AIRFLOW MEASUREMENT WITH TEMPERATURE AND ALARM CAPABILITY

TYPICAL APPLICATIONS

- Smaller openings (≤ 8 sq ft [0.74 sq m]) for outdoor air delivery monitoring where 10% installed accuracy is acceptable
- ERV/HRV outdoor air and exhaust air monitoring
- Classroom unit ventilator outdoor air delivery monitoring

PRODUCT HIGHLIGHTS

- *"Plug and Play"* operation
- EBTRON exclusive bead-in-glass thermistor sensors
- NIST traceable calibration
- 0 to 3,000 FPM calibrated range with percent-of-reading accuracy
- Airflow and status alarm
- Single or dual airflow output
- Two mounting styles
- Analog and RS-485 output models
- Dry contact relay
- Remote transmitter with LCD display
- Actual (CFM) or mass (SCFM) airflow measurement
- Velocity-weighted temperature measurement between -20° F to 160° F
- Smart *Sensor Detection System* (*SDS*) continuously monitors for sensor and transmitter faults
- Standard FEP plenum rated cable between sensor probes and transmitter
- Three-year warranty
- Toll-free customer support for the lifetime of the product

EBTRON ADVANCED THERMAL DISPERSION TECHNOLOGY

EBTRON pioneered bead-in-glass thermistor based thermal dispersion over 40 years ago. EBTRON's thermal dispersion technology relates the power dissipated by a self-heated thermistor to the airflow rate at one or more sensor nodes in an airstream. All EBTRON airflow monitoring systems use this time-tested thermal dispersion technology.

MODEL DESCRIPTION

The EF-x2000-U is a cost effective measurement solution for smaller rooftop packaged units, fan coils and classroom ventilators. Available with adjustable standoff or insertion mount universal probes. Dual airflow output capability makes it ideal for outdoor air and exhaust airflow measurement in RTUs with powered exhaust and in energy/heat recovery ventilators.

EF-x2000-U TECHNICAL SPECIFICATIONS

General

Probe and Sensor Node Configurations
1 probe x 1 sensor node
2 probes x 1 sensor node/probe

Installed Airflow Accuracy[1]
≤ 8 sq.ft. [0.74 sq.m.]: ±(3% to 15%), typical (increases with increasing opening size). May be improved by field adjustment using the Field Adjust Wizard (FAW) to a reliable reference.
> 8 sq.ft. [0.74 sq.m.]: Not recommended.

Sensor Node Averaging Method
Airflow: Independent (arithmetic average on 2 sensor configurations installed at a single measurement location)
Temperature: Independent, velocity weighted average on 2 sensor configurations installed at a single measurement location

Listings and Compliance
UL: 60730-1, 60730-2-9; CAN E60730-1, E60730-2-9 (EF-A2000-U Only)
FCC: This device complies with Part 15 of the FCC rules
RoHS: This device is RoHS2 compliant

Environmental Limits
Temperature:
Probes 0 to 2,000 fpm [0 to 10.16 m/s]**:**
 -20 to 160 ºF [-28.9 to 71.1 ºF]
Probes 0 to 3,000 fpm [0 to 15.24 m/s]**:**
0 to 160 ºF [-17.8 to 71.1 ºC]
Transmitter: -20 to 120 ºF [-28.9 to 48.9 ºC]
Humidity: (non-condensing)
Probes: 0 to 100%
Transmitter: 5 to 95%

Individual Sensing Nodes

Sensing Node Sensors
Self-heated sensor: Precision, hermetically sealed, bead-in-glass thermistor probe
Temperature sensor: Precision, hermetically sealed, bead-in-glass thermistor probe

Sensing Node Housing
Material: Glass-filled Polypropylene
Sensor Potting Materials: Waterproof marine epoxy

Sensing Node Internal Wiring
Type: Kynar® coated copper

Airflow Measurement
Accuracy: ±3% of reading (typical), 4% max. to NIST-traceable airflow standards (includes transmitter uncertainty)
Calibrated Range: 0 to 3,000 fpm [0 to 15.24 m/s]
Calibration Points: 7

Temperature Measurement
Type: Velocity-weighted average
Accuracy: ±0.15 ºF [0.08 ºC] to NIST-traceable temperature standards (includes transmitter uncertainty)

Sensor Probe Assembly

Tube
Material: Mill finish 6063 aluminum
Mounting Brackets
Material: 304 stainless steel
Mounting Options & Overall Probe Length
Insertion: 6, 8 or 16 in. [152.4, 203.2 or 406.4 mm] (adjustable)
Stand-off: 6, 8 or 16 in. [152.4, 203.2 or406.4 mm] (adjustable)

Probe to Transmitter Cables
Type: FEP jacket, plenum rated CMP/FT6/CL2P, UL/cUL listed, -67 to 302 ºF [-55 to 150 ºC], UV tolerant
Standard Lengths: 10, 25 and 50 ft. [3.1, 7.6 and 15.2 m]
Connecting Plug: 0.60" [15.24 mm] nominal diameter

Transmitter

Power Requirement: 24 VAC (22.8 to 26.4 under load) @8V-A
User Interface: 16-character LCD display and 4 button interface
B.A.S. Connectivity Options
EF-A2000 Transmitter: Two field selectable (0-5/1-5/0-10/2-10 VDC*), scalable and protected analog output signals (AO1 = airflow, airflow1, airflow1-2, or airflow2-1, AO2 = airflow2, airflow1-2, airflow2-1, temperature, or alarm)
* The VDC output circuit of the EF-A2000 transmitter can drive the input circuit of devices designed to measure 4-wire current loops with a resistive load ≥250 ohms.
EF-N2000 Transmitter: One field selectable (BACnet MS/TP or Modbus RTU) and non-isolated RS-485 network connection - Individual sensor node airflow rates and temperatures are available via the network (provide individual 24 VAC transformers for each EF-N2000 transmitter for applications requiring isolated RS-485)

Relay
Type: Dry Contact w/ onboard jumper to drive a remote LED (R1=alarm)
Status: N.O. or N.C. via user setup configuration
Rating: 30 VDC or 24 VAC @ 3 amp. max.

Airflow Alarm
Type: Low and/or high user defined setpoint alarm
Tolerance: User defined % of setpoint
Delay: User defined
Zero Disable: Alarm can be disabled when the airflow rate falls below the low limit cutoff value (unoccupied periods)
Reset Method: Manual or automatic
Visual Indication: Yes, LCD display
Network Indication: Yes (EF-N2000 only)
Analog Signal Indication: Yes, on AO2 assignment (EF-A2000 only)
Contact Closure Relay: Yes, on R1 assignment

System Status Alarm
Type: Sensor diagnostic system trouble indication
Visual Indication: Yes, LCD display
Network Indication: Yes (EF-N2000 only)
Analog Signal Indication: Yes, on AO2 assignment (EF-A2000 only)
Contact Closure Relay: Yes, on R1 assignment

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[1] Installed airflow accuracy is the actual system accuracy expected and includes sampling uncertainty of the sensor probes when installation meets or exceeds placement guidelines.
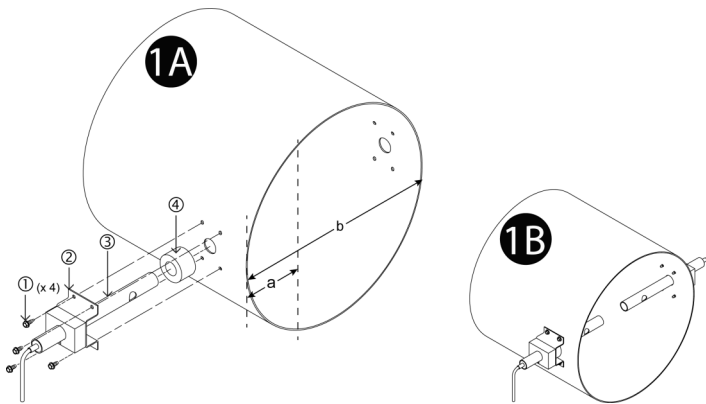
SENSOR PROBE PLACEMENT

Determine the location where the sensor probes will be mounted. Refer to the O&M Manual for Duct and Plenum Probe Placement or contact EBTRON or your local EBTRON representative for assistance. A selection software tool is available at EBTRON.com that creates a placement schedule.
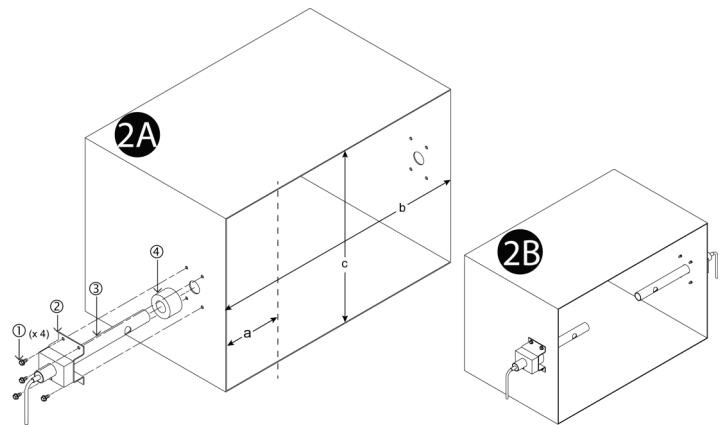
SENSOR PROBE INSTALLATION

Detailed installation guidelines for probes are provided in the O&M Manual for the following duct configurations.
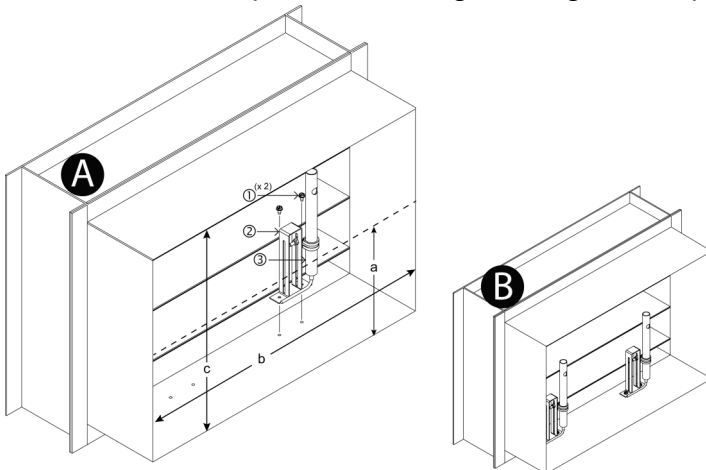
Sensor Probe Installation Diagrams

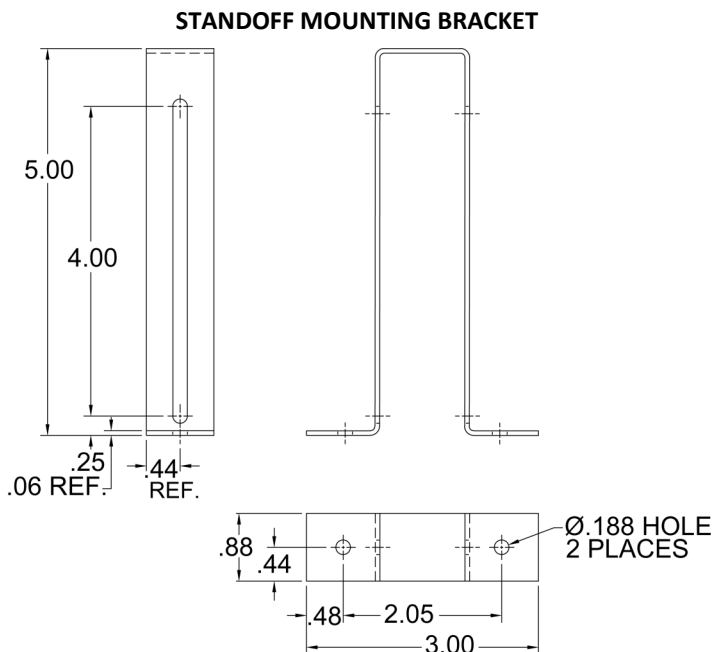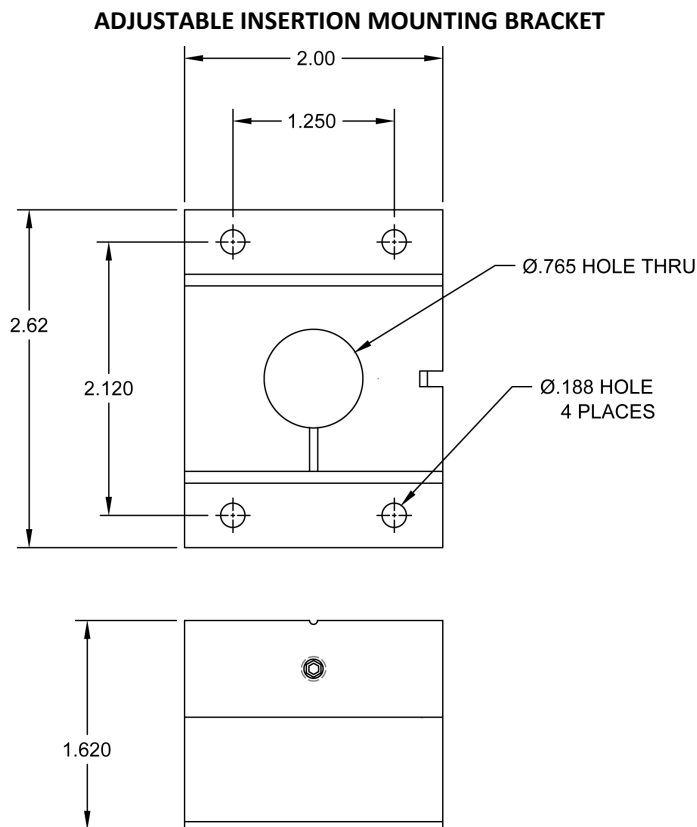**-U Probe Installation (Insertion Mounting—Round Ducts)**   **-U Probe Installation (Standoff Mounting—Rectangular/Oval Ducts)**

-U Probe Installation (Standoff Mounting—Rectangular Ducts)

Sensor Probe Mounting Bracket Dimensions

ADJUSTABLE INSERTION MOUNTING BRACKET


STANDOFF MOUNTING BRACKET

TRANSMITTER INSTALLATION AND WIRING

Detailed installation guides for transmitters are provided in the O&M Manual for the connectivity options that follow. All EF-x2000 transmitters are provided with either an analog (x = A) or a RS-485 (x = N) output.
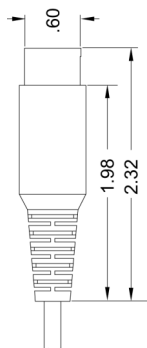
Locate the transmitter where all of the sensor probe connecting cables will reach the transmitter and it is protected from moisture, rain, and snow.

Transmitter Mounting Diagram and Dimensions

EB-Flow EF-x2000 Series Transmitter Installation

EF-x2000-U DataSheet (R1D)
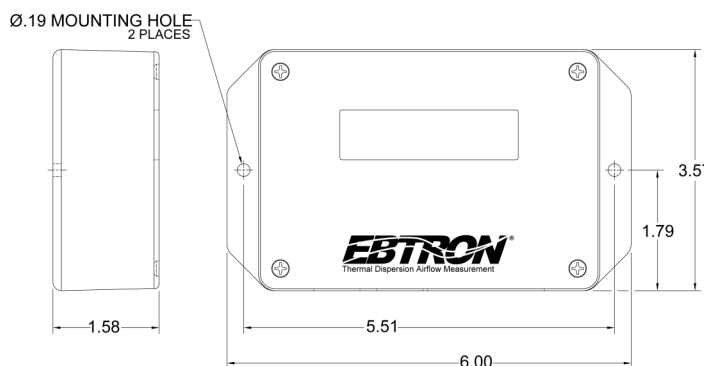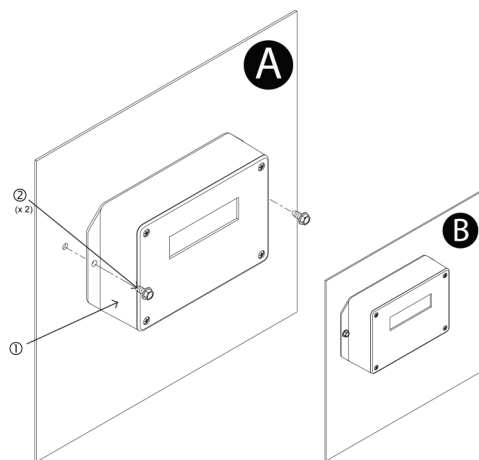
All Models - Probe Connector

⚠️ *Push in __keyed__ connector plugs (sensor data is stored in serial memory chip in connector plug). **DO NOT TWIST!***

ⓘ *Cables have an FEP plenum rated jacket that are UV tolerant and suitable for operation over the entire operating temperature range of the device.*

EF-A2000-U - Wiring and Probe Connections
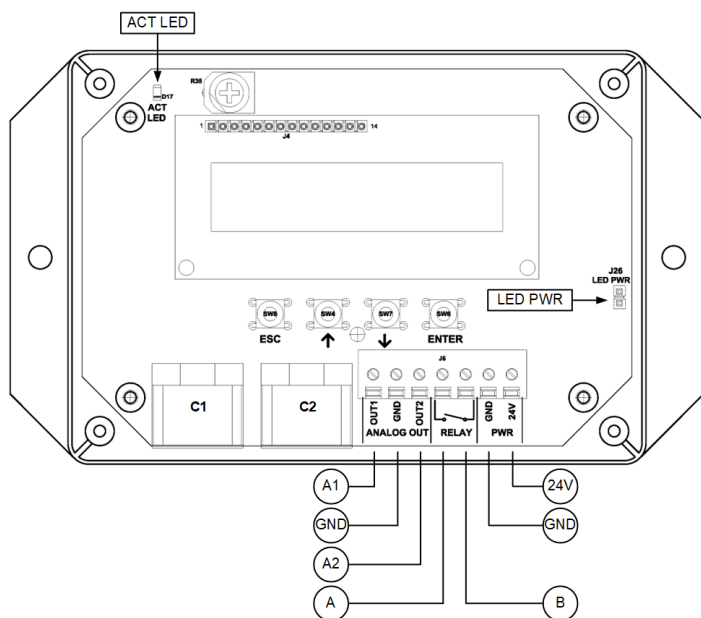
TRANSMITTER CONNECTIONS

Single Location Configuration (Default)

Power		Analog Out (non-isolated)			Contact Closure		Connector	
24V	GND	A1	A2	GND	A	B	C1	C2
24 VAC (hot)	24 VAC (neutral)	Airflow +	Temperature or Alarm +	Signal Common	OUT	IN	1 probe x 1 sensor/probe	1 probe x 1 sensor/probe

Dual Location Configuration

Power		Analog Out (non-isolated)			Contact Closure		Connector	
24V	GND	A1	A2	GND	A	B	AF1	AF2
							C1	C2
24 VAC (hot)	24 VAC (neutral)	Airflow1, Airflow1-2, or Airflow2-1 +	Airflow2, Airflow1-2, or Airflow2-1 +	Signal Common	OUT	IN	1 probe x 1 sensor/probe	1 probe x 1 sensor/probe

Connect each analog output signal required to the host B.A.S. using shielded twisted-pair wire. Properly terminate the shield (typically at the B.A.S.).

⚠️ *If twisted pair wire and/or shielded cable is not used, extraneous electrical noise can be picked up between the transmitter and host control panel.*

ⓘ *Transmitters are preconfigured for 2-10VDC. Consult the Startup Guide for the appropriate model to change the output to either 0-5 VDC, 0-10 VDC or 1-5 VDC.*

EF-N2000-U - Wiring and Probe Connections
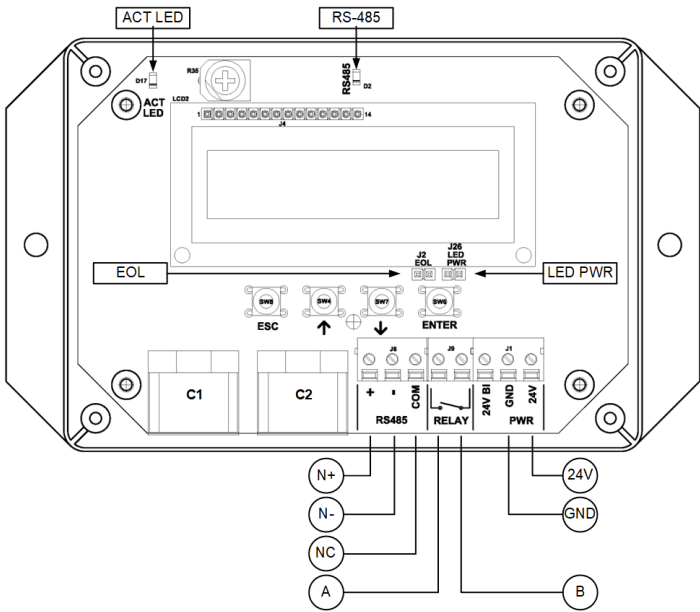
TRANSMITTER CONNECTIONS

Single Location Configuration (Default)

Power		RS-485 (non-isolated)			Contact Closure		Connector	
24V	GND	N+	N-	NC	A	B	C1	C2
24 VAC (hot)	24 VAC (neutral)	Network +	Network -	Network Common	OUT	IN	1 probe x 1 sensor/probe	1 probe x 1 sensor/probe

Dual Location Configuration

Power		RS-485 (non-isolated)			Contact Closure		Connector	
							AF1	AF2
24V	GND	N+	N-	NC	A	B	C1	C2
24 VAC (hot)	24 VAC (neutral)	Network +	Network -	Network Common	OUT	IN	1 probe x 1 sensor/probe	1 probe x 1 sensor/probe

Use a 3-conductor network cable meeting the corresponding BACnet or Modbus standards. Ensure that all three connections, N+, N- and NC are connected.

ⓘ *Refer to the O&M Manual for information regarding network configuration, BACnet objects, and Modbus registers.*

ⓘ *Transmitters are preconfigured for BACnet MS/TP. Consult the Startup Guide for the appropriate model to change the output to Modbus RTU network protocol.*

⚠ *If a 2-conductor network cable or other non-conforming cable is used, network speed, length and reliability may be compromised or network failure may occur.*

ⓘ *If the transmitter is the first or last device on the network run, place the shunt jumper across the EOL posts (J2).*

STARTUP

Detailed startup guides are provided in the O&M Manual.

VERIFICATION, TROUBLESHOOTING, AND MAINTENANCE

Verification and troubleshooting is discussed in detail in the O&M manual.

EBTRON airflow monitoring devices are factory calibrated and should not require periodic maintenance or recalibration in most HVAC environments. If the sensor probes are installed in a location that is subject to excessive dust, lint, or other airborne debris accumulation, filtration at the source or access for cleaning should be provided. Please note that this issue is not specific to EBTRON or EBTRON technology. Consult EBTRON to discuss specific concerns or suggested remedies if airborne particulates are a concern.

APPLICATION REVIEW REQUESTS

EBTRON and/or your local representative will review the application and make recommendations on the proper use of this device prior to requesting a quotation or placing an order. Provide as much of the following information as possible to facilitate the review process:

√ Service: SA, RA, OA, EA, Other (specify)
√ Duct or opening size where the probes will be installed
√ Minimum and maximum expected airflow rates
√ Minimum and maximum expected airstream temperatures

√ Immediate up and downstream disturbance and the distance between disturbances
√ Mechanical drawings or sketches
√ Sequence of operation
√ Control schematic

QUOTATIONS AND ORDERING

Use the model code below to request a quote or place an order. Quotations and orders are provided by your local EBTRON representative.

EF - 2 1 0-U- - /

Mounting
  MS = stand-off, MI = insertion
Cable length
  10 = 10 ft., 25 = 25 ft., 50 = 50 ft.
Probe length
  06 = 6", 08 = 8", 16 = 16"
Probe type
  U = Universal mounting probe
Hardware variations
  0 = standard dual analog output or RS-485
Sensor nodes per probe
  1 = 1 sensor
Probes
  1 = 1 probe, 2 = 2 probes
Series
  2 = 2000
Interface to host controls.
  A = analog outputs
  N = RS-485 field selectable BACnet MS/TP or Modbus RTU