Air Quality Solutions

Technical Bulletin

Model: TDFi-FA

Airflow & Temperature Measuring System for Fan Arrays

TDFi-FA Airflow & Temperature Measuring System for Fan Arrays

Technical Bulletin

TDFi-FA

Refer to the Ruskin.com website for the most up-to-date version of this document.

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DOCUMENT INTRODUCTION

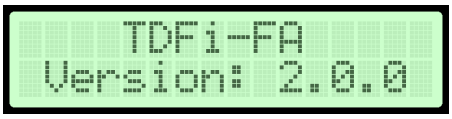
This document describes the features and functions of the model TDFi-FA airflow & temperature measuring system for fan array applications. It also provides guidelines and instructions for setting up and trouble-shooting these devices used in plenum and duct applications.

START-UP

Navigating the Start-Up Menu

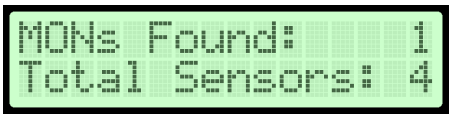
After Installation has been verified, apply power to the TDFi-FA Host Monitor. Menu displays will be generated on the Host Monitor's front panel (16x2 LCD).

Display will briefly indicate:



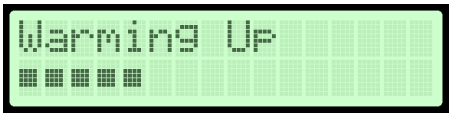
The boot splash screen indicates the firmware version and model name.

After 5 seconds, display will indicate:



The number of active/total MONITORS & SENSORS will be represented here numerically. There is 1 monitor and 4 sensors in this example.

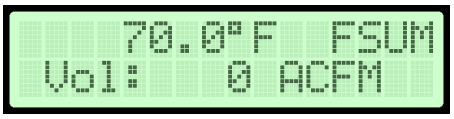
After an additional 5 seconds, if the fans have already been configured, display will indicate:



With the ■ progressing from left to right.

*NOTE: If fan count is set to 0 (i.e., no fans configured), the Host Monitor will prompt to complete the Boot Fan Setup before warm-up. The Boot Fan Setup process is outlined on the following pages.

NORMAL OPERATION



Normal Display Mode
Volume (ACFM) selected for display

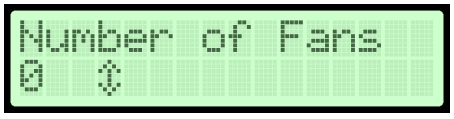
The normal operation screen will display the average temperature & average velocity or volume of the selected fan or the Fan Summary. The Fan Summary will display the average velocity or the sum of the volumetric flow for all configured fans. The selected fan address is indicated in the top right of the screen, for example FSUM is the Fan Summary and F01 is fan 1. Fans 01 through 16 can be viewed after they are configured. UP and DOWN buttons are used to cycle through the associated fans with ESC bringing the display back to the fan summary. Prior to setup, with no fans configured, it will display the average of all connected sensors discovered on initial boot and display 'F-' in the top right.

BOOT FAN SETUP

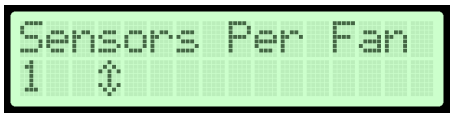
The fan count and number of sensors per fan are programmed into the TDFi-FA by the factory prior to shipping. If the fan count displays as zero (0) due to user input or user resetting the unit to the factory defaults, the Host Monitor will prompt the user to configure the system during boot immediately before warm-up. This process will step the user through the setup process. Pressing MENU at any point in the setup will skip the setup process. Pressing ESC will go back a step. To return to automatic Boot Fan Setup if exited early, ensure the number of fans is set to 0 and cycle power to the system.

1. The user will be prompted to configure the system. Use UP or DOWN keys to select Yes and press ENTER. Pressing ESC here will cancel the setup process.

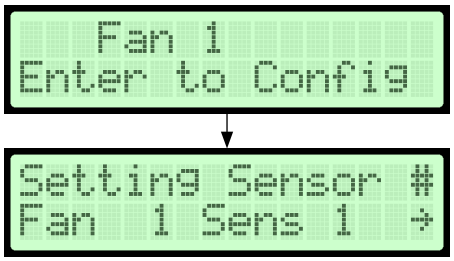
2. The user will then be prompted to set the number of fans that this Host box will monitor. Use UP and DOWN keys to select a number from 1 – 16. Selecting 0 fans will skip the setup and go into warm-up. Press ENTER to confirm selection.



3. The display will then prompt the user to set the number of sensors per fan. This setting applies to all fans. Use Up and Down keys to select 1 or 2. Press ENTER to confirm selection.



4. A prompt to enter setup/configuration of the displayed fan will be displayed. Press ENTER to enter the setup/configuration



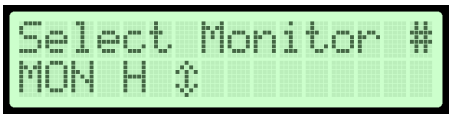
5. The user will then select the monitor for the fan being setup. Use UP and DOWN to select the monitor to associate with the fan being setup, H is the Host, 0-F are the Clients. Press ENTER to confirm selection. Use UP and DOWN to select a sensor. Press Enter to confirm selection.

   Terminology:

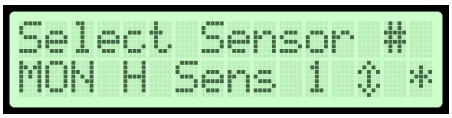
   Monitor Box - A monitor box can be either a Host box or a Client box.

   Host - The monitor box which is the interface of the airflow measuring station to the system's BAS and includes the 5 membrane push-buttons on the front panel. The Host address will always be shown as MON H.

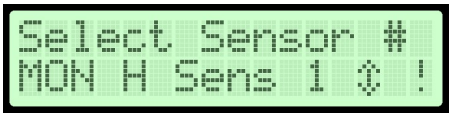
   Client - The monitor box(es) which do not include the 5 membrane push-buttons on the front panel. Data from each Client monitor box is drawn by the Host monitor box for processing and transmitting to the BAS. Client monitor boxes have a rotary dial that is used to set the address displayed as MON 0, MON 1, etc., up to MON F (Hex 15). In systems with less than 16 fans, it is recommended to set the rotary address in the Client monitor box to match the fan number to which it is connected in order to avoid confusion.



   a. When selecting the assignment, there are 2 errors that can be displayed. If there is an error, it is shown as the last character of the 2nd line. If both errors are present, it will flash between the 2 characters.

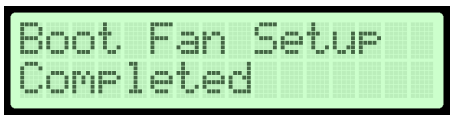


   Error 1: '*' is present when the selected assignment is not connected or communicating with the host.



   Error 2: '!' is an indication that the displayed assignment has been previously assigned by the user to another fan.

6. Steps 4 through 6 will be repeated for any additional fans that need to be setup.
7. The display will indicate when all fans have been setup.



NORMAL OPERATION

Under normal operation, the front panel on the TDFi-FA Host monitor box will continuously display average airflow and average temperature in Imperial or SI units from the fan summary or selected fan.

Configuration

The on-board microprocessor in the TDFi-FA Host Monitor allows for system configuration, operating parameter selection, analog output configuration, and display filtering. The Host Monitor also acts as a master across a wired network to other Client Monitor boxes, up to 16.

The operator or supervisor can verify configuration and change certain parameters, within defined ranges, by entering the TDFi-FA configuration mode. This is accomplished using the five membrane pushbuttons located on the TDFi-FA Monitor Host front panel display cover.

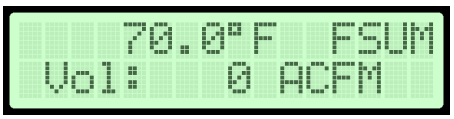
Membrane Push Buttons

The five membrane push-buttons on the front panel display (MENU, ESC, UP, DOWN, ENTER) are used to interface with the TDFi-FA Host Monitor. Membrane pushbuttons are used during system configuration setup and can be used for certain functions when in the Normal operation mode.

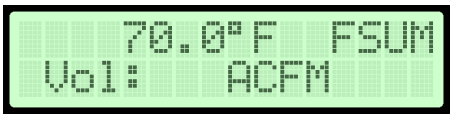
Normal Operation Display Mode

The normal operation screens will display the TDFi-FA system's average temperature and velocity or volume of the selected fan or the fan summary. The fan summary will show the average velocity or sum of volume of all configured fans. The selected fan is indicated in the top right of the screen, for example FSUM is the fan summary and F01 is fan 1. Fans 01 through 16 are available if they are configured. UP and DOWN buttons are used to cycle through the displayed fans with ESC bringing the display back to the fan summary.

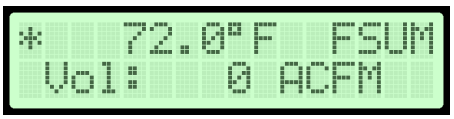
The Normal Operation Display Mode is available upon completion of system warm-up.



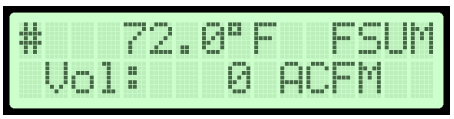
When in Normal Operation Display Mode, the second line can sometimes be too long to display everything at once. This typically occurs when a 'custom' line 2 text is set and a large volume is being displayed. In this event, the display will flash between the read value and the unit every 3 seconds on line 2 while still displaying the line 2 label.



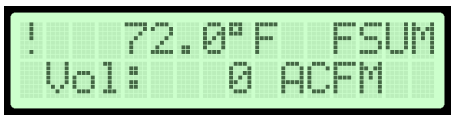
Note: There are 5 errors that can be displayed. The first placeholder on the first line will display the error character if any are present. If multiple errors are present, the character will flash between the errors.



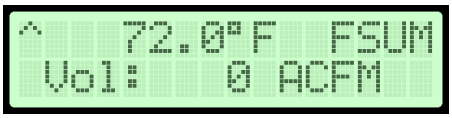
Error 1: '*' indicates that a sensor and/or monitor assigned to a fan is not connected or responding.



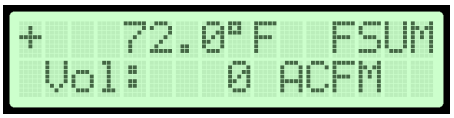
Error 2: '#' indicates that the number of sensors or monitors has changed since the last sensor scan.



Error 3: '!' indicates that there are duplicate sensors assigned to the same fan number.



Error 4: '^' indicates that a site calibration is not present.



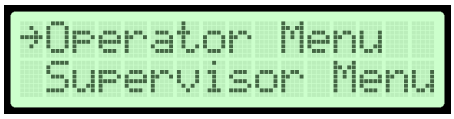
Error 5: '+' indicates that a TDFi-RT device(s) is on the Ruskin network.

NAVIGATING THE MENU OPTIONS

NOTE: Network settings are required prior to connecting any building automated control networks.

Navigating The Operator Menu

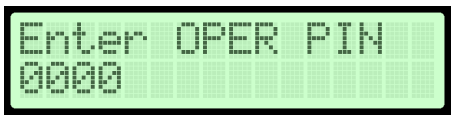
1. With power ON and Warm-Up complete, press MENU, then UP and DOWN until the arrow " ➔" is next to Operator Menu; press ENTER to activate the menu.



The display will then indicate:

...Allowing the user to scroll to each Operator Sub-Menu (See Table 1 below)

2. If the Operator PIN has been enabled, the display will then indicate:



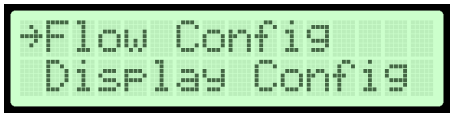
Enter the 4 digit PIN to access the Operator Menu. Pin entry is made starting at the most significant digit, working to the least significant digit (left to right); one digit at a time. Scrolling up or down will display 0 to 9.

When the correct number is displayed, then select ENTER to accept the digit. The cursor will automatically move to the next position. If an error is made after ENTER is pressed, press ESC to go back and change the digit. Upon entering the last digit, the PIN is stored in non-volatile memory. When enabled, the PIN is required each time the Operator Menu is entered.

Note: Write down and retain the PIN in system configuration documentation for future use, to access the TDFi-FA Operator Menu features.

From the Factory, the PIN is 9999 and it is not enabled

3. Once the Operator PIN is correctly entered or disabled, the display will indicate:



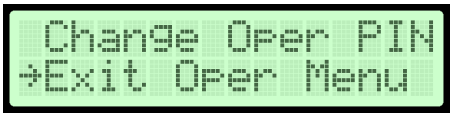
By using the UP and DOWN pushbuttons, the user can scroll through the following selections:

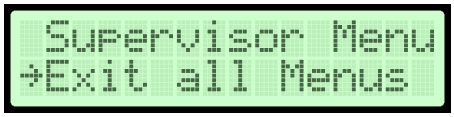
Table 1: Operator Menu Sub-Menus

Operator Menu - Sub-Menu Selections	**Sub-Menu Description**
Flow Configuration	Allows for the configuration of system variable such as: Fan area, elevation, relative humidity, flow units, and zero cutoff.
Display Configuration	Allows the selection of parameters (what and where) to be displayed on LCD lines and display filtering.
Output 1 Parameters	Allows the selection of Analog Output #1 Parameters: Temperature, Flow, or None for Analog Output #1.
Output 2 Parameters	Allows the selection of Analog Output #2 Parameters: Temperature, Flow, or None for Analog Output #2.
Temperature Low Pass Filter	Temperature Low Pass Filter
Flow Low Pass Filter	Selects amount of filtering applied to the Analog Output for Flow.
Analog Output Calibration	Allows for setting the zero and span of the Analog outputs for AO1 & AO2.
Temperature Balance Menu	Selects an offset to apply to the reported average temperature including front panel display, BACnet®, Modbus RTU, and Analog Outputs 1 and 2.
Menu Inactivity Timeout	Allows for the selection a time after which the unit will return to Normal operation display mode and turn off the Front Panel back light, if no activity is detected from the keypad.
Network Configuration	Selects RS-485 network type (BACnet or Modbus) and allows configuration.
Alarm Configuration Menu	Flow Alarm Configuration: Configures high and low setpoints, deadband, and alarm delay settings and turns the high and low flow RS-485 interface flow alarms on and off.
	Temperature Alarm Configuration: Configures high and low setpoints, deadband, and alarm delay settings and turns the high and low RS-485 interface temperature alarms on and off.
Enable Operator PIN	Allows for the selection of a PIN for accessing the Operator Menu.
Change Operator PIN	Allows for changing of the PIN to access the Operator Menu.
Operator Menu Exit	Returns display to Normal operation.

Once the desired Sub-Menu is displayed with the arrow "→", press ENTER to select the corresponding Sub-Menu.

At any time while in the Operator Menu, the user can return to Normal display mode by pressing MENU or scrolling to:



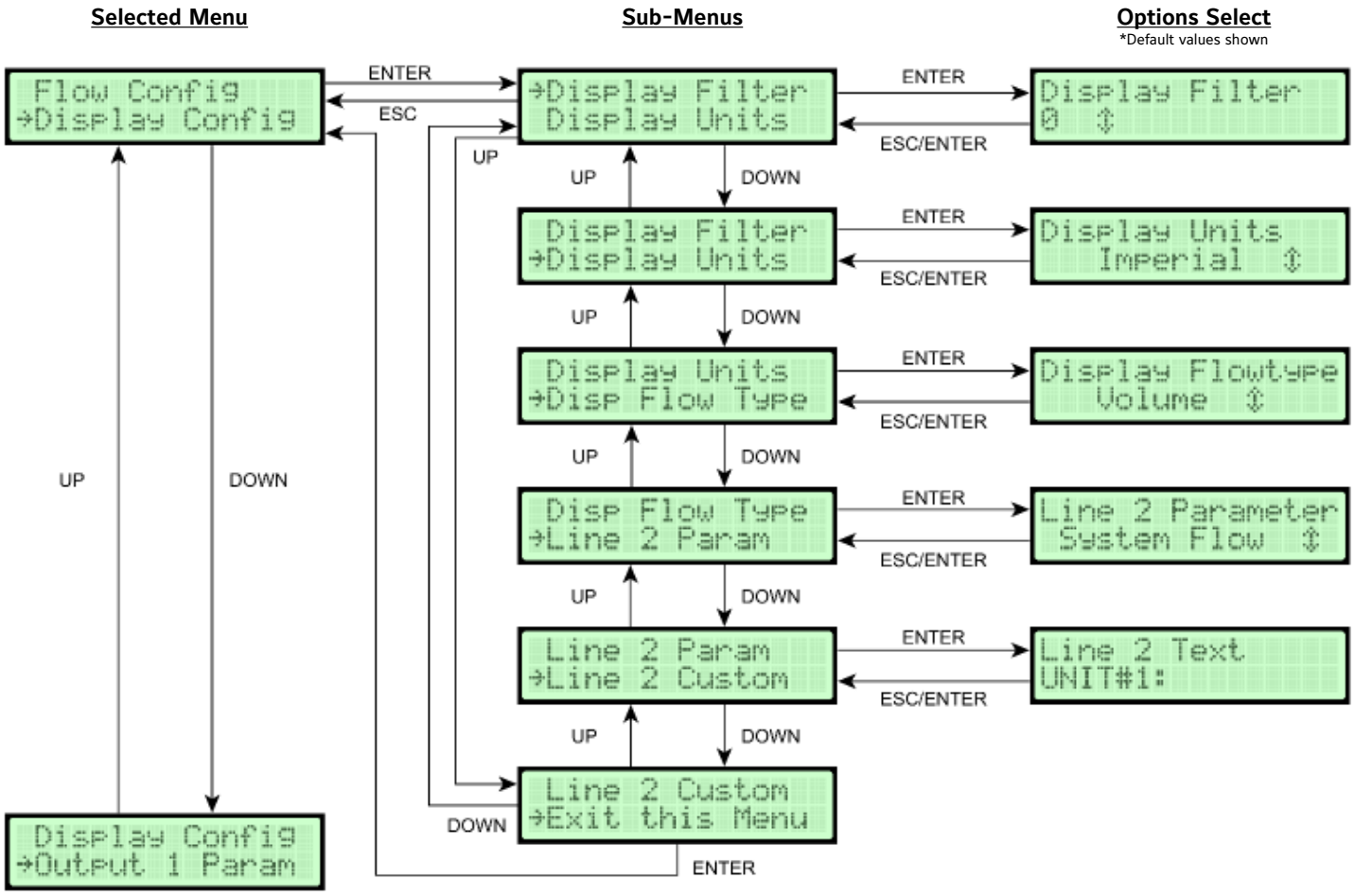


And pressing ENTER. Then scroll DOWN to Exit all Menus and press ENTER.

Operator Sub-Menu Example

Arrows with pushbutton designations have been included on the following flow chart of Display Configuration Menu. This will aid in the navigation of the setup configuration process.

Example of navigation is similar for all Operator Sub-Menu selections.



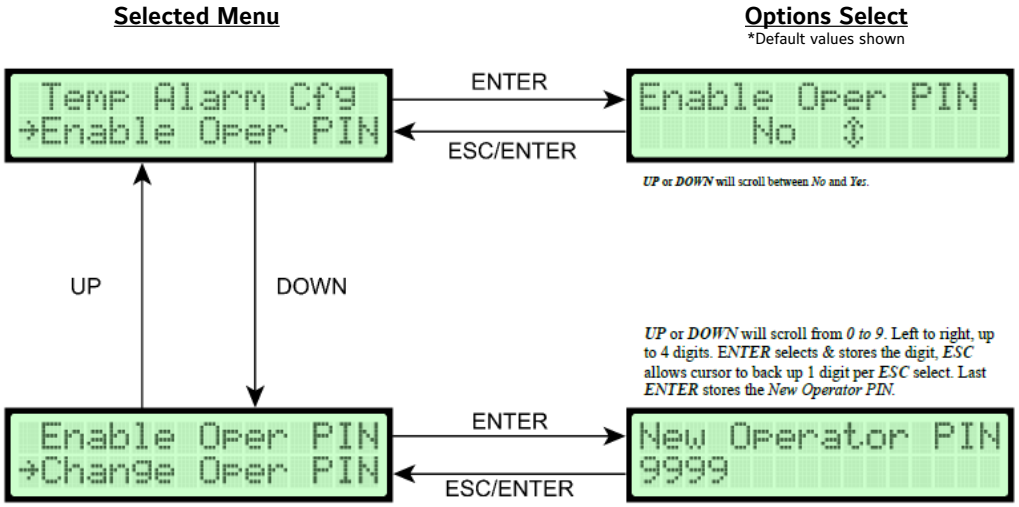
Configuration Selections	Configuration Options
Display Filter	Select between 0 and 9 where 0 is off. Filtering is equal to the value times 10%. Ex. A value of 2 would be 20% filtering. 9 is maximum filtering, 0 is no filtering.
Display Units	Select between SI or Imperial units
Display Flow Type	Select between Velocity or Volume
Line 2 Parameter	Select between System Flow or Custom Text for the text appearing on line 2 of the display. The BACnet or Modbus device name gets updated to display the custom text when this value is set to Custom Text. BACnet or Modbus service must be restarted to display changes.
Line 2 Custom Text	Select up to sixteen (16) ASCII characters to display on line 2 of the display. Custom text longer than 7 characters will scroll 1 character at a time. Trailing spaces are ignored.

NOTE: An arrow " ► " symbol will be displayed on the left side of the currently selected menu, sub-menu, or option. Scrolling ability for data entry will have a " ⇕ " symbol displayed on the line 2 of the display. Certain values are edited a single digit or character at a time. The currently selected digit or character for those values will blink.

The remainder of this Section details steps to verify or change TDFi-FA System Configuration Setup of Operator Sub-Menus.

Operator Pin Selection

Allows the configuration of an Operator PIN. PIN options are at the bottom of the Operator Menu.



Note: The Operator Menu can be only accessed with a PIN, when enabled.

Example below depicts the Operator Menu selected when the Operator PIN is enabled:

Note: From the Factory, PIN is 9999 and is not enabled.

Use UP or DOWN to change PIN one digit at a time. The cursor position originates at the left, most significant, and working right, least significant with 0 to 9 digit representation during the UP or DOWN scroll. Press ENTER to then select the 0 to 9 entry and moves to the next digit. ESC pressed will cause the cursor to back up one digit per press. Once desired PIN is displayed, press ENTER on the last digit. New PIN will be stored in memory and display will return to previous menu.

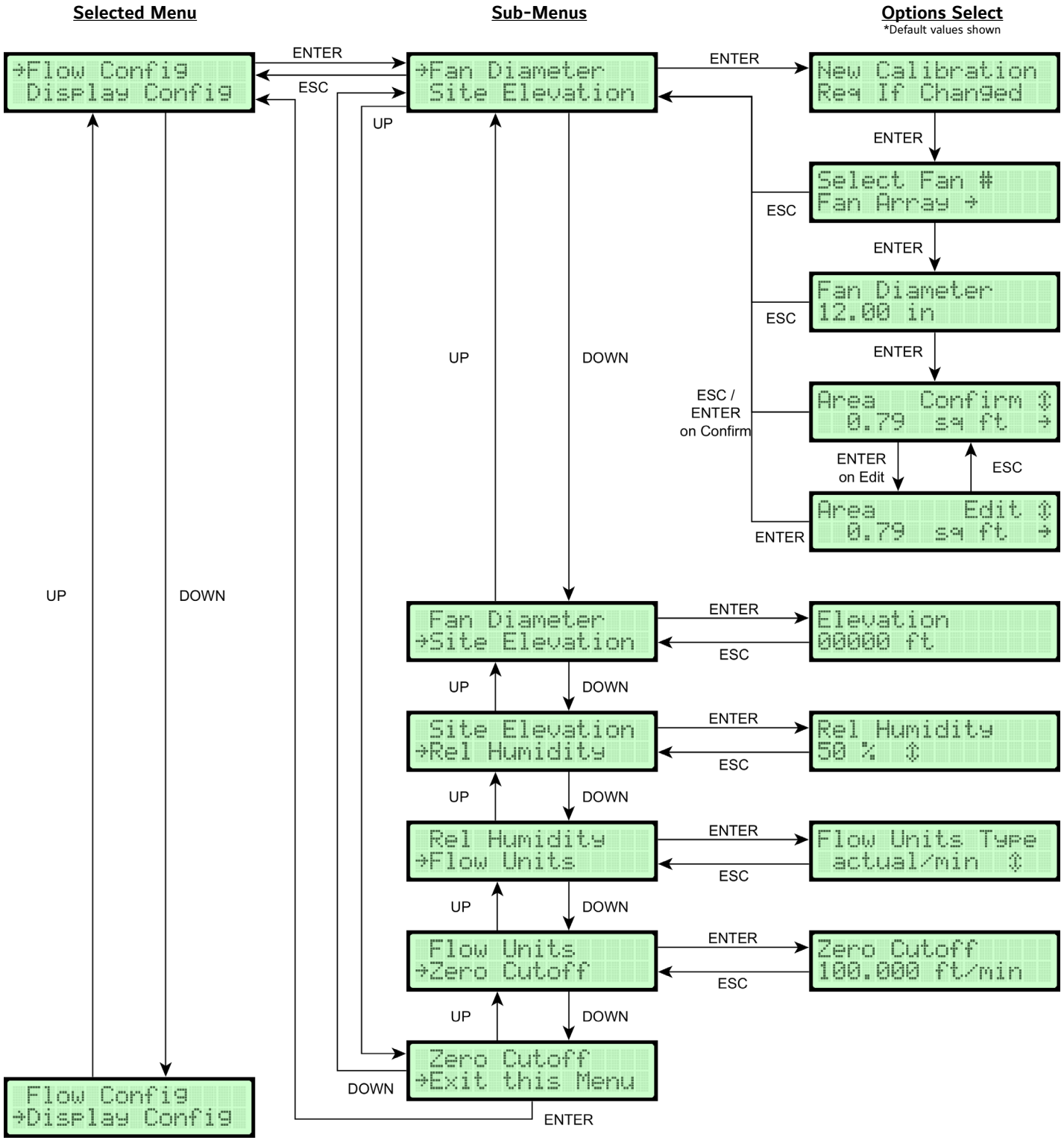
Caution: If PIN is enabled or changed, write it down and retain in system configuration records in the case it is forgotten.

Note: If user desires not to change PIN, press ESC. The controller will remain programmed as it was originally.

1. To return to Main Menu, scroll and select Exit Operator Menu, press ENTER. Alternatively, pressing ESC from the Operator Menu will exit out to the Main Menu.
2. To return to Normal display mode, press MENU.

Flow Configuration

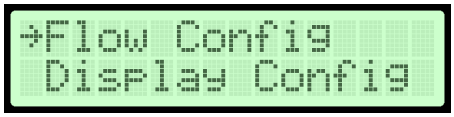
The Operator Menu selection is where all application specific data is entered to configure the TDFi-FA Host Monitor for a unique application. Typical data includes: Units of Measure, Fan Diameters, Flow Units, Site Elevation, System Ranges, and Zero Cutoff.



Configuration Selections	Configuration Options
Fan Diameter	Select the diameter associated with the fans of the fan array. Must be between 6" and 46". The TDFi-FA will configure the diameter to be the same for all fans. Selecting 'Fan Array' will configure the diameter to be the same for all fans. If a specific area is needed, selecting 'Edit' will allow manual area entry.
Site Elevation	Enter the site elevation from 0 to 15,000 feet or 0 to 4572 meters.
Relative Humidity	Enter the relative humidity from 0 to 100%, 1% at a time.
Flow Units	Enter the flow units. Refer to Table 1 for available Units.
Output Lockout	Enter the output lockout from 0 to 750 FPM or 0 to 3.81 MPS. When the measured velocity of a fan is less than this amount, the output will remain zero.

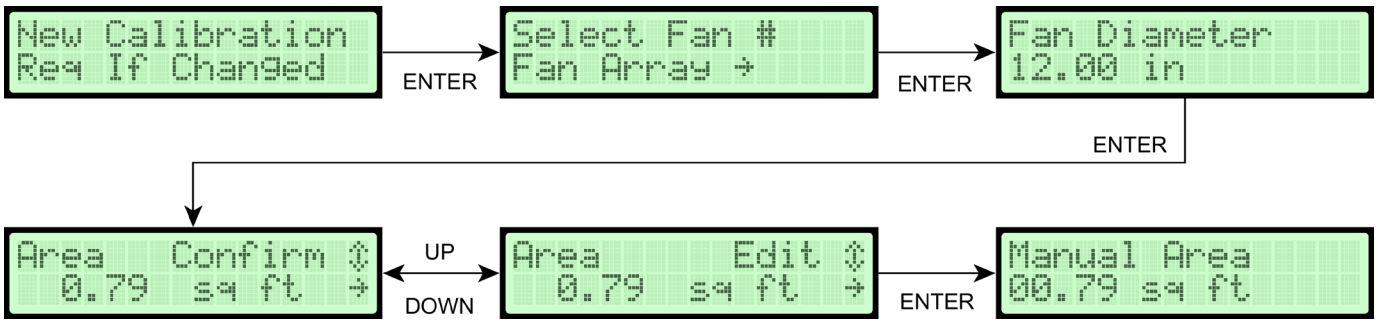
Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

1. While in Operator Menu, use UP or DOWN to scroll to:



2. Press ENTER to enter Flow Configuration Menu. Display will indicate:

3. Press ENTER and display will prompt the user to confirm that a new calibration is required if diameter is modified. Use Up and DOWN to select the fan or fan array. Press ENTER to select the fan or fan array to view and edit its diameter. Selecting Fan Array will set the same diameter for all fans. When viewing the calculated area, use UP or DOWN to select between 'Confirm' and 'Edit' and press ENTER to select. Selecting 'Confirm' will accept the entered diameter and calculated area. Selecting 'Edit' will allow manual entry for the area and will change the diameter to match the entered area.



4. Use UP or DOWN to change setting. Once desired setting is displayed, press ENTER. New setting will be stored in memory and display will progress through the required values for the shape selected and save each value as they are confirmed. With all required values entered the display will return to the Flow Configuration Menu shown in Step #2.
5. Use UP or DOWN to select remaining parameters to be changed within the Flow Configuration Menu. Press ENTER to change the selected setting.

Note: See Tables 2 and 3 for the list of available selections for the appropriate Flow Type.

Table 2: Volumetric Units of Measurement from Flow Unit selection and Display Units

Actual Flow Units	SI Units	Imperial Units
Actual/Sec	ALPS	ACFS
Actual/Min	ALPM	ACFM
Actual/Hour	ACMH	ACFH

Standard Flow Units	SI Units	Imperial Units
Standard/Sec	SLPS	SCFS
Standard/Min	SLPM	SCFM
Standard/Hour	SCMH	SCFH

Table 3: Volumetric Units of Measurement

Volumetric units of measurement	Display
Actual cubic feet per second	ACFS
Actual cubic feet per minute	ACFM
Actual cubic feet per hour	ACFH
Actual liters per second	ALPS
Actual liters per minute	ALPM
Actual cubic meters per hour	ACMH

Volumetric units of measurement	Display
Standard cubic feet per second	ACFS
Standard cubic feet per minute	SCFM
Standard cubic feet per hour	SCFH
Standard liters per second	SLPS
Standard liters per minute	SLPM
Standard cubic meters per hour	SCMH

6. To return to the Operator Menu, scroll to Exit this Menu in the Flow Configuration Menu and press ENTER. Alternatively, pressing ESC will also return to the Operator Menu. Pressing MENU pushbutton will return to the Normal display mode.

Display Configuration

Allows selection of display units, parameters, Line 2 customizing, and the level of display filtering, 0 to 9 (0 is off, 9 is 90%).

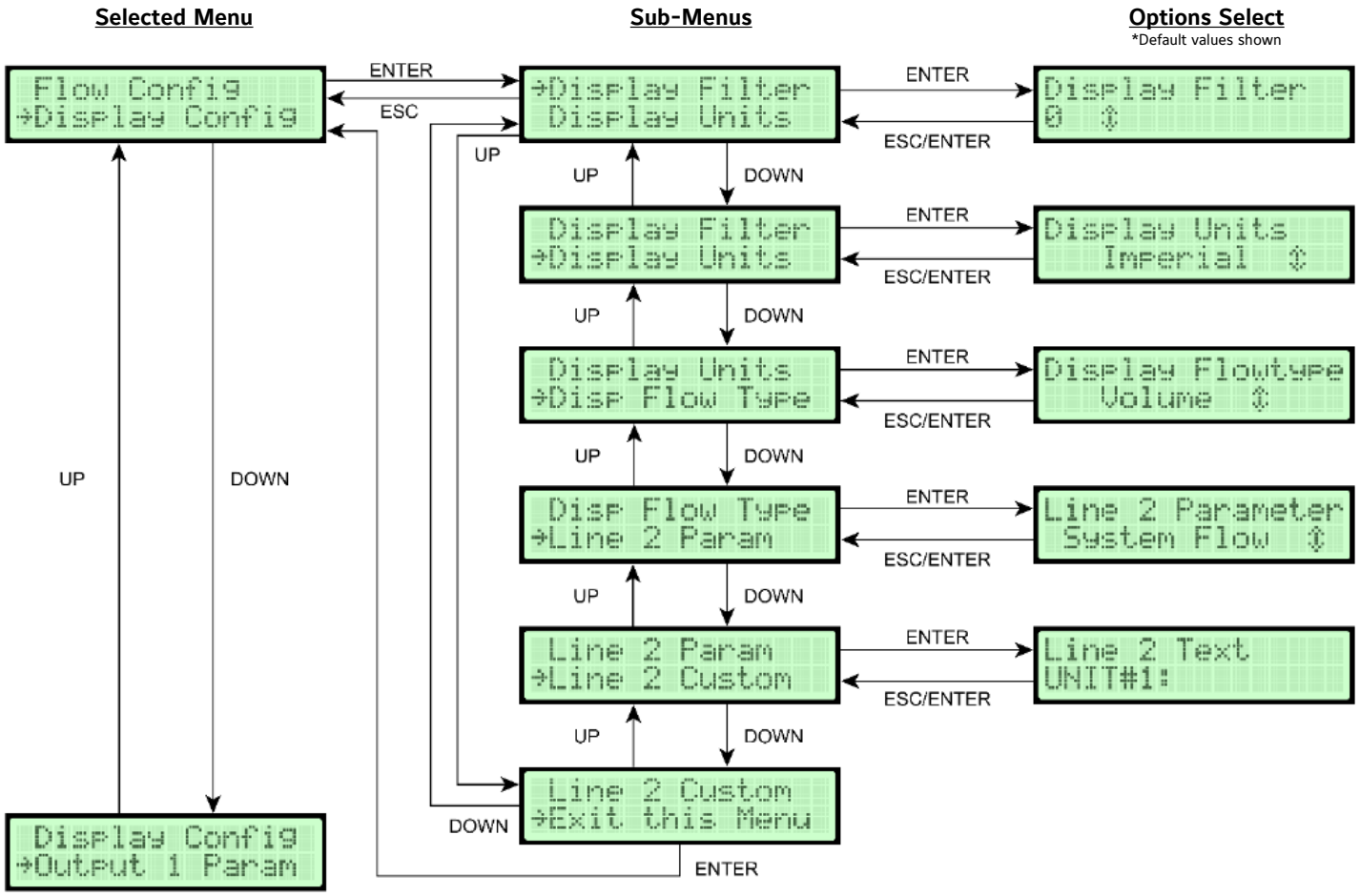
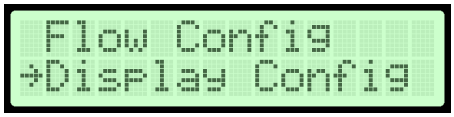


Table 4: Display Configuration Sub-Menu Selections and Configuration Options

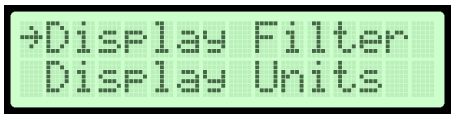
Display Configuration Sub-Menu Selections	Configuration Options
Display Filter	Select between 0 and 9 where 0 is off. Filtering is equal to the value times 10%. Ex. A value of 2 would be 20% filtering. 9 is maximum filtering, 0 is no filtering.
Display Units	Select between SI or Imperial units
Display Flow Type	Select between Velocity or Volume
Line 2 Parameter	Select between System Flow or Custom Text for the text appearing on line 2 of the display. The BACnet or Modbus device name gets updated to display the custom text when this value is set to Custom Text. BACnet or Modbus service must be restarted to display changes
Line 2 Custom Text	Select up to sixteen (16) ASCII characters to display on line 2 of the display. Custom text longer than 7 characters will scroll 1 character at a time. Trailing spaces are ignored.

Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

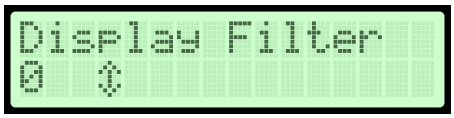
1. While in Operator Menu, use UP or DOWN to scroll to:



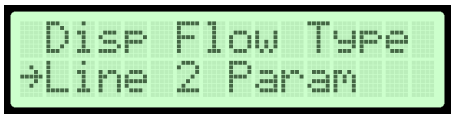
2. Press ENTER to enter Display Configuration Menu. Display will indicate:



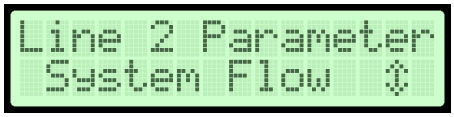
3. Press ENTER and the display will indicate current setting of the filter 0 to 9 (0 is off, 4 is 40%).



4. Use UP or DOWN to change setting. Once desired setting is displayed, press ENTER, new setting will be stored in memory and the display will return to Display Configuration Menu as in Step #2.
5. Use DOWN scroll to indicate:



6. Press ENTER and display will indicate current parameter selected to display on Line 2 [Velocity or Volume (determined by Flow Type setting) or Custom Text].



7. Use UP or DOWN to scroll to desired parameter. Press ENTER and parameter will be stored in memory and the display will indicate as in Step #5.
8. Scroll through the remaining Display Configuration Menu settings and make the appropriate system setup changes.
9. If Custom Text was selected and ENTER pressed in Step #7, scroll to Line 2 Custom and press ENTER.
10. Use UP or DOWN to scroll through available characters set (see ASCII chart, Table 5, at the end of this Section for available characters).
11. When desired character is displayed, press ENTER. Character will be stored and cursor will advance one position to the right, ESC allows the Operator to back-up one character position.

12. Repeat Steps 10 and 11 for the remaining character positions. When position 16 is entered, user will be exited back to display as in Step 13 and Custom Text will be stored in memory.
13. Scroll to Exit this Menu and press ENTER to back out to the Operator Menu, otherwise, press MENU to return to the Normal display mode. Alternatively, pressing ESC will also return to the Operator Menu.

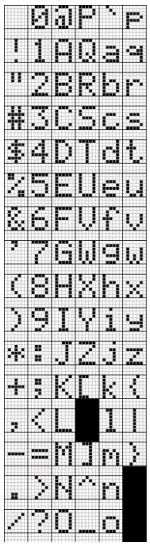
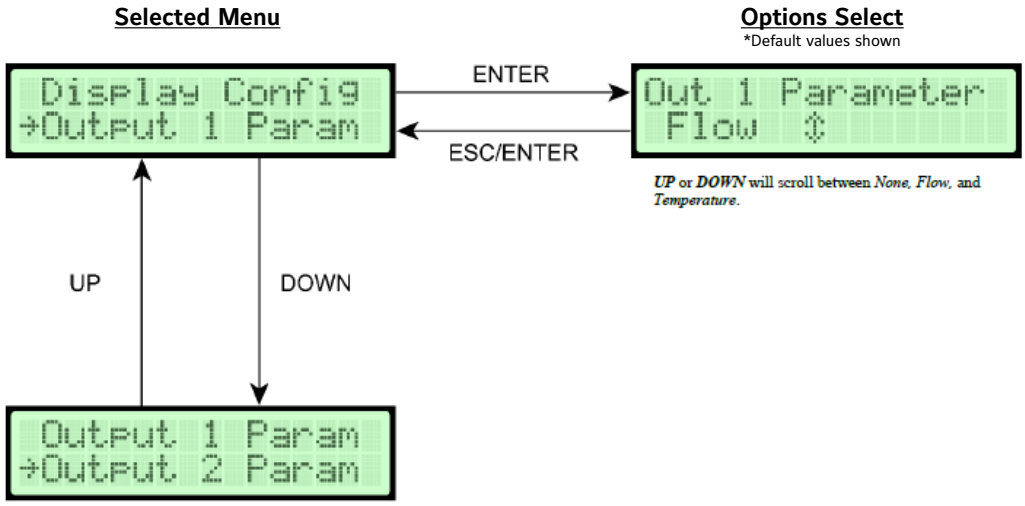


Table 5: LCD Character Chart

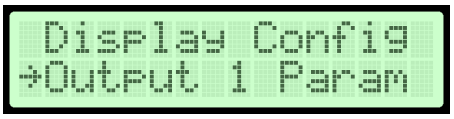
Analog Output 1 Parameters

Allows the selection for which the process variables Output #1 represent. Process variables available for output are: Flow, Temperature, or None. If Flow is selected, output will represent the user's defined flow Design Range. If Temperature is selected, output span will be the user's temperature Design Range. The Fan Summary values controls the analog output.

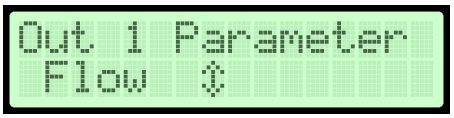


Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

1. While in Operator Menu, use UP or DOWN to scroll to:



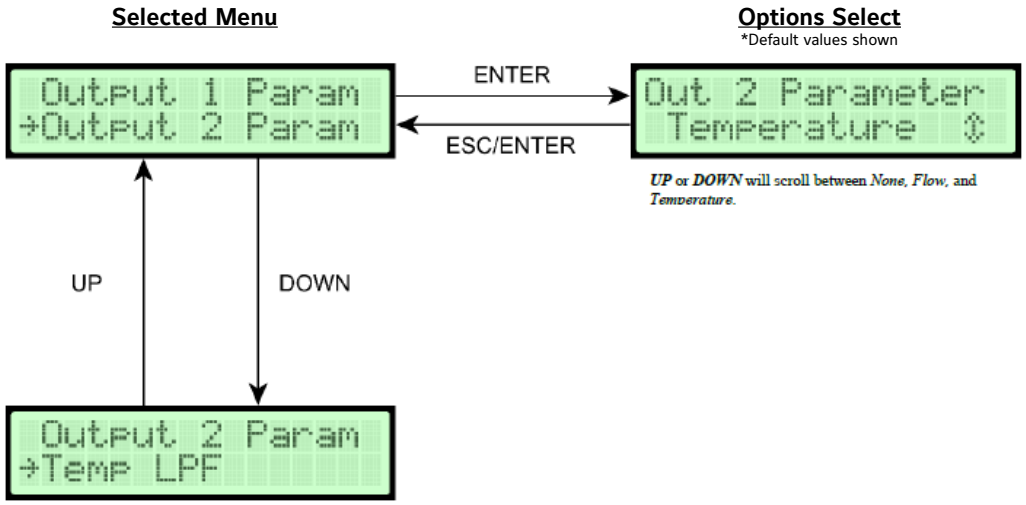
2. Press ENTER and display will indicate current setting of Analog Output #1 (Flow, Temperature or None).



3. Use UP or DOWN to change setting. Once desired setting is displayed (Flow, Temperature or None), press ENTER. New setting will be stored in memory and display will return as in Step #1.

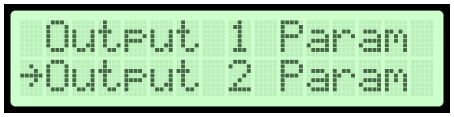
Analog Output 2 Parameters

Allows the selection for which the process variables Output #2 represent. Process variables available for output are: Flow, Temperature, or None. If Flow is selected, output will represent the user's defined flow Design Range. If Temperature is selected, output span will be the user's temperature Design Range. The Fan Summary values controls the analog output.

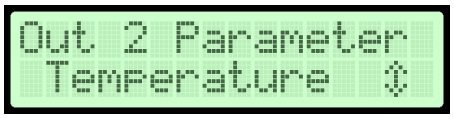


Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

1. While in Operator Menu, use UP or DOWN to scroll to:



2. Press ENTER and display will indicate current setting of Analog Output #2 (Flow, Temperature or None).



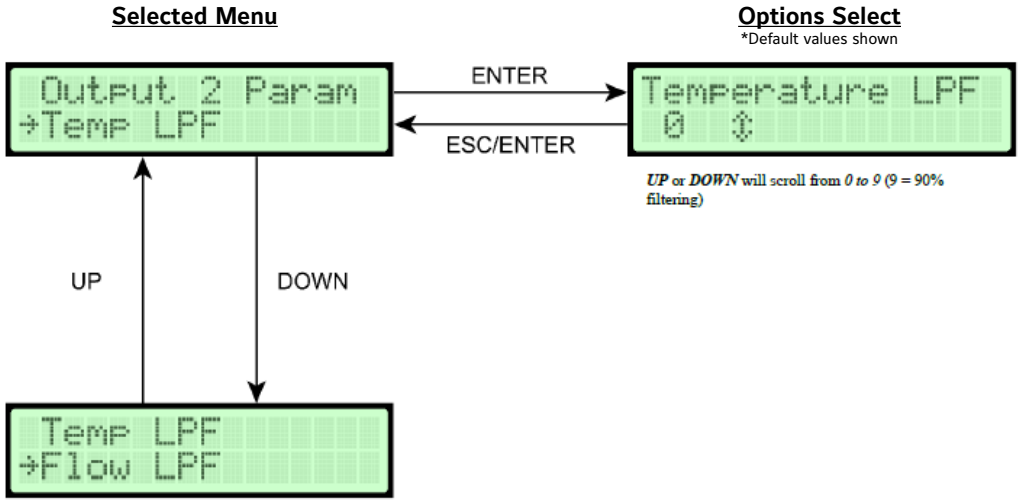
3. Use UP or DOWN to change setting. Once desired setting is displayed (Flow, Temperature or None), press ENTER. New setting will be stored in memory and display will return as in Step #1.

Temperature Output LPF (Low Pass Filter)

Allows selection of level of Process filtering applied to Temperature outputs. Levels are 0 to 9, with 0 representing the filter off and 9 for maximum filtering (Each unit of filtering is equal to 10% filtering, e.g., 2 is equal to 20%).

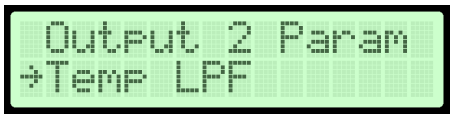
Note: Display Filter is an additional filter selection applied only to the display.

This filtering affects reported temperature values and analog channels configured for temperature

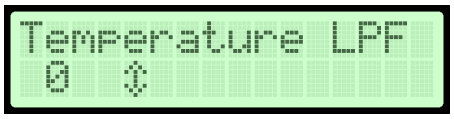


Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

1. While in Operator Menu, use UP or DOWN to scroll to:



2. Press ENTER and display will indicate current setting of Process filter (0 (off) to 9 (maximum); 9 = 90%).



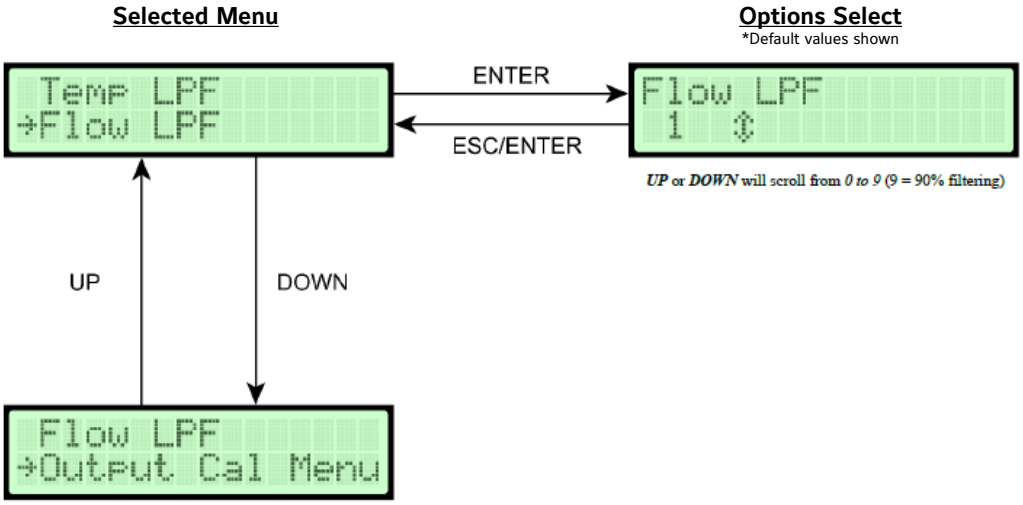
3. Use UP or DOWN to change setting. Once desired setting is displayed, press ENTER. New setting will be stored in memory and display will return as in Step #1.

Flow Output LPF (Low Pass Filter)

Allows selection of level of Process filtering applied to Flow outputs. Levels are 0 to 9, with 0 representing the filter off and 9 for maximum filtering (Each unit of filtering is equal to 10% filtering, ex. 2 is equal to 20%).

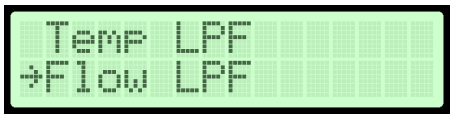
Note: Display Filter is an additional filter selection applied only to the display.

This filtering affects reported flow values and analog channels configured for flow.

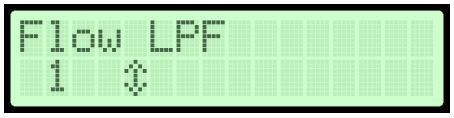


Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

1. While in Operator Menu, use UP or DOWN to scroll to:



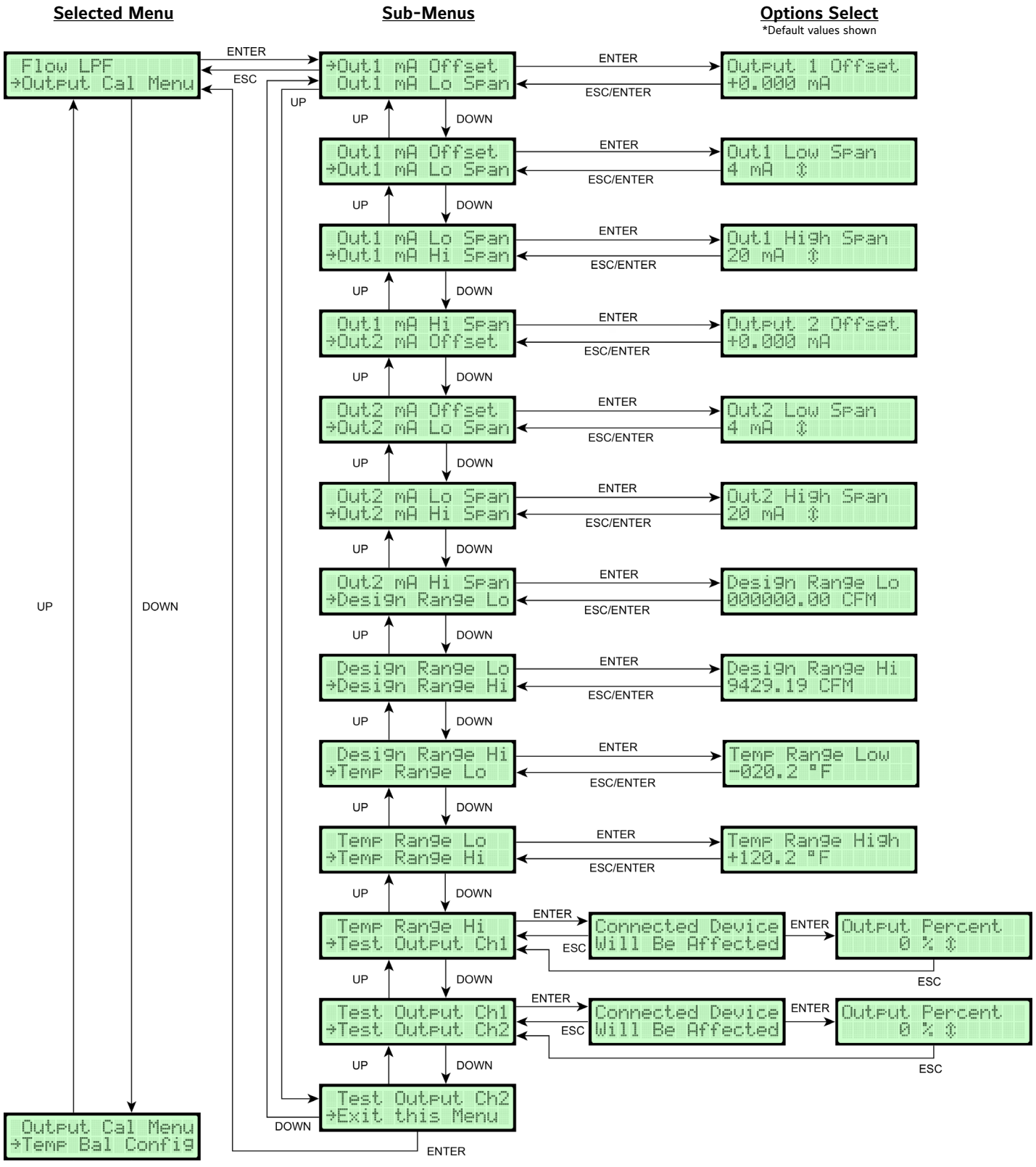
2. Press ENTER and display will indicate current setting of Process filter (0 (off) to 9 (maximum); 9 = 90%).



3. Use UP or DOWN to change setting. Once desired setting is displayed, press ENTER. New setting will be stored in memory and display will return as in Step #1.

Analog Output Calibration

Allows for the calibration adjustments of the TDFi-FA Host Monitor Analog Outputs 1 & 2.

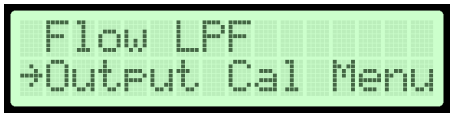


Configuration Selections	Configuration Options
Output 1 mA Offset	Set the mA Offset for Output 1 from -2 mA to +2 mA.
Output 1 mA Low Span	Select the Low Span of Output 1 from 1 to 4 mA. Must be lower than the High Span.
Output 1 mA High Span	Select the High Span of Output 1 from 1 to 20 mA. Must be higher than the Low Span.
Output 2 mA Offset	Set the mA Offset for Output 2 from -2 mA to +2 mA.
Output 2 mA Low Span	Select the Low Span of Output 2 from 1 to 4 mA. Must be lower than the High Span.
Output 2 mA High Span	Select the High Span of Output 2 from 1 to 20 mA. Must be higher than the Low Span.
Design Range Low	Set the Design Range Low for outputs configured for Flow from 0 to 12,000 FPM (or equivalent volumetric flow). Must be lower than Design Range High.
Design Range High	Set the Design Range High for outputs configured for Flow from 0 to 12,000 FPM (or equivalent volumetric flow). Must be higher than Design Range Low.
Temperature Range Low	Set the Temperature Range Low for outputs configured for Temperature from -25 to +140°F. Must be lower than Temperature Range High.
Temperature Range High	Set the Temperature Range High for outputs configured for Temperature from -25 to +140°F. Must be higher than Temperature Range Low.
Output 1 Test	Allows the user to test Output 1 with the Offset and Span settings at 0, 50, and 100% output.
Output 2 Test	Allows the user to test Output 2 with the Offset and Span settings at 0, 50, and 100% output.

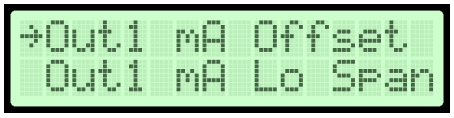
This section can be accomplished with the TDFi-FA Host Monitor mounted in its operating location or at a test bench in a calibration lab.

Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

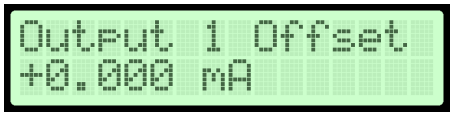
1. Set Analog Output #1's parameter to None to keep the output from changing with flow or temperature.
2. While in Operator Menu, use UP or DOWN to scroll to:



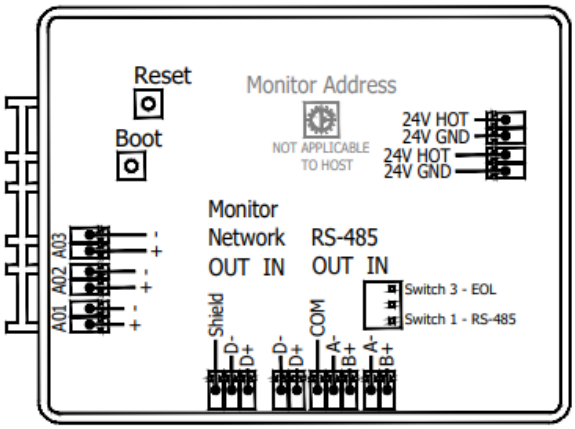
3. Press ENTER to enter Output Calibration Menu. Display will indicate:



4. Press ENTER. Display will indicate:



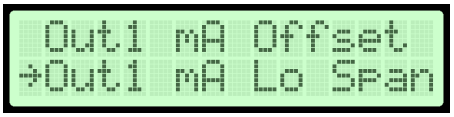
5. Connect a DMM set for the scaling of the Analog Output #1 across terminals 1 and 2 on the TDFi-Rt Host Monitor.



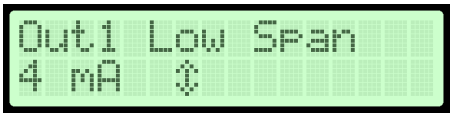
HOST MONITOR

Note: Output is 1-20mA, a load resistance should be in series with the Digital Multi-Meter. This can be accomplished by connecting the actual process load or a resistor of similar value to the actual process load (250 Ω min).

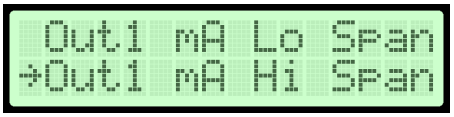
6. Digital Multi-Meter should be reading a minimum value: 4.00 ± 0.01mA, as determined in the Output 1 Span.
7. If the Digital Multi-Meter is reading out of tolerance, use UP or DOWN to adjust the TDFi-FA Host Monitor output for an acceptable reading. Single digit data entry, left to right, to change the Output 1 Offset. Once ENTER is pressed on the last digit, the Digital Multi-Meter will reflect the adjusted Output 1 Offset.
8. Once an acceptable zero reading is obtained, scroll UP or DOWN and display will indicate:



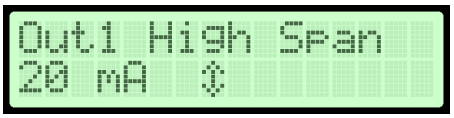
9. Press ENTER. Display will indicate:



10. Set the low span using Up and Down to scroll between 1-4 mA. The Low span must be lower than the high span. Once the low span set, press ENTER and then scroll and the display to indicate:



11. Press ENTER. Display will indicate:

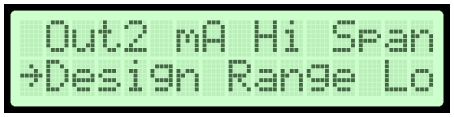


12. Set the high span using Up and Down to scroll between 1-20 mA. The high span must be higher than the low span. Once the high span is set, press ENTER to confirm the setting.
13. Analog Output #1's parameter can now be set back to its previous value before the calibration process.
14. Repeat Steps 1 through 8 for TDFi-FA Monitor Host Analog Output #2, connect Digital Multi-Meter across terminals 3 and 4.

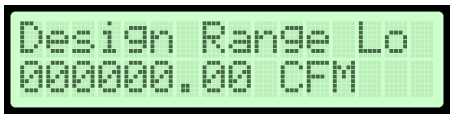
Note: Output is 1-20mA, a load resistance should be in series with the Digital Multi-Meter. This can be accomplished by connecting the actual process load or a resistor of similar value to the actual process load (250 Ω min).

Warning: Failure to put resistance in series with output will trip internal solid state fuse protection.

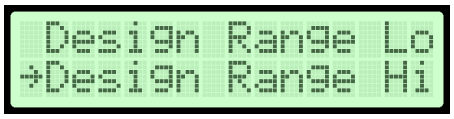
15. Now that both analog outputs have been configured and calibrated, the Design Range Low and Design Range High should be configured. Scroll to display:



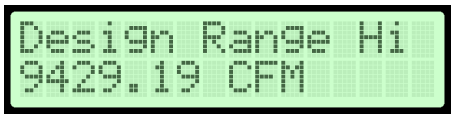
16. Press ENTER. Display will indicate:



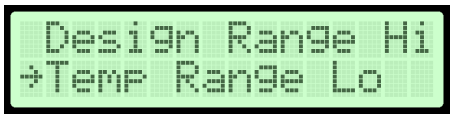
17. Press UP or DOWN to adjust the Design Range Low value. Single digit entry, left to right. Press ENTER after the final digit to confirm the value.
18. Press UP or DOWN to scroll and display:



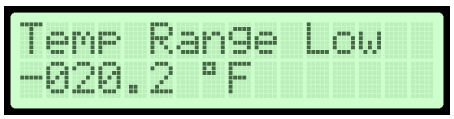
19. Press ENTER. Display with indicate:



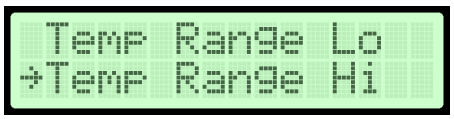
20. Press UP or DOWN to adjust the Design Range High value. Single digit entry, left to right. Press ENTER after the final digit to confirm the value.
21. The final design range to configure is the Temperature Range Low and Temperature Range High. Scroll to display:



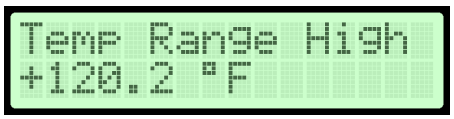
22. Press ENTER. Display will indicate:



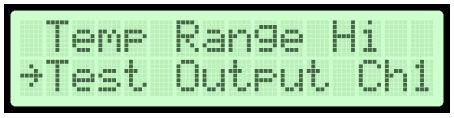
23. Press UP or DOWN to adjust the Temperature Range Low value. Single digit entry, left to right. Press ENTER after the final digit to confirm the value.
24. Press UP or DOWN to scroll and display:



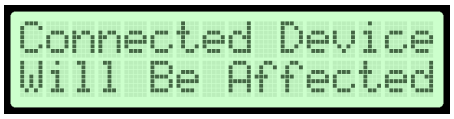
25. Press ENTER. Display will indicate:



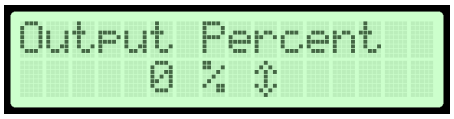
26. Press UP or DOWN to adjust the Temperature Range High value. Single digit entry, left to right. Press ENTER after the final digit to confirm the value.
27. Press UP or DOWN to scroll and display:



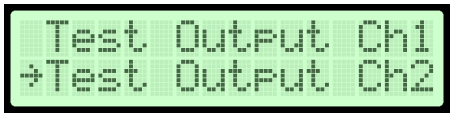
28. Press ENTER. Display will indicate:



29. Press ENTER to confirm warning prompt. ESC will return to the Output Cal Menu without affecting the output. When confirmed, display will indicate:



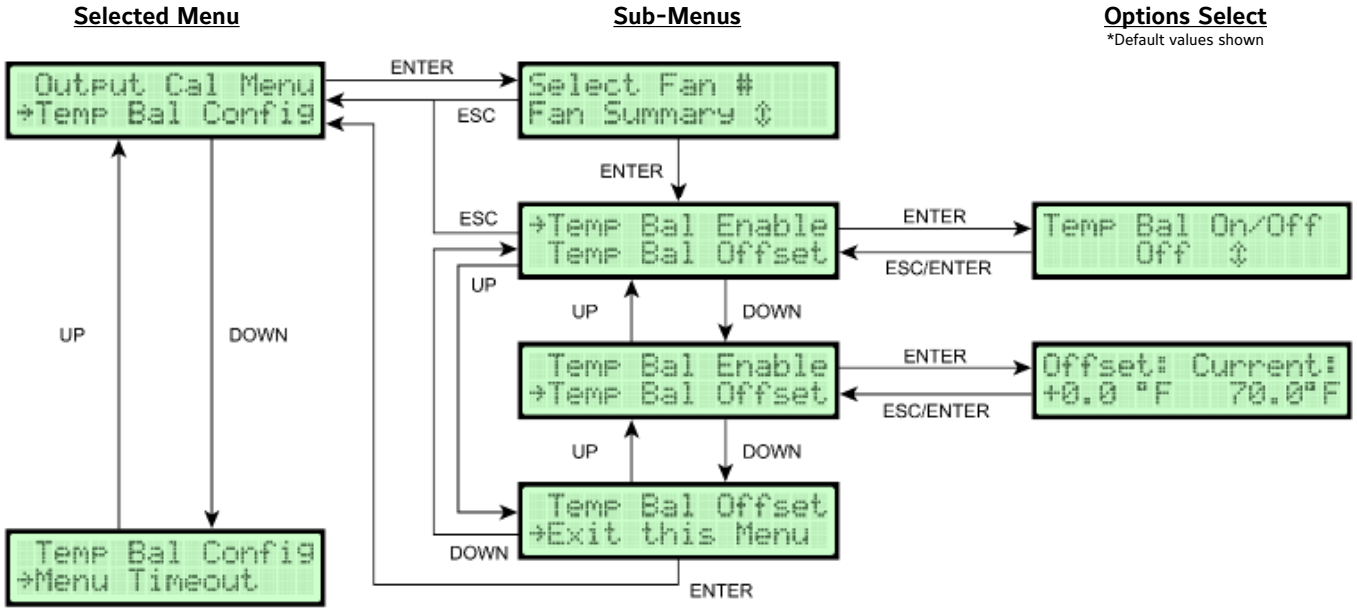
30. Press UP or DOWN to adjust the channel's output between 0, 50, and 100%. A 0% will output the channel's low span,100% the channel's high span.
31. Press ESC to return back to the Output Cal Menu. Returning to the menu or normal operating screen will stop all test output and return the outputs to normal operation.
32. Press UP or DOWN to scroll and display:



33. Press ENTER to test the output for channel 2 using steps 27 through 31.
34. Press UP or DOWN to scroll to Exit this Menu, press ENTER to back out to the Operator Menu. Alternatively, pressing ESC will also return to the Operator Menu.

Temperature Balance Configuration

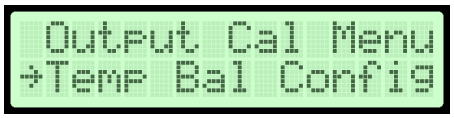
The Temperature Balance Configuration sub-menu applies a temperature offset to the displayed and reported temperature for the fan summary and each fan.



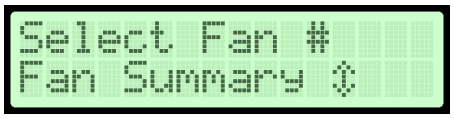
Temperature Balance Configuration Sub-Menu Selections	Configuration Options
Temperature Balance Enable	Set the offset for the selected fan.
Temperature Balance Offset	Sets the offset for the selected fan from -5.4 to +5.4°F

Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

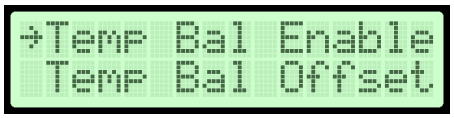
1. While in Operator Menu, use UP or DOWN to scroll to:



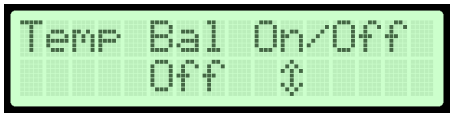
2. Press ENTER to enter the Temperature Balance Configuration menu and display will indicate below:



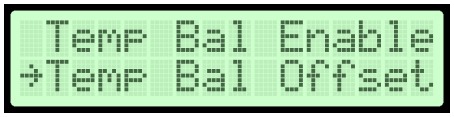
3. Use UP and DOWN to select the fan or summary to edit its Temperature Balance Configuration. Press ENTER to confirm the selection. The Display will then indicate:



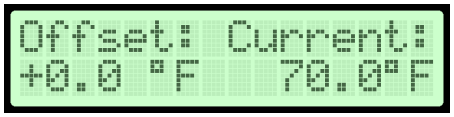
4. Press ENTER. Display will indicate:



5. Use UP or DOWN to enable Temperature Balance, ON / OFF. Press ENTER to confirm the selection. Scroll to display:



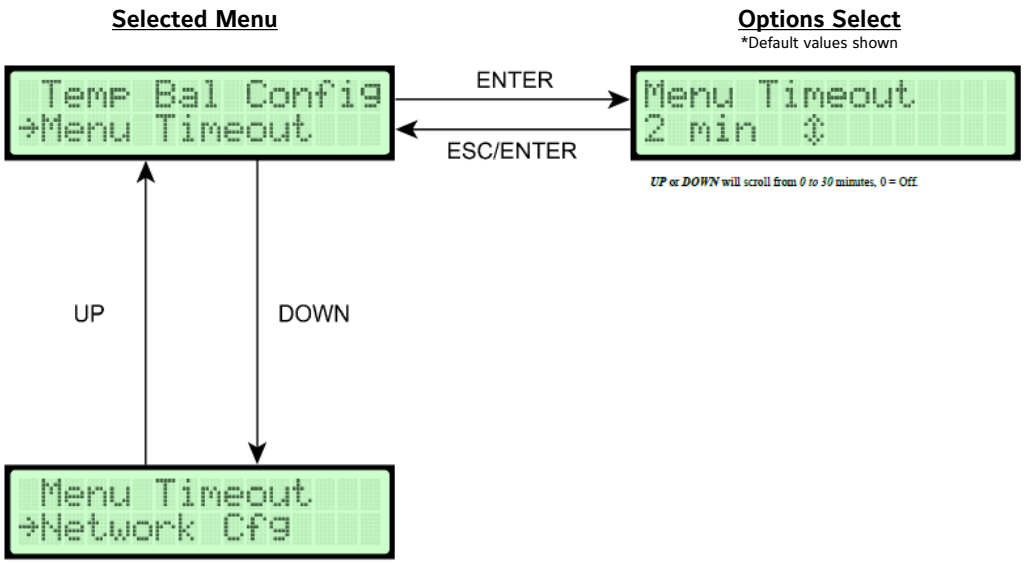
6. Press ENTER. Display will indicate:



7. Scroll UP / DOWN to change the currently selected value. Single digit entry, left to right. The temperature displayed on the left side, line 2, is the offset and the right side, line 2, is a 'live' view of the current temperature with the last confirmed offset. Once the last digit is adjusted, press ENTER to confirm the new offset.
8. Press UP or DOWN to scroll to Exit this Menu, press ENTER to back out to the Operator Menu. Alternatively, pressing ESC will also return to the Operator Menu.

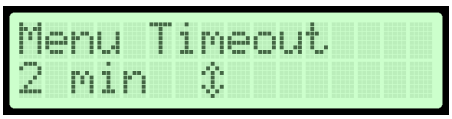
Menu Time-Out

The Menu Time-Out sub-menu allows user to select a time (minutes) after which the unit returns to Normal operation mode if no activity in the Operator Menu. This time is also linked to the back light. A setting of 0 will never timeout and the back light will always be on.



1. While in Operator Menu, use UP or DOWN to scroll to:

2. Press ENTER and display will indicate current timeout value (1 to 30 minutes or (0) OFF).

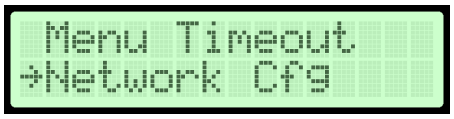


3. Use UP or DOWN to change timeout value. Once desired value is displayed, press ENTER. New setting will be stored in memory and display will return to Main Menu.

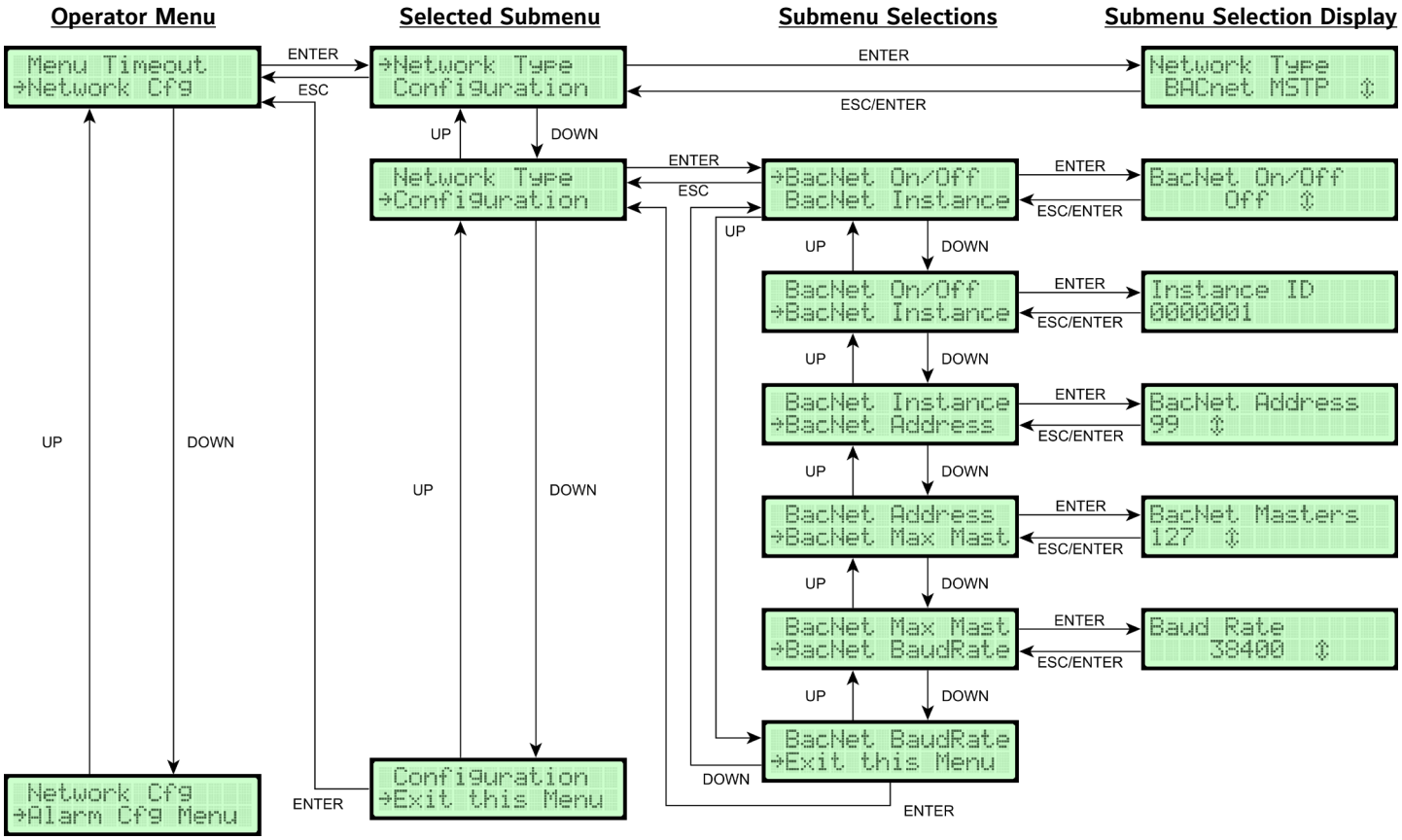
BACnet Network Configuration

The BACnet Network Configuration submenu turns BACnet on or off and configures parameters based on the BACnet type.

1. In the Operator Menu, press UP or DOWN to scroll to the BACnet Network Configuration submenu.



2. Press ENTER.
3. Scroll through the submenu options and make any necessary updates. See Table 5 for a description of the BACnet Network Configuration submenu selection options and their configurable options.



Firmware Note: Only **ONE** Network output configuration can be active at a time.

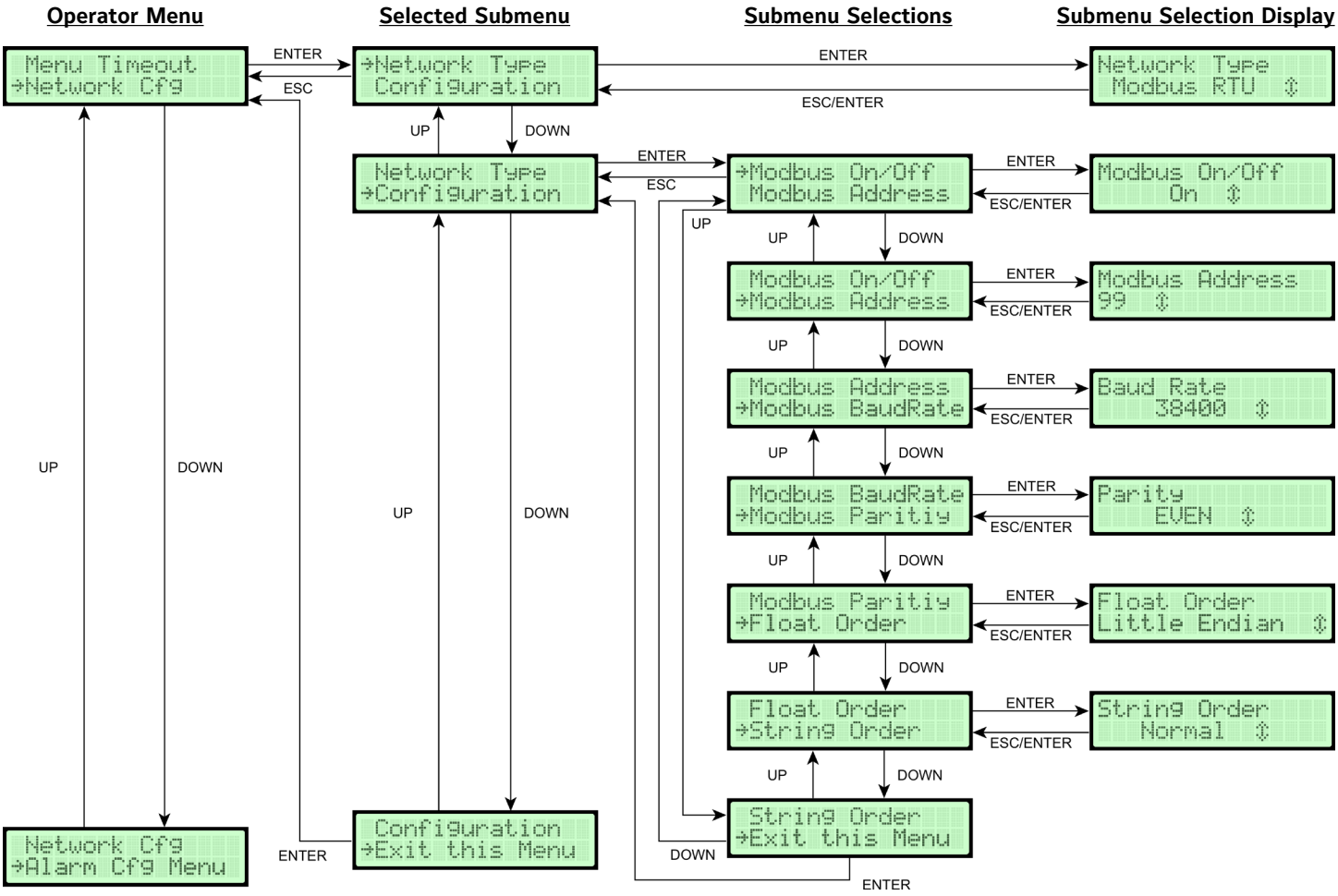
- Modbus RTU (Default On)
- BACnet (Default Off)

Table 5: BACnet Network Configuration Submenu Selections and Configurable Options

BACnet Network Configuration Submenu Selections	**Configurable Options**
BACnet On/Off	Select On or Off.
BACnet Instance	Update the currently selected value. The instance number must be unique from all BACnet devices on the entire system. The range of values is 1 to 4,194,302.
BACnet Address	Select a value between 4 and 127. Holding down the button increases the rate the value updates
BACnet Max Mast	Select a value between 1 and 127. Holding down the button increases the rate the value updates.
BACnet Baud Rate	Select the 9,600, 19,200, 38,400 (default), or 76,800 baud rate.

Modbus RTU Network Configuration

The Modbus RTU Network Configuration sub-menu turns Modbus RTU on or off and configures parameters based on the Modbus RTU type.



Firmware Note: Only **ONE** Network output configuration can be active at a time.

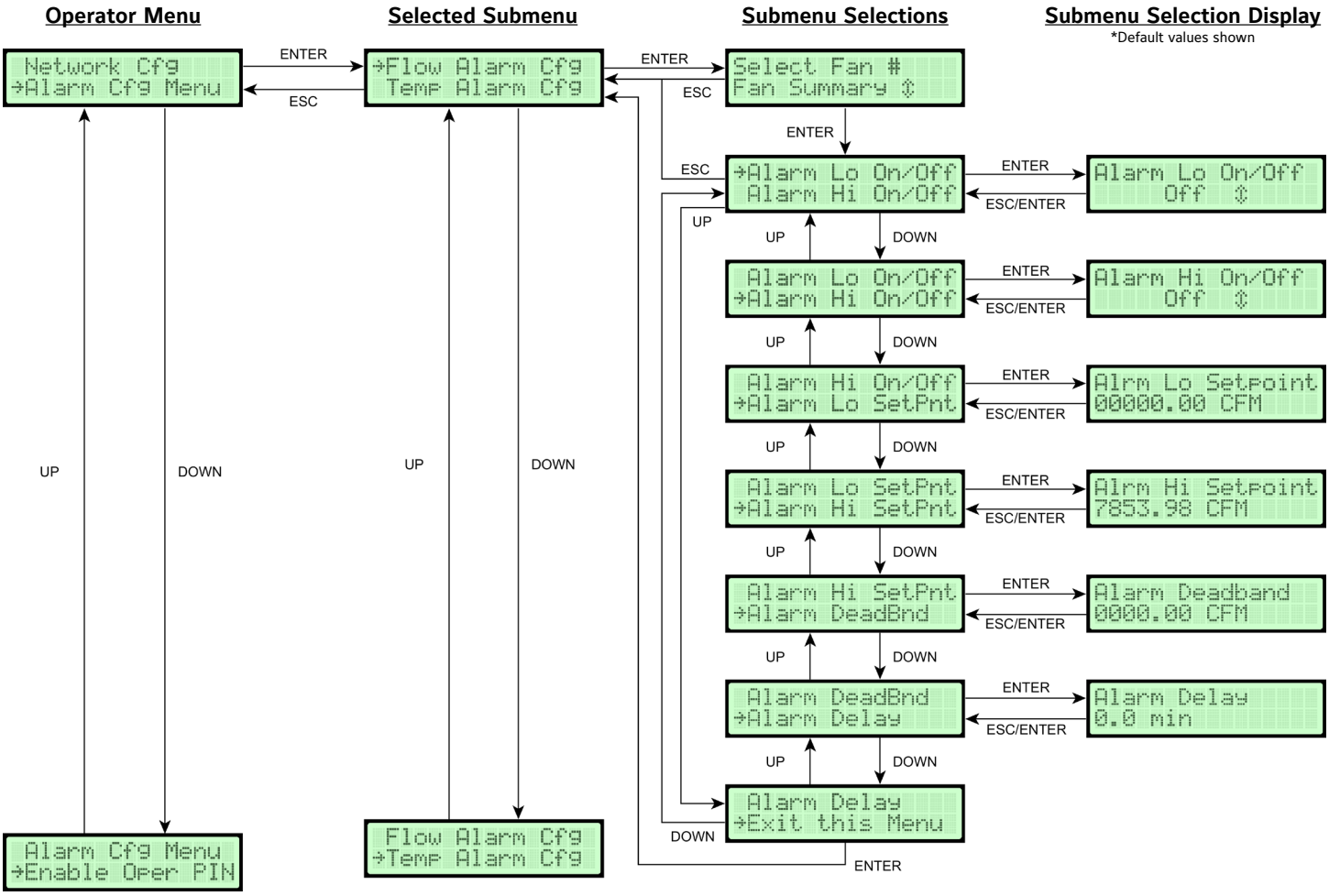
- Modbus RTU (Default On)
- BACnet (Default Off)

Table 6: Modbus RTU Network Configuration Submenu Selections and Configurable Options

Modbus RTU Network Configuration Submenu Selections	**Configurable Options**
Modbus On/Off	Select On or Off.
Modbus Address	Select a value between 1 and 247. Holding down the button increases the rate the value updates
Modbus Baud Rate	Select baud rate of 9600, 19200, 38400 (default), 57600, 76800, or 115200.
Modbus Parity	Select ODD, EVEN (default), NONE1 (one stop bit), or NONE2 (two stop bits).
Float Order	Select Little Endian (default) or Big Endian.
String Order	Select Normal (default) or Swapped.

RS-485 Interface Flow Alarm Configuration

The RS-485 Interface Flow Alarm Configuration sub-menu is only available when either the BACnet or Modbus RTU network is ON (see BACnet or Modbus RTU Network Configuration menu). Alarm parameters can be configured including high and low alarms, set points, and alarm delay.



1. In the Operator Menu, press UP or DOWN to scroll to the RS-485 interface Flow Alarm Configuration submenu.

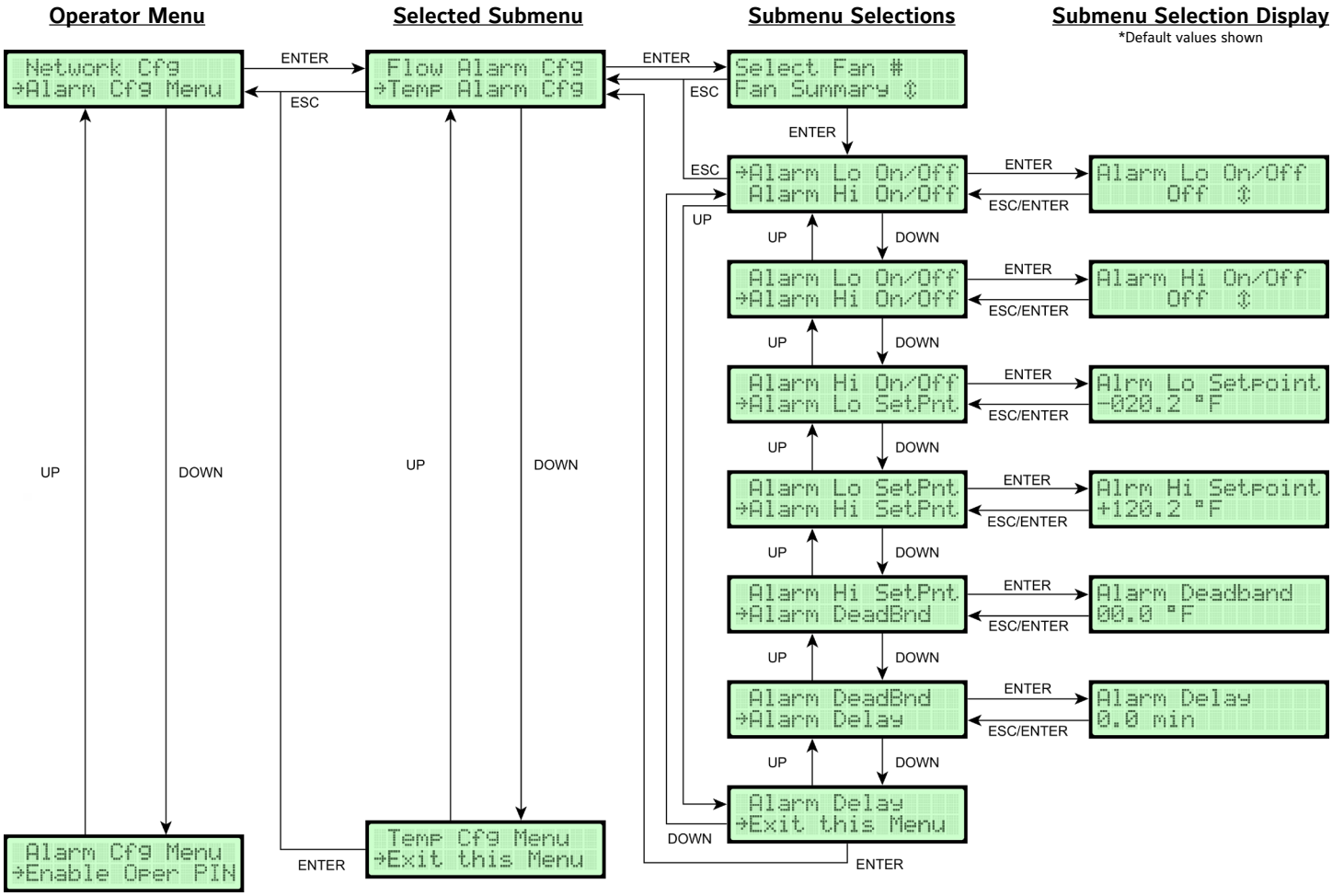
2. Press ENTER.
3. Scroll through the submenu options and make any necessary updates. See Table 7 for a description of the RS-485 interface Flow Alarm Configuration submenu selection options and their configurable options.

Table 7: RS-485 Flow Alarm Configuration Submenu Selection and Configurable Options

RS-485 Flow Alarm Configuration Submenu Selections	Configurable Options
Alarm Low On/Off	Select On or Off.
Alarm High On/Off	Select On or Off.
Alarm Low Setpoint	Choose a value the flow must go below for an alarm condition to exist.
Alarm High Setpoint	Choose a value the flow must surpass for an alarm condition to exist.
Alarm Deadband Setpoint	Choose a value of flow the controller must reach above the Alarm Low Setpoint for Alarm Low or below the Alarm High Setpoint for Alarm High before an activated alarm resets. The display units are the same as those chosen in the Display Configuration submenu and flow configuration.
Alarm Delay	Select the amount of time between any alarm condition and the RS-485 interface Flow Alarm Low and High activation. This value is adjustable between 0 and 10 minutes.

RS-485 Interface Temperature Alarm Configuration

The RS-485 Interface Temperature Alarm Configuration sub-menu is only available when either the BACnet or Modbus RTU network is ON (see BACnet or Modbus RTU Network Configuration). In this submenu, you can configure temperature parameters including high and low alarms, setpoints, and alarm delay.



1. In the Operator Menu, press UP or DOWN to scroll to the RS-485 Interface Temperature Alarm Configuration submenu.

3. Press ENTER.
3. Scroll through the submenu options and make any necessary updates. See Table 8 for a description of the RS-485 Temperature Alarm Configuration sub-menu selection options and their configurable options.

Table 8: RS-485 Temperature Alarm Configuration Sub-menu Selections and Configurable Options

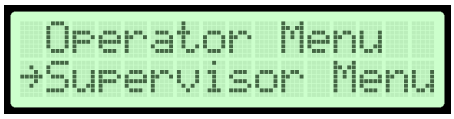
RS-485 Temperature Alarm Configuration Submenu Selections	Configurable Options
Alarm Low On/Off	Select On or Off.
Alarm High On/Off	Select On or Off.
Alarm Low Setpoint	Choose a value the temperature must go below for an alarm condition to exist.
Alarm High Setpoint	Choose a value the temperature must surpass for an alarm condition to exist.
Alarm Deadband Setpoint	Choose a value of temperature the controller must reach above the Alarm Low Setpoint for Alarm Low or below the Alarm High Setpoint for Alarm High before an activated alarm resets. The display units are the same as those chosen in the Display Configuration submenu.
Alarm Delay	Select the amount of time between any alarm condition and the BACnet or Modbus Temperature Alarm Low and High activation. This value is adjustable between 0 and 10 minutes.

NAVIGATING THE SUPERVISOR MENU

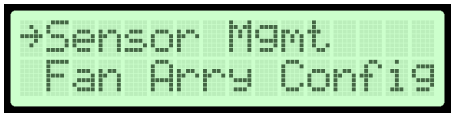
Introduction

The Supervisor Menu allows monitors and/or individual sensors to be enabled or disabled, scans all sensors for status updates, and perform diagnostics on alert conditions. Supervisor can also perform a Factory Default to restore to a pre-installation state.

1. With power ON and Warm-Up complete, press MENU, then UP and DOWN until the arrow " ► " is next to Operator Menu; press ENTER to activate the menu.

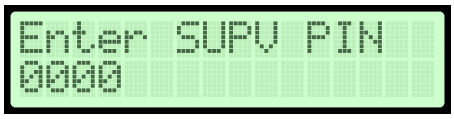


The display will then indicate:



Allowing the user to scroll to each Supervisor Sub-Menu.

2. If the Supervisor PIN has been enabled, the display will then indicate:

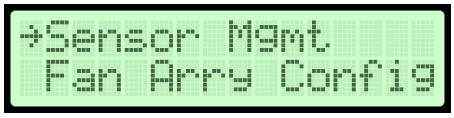


Enter the 4 digit PIN to access the Supervisor Menu. PIN entry is made starting at the most significant digit, working to the least significant digit (left to right); one digit at a time. Scrolling up or down will display 0 to 9. When the correct number is displayed, then select ENTER to accept the digit. The cursor will automatically move to the next position. If an error is made after ENTER is pressed, press ESC to go back and change the digit. Upon entering the last digit, the PIN is stored in non-volatile memory. The PIN is required each time the Supervisor Menu is entered, if enabled.

Note: Write down and retain the PIN in system configuration documentation for future use, to access the TDFi-FA Supervisor Menu features.

From the Factory, the PIN is 2222 and is not enabled.

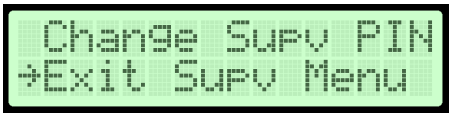
3. Once the PIN is correctly entered, the display will indicate:



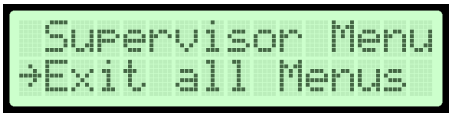
By using the UP and DOWN push buttons, the supervisor can scroll through the following selections:

Supervisor Menu Sub-Menu Selections	Description
Sensor Management	Allows for the scanning of the sensor network for active and/or enabled sensors. Also allows for the enabling/disabling of individual sensors. Displays each sensor's current reading of velocity and temperature.
Fan Array Configuration	Opens the Fan Array Configuration menu. Allows for changing fan count, sensors per fan, setting the fan sensors, and setting the field calibration of each fan.
Reset Sensor Network	Allows for the cycling of power to the sensors.
Factory Default	Allows the device to be restored to factory default state. Any previous setting made by Operator and Supervisor will be reset (dimensions, units, balance pts, custom text, PINs, etc.).
About Device	Displays the firmware versions for each device connected to the host monitor.
Enable Supervisor PIN Selection	Allows for the selection of a PIN for accessing the Supervisor Menu.
Change Supervisor PIN Selection	Allows for changing of the PIN to access the Supervisor Menu.
Supervisor Menu Exit	Returns display to Main Menu.

Once the desired selection is displayed with the arrow "→", press ENTER to enter the Supervisor Sub-Menu.
At any time while in the Supervisor Menu, the user can return to Normal display mode by pressing MENU or scrolling to:



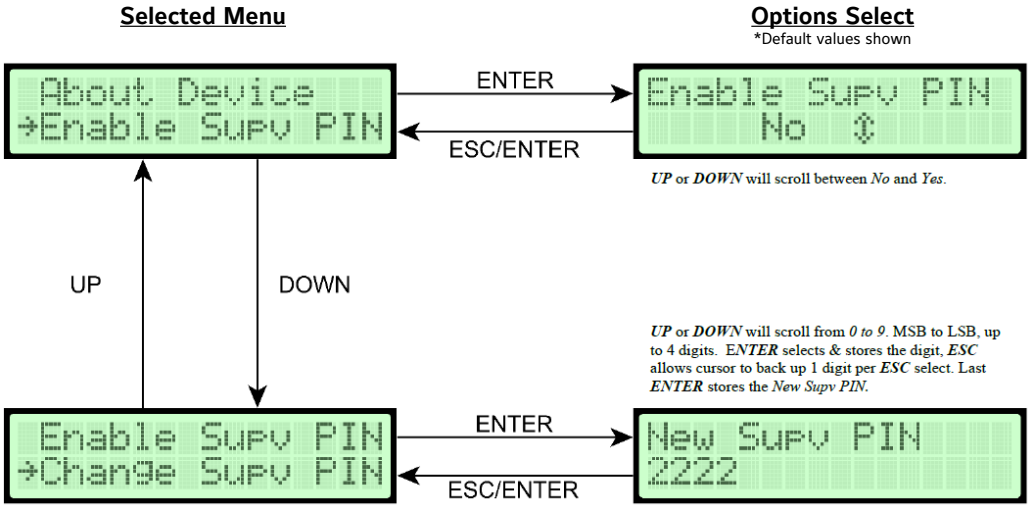
And pressing ENTER. Then scroll DOWN to Exit all Menus and press ENTER.



The remainder of this Section details steps to verify or change TDFi-FA System Management Settings of Supervisor Sub-Menus.

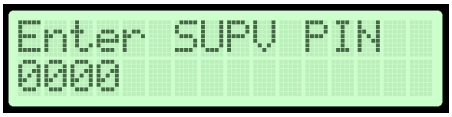
Supervisor Pin Selection

Allows the configuration of the Supervisor PIN. PIN options are at the bottom of the Supervisor Menu.



Note: The Supervisor Menu can be only accessed with a PIN, when enabled.

Example below depicts the Supervisor Menu selected when the Supervisor PIN is enabled:



Note: From the Factory, PIN is 2222 and is not enabled.

Use UP or DOWN to change PIN one digit at a time. The cursor position originates at the left, most significant, and working right, least significant with 0 to 9 digit representation during the UP or DOWN scroll. Press ENTER to then select the 0 to 9 entry and moves to the next digit. ESC pressed will cause the cursor to back up one digit per press. Once desired PIN is displayed, press ENTER. New PIN will be stored in memory and display will return to previous menu.

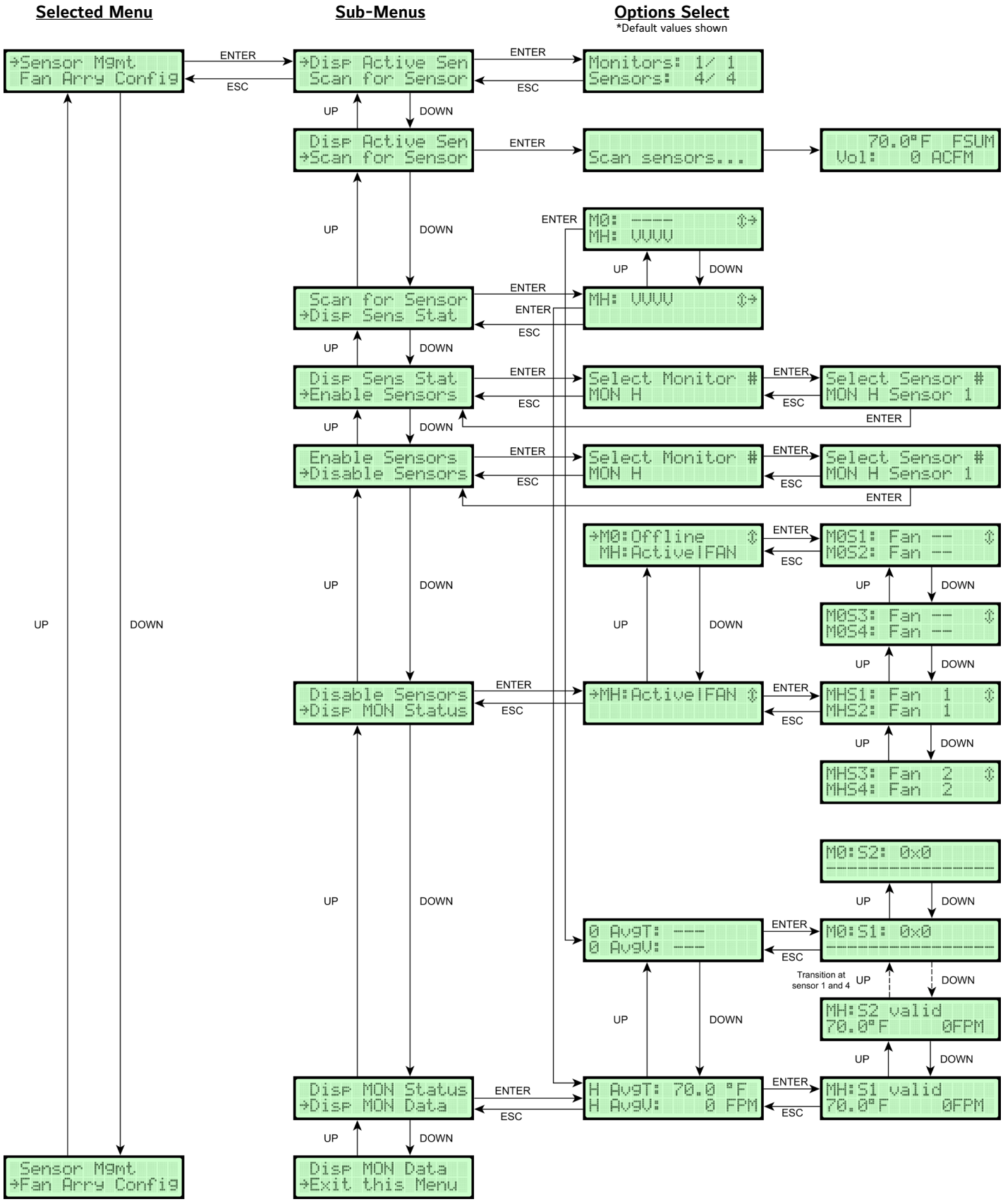
Caution: If PIN is enabled or changed, write it down and retain in system configuration records in case it is forgotten.

Note: If user desires not to change PIN, press ESC. Controller will remain programmed as it was originally.

1. To return to Main Menu, scroll and select Exit Supervisor Menu, press ENTER.
2. To return to Normal display mode, press MENU.

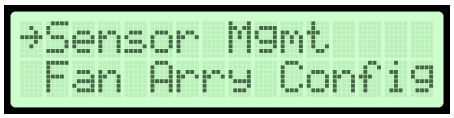
Sensor Management

The Sensor Management sub-menu is used to scan the sensor network for active sensors and enable or disable individual sensors. This sub-menu also displays each sensor's velocity and temperature reading.

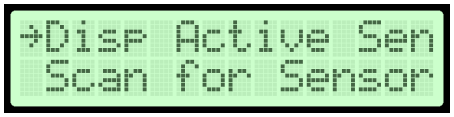


Sensor Management Sub-Menu Configuration Selections	Configuration Options
Display Active Sensors	Displays the active sensors and monitors
Scan Sensors	Will scan and update the active sensors and monitors
Display Sensor Status	Displays the status of each sensor on each monitor
Enable Sensors	Allows the user to set a sensor on any monitor to be enabled
Disable Sensors	Allows the user to set a sensor on any monitor to be disabled
Display Monitor Status	Displays the status of each monitor and the Fan assignments associated with the monitor
Display Monitor Data	Displays the average and individual raw values of the selected monitors sensors

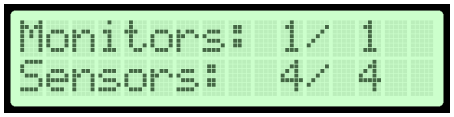
1. While in Supervisor Menu, use UP or DOWN to scroll to:



2. Press ENTER to enter Sensor Management Menu. Display will indicate:

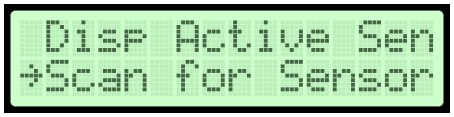


3. Press ENTER to Display Active Sensors. Display will indicate:



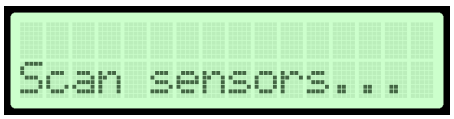
Note: The example above: 1 of 1 Monitors (Active & Enabled) and 4 of 4 Sensors (Valid & Enabled).

4. Press ESC or ENTER to return to previous menu step #2.
5. Press UP or DOWN to Scan for Sensors Sub-Menu.

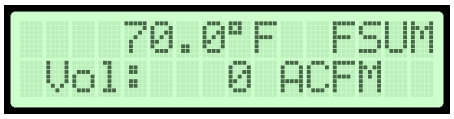


Note: Network Sensor Scan: Host Monitor will send scan and restart commands to all Client Monitors on the wired monitor network. The Host Monitor will then restart to poll for connected monitors and sensors, updating the inventory.

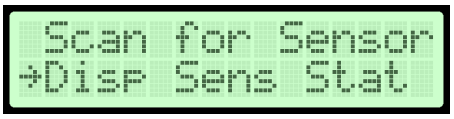
6. Press ENTER and display will indicate:



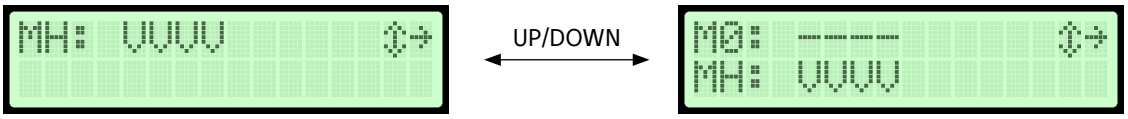
7. The Host Monitor will provide scan and restart commands to the network. Once warm-up is completed, display will indicate the Normal operation mode:



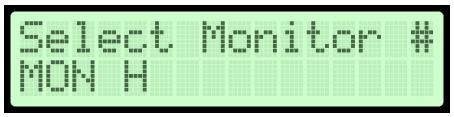
8. Press MENU, scroll DOWN, select the Supervisor Menu and press ENTER to return to Sensor Management Menu.
9. Press UP or DOWN to Display Sensor Status; display will indicate:



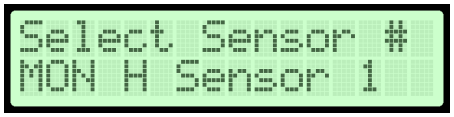
10. Press ENTER. Display will indicate:



11. Press UP or DOWN to scroll the monitor to be displayed on Line 1 of the LCD (H, 0-F, bottom to top). Pressing enter will go to the monitor data (step 18) of the monitor on the top line.
12. Press ESC. Display will return to the Sensor Management Menu.
13. Use UP or DOWN to scroll to Enable Sensors, and press ENTER.



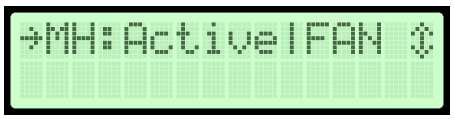
14. Scroll to display the monitor # on Line 2 that is to be selected, press ENTER.



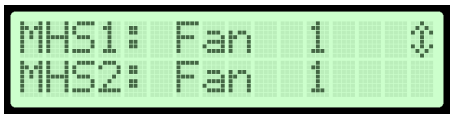
15. Press UP or DOWN to display the sensor # to be enabled, press ENTER. Display will return to the Sensor Management Menu.

Note: Scroll in the Sensor Management Menu to Disable Sensors. The process is the same as the above Enable Sensors steps.

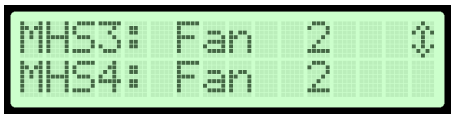
16. Press UP or DOWN to scroll to Display Monitor Status. Press ENTER and display will indicate:

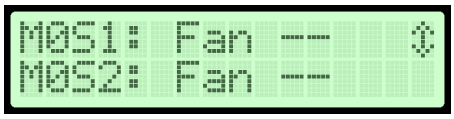


17. Use UP or DOWN to scroll the monitor to be displayed on the Line 1 of the LCD (H, 0-F, bottom to top), press ENTER. Display indicates fan assignments if assigned. After viewing, press ESC until returned to the Sensor Management Menu.

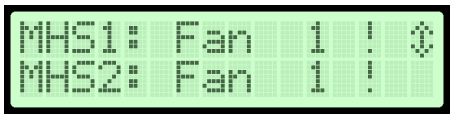


Fan assignment for the HOST monitor with 'sensors per fan' designation set to 2; with all sensors assigned to either Fan 1 or Fan 2



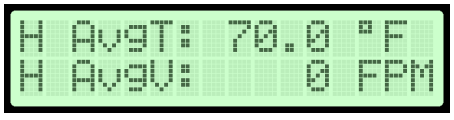


Indication when no sensor on the selected monitor is assigned to a fan

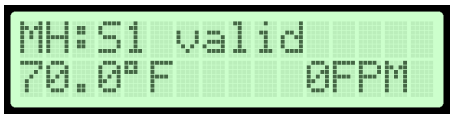


(!) Indicates that there are duplicate sensors assigned to the same fan number

18. 18.Use UP or DOWN to scroll to Display Monitor Data. Press ENTER and display will indicate.



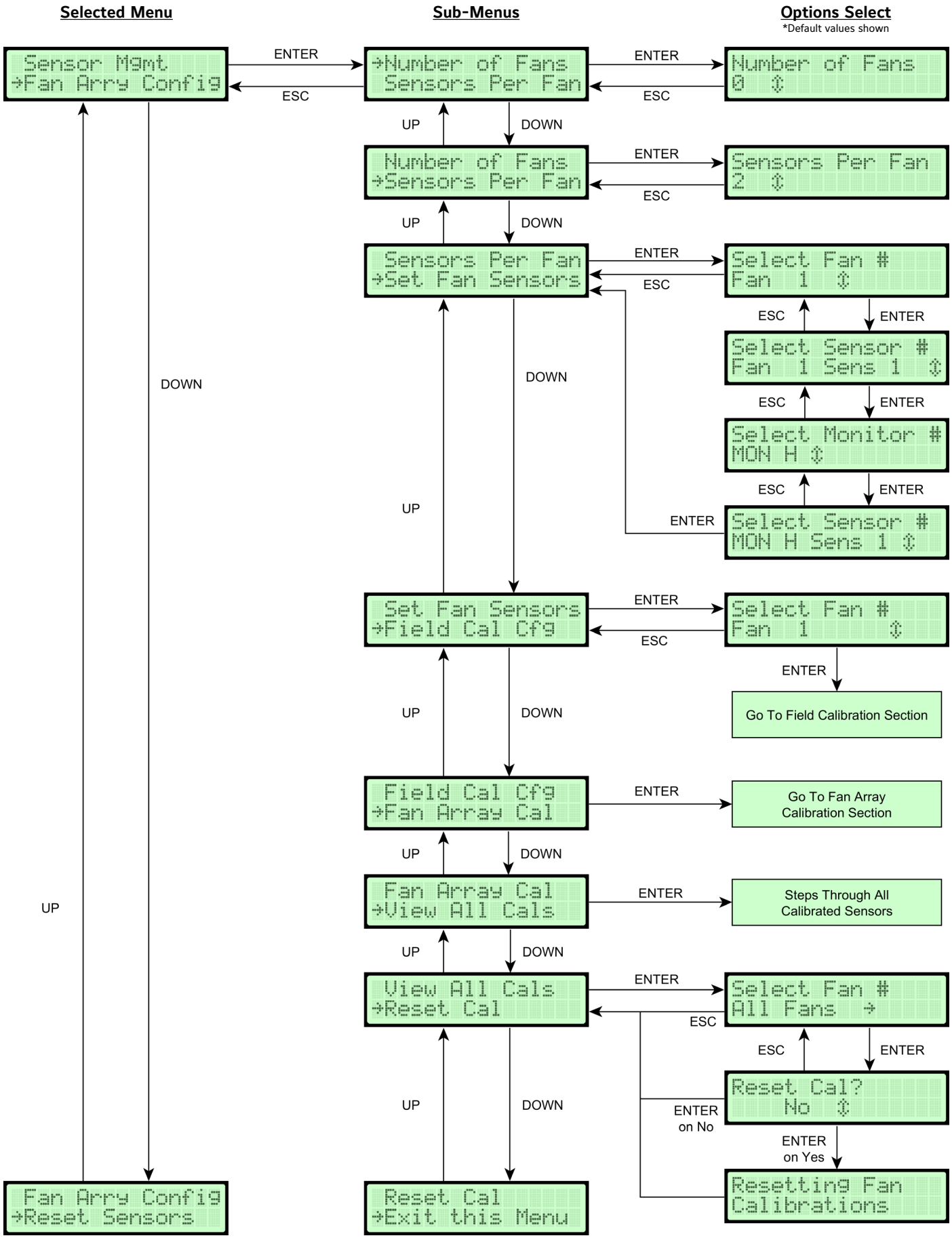
19. Press ENTER to view the status and values of individual sensors on the selected monitor. UP or DOWN will scroll through the sensors (1-4). Scrolling past the current monitors max sensor will continue to the first sensor of the next monitor and vice versa. Press ESC to return to the Monitor Data screen.



20. Press UP or DOWN to scroll to display the remaining monitors. Press ESC to return to the Sensor Management Menu.
21. Press UP or DOWN to scroll to Exit this Menu and press ENTER to return to Supervisor Menu.

Fan Array Configuration

Allows the user to set the fan array settings and perform a field calibration for a selected fan.

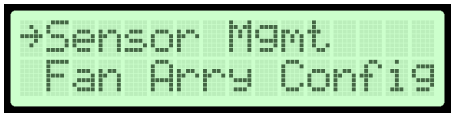


Configuration Selections	Configuration Options
Number of Fans	Sets the number of fans this Monitor network will track.
Sensors Per Fan	Sets the number of sensors that will be on each fan. This applies to all fans.
Set Fan Sensors	Assigns a monitor and sensor(s) to a given fan. When Sensors Per Fan is set to 2, only the selection of a monitor is required as both sensors on that monitor will be assigned to the selected fan. With Sensors Per Fan is set to 1, selection of a monitor and a sensor is required.
Field Calibration Configuration	Opens the Field Calibration Configuration menu for a selected fan. Depending on the value of 'Use Calc'd Cal', either the Manual calibration menu or the Calculated calibration menu will be available.
Fan Array Cal	Performs the calculated field calibration process as a fan array.
View All Cals	Step through each fan and sensor to display the calibration data for all fans in order.
Reset Calibration	Selection to reset all fan calibrations.

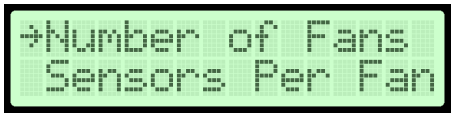
Note: Press ESC at any time to return to the previous menu and exit without changing any settings.

Note: If the Boot Fan Setup was completed, the user can skip to step 10.

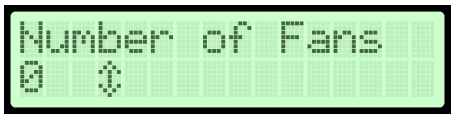
1. While in Supervisor Menu, use UP or DOWN to scroll to:



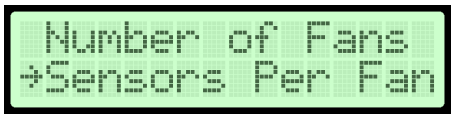
2. Press ENTER to enter the Fan Array Configuration menu. The display will indicate:



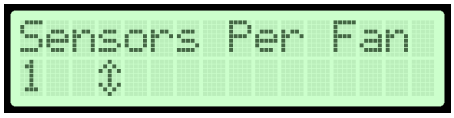
3. Press ENTER to modify the number of fans that will be monitored by this monitor network from 0 (no fans configured)to 16 total fans. The display will indicate:



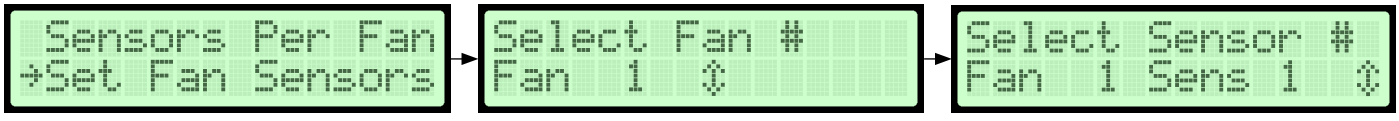
4. Use UP and DOWN to modify the value and press ENTER to confirm the value.
5. Use UP or DOWN to scroll to:



6. Press ENTER to modify the number of sensors per fan, 1 or 2. This setting applies to all fans on this monitor network. Press ENTER to confirm the value. The display will indicate:

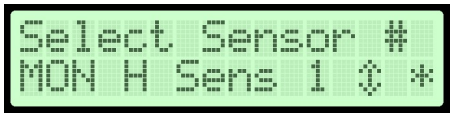


7. Use UP or DOWN to scroll to Set Fan Sensors and press ENTER. Then use UP and DOWN to select the fan (1-16) that you want to assign the sensor(s) for. Press ENTER to confirm. On Select Sensor # screen, assign sensor(s) to selected fan. Press ENTER.

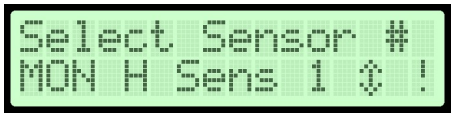


8. Select the monitor for the fan being setup. Use UP and DOWN to select the monitor to associate with the fan being setup, H is the Host, 0-F are the Clients. Press ENTER to confirm selection. When Sensors per Fan is setup as 1, the sensor associated with the fan being setup must be selected. Use UP and DOWN to select either sensor. Press ENTER to confirm selection.

   a. When selecting the assignment there are 2 errors that could be displayed. If there is an error, it is shown on the last character of the 2nd line. If both errors are present, it will flash between the 2 characters.



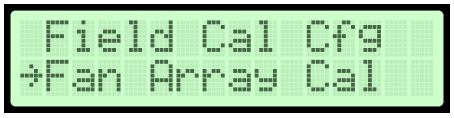
   Error #1: '*' indicates the selected assignment is not connected or communicating with the host.



   Error #2: '!' indicates the displayed assignment has been previously assigned by the user to another fan.

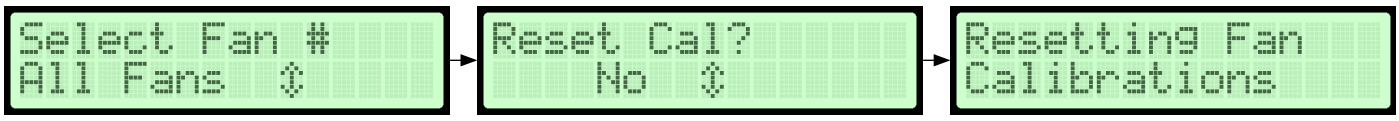
9. Scroll to the Field Calibration Configuration menu item and press ENTER. Then use UP and DOWN to select the fan 1-16, to edit its field calibration. If Use Calc'd Cal is set to On then the Calculated menu will be present,otherwise refer to the Manual menu.

10. To perform he calculated field calibration as a fan array, scroll to the Fan Array Calibration menu item and press Enter. This will step through the Fan Array Field Calibration process. The field calibration process will perform the field calibration for all configured fans simultaneously.



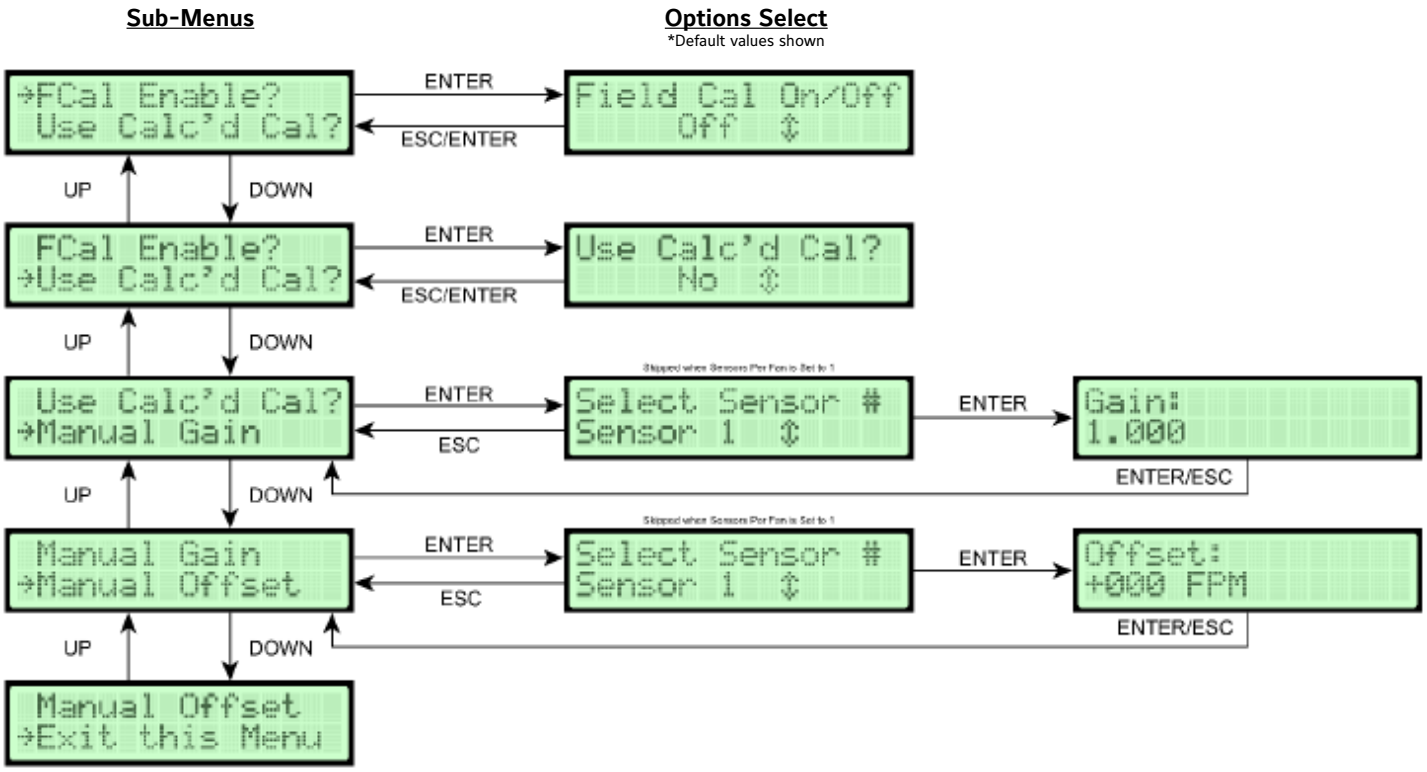
11. Selecting View All Cals will step through each fan and sensor that has been assigned to display the calculated Field Cal results. Pressing ENTER will progress through the data. Pressing ESC will retreat through the data.

12. Selecting Reset Cal from the menu will prompt to select all fans or an individual fan to reset the calibration of using UP and DOWN and ENTER to confirm. A confirmation screen will confirm to reset the cal, use UP and DOWN to select and ENTER to confirm.



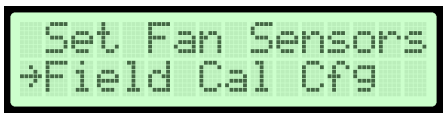
Fan Field Calibration – Manual

Note: Not Recommended. Use automatic 1, 2, or 3 point calibration feature. Use Manual gain and offset menus to restore recorded values from a previous calibration.

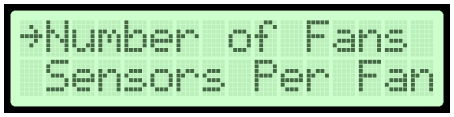


Configuration Selections	Configuration Options
Field Calibration Enable	Enables the field calibration manual or calculated gain and offsets to be applied to the selected fan's final output.
Use Calculated Calibration	Sets if the fan will use the manual gain and offset values or a 1 to 3 point calculated calibration. When set to No the fans will use the manual gain and offsets.
Field Calibration Gain	Sets the gain value of the selected fan's final output from 0.25 to 2.0. Only available with Use Calculated Calibration set to No.
Field Calibration Offset	Sets the offset value of the selected fan's final output from -750 to 750 FPM. Only available with Use Calculated Calibration set to No.

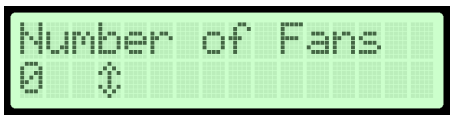
1. In the Fan Array Configuration menu navigate to the Field Calibration Configuration menu item and press ENTER:



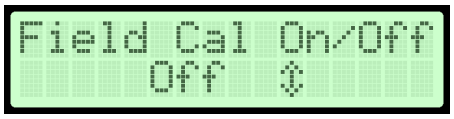
2. Use UP and DOWN to select the fan and press ENTER to confirm the selection. Selection is limited by the number of fans that were previously setup.



3. Navigate to Field Calibration Enable and press ENTER.

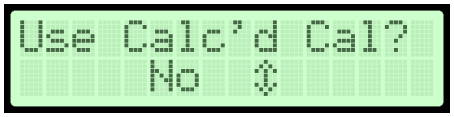


4. Use UP and DOWN to enable the field calibration adjustment. Press ENTER to confirm selection.

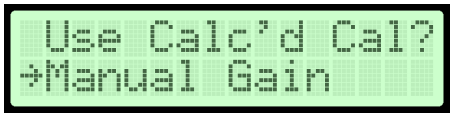


5. Navigate to Use Calculated Calibration and press ENTER.

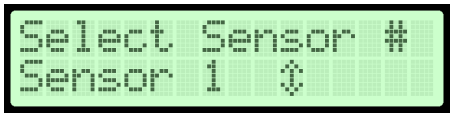
6. Use UP and DOWN to select if the previously selected fan will use a calculated calibration process. If yes is selected goto the Calculated Calibration section.



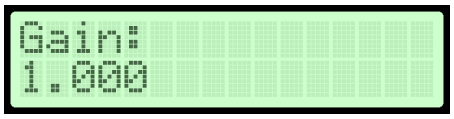
7. Navigate to Manual Gain and press ENTER.



8. If Sensors per Fan is set to 1, skip to step 9. If Sensors per Fan is set to 2, the device will prompt to select the fan's sensor to adjust its values. Use UP and DOWN to select the sensor to adjust and press ENTER. Repeat steps 7 and 8 for both sensors if needed.

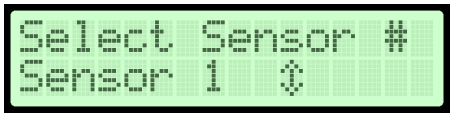


9. Use UP and DOWN to adjust the currently blinking digit. ENTER will advance to the next digit or confirm the value when on the last digit. ESC will go back a digit or cancel the value entry when on the first digit.

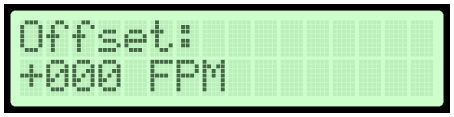


10. Navigate to Manual Offset and press ENTER.

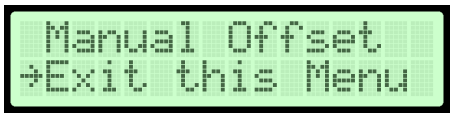
11. If Sensors per Fan is set to 1, skip to step 12. If Sensors per Fan is set to 2, the device will prompt to select the fan's sensor to adjust its values. Use UP and DOWN to select the sensor to adjust and press ENTER. Repeat steps 10 and 11for both sensors if needed.



12. Use UP and DOWN to adjust the currently blinking digit. ENTER will advance to the next digit or confirm the value when on the last digit. ESC will go back a digit or cancel the value entry when on the first digit.



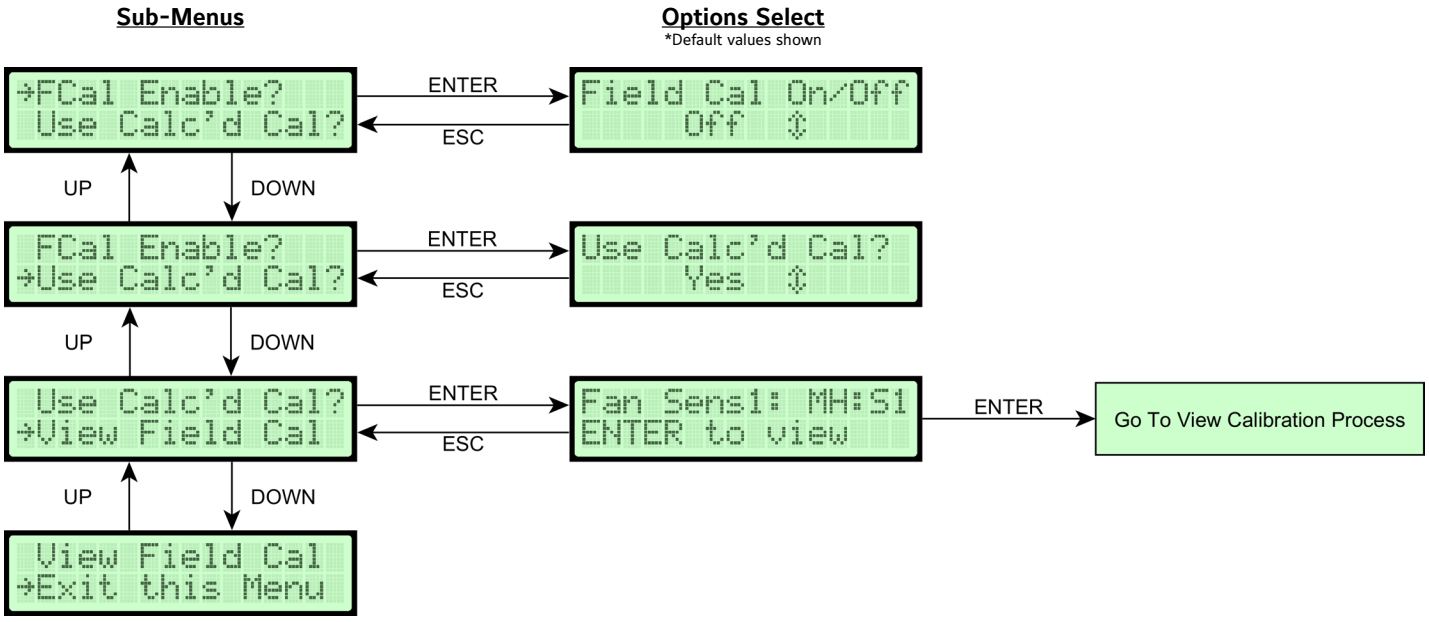
13. Navigate to Exit this Menu and press ENTER.



14. Repeat steps 1 through 13 for each fan to calibrate.

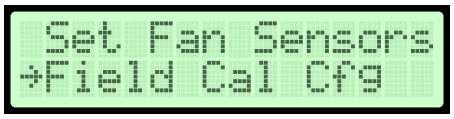
Fan Field Calibration – View Field Cal

Allows the user to view the automatic calculated field calibration for each fan.

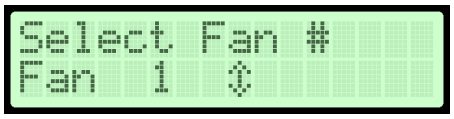


Configuration Selections	Configuration Options
Field Calibration Enable	Enables the field calibration manual or calculated gain and offsets to be applied to the selected fan's final output.
Use Calculated Calibration	Sets if the fan will use the manual gain and offset values or a 1 to 3 point calculated calibration. When set to No the fans will use the manual gain and offsets.
Run Automatic Calibration	Runs a 1 to 3 point automatic calibration calculation process for the selected fan.
View Field Calibration	Displays the results of a previous automatic calibration for the selected fan.

1. In the Fan Array Configuration menu navigate to the Field Calibration Configuration menu item and press ENTER:



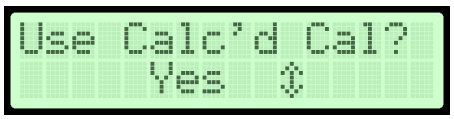
2. Use UP and DOWN to select the fan and press ENTER to confirm the selection. Selection is limited by the number of fans that were previously setup.



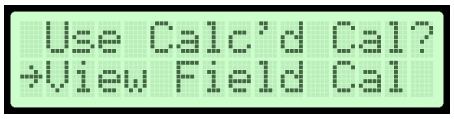
3. Navigate to Field Calibration Enable and press ENTER.

4. Navigate to Use Calculated Calibration and press ENTER.

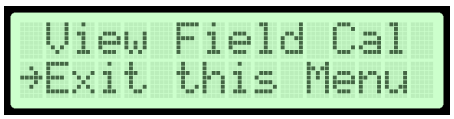
5. Use UP and DOWN to select if the previously selected fan will use a calculated calibration process. If no is selected goto the Manual Calibration section.



6. Navigate to View Field Calibration and press ENTER. Refer to the View Field Calibration Process section.



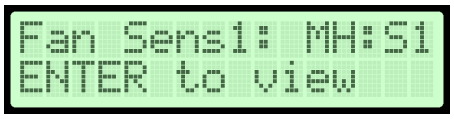
7. Navigate to Exit this Menu and press ENTER.



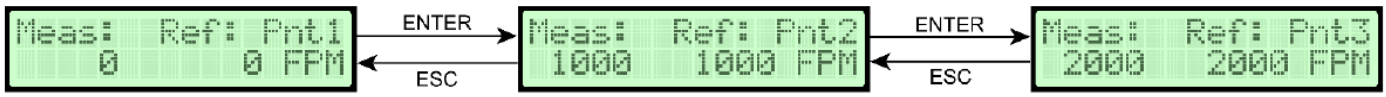
Fan Field Calibration – View Field Calibration Process

This section outlines the process for viewing the gain and offsets calculated during the automatic field calibration process.

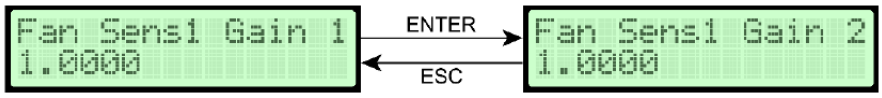
1. The device will prompt to start viewing the field calibration values calculated for sensor 1 of the fan. The display will show the Monitor and Sensor assigned to the selected fan's sensor. Press ENTER to view the field calibration values.



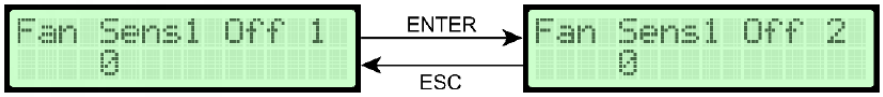
2. The device will display the measured value entered during calibration and the reference point recorded by the sensor for each point that was calibrated. Press ENTER to advance to the next screen or ESC to go back one screen. The device will only display the number of points that was selected during calibration.

3. 

4. If only 1 point was selected during calibration, only 1 gain will display and skip step 4. The device will display the gains that were calculated during calibration. If 2 points was selected during calibration, only 1 gain will be displayed. If 3points was selected during calibration, 2 gains will be displayed. Press ENTER to advance to the next screen or ESC to go back one screen.



5. The device will display the offsets that were calculated during calibration. If 2 points were selected during calibration,only 1 offset will be displayed. If 3 points was selected during calibration, 2 offsets will be displayed. Press ENTER to advance to the next screen or ESC to go back one screen.

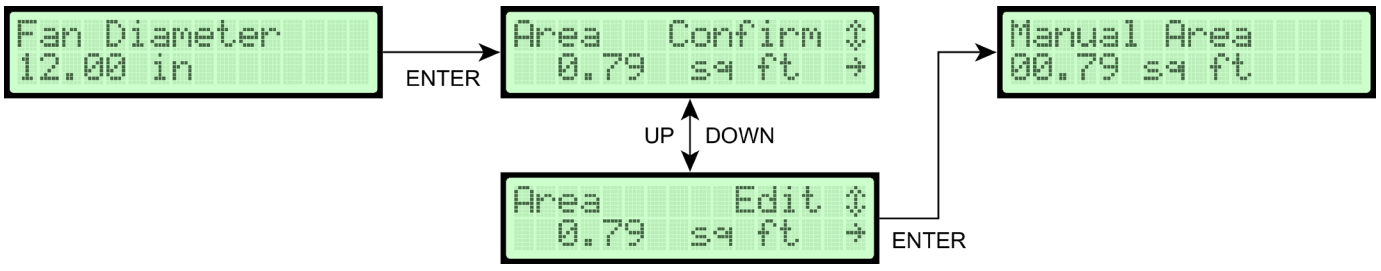


6. If Sensors per Fan is set to 2, steps 1 through 4 will repeat for the second sensor assigned to the fan.

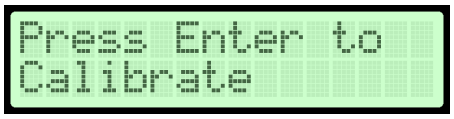
Fan Field Calibration - Fan Array Calibration Process

This process outlines the Fan Array Calibration of 1 to 3 points. This is for when the configured fans are part of a fan array that all share the same airflow.

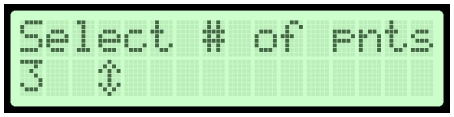
1. The display will prompt to enter the fan diameter that all fans in the fan array share. Use UP and DOWN to adjust the currently blinking digit. ENTER will advance to the next digit or confirm the value when on the last digit. ESC will go back a digit or cancel the value entry when on the first digit. After confirming the diameter value, the calculated area will be shown. Use UP and DOWN to select Edit or Confirm. Use ENTER to select. Edit will allow manual editing of the area.



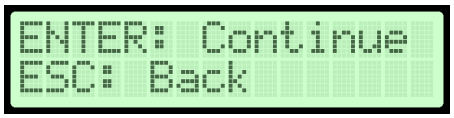
2. Navigate to Exit this Menu and press ENTER.



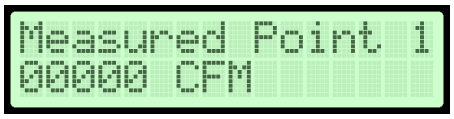
3. Use UP and DOWN to select the number of points to calibrate the previously selected fan to. Press ENTER to confirm the selection.



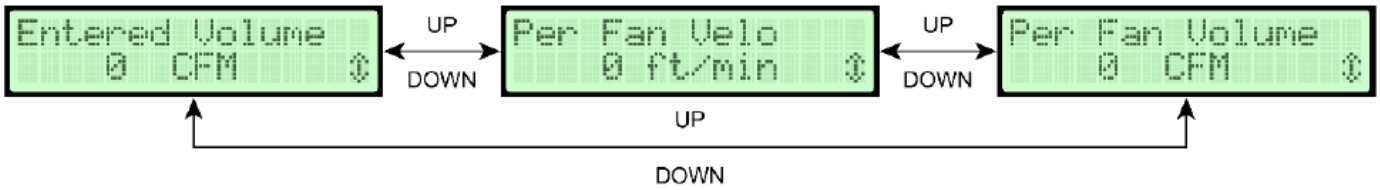
4. A confirmation screen will show. Press ENTER to continue. ESC will return to the previous step.



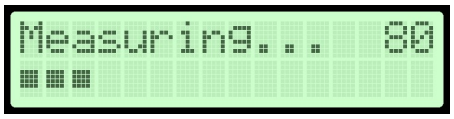
5. Enter the airflow of the total fan array a volumetric value. CFM is default, the unit is based on the display settings. Use UP and DOWN to adjust the currently blinking digit. ENTER will advance to the next digit or confirm the value when on the last digit. ESC will go back a digit or cancel the value entry when on the first digit. When the fan has been at the desired speed for point 1 of the calibration, confirm the value. The entered value must be within the operating range of 0-12,000 FPM and multiplied by the area of the fan inlet to achieve the equivalent volumetric value. After entering the airflow value, the per fan volumetric and equivalent velocity will be shown. The entered value when number of points is 1 must be greater than 0.



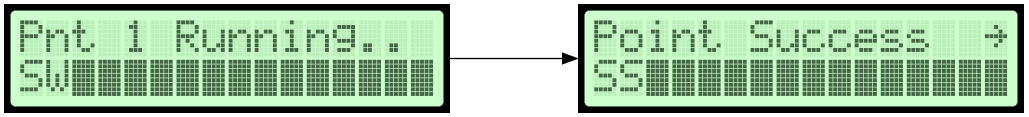
6. Press UP and DOWN to scroll between the per fan volumetric and equivalent volumetric value. Press ENTER to continue. ESC will return to the previous step.



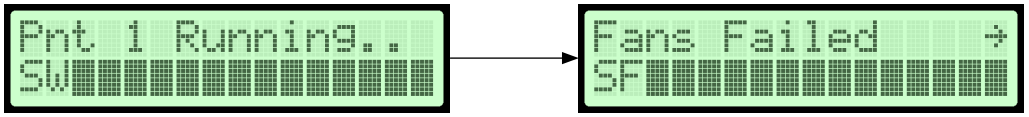
7. A screen will prompt to continue when the system is stable. Press ENTER to continue. ESC will return to the step 5.
8. The sensors will be measured with a count-down timer displayed to show time to completion.



9. After the sensors have been measured the display will indicate that the calibration point is running then show success or failure. Depending on the number of fans, the progression from running to success or failure can be quick. Press ENTER to continue if successful. If failed ENTER will return to step 5 at the current calibration point. For each fan being calibrated a character will show its status. A 'W' indicated the fan is waiting on a previous fan or processing the point. 'S' indicates the fan was successful. 'F' indicates the fan failed that calibration point. A fan can fail a calibration point if either of the following are true:
   a. The measured or reference value was higher than the previous point.
   b. The associated monitor and/or sensor is not responding or the sensor is not valid.



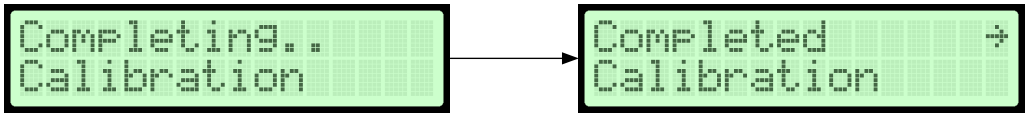
A successful calibration point



A failed calibration point.

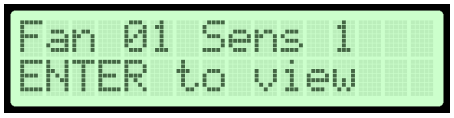
10. Steps 5 through 9 will repeat for any remaining calibration points.
11. After successfully completing the final calibration point a confirmation will display. ENTER will complete the calibration. ESC will return to the last calibration point at step 5.

12. The display will indicate that the device is completing the calibration then complete. Depending on the number of fans, this can progress quickly to complete. Press ENTER to continue.



13. After completion a prompt to view the calibration will show. ENTER will step through the fans and their associated sensors calibration points, continue to step 14. ESC will complete the process at this step and return to the Fan Array Configuration menu.

14. The display will start with Fan 1 Sensor 1. ENTER to view the displayed sensors calibration data.

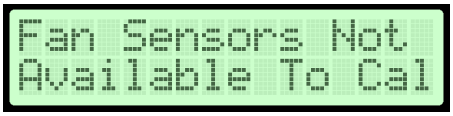


15. Press ENTER to progress forward through the calibration data. ESC will go back a screen.
16. Once the calibration data for all fan sensors has been displayed the screen will show a confirmation screen. ENTER will complete the viewing stage and return to the Fan Array Configuration menu. ESC will return to viewing the calibration data.

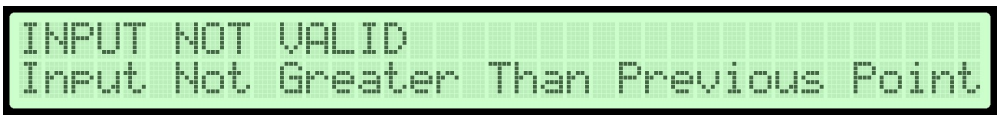
Fan Array Field Calibration – Calibration Error Screens

This section covers any error screens that may occur during calibration or viewing a calibration.

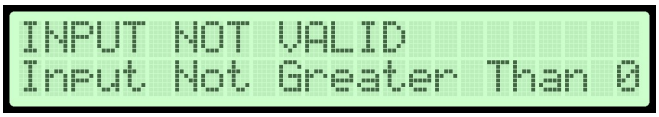
Error	Monitor Client Did Not Respond
Possible Cause	The Host lost communication with the Client that was assigned to the fan that was being calibrated or had the calibration that was attempted to be viewed.
Possible Resolution	Check communication wiring for breaks or kinks and ensure all plugs are firmly seated and wires are connected to the correct plug and polarity for the Host-Client network. Do not over-tighten the cord grip. A pinched cable will deter proper communication.



Error	Fan Sensors Not Available to Calibrate
Possible Cause	The sensors assigned to the fan being calibrated were not in an active state.
Possible Resolution	Check sensors and sensor cables of the fan being calibrated and ensure they are firmly plugged in and that there are no breaks or pinches in the cable.

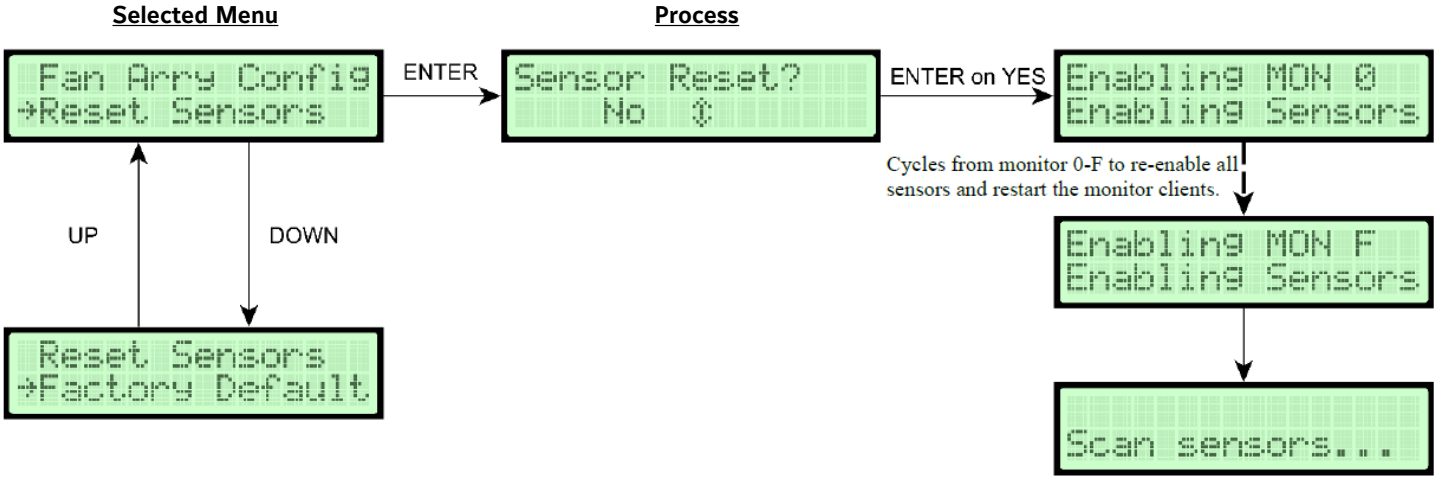


Error	Entered Point Not Greater Than Previous Point
Possible Cause	The entered calibration point was not greater than the previous calibration point.
Possible Resolution	Each calibration point needs to be greater than the previous. Use a greater airflow as the calibration point.

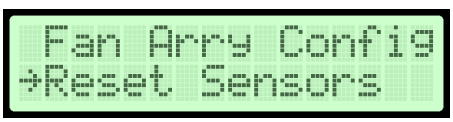


Error	Input Out of Range
Possible Cause	The entered calibration point was out of range. Must be between 0 and 10,000 FPM.
Possible Resolution	Enter a calibration point within the operating range of 0 to 10,000 FPM.

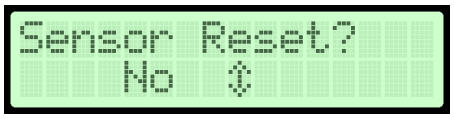
The user to reset all sensors on the network and cycles power to devices for re-inventory. Re-enables any previously disabled monitors or sensor on the network.



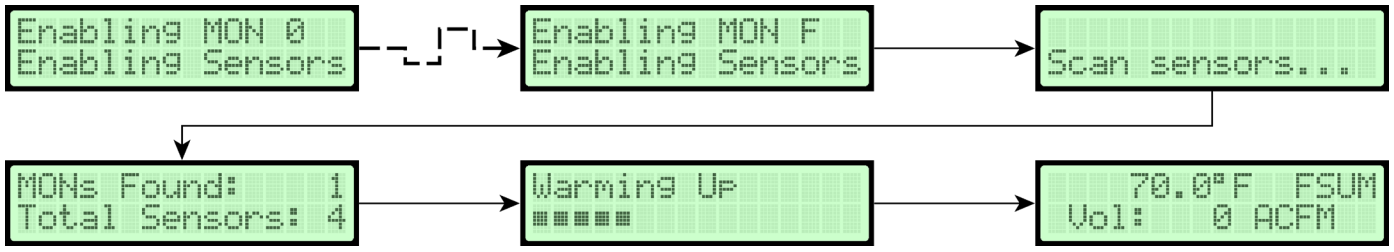
1. While in Supervisor Menu, use UP or DOWN to scroll to:



2. Use UP or DOWN to select YES to confirm resetting the sensors.



3. Press ENTER the display will indicate:

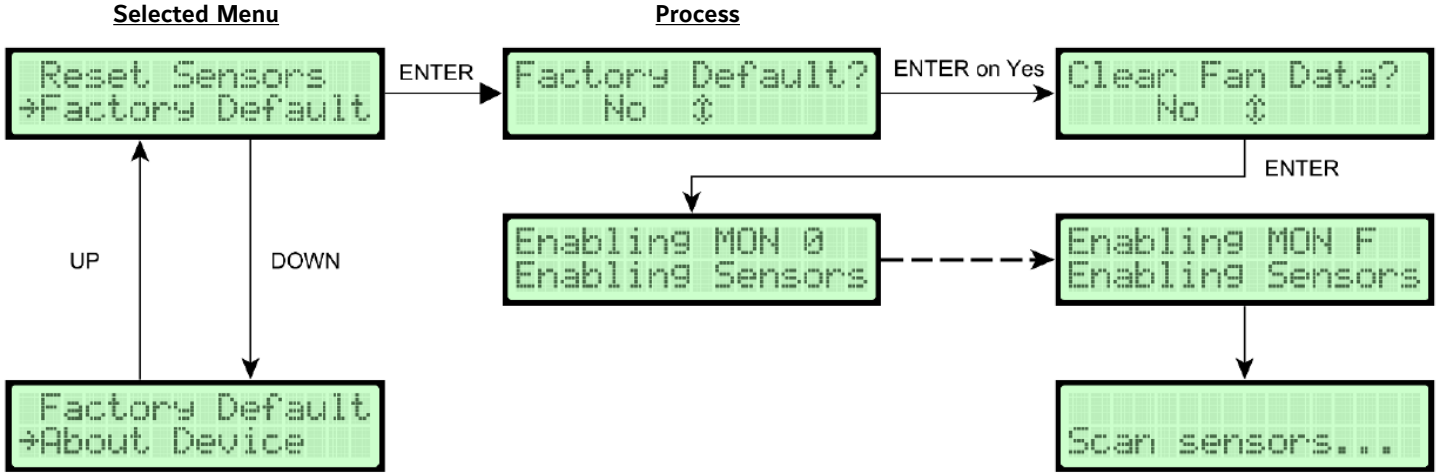


4. The TDFi-FA system will automatically reset all sensors and devices, then restart and warm-up. Then returns to the Normal Operational Mode.

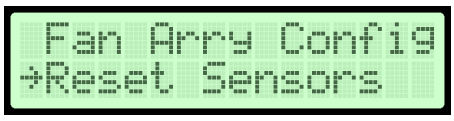
Factory Default Reset

The Factory Default Reset Sub-Menu allows the user to reset all parameters back to original factory default settings.

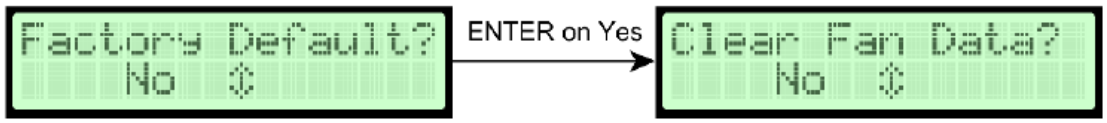
Note: If Factory Default Reset is performed, all configuration setup processes will need to be performed. Operator and Supervisor PINs, and any custom parameters will be cleared. Selecting to clear fan data will also clear the fan assignments, diameters, and field calibrations.



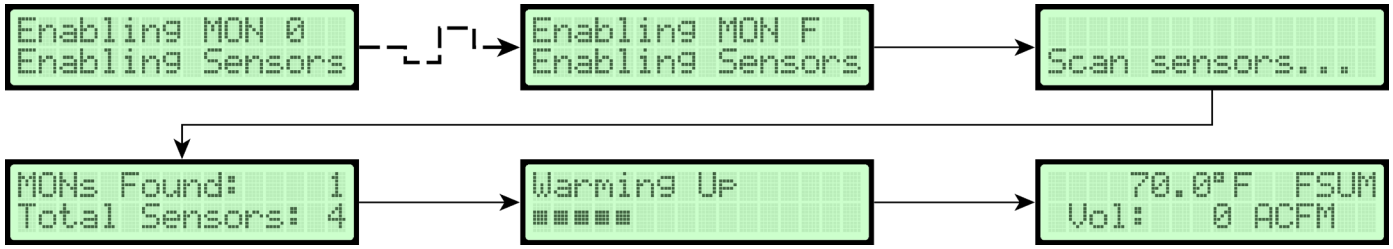
1. While in Supervisor Menu, use UP or DOWN to scroll to:



2. Use UP or DOWN to select YES to confirm resetting to default settings. To also clear the fan assignments, diameters, and field calibrations, select YES on Clear Fan Data? Otherwise those values will not be reset.



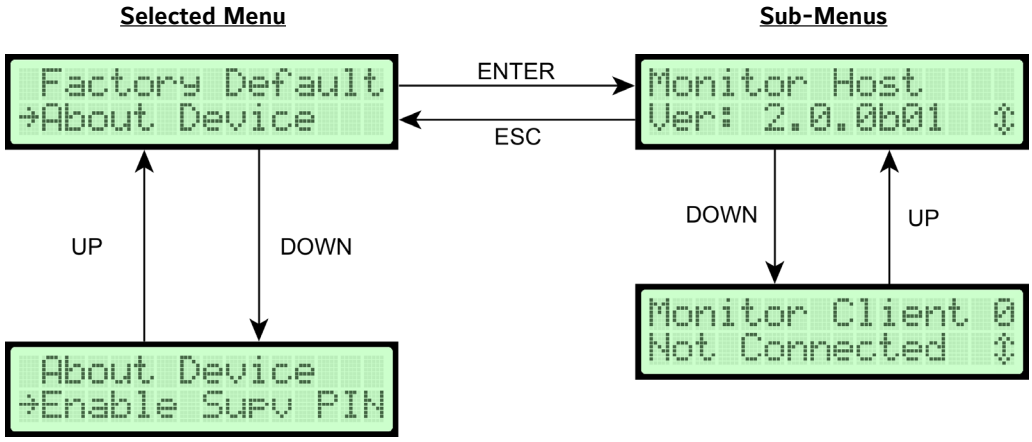
3. Press ENTER the display will indicate:



4. The TDFi-FA system will automatically reset all settings to default, all sensors, and devices, then restart and warm-up. Then returns to the Normal Operational Mode. All settings will be returned to a default state from the factory.

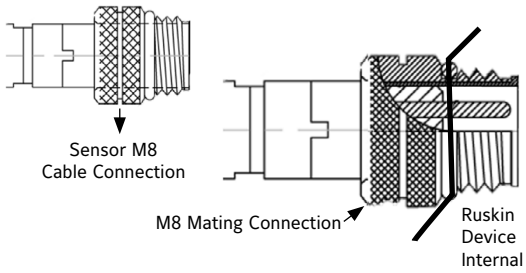
"About Device" Selection

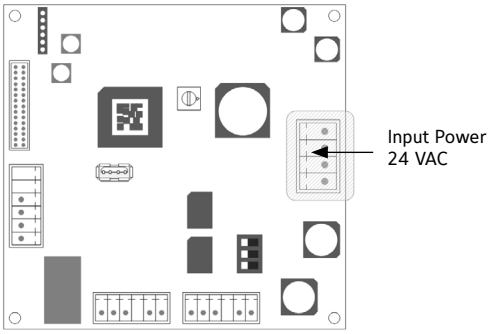
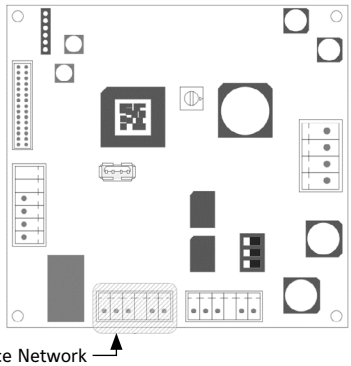
Allows the configuration of the Supervisor PIN. PIN options are at the bottom of the Supervisor Menu.



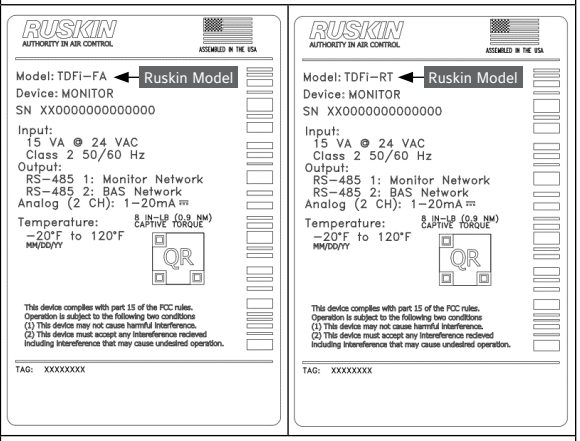
Use UP and DOWN to scroll through the possible connected devices on the monitor network to view the firmware version of each if they are connected.

TROUBLESHOOTING

Problem	Possible Cause	Corrective Action	UI Location & Steps
Host displays Config System?	Site user has restores defaults and cleared the fan configuration profile.	Fan configuration is required.	Config System ? > Yes > Number of Fans > Enter Site Fan Quantity > Sensors Per Fan > Enter Number of Sensors per Each Site Fan > Fan 1 ENTER to Config > Select Monitor # > Enter Site Sensor-2-Monitor Box Association > . . . (repeat sensor assignment) **Note:** Underline Process Text indicates Site Unique Hardware Installation. Determined by End User.
Normal Operation Display Mode indicates an * in the upper left corner	Sensor(s) assigned to a fan is not connected or responding.	Verify that all Monitor Boxes have 24 VAC or VDC and that they are ONLINE.	Menu > Supervisor Menu > Sensor Mgmt > Disp MON Status 1. Use the 'Up' or 'Down' buttons to view Active Monitors **Note:** If a monitor should be present and online. Verify that the monitor is assigned to the appropriate fan and communicating.
		Ensure all sensor 'M8' connectors are properly installed and making a good electrical connection.	
	Monitor(s) assigned to a fan is not connected or responding.	Verify that the user fan assignment is correct.	Menu > Supervisor Menu > Fan Array Config 1. Number of Fans = Select Desired Fan Quantity 2. Sensor Per Fan = Select Number of sensors install per fan 3. Set Fan Sensors = Select Fan # **Note:** Under the menu the user MUST assign the Fan # to the respective Monitor Box and all sensors to their respective EJ Sensor location(s).
	A Sensor(s) is operating outside of the models designed limits.	Verify that all sensors are present and valid.	Menu > Supervisor Menu > Sensor Mgmt > Disp Sens Stat 1. Use the 'Up' or 'Down' buttons to view Active Sensor Status N**ote:** If a sensor(s) indicates a 'F' status code, contact Ruskin Field Service for support. Device in questions Order Number is REQUIRED for device support and troubleshooting.
Normal Operation Display Mode indicates an ! in the upper left corner	Indicates that there are duplicate sensors assigned to the same fan number.	Verify that the user fan and sensor assignments are correct	Menu > Supervisor Menu > Fan Array Config 1. Number of Fans = Select Desired Fan Quantity 2. Sensor Per Fan = Select Number of sensors install per fan 3. Set Fan Sensors = Select Fan # **Note:** Under the menu the user MUST assign the Sensor # to the respective Monitor Box. A single sensor can only be assigned to one EJ Sensor location.
Normal Operation Display Mode indicates an # in the upper left corner	Indicates that the number of fans have changed since the last sensor scan.	Verify that the user fan assignments are the same as originally installed.	Menu > Supervisor Menu > Fan Array Config 1. Number of Fans = Select Desired Fan Quantity 2. Sensor Per Fan = Select Number of sensors install per fan 3. Set Fan Sensors = Select Fan # **Note:** Under the menu the user MUST assign the Fan # to the respective Monitor Box.

<table>
<tr><th>Problem</th><th>Possible Cause</th><th>Corrective Action</th><th>UI Location & Steps</th></tr>
<tr><td rowspan="2">Normal Operation Display Mode indicates an # in the upper left corner</td><td rowspan="2">Monitor-2-monitor inner connect wiring is not present or does not have continuity between two or more electrical contacts.</td><td>With a multi-meter verify that 24VAC or VDC is applied to all connected monitors.</td><td> 
</td></tr>
<tr><td>Remove network power and with a multi-meter verify that continuity is present between all connected monitors on the Ruskin Device Network.</td><td> 
</td></tr>
<tr><td>Normal Operation Display Mode indicates an ^ in the upper left corner</td><td>Indicates that the REQUIRED site calibrate has not been performed.</td><td>Using the Automatic Calibration Feature perform a 1 point (fixed speed fan), 2 point (two speed fan) or 3 point (multi-speed fan) site calibration.</td><td><u>Automated Calibrations</u>
Fan Array Calibrations (TDFi-FA or TDFi-RT):
Menu > Supervisor Menu > Fan Array Config > Fan Array Cal
If Individual Fans (TDFi-RT ONLY):
Menu > Supervisor Menu > Fan Array Config > Field Cal Cfg
1. Select Fan # = Select Desired Fan
2. Fcal Enable? = Select On
3. Use Calc'd Cal? = Select Yes
4. Run Auto Cal = Follow Setup Steps

<u>Manual Calibrations</u>
Enter Gain & Offset (TDFi-FA or TDFi-RT):
Menu > Supervisor Menu > Fan Array Config > Field Cal Cfg
1. Select Fan # = Select Desired Fan
2. Fcal Enable? = Select On
3. Use Calc'd Cal? = Select No
4. Manual Gain = Enter user desired value
5. Manual Offset = Enter user desired value

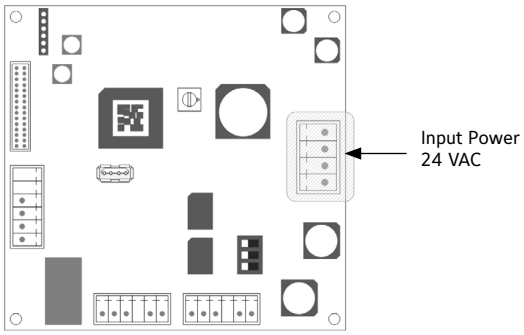
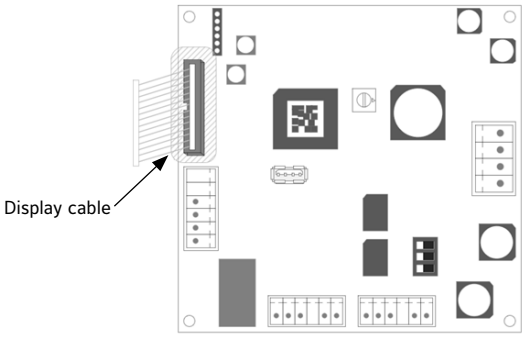
Note: For Automated Calibrations follow the Auto Calibration Steps displayed on the Host Device.</td></tr>
<tr><td>Normal Operation Display Mode indicates an + in the upper left corner</td><td>Indicates that a none supported Host or Client(s) model was found on the Ruskin Device Network.</td><td>Ensure all monitors on the Ruskin Network are the same model by removing none supported model.</td><td> 

Note: Ruskin Device Model Numbers are located on the Product Rating Label located behind the Monitor Box Hinge.</td></tr>
</table>

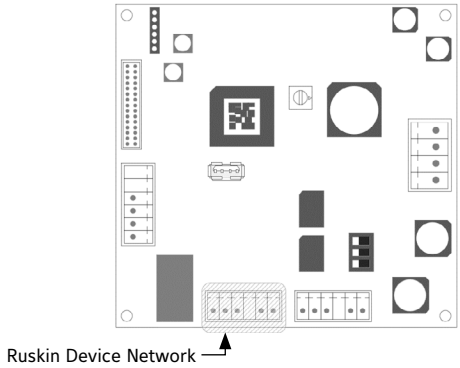
<table>
<tr><th>Problem</th><th>Possible Cause</th><th>Corrective Action</th><th>UI Location & Steps</th></tr>
<tr><td rowspan="2">Analog Output flow does not match what T&B is reporting

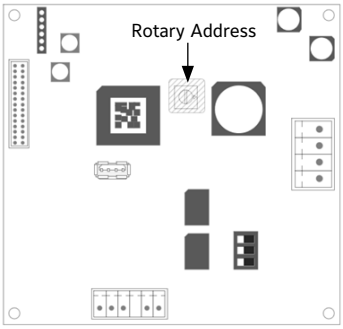
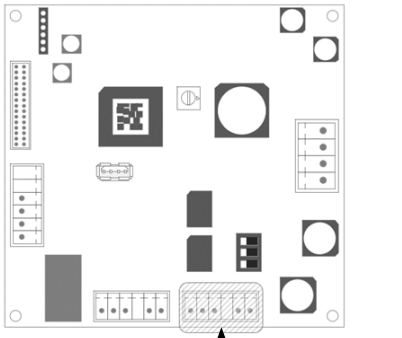
Note: The analog output is the Fan Sum value and cannot be configured for or used as an output for individual fans when installed as more than one air measurement station.</td><td>Design Range High is not set correctly</td><td rowspan="2">Verify the appropriate device settings.</td><td rowspan="2">Menu > Operator Menu > Output Cal Menu > Design Range Hi

1. Use the ‘UP’ or ‘Down’ buttons to make changes.

Note: If a change was made to the Fan Diameter post Calibration. A new calibration is REQUIRED!</td></tr>
<tr><td>User made a change to the Fan Diameter, post Calibration or post setting the Design Range high</td></tr>
<tr><td rowspan="3">No Display</td><td rowspan="3">No Power</td><td>Verify the appropriate input power supply voltage selection to the 24 VAC or VDC transformer.</td><td>Verify that voltage is applied to the line side of the transformer.</td></tr>
<tr><td>With a multi-meter verify that 24VAC or VDC is applied to the correct terminals.</td><td> 
</td></tr>
<tr><td>If LED’s near the processor chip are flashing, ensure that the ribbon cable is fully seated in the boards socket.</td><td> 
</td></tr>
<tr><td>Number of Monitor Boxes shown when power is applied is incorrect</td><td>Host to Client monitor boxes on the Ruskin Network are not wired correctly or terminated on wrong port.</td><td>Verify Ruskin Device Network wiring.

Left to Right pinout:
Pin 1 = Shield
Pin 2 = D-
Pin 3 = D+
Pin 4 = N/A
Pin 5 = D-
Pin 6 = D+

Note: Analog Out (AO), Probe Network, and BACnet/Modbus ports on the primary use interchangeable connectors.</td><td> 
</td></tr>
</table>

Problem	Possible Cause	Corrective Action	UI Location & Steps
Number of Monitor Boxes shown when power is applied is incorrect	Two Client Boards may have the same addresses. Verify that all Client rotary address dials are set appropriately. **Note:** Host is hard coded and rotary setting has no effect.	Assign the correct Address per Fan Client	 Monitor Box 0: Rotary Address '0' Monitor Box 1: Rotary Address '1' Monitor Box 2: Rotary Address '2' Monitor Box 3: Rotary Address '3' Monitor Box 4: Rotary Address '4' Monitor Box 5: Rotary Address '5' Monitor Box 6: Rotary Address '6' Monitor Box 7: Rotary Address '7' Monitor Box 8: Rotary Address '8' Monitor Box 9: Rotary Address '9' Monitor Box 10: Rotary Address 'A' Monitor Box 11: Rotary Address 'B' Monitor Box 12: Rotary Address 'C' Monitor Box 13: Rotary Address 'D' Monitor Box 14: Rotary Address 'E' Monitor Box 15: Rotary Address 'F'
	Fan Assignment Error	Verify that the user fan assignment is correct	Menu > Supervisor Menu > Fan Array Config 1. Number of Fans = Select Desired Fan Quantity 2. Sensor Per Fan = Select Number of sensors install per fan 3. Set Fan Sensors = Select Fan # **Note:** Under the menu the user MUST assign the Fan # to the respective Monitor Box.
	Monitor does not have power	Verify that all Monitor Boxes have 24 VAC or VDC and that they are ONLINE.	Menu > Supervisor Menu > Sensor Mgmt > Disp MON Status 1. Use the 'Up' or 'Down' buttons to view Active Monitors **Note:** If a monitor should be present and online. Verify that the monitor is assigned to the appropriate fan and communicating.
No BACnet or Modbus RTU communications with BAS	Network wires are not wired correctly or terminated on wrong port.	Verify Ruskin Device Network wiring. Left to Right pinout: Pin 1 = Shield Pin 2 = A- Pin 3 = B+ Pin 4 = N/A Pin 5 = A- Pin 6 = B+ **Note:** Analog Out (AO), Probe Network, and BACnet/Modbus ports on the primary use interchangeable connectors.	
	BAS Communication Settings are Not Configured Correctly.	Verify configuration parameters match site required communication settings for the BAS.	Menu > Operator Menu > Network Cfg TDFi-RT: https://www.ruskin.com/doc/Id/9829 TDFi-FA: https://www.ruskin.com/doc/Id/10176
Device Serial Number is not viewable	Client devices are internally mounted to the fan wall.	Serial numbers are available through the Host's GUI for all devices connected.	Menu > Supervisor Menu > About Device > Enter 1. Use the 'UP' or 'Down' button to view Active Monitor Firmware Versions. 2. Pressing 'Enter' on the Host when the desired Monitor is displayed will show the Monitor's Serial Number. **Note:** If a monitor should be present and online. Verify that the monitor is assigned to the appropriate fan and communicating.
Received an 'INPUT NOT SAVED Out of Range' message.	User entered a value outside of the settings parameters.	Verify that the entered setting falls within the design range values.	TDFi-RT: https://www.ruskin.com/doc/Id/9829 TDFi-FA: https://www.ruskin.com/doc/Id/10176

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