Verasys® 18 Point 24VAC Application Controller

Installation Instructions

LC-VAC100x-0

Part No. 24-10143-01477, Rev. A
Issued May 2018

Refer to the QuickLIT website for the most up-to-date version of this document.

Application

The Verasys 18 point 24V Application Controller is part of the SMART Equipment controller family. Verasys Application Controllers run pre-engineered applications and provide the inputs and outputs required to monitor and control a wide variety of HVAC equipment.

Verasys Application Controllers operate on an RS-485 BACnet® (MS/TP) Bus as BACnet Advanced Application Controllers (B-AACs) and integrate into Johnson Controls® and third-party BACnet systems.

Verasys Application Controllers include an integral real-time clock, which enables the controllers to monitor and control schedules, calendars, trends, and operate for extended periods of time as stand-alone controllers when offline from the system network.

IMPORTANT: Use this Verasys Application Controller only as an operating control. Where failure or malfunction of the Verasys Application Controller could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the Verasys Application Controller.

IMPORTANT : Utiliser ce Verasys Application Controller uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du controller risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du Verasys application controller.

Verasys Application Controller Features

The Verasys Application Controllers are used for a Verasys system. This specific controller comes without an application, but you can load custom built applications into this controller. Depending on your market, an application library may exist and those applications can be made available to you. See your local Verasys representative. The specific controller detailed in this document has the following features:

- I/O quantities and characteristics of the Verasys Application Controllers
- A real-time clock with local display
- Built-in BACnet schedule objects and calendars
- Mobile Access Portal (MAP) compatibility for configuration through smart mobile devices and remote connectivity
- Verasys Smart Building Hub (SBH) compatible through the BACnet MSTP system bus connection
- Dedicated sensor bus for Johnson Controls smart end-devices
- Some applications may use the dedicated modbus port for third-party end-device integration with modbus
- All products have a display and support of power input of 24 VAC

- Multi protocol support for BMS integration BACnet MSTP, N2 and modbus RTU through on-board display

North American Emissions Compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case users will be required to correct the interference at their own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Installation

Follow these guidelines when installing a Verasys application controller:

- Transport the controller in the original container to minimize vibration and shock damage.
- Verify that all parts shipped with the controller.
- Do not drop the controller or subject it to physical shock.

Parts Included

- One Verasys 18 point 24V application controller
- One installation instruction sheet

Materials and Special Tools Needed

- Three fasteners appropriate for the mounting surface (M4 screws or #8 screws)
- One 20 cm (8 in.) or longer piece of 35 mm DIN rail and appropriate hardware for DIN rail mount (only)
- Small straight-blade screwdriver for securing wires in the terminal blocks

Mounting

IMPORTANT: Only qualified personnel should install or service Verasys products. These instructions are a guide for such personnel. Mount the Verasys controllers on a wall or DIN rail inside an enclosure (rated at least IP20). Carefully follow all instructions in this document and all instructions for the controller.

Follow these guidelines when mounting a field controller:

- Ensure that the mounting surface can support the controller, DIN rail, and any user-supplied enclosure.
- Mount the controller horizontally on 35 mm DIN rail whenever possible.
- Mount the controller in the proper mounting position, see Figure 1.
- Use shims or washers to mount the controller securely and evenly on the mounting surface.
- Mount the controller in an area free of corrosive vapors and observe the ambient condition requirements in Table 9.

- Provide sufficient space around the controller for cable and wire connections, for easy cover removal, and good ventilation through the controller. Provide a minimum of 50 mm [2 in.] on the top, bottom, and front of the controller.
- Do not mount the controller on surfaces prone to vibration, such as duct work.
- Do not mount the controller in areas where electromagnetic emissions from other devices or wiring can interfere with controller communication.

Follow these additional guidelines when mounting a field controller in a panel or enclosure:

- Mount the controller so that the enclosure walls do not obstruct cover removal or ventilation through the controller.
- Mount the controller so that the power transformer and other devices do not radiate excessive heat to the controller.
- Do not install the controller in an airtight enclosure.
- Use a zip tie to secure the controller when shipping.

Figure 1: Application Controller horizontal Mounting Position

DIN Rail Mount Applications

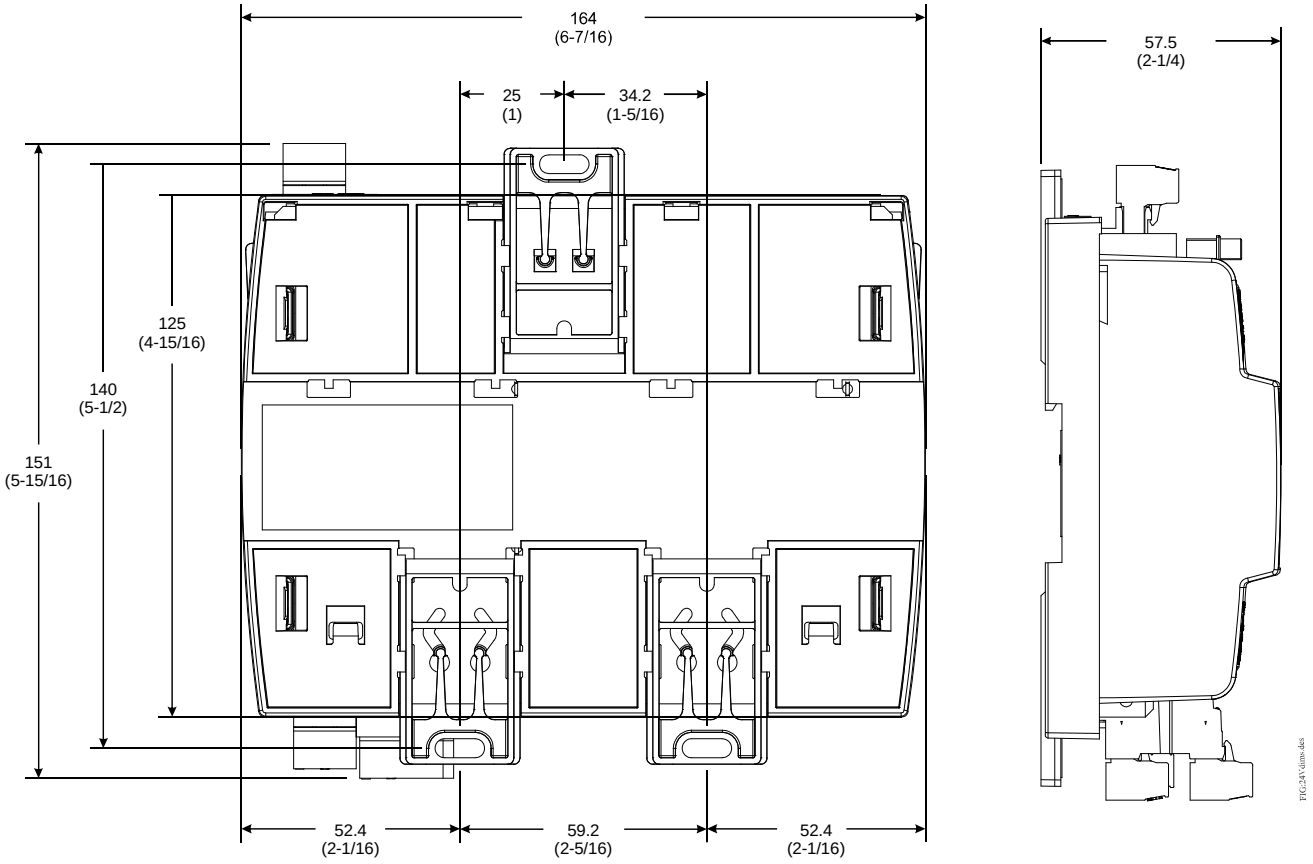
To mount the field controller on 35 mm DIN rail, complete the following steps:

1. Securely mount a 20 cm (8 in.) or longer section of 35 mm DIN rail horizontal and centered in the appropriate space, so that the controller mounts in the horizontal position in Figure 1.
2. Pull the two bottom mounting clips outward from the controller to the extended position.
3. Hang the controller on the DIN rail by the hooks at the top of the DIN rail channel on the back of the controller, and position the controller snugly against the DIN rail.
4. Zip-tie the controller to the DIN rail when shipping.
5. Push the bottom mounting clips inward (up) to secure the controller on the DIN rail.

To remove the controller from the DIN rail, pull the bottom mounting clips out to the extended position and carefully lift the controller off the DIN rail.

IMPORTANT: Do not overtighten the mounting screws. Overtightening the screws may damage the mounting clips.

Figure 2: Back of Controller Showing Extended Mounting Clips, DIN Rail Channel, and Mounting Dimensions, mm (in.)



Wiring

Follow these guidelines when wiring the field controller:

⚠ WARNING

Risk of Electric Shock.
Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

⚠ ADVERTISSEMENT

Risque de décharge électrique.
Débrancher ou isoler toute alimentation avant de réaliser un branchement électrique. Plusieurs isolations et débranchements sont peut-être nécessaires pour -couper entièrement l'alimentation de l'équipement. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

IMPORTANT: Do not exceed the controller electrical ratings. Exceeding controller electrical ratings can result in permanent damage to the controller and void any warranty.

IMPORTANT: Use copper conductors with a rating of at least 75°C (167°F). Make all wiring in accordance with local, national, and regional regulations.

IMPORTANT: Electrostatic discharge can damage controller components. Use proper electrostatic discharge precautions during installation, setup, and servicing to avoid damaging the controller.

For detailed information on configuring and wiring an MS/TP bus, system bus, and sensor bus, refer to the *Verasys™ BACnet® MS/TP Communications Bus Technical Bulletin (LIT-12012362).*

Verasys Application Controller Terminal Blocks and Bus Ports

See Figure 11 for terminal block, spade location, and bus port locations on the LC-VAC100x-0 controller. Use the following guidelines when wiring a controller.

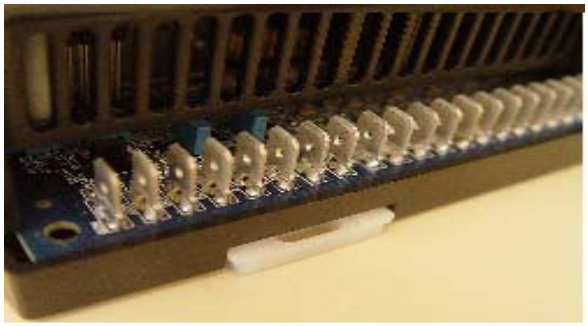
Input and Output Terminal Blocks

On most field controller models, all of the input terminal blocks or spade terminals are mounted on the bottom of the controller and the output terminal blocks and spade terminals are mounted on the top of the controller. See Table 3 for more information about I/O terminal functions, requirements, and ratings.

Wiring

For all the I/O terminals listed in Table 3, use the appropriate gauge wiring. For all the spade terminals used in this application, follow the guidelines in Table 3 and use a spade connector with screw terminals. Table 8 provides the product code numbers for the removable terminal block. Figure 3 shows the spade I/O terminals.

Figure 3: Verasys Application Controller — Spade Terminals



Field Wiring

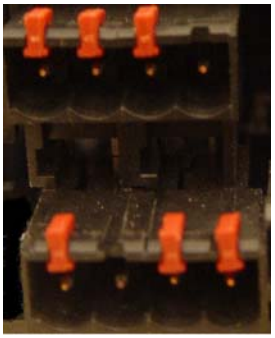
For all I/O terminals listed in Table 3, use the appropriate gauge wiring. For all the spade terminals used in this application, follow the guidelines in Table 3 and use a spade connector with screw terminals.

Figure 4: Verasys Application Controller — Spade Connector with Screw Terminals

Stacked System and Sensor Bus Terminal Block

A dual-stacked connector serves as the system bus and sensor bus port on the Verasys Application Controllers. The upper row on the connector is the system bus port. The lower connector row is the sensor bus port.

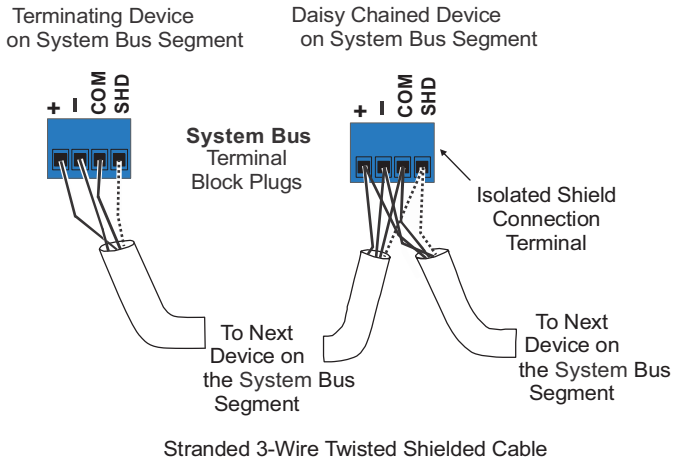
Figure 5: Stacked System and Sensor Bus Terminal Block



System Bus Terminal Block

The system bus terminal block is a blue, removable, 4-terminal plug that fits into a board-mounted jack. Wire the removable system bus terminal block plugs on the controller that is on the top row of the stacked connector. Wire the other field controllers in a daisy-chain configuration using 3-wire twisted, shielded cable as shown in Figure 6. See Table 5 for more information on functions, ratings, requirements and cables.

Figure 6: System Bus Terminal Block Wiring



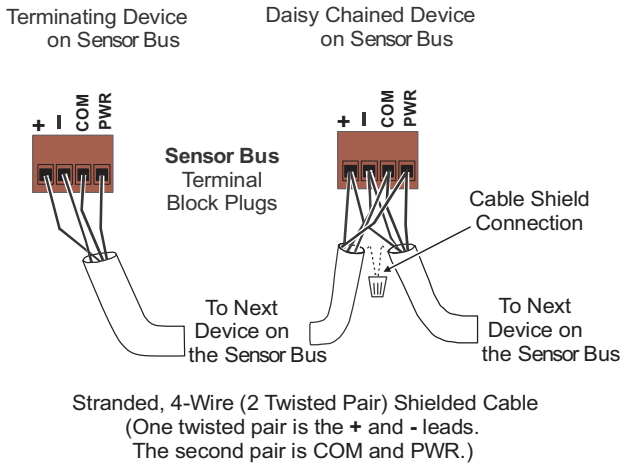
Note: The System Bus Shield (SHD) terminal is isolated and you can use it to connect the shields, in a daisy-chain configuration, for system bus wiring.

Sensor Bus Terminal Block

The sensor bus terminal block is a brown, removable, 4-terminal plug that fits into a board-mounted jack.

Wire the removable sensor bus terminal block plugs on the lower port of the dual stacked connector to the controller, and wire the other sensor bus devices in a daisy-chain configuration using 4-wire twisted, shielded cable as shown in Figure 7. See Table 5 for more information on functions, ratings, requirements and cables.

Figure 7: Sensor Bus Terminal Block Wiring



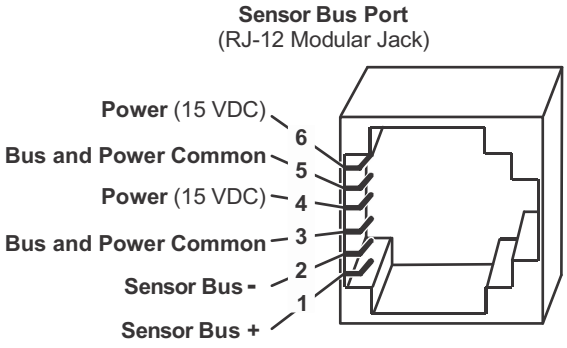
Note: The sensor bus PWR terminal supplies 15 VDC. You can use the sensor bus PWR terminal to connect, in a daisy-chain configuration, the 15 VDC power leads on the sensor bus.

Sensor Bus Port

The sensor bus port on the middle left side of the controller, see '9' on Figure 11, is an RJ12, 6-position modular jack that provides a connection for the Smart Building Hub (SBH), the VAV Balancing Tool, specified network sensors, or other sensor bus devices with RJ12 plugs.

The sensor bus port is connected internally to the sensor bus terminal block. See Table 5 for more information on functions, ratings, requirements and cables. The sensor bus port pin assignment is shown in Figure 8.

Figure 8: Pin Number Assignments for Sensor Bus Ports on Verasys Application Controllers



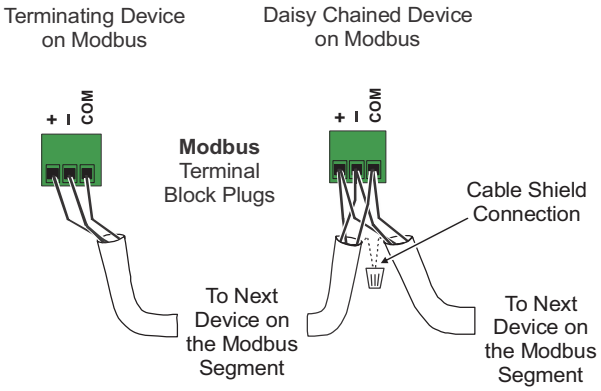
Modbus Terminal Block

The modbus terminal block is a green, removable, 3-terminal plug that fits into a board-mounted jack.

Wire the removable modbus terminal block plugs on the controller, and wire the other field controllers in a daisy-chain configuration using 3-wire twisted, shielded cable as shown in Figure 9. See Table 5 for more information on functions, ratings, requirements and cables.

The modbus port communicates as a master modbus device and connects to the modbus network, which may consist of one-to-many modbus devices. Each modbus device has a unique modbus register table and you must configure it within the application of the Verasys Controller.

Figure 9: Modbus Terminal Block

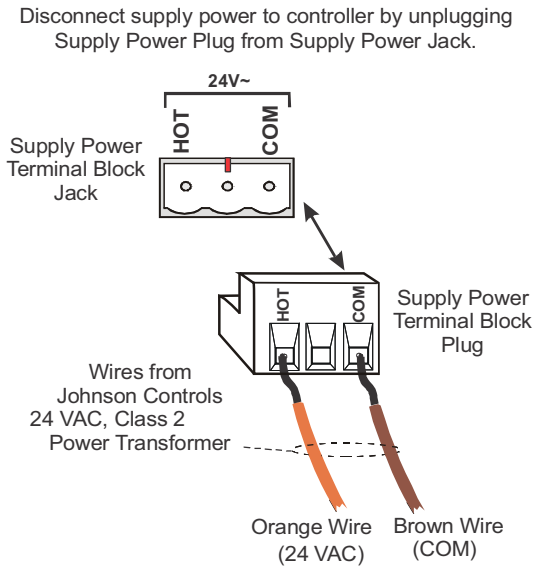


Supply Power Terminal Block

The 24 VAC supply power terminal block is a gray, removable, 3-terminal plug that fits into a board-mounted jack on the top right of the controller.

Wire the 24 VAC supply power wires from the transformer to the HOT and COM terminals on the terminal plug as shown in Figure 10. The middle terminal on the supply power terminal block is not used. See Table 5 for more information about the supply terminal block.

Figure 10: 24 VAC Supply Power Terminal Block



Note: The supply power wire colors may be different on transformers from other manufacturers. Refer to the transformer manufacturer's instructions and the project installation drawings for wiring details.

End of Line (EOL) Switch

Located under the cover of the controller is a red end of line switch that you can set when this device is located at the end of the trunk or at the start of the trunk.

To set the end of the line, complete the following steps:

1. Gently pull up on the side of the cover of the controller to access the switch. See ‘8’ on figure 11 for the location of the cover lift tabs. Ensure you do not to pull the ribbon cable from the display membrane that connects to the display.
2. The red EOL switch is located near the system bus terminal. For location of the system bus terminal, see ‘15’ on Figure 11.
3. Set the switch to **ON**.

Figure 11: Verasys Application Physical Features

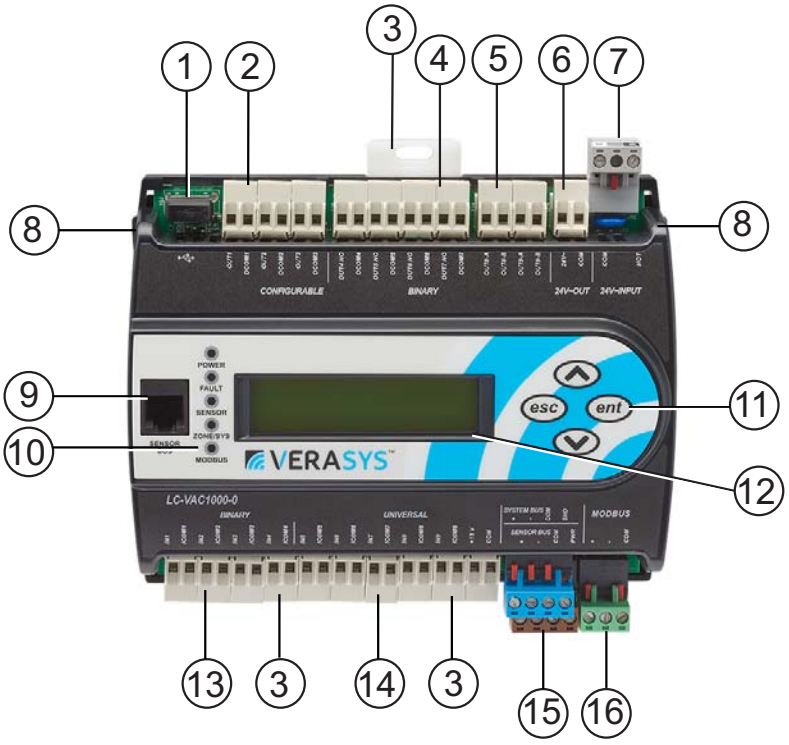


Table 1: Verasys Application Physical Features (Part 1 of 2)

Callout	Physical Feature: Description and Reference
1	USB host port
2	Three configurable outputs: 0 to 10 VDC, 10 mA, 24 VAC externally sourced Triac outputs 0.5A (maximum) output current
3	Mounting clips (three)
4	Four binary outputs: relays SPST (3A) (240 VAC), dry contact
5	Two binary outputs: 0.5 A Triac (24 or 240 VAC, externally powered). See Table 3
6	24 VAC utility output power for actuator supply
7	24 VAC, class 2 power supply terminal block. See the *Supply Power Terminal Block* section.
8	Cover lift tabs
9	Sensor bus port (RJ-12 6-pin Modular Jack). See .
10	LED status indicators. See Table 7

Table 1: Verasys Application Physical Features (Part 2 of 2)

Callout	Physical Feature: Description and Reference
11	Four keypad buttons
12	Display with backlight.
13	Four binary inputs terminal blocks. Dry contact maintained or pulse counter/accumulator mode. See Table 3
14	Five universal inputs (UI) terminal blocks. Voltage analog input 0-10 VDC. Current analog Input 4–20 mA. Resistive analog inputs (0 to 600 ohms) or dry contact binary input. See Table 3.
15	Dual-stacked connector. See *Stacked System and Sensor Bus Terminal Block*
16	Modbus Communication Port. See *Modbus Terminal Block*.

Termination Details

A set of termination diagrams provide details for wiring inputs and outputs to the controllers. See the tables in this section for the applicable termination diagrams.

Table 2: Termination Details (Part 1 of 5)

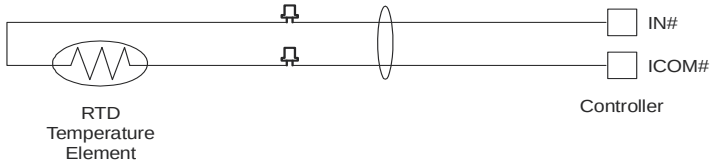
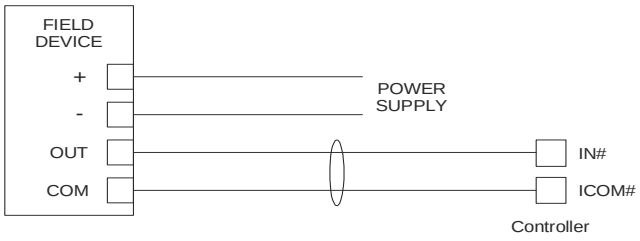
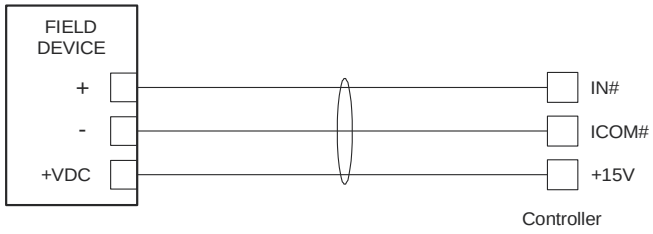
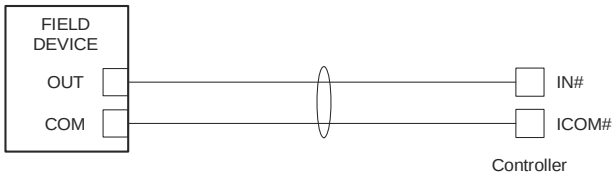
Type of Field Device	Type of Input/Output	Termination Diagrams
Resistive Input - RTD Monitor	**UI**	
Voltage Input - External Source	**UI**	
Voltage Input - Internal Source	**UI**	
Voltage Input (Self-Powered)	**UI**	

Table 2: Termination Details (Part 2 of 5)

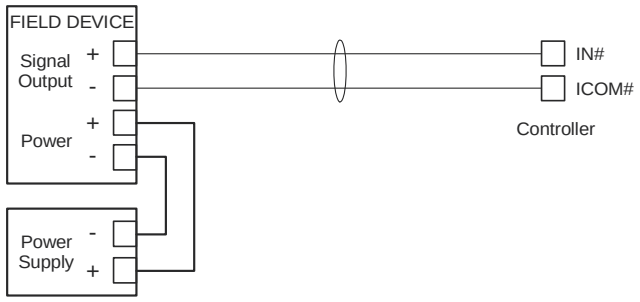
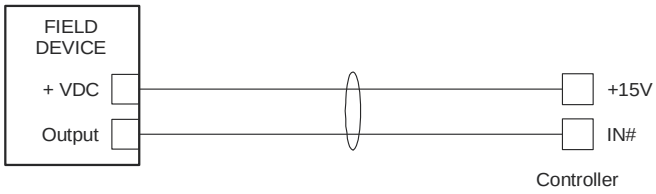
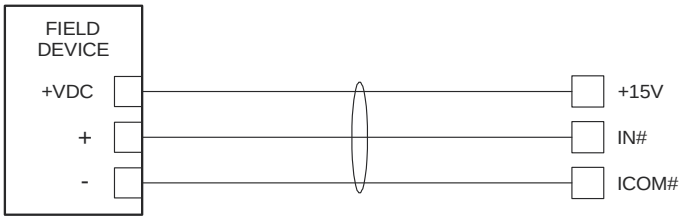
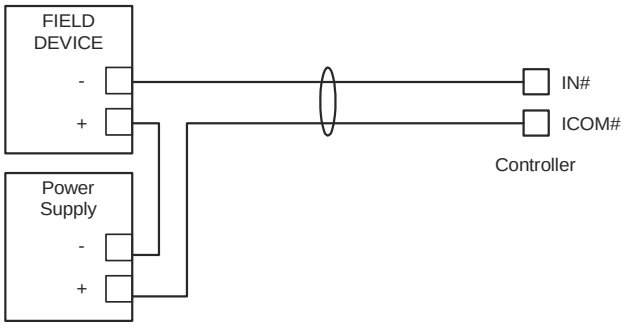
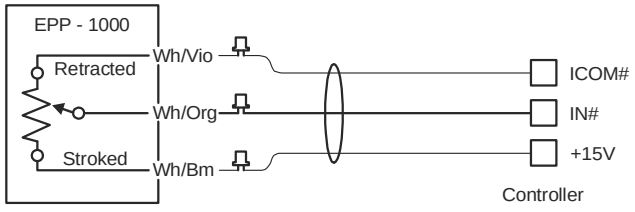
Type of Field Device	Type of Input/Output	Termination Diagrams
Current Input - External Source (Isolated)	**UI**	
Current Input - Internal Source (2 wire)	**UI**	
Current Input - Internal Source (3 wire)	**UI**	
Current Input - External Source (in Loop)	**UI**	
Feedback from EPP-1000	**UI**	

Table 2: Termination Details (Part 3 of 5)

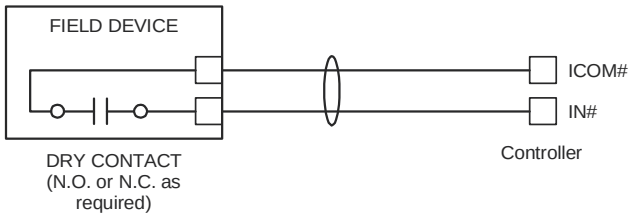
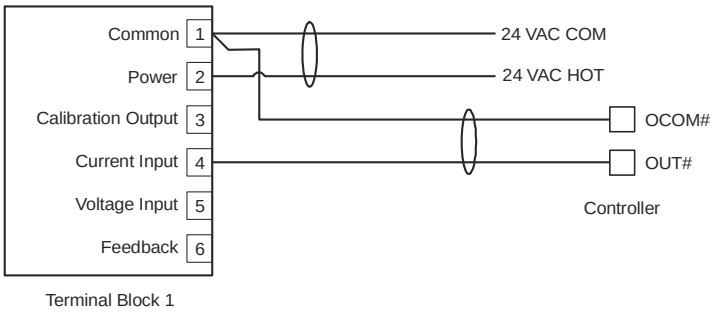
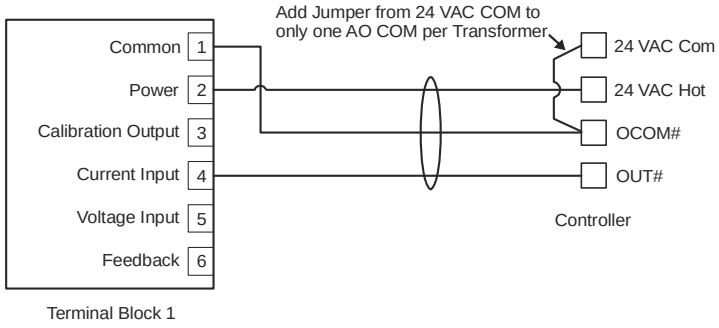
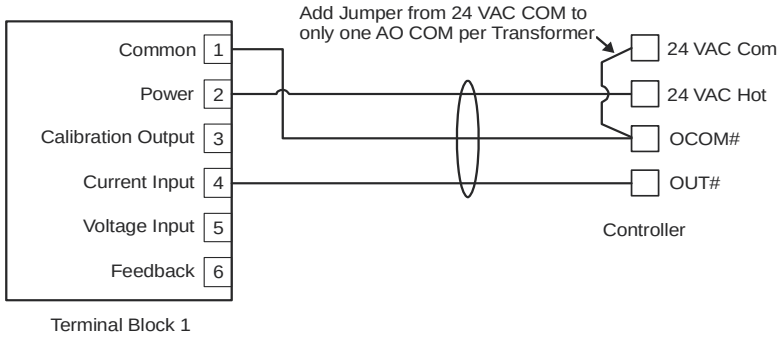
Type of Field Device	Type of Input/Output	Termination Diagrams
Dry Contact (Binary Input)	**UI/BI**	
0–10 VDC Output to Actuator (External Source)	**CO**	
0–10 VDC Output to Actuator (Internal Source)	**CO**	
0–20 mA Output to Actuator	**CO**	

Table 2: Termination Details (Part 4 of 5)

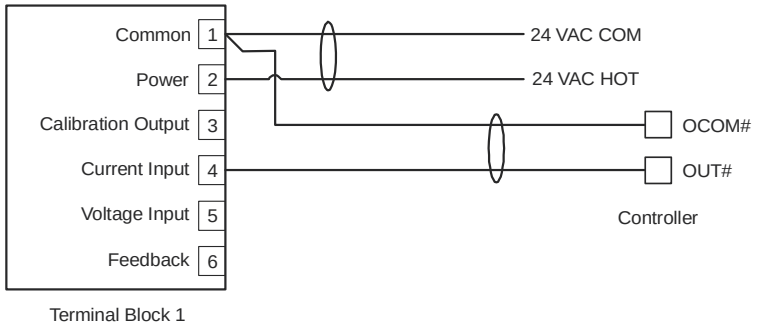
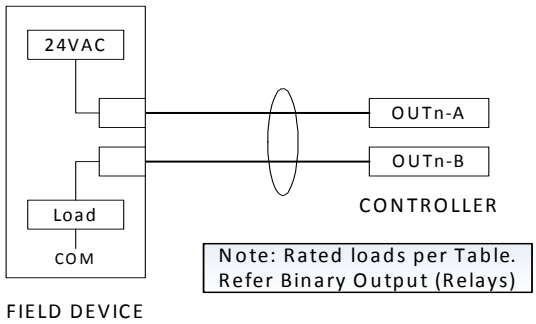
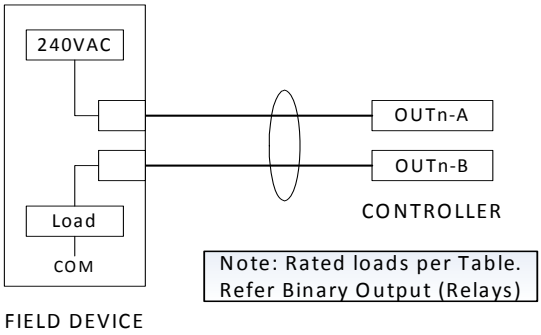
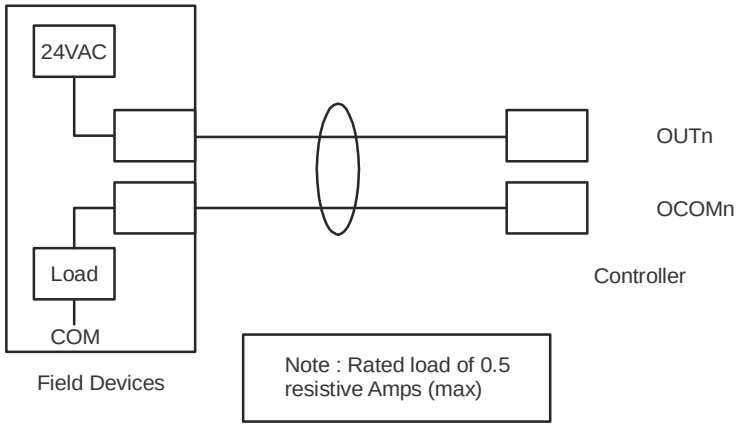
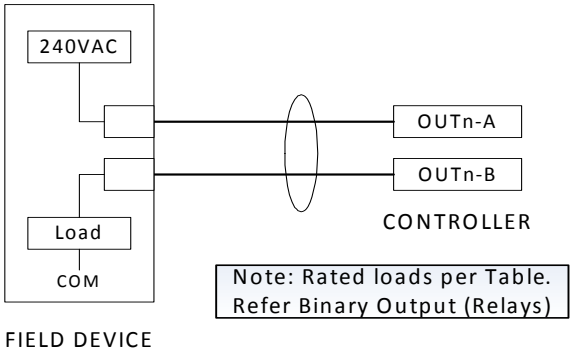
Type of Field Device	Type of Input/Output	Termination Diagrams
0–20 mA Output to Actuator	**CO**	
24 VAC Triac Output	**BO**	
240 VAC Triac Output	**BO**	

Table 2: Termination Details (Part 5 of 5)

Type of Field Device	Type of Input/Output	Termination Diagrams
24 VAC Triac Output	**CO**	
240 VAC Relay Output	**RO**	

Terminal Wiring Guidelines, Functions, Ratings, and Requirements

Input and Output Wiring Guidelines

Table 3 and Table 4 provide information and guidelines about the functions, ratings, and requirements for the controller input and output terminal guidelines for determining wire sizes and cable lengths.

In addition to the wiring guidelines in Table 3 and Table 4 use these guidelines when wiring controller inputs and outputs:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All input and output cables, regardless of wire size or number of wires, should consist of stranded, insulated, and twisted copper wires.
- Shielded cable is not required for input or output cables.
- Using shielded cable is best practice for input and output cables that are exposed to high electromagnetic or radio frequency noise.
- Inputs/outputs with cables less than 30 m (100 ft) typically do not require an offset in the software setup. Cable runs over 30 m (100 ft) may require an offset in the input/output software setup.

Table 3: Controller Terminal Blocks, Functions, Ratings, Requirements, and Cables (Part 1 of 2)

Terminal Block Label	Terminal Label	Function, Ratings, Requirements	Determine Wire Size and Maximum Cable Length[1]
UNIVERSAL (Inputs)	**+15 V**	**15 VDC Power Source** for active (3-wire) input devices connected to the Universal IN*n* terminals; provides 80 mA total current.	Same as (Universal) **IN*n*** **Note:** Use 3-wire cable for devices that source power from the +15V terminal.
	COM	**15 VDC Power Source Common** for active (3-wire) input devices connected to the Universal IN*n* terminals; provides 80 mA total current.	Same as (Universal) **IN*n***
	IN*n*	**Analog Input - Voltage Mode (0–10 VDC)** 10 VDC maximum input voltage Internal 67k ohm pull-down	See Guideline **A** in Table 4.
		Analog Input - Current Mode (4–20 mA) Internal 100 ohm load impedance	See Guideline **B** in Table 4.
		Analog Input - Resistive Mode (0–600k ohm) Internal 12 V. 15k ohm pull-up Qualified Sensors: 0-2k ohm potentiometer RTD (1k Nickel [Johnson Controls sensor] 1k Platinum, and A99B Silicon Temperature Sensor) Negative Temperature Coefficient (NTC) Sensor (10k Type L, 10k JCI Type II, 2.252k Type II)	See Guideline **A** in Table 4.
		Binary Input - Dry Contact Maintained Mode 1 second minimum pulse width Internal 12 V. 15k ohm pull-up	See Guideline **A** in Table 4.
	ICOM*n*	**Universal Input Common** for all Universal Input terminals	Same as (Universal) **IN*n***
BINARY (Inputs)	**IN*n***	**Binary Input - Dry Contact Maintained Mode** 0.01 second minimum pulse width Internal 17 V. 100k ohm pull-up	See Guideline **A** in Table 4.
		Binary Input - Pulse Counter/ Accumulator Mode 0.01 second minimum pulse width (50 Hz at 50% duty cycle) Internal 17 V. 100k ohm pull-up	
	ICOM*n*	**Binary Input Common** for all Binary Input (IN) terminals	

Table 3: Controller Terminal Blocks, Functions, Ratings, Requirements, and Cables (Part 2 of 2)

Terminal Block Label	Terminal Label	Function, Ratings, Requirements	Determine Wire Size and Maximum Cable Length[1]
CONFIGURABLE (Outputs)	**OUT*n***	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage 10 mA maximum output current Required an external load of 1,000 ohm or more.	See Guideline **A** in Table 4.
		Binary Output - 24 VAC Triac (External Power Source only) Connects OUT*n* to OCOM*n* when activated External Power Source Requirements: 30 VAC maximum output voltage 0.5 A maximum output current	See Guideline **C** in Table 4.
	OCOM*n*	**Analog Output Signal Common** All Configurable Outputs (COs) defined as Analog Outputs (AOs) share one common. **Binary Output Signal Common** All Configurable Outputs (COs) defined as Binary Outputs are isolated from all other commons, including other CO commons.	Same as (Configurable) **Out*n***.
BINARY - RELAY (Outputs)	**OUT*n* NO**	**Normal Open Contact** Connects OCOM to OUT NO when activated. **UL 916** 240 VAC 5A Resistive, 1.9 FLA/11/4 LRA, D300 Pilot Duty, + 70°C (158°F), 30 K cycles **EN 60730** 240 VAC 3A Resistive, 3A Inductive, Cos(phi) = 0.6, -20° to 70°C (-4 to 158°F), 100K cycles	The RELAY output terminals can accommodate the following maximum wire sizes: Two wires per terminal: 1.5 mm^2 (16 AWG) maximum **or** One wire per terminal: 2.5 mm^2 maximum (12 AWG or 2–16 AWG) **Note:** You must determine the **required** wire size for the high-voltage (>30 V) terminals according to relay ratings, the applied load, and the local, national, or regional electrical codes. Maximum loads stated require 12 AWG or 2-16 AWG wires.
	OCOM*n*	**Relay Common** Isolated from all other terminal commons, including other Relay Commons. **Note:** Reference all relay commons to the same pole of the supply circuit.	
BINARY - Triacs (Outputs)	**OUT*n*-A** **OUT*n*-B**	**Binary Output - 24 VAC or 240VAC Triac (External Power Source Only)** Connects OUTn-A and OUTn-B when activated. External Power Source Requirements: 30 VAC or 240 VAC maximum output voltage 0.5 A maximum output current **Note:** Reference all triac commons to the same pole of the supply circuit.	

1. See Table 4 to determine wire size and cable lengths for cables.

Cable and Wire Length Guidelines

Table 4 defines cable length guidelines for the various wire sizes that may be used for wiring low-voltage (<30 V) input and output wiring.

Table 4: Cable Length Guidelines for Wire Sizes for Low-Voltage (<30 V) Inputs and Outputs

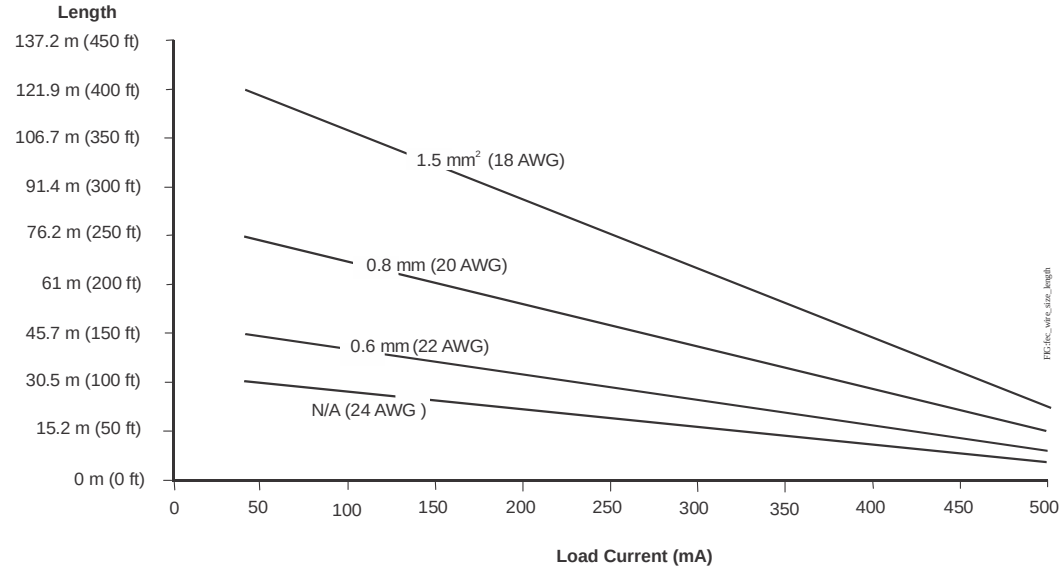
Guidelines	Wire Size/Gauge and Type	Maximum Cable Length and Type	Assumptions
A	1.5 mm^2 (18 AWG) stranded copper	457 m (1,500 ft) twisted wire	100 mV maximum voltage drop. Depending on the cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	297 m (975 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	183 m (600 ft) twisted wire	
	N/A (24 AWG) stranded copper	107 m (350 ft) twisted wire	
B	1.5 mm^2 (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop. Depending on the cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	137 m (450 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	91 m (300 ft) twisted wire	
	N/A (24 AWG) stranded copper	61 m (200 ft) twisted wire	
C	See Figure 12 to select wire size/ gauge. Use stranded copper wire.	See Figure 12 to determine cable length. Use twisted wire cable.	N/A

Maximum Cable Length versus Load Current

Use Figure 12 to estimate the maximum cable length relative to the wire size and the load current (in mA) when wiring inputs and outputs.

Note: Figure 12 applies to low-voltage (<30 V) inputs and outputs only. Determine the required wire size and length for high-voltage (>30 V) relay outputs by the load connected to the relay and local electrical codes.

Figure 12: Maximum Wire Length for Low-Voltage (<30 V) Inputs and Outputs by Current and Wire Size



System/Sensor Bus and Supply Power Wiring Guidelines

Table 5 provides information about the functions, ratings, and requirements for the communication bus and supply power terminals. Table 5 also provides guidelines for wire sizes, cable types, and cable lengths when wiring the controller's communication buses and supply power.

In addition to the guidelines in Table 5, use these guidelines to wire a sensor or system bus and the 24 VAC supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All sensor or system bus cables, regardless of wire size, should be twisted, insulated, stranded copper wire.
- Using shielded cable is best practice for all sensor or system bus cables.
- Refer to the Verasys MSTP Communications Technical Bulletin (LIT-12012362) for detailed information on wire size and cable length requirements for the sensor or system buses.

Table 5: Communication Bus and Supply Power Terminal Blocks, Functions, Ratings, Requirements, and Cables (Part 1 of 2)

Terminal Block/Port Label	Terminal Labels	Function, Electrical Ratings/ Requirements	Cable Type
System Bus (Upper)	**+**	System Bus Communications	0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable shielded cable is best practice.
	-		
	COM	Signal Reference (Common) for Bus communications	
	SHD	Isolated terminal (optional shield drain connection)	
Sensor Bus (Port)	**Sensor BUS**	RJ-12 6-Position Modular Connector provides: Sensor Bus Communications Sensor Bus Signal Reference and 15 VDC Common 15 VDC, 71.5 ohms at 4 W	24 AWG 3-pair CAT3 cable <30.5 m (100 ft)
Sensor Bus Terminal (Lower)	**+**	Sensor Bus Communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable is best practice. **Note:** The + and - wire are one twisted pair, and the COM and sensor PWR are the second twisted pair of wires.
	-		
	COM	Sensor Bus Signal Reference and 15 VDC Common	
	PWR	15 VDC Supply Power for Devices on the Sensor bus. Maximum total current draw for Sensor bus is 240 mA.	
24~ INPUT	**HOT**	**24 VAC Power Supply - Hot** Supplies 20–30 VAC Nominal 24 VAC	0.8 mm to 1.5 mm^2 (18 AWG) 2-wire
	COM	**24 VAC Power Supply Common** Isolated from all other Common terminals on controller 20 VA at 24 VAC nominal	
24~ OUT	**24~**	**24 VAC Utility Supply** for actuators 80 mA continuous	0.8 mm to 1.5 mm^2 (18 AWG) 2-wire
	COM	**24 VAC Power Supply Common**	

Table 5: Communication Bus and Supply Power Terminal Blocks, Functions, Ratings, Requirements, and Cables (Part 2 of 2)

Terminal Block/Port Label	Terminal Labels	Function, Electrical Ratings/ Requirements	Cable Type
MOD BUS	**+**	Modbus communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted pairs), shielded cable is best practice.
	-		
	COM	Signal Reference (Common) for bus communications	

Setup and Adjustments

Setting the Device Addresses

Use the local display or MAP Gateway to set up the device addresses. Verasys application controllers are master devices on MS/TP sensor buses. Before operating field controllers on a bus, you must set a valid and unique device address for each controller on the bus through the local display or MAP gateway. Device addresses 4 through 127 are the valid addresses for these controllers.

Refer to the *Verasys™ BACnet® MS/TP Communications Bus Technical Bulletin (LIT-12012362)* for more information on field controller device addresses and how to set them on MS/TP buses.

Table 6: System Bus Device Address Description

Device Address	Use on Description
0	Reserved for system bus supervisory controller. Not for use on field controllers
1 to 3	Reserved for peripheral devices. Not for use on field controllers
117	Reserved for the Smart Building Hub
4 to 127	Used for MS/TP devices (field controllers) that are hard-wired to an sensor bus or system bus

Troubleshooting Field Controllers

Observe the Status LEDs on the front of the controller and see Table 7 to troubleshoot the controller.

Table 7: Status LEDs and Descriptions of LED States (Part 1 of 2)

LED Label	LED Color	Normal LED State	Description of LED States
POWER	Green	On steady	Off steady = No supply power. Check the output wiring for short circuits and cycle power to the controller. On steady = power connected
FAULT	Red	Off steady	Off steady = no faults On steady = device fault: no application loaded; main code download required if controller is in boot mode, or a firmware mismatch exists between the Verasys controllers and the ZRF1811 Wireless Field Bus Router. Blink - 2 Hz = download or startup is in progress, not ready for normal operation.
Sensor BUS	Green	Blink - 2 Hz	Blink - 2 Hz = data transmission (normal communication) Off steady = no data transmission (auto baud in progress) On steady = communication lost, waiting to join

Table 7: Status LEDs and Descriptions of LED States (Part 2 of 2)

LED Label	LED Color	Normal LED State	Description of LED States
System BUS	Green	Blink - 2 Hz	Blink - 2 Hz = data transmission (normal communication) Off steady = no data transmission (auto baud in progress) On steady = communication lost, waiting to join
MODBUS	Green	Blink - 2 Hz	Blink - 2 Hz = data transmission (normal communication) Off steady = no data transmission (auto baud in progress) On steady = communication lost, waiting to join

Accessories Ordering Information

Table 8: Accessories Information

Product Code Number	Description
PK-KIT1810-0	Removable terminal block kit for all spade connections

Repair Information

If the Verasys Application Controllers fail to operate within their specifications, replace the controller. For a replacement controller, contact your local representative.

Technical Specifications

Table 9: LC-VAC100x-0 (Part 1 of 2)

Product Code Numbers	LC-VAC100x-0 Verasys 18 point 24V Application Controller with Display
Supply Voltage	24 VAC, 20 VAC minimum/30 VAC maximum, 50/60 Hz, power supply class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	**20 VA maximum for LC-VAC100x-0** **Note:** VA rating does not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs). This can consume up to 12 VA for each BO or CO; for a possible total consumption of an additional 60 VA maximum.
Ambient Conditions	**Operating:** -20 to 70°C (-4 to 158°F); 10 to 95% RH noncondensing; Pollution Degree 2 **Storage:** -40 to 85°C (-40 to 185°F); 5 to 95% RH noncondensing
Addressing	**BACnet® MS/TP:** valid field controller device addresses 4–127 Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses **N2:** Valid field controller device addresses 1 to 255
Communications Bus	**BACnet® MS/TP, ModBus and N2 through RS-485:** 3-wire system bus between the supervisory controller and field controller. 3-wire sensor bus between controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power from controller to bus devices 3-wire one modbus communication half-duplex (RTU port)
Processor	RX631 Renesas® 32-bit microcontroller.
Memory	16 MB flash memory and 8 MB RAM.
Input and Output Capabilities	**Five Universal Inputs:** User-Configurable, 3 available modes: • Voltage input: 0 to 10 VDC • Current sense input: 4 to 20 mA • Resistive inputs/dry contact inputs **Four Binary Inputs:** Defined as dry contact maintained or Pulse Counter/Accumulator Mode. **Three Configurable Outputs:** User-Configurable, 2 available modes: • Analog output: 0 to 10 VDC, 10 mA • Triac output: 24 VAC, 0.5 A (externally sourced powered) **One Utility Output Power Port (24~ OUT):** Ability to deliver 24 VAC **Four Binary Outputs (Relays):** Single-Pole, Single-Throw. Dry Contacts rated 240 VAC • UL: 240 VAC 5 A Resistive, 1.9 LA/11.1LRA, D300 Pilot Duty, 70°C/158°F (30,000 cycles) • IEC: 240 VAC 3 A Resistive, 3A Inductive, Cos=0.6, -20 to 70°C (-4 to 158°F) (100,000 cycles). **Note:** Reference all relay commons to the same pole of the supply circuit **Two Binary Outputs (Triacs):** Output: 24 VAC or 240 VAC, 0.5 A (Externally Powered) **Note:** Reference all triac commons to the same pole of the supply circuit
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 12-bit resolution; Analog Output: 15-bit resolution; +/- 200 mV accuracy in 0 to 10 VDC applications
Terminations	Input/Output: fixed spade terminals. Sensor/system/modbus: 4-Wire and 3-Wire pluggable screw terminal blocks Sensor bus tool port: RJ12 6-Pin modular jack **Field Install Option:** Input/Output: Fixed solder terminals Sensor/system/modbus: 4-Wire and 3-Wire pluggable screw terminal blocks Sensor bus tool port: RJ12 6-Pin modular jack See Table 5 for number of cycles and electrical ratings
Mounting	Horizontal on single 35 mm DIN rail mount is preferred, or screw mount on flat surface with three integral mounting clips on controller Mount the controller on a wall or DIN rail inside an enclosure rated at least IP20
Housing	Enclosure material: Polycarbonate Lexan SABIC EXL9330

Table 9: LC-VAC100x-0 (Part 2 of 2)

Dimensions (H x W x D)	164 x 125 x 53 mm (6.45 x 4.92 x 2.08 in.) excluding terminals and mounting clips
Weight	0.5 kg (1.1 lb)
Compliance	**United States:** cULus Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CRF47, Part 15, Subpart B, Class A
	Canada: cULus Listed, File E107041, CNN PAZX7 CAN/CSA C22.2 No.205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** Johnson Controls declares that this product is also in compliance with the essential requirements and other relevant provisions of the EMC Directive Declared as Electronic Independently mounted control, suitable for DIN rail mounting. Intended to mount in remote panel. Type 1.C (Micro-interruption), 330 V rated impulse voltage. 125°C ball pressure test.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories (BTL) Protocol Revision 12 Listed BACnet Advanced Application Controller (B-AAC)

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45143 ESSEN
GERMANY

NA/SA Single Point of Contact:

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USA

APAC Single Point of Contact:

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CHINA

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