

VAV-B

Programming Manual

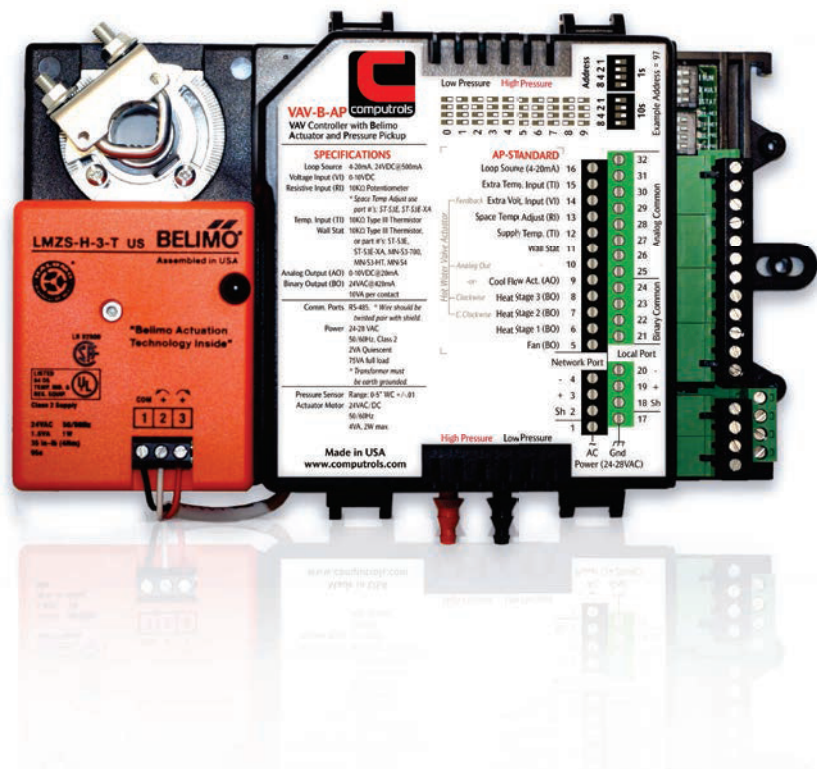


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VAV-B Programming Manual

CBAS version 11.1.9 or newer
Firmware version 13.7 or newer on Host controller
USB to 485 commissioning cable (need part number) or
USB Isolator (B&B Electronics model USOPTL4)
Drivers for cable or isolator
VAV_Utility.exe commissioning software
vcredist_x86.exe (in certain cases)

All of the above software and firmware are included in the VAV-B Package. Contact Customer Service or Technical Support for this, or for cables.

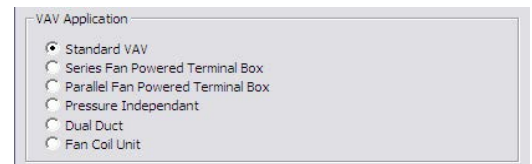
Things you need to know:

The preferred protocol for the VAV-B is OPTO. It is easier to program the points in CBAS with OPTO. However, BASnet is also available if you need to add a VAV-B to an existing BASnet channel.

There are 2 ways of connecting to the VAV-B controller: One is through a USB port direct to the controller's Local Port using a USB to 485 cable. This method is also used for balancing VAV boxes later after installation. The second is through the CBAS DPU using the host controller and OPTO 485 channel. The second method is covered later in this manual. For your first time, it is suggested that you use the direct connection method in your office before going to the jobsite.

The points you program in the CBAS database DO NOT DOWNLOAD to the controller. They are there for you to monitor the application that is running on the controller, and to command a few points if necessary.

The available applications included with the controller are *(See figure right)*:



Basic Steps Summary

- Wire the VAV-B including power, 485 Comm to Host, and commissioning cable.
- Set Address using dipswitches.
- Place the VAV_Utility.exe commissioning software in the CBAS folder.
- Create shortcut to above software (optional).
- Plug in the cable to a USB slot and complete installation using drivers.
- Start Utility Program.
- Click VAV Connection and set the parameters to connect.
- Choose "Serial Port via 485 converter" and enter address.
- Select USB serial port, then click Connect. Database should download and Status should show Ready.
- You can now Click Pre Box Setup and work your way down the list of parameters. Click OK.
- Do the same with Installer button.
- Click "Save and Export Database".
- Click Save All Changes to VAV. The controller will reboot and the program will reconnect.
- To zero out the pressure pickup and damper actuator, etc, click Test and Balance.
- Return to Main Screen, then Save/Export Database.
- Save All Changes to the VAV.
- Open CBAS in Editor Mode.
- In Hardware View, add a channel to host the VAV-B controllers (could be OPTO, BASnet, or BACnet (pending)).
- Add a VAV-Belimo to the channel.
- OPTO: Import points from file saved in earlier step during commissioning.
- BASnet: Add a blank controller. DO NOT choose to Add from Template, or Copy from another controller. Click controller, then Add Points to VAV-B.
- BACnet: Pending.
- Go to Real Mode and start monitoring.
- Add a VAV-B Commission point to the Workstation channel. This allows you to commission VAV-Bs through the 485 channel. VAV_Utility.exe must be in the C:\CBAS folder.

Hardware

Wiring the VAV-B Controllers

See wiring diagram. The commission cable can be connected through a MN-S3 display stat as shown.

- If you are not using a MN-S3, you will need a cable with bare wires on the end opposite the USB plug.
- The black wire attaches to the Programming Port (–) terminal and the red wire attaches to the (+) terminal.
- The 24VDC common must be connected to earth ground!
- You may daisy chain up to 50 VAV-B controllers on one 485 channel connected to either the Host port or Secondary port on the Host Controller.
- Terminate sensor and output wires to terminals according to the label on the controller.

Set the address

Using the dipswitches, set the address.

- There is one set for the 10s and one set for the 1s, so the address can be from 1 to 99. Zero is an invalid address.
- Dipswitches in the UP position are added up to make the address.
- There are examples shown on the controller's label.

Install Commission Cable

To install the Ulinx USOPTL4 USB to RS-485 adapter, follow the instructions provided with the driver installation CD. To install the USB to 485 cable, continue.

- Plug in the USB to 485 commissioning cable and the Found New Hardware Wizard will appear.
- Browse to the location where you placed the cable drivers.
- Inside the i386 folder, highlight the ftdibus.sys file and click next.
- Complete the installation wizard.

The cable will be listed in Device Manager under Ports, as USB Serial Port COMXX. (XX represents the comm port number)

Software

Utility Program

Copy the VAV_Utility.exe commissioning software to C:\CBAS.

Right-click the file and click Send To, then Desktop (Shortcut), if you need a desktop shortcut for commissioning purposes.

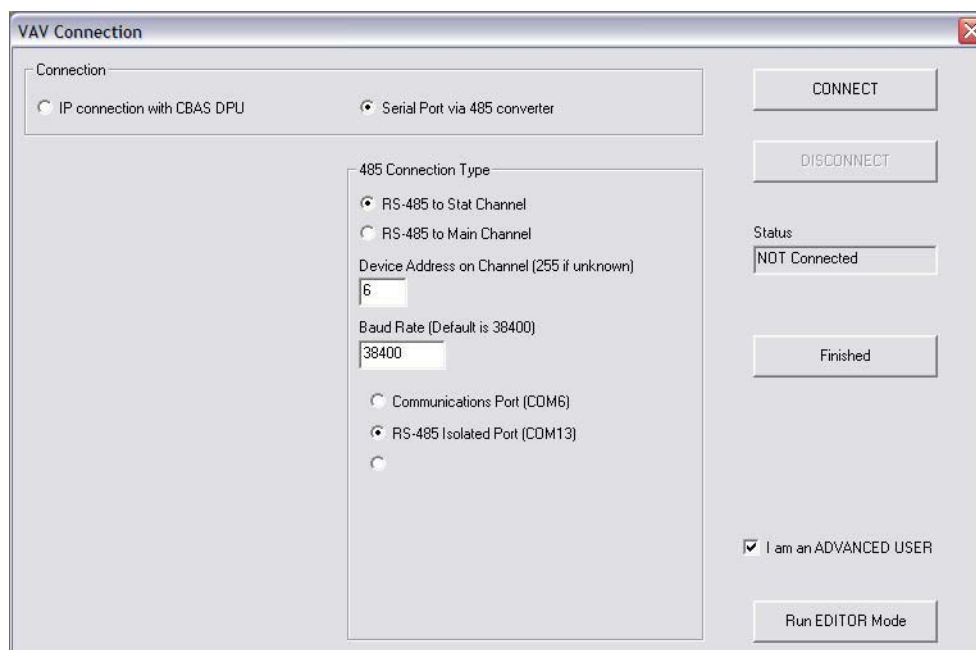
Connecting

- Start the VAV_Utility program.
- If you get an error, run the vcredist_x86.exe then start the program again. (Should only be necessary on Windows XP, if CBAS has not been installed on the PC)
- At the top of the window, click VAV Connection. (*see figure on next page*)
- Choose Serial Port Via 485 converter.
- Choose RS-485 to Stat Channel. (Main Channel refers to 485 network to Host controller)
- Enter the address of the VAV-B.
- Leave the Baud rate at default.
- Choose the USB Serial port.
- If you are going to program the VAV-B as a Master or Slave box, or change from English units to Metric (DEG C), check the "I am an advanced User" box.
- Click Connect and the database will load with 10 seconds.

Note:

Editor mode is a way to simulate programming without being connected to a controller. This is equivalent to Simulator Mode in CBAS.

Connecting continued...



The VAV Connection dialog box is shown. It has a title bar with a close button. The main area is divided into two sections. The top section, labeled 'Connection', has two radio buttons: 'IP connection with CBAS DPU' (unselected) and 'Serial Port via 485 converter' (selected). The bottom section, labeled '485 Connection Type', has two radio buttons: 'RS-485 to Stat Channel' (selected) and 'RS-485 to Main Channel' (unselected). Below these are two text boxes: 'Device Address on Channel (255 if unknown)' with the value '6' and 'Baud Rate (Default is 38400)' with the value '38400'. There are three radio buttons for the port type: 'Communications Port (COM6)' (unselected), 'RS-485 Isolated Port (COM13)' (selected), and an unlabeled one (unselected). On the right side, there are three buttons: 'CONNECT', 'DISCONNECT', and 'Finished'. Below these is a 'Status' label with a text box containing 'NOT Connected'. At the bottom right, there is a checked checkbox 'I am an ADVANCED USER' and a 'Run EDITOR Mode' button.

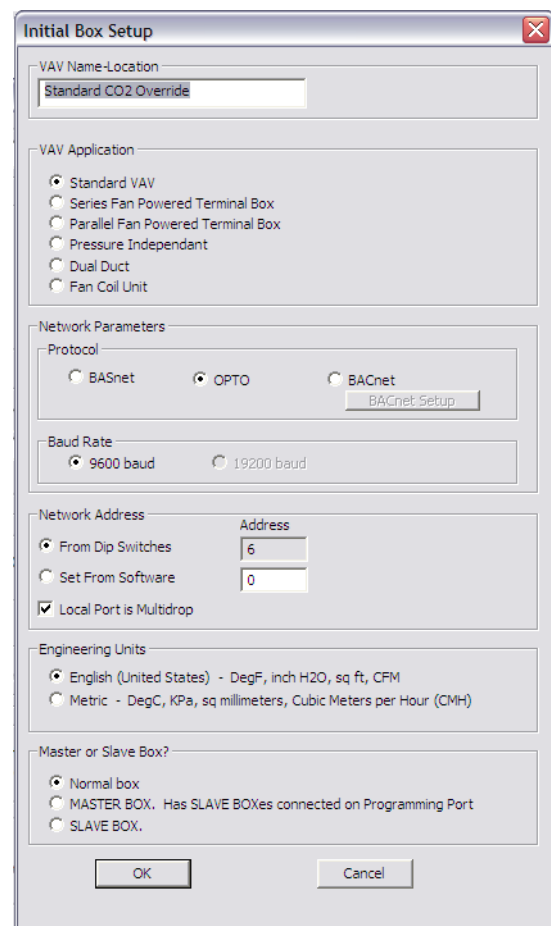
Commissioning the First VAV-B

Once you have connected, all the buttons will be active, except the Save All Changes button. It will be active as soon as changes are made.

The buttons are in order from top to bottom, but you should normally only need the first 3, then the Save and Load buttons will be used.

Prebox Setup

Click the first button, PreBox Setup. (See figure right)
Type in Name-Location.



The Initial Box Setup dialog box is shown. It has a title bar with a close button. The main area is divided into several sections. The first section, 'VAV Name-Location', has a text box with the value 'Standard CO2 Override'. The second section, 'VAV Application', has five radio buttons: 'Standard VAV' (selected), 'Series Fan Powered Terminal Box', 'Parallel Fan Powered Terminal Box', 'Pressure Independent', and 'Dual Duct'. The third section, 'Network Parameters', has three radio buttons for 'Protocol': 'BASnet' (unselected), 'OPTO' (selected), and 'BACnet' (unselected). There is a 'BACnet Setup' button next to the BACnet option. Below this is a 'Baud Rate' section with two radio buttons: '9600 baud' (selected) and '19200 baud'. The fourth section, 'Network Address', has two radio buttons: 'From Dip Switches' (selected) and 'Set From Software' (unselected). There are two text boxes for 'Address': one with '6' and one with '0'. There is a checked checkbox 'Local Port is Multidrop'. The fifth section, 'Engineering Units', has two radio buttons: 'English (United States) - DegF, inch H2O, sq ft, CFM' (selected) and 'Metric - DegC, KPa, sq millimeters, Cubic Meters per Hour (CMH)'. The sixth section, 'Master or Slave Box?', has three radio buttons: 'Normal box' (selected), 'MASTER BOX. Has SLAVE BOXes connected on Programming Port', and 'SLAVE BOX.'. At the bottom, there are 'OK' and 'Cancel' buttons.

Choose the VAV Application type

Choices should be self-explanatory. Pressure Independent controls the VAV box based solely on Space Temperature and Setpoint, not CFM and CFM Min/Max.

Network Address

You should not have to change anything in the Network Address section. It is possible to change the address by selecting “Set in Software”.

- When you Save to VAV, the address changes.
- You will lose connection and will have to restart the connection using the new address.
- Choose your protocol and baud rate.
- 19200 Baud is only available in Bacnet (pending).

Choose English or Metric units.

Master or Slave Box

With most VAV-Bs, the box type will be Normal Box. Master and Slave are used when you have 2 or more boxes sharing a single space temperature and setpoint. The Master will contain the actual Space Temp and Setpoint.

- Select Master for the Master box and Slave for the Slave Box.
- You must also select “Local Port is Multidrop”. (Necessary for controllers to share Temp and SP) You have to select “I am an Advanced User” on the VAV Connection screen in order to see this option. • Choose your protocol and baud rate.
- Then, connect the 485 Local Port wires together on the 2 VAV-Bs.
- The Master box will share it's space temp and setpoint with the Slave box. You can have multiple slave boxes per master. So, you could have 1 VAV-B with a S3 then several other VAV-Bs maintaining the space temp using the Master space temp and setpoint.

Saving Changes

Once you have made all of your choices under Pre Box Setup, click OK to save them. However, they will not be saved to the VAV-B until you Save All Changes to the VAV from the main screen. But, you can complete the Installer screen setup prior to saving.

Installer Screen

Now click the Installer button. *(See figure next page)*

The screen will have different choices depending on the application chosen in the Pre Box Setup screen.

- Make your choices for the type of temperature sensor, setpoint, and overtime. The Software Point choices refer to a point on the VAV-B controller where the setpoint can be commanded from CBAS. This is covered in a later section.
- To change the range of the Setpoint (ex. 68-72), click the Setpoint Setup button.

Installer Screen continued...

The Installer window is divided into several sections:

- Hardware Configuration:**
 - Space Temp (Wall Sensor): ☐ 10K Thermistor, ☐ Software Point, ☒ SIEBE S3
 - Setpoint: ☐ Software Point, ☐ 10K Potentiometer (Resistive Input 1), ☒ SIEBE S3. A "Setpoint Config" button is next to it.
 - Overtime: ☒ None, ☐ Software Point, ☐ Short 10K Thermistor, ☐ SIEBE S3
 - Heat: ☒ None, ☐ 1 Stage (BO2), ☐ 2 Stage (BO3), ☐ 3 Stage (BO4), ☐ Prop Hot Water Valve (Analog Output 1), ☐ Prop Hot Water Valve (Analog Output 2), ☐ Prop Hot Water Valve (BO 1 and 2), ☐ Prop Hot Water Valve (BO 3 and 4)
 - Cool: ☐ None, ☒ Binary No Feedback (Internal Actuator Default), ☐ Binary Resistive Feedback (Int Actuator and Int Res), ☐ Analog (AO1) No Feedback, ☐ Analog (AO1) Voltage Feedback (AI1). An "Actuator Setup" button is next to it.
- CFM Setup:**
 - Min Cool Flow: 100 CFM, Max Cool Flow: 1200 CFM
 - Heat Flow: 100 CFM
 - Duct Area: 0.54 Sq Ft, Calculate... 10.0" Round Duct
 - Min Readable Pressure: 0
- Points Table:**

Point	Configuration
Internal Actuator	Cooling Actuator
Internal Resistive Feedback	
Internal Voltage Feedback	
Internal Pressure Sensor	Pressure
BO1 Fan	—
BO2 Heat1	—
BO3 Heat2	—
BO4 Heat3	—
Analog Output1	—
Analog Output2	—
Wall Sensor	S3
Resistive Input 1	—
Resistive Input 2	—
Volt Input1	Scaled Voltage Input
Volt Input2	—
- Buttons:** "Scaler Setup", "Generic Control Sequence 1 (used)", "Generic Control Sequence 2 (used)", and "Return to Main Screen".

Choose your type of Heat, or None

- The 1 – 3 Stage Heat choices are for electric heat of course, and require a relay. Proportional Hot Water Valves are 0-10VDC and it is possible to change to 2-10VDC by clicking the Actuator Setup button.
- The final 2 choices are for Pulse Valves and those choices take up 2 Binary Outputs each. BO1 pulses the valve in a positive direction and BO2 is the negative or opposite pulse. The same is true for BO3 and 4.

Choose your Cooling Damper type, or None

- Binary No Feedback is the default when you are using the internal damper included with the VAV-B-AP.
- With Resistive Feedback, you would not be using an Internal Damper. On the VAV-B-X, there is a plug on the side where you would plug in that damper with feedback.
- The final 2 choices are for External Dampers on AO1 and are 0-10VDC. Click the Actuator Setup button and you will find a check box to make the damper 2-10 Volts.
- The last choice allows you to use the actuator feedback on AI1.

Unused Points

- In the section listing the points in the bottom right, you can click a line that is not being used and manually configure the type of input or output. Use the Scaler Setup button to manually configure scaling on any of the scalable points. You can use the following Generic Control Sequences to command the outputs.

Generic Control Sequence 1 and 2

- Click one of the Generic Control Sequence buttons to configure a sequence to override internal application and/or command a point.
- You can find an example of how to use these sequences in Appendix B at the end of this manual.

Initial CFM Calibration

In the top right section, set your Min, Max, and Heat CFM targets.

- For your CFM calculation to work, you must set the correct duct area.
- Click the Calculate button.
- Enter the size and shape of the duct and click Calculate.
- Then click Save and it will be saved to the Duct Area field.
- Min Readable Pressure is the lowest that your sensor can read in Inches of Water Column ("WC). Anything below this amount will display as 0 CFM.
- If you are not using a pressure sensor, you can check the box at the top of this section.

When the Installer screen is complete, click Return to Main Screen.

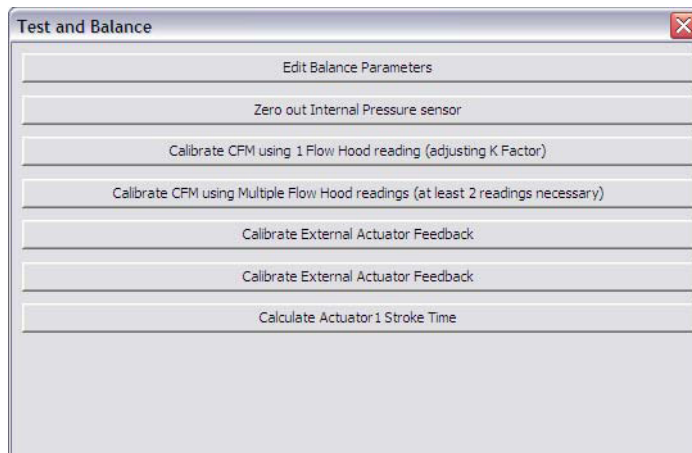
Save Configuration

Now is a good time to click Save/Export Database. This will create a file containing all of the setup choices you have made. The file is saved in the C:\CBAS\Personalities folder and can be used to add identical VAV-B controllers in the future. This will be covered in a later section.

Now click Save All Changes to VAV. Within a minute, the utility program will reconnect to the VAV-B for further configuration.

Test, Balance and Zero-out Pressure/Damper

From the Main Screen, click the Test and Balance button. (See figure below)



Edit Balance Parameters

(see figure below)

Test and Balance

Test Damper Loop
Force Damper To: 0 [Go] [Done] (Release damper to control loop)

Test Flow Control Loop
Desired CFM: 0 [Go] [Done] (Release CFM Setpoint to control loop)

CFM Control Loop Setup
Slowest Default Fastest
CFM Deadband: 10 CFM
☒ Use Pressure Sensor Filter

Cooling Design CFM
Min Cool: 595 CFM Max Cool: 595 CFM

Heating Design CFM: 595 CFM
Unoccupied CFM: 100 CFM
Duct Size: 0.5454 Sq In [Duct Size Calculator]

VAV Readings
Damper Position: 4.21041
Feedback: 4.21
Overshoot: -5
Pressure: 0
CFM: 0
Disabled: Damper Disabled
Force Value: 0.0

[Return to Main Screen]

From this screen, you can test the operation of the damper alone and in relation to CFM Targets. Also, targets, duct size and control loop speed can be adjusted.

To test, just type in a damper position or a desired CFM flow then click the GO button. You will see actual readings from the damper on the right as they change. When finished testing, click Done and the control loop will take over.

Click Return to Main Screen when finished testing and making changes. If changes are made to the control loop and CFM Targets, you will need to Save All Changes again.

Zero Out Internal Pressure Sensor

In order to get an accurate zero CFM reading from the internal pressure sensor when there is no airflow, you must zero it out. Click the button and you will see the following screen.

Zero Pressure Sensor

To Zero out the Pressure sensor you must first remove all pressure from the pressure sensor. Do this by either:
1) Removing the air line from the pressure sensor or
2) Turning off the Air Handler.
When all pressure has been removed press the 'Pressure Sensor is at ZERO' button.

[Pressure Sensor is at ZERO]

Current Zero offset in Controller: -1
New Zero Offset to be saved to Controller: 0 [Manual Zero Set]

Current Pressure Reading: 0.000
Current Pressure Reading using new Zero: --

Live Counts: 264
265 264 264 264 264

Minimum Pressure the sensor can reliably read: 0 "WC

[Save New Zero Number]

[Return to Previous Screen]

Zero Out Internal Pressure Sensor continued...

- This is an easy process. Either turn off the AHU or remove the tubes from the pressure sensor on the VAV-B.
- When you know that the flow has stopped, click Pressure Sensor is at ZERO. The process will take about a minute.
- When the process is complete, the Save New Zero Number button will become active. Click that button.
- You will get a warning to Reboot Controller for New Setting to Take Affect.
- Click OK to return to the Test and Balance choices.
- When you save changes again, the new settings will be saved.

Calibrate CFM Using 1 Flow Hood Reading

Click this button and you will see the following screen, which is intended for use in balancing the VAV boxes after installation.

The first step is to override the CFM so that it doesn't move during the calibration process. Wait for the CFM to settle, then click the Load Average.

Calibrate CFM

0 0 0 0 0 0 0

CFM Reading in Controller: 0 CFM Setpoint is 595 CFM

Average CFM Reading: 0 Load Average CFM from Controller

CFM Reading from Flow Hood: 0 Calculate new K Factor

Adjusted CFM using new K Factor: --

K Factor in Controller: 0.389

New K Factor: 0 Manually Set K Factor

CFM or Damper Override

Set CFM Setpoint to box Design MAX Cooling CFM (595)

Set CFM Setpoint to box Design MIN Cooling CFM (595)

595 Set CFM Setpoint to entered value

Release CFM Override

COOLING Damper Override: 0 Command Damper: 100.0 OPEN

Return to Previous Screen

- Click Load Average CFM From Controller.
- Type in the CFM Reading from the Flow Hood and click Calculate New K Factor.
- If you would like to manually set the K factor, type it into the New K Factor field and click the button to the right.
- To test the operation of the damper in relation to the Setpoints, click the buttons in the next section.
- Be sure to click the Release CFM Override button when finished.
- Click Return to Previous Section.

Calibrate CFM using Multiple Flow Hood Readings

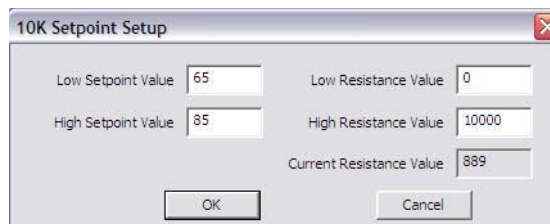
Complete the process by following the onscreen instructions for steps 1 and 2. There is also a test section identical to the one in the Edit Balance Parameters screen. When finished, click Return to Main Screen.

Calibrate External Actuator Feedback

Allows you to verify that the feedback actually matches output.

Calibrate 10K Resistive Setpoint

If you are using a 10K Potentiometer for the field setpoint, this is where you set the range of possible temperatures for the setpoint. In most cases, you should be able to just type in the low and high setpoint value and click OK. This is the same screen as the Setpoint Setup found on the Installer screen.



The '10K Setpoint Setup' dialog box contains the following fields and buttons:

Field	Value
Low Setpoint Value	65
High Setpoint Value	85
Low Resistance Value	0
High Resistance Value	10000
Current Resistance Value	889

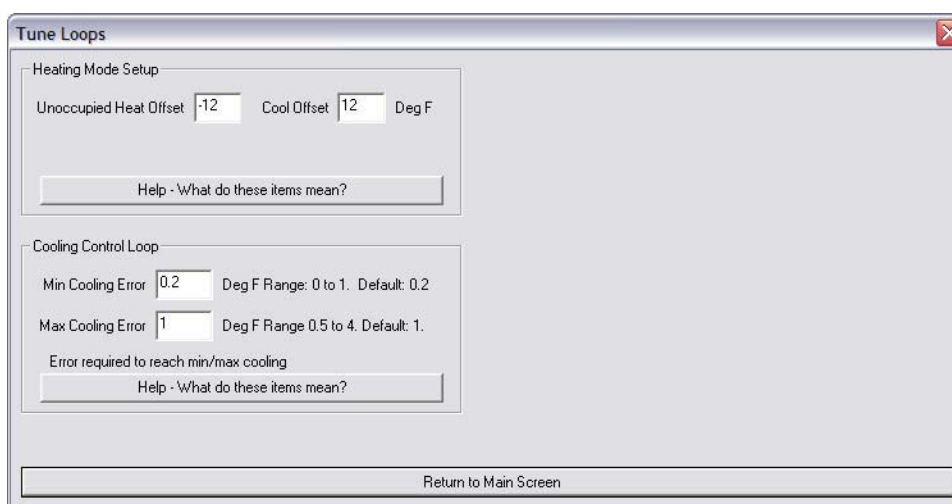
Buttons: OK, Cancel

Calibrate Actuator 1 Stroke Time

You must calibrate (or at least verify) stroke time. It should not be necessary to do this with the Internal Damper, as it is calibrated at the factory. Stroke time is the time it takes to go from 0% to 100%. The standard damper has a stroke time of about 95 seconds. Damper 1 is the Internal Damper. If all VAV boxes at a site are the same, then maybe you can calibrate the first few, then use the same setting on the rest.

- This is another easy process. Click the first button.
- When the damper has gotten to zero percent, click the second and it will go to 100 percent.
- You must watch the damper. When it stops moving, click the third button and it will stop counting.
- Click the next button to save the new stroke time.

Tune Control Loops



The 'Tune Loops' dialog box contains the following sections and fields:

Heating Mode Setup

Unoccupied Heat Offset: -12 Cool Offset: 12 Deg F

Help - What do these items mean?

Cooling Control Loop

Min Cooling Error: 0.2 Deg F Range: 0 to 1. Default: 0.2

Max Cooling Error: 1 Deg F Range: 0.5 to 4. Default: 1.

Error required to reach min/max cooling

Help - What do these items mean?

Return to Main Screen

- Change your Heating and Cooling Offsets. Ex: if Heat Setpoint is 68 and the offset is -12, then Heat will activate when the temperature gets below 56 Degrees.
- Cooling Control Loop allows you to change when the box goes into Min and Max cooling CFM. Click Help for explanation.

Time and Schedule

This screen allows you to adjust the time and set an Occupied Schedule. It should be self-explanatory, except Network Schedule. Choosing that allows you to add the Occupied point in CBAS and place a Schedule on the point. When the point goes On, the VAV-B is commanded to Occupied.

(See figure right)

DON'T FORGET TO SAVE CHANGES TO VAV!

Time and Schedule

VAV Time

Current Time on Computer: Tue Oct 18 15:10:53 2011 | Set VAV Time to Computer Time

Current Time on VAV: Tue Oct 18 15:09:00 2011 | Download Time to VAV

☒ No Schedule (always Occupied)
☐ Network Schedule
☐ Internal Schedule (Below)

	Optimal Start Time	Occupied Time	Unoccupied Time
Sunday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Monday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Tuesday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Wednesday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Thursday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Friday	3:10:53 PM	3:10:53 PM	3:10:53 PM
Saturday	3:10:53 PM	3:10:53 PM	3:10:53 PM

Optimal Start Heat Slope: 30 | Cool Slope: 30 | Min / Degree (Default is 30)

Any Day with no entries will be Unoccupied all day.

Optimal Start is Morning Warm Up for a FAN Powered Box.

Copy To

Return to Main Screen

Live Controller Data

The screen below allows you to see what is actually happening in the application on the controller. For instance, you can change the setpoint in the field or in CBAS, and watch it change from Heat Mode to Cool Mode as well as the CFM Setpoint change. This is a good way to test operation.

Also, you can double-click points with a ** next to them in order to command.

The S3 section allows you to simulate changing the setpoint at the S3, but only when in Editor Mode, which can be selected on the VAV Connection screen. This is like using Simulator Mode in CBAS.

Live Data

Point	Configuration	Counts	Value
Internal Pressure Sensor	Pressure	253	0.000
Wall Sensor	S3	4091	73.010
Resistive Input 1	Resistive	4091	1.000
Resistive Input 2		2132	1.000
Internal Resistive Input		4091	1.000
Voltage Input 1	** Scaled MilliVolts 1	131	48.400
Voltage Input 2		107	0.000
Voltage Input Internal		112	1.000
Voltage Monitor 3V		141	1.000
Voltage Monitor 5V		121	0.000
Voltage Monitor 15V		127	0.000
Voltage Monitor 24V		127	19.685
Analog Output 1			0.000
Analog Output 2			0.000
Internal Actuator	BinaryActuator		0
B01 Fan			0
B02 Heat1			0
B03 Heat2			0
B04 Heat3			0
UpdateCount		43	

Item	Value
Box Mode	Deadband
Application Running	YES
Box Running	YES
Emergency Shutdown **	NO
RunTime	Days:0 Minutes:42
Occupied	Occupied
Occ Change Value **	none
UnOcc Change Value **	none
S3 Occupied **	NO
Running	YES
Network Schedule **	UseLocal
Overtime **	NO
Space Temp	73.0
Setpoint Actual - Heat/Cool	80.0 80.0 - 80.0
Space Temp Error	-7.0
Space Temp Alarm	ALARM
Network Space Temp **	0.0
Network Setpoint **	0
S3 Temp/Humid	73.0 52.4
COOLING CFM LOOP 1	*****
Pressure	0.000000
CFM Loop Disable **	no
CFM	0
CFM Setpoint **	100 (100 to 1200)
ACTUATOR 1	*****
Disabled **	no
Command **	100.0 UPPER LIMIT
Overshoot	237

S3: 73.0 (SIMULATION)

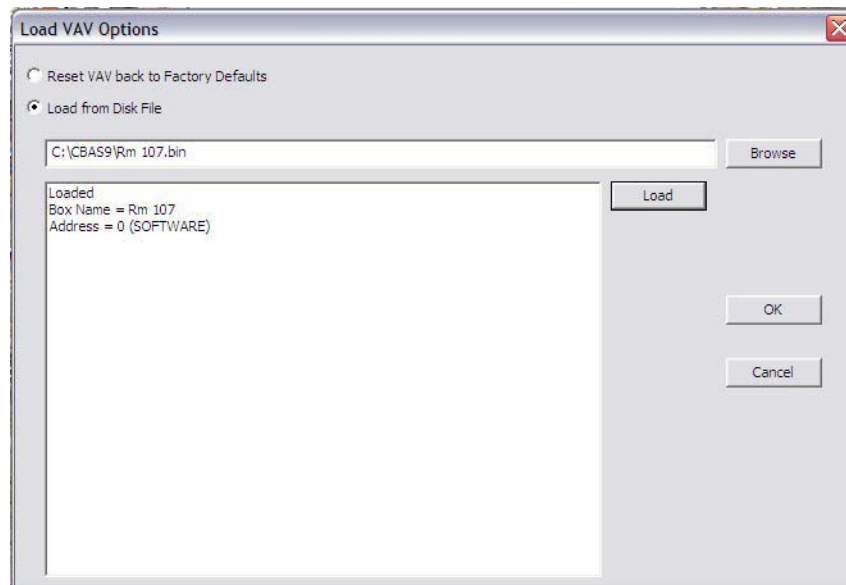
80

Double Click on items with "**" to command or calibrate.

OK Cancel

Adding More VAV-Bs from Saved Configuration File

- First, open the Utility program and connect to the next VAV-B.
- Now click Load/Reset Database.



- Click Browse and find the file you saved earlier. It should have been saved in C:\CBAS\Personalities.
- Select it and click OPEN. The path will be shown next to the Browse button.
- Click Load, then OK.
- Now go back to Pre Box Setup and change the name/location of the box, then click OK.
- If the duct size or Min/Max CFM is different on this box, go back to the Installer screen and make the change there, then click OK.
- If you would like to save this configuration also, click Save/Export Database.
- Now click Save All Changes to VAV.

CBAS Configuration

Adding VAV-B to the Database

VAV-B controllers can be added to the following channel types at this time: OPTO 485 over TCP/IP (same as N2), OPTO-22 on Controller (also N2), BASnet 485 over TCP/IP, and BACnet 485 over TCP/IP (BACnet MS/TP). Of course, you must match the CBAS Protocol selection to the one that you chose earlier in the VAV-B Utility program and then saved to the controller. BACnet on Controller is a channel choice in CBAS. However, it is not available at this time.

The advantage of an “On Controller Channel” is that the databases of the controllers on the channel are contained in the database of the Host controller as well as the Server PC. So, all software points and the logic, schedules, etc. should be programmed on the Host controller, making the entire channel head-end independent or stand-alone.

Either of the OPTO channels would be preferred and would also work if the site had an existing channel of Johnson Metasys controllers that you would like to add a VAV-B to. BASnet would only be preferred if the site had an existing channel of VAVs and you were replacing one with a VAV-B, or needed to add an additional one to the channel.

Add a Channel to the Host Controller

These instructions assume that you have already learned how to add a controller to the TCP/IP for Controllers channel.

- In Editor Mode, Hardware View, TCP/IP for Controllers channel, locate the controller that will host the VAV-B channel.
- Click the controller, then Channels.
- Click Add A Channel to either the Host or Secondary 485.
- Give the channel a name and choose the protocol configuration.
- Click Add Channel Now.
- If the channel is an "On Controller" channel, click the channel just created to add a controller to it.
- If not, press Esc key to the main Channel screen in Hardware View to find the channel.

Add a VAV-B

- Click the Channel, then Controllers.
- Click Add a Controller on the line that contains the address you want to use. (The address can later be changed on the controller program screen)
- Give the controller a name similar to the one you gave it in the Utility program.
- For configuration, choose VAV-Belimo.
- Click Add Controller Now.
- A popup box will ask if you would like to import the points.
- If the channel is BASnet, answer NO. (For the second VAV-B, you can Copy or Use a Template)
- If the channel is OPTO or BACnet, answer YES.
- The next screen will allow you to browse to the location where you saved the configuration from the VAV Utility program.
- Choose the txt file with either OPTO or BACnet in the name, then click OPEN.
- You will be prompted to enter a prefix for the point names. Click Yes and you can enter the prefix which will differentiate these points from the points of another controller.
- Hit the ENTER key and CBAS will verify how many points were imported.
- Click OK, and you can now click the controller and view the points.
- Subsequent controllers can be added the same way.

Adding Points to a BASnet VAV-B

When adding a VAV-B to a BASnet 485 over TCP/IP channel, you will have a choice of adding a Blank Controller, Using a Template Database, or Copying from Another Controller. **ADDING A BLANK CONTROLLER IS THE ONLY VALID CHOICE.** Once the controller is added, click the controller then click Add Points to Controller. *(See figure next page)*

Adding Points to a BASnet VAV-B continued...

[illegible]

- Type in a prefix in the Name Préfix field. Each point you add will have that prefix added to it.
- The list of points on the right side contains the points that are available. It is recommended that you only add the ones you will need. Highlight a point on the list.
- Now click Add a Point on the left column. The points will appear on the controller in order from top to bottom, once added.
- Type in a name for the point after the prefix, then press enter.
- Click the field in the middle column on the same line and the point that is highlighted on the right column will be added.
- Continue adding points the same way.
- To remove a point, highlight Remove Point at the top of the right column, then click the point on the left middle column. It will say Remove Point until you click Convert Now.
- You can also go back in at a later time and add or remove points using the same procedure.

Adding Subsequent BASnet VAV-B Controllers

Subsequent VAV-Bs can be added by Copying from the previously added controller. Or, you can create a Template and add from that.

Proceed to Real Mode and begin monitoring the VAV-B

Commanding the Setpoints

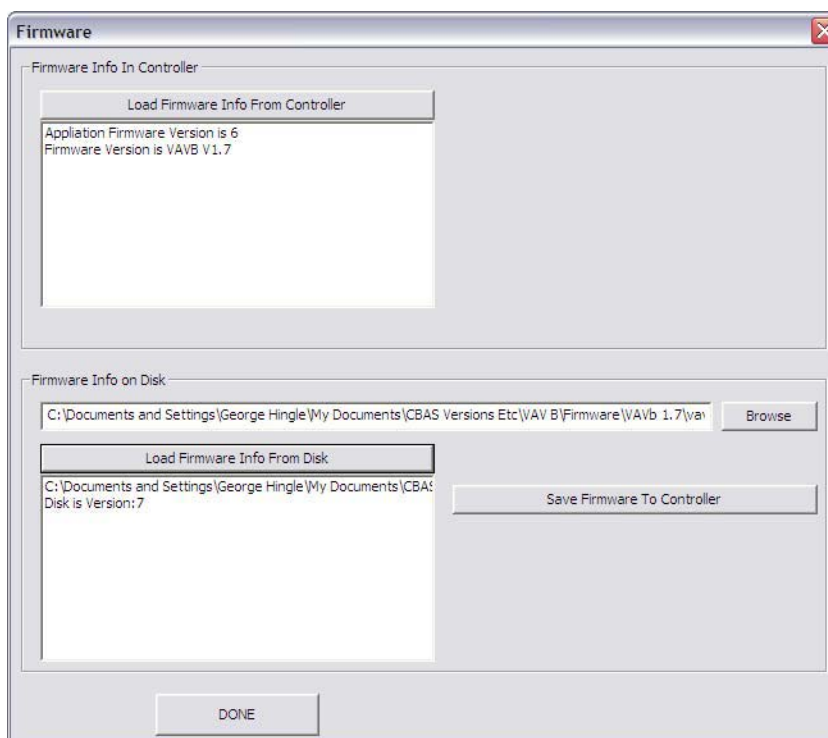
There is a NET SPACE TEMP point that you can command at any time. A command to this point will override the space temp sensor. The space temp will remain at the commanded value until the user commands the point to 0. Zero releases the space temp. This is only used for simulation purposes.

The NETWORK SETPOINT is the point you command to change the Active Setpoint, which can be changed from the S3 or Potentiometer. If you command this point from CBAS it overrides the internal setpoint in the VAV-B. The setpoint point may behave differently if the VAV-B is using an S3 or 10K potentiometer. When using a S3 the NETWORK SETPOINT point will go back to 0 after the command. But when using a 10K potentiometer, it will retain its value. For the 10K potentiometer, you would have to command to 0 to release the setpoint override. That is because when using a S3, the user can override the commanded value. But when using 10K potentiometer, you can slide the potentiometer all you want, but as long as there is a NETWORK SETPOINT command it will keep the network setpoint.

Reburning the Application Firmware

The Application Firmware contains the programming code for each of the VAV Applications that you can choose in the Pre Box Setup screen of the Utility program. If Computrols makes a change to one of the applications, it may be necessary for you to upgrade the firmware. Obtain the firmware file from Computrols Technical Support.

Connect to the controller using the VAV Utility program. The last button is labeled Firmware. Click Firmware and you will see the following screen.



- To check the firmware on the controller, use the first button.
- Click Browse and select the firmware file, which will have a .bin extension.
- To check the version of your firmware file, click Load Firmware Info from Disk.
- Click Save Firmware to Controller.
- When complete, click DONE to exit.

Setup Program

To burn both the Application and non-Application firmware, a program called Setup.exe is required. Firmware file, VAV7xxxx.bin, contains both firmwares.

- Open the Setup Program by double clicking Setup.exe.
- Click the Alpha Set button then Comm Port Config. and choose your comm port. This is the port number that the USB to 485 Commissioning cable uses.
- Click “Put Controller into Bootload” and you will see 3 lights blinking in succession on the controller.
- Click VAV7 Setup button and point to the bin (firmware) file.
- Click VAV7 Burn then Start.
- Once finished, open Utility program to verify firmware versions.

VAV Utility through CBAS

This allows you to commission VAV-Bs through the 485 channel.

- VAV_Utility.exe must be in the C:\CBAS folder.
- Add a VAV-B Commission point to the Workstation channel in CBAS.
- In Real Mode, go to the channel containing the VAV-B you want to work with.
- Once the controller has Normal communication, click the VAV-B controller, then click Utility Program.
- The Utility Program will pop up and connect to the VAV-B automatically as long as the controller is online.
- From there, everything is the same as described earlier in this manual.
- Don't forget to Save All Changes and Save/Export the Database.

Appendix A

VAV-B Points in CBAS

CBAS Name (Suggested)	BASnet Name	OPTO Position	Commandable
Essential			
Occupied Command	Occupied	BDM46	YES
Occupied Feedback	Box Occupied	BDM45	
Space Temp	Space	ADF3	
Space Temp Setpoint	Setpoint	ADF23	
Space Temp Setpoint Com	Network Setpoint	BDM49	YES
Space Temp Error	Space Err	ADF19	
Space Temp Alarm	Space Alm	BD50	
CFM	CFM	ADI17	
CFM Setpoint	CFM SP	ADI21	
Box Mode	Box Mode	BDM26	
Damper Feedback	Dampr FB2	ADF6	
Damper Position	Dampercmd	ADF39	
Supply Temp	Extra Temp	ADF5	
Humidity	Humidity	ADF17	
Non-Essential			
Occupied Schedule	Net Sched	BDM46	YES
Overtime Command	Overtime	BD47	YES
Emergency Shutdown	Emer Shut	BD29	YES
Heat Control Loop Disable	Heat LP Dis	BD56	YES
Damper 1 Disable	Damp Dis	BDM64	YES
Damper 2 Disable	Damp Dis	BDM65	YES
Cooling Setpoint	Cool SP	ADF29	
Heating Setpoint	Heat SP	ADF30	
Pressure	Pressure	ADF27	
External Pressure	Pressure 2	ADF28	
Multiplexor			
Binary Output 1 (Fan)	BO1 FAN	BD20	YES
Binary Output 2 (Heat 1)	BO2 HEAT1	BD21	YES
Binary Output 3 (Heat 2)	BO3 HEAT2	BD22	YES
Binary Output 4 (Heat 3)	BO3HEAT3	BD23	YES
Analog Output 1	VOLT OUT 1	ADF14	YES
Analog Output 2	VOLT OUT 2	ADF15	YES
Internal Pressure Sensor	PRESSURE	ADF2	
Wall Sensor	WALL STAT	ADF3	

VAV-B Points in CBAS continued...

CBAS Name (Suggested)	BASnet Name	OPTO Position	Commandable
Multiplexor continued...			
External Resistive Input 1	RES INPUT 1	ADF4	
External Resistive Input 2	RES INPUT 2	ADF5	
Internal Resistive Input	INT RES INPUT	ADF6	
External Voltage Input 1	VOLTIN 1	ADF7	
External Voltage Input 2	VOLTIN 2	ADF8	
Internal Voltage Input	INT VOLTIN	ADF9	
Not Needed			
Internal Sched	Int Sched	BDM48	
Application Running	app running	BD27	
Application Error	app error	ADI2	
Fault Code	fault code	BDM28	
Cooling Damper Position	Damper Position 1	ADF39	
Heating Damp/HWV Pos	Damper Position 2	ADF40	
Internal Press Sensor DP	Internal Press Sensor	ADF27	
External Press Sensor DP	Voltage Input 2	ADF28	
Damper 1 Moving	Damp Mov	BDM68	
Damper 2 Moving	Damp Mov	BDM69	
Damper 1 Runtime	Damp Run	ADF55	
Damper 2 Runtime	Damp Run	ADF56	
Notes on Commanding Points			
Occupied Command	0=useLocal, 1=OCC, 2=OptStart, 3=UNOCC-OvrdOFF		
Space Temp Setpoint Command	Command, then 0=release		
Overtime Command	Used for overtime scheduling		
Emergency Shutdown	Rarely used/needed		
Heat Control Loop Disable	Stops the 4 BOs from doing anything so they can be commanded via network		
Damper 1 Disable	1-Stops Damp 4-104 Cmds Damp to 0-100. 2 and 3 are resvd for Box Startup		
Damper 2 Disable	1-Stops Damp 4-104 Cmds Damp to 0-100. 2 and 3 are resvd for Box Startup		

Appendix B

Using Generic Control Sequences

The Generic Control Loop buttons are in the bottom right of the Installer screen.

Hardware Configuration

Space Temp (Wall Sensor)

10K Thermistor

Software Point

SIEBE S3

Setpoint

Setpoint Config

Software Point

10K Potentiometer (Resistive Input 1)

SIEBE S3

Overtime

None

Software Point

Short 10K Thermistor

SIEBE S3

Heat

None

1 Stage (B02)

2 Stage (B03)

3 Stage (B04)

Prop Hot Water Valve (Analog Output 1)

Prop Hot Water Valve (Analog Output 2)

Prop Hot Water Valve (B0 1 and 2)

Prop Hot Water Valve (B0 3 and 4)

Cool

Actuator Setup

None

Binary No Feedback (Internal Actuator Default)

Binary Resistive Feedback (Int Actuator and Int Res)

Analog (AD1) No Feedback

Analog (AD1) Voltage Feedback (AI1)

CFM Setup

Min Cool Flow100CFM

Max Cool Flow1200CFM

Heat Flow100CFM

Duct Area0.54Sq Ft

Calculate...10.0 " Round Duct

Min Readable Pressure0

Point	Configuration
Internal Actuator	Cooling Actuator
Internal Resistive Feedback	
Internal Voltage Feedback	
Internal Pressure Sensor	Pressure
B01 Fan	—
B02 Heat1	—
B03 Heat2	—
B04 Heat3	—
Analog Output1	—
Analog Output2	—
Wall Sensor	S3
Resistive Input 1	—
Resistive Input 2	—
Volt Input1	Scaled Voltage Input
Volt Input2	—

Double Click to Manually configure points

Scaler Setup

Generic Control Sequence 1 (used)

Generic Control Sequence 2 (used)

Return to Main Screen

Here is an example how to setup a sequence where a CO2 sensor is used to set the CFM Setpoint to the Max CFM when CO2 level reaches a certain value.

The sensor is connected to Voltage input 1. It also needs 24V. And the Thermistor part of it will connect to Wall Sensor.

In the installer screen, click to the right of VoltInput1 and make it a Scaled Voltage Input. See above.

Then click the Scaler Setup button and set the values as seen below. I assumed that the high limit of the output from the sensor is 2000 ppm, so the Low Limit is 0 and the High Limit is 2000. The 10000 is the number of millivolts in 10 Volts. So, 0 to 10 Volts equals 0 to 2000 ppm. Click OK when done.

Scaled Values Setup

Select 2 points on the line

	Low and High	Counts	MilliVolts	Resistance	Low and High Value	Enforce Limits on Low and High	Is Pressure
Voltage Input 1	010000	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	02000	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
none selected	102700	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	0100	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
none selected	102700	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	0100	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>
none selected	00	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	00	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>

OK

Cancel

Using Generic Control Sequences continued...

Then click the first Generic Control Sequence button.

The screenshot shows the 'Generic Control Sequence Setup' window. The 'Select Input Point' is 'Voltage Input 1', 'Select Setpoint' is 'None', and 'Select Output Point' is 'CFM Disable 1'. The 'Point Configuration' dropdown is set to 'Millivolts1'. The 'software point - no config' dropdown is also visible. The 'Off Value' is 690, 'On Value Min' is 700, and 'On Value Max' is 700. The 'Output Value at OFF' is 0, 'Output Value at Min' is 1, and 'Output Value at Max' is 1. The 'Off Delay' is 20 seconds, and 'Run Every' is 1 second. The 'Emergency Value (255 for none)' is 0. A 'Return to Previous Screen' button is at the bottom.

You choose VoltInput1 for the input, which is CO2 Level. Leave it as None for the setpoint. Choose CFM Disable for the output. CFM Disable is the point that allows you to disable the internal programming that determines which Setpoint is used to open the damper. The output when it goes over the limit is going to be 1, which disables the internal setpoint logic and allows you to command it. It will go to 0 when the value goes below 690, which gives you a deadband of 10 ppm. This releases the point.

Click Generic Control Sequence 2 and set it up.

The screenshot shows the 'Generic Control Sequence Setup' window for the second sequence. The 'Select Input Point' is 'Voltage Input 1', 'Select Setpoint' is 'None', and 'Select Output Point' is 'CFM Setpoint 1'. The 'Point Configuration' dropdown is set to 'Millivolts1'. The 'software point - no config' dropdown is also visible. The 'Off Value' is 0, 'On Value Min' is 700, and 'On Value Max' is 700. The 'Output Value at OFF' is 0, 'Output Value at Min' is 1200, and 'Output Value at Max' is 1200. The 'Off Delay' is 120 seconds, and 'Run Every' is 1 second. The 'Emergency Value (255 for none)' is 0. A 'Return to Previous Screen' button is at the bottom.

This time, the Input point is the same, but your Output is going to be CFM Setpoint. The limits will be the same, but the output will be whatever you want the CFM setpoint to be. I guess the same as the MAX Cooling CFM.

There is another way of doing this with a Setpoint used in the loop. That way you could command the Setpoint from CBAS. But this way is easier.

VAV-B Connection Diagram

