Fume Hood 1650
Hood Status: UNOCCUPIED
Sash Position: 17.5 inches
Temperature: 76 deg F
91 ft/min
Aug 30, 2010 2:36 am
### HMS-1650L Fume Hood Controller Settings

<table>
<thead>
<tr>
<th>Fume Hood Name / Number</th>
<th>Unit Model Number and Serial Number (ESN)</th>
</tr>
</thead>
</table>

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

#### Sidewall Sensor Input
- Normal Operating Face Velocity
- Sensor Linearization (enabled or disabled)
- Sensor Input Mode (normal or inverted)
- 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)

#### Sash Switch
- Operating Mode (normally-open or normally-closed)
- Delay Setting (0 - 240 secs)

#### Relay Output
- Trigger Mode (Setpoints or Operating Mode)
- Input Channel (AI-1 thru AI-4, TI-1 or TI-2)
- Occupied Mode High Setpoint
- Occupied Mode Low Setpoint
HMS-1650L Fume Hood Controller Settings

- Unoccupied Mode High Setpoint
- Unoccupied Mode Low Setpoint
- 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)
- 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
CAUTION

Failure to follow the enclosed 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.

CORRECT

120/24VAC, 30Va Transformer
Supplied by Triatek

CORRECT

120/24VAC, 20Va Third Party Transformer
TABLE OF CONTENTS

SPECIFICATIONS ........................................................................................................................................... 6-7

INSTALLATION ........................................................................................................................................... 8-9
  Pre-Installation ................................................................................................................................. 8
  Installation ......................................................................................................................................... 8-9

MOUNTING/WIRING ................................................................................................................................. 10-24
  HMS Display/Processor Mounting Hole Pattern .............................................................................. 10
  Case Dimensions ............................................................................................................................ 11
  Controller Mounting Hole Pattern .................................................................................................. 12
  Sensor Mounting Hole Pattern & Location ...................................................................................... 13
  Sidewall Sensor Types ..................................................................................................................... 15
  HMS-1650L Standard Sidewall Sensor (9-pin) .............................................................................. 16
  HMS-1650L with Honeywell Sidewall Sensor (3-terminal) ............................................................ 17
  Wiring Diagram - Analog Output to Pneumatic Actuator ............................................................... 18
  Wiring Diagram - Analog Output to Electric Actuator ................................................................. 19
  Analog Input Single Flow Sensor .................................................................................................... 20
  Analog Input Dual Flow Sensors ...................................................................................................... 21
  Analog Input Position Sensor ......................................................................................................... 22
  Notes .................................................................................................................................................. 23
  Digital Input Occupancy Sensor ....................................................................................................... 24
  Power ................................................................................................................................................ 25
  Stepdown Isolation Transformer ...................................................................................................... 26
  Wiring ............................................................................................................................................... 27
  LON Wiring Instructions .................................................................................................................. 28
  Wiring Display to Control Unit ......................................................................................................... 28

QUICK START GUIDE ............................................................................................................................... 29-33
  Introduction ....................................................................................................................................... 29
  Main Display Screen ........................................................................................................................ 29-30
  Calibrating the Sidewall Sensor ....................................................................................................... 30
  Calibrating the Sash Position Sensor ............................................................................................... 31
  Setting up the Analog Output ........................................................................................................... 31
  Setting Alarm Limits ........................................................................................................................ 31
  Changing the Operating Mode ......................................................................................................... 31
  Adding Password Security ............................................................................................................... 32
  Changing Display Settings ............................................................................................................... 32
  Built-in Diagnostics .......................................................................................................................... 32-33
  Enabling MAX FLOW Capability .................................................................................................... 33

MODULE SETTINGS ................................................................................................................................... 34

CLEANING THE HMS-1650L DISPLAY .............................................................................................. 35

FLOW DIAGRAMS ................................................................................................................................. 36-39
**Specifications**

**Electrical**
- 4 Analog Inputs: 4-20mA DC, 0-5V DC or 0-10V DC
- 4 Analog Outputs: 0-5V DC or 0-10V DC
- 4 Digital Inputs: 0-5, 30V DC
- 4 Relay Outputs: 1A @ 24V DC, 1A @ 24V AC
- Control Signal Wire Size: 18 AWG minimum
- Input Impedance: 10k - 0 Ω
- Output Impedance: 0 - 10k
- Power Supply: Class 2, 24Vac ±10%, 30VA universal 120/240 to 24 Vac, 60/50 Hz, step-down isolation transformer provided

**Communications**
- LonWorks® FTT-10A: Two-Wire Twisted Pair
- Recommended Cable Type:
  - Level IV, 22AWG Unshielded Plenum UL Type CMP (Windy City 105540; Connet Air W22IP-2001; Metro Wire MWC-1000)
  - Level IV, 22AWG Shielded Plenum UL Type CMP (Windy City 106500; Connet Air W22IP-2002; Metro Wire MWC-1002)

**Touch Screen 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
- Recommended Cable Type (interface between display and LON controller): Belden 1325A
Specifications

Mechanical
HMS-1650L Display Housing ................................................................. 3"W x 5"H x .75"D
HMS-1650L 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

HMS1650L - □ - □

Sensor Type Options for Sash Sensor
1 = single smart sidewall sensor blank = no sash sensor
2 = dual smart sidewall sensor S = sash position sensor included
A = single Honeywell sidewall sensor
B = dual Honeywell sidewall sensor

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

TRIATEK reserves the right to change product specifications without notice.
Pre-Installation
The HMS-1650L is calibrated and programmed in the factory according to the customer specifications. Depending upon the actual model number ordered, the HMS-1650L 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 12 through 17 for physical representations of the two sidewall sensor options.

Note: Final calibration of face velocity is usually required after installation of the HMS-1650L.

Installation
This section will illustrate a typical method of installing the HMS-1650L 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. Also a suitable tool will be needed for cutting the opening shown on page 7.

1. Proper location of the sensor is very important for obtaining the best possible operation of the HMS-1650L. 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 10. There are two types of fume hood arrangements which need to be considered; By-Pass and Non-By-Pass.
   a. Front-to-Back Position – With either type the sensor is best located approximately 6 inches back from the vertical sash track.
   b. Vertical Position (By-Pass type) – Locate the sensor vertically in the center of the region between the bottom of the sash in its fully open position and the bottom edge of the by-pass opening.
   c. Vertical Position (Non-By-Pass type) – Locate the sensor vertically 6” above the bottom of the sash in its fully open position.

2. See pages 10 and 11 for dimensions and suggested mounting arrangements of the TRIATEK flow sensor on the hood wall.

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

   NOTE: Be certain that sensor reference port is in laboratory room air. If necessary to obtain this, use TRIATEK HMS-1650L-PLATE mounted on exterior panel of the fume hood.

4. See page 8 for mounting details for the HMS-1650L 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 hood sash or sash cable. The control unit is typically placed in a convenient location on top of the fume hood.

   NOTE: Remove red cap from sensor after installation.

5. Connect the cable between the display and control unit before applying power to the control unit. Power supply connections - input voltage must be Class 2, 24 VAC or 24 VDC. An isolation stepdown transformer is supplied with the HMS-1650L. 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 11, 20 and 21 for connection details.

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

   For standard sidewall sensor modules with the 9-pin terminal block, connect the 3-conductor signal cable as follows:
   - Red: +Vin ➤ +Vin
   - Black: GND ➤ GND
   - White: $V_o$ ➤ Al-1

   For Honeywell sidewall sensor modules with the 3-position terminal block, connect the 3-conductor signal cable as follows:
   - Red: + ➤ +10V
   - Black: G ➤ GND
   - White: IN ➤ Al-1
7. All wiring should conform to the Local Regulations and National Electrical Code. Take care not to run Sensor wiring in the same conduit as line voltage or other conductors that supply highly inductive loads such as generators, motors, solenoids or contactors, etc. Use 22 AWG or larger.

8. After installation is complete, apply power to the unit, open the sash to a normal operating position and observe the flow reading on the HMS unit.

Caution:
Do not connect or disconnect the control cable from the display unit or the control unit while the unit is powered up. Doing so is likely to cause damage to either or both units, requiring repair.
The HMS-1650L 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.
HMS Case Dimensions

Recommended Cable Type: Belden 1325A

Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.
Controller Mounting Hole Pattern

The P1 Port must be referenced to the Laboratory air for proper operation and should be located away from air turbulence.

Note: Text stamp "GND" is on inside of formed part.
Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.

Sensor Mounting Hole Pattern

1/8 DIA (typ 4 places)

2 1/16"

1 1/2"

3/8 DIA

4 1/8"

Sensor Placement - Non By-Pass Type

The P1 Port must be referenced to the Laboratory air for proper operation and should be located away from air turbulence.

Sensor

If the hood is bypassed or in close proximity to items like baffles, deflectors, etc., contact the factory.

Bottom edge of sash in uppermost position
CAUTION

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 16.

Power (+Vin): +V (>15 V)

---

**HONEYWELL Analog Sensor**
(3-Terminal)

Wire According To Illustration Found on Page 17.

Power (+): 10 V
SENSIRION Digital Sidewall Sensor (9-pin)

FIGURE 1
Preferred Sensor Mounting

This port must be referenced to laboratory air for proper orientation and should be located away from turbulence.

FIGURE 2
Alternate Sensor Mounting

This port must be referenced to laboratory air for proper orientation and should be located away from turbulence.
Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.

HONEYWELL Analog Sidewall Sensor (3-terminal)

**FIGURE 1**
Preferred Sensor Mounting

- **Interior of Fume Hood**
- **Flexible Tubing** (3 FT Supplied, Do Not Cut)
- **Exterior of Fume Hood**
- **To HMS Control Unit**

This port **must** be referenced to Laboratory air for proper operation, and should be located away from air turbulence.

**FIGURE 2**
Alternate Sensor Mounting

- **Interior of Fume Hood**
- **Flexible Tubing**
- **Exterior of Fume Hood**
- **To HMS Control Unit**

This port **must** be referenced to Laboratory air for proper operation, and should be located away from air turbulence.
Analog Output to Pneumatic Actuator

Purchased Separately

Fume Hood

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 GND at the HMS-1650L controller board. (See page 9)

Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td>⬅️</td>
<td>Field Wiring whitespace for Name</td>
</tr>
<tr>
<td>⬅️</td>
<td>Internal Wiring</td>
</tr>
<tr>
<td>⬅️</td>
<td>Screw Terminal</td>
</tr>
<tr>
<td>⬅️</td>
<td>Air Flow To and From Unit Between Room and Corridor</td>
</tr>
</tbody>
</table>

Jumper Setting

Note: Each Analog Input or Output value can be set independent of one another. Example:
- AI 1 can be set to 0-5v jumper OFF (JP7 PIN 1)
- AI 2 can be set to 0-10v jumper ON (JP7 PIN 2)
- AI 3 can be set to 4-20mA jumper ON (JP6 PIN 3) and jumper OFF (JP7 PIN 3)
- AO 1 can be set to 0-10v jumper ON (JP5 PIN 1)
- AO 2 0-5v can be set to 0-5v jumper OFF (JP5 PIN 2)
Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.

MOUNTING/WIRING

Analog Output to Electronic 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 GND at the HMS-1650L controller board. (See page 9)

Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td>Field Wiring w/Space for Number</td>
<td></td>
</tr>
<tr>
<td>Internal Wiring</td>
<td></td>
</tr>
<tr>
<td>Screw Terminal</td>
<td></td>
</tr>
<tr>
<td>Air Flow To and From Unit Between Room and Corridor</td>
<td></td>
</tr>
</tbody>
</table>

Jumper Setting

Analog Input 0-5v (JP7)

<table>
<thead>
<tr>
<th>AI 1</th>
<th>AI 2</th>
<th>AI 3</th>
<th>AI 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Analog Input 4-20mA (JP6)

<table>
<thead>
<tr>
<th>AI 1</th>
<th>AI 2</th>
<th>AI 3</th>
<th>AI 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Analog Output 0-5v (JP5)

<table>
<thead>
<tr>
<th>AO 1</th>
<th>AO 2</th>
<th>AO 3</th>
<th>AO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Analog Output 0-10v (JP5)

<table>
<thead>
<tr>
<th>AO 1</th>
<th>AO 2</th>
<th>AO 3</th>
<th>AO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Each Analog Input or Output value can be set independent of one another. Example:

- AI 1 can be set to 0-5v jumper OFF (JP7 PIN 1)
- AI 2 can be set to 0-10v jumper ON (JP7 PIN 2)
- AI 3 can be set to 4-20mA jumper ON (JP7 PIN 3) and jumper OFF (JP7 PIN 3)
- AO 1 can be set to 0-5v jumper ON (JP5 PIN 1)
- AO 2 0-5v can be set to 0-10v jumper OFF (JP5 PIN 2)
Analog Input Single Flow Sensor

Provided with HMS-1650L

Digital

Sidewall Flow Sensor

GND

V_o

+Vin

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 GND at the HMS-1650L controller board. (See page 9)

Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td></td>
<td>Field Wiring/w/Space for Number</td>
</tr>
<tr>
<td></td>
<td>Internal Wiring</td>
</tr>
<tr>
<td></td>
<td>Screw Terminal</td>
</tr>
<tr>
<td></td>
<td>Air Flow To and From Unit Between Room and Corridor</td>
</tr>
</tbody>
</table>

Jumper Setting

Analog Input 0-5v (JP7)

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>0-5v (JP7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 4</td>
<td>4</td>
</tr>
<tr>
<td>AI 3</td>
<td>3</td>
</tr>
<tr>
<td>AI 2</td>
<td>1</td>
</tr>
</tbody>
</table>

Analog Input 0-10v (JP7)

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>0-10v (JP7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 4</td>
<td>4</td>
</tr>
<tr>
<td>AI 3</td>
<td>3</td>
</tr>
<tr>
<td>AI 2</td>
<td>1</td>
</tr>
</tbody>
</table>

Example:

AO 1 can be set to 0-10v jumper ON (JP5 PIN 1)
AO 2 can be set to 0-10v jumper OFF (JP5 PIN 2)
AO 3 can be set to 0-10v jumper OFF (JP5 PIN 3)
AO 4 can be set to 0-10v jumper OFF (JP6 PIN 3)
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 GND at the HMS-1650L controller board. (See page 9)

Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td></td>
<td>Field Wiring w/ space for Number</td>
</tr>
<tr>
<td></td>
<td>Internal Wiring</td>
</tr>
<tr>
<td></td>
<td>Screw Terminal</td>
</tr>
<tr>
<td></td>
<td>Air Flow To and From Unit Between Room and Corridor</td>
</tr>
</tbody>
</table>

Jumper Setting

- Analog Input 0-5v (JP7)
  - AI_6: JUMPER ON
  - AI_3: JUMPER ON
  - AI_1: JUMPER OFF

- Analog Input 0-10V (JP7)
  - AI_4: JUMPER ON
  - AI_2: JUMPER OFF
  - AI_1: JUMPER OFF

- Analog Output 0-5v (JP5)
  - AO_4: JUMPER ON
  - AO_3: JUMPER OFF
  - AO_1: JUMPER OFF

- Analog Output 0-10V (JP5)
  - AO_4: JUMPER ON
  - AO_3: JUMPER OFF
  - AO_1: JUMPER OFF

Note: Each Analog Input or Output value can be set independent of one another.

Example:
- AI_1 can be set to 0-5v jumper OFF (JP7 PIN 1)
- AI_2 can be set to 0-10v jumper ON (JP7 PIN 2)
- AI_3 can be set to 4-20mA jumper ON (JP6 PIN 3) and jumper OFF (JP7 PIN 3)
- AO_1 can be set to 0-10v jumper ON (JP5 PIN 1)
- AO_2 can be set to 0-5v jumper OFF (JP5 PIN 2)
Analog Input Position Sensor

Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td></td>
<td>Field Wiring w/ space for Number</td>
</tr>
<tr>
<td></td>
<td>Internal Wiring</td>
</tr>
<tr>
<td></td>
<td>Screw Terminal</td>
</tr>
<tr>
<td></td>
<td>Air Flow To and From Unit</td>
</tr>
<tr>
<td></td>
<td>Between Room and Corridor</td>
</tr>
</tbody>
</table>

Jumper Setting

Note: Each Analog Input or Output value can be set independent of one another. Example:
- AI 1 can be set to 0-5v jumper OFF (JP7 PIN 1)
- AI 2 can be set to 0-10v jumper ON (JP7 PIN 2)
- AI 3 can be set to 4-20mA jumper ON (JP6 PIN 3) and jumper OFF (JP7 PIN 3)
- AO 1 can be set to 0-10v jumper ON (JP5 PIN 1)
- AO 2 can be set to 0-5v jumper OFF (JP5 PIN 2)
Digital Input Occupancy Sensor

**Jumper Setting**

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>0-5v (JP7)</th>
<th>Analog Input</th>
<th>4-20mA (JP6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 1</td>
<td>4</td>
<td>AI 2</td>
<td>4</td>
</tr>
<tr>
<td>AI 2</td>
<td>2</td>
<td>AI 3</td>
<td>3</td>
</tr>
<tr>
<td>AI 3</td>
<td>1</td>
<td>AI 1</td>
<td>JUMPER ON</td>
</tr>
</tbody>
</table>

Note: 4-20mA can only be used if the corresponding JP7 Analog Input Jumper is set to OFF.

**Wiring Guide Legend**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td></td>
<td>Field Wiring w/space for Number</td>
</tr>
<tr>
<td></td>
<td>Internal Wiring</td>
</tr>
<tr>
<td></td>
<td>Screw Terminal</td>
</tr>
<tr>
<td></td>
<td>Air Flow To and From Unit</td>
</tr>
<tr>
<td></td>
<td>Between Room and Corridor</td>
</tr>
</tbody>
</table>

TRIATEK reserves the right to change product specifications without notice.
Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.

### Power

- **HMS-1650L**

#### Wiring Guide Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[]</td>
<td>No Connection to Field Wiring</td>
</tr>
<tr>
<td>[]</td>
<td>Field Wiring w/space for Number</td>
</tr>
<tr>
<td>[]</td>
<td>Internal Wiring</td>
</tr>
<tr>
<td>[]</td>
<td>Screw Terminal</td>
</tr>
<tr>
<td>[]</td>
<td>Air Flow To and From Unit Between Room and Corridor</td>
</tr>
</tbody>
</table>

#### Jumper Setting

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>0-5v (JP7)</th>
<th>4-20mA (JP6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>AI 3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>AI 2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>AI 1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: 4-20mA can only be used if the corresponding JP7 Analog Input Jumper is set to OFF.

<table>
<thead>
<tr>
<th>Analog Input</th>
<th>0-10v (JP7)</th>
<th>0-5v (JP5)</th>
<th>0-10v (JP5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Each Analog Input or Output value can be set independent of one another.

Example:
- AI 1 can be set to 0-5v jumper OFF (JP7 PIN 1)
- AI 2 can be set to 0-10v jumper ON (JP7 PIN 2)
- AI 3 can be set to 4-20mA jumper ON (JP6 PIN 3) and jumper OFF (JP7 PIN 3)
- AO 1 can be set to 0-10v jumper ON (JP5 PIN 1)
- AO 2 0-5v can be set to 0-5v jumper OFF (JP5 PIN 2)
Stepdown Isolation Transformer

Red / 24 VAC / 30Va connected to the FMS

Transformer 50/60 Hz

Only Class 2 wiring in this compartment.

Ground

Blue

Black

White

240 VAC 50/60 Hz
- Or -
120 VAC 50/60 Hz

Stepdown Isolation Transformer (provided with HMS-1650L)

*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. Make sure you cap off any unused lead.
Due to continuous improvement, TRIATEK reserves the right to change product specifications without notice.
General, Wiring

LON Wiring Instructions
Communications connections require that the HMS-1650L units be connected with twisted pair communication cable to each unit in the network. The unique network address of each HMS unit is set by a network management tool like LONMAKER.

All wiring must be done in accordance with the NEC as well as regulations of all authorities having jurisdiction, and must conform to applicable codes. When required by code, communications wiring may be installed in conduit of a type designed specifically for this purpose.

Wire Terminus
The HMS-1650L is provided with a removable connector block with convenient screw terminals. Make the LON FTT-10 communications connections as follows:

1. Connect a cable lead to the “NT1 -” terminal (#1).
2. Connect a cable lead to the “NT2” terminal (#2)

Guidelines for wiring
Following these guidelines will help to keep wiring-related communications problems to a minimum:

1. Do not splice communications cable or wire at any point.
2. Avoid “T-tap” technique of routing/connecting communications cable. Conductor discontinuities produced by such connections may generate RFI or other electromagnetic interference on the communications circuit.
3. Do not use wire nut devices for connecting communications cable.
4. Do not route any part of the communications cable through conduit, junction boxes or other devices containing AC electrical wiring.
5. Do not strap communications cable to any conduit or other device containing AC electrical wiring, or run communications cable parallel to (or against) such devices.

NOTE: AC electrical devices such as transformers, disconnects, fluorescent lighting, motor-controllers, variable frequency drives or other high voltage power sources may generate RF interference which could cause intermittent problems in the communications network.

Wire the LON network in accordance with LON network standards.

NOTE: Be sure to observe installation instructions regarding possible need for a termination load or other device that may have to be attached on the end of a run.

Wiring Display to Control Unit
The HMS-1650L display is supplied with a removable 4-position terminal block connector for convenient connection to the control unit. The recommended interface cable type (Belden 3107A) should be connected as follows:

1. Connect the ‘+V’ terminal on the display connector to the ‘+V’ terminal on the display adapter module located inside the control unit.
2. Connect the ‘GND’ terminal on the display connector to the ‘GND’ terminal on the display adapter module.
3. Connect the ‘+’ terminal on the display connector to the ‘+’ terminal on the display adapter module.
4. Connect the ‘-’ terminal on the display connector to the ‘-’ terminal on the display adapter module.
Quick Start Guide
After the HMS-1650L unit has been installed, apply power to the unit. On power up, you will hear two short beeps that indicate the HMS-1650L display module is communicating with the main controller module, and has begun the initialization sequence. The LED backlighting 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, and network address (Figure 1).

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.

Main Display Screen
All HMS-1650L units come shipped from the factory in the disabled mode, which is represented by white text being displayed on a blue background. Information displayed on the main screen includes the following (see Figure 2):

- Name of monitored fume hood (up to 20 chars)
- Current hood status (occupied, unoccupied, or disabled)
- Current temperature (if temperature sensor has been installed)
- Current face velocity reading in selected engineering units (default is FPM)
- Current time and date

As mentioned above, the background color of the main display screen will be blue while set to disabled mode. However, while in either Occupied or Unoccupied modes, the background color actively represents that current alarm status of the monitor. A green background indicates that the current face velocity is within allowable limits of the desired setpoint, as shown in the case represented by Figure 2 above. A yellow background as shown in Figure 3 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 significantly outside of the allowable limits of the desired setpoint.

The HMS-1650L incorporates a full-color touch screen with an extensive easy-to-use menu system that allows the user to quickly setup the controller for immediate use. Also integrated into the HMS-1650L display are several hotspots that provide quick access to various settings. Refer to page 31 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.

The following section details the simple procedure for quickly configuring the fume hood controller.

The following section details the simple procedure for quickly configuring the fume hood controller.
Configuring Fume Hood Controller

Configuring the HMS-1650L fume hood controller settings can be accomplished in four simple steps:

1. Calibrate the sidewall sensor
2. Calibrate the sash position sensor
3. Configure the analog output
4. Configure alarm limits

The HMS-1650L incorporates a closed-loop control scheme which uses a flow sensor mounted in the sidewall of the fume hood to maintain an accurate face velocity reading. This sidewall sensor comes preconfigured and pre-calibrated with the fume hood controller. However, it must be calibrated to the fume hood once it has been installed in the fume hood being monitored and/or controlled. If a sash position sensor was included with the HMS-1650L, then it must also be recalibrated following installation. The field calibration menu options can be found on the Fume Hood Setup menu as shown in Figure 4.

Calibrating the Sidewall Sensor

Field Calibrating the side wall sensor once it has been installed at the fume hood being monitored and/or controlled is very easily accomplished using the Field Calibration options on the user menus.

Initial Zeroing

Enter the HMS-1650L user menus and select the Unit Setup option from the Main Setup Menu. Select the Hood Setup Menu. After the side wall sensor and the controller have been installed, the first field calibration may require that the sensor output be zeroed relative to its associated controller. This would not necessarily be required for future calibrations of the same sensor / controller pair. To do this select the Zero Calibration option on the second page of the menu. This will require that the sensor be capped off to prevent any air movement or pressure from being measured, just the zero output value. The sensor must be capped inside the hood, and if the sensor is not directly attached to the side of the hood with the sensor “nipple” inside the hood, but uses tubing to connect the sensor to the inside of the hood, then both the tube end inside the hood and the tube end at the reference plate must be capped or sealed to get an accurate zero reading. Follow the onscreen instructions and wait the required settling delays to take a Zero sensor reading.

Gain and Offset Setting

Following this, and for subsequent Field Calibrations, select the Field Calibration menu item under the Hood Setup Menu. The on screen instructions will direct you to cap the sensor inside the hood. The capping procedure should be the same as per the Zero Calibration procedure, in that both ends of the sensor tubing will need to be capped if the sensor is not directly attached to the hood side wall with the sensor “nipple” inside the hood. Wait at least 10 seconds for the sensor output and the filtered value in the controller to settle. Click the Next button to accept this and move to the next step in the calibration. Ensure to remove the cap(s) from the sensor and set the sash to the operating height (18 inches typically). Do a traverse of the hood face, directly in the same plane as the sash, and accumulate an accurate indication of the actual hood face velocity using a accurate velocity meter. If the hood valve is not at a position to give sufficient air or gives too much air to get an accurate actual air flow reading, adjust the
Override slider to position the valve to a better setting. Select Next and enter the actual air velocity value on the display screen by using the input slider. Select Finish to complete the calibration.

If a sash position sensor was NOT included with the HMS-1650L, then the following section may be omitted.

Calibrating the Sash Position Sensor
Calibrating the sash position sensor once it has been installed at the fume hood being monitored and/or controlled may be accomplished using the Sash Position option on the Field Calibration menu which brings up the Field Calibration screen. Position the sash at the minimum position and enter the actual measured height using the slider. If the sash may be closed completely, enter zero as the minimum sash height. Click the Next button to advance to the next step in the calibration procedure. Set the sash to the maximum position and enter the actual measured height using the slider at the calibration screen, and click the OK button to save the new calibration.

The next step is to configure the analog output that controls the exhaust damper actuator of the monitored fume hood, if control is required. If the specific application only requires monitoring, then the next step may be omitted.

Setting up the Analog Output
For those applications requiring control of an exhaust damper actuator, the analog output must be configured accordingly. To access the analog output configuration option, select the Unit Setup option from the Main Setup Menu, and then select the Controller Setup option.

At the first configuration screen, the user is prompted to select an action mode (direct or reverse action). Also, the output range (0-5/0-10 or 1-5/2-10V operation. The second screen allows the span of the output to be limited to a percentage of the selected range. These settings only related to A0-1.

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.

Setting Alarm Limits
To determine the limits at which the unit status changes from Normal to Warning, and from Warning to Alarm, the alarm limits must be configured. To configure the alarm limits for the HMS-1650L Fume Hood Controller, select the Alarm Limits option from the Controller Setup menu. The high and low alarm limits, as well as the high and low warning limits, for both occupied and unoccupied operating modes may be specified in sequence. These limits should be specified to set the face velocity range which should be considered normal, as well as the range which indicates a warning condition, and the range which is considered critical and indicates an alarm condition.

Changing the Operating Mode
The HMS-1650L Fume Hood Controller can be set for occupied, unoccupied, or disabled modes of operation. To change the operating mode, select the Unit Setup option from the Main Setup Menu, and then select the Hood Setup option. At the Hood Setup menu, select the Operating Mode option which allows the user to select one of three operating modes. Changing the mode of operation automatically selects the pre-programmed setpoint and analog output action mode associated with each mode.

Adding Password Security
The HMS-1650L menu system can be protected by adding up to ten (10) multi-level passwords to the system. The Password Setup option on the System Setup menu allows the user to manage the security passwords. Options on the Password Setup menu include those for adding, editing, and deleting entries from the system as shown in Figure 7.

There is also an option that allows all of the system password entries to be purged. To add a new password entry, select the Add Password option from the Password Setup menu, which prompts the user to enter a minimum of four (4) and up to eight (8) digits. Once a valid 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 the factory for more information regarding this password.
Changing Display Settings

The HMS-1650L display screen can be customized very easily using options available under the Display Setup menu shown in Figure 8. The information included on the main display screen may be selectively enabled or disabled by selecting Display Options from the Display Setup menu. To disable specific display information, simply deselect those items which should be suppressed on the main display screen.

Changing the time and date can be accomplished either by using the hotspots on the main display screen, or through the Set Time & Date option on the Display Setup menu. Both methods access the same configuration popup screens that allow the user to specify new time and date settings.

The brightness of the main display screen on the HMS-1650L can be adjusted using the Set Brightness option on the Display Setup menu. The brightness settings are stored in nonvolatile memory and remain in effect through a power cycle.

The names associated with the four analog inputs of the main controller may be customized using the Edit Input Names option on the Display Setup menu. For example, the text string associated with the fume hood being monitored and/or controlled may be modified by selecting Analog Input 1 option on the Input Names Setup menu; the sidewall sensor is connected to analog input 1 (AI-1). The sash position sensor by default is connected to analog input 4 (AI-4), and the name associated with this input may be modified by selecting Analog Input 4 from the Input Names Setup menu.

Built-in Diagnostics

The HMS-1650L incorporates several useful diagnostic tools. These include an About this HMS option, an override facility, a real-time view feature, and a self-test function. The About this HMS option on the Diagnostics menu provides information specific to this particular unit, including the firmware versions and electronic serial numbers of the display and controller modules, and its network address.

During the test and balance phase, oftentimes it is convenient to be able to adjust exhaust damper actuator to a specific position to force a specific airflow condition. The analog outputs may be individually overridden by selecting the Overrides option from the Diagnostics menu, Analog Outputs option, and then selecting the specific analog output to be overridden. The user can then, in real-time, dynamically move the damper actuator to a specific position using the slider on the override screen. While in override mode, the selected analog output is “disconnected” from its PID control loop, if configured for PID control.
mode. Canceling override mode effectively resumes PID or direct analog output control. AO-1 is used to position the valve for fume hood applications.

The HMS-1650L incorporates a convenient feature that allows the installer or commissioning technician to view the real-time conditions of all of the hardware resources as well as several system variables. This includes the analog inputs, analog outputs and digital inputs. Selecting the Real-Time View option from the Diagnostics menu allows the user to view the real-time conditions of any of the listed resources. For example, selecting the Analog Inputs option from the Real-Time View menu invokes the real-time view configuration screen. To skip to the next set of resources to view, click the Next button. To cancel the real-time view display at any time, click the Exit button to return to the Real-Time View menu.

By selecting the Run Self-Test option from the Diagnostics menu, the unit performs a quick self-test of the alarm status screens and audible alert by cycling through the normal (green), warning (yellow) and alarm (red) screens while sounding the alarm buzzer.

**Enabling MAX FLOW Capability**

The HMS-1650L may be configured to enable a convenient feature that allows the fume hood to be put into a maximum face velocity mode, or MAX FLOW mode, for emergency situations where the exhaust valve is forced to its maximum open position. To enable the MAX FLOW mode at the main display of the HMS-1650L, set the configuration dipswitch S2 accordingly (see table on page 28). Setting position 2 of S2 to the ON position enables the MAX FLOW feature, and results in the ‘Press for MAX FLOW’ button appearing on the as shown in Figure 10.
# Configuring Display Module Settings

## Options Dipswitch (S1) – internal use only

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1. | Graphics Chip Mode Selection | OFF = Programming Mode  
ON = Run Mode |
| 2. | Touch Screen Calibration Mode | OFF = Force calibration  
ON = Auto calibration |
| 3. | Reserved |   |
| 4. | Reserved |   |

## Options Dipswitch (S2) – Product Configuration

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1. | Sensor Mode | OFF = Single  
ON = Dual |
| 2. | MAX FLOW button | OFF = Disabled  
ON = Enabled |
| 3. | Product Type | OFF = FMS-1650L  
ON = HMS-1650L |
| 4. | Operational Mode | OFF = Demo Mode  
ON = Run Mode |

<table>
<thead>
<tr>
<th>Pushbutton Switch (SW1)</th>
<th>Reset Button</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushbutton Switch (SW2):</td>
<td>Options Configuration</td>
</tr>
</tbody>
</table>
Cleaning the HMS-1650L 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, toluene, xylene, propyl or isopropyl alcohol, or kerosene.

**Hot-Spot Features of HMS-1650L Touch Screen Display**

- Touching the current fume hood name text brings up an alphanumeric keyboard to quickly change the name of the monitored fume hood.
- Touching any other part of 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 UNITS brings up engineering units selection popup to quickly change face velocity units.
- Touching TIME brings up Time Entry popup to quickly change the current displayed time.

**Cleaning the HMS-1650L 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, toluene, xylene, propyl or isopropyl alcohol, or kerosene.
FLOW DIAGRAMS

Unit Setup Menu Tree

- Main Setup
  - Menu
  - Unit Setup
    - Control Setup
      - PID Loop Setup
        - P
        - I
        - D
      - Analog Output
      - Alarm Limits
        - Occupied
          - xxx ISO Hi Alm
        - Occupied
          - xxx ISO Hi Warn
        - Occupied
          - xxx ISO Lo Warn
        - Unoccupied
          - xxx ISO Hi Alm
        - Unoccupied
          - xxx ISO Hi Warn
        - Unoccupied
          - xxx ISO Lo Warn
      - Audible Alert
        - Audible / Silent
        - Time Base
        - Delay Time
        - Alarm Quiet
        - Period
    - Hood Setup
      - Isolation Mode
        - Pos / Neg / Neut
      - Set Occupancy
        - Occ / UnOcc
      - Edit Setpoints
        - Occupied
          - Setting 1
          - Setting 2
          - Setting 3
        - UnOccupied
          - Setting 1
          - Setting 2
          - Setting 3
      - Field Calibration
        - Set Zero Input
        - Set True Input
    - Sash Setup
    - Service Pin
Diagnostcs Menu Tree
Triatek is located in Norcross, Georgia and has an extensive network of manufacturer’s representatives located throughout North America to service you. Our helpful, experienced sales team can provide solutions for your Laboratory Controls, Medical Controls, HVAC Controls, and Industrial Instrumentation needs. Call 770-242-1922 or visit our website at www.triatek.com for more information or to find an agent near you.

Triatek has been a pioneer in controllers since its origins back in the 1980’s. Today, Triatek has the most complete line of controllers and monitors in the industry - the latest of which use full color touchscreens. Additionally, Triatek is unique in that the company engineers and sells both venturi valves and controllers or monitors. In other words, Triatek is the one company that can be turned to for a complete air pressure solution.