Verasys ZEC310 Zone Damper and BYP200 Bypass Damper Controllers Installation Guide

24-10143-1248 Rev. D

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Applications

The ZEC310 Zone Damper Controller and BYP200 Bypass Damper Controller are components of the Verasys® zoning system. The controllers run a pre-engineered HVAC zoning application and provide the inputs and outputs required for this application. These controllers ship with a factory-configuration that makes them ready for field installation on a Verasys system zone or bypass damper assembly.

The zone and bypass damper controllers include advanced operating modes and multiple features that ensure occupant comfort. The ZEC uses a CO_2 demand controlled ventilation (DCV) mode to regulate CO_2 levels within a zone. The ZEC uses the DCV mode when fresh air enters the zone during occupied times. Occupancy sensing capability enables the controller to switch from occupied mode to standby mode based on the presence of local activity. Standby mode maximizes energy savings by using higher cooling setpoints and lower heating setpoints than in occupied mode.

See the Table 16 table for additional information about optional sensor features. For further information about Verasys configurations, refer to the *Verasys System User's Guide (LIT-12012371)*.

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 the 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 you install a Zone Damper and Bypass Damper Controller:

- Transport the controllers in the original container to minimize vibration and shock damage.
- Do not drop the controller or subject it to physical shock.

Parts included

- One controller with removable zone and sensor buses and power terminal blocks
- One self-drilling No. 10 x 25 mm (1 in.) screw

Materials and special tools needed

- 6 mm (1/4 in.) female spade terminals for input and output wiring and crimping tool or spade-mounted terminal blocks
- A small straight-blade screwdriver for securing wires in the terminal blocks
- An 8 mm (5/16 in.) wrench or 10 mm (3/8 in.) 12-point socket to tighten the square coupler bolt
- Shims or washers to mount the controller, if necessary
- A power screwdriver, 100 mm (4 in.) extension socket, or a punch drill, and 3.5 mm (9/64 in.) drill bits to mount the ZEC
- A pliers to open and close the damper
- 3.97 mm (5/32 in.) ID poly tubing

Mounting

Safety guidelines

Follow these safety guidelines when you mount a Zone Damper and Bypass Damper Controller:

- Ensure that the mounting surface can support the controllers and any user-supplied enclosure.
- Mount the controller on a hard, even surface whenever possible.
- 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 that matches the ambient conditions specified in the ZEC310 Zone and BYP200 Bypass Controllers technical specifications section.
- Provide at least 50 mm (2 in.) on the top, bottom, sides, and front of the controller for cable and wire connections and for adequate ventilation through the controller.
- Do not mount the controller in areas where electromagnetic emissions from other devices or wiring can interfere with controller communication.

- Avoid mounting the controller on surfaces with excessive vibration.
- Wear the appropriate personal protective equipment (PPE). For example, a hard hat, safety glasses, steel toe boots, and gloves.

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

- Do not install the controller in an airtight 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.

Mounting the Zone Damper and Bypass Damper Controller

1. Disconnect power from the controller transformer, and heater circuits, if applicable.
2. Set all the switches on the field controller to their known settings. See Setup and adjustments.
3. Set the MS/TP address. See Setup and adjustments.
4. Ensure that end-of-line (EOL) is set to the off position. Refer to the *Verasys Zone Coordinator Installation Instructions (Part No. 24-10143-1280)* for proper switch setting.
5. Place the controller in the proper mounting position on the actuator shaft so that the wiring connections are easily accessible.
6. Ensure that the controller base is perpendicular to the damper shaft. If necessary, use a spacer to offset tipping of the controller caused by the shaft bushings.

ⓘ **Note:** Use the alignment marks to center the captive spacer to ensure sufficient ZEC/BYP controller movement in either direction.

Figure 1: Captive spacer alignment marks

7. Secure the self-drilling No. 10 screw through the captive spacer with a power screwdriver and 100 mm (4 in.) extension socket. Alternatively, use a punch drill to mark the position of the shoulder washer.
8. Drill a hole using an 8 mm (5/16 in.) drill bit.
9. Insert the mounting screw and tighten against the spacer.
10. Locate the damper position using the typical marking on the end of the damper shaft.
11. Note the direction, clockwise (CW) or counterclockwise (CCW), required to close the damper. The actuator configuration depends on the amount of rotation necessary for the damper to go from the full-open to full-closed position.
    - For 90° rotation, install the ZEC while the damper is in the full-closed position.
    - For 45° or 60° rotation, install the ZEC when the damper is in the full-open position. See step 13 for further information.
12. Push down and hold the manual override button and turn the actuator coupler until it contacts the mechanical end-stop at either the full-closed or full-open position.

Figure 2: Manual override and actuator coupler

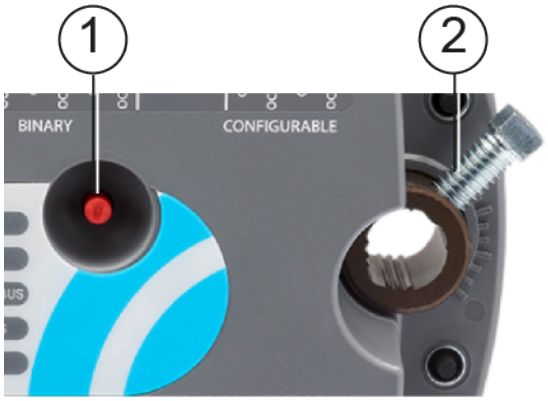

Table 1: Manual override and actuator coupler

Callout	Description
1	Manual override button
2	Actuator coupler

13. If the damper for a 45° or 60° box closes CCW, rotate the coupler to the CW mechanical limit. If the damper for a 45° or 60° box closes CW, rotate the coupler to the CCW mechanical limit. This action sets the open end-stop; the closed end-stop is set by the closed damper.

For 45° and 60° boxes, hard stops must be provided at both full-closed and full-open damper positions. If you install the controller at the full-open position, the controller provides the open stop for 45° and 60° boxes. The closed damper seal provides the full-closed stop.

14. Tighten the square coupler bolt to the shaft using an 8 mm (5/16 in.) wrench or 10 mm (3/8 in.) 12-point socket. Tighten to 10.5 to 11.5 N·m (95 to 105 lb·in).
15. Attach the poly tubing to the ZEC pressure transducer ports and put a loop in the poly tubing to trap condensation. Loop the poly tubing before you make the final connections.
16. Push the manual override button, and turn the actuator coupling manually to ensure that the actuator can rotate from full-closed to full-open positions without binding.

17. Rotate the damper to the full-open position.

Wiring

⚠ CAUTION

Risk of Electric Shock

Disconnect the power supply before making electrical connections to avoid electric shock.

⚠ ATTENTION

Risque de décharge électrique

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

- **Important:** Make all wiring connections in accordance with the National Electrical Code and local regulations. Use proper electrostatic discharge (ESD) precautions during installation and servicing to avoid damaging the electronic circuits of the controller.
- **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:** Do not connect supply power to the controller before finishing wiring and checking all wiring connections. Short circuits or improperly connected wires can result in damage to the controller and void any warranty.
- **Important:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations.
- **Important:** Maintain proper polarity and voltage or current ratings. Improper polarity or exceeding the voltage or current ratings voids the warranty.

Input and Output terminals

Sensor bus terminal block

The sensor bus terminal block is a brown, removable, 4-terminal plug that fits only into the brown, board-mounted sensor bus jack. Wire the removable sensor bus terminal block plugs on the ZEC310 and other field devices in a daisy-chain configuration using a 4-wire twisted, shielded cable as shown in the following figure.

Figure 3: Sensor bus terminal block wiring

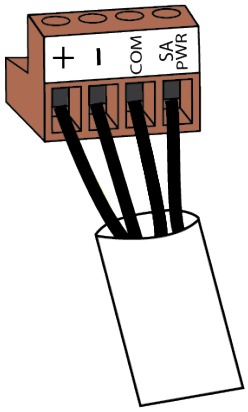

Figure 4: Sensor bus daisy chaining configuration

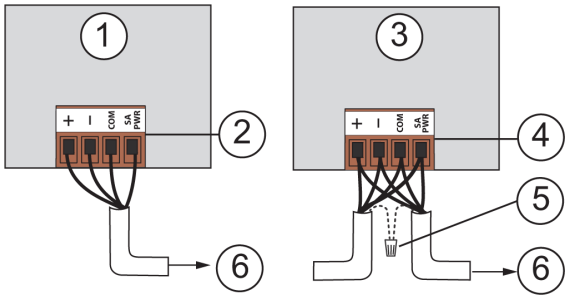

Table 2: Sensor bus daisy chaining configuration

Callout	Description
1	Terminating device on the sensor bus
2	Sensor bus terminal block plug on the terminating device
3	Daisy-chained device on a sensor bus segment
4	Sensor bus terminal block plug on the daisy-chained device
5	Cable shield connection
6	Connects to the next device on the sensor bus. Connects tothe NS-xxxx sensors. See the Accessories section for a listof the NS-xxxx sensors.

Zone bus terminal block

ⓘ **Note:** The Verasys System zone bus is equivalent to the ZEC310/BYP200 controller zone bus.

The zone bus terminal block is a gray, removable, 4-terminal plug with +15 VDC that fits into a board-mounted, zone bus jack. Wire the removable zone bus terminal block plugs on the ZEC/BYP and other zone bus controllers in a daisy-chain configuration using a 3-wire twisted, shielded cable, as shown in the following figures.

Figure 5: Zone bus terminal block wiring

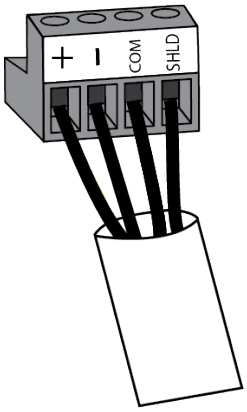

Figure 6: Zone bus daisy chaining configuration

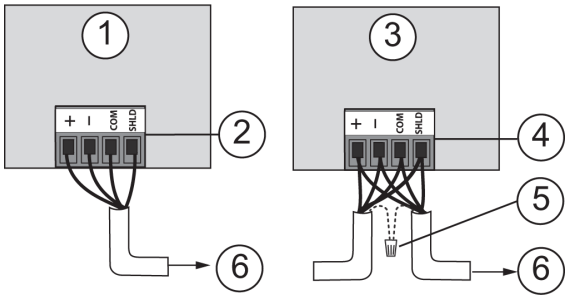

Table 3: Zone bus daisy chaining configuration

Callout	Description
1	Terminating device on the zone bus
2	Zone bus terminal block plug on the terminating device
3	Daisy-chained device on a zone bus segment
4	Zone bus terminal block plug on the daisy-chained device
5	Cable shield connection
6	Connects to the next device on the zone bus. Connects to all ZECs and to the zoning roof top unit (RTU) port of theVZC100.

Modular ports

The modular sensor and zone bus ports on the face of the controller are RJ-12, six-position, modular jacks. The modular system bus and modular sensor bus port's provide a connection for the VAV Balancing Tool. The zone bus port is not used in ZEC/BYP controller installations. The zone bus port is not used in ZEC/BYP controller installations. The following figure shows the pin number assignments on the modular port.

Figure 7: Pin number assignments

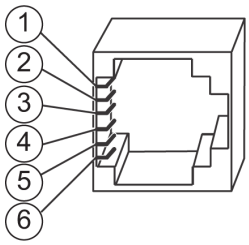

Table 4: Pin number assignments

Pin number	Description
1	Power 15 VDC
2	Bus and power common
3	Power 15 VDC
4	Bus and power common
5	Sensor or zone bus -
6	Sensor or zone bus +

Supply power terminal block

The 24 VAC supply power terminal block is a gray, removable, 2-terminal plug that fits into a board-mounted jack on the upper left of the ZEC/BYP controller. Wire the 24 VAC supply power wires from the transformer to the terminal plug as shown on the following figure.

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.

Figure 8: VAC Supply power terminal block wiring

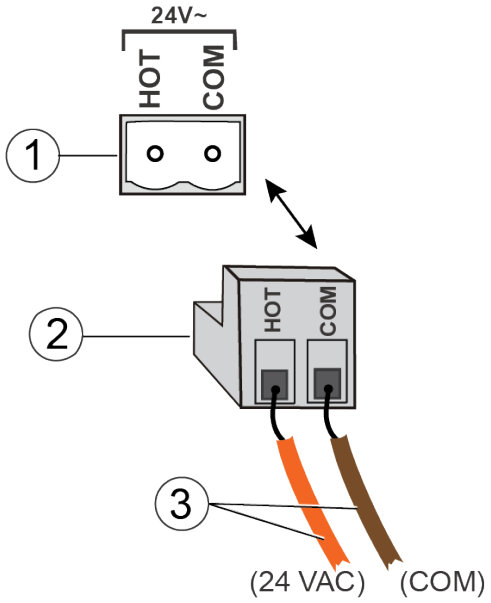

Table 5: VAC Supply power terminal block wiring

Calllout	Description
1	Supply power terminal block jack
2	Supply power terminal block plug
3	Wires from Johnson Controls 90 VAC to 24 VAC, Class 2, power transformer

Important: The 24 VAC power should not be shared with other network devices. Sharing power with other network devices may cause noise, interference, and ground loop problems. You may damage the controller by sharing power with other devices.

Wiring diagrams

1. Terminate the ZEC wiring according to Figure 11. Terminate the BYP wiring according to Figure 15.
2. Wire the zone sensor to the ZEC's Sensor Bus.
3. Wire the Zone Bus in a daisy chain.
4. Ensure that the controller's device address DIP switches are set to the appropriate device address. (See Setup and adjustments). Also, activate the end-of-line (EOL) switch if necessary.

Important: Maintain proper polarity and voltage or current ratings. Improper polarity or exceeding the voltage or current ratings voids the warranty.

5. Connect the controller to 24 VAC, Class 2 power.

Figure 9: ZEC310 flow diagram

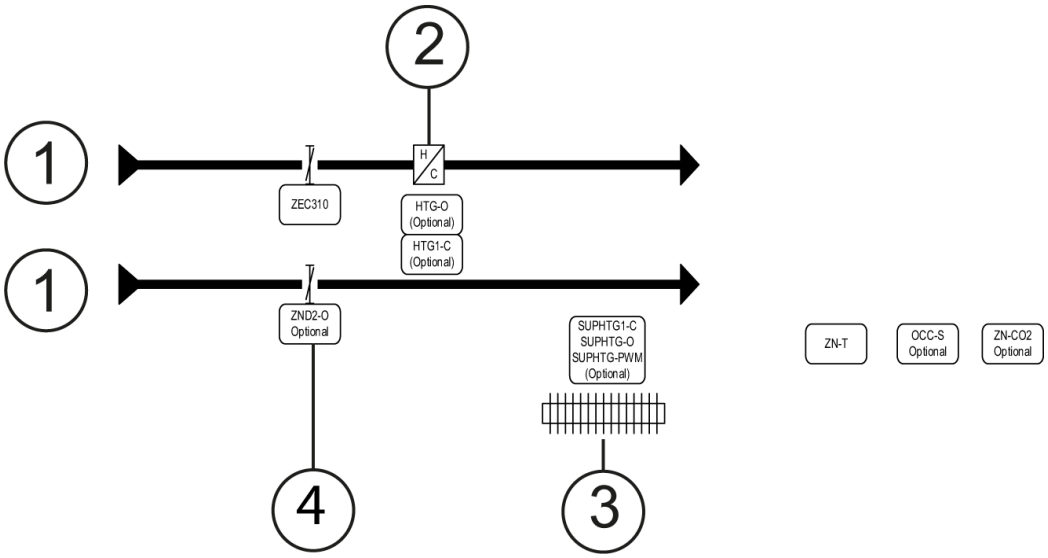

Table 6: ZEC310 flow diagram

Callout	Description
1	Supply air from rooftop unit
2	Proportional water or Silicon Controller Rectifier (SCR) or 1 stage
3	Optional supplemental heating 1 command
4	Second damper is not required but an output is available to drive a second zone damper

Figure 10: BYP200 flow diagram

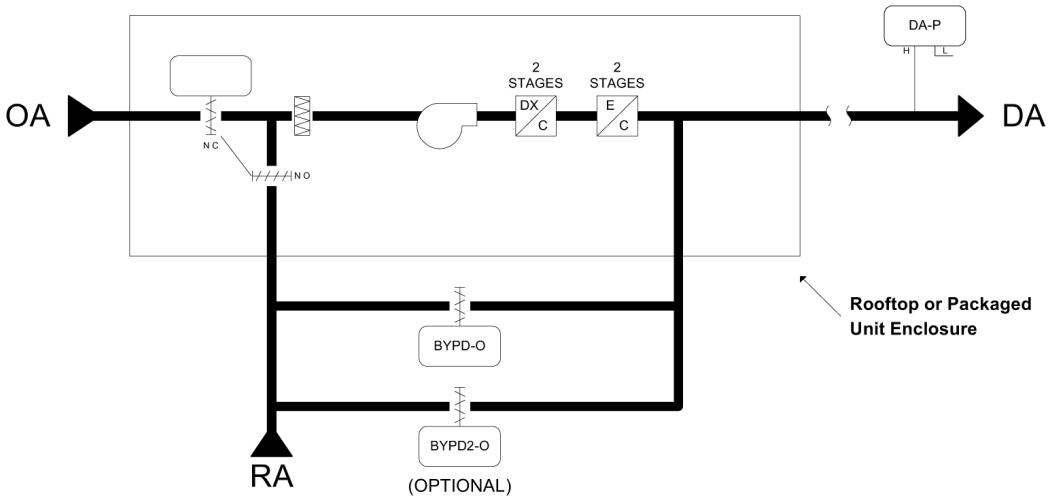

Figure 11: ZEC310-0 wiring diagram

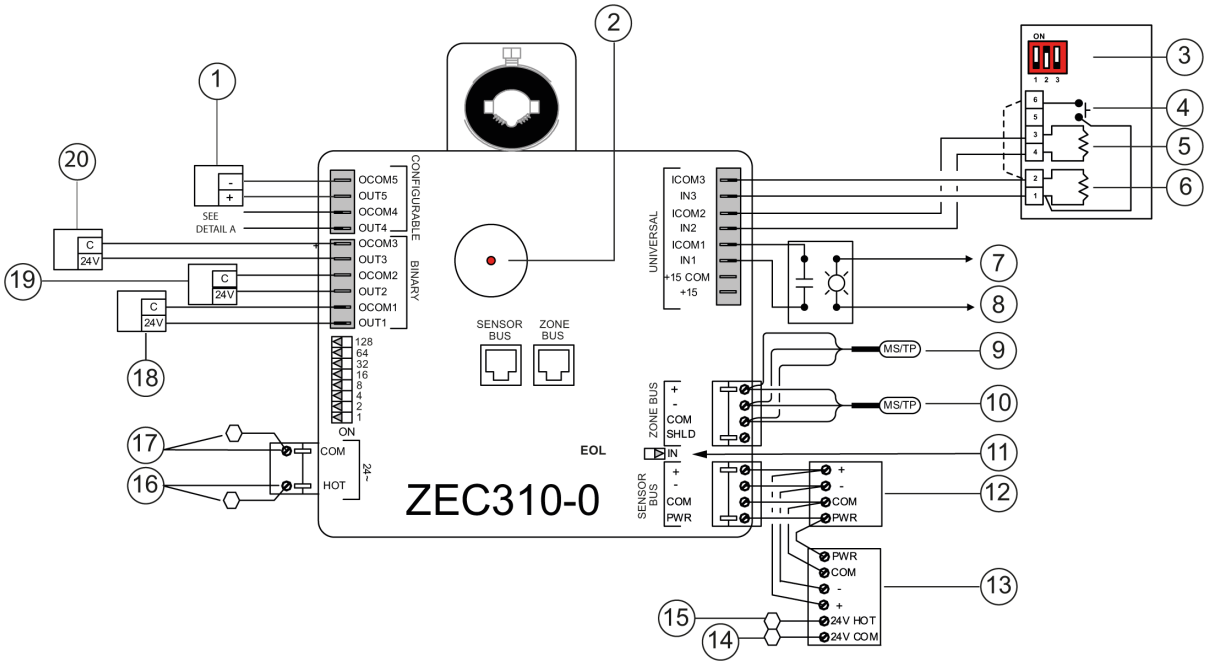

Table 7: ZEC310-0 controller wiring diagram

Callout	Description	Object name	Johnson Controls part number	Required or optional
1	Supplemental heating output	SUPHTG-O	n/a	**Optional:** Used if a 0 VDC to 10 VDC supplemental heat source is being controlled.
2	Manual override	n/a	n/a	n/a
3	Dip switch	ZN-T (If the hardwired sensors are selected)	TE-68NT-1N00S	**Required:** ZN-T can either come from hardwired sensor or network sensor
4	Temp occ button			
5	Setpoint			
6	Sensor			

Table 7: ZEC310-0 controller wiring diagram

Callout	Description	Object name	Johnson Controls part number	Required or optional
7	Occupancy sensor OLS-2100-1. To red wire occupancy switch	OCC-S	OLS-2100-1	**Optional**
8	Occupancy sensor OLS-2100-1. To neutral occupancy switch			
9	To next device. See riser detail for zone bus wiring.	n/a	n/a	n/a
10	From last device. See riser detail for zone bus wiring.	n/a	n/a	n/a
11	See riser schedule to determine the EOL device.	n/a	n/a	n/a
12	• Zone sensor (If netstat is selected) • You can average up to five NS sensors. Connect the NS sensors in a daisy-chain configuration using the addresses in the section. The fifth sensor must have the fixed address 199.	ZN-T	NSB8BTN240-0	**Required:** ZN-T can either come from hardwired sensor or network sensor
13	• Optional. Zone sensor • The connector is located on the back of sensor.	ZN-CO2	NS-BCN7004-0	**Optional**
14	24V Com			
15	24V Hot			
16	24V Hot	n/a	n/a	n/a
17	24V Com	n/a	n/a	n/a
18	Supplemental heating stage 1	SUPHTG1-C	n/a	**Optional:** Use this output to control on/off supplemental heating.
19	Box heating stage 1	HTG1-C	n/a	**Optional:** Use this output to control staged box heating.
20	Supplemental pulse output	SUPHTG-PWM	n/a	**Optional:** Use this output to control pulse-width modulation (PWM) supplemental heating

Detail A

Figure 12: Detail A

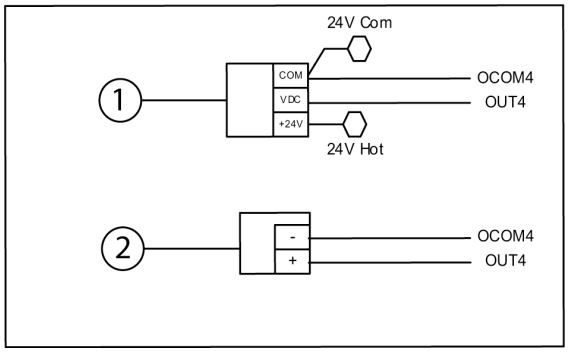

Table 8: Detail A

Callout	Description	Object name
1	Zone damper output 2 (optional)	ZND2-O
2	Box heating output (optional) If box heat is selected, the second damper is not available.	HTG-O

Configuring the NS sensors

Use the following diagrams and tables to address the NS sensors:

Figure 13: CO_2net stat with terminals addressable

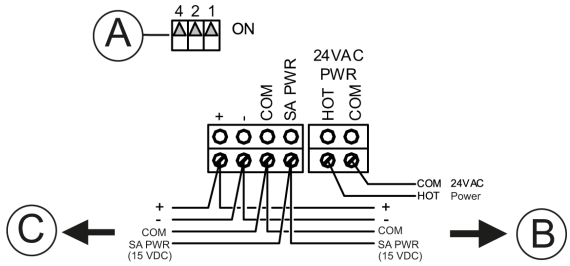

Table 9: CO_2 NS sensors with terminals addressable

Callout	Description
A	Address switch
B	To next device on the sensor bus if required
C	From previous device on the sensor bus

Table 10: CO2 NS sensor addresses

Available DIP switch addresses	DIP switch settings		
	Switch 4	Switch 2	Switch 1
212	Off (open)	Off (open)	Off (open)
213	Off (open)	Off (open)	On (closed)
214	Off (open)	On (closed)	Off (open)
215	Off (open)	On (closed)	On (closed)
216	On (closed)	Off (open)	Off (open)
217	On (closed)	Off (open)	On (closed)
218	On (closed)	On (closed)	Off (open)
219	On (closed)	On (closed)	On (closed)

Figure 14: NS sensors with terminals addressable

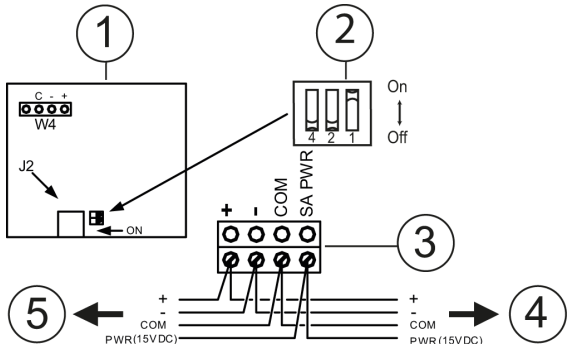

Table 11: NS sensors with terminals addressable

Callout	Description
1	Thermostat circuit board **Note:** Jack J2 is for commissioning tools.
2	Address switch
3	Terminal block on the NS sensor. Connector on themounting base slides into W4 pins on the circuit board.
4	To next device on the sensor bus if required
5	From previous device the on the sensor bus

Table 12: Network sensor addressing

DIP switch SA bus address	Switch 4	Switch 2	Switch 1
199	Off	Off	Off
200	Off	Off	On
201	Off	On	Off
202	Off	On	On
203	On	Off	Off
204	On	Off	On
205	On	On	Off
206	On	On	On

Note: Addresses 204 to 206 are not supported.

Sequence of operation

Occupied mode

- The zone damper controller monitors supply air temperature.
- When the zone temperature rises above the **Occupied Cooling Setpoint**, the primary air damper modulates open from **Damper Cooling Min Position** to **Damper Max Position**.
- When the zone temperature drops below the **Occupied Heating Setpoint**, the primary air damper modulates from **Damper Heating Min Position** to **Damper Max Position**.
- If the supply air does not satisfy the cooling or heating requirements, the primary air damper remains at the **Damper Satisfied Min Position**.

Unoccupied mode

- All zone damper controllers are indexed to unoccupied heating and cooling setpoints.
- When the zone temperature rises above the **Unoccupied Cooling Setpoint**, the primary air damper modulates from **Damper Cooling Min Position** to **Damper Max Position**.

- When the zone temperature drops below the **Unoccupied Heating Setpoint**, the primary air damper modulates from **Damper Heating Min Position** to **Damper Max Position**.
- If the supply air does not satisfy the cooling or heating requirements, the primary air damper remains at the **Damper Satisfied Min Position**.

Box heating (optional)

- Two optional outputs are available for box heating. The controller uses local heat before voting for unit heating.
- Output 4 is 0 VDC to 10 VDC output.
- Output 2 is a 24 VAC maintained output.

Note: If box heating is installed, the second damper functionality automatically disables.

Supplemental heating (optional)

- You can use three optional outputs to add supplemental heating to the controller. If you add supplemental heating and set the relevant parameter to **True**, the controller uses supplemental heating before voting for unit heating.
- If supplemental heating does not satisfy the space, the controller uses the heat available to satisfy the space.
- Output 1 is a 24 VAC maintained output.
- Output 3 is a 24 VAC output for PWM.
- Output 5 is a 0 VDC to 10 VDC output.

Second damper (optional)

- An optional output for controlling a second actuator.
- The output mimics the position of the integrated actuator on the ZEC310.
- Output 4 is 0 VDC to 10 VDC output.

Occupancy lighting switch (optional)

- You can add an occupancy lighting switch to the box to temporarily set the controller to standby mode it does not detect occupancy. When the box detects occupancy, the zone switches back to occupied mode.
- Standby mode uses standby temperature setpoints that are slightly higher or lower than the occupied cooling or heating setpoints, respectively.

Demand control ventilation (optional)

- You can proportionally reset the minimum damper positions based on an air quality setpoint when you wire the zone CO2 sensors to the controller to detect the air quality in the zone.
- The reset of the damper minimum positions do not exceed the maximum value that you set. When the CO2 sensor is not connected, the controller uses the cooling minimum position and the heating minimum position.

Figure 15: BYP200 wiring diagram

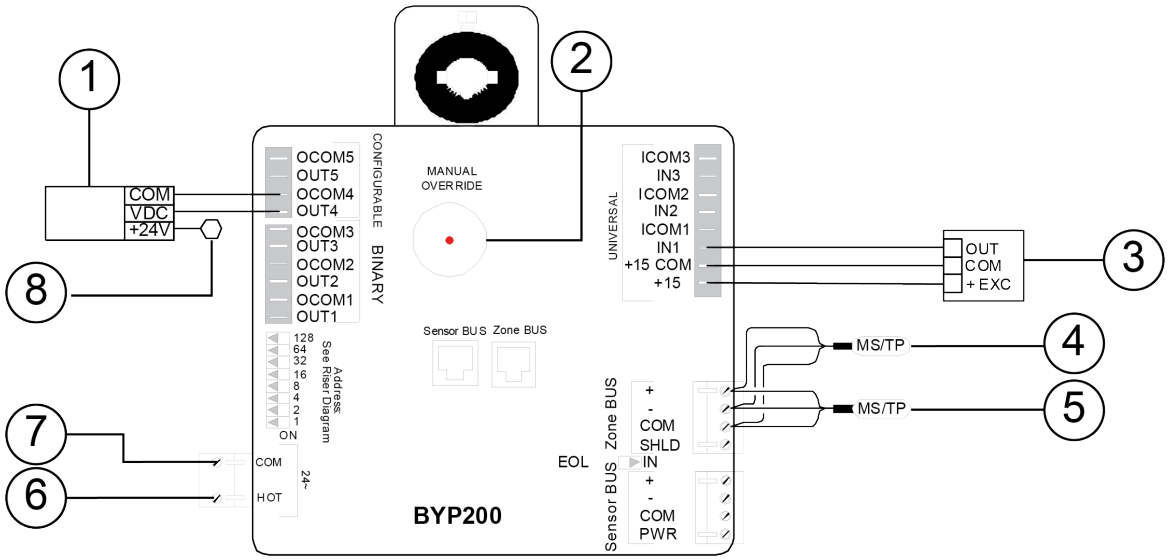

Table 13: BYP200 wiring diagram

Callout	Description	Object name
1	Bypass damper output	BYPD2-O
2	Manual override	n/a
3	Discharge air static pressure	DA-P
4	To next device	n/a
5	From last device	n/a
6	24 V HOT	n/a

Table 13: BYP200 wiring diagram

Callout	Description	Object name
7	24 V COM	n/a
8	24 V HOT	n/a

BYP200 Sequence of Operation

In occupied mode, the Bypass Damper Controller monitors the duct static pressure. When the static pressure rises above the setpoint, the Bypass Damper modulates opens to decrease the pressure. When the static pressure drops below the setpoint, the Bypass Damper modulates towards the closed position to increase pressure.

In unoccupied mode, when the single packaged unit is OFF, the Bypass Damper modulates to 50%. If the single packaged unit is ON, the Bypass Damper controls according to the occupied mode sequence.

ZEC terminal functions, ratings, requirements, and wiring guidelines

Input and Output wiring guidelines

Table 14 provides information about the functions, ratings, and requirements for the ZEC input and output terminals.

In addition to the wiring guidelines in Table 14, follow these guidelines when wiring ZEC inputs and outputs:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- It is best practice to ensure all input and output cables, regardless of wire size or number of wires, consist of twisted, insulated, and stranded copper wires.
- Shielded cable is not required for input or output cables. It is best practice to use shielded cable for input and output cables that are exposed to high electromagnetic or radio frequency noise.

Sensor and Zone bus supply power wiring guidelines

Table 14 provides information about terminal block functions, ratings, and requirements.

In addition to the guidelines in Table 14, follow these guidelines when wiring the Sensor and Zone Buses and supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- It is best practice to ensure all zone and sensor bus cables, regardless of wire size, consist of twisted, insulated, and stranded copper wires.
- Shielded cable is strongly advised for all zone and sensor 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.

Wire gauges and lengths

Table 14: Zone controller wiring

Terminal	Terminal labels	Function and electrical ratings and requirements	Best practice cable type and length
Analog Input (AI)	IN1	BI connection for occupancy sensor (OCC-S) dry contact (optional).	0.6 mm (22 AWG) stranded, 2-wire twisted cable best practice for runs of <30 m (90 ft)
	IN2	AI connection for Warmer/Cooler adjust (optional).	
	IN3	AI connection for zone temperature (ZN-T) sensor (optional). ⓘ **Note:** You can wire either a network sensor or a zone sensor to AI13.	
Binary Output (BO)	(Integrated)	BO connection for clockwise (CW) rotation to the open position of the actuator, 24 VAC triac output.	N/A
	(Integrated)	BO connection for counterclockwise (CCW) rotation to (Close) of actuator, 24 VAC triac output.	N/A
Sensor Bus Terminal Block	+, -, COM, PWR	Sources 15 VDC power for Sensor Bus devices; supports 1 NS Series Network CO_2 Sensor and 1 NS Series Network Sensor.	0.6 mm (22 AWG) stranded, 4-wire twisted cable best practice for runs of <30 m (99 ft)

Table 14: Zone controller wiring

Terminal	Terminal labels	Function and electrical ratings and requirements	Best practice cable type and length
Zone Bus Terminal Block	+, -, COM	Communication network	0.6 mm (22 AWG) stranded, twisted shielded cable best practice for runs of 1,000 feet maximum
24 VAC Power	HOT	AC supply input supply 20 VAC to 30 VAC (Nominal 24 VAC)	0.8 mm to 1.5 mm (20 to 16 AWG) 2-wire
	COM	24 VAC power common	
Configurable Output (CO)	OUT4	Select box heat for an output signal of 0 V to 10 V to control box heat. Set the box heat to false for a 0 V to 10 V output signal to drive a second damper actuator. ⓘ **Note:** Box heat is a heating output that is in the duct.	0.6 mm (22 AWG) stranded, 3-wire twisted cable best practice for runs of <30 m (99 ft)
	OUT5	0 V to 10 V Supplemental Heating Output. Supplemental heating is heating that is outside the duct.	0.8 mm to 1.5 mm (20 to 16AWG) 2-wire
Binary Output (BO)	OUT1	24 VAC power output to turn on a supplemental heat command.	0.8 mm to 1.5 mm (20 to 16AWG) 2-wire
	OUT2	24 VAC to turn on a box heat command.	0.8 mm to 1.5 mm (20 to 16AWG) 2-wire
	OUT3	PWM 24 VAC signal with a 10 second cycle for a supplemental heat PWM command.	0.8 mm to 1.5 mm (20 to 16AWG) 2-wire

Table 15: Bypass controller wiring

Terminal	Terminal labels	Function and electrical ratings and requirements	Best practice cable type and length
Analog Input (AI)	AI-1	AI connection for duct static pressure sensor, 0.0 VDC to 5.0 VDC, 0 in. W.C to 5 in. W.C.	0.6 mm (22 AWG) stranded, 2-wire twisted cable best practice for runs of <30 m (90 ft)
Binary Output (BO)	(Integrated)	BO connection for clockwise (CW) rotation to the open position of the actuator, 24 VAC triac output.	N/A
	(Integrated)	BO connection for counterclockwise (CCW) rotation to (Close) of actuator, 24 VAC triac output.	N/A
Zone Bus Terminal Block	+, -, COM	Communication network	0.6 mm (22 AWG) stranded, twisted shielded cable best practice for runs of 1,000 feet maximum
24 VAC Power	HOT	AC supply input supply 20 VAC to 30 VAC (Nominal 24 VAC)	0.8 mm to 1.5 mm (20 to 16 AWG) 2-wire
	COM	24 VAC power common	
Configurable Output (CO)	OUT4	Analog output signal of 0 to 10 V to drive a second Bypass Damper actuator.	0.6 mm (22 AWG) stranded, 3-wire twisted cable best practice for runs of <30 m (90 ft0)

Setup and adjustments

Setting the device address

ZEC controllers are master devices on BACnet® MS/TP sensor or zone buses. Before operating field controllers on a bus, you must set a valid and unique device address for each controller on the bus.
To set a field controller's device address, change the positions of the switches on the device address DIP switch block, at the top of the controller. Device addresses 4 through 127 are the valid addresses for the ZEC and BYP controllers.

ⓘ **Note:** The ZEC and BYP controllers ship with all address switches set to ON. Set a valid and unique device address on the field controller before applying power to the controller on the bus.

The DIP switch block has eight switches numbered 128, 64, 32, 16, 8, 4, 2, and 1.

To set the device addresses on a field controller, follow these steps:

1. Set all of the switches on the field controller's device address DIP switch block (128 through 1) to OFF.
2. Set one or more of the six address switches (32 through 1) to ON, so that the sum of the switch numbers set to ON equals the intended device address.
3. Set the highest number switch that is less than or equal to the intended device address to ON. Then continue setting lower numbered switches until the total equals the intended address. For example, if the intended device address is 21, set Switch 16 to ON first, then set Switch 4 ON, followed by Switch 1 (16+4+1=21).
4. Set a unique and sequential device address for each of the field controllers connected on the System Bus or Zone Bus, starting with device address 4.

To ensure the best bus performance, set sequential device addresses with no gaps in the device address range (4, 5, 6, 7, and so on). The field controllers do not need to be physically connected on the bus in their numerical device address order.

5. Write each field controller's device address on the white label below the DIP switch block on the controller's cover.

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 Bus devices.

Duct static pressure probe requirement

The Bypass Damper requires the use of a duct static pressure probe (FTG618A-600R) and 6.4 mm (1/4 in.) I.D. user-supplied tubing. The tubing must connect to the probe and link the H1 (+) port of the pressure sensor, located on the Bypass Damper controller.

Accessories

Table 16 lists the Zone controller accessories. Table 17 lists the Bypass Controller accessories.

Table 16: Zone Controller accessories

Product code number	Description
Zone Temperature Sensors (Hardwired)	
TE-68NT-0N00S	Wall temperature sensor, 1k ohm, nickel with temperature occupancy button.
TE-68NT-1N00S	Wall temperature sensor, 1k ohm, nickel with warmer/cooler (W/C) adjustment and temperature occupancy pushbutton.
Zone CO_2 Sensor	
NS-BCN7004-0	BACnet network CO_2 sensor designed to function directly with Johnson Controls® BACnet MS/TP digital controllers, in a 80 mm x 120 mm (3 in. x 4.5 in.) enclosure with terminal block and modular jack wiring connections. ⓘ **Note:** Only addresses 212 to 214 are supported.
Second Zone Damper Actuator	
M9106-GGA-2	6 N·m torque non-spring return damper actuator ⓘ **Note:** You must purchase the actuator and add it to a damper without a ZEC310 controller.
Network Sensors for Zone Temperature	
NSB8BTN240-0	Network sensor, 120 x 80, Johnson Controls logo, local setpoint, white
NSB8BTN241-0	Network sensor, 120 x 80, no logo, local setpoint, white
NSB8BTN242-0	Network sensor, 120 x 80, Johnson Controls logo, no setpoint, black
NSB8BTN243-0	Network sensor, 120 x 80, no logo, no setpoint, black
NSB8BTN140-0	Network sensor, 120 x 80, Johnson Controls logo, W/C adjustment, white

Table 16: Zone Controller accessories

Product code number	Description
NSB8BTN141-0	Network sensor, 120 x 80, no logo, W/C adjustment, white
NSB8BTN142-0	Network sensor, 120 x 80, Johnson Controls logo, W/C adjustment, black
NSB8BTN143-0	Network sensor, 120 x 80, no logo, W/C adjustment, black
Occupancy Lighting Switch	
OLS-2100-1	Occupancy sensing light switch for control of indoor incandescent and fluorescent lights
RIBU1C	Enclosed relay for OLS-2100-1 Sensor

Table 17: Bypass Controller accessories

Product code number	Description
DPT2640-005D	264 Series Low Differential Pressure Transducer to measure differential air pressure. The transducer senses static pressure and converts this pressure difference to a proportional analog output. Accuracy: ± 5% within a 0 VDC to 5 VDC range. Units available in voltage or currents.
FTG18A-600R	Duct static pressure probe kit: 4 in. flanged sensing tube, two barbed fittings, two No. 10 screws, and O-gasket. ⓘ **Note:** The duct static pressure probe is field-installed and required for use with the Bypass Controller. See the Duct static pressure probe requirement section.
M9106-GGA-2	6 N·m torque non-spring return damper actuator

Operation

The ZEC/BYP controller is pre-programmed for the operating sequence as ordered. You do not need to program the controller; however, you need to provide configuration information using the Zone Setup screen on the Verasys Smart Building Hub (SBH).

For detailed information on Verasys system operation, including dehumidification capability, DCV, occupancy sensing, and general operating modes, refer to the *Verasys System Operation Overview Technical Bulletin (LIT-12012370)*.

Occupancy Sensor

All zone controllers support an occupancy sensor. The occupancy sensor enables the controller to switch from occupied mode to standby mode. This occurs in normal occupied mode during a set time period, when local activity is absent. When in standby mode, the zone controller uses standby temperature setpoints that are higher and lower than the occupied cooling and occupied heating temperature setpoints. These standby setpoints save energy by reducing the demand for heating and cooling in an unoccupied zone. For Zone Dampers, the sensor uses unoccupied flow setpoints in addition to standby temperature setpoints. You can enable the occupancy sensor in the Zone Setup screen of the System Manager or Zone Coordinator. You can set occupancy sensitivity and time delay until standby locally at the sensor. Refer to the *Verasys System User's Guide (LIT-12012370)* for more information.

CO_2 Demand Controlled Ventilation (DCV)

CO_2 DCV monitors CO_2 levels using a wall-mounted CO_2 sensor. This ensures high indoor air quality (IAQ) for the zone. The sensor measures CO_2 levels on a scale of 0 to 2,000 parts per million (ppm). When the CO_2 sensor detects that CO_2 levels in the zone are above the setpoint, such as when a high number of occupants are within the zone, the Zone Damper opens to allow more outside air into the zone. You can enable CO_2 DCV in the Zone Setup screen of the System Manager or Zone Coordinator. Refer to the *Verasys System User's Guide (LIT-12012370)* for more information.

Troubleshooting

Use the following information to troubleshoot the ZEC/BYP controllers.

Power Status LED

A green LED shows the power supply status for the Zone Damper Controller. See Table 18 for a description of modes.

Table 18: Status LED for Power (PWR)

Mode	Description
Off	No Power
On	Power is supplied by primary voltage (Normal operation)

Communication Bus problems

Several factors influence the functioning of the Zone Communication Bus.

I/O wiring

It is important that the ZEC/BYP controller is wired properly. If the ZEC/BYP controller is wired incorrectly, communication problems can occur. These problems include devices going online and offline, or devices not coming online at all.

Incomplete address

The ZEC/BYP controller must have the address switch set to a range between 4–127. Other settings prevent the controllers from communicating on the network.

Duplicate addresses

Two or more devices on a Communication bus cannot have the same address. If two devices on the same bus have the same address, performance can degrade or serious communication problems can occur. These problems include the devices not coming online and all communication stopping completely.

Depending on the severity of the situation, check for duplicate addresses in the following ways:

- If the bus performance is degraded, check the address switch settings at the devices that have unreliable communication.
- If a specific device is not communicating, disconnect that device and check if the device address remains online at the SBH.
- If the bus communication problems are severe and no communication is present, or you cannot determine where communication is unreliable, disconnect and isolate a portion of the bus for testing purposes, and test the bus portion connected to the Zone Coordinator.

Correcting physical Communication Bus problems

The Communication Bus is subject to a number of physical factors that can affect performance. Consider the following list of common physical problems that affect the Communications Bus:

- Check the status LED to verify power at the controller.
- Check wires
    - Verify that the wire is a 0.6 mm (22 AWG) three-conductor, twisted, shielded cable.
    - Verify that the shield is continuous and hard-grounded at one end.
- Check wiring
    - Check for and eliminate T-Taps, wire configurations that create a T shape, and star configurations.
    - Ensure that the bus is wired in a daisy-chain fashion.
    - Verify that appropriate devices have three wires entering and exiting each terminal. Devices at the ends of the trunk do not have this wiring.
- Check EOL switch settings
    - Verify that only the EOL switch at the end of the system bus is set to ON, and all other system bus EOL switches are set to OFF.
- Check connections, polarity, and lengths
    - Verify that communications loops are less than approximately 304 m (1,000 ft) total in length.
    - If you are using one transformer to power multiple devices, verify that the device 24 VAC power connection follows the polarity of the common and 24 V terminations.
- Check for opens and shorts
- Check terminations
- Check addresses
    - Check for duplicate addresses.
    - Verify that the address range is sequential.
- Check for sources of interference
- Check bus voltages:
    - (+) to COM must be within 2.0 VDC to 3.0 VDC
    - (-) to COM must be within 1.5 VDC to 2.54 VDC
    - (+) to (-) must be within 0.3 VDC to 1.0 VDC

Note: Values may fluctuate due to ongoing communications. This operation is normal provided that the voltage is within the defined range.

ZEC310 Zone and BYP200 Bypass Controllers technical specifications

Table 19: ZEC310 Zone and BYP200 Bypass Controllers technical specifications

Specification	Description
Product code number	LC-ZEC310-0: Field Installed, Zone Damper Controller LC-BYP200-0: Field Installed Bypass Damper Controller
Power supply requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50 to 60 Hz, Class 2 power supply (North America) or Safety Extra-Low Voltage (SELV) (Europe)

Table 19: ZEC310 Zone and BYP200 Bypass Controllers technical specifications

Specification	Description
Power consumption	10 VA (not including external load) **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can each consume up to 12 VA per BO or CO, for a possible total consumption of an additional 60 VA (maximum).
Ambient conditions	Ambient Operating Conditions: 0°C to 50°C (32°F to 122°F) Ambient Storage Conditions: -40°C to 70°C (-40°F to 158°F)
Processor	RX630 32-bit Renesas® microcontroller
Memory	1 MB flash memory and 512 KB Random Access Memory (RAM)
Input and Output capabilities	3 Universal Inputs: Defined as 0 VDC to 10 VDC, 4 mA to 20 mA, 0k to 600k ohm, or Binary Dry Contact 3 Binary Outputs: Defined as 24 VAC Triac (internal power source) 2 Configurable Outputs: Defined as 0 VDC to 10 VDC or 24 VAC Triac BO
Analog Input/Analog Output accuracy	Analog Input: 15-bit resolution on UIs Analog Output: 0 VDC to 10 VDC ± 200 mV
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw
Actuator rating	4 N•m (35 lb•in) minimum shaft length = 44 mm (1-3/4 in.)
Dimensions (Height x Width x Depth)	165 mm x 125 mm x 73 mm (6.5 in. x 4.92 in. x 2.9 in.)
Shipping weight	0.65 kg (1.45 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A.
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
	Australia and New Zealand: RCM, Australia/NZ Emissions Compliant.
CE	**Europe:** CE Mark - Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Repair information

If the ZEC310 or BYP200 Controller fails to operate within its specifications, replace the unit. For a replacement unit, contact your nearest Verasys representative.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: http://jcipat.com

Single point of contact

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