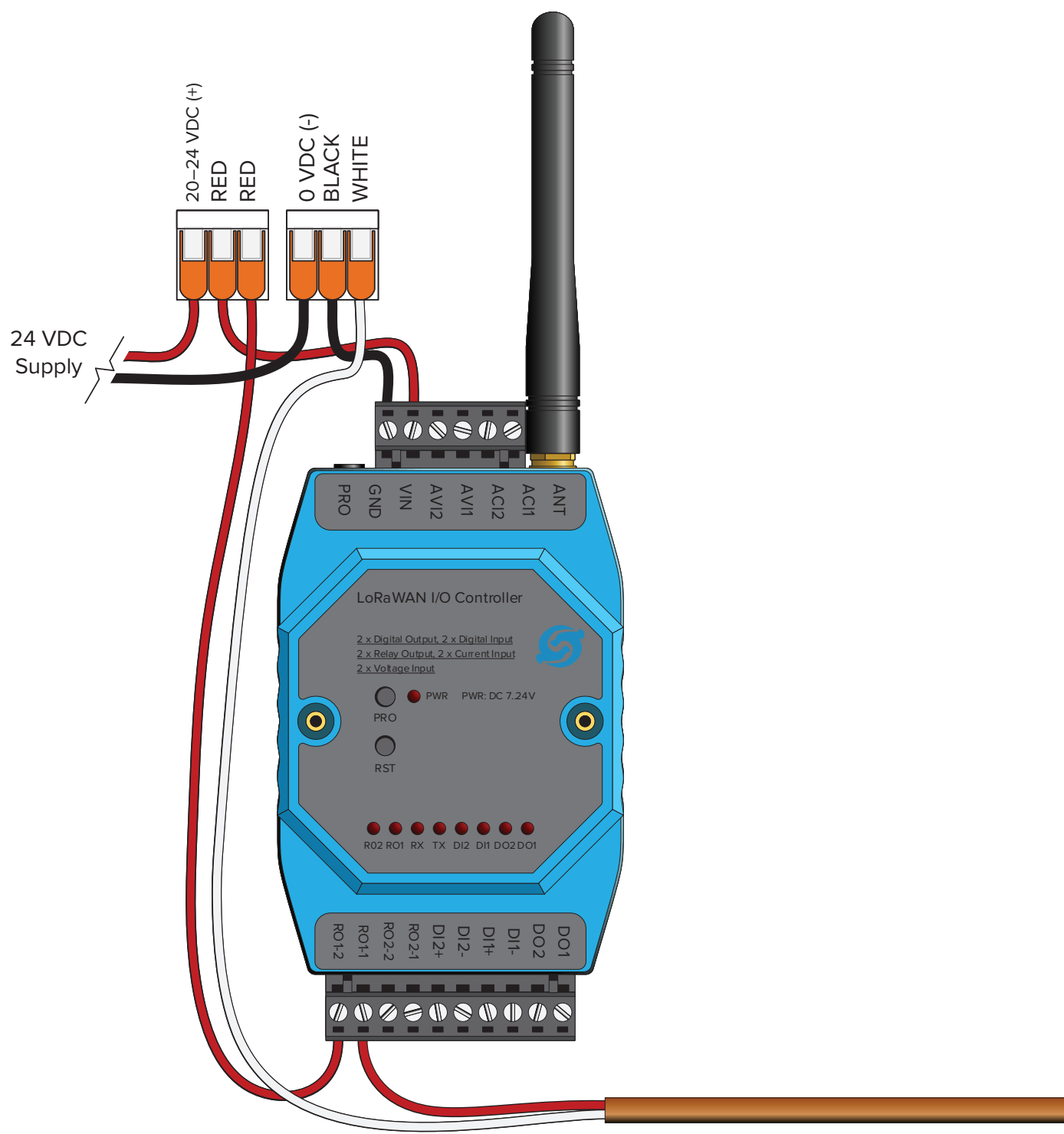


HEATER CONNECTIONS

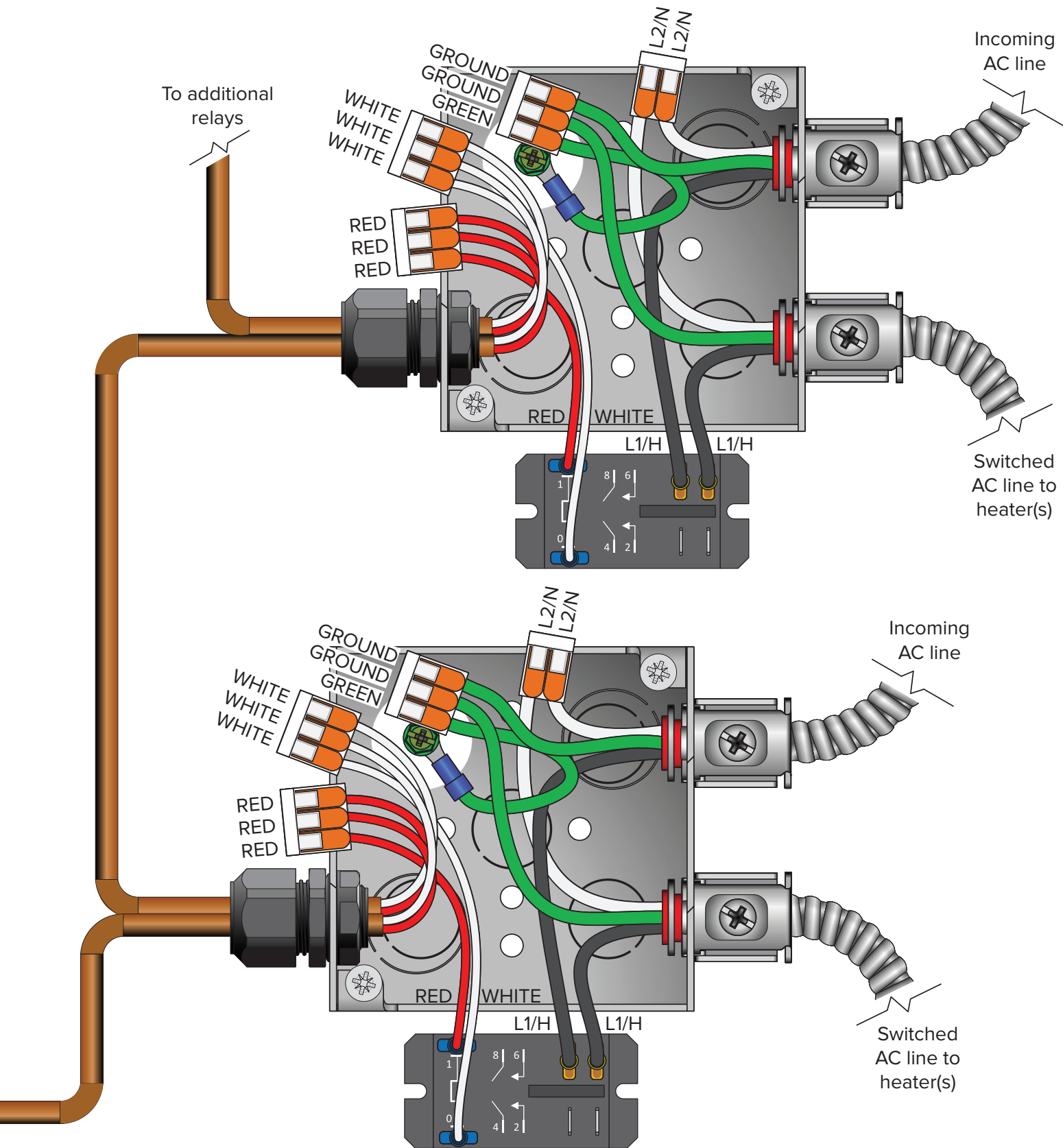


HEATER CONNECTIONS

Multiple radiant infrared heaters with RO-1 module output channel

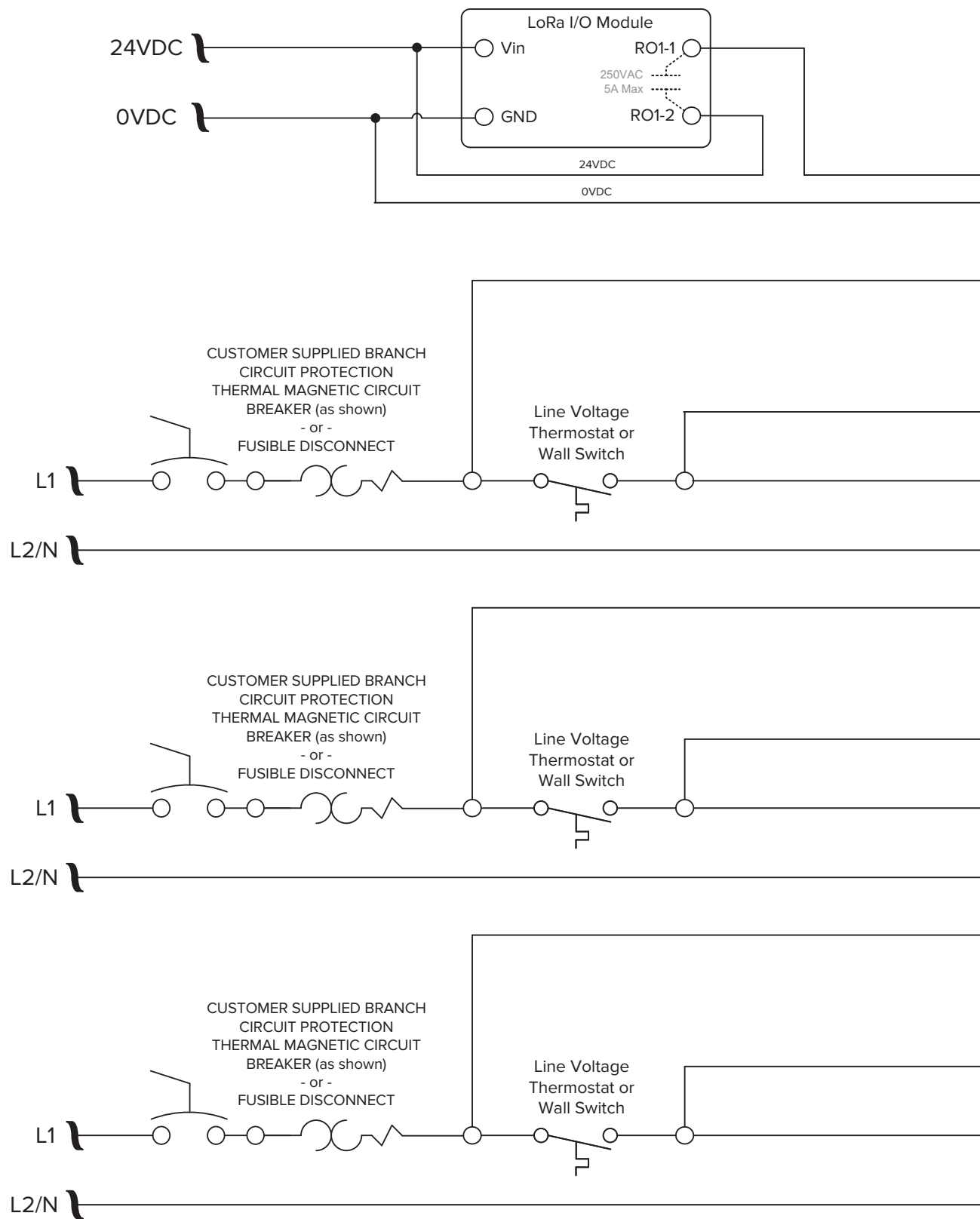


HEATER CONNECTIONS

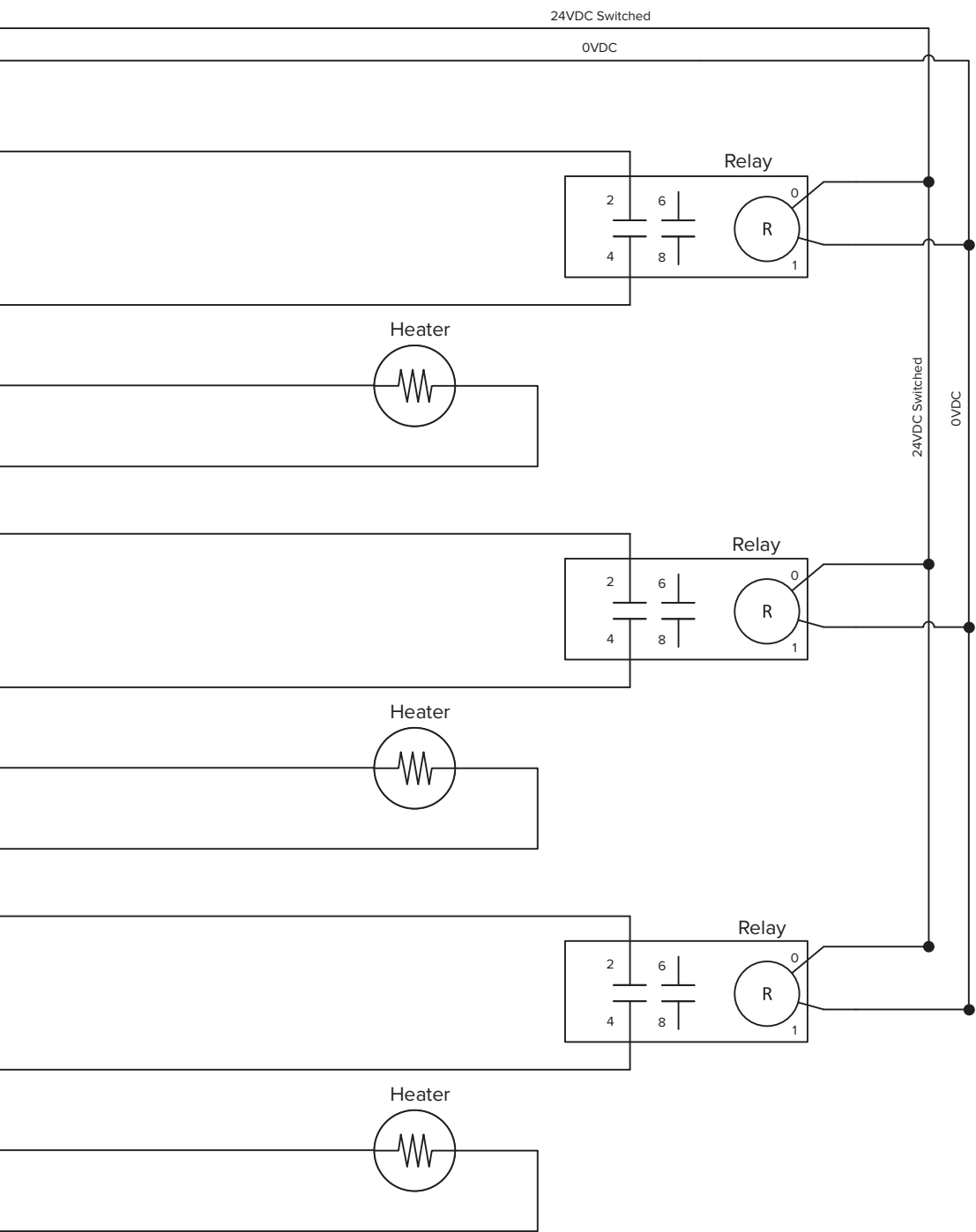


HEATER CONNECTIONS

Multiple radiant infrared heaters with RO-1 module output channel



The relay contact can connect parallel to the existing thermostat or can replace the thermostat depending on customer preference. **Consult the manufacturer’s documentation for the heater and thermostat as needed.**



EXHAUST FAN CONNECTIONS

Install the following exhaust fan components according to the diagram on the following page and **according to the manufacturer's installation guide provided with each component**. Refer to the component manufacturer's documentation for all other installation, setup, operation, troubleshooting, and safety/regulatory information.

- LoRa I/O Module
- 18 W, 24 VDC Junction Box Mount I/O Module Power Supply
- 20–32 VDC Encapsulated Relay

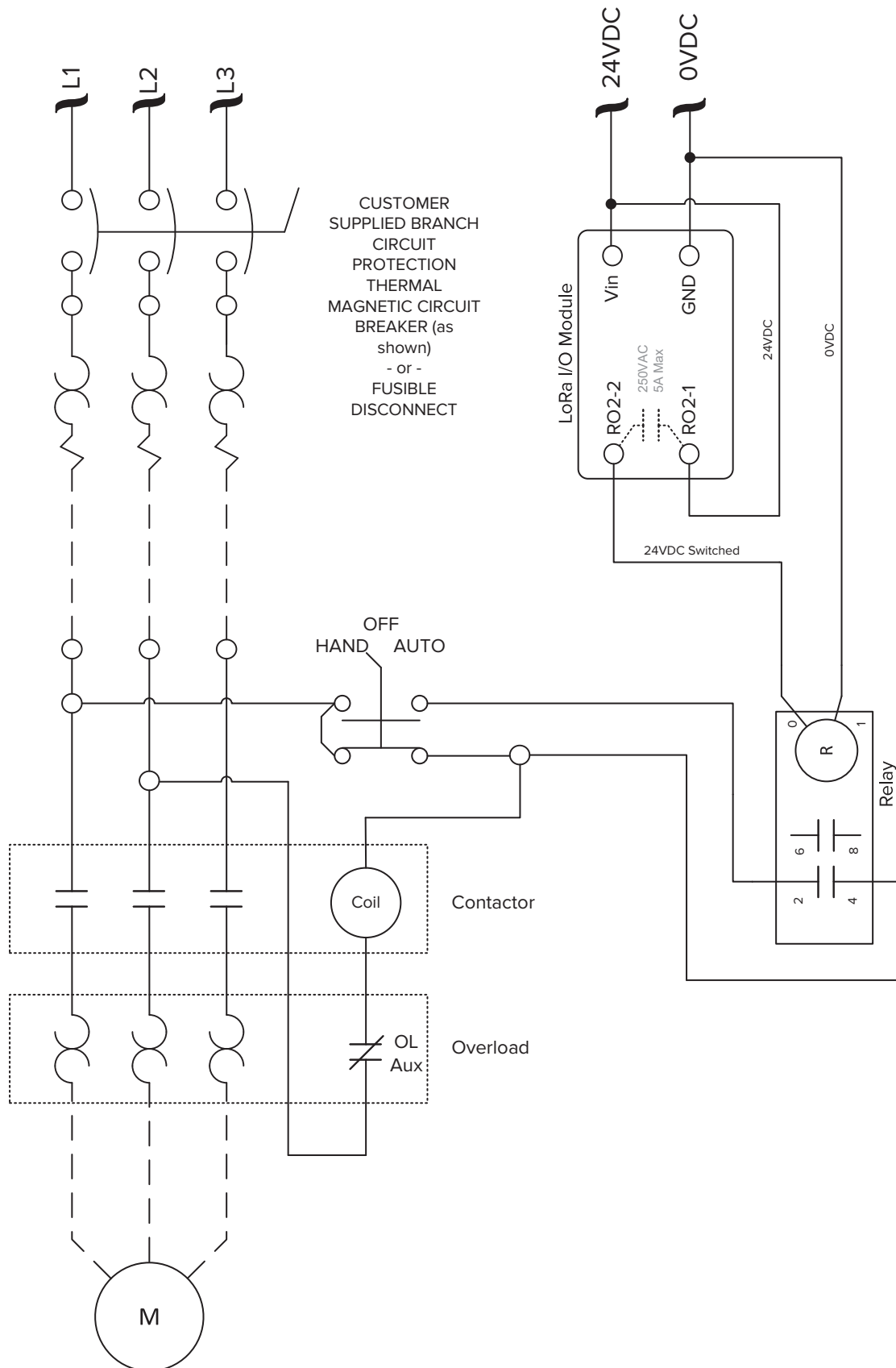
Exhaust fan motor starters and RO-2 module output channel

Exhaust fans are controlled with the I/O module's RO-2 output channel. The most common wiring scenario is shown on the following page. This scenario utilizes a relay being driven by the module's RO-2 output channel.

Piloting multiple motor starters is achieved in the same fashion as piloting multiple radiant heaters as shown on pages 22–25.

NOTE: The provided relay is not suitable for most use cases because simple motor starters commonly use the motor's line voltage for control voltage (208 VAC, 480 VAC, etc.). Verify voltage and current ratings of the load being controlled prior to application, and specify a suitable relay or contactor with a 24 VDC coil. The diagram on the following page illustrates the use of a 24 VDC power relay that meets these requirements.

EXHAUST FAN CONNECTIONS



CONTROLS CHECKLIST

After installation is complete, confirm the following on the Equipment screen of the CommandSense application on the wall-mounted tablet:

Overhead fans

- ☐ All overhead fans appear on the Equipment screen
- ☐ All overhead fans can be controlled from the Equipment screen (On/Off is sufficient)

Exhaust fans

- ☐ All exhaust fans appear on the Equipment screen
- ☐ All exhaust fans can be controlled from the Equipment screen (On/Off)

Heaters

- ☐ All heaters appear on the Equipment screen
- ☐ All heaters can be controlled from the Equipment screen (On/Off)

Indoor temperature sensors

- ☐ All indoor temperature sensors appear on the Equipment screen
- ☐ All indoor temperature sensors are reporting reasonable values

Indoor humidity sensors

- ☐ All indoor humidity sensors appear on the Equipment screen
- ☐ All indoor humidity sensors are reporting reasonable values

Outdoor temperature sensors

- ☐ All outdoor temperature sensors appear on the Equipment screen
- ☐ All outdoor temperature sensors are reporting reasonable values

Outdoor humidity sensors

- ☐ All outdoor humidity sensors appear on the Equipment screen
- ☐ All outdoor humidity sensors are reporting reasonable values

Motion sensors

- ☐ All motion sensors appear on the Equipment screen
- ☐ All motion sensors are reporting reasonable values. Walk past each sensor and confirm it detects motion.

Touchscreen

- ☐ Touchscreen PIN code has been set
- ☐ Touchscreen PIN code has been shared with building manager

Zone assignment

Confirm the following on the Settings screen under Zones:

- ☐ All devices are assigned to the correct zone

CONTACT US

Customer Service

United States
2348 Innovation Drive
Lexington, KY 40511
USA
877-244-3267
bigassfans.com

Manufacturing and Warranty

You are responsible for providing and paying for shipping when returning a product to Big Ass Fans for the purpose of recycling under the WEEE directive.

Manufacturer 
2348 Innovation Drive
Lexington, KY 40511
USA

Warranty and WEEE Returns
2201 Jaggie Fox Way
Lexington, KY 40511
USA

Manufacturing Site
2251 Innovation Drive
Lexington, KY 40511
USA



BIG ASS FANS®

bigassfans.com

