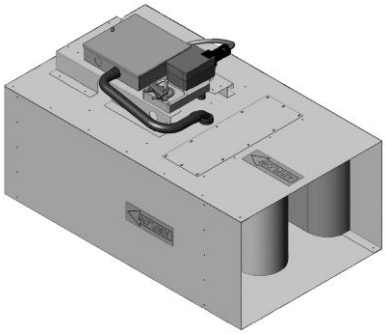
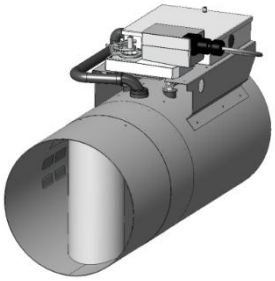
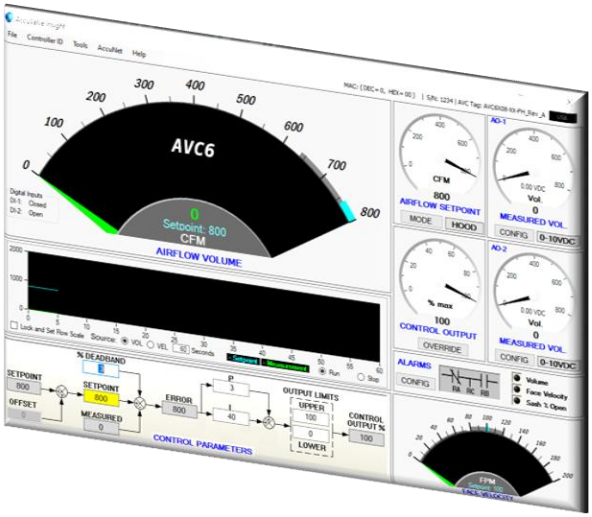
Installation & Operation Manual – Model AVC6000

Airflow Control Valve





With AccuValve **Insight™** Configuration Software



Manufactured by:

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CE

Member of BACnet International

BACnet Testing Laboratories

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AVC6000 MANUAL REV M, 2026-10-01, ECN 3231

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LIMITED WARRANTY

Accutrol LLC, having its principal place of business at 21 Commerce Drive, Danbury, CT USA ("Manufacturer") warrants its AccuValve®, Model AVC6000 product (the "Products") as follows:

1. Limited Warranty.

Manufacturer warrants that the Products sold hereunder will be free from defects in material and workmanship for a period of sixty (60) months from the date of purchase. If the Products do not conform to this Limited Warranty during the warranty period (as herein above specified), Buyer shall notify Manufacturer in writing of the claimed defects and demonstrate to Manufacturer's satisfaction that said defects are covered by this Limited Warranty. If the defects are properly reported to Manufacturer within the warranty period, and the defects are of such type and nature as to be covered by this warranty, Manufacturer shall, at its own expense, furnish, replacement Products or, at Manufacturer's option, replacement parts or services for the defective Products. Shipping and installation of the replacement Products or replacement parts shall be at Buyer's expense.

2. Other Limits.

THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Manufacturer does not warrant against damages or defects arising out of improper or abnormal use or handling of the Products; against defects or damages arising from improper installation (where installation is by persons other than Manufacturer), against defects in products or components not manufactured by Manufacturer, or against damages resulting from such non-Manufacturer made products or components. Manufacturer passes on to Buyer the warranty it received (if any) from the maker thereof of such non-Manufacturer made products or components. This warranty also does not apply to Products upon which repairs have been affected or attempted by persons other than Manufacturer or pursuant to written authorization by Manufacturer. This warranty also does not apply to any product provided by the Buyer and mounted by the Manufacturer to Products.

3. Exclusive Obligation.

THIS WARRANTY IS EXCLUSIVE. The sole and exclusive obligation of Manufacturer shall be to repair or replace the defective Products in the manner and for the period provided above. Manufacturer shall not have any other obligation with respect to the Products or any part thereof, whether based on contract, tort, and strict liability or otherwise. Under no circumstances, whether based on this Limited Warranty or otherwise, shall Manufacturer be liable for incidental, special, or consequential damages.

4. Other Statements.

Manufacturer's employees or representatives' ORAL OR OTHER WRITTEN STATEMENTS DO NOT CONSTITUTE WARRANTIES, shall not be relied upon by Buyer, and are not a part of the contract for sale or this limited warranty.

5. Entire Obligation.

This Limited Warranty states the entire obligation of Manufacturer with respect to the Products. If any part of this Limited Warranty is determined to be void or illegal, the remainder shall remain in full force and effect.

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APPENDIX A – FUME HOOD MONITORS A1

FUME HOOD MONITOR, MODEL FHM1 OPERATION A1

FUME HOOD MONITOR, MODEL FHM3 OPERATION A3

APPENDIX B: BLUETOOTH B1

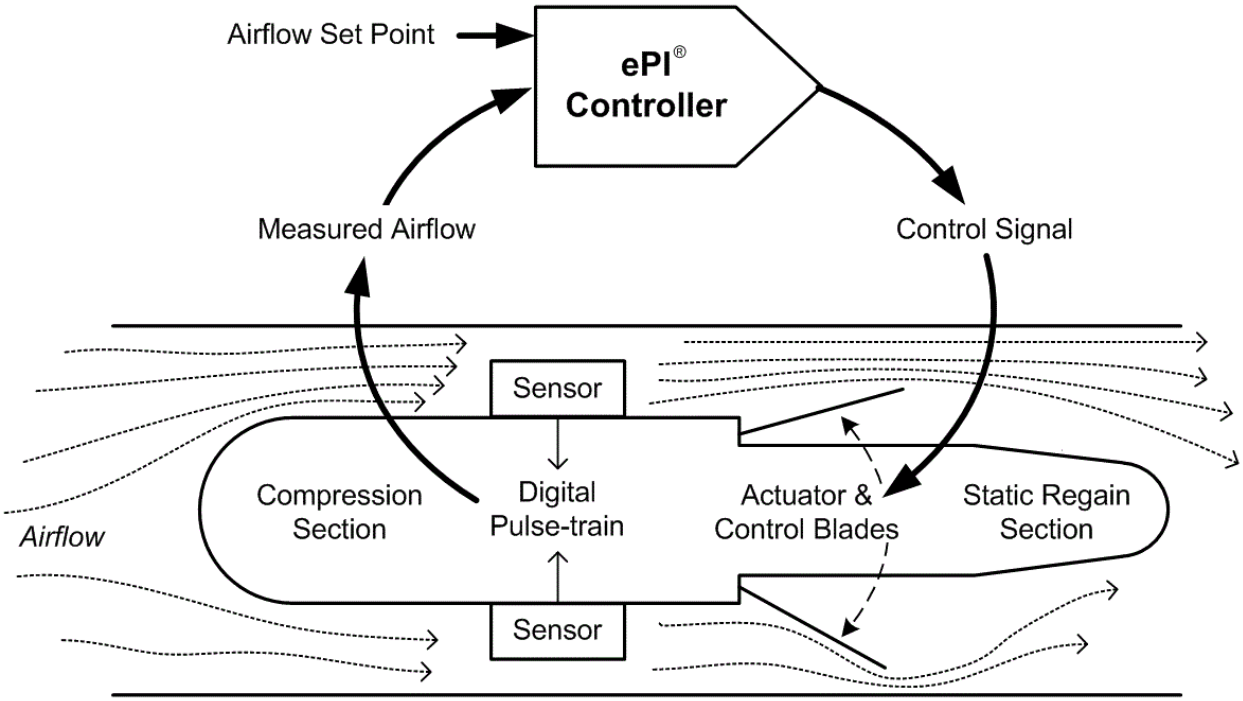
APPENDIX C: ACCUNET C1

SECTION 1 - INTRODUCTION

The AVC product family integrates a high-performance controller with the revolutionary award winning AccuValve® product. The Engineers at Accutrol have used technology and innovation to make the AVC AccuValve® not only the most advanced airflow control valve in the industry, but also the most reliable and intuitive airflow control valve available.

1.1 Theory of Operation (Reference the Diagram Below)

The AccuValve® divides the airflow into two equal chambers using an airfoil shaped compression section. Each chamber is comprised of a vortex shedding airflow sensor, a modulating control blade and a static regain section. As air enters the chambers it accelerates and compresses, creating an ideal zone for measuring airflow velocity. The vortex shedding airflow sensors provide a highly repeatable digital pulse-train with a frequency that is directly proportional to the air flow velocity in each chamber of the AccuValve®.



The digital signal generated by each vortex shedding sensor provides a direct measurement of the volumetric flow rate in each chamber of the AccuValve®. The airflow measurement provides closed-loop feedback to the ePI® controller which modulates the valve actuator to maintain the desired airflow set point. The airflow set point can be provided from either, analog input, digital input, communications over BACnet MS/TP or AVC internal program memory. The AVC also provides analog output signals and alarm outputs which can be used to indicate abnormal airflow conditions.

For network communications, the AVC provides an EIA-485 port supporting BACnet MS/TP as a Full Master Node state machine. Field programming is accomplished through AccuValve Insight, which is an intuitive user-interface software. Connection between the AVC and computer is provided through a USB port located on the AVC control module, optional monitor, or through an optional wireless Bluetooth connection.

1.2 Model Code

A V C 6 [ ][ ][ ] - [ ][ ] - [ ][ ][ ][ ][ ]

VALVE MATERIAL

2 = 304ss, 20 Ga.
3 = 316ss, 20 Ga.
4 = Aluminum, 16 Ga.
5 = PFA Coated 304ss, 20 Ga.
6 = High Temp 304ss, 20 Ga.

VALVE SIZE

06 = 6" Diameter
08 = 8" Diameter
10 = 10" Diameter
12 = 12" Diameter
14 = 14" Diameter
18 = 12" h x 18" w
24 = 12" h x 24" w
36 = 12" h x 36" w
48 = 12" h x 48" w

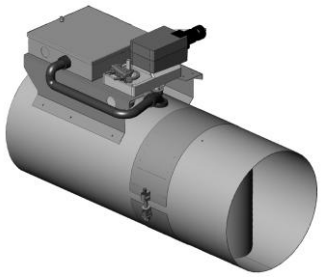
ACTUATOR

03 = Fail Last Position (FLP), 2-10V, 2-sec full cycle
05 = Fail Open/Closed (FSP), 2-10V, 2-sec full cycle
07 = Fail Last Position (FLP), 2-10V, 21-sec full cycle

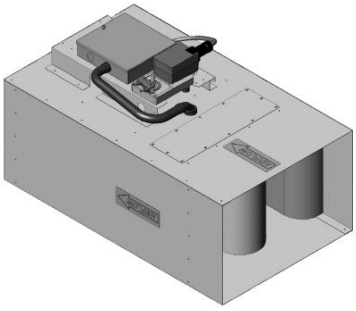
OPTIONS

BLANK = No Options
A = AccuNet
F = Flanges, Vanstone
I = Insulation
S = Tight Shut-off
W = Wireless Bluetooth

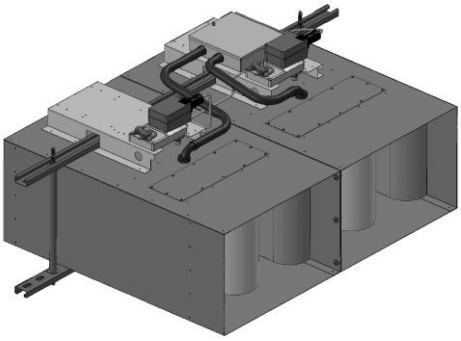
1.3 Valve Types



Round AccuValve
Sizes 06, 08, 10, 12 and 14



Rectangular AccuValve
Sizes 18 and 24



Rectangular AccuValve
Sizes 36 and 48

SECTION 2 – SPECIFICATIONS

PERFORMANCE

Accuracy	+/- 5% of reading or 5 CFM, whichever is greater
Speed of Response	< 1 second control signal response (full stroke cycle time based on actuator type)
Shut-off Leakage Rate	Standard: < 1.5% FS at max operating pressure
	"S" Option: < 0.5% FS round valves, < 1% FS rectangular valves @ max operating pressure
Max Operating Pressure	3"wc Differential Pressure Across Valve
Min Operating Pressure	Reference Section 2.1
Airflow Range	Reference Section 2.1
Failure Mode	Open, Closed or Last Position (based on actuator type selection)

ENVIRONMENTAL

Temperature	Airstream: -20 to 165 deg. F for all Standard Valve Models
	-20 to 375 deg. F for the High Temp SS Valve Models
	Ambient: -20 to 125 deg. F Storage: -40 to 165 deg. F
Humidity	0 to 90% non-condensing

ELECTRICAL

Input Power	24VAC +/- 20% 50-60Hz (Class 2) or 24 VDC +/- 10%
	Max Power for Valve Size 06-24: 28VA or 16W for units with actuator type 3 & 5
	11VA or 7W for units with actuator type 7
	Max Power for Valve Size 36, 48: 51VA or 29W for units with actuator type 3 & 5
	17VA or 11W for units with actuator type 7
	If monitor FHM1 is connected to AVC, increase above values by 3VA or 1W If monitor FHM3 is connected to AVC, increase above values by 6VA or 3W
Analog Inputs	AI-1; Software Configurable for Voltage or Current, 12-bit resolution
	Voltage: 0-10Vdc Range, 1M ohm Impedance
	Current: 0-20mA Range, 500 ohm Impedance
	AI-2, AI-3; Software Configurable for Resistance range of 20K ohm or 100K ohm
	500uA Current Source for 20K ohm Range, 100uA Current Source for 100K ohm Range
Digital Inputs	DI-1 and DI-2; Dry-contact inputs
Analog Outputs	AO-1 and AO-2; Software Configurable; 0-20mA, 4-20mA, 0-10v, 2-10v, 0-5v or 1-5v
	12-bit Resolution, capable of driving 1K ohm load
Alarm Relay Output	SPST, NC/NO contacts, rated load 1A @ 30 vDC
	Max carry current = 1A, Max switching capacity = 37 VA, 30W
Network Com Port	EIA 485 2-wire BACnet MS/TP
	Full Master Node State Machine
	Data Rates 9600, 19200, 38400, 76800 and 115200
	Mac address is software configurable ¼ Unit Load Receiver Input Impedance, bias & EOL termination not provided within the AVC
Configuration Port	USB 2.0, Isolated, Type C Connector, Optional Bluetooth (Ver 4.2 or later)
Status Indicators	LED Indicators for Power, Alarm, AO, BACnet, USB, AVC Status, Bluetooth & AccuNet
I/O Terminal Blocks	2 and 3 position vertical pluggable screw terminal blocks
Compliance	CE , RoHS, BTL Listed, cULus 916 Listed

SPECIFICATIONS CONTINUED

Electromagnetic Compatibility
2014/30/EU, EMC Directive
EN61236-1:2013
2014/53/EU, Radio Equipment Directive
EN301489-1, V1.9.2:2011
ETSI EN301489-1, V2.2.0:2017
ETSI EN301489-3, V1.6.1:2013/V2.1.1:2017
ETSI EN301489-17, V2.2.1:2012/V3.2.0:2017

Product Safety
2014/35/EU, Low Voltage Directive
EN61010-1:2010/A1:2019/AC:2019

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

Units provided with the optional Bluetooth low energy module contain
FCC ID: XPYNINAB1
IC: 8595A-NINAB1
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions;

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

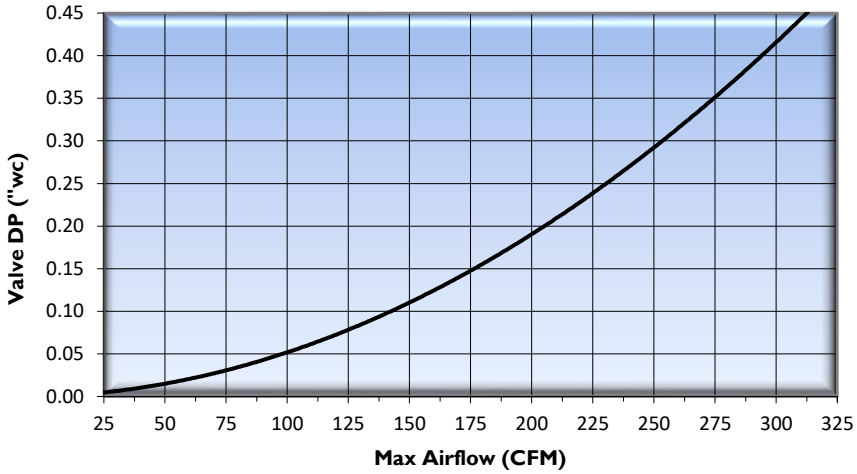
KCC South Korea compliance certification number MSIP-CRM-ULX-NINA-B111

Australia and New Zealand regulatory compliance. The NINA-B1 modules are compliant with AS/NZS 4268:2012?AMDT 1:2013 standard – Radio equipment and systems – Short range devices – Limits and methods of standard measurement made by the Australian Communications and Media Authority (ACMA)

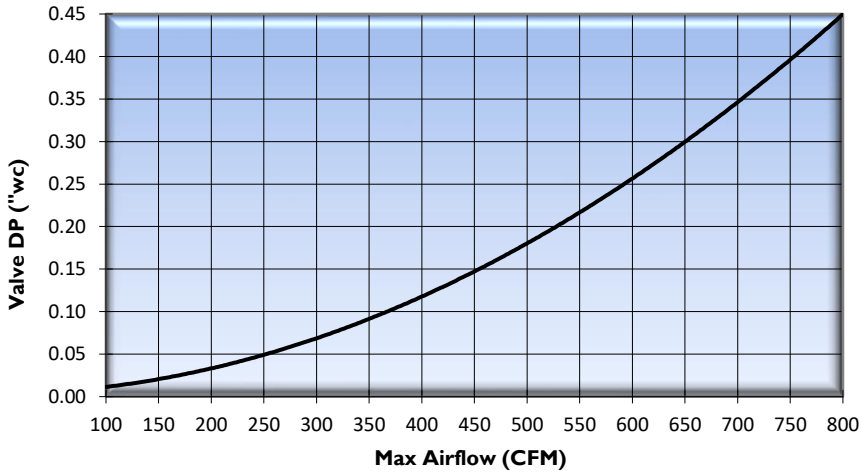
Designator	**(2) 304SS**	**(3) 316SS**	**(4) Aluminum**	**(5) PFA Coated**	**(6) 304SS High Temp**
Housing	304L SS	316L SS	Alum.	PFA Coated, 304 SS	304L SS
Compression Section	304L SS	316L SS	Alum.	PFA Coated, 304SS	304L SS
Static Regain Section	304L SS	316L SS	Alum.	PFA Coated, 304SS	304L SS
End Plate	304L SS	316L SS	304L SS	PFA Coated, 304SS	304L SS
Blades	304L SS	316L SS	304L SS	PFA Coated, 304SS	304L SS
Shafts	316L SS	316L SS	316L SS	PFA Coated, 316SS	316L SS
Shaft Bearings	Teflon	Teflon	Teflon	Teflon	Teflon
Vortex Sensors	PC UL94-V0	PC UL94-V0	PC UL94-V0	Kynar PVDF	303 SS
Sensor Tubing	Polyurethane (Ether-based)	Polyurethane (Ether-based)	Polyurethane (Ether-based)	Viton Rubber	Viton Rubber
Compression Seals	EPDM Rubber	EPDM Rubber	EPDM Rubber	Viton Rubber	Viton Rubber
Machine Screws	304 SS	316 SS	304 SS	FEP Coated, 304 SS	304 SS
Rivets	304 SS	316 SS	304 SS	FEP Coated, 304 SS	304 SS
Blade Seals	EPDM Rubber	EPDM Rubber	EPDM Rubber	N/A	Viton Rubber

2.1 Operating Range

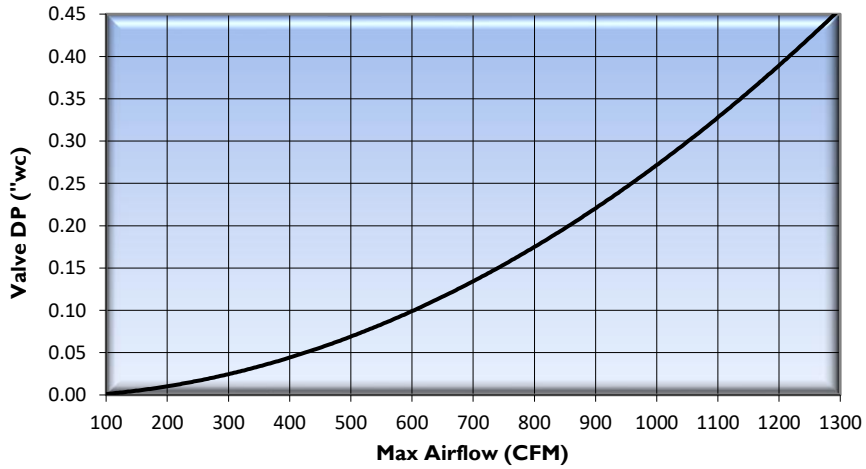
The operating range of each AccuValve is provided below along with a characteristic curve showing the relationship between the minimum operating pressure and maximum airflow volume as tested in accordance with ANSI/ASHRAE STD 130.



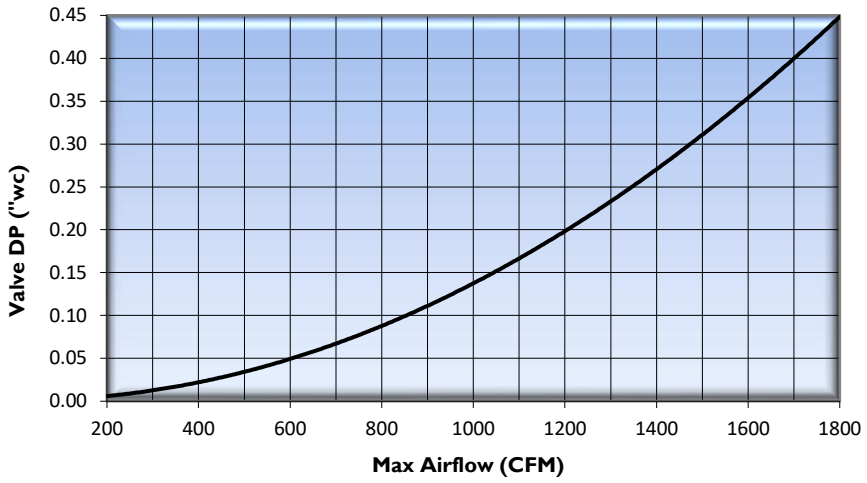
6" AccuValve
Operating Range: 0-315 CFM
Min. Measurement: 30 CFM



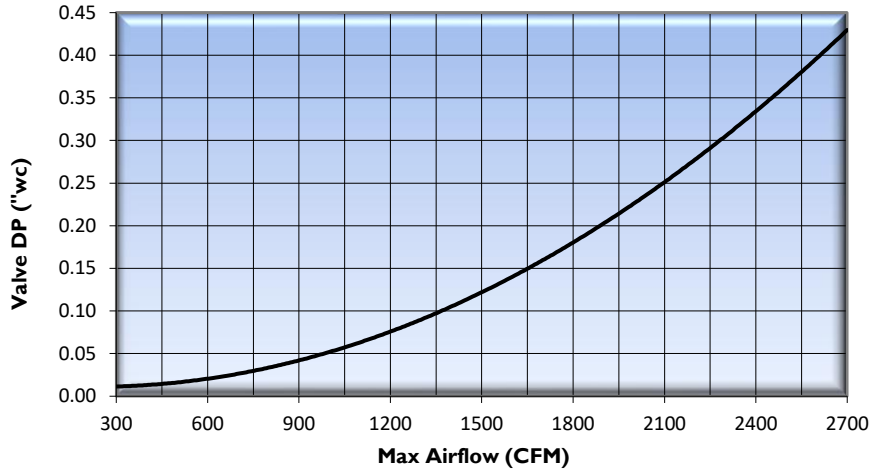
8" AccuValve
Operating Range: 0-800 CFM
Min. Measurement: 80 CFM



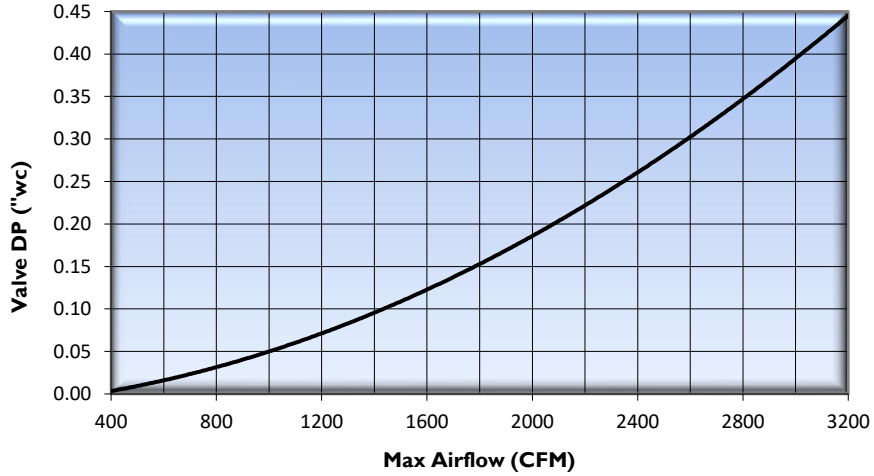
10" AccuValve
Operating Range: 0-1300 CFM
Min. Measurement: 120 CFM



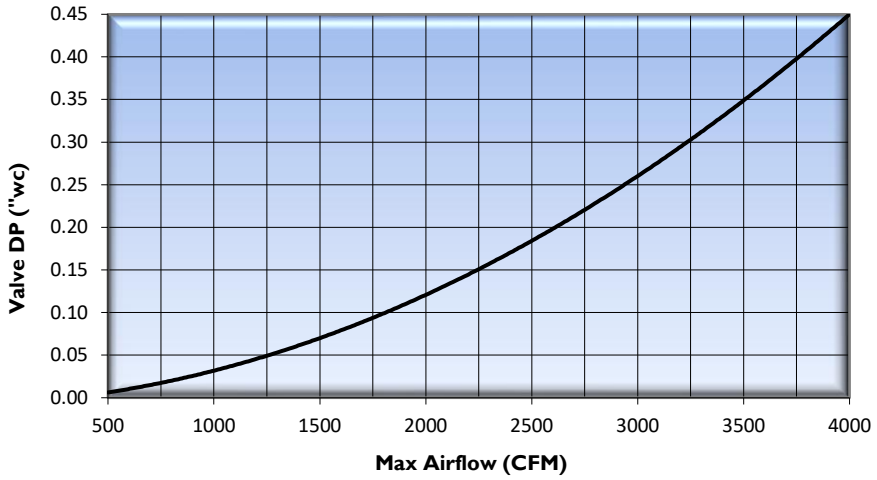
12" AccuValve
Operating Range: 0-1790 CFM
Min. Measurement: 180 CFM



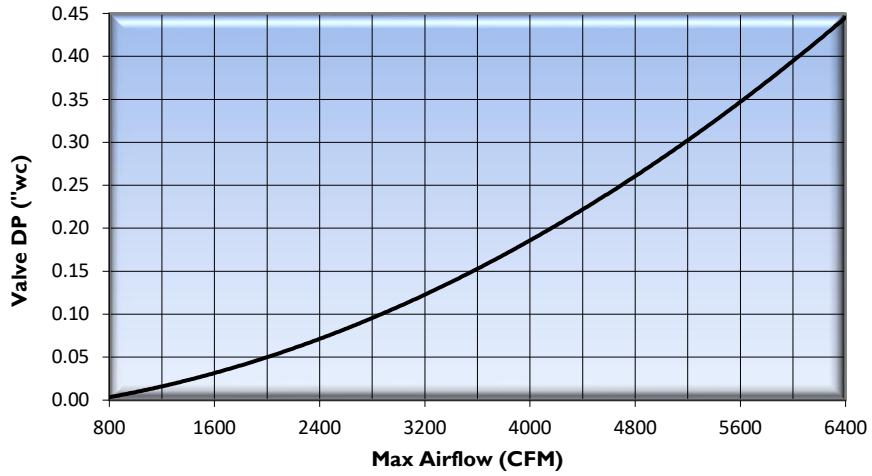
14" AccuValve
Operating Range: 0-2750 CFM
Min. Measurement: 250 CFM



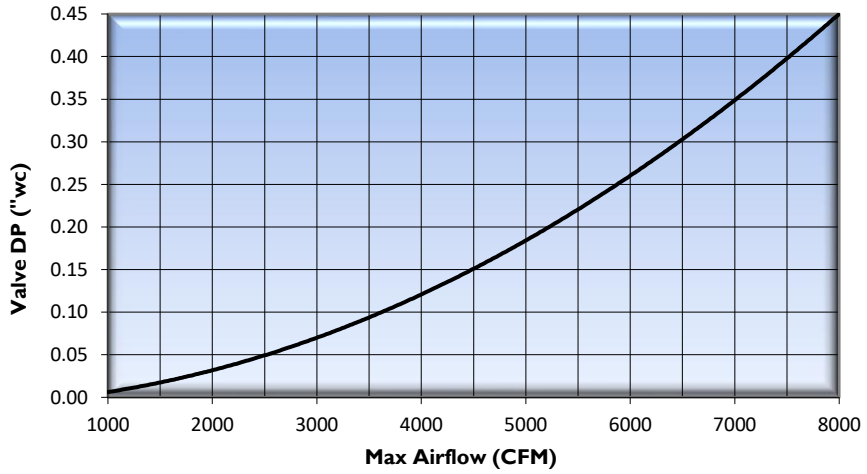
12x18" AccuValve
Operating Range: 0-3200 CFM
Min. Measurement: 260 CFM



12x24" AccuValve
Operating Range: 0-4000 CFM
Min. Measurement: 350 CFM



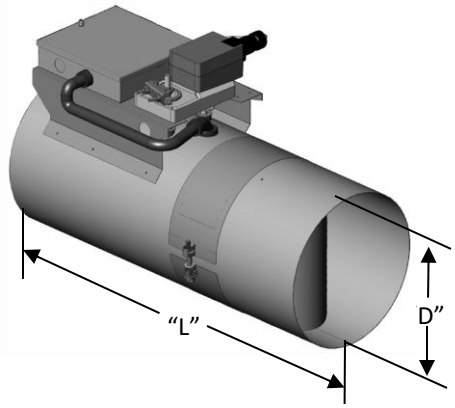
12x36" AccuValve
Operating Range: 0-6400 CFM
Min. Measurement: 520 CFM

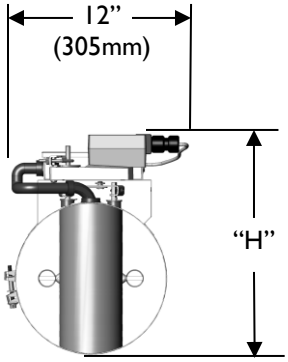


12x48" AccuValve
Operating Range: 0-8000 CFM
Min. Measurement: 700 CFM

SECTION 3 – PHYSICAL DIMENSIONS & WEIGHTS

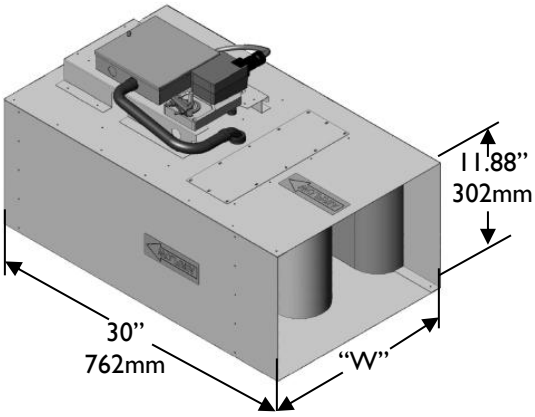
3.1 Round Valve Sizes

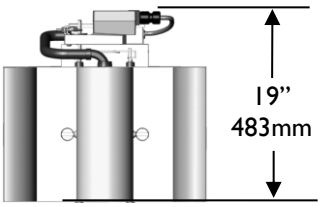




Valve Model Size	Dimensions						Weight					
	"D"		"L"		"H"		Stainless Steel		Aluminum		Flange Add	
	in.	mm	in.	mm	in.	mm	Lbs.	kg	Lbs.	kg	Lbs.	kg
06	5.88	149	22	559	10	254	13	5.9	9	4.1	2.0	0.9
08	7.88	200	24	610	13	330	16	7.3	12	5.4	2.6	1.2
10	9.88	250	24	610	15	381	20	9.1	14	6.4	3.2	1.5
12	11.88	300	27	686	17	432	26	11.8	16	7.3	4.5	2.0
14	13.88	350	30	762	19	483	30	13.6	20	9.1	5.2	2.4

3.2 Rectangular Valve Sizes





Valve Model Size	Valve Width "W" Ref Diagram		Weight					
			Stainless Steel		Aluminum		Flange Add	
	in.	mm	Lbs.	kg	Lbs.	kg	Lbs.	kg
18	17.88	454	43	19.5	26	11.8	5.0	2.3
24	23.88	607	49	22.2	29	13.2	5.5	2.5
36	35.88	911	97	44.0	59	26.8	10.0	4.5
48	47.88	1216	109	49.4	69	31.3	11.0	5.0

Note: *All dimensions are to the "outside" and have a tolerance of +/- .062" (1.6mm).*

SECTION 4 - INSTALLATION

Read all instructions and review the installation diagrams provided on the following pages prior to beginning installation.

CAUTION: *Wear eye protection, cut-resistant gloves, and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*

1. Verify the tag number located on the valve label matches the HVAC schedule.
2. Locate the duct section which the valve is servicing and select a suitable mounting location for the valve.

NOTE: *Though the AccuValve does not require straight-run inlet conditions to operate properly, it's always best to follow HVAC Best Practices for Commercial Buildings during installation which includes locating the valve away from transitions and bends to minimize impact on system static pressure. Also, be sure to select a location that will provide a minimum clearance of 14" (356mm) unobstructed access to the control module, actuator and valve access cover.*

3. Provide an opening in the duct section sized appropriately for the valve being installed.

NOTE: *A slip-fit valve will require an opening approximately 2" smaller than the valve length and a flanged valve will require an opening the same as the valve length. For valve dimensions, reference Section 3.*

5. Install duct hangers within 12" (305mm) from each end of the valve connections. Reference Section 3 for valve weights.

WARNING: *Use duct hangers and hardware designed to support the total load of the valve and associated duct sections. Failure to do so may result in serious personal injury or death.*

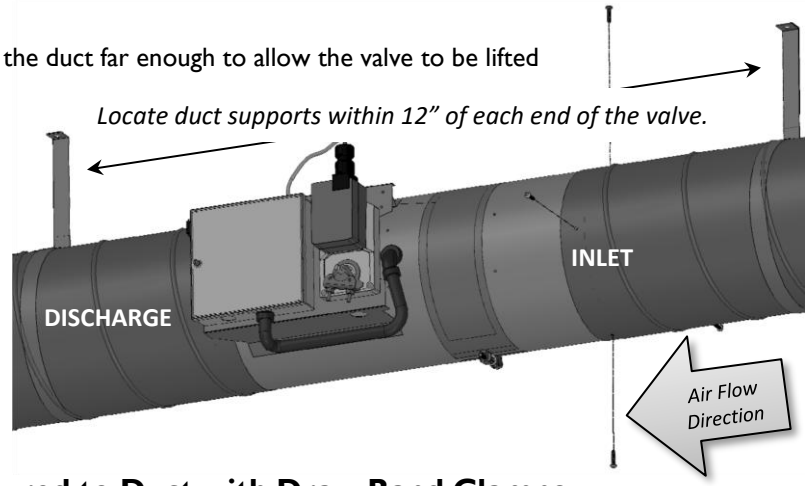
6. Install the valve into the duct in accordance with the airflow direction label located on the valve. Position the valve for easy access to the control module side. Since the AccuValve is not position sensitive, it can be installed in any plane or rotational axis without having impact on the performance.

NOTE: *Screws, nuts, fasteners, duct sealant, hangers, companion flanges and gaskets are NOT provided by Accutrol.*

4.1 Round Valve Installation Diagrams

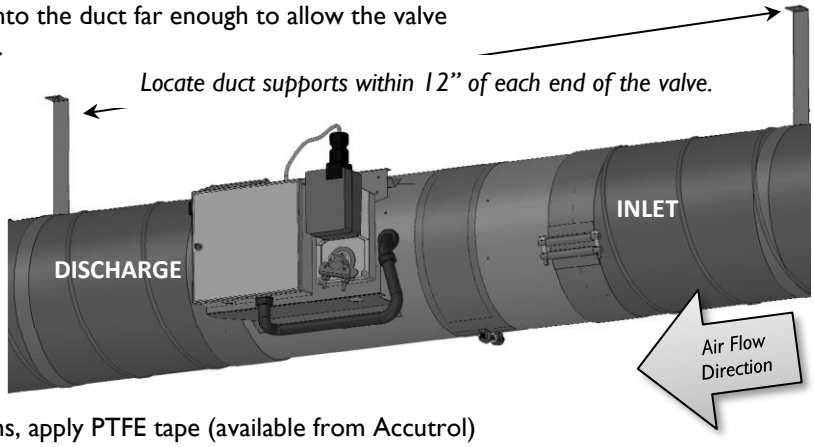
Standard Slip-fit Valve Secured to Duct with Tek Screws. NOT ACCEPTABLE FOR PFA COATED VALVE.

1. Slip the inlet end of valve into the duct far enough to allow the valve to be lifted into the duct opening.
2. Slip the discharge end of the valve into the duct engaging valve into duct 1" at each end.
3. Position valve to provide unobstructed access to the control module, actuator and access panel.
4. Apply duct sealant and secure valve to duct at both ends using tek-screws.



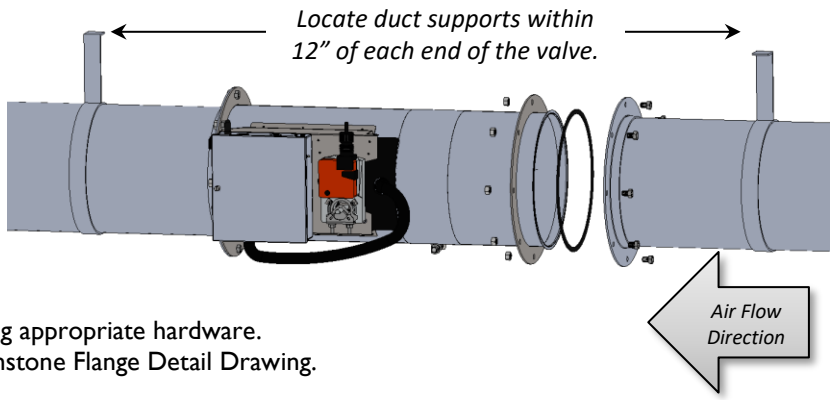
Standard Slip-fit Valve Secured to Duct with Draw Band Clamps

1. Slip the draw band clamps over each end of the duct.
2. Slip the inlet end of the valve into the duct far enough to allow the valve to be lifted into the duct opening.
3. Slip the discharge end of the valve into the duct engaging valve into duct 1" at each end.
4. Position valve to provide unobstructed access to the control module, actuator and access panel.
5. For clean air applications, apply UL181 compliant foil tape over the valve/duct seams.
   For corrosive exhaust applications, apply PTFE tape (available from Accutrol) over the valve/duct seams.
6. Secure both ends of valve to the duct using draw band clamps.



Flanged Valve "Option F" Secured to Duct with Companion Flanges and Hardware

1. Slip the companion flanges over each end of the duct and install to duct as required.
2. Position valve to provide unobstructed access to the control module, actuator and access panel.
3. Install gaskets and/or duct sealant between the valve flanges and companion flanges.
4. Secure valve to duct using appropriate hardware.
   Reference the Accutrol Vanstone Flange Detail Drawing.



4.2 Rectangular Valve Installation Diagrams

Valve Sizes 18 and 24

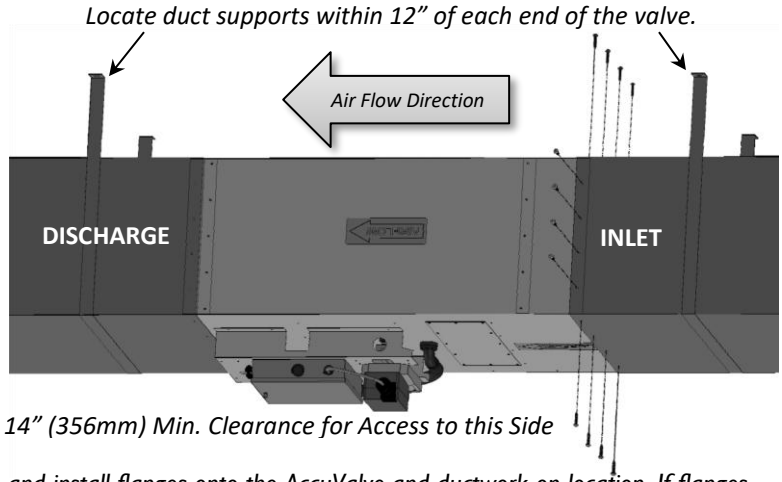
1. Verify the opening in the duct is properly sized for the valve and installation method being used. Also verify both ends of the duct where the valve is to be attached are true and square before attempting to install valve. If the duct ends are not square and true, do not attempt to install valve as it will not operate properly.

2. Lift valve into position to provide unobstructed access to the control module, actuator and access panel.

3. Slip the inlet end of valve into the duct far enough to allow the valve to be lifted into the duct opening.

4. Slip the discharge end of the valve into the duct engaging valve into duct 1" at each end.

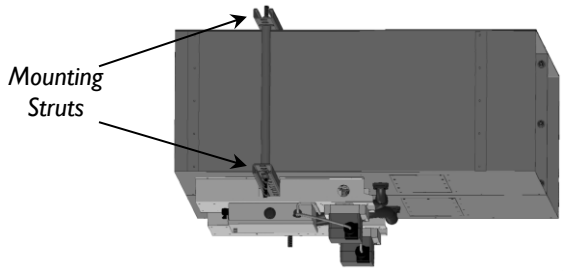
5. Secure both ends of valve to duct using tek-screws and duct sealant.

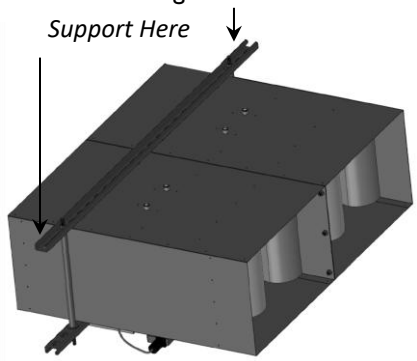


NOTE: *It's acceptable to fabricate and install flanges onto the AccuValve and ductwork on location. If flanges are fabricated on site, it's still important to verify both ends of duct are true and square prior to and after installing flanges, otherwise the valve will not operate properly.*

Valve Sizes 36 and 48

The 36" and 48" wide valves are provided with integral mounting struts to help support the weight of the valve. In addition to following the installation instructions above, each end of the strut shall be secured to the building structure using properly rated hardware and methods in accordance with local building codes.





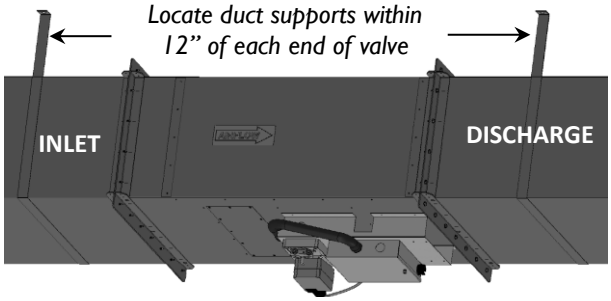
Flanged Valve "Option F"

1. Install companion flanges (provided by others) over each end of the duct.

2. Lift the valve into position to provide unobstructed access to the control module, actuator and access panel.

3. Install gaskets and/or duct sealant between the valve flanges and companion flanges.

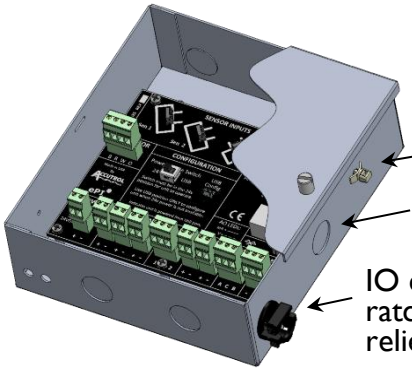
4. Secure both ends using tek-screws.



14" (356mm) Min. Clearance for Access to this Side

SECTION 5 – WIRING

5.1 AVC6000 Control Module



Use cable tie for monitor cable strain relief

Entry for remote monitor cable connection

IO cable entry with ratcheting strain relief fitting

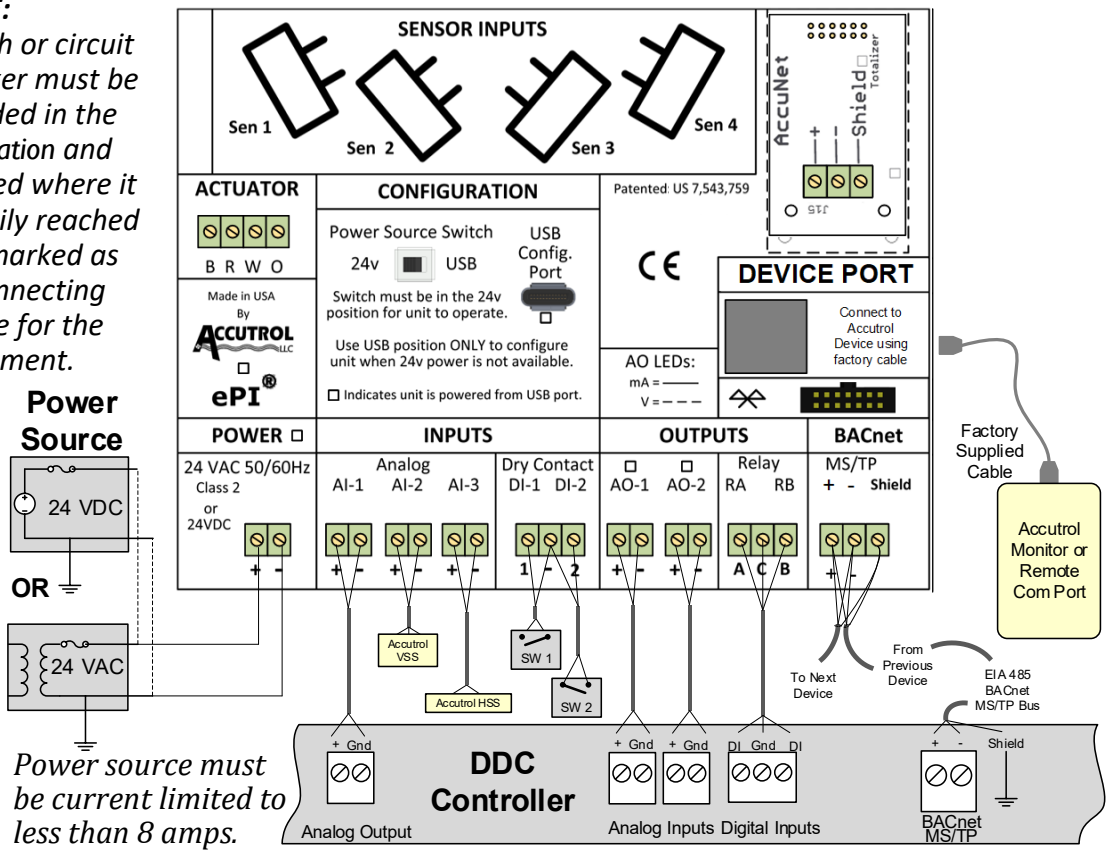
Note: *For conduit connection, remove strain relief fitting and install .875 (22mm) conduit fitting (Provided by Others)*

5.2 Wiring Instructions

1. Remove Control Module Cover and insert cables through strain relief fitting into enclosure.
2. Remove terminal block plug(s) and connect wires to the appropriate terminals.
3. Secure terminal screws and reinstall plug(s).
4. Insert the ratcheting strain relief over cable(s) and push down until snug.
5. Reinstall cover and secure thumb screw.

5.3 Control Module Wiring Diagram: Connections will vary based on application.

NOTE:
Switch or circuit breaker must be included in the installation and located where it is easily reached and marked as disconnecting device for the equipment.



Power source must be current limited to less than 8 amps.

CAUTION: *Maintain polarity if power source is used for multiple devices, otherwise equipment may be damaged.*

SECTION 6 – ACCUVALVE INSIGHT CONFIGURATION SOFTWARE

AccuValve Insight is a software configuration tool that provides a means to communicate directly with the AVC6000. All that's required is a Windows computer or tablet with a USB Port, USB cable and the AccuValve Insight Software. For wireless communication, an AVC6000 can be ordered from the factory with an optional Bluetooth module.

6.1 Minimum Requirements for PC

- PC or Tablet with Windows Version 10 or greater
- Windows region set to English
    - Windows Control Panel → Region → Administrative Tab → System Location Option set to English (United States)
- USB 2.0 Port
- Screen Resolution 1280 x 768 or greater suggested
- USB Type A to USB Type C Data Cable

6.2 Installing the AccuValve Insight Software

Before starting the installation process, close any programs running on the computer.

1. Download the **Accutrol Software Manager (ASM)** from https://www.accutrolllc.com/accuvalve-software-downloads/. If the **ASM** is already installed, skip to step 3.

2. Go to the downloads folder in the File Explorer app of your PC and Extract All contents from the folder. Once done, install the **ASM** by executing the Setup File within the extracted **AccutrolSoftwareSuite.zip** file. A desktop icon will appear.

3. Once installed, launch the **ASM** using the Desktop Icon.

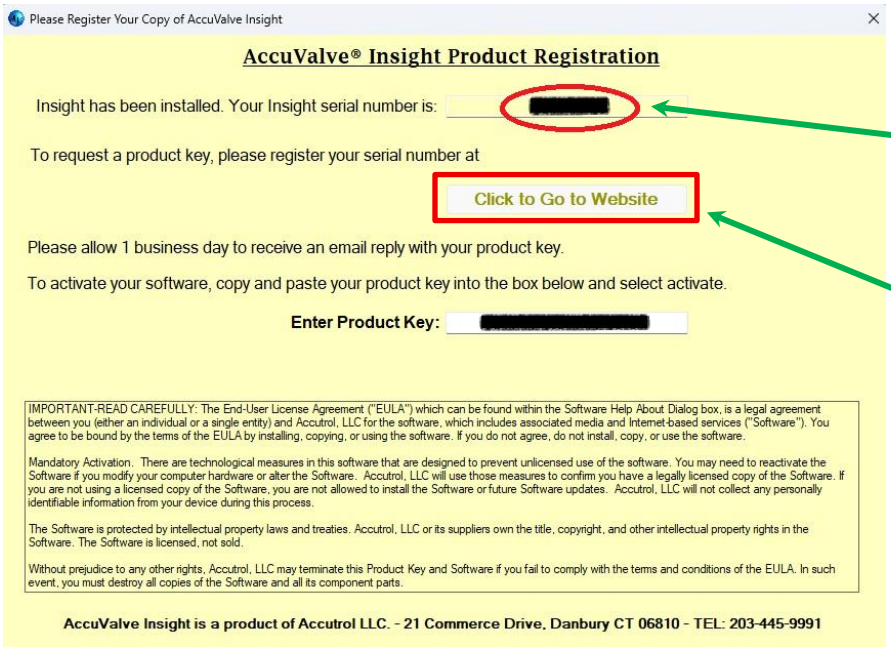
(ASM Desktop Icon)

4. Click on the **AccuValve Insight Software** Icon to download the install folder to your PC. This will launch the user's Default Browser.

5. Extract All contents from the install folder. Once done, execute the Setup File to install the program.

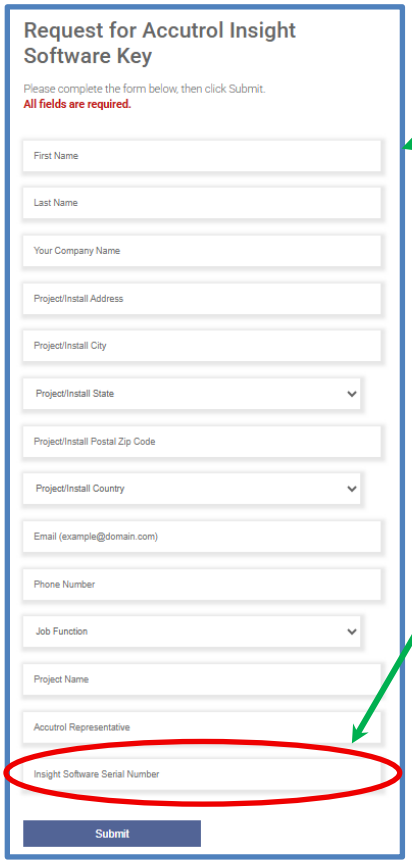
6.3 Software Registration

When the **AccuValve Insight Software** is installed, start **AccuValve Insight** from inside the **ASM** to run the application. A registration window will open, copy the Insight serial number, select "Click to Go to Website" and complete the Product Registration Form. Then select "submit".



Copy the Insight serial number

Select to continue



Fill in all fields required on the blank

Paste the Insight serial number here

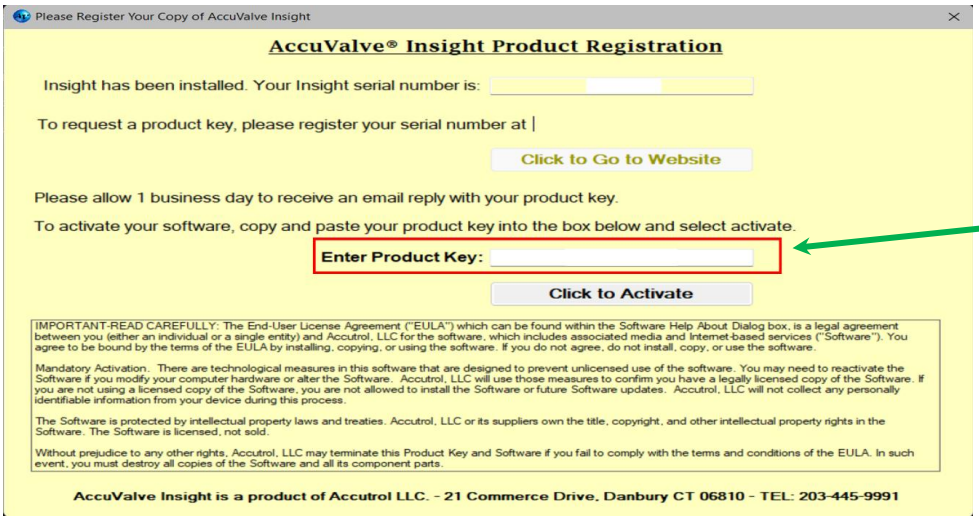
Note: *The Insight Serial Number is unique to the computer which it was installed on. Therefore, the Registration Key will only function on this one computer. If you require the software to be installed on more than one computer, a request for each computer must be generated separately.*

6.3.1 Insight Software Key

Once you have received the Product Key from Accutrol, you will need to do the following to activate the software.

a. Open the AccuValve Insight application by opening the Accutrol Software Manager and clicking on the AccuValve Insight Icon or go to the Start Menu -> All Apps -> Accutrol LLC -> AccuValve Insight.

b. Copy the Product Key provided in the email from Accutrol, paste it into the "Product Key" field provided at the bottom of the form, then click on the "Register Product Key" button that appears. You must be connected to the internet during the first launch of AccuValve Insight after a valid Product Key has been submitted.



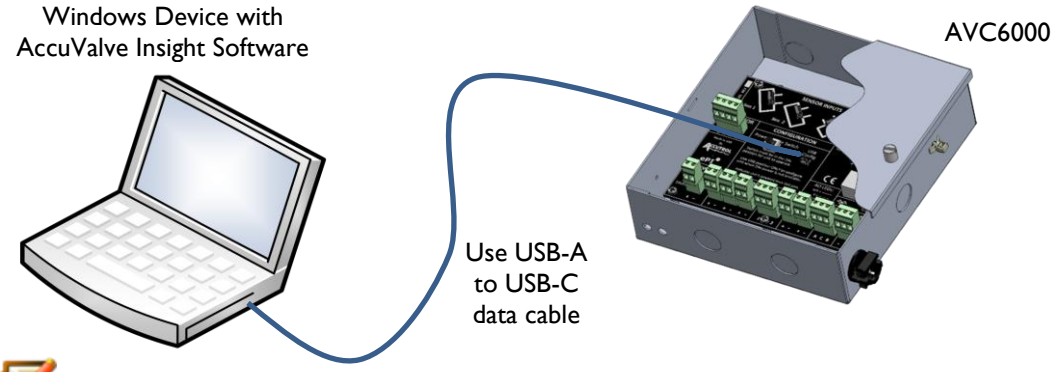
c. You will now be able to use the AccuValve Insight Software on your computer. If you have any problems, contact Accutrol LLC at 203-445-9991.

Note: *AccuValve Insight will attempt to update itself with the latest released version of software each time it is initiated when the computer is connected to the internet. If you do not wish to update, you will be given a choice to not update each time.*

6.4 Connecting the PC to an AVC Control Module

6.4.1 Connecting to a standard AVC6000 using USB cable

Note: If 24VAC is applied when the USB is already connected, or if the switch position is changed while a USB connection is active, the controller will revert to bootloader mode and will not function properly. Bootloader Mode is indicated by the EPI LED being off.



Note: If a controller is in bootloader mode, disconnect the USB, disconnect the 24VAC power, ensure the power source switch is set to the "operational position", and wait 5 seconds. After these steps, reconnecting 24VAC power first will resume normal operation.

6.4.1.1 Power Source Switch

The AVC6000 controller has a Power Source Switch which should always be in the "Operational Position" for the controller to function normally. The "Nonoperational Position" is provided so the controller can be programmed or configured when there is no 24v power source available. This is a convenient feature for configuring the BACnet parameters or the controller's analog output prior to having the 24v power source wired.

Operational Position

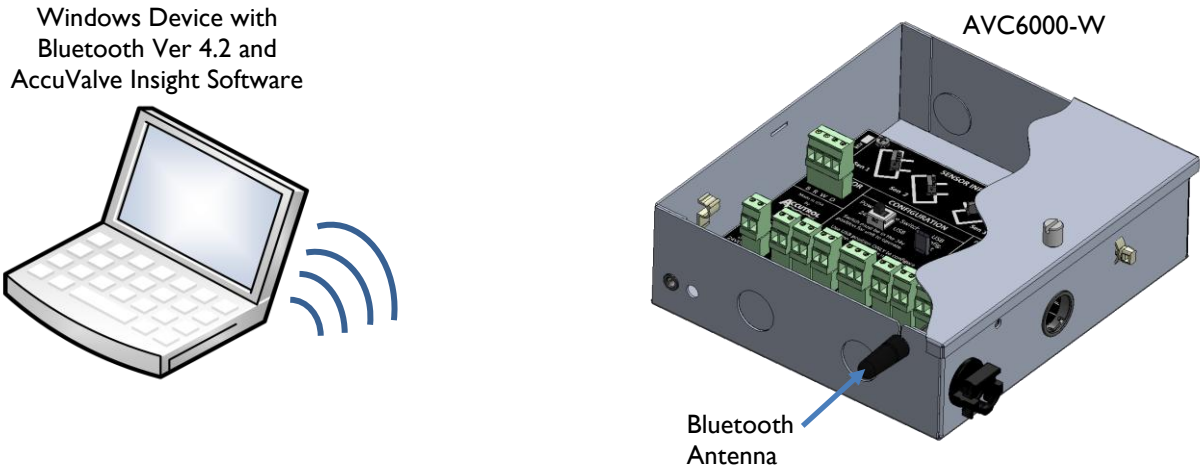
24v power is provided to the controller through the 24v connector. This is the normal position for the Power Source Switch.

Nonoperational Position

5vdc power is provided to the controller through the computer connected to the USB Configuration Port. This is a temporary position only.

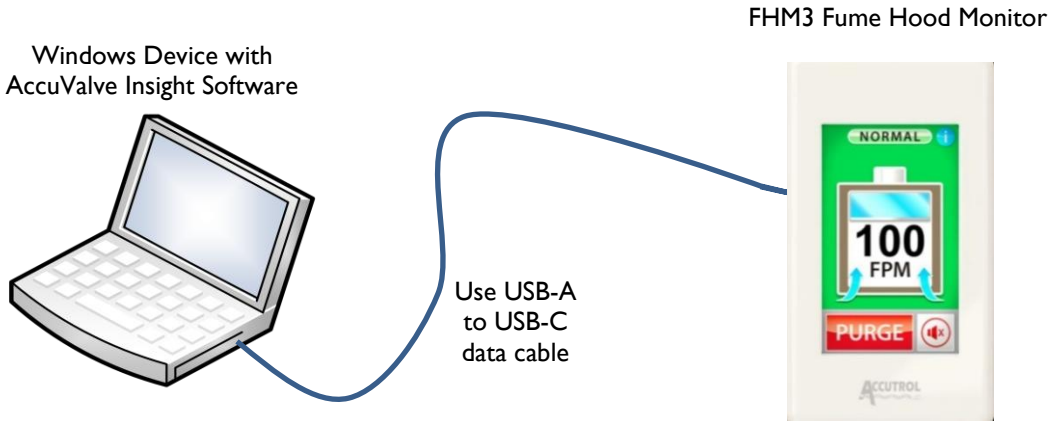
Note: The Power Source Switch must be returned to the Operational Position after completing the configuration otherwise the controller will not function.

6.4.2 Connecting to AVC6000-W (with optional wireless Bluetooth module)



Note: *Reference Appendix B for Bluetooth Connection Details.*

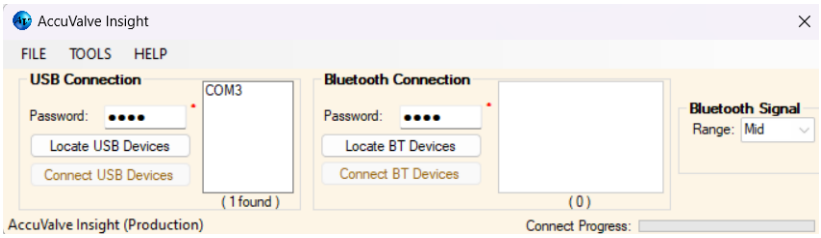
6.4.3 Connecting to a remote monitor such as the FHM3 Fume Hood Monitor



6.5 AccuValve Insight Software

To open the AccuValve Insight application, double click on the AccuValve Insight icon within the ASM or go to the Start Menu and select Programs > AccuValve Insight.

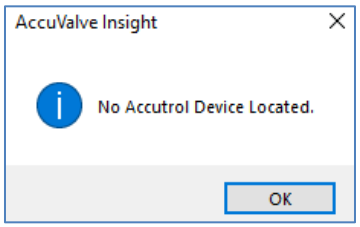
To communicate to the AVC6000 via USB connection, select "Locate Accutrol Devices" then select the com port associated with the AVC6000 that your computer is connected to. To communicate to the AVC6000-W (with optional Wireless Bluetooth Module) select "Locate BT Devices" then select the discovered device TAG Name associated with the AVC6000 that you would like to communicate with. Reference Appendix B for details on the Bluetooth connection.



6.5.1 Configuring USB Driver

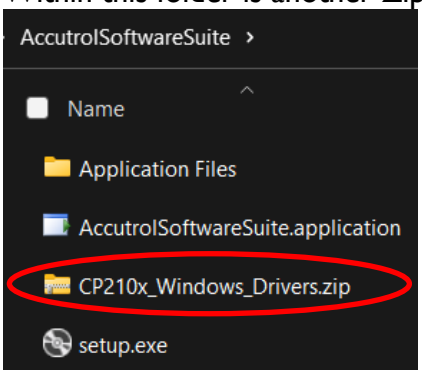
In some instances, the Windows machine being used to run Insight may not be equipped with the appropriate USB driver package needed to connect. This is a possible occurrence with new machines which have never downloaded this driver package. This can be fixed by now downloading the driver package which Accutrol has provided.

If the correct driver is missing, Insight will likely display "No Accutrol Device Located" after clicking Locate Accutrol USB Devices despite the PC being connected to the controller board.

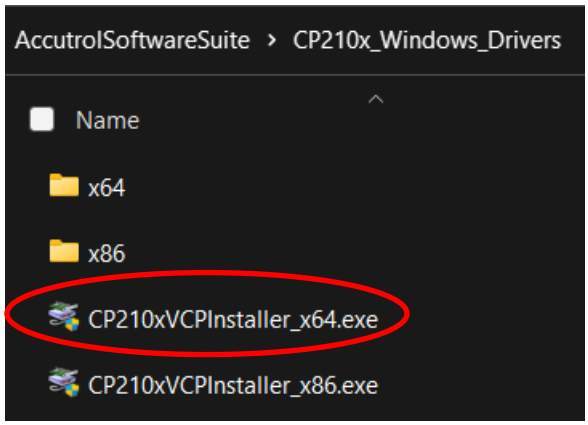


Should troubleshooting indicate that a missing driver is the problem; follow the steps listed below:

1. Navigate to the unzipped Zip file named "Accutrol Software Suite" that was already downloaded to your pc when first installing the ASM.
2. Within this folder is another Zip file called CP210x_Windows_Drivers.zip.



3. Extract the contents of this .zip file and enter the unzipped folder.

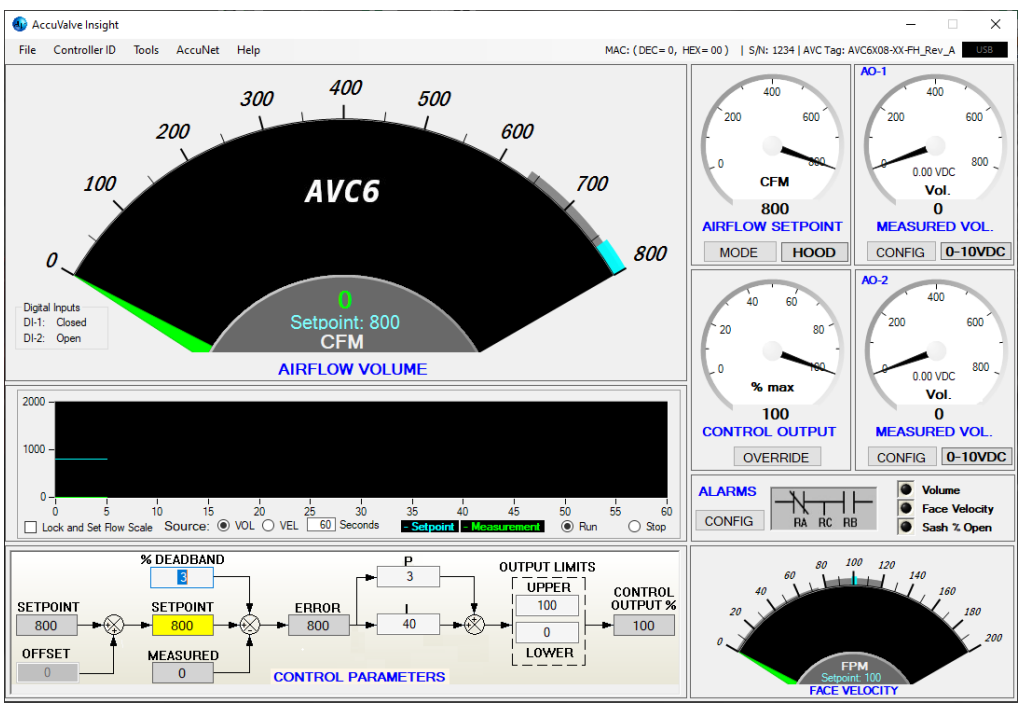


4. Find and run the file called "CP210xVCPInstaller_x64.exe" (Note: If you are running windows 10 on an older 32bit computer run "CP210xVCPInstaller_x86.exe").
5. After installation, clicking the locate Accutrol USB Device button should successfully locate a COM port when connected to an AccuValve Controller.

Note: *It may be necessary to restart your PC after installation of the CP210x driver for the install to take effect.*

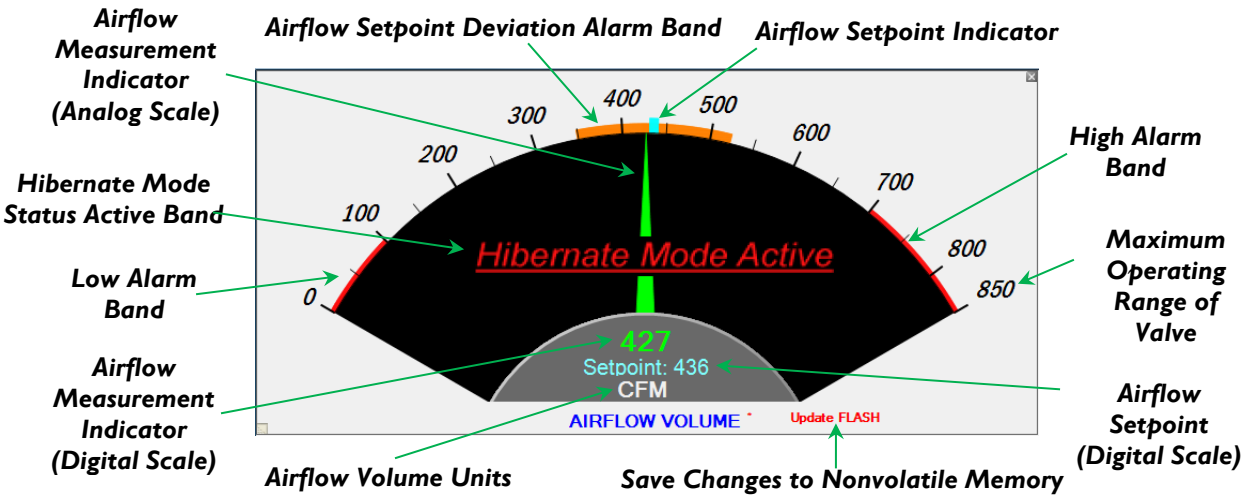
6.5.2 AccuValve Insight Dashboard

The Dashboard provides real-time performance information while also serving as an intuitive graphical user interface that is easy to understand while providing access to the most common field-configurable parameters with one click. The Dashboard that is pictured below is connected to an AVC6000 control valve configured for the Fume Hood Operating Mode. A brief description of each Dashboard object is provided on the following pages.



6.5.3 Airflow Volume Gauge

The Airflow Volume Gauge provides the most critical real-time operating parameters of the AVC6000. The Airflow Volume Gauge is an "information only" object; therefore, no field programming can be accessed through the Airflow Volume Gauge.

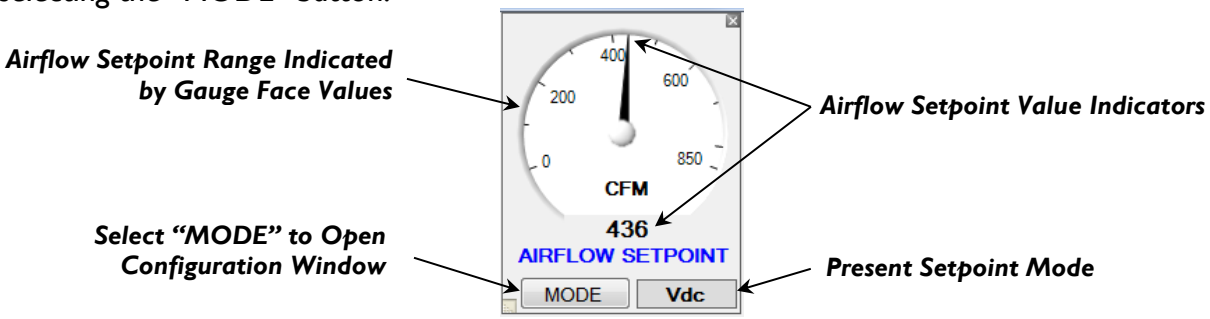


Notes

1. *The colors used for the Alarm Band Indicators are user-definable by right-clicking anywhere on the Airflow Volume Gauge.*
2. *When the Alarms are not active, the Alarm Band Indicator will appear on the gauge; however, the color will be gray.*

6.5.4 Airflow Setpoint Gauge

The Airflow Setpoint Gauge displays the Airflow Setpoint Value, the Airflow Setpoint Range and the Airflow Setpoint Operating Mode. Access to the Mode Configuration Menu is provided by selecting the "MODE" button.



6.5.5 Operating Modes

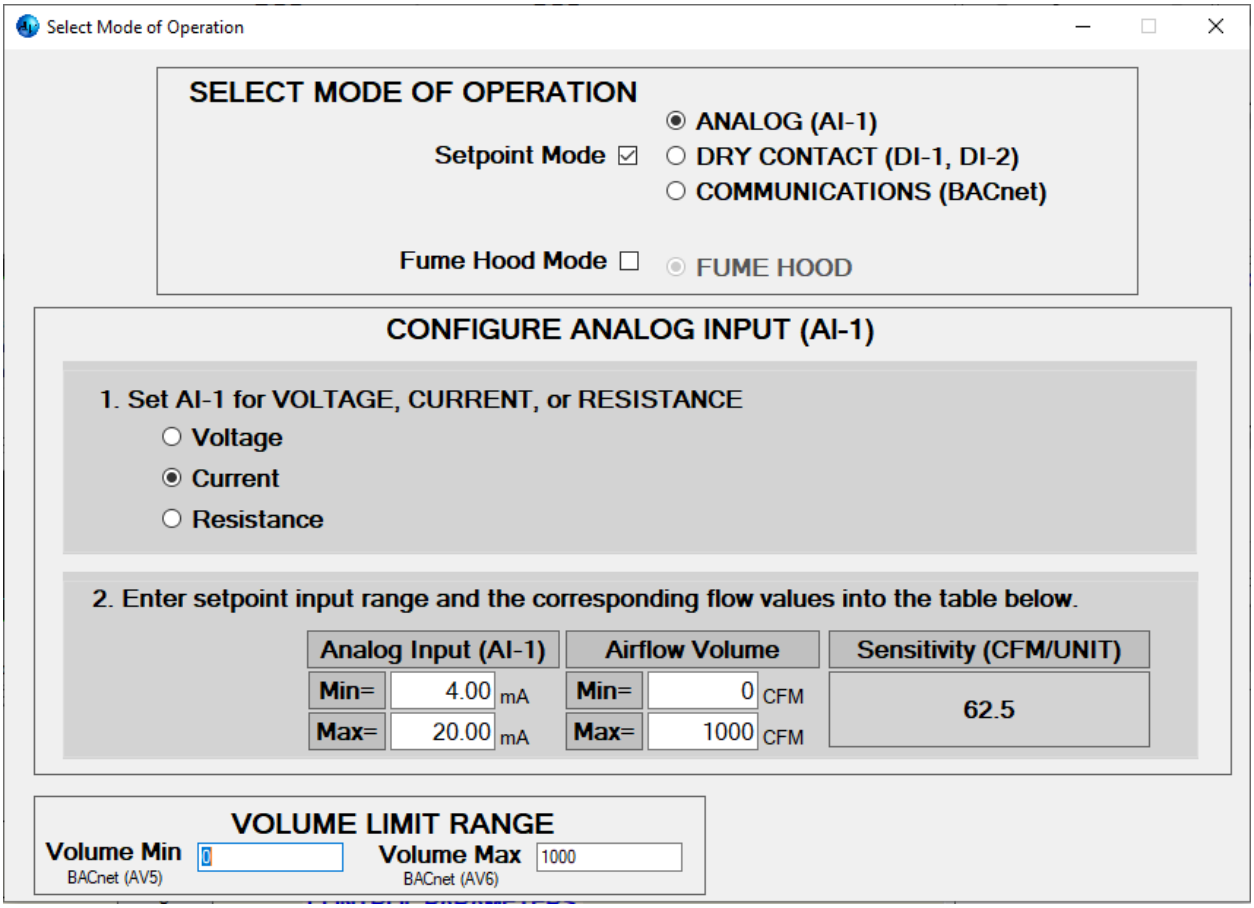
The AVC6000 has two different Modes of Operation; Setpoint Mode and Fume Hood Mode. The Mode of Operation is factory-configured, therefore it's unlikely that it will need to be changed in the field, however it can be changed if required. A description of each Operating Mode and associated parameters is provided below.

6.5.5.1 Setpoint Mode

Within Setpoint Mode, there are three different options for configuring the airflow setpoint source; Analog Input (AI-1), Dry Contact Inputs (DI-1, DI-2) or BACnet MS/TP Communications. The following examples show how to configure each setpoint source and their associated parameters.

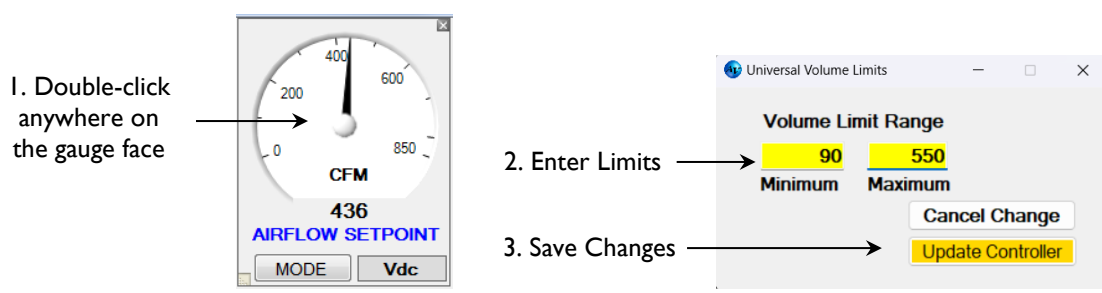
6.5.5.1.1 Setpoint Source = Analog Input (AI-1)

The following example shows how the controller would be configured to receive its setpoint from Analog Input 1 (AI-1) as a 4 to 20mA signal scaled from 0 to 1000 cfm.



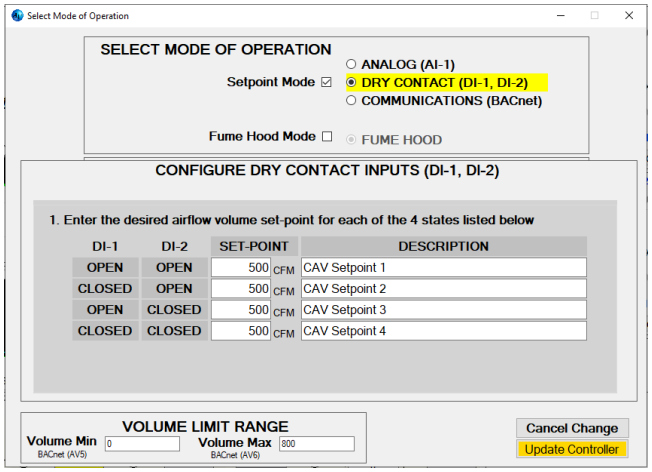
6.5.5.1.1.1 Setting Min and Max Volume Limits on the Setpoint

When the setpoint source is configured for "Analog", min and max limits can be applied to the setpoint without affecting the analog input scaling. To set min/max setpoint limits, double-click the Airflow Setpoint Gauge Face, which will open the dialog box shown below on the right. Enter the desired min and max limits and select Update Controller to save the changes. These values will also appear on the PID graphic as a Tool Tip for the displayed SETPOINT value.



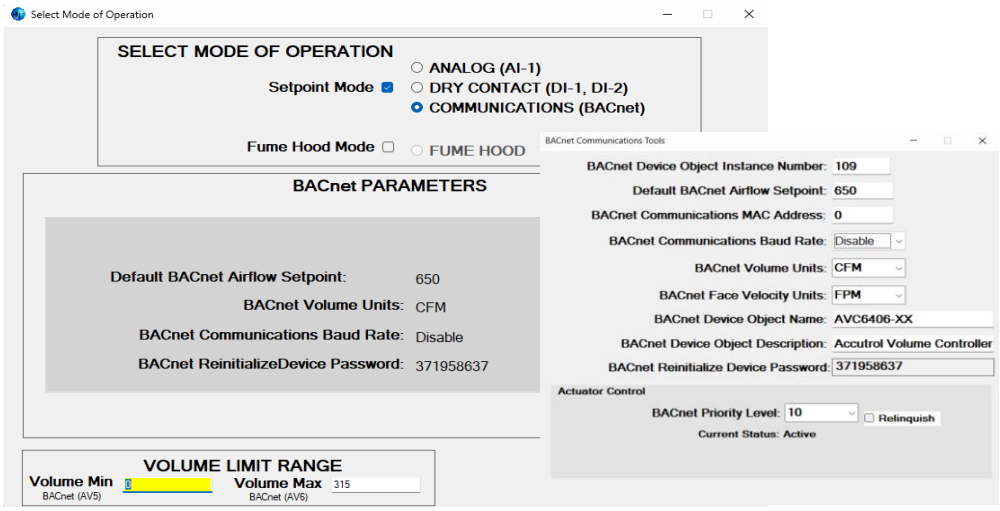
6.5.5.1.2 Setpoint Source = Dry Contact Inputs (DI-1, DI-2)

The following example shows how the controller would be configured to receive it's setpoint from the Dry Contact Inputs (DI-1 and DI-2) for constant volume operation with a setpoint of 500 cfm.



6.5.5.1.3 Setpoint Source = BACnet MS/TP Communications

The following example shows how the controller would be configured to receive it's setpoint from the BACnet MS/TP network. The BACnet configuration parameters shown below can be set at the factory if provided by the customer at the time of placing the order.



***NOTE**: The Factory Default BACnet Airflow Setpoint is the initial setpoint prior to receiving a setpoint from the network. After the controller receives a setpoint over BACnet this value is no longer valid unless "restore factory defaults" has been initiated.*

***NOTE**: Each AVC Control Module has a unique password which is stored in non-volatile memory. After "BACnet Communications" Mode has been selected, this password will appear in the box located next to "BACnet Reinitialize Device Password." This password is required when issuing a "controller reinitialization command" over BACnet*

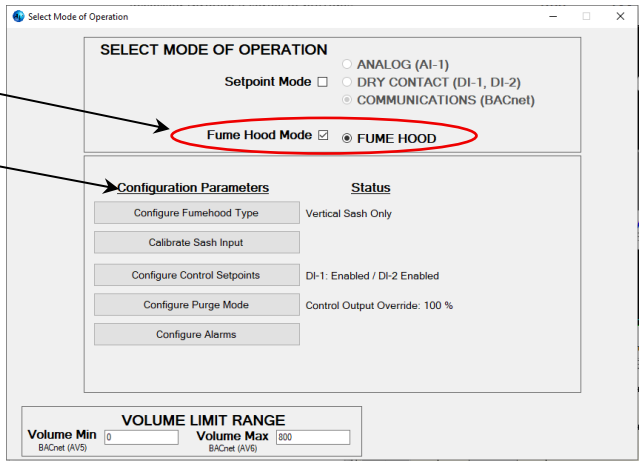
6.5.5.2 Fume Hood Mode

Selecting Fume Hood Mode will enable the AVC6000 to operate as a fume hood controller using the remote FHM module. For a detailed description of the FHM module, reference Appendix A. When operating in Fume Hood Mode, the airflow setpoint is derived from the fume hood configuration parameters described below. Because the AVC controller must be configured specifically for the fume hood which it is serving, **field configuration is required**.

Indicates Fume Hood Mode is Active

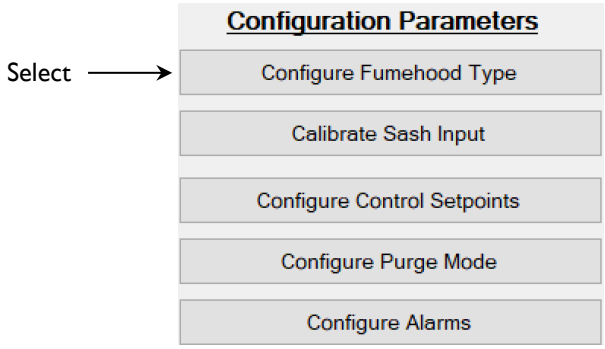
The Fume Hood Mode **Configuration Tools** are accessed through a series of buttons that are positioned in the order of which they should be completed during the initial startup. It's critical that each item is completed and verified to setup the controller and configure it specifically for the fume hood it is servicing.

Each configuration parameter is explained in the following section.



6.5.5.2.1 Configure Fume Hood Type

Because the AVC is capable of operating on many different types of fume hoods, bio safety cabinets, flow benches or any device that requires precise control of the exhaust airflow, it is necessary to define the fume hood type as the first step in the process.

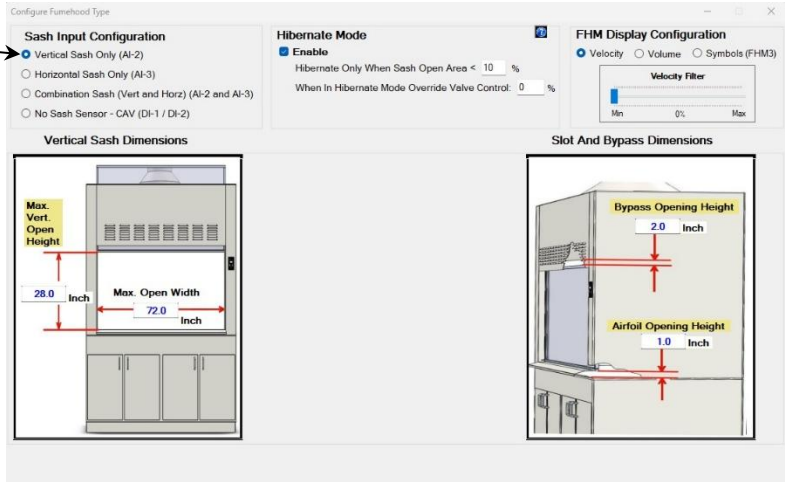


After selecting "Configure Fumehood Type" you will be required to select one of four possible choices which best fits your application. An example of each configuration is provided in the following section.

6.5.4.2.1.1 Vertical Sash Only (AI-2) Configuration

Follow the steps below to configure the controller for a **Vertical Sash** style fume hood.

1. Select
2. Open Sash to 100%
3. Measure Max Open Width & Height and enter values in the boxes provided
4. Measure the Upper Bypass with Sash Closed and enter value in the box provided
5. Measure the Lower Bypass between Work Surface & Lower Airfoil and enter value in the box provided



6. Select the configuration (Velocity, Volume, or Symbols) to be used for the Fume Hood Monitor

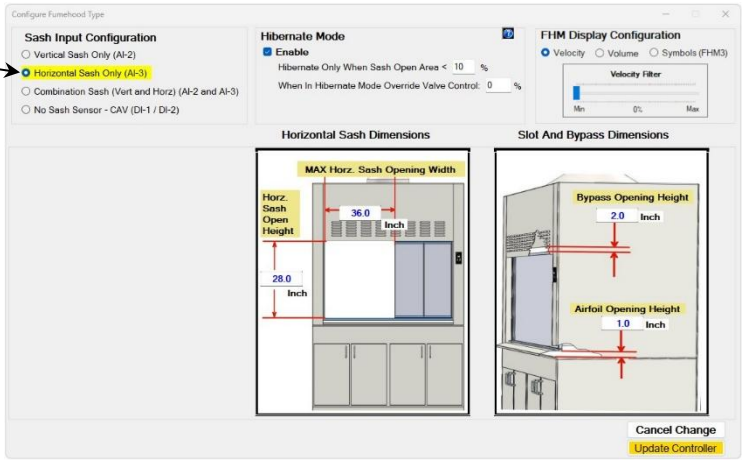
Note: *Most VAV fume hoods are designed with some open area located above and below the sash to provide a means for air to enter the fume hood from the room when the sash is in the closed position. The open area above the sash, usually referred to as a "restricted upper bypass", allows air to enter the fume hood only when the sash is closed, or nearly closed. As the sash is raised, the upper bypass becomes blocked limiting the amount of air that can enter from this opening. The lower bypass or airfoil slot provides a means below the sash for air to enter the fume hood and flow over the work surface. The lower bypass area is not affected by the sash position.*

6.5.4.2.1.2 Horizontal Sash Only (AI-3) Configuration

Refer to the Horizontal Sash Sensor Installation Guide for proper installation of the Accutrol Horizontal Sash Sensor.

Follow the steps below to configure the controller for a Horizontal Sash style fume hood.

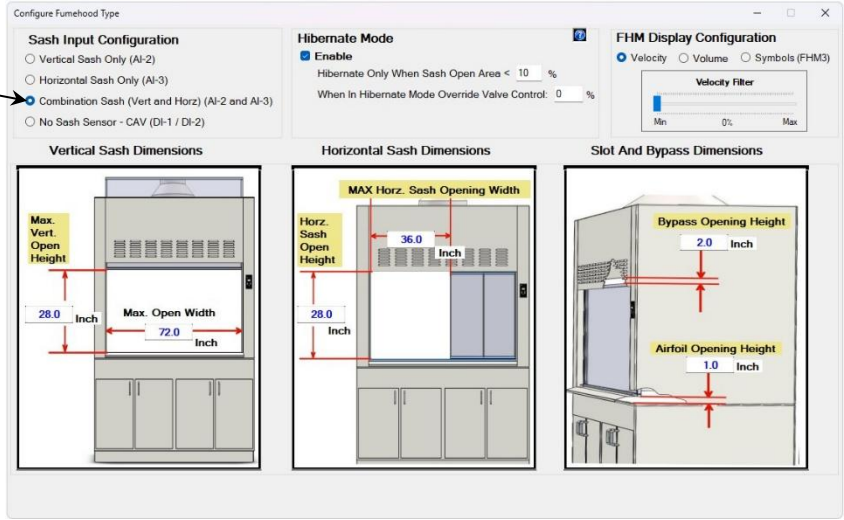
1. Select
2. Position Panels to Achieve the Maximum Opening
3. Measure Max Open Width & Height and enter values into the boxes provided
4. Measure the slot between work surface and airfoil and Enter Value in the Box Provided. If there is a slot above the horizontal panels, measure and add this value to the "Airfoil Opening Height" value.
5. Enter "**0**" for the Upper Bypass Opening Height.
6. Select the Monitor configuration (Velocity, Volume, or Symbols)



6.5.4.2.1.3 Combination Sash (AI-2 and AI-3) Configuration

Follow the steps below to configure the controller for a Combination Sash style fume hood.

1. Select
2. Open Vert. Sash to 100%, Measure Max Vert Open Height & Width and enter values in the boxes provided
3. Close Vert Sash
4. Position Horiz. Panels to Achieve Max Horizontal Opening and measure and enter values in the boxes provided

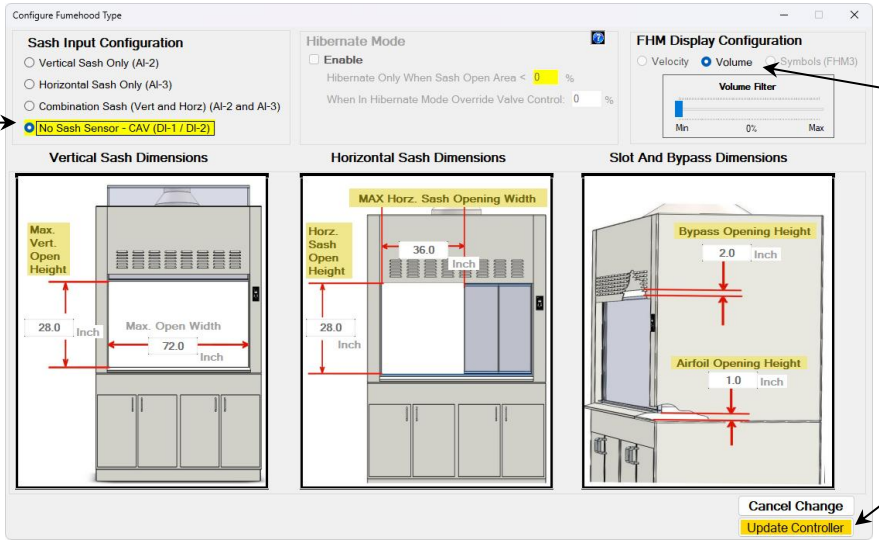


5. Measure the Upper Bypass and Lower Bypass Opening Height and enter values in the boxes provided then Save Changes
6. Select the configuration (Velocity, Volume, or Symbols) to be used for the Fume Hood Monitor.

Note: *Most VAV fume hoods are designed with some open area located above and below the sash to provide a means for air to enter the fume hood from the room when the sash is in the closed position. The open area above the sash, usually referred to as a "restricted upper bypass", allows air to enter the fume hood only when the sash is closed, or nearly closed. As the sash is raised, the upper bypass becomes blocked limiting the amount of air that can enter from this opening. The lower bypass or airfoil slot provides a means below the sash for air to enter the fume hood and flow over the work surface. The lower bypass area is not affected by the sash position.*

6.5.4.2.1.4 No Sash Sensor (CAV) Configuration (DI-1 and DI-2)

1. Select



2. Confirm

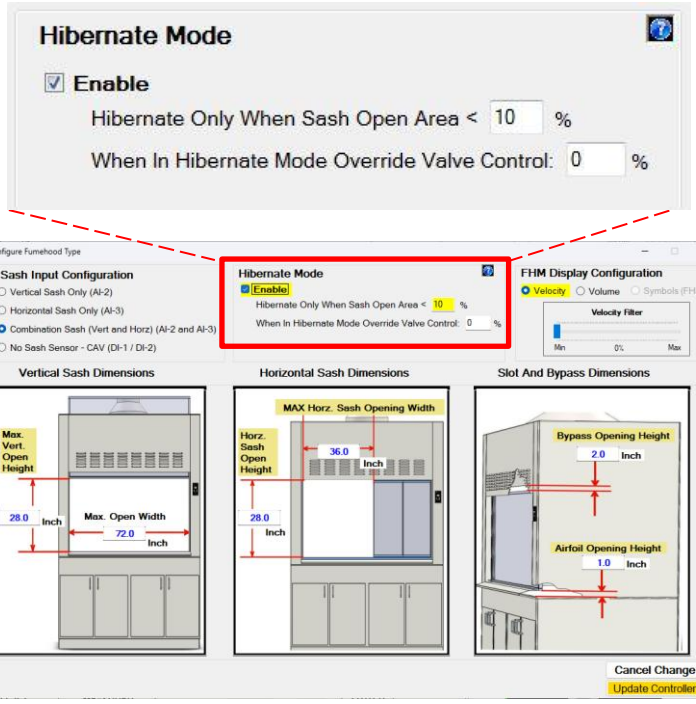
3. Save Changes

6.5.4.2.1.5 Follow the steps below to configure the controller to operate on a fume hood using no vertical or horizontal sash position sensors. This includes applications that may or may not utilize sash switches or manual switches connected to the controller's dry contact inputs DI-1 and/or DI-2.

6.5.4.2.1.6 Hibernate Mode *(Available for Sash Input Configuration = Vertical, Horizontal or Combination)*

The purpose of Hibernate Mode is to provide a means to conserve energy when a fume hood is not in use. Hibernate Mode can only be activated from the local FHM module or BACnet point (BV5) if it has been previously enabled and configured using Insight. To Enable and Configure Hibernate Mode using Insight, select Configure Fume Hood Type from the Configuration Parameters list, then follow the steps described below.

1. Select to Enable Hibernate Mode
2. Enter the threshold value for the sash % open area in the box provided. When the sash area is greater than this value, Hibernate Mode will be inactive.
3. Enter the desired Valve Override Control Position (% Open) for Hibernate Mode.



The following example assumes Hibernate Mode has been configured as follows:

- ☑ Enable
- Hibernate Only When Sash Open Area < **10** %
- When in Hibernate Mode Override Valve Control: **0** Open

To Activate Hibernate Mode from the FHM module:

1. Close the fume hood sash so the "Sash Open Area" is less than **10%**.
2. Press and hold the Mute Button while observing line 2 of the LCD where the following information will be sequentially displayed; **AVC Rev.**, x.x.x.x, **FHM Rev.**, x.x.x.x, **DevObjID**, xxx, **MAC Addr**, xxx, **Serial #**, xxxxxx and **Hibernate**
3. When "**Hibernate**" is displayed, Press and Hold the Purge Button for an instant while continuing to hold the Mute Button to activate Hibernate Mode.

- To indicate Hibernate Mode has been activated, the LCD will read; "**Hibernate Active**".
- After approximately 1 minute, the **LCD backlight will go off**.

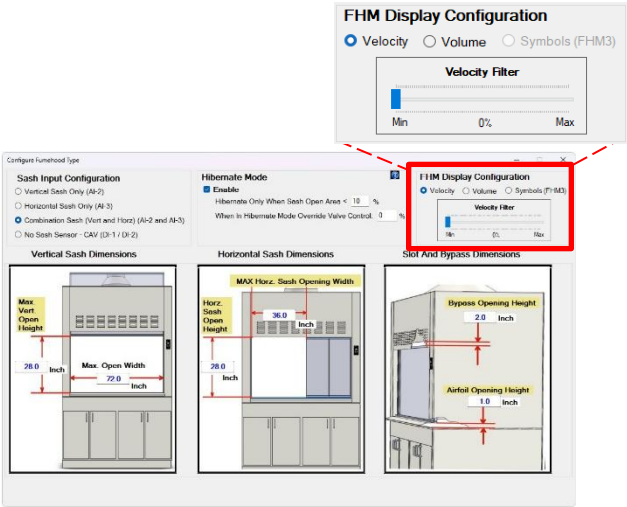
To Deactivate Hibernate Mode:

- To deactivate Hibernate Mode from the FHM Monitor, Press and Hold the Purge Button for 3 seconds. This will not only deactivate Hibernate, but will also activate Purge, so be sure to press the Purge Button again to return to normal control.
- Another way to deactivate Hibernate Mode is to open the sash until the sash open area exceeds 10% open, or the value programmed using Insight.

Note: *For a detailed description of the FHM module, reference Appendix A.*

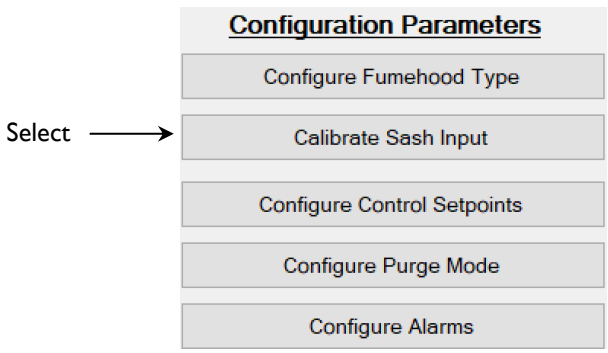
6.5.4.2.1.7 FHM Display Configuration

6.5.4.2.1.8 The purpose of configuring the FHM Display is to provide the necessary displayed information to the user.



- Select 'Velocity' or 'Volume' to display the Face Velocity or Face Volume.
- Select 'Symbols (FHM3 Only)' to disable the Face Velocity or Face Volume from being displayed at the FHM3 monitor.
- The Velocity/Volume Filter applies to the FHM Display only. - Increasing the filter will smooth out the reading, however it also slows down the response, therefore it should be used with caution.

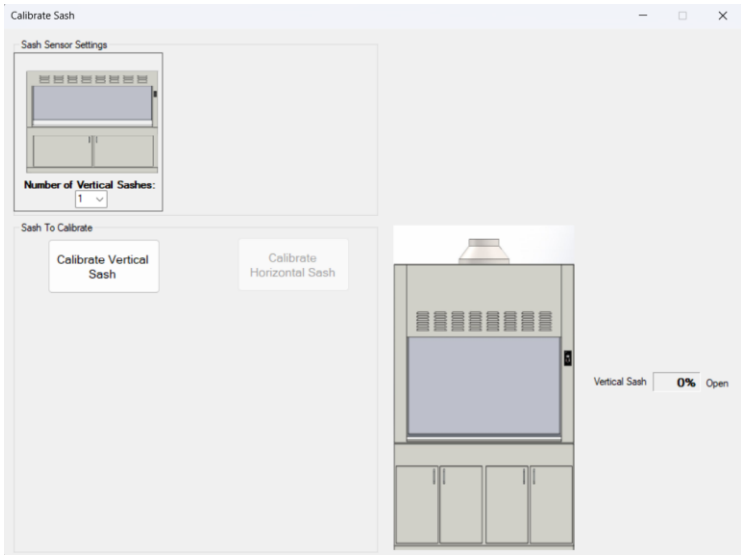
6.5.4.2.2 Calibrate Sash Input



The sash calibration options are based on the sash configuration that was selected in the previous section. The following example is for a Combination Sash type fume hood.

6.5.4.2.2.1 Vertical Sash Calibration

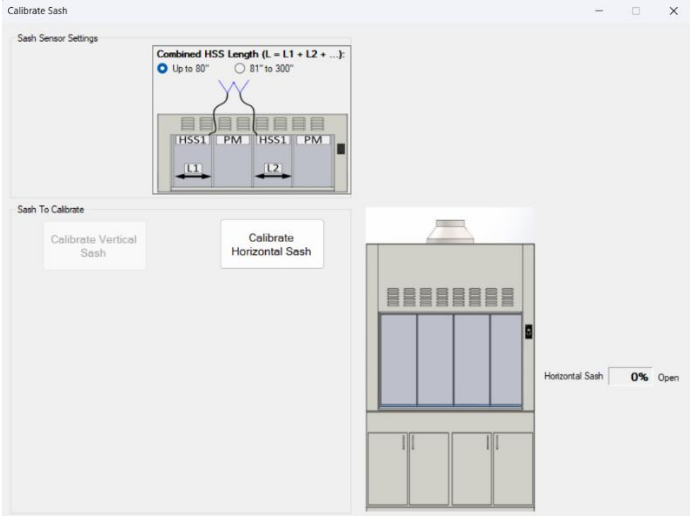
1. Select the number of vertical sashes
2. Select "Vertical Sash Calibration" and follow the instructions that appear below the button
3. Verify Calibration was successful by moving the Vertical Sash while observing the displayed "Vertical Sash % Open" and confirm the displayed value is accurate.



6.5.4.2.2.2 Horizontal Sash Calibration

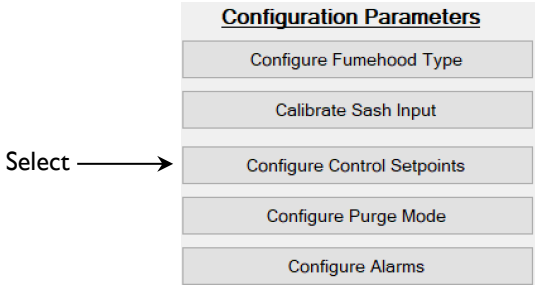
1. Select the "Calibrate Horizontal Sash" button and follow the instructions that appear below the button.

2. Verify Calibration was Successful by moving the Horizontal Panels while observing the displayed "Horizontal Sash % Open". Confirm the Displayed Value = the Actual Value.

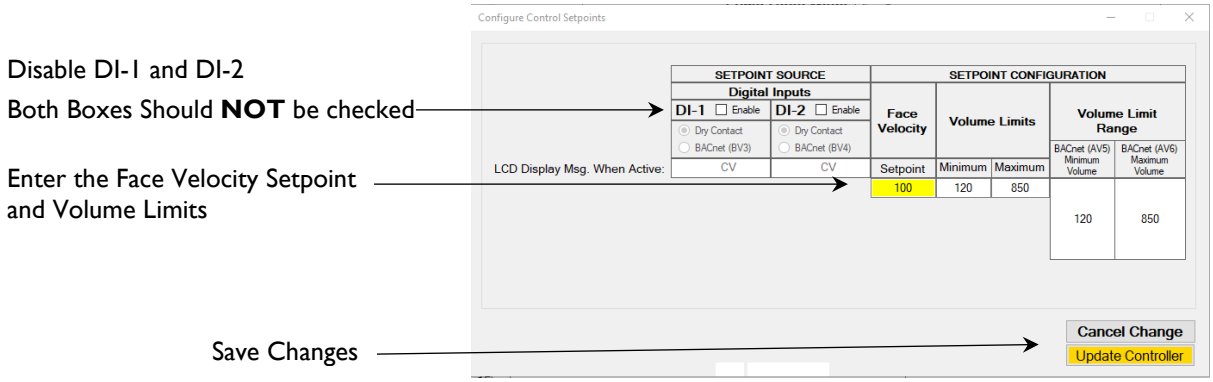


6.5.4.2.3 Configure Control Set points

To maximize energy conservation, there are 4-levels of user-definable control set points for Face Velocity and Airflow Volume. These control set points are state-based values activated by either the two dry contact inputs (DI-1 and DI-2) or BACnet Communications Points (BV3 and BV4). BV3 and BV4 are only available when the Controller is configured to Fume Hood Mode. When the Digital Input is set to BACnet Communications Point (BV) the DI hardwire connection is ignored and the associated BACnet BV point is used to set the digital state. The following examples demonstrate the control set point configuration for some typical applications.



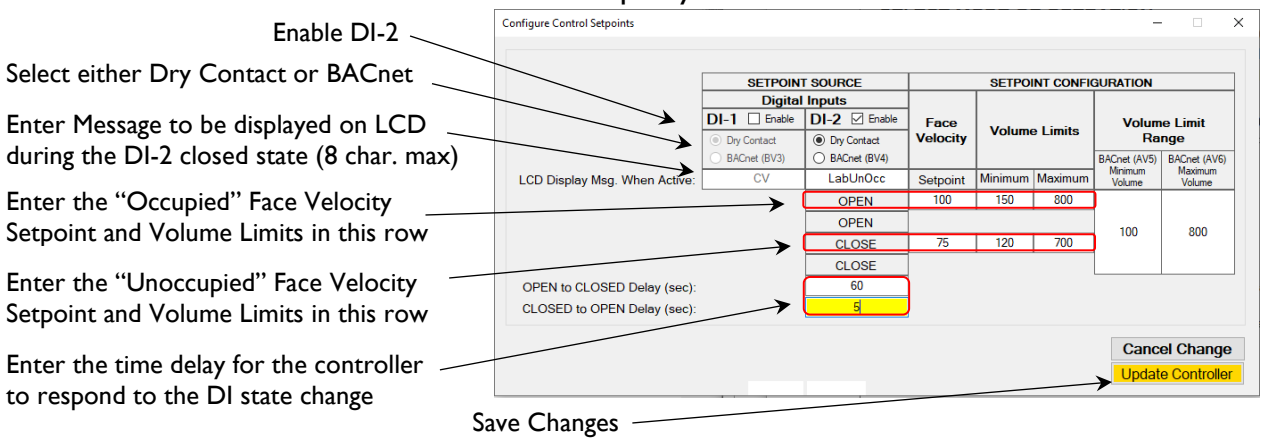
Example 1: No Setback, Digital Inputs Not Used



Control Set Point Sequence for Example 1
Controller will maintain a face velocity of 100 FPM with a minimum volume limit of 120 CFM and a maximum volume limit of 850 CFM.

Example 2: Night Setback using Occupancy Sensor on Dry Contact Input DI-2

Dry Contact Input Logic: Occupancy Detected: DI-2 = OPEN
No Occupancy Detected: DI-2=CLOSED

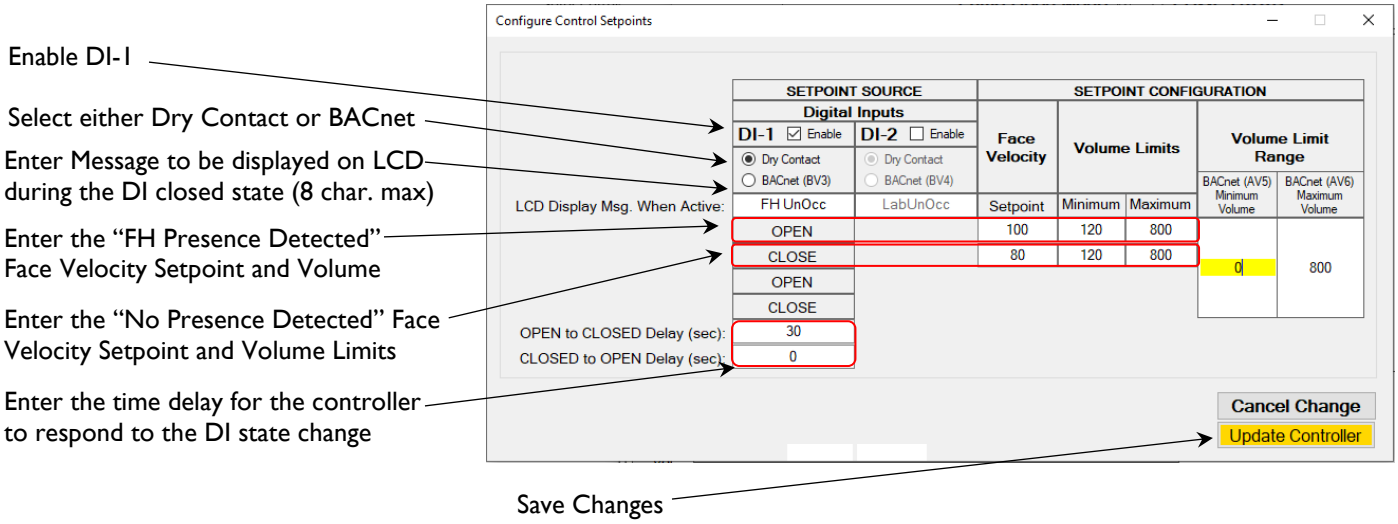


Control Set Point Sequence for Example 2	
DI-2 state is OPEN	**Lab is Occupied** Controller will maintain a face velocity of 100 FPM with a minimum volume limit of 100 CFM and a maximum volume limit of 800 CFM
DI-2 state changes from OPEN to CLOSED	**Lab is set to go into Unoccupied Mode** 60 seconds after the DI-2 state changes from OPEN to CLOSED; • Face Velocity Set Point changes from 100 to 75 FPM • Min Volume Limit changes from 150 to 120 CFM • Max Volume Limit changes from 800 to 700 CFM • LCD Display shows "LabUnOcc" message
DI-2 state changes from CLOSED to OPEN	**Lab is set to return to Occupied Mode** 5 seconds after the DI-2 state changes from CLOSED to OPEN; • Face Velocity Set Point changes from 75 to 100 FPM • Min Volume Limit changes from 120 to 150 CFM • Max Volume Limit changes from 700 to 800 CFM • LCD Display no longer shows "LabUnOcc" message

Note: *The occupancy sensor may have an internal time delay of its own. Before setting the AVC DI time delays, check to see if the occupancy sensor has a time delay and be sure to take this into consideration when setting the AVC DI time delays.*

Example 3: Setback using Fume Hood Presence Sensor on DI-1

Dry Contact Input Logic: FH Presence Detected: DI-1=OPEN
No FH Presence Detected: DI-1=CLOSED



Control Set Point Sequence for Example 3	
DI-1 is OPEN	**Presence is detected at the Fume Hood** Controller will maintain a face velocity of 100 FPM with a minimum volume limit of 0 CFM and a maximum volume limit of 800 CFM
DI-1 changes from OPEN to CLOSED	**No Presence is detected at the Fume Hood** 30 seconds after the DI-1 state changes from OPEN to CLOSED; • Face Velocity Set Point changes from 100 to 80 FPM • Min Volume Limit remains at 120 CFM • Max Volume Limit remains at 800 CFM • LCD Display shows "FH UnOcc" message
DI-1 changes from CLOSED to OPEN	**Presence is detected at the Fume Hood** Immediately after the DI-1 state changes from CLOSED to OPEN; • Face Velocity Set Point changes from 80 to 100 FPM • Min Volume Limit remains at 120 CFM • Max Volume Limit remains at 800 CFM • LCD Display no longer shows "FH UnOcc" message

Note: *The occupancy sensor may have an internal time delay of its own. Before setting the AVC DI time delays, check to see if the occupancy sensor has a time delay and be sure to take this into consideration when setting the AVC DI time delays.*

Example 4: Setback using Presence Sensor on DI-1 and Occupancy Sensor on DI-2

Dry Contact Input Logic: FH Presence Detected: DI-1=OPEN
No FH Presence Detected: DI-1=CLOSED
Occupancy Detected: DI-2=OPEN
No Occupancy Detected: DI-2=CLOSED

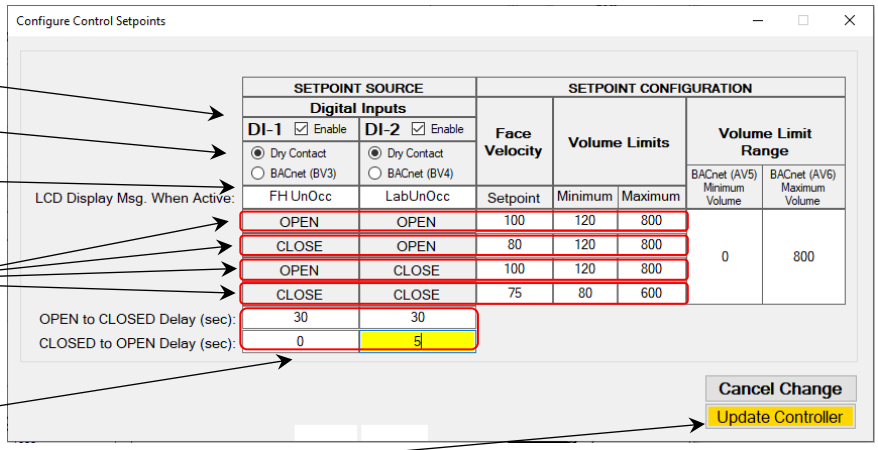
Enable both DI-1 and DI-2

Select either Dry Contact or BACnet

Enter Messages to be displayed on LCD during the DI closed state (8 char. max)

Enter the Face Velocity Setpoint and Volume Limits for each of the four corresponding DI states

Enter the time delay for the controller to respond to the DI state changes



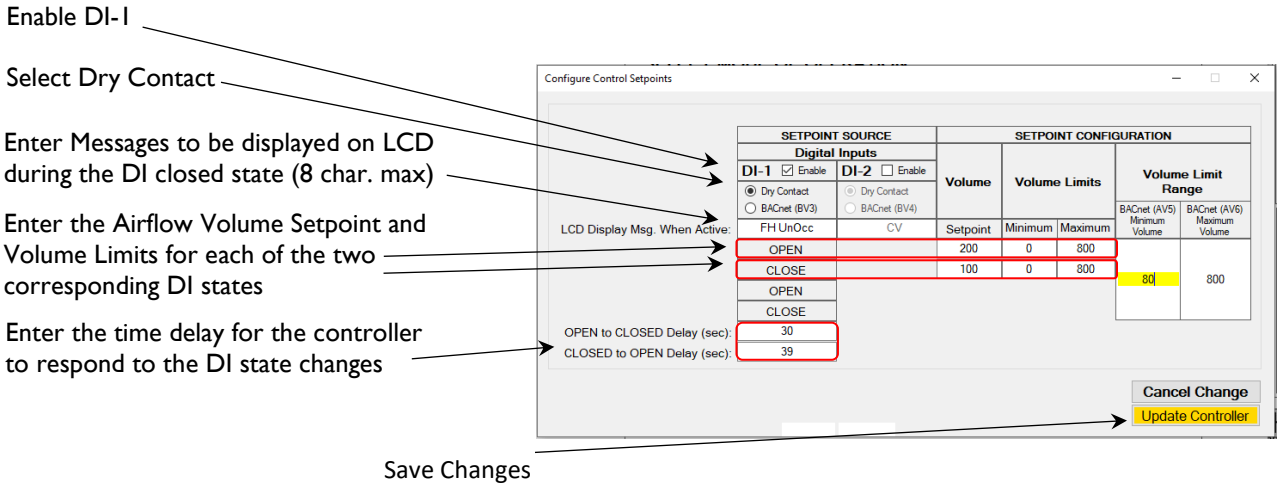
Save Changes

Control Set Point Sequence for Example 4	
DI-1 and DI-2 are both OPEN	**Lab is Occupied and Presence is detected at Fume Hood** Controller will maintain face velocity at 100 FPM with a minimum volume limit of 120 CFM and a maximum volume limit of 800 CFM
DI-1 changes from OPEN to CLOSED DI-2 remains OPEN	**Lab is Occupied and No Presence is detected at Fume Hood** 30 seconds after the DI-1 state changes from OPEN to CLOSED; • Face Velocity Set Point changes from 100 to 80 FPM • Min Volume Limit remains at 120 CFM • Max Volume Limit remains at 800 CFM • LCD Display shows "FH UnOcc" message
DI-1 changes from CLOSED to OPEN DI-2 remains OPEN	**Lab is Occupied and Presence is detected at Fume Hood** Immediately after the DI-1 state changes from CLOSED to OPEN; • Face Velocity Set Point changes from 80 to 100FPM • Min Volume Limit remains at 120 CFM • Max Volume Limit remains at 800 CFM • LCD Display no longer shows "FH UnOcc" message
DI-1 is OPEN DI-2 changes from OPEN to CLOSED	**Lab is Unoccupied, however Presence is detected at Fume Hood** • Face Velocity Set Point remains at 100 FPM • Min Volume Limit remains at 120 CFM • Max Volume Limit remains at 800 CFM • LCD Display shows "LabUnOcc" message

Note: *The occupancy sensor may have an internal time delay of its own. Before setting the AVC DI time delays, check to see if the occupancy sensor has a time delay and be sure to take this into consideration when setting the AVC DI time delays.*

Example 5: No Night Setback using Presence Sensor on DI-1 Constant Volume FH

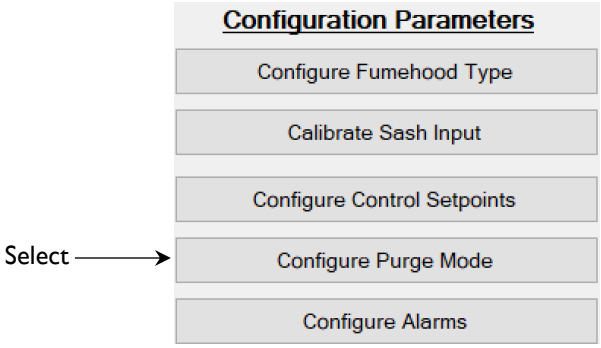
Dry Contact Input Logic: FH Presence Detected: DI-1=OPEN
No FH Presence Detected: DI-1=CLOSED



Control Set Point Sequence for Example 5	
DI-1 is OPEN	**Presence is detected at Fume Hood** Controller will maintain setpoint at 200 CFM with a minimum volume limit of 80 CFM and a maximum volume limit of 800 CFM
DI-1 changes from OPEN to CLOSED	**No Presence is detected at Fume Hood** 30 seconds after the DI-1 state changes from OPEN to CLOSED; • Airflow Volume Setpoint changes from 200 to 100 CFM • LCD Display shows "FH UnOcc" message
DI-1 changes from CLOSED to OPEN	**Presence is now detected at Fume Hood** 30 seconds after the DI-1 state changes from CLOSED to OPEN; • Airflow Volume Setpoint changed from 100 to 200 FPM • LCD Display no longer shows "FH UnOcc" message

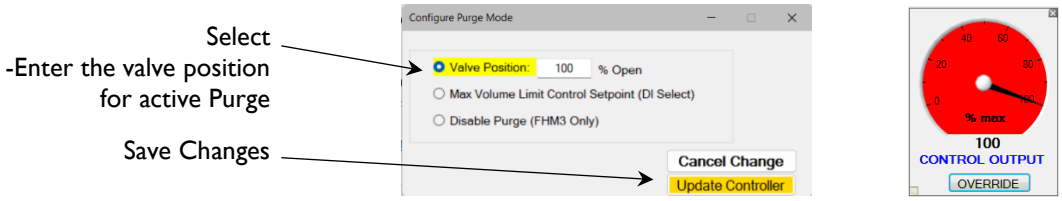
6.5.4.2.4 Configure Purge Mode

The Purge Function can be configured to operate differently based on the application requirements.



6.5.4.2.4.1 Purge Configured for "Valve Position"

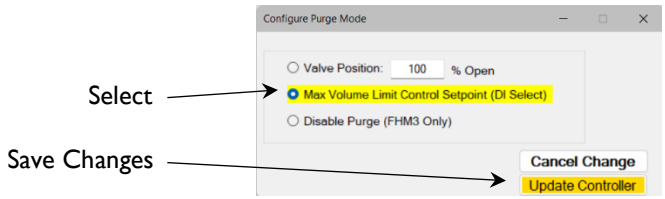
For applications that require "Purge" to drive the valve to a specific position, configure Purge Mode as follows:



When Purge is activated, either by pressing the Purge Button on the remote FHM module or via BACnet, the controller will respond by overriding the control loop and driving the value to the programmed position. The control output gauge face will turn red to indicate the control loop is being overridden.

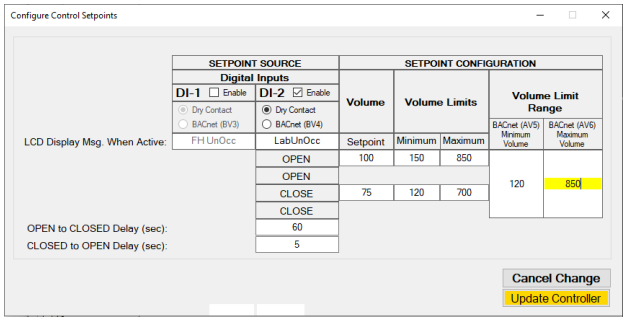
6.5.4.2.4.2 Purge Configured for "Max Volume Limit Control Setpoint (DI Select)"

For applications that require the "Purge" function to control and maintain the maximum volume limit, configure Purge Mode as follows:



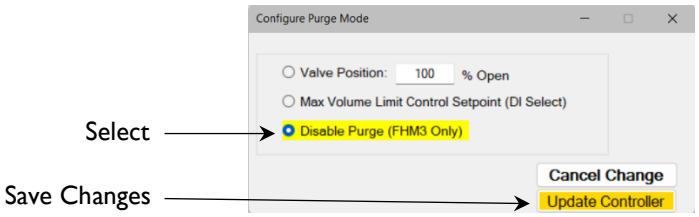
When Purge is activated, either by pressing the Purge Button on the remote FHM module or via BACnet, the controller will respond by controlling to the Maximum Airflow Volume Limit.

For the "Control Setpoint Configuration" shown on the right, activating Purge when lab is Occupied (DI-2 Open), will result in the controller maintaining 850 CFM. Activating Purge when lab is Unoccupied (DI-2 Closed) will result in the controller maintaining 700 CFM.



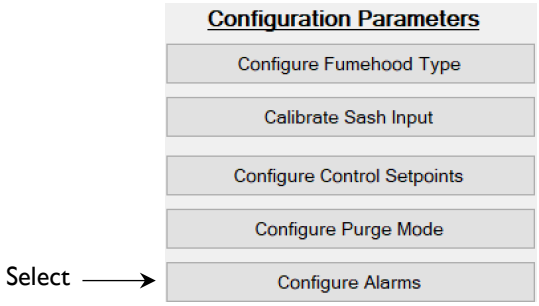
6.5.4.2.4.3 Purge Disabled (FHM3 Only)

For applications that require the "Purge" function to be disabled, configure Purge Mode as follows:



When Purge is disabled, the Purge button on the FHM3 display is removed and the remote Purge BACnet Point (BV1) is deactivated.

6.5.4.2.5 Configure Alarms



Because there can be up to 4-levels of user-defined control set points based on the DI states, each available alarm must be configured to coincide with a corresponding control setpoint based on the DI states. The AVC has the following alarms and parameters available.

6.5.4.2.5.1 Face Velocity Alarms *(programmable Alarm delays are available)*

- **Low Face Velocity Alarm**: Indicates when the measured face velocity is less than the low velocity alarm threshold.
- **High Face Velocity Alarm**: Indicates when the measured face velocity is greater than the high velocity alarm threshold.
- **Face Velocity Set Point Deviation Alarm:** Indicates when the measured face velocity deviates from set point by more than the programmed value (% set point).

6.5.4.2.5.2 Volume Alarms *(programmable Alarm delays are available)*

- **Low Volume Alarm**: Indicates when the measured airflow volume is less than the low volume alarm threshold.
- **High Volume Alarm:** Indicates when the measured airflow volume is greater than the high volume alarm threshold.
- **Volume Deviation Alarm:** Indicates when the measured airflow volume deviates from set point by more than the programmed value (% set point)

6.5.4.2.5.3 Sash % Open Alarm *(programmable Alarm delays are available)*

Indicates when the sash open area is greater than the programmed sash high % alarm threshold

6.5.4.2.5.4 Sash Sensor Fault Alarm

Provides an alarm if the vertical or horizontal sash sensor exceeds their normal range of operation which occurs if a wire breaks or a sensor is damaged.

6.5.4.2.5.5 Actuator Fault Alarm *(programmable Alarm delays are available)*

Indicates when the actuator feedback signal deviates from the control input signal by more than the programmed value. The value can be programmed anywhere between 5% and 100%.

6.5.4.2.5.6 Face Velocity High Alarm Override

Enabling this feature will temporarily suspend all high face velocity, minimum volume, and CFM alarms from occurring when the controller is actively controlling to the minimum airflow volume limit. All other alarms will remain active during this time. When the sash is raised to the point where the minimum volume limit is exceeded, the high face velocity alarm functionality will return to normal.

Note: Reason for Using the Volume Limits

VAV fume hood control applications utilize volume limits to conserve energy and maintain safe operating conditions. The max volume limit conserves energy by limiting the airflow when the

sash is opened above the sash stops. The max volume limit is also used to ensure the exhaust volume does not exceed the system capacity when multiple fume hoods that share a common exhaust system have their sashes opened simultaneously. The min volume limit is selected to ensure the fume hood continues to draw clean air from the room into the fume hood when the sash is closed or nearly closed. This min volume limit is normally selected to provide sufficient dilution of the fume hood exhaust to meet local safety fire and building code requirements based on the application.

Note: How Volume Limits Interact with Fume Hood Face Velocity

When volume limits are not used*, as the sash is opened and closed, the controller will increase and decrease the airflow volume as required to maintain the face velocity set point.*

When volume limits are used, *the following performance characteristics will apply:*
When the volume required to achieve the face velocity set point is between the min and max volume limits, the same performance characteristics as described above will apply.

When the volume required to achieve the face velocity set point is greater than the max volume limit, the controller will maintain the max volume limit resulting in the face velocity falling below the face velocity set point.

When the volume required to achieve the face velocity set point is less than the min volume limit, the controller will maintain the min volume limit resulting in the face velocity increasing above the face velocity set point. Depending on the type of fume hood and the bypass area, as the sash is lowered, the indicated face velocity can exceed the face velocity high alarm set point. When controlling to the min volume limit, the face velocity measurement is irrelevant; therefore the face velocity alarms are also irrelevant. Enabling the "Face Velocity High Alarm Override" Feature will temporarily suspend the face velocity alarms during this control sequence and the FHM will indicate the controller is maintaining the min volume limit and will display the airflow volume rather than the face velocity. When the sash is raised to the point where the min volume limit is exceeded, the face velocity alarm functionality will return to normal.

6.5.4.2.5.7 Alarm Mute Reminder

When an alarm condition is indicated, pressing the Mute button on the FHM will silence the audible horn until the Mute button is pressed again or the alarm condition is cleared. The Mute Reminder feature will provide a periodic reminder chirp at regular intervals. The interval rate of the reminder chirp and the expiration of the reminder are both programmable using Insight.

6.5.4.2.5.8 Energy Conservation Alarm *(programmable Alarm delays are available)*

The Energy Conservation Alarm is available when operating in Fume Hood Mode with a Presence/Occupancy Sensor connected to either DI-1 or DI-2. The purpose of the Energy Conservation Alarm is to alert lab occupants that a fume hood sash has been left in the open or partially open position when nobody is working in front of the hood. The sash % open and time delay for entering into the alarm condition are both programmable using Insight.

Note: *If the fume hood is controlling to the minimum volume limit, the Energy Conservation Alarm will not be triggered because the fume hood is already operating at the lowest airflow volume permitted for the application.*

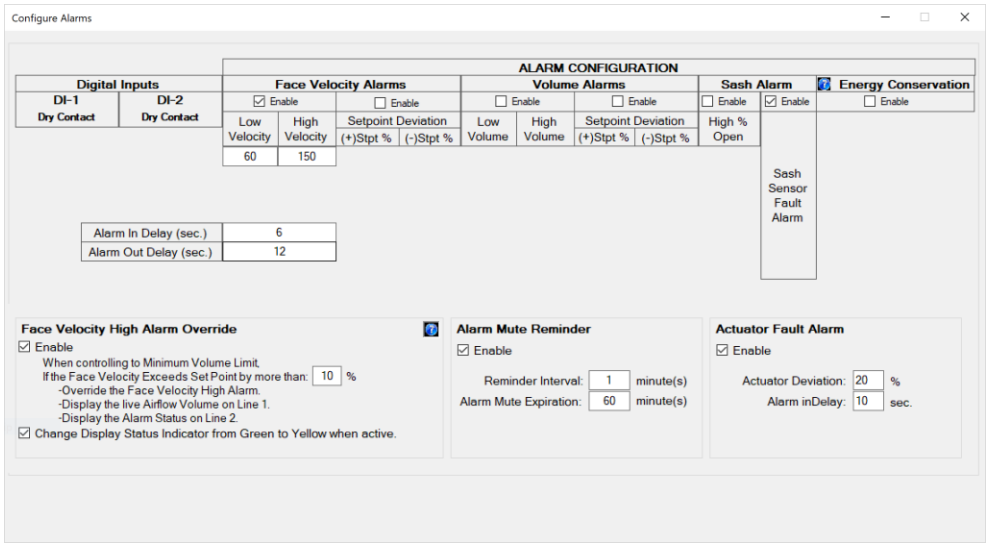
6.5.4.2.5.9 Examples of How to Configure Alarms

There are many different alarms and alarm parameters available, however the same basic configuration steps are similar therefore only two examples have been provided below.

Example 1

Control Configuration = No Setback, Digital Inputs are Not Used

Alarm Configuration = Enable Low/High Face Velocity Alarm, Other Alarms Disabled (Except Volume, Face Velocity, and Sash % Open alarms)



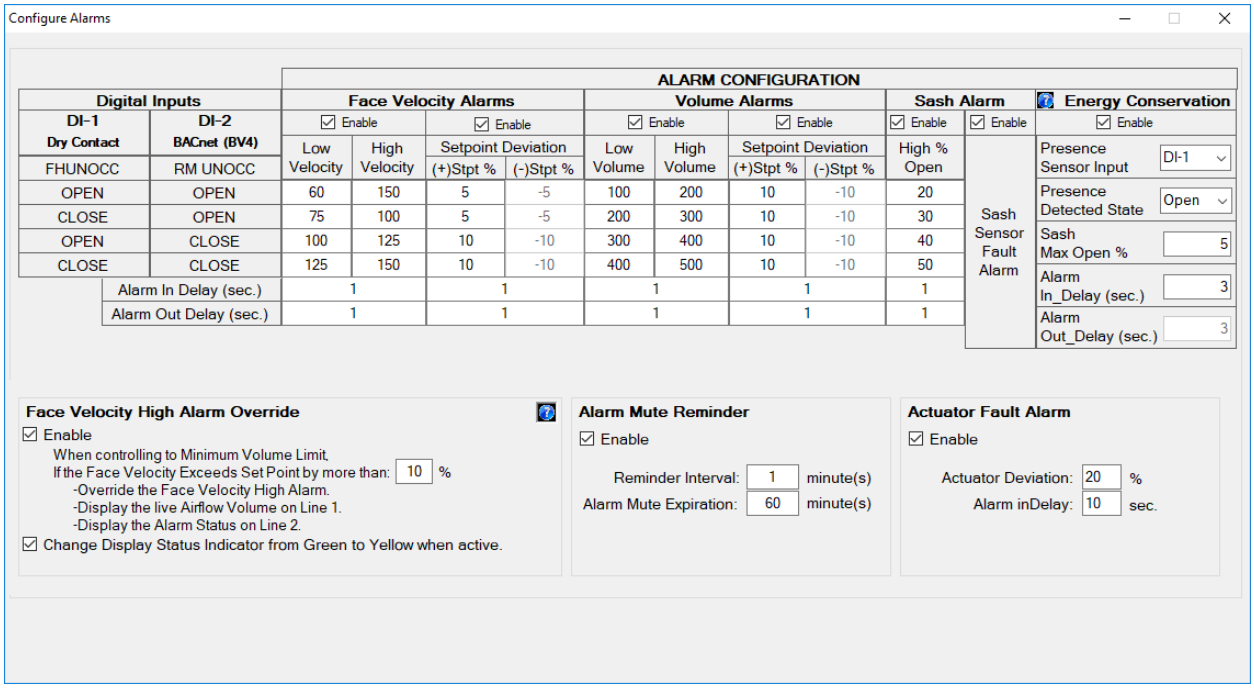
Note: *Time delays are used to eliminate false triggering and nuisance alarms.*

Alarm Sequence for Example 1	
Face Velocity = 100 FPM	No Active Alarms; Low Velocity Alarm = Normal State
Face Velocity drops below 60 FPM	6 seconds after Face Velocity is drops below 60 FPM, the Low Velocity Alarm will enter into its Alarm State
Face Velocity increases above 60 FPM	12 seconds after Face Velocity goes above 60 FPM, the Low Velocity Alarm will return to its Normal State

Example 2

Control Configuration = Setback with Pres Sen on DI-1 and Occ Sen on DI-2

Alarm Configuration = Enable all Alarms



6.5.4.2.5.10 Relay Default Settings in Fume Hood Mode

The Alarm relay in fume hood mode is set to operate as follows:

RA is **normally closed**, opens upon alarm
RB is **normally open**, closes on alarm

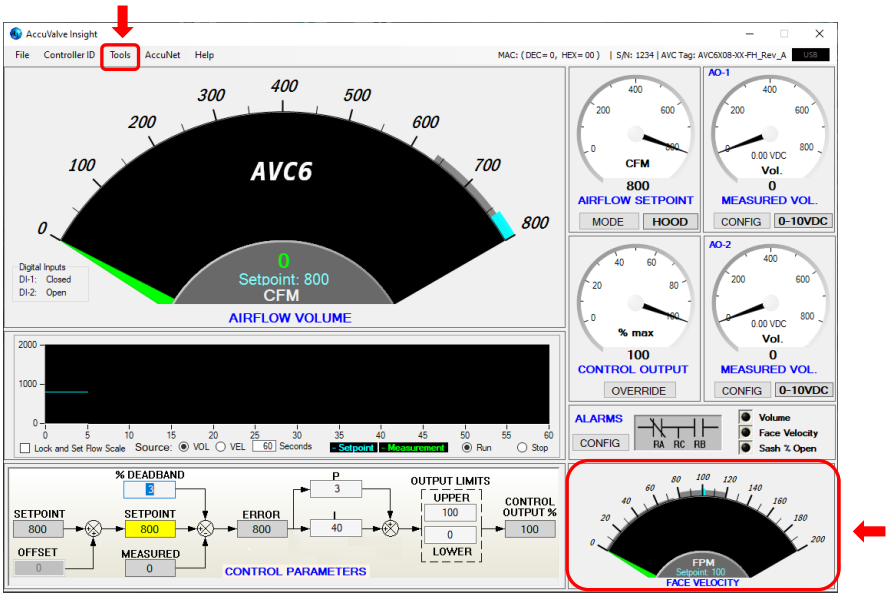
Note: *The Alarm relay will not close for all alarms. Only Low/High Face Velocity alarms, Low/High Volume alarms, and Sash % open alarms will trigger the relay to change state from RA to RB.*

6.5.4.2.6 Face Velocity Verification

The AVC Controller continuously calculates the face velocity using the real-time fume hood exhaust airflow and the total open area. The FHM Module provides personnel working near the fume hood with an indication of the average face velocity in addition to providing audible and visual alarm indicators and the ability to activate the purge function in case of emergency. Prior to commissioning the fume hood, the face velocity displayed by the FHM should be verified by performing a field measurement taken in accordance with ANSI/ASHRAE Standard 110.

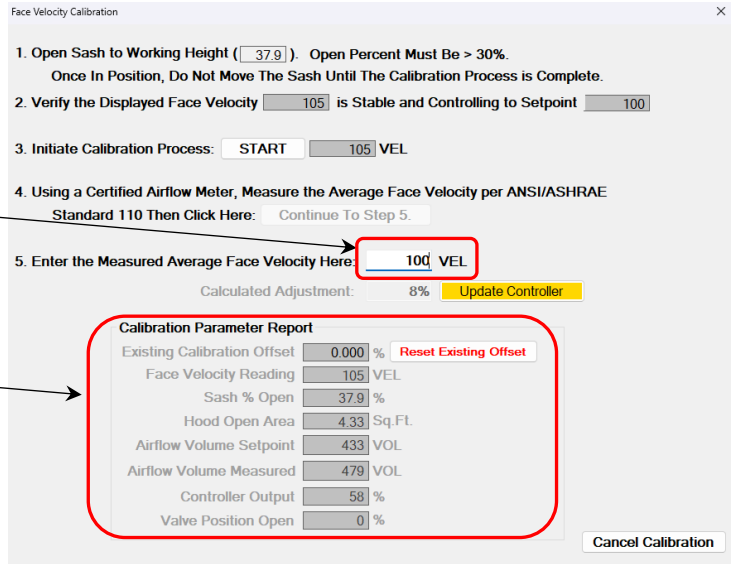
6.5.4.2.6.1 Face Velocity Adjust

The face velocity reading can be correlated to a field measurement by using the "Face Velocity Adjust" calibration tool which can be accessed under the Tools menu or by right-clicking on the Face Velocity Gauge which is located in the lower right corner of the dashboard.



Field measurement entered here

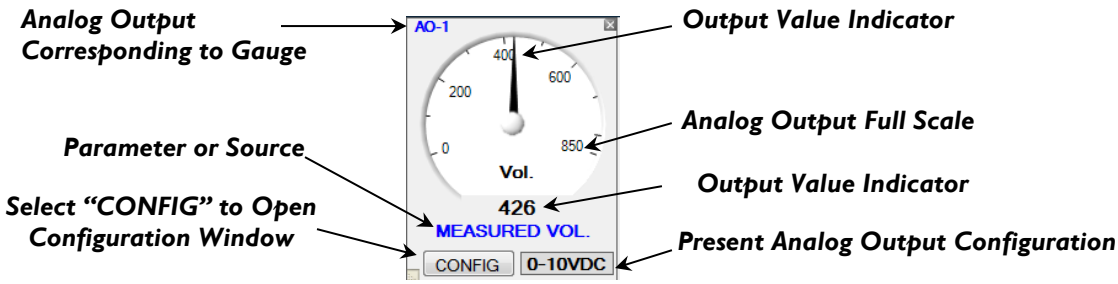
Parameters captured during the calibration process which can be saved to a .csv file for record



After the calibration process has been completed, verify the face velocity is within acceptable limits by repeating the face velocity measurement.

6.5.5 Analog Output Gauges

There are two Analog Output Gauges, AO-1 and AO-2, provided for indicating the status and configuration of each Analog Output. Both AO Gauges operate in a similar manner and each can be configured independently. Access to the Analog Output Configuration Menu is provided by selecting the "CONFIG" button.



6.5.5.1 Analog Output Configuration

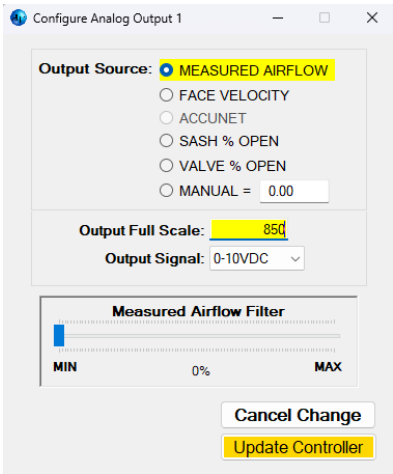
Selecting the "CONFIG" button on the Analog Output Gauge will open a window that will enable you to enter the configuration parameters available for that Analog Output. The examples provided below explain the parameters available and how to configure each.

Output Source Selected: **MEASURED AIRFLOW** sets the AO to correspond with the measured airflow volume.

Output Full Scale: Provides the full-scale range of the AO and the corresponding AO Gauge, which is 850 cfm for this example.

Output Signal Type: Select from dropdown list. For this example, 10v corresponds to 850 cfm.

Filter: Increasing the filter will smooth out the reading, however it also slows down the response, therefore it should be used with caution.

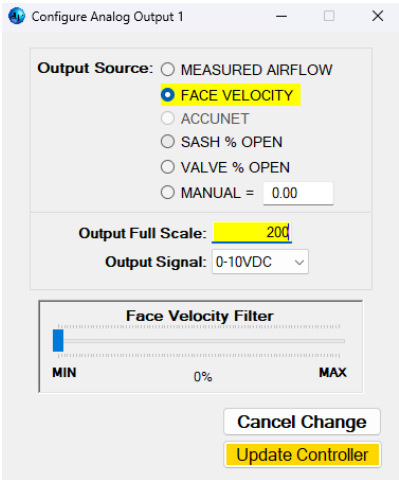


Output Source Selected: **FACE VELOCITY** sets the AO to correspond with the measured face velocity. (only available for Fume Hood Mode)

Output Full Scale: Provides the full-scale range of the AO Signal and the corresponding AO Gauge.

Output Signal Type: Select from dropdown list. For this example, 10v corresponds to 200 fpm.

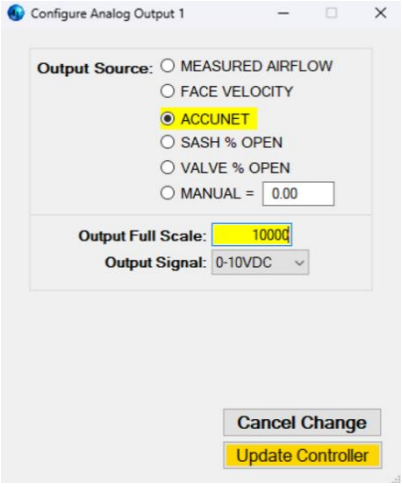
Filter: Increasing the filter will smooth out the reading, however it also slows down the response, therefore it should be used with caution.



Output Source Selected: **ACCUNET** sets the AO to correspond with the sum of airflow volume for all AccuValves on the AccuNet network. (only available for units with AccuNet that are configured as the totalizer)

Output Full Scale: Provides the full-scale range of the AO Signal and the corresponding AO Gauge.

Output Signal Type: Select from dropdown list. For this example, 10v corresponds to 10000 cfm.

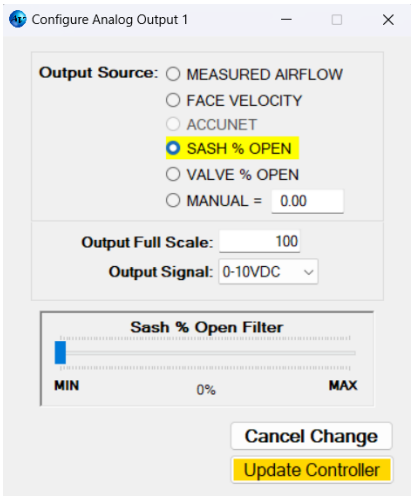


Output Source Selected: **SASH % OPEN** sets the AO to correspond with the sash % open value. (only available for Fume Hood Mode)

Output Full Scale: Provides the full-scale range of the AO Signal and the corresponding AO Gauge.

Output Signal Type: Select from dropdown list. For this example, 10v corresponds to 100 % open.

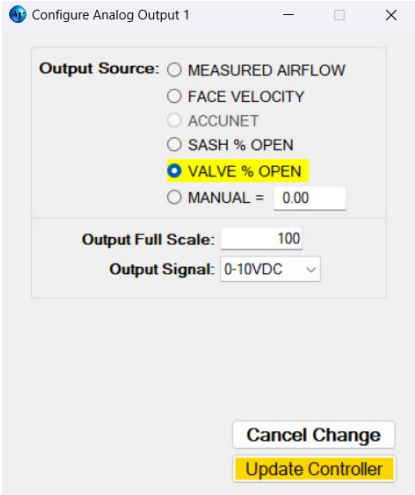
Filter: The filter helps to smooth out the reading, however it also slows down the response, therefore it should be used with caution.



Output Source Selected: **VALVE % OPEN** sets the AO to correspond with the valve % open value.

Output Full Scale: Provides the full-scale range of the AO Signal and the corresponding AO Gauge.

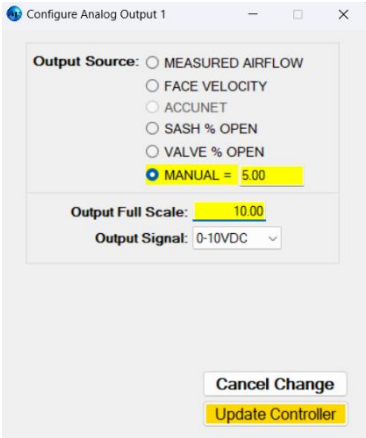
Output Signal Type: Select from dropdown list. For this example, 10v corresponds to 100 % open.



Output Source Selected: **MANUAL** sets the AO to correspond with the value entered in the box to the right of the "=" sign

Output Full Scale: Provides the full-scale range of the AO Signal and the corresponding AO Gauge. This example is set for a full scale of 10.00 units, which is based on the signal type selected.

Output Signal Type: Select from dropdown list. For this example, 10v corresponds full scale. Setting Manual = 5 with the Output Full Scale set to 10.00 will result in the AO = 5v.



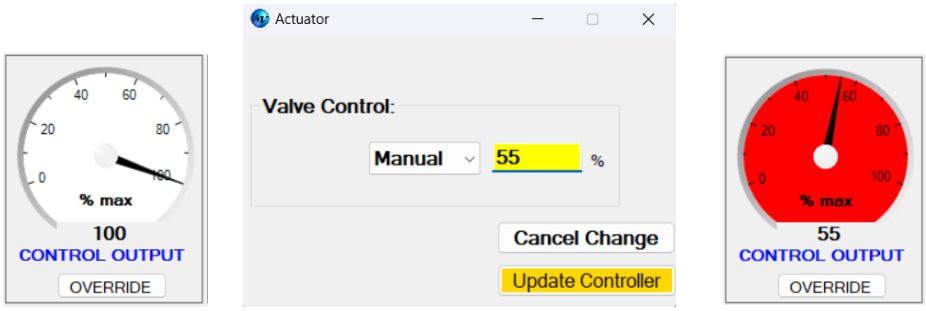
6.5.6 Control Output Gauge

The Control Output Gauge displays the Control Output % and provides a means for overriding the control-loop enabling direct command of the actuator.

6.5.6.1 Control Output Override

To override the control to Manual;

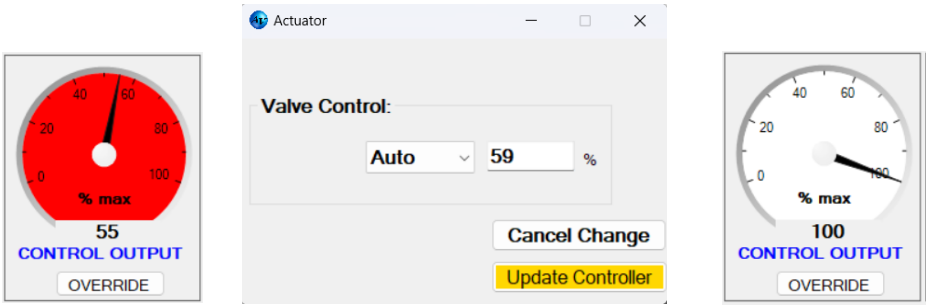
1. Select the OVERRIDE button at the bottom of the Control Output Gauge.
2. Select "Manual" and enter the desired control output % to position the actuator.
3. Select Update Controller.



NOTE: *Because the Override function is not intended to be used for extended durations the manual override value is not saved to the controller's nonvolatile memory. A power cycle will release the control to Auto.*

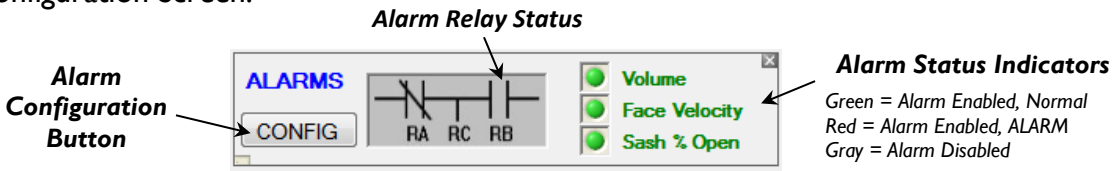
To return to Auto Control;

4. Select the OVERRIDE button at the bottom of the Control Output Gauge.
5. Select "Auto".
6. Select Update Controller.



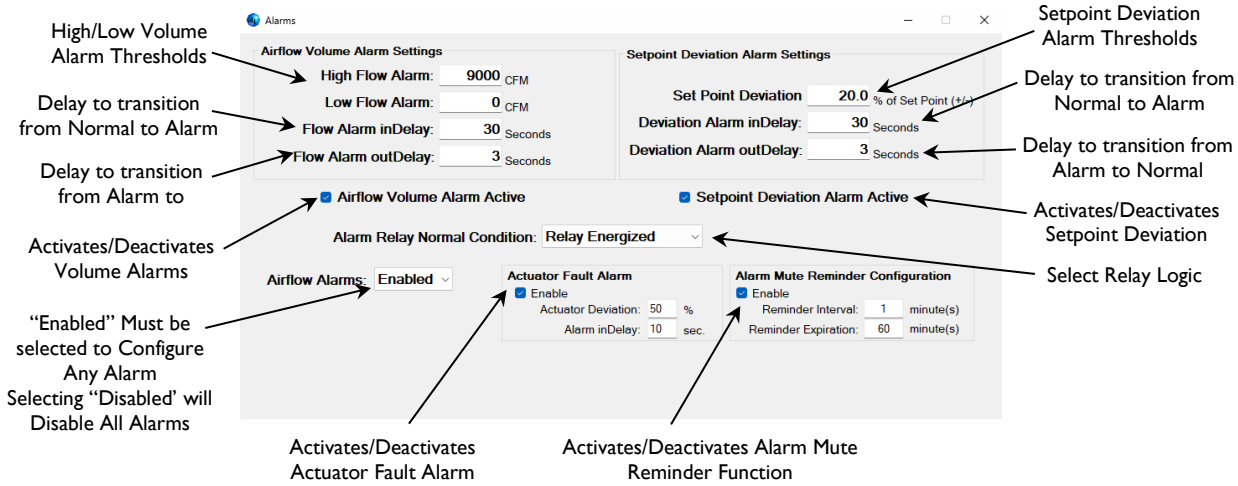
6.5.7 Alarm Indicator Diagram

The Alarm Indicator Diagram provides a visual indication of the alarm status, real-time monitoring and visual status of the alarm relay state and a Configuration Button to access the Alarm Configuration Screen.



6.5.7.1 Alarm Configuration

When the "CONFIG" button is selected the Alarm Configuration Screen that appears will be based on the current Operating Mode. The Alarm Configuration Screen for Setpoint Mode is described below. For Fume Hood Mode, reference Section 6.5.4.2.5. To modify any of the alarm parameters, click in the appropriate box and enter the desired value in the boxes that are to be modified. To save the changes, select "Update Controller".

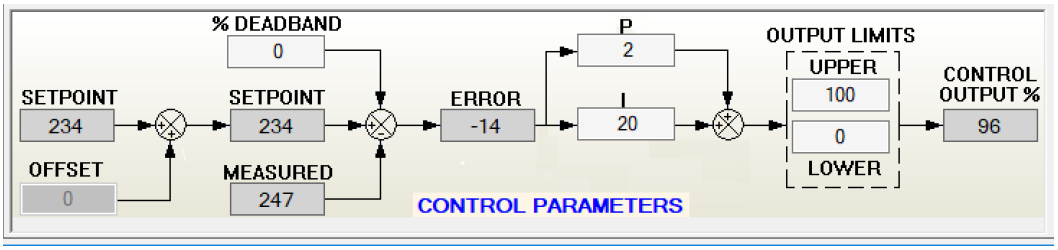


The Actuator Fault Alarm indicates when the actuator feedback signal deviates from the control input signal by more than the programmed value.

The Alarm Mute Reminder is for applications that use one of the Accutrol Monitors that is compatible with the AVC6000. When an alarm condition is present and the audible horn sounds, pressing the Mute button will silence the horn until the Mute button is pressed again or the alarm condition is cleared. The Mute Reminder feature will provide a periodic chirp at regular intervals to remind the occupants that the alarm condition still exists. The interval rate and expiration of the reminder chirp can be configured using Insight.

6.5.8 Control Parameters Diagram

The Control Diagram provides real-time information of the parameters associated with the closed-loop control function. Configurable parameters are displayed in the white boxes and non-configurable parameters are displayed in gray. Each parameter is briefly described below.

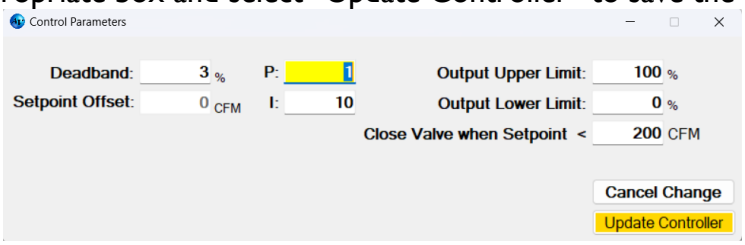


- **SETPOINT:** The SETPOINT value is based on the controller "Operating Mode" and is not a configurable parameter in the CONTROL OBJECT. The Min and Max Volume Setpoint values can be displayed by hovering the mouse over the SETPOINT box. The SETPOINT display box will change to yellow when the calculated setpoint value is greater than the maximum or less than the minimum allowable value.
- **OFFSET**: The OFFSET value is a configurable parameter which is normally used in tracking pair applications. The sum of the OFFSET and SETPOINT make up the control loop SETPOINT value. Polarity can be either positive or negative, based on application. The offset parameter is disabled when operating in Fume Hood Mode.
- **% DEADBAND**: The % DEADBAND value is a configurable parameter which is applied as a percentage of the SETPOINT value. The purpose of the DEADBAND is to improve control loop stability by holding the control output constant until the ERROR exceeds the % DEADBAND. The DEADBAND also serves to reduce the wear and tear on the actuator.
- **MEASURED:** The MEASURED value is the airflow measurement provided by the airflow sensors and is not a configurable parameter. The airflow measurement value is the process variable which closes the feedback loop.
- **ERROR:** The control ERROR is difference between the SETPOINT and MEASURED values. The control ERROR is input to the PI algorithm which generates the control output.
- **P & I:** The AVC utilizes a parallel PI algorithm which includes two configurable parameters, "P" (Proportional Gain) and "I" (Integral). Both parameters act in parallel on the same error and are combined to generate the control output signal. Increasing the "P" term makes the control loop more sensitive and less stable. The "I" term, sometimes referred to as "automatic reset", increases the control output by the integral of the error. Increasing the "I" term makes the control loop more sensitive and less stable. Both the "P" and "I" terms can vary based on the valve size and operating parameters. The factory default values for P & I will accommodate the majority of applications.
- **OUTPUT LIMITS:** The control output limits are configurable parameters which are essentially clamps for the control output. Normally the LOWER limit is set to 0% and the UPPER limit is set to 100%. The OUTPUT LIMITS are only used for applications that would benefit from limiting the control output thereby preventing the valve from fully closing and/or fully opening.

- **CONTROL OUTPUT:** The CONTROL OUTPUT % is generated by the PI control loop and is used to modulate the valve actuator resulting in a reduced error between the setpoint and measurement.

6.5.8.1 Changing Configurable Control Parameters

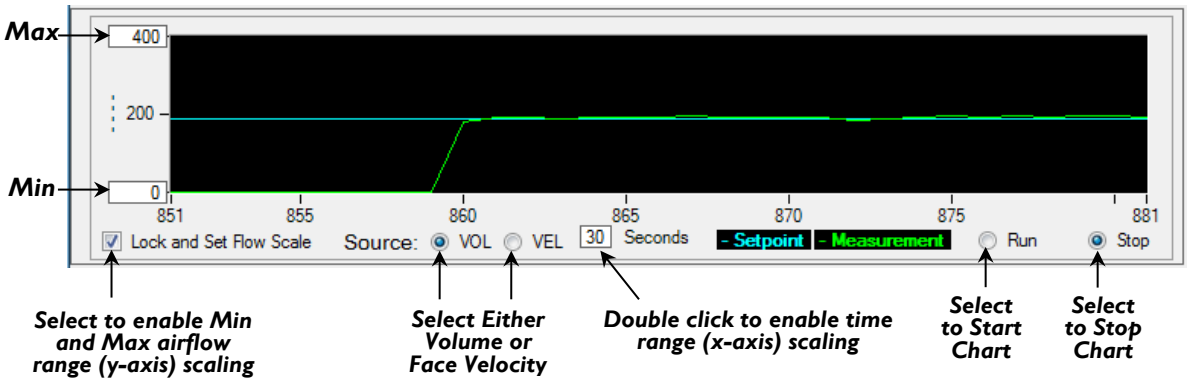
Open the Control Parameters window by double-clicking in the Control Diagram inside one of the white boxes. To modify any of the configuration parameters, enter the desired value in the appropriate box and select "Update Controller" to save the change.



In addition to the parameters described in section 6.5.8, the Control Parameters window includes a value titled "Close Valve when Setpoint < ___CFM". When the Setpoint is less than this value, the controller will drive the valve to the fully closed position.

6.5.9 Strip Chart

The Strip Chart provides a real-time x-y strip chart plot of the Airflow Setpoint and Measurement values with respect to time. The Strip Chart is a useful tool for troubleshooting and evaluating the controller performance. The time scale (x axis) is adjustable between 10 and 300 seconds and the airflow volume scale (y axis) can either be set for auto range or bounded by upper and lower limits.



6.5.10 Dashboard Menu

The area located along the top of Dashboard provides access to Menu Items in addition to displaying information about the device such as; MAC Address, Serial Number, Tag Number and USB/Bluetooth com status. Each of the menu items are described below.

6.5.10.1 File Menu Items

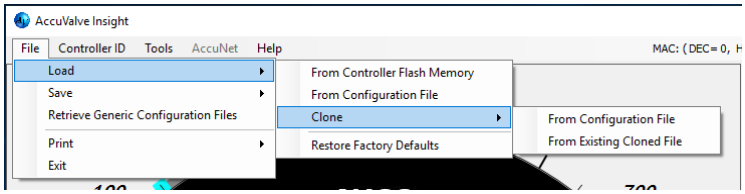
6.5.10.1.1 Load

From Controller Flash Memory loads the configuration file that resides in the AVC controller's nonvolatile memory (FLASH) into the AVC controller's volatile memory (RAM).

From File loads the configuration file that resides in a nonvolatile storage device (i.e. hard drive or USB Flash Drive) to the AVC controller's volatile memory (RAM).

***CAUTION**: This selection will load Configuration Settings and Calibration Data, which is valve size specific. When using this function, verify the configuration file is the correct valve size for the application.*

Clone loads either from a previously existing clone (.acv6c) file or loads from a standard configuration (.avc6) file and then prompts you to convert the standard file into a clone file.



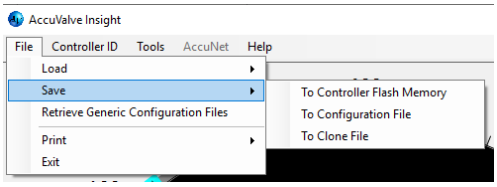
Restore Factory Defaults loads the original factory configuration file that resides in a protected portion of the AVC controller's nonvolatile memory (FLASH) to the AVC controller's volatile memory (RAM).

6.5.10.1.2 Save

To Controller Flash Memory saves the configuration file that resides in the AVC controller's volatile memory (RAM) to the AVC controller's nonvolatile memory (FLASH).

To File saves the configuration file that resides in the AVC controller's volatile memory (RAM) to a nonvolatile storage device (i.e. hard drive or USB flash drive).

To Clone File saves the configuration file that resides in the AVC controller's volatile memory along with more specific clone parameters to a nonvolatile storage device (i.e. hard drive of USB flash drive).



6.5.10.1.3 Print

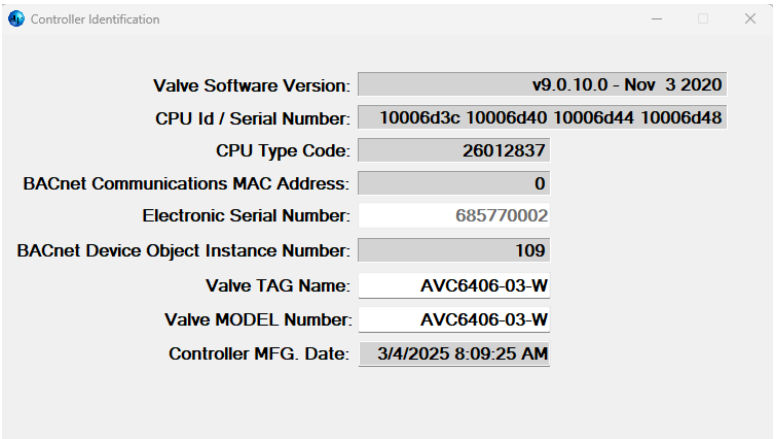
Parameters Report prints a timestamped PDF document of the primary configuration parameters which reside in the AVC controller's nonvolatile (FLASH) memory.

Tabbed Print prints individual timestamped PDF documents of specific groups of configuration parameters which reside in the AVC controllers nonvolatile (FLASH) memory

6.5.10.1.4 Exit

Closes the Dashboard and disconnects the communications.

6.5.10.2 Controller ID



6.5.10.3 AccuNet

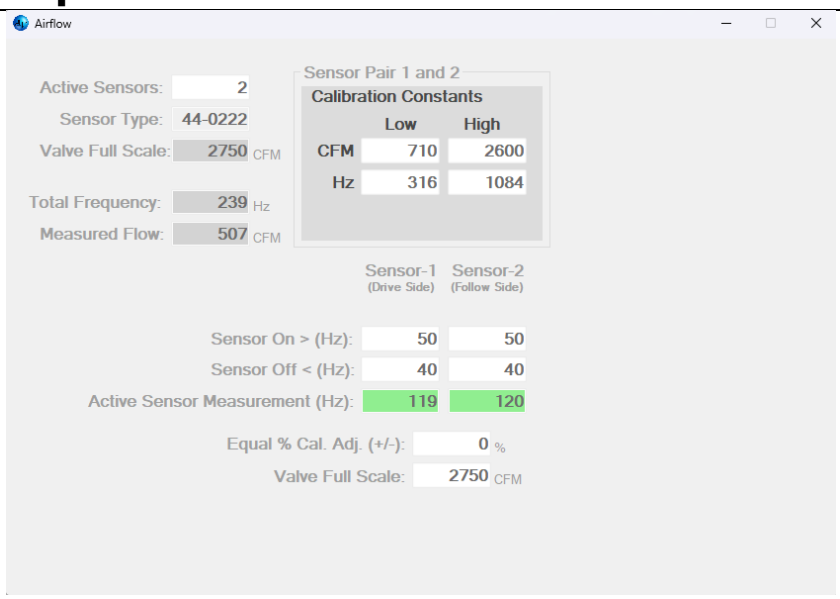
AccuNet™ is a high-speed serial bus that is designed to provide a room-level network for summing the airflow volume of multiple AccuValves while providing a single analog signal representing the total sum of the AccuValve airflows.

The primary application for AccuNet is in laboratories that have multiple VAV fume hoods which require the total lab exhaust airflow to be instantly tracked by the supply airflow to maintain the proper room pressurization. AccuValves must be equipped with the optional AccuNet Module to operate on the AccuNet Network. Reference Appendix C for detailed field instructions for configuring the AccuNet Network.

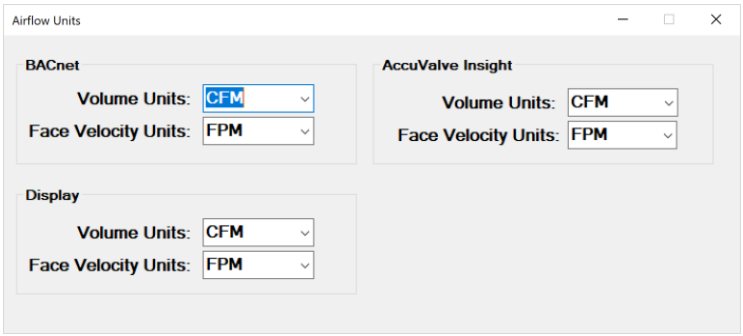
6.5.10.4 Tools

6.5.10.4.1 Airflow Measurement

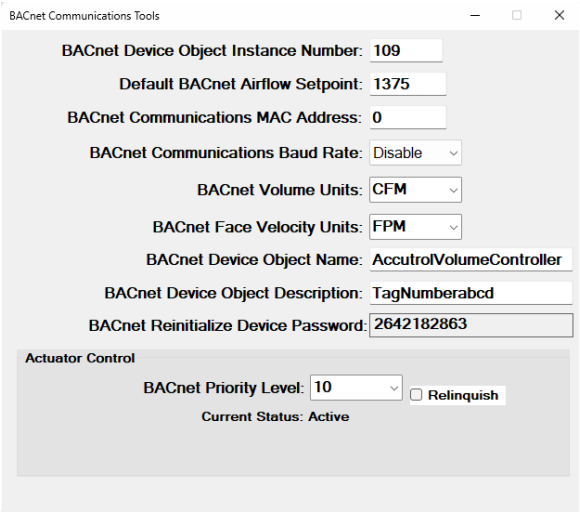
provides viewing access to the AVC's real-time airflow measurement data window. In addition to providing the factory calibration constants, the Airflow Window also provides the real-time vortex shedding frequency measurement in each chamber of the AccuValve, which can be a useful troubleshooting tool. This window does not provide access for making changes to the calibration data.



6.5.10.4.2 Airflow Units provides a means to set the units for Airflow Volume and Face Velocity for BACnet, the Monitor and the AccuValve Insight UI. Each item can be configured to provide different units.

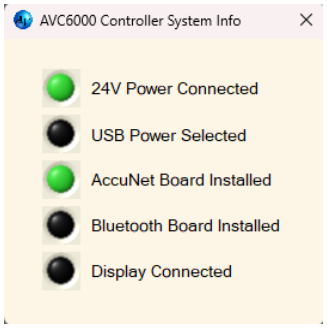


6.5.10.4.3 BACnet Communications provides a means for setting the AVC6000 BACnet parameters. In the lower portion of the dialog box, the Actuator Control BACnet Priority Level is displayed along with the current status of the selected Priority Level. Checking the "Relinquish" box will release the AVC's priority level.

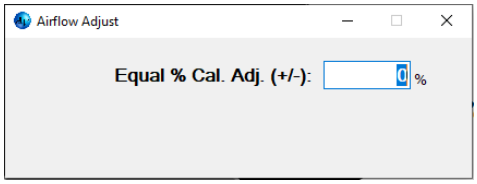


WARNING: *By selecting "Relinquish" the internal control loop will not control the actuator. Command of the actuator will be provided by the highest AO1 priority level on the BACnet network.*

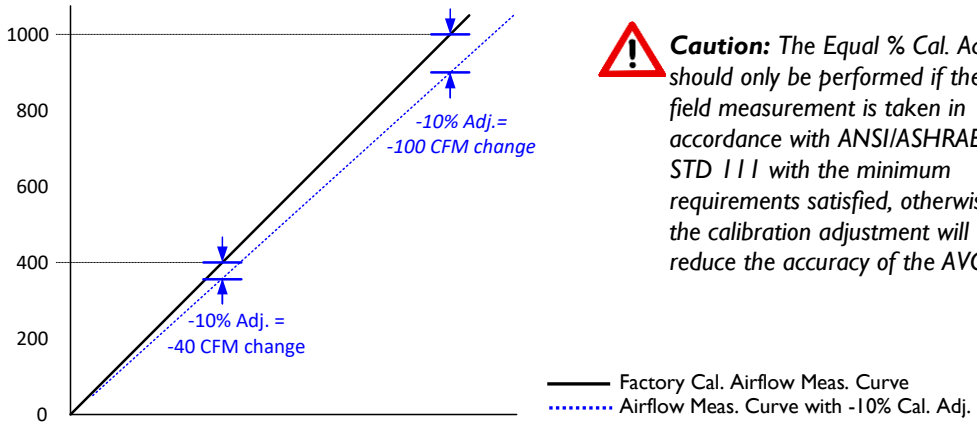
6.5.10.4.4 Hardware Status provides an indication of AVC power source status in addition to status indicators to identify if the AccuNet & wireless Bluetooth adaptor are installed and if an FHM display is connected.



6.5.10.4.5 Volume Measurement Adjust is a calibration tool that can be used to correlate the airflow volume measured by the AVC6000 with a field measurement.



NOTE: *The **Equal % Cal. Adj.** is a single-step field calibration method which does not overwrite the factory calibration of the AVC6000. Using this function is not normally required (or advisable) and is only provided as a tool for the **Airflow** Balancer to correlate the AVC airflow measurement to a field airflow measurement. The graph below shows the effect the Equal % Cal Adj. has over the entire operating range.*



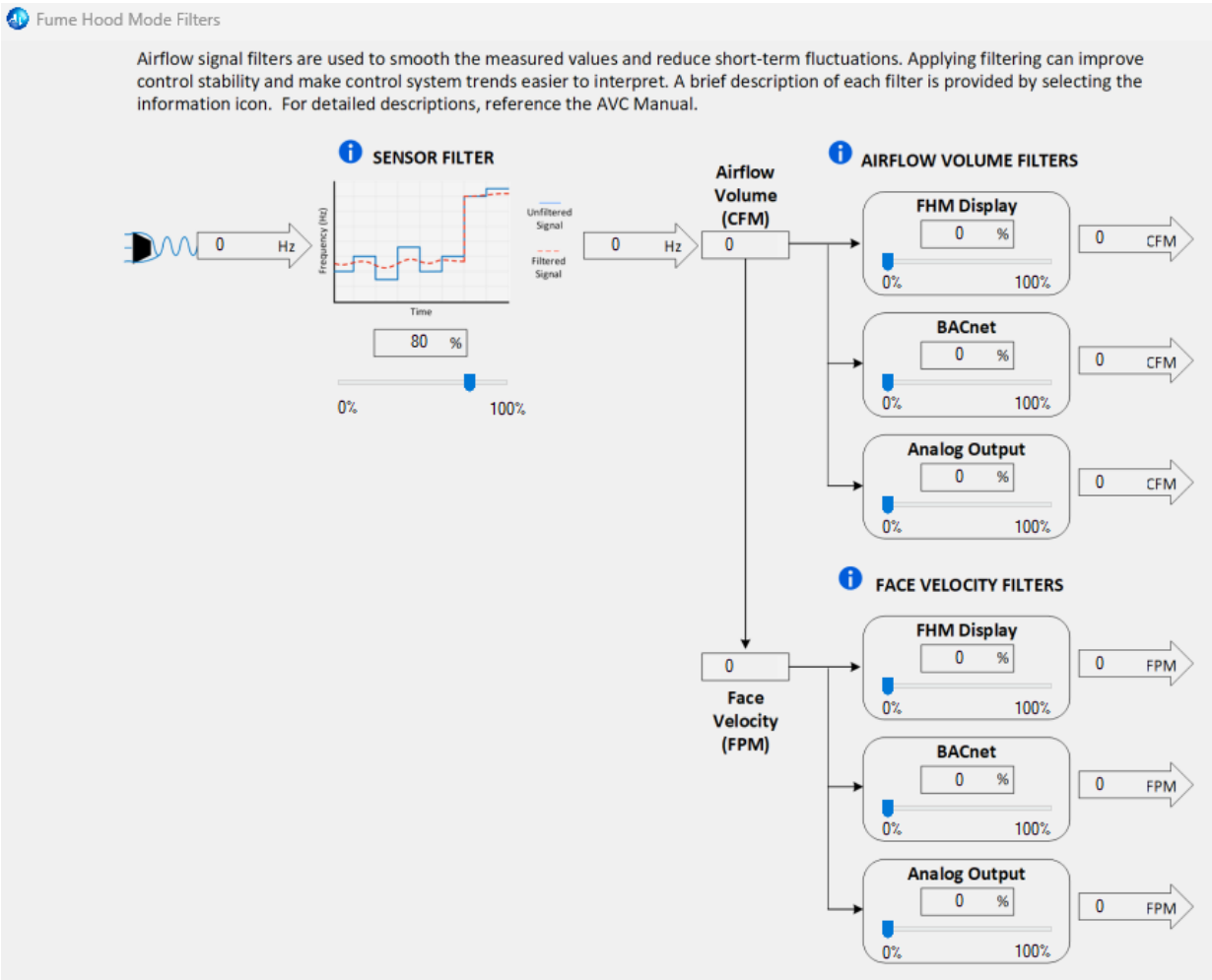
Caution: *The Equal % Cal. Adj. should only be performed if the field measurement is taken in accordance with ANSI/ASHRAE STD 111 with the minimum requirements satisfied, otherwise the calibration adjustment will reduce the accuracy of the AVC.*

6.5.10.4.6 Face Velocity Adjust is only available when the controller is operating in Fume Hood Mode and is explained in Section 6.5.4.2.6.1.

6.5.10.4.7 Close Active Window After Update If this item is checked, the active window will automatically close after the change has been saved. If this item is not checked, the active window will remain open until the user closes the window.

6.5.10.4.8 View Data Throughput Indicator If this item is checked, A box will appear in the upper right corner of the Dashboard window that changes color and counts to 7 when data is transmitted between the AVC6000 and Insight. This is used for troubleshooting only and should normally stay unchecked.

6.5.10.4.9 Filters Airflow signal filters are used to smooth the measured values and reduce short-term fluctuations. Applying filtering can improve control stability and make control system trends easier to interpret. A brief description of each filter is provided by selecting the information icon.



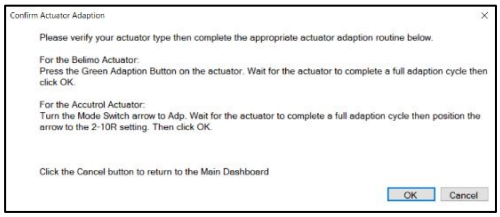
6.5.10.4.9.1 Sensor Filter smooths out the signal generated by the vortex sensors and is applied to the airflow measurement signal prior to any control processing. This filter has the highest impact on overall performance and is often the only filter that is needed to optimize performance.

6.5.10.4.9.2 **AirFlow Volume Filters** are used to smooth out the airflow volume readings that are output to other devices (local display, BACnet, and Analog Outputs). These filters are applied after the sensor filter; therefore, they have no impact on the valve control.

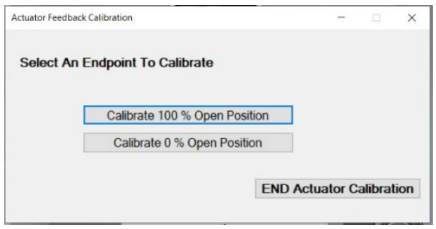
6.5.10.4.9.3 **Face Velocity Filters** are only available for fume hood mode applications. These filters are used to smooth out the face velocity readings that are output to other devices (local display, BACnet, and Analog Outputs). These filters are applied after the sensor filter; therefore, they have no impact on the valve control.

6.5.10.4.10 **Actuator Feedback Calibration** provides a means to calibrate the actuator feedback signal to precisely coincide with the "valve % open" parameter. The steps required to calibrate the actuator feedback are provided below.

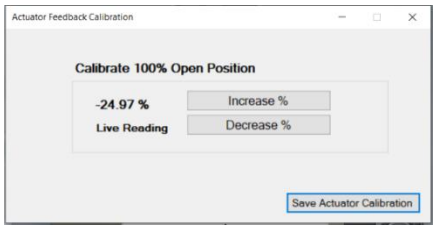
Step 1: Press the Adaption Button on the Actuator, Select **OK** after Complete.



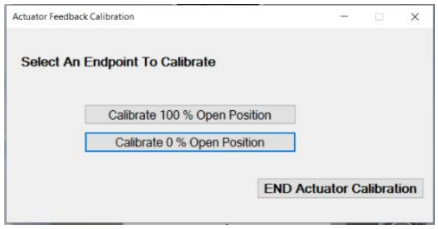
Step 2: Select **Calibrate 100% Open Position** to Drive Valve to the Full-Open Position.



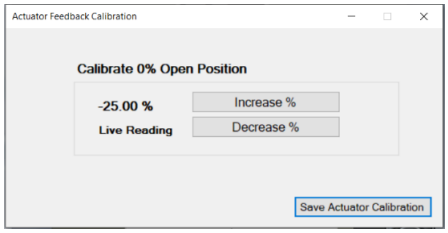
Step 3: Select **Increase %** or **Decrease %** to Adj. Live Reading to 100%. Save Actuator Calibration when done.



Step 4: Select **Calibrate 0% Open Position** to Drive Valve to the Closed Position.

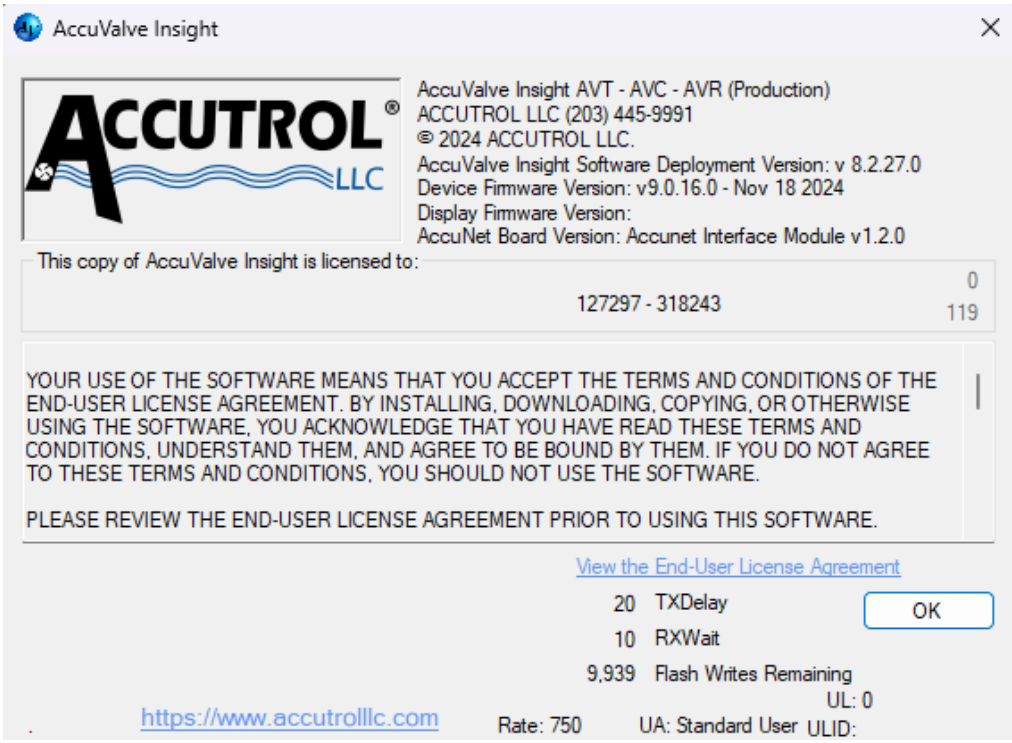


Step 5: Select **Increase %** or **Decrease %** to Adj. Live Reading to 0%. Save Actuator Calibration when done.



6.5.10.5 Help

About AccuValve Insight dialog box is shown below.



SECTION 7 – BACnet

BACnet® is a standard data communication protocol designed specifically for building automation and control networks. The AVC controller uses the BACnet MS/TP (Master-Slave/Token Passing) protocol which is a type of MAC layer implemented using the EIA-485 signaling standard. The performance of the MS/TP network is heavily influenced by the network traffic load, the assignment of MS/TP node addresses and the network configuration parameter *Nmax_info_frames*. Additionally, it is imperative the physical network layer is properly configured (cabling, EOL terminations, bias, etc...) and is verified to be reliable otherwise the network performance can be compromised. Due to the complexities associated with network communications, the most reliable method for communicating the airflow set point to the AVC controller is via Analog Signal.

7.1 BACnet Objects

The AVC AccuValve supports a collection of BACnet-visible objects. In addition to a Device object whose instance is programmed by writing to the current Object_Identifier or the "wildcard" Object_Identifier whose instance is 4194303, the AVC supports several standard object types as described herein. The following table defines the visible objects. The PV column indicates whether the Present_Value is Read Only "R", Writable "W" or a Commanded "C" point.

The standard objects; DEV, AI, AV, AO, BI, BV, and MSI support required properties for those object types. Object_Name is writable with provision for 64-character maximum length names. BI Inactive_Text and Active_Text, and MSI State_Text are writable.

Each AI/AV/AO object's Units property automatically changes to the appropriate unit for US or SI measurement based on the value of MSI3 and MSI4. Internally Present_Values are stored in US units and converted to/from SI units only when read or written.

Standard object property values other than Present_Value shall be derived as follows:

Object_Identifier:	generated automatically from request
Object_Type:	generated automatically from request
Object_Name:	writable
Polarity:	always NORMAL
Units:	MSI3 and MSI4 (Reference BACnet Tables below)
State_Text, Inactive_Text: Active_Text	writable
Status_Flags:	always {FALSE,FALSE,FALSE,FALSE}
Event_State:	always NORMAL
Out_Of_Service:	always FALSE

The internal Airflow Control loop dictates the Airflow Actuator Position (AO1) at a priority of 10. Devices external to the AVC that need to control the actuator directly shall use higher priority levels (9, 8, 7 etc.).

Objects; AI, AV, and AO shall support the COV_INCREMENT property which shall also be writable.

AVC6000 BACnet Points List – Fume Hood Mode

Object I.D.	Description	PV	Units	Reference
DExxx	Device Object		x	
AI1	Airflow Volume	R	Volume	
AI2	Analog Airflow Volume Setpoint	R	Volume	Note 4
AI3	Valve Position Feedback	R	%	
AI4	Face Velocity	R	Velocity	
AI5	Face Velocity Set point	R	Velocity	
AI6	Sash Position % OPEN	R	%	
AI7	Flash Writes Remaining	R		
AI8	Airflow Volume Setpoint to Control Loop	R	Volume	
AI9	AccuNet Totalized Airflow Volume	R	Volume	
AV1	BACnet Airflow Volume Setpoint	W	Volume	Note 4
AV2	Unsubscribed COV Interval	W	Seconds	
AV3	Airflow Volume Setpoint Offset	W	Volume	Note 4
AV4	Airflow Volume Measurement Adjust	W	%	
AV5	Airflow Volume Range Minimum Limit	W	Volume	
AV6	Airflow Volume Range Maximum Limit	W	Volume	
AO1	Valve Actuator Command Position	C	%	
BI1	Alarm: 0=normal, 1=alarm	R		
BI2	Low Face Velocity Alarm Status: 0=normal, 1=alarm	R		
BI3	Low Volume Alarm Status: 0=normal, 1=alarm	R		
BI4	Sash Position Alarm Status: 0=normal, 1=alarm	R		
BI5	Emergency (Purge) Status: 0=normal, 1=purge	R		
BV1	Remote Purge Request: 0=normal, 1=purge	W		
BV2	Write to Flash *(Reference Note 1)*	W		Note 1
BV3	DI-1 BACnet: 0=OPEN, 1=CLOSED	W	Binary	
BV4	DI-2 BACnet: 0=OPEN, 1=CLOSED	W	Binary	
BV5	Enter Hibernate	W	Binary	
MSI1	DI states 1..4	R		
MSI2	Mode Selector: 1=AI2, 2=MSI1, 3=AV1, 4=Fume Hood, 5=Hibernate	R		Note 3
MSI3	Airflow Volume Units: 1=CFM, 2=CMS, 3=CMM,4=CMH, 5=LPS,	W		
MSI4	Face Velocity Units: 1=FPM, 2=MPM, 3=MPS	W		
MSI5	AccuNet Status: 1=Disabled, 2=StandardNode, 3=TotalizerNode Network Healthy, 4=TotalizerNode Network Unhealthy	R		

AVC6000 BACnet Points List - Set Point Mode

Object I.D.	Description	PV	Units	Reference
DExxx	Device Object		x	
AI1	Airflow Volume	R	Volume	
AI2	Airflow Volume Setpoint (*Hardware Physical Input AI-1*)	R	Volume	Note 5
AI3	Valve Position Feedback	R	%	
AI7	Flash Writes Remaining	R		
AI8	Airflow Volume Setpoint to Control Loop	R	Volume	
AI9	AccuNet Totalized Airflow Volume	R	Volume	
AV1	BACnet Airflow Volume Setpoint	W	Volume	Note 6
AV2	Unsubscribed COV Interval	W	Seconds	
AV3	Airflow Volume Setpoint Offset	W	Volume	
AV4	Airflow Volume Measurement Adjust	W	%	
AV5	Airflow Volume Range Minimum Limit	W	Volume	
AV6	Airflow Volume Range Maximum Limit	W	Volume	
AO1	Valve Actuator Command Position	C	%	
BI1	Alarm: 0=normal, 1=alarm	R		
BV2	Write to Flash	W		Note 1
MSI1	DI states 1..4	R		
MSI2	Mode Selector: 1=AI2, 2=MSI1, 3=AV1, 4=Fume Hood, 5=Hibernate	R		Note 3
MSI3	Airflow Volume Units: 1=CFM, 2=CMS, 3=CMM,4=CMH, 5=LPS,	W		
MSI5	AccuNet Status: 1=Disabled, 2=StandardNode, 3=TotalizerNode Network Healthy, 4=TotalizerNode Network Unhealthy	R		

***Note 1**: Writing a value of (1) to the BACnet Object BV2 will cause the controller to copy the active configuration stored in volatile (RAM) memory and write it to nonvolatile (Flash memory). Nonvolatile Flash memory has a limited number of Lifetime Write Cycles. Reference Section 7.1.1 for details.*

***Note 2**: The AVC control module includes a USB port and an optional Bluetooth transceiver to provide local connectivity for configuring the AVC using the PC based software tool "Insight". For BACnet operation, the PC USB and/or Bluetooth must be disconnected from the AVC controller to avoid communication conflicts.*

***Note 3**: The AVC6000 Controller can operate in 5 different control modes, each of which is briefly described below. BACnet object MSI2 is provided to identify which mode the controller is operating in. This information is important because many of the BACnet objects are mode-dependent.*

MSI2=1: Setpoint mode using the controllers analog input (AI-1) to provide the airflow volume setpoint. BACnet object AI2 provides this value.

MSI2=2: Setpoint mode using the controllers dry contact inputs (DI-1, DI-2) to provide up to four different airflow volume setpoints. BACnet object MSI1 provides the dry contact input states.

MSI2=3: Setpoint mode using BACnet object AVI to provide the airflow volume setpoint.

MSI2=4: Fume Hood mode

MSI2=5: Hibernate mode

***Note 4**: Object is invalid when operating in Fume Hood mode when MSI2= 4 or 5.*

***Note 5**: Object is invalid when operating in BACnet setpoint mode when MSI2=3.*

***Note 6**: Object is invalid when operating in AI setpoint mode when MSI2=1.*

7.1.1 Save Active Configuration to Nonvolatile Flash Memory

The AVC has both volatile (RAM) and nonvolatile (Flash) memory types. RAM memory has an infinite number of write cycles however Flash memory has a finite number of write cycles which if exceeded will damage the device. RAM memory is used by the controller to store and retrieve active values which are to be used for control. Any values in RAM are lost when the controller is powered down. The values stored in Flash memory are copied to RAM memory during the power up sequence of the controller.

Writing a value of one (1) to the BACnet Object BV2 will cause the controller to copy the values stored in RAM to Flash memory, which is retained through power cycles. To protect the microcontroller from damage due to excessive flash writes, the AVC controller limits the number of flash write cycles to 10,000. The number of write cycles remaining are counted and made available via BACnet Object AI7.

7.2 Commanded Points

Only object AO1 supports BACnet command prioritization for writable Present_Values. AO1 shall include the Priority_Array and Relinquish_Default properties and their corresponding behaviors with respect to controlling the value written to the object's Present_Value. The AVC proactively manages each of these Priority_Arrays and updates the Present_Value accordingly.

7.3 Unsubscribed COV

The AV2 object Present_Value shall specify an interval in whole seconds at which the AVC shall periodically issue Unsubscribed COV Notifications as local segment broadcasts. An AV2 value of zero shall disable this behavior. When non-zero, the Unsubscribed COV shall also be issued if the Present_Value of any object AI1, AI2, AI3, AV1, or AO1 changes by more than the COV_INCREMENT for the corresponding object. If COV_INCREMENT is zero for a given object, it shall also disable Unsubscribed COV for that object, even if AV2 is non-zero.

7.4 COV

The AVC supports a pool of 40 subscription resources that may be applied to track COV subscriptions for change of value of any of the objects AI1, AI2, AI3, AI4, AI5, AI6, AI7, AV1, or AO1. Each subscription shall include the objectID, the last transmitted value, the remaining subscription lifetime in seconds, the subscriber process ID, a flag indicating whether confirmed or unconfirmed notifications should be used and the (network number, MAC address) of the subscriber.

7.5 BACnet Protocol Implementation Conformance Statement (PICS)

Date: November 2018
Vendor ID: 377
Vendor Name: Accutrol LLC
Product Name: AVC
Product Model Number: AVC Product Family
Firmware Revision: 9.0
Application Software Revision: 0.01
BACnet Protocol Revision: 7
BACnet Device Profile: B-ASC

Product Description:
The AVC is a product family of airflow control valves incorporating a unitary valve-mounted controller designed specifically for the AccuValve® airflow control valve.

BACnet Standardized Device Profile:
☐ BACnet Operator Workstation (B-OWS)
☐ BACnet Advanced Operator Workstation (B-AWS)
☐ BACnet Operator Display (B-OD)
☐ BACnet Building Controller (B-BC)
☐ BACnet Advanced Application Controller (B-AAC)
☑ BACnet Application Specific Controller (B-ASC)
☐ BACnet Smart Sensor (B-SS)
☐ BACnet Smart Actuator (B-SA)

List all BACnet Interoperability Building Blocks Supported

Specification	BIBB Name	Supported BIBB
K.1.2	Data Sharing – ReadProperty-B	DS-RP-B
K.1.4	Data Sharing – ReadPropertyMultiple-B	DS-RPM-B
K.1.8	Data Sharing – WriteProperty-B	DS-WP-B
K.1.12	Data Sharing – COV-B	DS-COV-B
K.1.16	Data Sharing – COV-Unsolicited-B	DS-COVU-B
K.5.2	Device Management – Dynamic Device Binding-B	DM-DDB-B
K.5.4	Device Management – DynamicObject Binding-B	DM-DOB-B
K.5.6	Device Management – DeviceCommunicationControl-B	DM-DCC-B
K.5.16	Device Management – DynamicReinitializeDevice-B	DM-RD-B

Segmentation Capability:
☐ Able to transmit segmented messages Window Size _____
☐ Able to receive segmented messages Window Size _____

Standard Object Types Supported:

Object	Create Object Service	Delete Object Service	Optional Properties Supported	Writeable Properties
DE Device Object	No	No	Active_COV_Subscriptions Description Max_Master Max_Info_Frames	Object_Identifier Object_Name Description Max_Master Max_Info_Frames ADPU_Timeout Number_Of_ADPU_Retries
AI Analog Input	No	No	COV_Increment	Object_Name COV_Increment
AO Analog Output	No	No	COV_Increment	Object_Name Relinquish_Default COV_Increment
AV Analog Value	No	No	COV_Increment	Object_Name Present_Value COV_Increment
BI Binary Input	No	No	Inactive_Text Active_Text	Object_Name Inactive_Text Active_Text
BV Binary Value	No	No	Inactive_Text Active_Text	Object_Name Present_Value
MSI Multi State Input	No	No	State_Text	Object_Name Present_Value State_Text

Data Link Layer Options:

☐ BACnet IP, (Annex J)
☐ BACnet IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7)
☐ ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s):
☑ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800, 115200
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐ Point-To-Point, modem, (Clause 10), baud rate(s):
☐ LonTalk, (Clause 11), medium:
☐ BACnet/ZigBee (ANNEX O)
☐ Other: _____

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes ☑ No

Networking Options:

☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.

☐ Annex H, BACnet Tunneling Router over IP

☐ BACnet/IP Broadcast Management Device (BBMD)

Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

Does the BBMD support network address translation? ☐ Yes ☐ No

Network Security Options:

☑ Non-secure Device - is capable of operating without BACnet Network Security

☐ Secure Device - is capable of using BACnet Network Security (NS-SD BIBB)

☐ Multiple Application-Specific Keys:

☐ Supports encryption (NS-ED BIBB)

☐ Key Server (NS-KS BIBB)

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☑ ANSI X3.4	☐ IBM™/Microsoft™ DBCS	☐ ISO 8859-1
☐ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS X 0208

Gateway:

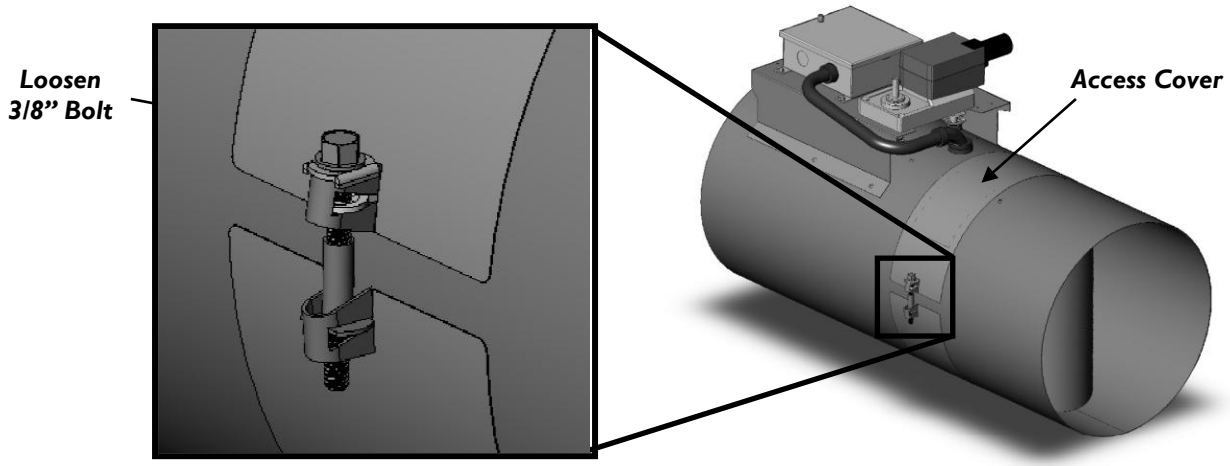
This product does not support gateway functionality for any types of non-BACnet equipment/networks(s)

SECTION 8 – MAINTENANCE

Scheduled maintenance for the AVC is not required; however each AccuValve does include an access cover which can be removed to inspect the airflow sensors if desired.

8.1 Round Valve Access Cover

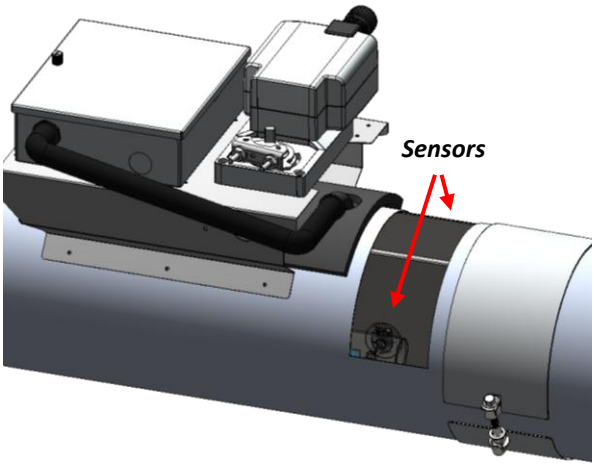
CAUTION: *Wear eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*



8.1.1 Loosen the 3/8" bolt enough to allow the access door to slide forward.

CAUTION: *If the bolt is removed from the captive nut, the access cover can spring open possibly causing injury.*

8.1.2 Using two hands; squeeze the access cover and slide it forward over the valve enough to uncover the access opening.



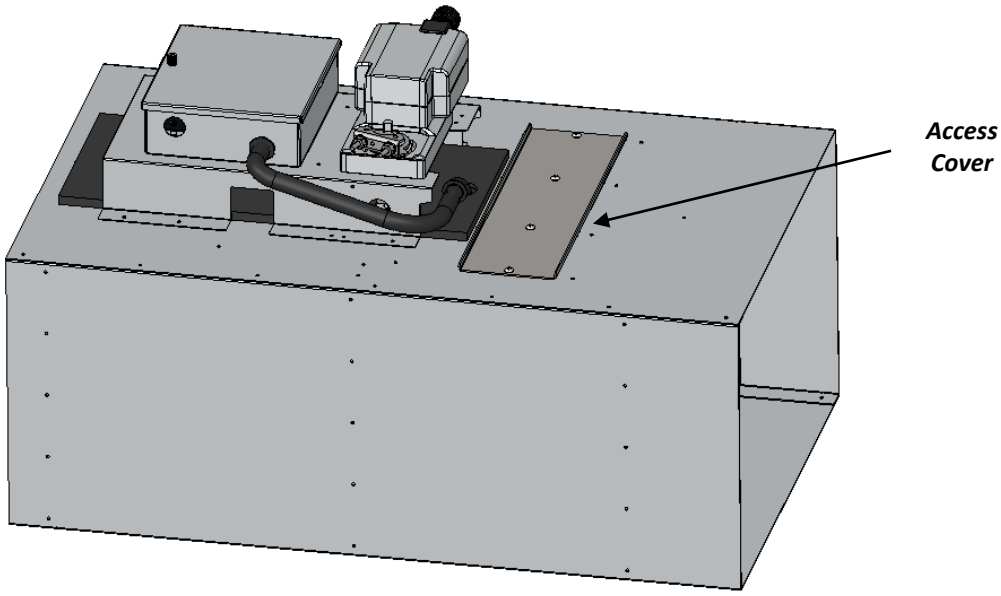
8.1.3 Once the cover is slid forward or removed, the airflow sensors can be visually inspected.

8.1.4 When inspection is complete, slide the access cover over the opening, being careful not to damage gasket in the process.

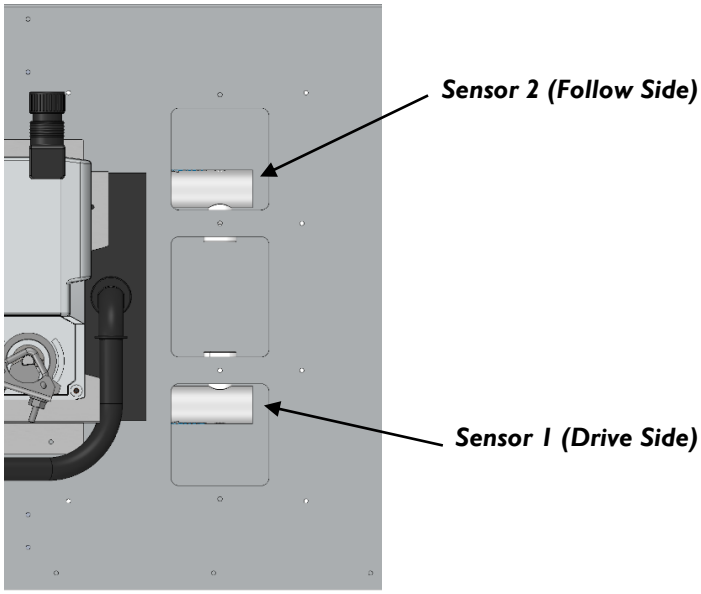
8.1.5 Verify the access cover is in position to completely cover the opening. Secure cover in place by tightening the 3/8" bolt using care not to over tighten.

8.2 Rectangular Valve Access Cover

CAUTION: *Wear eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*



8.2.1 The access cover is secured to the valve using (4) #2 blunt-head Phillips head screws. To inspect the sensors, remove the access cover by removing the screws using a #2 Phillips head screwdriver. Put the screws aside for reinstalling the cover later.



8.2.2 Once the cover is removed the sensors are accessible for inspection.

8.2.3 When inspection is complete, place the access cover in position and secure using the same screws previously removed.

8.3 Actuator Calibration

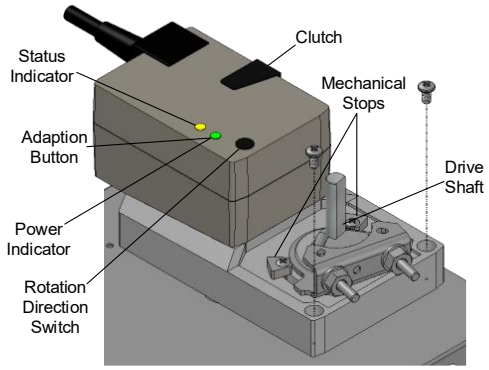
8.3.1 Scheduled maintenance for the actuator is not required as each actuator is installed, configured and tested on the AccuValve prior to shipping. However, if the actuator's clutch is pressed or if the actuator is replaced, the actuator will need to be re-adapted.

Note: The adaptation process allows the actuator to find its end-points (full-open and full-close) and correlates these positions to the analog control signal.

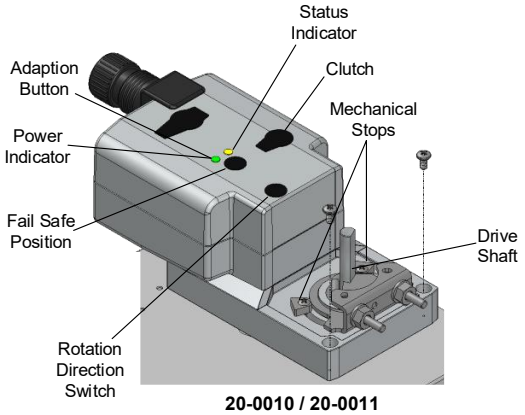
8.3.2 To re-adapt the actuator, with 24v power applied to the actuator, press and hold the Adaptation button for approximately 2 seconds, or until the actuator starts to cycle. The actuator will cycle to the full-open and full-close positions. This process is required to adapt the actuator to the valve which it has been installed upon.

Note: Ensure actuator stops are properly set before the adaptation process is initiated.

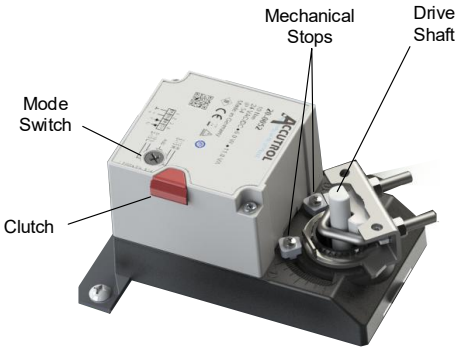
8.3.3 If the actuator's clutch is pressed, failure to perform this adaptation process will result in poor performance.



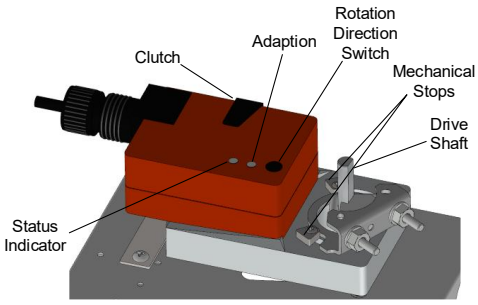
20-0008 / 20-0009



20-0010 / 20-0011



20-0052

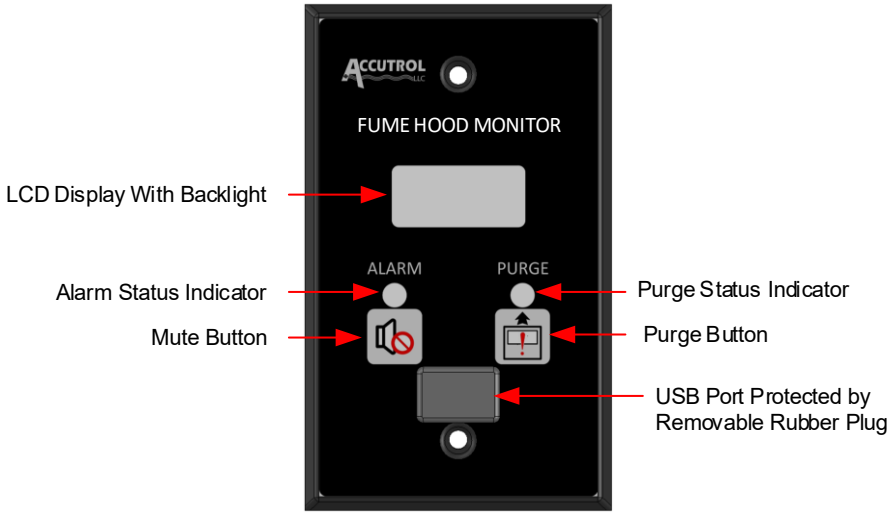


20-0057

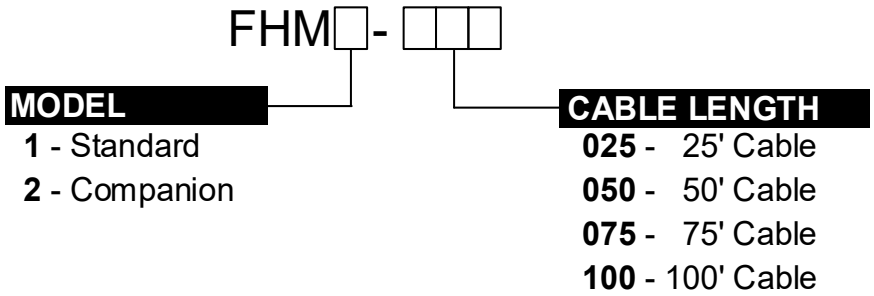
APPENDIX A – FUME HOOD MONITORS

FUME HOOD MONITOR, MODEL FHM1 OPERATION

The FHM1 is used in conjunction with the AVC6000 to provide a comprehensive Fume Hood Control System. The FHM1 is provided with 2 mounting screws for securing to a standard single-gang electrical box. Prefabricated plenum-rated cables are provided with the FHM1 for connecting directly to the AVC6000 control module. The FHM1 does not require configuration. All configuration parameters are stored in the AVC6000 control module and can be accessed using the AccuValve Insight Configuration Software.



Model Code



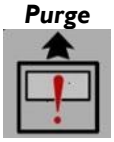
LCD Display

Type: Character Liquid Crystal Display, 2 Lines x 8 Characters with White LED Backlight
Line 1: Indicates Face Velocity or Airflow Volume, Depending on Operating Mode
Line 2: Provides Alarm Messages and Programmable Messages to Indicate Operating State
Note: LED backlight turns off during Hibernate Mode

Configuration Port

USB Type C Protected by Removable Rubber Plug
Provided for connecting PC with AVC6000 using the AccuValve Insight Configuration Software only

Display Button Functions

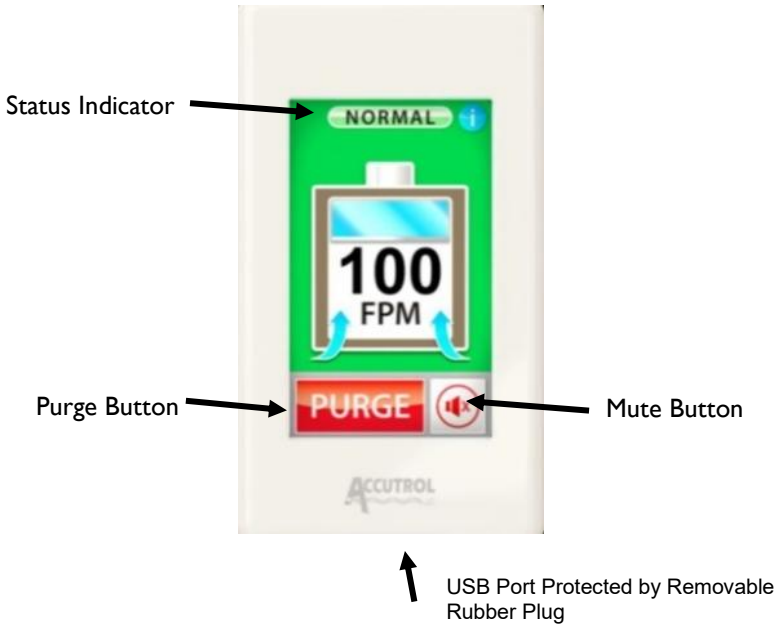
Mute		***Purge*** 	**Resulting Function**
Momentary Press & Release		-	When alarm condition exists; pressing will silence the audible alarm horn, pressing again will return audible alarm horn.
-		Momentary Press & Release	Activates Purge Mode, pressing again deactivates Purge Mode. Valid for Fume Hood Mode Only
Press & Hold		-	The LCD will sequentially display the following information; AVC Rev. x.x.x.x, DSPLYRev. x.x.x.x, DevObjID xxx, MAC Addr xxx, Serial # xxxxxx and Hibernat?
Press & Hold	+	Press & Hold	The LCD will sequentially display the following information; Mode: xxxxxx, Present Setpoint xxxxx, Measured Volume xxxx, and Actuator Feedback Position xxxx.
Press & Hold	+	Press when LCD = Hibernat	Activates Hibernate Mode

LED Status Indicators

Alarm Status LED Indicator	***Purge Status LED Indicator***	**Status**
Green	Off	System operation is normal with no active alarms. Purge is inactive.
Green	Red	System operation is normal with no active alarms. Purge is active. *Note; Purge can initiated locally using the Purge button, however it can also be activated via BACnet (only in FH mode) command or by using manual override function in Insight.*
Yellow	Off	Sash is closed and controller is maintaining airflow at the minimum volume limit
Red	Off	Active alarm condition. Check display for alarm message. Purge is inactive.
Red	Red	Active alarm condition. Check display for alarm message. Purge is active. *Note; Purge can initiated locally using the Purge button, however it can also be activated via BACnet command or by using manual override function in Insight.*
Off	Off	Hibernate Mode is active. Hood is not in use.

FUME HOOD MONITOR, MODEL FHM3 OPERATION

The FHM3 is used in conjunction with the AVC6000 to provide a comprehensive Fume Hood Control System. The FHM3 is provided with 2 mounting screws for securing to a standard single-gang electrical box. Prefabricated plenum-rated cables are provided with the FHM3 for connecting directly to the AVC6000 control module. The FHM3 does not require configuration. All configuration parameters are stored in the AVC6000 control module and can be accessed using the AccuValve Insight Configuration Software.



Model Code

FHM 3 - □□□

MODEL
3 – Touchscreen

CABLE LENGTH
25' Cable = **025**
50' Cable = **050**
75' Cable = **075**
100' Cable = **100**

LCD Display

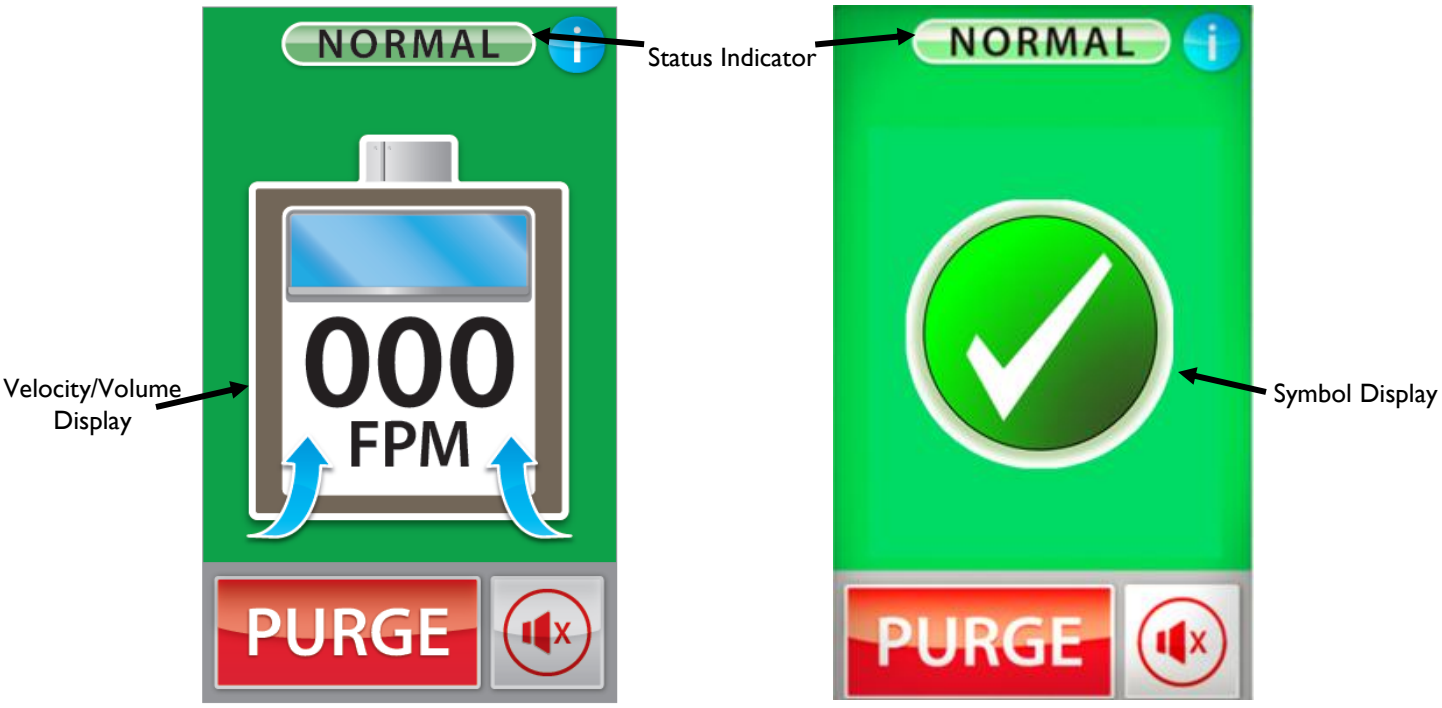
3.5 Inch Touchscreen Resistive. Resolution: 480 x 320 Pixel, 64K Colors
Indicates face velocity or airflow volume on screen
Provides alarm and setback messages on screen

Configuration Port

USB Type C protected by removable rubber plug
Connect to PC with the AccuValve Insight software
All configuration settings for the FHM3 are programmed through the AccuValve Insight software

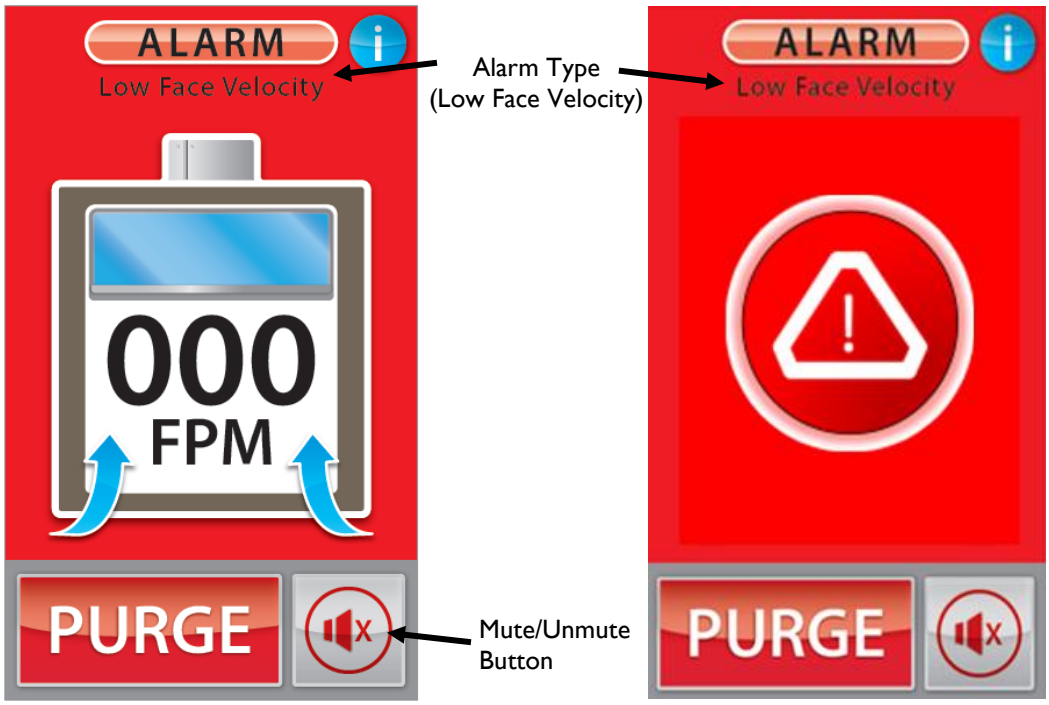
General:

The FHM3 monitor will remain in one of four general conditions at any given time (Alarm, Purge, Normal, Hibernate).



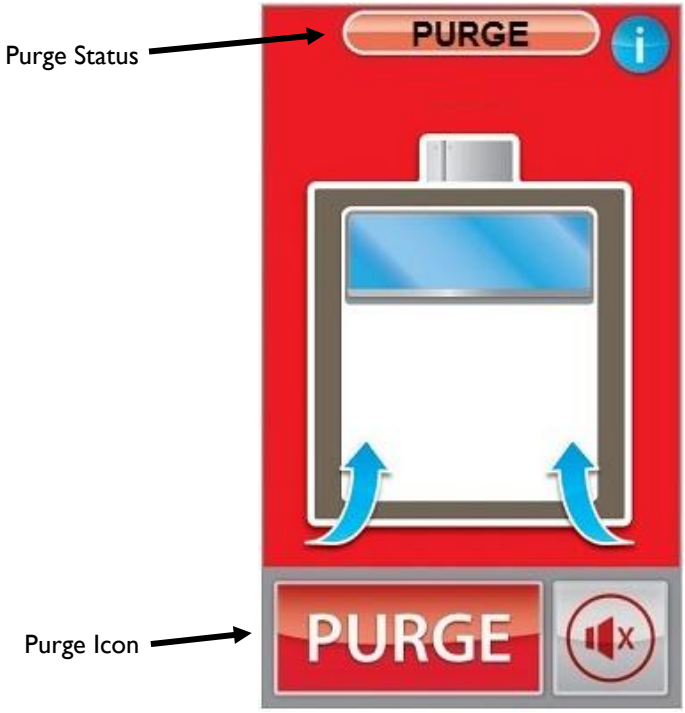
Alarm:

When an alarm is present; the touchscreen will turn red and a notification will appear stating the type of alarm present. Pressing the alarm icon will silence the audible alarm horn. Pressing it again will re-enable the audible alarm horn.



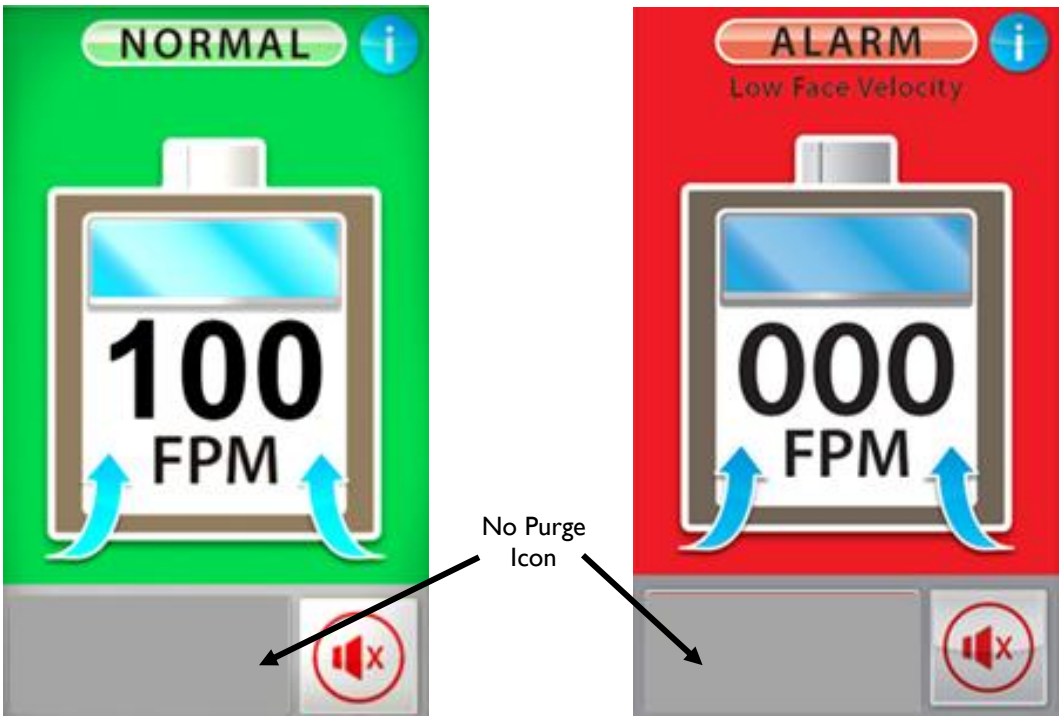
Purge:

To enter Purge momentarily press and release the Purge icon in the bottom left corner of the display. To exit Purge mode momentarily press the same icon again. The status bar on the top of the display will change to reflect that the Fume Hood has entered Purge mode.

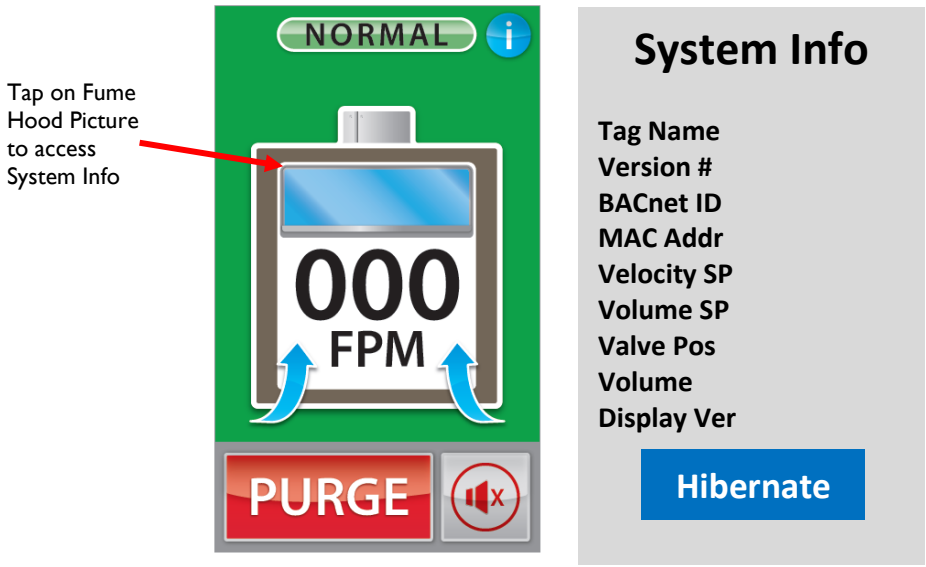


Purge Disabled:

When the Purge function is disabled through the Insight Software, the Purge button on the FHM3 is removed and the BACnet point (BV1) is deactivated.



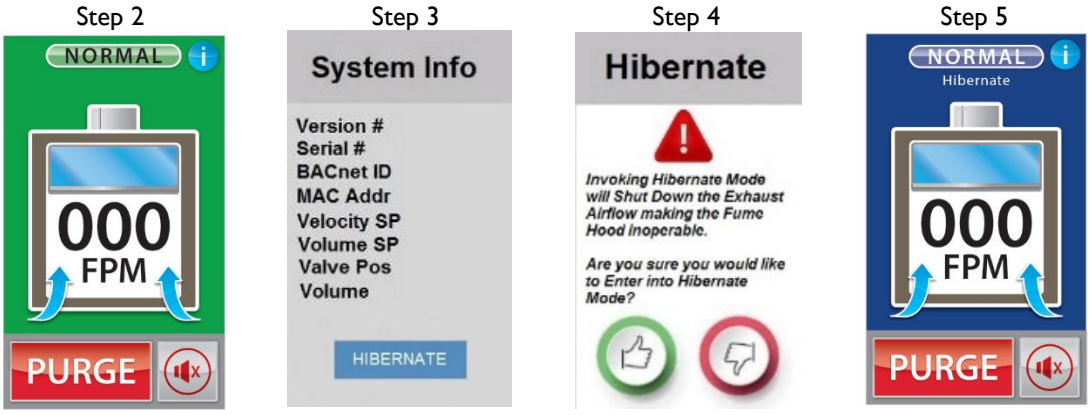
System Information:
General information shown below. To return to the original menu tap the Fume Hood picture or wait 5 seconds.



Hibernate Mode:
To activate Hibernate mode through the display, the controller must first be configured to enable Hibernate using the Insight software as described in section 6.5.4.2.1.5.

To enter into Hibernate Mode;

1. Close the fume hood sashes completely.
2. Touch the Fume Hood Image on the display to access the System Info screen.
3. On the System Info Screen, touch the Hibernate Button located on the bottom screen.
4. Read the warning message and select "thumbs up" to enter Hibernate and "thumbs down" to exit.
5. The screen will slowly fade to black to reduce energy consumption as the controller enters Hibernate.



To exit from Hibernate Mode, open the sash.

APPENDIX B: BLUETOOTH

The AVC6000 Series AccuValve® is offered with an optional Bluetooth module that provides wireless connectivity between the AccuValve® and configuration PC equipped with Bluetooth ver 4.2 or later. AVC6000's that are Bluetooth enabled have a -W suffix on the end of the model code which specifies the control module includes the optional Bluetooth module which is required for wireless communication.

Minimum Requirements for PC or Tablet

- Windows 10 (or newer) Operating System
- Bluetooth Version 4.2 or later
- AccuValve Insight Software Version 8.2 or later

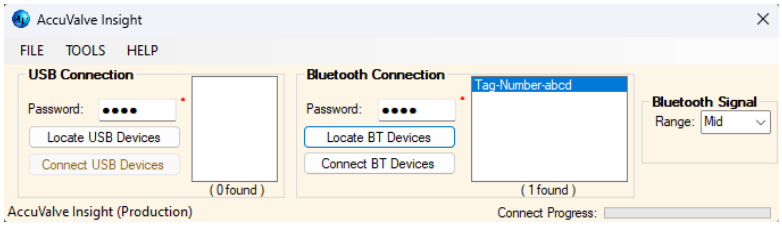
Note: *Bluetooth signals are influenced by environmental factors such as; distance between devices, RF interference caused by other devices, objects in the area, and building construction. Because the AccuValve is typically installed in locations that have sheet metal duct work, metal trusses, ceiling grids, and concrete with metal mesh; Accutrol recommends technicians carry a long-range Bluetooth transceiver such as the AIRcable Host XR5 Bluetooth dongle which will provide superior performance over the PC's internal Bluetooth transceiver.*

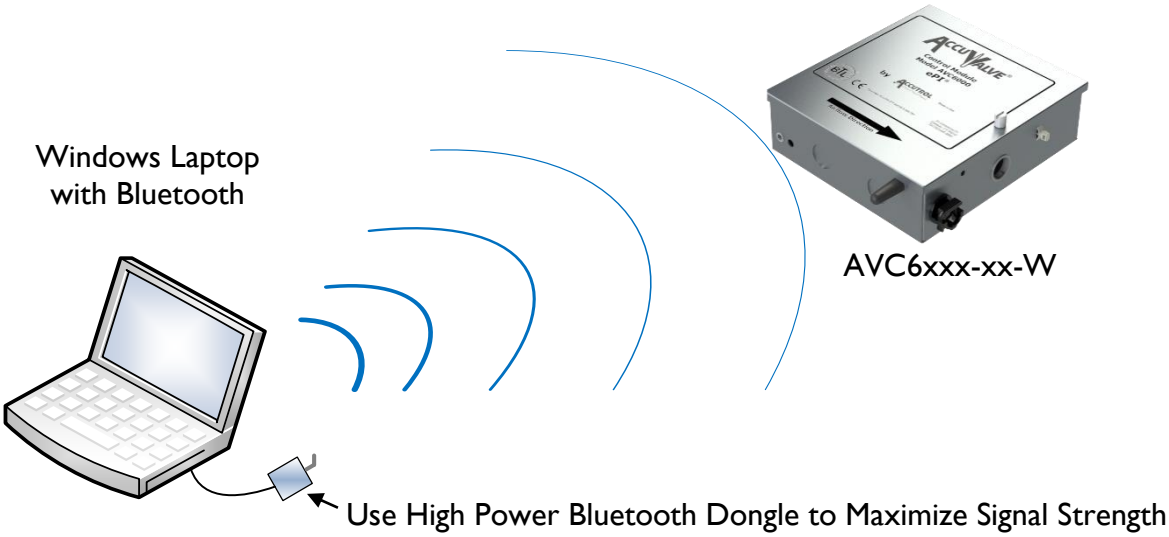
Note: *Do not attempt to upgrade the device firmware over the Bluetooth connection.*

To Connect to the AccuValve® with Bluetooth

Launch the AccuValve® Insight application and select "Locate BT Devices". Only Bluetooth enabled Accutrol devices within range will be discovered and listed by their TAG names. Double-click on the appropriate device to connect.

Note: *Changing the Tag name via Bluetooth will reset the Bluetooth Connection*





APPENDIX C: ACCUNET

This guide provides a general description of AccuNet™, it's intended applications and instructions for performing the field network configuration.

Description

AccuNet™ is a high-speed serial bus that is designed to provide a room-level network for summing the airflow volume of multiple AccuValves while providing a single analog signal representing the total sum of the AccuValve airflows.

The primary application for AccuNet is in laboratories that have multiple VAV fume hoods which require the total lab exhaust airflow to be instantly tracked by the supply airflow to maintain the proper room pressurization.

Network Design

The AccuNet field network shall be designed and documented with wiring diagrams that are included as part of the project submittal. The following network design criteria must be strictly adhered to otherwise the network will not perform as intended:

- Each network must be comprised of AccuValves serving only one lab space.
- Each network shall include no less than two and no more than twenty AccuValves.
- The network shall be wired using Windy City Wire PN: 042002. (or equivalent wire)
- The total cable length of each network shall not exceed 800 ft.
- A 120-ohm resistor shall be installed across the +/- terminals on the AccuNet modules located on each end of the network.
- Only one AccuValve, referred to as the "Totalizer", shall be configured to provide the sum of the individual airflows of each AccuValve located on the network. It's important to identify the Totalizer on the network wiring diagram to ensure the analog output is wired to the lab controller as feedback for the tracking control.

How to Order AccuValves with AccuNet

AccuValve model series AVT6 and AVC6 can be provided with factory-installed AccuNet modules by including the "-A option" on the model code when placing the order.

Note: *It is strongly recommended to save a copy of the AccuNet configuration file after the configuration of each unit and the entire network. This prevents having to rebuild the entire network if a unit must be replaced due to a failure or upgrade.*

How to Field-Configure the AccuNet Network Devices

Each AccuValve on the network must be field-configured using the AccuValve Insight Program for the purpose of; assigning a unique network address to each device, associating each device on the network with one another, and configuring one device as the network Totalizer. This process will take approximately one minute per unit, and when completed will generate a unique AccuNet network configuration file that documents the network details. This file should be retained for record.

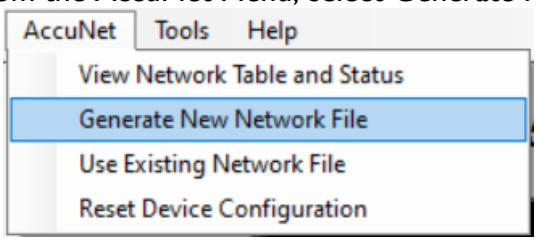
Step 1: Verify Physical Network

Confirm the network is wired per the wiring diagrams, the termination resistors are installed, and the analog output on the Totalizer is wired to the room controller. The network diagram used for this example is shown in Figure 1.

Step 2: Generate a New Network Configuration File

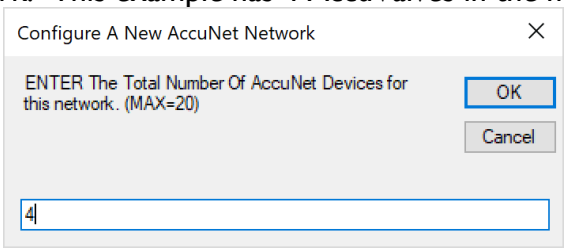
2-1. Launch AccuValve Insight and connect pc to the first AccuValve on the network.

2-2. From the AccuNet Menu, select Generate New Network File.

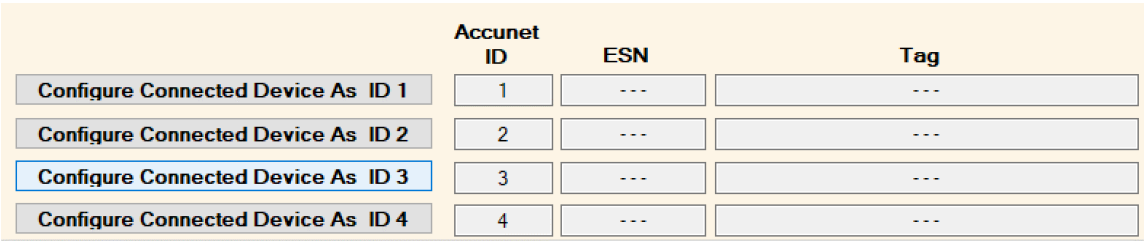


You will be prompted to provide a file name which should be unique to this network and easily identifiable to the project and lab. For this example, the project number is 220 and the first network is Lab1.

2-3. Next you will be prompted to Enter the Total Number of AccuNet Devices in this Network. This example has 4 AccuValves in the network.



2-4. A table will be generated with the number of rows corresponding the number of devices in the network.



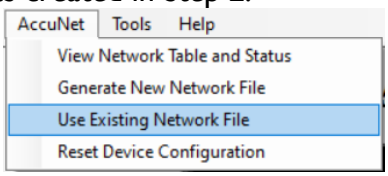
	Accunet ID	ESN	Tag
Configure Connected Device As ID 1	1	---	---
Configure Connected Device As ID 2	2	---	---
Configure Connected Device As ID 3	3	---	---
Configure Connected Device As ID 4	4	---	---

Step 3: Configure each AccuValve in the Network (this example is a 4 AccuValve network)

3-1. Configure the first AccuValve in the network.

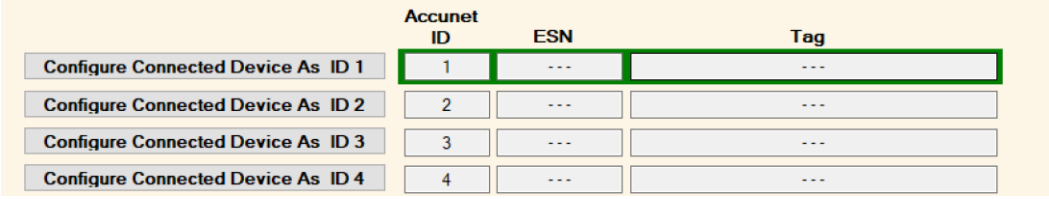
3-1a. Connect to the first AccuValve on the network and open AccuValve Insight.

3-1b. From the AccuNet Menu, select Existing Network File and open the same file that was created in Step 2.



Note: *Before adding a device to the AccuNet network, verify that the device has a default address of 127 by opening View Network Table and Status. If it does not have an address of 127 the device has already been used in another network before and it will have to be reset prior to being added to this network. This requirement is true for all units that are to be added to the network.*

3-1c. Select the button "Configure Connected Device AS ID 1".



The utility will now assign a unique network address to this AccuNet Module. The AccuValve TAG name will be assigned as the TAG name of this AccuNet Module.

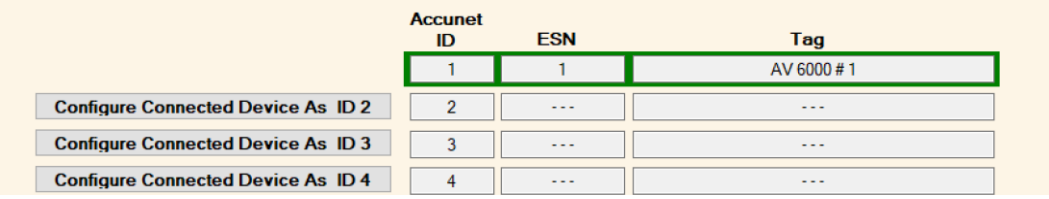
3-1d. Close the Insight Program Dashboard then disconnect the pc from the AccuValve.

3-2. Configure the second AccuValve in the Network

3-2a. Connect to the second AccuValve on the network and open AccuValve Insight.

3-2b. From the AccuNet Menu, select Existing Network File and open the same file that was created in Step 2.

3-2c. Select the "Configure Connected Device AS ID 2".



The utility will now assign a unique network address to this AccuNet Module. The AccuValve TAG name will be assigned as the TAG name of this AccuNet Module.

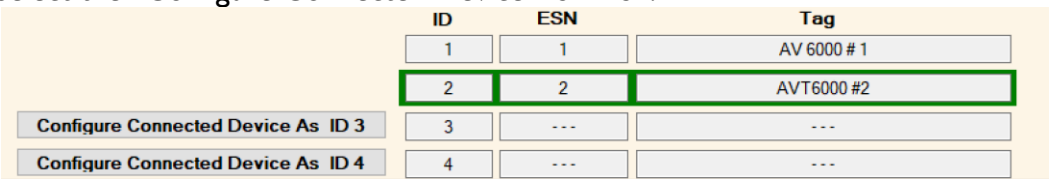
3-2d. Close Insight and disconnect from the AccuValve.

3-3. Configure the third AccuValve in the Network.

3-3a. Connect to the third AccuValve on the network and open AccuValve Insight.

3-3b. From the AccuNet Menu, select Existing Network File and open the same file that was created in Step 2.

3-3c. Select the "Configure Connected Device AS ID 3".



The utility will now assign a unique network address to this AccuNet Module. The AccuValve TAG name will be assigned as the TAG name of this AccuNet Module.

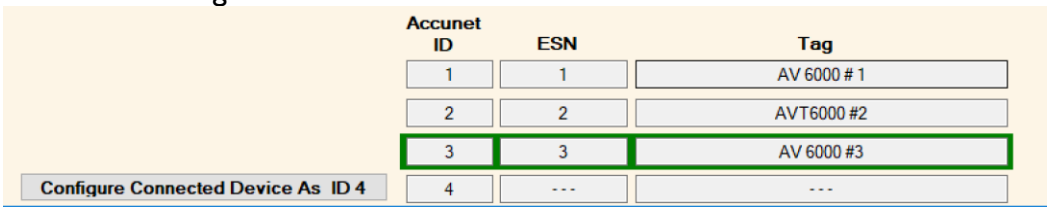
3-3d. Close Insight and disconnect from the AccuValve.

3-4. Configure the fourth AccuValve in the Network.

3-4a. Connect to the fourth AccuValve on the network and open AccuValve Insight.

3-4b. From the AccuNet Menu, select Existing Network File and open the same file that was created in Step 2.

3-4c. Select the "Configure Connected Device AS ID 4"



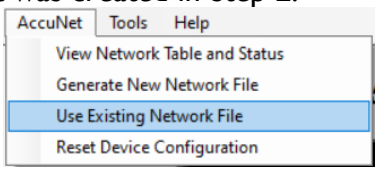
The utility will now assign a unique network address to this AccuNet Module. The AccuValve TAG name will be assigned as the TAG name of this AccuNet Module.

3-4d. If this device is the Totalizer, continue to Step 4b. If this device is not the Totalizer, Close Insight and disconnect from the AccuValve.

Step 4: Configure the Totalizer

4a. Connect to the AccuValve that is the network Totalizer and open AccuValve Insight.

4b. From the AccuNet Menu, select Use Existing Network File and open the same file that was created in Step 2.

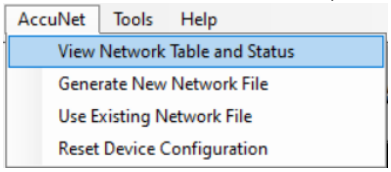


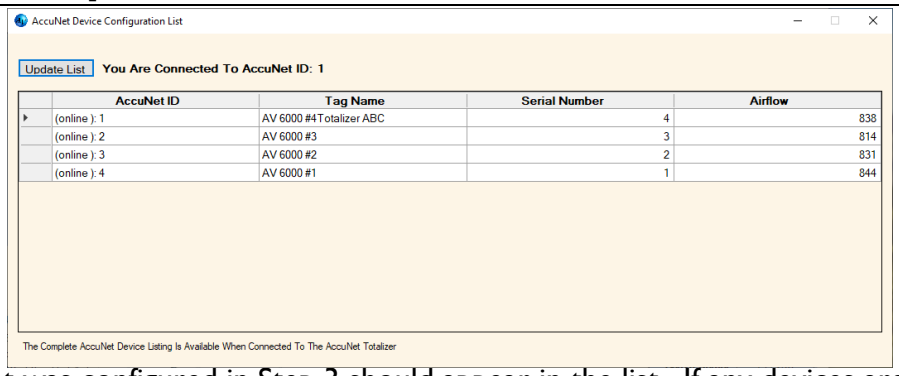
There should only be one active button labeled "Click Here to Make this the Totalizer". Selecting this button will configure this AccuValve as the Totalizer.

Step 5: Confirm AccuNet Network is Activated

5a. Connect the pc to the Totalizer AccuValve.

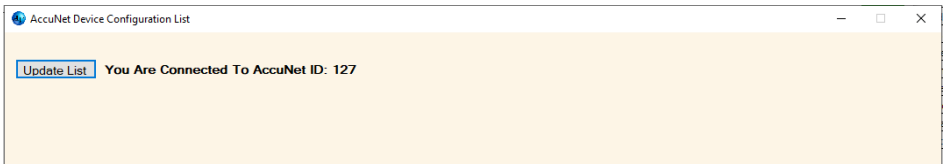
5b. From the AccuNet Menu, select View Network Table and Status.





AccuNet ID	Tag Name	Serial Number	Airflow
(online): 1	AV 6000 #4Totalizer ABC	4	838
(online): 2	AV 6000 #3	3	814
(online): 3	AV 6000 #2	2	831
(online): 4	AV 6000 #1	1	844

Each item that was configured in Step 3 should appear in the list. If any devices are missing, there may be problems with the physical network or one of the devices was not configured properly. If only the Totalizer appears on the list, check the network wiring and verify the 120-ohm termination resistors are installed on each end of the network. If only one or two items are missing from the list, plug into those items to confirm they have been properly configured.

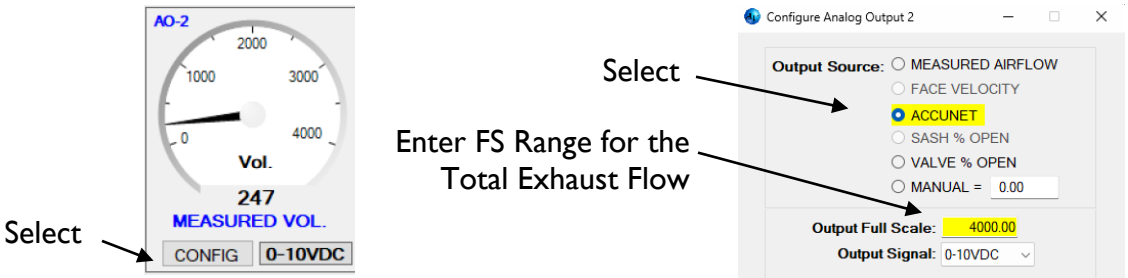


If your device has not yet been configured the default device address of 127 will be shown. The complete device list can *only* be viewed from the valve assigned as the totalizer valve. All other devices will only show their own individual AccuNet ID information.

Step 6: Setting the Analog Output to Totalizer

6-1. Connect the pc to the Totalizer AccuValve and open AccuValve Insight.

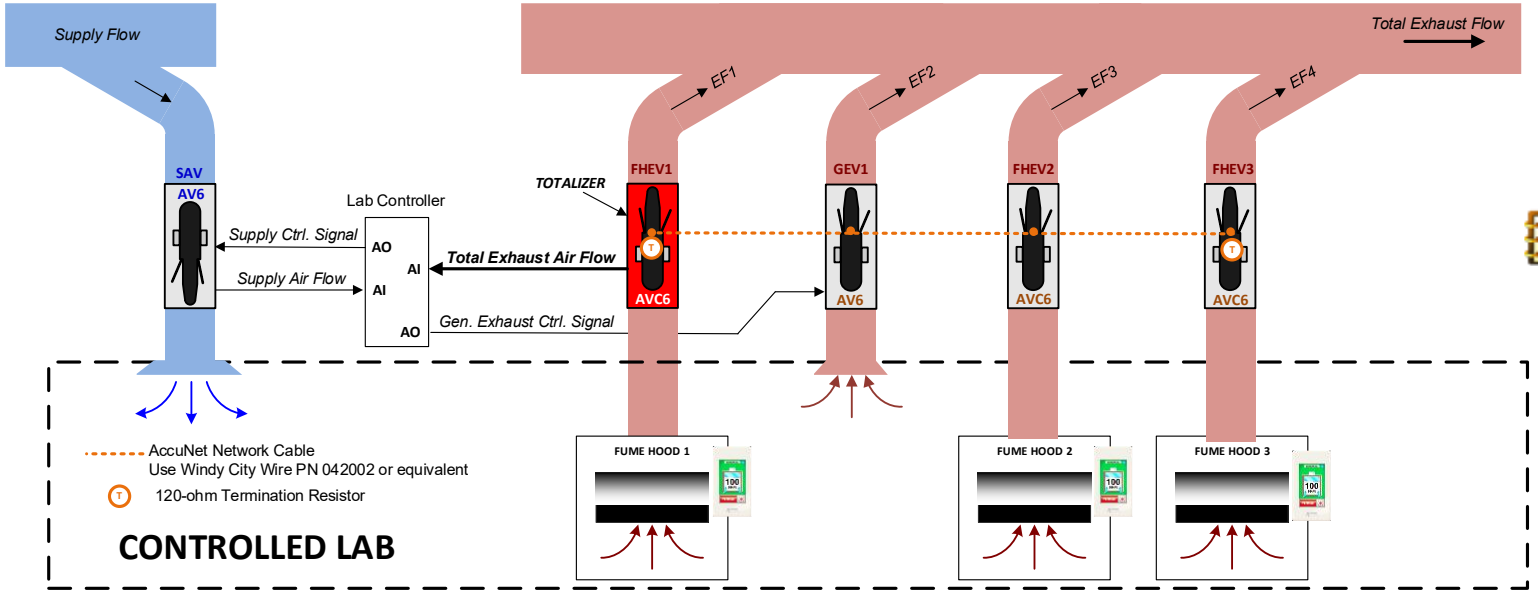
6-2. Select the Config Button on the appropriate Analog Output Gauge, then select ACCUNET and enter the Analog Output Full Scale Range for the total exhaust airflow in the AccuNet network.



Note: When an AVC's Analog Output is configured for ACCUNET, on the AccuNet module, a red LED will turn on.

6-3. Verify the Totalized airflow indicated is equivalent to the sum of each of the airflows from all devices on the AccuNet network.

Figure 1: Lab with (4) AccuValves on the AccuNet Network



Note: *Reference Figure 2 for AccuNet Wiring Details.*

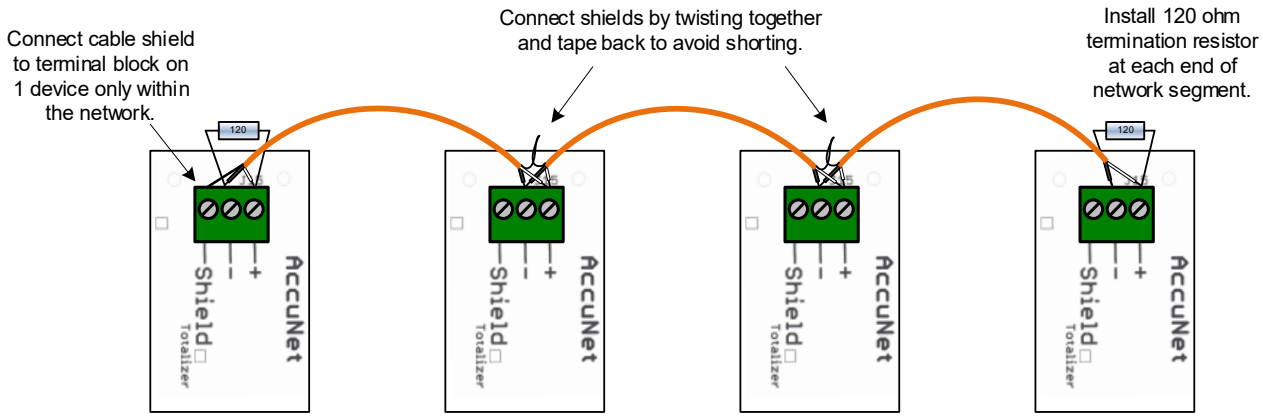



Figure 2: AccuNet Wiring Diagram