

Overview

Use the VMS-1655M Vortex Monitor in the Flowsafe Stable Vortex II fume hood and Flowsafe Stable Vortex conversion kit to measure and control the vortex pressure and adjust to maintain correct fume hood containment. The VMS-1655M adjusts for environmental and usage conditions such as sash movement, fume hood loading, room pressure fluctuations, and cross drafts with active vortex stabilization in real-time. The alarm function notifies you if there is a compromise in fume hood performance. Some of the features and benefits include:

- Full-color touchscreen display with programmable display options and adjustable back-light
- 360° Safety Halo™
- Intuitive user interface that simplifies setup and configuration of unit
- Optional display mode to show real-time face velocity at main screen
- Graphical hood status display
- Audible and visual alarms
- Multi-level password protection
- 1 analog input: 0 VDC to 10 VDC
- 2 analog outputs, actuator control, exhaust air flow feedback
- BACnet® MS/TP network comms
- Real-time view facility facilitates diagnostics during setup and commissioning

IMPORTANT: Make all wiring connections in accordance with the National Electrical Code and local regulations. Use proper Electrostatic Discharge (ESD) precautions during installation and servicing to avoid damaging the electronic circuits of the VMS-1655M Fume Hood Monitor.

IMPORTANT : Assurez-vous que tous les branchements de câbles sont effectués selon le Code national de l'électricité et les réglementations locales. Utilisez une bonne protection contre les décharges électrostatiques (ESD) pendant l'installation et l'entretien pour éviter d'endommager les circuits électroniques du VMS-1655M Fume Hood Monitor.

The VMS-1655M has a 3.2 in. diagonal full-color touchscreen and displays in portrait orientation (240 pixels by 320 pixels). The password-protected menu tree is intuitive and simplifies the setup and configuration of the unit. The menus incorporate touch-based interfaces such as sliders, radio buttons, and dialog popup windows.

The display implements bright background color changes along with the 360° Safety Halo to indicate the three different hood statuses. These background colors indicate **Normal** when the face velocity at the sash opening is within defined limits, **Warning** when it nears an out-of-limits condition, and **Alarm** when the face velocity is outside defined acceptable limits. You can easily set the face velocity ranges for these conditions for the specific installation when necessary. The 360° Safety Halo color changes provide an at-a-glance view of the fume hood face velocity conditions from anywhere in the lab.

You can define alarm conditions in terms of required face velocity settings for the monitored fume hood. When an alarm condition occurs, it announces in three user-definable ways: 1) on the display, 2) the 360° Safety Halo, and 3) with an audible alarm. The alarm automatically resets when the unit senses that the fume hood face velocity returns to correct limits. To mute the audible alarm, touch the Alarm Audible button at the bottom of the touchscreen display.

The VMS-1655M provides an optional Analog Input that you can use to monitor the exhaust air flow of the fume hood that uses a third party flow pressure sensor with a 0 VDC to 10 VDC output.

You can configure multi-level passwords to prevent the unauthorized or casual access to the VMS-1655M configuration settings. You can store up to ten passwords of up to eight digits, each can have one of four associated access levels. Administrators and facility management personnel may have unrestricted access, while you can assign restricted access passwords to general staff, which limit the functionality of the user menus.

The VMS-1655M includes its own power supply, which connects to the system shown on page 6. The standard power supply includes a universal 120/240 VAC-to-24 VAC isolation transformer enclosed within a 4x4 electrical box with a 1A slow blow fuse.

This power supply also provides power to the vortex sensor module which monitors the effective vortex in the fume hood. A 10-foot length of 4-conductor cable is supplied with the VMS-1655M to interface the vortex sensor to the touchscreen display.

The VMS-1655M includes a vortex sensor to measure the vortex of the monitored fume hood. Install this sensor at the top of the monitored fume hood. Tools required for the installation include: drill, 3/4 in. drill bit, 3/8 in. drill bit, 1/4 in. drill bit, 1/8 in. drill bit, #2 Phillips screwdriver, standard medium blade screwdriver, and silicone sealant.

An included interface cable pre-wired to the sensor module, connects it to the touchscreen display module.

VMS-1655M Vortex Monitor

Fume Hood Name / Number

Unit Model Number and Serial Number (ESN)

Analog Output

Dead band percentage

Alarm Limits

Occupied Mode High Alarm Setpoint

Occupied Mode High Warning Setpoint

Occupied Mode Low Warning Setpoint

Occupied Mode Low Alarm Setpoint

Audible Alert

Operating Mode (audible or silent)

Delay Time Base (secs or mins)

Delay Setting (0 - 60)

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NOTICE

Risk of Property Damage

Do not use a single transformer to power both the actuator and the controller. Use a 24 VAC 30 VA Class 2, Limited Energy, or LPS for the controller, and a separate 24 VAC 20 VA Class 2, Limited Energy, or LPS for the actuator. Failure to follow the wiring diagrams may result in damage to the actuator, the transformer, the controller, or all devices and could void your warranty.

Note: The Actuator is sold separately.

AVIS

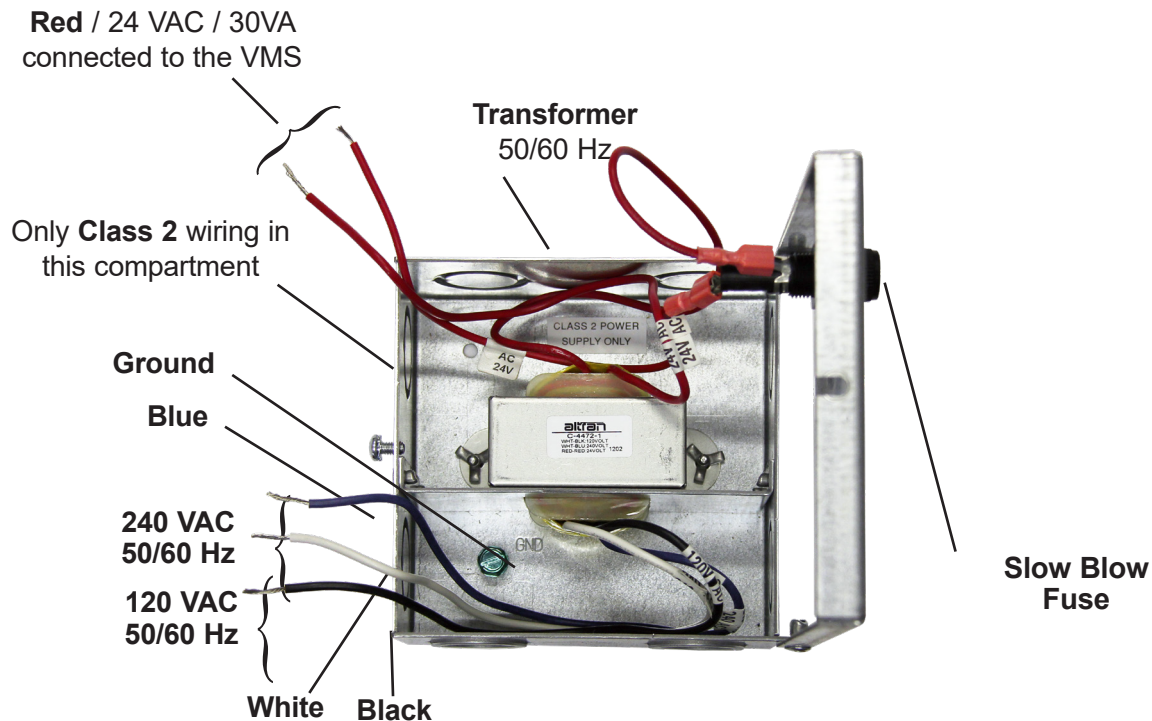
Risque de dommage à la propriété

N'utilisez pas un seul transformateur pour alimenter à la fois l'actionneur et le régulateur. Utilisez un transformateur de classe 2 à 24 V CA 30 VA, à limitation d'alimentation ou LPS pour le régulateur et un transformateur de classe 2 à 24 V CA 20 VA à limitation d'alimentation ou LPS séparé pour l'actionneur. Ne pas respecter les schémas de câblage peut causer des dommages à l'actionneur, le transformateur, le régulateur ou tous les appareils et peut annuler votre garantie.

Remarque : L'actionneur est vendu séparément.

Isolated power supply

Figure 2: Stepdown isolation transformer, provided with the VMS-1655M



Note: Install this product with the manufacturer provided isolated power supply and connect to an electrical circuit protected by a minimum 20A circuit breaker. Mount this circuit breaker in an approved electrical enclosure located separately, but in close proximity, to this product.

Installation

The VMS-1655M incorporates two analog output signals, one is a 0 VDC to 10 VDC actuator control output for controlling the Flow Safe Vortex II baffles and the other is a 4 mA to 20 mA output for monitoring hood exhaust air flow remotely. These factory-calibrated analog signals are available at the vortex sensor connector. The VMS-1655M is also capable of being directly monitored by the BMS over the BACnet MS/TP RS485 port (CN7) located at back of the VMS-1655M touchscreen display. See page 17 for BACnet object list.

Note: While the VMS-1655M model is calibrated and programmed at the factory with default settings for fume hood applications, a final calibration of face velocity is required following installation.

Installation

Correct location of the vortex sensor is crucial for obtaining the best possible operation of the VMS-1655M. The system measures the internal negative pressure of the fume hood to accurately determine the face velocity at the sash opening. The sensor must be located in a position that is least affected by turbulent air within the fume hood. See Figure 10.

See Figure 9 and Figure 10 for dimensions and suggested mounting arrangements of the flow sensor on the fume hood.

Note: Be certain that sensor reference port is in laboratory room air. If necessary to obtain this, use the louvered mounted on exterior panel of the fume hood.

See Figure 10 for mounting details for the VMS-1655M touchscreen display unit. The preferred location is eye-level, usually on one of the side bezel panels. Please note that the display unit is cable connected to the vortex sensor module, and provisions must be made to route the cable without interference with the fume hood sash or sash cable.

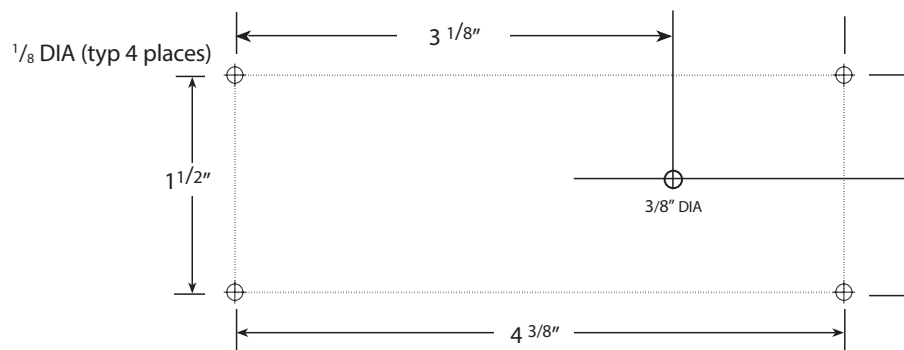
Note: Remove red cap from sensor after installation.

To monitor the VMS-1655M over a BACnet MS/TP BAS network, connect the VMS-1655M touchscreen display to the BMS via the CN7 terminal block located on back of display board. Make sure to observe correct polarity of RS485 connection.

Connect the interface cable between the vortex sensor and the touchscreen display before applying power to the system.

Mounting and wiring

Figure 3: Vortex sensor mounting location



Sensor placement

New Stable Vortex II Fume Hoods come with the VMS-1655M pre-installed at the factory. If you install the VMS-1655M on a Conversion Kit, install the sensor and its reference plate as shown in the following figures.

Figure 4: Vortex sensor location

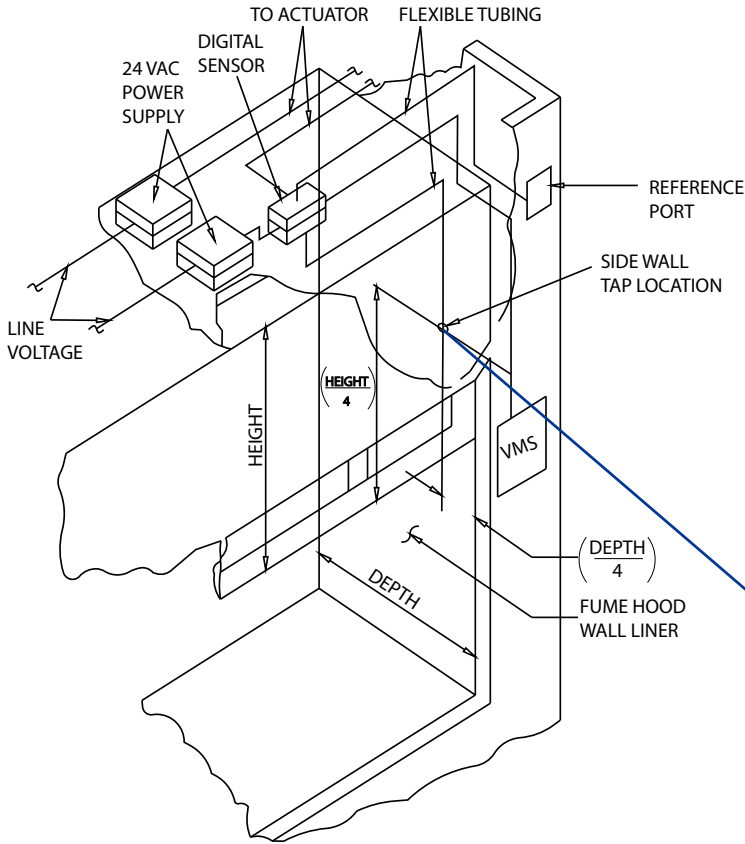


Figure 5: Vortex sensor location



Figure 6: Vortex sensor location



Note: Height equals maximum sash opening measured from hood ceiling surface. Depth equals measurement from sash window to rear baffle.

Install the sensor in the hood's sidewall as shown in Figure 4.

Figure 7: Hood location



Mount the vortex sensor reference plate on the hood away from where it might encounter airflow turbulence. Connect the supplied tubing to the reference port of the sensor and then to the barbed fitting on the sensor reference plate.

Vortex sensor mounting location

Figure 8: Preferred vortex sensor mounting

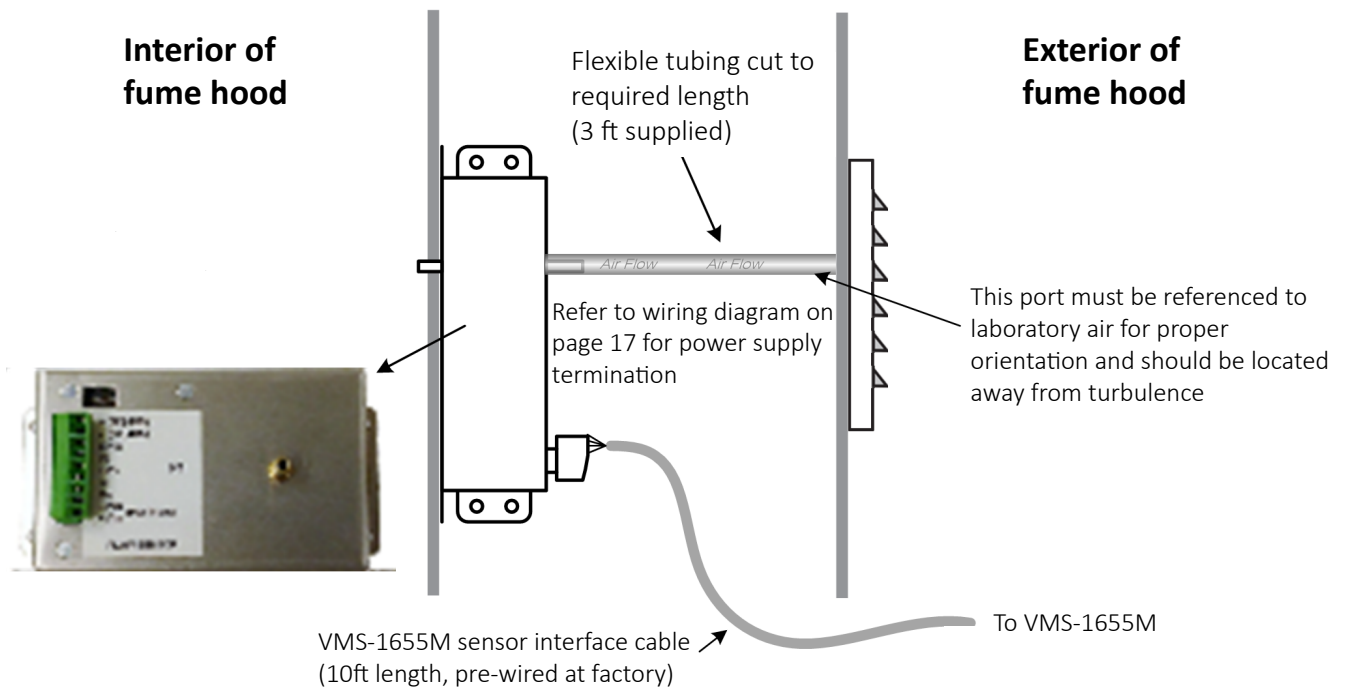
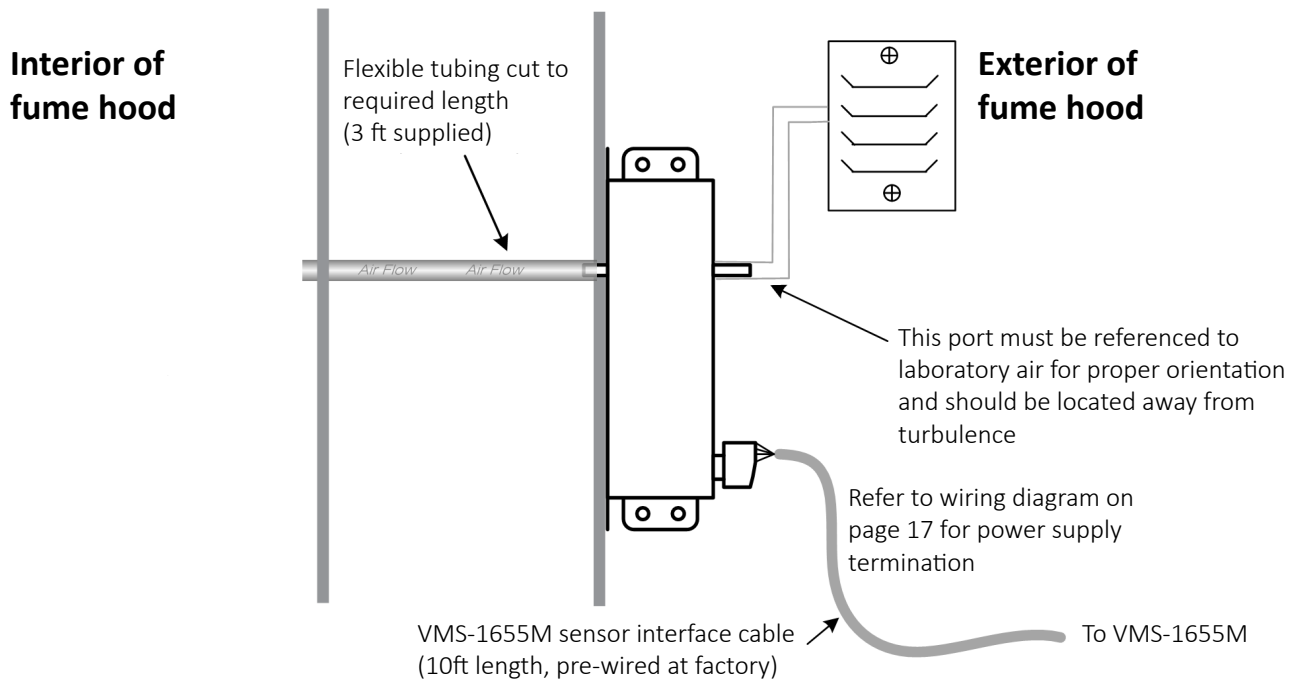
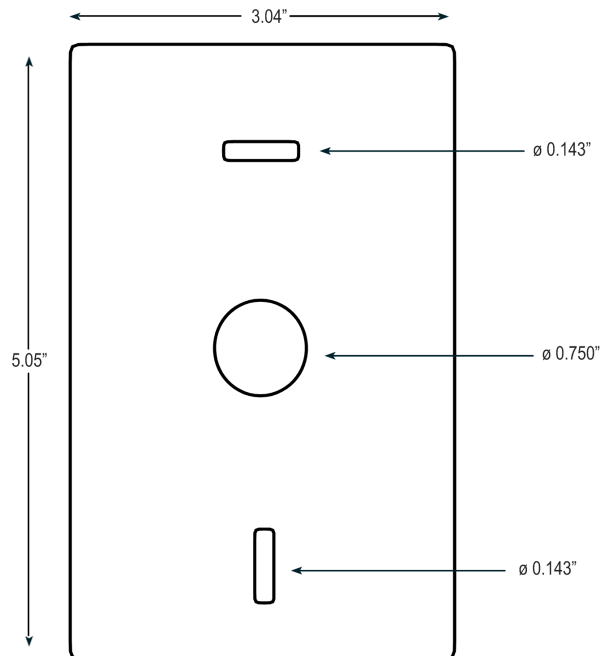


Figure 9: Alternative vortex sensor mounting location



Mounting location

Figure 10: Display mounting hole pattern



You can use the two slots along the centerline to mount the VMS-1655M backplate directly to a standard single-gang wall box. Use the backplate as a template to mark the mounting holes and the cable access hole at the center of the backplate.

Applying power

Follow the correct installation of the VMS-1655M, apply power to the unit, and confirm that you hear a brief chirp at the touchscreen display. There is a 6 s power-up delay during which time, the 360° Safety Halo cycles through the following colors: red, green, blue, yellow, magenta, cyan, and white.

After this power-up delay, the unit displays a brief 5 s animation of the action icons, followed by the VMS-1655M splash screen. The splash screen displays the model number, electronic serial numbers, firmware version numbers, and current network address. The splash screen displays for about 15 s, and then proceeds to the main display screen. Use the About This VMS option on the diagnostics menu to re-display the information that shows on the splash screen during the power-up sequence.

Main display screen

All VMS-1655M units ship from the factory in the decommissioned operating mode, which is represented by a blue graphical screen with a disabled status icon at the center of the screen. The information that displays on the main screen includes the following information from top to bottom:

- Current operating mode and status
- Status icon centrally located

Located at the bottom of the display is an audible toggle button.

While in decommissioned operating mode, the screen background is blue. However, while in occupied mode, the screen background represents the current alarm status of the unit. A green background with a check mark at the center indicates that the current face velocity is within enableable limits of the required setpoint.

A yellow background with an exclamation point at the center indicates that the current face velocity drifts outside the enableable limits of the required setpoint and is in the caution range. A red background with an exclamation point at the center indicates that the current face velocity reaches a critical unsafe condition, as it is beyond the safe operating range. An alarm buzzer sounds at this screen and also provides an audible alert of the unsafe conditions.

Configuring the vortex monitor

The initial setup of the VMS-1655M Vortex Monitor involves the following simple steps:

- Calibrate vortex sensor
- Configure face velocity alarm setpoints

Calibrating the vortex sensor

The standard VMS-1655M comes pre-configured and pre-calibrated with a vortex sensor that is installed in the sidewall of the monitored fume hood.

After installation, to begin the calibration of the vortex sensor, complete the following steps:

1. Touch the touchscreen display anywhere other than one of the hotspot locations to enter the **Main Setup Menu**. See page 13 for hot spots features.
2. From the **Main Setup Menu**, select **Unit Setup > Hood Setup > Field Calibration**. At this initial field calibration screen, cap the vortex velocity sensor to prevent air flow.
3. Confirm that the sensor pressure reading is at 0.00 pascals, and tap the **Next** button to proceed to the next field calibration screen.
4. With the sash positioned at a height of 18 in., measure the face velocity in 3 locations across the sash opening with a calibrated air flow measuring instrument.
5. Use the slider on the field calibration screen to enter the average of the three velocity readings.
6. Tap the **OK** button to complete the field calibration procedure of the fume hood vortex sensor.

Configuring face velocity alarm setpoints

The VMS-1655M features a comprehensive alarm facility that includes both audible and visual capabilities. To configure the alarm setpoints for the face velocity, complete the following steps:

1. Touch the touchscreen display anywhere other than one of the hotspot locations to enter the **Main Setup Menu**. See page 13 for hot spots features.
2. From the **Main Setup Menu**, select **System Setup > Alarm Limits**.
3. Use the popup numeric keypad on the touchscreen display to enter the **High Alarm**, **High Warning**, **Low Warning**, and **Low Alarm** setpoints. The default settings for the occupied mode face velocity alarm setpoints are 150 fpm, 130 fpm, 90 fpm, and 75 fpm.

Changing fume hood operating mode

You can set the VMS-1655M vortex monitor for occupied, and decommissioned modes of operation. To change the mode of operation, select **Unit Setup > Hood Setup > Operating Mode** to prompt you to select one of two modes.

Setting a deadband

The VMS-1655M vortex monitor has a deadband feature to help keep the actuator control signal constant until the sensed velocity has gone above or below the deadband limit.

To set the deadband, select **Unit Setup > Hood Setup > Set Deadband** and use the numeric keypad to enter the deadband value as a percentage using the numeric keypad. Click **Finish** to save the setting.

Figure 11: Operating mode election pop-up screen



To quickly change the operating mode from the main display without entering the user menus, use the Hood Status hotspot to invoke the Operating Mode selection pop-up. See Figure 7.

Figure 12: Alarm buzzer may be set for audible



The alarm buzzer may be selected for one of two modes of operation: Audible or Silent Mode. If audible mode is selected, a delay may be specified in seconds or minutes.

If Silent Mode is selected, then the alarm buzzer will not sound whenever the unit encounters an alarm condition. The alarm buzzer will reset to audible mode when alarm condition has cleared

The VMS-1655M can be monitored over a BMS network using the BACnet MS/TP protocol available at CN7 terminal on the VMS-1655M- User Interface display. Refer to page 17 for CN7 location.

The VMS-1655M also provides an analog output signal that linearly represents the exhaust air flow when a flow pressure sensor is connected to the analog input at the VMS-1655M vortex sensor. This output may be connected to an available analog input on a third party controller, thereby allowing the hood exhaust air flow to be monitored from the BMS front-end.

Changing network settings

To change network settings on the VMS-1655M, select **Unit Setup > Network Setup**. The **Network Setup** menu presents you with the available options.

All VMS-1655M units have a BACnet MS/TP protocol and the **Network Setup** menu options relate to this protocol. From this menu, you can select a different baud rate or change the network address of the unit.

Adding password security

You can add up to ten multi-level passwords to the system to protect the VMS-1655M menu system. To create a password entry, complete the following steps:

1. Select **System Setup > Passwords Setup > Add Password** to prompt you to enter a minimum of four digits and a maximum of eight digits.
2. When you enters a password, the system prompts you to specify one of four access levels: Unrestricted, Standard, Basic, and Restricted. All password entries save to non-volatile memory.

In the event of a forgotten password, a factory-default password provides unrestricted access to the user menu system. Consult with the factory for more information about this password. The first user password automatically saves as unrestricted.

Changing display settings

The 360° Safety Halo feature significantly enhances the status visibility of individual units, and enables an unsafe fume hood to be immediately recognized from anywhere in the laboratory space. Use the 360° Safety Halo option on the Display Setup menu to configure the display settings of this feature. Disable this option if the installation does not require it, which simply turns off the 360° Safety Halo status indicator. If you enable this option, you can adjust the brightness from full intensity to barely visible in daylight conditions.

You can also use the **Set Brightness** option on the **Display Setup** menu to adjust the brightness of the VMS-1655M main display screen. All brightness settings store to non-volatile memory and remain in effect through a power cycle.

Built-in diagnostics

The VMS-1655M incorporates several useful diagnostic tools to diagnose and troubleshoot the system during the installation and commissioning phase. The **Override PID Out** option enables an override of the analog output. You can lock the analog output at the overridden percentage, while test and balance makes adjustments to the exhaust damper. If you enable this option, the analog output disconnects from its control loop while in the overridden state. If you cancel the override, the normal control loop operation resumes.

A unique feature of the VMS-1655M is the real-time view option, which enables you to see in real-time the actual face velocity, actuator deadband, actuator position, and exhaust flow.

Cleaning the display

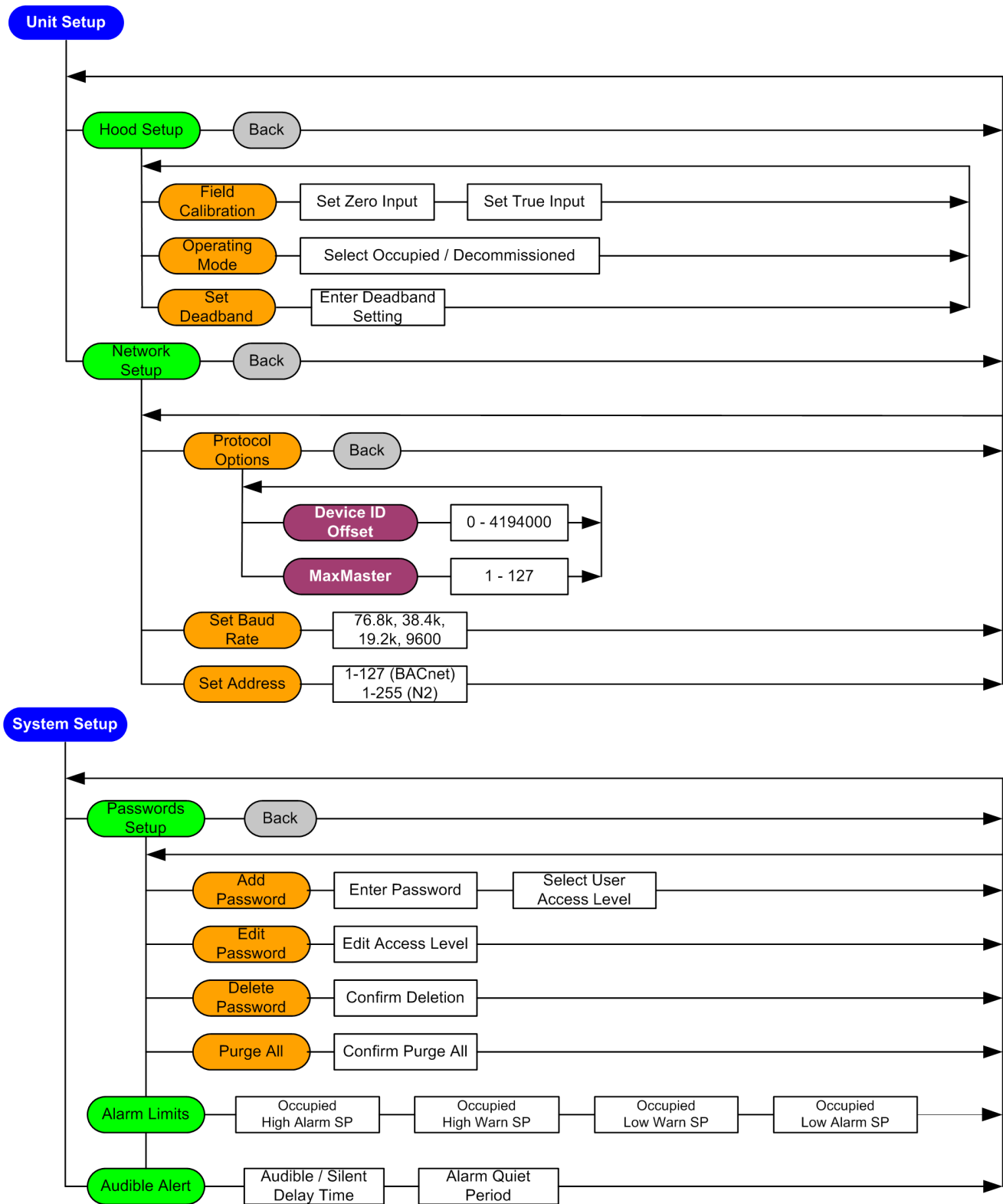
- Use a dry or lightly dampened cloth with a mild cleaner or ethanol. Make sure that the cloth is only lightly dampened, not wet.
- Never apply cleaner directly to the touch panel surface. If you spill cleaner on to the touch panel, soak it up immediately.
- Cleaner must be neither acid or alkali. Use a cleaner with a neutral pH.
- Never use organic chemicals such as: paint thinner, acetone, toluene, xylene, propyl or isopropyl alcohol, or kerosene.

Figure 13: Hot-Spot features of VMS-1655M touchscreen display



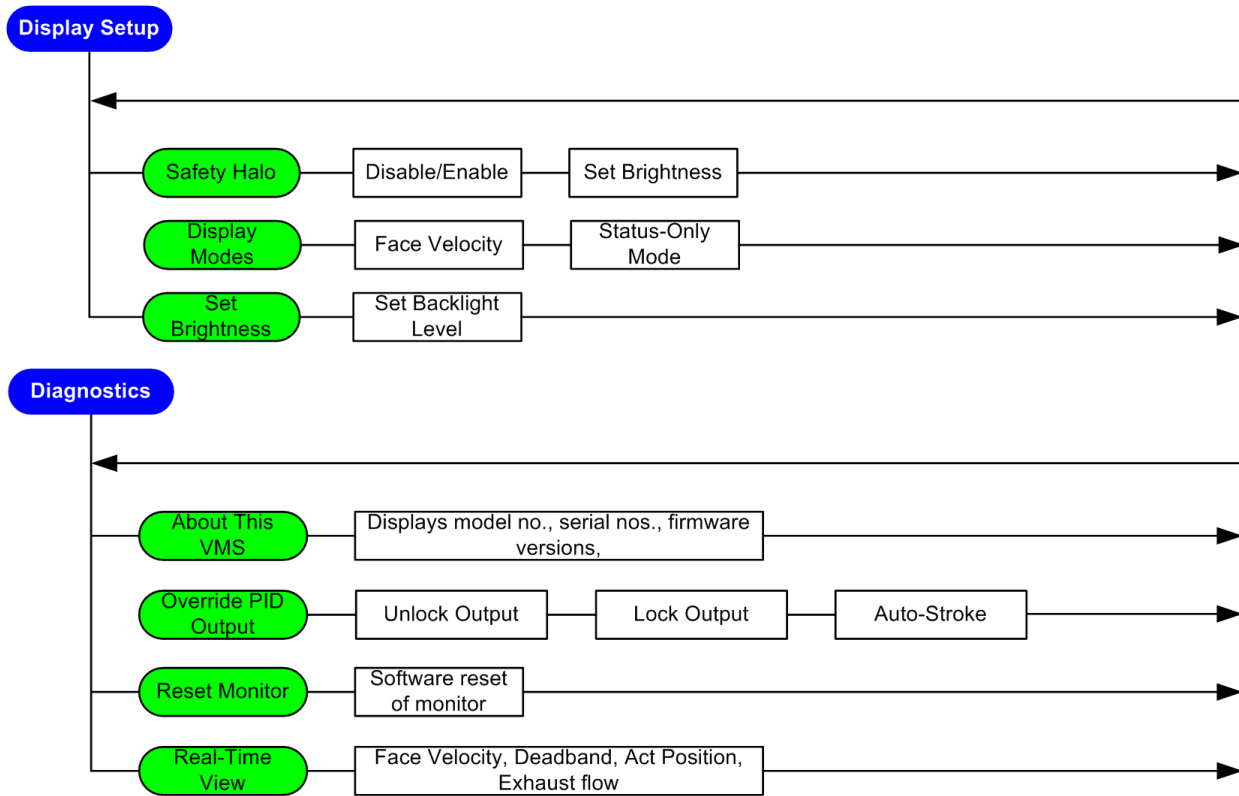
Setup menu tree

Figure 14: Unit and system setup



Display setup

Figure 15: Display setup



Module settings

Configuring display module settings

Options dipswitch (S1): internal use only		
1. Graphics Chip Mode Selection	OFF = Programming Mode	ON = Run Mode
2. Touchscreen Calibration Mode	OFF = Force calibration	ON = Auto calibration
3. Reserved		
4. Reserved		

Options dipswitch (S2): mode configuration 1		
1. Product Type	OFF = VMS-1655M	ON = Invalid
2. Reserved		
3. Mode Select	OFF = Invalid	ON = VMS-1655M
4. Operational Mode	OFF = Demo Mode	ON = Run Mode

Push button Switch (SW1):	Reset Button	
Push button Switch (SW2):	Reserved	

BACnet objects

The following table itemizes the list of points available for integration in a building management system (BMS). This table contains the objects for open BACnet integration.

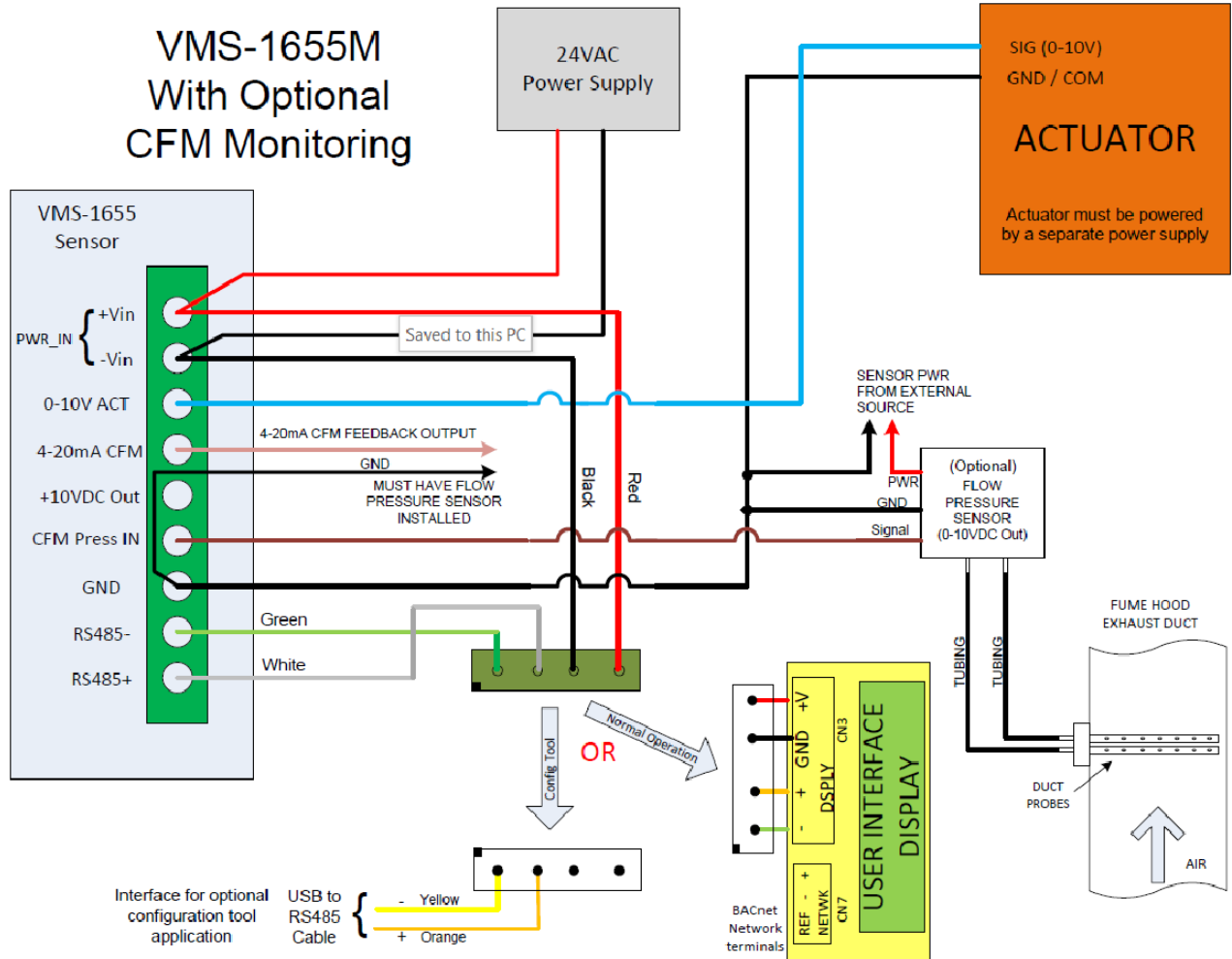
Object instance	Functional description	Read or Write
Analog inputs		
AI - 1	Analog Input 1 (Fume Hood Face Velocity)	Read-only
AI - 2	Analog Input 2 (Exhaust Air Flow)	Read-only
Analog outputs		
AO - 1	Analog Outputs (Actuator Position %)	Read-only

Object instance	Functional description	Read or Write
Analog inputs		
AV - 1	Face Velocity Low Alarm Setpoint	Read/Write
AV - 2	Face Velocity Low Warning Setpoint	Read/Write
AV - 3	Face Velocity High Warning Setpoint	Read/Write
AV - 4	Face Velocity High Alarm Setpoint	Read/Write
AV - 5	Face Velocity Deadband percentage	Read/Write
Multistate objects		
MSO - 1	Operating Mode: 1 = occupied, 2 unoccupied*, 3 = decom	Read/Write
MSO - 2	Alarm Status: 1 = normal, 2 = warning, 3 = alarm	Read-only

* Can only be set if you enable the option at the VMS-1655M User Interface.

Wiring

Figure 16: VMS-1655M wiring



■ Technical specifications

Electrical	Face velocity range	0 fpm to 600 fpm
	Accuracy of measurement	± 2 fpm, Accuracy is ± 5 fpm when velocity drops below 60 fpm or exceeds 140 fpm. Configure maximum face velocity through the Configuration Tool.
	2 analog outputs	0 VDC to 10 VDC, 4 mA to 20 mA
	1 analog inputs	0 VDC to 10 VDC
	Power supply	Class 2, 24 VAC ± 10%, 30 VA universal 120/240 VAC to 24 VAC, 60/50 Hz, step-down isolation transformer provided
	Cable type	Belden 1325A
Communications	BACnet MS/TP network	Two-wire twisted pair, RS-485 signaling
	Cable type	Belden 3107A
Touch screen user interface	LCD size	3.2 in. diagonal
	LCD type	Transmissive
	Resolution	240 pixels x 320 pixels portrait
	Viewing area	50.6 mm x 66.8 mm
	Color depth	18-bit or 262K colors
	Back light color	White
	Luminous intensity	Min 2500 cd/m2
Mechanical	VMS-1655M surface-mount enclosure (height x width x depth)	5 in. x 3 in. x 1.13 in.
	External vortex sensor housing (height x width x depth)	4 in. x 2.5 in. x 2 in.
	Stainless steel cover plate for flow tube (height x width x depth)	4.5 in. x 2.7 in. x 0.2 in.
	VMS-1655M with flow tube cover plate	Approx. 3.5 lb
	VMS-1655M with vortex sensor	Approx. 4.0 lb
	Flow tube cover plate mounting	Flush
Environmental	Operating temperature	32°F to 125°F
	Operating humidity	10% - 95%

1. NIST Traceable/Individual certification available as an option.
2. Accuracy is ±5 FPM when velocity drops below 60 FPM or exceeds 140 FPM.

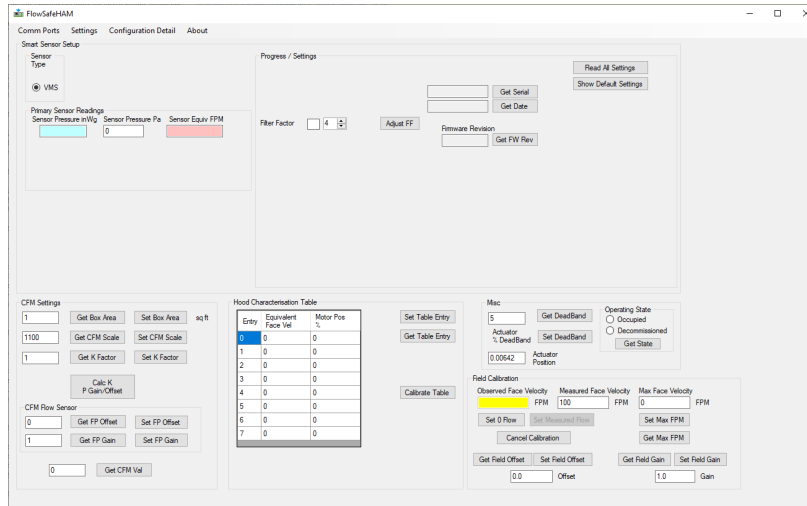
The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult your local Triatek representative. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

VMS configuration

The VMS configuration tool comes as a zipped file folder. To connect the tool to the sensor, you need a USB to RS485 cable, available from an online retailer or from the JCI factory. To install the VMS configuration tool, complete the following steps on a laptop:

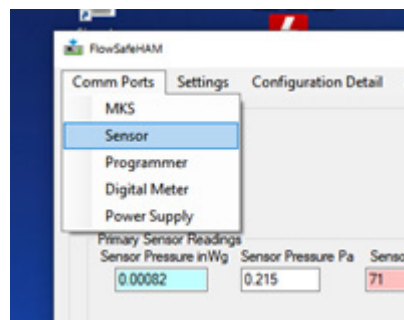
1. Open the tool folder.
2. Double-click the **setup.exe** file and follow the steps in the install wizard. When installed, the program appears as shown in the following figure.

Figure 17: FlowSafeHAM homescreen



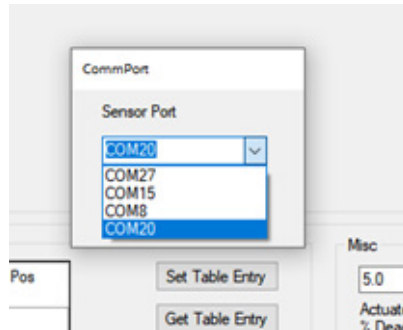
3. With the USB to RS485 cable, connect the orange (+) wire to the RS485+ terminal of the sidewall sensor and connect the yellow (-) wire to the RS485- terminal.
4. Remove the RS485 connection to the display module. The display continually communicates with the sensor and disrupts the computer communications.
5. Insert the USB connector of the cable into an available USB port on your computer and, for first time connections, wait until the USB driver installs.
6. Open the computer Control Panel program and select **Device Manager**.
7. Click **Ports** to view the list of Comm ports on the computer. Remove the USB plug and take note of which COM port number vanishes. Reinsert the USB plug.
8. In the VMS configuration tool, select the **Comm Ports** tab and select **Sensor**.

Figure 18: Comm ports



9. A **Comms Port** dialog appears. Select the COM port number that you noted in Step 7.

Figure 19: Comm port number



Make sure that the VMS sensor powers on. The USB plug flashes red for the request and green as a response from the sensor. Some of the pressure and face velocity fields populate. The GET buttons request and present the associated information. **Get Serial**, **Get Date**, and **Get FW Rev** return preset information about the sensor unit. The sensor is in an operating and calibrated condition from the factory settings, but you can field-calibrate various aspects.

Note: As the airflow in the fume hood is turbulent, the pressure readings that you use to compute face velocity can also be noisy. You can dampen the pressure readings with a Filter Factor parameter. The greater the number is, the larger the damping effect on the face velocity reading is, and also the slower the response with changes in the face velocity is. In most cases, a starting value of 4 to 6 is sufficient.

Figure 20: Filter Factor

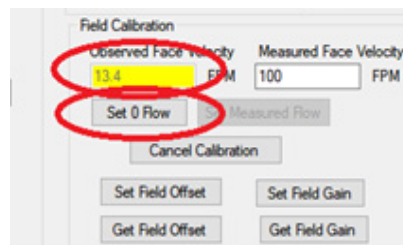


You can calibrate the measured Face Velocity to conform with the specifics of the local fume hood. The sensor uses a two-point calibration. The first point is the zero or offset calibration. Before calibration, you must cap the sensor to remove any air pressure from the hood on it.

To achieve the first point, zero or offset calibration, complete the following steps:

1. Cap the ¼ in. nipple exposed inside the hood with the red sensor cap.
2. In the **VMS configuration tool**, watch the **Observed Face Velocity** field and wait until the value is stable, this may or may not be 0.
3. When stable, click the **Set 0 Flow** button.

Figure 21: Observed Face Velocity



4. Remove the cap from the sensor.
5. Adjust the hood sash so that the face velocity is at a normal operating value or higher than 60 fpm. Wait until the value stabilizes.
6. Use an external velocity measuring instrument, for example, Shortridge, Alnor or equivalent, to measure the velocity at the face.
7. Enter the measured face velocity in the **Measured Face Velocity** field and click the **Set Measured Flow** button. The Offset and Gain fields now update and the data is sent to the sensor. The sensor is now calibrated to local conditions.

Figure 22: Measured Face Velocity

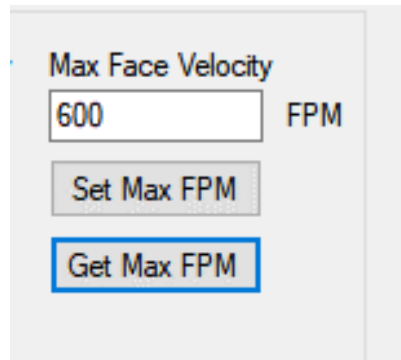


8. At any point, if you need to stop the procedure, click the **Cancel Calibration** button.

Face velocity

As the exhaust is at a constant volume, the face velocity varies as the sash moves up and down. When the sash reaches the closing position, the face velocity is very high. Use the **Max Face Velocity** setting to limit the internally used limit and the face velocity on display.

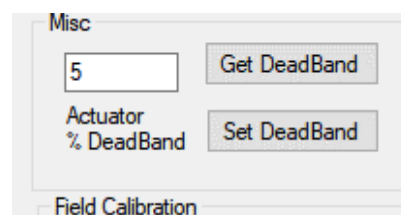
Figure 23: Max Face Velocity



Click the **Get Max FPM button** to obtain the current setting. To change the current setting, enter a new value in the text field and click **Set Max FPM**.

To prevent the baffle actuator from continually adjusting with fluctuating face velocities, You can set a deadband on the motor operation. The deadband is expressed as a percentage of motor movement. For example, a value of 5 indicates that the motor only moves if its positional requirement changes more than +5% or -5% from the current position. View or set this value with the **Get DeadBand** and **Set DeadBand** fields.

Figure 24: DeadBand

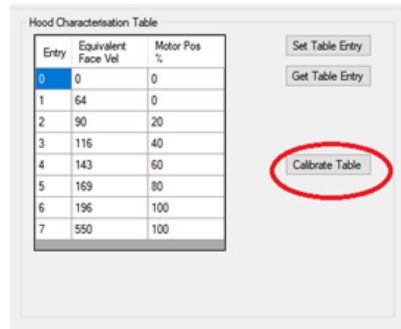


Calibrating the characterization table

The Flow Safe fume hood uses a vortex technology to maintain fume hood safety. A baffle at the rear of the fume hood manipulates the vortex. The face velocity derives a characterization table that determines the position of the baffle. As each fume hood is different, and the cfm settings are different, the characterization table may need calibration in the field with its respective hood. To calibrate the characterization table, complete the following steps:

1. In the FlowSafeHAM window, in the **Hood Characterisation Table** section, click **Calibrate Table** to view the table calibration dialog.

Figure 25: Hood Characterisation Table

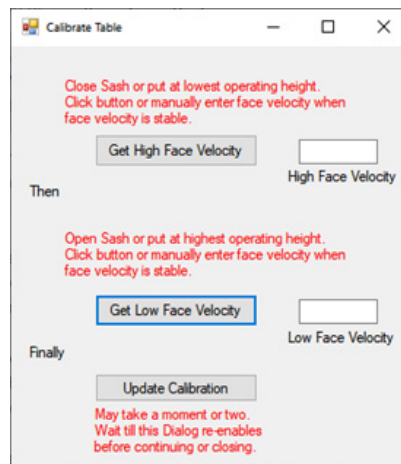


2. In the **Calibrate Table** window, move the sash to the lowest operating height or lowest expected point of use. At this position, the face velocity is the highest.
3. Wait until the face velocity stabilizes and either click the **Get High Face Velocity** button, or manually enter the tool-reported face velocity into the **High Face Velocity** text box.
4. When the low sash position is complete, move the sash to the highest operating height or highest expected point of use. At this position, the face velocity is the lowest.
5. Wait until the face velocity stabilizes and either click the **Get Low Face Velocity** button, or manually enter the tool-reported face velocity into the **Low Face Velocity** text box.
6. When the **High Face Velocity** and **Low Face Velocity** entries are in place, click the **Update Calibration** button.

The tool computes a new characterization table and sends it to the controller. During this time, the **Calibrate Table Dialog** is grayed out.

Note: Make sure that you set the max face velocity as this is also used to generate a table.

Figure 26: Table Calibration options



When the process completes, the **Dialog** re-enables. You can close the Dialog at this time.

The table in the tool updates with values that correspond to the high and low face velocities, as well as the max face velocity.

Figure 27: Updated Hood Charactization table

Entry	Equivalent Face Vel	Motor Pos %
0	0	0
1	64	0
2	90	20
3	116	40
4	143	60
5	169	80
6	196	100
7	550	100

Optional flow sensor setup

The controller can accept three input signal ranges (0 V to 5 V, 0 V to 10 V, 4 mA to 20 mA) from a pressure or flow sensor that attaches to a flow probe in the duct work. This signal computes a cfm value that, with scaling, outputs on the 4 mA to 20 mA output signal. Information and tools to set this up are available in the **CFM Settings** tab.

Figure 28: CFM settings

CFM Settings

1 Get Box Area Set Box Area sq ft

1100 Get CFM Scale Set CFM Scale

1 Get K Factor Set K Factor

Calc K P Gain/Offset

CFM Flow Sensor

0 Get FP Offset Set FP Offset

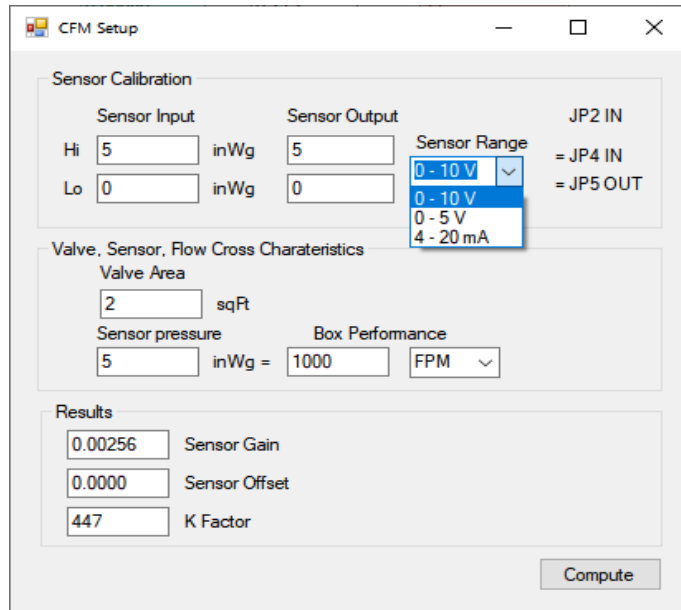
1 Get FP Gain Set FP Gain

0 Get CFM Val

To calculate and generate the cfm and cfm 4 mA to 20 mA, the tool uses the following parameters:

- Pressure reading: The pressure sensor calibration, gain, and offset.
- K factor
- Valve area
- Scaling factor for cfm to 4 mA to 20 mA conversion

Figure 29: Sensor Calibration



To set the calibration factors, gain, and offset to convert the sensor voltage to pressure, complete the following steps:

1. In the **CFM Settings** window, click the **Calc K P Gain/Offset** button and a **CFM Setup** window opens.
2. In the **CFM Setup** window, in the **Sensor Calibration** section, enter the features of the sensor that are in use.
3. From **Sensor Range** list, select the sensor range or signal type.

Note: Make sure that the configuration of JP2, JP4, and JP5 links correspond to the information on the dialog.

4. Enter the output of the sensor for a specific duct velocity or cfm.
5. In the **Valve, Sensor, Flow Cross Characteristics** section, in the **Valve Area** field, enter the valve area in sq. ft.
6. From the **Box Performance** list, select **FPM** (velocity) or **CFM** (flow) as the interpretation of the sensor signal.
7. Click **Compute**. The **Sensor Gain**, **Sensor Offset**, and **K Factor** compute. These values transfer to the appropriate fields in the main tool display. The values you update highlight in yellow, as they do not pass to the controller yet.
8. If the values are valid, click **Set K Factor**, **Set FP Offset**, and **Set FP Gain** to update the VMS with the settings.
9. **Optional:** Click **Get CFM Val** to view the current CFM value.

Note: To enable multiple cfm ranges for the 4 mA to 20 mA output signal, you must enter a CFM Scale factor. This value represents what cfm the 20 mA signal output represents. For example, if you enter a scale factor of 1000, when the cfm is 0, the output is 4 mA, when the cfm is 1000 cfm or above, the output is 20 mA, and when the cfm is 500 cfm, the output is 12 mA. In the CFM Setting window, in the CFM Scale field, enter the scaling factor and click **Set CFM Scale** to communicate it to the VMS.

■ North American Emissions Compliance

United States

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 this 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 may cause harmful interference, in which case users will be required to correct the interference at their own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Patents

Patents: <https://jciapat.com>

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