24-10143-1264, Rev. B

ZEC410 VAV Controllers

Installation Instructions

LC-ZEC410-x

Part No. 24-10143-1264, Rev. B
Issued March 2018

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

Applications

The ZEC410 VAV Controllers are components of the Verasys® SMART equipment family. The VAV Zone controllers run a pre-engineered HVAC zoning sequence and provide the inputs and outputs required for this application.

The ZEC Controller contains multiple features to ensure occupant comfort. Optional occupancy sensing capability enables the ZEC controller to switch from occupied mode to standby mode based upon zone activity. Standby mode maximizes energy savings by using set points that are higher and lower than occupied mode set points.

The ZEC410 controller also uses plug and play technology to detect which network sensor types are connected. See the *Accessories* section to determine availability of additional sensing product information.

You use the Verasys® Smart Building Hub to set up the ZEC410 controller. Use the Smart Building Hub or the VAV Balancing Thermostat to commission the controller.

IMPORTANT: Use this ZEC410 VAV controller only as an operating control. Where failure or malfunction of the ZEC410 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 ZEC410 VAV controller.

IMPORTANT: Utiliser ce ZEC410 VAV 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 ZEC410 VAV 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

Follow these guidelines when you install a ZEC controller:

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

Parts Included

- One ZEC controller with removable System and Zone 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 a 10 mm (3/8 in.) 12-point socket to tighten the square coupler bolt.
- Shims or washers to mount the ZEC, if necessary.
- A power screwdriver, a100 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

Follow these guidelines when mounting a ZEC:

IMPORTANT: When the air supply to the VAV box is below 10°C (50°F), make sure that any condensation on the VAV box, particularly on the damper shaft, does not enter the ZEC electronics. Mount the ZEC vertically above the damper shaft to allow any shaft condensation to fall away from the ZEC. Additional measures may be required in some installations.

- Ensure that the mounting surface can support the ZEC and any user-supplied enclosure.
- Mount the ZEC on a hard, even surface whenever possible.
- Use shims or washers to mount the ZEC securely and evenly on the mounting surface, if necessary.
- Mount the ZEC in an area free of corrosive vapors that matches the ambient conditions specified in the *Technical Specifications* section.
- Provide sufficient space around the ZEC for cable and wire connections and adequate ventilation through the controller. Provide at least 50 mm (2 in) on the top, bottom, sides, and front of the controllers.
- Do not mount the ZEC in areas where electromagnetic emissions from other devices or wiring can interfere with controller communication.
- Avoid mounting the ZEC on surfaces with excessive vibration.

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

- Do not install the ZEC in an airtight enclosure.
- Mount the ZEC so that the enclosure walls do not obstruct cover removal or ventilation through the controller.
- Mount the ZEC so that the power transformer and other devices do not radiate excessive heat to the controller.

To mount the ZEC controllers:

1. Ensure you wear the appropriate personal protective equipment (PPE), such as a hard hat, safety glasses, steel toe boots, and gloves.
2. Disconnect power from the controller transformer as well as the VAV box fan and heater circuits, if applicable.
3. Set all the switches on the field controller to their known settings, and then set the MS/TP address, and ensure that EOL is set to Off. See *Setup and Adjustments*.
4. Use the Zone Bus Address/Range 4-127 for Verasys Zone Bus controllers.
5. Place the ZEC controller in the proper mounting position on the actuator shaft so that the wiring connections are easily accessible. Make sure the ZEC controller base is parallel to the VAV box (perpendicular to the damper shaft). If needed, use a spacer to offset tipping of the ZEC controller caused by the shaft bushings.

Note: Use the alignment marks to center the captive spacer to ensure sufficient ZEC movement in either direction (Figure 8).

Figure 1: Captive Spacer Alignment Marks

6. 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 to mark the position of the shoulder washer, and then drill a hole into the VAV box using a 5/16 in. drill bit. Insert the mounting screw and tighten it against the spacer.

IMPORTANT: Do not over-tighten the screw, or the threads may strip. If you mount the ZEC to the VAV box, make sure that the screws do not interfere with damper blade movement.

7. Locate the damper position using the typical marking on the end of the damper shaft.
8. Note the direction, clockwise (CW) or counterclockwise (CCW), required to close the damper. The actuator setup depends on the necessary amount of rotation required for the damper to go from full-open to full-closed. For 90° rotation, install the damper full-closed. For 45° or 60° rotation, install the damper full-open.

9. Push down and hold the Manual Override button and turn the ZEC controller coupler until it contacts the mechanical end-stop at either the full-closed or full-open position.

Figure 2: Manual Override and Coupler

10. If the damper for a 45° or 60° box closes CCW or CW, rotate the coupler to the CW 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 ZEC controller at the full-open position, the ZEC controller provides the open stop for 45° and 60° boxes. The closed damper seal provides the full-closed stop.

11. 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).

12. Put a loop in the poly tubing, to trap condensation, when you attach the poly tubing to the ZEC pressure transducer ports. Loop the poly tubing before you make the final connections.

13. 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.

14. Complete the mounting by rotating the damper to the full-open position.

Wiring

⚠ 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.

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.

Follow these guidelines when wiring a ZEC controller:

Input and Output Terminals

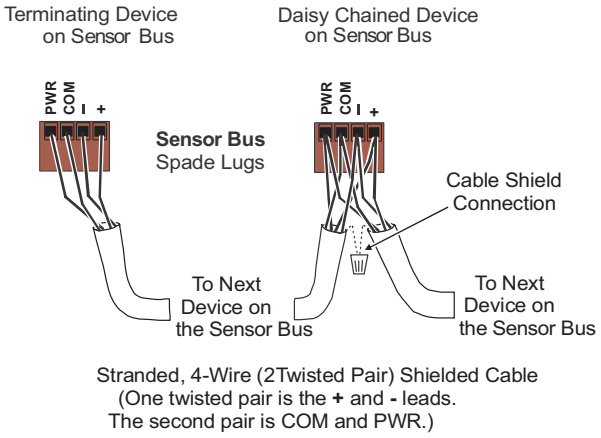
See Figure 8 for an example of the staged control wiring. See Figure 9 for an example of the incremental control wiring.

Sensor Bus Terminal Block

The Sensor Bus terminal block is a brown, removable 4-terminal plug, that is keyed to only fit into the board-mounted brown Sensor bus.

Wire the removable Sensor Bus terminal block plugs on the ZEC and other field devices in a daisy-chain configuration using 4-wire twisted, shielded cable as shown in Figure 3.

Figure 3: Sensor Bus Terminal Block Wiring

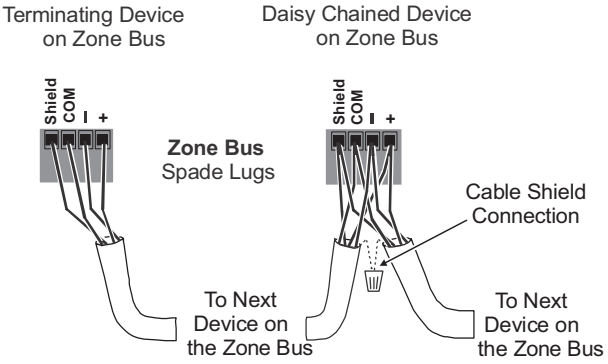


Zone Bus Terminal Block

The Zone Bus terminal block is a grey, removable, 4-terminal plug that is keyed to only fit into the board-mounted, blue Zone Bus jack.

Wire the removable Zone Bus terminal block plugs on the ZEC and other Zone Bus controllers in a daisy-chain configuration using 3-wire twisted, shielded cable, as shown in Figure 4.

Figure 4: Zone Bus Terminal Block Wiring

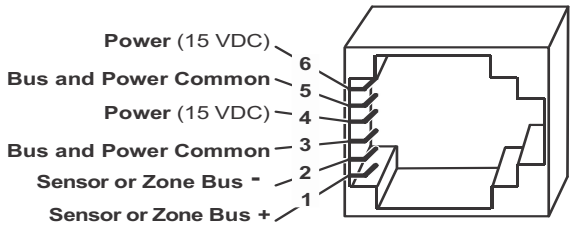


Modular Ports

The modular Sensor Bus and Zone Bus ports on the face of the ZEC are RJ-12 (6-position) modular jacks.

The modular Sensor Bus ports provide a connection for the VAV Balancing Tool. The Zone Bus port is not used in ZEC installations.

Figure 5: Pin Number Assignments
Sensor and Zone Bus Ports

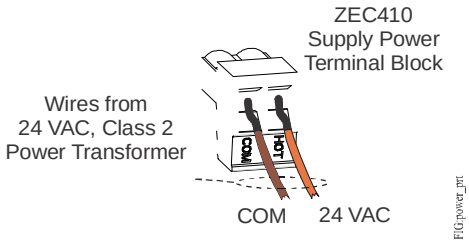


Supply Power Terminal Block

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 controller.

Wire the 24 VAC supply power wires from the transformer to the HOT and COM terminals on the terminal plug.

Figure 6: VAC Supply Power Terminal Block Wiring



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.

Follow these guidelines to wire the ZEC410 controller:

1. Terminate wiring according to Figure 8 if you are using staged outputs for the heating control. See Figure 9 if you are using incremental outputs for the heating control.
2. Wire the network temperature sensor and CO_2 sensor to the ZEC's Sensor Bus.
3. Wire the Zone Bus in a daisy chain.
4. Ensure that the ZECs device address DIP switches are set to the appropriate device address. See *Setup and Adjustments*. If necessary you can also activate the end-of-line (EOL) switch.
5. Connect the ZEC controller to 24 VAC, Class 2 power

Figure 7: ZEC410-1 Controller - VAV with Staged Reheat Control Wiring Example

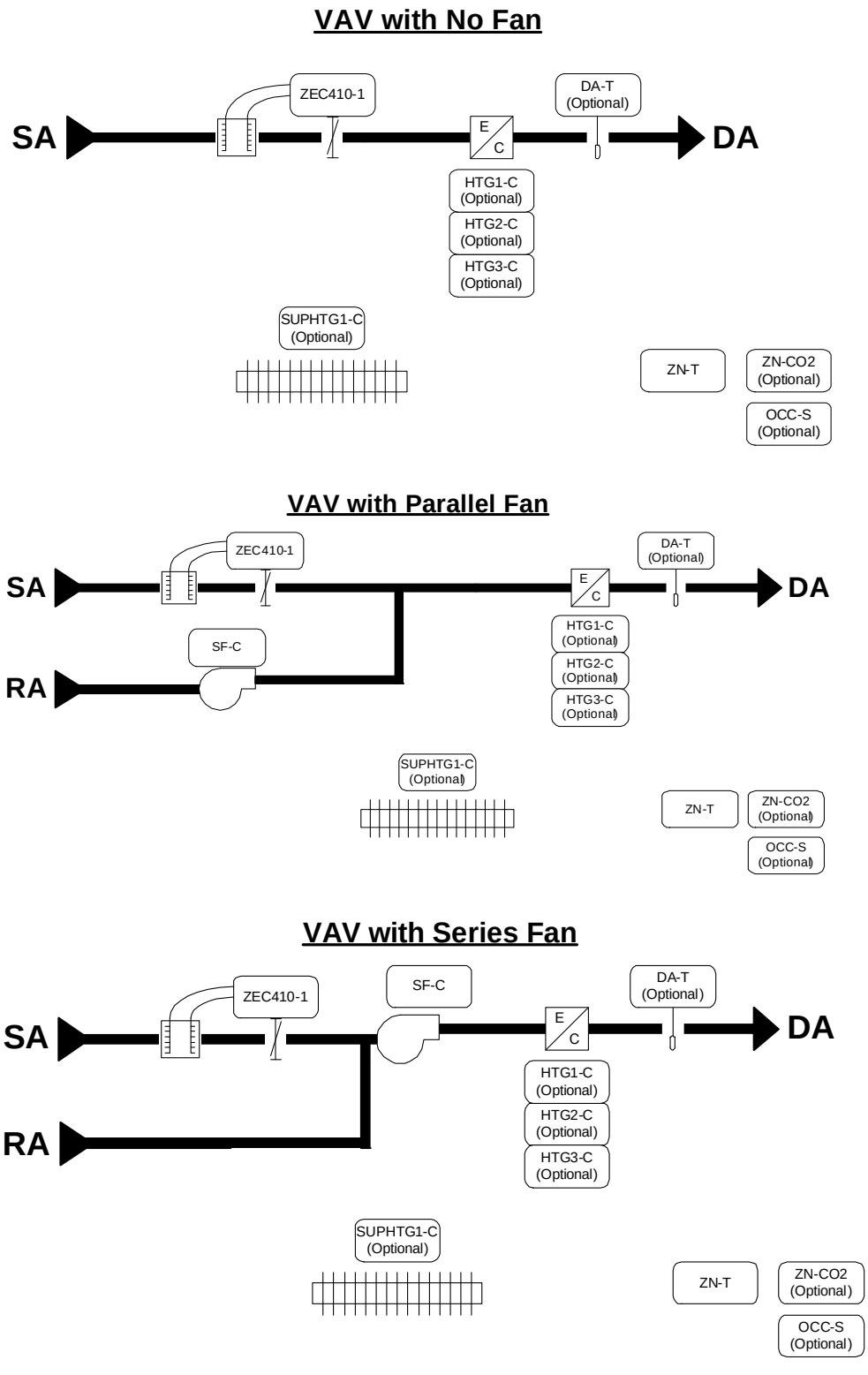
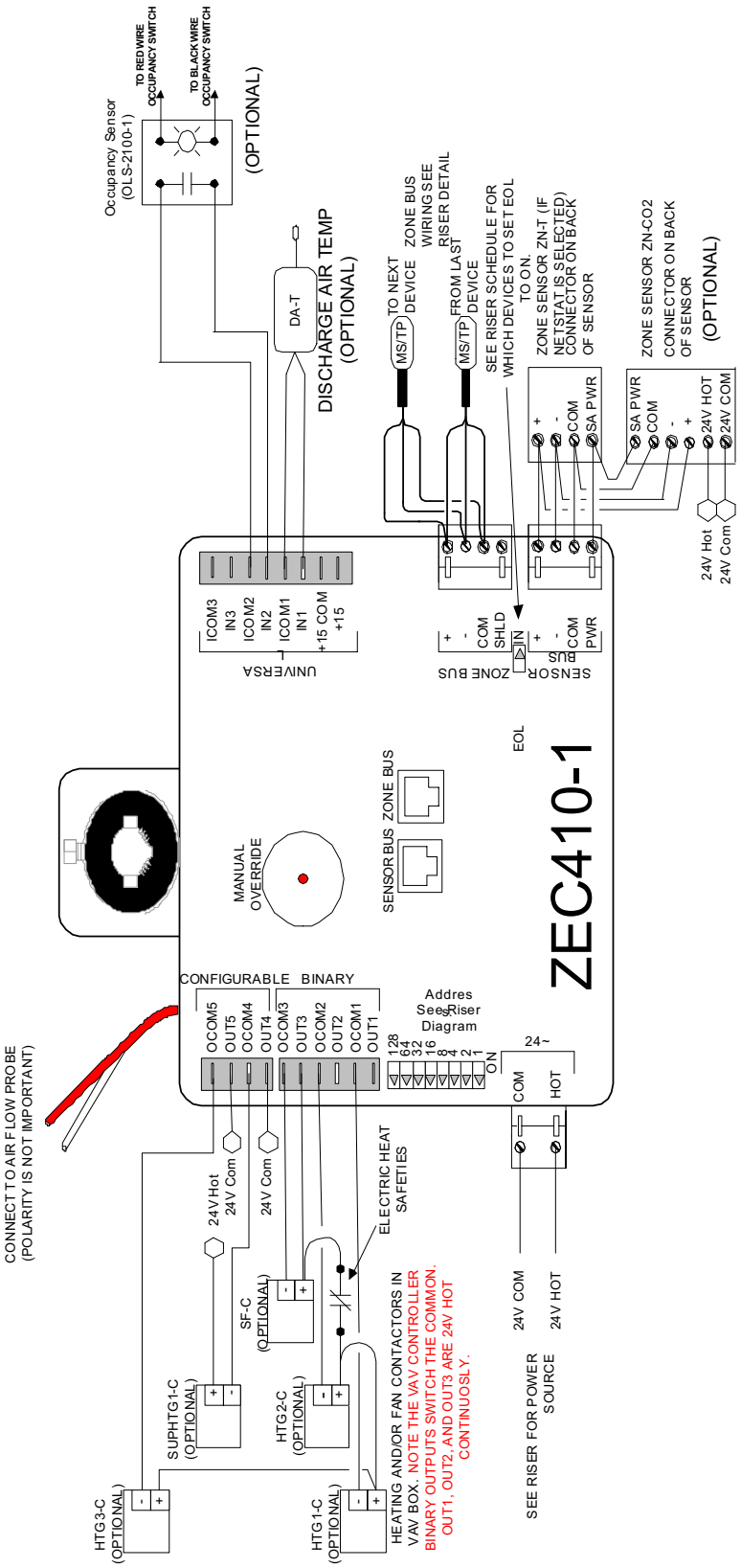


Figure 8: ZEC410-1 Controller - VAV with Staged Reheat Control Wiring Example



Sequence of Operation for Staged with Reheat Control

Occupied Mode:

- When the zone temperature is between the occupied heating and cooling setpoints inside of the bias, the primary air damper is at the minimum cfm and no mechanical heating runs.
- When the zone temperature rises above the cooling setpoint, the primary air damper increases the cfm and no mechanical heating runs.
- When a drop in zone temperature below the heating setpoint occurs, the supplemental heating coil is fully used before the reheat heat coil enables, and the damper opens at the minimum cfm.

Note: The box reheat and supplemental reheat are a box option. You have a cooling only box if you do not select either reheat or supplemental reheat.

Unoccupied Mode:

- The primary air damper is at the minimum cfm and no mechanical heating runs when the zone temperature is between the unoccupied heating and cooling setpoints inside of the bias.
- When the zone temperature rises above the unoccupied cooling setpoint, the primary air damper increases the cfm (if available), and no mechanical heating runs.
- When the zone temperature drops below the unoccupied heating setpoint, the supplemental heating coil is fully used before the reheat heat coil enables. The damper is at the minimum cfm.

Unit Enable: A network unit enable signal, controls the mode of the box.

Fan Control (Optional): A parallel fan cycles on when a request for heat occurs. The fan remains off in all other states. Series fans run continuously in occupied mode. The fan moves from unoccupied mode to cycle on mode when it receives a call for heating or cooling.

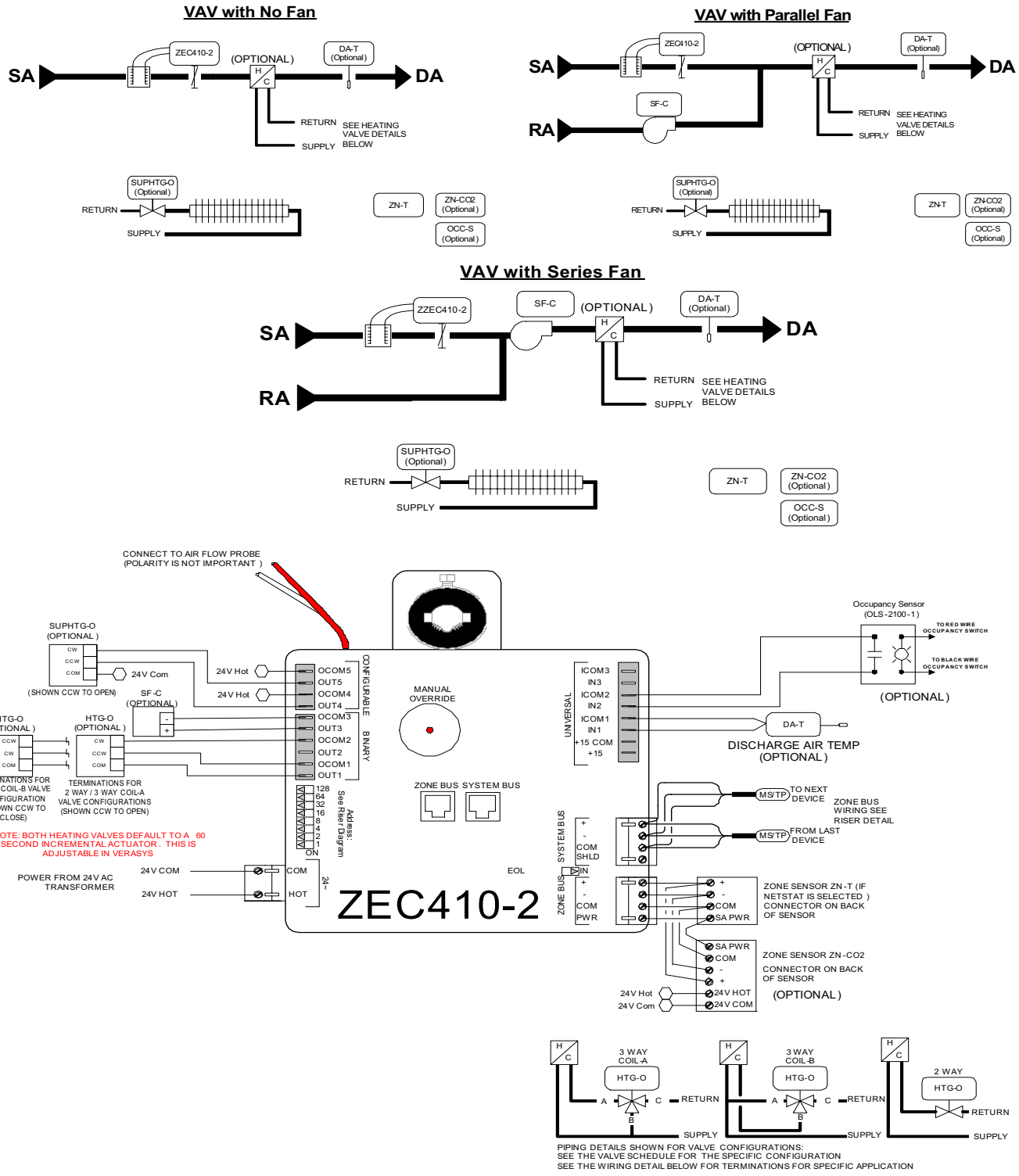
Occupancy Lighting Switch (Optional):

- You can add an occupancy lighting switch to the box to temporarily set the VAV box to Standby mode when the occupancy is not detected. The zone switches back to occupied when the box detects occupancy.
- Standby mode uses standby temperature setpoints that are slightly higher or lower than the occupied cooling or heating setpoints, respectively. The VAV box also uses unoccupied flow setpoints in addition to the low temperatures.

Demand Control Ventilation (Optional):

- You can proportionally reset the minimum damper flows based on an air quality setpoint (CO_2) when the zone (CO_2) sensors wire to the boxes to detect the air quality in the zone.
- The reset of the damper minimum flows do not exceed the maximum value that you set. The CO_2 sensor with the highest value determines the reset when more than one CO_2 sensors are wired.

Figure 9: ZEC410-2 Controller - VAV with Incremental Reheat Control Wiring Example



Sequence of Operation for Incremental Control Wiring Example

Occupied Mode:

- When the zone temperature is between the occupied heating and cooling setpoints inside of the bias, the primary air damper is at the minimum cfm and mechanical heating is unavailable.
- When the zone temperature rises above the cooling setpoint, the primary air damper increases the cfm and mechanical heating is unavailable.
- When the zone temperature drops below the heating setpoint, the supplemental heating coil is fully used before the reheat coil enables. The damper is controlled to provide a minimum cfm.

Note: The box reheat and supplemental reheat are box options. You have a cooling only box if you do not select either reheat or supplemental reheat.

Unoccupied Mode:

- The primary air damper is at the minimum cfm and no mechanical heating runs when the zone temperature is between the unoccupied heating and cooling setpoints inside of the bias.
- When the zone temperature rises above the unoccupied cooling setpoint, the primary air damper increases the cfm (if available), and no mechanical heating runs.
- When the zone temperature drops below the unoccupied heating setpoint, the supplemental heating coil is fully used before the reheat heat coil enables. The damper is at the minimum cfm.

Unit Enable: A network unit enable sign controls the box mode.

Fan Control (Optional): A parallel fan cycles on when a call for heat occurs. The fan remains off in all other states. Series fans run continuously in occupied mode. The fan moves from unoccupied mode to cycle on mode when it receives a call for heating or cooling.

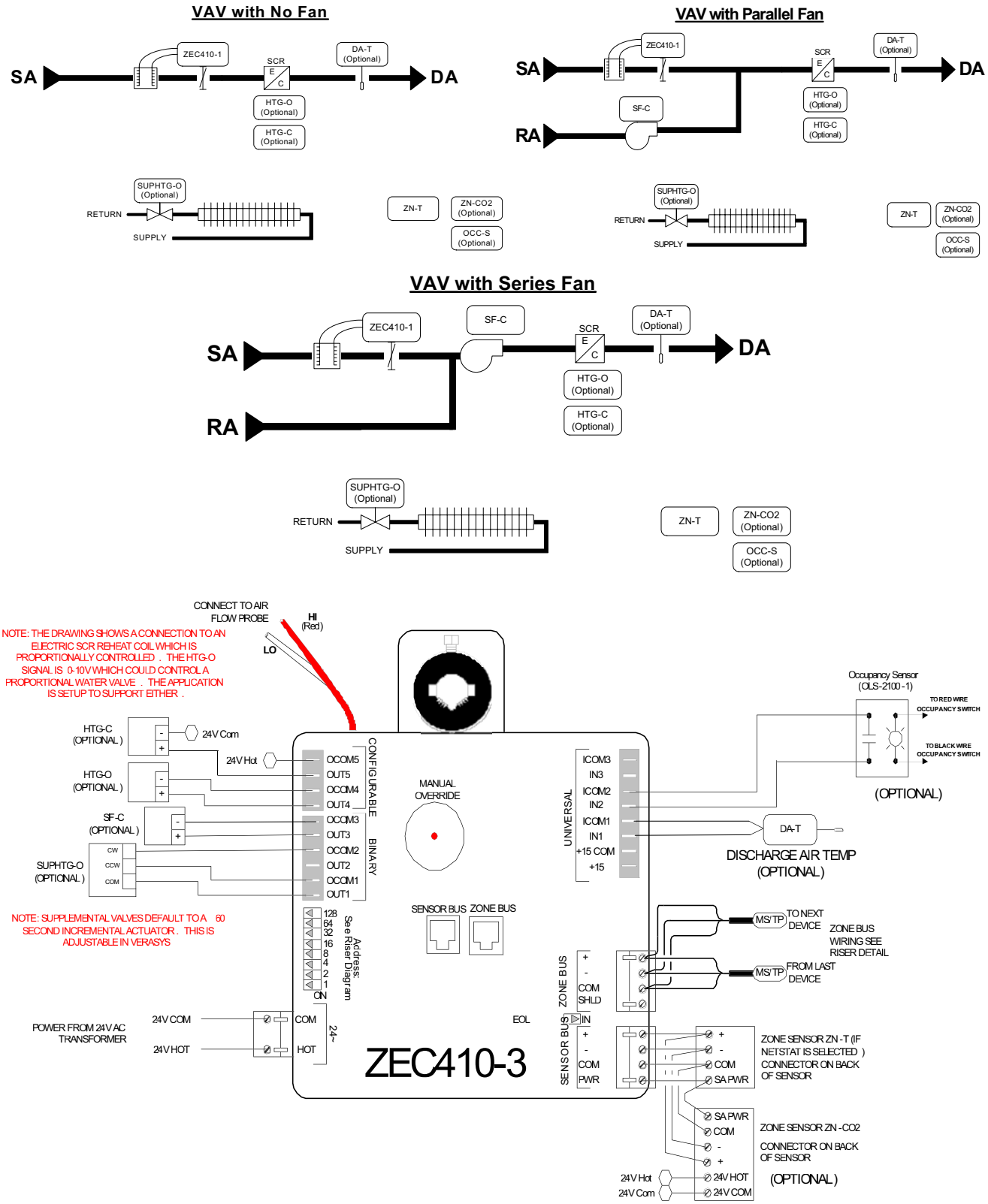
Occupancy Lighting Switch (Optional):

- You can add an occupancy lighting switch to the box to temporarily set the VAV box to Standby mode when the occupancy is not detected. The zone switches back to occupied when the box detects occupancy.
- Standby mode uses standby temperature setpoints that are slightly highter or lower than the occupied cooling or heating setpoints, respectively. The VAV box also uses unoccupied flow setpoints in addition to the low temperatures.

Demand Control Ventilation (Optional):

- You can proportionally reset the minimum damper flows based on an air quality setpoint (CO_2) when the zone (CO_2) sensors wire to the boxes to detect the air quality in the zone.
- The reset of the damper minimum flows do not exceed the maximum value that you set. The CO_2 sensor with the highest value determines the reset when more than one are wired.

Figure 10: MULTIZONE UNIT VAV WITH PROPORTIONAL REHEAT CONTROL



Sequence of Operation for Multizone Unit VAV with Proportional Reheat Control

Occupied Mode:

- When the zone temperature is between the occupied heating and cooling setpoints inside of the bias, the primary air damper is at the minimum cfm and mechanical heating is unavailable.
- When the zone temperature rises above the cooling setpoint, the primary air damper increases the cfm and mechanical heating is unavailable.
- When the zone temperature drops below the heating setpoint, the supplemental heating coil is fully used before the reheat coil enables. The damper is controlled to provide a minimum cfm.

Note: The box reheat and supplemental reheat are box options. You have a cooling only box if you do not select either reheat or supplemental reheat.

Unoccupied Mode:

- When in unoccupied mode, if the zone temperature is between the unoccupied heating and cooling setpoints inside of the bias, the primary air damper is at the minimum cfm and mechanical heating is unavailable.
- When the zone temperature rises above the unoccupied cooling setpoint, the primary air damper increases the cfm, if available, and mechanical heating is unavailable.
- When the zone temperature drops below the unoccupied heating setpoint, the supplemental heating coil is fully used before the reheat heat coil enables. The damper is at the minimum cfm.

Unit Enable: A network unit enable sign controls the box mode.

Fan Control (Optional): Parallel fans cycle on when a call for heat occurs. The fan is off in all other states. Series fans run continuously in occupied mode. The fan moves from unoccupied mode to cycle on mode when it receives a call for heating or cooling.

Occupancy Lighting Switch (Optional): You can add an occupancy lighting switch to the box to temporarily set the VAV box to Standby mode when the occupancy is not detected. The zone switches back to occupied when the box detects occupancy. Standby mode uses standby temperature setpoints that are slightly highter or lower than the occupied cooling or heating setpoints, respectively. The VAV box also uses unoccupied flow setpoints in addition to the low temperatures.

Demand Control Ventilation (Optional): You can proportionally reset the minimum damper flows based on an air quality setpoint (CO_2) when the zone (CO_2) sensors wire to the boxes to detect the air quality in the zone. The reset of the damper minimum flows do not exceed the maximum value that you set. The CO_2 sensor with the highest value determines the reset when more than one is wired.

ZEC Terminal Functions, Ratings, Requirements, and Wiring Guidelines

Input and Output Wiring Guidelines

Table 1 provides information about the functions, ratings, and requirements for the ZEC input and output terminals.

In addition to the wiring guidelines in Table 1, follow these guidelines when wiring ZEC 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 twisted, insulated, and stranded copper wires.
- Shielded cable is not required for input or output cables.
- Use shielded cable for input and output cables that are exposed to high electromagnetic or radio frequency noise.

System and Zone Bus Supply Power Wiring Guidelines

Table 1 provides information about terminal block functions, ratings, and requirements.

In addition to the guidelines in Table 1, follow these guidelines when wiring the System/Zone Buses and supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All FC and SA Bus cables, regardless of wire size, should be twisted, insulated, stranded copper wire.
- Use Shielded cable for all FC and SA Bus cables.
- Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011670)* for detailed information regarding wire size and cable length requirements for the Zone Bus.

Wire Gauges and Lengths

Table 1: ZEC VAV Controller Wiring Details

Terminal	Terminal Labels	Function and Electrical Ratings/ Requirements	Recommended Cable Type and Length
Analog Input (AI)	IN1	Provides an AI connection for discharge air (DA-T) sensor	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (90 ft).
	IN2	Provides a BI connection for occupancy sensor dry contact (optional)	N/A
Binary Output (BO)	(Integrated)	Provides a BO connection for clockwise (CW) rotation to (Open) of actuator, 24 VAC triac output.	N/A
	(Integrated)	Provides a BO connection for counterclockwise (CCW) rotation to (Close) of actuator, 24 VAC triac output.	N/A
Sensor Actuator (SA) Bus Terminal Block	+, -, COM, PWR	Sources 15 VDC power for SA Bus devices; supports 5 NS Series Network Zone Temperature Sensors and up to 5 NS Series Network CO_2 Sensors.	0.6 mm (22 AWG) stranded, 4-wire twisted cable recommended for runs of <30 m (99 ft)
FC Bus Terminal Block	+ - Com	Provides communication network	0.65 mm (22 AWG) stranded, twisted shielded cable recommended for runs of 1,000 feet maximum
24 VAC Power	Hot	AC supply input supply 20–30 VAC (Nominal 24 VAC)	0.8 mm to 1.5 mm (20 to 16 AWG) 2-wire
	Com	24 VAC power common	

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.

You set a field controller's device address by setting 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 controller.

Note: ZEC 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 ZEC field controller:

1. Set all of the switches to OFF on the field controller's device address DIP switch block (128 through 1).
2. Set one or more of the six address switches (32 through 1) to ON, so that the amount of switch numbers set to ON equals the intended device address.

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).

3. 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 6.

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

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

Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information on field controller device addresses and how to set them on MS/TP Bus devices.

Accessories

Table 2: Zone Controller Accessories

Product Code Number	Description
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. Only addresses 212 to 214 are supported.
Zone Temperature Sensors (NS Sensors)	
NS-BTB7003-0	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), Johnson Controls® logo, local setpoint, terminals
NS-BTB7003-2	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), no logo, local setpoint, terminals
NS-BTN7003-0	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), no logo, no setpoint, terminals
NS-BTN7003-2	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), no logo, no setpoint, terminals.
NS-BTP7002-0	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), Johnson Controls logo, Warmer/Cooler adjustment, terminals
NS-BTP7002-2	Network sensor, 120 x 80 mm (4.7 x 3.1 in.), no logo, warmer/cooler adjustment, terminals
Occupancy Lighting Switch	
NS-BCN7004	Occupancy sensing light switch for control of indoor incandescent and fluorescent lights
RIBU1C	Enclosed relay for OLS-2100-1 sensor
Balancing Tool	
NS-ATV7003-0	Handheld VAV balancing tool

Operation

The ZEC controller is pre-programmed for the VAV box operating sequence as ordered. You do not need to program the controller; however, you need to provide configuration information using either the Balancing Sensor or the Zone Setup screen on the Verasys System Smart Building Hub.

For detailed information on Verasys System, 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 switches the controller 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. The sensor also uses unoccupied flow setpoints for VAV zone dampers. 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-12012371)* for more information.

CO_2 Demand Controlled Ventilation (DCV)

CO_2 DCV uses up to four wall-mounted CO_2 sensors to monitor CO_2 levels. This ensures the zone receives high Indoor Air Quality (IAQ). The sensor measures CO_2 levels on a scale of 0 to 2,000 parts per million (ppm). When the CO_2 sensor with the highest CO_2 reading detects that CO_2 levels in the zone are above the setpoint (such as caused by a high number of occupants within the zone), the zone damper opens, to allow more outside air into the zone. 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-12012371)* for more information.

Troubleshooting

Use the following information to troubleshoot the ZEC controllers.

Power Status LED

A green LED shows the power supply status to the VAV zone damper controller. See Table 3 for a description of the modes.

Table 3: Status LED for Power (PWR)

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

Communication Bus Problems

Several factors may influence the behavior of the Zone Communication bus.

I/O Wiring

The ZEC controller must be wired properly. If the ZEC controller is wired incorrectly, communication problems may occur. These problems include devices going online and offline, to devices not coming online at all.

Incomplete Address

The VAV controller must have the address switch set to a range between 4-127.

Duplicate Addresses

Two or more devices on a communication bus cannot have the same address. For example, two controllers on the Zone Communication bus cannot both have an address of 18. If two devices on the same bus have the same address, performance can degrade or serious communication problems may occur. These problems include the devices not coming online and all communication stopping completely.

Check for duplicate addresses in the following ways:

- If a specific device is not communicating, remove the device with communication problems and check if device address remains online at the Smart Building Hub. This determines if the device address remains online.
- If the bus communication problems are severe and no communication is present, or you cannot determine where communication is unreliable, partition (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 22 AWG (0.6 mm) 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 the zone bus EOL switch on the Zone Coordinator is set to ON and the Zone Coordinator is located at the end of the zone bus trunk.
  - Verify that only the EOL switch at the end of the Zone bus is set to ON and all other Zone bus EOL switches are set to OFF.
- Check connections, polarity, and lengths:
  - Verify that communications loops are less than 1,000 ft (304 m) 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 (see *System and Zone Bus Supply Power Wiring Guidelines*).
- 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 to 3.0 VDC
  - (-) to COM must be within 1.5 to 2.54 VDC
  - (+) to (-) must be within 0.3 to 1.0 VDC

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

Repair Information

If the ZEC410 controller fails to operator within its specifications, replace the unit. For a replacement unit, contact the nearest Verasys representative.

Technical Specifications

ZEC410 VAV Controller

Product Code Number	**LC-ZEC410-x**
Power Supply Requirement	20–30 VAC at 50 to 60 Hz, Class 2 power supply or Safety Extra-Low Voltage (SELV) at 50/60 Hz (20 VAC minimum)
Power Consumption	10 VA, 14 VA maximum
Ambient Conditions	Ambient Operating Conditions: 0 to 50°C (32 to 122°F); 10 to 90% RH condensing Ambient Storage Conditions: -40 to 85°C (-40 to 185°F); 10 to 90% RH
Processor	20 MHz Renesas® H8S2398 processor
Memory	1 MB flash nonvolatile memory for operating system, configuration data, and operations data storage and backup. 512k Synchronous Random Access Memory (SRAM) for operations data dynamic memory.
Mounting	On a flat surface with screws.
Dimensions (Height x Width x Depth)	140 x 140 x 25 mm (5-1/2 x 5-1/2 x 1 in.)
Shipping Weight	0.30 lb (0.14 kg)
Compliance	**United States** UL Listed, File E107041, CCN PAZX, UL 916 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

European Single Point of Contact:

JOHNSON CONTROLS
WESTENDHOF 3
45143 ESSEN
GERMANY

NA/SA Single Point of Contact:

JOHNSON CONTROLS
507 E MICHIGAN ST
MILWAUKEE WI 53202
USA

APAC Single Point of Contact:

JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT
NO. 22 BLOCK D NEW DISTRICT
WUXI JIANGSU PROVINCE 214142
CHINA

VERASYS®

Building Technologies and Solutions
507 E. Michigan Street, Milwaukee, WI 53202