TRIATEK®

HMS-1650
Installation Manual
Version: 03.06.17

Triatek HMS-1650
Fume Hood Controller

CONTROLLER SETTINGS

HMS-1650 Fume Hood Controller Settings

Fume Hood Name / Number _____

Unit Model Number and Serial Number (ESN) _____

This form should be completed during the initial configuration for each fume hood controller. See HMS-1650 Installation Manual for details.

Network Setting

- Address _____
- Device ID Offset _____
- Baud Rate _____

Setpoints

- Sensor Input Range (zero-based or offset) _____
- Occupied Mode Setpoint _____
- Unoccupied Mode Setpoint _____
- Standby Mode Setpoint _____

Analog Output

- Operating Mode (Direct or PID) _____
- Analog Output Range (zero-based or offset) _____
- Analog Output Upper Limit (0 – 100%) _____
- Analog Output Lower Limit (0 – 100%) _____
- Analog Output Input Channel (AI-1 thru AI-4, TI-1 or TI-2) _____
- Analog Output Action (Direct or Reverse) _____
- Analog Output Range (zero-based or offset) _____
- Flow Range (Maximum) _____
- Flow Range (Minimum) _____

Sash Switch

- Operating Mode (normally-open or normally-closed) _____
- Delay Setting (0 - 240 secs) _____

Relay Output

- Trigger Mode (Setpoints, Operating Mode or Timer-based) _____

HMS-1650 Fume Hood Controller Settings

Input Channel (AI-1 thru AI-4, TI-1 or TI-2) _____

Occupied Mode High Setpoint (if Setpoints Mode) _____

Occupied Mode Low Setpoint (if Setpoints Mode) _____

Unoccupied Mode High Setpoint (if Setpoints Mode) _____

Unoccupied Mode Low Setpoint (if Setpoints Mode) _____

Relay Acting Mode (Direct or Reverse) _____

Delay Setting (0 - 180 secs) _____

PID Constants

Proportional Constant (0.5 – 100.0 %) _____

Integral Constant (0.0 – 100.0 %) _____

Derivative Constant (0.0 – 100.0 %) _____

Alarm Limits

Occupied Mode High Alarm Setpoint _____

Occupied Mode High Warning Setpoint _____

Occupied Mode Low Warning Setpoint _____

Occupied Mode Low Alarm Setpoint _____

Unoccupied Mode High Alarm Setpoint _____

Unoccupied Mode High Warning Setpoint _____

Unoccupied Mode Low Warning Setpoint _____

Unoccupied Mode Low Alarm Setpoint _____

Audible Alert

Enabled Input Channels (AI-1 thru AI-4, TI-1, TI-2) _____

Operating Mode (audible or silent) _____

Delay Time Base (secs or mins) _____

Delay Setting (0 – 60) _____

Alarm Quiet Period Starting Hour (0 – 23) _____

Alarm Quiet Period Ending Hour (0 – 23) _____

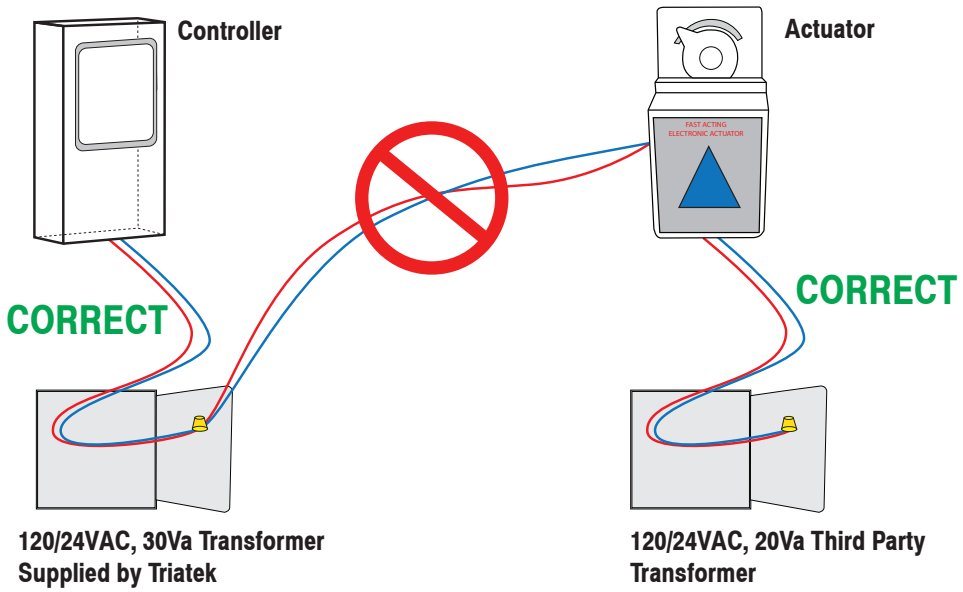
Engineering Units

Feet per Minute or Meters per Second _____

Warning

Failure to follow the wiring diagrams could result in damage to your equipment and could void your warranty. Wiring diagrams can also be found at www.triatek.com.

Under no circumstances should a single transformer be split between actuator and controller. Doing so will damage the actuator, the transformer, the controller or all units. A single 120/24V 30Va transformer is required for the controller and a separate 120/24V 20Va transformer is required for the actuator.



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GENERAL

Specifications

Electrical

4 Analog Inputs ..... 4-20mAdc, 0-5Vdc or 0-10Vdc
4 Analog Outputs ..... 4-20mAdc, 0-5Vdc or 0-10Vdc
2 Thermistor Inputs ..... NTC Type 2 or 3, 10kΩ @ 25°C
4 Digital Inputs ..... 0-5Vdc or 0-24Vdc, Active-High or Active Low
4 Relay Outputs ..... 1A@24VDC
Control Signal Wire Size ..... 18 AWG minimum
Power Supply ..... Class 2, 24Vac ±10%, 30VA universal 120/240 to 24 Vac, 60/50 Hz, step-down isolation transformer provided

Communications

BACnet® MS/TP network ..... Two-wire Twisted Pair, RS-485 signaling
Metasys® N2 network ..... Two-wire Twisted Pair, RS-485 signaling
Recommended Cable Type ..... Belden 1325A

Touchscreen User Interface

LCD Size ..... 3.2" diagonal
LCD Type ..... Transmissive
Resolution ..... 240 x 320 portrait
Viewing Area ..... 50.60 mm x 66.80 mm
Color Depth ..... 18-bit or 262K colors
Backlight Color ..... White
Luminous Intensity ..... min 2500 cd/m2

Specifications

Mechanical

HMS-1650 Display Housing ..... 3"W x 5"H x .75"D
HMS-1650 Controller Housing ..... 4.1"W x 6"H x 1.85"D

Environmental

Operating Temperature ..... 32° to 125° F Operating
Operating Humidity ..... 10% - 95% RH, Non-condensing

HMS Air Flow Sensor

Type of Sensor ..... Thru-the-hood ultra sensitive
Face Velocity Accuracy ..... 0-200 FPM ± 2 FPM*
Dimensions..... 25/32"H x 43/4"W x 35/16"D
NIST Traceable / Individual certification available as option
**@72°F ± 5°F*

Venturi Valve (Order Separately)

Diameter..... 6", 8", 10", 12", 14" & 16"O.D.
CFM Range 30-2400
Materials ..... Aluminum, Stainless Steel, Heresite Coating
Sound Insulation ..... Optional
Actuation ..... Electronic or Pneumatic

Part Number Guide

HMS1650 - □ - □

Sensor Type
1 = single smart sidewall sensor
2 = dual smart sidewall sensor
A = single Honeywell sidewall sensor
B = dual Honeywell sidewall sensor

Sash Sensor
blank = sash sensor not included
S = sash position sensor included

*Accuracy is ± 5FPM when velocity drops below 60FPM or exceeds 140 FPM

GENERAL

Overview

The Triatek HMS-1650 Series Fume Hood Controller is an ultra-sensitive instrument used to monitor and/or control the fume hood face velocity in laboratories and clean rooms. This unit is a precision measuring system capable of measuring and displaying face velocities from zero to 200 ft/min (1.016 m/sec) with an accuracy of ±2 ft/min.

Key features of the HMS-1650 include:

- Comprehensive closed-loop sash control with sidewall velocity sensing
- Full-color touchscreen display with programmable display options and adjustable backlight
- Intuitive user interface simplifies setup and configuration of unit
- Display background changes color to indicate hood status at a glance
- Audible and visual alarm annunciation
- Auxiliary universal analog inputs for use with optional sensors
- Four independent PID control loops for controlling damper actuators, speed drives, hot water valves, humidifiers, etc.
- Digital input used to monitor an optional fume hood sash switch, zone presence sensor, or emergency override switch
- Relay outputs used for transmitting alarm condition to remote location
- Dedicated thermistor inputs for temperature monitoring and/or control applications
- Multi-level password protection of touchscreen user interface
- Field Calibration of both sidewall velocity sensor and optional sash position sensor
- Multi-protocol native (BACnet®, Metasys® N2) for easy integration with any BMS
- Manual override of Analog and Relay outputs assist with Test & Balance procedures
- Comprehensive Real-Time View diagnostics tool displays built-in to each unit
- Easy-to-install backplane/backplate assembly facilitates permanent termination of all wiring

The HMS-1650 is equipped with a 3.2" diagonal **Full-color Touchscreen** display in portrait orientation (240 x 320). The password-protected menu tree is very intuitive and simplifies the setup and configuration of the unit. The menus incorporate touch-based interfaces such as sliders, radio buttons, and dialog popups to facilitate the ease-of-use of the HMS-1650.

The display implements bright background color changes to indicate the three different **Alarm Status** indications of the monitored fume hood. These background colors indicate "Normal" when the face velocity is within defined limits, "Warning" when the face velocity is nearing an out-of-limits condition, and "Alarm" when the face velocity is outside defined acceptable limits. The face velocity ranges for these conditions are easily set by the user for the specific installation when necessary. The background color changes provide an overview of the monitored fume hood face velocity conditions at a glance.

Alarm conditions may be defined by the user, in terms of desired face velocity settings for the fume hood being monitored. When an alarm condition occurs, it may be annunciated in four user-definable ways: 1) on the display, 2) with an audible alarm, and 3) transmitted via contacts to a remote monitoring location and 4) over the BMS network. The alarm will automatically reset when the unit has sensed that the fume hood face velocity has returned to proper limits. The operator may easily mute the audible alarm by touching the OK button on the alarm notification message popup window of the touchscreen display.

For many applications, it is important to have other variables such as sash position or ambient temperature displayed along with the fume hood face velocity. The HMS-1650 provides for this by means of three additional **Universal Analog Inputs**, each of which may be configured for either current loop operation or voltage input operation (0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA). Each input may be scaled as needed to display correct values, and may have an engineering units selection associated. The configuration of each analog input is field selectable through the use of miniature dipswitches on the controller unit.

For those applications requiring monitoring and/or control based on temperature variances, the HMS-1650 provide two dedicated **Thermistor Inputs** in addition to the four universal analog inputs. Therefore, a total of six analog inputs are available for control applications. The two thermistor inputs may be used with negative temperature coefficient (NTC) Type 2 or Type 3 sensors.

The HMS-1650 provides four **Universal Analog Outputs**, which may be configured for either current loop operation or for voltage operation. Each analog output may be configured for proportional operation to provide a linear signal to the BMS, or for PID (proportional-integral-derivative) control operation for closed-loop feedback control of damper actuators, variable frequency (speed) drives, hot water valves, humidifiers, or other analog-controlled devices. Each universal analog output may be field-configured for the required application using onboard configuration dipswitches on the controller module. Each analog output

Overview

may also be temporarily overridden using the built-in diagnostic tools for troubleshooting during the installation and commissioning phase.

The HMS-1650 provides four **Digital Inputs** that may be used for monitoring sash switches, override switches, flow switches, occupancy sensors or other devices with binary outputs. The configuration and operation of each input may be configured by the user to define the effect of a change in its state. Each digital input may have a programmable delay duration associated with it. Each digital input may be configured for either normally-closed or normally-open operation, and may also be configured to be active-high or active-low triggered. The global configuration of the digital inputs is field selectable through the use of a configuration switch on the controller unit.

The HMS-1650 provides four **Relay Outputs**, which may be configured for either direct-acting or reverse-acting operation, and may have a programmable delay associated to meet the specific needs of the required application. A unique feature of the HMS-1650 is its ability to trigger a relay output for the purpose of activating an optional automatic sash closer device, thereby keeping an unattended fume hood with an open sash safe for occupants of the lab. Each relay output may also be temporarily overridden using the built-in diagnostic tools for troubleshooting during the installation and commissioning phase.

The user may set up multiple multi-level **Passwords** to prevent unauthorized or casual access to the HMS-1650 configuration settings. Up to ten passwords of up to eight digits may be programmed, with each having one of four associated access levels. Administrators and Facility Management personnel may have unrestricted access, while general staff may be assigned restricted access passwords which limit the functionality of the user menus.

Fume hood operating mode selection of Occupied, Unoccupied, or Standby may be protected using limited access passwords, thereby eliminating the need for keylock switches and keys. However, an **Optional Keylock Switch** may be used to further control access to change in operating modes.

The HMS-1650 provides a unique set of built-in diagnostics tools that are extremely valuable for facilitating the troubleshooting process during the installation and commissioning phase. Included in these built-in diagnostics tools are **Manual Override** capabilities for both analog outputs and relay outputs, and a comprehensive **Real-Time View** capability that allows the real-time values and states of each analog and digital input and output to be displayed conveniently. This is an extremely useful tool that facilitates the verification and certification processes conducted by typical test and balance personnel during the commissioning of the system. There are also options for storing configuration settings and for restoring those settings, as well as performing a complete restoration of the factory default configuration settings.

The HMS-1650 touch-screen user interface incorporates an easy-to-use **Manual Override** capability that allows the unit's analog and digital outputs to be overridden independent of their proportional or PID loop control operation. This is an extremely useful function that facilitates the verification and certification processes conducted by typical Test and Balance personnel during the commissioning of the system.

The HMS-1650 incorporates an innovative **Backplane/Backplate** assembly which greatly facilitates the installation process and permits all wiring terminations to be permanent. The HMS-1650 serves as a direct drop-in functional replacement for all previous models of HMS-1600 series of BACnet/N2 fume hood controllers.

Depending upon the actual model number ordered, the HMS-1650 may be accompanied by one of two types of sidewall sensor modules for measuring face velocity. The standard sidewall sensor includes a 9-pin pluggable terminal block connector, while the Honeywell sidewall sensor includes a 3-position terminal strip. See pages 13 through 14 for physical representations of the two sidewall sensor options.

MOUNTING/WIRING

Installation

This section will illustrate a typical method of installing the HMS-1650 to a fume hood. Tools required include: drill, 3/8 drill bit, 1/8 drill bit, Phillips #2 screwdriver, standard medium blade screwdriver, silicone sealant.

Depending upon the actual model number ordered, the HMS-1650 may be accompanied by one of two types of sidewall sensor modules for measuring face velocity. See pages 15 through 18 for physical representations of the two sidewall sensor options.

1. Proper location of the sensor is very important for obtaining the best possible operation of the HMS-1650. The system uses through-the-wall sensing to measure the internal negative pressure of the fume hood to accurately determine the face velocity. The sensor must be located in a position that is least affected by turbulent air within the hood. See illustration on page 16. There are two types of fume hood arrangements which need to be considered: By-Pass and Non-By-Pass.

    - **Front-to-Back Position** – With either type of fume hood arrangement, the sensor is best located approximately 6 inches back from the vertical sash track.
    - **Vertical Position (By-Pass type)** – Locate the sensor vertically in the center of the region between the bottom of the sash in the fully open position and the bottom edge of the by-pass opening.
    - **Vertical Position (Non-By-Pass type)** – Locate the sensor vertically 6" above the bottom of the sash in the fully open position.

2. See page 16 for dimensions and suggested mounting arrangements of the Triatek flow sensor on the hood wall. **NOTE: Be certain that sensor reference port is in laboratory room air. If necessary to obtain this, use Triatek HMS-1600-PLATE mounted on exterior panel of the fume hood.**

3. Apply silicone sealant around the sensor immediately prior to mounting the assembly to its mounting surface. Be careful to avoid getting sealant in the sensor port.

4. See page 12 for mounting details for the HMS-1650 display unit. The preferred location is eye level, usually on one of the side bezel panels. Please note that the display unit is cable connected to the control unit, and provision must be made to route the cable without interference with the fume hood sash or sash cable. The control unit is typically secured in a convenient location on top of the fume hood. (See page 13)

5. For **standard sidewall sensors**, at the HMS-1650 backplane, assuming the colors of the 3-conductor signal cable being red, black, and white, connect the leads to the terminals as follows:

    Red: SNS_PWR
    Black: AGND
    White: AI_1

    If a **Honeywell sidewall sensor** is being used, the signal cable leads should be connected to the HMS-1650 backplane terminals as follows:

    Red: +10V
    Black: AGND
    White: AI_1

    For **standard sidewall sensor** modules with the 9-pin terminal block, connect the 3-conductor signal cable as follows:

    Red: +Vin
    Black: GND
    White: V_o

    For **Honeywell sidewall sensor** modules with the 3-position terminal block, connect the 3-conductor signal cable as follows:

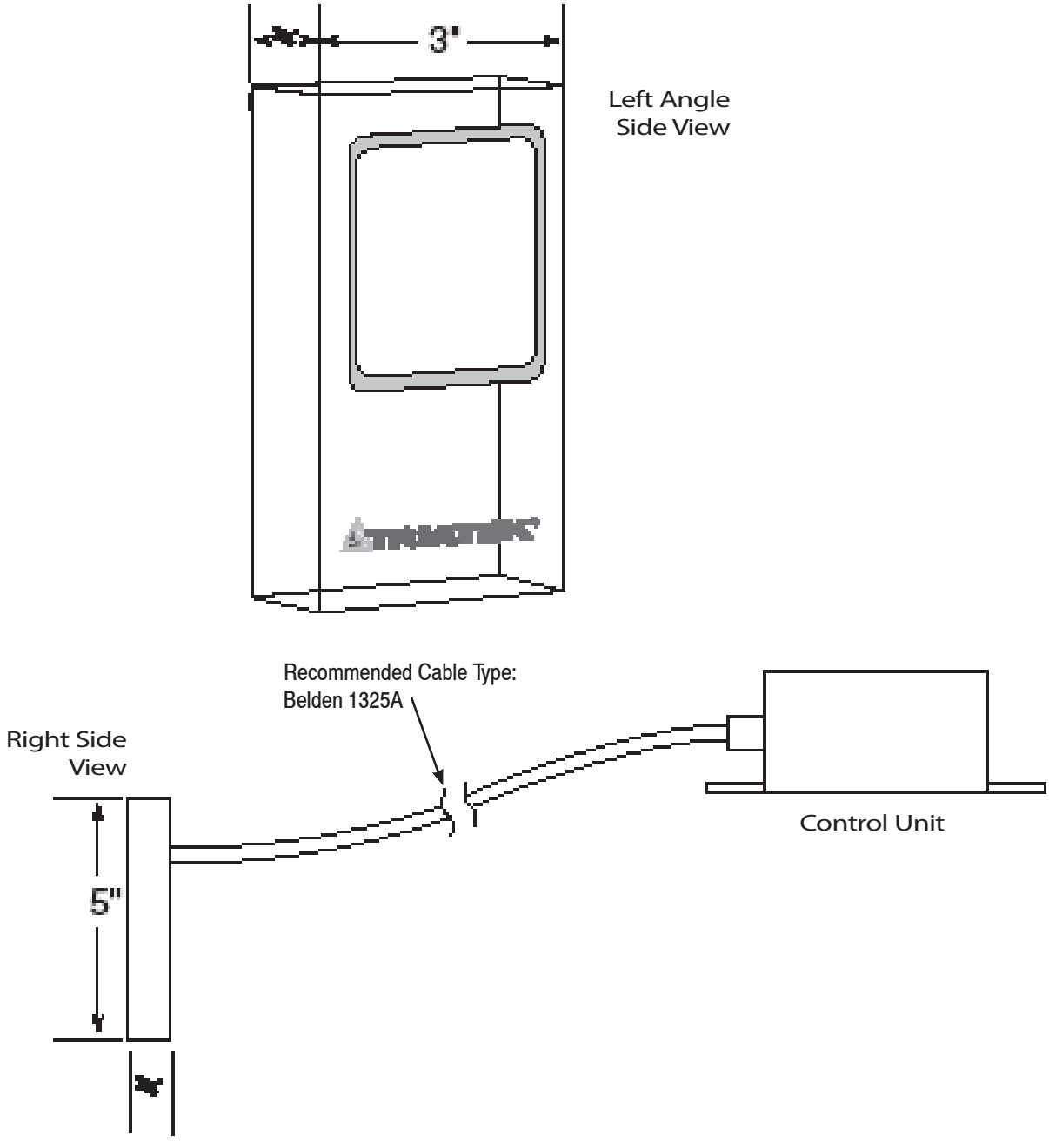
    Red: +
    Black: G
    White: IN

6. Power supply connections - input voltage must be Class 2, 24 VAC or 24 VDC. A step-down isolation transformer is supplied with the HMS-1650. Triatek recommends that the HMS unit be powered using the supplied transformer, and that only one unit be powered with each transformer. Do not power any other device with the same transformer. See pages 26 and 27 for connection details.

7. All wiring should conform to the Local Regulations and the National Electrical Code. Take precautions to prevent routing the sidewall sensor wiring in the same conduit as line voltage or other conductors that supply highly inductive loads such as generators, motors, solenoids or contacts, etc. For all wiring connections, use 22 AWG or larger.

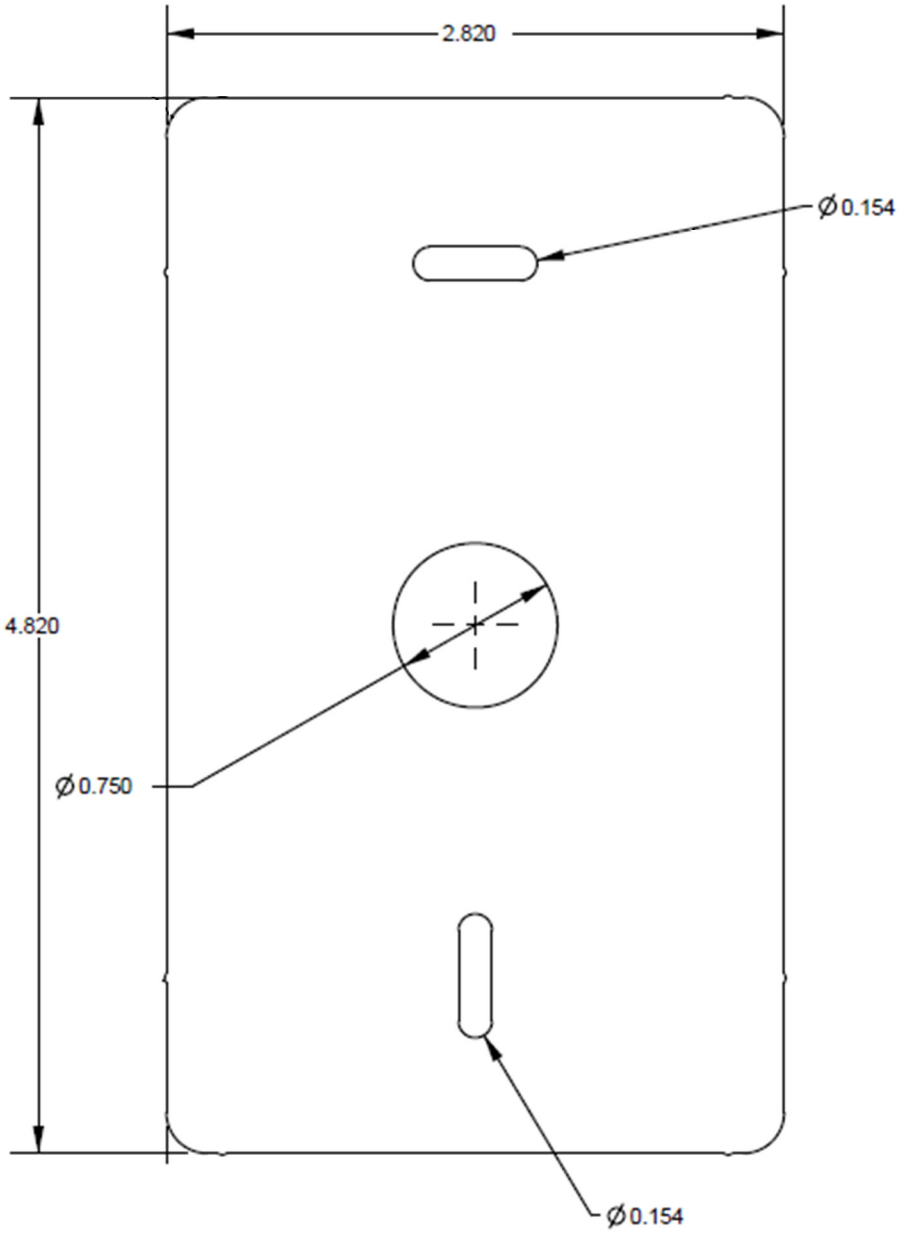
8. After the installation is complete, apply power to the unit, open the sash to a normal operating position and observe the flow reading on the touchscreen display. If necessary, proceed to the Programming Section beginning on page 31.

HMS Case Dimensions



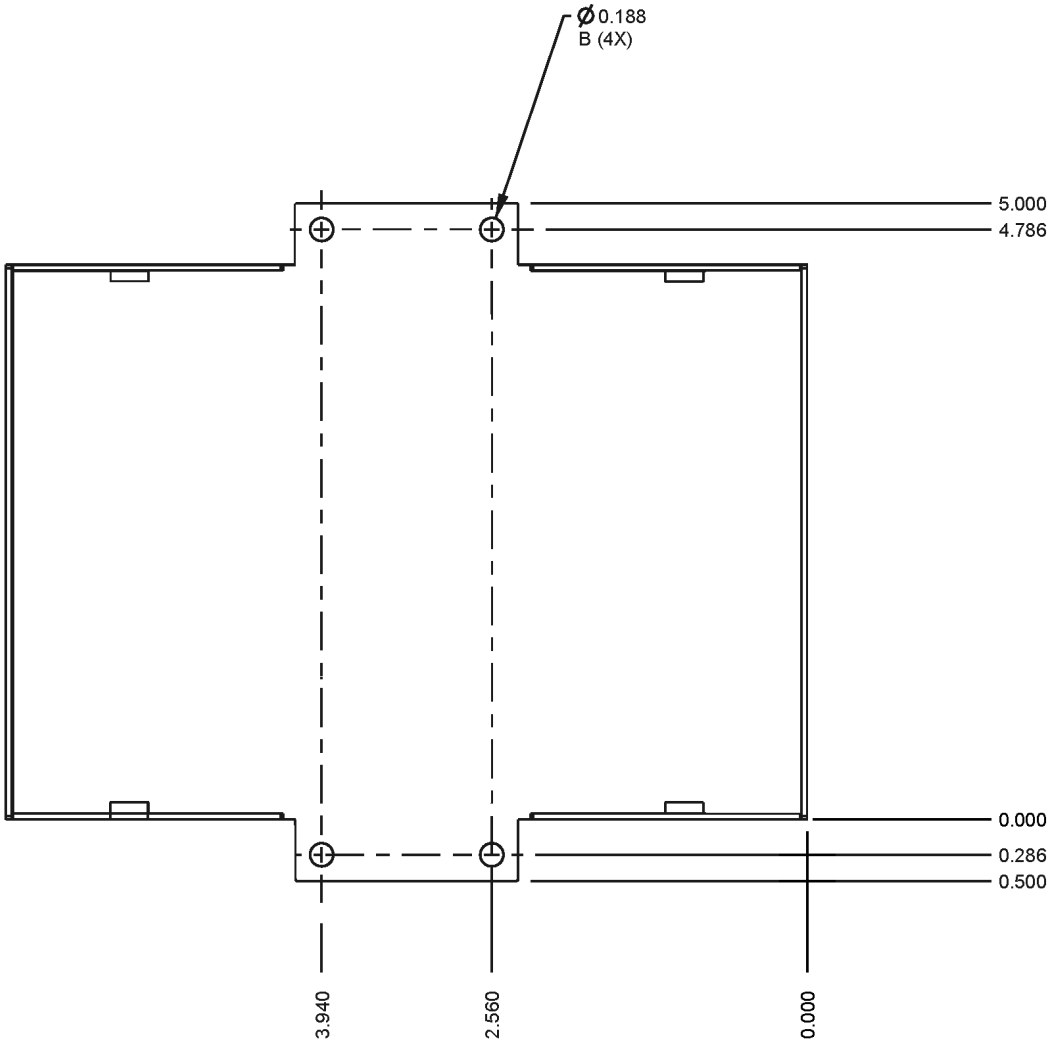
MOUNTING/WIRING

Display Mounting Hole Pattern



The HMS-1650 display backplate may be mounted directly to a standard single-gang wall box using the two slots along the centerline. Use the backplate as a template to mark the mounting holes and the cable access hole at the center of the backplate.

Controller Mounting Hole Pattern

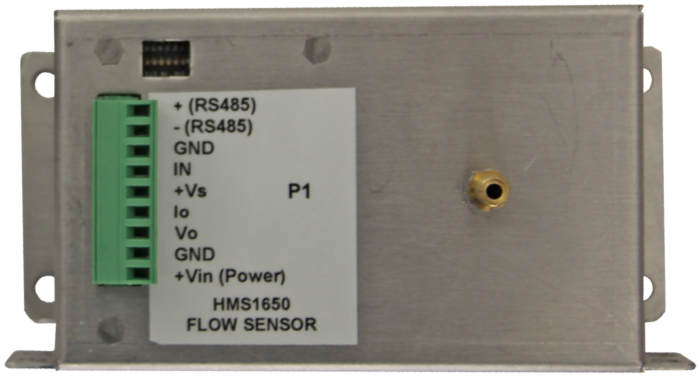


Warning

Failure to properly identify the sensor that came with your HMS controller could result in incorrect wiring and sensor damage. Make sure you use the correct wiring sequence for the sensor you received.

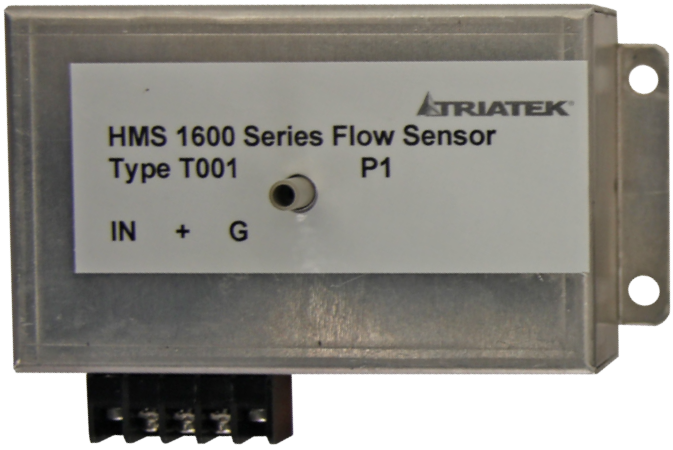
For reference, photos of both types of sensors are provided on the following page. If unsure as to which type of sensor you have and/or how to properly wire the sensor you received, contact the factory at 888-242-1922.

Sidewall Sensor Types



SENSIRION Digital Sensor (Standard 9-Pin)

Wire According To Illustration Found on Page 17.

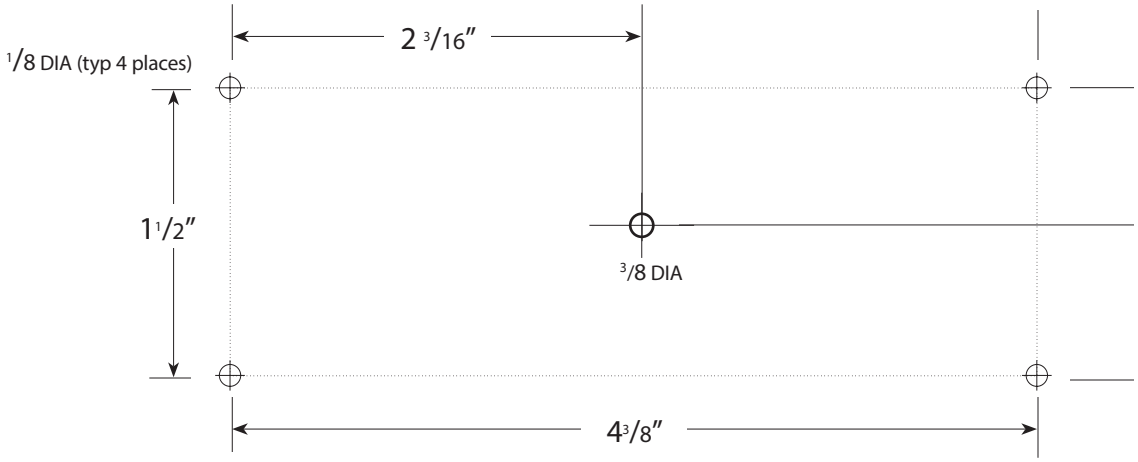


HONEYWELL Analog Sensor (3-Terminal)

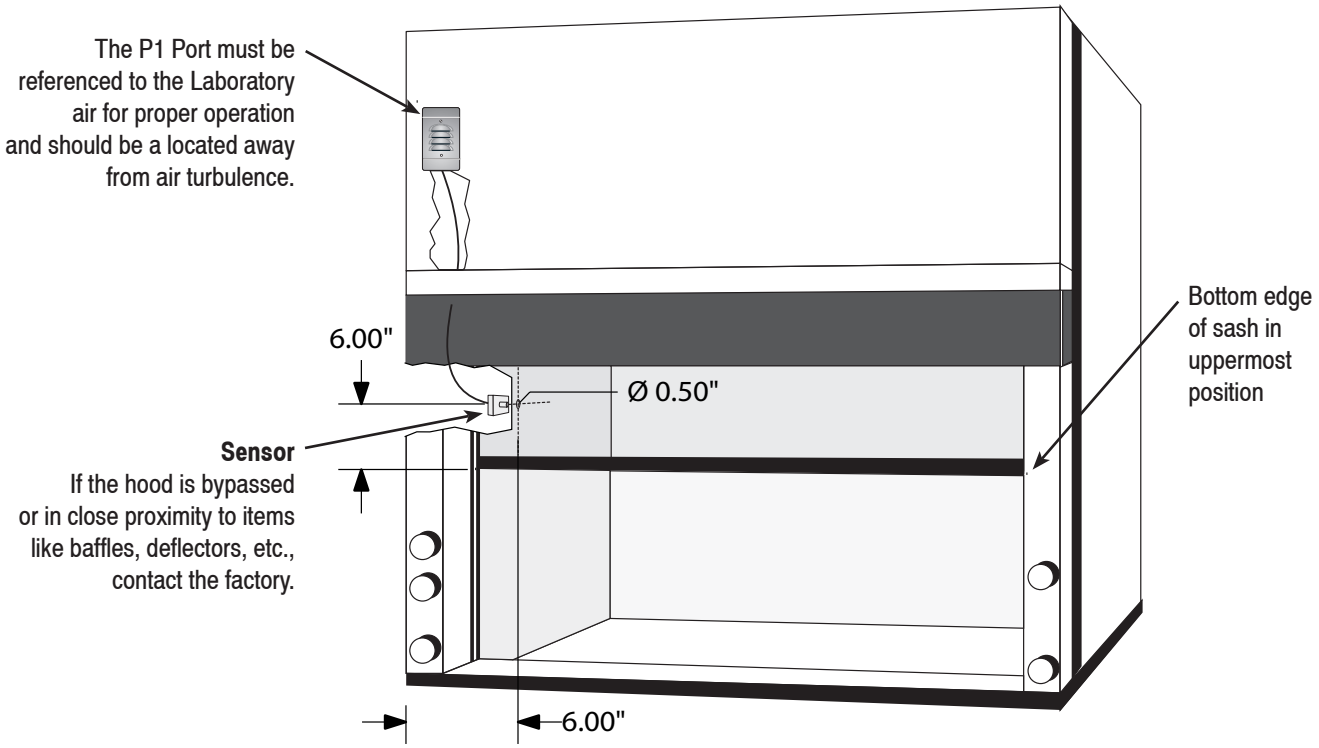
Wire According To Illustration Found on Page 18.

MOUNTING/WIRING

Sensor Mounting Hole Pattern



Sensor Placement - Non By-Pass Type



SENSIRION Digital Sidewall Sensor (9-pin)

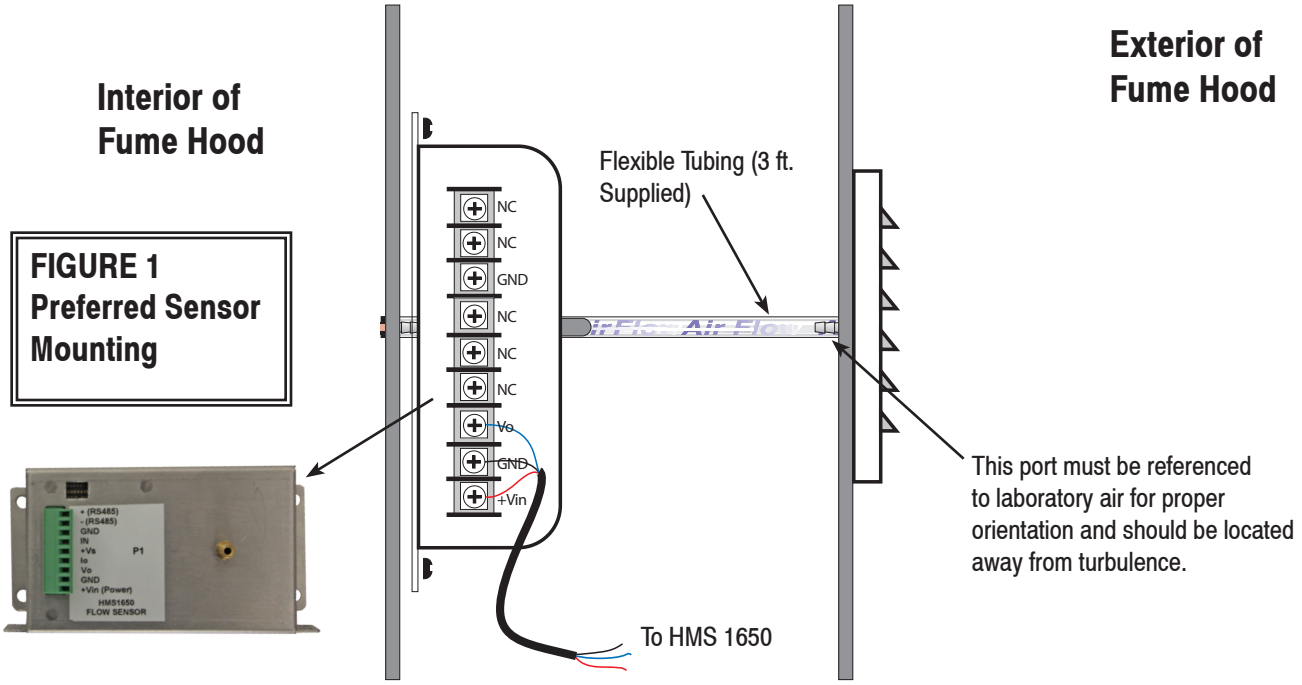


FIGURE 1
Preferred Sensor Mounting

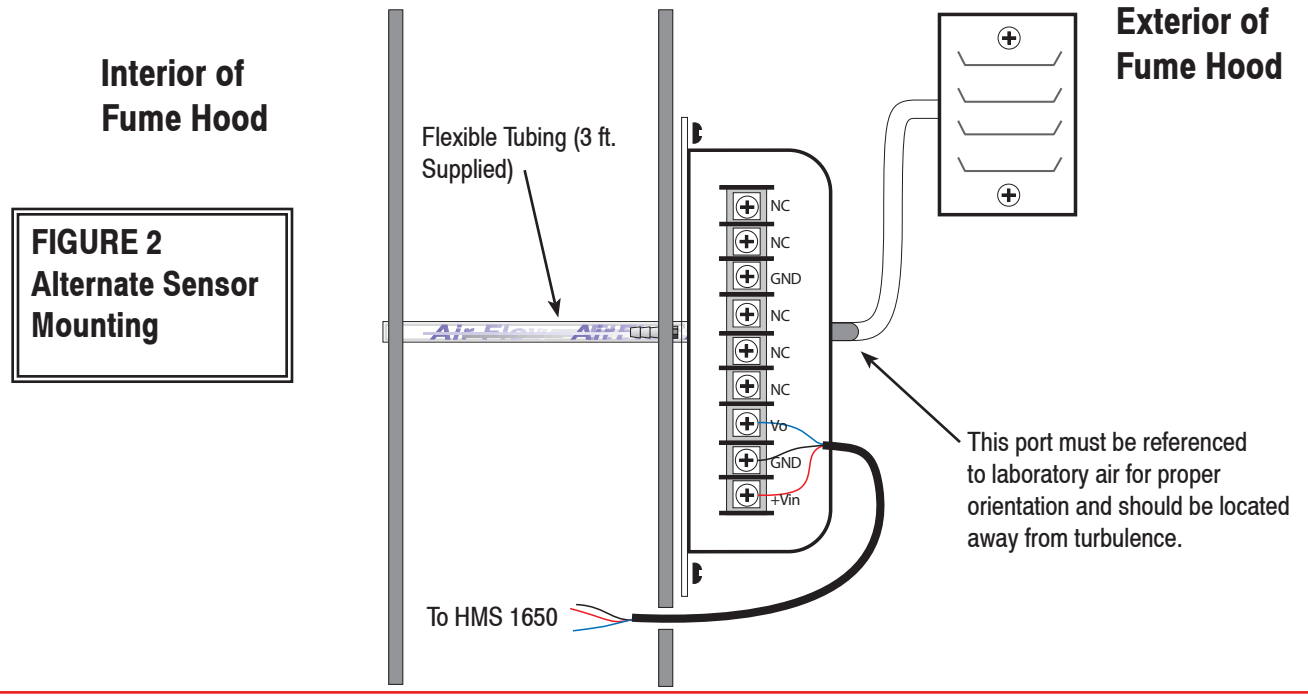


FIGURE 2
Alternate Sensor Mounting

MOUNTING/WIRING

HONEYWELL Analog Sidewall Sensor (3-terminal)

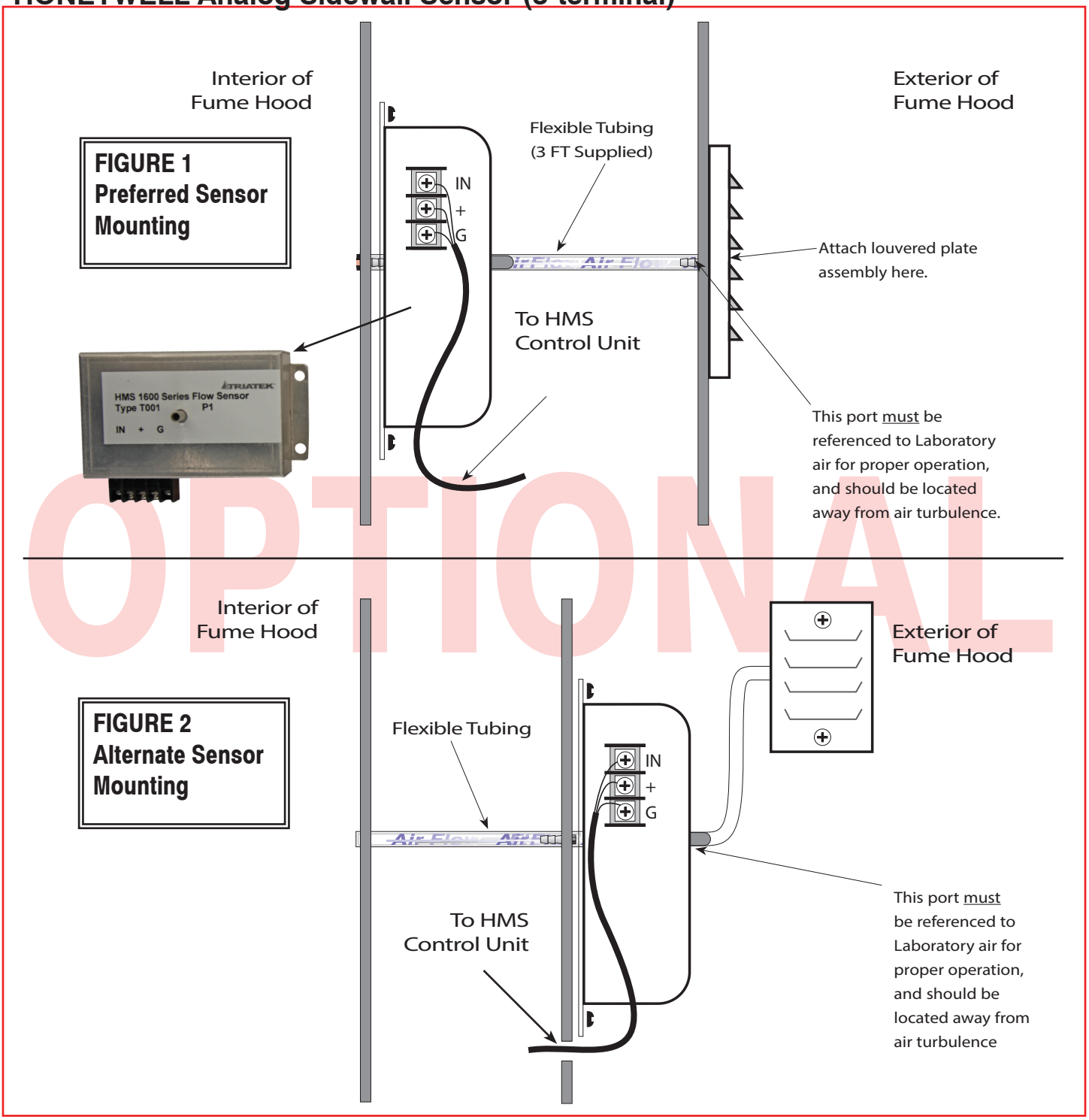


FIGURE 1
Preferred Sensor Mounting

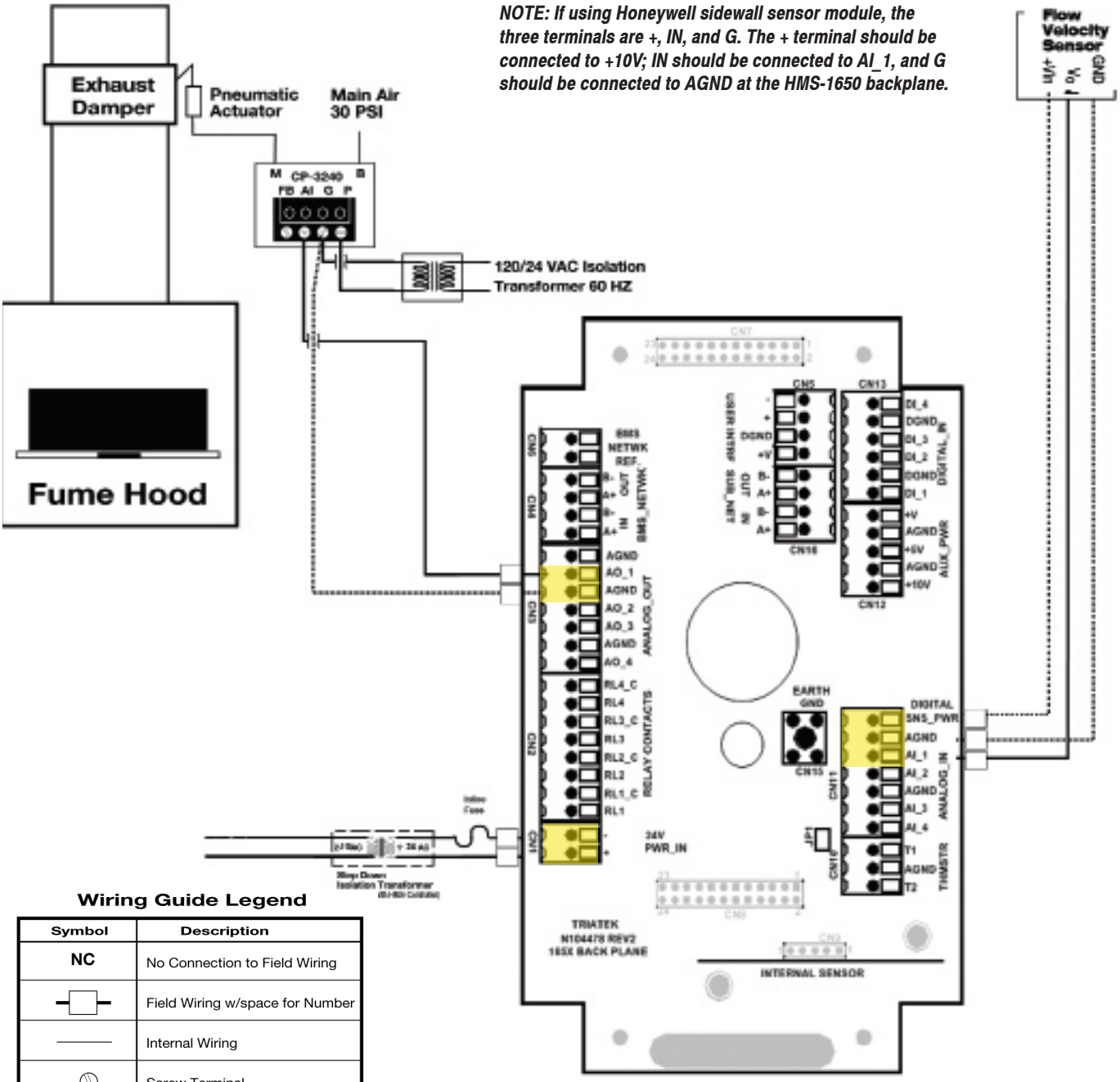
FIGURE 2
Alternate Sensor Mounting

Notes

MOUNTING/WIRING

Analog Output to Pneumatic Actuator

NOTE: If using Honeywell sidewall sensor module, the three terminals are +, IN, and G. The + terminal should be connected to +10V; IN should be connected to AI_1, and G should be connected to AGND at the HMS-1650 backplane.

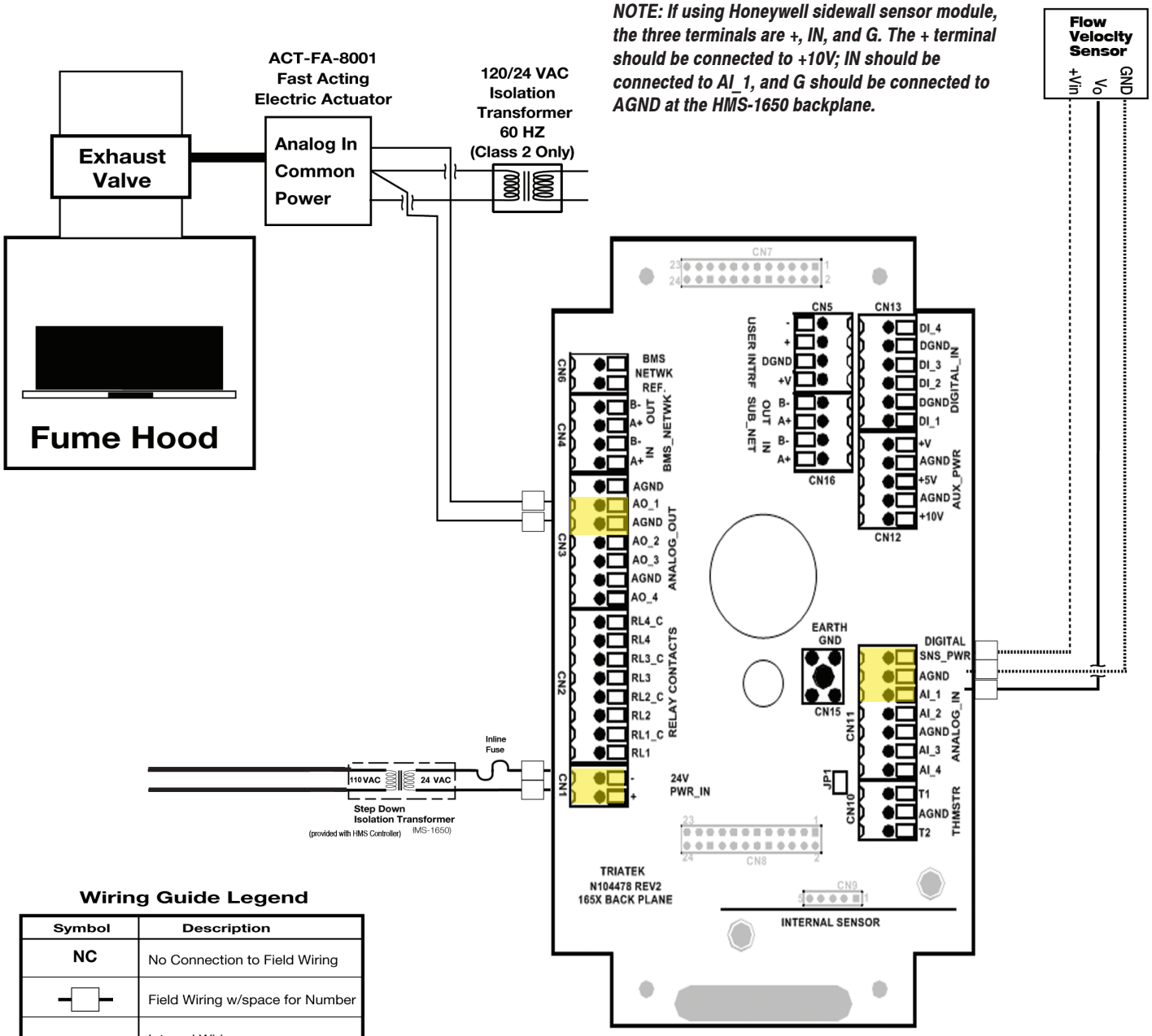


Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

Controller Configuration Dipswitch Settings
S1 - 1 = OFF, S1 - 5 = OFF (AI - 1 set as 0-5V Input)

Analog Output to Electric Actuator



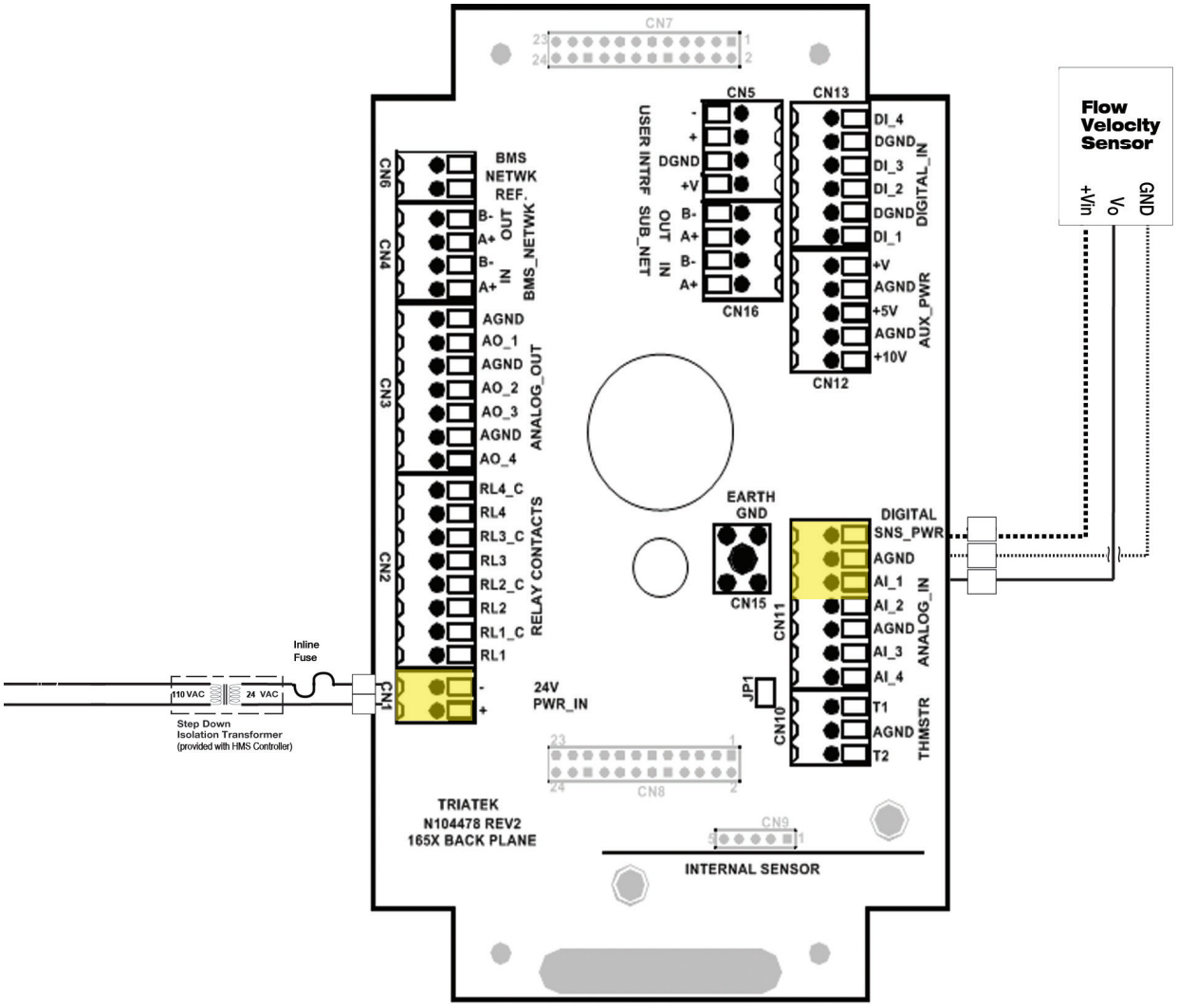
Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

Controller Configuration Dipswitch Settings
S1 - 1 = OFF, S1 - 5 = OFF (AI - 1 set as 0-5V Input)

MOUNTING/WIRING

Analog Input Single Flow Sensor



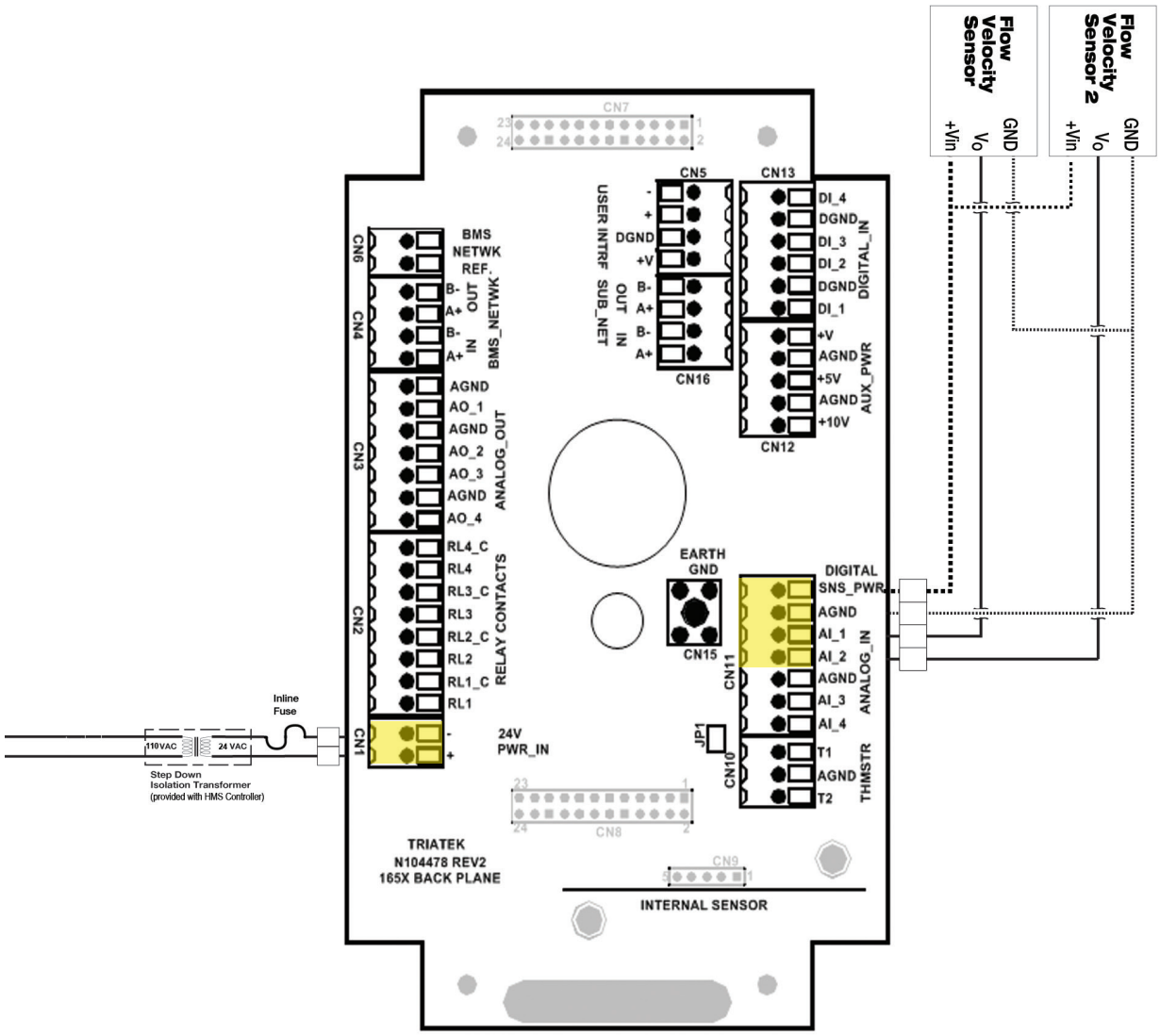
Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

NOTE: If using Honeywell sidewall sensor module, the three terminals are +, IN, and G. The + terminal should be connected to +10V; IN should be connected to AI_1, and G should be connected to AGND at the HMS-1650 backplane.

Controller Configuration Dipswitch Settings
S1 - 1 = OFF, S1 - 5 = OFF (AI - 1 set as 0-5V Input)

Analog Input Dual Flow Sensors



NOTE: If using Honeywell sidewall sensor module, the three terminals are +, IN, and G. The + terminal should be connected to +10V; IN should be connected to AI_1, and G should be connected to AGND at the HMS-1650 backplane.

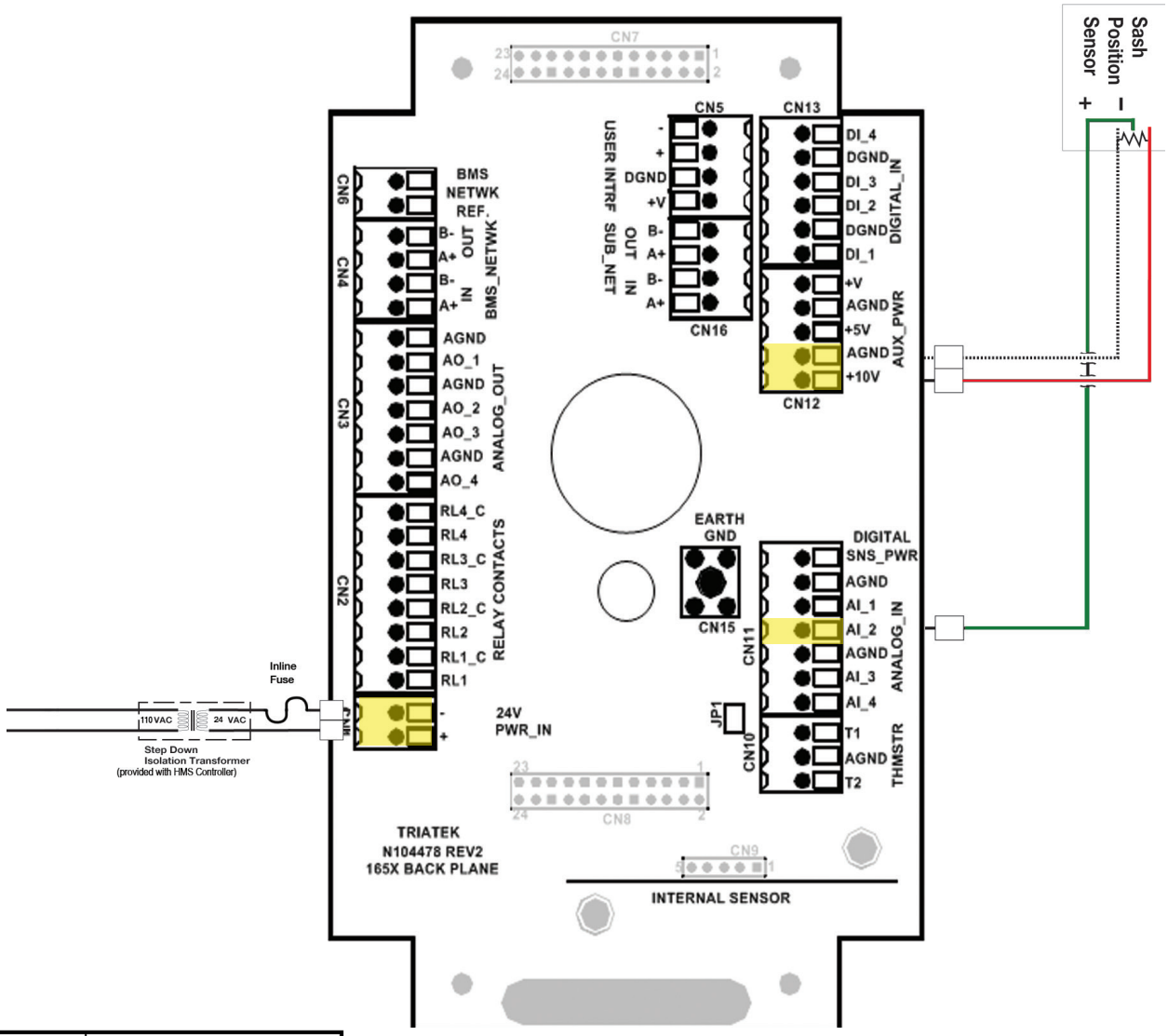
Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

Controller Configuration Dipswitch Settings
S1 - 1 = OFF, S1 - 5 = OFF (AI - 1 set as 0 - 5V Input)
S1 - 2 = OFF, S1 - 6 = OFF (AI - 2 set as 0 - 5V Input)

MOUNTING/WIRING

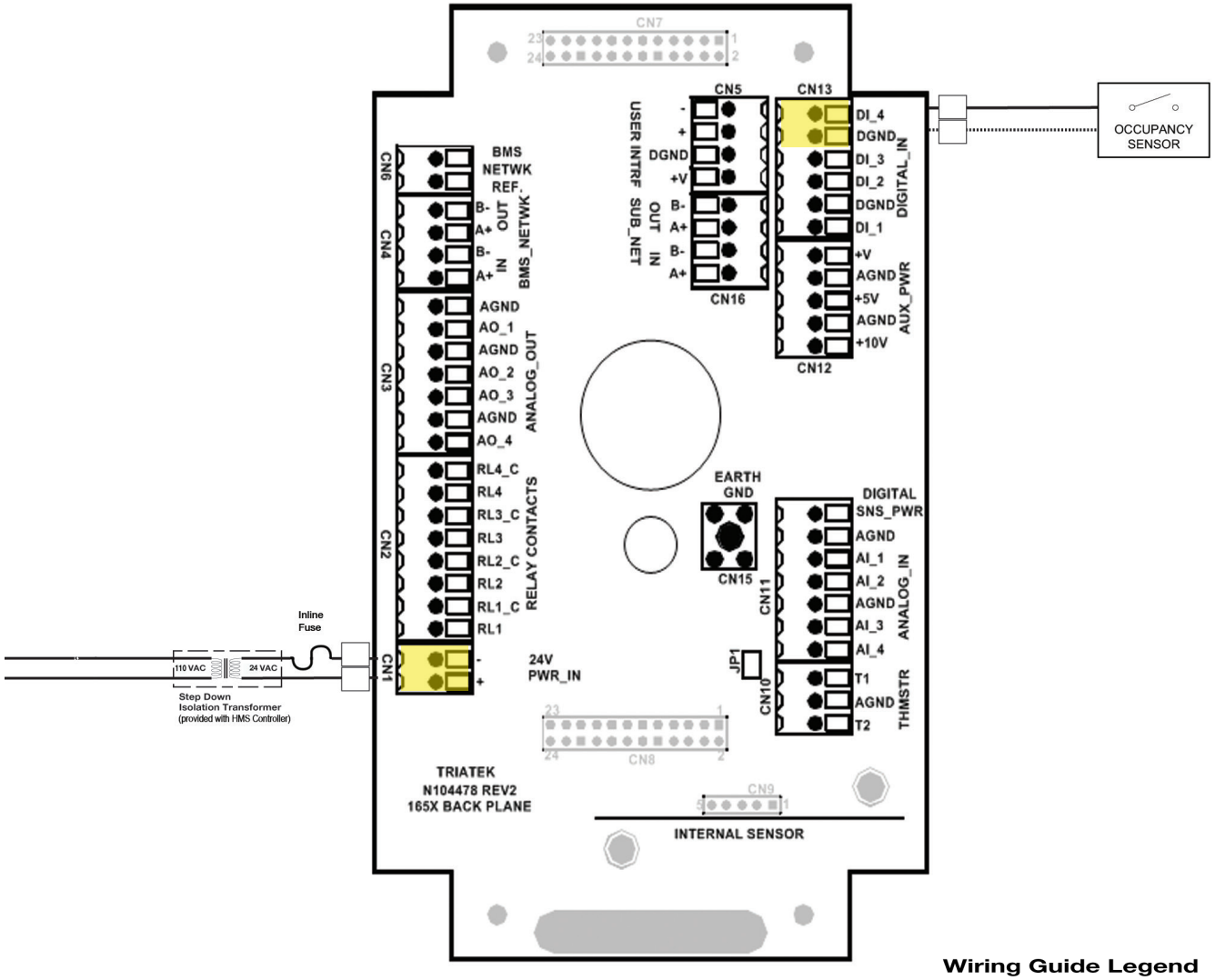
Analog Input Sash Position Sensor



Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

Controller Configuration Dipswitch Settings
S1 - 2 = OFF, S1 - 6 = ON (AI - 2 set as 0-10V Input)

Digital Input Occupancy Sensor



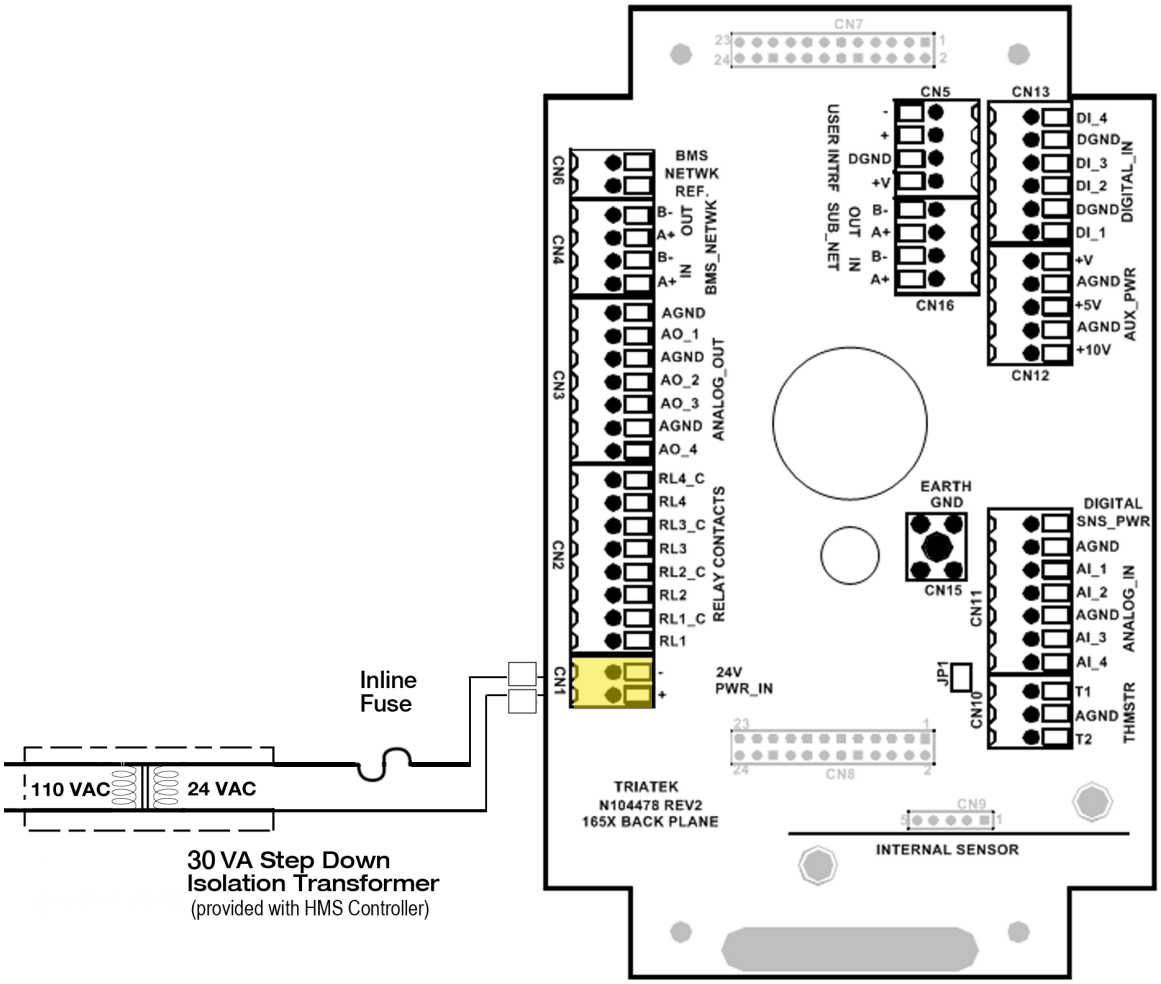
Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

Controller Configuration Slideswitch Settings
S5 = Left (Active - Low Digital Input)

MOUNTING/WIRING

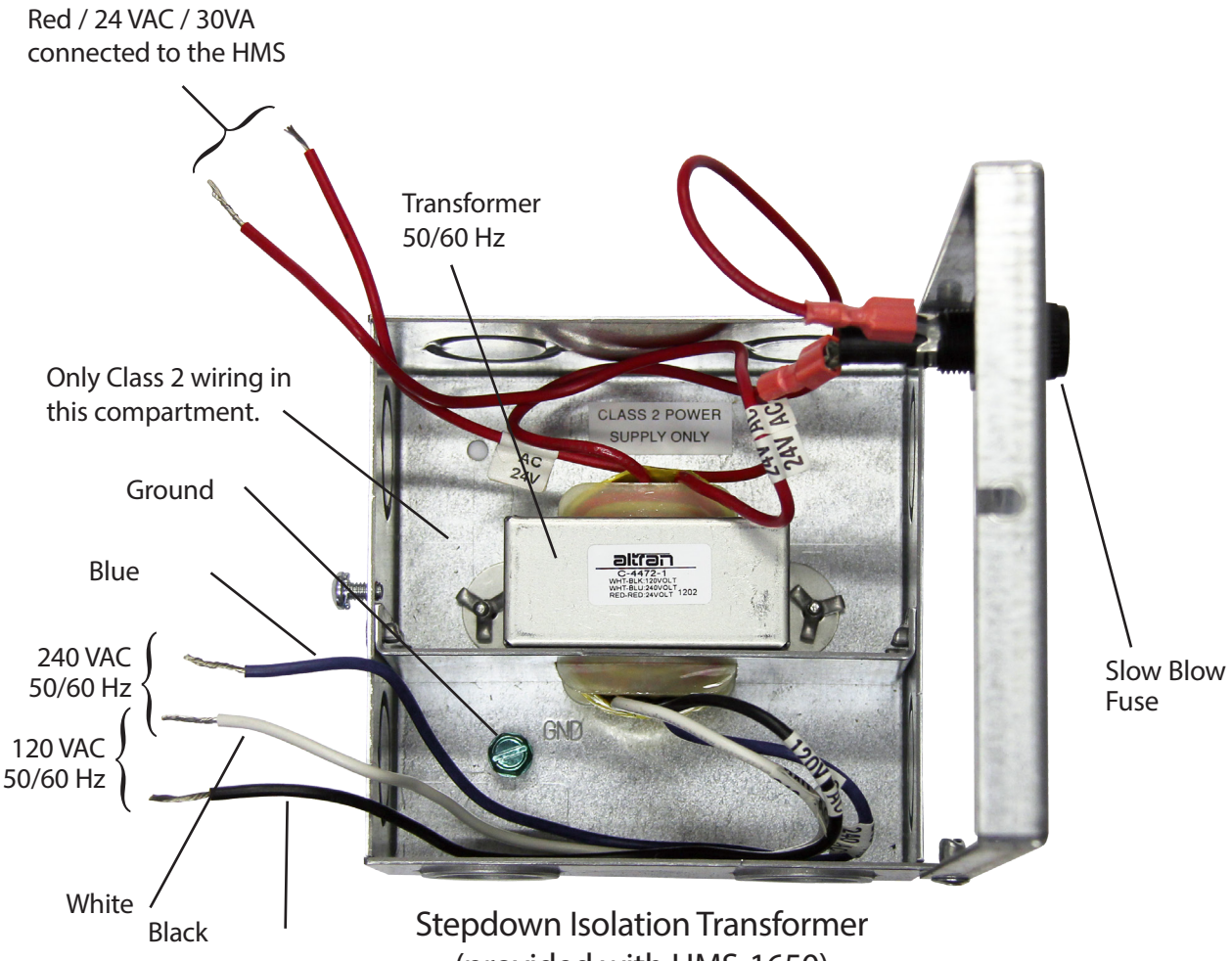
Power



Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

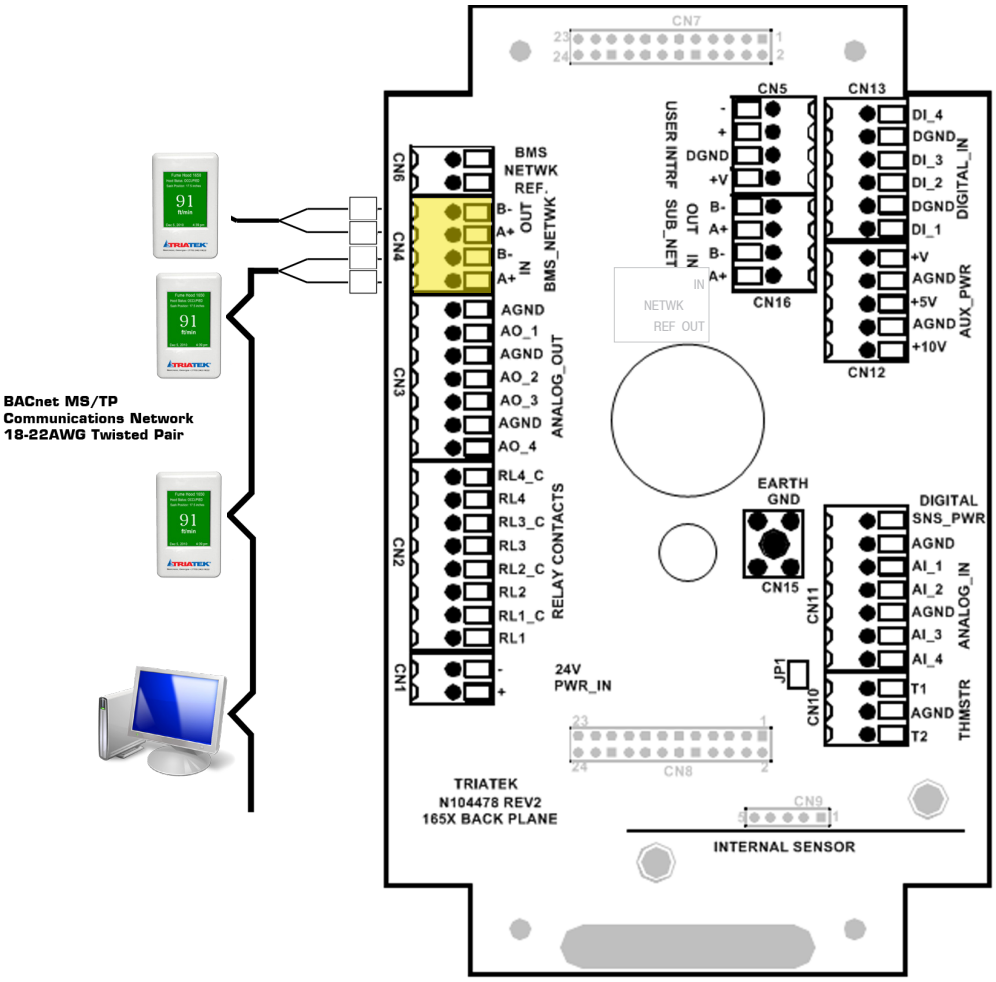
Isolated Power Supply



Stepdown Isolation Transformer
(provided with HMS-1650)

***Note:**
This product should be installed with the manufacturer provided isolated power supply and connected to an electrical circuit protected by a minimum 20A circuit breaker. This circuit breaker should be mounted in an approved electrical enclosure located separately, but in close proximity to this product.

BACnet MS/TP Wiring



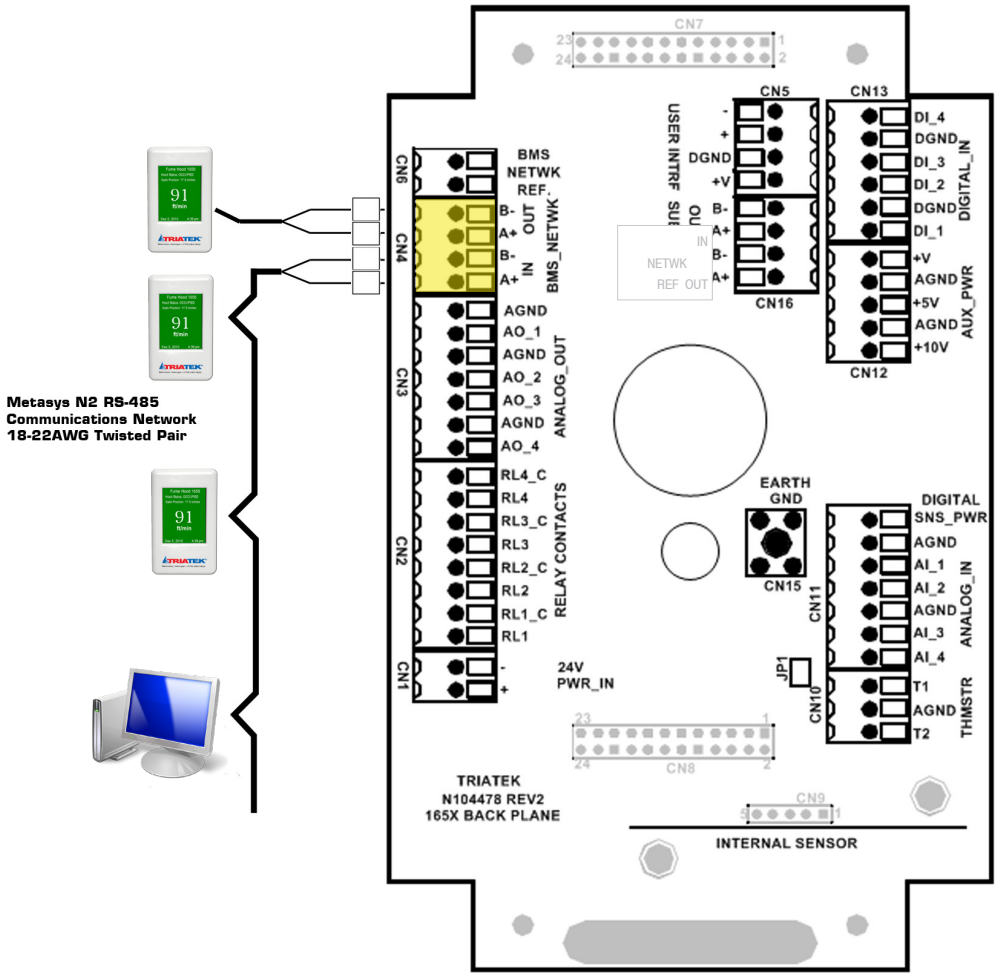
Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

NOTE: For optimum network communications, the reference signal (REF) must be connected to the "NETWK REF" terminals at the backplane.

Controller Configuration Dipswitch Settings
S3 - 7 = ON, S3 - 8 = ON (BACnet MS/TP protocol selected)

Metasys N2 Open Wiring



Wiring Guide Legend

Symbol	Description
NC	No Connection to Field Wiring
	Field Wiring w/space for Number
	Internal Wiring
	Screw Terminal
	Air Flow To and From Unit Between Room and Corridor

NOTE: For optimum network communications, the reference signal (REF) must be connected to the "NETWK REF" terminals at the backplane.

Controller Configuration Dipswitch Settings
S3 - 7 = ON, S3 - 8 = OFF (Metasys N2 Open protocol selected)

Notes

Introduction
After the HMS-1650 unit has been properly installed, apply power to the unit. On power up, you will hear two short beeps that indicate the HMS-1650 display module is communicating with the main controller module, and has begun the initialization sequence. The LED backlighting of the HMS-1650 display will cycle through the three unit status colors (green, yellow, red) as part of the power-up initialization sequence, followed by the displaying of the Triatek splash screen indicating serial numbers, firmware version numbers, protocol selection, and network address. This splash screen remains displayed for approximately 5 seconds and then disappears to reveal the main display screen. This splash screen information can also be redisplayed using the **About This HMS** option on the Diagnostics menu.

Each HMS-1650 comes pre-configured in Standby mode.

Main Display Screen
All HMS-1650 units come shipped from the factory in the **Standby** operating mode. The standby operating mode will be represented by white text on a blue background. Information displayed on the main screen includes the following:

- Name of monitored fume hood (up to 20 characters)
- Current operating mode (occupied, unoccupied, or standby)
- Current sash position or height in selected engineering units (default is inches)
- Current temperature (if sensor is available)
- Current face velocity reading in selected engineering units (default is ft/min)
- Current time and date

While in standby operating mode, the background color of the main display screen is blue. However, while in either Occupied or Unoccupied operating modes, the background color actively represents that current status of the monitor. A green background indicates that the current face velocity is within allowable limits of the desired setpoint. A yellow background indicates that the current face velocity has drifted outside of the allowable limits of the desired setpoint and is in the caution range. A red background indicates that the current face velocity has reached a critical condition and is outside of the allowable limits of the desired setpoint.

The HMS-1650 incorporates a full-color touchscreen and includes an extensive easy-to-use menu system that allows the user to quickly setup the fume hood controller for immediate use. Also integrated into the HMS-1650 display are several hotspots that provide quick access to various settings. Refer to page 36 for details on using these hotspots as display settings shortcuts. Touching the screen anywhere other than one of the reserved hotspots invokes the menu system, unless one or more security passwords have been entered.

Configuring Fume Hood Monitor
The initial setup of the HMS-1650 Fume Hood Controller involves the following simple steps:

- Configure analog output
- Calibrate face velocity sensor
- Configure face velocity setpoints
- Configure sash position sensor input
- Calibrate sash position sensor
- Configure sash alarm heights
- Configure face velocity alarm setpoints

Configuring Analog Output for Exhaust Damper Control
For those applications requiring control of an exhaust damper actuator by the HMS-1650, the analog output must be configured accordingly. If this application requires monitoring only and does not include controlling the exhaust damper of the fume hood, then proceed to the next section to calibrate the fume hood face velocity sensor.

To begin configuring the analog output for controlling the exhaust damper actuator, enter the *Main Setup Menu* by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *Unit Setup* --> *Controller Setup* --> *Analog Output* and the user is prompted to select an operating mode (direct control or PID control) and an operating range. Most applications will take advantage of the PID (proportional-integral-derivative) control mode, where the control output can be customized

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by varying the control loop constants. The operating range can either include an offset from zero or not, independent of whether the analog output is configured for current or voltage mode.

Once the operating mode and range are selected, the user is prompted to specify the upper and lower limits of the analog output as percentages. Most applications will use the default settings of zero and 100 percent. But for those applications where the top or bottom limits need to be tweaked, these settings may be adjusted accordingly to further limit the range of the actual analog output signal. Finally, the user is prompted to specify the analog input channel to be used for this analog output. The default channel is AI-1, which is the sidewall-mounted velocity sensor input. The analog output can be configured for either direct-acting or reverse-acting mode. Each of the three operating modes (*Occupied*, *Unoccupied*, *Standby*) has a unique setpoint. This allows the target setpoint to automatically update based on the selected operating mode. For controlling Triatek's fast-acting actuators, the HMS-1650 comes pre-configured from the factory with the correct settings for proper PID loop control of the exhaust damper.

To confirm that the analog output has been configured properly, use the *Overrides* option on the *Diagnostics* menu to manually override analog output 1. Moving the slider from zero to 100 percent should cause the damper to move from a fully closed position to a fully open position, or vice versa, depending on the acting mode selected.

Calibrating Face Velocity Sensor

The standard HMS-1650 comes pre-configured and pre-calibrated with a face velocity sensor that gets installed in the sidewall of the fume hood being monitored. If the application requires sash position control only, then proceed to the next section to configure the sash position sensor settings.

To begin calibrating the face velocity sensor following installation, enter the Main Setup Menu by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *Unit Setup* --> *Hood Setup* --> *Field Calibration*. At the initial field calibration screen, the analog output is overridden to close off the exhaust damper and the sidewall velocity sensor should be capped to prevent air flow.

Once the face velocity reading stabilizes, click the *Next* button to proceed to the next field calibration screen where the overriden analog output should be repositioned to achieve approximately 100 ft/min at the sash opening with the sash positioned at a height of 18 inches.

An air flow measuring instrument should be used to confirm that the face velocity is approximately 100 ft/min. Move the analog output slider to increase or decrease the effective face velocity at the sash opening, and then click the *Next* button to proceed to the next field calibration screen. Using the air flow measuring instrument, take three measurements across the 18-inch sash opening and enter the average using the slider on the field calibration screen. Click the *Next* button to complete the field calibration procedure of the fume hood face velocity sensor. Proceed with the next section to configure the face velocity setpoints of the HMS-1650.

Configuring Face Velocity Setpoints

To begin configuring the face velocity setpoints following the field calibration procedure, select Edit Setpoints from the Hood Setup menu. Enter the desired setpoint for the current operating mode using the popup numeric keypad. To configure setpoints for the other two operating modes, use the Operating Mode option on the Hood Setup menu to switch modes and enter the setpoints as described above. Once setpoints have been entered for all three operating modes, proceed with the next section to configure the sash position sensor (POS-100) if included with this unit. If a sash position sensor was not included with this unit, proceed to the section describing the procedure for setting the face velocity alarm setpoints below.

Configuring Sash Position Sensor

For those applications requiring sash position control of an exhaust damper actuator by the HMS-1650, the sash position sensor (POS-100) must be configured and calibrated accordingly. If this application requires monitoring only and does not include controlling the exhaust damper of the fume hood, then proceed to the next section to configure the fume hood face velocity alarm setpoints.

To begin configuring the sash position sensor input, enter the Main Setup Menu by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *System Setup* --> *Analog Inputs* and select the analog input to which the sash position sensor is physically connected (default is AI-3). At the *Select Input Type* screen for the selected input, click on *Sash Position* and then click the *Next* button to proceed. At the *Analog* Input x *Settings* popup screen, select the desired engineering units (default is inches) and the range (default is 0-5V,0-10V,0-20mA), and click the *Finish* button to save the settings to non-volatile memory.

To confirm that the analog input has been configured properly, use the *Real-Time View* option on the *Diagnostics* menu to monitor the

selected analog input. Moving the sash from fully closed to fully open should result in a change for the selected analog input on the *Analog Inputs Real-Time View* screen.

Calibrating Sash Position Sensor

To begin calibrating the sash position sensor, enter the Main Setup Menu by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *Unit Setup* --> *Sash Setup* --> *Field Calibration*. At the initial field calibration screen, the sash should be moved to the fully closed position. Move the slider to represent the actual sash height in the fully closed position (default is zero), and click the Next button to proceed to the next field calibration screen. Move the sash to the fully open position, measure the actual height of the sash opening, and enter the measured value using the slider. Click the *Next* button to complete the field calibration of the sash position sensor. Proceed with the next section to configure the sash height settings of the HMS-1650.

Configuring Sash Height Settings

The HMS-1650 monitors sash height for alarming purposes, if this unit has been equipped with a sash position sensor (POS-100). The *Sash High Position* specifies the height at which the HMS-1650 will sound an audible alarm if the sash is left at or above this position for an extended period of time, specified as the *Sash High Delay* setting. The *Sash Low Mute Level* specifies the height below which the HMS-1650 will mute the audible alarm if it has been activated due to high face velocity conditions.

To begin configuring these sash settings, enter the *Main Setup Menu* by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *Unit Setup* --> *Sash Setup* --> *Sash Heights*. Enter the *Sash High Position*, *Sash High Delay*, and *Sash Low Mute Level* using the popup numeric keypad on the touchscreen display. The sash heights should be entered in inches, while the sash high delay should be entered in seconds. Proceed with the next section to configure the face velocity alarm setpoints of the HMS-1650.

Calibrating the Sash Control Feature

The HMS-1650 features a comprehensive closed-loop control scheme using both sash control and sidewall sensing. The sash control is activated automatically anytime the sash moves, and immediately positions the exhaust damper at the position calibrated to provide the required face velocity at the sash opening. This provides an immediate response to the moving sash to adjust the exhaust damper accordingly. Once the sash stops moving, the PID control loop resumes using the sidewall sensor to fine tune the face velocity to meet the target setpoint.

Selecting the *Sash Control* option on the *Sash Setup* menu invokes the sash width configuration screen, where the width of the sash opening may be specified in inches. This width is used in conjunction with the height of the sash opening to calculate the effective flow in cfm. After entering the sash width, click the *Next* button to advance to the first calibration screen where the sash should be moved to the closed position. Wait for the face velocity to stabilize near the current setpoint, and then click the *Next* button to advance to the next calibration screen. Move the sash to the quarter open position, wait for the face velocity to resume the target setpoint, and then click the *Next* button to advance to the next calibration screen. Move the sash to the half open position, wait for the face velocity to resume the target setpoint, and then click the *Next* button to advance to the next calibration screen. Move the sash to the three-quarter open position, wait for the face velocity to resume the target setpoint, and then click the *Next* button to advance to the next calibration screen. Move the sash to the full open position, wait for the face velocity to resume the target setpoint, and then click the *Next* button to invoke the calibration results screen.

Configuring Face Velocity Alarm Setpoints

The HMS-1650 features a comprehensive alarm facility that includes both audible and visual capabilities. To begin configuring the alarm setpoints for the face velocity, enter the *Main Setup Menu* by touching the touchscreen display anywhere other than one of the hot-spot locations. From the *Main Setup Menu*, select *Unit Setup* --> *Controller Setup* --> *Next* --> *Alarm Limits*. Enter the *High Alarm*, *High Warning*, *Low Warning*, and *Low Alarm* setpoints for the current operating mode (*Occupied* or *Unoccupied*) using the popup numeric keypad on the touchscreen display. Alarm setpoints are unavailable for standby mode. The default settings for the face velocity alarm setpoints are 150 fpm, 130 fpm, 90 fpm, and 75 fpm.

Changing Fume Hood Operating Mode

The HMS-1650 fume hood controller can be set for occupied, unoccupied, and standby modes of operation. To change the mode of operation, select *Unit Setup* --> *Hood Setup* --> *Operating Mode* and the user is prompted to select one of three modes. Changing the mode of operation automatically selects the pre-programmed setpoints and alarm limits associated with each mode. To quickly change the operating mode from the main display without entering the user menus, the *Hood Status* hotspot may be used to invoke the *Operating*

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Mode selection popup. Also, if the fume hood controller is in *Standby mode*, the *OCCUPIED* button at the bottom of the main display may be used to directly switch to the Occupied operating mode.

Changing Network Settings

Changing network settings on the FMS-1650 is extremely simply and can be accessed by selecting *Unit Setup* --> *Network Setup*. Depending upon the protocol selected, the *Network Setup* menu will present the user with the available options. All HMS-1650 demo units have a default protocol selection of BACnet, and therefore the *Network Setup* menu options pertain to this protocol. From this menu, the user can select a different baud rate or change the network address of the unit.

Adding Password Security

The HMS-1650 menu system can be protected by adding up to ten (10) multi-level passwords to the system. A password entry may be created by selecting *System Setup* --> *Next* --> *Passwords Setup* --> *Add Password* and the user is prompted to enter a minimum of four (4) and up to eight (8) digits. Once a password has been specified, the user is prompted to specify one of four access levels: *Unrestricted*, *Standard*, *Basic*, and *Restricted*. All password entries are saved to non-volatile memory. In the event that a password has been forgotten, there is a factory-default "back door" password that will provide unrestricted access to the user menu system. Please consult with the factory for more information regarding this password.

Changing Display Settings

The HMS-1650 display screen can be customized very easily using options available under the *Display Setup* menu. For those applications where the user or customer wants to minimize or eliminate the verbose text shown on the main display screen, a status-only display mode may be enabled by selecting *Display Setup* --> *Display Modes*, and choosing the *Status-Only* option. This mode suppresses all of the information on the main display screen, leaving only the background color to indicate status. A green screen indicates normal operating differential pressure range. A yellow screen indicates that either the monitored door is opened or the differential pressure is operating in the warning range. A red screen indicates that the differential pressure has crossed into the critical operating range.

If the user does not want to completely suppress all information on the main display screen, specific information may be individually suppressed by selecting *Display Setup* --> *Display Options*, and deselecting the status information that should be disabled. For those customers who need support for multiple languages, the *Language Options* selection allows the user to change the language displayed in the menu system and on the main display screen. Changing the time and date can be accomplished either by using the hotspots on the main display screen, or by selecting *Display Setup* --> *Set Time & Date*. The time and date settings are dynamic and do not get saved to non-volatile memory on the demo unit. Operational units connected to a controller, however, can retain their time and date settings for up to two hours with no power connected. Finally, the brightness of the LED backlighting on the HMS-1650 can be adjusted by selecting *Display Setup* --> *Next* --> *Set Brightness*. The brightness settings are saved in nonvolatile memory and remain in effect through a power cycle.

Built-in Diagnostics

The HMS-1650 incorporates several very useful diagnostic tools that may greatly facilitate diagnosing and troubleshooting the system during the installation and commissioning phase. The Overrides option allows both analog and relay outputs to be overridden individually. Each analog output may be locked at the overridden percentage while test and balance makes adjustments to supply or exhaust dampers, for example. While in the overridden state, the analog output is "disconnected" from its PID control loop, if enabled. Cancelling the override effectively resumes the normal PID control loop operation, again if enabled.

A unique feature of the HMS-1650 is the Real-Time View option, which allows the user to see in real-time the actual inputs and outputs, along with their voltage levels or states. One of the most useful tools for fine-tuning the PID loop performance is the Analog I/O Pairs screen, which displays the analog input and its current setpoint, along with the analog output which is mapped to it. This allows the user to see in real-time the varying analog input signal and its corresponding analog output control signal.

To preserve the configuration settings after verifying that everything is configured properly, the Save Settings option on the Diagnostics menu will take a snapshot of the current configuration settings for later retrieval. In the event that some of the configuration settings inadvertently get overwritten with invalid settings, typically through unauthorized operator error, they may be restored either to the previously saved user settings or to the factory-default settings.

Configuring Display Module Settings

Options Dipswitch (S1) – internal use only			
1.	Graphics Chip Mode Selection	OFF = Programming Mode	ON = Run Mode
2.	Touchscreen Calibration Mode	OFF = Force calibration	ON = Auto calibration
3.	Reserved		
4.	Reserved		

Options Dipswitch (S2) – mode configuration 1			
1.	Product Type	OFF = FMS/HMS	ON = CMS-1650
2.	MAX FLOW Button	OFF = Disabled	ON = Enabled
3.	Mode Select	OFF = FMS-1650 / CMS-1650	ON = HMS-1650
4.	Operational Mode:	OFF = Demo Mode	ON = Run Mode

Pushbutton Switch (SW1):	Reset Button	
Pushbutton Switch (SW2):	Reserved	

MODULE SETTINGS

Configuring Main Controller Module Settings

Analog Input Configuration Dipswitch (S1)			
1.	AI-1 Mode Selection:	OFF = voltage input	ON = current input
2.	AI-2 Mode Selection:	OFF = voltage input	ON = current input
3.	AI-3 Mode Selection:	OFF = voltage input	ON = current input
4.	AI-4 Mode Selection:	OFF = voltage input	ON = current input
5.	AI-1 Voltage Range Selection:	OFF = 0-5Vdc	ON = 0-10Vdc
6.	AI-2 Voltage Range Selection:	OFF = 0-5Vdc	ON = 0-10Vdc
7.	AI-3 Voltage Range Selection:	OFF = 0-5Vdc	ON = 0-10Vdc
8.	AI-4 Voltage Range Selection:	OFF = 0-5Vdc	ON = 0-10Vdc

NOTES: To configure HMS-1650 for sidewall velocity sensor, set dipswitch positions 1 and 5 to OFF. To configure HMS-1650 for sash position sensor at AI-3 (default), set dipswitch position 3 to OFF and dipswitch position 7 to ON.". For other inputs, see Table 1.

Analog Output Configuration Dipswitch (S3)			
1.	AO-1 Mode Selection:	OFF = current output	ON = voltage output
2.	AO-2 Mode Selection:	OFF = current output	ON = voltage output
3.	AO-3 Mode Selection:	OFF = current output	ON = voltage output
4.	AO-4 Mode Selection:	OFF = current output	ON = voltage output

Network Configuration Dipswitch (S3)			
5.	RS485 Network Termination:	OFF = disabled	ON = enabled
6.	RS485 Display Termination:	OFF = disabled	ON = enabled
7.	Protocol Select: see Table 2 below		
8.	Protocol Select: see Table 2 below		

Configurations & Settings

Table 1. Analog Input Configuration Settings (S1)								
Mode	S1 - 1	S1 - 2	S1 - 3	S1 - 4	S1 - 5	S1 - 6	S1 - 7	S1 - 8
AI-1 5Vdc	OFF				OFF			
AI-1 20mA	ON				OFF			
AI-1 10Vdc	OFF				ON			
Not Valid	ON				ON			
AI-2 5Vdc		OFF				OFF		
AI-2 20mA		ON				OFF		
AI-2 10Vdc		OFF				ON		
Not Valid		ON				ON		
AI-3 5Vdc			OFF				OFF	
AI-3 20mA			ON				OFF	
AI-3 10Vdc			OFF				ON	
Not Valid			ON				ON	
AI-4 5Vdc				OFF				OFF
AI-4 20mA				ON				OFF
AI-4 10Vdc				OFF				ON
Not Valid				ON				ON

Table 2. Protocol Selection Settings (S3)		
Protocol Selection	S3-7	S3-8
Reserved	OFF	OFF
Metasys® N2	ON	OFF
LonWorks®	OFF	ON
BACnet® MS/TP (default)	ON	ON

Controller Configuration Dipswitch (S4)		
1. AO-1 Voltage Range Selection:	OFF = 0-10Vdc	ON = 0 - 5Vdc
2. AO-2 Voltage Range Selection:	OFF = 0-10Vdc	ON = 0 - 5Vdc
3. AO-3 Voltage Range Selection:	OFF = 0-10Vdc	ON = 0 - 5 Vdc
4. AO-4 Voltage Range Selection:	OFF = 0-10Vdc	ON = 0 - 5 Vdc

Controller Configuration Slideswitch (S2)	Controller Configuration Slideswitch (S5):
LEFT = Analog Outputs powered by remote source	LEFT = Digital Inputs pulled-high (triggered by active low input - default)
RIGHT = Analog Outputs powered locally by HMS1650 (default)	RIGHT = Digital Inputs pulled-low (triggered by active high input, up to 24Vdc)

BACnet® Objects

The following table itemizes the list of points available for integration in a building management system (BMS). This table contains the objects for open BACnet integration.

Object Instance	Functional Description	Read or Write
Analog Inputs		
AI - 1	Analog Input 1 (default: Fume Hood Face Velocity)	Read-Only
AI - 2	Analog Input 2 (default: Secondary Face Velocity)	Read-Only
AI - 3	Analog Input 3 (default: Sash Position Sensor)	Read-Only
AI - 4	Analog Input 4 (default: Exhaust Air Flow Volume)	Read-Only
AI - 5	Thermistor Input 1 (default: Ambient Temperature)	Read-Only
AI - 6	Thermistor Input 2 (default: Duct Temperature)	Read-Only
Analog Outputs		
AO - 1	Analog Output 1 (default: Exhaust Damper Position)	Read-Only
AO - 2	Analog Output 2 (spare control output)	Read-Only
AO - 3	Analog Output 3 (spare control output)	Read-Only
AO - 4	Analog Output 4 (spare control output)	Read-Only
Binary Inputs		
BI - 1	Digital Input 1 (default: Fume Hood Sash Switch)	Read-Only
BI - 2	Digital Input 2 (default: Secondary Sash Switch)	Read-Only
BI - 3	Digital Input 3 (spare digital input)	Read-Only
BI - 4	Digital Input 4 (spare digital input)	Read-Only
Binary Outputs		
BO - 1	Relay Output 1 (default: Primary Alarm Relay Output)	Read-Only
BO - 2	Relay Output 2 (default: Secondary Alarm Relay Output)	Read-Only
BO - 3	Relay Output 3 (spare relay output)	Read-Only
BO - 4	Relay Output 4 (spare relay output)	Read-Only
Binary Values		
BV-1	Occupancy Status	Read/Write
BV-2	Emergency Purge (MAX FLOW)	Read/Write
Analog Values		
AV - 1	AI-1 Setpoint (Fume Hood Face Velocity Setpoint)	Read/Write
AV - 2	AI-2 Setpoint (Secondary Face Velocity Setpoint)	Read/Write
AV - 3	AI-3 Setpoint	Read/Write
AV - 4	AI-4 Setpoint	Read/Write
AV - 5	TI-1 Setpoint (Ambient Temperature Setpoint)	Read/Write
AV - 6	TI-2 Setpoint	Read/Write
AV - 7	Air Change Rate based on Flow Input at AI-1	Read/Write
AV - 8	Air Change Rate based on Flow Input at AI-2	Read/Write
AV - 9	Air Change Rate based on Flow Input at AI-3	Read/Write
AV - 10	Air Change Rate based on Flow Input at AI-4	Read/Write
AV - 11	Alarm Relay 1 High Setpoint	Read/Write
AV - 12	Alarm Relay 1 Low Setpoint	Read/Write
AV - 13	Alarm Relay 2 High Setpoint	Read/Write
AV - 14	Alarm Relay 2 Low Setpoint	Read/Write
AV - 15	Alarm Relay 3 High Setpoint	Read/Write
AV - 16	Alarm Relay 3 Low Setpoint	Read/Write
AV - 17	Alarm Relay 4 High Setpoint	Read/Write
AV - 18	Alarm Relay 4 Low Setpoint	Read/Write
AV - 19	AI-1 Low Alarm Setpoint (Low Face Velocity Alarm Setpoint)	Read/Write
AV - 20	AI-1 Low Warning Setpoint (Low Face Velocity Warning Setpoint)	Read/Write
AV - 21	AI-1 High Warning Setpoint (High Face Velocity Warning Setpoint)	Read/Write

BACnet® Objects

Object Instance	Functional Description	Read or Write
AV - 22	AI-1 High Alarm Setpoint (High Face Velocity Alarm Setpoint)	Read/Write
AV - 23	AI-2 Low Alarm Setpoint	Read/Write
AV - 24	AI-2 Low Warning Setpoint	Read/Write
AV - 25	AI-2 High Warning Setpoint	Read/Write
AV - 26	AI-2 High Alarm Setpoint	Read/Write
AV - 27	AI-3 Low Alarm Setpoint	Read/Write
AV - 28	AI-3 Low Warning Setpoint	Read/Write
AV - 29	AI-3 High Warning Setpoint	Read/Write
AV - 30	AI-3 High Alarm Setpoint	Read/Write
AV - 31	AI-4 Low Alarm Setpoint	Read/Write
AV - 32	AI-4 Low Warning Setpoint	Read/Write
AV - 33	AI-4 High Warning Setpoint	Read/Write
AV - 34	AI-4 High Alarm Setpoint	Read/Write
AV - 35	TI-1 Low Alarm Setpoint	Read/Write
AV - 36	TI-1 Low Warning Setpoint	Read/Write
AV - 37	TI-1 High Warning Setpoint	Read/Write
AV - 38	TI-1 High Alarm Setpoint	Read/Write
AV - 39	TI-2 Low Alarm Setpoint	Read/Write
AV - 40	TI-2 Low Warning Setpoint	Read/Write
AV - 41	TI-2 High Warning Setpoint	Read/Write
AV - 42	TI-2 High Alarm Setpoint	Read/Write
AV - 43	Writable Network Variable – Humidity	Read/Write
AV - 44	Writable Network Variable – Temperature	Read/Write
AV - 45	Writable Network Variable – Air Changes	Read/Write
AV - 46	Writable Network Variable – Differential Pressure	Read/Write
AV - 47	Device ID Offset (range: 0 – 4,194,000)	Read/Write
AV - 48	Duct Air Flow based on AI-1 flow input	Read-Only
AV - 49	Duct Air Flow based on AI-2 flow input	Read-Only
AV - 50	Duct Air Flow based on AI-3 flow input (Supply Flow)	Read-Only
AV - 51	Duct Air Flow based on AI-4 flow input (Exhaust Flow)	Read-Only
AV - 52	Volumetric Offset (Supply Flow – Exhaust Flow)	Read-Only
AV - 53	Volumetric Offset Setpoint	Read-Write
AV - 54	AO-1 Override Level	Read-Write
AV - 55	AO-2 Override Level	Read-Write
AV - 56	AO-3 Override Level	Read-Write
AV - 57	AO-4 Override Level	Read-Write
	Multistate Objects	
MSO - 1	Fume Hood Operating Mode: 1=occupied, 2=unoccupied, 3=standby	Read/Write
MSO - 2	Secondary Operating Mode: 1=occupied, 2=unoccupied, 3=standby	Read/Write
MSO - 3	Fume Hood Face Velocity Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
MSO - 4	Secondary Face Velocity Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
MSO - 5	AI-3 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
MSO - 6	AI-4 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
MSO - 7	TI-1 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only

MODULE SETTINGS

Metasys® N2 Objects

The following table itemizes the list of points available for integration in a building management system (BMS). This table contains the objects for open N2 integration.

Object Instance	Functional Description	Read or Write
Analog Inputs		
AI - 1	Analog Input 1 (default: Fume Hood Face Velocity)	Read-Only
AI - 17	Analog Input 2 (default: Secondary Face Velocity)	Read-Only
AI - 18	Analog Input 3 (default: Sash Position Sensor)	Read-Only
AI - 19	Analog Input 4 (default: Exhaust Air Flow Volume)	Read-Only
AI - 20	Thermistor Input 1 (default: Ambient Temperature)	Read-Only
AI - 21	Thermistor Input 2 (default: spare temperature input)	Read-Only
Analog Outputs		
AO - 1	Analog Output 1 (default: Primary Exhaust Damper Control)	Read-Only
AO - 11	Analog Output 2 (default: Supply/Exhaust Damper Control)	Read-Only
AO - 12	Analog Output 3 (spare control output)	Read-Only
AO - 13	Analog Output 4 (spare control output)	Read-Only
Binary Inputs		
BI - 3	Digital Input 1 (default: Fume Hood Sash Switch)	Read-Only
BI - 4	Digital Input 2 (default: Secondary Sash Switch)	Read-Only
BI - 5	Digital Input 3 (spare digital input)	Read-Only
BI - 6	Digital Input 4 (spare digital input)	Read-Only
Binary Outputs		
BO - 1	Relay Output 1 (default: Primary Alarm Relay Output)	Read-Only
BO - 2	Relay Output 2 (spare relay output)	Read-Only
BO - 3	Relay Output 3 (spare relay output)	Read-Only
BO - 4	Relay Output 4 (spare relay output)	Read-Only
Internal Float Values		
ADF - 1	PID Control Loop 1 Setpoint (Fume Hood Face Velocity Setpoint)	Read/Write
ADF - 2	Primary Alarm Relay High Setpoint	Read/Write
ADF - 3	Primary Alarm Relay Low Setpoint	Read/Write
ADF - 4	Secondary Alarm Relay High Setpoint	Read/Write
ADF - 5	Secondary Alarm Relay Low Setpoint	Read/Write
ADF - 8	AI-1 Low Alarm Setpoint (Low Face Velocity Alarm Setpoint)	Read/Write
ADF - 9	AI-1 Low Warning Setpoint (Low Face Velocity Warning Setpoint)	Read/Write
ADF - 10	AI-1 High Warning Setpoint (High Face Velocity Warning Setpoint)	Read/Write
ADF - 11	AI-1 High Alarm Setpoint (High Face Velocity Alarm Setpoint)	Read/Write
ADF - 13	PID Control Loop 2 Setpoint	Read/Write
ADF - 14	PID Control Loop 3 Setpoint	Read/Write
ADF - 15	PID Control Loop 4 Setpoint	Read/Write
ADF - 16	Air Change Rate based on Flow Input at AI-1	Read-Only
ADF - 17	Air Change Rate based on Flow Input at AI-2	Read-Only
ADF - 18	Air Change Rate based on Flow Input at AI-3	Read-Only
ADF - 19	Air Change Rate based on Flow Input at AI-4	Read-Only

Metasys® N2 Objects

Object Instance	Functional Description	Read or Write
ADF - 20	Alarm Relay 3 High Setpoint	Read/Write
ADF - 21	Alarm Relay 3 Low Setpoint	Read/Write
ADF - 22	Alarm Relay 4 High Setpoint	Read/Write
ADF - 23	Alarm Relay 4 Low Setpoint	Read/Write
ADF - 24	AI-2 Low Alarm Setpoint	Read/Write
ADF - 25	AI-2 Low Warning Setpoint	Read/Write
ADF - 26	AI-2 High Warning Setpoint	Read/Write
ADF - 27	AI-2 High Alarm Setpoint	Read/Write
ADF - 28	AI-3 Low Alarm Setpoint	Read/Write
ADF - 29	AI-3 Low Warning Setpoint	Read/Write
ADF - 30	AI-3 High Warning Setpoint	Read/Write
ADF - 31	AI-3 High Alarm Setpoint	Read/Write
ADF - 32	AI-4 Low Alarm Setpoint	Read/Write
ADF - 33	AI-4 Low Warning Setpoint	Read/Write
ADF - 34	AI-4 High Warning Setpoint	Read/Write
ADF - 35	AI-4 High Alarm Setpoint	Read/Write
ADF - 36	TI-1 Low Alarm Setpoint	Read/Write
ADF - 37	TI-1 Low Warning Setpoint	Read/Write
ADF - 38	TI-1 High Warning Setpoint	Read/Write
ADF - 39	TI-1 High Alarm Setpoint	Read/Write
ADF - 40	TI-2 Low Alarm Setpoint	Read/Write
ADF - 41	TI-2 Low Warning Setpoint	Read/Write
ADF - 42	TI-2 High Warning Setpoint	Read/Write
ADF - 43	TI-2 High Alarm Setpoint	Read/Write
ADF - 44	Humidity Network Variable (writable)	Read/Write
ADF - 45	Temperature Network Variable (writable)	Read/Write
ADF - 46	Air Changes Network Variable (writable)	Read/Write
ADF - 47	Differential Pressure Network Variable (writable)	Read/Write
ADF - 48	Air Flow based on Flow Input at AI-1	Read-Only
ADF - 49	Air Flow based on Flow Input at AI-2	Read-Only
ADF - 50	Air Flow based on Flow Input at AI-3 (default: Supply Flow)	Read-Only
ADF - 51	Air Flow based on Flow Input at AI-4 (default: Exhaust Flow)	Read-Only
ADF - 52	Volumetric Offset (Supply Flow – Exhaust Flow)	Read-Only
ADF - 53	Volumetric Offset Setpoint	Read-Write
ADF - 54	AO-1 Override Level	Read-Write
ADF - 55	AO-2 Override Level	Read-Write
ADF - 56	AO-3 Override Level	Read-Write
ADF - 57	AO-4 Override Level	Read-Write
	Internal Integer Values	
ADI - 1	Fume Hood Operating Mode: 1=occupied, 2=unoccupied, 3=standby	Read/Write
ADI - 7	Secondary Operating Mode: 1=occupied, 2=unoccupied, 3=standby	Read/Write
ADI - 8	AI-2 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
ADI - 9	AI-3 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
ADI - 10	AI-4 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
ADI - 11	TI-1 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only
ADI - 12	TI-2 Alarm Status: 1=normal, 2=warning, 3=alarm	Read-Only

CLEANING THE HMS DISPLAY

Cleaning the HMS-1650 Display

- The cloth may be used dry, or lightly dampened with a mild cleaner or Ethanol.
- Be sure the cloth is only lightly dampened, not wet. Never apply cleaner directly to touch panel surface; if cleaner is spilled onto touch panel, soak it up immediately with absorbent cloth.
- Cleaner must be neither acid nor alkali (neutral pH).
- Wipe the surface gently; if there is a directional surface texture, wipe in the same direction as the texture.
- Never use acidic or alkaline cleaners, or organic chemicals such as: paint thinner, acetone, tolulene, xylene, propyl or isopropyl alcohol, or kerosene.

Touching the current hood name text brings up an alphanumeric keyboard to quickly change the name of the monitored fume hood.

Touching anywhere else on the screen enters the Main Setup Menu if no password is stored. Otherwise, a password must be entered before the Main Setup Menu can be accessed.

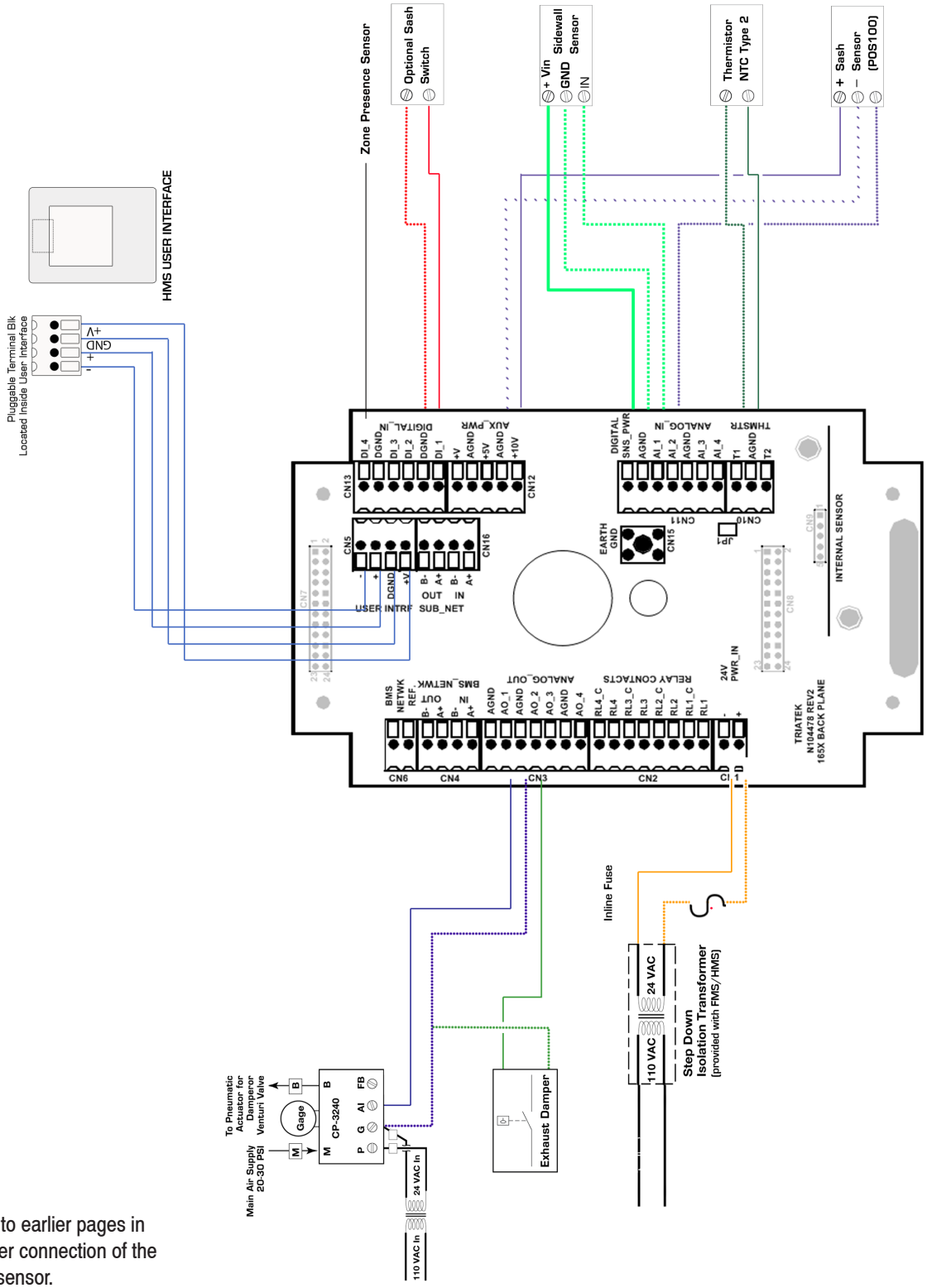
Touching DATE brings up the Date Entry popup to quickly change the current displayed date.

Touching the engineering units selection brings up a popup to quickly change velocity measurement units.

Touching TIME brings up Time Entry popup to quickly change the current displayed time.

Hot-Spot Features of HMS-1650 Touchscreen Display

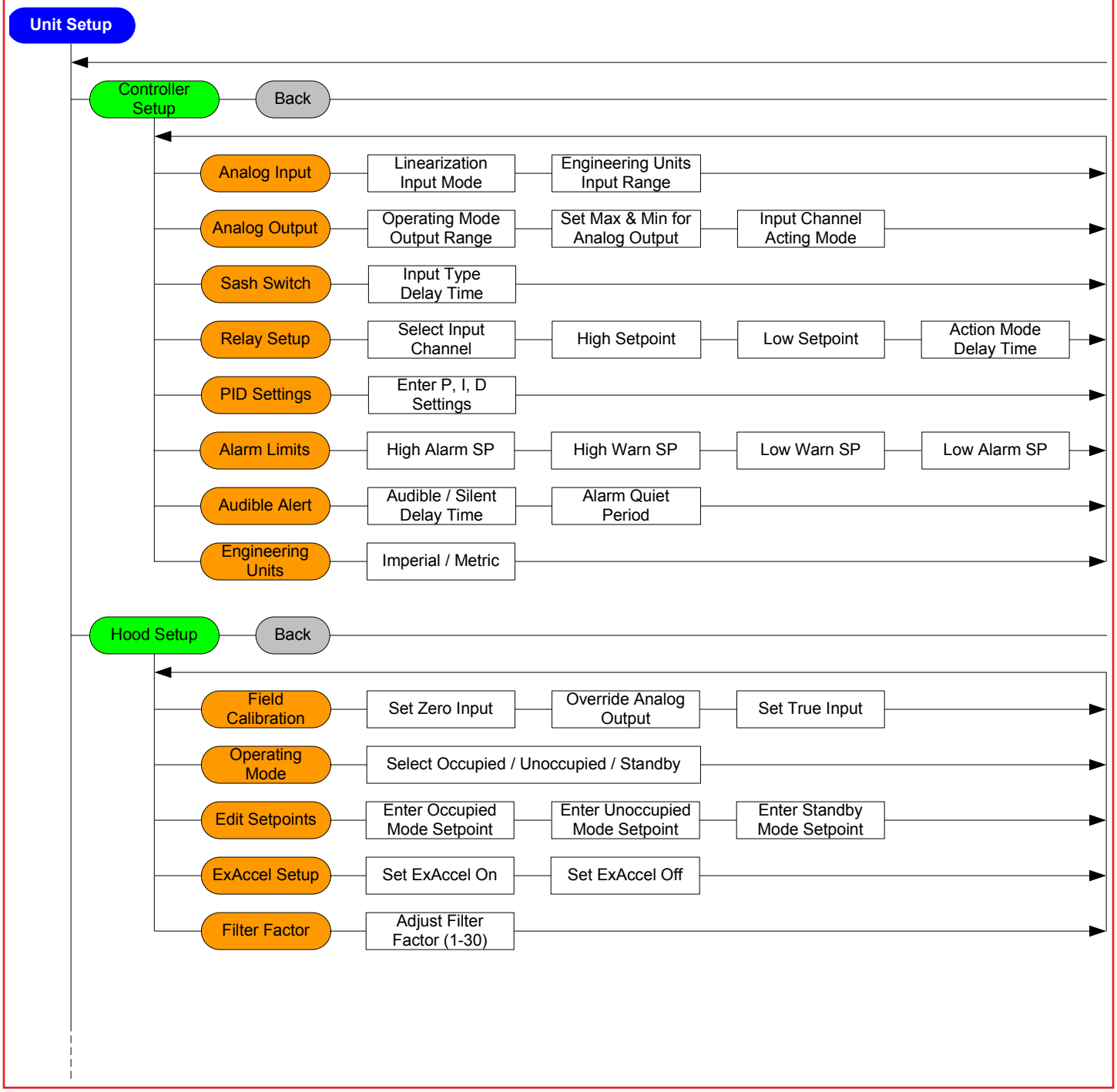
COMPREHENSIVE WIRING DIAGRAM



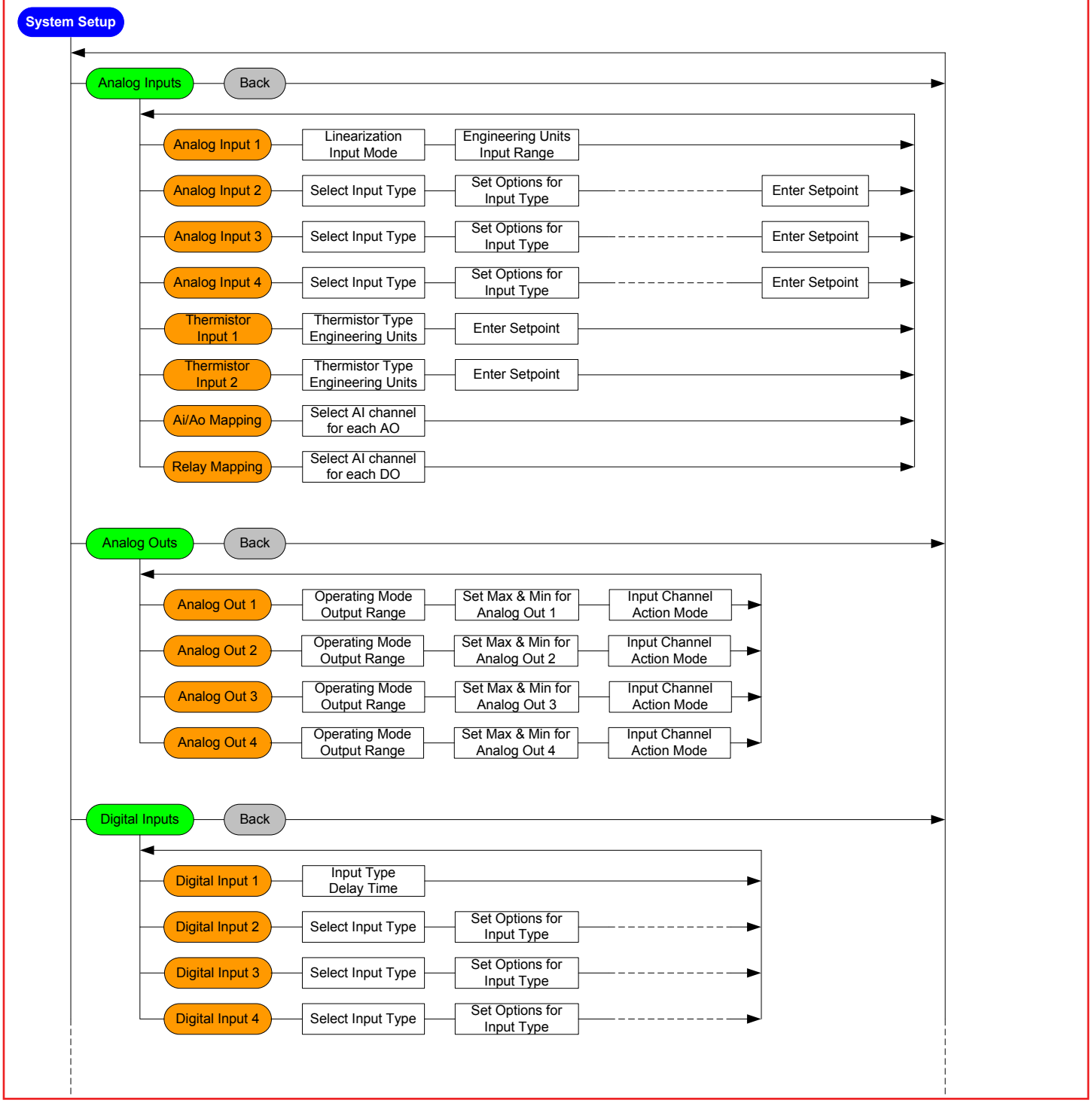
NOTE: Please refer to earlier pages in this manual for proper connection of the Honeywell sidewall sensor.

FLOW DIAGRAMS

Unit Setup Tree

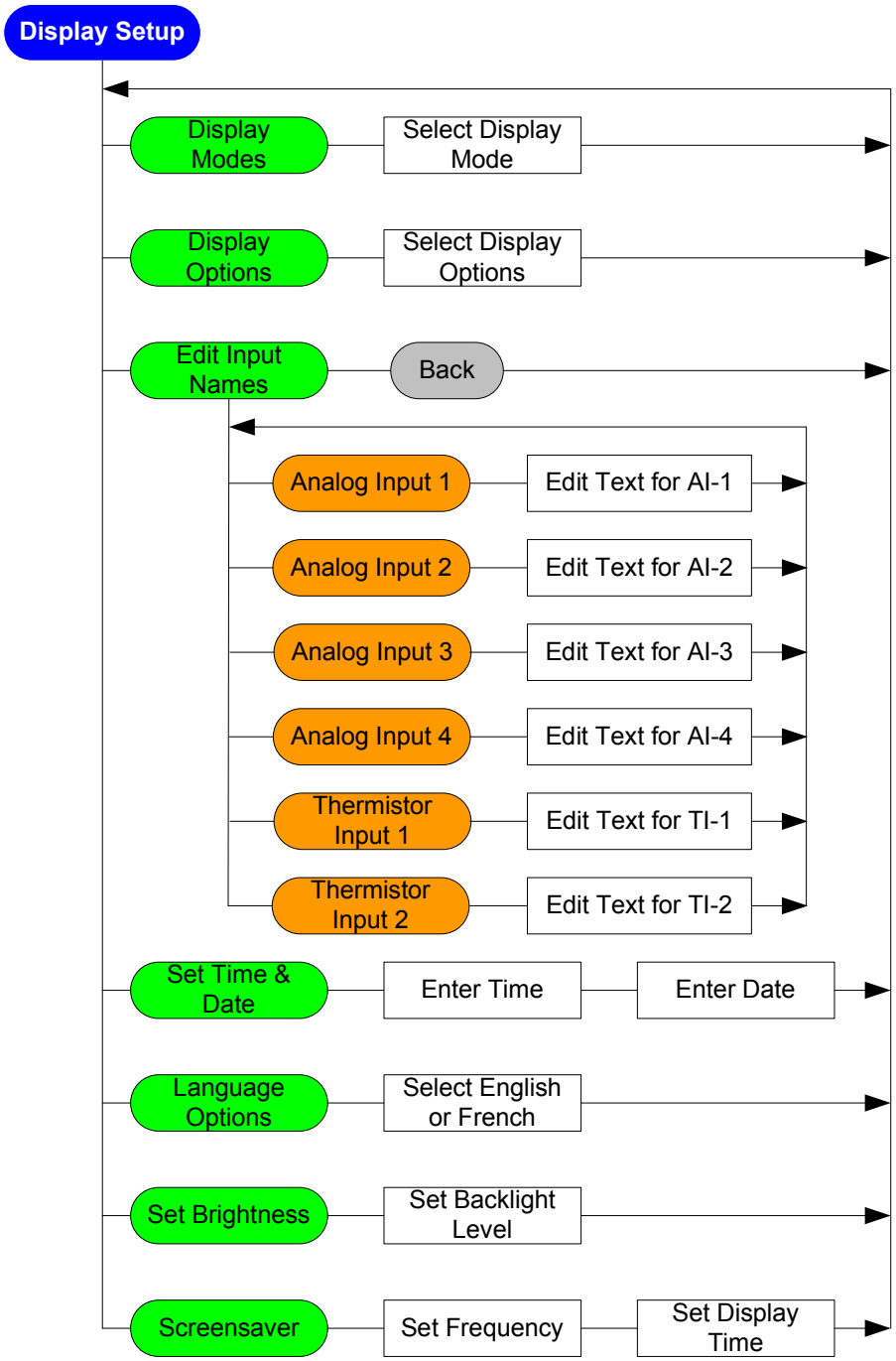


System Setup Tree

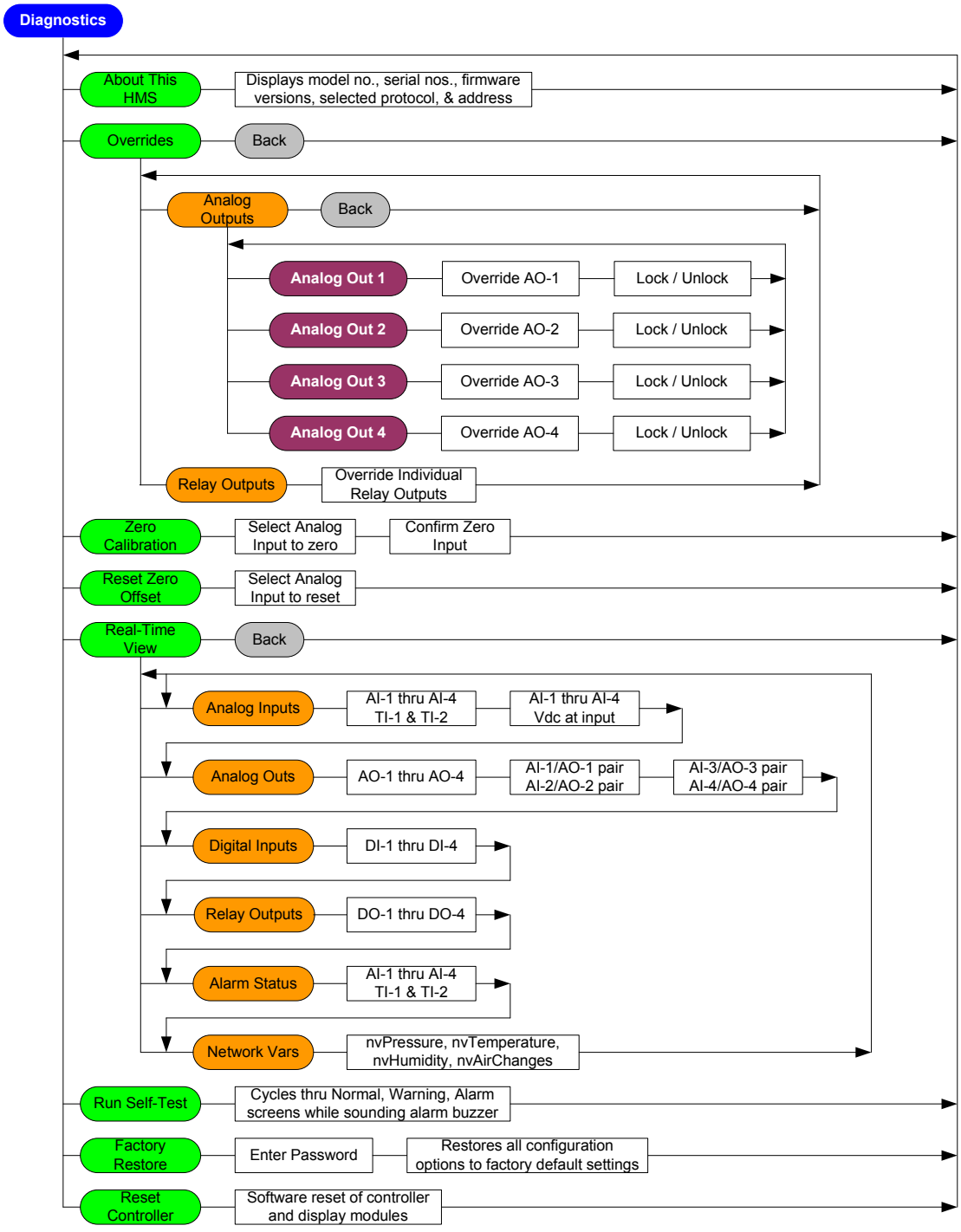


FLOW DIAGRAMS

Display Setup Tree



Diagnostics Tree



HMS-1650
Installation Manual
Version: 03.06.17

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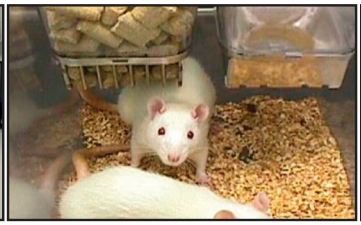

Hospitals