

FAN IV

Fan Array Transmitter Installation and Operation Manual



SAFETY INFORMATION

The FAN IV Fan Array Transmitter was calibrated at the factory before shipment. To ensure correct use of the system, please read this manual thoroughly.

Regarding this Manual:

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Air Monitor's written permission.
- Air Monitor makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform Air Monitor.
- Air Monitor assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Air Monitor assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

SAFETY PRECAUTIONS:

The following general safety precautions must be observed during all phases of installation, operation, service, and repair of this product. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Air Monitor assumes no liability for the customer's failure to comply with these requirements. If this product is used in a manner not specified in this manual, the protection provided by this product may be impaired.

The following messages are used in this manual:

WARNING

Messages identified as "Warning" contain information regarding the personal safety of individuals involved in the installation, operation or service of this product.

CAUTION

Messages identified as "Caution" contain information regarding potential damage to the product or other ancillary products.

IMPORTANT NOTE

Messages identified as "Important Note" contain information critical to the proper operation of the product.

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SECTION 1.0 GENERAL INFORMATION

Thank you for purchasing the FAN IV Fan Array Transmitter. As our valued customer, Air Monitor's commitment to you is to provide quality service and support while continuing to offer you accurate, reliable products to meet your flow measurement needs.

1.1 PURPOSE OF THIS MANUAL

This manual provides information regarding the installation, operation and maintenance of your differential pressure and flow transmitter. This is not an electrical or HVAC trade manual. This manual is the basic reference tool for the FAN IV Fan Array transmitter, including its main power connection and associated signal inputs and outputs. The complete system consists of the transmitter and associated airflow and temperature sensors. Please refer to supplemental documents for additional information.

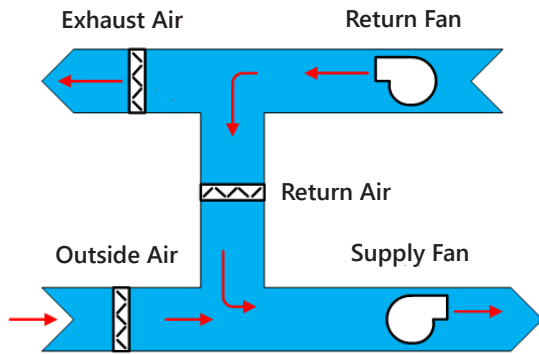
1.2 TYPICAL AIRFLOW MEASUREMENT SYSTEM INSTALLATIONS

Air Monitor's FAN IV Fan Array Transmitter accurately measures the differential pressure created by airflow entering and moving through an air flow probe.

Temperature is also measured via a separate sensor. The measured pressure drop and temperature are converted to actual air flow readings utilizing proprietary algorithms that provide density compensation and signal conditioning.

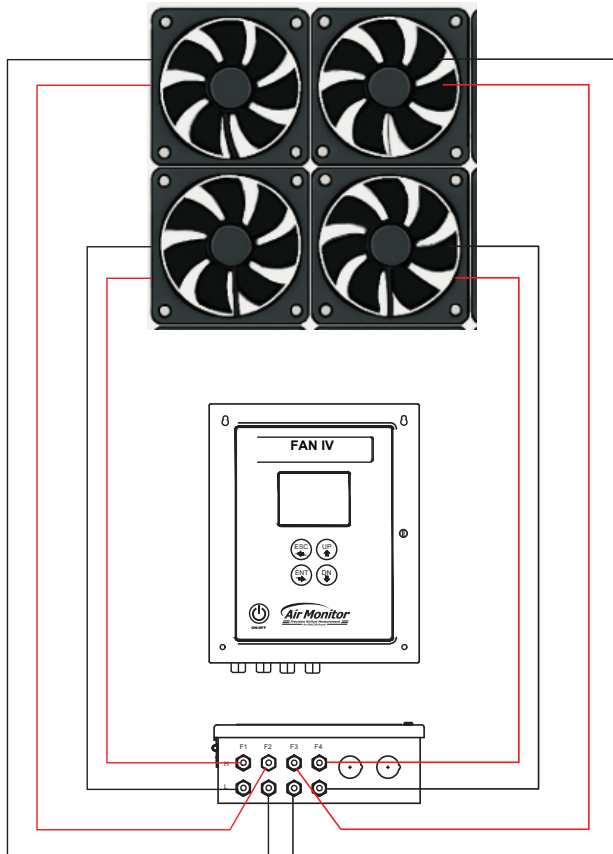
The FAN IV Fan Array Transmitter can be used with most fans found on air handlers and built-up systems.

1.2 TYPICAL AIRFLOW MEASUREMENT SYSTEM INSTALLATIONS (CONTINUED)



Supply and Return Fan Measurement

Individual channels are used per each fan installation location in a variety of configurations, primarily used for supply and return air flow. Differential pressure can be measured via piezo ring or paired with VOLU-probe/FI probes to determine airflow.



Fan Array Measurement

With multiple fans or fan arrays, individual channels can be used per each fan to provide individual fan tracking. If fans are controlled by the same VFD, fans can be grouped together to provide overall fan group airflow per channel. Differential pressure can be measured via piezo ring or paired with VOLU-probe/FI probes to determine airflow.

1.3 STANDARD FEATURES AND SPECIFICATIONS*

FAN IV TRANSMITTER		
PERFORMANCE	SYSTEM ACCURACY	±3% of reading when combined with Air Monitor Probes
	PRESSURE ACCURACY	50" Max DP Selection Accuracy: ±1% of reading from 2.4 to 50.0" w.c. 10" Max DP Selection Accuracy: ±1% of reading from 0.25 to 1.0" w.c.
	TEMPERATURE ACCURACY	±0.1°F AT 32°F
	RESPONSE TIME	5 ms
OPERATING CONDITIONS	AMBIENT TEMPERATURE	-20°F to 180°F (storage) 0°F to 120°F without heater -40°F to 120°F with heater
	PROCESS AIR TEMPERATURE	-40°F to 120°F
	HUMIDITY	0 to 99% RH, non-condensing
POWER	24 VAC	15 VA @ 24 VAC; 40 VA with heater
	24 VDC	10 W @ 24 VDC; 35 W with heater
TRANSDUCER DESIGN	AVAILABLE OPTIONS	• 10" w.c. (2500 Pa) Max Differential Pressure • 50" w.c. (5000 Pa) Max Differential Pressure
I/O SIGNALS	ANALOG OUTPUTS	Four (4) analog outputs, selectable based on configuration
	SERIAL COMMUNICATION	RS485, BACnet® MS/TP or MODBUS® RTU
	TEMPERATURE INPUT(S)	One optional 100Ω 3-wire RTDs can be configured
	BAROMETRIC PRESSURE INPUT	Built-in barometric (absolute) pressure sensor for automatic elevation compensation
ELECTRONICS ENCLOSURE	AVAILABLE OPTIONS	• Aluminum, NEMA 1 • Poly, NEMA 4X with window • Poly, NEMA 4X, no window • Poly, NEMA 4X, no window with heater
	DISPLAY	3.5" diagonal color graphical FTF LCD
PROGRAMMING	VIA KEYPAD	Menu driven user interface via four (4) push buttons
ELECTRICAL CONNECTIONS	POWER	Removable terminal block for use with 16 to 24 gauge wire
	COMMUNICATIONS	Removable terminal block for use with 16 to 24 gauge wire
	I/O	Removable terminal block for use with 16 to 24 gauge wire
PROCESS CONNECTIONS	AVAILABLE OPTIONS	• 1/4" compression, both High and Low signal connections • 3/16" hose barb, both High and Low signal connections

* SPECIFICATIONS subject to change without notice.

1.4 MODEL NUMBERING CODIFICATION

FAN IV-ABCD-EFGH

A = Channel Type

- 1 = Single Channel
- 2 = Dual-Channel
- 3 = Three-Channel
- 3 = Four-Channel

B = Enclosure

- 1 = NEMA 1 Aluminum Enclosure
- 2 = NEMA 4X Poly Enclosure with window
- 3 = NEMA 4X Poly Enclosure, no window
- 4 = NEMA 4X Poly Enclosure, no window with heater

C = I/O

- 1 = 24 VAC/DC Power, Four (4) Analog Outputs, RS485 Serial Communication and no RTDs
- 2 = 24 VAC/DC Power, Four (4) Analog Outputs, RS485 Serial Communication and w/ RTD

D = Process Connection

- 1 = Pressure Signal Connections made via 1/8" FNPT
- 2 = Pressure Signal Connections made via 1/4" Compression
- 3 = Pressure Signal Connections made via 3/16" Hose Barb Fittings

E = Channel One Pressure Range

- 1 = 10" w.c. (2500 Pa)
- 5 = 50" w.c. (12500 Pa)

F = Channel Two Pressure Range

- 0 = None (Requires A=1)
- 1 = 10" (Requires E=1)
- 5 = 50" w.c. (12500 Pa) (Requires E=5)

G = Channel Three Pressure Range

- 0 = None (Requires A=1 or 2)
- 1 = 10" w.c. (2500 Pa) (Requires F=1)
- 5 = 50" w.c. (12500 Pa) (Requires F=5)

H = Channel Four Pressure Range

- 0 = None (Requires A=1, 2, or 3)
- 1 = 10" w.c. (2500 Pa) (Requires G=1)
- 5 = 50" w.c. (12500 Pa) (Requires G=5)

1.5 CHECKING THAT YOU RECEIVED EVERYTHING

Carefully open the FAN IV shipping container(s) and remove all equipment. Inspect equipment for any damage. If damaged, contact Air Monitor and your freight company. Verify that the following items have been shipped:

- (1) FAN IV Transmitter
- (1) Factory Set-Up Information Sheet
- (1) FAN IV Quick Start Guide
- RTD Temperature Sensor (If selected upon ordering)

Additional items included with the shipment may contain the following:

- One temperature probe with mounting hardware for use with a single channel or dual channel, split system.

1.6 WORKING ENVIRONMENT

FAN IV NEMA 1 transmitter enclosures are designed for use in indoor installations that are free of condensing moisture. NEMA 4X enclosures with display windows are designed for use in wet indoor installations. Do not expose these transmitters to direct sunlight, temperature extremes or excessive vibration. The operating ambient air temperature range for both enclosures is 0°F to 120°F.

FAN IV NEMA 4X transmitter enclosures without windows are designed for indoor or outdoor use. Do not expose these transmitters to excessive vibration. Whenever possible, avoid exposure to direct sunlight. The operating ambient air temperature range is 0°F to 120°F. When provided with a heater, the operating ambient temperature range is -40°F to 120°F.

1.7 SERIAL NUMBER

The serial number of your Fan IV transmitter is located outside of the enclosure. The serial number is a unique identifier for your product. Please have it available when contacting Air Monitor for assistance regarding your product.

SECTION 2.0 INSTALLATION

The FAN IV Fan Array transmitter should be installed by experienced HVAC technicians and others with related knowledge and experience with airflow systems. Air Monitor support personnel are available to assist with technical recommendations and to provide guidance by telephone and/or e-mail. On-site field engineering, installation, and service are also available at an additional cost. The installer should use good trade practices and must adhere to all state and local building codes.

Each FAN IV is individually calibrated, configured and programmed using customer specific application data. Configuration and programming parameters are recorded on the factory set-up information sheet provided with the unit. Review this information and verify that the FAN IV set-up is correct for your application. If any problems or discrepancies are detected, contact Air Monitor’s Customer Service Department at 727-447-6140 prior to proceeding.

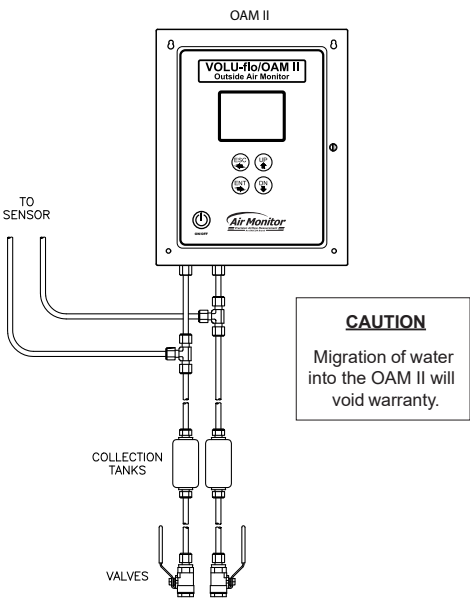
2.1 TRANSMITTER

2.1.1 Site Selection

Careful attention to the site selection for the system components will help the installers with the initial installation, reduce start-up problems, and make future maintenance easier. For example, do not install the FAN IV transmitter where it will be difficult for personnel to perform periodic maintenance. When selecting a site for mounting the system components, consider the criteria under Section 1.6 WORKING ENVIRONMENT, as well as the following:

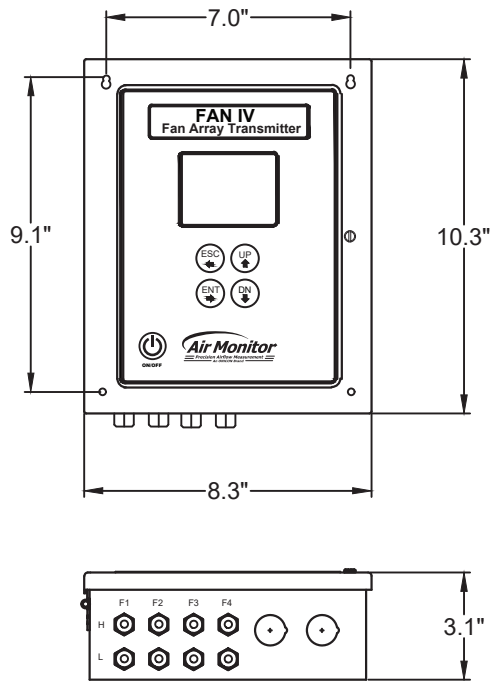
- Find an easily accessible mounting location near the air handler to minimize sensor tubing lengths.
- Mount the enclosure slightly higher than the airflow sensors to reduce the risk of any condensation migrating into the enclosure. If this cannot be done, provisions for drip legs should be installed at the lowest point in the sensing lines, and example is provided below.
- Use the table below to determine the appropriate sensor tubing diameter based on the distance from the enclosure to the airflow sensors. Contact Air Monitor for assistance if longer tubing lengths are required.

Nominal/Min Tubing Internal Diameter (in)	Tube Length Total (ft)	DP Sensor Max Distance from Transmitter (ft)
1/8 (0.125)	30	15
3/16 (0.1875)	200	100
1/4 (0.25)	500	250
3/8 (0.375)	1000	500

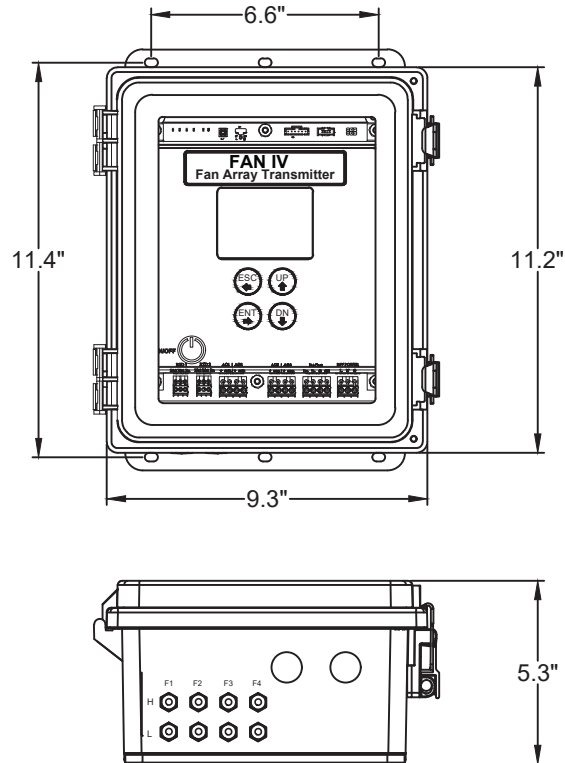


2.1.2 Transmitter Dimensions

NEMA 1 ENCLOSURE



NEMA 4X ENCLOSURE



2.1.3 Transmitter Installation

Find an easily accessible location where electrical connections can be made and display readings can be taken from the floor level. The mounting surface must be structurally sound and capable of withstanding a minimum weight of 10lbs (4.5kg). Use the following screws for mounting.

For NEMA 1 Enclosure:

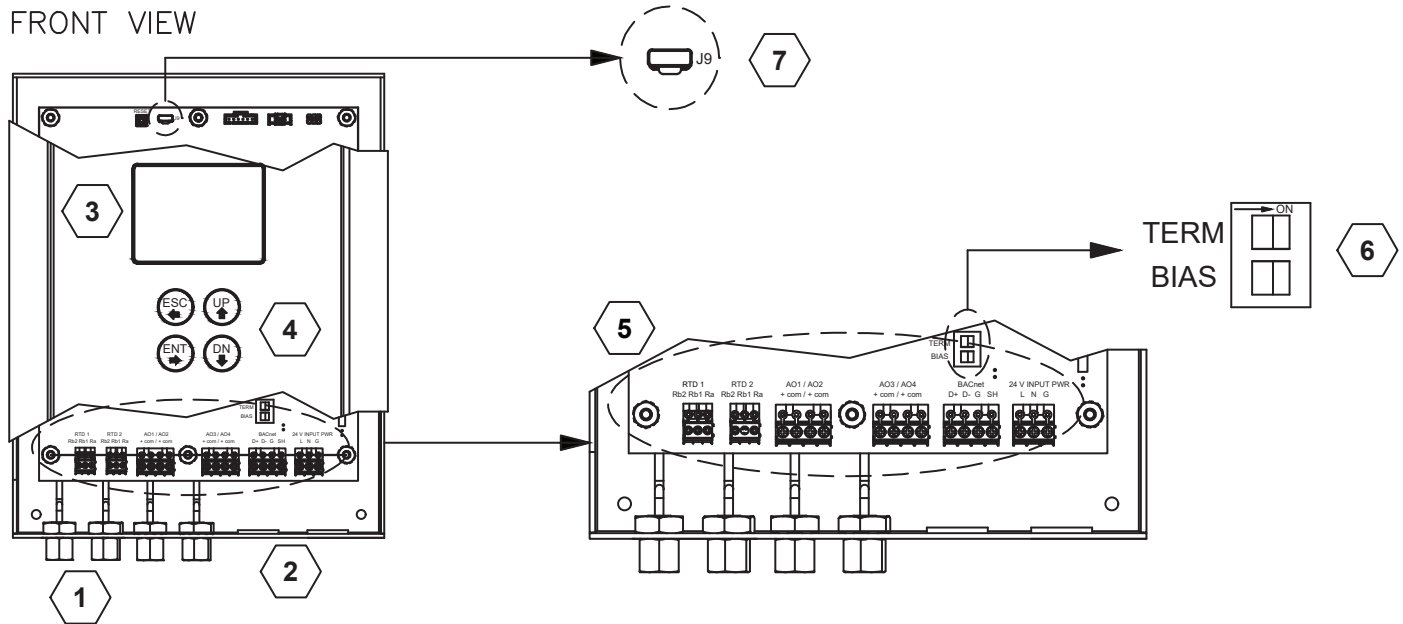
- (4) Machine screws - #8-32 x 1.5"
- (4) Wood screws - #8 x 1.5"
- (4) Concrete screws - $\frac{3}{16}$ " x 1.5"

For NEMA 4X Enclosure:

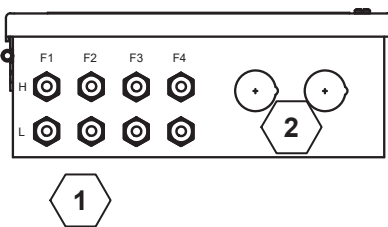
- (4) Machine screws - HHMS .25-20 x 1.5"
- (4) Wood screws - FHLS .25 x 1.5"
- (4) Concrete screws - HHCS .25 x 1.5"

2.1.4 Transmitter Wiring Connections

FRONT VIEW



BOTTOM VIEW



1. 1/8" FNPT connection, two (2) fittings per channel
2. Two (2) 1/2" conduit connection knockouts
3. Graphical LCD for user set-up, commissioning and real time data display
4. User programming and display keys
5. I/O, RTD and power input terminal block location. See page 13-16 for additional information
6. Termination resistor/bias switch location
7. Micro USB connection location

CAUTION

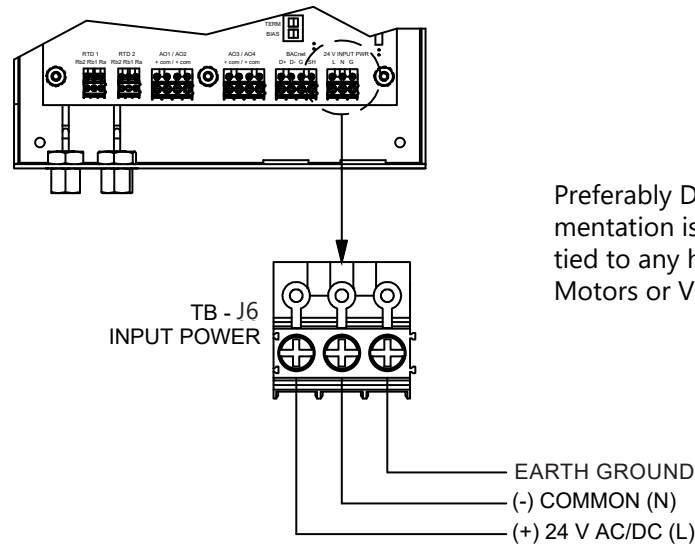
The electrical supply should be relatively clean, free of high frequency noise, large voltage transients, and protected from power surges and brown outs. Avoid installation locations that are in close proximity to strong sources of electrical interference.

2.1.4 Transmitter Wiring Connections (Continued)

A. Power/Signal Connections

Input Power Requirements:

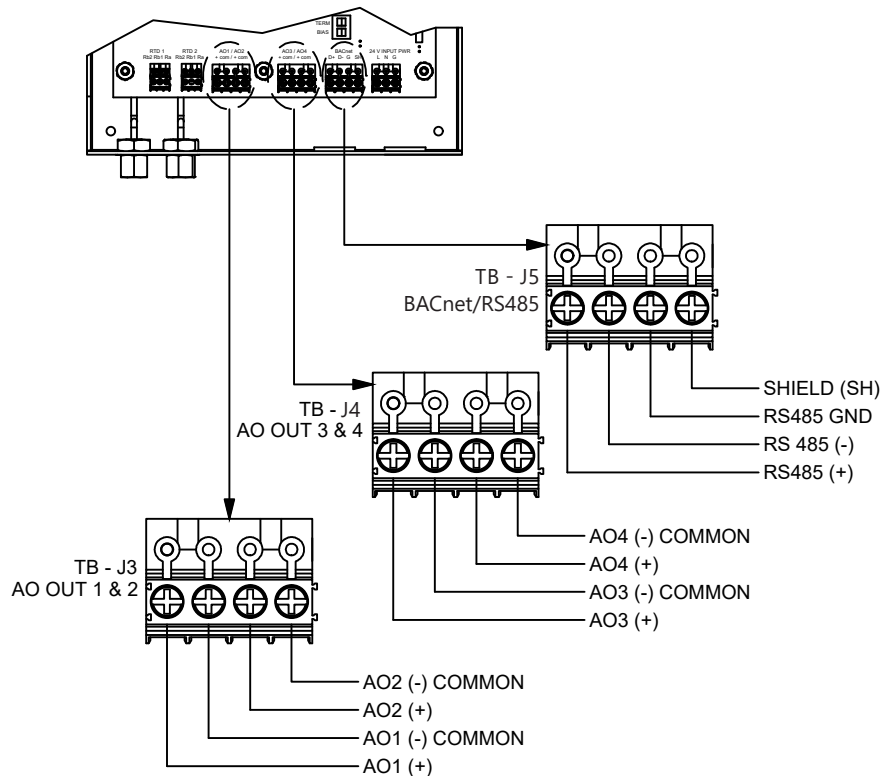
- 24 VAC, 15VA @ 24 VAC, 40 VA with heater
- 24 VDC, 10W @ 24 VDC, 35W with heater



Preferably Dedicated Earth Ground for instrumentation isolated from grounds tied to any high Voltage AC devices, Motors or VFDs is to be used.

B. Analog Output & Serial Communication

Four (4) analog outputs (4-20 mA, 0-5 VDC, or 0-10 VDC) are available based on configuration. Refer to section 5.3 ANALOG OUTPUT CONFIGURATION for more information.



2.2 AIRFLOW SENSOR

2.2.1 Airflow Sensor Process Connections

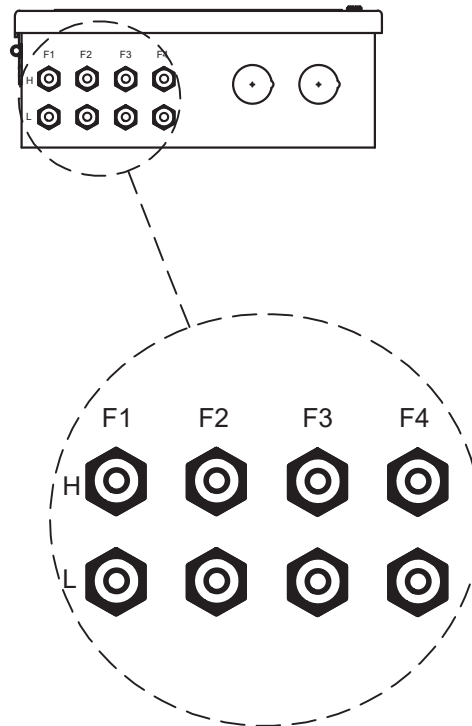
Air Monitor recommends that signal tubing between the transmitter enclosure and all sensors be stainless steel or copper of the appropriate size. Use tees or manifolds to combine multiple sensors into single high and low pressure lines running to the transmitter's channel fittings for each channel.

UV resistant, flexible, plastic tubing specifically designed for outdoor use, such as Tygon R-3400 or equivalent, may also be used. Use brass inserts with the plastic tubing as required to ensure a leak free connection.

Refer to section 2.1.1 Site Selection to determine the proper tubing dimension required based on the distance between the transmitter and airflow sensor(s).

CAUTION

Flexible plastic signal tubing used in outdoor applications must be resistant to weathering and the effects of UV exposure. When installing or removing signal tubing from either the enclosure or the sensors, a wrench should be used on the bulkhead nut to prevent it from turning.

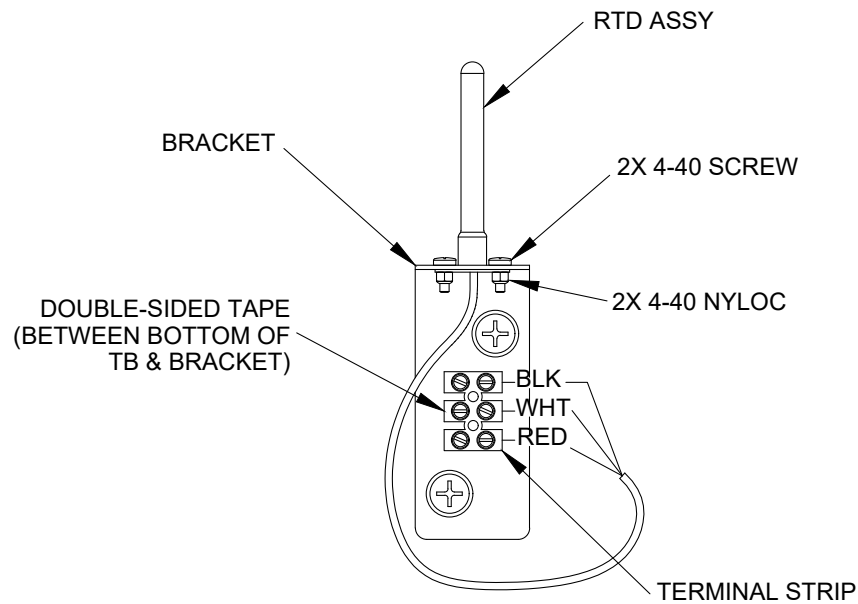


2.3 TEMPERATURE SENSORS

Temperature sensors RTD(s) provide ambient air temperature for density correction calculations. When the FAN IV is provided with a NEMA 1 enclosure, the sensor may be installed in the airflow stream or outside the inlet in a shaded area.

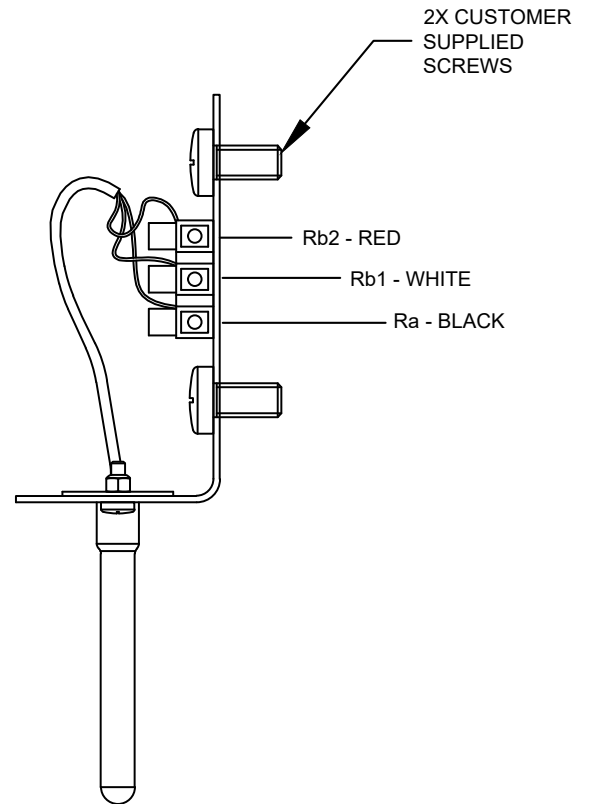
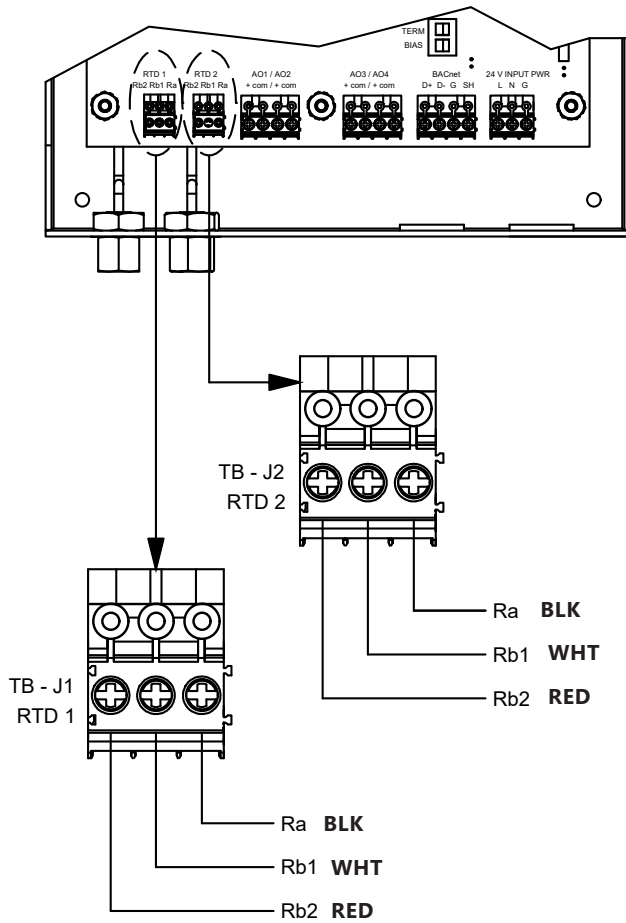
2.3.1 Temperature Sensors Installation

- Remove the RTD from the transmitter enclosure (taped in bag at bottom).
- Select a convenient mounting location(s) near the inlet or inside the air handler/duct to mount the RTD(s).
- Use the supplied sheet metal screws to mount the RTD(s).



- A shielded 3 wire with the drain connected to an earth ground at the transmitter end is recommended.
- We recommend a 18-gauge wire for up to lengths of 150ft.
- It is essential that all three wires must be identical in type, gauge, and length.

2.3.2 Temperature Sensor (RTD) Input Connections



IMPORTANT NOTE

Never mount temperature sensors in direct sunlight.

SECTION 3.0 OPERATION

3.1 START-UP

TOTAL FLOW 0		ACFM	
Temperature	72.7	F	
Group 1		Group 2	
0	ACFM	0	ACFM
0.000017	inH2O	-0.000096	inH2O
Group 3		Group 4	
0	ACFM	0	ACFM
-0.000319	inH2O	-0.000348	inH2O

Example of The Main Display for Single System

Press the power button located in the lower left corner of the cover. You will see the current version of the software and the company logo displayed at power-up.

Flow data will be displayed after a brief pause. Information shown on this screen (flow, temperature, velocity, etc.) will vary based on the FAN IV operating configuration. In addition, system status data is provided at the top of the display window and the user defined locations tag is displayed at the bottom.

Line 1 is for Total Flow

Line 2 is for temperature

Groups 1 through 4 can display flow and differential pressure for each independent group.

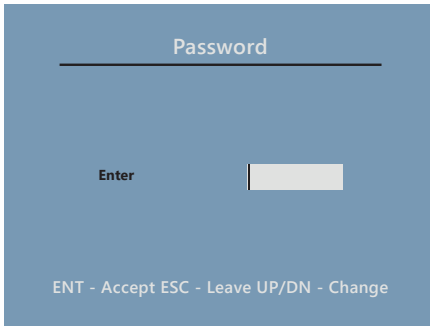
3.2 CONFIGURATION

The user interface consists of 4 push-buttons used for programming the transmitter. The displayed information is dependent on the factory configuration of the FAN IV. The transmitter can be configured from 1 to 4 channels.

Push-button Definitions:

Button	In an Editable Field	In a Selectable Field
ENT	Press once to select next character Press twice to enter the value and go to the next field	To select the value and go to the next field
ESC	Press once to delete the character to the left	Exits the menu, discards change
UP	Selects the next character (Note: Some fields support alpha or numeric or both)	Selects the next item in the list (Note: Once at the top of the list, this button has no effect)
DN	Selects the next character (Note: Some fields support alpha or numeric or both)	Selects the next item in the list (Note: Once at the bottom of the list, this button has no effect)

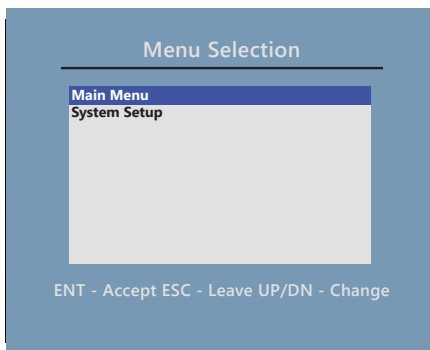
3.3 ENTERING THE PROGRAMMING MENUS



Press ENT at any time to access the programming menus. If the password has been set previously, the following screens will be displayed.

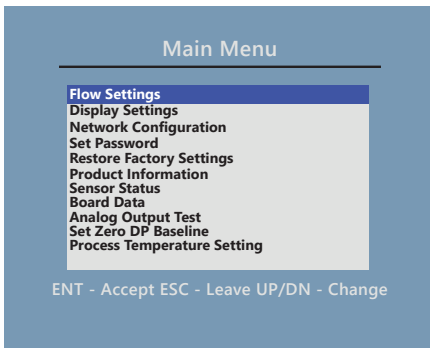
Password Menu

Enter the password and you will be brought to the menus selection screen. Information regarding the password settings can be found in section 4.4 SET PASSWORD.



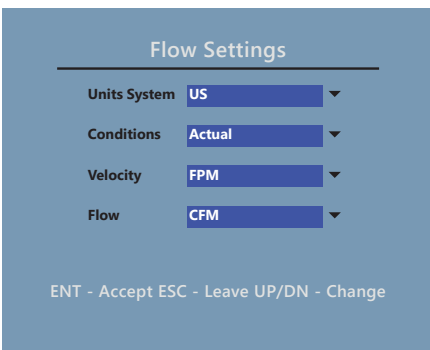
This screen provides menu selection for the FAN IV.

SECTION 4.0 MAIN MENU



Main menu functions are used to configure transmitter settings common to the FAN IV Configuration.

4.1 FLOW SETTINGS



Flow settings will set the engineering units for the whole system. You cannot individually change units on other menu pages; for example, if you set the units to be in US and the velocity to be in FPM, the lockdown (low flow cut-off) settings will be in FPM.

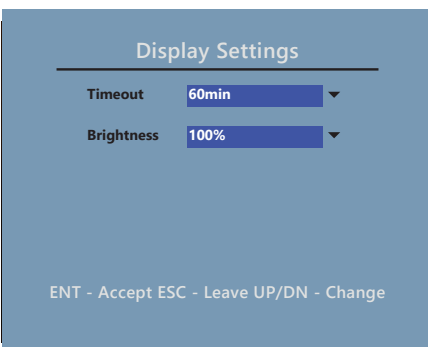
Actual Conditions –

The transmitter calculates airflow volume based on the current temperature and atmospheric pressure.

Standard Conditions –

The transmitter calculates airflow volume based on 68°F and 29.29" Hg.

4.2 DISPLAY SETTINGS



This menu provides adjustment for the display.

Time Out -

This refers to the time the menu system stays active. If the user leaves the system on a menu screen, it will eventually time out and return to the main display.

Brightness -

This is a real-time control of the LCD backlight. Selecting a value will immediately cause a change to the brightness.

4.3 NETWORK CONFIGURATION

Network Configuration

Type **BACnet/MSTP** ▼

Baud Rate **38400** ▼

Device ID **10**

Device Address **1**

Max Masters **127**

ENT - Accept ESC - Leave UP/DN - Change

This menu allows the user to set up the serial communications network. It can be used to configure the device for BACnet MS/TP or MODBUS RTU networks. When the network is enabled, the user will see the following icon next to the "System Run" indicator



Network Type - BACnet Settings

Baud Rate - Available in 9600/19200/38400/56700/76800/115200

Device ID (Instance Number) - Enter a value between 0 – 4,194,303

Device Address - Enter an address between 0 – 127

Max Masters - Enter a number between 0 – 127

Network Type – MODBUS Settings

Baud Rate - Available in 9600/19200/38400/56700/76800/115200

Device Address - Enter an address between 1 – 254

Parity - Select from EVEN, ODD or NONE

4.4 SET PASSWORD

Password Setting

Enable/Disable **Disable** ▼

Change **12312**

ENT - Accept ESC - Leave UP/DN - Change

To change the password, enter your new password into the editable field. This overwrites the old password. The password can be up to 8 digits. Alpha and numeric characters are supported. The drop down will allow the user to disable the password if so desired.

4.5 RESTORE FACTORY SETTINGS

Restore Factory Settings

Back to Factory **All** ▼

ENT - Accept ESC - Leave UP/DN - Change

This menu allows the user to return the system back to the factory settings.

Options for restoring settings include:

- All
- Other duct coefficients
- Display
- Analog outputs
- Flow settings
- Flow configuration

4.6 PRODUCT INFORMATION

Product Information

Work Order: 123456-F

Serial Number: 123456789

Part Number: 106-065-00

Egpt Type: Dual

Date of Mfg: 10/29/2018

Model:

XDCR Heater: No

Firmware Version: 2.0.0 Build 101

Hardware Version: 2.0

ENT - Accept ESC - Leave UP/DN - Change

This screen provides detailed information about the transmitter hardware.

4.7 SENSOR STATUS

Sensor Status				
Sensor	Range (inH ₂ O)	Press (inH ₂ O)	Mfg	S/N
1	5.0	0.00003	SS	24-18-132
2	5.0	-0.00044	SS	23-18-178
3	5.0	0.00002	SS	24-18-133
4	5.0	-0.00031	SS	23-18-215

Present
 Missing

ESC - Leave

This screen provides real-time operating status for the pressure transducers.

The Range is the Scale for the DP for Analog output refer to Section 5.3.

4.8 BOARD DATA

Board Data		
Volt_1	1.110	V
Volt_2	5.026	V
Volt_3	24.003	V
Board Temp	72.399	F

ESC - Leave

This screen provides real-time operating information for the transmitter electronics.

4.9 ANALOG OUTPUT TEST

Analog Output Test	
Output Mode	4-20 mA
Warning: All outputs are set to the selected level simultaneously	☒ Zero ☐ 50% ☐ 100%

ENT - Accept ESC - Leave UP/DN - Change

This function allows the user to test the analog outputs. The user can force the outputs to operate at 0%, 50% or 100%.

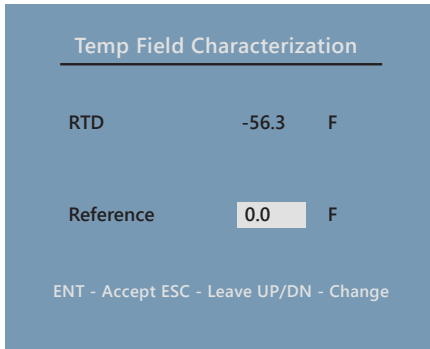
4.10 SET ZERO DP BASELINE

Set Zero DP Baseline	
Zeroing: After activation, the process will prompt you when finished	☒ Activate

ENT - Accept ESC - Leave UP/DN - Change

This function sets the DP zero baseline prior to usage. This is performed by connecting the transmitter to the fans and having them off. Then running the DP zero baseline will set this pressure as your zero.

4.11 TEMP FIELD CHARACTERIZATION



Temp Field Characterization

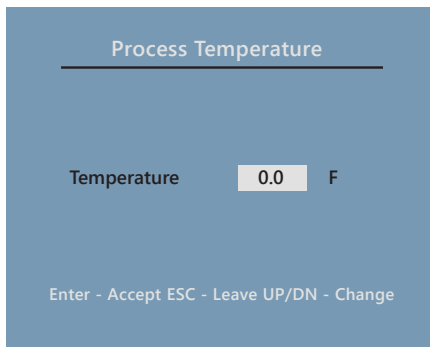
RTD -56.3 F

Reference 0.0 F

ENT - Accept ESC - Leave UP/DN - Change

This function allows the user to calibrate the temperature probe by entering in a reference temperature to the RTD.

4.12 PROCESS TEMPERATURE SETTING (NO RTD)



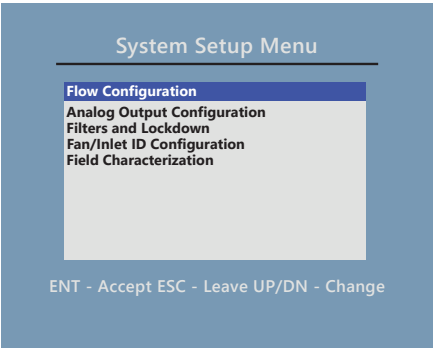
Process Temperature

Temperature 0.0 F

Enter - Accept ESC - Leave UP/DN - Change

If no RTD is selected the user will be able to manually enter the temperature in the GUI to use instead of STD conditions for air calculations.

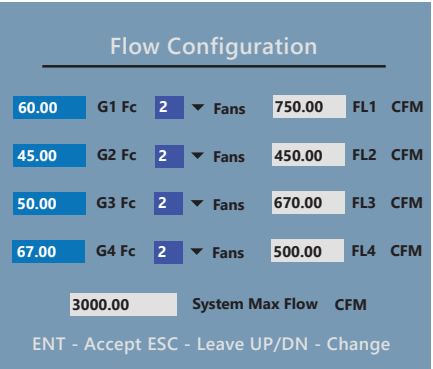
SECTION 5.0 SYSTEM SET-UP MENU



This screen provides the system set up menu for the FAN IV system configuration.

5.1 FLOW CONFIGURATION

Piezo Ring



This menu is used to select the flow inlet type and adjust the flow settings.

Piezo Ring Configuration:

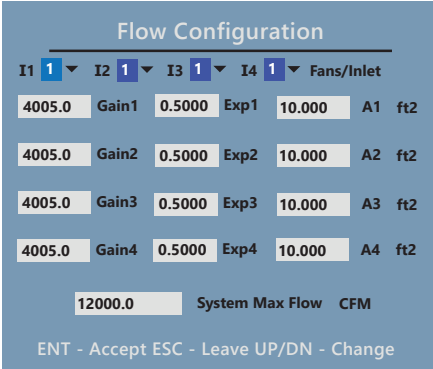
G1-G4: Allows the user to enter in the Fan Coefficient per group G1 through G4.

User can select 1-5 number of fans from the pull down tab in each group. User can select 1 for individual fan measurement per channel. Select 2-5 if the selected number of fans will be daisy-chained together. Up to five fans can be daisy-chained per channel.

FL1 through FL4: The user can define the analog scale of the CFM for each individual group. This will be the analog scale of a single fan if 1 fan is selected or the analog scale of the total sum of a group of fans if number of fans 2-5 is selected.

System Max Flow: The user can define the analog scale of the CFM for the total of all the groups.

VOLU-probe/FI



Fan Inlet Configuration:

Gain1-Gain4: Allows the user to enter in the gain per group 1-4.

Exp1-Exp4: Allows the user to enter the exponent per group of 1-4.

A1-A4: Allows the user to enter the fan inlet area per group of 1-4.

I1-I4: Allows the user to select 1-5 number of fans from the pull down tab in each group.

System Max Flow: The user can define the analog scale of the CFM for the total of all groups. The fan/group analog scale will be the total divided by the number of groups.

5.2 ANALOG OUTPUT CONFIGURATION

Analog Output Configuration

Type: 4-20 mA

Output 1: Total Flow

Output 2: Temperature

Output 3: Fan1/Grp Flow

Output 4: DP1

ENT - Accept ESC - Leave UP/DN - Change

This menu is used to configure the analog outputs. In split and dual modes the outputs are assigned to the specific channels.

Output Type

Use this to configure the output type. The options are 4-20mA, 0-10VDC, 0-5VDC or off. All four outputs are set to the same type.

User shall have a list of choices, dependent on configuration, available for each of (4) AO's

Flow AO outputs will be at Actual or Standard Conditions according to choice in "4.1 FLOW SETTINGS"

The selections for output are the following:

- Total Flow
- Temperature
- Fan 1/Grp Flow, Fan 2/Grp Flow, Fan 3/Grp Flow, Fan 4/Grp Flow
- DP1, DP2, DP3, DP4
- Atmospheric Pressure

5.3 FILTERS AND LOCKDOWN

Filters and Lockdown

Process Filter: 5

Display Filter: 5

Lockdown: 10 %

ENT - Accept ESC - Leave UP/DN - Change

This menu function sets filtering for the analog outputs and the display. It is also used to set the lockdown (low flow cut-off).

Process Filter

The process filter is used to dampen the analog outputs. The settings are from 1-10, where 1 is the softest filter and 10 is the hardest filter. Typically, 2-4 will give a filtered signal which is responsive but provides some dampening.

Display Filter

This filter is used to dampen the flow display. The settings are from 1-10, where 1 is the softest filter and 10 is the hardest filter. Typically, 2-4 will give a filtered signal which is responsive but provides some dampening.

Lockdown Setting

The lockdown setting is a low flow cut-off. The Lockdown is a percentage flow. That percentage gets applied to the Total Flow as well as to the individual channels:

System Lockdown = System Max Flow * %Lockdown

Flow Ch X Lockdown = Channel X Max FLOW * %Lockdown (X = 1...4)

****The analog temperature output range is fixed at the factory, -40°F to 120°F***

5.4 FIELD CHARACTERIZATION

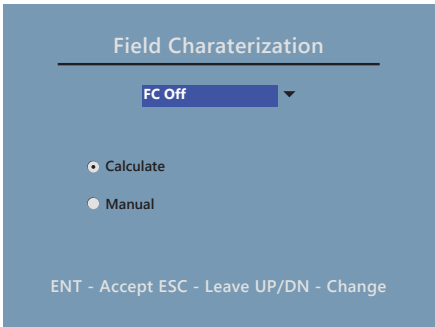
The FAN IV is equipped with a field characterization (K-factor) feature which allows for the introduction of gain and/or bias factors into the transmitter’s flow calculations. This feature is intended to be used in two types of applications:

1. To adjust for flow measurement error as a result of highly distorted airflow induced by upstream or downstream flow disturbances.
2. To adjust the transmitter’s output to bring it into close correlation with field measured flow data.

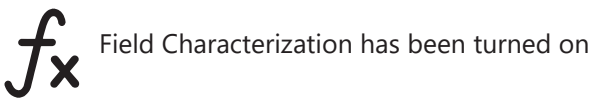
The K-Factor gain and bias values can be entered directly or the FAN IV can calculate these values based on measured and reference values from a 1, 2 or 3 point airflow traverse.

For best results, Air Monitor recommends at least 2 flow points be used to characterize the installation, with one flow reading taken in the bottom 1/3 of the operating range. When making this measurement, it is essential that the flow measurement be within the operating range of the FAN IV and airflow sensor.

Field characterization is performed with all fans running (NOT by individual Fans) and the total sum is entered into the GUI for both Reference and FAN IV data points. The offset curves are applied to adjust the total.



This menu allows the user to field characterize (FC) system flow and adjust the factory calibration parameters in the FAN IV. When FC is enabled, the icon shown below appears in the status bar of the main display.



If you enable the field characterization you will have the option to select calculate or manual field characterization.

Number of Points

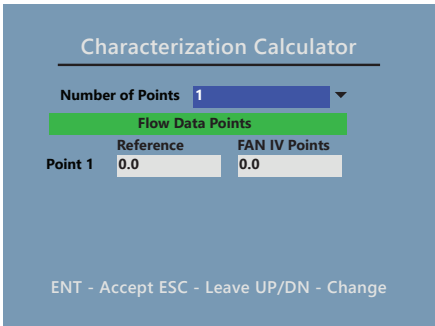
The number of data points (1-3) to be used for field characterization.

Data Points

There are two columns shown on the menu; one for Reference (the test and balancer results) and one for FAN IV Points. Data is stored in the system’s non-volatile memory. The following are general guidelines characterizing flow based on the number of data points.

IMPORTANT NOTE

Data must be entered as flow (e.g. CFM) in actual, not standard, flow conditions.



1 Point - Enter a total flow rate that is at or near the top of the operating range.

5.4 FIELD CHARACTERIZATION (CONTINUED)

Characterization Calculator

Number of Points **2**

Flow Data Points

	Reference	FAN IV Points
Point 1	0.0	0.0
Point 2	0.0	0.0

ENT - Accept ESC - Leave UP/DN - Change

1 Point - Enter a total flow rate that is at or near the top of the operating range.

2 Points - For point 1, enter a total flow rate that is near the bottom of the operating range. For point 2, enter a total flow rate that is near the top of the operating range.

Characterization Calculator

Number of Points **3**

Flow Data Points

	Reference	FAN IV Points
Point 1	0.0	0.0
Point 2	0.0	0.0
Point 3	0.0	0.0

ENT - Accept ESC - Leave UP/DN - Change

For point 1, enter the total flow rate fans that is in the bottom third of the operating range.

For point 2, enter the total flow rate of fans that is in the middle third of the operating range.

For point 3, enter the total flow rate of fans that is in the upper third of the operating range.

This is an example of how to get the total of 4 individual fans to enter into the GUI. For point 1 the user would enter 8000 as the total FAN IV reading and enter 8100 which T&B would get from an anemometer or similar means.

	Point 1	Point 2	Point 3
Fan1	1975	3950	5925
Fan2	2000	4000	6000
Fan3	2025	4050	6075
Fan4	2000	4000	6000
Total	8000	16000	24000
Reference	8100	16200	24300

Manual Characterization

Exponent **0.500**

Gain **1837.0**

ENT - Accept ESC - Leave UP/DN - Change

If you select the manual option in the field characterization menu, you will be provided with data entry fields for manually entering exponent and gain values. This data will be calculated and provided by the balancer or others.

5.5 FAN/INLET ID CONFIGURATION

Fan/Inlet ID Configuration

Fan/Inlet ID 1 **Group 1**

Fan/Inlet ID 2 **Group 2**

Fan/Inlet ID 3 **Group 3**

Fan/Inlet ID 4 **Group 4**

Device ID **AHU 1**

ENT - Accept ESC - Leave UP/DN - Change

This dialog allows for an alpha-numeric entry of up to 20 characters. This entry is visible on the bottom of the main display screen and is written to the Device Name field in the BACnet device object.

SECTION 6.0 COMMUNICATIONS

The FAN IV is provided with BACnet MS/TP and MODBUS RTU as serial communications protocol options. BACnet is the default setting. The field configurable serial communications interface is described on the following pages. Refer to section 2.1.4 Transmitter Wiring Connections for detailed information on wiring connections.

Air Monitor recommends that 3-wire systems with a separate shield be used for communications. The interface can operate on 2-wire networks with no common, but this configuration is more susceptible to noise.

CAUTION

Do not connect shield drains to the common terminal.

6.1 BACnet MS/TP

Transceiver	Isolated, 3-wire, half-duplex (1/3 unit load)
Recommended maximum units per segment	32
BACnet address range	1 - 255
BACnet device ID (Instance number)	0 - 4,194,303
Max master range	0 - 127
Baud rate	9600, 19200, 38400, 57600, 76800 or 115200

6.1.1 BACnet Object Types

BACnet Object Type and Number of Objects implemented: Device 1
Analog Input – 5, 9 or 11 depending on operating configuration See below for details.

6.1.2 Protocol Implementation Statement

BACnet Protocol Revision: 12
Device Profile (Annex L): BACnet Application Specific Controller (B-ASC)
MS/TP Master (Clause 9), Baud Rate(s): 9600, 19200, 38400, 56700, 76800, 115200
Device Address Binding: No
BBMD Support Registration By Foreign Devices: No
Character Set Supported: ANSI X3.4
BACnet Interoperability Building Blocks Supported (Annex K):
Data Sharing – Read Property-B (DS-RP-B)
Data Sharing – Read Property Multiple-B (DS-RPM-B)
Data Sharing – Write Property-B (DS-WP-B)
Device Management – Dynamic Device Binding-B (DM-DDB-B)
Device Management – Dynamic Object Binding-B (DM-DOB-B)
Device Management – Device Communication Control-B (DM-DCC-B)
Device Management – Reinitialize Device-B (DM-RD-B)

6.1.3 Standard BACnet Objects Supported

Object Identifier	1	Writeable	0 – 4,194,303
Object Name	FAN IV	Writeable	Alpha-numeric; 20 character limits. See “Custom ID” setting in the Service Menu.
Object Type	Device	Read-only	
System Status	Operational	Read-only	
Vendor Name	AMC	Read-only	
Vendor ID	58	Read-only	
Model Name	FAN IV	Read-only	
Location	Default Location	Read-only	
Description	Airflow Measurement	Read-only	
Protocol Version	1	Read-only	
Protocol Revision	12	Read-only	
Services Supported	readProperty, readPropertyMultiple, writeProperty, deviceCommunicationControl, reinitializeDevice, who-Has, who-is	Read-only	
Object Types Supported	Analog-input, Device	Read-only	
Object List	Only: (15) Flow1, Flow2, Flow3, Flow4, Total Flow, Temperature, Velocity1, Velocity2, Velocity3, Velocity4, Atm. Pressure, DP1, DP2, DP3, DP4	Read-only	
Max ADPU Length	128	Read-only	
Segmentation Supported	No Segmentation	Read-only	
APDU Max Time-out	3000	Read-only	
#APDU Retries	3	Read-only	
Max Masters	127	Writeable	
Device Address Binding	{}	Read-only	
Database Revision	3	Read-only	

6.1.4 Analog Input Object

Object Identifier	Analog Input-0 to Analog Input-X1	Read-only
Object Name	Various	Read-only
Object Type	Analog-Input	Read-only
Present Value	REAL	Read-only
Status Flags	F, F, F, F	Read-only
Event State	Normal	Read-only
Out of Service	FALSE	Read-only
Description	Various	Read-only
Units	Various	Read-only

For each analog input object, there are four status flags: IN_ALARM, OUT_OF_SERVICE, FAULT and OVERRIDDEN. Only the FAULT flag is used in this product. If there is an out-of-range condition or other alarm, the FAULT flag will be set.

6.1.5 BACnet Analog Inputs

Object Name	Description	Units
Analog Input 1	Flow 1	Cubic feet per minute
Analog Input 2	Flow 2	Cubic feet per minute
Analog Input 3	Flow 3	Cubic feet per minute
Analog Input 4	Flow 4	Cubic feet per minute
Analog Input 5	Total Flow	Cubic feet per minute
Analog Input 6	Temperature	Degrees Fahrenheit
Analog Input 7	Velocity 1	Feet per minute
Analog Input 8	Velocity 2	Feet per minute
Analog Input 9	Velocity 3	Feet per minute
Analog Input 10	Velocity 4	Feet per minute
Analog Input 11	Atm Pressure	Inches of Mercury
Analog Input 12	D.P.1	Inches of Water
Analog Input 13	D.P.2	Inches of Water
Analog Input 14	D.P.3	Inches of Water
Analog Input 15	D.P.4	Inches of Water

6.2 MODBUS RTU

Transceiver	Isolated, 3-wire, half-duplex (1/3 unit load)
Recommended maximum units per segment	32
MODBUS address range	1 - 255
Parity	Even, Odd or None
Baud Rate	9600, 19200, 38400, 57600, 76800 or 115200

6.2.1 MODBUS Registers

Description	Register Type	Address	Data Type	Description
System Velocity Units	Read Input	30201	uint16_t	1 = FPM, 2 = FPS, 3 = MPM, 4 =MPS
System Flow Units	Read Input	30202	uint16_t	1 = CFM, 2 = CFH, 3 = L/S, 4 = L/M, 5 = M3H
System Version	Read Input	30203	uint16_t	
System Version 2	Read Input	30204	uint16_t	MSB = Major, LSB = Minor
Probe Type	Read Input	30205	uint16_t	0 = Piezo 1 = FI
Max Flow Ch1 (Or Max Flow of Group on Ch1)	Read Input	30206	float	Flow to scale Analog Output
Max Flow Ch2 (Or Max Flow of Group on Ch2)	Read Input	30208	float	Flow to scale Analog Output
Max Flow Ch3 (Or Max Flow of Group on Ch3)	Read Input	30210	float	Flow to scale Analog Output
Max Flow Ch4 (Or Max Flow of Group on Ch4)	Read Input	30212	float	Flow to scale Analog Output
Sys Max Flow (Of all Channels or Groups)	Read Input	30214	float	Flow to scale Analog Output
System Status	Read Input	30216		1= ALL_OK 2 = IN ALARM
				3 = IN FAULT
				4 = OOS
System Units	Read Discreet	20000	boolean	Bit 0: 1 = SI, Bit 0: 0 = US
System Conditions	Read Discreet	20001	boolean	Bit 0: 1 = Std, Bit 0: 0 = Actual
K-factor	Write Coil 1	50000	boolean	1 = ON, 0 = OFF
System Reset	Write Coil 2	50000	boolean	1 = RESET
K-factor	Write Multiple Coil	150000	boolean	1 = ON, 0 = OFF
System Reset	Write Multiple Coil	150000	boolean	1 = RESET
Read Slave ID	N/A	17000	ASCII	Returns string "FAN IV"
K-factor	Read Coil	10000		Returns the state of the K-factor

SECTION 7.0 MAINTENANCE

The FAN IV does not contain any parts that require scheduled maintenance.

The following information is provided, as general guidelines, if you wish to establish an inspection/maintenance program. Start with annual inspections and adjust the frequency as required to meet your needs.

Cleanliness

- Verify condensation or other sources of liquids are not present inside the FAN IV.

Mechanical

- Verify signal connections are secure.
- Inspect signal lines for any cracks or leaks.
- Verify mounting hardware is secure.

Electrical

- Inspect wiring to the FAN IV for good connections and absence of corrosion.

Calibration Intervals

- Air Monitor does not recommend a specific time interval between re-calibrations. Calibrations should be scheduled to meet the needs of the facility where the FAN IV is installed. For example, critical care facilities may wish to schedule annual re-calibrations while commercial/retail buildings may only schedule re-calibrations at 3-5 year intervals.

SECTION 8.0 TROUBLESHOOTING

Problem	Solution
Display indicates 0 FPM while in Normal Mode	Verify fan is operational. Verify flow is above lockdown value. Verify connections are not backwards. If High and Low ports are switched it will report zero flow.
Total Flow is greater than the Design Flow Max setting in the Flow Configuration dialog	The flow setting is too low for the actual flow from the fan(s). This can be simply fixed by increasing the DFM setting.
Temperature is very low (<-50°F)	RTD has a loose wire connection.
Flow seems high or low for given conditions	The transducer must be sized correctly for the flow in the duct, and the system must have the correct span value selected in the Transducer Configuration menu. If these conditions are correct, perform a transducer calibration. Verify air handler is operating correctly.
Flow is lower than expected or erratic	Check for pinched or crimped tubing.

