PARAGON CONTROLS INCORPORATED

FAATS-1000

FAN ARRAY AIRFLOW TOTALIZING SYSTEM

Operation & Maintenance Manual

Engineered for accuracy, applicability, durability and simplicity in HVAC air systems and industrial process control loop

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1. Description 1
1.2. Specifications 1
1.2.1. Power Supply 1
1.2.2. Power Consumption 1
1.2.3. Circuit Protection 1
1.2.4. Accuracy 1
1.2.5. Digital Inputs 1
1.2.6. Process Output Options 2
1.2.7. Alarm Relay Outputs 2
1.3. Safety 2
1.3.1. Electrical Connections 2
1.3.2. Static Electricity 2
2. ELECTRICAL CONNECTIONS 3
2.1. Main CPU Board Electrical Connections 3
Main CPU Connector Definitions 4
2.2. Sensor Module Connection 4
2.3. CPU to Sensor Module Connection Diagram 5
2.4. Outside Air Module Connection 6
3. CONFIGURATIONS AND PNEUMATIC CONNECTIONS 7
3.1. Typical FAATS-1000 Enclosure Configurations 7
3.1.1. Modular Configuration 7
3.1.2. Consolidated Configuration 8
3.2. Pneumatic Connections 9
3.2.1. 8 Fan Single Array Pneumatic Connection Layout 9
3.2.2. 8 Fan Dual Array Pneumatic Connection Layout 10
3.2.3. Pneumatic Connection Installation 11
4. POWER UP & MONITOR SCREENS 12
4.1. Power Up Screen 12
4.2. Monitor & Help Screens 12
4.2.1. TYPICAL FAATS-1000 CONFIGURATION 12
4.2.2. FAATS-1000 Configuration With Outside Air (Optional) 13
4.3. Individual Fan Data Popup Window 13
4.4. Sub Menu Selections 14
5. SETUP MENUS 15
5.1. SETUP-1 Menu 15
5.1.1. Setup Menu Log In 15
5.1.2. Setup-1 Help Screen 16
5.1.3. Setup-1 Menu Variables 16
5.1.3.1. Total Fan Array Operating Range 16
5.1.3.2. Fan Array ID 17
5.1.3.3. Engineering Units 17
5.1.4. K-Factor Selection 18
5.1.4.1. System K-Factor 18
5.1.4.2. Fan Alignment 19
5.1.5. Setup-1 Factory Defaults 20
5.2. SETUP-2 Menu 21

5.2.1. Setup-2 Help Screens 21
5.2.2. Setup-2 Menu Variables 21
5.2.2.1. Display and Output Filter Interval 22
5.2.2.2. Screen Backlight Time 22
5.2.2.3. Relay Function 22
5.2.2.4. Start Alarm Delay 23
5.2.2.5. Group Run Delay 23
5.2.2.6. Fault Alarm Delay 23
5.2.2.7. Lockdown 23
5.2.2.8. Lockdown Delay 23
5.2.3. Zero Calibration 24
5.2.3.1. Zero Calibration - Individual Fan 24
5.2.3.2. Zero Calibration - All Fans on a Single Sensor Board 24
5.2.4. Setup-2 Factory Defaults 25
5.3. SETUP-3 Menu 26
5.3.1. Clock & Date Display 26
5.3.2. Clock & Date Data 26
5.3.3. WO# and Software Version 26
6. TECH MENUS 27
6.1. TECH-1 Menu 27
6.1.1. Tech Menu Log In 27
6.1.2. Tech-1 Help screen 28
6.1.3. Tech-1 Menu Variables 28
6.1.3.1. Fan Coefficient 28
6.1.3.2. Area Factor (Optional) 29
6.1.3.3. Fixed Temperature 30
6.1.3.4. Temperature Source 30
6.1.3.5. Site Elevation 30
6.1.4. Tech-1 Factory Defaults 30
6.1.5. Diagnostics 30
6.2. TECH-2 Menu 31
6.2.1. Tech-2 Help Screen 31
6.2.2. Tech-2 Menu Variables 32
6.2.2.1. Caution Alarm 32
6.2.2.2. Display and Output Filter Count 32
6.2.2.3. Temperature Units 32
6.2.2.4. Fan Alarms 32
6.2.2.5. MAC Code (BACnet Only) 32
6.2.2.6. Modbus ID (Modbus Only) 33
6.2.2.7. Instance Number (BACnet Only) 33
6.2.2.8. Baud Rate 33
6.2.2.9. Group Input Control 33
6.2.3. Tech-2 Factory Defaults 33
6.2.4. Fan Group Configuration & Help Screens 34
6.2.5. Output Configuration, Calibration, & Help Screens 35
6.3. TECH-3 Menu (Optional) 36
6.3.1. Tech-3 Help Screen 36
6.3.2. Tech-3 Menu Variables 37

6.3.2.1. OA Units Quantity 37
6.3.2.2. OA Units ID 37
6.3.2.3. OA Units Op Range 38
7. FAN ARRAY DATA, CALC. DATA, & HELP SCREENS 39
8. DPT SENSOR & HELP SCREENS 40
9. FAN AND OA DETAIL & HELP SCREENS (OPTIONAL) 41
9.1. Fan Detail & Help Screen 41
9.2. OA Detail & Help Screen 41
10. ALARM CONDITIONS AND WARNING MESSAGES 42
10.1. Fan Status Indicator Lights 42
10.2. Total Fan Array Airflow Exceeds Op Range Value 42
10.3. Op Range Reset Message 43
11. NETWORK COMMUNICATIONS 44
11.1. BACNET 44
11.1.1. Network Control Settings 44
11.1.2. Network Connection 44
11.1.3. Connecting to a Communication Network 44
11.1.4. BACnet Communication Board & Terminator Switch 45
11.1.5. PICS (Protocol Implementation Conformance Statement) 45
12. TROUBLESHOOTING GUIDE 50
13. OA INTEGRATED TROUBLESHOOTING GUIDE 54
14. DEFAULT SETTINGS RECORD 55

1. INTRODUCTION

1.1. Description

The FAATS-1000 Fan Array Airflow Totalizing System (FAATS) has been specifically designed to provide a cost-effective means for accurate (±0.25%F.S.) airflow measurement of up to forty individual fans within a single fan array or forty combined fans in an air handling unit with both supply and return fan arrays. The FAATS-1000 utilizes either existing airflow sensors provided by the fan manufacturer or field installed airflow sensors as inputs to each fan's independent airflow transducer.

The individual airflow rate of each fan in an array is indicated on a seven-inch, full color, Human-Machine-Interface (HMI) touch screen panel as well as the summed (total) airflow rate of each array. Device monitoring and configuration can also be performed by a building management system (BMS) through BACnet®-MS/TP Master, or Modbus® Slave communication network.

Independent monitoring of each fan allows the FAATS-1000 to identify and alarm fan failures and airflow rate discrepancies between fans. All caution alarms and failure alarms are available to the BMS for facility operator notification. Optional features include Temperature Compensation, Outside Air (OA) Flow Measurement, and NEMA 4 enclosure types.

1.2. Specifications

1.2.1. Power Supply

20 to 28 VAC

1.2.2. Power Consumption

Standard Unit (HMI, CPU & 1 Sensor Module): 27VA

Each additional Sensor Module: 5.28VA

1.2.3. Circuit Protection

Power input is isolated, reverse polarity protected, and supplied with an electronic self-resetting fuse

1.2.4. Accuracy

±0.25% full scale

1.2.5. Digital Inputs

Group 1 - Dry Contact

Group 2 - Dry Contact

Group 3 - Dry Contact

Group 4 - Dry Contact

1.2.6. Process Output Options

Fan Array 1: 0-5VDC, 0-10VDC, or 4-20mA (700Ω maximum load)
Fan Array 2: 0-5VDC, 0-10VDC, or 4-20mA (700Ω maximum load)

1.2.7. Alarm Relay Outputs

Fan Array 1 Alarm: two single (1 form C) dry contacts rated for 5 amps at 30 VAC/VDC and 10 amps at 120 VAC resistive load

Fan Array 2 Alarm: two single (1 form C) dry contacts rated for 5 amps at 30 VAC/VDC and 10 amps at 120 VAC resistive load

1.3. Safety

1.3.1. Electrical Connections

Before any electrical connections are made, ensure the **POWER SWITCH** is in the **OFF** position.

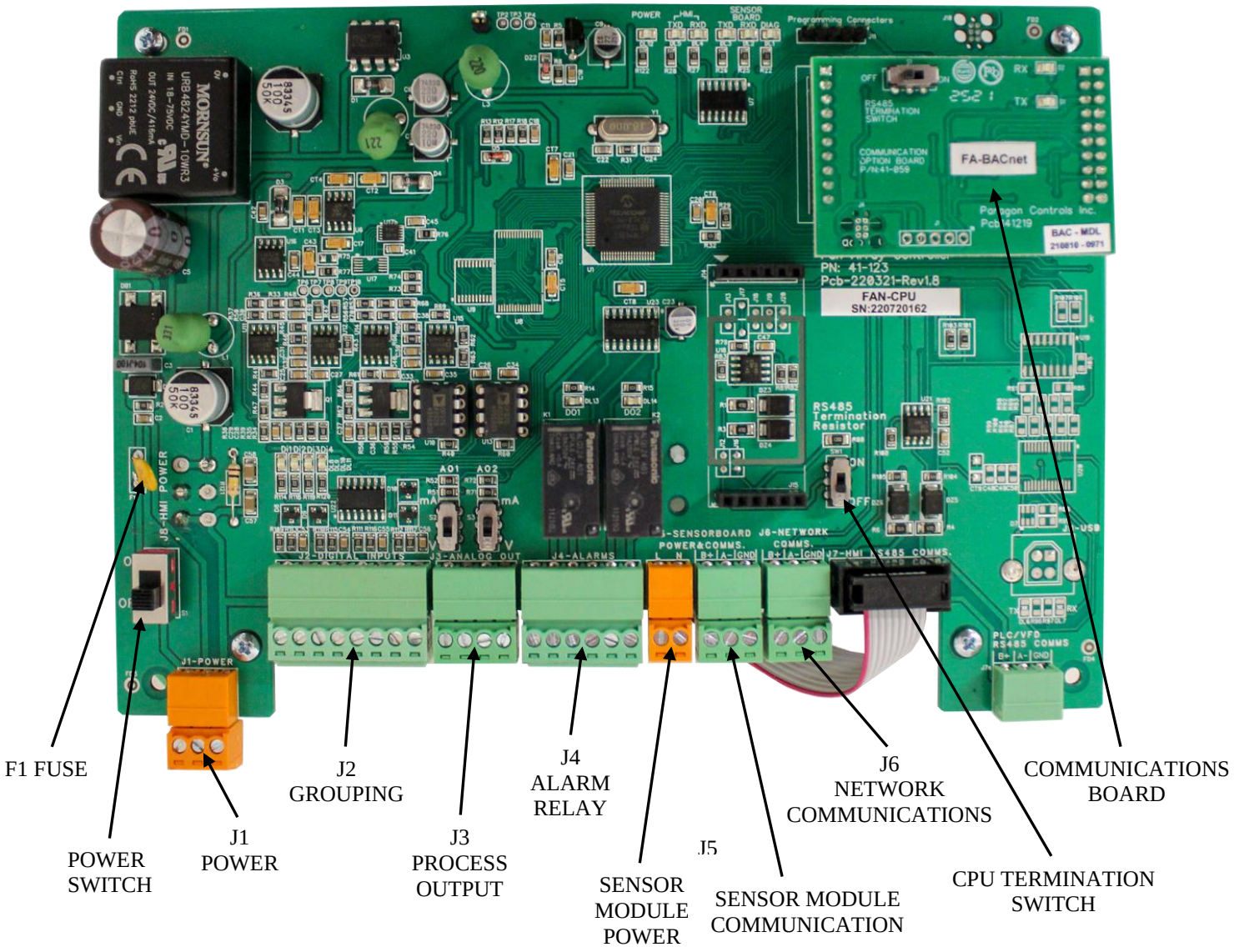
1.3.2. Static Electricity

The circuit board contains components which are susceptible to damage caused by static electrical discharge. Should it be necessary to remove the circuit board from the enclosure, appropriate precautions must first be taken to ensure that the operator and the circuit board are at the same electrical potential.

2. ELECTRICAL CONNECTIONS

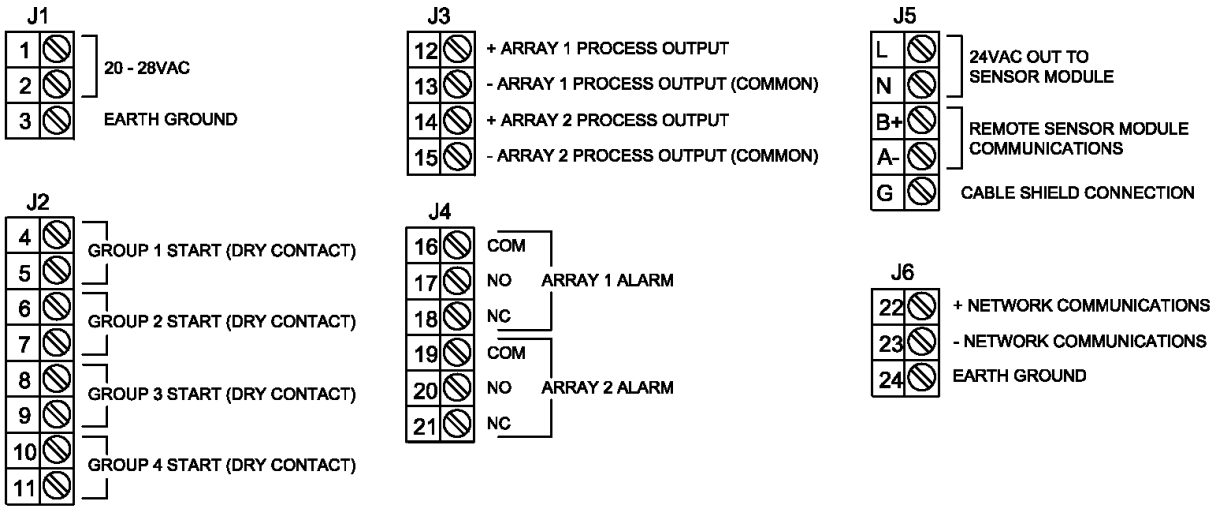
2.1. Main CPU Board Electrical Connections

(The CPU board is mounted to the back side of the HMI display)



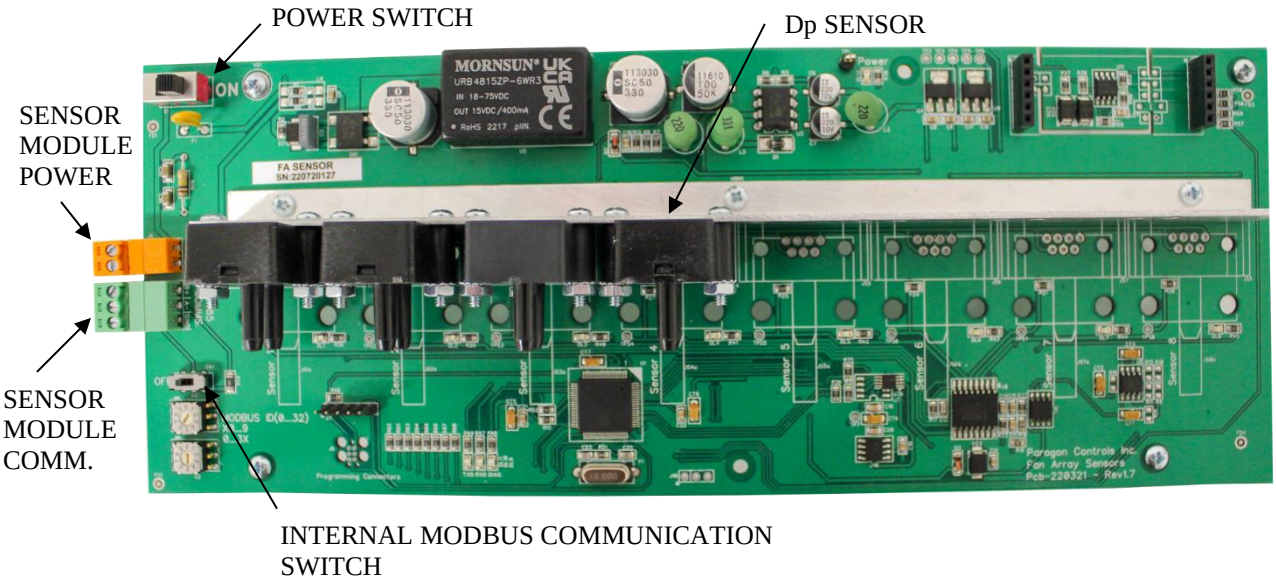
Main CPU Connector Definitions

(Note: A physical connection between J1 pin 3 (EARTH GROUND) and actual earth ground is required)



2.2. Sensor Module Connection

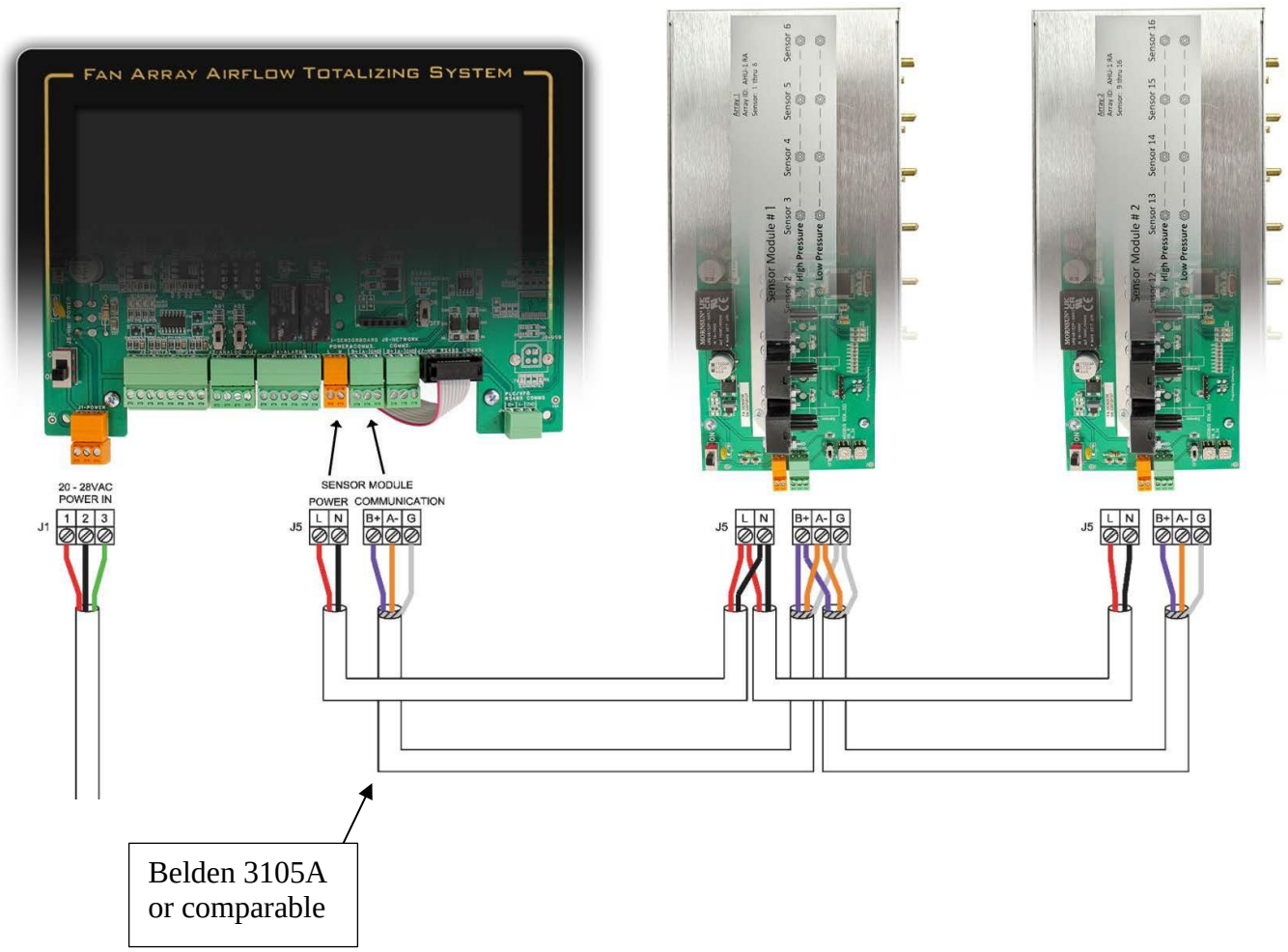
The fan array sensor modules are easily connected with twisted pair as shown in Section 2.3. Previous sensor modules connect with plenum-rated CAT5e patch cable (shielded 24-gauge wire). The CAT5e patch cables can be plugged into either of the sockets on the sensor module circuit board and multiple boards are daisy-chained together by plugging the next sensor module into the open socket. Additionally, both sensor modules versions can be connected together in any sequence if multiple sensor modules are included, i.e., sensor module #1 does not need to be the first module connected to the FAATS CPU (see Section 2.1) nor does sensor module #2 need to be connected to sensor module #1, and so on. However, the sensor modules are unique to their respective fan arrays and the sensor modules associated with array 1 must be connected to the array 1 fans in the order described in Section 3. Below is a photo of a sensor board for 4 fans (4 Dp sensors).



2.3. CPU to Sensor Module Connection Diagram

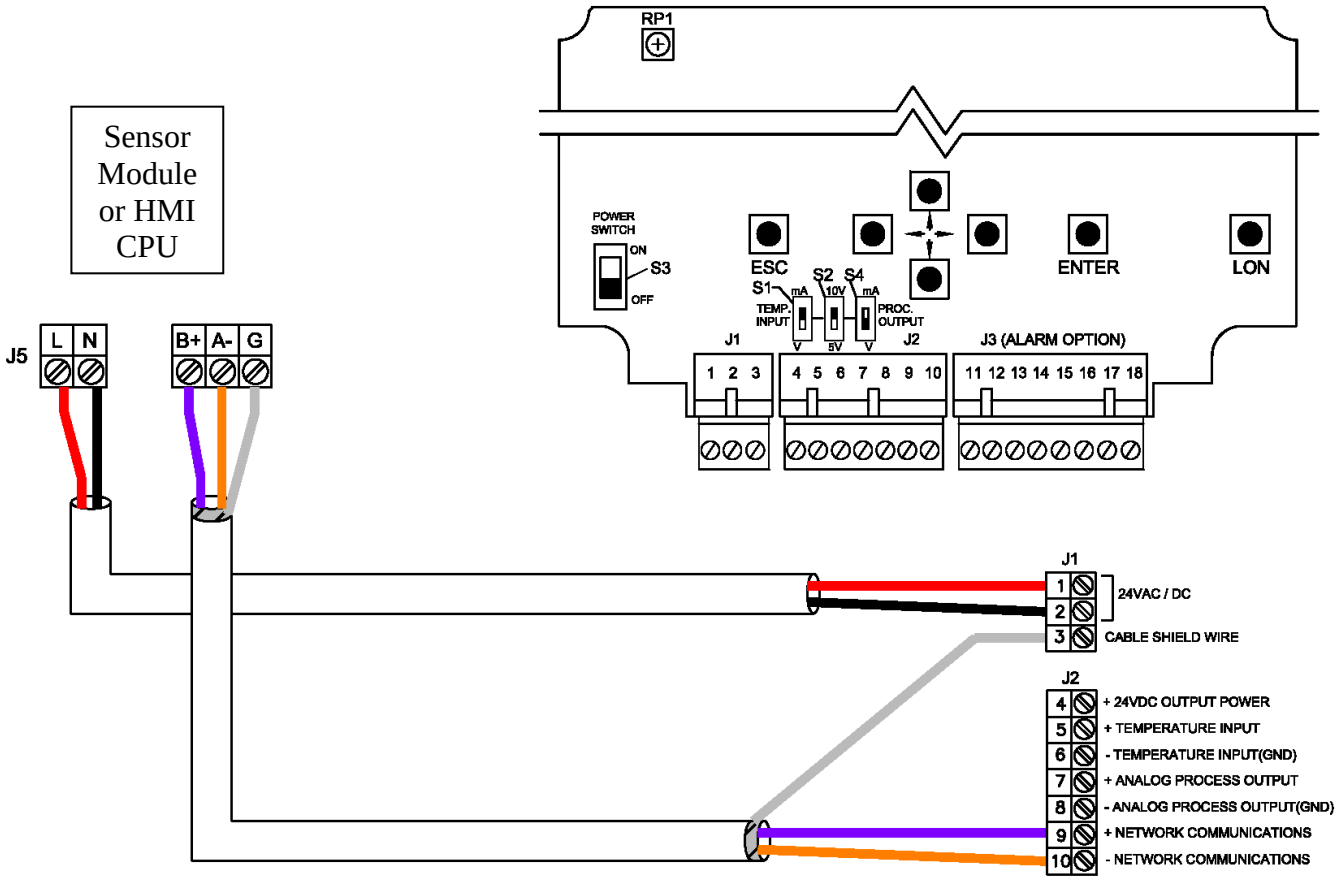
Recommended wire gauge for power is 18-20awg.Sensor module communication wiring must adhere to EIA/TIA-485 standards and be a low capacitance (<30pF per foot) shielded twisted pair with a characteristic impedance of 120Ω such as **Belden 3105A** or comparable. . Wiring the FAATS-1000 CPU to Sensor Modules requires daisy chaining all like-connections together as outlined in the table and image below.

Terminal Block Label	Terminal Block Description	Wiring Description
J5 “L”	Power - 24VAC live connection	Daisy chain all “L” terminals
J5 “N”	Power - 24VAC neutral connection	Daisy chain all “N” terminals
J5 “B+”	Sensor Board communication	Daisy chain all “B+” terminals
J5 “A-”	Sensor Module communication	Daisy chain all “A-” terminals
J5 “G”	Shield or drain wire ground	Daisy chain all cable shields



2.4. Outside Air Module Connection

The Outside Air Module (MicroTrans^{EQ} Signal Processor) is treated like another Sensor Module, meaning the twisted pairs can be daisy chained together to connect devices. Previous board versions with the RJ45 connection the CAT5e patch cables can be plugged into either of the sockets (if available) on the MicroTrans^{EQ} and two MicroTrans^{EQ} signal processors can be connected together by plugging the next MicroTrans^{EQ} into the open socket.



3. CONFIGURATIONS AND PNEUMATIC CONNECTIONS

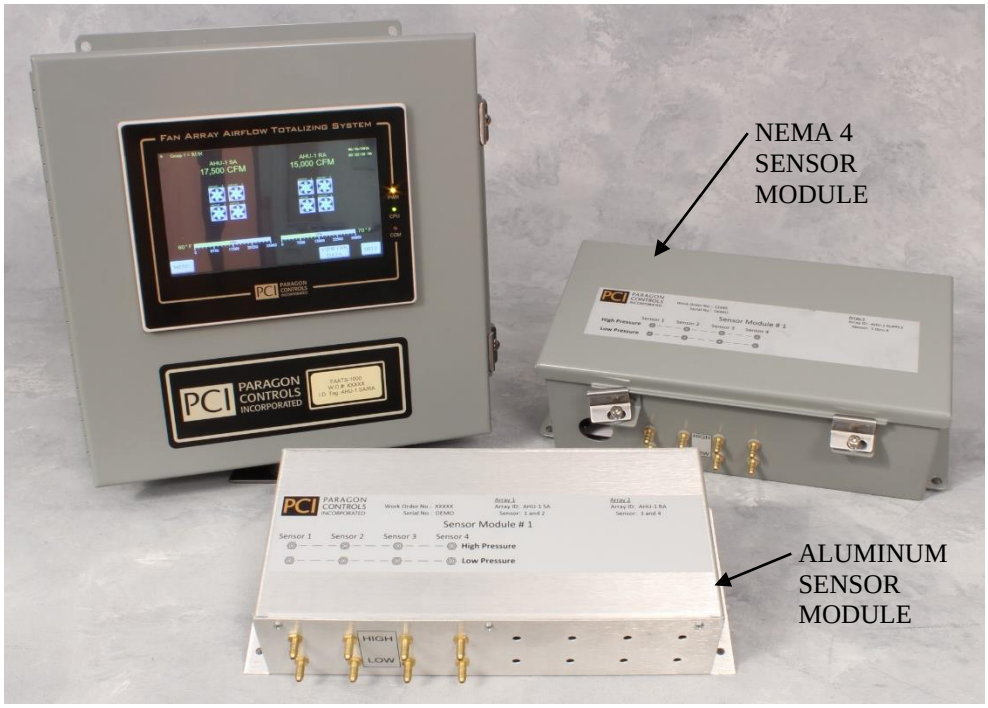
3.1. Typical FAATS-1000 Enclosure Configurations

The FAATS-1000 can monitor and alarm up to 40 fans configured as a single array or a dual array. The Sensor Modules are in groups of 8 sensors per module (Example: a 12-fan system would require 2 Sensor Modules). Viewing the fan array from the air entering side, the plumbing sequence would start from the upper left fan (sensor 1) and continue to the end of the first row. The count sequence would continue on the left side of the second row until all fans are counted.

The FAATS-1000 is customizable to meet the customers' needs. It can be modular with small enclosures being installed in the supply and return plenums reducing the installation of pneumatic tubing runs; it can be consolidated into one enclosure; or any custom layout in between.

3.1.1. Modular Configuration

The FAATS modular configuration consists of a remote HMI mounted in a 12" x 12" x 6" powder-coated steel enclosure and sensor module housed in an aluminum enclosure (standard). NEMA 4 enclosures are optional for both the remote HMI and sensor module.



NEMA 4 Remote HMI Option

3.1.2. Consolidated Configuration

The picture below shows a typical Consolidated Layout for an 8 Fan Dual Array System. A larger fan system would have more sensor modules mounted in a larger enclosure.

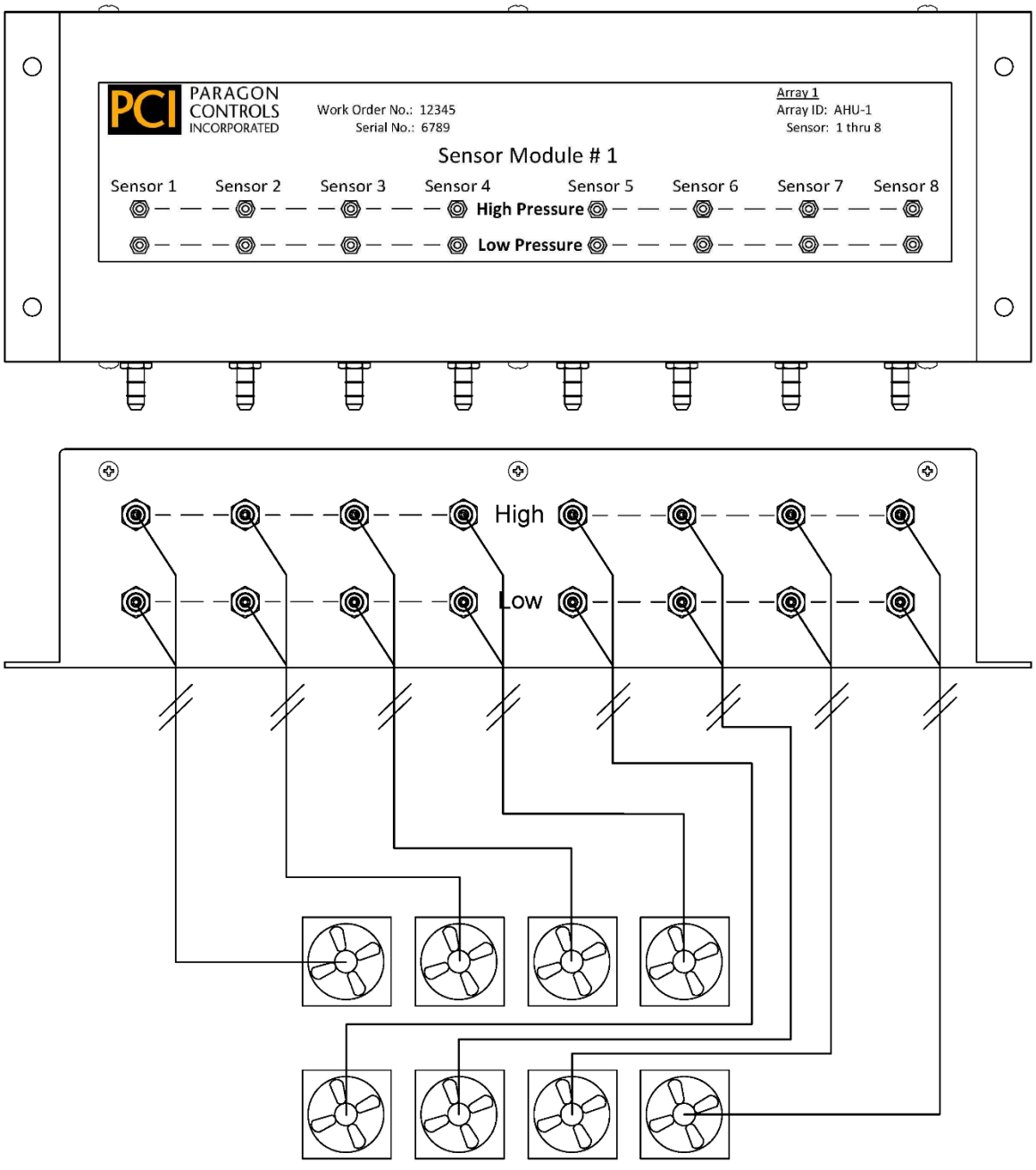
SENSOR 1 (FAN 1)

SENSOR 8 (FAN 8)

3.2. Pneumatic Connections

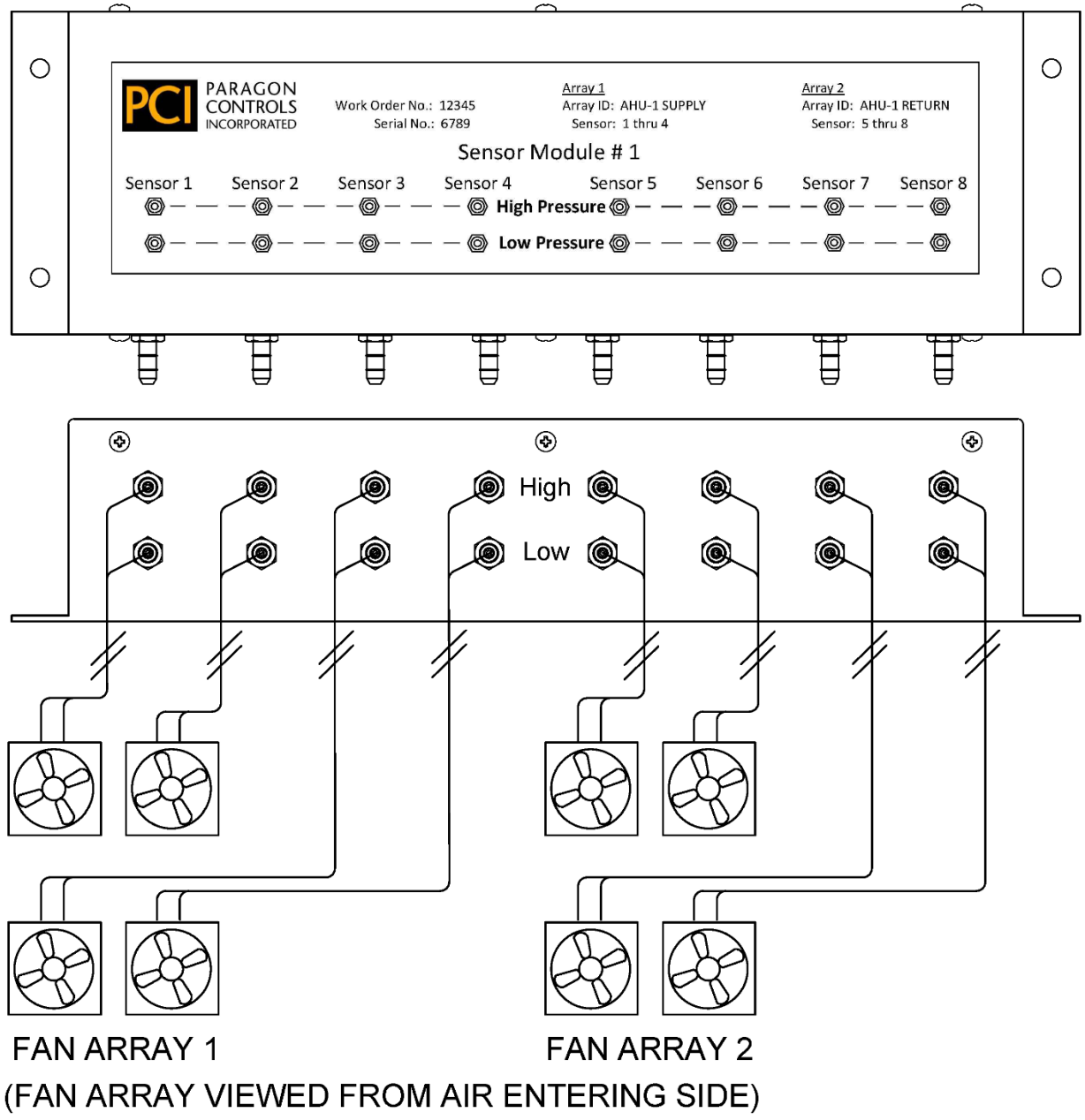
The FAATS-1000 can monitor and alarm up to 40 fans configured as a single array or a dual array. The Sensor Modules are in groups of 8 sensors per module (Example: a 12-fan system would require 2 Sensor Modules). Viewing the fan array from the air entering side, the plumbing sequence would start from the upper left fan (sensor 1) and continue to the end of the first row. The count sequence would continue on the left side of the second row until all fans are counted.

3.2.1. 8 Fan Single Array Pneumatic Connection Layout



(FAN ARRAY VIEWED FROM AIR ENTERING SIDE)

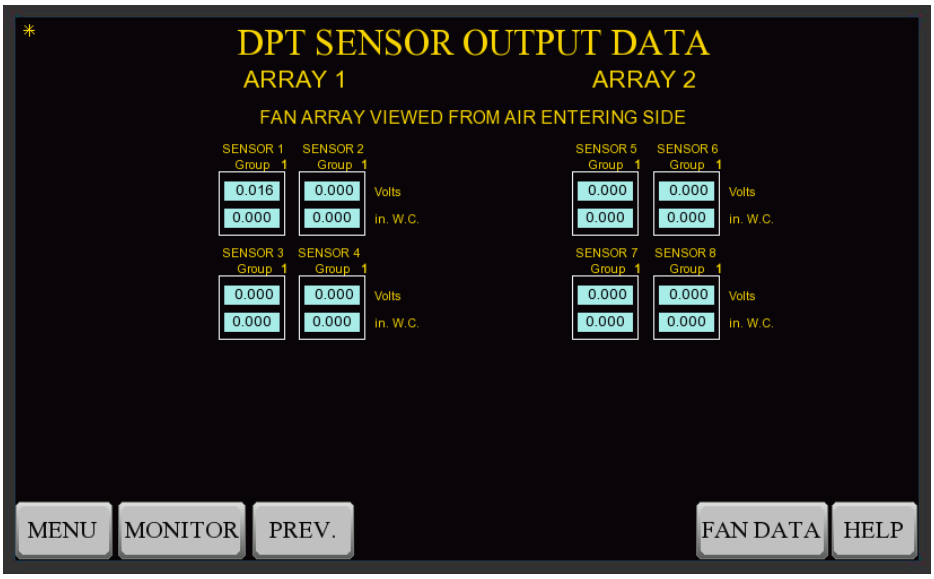
3.2.2. 8 Fan Dual Array Pneumatic Connection Layout



3.2.3. Pneumatic Connection Installation

The screens in the FAATS-1000 are custom configured to resemble the fans as arranged in each array, as viewed from the air entering side. As described above, pneumatic connections must be plumbed from Fan 1 to Sensor 1, and so on. The sensors in the FAATS-1000 are numbered sequentially and are visually displayed on the DPT Sensor Output Data screen as a visual representation of the fan arrays to aid in connection of the tubing.

DPT Sensor Screen



4. POWER UP & MONITOR SCREENS

4.1. Power Up Screen

The following Power up screen will appear for 5 seconds before switching to the Monitor screen.

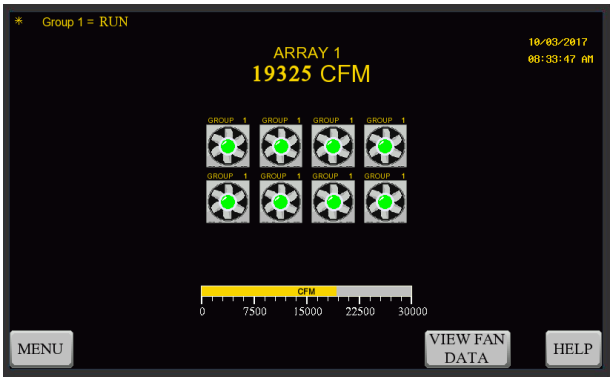
4.2. Monitor & Help Screens

The screens in the FAATS-1000 are custom configured to resemble the fans as arranged in each array, as viewed from the air entering side. The following monitor and menu configurations will vary depending on the options selected at the time of purchase.

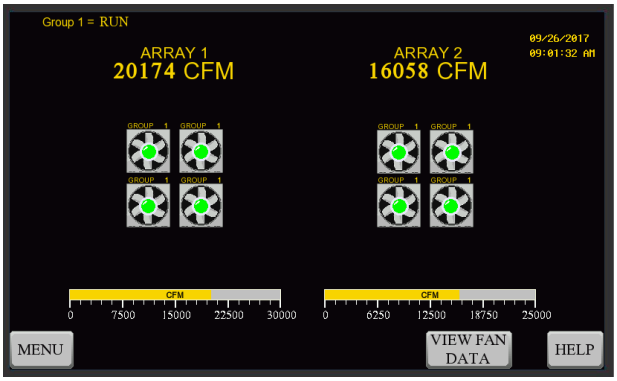
4.2.1. TYPICAL FAATS-1000 CONFIGURATION

The FAATS-1000 can display up to 40 fans configured as a single array or any combination configured as a dual array. Touching the HELP button located in the lower right-hand corner of the screen will display page 1 and 2 help screens describing the information presented on the Monitor screen.

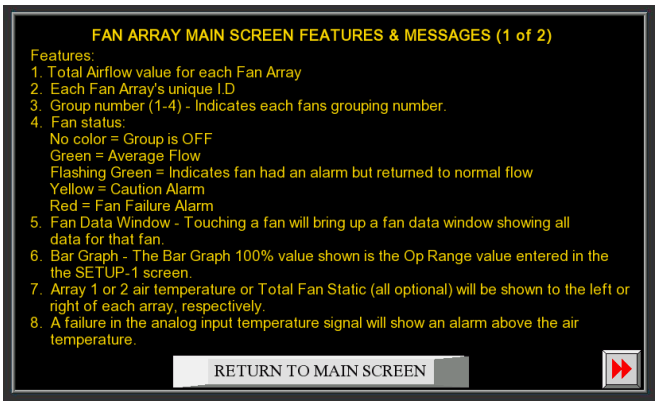
Typical 8 Fan Single Array Monitor Screen



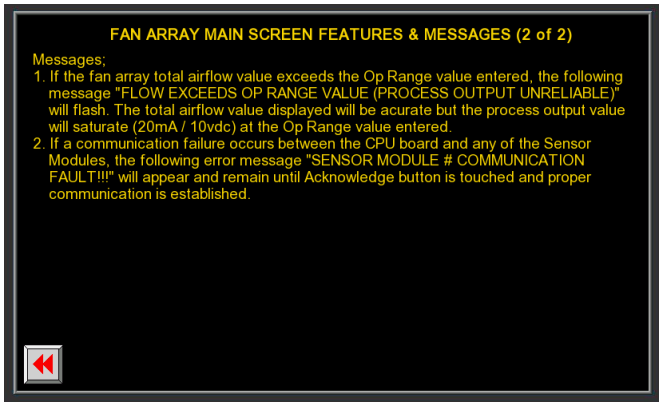
Typical 8 Fan Dual Array Monitor Screen



Page 1 of Monitor Help Screen



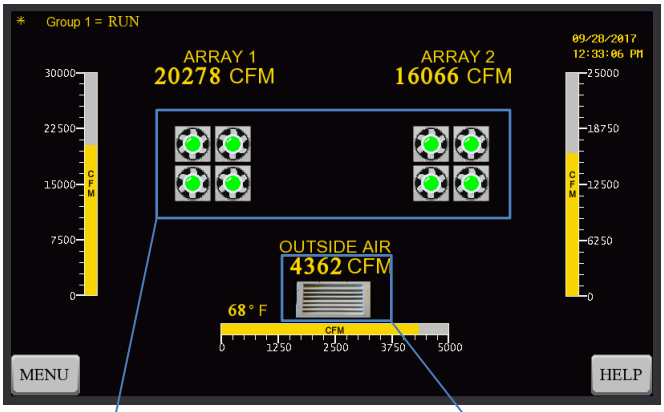
Page 2 of Monitor Help Screen



4.2.2. FAATS-1000 Configuration With Outside Air (Optional)

The following Monitor and Help screens will be available only if the Outside Air (OA) option was configured at the Factory and the FAATS-1000 is connected to the MicroTrans^{EQ} Signal Processor. Refer to Section 6.3. for OA Configuration setup.

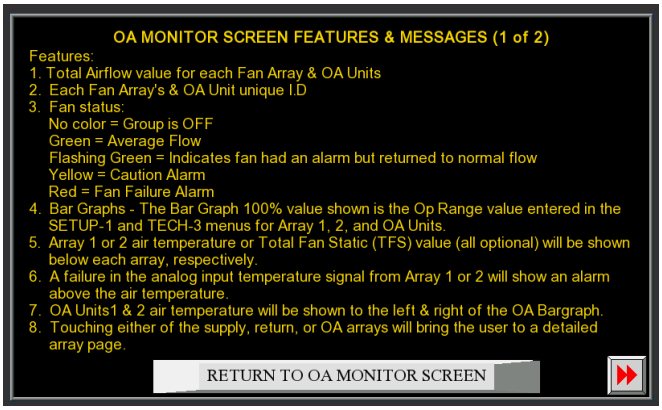
Typical Dual Array OA Monitor Screen



Press inside this area to access the Fan Detail Screen (see Section 9.1)

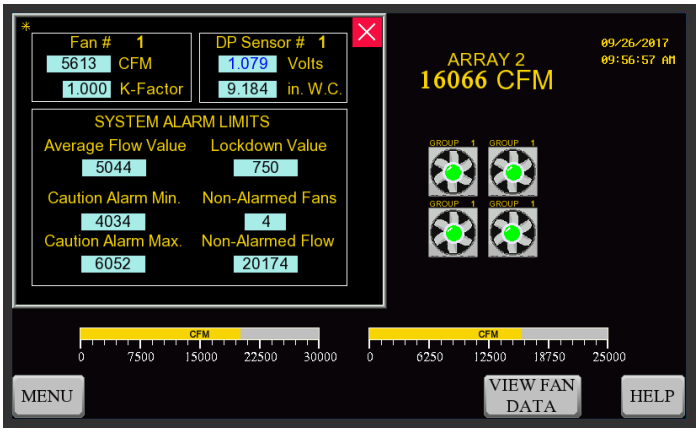
Press inside this area to access the OA Detail Screen (see Section 9.2)

OA Monitor Help Screen



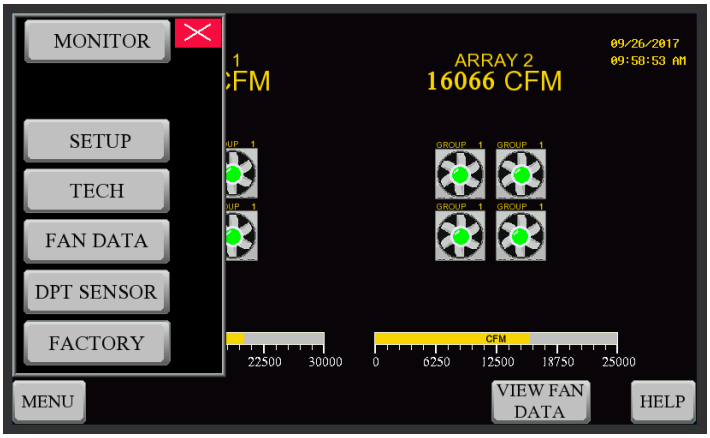
4.3. Individual Fan Data Popup Window

From the Monitor screen (or Fan Detail screen for FAATS OA option) the user can touch any fan in the Fan Array and view the following information associated with that individual fan in a popup window: airflow value, K-factor, sensor voltage, DP value in inch W.C., average airflow value, caution minimum airflow value, caution maximum airflow value, lockdown airflow value, number of non-alarmed fans, and total airflow value of non-alarmed fans.



4.4. Sub Menu Selections

Touching the MENU button located in the lower left-hand corner of the Monitor screen allows the user to view all configuration (Setup & Tech) screens and fan data (Fan Data & DPT Sensor) screens.



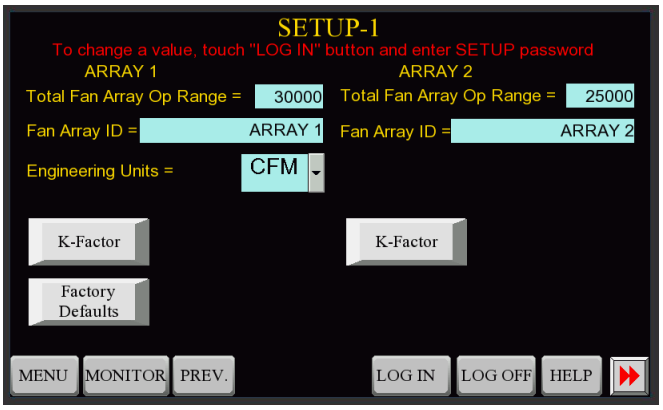
5. SETUP MENUS

The FAATS-1000 has three Setup Menu screens for user input. To change a value in the Setup menus, touch the blue highlighted box, enter the new value, and touch the ENTER button. Log In is required before any value changes can occur (see section 5.1.1).

5.1. SETUP-1 Menu

To access the Setup Menus, touch the MENU button and press Setup as shown in Section 4.4.

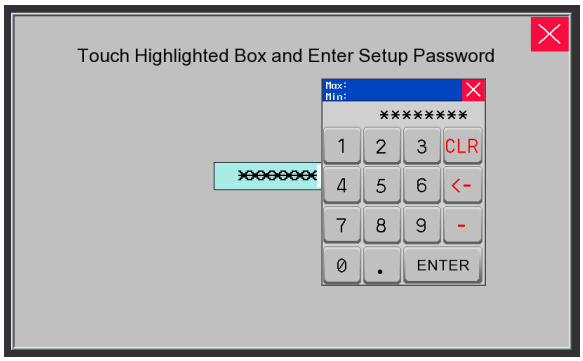
Setup-1 Screen



5.1.1. Setup Menu Log In

Password-protected log in is required before menu items may be changed. Touch the "LOG IN" button in Setup-1 screen, touch the blue highlighted box, enter 1000 for the password, and touch the ENTER button. Touching the APPLY button allows the user to change any value in Setup-1, Setup-2, & Setup-3 screens. The user can Log Off by touching the Log Off button or an internal 1-hour timer after Log In will automatically Log Off.

Enter the Setup Password

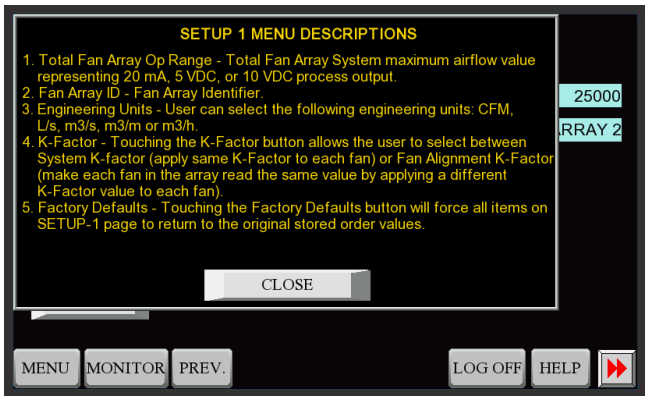


Touch Apply Button

5.1.2. Setup-1 Help Screen

The HELP button shown on Setup-1 Screen, describes the function of each line item shown.

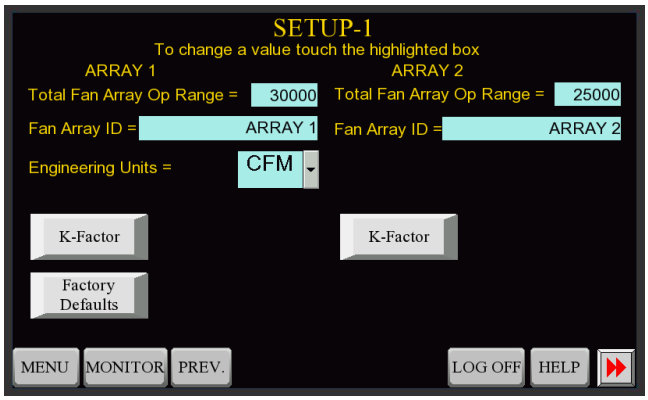
Setup-1 Help Screen



5.1.3. Setup-1 Menu Variables

The following menu variables are available on the Setup-1 screen.

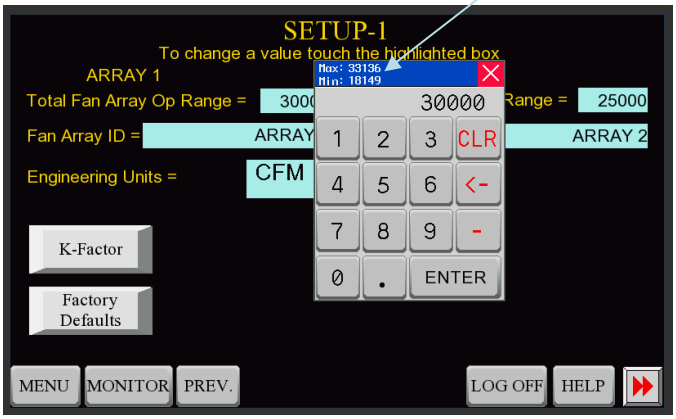
Setup-1 Menu Variables



5.1.3.1. Total Fan Array Operating Range

The Total Fan Array Op Range value is used by the FAATS-1000 to determine the Total Airflow value that represents the full-scale process output signal (5VDC, 10VDC, or 20mA). To change Total Fan Array Op Range value, touch the blue highlighted box on Setup-1 screen, enter the new value, and touch the ENTER button. The allowable Op Range limits are shown in the upper left-hand corner of the numeric keyboard (see screen below) and are limited by the transducer span set at the Factory and the manufacturer's Fan Coefficient.

Minimum and Maximum Op Range limits



The operating range entered in the FAATS-1000 at the factory is based on the following:

- For arrays with 10 or less fans, the array operating range will be based on the following formula to allow for individual fan flow measurement during a fan-failed scenario.

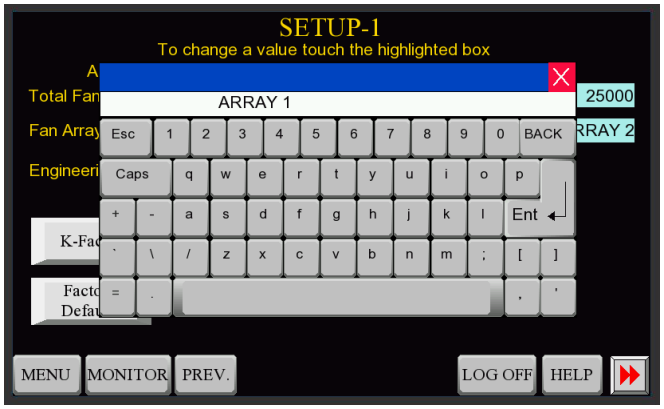
$$Operating\ Range = N \times \frac{Q}{(N-1)}$$

Where:
N = Number of Fans in Array
Q = Array Total Design Maximum Flow Rate

- For arrays with greater than 10 fans, the operating range will be 110% of the array total design maximum flow rate specified.

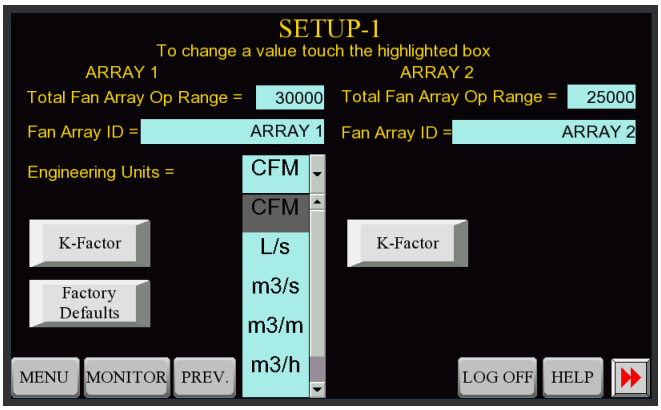
5.1.3.2. Fan Array ID

The Fan Array ID allows the user to enter a unique Fan Array ID for either a single or dual Fan Array. To enter a "New Fan Array ID" touch the blue highlighted box, enter the new ID, and touch the ENTER button. The field is limited to 16 characters.



5.1.3.3. Engineering Units

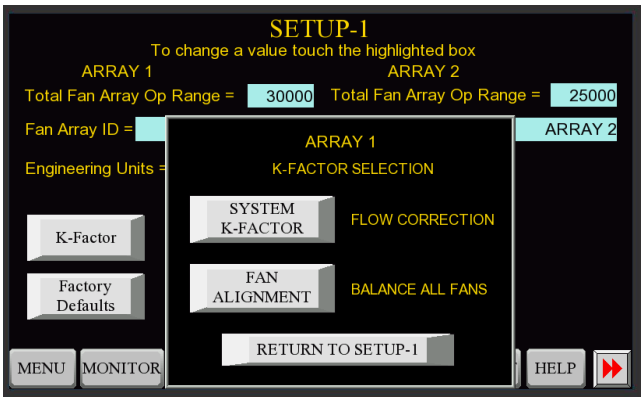
The Engineering Units allows the user to change the engineering units by touching the highlighted box and touching the desired engineering unit. To change the Engineering Units, touch the blue highlighted box and select to new Engineering Unit from the drop-down box.



5.1.4. K-Factor Selection

Two K-Factor Selection menus are available for both Array 1 and Array 2 airflow values: 1) the System K-Factor allows the user to apply a flow correction to the total airflow value in an array, and 2) the Fan Alignment allows the user to make all fans in an array display the same airflow value. If flow correction is required for both arrays, the user will need to select the Array 2 K-Factor Selection and duplicate the steps.

K-Factor Selection



5.1.4.1. System K-Factor

The System K-Factor allows the user to have a System K-Factor calculated by entering a Displayed Value (observed during operation) and a Correct Value (from Balancer or desired value) and touching the Calculate button or the user can enter a System K-Factor value directly. The new System K-Factor value will be applied to the airflow value of each fan in the array.

To calculate a new System K-Factor, perform the following steps:

1. Touch the Displayed Value blue highlighted box.
2. Enter the new value and touch the ENTER button.
3. Touch the Correct Value highlighted box.
4. Enter the new value and touch the ENTER button.
5. Touch the Calculate button.

6. Verify System K-Factor value updates to the new calculated value. Touching the APPLY button will apply the new System K-Factor value to the airflow value of each fan in the array.

To enter a new System K-Factor value, perform the following steps:

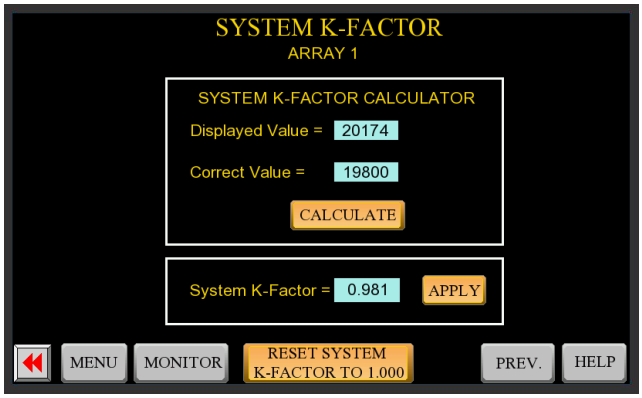
1. Touch the System K-Factor blue highlighted box.
2. Enter the new System K-Factor value and touch the ENTER button.
3. Touching the APPLY button will apply the new System K-Factor value to the airflow value of each fan in the array.

The steps above will need to be performed for both arrays.

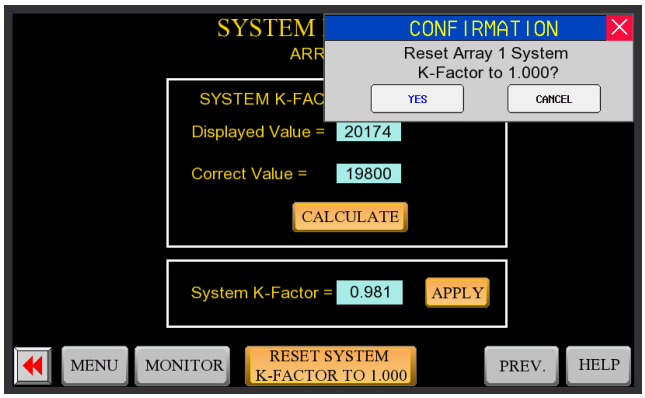
If incorrect values were entered, touching the "RESET SYSTEM K-FACTOR TO 1.000" button will cause a Reset System K-Factor confirmation window to appear. Touching the YES button will reset the current System K-Factor value to 1.000. If an Alignment K-Factor has previously been applied, each fan will return to the Alignment K-Factor.

The System K-Factor can be applied in conjunction with the Fan Alignment K-Factor for airflow correction. The K-Factor value displayed on the Individual Fan Data Popup window (see Section 4.3), Fan Array Data screen (see Section 7), and Fan Alignment screen (Section 5.1.7) is the product of both the System K-Factor and the Alignment K-Factor. Therefore, if both a System K-Factor and Alignment K-Factor are applied then the displayed value will not match what is entered as the System K-Factor.

Calculate or Enter System K-Factor



Confirm System K-Factor Reset to 1.000



5.1.4.2. Fan Alignment

(Note: It is recommended that all fans in the Fan Array be running at approximately the normal operating flow rate to perform this operation. A Fan Alignment cannot be performed if any fan in the array is in an alarm condition.)

If any fan or fans are in alarm condition when the process is started, an error message "**All Fans must be in normal operating condition to perform the Fan Alignment K-Factor procedure**" will appear.

The Fan Alignment K-Factor allows the user to make each fan in the array display the same airflow value; the Total Airflow value for the array will not change. Touching the "START ALIGNMENT" button causes the FAATS-1000 to perform the follows steps:

1. Stores the current Total Fan Array Airflow value.

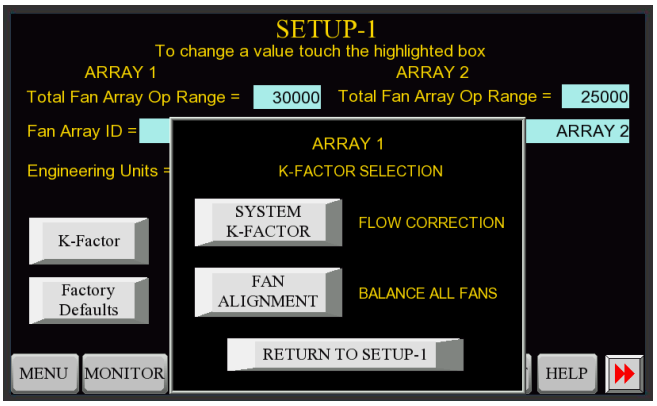
2. Calculate the average airflow value by dividing the stored Total Fan Array Airflow value by the number of fans in the array.
3. Make a correction to each fans K-Factor value to match the calculated average airflow value.

The steps above will need to be performed for both arrays.

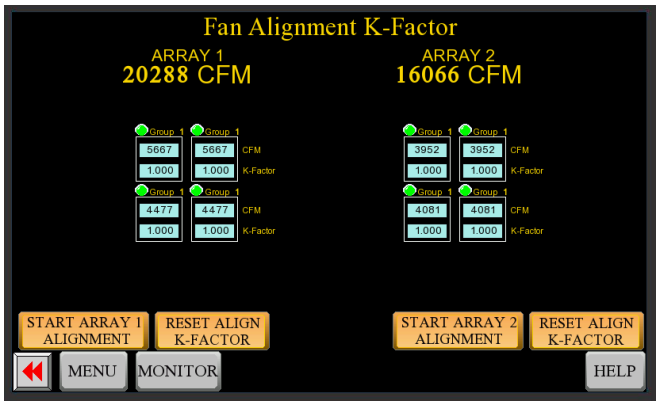
If the "Start Array Alignment" button is Grayed out then there already is an alignment K-Factor in place. The user can reset the Alignment K-Factors to 1.000 by touching the "RESET ALIGNT K-FACTOR" button. If a System K-Factor was previously applied, each fan will return to the System K-Factor value.

The Fan Alignment K-Factor can be applied in conjunction with the System K-Factor for balancing all fans in the array. The K-Factor value displayed on the Individual Fan Data Popup window (see Section 4.3), Fan Array Data screen (see Section 7), and Fan Alignment screen (see Section 5.1.7) is the product of both the System K-Factor and the Alignment K-Factor. Therefore, if both a System K-Factor and Alignment K-Factor are applied then the displayed value will not match what was entered as the System K-Factor.

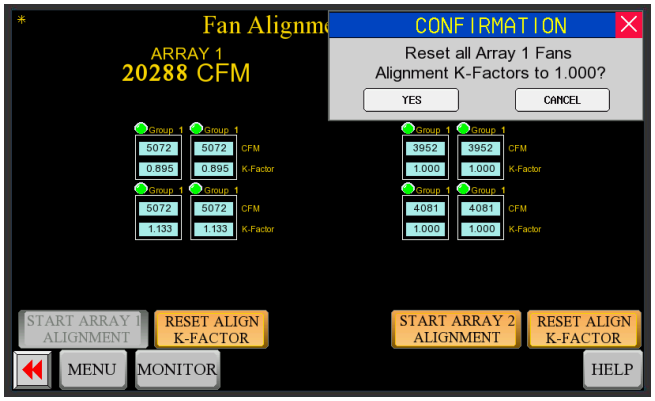
K-Factor Selection



Touch the "START ARRAY ALIGNMENT" button



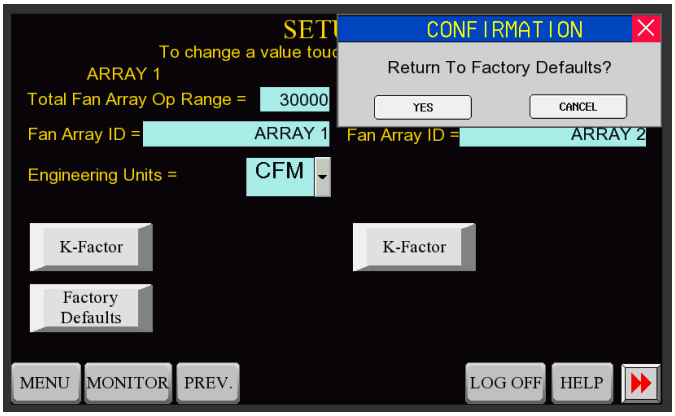
Confirm Alignment K-Factor Reset to 1.000



5.1.5. Setup-1 Factory Defaults

The Factory Defaults button shown in Setup-1 screen allows the user to return all values shown in Setup-1 screen to the values entered at the Factory. The user must touch the YES button in the confirmation popup window before values will be changed. Only the values displayed on the specific screen will be reset to the Factory values.

Setup-1 Factory Default



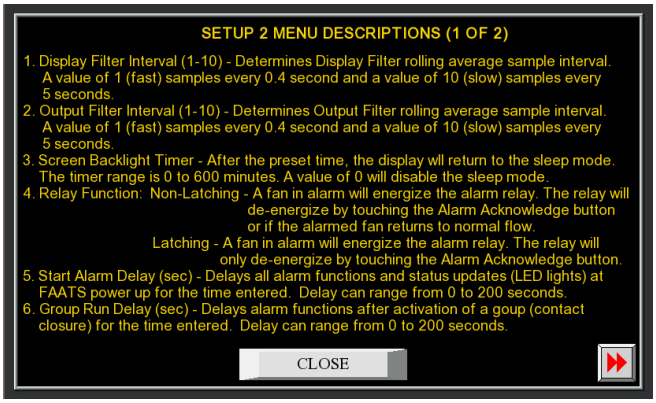
5.2. SETUP-2 Menu

To access the Setup-2 screen, press the red double arrow button on the bottom right of the Setup-1 screen.

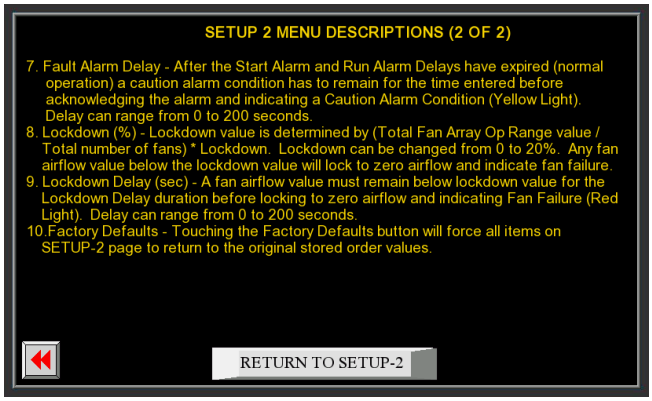
5.2.1. Setup-2 Help Screens

The HELP button shown on Setup-2 Screen, describes the function of each line item shown.

Setup-2 Help Page 1 Screen



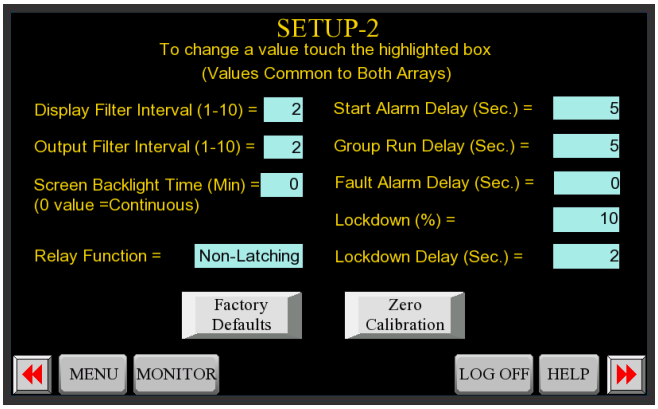
Setup-2 Help Page 2



5.2.2. Setup-2 Menu Variables

The following menu variables are available on the Setup-2 screen and are common to both arrays.

Setup-2 Menu Variables



5.2.2.1. Display and Output Filter Interval

The Filter Interval menus allow the user to independently vary the filter sample rate for the displayed flow value and the process output (0-5 VDC, 0-10VDC, or 4-20mA) rolling average calculation. The filter interval is used in conjunction with the filter count entered in the Filter Count (see Section 6.2.1.2) to determine the rolling average. An interval setting of 1 (Fastest Filter), samples every 0.4 seconds and a setting of 10 (Slowest Filter), samples every 5 seconds. To change either Filter value, touch the blue highlighted box on Setup-2 Screen, enter the new value, and touch the ENTER button. The table below shows the sample interval corresponding to the setting number.

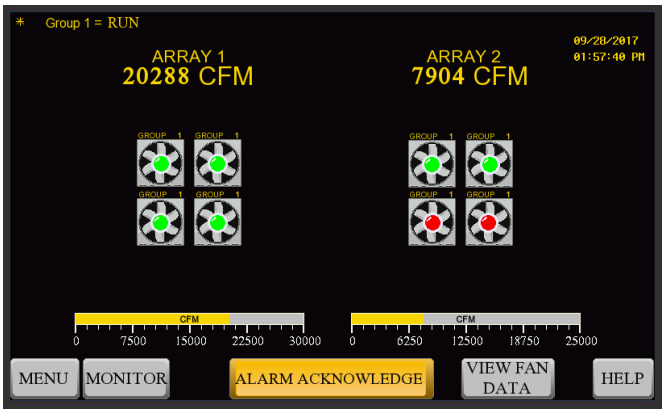
Setting Number	Sample Interval (Seconds)
1	0.4
2	0.5
3	0.6
4	0.7
5	0.8
6	0.9
7	1.0
8	2.0
9	3.0
10	5.0

5.2.2.2. Screen Backlight Time

The Screen Backlight Timer allows the user to set when the display backlight will turn off by entering a value of 1 to 600 minutes. A value of 0 will keep the backlight on. To change the value, touch the blue highlighted box on Setup-2 screen, enter the new value, and touch the ENTER button.

5.2.2.3. Relay Function

The Alarm Relay Function allows the user to select between Latching and Non-Latching remote alarm relay function. If Non-Latching is selected, the energized alarmed relay will de-energize as soon as the failed fans have been acknowledged by pressing the ALARM ACKNOWLEDGE button shown in the below image. If Latching is selected, the energized alarm relay will not de-energize until the user acknowledges the failed fan(s) AND the fan(s) returns to normal operation (green). Touching the blue highlighted box on Setup-2 screen will toggle the relay function from Latching to Non-Latching.



5.2.2.4. Start Alarm Delay

The Start Alarm Delay allows the user to delay the alarm functions and status updates (see Section 10.1) at FAATS power up for the time entered to allow the FAATS-1000 to warm up and begin taking samples for its calculations. Delay value can range from 0 to 200 seconds. To change the value, touch the blue highlighted box on Setup-2 screen, enter the new value, and touch the ENTER button.

5.2.2.5. Group Run Delay

The Group Run Delay allows the user to delay the alarm functions when a fan group transitions from OFF mode (open contacts on J2) to a RUN mode (closed contacts on J2) to allow the fan system to ramp up. Delay value can range from 0 to 200 seconds. To change the value, touch the blue highlighted box on Setup-2 Screen, enter the new value, and touch the ENTER button.

5.2.2.6. Fault Alarm Delay

The Fault Alarm Delay allows the user to delay the alarm functions while the system is running to account for system dynamics. The Fault Alarm Delay timer is activated after the Start Alarm and Group Run Delay values have expired (normal operation). The alarm condition must remain for the duration of the Fault Alarm Delay value before the FAATS-1000 will acknowledge the Caution Alarm (Yellow Light). Delay value can range from 0 to 200 seconds. To change the value, touch the blue highlighted box on Setup-2 Screen, enter the new value, and touch the ENTER button.

5.2.2.7. Lockdown

The Lockdown allows the user to enter a value from 0 to 20% of each fan's capacity. Any individual fan airflow below the Lockdown value for the duration of the Lockdown Delay setting will lock to zero airflow and indicate Fan Failure (Red Light). The Lockdown airflow value is determined by (Total Fan Array Op Range value / total number of fans) * Lockdown value. To change the value, touch the blue highlighted box in Setup-2 Screen, enter the new value, and touch the ENTER button.

5.2.2.8. Lockdown Delay

The Lockdown Delay allows the user to enter a lockdown delay to account for system dynamics. An individual fan's airflow value must remain below the Lockdown value for the duration of Lockdown Delay before locking to zero airflow and indicating a Fan Failure (Red Light). Delay value can range from 0 to 200 seconds. To change the value, touch the blue highlighted box in Setup-2 Screen, enter the new value, and touch the ENTER button.

5.2.3. Zero Calibration

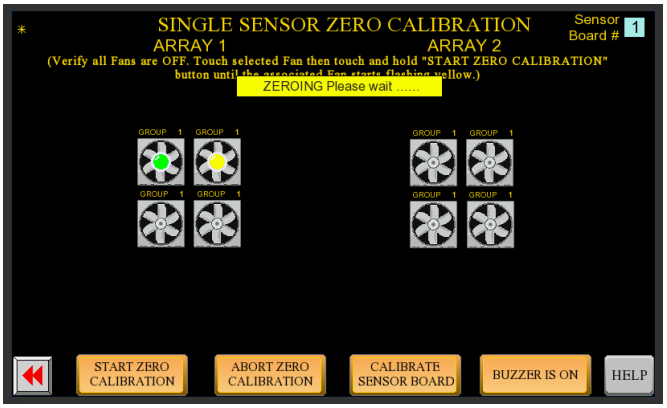
(Note: Verify ALL fans are OFF before performing a zero calibration)
The Zero Calibration button on Setup-2 Screen allows the user to zero an individual fan or zero all fans on a sensor board as described below.

5.2.3.1. Zero Calibration - Individual Fan

To perform a zero calibration, touch the Zero Calibration button. Perform the following steps:

1. Touch the fan to be zeroed.
2. The associated fan will flash green
3. Touch the "START ZERO CALIBRATION" button.
4. The associated fan will flash yellow.
5. Once completed, "ZERO CALIBRATION COMPLETE" will appear in green and the fan will change to solid green. If measured sensor voltage is beyond PCI limits, the following error message will appear "CALIBRATION NOT ACCEPTED, SENSOR SIGNAL OUT OF LIMIT. VERIFY ZERO PRESSURE, TOUCH FAILED FAN AND TRY AGAIN".

Touch Fan to Zero



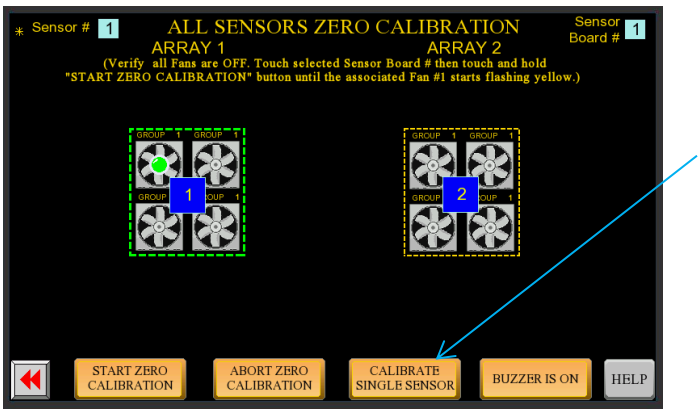
5.2.3.2. Zero Calibration - All Fans on a Single Sensor Board

To perform a zero calibration on all fans on a single sensor board, perform the following steps:

1. Touch the Calibrate Sensor Board button in the bottom middle of the Single Sensor Zero Calibration Screen. Yellow dashed-line boxes will appear around the fan icons indicating fans located on the sensor board number shown in the blue box.
2. Touch the sensor board number to be zeroed.
3. The associated boundary around the fans will turn green and the first fan in the array will flash green.
4. Touch the "START ZERO CALIBRATION" button.
5. The first fan will flash yellow during calibration and will change to solid green when calibration is complete. The next fan in series will flash yellow showing it is calibrating, and continue until all fans on the sensor board are calibrated.
6. Once all fans are completed, "ZERO CALIBRATION COMPLETE" will appear in green and all fans will be solid green. If measured sensor voltage is beyond PCI limits, the following error message will appear "CALIBRATION NOT ACCEPTED, SENSOR SIGNAL OUT OF LIMIT. VERIFY ZERO PRESSURE, TOUCH FAILED FAN AND TRY AGAIN".

7. If multiple sensor boards are present follow the sequence above; the calibrated fans will remain solid green as the other fans are being calibrated.

Zero Calibration Selection

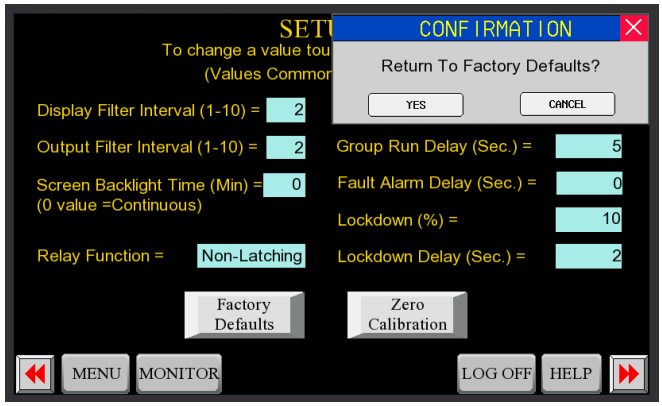


Touch Calibrate Single Sensor button to return to the individual sensor zero calibration

5.2.4. Setup-2 Factory Defaults

The Factory Defaults button shown in Setup-2 screen allows the user to return all values shown in Setup-2 screen to the values entered at the Factory. The user must touch the YES button in the confirmation popup window before values will be changed. Only the values displayed on the specific screen will be reset to the Factory values.

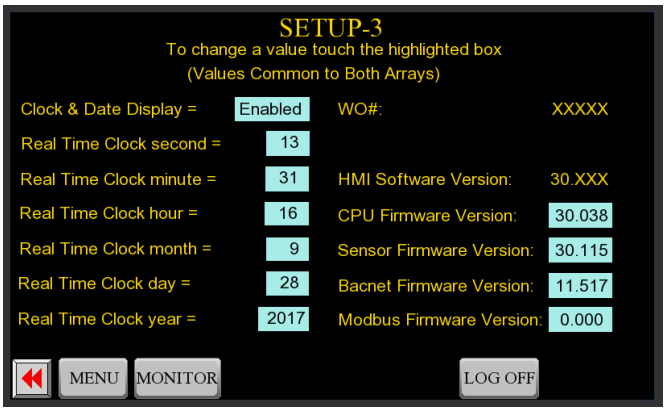
Setup-2 Factory Default



5.3. SETUP-3 Menu

To access the Setup-3 screen, press the red double arrow button on the bottom right of the Setup-2 screen.

Setup-3 Screen Variables



5.3.1. Clock & Date Display

The Clock & Date allows the user to disable or enable the Clock & Date display located on the upper right-hand corner of the Monitor screen. Touching the blue highlighted box on Setup-3 Screen will toggle between Enabled and Disabled.

5.3.2. Clock & Date Data

The Clock & Date information screen allows the user to enter seconds, minutes, hours, month, day and year. To make a change, touch the appropriate blue highlighted box on Setup-3 Screen, enter the new value, and touch the ENTER button.

5.3.3. WO# and Software Version

The job-specific Work Order number and software/firmware versions can be found on Septup-3 Screen for troubleshooting with the Factory.

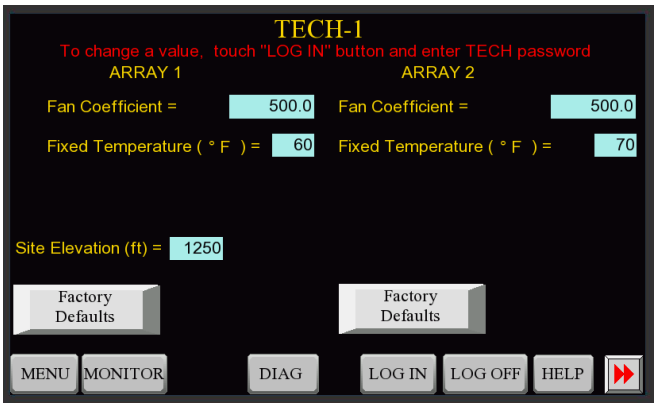
6. TECH MENUS

The FAATS-1000 has three Tech Menu screens for user input. To change a value in the Tech menus, touch the blue highlighted box, enter the new value, and touch the ENTER button. Log In is required before any value changes can occur (see Section 6.1.1).

6.1. TECH-1 Menu

To access the Tech Menus, touch the MENU button and press Tech as shown in Section 4.4.

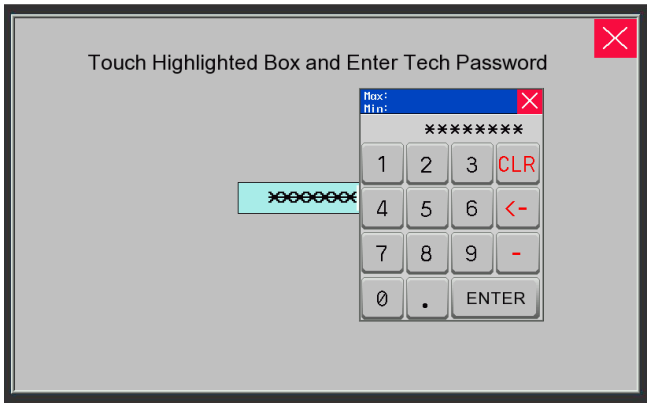
Tech-1 Screen



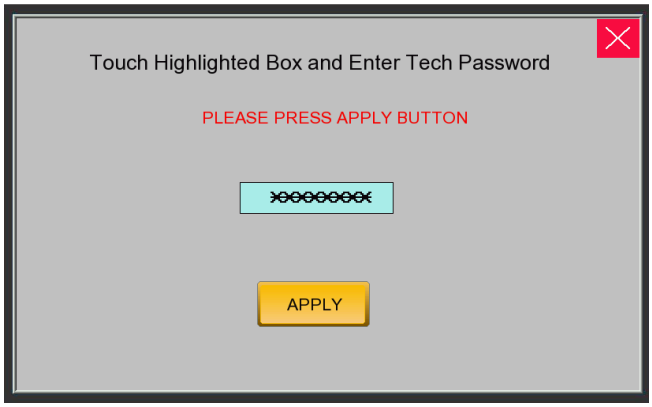
6.1.1. Tech Menu Log In

Password-protected log in is required before menu items may be changed. Touch the "LOG IN" button on Tech-1 screen, touch the blue highlighted box, enter 2000 for the password and touch the ENTER button. Touching the APPLY button allows the user to change any value in Tech-1, Tech-2, and Tech-3 screens. The user can Log Off by touching the Log Off button or an internal 1-hour timer after Log In will automatically Log Off.

Enter the Tech Password



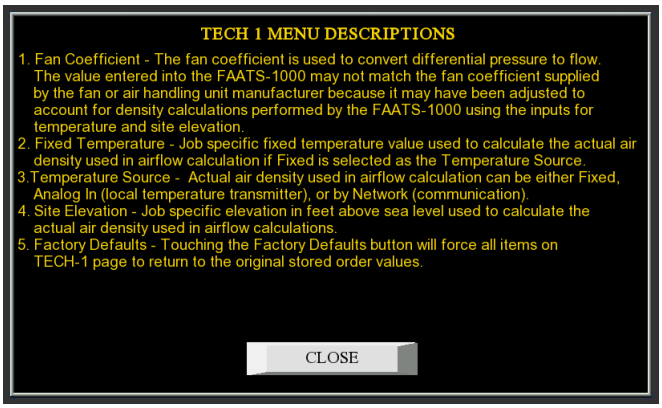
Touch Apply Button



6.1.2. Tech-1 Help screen

The HELP button located on Tech-1 screen describes the functions of the Menu Variables shown on the Tech-1 screen.

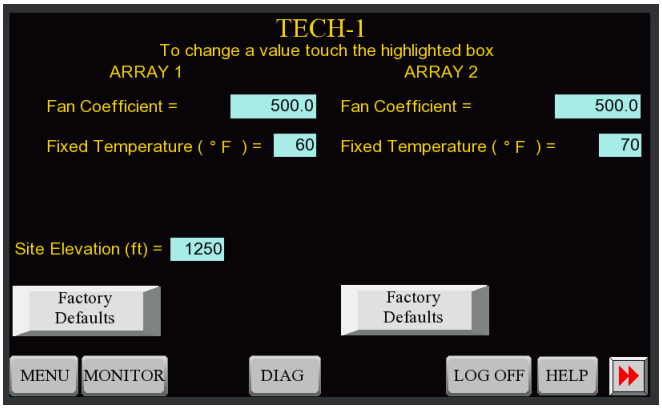
Tech-1 Help Screen



6.1.3. Tech-1 Menu Variables

The following menu variables are available on the Tech-1 screen.

Tech-1 Menu Variables



6.1.3.1. Fan Coefficient

The Fan Coefficient (Piezometer Ring Coefficient) is used to convert differential pressure to flow. The Fan Coefficient variable allows the user to enter the specific fan manufacturer's airflow Fan Coefficient value. To change the value, touch the highlighted box, enter the new value and touch the ENTER button.

The fan coefficient should be obtained from the fan or air handling unit manufacturer for the specific fan model and size. However, the value entered into the FAATS-1000 may not match the fan coefficient supplied by the fan or air handling unit manufacturer because it may have been adjusted to account for density calculations performed by the FAATS-1000 using the inputs for temperature and site elevation. The coefficient entered into the FAATS-1000 is based on the following equation:

$$Q = C_{PR} \times \sqrt{\frac{\Delta P}{\rho_a}}$$

Where:

Q = Flow (acfm)
C_{PR} = Fan Coefficient (Piezometer Ring Coefficient)
ΔP = Differential Pressure Measured by the Piezometer Ring (in. w.c.)
ρ_a = Actual Density of Air (lb/ft^3)

Since ρ_a is known for a given job site, some fan and air handling unit manufacturers will include this value (or the value for standard air density 0.075 lbm/ft^3) in the factor F, simplifying the above equation to:

$$Q = F \times \sqrt{\Delta P}$$

Where:

$$F = \frac{C_{PR}}{\sqrt{\rho_e}}$$

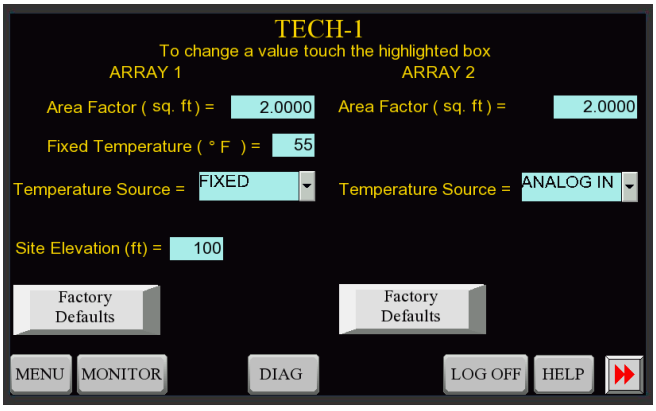
ρ_e = ρ_a or 0.075 (standard density) depending on the fan or air handling unit manufacturer equation for converting differential pressure to flow.

If a coefficient or F value has been supplied by the fan or air handling unit manufacturer that includes density, this value will need to be modified before entering the coefficient into the FAATS-1000 as shown below.

$$C_{PR} = F \times \sqrt{\rho_e}$$

6.1.3.2. Area Factor (Optional)

If the FAATS-1000 was configured at the factory to perform flow calculations using flow element (PCI part number FE-1050) probe calculations instead of the piezometer ring calculations, a user input for Area Factor will be shown instead of Fan Coefficient. The area of the measuring plane where the flow elements are installed in the fan inlet is used to calculate airflow. To change the value, touch the highlighted box, enter the new value in square feet and touch the ENTER button.



6.1.3.3. Fixed Temperature

The Fixed Temperature allows the user to enter the single point temperature value of the airflow being measured. The FAATS-1000 will use the Fixed Temperature value to calculate air density for airflow calculations if Fixed is selected in the Temperature Source (see Section 6.1.3.4). To change the value, touch the highlighted box, enter the new value and touch the ENTER button.

6.1.3.4. Temperature Source

Air density used in airflow calculation can be either Fixed, Analog In (local temperature transmitter), or by Network (communication). If Analog In is selected, a local temperature transmitter must be connected to the Sensor Module temperature input terminals. If the temperature source is by network communication, then the building management system must provide a temperature value to the FAATS-1000. To change the source selection, touch the drop-down arrow and select the desired source.

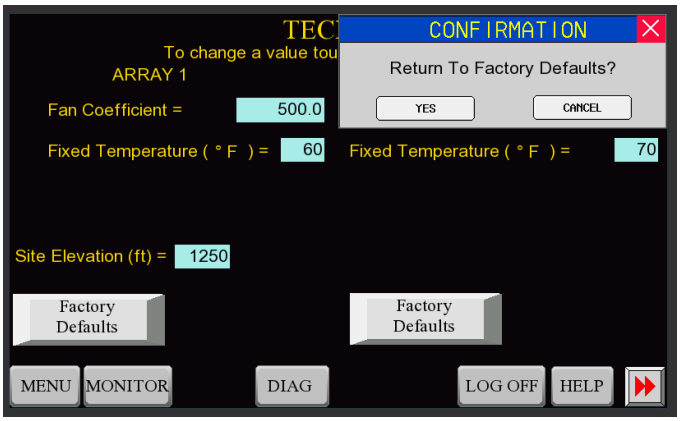
6.1.3.5. Site Elevation

The Site Elevation allows the user to enter a job specific elevation in feet above sea level required to calculate the actual air density used in airflow calculations. To change the value, touch the highlighted box, enter the new value and touch the ENTER button.

6.1.4. Tech-1 Factory Defaults

The Factory Defaults button shown in Tech-1 screen allows the user to return all values shown in Tech-1 screen to the values entered at the Factory. The user must touch the YES button in the confirmation popup windows before values will be changed. Only the values displayed on the specific screen will be reset to the Factory values.

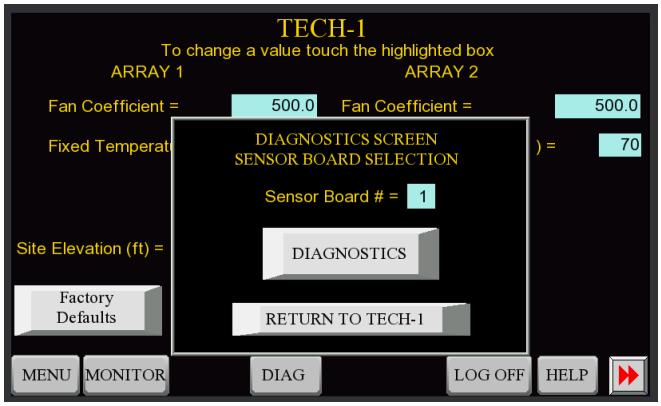
Tech-1 factory Default



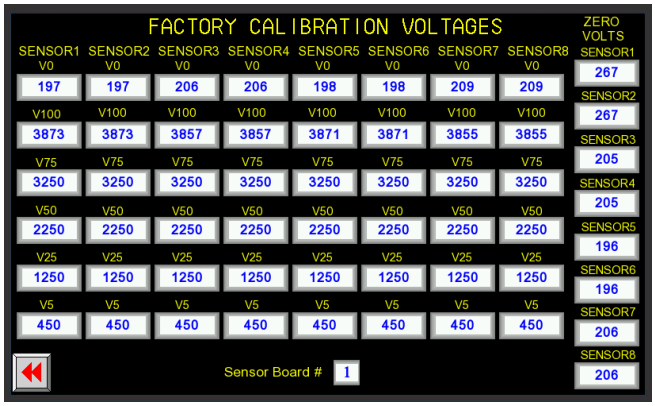
6.1.5. Diagnostics

If necessary, and to assist the Factory in troubleshooting potential fan sensor problems, Factory Calibration Voltages can be displayed by pressing the DIAG button on the bottom middle of the Tech-1 screen. Enter the sensor board number in the blue highlighted box and press the Diagnostics button to view the factory calibration voltages.

Enter Sensor Board # to be Diagnosed



Factory Calibration Voltages



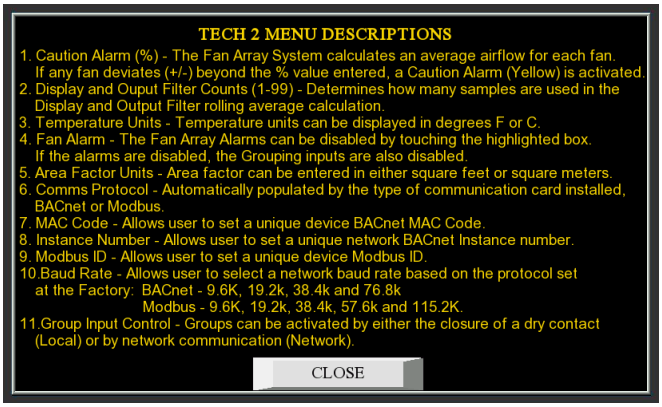
6.2. TECH-2 Menu

To access the Tech-2 screen, press the red double arrow button on the bottom right of the Tech-1 screen. The Menu Variables on the Tech-2 screen are common to both arrays.

6.2.1. Tech-2 Help Screen

The HELP button located in the bottom right corner of the Tech-2 screen describes the functions of the Menu Variables shown on the Tech-2 screen.

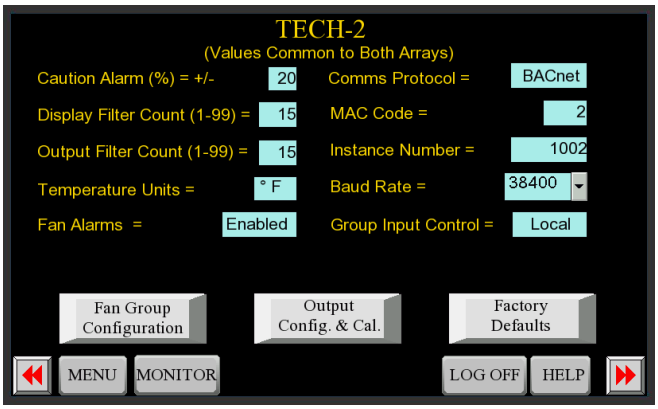
Tech-2 Help Screen



6.2.2. Tech-2 Menu Variables

The following menu variables are available on the Tech-2 screen.

Tech-2 Menu Variables



6.2.2.1. Caution Alarm

The Caution Alarm allows the user to change the Caution Alarm (Yellow Lights) value from 0 to ±50% of the average airflow value of the fans in the array. If any fan deviates ± beyond the % value entered for the duration of the Fault Alarm Delay setting, a Caution Alarm is activated. To change the value, touch the highlighted box, enter the new value and touch the ENTER button.

6.2.2.2. Display and Output Filter Count

The Display and Output Filter Count menus allow the user to enter how many samples from 1 to 99 are used in the Display and Output Filter rolling average calculation. This count is used in conjunction with the sample interval entered in the Filter Interval (see Section 5.2.3) to determine the rolling average. To change the value, touch the highlighted box, enter the new value and touch the ENTER button.

6.2.2.3. Temperature Units

The Temperature Units allows the user to enter the Temperature value in °F or °C. Touching the highlighted box will toggle between °F and °C.

6.2.2.4. Fan Alarms

The Fan Alarms allows the user to Enable or Disable all Fan Array (Caution and Failure) alarms. All fans will indicate normal operating conditions (Green Lights) when the Fan Alarms is disabled even if in Caution or Failed condition. If the Fan Array Alarms are disabled, the Alarm Relays are also disabled. Touching the highlighted box will toggle between Enabled and Disabled.

6.2.2.5. MAC Code (BACnet Only)

The MAC Code allows the user to set a unique device address when connecting to a BACnet network. The MAC Code identifies each device on a branch of the network and can range from 1 to 127. The MAC Code must be unique within a particular branch of a network however, MAC Codes can repeat if on another branch of the network. To change the MAC Code, touch the highlighted box, enter the new value and touch the ENTER button. IN ORDER FOR NEW VALUE TO BE UPDATED, POWER MUST BE CYCLED BY TURNING POWER SWITCH SHOWN ON PAGE 3 OFF AND ON.

6.2.2.6. Modbus ID (Modbus Only)

The Modbus ID allows the user to set a unique device address when connecting to a Modbus network. The Modbus ID identifies each device on a branch of the network and can range from 1 to 254. To change the Modbus ID, touch the highlighted box, enter the new value and touch the ENTER button. IN ORDER FOR NEW VALUE TO BE UPDATED, POWER MUST BE CYCLED BY TURNING POWER SWITCH SHOWN ON PAGE 3 OFF AND ON.

6.2.2.7. Instance Number (BACnet Only)

The Instance Number allows the user to set a unique device network address when connecting to a BACnet network. The Instance Number can range from a value of 1,002 to 4,194,302 and cannot repeat within any part of a network. Touch the highlighted box, enter the new Instance Number and touch the ENTER button. IN ORDER FOR NEW VALUE TO BE UPDATED, POWER MUST BE CYCLED BY TURNING POWER SWITCH SHOWN ON PAGE 3 OFF AND ON.

6.2.2.8. Baud Rate

The Baud Rate allows the user to select a network baud rate of 9,600; 19,200; 38,400; and 76,800 bps for BACnet and a network baud rate of 9,600; 19,200; 38,400; 57,600; and 115,200 bps for Modbus. The default Baud Rate is 38,400 bps. To change the Baud Rate, touch the highlighted box and select the new Baud Rate. IN ORDER FOR NEW VALUE TO BE UPDATED, POWER MUST BE CYCLED BY TURNING POWER SWITCH SHOWN ON PAGE 3 OFF AND ON.

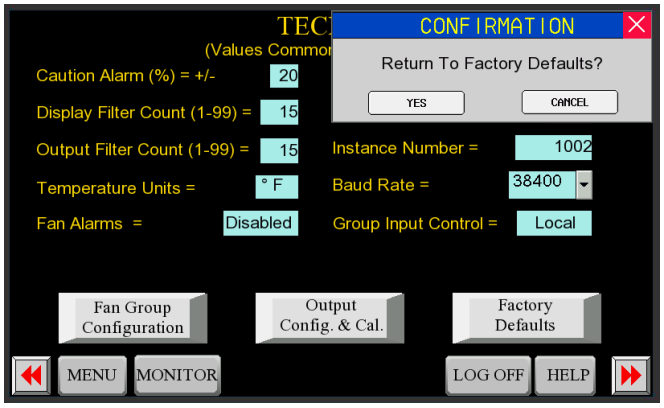
6.2.2.9. Group Input Control

The Group Input Control allows the user to select how the Fan Groups are activated. Groups can be activated by either the closure of dry contacts at J2 (see Sections 2.1 and 2.2) considered local control (Local) or by network communication (Network). To change the Group Input Control, touch the highlighted box to toggle between Local or Network. If Network is selected, the dry contacts at J2 are inactive.

6.2.3. Tech-2 Factory Defaults

The Factory Defaults button shown in Tech-2 screen allows the user to return all values shown in Tech-2 screen to the values entered at the Factory. The user must touch the YES button in the confirmation popup windows before values will be changed. Only the values displayed on the specific screen will be reset to the Factory values.

Tech-2 Factory Default

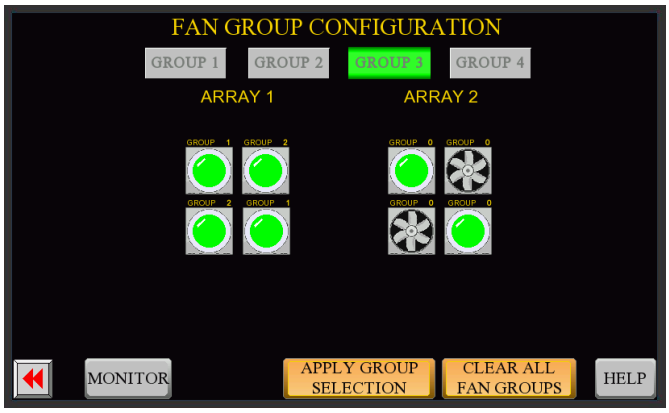


6.2.4. Fan Group Configuration & Help Screens

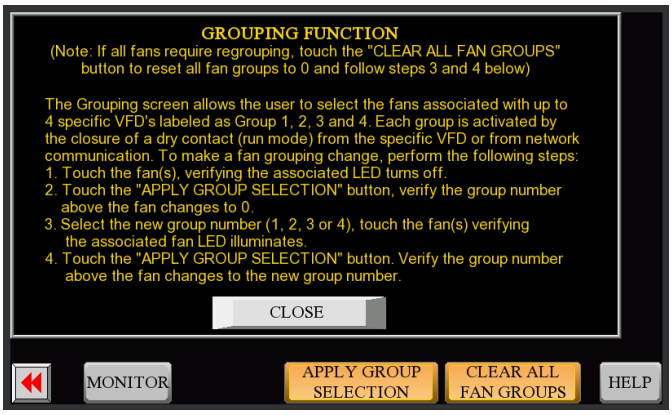
The Fan Grouping Configuration allows the user to assign specific fans to a specific Group number (1-4). Activating a specific Group (closing the specific Group dry contact input on J2 [see Section 2.2] or through network communication [see Section 6.2.1.9 for Group Input Control]) will enable the alarms and total airflow calculations of those fans associated with that group number. To change a fan or fans Group number, press the Fan Group Configuration button on the Tech-2 screen and perform the following steps:

1. Touch the fan or fans to change, verify the associated fan LED's turn off.
2. Touch the APPLY GROUP SELECTION button, verify the group number above the fan or fans changes to 0.
3. Touch the new Group number button (1-4) verifying the button illuminates.
4. Touch the fan or fans verifying the fan LED's illuminate.
5. Touch the APPLY GROUP SELECTION button. Verify the Group number above the fan changes to the new group number.

Fan Grouping Screen



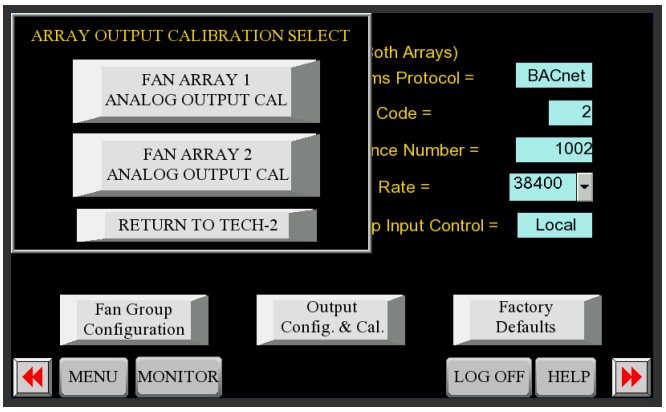
Fan Grouping Help Screen



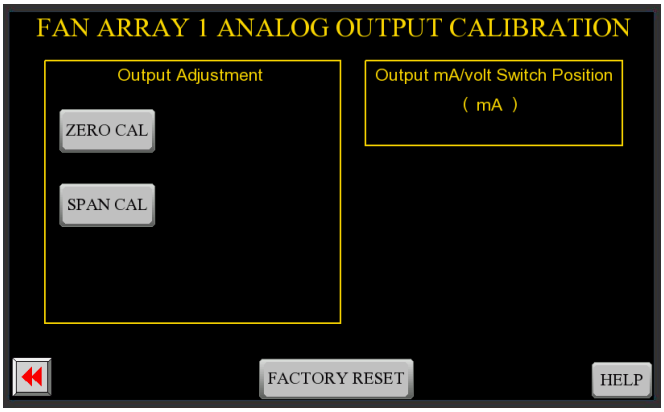
6.2.5. Output Configuration, Calibration, & Help Screens

Enter the Output Configuration and Calibration Screen by pressing the "Output Config. & Cal." button on the Tech-2 Screen and selecting either Array 1 or Array 2 Analog Output Cal. The Fan Array Analog Output Calibration screen indicates the Output Switch Position by displaying Volt or mA. To re-configure either Fan Array 1 or 2 process output signal (V/mA), locate S2 (Fan Array 1) or S3 (Fan Array 2) switch and re-position the switch to V (Voltage) or mA (Current). If the Process Output selection switch is set to V, the Fan Array Analog Output Calibration screen allows the user to select between 0-5VDC or 0-10VDC output by touching the highlighted box.

Fan Array 1 & 2 Output Selection



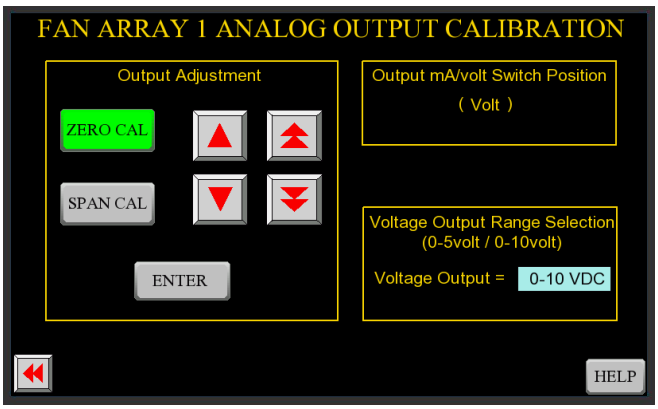
Fan Array 1 Analog Output Calibration Screen



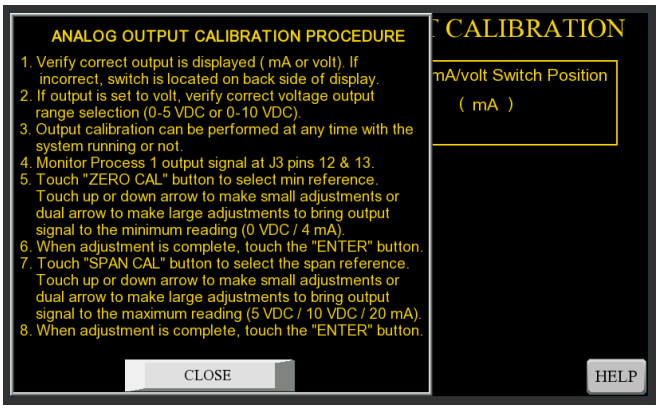
Output switch location

To make Zero or Span output signal adjustment, monitor the output with a digital volt meter set to the appropriate setting. Touching either the ZERO CAL or SPAN CAL buttons will cause single and double up and down arrows to appear. Touching the single arrow adjusts the output signal in small increments were touching the double arrow makes larger output adjustments. After completing the ZERO or SPAN output adjustments, touch the ENTER button to store the adjustment values into memory.

Output Adjustment



Output Calibration Help Screen



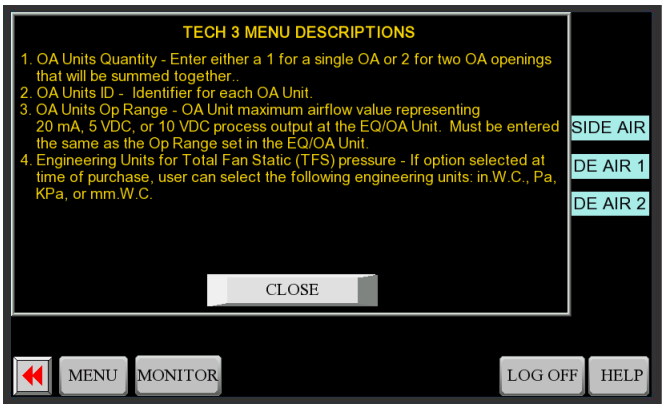
6.3. TECH-3 Menu (Optional)

The Tech-3 screen will be available if the Optional item Outside Airflow measurement was configured at the Factory at the time of FAATS-1000 order. To access the Tech-3 screen, press the red double arrow button on the bottom right of the Tech-2 screen.

6.3.1. Tech-3 Help Screen

The HELP button located in the bottom right corner of the Tech-3 screen describes the functions of the Menu Variables shown on the Tech-3 screen.

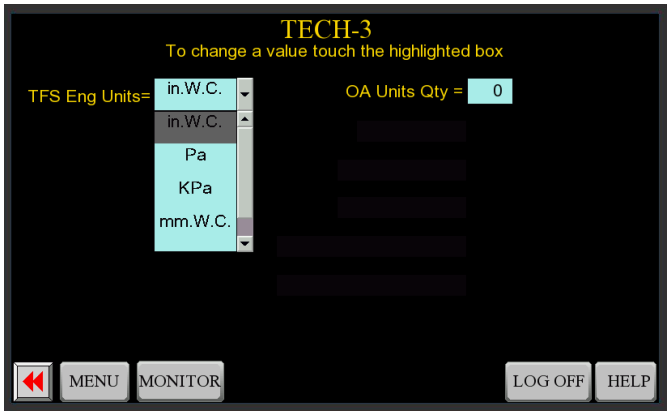
Tech-3 Help Screen



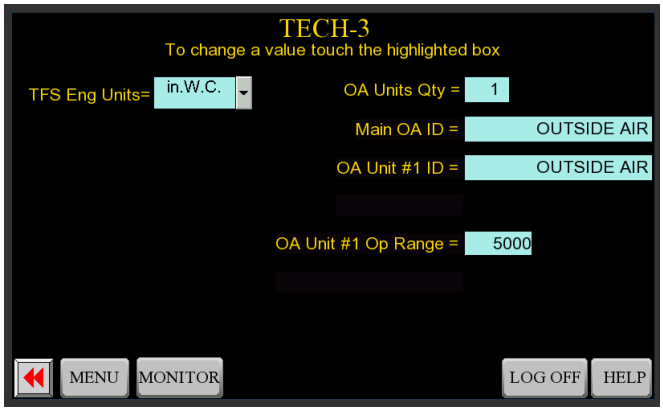
6.3.2. Tech-3 Menu Variables

The following menu variables are available on the Tech-2 screen.

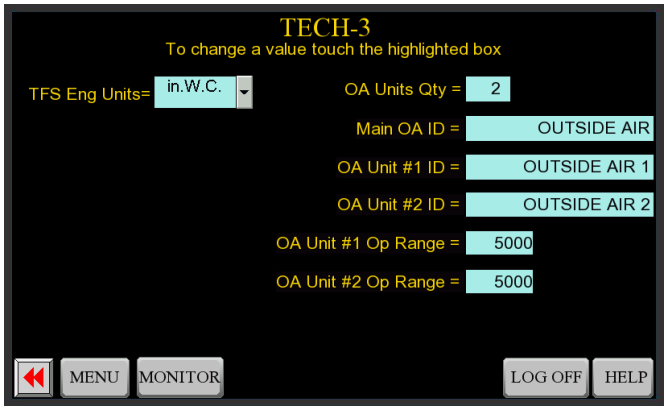
Tech-3 Menu Variables



Single OA Opening



Dual OA Opening



6.3.2.1. OA Units Quantity

The FAATS-1000 can measure and display the airflow values from one or two separate outdoor airflow measurement stations (PCI part number OAFE-1550). The OA Units Quantity allows the user to change the quantity of OA units to 0, 1, or 2 by touching the highlighted box and enter a new value. When the OA Units Qty is 1 or 2, additional menu variables will be revealed for the user to enter the OA identification (OA ID) and operating range (OA Op Range) values for each OA unit.

When the OA Units Qty is 2, the individual OA airflow values are shown on the OA Details screen (see Section 9.2) by touching the OA louver icon on the Monitor screen; additionally, both OA values will be summed together and displayed as one airflow value on the Monitor screen.

6.3.2.2. OA Units ID

The OA Units ID allows the user to enter a unique OA ID for either a single or dual OA. To enter a "New OA ID" touch the blue highlighted box, enter the new ID, and touch the ENTER button. The field is limited to 16 characters. The Main OA ID value entered will be displayed on the Monitor screen.

6.3.2.3. OA Units Op Range

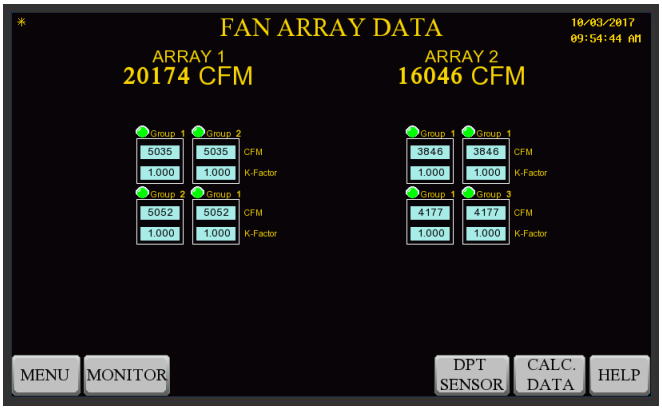
The OA Unit Op Range value is used by the FAATS-1000 to scale the airflow value bar graph that represents the full-scale process value. To change OA Op Range value, touch the blue highlighted box on the Tech-3 screen, enter the new value, and touch the ENTER button.

In order for the FAATS-1000 to correctly display the airflow value from the OA airflow measurement station(s), the operating range values entered into the blue highlighted box in the Tech-3 screen must match the operating range values in the MicroTrans^{EQ} (see the MicroTrans^{EQ} IO&M for details on how to identify operating range in the MicroTrans^{EQ}). Modifying the OA operating range value here does not change the operating range value in the MicroTrans^{EQ}; additionally, modifying the operating range value in the MicroTrans^{EQ} does not change the OA operating range value in the FAATS-1000.

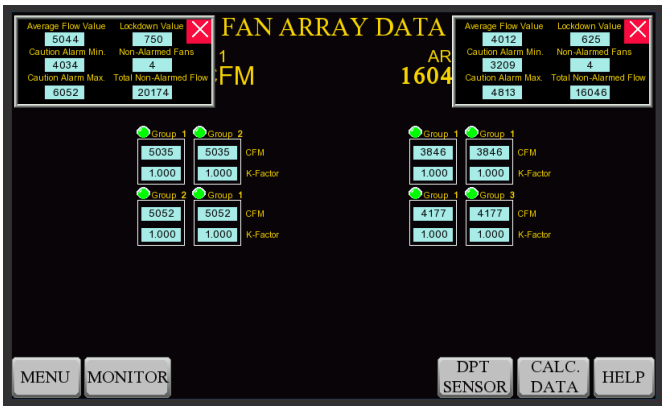
7. FAN ARRAY DATA, CALC. DATA, & HELP SCREENS

The Fan Data screen displays the airflow and K-Factor value for every fan in the array. To enter the Fan Data screen, touch the "View Fan Data" button in the Monitor screen or touch the "Menu" button located at the lower left-hand corner of the screen and touch the "Fan Data" button. Touching the "CALC. DATA" button in the Fan Array Data screen will display a calculation data screen which indicates the calculated average airflow value, caution min alarm value, caution max alarm value, lockdown airflow value, number of non-alarmed fans and total airflow for all non-alarmed fans used by the FAATS-1000. Touching the "HELP" button brings up a help screen which describes the data shown on the Fan Array Data screen and Calculated Data screen.

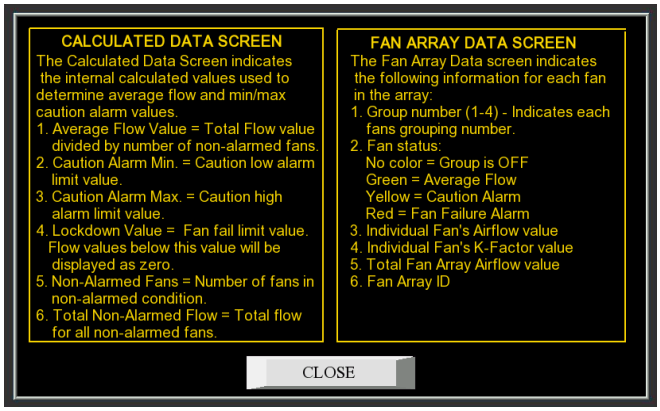
Fan Array Data Screen



Calc. Data Popup Screen



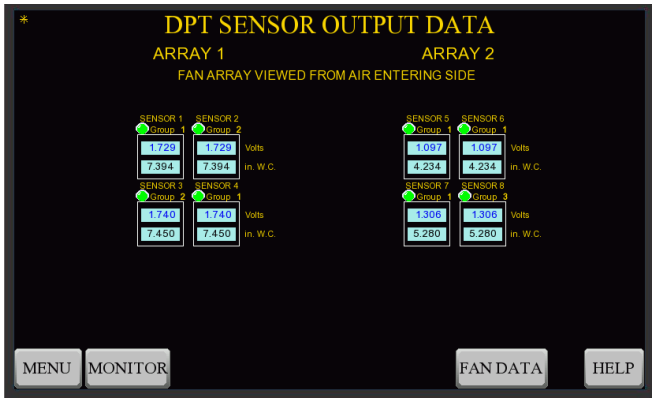
Calc. and Fan Array Data Help Screen



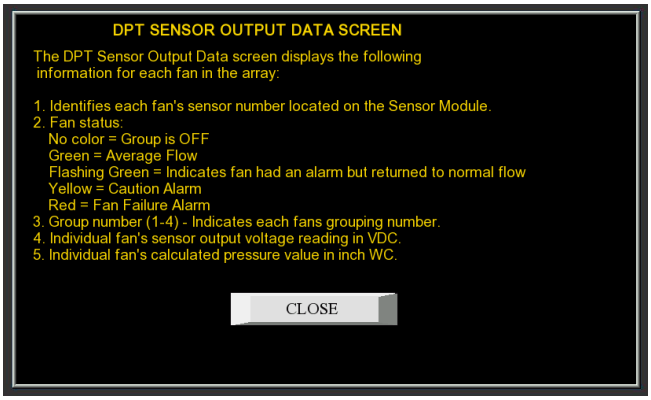
8. DPT SENSOR & HELP SCREENS

The DPT Sensor screen displays the fan sensor input voltage value and associated pressure value for every fan in the arrays. To enter the DPT Sensor Screen, touch the "Menu" button located at the lower left-hand corner of the display and touch the "DPT SENSOR" button or in the Fan Array Data screen, touch the "DPT SENSOR button. Touching the "HELP" button brings up a help screen which describes the data shown on the DPT Sensor Output Data Display screen.

DPT Sensor Screen



DPT Sensor Help Screen

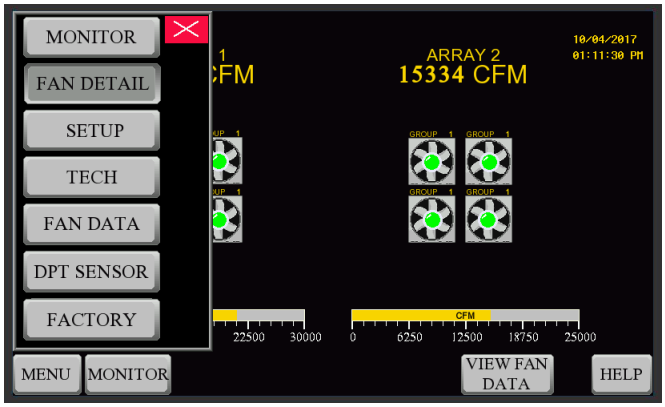


9. FAN AND OA DETAIL & HELP SCREENS (OPTIONAL)

If the FAATS-1000 was configured at the Factory for Outside Airflow measurement, the following screens will be available.

9.1. Fan Detail & Help Screen

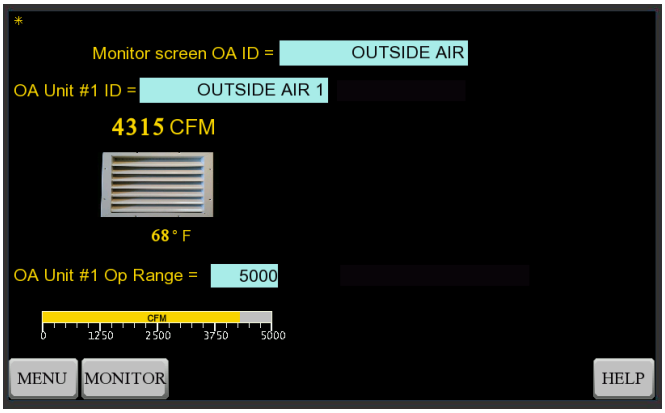
The Fan Detail screen is identical to the Monitor screen as described in Section 4.2.1, and is available when the FAATS-1000 is configured for OA flow measurement. When OA is configured at the Factory, a new Monitor page has been added that displays the additional OA features (see Section 4.2.2 for the new Monitor screen). The Fan Detail screen has the same popup windows as described in Section 4.3 and can be accessed by touching any of the fan icons on the Monitor screen or by touching the MENU button located in the lower left-hand corner of most screens and pressing the Fan Detail button.



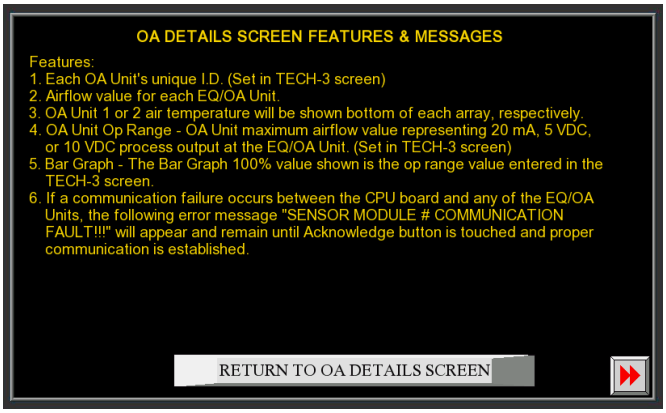
9.2. OA Detail & Help Screen

The OA detail screen can be accessed by touching the OA louver icon on the Monitor screen. The OA Detail screen displays the OA ID, OA unit # ID, airflow value, air temperature, OA unit operating range, and airflow bar graph for the OA airflow measurement station. If a quantity of two OAs is selected in the Tech-3 screen, then two separate graphics will be shown on this screen. The values in the blue highlighted boxes can only be edited in the Tech-3 screen.

OA Detail Screen



OA Detail Help Screen



10. ALARM CONDITIONS AND WARNING MESSAGES

10.1. Fan Status Indicator Lights

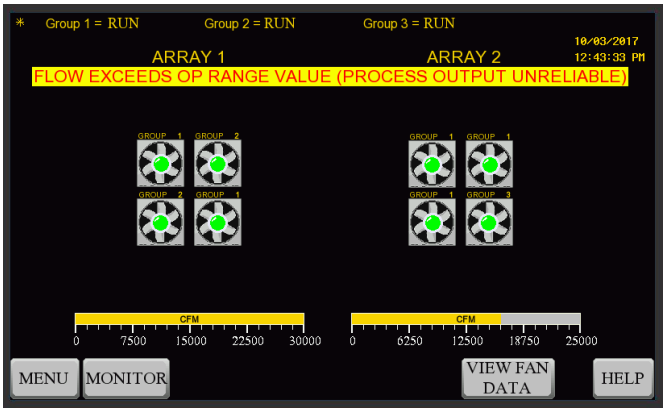
The FAATS has 6 types of indicator lights that alert the user to fan status. There are steady and flashing green, yellow, and red lights indicating the following:

- Steady Green – fan is operating normally
- Flashing Green – fan had an alarm but returned to normal flow and has not been acknowledged
- Steady Yellow – fan in caution alarm and has been acknowledged
- Flashing Yellow – fan in caution alarm and has not been acknowledged
- Steady Red – fan failure or airflow below lockdown value and has been acknowledged
- Flashing Red – fan failure or airflow below lockdown value and has not been acknowledged

A flashing light indicates that the user has not pressed the ALARM ACKNOWLEDGE button and alerts the user that attention is required.

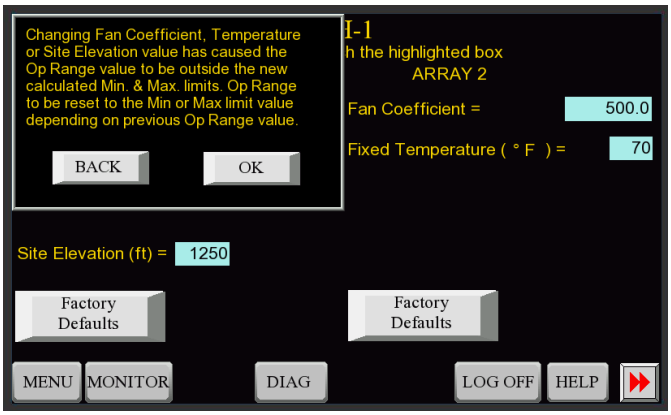
10.2. Total Fan Array Airflow Exceeds Op Range Value

If the total airflow value on a single or a dual array system exceeds the Total Fan Array Op Range value entered in the Setup-1 screen, the following warning message "FLOW EXCEEDS OP RANGE VALUE (PROCESS OUTPUT UNRELIABLE)" will flash on the screen. The message will continue to flash until the total fan array airflow value drops below the Op Range value entered (see Section 5.1.3).



10.3. Op Range Reset Message

If a user enters a new Fan Coefficient, Temperature, or Site Elevation value that causes the current Op Range value to be outside the new calculated minimum or maximum limits, the following message will appear. The user can decide to reenter a new value by touching the BACK button or proceed by touching the OK button. Touching the OK button will cause the screen to change to the Setup-1 screen enabling the user to change the Op Range to a new value.



11. NETWORK COMMUNICATIONS

11.1. BACNET

11.1.1. Network Control Settings

Refer to Sections 6.2.1.5, 6.2.1.7, and 6.2.1.8 for communication network control settings.

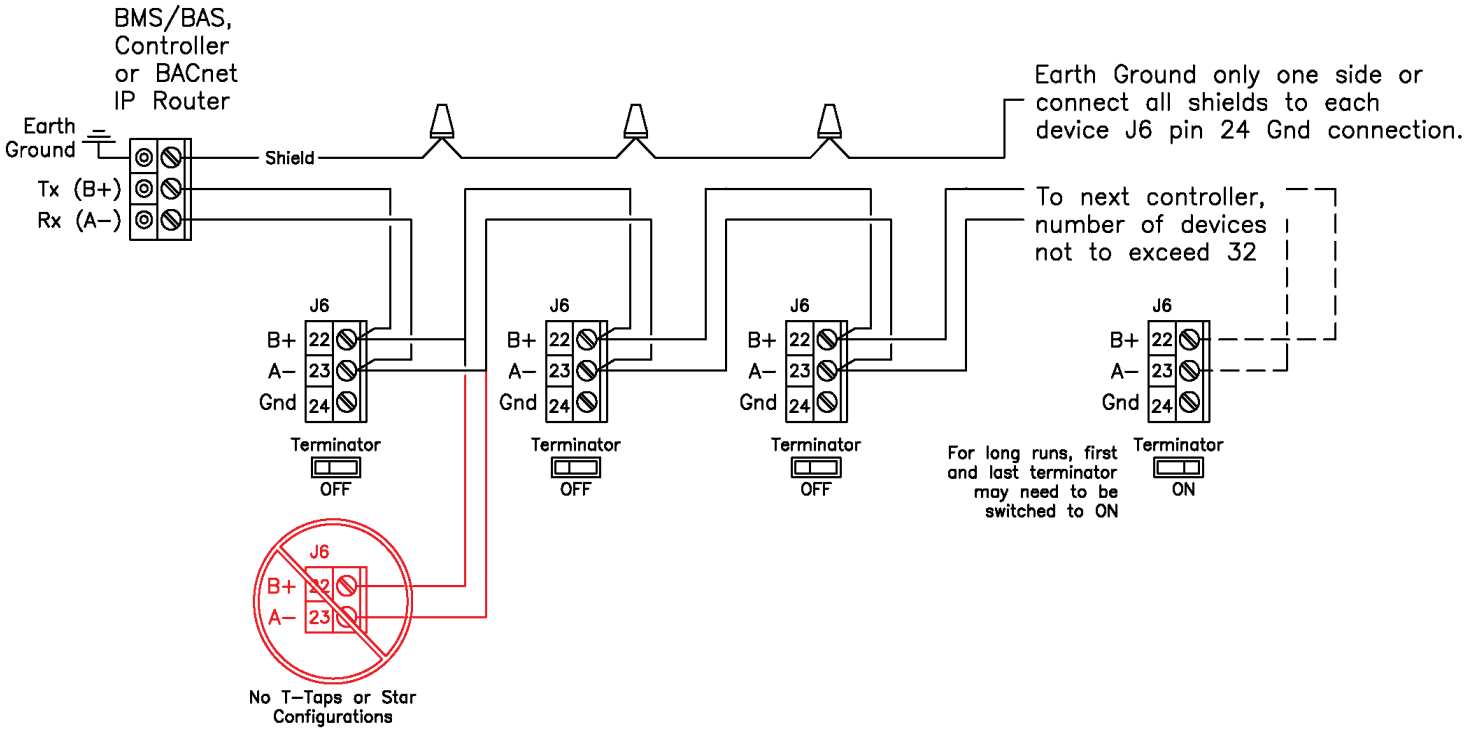
11.1.2. Network Connection

Refer to Section 2.2 for communication network connection code.

11.1.3. Connecting to a Communication Network

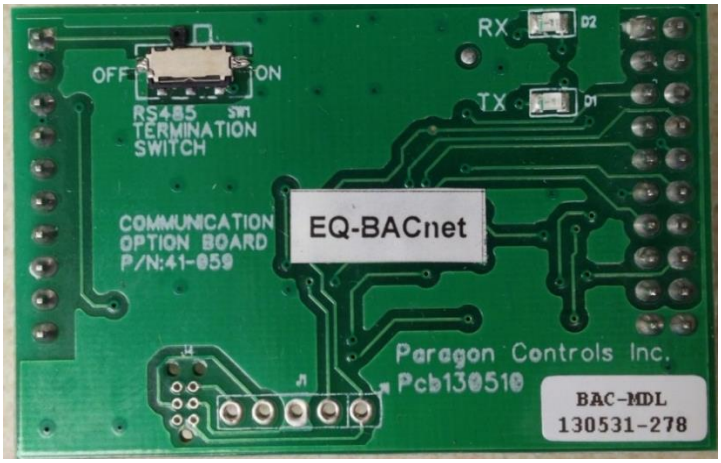
Network wire should be low capacitance, shielded 18 to 24 AWG twisted wire with PVC jacket such as Belden Part number 3105A or equivalent. (Recommended maximum wire length is 4,000 feet).

It is best practice for external noise immunity on communication lines to connect all shield drain wires together and then Earth Ground only on one end of the drain wire line as depicted in the image below. However, it may also be an acceptable alternative to ground the Network Communication's shield drain at each device's chassis ground on the trunk, though that is dependent on local conditions and should be determined at installation. A signal common should not be attached to the drain wire at any point in the run.



11.1.4. BACnet Communication Board & Terminator Switch

For proper BACnet operation, the device that is electrically installed at the end of the network may require the Terminator Switch be moved to the ON position to prevent line and data reflection. This is not common, however if Terminator is required, it must be applied to both physical ends of the network at the two end devices (see images above in Sections 11.1.3 for visual description). All other devices should have the Terminator Switch in the OFF position. The communication board is located on the back side of the main CPU board mounted to the back side of the display (see Section 2.1 for location). See picture below for switch location.



11.1.5. PICS (Protocol Implementation Conformance Statement)

Fan Array Unit BACnet Protocol Implementation Conformance Statement

BACnet Standardized Device Profile (Annex L):
BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):
DS-RP-B
DS-RPM-B
DS-WP-B
DS-WPM-B
DM-RD-B
DM-DDB-B
DM-DOB-B
DM-DCC-B

Segmentation Capability:
NONE

Standard Object Types Supported: (See Table 1 for details)
Analog Input
Analog Value
Binary Value
Multistate Value

Data Link Layer Options:
MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800

Device Address Binding:
NO

Networking Options:
NONE

Character Sets Supported:
ANSI 3.4

Supported Services:

ReadProperty	Execute
ReadPropertyMultiple	Execute
WriteProperty	Execute
WritePropertyMultiple	Execute
DeviceCommunicationControl	Execute
Who-Is	Initiate, Execute
Who-Has	Execute
I-Am	Initiate, Execute
I-Have	Execute

Gateway:
This product does not support gateway functionality for any types of non-BACnet equipment/network(s).

TABLE 1 - Object Types Supported – Fan Array Device

Object	Create Object Service	Delete Object Service	Optional Properties Supported	Writeable Properties	Property Data Type	Data Value Description (State_Text)
Device	No	No	• Object Name • Description • Location • Object Identifier • APDU Timeout • Max Info Frames • Max Master	• Description • Location		
Analog Input 1 – Fan Array 1 Total Process Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Input 2 – Fan Array 2 Total Process Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Input 3 – Supply Temperature / Total Fan Static Value	No	No	• Description • Eng Units	Present Value	REAL	
Analog Input 4 – Return Temperature / Total Fan Static Value	No	No	• Description • Eng Units	Present Value	REAL	
Analog Input 5 – OA Flow1 Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Input 6 – OA Flow2 Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Input 7 – OA Temperature1 Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Input 8 – OA Temperature2 Value	No	No	• Description • Eng Units	Read Only	REAL	
Analog Value 1 – Fan Array 1 Operating range Value	No	No	Description	Present Value	REAL	
Analog Value 2 – Fan Array 2 Operating range	No	No	Description	Present Value	REAL	
Binary Value 1 – Group 1 Status	No	No	Description	Read Only *see note 3	Enumerated	0 = Off 1 = Run
Binary Value 2 – Group 2 Status	No	No	Description	Read Only *see note 3	Enumerated	0 = Off 1 = Run
Binary Value 3 – Group 3 Status	No	No	Description	Read Only *see note 3	Enumerated	0 = Off 1 = Run
Binary Value 4 – Group 4 Status	No	No	Description	Read Only *see note 3	Enumerated	0 = Off 1 = Run

Object	Create Object Service	Delete Object Service	Optional Properties Supported	Writeable Properties	Property Data Type	Data Value Description (State_Text)
Multistate Value 1 – Fan Group Run Source	No	No	Description	Present Value	Unsigned Integer	1 = Local 2 = Network
Multistate Value 2 – Engineering Units	No	No	Description	Present Value	Unsigned Integer	See Table 2 below
Multistate Value 3 – Fan Array 1 Alarm Status	No	No	Description	Read Only	Unsigned Integer	1 = Off (no alarms) 2 = On (in alarm)
Multistate Value 4 – Fan Array 2 Alarm Status	No	No	Description	Read Only *see note 2	Unsigned Integer	1 = Off (no alarms) 2 = On (in alarm)
Multistate Value 5 – Temperature Units	No	No	Description	Present Value	Unsigned Integer	1 = Fahrenheit 2 = Celsius
Multistate Value 6 – Supply Temp. Source	No	No	Description	Present Value	Unsigned Integer	1 = Fixed Temp. Value 2 = Temp. Input 3 = Network
Multistate Value 7 – Return Temp. Source	No	No	Description	Present Value	Unsigned Integer	1 = Fixed Temp. Value 2 = Temp. Input 3 = Network
Multistate Value 8 – Supply Temp. Alarm	No	No	Description	Present Value	Unsigned Integer	1 = Normal 2 = Alarm
Multistate Value 9 – Return Temp. Alarm	No	No	Description	Present Value	Unsigned Integer	1 = Normal 2 = Alarm
Multistate Value 10 – Total Fan Static Units	No	No	Description	Read Only	Unsigned Integer	See Table 3 below
Analog Input 9– Fan 1 Process Value	No	No	• Description • Eng Units	Read Only	REAL	
Multistate Value 11 – Fan 1 Status	No	No	Description	Read Only	Unsigned Integer	1 = Normal 2 = Caution 3 = Failure
Analog Input 10– Fan 2 Process Value	No	No	• Description • Eng Units	Read Only	REAL	
Multistate Value 12– Fan 2 Status	No	No	Description	Read Only	Unsigned Integer	1 = Normal 2 = Caution 3 = Failure
Total 40 Fans can be displayed. The # of Fans displayed is automatically set based on the Fan Qty entered at the factory in the HMI Factory Setup menu. ↓						
Analog Input 48– Fan 40 Process Value	No	No	• Description • Eng Units	Read Only	REAL	
Multistate Value 50 – Fan 40 Status	No	No	Description	Read Only	Unsigned Integer	1 = Normal 2 = Caution 3 = Failure

Rev 8; 11/14/17

TABLE 2 – MSV3 Engineering Units State_Text List

1: CFM
2: L/S
3: m^3/Sec
4: m^3/Min
5: m^3/HR

TABLE 3 - MSV10 Total Fan Static Units State_Text List

1: Inch W.C.
2: Pa
3: KPa
4: mm W.C.
5: % (Pressure %)

Notes:

1. All BACnet required properties are supported. The table above lists optional & writable properties supported.
2. If there is only 1 Fan Array e.g. only Supply Fan Array present then Fan Array 2 Alarm Status object "out-of-service" property will display "TRUE". In this case the Fan Array 2 Total Process Value object will display the same value as the Fan Array 1 Total Process Value.
3. Binary Value 1-4 – Group 1-4 Status will be Read Only when Multistate Value 1 – Fan Group Run Source is set to 1= Local. Binary Value 1-4 – Group 1-4 Status will be Read/Write Present Value when Multistate Value 1 – Fan Group Run Source is set to 2= Network.
4. Analog Input 3 – will display Supply Temperature or Total Fan Static Value based on FAATS Factory setting.
5. Analog Input 4 – will display Return Temperature or Total Fan Static Value based on FAATS Factory setting.
6. Multistate Value 8 – will only be displayed if Supply Temperature is selected in FAATS Factory setting.
7. Multistate Value 9 – will only be displayed if Return Temperature is selected in FAATS Factory setting.
8. Multistate Value 10 – will only be displayed if Total Fan Static Value is selected in FAATS Factory setting.

12. TROUBLESHOOTING GUIDE

TROUBLESHOOTING TABLE	
SYMPTOM	**SOLUTION**
1. Display Blank	1. Tap Display; optional Screen Saver may be on.
	2. Verify ON/OFF switch is in ON position.
	3. Verify input power value (20-28VAC) and correct power connection to J1 (see Section 2.2).
	4. Inspect board for potential burn or water damage. If F1 fuse (See Section 2.1) is hot the board may be damaged (See Section 2.1).
	5. Contact Factory.
2. Fans running but zero Total Airflow values	1. On main monitor page, if Group 1= OFF verify Group Input Control is set to Local on TECH-2 page and jumper wire or relay is connected to J2 (see Section 2.1 and 2.2).
	2. Verify High and Low pneumatic connections from fan to the sensor module are correct.
	3. View DPT Sensor Page. If Transducer voltages are 0 tubing may be reversed or there may be no power at the sensor module;. if Transducer voltages are 0.049 a sensor module may not be communicating properly (Reference 7. Sensor Module Communication Fault below). If transducer voltages are ~0.250 there is no pressure applied to transducer.
	4. Verify Grouping number (1, 2, 3 or 4) at top of main screen is in a RUN mode. If Grouping number reads OFF, check wire connections at J2 (see Section 2.1 and 2.2)
	5. Contact Factory.
3. **CAUTION INPUT OVERRANGE** message on Display	1. Verify data on ID Label located inside the FAATS-1000 enclosure is correct for the application.
	2. View Fan Data screen and verify that all fans are showing approximately the same airflow. If one fan is higher than the other fans, check for a plugged sensing line or a leak on the low connection.

TROUBLESHOOTING TABLE	
SYMPTOM	**SOLUTION**
	3. Verify menu selections are set correctly: Operating Range, Fixed Temperature and Site Elevation.
	4. Contact Factory.
4. No Output signal, Display is reading correct value.	1. Verify Process Output S2 & S3 switches are in the correct position for the application (see Section 6.2.5).
	2. Disconnect Output signal wires and verify output signal at connector J3 is correct.
	3. Check if either current or voltage will provide output. If current works and voltage does not, output chip may be damaged.
	4. Verify correct Operating Range (see Section 5.1.3).
	5. Perform Output Cal (see Section 6.2.5).
	6. Contact Factory.
5. Building Management System not communicating with any of the devices	1. Verify each device has a unique MAC Code and the Instance Number includes the MAC Code number. Example: Instance Number=01002 / MAC Code = 002 (see Section 6.2.2).
	2. Verify data +&- connections on all devices and the Building Management System are wired correctly.
	3. Verify the communications Baud Rate is set the same for all devices (see Section 6.2.2.8).
	4. If MAC Code, Instance Number, Mod ID, or Baud Rate were changed, power must be cycled by turning power switch shown on page 3 off and on.
	5. Verify all signal commons are connected as shown in Section 11, if required.
	6. Check termination switch on BACnet Card is set to off position (see Section 11.1.4).
	7. Unplug and reset BACnet Card with power off.

TROUBLESHOOTING TABLE	
SYMPTOM	**SOLUTION**
	8. Swap current BACnet card with working communication card from another FAATS-1000 on site if possible, to diagnose.
	9. Contact Factory Service Department.
6. Building Management System communicating with some devices but not others.	1. Verify each device has a unique MAC Code and the Instance number includes the unique MAC Code number. Example: Instance Number = 01002 / MAC Code = 002 (see Section 6.2.2).
	2. Verify data +&- wires are connected correctly on those devices not communicating.
	3. Verify the communications Baud Rate is set the same for all devices (see Section 6.2.2.8).
	4. If MAC Code, Instance Number, Mod ID, or Baud Rate were changed, power must be cycled by turning power switch shown on page 3 off and on.
	5. Try setting the BACnet termination switch on the last device in the communication chain to the ON position. (see Section 11.1.4 for switch location)
	6. Contact Factory Service Department.
7. Sensor Module Communication Fault	1. Verify Sensor Modules are connected to system via twisted pair or plenum-rated CAT5e patch cable, shielded 24-gauge wire.
	2. Verify Sensor Module(s) power switch is in on position (see Section 2.3).
	3. Verify CAT5e Cable is not crossover and check continuity with CAT5e cable tester.
	4. Verify Modbus Terminator switches are set to off position on all sensor modules (See Section 2.3) and FAATS-1000 main CPU board (See Section 2.1).
	5. Disconnect J3 and J6 and cycle Power by turning power switch shown on page 3 off and on. If this fixes the issue check that there is no AC or DC voltage going to the outputs of the FAATS-1000.

TROUBLESHOOTING TABLE	
SYMPTOM	**SOLUTION**
	6. Contact Factory.
8. CPU COM Error	1. Unplug ribbon cable from CPU board and reset to verify connection.
	2. Disconnect J3 and J6 and cycle Power by turning power switch shown on page 3 off and on. If this fixes the issue check that there is no AC or DC voltage going to the outputs of the FAATS-1000.
	3. Contact Factory.

13. OA INTEGRATED TROUBLESHOOTING GUIDE

TROUBLESHOOTING TABLE	
SYMPTOM	**SOLUTION**
1. Outside Air not displayed on monitoring page	1. Confirm that OA is enabled in the FAATS-1000 on the TECH-3 page (see Section 6.3.2).
	2. Cycle Power on the FAATS-1000 by turning power switch shown on page 3 off and on.
	3. Contact Factory
2. Outside Air displaying zero CFM	1. Check that the OA-Signal Processor has its power switch in the ON position.
	2. Verify OA-Signal Processor is daisy-chained within the FAATS-1000 system via CAT5e cable or twisted pair(s).
	3. Verify pneumatic connection between OA flow station and Signal Processor.
	4. Verify operating range on the Signal Processor label matches operating range value in TECH-3 menu.
3. Sensor Communication Fault	1. Check that the OA-Signal Processor has its power switch in the ON position.
	2. Verify OA-Signal Processor is daisy-chained within the FAATS-1000 system via CAT5e cable.
	3. Verify MOD ID in the Signal Processor indexed as the last sensor module (MOD ID correlates to sensor module qty).
	4. Verify continuity of cable and ensure properly shielded.
	5. Contact Factory

Note: When integrating OAFE-1550 MicroTrans^{EQ} Signal Processor with the FAATS-1000 for Outside Air Flow Measurement display on the FAATS, the MicroTrans^{EQ} Modbus ID must be set to the next number in series after the FAATS sensor modules AND the MicroTrans^{EQ} Baud Rate must be set to 57.6 Kbps. All the FAATS default values remain the same as shown below.

14. DEFAULT SETTINGS RECORD

Setup Menu

Screen	Menu	Array 1 or Common Values	Array 2
SETUP-1	Total Fan Array Op Range		
	Fan Array ID		
	Engineering Units	CFM	NA
	K-Factor	1	1
SETUP-2	Display Filter Interval	2	NA
	Output Filter Interval	2	NA
	Screen Backlight Time (Min)	0	NA
	Relay Function	Non-Latching	NA
	Start Alarm Delay	5	NA
	Group Run Delay	5	NA
	Fault Alarm Delay	200	NA
	Lockdown (%)	5	NA
	Lockdown Delay (Sec.)	20	NA
SETUP-3	Clock & Date Display	Enabled	NA
	Real Time Clock settings		NA
	Software Revisions		NA

Tech Menu

Screen	Menu	Array 1 or Common Values	Array 2
TECH-1	Fan Coefficient		
	Fixed Temperature	60	70
	Site Elevation (ft)		NA
TECH-2	Caution Alarm (%)	40	NA
	Display Filter Count (1-99)	15	NA
	Output Filter Count (1-99)	15	NA
	Temperature Units	F	NA
	Fan Alarms	Enabled	NA
	MAC Code	002	NA
	Instance Number	1002	NA
	Baud rate	38400	NA
	Group Input Control	Local	NA
	Fan Group Configuration	1	1

PARAGON CONTROLS INCORPORATED

Paragon Controls Incorporated
P.O. Box 99, Forestville, CA 95436
http://www.paragoncontrols.com
Phone 707 / 579-1424
Revision Level 009