VAV Zone Controllers

Installation and Start-up Guide

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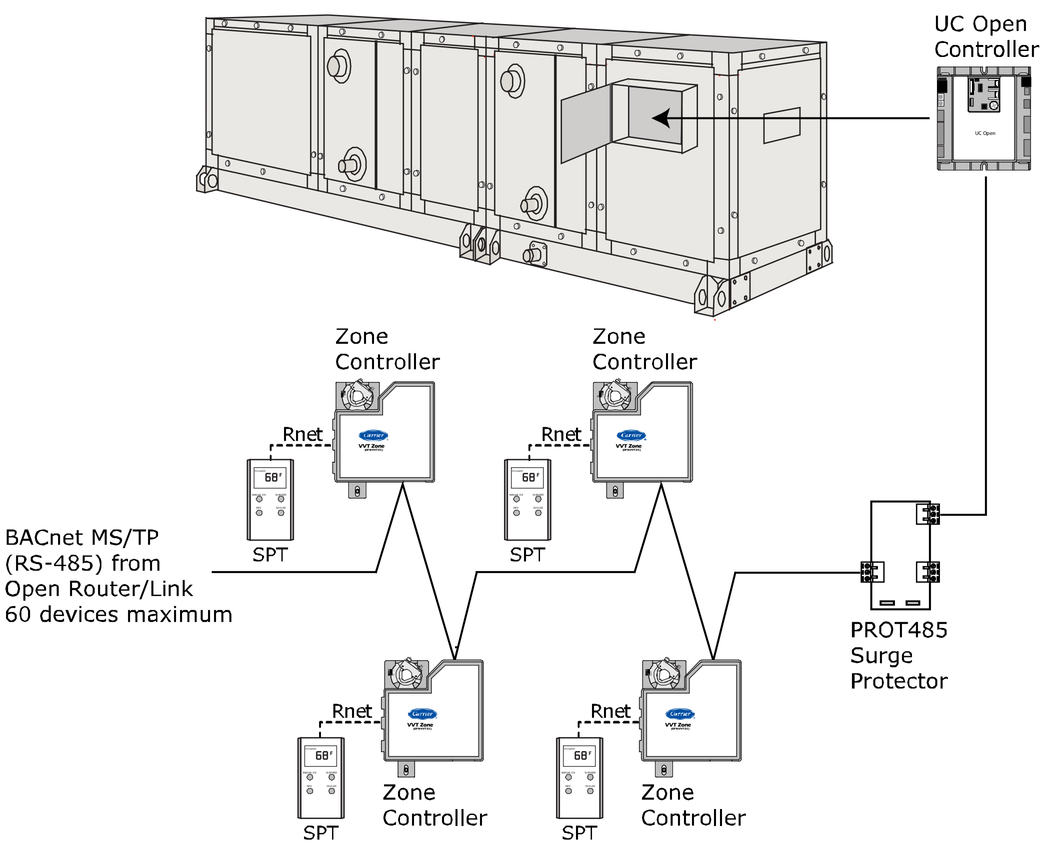
Introduction

What are VAV Zone Controllers?

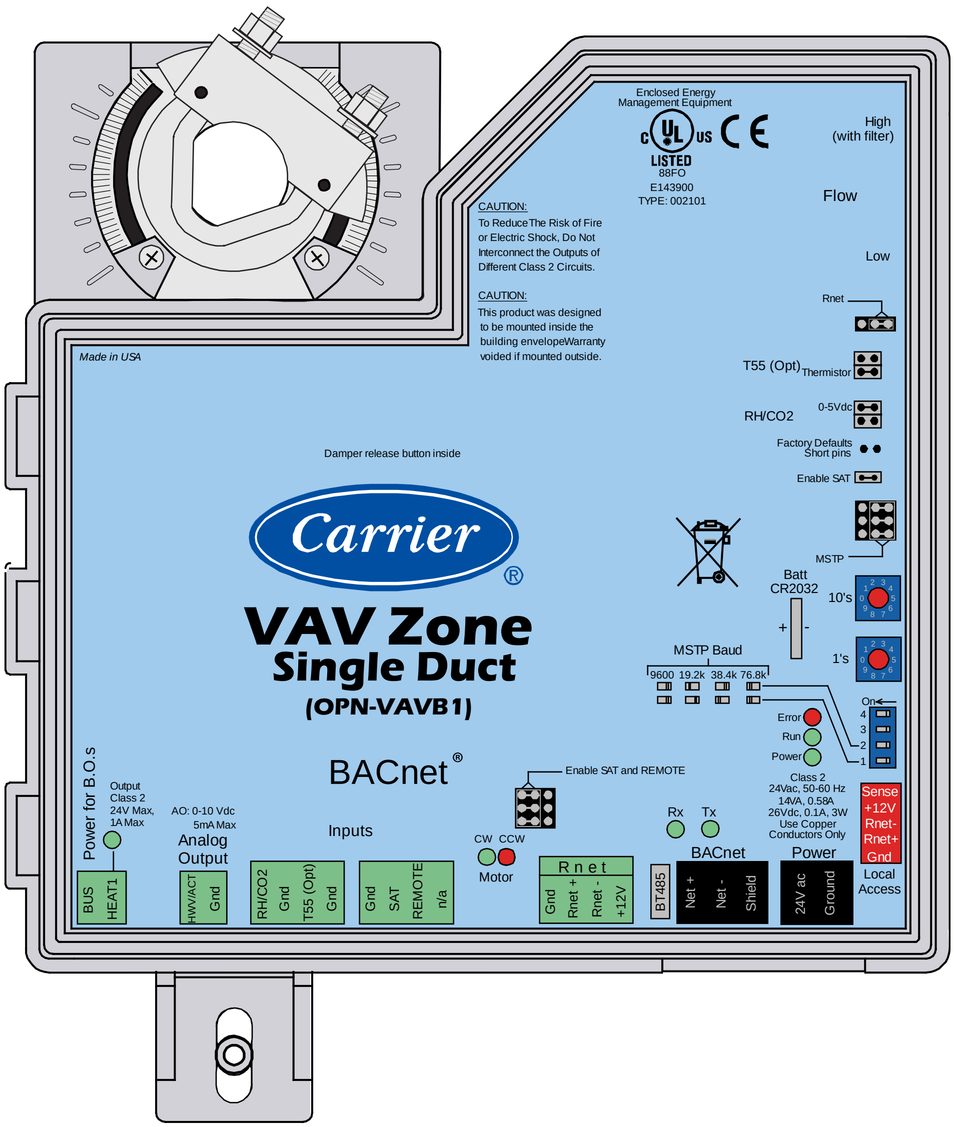
An i-Vu® Open Control System offers 2 VAV Zone Controllers, the VAV Zone Single Duct controller (#OPN-VAVB1) and the VAV Zone Fan Terminal controller (#OPN-VAVB3), to control zone temperature using single duct or fan powered terminals in a Variable Air Volume (VAV®) application. Although a VAV Zone Controller can be included in a VVT system, this manual focuses mainly on its usage in VAV applications.

The VAV Zone Controller has a built-in actuator and maintains zone temperature by operating the terminal fan and regulating the flow of conditioned air into the space. Buildings with diverse loading conditions can be supported by controlling the local terminal's supplemental heat. The VAV Zone Controller provides dedicated control functions for single duct, parallel fan box terminals and series fan box terminals with modulating heat, up to 2 stages of ducted heat, or combination baseboard and ducted heat.

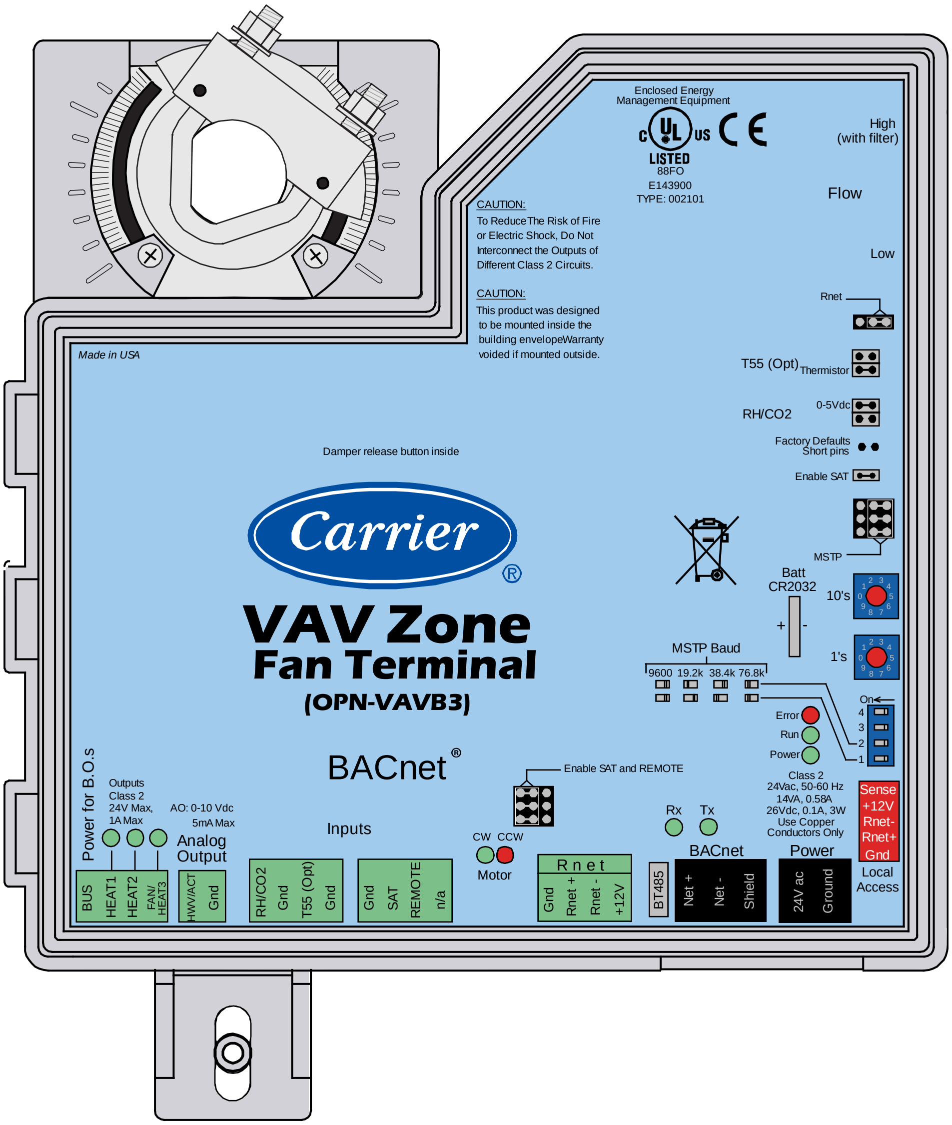
The following illustration shows the VAV Zone Controller in a typical i-Vu Open Control System.



VAV Zone Single Duct controller (#OPN-VAVB1)



VAV Zone Fan Terminal controller (#OPN-VAVB3)



NOTE This document gives instructions for field-installation of a VAV Zone Controller in an i-Vu Open Control System. However, VAV Controllers are available factory-mounted to Carrier's 35 single duct and 45 parallel and series fan terminals. All terminals require an integrated duct temperature sensor.

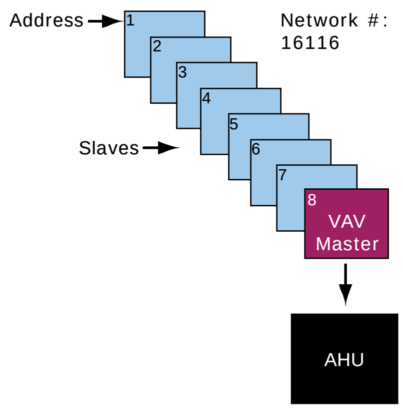
Linkage

The i-Vu Open Control System uses linkage to exchange data between the zone terminals and their air source to form a coordinated HVAC system. The system's air source controller and zone controllers are linked so that their data exchange can be managed by one zone controller configured as the VAV Master.

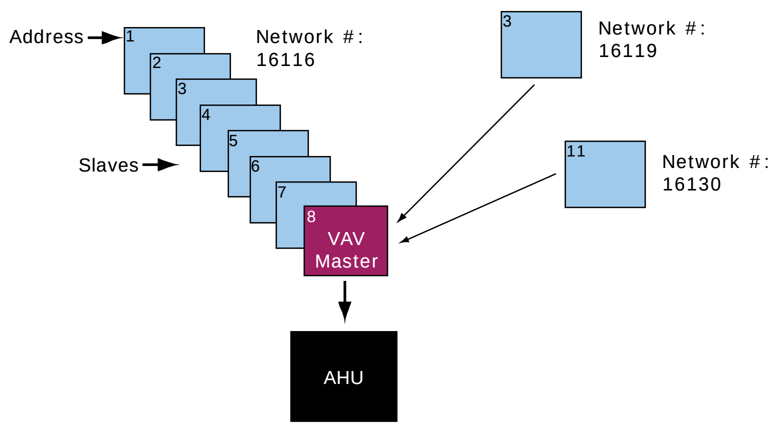
A VAV Master can have a maximum of 63 slave zone controllers reporting to it. An MS/TP network is limited to a maximum of 60 controllers, but a VAV Master can have controllers from other networks as slaves.

A linked VAV system can be as simple as a single MS/TP network with a VAV Master and slaves, or it can be as complex as multiple MS/TP networks with VAV sub-masters and slaves on other networks. See the following examples.

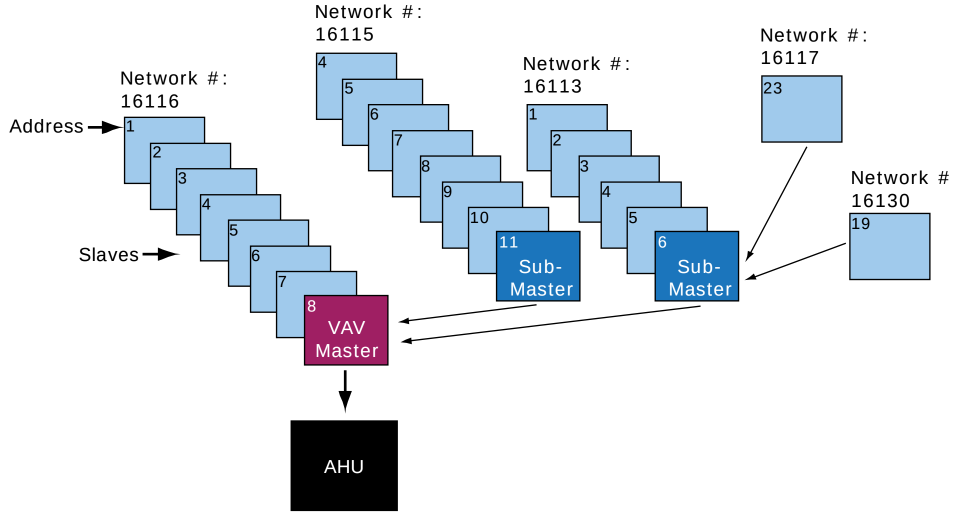
EXAMPLE #1: A simple network. The VAV Master exchanges data between the slave controllers and the AHU controller. The linked controllers on an MS/TP network must be sequentially addressed, and the VAV Master must have the highest address.



EXAMPLE #2: The above network plus slave controllers on other networks.



EXAMPLE #3: The above network plus sub-masters and their slaves. (For VAV systems only. VVT systems do not support sub-masters.) The sub-masters exchange data between their slaves and the VAV Master, and the VAV Master handles data exchange for the whole system.

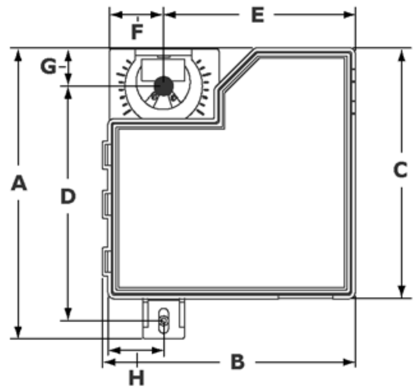


You set up linkage for the system by defining the Linkage properties for each controller. See *Linkage Properties* (page 68).

Specifications

Driver	**Part number** **Driver** OPN-VAVB1 drv_vav1open OPN-VAVB3 drv_vav3open
Maximum number of control programs	1
Power	24 Vac ±10%, 50–60 Hz 14 VA power consumption (20 VA with BAC*view*® device attached) 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less
BACnet port	For communication with the controller network using MS/TP (9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps)
Rnet port	For SPT sensors and a BAC*view*6 device in any of the following combinations, wired in a daisy-chain configuration: • 1 SPT Plus or SPT Pro • 1–4 SPT Standards • 1–4 SPT Standards, and 1 SPT Plus or SPT Pro • Any of the above combinations, plus a BAC*view*6 device, but no more than 6 devices total
Local Access port	For system start-up and troubleshooting

Inputs	4 inputs for connecting the following types of sensors: • An alternate space temperature sensor (#33ZCT55SPT) • Supply air temperature sensor (#33ZCSENSAT) • Duct air temperature sensor (#33ZCSENDAT) • CO2 sensor (#33ZCSENCO2) • Relative humidity sensor (#33ZCSENSRH-02 [indoor space] or 33ZCSENDRH-02 [duct]) • Remote occupancy sensor
Input resolution	10 bit A/D
Digital outputs	#OPN-VAVB1: 1 digital output #OPN-VAVB3: 3 digital outputs Relay contact rated at 1 A max. @ 24 Vac/Vdc. Configured normally open.
Analog output	1 analog output, 0–10 Vdc (5 mA max). The controlled device must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the controller.
Output resolution	8 bit A/D, using filtered PWM
Integral actuator	Brushless DC motor, torque 35 inch-pounds (4 Nm), runtime 205 seconds for 90 degree travel during control, or 25 seconds in high-speed test and balance mode
Battery	10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends.
Protection	Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.
BT485 connector	You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.
Status indicators	LED's indicate status of communications, running, errors, power, and digital outputs
Environmental operating range	0 to 130°F (-18 to 54°C), 0 to 90% relative humidity, non-condensing
Storage temperature range	-24 to 140°F (-30 to 60°C), 0 to 90% relative humidity, non-condensing
Physical	UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d)



Overall dimensions	A: B: C:	7 in. (17.8 cm) 6-1/32 (15.4 cm) 6 in. (15.24 cm)
Mounting dimensions	D: E: F: G: H:	5-5/8 in. (14.3 cm) 4-9/16 in. (24.3 cm) 1-5/16 in. (3.3 cm.) 7/8 in. (2.2 cm) 1-5/16 in. (3.3 cm)
Panel depth	2-1/2 in. (6.4 cm) minimum	
Shaft dimensions	Minimum shaft diameter: 3/8 in. (.95 cm.) Maximum shaft diameter: 1/2 in. (1.27 cm) Minimum shaft length: 1 3/4 in. (4.45 cm)	
Weight	1.7 lbs (0.77 kg)	
BACnet support	Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9	
Listed by	UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE EN50082-1997, UL94-5VA plenum rated enclosure	

Safety Considerations

SAFETY NOTE

Air conditioning equipment will provide safe and reliable service when operated within design specifications. The equipment should be operated and serviced only by authorized personnel who have a thorough knowledge of system operation, safety devices, and emergency procedures.

Good judgment should be used in applying any manufacturer's instructions to avoid injury to personnel or damage to equipment and property.

⚠ Warning!

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury, death, and/or equipment damage.

Disconnect all power to the unit before performing maintenance or service. Unit may automatically start if power is not disconnected.

⚠ Warning!

Follow all local, state, and federal laws regarding disposal of equipment containing hazardous materials such as mercury contactors.

Installation

To install the VAV Zone Controller:

1 *Mount the controller to the VAV terminal.* (page 10)

2 *Wire the controller for power.* (page 12)

3 *Set the controller's address.* (page 13)

4 *Wire the controller to the MS/TP network.* (page 14)

5 *Wire sensor(s) to the controller.* (page 15)

6 *Wire equipment to the controller's outputs.* (page 23)

Field-supplied hardware

Each zone controller installation requires the following field-supplied components:

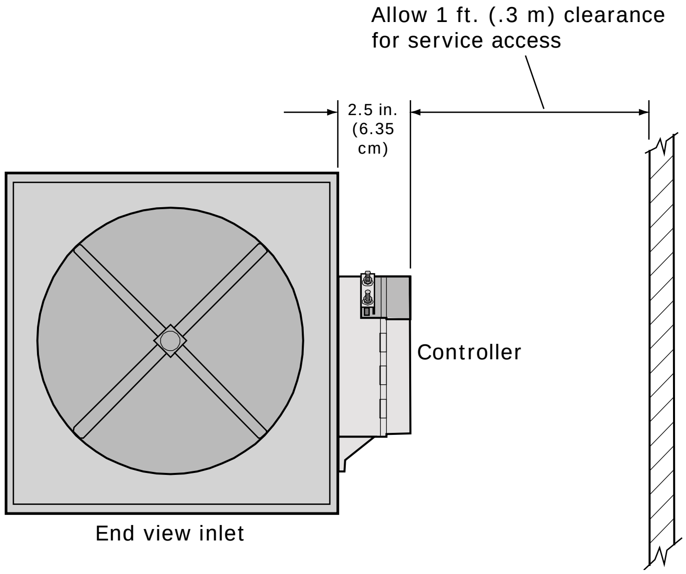
- zone terminal unit
- round or rectangular mounting bracket
- space temperature sensor
- supply air temperature sensor
- 2x4 in. standard single gang electrical box
- transformer— 24 Vac, 40 VA
- two no. 10 x 1/2-in. sheet metal screws (to secure SAT sensor to duct)
- two no. 6-32 x 5/8-in. screws (to mount space temperature sensor base to electrical box)
- wiring
- bushings (required when mounting SAT sensor in a duct 6-in. (15.2 cm) or less in diameter)

Optional:

- contactors (if required for fan or electric heat)
- indoor air quality sensor
- relative humidity sensor
- 2 screws and 2 hollow wall anchors (to mount relative humidity sensor directly to wall)
- valve and actuator for hot water heat (if required)

Mounting the VAV Zone Controller

Mount the VAV Zone Controller on the zone terminal's damper actuator shaft. For service access, allow at least 1 foot (.3 m) of clearance between the front of the controller and adjacent surfaces.

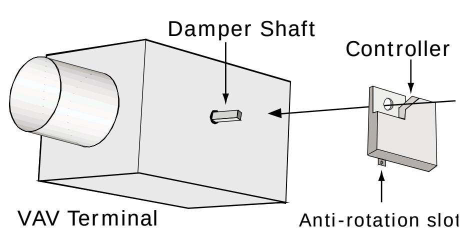


To mount the controller

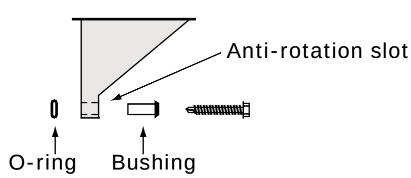
1 Turn the damper shaft to fully close the damper.

2 Remove the controller's cover.

3 Mount the controller to the VAV terminal by sliding the clamp assembly onto the damper shaft.

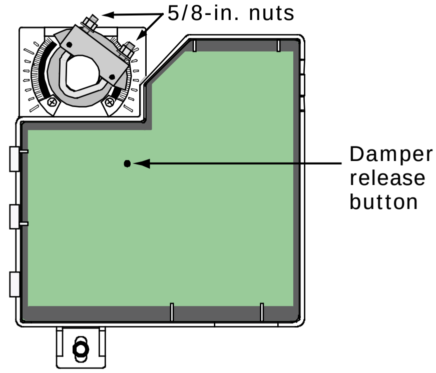


4 Secure the controller by installing the screw provided through the anti-rotation slot's bushing and o-ring.



NOTE Center the bushing in the slot. Failure to do so may cause the actuator to stick or bind.

5 Hold down the controller's damper release button and rotate the actuator clamp in the same direction that closed the damper. Rotate the clamp until it stops, then rotate it back one notch.



6 Release the button.

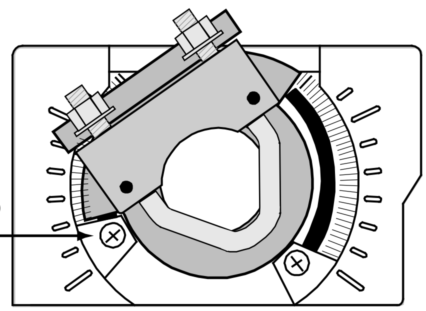
7 Tighten the actuator clamp to the damper shaft by tightening the two 5/16 inch nuts.

8 Hold down the damper release button and rotate the damper from fully closed to fully open. If the damper traveled less than 90 degrees, do the following to set the actuator's fully open position:

a) Loosen the appropriate stop clamp screw. See figure below.

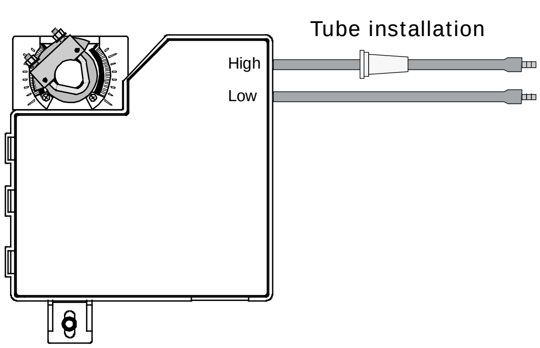
b) Move the stop clamp until it contacts the edge of the actuator cam.

c) Tighten the screw.



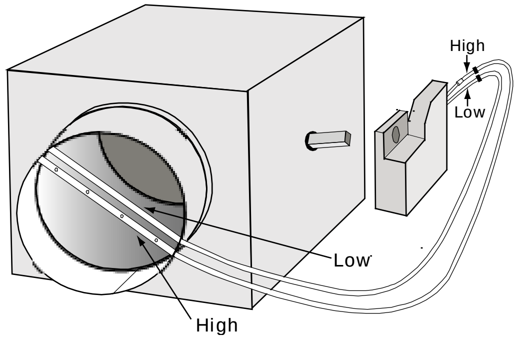
9 Hold down the damper release button, rotate the damper to verify that it fully opens and closes, then release the button.

10 Connect the filter tubes to the controller's **High** and **Low** connectors.



11 Connect at least 2 feet of 1/4-inch poly tubing to each filter tube.

12 Connect the other ends of the poly tubing to the airflow pickup located in the VAV terminal's primary air inlet, Connect **High** to **High** and **Low** to **Low**.



13 Replace the controller's cover.

Wiring the VAV Zone Controller for power

Caution!

The VAV Zone Controller is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.

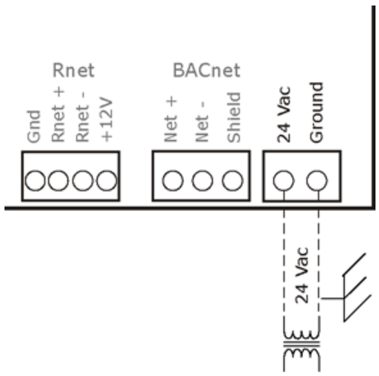
Carrier controllers can share a power supply as long as you:

- Maintain the same polarity
- Use the power supply only for Carrier Open controllers

To wire the controller for power

1. Remove power from the power supply.
2. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac** or **Hot**.
3. Connect the transformer wires to the screw terminal connector.
4. Apply power to the power supply.
5. Measure the voltage at the VAV Zone Controller's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Connect a 4-inch (10.2 cm) wire from **Gnd** to the control panel.
7. Insert the screw terminal connector into the VAV Zone Controller's power terminals.

8 Verify that the **Power** LED is on and the **Run** LED is blinking.



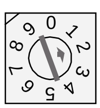
To address the VAV Zone Controller

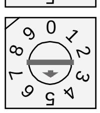
You must give the VAV Zone Controller an address that is unique on the network. You can address the VAV Zone Controller before or after you wire it for power.

1 If the VAV Zone Controller has been wired for power, pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the controller's address. Set the **Tens** (**10's**) switch to the tens digit of the address, and set the **Ones** (**1's**) switch to the ones digit.

EXAMPLE If the controller's address is 25, point the arrow on the **Tens** (**10's**) switch to 2 and the arrow on the **Ones** (**1's**) switch to 5.


10's


1's

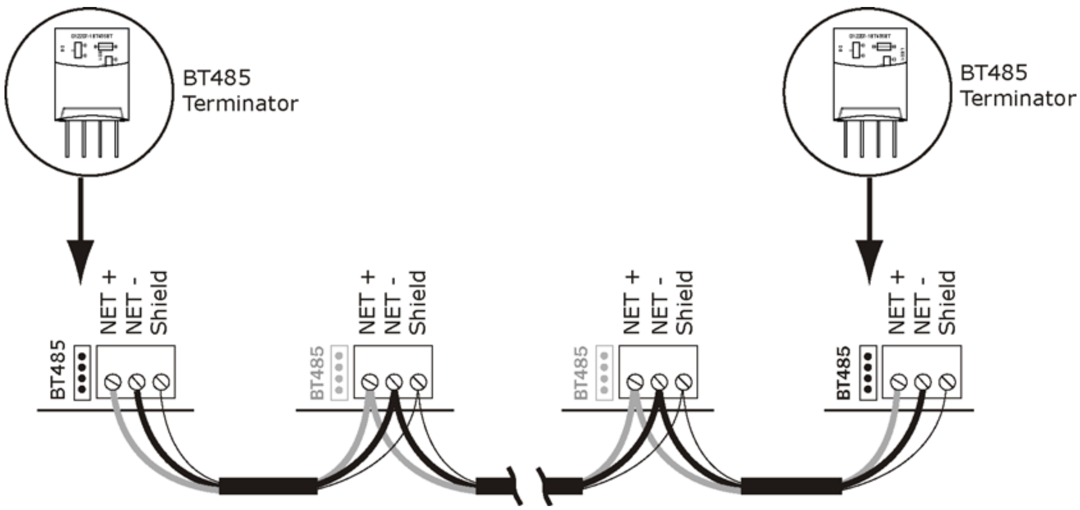
CAUTION The factory default setting is **00** and must be changed to successfully install your VAV Zone Controller.

Wiring the VAV Zone Controller to the MS/TP network

The VAV Zone Controller communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

Wire the controllers on an MS/TP network segment in a daisy-chain configuration.

Install a BT485 on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing.



See the *MS/TP Networking and Wiring Installation Guide* for more details.

Wiring specifications

Cable:	22 AWG or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire
Maximum length:	2000 feet (610 meters)

To wire the controller to the network

1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac** or **Hot**.

2 Check the communications wiring for shorts and grounds.

3 Connect the communications wiring to the BACnet port's screw terminals labeled **Net +**, **Net -**, and **Shield**.

NOTE Use the same polarity throughout the network segment.

4 Verify that the **MSTP** jumper is set to **MSTP**.

5 Set DIP switches 1 and 2 to the appropriate baud rate. See the MSTP baud diagram on the VAV Zone Controller. The default baud rate is 76.8 kbps.

NOTE Use the same baud rate for all controllers on the network segment.

6 Insert the power screw terminal connector into the VAV Zone Controller's power terminals.

7 Verify communication with the network by viewing a module status report.

Wiring sensors to inputs

You can wire the following sensors to the VAV Zone Controller's inputs:

- Space temperature sensor
- *Alternate space temperature sensor* (page 18)
- *Supply Air Temperature sensor* (page 18)
- *CO_2 sensor* (page 19)
- *Relative Humidity sensor* (page 21)
- *Remote occupancy contact sensor* (page 22)

NOTE This document gives instructions for wiring the sensors to the VAV Zone Controller. For mounting and wiring the sensors, see the *Carrier Sensors Installation Guide*.

Warning!

Disconnect electrical power to the VAV Zone Controller before wiring it. Failure to follow this warning could cause electrical shock, personal injury, or damage to the controller.

Caution!

- Do not run sensor or relay wires in the same conduit or raceway with Class 1 AC or DC service wiring.
- Do not abrade, cut, or nick the outer jacket of the cable.
- Do not pull or draw cable with a force that may harm the physical or electrical properties.
- Avoid splices in any control wiring.

Wiring an SPT sensor

The VAV Zone Controller is connected to a wall-mounted space temperature sensor to monitor room temperature.

An i-Vu Open Control System offers the following SPT sensors:

Sensor	Part #	Features
SPT Standard	SPS	• Local access port • No operator control
SPT Plus	SPPL	• Slide potentiometer to adjust setpoint • MANUAL ON button to override schedule • LED to show occupied status • Local access port
SPT Pro	SPP	• LCD display • MANUAL ON button to override schedule • WARMER and COOLER buttons to adjust setpoint • INFO button to cycle through zone and outdoor air temperatures, setpoints, and local override time • Local access port
SPT Pro Plus	SPPF	• LCD display • MANUAL ON button to override schedule • WARMER and COOLER buttons to adjust setpoint • INFO button to cycle through zone and outdoor air temperatures, setpoints, and local override time • MODE button to cycle through custom programmed modes • FAN button to select fan AUTO/ON • Local access port

You wire SPT sensors to a controller's **Rnet** port. An Rnet can consist of any of the following combinations of devices wired in a daisy-chain or hybrid configuration:

- 1 SPT Plus, SPT Pro, or SPT Pro Plus
- 1–4 SPT Standards
- 1–4 SPT Standards, and 1 SPT Plus, SPT Pro, or SPT Pro Plus
- Any of the above combinations, plus a BAC*view*®6 device, but no more than 6 devices total

NOTE If the Rnet has multiple SPT Standard sensors, you must give each a unique address on the Rnet. See the *Carrier Sensors Installation Guide*.

Rnet wiring specifications

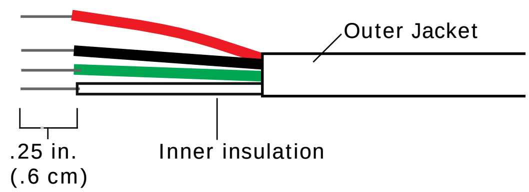
NOTE Use the specified type of wire and cable for maximum signal integrity.

Description	4 conductor, unshielded, CMP, plenum rated cable
Conductor	18 AWG
Maximum length	500 feet (152 meters)
Recommended coloring	Jacket: White Wiring: Black, white, green, red
UL temperature rating	32–167°F (0–75°C)

Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

To wire the SPT sensor to the controller

1 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation. Strip about .25 inch (.6 cm) of the inner insulation from each wire.

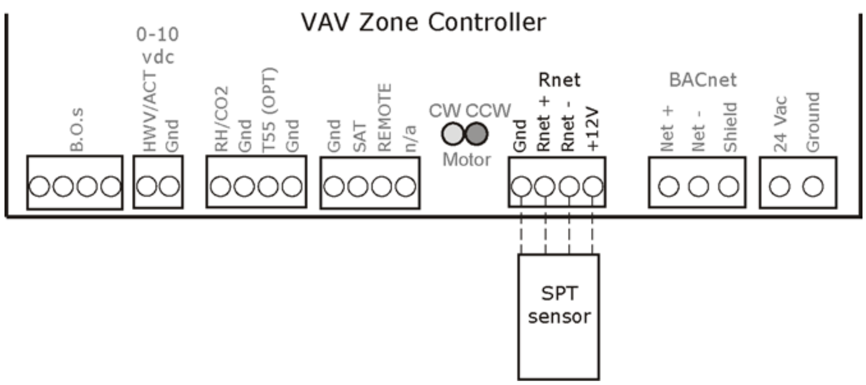


2 Wire each terminal on the sensor to the same terminal on the controller. See diagram below.

NOTE Carrier recommends that you use the following Rnet wiring scheme:

Connect this wire...	To this terminal...
Red	+12V
Black	Rnet-
White	Rnet+
Green	Gnd

3 Verify that the **Rnet** jumper is set to **Rnet**.



Wiring a T55 space temperature sensor

Part #33ZCT55SPT

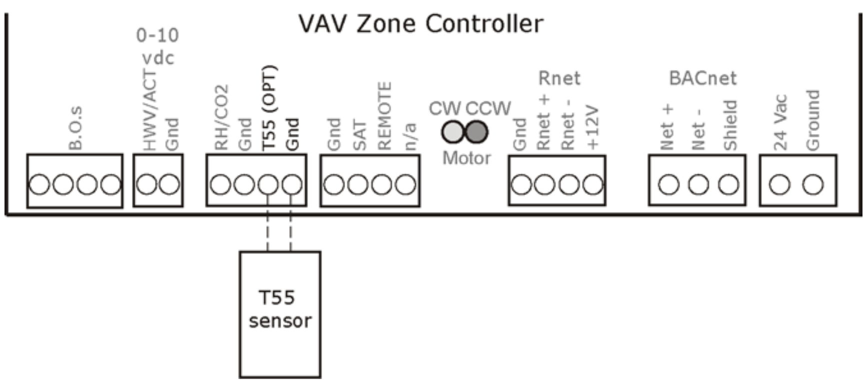
This wall-mounted sensor monitors space temperature and can be used instead of an SPT sensor.

Wiring specifications

Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

To wire the T55 sensor to the controller

1. Strip the outer jacket from the cable for at least 3 inches (7.62 cm). Strip .25 inch (.6 cm) of insulation from each wire. Cut the shield and drain wire from the cable.
2. Wire the sensor to the controller, attaching the red wire to the **T55 (Opt)** terminal and the black wire to the **Gnd** terminal. See diagram below.
3. Verify that the **T55 (Opt)** jumper is in the **Thermistor** position.



Wiring a Supply Air Temperature sensor

Part #33ZCSENSAT

Each VAV Zone Controller requires that a temperature sensor be installed in the supply air stream. Mount the SAT sensor at least 2 feet downstream from a hot water or steam coil, or at least 4 feet downstream from an electric heating coil.

Wiring specifications

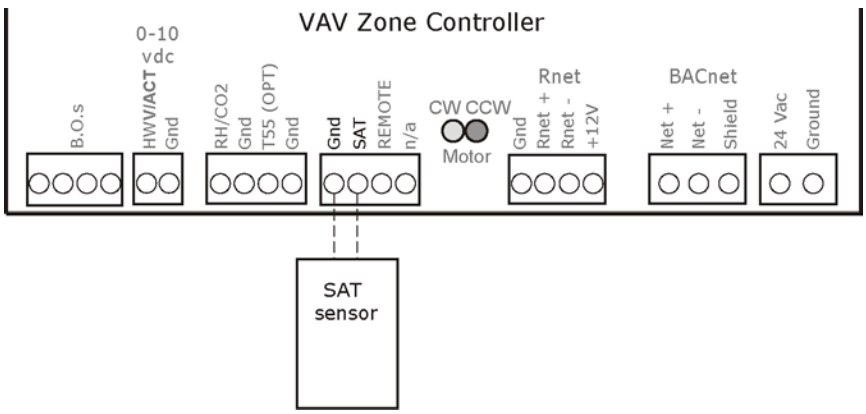
Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

To wire the SAT sensor to the controller

1 Wire the sensor to the controller. See diagram below.

2 Verify that the **Enable SAT** jumper is on.

3 Verify that the **Enable SAT and REMOTE** jumper is in the left position.



Wiring a CO2 sensor

Part #33ZCSPTCO2LCD-01 (Display model)
Part #33ZCSPTCO2-01 (No display)
Part #33ZCT55CO2 (No display)

A CO_2 sensor monitors carbon dioxide levels. As CO_2 levels increase, the VAV Zone Controller adjusts the outside air dampers to increase ventilation and improve indoor air quality. These sensors also monitor temperature using a 10K thermistor.

A CO_2 sensor can be wall-mounted or mounted in a return air duct. (Duct installation requires an Aspirator Box Accessory - Part #33ZCASPCO2.)

The sensor has a range of 0–2000 ppm and a linear 4-20 mA output. This is converted to 1-5 Vdc by a 250 Ohm, 1/4 watt, 2% tolerance resistor connected across the zone controller's CO_2 input terminals.

NOTE Do not use a relative humidity sensor and CO_2 sensor on the same zone controller.

Wiring specifications

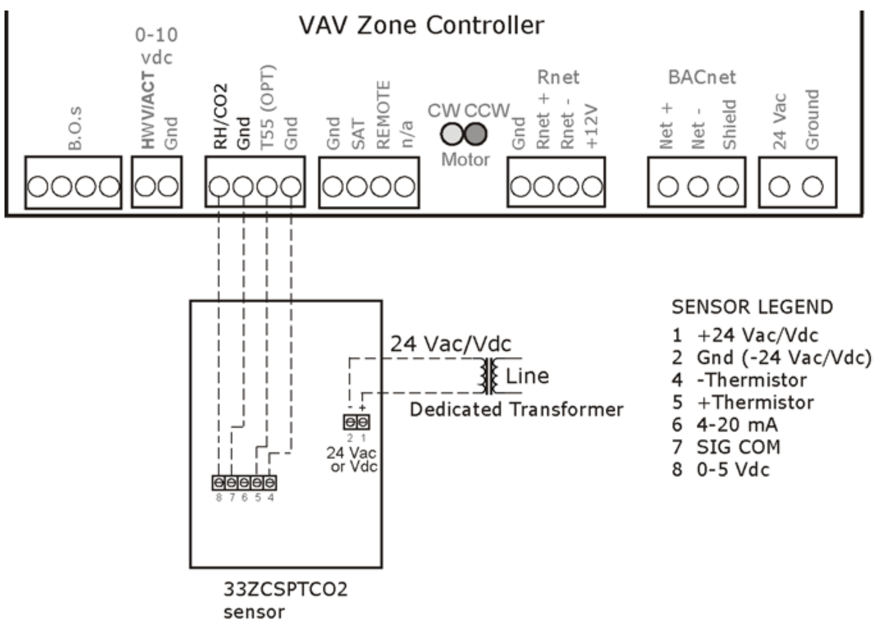
Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

To wire the CO2 sensor to the controller

#33ZCSPTCO2

1. Wire the sensor to the controller. See appropriate diagram below.
2. Verify that the **RH/CO2** jumper is set to **0-5Vdc** on the VAV Zone Controller.
3. Verify the **J7** jumper on the sensor is set to **0-5Vdc**.

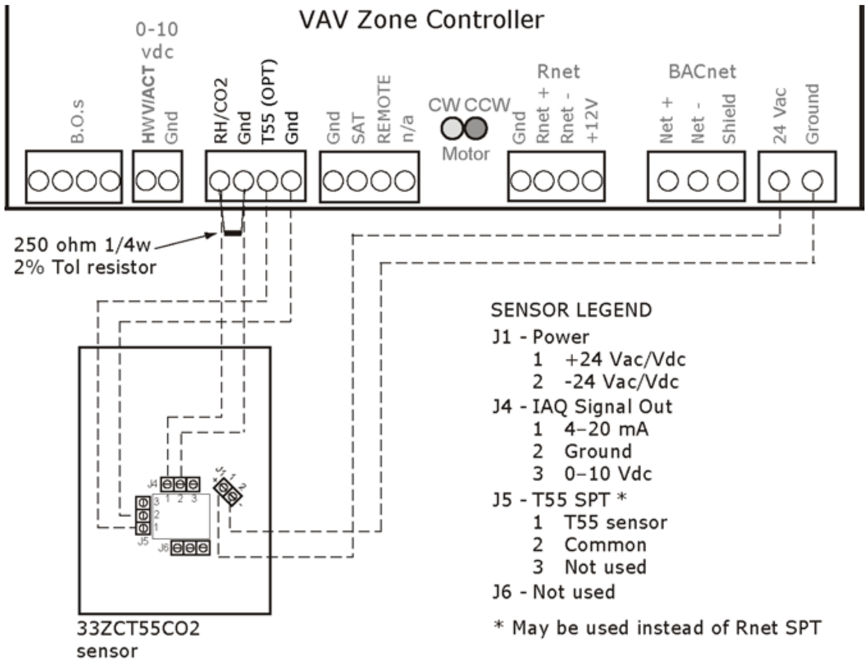
Wiring diagram for #33ZCSPTCO2:



#33ZCT55CO2

1. Wire the sensor to the controller. See appropriate diagram below.
2. Install a field supplied 250 Ohm 1/4 watt 2% tolerance resistor across the controller's **RH/CO2** and **Gnd** terminals.
3. Verify that the **RH/CO2** jumper is set to **0-5Vdc** on the VAV Zone Controller.

Wiring diagram for #33ZCT55CO2:



Wiring a Relative Humidity sensor

Part #33ZCSENSRH-02

The Relative Humidity (RH) sensor is used for zone humidity control (dehumidification) if the rooftop unit has a dehumidification device. If not, the sensor only monitors humidity.

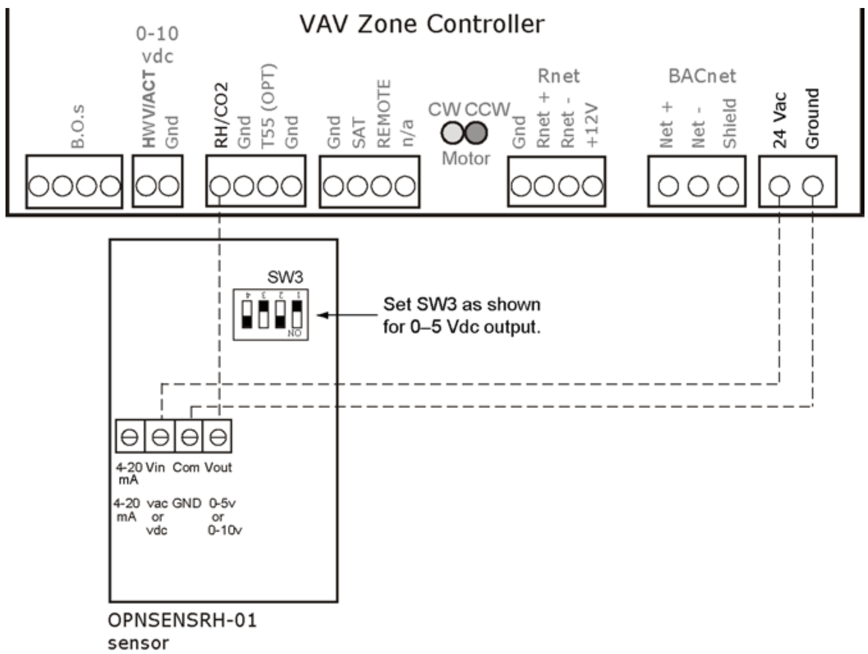
NOTE Do not use a relative humidity sensor and CO_2 sensor on the same zone controller.

Wiring specifications

Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

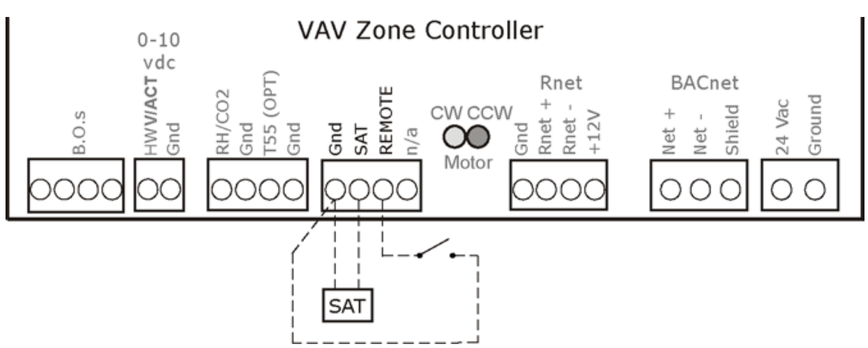
To wire the RH sensor to the controller

1. Strip the outer jacket from the cable for at least 4 inches (10.2 cm). Strip .25 inch (.6 cm) of insulation from each wire.
2. Wire the sensor to the controller. See diagram below.
3. Using electrical tape, insulate any exposed resistor lead to prevent shorting.
4. Verify that the **RH/CO2** jumper is set to **0-5Vdc**.
5. Set **SW3** on the sensor as shown below.



Wiring a remote occupancy sensor

You can wire a normally open or normally closed dry-contact occupancy sensor to the VAV Zone Controller's **REMOTE** input as shown below. The controller supplies the 24 Vac needed for the input.



Wiring specifications

Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

Wiring equipment to outputs

Use the following wiring diagrams to wire zone terminal equipment to the VAV Zone Controller's outputs.

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**

No heat - Single duct (page 28)

2-position hot water/steam heat - Single duct (ducted or baseboard) (page 29)

Modulating hot water/steam - Single duct (ducted or baseboard) (includes CV Modulating) (page 29)

Combination heat - Single duct (ducted electric heat with modulating baseboard heat) (page 30)

3-stage electric heat - Single duct (ducted or baseboard) (page 30)

SCR electric heat - Single duct (ducted or baseboard) (page 31)

VAV Zone Fan Terminal Controller only

2-position hot water/steam - Fan box (ducted or baseboard) (page 31)

Modulating hot water/steam - Fan box (ducted or baseboard) (includes CV Modulating) (page 32)

Combination heat - Fan box (ducted electric heat with modulating baseboard heat) (page 32)

2-stage electric heat - Fan box (ducted or baseboard) (page 33)

SCR electric heat - Fan box (ducted or baseboard) (page 33)

Warning!

Disconnect electrical power to the VAV Zone Controller before wiring it. Failure to follow this warning could cause electrical shock, personal injury, or damage to the controller.

Wiring specifications

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device

  NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.

- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

Balancing the system using the i-Vu/Field Assistant applications

Most VAV system airflow designs are based on cooling requirements which require a greater cfm (liters/second) flow than heating requirements. Using this balancing procedure, you will adjust the cooling airflow first. If the heating and cooling maximum airflow requirements are the same, you will not need to balance the heating airflow.

NOTE We recommend that the total heating minimum airflow settings for all the zones in the system be set to maintain the air source's design minimum heat cfm (liters/second) airflow across its heat exchanger to prevent damage to the equipment.

The following procedures instruct you to use the i-Vu or Field Assistant application to balance the system. However, you can also use the Test & Balance tool that includes global commands to assist you in balancing the system.

Step 1: Prepare for balancing

1. Log in to the i-Vu application with an Administrator or Installer security level, or use Field Assistant.
2. Make sure the air source and its controller have been properly started and can run as a stand-alone unit.
3. Make sure all zone controllers have been addressed, commissioned, and started.
4. If a manual damper is installed upstream of the zone damper, verify that it is fully open before any balancing occurs.
5. Verify that any zone controller supplying multiple diffusers has a manual balancing damper installed on each duct for balancing the design airflow through each diffuser.
6. Disable the air source heating and cooling outputs using one of the following methods:
   - Physically disconnect the air source controller's output wiring to the unit, then enable the fan.
   - In the i-Vu or Field Assistant tree, select the AHU controller. Go to **Properties** > **Equipment** tab > **Equipment Enable/Disable** and enable **Test and Balance Command**.
7. Verify that the air source's supply static pressure setpoint is set to the system's design specification and that it does maintain the setpoint.

Step 2: Balance each zone

1 In the i-Vu or Field Assistant tree, select the zone controller that is physically closest to the air source. Go to **Properties** > **Equipment** > **Configuration** > **Service Configuration** > **Flow Control** > **Details** tab.

2 Do one of the following:

- Single Duct or Parallel Fan zone terminals – Click **Cool Max Airflow** to override the zone control and increase the airflow to the cooling maximum cfm (liters/second) . Check the zone for design cooling maximum airflow using certified measuring devices. Enter the measured cfm (liters/second) and click the arrow to enter the current sensor reading value.
- Series Fan zone terminals – Click **Damper Full Close** to override the zone damper to its fully closed position. Wait 30 seconds after the damper is closed, select the **Fan**'s **Lock value to** checkbox, then select **On** in the droplist. Click **Apply**. You must follow this procedure to prevent the fan from turning backwards. Check the zone for design cooling maximum airflow using certified measuring devices. See the zone terminal manufacturer's instructions to adjust the fan speed to meet design airflow requirements. After you set the fan speed to deliver the **Cool Max Airflow**, click the **Cool Max Airflow**. Verify the airflow using a certified measuring device. Enter the measured cfm (liters/second) and press the arrow to enter the current sensor reading value. Verify that the zone terminal plenum air intakes do not have a positive airflow.

3 Check all branch duct terminal registers for design flow. If necessary, adjust the manual volume dampers in the branch ducts.

4 Single Duct or Parallel Fan zone terminals - Click **Occupied Min Airflow** to set the zone damper to its minimum airflow position. Verify the airflow using a certified measuring device. Enter the measured cfm (liters/second) and click the arrow to enter the current sensor reading value.

5 Parallel Fan Zone Terminals only - To adjust Parallel Fan airflow, make sure **Occupied Min Airflow** is selected, select the **Fan**'s **Lock value to** checkbox, then select **On** in the droplist. Click **Apply**. See the zone terminal manufacturer's instructions on adjusting the fan speed to meet design airflow requirements. When finished, clear the **Fan**'s **Lock value to** checkbox.

6 If the terminal has ducted reheat, select the **Flow Setpoint** in the **Locks** section and enter **Auxiliary Heat Min Airflow** if it is greater than the **Occupied Min Airflow**. Select **Auxheat** and enter 100%. Click **Apply**. Verify the supply air temperature rises for ducted heat. For non-ducted heat, physically verify that the heat is energized. Deselect a **Flow Setpoint** and **Auxheat** and click **Apply** when finished.

7 Repeat steps 1 through 6 for each zone until all zones have been balanced. Make sure that you select **Automatic Control** before moving on to the next zone.

Balancing the system using Test & Balance tool

Use the Test & Balance tool to manipulate the controllers associated with an air source, but not the air source itself or heating and cooling equipment such as chillers and boilers. See the Test & Balance Help files for more information on using the tool.

Most VAV system airflow designs are based on cooling requirements which require a greater cfm (liters/second) flow than heating requirements. Using this balancing procedure, you adjust the cooling airflow first. If the heating and cooling maximum airflow requirements are the same, you will not need to balance the heating airflow.

NOTE We recommend that the total heating minimum airflow settings for all the zones in the system be set to maintain the air source’s design minimum heat cfm (liters/second) airflow across its heat exchanger to prevent damage to the equipment.

To calibrate VAV Zone airflow

1. Select the VAV Zone air terminal in the tree.

   NOTE You can select **View** > **Device ID** or **View** > **Primary Use** to show this information next to each item in the tree.

2. Select the **Test and Balance** tab.

   NOTE If or appear on the status bar, see Air terminal calibration status to determine what you must do before calibration can occur.

3. Verify that the air source is off and that airflow has stopped.

4. Click **Zero Calibrate**.

   NOTE The table below describes each damper command. Commands with a are required. Optional commands improve system accuracy. Do these in order from top to bottom for best results.

5. The status bar shows **Damper Moving**. Wait until it shows **Damper Ready**.

6. If the controller has an external actuator, do the following:

   a) Type the **Measured Flow** in the fields beside **Zero Calibrate**.

   b) Click the **Current Sensor Reading** button to copy the value to the **Sensor Reading** field, or type an adjusted value in the field.

7. Turn on the air source.

8. For each additional calibration step that you want to perform, do the following:

   a) Click its Damper Command button.

   b) Wait for **Damper Ready**.

   c) Enter the **Measured Flow** and **Sensor Reading** as described in step 6.

9. Click **Apply** to send your changes to the controller and update the **Last Calibration Date** on the air source's page.

   NOTE If desired, you can click **Apply** after each calibration step.

10. Remove any locks you have applied. See To view, lock, or unlock an air terminal function.

11. Click **Automatic** to return the controller to normal operation.

NOTES

- For **Cool Max**, **Heat Max**, and **Occupied Min** – When the setpoint is reached and stable, you can select **Lock damper at current open position** on the **Locks** tab to prevent damper movement while you take flow readings.
- You can repeat a calibration step to further calibrate the airflow sensor.
- An airflow sensor only reports air delivered from the air source. To adjust the cfm (liters/second) of variable speed fans in parallel VAV reheat, close the primary air damper.

Damper Command	Action
Zero Calibrate	Closes the damper, takes a number of flow samples, then sets the zero calibration.
Damper Open	Opens damper fully and enables the **Damper Open** calibration fields.
Cool Max	Forces the damper to its maximum cooling position. Calibration fields apply only if the primary use of this damper is cooling.

Damper Command	Action
Occupied Min	Forces the damper to its minimum occupied position and enables the **Occupied Min Flow** calibration fields.
Damper Close	Forces the damper to its full closed position.
Heat Max	Forces the damper to its maximum heating position. Calibration fields apply only if the primary use of the damper is heating.
Automatic	Returns control of the damper to the control program. **You must perform this step when you finish test and balance.**

Step 3: Upload calibration values to the i-Vu/Field Assistant application

CAUTION! If your system has an i-Vu/Field Assistant user interface, you **must** run the Test and Balance report in the i-Vu/Field Assistant application after using VAV Zone Controller. Running the report uploads the values from the controller to the i-Vu/Field Assistant application. You will lose all your calibrations if you download to the controller in the i-Vu/Field Assistant interface before running this report.

1 In the i-Vu/Field Assistant interface, select the top level in the navigation tree.

2 Click **Reports** > **Commissioning** > **Test and Balance**.

3 On the **View** tab, click **Run**.

Go to Step 4: Run a report (Optional).

Step 4: Run a report in VAV Zone Controller (Optional)

After balancing, you can run a report (.htm file) in Test & Balance that shows each controller's calibrated values and design values. You can view or edit the file in Microsoft Excel, Microsoft Word, or any web browser.

1 Select **Session** > **Report**.

2 Select an existing report or type a name in the **File Name** field.

3 Click **Save**.

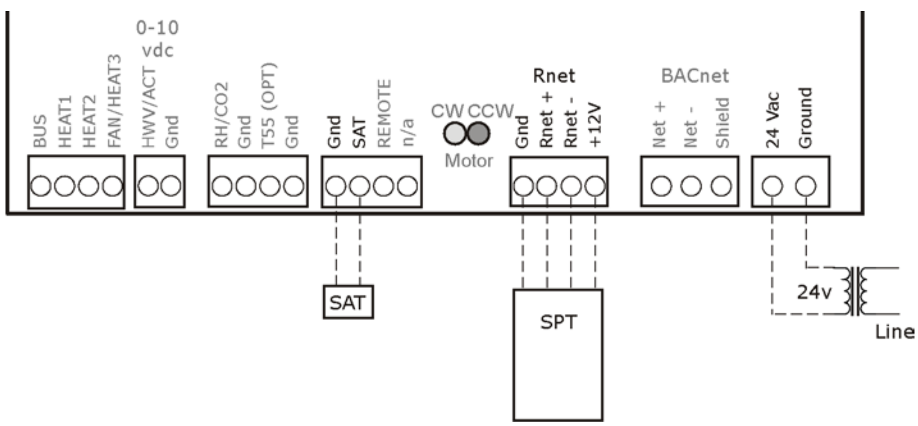
4 If you chose an existing report in step 2, select **Append** to add to the report or **Overwrite** to replace the report.

Wiring diagram legend

Gnd	=	Ground
HWV	=	Hot water valve
CO2	=	CO_2 sensor
LED	=	Not used
REMOTE	=	Remote occupancy sensor
RH	=	Relative humidity sensor
SAT	=	Supply air temperature sensor
SCR	=	Silicon controlled rectifier
SPT	=	Space temperature sensor
T55 (OPT)		Alternate space temperature sensor
- - -		Field-supplied wiring

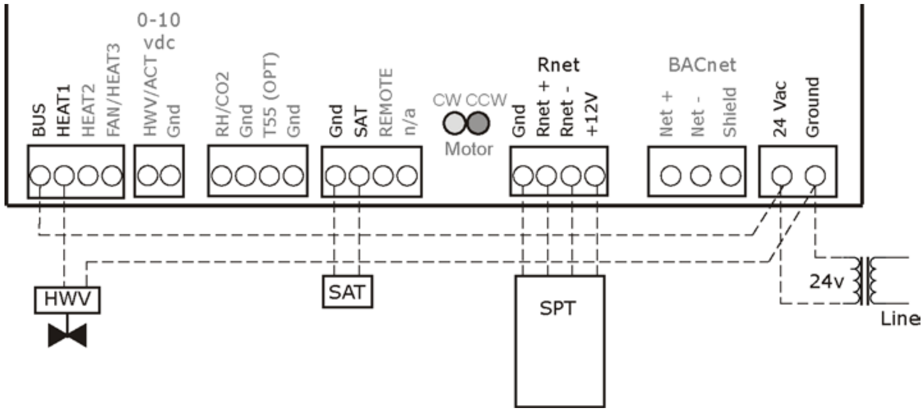
No heat - Single duct or fan box application

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



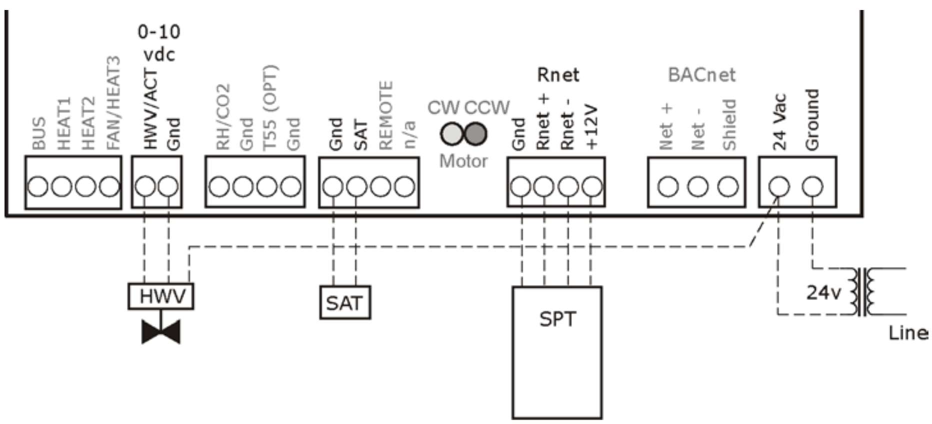
2-position hot water/steam heat - Single duct

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



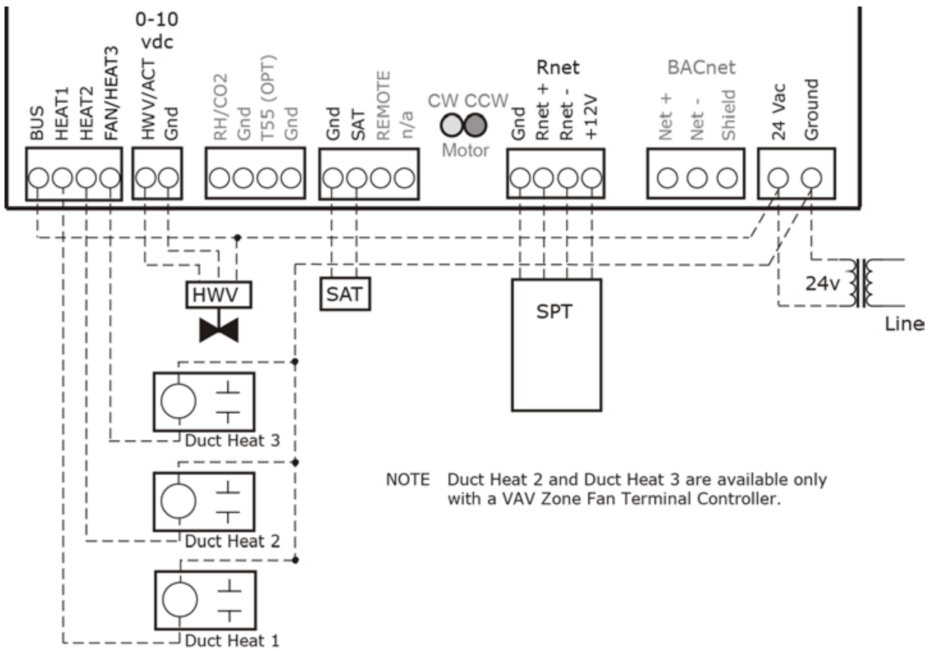
Modulating hot water/steam (ducted or baseboard) - Single duct application

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



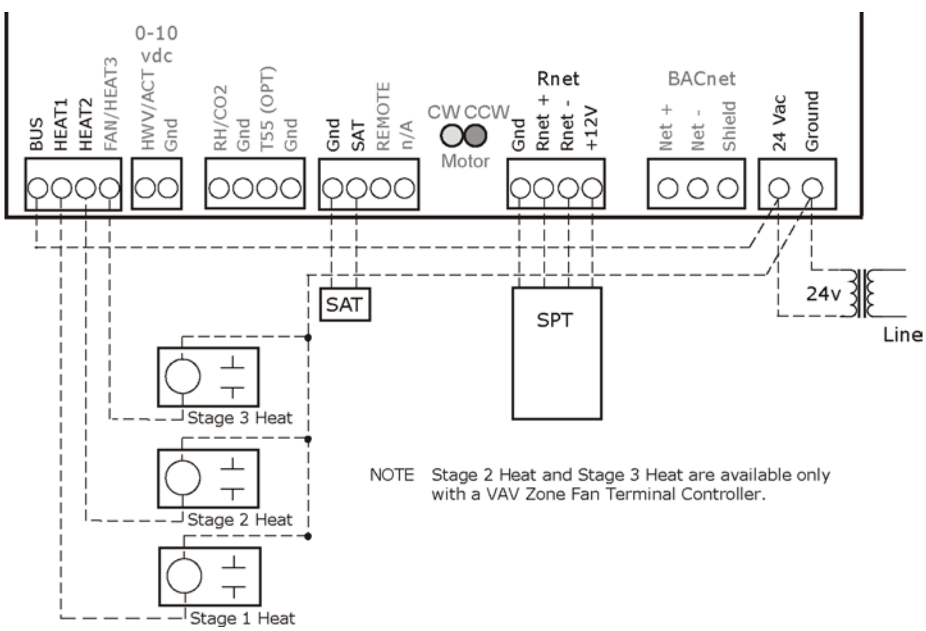
Combination heat (ducted electric heat with modulating baseboard heat) - Single duct application

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



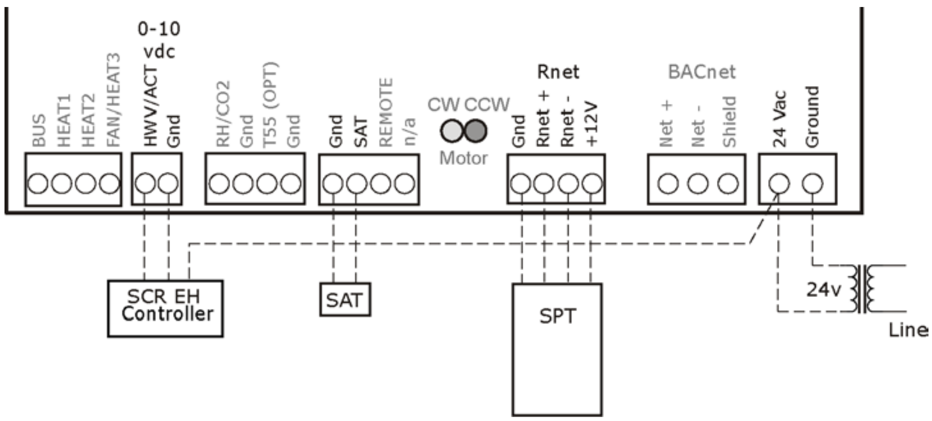
Electric heat (ducted or baseboard) - Single duct application

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



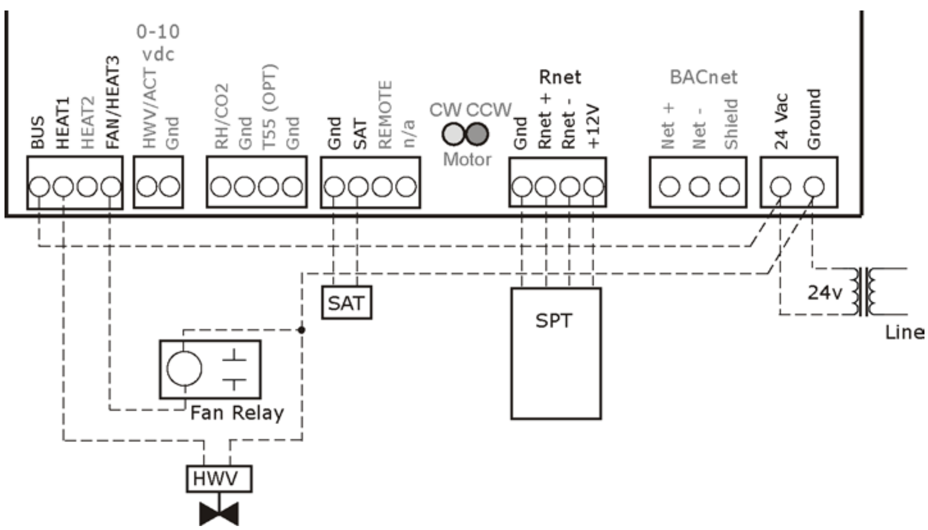
SCR electric heat (ducted or baseboard) - Single duct application

VAV Zone Single Duct Controller or **VAV Zone Fan Terminal Controller**



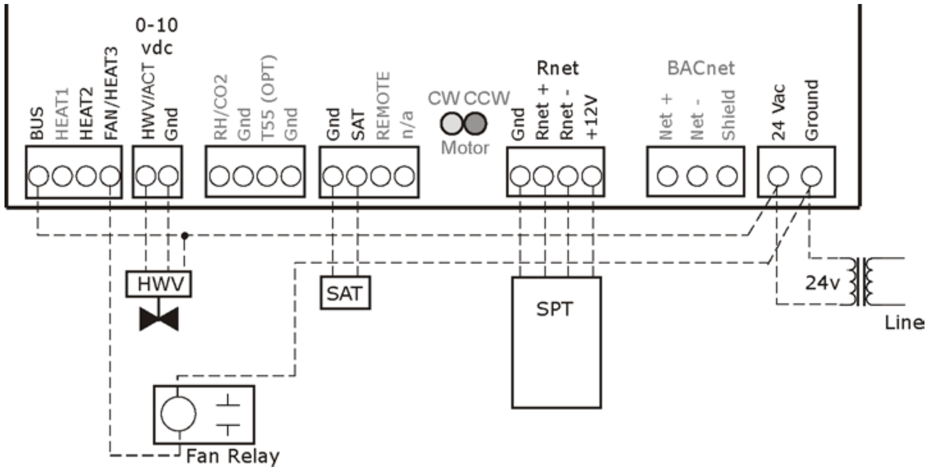
2-position hot water/steam (ducted or baseboard) - Fan box application

VAV Zone Fan Terminal Controller only



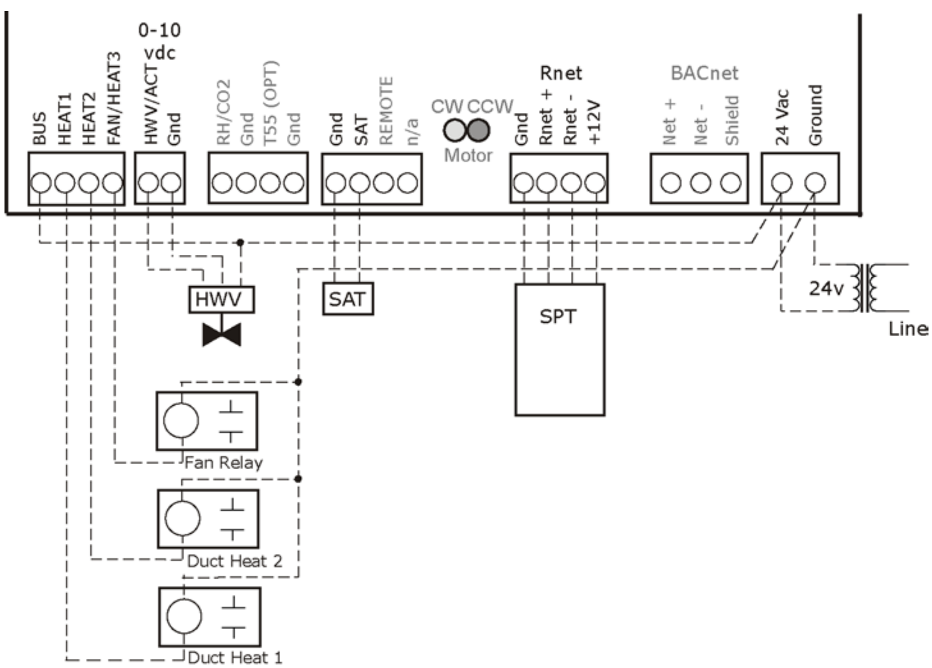
Modulating hot water (ducted or baseboard) - Fan box application

VAV Zone Fan Terminal Controller only



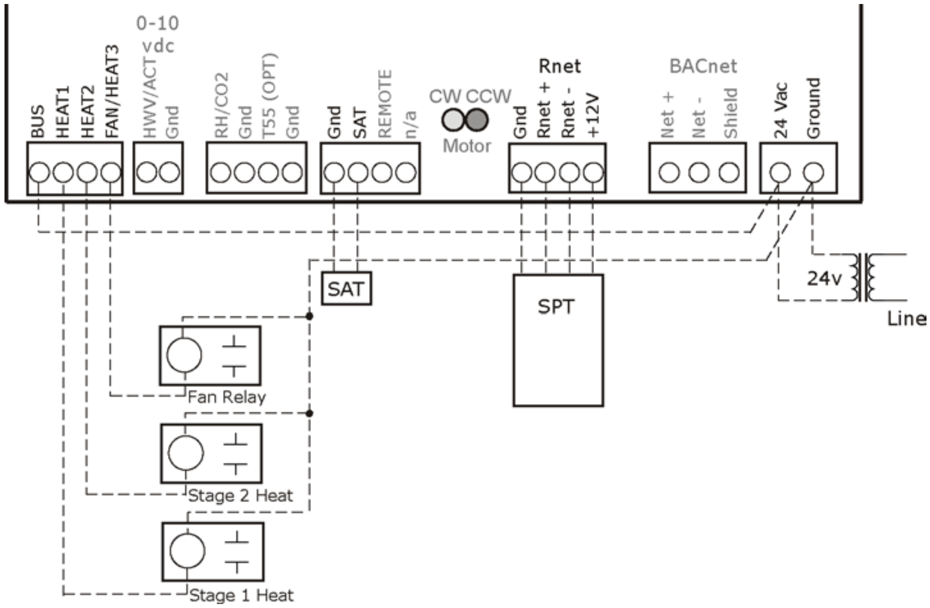
Combination heat (ducted electric heat with modulating baseboard heat) - Fan box application

VAV Zone Fan Terminal Controller only



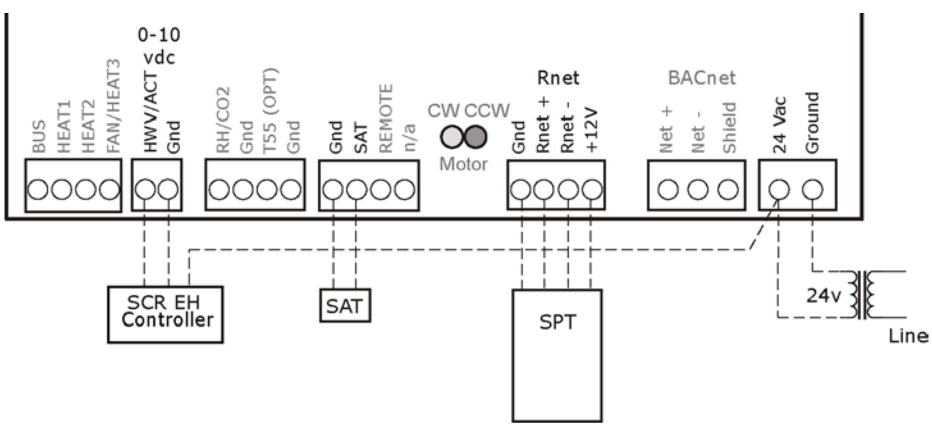
2-stage electric heat (ducted or baseboard) - Fan box application

VAV Zone Fan Terminal Controller only



SCR electric heat (ducted or baseboard) - Single duct application

VAV Zone Fan Terminal Controller



Wiring a field-supplied high-torque actuator to the analog output

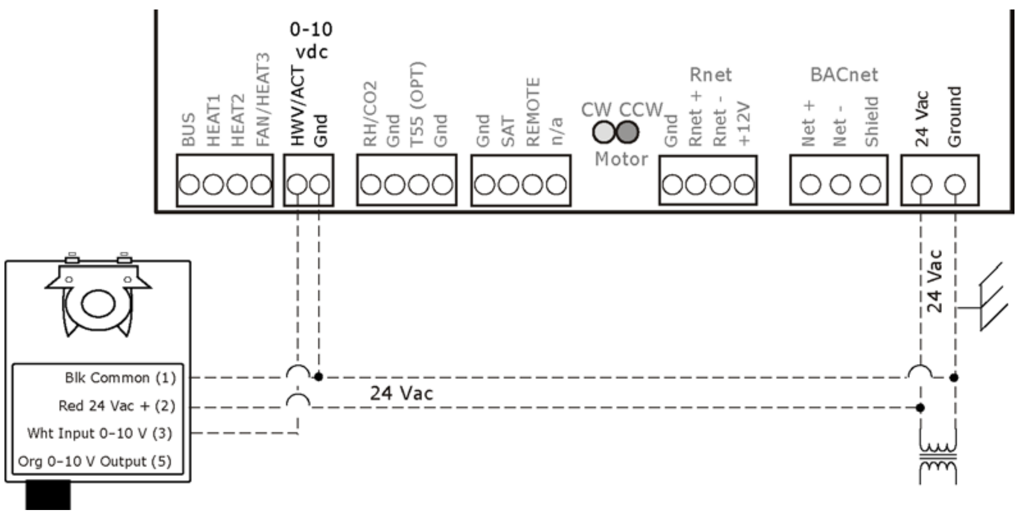
You can wire one of the following Belimo actuators to the VAV Zone Controller's analog output instead of using the controller's built-in, 35 in.-lb (4 Nm) actuator.

NMX24-MFT P-10028	90 in.-lb (10 Nm) actuator with 0–10 Vdc control and 0–10 Vdc feedback
AMX24-MFT P-10028	180 in.-lb (20 Nm) actuator with 0–10 Vdc control and 0–10 Vdc feedback

1 Install the actuator according to the manufacturer's instructions.

2 Wire the actuator to the controller using the diagram below.

NOTE For proper operation and to prevent damage to the devices, use the same polarity for the actuator's power and the VAV Zone Controller's power.



Start-up

To start up the VAV Zone Controller, you need one of the following user interfaces. These items let you access the controller information, read sensor values, and test the controller.

This interface...	Provides a...
i-Vu Open application	Permanent interface
Field Assistant application runs on a laptop connected to controller's Local Access port [1]	Temporary interface
Virtual BACview application runs on a laptop connected to controller's Local Access port [1, 2]	Temporary interface
BACview6 Handheld keypad/display device connects to controller's Local Access port [1, 2]	Temporary interface
BACview6 keypad/display device connected to controller's Rnet port [2]	Permanent interface

[1] Requires a USB Link (USB-L).
[2] See the *BACview Installation and User Guide* for instructions on connecting and using the above items.

Configuring the VAV Zone Controller's properties

To start up the VAV Zone Controller, you must configure certain points and properties. *Appendix A* (page 51) is a complete list of all the points and properties, with descriptions, defaults, and ranges. These properties affect the unit operation and/or control. Review and understand the meaning and purpose of each property before changing it.

- *Unit Configuration properties* (page 52)
- *Setpoint Configuration properties* (page 61)
- *Service Configuration properties* (page 61)
- *Linkage properties* (page 68)

See *Appendix A* (page 51) for a complete list of the controller's points/properties.

NOTE Engineering units shown in this document in the defaults and ranges are strictly for reference. You must enter an integer only.

Performing system checkout

1. Verify that all power and communication connections are correct and tight.
2. Verify that all zone terminals, ductwork, and zone controllers are properly installed and set according to installation instructions and job requirements.
3. Verify that all air duct connections are tight.

4 Verify that zone terminal fans and system controls operate properly. Verify that actuator screws are properly tightened.

5 At the zone terminals, check electrical system and connections of any optional electric reheat coil. If hot water reheat is used, check piping and valves against job drawings.

6 Verify that all zone terminal dampers are fully open.

7 If using an air source with field-installed controls, make sure controls and sensors have been installed and wired per manufacturer installation instructions.

8 Verify that the air source motor starter and, if applicable, the Hand/Off/Auto (HOA) switch are installed and wired.

9 Verify that the area around the air source is clear of construction dirt and debris.

10 Verify that final filters are installed in the air handler(s). Dust and debris can adversely affect system operation.

11 Verify that the space sensor and all optional sensors are reading correctly.

Caution!

Before starting the air source fan, make sure the zone terminal dampers are not closed. Starting the fan with dampers closed will damage the system ductwork.

Commissioning the VAV Zone Controller

Using Field Assistant or the i-Vu application:

1 Calibrate the damper travel.

a) Go to **Properties** > **Configuration** > **Service Configuration** > **Flow Control** > **Details** tab > **Test and Balance**. Click **Close Damper** and verify it goes to the closed position.

b) Click **Dampers Full Open** and verify it goes to the full open position.

c) Verify that the air source is off, and then calibrate the zero airflow reading at the terminal control. Click **Zero Flow** and verify the damper goes to the fully closed position and the airflow transducer is calibrated. Once the **Autozero complete** message is displayed, make sure the Measured Flow column under Calibration parameters for Zero Flow reads near zero cfm (liters/second) and the sensor reading should be less than 0.03.

d) Click **Automatic Control** to return the damper to normal operation.

2 For Parallel or Series Fan terminals – In the **Locks** section, select the **Fan**'s **Lock value to** checkbox, then select **On** in the droplist. Click **Apply**. Verify the fan's operation.

3 For modulating hot water reheat – Go to **Properties** > **I/O Points** tab, then lock **Hot Water Valve** to 100%. If the controller is configured for Single Duct, make sure the air source fan is on. If ducted heat, verify the heat works by verifying that the SAT rises. For baseboard heat, physically check the heating element for proper temperature rise. Release the **Hot Water Valve**.

4 Release the fan.

5 If the controller is part of a linked system, verify **Linkage** > **Airside Linkage Status** shows **Active**.

CAUTION Pressing the actuator release button and moving the damper or disconnecting the actuator ribbon connector while the bypass controller is powered will cause the damper position to be out of calibration. To recalibrate the damper position, you must perform steps 1a–1d above or power cycle the controller.

Balancing the system

Most VAV system airflow designs are based on cooling requirements which require a greater cfm (liters/second) flow than heating requirements. Using the following balancing procedure, you adjust the cooling airflow first. If the heating and cooling maximum airflow requirements are the same, you do not need to balance the heating airflow.

Use the Test & Balance program to balance the system. Test & Balance can perform all the necessary functions, including shutting down the Linked air source and performing global commands to all zones in the system. You should do steps 1 through 4 in *Prepare for balancing* (page 37) prior to using Test & Balance. Please refer to Test & Balance's Help files for details on the steps required to complete the balancing procedure.

NOTE We recommend that you set the heating minimum airflow settings for all the zones in the system to maintain the air source's design minimum heat cfm (liters/second) airflow across its heat exchanger to prevent damage to the equipment.

Prepare for balancing

1. Log in to the i-Vu application with an Installer or Administrator role, or use Field Assistant.
2. Make sure the air source and its controller have been properly started and can run as a standalone unit.
3. Make sure you have addressed, commissioned, and started the zone and bypass controllers, if present.
4. Verify that zone controllers supplying multiple registers have manual dampers on each register branch duct for balancing the design airflow through each register.

Sequence of operation

The VAV Zone Controller supports 3 types of pressure-independent terminal configurations:

- Single duct
- Series fan-powered
- Parallel fan-powered

The controller can operate as part of a linked system (VAV or VVT) or as a stand-alone controller.

Temperature sensors

The VAV Zone Controller supports the following temperature sensors:

Sensors	Notes
Space temperature sensors:	
• SPT Standard, Plus, or Pro	You can average up to 5 SPT communicating sensors.
• T55	Push the sensor's override button from 2 to 10 seconds to initiate a timed override.
	If a network space temperature value is used, that value must be written to the BACnet space temperature point (system_spt) at 1 to 5 minute intervals or on a COV of 0.1Δ°F (.06Δ°C).
Supply Air Temperature (SAT) sensor	If the zone has ducted reheat, install an SAT sensor downstream of the reheat source. The SAT is used in controlling the reheat. If heat is not supplied, install the SAT sensor in the duct on the terminal's leaving air side.
	The SAT determines the air source mode should Linkage communication fail or if the controller is stand-alone. See *Air Source Mode Determination* (page 46) for details.

See the *Carrier Sensors Installation Guide* for details on these sensors.

Zone airflow control

The VAV Zone Controller provides pressure-independent zone temperature control by modulating its built-in damper actuator to control the flow of primary air into the zone. The controller uses PID control to calculate the airflow setpoint based on the air source mode and the difference between the zone's temperature and setpoints.

The air source mode determines if the primary air can meet the zone's need. If the zone controller is in a linked system, the air source mode is determined by the air source. If the zone controller is stand-alone or if linkage communication fails, the mode is determined by the controller's SAT sensor. See *Air source mode determination* (page 46). If the air source mode is the same as the zone's required mode, the damper is positioned so as to modulate the airflow setpoint between the mode's configurable minimum and maximum airflow based on the occupancy status of the zone. This minimum insures sufficient minimum airflow at the air source and sufficient ventilation to the zone during occupied periods.

Single duct with reheat – The **Auxiliary Heat Min Airflow** allows an increase of primary airflow across the terminal's ducted heating coil whenever the terminal operates its local heat. This provides the ability to lower the cooling minimum airflow limits while providing the necessary airflow when the terminal is heating to ensure design load conditions and electric heater minimum airflow.

Parallel fan terminals – The controller's **Parallel Fan On Value** determines when the fan turns on to increase airflow at the zone's diffusers and prevent cold air from dumping into the zone. This is achieved by increasing the volume and temperature of the air exiting the diffusers. If the zone's airflow control setpoint falls below the **Parallel Fan On Value**, the parallel fan turns on to mix ceiling plenum air with the primary air to increase total airflow and ventilation to the zone. The fan turns off when the airflow control setpoint rises above this value. If the zone requires heat while the AHU fan is off, the damper will close while heating is active to prevent reverse flow out through the terminal inlet.

The fan also starts in Heat mode if the zone is configured for ducted heat as described in *Zone reheat control* (page 39).

Series fan terminals – The fan turns on when the air source fan is on as determined by Linkage or in stand-alone operation by airflow monitoring (the fan is determined to be ON if the measured airflow increases above 20% of the **Cooling Max Airflow** or if the measured airflow is greater than 50% of the current airflow setpoint). When the air source starts operation, there is a fan start delay on transition to occupied, based on the **Power Fail Start Delay**. The terminal's damper fully closes and, after a 15 second delay, the fan starts. This prevents the fan from rotating backwards. Therefore, each series fan box should have a unique power fail restart delay to avoid closing all dampers simultaneously.

Damper Actuator(s) – The VAV Zone Controller's built-in 35 in/lb (4 Nm) actuator has a 205 second full travel time for 90° operation. For field retrofit applications, the actuator can be adjusted for a damper stroke between 30° and 90°, and it can be configured to move clockwise (default) or counterclockwise.

If the built-in actuator's torque is insufficient for large damper applications, the VAV Zone Controller's analog output can drive an external, 0-10 volt, high-torque actuator.

Zone reheat control

The VAV Zone Controller can be configured for one of the following **Heat Types** to meet the zone's heating requirements:

- Modulating Hot Water/Steam
- Two Position Hot Water/Steam
- Staged Electric Heat (2 stages for VAVB3 with Series/Parallel Fan, 3 stages for Single duct. VAVB1 is 1 stage only.)
- Combination Modulating Baseboard/Staged Electric Heat (2 stages) (2 stages for VAVB3 with Series/Parallel Fan, 3 stages for Single Duct. VAVB1 is 1 stage only.)

All of the above except Combination Modulating Baseboard/Staged Electric Heat can be ducted or non-ducted (baseboard). For ducted type heat, the controller has a configurable **Maximum Heating SAT** for supply air temperature control. The controller monitors the SAT when the terminal's ducted heat operates.

If the network provides the OAT, heating can be disabled if the OAT rises above the configured **Heating Lockout Temperature**.

Modulating Hot Water / Steam Heating Heat – The controller modulates a normally closed or normally open hot water or steam valve connected to the discharge air heating coil. The valve opens and closes as needed to satisfy the zone's heating requirements. For ducted heat, the terminal's heat supplements any heat from the primary air source, but the terminal's SAT is controlled so that it does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default). For baseboard heating (non-ducted heat), the valve modulates to keep the zone's temperature at the heating setpoint.

Two-Position Hot Water / Steam Heating Heat – The controller operates a normally closed or normally open hot water or steam valve connected to the discharge air heating coil. The valve opens and closes as needed to satisfy the zone's heating requirements. For ducted heat, the terminal's heat supplements any heat from the primary air source, but the terminal's SAT is controlled so that it does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default). For non-ducted (baseboard) heating, the valve is controlled to keep the zone's temperature at the heating setpoint.

Electric Auxiliary Heat – The controller operates 1, 2, or 3 stages of electric heat. For ducted heat, the terminal's heat supplements any heat from the primary air source, but the terminal's SAT is controlled so that it does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default). For non-ducted (baseboard) electric heat, the stages are controlled as needed to keep the zone's temperature at the heating setpoint.

SCR Electric Heat – The controller modulates an SCR heat output connected to the SCR electric heat control input. The output increases as needed to satisfy the zone's heating requirements. For ducted heat, the terminal's heat supplements heat from the primary air source, if it is in heating mode and is controlled so that the SAT does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default). For baseboard heating (non-ducted heat), the SCR heat output modulates to keep the zone's temperature at the heating setpoint.

Combination Modulating Baseboard / Electric Heat – The controller can modulate a normally closed or normally open hot water or steam valve connected to a perimeter baseboard radiation system and control up to 2 stages of ducted electric heat. The valve modulates as needed to satisfy the zone's heating requirements. If the valve cannot meet the load, then the terminal's ducted electric heat is used. The terminal's electric heater supplements any heat from the primary air source, but the terminal's SAT is controlled so that it does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default).

CV Modulating Heat – The controller can modulate a normally closed or normally open hot water or steam or steam valve connected to a perimeter baseboard radiation system or discharge air heating coil. The valve modulates as needed to keep the zone's temperature at the heating setpoint. For ducted applications, the terminal's SAT is controlled so that it does not exceed the **Maximum Heating SAT** (105°F [40.5°C] default). [Used primarily on single-duct terminals with ducted modulating hot water or steam heat in health care (hospital) applications, where discharge air temperature swings may be problematic. **CV Modulating Heat** may also be used in all non-ducted modulating heating applications.]

Parallel Fan Heat On Delay – For Parallel Fan terminals only, the controller has a configurable **Parallel Fan Heat On Delay** to save energy. During the delay period (15 minute default), only the fan operates to recycle heat from the ceiling plenum. If the heating requirement is not met by the end of the delay, the auxiliary heat is used.

Fan Heat Off Delay – For fan-powered terminals, the controller has a configurable **Fan Off Delay**. After the heating coil is de-energized, the fan continues to run for the length of the delay to deliver to the zone any heat stored in the coil. The default delay of 120 seconds is optimal for a ducted hot water coil. For ducted electric heat coils, the nominal delay is approximately 45 seconds. For baseboard and non-ducted heat, the delay should be set at 0.

This feature applies to parallel fan terminals in both occupied and unoccupied mode and series fan terminals in the unoccupied mode if the air source fan is off.

Demand control ventilation (DCV) and dehumidification using optional sensors

The VAV Zone Controller's **RH/CO2** input supports an optional CO2 sensor or Relative Humidity (RH) sensor. The sensor can have a 5-volt maximum output. The range is configurable as either 0–5 or 1–5 volts (1–5 volt supports 4–20 mA sensors with a 250 ohm resistor). The controller's low and high sensor input configuration allows for a wide range of sensors.

The controller can also support both DCV and dehumidification functions by using a system RH or CO_2 sensor input connected to another controller.

NOTE If the connected sensor and/or system sensor value are to be used by the air source through Linkage, set the appropriate control type to **Enable**. If you do not need local control at the zone, set **DCV Max Vent Airflow** or **Maximum RH Override Airflow** to 0.

Demand Control Ventilation (DCV) – Requires CO2 sensor

The zone controller monitors the CO2 sensor and can override the temperature control to respond to increasing CO2 levels when the zone is occupied. If the sensor's value remains below the **DCV Start Ctrl Setpoint**, the **Occupied Min Airflow** setpoint provides the base ventilation rate as defined by ASHRAE. As the CO2 level exceeds the **DCV Start Ctrl Setpoint** and the air source is in cooling or ventilation mode, the controller increases airflow to the zone starting at the **Occupied Min Airflow** and then proportionally increases ventilation as the CO2 level increases. If the sensor's value exceeds the **DCV Max Ctrl Setpoint**, the controller maintains the **DCV Max Vent Airflow** until the zone's CO2 level decreases.

When the zone is unoccupied, the **Unoccupied Min Airflow** provides the base ventilation as required.

If the controller is configured for auxiliary heat, the controller will maintain the zone's temperature at a heating setpoint that is temporarily increased to a value halfway between the heating and cooling setpoints whenever DCV is active. This prevents an excessive drop in zone temperature caused by the additional ventilation. If auxiliary heat is not available, the **DCV Max Vent Airflow** setpoint should be readjusted to prevent overcooling or set to 0 to disable DCV at the zone.

Dehumidification – Requires RH sensor

The zone controller monitors the RH sensor and can provide dehumidification if the sensor's value exceeds the **Occupied RH Control Setpoint** and the zone is occupied. If the zone is occupied, does not require heating, and the air source is operating in a cooling mode, the controller will override the temperature control to increase airflow to the zone. The primary air must have a sufficiently low dew point for dehumidification to function properly. During the dehumidification mode, the heating setpoint is temporarily increased to a value halfway between the heating and cooling setpoints to prevent overcooling in the zone. The controller uses a PID control loop to provide dehumidification. If auxiliary heat is not available, the **Maximum RH Override Airflow** should be readjusted to prevent overcooling or set to 0 to disable Dehumidification at the zone.

NOTE If both control functions are enabled, the zone will control to the greatest calculated minimum cfm (liters/second) airflow value of the three functions (temperature, RH, or IAQ).

Occupancy

The VAV Zone Controller's operation depends on the zone's occupancy state as determined by occupancy schedules or a remote occupancy override.

Occupancy Schedules – An occupancy schedule can be one of the following:

- A local schedule set up directly in the controller using a BAC*view* device or Field Assistant.
- A network schedule from an i-Vu internal router. The VAV Zone Controller must be networked to an i-Vu Open Router or an i-Vu internal router.
- A **System Occupancy** network point. This point links the controller occupancy to another controller in the network so that multiple zones can follow the occupancy of another VAV Zone or other controller on the network.

To set up occupancy schedules, you first define a schedule for each day of the week and then define schedules for the exceptions, such as holidays. The exceptions can be based on a date, a date range, or a week and day.

NOTES

- The **Occupancy Schedules** property must be enabled (default).
- A network schedule downloaded from the i-Vu application will overwrite a local schedule that was set up in a BAC*view* device or Field Assistant.

Remote Occupancy Override – The controller monitors its **Remote** input that is typically connected to the isolated, dry contact of an occupancy sensor located in the zone. (To use the occupancy override as described here, the **Standby Offset** value must be set to zero.) The controller can override the occupancy state based on whether or not the space is actually occupied. If the occupancy sensor contact is in the same state as **Occ Override Normal Logic State** setting, the zone follows its normal occupancy schedule. If the contact is in the opposite state, it overrides the zone into the unoccupied mode. The input can be configured for normally closed or normally opened contact types and is set to Open by default so that it does not affect the controller occupancy operation if left unused.

The **Remote** input can also be used to expand the setpoints during occupied periods without affecting the occupancy status of the zone. Whenever the zone is occupied and the **Remote** input senses the occupant has left the zone, if a value greater than zero has been entered for the **Standby Offset**, then the occupied setpoints will be expanded by that number of degrees. This provides the ability to save energy but recover more rapidly rather than having the zone go unoccupied.

Learning Adaptive Optimal Start – This function gradually adjusts the unoccupied setpoints over a specified period of time to achieve the occupied setpoint by the time scheduled occupancy begins. This learning adaptive algorithm uses the **learned heating capacity** and **learned cooling capacity** values to calculate the effective setpoints prior to the occupied start time. The algorithm calculates a learned cooling and heating capacity during the previous unoccupied time. Set the **Learning Adaptive Optimal Start** recovery period from 1 to 4 hours in **Optimal Start**. When the **Learning Adaptive Optimal Start** routine runs, adjustments are based on the color that is achieved when occupancy begins. Adjustment amounts are defined in the thermographic color fields located directly above the **Effective Setpoints** graph under **Setpoints**.

BAS On/Off – This function allows third party control of the controller occupancy. **Occupancy Schedules** must be set to **Disable** to use this function. When set to **Occupied** or **Unoccupied**, **Optimal Start** is automatically disabled.

Alarms

Space Temp Sensor Alarm – The VAV Zone Controller monitors each space temperature sensor and the network input for space temperature. If no valid space temperature value is available, the controller generates an alarm and disables all local heating or cooling. The controller modulates the damper to the minimum heat, minimum cool, or ventilation position based on the air source mode. Normal operation resumes when the controller detects a valid sensor value.

Space Temperature Alarm – The controller generates an alarm if the space temperature exceeds the alarm setpoint. The occupied alarm setpoints are determined from the configurable **Occupied Alarm Hysteresis** (5Δ°F [2Δ°C) default) which is subtracted from the configured occupied heat and added to the configured occupied cool setpoints. If the space temperature rises above or falls below this value and the condition lasts for more than 15 minutes, an alarm is generated. The configurable unoccupied high and low alarm setpoints have a fixed 10 minute alarm delay. When a transition from unoccupied to occupied occurs or the occupied temperature setpoints are changed causing an immediate alarm condition, the controller automatically calculates an additional alarm delay equal to 10 minutes for each degree of change. This additional delay is added to the 15 minute fixed delay and allows the space temperature to recover and achieve the new setpoints, preventing unnecessary alarms. The space temperature alarm returns to normal when the space temperature again falls between the current mode's alarm setpoints.

Supply Air Temperature Alarm – The controller generates an alarm if the SAT exceeds the configured **High SAT Alarm Limit** (120°F [48.9°C] default) or falls below the **Low SAT Alarm Limit** (45°F [7°C] default) for more than 5 minutes. The hysteresis for return to normal is 3Δ°F (1.6Δ°C). The **High SAT Alarm Limit** should be set to a value at least 15Δ°F (8.3Δ°C) (above the **Maximum Heating SAT** or the maximum discharge temperature from the air source, whichever is greater.

Space Relative Humidity Alarm – If **Optional Ctrl Type** is set to **RH Control** (Space Relative Humidity (RH) sensor is installed), the controller generates an alarm if the sensor's value exceeds the **Occ High RH Alarm Limit** (100% rh default) or the **Unocc High RH Alarm Limit** (100% rh default). The controller provides a 30-minute alarm delay during unoccupied periods. During occupied periods, the controller uses the **Occ High RH Alarm Limit**. When a transition from unoccupied to occupied occurs or the occupied high alarm limit is lowered causing an alarm condition to occur, the controller automatically calculates an alarm delay equal to 5 minutes for each % RH of change. This additional delay is added to the 15 minute fixed delay and allows the space relative humidity to recover and achieve the new setpoints, preventing unnecessary alarms.

Indoor Air Quality Alarm – If **Optional Ctrl Type** is set to **IAQ Control** (CO_2 sensor is installed), the controller generates an alarm during occupied periods if the sensor's value exceeds the **Occupied High CO2 Alarm Limit**. When a transition from unoccupied to occupied occurs, or if the occupied alarm limit is changed to a value that causes an alarm condition to occur, the controller automatically calculates an alarm delay equal to 15 seconds for each ppm of change based on the error from setpoint (15 minutes minimum, 4 hours maximum). This delay prevents unnecessary alarms and gives the zone time to correct the alarm condition. To disable the IAQ alarm, set **Occupied High CO2 Alarm Limit** to 0. The default value is 1100ppm. The hysteresis for return to normal is 100ppm.

Filter Alarm – For series or parallel fan-powered terminals, the controller monitors the accumulated hours of fan operation and generates an alarm when accumulated hours exceed the configured **Filter Service Alarm Timer** limit. The default value is 0 hours which disables the alarm. The alarm can be reset by setting **Reset Filter Alarm** to On or resetting the configured alarm limit to 0 hours.

Airside Linkage Alarm – The slave zone controller generates an alarm if it has once been linked successfully to a master zone and then it fails to receive linkage information for 5 minutes. If the controller is the VVT Master, it generates an alarm if it does not communicate with its air source for 5 minutes after having been previously communicating successfully. A return-to-normal is generated after successful Linkage communication resumes. A power cycle will reset and re-initialize the **Airside Linkage Alarm**.

Demand limiting

Demand limiting is a cost-saving strategy to reduce energy consumption. The strategy expands the setpoints when the system reaches one of 3 levels of consumption. With the expanded setpoints, the equipment works less, thereby saving energy.

If the VAV Zone Controller receives a demand limit signal through the network, it expands its setpoints based on the demand level. The default amounts are:

- Demand Level 1: 1Δ°F (.6Δ°C)
- Demand Level 2: 2Δ°F (1.1Δ°C)
- Demand Level 3: 4Δ°F (2.2Δ°)

Linkage

The i-Vu Open Control System uses linkage to exchange data between the zone terminals and their air source to form a coordinated HVAC system. The system's air source controller, zone controllers, and bypass controller (if applicable) are linked so that their data exchange can be managed by one zone controller configured as the Master.

The basic linkage process is as follows:

1 The Master gathers data from the slave zone controllers such as occupancy status, setpoints, and zone temperature.

2 The Master performs mathematical calculations and algorithms on the data.

3 The Master sends the composite information to the air source.

4 The air source returns information such as mode, supply air temperature, and outside air temperature, if present.

5 The Master passes that information to all slave zone controllers.

The following sections detail the process for VAV Systems and VVT Systems.

VAV Systems

The VAV Master continuously scans the system and gathers the following information from each zone:

- Setpoints and zone temperature
- Zone size
- Occupancy status
- Damper position
- RH and CO_2 values (if applicable)

The VAV Master then does the following calculations and sends the results to the air source.

- If any zone is occupied, the system's occupancy status is set to occupied.
- If the system is occupied, it averages the space temperatures from all occupied zones using their normal terminal size at 1" (.249 kpa) VP to apply a weighting factor to that average (OCCSPT).
- It performs this same weighted average space temperature calculation for all the zones in the system (SPT).
- If no zone is occupied, it sets the occupied space temperature to "?". ("?" only displays on the **Details** tab of the Collector microblock and the Linkage status section of the **Properties** page.
- It calculates 4 weighted average setpoints:
    - the occupied heating weighted average setpoint (OHSP)
    - occupied cooling weighted average setpoint (OCSP)
    - the weighted average unoccupied heating setpoint (UHSP)
    - unoccupied cooling setpoint (UCSP).
- If the zones supply CO_2 or RH values, it calculates either a maximum or average value as determined by the configuration for each.

The air source determines its operating mode from the information received, and then sends the following to the Master:

- Air source mode
- Supply air temperature
- Outside air temperature
- Static pressure (if applicable)

The air source verifies the mode by comparing its supply air temperature to the space temperature received through linkage. See the air source documentation for operation and parameters used to verify its mode. This verification allows the system to verify that the stated air source mode is actually being provided. For example, if the air source heat has failed, the air source's actual mode would not indicate heat unless that mode was verified by the equipment's supply air temperature.

The VAV Master continuously evaluates all zones and processes their data as described above. The system switches modes only if the equipment mode changes.

VVT Systems

A VVT Master determines system operation by prioritizing heating and cooling requirements from all the zones based on their occupancy, demand, and damper size.

The VVT Master continuously scans the system to determine if any zones are occupied. If any zones are occupied, the VVT Master evaluates the occupied zones' heating or cooling demands to determine the following:

- The system mode. The mode is:
  - Cooling if the number of occupied zones with cooling demands exceeds the number of occupied zones with heating demands, and the demand is greater than or equal to the number of configured Linkage Callers.
  - Heating if the number of occupied zones with a heating demand exceeds or is equal to the number of Linkage Callers.
- The reference zone, the zone with the greatest demand for the system mode

If no zones are occupied or no occupied zones require heating or cooling, the VVT Master performs the evaluation described above for the unoccupied zones.

The VVT Master then sends the following information to the air source:

- The setpoints and zone temperature from the zone with the reference zone
- The system occupancy status
- Most open damper position from any zone
- RH and CO_2 values (if applicable)

The air source then sends to the VVT Master:

- The air source mode
- Supply air temperature
- Outside air temperature (if applicable)
- Static pressure (if applicable)

The air source verifies the mode by comparing its supply air temperature to the space temperature received through Linkage. See the air source documentation for operation and parameters used to verify its mode. This verification determines if the desired air source mode is being provided. For example, if the VVT Master requests heating but the air source does not have heat or its heat has failed, the verification indicates this. The actual current mode is sent to the zones so that they can control accordingly.

The system remains in that mode until all zones of that demand are satisfied or until the System Mode Reselect Timer (30 minute factory default) causes a forced re-evaluation of the system. If there is no demand for the opposite mode or the demand is smaller than the current mode, the reselect timer is reset to 30 and the current mode continues until all zones are satisfied or until the reselect timer expires, repeating the process. If there is a demand for the opposite mode, the VVT Master sends the new reference zone's space temperature and setpoints for the opposite mode to the air source and restarts the reselect timer. The air source re-evaluates this data and then attempts to provide the air required by the new information. The amount of time it takes to switch modes is determined by the air source's operating parameters.

The VVT Master continuously evaluates the system and updates the air source with the most current system demand. Based on the evaluation, the reference zone can change from one zone to another. The evaluation process continues until there is no demand from any zone or the 30 minute timer causes a re-evaluation of the system conditions.

If no heating or cooling is required or the current air source mode is satisfied, the VVT Master calculates:

- The weighted average of the occupied and unoccupied heating and cooling setpoints
- A zone temperature that is midway between the setpoints (occupied or unoccupied based on the system's current occupancy status).

This information, plus the occupancy status, is sent to the air source so that its current mode is disabled and the unit ceases heating or cooling operation. If the system is occupied, the air source fan and OA damper, if applicable, operate to maintain proper ventilation.

Air source mode determination

Linked air source modes – In a linked system, the air source determines its operating mode and qualifies that mode based on its own SAT. The following modes can be sent by the air source depending on its capability and configuration:

- **OFF** – Air source fan is off.
- **WARMUP** – Air source fan is on and providing first cycle of heat when changing from unoccupied to occupied.
- **HEAT** – Air source fan is on and providing heat.
- **FREECOOL** – Air source fan is on, providing cooling using economizer only, and system is unoccupied.
- **COOL** – Air source fan is on, and cooling is provided by economizer and/or mechanical cooling.
- **PRESSURIZATION** – Fire/Life-safety override mode which causes the air source supply fan to operate, and if equipped, the OA damper to provide 100% outside air. Mechanical heating and cooling may be disabled. Any linked terminal will open its primary air damper to provide the configured maximum cooling airflow.
- **EVACUATION/SHUTDOWN** – Fire/Life-safety override mode which causes the air source supply fan to stop, the return fan to operate, and if equipped, the exhaust air damper to open 100%. Any linked terminal will fully close its primary air damper and disable its terminal fans, if equipped.
- **VENT** – Air source fan is on, economizer providing ventilation without any mechanical heating or cooling and providing neutral supply air temperature.

See the air source's installation manual for more specific operation.

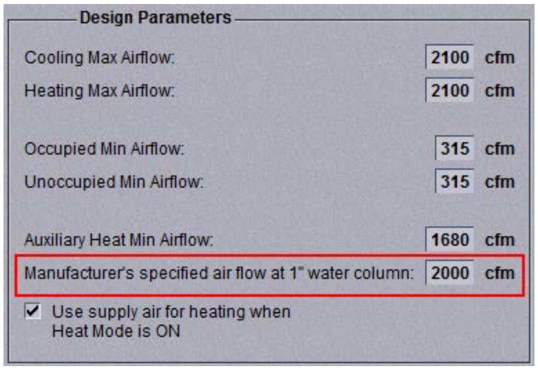
Local air source modes – If the zone controller is stand-alone or if linkage communication fails, the zone controller monitors the cfm (liters/second) for fan status and its SAT sensor to determine if the primary air source is providing heating, cooling, or recirculating air in a fan-only or ventilation mode.

- **HEAT** – For Series or Parallel Fan controllers when the zone terminal fan is off or for single duct controllers: The zone's local heat has not operated for at least 5 minutes, and the SAT is more than 5Δ°F (2.8Δ°C) warmer than the space temperature. If the terminal fan is on, the SAT must be more than 8Δ°F (4.4Δ°C) (warmer than the space temperature.
  In all cases, Heat mode is maintained until the SAT drops 2Δ°F (1.1Δ°C) below the space temperature.
- **VENT** – The zone's local heat has not operated for at least 5 minutes and the SAT is between 65°F (18.3°C) and 80°F (26.6°C).
- **COOL** – The zone's local heat has not operated for at least 5 minutes, the current mode is not Heat, and the SAT is less than 65°F (18.3°).
- **OFF** – Terminal airflow is used determine if the primary air source fan is on or off. If the terminal's Damper Position is greater than 95% and the CFM (liters/second) is less than 10% of **Nominal CFM*** (liters/second) at 1" (.249 kpa) Velocity Pressure for 1 minute and the CFM (liters/second) Setpoint is not equal to 0, then the fan is determined to be off. If CFM (liters/second) is greater than 20% of the **Nominal CFM*** (liters/second) at 1" (.249 kpa) Velocity Pressure, or greater than 50% of CFM (liters/second) Setpoint for 10 seconds (whichever is greater), then the fan is determined to be on. Occupied/Unoccupied Min CFM (liters/second) must be set for greater than 10% of Max Cool CFM (liters/second).

  * Shown on **Properties** page as **Manufacturer's specified air flow at 1" water column:** for both English and Metric applications.

  English: Use manufacturer's CFM at 1" water column

Metric: Use manufacturer's liters/second at .249 kpa



NOTE A local air source fan mode of OFF usually cannot be detected on series fan boxes. This is because the terminal's series fan, when operating with the terminal damper open, usually creates enough primary airflow to prevent the control from properly detecting that the air source is off.

Troubleshooting

If you have problems mounting, wiring, or addressing the VAV Zone Controller, contact Carrier Control Systems Support.

NOTE To help you troubleshoot, obtain a Module Status (Modstat) from the controller and review the System Error and Warning details.

LED's

The LED's on the VAV Zone Controller show the status of certain functions. Verify the LED patterns by cycling power to the controller and noting the lights and flashes.

If this LED is on...	Status is...
Power	The VAV Zone Controller has power
Rx	The VAV Zone Controller is receiving data from the network segment
Tx	The VAV Zone Controller is transmitting data over the network segment
DO#	The digital output is active
CW	The actuator motor is turning clockwise
CCW	The actuator motor is turning counterclockwise

The **Run** and **Error** LED's indicate controller and network status.

If Run LED shows...	And Error LED shows...	Status is...
1 flash per second	1 flash per second, alternating with the **Run** LED	The controller files are archiving. Archive is complete when **Error** LED stops flashing.
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	The controller has just been formatted
2 flashes per second	4 flashes, then pause	Two or more devices on this network have the same MS/TP network address
2 flashes per second	1 flash per second	The controller is alone on the network

If Run LED shows...	And Error LED shows...	Status is...
2 flashes per second	On	Exec halted after frequent system errors, due to: • Controller halted • Program memory corrupted • One or more programs stopped
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout
On	On	Failure. Try the following solutions: • Turn the VAV Zone Controller off, then on. • Download memory to the VAV Zone Controller. • Replace the VAV Zone Controller.

Serial number

If you need the VAV Zone Controller's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (modstat) from your user interface

To replace the VAV Zone Controller's battery

If the VAV Zone Controller experiences a power outage and the control program stops functioning, replace the battery.

1 Verify that the VAV Zone Controller's power is on.

2 Remove the VAV Zone Controller's cover.

3 Remove the battery from the controller, making note of the battery's polarity.

4 Insert the new battery, matching the battery's polarity with the polarity indicated on the controller's cover.

5 Replace the VAV Zone Controller's cover.

6 Download the VAV Zone Controller.

Compliance

FCC Compliance

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 the 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 is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

CE Compliance

WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

BACnet® is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet Manufacturers Association (BMA). BTL® is a registered trademark of the BMA.

Appendix A: VAV Zone Controller Points/Properties

NOTE Engineering units shown in this document in the defaults and ranges are strictly for reference. You must enter an integer only.

Status

Navigation:	i-Vu® / Field Assistant:	**Properties** > **Control Program** > **Status**
	BAC*view*®:	**HOME** > **STATUS**

Point Name/Description	Range
Terminal Mode – The controller's current operating status.	R: OFF HEATING WARM-UP VENT COOLING DEHUMIDFY REHEAT PRESSURIZE EVACUATE SHUTDOWN IAQ OVERRIDE AIR BALANCING
Term Type – The type of zone terminal that the controller is installed on.	R: Single Duct Parallel Fan Series Fan
Space Temperature - Prime Variable – The space temperature value currently used for control.	R: -56 to 245°F (-48.9 to 118.3°C)
Primary Airflow – The current airflow measured through the primary air damper.	R: 0 to 99999 cfm (liters/second)
Damper Position – The current damper position.	R: 0 to 100%
Supply Air Temperature – Displays the current supply air temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Heating Capacity – The current reheat capacity when the zone is configured for reheat.	R: 0 to 100%
Baseboard Heating Capacity – The current baseboard heat capacity when the zone is configured for Combination Baseboard or Non-ducted Heat.	R: 0 to 100%
Outdoor Air Temperature – The current outdoor air temperature from a linked air source, if available, or from another network source.	R: -56 to 245°F (-48.9 to 118.3°C)
Fan – The status of the terminal fan if **Term Type** is **Parallel Fan** or **Series Fan**.	R: On/Off
Space Relative Humidity – The current space relative humidity if **Optional Sensor Type** is set to **RH Control**.	R: 0 to 100%rh
Indoor Air Quality CO2 (ppm) – The current IAQ value if **Optional Sensor Type** is set to **IAQ Control**.	R: 0 to 5000ppm
Shutdown – When **Active**, disables all control functions, at normal equipment time delays and maintains minimum airflow.	D: Inactive R: Inactive/Active

Unit Configuration

Navigation:	i-Vu® / Field Assistant:	**Properties** > **Equipment** > **Configuration** > **Unit Configuration**
	BAC*view*®:	**HOME** > **CONFIG** > **UNIT**

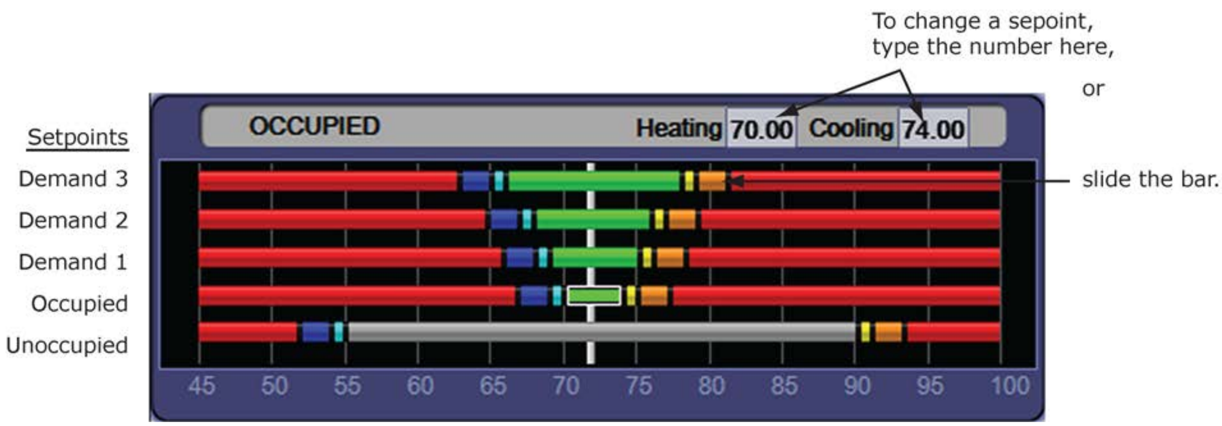
Point Name/Description	Default/Range
Heat Enable – Enables the reheat function.	D: Enable R: Disable/Enable
Parallel Fan Heat On Delay – Parallel type terminal only. The delay before reheat is enabled after the zone has a heating demand. The terminal fan runs immediately and attempts to meet the heating demand using the heated air from the ceiling plenum.	D: 15 minutes R: 0 to 30 sec
Fan Off Delay – Fan-type terminals only. The amount of time the terminal fan continues to operate after a heating demand is satisfied.	D: 120 seconds R: 0 to 180 seconds
Maximum Heating SAT – The maximum supply air temperature allowed while ducted heat is operating. Ducted type supplemental heat is controlled so that it will not exceed this limit.	D: 105°F (40.6°C) R: 100 to 140°F (37.7 to 60°C)
Maximum RH Override Airflow – The maximum airflow allowed when the RH function overrides the temperature control. When active, the damper modulates to the temperature control requirement or the RH override airflow, whichever is greater. This value is the percentage of the **Maximum Cooling Airflow Setpoint**.	D: 60% R: 0 to 100%
DCV Max Vent Airflow – The maximum airflow allowed when the IAQ function overrides the temperature control. When active, the damper modulates to the temperature control requirement or the **DCV Max Vent Airflow**, whichever is greater. This value is a percentage of the **Maximum Cooling Airflow Setpoint**.	D: 70% R: 0 to 100%
Filter Service Alarm Timer – Fan type terminals only. The amount of time the fan will run before generating a **Filter Alarm**. Set to 0 to disable the alarm.	D: 0 hr R: 0 to 9999 hr
Pushbutton Override – Enables or disables the use of a pushbutton override from a local space temperature sensor.	D: Enable R: Disable/Enable
Setpoint Adjustment – Enables or disables the setpoint adjustment mechanism on the local space sensor.	D: Enable R: Disable/Enable
Setpoint Adjustment Range - The maximum amount that a user can adjust the setpoint on the local SPT sensor.	D: 2Δ°F (1.1Δ°C) R: 0 to 5Δ°F (0 to 2.7Δ°C)
Heating Lockout Temperature – Supplemental reheat is disabled if outside air temperature exceeds this value. Supplemental reheat is enabled when the outside air temperature falls below a fixed hysteresis of 2Δ°F (1.1Δ°C). This function is active only if there is a valid network outside air temperature.	D: 70°F (21.1°C) R: 35 to 150°F (1.6 to 65.5°C)
Power Fail Restart Delay – How long the controller delays normal operation after the power is restored. This is typically used to prevent excessive demand when recovering from a power failure. Applies to Series Fan start delay when system mode transitions from unoccupied to occupied. A delay of no greater than 120 seconds is recommended for Series Fan applications.	D: 60 seconds R: 0 to 600 seconds

Point Name/Description	Default/Range
Occupancy Schedules – If **Enabled**, the controller stores and follows a schedule sent over the network or programmed locally through a BAC*view* device or Field Assistant. If **Disabled**, the controller occupancy is controlled from the **BAS On/Off** or **System Occupancy** network point.	D: Enable R: Disable/Enable
T55 Override Duration – The amount of time that the controller runs in the occupied mode when a user presses the T55 sensor's override button for 1 to 10 seconds. **Pushbutton Override** must be set to **Enable**.	D: 1 hr R: 1 to 4 hr
Local Sensor Calibration	
Space Temperature – The current space temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Space Temp Calibration – A calibration offset value to allow the local space temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D: 0Δ°F/Δ°C R: -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)
Supply Air Temperature – Displays the current supply air temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Supply Air Temp Calibration – A calibration offset value to allow the supply air temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D: 0Δ°F/Δ°C R: -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)
Space Relative Humidity – Displays the current value of relative humidity sensor, if present.	R: 0 to 100%
Relative Humidity Calibration – You can enter a calibration offset for the relative humidity. The offset is added to or subtracted from the controller's RH input value, and the calculated value is shown in the **Status** > **Space Relative Humidity**.	D: 0% R: -15 to 15%rh

Setpoints

Navigation:	i-Vu® / Field Assistant:	**Properties** > **Equipment** > **Configuration** > **Setpoints**
	BAC*view*®:	**HOME** > **CONFIG** > **SETPOINT**

Select a color band on the setpoint graph to see the current setpoints in the **Heating** and **Cooling** fields. The values in this graphic are Fahrenheit. See setpoint descriptions below.



Occupied Setpoints

The occupied setpoints described below are the setpoints under normal operating conditions. The Demand Level 1–3 setpoints apply if demand limiting is used.

Demand limiting is a cost-saving strategy to reduce energy consumption. The strategy expands the occupied heating and cooling setpoints when the system reaches one of 3 levels of consumption. With the expanded setpoints, the equipment works less, thereby saving energy. By default, Demand Level 1 expands the occupied heating and cooling setpoints by 1Δ°F (Δ.5°C), Demand Level 2 by 2Δ°F (1.1Δ°C), and Demand Level 3 by 4Δ°F (2.2Δ°C). If the occupied heating or cooling setpoints change, the (effective) demand level setpoints automatically change by the same amount. See *Sequence of Operation* (page 38) for more information.

	Default **Range:** -40 to 245°F (-40 to 118.3°C)				
			Demand Level		
Point Name/Description	**Occupied**		**1**	**2**	**3**
Occupied Heating – Green The heating setpoint the controller maintains while in occupied mode.	D: R:	70°F (21.1°C) 40 to 90°F (4.4 to 32.2°C)	69°F (20.5°C)	68°F (20°C)	66°F (18.9°C)
Occupied Cooling – Green The cooling setpoint the controller maintains while in occupied mode.	D: R:	76°F (24.4°C) 55 to 99°F (12.7 to 37.2°C)	77°F (25°C)	78°F (25.5°C)	80°F (26.6°C)

Point Name/Description	Default Range: -40 to 245°F (-40 to 118.3°C)			
		Demand Level		
	Occupied	1	2	3
Occupied Heating 1 – Light Blue The space temperature must be less than the **Occupied Heating 1** setpoint for the VVT Master to consider the zone a heating caller in a linked system. In a single-zone application, the heating requirement begins as soon as the space temperature falls below the **Occupied Heating** setpoint. We recommend that the **Occupied Heating 1** value be set no less than 0.5Δ°F (.27Δ°C) below the **Occupied Heating** setpoint.	69°F (20.5°C)	68°F (20°C)	67°F (19.4°C)	65°F (18.3°C)
Occupied Heating 2 – Dark Blue The space temperature must be less than the **Occupied Heating 2** setpoint to generate a low space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) below the **Occupied Heating 1** setpoint.	67°F (19.4°C)	66°F (18.9°C)	65°F (18.3°C)	63°F (17.2°C)
Occupied Cooling 1 – Yellow The space temperature must be greater than the **Occupied Cooling 1** setpoint for the VVT Master to consider the zone a cooling caller in a linked system. In a single-zone application, the cooling requirement begins as soon as the space temperature exceeds the **Occupied Cooling** setpoint. We recommend that the **Occupied Cooling 1** value be set no less than 0.5Δ°F (.27Δ°C) above the **Occupied Cooling** setpoint.	77°F (25°C)	78°F (25.5°C)	79°F (26.1°C)	81°F (27.2°C)
Occupied Cooling 2 – Orange The space temperature must be greater than the **Occupied Cooling 2** setpoint to generate a high space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) above the **Occupied Cooling 1** setpoint.	79°F (26.1°C)	80°F (26.6°C)	81°F (27.2°C)	83°F (28.3°C)

Unoccupied Setpoints

Point Name/Description	Default/Range
Unoccupied Heating – Gray The heating setpoint the controller maintains while in unoccupied mode.	D: 55°F (12.7°C) R: 40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling – Gray The cooling setpoint the controller maintains while in unoccupied mode.	D: 90°F (32.2°C) R: 45 to 99°F (7.2 to 37.2°C)
Unoccupied Heating 1 – Light Blue The space temperature must be less than the **Unoccupied Heating 1** setpoint for the VVT Master to consider the zone an unoccupied heating caller in a linked system. In a single-zone application, the unoccupied heating requirement begins as soon as the space temperature falls below the **Unoccupied Heating** setpoint. We recommend that the **Unoccupied Heating 1** value be set no less than 0.5Δ°F (.27Δ°C) below the **Unoccupied Heating** setpoint.	D: 54°F (12.2°C) R: 40 to 90°F (4.4 to 32.2°C)

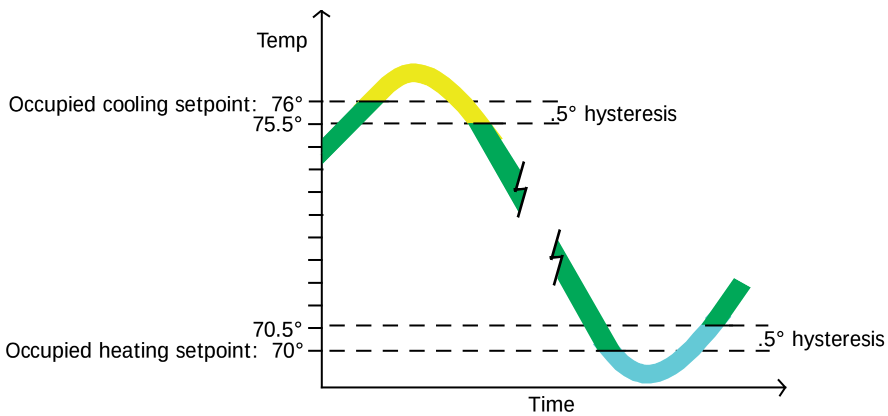
Unoccupied Heating 2 – Dark Blue The space temperature must be less than the **Unoccupied Heating 2** setpoint to generate an unoccupied low space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) below the **Unoccupied Heating 1** setpoint.	D: 52°F (11.1°C) R: 40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling 1 – Yellow The space temperature must be greater than the **Unoccupied Cooling 1** setpoint for the VVT Master to consider the zone an unoccupied cooling caller in a linked system. In a single-zone application, the unoccupied cooling requirement begins as soon as the space temperature exceeds the **Unoccupied Cooling** setpoint. We recommend that the **Unoccupied Cooling 1** value be set no less than 0.5Δ°F (.27Δ°C) above the **Unoccupied Cooling** setpoint.	D: 91°F (32.8°C) R: 45 to 99°F (7.2 to 37.2°C)
Unoccupied Cooling 2 – Orange The space temperature must be greater than the **Unoccupied Cooling 2** setpoint to generate an unoccupied high space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) above the **Unoccupied Cooling 1** setpoint.	D: 93°F (33.9°C) R: 45 to 99°F (7.2 to 37.2°C)
Point Name/Description	**Range**
Heating Capacity – Used for Optimal Start, this is the rate at which the zone temperature changes when the heating system runs at full capacity to maintain designed occupied heating setpoint.	D: 5Δ°F (2.7Δ°C) R: 0 to 120Δ°F (0 to 66.6Δ°C)/hr
Heating Design Temp – The geographically-based outdoor air temperature at which the heating system must run constantly to maintain comfort. This information is available in ASHRAE publications and most design references.	D: 0°F/C R: -100 to 150°F (-73.3 to 65.5°C)
Cooling Capacity – Used for Optimal Start, this is the rate at which the zone temperature changes when cooling system runs at full capacity to maintain designed occupied cooling setpoint.	D: 5Δ°F (2.7Δ°C) R: 0 to 140Δ°F (0 to 77.7Δ°C)/hr
Cooling Design Temp – The geographically-based outdoor air temperature at which the cooling system must run constantly to maintain comfort. This information is available in ASHRAE publications and most design references. Displays the value set in **Min Setpoint Separation**.	D: 100°F (37.7°C) R: -100 to 150°F (-73.3 to 65.5°C)

Hysteresis – The desired difference between the temperature at which the zone color changes as the zone temperature departs from the acceptable range between the heating and cooling setpoints (green) into the Cooling 1 (yellow) or Heating 1 (light blue) and the temperature at which the zone color changes back to the acceptable range between the heating and cooling setpoints.

For example, the following graph shows the zone color that results as the zone temperature departs from and returns to the acceptable range in a zone with the following settings:

- Color Change Hysteresis = .5Δ°F (.27Δ°C) (applies as the temperature returns to the acceptable range)
- Occupied cooling setpoint = 76°F (24.4°C)
- Occupied heating setpoint = 70°F (21.1°C)

NOTE The values in the graph below are Fahrenheit.



D: 0.5Δ°F (.27Δ°)

R: 0.2 to 1.0Δ°F (.1 to .5Δ°C)

Learning Adaptive Optimal Start

Red	DkBlue	LtBlue	Green or SpGrn		Yellow	Orange	Red
0.1900	0.1300	0.0600	0.0600	0.0600	0.0600	0.1300	0.1900

When the Learning Adaptive Optimal Start algorithm runs, the learned heating capacity or learned cooling capacity values are adjusted based on the color that is achieved when occupancy begins. The adjustment amounts for each color are displayed in the thermographic color fields (shown above with English default values).

Point Name/Description	Range English	Metric
Red – The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is red.	D: 0.1900 R: 0 to 1	.1055
DkBlue – The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is dark blue.	D: 0.1300 R: 0 to 1	.0722
LtBlue – The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is light blue.	D: 0.0600 R: 0 to 1	.0333

Point Name/Description	**Range** **English**	**Metric**
Green – The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is green.	D: 0.0600 R: 0 to 1	.0333
SpGrn – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is green.	D: 0.0600 R: 0 to 1	.0333
Yellow – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is yellow.	D: 0.0600 R: 0 to 1	.0333
Orange – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is orange.	D: 0.1300 R: 0 to 1	.0722
Red – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is red.	D: 0.1900 R: 0 to 1	.1055
Point Name/Description	**Default/Range**	
Heating – (Occupied or Unoccupied, depending on mode) The current programmed **Heating** setpoint adjusted by any offset that may be in effect.	R: 0 to 120°F (-17.8 to 48.9°C)	
Cooling – (Occupied or Unoccupied, depending on mode) The current programmed **Cooling** setpoint adjusted by any offset that may be in effect.	R: 0 to 120°F (-17.8 to 48.9°C)	
Learned cooling capacity – The cooling capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature down to the occupied cooling setpoint prior to the occupied time.	R: °F/C	
Learned heating capacity – The heating capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature up to the occupied heating setpoint prior to the occupied time.	R: °F/C	
Optimal Start – The number of hours prior to occupancy, at which the Optimal Start function may begin to adjust the effective setpoints to achieve the occupied setpoints by the time scheduled occupancy begins. Enter 0 to disable Optimal Start. **NOTE** Optimal Start is automatically disabled when **Properties** > **Equipment** > **Maintenance** > **Occupancy** > **BAS On/Off** is set to either **Unoccupied** or **Occupied**.	D: 1 hr R: 0 to 4 hours	

Point Name/Description	**Range** **English**	**Metric**
Optimal Start Type – The method used to change from unoccupied to occupied setpoint. Options: **None*** – Unit will not change to occupied setpoint until the scheduled time or the unit goes into an occupied mode. Setpoints do not ramp, but change immediately from unoccupied to occupied values. **Temp Compensated*** – Unit changes to occupied setpoints at a variable time prior to the occupied time, which is calculated by the current error between space temperature and the appropriate heating or cooling setpoint. At that time, the setpoints do not ramp, but change immediately from unoccupied to occupied values. **Learning Adaptive Start** – Unit gradually changes to occupied setpoints by adjusting the unoccupied setpoints over a specified period of time to achieve the occupied setpoint by the time scheduled occupancy begins. ***When selecting **None** or **Temp Compensated**, you should set all **Learning Adaptive Optimal Start** transition factors to **0**, as shown below. Red DkBlue LtBlue Green or SpGrn Yellow Orange Red 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	D: Temperature Compensated R: None Temperature Compensated Learning Adaptive	
Heat Start K factor (min/deg) – If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is below the occupied heating setpoint (including any setpoint offset).	D: 15.00 R: 0 to 99	
Cool Start K factor (min/deg) – If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is above the occupied cooling setpoint (including any setpoint offset).	D: 15.00 R: 0 to 99	
Standby Offset – The value by which the occupied setpoints are expanded when the space occupancy sensor indicates that the space is unoccupied. If 0, the unoccupied setpoints are used.	D: 0Δ°F/Δ°C R: 0 to 15Δ°F (0 to 8.3Δ°C)	
Occupied RH Control Setpoint – If **Optional Sensor Type** is set to **RH Sensor** and **RH Control** is set to **Enable**, this is the relative humidity setpoint during occupancy. The air source mode must be **Cool** or **Vent** and the terminal mode must be **Cooling** or **Vent** before the dehumidification function can be active.	D: 65%rh R: 0 to 100%rh	
DCV Start Ctrl Setpoint – If **Optional Sensor Type** is set to **IAQ Sensor** and **DCV Control** is set to **Enable**, this is the value that the CO2 sensor must exceed to begin the DCV control function. This value should be set to approximately 75 ppm above the outdoor air CO2 level.	D: 500ppm R: 0 to 9999 ppm	
DCV Max Ctrl Setpoint – If **Optional Sensor Type** is set to **IAQ Sensor** and **DCV Control** is set to **Enable**, this is the value that the CO2 level must exceed to begin the IAQ function to control the damper to **DCV MAX Vent Airflow**.	D: 1050ppm R: 0 to 9999 ppm	
Parallel Fan ON Value – If **Terminal Type** is **Parallel Fan** and the zone does not require heating, when the zone's airflow control setpoint decreases below this value, the parallel fan turns on to increase airflow, ventilation, and prevent cold air dumping into the zone. If the airflow control setpoint rises above this value by more than 1 cfm (liters/sec), the parallel fan turns off. We recommend this value be set to approximately 10% above the **Occupied Min Airflow** setpoint. Set to 0 to disable this function.	D: 0 cfm (liters/sec) R: 0 to 99999 cfm (liters/second)	

Alarm Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Configuration** > **Alarm Configuration**
BAC*view*®: **HOME** > **CONFIG** > **ALARMS**

Point Name/Description	Default/Range
Space Temperature Alarm	
Occupied Alarm Hysteresis – This value is added to the effective cooling setpoints and subtracted from the effective heating setpoints as output from the **Setpoint** microblock. These values establish the occupied high and low limits that the space temperature must exceed before an occupied SPT alarm is generated. The alarm returns to normal when the space temperature drops below the high effective setpoint or rises above the low effective setpoint.	D: 5Δ°F (2.7Δ°C) R: 0 to 20Δ°F (0 to 11.1Δ°C)
Alarm Delay (min/deg) – Determines the amount of delay before an occupied space temperature alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor temperature and occupied alarm setpoint plus 15 minutes.	D: 10 minutes R: 0 to 30 minutes
Unoccupied Low SPT Alarm Limit –The value that the space temperature must drop below to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 45°F (7.2°C) R: 35 to 90°F (1.6 to 32.2°C)
Unoccupied High SPT Alarm Limit – The value that the space temperature must exceed to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 95°F (35°C) R: 45 to 100°F (7.2 to 37.7°C)
Supply Air Temperature Alarm	
Low SAT Alarm Limit – The value that the supply air temperature must drop below to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 45°F (7.2°C) R: 15 to 90°F (-9.4 to 32.2°C)
High SAT Alarm Limit – The value that the supply air temperature must exceed to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 120°F (48.9°C) R: 90 to 175°F (32.2 to 79.4°C)
Space Humidity Alarm	
Occupied High RH Alarm Limit – The value that the relative humidity sensor must exceed to generate a **Space Humidity Alarm** in the occupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D: 100%rh R: 45 to 100%rh
Alarm Delay (min/%RH) – Determines the amount of delay before an occupied RH alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor RH value and the occupied RH setpoint plus 15 minutes.	D: 5 minutes R: 0 to 30 minutes
Unocc High RH Alarm Limit – The value that the relative humidity sensor must exceed to generate a **Space Humidity Alarm** in the unoccupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D: 100%rh R: 45 to 100%rh
IAQ/Ventilation Alarm	

Point Name/Description	Default/Range
Occupied High CO2 Alarm Limit – The value that the CO_2 sensor must exceed to generate an **Indoor Air Quality Alarm** in the occupied mode if **DCV Control** is set to **Enable**. There is a fixed hysteresis of 100ppm for return to normal.	D: 1100ppm R: 0 to 9999 ppm
Alarm Delay (min/ppm) – The fractional portion of a minute used to determine the amount of delay before an indoor air quality alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor CO_2 value and the setpoint plus 15 minutes.	D: 0.25 minutes R: 0.10 to 1.00 minutes
Alarms Displayed on SPT Sensor	
Space Temperature Alarm – If set to display, shows the alarm indicator on the SPT Pro sensor if the space temperature alarm is active.	D: Ignore R: Ignore/Display
Supply Air Temp Alarm – Shows the alarm indicator on the SPT Pro sensor if the **Supply Air Temp Alarm** is active.	D: Ignore R: Ignore/Display
Dirty Filter Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus' sensor if a **Filter** alarm is active.	D: Display R: Ignore/Display
Space High Humidity Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus' sensor if the **Space Relative Humidity** alarm is active.	D: Ignore R: Ignore/Display
Space High CO2 Alarm – If set to display, shows the alarm indicator on the SPT Pro sensor if the **Indoor Air Quality Alarm** is in alarm.	D: Ignore R: Ignore/Display

Service Configuration

Navigation:	i-Vu® / Field Assistant:	**Properties** > **Equipment** > **Configuration** > **Service Configuration**
	BAC*view*®:	**HOME** > **CONFIG** > **SERVICE**

Point Name/Description	Default/Range
Terminal Type – The type of zone terminal that the controller is installed on. Not available for VAVB1.	D: Single Duct R: Single Duct Parallel Series Fan
Terminal Size – Shows the value entered as the **Cooling Max Airflow** in the **Flow Control** object.	D: 2100 cfm (991.2 liters/second) R: 0 to 99999 cfm (liters/second)
Disable Series Fan – When set to **Enable**, the controller disables the fan on a series-type terminal when the airflow setpoint equals 0. (We do not recommend configuring the minimum occupied airflow setpoint to 0, as this does not meet minimum ventilation requirements.)	D: N/A R: N/A Enable

Point Name/Description	Default/Range
External Actuator Enable – Enable if the controller's analog output is used for an external high-torque or slave actuator. Enabling this setting disables the output for Modulating Hot Water or Combination reheat functions.	D: Disable R: Disable/Enable
Heat Type – The type of supplemental reheat that the zone controller will control. The heat may be used with system heat, depending on the space temperature demand. Options: **None** – no heat **Modulating** – ducted or baseboard modulating hot water **Two Position** – two position hot water **Staged EH** – ducted or baseboard electric heat **Combination** – combination baseboard modulating hot water and ducted staged electric heat **CV Modulating** – constant volume modulating reheat used for single duct terminal application with modulating hot water reheat (typically used in hospital applications) **SCR Electric** – modulating control for SCR-type electric heater	D: None R: None Modulating Two Position Staged EH Combination CV Modulating SCR Electric
Ducted Heat – Determines whether the zone is using ducted heat or baseboard. If **Heat Type** is **Combination**, set this field to **Yes** for ducted heat.	D: Yes R: No/Yes
CV Modulating PID – This BACnet object calculates the amount of capacity required to satisfy the current space temperature setpoint, when the terminal is heating and the **Heat Type** is set to **CV Modulating**. **CAUTION** The default values should be changed only by a technician trained in PID Loop algorithms.	D: Type = reverse Update Interval = 0:15 P = 20 (40 metric) I = 1.0 (2.0 metric) D = 0 Bias = 0 Deadband = 0
VAV Heating – Set to **Enable** to have the terminal modulate its airflow to meet a zone heating demand when the air source mode is Heating or Warm-up. Always set to **Disable** for parallel fan terminals.	D: Disable R: Disable/Enable
Number of Heat Stages – The number heat stages when the **Heat Type** is **Staged EH**. Fan-powered terminals are limited to no more than 2 stages.	D: Two stages R: One stage Two stages Three stages
Valve Type – Two Position hot water only - The hot water valve's position with no power applied to the valve.	D: NC R: NC/NO (normally closed/normally open)
Optional Sensor Type – The type of sensor used on the controller's **RH/CO2** input. This setting determines the control channel input function. Options: **RH Sensor –** Relative humidity for zone dehumidification **IAQ Sensor** – Indoor air quality for DCV control	D: None R: None RH Sensor IAQ Sensor
RH Control – Enables or disables zone dehumidification control if valid RH sensor values are available.	D: Disable R: Disable/Enable
DCV Control – Demand control ventilation control.	D: Disable R: Disable/Enable
Min Setpoint Separation – Minimum separation that must be maintained between the heating and cooling setpoints.	D: 4Δ°F (2.2Δ°C) R: 2 to 10Δ°F (1.1 to 5.5Δ°C)

Point Name/Description	Default/Range
Occ Override Normal Logic State – The normal state of the controller's **Remote Occupancy** input. If the input's contact is the same state as the configured state, the controller follows its controlling schedule. If the contact is in the opposite state of the configured state, the controller is forced into the unoccupied mode.	D: Open R: Open/Closed
RH Sensor Min Input Volts – The lowest voltage that should be read from the relative humidity (RH) sensor.	D: 0.00 V R: 0 to 5.00 V
RH Sensor Max Input Volts – The highest voltage that should be read from the RH sensor.	D: 5.00 V R: 0 to 5.00 V
RH Sensor Value @ Min Volts – The % relative humidity that correlates to the RH sensor's low voltage reading.	D: 0% R: 0 to 99%
RH Sensor Value @ Max Volts – The % relative humidity that correlates to the RH sensor's high voltage reading.	D: 100% R: 0 to 100%
CO2 Sensor Min Input Volts – The lowest voltage that should be read from the CO_2 sensor.	D: 1.00 V R: 0 to 5.00 V
CO2 Sensor Max Input Volts – The highest voltage that should be read from the CO_2 sensor.	D: 5.00 V R: 0 to 5.00 V
CO2 Sensor Value @ Min Volts – The ppm value that correlates to the CO_2 sensor's low voltage reading.	D: 0 ppm R: 0 to 9999 ppm
CO2 Sensor Value @ Max Volts – The ppm value that correlates to the CO_2 sensor's high voltage reading.	D: 2000 ppm R: 0 to 9999 ppm
Flow Control: Click **Flow Control** to access the microblock popup **Properties** page > **Summary** and **Details** tabs. See the microblock Help files for more detailed explanations.	
Flow sensor - The airflow sensor type used by your equipment. Leave as **Built-in flow sensor**.	D: Built-in flow sensor
Damper Actuator - The damper type used by the equipment. Leave as **Built-in actuator**.	D: Built-in actuator
Flow Measurement Units – The flow measurement output. Do not change the default of **cfm** (liters/second).	D: CFM (liters/second)
Damper Motor Travel Time – The actuator's travel time from full closed to full open. Leave this field at 205 seconds.	D: 205 seconds
Direction Clockwise – If **Damper Actuator** is set to **Built-in actuator**, set this field to the damper's position when it rotates clockwise.	D: Closed R: Open/Closed
Target Damper Position - The current damper position. To override normal control for troubleshooting purposes, select **Lock value to** and then enter a value. The damper moves to that position until **Lock value to** checkbox is cleared.	R: 0 to 100%
Auxheat - The current configured **Reheat Min Damper Position**. To override normal control for reheat troubleshooting purposes, select **Lock value to** and then enter a value. The damper moves to that position until **Lock value to** checkbox is cleared.	R: 0 to 100%

Point Name/Description	Default/Range
Fan – The current value of the fan output relay. To override normal control for troubleshooting purposes, select **Lock value to** and then enter **On** or **Off**. The relay stays in that state until the **Lock value to** checkbox is cleared.	R: Off/On
Cooling Max Airflow – The maximum airflow the terminal will supply when trying to meet a zone cooling demand when the air source mode is Cooling, Vent, or Free Cooling.	D: 2100 cfm (991.2 liters/second) R: 0 to 99999 cfm (liters/second)
Heating Max Airflow – The maximum airflow the terminal will supply when trying to meet a zone heating demand when the air source mode is Heating or Warm-up and **VAV heating** has been enabled.	D: 2100 cfm (991.2 liters/second) R: 0 to 99999 cfm (liters/second)
Occupied Min Airflow – The minimum airflow setpoint the terminal controls to when the air source is operating and the terminal mode is occupied.	D: 315 cfm (148.9 liters/second) R: 0 to 99999 cfm (liters/second)
Unoccupied Min Airflow – The minimum airflow setpoint the terminal controls to when the air source is operating and the terminal mode is unoccupied.	D: 315 cfm (148.9 liters/second) R: 0 to 99999 cfm (liters/second)
Auxiliary Heat Min Airflow – ONLY used for Single Duct units with ducted reheat. Set to the minimum airflow specified by the manufacturer to allow the reheat to provide optimum performance. This value is compared to the appropriate **Min Airflow** value above and the greater of the two values determines the damper position. For all other terminal types, set to 0.	D: 1680 cfm (793 liters/second) R: 0 to 99999 cfm (liters/second)
Test and Balance – Use the following command buttons when commissioning a zone, balancing the system, replacing the zone controller, or troubleshooting. If **Automatic Control** is not selected within 4 hours, the controller will resume normal control. **Zero Flow** – Closes the damper, takes a number of flow samples, then sets the zero calibration. **Damper Full Open** – Opens damper fully and enables the **Damper Full Open** calibration fields. **Cool Max Airflow** – Forces the damper to its maximum cooling position. Calibration fields apply only if the primary use of this damper is cooling. **Occupied Min Airflow** – Forces the damper to its maximum cooling position. Calibration fields apply only if the primary use of this damper is cooling. **Automatic Control** – Returns the damper to its normal control routines. **This must be activated when you finish using any of the other Test and Balance commands.** **Close Damper** – Forces the damper to its full closed position. **Heat Max Airflow** – Forces the damper to its maximum heating position. Calibration fields apply only if the primary use of the damper is heating.	
System Space Temperature – The current value of the controlling space temperature received over the network from another source. -999 indicates no value has been received and it will not be used.	R: -50 to 150°F (-45.5 to 65.5°C)
System Setpoint Adjustment – The space temperature setpoint adjustment value received over the network.	R: -5 to 5Δ°F (-2.7 to 2.7Δ°C)
System Space RH – The relative humidity received over the network. -999 indicates no value has been received and it will not be used.	R: 2 to 100%

Point Name/Description	Default/Range
System Space AQ – The indoor air quality received over the network. -999 indicates no value has been received and it will not be used.	R: 300 to 9999 ppm
System Cool Demand Level– The value received over the network and used by the demand limiting function to expand the cooling setpoint.	R: 0 to 3
System Heat Demand Level– The value received over the network and used by the demand limiting function to expand the heating setpoint.	R: 0 to 3
System Outdoor Air Temperature – The OAT received over the network.	R: -50 to 150°F (-45.5 to 65.5°C)
System Occupancy – Allows an occupancy status value from another controller to be read over the network and used by this controller. The remote controller must be equipped with a network-accessible occupancy status point.	D: Unoccupied R: Unoccupied/Occupied

Maintenance

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Maintenance**
BAC*view*®: **HOME** > **MAINT**

Point Name/Description	Default/Range
Unit	
Occupancy Status – The controller's occupancy status as determined by a network schedule, a local schedule, or a timed override.	R: Unoccupied/Occupied
Temp Compensated Start or **Learning Adaptive Start** – Indicates the type of optimal start (if any) that is configured and whether the algorithm is active or inactive.	R: Inactive/Active
Space Temp Source – The source of the controlling space temperature value. Options: **Sensor Failure** – No valid space temperature or sensor status = failed. **SPT Sensor** – An SPT sensor is connected to the controller's Rnet port. **T55/56** – A T55, T56, or T59 sensor is connected to the controller's J20 terminals. **Network** – A network temperature sensor is bound to the controller's space temperature AV. **Airside Linkage** – The space temperature from a linked terminal. **Locked Value** –The controller's space temperature input has been manually locked at a value.	R: Sensor Failure SPT Sensor T55/T56 Network Airside Linkage Locked Value
Setpoint Adjustment – The amount that a user has adjusted the setpoints at an SPT space sensor.	R: -20 to 20Δ°F (-11.1 to 11.1Δ°C)
Effective Heat Setpoint – The current heating setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: °F/C
Effective Cool Setpoint – The current cooling setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: °F/C

Point Name/Description	Default/Range
Primary Airflow Setpoint – The desired airflow setpoint calculated by the controller to meet the required temperature, IAQ, or dehumidification requirements.	R: 0 to 99999 cfm (liters/second)
Relative Humidity Source – The source of the relative humidity value.	R: N/A Local Network Linkage Locked Value
IAQ Source – The source of the indoor air quality value.	R: N/A Local Network Linkage Locked Value
Outdoor Air Temperature Source – The source of the outdoor air temperature.	R: N/A Local Network Linkage Locked Value
Cooling Demand Level – The system cool demand level received over the network.	R: 0 to 3
Heating Demand Level – The system heat demand level received over the network.	R: 0 to 3
Heat Delay – The status of the terminal heat delay.	R: Inactive/Active
Remaining Heat Delay – If **Heat Delay** is **Active**, this is the remaining delay time.	R: 0 to 60 minutes
Calculated DCV Capacity – If **DCV Control** is set to **Enable**, this is the calculated minimum airflow, expressed as a percentage, that will be maintained to satisfy the ventilation requirement.	R: 0 to 100%
Calculated Dehumidify Capacity – If **RH Control** is set to **Enable**, this is the calculated minimum airflow, expressed as a percentage, that will be maintained to satisfy the dehumidification requirement.	R: 0 to 100%
Reset Filter Alarm – Set this to **On** to reset an active **Filter Alarm** and restart the **Filter Service Alarm Timer**. After the alarm returns to normal, this automatically changes to **Off**.	D: Off R: Off/On
Occupancy Contact State - The physical state of the **Remote** input.	R: Open/Closed
Occupancy	
BAS On/Off – Determines the occupancy state of the controller and can be set over the network by another device or third party BAS. Options: • **Inactive** – Occupancy is determined by a configured schedule. • **Occupied** – The controller is always in the occupied mode. • **Unoccupied** – The controller is always in the unoccupied mode. **NOTE** If **BAS On/Off** is set to either **Unoccupied** or **Occupied**, the **Optimal Start** routine is automatically disabled.	D: Inactive R: Inactive Occupied Unoccupied
Schedules – The controller's occupancy status based on the local schedule.	R: Unoccupied/Occupied
Pushbutton Override – **Active** indicates if a user pushed the sensor's override button to override the occupancy state.	R: Off/Active

Point Name/Description	Default/Range
Override Time Remaining – The amount of time remaining in an override period.	R: 0 to 480 minutes
Occupancy Contact Status – The physical state of the controller's **Remote** input.	R: Inactive Active Unoccupied/Stdby
Global Occupancy – The **System Occupancy** network input's current state.	D: Unoccupied R: Unoccupied/Occupied

Alarms

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Alarms**
BAC*view*®: **HOME** > **ALARM**

Point Name/Description	Range
Space Temperature – Indicates if the space temperature exceeds the high or low alarm limit.	R: Normal/Alarm
Alarming Temperature – Indicates the space temperature value that caused the space temperature alarm. This value is only displayed when the **Space Temperature** alarm (above) is in **Alarm**.	R: -56 to 245°F (-48.9 to 118.3°C)
Alarm Limit Exceeded – Indicates the value of the space temperature alarm limit that caused the space temperature alarm condition. Value is only displayed when the **Space Temperature** alarm (above) is in **Alarm**.	R: -56 to 245°F (-48.9 to 118.3°C)
Space Temp Sensor – Indicates if the space temperature sensor fails.	R: Normal/Alarm
Indoor Air Quality – Indicates if the occupied CO_2 level exceeds the **Occupied High CO2 Alarm Limit**.	R: Normal/Alarm
Supply Air Temperature – Indicates if the supply air temperature exceeds the high temperature alarm limit or drops below the low temperature alarm limit.	R: Normal/Alarm
Filter – Indicates if the filter's runtime hours exceeds the runtime alarm limit.	R: Clean/Dirty
Space Relative Humidity – Indicates if the relative humidity exceeds the high RH alarm limit.	R: Normal/Alarm
Network OAT - Indicates if the controller is not receiving a valid OAT value over the network.	R: Normal/Alarm
Airside Linkage Status – If the controller is the VVT Master, **Alarm** indicates that it lost Linkage communications with the air source. If the controller is a slave, **Alarm** indicates that it lost Linkage communications with the VVT master.	R: Normal/Alarm

Linkage

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Linkage**
BAC*view*®: **HOME** > **CONFIG** > **LINKAGE**

<table>
<tr><th>Point Name/Description</th><th>Default/Range</th></tr>
<tr><td>Airside Linkage</td><td></td></tr>
<tr><td>Click Linkage Collector/Linkage Provider to access the microblock popup's Summary and Details tabs. See the microblock popup's Help for more detailed explanations.</td><td></td></tr>
<tr><td>Linkage Collector – For a VAV Master, set the Number of Providers to the total number of controllers that will report to the Master, including the Master. For a slave, the Number of Providers is 1. See Linkage (page 43) for additional information.</td><td>D: 1
R: 1 to 64</td></tr>
<tr><td>Linkage Provider – Depends on this controller's function.
<table>
<tr><th>If the controller is...</th><th>Enter the MS/TP network number and MAC address of...</th></tr>
<tr><td>The main VAV Master</td><td>The linked air source controller</td></tr>
<tr><td>A sub-master</td><td>The main VAV Master</td></tr>
<tr><td>A slave that is not on the same MS/TP network as its master</td><td>Its masters</td></tr>
</table>
Network Number

Address
NOTE If you change the Network Number or Address from a BACview device, you must cycle power to the controller for the changes to take effect.</td><td>D: 0
R: 0 to 65,535

D: 0
R: 0 to 127</td></tr>
<tr><td>Airside Linkage Status – If Active, the controller is part of a linked system. If Not Active, the controller is a stand-alone device.</td><td>R: Not Active/Active</td></tr>
<tr><td>Linkage Zone Type – Select whether the controller is a Master or a slave.
Select VAV Master if the controller is the Master or a sub-master in a VAV application.
Select VVT Master only if the controller is the Master in a VVT application. VVT applications do not support sub-masters.</td><td>D: Slave
R: Slave
VVT Master
VAV Master</td></tr>
<tr><td>Inhibit Heating Call from this zone? - VVT system only. If Yes, the VVT Master ignores this controller as a heating caller.</td><td>D: No
R: No/Yes</td></tr>
<tr><td>Active Heating Caller? – VVT system only. Determines if the zone will be counted as a heat caller for system heating when the zone has a local demand for heat.</td><td>D: Yes
R: No/Yes</td></tr>
<tr><td>Inhibit Cooling Call from this zone? - VVT system only. If Yes, the VVT Master ignores this controller as a cooling caller.</td><td>D: No
R: No/Yes</td></tr>
</table>

Point Name/Description	Default/Range
Active Cooling Caller? – VVT system only. Determines if the zone will be counted as a cool caller for system cooling when the zone has a local demand for cooling.	D: Yes R: No/Yes
Linkage Callers – VVT system only. The minimum number of zones required to make the air source go into heating or cooling mode. 1 is typical for systems with 8 zones or less. For larger systems, increase the number by 1 for each 6 zones. For example, 3 linkage callers for a 20 zone system.	D: 1 R: 1 to 32
System Mode Reselect Timer (minutes) – Applies only to a VVT master. Defines how long the system continues to operate in the current mode before it reassesses all zones while the current demand is still active.	D: 30 R: 10 to 120
Linkage RH Type – Determines if the VVT or VAV Master sends to the air source the average or maximum values of all linked zone controllers that have a relative humidity (RH) sensor.	D: Avg R: Avg/Max
Linkage IAQ Type – Determines if the Master controller sends to the air source the average or maximum values of all linked zone controllers that have a CO_2 sensor for DCV and IAQ control.	D: Max R: Avg/Max
Air Source Mode – If **Airside Linkage Status** is **Active**, this is the current mode of the linked air source. If **Airside Linkage Status** is **Not Active**, this is the mode of the air source as determined by the zone controller's SAT sensor.	R: OFF WARMUP HEAT COOL FREECOOL PRESSURE EVAC VENT
Air Source Supply Air Temp – Displays the air source's SAT when **Airside Linkage Status** is **Active**.	R: -56 to 245°F (-48.9 to 118.3°C)
Air Source Static Pressure – Displays the air source's supply static pressure when **Airside Linkage Status** is **Active**.	R: 0 to 5.0 in wc (0 to 1.245 kPa)
Air Source Outdoor Air Temp – Displays the air source's OAT when **Airside Linkage Status** is **Active**.	R: -56 to 245°F (-48.9 to 118.3°C)

I/O Points

Navigation:	i-Vu / Field Assistant:	**Properties** > **I/O Points**
	BACview:	**N/A**

WARNING! Do not change the **Value**, **Offset/Polarity**, **Exp:Num**, **I/O Type**, **Sensor/Actuator Type**, **Min/Max**, or **Resolution** I/O configuration parameter for the points listed below. Changing these parameters could cause improper control and/or equipment damage. Use extreme caution if locking a point as this may also cause improper control and/or equipment damage.

Point Name/Description	Default/Range
Zone Temp Sensor/Zone Temp • **Zone Temp Sensor** - (SPT Standard, SPT Plus, and SPT Pro sensors only). Sensor configurations on the microblock's **Properties** > **Details** tab are listed below. For more information, consult the *Carrier Sensors Installation Guide*. • **Zone Temp** - do not adjust these settings.	R: -56 to 245°F (-48.9 to 118.3°C)
Sensor Type: **Min Present Value** - Minimum present value the sensor transmits before indicating an alarm.	D: 45°F (7.2°C)
Max Present Value - Maximum present value the sensor transmits before indicating an alarm.	D: 96°F (35.5°C)
Setpoint Adjustment: **Max Adjust** – The amount that a user may adjust the setpoint at the sensors.	D: 5Δ°F (2.7Δ°C) R: 0 to 15Δ°F (0 to 8.3Δ°C)
Reset setpoint adjust to zero when unoccupied - Resets the setpoint bias to zero when the controller transitions to unoccupied..	D: Off
Timed Local Override: **Allow Continuous** (SPT Pro only) – If checked, a user can press the sensor's local override button until the **Max Accum** value is reached, then press one more time to have a continuous override until the next occupied period or until the user cancels the override. The display shows **On** during a continuous override.	D: Off R: Off/On
Each Pulse – The amount of time added to the total override time whenever a user pushes the sensor's override button.	D: 30:00 mm:ss R: 0:00 to 1440:00 mm:ss
Max Accum – The maximum amount of override time accumulated when a user pushes the sensor's override button.	D: 240:00 mm:ss R: 0:00 to 2000:00 mm:ss
Cancel override – How long a user must push the sensor's override button to cancel an override.	D: 3 seconds R: 0 to 60 seconds

Point Name/Description	Default/Range
Sensor Array: **Sensor calculation method -** When using multiple SPT sensors, select the process variable to be passed to the controller..	D: Avg R: Avg, Min, Max
BACnet configuration: **Network Visible -** Must be enabled for other BACnet objects to read or write to this point, and for this point to generate alarms.	D: Enabled
Object Name - Do <u>not</u> change.	D: zone_temp
CO2 Sensor – The current voltage of the controller's **RH/CO2** input.	R: 0 to 5 Vdc
Flow Control / Flow Input - The current value of the controller's flow sensor input.	R: 0 to 99999 cfm (liters/second)
RH Sensor – The current voltage of the controller's **RH/CO2** input.	R: 0 to 5 Vdc
Zone Temp – The value of the controller's **T55** space temperature sensor input.	R: -56 to 245°F (-48.9 to 118.3°C)
SAT Sensor – The current value of the controller's SAT input.	R: -56 to 140°F (-48.9 to 60°C)
Occupancy Contact State – The current hardware state of the controller's **REMOTE** input.	R: Open/Closed
Sensor Invalid – This internal input monitors the communication between the controller and the SPT sensor. **Off** indicates communication is normal.	R: Off/On
Hot Water Valve - The current value of the controller's **HWV/ACT** output.	R: 0 to 100%
Heating Stage 1 - The current hardware state of the controller's **HEAT1** output.	R: Off/On
Heating Stage 2 - The current hardware state of the controller's **HEAT2** output.	R: Off/On
Fan S/S or EH 3 - The current hardware state of the controller's **FAN/HEAT3** output. The function of this output depends on the terminal type.	R: Off/On

Appendix B: VVT terminal modes

Air Source Mode	Temperature Control Requirement	Terminal Type	Aux Heat	Terminal Mode	Damper Control (Damper Setpoint used)	Heat Control	Fan Control
Off	None	All	N/A	Off	Hold Damper @ 70% (None)	Disable	Disable
	Cooling	All	N/A	Off	Hold Damper @ 70% (None)	Disable	Disable
	Heating	Single Duct	N/A	Off	Hold Damper @ 70% (None)	Disable	N/A
		Series or Parallel Fan	No	Off	Hold Damper @ 70% (None)	Disable	Disable
		Series Fan	Yes	Heating	Hold Damper @ 70% (None)	Enable	Enable
		Parallel Fan	Yes	Heating	Close Damper (None)	Enable	Enable
Vent	None	Single Duct	N/A	Heating	Minimum CFM (Vent)	Disable	N/A
		Series Fan	N/A	Vent	Minimum CFM (Vent)	Disable	Enable
		Parallel Fan	N/A	Vent	Minimum CFM (Vent)	Disable	Disable
	Cooling	Single Duct	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	N/A
		Series Fan	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	Enable
		Parallel Fan	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	Disable
	Heating	Single Duct, Parallel Fan	No	Cooling	Minimum CFM (Cool)	Disable	Disable
		Series Fan	No	Heating	Minimum CFM (Cool)	Disable	Enable
		Single Duct	Yes	Reheat	Minimum CFM	Enable	N/A
		Series or Parallel Fan	Yes	Heating	Minimum CFM (Cool)	Enable	Enable
Cool, Freecool	None	Single Duct	N/A	Vent	Minimum CFM (Cool)	Disable	N/A
		Series Fan	N/A	Vent	Minimum CFM (Cool)	Disable	Enable
		Parallel Fan	N/A	Vent	Minimum CFM (Cool)	Disable	Disable
	Cooling	Single Duct	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	Disable
		Series Fan	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	Enable
		Parallel Fan	N/A	Cooling	Modulate Min/Max CFM (Cool)	Disable	Disable
	Heating	Single Duct, Parallel Fan	No	Cooling	Minimum CFM (Cool)	Disable	Disable
		Series Fan	No	Heating	Minimum CFM (Cool)	Disable	Enable
		Single Duct	Yes	Reheat	Minimum CFM	Enable	N/A
		Series or Parallel Fan	Yes	Heating	Minimum CFM (Cool)	Enable	Enable

Air Source Mode	Temperature Control Requirement	Terminal Type	Aux Heat	Terminal Mode	Damper Control (Damper Setpoint used)	Heat Control	Fan Control
Heat, Warmup	None	Single Duct, Parallel Fan	N/A	Heating	Minimum CFM (Heat)	Disable	Disable
		Series Fan	N/A	Heating	Minimum CFM (Heat)	Disable	Enable
	Cooling	Single Duct, Parallel Fan	N/A	Heating	Minimum CFM (Heat)	Disable	Disable
		Series Fan	N/A	Heating	Minimum CFM (Heat)	Disable	Enable
	Heating	Single Duct	No	Heating	Modulate Min/Max CFM (Heat)	Disable	N/A
		Single Duct	Yes	Heating	Modulate Min/Max CFM (Heat)	Enable	N/A
		Series or Parallel Fan	No	Heating	Modulate Min/Max CFM (Heat)	Disable	Enable
		Series or Parallel Fan	Yes	Heating	Modulate Min/Max CFM (Heat)	Enable	Enable
Pressurization (Linked air source only)	None	Single Duct, Parallel Fan	N/A	Pressurize	Minimum CFM (Cool)	Disable	Disable
		Series Fan	N/A	Pressurize	Minimum CFM (Cool)	Disable	Enable
	Cooling	Single Duct, Parallel Fan	N/A	Pressurize	Minimum CFM (Cool)	Disable	Disable
		Series Fan	N/A	Pressurize	Minimum CFM (Cool)	Disable	Enable
	Heating	Single Duct, Parallel Fan	No	Pressurize	Minimum CFM (Cool)	Disable	Disable
		Series Fan	No	Pressurize	Maximum Cool CFM (Cool)	Disable	Enable
		Single Duct, Parallel Fan	Yes	Pressurize	Maximum Cool CFM (Cool)	Disable	Disable
		Series Fan	Yes	Pressurize	Maximum Cool CFM (Cool)	Disable	Enable
Evacuation/ Shutdown (Linked)	All	All	N/A	Evac	Close Damper	Disable	Disable

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