SmartNode V2

Installation and Operations Manual

 • Catalog No. 11-808-1274-01 • 8/3/2026

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

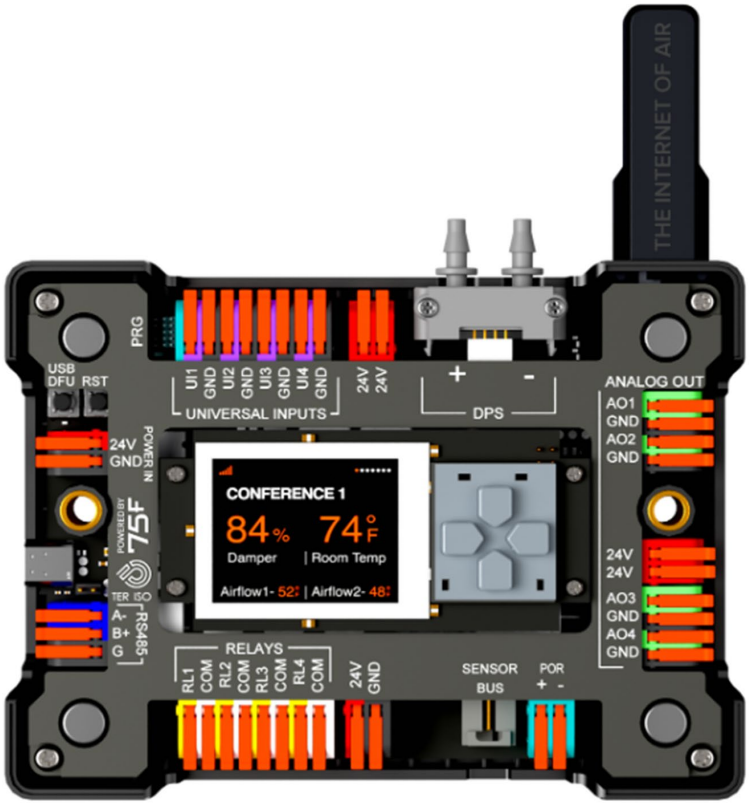
Important changes are listed in **Document revision history** at the end of this document.

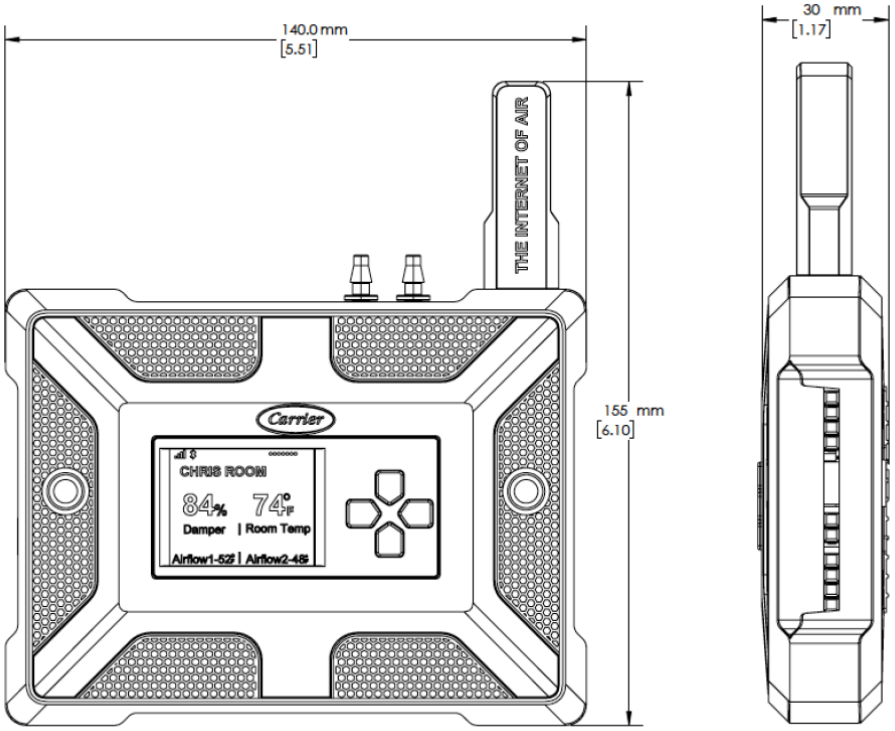
Specifications subject to change without notice.

Contents

What is the SmartNode V2?

The SmartNode V2 is an enhanced version of the SmartNode V1. It is a highly versatile input/output (IO) controller. Many applications can be set up out-of-the-box with minimal configuration options. The SmartNode can also be used for more custom sequences outside its typical terminal application profiles. The SmartNode V2 is available in two configurations: one without a differential pressure sensor (7C-SN-C3X-X) and one with a differential pressure sensor (7C-SN-C8X-X).





Specifications

Dimensions	5.51” x 6.1” x 1.18” (140mm x 155mm x 30mm)
Operating Environment	Humidity 20-85% non-condensing Temperature 0°F to 122°F (-17°C to 50°C) Plenum-rated
Screen	TFT
Termination	Lever, no tool connectors. 3-wire Molex connectors
Supply	24V AC/DC input (+/-15%)
Max power consumption	3VA (when no two-wire sensors are connected). Typical <VA when the PoR is on full load
Protection	IP 20, NEMA Type 1
Rated Impulsive Voltage	330V AC RMS
Inputs	(4-UIs) Each input configurable for 10k Thermistor OR 0-10V DC
Outputs	(4 AOs) 0-10V DC analog outputs (4 DOs) Dry contact relays rated at 24VDC
Sensors	Differential Pressure Sensor (on part number 7C-SN-C8X-X) 0 – 500Pa
Bluetooth	BLE 4.1 for commissioning
Mesh	900 Mhz Mesh IEEE 802.15.4- compliant, for communications to CCU
Wired	PoR (Power over RS485) for v2 sensor bus 3-wire Molex connector for legacy sensor bus RS-485 port for wired connection to CCU 4-wire Molex connector sensor bus no longer supported (i.e. HyperSense)
Pollution Grade	2
Certification	ROHS, UL 60730-1- Automatic Electrical Controls – in progress
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Installation

Precautions

- Do not install devices in direct sunlight.
- Do not install devices on an exterior wall.
- Do not install devices near heat-producing equipment.
- Disconnect the power before installing. Do not connect or disconnect wiring while power is applied.
- Do not run the wall sensor harness next to the line voltage.
- Install according to all state and local codes.
- Do not mount the SmartNode directly on the bottom of ductwork. This can cause a drip hazard to the electronics in the case of condensation buildup.

Features

- Accurate Temperature measurement
- Accurate Humidity measurements
- Wireless communication to the Central Control Unit (CCU)

Mounting

- Inputs on the SmartNode are on the top, outputs are on the right side. Mount the device appropriately.
- Attach the SmartNode V2 to the mounting bracket with the 2 allen screws provided. Some dampers may come with a mounting bracket, VAV applications may require a separate mounting bracket.
- Place the mount between the 8 and 4 o'clock position relative to the ductwork.

Wiring

The SmartNode is an I/O controller that can control many unique applications. The terminal profile is determined by the equipment.

WARNING Do not connect or disconnect wiring while power is applied.

CAUTION Do not run the Wall Sensor harness next to the line voltage.

Wall Sensor Harness

Both ends of the Wall Sensor harness have the same male connectors.

1. Run one of the ends down the wall and feed through a previously-drilled 1-inch hole.
2. Plug into the wall sensor.
3. Plug the other end into the sensor BUS port on the SmartNode.

Powering the SmartNode

1. Remove power from the power supply.
2. Run an 18/2AWG bus line to the **24v** and **GND** on the SmartNode. All devices with a shared transformer must be the same polarity.
   - If you have another SmartNode that needs to be powered, daisy chain them from **24v** and **GND** to the next **24v** and **GND**.
   - Secure your cables so there is no excessive strain on any connections.
   - To remove the power lines, lift the WAGO lever connectors and remove the power line.

NOTE **Power 24v** and **GND** can be used in reverse order if necessary.

Startup

Pairing to CCU

Pair the SmartNode with a zone that is preconfigured, or create and configure a zone yourself through **Setup** > **Floor Plan** on the CCU.

Adding a Floor

1. On the tablet select **Settings**. under **Floor Layout**, and then tap **Add a Floor**.
2. Click the “Plus” sign to Enter a Floor name.

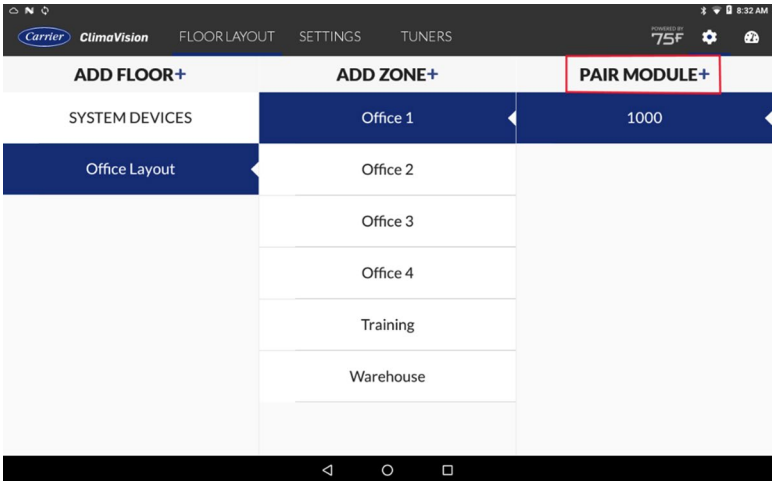
Adding a Zone

1. On the tablet select **Settings**. and then tap **Add a Zone**.
2. Click the “Plus” sign to Enter a zone name.

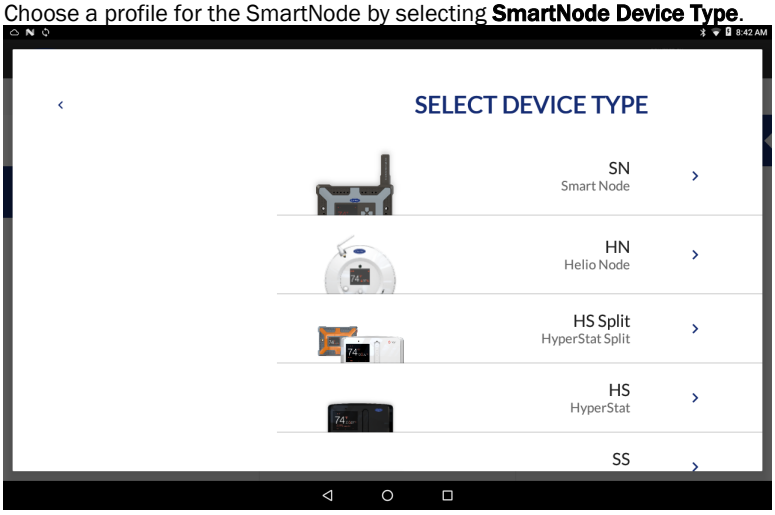
Pairing Device

1. Apply power to the system. "Waiting to Connect over 900MHZ" default message appears.
2. Verify all SmartNodes display the default room.
3. Disconnect the tablet from the CM and bring it with you. The pairing uses Bluetooth.
4. Press **Right Arrow** on the SmartNode until you reach **Installer Options**., and then select **Pair with CCU**. Press the **Right Arrow** again. This puts the SmartNode in advertising mode

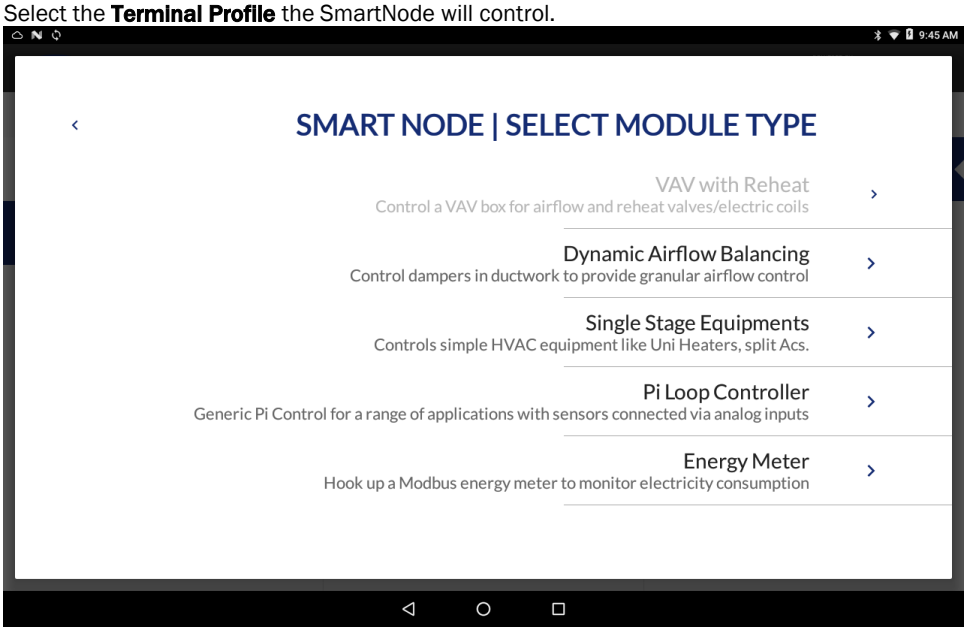
5. On the CCU tablet choose the zone you wish to pair and press **Pair Module** to begin the pairing process. If no zones appear, add all floors and rooms before pairing. See *Adding a Zone* above.



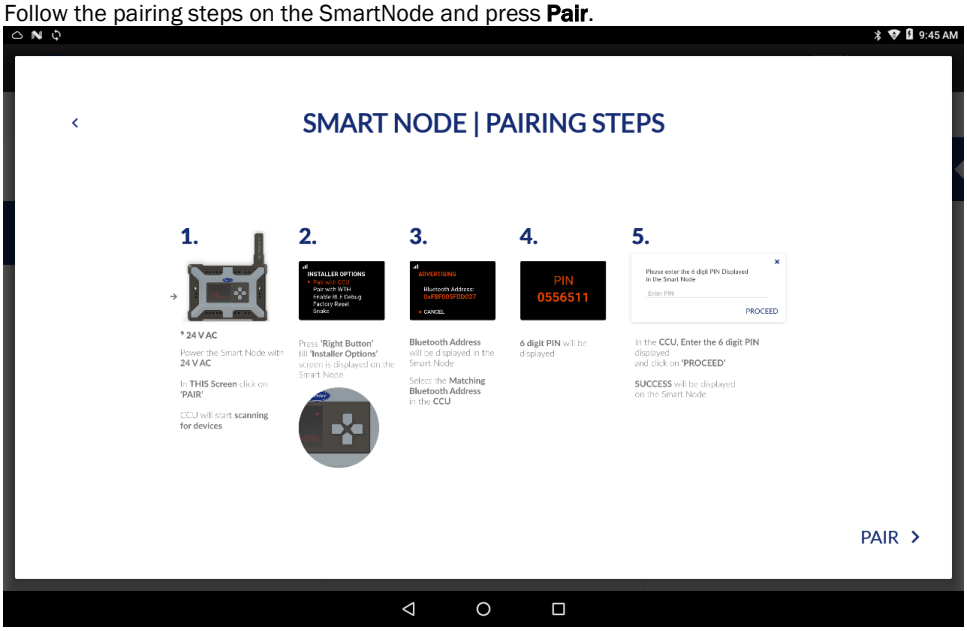
6. Choose a profile for the SmartNode by selecting **SmartNode Device Type**.



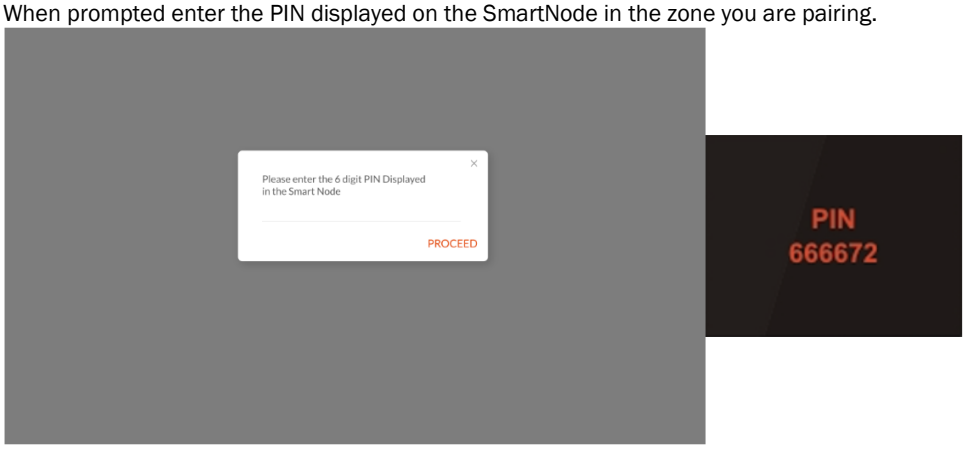
7. Select the **Terminal Profile** the SmartNode will control.



8. Follow the pairing steps on the SmartNode and press **Pair**.



9. When prompted enter the PIN displayed on the SmartNode in the zone you are pairing.



NOTES

- The pairing process takes several seconds. When complete, "Success" appears.
- The tablet does not display any zone data until it is reconnected (docked) to the CM where it communicates over a 900 Mhz channel.
- After docking the tablet to the CCU, it takes a few minutes before the SmartNode displays the new zone name.

10. Once paired, configure the device using the options that appear. See the devices *Installation and Operation* guide for details.

See *Troubleshooting Pairing* (page 13) for information on pairing problems.

Choosing the right profile

- VVT-C Terminal Profile (page 16)
- VVT-C with Reheat (page 20)
- VVT-C Dual Duct (page 23)
- Dynamic Airflow Balancing (page 26)

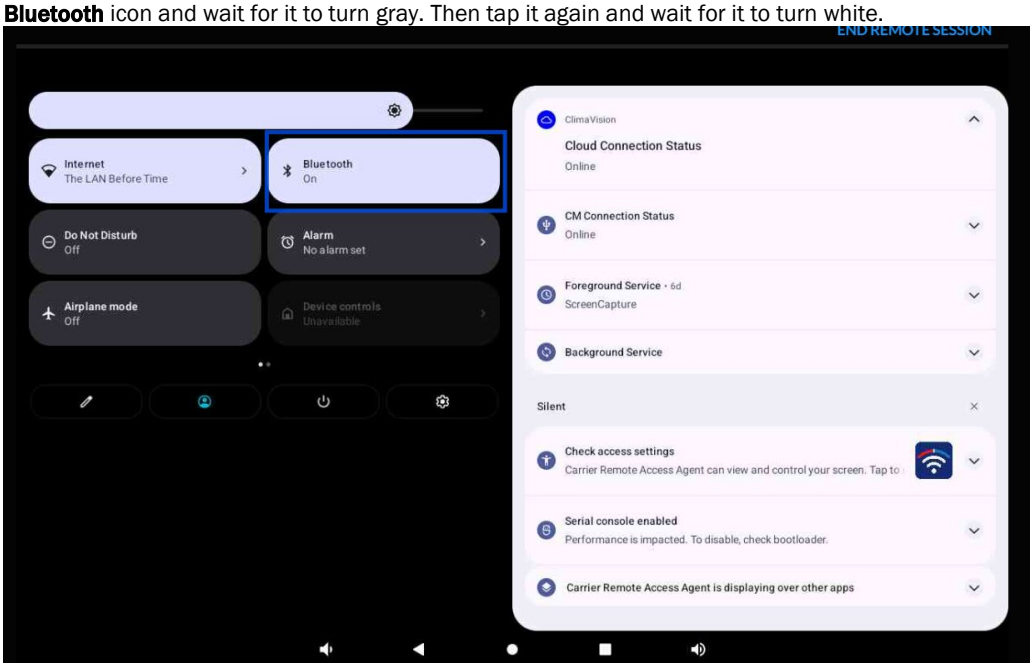
Troubleshooting

Troubleshooting Pairing

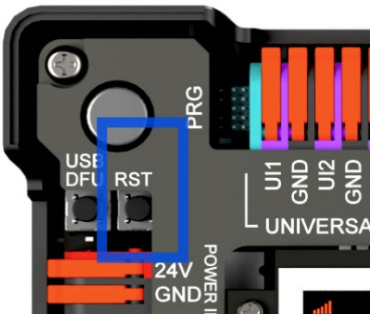
If you are having trouble pairing your device with your CCU and the device displays a MAC address or PIN but is not displayed on the CCU, try the steps below one at a time.

Bluetooth Reset

1. Tap away from the pairing screens on the CCU and retry the pairing.
2. Toggle the Bluetooth adapter Off and back On. Swipe down from the upper right corner of the CCU and press the **Bluetooth** icon and wait for it to turn gray. Then tap it again and wait for it to turn white.

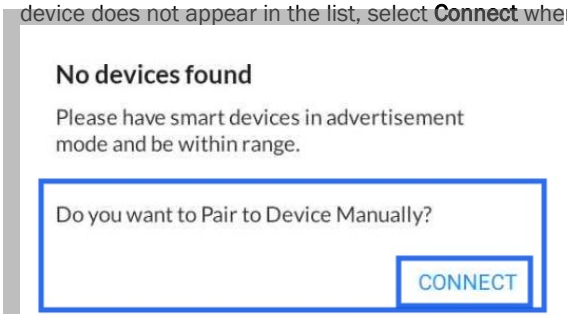


3. Power cycle, or press **Reset** on the device itself.
   - CCU – Press and hold the power button on the top right of the tablet
   - SmartNode V2 - Press the “RST” button to power cycle the device

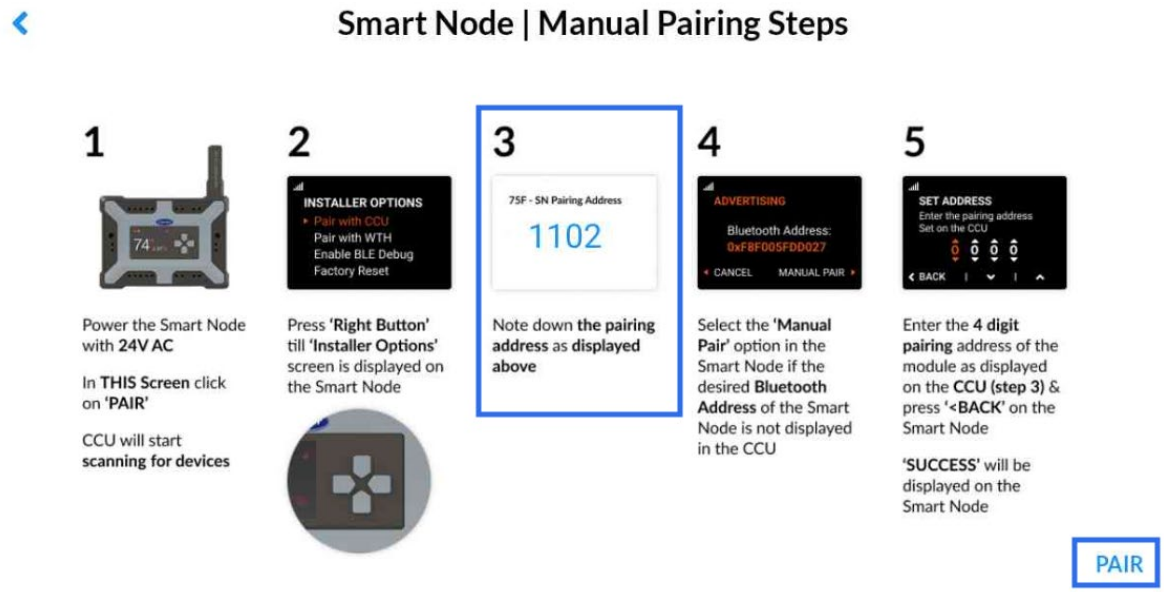


Manual Pairing Mode

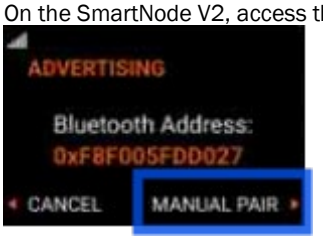
1. If resetting Bluetooth does not resolve the issue, try pairing the device manually. After selecting Pair on the CCU, if your device does not appear in the list, select **Connect** when prompted with “Do you want to pair to a device manually?”.



2. After selecting this option, you will be taken to the Manual Pairing Steps screen, where the device’s pairing address is displayed. In Step 3, note the **pairing address** listed, then select **Pair**.



3. On the SmartNode V2, access the **Manual Pairing** options by pressing the right arrow button.



4. Once there, enter the **4-digit pairing address** for the module as shown in the previous step.
5. Then press the **Back** button to save. A success message will appear on the SmartNode.

Device Does not Power On

1. Verify that the SmartNode is receiving 24VAC power.
2. Check the wiring polarity.
3. Confirm that the wiring at the Power in terminals are secure and properly seated.
4. Use a meter to check for the correct voltage.

To revert to default settings (factory reset)

1. From the **Home** screen press the right button five times to navigate to **Installer Options**.
2. Select **Factory Reset** to restore the SmartNode to the default configuration.

Serial Number and Software version

1. From the **Home** screen press the right button five times to navigate to**"75F SmartNode"** screen.
2. Locate the Serial Number and FW Version fields.

Compliance

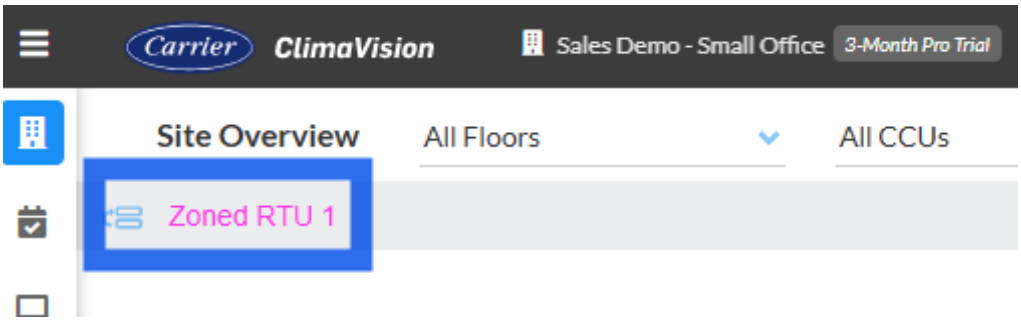
Certifications

	UL Listed for Canada and North America	Yes
	UL Fire tested under UL 2043	Yes
	Federal Communications Commission	Yes
	Industry Canada (ISED)	Yes
	Conformité Européenne	Yes
	Telecommunications and Digital Government Regulatory Authority (TDRA)	Planned

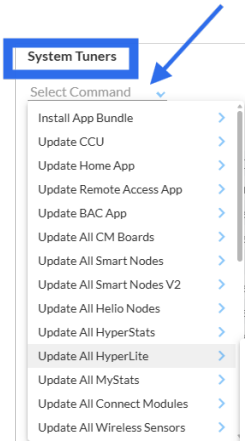
Updating the software or profile

To update the SmartNode V2 software, navigate to the **WebUi** (webui.carrierclimavision.com). You must have **Level 2 Access.**

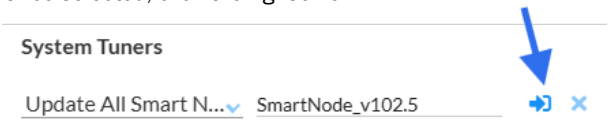
1. In the **WebUi**, navigate to the applicable site.
2. Click the CCU name (for example, Zoned RTU 1)



3. Scroll down to **System Tuners** and click in **Select Command**.
NOTE You will not see this screen if you do not have Level 2 Access.



4. In the drop down, go to **Update All Smart Nodes V2**, and click the **Recommended** option.
5. Once selected, click the right arrow.



6. "Success" appears.

Sequence of Operations

VVT-C Terminal Profile

The VVT-C terminal profile controls the terminal equipment of a space, which is provided by an **RTU** or an **AHU** for its HVAC needs.

The profile is supported by a **SmartNode.** This device provides the necessary control outputs based on the profile configured.

How it Works

Carrier Dynamic Airflow Balancing temperature balances a system without fully closing off zones and creating harmful back pressure on the AHU.

Once you select the **VVT-C** terminal profile under **SmartNode VVT-C** profiles the configuration provides options to:

- Define the damper **types**, **size**, **shape**, and **zone priority**
- Define the minimum and maximum damper positions during heating and cooling along with the Temperature Offset
- Modify the controls based on the Internal Air Quality and CO2 with the **IAQ** and **CO2** control that can be enabled or disabled.

Normally the Algorithm continuously tracks the current temperature of the zone and looks for a change in the difference between the terminal level **Desired Temperature** and **Current Temperature** and provides an optimal damper opening position within the dead band range which is a result of the loop output based on the PI loop for control signals.

When the **Current Temperature** increases above the set point or desired temperature, the zone calls for cooling from the system or building-level equipment.

When the **Current Temperature** decreases below the set point or desired temperature the zones call for Heating from the system or building-level equipment.

The building or system-level device is an RTU or AHU which is controlled by the system-level VVT-C profiles.

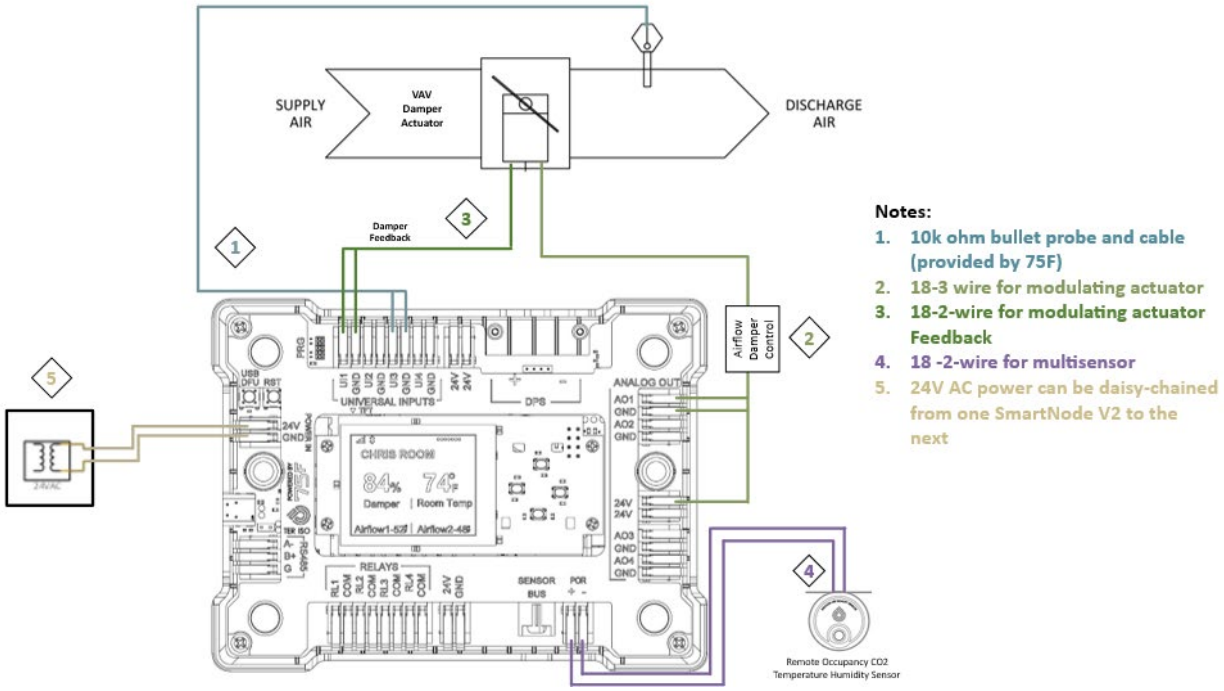
When the **CO2** or the **IAQ** control is enabled the algorithm takes the target and threshold values of **CO2** and **VOC** into consideration. An increase in the value from the threshold value results in a loop output and it changes the minimum damper position for the actual control to the changes in percentage value.

This resultant loop output is called the CO2 loop output, which is the weighted average CO2 loop output for all the zones that have CO2 control enabled.

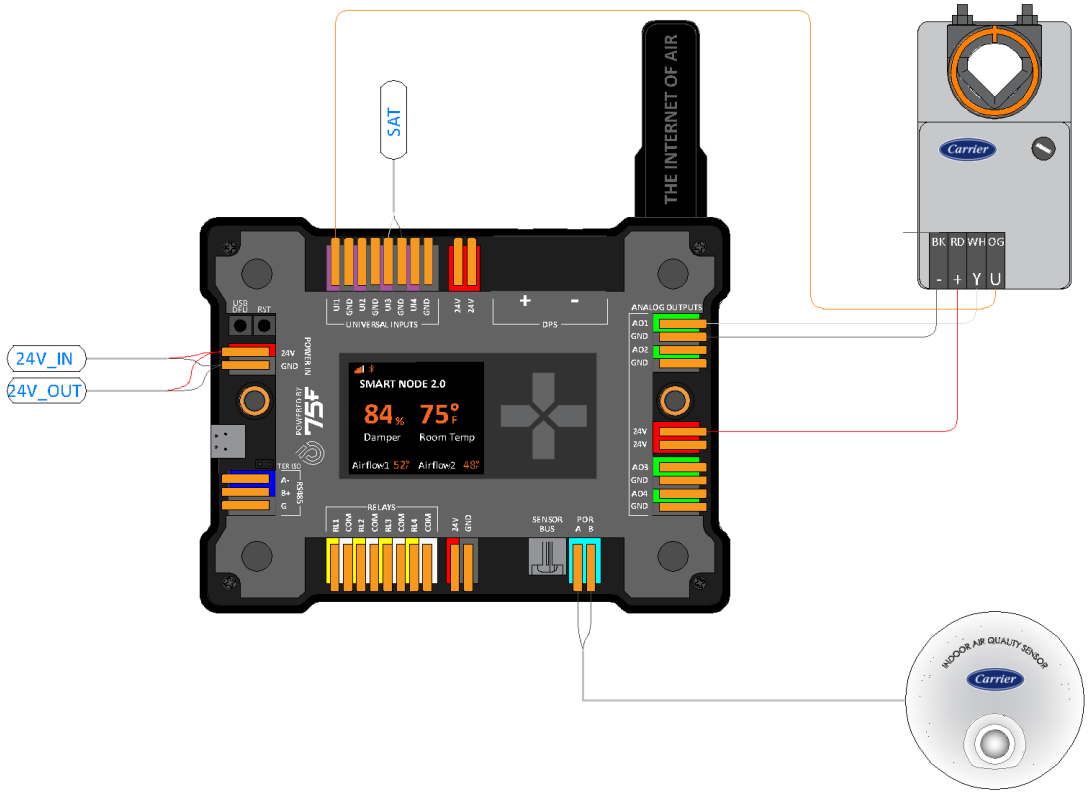
Example- If the target and threshold are 1000ppm and 800, measured CO2 is 850 and configured damper limits are 0-100. The algorithm starts raising the minimum damper position proportionally from 800. A CO2 measurement of 850 yields a loop output of 25%. This raises the damper's min position so that it now varies in the range of 25 – 100 based on temperature.

Wiring

The wiring schematic for the VVT-C terminal profile below shows the connection between the SmartNode, Damper Actuator, and the Damper.



A **Temperature and Humidity** only sensor, which can be a **Wall Sensor/Ceiling Sensor/Duct Sensor/Flush Mount Sensor/MultiSensor V1**, is connected to the **RTS** port (Sensor Bus) of the SmartNode. Alternatively, if you are using the **MultiSensor V2** or **MySense,** the sensor is connected to the **POR** port of the SmartNode as seen in the image below.



Carrier ClimaVision Damper Installation:

1. The “BK (-)” wire (Black) connects to the Analog Out Ground (GND) section.
2. The “RD (+)” wire (Red) connects to the 24V port to draw power from.
3. The “WH (Y)” wire (White) connects to the Analog Out (AO1/AO2).
4. The “OG (U)” wire (Orange) connects to the Universal Inputs section (UI1/UI2/UI3/UI4).[C

Points to consider while wiring

- When installing a Belimo actuator use the 18 gauge thermostat wire for connections between the SmartNode and actuator.
- For sensors that use the RTS port, both ends of the harness are the same male connectors. Plug one end into the wall sensor, and plug the other end into the RTS port on the SmartNode.

Configuration

Below is the configuration screen for the VVT-C terminal profile.

Once you pair the SmartNode as a VVT-C profile and set configuration parameters that define the physical characteristics of the setup in the configuration screen, the Carrier sequence for the VVT-C controls the setup.

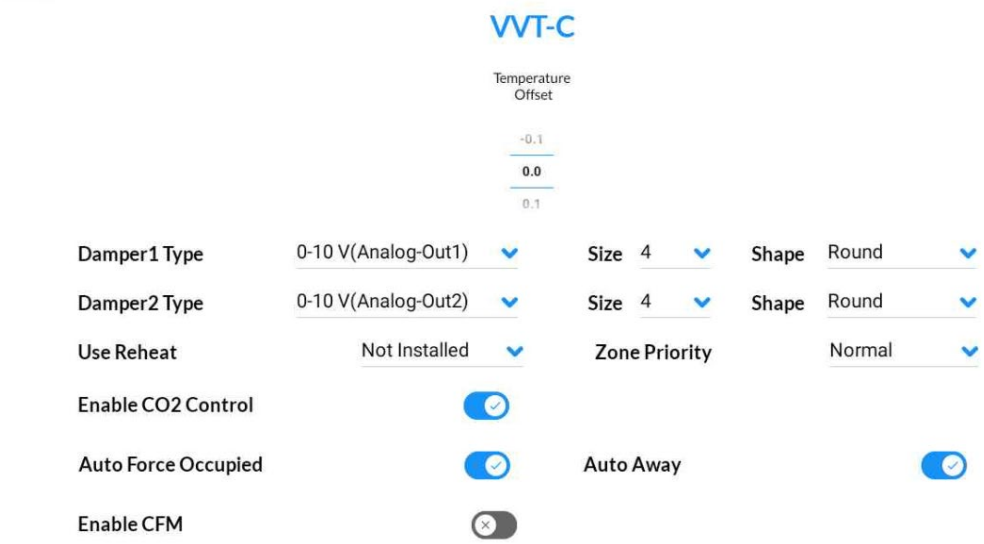
Configuration Parameters

Damper Type	• 0-10v (Analog-out1) • 2-10v (Analog-out1) • 10-2v (Analog-out1) • 10-0v (Analog-out1)
Use Reheat	It is a provision to include Reheat capability in the profile for more information on the reheat aspect refer to VVT-C with Reheat (page 20)
Size	Size of the associated damper, used for calculating CFM
Shape	Shape of the associated damper, used for calculating CFM
Zone Priority	Used in calculations for driving the AHU into heating or cooling (Low = 1, Normal = 10, High = 50)
Enable IAQ Control	Must have an IAQ sensor present, nonstandard option
Enable CO2 Control	Must have a CO2 sensor present, nonstandard option
Enable Occupancy Control	Must have an Occupancy Sensor present, nonstandard option
Enable CFM	Enables operation based on the **Airflow in cubic feet per minute** calculation
Temperature Offset	Value applied to the current temperature reading if the current temperature needs calibration, sensors should not typically need calibration
Min/ Max Damper Positions	Hard limits on damper positions in a given mode

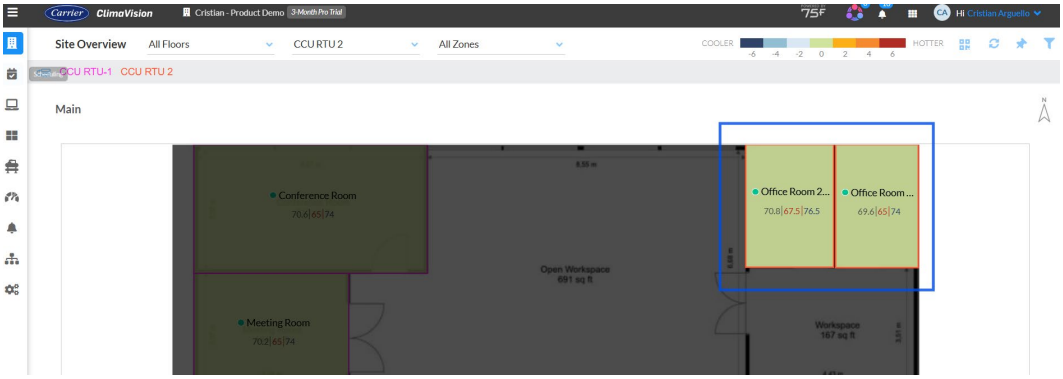
Once the required parameters are configured, click **Set** to confirm the configuration.

Post Configuration

Once a VVT-C terminal profile is configured it appears in the CCU as shown below.



And in portals as below:



Operation

Considering there is more than one terminal profile connected to the VVT-C system profile when the zones are within the dead band, the damper positions are managed using the terminal level loop output.

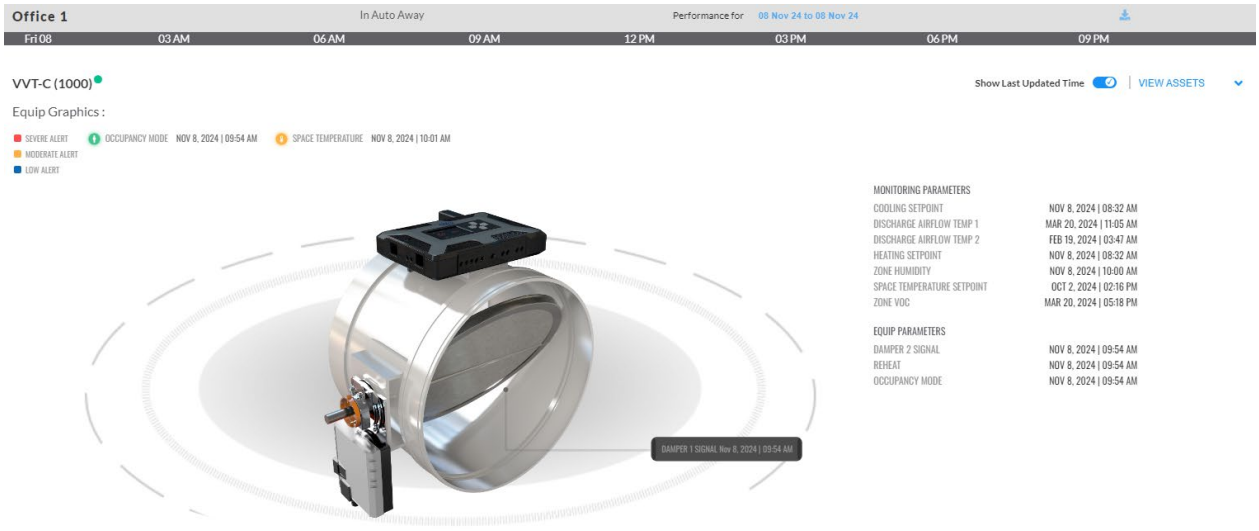
When the temperatures cross the dead band and zones call for cooling or heating from the system level equipment, the cooling or heating which the system level equipment provides is divided optimally for the zones to help temperature-balance a system without fully closing off zones and creating harmful back pressure on the AHU. This is achieved based on:

- **Normalization**
- **Minimum overall Damper Position**

These are based on the VVT-C profile sequences and use aspects like the **Zone priority, Damper size,** and other tuner parameters for the output calculations.

Equip Graphics

Equipment graphics are available for all the terminal profiles. These graphical representation of system-level equipment enable monitoring of key point parameters associated with terminal profiles, along with alert rings and alert severity legends.

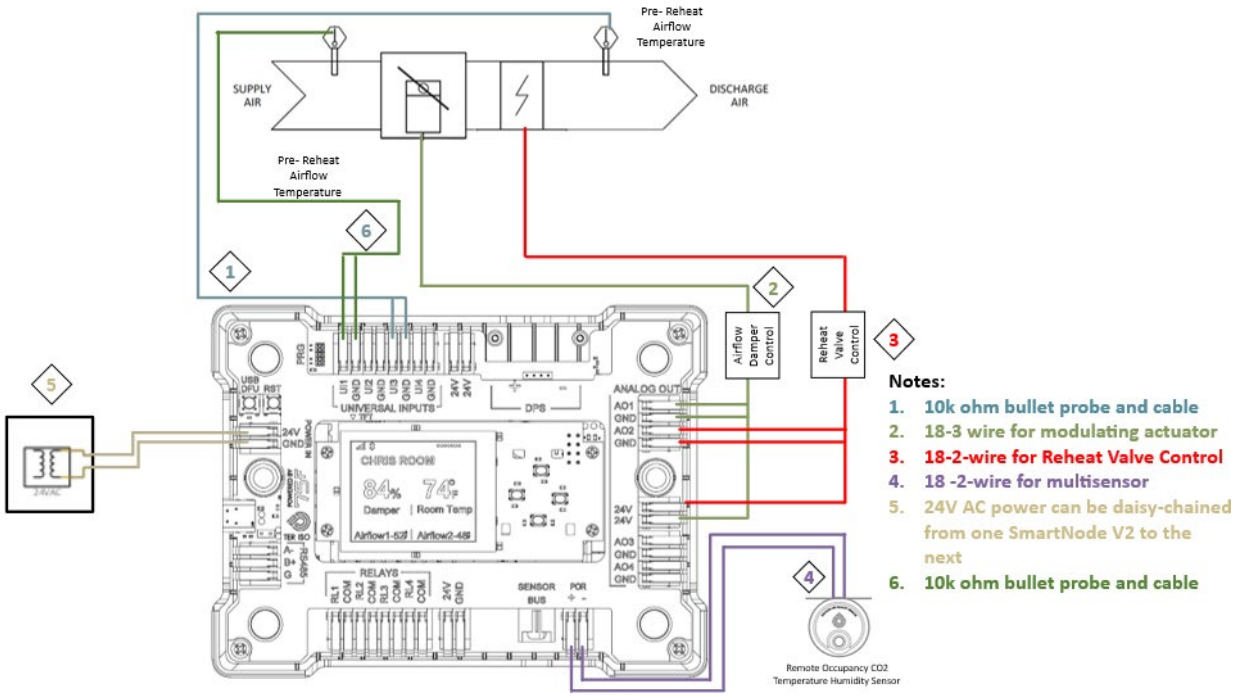


VVT-C with Reheat

Overview

On the software side, the Carrier® BMS reviews the system at regular intervals and continues to upgrade and enhance features. A provision to include Reheat capability in the VVT-C terminal profile is introduced as part of that process. With this in place, the overcooling of certain zones during a VVT-C system profile operation can be avoided.

Wiring



Configuration

In the configuration space, a new field **"Use Reheat"** is introduced to provision the reheat capability.

NOTE "Not installed" is the default value.

Staged Reheat Control

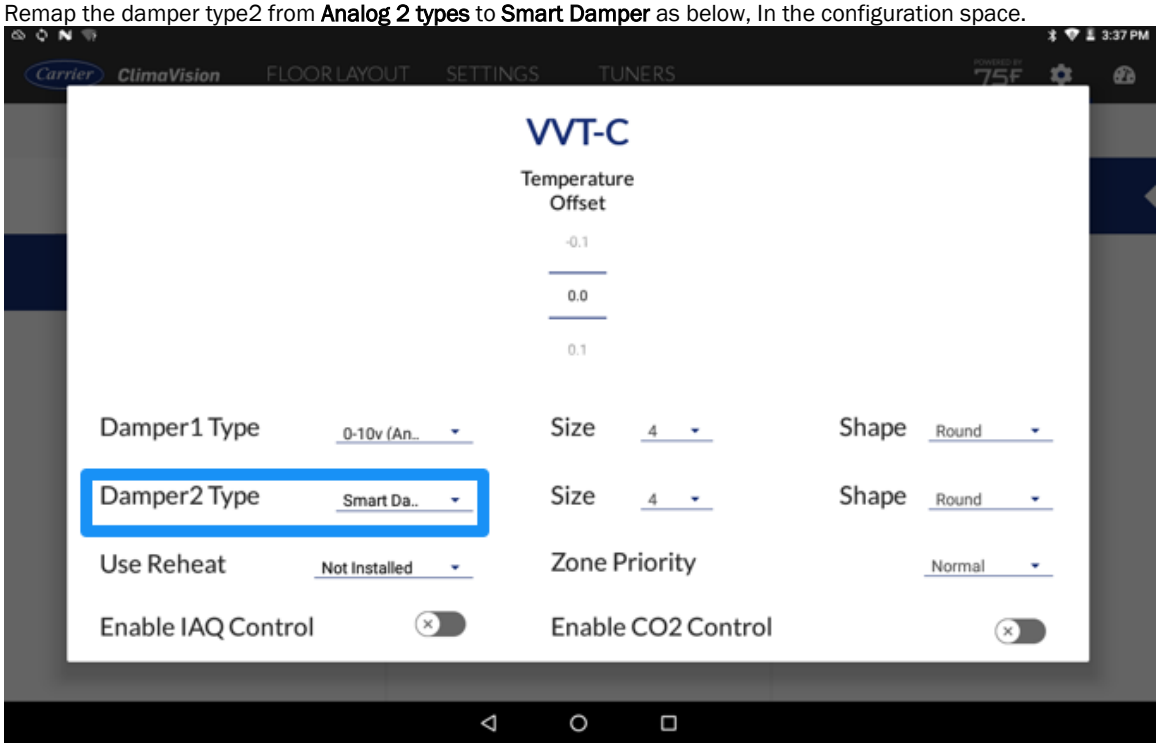
A VVT-C terminal profile is already provided with options to control two dampers, with the Analog 1 and 2 of the SmartNode. Since Analog 2 is mapped to Damper type 2 by default, only the relay options of the SmartNode are available for the staged reheat control as below.

The user can use this option for a staged reheat control, in the terminal.

Modulating Reheat Control

"Use Reheat" can provision a modulating Reheat control. To set up a modulating reheat control

1. Remap the damper type2 from **Analog 2 types** to **Smart Damper** as below, In the configuration space.



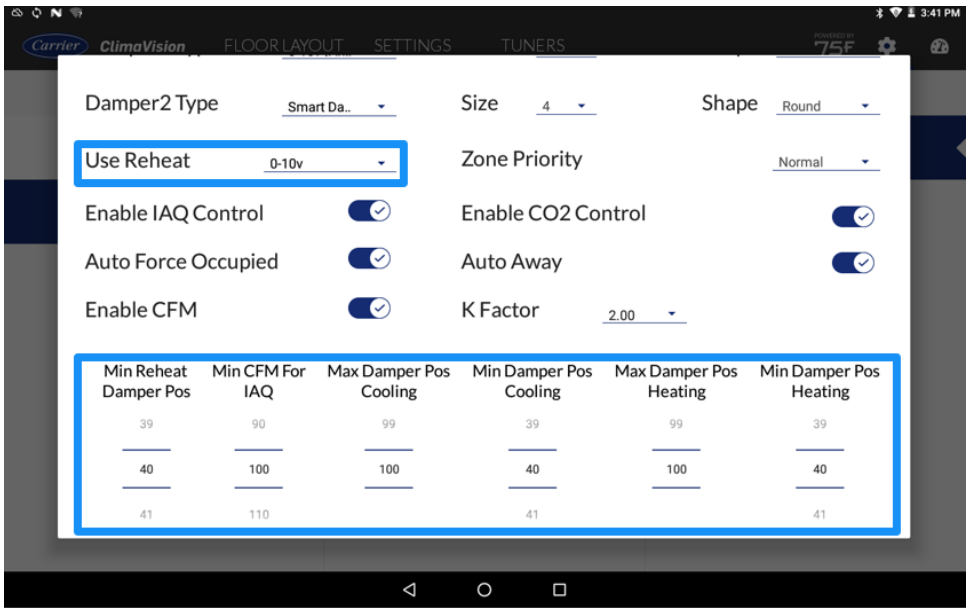
The Analog 2 of the SmartNode is made free and is therefore made available for the modulating Reheat control.

2. Map any of the Analog 2 types to the reheat control.

You can configure either an electric reheat or a water reheat.

Additional Parameter

With the reheat mapped to Analog 2 or relays, an additional configuration parameter for the Minimum Reheat Damper Position is introduced. The "Minimum Reheat Damper position" ensures that a minimum amount of air always flows to the zone while the reheat loop is running as insufficient air during reheating might damage the unit.



Operation

A PI loop that uses the value of **Heating Desired Temperature - the Reheat Offset** (Tuner value) with the **current temperature** to produce loop outputs is introduced.

When	Result
Current Temperature < Heating Desired Temperature - Reheat Offset (Tuner Value)	The resultant loop output is positive and is scaled for the Analog out 2 or Relay mapped modulating or staged reheat. **NOTE** When the reheat loop is activated the loop output scales the analog 2 mapped to the modulating or stage reheat, but the min reheat damper position is not dependent on the same and remains at the default value of 40% until changed from the configuration by the user.
Current Temperature > Heating Desired Temperature - Reheat Offset (Tuner Value)	There will be no reheat loop output, meaning the zone requires no further reheat. During this, the zone is conditioned as per the VVT-C profile logic.

VVT-C Dual Duct

The Carrier® Dual Duct is a custom terminal profile that supports the dual-duct systems. It consists of an air handling unit with two coils, a continuously operating cooling coil, and a continuously operating heating coil.

Advantages

- The System Dual duct variable air volume obtains zone-level temperature control by mixing the cold and warm air in various volume combinations.
- The fan used is of a size that anticipates the maximum hot or cold air volume, and not the sum of the instantaneous peaks.
- With control provided by a customized VVT-C Dual Duct Terminal zone, you can install Carrier products in buildings that have dual-duct systems.

How it works

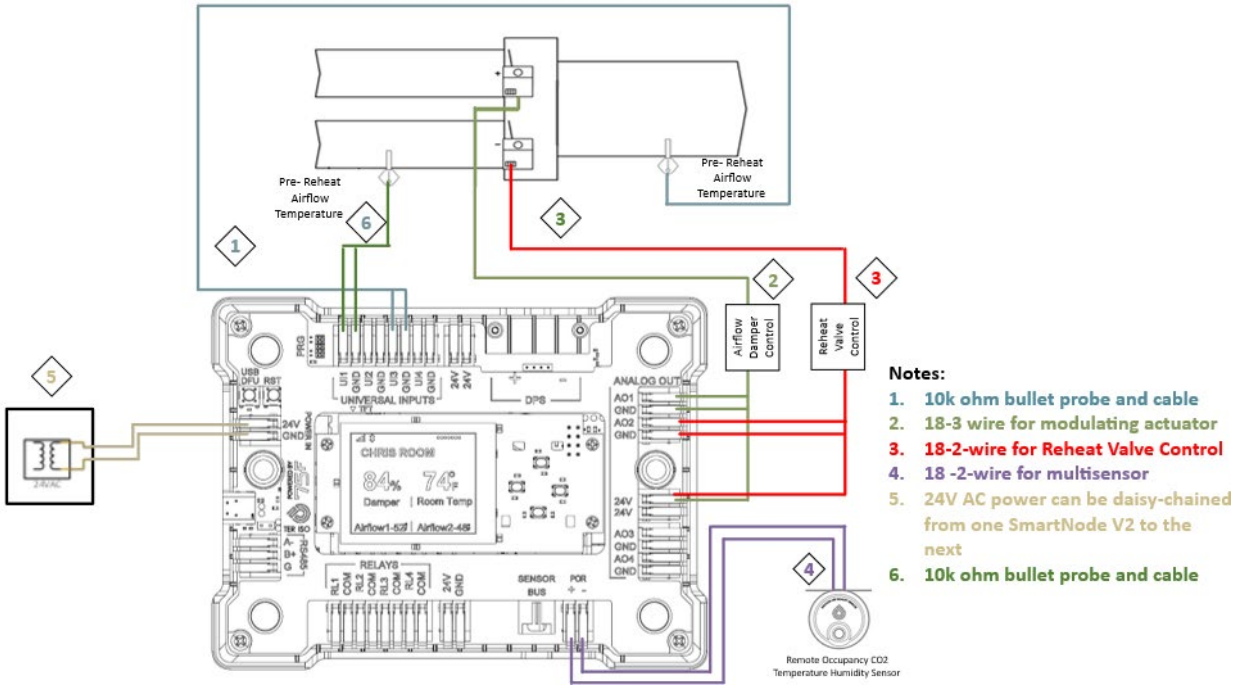
- Once you select the **VVT-C Dual duct** terminal profile under SmartNode VVT-C profiles, the configuration provides the options to define the **damper actuator types** for the **analog outputs**, made available from the **SmartNode** for controlled output.
- The profile provides options to modify the controls based on the Internal Air Quality, CO2, and occupancy, with the **IAQ**, **CO2,** and **Occupancy** control that can be enabled or disabled.
- The Algorithm continuously tracks the current temperature of the zone and looks for changes in the difference between the terminal level **Desired Temperature** and **Current Temperature** and provides an optimal damper opening position within the deadband range. This is a result of the loop output based on the PI loop for control signals.
- When the **Current Temperature** increases above the set point or desired temperature, the zone calls for cooling from the system or building-level equipment, and the cooling coil of the system-level device supplies via the Cooling Deck to support the zone.
- When the **Current Temperature** decreases below the set point or desired temperature, the zones call for Heating from the system or building level equipment, and the heating coil of the system level device supplies via the Heating Deck to support the zone.

- The building or system-level device is an RTU or AHU which is controlled by the system-level VVT-C profiles.
- When the **CO2** or the **IAQ** control is enabled, the algorithm takes the target and threshold values of **CO2** and **VOC** into consideration. An increase in the value from the threshold value results in a loop output and changes the minimum damper position for the actual control to the changes in percentage value.

  Example - If the target and thresholds are 1000 ppm and 800, measured CO2 is 850 and configured damper limits are 0-100. The algorithm starts raising the minimum damper position proportionally from 800. A CO2 measurement of 850 yields a loop output of 25%. This raises the damper's min position so that it now varies in the range of 25 – 100 based on temperature.

Wiring

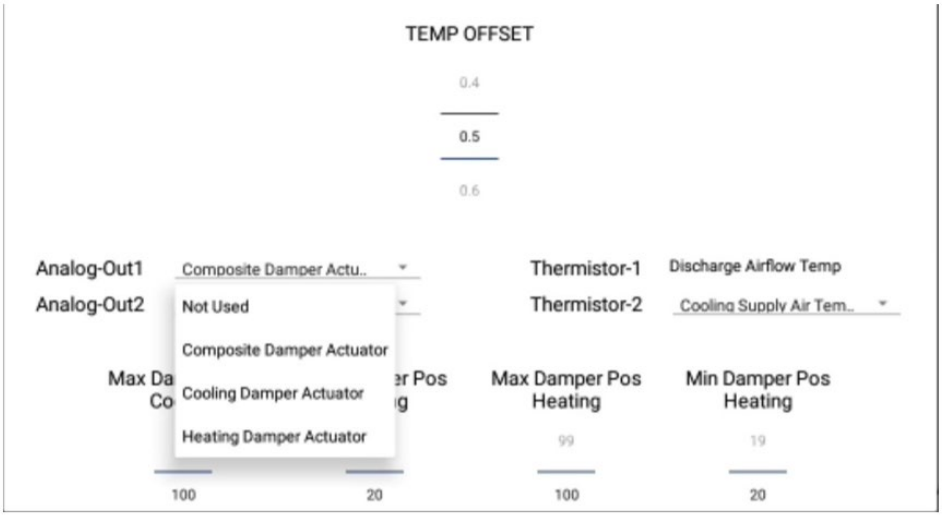
The wiring schematic below is for the VVT-C Dual duct terminal profile and shows the connection from the SmartNode to the Airflow and Reheats damper actuators.

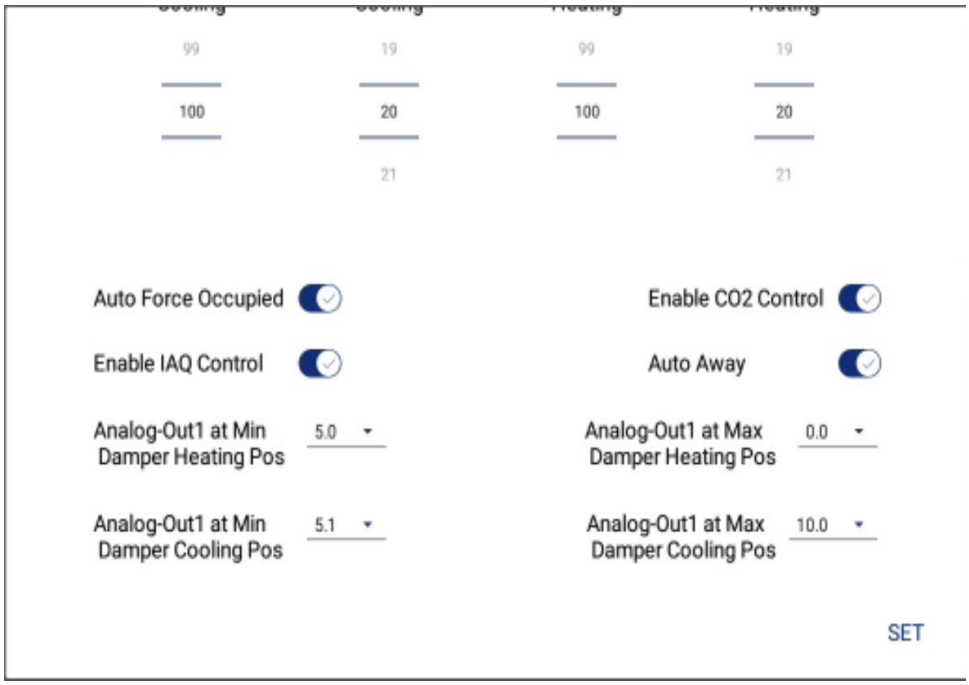


Configuration

Below is the configuration screen for the VVT-C Dual duct terminal profile.

Once you've paired the SmartNode as a VVT-C Dual duct profile, and once a few specific configuration parameters that define the physical characteristics of the setup are set in the configuration screen, the Carrier sequence for the VVT-C controls the setup.





Analog-out1	Set to **'Composite Damper Actuator'** by default – Drop-down options include: • **Not Used** • **Composite Damper Actuator** • **Cooling Damper Actuator** • **Heating Damper Actuator**
Analog-out2	Set to **'Not Used'** by default – Drop-down options include: • **Not Used** • **Composite Damper Actuator** • **Cooling Damper Actuator** • **Heating Damper Actuator**
Thermistor-1	Connects to Discharge airflow 10K sensor

Thermistor-2	Connects to Supply Air Temperature • Optionally differential pressure sensors connect to the SmartNode 1-wire sensor bus • Below the profile configuration, you can program the output voltage for the modulating equipment configured.

Operation

The cooling coil feeds chilled air into a cold air duct and the heating coil feeds hot air into a hot air duct. The ducts run parallel throughout the building. The air is tapped from the two ducts by a terminal unit at each space. The terminal unit can have a hot or cold air damper. When the zone requires heating, the hot air damper opens. When cooling is required, the cold air damper opens.

Dynamic Airflow Balancing

Introduction

Dynamic Airflow Balancing is concept introduced by Carrier which, unlike the other profiles in the system, does not use the HVAC domain specific concepts as algorithm. Instead, it uses a proprietary Carrier algorithm. Carrier clearly understands that regardless of any building the HVAC needs of the building are not the same throughout the day, and vary from one floor to another and one room to another. With this in mind, the Dynamic Airflow Balancing profile was introduced under the Carrier BMS umbrella. It uses this aspect of variable load requirement to clearly define its value in terms of comfort and efficiency.

Principle

Unlike the traditional Variable Volume concepts in use, the Dynamic airflow balancing uses the concept of Variable Temperature.

How it works

The Dynamic Airflow Balancing (VVT-C) uses an intelligent algorithm that constantly looks for the change in the difference between the desired and current temperatures and provides the required conditioning via Staged/Modulating HVAC equipment.

Arrangement

At the AHU or the RTU level the VVT-C profile uses the CCU along with the CM board and different type of actuators to provide the necessary controls.

At zone level it uses the SmartNode, HelioNode, smart dampers and damper actuators to provide the necessary controls.

Profiles Supported

At system level the VVT-C supports four types of Profiles.

- VVT-C Staged RTU
- VVT-C Staged RTU with VFD

- VVT-C Fully Modulation AHU
- VVT-C Advanced Hybrid AHU

With the introduction of the concept of zoning, and with module or terminal level controls required, the VVT-C also supports Terminal Profile.

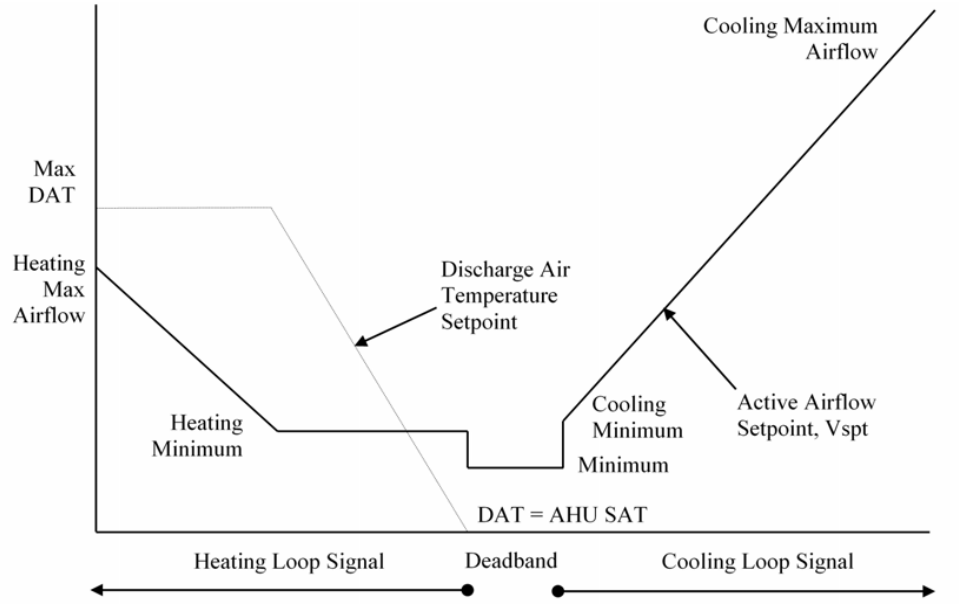
- VVT-C Terminal profile
- VVT-C Dual Duct Terminal profile

VAV w/ Reheat (Parallel Fan)

How it Works

ClimaVision VAV profiles operate by ASHRAE GPC36. For a full description please read GPC36 in its entirety. Below is a highly summarized description of how this VAV application operates. The description does not cover all details of GPC36 but is a quick field-level understanding of the VAV box operation.

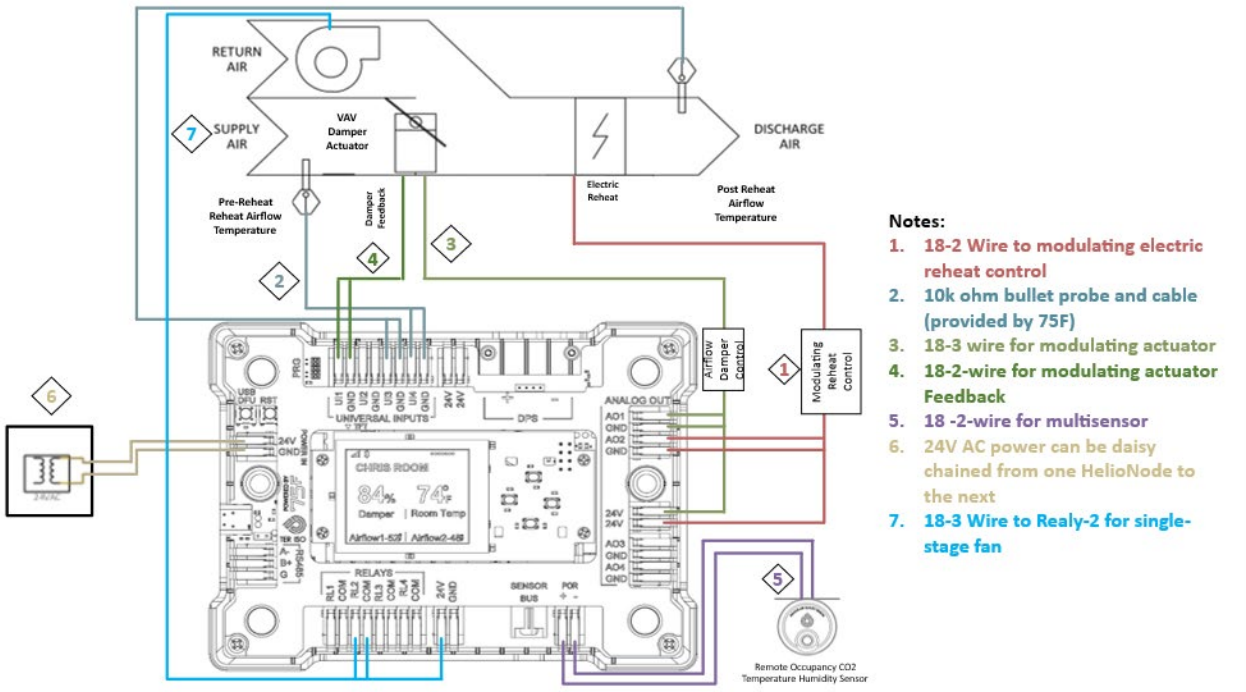
Cooling Mode	If the system is supplying cool air and the zone requires cooling, the damper actuator modulates towards its maximum cooling position until the airflow setpoint is achieved. If the system is supplying cool air, but the zone requires heating, the damper maintains its minimum heating airflow setpoint and first stages on the parallel fan to try to meet the DAT setpoint. If the plenum air is not enough to raise the DAT setpoint then the reheat is engaged to raise the DAT. As the DAT rises past the DAT setpoint then the damper actuator begins to modulate open to its max heating airflow setpoint to mix the air back down to its DAT setpoint.
Heating Mode	If the system is supplying warm air and the zone needs cooling then the damper actuator modulates down to its minimum heating airflow setpoint. If the system is supplying warm air and the zone needs heating, then the damper actuator modulates open to its maximum damper position.
Recirculate	If the zone is satisfied the damper actuator modulates near closed to maintain its minimum airflow setpoint.



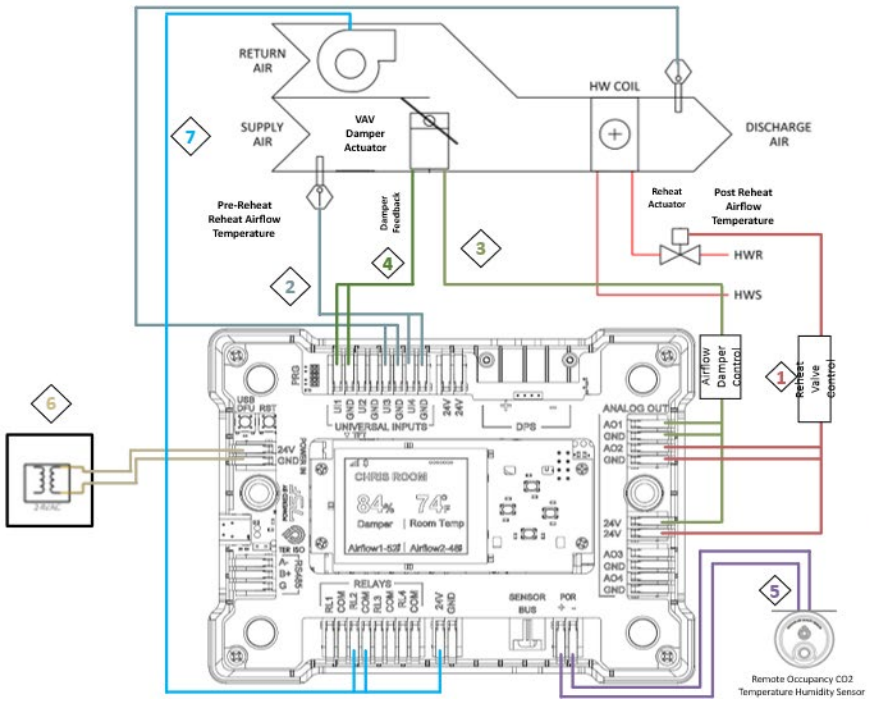
Wiring

Use 18-gauge thermostat wire for power and actuator connections.

Modulating Electric Reheat



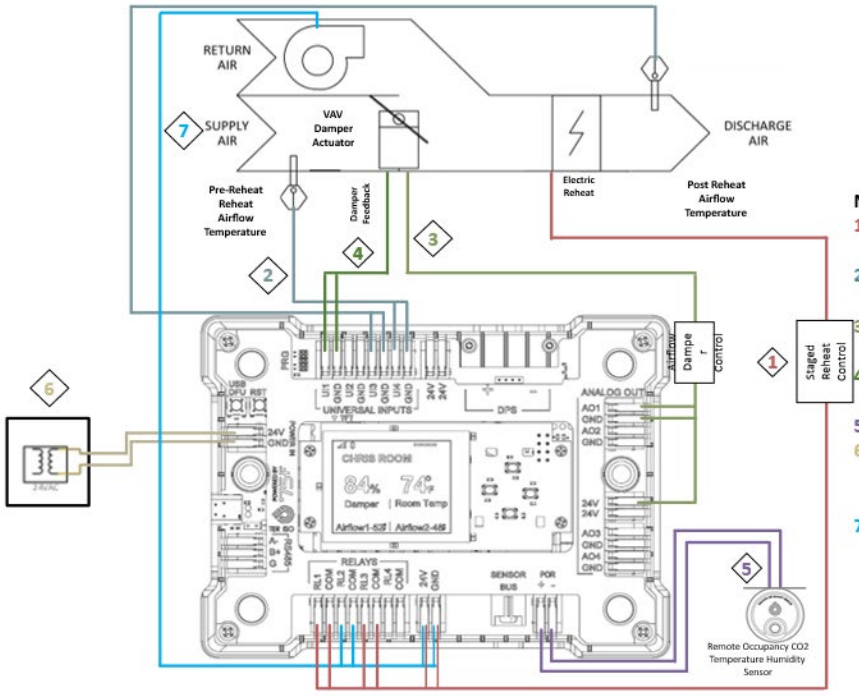
Modulating Valve



Notes:

1. 18-2 Wire to modulating valve for reheat
2. 10k ohm bullet probe and cable (provided by 75F)
3. 18-3 wire for modulating actuator
4. 18-2-wire for modulating actuator Feedback
5. 18 -2-wire for multisensor
6. 24V AC power can be daisy chained from one HelioNode to the next
7. 18-3 Wire to Realy-2 for single-stage fan

Staged Electric Reheat



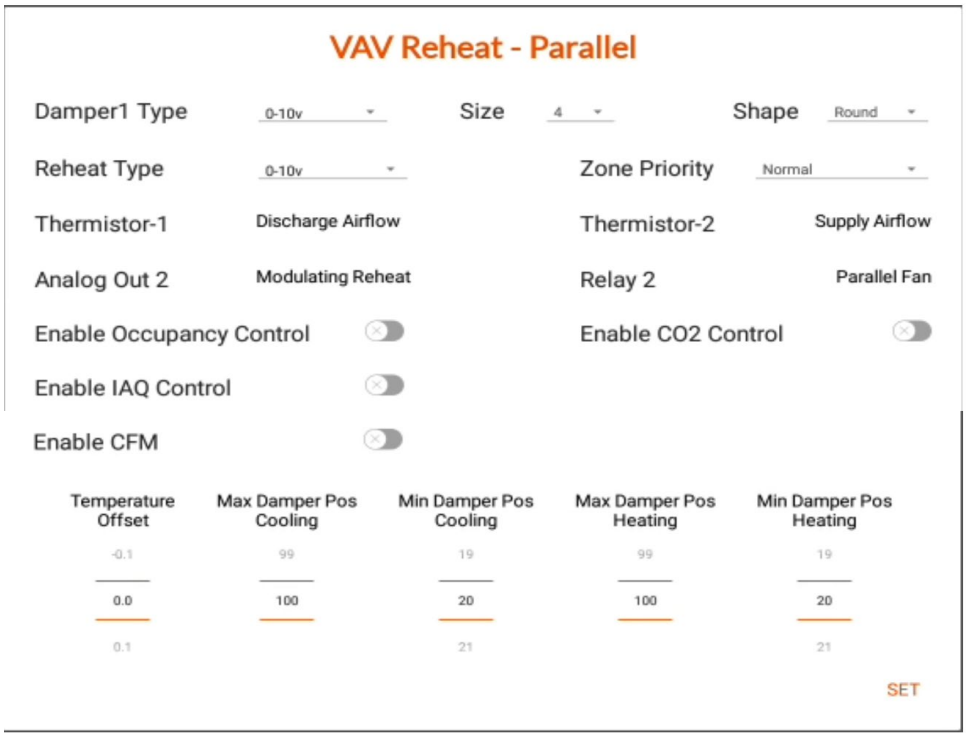
Notes:

1. 18-2 Wire to staged electric reheat control
2. 10k ohm bullet probe and cable (provided by 75F)
3. 18-3 wire for modulating actuator
4. 18-2-wire for modulating actuator Feedback
5. 18 -2-wire for multisensor
6. 24V AC power can be daisy chained from one HelioNode to the next
7. 18-3 Wire to Realy-2 for single-stage fan

I/O						
VAV Reheat - Parallel Fan - Staged Electric RH						
Inputs/ Outputs						
#	DI	AI	DO	AO	Point	Comments
AI1		X				0-10Vdc
AI2		X				0-10Vdc
TH1		X			Discharge Air Temp	10k Type II or DI
TH2		X			Entering Air Temp	10k Type II or DI
AO1				X	Damper Actuator	0-10Vdc
AO2				X		0-10Vdc
R1			X		Reheat Stage 1	Dry contact
R2			X		Parallel Fan	Dry contact
Other Ports						
Damper 1	8 Pin RJ45					Primary Smart Damper
Damper 2	8 Pin RJ45					Secondary Smart Damper
RTS	3 Pin Molex Sensor Bus				Temperature/ Humidity/ Duct Pressure	3 pin cable connector (No local interface option)
RS485	4 Pin Molex Sensor Bus				Temperature/ Humidity Local control	4 pin cable connector (Local Interface option)

Configuration

Once you've paired the SmartNode as a VAV profile, follow the sequences for VAV applications in GPC36. Select the specific configuration parameters that define the physical characteristics of your box.



Damper Type	Select the type of damper actuator. The most common is a 2-10 Vdc actuator but other types exist • 0-10v • 2-10v • 10.2v • 10-0v
Size	The size of the duct, helps the system accurately calculate the CFM
Shape	Helps the system calculate the CFM
Reheat Type	Tells the system which output to use as the reheat, both tagged and modulating options are available
Zone priority	Zone priority is a concept of ClimaVision which equates to the importance multiplier in guideline 36
Damper Min/ Max Positions	Sets the hard limit for damper actuator minimum and maximum positions
Enable Occupancy Control	Only used if an occupancy sensor exists and is not a standard option. If you have the option and enable this feature the occupancy sensor sets the zone to occupied during unoccupied hours if occupancy is detected.
Enable IAQ Control	Only used if an IAQ sensor exists and is not a standard option, enables the trim and respond logic from this controller for IAQ
Enable CO2 Control	Only used if a CO2 sensor exists and is not a standard option, enables the trim and respond logic from this controller for DCV.
Enable CFM	Enables operation based on the **Airflow in cubic feet per minute** calculation
Operation	The VAV Series Fan terminal profile, with Reheat capability, provides two major operations to provide the necessary conditioning required for the zone: • **Damper Position Operation** • **Reheat Operation**
Damper Position Operation	Satisfies the cooling load requirement for the zone - The operation is usually influenced by the current and desired temperature of the zone, but the user can also configure for a CO2, IAQ, and CFM-based damper operation.
Reheat Operation	Satisfies the heating load requirement for the zone when the system is in cooling operation mode • The Reheat type **can be staged or modulating based on the selection made during the configuration.** • **The modulating reheat is enabled and ramped from 0% to 100%, based on reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temperature.** • **The staged reh**eat is also enabled based on reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temp. The table below explains the operation of each stage in detail:

Reheat Stages	**ON**	**OFF**
Reheat Stage 1	(reheatLoopOutput) > 0% **+** relayActivationHysteresis.	(reheatLoopOutput) = 0%
Reheat Stage 2	(ReheatLoopOutput) > 50% **+** relayActivationHysteresis.	(reheatLoopOutput) <= 50%

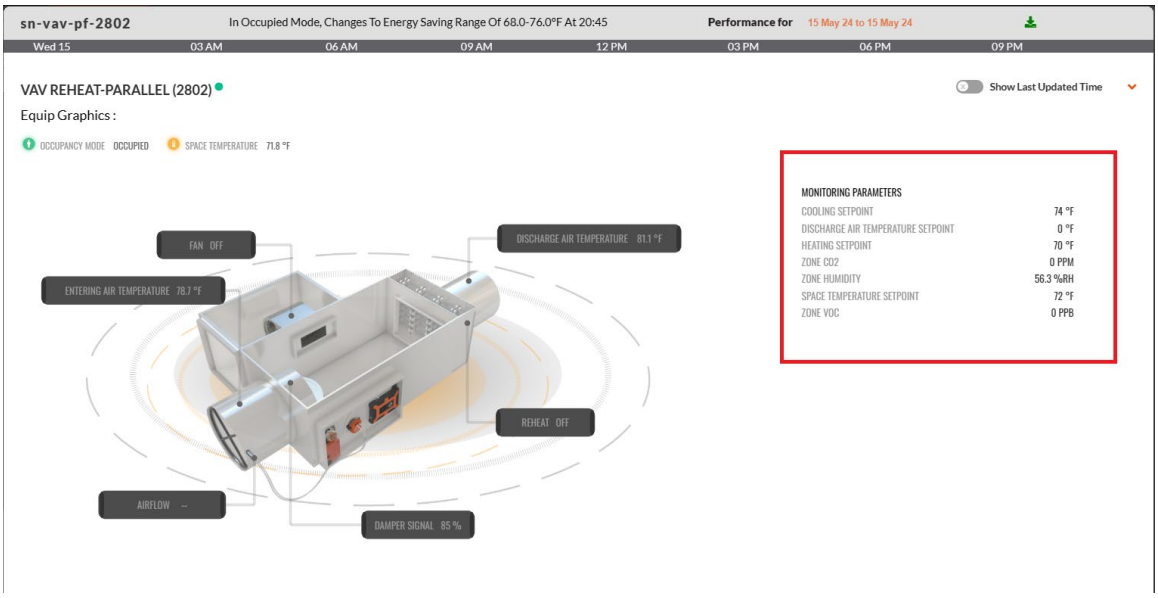
Failsafe Mode

When the SmartNode loses the connection with the CCU, the system enters the failsafe mode where the required controls are still available from the SmartNode itself.
The Occupancy, IAQ and VOC controls are not available in Fail Safe, only CFM and all its tuners and configs work as intended in Fail Safe.

Equip Graphics for VAV w/Reheat (Parallel Fan)

Equipment graphics are available for all the terminal profiles. It provides a graphical representation of system-level

equipment and enables monitoring of key point parameters associated with terminal profiles.



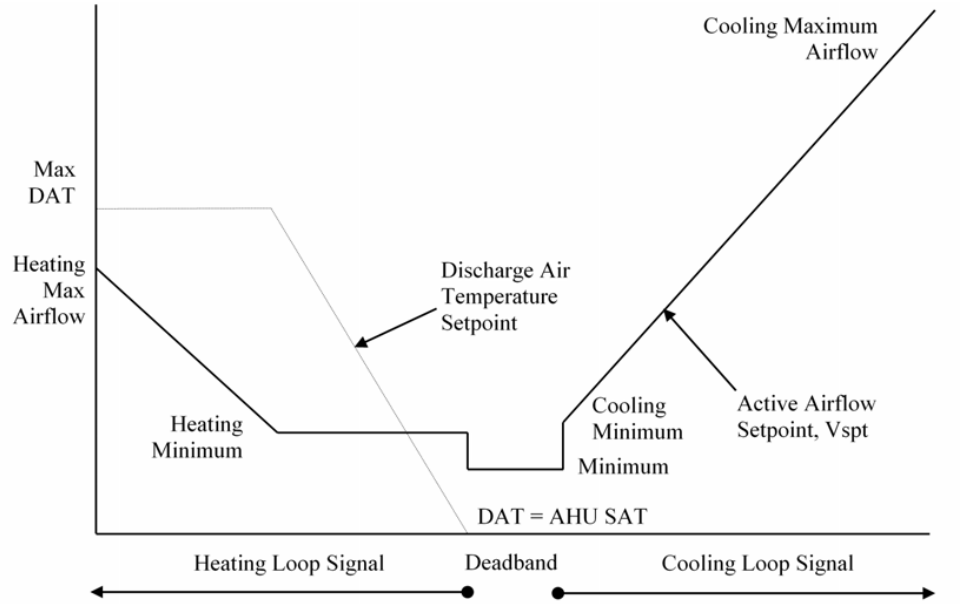
The highlighted list of points is predefined for visualization alongside the graphic for the respective profile.

VAV w/ Reheat (Series Fan)

How it Works

ClimaVision VAV profiles operate by ASHRAE GPC36. For a full description please read GPC36 in its entirety. Below is a highly summarized description of how this VAV application operates. The description below does not cover all details of GPC36 but is meant to be used as a quick field-level understanding of the VAV box operation.

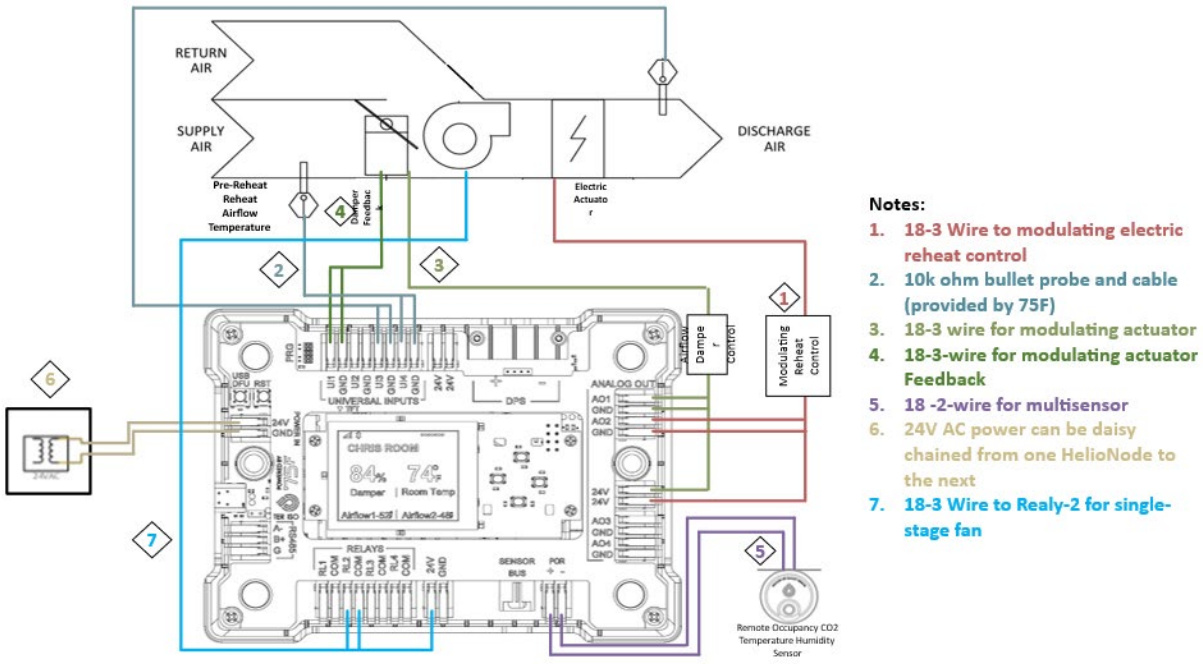
Cooling Mode	If the system is supplying cool air and the zone requires cooling, the damper actuator modulates towards its maximum cooling position until the airflow setpoint is achieved. If the system is supplying cool air but the zone requires heating, the damper maintains its minimum heating airflow setpoint and stages on the reheat to raise the DAT. As the DAT rises past the DAT setpoint then the damper actuator begins to modulate open to its max heating airflow setpoint to mix the air back down to its DAT setpoint.
Heating Mode	If the system is supplying warm air and the zone needs cooling then the damper actuator modulates down to its minimum heating airflow setpoint. If the system is supplying warm air and the zone needs heating then the damper actuator modulates open to its maximum damper position.
Recirculate	If the zone is satisfied the damper actuator modulates near closed to maintain its minimum airflow setpoint. The Series fan is enabled during any recirculating time or occupied hours.



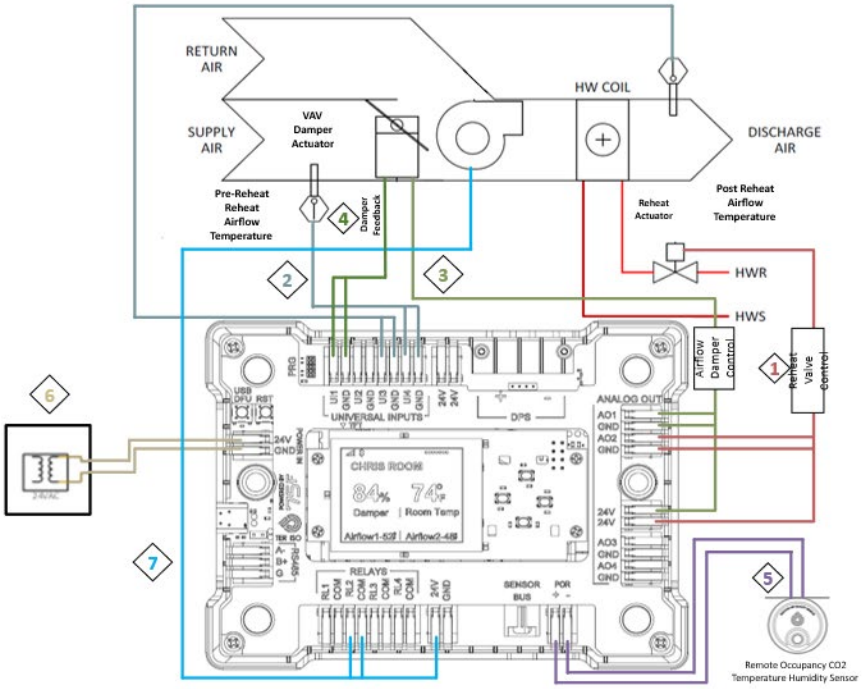
Wiring

Use 18-gauge thermostat wire for power and actuator connections.

Modulating Electric Reheat



Modulating Valve



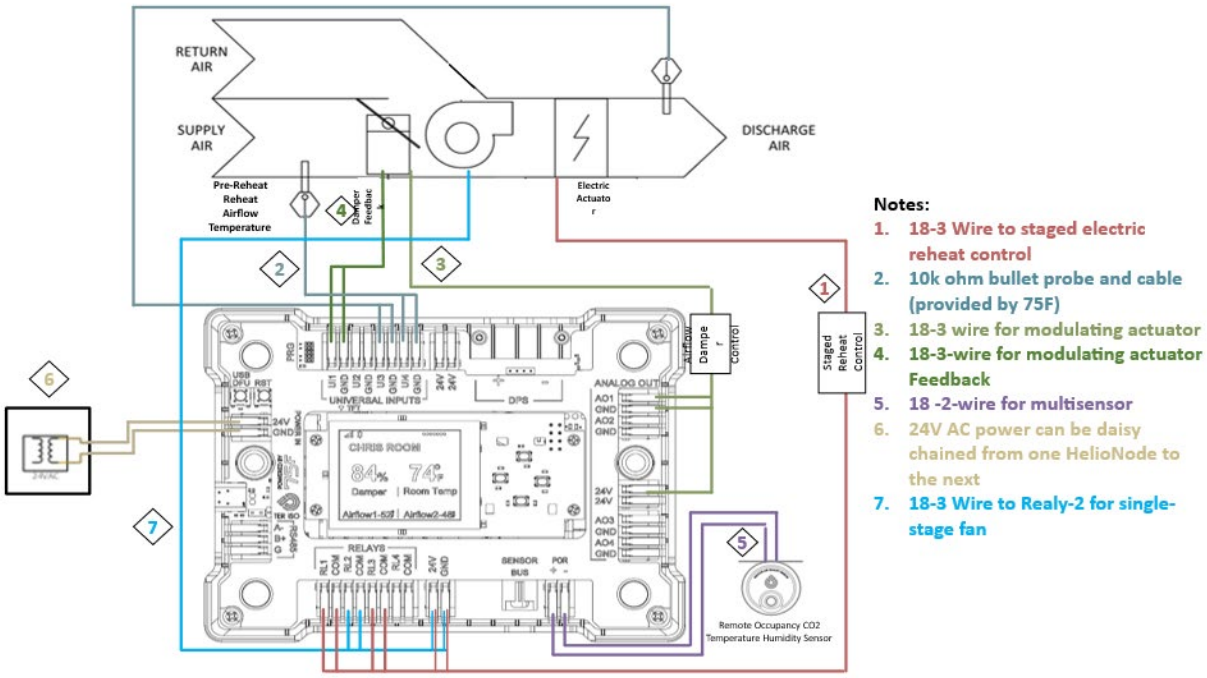
Notes:

1. 18-2 Wire to modulating valve for reheat
2. 10k ohm bullet probe and cable (provided by 75F)
3. 18-3 wire for modulating actuator
4. 18-2-wire for modulating actuator Feedback
5. 18 -2-wire for multisensor
6. 24V AC power can be daisy chained from one HelioNode to the next
7. 18-3 Wire to Realy-2 for single-stage fan

I/O						
VAV Reheat - Series Fan - Modulating RH						
Inputs/ Outputs						
#	DI	AI	DO	AO	Point	Comments
AI1		X				0-10Vdc
AI2		X				0-10Vdc
TH1		X			Discharge Air Temp	10k Type II or DI
TH2		X			Entering Air Temp	10k Type II or DI
AO1				X	Damper Actuator	0-10Vdc
AO2				X	Modulating Reheat	0-10Vdc
R1			X			Dry contact
R2			X		Series Fan	Dry contact other

Other Ports			
Damper 1	8 Pin RJ45		Primary Smart Damper
Damper 2	8 Pin RJ45		Secondary Smart Damper
RTS	3 Pin Molex Sensor Bus	Temperature/ Humidity/ Duct Pressure	3 pin cable connector (No local interface option)
RS485	4 Pin Molex Sensor Bus	Temperature/ Humidity Local control	4 pin cable connector (Local Interface option)

Staged Electric Reheat

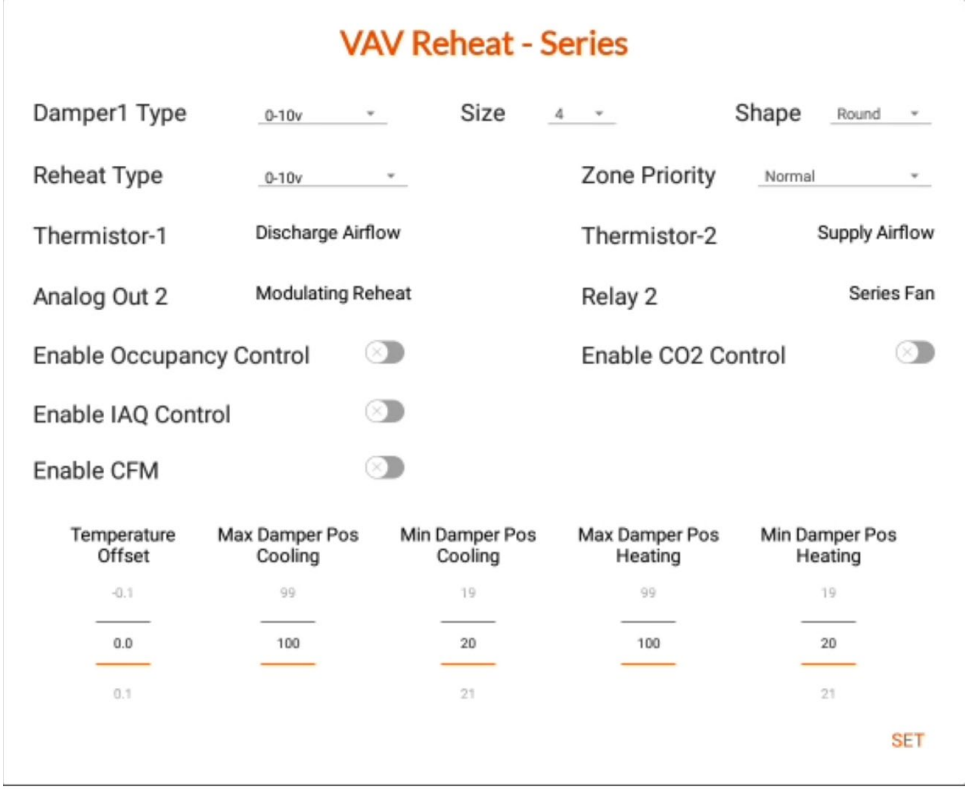


I/O						
VAV Reheat - Series Fan - Staged Electric RH						
Inputs/ Outputs						
#	DI	AI	DO	AO	Point	Comments
AI1		X				0-10Vdc
AI2		X				0-10Vdc
TH1		X			Discharge Air Temp	10k Type II or DI
TH2		X			Entering Air Temp	10k Type II or DI
AO1				X	Damper Actuator	0-10Vdc
AO2				X		0-10Vdc
R1			X		Reheat Stage 1	Dry contact
R2			X		Series Fan	Dry contact
Other Ports						

Damper 1	8 Pin RJ45		Primary Smart Damper
Damper 2	8 Pin RJ45		Secondary Smart Damper
RTS	3 Pin Molex Sensor Bus	Temperature/ Humidity/ Duct Pressure	3 pin cable connector (No local interface option)
RS485	4 Pin Molex Sensor Bus	Temperature/ Humidity Local control	4 pin cable connector (Local Interface option)

Configuration

Once you pair the SmartNode as a VAV profile, the sequences for VAV applications in GPC36 are followed. Select specific configuration parameters that define the physical characteristics of your box.



Damper Type	Select the type of damper. The most common is a 2-10Vdc actuator. For example, if you are using smart damper select **Smart Damper** as the damper type. • 0-10v • 2-10v • 10-2v • 10-0v • Smart Damper
Size	The system the size of the duct, helps the system accurately calculate the CFM
Shape	Helps the system calculate the CFM.
Reheat Type	Tells the system which output to use as the reheat, staged and modulating
Zone priority	Zone priority is a concept of 75F that equates to the importance multiplier in guideline 36
Damper Min/ Max Positions	Sets the hard limit for damper actuator minimum and maximum positions.
Enable Occupancy Control	Only used if an occupancy sensor exists and is not a standard option - If you enable this feature the occupancy sensor sets the zone to occupied during unoccupied hours if occupancy is detected.
Enable IAQ Control	Only used if an IAQ sensor exists and is not a standard option - This enables an IAQ-level-based damper operation alongside a temperature-based damper operation
Enable CO2 Control	Only used if a CO2 sensor exists and is not a standard option - This enables a CO2-level-based damper operation alongside a temperature-based damper operation.

Enable CFM	Enables operation based on the **Airflow in cubic feet per minute** calculation - This enables a CFM-based damper operation alongside a temperature-based damper operation.

Operation

The VAV Series Fan terminal profile, with Reheat capability, provides two major operations to provide the necessary conditioning required for the zone.

- Damper Position Operation
- Reheat Operation

<table>
<tr><td>Damper Position Operation</td><td>Satisfies the cooling load requirement for the zone - The operation is usually influenced by the current and desired temperature of the zone, but the user can also configure for a CO2, IAQ, and CFM-based damper operation as well</td></tr>
<tr><td>Reheat Operation</td><td>Satisfies the heating load requirement for the zone when the system is in cooling operation mode

The Reheat type can be staged or modulating based on the selection made during the configuration.
The modulating reheat is enabled and ramped from 0% to 100%, based on reheatPos or reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temperature.
The staged reheat is also enabled based on reheatPos or reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temperature. The table below explains the operation of each stage in detail.

<table>
<tr><th>Reheat Stages</th><th>ON</th><th>OFF</th></tr>
<tr><td>Reheat Stage 1</td><td>(reheatLoopOutput) > 0% + relayActivationHysteresis.</td><td>(reheatLoopOutput) = 0%</td></tr>
<tr><td>Reheat Stage 2</td><td>(ReheatLoopOutput) > 50% + relayActivationHysteresis.</td><td>(reheatLoopOutput) <= 50%</td></tr>
</table>
</td></tr>
</table>

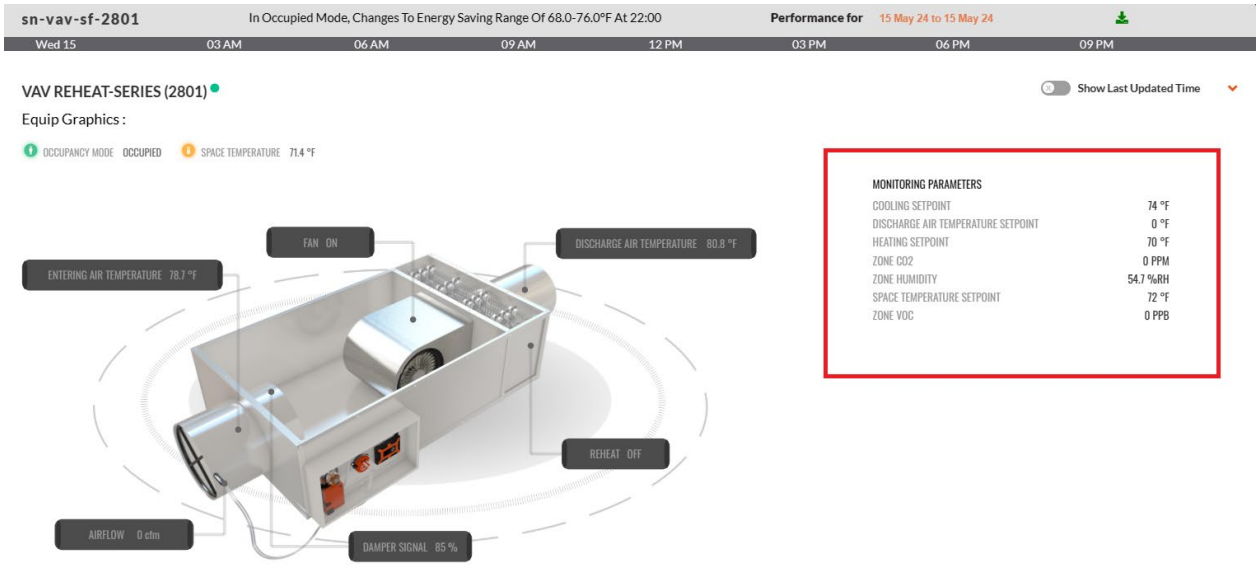
Failsafe Mode

When the SmartNode loses the connection with the CCU the system enters the failsafe mode where the required controls are still available from the SmartNode itself.

The Occupancy, IAQ and VOC controls are not available in Fail Safe. Only CFM and all its tuners and configs work as intended in Fail Safe.

Equip Graphics for VAV w/Reheat (Series Fan)

Equipment graphics is available for all the terminal profiles. It provides a graphical representation of system-level equipment and enables monitoring of key point parameters associated with terminal profiles.



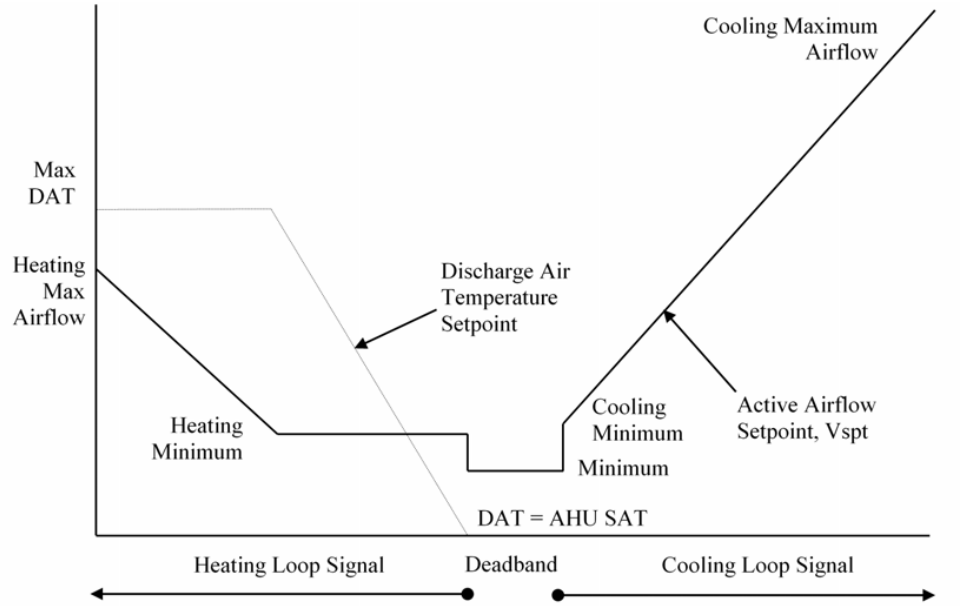
The highlighted list of points is predefined for visualization alongside the graphic for the respective profile.

VAV w/ Reheat (No Fan)

How it Works

Carrier® ClimaVision VAV profiles operate by ASHRAE GPC36. To read a full description please read GPC36 in its entirety. Below is a highly summarized description of how this VAV application operates. The description does not cover all details of GPC36 but is a quick field-level understanding of the VAV box operation.

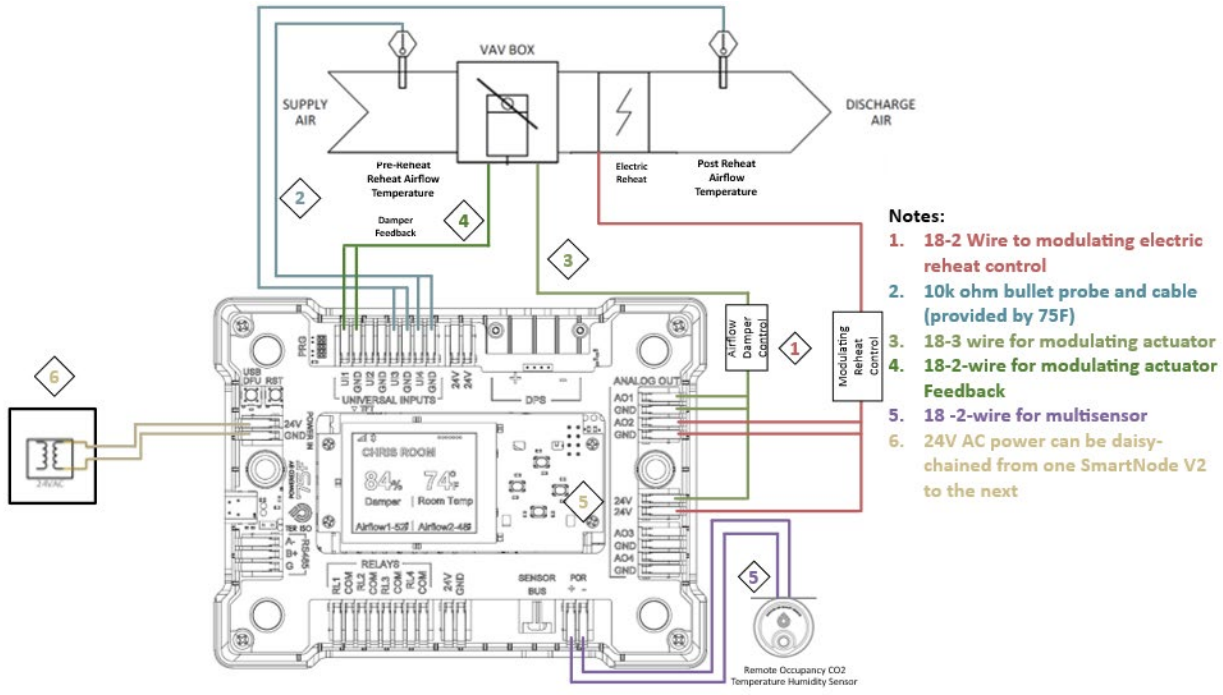
Cooling Mode	If the system is supplying cool air and the zone requires cooling, the damper actuator modulates toward its maximum cooling position until the airflow setpoint is achieved. If the system is supplying cool air but the zone requires heating, the damper maintains its minimum heating airflow setpoint and stages on the reheat to raise the DAT. As the DAT rises past the DAT setpoint then the damper actuator begins to modulate open to its max heating airflow setpoint to mix the air back down to its DAT setpoint.
Heating Mode	If the system is supplying warm air and the zone needs cooling, the damper actuator modulates down to its minimum heating airflow setpoint. If the system is supplying warm air and the zone needs heating, the damper actuator modulates open to its maximum damper position.
Recirculate	If the zone is satisfied the damper actuator modulates near closed to maintain its minimum airflow setpoint.



Wiring

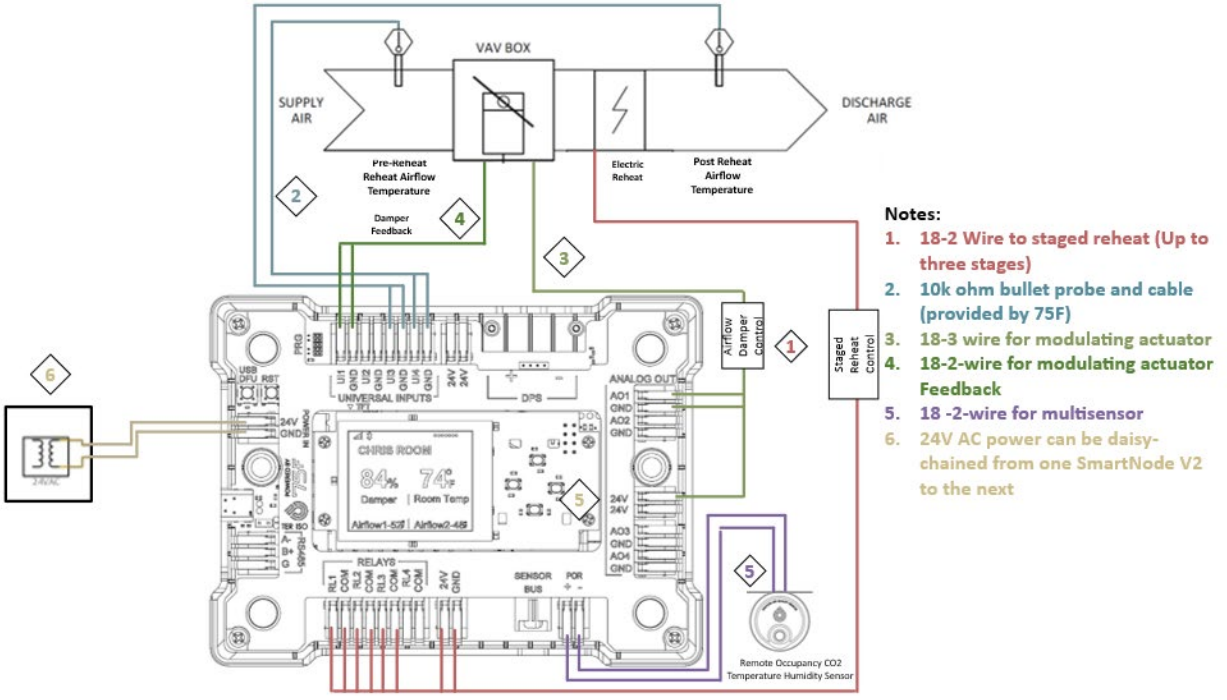
Use 18-gauge thermostat wire for power and actuator connections.

Modulating Electric Reheat



I/O						
VAV Reheat - No Fan - Staged Electric						
Inputs/ Outputs						
#	DI	AI	DO	AO	Point	Comments
AI1		X				0-10Vdc
AI2		X				0-10Vdc
TH1		X			Discharge Air Temp	10k Type II or DI
TH2		X			Entering Air Temp	10k Type II or DI
AO1				X	Damper Actuator	0-10Vdc
AO2				X		0-10Vdc
R1			X		Reheat Stage 1	Dry contact
R2			X		Reheat Stage 2	Dry contact
Other Ports						
Damper 1	8 Pin RJ45				Primary Smart Damper	
Damper 2	8 Pin RJ45				Secondary Smart Damper	
RTS	3 Pin Molex Sensor Bus		Temperature/ Humidity/ Duct Pressure		3 pin cable connector (No local interface option)	
RS485	4 Pin Molex Sensor Bus		Temperature/ Humidity Local control		4 pin cable connector (Local Interface option)	

Staged Electric Reheat

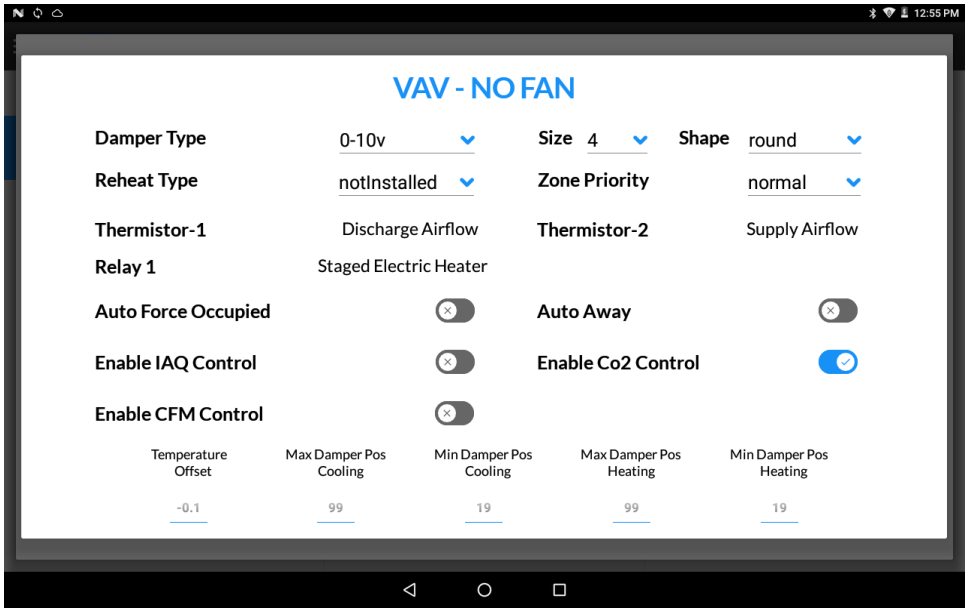


I/O						
VAV Reheat - No Fan - Staged Electric						
Inputs/ Outputs						
#	DI	AI	DO	AO	Point	Comments
AI1		X				0-10Vdc
AI2		X				0-10Vdc
TH1		X			Discharge Air Temp	10k Type II or DI
TH2		X			Entering Air Temp	10k Type II or DI
AO1				X	Damper Actuator	0-10Vdc
AO2				X		0-10Vdc
R1			X		Reheat Stage 1	Dry contact
R2			X		Reheat Stage 2	Dry contact
Other Ports						

Damper 1	8 Pin RJ45		Primary Smart Damper
Damper 2	8 Pin RJ45		Secondary Smart Damper
RTS	3 Pin Molex Sensor Bus	Temperature/ Humidity/ Duct Pressure	3 pin cable connector (No local interface option)
RS485	4 Pin Molex Sensor Bus	Temperature/ Humidity Local control	4 pin cable connector (Local Interface option)

Configuration

Once you pair the SmartNode as a VAV profile, the sequences for VAV applications in GPC36 are followed. Select a few specific configuration parameters that define the physical characteristics of your box.



Damper Type	Select the type of damper actuator. The most common is a 2-10Vdc actuator. • 0-10v • 2-10v • 10-2v • 10-0v
Size	The size of the duct - helps the system accurately calculate the CFM
Shape	Helps the system calculate the CFM
Reheat Type	Tells the system which output to use as the reheat, both staged and modulating options are available
Zone priority	Zone priority is a concept of 75F which equates to the importance multiplier in guideline 36.
Damper Min/ Max Positions	Sets the hard limit for damper actuator minimum and maximum positions
Enable Occupancy Control	Only used if an occupancy sensor exists and is not a standard option - If you have the option and you enable this feature the occupancy sensor sets the zone to occupied during unoccupied hours if occupancy is detected.
Enable IAQ Control	Only used if an IAQ sensor exists and is not a standard option - This enables the trim and respond logic from this controller for IAQ
Enable CO2 Control	Only used if a CO2 sensor exists and is not a standard option - Enable the trim and respond logic from this controller for DCV.
Enable CFM	Enables operation based on the **Airflow in cubic feet per minute** calculation

Operation

The VAV Series Fan terminal profile with Reheat capability provides two major operations to provide the necessary conditioning required for the zone:

- **Damper position operation**
- **Reheat Operation**

Damper Position Operation	The damper position operation satisfies the cooling load requirement for the zone. The operation is usually influenced by the current and desired temperature of the zone, but the user can also configure for a CO2, IAQ, and CFM-based damper operation.
Reheat Operation	The reheat operation satisfies the heating load requirement for the zone when the system is in cooling operation mode. • The Reheat type can be staged or modulating based on the selection made during the configuration. • The modulating reheat is enabled and ramped from 0% to 100%, based on reheatPos or reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temperature. • The staged reheat is also enabled based on reheatPos or reheatLoopOuput, which is the reheat load calculated as a loop output based on the discharge air temperature. The table below explains the operation of each stage in detail:

Reheat Stages	**ON**	**OFF**
Reheat Stage 1	(reheatLoopOutput) > 0% **+** relayActivationHysteresis.	(reheatLoopOutput) = 0%
Reheat Stage 2	(ReheatLoopOutput) > 50% **+** relayActivationHysteresis.	(reheatLoopOutput) <= 50%

Failsafe Mode

When the SmartNode loses the connection with the CCU, the system enters the failsafe mode where the required controls are still available from the SmartNode itself.

The Occupancy, IAQ and VOC controls are not available in Fail Safe. Only CFM and all its tuners and configs work as intended in Fail Safe.

Equip Graphics for VAV w/Reheat (No Fan)

Equipment graphics is available for all the terminal profiles. It provides a graphical representation of system-level equipment and enables monitoring of key point parameters associated with terminal profiles.

The highlighted list of points is predefined for visualization alongside the graphic for the respective profile.

Bypass Damper Control

How It Works

In many VVT applications, we have found the dynamic loads of the spaces to exceed that of native VVT's ability to redirect the airflow. This means there are zones with competing loads for cooling and heating and the targetCumulativeDamperPos = 70% keeps the zone dampers open too far to satisfy the comfort.

We have already begun deploying the Smart Node PI loop controller as a standalone bypass damper, ensuring the unit's back pressure never reaches dangerous levels when we set the targetCumulativeDamperPos to a much lower value.

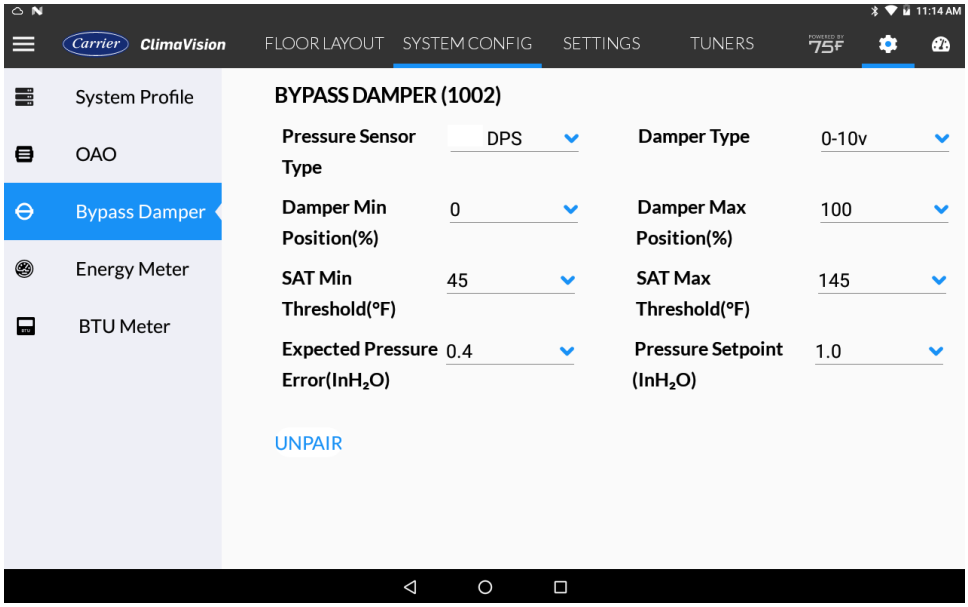
The PI loop profile has been very beneficial in this way but has limits and does not allow the system to operate as a whole to take the most advantage of having a bypass damper installed.

Wiring

1. Wire the Analog out and the 24-volt power supply from the SmartNode to the bypass damper actuator.
2. Wire the input from the Differential Pressure Sensor to the Analog in of the SmartNode, and the common 24-volt power supply from the SmartNode to power the Differential Pressure Sensor.

Bypass Damper System Device

A bypass damper is added as a System Device just like the OAO, similar to how OAO operates in conjunction with the system, as below.



Configuration Parameter

Parameter	Description
Pressure Sensor Type	To select a pressure sensor type
Damper Type	To define the damper type in terms of voltage
Damper Min Position (%)	To define a minimum damper position for the device
Damper Max Position (%)	To define a maximum damper position for the device
SAT Min Threshold (°F)	To define a supply air temperature minimum threshold
SAT Max Threshold (°F)	To define a supply air temperature maximum threshold
Expected Pressure Error (InH2O)	To define a pressure error in InH2O to be used by the bypass loop output
Expected Pressure Error (InH2O)	To define a pressure setpoint in InH2O to be used by the bypass loop output

Operations

Bypass Loop Output

When system **FanLoopOutput = 0** then **damperPosition = minDamperPosition**

When **fanLoopOutput > 0** the **bypassLoopOuput** is enabled which uses **staticDuctPressureSensor** as the control variable and **staticDuctPressureSp** as the setpoint.

damperPosition = bypassLoopOutput(%)*100 respecting **damperMinPosition** and **damperMaxPositions.**

Supply Air Temp Equipment Lockouts

Adding bypass dampers introduces risk to customers' HVAC equipment by assuming pressure will always be under control.

But in extreme cases or when a bypass damper actuator fails or the damper gets stuck open, that could cause severe harm to the unit.

So, the following lockouts are in place:

- If **bypassSupplyAirTemp > satMaxThreshold** for more than **satLimitBreachTime** then bypassHeatingLockout is enabled.
- If **bypassSupplyAirTemp < satMinThreshold** for more than **satLimitBreachTime** then bypassCoolingLockout is enabled.

When either of the above conditions clear conditioning resumes.

Failsafe Mode

When the SmartNode loses the connection with the CCU, all the PI loop controls and SAT safety checks, are handled by the SmartNode itself.

Economizer Damper Control

Overview

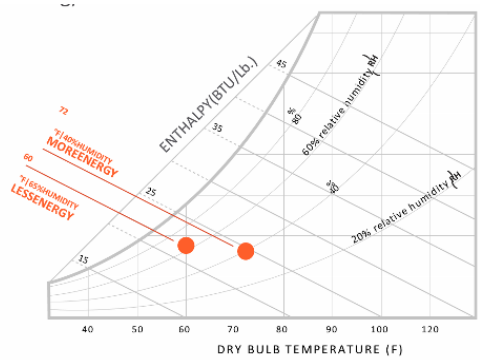
The Outside Air Optimization is a software profile supported by the Carrier system. It controls the outside air damper to regulate the amount of outer fresh air that is brought into the building. This is known as the economizer, a feature of HVAC systems that uses cold outside air to provide free cooling to the building. The OAO has 2 main functions, Demand Control Ventilation(DCV) and economizing. Optionally, it is also used for maintaining pressure inside the building.

How It works

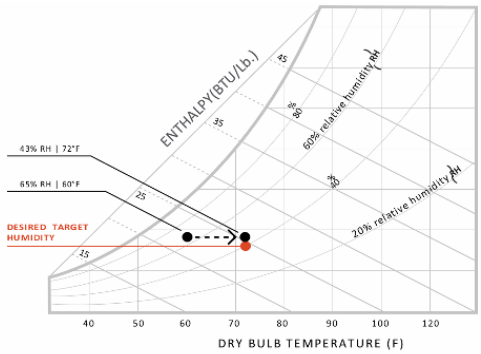
The OAO combines two primary aspects for Economizer control.

Demand Control Ventilation	A CO2 level-based economizing used to control CO2 IAQ levels in space - If CO2 is above the threshold that is set, then the OAO control opens the outside air damper proportionately. DCV essentially sets a minimum damper position for the outside air, and it's applicable for both cooling and heating.

Comparative Enthalpy/ Dry Bulb free cooling control	A temperature and humidity-based economizing condition where the enthalpy of the outdoor air and the indoor air is derived to make the decision on whether to bring in outside air for free cooling, where Enthalpy determines the total amount of energy in the air based on humidity and temperature Enthalpy determines the total amount of energy in the air and is based on both humidity and temperature. While there is no simple math to determine enthalpy, The psychometric chart shown below is used to discover how much energy the air has.



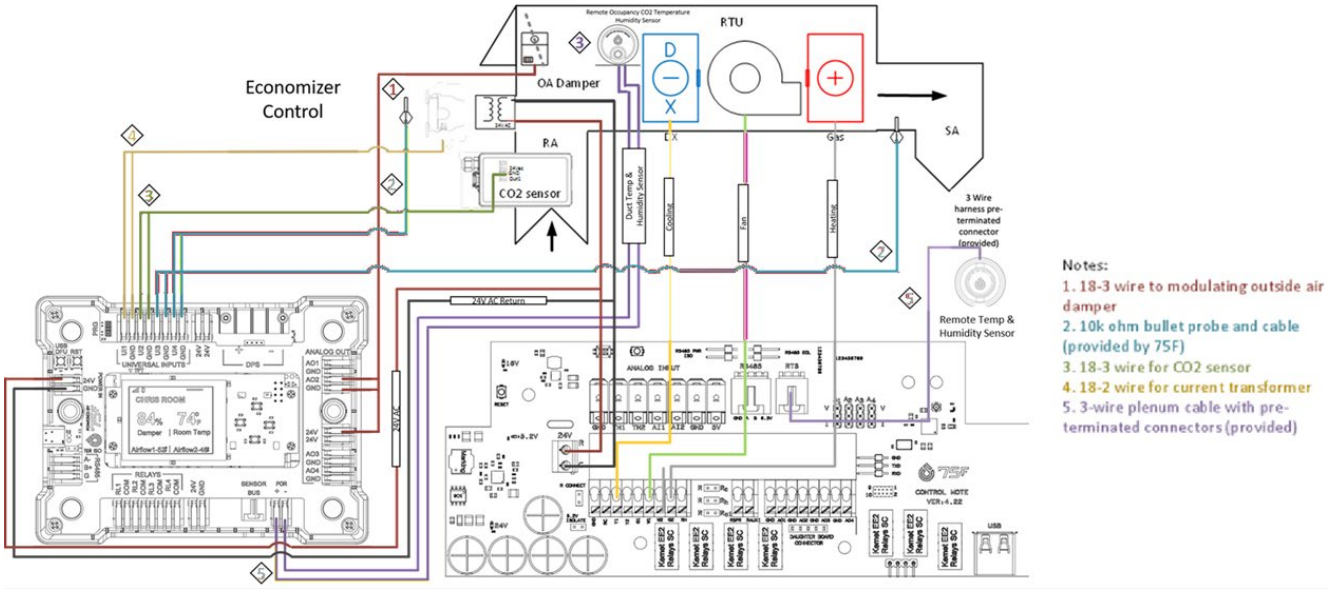
This psychometric chart indicates that air which is 72°F with 40% humidity, has more energy than 60°F with 65% humidity.



This psychometric chart indicates that air which is at 60°F with 65% humidity, will end up with 43% humidity when heated to 72°F.

The Carrier Outside Air Optimization (OAO) kit includes a Carrier economizer controller, CO2 sensor, Mixed Air Temperature (MAT) sensor, two 10K thermistors for SAT and OAT, and cloud computing software with predictive analytics that provides optimum positioning of the outside air damper on package HVAC units throughout the year using demand-controlled ventilation (DCV) and differential enthalpy. Economizer logic is enhanced by predictive analytics to yield increased energy savings and comfort.

Wiring



Below are the connection details for the wiring schematic above

- Analog-in1 connects to return air CO2 sensor
- Analog-in2 connects to RTU current transformer
- Th-in1 connects to Outside Air Temperature

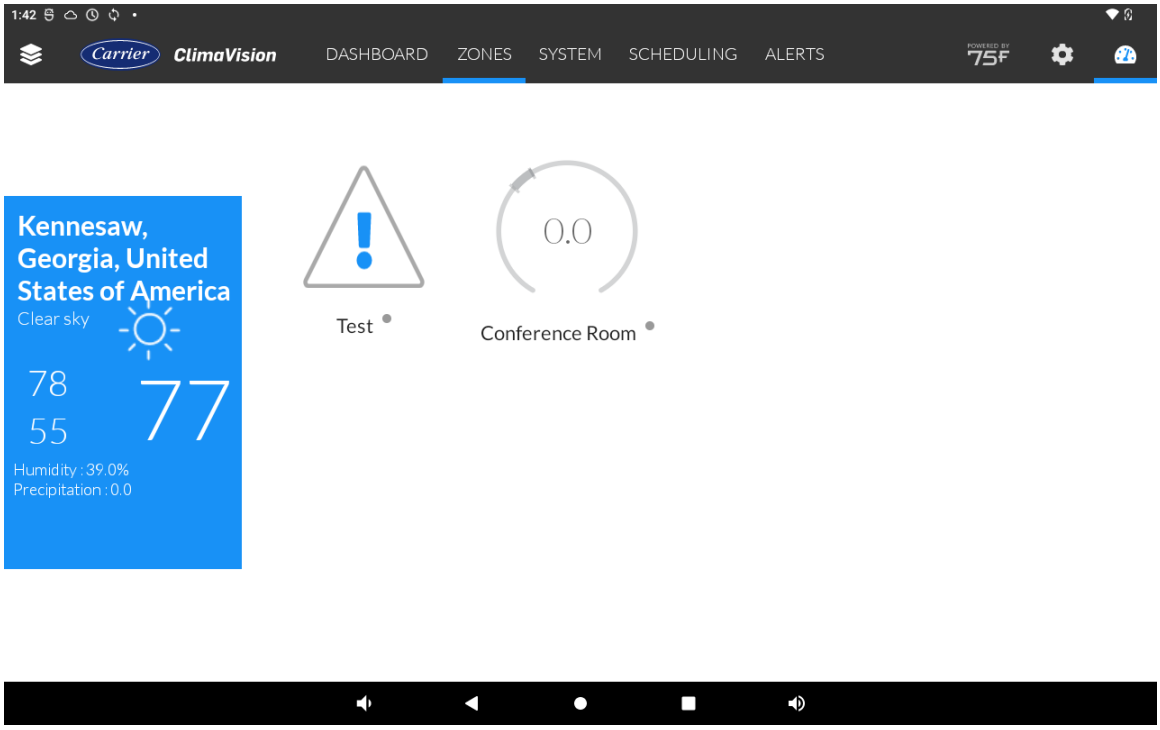
- Th-in2 connects to Supply Air Temperature
- One Wire sensor bus connects to the Duct Temperature/Humidity sensor for Mixed Air Temperature/Humidity
- Analog-out1 connects to the Outside Air Damper
- Analog-out2 connects to Return Air Damper
- Relay-1 connects to exhaust fan stage 1
- Relay-2 connects to exhaust fan stage 2

Pairing

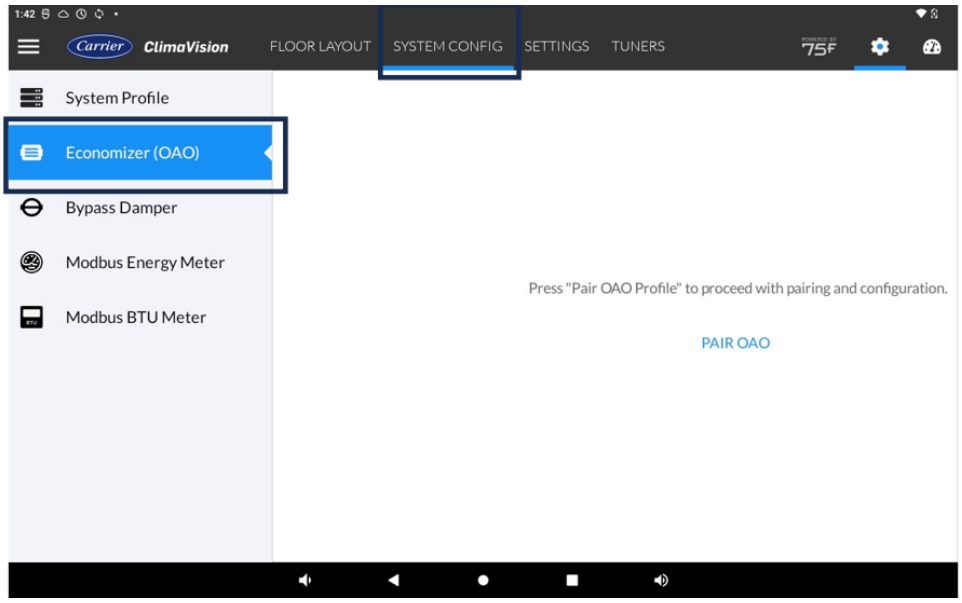
The Carrier SmartNode is used along with the CCU to achieve the Outside Air Optimization control in the buildings.

Once power is supplied to the system and all SmartNodes display the default room:

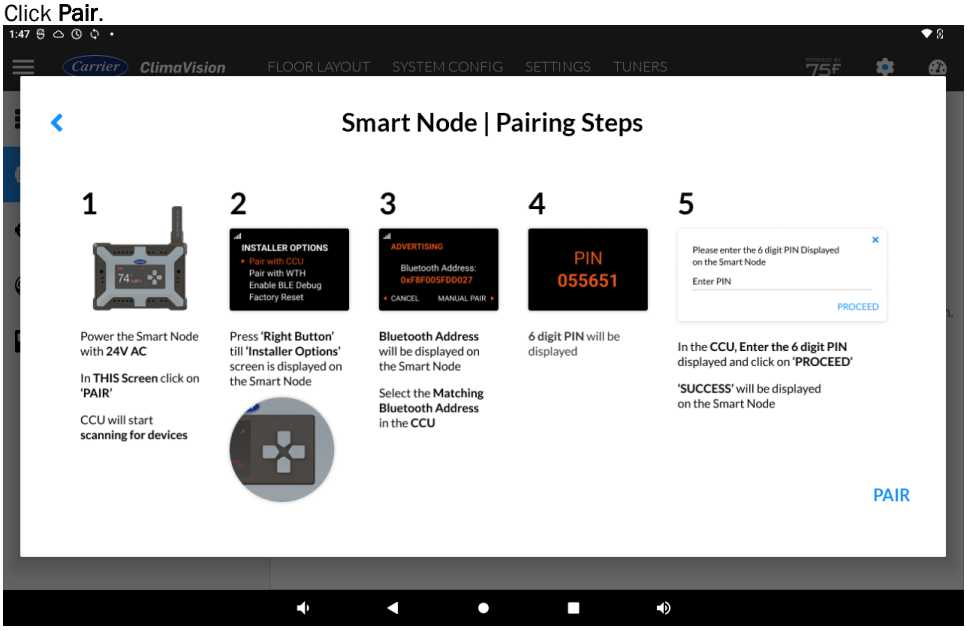
From the zones page of the CCU:



1. Click the settings  icon. The floor layout screen appears.



2. Navigate to **System Config**, then drop down to **Economizer (OAO),** and select **Pair OAO**.
3. **Disconnect** the tablet from the CM and carry it with you. The device is paired via Bluetooth.
4. **Press** the right button on the SmartNode until you reach the advertising mode screen
5. Follow the pairing steps on the SmartNode.
6. Click **Pair**.



The CCU detects all the devices ready for pairing at close range, confirm the Bluetooth Pairing address of the SmartNode that needs to be paired, and select the device. The pairing pin entry screen appears.

7. **Enter** the pin displayed on the advertising screen in the SmartNode and click **Proceed**.
8. Pairing process takes a few seconds and then completes showing “Success”.

Configuration

The OAO system profile configuration screen appears.

Configuration Parameters

Parameter	Purpose	Default Value	Values in the drop-down list
Outside Damper at Min Drive (V)	To select a voltage value for the min outside air damper opening position, at minimum economizing requirement.	2V	Range from 0V to 10V in 1V increments The outside damper output signal will modulate between outsideDamperAtMinDrive and outsideDamperAtMaxDrive as the oaoFinalLoopOutput changes from 0% to 100% depending on the conditions.
Outside Damper at Max Drive (V)	To select a voltage value for the max outside air damper opening position, at maximum economizing requirement.	10V	Range from 0V to 10V in 1V increments
Return Damper at Min Drive (V)	To select a voltage value for the min return air damper opening position, at minimum economizing requirement.	2V	Range from 0V to 10V in 1V increments
Return Damper at Max Drive (V)	To select a voltage value for the max return air damper opening position, at maximum economizing requirement.	2V	Range from 0V to 10V in 1V increments The return air damper works opposite to the outside air damper and is calculated as follows returnAirFinalOutput = 100 - outsideAirFinalLoopOutput
Outside Damper Min Open(%)	To select a percentage value for the minimum outside air damper opening position	0	Range from 0 to 100 in 1% increments
Return Damper at Min Open(%)	To select a percentage value for the minimum return air damper opening position	0	Range from 0 to 100 in 1% increments
Exhaust Fan Stage 1 Threshold (%)	To select a percentage value for the exhaust fan stage 1 threshold	50	Range from 0 to 100 in 1% increments
Exhaust Fan Stage 2 Threshold (%)	To select a percentage value for the exhaust fan stage 2 threshold	90	Range from 0 to 100 in 1% increments
Current Transformer Type	To select the type of current transformer used in the setup	0-20 (A)	0-10 (A) 0-20 (A) 0-50 (A)
CO2 Threshold (ppm)	To select a CO2 threshold value	1000	Range from 0 to 2000 in 10 ppm increments
Exhaust Fan Hysteresis (%)	To select a hysteresis percentage value for the Exhaust Fan	5	Range from 0 to 100 in 1% increments

Use Per Room CO2 Sensing	To enable or disable use of per room CO2 sensing values to determine the loop output	Disabled	NA
Smart Purge Outside Damper Min open	To select a value for the minimum outside air damper opening position during the smart purge operation in the profile.	100	Range from 0 to 100 in increments of 1
Enhanced Ventilation Outside Damper Min Open	To select a value for the minimum outside air damper opening position during the enhanced ventilation operation in the profile.	50	Range from 0 to 100 in increments of 1

1. **Set** the required parameters from the configuration parameters screen, using the table provided as a reference.
2. **Click Set** to confirm the configuration changes made.

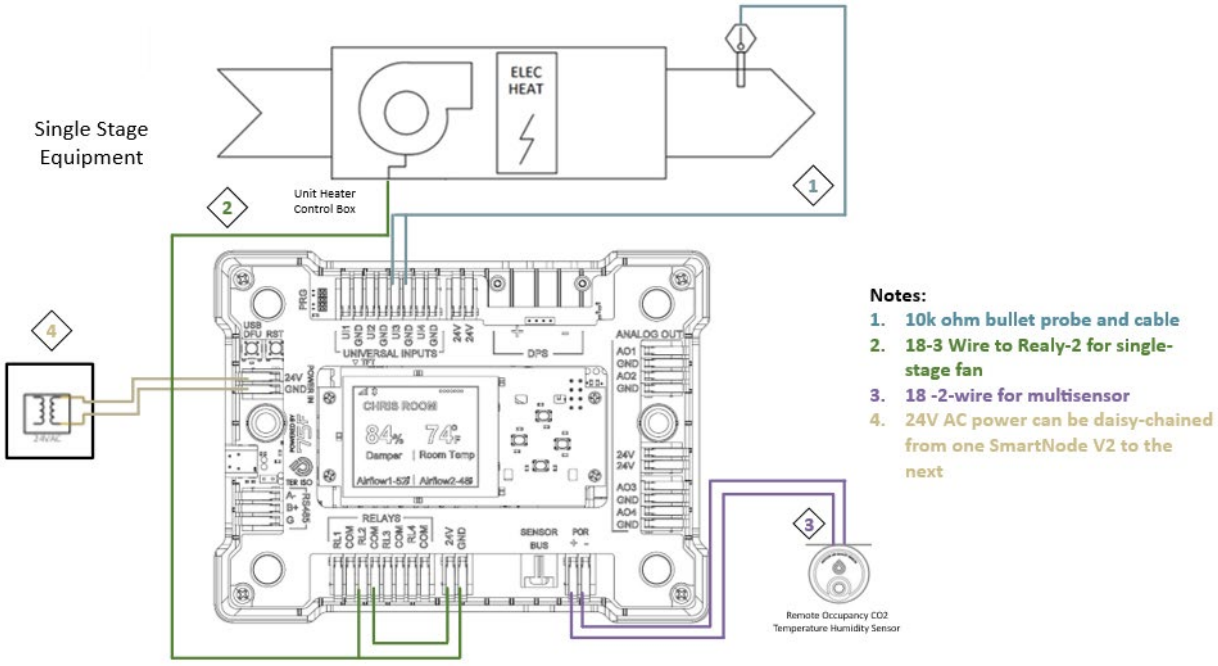
The OAO profile is configured and the same can be seen in the CCU and portals.

Single State Equipment

How it Works

- The SSE module is like a simple thermostat and works independently on the main CCU. The CCU acts as an aggregator point, The system profile in this case is set to default and is not connected to any HVAC equipment.
- The CCU at times is used for various system-level profiles like the DAD/VAV/OAO. So, while the CCU is in the heating mode, the SSE is connected to a split AC for cooling the room (like a server room in winter).
- Depending on the equipment selection the SSE provides either heating/cooling.
- Multiple SSE modules may be paired to a single zone.
- The SSE module can be in setback mode based on the vacation or the unoccupied schedule, and since the SSE does not control any HVAC equipment it does not have a Zone priority.

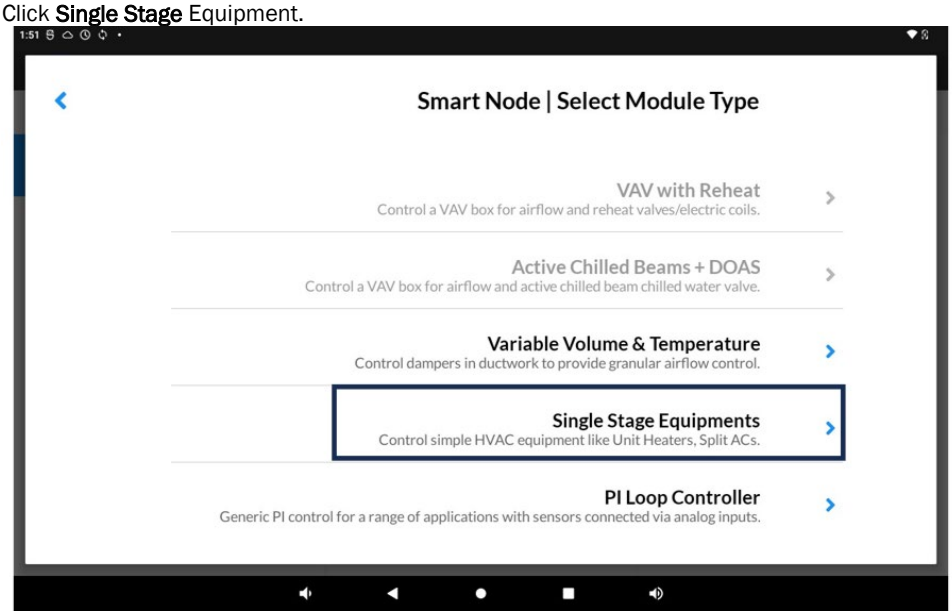
Wiring



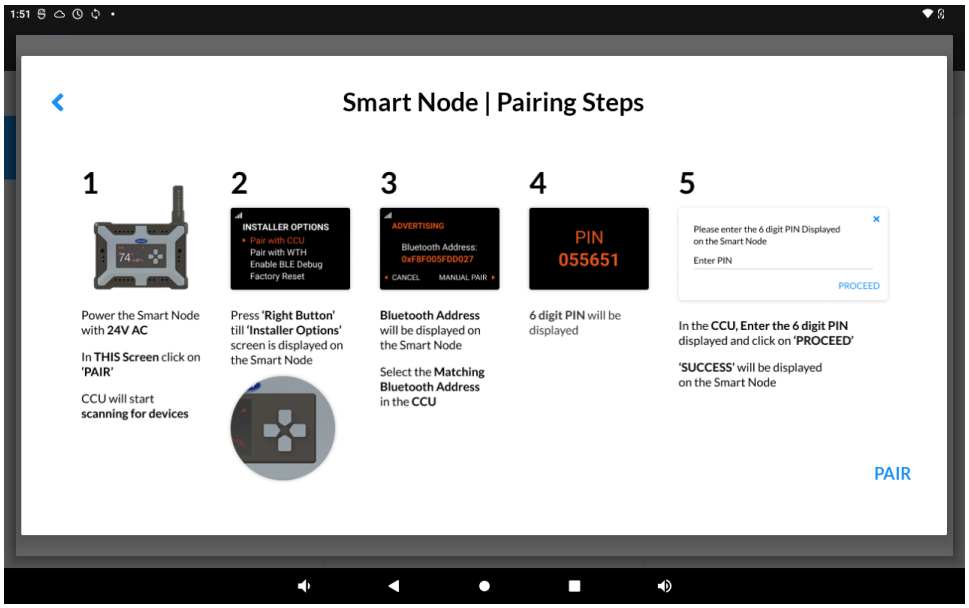
Configuration

From the **Select Module Type** screen for the SmartNode:

1. Click **Single Stage** Equipment.

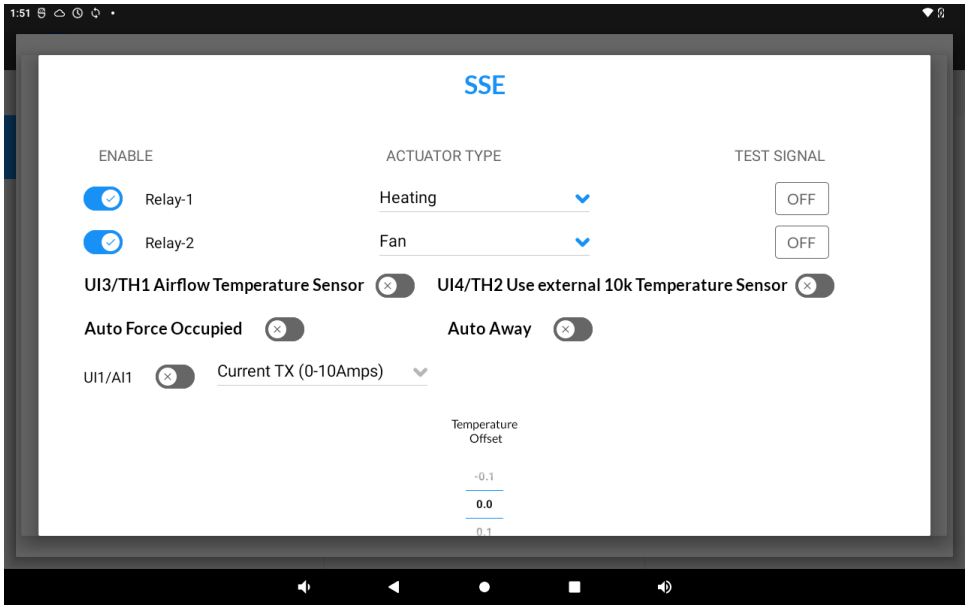


2. Follow the instructions for pairing as shown below.



The configuration screen displays the following.

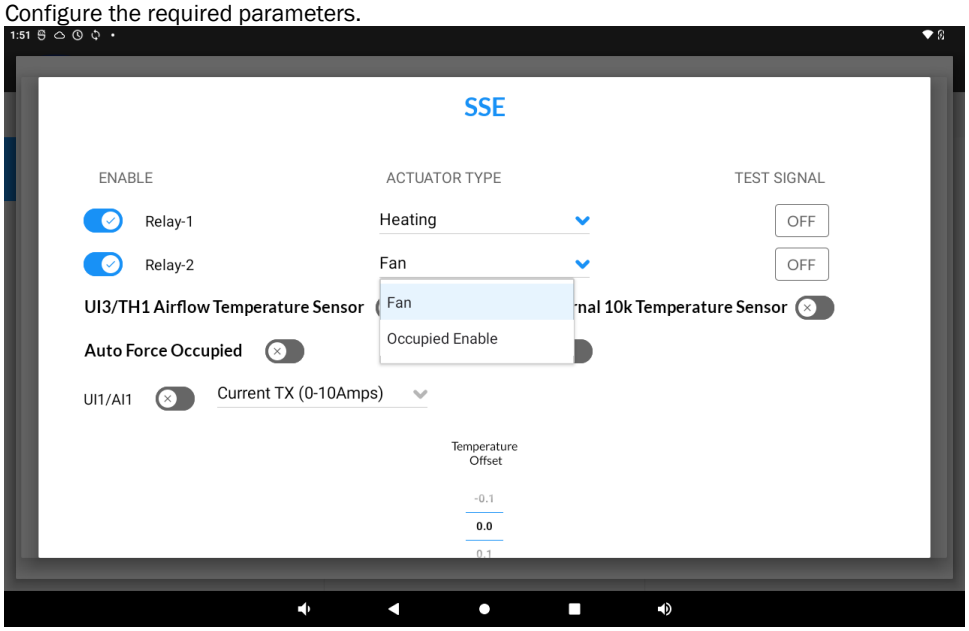
- Relay-1
- Relay-2
- Thermistor-1
- Thermistor-2
- Analog-in 1

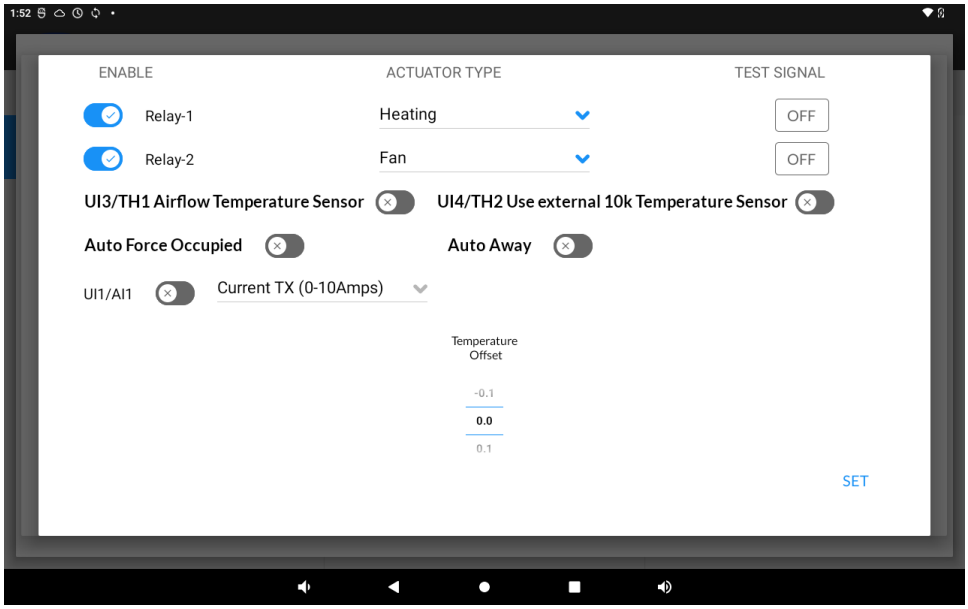


Configuration Parameters

Parameter	Purpose	Default Value	Values in the drop-down list
Relay 1	To enable Heating / cooling	Cooling	Heating Cooling
Relay 2	To enable Fan	Not Enabled	Occupied Enable Fan
Thermistor-1	To enable supply air temperature monitoring	NA	NA
Thermistor-2	To enable external temperature sensing	NA	NA
Analog-In1	To enable connection of any one type of transformer in the circuit and simply measures the current consumption in the circuit.	Current TX (0-10Amps)	Current TX (0-10Amps) Current TX (0-20Amps) Current TX (0-50Amps)

Configure the required parameters.





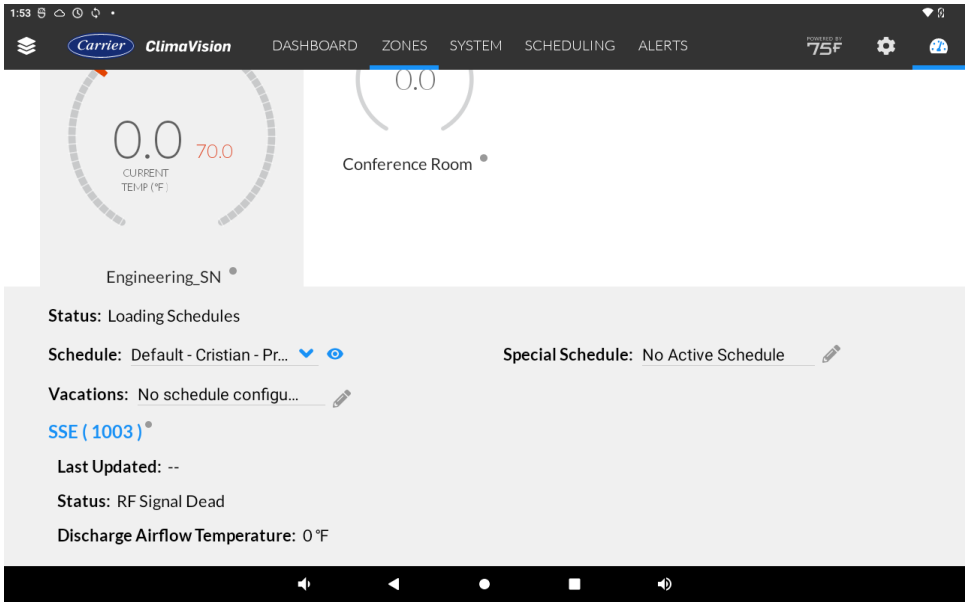
3. Click **Set** to confirm the configuration.

- The Single stage equipment profile using the SmartNode is configured and ready to control the equipment.
- The profile data that is aggregated by the CCU can be seen in the portals.

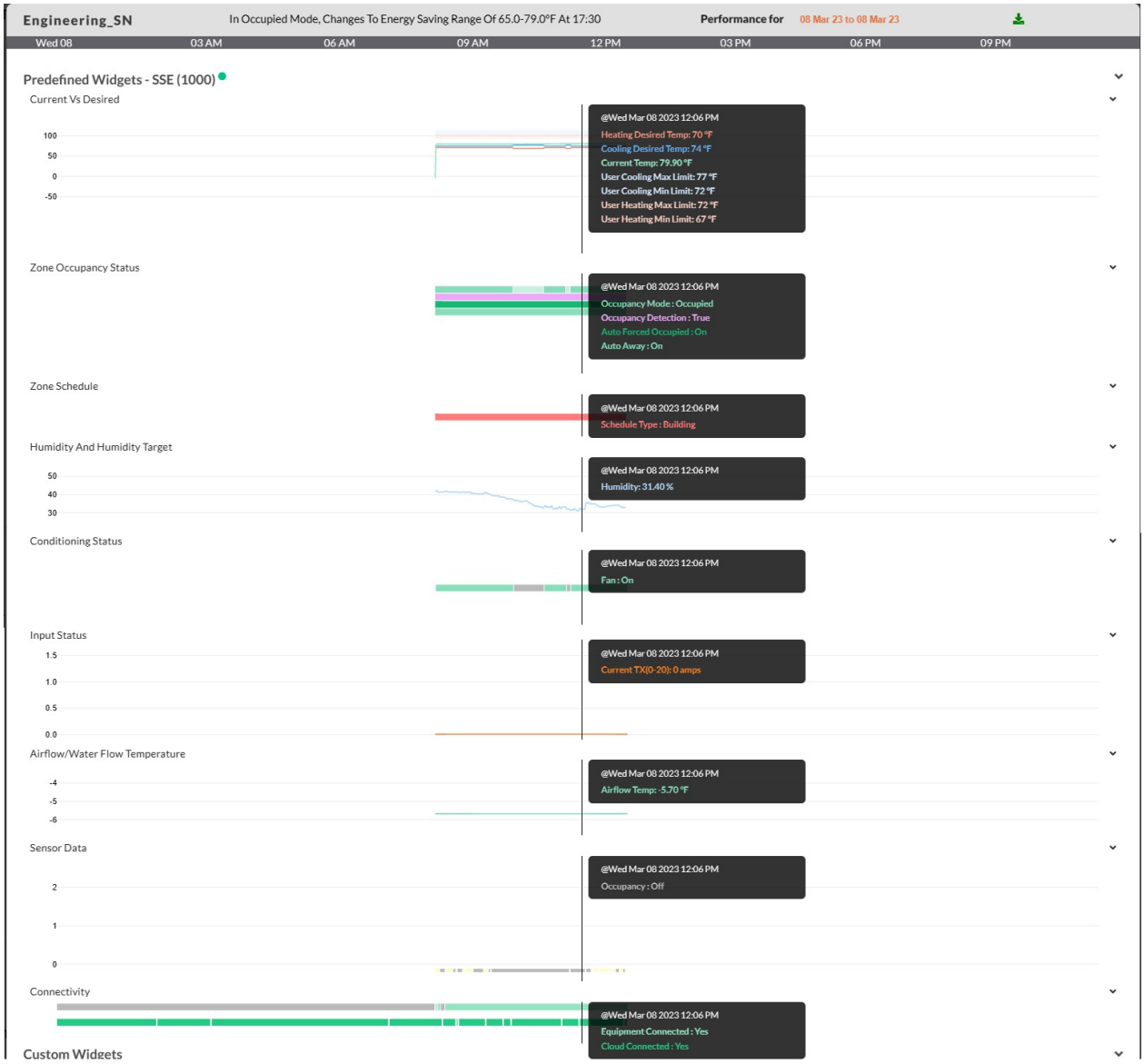
NOTE You can configure SSE modules from CCU but can reconfigure the values from the internal portal.

Post Configuration

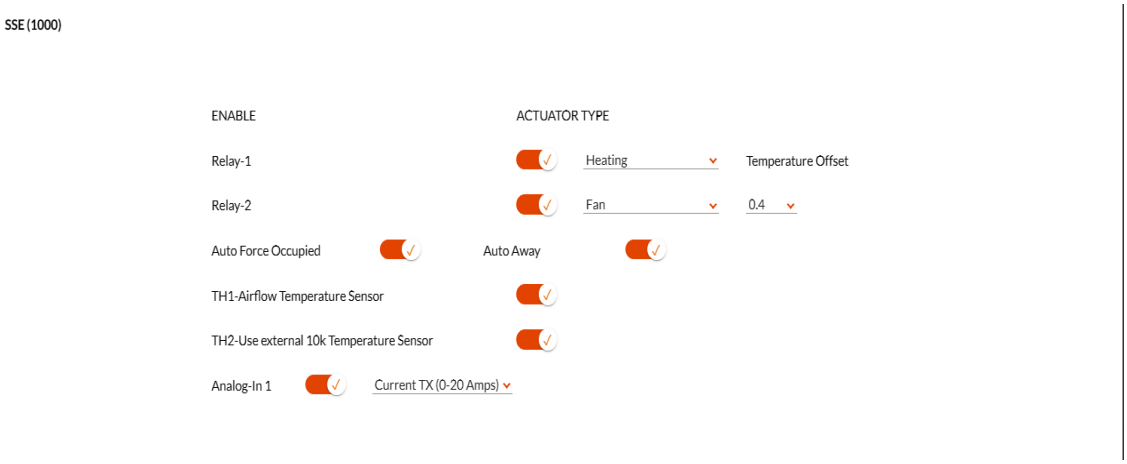
Once an SSE profile for using the SmartNode is configured it is reflected in the CCU as below.



And appears in the portals as shown below:



With the reconfiguration provisioned via portals as below



Operation

The heating and cooling stage is triggered based on the PI loop where the sensed temperature plays a vital role to influence the loop output.

Fan stages trigger even when no temperature is sensed due to any issue (faulty sensors/improper connectivity) and the zone temperature is dead.

Failsafe Mode

When the SmartNode loses the connection with the CCU, the system enters the failsafe mode where the required controls are still available from the SmartNode itself.

Feature Availability Version

Feature	Hardware/Firmware	Version
The fail-safe support for the SmartNode-based Single Stage Equipment control	CM	3.44 and above.
The fail-safe support for the SmartNode-based Single Stage Equipment control	SmartNode	5.32 and above

Modbus EM as Zone Profile

Overview

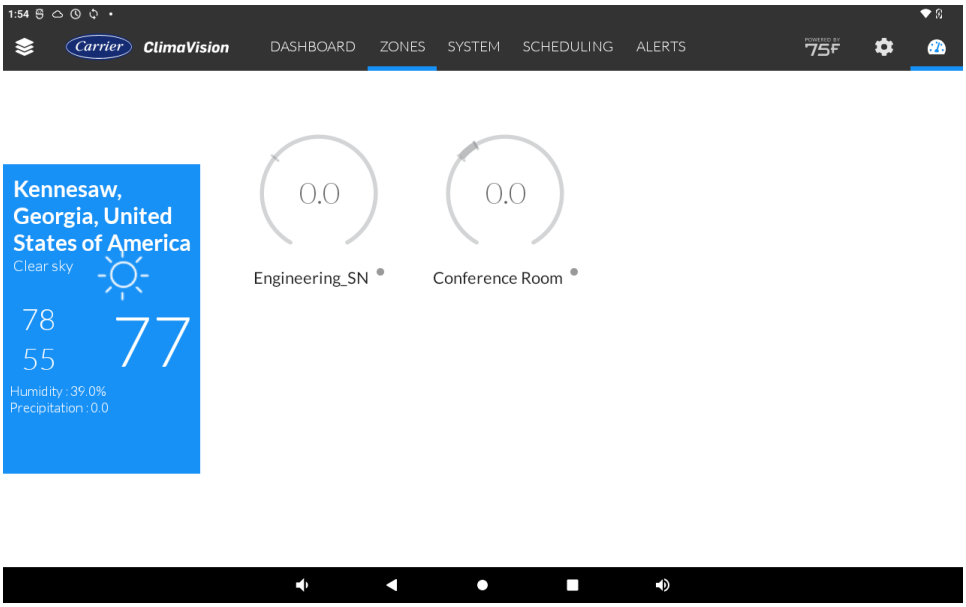
On the software side Carrier provides profiles to support Modbus based Energy Meter, which uses Modbus as a communication protocol to communicate with the BMS. The profile aggregates the consumption data of the Energy Meter and plots the aggregated data in the trending charts of the Carrier BMS application, the ClimaVision Web UI, and the ClimaVision Web UI mobile app.

The Carrier system provides three kinds of profiles that support the Modbus Energy Meter energy consumption data reading and aggregation in BMS.

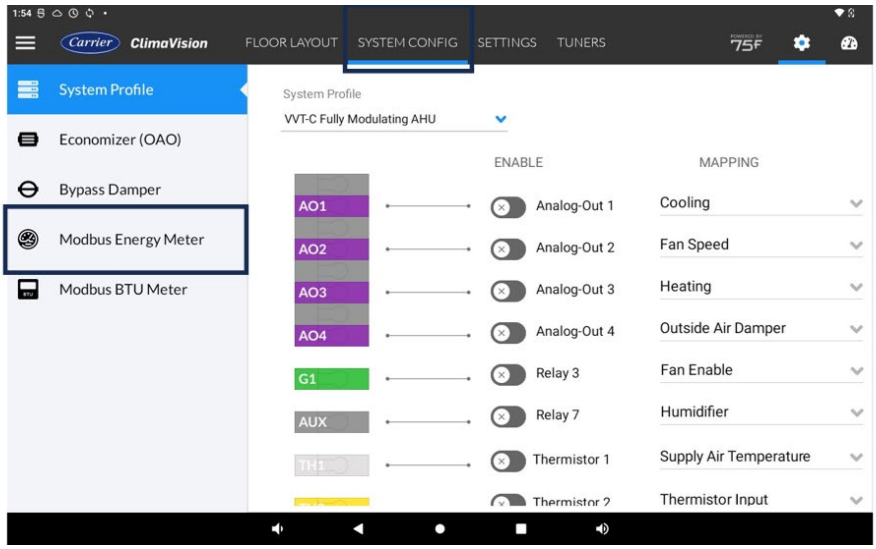
- A Modbus Energy Meter profile can be configured at the system level to track the energy consumption of a larger area in the building where a CCU is used to aggregate the consumption data and visualize it in the BMS.
- A Modbus Energy Meter profile can be configured at the zone level to track the energy consumption of a smaller area in the building where a CCU is used to aggregate the consumption data and visualize it in the BMS.
- A Modbus Energy Meter profile can be configured at the zone level to track the energy consumption of a smaller area in the building, where the SmartNode aggregates the consumption information to a CCU which in turn is visualized in the BMS.

Configuring a Modbus Energy Meter Profile at Zone Level.

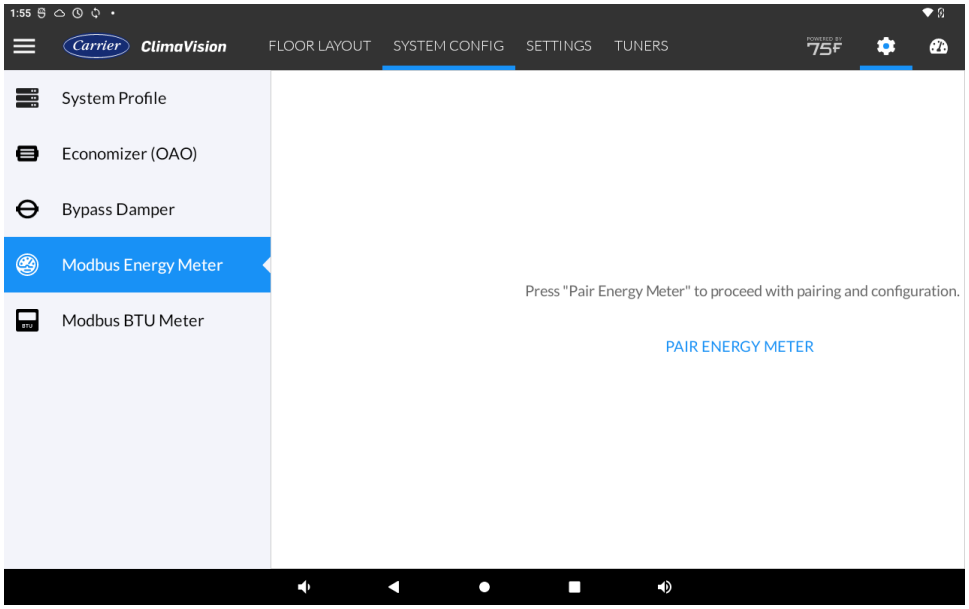
From the CCU zone page:

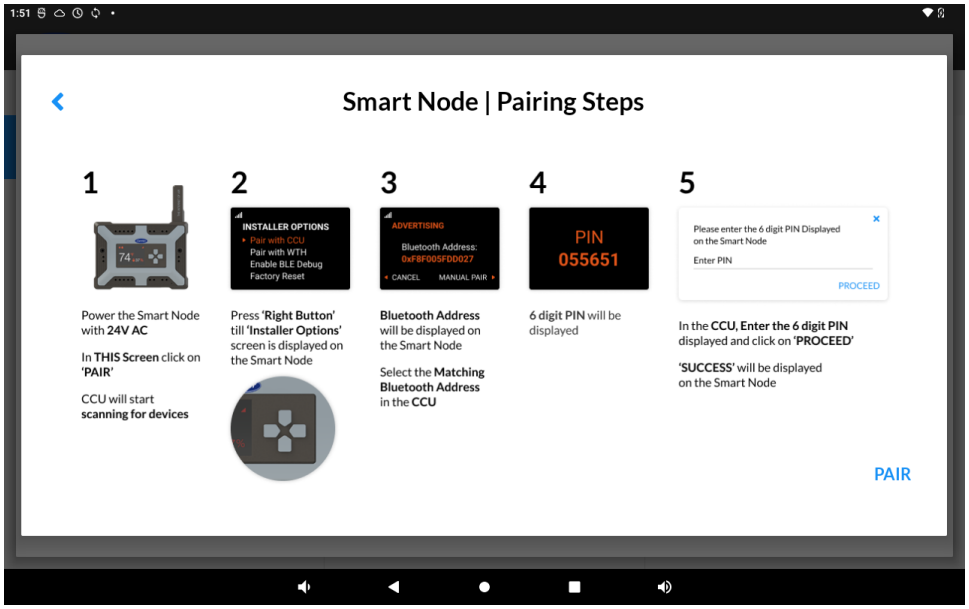


1. Click the settings  icon.
2. Click **System Config**, then navigate to **Modbus Energy Meter.**



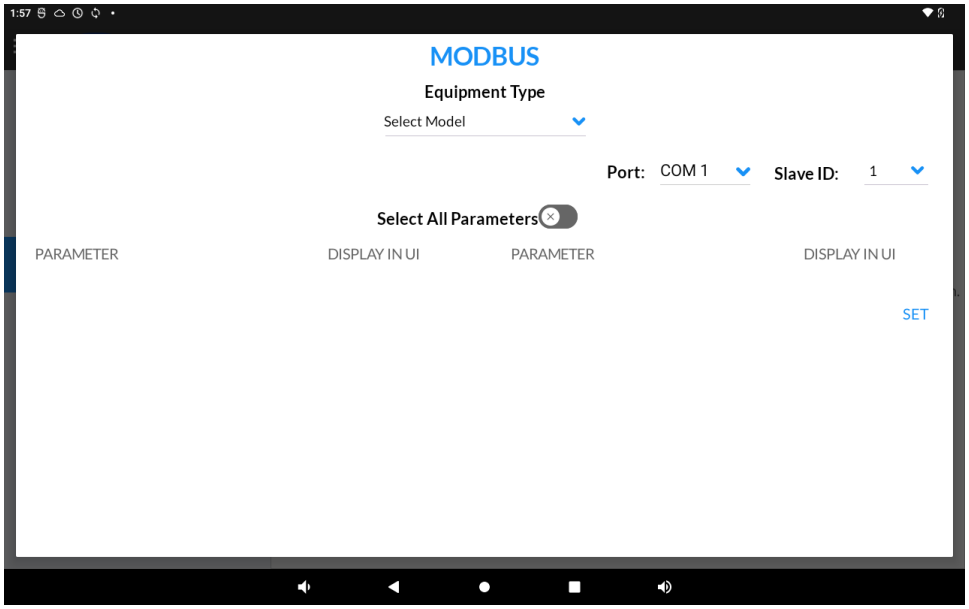
3. click **Pair Energy Meter** to pair device.





The **Energy Meter** profile configuration screen appears.

4. Click **Set** to confirm.



The Energy Meter profile at the zone level is configured and ready for visualization in the CCU.

Energy Meter

How it Works

Every minute the Modbus pulse uses the SmartNode to read the current kWh of the Schneider 3150 or other Modbus Schneider energy meter in the same family, 3455 for example. These points are plotted in the trending data on ClimaVision Web UI.

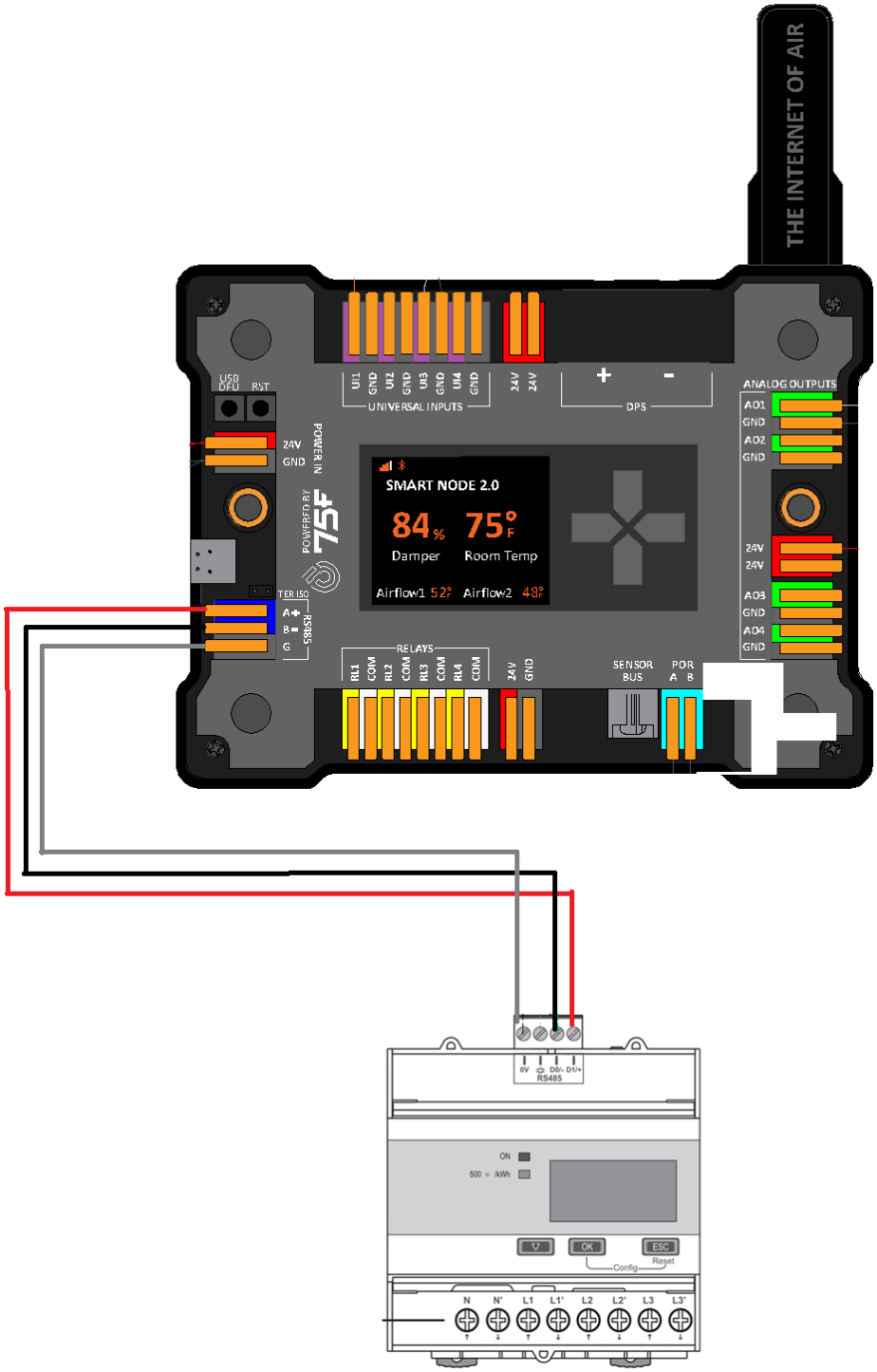
Wiring

Control Wiring

To wire the Schneider meter to a SmartNode please use the diagram below. The 4 Pin cable that plugs into the RS485 port on the SmartNode on one end, and cut on the other end to land the wires directly on the meter.

Load Wiring

To wire the load side of the Schneider meter please refer to the 3150-installation guide. Depending on the load you plan to measure your wiring diagram may vary.



Configuration

When pairing the SmartNode choose the Energy Meter profile. Once you have paired the SmartNode successfully as an Energy Meter confirm the parameters are set correctly on the meter itself. Once these values are set, the energy consumption data begins streaming.

Configuring the Schneider 3150 to communicate with the SmartNode is easy. Set a slave/child address and configure the frequency.

Frequency

1. Press and hold **OK** and **ESC** simultaneously to enter the Configuration menu.
2. Press **V** once to show Frequency.
3. The frequency must be 60Hz. If it is not, press **OK** and then press **V** until “60Hz” appears.
4. Click **OK** when 60 Hz appears.

Slave/Child Address

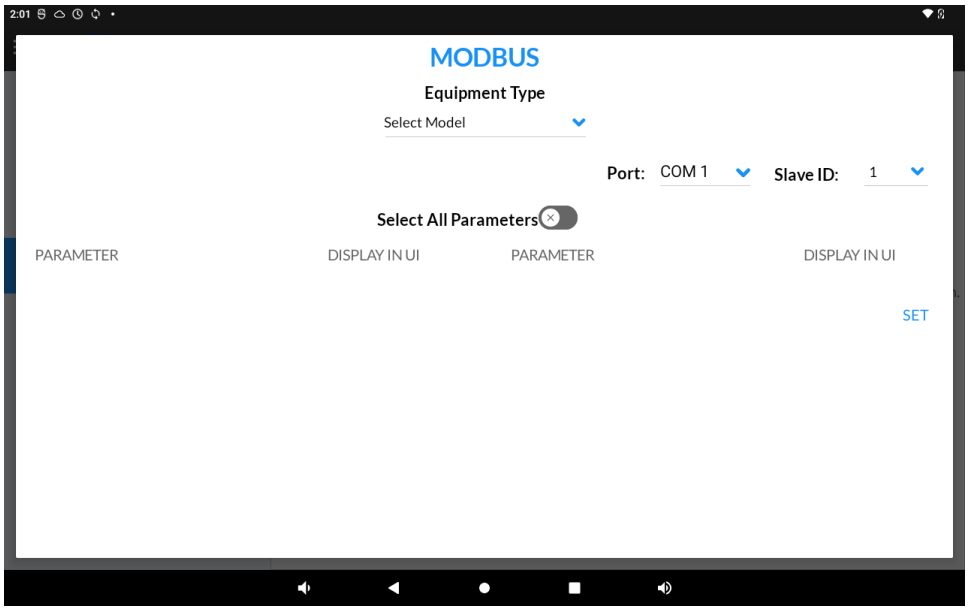
1. To set the slave/child address click **V** until **Communication** appears.
2. Click **OK** to enter.
3. The slave/child address needs to be set to 001. Once 001 appears click **OK**.
4. Click **ESC** and then **OK** to leave the configuration menu.

Baud Rate – 9600 / Parity – None

CT Secondary

(CT models only) 0.333V or manufacturer-recommended setting.

1. Once the values above are set, the SmartNode begins receiving data from the meter.
2. Pair the SmartNode as a VVT-C or lighting zone.
3. Once the SmartNode and Energy meter are wired, paired, and communicated the Energy Meter appears in the Sensor Data row in ClimaVision Web UI trending data. The value read 'rate(total)'.



Troubleshooting

Meter is not counting - If you are using a 3455 or similar with wired CTs and the KWh is not counting as anticipated:

In the **P**, **Q**, and S settings the active power reading must be a positive number. If the reading is negative, check that the label on the CTs that says 'toward source' is oriented correctly. If it is, reverse the wiring on the CT one at a time until that number reads positive.

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*
		No updates yet.	

* For internal use only

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