MANUAL

AF4 (AIRFLOW MEASUREMENT SYSTEM)

POWERED BY WING TECHNOLOGY

CRC™

Measure What Matters.

TABLE OF CONTENTS

IMPORTANT NOTES

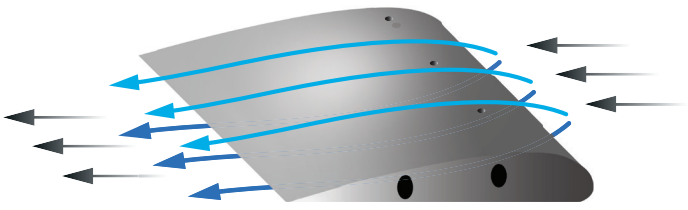
The “Important Notes” header is used throughout this manual to callout important considerations that the reader should be aware of. Please take time to thoroughly read these sections.

PRODUCT OVERVIEW

AF4 TRANSMITTER

The AF4 Airflow Measurement System provides stable airflow measurement using CRC's patented WING technology. Designed for HVAC and critical environment applications, the AF4 combines aerodynamic airfoil probes with passive indirect sensing to deliver repeatable airflow feedback without the limitations of thermal and pitot-based devices.

Each system is managed by the AF4 Transmitter, which supports up to four independent airflow measurement stations. The built-in touchscreen interface provides configuration, commissioning, diagnostics, and real-time monitoring without requiring external software. With analog output and BACnet® MS/TP communication options, the AF4 supports both standalone measurement applications and integration with building automation systems.



KEY FEATURES

AF4 TRANSMITTER

- **Multi-Station Support –** Connect and manage up to four AF4 Airflow Measurement Stations from a single transmitter, minimizing hardware footprint and network load.
- **Fast Commissioning –** Touchscreen-based workflow simplifies setup, balancing, and verification without laptops or software utilities.
- **Integrated Diagnostics –** Onboard I/O status, BACnet® MS/TP counters, and live airflow data provide clear insight into device performance and network health.
- **Flexible Communication –** Supports analog outputs and BACnet® MS/TP with configurable scaling, network settings, and station assignments.

PATENTED WING TECHNOLOGY

- **Patented WING Design:** Aerodynamically shaped airfoil probes generate a stable pressure differential for airflow measurement across a wide operating range.
- **Maintenance-free Sensing:** Passive indirect sensing eliminates exposure of the sensing element to the air stream, minimizing common maintenance concerns associated with direct-exposure airflow technologies.
- **Contaminant-Resistant Operation:** The WING design reduces susceptibility to debris buildup compared to pitot tube or thermal airflow measurement methods.
- **Repeatable Field Performance:** Provides stable airflow feedback when installed in accordance with CRC placement guidelines and verified during commissioning.

APPLICATIONS

- Outside Air Intakes
- Exhaust Air Systems
- Return Air Paths
- Fan Inlets and Plenums
- Small and Medium Ducts
- Large Distribution Ducts
- Variable and Constant Volume Systems
- Applications requiring stable, low-maintenance airflow measurement

AF4 PART NUMBER NOMENCLATURE (AIRFLOW MEASUREMENT STATION CONFIGURATION MATRIX)

AF4 - A1040 - B1040 - C1040 - D1040

Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
AF4 = Product Series	**A1040 = Station 1 Configuration**	**B1040 = Station 2 Configuration**	**C1040 = Station 3 Configuration**	**D1040 = Station 4 Configuration**
Product series / airflow measurement station platform	**A** = Normal Insertion	**B** = Normal Internal	**C** = Normal Standoff	**D** = High Insertion
	1 = One probe	**1** = One probe	**1** = One probe	**1** = One probe
	040 = 40-inch probe length	**040** = 40-inch probe length	**040** = 40-inch probe length	**040** = 40-inch probe length

⚠ Each station segment follows the format: [Configuration Letter][Number of Probes][Probe Length]

⚠ Up to four station segments may be included.

⚠ Base configuration may include only Station 1, for Example: **AF4-A1040**

REFERENCE MATRIX

Configuration Letter	Number of Probes	Probe Length
A = Normal Insertion	**1** = One probe	**010** = 10 inches
B = Normal Internal	**2** = Two probes	**040** = 40 inches
C = Normal Standoff	**3** = Three probes	**054** = 54 inches
D = High Insertion	**4** = Four probes	
E = High Internal		
F = High Standoff		

ADDITIONAL FORMAT EXAMPLES

Example	Description	Breakdown
AF4-A1040	Single-station configuration	**A** = Normal Insertion, **1** = One probe, **040** = 40-inch probe length
AF4-C2054-D1040	Multi-station configuration	**C2054** = Station 1: Normal Standoff, 2 probes, 54-inch probe length **D1040** = Station 2: High Insertion, 1 probe, 40-inch probe length

Station segments repeat as required for Stations 1–4.

AF4-XMT

AF4-DPX

Insertion Mount/Internal/Standoff Mount

CHARACTERISTICS AND PERFORMANCE

Airflow Measurement		1 Airflow Station Up to 3 additional
Operating Velocity	Normal Flow	50 to 2500 FPM
	High Flow	50 to 5000 FPM
Commissioned Accuracy		± 2%
Display		4.3" full color resistive touchscreen
Communication Protocol		BACnet® MS/TP
Material of Construction	Airfoil Probes	Anodized Aluminum Airfoil
	AF4-XMT	ABS Plastic
	AF4-DPX	ABS Plastic
Airfoil Probe Length		6 in to 120 in
Pneumatic Tubing		¼ in O.D
Mounting Types	Insertion	ABS Plastic Hardware
	Internal	304 SS Hardware
	Standoff	304 SS Hardware

ENVIRONMENTAL LIMITATIONS

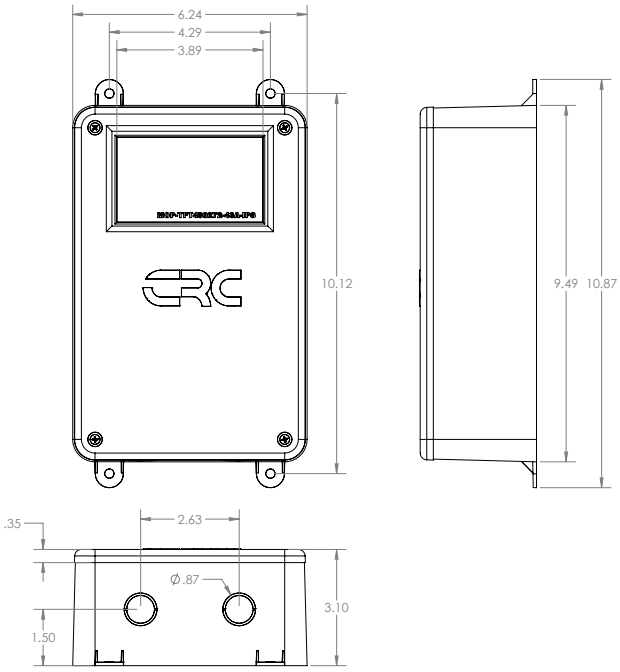
Operating Temperature	Airfoil Probes	-30 to 200 °F (-34 to 93 °C)
	AF4-XMT	32 to 158 °F (0 to 70 °C)
	AF4-DPX	-4°F to 140°F (-20°C to 60°C)
Storage Temperature	Airfoil Probes	-30 to 200 °F (-34 to 93 °C)
	AF4-XMT	-22 to 158 °F (-30 to 70 °C)
	AF4-DPX	-40°F to 158°F (-40°C to 70°C)
Operating Humidity	Airfoil Probes	0 to 95% RH non-condensing
	AF4-XMT	10 to 70% RH non-condensing
	AF4-DPX	10% to 90% RH non-condensing

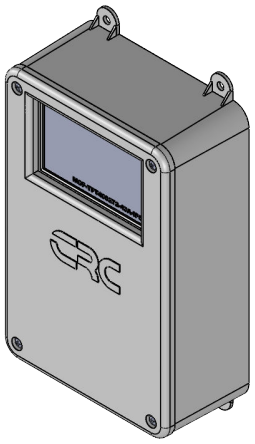
ELECTRICAL

AF4-XMT - Input Power	24 VAC ±10%, 50/60 Hz, maximum 30 VA (10 VA typical), Class 2
AF4-DPX - Input Power	24 VDC from AF4-XMT

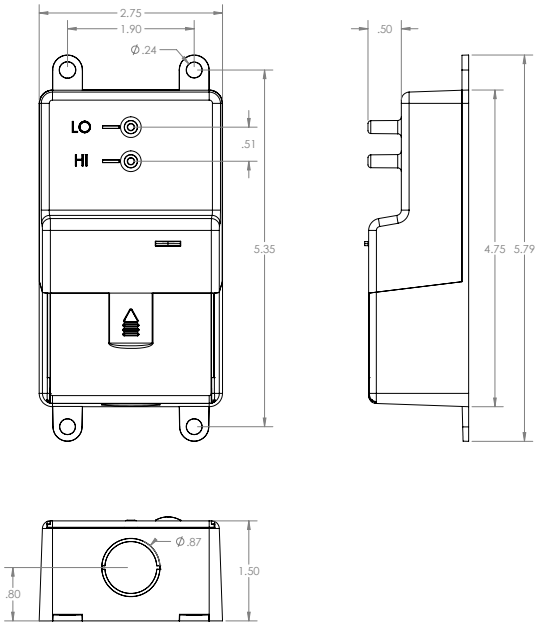
Dimensions

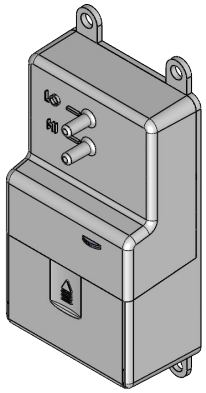
AF4-XMT





AF4-DPX



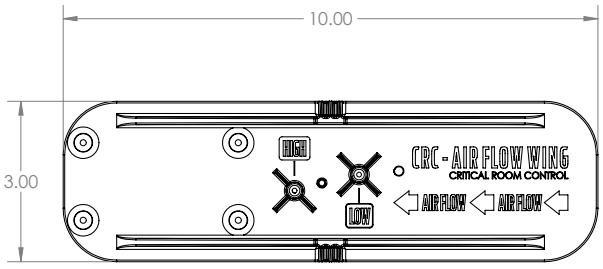


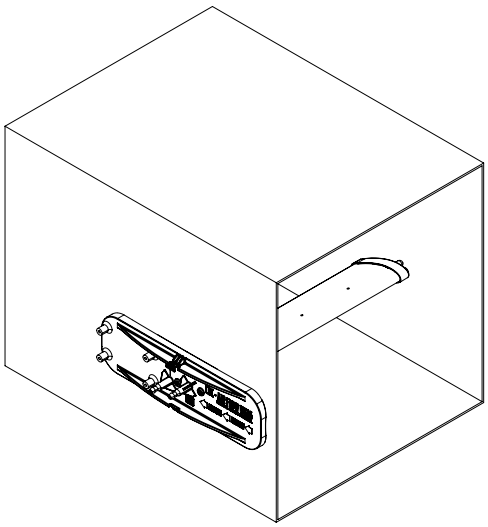
AF4-DPX-P5: Normal Flow| 50-2500 FPM
AF4-DPX-02: High Flow | 50-5000 FPM

Key
[BRACKETS] = MILLIMETERS (mm)
NO BRACKETS = INCHES (in)

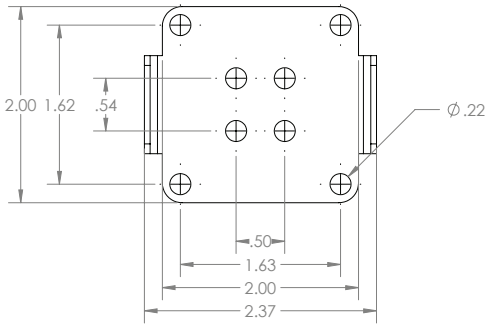
Dimensions

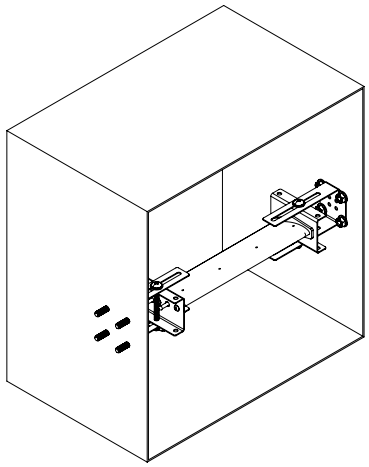
Insertion Mount



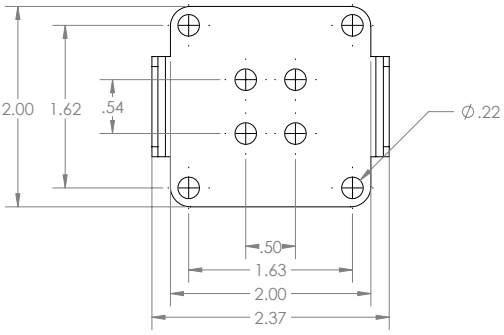


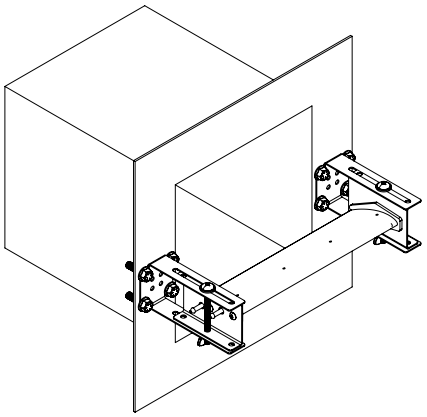
Internal Mount





Standoff Mount





Key
[BRACKETS] = MILLIMETERS (mm)
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SYSTEM TERMINOLOGY

The AF4 Airflow Measurement System uses several related terms to describe the components and measurement structure. The following definitions are used throughout this manual:

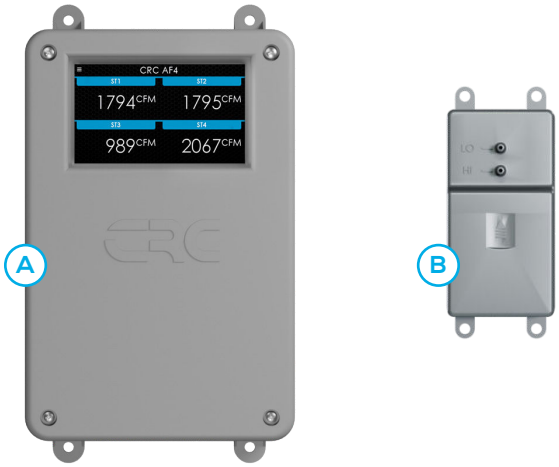
Term	Meaning
AF4 Transmitter / AF4-XMT	The main AF4 enclosure with touchscreen display, configuration interface, power input, analog outputs, and BACnet® MS/TP communication. One transmitter supports up to four airflow measurement stations.
AF4 Airflow Sensor / AF4-DPX	The remote pressure sensor connected to an airflow measurement station. Each sensor receives pneumatic pressure signals from the airfoil probe array and sends the measurement signal to the AF4 Transmitter.
Airfoil Probe	The WING sensing element installed in the duct, plenum, hood, louver, or intake path. One or more airfoil probes may be used for a single measurement station.
Airflow Measurement Station	One complete measurement point consisting of an AF4 Airflow Sensor and the associated airfoil probe or probe array. Each station reports one airflow/velocity value.
Airfoil Probe Array	A group of one or more airfoil probes pneumatically connected together and assigned to one AF4 Airflow Sensor.
Station 1–4	The four configurable measurement channels supported by the AF4 Transmitter. Each enabled station corresponds to one sensor input, one calculated airflow/velocity value, and one associated analog output.

WHAT'S INCLUDED

The components of the AF4 Airflow Measurement System are provided in separate packaging:

AF4 CONTROLS BOX

- **A** (1) AF4 Transmitter (AF4-XMT)
- **B** (1 to 4) AF4 Airflow Sensor (AF4-DPX-##)



AIRFOIL PROBE BOXES

- **C** AF4 airfoil probes (probe quantity up to 16)
- **D** Mounting hardware (varies by selected mounting style: insertion, internal, or standoff)

SYSTEM LAYOUT

The AF4 Airflow Measurement System is built around two core elements that work together to deliver accurate, maintenance-free airflow performance.

AF4 TRANSMITTER

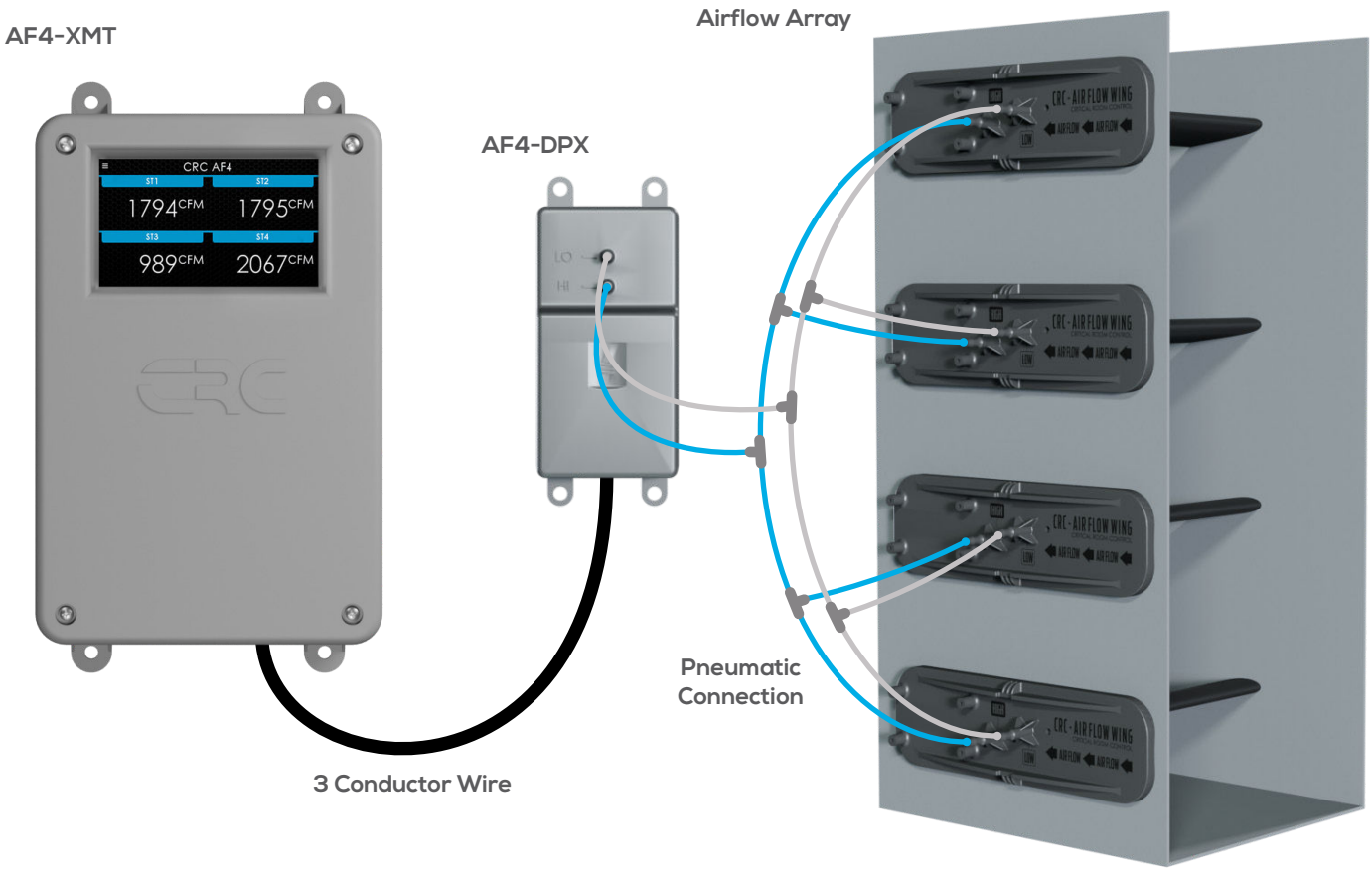
The AF4 Transmitter serves as the display and communication center for the system. It receives airflow data from each connected AF4 Airflow Measurement Station, processes and displays real-time performance information, and provides analog and BACnet outputs to the building automation system. A single transmitter can support up to four independent measurement points.

AF4 AIRFLOW MEASUREMENT STATION WITH WING TECHNOLOGY

Each AF4 Airflow Measurement Station combines CRC's patented WING technology with an integrated airflow sensor to form a complete measurement point. Installed within the duct or plenum, the airfoil probes passively sample airflow across multiple locations, while the sensor converts those pressure signals into a precise airflow value. Measurement stations are available in standard-flow and high-flow ranges to accommodate a wide variety of applications and duct sizes.

When multiple airfoil probes are required for a single measurement, they are combined into a unified array, ensuring accurate, representative airflow feedback for that measurement point.

A system diagram below illustrates the relationship between the transmitter, sensors, and airfoil probes, including their electrical and pneumatic connections.



PLACEMENT GUIDELINES

OVERVIEW

Proper placement of AF4 airflow measurement components is essential to achieve accurate and reliable performance. Each measurement array powered by WING technology must be installed in accordance with CRC's placement guidelines and the project's mechanical design documents.

Improper location, orientation, or spacing of airfoil probes can introduce measurement error and reduce system responsiveness.

Before beginning installation

- Review the full system layout and confirm the number and size of AF4 airflow measurement stations.
- Ensure mounting locations are physically accessible for installation and service.
- Verify adequate straight duct length is available upstream and downstream per CRC guidelines.

⚠ Warnings

- **Accuracy Dependence:** The performance of the AF4 Airflow Measurement System and WING technology relies heavily on correct airfoil probe placement. Failure to meet minimum placement guidelines may compromise accuracy.
- **Alignment:** Airfoil probes must be mounted level and parallel to the airflow direction. Even slight tilt or misalignment within the duct plane can affect readings.
- **Installation Integrity:** All components must be securely mounted and correctly connected to the AF4 Transmitter. Loose or miswired connections will result in signal errors or instability.
- **Physical Clearance:** Confirm adequate clearance exists for both installation and future service access. Avoid placing components where vibration, condensation, or high temperatures could affect performance.
- **Field Adjustment Limitations:** If the minimum placement requirements cannot be met, installed accuracy may be reduced. Field adjustment can be performed to align readings with a verified third-party measurement; however, this adjustment introduces additional uncertainty and should be used only when necessary.

⚠ When AF4 airflow measurement stations are installed in constrained ductwork or non-standard configurations, consult CRC for guidance on alternate placement strategies or field calibration methods.

COMPONENT LOCATION CONSIDERATIONS

The performance of the AF4 Airflow Measurement System depends not only on proper airfoil probe placement but also on positioning of the associated sensors and transmitter.

AF4 Airflow Sensors

AF4 Airflow Sensors should be installed in close proximity to their associated measurement array. Mount sensors directly on or near the duct or unit whenever possible to minimize pneumatic tubing length and exposure to temperature differences.

- Maintain equal tubing length and diameter between the HI and LO ports.
- Keep tubing runs as short and direct as possible to ensure signal stability.
- Avoid routing tubing near hot surfaces or through areas prone to condensation.

AF4 Transmitter

The AF4 Transmitter can be mounted in any accessible, visible location that provides adequate clearance for wiring, configuration, and service. Typical locations include nearby walls, panels, or mechanical room enclosures.

- Connect AF4 Airflow Sensors to the transmitter using 3-conductor cable (22 AWG recommended).
- The total cable length between AF4 Airflow Sensors and the AF4 Transmitter should not exceed 200 ft (61 m).
- Route wiring separately from high-voltage conductors to prevent electrical interference.

⚠ Properly locating both the AF4 Airflow Sensors and Transmitter helps maintain measurement accuracy and simplifies installation. Where space constraints limit placement options, contact CRC for guidance on alternative configurations.

PLACEMENT GUIDELINES

DUCT AND PLENUM APPLICATIONS

Proper measurement array placement ensures stable airflow readings and long-term performance. The airfoil probes' patented WING aerodynamic design uses passive indirect sensing, maintaining accuracy even in real-world duct conditions where contaminants or turbulence may be present.

Typical duct applications include:

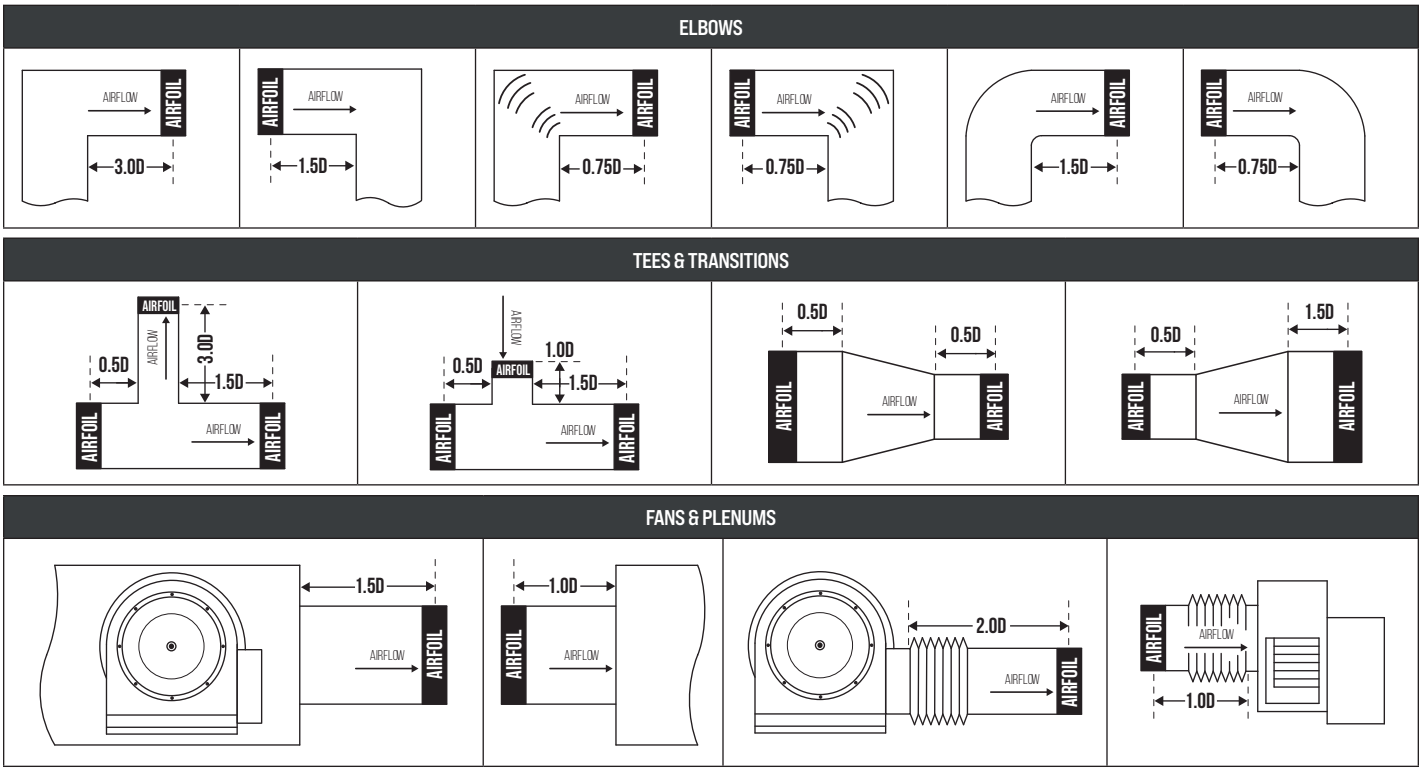
- Supply air
- Return air
- Relief air
- Outdoor air intake

Whenever possible, locate airfoil probes where airflow is uniform — ideally with at least one equivalent duct diameter (D) of straight duct upstream and ½ D downstream.

PLACEMENT GUIDANCE

- In installations with strong turbulence (such as immediately downstream of elbows, dampers, or transitions), additional straight-run length — up to 3 D upstream — is recommended for best performance.
- Mount airfoil probes level and aligned with the direction of airflow, as shown in the applicable mounting diagrams.
- Where straight-run distance is limited, the WING design helps maintain reliable readings; however, minor performance variation may occur in highly turbulent conditions.
- If these conditions cannot be met, the system can be field-calibrated to compensate for local airflow characteristics and maintain reliable performance.

⚠ Ducted installation provides the most predictable performance. The airfoil probe WING technology reduces—but does not eliminate—the influence of upstream obstructions or swirl.



PLACEMENT GUIDELINES

HOOD, DAMPER, AND LOUVER APPLICATIONS

Airflow measurement at outdoor air intakes, such as rooftop hoods, louvers, and damper assemblies, presents unique challenges due to turbulence, variable wind conditions, and limited straight duct length. Proper airfoil probe placement is essential for achieving accurate, repeatable results.

CRC's WING technology is designed to maintain reliable performance in these conditions. The passive indirect sensing minimizes errors caused by non-uniform velocity profiles and is less susceptible to debris or condensation compared to thermal or static/total pressure-based devices.

PLACEMENT GUIDANCE

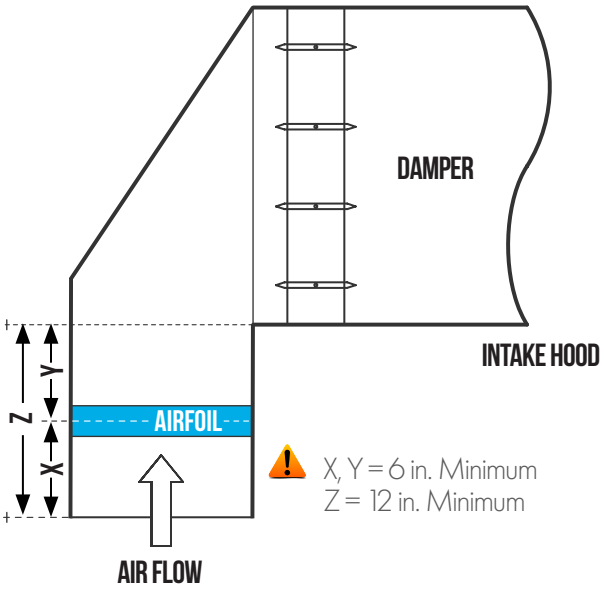
- **Airfoil Probe Orientation:** When dampers, louvers, or intake blades are present, mount airfoil probes perpendicular to the orientation of those components. This ensures each airfoil probe measures across multiple flow passages, providing a more representative average of the total airflow.
- **Distance from Louvers:** Allow sufficient distance downstream of the intake louver for airflow to stabilize before it reaches the airfoil probes. A minimum of 18 inches is recommended when space allows.
- **Distance from Hoods:** Allow sufficient distance downstream of the intake hood for airflow to stabilize before it reaches the airfoil probes. A minimum of 12 inches is recommended when space allows.
- **Distance from Dampers:** Avoid placing airfoil probes immediately downstream of a modulating or partially open damper. Damper blade position can cause highly uneven velocity profiles, leading to measurement instability.
- **System Interaction:** Locate airfoil probes where recirculation or fan-induced turbulence will not distort incoming airflow.
- **Access and Service:** Ensure the selected location allows for airfoil probe installation, tubing routing, and service without obstruction.

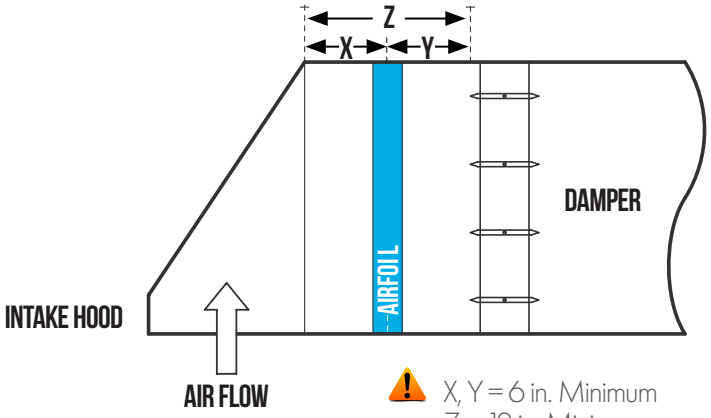
⚠ If space limitations prevent ideal placement, installed accuracy may be reduced. The AF4 Transmitter includes calibration and balancing tools that allow field adjustment to align readings with verified third-party measurements.

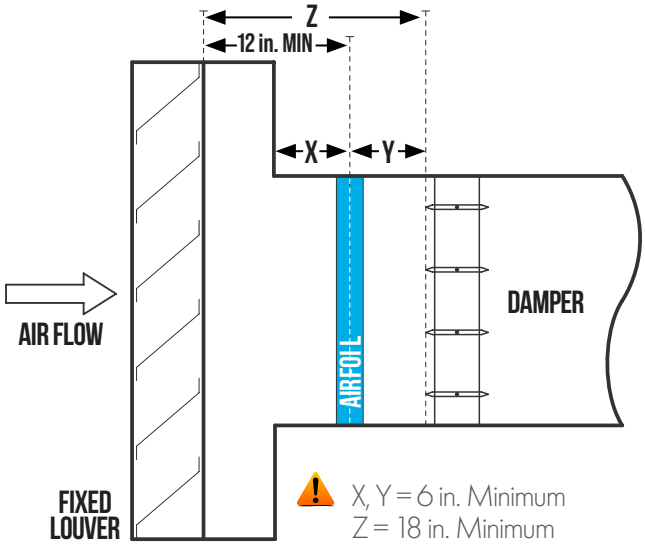
⚠ Outdoor air intake measurement typically provides the most predictable performance when airfoil probes are installed in ducted sections rather than open hoods or plenums. When ducted placement is not possible, select an installation location that captures the full velocity profile of the intake.

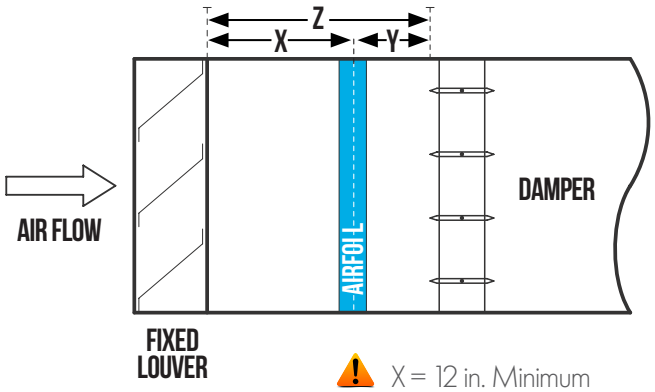
PLACEMENT GUIDELINES

HOOD, DAMPER AND LOUVER APPLICATIONS









All measurements in inches

X = Distance to upstream interface
Y = Distance to downstream interference
Z = Distance between interferences

PLACEMENT GUIDELINES

SQUARE AND RECTANGULAR DUCT

Airfoil Probe Quantity

Once the array location within the system has been determined, the next step is to identify the number of airfoil probes required for proper coverage across the duct. The airfoil probe quantity is dictated by the duct's size and the selected airfoil probe direction—it is not user-selected.

Use the table below to find the required number of airfoil probes based on the duct's airfoil probe direction and perpendicular direction dimensions. For rectangular ducts, the airfoil probe direction defines which dimension establishes the airfoil probe length. When possible, select the smaller duct dimension as the airfoil probe direction to minimize hardware and simplify installation without affecting accuracy.

For square ducts, airfoil probe length remains the same regardless of direction.

⚠ When probes are mounted vertically in applications where condensation may occur, it is recommended to orient the pneumatic connections on the upper side of the airfoil probe to prevent moisture accumulation in the pressure lines.

In the table below:

- Airfoil probe direction (columns): Dimension along which airfoil probes are installed.
- Perpendicular direction (rows): Dimension perpendicular to the airfoil probe, across which flow is characterized.

AIRFOIL PROBE TABLE

PERPENDICULAR DIRECTION (inches) \ AIRFOIL PROBE DIRECTION (inches)	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	52	56	60	66	72	78	84	90	96	102	108	114	120
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⚠ Airfoil probe direction is typically chosen based on the smaller duct dimension to minimize hardware.

PLACEMENT GUIDELINES

SQUARE AND RECTANGULAR DUCT

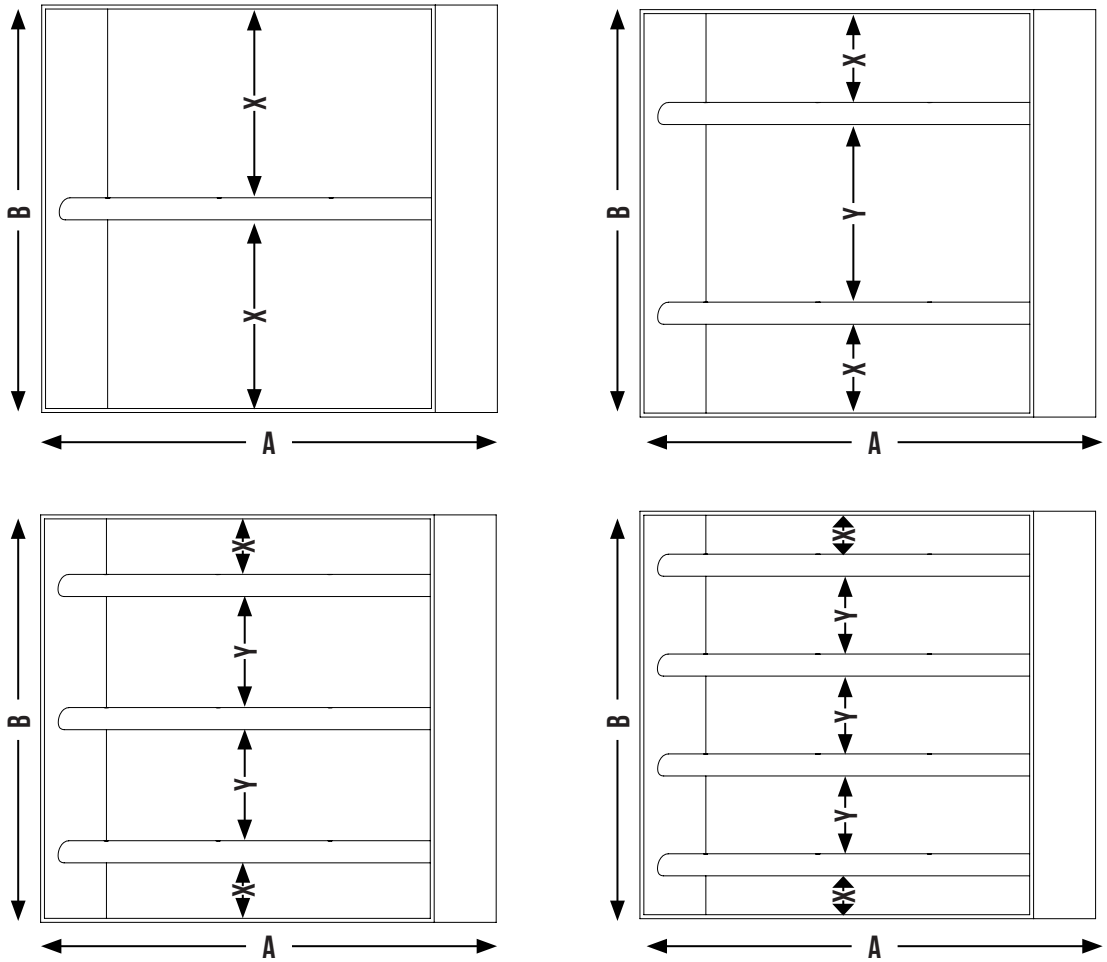
Probe Spacing and Positioning

Proper airfoil probe spacing ensures uniform sampling across the duct cross-section and consistent airflow measurement. The illustrations below show the standard spacing layouts for ducts requiring one, two, three, or four airfoil probes.

Airfoil probe spacing is determined automatically based on the number of airfoil probes required. Airfoil probes should be evenly distributed along the Perpendicular Direction, centered within the duct.

A = Probe Direction
B = Perpendicular Direction

SQUARE / RECTANGULAR DUCT AIRFOIL PROBE POSITIONING TABLE		
PROBES	X	Y
1	$\frac{B}{2}$	N/A
2	$\frac{B}{4}$	$\frac{B}{2}$
3	$\frac{B}{6}$	$\frac{B}{3}$
4	$\frac{B}{8}$	$\frac{B}{4}$



⚠ For nonstandard or irregular duct shapes, contact CRC for custom spacing recommendations.

⚠ When feasible, verify clearances for probe installation and sensor mounting prior to fabrication.

PLACEMENT GUIDELINES

CIRCULAR DUCT

Airfoil Probe Quantity

Once the airfoil probe location within the system has been determined, the next step is to identify the number of airfoil probes required for proper coverage across the duct. Airfoil probe quantity for circular ducts is determined solely by the duct diameter—it is not user-selected.

Use table below to determine the required number of airfoil probes based on the duct's diameter. Each airfoil probe spans the full diameter of the duct, and additional airfoil probes are introduced as duct size increases to maintain uniform airflow sampling.

AIRFOIL PROBE QUANTITY IDENTIFIER TABLE

DUCT DIAMETER (inches)	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40	44	48	52	56	60	66	72	78	84	90	96	102	108	114	120
R (inches)	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	22	24	26	28	30	33	36	39	42	45	48	51	54	57	60
PROBES	1										2													3								

⚠ When airfoil probes are mounted vertically in applications where condensation may occur, it is recommended to orient the pneumatic connections on the upper side of the airfoil probe to prevent moisture accumulation in the pressure lines.

PLACEMENT GUIDELINES

CIRCULAR DUCT

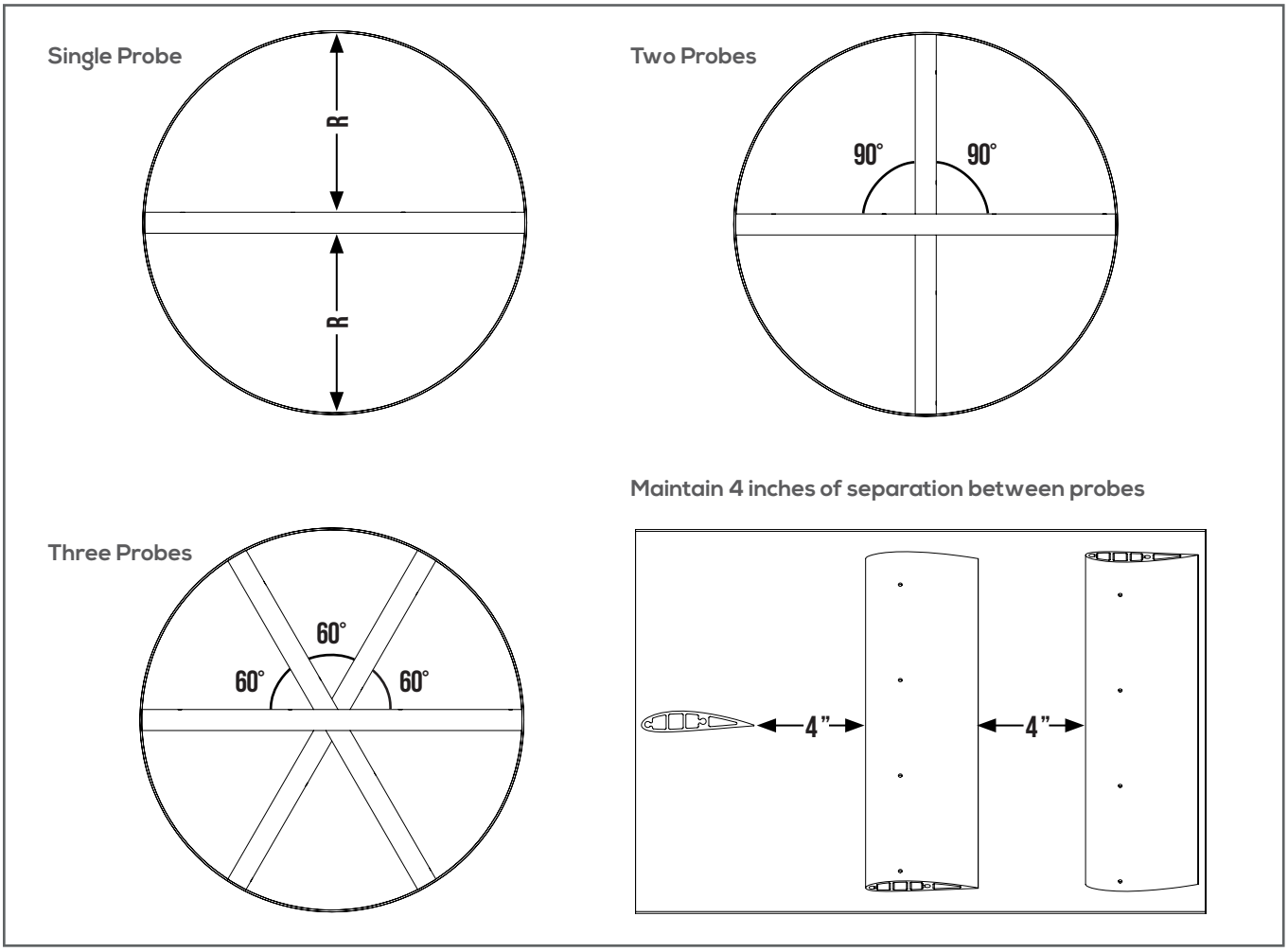
Probe Spacing and Positioning

Proper airfoil probe spacing and orientation within circular ducts ensure balanced airflow sampling and accurate performance. The illustrations below show the standard mounting layouts for ducts requiring one, two, or three probes.

Probe spacing is determined automatically based on the number of probes required. Probes should be installed at equal angular intervals around the duct, centered along the duct diameter:

- **Single probe:** Positioned through the duct centerline.
- **Two probes:** Mounted 90° apart.
- **Three probes:** Mounted 60° apart.

Maintain approximately 4 inches of separation between probes where applicable to ensure proper clearance for mounting hardware and tubing connections.



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INSTALLATION & WIRING

OVERVIEW

This section provides installation and wiring instructions for the AF4 Transmitter, AF4 Airflow Sensors, and airfoil probes. Not every component or mounting style described in this section will apply to every project. Follow the instructions that match the supplied configuration and project drawings.

Installation must be performed by qualified personnel in accordance with local electrical codes, project specifications, and applicable safety requirements.

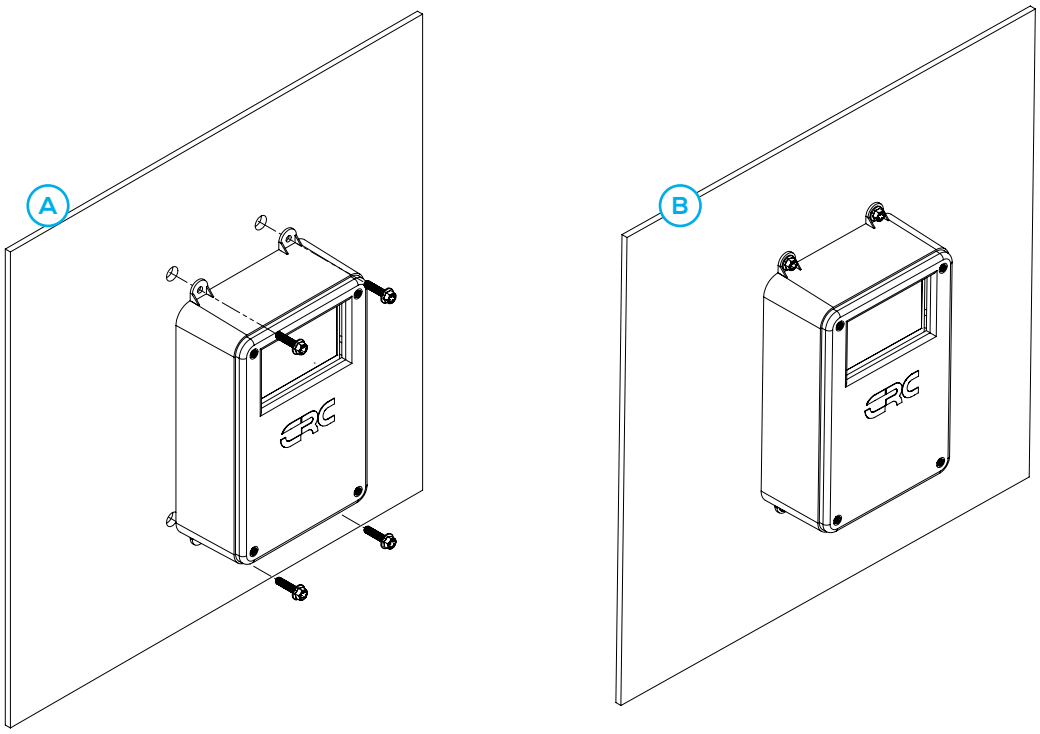
Before beginning installation:

- Verify all components are present and undamaged.
- Confirm airfoil probe sizes, quantities, and mounting styles match the project requirements.
- Review the placement guidelines before cutting ductwork or mounting probes.
- Confirm all mounting locations are accessible for installation, wiring, tubing, and future service.
- Disconnect power before performing wiring or service work.

Do not install damaged, incorrect, or incomplete components. Contact CRC before proceeding if any supplied parts do not match the project requirements.

INSTALLATION & WIRING

TRANSMITTER INSTALLATION



The AF4 Transmitter should be mounted in an indoor location that is visible, accessible, and protected from moisture, excessive heat, and physical damage.

Mounting Requirements:

Mount the transmitter within 200 ft [61 m] of all connected AF4 Airflow Sensors.

- Provide at least 3 in. [76 mm] of clearance below the enclosure for conduit and wiring access.
- Mount the transmitter where the touchscreen can be viewed and operated during setup and service.
- Route power, signal, and network wiring in accordance with the wiring requirements in this manual.

INSTALLATION STEPS

1. Select a mounting location that meets the requirements above.
2. Hold the transmitter against the mounting surface and mark the four mounting hole locations.
3. Drill appropriately sized pilot holes for the mounting hardware.
4. Secure the transmitter to the mounting surface using four suitable screws.
5. Verify the enclosure is firmly mounted and that conduit/wiring access is unobstructed.

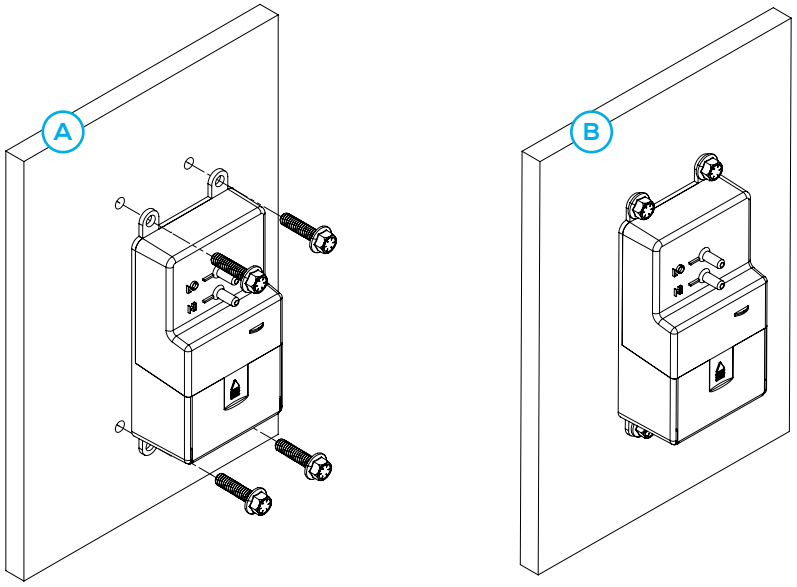
WIRING REQUIREMENTS

- Connect 24 VAC power to the transmitter power input.
- Connect all AF4 Airflow Sensors to the assigned station inputs.
- Connect BACnet® MS/TP wiring, if used.
- Connect analog outputs to the BAS or field device, if used.

Do not apply power until all wiring has been completed and verified.

INSTALLATION & WIRING

SENSOR INSTALLATION



Each AF4 Airflow Sensor should be installed near its associated airfoil probe array to minimize pneumatic tubing length and maintain measurement stability.

Mounting Requirements:

- Mount the sensor within 200 ft [61 m] of the AF4 Transmitter.
- Install the sensor near the associated airfoil probe array whenever possible.
- Keep pneumatic tubing runs as short and direct as practical.
- Provide access to the pneumatic ports, electrical terminals, and enclosure cover.
- Protect the sensor from moisture, direct heat, vibration, and physical damage.

INSTALLATION STEPS

1. Select a mounting location near the associated airfoil probe array.
2. Hold the sensor against the mounting surface and mark the four mounting hole locations.
3. Drill appropriately sized pilot holes for the mounting hardware.
4. Secure the sensor to the mounting surface using four suitable screws.
5. Verify the sensor is firmly mounted and accessible for wiring and tubing connections.

CONNECTION REQUIREMENTS

- Connect the sensor wiring to the assigned station input on the AF4 Transmitter.
- Connect the HI pneumatic line from the airfoil probe array to the sensor HI port.
- Connect the LO pneumatic line from the airfoil probe array to the sensor LO port.
- Verify tubing is fully seated, leak-free, and not kinked.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION

GENERAL REQUIREMENTS

Airfoil probes must be installed in the correct location, orientation, and spacing to meet CRC standard performance criteria. Review the placement guidelines before cutting, drilling, or mounting probes.

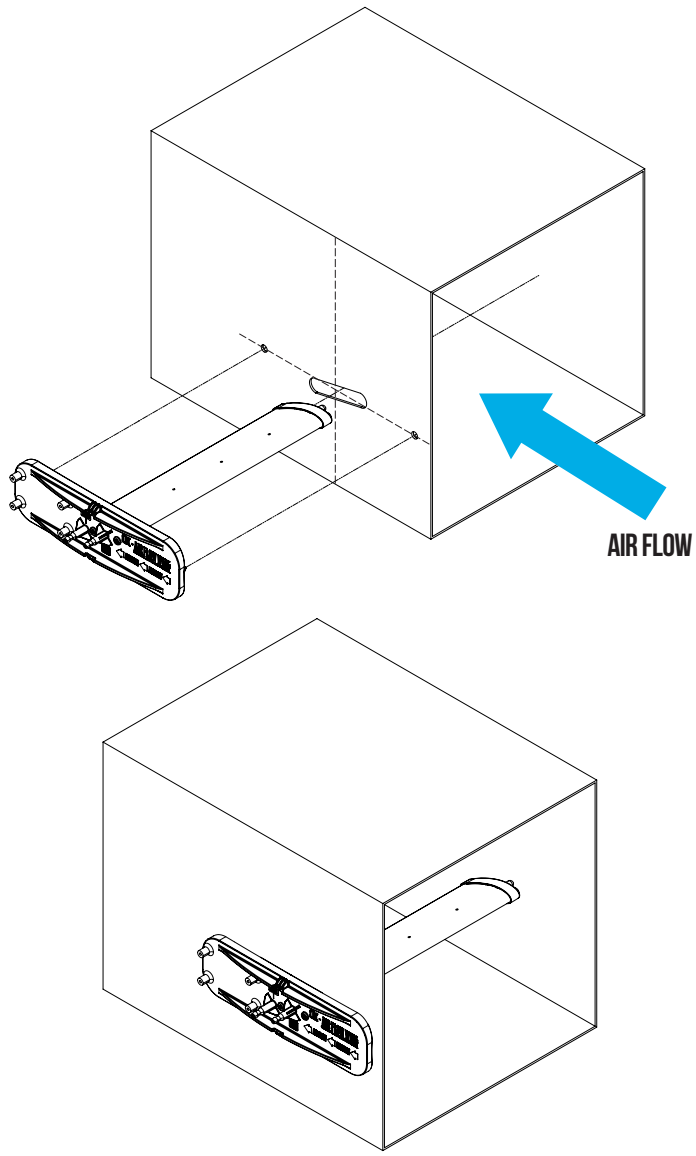
Before installing airfoil probes:

- Confirm the required probe quantity, probe length, and mounting style for each airflow measurement station.
- Verify the installation location matches the project drawings or CRC placement guidelines.
- Confirm adequate access for probe installation, pneumatic tubing, and future service.
- Confirm airflow direction before marking or cutting ductwork.
- Follow the required spacing and positioning guidelines for round, square, or rectangular ducts.
- Keep pneumatic connections accessible whenever possible.
- Cap all unused pneumatic ports.
- Verify all probes are securely mounted before connecting pneumatic tubing.

Airfoil probes must be mounted level and aligned with the direction of airflow. Incorrect placement, spacing, orientation, or tubing connection can reduce measurement accuracy or cause unstable readings.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INSERTION MOUNT (COMPRESSION FIT)



Compression fit hardware is standard for airfoil probes 16 inches long or shorter.

Before You Begin:

- Review the placement guidelines for the correct probe location.
- Confirm the probe quantity and spacing for the duct size
- Confirm airflow direction.
- Confirm the probe will be mounted level and aligned with airflow.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INSERTION MOUNT (COMPRESSION FIT)

INSTALLATION STEPS

1. Mark the probe location
Identify the required probe location on the insertion side of the duct. Mark the centerline of the probe location in the direction of airflow.

2. Mark the perpendicular reference line
Mark a perpendicular reference line across the probe location to create a ✚. This line is used to center and align the mounting template.

3. Apply the mounting template
Align the insertion mounting template with the ✚ marked on the duct. Confirm the airflow arrow on the template matches the actual airflow direction.

4. Drill the indicated holes
Drill the holes shown on the mounting template.

5. Cut the probe slot
Cut the probe slot between the indicated holes as shown on the mounting template.

6. Deburr the opening
Remove sharp edges from all drilled holes and the probe slot.

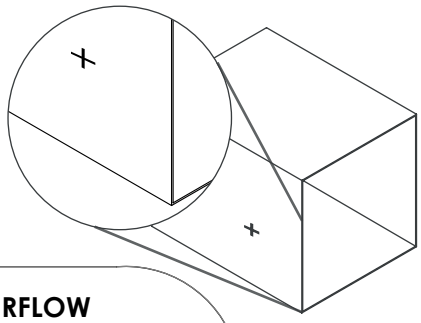
7. Insert the airfoil probe
Insert the probe through the slot and seat the dowels into the drilled holes. Confirm the probe is aligned with airflow.

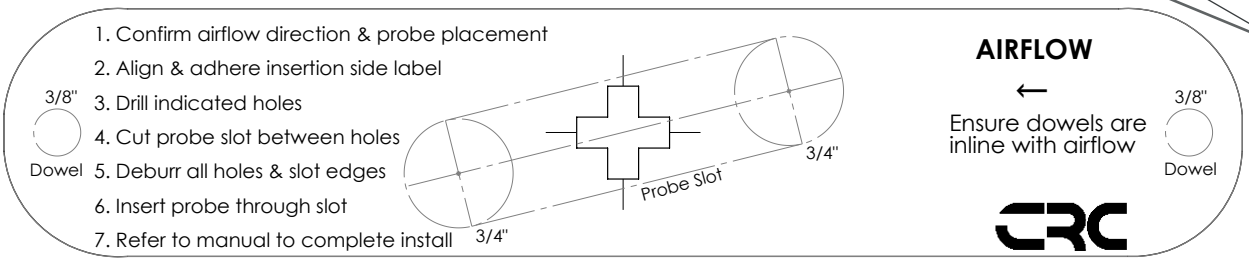
8. Secure the probe plate
Secure the probe plate to the duct using one of the following methods:
- Tighten a band clamp until the rubber screw seats and compresses.
- Fasten the insertion plate directly to the duct using sheet metal screws.

9. Verify installation
Confirm the probe is fully seated, sealed, secure, and aligned with the airflow direction.

VERIFICATION

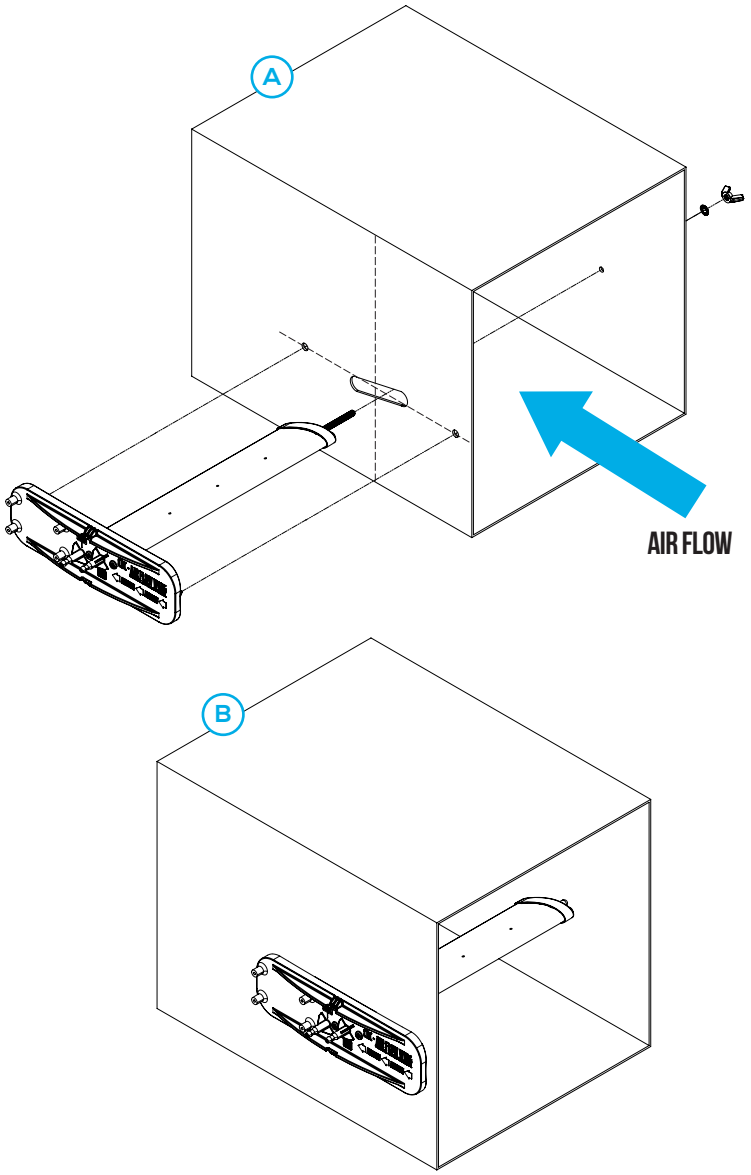
Before connecting pneumatic tubing, verify:
- Probe is level.
- Probe is aligned with airflow.
- Probe plate is sealed against the duct.
- Dowels are seated correctly.
- Mounting hardware is tight.
- Probe is not loose or misaligned.





INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INSERTION MOUNT (SCREW FIT)



Screw fit hardware is standard for airfoil probes longer than 16 inches.

Before You Begin:

- Review the placement guidelines for the correct probe location.
- Confirm the probe quantity and spacing for the duct size.
- Confirm airflow direction.
- Verify access to both sides of the duct.
- Confirm the probe will be mounted level and aligned with airflow.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INSERTION MOUNT (SCREW FIT)

INSTALLATION STEPS

1. Mark the probe location
Identify the required probe location on the insertion side of the duct. Mark the centerline of the probe location in the direction of airflow.

2. Mark the perpendicular reference line
Mark a perpendicular reference line across the probe location to create a ✚. This line is used to center and align the mounting template.

3. Apply the mounting template
Align the insertion mounting template with the ✚ marked on the duct. Confirm the airflow arrow on the template matches the actual airflow direction.

4. Drill the indicated insertion-side holes
Drill the holes shown on the mounting template.

5. Cut the probe slot
Cut the probe slot between the indicated holes as shown on the mounting template.

6. Deburr the opening
Remove sharp edges from all drilled holes and the probe slot.

7. Mark the opposite side of the duct
On the opposite side of the duct, mark the attachment point aligned with the insertion-side probe location. Confirm this point is centered with the probe path and aligned with airflow.

8. Drill the screw-fit attachment hole
Drill one 13/64 in. hole at the marked opposite-side attachment location.

9. Insert the airfoil probe
Insert the probe through the insertion-side slot. Seat the dowels into the drilled holes and guide the screw-fit end through the opposite-side attachment hole.

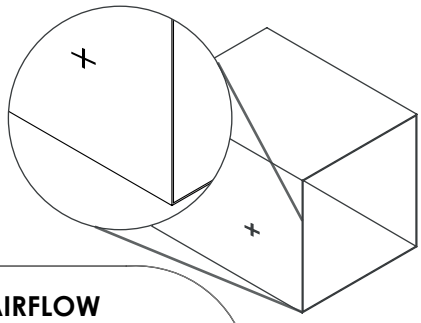
10. Secure the probe
Install the provided screw-fit hardware and tighten until the probe is fully seated and secure.

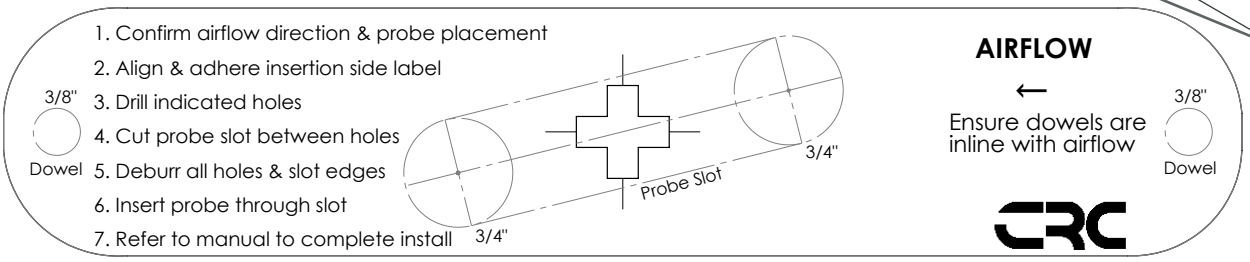
11. Verify installation
Confirm the probe is fully seated, sealed, secure, and aligned with the airflow direction.

VERIFICATION

Before connecting pneumatic tubing, verify:

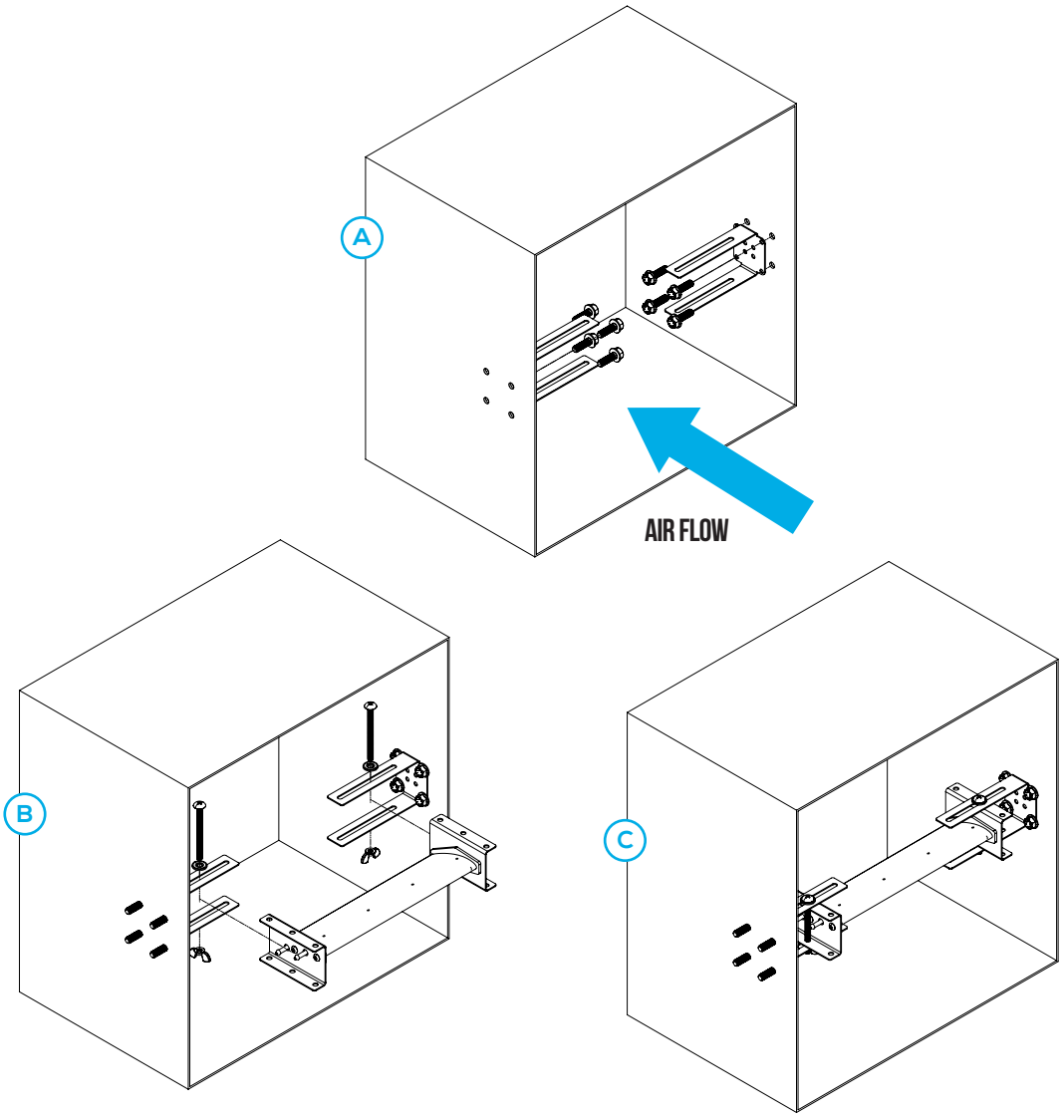
- Probe is level.
- Probe is aligned with airflow.
- Probe plate is sealed against the duct.
- Opposite-side hardware is secure.
- Probe does not sag, rotate, or move.
- Mounting hardware is tight.





INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INTERNAL MOUNT



Internal mount hardware allows the airfoil probe to be mounted inside the duct or plenum. This mounting style also allows field selection of the pneumatic connection end.

Before You Begin:

- Review the placement guidelines for the correct probe location.
- Confirm the probe quantity and spacing for the duct size.
- Confirm airflow direction.
- Verify access inside the duct or plenum.
- Determine which end of the probe will be used for pneumatic tubing connections.
- Confirm unused pneumatic ports will be capped.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION INTERNAL MOUNT

INSTALLATION STEPS

1. Mark the probe location
Mark the required probe mounting location on both inside duct walls. Confirm the marks are aligned with each other and with the direction of airflow.
2. Confirm pneumatic connection end
Determine which end of the probe will be used for HI and LO pneumatic tubing connections. Cap all unused ports on the opposite end.
3. Prepare the mounting brackets
If needed, remove the mounting brackets from the airfoil probe before fastening the brackets inside the duct.
4. Install the mounting brackets
Fasten the mounting brackets to the inside duct walls at the marked locations. Brackets must be level and aligned with airflow.

Recommended hardware:
- #10 × 1 in. sheet metal screws, or
- #10 × 1/2 in. sheet metal screws

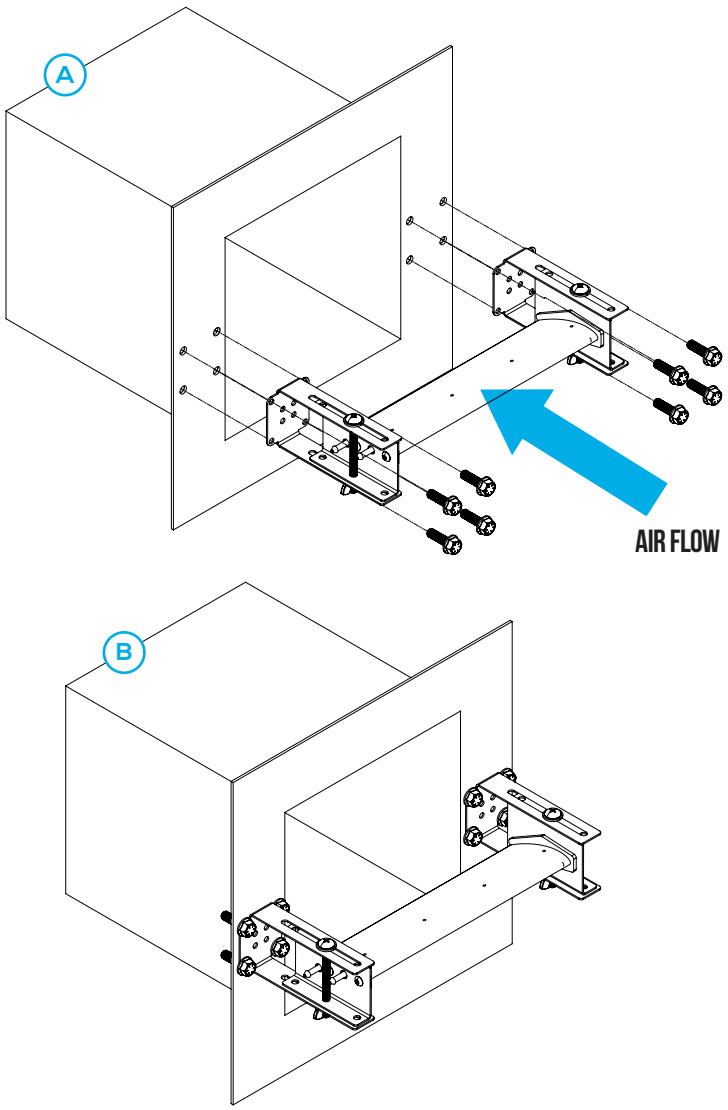
5. Install the airfoil probe
Reinstall the airfoil probe onto the mounted brackets using the provided hardware.
6. Align the probe
Confirm the probe is level, centered, and aligned with airflow.
7. Tighten hardware
Securely tighten all probe and bracket hardware after final alignment.
8. Verify installation
Confirm the probe is fully seated, secure, and aligned with the airflow direction.

VERIFICATION

Before connecting pneumatic tubing, verify:
- Probe is level.
- Probe is aligned with airflow.
- Brackets are secure.
- Probe hardware is tight.
- Unused pneumatic ports are capped.
- Pneumatic connection ports remain accessible.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION STANDOFF MOUNT



Standoff mount hardware allows the airfoil probe to be mounted across an offset or standoff section. This mounting style also allows field selection of the pneumatic connection end.

Before You Begin:

- Review the placement guidelines for the correct probe location.
- Confirm the probe quantity and spacing for the application.
- Confirm airflow direction.
- Verify access to both standoff mounting locations.
- Determine which end of the probe will be used for pneumatic tubing connections.
- Confirm unused pneumatic ports will be capped.

INSTALLATION & WIRING

AIRFOIL PROBE INSTALLATION STANDOFF MOUNT

INSTALLATION STEPS

1. Mark the standoff mounting locations
Mark the required mounting locations on both sides of the standoff opening. Confirm both sides are aligned with each other and with the direction of airflow.

2. Confirm pneumatic connection end
Determine which end of the probe will be used for HI and LO pneumatic tubing connections. Cap all unused ports on the opposite end.

3. Prepare the mounting brackets
If needed, remove the mounting brackets from the airfoil probe before fastening the brackets to the standoff locations.

4. Install the mounting brackets
Fasten the mounting brackets to the marked standoff locations. Brackets must be level and aligned with airflow.

Recommended hardware:
- #10 × 1 in. sheet metal screws, or
- #10 × 1/2 in. sheet metal screws

5. Install the airfoil probe
Reinstall the airfoil probe onto the mounted brackets using the provided hardware.

6. Align the probe
Confirm the probe is level, centered, and aligned with airflow.

7. Tighten hardware
Securely tighten all probe and bracket hardware after final alignment.

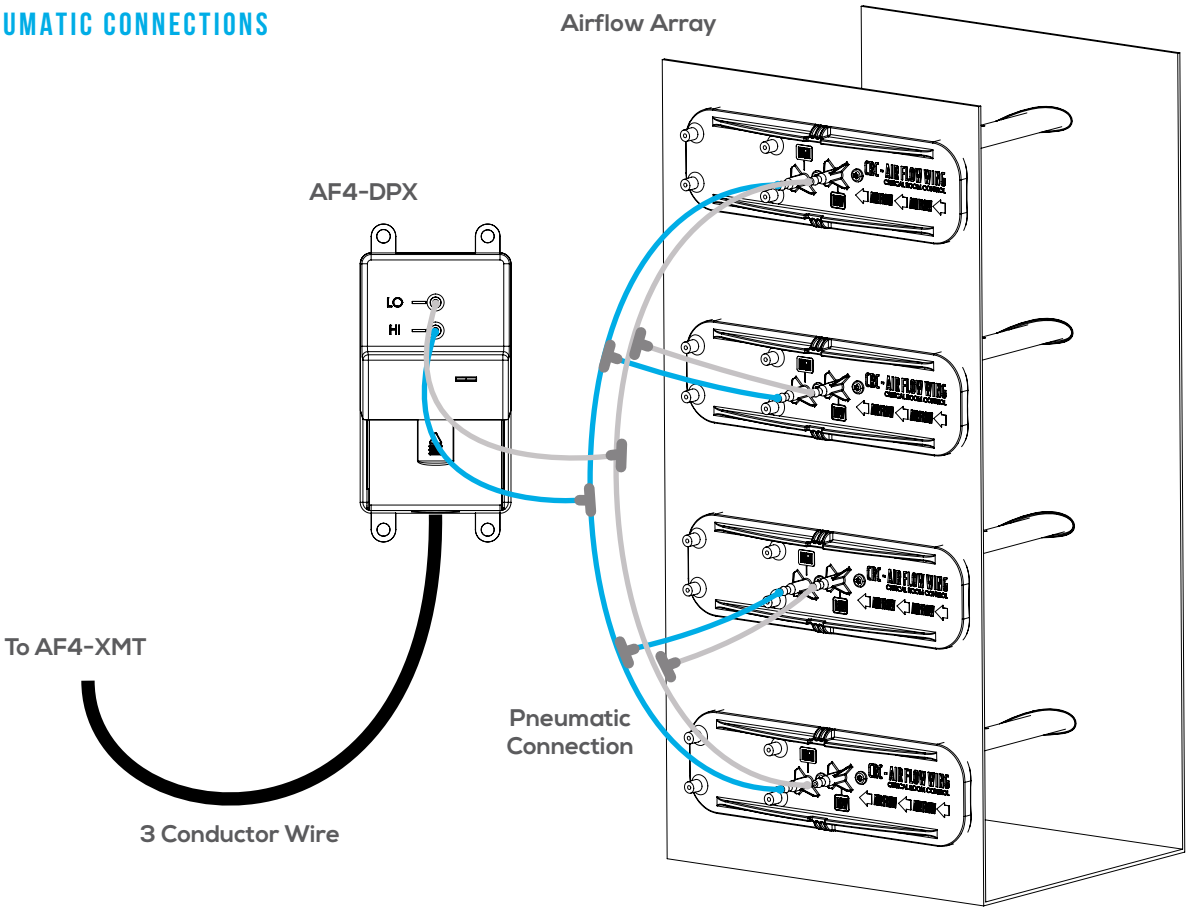
8. Verify installation
Confirm the probe is fully seated, secure, and aligned with the airflow direction.

VERIFICATION

Before connecting pneumatic tubing, verify:
- Probe is level.
- Probe is aligned with airflow.
- Brackets are secure.
- Probe hardware is tight.
- Unused pneumatic ports are capped.
- Pneumatic connection ports remain accessible.

INSTALLATION & WIRING

PNEUMATIC CONNECTIONS



All airfoil probes assigned to the same airflow measurement station must be pneumatically connected to the associated AF4 Airflow Sensor.

Connection Requirements

- Connect all HI ports from the airfoil probes together to create one common HI pressure line.
- Connect all LO ports from the airfoil probes together to create one common LO pressure line.
- Route the common HI line to the HI port on the AF4 Airflow Sensor.
- Route the common LO line to the LO port on the AF4 Airflow Sensor.
- Use 1/4 in. pneumatic tubing and compatible fittings.
- Keep HI and LO tubing runs similar in length where practical.
- Avoid sharp bends, kinks, hot surfaces, vibration, and areas where condensation may collect.
- Secure tubing to prevent sagging or accidental disconnection.

Before commissioning, verify all fittings are fully seated and leak-free.

INSTALLATION & WIRING

POWER AND GROUNDING REQUIREMENTS

This section outlines the power, grounding, and signal wiring requirements for the AF4 Airflow Measurement System. Follow these guidelines carefully to ensure reliable operation and minimize electrical noise or interference.

Power

- **AF4 Transmitter:** 24 VAC supplied by Class 2 transformer.
- **AF4 Airflow Sensor:** 24 VDC supplied by the transmitter.
- Route power wiring separately from low-voltage and signal wiring to avoid interference.

⚠ Do not power airflow sensors from any source other than the transmitter.

Grounding

- Maintain consistent 24 VAC transformer secondary wiring. Reversing transformer secondary connections between interconnected devices may cause damage.
- Keep low-voltage signal wiring (AI, AO) physically separated from high-voltage wiring to prevent electrical noise.
- Verify continuity of grounding connections during installation.

Signals

- Use twisted, shielded cable for all low-voltage signals.
- Keep signal wiring at least 12 in. (300 mm) away from power wiring; cross at right angles if needed.
- Terminate shields at one end only to prevent ground loops.

Wire Recommendations

- **Power:** 18 AWG stranded, shielded if possible.
- **Analog signals (AI/AO):** 22–24 AWG twisted pair, shielded.
- **Max cable length:** per sensor spec, typically ≤250 ft for analog signals.

BACnet® MS/TP WIRING NOTES

- **Cable Type:** Use 3-conductor cable (A, B, Signal Ground), 22–24 AWG, twisted pair, shielded.
- **Topology:** Daisy-chain only. Do not star-wire or T-tap. Maximum 32 devices per segment, 4000 ft (1200 m) total length.
- **Termination:** Install 120 Ω termination resistors at both ends of the trunk. Provide biasing only once per segment. The AF4 does not provide onboard MS/TP biasing. Biasing must be provided by the BACnet router, supervisory controller, or another approved device on the MS/TP segment.
- **Grounding:** Connect Signal Ground across all devices in the segment. Earth-ground the shield at the BACnet® router or supervisory controller only.
- **Polarity:** Maintain consistent polarity for A+ and B- along the entire trunk. Reversed polarity will prevent communication.
- **Device Addressing:** Assign a unique MAC address (1–126) to each controller. Duplicate addresses will disable communication.

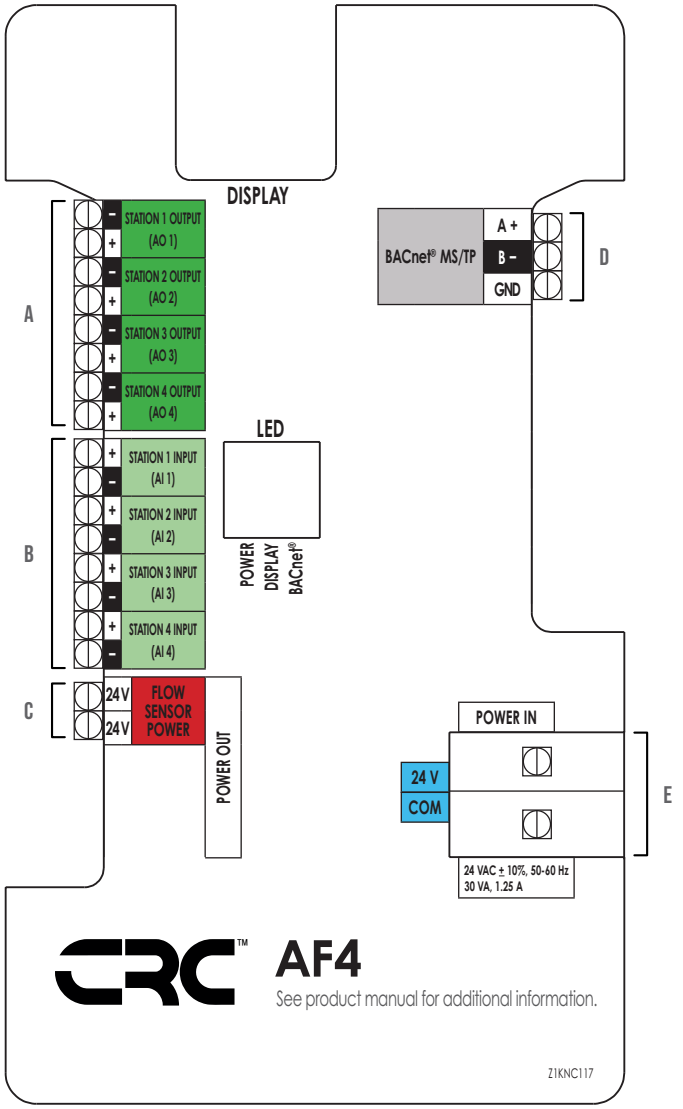
Verification

- Confirm baud rate matches across all devices.
- Use the controller's diagnostics or supervisory system to verify devices appear online and error counts are within acceptable limits.

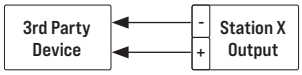
⚠ Improper MS/TP wiring (open shield, missing ground, or reversed polarity) is the most common cause of communication failures. Always verify wiring before commissioning.

INSTALLATION & WIRING

AF4 WIRING DIAGRAM

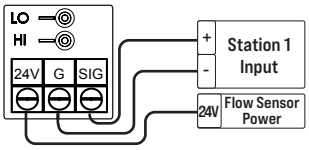


A: Station Outputs



- Station Outputs used to send FPM/CFM scaled voltage signal.
- Configure output units and range at AF4-XMT.
- Repeat as needed for each station.

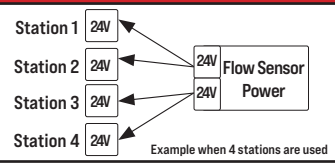
B: Station Inputs (AF4-DPX)



- Station 1 shown. Repeat for each required station.
- AF4-DPX-P5: Normal Flow | 50-2500 FPM
- AF4-DPX-02: High Flow | 50-5000 FPM

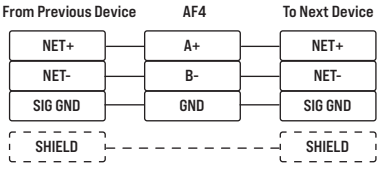
Station 1 --> AI 1 **Station 2** --> AI 2
Station 3 --> AI 3 **Station 4** --> AI 4

C: Flow Sensor Power



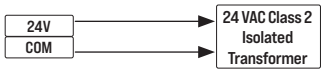
- Each AF4-DPX is powered from 24V Flow Sensor Power
- Two Flow Sensor Power terminals are provided.
- When more than 2 stations are used, distribute conductors properly across both terminals

D: BACnet MS/TP

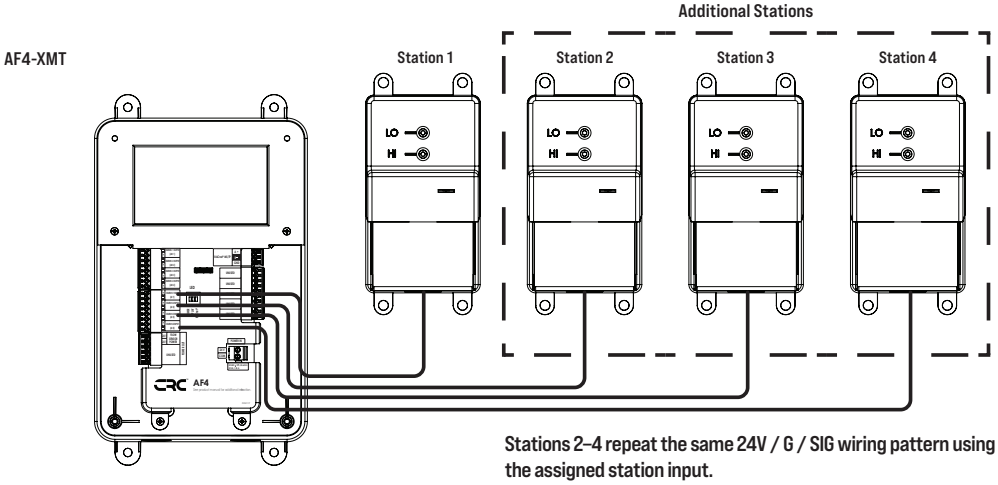


- Daisy-chain only. Do not star-wire or T-tap.
- Install 120 Ohm termination at both physical ends of the MS/TP trunk.
- Maintain shield continuity. Earth-ground shield at one location only. Do not land shield on AF4.
- AF4 does not provide onboard MS/TP biasing

E: Transmitter Power



- 24 VAC +/-10%, 50/60 Hz, 30 VA max (10 VA typical)
- Maintain transformer secondary orientation when devices share a common reference



Stations 2–4 repeat the same 24V / G / SIG wiring pattern using the assigned station input.

INSTALLATION AND WIRING

WIRING CHECKLIST

Power Wiring

- ☐ Circuit breaker/fuse sized correctly
- ☐ Dedicated power provided to controller
- ☐ Power and signal wiring separated (≥12 in / 300 mm)

Signal Wiring

- ☐ Twisted, shielded cable used for airflow sensors and analog outputs
- ☐ Shield grounded at controller end only
- ☐ Tubing and wiring routes avoid power cables and high-voltage equipment
- ☐ Sensor polarity and port connections verified (high/low pressure)

BACnet® MS/TP Wiring

- ☐ 3-conductor cable used (A+, B-, Signal Ground)
- ☐ Daisy-chain topology (no T-taps or stars)
- ☐ Termination resistors installed at both ends (120 Ω)
- ☐ Shield grounded at supervisory controller/router only
- ☐ Signal Ground continuous across all devices
- ☐ Polarity consistent along trunk
- ☐ Unique MAC addresses set (1–126)
- ☐ Baud rate matches across all devices

Verification

- ☐ Controller powers on and boots normally
- ☐ Continuity confirmed for all signal and network wiring
- ☐ Airflow sensor detected and displaying live readings
- ☐ Supervisory system detects controller on BACnet network
- ☐ No communication or sensor errors present in diagnostics

USER INTERFACE AND CONFIGURATION

OVERVIEW

The AF4 Airflow Measurement System includes an integrated touchscreen interface that provides full visibility into system operation and simplifies configuration, verification, and diagnostics. This section introduces the layout of the user interface, defines the primary navigation elements, and outlines the types of parameters available for setup.

The AF4 touchscreen is used to:

- View real-time airflow data for each station
- Configure and commission AF4 Airflow Measurement Stations
- Adjust analog outputs and BACnet® communication settings
- Review diagnostics and input/output status

NAVIGATION STRUCTURE

The AF4 user interface is organized into a clear set of screens that guide you from live system data to full configuration and commissioning. The menus below appear consistently throughout the interface and form the primary structure of device navigation.

Home Screen: The Home Screen provides an at-a-glance view of system status and airflow performance.

Administrative Menu: The Administrative Menu is the central access point for all configuration and system-level actions.

Station Commissioning: This menu provides guided tools for completing station-level commissioning.

Network: Configures all BACnet® communication settings for integration with supervisory systems.

General: Includes global device settings and utilities needed for managing the transmitter.

PARAMETER DEFINITIONS

Each screen within the transmitter contains configurable parameters.

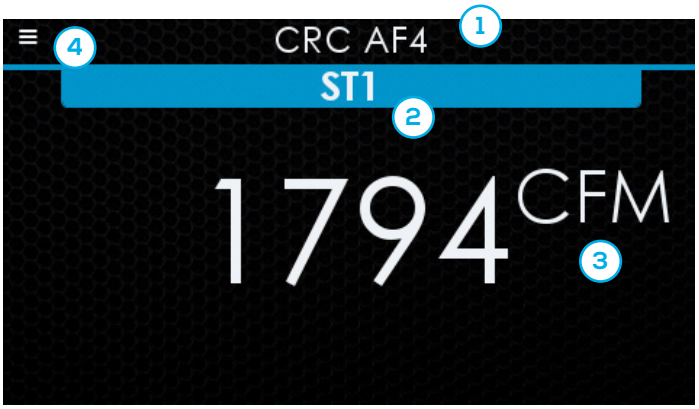
The following pages include tables that define:

- The purpose of each parameter
- Available options or ranges
- Default settings
- Any dependencies or restrictions

These tables allow installers and technicians to understand every setting before performing the commissioning steps later in the manual.

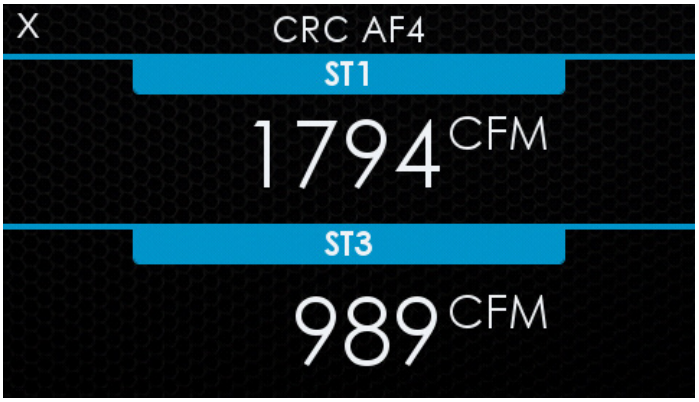
USER INTERFACE AND CONFIGURATION

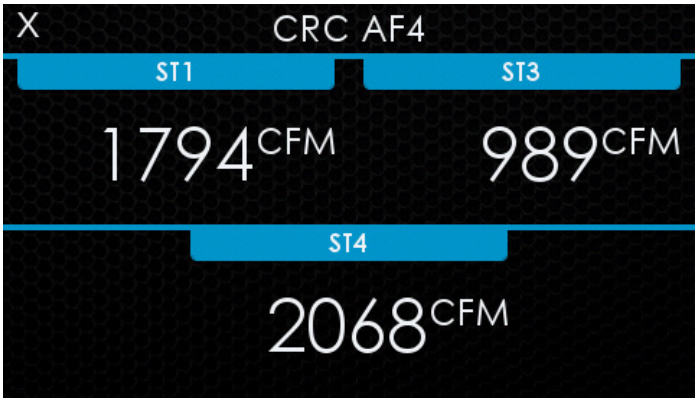
AF4 HOME SCREEN

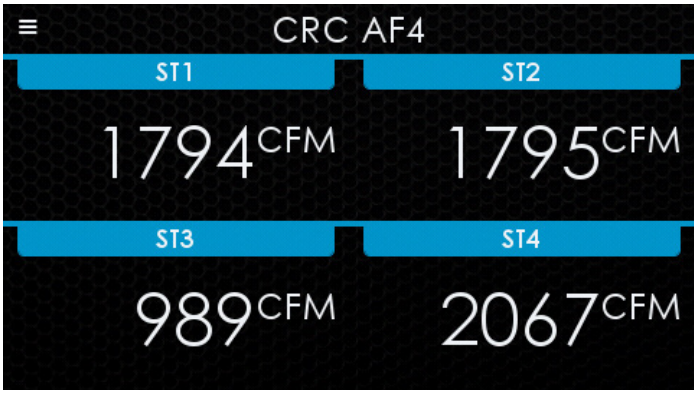


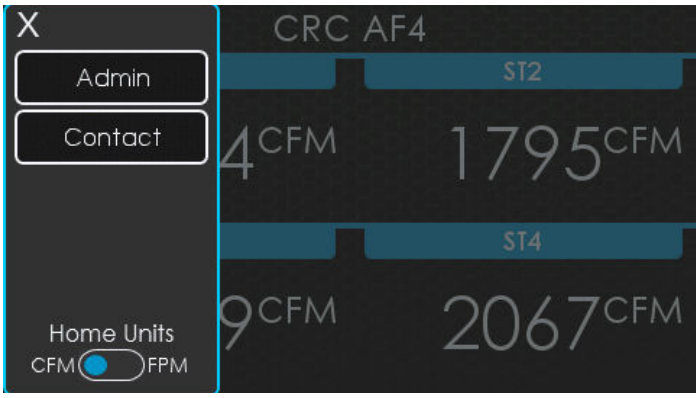
1. **Device Name:** Displays the main device name.
2. **Station Name:** Displays station name (up to 4 total stations).
3. **Value:** Displays current velocity or airflow.
4. **Menu:** Click to access Administrative Menu, Contact menu, or change display units (FPM or CFM)

ENABLED STATIONS LAYOUT EXAMPLES



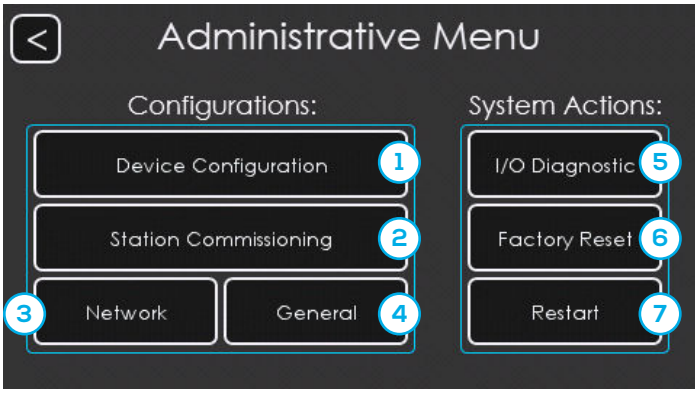






USER INTERFACE AND CONFIGURATION

ADMINISTRATIVE MENU

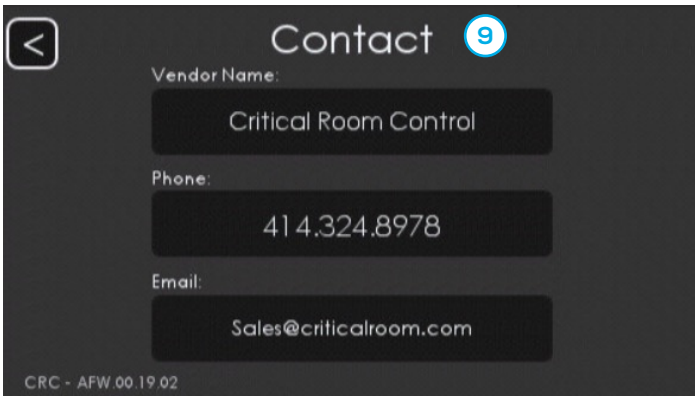


CONFIGURATIONS

1. **Device Configuration:** Enable, setup, and zero each airflow station.
2. **Station Commissioning:** Complete commissioning including duct area configurations, flow calibrations, output calibrations, and offsets.
3. **Network:** Configure BACnet communication settings.
4. **General:** Access basic configurations including password, device name, firmware upgrade, and contact information.

SYSTEM ACTIONS

5. **I/O Diagnostic:** Access controller inputs and outputs.
6. **Factory Reset:** Restore the controller to factory default settings.
7. **Restart:** Restart the controller and access touch screen calibration.
8. **<** : Returns user to home screen



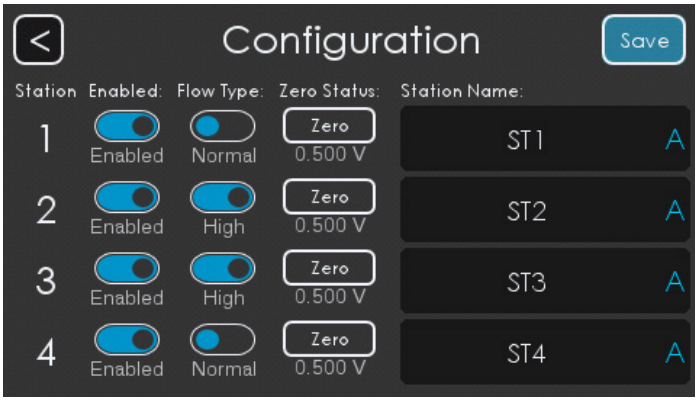
CONTACT INFO

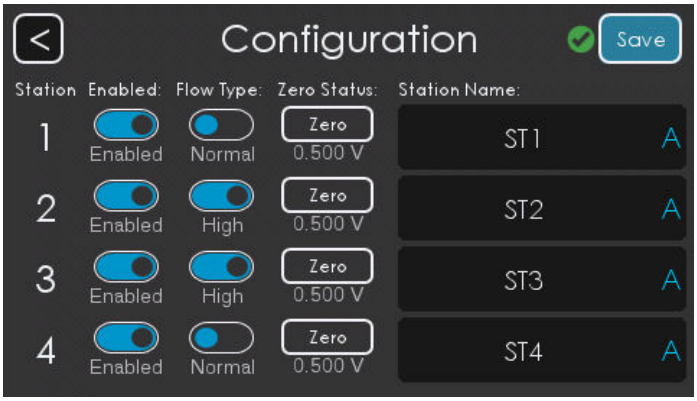
9. Displays local support contact info. Contact Info updated in the General screen.

USER INTERFACE AND CONFIGURATION

STATION CONFIGURATION

The Station Configuration menu is utilized to configure your **AF4**. The user is able to enable and customize up to 4 stations.





COMMISSIONING PARAMETERS

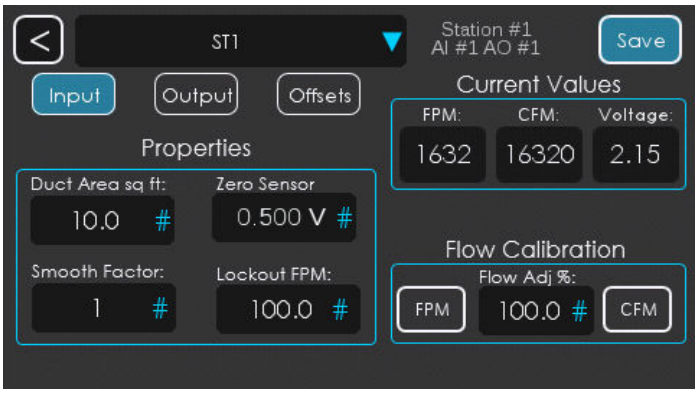
Parameter	Unit Selections	Description	Default
Station	--	Identifies the station (1-4) [also ties the station to this AI/AO pair]	N/A
Enabled	Enabled Disabled	Toggle to enable a station. Enabled stations appear on the Home Screen.	Station 1: Enabled Station 2-4: Disabled
Flow Type	Normal High	Toggle to select between Normal and High Flow types Refer to AF4 Airflow Sensor for selection.	Normal
Zero Status	--	Select to Zero the station. This value represents the signal baseline at zero flow. ⚠To zero, follow one of these two options. Option 1: Shunt the tubing at the sensor. Option 2: Verify the system is fully at rest (zero flow).	0.500 V
Station Name	Alphanumeric Selection	Enter the station name. This name will also be transmitted over identified dynamic BACnet® objects. See BACnet® Points table for more details.	ST1, ST2, ST3, ST4

USER INTERFACE AND CONFIGURATION

STATION COMMISSIONING

The Station Commissioning menu completes configuration and commissioning of each airflow measurement. It also allows for optional configuration of analog outputs and advanced station calibration. See COMMISSIONING section for commissioning process and instructions.

Input: Commission and calibrate the selected airflow station.



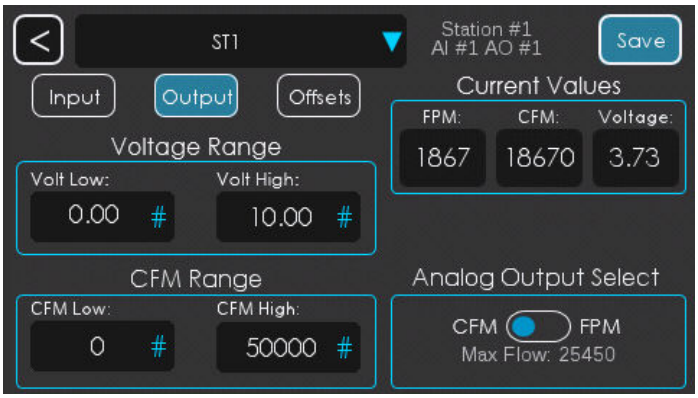
INPUT

Parameter	Unit Selections	Description	Default
Properties Section			
Duct Area sq ft	Numerical Value	Enter the measured duct area for this station. This value will change the measured CFM.	1.0
Zero Sensor	Numerical Value	Voltage at which the Sensor was zeroed. If needed, select to re-zero. ⚠To zero, follow one of these two options. Option 1: Shunt the tubing at the sensor. Option 2: Verify the system is fully at rest (zero flow).	0.500 V
Smooth Factor	1 - 5	Increase this value to reduce measurement speed and value fluctuations.	1
Lockout FPM	Numerical Value	Velocity measurement below this value will register as 0 FPM.	100.00
Current Values Section			
FPM	Numerical Value	Current value for velocity measurement.	N/A
CFM	Numerical Value	Current value for airflow measurement.	N/A
Voltage	Numerical Value	Current value for airflow sensor signal.	N/A
Flow Calibration Section			
FPM	Numerical Value	Enter field-measured velocity to automatically calculate Flow Adj %.	N/A
Flow Adjust %	Numerical Value	Balance correction applied to the station measurement. 100% represents no adjustment.	100.0
CFM	Numerical Value	Enter field-measured airflow to automatically calculate Flow Adj %.	N/A

USER INTERFACE AND CONFIGURATION

STATION COMMISSIONING (CONTINUED)

Output (optional): Configure the analog output for the selected station.



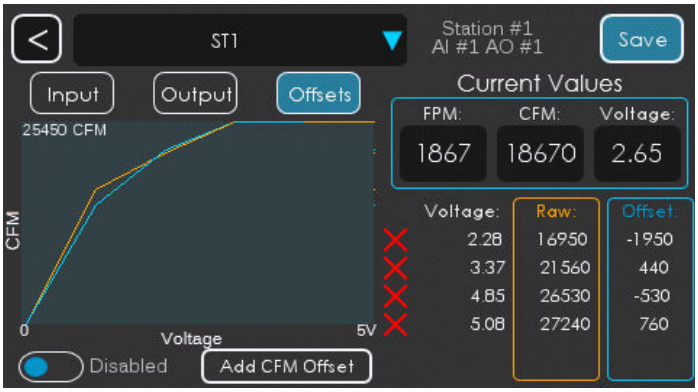
OUTPUT

Parameter	Unit Selections	Description	Defaults
Voltage Range			
Volt Low	0 - 10V	Enter the low end voltage range for this Analog Output using values between 0-10V	0.0
Volt High	0 - 10V	Enter the high end voltage range for this Analog Output using values between 0-10V	10.0
CFM/FPM Range			
CFM/FPM Low	Numerical Value	Enter the low end value for this Analog Output.	0 FPM / 0 CFM
CFM/FPM High	Numerical Value	Enter the high end value for this Analog Output.	2500 FPM / 50000 CFM
Current Values Section			
FPM	Numerical Value	Current value for velocity measurement.	N/A
CFM	Numerical Value	Current value for airflow measurement.	N/A
Voltage	Numerical Value	Current value for airflow sensor signal.	N/A
Analog Output Select			
CFM/FPM	CFM/FPM	Select analog output to be CFM or FPM.	CFM
Max Flow	Numerical Value	The maximum measurement value based on sensor type and entered duct area. Units based on selector.	N/A

USER INTERFACE AND CONFIGURATION

STATION COMMISSIONING (CONTINUED)

Offset (optional - advanced): Apply advanced corrections for nonstandard installations.



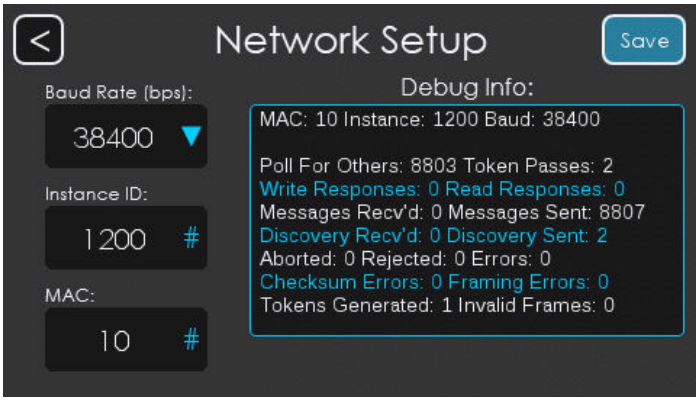
OFFSETS

Parameter	Unit Selections	Description	Defaults
Graph			
Orange Line	--	Plotted line of raw measurement values.	N/A
Blue Line	--	Plotted line of offset measurement values.	N/A
Enable Offsets	Enabled/Disabled	After configuring offsets, set as Enabled to activate the calibration.	Disabled
Add CFM Offset	--	Click to add a new CFM Offset (up to 5 per station). Refer to Commissioning section for details.	N/A
Voltage	V	Sensor voltage at respective offset point.	N/A
Raw	CFM	Raw CFM measurement at respective offset point.	N/A
Offsets	CFM	CFM differential between station value and field measured value at respective offset point.	N/A
Current Values Section			
FPM	Numerical Value	Current value for velocity measurement.	N/A
CFM	Numerical Value	Current value for airflow measurement.	N/A
Voltage	Numerical Value	Current value for airflow sensor signal.	N/A

USER INTERFACE AND CONFIGURATION

NETWORK SETUP

The Network Setup menu allows you to configure the I/O board's communication settings, including MAC address, baud rate, and BACnet® Instance ID. It also provides network debugging information for troubleshooting.



NETWORK

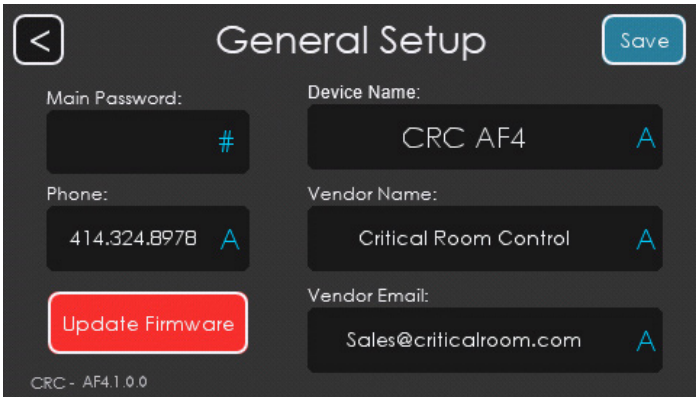
Parameter	Unit Selections	Description	Defaults
Baud Rate	9600 19200 38400 57600 76800	Select a baud rate for this AF4.	38400
Instance ID	(0-4,194,303)	Enter a BACnet® Instance ID (0- 4,194,303), unique to this AF4.	1200
MAC	1-126	Enter a MAC address (1-126), unique to this AF4.	10

Debug Info	
Parameter	Description
MAC	Current MAC Address
Instance	Current Instance ID
Baud	Current Baud Rate
Poll For Others	This number increases every time a BACnet Poll For Master frame is sent.
Token Passes	This number increases when this device passes the BACnet token.
Write Responses	This number increases when a BACnet value is written over the network.
Read Responses	This number increases when a BACnet value is read over the network.
Messages Recv'd	This number increases when the device receives a BACnet message intended for it
Messages Sent	This number increases with when this device sends out a message (including passing a token).
Discovery Recv'd	This number increases when the device receives a BACnet WHO IS message from another device on the network.
Discovery Sent	This number increases when the device sends out a BACnet I AM message notifying the entire network that it is online.
Abort	This number increases if a BACnet response was canceled.
Reject	This number increases when this device refuses to answer a BACnet message (for a valid reason).
Error	This number increases when a message received is not a valid BACnet message, can indicate a problem with the network connection
Checksum Errors	This number increases when a message received is a BACnet message, but the data got corrupted during transmission
Framing Errors	This number increases when a Framing Error is detected, usually indicating an issue with the network connection
Tokens Generated	This number increases when the device generates a BACnet token, if increasing rapidly it means that the device cannot see any other device on the network
Invalid Frames	This number increases when the device receives an invalid frame over the network, usually indicating a problem with the network connection.

USER INTERFACE AND CONFIGURATION

GENERAL SETUP

The General Menu allows users to configure basic settings, including password management, station identification, and contact information.



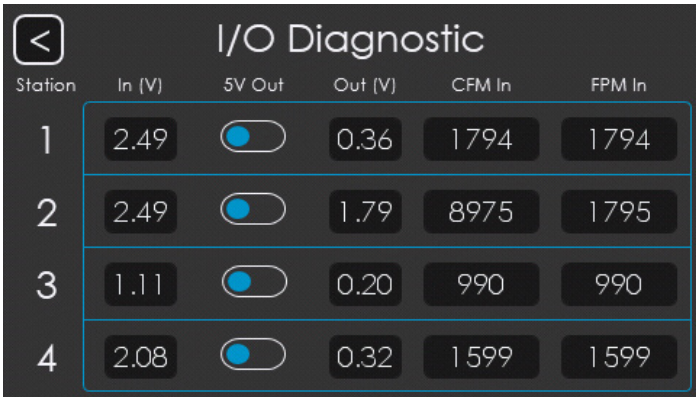
GENERAL SETUP

Parameter	Unit Selections	Description
Main Password	Numeric Value (up to 4 Digits)	Set a password for accessing the administrative menu.
Device Name	Alphanumeric Selection	Change the name of the device displayed on the main screen and over BACnet®.
Phone Number	Numeric Selection	Enter contact phone for local support.
Vendor Name	Alphanumeric Selection	Enter contact name for local support.
Vendor Email	Alphanumeric Selection	Enter contact email for local support.
Update Firmware	–	Only used when directed by factory.
Version	–	Displays current device version.

USER INTERFACE AND CONFIGURATION

I/O DIAGNOSTIC

The I/O Diagnostic screen is used to verify the wiring and functionality of the device.



I/O DIAGNOSTIC PARAMETERS

Parameter	Unit Selections	Description
Station	–	Identifies the station (1-4) [also ties the station to this AI/AO pair]
In (V)	Numerical Value	Current voltage for airflow sensor signal.
5V Out	On/Off	Toggle on to set respective analog output at 5 V. Used for troubleshooting. Automatically turns off when exiting this screen.
Out (V)	Volts	Current voltage for station output signal.
CFM in	Numerical Value	The current calculated CFM from the current input voltage.
FPM In	Numerical Value	The current calculated FPM for the current input voltage.

STARTUP

OVERVIEW

Startup verifies that the AF4 system has been installed correctly, powers on properly, and is ready for commissioning. Complete startup before performing flow calibration or BAS integration.

Startup consists of:
1. Pre-power installation checks
2. Power-up verification
3. Station configuration
4. Initial live reading verification
5. Saving configuration parameters

PRE-POWER CHECKS

Before applying power, verify that all wiring, connections, and components have been installed in accordance with the instructions in the previous sections.

Confirm the following:

- All airflow probes are installed securely and oriented correctly.
- Airflow sensors are properly connected to the transmitter.
- Power wiring has been verified for correct voltage and polarity.
- Network communication wiring is connected with correct polarity and shield termination.
- Analog connections to the Building Automation System (BAS) are complete and labeled.
- Grounding continuity has been verified between all connected devices.
- No exposed conductors or loose wiring are present.

⚠ Do not proceed until all pre-power checks have been verified.

POWER UP

Once all pre-checks are complete, energize the circuit supplying the transmitter. The unit will power on automatically when 24 VAC is applied.

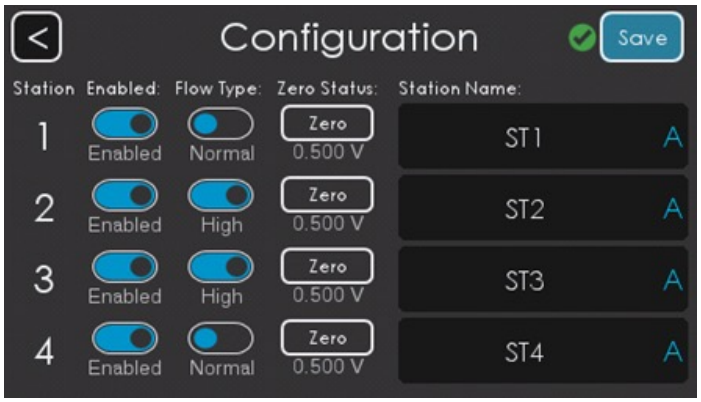
Upon power up:

- Upon first power up, the AF4-XMT will boot to the Station Configuration screen.
- The Airflow sensors will power up and LED will illuminate.

If the display does not activate, disconnect power and re-verify wiring before proceeding.

STARTUP

AIRFLOW STATION CONFIGURATION



At first power-up, the AF4 Transmitter opens to the Device Configuration screen. Configure each active airflow measurement station before proceeding to commissioning.

For each station:

1. Enable the station
Enable each station that is physically installed and connected. Disabled stations will not appear on the Home Screen.

2. Select the flow type
Select Normal or High Flow to match the installed AF4 Airflow Sensor range.

3. Zero the sensor
Zeroing establishes the no-flow baseline for the station. Perform zeroing only when the pressure signal represents zero airflow.

Acceptable zeroing methods:
- Shunt the HI and LO tubing together at the sensor.
- Confirm the system is fully at rest with no airflow through the probes.

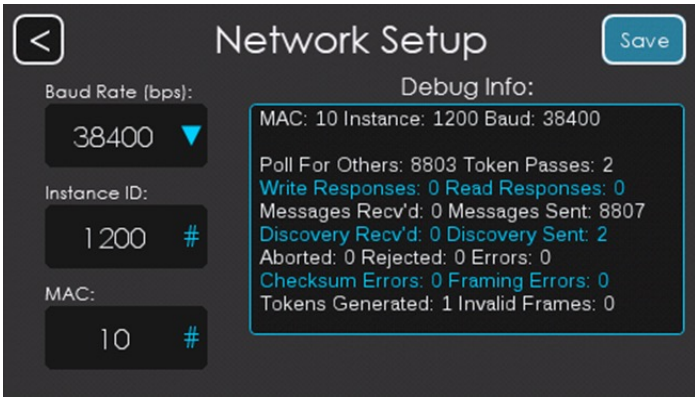
4. Enter or confirm station name
Enter a station name that matches the project drawings or BAS naming convention. Station names are used on the display and associated BACnet® objects.

5. Save configuration
Select Save and confirm the green check mark appears before leaving the screen.
Repeat for all active stations.

STARTUP

SYSTEM CONFIGURATION

After completing the setup, additional configuration options are available to customize the system for your specific application. These settings are not required for initial operation but may be necessary for complete integration with building systems or to enable advanced functionality.



SYSTEM CONFIGURATION INCLUDES THE FOLLOWING SETUP CATEGORIES

Menu Area	Purpose	When to Use
Network Setup	Define BACnet MSTP network parameters for communication with BMS.	Use when the controller will communicate with a BMS or supervisory system.
General Setup	Adjust general display and preferences, including password and Device Name. Add Contact Information.	Use for user or facility preferences. Update with contact info for local CRC support.

STARTUP

STARTUP CHECKLIST

- ☐ Transmitter, sensors, and probes installed per installation requirements
- ☐ Power supply verified (correct voltage, polarity, and grounding)
- ☐ All signal and sensor wiring landed, secure, and strain-relieved
- ☐ BACnet or integration cabling connected and verified for continuity
- ☐ Tubing connected correctly (High/Low ports) and free of kinks or leaks
- ☐ All covers and enclosures closed prior to energizing

Power-On Checks

- ☐ Transmitter powers up
- ☐ Sensors initialize and LED illuminates
- ☐ Display is accessible and responsive
- ☐ Voltage present at sensor terminals within expected range

Configuration Checks

- ☐ Correct number of stations enabled (1–4)
- ☐ Flow type (Normal / High Flow) set correctly for each station
- ☐ Duct area entered for each active station
- ☐ Station names and BACnet object mappings verified
- ☐ Zeroing performed per procedure (zero airflow or tubing shunted)
- ☐ All parameters saved (green check confirmation)

Commissioning Checks

- ☐ Live readings of FPM, CFM, and voltage confirmed for each station
- ☐ Field airflow measurements taken and entered for flow calibration
- ☐ Flow Adjustment % values reviewed and within expected range
- ☐ Analog outputs verified for correct scaling (if applicable)
- ☐ Offset curve configured (if applicable) and saved

Final Checks

- ☐ BACnet communication (if applicable) verified and device visible to supervisory system
- ☐ All configuration changes saved
- ☐ Installation and commissioning documentation updated
- ☐ Commissioning Report completed and submitted to project record

COMMISSIONING

OVERVIEW

Commissioning verifies that each AF4 airflow measurement station is installed correctly, configured correctly, and reporting airflow values that align with verified field measurements. Commissioning should be completed after startup and before the system is released for normal operation, BAS integration, or project turnover.

Commissioning includes:

- Confirming station configuration
- Entering duct area
- Verifying sensor zero
- Confirming live FPM, CFM, and sensor voltage values
- Comparing AF4 readings to field-measured airflow
- Applying Flow Calibration, if required
- Configuring analog output scaling, if used
- Configuring BACnet® communication, if used
- Applying offset correction only when required and under CRC guidance
- Completing the commissioning report

AF4 COMMISSIONING QUICK START

Step	Action	Complete when
1	Verify installation	Probes, tubing, wiring, and power are confirmed
2	Enable stations	Only installed stations are enabled
3	Select flow type	Normal/High matches installed sensor
4	Enter duct area	Area matches actual measured duct
5	Zero sensor	Zero performed under no-flow condition
6	Confirm live readings	FPM, CFM, and voltage update normally
7	Compare to field measurement	Balancer/verified airflow value recorded
8	Apply Flow Calibration*	Flow Adj % calculated and reviewed
9	Configure outputs*	Analog/BACnet settings verified if used
10	Document results	Commissioning report completed

*Only if required

BEFORE ADJUSTING CALIBRATION

Do not use Flow Calibration or Offset Correction to compensate for unresolved installation issues.

Before applying calibration, verify:

- Correct duct area has been entered.
- Correct flow type is selected.
- HI and LO tubing are connected correctly.
- Tubing is not kinked, leaking, blocked, or disconnected.
- Airfoil probes are installed in the correct location and orientation.
- All unused pneumatic ports are capped.
- Airflow is stable during field measurement.
- The field measurement method is appropriate for the application.
- Analog output or BAS scaling is not causing the apparent mismatch.

If readings are negative, unstable, zero, or significantly different than expected, resolve installation and configuration issues before applying calibration.

COMMISSIONING

STATION COMMISSIONING

The Station Commissioning screen is used to commission and verify each airflow measurement station. Up to four stations can be configured per AF4 Transmitter.

From the Home Screen, navigate to:

Admin Menu → Station Commissioning
Use the station selector at the top of the screen to select the desired station.

Each station includes three commissioning areas:

Area	Purpose	When to Use
Input	Configures measurement settings and applies flow calibration.	Required for each active station
Output	Configures analog output scaling.	Use when the station analog output is connected to a BAS or field device.
Offsets	Applies multi-point correction for nonstandard installations.	Advanced use only, under CRC guidance.

The current velocity, airflow, and sensor voltage are displayed on each commissioning screen.

COMMISSIONING

INPUT CONFIGURATION

The Input screen establishes the measurement configuration for the selected station and provides the primary flow calibration tools.

INPUT CONFIGURATION PROCEDURE

1. Select the station
Select the station being commissioned from the station selector.

2. Confirm station setup
Verify the station is enabled and the selected flow type matches the installed AF4 Airflow Sensor.

3. Enter duct area
Enter the measured duct cross-sectional area in square feet.

4. Verify sensor zero
Confirm the sensor has been zeroed under a valid no-flow condition. Re-zero only if the existing zero is questionable or the baseline appears incorrect.

Acceptable zeroing methods:

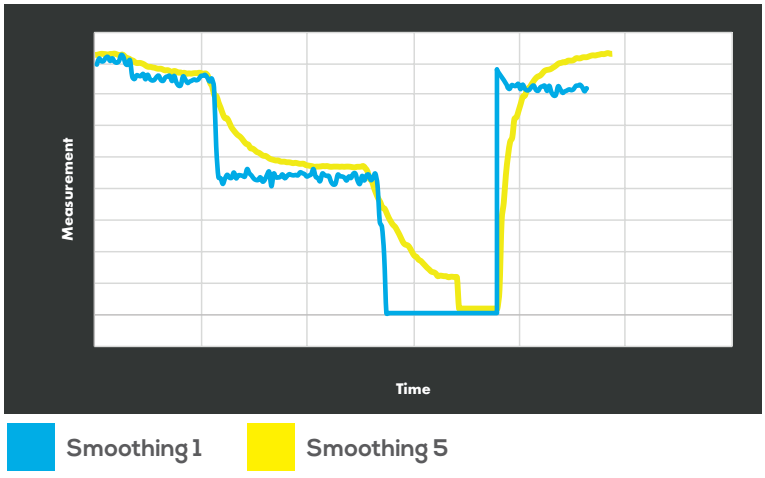
Method 1: Shunt the tubing at the sensor. Temporarily connect the HI and LO ports together at the sensor so both ports see the same pressure.
Method 2: Verify no airflow condition. Confirm the system is fully at rest with no airflow through the probes.

5. Confirm live readings
Verify FPM, CFM, and voltage values are updating and responding as expected.

6. Adjust smoothing, if required
Increase Smooth Factor only if the reading is fluctuating due to normal airflow variation. Do not use smoothing to hide unstable installation or tubing issues.

7. Set lockout, if required
Use Lockout FPM when low-level velocity readings should be treated as zero airflow.

8. Save settings
Select Save and confirm the green check mark appears before leaving the screen.



COMMISSIONING

FLOW CALIBRATION

Flow Calibration aligns the AF4 station reading with a verified field measurement. Flow Calibration applies a single adjustment factor to the selected station. This adjustment is shown as Flow Adj %.

A Flow Adj % of 100% represents no adjustment. Values above or below 100% indicate the correction applied to align the AF4 reading with the field measurement.

WHEN TO USE FLOW CALIBRATION

Use Flow Calibration when:

- Installation has been verified.
- Duct area and flow type are correct.
- Sensor zero has been verified.
- Field measurement shows the AF4 reading is consistently high or low.
- A single correction factor is appropriate for the operating range.

FLOW CALIBRATION PROCEDURE

1. Stabilize airflow
Set the system to a stable operating condition. Allow airflow to settle before recording measurements.

2. Record the AF4 reading
Record the displayed FPM and CFM values for the selected station.

3. Take field measurement
Measure airflow or velocity using the project-approved balancing method.

4. Select FPM or CFM
Use the same unit type as the field measurement.

5. Enter the field-measured value
Enter the verified field value into the Flow Calibration field.

6. Review Flow Adj %
Confirm the calculated Flow Adj % is reasonable for the installation.

7. Save calibration
Select Save and confirm the green check mark appears.

8. Verify result
Confirm the displayed airflow or velocity now aligns with the field-measured value.

FLOW ADJ % REVIEW

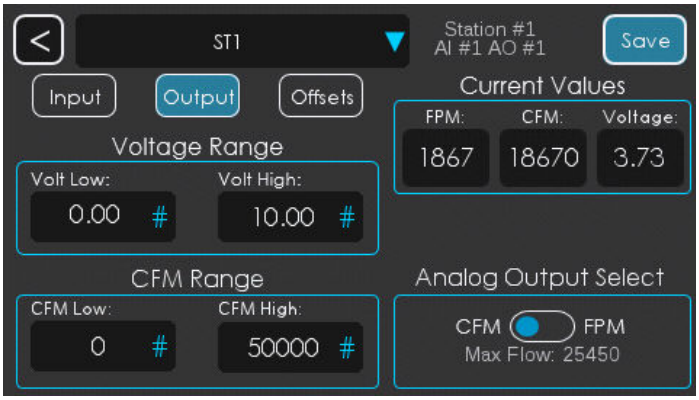
Large Flow Adj % corrections may indicate an unresolved issue. Before accepting a large correction, verify:

- Duct area is correct.
- Normal/High Flow selection is correct.
- HI and LO tubing are not reversed.
- Tubing and fittings are leak-free.
- Probe location and orientation are correct.
- Field measurement was taken under stable conditions.
- BAS or analog output scaling is not being confused with the AF4 displayed value.

COMMISSIONING

OUTPUT CONFIGURATION (OPTIONAL)

The Output screen configures analog output scaling for the selected station. Configure this section only when the station analog output is connected to a BAS or field device. The analog output can be scaled to represent either airflow in CFM or velocity in FPM.



OUTPUT CONFIGURATION PROCEDURE

1. Select output units
Select whether the analog output will represent CFM or FPM.

2. Set voltage range
Enter the low and high voltage limits for the analog output.

3. Set value range
Enter the airflow or velocity values associated with the low and high voltage limits.

4. Verify Max Flow
Review the displayed maximum measurement value and confirm the output range is appropriate.

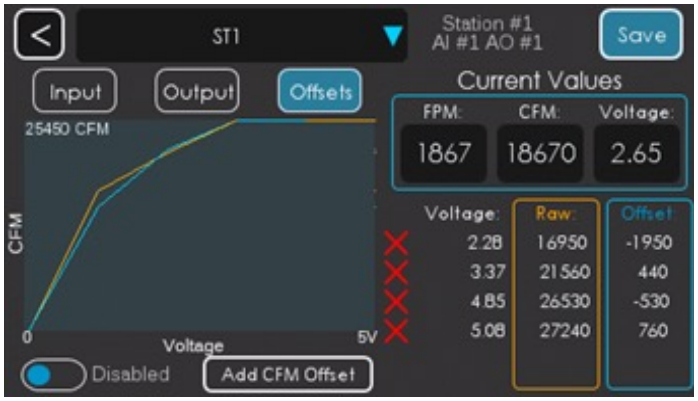
5. Save output settings
Select Save and confirm the green check mark appears.

6. Verify output voltage
Measure the analog output voltage at the receiving BAS or field device and confirm it matches the configured scaling.

COMMISSIONING

OFFSET CONFIGURATION (ADVANCED)

Offset Correction is an advanced calibration feature used to apply multiple correction points across the airflow measurement curve. The orange line represents the raw measurement values. The blue line represents the offset-corrected measurement values. Offsets should only be used for nonstandard installations or applications where a single Flow Adj % does not adequately align the AF4 reading across the operating range.



OFFSET PROCEDURE

1. Verify Flow Calibration first
Confirm standard configuration and Flow Calibration have been completed before using offsets.

2. Set the first stable airflow point
Adjust the system to a stable airflow condition.

3. Add CFM offset
Select Add CFM Offset.

4. Enter measured CFM
Enter the field-measured CFM value for the current airflow condition.

5. Repeat for additional points
Repeat the process for up to five total airflow points as required.

6. Review the offset curve
Confirm the offset-corrected curve is reasonable and does not create unexpected measurement behavior.

7. Enable offsets
Toggle Enable to activate the offset curve.

8. Save configuration
Select Save and confirm the green check mark appears.

9. Verify corrected readings
Confirm the displayed readings align with field measurements across the intended operating range.

Offsets remain disabled until explicitly enabled and saved.

COMMISSIONING

VERIFICATION

After completing configuration and calibration, verify the final system operation.

For each active station, confirm:

- Station is enabled.
- Station name is correct.
- Flow type is correct.
- Duct area is entered correctly.
- Sensor zero has been completed.
- FPM, CFM, and voltage values are updating.
- Displayed airflow aligns with field measurement.
- Flow Adj % has been reviewed.
- Analog output scaling is correct, if used.
- BACnet points are visible and updating, if used.
- Offset curve is disabled unless intentionally applied.
- All settings have been saved.

COMMISSIONING REPORT

COMPANY	
CONTACT INFO	

EQUIPMENT DETAILS

PART NUMBER	
DEVICE NAME	
FIRMWARE VERSION	

	STATION 1	STATION 2	STATION 3	STATION 4
NAME				
PROBE SIZE X QTY				
MOUNTING STYLE	☐ INSERTION ☐ INTERNAL ☐ STANDOFF	☐ INSERTION ☐ INTERNAL ☐ STANDOFF	☐ INSERTION ☐ INTERNAL ☐ STANDOFF	☐ INSERTION ☐ INTERNAL ☐ STANDOFF

INSTALLATION VERIFICATION

CHECK	VERIFIED	NOTES
WIRING VERIFIED PER POWER & GROUNDING REQUIREMENTS	☐	
TUBING CORRECTLY ROUTED (HIGH/LOW) AND LEAK-FREE	☐	
PROBES INSTALLED PER LAYOUT AND ORIENTATION	☐	
BACNET / INTEGRATION CABLING VERIFIED	☐	

CONFIGURATION SUMMARY

PARAMETER	STATION 1	STATION 2	STATION 3	STATION 4
ENABLED	☐	☐	☐	☐
FLOW TYPE	☐ NORMAL ☐ HIGH	☐ NORMAL ☐ HIGH	☐ NORMAL ☐ HIGH	☐ NORMAL ☐ HIGH
DUCT AREA (FT^2)				
FLOW ADJ %				
ANALOG OUTPUT UNITS	☐ CFM ☐ FPM	☐ CFM ☐ FPM	☐ CFM ☐ FPM	☐ CFM ☐ FPM
ANALOG OUTPUT VOLTAGE RANGE				
ANALOG OUTPUT VALUE RANGE				
OFFSET CURVE APPLIED	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO

BACnet® INTEGRATION

ITEM	VERIFIED	NOTES
DEVICE VISIBLE ON NETWORK	☐	
MAC ADDRESS UNIQUE	☐	
BAUD RATE MATCHES	☐	
POINTS VERIFIED BY SUPERVISORY SYSTEM	☐	

TECHNICIAN SIGNATURE	DATE	CUSTOMER / COMMISSIONING AGENT SIGNATURE	DATE

INTEGRATION

BACnet® INTEGRATION

Dynamic Device Name: The AF4 supports a dynamic device name. When the name of the device is changed at the display, the name of the device will update over the network.

Dynamic Station Names: The AF4 supports dynamic station names. When the name of the station is changed at the display, the name of the associated BACnet points will update.

The below sets of points have Dynamic point names that will update based on user station name in the AF4. Factory reset will revert any user set station names to the default names listed below.

Dynamic BACnet OID Points (Default Station Name)

- 1200-1206, 1260 & 1261 (ST 1)
- 1207-1213, 1262 & 1263 (ST 2)
- 1214-1220, 1264 & 1265 (ST 3)
- 1221-1227, 1266 & 1267 (St 4)

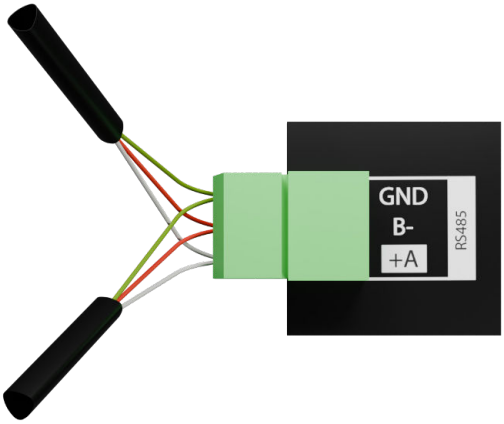
COV Subscriptions: Change of value subscriptions are available for certain points. Refer to the BACnet Points list for more details.

BACnet® MS/TP WIRING NOTES

- **Cable Type:** Use 3-conductor cable (A, B, Signal Ground), 22–24 AWG, twisted pair, shielded.
- **Topology:** Daisy-chain only. Do not star-wire or T-tap. Maximum 32 devices per segment, 4000 ft (1200 m) total length.
- **Termination:** Install 120 Ω termination resistors at both ends of the trunk. Provide biasing only once per segment. The AF$ does not provide onboard MS/TP biasing. Biasing must be provided by the BACnet router, supervisory controller, or another approved device on the MS/TP segment.
- **Grounding:** Connect Signal Ground across all devices in the segment. Earth-ground the shield at the BACnet router or supervisory controller only.
- **Polarity:** Maintain consistent polarity for A+ and B- along the entire trunk. Reversed polarity will prevent communication.
- **Device Addressing:** Assign a unique MAC address (1–126) to each controller. Duplicate addresses will disable communication.
- **Verification:** Confirm baud rate matches across all devices. Use the controller's diagnostics or supervisory system to verify devices appear online and error counts are within acceptable limits.

⚠ Improper MS/TP wiring (open shield, missing ground, or reversed polarity) is the most common cause of communication failures. Always verify wiring before commissioning.

BACnet® MS/TP WIRING



INTEGRATION

BACnet® Points

Object	Point Name	Units	Default	Range	Description	Write Setting	COV Increment
1200	ST1 AIRFLOW CFM	CFM	—	0-999999	Measured airflow in cubic feet per minute (CFM).	R	10000
1201	ST1 VELOCITY FPM	FPM	—	0-999999	Measured duct air velocity in feet per minute (FPM).	R	2500
1202	ST1 DUCT AREA	SQ FT	1	0-999	Configured duct cross-sectional area used to calculate airflow from velocity.	R/W	1
1203	ST1 LOCKOUT FPM	FPM	100	100-9999	Velocity threshold below which airflow is reported as zero.	R/W	1
1204	ST1 FLOW ADJ %	%	100	0-999	Balance value applied to the measurement. 100% represents no adjustment.	R/W	1
1205	ST1 SMOOTH FACTOR	No Units	1	1-5	Controls averaging applied to stabilize the airflow measurement output.	R/W	1
1206	ST1 MAX FLOW OUT	CFM FPM	—	0-999999	Maximum airflow value supported by the station measurement range. If CFM: Value = Station Duct Area * Max Velocity Range If FPM: Value = Max Velocity Range	R	1
1207	ST2 AIRFLOW CFM	CFM	—	0-999999	Measured airflow in cubic feet per minute (CFM).	R	10000
1208	ST2 VELOCITY FPM	FPM	—	0-999999	Measured duct air velocity in feet per minute (FPM).	R	2500
1209	ST2 DUCT AREA	SQ FT	1	0-999	Configured duct cross-sectional area used to calculate airflow from velocity.	R/W	1
1210	ST2 LOCKOUT FPM	FPM	100	100-9999	Velocity threshold below which airflow is reported as zero.	R/W	1
1211	ST2 FLOW ADJ %	%	100	0-999	Balance value applied to the measurement. 100% represents no adjustment.	R/W	1
1212	ST2 SMOOTH FACTOR	No Units	1	1-5	Controls averaging applied to stabilize the airflow measurement output.	R/W	1
1213	ST2 MAX FLOW OUT	CFM FPM	—	0-999999	Maximum airflow value supported by the station measurement range. If CFM: Value = Station Duct Area * Max Velocity Range If FPM: Value = Max Velocity Range	R	1
1214	ST3 AIRFLOW CFM	CFM	—	0-999999	Measured airflow in cubic feet per minute (CFM).	R	10000
1215	ST3 VELOCITY FPM	FPM	—	0-999999	Measured duct air velocity in feet per minute (FPM).	R	2500
1216	ST3 DUCT AREA	SQ FT	1	0-999	Configured duct cross-sectional area used to calculate airflow from velocity.	R/W	1
1217	ST3 LOCKOUT FPM	FPM	100	100-9999	Velocity threshold below which airflow is reported as zero.	R/W	1
1218	ST3 FLOW ADJ %	%	100	0-999	Balance value applied to the measurement. 100% represents no adjustment.	R/W	1
1219	ST3 SMOOTH FACTOR	No Units	1	1-5	Controls averaging applied to stabilize the airflow measurement output.	R/W	1
1220	ST3 MAX FLOW OUT	CFM FPM	—	0-999999	Maximum airflow value supported by the station measurement range. If CFM: Value = Station Duct Area * Max Velocity Range If FPM: Value = Max Velocity Range	R	1
1221	ST4 AIRFLOW CFM	CFM	—	0-999999	Measured airflow in cubic feet per minute (CFM).	R	10000
1222	ST4 VELOCITY FPM	FPM	—	0-999999	Measured duct air velocity in feet per minute (FPM).	R	2500
1223	ST4 DUCT AREA	SQ FT	1	0-999	Configured duct cross-sectional area used to calculate airflow from velocity.	R/W	1
1224	ST4 LOCKOUT FPM	FPM	100	100-9999	Velocity threshold below which airflow is reported as zero.	R/W	1
1225	ST4 FLOW ADJ %	%	100	0-999	Balance value applied to the measurement. 100% represents no adjustment.	R/W	1
1226	ST4 SMOOTH FACTOR	No Units	1	1-5	Controls averaging applied to stabilize the airflow measurement output.	R/W	1
1227	ST4 MAX FLOW OUT	CFM FPM	—	0-999999	Maximum airflow value supported by the station measurement range. If CFM: Value = Station Duct Area * Max Velocity Range If FPM: Value = Max Velocity Range	R	1
1228	ST1 ANALOG IN	V	0	0-10	Voltage measured at the station analog input.	R	10

INTEGRATION

BACnet® Points

Object	Point Name	Units	Default	Range	Description	Write Setting	COV Increment
1229	ST1 ANALOG OUT	V	0	0-10	Voltage currently transmitted by the station analog output.	R	10
1230	ST1 OFFSET COUNT	No Units	0	0-5	Number of offset points configured in the calibration curve.	R	1
1231	ST1 IN V LOW	V	0.50	0-10	Input voltage corresponding to zero airflow from the connected sensor.	R/W	1
1232	ST1 OUT V HIGH	V	10	0-10	Analog output voltage corresponding to the configured maximum airflow value.	R/W	1
1233	ST1 OUT V LOW	V	0	0.00-10.00	Analog output voltage corresponding to the configured minimum airflow value.	R/W	1
1234	ST1 OUTPUT VALUE HIGH	CFM FPM	50000	0-999999	Airflow value associated with maximum analog output voltage.	R/W	1
1235	ST1 OUTPUT VALUE LOW	CFM FPM	0	0-999999	Airflow value associated with minimum analog output voltage.	R/W	1
1236	ST2 ANALOG IN	V	0	0-10	Voltage measured at the station analog input.	R	10
1237	ST2 ANALOG OUT	V	0	0-10	Voltage currently transmitted by the station analog output.	R	10
1238	ST2 OFFSET COUNT	No Units	0	0-5	Number of offset points configured in the calibration curve.	R	1
1239	ST2 IN V LOW	V	0.50	0-10	Input voltage corresponding to zero airflow from the connected sensor.	R/W	1
1240	ST2 OUT V HIGH	V	10	0-10	Analog output voltage corresponding to the configured maximum airflow value.	R/W	1
1241	ST2 OUT V LOW	V	0	0-10	Analog output voltage corresponding to the configured minimum airflow value.	R/W	1
1242	ST2 OUTPUT VALUE HIGH	CFM FPM	50000	0-999999	Airflow value associated with maximum analog output voltage.	R/W	1
1243	ST2 OUTPUT VALUE LOW	CFM FPM	0	0-999999	Airflow value associated with minimum analog output voltage.	R/W	1
1244	ST3 ANALOG IN	V	0	0-10	Voltage measured at the station analog input.	R	10
1245	ST3 ANALOG OUT	V	0	0-10	Voltage currently transmitted by the station analog output.	R	10
1246	ST3 OFFSET COUNT	No Units	0	0-5	Number of offset points configured in the calibration curve.	R	1
1247	ST3 IN V LOW	V	0.50	0-10	Input voltage corresponding to zero airflow from the connected sensor.	R/W	1
1248	ST3 OUT V HIGH	V	10	0-10	Analog output voltage corresponding to the configured maximum airflow value.	R/W	1
1249	ST3 OUT V LOW	V	0	0-10	Analog output voltage corresponding to the configured minimum airflow value.	R/W	1
1250	ST3 OUTPUT VALUE HIGH	CFM FPM	50000	0-999999	Airflow value associated with maximum analog output voltage.	R/W	1
1251	ST3 OUTPUT VALUE LOW	CFM FPM	0	0-999999	Airflow value associated with minimum analog output voltage.	R/W	1
1252	ST4 ANALOG IN	V	0	0-10	Voltage measured at the station analog input.	R	10
1253	ST4 ANALOG OUT	V	0	0-10	Voltage currently transmitted by the station analog output.	R	10
1254	ST4 OFFSET COUNT	No Units	0	0-5	Number of offset points configured in the calibration curve.	R	1
1255	ST4 IN V LOW	V	0.50	0-10	Input voltage corresponding to zero airflow from the connected sensor.	R/W	1
1256	ST4 OUT V HIGH	V	10	0-10	Analog output voltage corresponding to the configured maximum airflow value.	R/W	1
1257	ST4 OUT V LOW	V	0	0-10	Analog output voltage corresponding to the configured minimum airflow value.	R/W	1

INTEGRATION

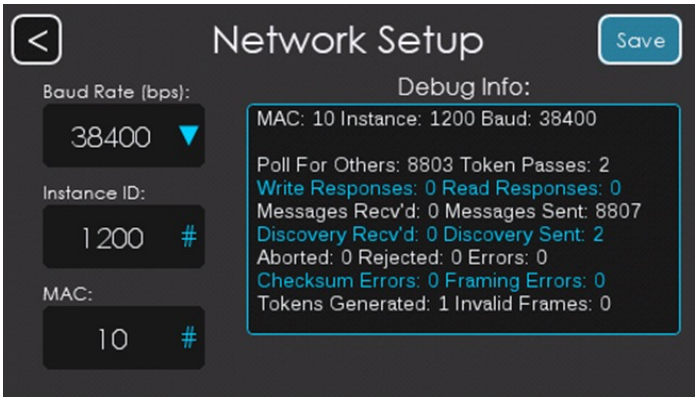
BACnet® Points

Object	Point Name	Units	Default	Range	Description	Write Setting	COV Increment
1258	ST4 OUTPUT VALUE HIGH	CFM FPM	50000	0-999999	Airflow value associated with maximum analog output voltage.	R/W	1
1259	ST4 OUTPUT VALUE LOW	CFM FPM	0	0-999999	Airflow value associated with minimum analog output voltage.	R/W	1
1260	UNUSED	—	—	—	—	—	—
1261	ST1 ENABLED	No Units	TRUE	TRUE/ FALSE	Indicates whether the station is enabled for airflow measurement.	R	—
1262	UNUSED	—	—	—	—	—	—
1263	ST2 ENABLED	No Units	FALSE	TRUE/ FALSE	Indicates whether the station is enabled for airflow measurement.	R	—
1264	UNUSED	—	—	—	—	—	—
1265	ST3 ENABLED	No Units	FALSE	TRUE/ FALSE	Indicates whether the station is enabled for airflow measurement.	R	—
1266	UNUSED	—	—	—	—	—	—
1267	ST4 ENABLED	No Units	FALSE	TRUE/ FALSE	Indicates whether the station is enabled for airflow measurement.	R	—
1268	ST1 HIGH FLOW	No Units	FALSE	—	Indicates the station is configured for high-flow measurement operation.	R	—
1269	ST1 OFFSET CURVE	No Units	FALSE	—	Indicates the advanced offset curve calibration feature is enabled for the station.	R	—
1270	ST2 HIGH FLOW	No Units	FALSE	—	Indicates the station is configured for high-flow measurement operation.	R	—
1271	ST2 OFFSET CURVE	No Units	FALSE	—	Indicates the advanced offset curve calibration feature is enabled for the station.	R	—
1272	ST3 HIGH FLOW	No Units	FALSE	—	Indicates the station is configured for high-flow measurement operation.	R	—
1273	ST3 OFFSET CURVE	No Units	FALSE	—	Indicates the advanced offset curve calibration feature is enabled for the station.	R	—
1274	ST4 HIGH FLOW	No Units	FALSE	—	Indicates the station is configured for high-flow measurement operation.	R	—
1275	ST4 OFFSET CURVE	No Units	FALSE	—	Indicates the advanced offset curve calibration feature is enabled for the station.	R	—
1276	ST1 ANALOG OUTPUT SELECT	No Units	CFM	CFM/FPM	Selects whether the analog output is scaled in airflow (CFM) or velocity (FPM).	R/W	—
1277	ST2 ANALOG OUTPUT SELECT	No Units	CFM	CFM/FPM	Selects whether the analog output is scaled in airflow (CFM) or velocity (FPM).	R/W	—
1278	ST3 ANALOG OUTPUT SELECT	No Units	CFM	CFM/FPM	Selects whether the analog output is scaled in airflow (CFM) or velocity (FPM).	R/W	—
1279	ST4 ANALOG OUTPUT SELECT	No Units	CFM	CFM/FPM	Selects whether the analog output is scaled in airflow (CFM) or velocity (FPM).	R/W	—

INTEGRATION

NETWORK TROUBLESHOOTING

The Debug Info screen provides real-time visibility into BACnet® MS/TP communication for advanced diagnosis. While the Network page describes each parameter, this section explains how to interpret the live data and use it to identify network issues.



QUICK DIAGNOSTIC WORKFLOW

1. Confirm Network Activity

- Verify Messages Sent and Messages Recv'd are increasing.
- If not, check physical wiring continuity, polarity, baud rate, and controller addressing.
- Tokens Generated increasing rapidly usually indicates the controller cannot detect other devices on the network.

2. Check Device Communication

- Messages Recv'd and Messages Sent should increment steadily during normal operation.
- If Messages Recv'd remains static, verify unique MAC and Instance values and confirm the controller is properly connected to the MSTP trunk.

3. Validate Network Transactions

- Read Responses and Write Responses should increase when the supervisory controller reads or writes points.
- If not incrementing, verify object mapping and confirm that BACnet integration settings are correct at the supervisory controller.

4. Monitor Discovery Traffic

- Discovery Recv'd (Who-Is) and Discovery Sent (I-Am) should both increment periodically.
- If Discovery Sent never increases, ensure the device is enabled for BACnet and instance ID matches the network database.
- Excessive Poll For Others counts may indicate a network segmenting or baud mismatch issue.

5. Watch for Errors

- Error, Checksum Errors, Framing Errors, or Invalid Frames increasing continually suggest wiring polarity issues, poor terminations, noise, or improper shield grounding.
- Occasional increments are normal; steady increases require physical network inspection.

INTEGRATION

NETWORK TROUBLESHOOTING

COMMON DIAGNOSTIC PATTERNS

Symptom	What to Check	Possible Resolution
No traffic (Messages not increasing)	Wiring, baud rate, addressing	Verify correct baud on all devices, check terminations, ensure unique MAC/Instance
Tokens Generated increasing rapidly	Device not detecting other devices	Check daisy-chain continuity, polarity, and proper termination at both ends
Read/Write Responses not increasing	BACnet point configuration	Verify points are bound correctly at supervisory controller
Discovery Recv'd increases, but Discovery Sent does not	Device not announcing presence	Confirm Instance ID and enable BACnet communication
Error or Checksum Errors increasing	Network noise, grounding, or polarity	Inspect shield grounding, cable routing, and device grounding
Framing or Invalid Frames increasing	Faulty wiring or noise interference	Verify trunk integrity, tighten terminations, and check for shield contact with power lines

NOTES ON INTERPRETATION

⚠ Increasing traffic values confirm communication activity, but do not guarantee correct device configuration. Always check Read/Write Responses to confirm active interaction with the network.

⚠ A few error counts are acceptable during startup or baud transitions. Continually increasing error counts indicate a physical layer issue that must be corrected.

⚠ Tokens Generated should rarely increase. If they do, it usually means the controller is isolated from the rest of the MSTP trunk.

FIELD TIP

If communication appears intermittent, temporarily connect the controller to a short segment with a known-good device and observe the debug counters. Stable communication in isolation confirms a network wiring or termination issue elsewhere on the trunk.

TROUBLESHOOTING

This section provides guidance for diagnosing and resolving common issues encountered during installation, setup, and operation of the AF4. Always verify wiring and sensor connections before adjusting parameters.

CONTROLLER & DISPLAY ISSUES

Symptom	Possible Cause	Corrective Action
Display shows only white screen CRC logo or all black	Cat6 cable not properly connected	Contact CRC factory
No power on controller (no LEDs) and no display (black screen)	Controller not receiving power (24 VAC)	Verify that the controller has proper 24 VAC power
Station not seen on main screen	Station not enabled	Verify station is enabled from Device Configuration menu.

SENSOR & AIRFLOW MEASUREMENT ISSUES

Symptom	Possible Cause	Corrective Action
No power on sensor (no LED)	Sensor not receiving power (24 VDC)	Verify that the sensor has proper 24 VDC power from the I/O board.
No airflow reading (0 CFM/FPM)	Sensor tubing not connected, reversed, or pinched	Verify pneumatic tubing routing and connection to sensor ports.
Airflow reading unstable or fluctuating	Smoothing factor too low / turbulent flow	Increase smoothing factor in commissioning screen. Verify probe placement and ensure stable airflow conditions.
Airflow reads negative when flow is present	Tubing reversed or Flow Type incorrectly configured	Check tubing polarity (high/low ports). Verify Flow Type (Normal/High) matches installed sensor.
Airflow reading offset or incorrect	Sensor requires zeroing	Navigate to Station Commissioning Input and perform Zero with no flow present.
Displayed value is consistently high/low vs balancer	Incorrect duct area, flow type, tubing issue, or calibration not performed	Verify duct area, sensor type, tubing polarity, and perform Flow Calibration using verified field measurement.

OUTPUT SIGNAL & COMMUNICATION

Symptom	Possible Cause	Corrective Action
No analog output signal	Output wiring incorrect	Verify analog output configuration and check voltage at terminals.
Output value not matching displayed reading	Output scaling incorrect	Confirm Output scaling (low/high voltage and value range). Save configuration after adjustment.
BAS not receiving airflow values	Network wiring issue or instance conflict	Verify BACnet wiring, polarity, and instance ID. Confirm correct baud rate and network settings.

CALIBRATION & OFFSETS

Symptom	Possible Cause	Corrective Action
Field reading does not match display	Calibration not performed	Use Flow Calibration in Station Commissioning →Input to enter field-measured value.
Adjustments not saving	Configuration not saved properly	Ensure Save is clicked after changes; look for green check confirmation.
Offset curve not applied	Offset disabled	Verify Enable toggle is ON in Offsets section and **Save** again.

TROUBLESHOOTING

NETWORK COMMUNICATION ISSUES

Symptom	Possible Cause	Corrective Action
No network traffic visible	Device not wired, baud rate mismatch, or incorrect polarity	Verify BACnet MSTP wiring (+, –, SIG GND). Confirm baud rate and polarity are consistent across all devices.
Messages not received (Messages Recv'd not increasing)	Duplicate MAC address or invalid Instance ID	Ensure unique MAC and Instance ID. Verify device address is within valid range.
Messages not sent (Messages Sent not increasing)	Device not participating in token passing	Check wiring continuity, trunk terminations, and baud rate. Confirm no breaks in the daisy-chain.
Read/Write responses not increasing (Read/Write Responses)	Supervisory system not communicating with device	Verify BACnet® object mapping and confirm point bindings in the supervisory controller.
Device not responding to discovery (Discovery Sent not increasing)	Device discovery disabled or Instance ID conflict	Confirm device Instance ID matches project database and that discovery is enabled.
Tokens Generated increasing rapidly	Device isolated on trunk	Check network continuity, polarity, and ensure both end-of-line terminations are installed correctly.
Frequent Error, Checksum, or Framing Errors	Electrical noise, reversed polarity, or improper shielding	Verify cable shielding and grounding. Check polarity and tighten all terminations. Ensure trunk length and device count limits are not exceeded.

GENERAL GUIDANCE

- Always verify power and wiring connections first.
- Confirm pneumatic tubing polarity (high/low).
- Use the Station Commissioning screen for live diagnostics and sensor zeroing.
- Re-zero sensors only when airflow is fully stopped.

For complex installations or persistent measurement discrepancies, contact CRC Technical Support with:

- Device firmware version
- Screenshots of Station Commissioning screen
- Recorded CFM/FPM readings and applied offsets

⚠ For advanced diagnosis, use the Debug Info screen. This provides detailed counters for traffic, messages, acknowledgments, discovery, and errors to help isolate network issues. See Network Troubleshooting for full guidance.

crchvac.com

Measure What Matters.

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