ANTEC TOOLBOX

MANUAL v126

ANTEC controls by price

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INTRODUCTION

General

In this manual, you will find information regarding:

- Toolbox specifications
- How to connect to the Pace™ Critical Space Controller (PACE), Cava™ Touchscreen Fume Hood Controller (CAVA), and the Fume Hood Controller (FHC)
- Detailed description of all options available for each controller
- Troubleshooting information

Product Overview

Antec Toolbox is a software tool designed to allow service and start-up personnel to configure Antec Controls products such as:

- Pace™ Critical Space Controller (PACE)
- Cava™ Touchscreen Fume Hood Controller (CAVA)
- Fume Hood Controller (FHC)

Some of its key features include:

- Easy-to-Use and intuitive layout
- Graphic layout that provides live feedback for select variables on one interface
- Balancing section for each valve
- Automatic software updates
- Built-in firmware updates for PACE, CAVA, and Sensor Modules
- Commissioning report generation

CAUTION ▼

This mark indicates an important point for the proper function of the controllers used with Toolbox. Improper setup may cause unit failure. Pay close attention to all caution points throughout this manual.

For local area support, please contact your local Antec Controls Representative

For more information visit www.AntecControls.com

GETTING STARTED WITH TOOLBOX

System Requirements

System requirements to run Toolbox:

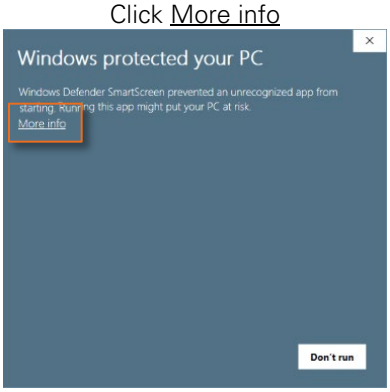
- Operating System: Windows 10 or higher
- CPU: 2 Gigahertz or faster
- RAM: 4 Gigabytes or more
- Hardware: Ethernet port **or** USB port and USB to Ethernet adapter

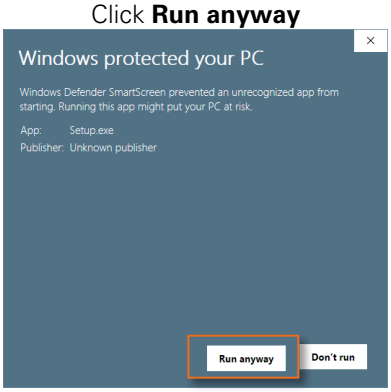
Installation Instructions

To install Toolbox:

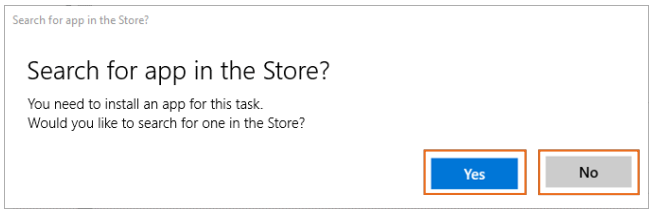
- Follow the link provided during the Antec Controls Certified Technician Training class
- Download the Antec Toolbox installer (Setup.exe)
- If prompted by Windows Defender:

Click More info then Click **Run anyway**





- If the following prompt is seen, click YES or NO:



NOTE: Clicking either option will result in successful installation of the software.

- Read the License Agreement and click Accept

CAUTION ▼

If you are not prompted by Windows Defender™ to allow Antec Toolbox through the firewall. Proceed to the Adjusting Windows DefenderTM Firewall Settings in the Troubleshooting section of the manual.

How to Connect to PACE and CAVA

Toolbox communicates to PACE and CAVA by utilizing the Room Information Network (RIN). For more information on RIN, please refer to the PACE manual found at www.anteccontrols.com/products/#PACE.

There are three methods to connect to PACE and CAVA:

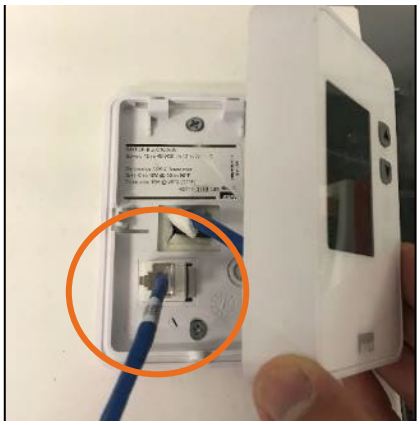
Connecting to a Keystone Jack on the Thermostat

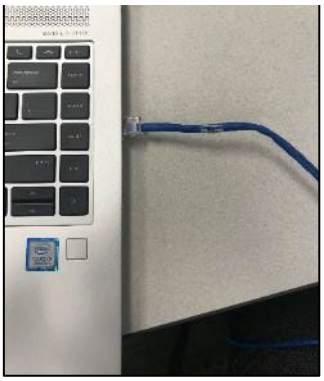
If there are no CAVA controllers in the room and ground level access is desired to perform setup, commissioning and balancing then a pluggable Keystone Jack (CKJ) can be installed on the back plate of the thermostat and wired into the RIN network. By default, this CKJ is included in all thermostats provided by Antec Controls, except for models with CO_2 measurement.

Tools Required:

- Computer running Windows 10 or higher with Toolbox installed
- Ethernet cable

Setup:





NOTE: For RIN typical wiring diagram please reference the PACE manual or the project specific wiring diagrams.

CAUTION

The CKJ must be at the end of line (EOL) of the RIN network.

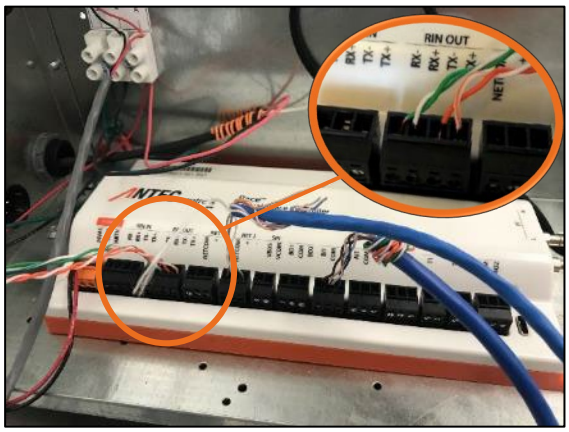
Connecting Directly to PACE

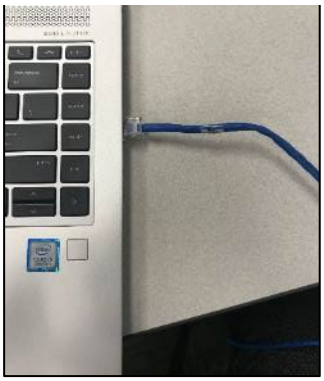
If a CKJ is not installed, then the user can connect directly to the RIN port on PACE (typically mounted on the supply or general exhaust valves).

Tools Required:

- Computer running Windows 10 or higher with Toolbox installed
- Ethernet cable with RJ45 to 4-wire connection

Setup:





NOTE: For RIN typical wiring diagram please reference the PACE manual or the project specific wiring diagrams.

CAUTION ▼

When connecting directly to PACE, use an end of line (EOL) controller.

Connecting Directly to CAVA

The user can connect directly to one of the ethernet ports on the back of any CAVA on a fume hood. This will give the user access to configure all PACE and CAVA controllers that are connected to the same RIN network.

NOTE: This can be used in lieu of a CKJ for any rooms that have fume hoods.

Tools Required:

- Computer running Windows 10 or higher with Toolbox installed
- Ethernet cable
- 1/16" Allen Wrench

Setup

NOTE: The ethernet cable can be connected to any of the 3 ports on the back of CAVA.

How to Connect to the Fume Hood Controller (FHC)

Toolbox communicates to the Fume Hood Controller (FHC) utilizing a Linker Tool. The Linker Tool is a Price Industries proprietary connector used by Antec Controls and can be purchased through Antec Select. For more information on installing the software required for the Linker Tool please refer to the Linker product information at www.priceindustries.com/linkersoft.

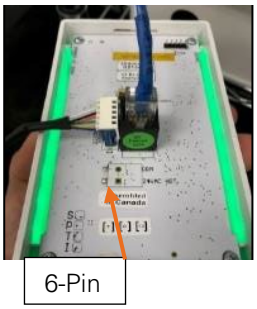
There are two methods to connect the Linker tool to the FHC:

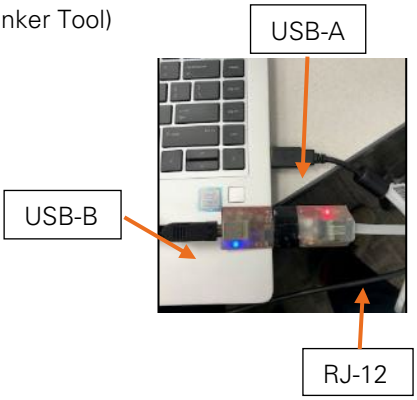
Connecting to the Fume Hood Interface (FHI)

For ground level access, there is a Linker Service Connection on the back of the Fume Hood Interface (FHI) that is mounted on the fume hood. This connection is present on every fume hood that has an Antec Controls FHI.

Tools required:

- Computer running Windows 10 or higher with Toolbox and Linkersoft2 installed
- Linker Tool
- USB-A to USB-B cable (provided when ordering the Linker Tool)
- RJ12 to 6-pin connector cable (provided when ordering the Linker Tool)



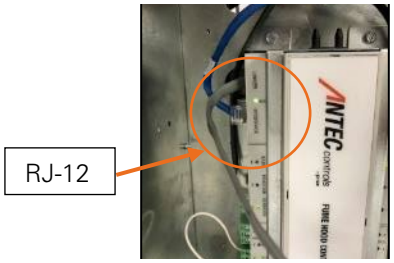


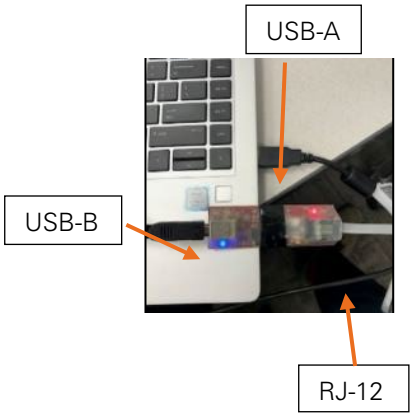
Connecting Directly to the FHC

If an FHI is not available, there is also a Linker Service Connection on the FHC (typically mounted on the fume hood exhaust valve).

Tools required:

- Computer running Windows 10 or higher with Toolbox and Linkersoft 2 installed
- Linker Tool
- USB-A to USB-B cable (provided when ordering the Linker Tool)
- RJ12 cable (provided when ordering the Linker Tool)





Toolbox Start-up

Upon start-up of the software, the user is prompted with the following screens:

Loading Screen

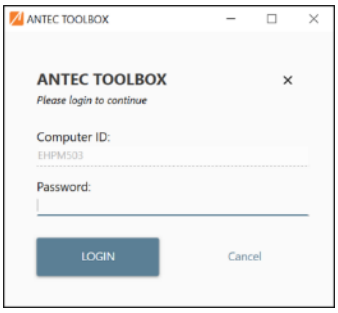
When opening Toolbox, the loading screen will display the current software version that is running on the computer. If there is a new version available, Toolbox will automatically update. This ensures users are always running the newest software version.

It will also check for the latest PACE, CAVA, FVM and SVS firmware. If what it has locally is not the latest version, it will download the latest version.

It is **always** recommended that firmware is updated prior to arriving on site when beginning the start-up process.

CAUTION

An Internet connection must be present for Toolbox to detect that an update is available. Always open Toolbox on an Internet connection before going to the job-site to ensure it is up to date.



Login Screen

After Antec Toolbox has loaded, the user is prompted with a Login Screen.

The Computer ID field will auto-populate with the user's computer name.

NOTES:

- The password is provided only to Antec Controls Certified Trained Technicians.
- The password will only need to be entered once for every Antec Toolbox software update.

Controller Selection

After logging in, select the controller that requires configuration.

This manual will cover both sections of the software. Click the links below or navigate to the page number shown in the Table of Contents for detailed descriptions of each of the settings for PACE and CAVA or the FHC.

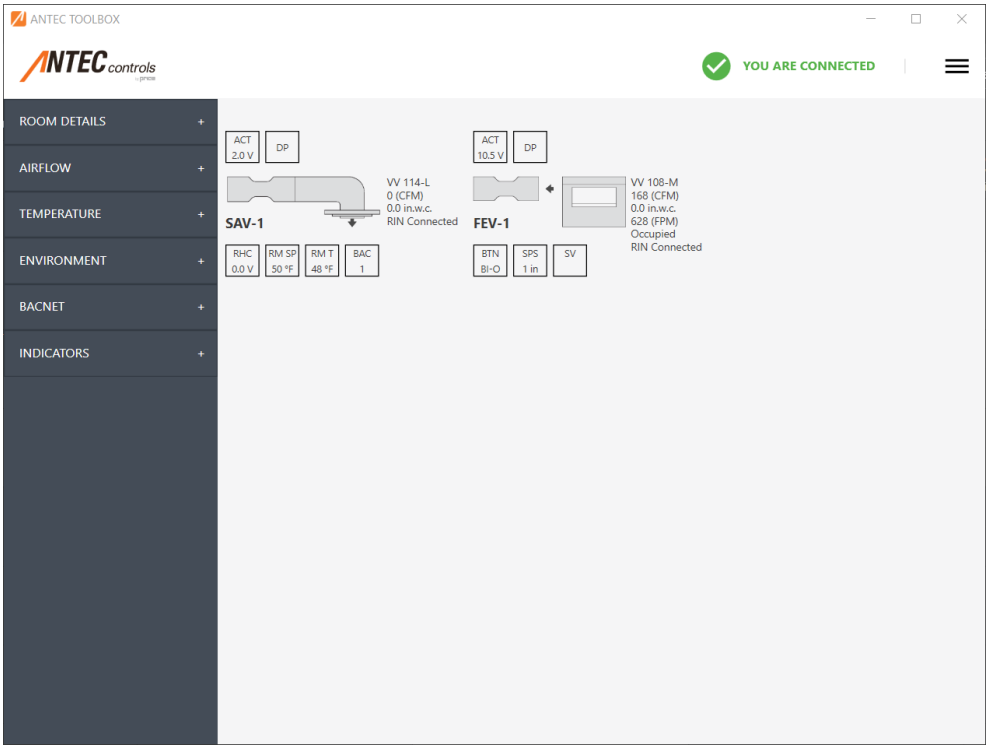
PACE and CAVA

FHC

PACE AND CAVA

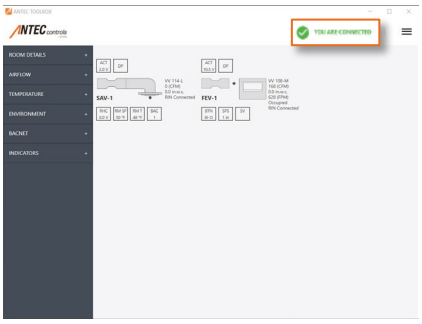
Home Screen

After selecting PACE and CAVA, the user is presented with the following screen:



In the example above, a PACE and a CAVA have been detected on the RIN network. The room has already been configured: Toolbox has populated with the configured devices for the controllers and the configured sequencing for the room.

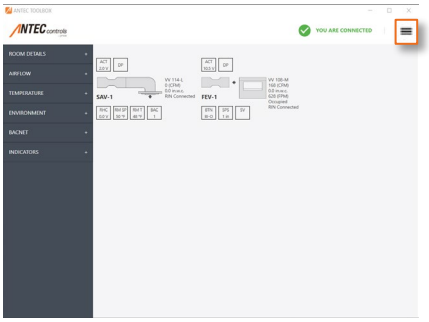
The Home Screen provides the user with useful information regarding the room's operation.

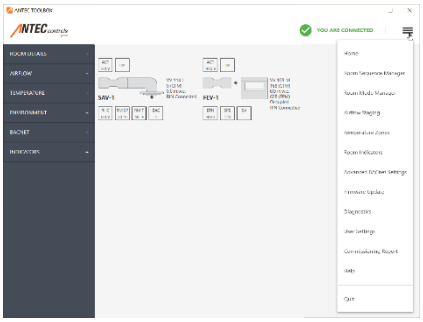


Connection Status

Display to show whether Toolbox is currently connected to PACE or CAVA on the RIN network.

NOTE: If a connection is not detected upon initial start-up, a dropdown will be available to select a different network port.

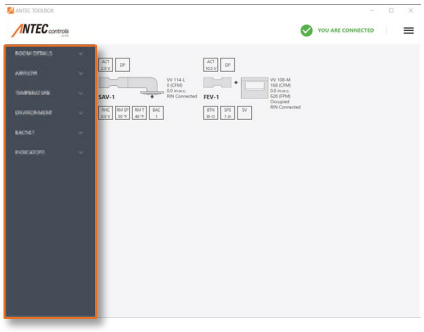




Menu Button

Click this dropdown to access the settings for the room's functionality. See the sections of this manual below for further information on available settings in each menu.

Menu/Option	Description
Room Sequence Manager	Allows the user to configure high-level room settings, the airflow control, temperature control and DCV control sequences if applicable.
Room Mode Manager	Allows the user to configure room airflow and temperature setpoints per room mode. Multiple modes of operation can be configured to allow for energy savings and emergency operation.
Airflow Staging	Allows user to stage airflow devices, if required.
Temperature Zones	Allows the user to configure the staging for heating and/or cooling devices, add airflow for temperature control and set up multiple temperature zones, if required.
Room Indicators	Allows the user to configure alarms that are to be displayed on BACnet or trigger a binary output when active.
Advanced BACnet Settings	Allows the user to rename and/or reorder BACnet points to conform to any building standards for naming conventions.
Firmware Updates	Allows the user to update to the latest PACE firmware or update to an older firmware version with a provided firmware file.
Diagnostics	Allows the user to view controller file listings, restart controllers, remove room configuration and retrieve diagnostic files for troubleshooting.
User Settings	Allows the user to adjust the units from imperial to metric.
Commissioning Report	Generates a CSV file containing all configured settings for the room.
Help	Displays current software version, Applications contact information and access to software changelog.

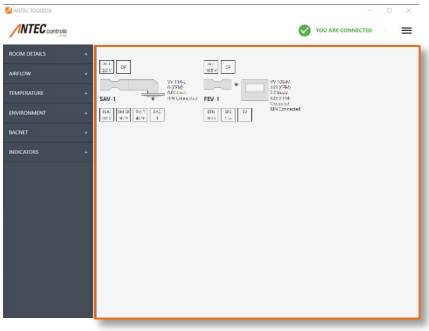


Left Bar

Displays room level configuration information, provides live updates for sequence related readings and indicator status.

Section Name	Description
Room Details	Displays general room information including room name, airflow sequence, pressurization, control method, room status, room mode, current room pressure and air changes per hour.
Airflow	Displays current and target supply and exhaust targets, room setpoints and current fume hood exhaust.
Temperature	Displays current and target temperature readings for each temperature zone.
Environment	Displays readings from environmental sensors including relative humidity, CO_2 and VOC.
BACnet	Displays BACnet device instance, MAC address and Baud Rate.
Indicators	Displays status of all indicators.

NOTE: The left bar is always shown for live updates on the room's operation.



Main Display

Displays all valves with a PACE or CAVA, live updates for valve airflow and pressure, and all configured inputs and outputs.

Inputs and outputs for each PACE or CAVA are configured by clicking on the valve icon. This will open the PACE MANAGER page or FUME HOOD MANAGER page for that controller.

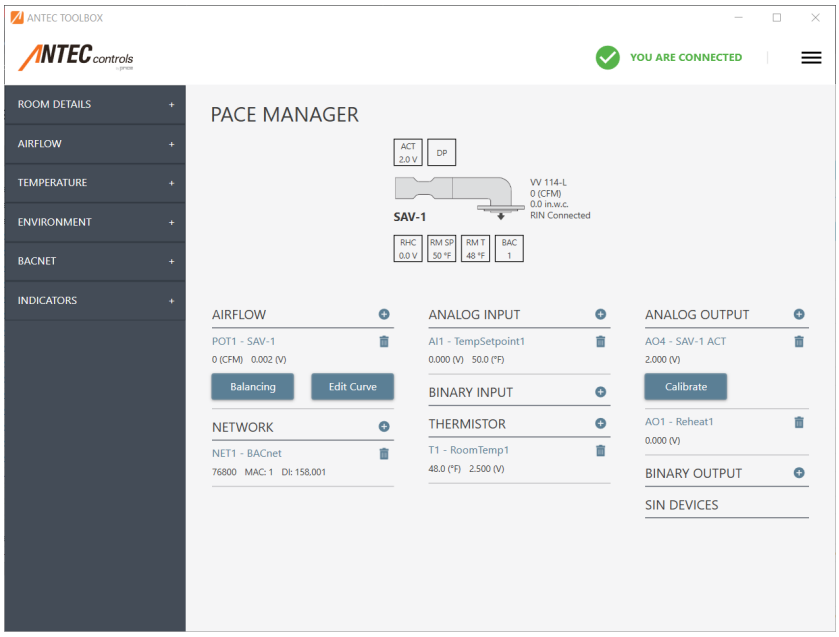
CAUTION

FHC valves are visible after configuring the Fume Hood Network (FHN) and values are read only. FHCs must be configured using the FHC portion of Toolbox.

PACE Manager

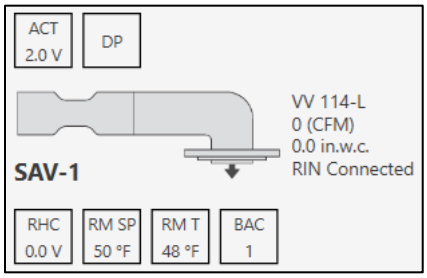
When on the Home Screen, click on the valve that requires configuration to open the PACE Manager Menu.

This menu allows the user to configure devices for airflow, configurable networks, thermistors, inputs, outputs and SIN devices for the selected PACE.



Controller Information

The top of the page shows a brief overview of the valve and all its configured devices.



Controller Information

Whenever the user adds a device to the controller, it will create a card. The cards will display above and below the valve's image with the live readings from the input or output.

- Cards above the valve are related that specific valve's operation
- Cards below the valve are related to the room's overall operation

NOTE: The graphic on the Home Screen will display the same image shown here, including the cards.

Live updates to the right of the valve will show the following:

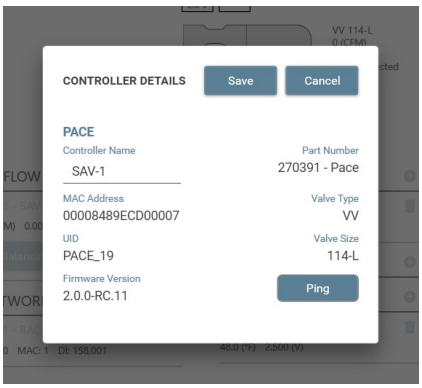
- Model information from the valve's linestring (e.g. VV-114-M indicates a single size 14 Venturi Valve designed for medium pressure operation)
- Airflow reading
- Valve differential pressure *(available for VV only)*
- Connection Status
  - RIN Connected = operating normally
  - RIN Unstable = intermittent RIN connection
  - RIN Offline = no RIN connection
  - Network Fault = error with either NET1 or NET 2. Will show BACnet, FHN, SIN, NET1 or NET2 fault depending on the usage of the network port where the error is detected

CAUTION

When a room configuration is being saved, RIN connection will intermittently say RIN Offline while controllers power cycle.

NOTES:

- The controller's name (e.g. GEV-9-1) and the image (VV, VFX or TU) for the valve will auto-populate using the valve information from the valve's linestring.
- RIN connection errors will take priority over the Network Fault status. If RIN Unstable, RIN Offline, or Network Fault is observed, please refer to the Troubleshooting section of this manual.



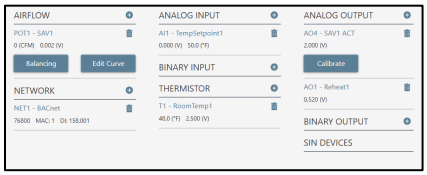
Controller Details

The controller details menu displays important information about the controller. Access the menu by clicking on the picture of the valve in the PACE Manager menu.

Variable Name	Description
Controller Name	Allows the user to edit the controller name that appears in Toolbox. The controller's name will also display on BACnet as a pre-fix to AI, AO, BI and BO objects. **NOTE:** The Controller Name is limited to 15 characters.
MAC Address	Displays the unique MAC for the controller provided by Antec Controls.
UID	A Unique Identifier used to identify each controller on the RIN network. This UID comes from the factory order and matches the Serial Number for the valve (if provided by Antec Controls).
Firmware Version	Current firmware running on the selected PACE.
Part Number	The Antec Controls part number for PACE firmware.
Valve Type	Displays the valve type loaded from the valve's linestring.
Valve Size	Displays valve size loaded from the valve's linestring.
Ping	Used to identify the controller being configured. The LED on the selected PACE will begin flashing green when the Ping function is activated. **NOTE:** Ping only works for PACEs that are configured and have a solid green light.

Devices

Any inputs/outputs that are configured on a PACE are referred to as devices.



Devices

Many device types are configurable for the selected PACE:

Variable Name	Description
Airflow	Configure the controlled valve. VV and VFX will be automatically configured with default settings from the linestring
Network	Configure NET1 and NET2 for FHN, SIN or BACnet.
Analog Input	Configure multiple usages for AI1 – AI4 using a 0 – 10 VDC input.
Binary Input	Configure multiple usages for BI1 and BI2 using a contact closure.
Thermistor	Configure multiple usages for T1 and T2 using a Thermistor.
Analog Output	Configure multiple usages for AO1 – AO4 using a 0 – 10 VDC output.
Binary Output	Configure multiple usages for BO1 and BO2 to output 24 VAC when active.
SIN Devices	Displays any currently detected SIN devices after configuring the network.

NOTE: Up to 15 devices can be configured per PACE controller (excluding devices shown in the Network section).

Adding, removing, and editing devices:

- To add a device, click the  button.
- To edit a device's setup, click the device's name. 

- To remove a device, click the  button.

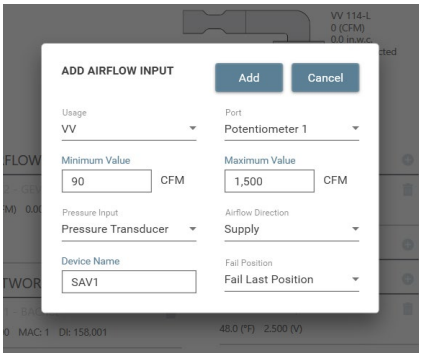
NOTE: Live readings are also visible for the device's input/output voltage or state and the value that corresponds to the particular usage that has been selected.

Airflow Devices

Airflow devices are required when PACE is measuring and controlling an airflow control device to maintain an airflow setpoint. These are only required for an input that is actively being measured and controlled by PACE.

Instructions and settings for an airflow input for a Venturi Valve (VV), Venturi FX Valve (VFX) and Terminal Unit (TU) are below.

NOTE: The airflow device will come pre-configured based on the linestring for the valve. Typically, the airflow device will not require any configuration.



Airflow Input *(VV)*

Below are the settings associated with configuring a Venturi Valve (VV) airflow input. The following settings are available if the TYPE is set to VV.

Variable Name	Available Options/Range	Description
Port	Potentiometer 1 Potentiometer 2	The physical port where the potentiometer for the Venturi Valve is connected. **NOTES:** • Single and Dual VVs are wired with ONE POT on Potentiometer 1. • Triple VVs are wired with TWO POTS on Potentiometer 1 and 2 respectively.
Minimum Value	0	Limits the minimum operating range of the valve. Typically set to the full minimum of the valve.
Maximum Value	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the full maximum of the valve.
Pressure Input	Pressure Transducer Analog Input 1 – 4	Differential pressure measured to confirm the Venturi Valve is operating within its required pressure range. Pressure Transducer is the on-board pressure transducer installed on every PACE. **NOTE:** If using a 3rd party sensor with 0 – 10 VDC output for the differential pressure measurement, AI 1 – 4 can be assigned for differential pressure.
Airflow Direction	Exhaust Supply	Flow direction of the valve controlled by PACE
Device Name	19 characters	The name for the airflow device. **NOTE:** This name will display on BACnet as part of the Analog Values for the POT reading.
Fail Position	Fail Last Position Fail Fully Open Fail Fully Closed	Sets the fail position for the Airflow Device if a PACE goes offline on the RIN network.

CAUTION

Ensure the valve's operation is not limited by the minimum flow or maximum flow. In rooms with fume hoods where the valve may have to modulate based on fume hood usage, the valve may need to exceed the design flows in the design documents in order to maintain the room's flow offset.

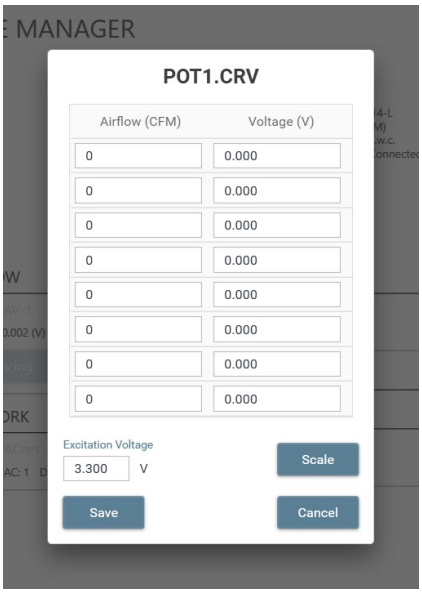
Balancing *(VV)*

The balancing menu is used to adjust the airflow reading from the PACE to match a Test and Balance (TAB) reading.

Variable Name	Available Options/Range	Description
Actuator Voltage Override	0 to 10.5 Volts On/Off	Provides the user with a voltage override to drive the actuator to a set position. Enter the desired voltage override value into the Actuator Voltage field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Valve Airflow Override	No Limits On/Off	Provides the user with a valve airflow override to set the valve to a specific flow. Enter the desired airflow override value into the Valve Airflow field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Current Actuator Voltage	Read Only	Live reading of the voltage being supplied to the actuator.
Current Valve Airflow	Read Only	Live reading of the airflow being reported by the Venturi Valve.
Current Valve Pressure	Read Only	Live reading of the pressure across the Venturi Valve. **NOTE:** Pressure drop is crucial to optimal performance of the Venturi Valve. Ensure the valve is within its operating limits during balancing.
Scale	0.5 to 2.0	Scales PACE's airflow reading by a multiplication. E.g. If PACE displays 1000 CFM and TAB measures 1050 CFM, set the Scale to 1.05. **NOTE:** This should be the primary balancing tool.
Airflow Offset (CFM)	-1000 to 1000	Offsets PACE's airflow reading by a set increment. E.g. If PACE displays 230 CFM and TAB measures 250 CFM, set the Offset to +20 CFM. **NOTE:** This should be a secondary balancing tool.

NOTES:

- Ensure any scale or offset values are saved before exiting the menu. If the values are not saved, then they will need to be re-entered.
- Airflow Overrides are only available with PACE firmware v1.1.1 or later.



Edit Curve *(VV)*

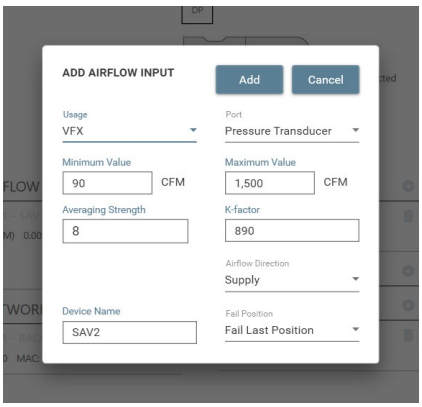
The edit curve menu is used to adjust the POT curve loaded onto PACE. The main use for the edit curve menu is for Venturi Valve Retrofit (VVR) kits.

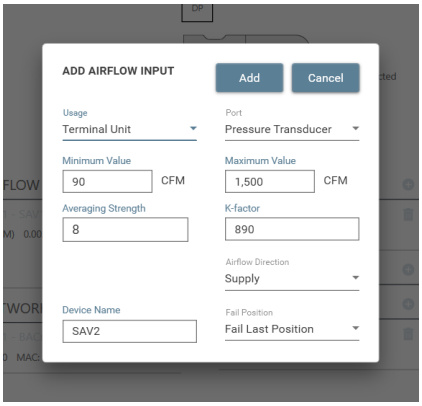
For replacement POT curves, contact Antec Controls Applications.

Variable Name	Available Options/Range	Description
Excitation Voltage	Controller Dependent	Allows the user to input the excitation voltage. **NOTE:** The excitation voltage for PACE is 3.3 VDC.
Scale	On/Off	Click to scale a POT curve to an excitation voltage of 3.3 VDC. When selected, the POT curve voltage values will change to correspond with an excitation voltage of 3.3 VDC. **NOTES:** • The voltage values will change when scaling the POT curve. • The scaling function is only required when the original excitation voltage differs from 3.3 VDC.

NOTES:

- The curve point flow and voltage values must be equal or increase from Point #1 to #8.
- When configuring VVR kits the POT curve and excitation voltage are input in this menu.





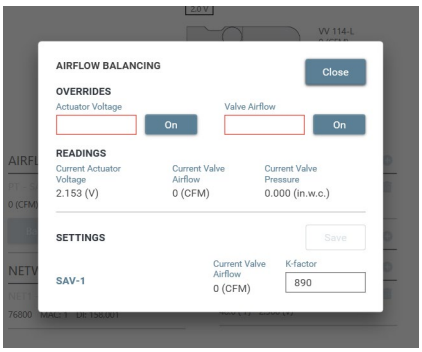
Airflow Input *(VFX/TU)*

Below are the settings associated with configuring a Venturi FX (FX) or terminal unit (TU) airflow input. The following settings are available if the TYPE is set to VFX or TU.

Variable Name	Available Options/Range	Description
Port	Pressure Transducer	The physical port where the pressure transducer for the VFX or TU is connected. This pressure will be used to calculate the airflow through the valve using the following equation: $$Q = K * \sqrt{dP}$$ **NOTE:** The on-board pressure transducer must be used for VFX or TU applications.
Minimum Value	0	Limits the minimum operating range of the valve. Typically set to the minimum of the valve.
Maximum Value	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the maximum of the valve.
Averaging Strength	0 to 30	Sets the amount of averaging done by the FVM on valve pressure readings. **NOTE:** An averaging strength that is too low may result in oscillation. An averaging strength that is too high may result in slow speed of response.
K-factor	0 to 15000	Sets the K-factor of the valve. The K-factor will be adjusted based on the TAB airflow measurements. **NOTE:** Reference the product literature for the airflow device to determine the factory K-factor. The VFX factory K-factors can be found in the product manual on the Antec Controls website.
Airflow Direction	Exhaust Supply	Flow direction of the valve being controlled.
Device Name	19 characters	The name for the airflow device. **NOTE:** This name will display on BACnet as part of the Analog Values for the flow reading.
Fail Position	Fail Last Position Fail Fully Open Fail Fully Closed	Sets the fail position for the airflow device if a PACE controller goes offline on the RIN network.

CAUTION

Ensure the valve's operation is not limited by the minimum flow or maximum flow. In rooms with fume hoods where the valve may have to modulate based on fume hood usage, the valve may need to exceed the design flows in the design documents in order to maintain the room's flow offset.



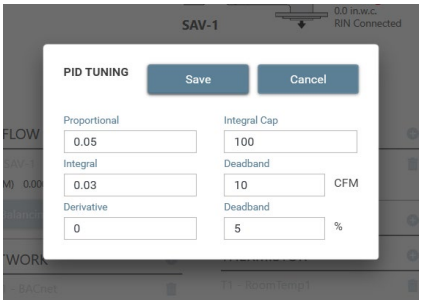
Balancing *(VFX/TU)*

The balancing menu is used to adjust the Venturi FX (FX) or terminal unit (TU) reading on PACE to match a Test and Balance (TAB) reading.

Variable Name	Available Options/Range	Description
Actuator Voltage Override	0 to 10.5 Volts On/Off	Provides the user with a voltage override to drive the actuator to a set position. Enter the desired voltage override value into the Actuator Voltage field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Valve Airflow Override	No Limits On/Off	Provides the user with a valve airflow override to set the valve to a specific flow. Enter the desired airflow override value into the Valve Airflow field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Current Actuator Voltage	Read Only	Live reading of the voltage being supplied to the actuator.
Current Valve Airflow	Read Only	Live reading of the airflow being reported by the Airflow Valve.
Current Valve Pressure	Read Only	Live reading of the pressure across the Airflow Valve. **NOTE:** Pressure drop is crucial to optimal performance of the Venturi Valve. Ensure the valve is within its operating limits during balancing.
K-factor	0 to 15000	Sets the K-factor of the valve. The K-factor will be adjusted based on the test and balancer airflow measurements using the following formula: $$(New\ K) = \frac{TAB\ reading}{PACE\ reading} * (Starting\ K)$$ **NOTE:** Reference the product literature for the airflow device to determine the factory K-factor. The VFX factory K-factors can be found in the product manual on the Antec Controls website.

NOTES:

- Ensure the K-factor value is saved before exiting the menu. If the value is not saved, then it will need to be re-entered.
- Airflow Overrides are only available with PACE firmware v1.1.1 or later



PID Tuning *(VFX/TU)*

The PID tuning menu allows for the adjustment of proportional, integral and derivative values for the Venturi FX (FX) or terminal unit (TU).

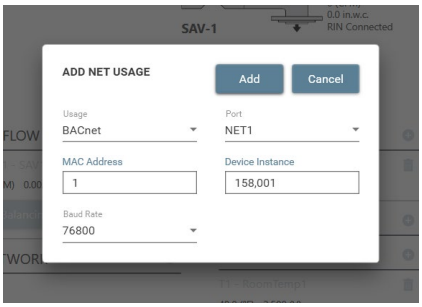
For supplementary information on adjusting PID settings for blade damper control contact Antec Controls Applications.

Variable Name	Available Options/Range	Description
Proportional	No Limits	Sets the proportional gain value used to control the damper blade.
Integral	No Limits	Sets the integral value used to control VFX damper blade.
Derivative	No Limits	Sets the derivative value used to control VFX damper blade.
Integral Cap	No Limits	Sets the limit for the integral term of the PID settings used to control damper blade.
Deadband	0 to 30 CFM and 0 to 10%	Sets the deadband for the CFM control through the valve. PACE will determine whether the control is in the deadband based on the larger of the CFM or % values. **NOTE:** The % deadband is based on the % of current flow target. If PACE is targeting 1000 CFM and the deadband is 5% of 1000 CFM, it will maintain position until the reading goes outside of the range between 950 – 1050 CFM.

NOTE: Before adjusting the proportional, integral and derivative values contact Antec Controls Applications for instructions.

Network

This section details configuration instructions and available settings for networks including BACnet, the Fume Hood Network (FHN) and the Sensor Information Network (SIN).



BACnet

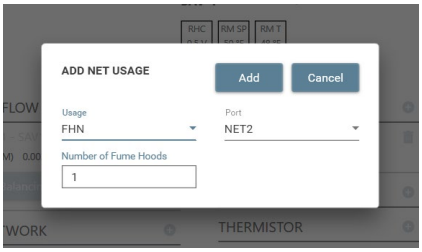
BACnet is the communication protocol used to provide the Building Automation System (BAS) with information about how the room is currently functioning. Additionally, it provides overrides from the BAS to control certain functions within the room.

The following settings are available if the Network Type is **BACnet**.

Variable Name	Available Options/Range	Description
Port	NET1 NET2	Choose the configurable network port where BACnet is physically wired to the PACE.
MAC Address	1 to 127	The MAC address is used locally on the MS/TP segment to physically address devices. The MAC address is not passed through routers. **NOTE:** This must be unique for each device within the MS/TP segment.
Device Instance	1 to 4,194,303	Whether on an MS/TP segment or IP network, the device instance is the logical address that matters to BACnet. **NOTE:** This must be a unique address throughout the entire facility.
Baud Rate	9,600 19,200 38,400 76,800	The rate at which information is transferred over the BACnet network. **NOTE:** All devices on a BACnet segment must be set to communicate at the same Baud Rate.

NOTES:

- Only one BACnet connection is allowed per RIN network.
- All BACnet points for the room will go through the one connection.



Fume Hood Network (FHN)

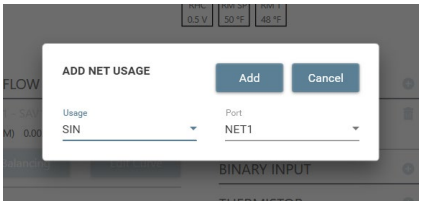
The FHN allows PACE to communicate with the FHCs in the room so they can be included in the room's flow offset calculation and also provide diagnostic information for the FHC using the same BACnet connection as the RIN network.

The following settings are available if the Network Type is **FHN**.

Variable Name	Available Options/Range	Description
Port	NET1 NET2	Choose the configurable network port where FHN is physically wired to the PACE.
Number of Fume Hoods	1 to 16	Select the number of fume hoods that reside on the physical FHN. **NOTE:** A maximum of 16 fume hoods are allowed on one Fume Hood Network.

NOTES:

- Only one FHN connection is allowed per RIN network.
- Addressing for the FHCs that are communicating on FHN must be done in the FHC setup.



Sensor Information Network (SIN)

Sensor Information Network (SIN) allows PACE to communicate with any SIND devices used in the room. This includes the SIN Room Pressure Sensor (SRPS), which can be used to either monitor or control room pressure in a space.

The following settings are available if the Network Type is **SIN**.

Variable Name	Available Options/Range	Description
Port	NET1 NET2	Choose the configurable network port where SIN is physically wired to the PACE.

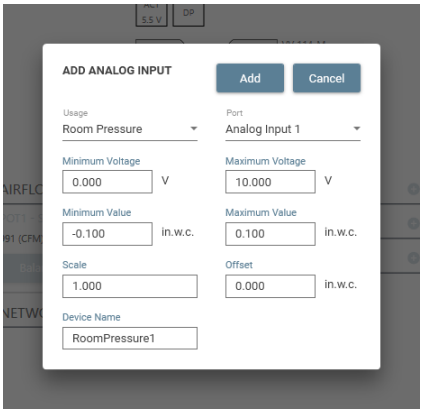
NOTES:

- Only one SIN connection is allowed per RIN network.
- SIN can support up to three SIND devices on each individual network.

Analog Inputs

This section details configuration instructions and available settings for analog inputs including room pressure, temperature setpoint, humidity, CO_2, VOC, duct pressure, room temperature, DAT, air temperature, ACH, monitored airflow and controlled airflow.

NOTE: A maximum of four analog inputs are configurable per PACE.

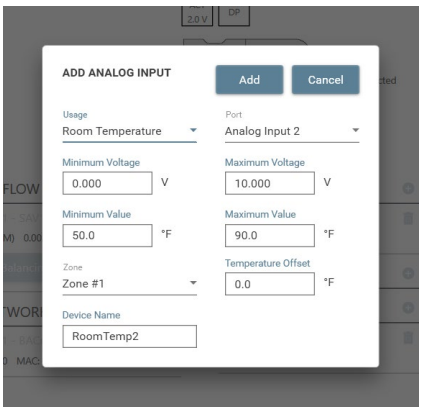


Room Pressure

Room pressure can be used for either monitoring or controlling the pressure differential in a given room.

The following settings are available if the Usage is **Room Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Scale	0.5 to 2.0	Scales PACE's pressure reading by a multiplication. E.g. If PACE displays 0.01 in.w.c. and TAB measured 0.011 in.w.c., set the scale to 1.1. **NOTE:** This should be the primary balancing tool.
Offset	-0.005 to +0.005 in.w.c.	Offsets PACE's pressure reading by a set increment. E.g. If PACE displays 0.00 in.w.c. and TAB measures -0.002 in.w.c., set the offset to -0.002 in.w.c.. **NOTE:** This should be a secondary balancing tool.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

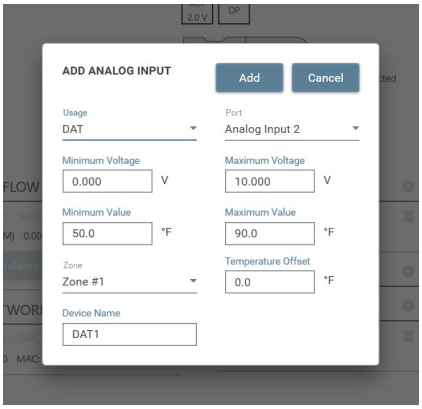


Room Temperature

This room temperature reading is used in the temperature control sequence for the configured temperature zone.

The following settings are available if the Usage is **Room Temperature**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Room Temperature input to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

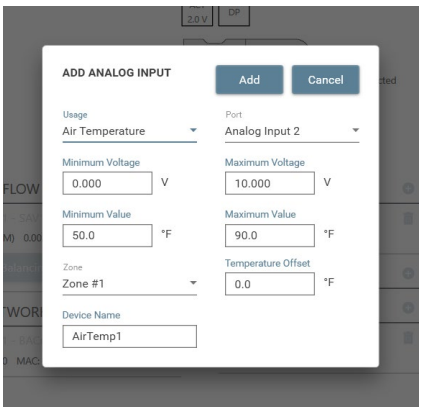


Discharge Air Temperature (DAT)

DAT temperature is used to monitor or control the air temperature in the duct after the reheat device. When using temperature control with DAT limits, this reading is used for control purposes.

The following settings are available if the Usage is **DAT**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the DAT to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

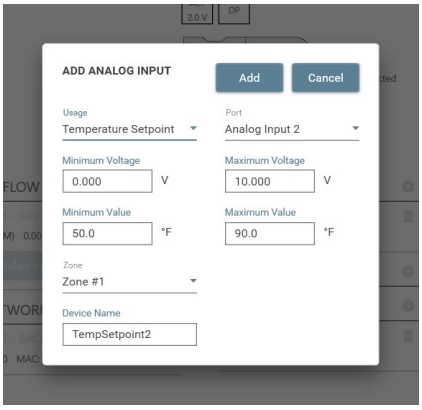


Air Temperature

Air temperature inputs are not used in the control for the room, but can be used to monitor air temperature. This may be useful if the entering air temperature to the reheat device is required for monitoring.

The following settings are available if the Usage is **Air Temperature**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Temperature Setpoint input to control the setpoint in either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

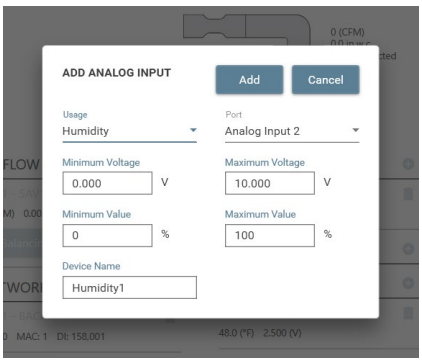


Temperature Setpoint

Temperature Setpoint is used to drive the temperature in the room either hotter or colder based on a locally adjusted input from the room user.

The following settings are available if the Usage is **Temperature Setpoint**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Temperature Setpoint input to control the setpoint in either Zone #1, #2, or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



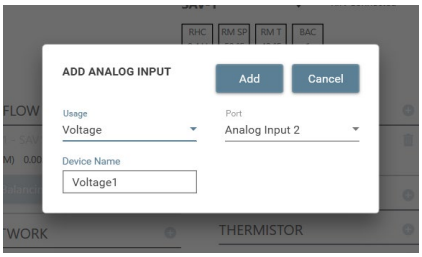
Humidity

Humidity is used when PACE is required to monitor a humidity reading in either a room or in the duct.

The following settings are available if the Usage is **Humidity**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: CAVA and PACE support humidity monitoring only.

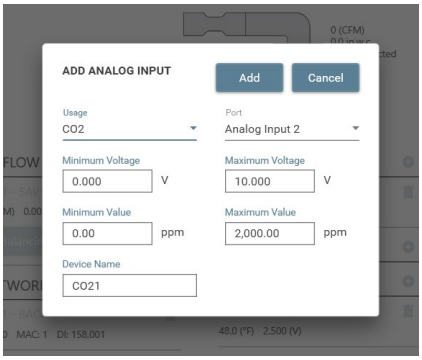


Voltage

A Voltage input is typically used when PACE is required to monitor a generic voltage input. This may be used if a voltage usage is not supported by PACE, but requires to be monitored by the facility on BACnet.

The following settings are available if the Usage is **Voltage**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



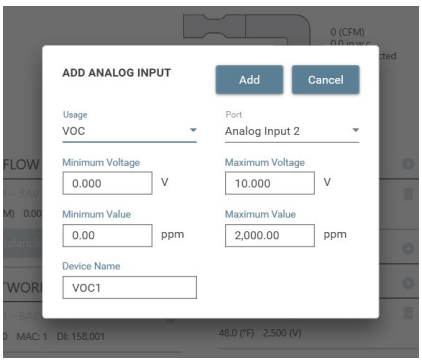
CO_2

CO_2 is used to monitor the carbon dioxide levels in a room.

The following settings are available if the Usage is **CO_2**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: PACE supports CO_2 monitoring only.



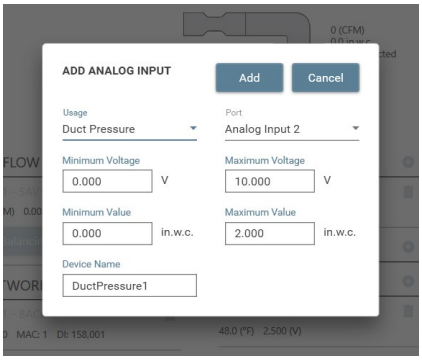
VOC

Volatile Organic Compounds (VOC) are used to monitor contaminants in the air.

The following settings are available if the Usage is **VOC**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: PACE supports VOC monitoring only.



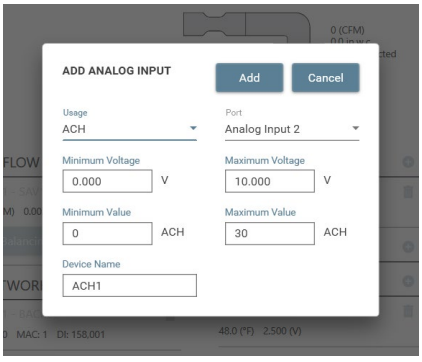
Duct Pressure

Duct pressure monitoring may be useful in determining if the duct static pressure is in an acceptable range so the airflow device can effectively control airflow.

The following settings are available if the Usage is **Duct Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: PACE supports duct pressure monitoring only.

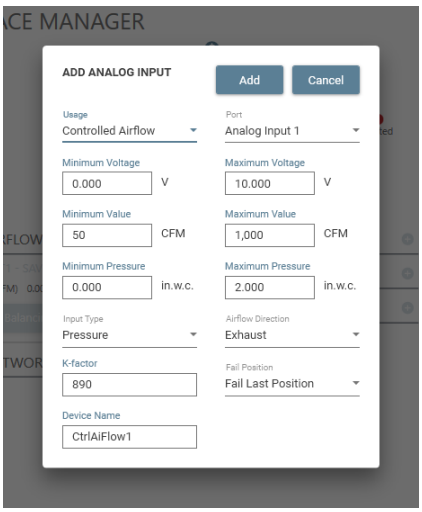


Air Changes per Hour (ACH)

An ACH demand input is required to configure the room for Demand Control Ventilation (DCV). This is not an ACH calculation for the room.

The following settings are available if the Usage is **ACH**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



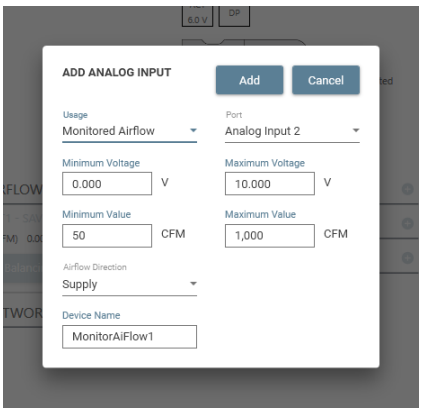
Controlled Airflow

A Controlled Airflow input is used when PACE is measuring and controlling a blade damper airflow device to maintain an airflow setpoint not using the on-board transducer.

The following settings are available if the Usage is **Controlled Airflow**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Minimum Value	0	Limits the minimum operating range of the valve. Typically set to the full minimum of the valve. **NOTE:** Reference the product literature for minimum flow requirements of the device. VFX flow ranges can be found in the product manual on the Antec Controls website.
Maximum Value	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the full maximum of the valve. **NOTE:** Reference the product literature for maximum flow requirements of the device. VFX flow ranges can be found in the product manual on the Antec Controls website.
Maximum/Minimum Pressure	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Input Type	Pressure	The type of input signal being provided to the PACE.
Airflow Direction	Exhaust Supply	Flow direction of the valve being controlled.
K-factor	0 to 15000	Sets the K-factor of the valve. The K-factor will be adjusted based on the TAB airflow measurements. **NOTE:** Reference the product literature for the airflow device to determine the factory K-factor. The VFX factory K-factors can be found in the product manual on the Antec Controls website.
Fail Position	Fail Last Position Fail Fully Open Fail Fully Closed	Sets the fail position for the airflow device if a PACE controller goes offline on the RIN network.
Device Name	19 characters	The name for the airflow device. **NOTE:** This name will display on BACnet as part of the Analog Values for the flow reading.

NOTE: PACE supports Controlled Airflow devices with a pressure input signal only. The pressure transducer must output a linear pressure signal.



Monitored Airflow

A Monitored Airflow input is typically used when PACE requires the airflow of a valve controlled by others for total airflow and offset calculations.

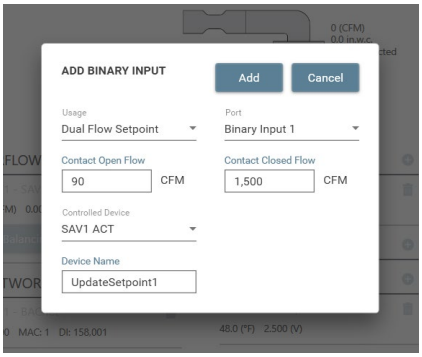
The following settings are available if the Usage is **Monitored Airflow**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to the PACE.
Airflow Direction	Exhaust Supply	Flow direction of the valve monitored by the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

Binary Inputs

This section details configuration instructions and available settings for binary inputs including dual flow setpoint switches, room mode switches, indicators, door contact switches, add static flows and generic binary inputs.

NOTE: A maximum of two binary inputs are configurable per PACE.

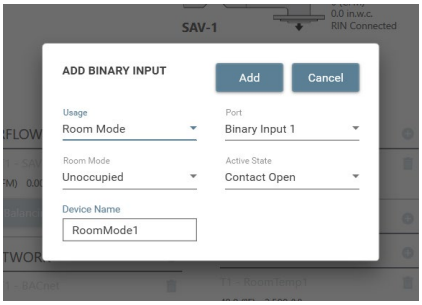


Dual Flow Set Point

Dual Flow Setpoint is used to control an auxiliary airflow device which has a VAV actuator and a PACE. The Binary Input will receive either a closed or open signal to change the setpoint for the auxiliary valve.

The following settings are available if the Usage is **Dual Flow Setpoint**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Contact Open Flow	Minimum to Maximum Range of Valve	Configures the flow set point when the binary input is in its open position.
Contact Closed Flow	Minimum to Maximum Range of Valve	Configures the flow setpoint when the binary input is in its closed state.
Controlled Device	Changes depending on Airflow Devices	This will be the Airflow Device that is controlled to the two different airflow setpoints. Any airflow devices configured with an actuator that are not already associated with a Dual Flow Setpoint BI will be available from the dropdown.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



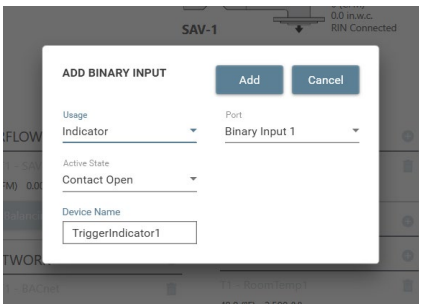
Room Mode

The Room Mode usage is used to switch to custom room modes based on a contact closure input signal. This may include Emergency Modes or Unoccupied Modes.

The following settings are available if the Usage is **Room Mode**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Room Mode	All room modes configured in the room mode manger menu (Excluding the Default Room Mode)	Sets the room mode that is activated when the binary input is in its active state.
Active State	Contact Open Contact Closed	When Active State is configured to Contact Open, an open contact will trigger a change in room mode. When Active State is configured to Contact Closed, a closed contact will trigger a change in room mode.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: The room mode to be configured for the input must first be created in the Room Mode Manager before it will be available for selection.



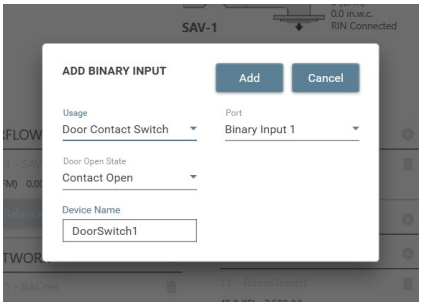
Indicator

The Indicator binary input is used to trigger an indicator based on a contact closure input.

The following settings are available if the Usage is **Indicator**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Active State	Contact Open Contact Closed	When Active State is configured to Contact Open, an open contact will trigger the indicator. When Active State is configured to Contact Closed, a closed contact will trigger the indicator.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: Navigate to the Indicators page after configuring your BI to establish which room modes the user would like the binary input to be active in.

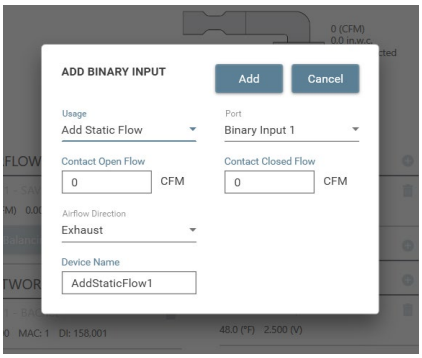


Door Contact Switch

Door Contact Switches can be used to monitor whether a door is open or closed. When a door contact switch is configured in conjunction with pressure control, the PID control will be paused while the door is open. If only used for monitoring, the door can also trigger an indicator if it is left open for too long.

The following settings are available if the Usage is **Door Contact Switch**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Door Open State	Contact Open Contact Closed	When Door Open State is configured to Contact Open, an open contact will signal an Open Door. When Door Open State is configured to Contact Closed, a closed contact will signal an Open Door.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

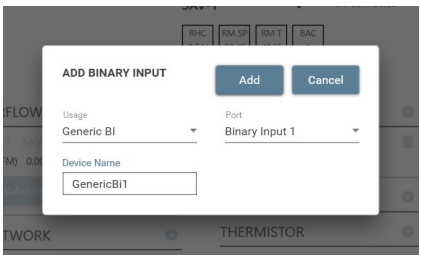


Add Static Flow

Add Static Flow is used with an auxiliary airflow device that has a 2-position actuator but no PACE. The static flow binary input adds a set amount of airflow to the room's total flow calculation based on the contact closure.

The following settings are available if the Usage is **Add Static Flow**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Contact Open Flow	Minimum to Maximum Range of Valve	Configures the airflow setpoint when the binary input is in its open state.
Contact Closed Flow	Minimum to Maximum Range of Valve	Configures the airflow setpoint when the binary input is in its closed position.
Airflow Direction	Exhaust Supply	Airflow direction of the auxiliary valve.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



Generic BI

Generic BI does not have any control functionality in the room's operation, but can be used to monitor external devices such as pressure switches to trigger alarms on BACnet or in the room.

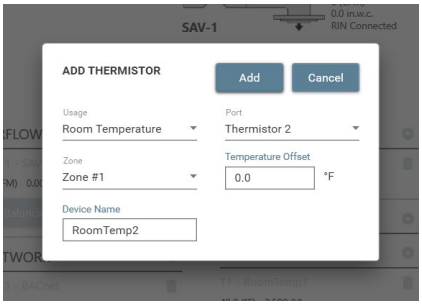
The following settings are available if the Usage is **Generic BI**.

Variable Name	Available Options/Range	Description
Port	Binary Input 1 Binary Input 2	Choose the Binary Input port where the device is physically wired to the PACE.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

Thermistors

This section details configuration instructions and available settings for thermistor inputs including room temperature, DAT and air temperature.

NOTE: A maximum of two thermistor inputs are configurable per PACE.

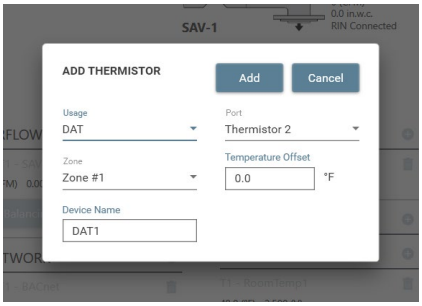


Room Temperature

This room temperature reading is used in the temperature control sequence for the configured temperature zone.

The following settings are available if the Usage is **Room Temperature**.

Variable Name	Available Options/Range	Description
Port	Thermistor 1 Thermistor 2	Choose the Thermistor Input port where the device is physically wired to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Room Temperature input to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

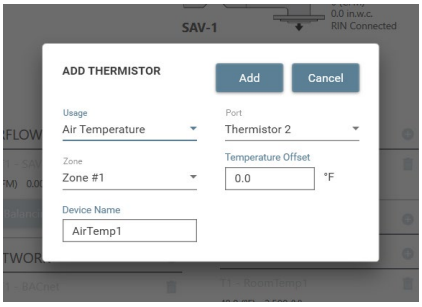


Duct Air Temperature (DAT)

DAT temperature is used to monitor or control the air temperature after the reheat device. When using temperature control with DAT limits, this reading is used for control purposes.

The following settings are available if the Usage is **DAT**.

Variable Name	Available Options/Range	Description
Port	Thermistor 1 Thermistor 2	Choose the Thermistor Input port where the device is physically wired to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the DAT to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



Air Temperature

Air temperature inputs are not used in the control for the room, but can be used to monitor air temperature. This may be useful if the entering air temperature to the reheat device is required for monitoring.

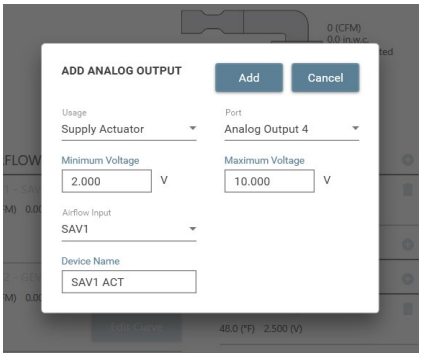
The following settings are available if the Usage is **Air Temperature**.

Variable Name	Available Options/Range	Description
Port	Thermistor 1 Thermistor 2	Choose the Thermistor Input port where the device is physically wired to the PACE.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Air Temperature to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

Analog Outputs

This section details configuration instructions and available settings for analog outputs including supply and exhaust actuator, reheat, room pressure, valve pressure, valve airflow, cooling and auxiliary heater devices.

NOTE: A maximum of four analog outputs are configurable per PACE.



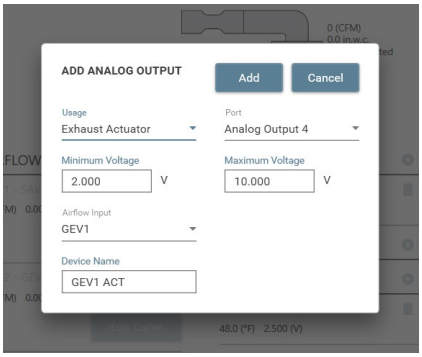
Supply Actuator

The Supply Actuator output is used to control the supply airflow device to meet the target airflow setpoint.

The following settings are available if the Usage is **Supply Actuator**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the actuator. **NOTE:** The Belimo actuators used by Antec Controls have a 2-10 VDC range.
Airflow Input	Supply airflow devices configured on same PACE	Set the airflow device that this actuator is meant to control. **NOTE:** When using triple venturi valves, there are two actuators and two airflow devices. Make sure the actuator being configured is set to control the correct valve in the assembly.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The Supply Actuator option is disabled and cannot be selected when an exhaust valve is configured in the airflow device menu.



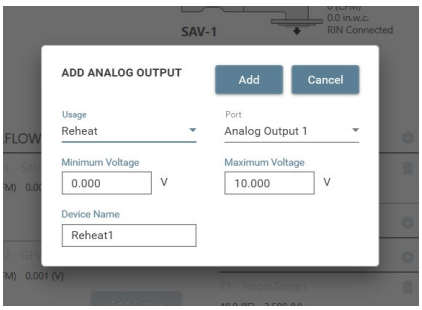
Exhaust Actuator

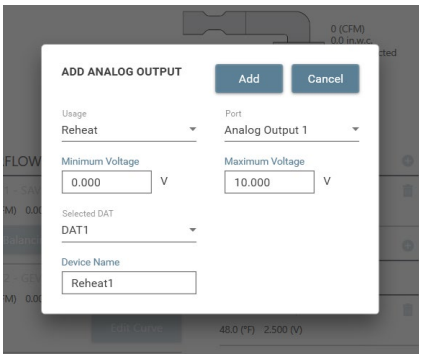
The Exhaust Actuator output is used to control the exhaust airflow device to meet the target airflow setpoint.

The following settings are available if the Usage is **Exhaust Actuator**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to PACE.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the actuator. **NOTE:** The Belimo actuators used by Antec Controls have a 2-10 VDC range.
Airflow Input	Exhaust airflow devices configured on the same PACE.	Allows user to set which valve the actuator is attached to.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The Exhaust Actuator option is disabled and cannot be selected when a supply valve is configured in the airflow device menu.





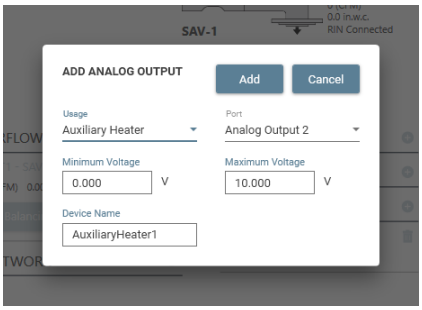
Reheat

Reheat devices are primarily used to control Electric Coils or Hot Water Coils, but can be used for any analog heating device.

The following settings are available if the Usage is **Reheat**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the heating device. **NOTE:** Check the reheat actuator specifications to input the correct voltage range.
Selected DAT	DAT Inputs configured on PACE	When using Space Temperature Control w/ DAT Limits, the Reheat Output must be associated with a DAT Input. **CAUTION** It is recommended that the Space Temperature Control w/ DAT Limits sequence is configured prior to the Reheat Analog Output. If the sequence is changed after the Output is configured, the user will have to reconfigure the Reheat Output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: When using firmware version v1.1.0 or earlier, the room will be limited to a maximum of five Heating/Cooling output devices.



Auxiliary Heater

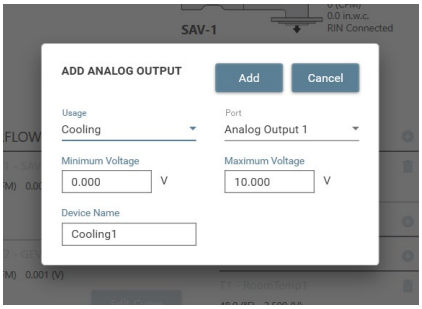
Auxiliary Heater devices can only be used when using Space Temperature Control w/ DAT Limits for devices that does not have a DAT reading, such as baseboard heaters.

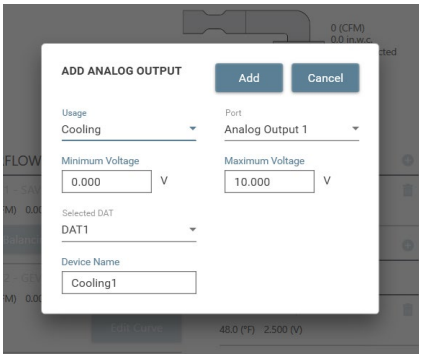
The following settings are available if the Usage is **Auxiliary Heater**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the auxiliary heater device. **NOTE:** Check the heater specifications to input the correct voltage range.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTES:

- Auxiliary Heater devices are only available with PACE firmware v2.0.4 or later.
- Auxiliary Heater devices can only be added when Space Temperature Control w/ DAT Limits is selected as the Temperature Sequence.
- Auxiliary Heater devices can only be added when at least one Reheat device with an associated DAT device is configured.





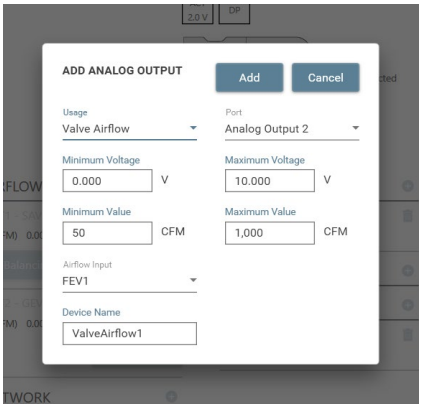
Cooling

Cooling devices are primarily used to control cooling coils.

The following settings are available if the Usage is **Cooling**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the cooling device. **NOTE:** Check the cooling actuator specifications to input the correct voltage range.
Selected DAT	DAT Inputs configured on PACE	When using Space Temperature Control w/ DAT Limits, the Cooling Output must be associated with a DAT Input. **CAUTION** It is recommended that the Space Temperature Control w/ DAT Limits sequence is configured prior to the Cooling Analog Output. If the sequence is changed after the Output is configured, the user will have to reconfigure the Cooling Output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: When using firmware version v1.1.0 or earlier, the room will be limited to a maximum of five Heating/Cooling output devices.

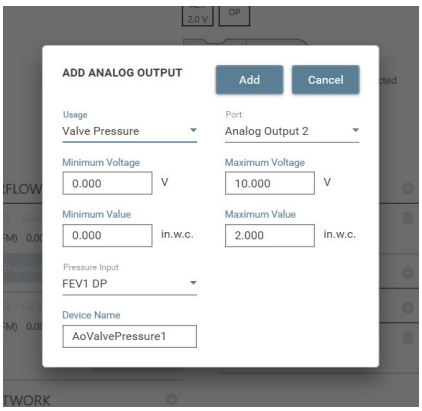


Valve Airflow

Valve Airflow can be used to output a voltage signal for current airflow reading from a valve on the RIN network. This may be used when providing the signal to a third party controller.

The following settings are available if the Usage is **Valve Airflow**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from the PACE.
Airflow Input	All Airflow Devices on RIN	Selects valve airflow measurement to which the output is linked.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

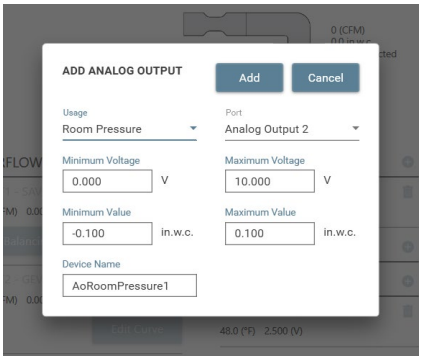


Valve Pressure

Valve Pressure can be used to output a voltage signal for the differential pressure measurement across the Venturi Valve. This may be used when providing the signal to a third party controller.

The following settings are available if the Usage is **Valve Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from the PACE.
Pressure Input	All Venturi Valve pressure devices on RIN	Selects valve pressure measurement to which the output is linked.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

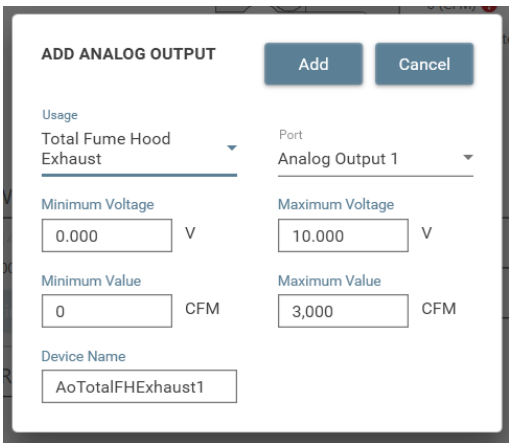


Room Pressure

Used to output the current room pressure reading via an analog signal. Primarily used when a third party device requires a room pressure reading from PACE. For example, a Room Pressure Sensor (SRPS) can be configured with PACE to measure the room pressure, this usage then outputs that reading as an analog signal.

The following settings are available if the Usage is **Room Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from the PACE.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from the PACE.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



Total Fume Hood Exhaust

Total Fume Hood Exhaust can be used to output a voltage signal for the total fume hood airflow reading from all fume hood valves on the RIN network. This may be used when providing the signal to a third party controller.

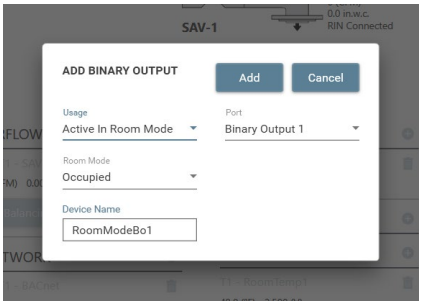
The following settings are available if the Usage is **Total Fume Hood Exhaust**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to the PACE.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from PACE.
Maximum/Minimum Value	Range of Total Fume Hood Exhaust	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from PACE.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

Binary Outputs

This section details configuration instructions and available settings for binary output devices including room mode, room indicator.

NOTE: A maximum of two binary outputs can be configured per PACE.



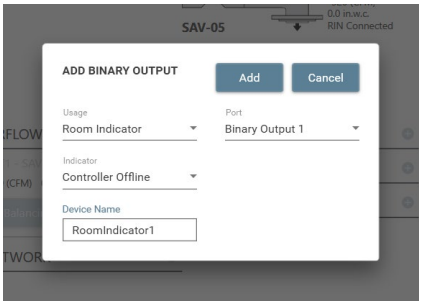
Active in Room Mode

Active in Room Mode will trigger the binary output on the selected PACE when in a particular room mode.

The following settings are available if the Usage is **Active in Room Mode**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to the PACE.
Room Mode	All room modes configured in the room mode manger menu	Sets the room mode that triggers an active signal on the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The room mode to be configured for the output must first be created in the Room Mode Manager before it will be available for selection.

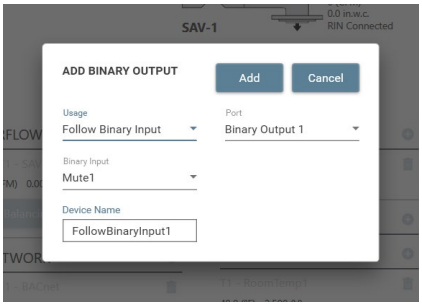


Room Indicator

Room Indicator will activate the binary output when the selected indicator is triggered. This may be used for a hard-wired signal to a third party alarming system, or to trigger an indicator in the room.

The following settings are available if the Usage is **Room Indicator**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to the PACE.
Indicator	All indicators	Sets the indicator that triggers an active signal from the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



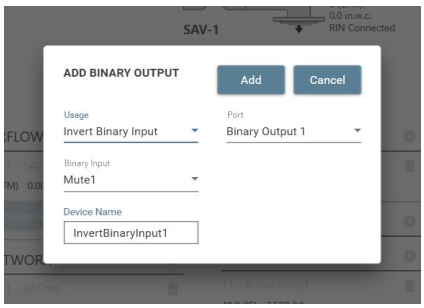
Follow Binary Input

Follow Binary Input will activate when the configured binary input is in the open state, and deactivate when the configured binary input is in the closed state.

The following settings are available if the Usage is **Follow Binary Input**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to the PACE.
Binary Input	All configured binary inputs	Sets the binary input that the binary output will follow.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The binary input to be configured for the output must first be configured in the PACE Manager menu before it will be available for selection.



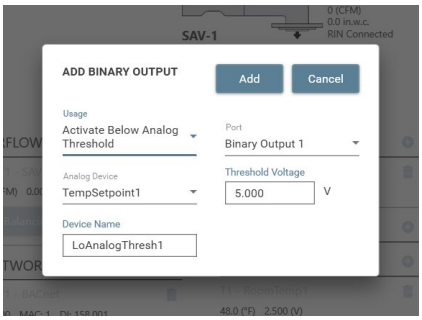
Invert Binary Input

Invert Binary Input will activate when a configured binary input is in the closed state, and deactivate when the configured binary input is in the open state.

The following settings are available if the Usage is **Invert Binary Input**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to the PACE.
Binary Input	All configured binary inputs	Sets the binary input that the binary output will follow.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The binary input to be configured for the output must first be configured in the PACE Manager menu before it will be available for selection.



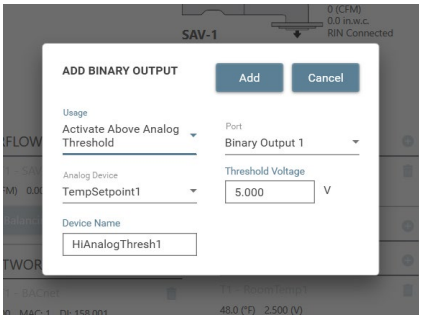
Activate Below Analog Threshold

Used to configure a binary output to activate when the configured analog device is lower than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Below Analog Threshold**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to the PACE.
Analog Device	All configured analog inputs and outputs	Sets the analog device that triggers the binary output when it is below the threshold voltage.
Threshold Voltage	0 to10 Volts	If the input or output voltage drops below this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device to be configured for the output must first be configured in the PACE Manager menu before it will be available for selection.



Activate Above Analog Threshold

Used to configure a binary output to activate when the configured analog device is higher than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Above Analog Threshold**.

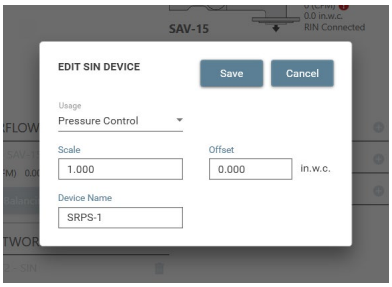
Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Sets the port that corresponds to the activate above AI threshold wiring to the PACE.
Analog Device	All configured analog inputs and outputs	Sets the analog device that triggers the binary output when it is above the threshold voltage.
Threshold Voltage	0 to 10 Volts	If the input or output voltage rises above this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device input to be configured for the output must first be configured in the PACE Manager menu before it will be available for selection.

Sensor Information Network (SIN) Devices

The SIN menu is used to configure SIN devices for the selected PACE. Up to three SIN devices can be added to a SIN network in a room.

NOTE: To modify a SIN device, the SIN network must be added using the Network Menu. Once connected, any Room Pressure Sensors that are detected will appear underneath SIN devices.



SIN Device

After the SIN device(s) have been discovered on the network, the user will be able to choose the functionality for each of the devices that were discovered.

The following settings are available for each SIN device on the network.

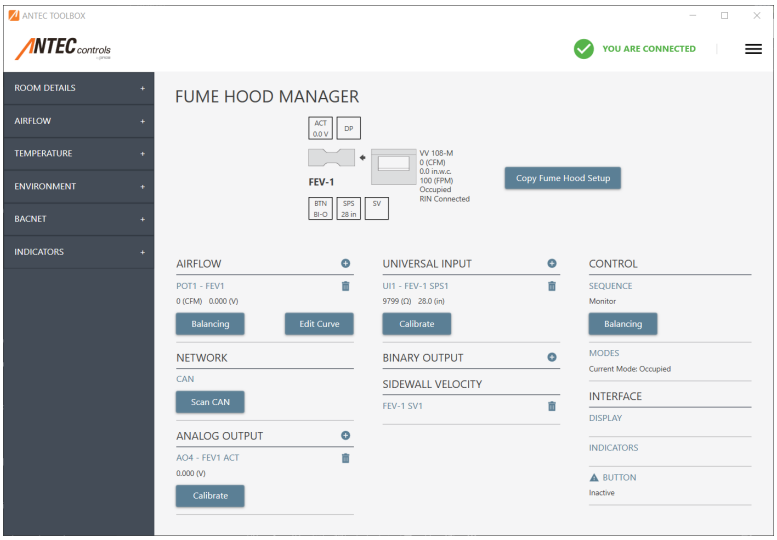
Variable Name	Available Options/Range	Description
MAC Address	Read Only	Displays the unique MAC Address for the sensor.
Usage	Pressure Control Pressure Monitor	Sets the functionality for the SIN device to either monitor or control room pressure.
Scale Factor	0.5 to 2.0	Scales PACE's pressure reading by a multiplication. E.g. If PACE displays 0.01 in.w.c. and TAB measured 0.011 in.w.c., set the scale to 1.1. **NOTE:** This should be the primary balancing tool.
Offset	-0.005 to +0.005 in.w.c.	Offsets PACE's pressure reading by a set increment. E.g. If PACE displays 0.00 in.w.c. and TAB measures -0.002 in.w.c., set the offset to -0.002 in.w.c.. **NOTE:** This should be a secondary balancing tool.
Device Name	19 Characters	Assigns a name to this SIN device. **NOTE:** This name will display in the BACnet object name.

NOTE: When using more than one SIN device for Room Pressure measurement, configuring the use of all three readings is done in the Airflow Sequence section of the Room Sequence Manager page.

Fume Hood Manager

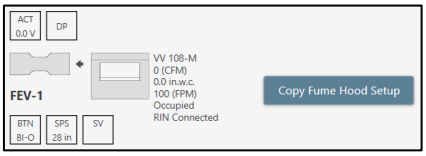
When on the Home Screen, click on the fume hood that requires configuration to open the Fume Hood Manager Menu.

This menu allows the user to configure devices for airflow, BACnet, inputs, outputs, sidewall velocity, control and interface for the selected CAVA and any associated FVM or SVS modules.



Controller Information

The top of the page shows a brief overview of the fume hood and all its configured devices.



Controller Information

Whenever the user adds a device to the controller, it will create a card. The cards will display above and below the valve's image with the live readings from the input or output.

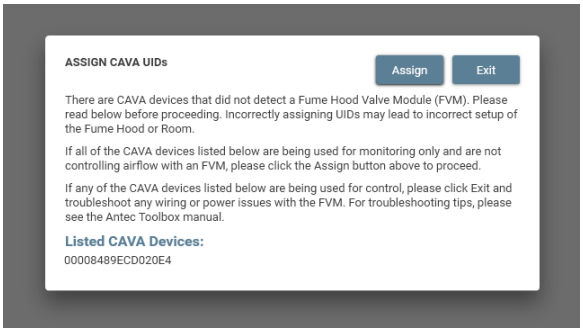
NOTE: The graphic on the Home Screen will display the same image shown here, including the cards.

Live updates to the right of the fume hood will show the following:

- Model information from the valve's linestring (e.g. VV-114-M indicates a single size 14 Venturi Valve designed for medium pressure operation)
- Airflow reading
- Differential pressure from the onboard pressure sensor
- Face velocity reading
- Fume hood mode
- Connection Status
  - RIN Connected = operating normally
  - RIN Unstable = intermittent RIN connection
  - RIN Offline = no RIN connection
  - Network Fault = error with either NET1 or NET 2. Will show BACnet, NET1 or NET2 fault depending on the usage of the network port where the error is detected

NOTES:

- The controller's name (e.g. FEV-1) and the image (VV, VFX or TU) for the valve will auto-populate using the valve information from the valve's linestring stored on the FVM. If there is no FVM present upon first connection to the controller (or if CAVA is being used to monitor face velocity without an FVM), they will be prompted with the screen below to assign a UID to CAVA.



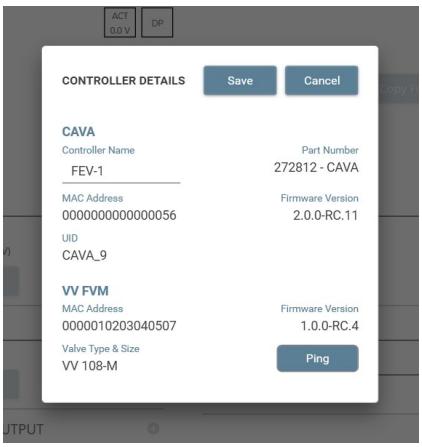
- RIN connection errors will take priority over the Network Fault status. If RIN Unstable, RIN Offline, or Network Fault is observed, please refer to the Troubleshooting section of this manual.

Copy Fume Hood Setup

When more than one CAVA are present in a room, the option to copy a fume hood setup will become available. This will copy the current fume hood configuration from the selected fume hood to any other fume hoodin the room.

CAUTION

When a room configuration is being saved, RIN connection will intermittently say RIN Offline while controllers power cycle.



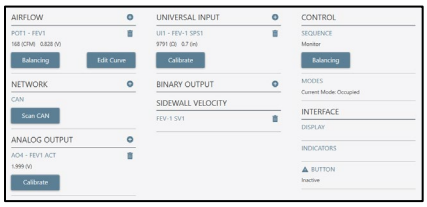
Controller Details

The controller details menu displays important information about the fume hood devices. Access the menu by clicking on the picture of the fume hood and valve in the Fume Hood Manager menu.

Variable Name	Description
Controller Name	Allows the user to edit the controller name that appears in Toolbox. The controller's name will also display on BACnet as a pre-fix to UI, AO, and BO objects. **NOTE:** The Controller Name is limited to 15 characters.
MAC Address	Displays the unique MAC for the module provided by Antec Controls.
UID	A Unique Identifier used to identify each controller on the RIN network. This UID comes from an FVM that is connected to the controller, or from the controllers MAC address if no FVM is present.
Part Number	The Antec Controls part number for CAVA firmware.
Firmware Version	Current firmware running on each module.
Valve Type & Size	Displays the valve type and size loaded from the valve's linestring.
Ping	The Ping button is used to identify an individual device. The LED on the selected device will begin flashing green when the Ping function is activated. **NOTE:** Ping only works for modules that are configured and have a solid green light.

Devices

Any inputs/outputs that are configured on a fume hood are referred to as Devices.



Devices

Many device types are configurable for the selected fume hood:

Variable Name	Description
Airflow	Configure the controlled valve. VV and VFX will be automatically configured with default settings from the linestring
Network	Configure NET1 for BACnet.
Universal Input	Configure multiple usages for UI1 – UI4 using various inputs.
Analog Output	Configure multiple usages for AO1 – AO4 using a 0 – 10 VDC output.
Binary Output	Configure multiple usages for BO1 and BO2 using a switchable ground output.
Sidewall Velocity	Configure multiple sidewall sensors to measure sidewall velocity.
Fume Hood Sequencing	Configure the control sequence for CAVA.
Fume Hood Modes	Configure control methods for fume hood modes.
Display	Configure display value and indicator preferences for the CAVA interface.
Indicators	Configure multiple fume hood parameters to activate alarms.
⚠ Button	Configure the emergency button to trigger a fume hood mode.

NOTE: Up to 15 devices can be configured per fume hood (excluding devices shown in the Network section).

Adding, removing, and editing devices:

- To add a device, click the  button.
- To edit a device's setup, click the device's name. 

- To remove a device, click the  button.

NOTE: Live readings are also visible for the device's input/output voltage or state and the value that corresponds to the particular usage that has been selected.

Airflow Devices

Airflow devices are required when CAVA is measuring and controlling an airflow control device to maintain a face velocity setpoint. These are only required for an input that is actively being measured and controlled by CAVA.

Instructions and settings for an airflow input for a Venturi Valve (VV), Venturi FX Valve (VFX) and terminal unit (TU) are below.

NOTE: The airflow device will come pre-configured based on the linestring for the valve. Typically, the airflow device will not require any configuration.

CAUTION

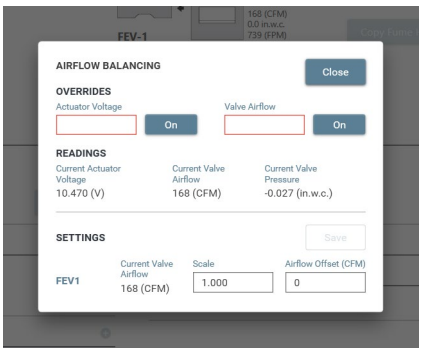
Ensure the valve's operation is not limited by the minimum flow or maximum flow.

Airflow Input *(VV)*

Below are the settings associated with configuring a Venturi Valve airflow input.

The following settings are available if the Usage is set to **VV**.

Variable Name	Available Options/Range	Description
Port	Potentiometer 1 Potentiometer 2	Choose the Potentiometer port where the device is physically wired to the FVM. **NOTES:** • Single and Dual VVs are wired with ONE POT on Potentiometer 1. • Triple VVs are wired with TWO POTS on Potentiometer 1 and 2 respectively.
Minimum Value	0	Limits the minimum operating range of the valve. Typically set to the full minimum of the valve.
Maximum Value	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the full maximum of the valve.
Device Name	19 characters	The name for the airflow device. **NOTE:** This name will display on BACnet as part of the Analog Values for the POT reading.
Fail Position	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a CAVA or PACE goes offline on the RIN network.

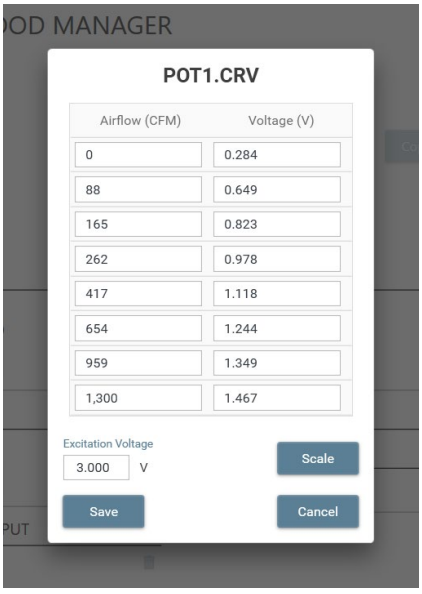


Balancing *(VV)*

The balancing menu is used to adjust the airflow reading from CAVA to match a Test and Balance (TAB) reading.

Variable Name	Available Options/Range	Description
Actuator Voltage Override	0 to 10.5 Volts On/Off	Provides the user with a voltage override to drive the actuator to a set position. Enter the desired voltage override value into the Actuator Voltage field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Valve Airflow Override	No Limits On/Off	Provides the user with a valve airflow override to set the valve to a specific flow. Enter the desired airflow override value into the Valve Airflow field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Current Actuator Voltage	Read Only	Live reading of the voltage being supplied to the actuator.
Current Valve Airflow	Read Only	Live reading of the airflow being reported by the Venturi Valve.
Current Valve Pressure	Read Only	Live reading of the pressure drop across the Venturi Valve. **NOTE:** Pressure drop is crucial to optimal performance of the Venturi Valve. Ensure the valve is within its operating limits during balancing.
Scale	0.5 to 2.0	Scales CAVA's airflow reading by a multiplication. E.g. If CAVA displays 1000 CFM and TAB measures 1050 CFM, set the Scale to 1.05. **NOTE:** This should be the primary balancing tool.
Airflow Offset (CFM)	-1000 to 1000	Offsets CAVA's airflow reading by a set increment. E.g. If CAVA displays 230 CFM and TAB measures 250 CFM, set the Offset to +20 CFM. **NOTE:** This should be a secondary balancing tool.

NOTE: Ensure any scale or offset values are saved before exiting the menu. If the values are not saved, then they will need to be re-entered.



Edit Curve *(VV)*

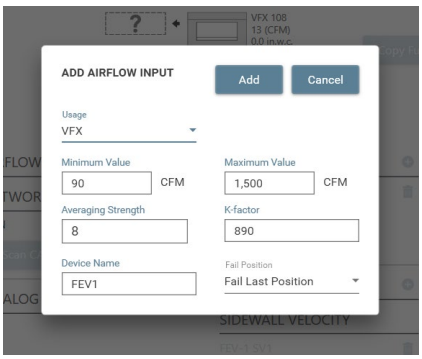
The edit curve menu is used to adjust the POT curve loaded onto CAVA. The main use for the edit curve menu is for Venturi Valve Retrofit (VVR) kits.

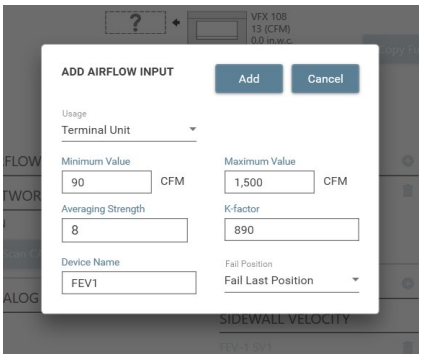
For replacement POT curves, contact Antec Controls Applications.

Variable Name	Available Options/Range	Description
Excitation Voltage	Controller Dependent	Allows the user to input the controller's excitation voltage. **NOTE:** The excitation voltage for CAVA is 3.0 VDC.
Scale	On/Off	Click to scale a POT curve to an excitation voltage of 3.0 VDC. When selected, the POT curve voltage values will change to correspond with an excitation voltage of 3.0 VDC. **NOTES:** • The voltage values will change when scaling the POT curve. • The scaling function is only required when the original excitation voltage differs from 3.0 VDC.

NOTES:

- The curve point flow and voltage values must be equal or increase from Point #1 to Point #8.
- When configuring VVR kits the POT curve and excitation voltage are input in this menu.





CAUTION

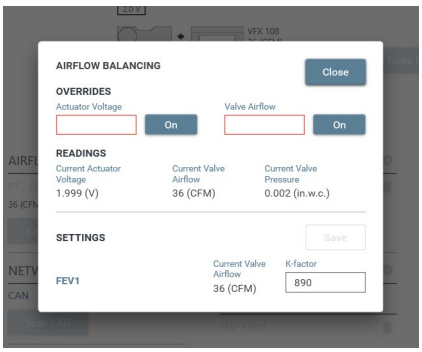
Ensure the valve's operation is not limited by the minimum flow or maximum flow.

Airflow Input *(VFX/TU)*

Below are the settings associated with configuring a VFX or TU airflow input.

The following settings are available if the TYPE is set to **VFX** or **TU**.

Variable Name	Available Options/Range	Description
Minimum Value	0	Limits the minimum operating range of the valve. Typically set to the minimum of the valve.
Maximum Value	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the maximum of the valve.
Averaging Strength	0 to 30	Sets the amount of averaging done by the FVM on valve pressure readings. **NOTE:** An averaging strength that is too low may result in oscillation. An averaging strength that is too high may result in slow speed of response.
K- factor	0 to 15000	Sets the K-factor of the valve. The K-factor will be adjusted based on the TAB airflow measurements. **NOTE:** Reference the product literature for the airflow device to determine the factory K-factor. The VFX factory K-factors can be found in the product manual on the Antec Controls website.
Device Name	19 characters	The name for the airflow device. **NOTE:** This name will display on BACnet as part of the Analog Values for the flow reading.
Fail Position	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a PACE or CAVA goes offline on the RIN network.

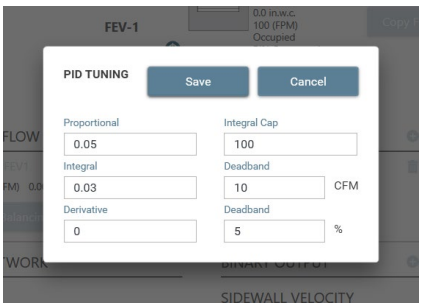


Balancing *(VFX/TU)*

The balancing menu is used to adjust the VFX or TU reading on CAVA to match a Test and Balance (TAB) reading.

Variable Name	Available Options/Range	Description
Actuator Voltage Override	0 to 10.5 Volts On/Off	Provides the user with a voltage override to drive the actuator to a set position. Enter the desired voltage override value into the Actuator Voltage field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Valve Airflow Override	No Limits On/Off	Provides the user with a valve airflow override to set the valve to a specific flow. Enter the desired airflow override value into the Valve Airflow field and click On to enable the override. This can be used to target different airflows for balancing. **NOTE:** The override is automatically removed after closing the window.
Current Actuator Voltage	Read Only	Live reading of the voltage being supplied to the actuator.
Current Valve Airflow	Read Only	Live reading of the airflow being reported by the Venturi Valve.
Current Valve Pressure	Read Only	Live reading of the pressure across the Venturi Valve. **NOTE:** Pressure drop is crucial to optimal performance of the Venturi Valve. Ensure the valve is within its operating limits during balancing.
K-factor	0 to 15000	Sets the K-factor of the valve. The K-factor will be adjusted based on the test and balancer airflow measurements using the following formula: $$(New\ K) = \frac{TAB\ reading}{FVM\ reading} * (Starting\ K)$$ **NOTE:** Reference the product literature for the airflow device to determine the factory K-factor. The VFX factory K-factors can be found in the product manual on the Antec Controls website.

NOTE: Ensure the K-factor value is saved before exiting the menu. If the value is not saved, then it will need to be re-entered.



PID Tuning *(VFX/TU)*

The PID tuning menu allows for the adjustment of proportional, integral and derivative values for the VFX or TU.

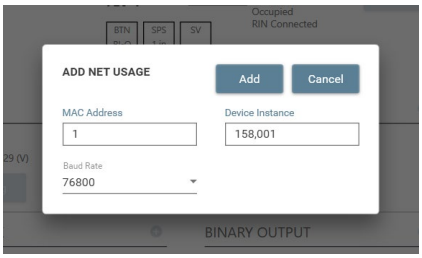
For supplementary information on adjusting PID settings for blade damper control contact Antec Field Support.

Variable Name	Available Options/Range	Description
Proportional	No Limits	Sets the proportional gain value used to control the damper blade.
Integral	No Limits	Sets the integral value used to control VFX damper blade.
Derivative	No Limits	Sets the derivative value used to control VFX damper blade.
Integral Cap	No Limits	Sets the limit for the integral term of the PID settings used to control damper blade.
Deadband	0 to 30 CFM and 0 to 10%	Sets the deadband for the CFM control through the valve. PACE will determine whether the control is in the deadband based on the larger of the CFM or % values. **NOTE:** The % deadband is based on the % of current flow target. If PACE is targeting 1000 CFM and the deadband is 5% of 1000 CFM. It will maintain position until the reading goes outside of the range between 950 – 1050 CFM.

NOTE: Before adjusting the proportional, integral and derivative values contact Antec Controls Applications for instructions.

Network

This section details configuration instructions and available settings for networks including BACnet and the Controller Area Network (CAN).



BACnet

BACnet is the communication protocol used to provide the Building Automation System (BAS) with information about how the room is currently functioning. Additionally, it provides overrides from the BAS to control certain functions within the room.

Variable Name	Available Options/Range	Description
MAC Address	1 to 127	The MAC address is used locally on the MS/TP segment to physically address devices. The MAC address is not passed through routers. **NOTE:** This must be unique for each device within the MS/TP segment.
Baud Rate	9,600 19,200 38,400 76,800	The rate at which information is transferred over the BACnet network. **NOTE:** All devices on a BACnet segment must be set to communicate at the same Baud Rate.
Device Instance	1 to 4,194,303	Whether on an MS/TP segment or IP network, the device instance is the logical address that matters to BACnet. **NOTE:** This must be a unique address throughout the entire facility.

NOTES:

- Only one BACnet connection is allowed per RIN network. This connection will only be made through CAVA if no PACE is present in the room.
- All BACnet points for the room will go through the one connection.

Controller Area Network (CAN)

CAN allows CAVA to communicate with any SVS or FVM on a fume hood to monitor and control face velocity.

Variable Name	Available Options/Range	Description
Scan CAN	Update Close	Click to discover all sensor modules connected through CAN. If any modules require changes, an option to update them will appear.

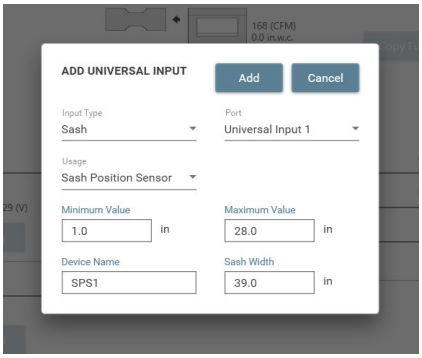
NOTES:

- Only one CAN connection is allowed per CAVA.
- CAN can support up to three SVS modules and one FVM module on a single fume hood.

Universal Inputs

This section details configuration instructions and available settings for universal inputs including sash, binary inputs and analog inputs.

NOTE: A maximum of four universal inputs are configurable per CAVA.

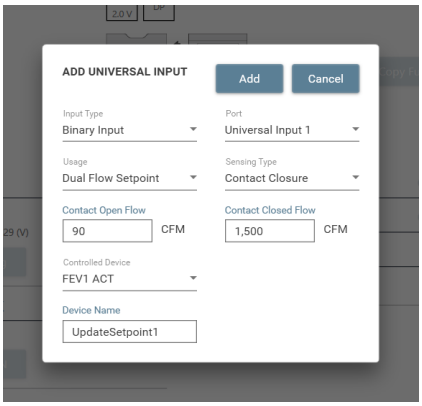


Sash

Sash is used to measure the vertical height of a fume hood's sash.

The following settings are available if the Input Type is **Sash,** and the Usage is **Sash Position Sensor**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Minimum/Maximum Value	Sash height in inches	Defines the operating range of the sash.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.
Sash Width	Sash width in Inches	Sets the width of the sash installed on the fume hood.

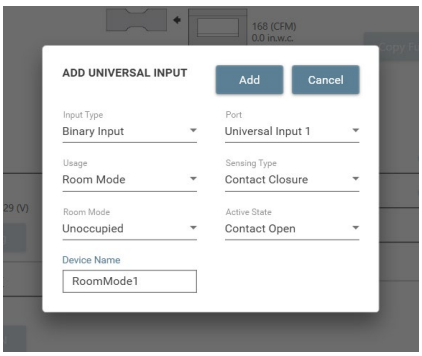


Dual Flow Set Point

Dual Flow Setpoint is used to control an auxiliary airflow device which has a VAV actuator and a CAVA or PACE. The Binary Input will receive either a closed or open signal to change the setpoint for the auxiliary valve.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Dual Flow Setpoint**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the room mode will be triggered by an active input or a contact closure input.
Contact Open Flow	Minimum to Maximum Range of Valve	Configures the flow set point when the binary input is in its open position.
Contact Closed Flow	Minimum to Maximum Range of Valve	Configures the flow setpoint when the binary input is in its closed state.
Controlled Device	Changes depending on Airflow Devices	This will be the Airflow Device that is controlled to the two different airflow setpoints. Any airflow devices configured with an actuator that are not already associated with a Dual Flow Setpoint BI will be available from the dropdown.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



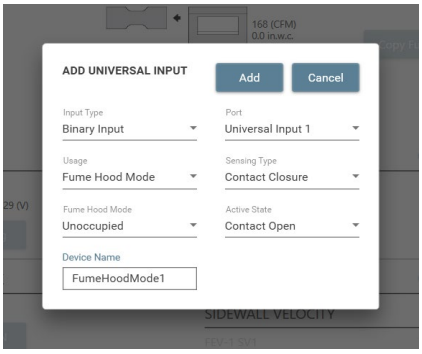
Room Mode

The Room Mode usage is used to switch to custom room modes based on a binary input signal. This may include Emergency Modes or Unoccupied Modes.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Room Mode**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the room mode will be triggered by an active input or a contact closure input.
Room Mode	All room modes configured in the room mode manger menu (Excluding the Default Room Mode)	Sets the room mode that is activated when the binary input is in its active state.
Active State	Contact Open / Contact Closed When On / When Off	When Sensing Type is configured to Contact Closure, Active State determines if the room mode is triggered when the contact is open or closed. When Sensing Type is configured to Active, Active State determines if the room mode is triggered when the input is on or off.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: The room mode to be configured for the input must first be created in the Room Mode Manager before it will be available for selection.

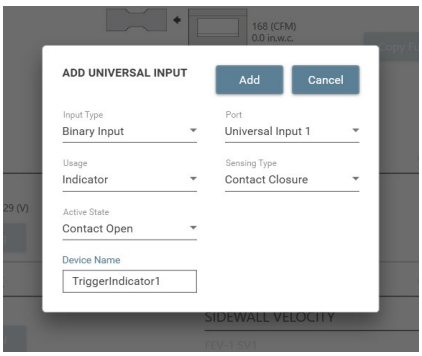


Fume Hood Mode

The Fume Hood Mode usage is used to switch to custom fume hood modes based on a binary input signal. This may include Emergency Modes or Unoccupied Modes.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Fume Hood Mode**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the fume hood mode will be triggered by an active input or a contact closure input.
Fume Hood Mode	All fume hood modes configured in the fume hood manger menu (Excluding the Default Fume Hood Mode)	Sets the fume hood mode that is activated when the binary input is in its active state.
Active State	Contact Open / Contact Closed When On / When Off	When Sensing Type is configured to Contact Closure, Active State determines if the fume hood mode is triggered when the contact is open or closed. When Sensing Type is configured to Active, Active State determines if the fume hood mode is triggered when the input is on or off.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



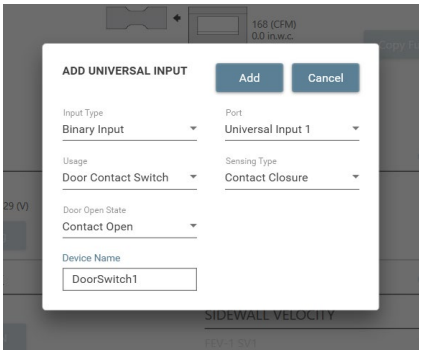
Indicator

The Indicator binary input is used to trigger an indicator based on a contact closure input.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Indicator**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the indicator will be triggered by an active input or a contact closure input.
Active State	Contact Open / Contact Closed When On / When Off	When Sensing Type is configured to Contact Closure, Active State determines if the indicator is triggered when the contact is open or closed. When Sensing Type is configured to Active, Active State determines if the indicator is triggered when the input is on or off.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: Navigate to the fume hood's Indicators page after configuring your BI to establish which room modes the user would like the binary input to be active in.

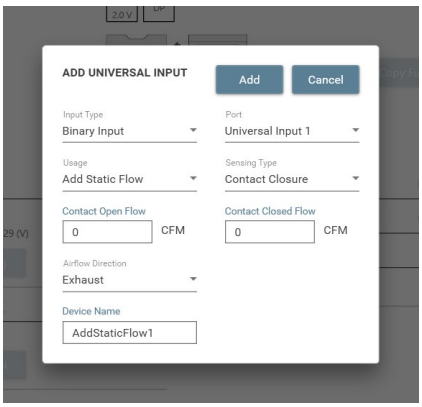


Door Contact Switch

Door Contact Switches can be used to monitor whether a door is open or closed. When a door contact switch is configured in conjunction with pressure control, the PID control will be paused while the door is open. If only used for monitoring, the door can also trigger an indicator if it is left open for too long.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Door Contact Switch**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the door signal will be triggered by an active input or a contact closure input.
	Contact Open / Contact Closed When On / When Off	When Sensing Type is configured to Contact Closure, Door Open State determines if an open door signal is triggered when the contact is open or closed. When Sensing Type is configured to Active, Active State determines if an open door signal is triggered when the input is on or off.
Device Name	19 Characters	Assigns a name to this input. NOTE: This name will display in the BACnet object name.

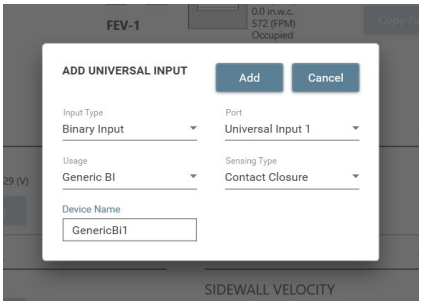


Add Static Flow

Add Static Flow is used with an auxiliary airflow device that has a 2-position actuator but no CAVA or PACE. The static flow binary input adds a set amount of airflow to the room's total flow calculation based on the contact closure.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Add Static Flow**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the static flow will be triggered by an active input or a contact closure input.
Contact Open Flow	Minimum to Maximum Range of Valve	Configures the airflow setpoint when the binary input is in its open state.
Contact Closed Flow	Minimum to Maximum Range of Valve	Configures the airflow setpoint when the binary input is in its closed position.
Airflow Direction	Exhaust Supply	Airflow direction of the auxiliary valve
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

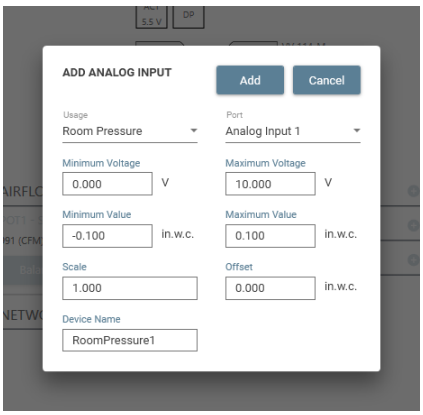


Generic BI

Generic BI does not have any control functionality in the room's operation but can be used to monitor external devices such as pressure switches to trigger alarms on BACnet or in the room.

The following settings are available if the Input Type is **Binary Input**, and the Usage is **Generic BI**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Sensing Type	Active Contact Closure	Determines whether the generic BI will be triggered by an active input or a contact closure input.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

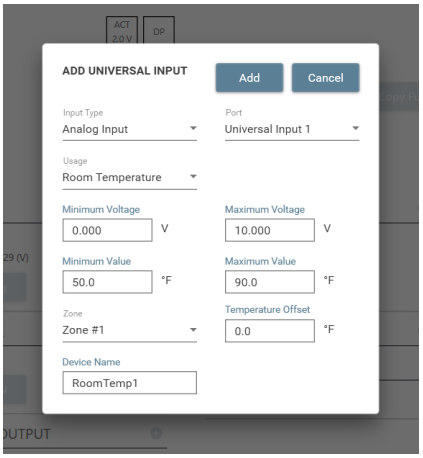


Room Pressure

Room pressure can be used for monitoring the pressure differential in a given room.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Room Pressure**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Scale	0.5 to 2.0	Scales CAVA's pressure reading by a multiplication. E.g. If CAVA displays 0.01 in.w.c. and TAB measured 0.011 in.w.c., set the scale to 1.1 **NOTE:** This should be the primary balancing tool.
Offset	-0.005 to +0.005 in.w.c.	Offsets CAVA's pressure reading by a set increment. E.g. If CAVA displays 0.00 in.w.c. and TAB measures -0.002 in.w.c., set the offset to -0.002 in.w.c.. **NOTE:** This should be a secondary balancing tool.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

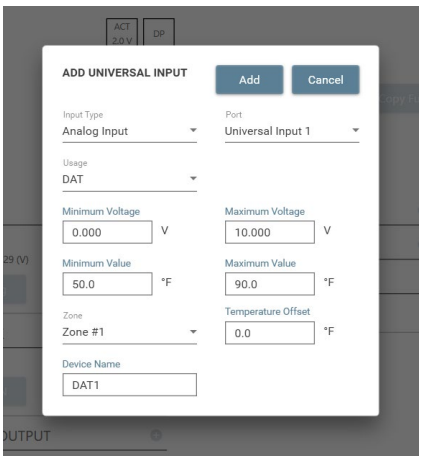


Room Temperature

This room temperature reading is used in the temperature control sequence for the configured temperature zone.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Room Temperature**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Room Temperature input to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

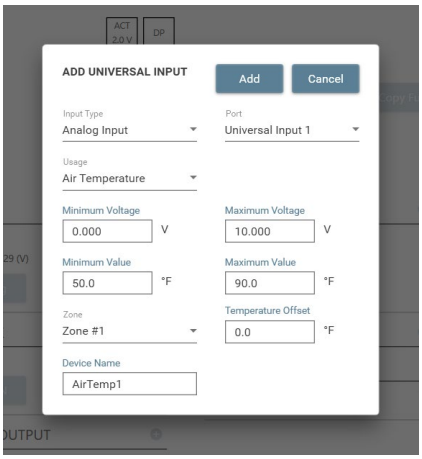


Discharge Air Temperature (DAT)

DAT temperature is used to monitor or control the air temperature in the duct after the reheat device. When using temperature control with DAT limits, this reading is used for control purposes.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **DAT**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Zone	Zone #1 Zone #2 Zone #3	Assigns the DAT to either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

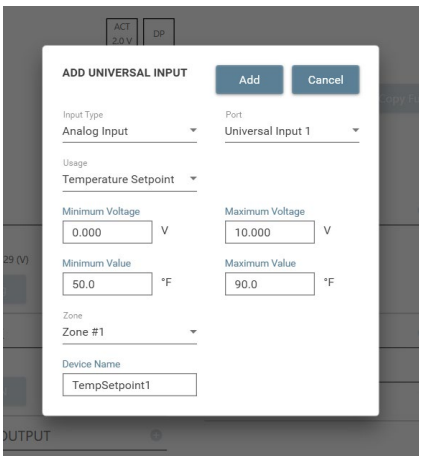


Air Temperature

Air temperature inputs are not used in the control for the room, but can be used to monitor air temperature. This may be useful if the entering air temperature to the reheat device is required for monitoring.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Air Temperature**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Temperature Setpoint input to control the setpoint in either Zone #1, #2 or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Temperature Offset	No Limits	Allows the user to adjust the temperature reading to match a reading from a balancer or commissioning agent. Applies a fixed offset to the room temperature reading.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

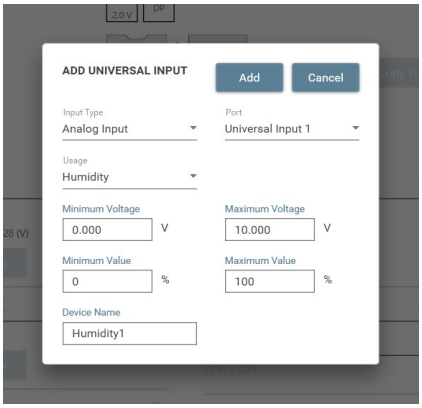


Temperature Setpoint

Temperature Setpoint is used to drive the temperature in the room either hotter or colder based on a locally adjusted input from the room user.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Temperature Setpoint**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Zone	Zone #1 Zone #2 Zone #3	Assigns the Temperature Setpoint input to control the setpoint in either Zone #1, #2, or #3. **NOTE:** The number of zones available will change depending on how many temperature zones are configured. See the Temperature Zones menu for more information on creating temperature zones.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



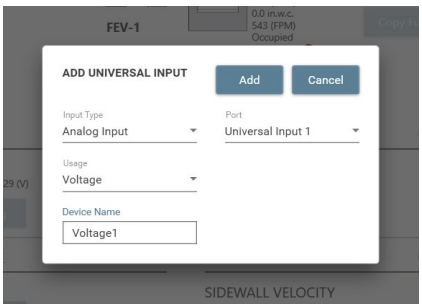
Humidity

Humidity is used when CAVA is required to monitor a humidity reading in either a room or in the duct.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Humidity**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: CAVA and PACE support humidity monitoring only.

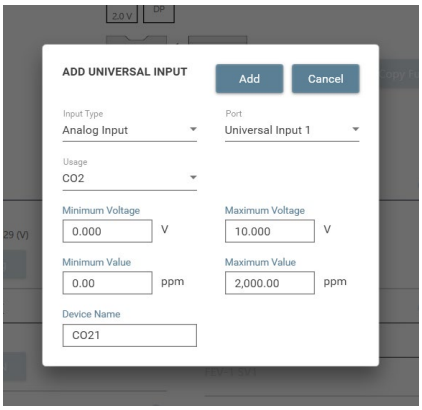


Voltage

A Voltage input is typically used when CAVA is required to monitor a generic voltage input. This may be used if a voltage usage is not supported by CAVA, but requires to be monitored by the facility on BACnet.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Voltage**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



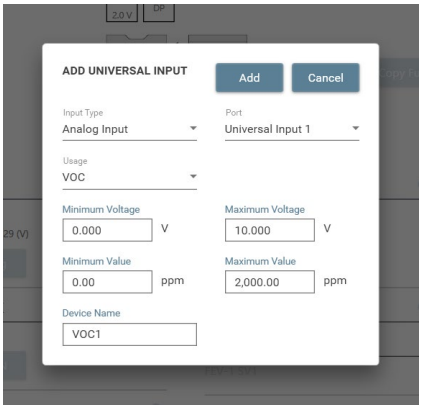
CO_2

CO_2 is used to monitor the carbon dioxide levels in a room.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **CO_2**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: CAVA supports CO_2 monitoring only.



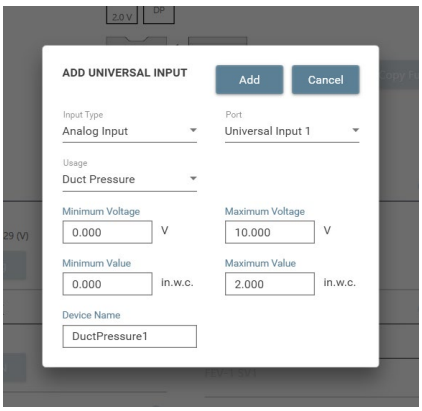
VOC

Volatile Organic Compounds (VOC) are used to monitor contaminants in the air.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **VOC**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: CAVA supports VOC monitoring only.



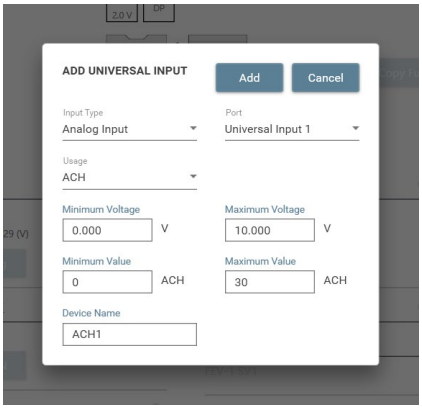
Duct Pressure

Duct pressure monitoring may be useful in determining if the duct static pressure is in an acceptable range so the airflow device can effectively control airflow.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **Duct Pressure**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

NOTE: CAVA supports duct pressure monitoring only.

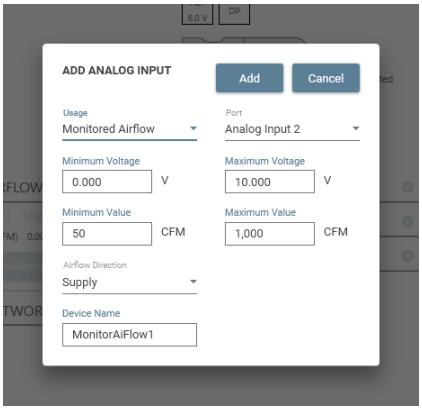


Air Changes per Hour (ACH)

An ACH demand input is required to configure the room for Demand Control Ventilation (DCV). This is not an ACH calculation for the room.

The following settings are available if the Input Type is **Analog Input**, and the Usage is **ACH**.

Variable Name	Available Options/Range	Description
Port	Universal Input 1 Universal Input 2 Universal Input 3 Universal Input 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the range for the device providing the signal voltage to CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.



Monitored Airflow

A Monitored Airflow input is typically used when CAVA requires the airflow of a valve controlled by others for total airflow and offset calculations.

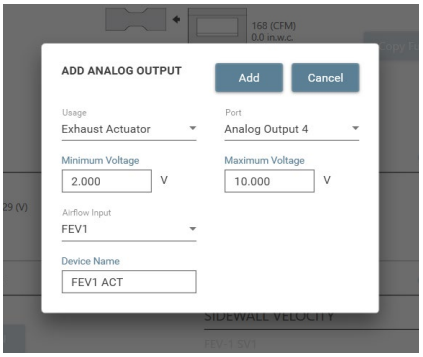
The following settings are available if the Usage is **Monitored Airflow**.

Variable Name	Available Options/Range	Description
Port	Analog Input 1 Analog Input 2 Analog Input 3 Analog Input 4	Choose the Analog Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. The voltage range entered here must match the voltage range for the device providing the signal voltage to CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. The value range entered here must match the value range for the device providing the signal voltage to CAVA.
Airflow Direction	Exhaust Supply	Flow direction of the valve monitored by CAVA.
Device Name	19 Characters	Assigns a name to this input. **NOTE:** This name will display in the BACnet object name.

Analog Outputs

This section details configuration instructions and available settings for analog outputs including exhaust actuator, reheat, auxiliary heater, cooling, valve airflow, valve pressure, room pressure and face velocity devices.

NOTE: A maximum of four analog outputs are configurable per CAVA when using a Fume Hood Valve Module (FVM). Analog outputs on the Sidewall Velocity Sensor (SVS) are not available. CAVA does not have any analog outputs, and uses the FVM to provide output to other devices.

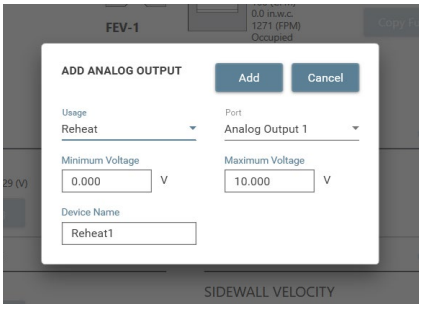


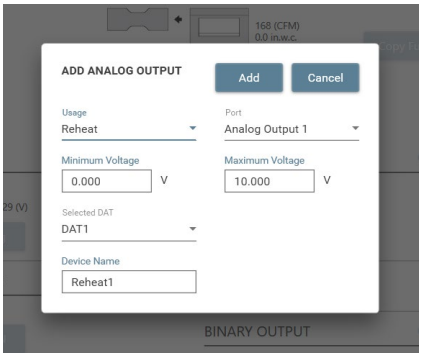
Exhaust Actuator

The Exhaust Actuator output is used to control the exhaust airflow device to meet the target airflow setpoint.

The following settings are available if the Usage is **Exhaust Actuator**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the actuator. **NOTE:** The Belimo actuators used by Antec Controls have a 2-10 VDC range.
Airflow Input	Exhaust airflow devices configured on the same CAVA.	Allows user to set which valve the actuator is attached to.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



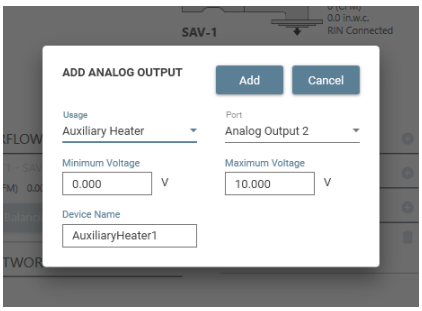


Reheat

Reheat devices are primarily used to control Electric Coils or Hot Water Coils but can be used for any analog heating device.

The following settings are available if the Usage is **Reheat**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the heating device. **NOTE:** Check the reheat actuator specifications to input the correct voltage range.
Selected DAT	DAT Inputs configured on CAVA	When using Space Temperature Control w/ DAT Limits, the Reheat Output must be associated with a DAT Input. **CAUTION** It is recommended that the Space Temperature Control w/ DAT Limits sequence is configured prior to the Reheat Analog Output. If the sequence is changed after the Output is configured, the user will have to reconfigure the Reheat Output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



Auxiliary Heater

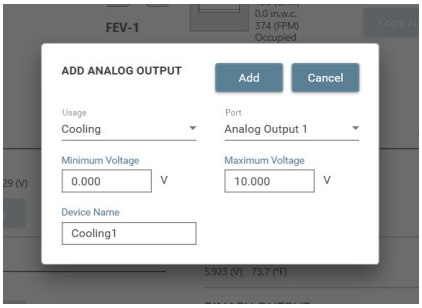
Auxiliary Heater devices can only be used when using Space Temperature Control w/ DAT Limits for devices that does not have a DAT reading, such as baseboard heaters.

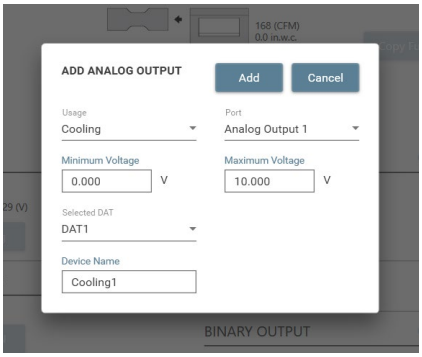
The following settings are available if the Usage is **Auxiliary Heater**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Analog Output port where the device is physically wired to CAVA.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the auxiliary heater device. **NOTE:** Check the heater specifications to input the correct voltage range.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTES:

- Auxiliary Heater devices are only available with CAVA firmware v2.0.4 or later.
- Auxiliary Heater devices can only be added when Space Temperature Control w/ DAT Limits is selected as the Temperature Sequence.
- Auxiliary Heater devices can only be added when at least one Reheat device with an associated DAT device is configured.





Cooling

Cooling devices are primarily used to control cooling coils.

The following settings are available if the Usage is **Cooling**.

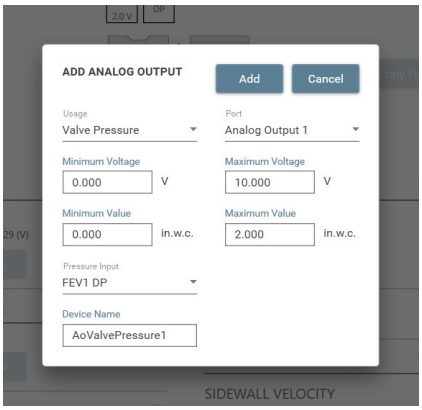
Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Minimum/Maximum Voltage	0 to 10 Volts	Sets the range of voltage of the cooling device. **NOTE:** Check the cooling actuator specifications to input the correct voltage range.
Selected DAT	DAT Inputs configured on CAVA	When using Space Temperature Control w/ DAT Limits, the Cooling Output must be associated with a DAT Input. **CAUTION** It is recommended that the Space Temperature Control w/ DAT Limits sequence is configured prior to the Cooling Analog Output. If the sequence is changed after the Output is configured, the user will have to reconfigure the Cooling Output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

Valve Airflow

Valve Airflow can be used to output a voltage signal for current airflow reading from a valve on the RIN network. This may be used when providing the signal to a third party controller.

The following settings are available if the Usage is **Valve Airflow**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from CAVA.
Airflow Input	All Airflow Devices on RIN	Selects valve airflow measurement to which the output is linked.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

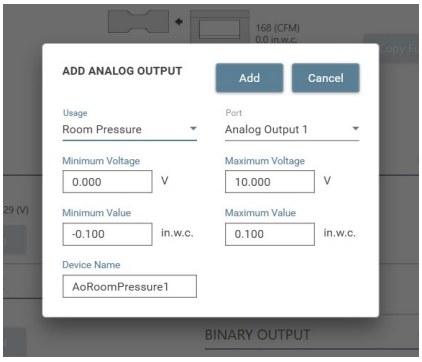


Valve Pressure

Valve Pressure can be used to output a voltage signal for the differential pressure measurement across the Venturi Valve. This may be used when providing the signal to a third party controller.

The following settings are available if the Usage is **Valve Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from CAVA.
Pressure Input	All Venturi Valve pressure devices on RIN	Selects valve pressure measurement to which the output is linked.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

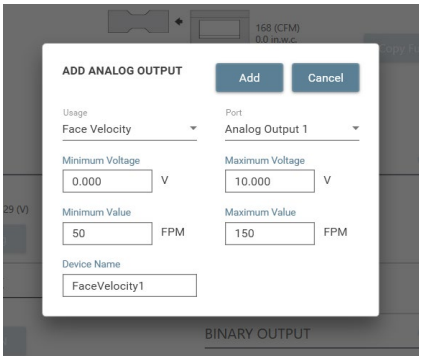


Room Pressure

Used to output the current room pressure reading via an analog signal. Primarily used when a third party device requires a room pressure reading from CAVA. For example, a Room Pressure Sensor (SRPS) can be configured with CAVA to measure the room pressure, this usage then outputs that reading as an analog signal.

The following settings are available if the Usage is **Room Pressure**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from CAVA.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

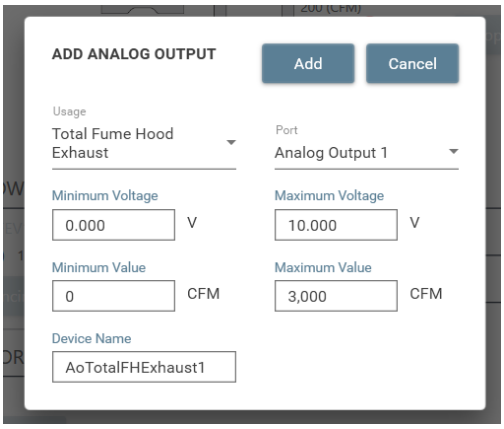


Face Velocity

Face Velocity can be used to output a voltage signal for the fume hood face velocity. This may be used when providing the signal to a third party controller.

The following settings are available if the Usage is **Face Velocity**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from CAVA.
Maximum/Minimum Value	Range of Sensor	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from CAVA.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



Total Fume Hood Exhaust

Total Fume Hood Exhaust can be used to output a voltage signal for the total fume hood airflow reading from all fume hood valves on the RIN network. This may be used when providing the signal to a third party controller.

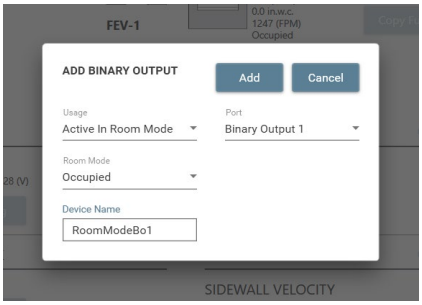
The following settings are available if the Usage is **Total Fume Hood Exhaust**.

Variable Name	Available Options/Range	Description
Port	Analog Output 1 Analog Output 2 Analog Output 3 Analog Output 4	Choose the Universal Input port where the device is physically wired to CAVA.
Maximum/Minimum Voltage	0 to 10 Volts	Sets the minimum and maximum voltage range. Ensure the voltage range entered here matches the voltage range on the device reading the signal voltage from CAVA.
Maximum/Minimum Value	Range of Total Fume Hood Exhaust	Sets the minimum and maximum value. Ensure the value range entered here matches the value range for the device reading the signal voltage from CAVA.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

Binary Outputs

This section details configuration instructions and available settings for binary output devices including room mode, fume hood mode, room indicator, fume hood indicator.

NOTE: A maximum of two binary outputs can be configured per CAVA.



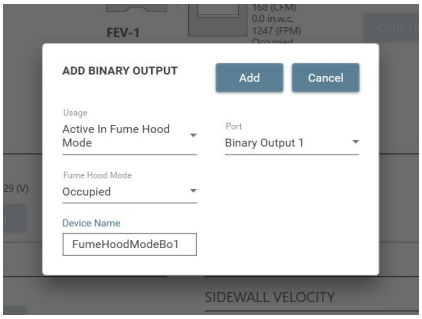
Active in Room Mode

Active in Room Mode will trigger the binary output on the selected CAVA when in a particular room mode.

The following settings are available if the Usage is **Active in Room Mode**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Room Mode	All room modes configured in the room mode manger menu	Sets the room mode that triggers an active signal on the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The room mode to be configured for the output must first be created in the Room Mode Manager before it will be available for selection.



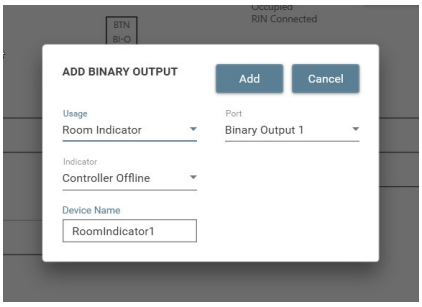
Active in Fume Hood Mode

Active in Fume Hood Mode will trigger the binary output on the selected CAVA when in a particular fume hood mode.

The following settings are available if the Usage is **Active in Fume Hood Mode**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Room Mode	All room modes configured in the room mode manger menu	Sets the fume hood mode that triggers an active signal on the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The fume hood mode to be configured for the output must first be created in the Control section before it will be available for selection.

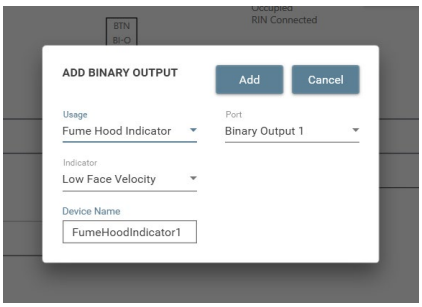


Room Indicator

Room Indicator will activate the binary output when the selected indicator is triggered. This may be used for a hard-wired signal to a third party alarming system, or to trigger an indicator in the room.

The following settings are available if the Usage is **Room Indicator**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Indicator	All indicators	Sets the indicator that triggers an active signal from the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

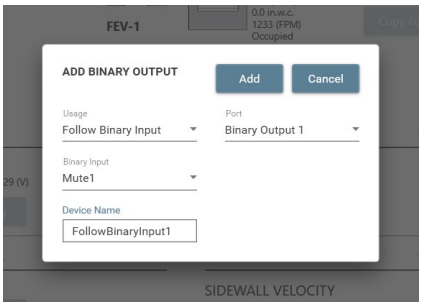


Fume Hood Indicator

Fume Hood Indicator will activate the binary output when the selected indicator is triggered. This may be used for a hard-wired signal to a third party alarming system, or to trigger an indicator at the fume hood.

The following settings are available if the Usage is **Fume Hood Indicator**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Indicator	All indicators	Sets the indicator that triggers an active signal from the binary output.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.



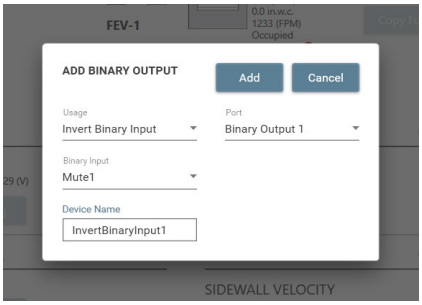
Follow Binary Input

Follow Binary Input will activate when the configured binary input is in the open state and deactivate when the configured binary input is in the closed state.

The following settings are available if the Usage is **Follow Binary Input**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Binary Input	All configured binary inputs	Sets the binary input that the binary output will follow.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The binary input to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.



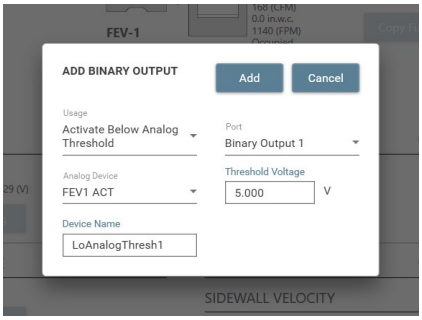
Invert Binary Input

Invert Binary Input will activate when a configured binary input is in the closed state and deactivate when the configured binary input is in the open state.

The following settings are available if the Usage is **Invert Binary Input**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Binary Input	All configured binary inputs	Sets the binary input that the binary output will follow.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The binary input to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.



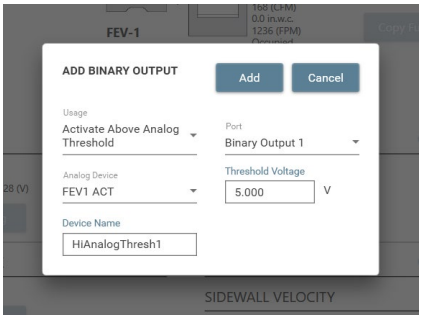
Activate Below Analog Threshold

Used to configure a binary output to activate when the configured analog device is lower than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Below Analog Threshold**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Analog Device	All configured analog inputs and outputs	Sets the analog device that triggers the binary output when it is below the threshold voltage.
Threshold Voltage	0 to10 Volts	If the input or output voltage drops below this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.



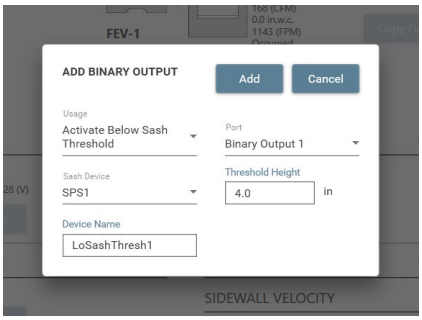
Activate Above Analog Threshold

Used to configure a binary output to activate when the configured analog device is higher than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Above Analog Threshold**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Analog Device	All configured analog inputs and outputs	Sets the analog device that triggers the binary output when it is above the threshold voltage.
Threshold Voltage	0 to 10 Volts	If the input or output voltage rises above this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device input to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.



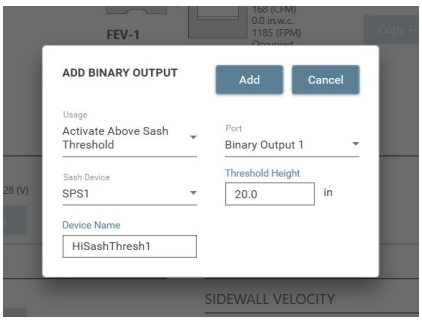
Activate Below Sash Threshold

Used to configure a binary output to activate when the configured analog device is lower than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Below Sash Threshold**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Sash Device	All configured sash inputs	Sets the sash device that triggers the binary output when it is below the threshold voltage.
Threshold Height	Sash height in inches	If the sash height drops below this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.



Activate Above Sash Threshold

Used to configure a binary output to activate when the configured analog device is higher than the specified threshold voltage. This may be used for a hard-wired signal to a third party alarming system, or to trigger an alarm indicator in the room.

The following settings are available if the Usage is **Activate Above Sash Threshold**.

Variable Name	Available Options/Range	Description
Port	Binary Output 1 Binary Output 2	Choose the Binary Output port where the device is physically wired to CAVA.
Sash Device	All configured sash inputs	Sets the sash device that triggers the binary output when it is above the threshold voltage.
Threshold Height	Sash height in inches	If the sash height rises above this value, the binary output will activate.
Device Name	19 Characters	Assigns a name to this output. **NOTE:** This name will display in the BACnet object name.

NOTE: The analog device input to be configured for the output must first be configured in the CAVA Manager menu before it will be available for selection.

Sidewall Velocity

This section details configuration instructions and available settings for sidewall velocity sensors.

NOTE: A maximum of three sidewall velocity sensors can be configured per CAVA.

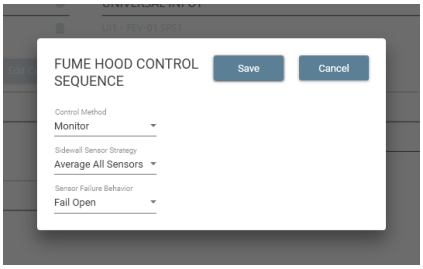
Sidewall Sensor

A Sidewall Sensor is used to measure the face velocity of a fume hood.

Variable Name	Available Options/Range	Description
Sidewall Sensor	All sidewall sensors connected to CAN	Choose the sidewall sensor to be configured.
Ping Sidewall Sensor	On/Off	Identifies the sensor being configured by flashing its green LED.
MAC Address	Read Only	Displays the unique MAC Address for the sensor.
Firmware Version	Read Only	Current firmware running on the selected sidewall sensor.
LSFV Averaging Strength	0 to 300	Averaging applied to the face velocity reading when the sash is not moving. **NOTE:** An averaging strength that is too low may result in oscillation. An averaging strength that is too high may result in slow speed of response.
HSFV Averaging Strength	0 to 300	Averaging applied to the face velocity reading when the sash is in motion. **NOTE:** An averaging strength that is too low may result in oscillation. An averaging strength that is too high may result in slow speed of response.
Device Name	19 Characters	Assigns a name to this sensor.

Fume Hood Control Sequence

This section details configuration instructions and available settings for fume hood sequencing including monitor, sash, sidewall, and hybrid configurations.

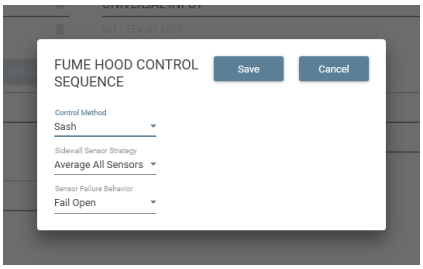


Monitor

Used to monitor a fume hood without providing any control.

The following settings are available if the Control Method is **Monitor**.

Variable Name	Available Options/Range	Description
Sidewall Sensor Strategy	Average Sensors Use Lowest Use Highest	When using multiple sidewall sensors, the user can choose to average all readings, use the lowest reading or use the highest reading.
Sensor Failure Behavior	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a sensor on the fume hood goes offline.

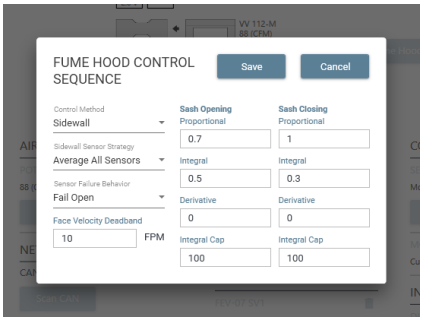


Sash

Used to control fume hood face velocity by measuring the height of the sash and calculating how much airflow is required.

The following settings are available if the Control Method is **Sash**.

Variable Name	Available Options/Range	Description
Sidewall Sensor Strategy	Average Sensors Use Lowest Use Highest	When using multiple sidewall sensors, the user can choose to average all readings, use the lowest reading or use the highest reading.
Sensor Failure Behavior	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a sensor on the fume hood goes offline.

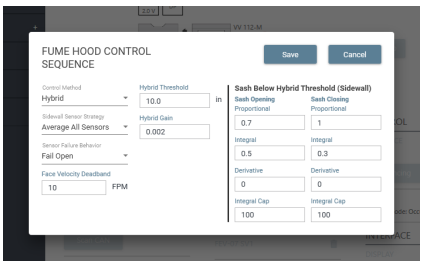


Sidewall

Used to control fume hood face velocity by measuring the face velocity and adjusting the valve position until the face velocity setpoint is achieved.

The following settings are available if the Control Method is **Sidewall**.

Variable Name	Available Options/Range	Description
Face Velocity Deadband	No Limits	Allows the user to adjust the deadband where the face velocity will be considered satisfied. No adjustments will be made to the airflow as long as the face velocity remains in the deadband.
Sidewall Sensor Strategy	Average Sensors Use Lowest Use Highest	When using multiple sidewall sensors, the user can choose to average all readings, use the lowest reading or use the highest reading.
Sensor Failure Behavior	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a sensor on the fume hood goes offline.
Sash Opening/Closing Proportional	No Limits	Sets the proportional gain value used to control the fume hood exhaust valve when the sash is being opened/closed.
Sash Opening/Closing Integral	No Limits	Sets the integral value used to control the fume hood exhaust valve when the sash is being opened/closed.
Sash Opening/Closing Derivative	No Limits	Sets the derivative value used to control the fume hood exhaust valve when the sash is being opened/closed.
Sash Opening/Closing Integral Cap	No Limits	Sets the limit for the integral term of the PID settings used to control the fume hood exhaust valve when the sash is being opened/closed.



Hybrid

Used to control fume hood face velocity by taking advantage of both sash and sidewall control.

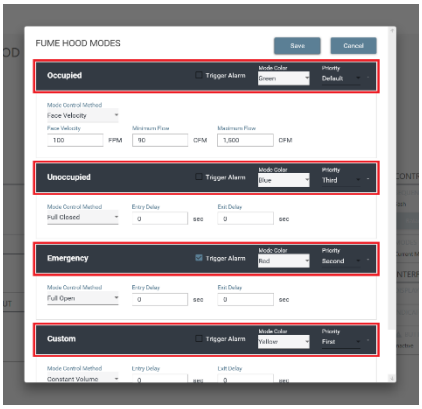
The following settings are available if the Control Method is **Hybrid**.

Variable Name	Available Options/Range	Description
Face Velocity Deadband	No Limits	Allows the user to adjust the deadband where the face velocity will be considered satisfied. No adjustments will be made to the airflow as long as the face velocity remains in the deadband.
Sidewall Sensor Strategy	Average Sensors Use Lowest Use Highest	When using multiple sidewall sensors, the user can choose to average all readings, use the lowest reading or use the highest reading.
Sensor Failure Behavior	Fail Last Position Fail Open Fail Closed	Sets the fail position for the Airflow Device if a sensor on the fume hood goes offline.
Hybrid Threshold	Sash Height in Inches	Sets the height at which the Hybrid control algorithm is enabled. **NOTE:** Below the Hybrid Threshold the Sidewall PID will be enabled.
Proportional	No Limits	Sets the proportional gain value used to control the fume hood exhaust valve
Integral	No Limits	Sets the integral value used to control the fume hood exhaust valve.
Derivative	No Limits	Sets the derivative value used to control the fume hood exhaust valve.
Integral Cap	No Limits	Sets the limit for the integral term of the PID settings used to control the fume hood exhaust valve.

Fume Hood Modes

Fume hood modes can be used to command the fume hood into different states of operation where different airflow setpoints are required. Examples would include, but are not limited to Occupied, Unoccupied and Emergency modes.

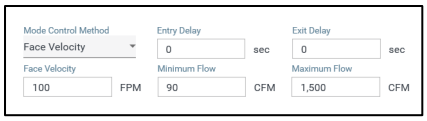
Fume Hood Priority: Toolbox allows for four fume hood modes to be configured by the user, each of which has a different priority. The lowest priority is known as Default, and the fume hood will always operate in the Default priority mode when no other fume hood modes are active.



Fume Hood Mode Header

The fume hood mode header contains settings that are applied to all fume hoods in a room. Changes to these settings on one fume hood apply to all other fume hoods on the same RIN.

Variable Name	Available Options/Range	Description
Mode Name	19 Characters	Assigns a name to this fume hood mode. **NOTE:** This name will display in the BACnet fume hood mode name.
Trigger Alarm	On Off	Sets whether an alarm will be triggered when the fume hood mode is entered.
Mode Color	Red Green Blue Yellow	Background color of CAVA Home Screen when in the fume hood mode.
Priority	First Second Third Default	Sets the priority of fume hood modes if multiple modes are activated simultaneously. CAVA will always enter the active fume hood mode with the highest priority and will enter the Default fume hood mode when no modes are active.
Mode Control Method	Face Velocity Constant Volume Full Open Full Closed	The method of control that CAVA will use when in the fume hood mode.



Face Velocity

The face velocity will be used to dictate the airflow of the fume hood exhaust valve. The user will provide a target face velocity for the fume hood's operation.

The following settings are available if the Mode Control Method is **Face Velocity**.

Variable Name	Available Options/Range	Description
Entry Delay	No Limits	Time from when the fume hood mode is triggered to when CAVA will change to this fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Exit Delay	No Limits	Time from when the fume hood mode is not triggered to when CAVA will change to the default fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Face Velocity	No Limits	Sets the target face velocity of the fume hood when in this mode.
Minimum Flow	Minimum flow corresponding to the operating range of the valve	Limits the minimum operating range of the valve. Typically set to the full minimum of the valve.
Maximum Flow	Maximum flow corresponding to the operating range of the valve	Limits the maximum operating range of the valve. Typically set to the full maximum of the valve.

Constant Volume

The airflow of the fume hood will be set to a constant value. The user will provide a target flow for the fume hood exhaust valve.

The following settings are available if the Mode Control Method is **Face Velocity**.

Variable Name	Available Options/Range	Description
Entry Delay	No Limits	Time from when the fume hood mode is triggered to when CAVA will change to this fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Exit Delay	No Limits	Time from when the fume hood mode is not triggered to when CAVA will change to the default fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Target Flow	Minimum to maximum flow corresponding to the operating range of the valve	Sets the target flow of the fume hood exhaust valve when in this mode.

Full Open

The fume hood exhaust valve will be set to full open, providing maximum achievable face velocity.

The following settings are available if the Mode Control Method is **Full Open**.

Variable Name	Available Options/Range	Description
Entry Delay	No Limits	Time from when the fume hood mode is triggered to when CAVA will change to this fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Exit Delay	No Limits	Time from when the fume hood mode is not triggered to when CAVA will change to the default fume hood mode. **NOTE:** This is not configurable in the Default priority mode.

Full Closed

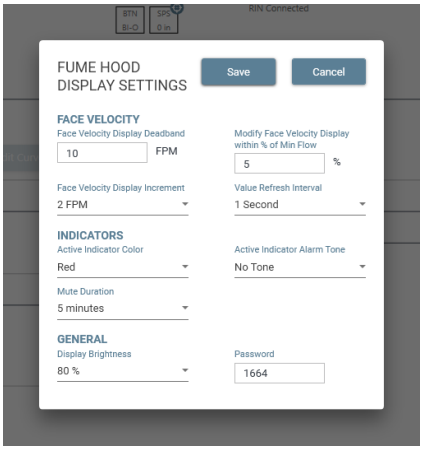
The fume hood exhaust valve will be set to full closed, halting all airflow through the fume hood.

The following settings are available if the Mode Control Method is **Full Closed**.

Variable Name	Available Options/Range	Description
Entry Delay	No Limits	Time from when the fume hood mode is triggered to when CAVA will change to this fume hood mode. **NOTE:** This is not configurable in the Default priority mode.
Exit Delay	No Limits	Time from when the fume hood mode is not triggered to when CAVA will change to the default fume hood mode. **NOTE:** This is not configurable in the Default priority mode.

Display

This section details configuration instructions and available settings for the CAVA display including display value settings, visual and audio cues, and user preferences.



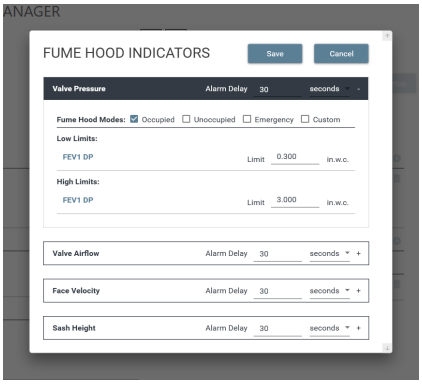
Fume Hood Display Settings

Display settings are used to customize how information is presented and communicated to the user through CAVA. Most of these settings are also configurable through the physical CAVA device.

Variable Name	Available Options/Range	Description
Face Velocity Display Deadband	No Limits	The range around the face velocity target within which no updates to the displayed value will occur.
Modify Face Velocity Display within % of Min Flow	0% to 100%	The percent of the minimum flow of the valve at which the displayed face velocity stops changing when it is above the face velocity setpoint.
Face Velocity Display Increment	1 FPM 2 FPM 5 FPM 10 FPM 15 FPM	Sets the resolution of the displayed face velocity.
Value Refresh Interval	0.5 Seconds 1 Second 1.5 Seconds 2 Seconds	Sets the amount of time between updates to the displayed values.
Active Indicator Color	Red Green Blue Yellow	Sets the background colour of CAVA during an alarm.
Active Indicator Alarm Tone	No Tone Wail Steady 2kHz Red Alert	Sets the sound CAVA emits during an alarm.
Mute Duration	10 Seconds 30 Seconds 1 Minute 5 Minutes 15 Minutes 60 Minutes Permanent	Sets the amount of time an alarm is muted for when the Mute button or Silence Alarm button is pressed.
Display Brightness	20% 40% 60% 80% 100%	Sets the brightness of the display.
Password	4 Digits	Sets the password used to enter the settings menu on CAVA. The default password is 1664.

Indicators

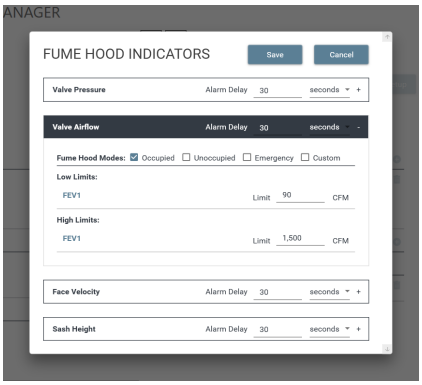
This section details configuration instructions and available settings for indicators including valve pressure alarms, valve airflow alarms, face velocity alarms and sash height alarms.



Valve Pressure

The valve pressure indicator is used to alert the user when the fume hood exhaust valve pressure exceeds the specified limits.

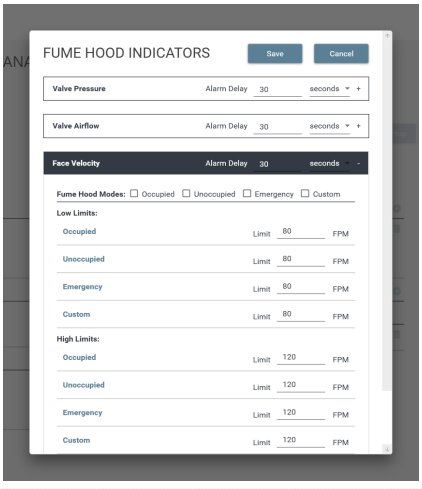
Variable Name	Available Options/Range	Description
Alarm Delay	No Limits	Time from when the valve pressure exceeds the low/high limits to when CAVA displays the alarm.
Fume Hood Modes	All configured fume hood modes	Selects which fume hood modes the alarm can be activated in.
Low Limits	No limits	Sets the low limit for the pressure across the fume hood exhaust valve. If the valve pressure goes below this value, the alarm will be activated.
High Limits	No limits	Sets the high limit for the pressure across the fume hood exhaust valve. If the valve pressure goes above this value, the alarm will be activated.



Valve Airflow

The valve airflow indicator is used to alert the user when the fume hood exhaust valve airflow exceeds the specified limits.

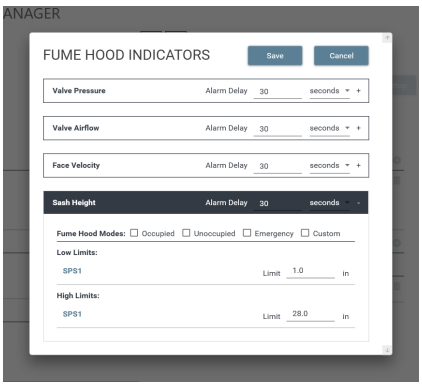
Variable Name	Available Options/Range	Description
Alarm Delay	No Limits	Time from when the valve airflow exceeds the low/high limits to when CAVA displays the alarm.
Fume Hood Modes	All configured fume hood modes	Selects which fume hood modes the alarm can be activated in.
Low Limits	0	Sets the low limit for the airflow through the fume hood exhaust valve. If the valve airflow goes below this value, the alarm will be activated.
High Limits	No limits	Sets the high limit for the airflow through the fume hood exhaust valve. If the valve airflow goes above this value, the alarm will be activated.



Face Velocity

The face velocity indicator is used to alert the user when the face velocity of the fume hood exceeds the specified limits.

Variable Name	Available Options/Range	Description
Alarm Delay	No Limits	Time from when the face velocity exceeds the low/high limits to when CAVA displays the alarm.
Fume Hood Modes	All configured fume hood modes	Selects which fume hood modes the alarm can be activated in.
Low Limits	0	Sets the low limit for the face velocity of the fume hood for each of the configured fume hood modes. If the face velocity goes below this value, the alarm will be activated.
High Limits	No limits	Sets the high limit for the face velocity of the fume hood for each of the configured fume hood modes. If the face velocity goes above this value, the alarm will be activated.



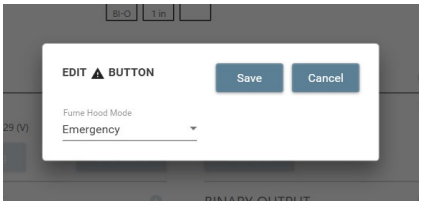
Sash Height

The sash height indicator is used to alert the user when a sash height exceeds the specified limits.

Variable Name	Available Options/Range	Description
Alarm Delay	No Limits	Time from when the sash height exceeds the low/high limits to when CAVA displays the alarm.
Fume Hood Modes	All configured fume hood modes	Selects which fume hood modes the alarm can be activated in.
Low Limits	No limits	Sets the low limit for the height of each connected sash sensor. If the sash goes below this height, the alarm will be activated.
High Limits	No limits	Sets the high limit for the height of each connected sash sensor. If the sash goes above this height, the alarm will be activated.

⚠ Button

This section details configuration instructions and available settings for the emergency button.



Edit ⚠ Button

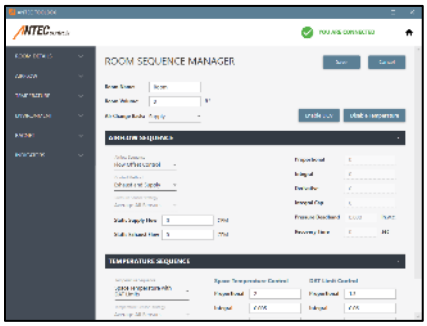
The emergency button is used to enter a particular fume hood mode at any time. The fume hood will remain in this mode until the emergency button is pressed again.

Variable Name	Available Options/Range	Description
Fume Hood Mode	All configured fume hood modes	The mode that the fume hood will enter when the emergency button is pressed.

Room Sequence Manager

The Room Sequence Manager allows the user to set the high-level airflow and temperature sequences in a room.

General Settings



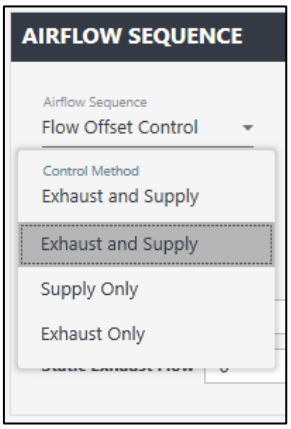
General Settings

Configures the general room settings.

Variable Name	Available Options/Range	Description
Room Name	19 characters	Allows the user to set the name of the room. **NOTE:** The name will appear as the controller's name when discovered on BACnet.
Room Volume	0 to 100,000,000 ft^3 0 to 2,831,685 m^3	Allows the user to set the volume of the room. The volume is used to calculate the air changes per hour (ACH) for the room. **NOTE:** If performing a DCV sequence, the room volume must be entered.
Air Change Basis	Supply Exhaust	Allows the user to select the airflow direction that will be used to calculate the ACH value for the room. **NOTE:** The air change basis will set the minimum and maximum flow type (supply or exhaust) to be configured in the room mode manager. **E.g.** If air change basis is set to supply, the supply flow minimum, supply heating flow maximum, supply cooling flow maximum and offset will be available for configuration.

Airflow Sequence

See below for descriptions of the different types of Airflow Sequences supported by PACE and how the settings will affect the room control.



Flow Offset Control

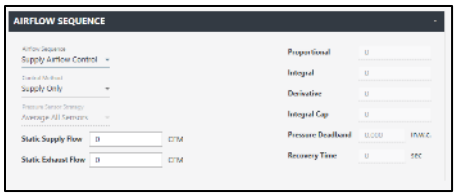
The primary controlled variable in offset flow control is the difference between the total supply air and the total exhaust air in the space. The control system is responsible for ensuring the offset is maintained at all times. Flow offset is a fast, stable solution to effectively control airflow in a critical space.

The user selects an air change basis of either supply or exhaust. The air change basis will dictate which flow direction sets the minimum required air changes in the space. After the minimum air change basis is met, the room will target the airflow offset setpoint and allows both the exhaust and supply actuators to drive to target values. Once target values have been achieved, the room uses its control method to maintain target values.

E.g. If exhaust is selected as the air change basis, the exhaust flow minimum and exhaust heat/cooling flow maximum will have to be set in the Room Mode Manager.

The following settings are available when the Airflow Sequence is **Flow Offset Control**.

Variable Name	Available Options/Range	Description
Control Method	Exhaust and Supply	The exhaust will modulate to maintain the room's airflow offset setpoint. If the exhaust reaches its control limit, then the supply valves will modulate to maintain the room offset. Additionally, for temperature control the user enters a heating maximum and cooling maximum based on the air change basis. The supply valves will modulate further open to meet temperature demand to a maximum of the heating or cooling max, as required. **NOTE:** Setting the air change basis is critical for the direction of the room flow minimum in the Room Mode Manager.
	Supply Only	The supply will modulate to maintain the room's airflow offset setpoint. The user enters a heating maximum and cooling maximum based on the air change basis. The supply valves will modulate further open to meet temperature demand to a maximum of the heating or cooling maximum, as required. **CAUTION** In the case that the supply has reached its control limit, a capacity error will be displayed.
	Exhaust Only	The exhaust will modulate to maintain the room's airflow offset setpoint. The user enters a heating maximum and cooling maximum based on the air change basis. The supply valves will modulate further open to meet temperature demand to a maximum of the heating or cooling maximum, as required. **CAUTION** In the case that the exhaust has reached its control limit, a capacity error will be displayed.
Static Supply Flow	No Limits	Enter any supply flow that is coming from an uncontrolled, unmonitored source
Static Exhaust Flow	No Limits	Enter any exhaust flow that is coming from an uncontrolled, unmonitored source



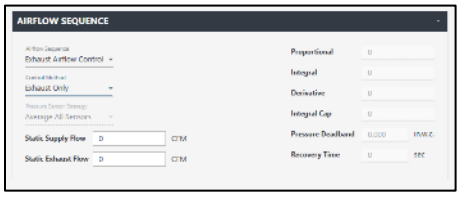
Supply Airflow Control

The supply airflow control sequence allows the user to configure a room in which PACE is the only controlling supply airflow valves. To select supply airflow control, no controlled exhaust valves can be present in the room.

The following settings are available when the Airflow Sequence is **Supply Airflow Control**.

Variable Name	Available Options/Range	Description
Control Method	Supply Only	The user enters a Supply Airflow setpoint that will be held at a constant value by all supply valves in the room.
Static Supply Flow	No Limits	Enter any supply flow that is coming from an uncontrolled, unmonitored source.
Static Exhaust Flow	No Limits	Enter any exhaust flow that is coming from an uncontrolled, unmonitored source.

NOTE: Supply airflow control limits the air change basis to supply.



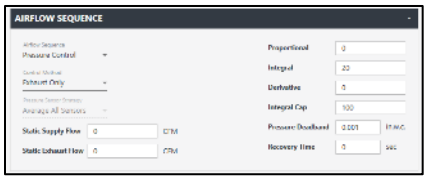
Exhaust Airflow Control

The exhaust airflow control sequence allows the user to configure a room in which PACE is the only controller exhaust airflow valves. To select exhaust airflow control, no controlled supply valves can be present in the room.

The following settings are available when the Airflow Sequence is **Exhaust Airflow Control**.

Variable Name	Available Options/Range	Description
Control Method	Exhaust Only	The user enters an Exhaust Airflow setpoint that will be held at a constant value by all exhaust valves in the room.
Static Supply Flow	No Limits	Enter any supply flow that is coming from an uncontrolled, unmonitored source.
Static Exhaust Flow	No Limits	Enter any exhaust flow that is coming from an uncontrolled, unmonitored source.

NOTE: Exhaust airflow control limits the air change basis to exhaust.



Pressure Control

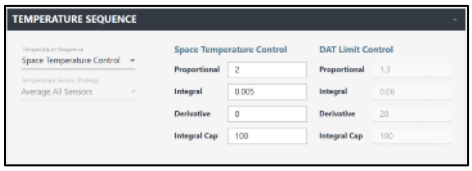
The primary controlled variable in pressure control is the pressure differential between the controlled room and an adjacent space. Pressure control requires a room pressure reading through SIN or an analog input. The control system is responsible for ensuring the pressure is maintained at all times. Pressure control typically requires tuning, but is capable of accurately controlling to a target room pressure.

The following settings are available when the Airflow Sequence is **Pressure Control**.

Variable Name	Available Options/Range	Description
Control Method	Supply Only	The user enters a fixed Exhaust Airflow setpoint. The supply will modulate to maintain room pressure. **NOTE:** Supply Only pressure control limits the air change basis to the exhaust.
	Exhaust Only	The user enters a fixed Supply Airflow setpoint. The exhaust will modulate to maintain room pressure. **NOTE:** Exhaust Only pressure control limits the air change basis to the supply.
Static Supply Flow	No Limits	Enter any supply flow that is coming from an uncontrolled, unmonitored source.
Static Exhaust Flow	No Limits	Enter any exhaust flow that is coming from an uncontrolled, unmonitored source.
Pressure Sensor Strategy	Average sensors Use lowest Use highest	When using multiple room pressure sensors, the user can choose to average all readings, use the lowest reading or use the highest reading. **NOTE:** BACnet will only display one reading for the Room Pressure based on the selected value for the Pressure Sensor Strategy.
PID Pressure Control		The PID pressure control settings allows the user to adjust proportional, integral, integral cap and derivative values.
Pressure Deadband	No Limits	Allows the user to adjust the deadband where the room pressure will be considered satisfied. No adjustments will be made to the airflow as long as the pressure remains in the deadband.
Recovery Time	No Limits	If door switches are installed, they will freeze the PID control when the door is open. Recovery time is the time from when the door is closed to when the PID control will re-engage.

Temperature Sequence

See below for a description of the two temperature sequences available when working with PACE.

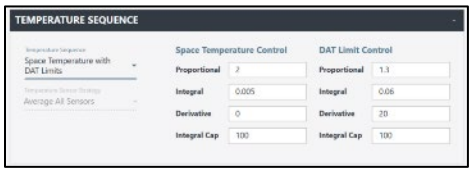


Space Temperature Control

Space temperature control uses room temperature readings and responds accordingly based on the PID settings. Temperature in most spaces can be controlled successfully with this temperature sequence.

The following settings are available when the using **Space Temperature Control**.

Variable Name	Available Options/Range	Description
Temperature Sensor Strategy	Average All Sensors Use Lowest Use Highest	The temperature sensor strategy appears when multiple room temperature readings are present in a single temperature zone. It allows the user to select how the room temperature for each zone is calculated and how to use the multiple readings in the temperature control algorithm.
Space Temp. Control (PID)		The space temperature control PID settings allows the user to adjust proportional, integral, integral cap and derivative values.



Space Temperature with DAT Limits

Space temperature control with DAT limits utilizes room temperature readings in conjunction with control of the DAT. As more or less heating is required in the space, the DAT target will raise or lower and the reheat will adjust to meet the DAT target within the acceptable limits set for each room mode. This temperature control method can provide increased stability and is useful in rooms with high air changes per hour (e.g. >20 ACH)

The following settings are available when the using **Space Temperature with DAT Limits**.

Variable Name	Available Options/Range	Description
Temperature Sensor Strategy		The temperature sensor strategy appears when multiple room temperature readings are present in a single temperature zone. It allows the user to select how the room temperature for each zone is calculated and how to use the multiple readings in the temperature control algorithm.
Space Temp. Control (PID)		The space temperature control PID settings allows the user to adjust proportional, integral, integral cap and derivative values.
DAT Temp. Limit Control (PID)		The discharge air temperature limit control PID settings allows the user to adjust proportional, integral, integral cap and derivative values.

Demand Control Ventilation (DCV) Sequence

See below for a description of the DCV sequencing and available options.

Demand Control Ventilation (DCV)

Demand control ventilation utilizes an ACH demand to ensure that contamination in the room remains within acceptable standards. Typically, labs with these systems are allowed to operate down to 2 ACH. If contaminants in the room are detected, a demand signal will be provided to PACE to increase the ACH in the room. If this demand exceeds the current temperature demand, then the airflow in the space will be increased to match the DCV's ACH demand.

The following settings are available when the **DCV** has been enabled.

Variable Name	Available Options/Range	Description
ACH Target Source	All configured ACH inputs	The user can select from any analog inputs that have been configured for the ACH usage.

NOTE: To use the DCV sequence a room volume must be entered in the Room Sequence Manager.

Room Mode Manager

Room modes can be used to command the room into different states of operation where different airflow or temperature setpoints are required. Examples would include, but are not limited to Occupied, Unoccupied and Emergency modes.

Types of Room Modes

There are two main types of room modes:

Default Room Mode: Toolbox creates the default room mode the first time a user connects to PACE. The default room mode is meant for the basic operation of the room and will populate based on some general information contained in the linestrings for all the valves in the room. The default room mode is the lowest priority room mode. PACE will only operate in this mode if no other room mode is currently activated.

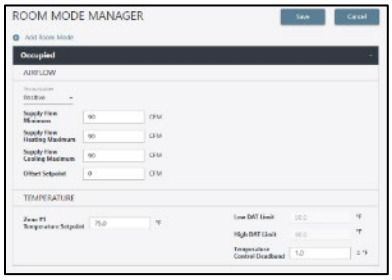
User Created Room Modes: The user has the ability to create up to five custom room modes. This allows the user to customize room modes that may require different airflow or temperature control setpoints for different control conditions in the space. The most common applications would be Unoccupied or Emergency modes.

NOTE: Users may create up to five User Created Room Modes.

Airflow

See below for the available settings when configuring the airflow setpoints for the default room mode and any User Created Room Modes.

NOTE: Available settings change based on previously selected settings, see below for a description of the settings available for different scenarios.

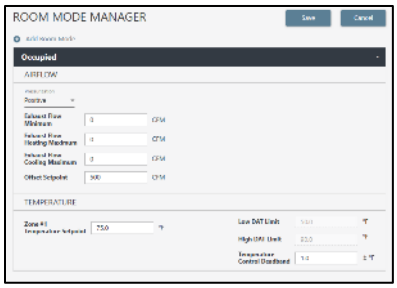


Flow Offset Control with Supply ACH Basis

The supply will be used to dictate the ACH in the room. The user will provide supply flow setpoints for the room's operation.

The following settings are available with **Flow Offset Control** and **Supply ACH Basis**.

Variable Name	Available Options/Range	Description
Pressurization	Positive Negative	Set either a negative or positive room pressurization.
Supply Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled supply flow allowed in the space to maintain the necessary air changes for this room mode.
Supply Flow Heating Maximum	*Supply Flow Minimum* to Maximum Range of Valve	The maximum scheduled supply heating flow allowed in the space to maintain temperature demand.
Supply Flow Cooling Maximum	*Supply Flow Minimum* to Maximum Range of Valve	The maximum scheduled supply cooling flow allowed in the space to maintain temperature demand.
Room Offset Setpoint	No Limits	The fixed offset between the supply and exhaust flows. As the supply modulates between its Minimum and Maximum, the exhaust will track to maintain this fixed offset. **NOTE:** This value is always entered as a positive number. The Pressurization dropdown will select whether the exhaust will offset with a higher or lower value than the supply.

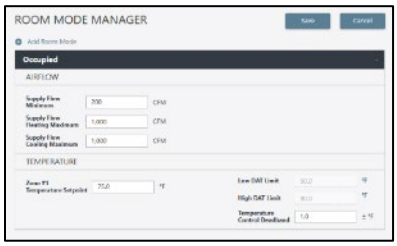


Flow Offset Control with Exhaust ACH Basis

The exhaust will be used to dictate the ACH in the room. The user will provide exhaust flow setpoints for the room's operation.

The following settings are available with **Flow Offset Control** and **Exhaust ACH Basis**.

Variable Name	Available Options/Range	Description
Pressurization	Positive Negative	Set either a negative or positive room pressurization.
Exhaust Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled exhaust flow allowed out of the space to maintain the necessary air changes for this room mode.
Exhaust Flow Heating Maximum	*Exhaust Flow Minimum* to Maximum Range of Valve	The maximum scheduled exhaust heating flow allowed in the space to maintain temperature demand.
Exhaust Flow Cooling Maximum	*Exhaust Flow Minimum* to Maximum Range of Valve	The maximum scheduled exhaust cooling flow allowed in the space to maintain temperature demand.
Room Offset Setpoint	No Limits	The fixed offset between the supply and exhaust flows. As the exhaust modulates between its Minimum and Maximum, the supply will track to maintain this fixed offset. **NOTE:** This value is always entered as a positive number. The Pressurization dropdown will dictate whether the exhaust will offset with a higher or lower value than the supply.

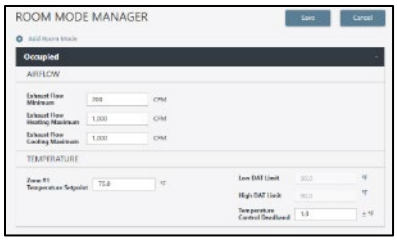


Supply Airflow Control

The supply will be used to dictate the ACH in the room. The user will provide supply flow setpoints for the room's operation.

The following settings are available with **Supply Airflow Control**.

Variable Name	Available Options/Range	Description
Supply Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled supply flow allowed in the space to maintain the necessary air changes for this room mode.
Supply Flow Heating Maximum	*Supply Flow Minimum* to Maximum Range of Valve	The maximum scheduled supply heating flow allowed in the space to maintain temperature demand.
Supply Flow Cooling Maximum	*Supply Flow Minimum* to Maximum Range of Valve	The maximum scheduled supply cooling flow allowed in the space to maintain temperature demand.

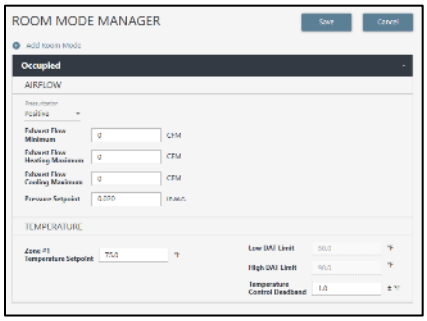


Exhaust Airflow Control

The exhaust will be used to dictate the ACH in the room. The user will provide exhaust flow setpoints for the room's operation.

The following settings are available with **Exhaust Airflow Control**.

Variable Name	Available Options/Range	Description
Exhaust Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled exhaust flow allowed out of the space to maintain the necessary air changes for this room mode.
Exhaust Flow Heating Maximum	*Exhaust Flow Minimum* to Maximum Range of Valve	The maximum scheduled exhaust heating flow allowed in the space to maintain temperature demand.
Exhaust Flow Cooling Maximum	*Exhaust Flow Minimum* to Maximum Range of Valve	The maximum scheduled exhaust cooling flow allowed in the space to maintain temperature demand.

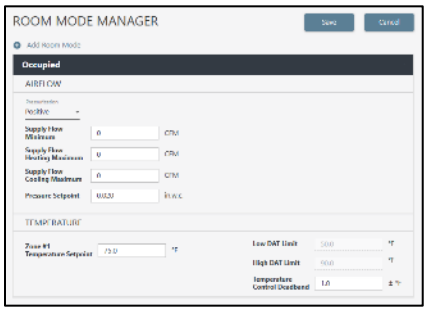


Pressure Control with Supply ACH Basis Only

The supply will be set to modulate for temperature demand and the user will then set a pressure setpoint for the room.

The following settings are available with **Pressure Control** with **Supply ACH Basis**.

Variable Name	Available Options/Range	Description
Pressurization	Positive Negative	Set either a negative or positive room pressurization.
Supply Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled supply flow allowed in the space to maintain the necessary air changes for this room mode.
Supply Flow Heating Maximum	Minimum to Maximum Range of Valve	The maximum scheduled supply heating flow allowed in the space to maintain temperature demand.
Supply Flow Cooling Maximum	Minimum to Maximum Range of Valve	The maximum scheduled supply cooling flow allowed in the space to maintain temperature demand.
Pressure Setpoint	No Limits	Sets the pressure control setpoint for the room. The exhaust valve will modulate until the room's pressure setpoint is satisfied.



Pressure Control with Exhaust ACH Basis

The exhaust will be set to modulate for temperature demand and the user will then set a pressure setpoint for the room.

The following settings are available with **Pressure Control** with **Exhaust ACH Basis**.

Variable Name	Available Options/Range	Description
Pressurization	Positive Negative	Set either a negative or positive room pressurization.
Exhaust Flow Minimum	Minimum to Maximum Range of Valve	The minimum scheduled exhaust flow allowed in the space to maintain the necessary air changes for this room mode.
Exhaust Flow Heating Maximum	Minimum to Maximum Range of Valve	The maximum scheduled exhaust heating flow allowed in the space to maintain temperature demand.
Exhaust Flow Cooling Maximum	Minimum to Maximum Range of Valve	The maximum scheduled exhaust cooling flow allowed in the space to maintain temperature demand.
Pressure Setpoint	No Limits	Sets the pressure control setpoint for the room. The supply valve will modulate until the room's pressure setpoint is satisfied.

Temperature

See below for the available settings when configuring the temperature setpoints for the Default Room Mode and any User Created Room Modes.

Temperature

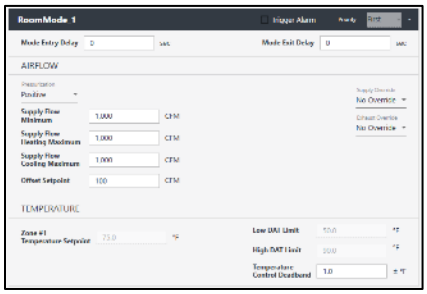
Temperature setpoints are fully customizable for any room modes. Different setpoints can be set for room modes that require tighter temperature control or a wider range of acceptable temperature control.

The following settings are available for **All Room Modes**.

Variable Name	Available Options/Range	Description
Zone #1 Temperature Set Point	No Limits	Allows the user to configure the temperature setpoint for Zone #1. Additional fields will be available when using multiple temperature zones. **NOTE:** This value is only available if there is no Analog Input configured for Temperature Setpoint.
Low DAT Limit	No Limits (when lower than the High DAT Limit)	The DAT control will not drop below this temperature value. If further cooling is required and the DAT has already reached this limit, the coil will not provide any cooler air. **NOTE:** Only available if Space Temperature Control w/ DAT Limits is selected.
High DAT Limit	No Limits (when higher than the Low DAT Limit)	The DAT control will not rise above this temperature value. If further heating is required and the DAT has already reached this limit, the coil will not provide any hotter air. **NOTE:** Only available if Space Temperature Control w/ DAT Limits is selected.
Temperature Control Deadband	0 to 10 F	Sets the deadband where the room temperature control will be considered satisfied. When in this deadband, the reheat or cooling coil and any added airflow will remain set in that position until heating or cooling are required. **NOTE:** The temperature control deadband sets the amount of degrees away from the set point that the temperature control PID loop initiates.

Additional Features

See below for the available settings for User Created Room Modes.



Additional Features

The following settings are available for **User Created Room Modes**.

Variable Name	Available Options/Range	Description
Room Mode Name	19 Characters	Customizable room name for simple identification of the available room modes. Click on the name to edit the field. **NOTE:** This field is also editable for the occupied room mode if a different name is desired to be displayed on BACnet, but it will still behave like an 'occupied' room mode.
Trigger Alarm	On/Off	Trigger an indicator whenever the room mode is active.
Priority	# of User Created Room Modes	Sets the priority of User Created Room modes if two are activated simultaneously.
Mode Entry Delay	No Limits	Time from when the mode input is triggered to when PACE will change to this room mode.
Mode Exit Delay	No Limits	Time from when the mode input is not triggered to when PACE will change to the default room mode.
Supply Override	Fully Open Fully Closed	Forces the supply valve(s) to a full open or full closed position.
Exhaust Override	Fully Open Fully Closed	Forces the exhaust valve(s) to a full open or full closed position.

NOTE: When using Supply or Exhaust Override functions within a room mode, room offset and airflow setpoints are not maintained.

CAUTION

If an indicator is required for a Room Mode (i.e. for Emergency or Purge) then the Trigger Alarm option must be checked here.

Airflow Staging

Airflow staging displays the operating airflow range of each supply or exhaust valve in the room.

In its simplest form, with only one supply and one exhaust valve, this should simply show the operating range of both valves. In larger rooms with multiple supply or exhaust valves, the airflow staging menu allows the user to stage specific supply or exhaust valves to react first in the system. The valves in each stage will move from the minimum to maximum flows set in the airflow device menu before moving onto the next stage. Usually the maximum and minimum are set to the full operating range of the valve.

NOTE: Fume hood exhausts will not appear in the airflow staging menu.

Moving Valves to a New Stage

A stage can be added in the airflow staging menu by selecting Add Stage.

Clicking the vertical arrow button next to SAV-2 ACT will open the following prompt to move the valve into a different stage.

SAV-2 will now appear underneath Stage 2 and will remain at its minimum flow until SAV-1 and SAV-3 have been fully opened.

CAUTION

A maximum of 10 airflow devices are allowed in a single stage. If more than 10 supply or exhaust airflow devices exist on a single RIN network, valves will need to be staged.

Triple or Quad Venturi Valves are considered 2 airflow devices, and therefore count as 2 airflow devices in the airflow stage.

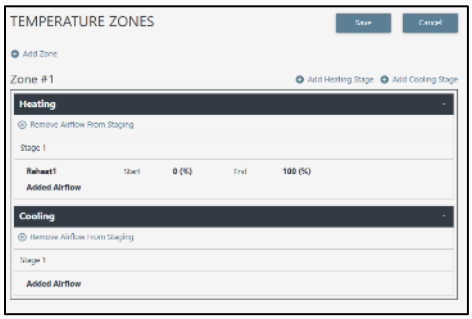
This excludes 2-P valves (with relay), 2-P valves (with PACE) and Mechanical Constant Volume VV.

CAUTION

Multiple airflow stages are only available if the room has only one Temperature Zone.

Temperature Zones

Allows the user to configure the specifics of the temperature control settings, either creating multiple stages or multiple temperature zones.



Temperature Zones

Staging allows the user to configure reheat, cooling and/or auxiliary heater devices and/or additional airflow to work in synchronization or in staged response for temperature control.

Variable Name	Available Options/Range	Description
Reheat	0 to 100%	A reheat device will automatically populate in Stage 1 of the heating sequence after the user has configured an analog output for a reheat device.
Add Airflow to Staging	0 to (Maximum value set in Room Mode Manager)	Added airflow can be applied to heating or cooling stages. The added airflow maximum is set for heating and cooling in the Room Mode Manager.
Add Heating Stage	Selection	Allows the user to add an additional heating stage. After the stage has been created, clicking the vertical arrows next to a reheat device or added airflow will allow the user to move the selection to another stage. **NOTE:** Adding a heating stage is only available if multiple heating items are in Heating.
Remove Heating Stage	Selection	Removes additional heating stages. Moves all devices or airflow in that stage to Stage 1.
Add Cooling Stage	Selection	Allows the user to add an additional cooling stage. After the stage has been created, clicking the vertical arrows next to added airflow will allow the user to move the selection to another stage. **NOTE:** Adding a cooling stage is only available if multiple cooling items are in Cooling.
Remove Cooling Stage	Selection	Removes additional cooling stages. Moves all devices or airflow in that stage to Stage 1.
Remove Airflow from Staging	Selection	Removes additional airflow from either heating or cooling stages.
Add Zone	Selection	Allows the user to add an additional temperature zone to the room. To move devices to a new zone the location button next to the device can be selected. To add airflow to a new zone select add airflow to staging. **NOTE:** Airflow staging cannot be implemented if an additional zone is added.
Remove Zone	Selection	Allows the user to remove an additional temperature zone in the room.

CAUTION

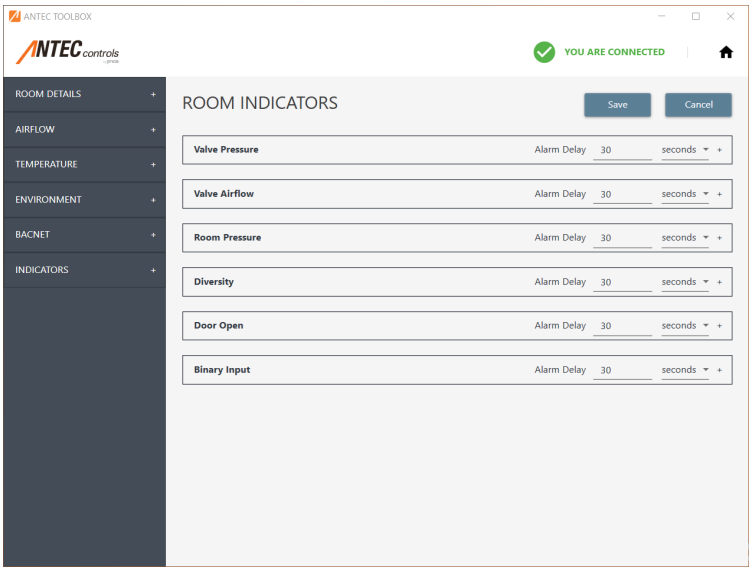
When staging devices in the temperature zones menu, all devices in Stage 1, including a reheat and added airflow, will modulate to 100% capacity or until the setpoint is reached. If the setpoint is reached before 100% is reached, the value will hold as long as the setpoint is satisfied. If the setpoint is not reached, then all devices in Stage 2 will begin to modulate until the setpoint is reached.

CAUTION

A maximum of five reheat devices are allowed in a single stage. If more than five reheat devices are present in a room, it is recommended that the room is divided into multiple temperature zones.

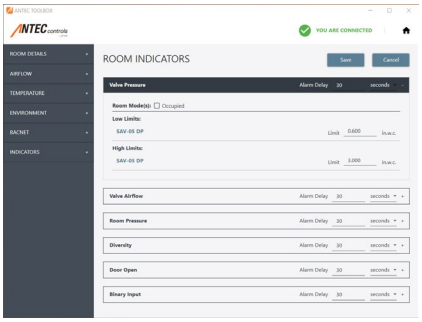
Room Indicators

Room Indicators are also known as alarms. They typically indicate when a desired room condition is not being achieved or may indicate that there is a problem with the operating conditions in the room. These indicators will be displayed locally in Toolbox when a technician is working in the room and are also transmitted to the BAS via BACnet for remote alarming.



CAUTION

Controller Offline, Sash Missing/Broken and CAN Device Missing indicators are all enabled by default with a delay of 0 seconds.

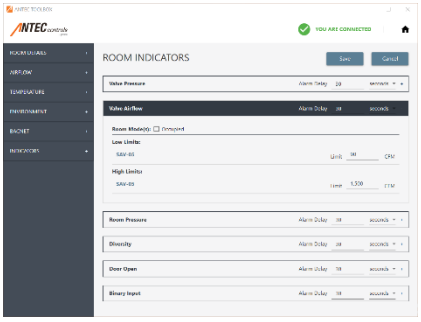


Valve Pressure

Valve pressure indicators are recommended when using Venturi Valves as they are designed to operate within specific pressure differential ranges.

The following settings are available for **Valve Pressure** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.
Low Limits	No Limits	Sets the low limit for the indicator. Should match the low limit on the Specification label of the valve.
High Limits	No Limits	Sets the high limit for the indicator. Should match the high limit on the Specification label of the valve.

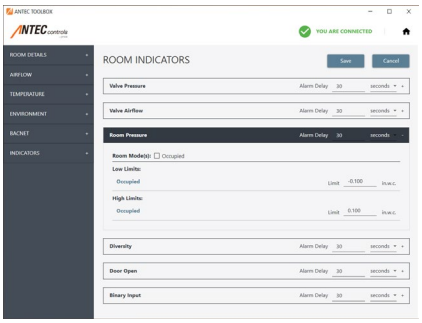


Valve Airflow

Valve airflow indicators are recommended when using a Venturi FX Valve or a terminal unit.

The following settings are available for **Valve Airflow** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.
Low Limits	No Limits	Sets the low limit for the indicator. Recommended to be the scheduled minimum of the valve.
High Limits	No Limits	Sets the high limit for the indicator. Recommended to be the scheduled maximum of the valve.

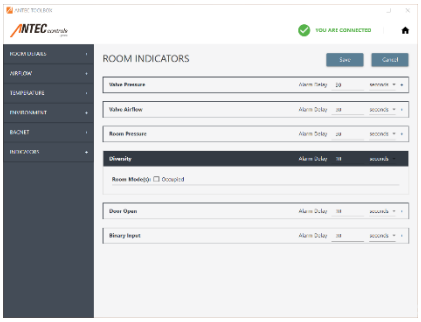


Room Pressure

Room Pressure indicators are recommended when using pressure control or when room pressure monitoring is utilized.

The following settings are available for **Room Pressure** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.
Low Limits	No Limits	Sets the low limit for the indicator.
High Limits	No Limits	Sets the high limit for the indicator.

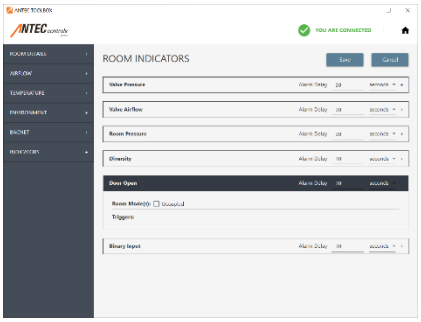


Diversity

Diversity alarms indicate when the flow offset is not capable of being achieved based on the demand required by fume hoods. Diversity is typically only seen in large labs that may be designed to operate with only a limited portion of the hoods open at any given time.

The following settings are available for **Diversity** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.

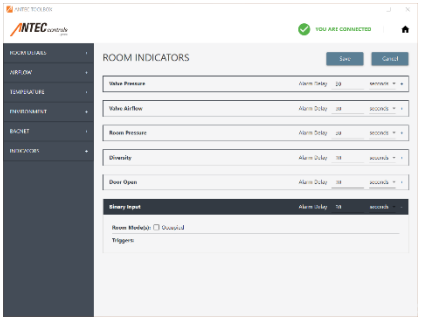


Door Open

Door alarms are typically used when using pressure control or pressure monitoring in a room. This allows users to better understand why a room cannot maintain room pressure. Without this door alarm, a user would simply be presented with a Low Pressure Alarm, even though the true issue is that the door is left open.

The following settings are available for **Door Open** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.
Triggers	All door contact inputs	All devices capable of triggering the indicator.



Binary Input

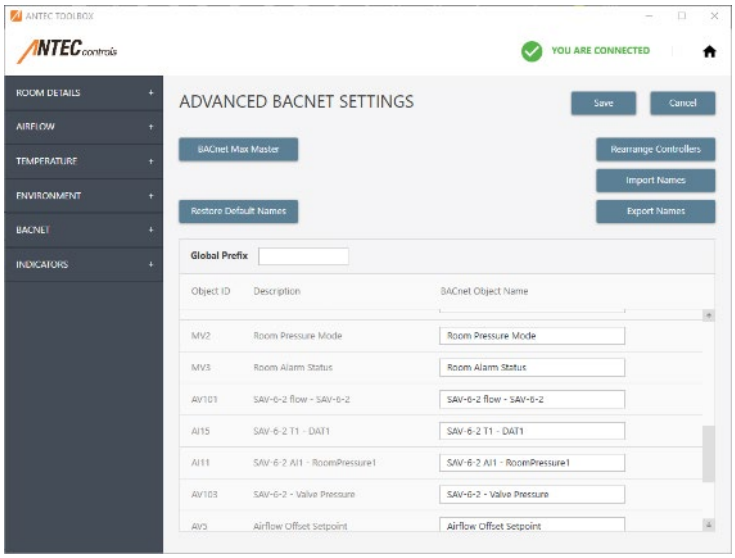
A specific binary input can be used to trigger an indicator. This may be useful if another system is sending an alarm signal to PACE.

The following settings are available for **Binary Input** indicators.

Variable Name	Available Options/Range	Description
Alarm Trigger Delay	No Limits	Time delay before the indicator becomes active.
Room Mode(s)	All configured room modes	Select which Room Mode the indicator will be enabled. **NOTE:** If a room mode is not checked, the indicator will not activate.
Triggers	All Binary Inputs	All devices capable of triggering the indicator.

Advanced BACnet Settings

Advanced BACnet settings allows the user to create a custom naming and numbering convention for BACnet points being sent out by PACE and CAVA. This is a useful tool if a customer would like a common convention across all devices on their network.



CAUTION

The Advanced BACnet Settings page shows the BACnet Points list for the most up-to-date firmware release. If using the newest Toolbox version with older firmware versions, the points list shown may not match the points list available on BACnet.

How Object Numbers are Created for Inputs And Outputs

Object ID	How it is created
AI#1	Based on the input/output type. **E.g.** AI11 shown above is an Analog Input.
AI#1	The # indicates the Controller Enumeration. Every PACE or CAVA on RIN is assigned a unique Enumeration based on the type of valve and the BACnet points will be assigned based on that enumeration. **E.g.** AI11 shown above is on the #1 Controller in the room. Controller Enumeration is created in the following order: SAV •Supply Air Valves GEV •General Exhaust Valves OEV •Other Exhaust Valves CAVA •Fume Hood Exhaust Valves FHC •Fume Hood Exhaust Valves
AI#1	Indicates the physical input/output being used on the associated PACE. **E.g.** AI11 shown above is using Analog Input 1.

How Object Names are Created by Default

Object Name	How it is created
[Controller name] – AI1 – [AI1 Device name]	Mimics the Controller Name set in the Controller Details menu.
[Pace name] – AI1 – [AI1 Device name]	Mimics the Device Name for each device.

Advanced BACnet Settings

BACnet Max Master

Limits the range over which the Poll For Master will scan on the MS/TP segment. For segments with less than 127 devices, optimizing the BACnet Max Master setting for each individual segment can increase the network efficiency.

NOTE: The BACnet Max Master must be configured for the highest MAC Address on the MS/TP segment.

CAUTION

Modifying BACnet Max Master setting could result in loss of communication with other devices on the BACnet MS/TP segment. Ensure that all devices on the MS/TP segment are configured with the same max master if it is required.

Restore Default Names

At any time, the points can be reverted back to the default point names.

CAUTION

This will cause all points to go back to defaults. Do not use this unless all points are desired to go back to defaults.

Global Prefix

Applies a prefix to the beginning of each BACnet Object Name

CAUTION

If a Global Prefix is entered and then edited in only one BACnet Point, the ability to remove the Global Prefix will be disabled.

Rearrange Controllers

Provides the user with the ability to modify the Controller Enumerations to reorder the Home Screen as well as the BACnet Points.

CAUTION

Changing the Controller Enumeration will change the order of the BACnet Points. It is not recommended to Rearrange Controllers after the BAS has been programmed.

Import Names

Allows the user to import a BN_NAMES.DAT file for a naming convention from another room.

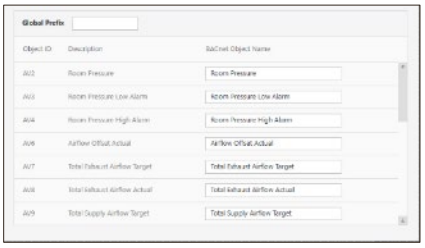
NOTE: This is only recommended when a project requires a very specific and consistent naming convention for the facility.

CAUTION

Before importing any BN_NAMES.DAT files, ensure that all valves are configured correctly and have been ordered in the same order as the valves from which the BN_NAMES.DAT file was created.

Export Names

Exports the BACnet names from the current room. This file can be used in other rooms when using the *Import Names* function.



BACnet Object Name

Displays the current BACnet object name and allows the user to adjust the name to provide unique naming to the points.

NOTE: Names are limited to 39 characters.

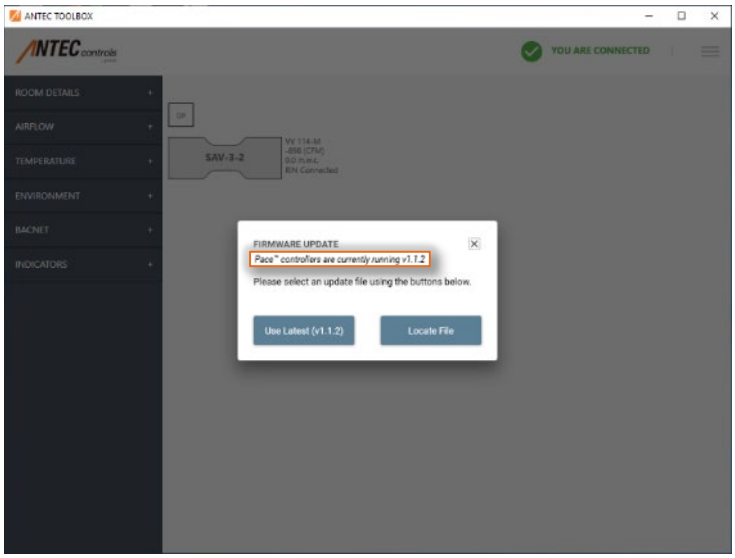
CAUTION

Use caution when updating BACnet point names. Changing the names to custom names may cause confusion if not done properly. When troubleshooting, always confirm the Object ID is correct to confirm the value being shown has the correct name.

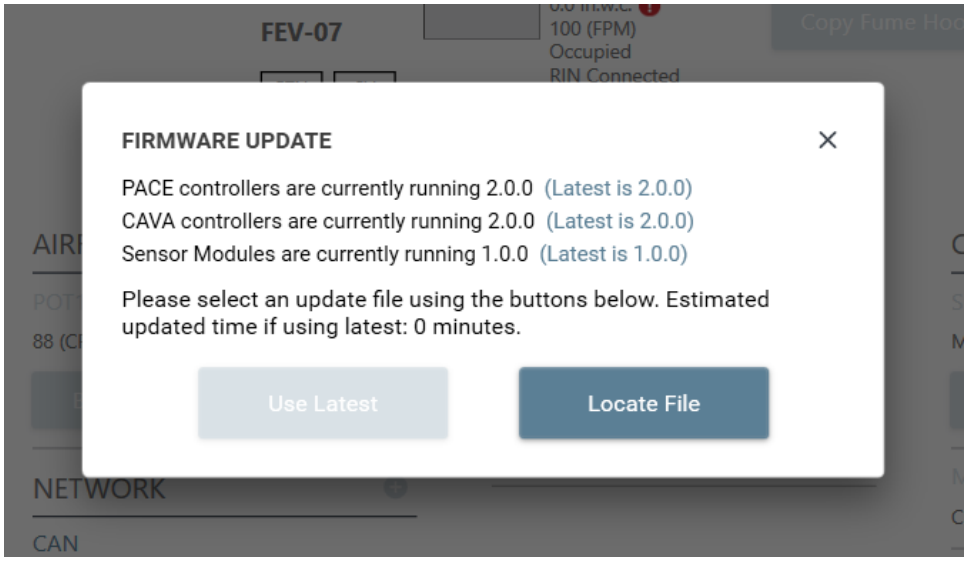
Firmware Update

The firmware update menu allows the user to manually update the firmware for PACE controllers, CAVA controllers, and FVM and SVS modules. The firmware will update on all controllers connected on the same RIN. The firmware update menu will tell you what firmware each controller and module is currently running.

NOTE: Toolbox will prompt the user to automatically update upon opening the program when it is not running the latest version of firmware.

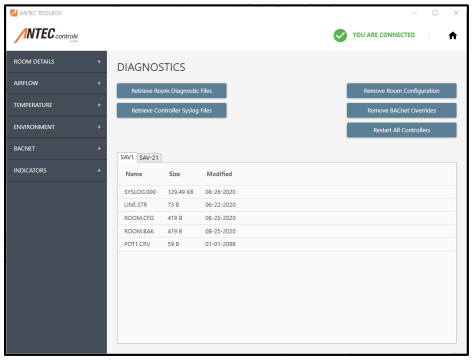


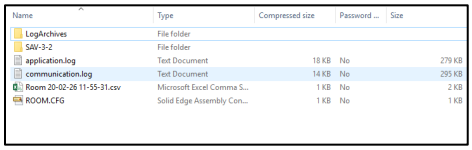
The user can use the locate file button to select a local version of firmware from their computer. If a specific version of firmware is required for a job, please contact Antec Controls Applications.



Diagnostics

The Diagnostics menu allows the user to download room diagnostic files, download controller syslog files, remove room configurations and restart all controllers.





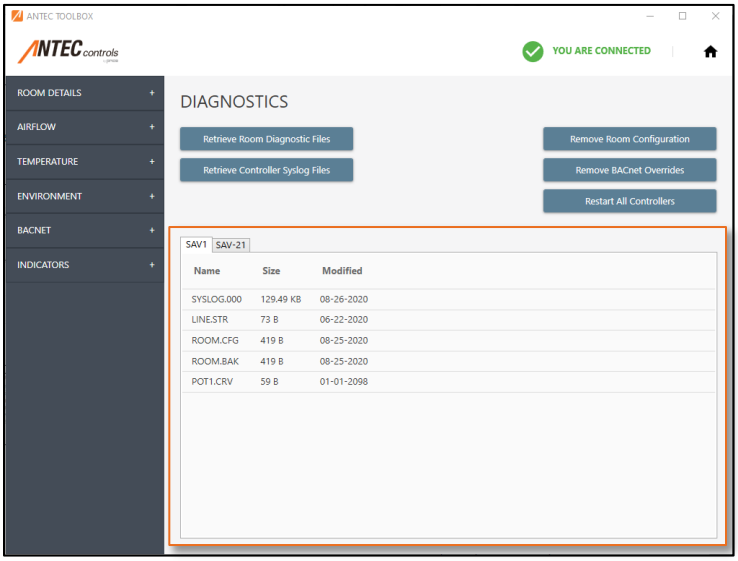
Diagnostics

The following settings are available in the Diagnostics Menu.

Variable Name	Available Options/Range	Description
Retrieve Room Diagnostic Files		Retrieves a ZIP file including a log archive, valve specific files (line string, POT curve, and room configuration), application log, communication log, commissioning report and ROOM.CFG file. The commissioning report allows the user to retrieve the valve specific configuration and room control sequences for all controllers connected on the same RIN. The ROOM.CFG file is a copy of the room configuration file. The application files log information about how Toolbox is running behind the scenes. The application files can assist the field support team with troubleshooting and diagnosing.
Retrieve Controller Syslog Files		Syslog files log information about how the firmware is running for a specific controller. The syslog files can assist the field support team with troubleshooting and diagnosing. **NOTES:** • Each controller has its own syslog files. Therefore, the syslog files must be removed from each individual controller on the diagnostics page. This can be done by selecting the tab corresponding to the valve tag. • This process will take a longer amount of time than retrieving diagnostic files because the syslog files are much larger files. The files also must be extracted from the controller and downloaded to your computer.
Remove Room Configuration		Allows the user to remove the room configuration for all controllers connected on the RIN network. **NOTE:** The BN_NAMES.DAT, ROOM.BAK, and AO#.CAL and ROOM.CFG files are all removed during this process.
Remove BACnet Overrides		Allows the user to remove all persistent BACnet overrides for the room. **NOTE:** BACnet overrides are saved to the controller as files. All BACnet override files should be removed after using the Remove BACnet Overrides feature.
Reset All Controllers		Allows the user to reset all controllers connected on the RIN network.

Stored Files

File listings for each controller are also available in the Diagnostics page. Each PACE and CAVA in the room will have a unique tab which shows all of the files currently stored on the controller:

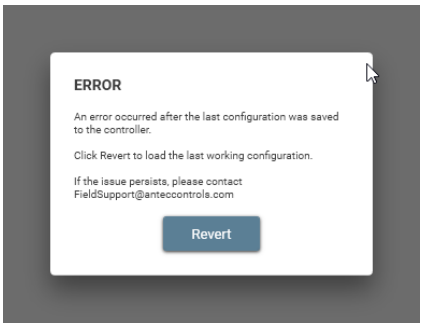


In a typical setup, the files that should appear in each tab are:

Venturi Valve	**VFX/Terminal Unit**	**BACnet Files**
ROOM.CFG	ROOM.CFG	Custom Names
ROOM.BAK	ROOM.BAK	BN_NAMES.DAT *(Only if Custom BACnet names are used)*
LINE.STR	LINE.STR	Persistent Overrides *(Only available with PACE firmware 1.2.0 or higher)*
SYSLOG.001	SYSLOG.001	MV#.DAT
AO#.CAL *(only if using VV valve and calibration has been completed)*		AV#.DAT
POT1.CRV		AO#.DAT
POT2.CRV *(Triple Venturi Valves Only)*		AI#.DAT BI#.DAT
AO3.CAL *(Triple Venturi Valves Only)*		BO#.DAT
		SCH#.DAT
		NOTE: Persistent overrides are only displayed if BACnet overrides are present.

Configuration Backups

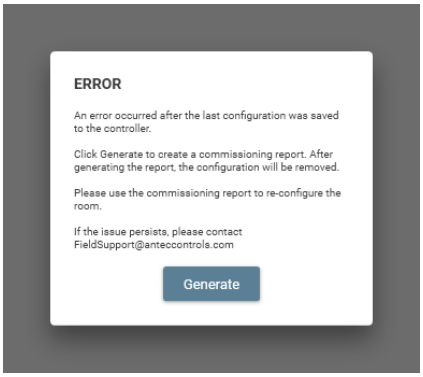
If an error is experienced while attempting to load a room configuration, the user will be prompted with one of the options shown below.



Revert

If a ROOM.BAK file is present on the controller, then the user will be prompted to revert the room to the last working configuration.

This will load the ROOM.BAK file as the room configuration to ensure that none of the settings are lost due to the error.



Generate

If a ROOM.BAK file is not present on the controller, then the user will be prompted to remove the room configuration that experienced the error.

Before removing the room configuration, Toolbox will generate the commissioning report that can be used when reconfiguring the room.

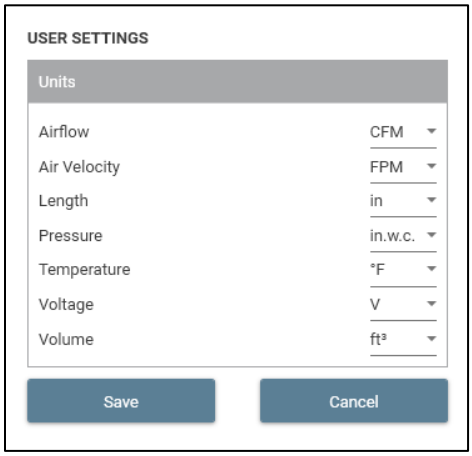
NOTE: After removing the room configuration, reconfiguration of the room is required.

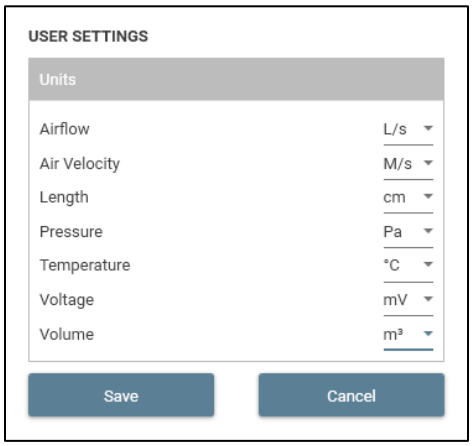
CAUTION

If the issue continues to persist, please contact Antec Controls Applications for assistance.

User Settings

The user settings menu allows for the units to be set to either imperial or metric. The options for imperial and metric are depicted below.





User Settings

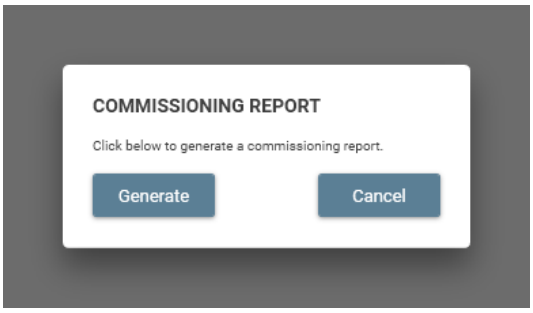
The following options for units are available in the User Settings Menu.

Variable Name	Available Options/Range	Description
Airflow	CFM L/s	Allows the user to select either metric or imperial airflow units.
Air Velocity	FPM M/s	Allows the user to select either metric or imperial air velocity units.
Length	In Cm	Allows the user to select either metric or imperial length units.
Pressure	In.w.c. Pa	Allows the user to select either metric or imperial pressure units.
Temperature	Fahrenheit Celsius	Allows the user to select either metric or imperial temperature units.
Voltage	V mV	Allows the user to select either mV or Volts.
Volume	Ft^3 M^3	Allows the user to select either metric or imperial volume units.

NOTE: Changing the units in Toolbox will also change the units that are viewed over BACnet.

Commissioning Report

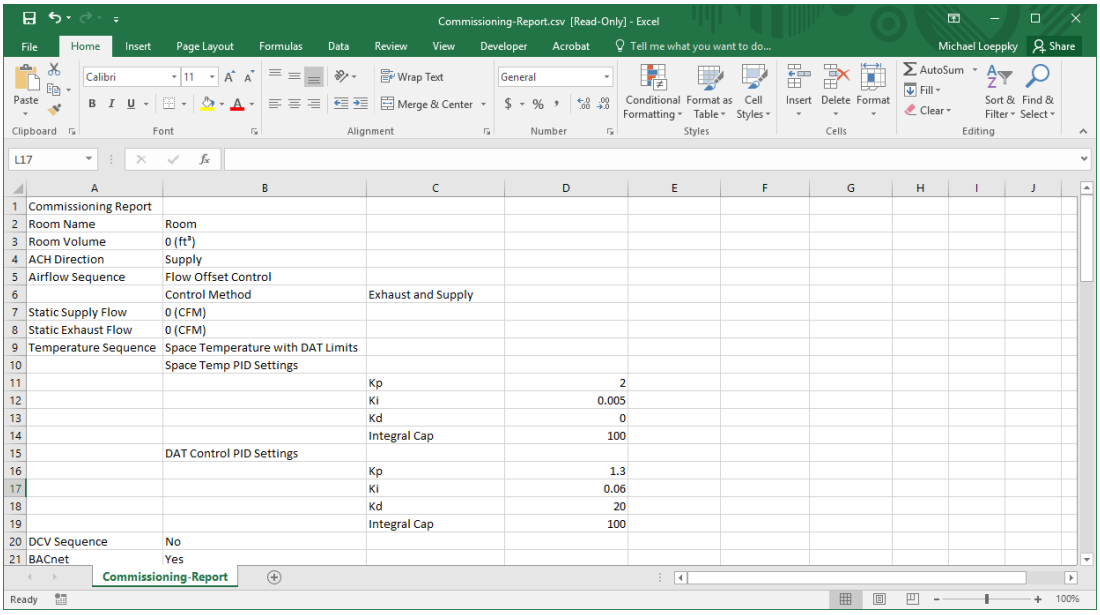
Allows the user to generate a commissioning report. When *Generate* is selected the user will be prompted to save a ZIP file that includes the following files.



NOTE: Commissioning Reports should be created whenever the user has completed configuration of a room. This will assist with future troubleshooting and will ensure that reports can be submitted upon successful completion of the project start-up.

Commissioning Report

The commissioning report includes all details of the room configuration in a csv formatted file. The report will present valve specific configuration and room control settings. It is important to generate a commissioning report for each room setup to have record of the inputs and outputs configured for each valve as well as the room control settings. Below is a sample of the formatting used for the commissioning report.



Commissioning-Report.csv [Read-Only] - Excel

	A	B	C	D
1	Commissioning Report			
2	Room Name	Room		
3	Room Volume	0 (ft³)		
4	ACH Direction	Supply		
5	Airflow Sequence	Flow Offset Control		
6		Control Method	Exhaust and Supply	
7	Static Supply Flow	0 (CFM)		
8	Static Exhaust Flow	0 (CFM)		
9	Temperature Sequence	Space Temperature with DAT Limits		
10		Space Temp PID Settings		
11			Kp	2
12			KI	0.005
13			Kd	0
14			Integral Cap	100
15		DAT Control PID Settings		
16			Kp	1.3
17			Ki	0.06
18			Kd	20
19			Integral Cap	100
20	DCV Sequence	No		
21	BACnet	Yes		

ROOM.CFG

Configuration file containing all settings from the room's setup.

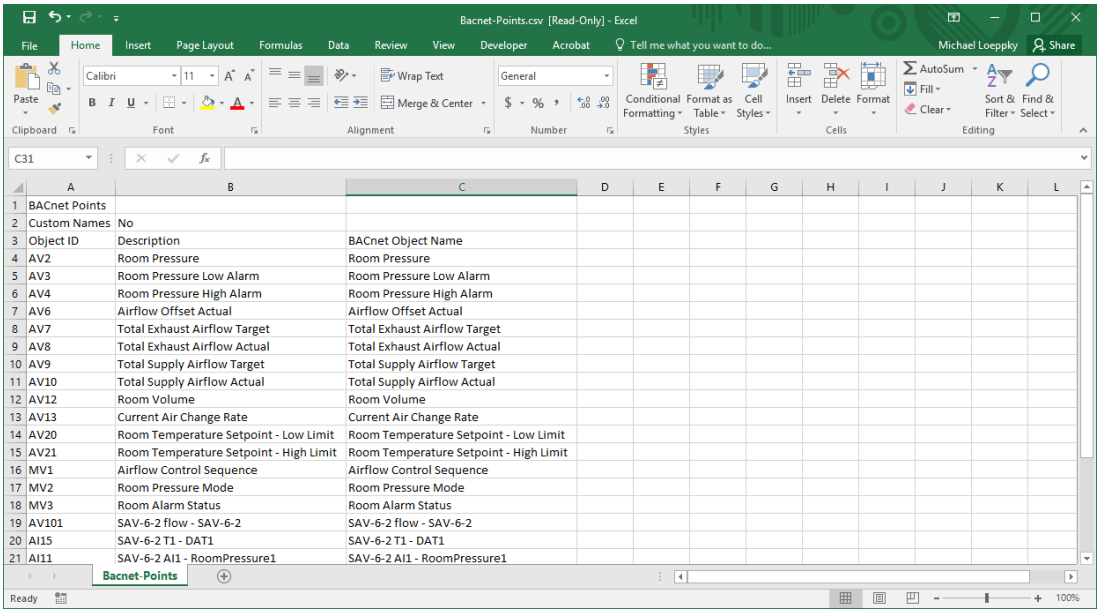
NOTE: This file should be stored for back-up purposes after each trip to the job-site and at the end of the project start-up. When troubleshooting, this can provide valuable information to the Antec Controls Applications Team to help assess any potential configuration issues.

BACnet Names

Exports a list of all of the current BACnet Points based on the room's configuration.

The BACnet Points file is extremely useful to provide to the controls contractor so they have a concise list of all the available BACnet points from each room.

NOTE: The file is only generated as part of the commissioning report if BACnet is configured for the room.



Bacnet-Points.csv [Read-Only] - Excel

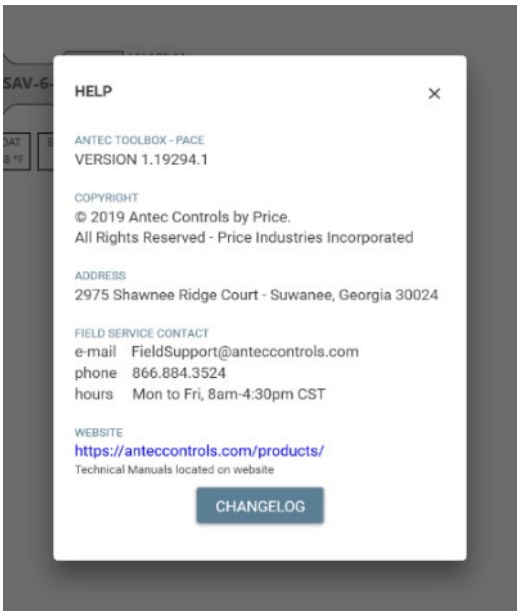
	A	B	C
1	BACnet Points		
2	Custom Names	No	
3	Object ID	Description	BACnet Object Name
4	AV2	Room Pressure	Room Pressure
5	AV3	Room Pressure Low Alarm	Room Pressure Low Alarm
6	AV4	Room Pressure High Alarm	Room Pressure High Alarm
7	AV6	Airflow Offset Actual	Airflow Offset Actual
8	AV7	Total Exhaust Airflow Target	Total Exhaust Airflow Target
9	AV8	Total Exhaust Airflow Actual	Total Exhaust Airflow Actual
10	AV9	Total Supply Airflow Target	Total Supply Airflow Target
11	AV10	Total Supply Airflow Actual	Total Supply Airflow Actual
12	AV12	Room Volume	Room Volume
13	AV13	Current Air Change Rate	Current Air Change Rate
14	AV20	Room Temperature Setpoint - Low Limit	Room Temperature Setpoint - Low Limit
15	AV21	Room Temperature Setpoint - High Limit	Room Temperature Setpoint - High Limit
16	MV1	Airflow Control Sequence	Airflow Control Sequence
17	MV2	Room Pressure Mode	Room Pressure Mode
18	MV3	Room Alarm Status	Room Alarm Status
19	AV101	SAV-6-2 flow - SAV-6-2	SAV-6-2 flow - SAV-6-2
20	AI15	SAV-6-2 T1 - DAT1	SAV-6-2 T1 - DAT1
21	AI11	SAV-6-2 AI1 - RoomPressure1	SAV-6-2 AI1 - RoomPressure1

CAUTION

If configuration changes are made after the initial export, it is important to provide the controls contractor with a new list to ensure they are working with the most up-to-date information.

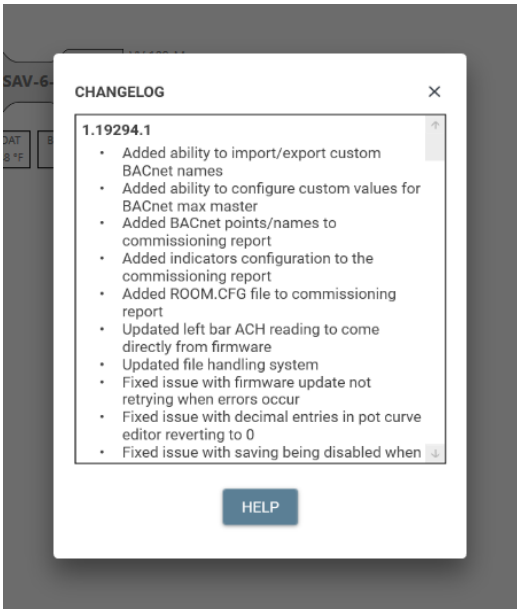
Help

The help menu allows the user to check the version of Toolbox being run, presents field support contact information, provides a link to the website and presents a changelog for Toolbox versions.



Changelog

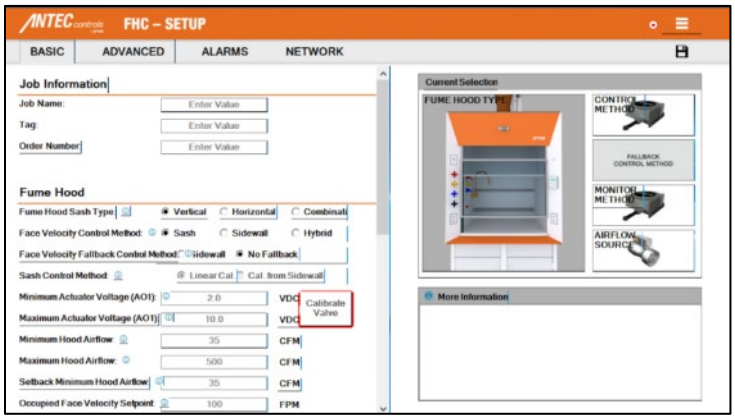
The changelog presents the changes made for each new version of Toolbox software.



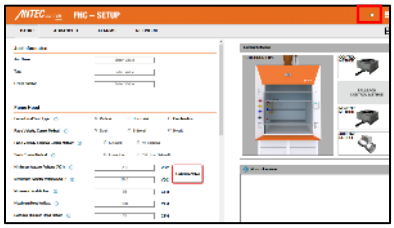
FHC

Home Screen

After selecting FHC, the user is presented with the following screen:



NOTE: Antec Toolbox cannot be used to configure FHC's with VFX. Settings must be configured through the Fume Hood Interface.



Connection Status

The FHC setup menu has a circular status light:

Green: Toolbox is connected to the FHC.

Red: Toolbox is not connected to the FHC.

NOTE: If a connection is not detected upon start-up, the program will display "No Linker Found". After correcting any connection issues, click the connection status to attempt to reconnect.

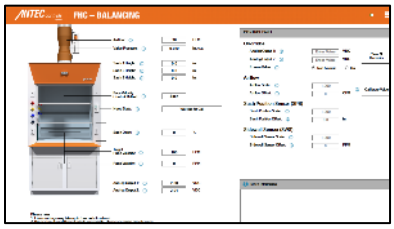
Setup

Variable Name	Description
Basic	Allows user to, input basic settings, calibrate the valve and calibrate the sash position sensor (SPS). This menu should cover the majority of the settings required for setup.
Advanced	Allows user to configure inputs, outputs and display settings.
Alarms	Allows user to set face velocity, airflow, valve pressure and sash height alarms.
Network	Allows user to setup a FHC for BACnet or FHN (Mnet).

Menu Button

Click this dropdown to access the settings menu for the FHC. See FHC – Settings for further information on available settings in each menu.

Variable Name	Description
Balancing	Displays live readings for fume hood balancing
Setup	FHC Configuration.
Generate Commissioning Report	Commissioning Report: Exports a PDF of all FHC settings.
Export Commissioning Data	Exports a CSV file of all FHC configuration settings.
Import Commissioning Data	Allows the user to import a commissioning CSV file with previously configured FHC settings.
Help	Provides FHC firmware version and Field Support contact information.
Exit	Closes program



Balancing Page

Displays live readings including airflow, valve pressure, sash height and face velocity.

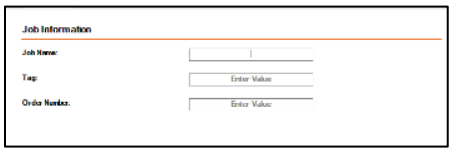
Presents information including face velocity control method and fume hood state.

Allows technicians to work with TAB by utilizing analog output overrides, airflow scale, airflow offset and valve calibrations.

NOTE: If the FHC has already been configured when the program is opened, the Balancing Menu will automatically appear.

Settings

Basic

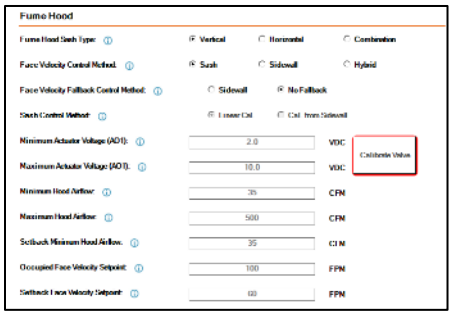


Job Information

Allows the user to input basic jobsite information.

Variable Name	Available Options/Range	Description
Job Name	No Character Limit	Job name to be displayed on the commissioning report.
Tag	No Character Limit	Valve tag to be displayed on the commissioning report.
Order Number	No Character Limit	Order number to be displayed on the commissioning report.

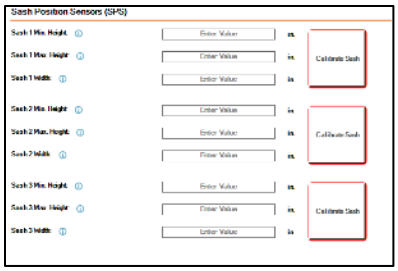
NOTE: When commissioning data is exported the file name format will populate based on the variables.



Fume Hood

Set up the primary control sequencing for the fume hood.

Variable Name	Available Options/Range	Description
Fume Hood Sash Type	Vertical Horizontal Combination	Used for graphic representation in the software for the type of fume hood.
Face Velocity Control Method	Sash Sidewall Hybrid	Configured the control type for the fume hood. Sash will measure the height of the sash and calculate how much airflow is required based on the height. Sidewall measures the face velocity and controls the valve until the face velocity setpoint is achieved. Hybrid uses a combination of both sash and sidewall control. **NOTE:** Options will be available based on which sensors are detected. If a sidewall sensor is not installed, Sidewall and Hybrid will not be available.
Face Velocity Fallback Control Method	Sidewall No Fallback	If both sash and sidewall sensors are installed on the fume hood, the user will have the ability to set up a fallback method in the case that the sash sensor ever fails.
Sash Control Method	Linear Cal. Cal. From Sidewall	Allows the user to map out the sash sensor's response. Linear Cal. will use the calculation for open area based on sash height and width to determine the required airflow. Cal. From Sidewall will allow the user to map out the sashes required airflow based on a reading from the sidewall sensor. **NOTE:** Cal. From Sidewall is only available if both sash and sidewall are installed.
Minimum Actuator Voltage	0 to 10 Volts	Minimum voltage for the actuator output.
Maximum Actuator Voltage	0 to 10 Volts	Maximum voltage for the actuator output.
Minimum Hood Airflow	Scheduled Value	Minimum scheduled airflow for the fume hood.
Maximum Hood Airflow	Scheduled Value	Maximum scheduled airflow for the fume hood.
Setback Minimum Hood Airflow	Scheduled Value	Minimum airflow when in an unoccupied mode.
Occupied Face Velocity Setpoint	Scheduled Value	Face velocity setpoint for the fume hood. Typically, 100 FPM, but depends on the fume hood specifications.
Setback Face Velocity Setpoint	Scheduled Value	Face velocity setpoint for the fume hood when the hood is not in use. Typically 60 FPM, but depends on the fume hood specifications.
Calibrate Valve	User Selection	Strokes the actuator from full closed to full open to map out the actuator voltage to the airflow value. **NOTE:** This must be performed to properly complete setup. Will be bordered by a Green outline after it has been completed.

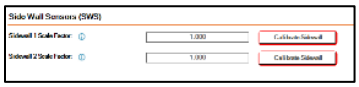


Sash Position Sensors (SPS)

Auto-detects the number of sash sensors wired to the FHC.

Variable Name	Available Options/Range	Description
Sash 1 Min. Height	0 to 120 inches	Must be the full closed position of the fume hood. Go past any stops that may be in place.
Sash 1 Max Height	0 to 120 inches	Must be the full open position of the fume hood. Go past any stops that may be in place.
Sash Width	0 to 120 inches	Width of the sash.

NOTE: The FHC can support up to three SPS. Every SPS must be calibrated individually. After the sensor is calibrated, the outline will become Green.



Side Wall Sensors (SWS)

Auto-detects the number of side wall sensors wired to the FHC.

Variable Name	Available Options/Range	Description
Scale Factor	0.5 to 2.0	Sets scale factor for side wall sensor. **NOTE:** This should only be adjusted if the technician or the balancer has measured face velocity during the sensor calibration.

NOTES:

- The FHC can support up to two SWS.
- When zeroing the sidewall sensor use tape to cover it. Both ports on the inside and outside of the hood must be covered.
- The calibration will calibrate both sensors at the same time. After the sensor(s) are calibrated, the outline will become Green.

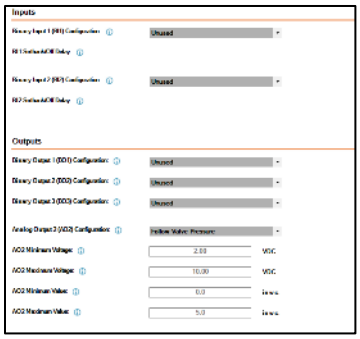
Advanced

Fume Hood

Advanced fume hood settings.

Variable Name	Available Options/Range	Description
Face Velocity Monitor Method	Sash Sidewall	Sets the sensor used to display face velocity on the FHI. **NOTE:** Whenever using Sidewall or Hybrid control it is recommended that the monitor method is Sidewall.
Airflow Control Device	Venturi Valve	Sets the type of airflow device being controlled. **NOTE:** Toolbox is only compatible with Venturi Valve setups for the FHC.
Report Zero CFM When OFF	Enabled Disabled	When enabled, if the FHC is in the Off Mode, zero airflow will be reported over the FHN to PACE. When disabled, if the FHC is in the Off Mode, the minimum airflow of the valve will be reported over FHN to PACE. **NOTE:** This is helpful when using Venturi Valves with a sequence that turns a dedicated exhaust fan off when the hood is in Off Mode.
Face Velocity Deadband	5 to 40	Sets the deadband range on the face velocity reading. **E.G.** If deadband is set to 10 FPM if the face velocity reading is between 90 FPM to 110 FPM it will display 100 FPM on the FHI.
Damper Position When Off	0 to 100%	Sets the damper position when the FHC is in the Off Mode.

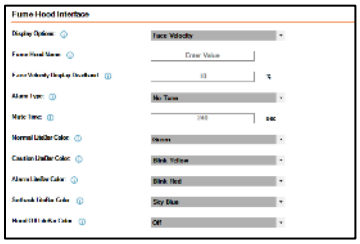
NOTE: For a VFX the setup wizard on the FHI must be used. Please refer the FHC manual for further instructions.



Inputs/Outputs

Configuring the FHCs inputs and outputs allows for full customization based on the sequence of operation.

Variable Name	Available Options/Range	Description
Binary Input 1 Binary Input 2	Unused	Binary Input has no functionality.
	Setback on Closed	When contact is closed, the FHC will enter Setback Mode.
	Setback on Opened	When contact is open, the FHC will enter Setback Mode.
	Off on Closed	When contact is closed, the FHC will enter Off Mode.
	Off on Opened	When the contact is open, the FHC will enter Off Mode.
	Alarm on Closed	When the contact is closed, an Alarm will display on the FHI.
	Caution on Closed	When the contact is closed, a Caution will display on the FHI.
	Emergency Purge on Closed	When the contact is closed, the FHC will enter Emergency Purge.
Binary Output 1 Binary Output 2 Binary Output 3	Unused	Binary output has no functionality.
	Active During Force On	Binary output is active when the FHC is forced to Occupied Mode.
	Active During Force Off	Binary output is active when the FHC is forced to Off Mode.
	Active During Normal	Binary output is active when the FHC is operating as expected.
	Active During Occupied	Binary output is active when the FHC is in Occupied Mode.
	Active During Setback	Binary output is active when the FHC is in Setback Mode.
	Active during Alarm	Binary output is active when the FHC is in alarm.
	Active during Caution	Binary output is active when the FHC is in caution.
	Follow BI1	Binary output will be active if binary input 1 is active.
	Follow BI2	Binary output will be active if binary input 2 is active.
	Active During Emergency	Binary output is active when the FHC is in Emergency Purge.
	Active During Sash 1, Sash 2 or Sash 3 Use	Binary output is active when the sash is above the minimum working height.
Analog Output 2	Unused	Analog output has no functionality.
	5V during Alarm	AO2 will output 5 VDC when the FHC is in alarm.
	Follow Face Velocity	Outputs a user set voltage signal for a user set face velocity range.
	Follow Valve Pressure	Outputs a user set voltage signal for a user set pressure range.
	Follow Valve Flow	Outputs a user set voltage signal for the full valve range.
AO2 Minimum Voltage	0 to10 Volts	Minimum voltage of the analog output.
AO2 Max Voltage	0 to 10 Volts	Maximum voltage of the analog output.
AO2 Minimum Value	0 to 500 FPM 0 to 5.0 in.w.c	Sets the minimum value for AO2. **NOTE:** Will be in in.w.c. if AO2 usage is Follow Valve Pressure or in FPM if AO2 usage is Follow Face Velocity.
AO2 Maximum Value	0 to 500 FPM 0 to 5.0 in.w.c	Sets the maximum value for AO2. **NOTE:** Will be in in.w.c. if AO2 usage is Follow Valve Pressure or in FPM if AO2 usage is Follow Face Velocity.



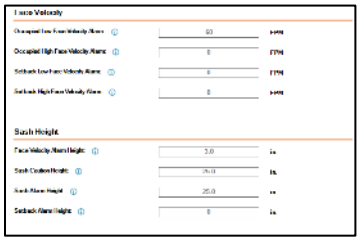
Fume Hood Interface

Configures the display settings for the Fume Hood Interface.

Variable Name	Available Options/Range	Description
Display Options	Face Velocity Name & Face Velocity Normal & Alarm Name & Normal & Alarm	Value to be displayed on screen.
Fume Hood Name	14 characters	The fume hood name that can be displayed on the interface if required.
Face Velocity Deadband	0 to 100	Prevents nuisance alarms when nearing the minimum airflow for the fume hood. This deadband is the difference of the current airflow to the Min airflow for the hood. While inside of this deadband, the display will show the face velocity setpoint.
Alarm Type	No Tone Steady 2KHz Wail Red Alert	Audible alarms can be used to provide feedback to the user when an error has occurred with the fume hood.
Mute Time	0 to 20,000 Seconds	The audible alarm can be silenced for a set time delay by pushing the mute button on the interface.
Normal LiteBar Color	Green White Sky Blue Off	Sets the LiteBar color when the fume hood is in normal operation.
Caution LiteBar Color	Blink Red Red Blink Green Blink Yellow Yellow Off	Sets the LiteBar color when the fume hood is in caution.
Alarm LiteBar Color	Blink Red Red Off	Sets the LiteBar color when the fume hood is in alarm.
Setback LiteBar Color	Green White Sky Blue Off	Sets the LiteBar color when the fume hood is in Setback Mode.
Hood Off LiteBar Color	Green White Sky Blue Off	Sets the LiteBar color when the fume hood is in the Off Mode.

NOTE: Once setup has been completed through FHC-Setup software. Settings can be adjusted through the FHI. The FHC manual has detailed menu options and can be found on the Antec Controls website.

Alarms



Face Velocity and Sash Height

Configure all the alarms on the FHC.

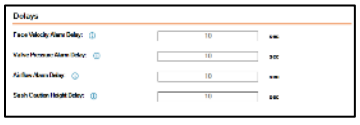
Variable Name	Available Options/Range	Description
Occupied Low Face Velocity Alarm	Disabled 1 to 100	Low alarm for the face velocity reading in Occupied Mode. Measured or Calculated face velocity below this value will trigger an alarm.
Occupied High Face Velocity Alarm	Disabled 100 to 200	High alarm for the face velocity reading in Occupied Mode. Measured or Calculated face velocity above this value will trigger an alarm.
Setback Low Face Velocity Alarm	Disabled 1 to 100	Low alarm for the face velocity reading in Setback Mode. Measured or Calculated face velocity below this value will trigger an alarm.
Setback High Face Velocity Alarm	Disabled 60 to 200	High alarm for the face velocity reading in Setback Mode. Measured or Calculated face velocity above this value will trigger an alarm.
Face Velocity Alarm Height	Disabled 1 to Sash Max Height	Disables the high velocity alarm below this sash height. Prevents nuisance alarms as the hood is closer to the minimum sash position.
Sash Caution Height	Disabled 1 to Sash Max Height	Enables a caution if the sash is raised above this height. Will prompt the user to close the sash.
Sash Height Alarm	Disabled 1 to Sash Max Height	Enables an alarm if the sash is raised above this height. Will prompt the user to close the sash.
Setback Alarm Height	Disabled 1 to Sash Max Height	Enables an alarm if the sash is raised above this height when in Setback Mode. Will prompt the user to close the sash.

NOTES: A value of 0 in any above fields will disable the alarm.

Pressure/Airflow

Configure valve pressure and valve airflow alarms.

Variable Name	Available Options/Range	Description
Low Valve Pressure	Disabled 0.1 to 5.0 in.w.c	Used for Venturi Valves. Will alarm if the valve differential pressure drops below the required operating pressure range.
High Valve Pressure	Disabled 0.1 to 5.0 in.w.c	Used for Venturi Valves. Will alarm if the valve differential pressure rises above the required operating pressure range.
Low Hood Airflow	Disabled 1 to 10,000	Used if it is critical that the fume hood remains within a set airflow range. Will alarm if the valve airflow drops below this value.
High Hood Airflow	Disabled 1 to 10,000	Used if it is critical that the fume hood remains within a set airflow range. Will alarm if the valve airflow rises above this value.



Delays

Add delay to any alarms to ensure no nuisance alarms are being triggered.

Variable Name	Available Options/Range	Description
Face Velocity Alarm Delay	0 to 30	Sets the time delay between when the face velocity alarm is detected and when the interface alarms.
Valve Pressure Alarm Delay	0 to 30	Sets the time delay between when the valve pressure alarm is detected and when the interface alarms.
Airflow Alarm Delay	0 to 30	Sets the time delay between when the airflow alarm is detected and when the interface alarms.
Sash Caution Height Delay	0 to 30	Sets the time delay between when the sash caution is detected and when the interface cautions.

Network

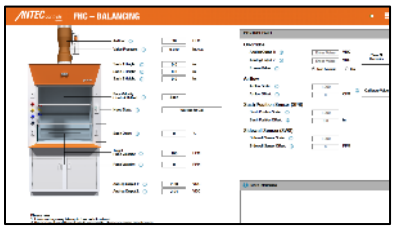
Network

Configure the network settings for either FHN (Mnet) or BACnet communication.

Variable Name	Available Options/Range	Description
Communication Protocol	Mnet BACnet	FHN (Mnet) is used any time that the FHC is connected to PACE. If the unit is standalone, it can be connected to BACnet.
Network Termination	Enabled Disabled	Sets whether the fume hood is end of line (EOL). EOL should only be enabled on the physical end of line FHC.
Mnet MAC Address	0 to 16	MAC Address for the fume hood controller on FHN. **NOTE:** The MAC address must be unique for every FHC on the FHN. The network must begin at 1 and increase sequentially through to 16.
BACnet Baud Rate	9,600 19,200 38,400 76,800	Sets the BACnet communication speed. **NOTE:** All devices on a BACnet segment must run at the same baud rate.
BACnet Device Instance	1 to 4,194,303	Sets the device instance. **NOTE:** The device instance must be unique for every device in the facility.
BACnet MAC Address	1 to 127	MAC Address for the fume hood controller on BACnet. **NOTE:** MAC address must be unique for every device on BACnet.

NOTE: 16 fume hoods can be configured on a single FHN.

Balancing



Balancing

Allows the user to assist TAB with balancing the face velocity and valve airflow in the fume hood.

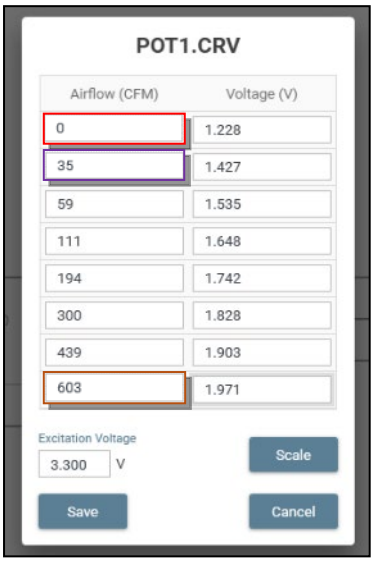
Variable Name	Available Options/Range	Description
Airflow	Live Reading	Displays current valve airflow reading.
Valve Pressure	Live Reading	Displays current valve pressure reading.
Sash Height 1 Sash Height 2 Sash Height 3	Live Reading	Displays current sash height.
Face Velocity Control Method	Sash Position Sensor (SPS) Side Wall Sensor (SWS) Hybrid	Sets the face velocity control method for the fume hood.
Hood State	Normal Caution Alarm	Displays the state of the fume hood.
Sash Open	Live Reading (%)	Displays the sash open percentage.
Target Face Velocity	Scheduled Value	Displays the target face velocity.
Face Velocity	Live Reading	Displays the current face velocity.
Analog Output 1 Analog Output 2	Voltage Range	Displays the voltage outputs for AO1 and AO2.
Overrides	User Input	Allows the user to override the analog outputs to certain voltages.
Airflow Scale/Offset	User Input	Allows the user to scale or offset the airflow.
SPS Scale/Offset	User Input	Allows the user to scale or offset the SPS reading.
SWS Scale/Offset	User Input	Allows the user to scale or offset the SWS reading.

HOW TO

Shutoff Valve Configuration

Shutoff Valves are designed to provide mechanical pressure independence, while also providing a 0-flow setting.

Shutoff Valve Basics



How to Identify a Shutoff Valve

Antec Toolbox will not visually indicate to the user whether a valve is a Standard Venturi Valve or a Shutoff Venturi Valve.

Toolbox identifies Shutoff Valves using the following values in the POT Curve file.

Variable Name	Description
First POT Point	If the valve is a Shutoff Venturi Valve, the first POT Point will be 0 CFM. **NOTE:** This is the only indication in the software that the valve is a Shutoff Valve.
Second POT Point	Indicates the first POT point where the valve can achieve mechanical pressure independence.
Eighth POT Point	Indicates the last POT point in the curve, or the maximum airflow that the valve can provide.

NOTE: The color of the Variable Name corresponds to the highlighted box in the image to the left.

Mechanical Range

The mechanical range of the valve is the full airflow range that the valve is capable of providing. This is indicated in the POT Curve as the range from the First POT Point to the Eighth POT Point.

E.g. For the POT Curve shown to the left, the mechanical range is 0 CFM to 603 CFM.

Operational Range

The operational range of the valve is the range in which the valve is capable of maintaining its airflow setpoint with mechanical pressure independence. This is indicated in the POT Curve as the range between the Second POT Point and the Eighth POT Point.

E.g. For the POT Curve shown to the left, the operational range is 35 CFM to 603 CFM.

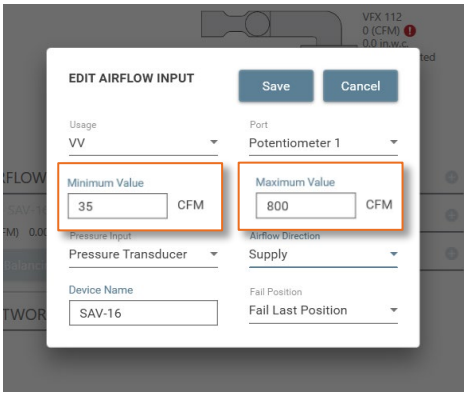
Shutoff Zone

The shutoff zone is the range in which the valve is not capable of maintaining its airflow setpoint with mechanical pressure independence. This is indicated in the POT Curve as the range between the First POT Point and the Second POT Point.

If the airflow target for the valve is in the Shutoff Zone, the valve will drive to the fully closed position to provide 0 CFM.

E.g. For the POT Curve shown to the left, the Shutoff Zone is between 0 CFM and 35 CFM.

Recommended Configuration for Supply or General Exhaust Valve Applications



Recommended Configuration *(SAV & GEV)*

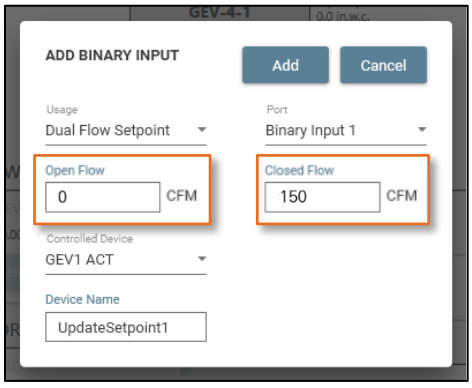
When using a Shutoff Venturi Valve in a Supply (SAV) or General Exhaust Valve (GEV) application, it is important to ensure that the Minimum CFM is configured to a value that is in the Operational Range of the valve, and not in the Shutoff Zone.

Using the settings below ensure that the valve will not fall into the Shutoff Zone during normal operation.

Variable Name	Recommended Value
Minimum Value	Larger than the First POT Point, and smaller than the Maximum Value. **E.g.** For the POT Curve shown above, this Minimum flow should be greater than or equal to 35 CFM.
Maximum Value	Larger than the Minimum Value, and smaller than the Eighth POT Point. **E.g.** For the POT Curve shown above, this Maximum Flow should be 600 CFM.

NOTE: Room Modes can still be used to override the valve to a full closed position if required.

Recommended Configuration for Other Exhaust Valve Applications



Recommended Setup *(2-Position Valve with PACE)*

When using a Shutoff Venturi Valve in an Other Exhaust Valve (OEV) application with a PACE controller, it is important to ensure the Minimum CFM is configured to either 0 CFM or a value that is not in the Shutoff Zone. The Maximum CFM should be in the Operational Range of the valve, and not in the Shutoff Zone.

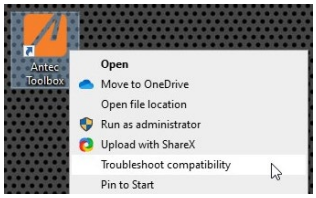
This gives the valve the ability to shutoff to 0 CFM when not in use, but ensures that it will not attempt to operate in the Shutoff Zone.

Variable Name	Recommended Value
Open Flow	If 0 CFM is required, it can be entered here. If 0 CFM is not required, then this value should be larger than the First POT Point, and smaller than the Closed Flow. **E.g.** For the POT Curve shown above, this Minimum flow can be 0 CFM or greater than or equal to 35 CFM.
Closed Flow	Larger than the Open Flow, and smaller than the Eighth POT Point **E.g.** For the POT Curve shown above, this Closed Flow should be between 35 and 600 CFM.

NOTE: Settings recommended above are written for when a Closed Contact on the Binary Input corresponds to Opening the Valve. If a Closed Contact on the Binary Input corresponds to Closing the Valve, reverse the values for the Open Flow and Closed Flow variables.

TROUBLESHOOTING

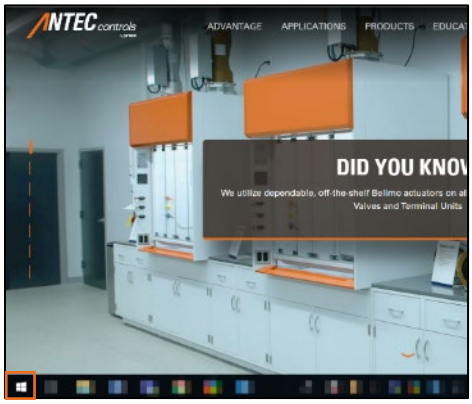
Symptom	Possible Cause/Solution
Software does not automatically update to the latest version when connected to a network	If using an unstable network connection, communication may be lost while checking for software updates. Download the latest version of Antec Toolbox from the login section of the website.
"**?**" shows instead of an image of the valve	The PACE controller was ordered loose (not factory mounted to an airflow device). 1. Configure an Airflow Device for the valve. a. Consult the product manual for the airflow device to ensure the correct airflow limits and/or k-factor are used. b. In the case of a Venturi Valve, use the Edit Curve function to input the valve curve.
	Toolbox failed to load the linestring containing the necessary information to automatically configure the airflow device. 1. In the Diagnostics menu, look through the controllers that are online. Are any/all of them missing the LINE.STR file? a. If **Yes**, contact Antec Controls Applications. b. If **No**, continue to next steps. 2. Check the status light on PACE. If it is GREEN, use the Remove Room Configuration feature in the Diagnostics menu 3. Close Toolbox. 4. Check wiring for RIN connections and Ethernet cable used to connect to controllers. 5. After confirming all RIN wiring, re-open Toolbox. 6. If no pop-up is observed, contact Antec Controls Applications.
Total Supply and Total Exhaust Airflow readings, Temperature readings and Indicators are not updating	The "Master" PACE may be off-line. 1. Check power at all devices is sufficient and that the LED is **not RED**. 2. Confirm RIN wiring matches the wiring shown in the Network Section of the PACE manual. To identify the "Master" PACE: 1. If the room was configured using Toolbox 1.19266.2 or later: The "Master" PACE is the first PACE displayed on the Home Screen. 2. If the room was configured using Toolbox earlier than 1.19266.2: Use the Retrieve Diagnostic Files feature and send the resulting file to Antec Controls Applications for review.
Unable to connect to PACE controllers	Toolbox may have been open prior to connecting to the RIN network. 1. Close Toolbox. 2. Connect to the RIN network. 3. Open Toolbox.
	Firewall may be blocking the network connection to RIN. See the Adjusting Windows Defender™ Firewall Settings.
	Possible faulty wiring. 1. Check that power at all devices is sufficient and that the LED is **not RED**. 2. Confirm RIN wiring matches the wiring shown in the Network Section of the PACE Manual.
	Controllers are stuck in a Reboot Cycle: 1. Were any changes made to the controllers before the issue occurred? 2. Was firmware updated unsuccessfully? 3. Check the PACE controller LED color. a. If the PACE LEDs are flashing from Blue to Green constantly, the controllers will need to be replaced. Please contact your local Antec Controls Representative.
T1 or T2 reading 244ºF	Possible faulty wiring – indicates a "short circuit." 1. Check that the thermistor wires are properly wired to the input terminal. 2. Check that the thermistor wire was not pinched or is not short circuited.
T1 or T2 reading 48ºF	Possible faulty wiring – indicates an "open circuit." 1. Check that the thermistor wires are properly wired to the input terminal. 2. Check that the thermistor wire does not have a break or cut in the line.

Unable to add reheat AO	Possibly limited by Temperature sequence. Space Temperature Control w/ DAT Limits requires a DAT probe before being able to add an Analog Output for the Reheat Usage.
Network Fault	Indicates unexpected voltage pulses on the NET1 or NET2 COM ports. 1. Check polarity of the MS/TP segment. 2. Check 24 VAC power polarity on any third party devices to ensure polarity is consistent with the PACE controllers on the MS/TP segment. 3. Use a multimeter to measure AC voltage on NET COM.
Antec Toolbox installer does not open	Possible compatibility issue. Right click the Antec Toolbox app and click Troubleshoot compatibility. 

Adjusting Windows Defender™ Firewall Settings

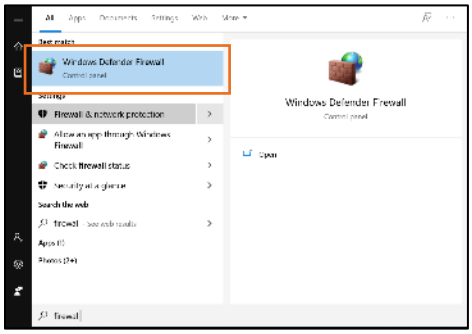
This section details how to manually allow Antec Toolbox through your Windows Defender™ Firewall Settings.

NOTE: The following instruction are for a Windows 10 operating system.



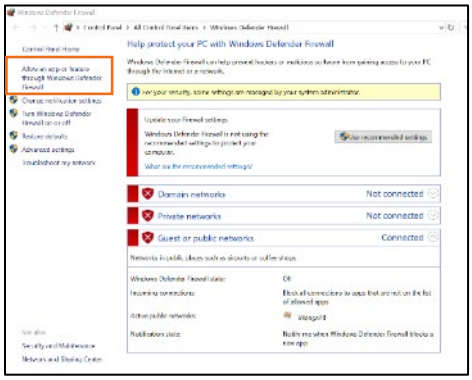
STEP 1

Select the **Start** button.



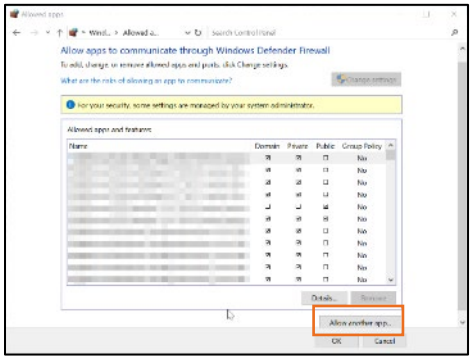
STEP 2

Type "firewall" in the start menu and select the Windows Defender™ Firewall option.



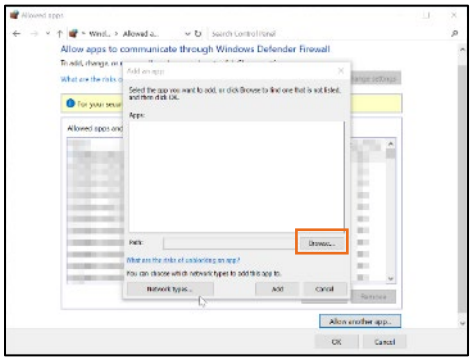
STEP 3

Choose the **Allow an app or feature through Windows Defender™ Firewall** option on the left side of the window.



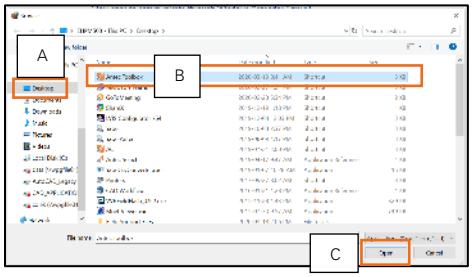
STEP 4

Select **Allow another app** in the bottom right hand corner of the window.



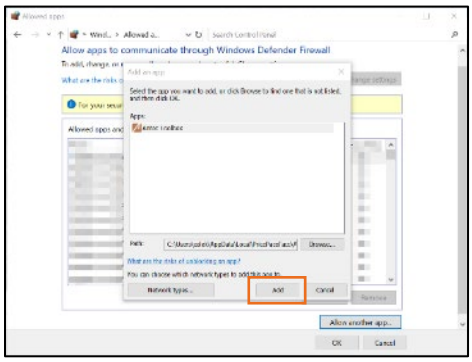
STEP 5

Select **Browse**.



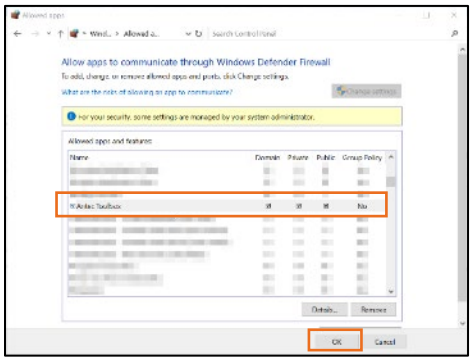
STEP 6

Select **Desktop** in the quick access bar of the window (A). Then select the Antec Toolbox Program (B), and click **Open** in the bottom right corner of the window (C).



STEP 7

Select Antec Toolbox and then click **Add**.



STEP 8

Check the box to the left of the Antec Toolbox, this will allow access for the application through the firewall. Then check all three boxes to allow access for Domain, Private and Public networks.

To exit select **OK** in the bottom right corner of the window. Antec Toolbox has successfully been allowed through the Windows Defender™ Firewall.

Technical Support

If technical support is required, please contact us:

By Email @ Applications@AntecControls.com

By Phone @ 866-884-3524

Hours of Operation: Monday – Friday, 8am to 4:30pm CST

NOTE: If you will need support after hours, please contact us 48 hours in advance.

CHANGELOG

Manual Version	Toolbox Release	Changes
v100	1.19029.1	Initial release
v110	1.19233.1	Formatting changes Image changes Added Section for Advanced BACnet Settings Added Section for Changelog Added Voltage type input in Analog Inputs section
v111	1.19266.2 1.19294.1	Formatting changes Image changes Added Cooling Devices to Analog Output section Added Cooling Maximum and Heating Maximum to Supply Airflow Control and Exhaust Airflow Control sequences Added Controller Ordering and BACnet MAX Master to Advanced BACnet Settings Added BACnet Naming Report and ROOM.CFG to Commissioning Report
v112	1.19324.2 1.20006.3	Image changes Added ROOM.BAK description and functionality
v113	1.20016.4	Updated balancing menu Added limit for User Created Room Modes Added limits for devices in Airflow and Temperature Staging
v114	1.20043.1 1.20052.5 1.20062.1	Updated SIN Device section Updated Retrieve Room Diagnostic Files description Updated the Firmware Update pictures
v115	1.20070.3	Added a section to troubleshooting outlining how to adjust the Windows Defender™ Firewall settings to allow access for Antec Toolbox. Updated information for the frequency of entering the Antec Toolbox password
v116	1.20120.1	Updated Temperature Zones descriptions for Add Heating Stage and Add Cooling Stage buttons Added items to troubleshooting section
v117	1.20140.3	Updated to include “Automatic Updates” Added items to troubleshooting section Added “How To” Section Added “Shutoff Valve Configuration” to How to Section
v118	1.20175.1	Updated Connection Status in Controller Information section Added items to troubleshooting section
v119	1.20232.1	Updated Diagnostics for new “Remove BACnet Overrides” button Updated Diagnostics for new BACnet Override Files Updated Binary Inputs descriptions
v120	1.21020.1	Updated Room Pressure usage in Analog Inputs to include Scale Factor and Offset Updated Sensor Information Network (SIN) Devices to include Scale Factor and Offset
v121	1.21252.1	Fume Hood Manager page added to provide support for CAVA
v122	1.21279.3 1.21306.2 1.21328.1 1.21329.1 1.21337.3 1.21350.1 1.22010.1	Added Airflow section to Left Bar description. Added Auxiliary Heater usage in Analog Outputs. Added Controlled Airflow usage in Analog Inputs. Updated Airflow usage in Analog Inputs to Monitored Airflow usage. Updated Sidewall Velocity device section.

v123	1.22032.2	Added ability to configure Fume Hood Indicators on Binary Outputs on CAVA. Updated name of Indicators to Room Indicators. Updated name of Indicator usage in Binary Outputs to Room Indicator.
v124	1.22054.1	Fixed issue related to modifying of sash width.
	1.22200.1	Updated room volume limit.
V125	1.22200.1	Formatting changes
v126	1.22208.2	Fixed use with triple VV FVM indicator limits.
	1.22300.1	Added Total Fume Hood Exhaust usage in Analog Outputs on PACE and CAVA.

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