

LIST OF EFFECTIVE AND CHANGED PAGES

Insert latest changed pages (in bold text); remove and dispose of superseded pages.
Total number of pages in this manual is **12**.

Page No	Revision *	Description of Change	Date
1	R1C	Updated Title page revision to R1C	6/22/2009
2	R1C	Updated List of Effective pages	6/22/2009
12	R1C	Updated Fig 14 and 16 item 'D' from 0.75 in. NPT to 0.5 in NPT	6/22/2009
1, 2	R1B	Added part number; updated revision to R1B	03/19/2009
3 through 12	R1A	Initial document release	12/03/2008

* R1A indicates an original page without change

OVERVIEW

HB1/SB1 thermal dispersion bleed airflow sensors (Figure 1) accurately measure airflow and direction across defined pressure zones through a small opening (0.5 inch diameter x adjustable length). Extraordinary accuracy is ensured through individual sensor characterization over a range of -3,000 and +3,000 fpm (-15.2 and 15.2 m/s) in wind tunnels calibrated to NIST-traceable airflow standards. Measurement accuracy and repeatability of the airflow “bled” through the opening makes the HB1/SB1 ideal for control of supply airflow to underfloor systems. This application typically requires accurate pressure measurement of very low pressure differentials (near 0.05 in. WC - 12.45 Pa). Other applications include accurate monitoring and positive airflow control via relief and/or return air dampers, ensuring that they are only open when a specified amount of positive airflow is sensed by the instrument.

HB1/SB1 bleed airflow sensors use three “bead-in-glass” thermistors to determine the airflow rate, direction and temperature at each sensing location. Accuracy is percent of reading (not percent of full scale). Performance is ensured throughout the entire calibrated range. One bleed sensor can be connected to a single STx102 transmitter and up to two bleed sensors can be connected to an HTx104 or STx104 transmitter for airflow or equivalent pressure output.. Airflow rate can easily be converted to equivalent pressure by simply applying an appropriate correction factor.

SPECIFICATIONS

Sensor Probe Configurations

- HTx104, STx104:
1 or 2 “Bleed” Sensors
- STx102: 1 “Bleed” Sensor

Sensor Accuracy

- Airflow: $\pm 2\%$ of reading,
 $\pm 0.25\%$ repeatability
- Temp: $\pm 0.15^\circ\text{F}$ ($\pm 0.08^\circ\text{C}$)

Sensor Ranges

- 0 to ± 0.5 in. WC
(0 to ± 125 Pa)
- 3,000 to +3,000 fpm
(-15.2 to +15.2 m/s)
- Temperature: -20°F to 160°F
(-28.9°C to 71.1°C)
- Humidity: 0 to 99% RH, non-condensing

Sensor Assembly (each sensing point)

- Heated element: Two bead-in-glass, hermetically sealed thermistors
- Temperature sensor: One bead-in-glass, hermetically sealed thermistor
- Sensor housing: Glass-filled polypropylene

- Sensor potting material: Marine grade, waterproof epoxy

Dimensions

- Length 3.75 in. (95.25 mm) x
Height 1 in. (25.4 mm) x
Width 2.625 in. (66.7 mm)
- Pipe and fitting connections:
0.5 in. (12.7mm) Female NPT
1 in. (279.4 mm) to 64 in.
(1625.6 mm)

Cable Assembly

- Type: UL® Plenum Rated, PVC jacket
- Length: 10 ft std. (3.048 m),
50 ft (15.24 m) max.
- Termination: 0.625 in. circular
DIN (15.875 mm) plug
[transmitter end]

“Plug and Play” Sensor Probes

- Probes do not require matching to transmitter

Compatible Transmitters

- HTA104, HTN104, STA104,
STN104, STA102

Warranty

- 36 months from shipment



Figure 1. EBTRON HB1/SB1 Bleed Sensor

ADVANCED TECHNOLOGY

- EBTRON Advanced Thermal Dispersion (TD) airflow measurement technology ensures accurate, repeatable measurement from zero flow (still air).
- Each sensor is factory calibrated to **NIST-traceable standards**.
- Highest quality, extremely stable hermetically sealed “bead-in-glass” thermistors.
- Exclusive “Plug and Play” SMART sensor design with provision for up to:
2 bleed sensors (HTx104-B and STx104-B)
1 bleed sensor (STA102-B).
- Versatile mounting options for placement in the most challenging field locations.

APPLICATIONS

- Bi-directional airflow and pressure measurement.
- Adjacent zone pressure monitoring.
- Pressure monitoring for cfm reset.
- Underfloor system supply airflow control (maintain low underfloor pressures).
- Independent, positive control of relief dampers.
- Indirect outside air measurement across fixed orifices.
- Monitor containment and isolation zones (LEED EQ applicable).

Underfloor/Wall Mounting Kit

Underfloor wall mounting kit (Figure 5 - P.N. 800-1260) is designed for wall mounting, above an underfloor air system, to ensure stable control of inherently low floor plenum pressure. Since most underfloor systems are maintained near 0.05 in. WC, a small change in pressure can result in a very large change in flow through the diffusers (a control fluctuation of ± 0.01 in. WC will result in approximately $\pm 10\%$ flow variation through the diffuser). Other commercially available HVAC pressure sensors are unstable at these low pressures. Each kit contains one 304 stainless steel face plate with stainless steel screen, a male NPT reducer, a right elbow and an NPT male pipe.



Figure 5. Underfloor/Wall Mounting Kit

Ducted Damper Mounting Kit

Ducted damper mounting kit (Figure 6 - P.N. 800-1245) is designed for duct mounted relief dampers (supply/return fan systems) or return dampers (supply/relief fan systems) with access on both sides of the damper, to ensure positive airflow control during periods of relief/exhaust at the air handling unit (AHU). It can also be used on systems where mixed air plenum pressure control is implemented to maintain minimum outside air intake flow rates. The kit is provided with flexible hose and fittings to simplify installation.

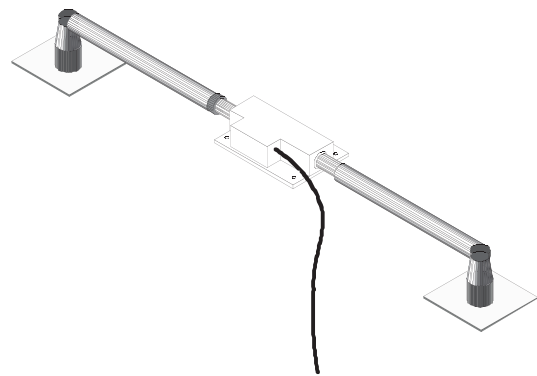


Figure 6. Ducted Damper Mounting Kit

Plenum Damper Mounting Kit

Plenum damper mounting kit (Figure 7 - P.N. 800-1250) is designed for plenum mounted dampers or louvers to ensure positive relief air damper control and prevent negative airflow through the relief flow circuit. This application also minimizes negative airflow during switch over from minimum outside air to economizer modes, especially on multi-story buildings where stack pressure can be problematic. The kit is provided with flexible hose and fittings to simplify installation.

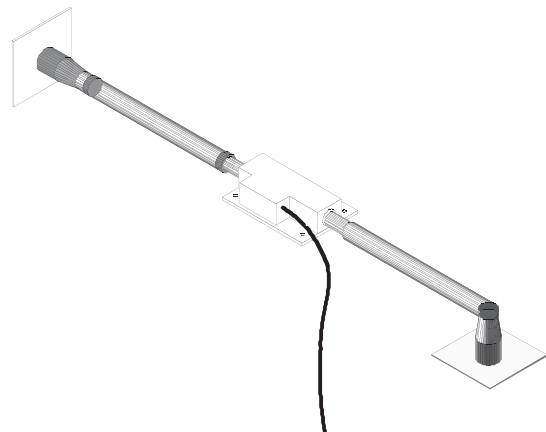


Figure 7. Plenum Damper Mounting Kit

Converting Velocity: Kv Factor Method

Controlling airflow, rather than pressure, is the most accurate method for the determination of differential pressure on analog input control and data logging devices since pressure is proportional to the square of the velocity. Setup the transmitter to output bidirectional airflow. To correct for the losses in the host control system, take the square of the velocity divided by the K_v factor from Table 1 (i.e. $\{\text{airflow measured by the host control system} / K_v\}^2$). To indicate corrected pressure on devices with an LCD display, set the LCD units of measure to in. WC (Pa for SI units) and enter K_p from Table 1. For transmitter configuration and setup details, refer to the associated transmitter Installation, Operation and Maintenance manual (under separate cover) for the model selected.

Converting Uncorrected Pressure: Kp Factor Method

Setup the transmitter to output bidirectional pressure. To correct for the losses in the host control system, scale the uncorrected pressure by the K_p factor from Table 1 (i.e. $K_p \times \text{uncorrected pressure measured by the host control system}$). To indicate corrected pressure on devices with an LCD display, set the LCD units of measure to in. WC (Pa for SI units) and enter K_p from Table 1. For transmitter configuration and setup details, refer to the associated transmitter Installation, Operation and Maintenance manual (under separate cover) for the model selected.

Converting Airflow or Uncorrected Pressure to Actual Pressure Using the Polynomial Method

The polynomial method is the most accurate method for converting to actual pressure when a wide range of pressure measurement is required. This method must be implemented in the host control system. Setup the transmitter to output bidirectional airflow and apply the polynomial values to the scaled output of the transmitter. To indicate the approximate corrected pressure on transmitters with an LCD display (HTx104), set the LCD units of measure to in. WC (Pa for SI units) and enter K_p for the nominal pressure from Table 1. For transmitter configuration and setup details, refer to the transmitter Installation, Operation and Maintenance manual (under separate cover) for the model selected.

Table 1. K Factors

Nominal Pressure (inWg)	K_v	K_p	Nominal Pressure (Pa)	K_v	K_p
0.0100	2241	3.192	2.4882	0.7217	3.192
0.0200	2460	2.651	4.9764	0.7920	2.651
0.0300	2523	2.521	7.4646	0.8122	2.521
0.0400	2583	2.405	9.9528	0.8316	2.405
0.0500	2661	2.265	12.4410	0.8569	2.265
0.1000	2854	1.969	24.8820	0.9190	1.969
0.2500	2977	1.810	62.2050	0.9585	1.810
0.5000	2992	1.792	124.4100	0.9633	1.792
0.7500	2962	1.828	186.6150	0.9538	1.828
1.0000	2963	1.828	248.8200	0.9539	1.828

Table 2. Polynomial Coefficients

Absolute Pressure Range		Corrected Pressure = $av^4 + bv^3 + cv^2 + dv + e$, where $v = \text{abs}\{\text{velocity}\}$				
		a	b	c	d	e
inWg	0 to 0.04		-5.4994E-11	1.5905E-07	9.4889E-06	0.0000E+00
	0.04 to 0.125	-4.5700E-13	1.4573E-09	-1.6064E-06	8.8239E-04	-1.5593E-01
	0.125 to 1.0	-2.6702E-15	2.1312E-11	6.7606E-08	1.4775E-05	1.9472E-02
Pa	0 to 10		-1.0444E-01	1.5341E+00	4.6486E-01	0.0000E+00
	10 to 30	-1.7088E-01	2.7676E+00	-1.5495E+01	4.3228E+01	-3.8800E+01
	30 to 300	-9.9843E-04	4.0473E-02	6.5210E-01	7.2384E-01	4.8450E+00

Note: Calculate polynomial coefficients using the absolute value of the velocity (i.e. unsigned) then apply the sign, positive or negative to the result.

HB1/SB1 UNDERFLOOR/WALL MOUNTING KIT INSTALLATION

Figures 12 and 13 show installation details for the HB1/SB1 underfloor wall mounting kit for underfloor systems. Figure 13 shows proper mounting of a bleed sensor using the floor mounting kit through a floor plate.

As shown in Figure 13, mount the bleed sensor so that the airflow directional arrow points away from the floor (up). Drill a 1.0 inch (25.4 mm) hole through the base wall beam and floor where the bleed sensor will be mounted. The end of the tube should protrude slightly into the floor plenum. Secure the bleed sensor housing (BS in Figure 12) to a support beam or other suitable bracket so that the base of the sensor is approximately 2.25 inches (57.2 mm) from the interior wall surface (room side). The bleed sensor requires a 3 inch (76.2 mm) opening through the wall surface. The opening is covered by the stainless steel face plate (A, Figure 12) after the wall surface is installed. A standard 10 foot (3.048 m) plenum rated cable (up to 50 ft (15.24 m) available) with terminal plug must be run to the remotely mounted transmitter.

The transmitter can be set up to indicate unidirectional airflow. Maintain the airflow rate that corresponds to the desired actual pressure for proper operation of the underfloor diffusers (consult diffuser manufacturer for recommended pressure ranges). Controlling the airflow directly, rather than the pressure, will result in more stable control.

If desired, the transmitter can be set up to indicate pressure on the LCD display. First, maintain the uncorrected pressure that corresponds to the actual pressure desired. Then, set Kp (in the transmitter setup) to display the corrected pressure on the LCD display. Refer to Table 3 for corrected setpoints. For transmitter configuration and setup details, refer to the associated transmitter Installation, Operation and Maintenance manual (under separate cover) for the model selected.

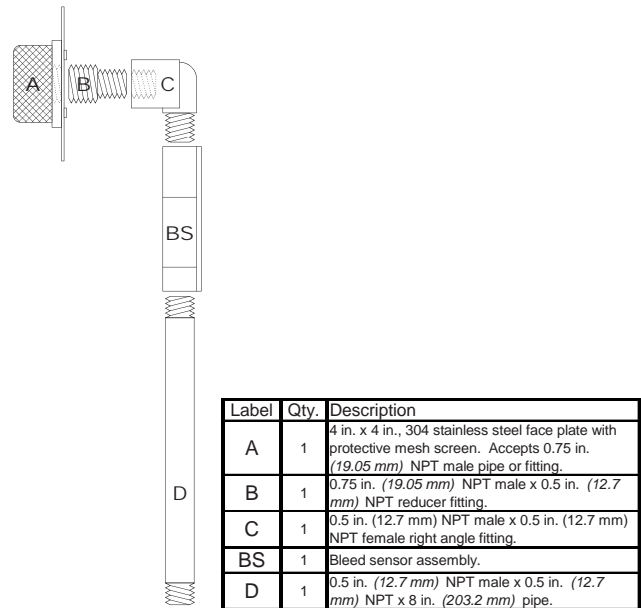


Figure 12. HB1/SB1 Underfloor Wall Mount Detail View

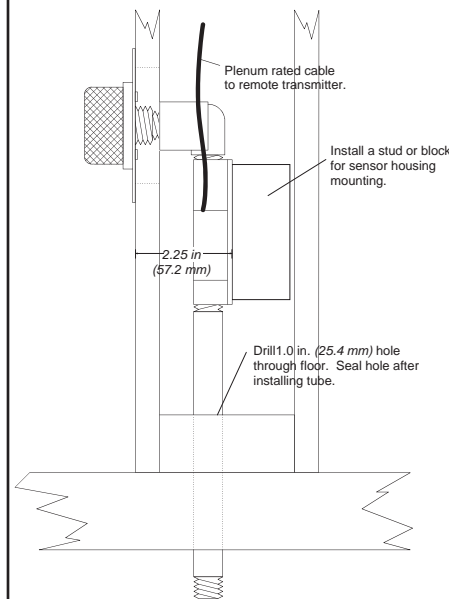


Figure 13. HB1/SB1 Underfloor Wall Mount Installation Detail

Table 4. Underfloor Wall Mount Control Setpoint Determination

Desired Floor Pressure (inWg)	Control Setpoint (transmitter output)		K _p	Desired Floor Pressure (Pa)	Control Setpoint (transmitter output)		K _p
	Airflow (FPM)	Pressure (inWg)			Airflow (m/s)	Pressure (Pa)	
0.0200	221.2	0.00305	6.556	4.98	1.12	0.76	6.556
0.0300	333.7	0.00694	4.321	7.46	1.69	1.73	4.321
0.0400	393.1	0.00964	4.151	9.95	2.00	2.40	4.151
0.0500	429.6	0.01150	4.346	12.44	2.18	2.86	4.346
0.0600	467.1	0.01360	4.410	14.93	2.37	3.39	4.410
0.0700	502.8	0.01576	4.442	17.42	2.55	3.92	4.442
0.0800	538.4	0.01807	4.427	19.91	2.73	4.50	4.427
0.0900	574.0	0.02054	4.381	22.39	2.92	5.11	4.381
0.1000	609.7	0.02317	4.315	24.88	3.10	5.77	4.315

TM_HB1_SB1_R1A

