Air Source Interface for AppController Installation and Start-up Guide

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Important changes are listed in **Document revision history** at the end of this document.

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ASI for AppController overview and specifications

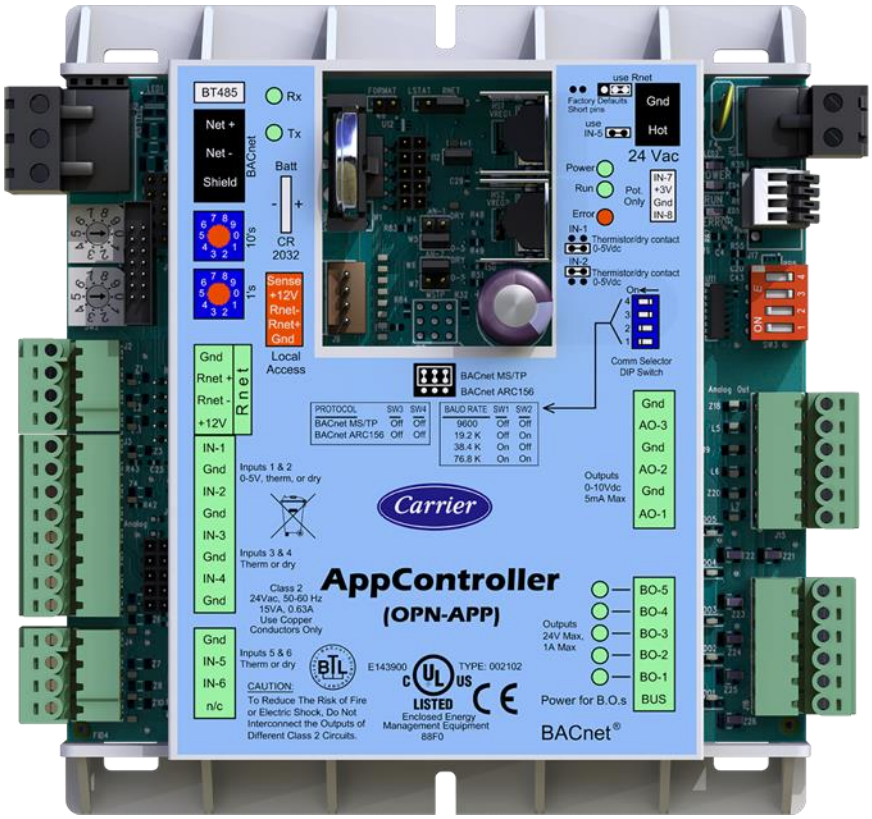
What is the Air Source Interface application?

The Air Source Interface (ASI) application for the AppController interfaces between the i-Vu® Control System (VVT Open or VAV Open) and the air source that is providing the conditioned air, in cases where the air source is NOT directly compatible and does not support Carrier Airside Linkage. These requirements are addressed through 2 different modes of operation (**Monitor** mode and **Control** mode).

NOTE The Air Source Interface application is available in both English and Metric units. The metric version is available on http://www.hvacpartners.com or *http://accounts.ivusystems.com* (*http://accounts.ivusystems.com*) > **Support** > **Download** > **Custom Applications** > **Metric Applications**.

You can use the ASI to control a 1 or 2-stage heating/cooling rooftop unit in a single zone application. The ASI interfaces with the unit's electro-mechanical thermostat terminals, enabling the unit to become a part of the i-Vu® Control System.

The AppController is a field-installed controller that mounts on the equipment. The controller must be downloaded in the field with the ASI application, available in EquipmentBuilder.



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Specifications

Power	24 Vac ±10%, 50–60 Hz 20 VA power consumption 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 BACnet ARC156 (156 kbps) or BACnet MS/TP (9600 bps – 76.8 kbps)
Rnet port	• Supports up to 10 wireless and/or ZS sensors, and one Equipment Touch or TruVu™ ET Display • Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77°F (25°C) with a 24 Vac nominal power source. NOTE Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port. **NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or TruVu™ ET Display must be powered by an external power source. See the specifications in each device's Installation and Start-up Guide to determine the power required.
Local Access port	For system start-up and troubleshooting using Field Assistant
Inputs	6 inputs configurable for thermistor or dry contact. 1 and 2 are also configurable for 0–5 Vdc sensors. **NOTES** • Inputs 7 and 8 are unused. • Input 5 has a maximum temperature of 140°F (60°C).
Input resolution	10 bit A/D
Analog outputs	analog outputs, 0–10 Vdc (5 mA max)
Binary outputs	5 binary outputs, dry relay contacts rated at 1 A max. @ 24 Vac/Vdc. Configured normally open
Output resolution	8 bit A/D, using filtered PWM
Real time clock	Battery-backed real time clock keeps track of time in the event of a power failure
Battery	10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, graphics, editable properties, schedules, and trends.
Protection	Built-in surge and transient protection for power and communications in compliance with EN61000-6-1. 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. **CAUTION** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building.

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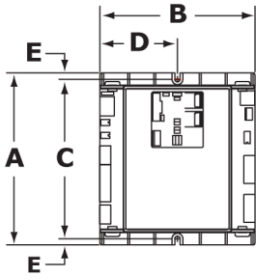
Status indicators	LEDs indicate status of communications, running, errors, and power.
Environmental operating range	0 to 130°F (-18 to 54°C), 0 to 90% relative humidity, non-condensing
Storage temperature range	-24 to 140°F (-30 to 60°C), 0 to 90% relative humidity, non-condensing
Physical	Rugged GE C2950HF Cycoloy plastic
	
Overall dimensions	A: 5-5/8 in. (14.3 cm) B: 5-1/8 in. (13 cm)
Mounting dimensions	C: 5-1/4 in. (13.3 cm) D: 2-9/16 in. (6.5 cm) E: 3/16 in. (.5 cm)
Panel depth	2 in. (5.1 cm)
Weight	0.44 lbs. (0.20 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

Safety considerations

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

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Installing the AppController

1. *Mount the controller* (page 4).
2. *Wire the controller for power* (page 5).
3. *Set the controller's address* (page 6).
4. *Wire the controller to the BACnet MS/TP or BACnet ARC156 network* (page 6).
5. *Wire inputs and outputs* (page 8).
6. Wire devices to the controller's Rnet port.
7. *Wire equipment to outputs* (page 19).

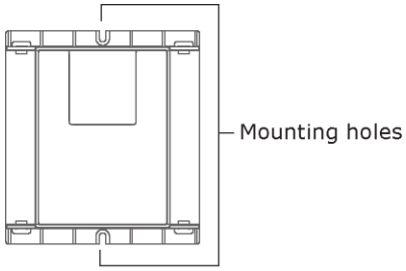
Mounting the controller

WARNING

When you handle the controller:

- Do not contaminate the printed circuit board with fingerprints, moisture, or any foreign material.
- Do not touch components or leads.
- Handle the board by its edges.
- Isolate from high voltage or electrostatic discharge.
- Ensure that you are properly grounded.

Screw the controller into an enclosed panel using the mounting slots on the coverplate. Leave about 2 in. (5 cm) on each side of the controller for wiring. Mounting hole dimensions 5 9/16" (14.1 cm) between mounting slot center lines.



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Wiring the controller for power

WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

CAUTIONS

- The 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 controllers.

To wire for power

1. Remove power from the power supply.
2. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**.
3. Connect the transformer wires to the screw terminal connector.

   NOTE If using a grounded transformer, connect the ungrounded lead to the **Hot** terminal to avoid damaging the transformer.
4. Apply power to the power supply.
5. Measure the voltage at the controller's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Insert the screw terminal connector into the controller's power terminals.
7. Verify that the **Power** LED is on and the **Run** LED is blinking.

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Addressing the controller

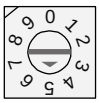
You must give the controller an address that is unique on the network. You can address the controller before or after you wire it for power.

1 If the controller has been wired for power, pull the screw terminal connector from the controller power terminals labeled **Gnd** and **Hot**. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the controller 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 controller.

Wiring for communications

The controller communicates using BACnet on the following types of network segments:

- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps
- ARC156 communicating at 156 kbps

NOTE For more networking details, see the *Open Controller Network Wiring Installation Guide*.

Wiring specifications for BACnet MS/TP and ARC156

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

WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

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To wire the controller to the BACnet network

1. Pull the screw terminal connector from the controller's power terminals labeled **24 Vac** and **Gnd** (**Return**).
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.

   NOTE Use the same polarity throughout the network segment.
4. Set the communication type and baud rate.

For...	Set Communications Selection jumper to...	Set DIP switches 1 and 2 to...	Set DIP switches 3 and 4 to...
MS/TP	**BACnet MS/TP**	The appropriate baud rate. See the **MS/TP Baud** diagram on the controller.	Off/Off
ARC156	**BACnet ARC156**	N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.	Off/Off

   NOTE Use the same baud rate for all controllers on the network segment.
5. Wire the controllers on a BACnet MS/TP or BACnet ARC156 network segment in a daisy-chain configuration.
6. If the controller is at either end of a network segment, connect a BT485 to the controller.
7. Insert the power screw terminal connector into the controller's power terminals.
8. Verify communication with the network by viewing a Module Status report in the i-Vu® interface.

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Wiring inputs and outputs

WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

See *Appendix A* (page 41) to print a blank wire list.

Inputs and outputs table

I/O	Type	I/O Terminal	Gnd Terminal	Point Name/ Function	Hardware/ Signal	Jumper Position of Pins
Zone Temp/ Zone Temp	AI	Rnet	Gnd	Space Temperature - Prime Variable	Communicating	N/A
Fan Status	BI	IN-1	2 - Gnd	Fan Status	Dry Contact	IN-1 Top
SAT Sensor	AI	IN-2	4- Gnd	Supply Air Temperature	10K Thermistor	IN-2 Top
RAT Sensor	AI	IN-3	6- Gnd	Return Air Temperature	10K Thermistor	N/A
OAT Sensor	AI	IN-4	8- Gnd	Outdoor Air Temperature	10K Thermistor	N/A
Input Channel #5	BI	IN-5*	1- Gnd	Filter status Pressurization Input	Dry Contact	N/A
Fire / Smoke Detect Input	BI	IN-6	1 - Gnd	Fire / Smoke Detector	Dry Contact	N/A
G Fan Output	BO	BO-1	1 - Pwr	Fan Output (G)	Relay	N/A
Y1 Cooling Output	BO	BO-2	1 - Pwr	1st Stage Cooling (Y1)	Relay	N/A
Y2 Cooling Output	BO	BO-3	1 - Pwr	2nd Stage Cooling (Y2)	Relay	N/A
W1 Heating Output	BO	BO-4	1 - Pwr	1st Stage Heating (W1)	Relay	N/A
W2 Heating Output	BO	BO-5	1 - Pwr	2nd Stage Heating (W2)	Relay	N/A

Legend

AI - Analog Input
BI - Binary Input **BO** - Binary Output

* This output is configurable.

NOTE Connect SPT sensors, ZS sensors, or the Wireless Adapter for wireless sensors, to the Rnet port if Airside Linkage is not used.

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Input wiring specifications

Input	Maximum length	Minimum gauge	Shielding
0–5 Vdc	500 feet (152 meters)	22 AWG	100 feet (30.4 meters) unshielded 100 - 500 feet shielded
Thermistor Dry contact Pulse counter TLO	500 feet (152 meters)	22 AWG	100 feet (30.4 meters) unshielded 100 - 500 feet shielded
ZS sensors Wireless Adapter for wireless sensors Equipment Touch TruVu™ ET Display	See *Wiring devices to the controller's Rnet port* (page 13).		

Inputs

The controller has 6 inputs that accept the following signal types.

These inputs...	Support this signal type...	Description
All	Thermistor	Precon type 2 (10 kOhm at 77°F/25°C) Input voltage for IN-5: 1 to 2.52 Vdc Input voltage for all other inputs: 0.33 to 2.52 Vdc
All	Dry contact	A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed.
IN-1, IN-2	0–5 Vdc	The input impedance of the controller is approximately 30 kOhm.
All	Pulse counter	Pulse counting up to 4 pulses per second. Minimum pulse width (on or off time) required for each pulse is 100 msec.

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Binary outputs

The controller has 5 binary outputs. You can connect each output to a maximum of 24 Vac/26 Vdc. Each output is a dry contact rated at 1 A, 24 V maximum and is normally open.

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

Analog outputs

The controller has analog outputs that support voltage. The controlled device must share the same ground as the controller and have the following input impedance:

0–10 Vdc	Minimum impedance 2000 Ohms, max 5 mA
	NOTE Ohm's law: -10V/.005a = 2000 Ohms

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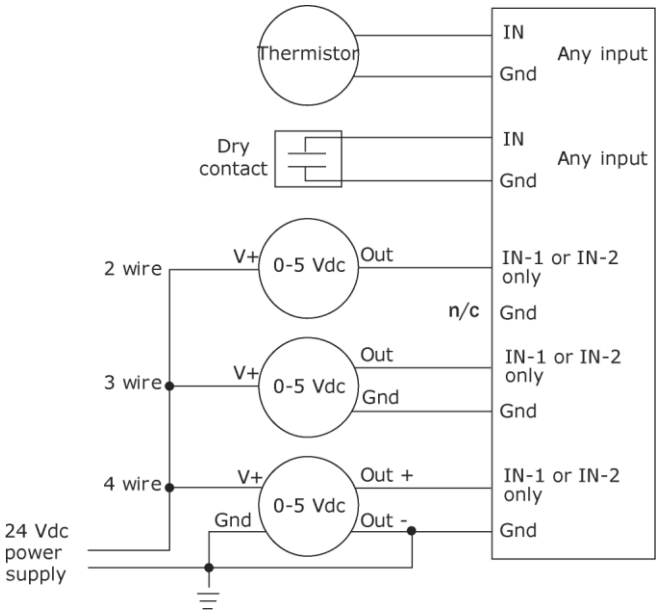
To wire inputs and outputs

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

1 Connect the input wiring to the screw terminals on the controller.

NOTES

- Connect the shield wire to the **GND** terminal with the ground wire.
- **IN-5** and **IN-6** share the **GND** terminal above **IN-5**.



2 Set the appropriate jumpers on the controller.

To use...	For...	
IN-1	Thermistor	Set jumpers **IN-1** to the Therm position.
IN-1	0–5 Vdc	Set jumpers **IN-1** to the 0-5 Vdc position.
IN-2	Thermistor/ Dry contact	Set jumpers **IN-2** to the Thermistor/Dry contact position.
All	Thermistor Dry contact	Verify the **IN-5** jumper is on.
Rnet Port	ZS sensors Wireless Adapter for wireless sensors Equipment Touch TruVu™ ET Display	Set the **Rnet** jumper to **Rnet**.

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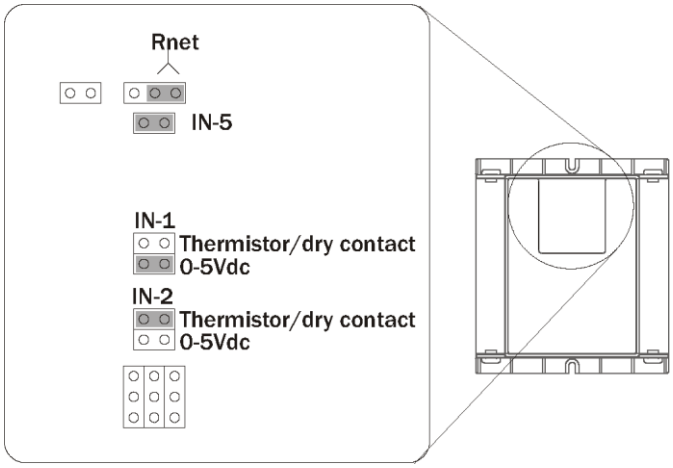
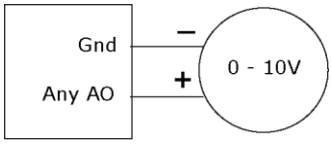
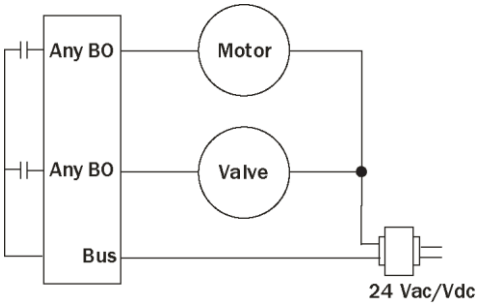


3 Connect the analog output wiring to the screw terminals on the controller and to the controlled device.



4 Connect the binary output wiring to the screw terminals on the controller and to the controlled device.



5 Insert the power screw terminal connector into the controller's power terminals.

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Wiring devices to the controller's Rnet port

The Rnet communicates at a rate of 115 kbps and should be wired in a daisy-chain configuration.

Supports up to

- 10 wireless and/or ZS sensors (5 per control program)
- One Equipment Touch
- One TruVu™ ET Display

NOTE ZS sensors, a Wireless Adapter, and an Equipment Touch can share the Rnet, but not SPT sensors.

Rnet wiring specifications

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

Description	4 conductor, shielded or unshielded, CMP, plenum rated cable
Conductor	22 AWG (7x0096) bare copper if Rnet has only sensors
Maximum length	500 feet (152 meters)
Insulation	Low-smoke PVC (or equivalent)
Color Code	Black, white, green, red
Shielding	If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire, terminated at controller
UL temperature rating	32–167°F (0–75°C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

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To wire ZS sensors to the controller

ZS Sensors are thermistor-based temperature sensors that may optionally sense humidity, CO_2, or VOC. ZS Sensors are wired to the Rnet port on i-Vu® Open controllers. You can use the following ZS sensors:

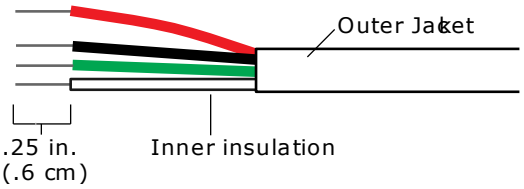
- ZS Standard
- ZS Plus
- ZS Pro
- ZS Pro-F

NOTES

- The ZS CO2 model uses 190 mA during sample period. Use auxiliary 12 Vdc, unless it is the only device on the Rnet port.
- A control program can use no more than 5 ZS Sensors
- SPT sensors cannot share the Rnet with other devices.
- For detailed instructions, see the *ZS Sensor Installation Guide*.

1 Remove power from the controller.

2 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.



3 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

4 Apply power to the controller.

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To wire the Wireless Adapter for wireless sensors

WARNING Do not apply line voltage (mains voltage) to the Wireless Adapter.

The Carrier wireless sensors are available in 868, 902, and 928 MHz radio frequency. The sensors are thermistor-based temperature sensors that may optionally sense humidity.

Wireless sensors communicate through a Wireless Adapter, which is wired to the Rnet port of the controller.

REQUIREMENTS

- A v6.5 or later i-Vu® system
- v6-xx-xxx or later controller drivers

To configure the control program for the desired user interaction with the sensor, see the *Wireless Sensors Application Guide*. For detailed instructions, see the *Wireless Sensors Installation Guide*.

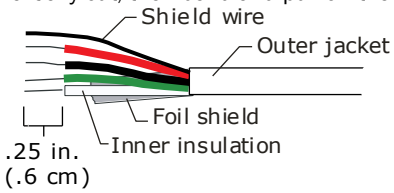
To wire, power, and mount the Wireless Adapter

NOTES

- The Wireless Adapter requires a 24 Vac power supply. It is not powered by the Rnet.
- If the Wireless Adapter will be:
  - Daisy-chained on the Rnet with ZS sensors, an Equipment Touch, or TruVu™ ET Displayuse the standard 4-conductor Rnet wiring.
  - The only device on the Rnet, you can use a 3-conductor cable instead of the standard 4-conductor Rnet cable.

1 Turn off the power to the controller that the Wireless Adapter will be wired to.

2 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



3 Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.

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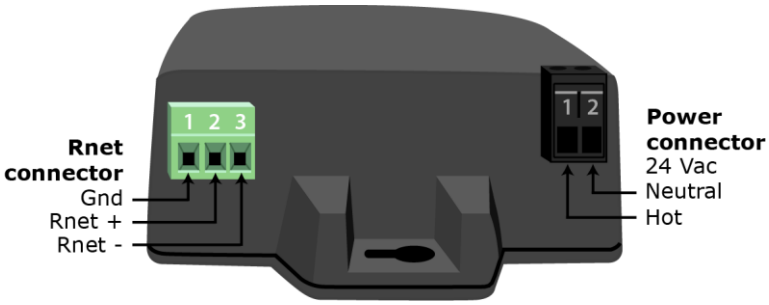
4 Wire the **Rnet +**, **Rnet -**, and **Gnd** terminals on the controller's **Rnet** port to the terminals of the same name on the Wireless Adapter's Rnet connector.

NOTE If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.



5 Wire the 24 Vac external power supply to the Wireless Adapter's power connector.

6 Mount the Wireless Adapter by inserting 2 screws through the mounting tabs on each end of the Wireless Adapter.

7 Apply power to the external power supply.

8 Verify that the LED on top of the Wireless Adapter is blinking. See "LED" below.

9 Turn on the controller's power.

LED

The blue LED on the top of the Wireless Adapter indicates the following:

If the LED is...	Then the device...
Off	Is not powered or there is a problem.
Blinking	Is working properly.
Steadily on	Has a problem. Do one of the following: • Cycle power to the device. • Insert a small screwdriver or paper clip into the hole next to the LED to reboot the device.

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To wire an Equipment Touch to the controller

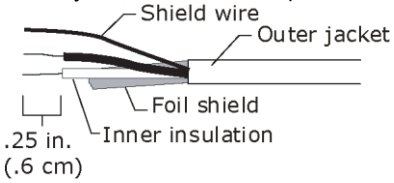
NOTES

- The Equipment Touch requires a 24 Vac power supply. It is not powered by the Rnet.
- If the Equipment Touch will be:
  - Daisy-chained on the Rnet with ZS sensors or a Wireless Adapter, use the standard 4-conductor Rnet wiring and follow the wiring instructions *To wire ZS sensors to the controller* (page 14).
  - The only device on the Rnet, you can use a 2-conductor cable instead of the standard 4-conductor Rnet cable and follow the instructions below.
- For complete Equipment Touch installation instructions including wiring diagrams, see the *Equipment Touch Installation and Setup Guide.*

CAUTION The controller can share a power supply with the Carrier controller as long as:

- The power supply is AC power.
- You maintain the same polarity.
- You use the power source only for Carrier controllers.

1. Turn **off** the controller's power.
2. Partially cut, then bend and pull off the outer jacket of the cable. Do not nick the inner insulation.



3. Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.
4. Wire the controller's **Rnet+** and **Rnet-** terminals to the terminals of the same name on the Equipment Touch's connector.

   NOTE If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.
5. Turn **on** the controller's power.
6. Turn on the Equipment Touch.

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To wire the TruVu™ ET Display

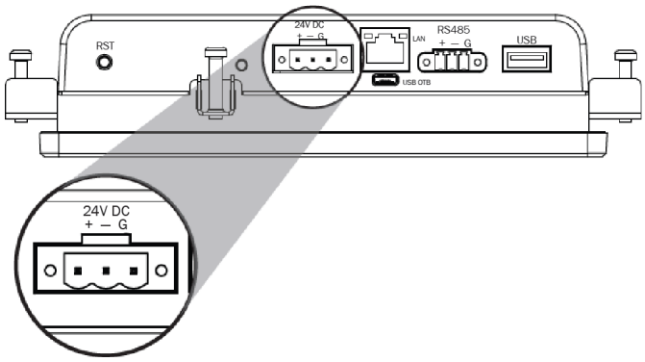
WARNING Do not apply line voltage (main) - 24 Vdc power only.

Wiring power

Wire the TruVu™ ET Display **24V DC** connector to the 24 Vdc power supply using 2-conductor 18 AWG wire. Maximum distance 100 feet (30 meters).

CAUTION The TruVu™ ET Display can share a power supply with the Carrier controller as long as:

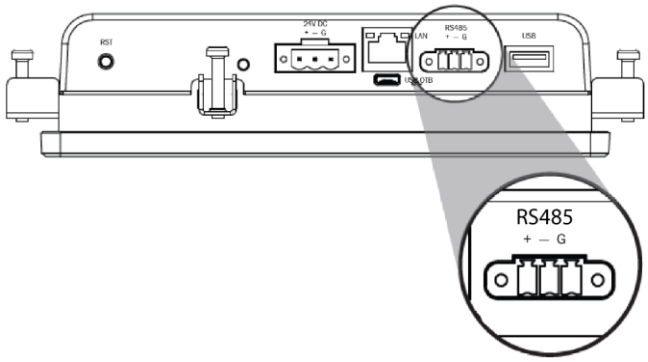
- The power supply is DC power.
- You maintain the same polarity.
- You use the power source only for Carrier controllers.



Wiring communication

1 Turn off the controller's power.

2 Wire the TruVu™ ET Display's **RS485** connector to the controller's **Rnet** port, **G** to **Gnd**, **+** to **Rnet +**, **-** to **Rnet -** using 2-conductor 22 AWG wire with a maximum distance of 500 feet (152 meters).



3 Turn on the controller's power.

For complete TruVu™ ET Display installation instructions, see the *TruVu™ ET Display Installation and Start-up Guide.*

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Wiring equipment to outputs (Control mode only)

Use the following table to wire equipment to the controller's outputs:

Wire these terminals from the thermostat connections on the equipment…	…to these terminals on the controller
R	**BUS**
G	**BO1**
Y1	**BO2**
Y2 (if applicable)	**BO3**
W1	**BO4**
W2 (if applicable)	**BO5**

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Installing the controller into the i-Vu® application

You must complete the following procedures to successfully install your controller into an i-Vu® Control System. Use the Help in the referenced software for detailed descriptions of these procedures.

EquipmentBuilder or Snap

1 Use EquipmentBuilder or Snap to create control program(s) for your controller.

2 If applicable, print the Sequence of Operation, which includes the points list.

NOTE You can create a points list under **Reports** in the i-Vu® application or Field Assistant after installing your control program.

This Installation Guide

1 Prepare a wire list using the points list. Refer to *Appendix A* (page 41).

2 Use the wire list and the following installation procedures to install and wire I/O points to your controller.

The i-Vu® or Field Assistant application

1 Upload the controller to the database by selecting the router in the navigation tree.

2 Select **Devices** > **Manage** tab.

3 Select the controller in the list on the page and click **Upload**.

4 If you are adding a new control program, click Add Control Program. A dialog window appears.

5 Enter a name for your control program in **Display Name** and select your controller in the **Controller** drop-down list.

NOTES

- If you already have the maximum number of control programs for a controller, it will not appear in the list.
- Optional: You can change the control program's **Reference Name** if needed.

6 Do one of the following:

If the control program is...	
In the **Control Program** drop-down list	Select the control program.
Not in the **Control Program** drop-down list	a. Click **Add New**. b. Browse to select the control program. c. Click **Open**. d. Click **Continue**. e. Click Close.

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7 To upload a graphic, click **Add New** under **Views** and browse to your .view file.

8 Click **Continue**. When message appears **File added successfully**, click **Close**.

9 Click **Close** again.

10 Right-click on the programmable controller in the controller list and select **Check Status** from the list. The status of the controller should say **File Mismatch**.

11 Click the **Download All Content** button.

12 Assign channel numbers to the physical points by selecting the controller in the navigation tree and going to **Properties** page > **I/O Points** tab.

13 Configure the controller on the **Properties** page > **Control Program** tab.

14 Check out and commission the equipment.

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Start-up

Use one of the following interfaces to start up, access information, read sensor values, and test the controller.

This interface...	Provides a...
Field Assistant application - Runs on a laptop that connects to controller's Local Access port [1]	Temporary interface
Equipment Touch device - Connects to controller's Rnet port [2]	Temporary or permanent interface
i-Vu® application Available for BACnet systems only	Permanent interface
System Touch device Available only for BACnet MS/TP systems. Wire to a BACnet MS/TP network connector and a 24 Vac power supply [3]	Temporary or permanent interface

[1] Requires a USB Link (Part #USB-L).
[2] See the *Equipment Touch Installation and Setup Guide* for detailed instructions.
[3] See the *System Touch Installation and Setup Guide* for detailed instructions.

CAUTION If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link. Purchase a USB isolator online from a third-party manufacturer.

Select or create a custom control program and graphic

The field-installed AppController does not come from the factory with a control program or graphic. You must load a control program and graphic as part of the installation/commissioning of the AppController. You can select a control program and graphic from EquipmentBuilder that has all the configurations that are currently available on a factory-installed ASI for AppController.

After creating your control program, save and download it to the AppController. If desired, create a custom graphic using ViewBuilder. See *ViewBuilder Help* for details.

NOTE Third party integration information for current Carrier PIC products, whether on a factory-installed controller or selected from EquipmentBuilder, can be found on the *Carrier Control Systems Support Site http://www.hvacpartners.com/*, *https://accounts.ivusystems.com/* under **Support Center** > **Controls Support** > **Controls Product Information**.

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Configure the ASI for AppController's properties

You must configure certain points and properties. *Appendix C* (page 43) 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.

To start up the controller, configure your necessary points/properties in the following:

- *Unit Configuration* (page 44)
- *Setpoints* (page 46)
- *Service Configuration* (page 56)

Examples of some settings that you need to configure for start-up are the **Occupied** and **Unoccupied Heating** and **Cooling** setpoints, found in the **Setpoints** section of *Appendix C* (page 43).

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Sequence of Operation

The Air Source Interface (ASI) application for the AppController interfaces between the i-Vu® Control System (VVT Open or VAV Open) and the air source that is providing the conditioned air, in cases where the air source is NOT directly compatible and does not support Carrier Airside Linkage. These requirements are addressed through 2 different modes of operation (**Monitor** mode and **Control** mode).

NOTE The Air Source Interface application is available in both English and Metric units. The metric version is available on http://www.hvacpartners.com or *http://accounts.ivusystems.com* (*http://accounts.ivusystems.com*) > **Support** > **Download** > **Custom Applications** > **Metric Applications**.

You can use the ASI to control a 1 or 2-stage heating/cooling rooftop unit in a single zone application. The ASI interfaces with the unit's electro-mechanical thermostat terminals, enabling the unit to become a part of the i-Vu® Control System.

The ASI provides the following 4 separate functions, based on your configuration:

- **Monitor mode 1** – Use with Airside Linkage-equipped Open terminals to provide a system interface to monitor the operation of a third party-controlled air source (air handler or rooftop). In this application, the ASI is mounted at the air source and provides the air source operating mode and supply air temperature to the Open zoning system. It can also provide the outdoor air temperature and smoke or fire system modes if you use the optional **Fire/Smk** or **Pressurization** inputs.
- **Monitor mode 2** - Use with Airside Linkage-equipped Open terminals in retrofit/upgrade applications to provide a control interface between the Open zoning system and the air handler. The ASI uses BACnet communications to transfer data between the zoning system and the air source. The ASI provides network-accessible data, such as:
    - setpoints
    - zone temperature
    - occupancy status
    - RH and CO2 levels from the zones (optional)

    The ASI retrieves the fan status, supply air temperature, and outdoor air temperature from the air source and then determines the AHU mode to send to the zoning system. It also sends the SAT and outdoor air temperature, if available.
- **Control mode 3** - Use with Airside Linkage-equipped Open terminals in retrofit/upgrade applications to provide a system interface to control the operation of a rooftop unit, through the rooftop's thermostat terminal interface. The ASI uses the existing electromechanical or DDC controls integral to the equipment, eliminating the need to replace the equipment or its controls.
- **Control mode 4** - Use in retrofit/upgrade applications in conjunction with a zone sensor to provide Open capability to an existing single zone rooftop. The ASI interfaces to the equipment's thermostat terminals. The ASI uses the existing electromechanical or DDC controls integral to the equipment, eliminating the need to replace the equipment or its controls.

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Monitor Mode

Monitor mode 1

You can use the ASI in **Monitor mode 1** to:

- Monitor the operation of a rooftop or air handling unit that may serve multiple areas, use its own controls, and provide air to an Open VAV or VVT zoning system
- Use the fan status input to detect if the equipment is operating and then use the supply air temperature sensor to determine the operating mode of the unit
- Provide additional capabilities and functionality with optional inputs in **Monitor** mode

The minimum required inputs include:

- **Supply Air Temperature**
- **Fan Status**

The optional hardware inputs include:

- **Outdoor Air Temperature**
- **Return Air Temperature**
- **Filter Status / Pressurization**
- **Fire / Smoke Shutdown**

The ASI also provides communicating BACnet points that you can use to eliminate the hardware sensor requirements by deriving the value directly from the air source through BACnet communications. These BACnet network inputs include:

- **Supply Air Temperature**
- **Fan Status**
- **Outdoor Air temperature**
- **Static Pressure**
- **Pressurization**
- **Fire / Smoke Shutdown**

The ASI provides the equipment operating mode and supply air temperature to the Open zoning system and as well as OAT and static pressure, if available.

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Monitor mode 2

You can use the ASI in **Monitor** mode 2 to:

- Control an existing BACnet air handling or rooftop unit that provides air to an Open VAV or VVT zoning system
- Provide information to BACnet-communicating equipment
- Collect information from the Open zoning system using Airside Linkage. The information is available as BACnet-accessible points so the air source can gather and use the data to tailor its operation. This allows the air source to better satisfy the requirements of the zones. See below for the pertinent data.

Available BACnet-accessible information:

BACnet Object Name	Variable Type and Instance Number
Space Temperature	link_spt / AV: 2601
Occupancy Status	a_link_occ_status / BV:2602
Occupied Cooling Setpoint	link_ocsp / AV:2602
Occupied Heating Setpoint	link_ohsp / AV:2603
Unoccupied Cooling Setpoint	link_ucsp / AV:2604
Unoccupied Heating Setpoint	link_uhsp / AV:2605
Space RH	link_rh / AV:2606*
Indoor Air CO2	link_iaq / AV:2607*
Maximum Damper Position	link_max_dmpr / AV:2611
Airside Linkage Status	a_link_status / BV:2601

*Optional value - if unavailable, -999 default is displayed.

The ASI makes this data available for the air source equipment to use. It is the responsibility of the BACnet-capable air source to gather and use the data to properly control the supply and return fans, heating and cooling coils, outdoor air ventilation dampers, etc.. In return, so the Open zoning system can function most efficiently, the ASI determines and transmits the air source operating mode to the zoning system along with any additional optional information.

The minimum required inputs include:

- **Supply Air Temperature**
- **Fan Status**

The ASI also provides communicating BACnet points that you can configure to eliminate the hardware sensor requirements by deriving the value directly from the air source through BACnet communications.

These BACnet network inputs include:

- **Supply Air Temperature**
- **Fan Status**
- **Outdoor Air temperature**
- **Static Pressure**
- **Pressurization**
- **Fire / Smoke Shutdown**

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Monitor mode operation

You can use the ASI in the **Monitor** mode to:

- Determine the operation of an air handler or rooftop that is controlled by others and serves multiple tenants, such as an Open VVT or VAV terminal system
- Determine the fan's status by monitoring a discrete input (IN-1) or the **Network Fan Status** binary network input. The hardware input is used to monitor a current switch installed on the fan motor or a delta pressure switch that monitors the supply duct air pressure.
- Read the **Supply Air Temperature** (SAT) from a duct temperature sensor connected to a hardware input channel (IN-2) or the **Network SAT** analog network input
- Receive zone space temperature (SPT) through Airside Linkage. By comparing the SPT with the SAT, the ASI determines if the air is suitable for heating, cooling, or ventilation.
- Read the **Outdoor Air Temperature** (IN-4) through an optional input or the **System Outdoor Air Temperature** analog network input. The ASI sends the air source mode, SAT, and OAT, if applicable, to each zone.

The following additional inputs allow interface with a fire/life safety system or local smoke/fire detector:

- The **Pressurization** input (IN-5) monitors a configurable, normally open (N.O.) or normally closed (N.C.), contact or the **System Pressurization** binary network input, which may be used to detect when the system requires all zones to go to maximum airflow or pressurization mode.
- The **Fire Smoke Detector** (FSD) input (IN-6), uses a N.C. contact, or the **System Fire / Smoke** binary network input, to detect when all zone dampers should completely close and disable local terminal fans.

  NOTE The 2 modes, when detected, are sent to the zones via Airside Linkage to provide enhanced smoke control operation.

Fire/Smoke Detector

The ASI can read the status of a N.C. FSD contact input to determine if a fire or smoke detector alarm is present. If the controller determines an alarm condition is present and the ASI is in a **Control** mode, the equipment heating, cooling, and fan are immediately disabled. If connected to an Open zoning system, the **Evacuate** mode is sent out through Airside Linkage, causing all terminals to fully close their primary air dampers and stop all local terminal fans immediately.

The default state of the switch is factory-set to normally closed and cannot be changed.

A **BACnet Binary Network Input** point can read the status of a network-accessible fire/smoke detector value. There is also a third party input. Both cause the unit to respond in the same manner as the contact input described above.

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Pressurization

The ASI can read the status of a configurable contact input to determine if a fire/life safety system requires maximum airflow for smoke control.

NOTE The air source equipment MUST be controlled separately from the fire system to ensure the OA damper opens and the fan operates.

If the controller determines the alarm condition is present and connected to an Open zoning system, the **Pressurization** mode is sent to each zone through Airside Linkage, causing every terminal to open its damper to the maximum cooling position (VVT) or to its maximum cooling airflow setpoint (VAV). The normal state of the input is configurable as either normally closed or normally open.

Also, a **BACnet Binary Network Input** can read the status of a network-accessible fire/life safety smoke purge or pressurization value. There is, also, a third party input. Both inputs cause the unit to respond in the same manner as the contact input described above.

Airside Linkage

The ASI can receive information through Airside Linkage and then provide air source operational information to a zoned system using Open VVT or Open VAV terminals. The ASI becomes the equipment master and receives setpoints, occupancy, and space temperature from the zoning system. The operating mode and supply air temperature of the air source in addition to the OAT value (if available) will be sent to all the zones in the system.

The air source operating mode is determined by comparing the **SAT** to the **Space Temperature** (Prime Variable) coming from the Linkage master and dependent on the configured Monitor mode.

Monitor Mode 1 – Airside Linkage not active:

- Heating = Fan status is on and SAT>82°F (2Δ°F hysteresis) [SAT>27.8°C (1.1Δ°C hysteresis)]
- Cooling = Fan status is on and SAT<63 (2Δ°F hysteresis) [SAT>17.2°C (1.1Δ°C hysteresis)]
- Vent = Fan status is on and SAT between 65°F and 80°F (SAT between 18.3°C and 26.7°C)

Monitor Mode 2 – Airside Linkage active:

- Heating = Fan status is on and SAT>Linkage SPT+5Δ°F (5Δ°F hysteresis) [SAT>Linkage SPT+2.8Δ°C (2.8Δ°C hysteresis)]
- Cooling = Fan status is on and SAT<Linkage SPT- 2Δ°F (2Δ°F hysteresis) [SAT>Linkage SPT-1.1Δ°C (1.1Δ°C hysteresis)]
- Vent = Fan status is on and SAT Linkage SPT+/-5Δ°F (+2.8Δ°C). If previous mode, prior to fan only, was heat, then that Linkage mode remains until SAT<Linkage Space Temperature +5Δ°F (+2.8Δ°C). If previous mode, prior to fan only, was cool, then that Linkage mode remains until SAT>Linkage Space Temperature - 2Δ°F (-1.1Δ°C).

Supply Air Temperature Alarm

The ASI can generate a supply air temperature alarm when the air temperature is excessively high or low. It monitors the supply air temperature (SAT) value and compares that value to the configured **High SAT Alarm Limit** and **Low SAT Alarm Limit**. The fan must have been operating for more than 3 minutes before any alarm condition is checked. After that time, if the SAT exceeds either value for more than 2 minutes, a **Supply Air Temperature** alarm is generated. There is a 3Δ°F (1.6Δ°C) hysteresis before the alarm is reset to normal.

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Filter Status Alarm

The ASI can generate a dirty filter alarm after the number of fan run-hours exceeds a configurable filter alarm timer-limit. It monitors the fan status input, and, if the fan is operating, accumulates run time. If the fan run time hours exceed the configurable limit, an alarm is generated. A **Reset Filter Alarm** input resets the alarm timer after the alarm has been generated. Disable the filter alarm by setting the **Filter Alarm Timer Delay** to **0** (factory default).

Optional - The ASI can generate a dirty filter alarm if you configure the IN-5 input as a filter monitor. It monitors the contact state and, if in the abnormal state, indicates a dirty filter alarm.

Outdoor Air Temperature Sensor Alarm

The ASI generates an outdoor air sensor alarm when the outdoor air temperature value is invalid after previously receiving valid information. The valid sensor range is between -50°F (-45°C) and 150°F (65.5°C). If the OAT exceeds either value for more than 1 minute, the OAT sensor alarm is generated. The alarm is also generated if the **BACnet Analog Network Input** value was used and is no longer being updated. The **Outdoor Air Sensor** alarm is reset when the **Shutdown** point is set to **Active**.

Outdoor Air Temperature Alarm

The ASI can generate an outdoor air temperature alarm when a valid outdoor air temperature value has been received successfully or an **Outdoor Air Temperature** (OAT) sensor is connected and the air temperature is excessively high or low. The control monitors the OAT value and compares that value to the configured **High OAT Alarm Limit** and **Low OAT Alarm Limit**. If the OAT exceeds either value for more than 1 minute, an **Outdoor Air Temperatur**e alarm is generated. There is a 1Δ°F (.5Δ°C) hysteresis before the alarm is reset to normal.

Airside Linkage Alarm

Once Airside Linkage has been successfully established between a zone master and the ASI, if communications fail for more than 5 minutes, an Airside Linkage alarm is generated. The alarm is reset automatically when communications are re-established. Also, the alarm will be generated if more than 1 zone master sends data to the ASI. The Airside Linkage alarm will be reset when the **Shutdown** point is set to **Active**.

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Control Mode

Control mode 3

You can use the ASI in **Control** mode 3 to control an existing electromechanical or DDC-controlled rooftop unit that has a thermostat-input terminal block to provide air to an Open VVT zoning system. Used in this manner, the ASI collects information from the zoning system via Airside Linkage and calculates the required operating mode. Using PID control, the ASI calculates the stages of heating or cooling to meet the zone's load and then controls the outputs to operate the rooftop in the appropriate mode with the appropriate number of stages of capacity.

The minimum required inputs include:

- **Supply Air Temperature**
- **Fan Status**

The optional hardware inputs include:

- **Outdoor Air temperature**
- **Return Air Temperature**
- **Filter Status / Pressurization**
- **Fire / Smoke Shutdown**

In addition, the ASI provides the following outputs to control the rooftop equipment:

- **G** (fan)
- **Y1** (1st cooling stage)
- **Y2** (2nd cooling stage)
- **W1** (1st heating Stage)
- **W2** (2nd heating Stage)
- **R** (common input)

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Control mode 4

You can use the ASI in **Control** mode 4 to:

- Integrate an existing electromechanical single zone rooftop into an Open system
- Control an existing electromechanical or DDC-controlled rooftop that has a thermostat-input terminal block. Used in this manner, the ASI uses an SPT space temperature sensor mounted in the zone to replace the thermostat. The ASI has configured setpoints for both occupied and unoccupied operating conditions and also occupancy schedule capability.
- The ASI operates the fan and calculates the required operating mode and stages of heating or cooling to meet the zone's load. The ASI then controls its outputs to operate the rooftop in the appropriate mode with the appropriate number of stages of capacity.

The minimum required inputs include:

- **Supply Air Temperature**
- **SPT sensor, ZS sensor, or Wireless Adapter for wireless sensor**
- **Fan Status**

The optional hardware inputs include:

- **Outdoor Air temperature**
- **Return Air Temperature**
- **Filter Status / Pressurization**
- **Fire / Smoke Shutdown**

In addition, the ASI provides the following outputs to control the rooftop equipment:

- **G** (fan)
- **Y1** (1st cooling stage)
- **Y2** (2nd cooling stage)
- **W1** (1st heating Stage)
- **W2** (2nd heating Stage)
- **R** (common input)

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Control Mode Operation

You can use the ASI in the **Control** mode to:

- Control a 1 or 2-stage package heating/cooling unit through its thermostat terminal interface
- Provide outputs for up to 2 cooling stages, 2 heating stages, and a fan. A common terminal is connected to the unit's **R** thermostat terminal.

  NOTE The fan status input and supply duct temperature are both required to verify proper unit operation. IN-5, if not used as a pressurization input, can be reconfigured to monitor a filter differential pressure switch to indicate a dirty filter condition
- Use zone data received through Airside Linkage to control a rooftop to provide the appropriate air required to satisfy the zone's thermal load conditions (VVT Open)
- Control an electro-mechanical single zone rooftop by connecting an SPT sensor directly to the ASI. In this mode, the single zone rooftop becomes part of an i-Vu® Control System

In either of the above cases, you may install an optional return air temperature sensor connected to IN-3. The ASI displays the value read from the sensor, if available, and also uses that value in place of the zone or space temperature if Airside Linkage or the SPT sensor fail.

Airside Linkage

The ASI can receive information through Airside Linkage and then control a rooftop for a sub-zoned system using VVT Open terminals. The rooftop is the equipment master and receives its setpoints, occupancy, and space temperature from the zoning system. The ASI then uses this information and its own sensors to provide the necessary air required to satisfy the load in the zones. The operating mode and supply air temperature of the air source, in addition to the OAT value (if available), will be sent to all the zones in the system.

The air source operating mode is determined by comparing the **SAT** to the **Space Temperature** (Prime Variable).

Control mode 3 and 4

- Heating =Local equipment mode is Heating and SAT > Space Temperature + 5Δ°F (+2.8Δ°C)
- Cooling = Local equipment mode is Cooling and SAT < Space Temperature - 2Δ°F (-1.1Δ°C)
- Vent = Local equipment mode is **Fan Only**. If previous mode, prior to fan only, was heat, then that Linkage mode remains until SAT<Linkage Space Temperature +5Δ°F (+2.8Δ°C). If previous mode prior to fan only was cool, then that Linkage mode remains until SAT >Linkage Space Temperature -2Δ°F (-1.1Δ°C).

IMPORTANT! If Linkage fails, the ASI uses the SPT or the RAT sensor (in that order), if available, and also uses its local occupancy and setpoint schedules.

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Scheduling

Airside Linkage Occupancy Schedules (applicable to **Monitor** modes 1 and 2 and **Control** mode 3) — uses the occupancy status value received from the zoning system through Airside Linkage when Airside Linkage is active. This value overrides any other occupancy value derived through any other means described below.

Scheduling (applicable only to **Control** mode 4) — You must set **Occupancy Schedules** to **ENABLE** and configure time periods to schedule the transitions from occupied to unoccupied operation. The time periods control the space temperature to occupied heating and cooling setpoints. The controller operates continuously in the **Occupied** mode until you either configure a **Time Schedule** or use another method of controlling occupancy, such as a third party control system that **Enables/Disables** the **BAS On/Off** point. You must set the local time and date for these functions to operate properly.

You can change the occupancy source to one of the following (listed in order of priority):

- **BAS (Building Automation System) On/Off**

  For use with a Building Automation System that supports network scheduling, you must disable the **Occupancy Schedules** so the BAS can control the unit through a network communication and the BAS scheduling function. The BAS occupancy function overrides any schedule function (except **Airside Linkage Occupancy**) when set to either **Occupied** or **Unoccupied**.

  NOTE Scheduling can either be controlled from the unit or the BAS, but not both.

- **Occupancy Schedules**

  The controller is occupied 24/7 until you configure a time schedule using the Equipment Touch, Field Assistant, or the i-Vu® application, or until a third party control system **Enables/Disables** the **BAS On/Off** point. You can disable this by going to **Configuration** > **Unit Configuration** > **Occupancy Schedules** and changing the point from **Enable** to **Disable** and clicking **OK**.

  NOTE You must **Enable** this point in order for the Equipment Touch, Field Assistant, or the i-Vu® application to assign a time schedule to the controller.

- **Schedule**

  The unit operates according to the schedule configured and stored in the unit. The schedule is accessible in the Equipment Touch, Field Assistant, or the i-Vu® application. The daily schedule consists of a start and stop time (standard or 24 hour mode) and seven days of the week, starting with Monday and ending on Sunday.

- **System Occupancy**

  Uses the network to obtain an occupancy status value from another controller, which is read over the network and used by this controller. **Occupancy Schedules** MUST be set to **Disable** to use this function.

  NOTE Scheduling can only be controlled from one source.

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Fan

The fan operates in 1 of 3 modes. You can configure the fan as:

- **Auto -** operates intermittently during both occupied and unoccupied periods
- **Continuous -** operates intermittently during unoccupied periods and continuously during occupied periods
- **Always On -** operates continuously during both occupied and unoccupied periods

When the fan is in the default mode of **Continuous**, it is turned on when the **Fire/Smoke Shutdown** and **Shutdown** modes are inactive and any one of the following is true:

- It is in occupied mode
- There is a demand for cooling or heating in the unoccupied mode
- The **Pressurization** mode is active

When power is reapplied after a power outage, there is a configurable time delay of 5 - 600 seconds before starting the fan. You can also configure fan delays for **Fan On** and **Fan Off**.

The **Fan On Delay** defines the delay time (0 - 30 seconds, default 15) before the fan begins to operate after heating or cooling starts. The **Fan Off Delay** defines the delay time(0 - 180 seconds, default 90) the fan operates after heating or cooling is stopped.

The **Fan On Delay** is automatically overridden if you select electric heat. The fan runs as long as the cooling or heating outputs are on. If a fire/smoke mode is detected, the fan shuts down immediately, regardless of occupancy state or demand.

Fan w/Heat allows the unit to control the fan in heating mode. If set to **Disable** and the **Fan Mode** is **Auto**, the fan output is NOT energized with the **W1** or **W2** outputs.

Cooling

The ASI operates 1 or 2 stages of cooling to maintain the desired cooling setpoint. The PI (Proportional-integral) cooling loop and staging algorithm controls the outputs. It calculates when the stages should be energized or de-energized to satisfy the load, by comparing the space temperature (SPT) to the appropriate cooling setpoint.

The following conditions must be true in order for the cooling algorithm to run:

- **Cooling** is set to **Enable**
- **Fire/Smoke Shutdown** and **Shutdown** modes are inactive
- **Heat** mode is not active or has been inactive for more than 2 minutes
- Stage 1 minimum off-time has expired
- If occupied, the SPT is greater than the occupied cooling setpoint
- Space temperature reading is valid
- If unoccupied, the SPT is greater than the unoccupied cooling setpoint
- OAT is greater than the **Cooling Lockout Temperature**, if OAT is available

If all the above conditions are met, the cooling output(s) are energized as required, otherwise they are de-energized. If cooling is active and the SAT approaches the minimum SAT limit, the cooling stage(s) are reduced or disabled as needed.

You can configure the **Min SAT** parameter, as well as **Cooling Lockout Temperature**, based on outdoor air temperature (OAT). Both can be adjusted to meet various specifications.

There is a 5-minute minimum off-time for each cooling stage. It may be restarted only after the 5-minute time-guard has expired and the supply air temperature is above the minimum supply air temperature limit.

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Heating

The ASI operates 1 or 2 stages of heating to maintain the desired heating setpoint. The heating PI (Proportional-integral) loop and staging algorithm control the output(s). It is used to calculate when the stages are energized or de-energized to satisfy the load by comparing the space temperature (SPT) to the appropriate heating setpoint.

The following conditions must be true in order for the heating algorithm to run:

- **Heating** is set to **Enable**
- The **Fire/Smoke Shutdown** and **Shutdown** modes are inactive
- **Cool** mode is not active or has been inactive for more than 2 minutes
- Stage 1 minimum off-time has expired
- If occupied, the SPT is less than the occupied heating setpoint
- Space temperature reading is valid
- If unoccupied, the SPT is less than the unoccupied heating setpoint
- OAT is less than the **Heating Lockout Temperature** if OAT is available

If all the above conditions are met, the heating output(s) is energized as required, otherwise they are de-energized. If the heating is active and the SAT approaches the maximum SAT limit, the heating stage(s) are reduced or disabled as needed. You can configure the **Max SAT** parameter, as well as **Heating Lockout Temperature**, based on outdoor air temperature (OAT). Both can be adjusted to meet various specifications

There is a 2-minute minimum off-time for the gas heat and a 30-second minimum off-time for electric heat. After any stage is turned off, it may be restarted only after the off-time has expired and if the supply air temperature is below the maximum supply air temperature limit. For gas-type heat, stage one is equipped with a 2-minute minimum on-time to prevent condensation buildup in the heat exchanger.

Shutdown Input

When the ASI's shutdown input (software point) is set to its **Active** mode, it resets any alarms and then safely shuts down the outputs in a controlled fashion (applicable to the **Control** mode only). Heating and cooling are disabled after any minimum runtime conditions expire and the fan is disabled after the fan off timer expires. After the shutdown input transitions from **Active** to **Inactive**, the ASI restarts, similar to a power fail restart.

Demand Limit

The ASI has the ability to accept 3 levels of demand limit from the network. In response to a demand limit, the unit decreases its heating setpoint and increases its cooling setpoint to widen the range in order to immediately lower the electrical demand. You can configure the amount of temperature adjustment for both heating and cooling and for each demand level. The response to a particular demand level may also be set to 0.

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Power Failure Restart Delay

The ASI provides a delay when recovering from a power failure or shutdown mode in order to prevent excessive demand when many units start simultaneously. You can configure each unit for a unique delay between 0 and 600 seconds. The factory-programmed default delay is 60 seconds.

Space Temperature Alarms

The ASI can generate an alarm when the space temperature exceeds the alarm setpoint. There are separate occupied hysteresis and fixed unoccupied high and low alarm setpoints. The ASI provides a 5-minute alarm delay during unoccupied periods. During occupied periods, it uses the occupied temperature setpoint and applies the hysteresis value to determine the alarm setpoints.

When occupancy transitions from unoccupied to occupied or the occupied temperature setpoints are changed and cause an alarm condition to occur, the ASI automatically calculates an alarm delay (equivalent to the configured delay time in minutes/degrees, times the temperature error that occurred, plus a fixed 15-minute delay). This prevents nuisance alarms when there is an occupancy change and it allows time for the unit to correct an alarming temperature condition.

Fan Status Alarm

The ASI generates an alarm when the fan is commanded to run but the fan status input detects an off-state. You must configure the ASI for the **Control** mode. The controller compares the status of the fan to the desired commanded state. When the fan is commanded to run (**G** = **ON**), the fan status is checked and verified to match that state. If the fan status is not on, then a **Supply Fan** alarm is generated after 1 minute and the equipment's heating and cooling are disabled.

Return Air Temperature Alarm

The ASI can generate a **Return Air Temperature** alarm when the return air temperature is excessively high or low. It monitors the optional return air temperature (RAT) value and compares that value to the configured **High RAT Alarm Limit** and **Low RAT Alarm Limit**. The fan must have been operating for more than 3 minutes before any alarm condition is checked. After that time, if the RAT exceeds either value for more than 2 minutes, a **Return Air Temperature** alarm is generated. There is a 1Δ°F (.5Δ°C) hysteresis before the alarm is reset to normal.

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Troubleshooting

If you have problems mounting, wiring, or addressing the 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 indicate if the controller is speaking to the devices on the network. The LED's should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LED's become.

Verify the LED patterns by cycling power to the controller and noting the lights and flashes.

LEDs	Status
Power	Lights when power is being supplied to the controller. **NOTE** The controller is protected by internal solid state Polyswitches on the incoming power and network connections. These Polyswitches are not replaceable, but they will reset themselves if the condition that caused the fault returns to normal.
Rx	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
Tx	Lights when the controller transmits data from the network segment; there is an Rx LED for Ports 1 and 2.
Run	Lights based on controller health.
Error	Lights based on controller health.

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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 network address
2 flashes per second	1 flash per second	The controller is alone on the network
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 controller off, then on. • Download memory to the controller. • Replace the controller.

NOTE If you resolve the issue but the **Error** LED does not turn off, cycle power to the controller.

Serial number

If you need the controller's serial number when troubleshooting, the number is on a sticker on the back of the main controller board.

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To restore defaults

WARNING This erases all archived information and user-configuration settings. You will have to reconfigure all custom settings. It is recommended to restore the factory defaults only under the guidance of Carrier Control Systems Support.

To erase volatile memory data and restore factory default configuration settings:

1. Turn off the controller's power switch.
2. Put the **Factory Defaults** jumper on.
3. Turn on the controller's power switch.
4. Remove the **Factory Defaults** jumper.

To replace the controller's battery

To determine when to replace the battery, remove power and measure the voltage. If the voltage is below 2.9 volts, you need to replace the battery.

CAUTION Power must be **ON** to the controller when replacing the battery, or your date, time, and trend data will be lost.

1. Remove the battery from the controller, making note of the battery's polarity.
2. Insert the new battery, matching the battery's polarity with the polarity indicated on the controller.

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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

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.

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Appendix A: ASI for AppController wire list

Open System Network AppController	
Project Name: **Location:**	**Controller:** **Network Number:** **MAC Address:**

Thermistor/dry contact 0-5Vdc

Point/ Cable#	Inputs (+)	(G)	Input Type	Jumper Position of Pins	I/O	Sensor code	Equipment Name	Point Name
	IN - 1	GND	Therm/Dry Contact	Upper	IN - 1			
	IN - 2	GND	Therm/Dry Contact	Upper	IN - 2			
	IN - 3	GND	Therm/Dry Contact	N/A	IN - 3			
	IN - 4	GND	Therm/Dry Contact	N/A	IN - 4			
	IN - 5	GND	Therm/Dry Contact	N/A	IN - 5			
	IN - 6	GND	Therm/Dry Contact	N/A	IN - 6			
Point/ Cable#	**Binary Outs (+)**	**COM**	**B-Output Type**	**Jumper Position of Pins**	**I/O**	**Sensor code**	**Equipment Name**	**Point Name**
	BO -1	BUS	N.O.	N/A	BO - 1			
	BO - 2	BUS	N.O.	N/A	BO - 2			
	BO - 3	BUS	N.O.	N/A	BO - 3			
	BO - 4	BUS	N.O.	N/A	BO - 4			
	BO - 5	BUS	N.O.	N/A	BO - 5			
Point/ Cable#	**Analog Outs (+)**	**COM**	**B-Output Type**	**Jumper Position of Pins**	**I/O**	**Sensor code**	**Equipment Name**	**Point Name**
	AO - 1	GND	0-10V 5mA Max	N/A	AO - 1			
	AO - 2	GND	0-10V 5mA Max	N/A	AO - 2			
	AO - 3	GND	0-10V 5mA Max	N/A	AO - 3			

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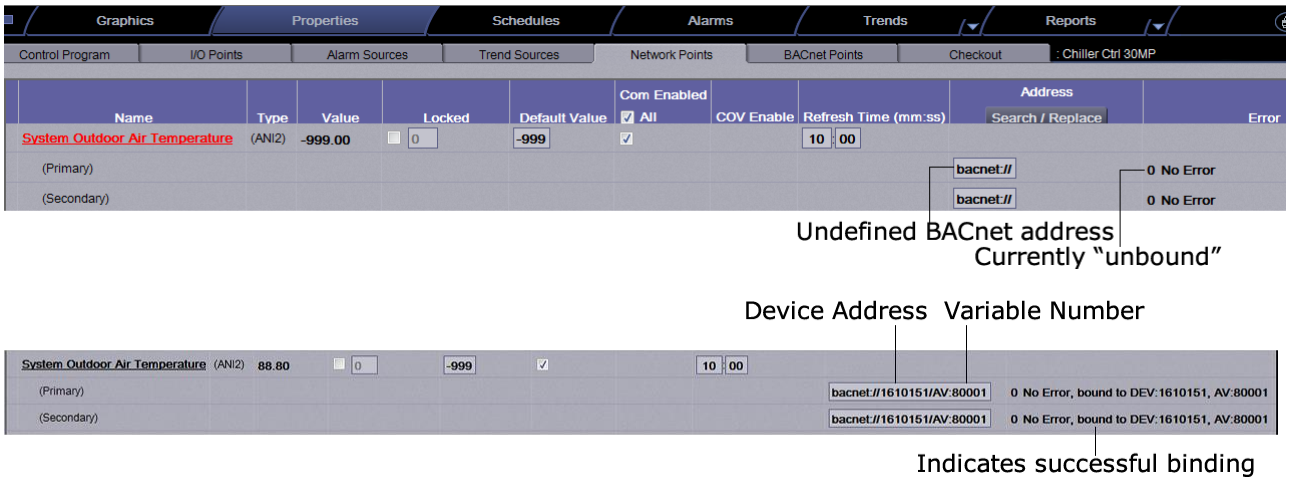
Appendix B: Device Address Binding

Device Address Binding (DAB) allows the controller to receive data from other Open controllers when they are connected by a network. The controller receives data from other Open or BACnet controllers when they are installed as part of an i-Vu® Control System. The data transfer takes the form of DAB, which you must configure.

Currently, the controller implements DAB for the following variables:

- **Network SAT**
- **Network Fan Status**
- **Network Static Pressure**
- **System Outside Air Temperature**
- **System Fire / Smoke**
- **System Pressurization**
- **System Occupancy** (Control mode 4 only)
- **System Cool Demand Level** (Control mode 4 only)
- **System Heat Demand Level** (Control mode 4 only)

You can implement DAB on network points with an undefined BACnet address, displayed in Field Assistant and the i-Vu® interface on the **Properties** page > **Network Points** tab. See example below.



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Appendix C: ASI for AppController Points/Properties

The following tables describe all of the possible settings for your controller on the i-Vu® or Field Assistant **Properties** tab.

NOTE Some of the properties are available only when other settings have been enabled. For example, **Status** > **Indoor Air Quality CO2 (ppm)** is visible only when **Configuration** > **Service Configuration** > **Optional Sensor Type** is set to **IAQ Sensor**.

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** > **Equipment** > **Status**

Point Name/Description	Range
System Mode – The controller's current operating mode.	R: OFF Fan Only Economize Cooling Heating Cont Fan Test Start Delay Temper SAT Fire Shutdown Shutdown IAQ Override Pressurization
Space Temperature - Prime Variable – The space temperature value currently used for control. Not displayed if **Function Type** is set to **Monitor**.	R: -56 to 245°F (-48.9 to 118.3°C)
Return Air Temperature – Displays the current return air temperature. Not displayed if optional RAT sensor is not connected.	R: -56 to 245°F (-48.9 to 118.3°C)
Supply Air Temperature – Displays the current supply air temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Fan Status – Displays the current operating status of the fan.	R: Off/On
Filter Status – Displays the current filter condition.	R: Clean/Dirty
Outdoor Air Temperature – The outdoor air temperature used for control. Not displayed if optional OAT sensor is not connected or network OAT value is unavailable.	R: -56 to 245°F (-48.9 to 118.3°C)
Fan Output – The commanded state of the G output that is used to control the equipment's fan. Not displayed if **Function Type** is set to **Monitor**.	R: On/Off

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Point Name/Description	Range
Cooling Output – Displays the current active cooling capacity as a percentage of the total available capacity. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 100%
Heating Output – Displays the current active heating capacity as a percentage of the total available capacity. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 100%
Shutdown – When **Active**, all alarms are reset. (Current active alarms are displayed.) In **Control** mode, provides a means to stop heating and cooling in an orderly manner.	R: Inactive/Active

Unit Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Configuration** > **Unit Configuration**

Point Name/Description	Default/Range
Heat Enable – Enables or disables heating operation. Not displayed if **Function Type** is set to **Monitor**.	D: Enable R: Disable/Enable
Cool Enable – Enables or disables cooling operation. Not displayed if **Function Type** is set to **Monitor**.	D: Enable R: Disable/Enable
Fan Mode – The supply fan's operating mode. Not displayed if **Function Type** is set to **Monitor**. Options: **Auto** - The fan cycles on/off in conjunction with heating or cooling. **Continuous** - The fan runs continuously during occupancy & intermittently during unoccupied periods with heating or cooling. **Always On** - The fan runs continuously regardless of occupancy or calls for heating and cooling.	D: Continuous R: Auto Continuous Always On
Fan On Delay – How long the fan should delay starting after heating or cooling starts. Automatically overridden to **0** if configured for DX cooling or electric heat is active. Not displayed if **Function Type** is set to **Monitor**.	D: 15 seconds R: 0 to 60 seconds
Fan Off Delay – The number of seconds that the fan continues to run after heating or cooling has ended. Not displayed if **Function Type** is set to **Monitor**.	D: 90 seconds R: 0 to 180 seconds
Minimum Cooling SAT – In cooling mode, the cooling outputs are controlled so that the supply air temperature does not drop below this value. Not displayed if **Function Type** is set to **Monitor**.	D: 50°F (10°C) R: 38 to 60°F (3.3 to 15.5°C)
Maximum Heating SAT – In heating mode, the heating outputs are controlled so the supply air temperature does not rise above this value. Not displayed if **Function Type** is set to **Monitor**.	D: 90°F (32.2°C) R: 80 to 180°F (26.6 to 82.2°C)
Cooling Lockout Temperature – Cooling is inhibited below this outdoor air temperature. Not displayed if **Function Type** is set to **Monitor**.	D: -65°F (-53.9°C) R: -65 to 80°F (-53.9 to 26.6°C)

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Heating Lockout Temperature – Heating is inhibited above this outdoor air temperature. Not displayed if **Function Type** is set to **Monitor**.	D: 150°F (65.5°C) R: 35 to 150°F (1.6 to 65.5°C)
Filter Service Alarm Timer – The amount of time the fan will run before generating a **Filter Alarm**. Set to 0 to disable the alarm and reset accumulated fan hours. Not displayed if **Filter Monitor Type** is set to **Switch**.	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. Not displayed if SPT sensor is connected.	D: Enable R: Disable/Enable
Setpoint Adjustment – Enables or disables the setpoint adjustment mechanism on the local space sensor. Not displayed unless SPT sensor is connected.	D: Enable R: Disable/Enable
Setpoint Adjustment Range - The maximum amount that a user can adjust the setpoint on the local SPT sensor. Not displayed unless SPT sensor is connected.	D: 2Δ°F (1.1Δ°C) R: 0 to 5Δ°F (0 to 2.7Δ°C)
Occupancy Schedules – Enables or disables the occupancy schedule function. Not displayed if **Function Type** is set to **Monitor**.	D: Enable R: Disable/Enable
Power Fail Restart Delay – How long the controller delays normal operation after the power is restored. Typically used to prevent excessive demand when recovering from a power failure. Not displayed if **Function Type** is set to **Monitor**.	D: 60 seconds R: 0 to 600 seconds
Sensor Calibration	
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/C R: -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)
Return Air Temperature – Displays the current return air temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Return Air Temp Calibration – A calibration offset value to allow the return air temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D: 0Δ°F/C R: -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)
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)
Outdoor Air Temp Calibration – A calibration offset value allows the outdoor air temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D: 0Δ°F/C R: -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)

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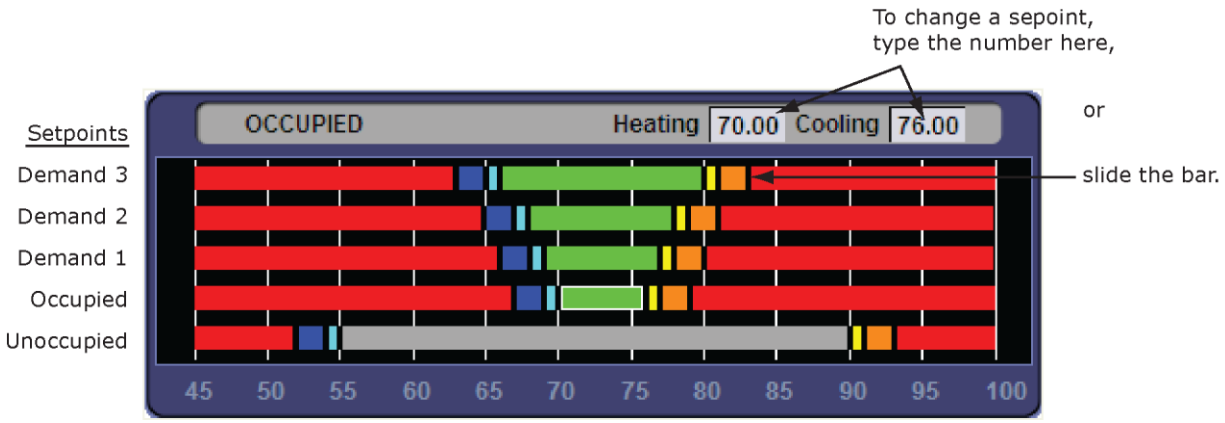
Setpoints

Navigation: i-Vu® / Field Assistant: **Properties** > **Control Program** > **Configuration** > **Setpoints**

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.

NOTE This graphic is an example only. Your setpoints may differ.



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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 24) for more information.

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

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Unoccupied Setpoints

Point Name/Description	Default/Range
Unoccupied Heating – Gray The heating setpoint the controller maintains while in unoccupied mode.	D: 60°F (15.5°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 (32.7°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)

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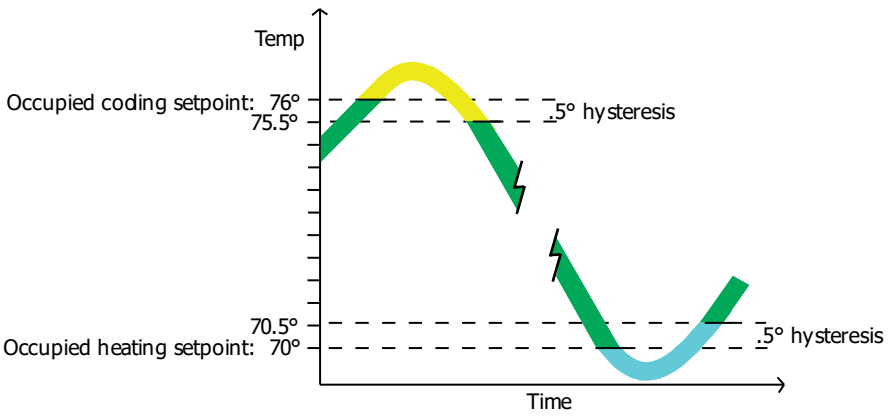
Point Name/Description	Default/Range
Heating Capacity – Used for Optimal Start, this is the rate at which the space temperature changes when the heating system runs at full capacity to maintain designed occupied heating setpoint.	D: 3Δ°F (1.6Δ°C)/hr R: 0 to 120Δ°F (0 to 66.6Δ°C)/hr
Heating Design Temp – 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 space temperature changes when cooling system runs at full capacity to maintain designed occupied cooling setpoint.	D: 3Δ°F (1.6Δ°C)/hr 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.	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 space 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 space 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°C) R: 0 to 120Δ°F (0 to 66.6Δ°C)

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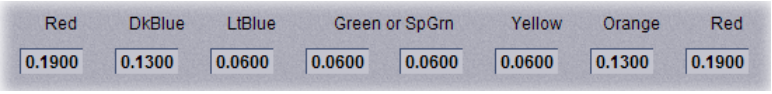
Learning Adaptive Optimal Start



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
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

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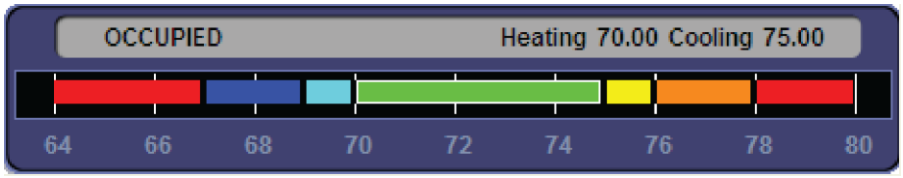
Effective Setpoints



The **Effective Setpoints** graph shows the current occupied or unoccupied setpoints. If occupied, these values are the current programmed setpoints plus the offset of any setpoint adjustment that may be in effect. If unoccupied, the values are the programmed unoccupied setpoints. The values in the above graphic are Fahrenheit.

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 (-17.7 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 (-17.7 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
Min Setpoint Separation – Minimum separation that must be maintained between the heating and cooling setpoints. May be adjusted at **Configuration** > **Service Configuration** > **Min Setpoint Separation**. See the *Service Configuration* (page 56) for additional detail.	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 occupancy is controlled by a network write to the controller's keypad_ovrde variable. (Display name: **BAS On/Off**, in **Properties** > **Control Program** > **Maintenance** > **Occupancy** > **BAS On/Off**. or when utilizing **Airside Linkage** or the **System Occupancy Network Variable**.	D: 1 hr R: 0 to 4 hrs

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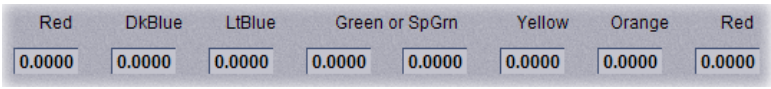
Point Name/Description	Default/Range
Optimal Start Type – The method used to change from unoccupied to occupied setpoint. Options: **None*** – Unit will not change to occupied setpoint until the scheduled time or the unit goes into an occupied mode. Setpoints do not ramp, but change immediately from 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 difference 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. 	D: Temperature Compensated None R: 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

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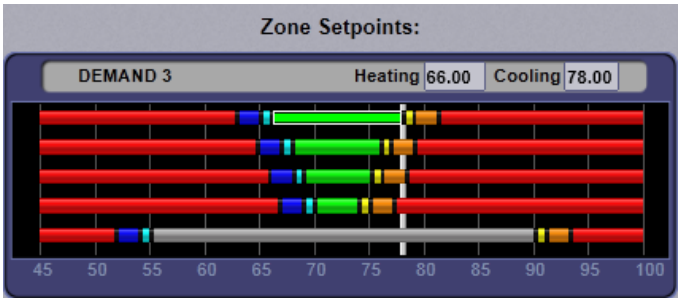
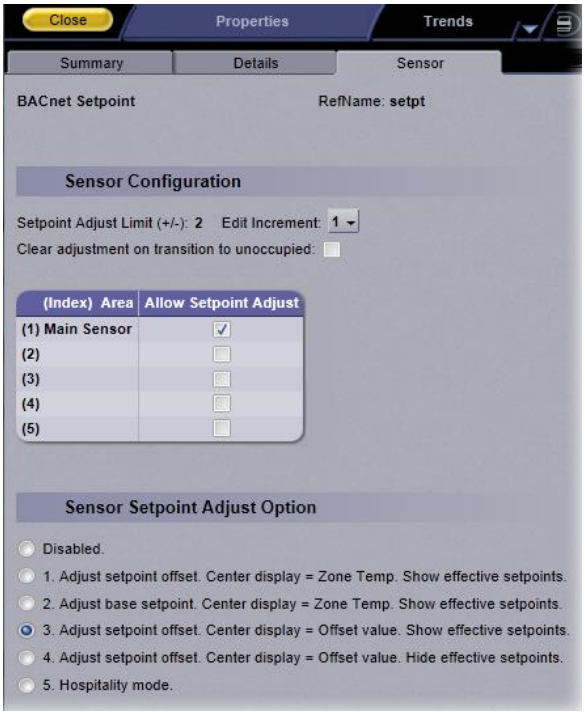
Setpoints for ZS and wireless sensors

Setpoints for ZS and wireless sensors	
To configure setpoint properties for ZS or wireless sensors, **Ctrl+click** anywhere on the **Zone Setpoints:** graph at the top of the **Setpoints** section in order to access the **Properties** microblock popup. 	
In the popup, on the **Properties** > **Sensor** tab, configure ZS or wireless sensors for **Setpoint Adjust**. 	
Edit Increment – Amount of offset in degrees for each press of the up or down arrows on the ZS or wireless sensor for setpoint adjustment.	D: 1 R: 0.1 0.5 1
Allow Setpoint Adjust – Check to allow setpoint adjustments on the specified ZS or Carrier wireless sensor.	D: (1) enabled R: disabled/enabled
Sensor Setpoint Adjust Option – Check to select the ZS or wireless setpoint adjustment display.	D: 3

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Alarm Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Configuration** > **Alarm Configuration**

Point Name/Description	Default/Range
Space Temperature Alarm	
Occupied Alarm Hysteresis – This value is added to the occupied high effective setpoint and subtracted from the occupied low effective setpoint to 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. Not displayed unless SPT sensor is connected.	D: 5Δ°F (2.7Δ°C) R: 2 to 20Δ°F (1.1 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. Not displayed unless SPT sensor is connected.	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. Not displayed unless SPT sensor is connected.	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. Not displayed unless SPT sensor is connected.	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 3Δ°F (1.6Δ°C) for return to normal.	D: 40°F (4.4°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 3Δ°F (1.6Δ°C) for return to normal.	D: 140°F (60°C) R: 90 to 245°F (32.2 to 118.3°C)
Return Air Temperature Alarm	
Low RAT Alarm Limit – The value that the return air temperature must drop below to generate a **Return Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.6Δ°C) for return to normal.	D: -65°F (-53.9°C) R: -65°F to 70°F (-53.9 to 21.1°C)
High RAT Alarm Limit – The value that the return air temperature must exceed to generate a **Return Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 245°F (118.3°C) R: 75 to 245°F (23.9 to 118.3°C)

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Point Name/Description	Default/Range
Outdoor Air Temperature Alarm	
Low OAT Alarm Limit – The **Outdoor Air Temperature** must drop below this value to generate an **Outdoor Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: -65°F (-53.9°C) R: -65°F to 70°F (-53.9 to 21.1°C)
High OAT Alarm Limit – The **Outdoor Air Temperature** must exceed this value to generate an **Outdoor Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 245°F (118.3°C) R: 75 to 245°F (23.9 to 118.3°C)
Alarms Displayed on ZS or SPT Sensor (if optional sensor is connected)	
Fire/Smk Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus sensors, if the **Fire/Smoke Alarm** is active.	D: Ignore R: Ignore/Display
Space Temperature Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus sensors if the **Space Temperature** alarm is active.	D: Ignore R: Ignore/Display
Supply Air Temp Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus sensors if the **Supply Air Temp** alarm is active.	D: Ignore R: Ignore/Display
Return Air Temp Alarm – If set to display, shows the alarm indicator on the SPT Pro or SPT Pro Plus sensors if the **Return Air Temp** alarm is active.	D: Ignore R: Ignore/Display
Fan Failure Alarm – If set to display, shows the alarm indicator on the SPT Pro and SPT Pro Plus sensors, if the supply fan failure alarm is active.	D: Display R: Ignore/Display
Maintenance Displayed on ZS Sensor	
ZS Config Fault – If set to display, shows the maintenance indicator on the ZS Pro Sensor, if ZS Sensor is configured incorrectly.	D: Ignore R: Ignore/Display
Air Side Linkage Fault – If set to display, shows the maintenance indicator on a ZS Sensor with display, if the Airside Linkage is in a Fault condition.	D: Ignore R: Ignore/Display
Dirty Filter Alarm – If set to display, shows the alarm indicator on the communicating zone sensors, if a **Filter** alarm is active.	D: Display R: Ignore/Display
Net OAT Fault – If set to display, shows the maintenance indicator on a ZS Sensor, if the network outside air reading is not valid.	D: Ignore R: Ignore/Display
SPT Sensor Fault – If set to display, shows the maintenance indicator on a ZS Sensor with display, if the zone temperature sensor reading is not valid.	D: Ignore R: Ignore/Display

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Service Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Configuration** > **Service Configuration**

Point Name/Description	Default/Range
Function Type – Defines the type of operation for this device. **Monitor** mode uses SAT and fan status to determine and report the air source mode through Linkage to the zoning system. **Control** mode additionally provides outputs used to control a rooftop air source from information received from the zoning system through Linkage.	D: Monitor R: Monitor/Control
Fan Contact (off) State – Defines the off state for the **Fan Status Input** channel that is used to determine the state of the fan. It defines the contact state when the fan is off.	D: Open R: Open/Closed
Fan w/Heat – When set to **Enable**, the fan output is set to **On** immediately when any heat output is energized. This setting is primarily used for fan coils or residential-type electric heat equipment. Not displayed if **Function Type** is set to **Monitor**.	D: Enable R: Disable/Enable
Heat Type – The type of heating that the unit has. Not displayed if **Function Type** is set to **Monitor**.	D: Gas R: None Gas Electric
Number Of Heat Stages – The number of heat stages. Not displayed if **Function Type** is set to **Monitor**.	D: Two Stages R: One Stage Two Stages
Number Of Cool Stages – The number of cool stages. Not displayed if **Function Type** is set to **Monitor**.	D: Two Stages R: One Stage Two Stages
Min Setpoint Separation – Minimum separation that must be maintained between the heating and cooling setpoints. Not displayed if **Function Type** is set to **Monitor**.	D: 4Δ°F (2.2Δ°C) R: 2 to 10Δ°F (1.1 to 5.5Δ°C)
Fire/Smk Detector Input – Set to **Enable** to activate the fire/smoke detector contact wired to the equipment. This must be a normally closed contact input for normal operation.	D: Disable R: Disable/Enable
Input Ch #5 Function – Determines the function of the input connected to channel #5.	D: Filter Status R: Filter Status/Press Input
Press Contact (normal) State – The non-alarming state for the pressure contact.	D: Open R: Open/Closed
Filter Monitor Type – Used to select the method that determines a dirty filter if **Input Ch #5 Function** is set to **Filter Status**. Not displayed if **Input Ch #5 Function** is set to **Press Input**.	D: Timer R: Switch/Timer
Filter Switch (clean) State – The non-alarming state for the filter switch.	D: Open R: Open/Closed

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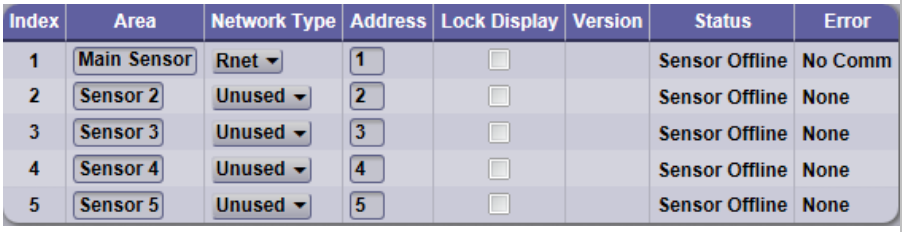
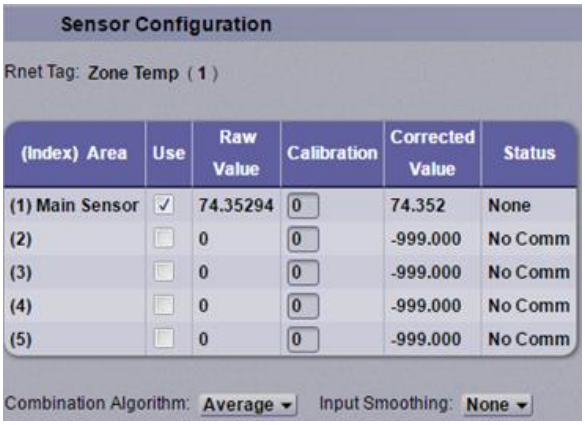
Point Name/Description	Default/Range
Sensor Binder / Zone Temp **Ctrl+click** on the name of these properties to access the microblock popup **Properties** page > **Details** tab. See below for instructions on configuring your ZS or wireless sensors. See the microblock Help for more detailed explanations.	
Sensor Binder - Use the **Associated Sensors** table to configure the Rnet to use additional ZS or wireless sensors. • **Network Type** - Set to **Rnet** • **Address** - Enter the DIP switch settings that are on the additional ZS sensors (up to 5 total) or RnetID assigned to each wireless sensor in SensorBuilder • **Lock Display** - Check to make the sensor display-only	D: **(Index)** - (1) **Network Type** - Rnet **Address** - 1
Zone Temp - Configure additional ZS or wireless temperature sensors used on the controller. • **Use** - Check to include ZS or wireless sensors' value in the **Combined Algorithm** (**Average** is the default). • **Raw Value** - Displays sensed temperature for each ZS or wireless temperature sensor's address • **Calibration** - If needed, enter value to adjust the **Corrected Value** from the **Raw Value**, in order to calibrate an individual ZS or wireless sensor's sensed value. • **Combination Algorithm** - Use **Average**, **Maximum**, or **Minimum** zone temperature to calculate the **Corrected Value** for temperature control.	D: **(Index) Area** - (1) Main Sensor **Use -** checked **Calibration** - 0 **Combination Algorithm** - Average **Input Smoothing** - None **Show on Sensors** - Calculated Value **Display Resolution** - 1 **COV Increment** - .1
WS Battery Strength % — Displays charge strength indicated on the wireless space temperature sensor. If there are multiple wireless sensors, it displays the lowest value.	R: _%



Index	Area	Network Type	Address	Lock Display	Version	Status	Error
1	Main Sensor	Rnet	1			Sensor Offline	No Comm
2	Sensor 2	Unused	2			Sensor Offline	None
3	Sensor 3	Unused	3			Sensor Offline	None
4	Sensor 4	Unused	4			Sensor Offline	None
5	Sensor 5	Unused	5			Sensor Offline	None



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Point Name/Description	Default/Range
WS Signal Strength % — Displays radio signal strength of the wireless space temperature sensor. If there are multiple wireless sensors, it displays the lowest value.	R: _%
WS Sensed Occupancy — Displays occupancy status detected by wireless infrared motion sensor.	R: Off/On
ZS model to show on graphic – Select the ZS model, from the drop-down list, that you want to display on the graphic.	D: ZS Pro-F model R: ZS Base model ZS Plus model ZS Pro model ZS Pro-F model
WS model to show on graphic – Select the wireless model, from the drop-down list, that you want to display on the graphic.	D: WS Plus model R: WS Base model WS Plus model WS Pro model
Net Space Temp to show on graphic — Select the type of sensor to display on graphic.	D: Equipment Touch R: Network Temp Equipment Touch
Network SAT — Allows a supply air temperature value from another BACnet controller to be read over the network and used by this controller. The remote controller must be equipped with a supply air temperature sensor that is network-accessible. -999 indicates no value has been received and it will not be used.	D: -999°
Network Fan Status — Allows a fan status value from another BACnet controller to be read over the network and used by this controller. The remote controller must be equipped with a fan status value that is network-accessible.	D: Off
Network Static Pressure — Allows a supply duct static pressure value from another BACnet controller to be read over the network and used by this controller. The remote controller must be equipped with a static pressure sensor value that is network-accessible. -999 indicates no value has been received and it will not be used.	D: -999°
System Cool Demand Level – The system cool demand level being received over the network. Not displayed if **Function Type** is set to **Monitor**.	D: 0.00 R: 0 to 3
System Heat Demand Level – The system heat demand level being received over the network. Not displayed if **Function Type** is set to **Monitor**.	D: 0.00 R: 0 to 3
System Outdoor Air Temperature – Allows the outdoor air temperature value to be network readable when enabled. Requires controller be equipped with an outdoor air temperature sensor.	D: -999° R: N/A
System Fire / Smoke – Allows a smoke detector or fire alarm status value from another BACnet controller to be read over the network and used by this controller. The remote controller must be equipped with a value that is network-accessible. When received, this will cause a **Linkage Evacuation** mode to be sent to all zones within the system.	D: Off R: Off/On
System Pressurization – Allows a pressurization request value from another BACnet controller to be read over the network and used by this controller. The remote controller must be equipped with a value that is network-accessible. When received, this will cause a **Linkage Pressurization** mode to be sent to all zones within the system.	D: Off R: Off/On
System Occupancy – Allows reading and using another controller's occupancy status value over the network. The remote controller must have a network-accessible Occupancy Status point.	D: Unoccupied R: Unoccupied/Occupied

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Maintenance

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Maintenance**

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. Not displayed if **Function Type** is set to **Monitor**.	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 States: **Sensor Failure** – No valid space temperature or sensor status = failed **SPT Sensor** – An SPT sensor is connected to the controller's Rnet port **RAT/T55** – Using a RAT or T55 sensor wired to I/O terminal **Network** – A network temperature sensor is bound to the controller's space temperature AV **Airside Linkage** – The space temperature is from a linked terminal **Locked Value** –The controller's space temperature input has been manually locked at a value **T-Stat Linkage** – Space temperature shared via Thermostat Linkage **ZS Sensor** - A ZS sensor is connected to the controller's Rnet port **Wireless Sensor** - A Carrier wireless sensor is connected to the controller's Wireless Adapter, which is connected to the Rnet port **NOTE Network** and **T-Stat Linkage** are not applicable to this product.	R: Sensor Failure SPT Sensor RAT/T55 Network Airside Linkage Locked Value T-Stat Linkage ZS Sensor Wireless Sensor
Setpoint Adjustment – The amount that a user has adjusted the setpoints at a zone sensor. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 5Δ°F (0 to 2.7Δ°C)
Effective Heat Setpoint – The current heating setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**. Not displayed if **Function Type** is set to **Monitor**.	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**. Not displayed if **Function Type** is set to **Monitor**.	R: _°F/C
Supply Air Temperature Source – The source of the Supply Air Temperature. States: **N/A** – No sensor value associated with this device **Local** – A physical sensor is wired and connected to the appropriate input channel of this controller **Network** – A network sensor value provided to this controller **Linkage** – The sensor value from an active Linkage connection, such as Airside Linkage. **Locked Value** –The controller's sensor input is manually locked to a specific value **NOTE Linkage** is not applicable to this product.	R: N/A Local Network Linkage Locked Value

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Point Name/Description	Default/Range
Fan Status Source – The source of the fan status. States: **N/A** – No sensor value associated with this device **Local** – A physical sensor is wired and connected to the appropriate input channel of this controller **Network** – A network sensor value provided to this controller **Linkage** – The sensor value from an active Linkage connection, such as Airside Linkage. **Locked Value** –The controller's sensor input is manually locked to a specific value **NOTE N/A**, **Linkage** and **Locked Value** are not applicable to this product.	R: N/A Local Network Linkage Locked Value
Outdoor Air Temperature Source – The source of the OAT value. States: **N/A** – No sensor value associated with this device **Local** – A physical sensor is wired and connected to the appropriate input channel of this controller **Network** – A network sensor value provided to this controller **Linkage** – The sensor value from an active Linkage connection, such as Airside Linkage. **Locked Value** –The controller's sensor input is manually locked to a specific value **NOTE Linkage** is not applicable to this product.	R: N/A Local Network Linkage Locked Value
Heating Demand Level – The system heat demand level received over the network. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 3
Cooling Demand Level – The system cool demand level received over the network. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 3
G Fan Output – The current value of the controller's output used to start and stop the supply fan through the equipment's G fan terminal. Not displayed if **Function Type** is set to **Monitor**.	R: Off/On
Fan Status Input – The current value of the controller's input used to detect the fan status.	R: Open/Close
Active Cooling Stages – The number of cooling stages currently operating. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 2
Y1 Cooling Output – The current value of the controller's output used to start and stop the first stage of cooling through the equipment's Y1 terminal. Not displayed if **Function Type** is set to **Monitor**.	R: Off/On
Y2 Cooling Output – The current value of the controller's output used to start and stop the second stage of cooling through the equipment's Y2 terminal. Not displayed if **Function Type** is set to **Monitor**.	R: Off/On
Time Guard Delay – When set to **Active**, indicates that the required number of cooling stages calculated by the control, is greater than the currently active number of cooling stages, but additional stages cannot be enabled due to a minimum off-time requirement that has not expired. Not displayed if **Function Type** is set to **Monitor**.	R: Inactive/Active
Min Compressor Runtime – When set to **Active**, indicates that the required number of cooling stages calculated by the control is less than the currently active number of cooling stages, but stages cannot be disabled due to a minimum on-time requirement that has not expired. Not displayed if **Function Type** is set to **Monitor**.	R: Inactive/Active
Active Heating Stages – The number of heating stages currently operating. Not displayed if **Function Type** is set to **Monitor**.	R: 0 to 2

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Point Name/Description	Default/Range
W1 Heating Output – The current value of the controller's output used to start and stop the 1st stage of heating through the equipment's W1 terminal. Not displayed if **Function Type** is set to **Monitor**.	R: Off/On
W2 Heating Output – The current value of the controller's output used to start and stop the 2nd stage of heating through the equipment's W2 terminal. Not displayed if **Function Type** is set to **Monitor**.	R: Off/On
Min Heat Runtime - When set to **Active**, indicates that the required number of heating stages calculated by the control is less than the currently active number of heating stages, but stages cannot be disabled due to a minimum on-time requirement that has not expired Not displayed if **Function Type** is set to **Monitor**.	R: Inactive/Active
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
Input Channel #5 – The current state of the input (if present) connected to channel #5.	R: Open/Closed
Smoke Detector Contact – Displays the current state of the input channel used to monitor a normally closed smoke or fire detector contact. Not displayed if **Fire / Smk Detector Input** is set to **Disable**.	R: Normal/Closed Open/Alarm
Fire/Smk Shutdown – Displays the current state of the **System Fire/Smoke** network input.	R: Normal/Alarm
Pressurization – Displays the current state of the **System Pressurization** network input and /or the input channel state if **Input Ch #5 Function** is set to **Press Input**.	
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
Global Occupancy – The **System Occupancy** network input's current state.	R: Unoccupied/Occupied

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Alarms

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Alarms**

Point Name/Description	Range
Fire / Smoke Shutdown – Indicates if the network **Fire / Smoke Shutdown** is in an alarm state.	Normal/Alarm
Pressurization – Indicates that the smoke control **Pressurization** mode is active.	Normal/Alarm
Space Temperature – Indicates if the space temperature sensor exceeds the high or low alarm limit.	Normal/Alarm
Alarming Temperature – Indicates the space temperature value that caused the space temperature alarm. Not displayed if **Space Temperature** is set to **Normal**.	Sensor's range
Alarm Limit Exceeded – Indicates the space temperature alarm limit that was exceeded and caused the space temperature alarm to occur. Not displayed if **Space Temperature** is set to **Normal**.	-60 to 250°F (-51.1 to 121.1°C)
SPT Sensor – Indicates if the SPT space temperature sensor fails to communicate with this controller after having successfully communicated previously. (Only displayed if SPT sensor is connected and has communicated successfully.)	Normal/Alarm
ZS Temp Sensor – Indicates if the ZS communicating zone temperature sensor is no longer communicating.	Normal/Alarm
ZS/WS Sensor Configuration– Indicates a configured ZS or wireless sensor is no longer communicating.	Normal/Alarm
Wireless Battery Strength – Indicates at least one Carrier wireless sensor is reporting that the remaining charge in the capacitor is low and below 5%. The wireless sensor needs more light to charge or requires an additional battery. There is a fixed hysteresis of 2% for return to normal.	Normal/Alarm
Wireless Signal Strength – Indicates that at least one Carrier wireless sensor is reporting the radio strength is less than 10%. Check the sensor or relocate to a different location for improved signal strength. There is a fixed hysteresis of 5% for return to normal.	Normal/Alarm
Space Temp Sensor – Indicates if the space temperature sensor fails.	Normal/Alarm
Supply Fan – Indicates an alarm condition if the supply fan's status fails to match the fan's commanded state when ON. (Only applicable if Input Ch#5 is set to **Fan Status**.)	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.	Normal/Alarm
Return Air Temperature – Displays the current return air temperature sensor exceeds the high or low alarm limit.	Normal/Alarm
Outdoor Air Temperature – Indicates if the outdoor air temperature exceeds the high temperature alarm limit or drops below the low temperature alarm limit.	Normal/Alarm
OAT Sensor – Indicates the controller is no longer receiving a valid network outdoor air temperature value.	Normal/Alarm
Filter – Indicates a dirty filter condition when the filter runtime exceeds the value of the **Filter Service Alarm Timer** or the **Input Channel#5** indicates a dirty filter is present (if configured).	Clean/Dirty
Airside Linkage – Indicates the controller is no longer actively linked to the zoning system after having previously been communicating.	Normal/Alarm

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Linkage

Navigation: i-Vu® / Field Assistant: **Properties** > **Equipment** > **Linkage**

Point Name/Description	Range
Airside Linkage	
Airside Linkage – If **Active**, the controller is part of a linked system. If **Not Active**, the controller is a stand-alone device.	R: Not Active/Active
Linkage Collector – Available to view the data received from a zoning system and the equipment information sent back to the zoning system through Linkage.	
Air Source Mode – Displays the operating mode of this equipment as reported to Linkage. **Airside Linkage** must be **Active**.	R: Off Warmup Heat Cool Freecool Pressure Evac Vent
Air Source Supply Air Temp – Displays the **Supply Air Temperature** value reported to Linkage. **Airside Linkage** must be **Active**.	R: -56 to 245°F (-48.9 to 118.3°C)
Air Source Static Pressure – Displays the air source's supply air static pressure when **Airside Linkage** is **Active** and a valid static pressure value exists.	R: 0:00 to 9.99 in H_2O (0 to 2.465 kPa)
Air Source Outdoor Air Temp – Displays the air source's OAT when **Airside Linkage Status** is **Active** and a valid outdoor air temperature value exists.	R: -56 to 245°F (-48.9 to 118.3°C)
Occupancy Status – The controller's occupancy status as received from **Airside Linkage**. **Airside Linkage** must be **Active**.	R: Unoccupied/Occupied
Linkage Optimal Start – When active, indicates that one or more of the zones connected to this equipment is in an **Optimal Start** mode. **Airside Linkage** must be **Active**.	R: Inactive/Active
Space Temperature – The value of the space temperature received from the zoning system. **Airside Linkage** must be **Active**.	R: __°F
Space Relative Humidity – The value of the space relative humidity received from the zoning system. **Airside Linkage** must be **Active**.	R: _%RH
Indoor Air CO2 – The value of the indoor air CO_2 level received from the zoning system. Linkage **Indoor Air CO2** is displayed when **Airside Linkage** is **Active** and a valid IAQ value exists in at least one zone.	R: _ppm
Occupied Cooling Setpoint – The value of the occupied cooling setpoint received from the zoning system. **Airside Linkage** must be **Active**.	R: __°F
Occupied Heating Setpoint – The value of the occupied heating setpoint received from the zoning system. **Airside Linkage** must be **Active**.	R: __°F
Unoccupied Cooling Setpoint – The value of the unoccupied cooling setpoint received from the zoning system. **Airside Linkage** must be **Active**.	R: __°F
Unoccupied Heating Setpoint – The value of the unoccupied heating setpoint received from the zoning system. **Airside Linkage** must be **Active**.	R: __°F

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I/O Points

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

WARNINGS

- 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 / Zone Temp (SPT Standard, SPT Plus, SPT Pro, and SPT Pro Plus sensors only). Sensor configurations on the microblock's **Properties** > **Details** tab are listed below. For more information, see the *Carrier Sensors Installation Guide*. **NOTE** Do not edit settings on the **Zone Temp** microblock on the right.	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 when 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

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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 not change.	D: zone_temp
SAT Sensor – The value of the controller's supply air temperature sensor input, prior to any operator-configured **Calibration Offset**.	R: -56 to 140°F (-48.9 to 60°C)
RAT Sensor – The value of the controller's return air temperature sensor input, prior to any operator-configured **Calibration Offset**.	R: -56 to 245°F (-48.9 to 118.3°C)
OAT Sensor – The value of the controller's outdoor air temperature sensor input, prior to any operator-configured **Calibration Offset**.	R: -56 to 245°F (-48.9 to 118.3°C)
WS Battery Strength % — Displays charge strength indicated on the wireless space temperature sensor. If there are multiple wireless sensors, it displays the lowest value.	R: _%
WS Signal Strength % — Displays radio signal strength of the wireless space temperature sensor. If there are multiple wireless sensors, it displays the lowest value.	R: _%
Zone Temp – The value provided by the controller's ZS or wireless sensor (if present).	R: _F°
Fan Status Input – The current value of the controller's fan status input.	R: Open/Closed
Input Channel #5 – The current state of the input (if present) connected to channel #5.	R: normal/reversed
Fire/Smk Detect Input – The current state of the smoke detector input (if present).	R: Normal/Closed Alarm/Open
Sensor Invalid – This internal input monitors the communication between the controller and the SPT sensor. **Off** indicates communication is normal.	R: On/Off
WS Sensed Occupancy — Displays occupancy status detected by wireless infrared motion sensor.	R: normal/reversed
G Fan Output – The current value of the controller's G fan output.	R: On/Off
Y1 Cooling Output – The current value of the controller's Y1 cooling output.	R: On/Off
Y2 Cooling Output – The current value of the controller's Y2 cooling output.	R: On/Off
W1 Heating Output – The current value of the controller's W1 heating output.	R: On/Off
W2 Heating Output – The current value of the controller's W2 heating output.	R: On/Off

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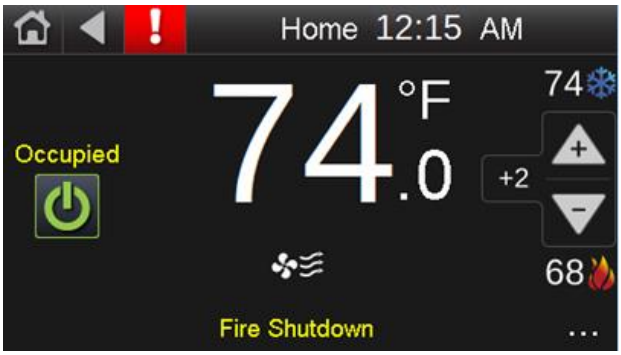
Appendix D: ASI for AppController Points/Properties on the Equipment Touch

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

Navigation screens

Screen Names	Display	Details
Standby	 Not an interactive screen. Touch anywhere to advance to **Home** screen.	Screen displays after the **Inactivity Timer** expires (default is 5 minutes). Displays: • Space temperature • Current setpoints • Mode - Cooling, Fan Speed, Economizer • Occupancy
Home	 Click ... on the right to navigate to **Snapshot** screen.	Displays: • Space temperature • Current setpoints • Mode - Cooling, Fan Speed, Economizer • Occupancy Allows: • Pushbutton Override • Space Setpoint Offset Adjustment

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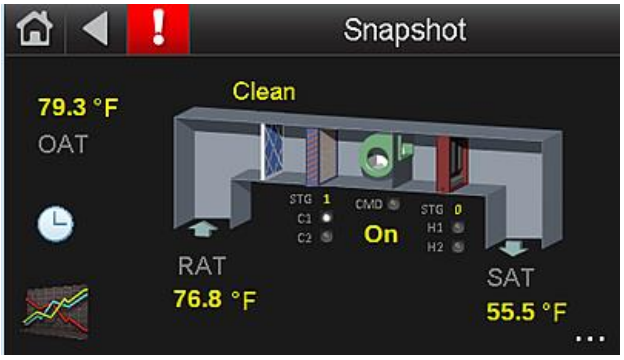
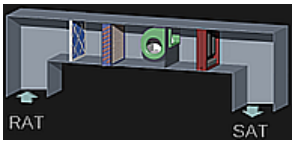
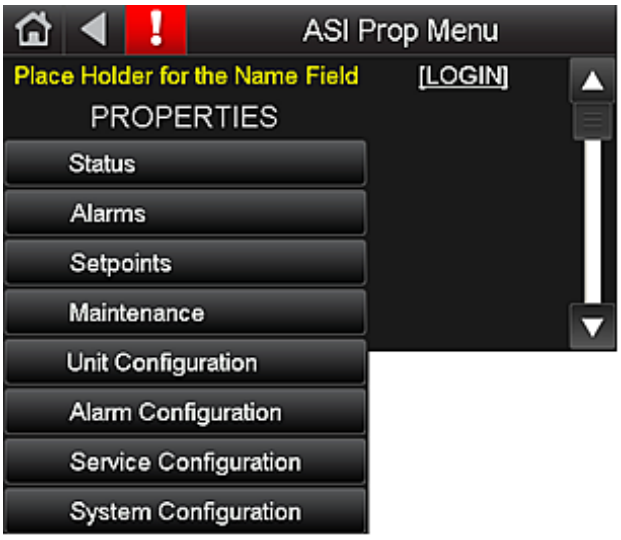
Screen Names	Display	Details
Snapshot	 Displays: • SAT, if allowed • OAT, if available and allowed • Coil and coil stages 	Navigates to: • Schedules • Trends • Forward to **ASI Properties Menu** screen - click ... on the right Displays: • Fan command • Filter status
ASI Properties Menu		Navigates to **Property** pages Login with one of the following passwords: ○ User level - type `user` ○ Admin level - type `admin` ○ Factory level - type `Touch` **NOTE** Only the buttons that are authorized for a specific password level are visible.

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Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
9/20/21	Wiring devices to the controller's Rnet port	Removed hybrid wiring configuration for Rnet port	X-TS-AK-E
8/19/20	Cover, What is the Air Source Interface application	Updated company logo	C-D
1/23/19	Wiring devices to the controller's Rnet port	Removed star configuration from the first paragraph.	X-TS-TS-O
	Specifications	Added surge CAUTION to Protection specification.	X-TS-AK-E-CC
10/26/18	Wiring inputs and outputs > Input wiring specifications	Removed SPT sensor from Input wiring table, added TruVu™ ET Display, and referred user to the device's Installation and Start-up Guide.	C-D
	Wiring devices to the controller's Rnet port	Combined overview and wiring on the zone sensors and touchscreen devices. Added TruVu™ ET Display.	C-D
	Specifications	Reworded Rnet port specification and added power supplied by Rnet port. Reworded Protection specification and added first paragraph. .	X-H-JS-O
3/14/18	Sequence of Operation > Supply Air Temperature Points and Properties	Hysteresis corrected	C-AE-WB-E
12/14/17	Analog outputs	New topic - analog outputs are not used in this application, but could be in a custom application.	C-AE-ZL-E-WB
2/15/17		Changed name of sensors from WS to wireless.	C-D
2/8/17		ASI application changed from using the UC Open to using the AppController. ARC156, ZS sensors, wireless sensors, and Equipment Touch capabilities added. Hardware topics and Properties updated.	C-D-WB

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