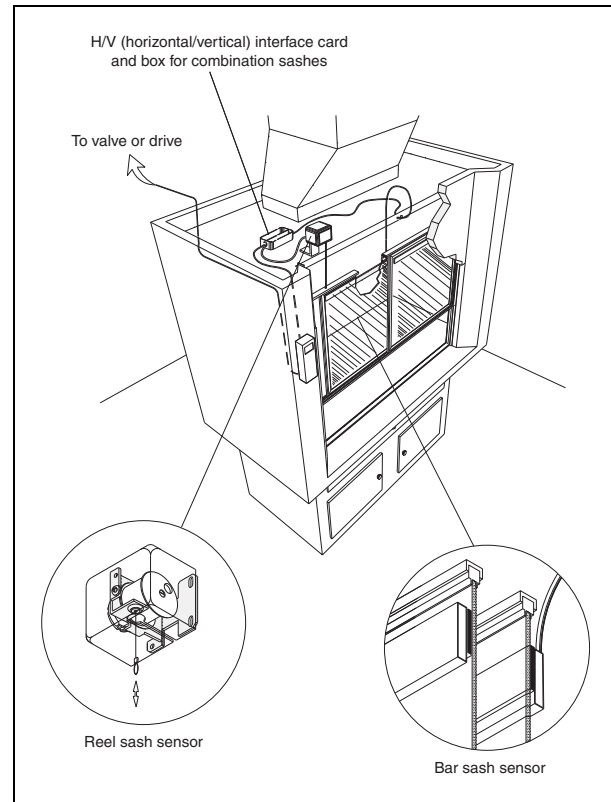


Phoenix Controls Sash Sensors detect a fume hood's sash position. Sensors can be configured to operate with the sash configurations found on most VAV fume hoods. The sash sensors are used together with a Phoenix Controls fume hood monitor and airflow control valve or drive to maintain a constant average face velocity at the sash opening (see drawing at right).

FEATURES

Phoenix Controls offers the following types of sash sensors:

- **Vertical sash sensor (VSS)** - A precision potentiometer coupled with a stainless steel, nylon-jacketed cable that attaches to the vertically rising fume hood sash or counterweight cable. As the sash moves, the reel/potentiometer rotates and changes resistance. A variable sash position voltage is received by the fume hood monitor.
- **Horizontal sash sensor (HSS)** - Either sensor and magnet bar sets attached directly to overlapping panes or magnet bars and blocking strips attached directly to the overlapping panes with a fixed sensor bar mounted across the entire horizontal sash opening. As the sashes are moved, the magnet bar covers part of the sensor bar, closing the magnetic switches it overlaps. The sensor bar changes resistance and a variable sash position voltage is received by the fume hood monitor.
- **Combination sash sensors (CSS)** - Measures vertically moving sashes that contain horizontally moving panes within each sash. Both reel and bar sensors (as with an HSS) are used in conjunction with a horizontal-to-vertical (H/V) card that combines all inputs. The H/V card sends one signal representing overall sash position to the fume hood monitor.
- **Special sash sensors (SSS)** - For sash configurations that can't be handled by other sash sensor products. Consult with Phoenix Controls when considering a customized, special sash sensor.



Types of Sash Sensors.

SPECIFICATIONS

VSS

- Direct reel sash sensing technology
- Stainless steel, nylon-jacketed cable coupled to a ten-turn precision potentiometer. Maximum retraction of 41 in. (1041 mm).
- 0-10,000 ohm output proportionate to sash position
- 1, 2, 3 or 4 vertical sensors available for side-by-side configurations
- Tested for 475,000 life cycles
- 22 AWG two-wire, PVC-jacketed signal cable factory wired (12 ft., 3.6 meters)
- Surface or bracket mount (bracket not included) on top of hood
- Dimensions: 2.05" H, 2.00" W, 2.50" L (52 x 51 x 64 mm)
- 0-50 °C (32-122 °F) ambient
- Color: Light gray

HSS

- A sensor bar/magnet combination measures overlap between sashes.
- Sensor/magnet bars are 0.3 in. (8 mm) thick with tape and 1 in. (25 mm) wide
- Standard and thin magnet bars must be mounted within 0.75 in. (19 mm) of the sensor bar
- Strong magnet bars must be mounted within 1.25 in. (31.75 mm) of the sensor bar
- 22 AWG two-wire, FEP-jacketed rigid plenum-rated cable factory wired (15 ft., 4.5 meters)
- Maximum sensor bar length of 75 in. (1905 mm) cumulative for HSS1xx and 120 in. (3048 mm) for HSS3xx
- Bar lengths made to order
- Color: Light gray

CSS

- Utilizes reel and bar sensors
 - Interface card and box mounted on top of hood
 - Requires a three-conductor cable from interface card to monitor
- SSS**—Requires factory consultation

FCC COMPLIANCE

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.
2. This device must accept any interference received, including interference that may cause undesired operation.



See wiring diagrams

ORDERING GUIDE

CSS 3 -nn nn-A 2 A -ZZ M - YYY S -XX B-WZ - NVS

SASH CONFIGURATION

VSS = Vertical sashes only (see Notes)
 HSS = Horizontal panes only (see Notes)
 CSS = Combination sashes (see Notes)

PRODUCT SERIES

1 = When present, Moveable sensor bars, analog H/V
 3 = Fixed sensor bars, analog H/V

TOTAL NO. OF VERTICALLY-MOVING SASHES

The entry in this field must be preceded by a zero
 Allowable range is 00 to the following maximums:
 VSS 1 = 05
 HSS 1 & 3 = 00
 CSS 1 & 3 = 04

TOTAL NO. OF HORIZONTALLY-MOVING PANES

Single digit numbers in this field must be preceded by a zero
 Range is 00 to the following maximum allowable for each series:
 VSS 1 = 00
 HSS 1 & 3 = 13
 CSS 1 & 3 = 13

THROW OF VERTICAL SASHES

A = All reels have a standard throw
 N = Not applicable

NO. OF TRACKS - ALL HORIZONTAL FRAMES

0 = Not applicable
 2 = Two tracks in all horizontal frames
 3 = Three tracks in all horizontal frames

LOCATION OF COMBINATION SASHES

A = All
 N = Not applicable

For Moveable & Fixed Sensor Products (except VSS)

MAGNET BAR LENGTH

Allowable range is from 06 to 75 inches, in whole inches only, rounded down
 Single digits must be preceded by a zero

MAGNET BAR TYPE

M = Standard magnet bar - aluminum housing 0.3" thick with tape, 0.75" from sensor bar
 P = Powerful magnet bar - aluminum housing 0.3" thick with tape, 1.25" from sensor bar
 T = Thin magnet bar - PVC jacket 0.17" thick with tape, 0.75" from sensor bar

SENSOR BAR LENGTH

Range is in whole inches only, rounded down
 Single digits must be preceded by two zeros; double digits preceded by one zero
 Allowable lengths by series are:
 HSS1: 006 - 075 inches
 HSS3: 006 - 150 inches
 CSS1: 006 - 080 inches
 CSS3: 006 - 150 inches

SENSOR BAR TYPE

S = Standard sensor bar
 R = Sensor bar with integral take-up reel (for Fixed Sensor products only)

For Fixed Sensor Products ONLY

BLOCKING STRIP LENGTH

Allowable range is in whole inches only from 06 to 75, rounded down
 Single digits must be preceded by a zero

BLOCKING STRIP TYPE

B = 2-inch wide blocking strip

Z BRACKET HEIGHT

1Z = 0.75 inches
 3Z = 3.00 inches
 4Z = 4.50 inches

OPTIONS

INT = Add an analog H/V card; applicable to HSS1 only, used to create direct acting signal
 NVS = No Vertical Sensor; removes the reel sensor from a CSS or SSS assembly
 CNV = Converter card; add-on card to the H/V assembly to convert 24 Vac to DC power for analog interface boards

Notes:

VSS - Multiple sashes cannot be above or below each other and must be of equal width.
 HSS - Multiple frames arranged side-by-side, above or below each other.
 CSS - Horizontal frame contained within a vertical frame. Multiple side-by-side only. Sashes cannot be above or below each other.
 Multiple combination sashes must have identical components and dimensions.

APPLICATIONS

Phoenix Controls sash sensors are used with fume hood monitors and airflow control devices to accomplish:

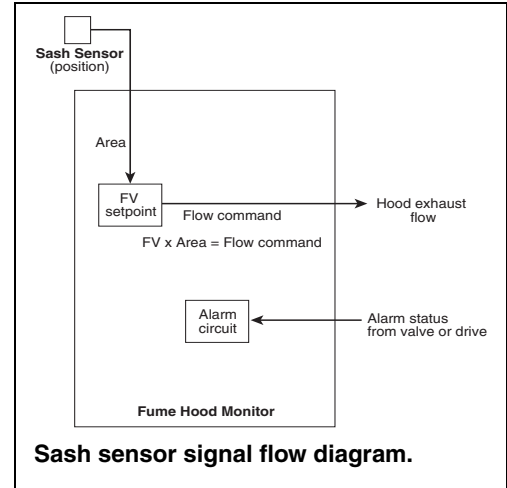
- **Constant face velocity control**—The goal is to maintain a constant face velocity (FV) as the sash opening varies. A change in the sash area causes a linear change in exhaust volume ($FV \times \text{Area} = \text{Flow command}$).

Example:

$$100 \text{ ft}^3/\text{min} \times 2 \text{ ft}^2 = 200 \text{ CFM} \quad (0.5 \text{ m/s} \times 0.5 \text{ m}^2 = 900 \text{ m}^3/\text{hr})$$

$$100 \text{ ft}^3/\text{min} \times 6 \text{ ft}^2 = 600 \text{ CFM} \quad (0.5 \text{ m/s} \times 1.0 \text{ m}^2 = 1800 \text{ m}^3/\text{hr})$$

- **Alarm indication**—A fume hood monitor, in conjunction with a sash sensor, generates the following alarms:
 - VAV fume hood monitors—Alarm indication when the feedback signal differs from the command signal.
 - Constant volume/two-position fume hood monitors—Optional sash opening alarm indication when sash position voltage exceeds the sash opening set point voltage.



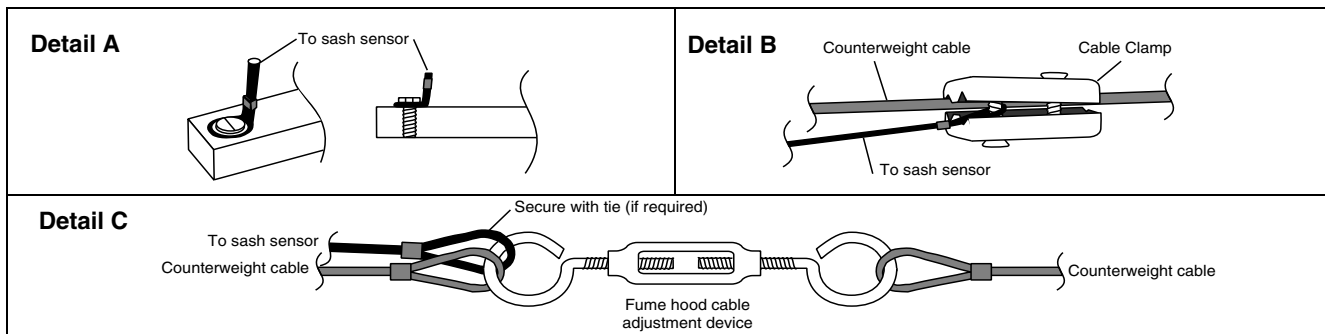
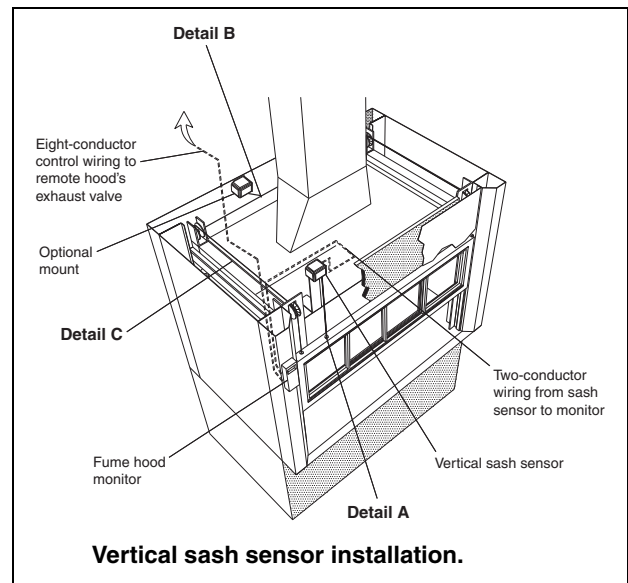
INSTALLATION

Materials and Procedures for Vertical Sash Sensor Installation

- Phoenix Controls sash sensor
- Two mounting screws*
- Optional:
 - Cable clamp
 - Mounting bracket*
 - Sheetmetal screw*

**not provided by Phoenix*

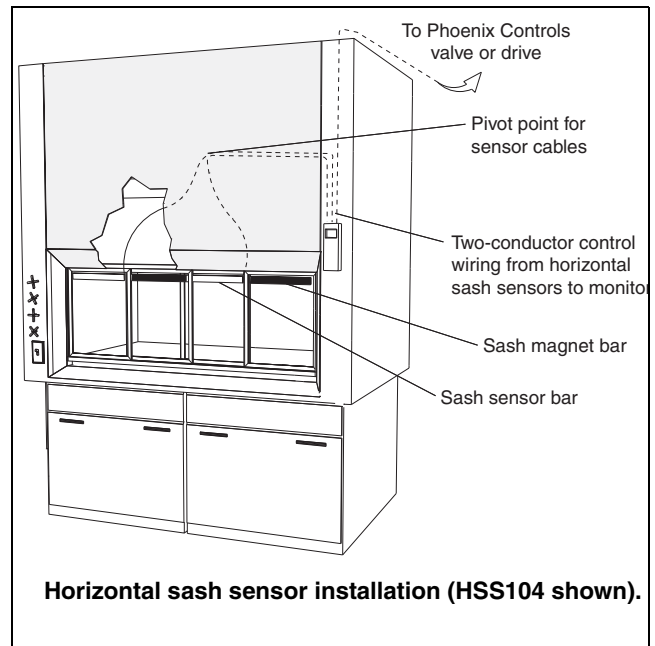
1. Always mount the sensor on top of the fume hood with two mounting screws. Use optional mounting bracket if desired (see drawing on right). Avoid front and inside mounting.
2. Attach the retracting cable to the sash or the counterweight cable (see detailed drawings below). The cable must not rub or chafe against any surface. The sash cable should retract as the sash is raised.



INSTALLATION (CONTINUED)

Materials and Procedures for Horizontal Sash Sensor/Combination Sash Sensor Installation (HSS1xx and CSS1xx only)

- Phoenix Controls sash sensor magnet and sensor bars
 - Double-sided tape
 - Tie wraps (*not provided by Phoenix*)
1. Verify that each bar has a proper flat-glass fit to its sash.
 2. Position the sensor bar wire-side-up on the inside sash near the top, leaving enough clearance to allow the sash panes to be removed. Securely mount the bar with double-sided tape. Use extreme caution; removing the bar is very difficult.
 3. Position the magnet bar in a similar fashion, except mount it on the outside sash parallel to the sensor bar. The magnetic side must face the sensor bar and be within 0.75" (1.9 cm). Carefully secure the bar with double-sided tape.
 4. Cable installation—The cable must be held in place at a pivot point that allows total sash movement. The ideal point is behind the bypass cover approximately one-half the distance of vertical and horizontal movement. Avoid cable droop or the potential of it catching on moving parts.
 5. For combination sensors, mount the horizontal/vertical interface box on the top of hood.



Materials and Procedures for Horizontal Sash Sensor/Combination Sash Sensor Installation (HSS3xx and CSS3xx only)

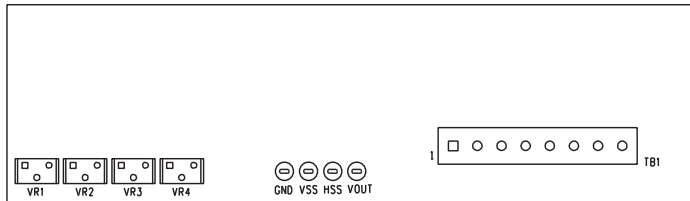
- Phoenix Controls sash sensor magnet, blocking strips, sensor bar, and sensor bar Z-bracket
 - Double-sided tape
 - Tie wraps (*not provided by Phoenix*)
1. Position the sensor bar wire-side-up on the 1-1/8" dimension step of the supplied Z-bracket using double-sided tape. Center the bar width on the bracket. In some cases, the ends of the bar may overhang the bracket by a few inches.
 2. Position the Z-bracket inside the hood against the inside of sash frame. Ensure that the sensor bar height is completely visible through the sash pane. Securely mount the bracket with double-sided tape. On combination hoods, the Z-bracket is mounted to the vertically moving sash frame.
 3. Position the blocking strip on the inside sash near the top, leaving enough clearance to allow the sash panes to be removed. Securely mount the strips with double-sided tape.
 4. Position the magnet bar in a similar fashion, except mount it on the outside sash parallel to the sensor bar. The magnetic side must face the sensor bar and be within 0.75" (1.9 cm) for standard and thin magnets or within 1.25" (3.2 cm) for strong magnets. Carefully secure the bar with double-sided tape.
 5. For combination sensors:
 - The cable to the sensor bar must be held in place at a pivot point allowing total vertical sash movement on a combination hood. Avoid cable drop or the potential of it catching on moving parts.
 - Mount the horizontal/vertical interface box on the top of hood.

Procedures for Strong and Thin Magnet Installations (All HSSs and CSSs)

The strong magnet (-SMG) and thin magnet (-TMG) must be offset vertically from the sensor bar by 0.25 in. (6.4 mm).

POINTS AND WIRING

Horizontal/Vertical (H/V) Interface Board for Combination Sash Sensor



TERMINAL BLOCK POINTS

TB1	Point
1	VSS input
2	VSS input
3	Ground
4	V+
5	Sum
6	Vout
7	HSS input
8	HSS input

COMPONENTS

Device	Function
VR1	VSS start
VR2	VSS gain
VR3	HSS start
VR4	HSS gain
GND	Ground test point
VSS	VSS test point
HSS	HSS test point
VOUT	Output test point

Horizontal/Vertical (H/V) Interface Board Power Requirements

STANDARD H/V CARDS

Part Number	Power	Current
800-220-017LF	+12 Vdc*	12 mA
	+15 Vdc	15 mA
800-220-022LF	+12 Vdc	12 mA
	+15 Vdc	15 mA

SPECIAL (SSS) H/V CARDS

Part Number	Power	Current
800-220-009	±15 Vdc**	17 mA
800-220-010	+12 Vdc	12 mA
	+15 Vdc	15 mA
800-220-019	±15 Vdc	17 mA
800-220-021	±15 Vdc	17 mA
800-220-023LF	+12 Vdc	12 mA
	+15 Vdc	15 mA
800-220-024LF	+12 Vdc	12 mA
	+15 Vdc	15 mA
800-220-027	±15 Vdc	17 mA
800-220-028	±15 Vdc	17 mA
800-220-030	±15 Vdc	17 mA
800-220-032LF	+12 Vdc	12 mA
	+15 Vdc	15 mA

Notes:

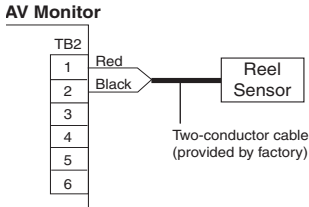
* +12 Vdc is available on TB1-1 of the FHM30. See Fume Hood Monitor product data sheet (MKT-0044).

** ±15 Vdc requires a WPSXXX power supply. See Power Supply product data sheet (MKT-0068).

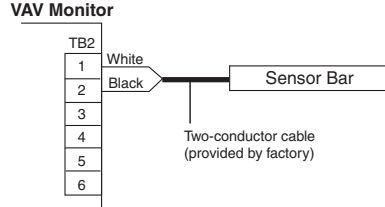
POINTS AND WIRING (CONTINUED)

Wiring Diagrams

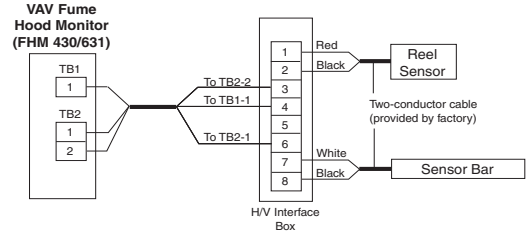
Vertical (VSS110)
single sash



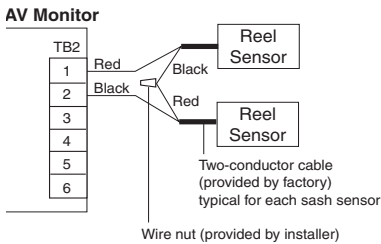
Horizontal (HSS)
single sash or single fixed sensor



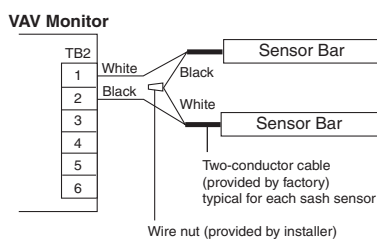
Combination (CSS)
single sash or single fixed sensor



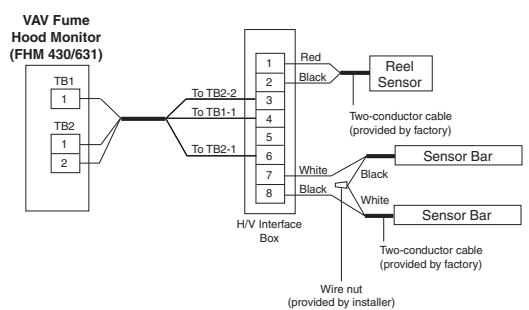
Vertical (VSS110)
multiple sashes



Horizontal (HSS)
multiple sashes or multiple fixed sensors



Combination (CSS)
multiple sashes or multiple fixed sensors



MAINTENANCE

Phoenix Controls sash sensors require no ongoing preventive maintenance. Once the field setup has been completed, the sensors will provide years of continuous operation. Replacement parts are available.

Replacement Part	Part Number
VSS110 (QTY: 1)	VSS110
VSS120 (QTY: 2)	250-220-008 (per sensor)
VSS130, VSS140 (QTY: 3, 4)	250-220-009 (per sensor)
HSS H/V sensor bar	Contact factory*
CSS1 H/V interface board	800-220-017
CSS3 H/V interface board	800-220-022

*Sensor bar length determines part number.

TROUBLESHOOTING

Problem	Possible Causes	Solutions
1. The Fume Hood Monitor is in constant alarm.	A. Broken sash sensor wire B. Fan problem C. Control problem	See Fume Hood Monitor data sheet for complete troubleshooting guide. To check sash sensor, remove circuit connections and connect ohm meter to sensor cables: <ul style="list-style-type: none">• VSS series: If >10 Kohm, sensor must be replaced.• HSS series: If ohm reading is infinite, sensor must be replaced.
2. The volume remains constant throughout sash travel.	A. VSS cable retracted B. H/V Interface Board (CSS)	Reinstall or replace cable. Recalibrate or replace board.*

* Contact Phoenix Controls Product Support for assistance.