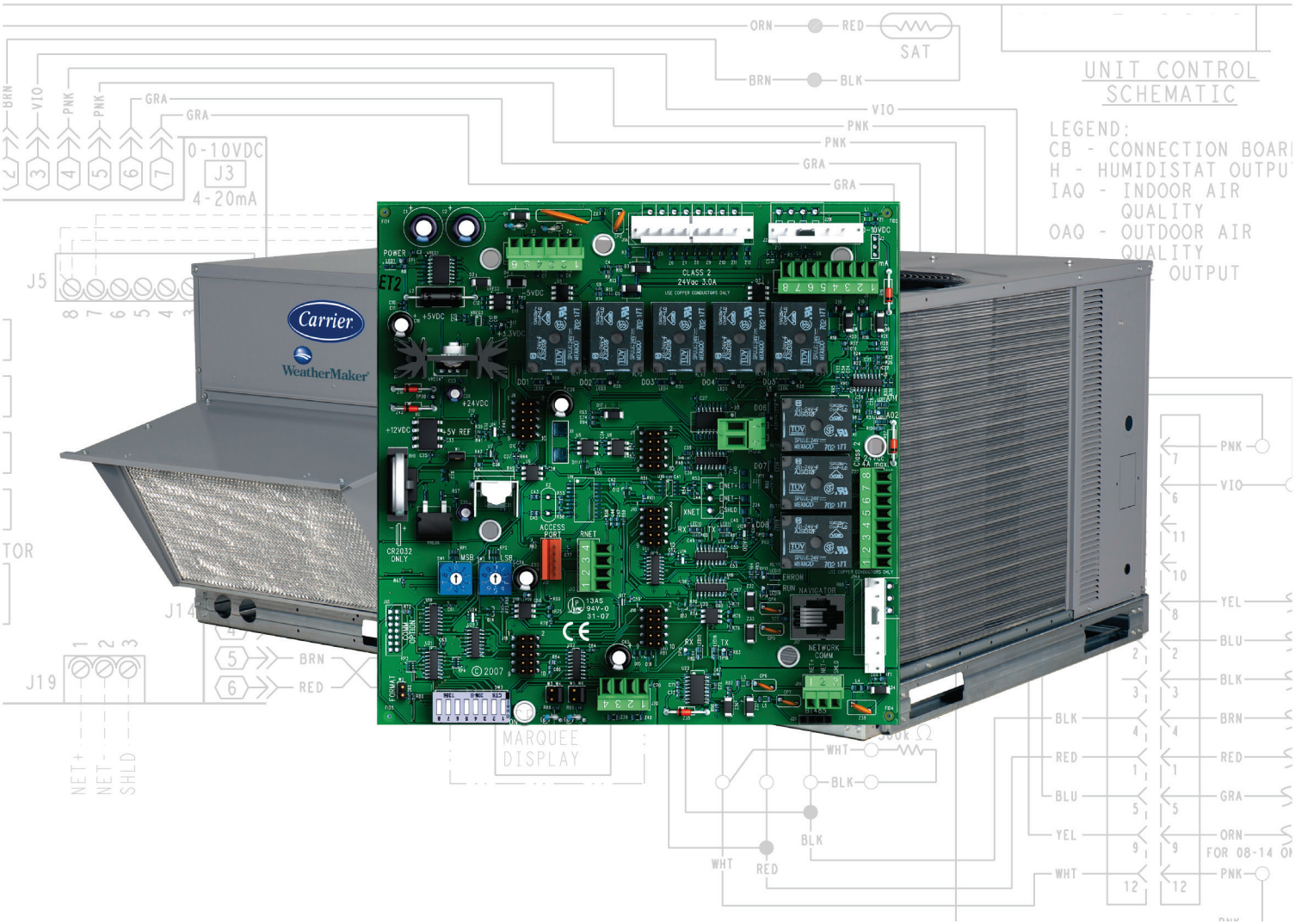
RTU Open v2

Installation and Start-up Guide



A member of the United Technologies Corporation family · Stock symbol UTX · Catalog No. 11-808-429-01 · 2/24/2016

 Verify that you have the most current version of this document from **www.hvacpartners.com** or your local Carrier office.

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

Contents

Introduction

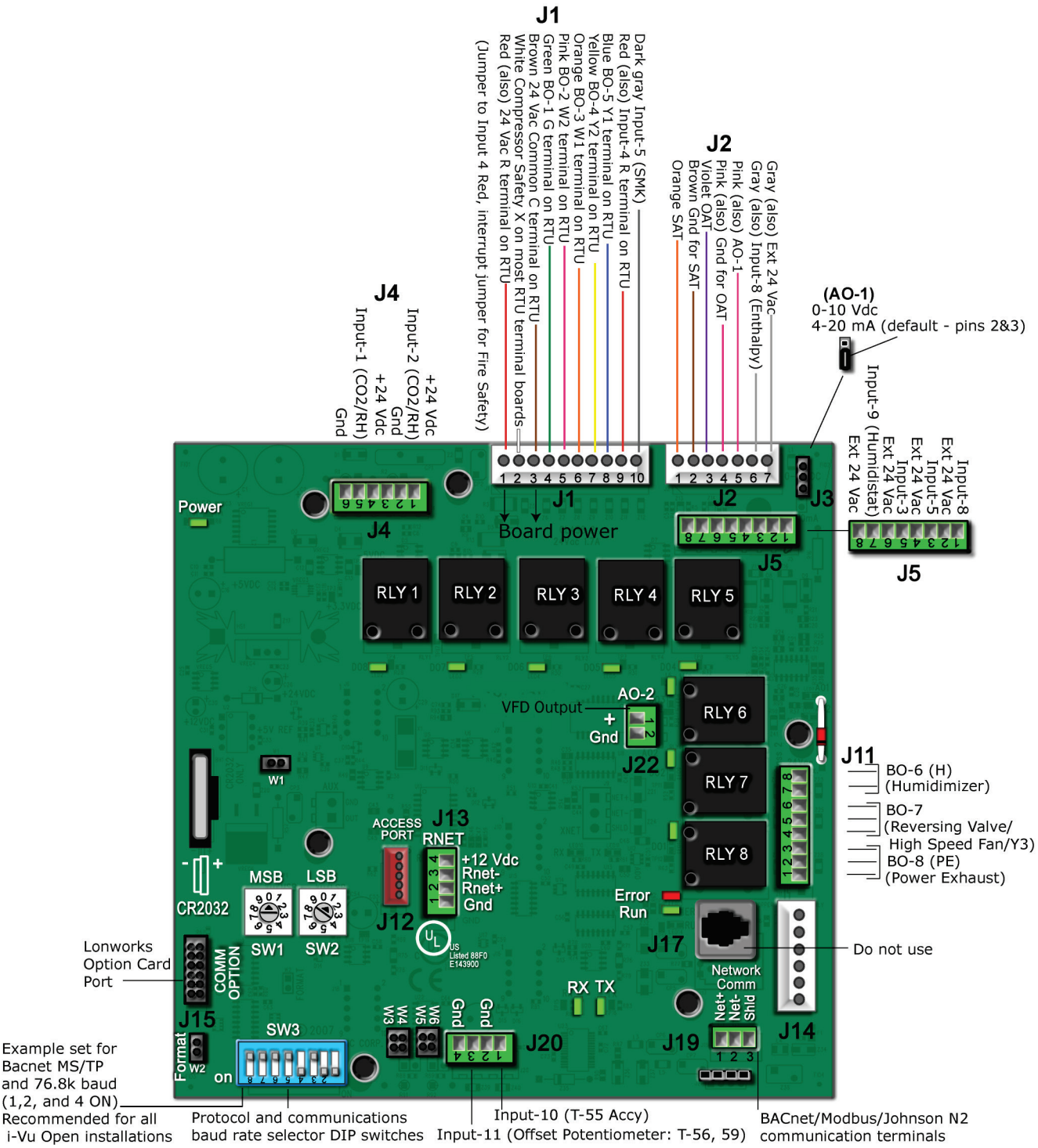
What is the RTU Open controller?

The RTU Open controller is available as an integrated component of a Carrier rooftop unit, or as a field-installed retrofit product. Its internal application programming provides optimum rooftop performance and energy efficiency. RTU Open enables the unit to run in 100% stand-alone control mode or it can communicate to the Building Automation System (BAS).

On board DIP switches allow you to select the baud rate and choose one of the following protocols:

- BACnet
- Modbus
- Johnson N2
- LonWorks

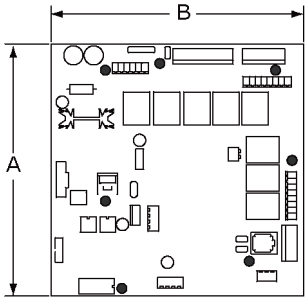
Carrier's diagnostic display tools such as the BAC*view*^{6}® Handheld device or the Virtual BAC*view* application can be used with the RTU Open controller via the **J12** Access Port. See illustration on the following page.



CAUTION If there is a jumper on the Format pins and power is cycled to the controller, all Modbus, N2, and LonWorks points will be lost.

Specifications

Driver	drv_rtuopn_std
Power	24 Vac ±10%, 50–60 Hz 20 VA power consumption (26 VA with BAC*view*® device attached) 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less
Access port **J12**	To connect a BAC*view*[6] Handheld device, Virtual BAC*view* application, or Field Assistant
Rnet port **J13**	Supports SPT or ZS sensors, and a BAC*view*®[6] device in any of the following combinations, wired in a daisy-chain configuration: • 1 SPT Plus or SPT Pro • 1 – 4 SPT Standards • 1 – 4 SPT Standards, and 1 SPT Plus or SPT Pro Any of the above combinations, plus a BAC*view*®[6] device, but no more than 6 devices total • 1 – 15 ZS sensors • Up to 15 ZS sensors and 2 BAC*view*® devices No more than 5 ZS sensors per control program and ZS and SPT sensors cannot be on the same Rnet
Comm Option port	For communication with the LonWorks Option Card.
Inputs	12 inputs: Inputs 1 - 2: 4-20 mA only Inputs 3, 5, 8, 9: Binary, 24 Vac Inputs 6 - 7: Thermistor Inputs 10 - 11: Thermistor Rnet sensor
Binary outputs	8 relay outputs, contacts rated at 3 A max @ 24 Vac Configured normally open.
Analog outputs	2 outputs AO-1: 2-10 Vdc or 4-20 mA (configurable on jumper J3) AO-2: 0-10 Vdc or 2-10 Vdc SC-VFD input
Output resolution	10 bit D/A
Real-time clock	Battery-backed real-time clock keeps track of time in event of power failure
Battery	10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends.

Protection	Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.
Status indicators	LED's indicate status of communications, running, errors, power, and digital outputs
Environmental operating range	-40 to 158°F (-40 to 70°C), 10–95% relative humidity, non-condensing **NOTE** Controllers should be mounted in a protective enclosure. Vibration during operation: all planes/directions, 1.5G @ 20–300 Hz Shock during operation: all planes/directions, 5G peak, 11 ms Shock during storage: all planes/directions, 100G peak, 11 ms
	
Overall dimensions	A: 6-1/2 in. (16.5 cm) B: 6-1/2 in. (16.5 cm)
Mounting dimensions	7 mounting holes in various positions
Depth	1-11/16 in. (4.3 cm)
Weight	11.2 oz (0.32 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-873, FCC Part 15-Subpart B-Class A, CE EN50082-1997

Safety considerations

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

Installation

To install the RTU Open:

1. *Mount the controller* (page 6).
2. *Wire the controller for power* (page 7).
   - *To use the rooftop equipment control power transformer* (page 8).
   - *To use an auxiliary control power transformer* (page 8).
3. *Set the controller's address* (page 10).
4. *Set the protocol and baud rate* (page 10).
5. *Wire to the MS/TP network* (page 11).
6. *Wire inputs and outputs* (page 12).
7. *Wire sensors to the controller* (page 19).

See *Field-supplied hardware* (page 5).

Field-supplied hardware

An RTU Open retrofit installation may require the following field-supplied components:

- wiring harness: Part #OPN-RTUHRN
- transformer – 24 Vac, 20 VA minimum
- wiring

Application-dependent components:

- carbon dioxide sensors
- damper/damper actuator
- differential pressure switch
- enthalpy switch
- fan status switch
- door switch
- fan section door switch
- relative humidity sensor
- remote occupancy contact
- smoke detector
- temperature sensors

To mount the RTU Open

WARNING

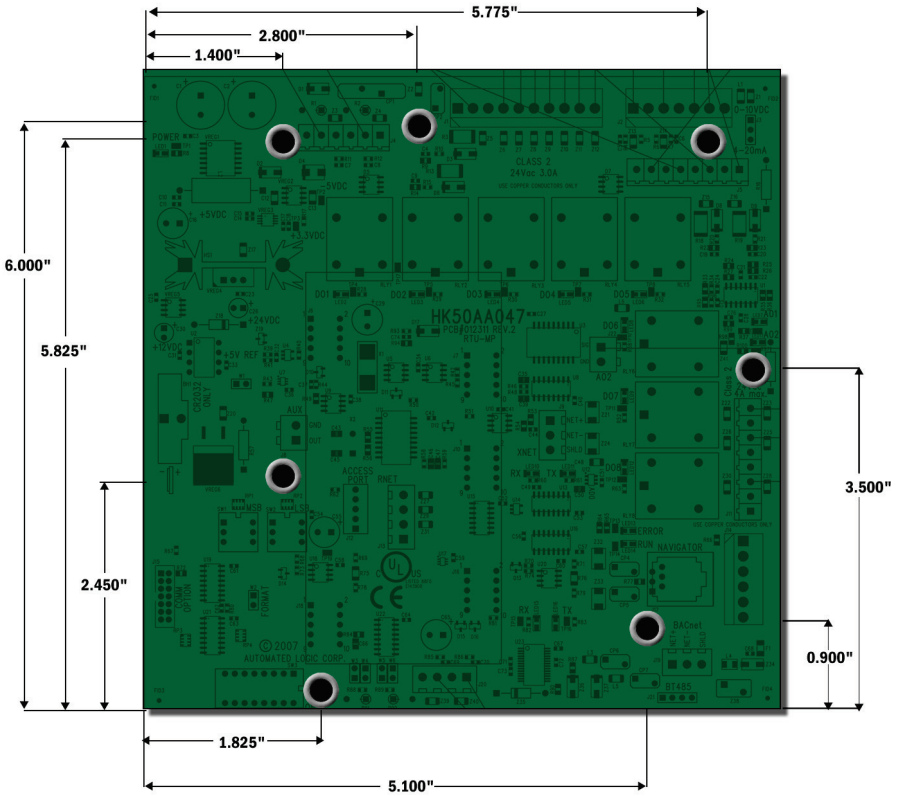
When you handle the RTU Open:
- Do not contaminate the printed circuit board with fingerprints, moisture, or any foreign material.
- Do not touch components or leads.
- Handle the board by its edges.
- Isolate from high voltage or electrostatic discharge.
- Ensure that you are properly grounded.

We highly recommend that you mount the RTU Open in the unit control panel!

WARNING

When you mount the RTU Open:
- Do not locate in an area that is exposed to moisture, vibration, dust, or foreign material.
- Follow NEC and local electrical codes.
- Do not obstruct access for unit maintenance.
- Protect from impact or contact during unit maintenance.

Screw the RTU Open into an enclosed panel using the mounting slots on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.



To wire the RTU Open for power

CAUTIONS

- The RTU Open 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.
- Do not power pilot relays from the same transformer that powers the RTU Open.
- Carrier controllers can share a power supply as long as you:
  - Maintain the same polarity
  - Use the power supply only for Carrier controllers
- The RTU Open has an operating range of 21.6 Vac to 26.4 Vac. If voltage measured at the RTU Open's input terminals is outside this range, the RTU Open may not work properly.
- Avoid running communication wires or sensor input wires next to AC power wires or the controller's relay output wires. The resulting noise can affect signal quality. Common sources of noise are:
  - Spark igniters
  - Radio transmitters

- Variable speed drives
- Electric motors (> 1hp)
- Generators
- Relays
- Transformers
- Induction heaters
- Large contactors (i.e., motor starters)
- Video display devices
- Lamp dimmers
- Fluorescent lights

- In most cases, the RTU Open will be powered from the control power transformer provided with the rooftop equipment. If you must use a separate control power transformer, additional precautions must be taken to ensure that the auxiliary transformer is in-phase with the rooftop equipment's control power transformer. See *To use an auxiliary control power transformer* (page 8).
- When using a permanent Equipment Touch or BAC*view*®6 device, they must be externally powered.

To use the rooftop equipment control power transformer

1. Remove power from the 24 Vac transformer.
2. Remove connector assembly from RTU Open's **J1** connector.
3. If the rooftop equipment has thermostat connection terminals, connect wiring harness **J1** wire 1 to R, and **J1** wire 3 to C. Alternately, connect the control power transformer wires to **J1** connector wires 1 (24 Vac) and 3 (Gnd).
4. Apply power to the rooftop equipment.
5. Measure the voltage at the RTU Open's **J1** terminals 1 and 3 to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Attach harness to RTU Open connector **J1**.

   NOTE The harness and connector are keyed and must be oriented properly for correct installation.
7. Verify that the **Power** LED is on and the **Run** LED is blinking.

To use an auxiliary control power transformer

If you use a separate control power transformer, it is essential that the auxiliary transformer and the rooftop transformer are in-phase. You **must** verify this prior to connecting the auxiliary transformer to the RTU Open.

Follow these steps:

1. Verify the available primary voltage at the rooftop equipment.
2. Remove power from the rooftop equipment and install the appropriate auxiliary transformer. Follow the manufacturer's installation instructions.
3. Ground one leg of the auxiliary transformer's secondary wiring.

4 Apply power to the rooftop equipment. Measure the potential between the rooftop equipment control power and auxiliary transformer's secondary hot (non-grounded) legs. If the voltage measured is less than 5 volts, the transformers are in-phase; proceed to step 7. If you measure a voltage greater than 24 Vac, then the phases are reversed.

5 Correct the phase reversal by either of the following methods:

- Remove the ground from the secondary at the auxiliary transformer and connect it to the other secondary
- Reverse the primary wiring at the auxiliary transformer

6 Repeat step 4 to rewire.

7 Remove connector assembly from RTU Open's **J1** connector.

8 Connect the auxiliary transformer wires to **J1** wires **1** (24 Vac) and **3** (Gnd).

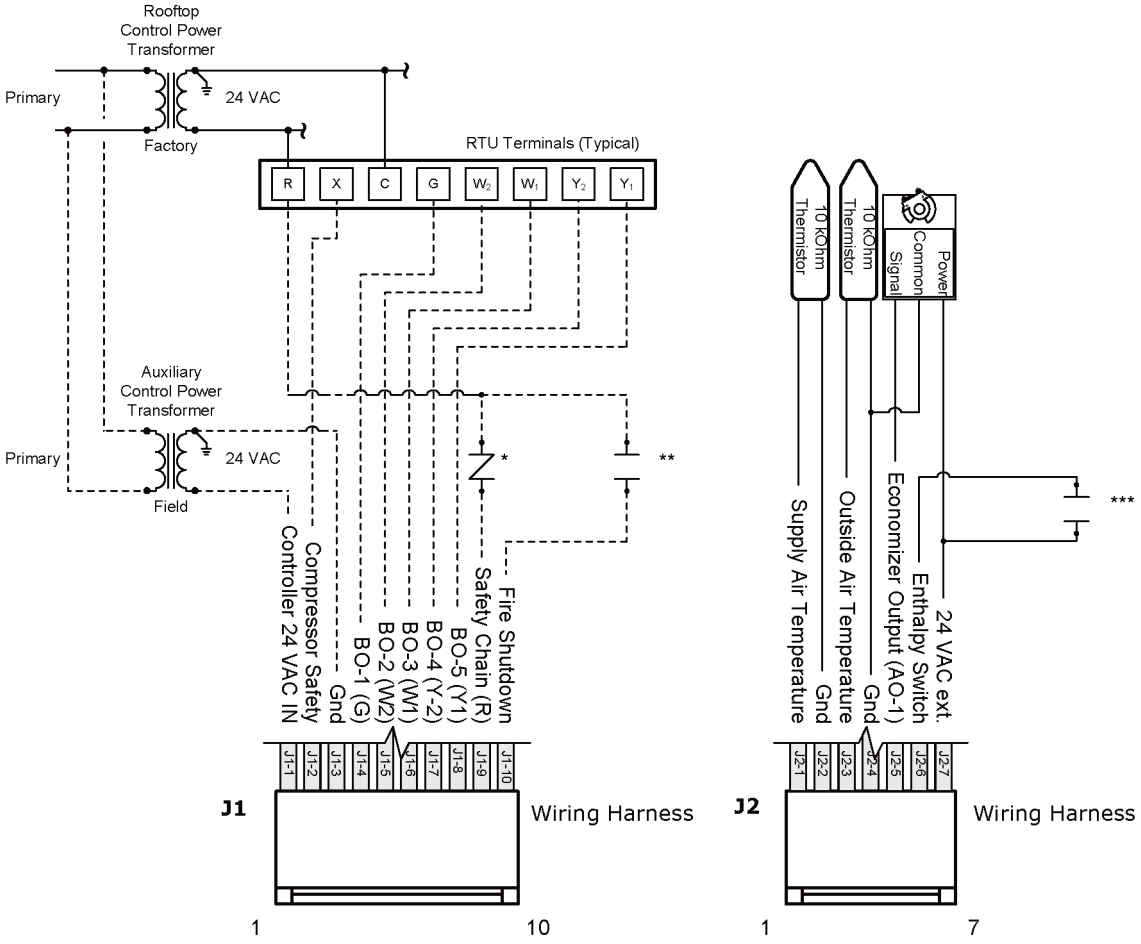
9 Apply power to the transformer.

10 Measure the voltage at the RTU Open's **J1** - **1** and **3** to verify that the voltage is within the operating range of 21.6–26.4 Vac.

11 Attach harness to RTU Open's connector **J1**. See illustration below.

NOTE The harness connectors are keyed and must be oriented properly for correct installation.

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



Optional

* Safety chain devices, field-installed - normally closed. Apply 24 Vac to this terminal (jumper from **J1** - 1 to **J1** - 9) where no safety devices are installed.

** Fire shutdown device, field-installed, configurable as normally open or closed

*** Enthalpy switch, field-installed - configurable as normally open or closed

To set the controller's address

The RTU Open's two rotary switches determine the RTU Open's MAC address when it is placed on an MS/TP network. The rotary switches define the MAC address portion of the RTU Open's BACnet device instance number, which is composed of the MS/TP network number and the MAC address. They also set the slave address on a Modbus or N2 network when less than 100. See the *RTU Open Integration Guide* for additional information on integration.

CAUTION The MAC address of the controller must be unique on its network.

1 Turn **off** the RTU Open's power. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the **MSB (SW1)** (**10's**) switch to the tens digit of the address, and set the **LSB (SW2)** (**1's**) switch to the ones digit.

EXAMPLE To set the RTU Open's address to 01, point the arrow on the **MSB** (**SW1**) switch to 0 and the arrow on the **LSB** (**SW2**) switch to 1.

3 Turn on the RTU Open's power.

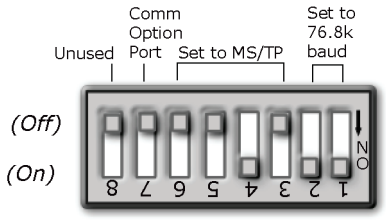
CAUTION The factory default setting is **00** and must be changed to successfully install your RTU Open.

To set the controller's communications protocol and baud rate

RTU Open's **SW3** DIP switches are used to set the controller's protocol and baud rate. The protocol and speed selection is determined by the network on which the controller will be installed. For Carrier BACnet implementations, select MS/TP @ 76.8 k as follows:

1 Power down the RTU Open. The controller reads the protocol and baud rate each time you apply power to it.

2 Set **SW3** DIP switches 1, 2, and 4 to **On** to configure the controller for BACnet MS/TP and 76.8 k baud.



3 Power up the RTU Open.

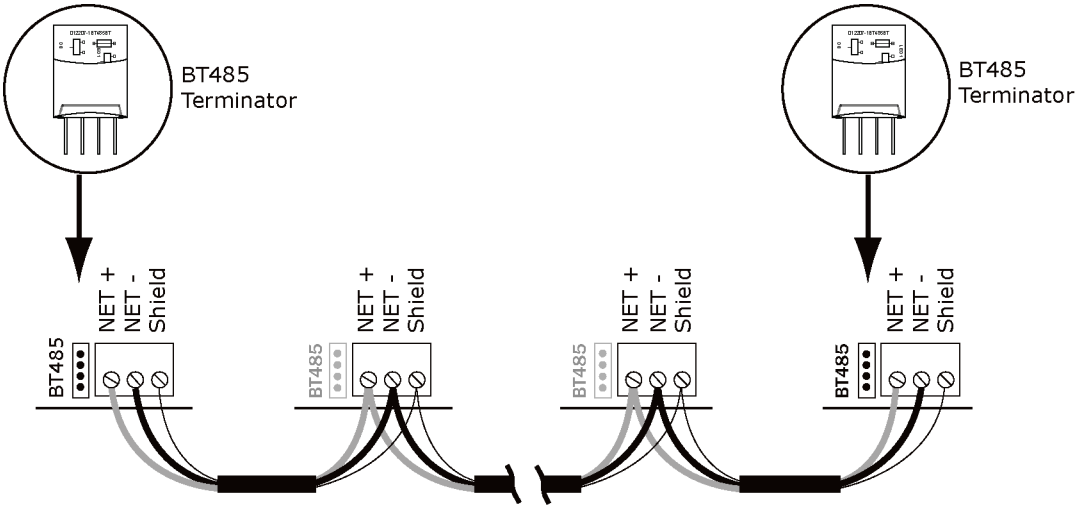
NOTE Other protocols and baud rates are available. See the *RTU Open Integration Guide* for additional instructions.

Wiring the RTU Open to the MS/TP network

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

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

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



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

Wiring specifications

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

To wire the controller to the network

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

   NOTE Use the same polarity throughout the network segment.
4. Verify that the **MSTP** jumper is set to **MSTP**.
5. Set DIP switches 1 and 2 to the appropriate baud rate. See the MSTP baud diagram on the RTU Open. The default baud rate is 76.8 kbps.

   NOTE Use the same baud rate for all controllers on the network segment.
6. Insert the power screw terminal connector into the RTU Open's power terminals.
7. Verify communication with the network by viewing a module status report.

Wiring inputs and outputs

RTU Open Inputs and Outputs Table

Channel Number	Type	Signal	Function	Part Number	Wire/Terminal Numbers	Alternate Terminals
Input 1	AI	4-20 mA	CO2 OAQ Space Relative Humidity	33ZCT55CO2 33ZCT56CO2 33ZCSPTCO2-01 33ZCSPTCO2LCD-01 w/ 33ZCASPCO2 33ZCSENSRH-02	**J4** - 5 & 6	N/A
Input 2	AI	4-20 mA	CO2 OAQ Space Relative Humidity	33ZCT55CO2 33ZCT56CO2 33ZCSPTCO2-01 33ZCSPTCO2LCD-01 w/ 33ZCASPCO2 33ZCSENSRH-02	**J4** - 2 & 3	N/A
Input 3	BI	24 Vac	Compressor Safety **[2] Fan Status Filter Status Remote Occupancy Door Contact	N/A CRSTATUS005A00 CRSTATUS005A00 Field-supplied Field-supplied	**J1** - 2	**J5** - 5 & 6 ***
Input 4	BI	24 Vac	Safety Chain *	N/A	**J1** - 9	N/A

Channel Number	Type	Signal	Function	Part Number	Wire/Terminal Numbers	Alternate Terminals
Input 5	BI	24 Vac	Fire Shutdown **[1, 2] Fan Status Filter Status Remote Occupancy Door Contact	Field-supplied CRSTATUS005A00 CRSTATUS005A00 Field-supplied Field-supplied	**J1** - 10	**J5** - 3 & 4 ***
Input 6	AI	10K Thermistor	Supply Air Temperature	33ZCSENSAT 33ZCSENDAT	**J2** - 1 & 2	N/A
Input 7	AI	10K Thermistor	Outside Air Temperature	33ZCSENOAT	**J2** - 3 & 2	N/A
Input 8	BI	24 Vac	Enthalpy ** Fan Status Filter Status Remote Occupancy Door Contact	33SENTHSW CRSTATUS005A00 CRSTATUS005A00 Field-supplied Field-supplied	**J2** - 6 & 7	**J5** - 1 & 2 ***
Input 9	BI	24 Vac	Humidistat ** Fan Status Filter Status Remote Occupancy Door Contact	--HL--38MG-029 CRSTATUS005A00 CRSTATUS005A00 Field-supplied Field-supplied	**J5** - 7 & 8	N/A
Input 10	AI	10K Thermistor	Space Temperature	33ZCT55SPT 33ZCT56SPT 33ZCT59SPT	**J20** - 1 & 2	N/A
Input 11	AI	100K Thermistor	Space Temperature Setpoint Adjust	33ZCT56SPT 33ZCT59SPT	**J20** - 3 & 4	N/A
Rnet	AI		Zone Temperature	SPS / SPPL / SPP	**J13** - 1, 2, 3, 4	N/A
AO - 1	AO	Economizer	Economizer	Actuator-Field-supplied	**J2** - 5 & 4	N/A
AO - 2	AO	0-10 Vdc or 2-10 Vdc	Variable Frequency Drive	Field-supplied	**J22** - 1 & 2	N/A
BO - 1	BO	N/A - Relay	Fan (G)	N/A	**J1** - 4	N/A
BO - 2	BO	N/A - Relay	Heat 2 (W2) Output	N/A	**J1** - 5	N/A
BO - 3	BO	N/A - Relay	Heat 1 (W1) Output	N/A	**J1** - 6	N/A
BO - 4	BO	N/A - Relay	Cool 2 (Y2) Output	N/A	**J1** - 7	N/A
BO - 5	BO	N/A - Relay	Cool 1 (Y1) Output	N/A	**J1** - 8	N/A
BO - 6	BO	N/A - Relay	Humidi-MiZer™	N/A	**J11** - 7 & 8	N/A
BO - 7	BO	N/A - Relay	Reversing Valve / High Speed Fan	N/A	**J11** - 5 & 6	N/A
BO - 8	BO	N/A - Relay	Power Exhaust	N/A	**J11** - 2 & 3	N/A

Channel Number	Type	Signal	Function	Part Number	Wire/Terminal Numbers	Alternate Terminals

Legend

AI - Analog Input **AO** - Analog Output

BI - Digital Input **BO** - Digital Output

* **Safety Chain Feedback** - 24 Vac required at this wire to provide **Run Enabled** status. Provide a jumper from **J1** - 1 to **J1** - 9 if no safeties are used. See *To wire inputs and outputs* (page 16) for additional information on the RTU Open wiring harness assembly terminations.

** Default input function

*** Parallel screw terminal at **J5** (**J5** - 1 = **J2** - 6, **J5** - 3 = **J1** - 10, **J5** - 5 = **J1** - 2) may be used in place of the associated flying leads at the harness (Part# OPN-RTUHRN). See *To wire inputs and outputs* (page 16) for additional information.

[1] N.C. contact must be used as a primary safety device for approved fire shutdown operation. N.O. contact for monitoring only.

[2] If a function other the default is used, do NOT connect wires from J1-x.

Input wiring specifications

Input	Maximum length	Minimum gauge	Shielding
Thermistor	1000 feet (305 meters)	22 AWG	Unshielded
4-20 mA	3000 feet (914 meters)	22 AWG	Unshielded
Binary input	1000 feet (305 meters)	22 AWG	Unshielded
SPT (RNET)	500 feet (152 meters)	18 AWG 4 conductor	Unshielded

Inputs

These RTU Open inputs accept the following signal types:

These inputs...	Support this signal type...	Description
1, 2	4-20 mA	The input resistance on the positive (+) terminal is 250 Ohms. The Aux Power Out terminal is capable of supplying 24 Vdc to a 4-20 mA transducer, but the total current demanded must not exceed 40 mA. If the voltage measured from the Aux Power Out terminal to Gnd is less than 18 Vdc, you need to use an external power supply.
3, 5, 8, 9	Binary (24 Vac)	24 Vac voltage, resulting in a 25 mA maximum sense current when the contacts are closed
6, 7, 10	Thermistor	10 kOhm at 77°F (25°C)
11	100k Potentiometer	Typically used for 33CZT56SPT Setpoint Offset Potentiometer

Binary outputs

The RTU Open has 8 binary outputs. You can connect each output to a maximum of 24 Vac/Vdc. Each output is a dry contact rated at 3 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 RTU Open has 2 analog outputs that support voltage or current devices.

AO-1 - 2-10 Vdc or 4-20 mA (Configure on jumper J3)
AO-2 - 0-10 Vdc or 2-10 Vdc

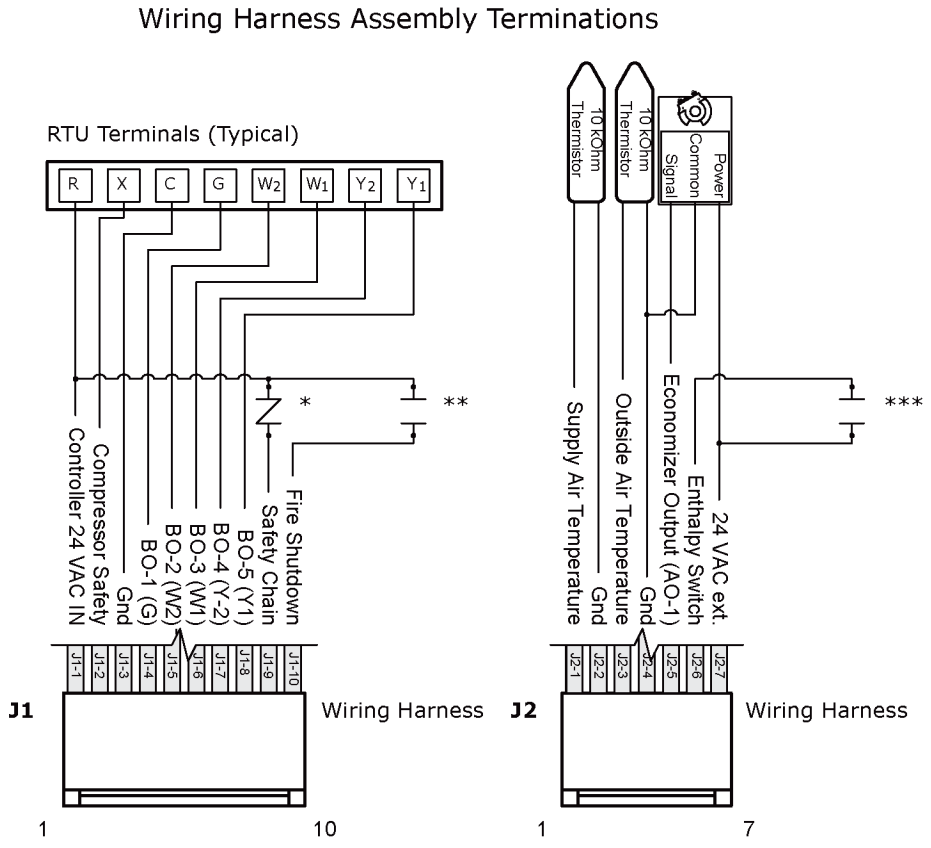
NOTE The controlled device must share the same ground as the controller and have input impedance of 500 Ohms maximum for the 4-20 mA mode on AO1.

To wire inputs and outputs

1. Turn **off** the RTU Open's power.
2. Connect the input wiring to the screw terminals on the RTU Open.
3. Turn **on** the RTU Open's power.
4. Set the appropriate jumpers on the RTU Open.

J3	AO - 1	0 - 10 Vdc/4-20 mA
W1	Battery Jumper	In (Do not remove)
W2	Format Jumper*	Out
W3	Input 11 mA Jumper	Out (mA not used on this channel)
W4	Input 11 Thermistor	In (default position)
W5	Input 10 mA Jumper	Out (mA not used on this channel)
W6	Input 10 Thermistor Jumper	In (default position)

*Formatting the controller may result in lost information and should only be done under the guidance of Carrier Control Systems Support.



Optional

* Safety chain devices, field-installed - normally closed. Apply 24 Vac to this terminal (jumper from **J1** - 1 to **J1** - 9) where no safety devices are installed.

** Fire shutdown device, field-installed, configurable as normally open or closed

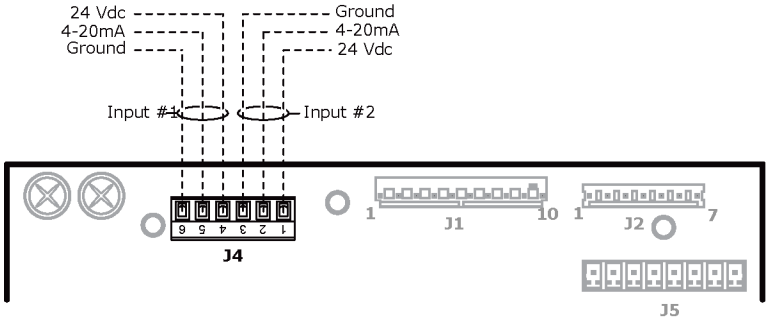
*** Enthalpy switch, field-installed - configurable as normally open or closed

J4 Inputs

1 Turn **off** the RTU Open's power.

2 Connect the input and output wiring to the screw terminals on the RTU Open.

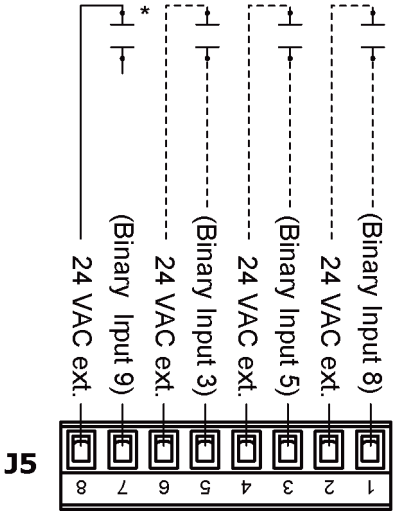
NOTE When utilizing the controller's 24 Vdc auxiliary power out, the total current demand for these two input channels must not exceed 40 mA (100mA per channel).



NOTE J4 Analog Inputs 1 and 2 may be set for the following device types:

- IAQ Sensor
- OAQ Sensor
- Space RH Sensor

J5 Inputs



The terminals for Inputs 3, 5, and 8 are available for use in place of the flying wire leads at Molex connectors J1 and J2 identified below:

NOTE J5 binary inputs 3, 5, and 8 are the same input channels as:

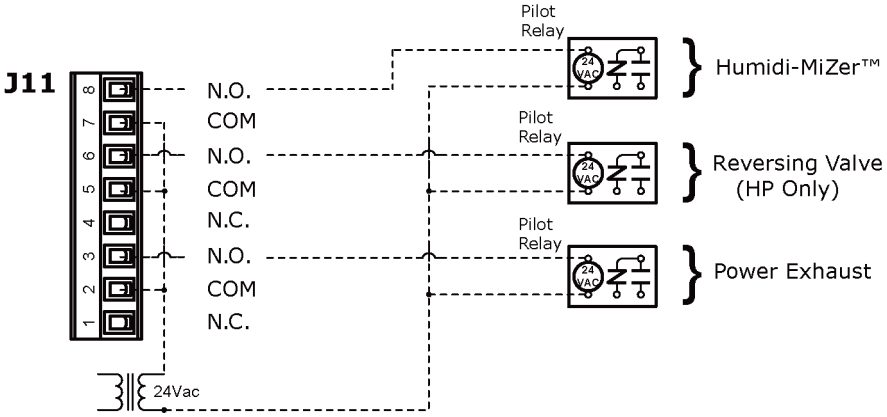
- **J1** wire 2, **J5 - 5** Input - 3 (**Compressor Safety**)
- **J1** wire 10, **J5 - 3** Input - 5 (**Fire Shutdown**)
- **J2** wire 6, **J5** - **1** Input - 8 (**Enthalpy Switch**).

These terminals are available for use in place of the flying wire leads at Molex connectors **J1** and **J2**.

Binary inputs are configurable and may be used for the following functions:

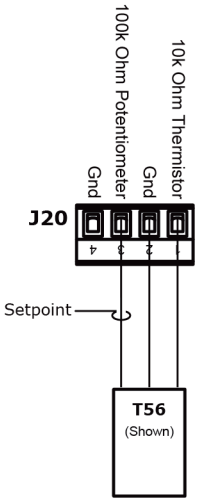
Input	Default input function	Additional functions
3	Compressor Safety	Fan Status Filter Status Remote Occupancy Door Contact
5	Fire Shutdown	Fan Status Filter Status Remote Occupancy Door Contact
8	Enthalpy Switch	Fan Status Filter Status Remote Occupancy Door Contact
9	HumidiStat	Fan Status Filter Status Remote Occupancy Door Contact

J11 Outputs



NOTE Output relay contacts rated at 3A, 24V maximum. Install pilot relays required by application.

J20 Inputs



NOTE J20 Analog Inputs 10 and 11 are reserved for a 10k Ohm space temperature sensor with an optional 100k Ohm offset potentiometer used for setpoint adjustment.

Wiring sensors and switches to the controller

You may wire various sensors to the RTU Open's inputs. See the table below for details.

NOTE This document gives instructions for wiring the sensors to the RTU Open. For specific mounting and wiring instructions, see the *Carrier Sensors Installation Guide*.

All field control wiring that connects to the RTU Open must be routed through the raceway built into the corner post. The raceway provides the UL-required clearance between high-and low-voltage wiring.

1 Pass the control wires through the hole provided in the corner post.

2 Feed the wires through the raceway to the RTU Open.

3 Connect the wires to the removable Phoenix connectors.

4 Reconnect the connectors to the board (where removed).

NOTE For rooftop unit installation, see the base unit installation instructions.

WARNING Electrical Shock Hazard

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

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

Field-supplied sensor hardware

The RTU Open controller is configurable with the following field-supplied sensors:

Sensor	Part numbers	Notes
Space temperature sensor (page 21)	SPS, SPPL, SPP, 33ZCT55SPT, 33ZCT56SPT, 33ZCT59SPT	
Supply air temperature sensor (page 23)	33ZCSENSAT	Factory-installed
Duct air temperature sensor (page 24)	33ZCSENDAT	
Outdoor air temperature sensor (page 25)	33ZCSENOAT	Factory-supplied with Economizer
CO2 sensor (page 26)	33ZCSPTCO2-01 33ZCSPTCO2LCD-01 33ZCT55CO2, 33ZCT56CO2	Required only for demand control ventilation - a dedicated 24-Vac transformer is required
Outdoor air quality sensor (page 28)	33ZCTSENCO2	Optional with demand control ventilation
Duct relative humidity sensor (page 29)	33ZCSENDRH-02	
Space relative humidity sensor (page 29)	33ZCSENSRH-02	
Humidistat (page 30)	--HL--38MG-029	
CO2 aspirator box (page 26)	C33ZCCASPCO2	Required for CO2 return duct/outside air applications
Outdoor air enthalpy switch (page 31)	33CSENTHSW	

Return air enthalpy sensor (page 31)	33CSENTSEN	Optional with 33CSSENTHSW
Filter status switch (page 33)	CRSTATUS005A00	
Fan status switch (page 33)	CRSTATUS005A00 or field-supplied	

For specific details about sensors, see the *Carrier Sensors Installation Gui*de.

Wiring an SPT sensor

The RTU Open is connected to a wall-mounted space temperature sensor to monitor room temperature.

The following table shows the 3 SPT sensor models and their feaures:

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

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

- 1 SPT Plus or SPT Pro
- 1–4 SPT Standards
- 1–4 SPT Standards, and 1 SPT Plus or SPT Pro
- Any of the above combinations, plus up to 2 BAC*view*[6] devices, but no more than 6 devices total

NOTES

- If you have 2 BAC*view*[6] devices, the second BAC*view*[6] device must have a separate power supply with the same ground as the controller.
- If the Rnet has multiple SPT Standard sensors, you must give each a unique address on the Rnet. See the *Carrier Sensors Installation Guide*.
- If the Rnet has multiple BAC*view* devices, you must give each a unique address on the Rnet. See the *BACview Installation and User Guide.*

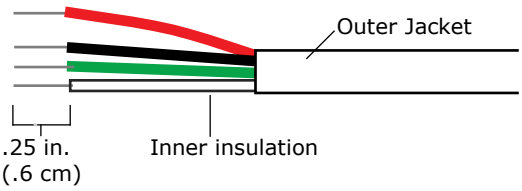
Rnet wiring specifications

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

Description	4 conductor, unshielded, CMP, plenum rated cable
Conductor	18 AWG
Maximum length	500 feet (152 meters)
Recommended coloring	Jacket: White Wiring: Black, white, green, red
UL temperature rating	32–167°F (0–75°C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

To wire the SPT sensor to the controller

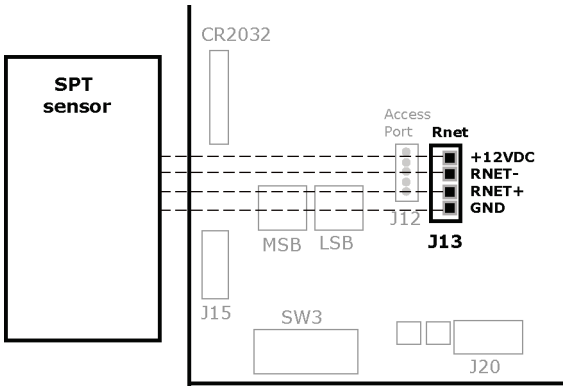
1 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation. Strip about .25 inch (.6 cm) of the inner insulation from each wire.



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

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

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



Wiring a supply air temperature sensor

Part #33ZCSENSAT

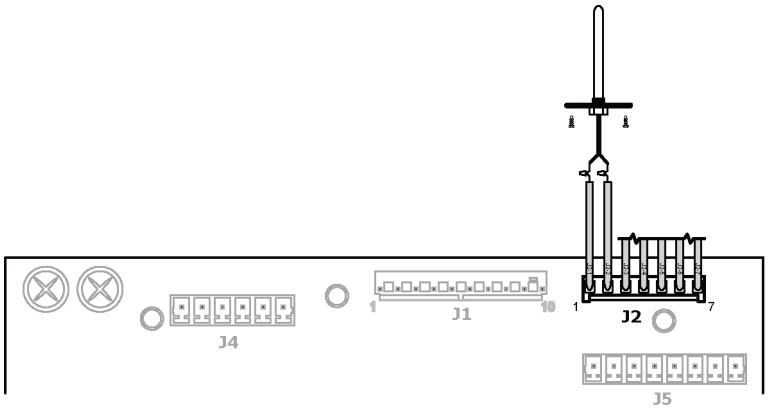
The RTU Open requires a temperature sensor installed in the supply air stream. The Supply Air Temperature (SAT) sensor is used when the rooftop unit is equipped with electric heating.

Wiring specifications

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

To wire the SAT sensor to the controller

1. Connect the wiring harness (OPN-RTUHRN). For details, see *To wire inputs and outputs* (page 16).
2. Wire the sensor to the wiring harness. See diagram below.
3. Connect to **J2** wires 1 and 2.
4. Verify your sensor readings.



Wiring a duct air temperature sensor

Part #33ZCSENDAT

The RTU Open requires a temperature sensor installed in the supply air stream. The Duct Temperature (DAT) sensor is generally used when the rooftop unit is NOT equipped with electric heating.

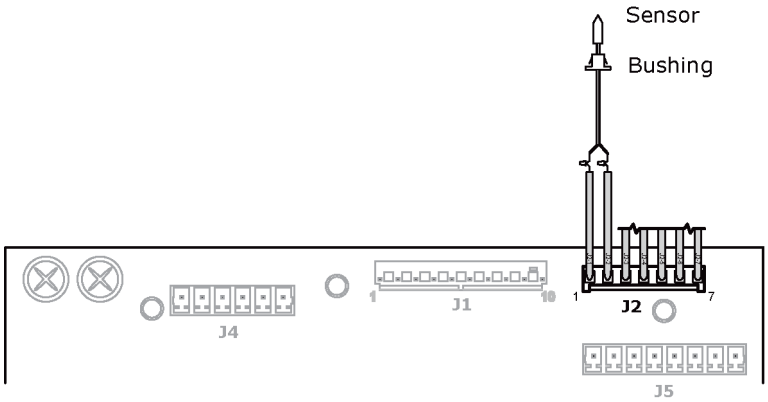
Wiring specifications

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

To wire a DAT sensor to the controller

1. Connect the wiring harness (Part#OPN-RTUHRN). For details, see *To wire inputs and outputs* (page 16).
2. Wire the sensor to the wiring harness. See diagram below.
3. Connect to **J2** wires 1 and 2.
4. Verify your sensor readings.

5 Drill .25" diameter hole. Pass sensor leads through bushing and insert assembly into hole. Secure leads to ductwork with aluminum tape.



NOTE Sensor termination requires installation of RTU Open wiring harness assembly (Part #OPN-RTUHRN).

Wiring an outdoor air temperature sensor

Part #33ZCSENOAT

Outdoor Air Temperature (OAT) is required to use all of the RTU Open's features. OAT may be provided by a local sensor (shown below) or a linked sensor in another controller. See *Single Point Linkage* (page 78).

Wiring specifications

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

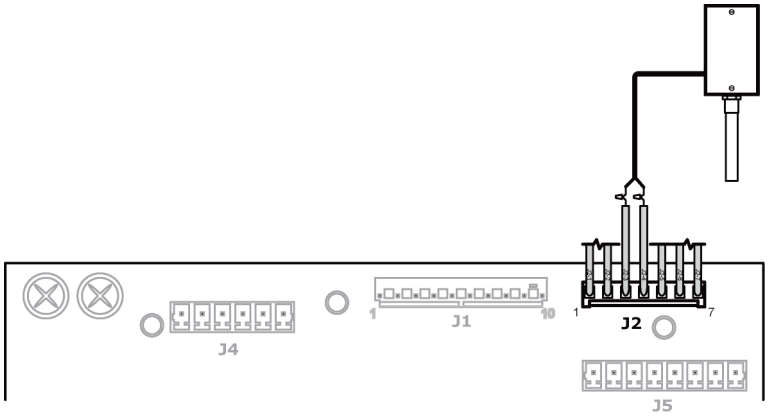
To wire an OAT sensor to the controller

1 Connect the wiring harness (Part#OPN-RTUHRN). For details, see *To wire inputs and outputs* (page 16).

2 Wire the sensor to the wiring harness. See diagram below.

3 Connect to **J2** wires 3 and 4.

4 Verify your sensor readings.



Wiring a CO2 sensor

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

Part #33ZCT55CO2 (No display)
Part #33ZCT56CO2 (No display)

A CO_2 sensor monitors carbon dioxide levels. As CO_2 levels increase, the RTU Open adjusts the outside air dampers to increase ventilation and improve indoor air quality. A CO_2 sensor can be wall-mounted or mounted in a return air duct. Duct installation requires an Aspirator Box Accessory (Part #33ZCASPCO2).

The sensor has a range of 0–2000 ppm and a linear 4-20 mA output. The CO_2 sensor's power requirements exceed what is available at **J4** - 1 and 4. Provide a dedicated 24Vac transformer or DC power supply.

Wiring specifications

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

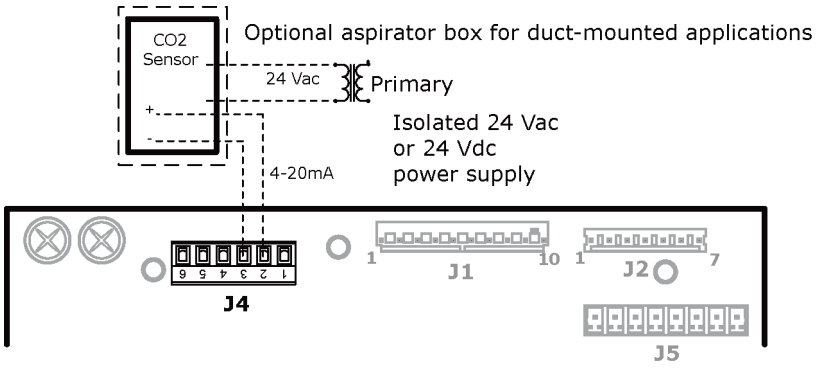
To wire a separate dedicated CO2 sensor to the controller

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

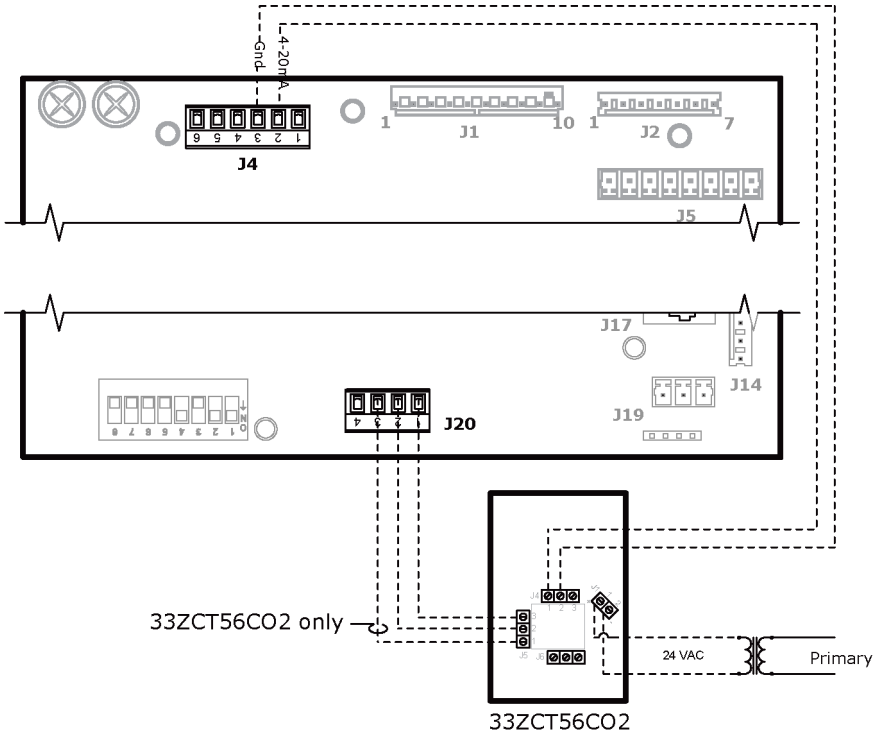
2 Install a field-supplied dedicated 24 Vac transformer or DC power supply.

3 Wire the sensor to the controller.

Wiring diagram for #33ZCSPTCO2:



Wiring diagram for #33ZCT55/56CO2:



Wiring an outdoor air quality sensor

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

An outdoor air quality (OAQ) sensor monitors outside air carbon dioxide levels. The RTU Open uses this information, in conjunction with a CO_2 sensor, to adjust the outside air dampers to provide proper ventilation. An OAQ sensor is typically duct-mounted in the outside air stream. Duct installation requires an Aspirator Box Accessory (Part #33ZCASPCO2).

The sensor has a range of 0–2000 ppm and a linear 4-20 mA output. The CO_2 sensor's power requirements exceed what is available at **J4** - 1 and 4. Provide a dedicated 24 Vac transformer or DC power supply.

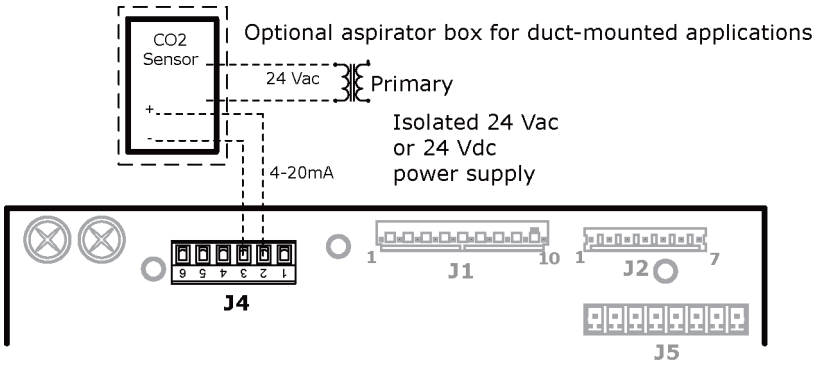
Wiring specifications

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

To wire the OAQ sensor to the controller

1. Wire the sensor to the controller. See appropriate diagram below.
2. Install a field-supplied dedicated 24 Vac transformer or DC power supply.
3. Apply power and verify sensor readings.

Wiring diagram for #33ZCSPTCO2-01:



NOTE Sensor may be terminated at Input 1 or 2.

Wiring a relative humidity sensor

Wall and duct sensor - Part #33ZCSENSRH-02 and 33ZCSENDRH-02

The Relative Humidity (RH) sensor may be used for zone humidity control (dehumidification) when applied to a Carrier rooftop unit equipped with the Humidi-MiZer™ option. On units not equipped for dehumidification, the sensor monitors humidity, but provides no control.

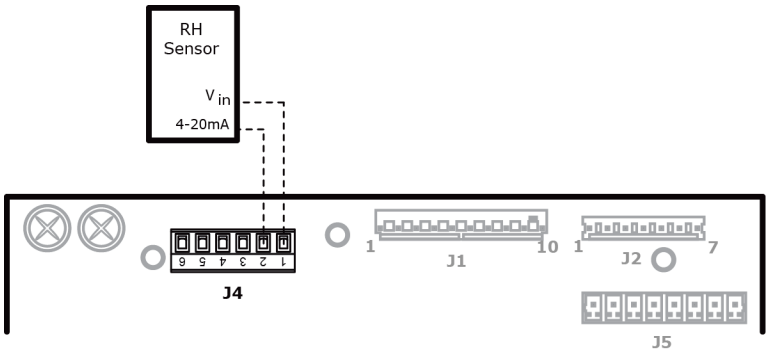
NOTE You cannot use a relative humidity sensor when using both a CO_2 and OAQ sensor on the controller.

Wiring specifications

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

To wire a separate dedicated RH sensor to the controller

1. Strip the outer jacket from the cable for at least 4 inches (10.2 cm). Strip .25 inch (.6 cm) of insulation from each wire.
2. Wire the sensor to the controller. See diagram below.
3. Apply power and verify sensor readings.



NOTE Sensor may be terminated at Input 1 or 2.

Wiring a humidistat

Locally Purchased

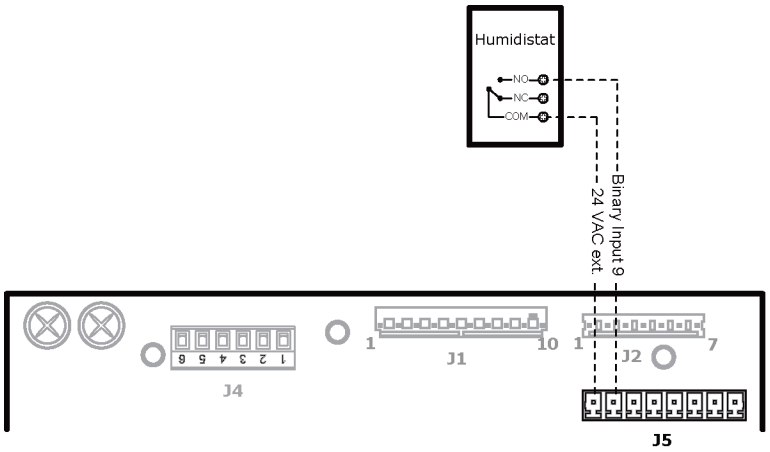
A humdistat may be used for zone humidity control (dehumidification) when applied to a Carrier rooftop unit equipped with the Humidi-MiZer™ option. On units not equipped for dehumidification, the humidistat will indicate a high humidity condition only.

Wiring specifications

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

To wire a humidistat to the controller

1. Strip the outer jacket from the cable for at least 4 inches (10.2 cm). Strip .25 inch (.6 cm) of insulation from each wire
2. Wire the humidistat to the controller. See diagram below.
3. Apply power and verify sensor readings.



NOTE Humidistat may be return duct or space mounted.

Wiring an enthalpy switch

Outdoor Air - Part #33CSENTHSW

Return air - Part #33CSENTSEN

The 33CSENTHSW is an outdoor air enthalpy switch/receiver. This control determines the suitability of the outdoor air as a cooling source, based on the heat content of the air. Differential enthalpy control requires installing a 33CSENTSEN enthalpy sensor in the rooftop unit's return air duct.

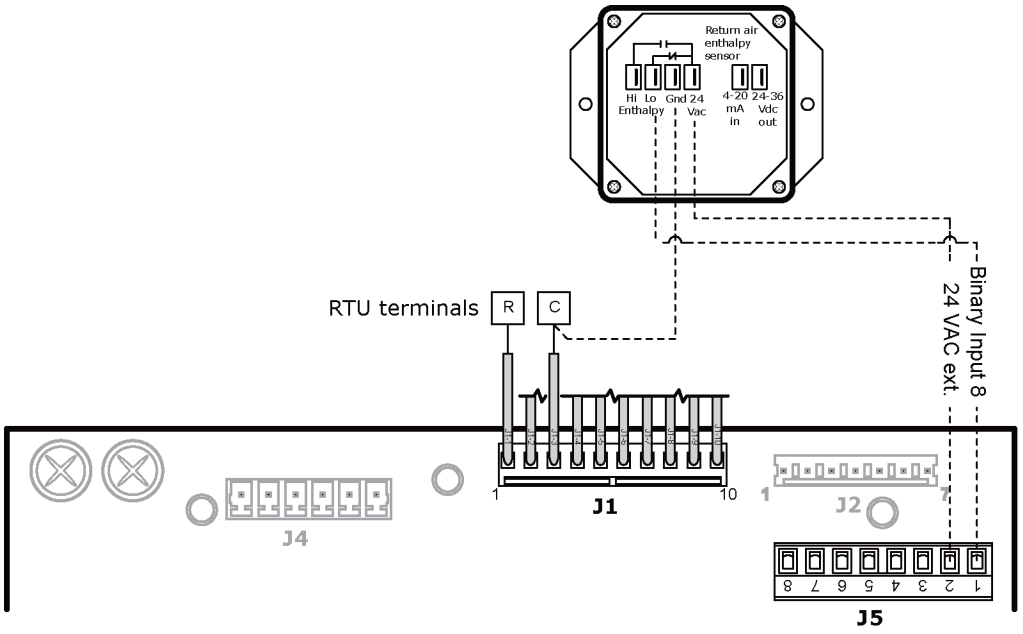
Wiring specifications

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

To wire an enthalpy switch (outdoor air) to the controller

An enthalpy switch is typically mounted in the outdoor air inlet.

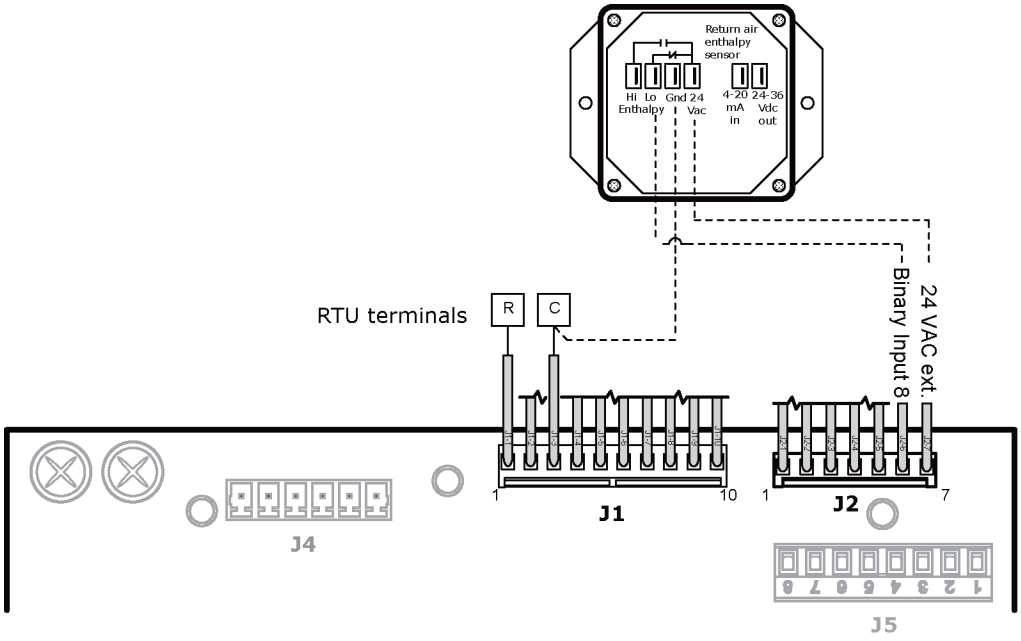
Wiring diagram for a field-installed enthalpy switch:



NOTES

- Factory-installed enthalpy switches terminate at **J2** wires 6 (switch input) and 7 (24 Vac).
- Input channel must be configured for the enthalpy contact (N.O. or N.C.) that you use.

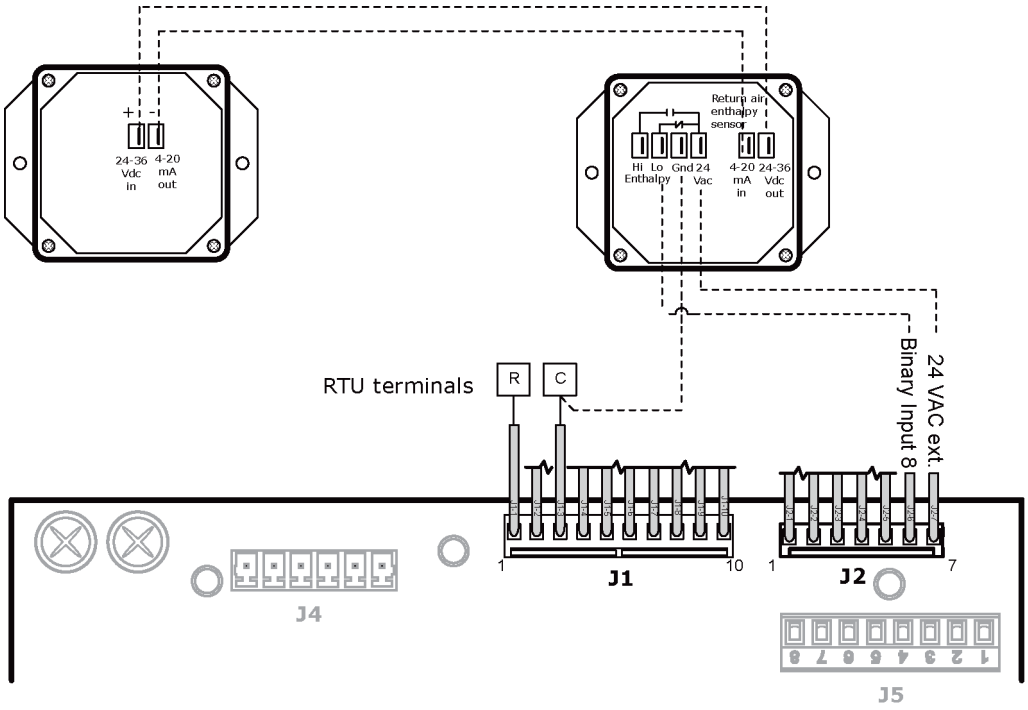
Wiring diagram for factory-installed enthalpy switch:



NOTE Factory-installed enthalpy switches terminate at **J2** wires 6 (switch input) and 7 (24 Vac).

To wire an enthalpy switch (differential) to the controller

Wiring diagram for optional enthalpy sensor mounted in the return air for differential enthalpy:



Wiring a status switch

Filter - Part #CRSTATUS005A00 or field-supplied

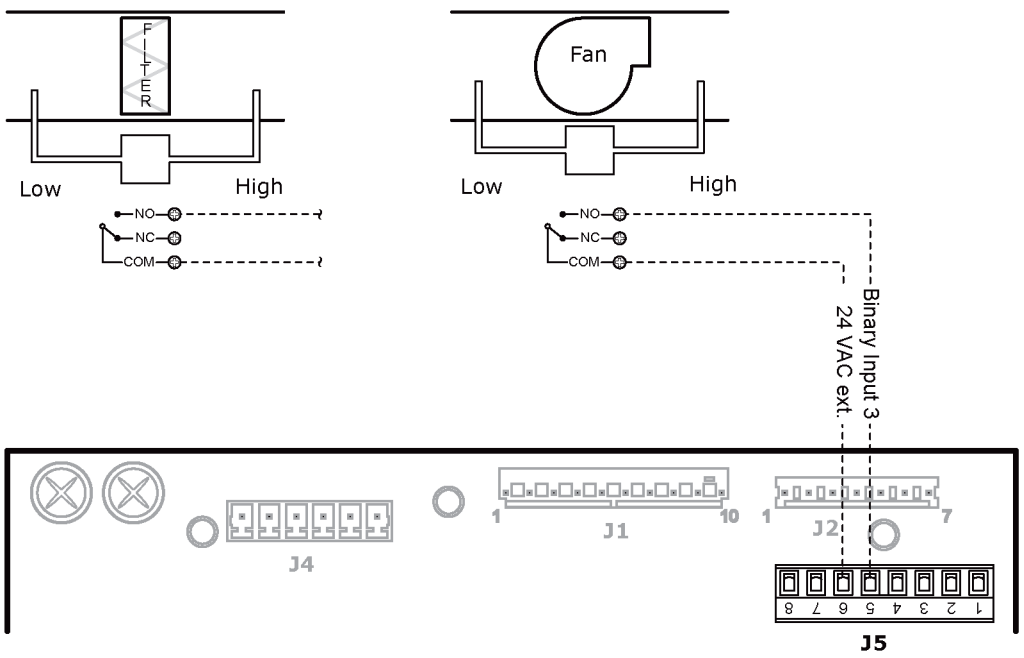
Fan status - Part #CRSTATUS005A00 or field-supplied

Filter and/or fan status switches may be installed to provide a **Dirty Filter** indication or **Fan Running** status.

Wiring specifications

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

To wire a status switch to the controller



NOTES

- Binary inputs 3, 5, 8, and 9 are configurable and may be used for **Fan Status**, **Filter Status**, **Remote Occupancy,** or **Door Contacts**, if they have not already been used for their default functions.
- Follow device manufacturer's installation and operating instructions.

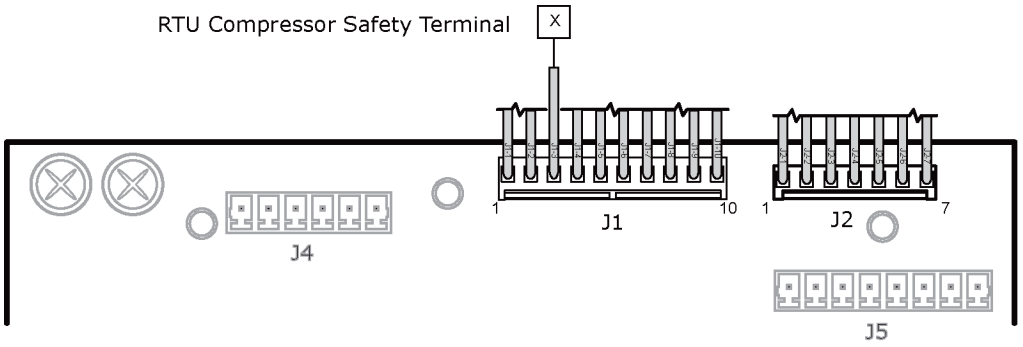
Wiring a compressor safety

This is typically provided by the manufacturer with the rooftop equipment. A compressor safety status may be monitored if available.

Wiring specifications

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

To wire a compressor safety input to the controller



NOTES

- An isolation relay may be required if the RTU Open is powered separately from the equipment's control power circuit.
- Follow device manufacturer's installation and operating instructions.

Wiring an occupancy switch or door contact

Occupancy switch - field-supplied

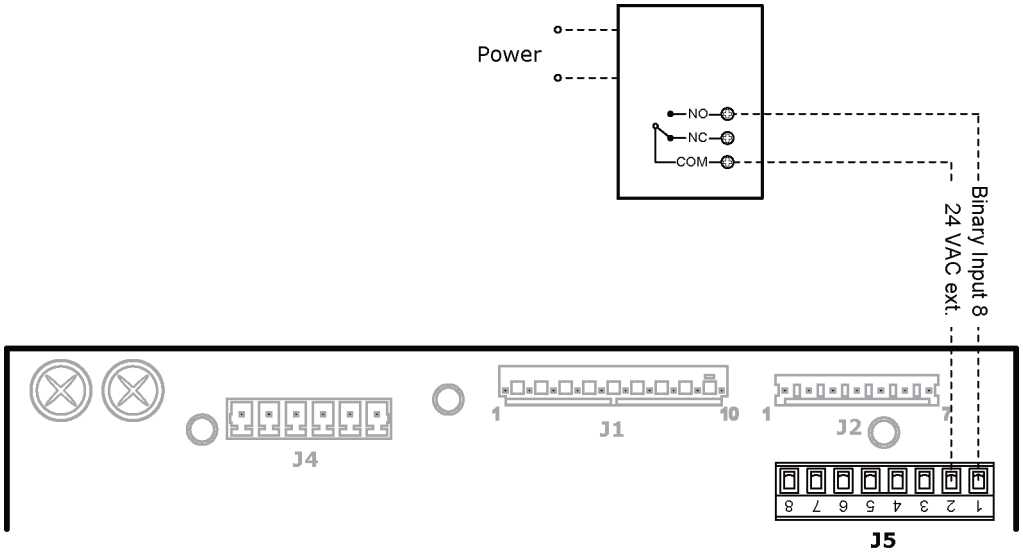
Door contact - field-supplied

Occupancy or door contact switches may be installed to provide an alternate means of occupancy determination or heating and cooling lockout. See *Sequence of Operation* (page 40) for additional details.

Wiring specifications

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

To wire an occupancy switch or door contact



NOTES

- Binary Inputs 3, 5, 8, and 9 are configurable and may be used for **Fan Status**, **Filter Status**, **Remote Occupancy**, or **Door Contacts** - provided they have not been used for their default functions.
- Follow device manufacturer's installation and operating instructions.

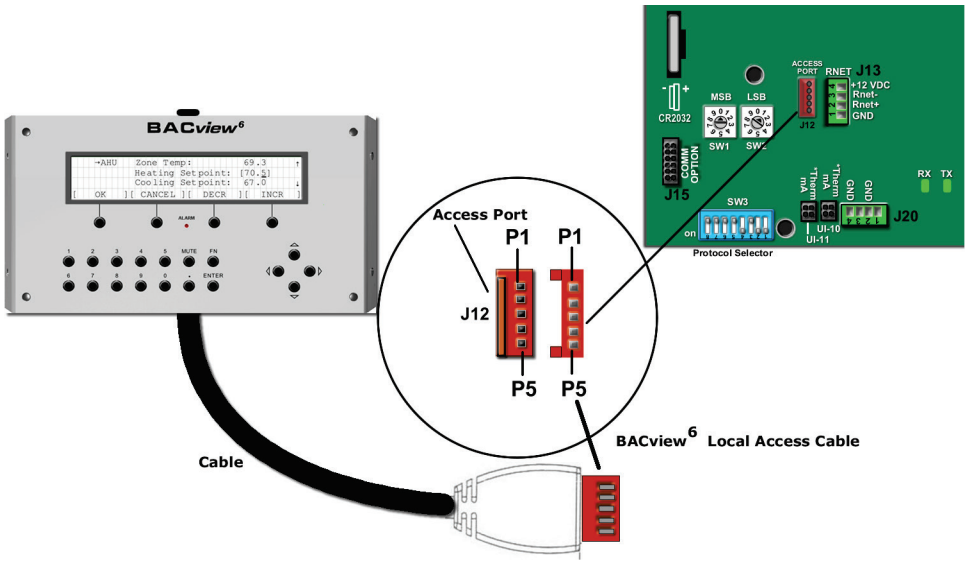
Start-up

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

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

[1] Requires a USB Link (Part #USB-L).

[2] See the *BACview Installation and User Guide* for instructions on connecting and using the above items.



Service Test

Navigation: i-Vu / Field Assistant: **Properties** > **Equipment** > **Configuration** > **Service Configuration** > **Service Test**
BACview: **HOME** > **CONFIG** > **SERVICE** > **TEST**

Service Test can be used to verify proper operation of compressors, heating stages, indoor fan, power exhaust fans, economizer, and dehumidification. It is highly recommended to use **Service Test** at initial system start-up and during troubleshooting. See *Appendix A: Points/Properties* (page 57) for more information.

Service Test differs from normal operation as follows:

- Outdoor air temperature limits for cooling circuits, economizer, and heating are ignored.
- Normal compressor time guards and other staging delays are ignored.
- Alarm statuses (except **Fire** and **Safety Chain**) are ignored, but all alarms and alerts are still broadcast on the network, if applicable.

Service Test can be turned on or off from a BAC*view* device, Field Assistant, or the i-Vu interface. Select **Default Value** of **Enable** to turn on and **Disable** to turn off.

NOTES

- **Service Test** mode is password-protected when accessed from a BAC*view* device.
- **Service Test** allows testing of each controller output.
- **Binary Service Test** functions are on when the **Default Value** is set to **Enable** and off when set to **Disable**.
- The output of the **Analog Service Test** is controlled by the percentage (0-100%) entered into the **Default Value**.
- It is recommended to return every **Service Test** variable to **Disable** or **0.00** after testing each function (unless that test variable must be active to test a subsequent function, as in **Compressor 2 Test**).
- All outputs return to normal operation when **Service Test** is set to **Disable**.

Service Test functions

- Use **Fan Test** to activate and deactivate the **Supply Fan** (BO - 1) output. Note that this output may enable simultaneously with other **Service Test** modes even with its **Default Value** set to **Disable**.
- Use **High Speed Fan Test** to activate and deactivate the **High Speed Fan Relay** (BO - 7) output. Note that this output is only applicable if **Fan Control** is set to **Two Speed** and **Unit Type** is NOT equal to **HP O/B Ctrl**.
- Use **Compressor 1 Test** to activate and deactivate the Compressor 1 (BO - 5) output. The **Supply Fan** output will be activated and deactivated in conjunction with this output. Leave **Compressor 1 Test** on **Enable** if **Compressor 2 Test** is required.
- Use **Compressor 2 Test** to activate and deactivate the Compressor 2 (BO - 4) output. Always test the Compressor 1 output first. **Compressor 1 Test** output must be set to **Enable** for **Compressor 2 Test** to function.
- Use the **Reversing Valve Test** to activate and deactivate the reversing valve (BO - 7) output.
- Use the **Dehumidification Test** to activate and deactivate the Humidi-MiZer™ (BO - 6) output. The Supply Fan output will be activated and deactivated in conjunction with the Dehumidification Test output.
- Use **Heat 1Test** to activate and deactivate the Heat 1 (BO - 3) output. The Supply Fan output is activated and deactivated in conjunction with the **Heat 1Test** output.

- Use **Heat 2Test** to activate and deactivate the Heat 2 (BO - 2) output. The Supply Fan output is activated and deactivated in conjunction with the **Heat 2Test** output.
- Use **Power Exhaust Test** to activate and deactivate the power exhaust (BO - 8) output.
- Use **Economizer Test** to set the (AO - 1) economizer output to any value from 0 to 100% of configured output (2-10 Vdc or 0-10 Vdc).
- **VFD Speed Test** is used to set the (AO - 2) **VFD Speed Control** output to any value from 0 to 100% of configured output (2-10 Vdc or 4-20 mA). Note that this output is only applicable if **Fan Control** is set to **Variable Speed**.
- **Analog Output 2 Test** (AO - 2) is currently unused and does not require testing.
- Service Test mode does not timeout. Return all test variables to **Disable** or **0.00**. Set **Service Test** to **Disable** or cycle power to the RTU Open to return to normal operation.

Configuring the RTU Open's properties

To start up the RTU Open, you must configure certain points and properties. *Appendix A* (page 57) is a complete list of all the points and properties, with descriptions, defaults, and ranges. These properties affect the unit operation and/or control. Review and understand the meaning and purpose of each property before changing it.

- *Unit Configuration properties* (page 58)
- *Setpoint Configuration properties* (page 60)
- *Service Configuration properties* (page 62)
- *Linkage properties* (page 76)

See *Appendix A* (page 57) for a complete list of the controller's points/properties.

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

Sequence of Operation

The RTU Open supports various types of constant volume air source configurations:

- Standard heat/cool unit types with up to 2-stages of mechanical cooling and gas or electric heating
- Heat pump units utilizing a reversing valve output for heating and cooling control
- Heat pump unit (Carrier) with an OEM control board
- Economizer, CO2, Demand Limiting, and RH control strategies are available for appropriately equipped units

The RTU Open may operate as part of a linked VVT system or as a stand-alone controller.

Occupancy

The RTU Open's operation depends upon its occupancy state (**Occupied**/**Unoccupied**). The RTU Open operates continuously in the **Occupied** mode until you configure an occupancy schedule.

An occupancy schedule may be:

- A local schedule configured in the controller using a BAC*view* device or Field Assistant
- A BACnet schedule configured in the i-Vu® application, networked through an i-Vu Open Router
- A BACnet or local schedule configured for subordinate VVT Zones, networked through an i-Vu Open Router(s) and employing Linkage

To set up occupancy schedules, see the documentation for your user interface.

NOTE A BACnet schedule, downloaded from the i-Vu application will overwrite a local schedule that was set up with a BAC*view* device or Field Assistant.

Occupancy Source - the following settings determine occupancy. See *Unit Configuration* (page 58).

Options:

- **Always Occupied** – (default) Controller operates continuously, regardless of any configured schedule
- **BACnet Schedule** – Uses a local BACnet occupancy schedule configured within the controller
- **BAS On/Off** – Occupancy is set over the network by another device or a third party BAS. Refer to the *RTU Open Integration Guide* for additional instructions in communication protocols.
- **Remote Occ Input** – Controller monitors an input contact connected to one of the available binary inputs configured to receive it. You must set **Unit Configuration** > **Occupancy Source** to **Remote Occ Input** and one **Input Switch Configuration** to **Remote Occupancy**.

Supply fan

The RTU Open supply fan may be configured for 1 of 3 **Fan Control modes**:

- **Single** - The fan operates at one speed only and provides on/off operation
- **Two Speed** - The fan operates at 1 of 2 speeds depending on the mode of operation and load conditions. During fan only or single stage cooling, the fan operates at low speed. During heating, second stage cooling, dehumidification, or if maximum economizer operation is required, the fan operates at high speed.
- **Variable Speed** - The fan operates at a variable speed to meet the load conditions and SAT safety requirements to provide maximum energy savings by minimizing fan horsepower consumption. Fan speed is NOT controlled by static pressure.

The RTU Open supply fan may be configured for 1 of 3 **Fan Modes**:

- **Auto** - The fan cycles on/off in conjunction with heating or cooling
- **Continuous** - The fan runs continuously during occupancy and intermittently during unoccupied periods with heating or cooling
- **Always On** - The fan runs continuously regardless of occupancy or calls for heating and cooling

Occupancy can be determined by Linkage, BACnet schedules, BAS schedules, or in response to a remote occupancy switch.

A **Fan Off Delay** allows the supply fan to continue operating after heating or cooling stops.

If the following alarms are active, the fan turns off immediately, regardless of the occupancy state or demand:

- **Fire Shutdown**
- **Safety chain**
- **SAT** alarm
- **SPT** alarms

The RTU Open does not include smoke-control functions such as smoke-purge, zone-pressurization, or smoke-ventilation. Each of these modes require a field-designed circuit to operate the following, as required by local fire codes:

- RTU supply fan
- RTU economizer
- RTU power exhaust

The RTU Open may be configured to accept a **Supply Fan Status** input to provide proof the supply fan is operating. When enabled, a loss or lack of fan status will stop heating and cooling operation.

A **Supply Fan Alarm Service Timer** function is available to track the number of supply fan run hours and generate an alarm when the accumulated runtime exceeds the set threshold.

Cooling

The RTU Open's application and configuration determines the specific cooling sequence. The RTU Open can control up to 2 stages of cooling with an additional output for a reversing valve (heat pump applications).

The following conditions must be true for the cooling algorithm to operate:

- **Outdoor Air Temperature** is greater than the **Cooling Lockout Temperature** setpoint
- The indoor fan has been on for at least 30 seconds

- The unit has a valid **Supply Air Temperature** input
- The unit has a valid **Space Temperature** input
- Heat mode is not active and the time guard between modes has expired
- Economizer is unavailable, or if the Economizer is active, mechanical cooling is available if the economizer is open > 85% for at least 5 minutes, the SAT > [**Minimum Cooling SAT** + 5Δ°F (2.7Δ°)] and SPT > [**Effective Cooling Setpoint** + 0.5Δ°F (.27Δ°C)].

The cooling relays are controlled by the Cooling Control PID Loop and Cooling Stages Capacity algorithm. They calculate the desired number of stages needed to satisfy the space by comparing the **Space Temperature** to the:

- **Effective Occupied Cooling Setpoint** when occupied
- **Effective Unoccupied Cooling Setpoint** when unoccupied

When the cooling algorithm preconditions have been met, the compressors are energized in stages, as applicable. Anti-recycle timers are employed to protect the equipment from short-cycling. There are fixed 3 minute minimum on-times, and 5 minute off-times for each compressor output.

During compressor operation, the RTU Open may reduce the number of active stages if the rooftop supply air temperature falls below the **Minimum Cooling SAT Setpoint**. A compressor staged off in this fashion may be started again after the normal time-guard period has expired, if the **Supply Air Temperature** has increased above the **Minimum Cooling SAT Setpoint**.

Compressor 2 Service Alarm Timer functions are available (1 for each stage of compression). This function tracks the number of compressor run hours and generates an alarm when the accumulated runtime exceeds the threshold set by the adjustable compressor service alarm timers.

Economizer

The RTU Open provides an analog economizer output for rooftop units with economizer dampers. Economizer dampers may be used to provide indoor air quality control and free cooling when outside air conditions are suitable.

The following conditions must be true for economizer operation:

- The **Outdoor Air Temperature** is less than the **Space Temperature** and less than the **Economizer High OAT Lockout Temp** setpoint
- The indoor fan has been on for at least 30 seconds
- The unit has a valid **Supply Air Temperature** input
- The unit has a valid **Space Temperature** input

If the RTU Open is configured for VFD or 2-speed fan, and the fan is on high speed or is configured for single-speed fan, and any of the preceding conditions are not true, the economizer will be set to the **Vent Dmpr Pos / DCV Min Pos** setpoint. If it is configured for VFD or 2-speed fan, and the fan is on low speed and any of the preceding conditions are not true, the economizer will be set to the **Low Fan Econ Min Pos**.

If all preceding conditions are true, the economizer PID loop modulates the damper.

The economizer position is reduced as the SAT falls below the **Minimum Cooling SAT** + 5Δ°F (2.8Δ°C), but never closes below the configured **Vent Dmpr Pos / DCV Min Pos**.

Power Exhaust

The RTU Open may enable and disable an exhaust fan, based on either the controller's occupancy or its economizer damper position. If the **Fan Control** is set to **Two Speed** or **Variable Speed**, the **Power Exhaust Setpoint** is automatically adjusted based on the fan's air delivery. The **Calculated PE Setpoint** used for control is displayed in the **Maintenance** section.

If **Continuous Occupied Exhaust** is **Yes**, the **Power Exhaust** binary output (BO-8) is energized while the RTU Open is occupied and de-energized when unoccupied.

If **Continuous Occupied Exhaust** is **No**, the **Power Exhaust** binary output (BO-8) is energized when the economizer damper output exceeds the **Power Exhaust Setpoint** value (default = 50%). The output remains energized until the economizer output falls below the **Power Exhaust Setpoint** value by a fixed hysteresis of 10%.

Pre-Occupancy Purge

Pre Occupancy Purge allows the rooftop equipment with an economizer damper to use outdoor air to purge the space of contaminants just prior to the beginning of the occupied period.

The following conditions must be true for pre-occupancy purge to operate:

- **Pre-Occupancy Purge** set to **Enable**
- **Economizer Exists** set to **Yes**
- A local time schedule is configured
- The local time schedule is currently unoccupied and the remaining time is less than the configured **Purge Time**

When the RTU Open schedule is unoccupied and the remaining unoccupied time is less than the purge time, the supply fan starts. The economizer damper opens to the configured **Economizer Purge Min Pos**. The RTU Open continues to operate in this mode until the occupied start time is reached. The **Pre-Occ Purge** state is displayed in the **Maintenance** section.

Unoccupied Free Cooling

Unocc Free Cool Enable allows rooftop equipment with an economizer damper to use outdoor air for free cooling during unoccupied periods.

The following conditions must be true for unoccupied free cooling to operate:

- **Unocc Free Cool Enable** set to **Enable**
- The system is unoccupied
- The outside air temperature is below the **Economizer High OAT Lockout Temp** setpoint
- The outside air temperature is less than the space temperature
- **Enthalpy** (if enabled) is **Low**

When the RTU Open schedule is unoccupied and the space temperature rises at least 1Δ°F (.5Δ°C) above the **Occupied Cooling Setpoint**, the supply fan starts. The economizer damper opens as necessary to cool the space. The RTU Open continues to operate in this mode until the space is satisfied or the outside air conditions are no longer suitable for free cooling.

Optimal Start

The RTU Open may use **Optimal Start**. **Optimal Start** adjusts the effective setpoints to achieve the occupied setpoints by the time scheduled occupancy begins. The Optimal Start recovery period may begin as early as 4 hours prior to occupancy. The algorithm works by moving the unoccupied setpoints toward the occupied setpoints. The rate at which the setpoints move is based on the outside air temperature, design temperatures, and capacities.

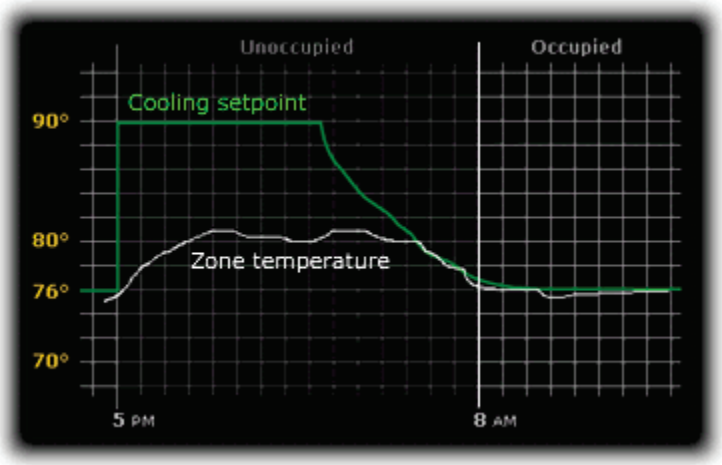
The following conditions must be true for optimal start to operate:

- On the **Properties** page > **Equipment** tab > **Configuration** > **Setpoints** > **Optimal Start**, the **Default Value** must be set greater than **0** and less than or equal to **4** (**0.00** disables **Optimal Start**).
- The system is unoccupied

NOTE If the Open controller does not have a valid outside air temperature, then a constant of 65°F (18.3°C) is used. This value is not adjustable.

The actual equation that the controller uses to calculate **Optimal Start** is nonlinear. An approximation of the result is shown below.

NOTE The values in the graph below are Fahrenheit.



To change **Optimal Start** settings:

1 In the navigation tree, select the equipment that you want to change.

2 Click **Properties** page > **Equipment** tab > **Configuration** > **Setpoints**.

Enthalpy control

You may use an enthalpy switch to indicate the suitability of outdoor air for economizer cooling. You can use either an outdoor air or differential enthalpy switch. A differential enthalpy switch has a sensing device in both the outdoor and return air streams. A differential enthalpy switch indicates when outside air is more suitable to be used than the return air and is available for economizer cooling. If no enthalpy switch is configured, a network point (Object Name: oae) is available. This point is displayed in the i-Vu application and a BAC*view* device as **Enthalpy** (BACnet).

The sequence of operation for economizer cooling is the same with or without an enthalpy switch, except that an enthalpy switch imposes one more validation on the suitability of outside air for economizer cooling. An **Enthalpy Status** that is **High** disables the economizer and the outside air damper goes to its minimum position. An **Enthalpy Status** that is **Low** enables the economizer if a call for cooling exists and the remaining preconditions are met.

Indoor Air CO2

Indoor Air CO2 is controlled on rooftop equipment with an economizer. **Indoor Air CO2** sequence is enabled by installing an air quality (CO2) sensor. A CO2 sensor may be terminated at the RTU Open, or a subordinate zone controller, when part of a zoned system.

An outdoor air quality sensor may also be installed and terminated at the RTU Open, but it is not required. When an outdoor air quality sensor is not installed, the algorithm uses 400ppm as the fixed outdoor air CO2 level.

The following conditions must be true for the **Indoor Air CO2** algorithm to operate:

- The system is occupied
- The supply fan has been started for at least 30 seconds
- The CO2 sensor has a valid reading

As the air quality within the space changes, the minimum position of the economizer damper changes, which allows more or less outdoor air into the space, depending on the relationship of the indoor air CO2 level to the differential setpoint.

The **Indoor Air CO2** algorithm calculates a minimum position value using a PID loop. The CO2 minimum damper position is then compared against the **Vent Dmpr Pos / DCV Min Pos** setpoint and the greatest value becomes the final minimum damper position of the economizer output.

The degree to which the outside air damper may be opened by the **Indoor Air CO2** algorithm is limited by the **DCV Max Vent Damper Pos** setpoint, which is adjustable between ten and sixty percent (10 – 60%).

Heating

The specific heating sequence is determined by the controller's application and configuration. The RTU Open controls up to two stages of gas or electric heating with an additional output for a **Reversing Valve** (Heat Pump applications).

The following conditions must be true for the heating algorithm to operate:

- The **Outdoor Air Temperature** is less than the **Heating Lockout Temperature** setpoint
- The indoor fan has been ON for at least 30 seconds
- The unit has a valid **Supply Air Temperature** input
- The unit has a valid **Space Temperature** input
- Neither Cool mode nor economizer are active and the time guard between modes has expired

The heating relays are controlled by the Heating Control PID Loop and Heating Stages Capacity algorithm, which calculate the desired number of stages to satisfy the space by comparing the **Space Temperature** to the:

- **Effective Occupied Heating Setpoint** when occupied
- **Effective Unoccupied Heating Setpoint** when unoccupied

When the heating algorithm preconditions have been met, the heating is energized in stages. Anti-recycle timers are employed to protect the equipment from short-cycling. There are fixed one minute minimum on and off times for each heating output.

During heating operation, the RTU Open may reduce the number of active stages if the rooftop **Supply Air Temperature** exceeds the **Maximum Heating SAT** setpoint. A heat stage turned off in this fashion may be started again after the normal time-guard period has expired, if the **Supply Air Temperature** has decreased below the **Maximum Heating SAT** setpoint.

Heat Pump operation

The RTU Open can control heat pumps **HP O/B** and **Y1/W1**.

HP O/B provides a separate output (BO-7) to control a reversing valve. The reversing valve control may be configured to be energized with a call for heating **(B)**, or energized with a call for cooling (**O**).

The sequence of operations are as previously described for heating and cooling except that the **Y1** and **Y2** outputs are compressor outputs, energizing mechanical heating or cooling, depending on the state of the reversing valve. **W1** and **W2** are used for auxiliary heat. Up to two stages are available.

Selection **Y1/W1** is for heat pumps that do not require a **O** terminal to energize the reversing valve. The sequences of operations are as described for *Heating* (page 46) and *Cooling* (page 41). The reversing valve output is not used in this application. **W1** and **W2** are used for auxiliary heat. Up to two stages are available.

Dehumidification

The RTU Open provides occupied and unoccupied dehumidification on units that are equipped with the Carrier Humidi-MiZer™ option from the factory. This requires a space relative humidity sensor or a humidistat for control.

The following conditions must be true for the dehumidification control to operate:

- The **Outside Air Temperature** is greater than the **Cooling Lockout Temperature** setpoint
- The **Indoor Fan** has been ON for at least 30 seconds
- The unit has a valid **Supply Air Temperature** input
- The unit has a valid **Space Temperature** input
- The unit has a valid **Space Relative Humidity Sensor** or **Humidistat** input
- Heat mode is not active and the time guard between modes has expired

When using a relative humidity sensor to control dehumidification, occupied and unoccupied dehumidification setpoints are used.

When using a humidistat, the setpoints are not used. The humidistat indicates a high-humidity condition.

When a high indoor relative humidity condition is indicated and the above conditions are satisfied, the RTU Open enters the dehumidification mode, energizing the Humidi-MiZer™ output.

The mode continues until the space relative humidity falls below the active setpoint by a 5% fixed Hysteresis when a humidity sensor is used, or when there is no longer a call for dehumidification where a humidistat is used.

See the base unit / Humidi-MiZer™ operations manual for additional information.

Demand Limiting

The RTU Open may employ a demand limit strategy. Demand limiting in the RTU Open works through setpoint expansion. The controller's heating and cooling setpoints are expanded in steps or levels. The degree to which the setpoints are expanded is defined by the **Demand Level Setpoints**.

Each **Demand Level** (1 through 3) adjusts the heating and cooling setpoints outwards. By default, **Demand 1** yields a 1Δ°F (.5Δ°C) expansion, **Demand 2** yields a 2Δ°F (1.1Δ°C) expansion, and **Demand 3** yields a 4Δ°F (2.2Δ°C) expansion.

The BACnet **Demand Limit** variable sets the desired level of setpoint expansion in the receiving controller. **Level 0** leaves the standard occupied and unoccupied heating and cooling setpoints in effect. Levels 1 through 3 expands occupied heating and cooling setpoints.

Door switch

A **Door Contact** may be configured on any unused binary input. A typical application is an occupancy sensor mounted within the space served by a single zone rooftop. **Door Contact** disables mechanical cooling and electric or gas heating, when active. Economizer cooling, if available, continues to operate.

Remote Occupancy

Remote occupancy may be configured on any unused binary input channel. A typical application is a remote contact, controlled by a third party, to set the controller's occupied mode. The **Remote Occupancy** function requires both an input configured for **Remote Occupancy**, and **Occupancy Source** set to **Remote Occ Input** to operate.

Once configured, the controller will operate in the occupied or unoccupied mode, as determined by the state of the **Remote Occupancy** input.

Fire Shutdown

Fire Shutdown may be configured on Binary Input 5. A typical application involves a smoke detector or fire shutdown contact, which, when active, immediately shuts down equipment operation.

Compressor Safety

Compressor Safety may be configured on Binary Input 3. A compressor safety tripped indicator circuit is available on most Carrier rooftop equipment.

A **Compressor Safety Alarm** is shown on **Properties** page > **Equipment** tab > **Alarms** and indicates that the equipment requires attention.

Cooling, heating, and supply fan outputs are not interrupted except where the RTU Open is configured for Heat Pump operation. When configured for Heat Pump, and in the heating mode, a compressor safety fault will cause the available stages of electric heating to be enabled in place of mechanical heating.

Normal operation resumes when the compressor safety circuit is de-energized.

Fan Status

Fan Status may be configured on any unused binary input channel. A typical application would be an airflow switch, current sensing relay, or other device that provides a supply fan running verification.

Enabling this function displays the supply fan’s status on the equipment graphic.

If the controller loses fan status during operation, heating and cooling are disabled, the economizer damper (if available) is closed, and an alarm for loss of status is indicated.

If the fan status is on when the controller is commanding the fan off, the unit remains in the off state. An alarm is generated indicating that the fan is running when it should be off.

Filter status

Filter status may be configured on any unused binary input channel. A typical application is a differential pressure switch that senses the pressure drop across a filter bank.

When the pressure across the filter bank exceeds the setpoint of the differential pressure switch, the **Filter** status is displayed as **Dirty** on the controller graphic. An alarm indicates a dirty filter.

Alarms

NOTE Some of the **Alarms** functions described in this section will only be visible on the **Properties** page > **Equipment** tab > **Alarms** when the appropriate inputs are configured. Alarms are not initiated when the input is not configured.

Safety Chain - You may use the RTU Open's safety chain circuit to shut down the unit for a safety condition. Examples: Low or High Temperature Cutouts (Freezestat / Firestat). See *To wire inputs and outputs* (page 16) for additional wiring instructions. This alarm indicates the safety chain circuit (Input 4) is open. Cooling, heating, and supply fan operation stop after appropriate time guards. Normal operation resumes when the safety chain circuit is complete.

Fire/Smoke Shutdown may configure the RTU Open to accept a **Fire Shutdown** contact on Input 5. Examples: Smoke detectors or fire shutdown relays. This alarm indicates this device (Input 5) has tripped. Cooling, heating, and supply fan operation immediately stop. Reset fire shutdown contact to resume normal operation.

Compressor Safety – You may configure the RTU Open to monitor the base unit's compressor safety circuit. This alarm indicates the base unit's compressor safety circuit is energized. Cooling, heating, and supply fan outputs are not interrupted except when the RTU Open is configured for Heat Pump. Normal operation resumes when the compressor safety circuit is de-energized.

If the Heat Pump is in the heating mode, it will automatically replace the compressor stage(s) with the equivalent number of auxiliary heat stages, as available.

- If it's a Carrier Heat Pump, there is only one auxiliary heat stage output and the staging is done by the machine itself, if it's two-stage gas or electric.
- For a non-Carrier Heat Pump, when configured for two stages of aux heat and two compressors, Compressor 1 is replaced by Aux Heat Stage 1 and Compressor 2 is replaced by Aux Heat Stage 2.

The compressor output stays on when the safety alarm is present. For cooling, the alarm indicates the compressors are down. See *Heat Pump operation* (page 46) for further information.

Space Temperature – This alarm indicates if the space temperature is outside the configured alarm limits. If active (Alarm), displays additional values for the space temperature when the alarm condition occurred and the alarm limit exceeded.

The following values are related to the **Space Temperature** alarm:

- **Alarming Temperature** – Displays the value of the space temperature that caused the alarm condition to occur and is only visible when the **Space Temperature** is in an alarm state.
- **Alarm Limit Exceeded** – Displays the value of the alarm setpoint that was exceeded by the alarming temperature and is only visible when the **Space Temperature** is in an alarm state.

SPT Sensor – This alarm indicates a communication failure of a connected SPT sensor that previously had been actively communicating. The alarm is reset when normal SPT sensor communications resume, if power is cycled to the controller, or if the **Shutdown** point is set to **Active**.

Space Temp Sensor – This alarm indicates an invalid sensor condition in a physically connected space temperature sensor (SPT Sensor/T5*). Cooling, heating, and supply fan operation stop after the appropriate time guards. Normal operation resumes when the controller detects a valid sensor.

Supply Air Temperature – This alarm indicates that the supply air temperature is outside the configured alarm limits. The alarm is reset to normal when the supply air temperature returns within the configured alarm limits plus a 5Δ°F (2.7Δ°C) hysteresis. This alarm is inhibited until the fan has been running for 15 minutes to allow for system stabilization after startup.

Supply Air Temp Sensor – This alarm indicates a shorted or open circuit in the SAT input. Cooling, heating, and supply fan operation stops after the appropriate time guards. Normal operation resumes when the controller detects a valid sensor.

Indoor Air Quality – The RTU Open generates an **Indoor Air Quality** alarm if the CO_2 level exceeds the configured alarm limits. (This alarm is only shown when a valid indoor air quality sensor value is available).

Indoor Air Quality Sensor – The RTU Open generates an **Indoor Air Quality Sensor** alarm if a valid sensor value is no longer available. For locally connected sensors, the mA input at the associated channel falls below 3.5 mA or rises above 21 mA. For network sensors, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan continue to operate. However, the controller's IAQ control function is disabled until the fault condition is corrected.

Space Relative Humidity – The RTU Open generates a **Space Relative Humidity** alarm if the space humidity level exceeds the configured low or high alarm limits. (This alarm is only shown when a valid relative humidity sensor value is available).

Space Relative Humidity Sensor – The RTU Open generates a **Space Relative Humidity Sensor** alarm if a valid sensor value is no longer available. For locally connected sensors, the mA input at the associated channel falls below 3.5 mA or rises above 21 mA. For network sensors, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan operation continues, however, the controller's Humidi-MiZer™ binary output is disabled until the fault condition is corrected.

Filter – If the RTU Open is configured to monitor the filter through a hardware input switch contact, it generates a **Filter** alarm if the associated input channel detects a dirty filter condition (opposite state of the **Input** "x" **Switch Configuration**). Otherwise, if no hardware switch monitoring is used, the RTU Open generates a filter alarm when the accumulated runtime exceeds the **Unit Configuration** > **Filter Service Alarm Timer** value (when not set to 0). This alarm is most commonly used to indicate a filter replacement is due. Reset the filter service runtime accumulator by setting the **Maintenance** > **Reset Filter Runtime Alarm** to **On**, back to **Off**, and clicking **OK** after each setting. Set **Unit Configuration** > **Filter Service Alarm Timer** value to **0** to disable the filter service alarm function.

Local OAT Sensor – This alarm indicates a shorted or open circuit in the locally connected OAT input.

Outdoor Air Temp Sensor – This alarm indicates a valid OAT sensor value is no longer available. An alarm condition can occur from a failed locally connected sensor or if a network OAT value is no longer being received by the controller. Cooling, heating, and supply fan operation continues. OAT lockouts will not operate while the sensor is in alarm. Normal operation resumes when the controller detects a valid sensor.

Outdoor Air Quality Sensor – The RTU Open generates an **Outdoor Air Quality Sensor** alarm if the mA input at the associated channel falls below 3.5 mA or rises above 21 mA. For network sensors, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan operation continues. However, the controller's IAQ control function uses 400ppm as the fixed outdoor air CO_2 level until the fault condition is corrected.

Setpoint Slider – The RTU Open generates this alarm when an open circuit is detected at Input 11 and the RTU Open **Configuration** > **Unit Configuration** > **Input Configuration** > **Space Sensor Type** is set to T56. Note that only an open circuit results in an alarm. A short across this input offsets the setpoints negatively by the amount configured in the **Unit Configuration** > **Setpoint Adjustment Range**.

Switch Configuration - The RTU Open generates this alarm when any two of the **Unit Configuration** > **Input Functions 3**, **5**, **8,** or **9** are configured identically. Neither input may work reliably and downstream control may be affected, depending on the function duplicated. The alarm clears and normal control is restored when the input function duplication is corrected.

Analog Input Configuration - The RTU Open generates this alarm when the **Unit Configuration** > **Input Functions 1** and **2** are configured identically. Neither input may work reliably and downstream control may be affected, depending on the function duplicated. The alarm clears and normal control is restored when the input function duplication is corrected.

Supply Fan Runtime - The RTU Open generates a this alarm when the accumulated runtime exceeds the **Unit Configuration** > **Supply Fan Service Alarm Timer** value (when not set to 0). This alarm is most commonly used to indicate an equipment maintenance interval is due. The supply fan runtime accumulator may be reset by setting the **Maintenance** > **Reset Supply Fan Runtime Alarm** to **Clear**, and then back to **Run** – acknowledging each selection by clicking the **OK** button when it appears. Setting **Unit Configuration** > **Supply Fan Service Timer** value to **0** disables the supply fan runtime alarm function.

Compressor 1 Runtime - The RTU Open generates this alarm when the accumulated runtime exceeds the **Unit Configuration** > **Compressor 1 Service Alarm Timer** value (when not set to **0**). This alarm is most commonly used to indicate an equipment maintenance interval is due. The **Compressor 1 Runtime** accumulator may be reset by setting the **Maintenance** > **Reset Comp 1 Runtime Alarm** to **Clear**, and then back to **Run** – acknowledging each selection by clicking the **OK** button when it appears. Setting **Unit Configuration** > **Compressor 1 Service Timer** value to **0** disables the **Compressor 1 Runtime** alarm function.

Compressor 2 Runtime - The RTU Open generates this alarm when the accumulated runtime exceeds the **Unit Configuration** > **Compressor 2 Service Alarm Time**r value (when not set to **0**). This alarm is most commonly used to indicate an equipment maintenance interval is due. The Compressor 2 runtime accumulator may be reset by setting the **Maintenance** > **Reset Comp 2 Runtime Alarm** to **Clear**, and then back to **Run** – acknowledging each selection by clicking the **OK** button when it appears. Setting **Unit Configuration** > **Compressor 2 Service Timer** value to **0** disables the Compressor 2 runtime alarm function. Note that this function is unavailable if the **Service Configuration** > **Compressor States** value is not set to **Two Stages**.

Airside Linkage Alarm - An RTU Open may act as an air source in a zoned system. Carrier systems use a function called Linkage™ to pass data between a master zone and its air source over an MS/TP network connection. When the RTU Open is part of a linked system, it will indicate an airside linkage alarm if it loses communications with its linkage master or if it receives data from more than 1 master zone.

Linkage

The RTU Open may serve as an air source to an Open Variable Volume Terminal (VVT) system. When the RTU Open is part of a VVT system and the controllers are wired together to form a network, the controllers may use a method of communication known as Linkage™. Linkage is a method by which an air source and its subordinate zone terminals exchange data to form a coordinated HVAC system. The system's air source controller, zone controllers, and bypass controller are linked so that their data exchange can be managed by one zone controller configured as the VVT Master.

The VVT Master gathers the following information from the slave zone controllers:

- occupancy status
- setpoints
- zone temperature
- relative humidity
- CO_2 level
- damper position
- optimal start data

The VVT Master performs mathematical calculations and algorithms on the data and then sends the composite information to the air source. The VVT Master receives information from the air source such as System Mode, Supply Air Temperature, and Outside Air Temperature (if available), and passes that information to all linked controllers.

NOTE The following paragraphs describe the interaction between the air source (RTU Open) and its subordinate zones. Additional information regarding Open Zoned Systems may be found in the *VVT Zone and VVT Bypass Controller Installation Guides*.

The VVT Master determines system operation by prioritizing heating and cooling requirements from all the zones based on their occupancy and demand. The VVT Master scans the system continuously to determine if any zones are occupied. Occupied zones are a higher priority than unoccupied zones. The VVT Master evaluates all the occupied zones' heating or cooling demands and sends a request to the air source (RTU Open) for:

- Cooling, if the number of occupied zones with cooling demands exceeds the number of occupied zones with heating demands, and the demand is greater than or equal to the number of configured **Linkage Callers**.
- Heating, if the number of occupied zones with a heating demand exceeds or is equal to the number of **Linkage Callers**.

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

The VVT Master then gathers the following information and sends it to the air source (RTU Open):

- The system mode
- The setpoints and zone temperature from the zone with the greatest demand for the requested air source mode (heating or cooling). (This zone is called the reference zone.)
- The system occupancy status
- Most open damper position from any zone
- RH and CO2 values (if applicable)

The air source responds by sending the air source mode, supply air temperature, and outside air temperature. The air source verifies the mode by comparing its supply air temperature to the space temperature received through Linkage. See the air source documentation for operation and parameters used to verify its mode. This verification allows the VVT system to determine if the desired air source mode is actually being provided. For example, if the VVT Master sends a request for heating and the air source does not have heat or it's heat has failed, the air source's actual mode indicates that and it's current mode is sent to the zones so that they can control accordingly.

The system remains in that mode until all zones of that demand are satisfied or until the system mode reselect timer (default 30 minutes) causes a forced re-evaluation of the system. If there is no demand for the opposite mode, the reselect timer starts again and the current mode continues until all zones are satisfied or until the reselect timer expires, repeating the process. If there is a demand for the opposite mode, the VVT Master sends the reference zone's space temperature and setpoints to the air source and restarts the reselect timer. The air source re-evaluates its demand based on the new information and goes to the Vent mode until the new mode can be verified as described above. The amount of time this takes is determined by the air source's operating parameters.

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

If no heating or cooling is required or the current air source mode is satisfied, the VVT Master calculates the weighted average of the occupied and unoccupied heating and cooling setpoints. It also calculates a zone temperature that is midway between the setpoints (occupied or unoccupied based on the system's current occupancy status). This information, plus the occupancy status, is sent to the air source so that its current mode is disabled and the unit ceases heating or cooling operation. If the system is occupied, the air source fan and OA damper, if applicable, operate to maintain proper ventilation.

Air source mode determination

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

- **OFF** – Air source fan is off.
- **WARMUP** – Air source fan is on and providing first cycle of heat when changing from unoccupied to occupied.
- **HEAT** – Air source fan is on and providing heat.
- **FREECOOL** – Air source fan is on and providing cooling using economizer only.
- **COOL** – Air source fan is on, and cooling is provided by economizer and mechanical cooling.
- **PRESSURIZATION** – Fire-Life safety override input is active. Air source fan is on providing 100 percent outside air. Mechanical heating and cooling may be disabled.
- **EVACUATION/SHUTDOWN** – Fire-Life safety override input is active. Air source fan is off.
- **VENT** – Air source fan is on, economizer providing ventilation without heating or cooling, providing neutral supply air temperature.

See the air source's Installation manual for specific operation.

Troubleshooting

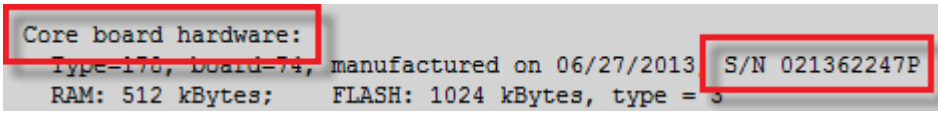
If you have problems mounting, wiring, or addressing the RTU Open, contact Carrier Control Systems Support.

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

To get the serial number

If you need the RTU Open's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under **Core** (or **Main**) **board hardware**



To obtain a modstat in the WebCTRL® interface:

1 Select the RTU Open in the navigation tree.

2 Right-click and select **Module Status**.

Communication LED's

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

If this LED is on...	Status is...
Power	The RTU Open has power
Rx	The RTU Open is receiving data from the network segment
Tx	The RTU Open is transmitting data over the network segment
DO#	The binary output is active

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

If Run LED shows...	And Error LED shows...	Status is..
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

If Run LED shows...	And Error LED shows...	Status is..
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
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 RTU Open off, then on. • Format the RTU Open. • Download memory to the RTU Open. • Replace the RTU Open.

To replace the RTU Open'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 RTU Open 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 RTU Open.

Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

CE Compliance

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

BACnet Compliance

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

Appendix A: RTU Open Points/Properties

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

Status

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

Point Name/Description	Range
Equipment Status – The controller's current status.	R: Disabled Test Run
System Mode – The controller's current operating mode.	R: Off Fan Only Economizer Cooling Cooling Heating Dehumidification Test Shutdown Unocc Free Cooling Fire Shutdown IAQ Override Pre-occ Purge
Supply Fan Status – The current fan status if an input is configured for **Fan Status**.	R: Off/Running
Fan / Speed – The current commanded fan speed if **Fan Control** is set to **Two Speed**.	R: Off/Low/High
Supply Fan VFD – The current commanded output to the VFD to control the fan's speed if **Fan Control** is set to **Variable Speed**.	R: Off/Low/High
Space Temperature - Prime Variable – The space temperature value currently used for control.	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)
Outdoor Air Temperature – The outdoor air temperature used for control.	R: -56 to 245°F (-48.9 to 118.3°C)
Space Relative Humidity – The current space relative humidity if a valid value exists either as a hardware sensor connected to this controller (**Configuration** > **Unit Configuration** > **Input 1** (or **2**) **Function** is set to **IAQ Sensor**) or a value received through the Network or Linkage.	R: 0 to 100%rh
Indoor Air Quality CO2 (ppm) – The current space CO_2 concentration if a valid value exists either as a hardware sensor connected to this controller (**Configuration** >**Unit Configuration** > **Input 1** (or **2**) **Function** is set to **IAQ Sensor)** or a value received through the Network or Linkage.	R: 0 to 5000ppm

Point Name/Description	Range
Outdoor Air Quality CO2 (ppm) – The current outdoor air CO_2 concentration if the **Configuration** >**Unit Configuration** >**Input 1** (or **2**) **Function** is set to **OAQ Sensor**.	R: 0 to 5000ppm
Economizer Output – The current economizer output with respect to the outdoor air damper (if equipped).	R: 0 to 100% Open
Shutdown – When **Active**, all alarms are reset. (Current active alarms continue to display.) 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**
BAC*view*®: **HOME** > **CONFIG** > **UNIT**

Point Name/Description	Range
Fan Mode – The supply fan's operating mode. Options: **Auto** - The fan cycles on/off in conjunction with heating or cooling. **Continuous** - The fan runs continuously during occupancy and 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
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.	D: 5 sec R: 0 to 30 sec
Fan Off Delay – The number of seconds that the fan continues to run after heating or cooling has ended.	D: 90 seconds R: 10 to 300 seconds
Minimum Cooling SAT – In cooling mode, the cooling outputs are controlled so that the supply air temperature does not drop below this value.	D: 50°F (10°C) R: 45 to 75°F (7.2 to 23.9°C)
Maximum Heating SAT – In heating mode, the heating outputs are controlled so the supply air temperature does not rise above this value.	D: 120°F R: 85 to 150°F
Vent Dmpr Pos / DCV Min Pos – The minimum outdoor air damper position maintained during occupied periods.	D: 20% Open R: 0 to 100% Open
Economizer Purge Min Pos – The minimum outdoor air damper position maintained during an unoccupied purge cycle when the Pre-Occ Purge mode is active.	D: 40% Open R: 0 to 100% Open
Low Fan Econ Min Pos – The minimum outdoor air damper position maintained during occupied periods when the fan is running at low speed (if configured for 2-speed fan control) or the minimum VFD speed (if configured for variable speed fan control).	D: 33% Open R: 0 to 100% Open

Point Name/Description	Range
DCV Max Vent Damper Pos – The maximum outdoor air damper position allowed while DCV is active.	D: 50% Open R: 0 to 75% Open
Supply Fan Service Alarm Timer – A Supply Fan Runtime alarm is generated when the supply fan run hours exceed this value. Set to 0 to disable.	D: 600 hr R: 0 to 9999 hr
Compressor 1 Service Alarm Timer – A Compressor 1 Runtime alarm is generated when the compressor 1 run hours exceed this value. Set to 0 to disable.	D: 0 hr R: 0 to 9999 hr
Compressor 2 Service Alarm Timer – A Compressor 2 Runtime alarm is generated when the compressor 2 run hours exceed this value. Set to 0 to disable.	D: 0 hr R: 0 to 9999 hr
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.	D: 600 hr R: 0 to 9999 hr
Door Alarm Delay – Determines the amount of delay before a door alarm is generated.	D: 60 seconds R: 0 to 3600 seconds
Pushbutton Override – Enables or disables the use of a pushbutton override from a local space temperature sensor.	D: Enable R: Disable/Enable
Setpoint Adjustment – Enables or disables the setpoint adjustment mechanism on the local space sensor. 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: 5Δ°F (2.7Δ°C) R: 0 to 5Δ°F (0 to 2.7Δ°C)
Cooling Lockout Temperature – Cooling is inhibited below this outdoor air temperature.	D: 45°F (7.2°C) R: -65 to 80°F (-53.9 to 26.6°C)
Economizer High OAT Lockout Temp– The outdoor air temperature above which economizer cooling is inhibited.	D: 75°F (23.9°C) R: 55 to 80°F (12.7 to 26.6°C)
HP Rev Cycle Lockout Temp – The outdoor air temperature below which reverse cycle heating is locked out. Once reverse cycle heating has been locked out, the OAT must rise 2Δ°F (1.1Δ°C) above this value to again allow heat pump reverse cycle heating. Requires that the unit be configured as a Heat Pump.	D: -3°F (-19.4°C) R: -20 to 65°F (-28.9 to 18.3°C)
HP Aux Heat Lockout Temp – The outdoor air temperature above which auxiliary heating is locked out. Once aux heat has been locked out, the OAT must fall 2Δ°F (1.1Δ°C) below this value to again allow aux heating. Requires that the unit be configured as a Heat Pump.	D: 47°F (8.3°C) R: -20 to 65°F (-28.9 to 18.3°C)
Heating Lockout Temperature – Heating is inhibited above this outdoor air temperature.	D: 65°F (18.3°C) R: 35 to 150°F (1.6 to 65.5°C)
Pre Occupancy Purge – Enables or disables the use of a purge cycle immediately prior to the start of a scheduled occupied period.	D: Disable R: Disable/Enable

Point Name/Description	Range
Purge Time – The maximum amount of time used for a pre-occupancy purge.	D: 60 minutes R: 0 to 240 minutes
Unocc Free Cool – Enables or disables the use of the economizer to provide unoccupied free cooling (NTFC).	D: Disable R: Disable/Enable
Minimum Setpoint Separation – The minimum amount of temperature separation between the heating and cooling setpoints.	D: 5Δ°F (2.7Δ°C) R: 2 to 10Δ°F (1.1 to 5.5Δ°C)
Occupancy Source - The method that the controller uses to determine occupancy. Options: **Always Occupied** = Controller operates continuously as occupied. **BACnet Schedule** = Controller follows a schedule set up in Field Assistant or the i-Vu® application. **BAS On/Off** = Occupancy is set over the network by another device or a third party BAS. **Remote Occ Input** = Occupancy is set by a remote contact.	D: Always Occupied R: Always Occupied BACnet Schedule BAS On/Off Remote Occ Input

Input Configuration	
Input 1 Function – The type of sensor (4-20 mA) connected to terminals J4 – 4, 5, and 6.	D: No Sensor R: No Sensor IAQ Sensor OAQ Sensor Space RH Sensor
Input 2 Function – The type of sensor (4-20 mA) connected to terminals J4 – 1, 2, and 3.	D: No Sensor R: No Sensor IAQ Sensor OAQ Sensor Space RH Sensor
Input 3 Function – The usage of Input 3. You must also set **Input 3 Switch Configuration**. Options: **No Function** – The input is not used. **Compressor Safety** – Safety device status. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active.	D: Compressor Safety R: No Function Compressor Safety Fan Status Filter Status Remote Occupancy Door Contact
Input 3 Switch Configuration – The normal (de-energized) state for the set of contacts terminated at **Input**	D: NO R: NO/NC (normally open/normally closed)

Input 5 Function – The usage of Input 5. You must also set **Input 5 Switch Configuration**. Options: **No Function** – The input is not used. **Fire Shutdown** – Fire Safety device status. Inhibits operation when tripped. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active.	D: R:	Fire Shutdown No Function Fire Shutdown Fan Status Filter Status Remote Occupancy Door Contact
Input 5 Switch Configuration – The normal (de-energized) state for the set of contacts terminated at **Input**	D: R:	NC NO/NC (normally open/normally closed)
Input 8 Function – The usage of Input 8. You must also set **Input 8 Switch Configuration**. Options: **No Function** – The input is not used. **Enthalpy Switch** – Indicates enthalpy status (high or low). **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Sets occupancy using a hardware contact.	D: R:	Enthalpy Switch No Function Enthalpy Switch Fan Status Filter Status Remote Occupancy Door Contact
Input 8 Switch Configuration – The normal (de-energized) state for the set of contacts terminated at **Input**	D: R:	NO NO/NC (normally open/normally closed)
Input 9 Function – The usage of Input 9. You must also set **Input 9 Switch Configuration**. Options: **No Function** – The input is not used. **Humidistat** – Indicates high humidity condition. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Sets occupancy using a hardware contact.	D: R:	Humidistat No Function Humidistat Fan Status Filter Status Remote Occupancy Door Contact
Input 9 Switch Configuration – The normal (de-energized) state for the set of contacts terminated at **Input**	D: R:	NO NO/NC (normally open/normally closed)
Space sensor type - The type of local space temperature sensor.	D: R:	T55 T55 T56 (Use for T59) SPT Sensor None
T5x Override Duration – If using a T55, T56, or T59 sensor, this is the amount of time that the controller runs in the occupied mode when a user presses the sensor's override button for 1 to 10 seconds.	D: R:	1 hr 0 to 24 hours
Sensor Calibration		
Space Temperature – The current space temperature.	D:	°F/C
Space Temp Calibration – A calibration offset value to allow the local space temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D: R:	0Δ°F/C -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)

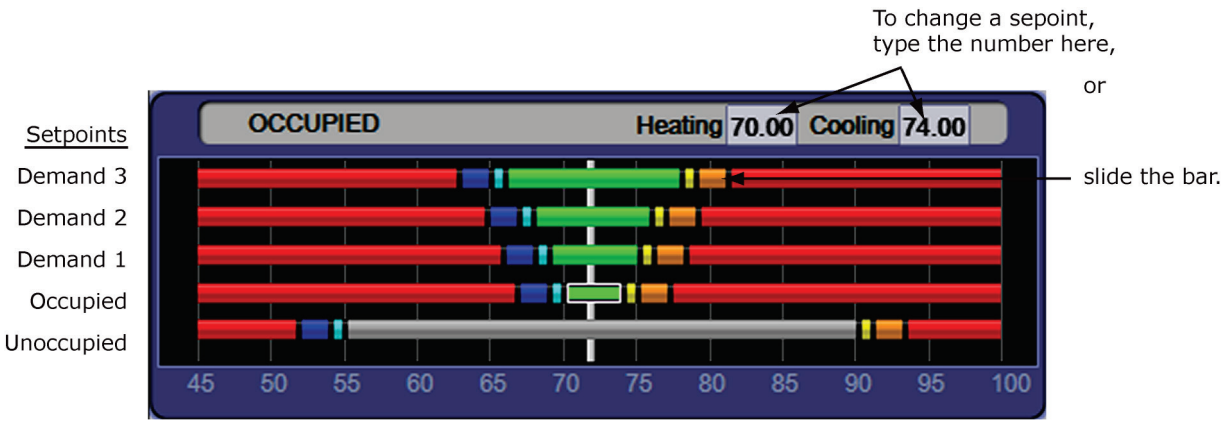
Space RH – Displays the value read from a local RH sensor connected to one of the hardware input channels.	R:	0 to 100%
Space AQ – Displays the value read from a local CO_2 sensor connected to one of the hardware input channels.	R:	0 to 5000ppm
Outdoor AQ – Displays the value read from an outdoor CO_2 sensor connected to one of the hardware input channels.		0 to 5000ppm
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: R:	0Δ°F/C -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)
Outdoor Air Temperature – The current outdoor air temperature.	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: R:	0°F/C -9.9 to 10Δ°F (-5.5 to 5.5Δ°C)

Setpoints

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

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

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



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.

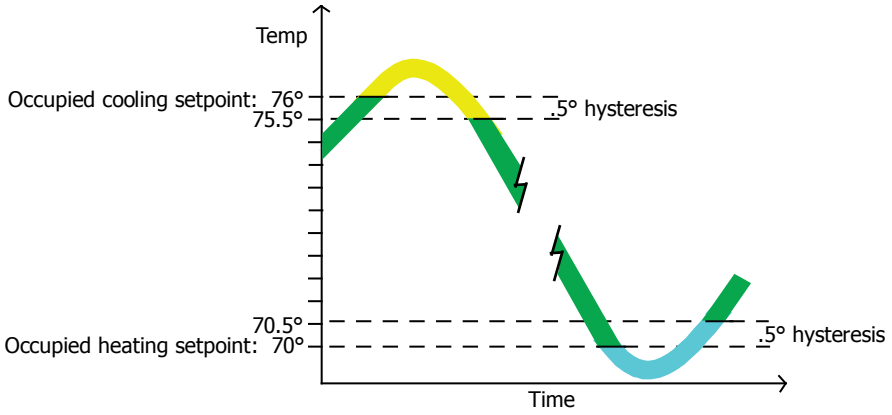
Demand limiting is a cost-saving strategy to reduce energy consumption. The strategy expands the occupied heating and cooling setpoints when the system reaches one of 3 levels of consumption. With the expanded setpoints, the equipment works less, thereby saving energy. By default, Demand Level 1 expands 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 40) for more information.

	Default **Range:** -40 to 245°F (-40 to 118.3°C)			
		Demand Level		
Point Name/Description	**Occupied**	**1**	**2**	**3**
Occupied Heating – Green The heating setpoint the controller maintains while in occupied mode.	D: 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)

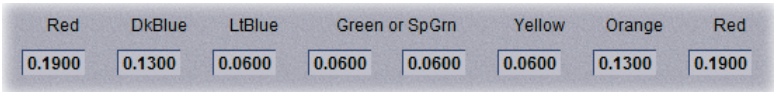
Unoccupied Setpoints

Point Name/Description	Default/Range
Unoccupied Heating – Gray The heating setpoint the controller maintains while in unoccupied mode.	D: 55°F (12.7°C) R: 40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling – Gray The cooling setpoint the controller maintains while in unoccupied mode.	D: 90°F (32.2°C) R: 45 to 99°F (7.2 to 37.2°C)
Unoccupied Heating 1 – Light Blue The space temperature must be less than the **Unoccupied Heating 1** setpoint for the VVT Master to consider the zone an unoccupied heating caller in a linked system. In a single-zone application, the unoccupied heating requirement begins as soon as the space temperature falls below the **Unoccupied Heating** setpoint. We recommend that the **Unoccupied Heating 1** value be set no less than 0.5Δ°F (.27Δ°C) below the **Unoccupied Heating** setpoint.	D: 54°F (12.2°C) R: 40 to 90°F (4.4 to 32.2°C)
Unoccupied Heating 2 – Dark Blue The space temperature must be less than the **Unoccupied Heating 2** setpoint to generate an unoccupied low space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) below the **Unoccupied Heating 1** setpoint.	D: 52°F (11.1°C) R: 40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling 1 – Yellow The space temperature must be greater than the **Unoccupied Cooling 1** setpoint for the VVT Master to consider the zone an unoccupied cooling caller in a linked system. In a single-zone application, the unoccupied cooling requirement begins as soon as the space temperature exceeds the **Unoccupied Cooling** setpoint. We recommend that the **Unoccupied Cooling 1** value be set no less than 0.5Δ°F (.27Δ°C) above the **Unoccupied Cooling** setpoint.	D: 91°F (32.8°C) R: 45 to 99°F (7.2 to 37.2°C)
Unoccupied Cooling 2 – Orange The space temperature must be greater than the **Unoccupied Cooling 2** setpoint to generate an unoccupied high space temperature alarm. We recommend that this value be set no less than 0.5Δ°F (.27Δ°C) above the **Unoccupied Cooling 1** setpoint.	D: 93°F (33.9°C) R: 45 to 99°F (7.2 to 37.2°C)

Point Name/Description	Default/Range
Heating Capacity – Used for Optimal Start, this is the rate at which the zone temperature changes when the heating system runs at full capacity to maintain designed occupied heating setpoint.	D: 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 zone 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 zone temperature departs from the acceptable range between the heating and cooling setpoints (green) into the Cooling 1 (yellow) or Heating 1 (light blue) and the temperature at which the zone color changes back to the acceptable range between the heating and cooling setpoints. For example, the following graph shows the zone color that results as the zone temperature departs from and returns to the acceptable range in a zone with the following settings: • Color Change Hysteresis = .5Δ°F (.27Δ°C) (applies as the temperature returns to the acceptable range) • Occupied cooling setpoint = 76°F (24.4°C) • Occupied heating setpoint = 70°F (21.1°C) **NOTE** The values in the graph below are Fahrenheit. 	D: .5Δ°F (.27Δ°C) R: 0 to 120Δ°F (0 to 66.6Δ°C)

Learning Adaptive Optimal Start

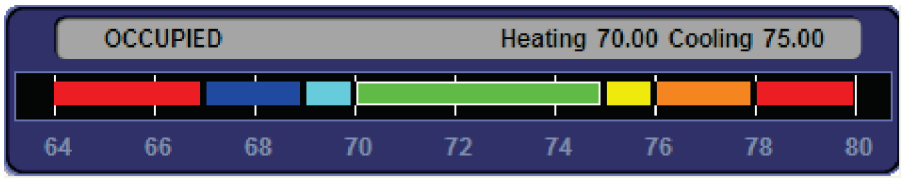


When the Learning Adaptive Optimal Start algorithm runs, the learned heating capacity or learned cooling capacity values are adjusted based on the color that is achieved when occupancy begins. The adjustment amounts for each color are displayed in the thermographic color fields (shown above with English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

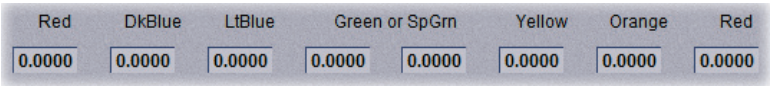
Point Name/Description	Range English	Metric
Green – The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is green.	D: 0.0600 R: 0 to 1	.0333
SpGrn – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is green.	D: 0.0600 R: 0 to 1	.0333
Yellow – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is yellow.	D: 0.0600 R: 0 to 1	.0333
Orange – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is orange.	D: 0.1300 R: 0 to 1	.0722
Red – The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is red.	D: 0.1900 R: 0 to 1	.1055

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 (-17.8 to 48.9°C)
Cooling – (Occupied or Unoccupied, depending on mode) The current programmed **Cooling** setpoint adjusted by any offset that may be in effect.	R: 0 to 120°F (-17.8 to 48.9°C)
Learned cooling capacity – The cooling capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature down to the occupied cooling setpoint prior to the occupied time.	R: °F/C
Learned heating capacity – The heating capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature up to the occupied heating setpoint prior to the occupied time.	R: °F/C
Min Setpoint Separation – Minimum separation that must be maintained between the heating and cooling setpoints.	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: 4 hr R: 0 to 4 hrs

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 R: None Temperature Compensated Learning Adaptive
Heat Start K factor (min/deg) – If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is below the occupied heating setpoint (including any setpoint offset).	D: 15.00 R: 0 to 99
Cool Start K factor (min/deg) – If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is above the occupied cooling setpoint (including any setpoint offset).	D: 15.00 R: 0 to 99
Occ Relative Humidity Setpoint – The percentage of relative humidity in the space during occupancy that will energize BO - 6 (Humidi-MiZer™).	D: 60%rh R: 0 to Unoccupied RH Control Setpoint
Unocc Relative Humidity Setpoint – The percentage of relative humidity in the space during the unoccupied time period that starts the unit and energizes BO - 6 (Humidi-MiZer™).	D: 95% R: 30 to 100%
DCV Max Ctrl Setpoint – The design difference between indoor and outdoor CO2 levels.	D: 650ppm R: 0 to 9999 ppm
Power Exhaust Setpoint - The outside air damper position at which the controller energizes the Power Exhaust relay. **Configuration** >**Service Configuration** > **Economizer Exists** must be set to **Yes**, and **Configuration** >**Service Configuration** > **Continuous Occupied Exhaust** must be set to **No**.	D: 50% Open R: 20 to 90% Open

Alarm Configuration

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

Point Name/Description	Default/Range
Space Temperature Alarm	
Occupied Alarm Hysteresis – This value is added to the 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.	D: 5Δ°F (2.7Δ°C) R: 0 to 20Δ°F (0 to 11.1Δ°C)
Alarm Delay (min/deg) – Determines the amount of delay before an occupied space temperature alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor temperature and occupied alarm setpoint plus 15 minutes.	D: 10 minutes R: 0 to 60 minutes
Unoccupied Low SPT Alarm Limit –The value that the space temperature must drop below to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 45°F (7.2°C) R: 35 to 90°F (1.6 to 32.2°C)
Unoccupied High SPT Alarm Limit – The value that the space temperature must exceed to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 95°F (35°C) R: 45 to 100°F (7.2 to 37.7°C)
Supply Air Temperature Alarm	
Low SAT Alarm Limit – The value that the supply air temperature must drop below to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 38°F (3.3°C) R: 15 to 90°F (-9.4 to 32.2°C)
High SAT Alarm Limit – The value that the supply air temperature must exceed to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 1Δ°F (.5Δ°C) for return to normal.	D: 160°F (71.1°C) R: 90 to 175°F (32.2 to 79.4°C)
Space Humidity Alarm	
Occupied High RH Alarm Limit – The value that the relative humidity sensor must exceed to generate a **Space Humidity Alarm** in the occupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D: 70%rh R: 0 to 100%rh
Alarm Delay (min/%RH) – Determines the amount of delay before an occupied RH alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor RH value and the occupied RH setpoint plus 15 minutes.	D: 5 minutes R: 0 to 30 minutes
Unocc High RH Alarm Limit – The value that the relative humidity sensor must exceed to generate a **Space Relative Humidity** alarm in the unoccupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D: 100%rh R: 0 to 100%rh
Low RH Alarm Limit – The value that the relative humidity sensor must drop below to generate a **Space Humidity Alarm** in either the unoccupied or occupied modes if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D: 30%rh R: 0 to 100%rh

Point Name/Description	Default/Range
IAQ/Ventilation Alarm	
Occupied High CO2 Alarm Limit – The value that the CO_2 sensor must exceed to generate an **IAQ Alarm** in the occupied mode. There is a fixed hysteresis of 100ppm for return to normal. Requires a valid **Indoor Air Quality CO2** sensor value and **IAQ Control** is set to **Enable**.	D: 1200ppm R: 0 to 9999 ppm

Service Configuration

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

Point Name/Description	Default/Range
Unit Type – The type of equipment that the RTU Open is controlling. Options: **Heat/Cool** – Standard rooftop air handling unit. **HP O/B Ctrl** – Heat Pump application, uses reversing valve output to control heating and cooling. **HP Y1/W1 Ctrl** – Carrier Heat Pump application only.	D: Heat/Cool R: Heat/Cool HP O/B Ctrl HP Y1/W1 Ctrl
Compressor Stages – The number of mechanical cooling stages.	D: One Stage R: One Stage Two Stages
Face Split Coil – Applies only to 2-stage cooling unit with variable speed fan control, this defines the type of cooling coil installed in the unit. The controller uses it to estimate the temperature of the air leaving the active portion of the cooling coil during part-load operation.	D: Yes R: No/Yes
Economizer Exists – Set to **Yes** to enable economizer control for units equipped with an economizer damper.	D: No R: No/Yes
Fan Control – The type of fan control used on this unit.	D: Single Speed R: Single Speed Two Speed Variable Speed
VFD Input – Defines the electrical control signal used by the Variable Frequency Drive's (VFD) input. Applies to **Variable Speed** fan control only.	D: 2-10 Vdc R: 0-10 Vdc 2-10 Vdc
Max VFD Output – The maximum output signal the control supplies to the VFD as a percentage of its range. The balancer can set this to adjust the unit's maximum airflow. Applies to **Variable Speed** fan control only.	D: 100% R: 33% to 100%

Point Name/Description	Default/Range
Min VFD Output – The minimum output signal the control supplies to the VFD as a percentage of its range. The balancer can set this to adjust the unit's minimum airflow. Applies to **Variable Speed** fan control only.	D: 40% R: 33% to 100%
Dehum Min VFD Output – The minimum output signal supplied by the control during dehumidification as a percentage of its range. Applies only to **Variable Speed** fan control.	D: 60% R: 50% to 100%
Reversing Valve Output – The type of reversing valve this unit uses.	D: O R: O/B
Heat Type – The type of heating that the unit has.	D: Electric R: Electric/Gas
Number Of Heat Stages – The number of heat stages.	D: 2 R: 1 /2 /0 (no heating)
Continuous Occupied Exhaust – Configures the exhaust fan control strategy (BO-8). If **Yes**, the power exhaust runs continuously in occupied mode and is off in unoccupied mode. If **No**, the power exhaust is controlled by the **Power Exhaust Setpoint.**	D: No R: No/Yes
RH Control – Enables dehumidification control if an RH sensor is available and the unit has the Humidi-MiZer™ dehumidification option installed.	D: Disable R: Disable/Enable
DCV Control – Enables demand controlled ventilation (DCV) if valid CO_2 sensor value is available and the unit has an economizer installed.	D: Disable R: Disable/Enable
Indoor CO2 Sensor Value @min (ma) – The CO2 value that corresponds to a 4mA input at the appropriate input channel.	D: 0 ppm R: 0 to 9999 ppm
Indoor CO2 Sensor Value @max (ma) – The CO2 value that corresponds to a 20mA input at the appropriate input channel.	D: 2000 ppm R: 0 to 9999 ppm
Outdoor CO2 Sensor Value @min (ma) – The CO2 value that corresponds to a 4 mA input at the appropriate input channel.	D: 0 ppm R: 0 to 9999 ppm
Outdoor CO2 Sensor Value @max (ma) – The CO2 value that corresponds to a 20 mA input at the appropriate input channel.	D: 2000 ppm R: 0 to 9999 ppm
System Space Temperature – The network space temperature value that the controller is using for control (if applicable).	D: -999.00° R: N/A
System Space RH – The network relative humidity value that the controller is using for control (if applicable).	D: -999.00% R: N/A
System Space AQ – The network indoor air quality (CO_2) value that the controller is using for control (if applicable).	D: -999.00 ppm R: N/A
System Outdoor AQ – The network outdoor air quality (CO_2) value that the controller is using for control (if applicable).	D: -999.00 ppm R: N/A
System Cool Demand Level – The system cool demand level being received over the network.	D: 0.00 R: 0 to 3

Point Name/Description	Default/Range
System Heat Demand Level – The system heat demand level being received over the network.	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: -999.0° R: N/A
Service Test	
Service Test – Enable to stop automatic control so you can test the controller's outputs. Automatically resets to **Disable** after 1 hour.	D: Disable R: Disable/Enable
Fan Test – Enable to test the controller's fan operation. Operates fan at low speed if the fan type is set to Two Speed. Resets to **Disable** when complete. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
High Speed Fan Test – Enable to test the unit's high speed fan operation. Operates fan at high speed if **Fan Control** is set to **Two Speed**. Resets to **Disable** when complete. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Compressor 1 Test – Enable to test the controller's compressor 1 output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Compressor 2 Test – Enable to test the controller's compressor 2 output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Heat 1 Test – Enable to test the controller's heat 1 output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Heat 2 Test – Enable to test the controller's heat 2 output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Reversing Valve Test – Enable to test the controller's reversing valve output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Dehumidification Test – Enable to test the controller's Humidi-MiZer™ output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Power Exhaust Test – Enable to test the controller's exhaust fan output. **Service Test** must be set to **Enable**.	D: Disable R: Disable/Enable
Economizer Test – Set to a value between 0 and 100% to test the controller's economizer output. **Service Test** must be set to **Enable**.	D: 0% Open R: 0 to 100% Open
VFD Speed Test – Set to a value between 0 and 100% to test the controller's variable speed fan output. **Service Test** and **Fan Test** both must be set to **Enable**.	D: 0% R: 0 to 100%

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.	R: Unoccupied/Occupied
Indicates the current status of the system: **Temp Compensated Start** **Learning Adaptive Start**	R: Inactive/Active
Pre-Occ Purge – Indicates if the pre-occupancy purge cycle is active.	R: Inactive/Active
Space Temp Source – The source of the controlling space temperature value. Sates: **Sensor Failure** – No valid space temperature or sensor status = failed. **SPT Sensor** – An SPT sensor is connected to the controller's Rnet port. **T55/56** – A T55, T56, or T59 sensor is connected to the controller's J20 terminals. **Network** – A network temperature sensor is bound to the controller's space temperature AV. **Airside Linkage** – The space temperature from a linked terminal. **Locked Value** –The controller's space temperature input has been manually locked at a value.	R: Sensor Failure SPT Sensor T55/T56 Network Airside Linkage Locked Value
Setpoint Adjustment – Indicates the amount of offset applied if you configured the space sensor as a type of T56. Set the display value range in **Setpoint Adjustment Range**.	R: °F/C
Effective Heat Setpoint – The current heating setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: °F/C
Effective Cool Setpoint – The current cooling setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: °F/C
Relative Humidity Source – The source of the relative humidity value.	R: N/A Local Network Linkage Locked Value Linkage & Local
IAQ Source – The source of the indoor air quality value.	R: N/A Local Network Linkage Locked Value Linkage & Local
OAQ Source – The source of the outdoor air quality value.	R: N/A Local Network Linkage Locked Value Linkage & Local

Point Name/Description	Default/Range
Outdoor Air Temperature Source – The source of the outdoor air temperature.	R: N/A Local Network Linkage Locked Value
System Cooling Demand Level – The demand limit used by the control in cooling mode.	R: 0 to 3
System Heating Demand Level – The demand level used by the control in heating mode.	R: 0 to 3
Safety Chain Feedback - Indicates a completed circuit from J1, 1 to J1, 9. This circuit is typically used for safety devices that immediately stop unit operation when tripped.	R: Off/Run Enabled
Fire Shutdown – **Shutdown** indicates that a fire shutdown is in effect.	R: Run Enabled/ Shutdown
Compressor Safety Status – **Trouble** indicates that the compressor safety device has tripped.	R: Normal/Trouble
Calculated Min Econ Pos – Indicates the minimum position value that the economizer control is using.	R: 0 to 100%
Calculated PE Setpoint – Indicates the setpoint value the power exhaust fan control is using. This value is automatically calculated from the configured setpoint when you use a 2-speed or variable speed fan.	R: 0 to 100%
Active Compressor Stages – The number of compressor stages currently operating.	R: 0 to 2
Active Heat Stages – The number of heating stages currently operating.	R: 0 to 2
Enthalpy Status – The enthalpy status determined by an enthalpy switch.	R: High/Low
Enthalpy (BACnet) – The enthalpy status the controller receives through BACnet communication.	R: High (0) / Low (1)
Humidistat Input Status – The humidity status determined by a humidistat.	R: High/Low
Filter Status – Displays the current filter condition to the filter input if that option is configured.	R: Clean/Dirty
Door Contact Switch – Displays the state of the door contact switch if that option is configured.	R: Off/On
Reset Supply Fan Runtime Alarm – Set to **Clear** to reset **Supply Fan Runtime** to 0.	D: Run R: Run/Clear
Reset Comp 1 Runtime Alarm – Set to **Clear** to reset **Compressor 1 Runtime** to 0.	D: Run R: Run/Clear
Reset Comp 2 Runtime Alarm – Set to **Clear** to reset **Compressor 2 Runtime** to 0.	D: Run R: Run/Clear
Reset Filter Alarm – Set to **On** to reset **Filter Runtime** to 0.	D: Off R: Off/On
Occupancy	

Point Name/Description	Default/Range
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
Occupancy Contact – **ON** indicates an external contact is controlling the occupancy state.	R: Off/On
Override Time Remaining – The amount of time remaining in an override period.	R: 0 to 240 minutes
Runtime	
Supply Fan Runtime – The total number of hours that the supply fan relay has been energized since the runtime was last reset to 0 using **Reset Supply Fan Runtime Alarm**.	R: __ hr
Compressor 1 Runtime – The total number of hours that the Compressor 1 relay has been energized since the runtime was last reset 0 using **Reset Comp 1 Runtime Alarm**.	R: __ hr
Compressor 2 Runtime – The total number of hours that the Compressor 2 relay has been energized since the runtime was last reset using **Reset Comp 2 Runtime Alarm**.	R: __ hr
Filter Runtime – The total number of hours that the unit has been operating since the runtime was last reset to 0 using **Reset Filter Runtime Alarm**.	R: __ hr

Alarms

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

Point Name/Description	Range
Safety Chain – Indicates if the safety chain circuit trips.	R: Normal/Alarm
Fire / Smoke Shutdown – Indicates if the fire shutdown circuit trips.	R: Normal/Alarm
Compressor Status – Indicates if the compressor safety circuit trips.	R: Normal/Alarm

Point Name/Description	Range
Space Temperature – Indicates if the space temperature sensor exceeds the high or low alarm limit.	R: Normal/Alarm
Alarming Temperature – Indicates the space temperature value that caused the space temperature alarm. Visible only in an alarm condition.	R: The sensor's range
Alarm Limit Exceeded – The alarm limit that the alarming space temperature sensor exceeded. Visible only in an alarm condition.	R: The configured limit
SPT Sensor – Indicates if the SPT communicating zone temperature sensor is no longer communicating.	R: Normal/Alarm
Space Temp Sensor – Indicates that a valid space temperature sensor or sensor value is no longer available to the controller.	R: Normal/Alarm
Supply Air Temperature – Indicates if the supply air temperature exceeds the configured alarm limits.	R: Normal/Alarm
Supply Air Temp Sensor – Indicates if the supply air temperature sensor fails.	R: Normal/Alarm
Supply Fan Failure – The supply fan is not operating when commanded on.	R: Normal/Alarm
Supply Fan in Hand – The supply fan is operating when commanded off.	R: Normal/Alarm
Indoor Air Quality – Indicates if the occupied CO_2 level exceeds the configured high alarm limit.	R: Normal/Alarm
Indoor Air Quality Sensor – Indicates that a valid indoor air quality sensor or sensor value is no longer available to the controller.	R: Normal/Alarm
Space Relative Humidity – Indicates that a valid space relative humidity sensor exceeds the configured alarm limits.	R: Normal/Alarm
Space Relative Humidity Sensor – Indicates that a valid space relative humidity sensor or sensor value is no longer available to the controller.	R: Normal/Alarm
Filter – Indicates a dirty filter condition when the filter runtime exceeds the value of the **Filter Service Alarm Timer** or in response to a filter status switch binary input.	R: Clean/Dirty
Local OAT Sensor – Indicates the local outdoor air temperature sensor connected to this equipment fails.	R: Normal/Alarm
Outdoor Air Temp Sensor – Indicates if the controller is no longer receiving a valid outdoor air temperature value either through the network or from a local sensor.	R: Normal/Alarm
Outdoor Air Quality Sensor – Indicates if the outdoor air quality (CO_2) sensor fails.	R: Normal/Alarm
Setpoint Slider – Indicates if the T56 sensor's setpoint slider potentiometer fails.	R: Normal/Alarm
Switch Configuration – Indicates if a duplicate configuration exists for two or more binary Input 3, 5, 8, & 9 Functions.	R: Normal/Alarm
Analog Input Configuration – Indicates if a duplicate configuration exists at the analog Input 1 & 2 Functions.	R: Normal/Alarm
Supply Fan Runtime – Indicates if the supply fan runtime exceeds the value of the **Supply Fan Service Alarm Timer**.	R: Normal/Alarm
Compressor 1 Runtime – Indicates if the compressor 1 runtime exceeds the value of the **Compressor 1 Service Alarm Timer**.	R: Normal/Alarm
Compressor 2 Runtime – Indicates if the compressor 1 runtime exceeds the value of the **Compressor 2 Service Alarm Timer**.	R: Normal/Alarm
Airside Linkage – Indicates if Linkage has failed in a zoned system using Linkage.	R: Normal/Alarm

Linkage

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

Point Name/Description	Range
Linkage Collector – Allows access to the Collector's details.	
Airside Linkage Status – If **Active**, the controller is part of a linked system. If **Not Active**, the controller is a stand-alone device.	R: Active/Not Active
If **Airside Linkage Status** is **Active**, the following information is received from the Zoning System Master Zone, as applicable: **Occupancy Status** **Space Temperature** **Occupied Cooling Setpoint** **Occupied Heating Setpoint** **Unoccupied Cooling Setpoint** **Unoccupied Heating Setpoint** **Indoor Air CO2** **Space Relative Humidity** **Linkage Max Damper Position** **Linkage Optimal Start** The following information is sent back to the Zoning System Master Zone: **Air Source Mode** **Air Source Supply Air Temp** **Air Source Outdoor Air Temp**	

I/O Points

The values shown on the **I/O Points Properties** page are the raw values at the I/O objects and may not match values shown on status displays that are affected by control program logic.

i-Vu users logged in as **Power User** and above are able to edit various parameters associated with the input channels and the display names for all channels.

We strongly recommend that you leave these parameters at their defaults. The RTU Open is not a programmable controller. I/O can only be used for the purpose designed in the equipment control program. Modifying these parameters may result in unpredictable equipment control.

See *Wiring inputs and outputs* (page 12) for more information. This table lists each of the I/O Channels, their functions, associated hardware, and terminal numbers.

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

Point Name/Description
Space Temp – The value of the Optional SPT (Rnet) sensor. Also allows i-Vu & Field Assistant users access to sensor configuration. See *Carrier Sensors Installation Guide* for additional details.

Point Name/Description
input 1 – Input Channel 1; 4 - 20 mA only. User-configurable for IAQ, OAQ, or Space Relative Humidity.
input 2 – Input Channel 2; 4 - 20 mA only. User-configurable for IAQ, OAQ, or Space Relative Humidity.
input 6 – Input Channel 6; 10K Thermistor only. Supply Air Temperature.
input 7 – Input Channel 7; 10K Thermistor only. Outside Air Temperature.
input 10 – Input Channel 10; 10K Thermistor only. Space Temperature (T55, 56, 59).
input 11 – Input Channel 11; 100K Potentiometer only. Setpoint adjust (T56, 59).
slidepot voltage reading – Input Channel 11; used to detect an open circuit (faulty Setpoint adjustment mechanism).
input 3 – Input Channel 3; Dry Contact only. User-configurable for No Function, Compressor Safety, Fan Status, Filter Status, Remote Occupancy, or Door Contact.
input 4 – Input Channel 4; Dry Contact only. Safety Chain.
input 5 – Input Channel 5; Dry Contact only. User-configurable for No Function, Fire Shutdown, Fan Status, Filter Status, Remote Occupancy, or Door Contact.
input 8 – Input Channel 8; Dry Contact only. User-configurable for No Function, Enthalpy, Fan Status, Filter Status, Remote Occupancy, or Door Contact.
input 9 – Input Channel 9; Dry Contact only. User-configurable for No Function, Humidistat, Fan Status, Filter Status, Remote Occupancy, or Door Contact.
Sensor invalid – Reflects the status of the Space Temp (Rnet) input. On = Space Temp invalid, Off = Space Temp valid.
ao 1 – Analog Output Channel 1; jumper-selectable.
ao 2 – Analog Output Channel 2; 0-10 Vdc or 2-10 Vdc user-configurable, provides VFD Output signal used for Variable Speed fan control.
relay 1 – Binary Output 1; Fan (G) Output.
relay 2 – Binary Output 2; Heat 2 (W2) Output.
relay 3 – Binary Output 3; Heat 1 (W1) Output.
relay 4 – Binary Output 4; Cool 2 (Y2) Output.
relay 5 – Binary Output 5; Cool 1 (Y1) Output.
relay 6 – Binary Output 6; Humidi-MiZer™ Output.
relay 7 – Binary Output 7; Reversing Valve Output or High Speed Fan Output.
relay 8 – Binary Output 8; Power Exhaust Output.

Appendix B: Single Point Linkage and Device Address Binding

Single Point Linkage

The RTU Open receives data from other Open controllers when they are installed as part of an i-Vu® Control System. The data transfer may take the form of Single Point Linkage (SPL), which is automatic, or Device Address Binding, which you must configure.

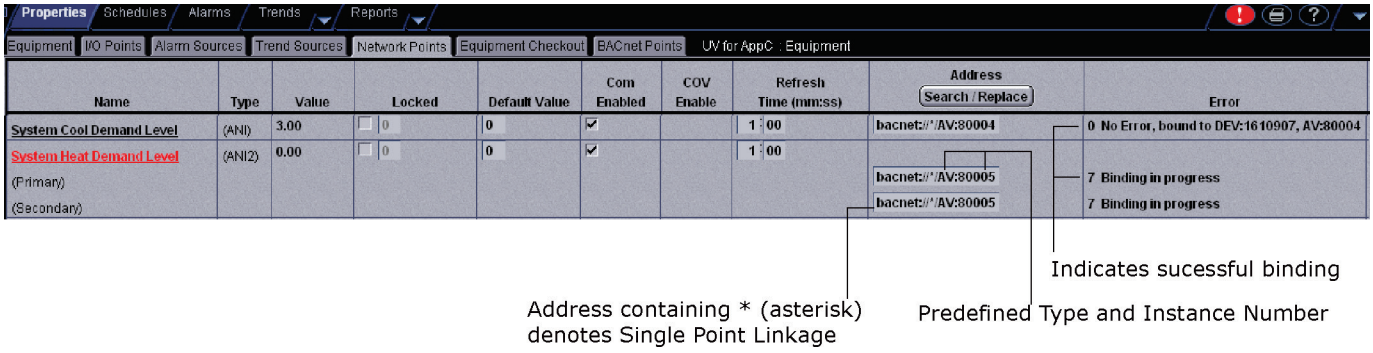
Currently, the RTU Open implements Single Point Linkage for 2 variables:

- **System Cool Demand Level**
- **System Heat Demand Level**

Network Points for which SPL has been implemented are displayed in Field Assistant and the i-Vu® interface on the **Properties** page > **Network Points** tab.

The following example involves outside air temperature. **System Heat & Cool Demand Level** behaves similarly, except that their usage involves a specific application loaded on a Universal Controller Open. See *UC Open Installation Guide* for additional information. In either case, note that the BACnet type and instance numbers specified in the **Address** field of these variables have been predefined.

Network variables for which SPL is used are easily identified on the **Properties** page > **Network Points** tab. The asterisk in the BACnet address invokes the SPL function. These addresses cause the controller to issue a BACnet "who has" command for this variable. The controller binds to the closest of the first 5 devices from which it receives a valid response.

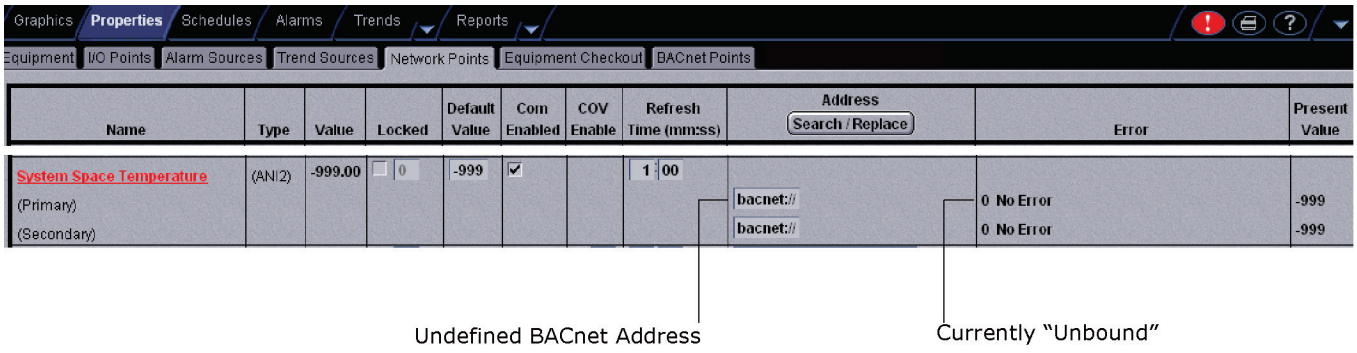


Device Address Binding

As described previously, **Device Address Binding** allows the controller to receive data from other Open controllers when they are connected by a network. You must configure this method.

Currently, the RTU Open allows **Device Address Binding** (DAB) only for **System Space Temperature**, **System Space RH**, System Space AQ, System Outdoor Air Temperature, and other optional points which may be in the controller. See *Service Configuration* (page 69).

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.



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*
2/24/16	Sequence of Operation	Space Air Quality section deleted - information is contained in the Indoor Air CO2 section	C-TS-CB-E-WB
	Start-up	Added USB Link wiring caution.	C-TS-RD-E-JH

* For internal use only

Index

Z

A member of the United Technologies Corporation family · Stock symbol UTX · Catalog No. 11-808-429-01 · 2/24/2016