

Advantage III

Hybrid Series by Ebtron

Installation Guide

HTA104

“Plug & Play” Transmitter with
Dual Analog/Alarm Output
for use with all sensor probes

Document Name: IG_HTA104_R2A



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This document provides only the instructions necessary to install the HTA104 Transmitter and prepare it for operation. Transmitter installation consists of mounting the transmitter, installing output/network cable and connecting the sensor probes cables. For complete setup and operating instructions refer to the HTx104 Installation, Operation and Maintenance technical manual, TM_HTx104 under separate cover.

1. HTA104 TRANSMITTER INSTALLATION

The HTA104 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. Install transmitter upright and in a field accessible location. The enclosure accepts 1/2 in. (12.7 mm) electrical fittings for signal and power wiring at both sides at the top of the enclosure.

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 unobstructed space of at least 7.5 in. (190.5 mm) above, 2 in. (50.8 mm) to each side and 3.5 in. (88.9 mm) below the transmitter to allow for cover removal, probe connections and heat dissipation.
-  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.

1.1 HTA104 Mechanical Dimensions

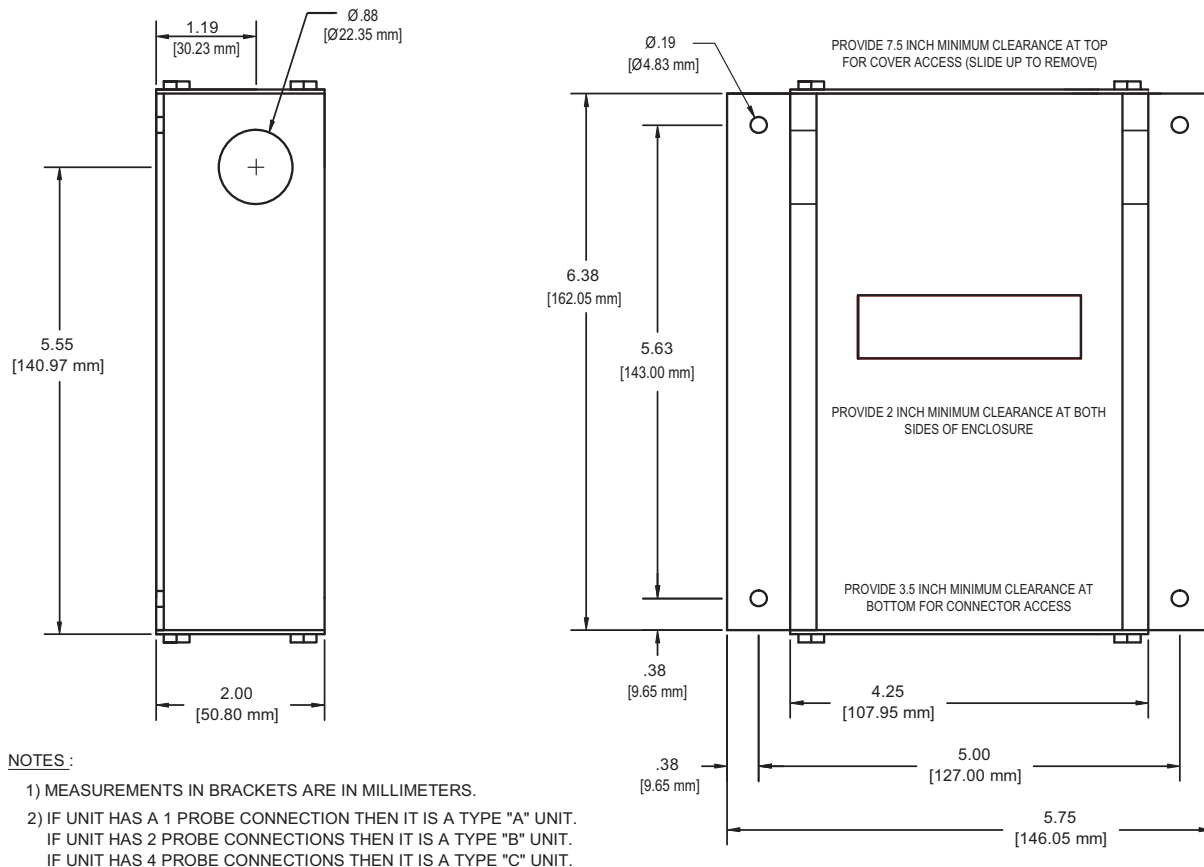
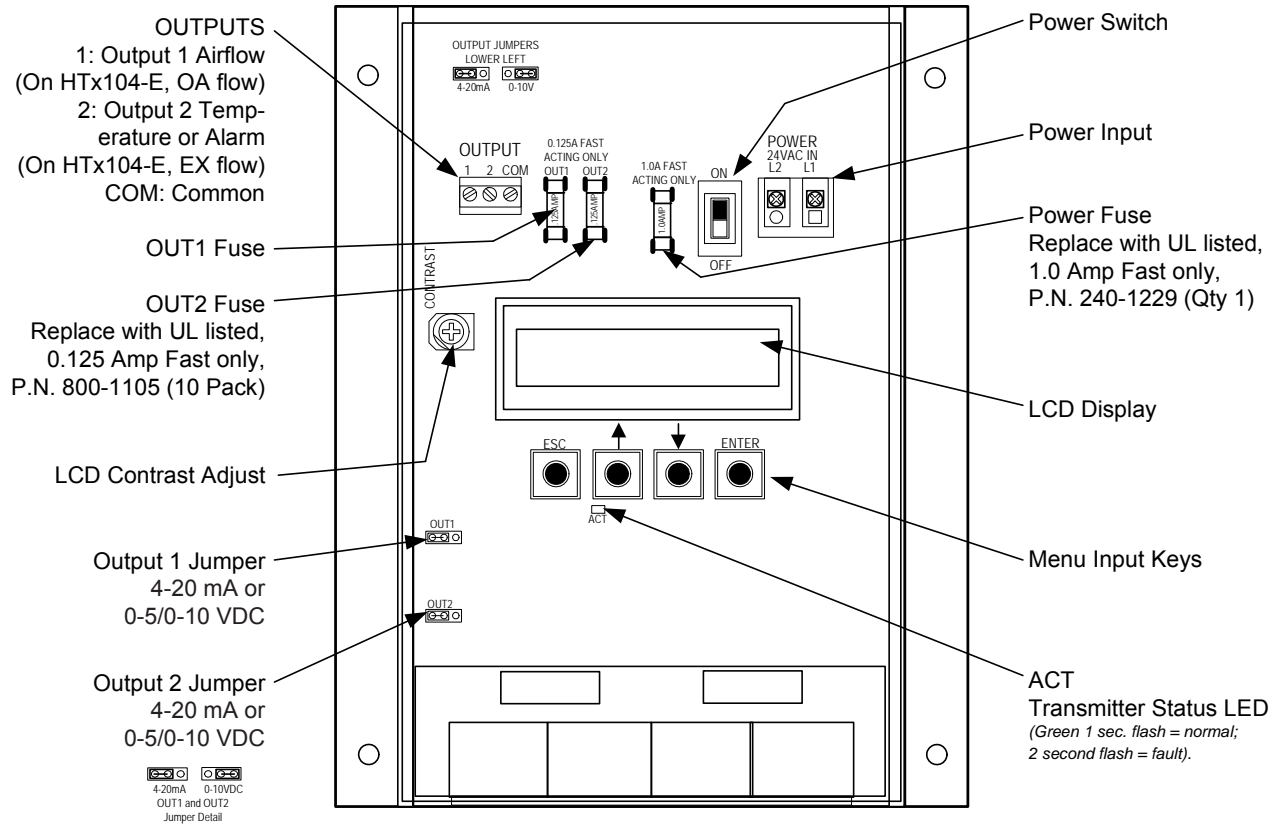


Figure 1. HTA104 Mechanical Dimensions

2. HTA104 TRANSMITTER INTERIOR VIEW/FEATURES



*Output 1 is Probe 1 Airflow when used with -U probes in DUAL mode
*Output 2 is Probe 2 Airflow when used with -U probes in DUAL mode

Figure 2. HTA104 Transmitter Interior View/Features

3. HTA104 TRANSMITTER POWER AND PROBE CONNECTIONS

3.1 Power Transformer Selection

Select a 24 VAC transformer based on the maximum power requirements indicated on the transmitter label (11 VA) or from the table below. 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 1. HTA104 Power Transformer Selection Guide

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

3.2 Connecting Power to the Transmitter

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 (Figure 3). Since the output signals are isolated from the power supply, it is not necessary to provide an isolated (secondary not grounded) power source.

- ⚠ Multiple HTA104 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.

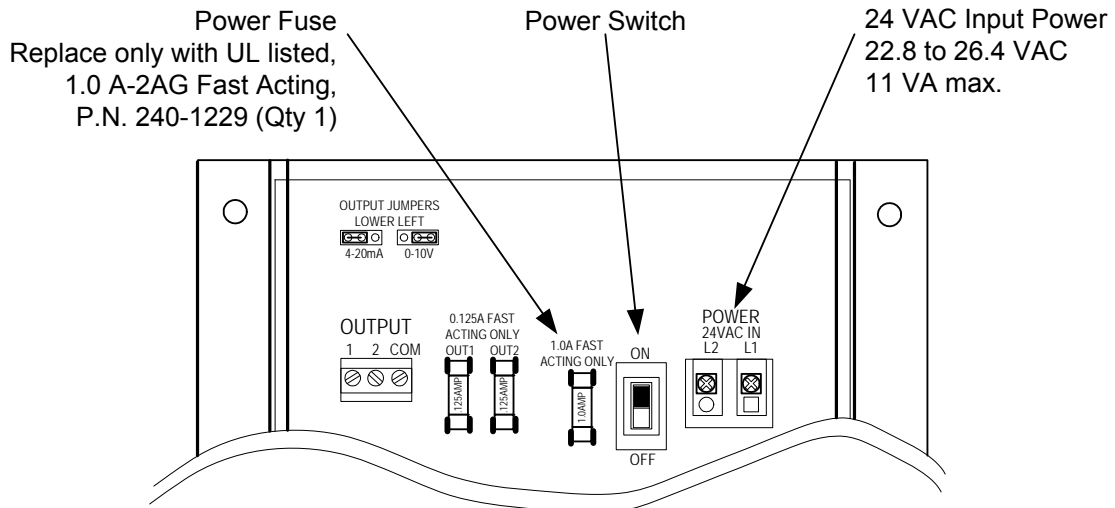


Figure 3. Connecting Power to the Transmitter

3.3 Connecting Sensor Probes to the Transmitter

After installing the sensor probes and transmitter, connect each of the sensor probe cable plugs to the circular receptacles located at the bottom of the HTA104 transmitter enclosure. Probes are “Plug and Play” and do not have to be connected to a specific receptacle on the transmitter unless traverse data is desired (see note below).

- ⚠ 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 below. Line up plug with receptacle and push straight in to receptacle.
- ⚠ DO NOT TWIST. Forcing the cable plug in or out of the receptacle will damage the connectors and void warranty.
- ⚠ When traverse data is desired, probes should be installed and connected to the transmitter using the mounting convention specified in the separate sensor probe Installation Guide. Proper installation simplifies sensor location decoding during data analysis.

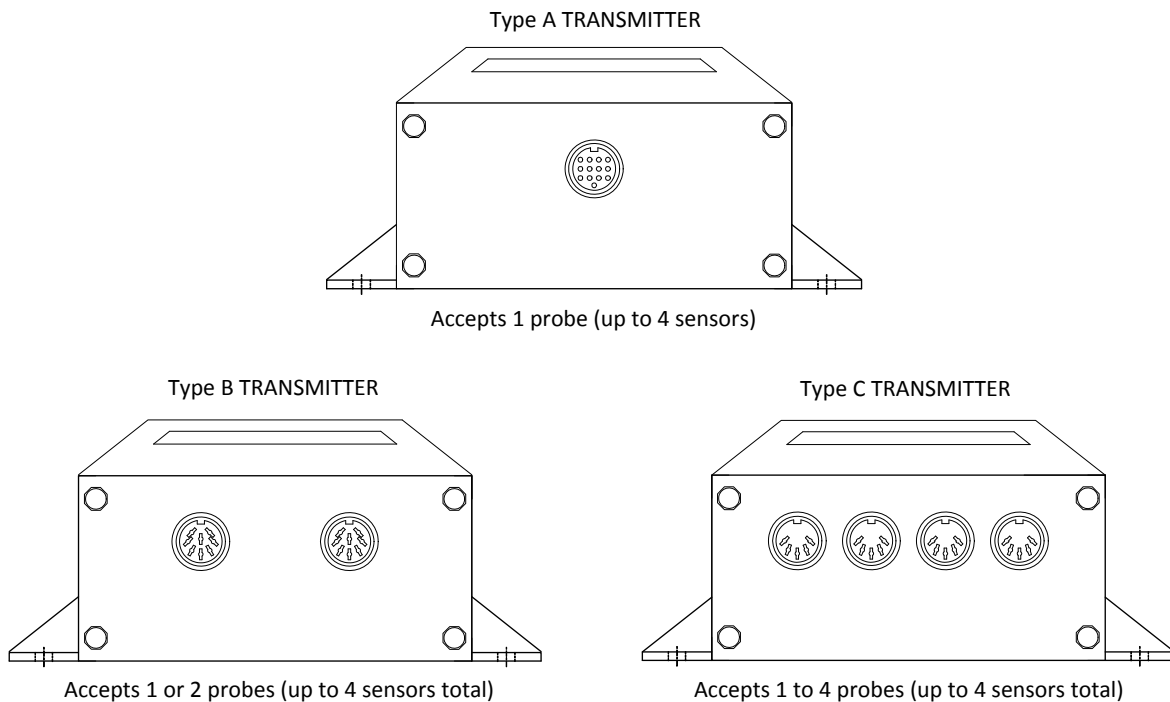


Figure 4. Type A, Type B and Type C Transmitter Connector Panel Detail

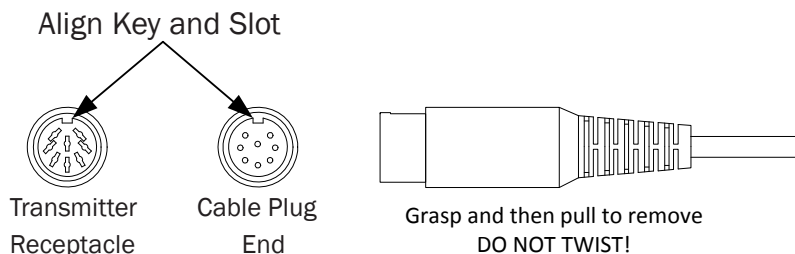


Figure 5. Connector Detail

4. HTA104 ANALOG OUTPUT CONNECTIONS

This section contains analog output wiring instructions for the HTA104 transmitter.

4.1 HTA104 - ANALOG OUTPUT WIRING CONNECTIONS

4.1.1 HTA104 - Analog Output Cable Recommendations

To prevent undesirable interference from other sources, EBTRON recommends the use of good quality shielded cable.

4.1.2 HTA104 - Analog Output Wiring

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 each analog output at the three position output terminal block labeled "OUTPUT" on the upper left hand side of the main circuit board as indicated in Figure 3. OUTPUT 1 is at terminal 1; OUTPUT 2 is at terminal 2; and the common connection is at the COM terminal.



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

For additional detail, refer to the HTA104 Wiring Diagram of Appendix A.

4.2 HTA104 Analog Output Features

4.2.1 HTA104 - Analog Output Signal Selection, 0-5VDC / 0-10VDC / 4-20mA

The analog output signal type at OUT1 and OUT2 can be set independently for current (mA) or voltage (VDC) output via jumper terminals OUT1 and OUT2 (Figure 6) and by selecting 4-20mA, 0-5VDC or 0-10VDC ranges in Setup menu options *OUT1= / *OUT2= settings. When changing Setup menu options *OUT1= or *OUT2=, the LCD display provides a user prompt to remind user to set OUT1 and/or OUT2 jumpers to the proper position. The factory default settings for *OUT1= and *OUT2= are for 4-20mA.

4.2.2 HTA104 - Converting Analog Output Signals to Airflow and Temperature

Table 2 lists specific conversion equations for analog voltage or current output options.

Table 2. HTA104 Converting Analog Output Values to Airflow/Temperature

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

TO CONVERT TO	ANALOG OUTPUT SCALING AND TYPE		
	0-10 VDC	0-5 VDC	4-20 mA
Airflow (FPM, MPS)	Output Voltage/10 x FS1	Output Voltage/5 x FS1	(Output Current-4)/16 x FS1
Airflow (CFM)	Area (SQF) x Output/10 x FS1	Area (SQF) x Output/5 x FS1	Area (SQF) x (Output - 4)/16 x FS1
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

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

TO CONVERT TO	ANALOG OUTPUT SCALING AND TYPE		
	0-10 VDC	0-5 VDC	4-20 mA
Airflow (CFM, LPS)	Output Voltage/10 x FS1	Output Voltage/5 x FS1	(Output Current - 4)/16 x FS1

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

TO CONVERT TO	ANALOG OUTPUT SCALING AND TYPE		
	0-10 VDC	0-5 VDC	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:

FS1 is AO1 full scale analog output value from ANALOG OUT MENU.

FS2 is AO2 full scale analog output value from ANALOG OUT MENU.

MS2 is AO2 minimum scale analog output value from ANALOG OUT MENU.

For -P probes, 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 all other sensors, the free area must be determined after the units are installed. Refer to Technical Manual TM_HTx104 for specific conversion factors for analog voltage or current options for each sensor type.

4.2.3 HTA104 - Sending a Test Output Signal to the Host Control System

A test output signal between 0 and 100% of the full scale output (4 to 20 mA or 0-5VDC/0-10VDC) 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 "UP" and "DOWN" to enter SETUP menu. Press "DOWN" to navigate to TOOLS sub menu, and press "ENTER". Press "ENTER" to OUTPUT TEST, navigate to the appropriate OUTx TEST and press "ENTER". Set either OUT1 or OUT2 to value between 0 and 100% of full scale analog output.

4.2.4 HTA104 - Analog Output Scaling

EBTRON's Hybrid Series sensors are individually calibrated in wind tunnels traceable to the National Institute of Standards and Technology (-T probes calibrated to volumetric flow standards). 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 detailed in Appendix A.

4.2.5 HTA104 - Resetting Transmitter to Factory Default Values

Transmitter settings can be reset to factory default values (asterisk) * values using the HTA104 RESET menu options.

5. HTA104 TRANSMITTER START-UP, INITIALIZATION AND SETUP MENUS

To ensure a successful start-up, verify that the airflow measuring station sensor probes and transmitter have been installed in accordance with *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. The LCD will display current airflow and temperature.

5.1 Changing the System of Units - IP or SI Units

The HTA104 transmitter is provided with the system of units set to IP. To change to SI units, simultaneously press and release the “ENT” and “ESC” buttons during normal operation. “IP/SI UNITS” will be indicated on the LCD display. Refer to Appendix A SYSTEM OF UNITS MENU for details on the System of Units menu. Note that Setup Menu items are shown in IP System Of Units. When SI System of Units is selected, the units of measure abbreviations used in the menus is shown in Table 3.

Table 3. Standard “IP” and “SI” Menu Units Abbreviations

“IP” System of Units	Description	“SI” System of Units	Description
FPM	Feet per minute	MPS	Meters per second
CFM	Cubic feet per minute	LPS	Liters per second
SQF	Square feet	SQM	Square meters
F	Fahrenheit	C	Celsius

5.2 HTA104 Transmitter Calibration

The HTA104 uses high quality industrial grade components and is designed for years of trouble-free operation. Periodic recalibration of the transmitter is neither required or recommended. Transmitter field calibration verifiers are available for purchase from *EBTRON* for installations requiring periodic validation of instrumentation. Contact *EBTRON* for more information.

5.3 HTA104 LCD Display Notifications

Following the brief initialization at power up, the LCD display automatically displays airflow and temperature with units of measurement in all upper case (caps) characters. The display provides additional information on system status and alarm conditions. Refer to the ALARM FEATURES section of this manual for additional detail on Alarm and Trouble Error code indications.

5.4 Factory Default Menu Settings for HP1 Sensor Probes

The HTA104 transmitter is “plug and play” and does not require setup. Table 4 shows the factory default settings for all compatible sensor probes.

To change the Factory Default Settings, see: CHANGING FACTORY DEFAULT SETUP MENU SETTINGS.

Table 4. Factory Default Menu Settings

Display	Description	I-P	S.I.
AIRFLOW=	Airflow measurement method, Actual or Standard.	ACT	ACT
*LCDU/M=	Airflow units of measure	ACFM	LPS
*AREA=	Free area where station is located (required for volumetric measurement)	0.00 sq.ft. (see note)	0.000 sq.meters (see note)
*AO1 SGNL=	Output 1 signal type voltage or mA	mA	mA
*AO1 UM=	Output 1 units of measure	AFPM	MPS
*AO1 FS=	Output 1 signal full scale	5,000 FPM	25 MPS
*LLIMIT=	Low limit cutoff	0 AFPM	0 MPS
*FLOW ADJ=	Offset-Gain On/Off	Off	Off
*GAIN=	Gain factor	1.000	1.000
*OFF=	Offset factor	0.000	0.000
*TEMP METH=	Temperature Averaging	Weighted Avg.	Weighted Avg.
*AO2 SGNL=	Output 2 signal type voltage or mA	mA	mA
*AO2 MS=	Output 2 signal minimum scale	-20° F	-30° C
*AO2 FS=	Output 2 signal full scale	160° F	70° C
*LCD INTG=	Number of flow calculations to be averaged for LCD display.	100	100
*AO1 INTG=	Number of flow calculations to be averaged for AO1 output.	30	30
*ALT=	Altitude for flow correction relative to mean sea level (0 ft).	0 ft	0 m
*AO2 ASGN =	*AO2 ASGN = TEMP Output 2 Assigned Type is Temperature	TEMP	TEMP
*SETPNT=	Alarm setpoint value. For AO2 ASGN=ALARM , operates in conjunction with TOL=value.	0	0
*TOL=	Alarm range tolerance value. For AO2 ASGN=ALARM , this setting establishes the alarm range relative to the SETPNT= value.	10%	10%
*NO FAULT=	Sets the AO2 normal (not alarm) output state relative to the full scale analog output selected. HI provides maximum full scale under normal conditions and minimum scale during alarm. LO provides minimum full scale under normal conditions and maximum scale during alarm.	HI	HI
*DELAY=	Time that the alarm condition must exist before alarm output is activated.	2 minutes	2 minutes
*ZERO OFF =	Set to YES to inhibit LO alarm condition when flow reading is below LLIMIT= setting. Set to NO to disable this feature.	NO	NO
*RESET =	Set to AUTO to have alarm self-clear when alarm condition no longer exists. Set to MANUAL to require manual reset of alarm.	AUTO	AUTO

Note: For HP1 probes, area is stored in one-wire, but can be changed.

5.5 HTA104 Changing Factory Default Setup Menu Settings

5.5.1 Setup Menu Options

The HTA104 Transmitter is setup and tested at the factory to be fully operational when sensor probes are connected and power is applied (set the power switch to the “ON” position). Factory settings can easily be changed using the SETUP MENU by simultaneously pressing and releasing the “UP” and “DOWN” buttons while the transmitter is in its normal operating mode. Appendix A details the SETUP menus. Navigate through the SETUP menus to make changes to the transmitter configuration. The settings take effect immediately. The following are common field modifications to the factory default settings.

5.5.2 Selecting Actual and Standard Output Measurement Type

The transmitter is set from the factory to provide actual airflow measurement units (displayed as “ACFM” and “AFPM”). In this mode, airflow measurements are calculated for actual airflow conditions. If using actual airflow, corrections for altitude are entered through the ALT= setting in the Setup menu. If desired, the output can be set to provide standard airflow measurement units (displayed as “SCFM” and “SFPM”) which provides measurements that are corrected to standard conditions.

5.5.3 Output Scaling

EBTRON sensors are individually calibrated between 0 and the factory default full scale in wind tunnels traceable to the National Institute of Standards and Technology (NIST). Sensors are independent and produce “percent of reading” accuracy. Changing the full scale value does not change the accuracy of the device. Factory default output scaling for the HTA104 transmitter can be changed within the SETUP menus.

5.5.4 Changing the LCD Display from Volumetric Flow CFM to Velocity FPM

The HTA104 transmitter is shipped from the factory to indicate volumetric flow. To display velocity in FPM, enter SETUP, DISPLAY submenu, and change the “*LCD UM=CFM” to “*LCD UM=FPM”. Changing the LCD display units will not affect the analog output signal. The analog output signal can be scaled if required as described below.

5.5.5 Locking the Configuration Settings

The HTA104 transmitter configuration settings can be locked at one of three security levels within the SECURITY submenu using the LOCK SEC= item.

When LOW security level is selected (LOCK SEC=LOW) the last 4 digits of the board serial number are automatically assigned as the lock code. To see the board serial number, navigate to DIAGNOSTICS, SERIAL NUMBERS menu item.

When the MED security level is selected (LOCK SEC=MED) the user enters a security code. In the event that this code is lost/misplaced, EBTRON can provide a key that is unique to the transmitter to unlock it. Contact EBTRON customer service for this code.

When the HIGH security level is selected (LOCK SEC=HIGH) the user enters a security code. In the event that this code is lost/misplaced, the transmitter must be returned to the factory in order to unlock it.



When LOCK SEC=HIGH is selected, the user defined setting can only be changed after entering the user defined code. STORE THE LOCK CODE IN A SAFE LOCATION! For security reasons, the HIGH level lock code can only be reset by returning the transmitter to the factory.

5.6 HTA104 - Alarm Features

Analog output AO2 (OUT2) can be assigned to function as an alarm output. The AO2 alarm output can be assigned in the SETUP menu to operate as an average alarm (AO2 ASGN=ALRM) or as a trouble alarm (AO2 ASGN=TRBL) for monitoring the status of the transmitter and sensors. The AO2 ASGN= setting is located in the ANALOG OUT submenu of the SETUP menu. The transmitter LCD display will indicate the Alarm status for 2 seconds, and will cycle through any other alarms if multiple alarm events are active for 2 seconds each, and then display the current actual flow for 2 seconds. The Alarm output is disabled by default at the factory to permit temperature output at OUT2. Detailed set up of the Alarm features is shown in the Setup menu.

5.6.1 Average Alarm (AO2 ASGN=ALRM)

AO2 output is assigned as an average airflow alarm output. Useful for applications where a low flow alarm or a high flow alarm for operation outside of a defined range (setpoint and tolerance) is required.

5.6.2 Trouble Alarm (AO2 ASGN=TRBL)

AO2 output is assigned as a transmitter trouble alarm indicating a fault within the transmitter or a sensor of the airflow measurement system. The transmitter LCD will indicate a trouble code and a brief description of the trouble. Contact EBTRON customer service for additional information or assistance with trouble codes.

5.6.3 No Fault (NO FAULT=HI)

When AO2 output is assigned as an alarm, this setting configures the normal output condition to be HI or LO relative to the full scale analog output level selected when no fault condition exists.

5.6.4 Alarm Indications

Table 5 details the alarm types, LCD indications and AO2 alarm output indication. User can select either or both of the two Average Alarms or the Trouble Alarm.

5.6.5 Low Alarm - "LO ALRM= ON"

The Low Alarm is activated when the average airflow falls to a defined level below the SETPNT= value. The defined level is equal to the SETPNT= value minus the calculated value of (TOL= value * SETPNT= value). Once active, the alarm can be cleared when the average airflow rises above the set point minus calculated tolerance value.

5.6.6 High Alarm - "HI ALRM= ON"

The High Alarm is activated when the average airflow rises above a defined level above the SETPNT= value. The defined level is equal to the SETPNT= value plus the calculated value of (TOL= value * SETPNT= value). Once active, the alarm can be cleared when the average airflow falls below the set point + calculated tolerance value.

5.6.7 Trouble Alarm - "AO2 ASGN=TRBL"

The Trouble alarm provides trouble codes useful for isolating setup issues or problems within the transmitter or sensors. The transmitter LCD will indicate TROUBLE! regardless of whether AO2 is assigned to TRBLE. The Diagnostic submenu can be engaged for the error code and a brief description of the trouble. Contact EBTRON customer service for information on troubleshooting using the Trouble error codes.

Table 5. HTA104 Alarm Types and Notifications

ALARM OUTPUT ASSIGNMENT TYPE	LOCAL LCD DISPLAY OF ALARM TYPE AND NOTIFICATION	ALARM (OUT2) INDICATION
User can select any one of the following Alarms:		
LOW ALARM (Average Alarm)	Display alternates between **LOW ALARM** (then any other alarms) and actual reading for 2 seconds each.	On alarm or trouble, OUT2 is active high (or active low) relative to the full scale maximum (or minimum) analog value as determined by SETUP Menu "NO FAULT=" selection. Individual sensor velocities can be viewed using the Diagnostics submenu.
HIGH ALARM (Average Alarm)	Display alternates between **HIGH ALARM** (then any other alarms) and actual reading for 2 seconds each.	
TROUBLE ! (Trouble Alarm)	Display indicates TROUBLE ! (Refer to DIAGNOSTIC menu to obtain a brief description of the error and any other alarms).	

5.7 Viewing Sensor Data

Airflow and temperature can be displayed on the local LCD display by entering the Diagnostic Menu. Simultaneously depress the up ↑ and down ↓ arrows to enter the HTA104 SETUP menu, and then navigate to the Diagnostic submenu.

6. SETUP MENUS

Appendix A details the various setup menus and submenus.

7. WIRING DIAGRAM

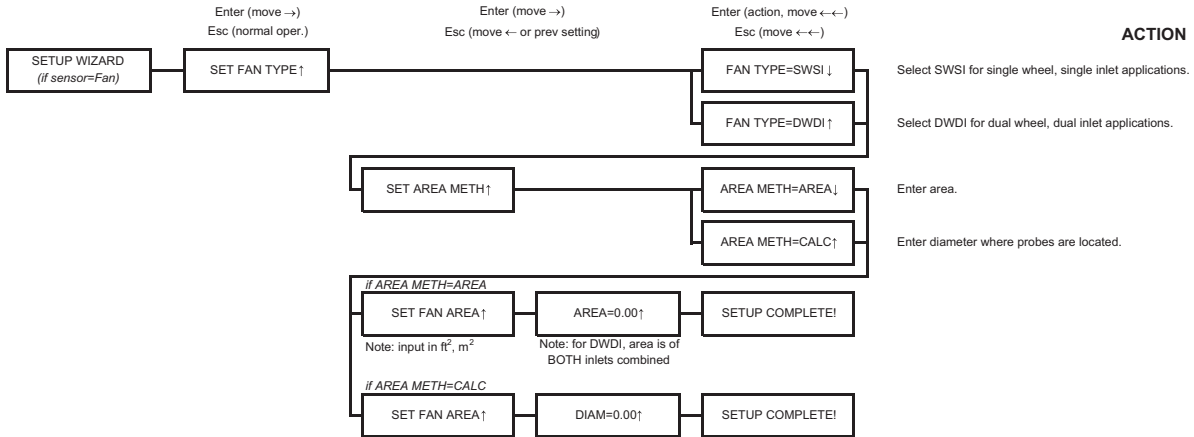
Appendix B is the wiring diagram for the HTA104 transmitter.

APPENDIX A - ADVANTAGE 3 HTA104 SETUP MENUS

FAN SENSOR SETUP WIZARD (ACTIVE ONLY WITH FAN INLET SENSOR PROBES)

FAN SENSOR SETUP WIZARD

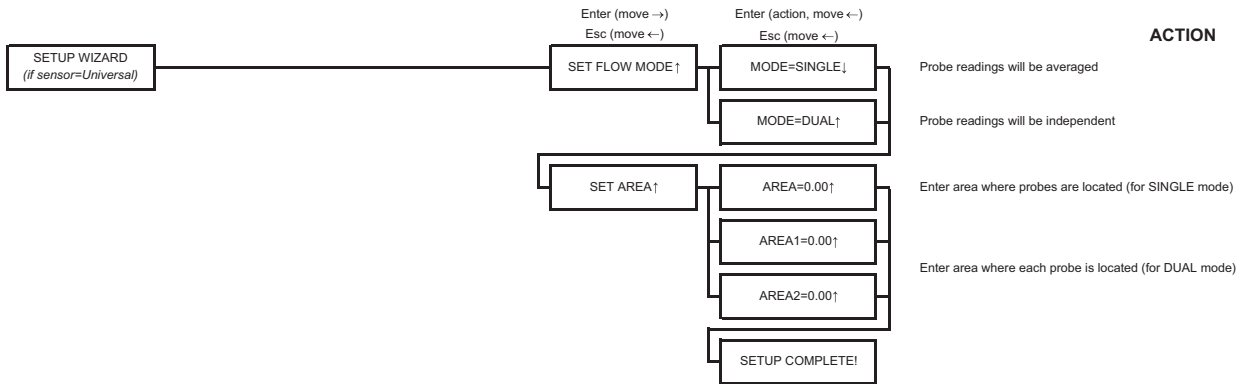
Launched at initial power-up when Fan Sensors are attached to transmitter, and if Setup Wizard was not completed.



UNIVERSAL PROBE SETUP WIZARD (ACTIVE ONLY WITH UNIVERSAL PROBES)

UNIVERSAL PROBE SETUP WIZARD

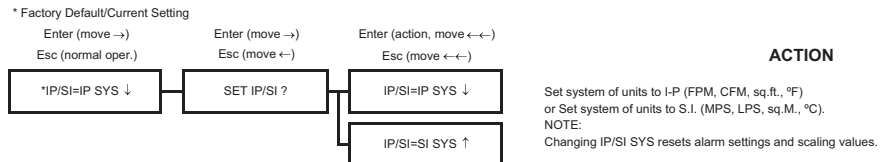
Launched at initial power-up when Universal Probes are attached to transmitter, and if Setup Wizard was not completed.



SYSTEM OF UNITS MENU

SYSTEM OF UNITS MENU

Simultaneously depress/release ENTER + ESC keys during normal operation to select

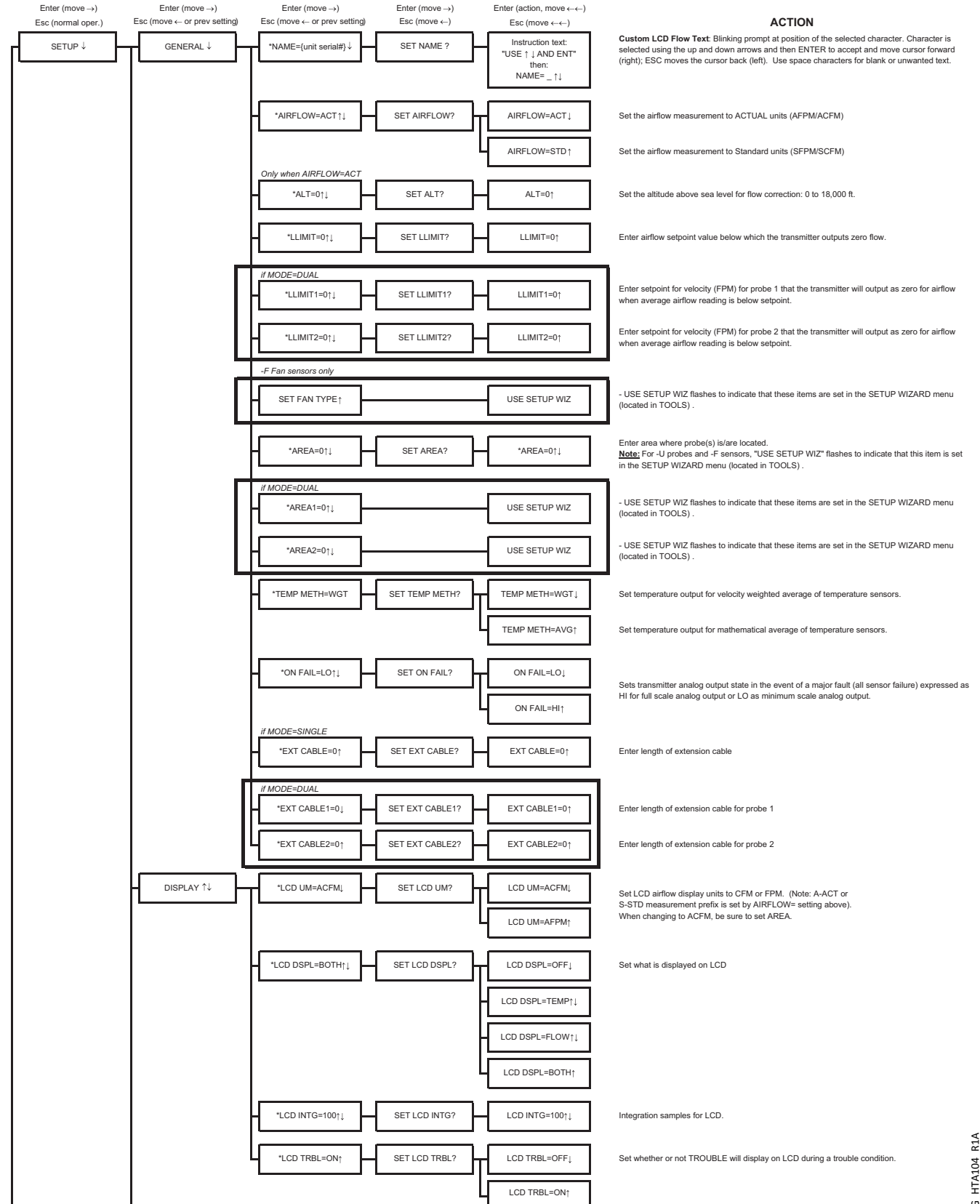


SETUP MENU PART 1

SETUP MENU

Simultaneously depress/release ↑ + ↓ keys during normal operation to select

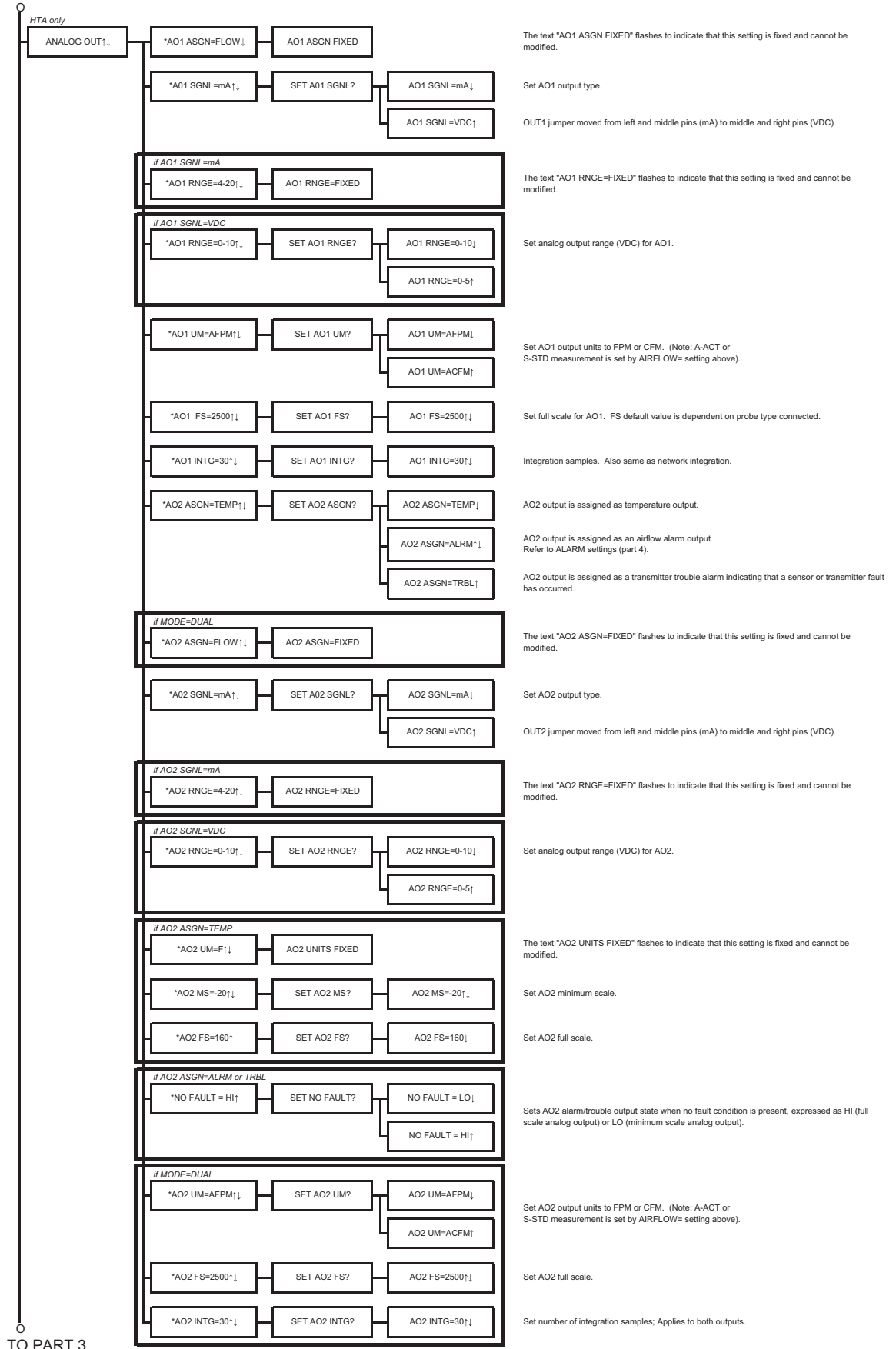
* Factory Default/Current Setting



TO PART 4 'A' TO PART 2

SETUP MENU PART 2

FROM PART 1

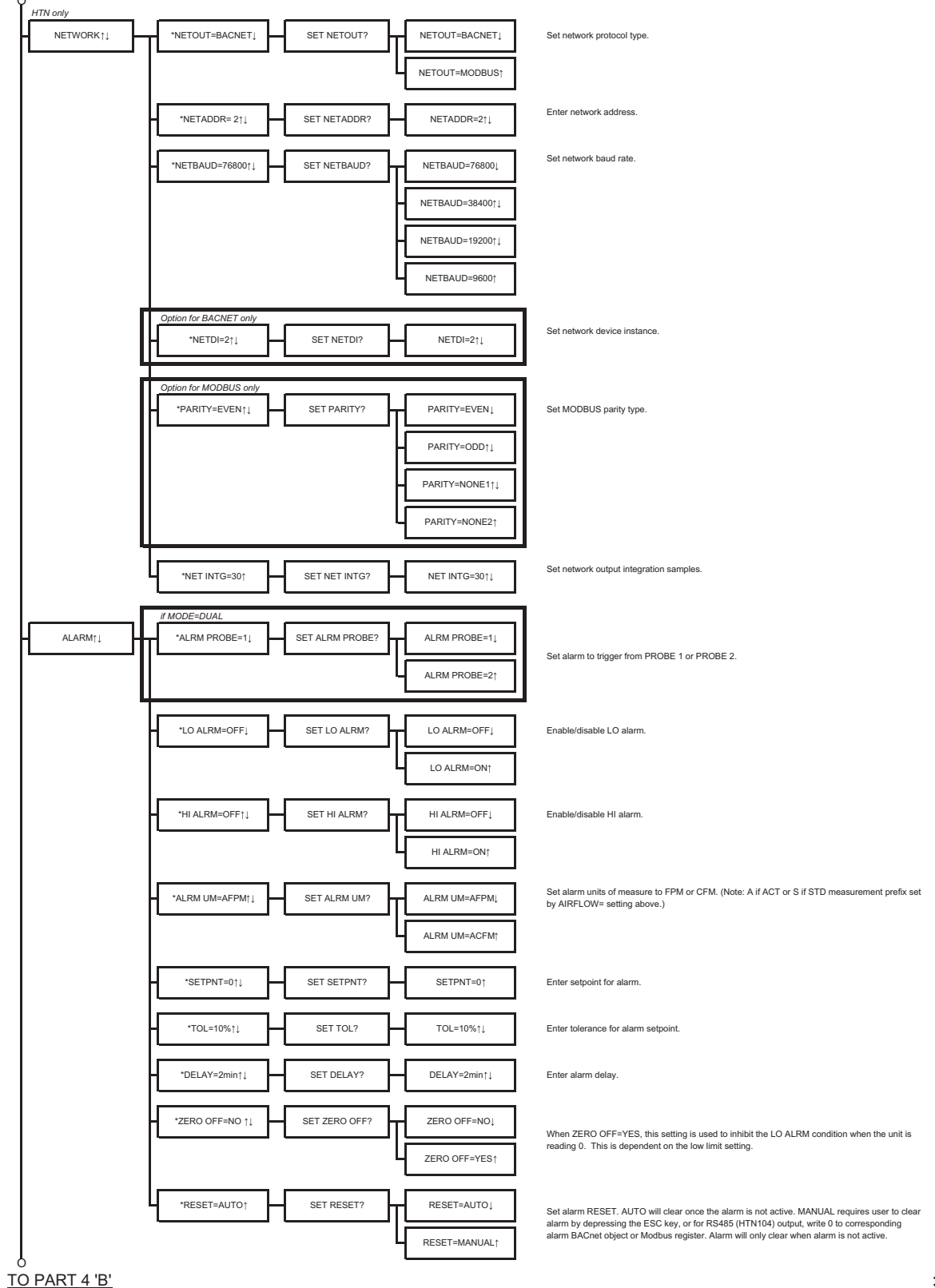


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TO PART 3

SETUP MENU PART 3

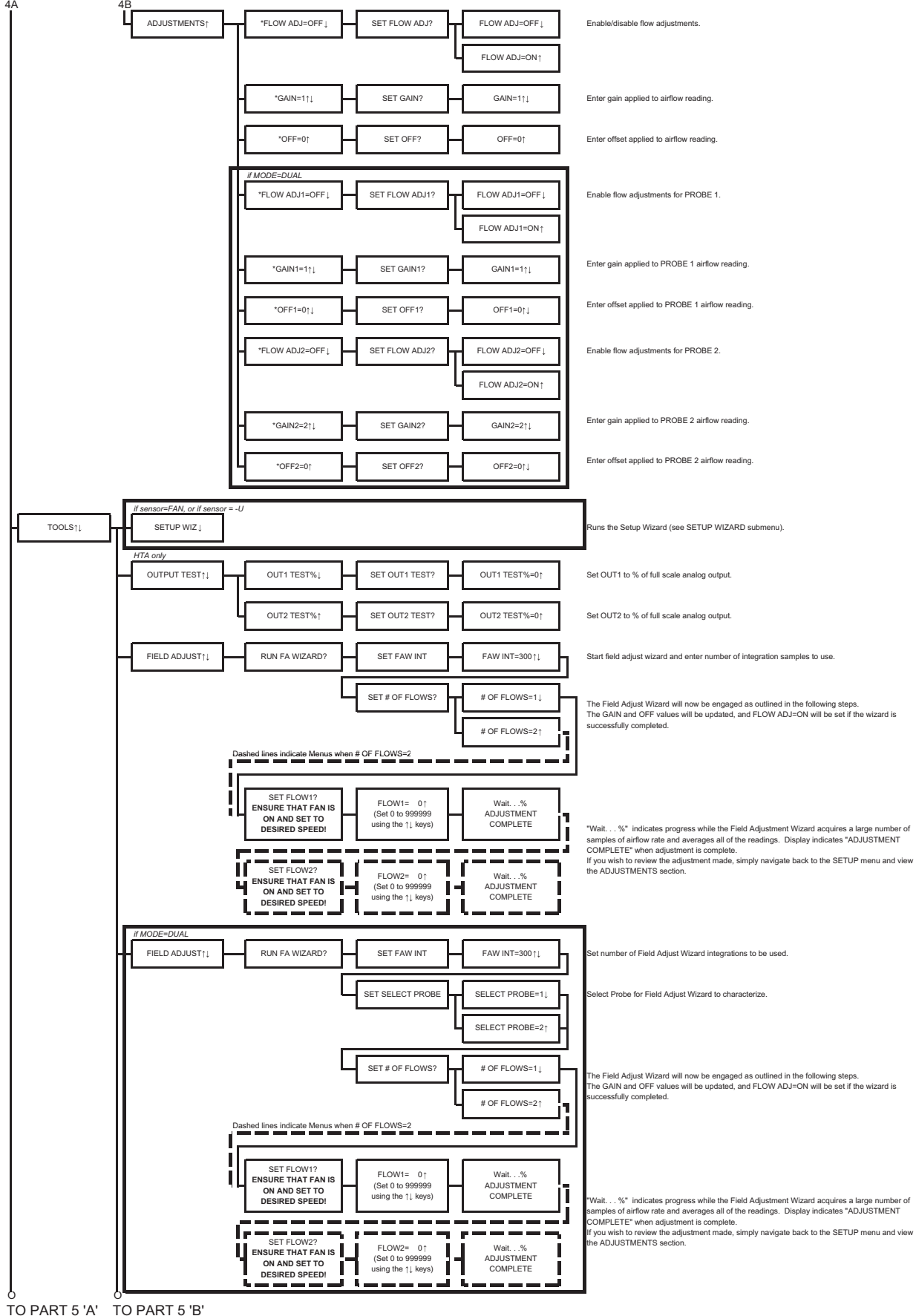
FROM PART 2



TO PART 4 'B'

SETUP MENU PART 4

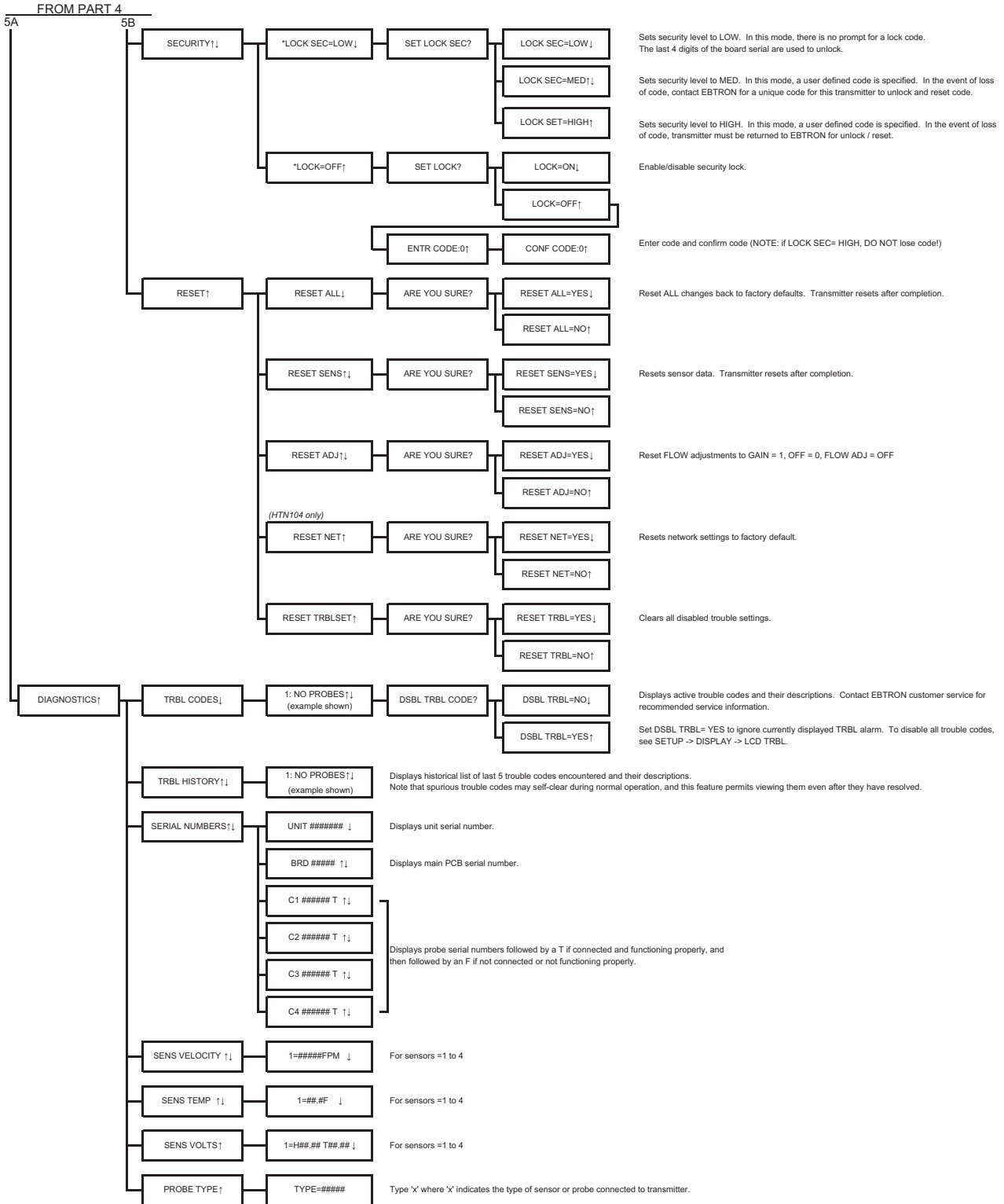
FROM PART 1 FROM PART 3



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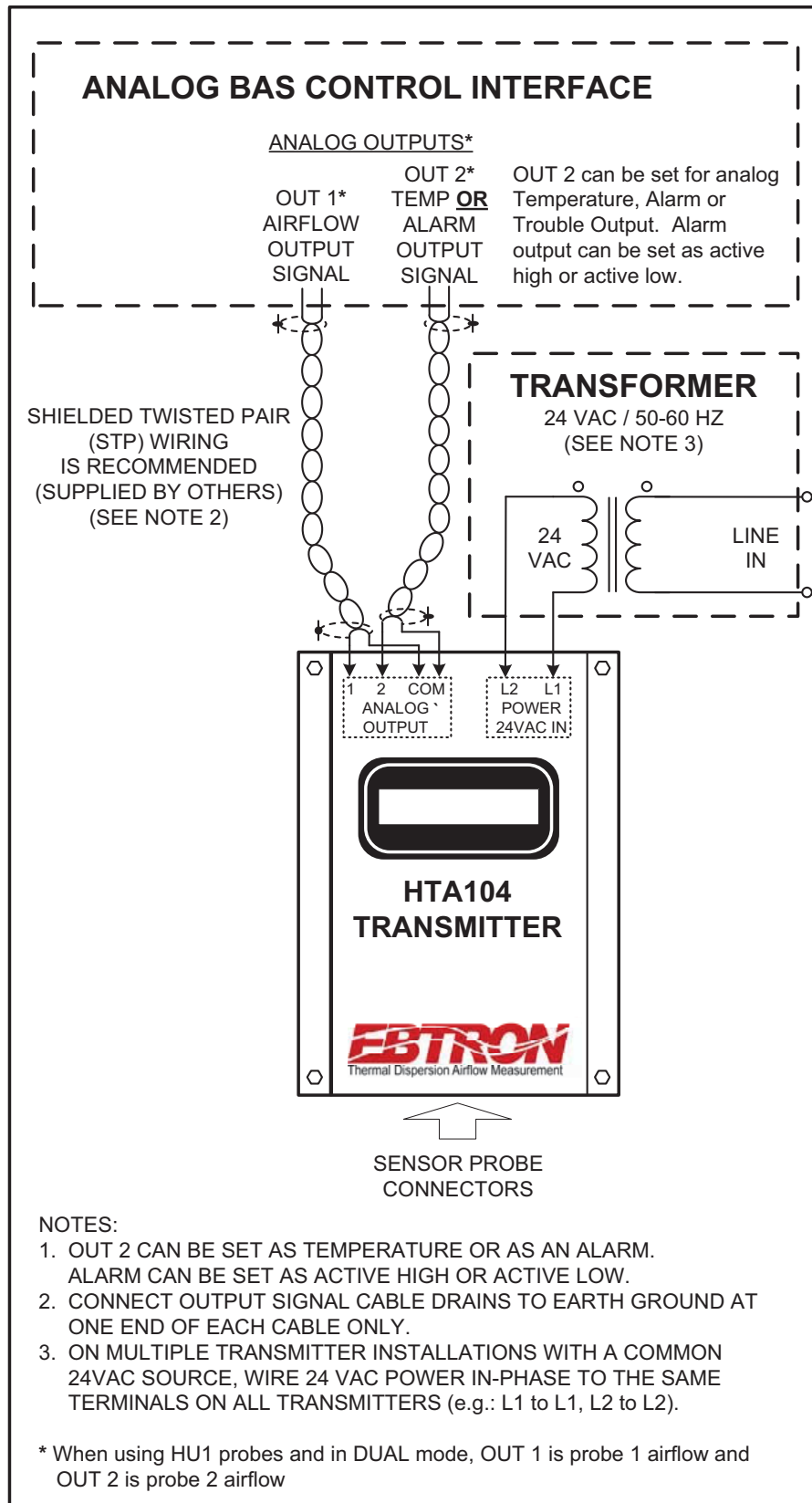
TO PART 5 'A' TO PART 5 'B'

SETUP MENU PART 5



APPENDIX B - HTA104 WIRING DIAGRAMS

HTA104 Analog Transmitter with -P, -F, -T or -U Probes



IG_HTA104_R1A

HTA104 Analog Transmitter with -U Probes in DUAL MODE Applications

