EBTRON®
Thermal Dispersion Airflow Measurement

Model HTx104
Technical Manual

Hybrid Series Thermal Dispersion Airflow Measurement Technology

Advantage
Hybrid Series by Ebtron

Installation, Operation and Maintenance Technical Manual

HTx104

"Plug & Play" Transmitters

Includes Analog output models: HTA104-P, HTA104-F, HTA104-B, HTA104-T, & HTA104-E
Includes RS-485 output models: HTN104-P, HTN104-F, HTN104-B, HTN104-T, & HTN104-E

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Part Number: 930-0150

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LIST OF EFFECTIVE AND CHANGED PAGES

Insert latest changed pages (**in bold text**); remove and dispose of superseded pages.
Total number of pages in this manual is **32.**

Page No	Revision *	Description of Change	Date
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3 through 29		No change	
30	**R3F**	**Added notes for clarification in Field Calibration Wizard menu**	**11/8/2009**
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28	R3B	Revised AREA STATUS/AREA MATCH menu option	11/21/2008
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OVERVIEW

EBTRON's HTx104 transmitter (Figure 1) can process up to four individual sensing points and is compatible with a number of *EBTRON* sensor systems. The transmitter requires 24 VAC and provides the host controls with output signals for airflow and temperature, as well as an alarm output (not available on HTx104-E probes on ERV systems).

Each transmitter is fully independent of the sensor probes and does not require field matching to sensor probes.

Figure 2 shows the HTx104 transmitter features. All HTx104 transmitters include a 16 character LCD display that indicates airflow, temperature and system status. The display is also used during configuration and diagnostic modes. Field configuration is accomplished using a simple four-button interface on the main circuit board. Individual airflow and temperature measurements can be displayed from the diagnostic mode and are beneficial as an HVAC system diagnostic tool. The airflow output signal can be filtered and a process low limit can be set that forces the output to zero when the airflow rate falls below the user defined value. Both features are beneficial on outside air intakes that are affected by transient wind gusts at low airflow rates. A simple to use Field Calibration Wizard allows for a one or two point field adjustment to factory calibration for installations that require field calibration or adjustment. The HTx104 transmitter is available in an analog and RS-485 version, and in 3 types depending upon number of sensor probes as shown in the Ordering Guide, Figure 3.

SPECIFICATIONS

Maximum Number of Sensing Points
- 4 (4 Airflow + 4 Temperature, independently processed)

Sensor System Configurations (max.)
- Type A (probes x sensors/probe): 1x4 (HP1 probes)
- Type B (probes x sensors/probe): 2x2 (HP1, HT1, HE1 probes), 2x1 (HB1 "bleed" sensors)
- Type C (probes x sensors/probe): 4x1 (HF1 fan inlets)

Digital Signal Processing
- Microprocessor: Yes
- Multiplexing: 8 individual channels
- A/D Converter: 12-Bit

"Plug and Play" Sensor Systems
- Probes do not require matching to transmitter

Power Requirements
- Voltage: 24 VAC (22.8 to 26.4 VAC), isolation not required
- "Brownout" protection: "Watchdog" reset circuit
- Power: 6 to 11 VA (dependent on number of sensors)
- Protection: Over voltage, over current and surge protection

Enclosure
- Aluminum

User Interface
- Pushbutton and LCD display

Display
- 16 character alpha-numeric auto-range

Output to Host Controls
- Output/Protocols Supported:
  a.) HTA104: Isolated 0-5[1]/ 0-10 VDC or 4-20mA (resolution 0.025% FS)
  b.) HTN104: RS-485, 76.8 kbps max., BACnet®, Modbus, JCI® N2-Bus®

Airflow Output Adjustments:
- Offset/gain (pushbutton LCD display)
- Airflow Output Integration: 1 to 150 samples
- Airflow Low Limit Cutoff: Forces output to zero below user defined value

System Diagnostics
- Sensor/transmitter diagnostic mode with notification

Environmental Limits
- Operating Temperature: -20° F to 120° F (-28.8° C to 48.8° C)
- Moisture: 0 to 99% RH, noncondensing (protect from water)

Compatible Sensor Systems
- HP1 probes, HF1 fan inlets, HB1 "bleed", HT1 small duct, and
- HE1 ERV sensorsn

Listings
- UL® 873 Airflow & Temperature Indicating Devices

Warranty
- 36 months from shipment

[1] 0-5 VDC analog output option introduced with firmware v. 1.07.

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Figure 1. HTx104 Transmitter

ADVANCED TECHNOLOGY

- Microprocessor-based electronics with industrial grade integrated circuits.
- "Plug and Play" sensor probe design.
- Accepts up to 4 individual airflow and temperature sensor pairs.
- LCD display.
- Pushbutton user interface for simple field configuration, diagnostics and Field Calibration Wizard.
- Independent airflow and temperature outputs.
- Airflow alarm output with adjustable hysteresis (available on analog model HTA104 only).
- Model HTA104 for Analog Output
- Model HTN104 for RS-485 output - **BACNet® - MS/TP Master, Modbus®-RTU or JCI N2-Bus®.**

Network Connectivity Solutions

BACnet® METASYS COMPATIBLE

Modbus JCI® N2-Bus®

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HTx104 TRANSMITTER FEATURES

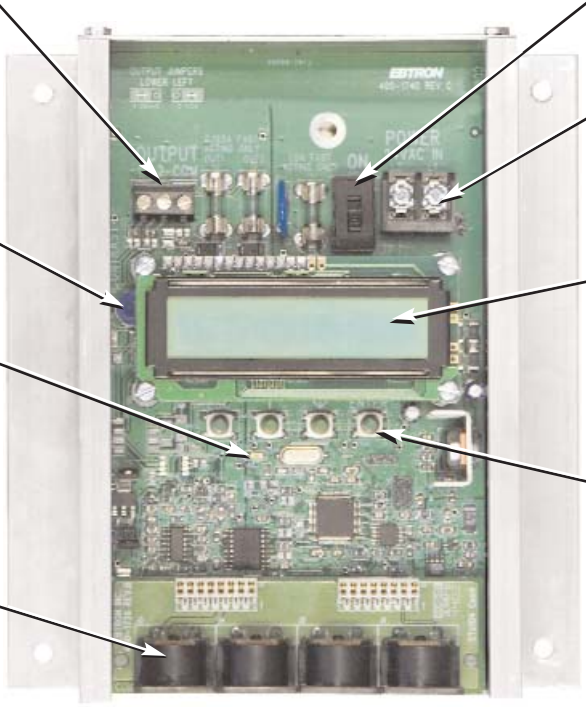

Figure 2. HTx104 Transmitter Features

ORDERING GUIDE FOR HTx104 TRANSMITTER

H T __ 104 -

Transmitter Type
Type A 1 Connector
Type B 2 Connectors
Type C 4 Connectors

Transmitter Output
A Analog, 0-5VDC / 0-10VDC or 4-20mA
N RS-485, BACnet®, Modbus, JCI® N2-Bus®

Figure 3. HTx104 Transmitter Ordering Guide

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Table 1. HTx104 Connectivity Options

Output to Host Controls	Output/Protocols Supported	Airflow	Temperature	Status
Analog x=A	Linear 0-5VDC[1] / 0-10VDC or 4-20mA	Yes	Yes	Visual Only
RS-485 x=N	BACnet®-MS/TP, BACnet®	Yes	Yes	Yes
	Modbus-RTU			
	JCI® N2-Bus®			

[1] 0-5 VDC analog output option introduced in firmware versions from 1.07 and later.

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HTx104 TRANSMITTER INSTALLATION

The HTx104 transmitter is designed for use in an environment between -20° F to 120° F *(-28.8° C to 48.8° C)* where it will not be exposed to rain or snow.

Mount the transmitter upright in a field accessible location. The enclosure (Figure 4) is designed to accept 3/4 in. *(19.0 mm)* conduit fittings for signal and power wiring at the top left and right sides of the circuit board. Locate the transmitter so that the connecting cables from all of the sensor probes will reach the receptacles on the bottom of the transmitter enclosure.

In locations exposed to direct rain and/or snow, the transmitter must be enclosed in a NEMA4 enclosure.

Leave at least 7" *(177.8 mm)* above, and 3" *(76.2 mm)* to each side and bottom, of unobstructed space around the transmitter to allow for heat dissipation and cover removal.

Locate the transmitter in a location that can be reached by all connecting cables from the sensor probes.

Do not drill into the transmitter enclosure since metal shavings could damage the electronics.

Mechanical Dimensions

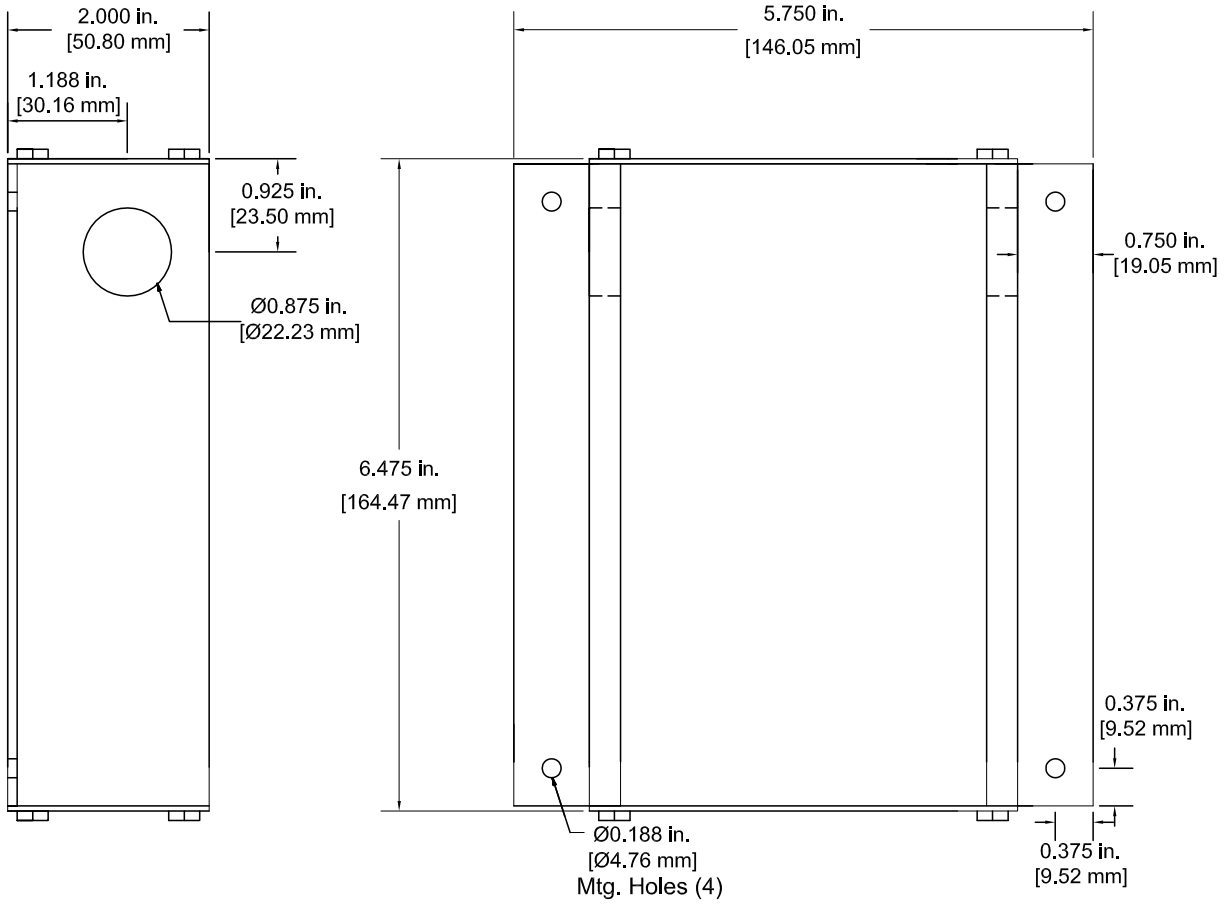

Figure 4. HTx104 Transmitter Mechanical Detail Drawing

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Power Transformer Selection

Select a 24 VAC transformer based on the maximum power requirements of the transmitter label (11 VA) or from the values of Table 2. The operating supply voltage (transmitter power "ON" with all sensor probes connected) should not be less than 22.8 VAC or greater than 26.4 VAC.

Table 2. HTx104 Power Transformer Selection Guide

Total Sensors	1	2	3	4
Minimum VA Req.	6	8	9	11

Connecting Power to the Transmitter

Slide the cover plate up and off of the transmitter enclosure, and ensure that the power switch is in the "OFF" position before connecting your 24 VAC power source.

Connect 24 VAC power to the large, two position power input terminal labeled "POWER" on the upper right hand side of the main circuit board (shown in Figure 5). Since the output signals are isolated from the power supply, it is not necessary to provide an isolated (secondary not grounded) power source.

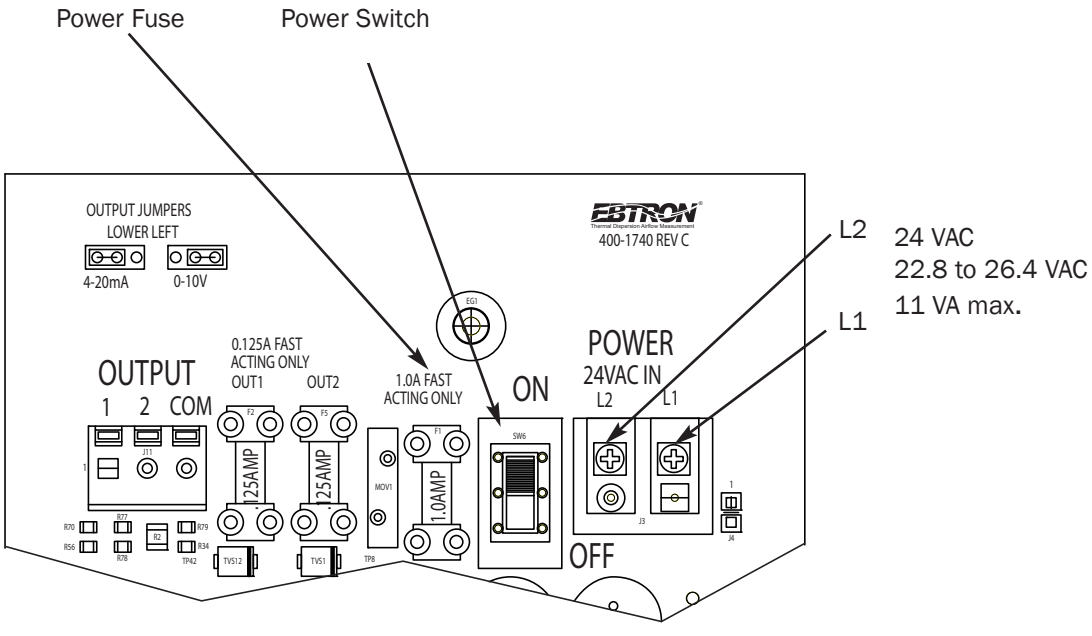

Figure 5. HTx104 Power Connections

Multiple HTx104 transmitters wired to a single transformer must be wired "in-phase" (L1 to L1, L2 to L2).

Sensor probes must be connected to the transmitter before turning the power switch to the "on" position to properly "flash" sensor calibration data to the transmitter.

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Connecting Sensor Probes to the Transmitter

After mounting the sensor probes and transmitter, connect one or more sensor probe cable plugs to the circular receptacles located at the bottom of the HTx104 transmitter enclosure. Probes are *"Plug and Play"* and do not have to be connected to a specific receptacle on the transmitter. Transmitters can accept HP1, HF1 , HB1, HT1, or HE1 sensors. Mixing sensor types on a single transmitter is not permitted. Match probes to transmitter by type (A, B or C) as indicated on the tags on the transmitter and sensor probes shown in Figure 6.

Provide a "drip loop" at the transmitter if there will be the potential for water runoff or condensation along the sensor probe cable(s).

Sensor probe cable plugs are "keyed" as shown in Figure 7. Line up plug with receptacle and push straight on to receptacle. DO NOT TWIST. Squeeze cable plug "ribs" towards receptacle when removing. Forcing the cable plug in or out of the receptacle will damage the connectors and void warranty.

TYPE A TRANSMITTER

Accepts 1 probe up to 4 sensors.

TYPE B TRANSMITTER

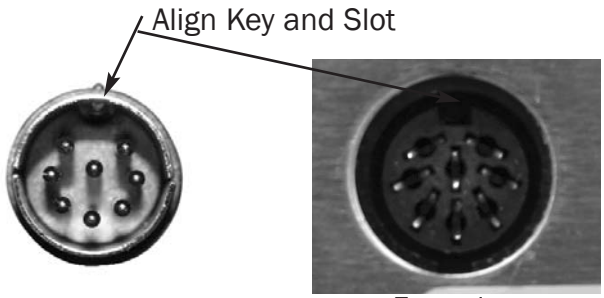
Accepts 2 probes up to 2 sensors each.

TYPE C TRANSMITTER

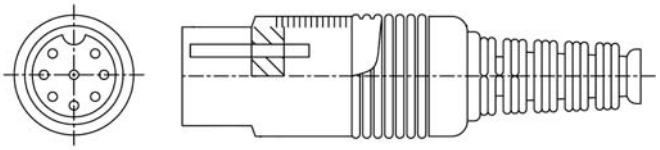
Accepts 4 probes, 1 sensor each.

Figure 6. Type A, Type B and Type C Transmitters

CONNECTING CABLE PROBES TO TRANSMITTER



Type B Shown



Pull to Remove
DO NOT TWIST!

Figure 7. Connector Detail

LCD Display and Menu Item Keys

Following a brief initialization at power up, the HTx104 LCD display automatically displays airflow and temperature when duct/plenum probes (**HP1 or HT1**), fan inlet probes (**HF1**) or bleed sensors (**HB1**) have been connected. When equipped with ERV probes (**HE1**), the HTx104 automatically cycles through and displays airflow and temperature of each ERV probe . A HOLD feature in the ERV firmware permits the user to hold the display at a particular probe at any time simply by depressing any of the Menu Item Keys (ESC, ↑, ↓, or ENTER - see Figures 8 and 9). The display will also indicate the letter "H" on the far right side of the display when it is in this hold state. To resume normal cycling through the probe readings, simply depress any key once again. Refer to the menus and descriptions which appear later in this manual for a complete description of programming features.

HTA104 Analog Transmitter Set Up

The HTA104 provides independent 12-bit (4096 discrete states) linear analog outputs for airflow at OUTPUT 1, and for temperature at OUTPUT 2; each with overvoltage and overcurrent protection. OUTPUT 2 can also be programmed as an alarm output with selectable range and hysteresis. Airflow and temperature (or alarm) outputs are field selectable for either VDC 0-5VDC[1] / 0-10VDC) or mA (4-20 mA). When programmed as an alarm output, OUTPUT 2, can be adjusted to provide either minimum analog output (0 VDC for 0-5 VDC[1] / 0-10VDC, or 4 mA for 4-20 mA) or maximum output (5VDC for 0-5 VDC[1] / 10VDC for 0-10VDC, or 20 mA for 4-20 mA) when airflow is outside of a user preset acceptable operating range. An Alarm hysteresis setting is used to establish the acceptable operating range around the absolute set value. Outputs are galvanically and optically isolated from the main power supply to permit simple integration to virtually all building automation systems.

To wire the output signal, slide the cover plate up and off of the enclosure. Ensure that the power switch is in the "OFF" position. Connect signal wires for airflow rate and temperature to the small, three position output terminal labeled "OUTPUT" on the upper left hand side of the main circuit board as indicated in Figure 8. Airflow output is at terminal 1, and temperature (or alarm) output is at terminal 2.

If OUT1 or OUT2 jumpers for 4-20 mA or 0-10 VDC are changed, the SETUP menus for OUT1 and OUT2 MUST also be changed to agree with the selected mode. Refer to SETUP menus, Figures 14 through 16.

When configured for 4-20 mA output, the HTA104 is a "4-wire" device. The host controls should not provide any excitation voltage to the output of the HTA104.

COM - Signal Common

2 - OUTPUT 2
Temperature (or Alarm)

1 - OUTPUT 1
Airflow

OUT1 Fuse
(Airflow)
Replace with UL® listed,
0.125 Amp only,
P.N. 800-1105 (10 Pack)

OUT2 Fuse
(Temperature/Alarm)
Replace with UL® listed,
0.125 Amp only.
P.N. 800-1105 (10 Pack)

OUT1 Jumper
Airflow Output:
4-20 mA or 0-5[1]/0-10 VDC
(Default: 4-20 mA)
SETUP MENU MUST BE CHANGED!

OUT2 Jumper
Temperature/Alarm Output:
4-20 mA or 0-5[1]/0-10 VDC
(Default: 4-20 mA)
SETUP MENU MUST BE CHANGED!

OUT1 and **OUT2**
Jumper Detail

[1] 0-5 VDC analog output option introduced with firmware version 1.07.

ON/OFF Power Switch

Menu Input Keys

ESC

↑

↓

ENTER

Transmitter Status
(Green LED - 1 second flash for normal; 2 second flash for fault).

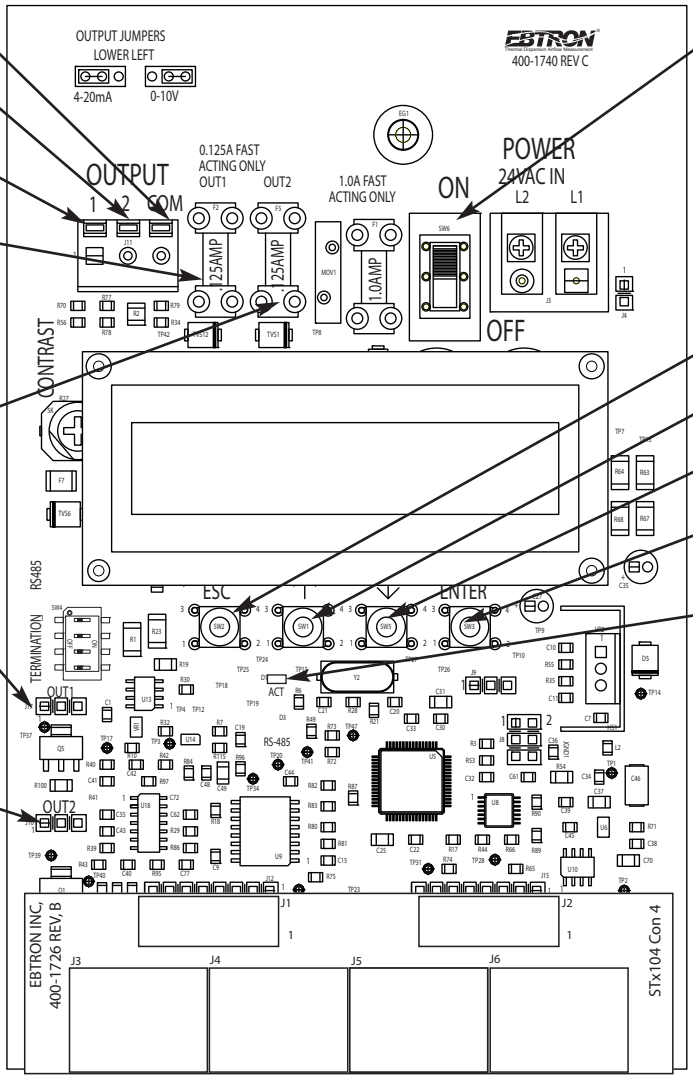


Figure 8. HTA104 Analog Circuit Board Detail

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HTA104 Alarm Output and Hysteresis

The alarm output, available only on the HTA104 at OUTPUT 2, can be adjusted to to provide either minimum analog output (0 VDC for 0-5 VDC[1] / 0-10VDC, or 4 mA for 4-20 mA) or maximum output (5VDC for 0-5 VDC[1] / 10VDC for 0-10VDC, or 20 mA for 4-20 mA) when airflow is outside of a user preset acceptable operating range.

An Alarm hysteresis setting is used to establish the acceptable operating range around the absolute set value. Refer to the setup menus of Figure 14 through Figure 16 for detail on the alarm menu functions.

The alarm output is enabled by setting the "*OUT2 TYP=" to "ALRM" in the setup menu. This enables a submenu for setting the desired alarm flow value (*ALR=0FPM/MPS) within the operating range of the transmitter.

An additional submenu for alarm hysteresis (*ALRM HYS=) prevents operating the alarm within a specified 'dead band' (default is 15%) as a percentage of the alarm flow value entered in the prior step.

The alarm output (*ALRM OUT=) menu can be set for active high (default) or active low. The "MAX" menu option sets the alarm output active high so that the alarm produces a 5 VDC[1] / 10 VDC or 20 mA output (depending on" OUT2" jumper selection for VDC/ma, and and user setting for 5 VDC[1]/10VDC scale selection). The "MIN" menu option sets the alarm output active low so that the alarm produces a 0 VDC or 4 mA output (depending on" OUT2" jumper selection for VDC/ma selection).

The transmitter is shipped from the factory with the analog output set for 4-20 mA. If the 0-5 VDC[1] or 0-10VDC output is desired, move the corresponding output jumper (OUT1 for airflow, and/or OUT2 for temperature/alarm) to the 0-10VDC position (see Figure 8), and set the "SET OUT1" and/or "SET OUT2" option in the SETUP MENU as shown in Figures 14 through 16.

Converting Analog Output Signals to Airflow and Temperature

Since the accuracy of the HTA104 is "percent of reading" there is no need to reconfigure the default output scales listed inside the transmitter cover. However, if desired, factory default settings can easily be reconfigured in the field (see: CHANGING FACTORY DEFAULT SETTINGS).

The equivalent volumetric flow full scale reading can easily be determined by multiplying the full scale reading by the free area where the airflow measuring station is located (free area x 1000 for SI units scaling when the area is calculated in square meters). For -P and -T units, the free area is electronically programmed into the probe at the factory prior to shipment, and is also printed on the hang-tag of each sensor probe. For -F and -B units, the free area must be determined after the units are installed. Table 3 lists specific conversion factors for analog voltage or current options for OUTPUT 1 and 2 for each sensor type.

[1] 0-5 VDC analog output option introduced with firmware version 1.07.

Table 3. HTA104 Analog Output Conversions

When OUTPUT 1 is Configured as Linear Airflow (FPM, MPS):

	ANALOG OUTPUT SCALING AND TYPE		
TO CONVERT TO	**0-10 VDC**	**0-5 VDC[1]**	**4-20 mA**
Unidirectional Airflow (FPM, MPS)	Output Voltage/10 x FS1	Output Voltage/5 x FS1	(Output Current-4)/16 x FS1
Unidirectional Airflow (CFM)	Area (SQF) x Output/10 x FS1	Area (SQF) x Output/5 x FS1	Area (SQF) x (Output - 4)/16 x FS1
Unidirectional Airflow (LPS)	Area (SQM) x Output/10 x FS1 x 1000	Area (SQM) x Output/5 x FS1 x 1000	Area (SQM) x (Output - 4)/16 x FS1 x 1000
Bidirectional Airflow (FPM,MPS) (-B only)	(Output Voltage - 5)/5 x FS1	(Output Voltage –2.5)/2.5 x FS1	(Output Current - 12)/8 x FS1
Bidirectional Airflow (CFM) (-B only)	Kv x (Output Voltage - 5)/5 x FS1 *K is determined by field measurement or from K tables in Bleed Sensor Technical Manual, TM_HB1/SB1.*	Kv x (Output Voltage –2.5)/2.5 x FS1 *K is determined by field measurement or from K tables in Bleed Sensor Technical Manual, TM_HB1/SB1.*	Kv x (Output Current - 12)/8 x FS1 *K is determined by field measurement or from K tables in Bleed Sensor Technical Manual, TM_HB1/SB1.*
Bidirectional Airflow (LPS) (-B only)			

When OUTPUT 1 is Configured as Volumetric Airflow (CFM, LPS):

	ANALOG OUTPUT SCALING AND TYPE		
TO CONVERT TO	**0-10 VDC**	**0-5 VDC[1]**	**4-20 mA**
Unidirectional Airflow (CFM, LPS)	Output Voltage/10 x FS1	Output Voltage/5 x FS1	(Output Current - 4)/16 x FS1
Bidirectional Airflow (CFM, LPS) (-B only)	(Output Voltage - 5)/5 x FS1	(Output Voltage –2.5)/2.5 x FS1	(Output Current - 12)/8 x FS1

When OUTPUT 1 is Configured as Pressure (iWC, PA):

	ANALOG OUTPUT SCALING AND TYPE		
TO CONVERT TO	**0-10 VDC**	**0-5 VDC[1]**	**4-20 mA**
Unidirectional Pressure (iWC, PA)	Output Voltage/10 x FS1	Output Voltage/5 x FS1	(Output Current - 4)/16 x FS1
Bidirectional Pressure (iWC, PA)	(Output Voltage - 5)/5 x FS1	(Output Voltage –2.5)/2.5 x FS1	(Output Current - 12)/8 x FS1

When OUTPUT 2 is Configured as Temperature (°F,°C):

	ANALOG OUTPUT SCALING AND TYPE		
TO CONVERT TO	**0-10 VDC**	**0-5 VDC[1]**	**4-20 mA**
Temp (°F,°C)	Output Voltage/10 x (FS2 - MS2) + MS2	Output Voltage/5 x (FS2 - MS2) + MS2	(Output Current - 4)/16 x (FS2 - MS2) + MS2

NOTES:

[1] 0-5 VDC analog output option introduced in firmware version 1.07 and later.

FS1 is OUTPUT1 full scale analog output value from SETUP MENU.

FS2 is OUTPUT2 full scale analog output value from SETUP MENU.

MS2 is OUTPUT2 minimum scale analog output value from SETUP MENU.

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Sending a Test Output Signal to the Host Control System

A test output signal between 0 and 100% of the selected full scale output (0-5 VDC[1]/0-10VDC or 4 to 20 mA) can be provided by the HTA104 transmitter to verify proper conversion of the output signals from the HTA104 transmitter at the host control system. To set a fixed output signal for airflow and temperature, simultaneously press and release the "ENTER" and "ESC" buttons within 10 seconds of power up. Use the "DOWN" arrow button until "*TESTOUT=0%" is displayed. Press the "ENTER" button and use the "UP" and "DOWN" arrow buttons to select an output between 0 and 100% of the full scale. Press the "ENTER" button to set the output percentage. Press the "ESC" button when verification is complete to return to the normal operating mode.

HTN104 RS-485 Transmitter Set Up

The HTN104 provides a differential bus/line transceiver designed to meet the requirements of the RS-485 standard for multipoint data transmission. Bus contention and wiring fault conditions are over-current and over-voltage protected, including an automatic thermal shutdown of the RS-485 transceiver. Flexibility to integrate with various network protocols and topologies is provided via field selectable firmware menu options for address and protocol selection, and a termination DIP switch for line termination selection as shown in Figure 9.

RS-485 Network Cable Specifications

The RS-485 network cable shall be shielded twisted pair with a characteristic impedance of 100 to 130 ohms.
Distributed capacitance between conductors shall be less then 100 pF per meter.
Distributed capacitance between conductors and shield shall be less then 200 pF per meter.
The maximum recommended length of a network segment is 1200 meters with AWG 18 cable.

HTN104 RS-485 Network Connections

The HTN104 RS-485 network circuitry is isolated from the 24VAC power and "floats" with respect to ground by default. This allows for the HTN104 to be interfaced with both isolated and non-isolated networks. To wire the output signal, slide the cover plate up and off of the enclosure. Ensure that the power switch is in the "OFF" position. Determine whether the RS485 network requires an isolated or non-isolated interface to the HTN104, and connect cables as outlined in the appropriate paragraph that follows. Pay particular attention to the network common connection and termination DIP switch requirements for each type of connection. Connections are made at the three position terminal block labeled "OUTPUT" on the upper left hand side of the main circuit board as shown in Figure 9.

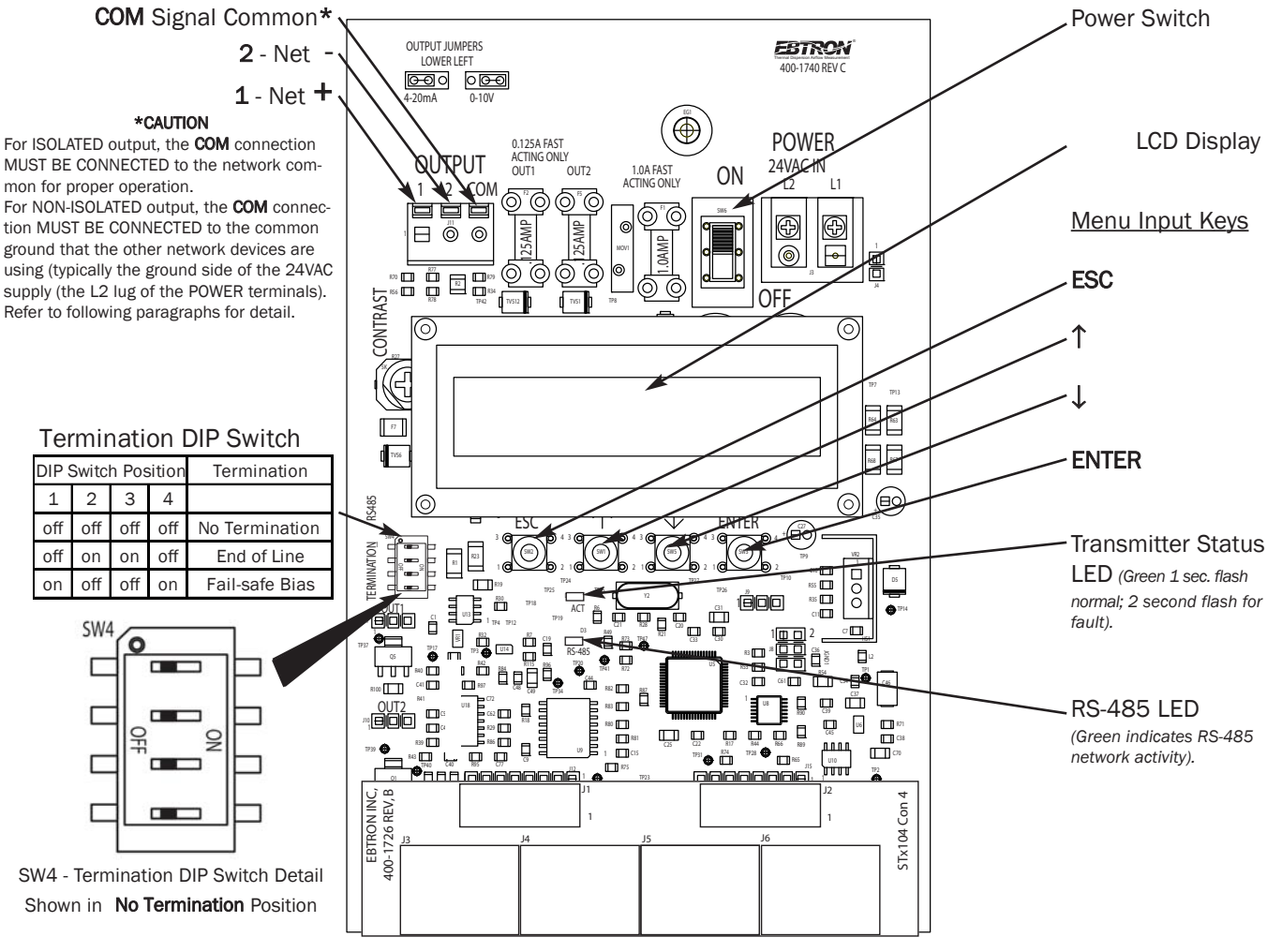

Figure 9. HTN104 RS-485 Transmitter Circuit Board Detail

Connecting to an Isolated RS-485 Network:

Connect the NET+, NET- and COM terminals to the network with shielded twisted pair cable meeting the specifications defined in the previous paragraph (typically using two pairs, with one wire not used; one pair for +/- and both wires in other pair for GND when using 2-pair cable). The connection to the network must be made in a "daisy chain" configuration. "T" connections and stubs are NOT permitted. The shield should be terminated at one end on the network only. If the HTN104 is not the first or last device, set the on-board termination DIP switches for NO TERMINATION. If the HTN104 is the first or last device, set the on-board termination DIP switches to either END OF LINE or FAIL SAFE BIAS termination.

***CAUTION**

For ISOLATED output, the **COM** connection MUST BE CONNECTED to the network common for proper operation.

Connecting to a Non-Isolated RS-485 Network:

Connect the NET+ and NET- terminals to the network with a shielded twisted pair cable meeting the specifications defined in the previous paragraph. The connection to the network must be made in a "daisy chain" configuration. No "T" connections or stubs are permitted. The shield should be terminated at one end on the network only. If the HTN104 is not the first or last device, set the on-board termination DIP switches for NO TERMINATION. If the HTN104 is the first or last device, set the on-board termination DIP switches to either END OF LINE or FAIL SAFE BIAS termination. Because the HTN104 output is isolated, the COM terminal must be connected to the "common ground" that the other devices on the network are using as their ground reference. This is typically the ground side of the 24VAC supply (L2 on the HTN104 POWER terminals).

***CAUTION**

For NON-ISOLATED output, the **COM** connection MUST BE CONNECTED to the common ground that is used by the other network devices (typically the ground side of the 24VAC supply; the L2 terminal at the POWER connector block as shown in Figure 9).

HTN104 Setting Network Options

The transmitter must be configured for proper protocol address and termination prior to power up. The transmitter is shipped from the factory with the protocol set to the BACnet® MS/TP Master, **address 1** and **no termination.** (Termination DIP switch is located on the circuit card - see Figure 9.) Figure 10 details the COMM Setup Menu options.

HTN104 Setting the Network Protocol

Transmitter protocol can be changed in the field by setting the address in the COMM setup menu (Figure 10). Tables 4 through 6 list the specific features of each protocol.

HTN104 Setting the Transmitter Address

Each transmitter must be assigned a **unique** address between 1 and 255 (127 BACnet®) prior to power up by setting the address in the COMM setup menu (Figure 10).

HTN104 Setting the Transmitter Termination

A termination resistor (typically 120 ohms) should be installed at each end of the bus between the NET+ and NET- (A and B) communication lines. The ***EBTRON*** transmitter provides the ability to select standard (120 ohm) or "fail-safe" termination whenever the device is installed at either end of the bus. When an ***EBTRON*** device is not installed at the end of the bus, the termination for that device should be disabled. The "fail-safe" termination will guarantee that the bus is in a known state during idle-line conditions (when no device is driving the bus). ***EBTRON*** recommends "fail-safe" termination at one end of the bus. Transmitter termination is selected by setting the DIP switch labeled "TERMINATION" (Figure 9) on the circuit card. Termination options are "No Termination", "End of Line" or "Fail-safe Bias" (recommended at one end of the bus).

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Navigating through the COMM Setup Menu (all System of Units)

Press and release ↑/↓ during normal operation to select

Press and release Enter and Escape during first 10 seconds of operation to select

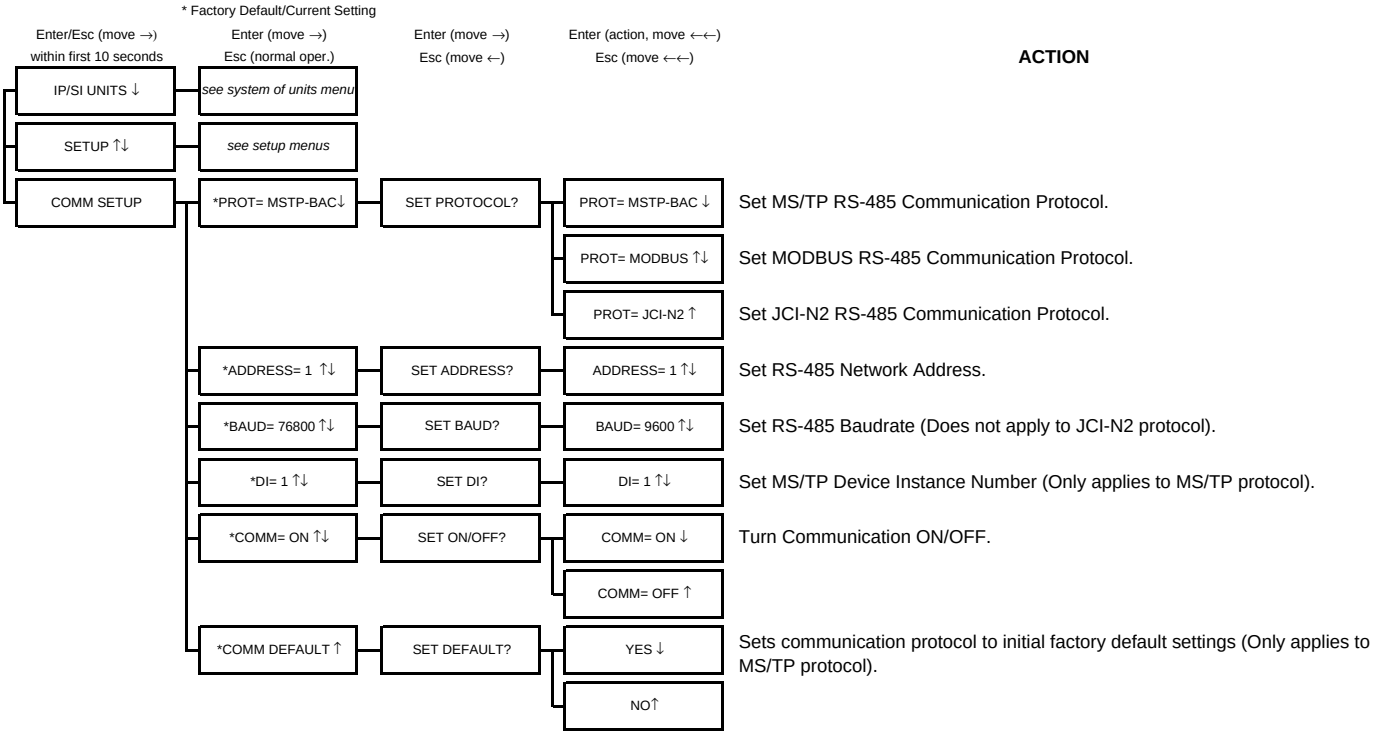

Figure 10. COMM (Communications) Setup Menu

Table 4. HTN104 RS-485 BACnet Object List

BACnet® MS/TP

OBJECTS (For all probes **EXCEPT HE1**)
Baud Rates: 9.6, 19.2, 38.4, 76.8 Kbps

Type, Instance	Description	Default Units
Device, 1	Device Object	
Analog Input, 1	Airflow	FPM
Analog Input, 2	Differential Pressure	in.w.c.
Analog Input, 3	Temperature	deg F
Analog Value, 1	Area	sq.ft.
Analog Value, 2	Baud Rate	None
Analog Value, 3	Airflow Traverse	FPM
Analog Value, 4	Temp Traverse	°F

OBJECTS (For **HE1** Probes **ONLY**)
Baud Rates: 9.6, 19.2, 38.4, 76.8 Kbps

Type, Instance	Description	Default Units
Device, 1	Device Object	
Analog Input, 1	Airflow 1	FPM
Analog Input, 2	Airflow 2	FPM
Analog Input, 3	Temperature 1	deg F
Analog Input, 4	Temperature 2	deg F
Analog Value, 1	Area 1	sq.ft.
Analog Value, 2	Baud Rate	None
Analog Value, 3	Area 2	sq.ft.

User Executed Services Supported: **Subscribe COV, Read Property, Write Property, Device Communication Control, Who-Is**

Table 5. HTN104 RS-485 Modbus Register Map

Modbus
Modbus RTU

REGISTER MAP
Baud Rate: 9,600 or 19,200 bps

	IEEE Floating Point		Binary				
Function	low/high word	high/low word		Length	Units	Point Description	Range/Value
02			10001	1		Status	0:OK, 1:Trbl.
04	30001	30009		2	FPM	Flow 1	0 to 15,000
04	30003	30011		2	in. w.c. or FPM	Pressure or Flow 2	-2.5 to +2.5 or 0 to 15,000
04	30005	30013		2	°F	Temp 1	-20 to +160
04	30007	30015		2	°F	Temp 2	-20 to +160
04			30017	1		Sensor Type	1 = Probe 2 = Bleed 3 = ERV 255 = Fan
04			30018	1		Connector C1 Sensors	0 to 4
04			30019	1		Connector C2 Sensors	0 to 4
04			30020	1		Connector C3 Sensors	0 to 4
04			30021	1		Connector C4 Sensors	0 to 4
04	30022	30038		2	FPM	Insert 1 Flow	0 to 15,000
04	30028	30044		2	FPM	Insert 4 Flow	0 to 15,000
04	30030	30046		2	°F	Insert 1 Temp	-20 to +160
04	30036	30052		2	°F	Insert 4 Temp	-20 to +160
06			40201	1		Modbus Baud Rate	0=9,600 1=19,200

Table 6. HTN104 RS-485 JCI N2®-Bus Point Map

JCI® N2-Bus®

POINT MAP (For all probes **EXCEPT HE1**)
Baud Rate: 9600 bps

NPT[1]	NPA[2]	Units	Point Description	Range/Value
AI	1	FPM	Flow 1	0 to 15,000
AI	2	in.w.c.	Differential Pressure	-2.5 to +2.5
AI	3	°F	Temperature 1	-20 to +160
BI	1		Status	0:OK, 1:Trbl.

[1]Network Point Type
[2]Network Point Address

POINT MAP (For **HE1** Probes **ONLY**)
Baud Rate: 9600 bps

NPT[1]	NPA[2]	Units	Point Description	Range/Value
AI	1	FPM	Flow 1	0 to 15,000
AI	2	FPM	Flow 2	0 to 15,000
AI	3	°F	Temperature 1	-20 to +160
AI	4	°F	Temperature 2	-20 to +160
BI	1		Status	0:OK, 1:Trbl.

[1]Network Point Type
[2]Network Point Address

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HTx104 TRANSMITTER SET UP

To ensure a successful start-up, verify that the airflow measuring station and transmitter are installed in accordance to ***EBTRON*** guidelines.

Check the physical installation, power connections and model specific signal wiring prior to turning the power switch to the "on" position.

Move the power switch to the "ON" position. The transmitter executes a complete self-check each time the power is turned on that takes 10 seconds to complete. Check that the readings at the host control system return an output that matches the output of the HTx104.

The HTA104 is designed to operate on "POWER-UP". Default output signals are set to 4-20 mA. No field configuration is necessary unless the output signal required is 0-5 VDC[1] or 0-10 VDC. The HTN104 must be properly wired and configured based on the system network protocol. Review the previous sections for the corresponding transmitter network output card or contact ***EBTRON*** Customer Service, toll free, at 800-232-8766.

Transmitter Initialization

The HTx104 Transmitter automatically initializes at power-up and conducts full system diagnostics. Under normal conditions, there is no reason to enter the *Initialization Mode*. The transmitter should only be initialized if one of the actions below is required. To enter the *Initialization Mode*, simultaneously press and release the "ENTER" and "ESC" buttons during the first 10 seconds after the transmitter power-up delay is completed (indicated by "- - - - - - - -"). Navigate through the menus as shown in Figure 11 below.

Press and release Enter and Escape during first 10 seconds of operation to select

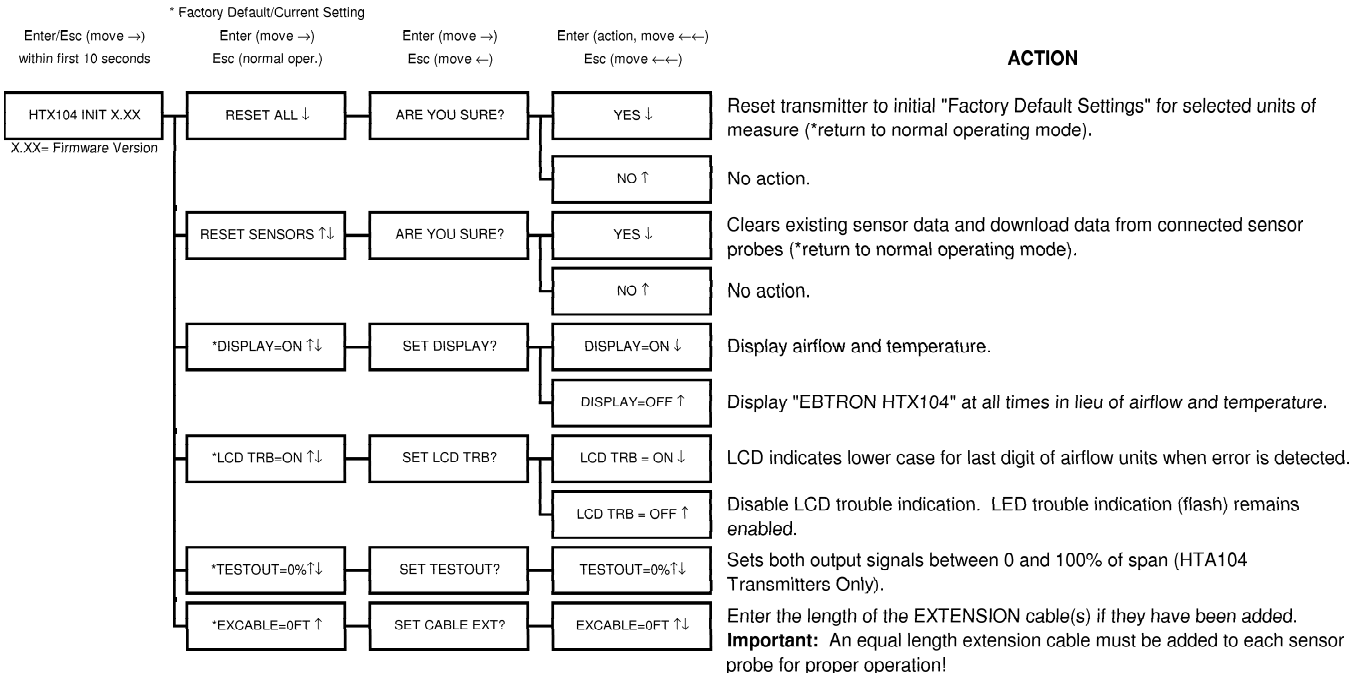

Figure 11. Transmitter Initialization Menu

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Changing the System of Units

The HTx104 transmitter is shipped with the system of units set to US inch-pound units (IP). The LCD will display units of measure as shown in the IP column of Table 7. To change to standard international (SI) units, simultaneously press and release the "UP" and "DOWN" arrow pushbuttons during normal operation. "IP/SI UNITS" will be indicated on the LCD display. Press "ENTER" three times, and then use the "UP" and "DOWN" arrow buttons to select the system of units desired. Press the "ENTER" button to save the changes, and then press "ESC" twice to return to the normal operating mode. Figure 12 details the System of Units menu. Note that the Setup Menus of Figures 14 through 16 are shown in IP System Of Units. When SI System of Units is selected, the units of measure abbreviations used in the menus change as shown in the SI column of Table 7.

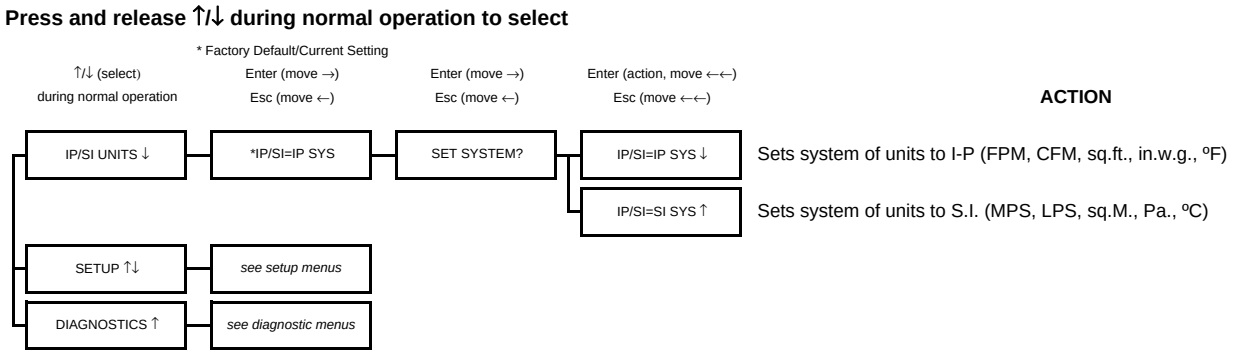

Figure 12. System of Units Menu

Table 7. Standard "IP" and "SI" Menu System of Units Abbreviations

"IP" System of Units LCD Display	Description	"SI" System of Units LCD Display	Description
FPM	Feet per minute	MPS	Meters per second
CFM	Cubic feet per minute	LPS	Liters per second
SQF	Square feet	SQM	Square meters
iWc	Inches H_20 (Water column)	Pa	Pascals
F	Fahrenheit	C	Celsius

Notes:

1. When the last character of the flow rate units on the LCD display is shown in lower case (for example FPm or CFm), this indicates an improper or malfunctioning probe is connected to the transmitter (see Table 9).

2. When all characters of the flow rate units on the LCD display are in lower case (for example fpm or cfm), this indicates that the transmitter is operating in the Field Calibration Wizard mode (see **FIELD ADJUSTMENTS - Field Calibration Wizard** section of this manual).

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Factory Defaults for HP1 (-P), HF1 (-F), HB1 (-B), HT1 (-T) and HE1 (-E) Sensor Probes

The HTx104 transmitter is "plug and play" and does not require setup unless a network option is selected that requires configuration. Table 8 shows the factory default settings for all compatible sensor probes. To change the Factory Default Settings, see: CHANGING FACTORY DEFAULT SETTINGS.

Table 8. Factory Default Menu Settings

Display	Sensor Type	Description	IP Units Display	SI Units Display
*LCD1 U/M=	ALL	Airflow units of measure	FPM	MPS
*AR1=	-P, -F, -T and -E	Free area where station is located	0.00 SQF	0.000 SQM
*K_V=	-B	Output 1 K_V factor for Airflow	0.00	0.000
*K_P=	-B	Output 1 K_p factor for Pressure	1.000	1.000
*DIRECTION=	-B	Output 1 Polarity	BI (bidirectional)	BI (bidirectional)
*OUT1=	ALL	HTA104 output 1 signal (airflow) [or pressure on -B]	4-20mA	4-20mA
*OUT 1 U/M=	-B	Output 1 units of measure	FPM	MPS
*FS1=	-P and -T Probes	HTA104 output 1 signal full scale	5,000 FPM	25 MPS
	-F Fan Inlets		10,000 FPM	50 MPS
	-B Bleed Sensors		3,000 FPM	15 MPS
	-E ERV Sensors		5,000 FPM	25 MPS
*LL1=	-P, -F, -T and -E	HTA104 low limit cutoff	0 FPM	0 MPS
	-B (airflow)		0 FPM	0 MPS
	-B (pressure)		0 iWc	0 Pa
*OFF-GAIN1=	ALL	Output 1 Offset-Gain On/Off	Off	Off
*O-G1MODE=	ALL	Output 1 Offset-Gain Mode	1 (direct entry)	1 (direct entry)
*GAIN1=	ALL	Output 1 Gain factor	1.000	1.000
*OFFSET1=	ALL	Output 1 Offset factor	0.000 FPM	0.000 MPS
*FILTER1=	ALL	Output 1 Digital Noise Filter	0 (off)	0 (off)
*FLOW BUF=	ALL	Number of samples used to perform flow calculation (3 to 150)	10	10
*OUT2METH=	-P, -F and -T	Temperature Averaging	Arithmetic Avg.	Arithmetic Avg.
*OUT2=	ALL	HTA104 output 2 signal (temperature)	4-20mA	4-20mA
*MS2=	ALL	HTA104 output 2 signal minimum scale	-20° F	-30° C
*FS2=	ALL	HTA104 output 2 signal full scale	160° F	70° C
*AR2	-E	Free area where station is located	0.00 SQF	0.000 SQM
*FS2=	-E	HTA104 output 2 signal full scale	5,000 FPM	25 MPS
*LL2	-E	HTA104 low limit cutoff	0 FPM	0 MPS
*OFF-GAIN2	-E	Output 2 Offset-Gain On/Off	Off	Off
*O-G2MODE	-E	Output 2 Offset-Gain Mode	1 (direct entry)	1 (direct entry)
*GAIN2	-E	Output 2 Gain factor	1.000	1.000
*OFFSET2	-E	Output 2 Offset factor	0.000 FPM	0.000 MPS
*FILTER2	-E	Output 2 Digital Noise Filter	0 (off)	0 (off)
*OUT2 TYP =	ALL	Output 2 Type: Temperature/Alarm	TEMP	TEMP
*ALR =	ALL	Flow rate that activates Alarm	0 FPM	0 MPS
*ALRM HYS =	ALL	Dead range in % above and below Alarm	15%	15%
*ALRM OUT =	ALL	Alarm output maximum or minimum	MAX	MAX

TRANSMITTER CALIBRATION

The HTx104 uses high quality industrial grade components and is designed for years of trouble-free operation. Periodic recalibration of the transmitter is neither required nor recommended. Transmitter field calibration verifiers are available for purchase from ***EBTRON*** for installations requiring periodic validation of instrumentation. Contact ***EBTRON*** for more information.

CHANGING FACTORY DEFAULT SETTINGS

Setup Menu Options

The HTx104 Transmitter is setup and tested at the factory, and is fully operational when sensor probes are connected and power is applied by turning the power switch to the "ON" position. The transmitter automatically determines the type of sensors connected and defaults to predetermined factory settings. Factory settings can easily be changed in the field through the Main Menu, selected by simultaneously pressing and releasing the "UP" and "DOWN" buttons while the transmitter is in its normal operating mode (see Figures 14 through 16 for a detailed flow chart of the setup menus for each system of units selected and for each type of probe). The *Setup Menu* for the corresponding sensor probe connected (-P, -F, -B, -E, or -T) will automatically be displayed in the *Setup Menu*. Navigate through the menu using the *Setup Menu* flow chart (Figures 14 through 16) to make changes to the transmitter configuration. The settings take effect immediately. The following are common field changes to the factory default settings.

Output Scaling

EBTRON's Hybrid Series sensors are individually calibrated in ***EBTRON*** wind tunnels (traceable to the National Institute of Standards and Technology [NIST]) between 0 and factory default full scale. All sensors are independent and produce "percent of reading" accuracy. Decreasing the full scale does not alter or improve the accuracy of the device. Factory default output scaling for analog output HTA104 transmitters can be changed by entering the setup menu (as shown in Figures 14 through 16).

Changing the LCD Display from Velocity FPM to Volumetric Flow CFM (MPS to LPS for SI units)

The HTx104 transmitter is shipped from the factory to display velocity in FPM (or MPS) and therefore, transmitter to sensor probe matching is not required. To change the HTx104 to display volumetric flow, (CFM or LPS) enter the *Setup Menu* and change the menu item "*LCD1U/M=FPM" to "*LCD1U/M=CFM" ("*LCD U/M = MPS" to "*LCD U/M = LPS" for SI units). Since this will now be a volumetric value, the free area of the airflow measurement probe location in square feet (square meters for SI units) must also be entered. For -P units, the free area is printed on the hang-tag of each sensor probe. For -F, -B and -E units, the free area must be determined following probe installation in accordance with the installation guidelines. Changing the display units will not affect the analog output signal from the transmitter. To convert the analog output readings from the transmitter, refer to the following paragraph.

Converting the Analog Output Signal from FPM to CFM (MPS to LPS for SI units scaling)

The HTx104 transmitter is shipped from the factory with analog output"OUTPUT 1" set to indicate velocity in FPM. To convert this velocity output to volumetric flow (CFM or LPS), simply multiply the indicated output velocity (in FPM or MPS) by the free area at the air flow probe installation location (free area x 1000 for SI units when area is calculated in square meters). For -P sensors, the total free area is programmed into the probe at the factory and printed on the probe hang-tag. For -F, -B and -E sensor probes, area should be determined following installation in accordance with the installation guidelines. Refer also to Table 3 for a complete listing of conversions for each of the analog outputs of the HTx104.

Locking the Configuration Settings

Using the *Lock Menu,* transmitter configuration settings can be secured by entering a user defined lock code from 1 to 9999. Once locked, user defined settings can only be altered after the defined lock code is entered in the *Initialization, IP/SI Units* or *Setup Menus*. To enter the *Lock Menu*, press the "ESCAPE" and "UP" arrow simultaneously at any time. To enable, the *Lock Menu* requires a code to be entered, and then verified. Figure 13 details the Lock menu.

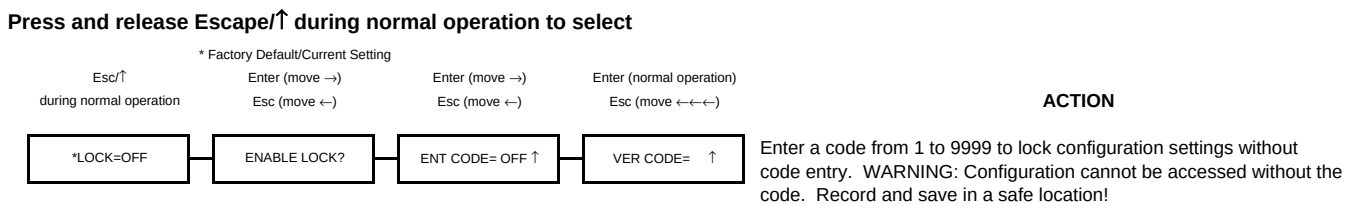

Figure 13. Factory Default Lock Menu Settings

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When LOCK is enabled, user defined settings can only be changed after entering the user defined LOCK CODE. STORE THE LOCK CODE IN A SAFE LOCATION! To ensure security, lock codes can only be disabled by returning the transmitter to *EBTRON*.

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Setup Menu Options: -P, -F and -T Sensor Systems (IP/SI Units Set for "IP SYS") Part 1 of 2

(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

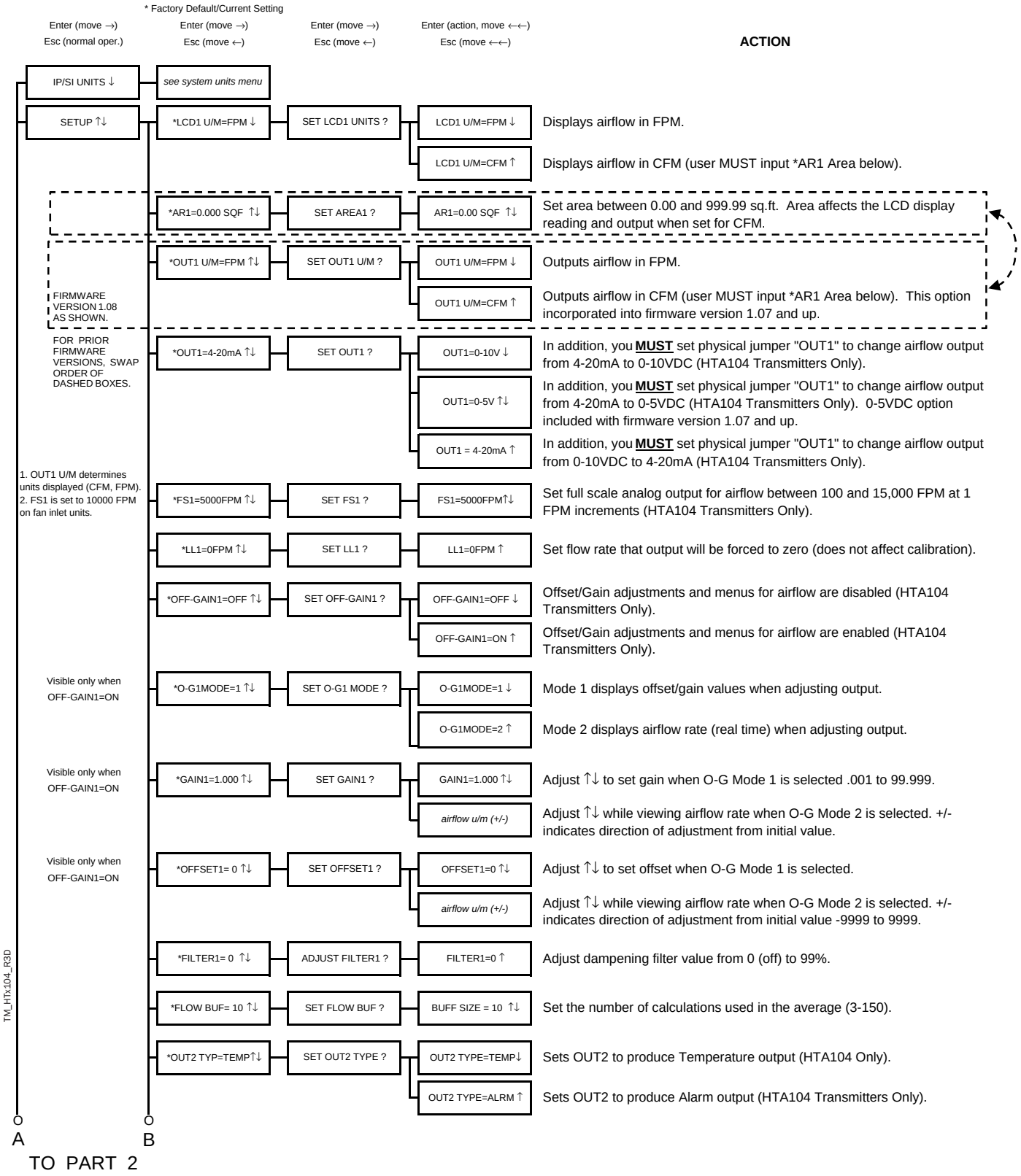


Figure 14. Setup Menu Options: -P, -F and -T Sensor Systems ("IP SYS")

Setup Menu Options: -P, -F and -T Sensor Systems (IP/SI Units Set for "IP SYS") Part 2 of 2

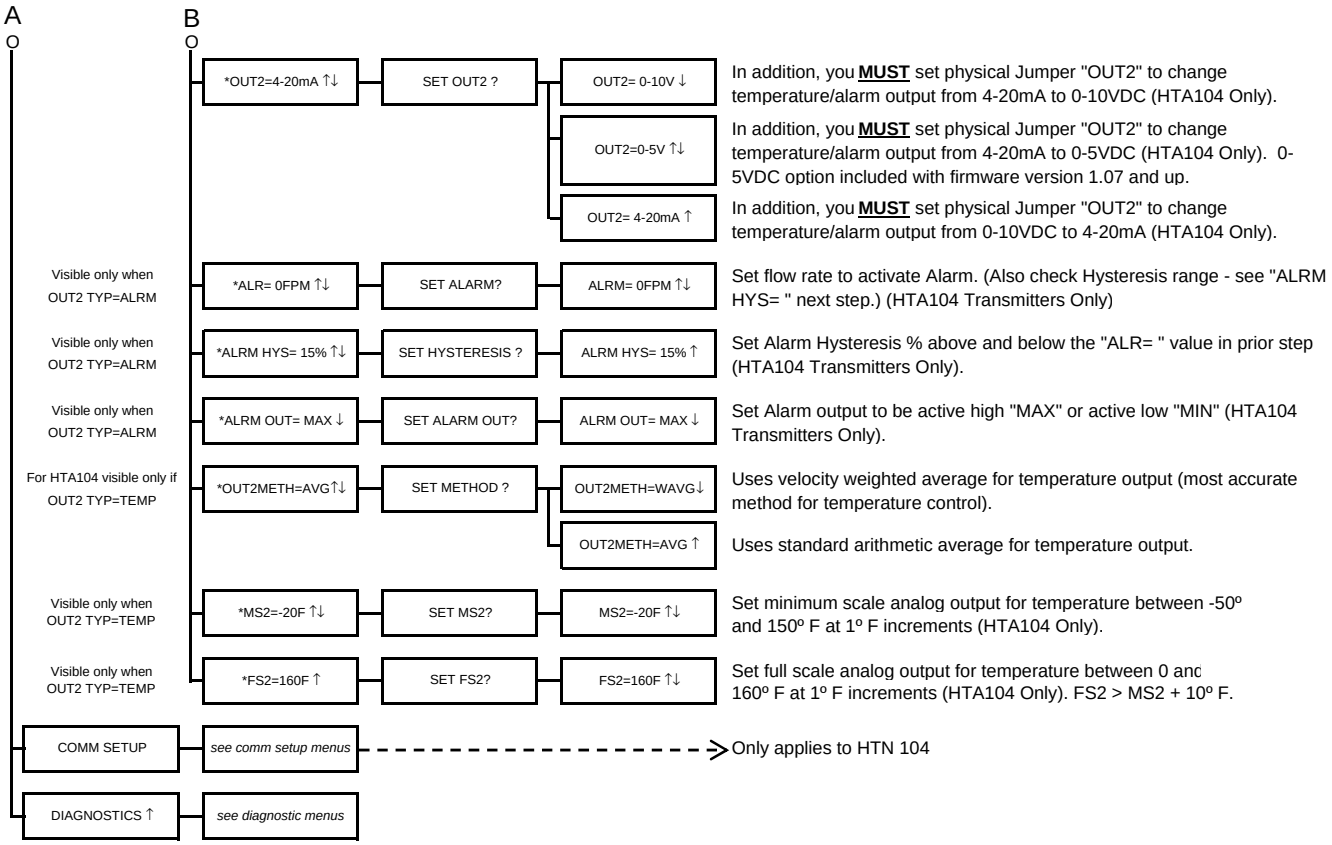
(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

* Factory Default/Current Setting

Enter (move →) Esc (normal oper.)	Enter (move →) Esc (move ←)	Enter (move →) Esc (move ←)	Enter (action, move ←←) Esc (move ←←)	**ACTION**

FROM PART 1



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Setup Menu Options: -B Systems (IP/SI Units Set for "IP SYS") Part 1 of 2

(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

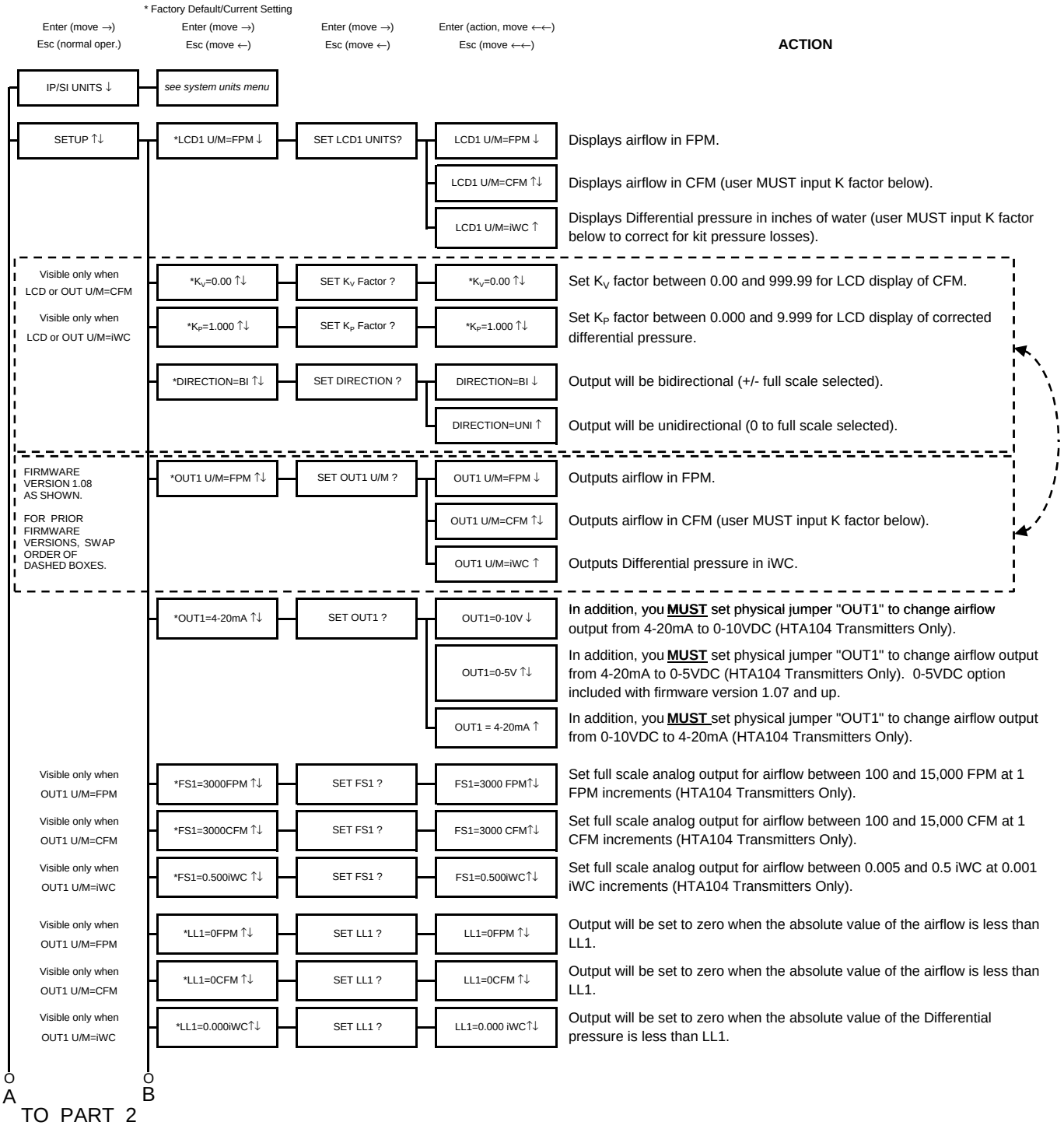

Figure 15. Setup Menu Options: -B Sensor Systems ("IP SYS")

Setup Menu Options: -B Systems (IP/SI Units Set for "IP SYS") Part 2 of 2

(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

* Factory Default/Current Setting

Enter (move →) Esc (normal oper.)	Enter (move →) Esc (move ←)	Enter (move →) Esc (move ←)	Enter (action, move ←←) Esc (move ←←)	ACTION

FROM PART 1

A
O

B
O

	*OFF-GAIN1=OFF ↑↓	SET OFF-GAIN1 ?	OFF-GAIN1=OFF ↓	Offset/Gain adjustments and menus for airflow are disabled. Adjustments affect airflow and Differential pressure. (HTA104 only).
			OFF-GAIN1=ON ↑	Offset/Gain adjustments and menus for airflow are enabled. Adjustments affect airflow and Differential pressure. (HTA104 only).
Visible only when OFF-GAIN1=ON	*O-G1MODE=1 ↑↓	SET O-G1MODE ?	O-G1MODE=1 ↓	Mode 1 displays offset/gain values when adjusting output. Values are linearly related to airflow, not Differential pressure.
			O-G1MODE=2 ↑	Mode 2 displays airflow rate or Differential pressure (real time) when adjusting output (whichever is selected on the display).
Visible only when OFF-GAIN1=ON	*GAIN1=1.000 ↑↓	SET GAIN1 ?	GAIN1=1.000	Adjust ↑↓ to set gain when O-G Mode 1 is selected .001 to 99.999.
			airflow u/m (+/-)	Adjust ↑↓ while viewing airflow rate when O-G Mode 2 is selected. +/- indicates direction of adjustment from initial value.
Visible only when OFF-GAIN1=ON	*OFFSET1= 0 ↑↓	SET OFFSET1 ?	OFFSET1=0	Adjust ↑↓ to set offset when O-G Mode 1 is selected -9999 to 9999.
			airflow u/m (+/-)	Adjust ↑↓ while viewing airflow rate when O-G Mode 2 is selected. +/- indicates direction of adjustment from initial value.
	*FILTER1=0 ↑↓	ADJUST FILTER1 ?	FILTER1=0 ↑↓	Adjust dampening filter value from 0 (off) to 99%.
	*FLOW BUF= 10 ↑↓	SET FLOW BUF ?	BUFF SIZE = 10 ↑↓	Set the number of calculations used in the average (3-150).
	*OUT2 TYP=TEMP↑↓	SET OUT2 TYPE ?	OUT2 TYPE=TEMP↓	Sets OUT2 to produce Temperature output (HTA104 Transmitters Only).
			OUT2 TYPE=ALRM ↑	Sets OUT2 to produce Alarm output (HTA104 Transmitters Only).
	*OUT2=4-20mA ↑↓	SET OUT2 ?	OUT2= 0-10V ↓	In addition, you **MUST** set physical jumper "OUT2" to change temperature/alarm output from 4-20mA to 0-10VDC (HTA104 Only).
			OUT2= 0-5V ↑↓	In addition, you **MUST** set physical jumper "OUT2" to change temperature/alarm output from 4-20mA to 0-5VDC (HTA104 Only). 0-5VDC option included with firmware version 1.07 and up.
			OUT2= 4-20mA ↑	In addition, you **MUST** set physical jumper "OUT2" to change temperature/alarm output from 0-10VDC to 4-20mA (HTA104 Only).
Visible only when OUT2 TYP=ALRM	*ALR= 0FPM ↑↓	SET ALARM?	ALRM= 0FPM ↑↓	Set flow rate to activate Alarm. (Also check Hysteresis range - see "ALRM HYS= " next step.) (HTA104 Transmitters Only)
Visible only when OUT2 TYP=ALRM	*ALRM HYS= 15% ↑↓	SET HYSTERESIS ?	ALRM HYS= 15% ↑	Set Alarm Hysteresis % above and below the "ALR= " value in prior step (HTA104 Transmitters Only).
Visible only when OUT2 TYP=ALRM	*ALRM OUT= MAX ↓	SET ALARM OUT?	ALRM OUT= MAX ↓	Set Alarm output to be active high "MAX" or active low "MIN" (HTA104 Transmitters Only).
Visible only when OUT2 TYP=TEMP	*MS2=-20F ↑↓	SET MS2 ?	MS2=-20F ↑↓	Set minimum scale analog output for temperature between -50º F and 150º F in 1º increments (HTA104 Transmitters Only).
Visible only when OUT2 TYP=TEMP	*FS2=160F ↑	SET FS2 ?	FS2=160F ↑↓	Set full scale analog output for temperature between 0 and 160º F at 1º increments (HTA104 Only). FS2 > MS2 + 10º F.
COMM SETUP	*see comm setup menus*			Applies to HTN104 only.
DIAGNOSTICS ↑	*see diagnostic menus*			

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Setup Menu Options: -E Systems (IP/SI Units Set for "IP SYS") Part 1 of 2

(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

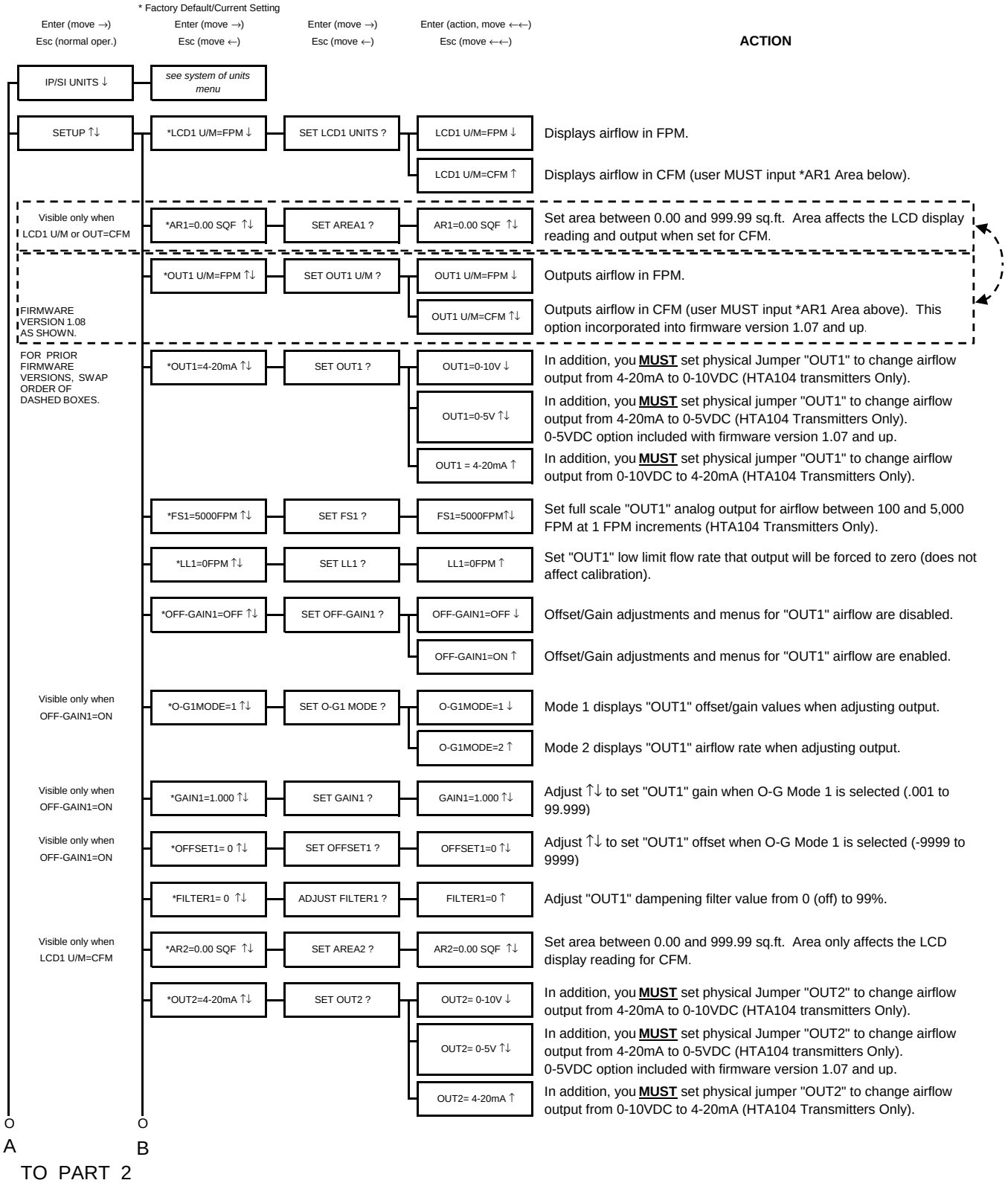

Figure 16. Setup Menu Options: -E Sensor Systems ("IP SYS")

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Setup Menu Options: -E Systems (IP/SI Units Set for "IP SYS") Part 2 of 2

(Refer to Table 7 for "SI" Standard International Units of Measure)

Press and release ↑/↓ during normal operation to select

* Factory Default/Current Setting

Enter (move →) Esc (normal oper.)	Enter (move →) Esc (move ←)	Enter (move →) Esc (move ←)	Enter (action, move ←←) Esc (move ←←)	**ACTION**

FROM PART 1

A
O

B
O

	*FS2=5000FPM ↑↓	SET FS2?	FS2=5000FPM ↑↓	Set full scale "OUT2" analog output for airflow between 100 and 5,000 FPM at 1 FPM increments (HTA104 Transmitters Only).
	*LL2= 0FPM ↑↓	SET LL2 ?	LL2=0 FPM ↑	Set "OUT2" low limit flow rate that output will be forced to zero (does not affect calibration).
	*OFF-GAIN2=OFF ↑↓	SET OFF-GAIN2 ?	OFF-GAIN2=OFF ↓	Offset/Gain adjustments and menus for "OUT2" airflow are disabled.
			OFF-GAIN2=ON ↑	Offset/Gain adjustments and menus for "OUT2" airflow are enabled.
Visible only when OFF-GAIN2=ON	*O-G2MODE=1 ↑↓	SET O-G2 MODE ?	O-G2MODE=1 ↓	Mode 1 displays "OUT2" offset/gain values when adjusting output.
			O-G2MODE=2 ↑	Mode 2 displays "OUT2" airflow rate when adjusting output.
Visible only when OFF-GAIN2=ON	*GAIN2=1.000 ↑↓	SET GAIN2 ?	GAIN2=1.000 ↑↓	Adjust ↑↓ to set "OUT2" gain when O-G Mode 1 is selected .001 to 99.999.
Visible only when OFF-GAIN2=ON	*OFFSET2= 0 ↑↓	SET OFFSET2 ?	OFFSET2=0 ↑↓	Adjust ↑↓ to set "OUT2" offset when O-G Mode 1 is selected.
	*FILTER2= 0 ↑↓	ADJUST FILTER2 ?	FILTER2=0 ↑	Adjust "OUT2" dampening filter value from 0 (off) to 99%.
	*FLOW BUF= 10 ↑↓	SET FLOW BUF ?	BUFF SIZE = 10 ↑↓	Set the number of calculations used in the average (3-150).
COMM SETUP	*see comm setup menus*			Only applies to HTN 104
DIAGNOSTICS ↑	*see diagnostic menus*			

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VIEWING SENSOR DATA

Local Sensor Data Display

Airflow and temperature of individual sensors can be displayed locally on the LCD from the diagnostic mode as detailed in Figure 17. They can also be read across an RS-485 BACnet® network. Sensors are automatically addressed after the power is energized to the transmitter. The probe that is connected to the left most **used** receptacle on the transmitter is probe number 1. The lowest sensor number on the probe is at the end opposite the connecting cable. Up to 4 sensors (addresses 1 to 4) can be individually viewed.

Example: Two 1 sensor probes are connected to receptacles C2 and C3 (refer to the connector diagram Figure 18). Sensor 1 is on C2 and sensor 2 to is on C3.

Sensor Data over RS-485 BACnet® Network

Two BACNET® analog variables can be read that contain a string describing the individual airflow and temperature data at the time of the request. The airflow variable is named **Airflow Traverse** and the temperature variable is named **Temperature Traverse**.

When using the HTx104-E with HE1 ERV sensors connected, airflow and temperature traverse data is not available.

The string is described as follows:

<sensor type>,<C1>,<C2>,<C3>,<C4>, $data_1$, $data_2$, $data_3$,...$data_n$

where

sensor type = PROBE, FAN, BLEED, SMALL PROBE, ERV, or UNIT VENTILATOR

C1 = number of sensors on connector C1 (0 to 4 on Probe, 0 to 1 on FAN, and BLEED)

C2 = number of sensors on connector C2 (0 to 4 on PROBE, 0 to 1 on FAN and BLEED)

C3 = number of sensors on connector C3 (0 to 4 on PROBE, 0 to 1 on FAN and BLEED)

C4 = number of sensors on connector C4 (0 to 4 on PROBE, 0 to 1 on FAN and BLEED)

data = Airflow FPM (MPS) or Temperature °F (°C) as sequential data starting at connector C1

Navigating through the Diagnostics Menu (all System of Units)

Press and release ↑/↓ during normal operation to select

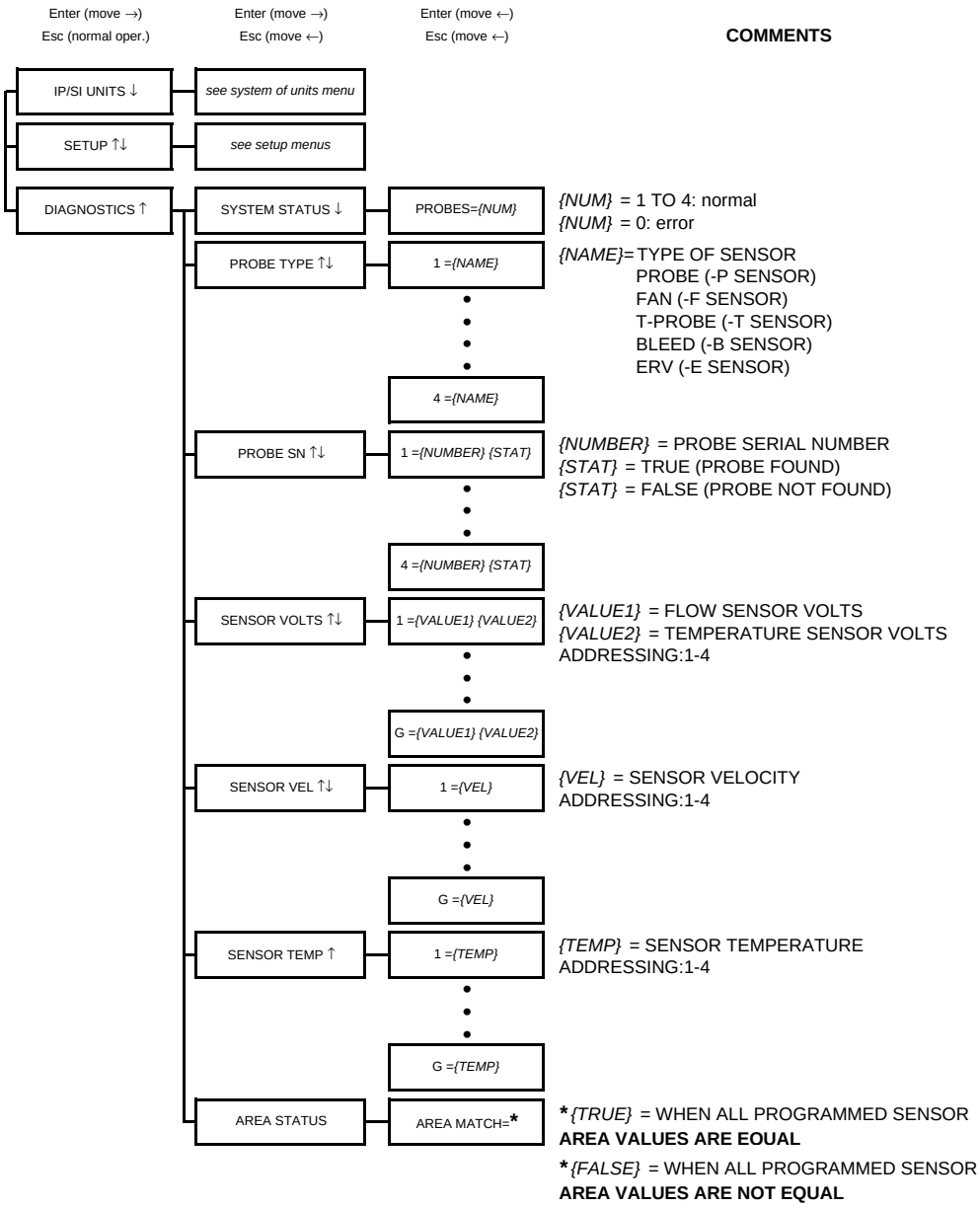
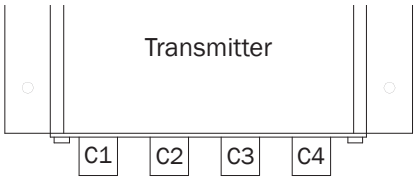


Figure 17. Navigating through the Diagnostics Menu (all System of Units)



Connector Diagram

Figure 18. HTx104 Transmitter Connector Diagram

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FIELD ADJUSTMENTS

The factory calibration should not require adjustment when sensor probes are installed in accordance with *EBTRON* installation guidelines. Some installations however, may not meet placement guidelines, or commissioning requirements may dictate field adjustment. Field adjustment may improve the "installed accuracy" of HTx104 systems when determining volumetric flow rates.

Adjusting the Low Limit Cutoff

The low limit cutoff forces the output signal for the airflow rate to zero whenever the airflow rate calculated falls below the specified Low Limit value. This feature is useful on outside air intakes that often indicate false airflow rates, induced by transient wind gusts or when the intake damper is closed and there is no net flow across the damper. Readings of 100 FPM or more are not uncommon on many outside air intake applications when the intake damper is closed and are a result of air movement in the intake plenum (not a malfunction in the airflow measuring device). Setting the low limit to a value significantly below the control setpoint and higher than the threshold flow for false wind readings simplifies control and interpretation of the airflow rate signal on many applications.

To set the low limit cutoff, enter the Setup menu and set "*LL1={desired value in FPM (MPS in SI units)}" as shown in Figures 14 through 16.

Adjusting the Digital Output Filter

The digital output filter is useful for dampening signal fluctuations resulting from transient wind gusts on outdoor air intakes or excessive turbulence generated from duct disturbances. The digital output filter range can be set between 0 (OFF) and 99%. Increasing the filter percentage limits the allowable change of the output signal.
To change the amount of filtering, enter the Setup menu and set "*FILTER1={desired value}" as shown in Figures 14 through 16.

Fluctuations in the airflow output signal are normal. *EBTRON's* laboratory research indicates that dampening true fluctuations will result in poor control and a larger dead-band of operation. Therefore, the use of the dampening filters in control devices is not recommended.

Field Calibration Wizard - Adjustment of Factory Calibration

Overview of the Field Calibration Wizard

The simple to use Field Calibration Wizard provides a one or two point menu driven field adjustment to factory calibration of the OUTPUT 1 airflow rate signal. (Only OUTPUT 1 can be adjustable in this manner). The Field Calibration Wizard is most useful on larger duct sizes where the sensor density is lower, and the installed accuracy uncertainty is greater. The Field Calibration Wizard allows engineers, contractors and owners to use ***EBTRON*** stable and linear flow meters at a more affordable cost, when field adjustment is necessary or acceptable. This feature is especially valuable on outside air intake applications in close-coupled installations where the lower sensor density of the HTx104 sensor probes may be inadequate to achieve the "out of the box" accuracy that can be realized using ***EBTRON***'s higher density Gold Series C sensor probes.
Make sure that the reference measurement device and the technique used to determine the airflow rate in the field are suitable for such measurement. Select a location that is acceptable for the reference measurement device, recognizing that this may not be the location where the ***EBTRON*** airflow station is installed. The inherent accuracy of the field reference measurement will not be better than ±5% of reading and can often exceed ±10%. Do not adjust the output of the HTx104 if the difference between the transmitter and the field reference measurement is less than 10%.

Engaging and Using the Field Calibration Wizard

To engage the Field Calibration Wizard, simultaneously depress the "DOWN" and the "ENTER" buttons at any time during normal operation. Figure 19 provides details of the FIELD CAL WIZARD menu and how to use it in applications for one or two point adjustment of factory calibration. Note that the flow rate units of measure will be displayed in lower case letters on the LCD display, indicating that the transmitter is operating with the Field Calibration Wizard engaged. To disengage the Field Calibration Wizard, simultaneously depress the "DOWN" and the "ENTER" buttons at any time during normal operation and set Field Calibration Wizard OFF as shown in Figure 19.

The Field Calibration Wizard is not available on the HTx104-E ERV transmitter equipped with HE1 ERV probes.

Navigating through the Field Calibration Wizard Menu

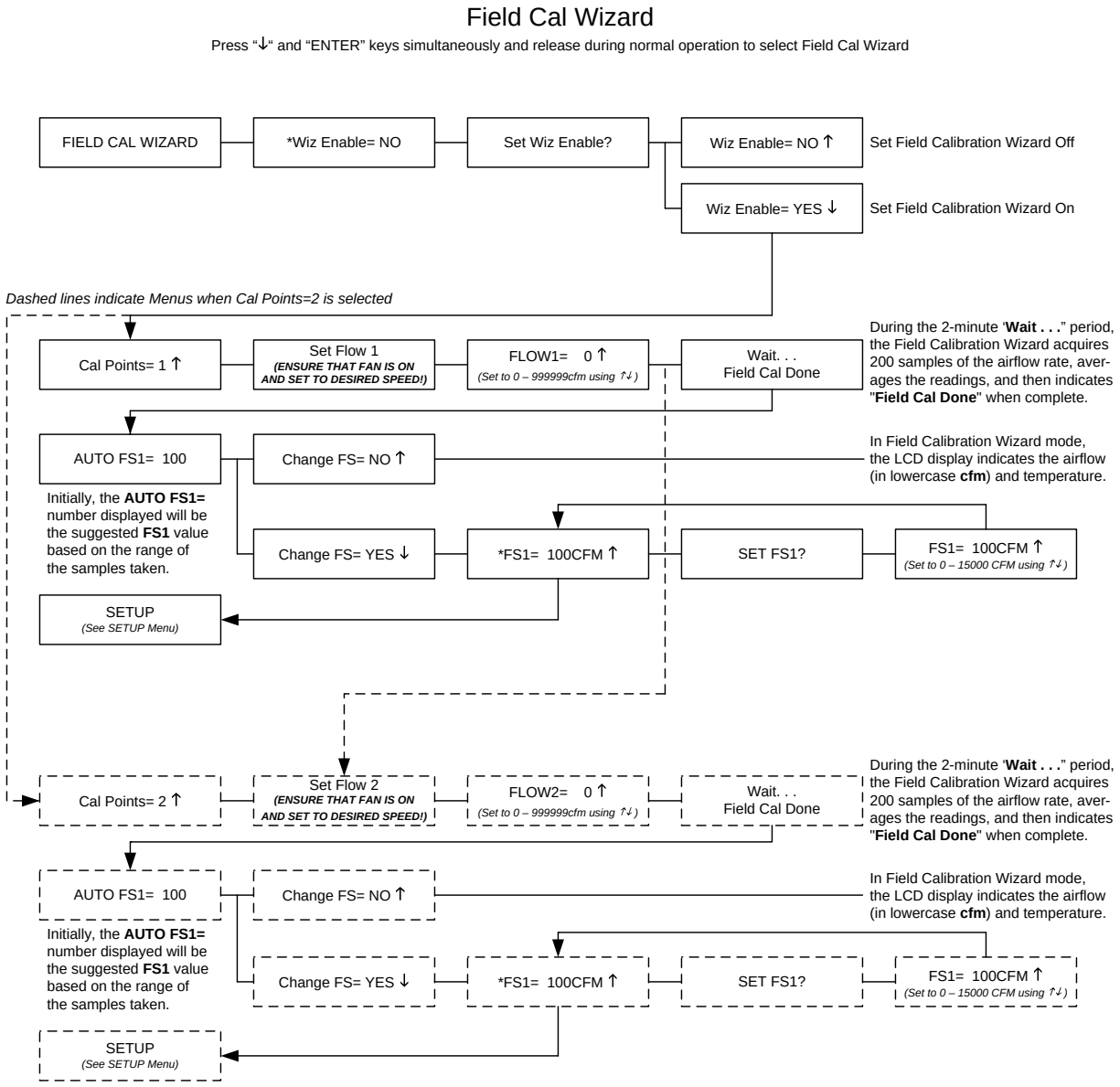

Figure 19. Field Calibration Wizard Menu (all System of Units)

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MAINTENANCE

When the transmitter and probes are installed in accordance with ***EBTRON*** guidelines, instrument difficulties are rare. Issues can be easily resolved by viewing Diagnostic data from the Diagnostic Menu (Figure 17) and by proceeding through the following troubleshooting guides (Tables 9 through 11). All devices come with a 3--Year Warranty on Parts and Factory Labor, as well as lifetime, toll-free customer support. Customer support is available Monday through Friday from 8:00 AM to 4:30 PM ET, at 800-2*EBTRON* (232-8766). ***EBTRON*** Diagnostic Customer Service forms are available on-line at www.ebtron.com. These forms are designed to assist us in quickly responding to and accurately diagnosing your specific issue and will greatly expedite its resolution. A sketch of the installation location, along with a control sequence of operations is very useful and is recommended to help us diagnose any issue you may encounter. Fax the completed information to 843.756.1838 before you call, and have it available when speaking with our Customer Service representative. Address all correspondence to the ***EBTRON*** Customer Service Department. Additional information is also available from your local ***EBTRON*** representative.

General Troubleshooting (All HTx104 Systems)

Table 9. General Troubleshooting (All HTx104 Systems)

Problem	Possible Cause	Remedy
No LCD display indication and the green 'ACT' transmitter status LED on the main circuit board is not illuminated.	Power switch not in the "ON" position.	Move the power switch to the "ON" position.
	Improper supply voltage to the power input terminal block.	Ensure that 24VAC power is connected to L1 and L2 of the POWER terminal block and that the voltage with the power switch in the "ON" position is between 22.8 and 26.4 VAC.
	Blown fuse.	Check power wiring. Ensure that multiple devices wired on a single transformer are wired "in-phase". Replace fuse only with a 1.0 amp, fast-acting fuse after the problem has been identified and corrected.
No LCD display indication and the green 'ACT' transmitter status LED on the main circuit board is flashing.	LCD contrast too low.	Turn "Contrast" potentiometer on the main circuit board "clockwise".
The LCD display is scrambled or there is no LCD display indication after touching the switches, LCD display or circuit board.	Static electricity.	Touch an earth-grounded object, such as a duct, to discharge static electricity then reset the power. Avoid direct contact with the LCD display or circuit board.
The LCD display indicates "No Probes".	The power switch on the transmitter was moved to the "ON" position before the sensor probes were connected.	Reset 24VAC power by moving the power switch from the "ON" to "OFF" position and then back to the "ON" position.
The LCD display indicates "DiffSensor Type".	Sensor probes have been mismatched.	Transmitters must have the same sensor type connected (HP1, HF1, HB1, HT1 or HE1 sensor probes).
The LCD display indicates "Too Many Sensors".	A probe with 5 or more sensors has been connected to a 'Type B' transmitter with 4 receptacles.	Probes with 5 or more sensors are shipped with and require a 'Type A' transmitter with 2 receptacles.
The last digit of the flow rate unit is displayed as a lower case letter.	The sensor detection system has detected one or more malfunctioning or missing sensors.	Check sensor probe cable connections. If sensor probe connections look OK and match the number of sensor probes indicated on each probe's hang tag, please call ***EBTRON***'s customer service department or visit us at www.ebtron.com for further assistance.
	A probe with 5 or more sensors has been connected to a 'Type B' transmitter with 4 receptacles.	Probes with 5 or more sensors are shipped with and require a 'Type A' transmitter with 2 receptacles.
The green 'ACT' transmitter status LED on the main circuit board is "ON" but not flashing.	The microprocessor is not running.	Reset 24VAC power by moving the power switch from the "ON" to "OFF" position and then back to the "ON" position.
The green 'ACT' transmitter status LED on the main circuit board is flashing at 1-second intervals.	No problem, normal operation.	No remedy required.
The green 'ACT' transmitter status LED on the main circuit board is flashing at 2-second intervals.	The sensor detection system has detected one or more malfunctioning or missing sensors.	Check sensor probe cable connections. If sensor probe connections look OK and match the number of sensor probes indicated on each probe's hang tag, please call ***EBTRON***'s customer service department or visit us at www.ebtron.com.
	A probe with 5 or more sensors has been connected to a 'Type B' transmitter with 4 receptacles.	Probes with 5 or more sensors are shipped with and require a 'Type A' transmitter with 2 receptacles.
The transmitter indicates airflow when the HVAC system is not operating.	Sensors are sensitive and can measure very low air velocities. If a reading is indicated, there is airflow present where the airflow measuring station is located.	Do not attempt to adjust zero ("offset"); doing so will result in an error in airflow measurement. The Low Limit airflow cutoff value can be set to force the output signal to zero.

HTA104 - Analog Transmitter Troubleshooting

Table 10. HTA104 Analog Transmitter Troubleshooting

Problem	Possible Cause	Remedy
No output signal can be measured at the OUTPUT terminal block of the HTA104 transmitter.	Blown output fuse (output 1 and output 2 are fused and protected independently on HTA104 transmitters).	Make sure that power has not been connected to the output terminal block. Correct the problem and replace with 0.125 amp, fast acting fuse only. Make sure that the host control system is not configured for a 2-wire device (no excitation voltage should be present on the signals from the host controls). Correct the problem and replace with 0.125 amp, fast acting fuse only.
	The Low Limit airflow cutoff value is above the actual airflow reading.	Decrease the Low Limit airflow cutoff value in the Setup Menu until it is below the actual airflow reading.
The output signal on the HTA104 transmitter fluctuates while the airflow and/or temperature readings on the LCD are steady.	Electrical interference from other devices is creating noise in the signal wires to the host control system.	The output signal wiring must be shielded. Individually ground one or more of the following points: the signal wire shield at host controls; signal wire shield at the transmitter, or L2 of the power terminal block of the HTA104.
The LCD display does not match the readings indicated by the host control system.	The scaling in the host control system is incorrect.	Compare the current configuration of the transmitter with that of the host control system. Compare the minimum and full scale settings for each output by navigating through the Setup Menu.

HTN104 - RS485 Transmitter Troubleshooting

Table 11. HTN104 RS-485 Transmitter Troubleshooting

Problem	Possible Cause	Remedy
The host control system is unable to communicate with the HTN104 transmitter.	The network signal wiring is not properly connected to the HTN104 transmitter or the host controls.	Verify that the network signal wires from the host controls are connected to the proper terminals of the OUTPUT block. On the HTN104 transmitter OUTPUT terminal block, NET+ is for A, NET- is for B and COM for common.
	The network protocol is not properly set in the HTN104.	Set network protocol based on the network requirements and reset transmitter power. Refer to COMM setup menu, Figure 10 of this technical manual.
	The network address is not properly set in the HTN104.	Set network address based on network requirements and reset transmitter power. Refer to COMM setup menu, Figure 10 of this technical manual. Note that each address must be unique for the network.
	The termination is not properly set in the HTN104.	Set transmitter termination based on network requirements and reset the transmitter power. Refer to the section describing network termination and Figure 9 of this technical manual for settings.
The LCD display does not match the readings indicated by the host control system.	The Area or K factor of the HTA104 transmitter does not match that of the host controls.	Compare the value of the Area or K factor of the HTN104 transmitter with that of the host control system and make adjustments in SETUP menu to ensure a match. Refer to the appropriate SETUP menu for the probe type in use within this technical manual for Area and K factor settings.
The returned value for airflow is zero when airflow is indicated on the LCD display of HTN104 transmitter.	The Low Limit airflow cutoff value is above the actual airflow reading.	Decrease the Low Limit airflow cutoff value in the Setup Menu until it is below the actual airflow reading.
The status point from the HTN104 transmitter has a Trouble value.	The sensor detection system has detected one or more malfunctioning or missing sensors.	Check sensor probe cable connections. If sensor probe connections look OK and match the number of sensor probes indicated on each probe's hang tag, please call ***EBTRON***'s customer service department or visit us at www.ebtron.com.
	A probe with 2 or more sensors has been connected to a 'Type C' transmitter with 4 receptacles.	Probes with 2 or more sensors are shipped with and require a 'Type B' transmitter with 2 receptacles.
There is no value for the differential pressure point.	Differential pressure is only available from transmitters that have ***EBTRON***'s Bi-directional Bleed Airflow Sensors connected.	If differential pressure measurement is required, contact your local ***EBTRON*** Representative about ***EBTRON***'s Bi-directional Bleed Airflow Sensor.

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STANDARD LIMITED PARTS WARRANTY

If any ***EBTRON*** product fails within 36 months from shipment, ***EBTRON*** will repair/replace the device free of charge as described in the company's warranty contained in ***EBTRON***'s *TERMS AND CONDITIONS OF SALE*. Defective equipment shall be shipped back to ***EBTRON***, freight pre-paid, for analysis.

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