24-10143-1272, Rev. B

(barcode for factory use only)

Verasys™ Equipment Controller (VEC)

Installation Instructions

LC-VEC100-0

Part No. 24-10143-1272, Rev. B
Issued September 2017

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

Application

The Verasys™ Equipment Controller (VEC) is part of the SMART Equipment Controller family. The VECs run pre-engineered applications and provide the inputs and outputs required to monitor and control HVAC equipment.

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

The VECs include an integral real-time clock that enables the controllers to monitor and control schedules, calendars, trends; and the integral real-time clock can operate for extended periods of time as a stand-alone controllers when offline from the system network.

IMPORTANT: Use this Verasys Equipment Controller only as an operating control. Where failure or malfunction of the VEC 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 Equipment Controller.

IMPORTANT : Utiliser ce Verasys Equipment 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* Equipment Controller.

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

Observe these guidelines when installing a Verasys Equipment 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 Equipment Controller.
- One installation instructions 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.
- Ratchet crimping tool to secure the wire to the quick disconnects.

Mounting

Observe these guidelines when mounting a field controller:

- Ensure 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 (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 6.
- Provide for sufficient space around the controller for cable and wire connections for easy cover removal and good ventilation through the controller (50 mm [2 in.] minimum 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.

Observe 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.

Figure 1: Verasys Equipment Controller Mounting Position

DIN Rail Mount Applications

Mounting the field controller horizontal on 35 mm DIN rail is the preferred mounting method.

To mount a field controller on 35 mm DIN rail:

1. Securely mount a 20 cm (8 in.) or longer section of 35 mm DIN rail horizontal and centered in the desired space, so that the controller mounts in the horizontal position shown in Figure 1.
2. Pull the two bottom mounting clips outward from the controller to the extended position (Figure 4).
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 (Figure 4), and position the controller snugly against the DIN rail.
4. 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.

Wiring

Observe the following guidelines when wiring a field controller:

⚠ WARNING

Risk of Electric Shock.
Disconnect power from the controller before making any adjustments. Do not touch any part of the printed circuit board while power is applied. Failure to follow these precautions can result in personal injury or death.

⚠ ADVERTISSEMENT

Risque de décharge électrique.
Déconnecter l'alimentation du controller avant toute opération de réglage. Veiller à ne toucher aucune partie du circuit imprimé lorsque celui-ci est sous tension. Le non-respect de ces précautions peut provoquer des blessures graves, voire mortelles.

⚠ 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, Zone bus, and Sensor bus, refer to the Verasys™ BACnet® MS/TP Communications Technical Bulletin *(LIT-12012362).*

Verasys *Equipment Controller Terminal Blocks and Bus Ports*

See Figure 8 for terminal block, spade location, and bus port locations on the LC-VEC100-0 controller. Observe 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. A package of terminals (PK-KIT1810-0) will come with the controller so if you wish to convert to terminal blocks you have that option. See Table 1 for more information about I/O terminal functions, requirements, and ratings.

Factory Wiring

For all the I/O terminals listed in Table 1, use the appropriate gauge wiring. Crimp and use an insulated female quick disconnect wire connector. Figure 2 shows spade I/O terminals.

Figure 2: Verasys Equipment Controller Spades

Field Wiring

For all I/O terminals listed in Table 1, use the appropriate gauge wiring. For all the spade terminals used in this application, follow the guidelines in Table 1 and use a screw terminal.

Note: Use WECO 130 Series or WIELAND® Electric 8105B. A maximum rated torque of 4.5 lb·in is acceptable when you use the WECO 130 Series terminal blocks.

Stacked Zone/Sensor Bus Terminal Block

A dual-stacked connector serves as the Zone Bus and Sensor Bus port on the VECs. The upper row on the connector is the Zone Bus Port. The lower connector row is the Sensor Bus port.

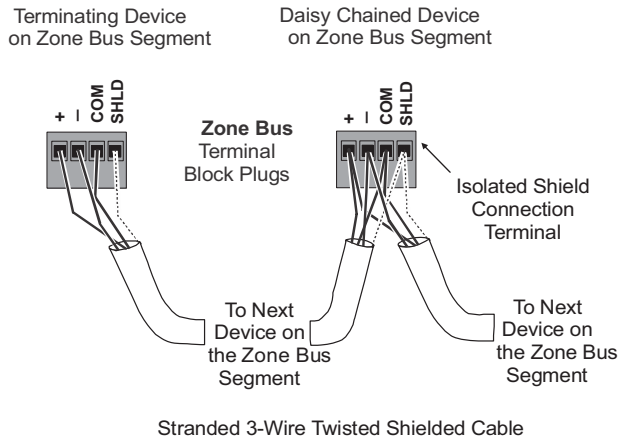
Figure 3: Stacked Zone/Sensor Bus Terminal Block

The Zone Bus will connect to the Zone Bus of the Verasys Zone Coordinator. The Sensor Bus will connect to additional sensors.

Zone Bus Terminal Block

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

Figure 4: Zone Bus Terminal Block Wiring



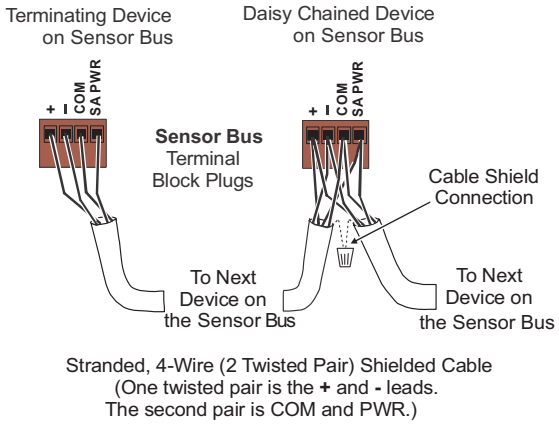
Note: The Zone bus Shield (SHLD) terminal is isolated and can be used to connect (daisy chain) the shields for Zone bus wiring.

Sensor Bus Terminal Block

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

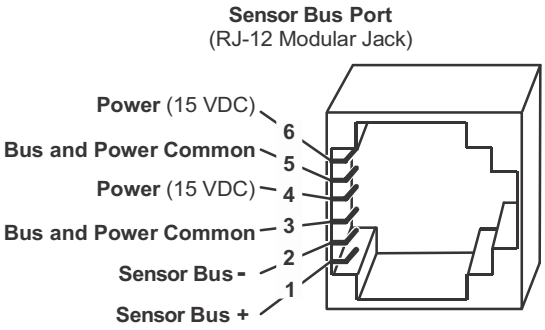
Wire the removable Sensor Bus terminal block plugs on the lower port of the Dual Stacked Connector to the controller, and other Sensor bus devices in a daisy-chain configuration using 4-wire twisted, shielded cable as shown in Figure 5. See Table 3 for more information.

Figure 5: SA Bus Terminal Block Wiring



Note: The PWR terminal supplies 15 VDC. The PWR terminal can be used to connect (daisy chain) the 15 VDC power leads on the Sensor bus.

Figure 6: Pin Number Assignments for Sensor Bus Ports on *Verasys* Equipment Controllers



Sensor Port

The Sensor port (Sensor Bus) on the top left side of the controller is an RJ-12, 6-position modular jack that provides a connection for specified network sensors with RJ-12 plugs. The terminal block method of connecting the devices to the Sensor Bus sensors is the recommended method. The application does not prevent you from using this connection, if the correct device is used.

Modbus Terminal Block

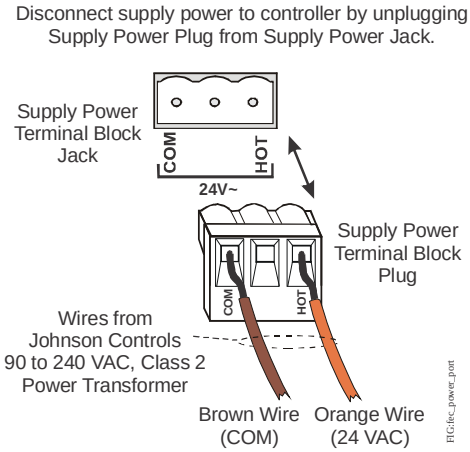
The Modbus terminal block is a green, removable, 3-terminal plug that fits into a board-mounted jack. This terminal block is not used for the VEC applications.

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 7. The middle terminal on the supply power terminal block is not used. See Table 3 for more information about the Supply Terminal Block.

Figure 7: 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.

Termination Details

Multizone Unit Control Applications

The LC-VEC100-0, using a software selection, is capable of controlling the unit for a third-party changeover bypass system or a third-party VAV unit. Figure 8 shows the multizone unit details.

COBP Sequence of Operation

Supply Fan Start/Stop: The Supply Fan starts according to the schedule and the control sequence enables. If the supply fan status does not match the commanded value after an adjustable period of time, an alarm generates and this feature is disabled. You can also set up a totalization alarm to generate an alarm after the fan has reached the run hours. This limit can be used to set service activities, such as filter replacement. Setting the limit to 0 disables the alarm.

Static Pressure Control: The bypass damper modulates to maintain the discharge static pressure at setpoint.

Discharge Air Temperature Control: The mixed air dampers, electric heating stages, and DX Cooling stages module (cycle) to maintain the discharge air setpoint. If the controller is calling for cooling and the discharge air does not drop over an adjustable period of time, a cooling alarm generates. Similarly, if a call for heating occurs and the temperature does not rise over a period of time, a heating alarm generates. Setting the limit to 0 disables the alarm.

Economizer Dry Bulb Switchover: When the outside air temperature is below the switchover setpoint, the economizer enables. When the outside air temperature rises above the switchover setpoint, plus a differential, the economizer disables. If enabled, the Economizer Low Limit modulates the damper closed when the discharge air reaches a low limit setpoint. If at anytime the purge contact is initiated the dampers position to wide open.

Demand Ventilation Control: When a return air CO_2 sensor is connected, the minimum outside air damper position proportionally increases if the return air CO_2 rises above the setpoint until the maximum position setpoint is reached.

Night Setback/Night Setup: When in Occupied mode, the unit cycles as necessary to maintain the shared night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively.

Shutdown: When the unit is in shutdown mode, by either a stop command or system safety, the unit sets as follows:

- supply fan = Off
- bypass damper = modulates to 50%
- outside air damper control = closes
- return air damper = opens
- DX Cooling = Off
- electric reheat = Off

Figure 8: LC-VEC100-0 Changeover Bypass Flow Diagram

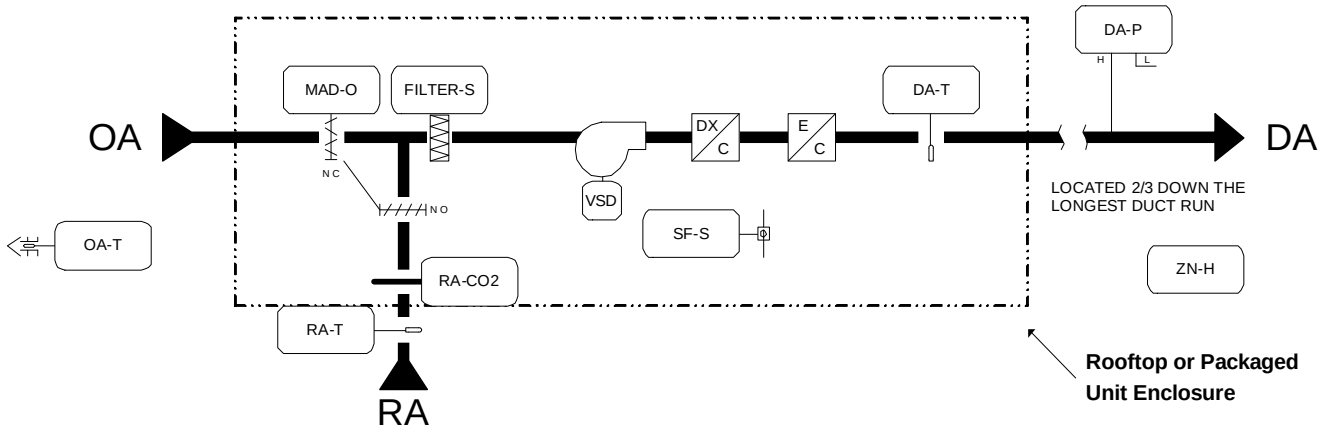
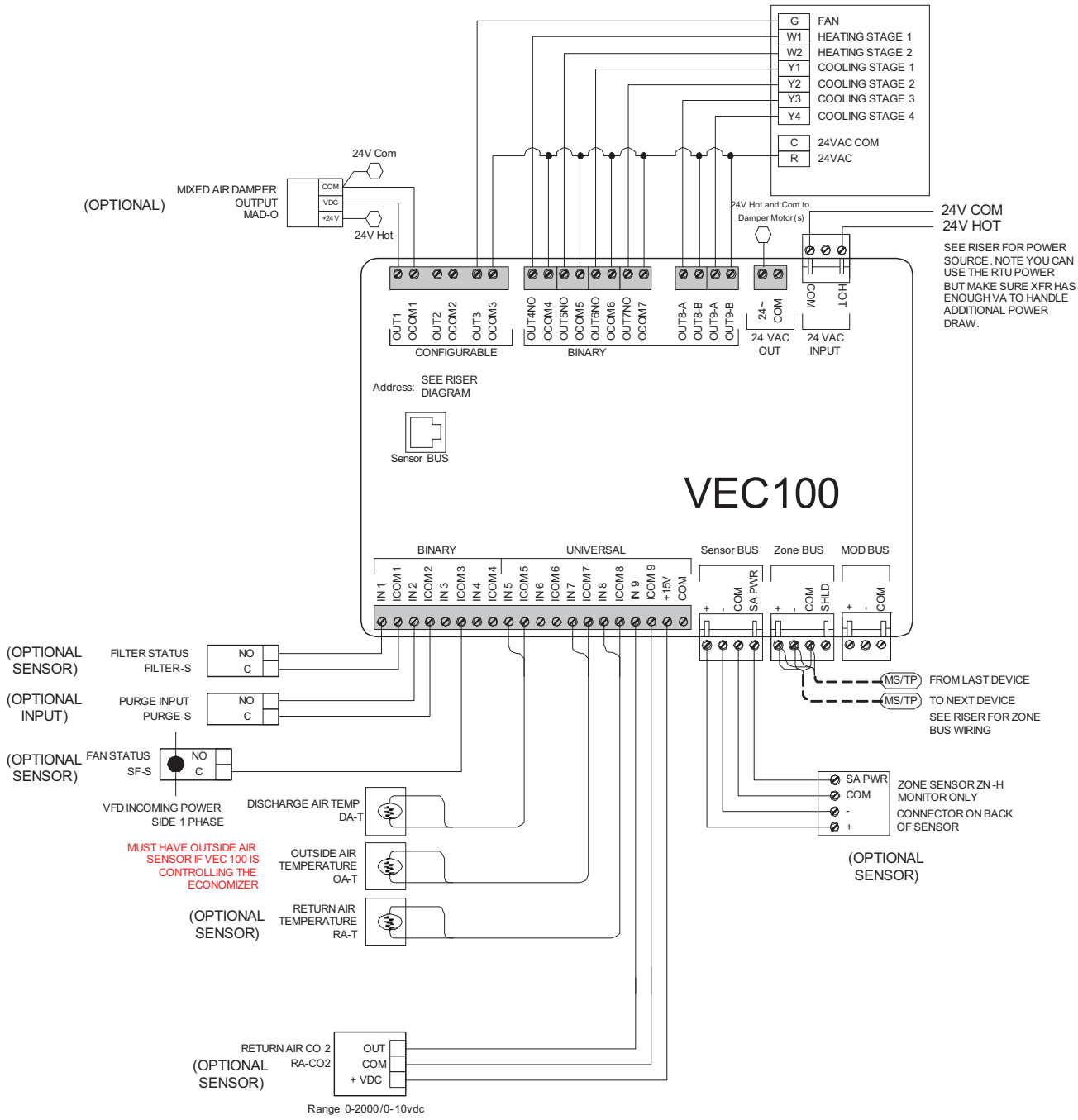


Figure 9: LC-VEC100-0 Changeover Bypass Wiring



VAV Unit Applications

This section describes the VAV Unit Application termination details.

VAV Sequence of Operation

Supply Fan Start/Stop: The Supply Fan starts according to the schedule and the control sequence enables. If the supply fan status does not match the commanded value after an adjustable period of time, an alarm generates and this feature is disabled. You can also set up a totalization alarm to generate an alarm after the fan has reached the run hours. This limit can be used to set service activities, such as filter replacement. Setting the limit to 0 disables the alarm.

Static Pressure Control: The variable frequency drive modulates to maintain the discharge static pressure at setpoint.

Discharge Air Temperature Control: The mixed air dampers, electric heating stages, and the DX Cooling stages module (cycle) to maintain the discharge air setpoint. This setpoint is adjusted to provide hot or cold air, depending on what the majority of the zones' demands. If the controller is calling for cooling and the discharge air does not drop over an adjustable period of time, a cooling alarm generates. Similarly, if a call for heating occurs and the temperature does not rise over a period of time, a heating alarm generates. Setting the limit to 0 disables the alarm.

Economizer Dry Bulb Switchover: When the outside air temperature is below the switchover setpoint, the economizer enables. When the outside air temperature rises above the switchover setpoint, plus a differential, the economizer disables. If enabled, the Economizer Low Limit modulates the damper closed when the discharge air reaches a low limit setpoint. If at anytime the purge contact is initiated, the dampers change position to wide open.

Demand Ventilation Control: When a return air CO_2 sensor is connected, the minimum outside air damper position proportionally increases if the return air CO_2 rises above the setpoint until the maximum position setpoint is reached.

Night Setback/Night Setup: When in Occupied mode, the unit cycles as necessary to maintain the shared night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively.

Shutdown: When the unit is in shutdown mode, by either a stop command or system safety, the unit sets as follows:

- supply fan = Off
- bypass damper = modulates to 50%
- outside air damper control = closes
- return air damper = opens
- DX Cooling = Off
- electric reheat = Off

Figure 10: VAV Flow Diagram

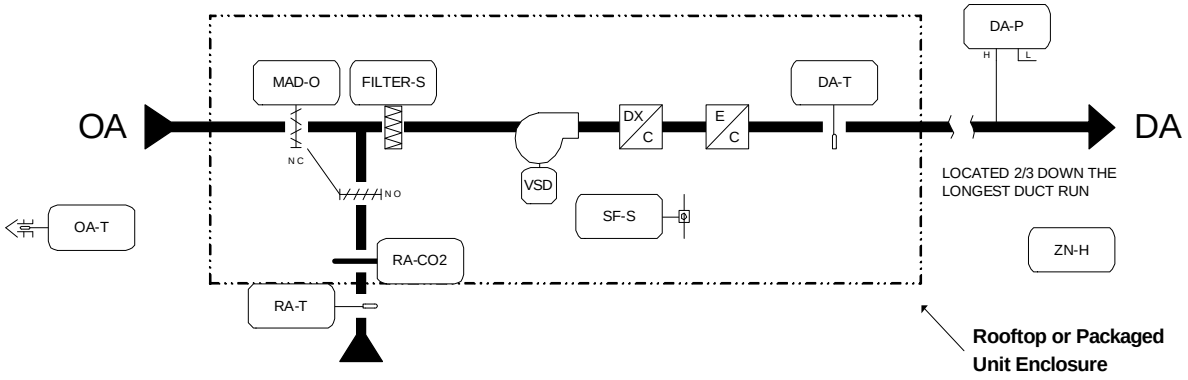
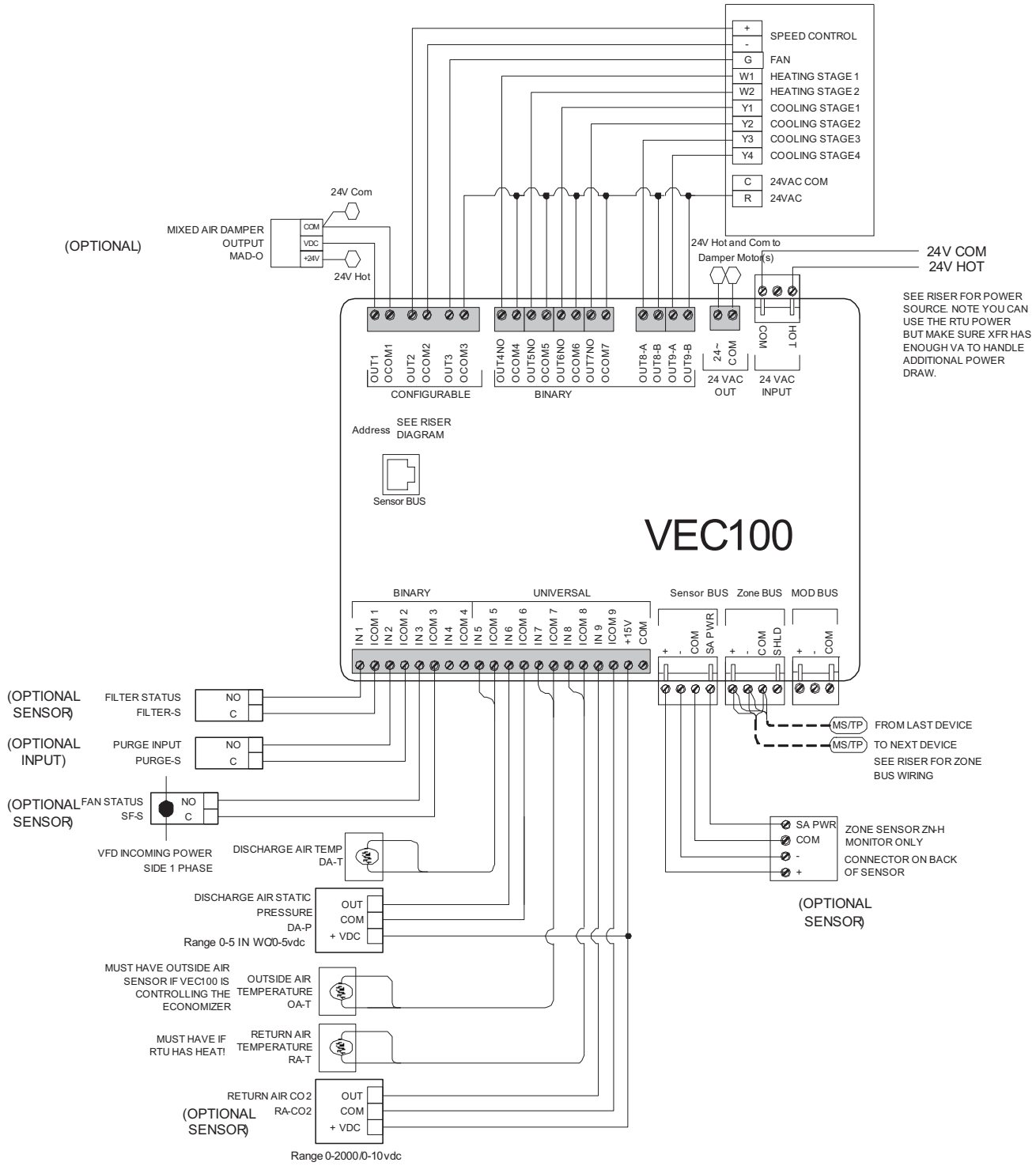


Figure 11: VAV Wiring Example



Terminal Wiring Guidelines, Functions, Ratings, and Requirements

Input and Output Wiring Guidelines

Table 1 provides information and guidelines about the functions, ratings, and requirements for the controller input and output terminal guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in Table 1, observe 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.
- Shielded cable is recommended 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 1: VEC Terminal Blocks, Functions, Ratings, Requirements, and Cables (Part 1 of 3)

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 100 mA total current.	Same as (Universal) **IN*n*** **Note:** Use 3-wire cable for devices that source power from the +15 V terminal.
	IN*n*	**Analog Input - Voltage Mode (0–10 VDC)** 10 VDC maximum input voltage Internal 67k ohm Pull-down	See Guideline **A** in Table 2.
		Analog Input - Current Mode (4–20 mA) Internal 100 ohm load impedance	See Guideline **B** in Table 2.
		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 2.
		Binary Input - Dry Contact Maintained Mode 1 second minimum pulse width Internal 12 V. 15k ohm pull up	See Guideline A in Table 2.
	ICOM*n*	**Universal Input Common** for all Universal Input terminals	Same as (Universal) **IN*n***

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

Terminal Block Label	Terminal Label	Function, Ratings, Requirements	Determine Wire Size and Maximum Cable Length[1]
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 2.
		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	
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 2.
		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 2.
	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***.

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

Terminal Block Label	Terminal Label	Function, Ratings, Requirements	Determine Wire Size and Maximum Cable Length[1]
BINARY - RELAY (Outputs)	**OUT NO*n***	**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 240 VAC 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 2 to determine wire size and cable lengths for cables other than the recommended cables.

Cable and Wire Length Guidelines

Table 2 defines cable length guidelines for the various wire sizes that may be used for wiring low-voltage (<30 V) input and output wiring.

Table 2: Cable Length Guidelines for Recommended Wire Sizes for Low-Voltage (<30 V) Inputs and Outputs (Part 1 of 2)

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 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	

Table 2: Cable Length Guidelines for Recommended Wire Sizes for Low-Voltage (<30 V) Inputs and Outputs (Part 2 of 2)

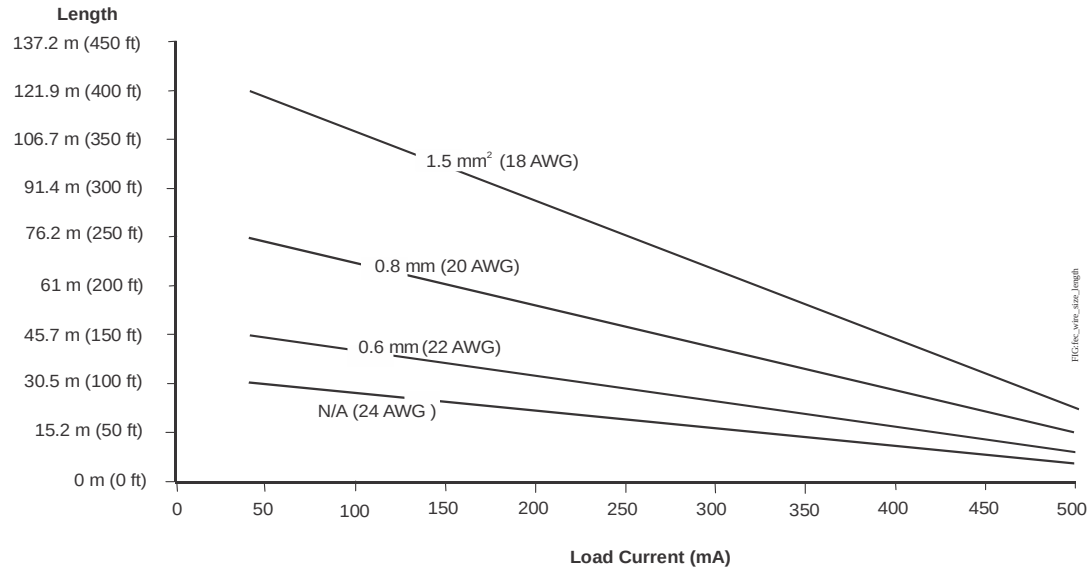
Guidelines	Wire Size/Gauge and Type	Maximum Cable Length and Type	Assumptions
B	1.5 mm^2 (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output device, you may have to define an offset in the setup software for the input or 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 (<30V) inputs and outputs only. The required wire size and length for high-voltage (>30V) Relay Outputs is determined by the load connected to the relay and local electrical codes.

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



Sensor/Zone Bus and Supply Power Wiring Guidelines

Table 3 provides information about the functions, ratings, and requirements for the communication bus and supply power terminals; and 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 3, observe these guidelines when wiring an Sensor or Zone bus and the 24 VAC supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All Sensor and Zone bus cables, regardless of wire size, should be twisted, insulated, stranded copper wire.
- Shielded cable is strongly recommended for all Sensor and Zone bus cables.
- Refer to the Verasys™ BACnet® MS/TP Communications Technical Bulletin *(LIT-12012362)* for detailed information regarding wire size and cable length requirements for the Sensor and Zone buses.

Table 3: Communication Bus and Supply Power terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal Block/Port Label	Terminal Labels	Function, Electrical Ratings/ Requirements	Recommended Cable Type
Zone BUS/ Sensor BUS Zone Bus (Upper)	**+** **-**	Zone Bus Communications	0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable recommended
	COM	Signal Reference (Common) for Bus communications	
	SHLD	Isolated terminal (optional shield drain connection)	
Sensor BUS (Port)	**Sensor**	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, Power for Bluetooth Commissioning Converter or ZFR1811 Wireless Router	24 AWG 3-pair CAT3 cable <30.5 m (100 ft)
Zone BUS/ Sensor Bus Sensor Bus (Lower)	**+** **-**	Sensor Bus Communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable recommended. **Note:** The + and - wire are one twisted-pair, and the COM and 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	

Setup and Adjustments

Setting the Device Addresses

Use the local display or Smart Building Hub (SBH) to set up device addresses. VECs 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 Technical Bulletin *(LIT-12012362)* for more information on field controller device addresses and how to set them on MS/TP buses.

Table 4: Zone Bus Device Address Description

Device Address	Use on Description
0	Reserved for Zone Bus Supervisory Controller (not for use on field controllers).
1 to 3	Reserved for peripheral devices (not for use on field controllers).
4 to 127	Used for MS/TP master devices (field controllers) that are hard-wired to a Sensor bus or Zone bus.

Commissioning the Controllers

Commission the VEC with a connection to the SBH. You can adjust parameters and monitor the system by using the SBH connection.

Troubleshooting

Observe the Status LEDs on the front of the controller and see Table 5 to troubleshoot the controller.

Table 5: Status LEDs and Descriptions of LED States

LED Label	LED Color	Normal LED State	Description of LED States
POWER	Green	On Steady	Off Steady = No Supply Power. Check Output wiring for short circuits and cycle power to the controller. On Steady = Power Connected
FAULT (updates required)	Red	Off Steady	Off Steady = No Faults On Steady = Device Fault: no application loaded; Main Code download required if controller is in Boot mode. Blink - 2 Hz = Download or Startup in progress, not ready for normal operation Blink Rapidly - 5 Hz = One or more defined Sensor Bus devices are offline. Check SA Bus devices for problems. Note if you did not connect the zone humidity sensor this light will be blinking.
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.
Zone 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 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.

Repair Information

If the Verasys Equipment Controller fails to operate within its specifications, replace the controller. For a replacement controller, contact your Verasys representative.

Technical Specifications

Table 6: VEC Controller (Part 1 of 2)

Product Code Numbers	LC-VEC100-0 Verasys Equipment Controller 24 Volts 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** **Note:** VA rating does not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs). The peripheral devices 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:** 3-wire Zone 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.
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 5A Resistive, 1.9 LA/11.1LRA, D300 Pilot Duty, 70°C/158°F (30,000 cycles) • IEC: 240 VAC 3A 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: 15-bit resolution Analog Output: 15-bit resolution, +/- 200 mV accuracy in 0 to 10 VDC applications
Terminations	Input/Output: Fixed Spade terminals Sensor/Zone/Modbus: 4-Wire and 3-Wire Pluggable Screw Terminal Blocks Sensor Bus Tool Port: RJ-12 6-Pin Modular Jack **Field Install Option:** Input/Output: Fixed Solder terminals Sensor/Zone/Modbus: 4-Wire and 3-Wire Pluggable Screw Terminal Blocks Sensor Bus Tool Port: RJ-12 6-Pin Modular Jack See Table 3 for Number of Cycles and Electrical Ratings
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: Polycarbonate Lexan SABIC EXL9330)
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

Table 6: VEC Controller (Part 2 of 2)

Weight	0.5 kg (1.1 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CRF47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CNN PAZX7 CAN/CSA C22.2 No.205, Signal Equipment Industry Canada Compliant, ICES-003
	Europe: Johnson Controls, Inc. declares that this product is also in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive Declared as Electronic Independently mounted control, suitable for DIN rain 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 7 Listed BACnet Application Specific Controller (B-ASC)

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