

# Installation, Operation, and Maintenance Manual

## CAMS

**Microprocessor Based  
Combustion Airflow Management System**

Versions 5.3X

Installation, Operation & Maintenance

**Air Monitor Corporation provides complete  
technical support between the hours of  
7 a.m. and 5 p.m. PST, M-F**

**Contact our Service Department  
Toll Free: 1-800-AIRFLOW**

**or fax us at 1-707-526-2825**





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## INSTRUMENT WARRANTY

Air Monitor Corporation (hereinafter referred to as "Seller") warrants that at the time of shipment, products sold pursuant to this contract will be free from defects in materials and workmanship, and will conform to the specifications furnished or approved in writing by Seller. No warranty is given that delivered products will conform to catalog sheets, data sheets, and the like, which are subject to change without notice.

Seller will repair or replace, at its option, the CAMM module under this warranty which is returned freight prepaid to Seller within three (3) years after start-up or thirty-nine (39) months after shipment that upon test and examination, proves defective within the terms of this warranty. The warranty period for the CAMM module repaired or replaced shall be for the time remaining on the warranty period of the original components. Purchaser shall notify Seller in writing of such defect within sixty (60) days of discovery of the defect.

Seller will repair or replace, at its option, the AUTO-purge III under this warranty which is returned freight prepaid to Seller within two (2) years after start-up or twenty-seven (27) months after shipment that upon test and examination, proves defective within the terms of this warranty. The warranty period for the AUTO-purge III repaired or replaced shall be for the time remaining on the warranty period of the original components. Purchaser shall notify Seller in writing of such defect within sixty (60) days of discovery of the defect.

This warranty does not extend to any product sold by Seller which has been the subject of misuse, neglect, accident, damage or malfunction caused by interconnection with equipment manufactured by others, improper installation or storage, or used in violation of instructions furnished by Seller, nor does it extend to any product which has been repaired or altered by persons not expressly approved by Seller. Nor does Seller warrant equipment against normal deterioration due to environment; nor items such as lamps, glass, and similar items subject to wear or burnout through usage. Adjustments for items or equipment not manufactured by Seller shall be made to the extent of any warranty of the manufacturer or supplier thereof.

Seller shall not be liable for any special or consequential damages or for loss of damage, directly or indirectly arising from the use of the products. Seller's warranty shall be limited to replacement of defective equipment and shall not include field removal and installation expenses.

The warranty set forth above is in lieu of all other warranties either express or implied and constitutes the full extent of Air Monitor Corporation's liability to the customer, or any other party for breach of warranty.

THERE ARE NO EXPRESS WARRANTIES EXCEPT AS SET FORTH HEREIN AND THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR ANY PARTICULAR PURPOSE, WHICH ARE PARTICULARLY DISCLAIMED.

### NOTICE OF PROPRIETARY RIGHTS

This document contains confidential technical data, including trade secrets and proprietary information which are the sole property of Air Monitor Corporation. The use of said data is solely limited to use as specified herein. Any other use is strictly prohibited without the prior written consent of Air Monitor Corporation.

# 1 – GENERAL INFORMATION

## 1.1 – DESCRIPTION

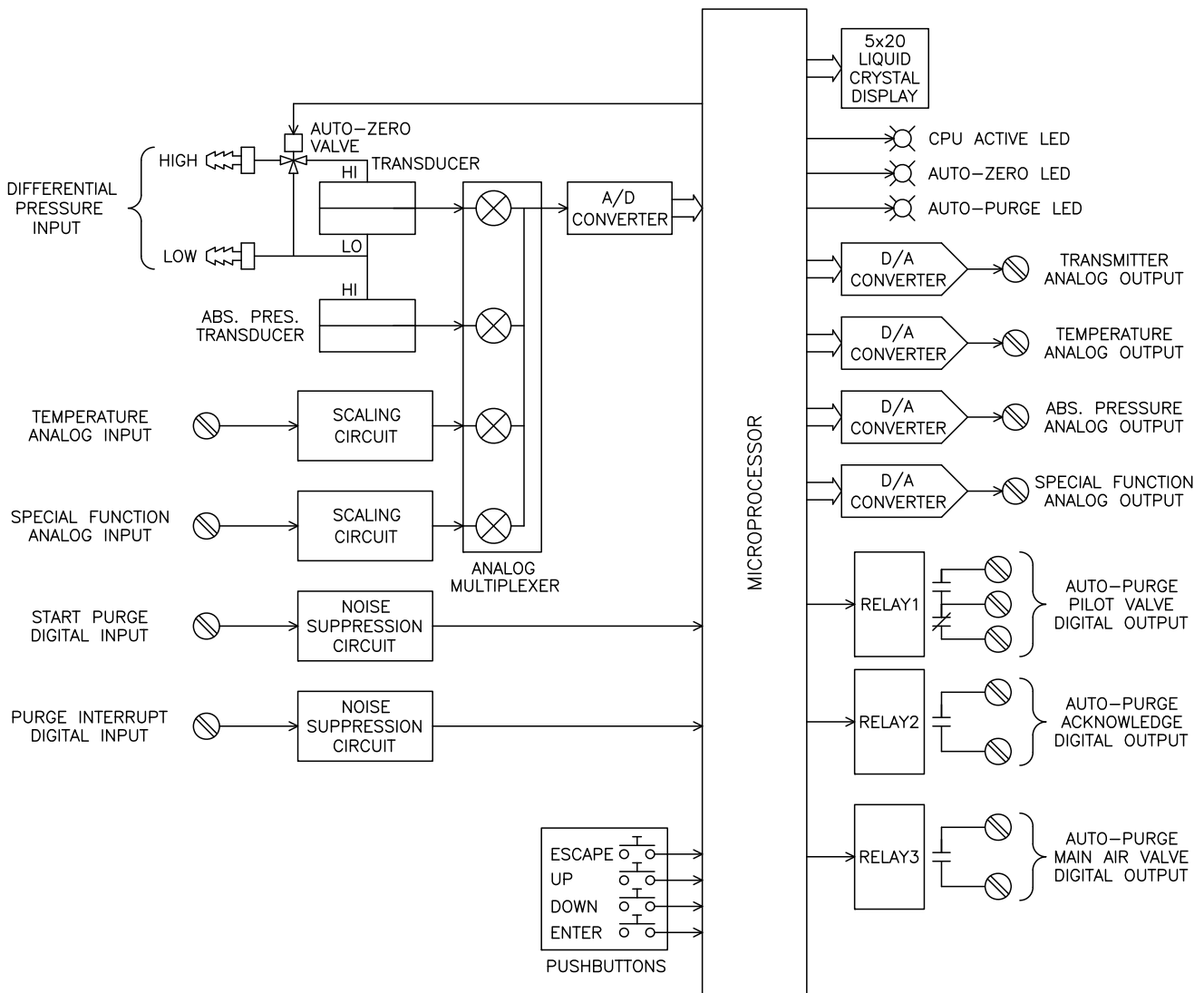
The Combustion Airflow Management System – CAMS consists of a Combustion Airflow Management Module – CAMM and an AUTO-purge III System. The CAMM is an ultra-low differential pressure "smart" mass flow transmitter designed to convert the low magnitude pressure signals generated by airflow stations or probes, plus process temperature and static pressure inputs into multiple output signals (4-20mA, 0-5VDC or 0-10VDC) linear to mass flow, temperature, and pressure.

Each CAMM is equipped with numerous standard features: A multi-line LCD used during configuration/calibration and for display of process variables; AUTO-zero for elimination of transmitter zero error; AUTO-purge management; analog outputs of flow (pressure), temperature, absolute pressure, and special function; Operator selectable primary signal noise filter, input power isolation; and capability of 10:1 flow or 100:1 pressure turndown.

The AUTO-purge III system consists of two air operated fail-safe valves and one solenoid operated pilot valve. The valve arrangement provides total isolation of the CAMM while purge air is routed through signal lines to station/probes.

### 1.2 – THEORY OF OPERATION

High and low pressure signals generated by a combustion airflow station or probes act upon opposite sides of a flexible diaphragm within the transducer. The differential between the two pressure signals displaces the diaphragm; the magnitude of the displacement being measured creates an electrical DC output from the transducer. Additional analog signals of process temperature (via external 4-20mA temperature input) and process static pressure (via internal absolute pressure transmitter) are made available. After being multiplexed and undergoing A/D conversion, the resulting digital signals representing process velocity pressure, temperature and static pressure can be manipulated within the microprocessor: square rooted; density compensated for air temperature and air pressure correction; scaled for units of measure and area for process outputs; filtered and scaled for local data display and utilized in performing a Special Function (see Section 3 – Features). The built-in microprocessor runs the program that provides the following basic functions: Timing, logic, mathematical operations, analog input signal multiplexing, analog input/output calibration, digital input (contact closure) detection, output relay operation, automatic zeroing valve operation, Operator Setup menu system, and display (LCD) indication.



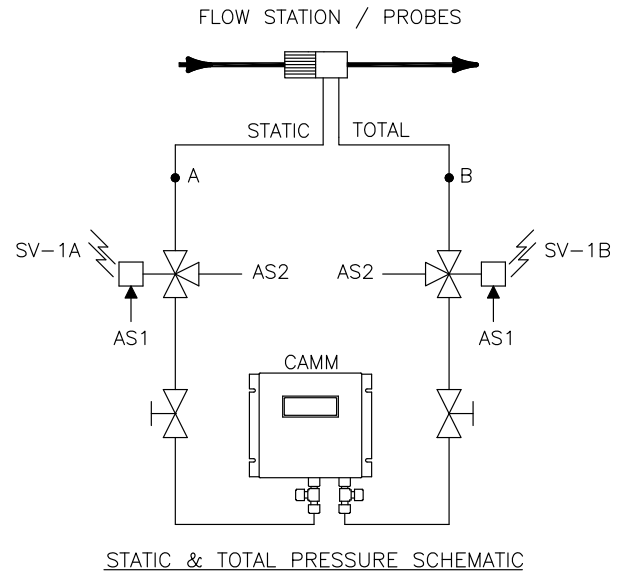
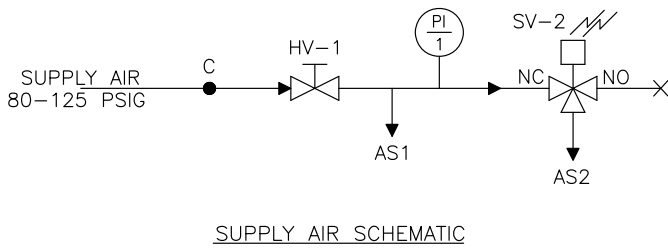
### 1.3 – AUTO-purge SEQUENCE OF OPERATION

Upon initiation of an AUTO-purge cycle (via CAMM or external command), solenoids on purge air valves SV-1A and SV-1B are energized, allowing pilot air (AS-1) to shuttle SV-1A and SV-1B, isolating the CAMM from the signal lines going to the flow station / probe array.

After three seconds the solenoid on supply air valve SV-2 is energized, allowing high pressure air (AS-2) to flow via the signal lines to the total and static sensing ports of the flow station / probe array.

When the programmable purging duration is completed, solenoid SV-2 is de-energized, shutting off the high pressure air supply. A programmable after purge duration allows time for the high pressure purge air in the signal lines to bleed down to process signal levels before SV-1A and SV-1B shuttle back to re-connect the CAMM to the signal lines.

During the entire AUTO-purge cycle the CAMM's outputs and displays will be "held" constant at the last measured values prior to the start of the cycle.





## 2 – PERFORMANCE SPECIFICATIONS

### 2.1 – TRANSMITTER

**Ranges.** Natural Spans

|                    |                   |
|--------------------|-------------------|
| 0 to 25.00 IN w.c. | 0 to 0.50 IN w.c. |
| 0 to 10.00 IN w.c. | 0 to 0.25 IN w.c. |
| 0 to 5.00 IN w.c.  | 0 to 0.10 IN w.c. |
| 0 to 2.00 IN w.c.  | 0 to 0.05 IN w.c. |
| 0 to 1.00 IN w.c.  |                   |

**Span Rangeability.** The calibrated span can be down ranged to 40% of the Natural Span.

**Accuracy.**  $\pm 0.1\%$  of Natural Span, including non-linearity, hysteresis, deadband, and non-repeatability.

**Stability.**  $\pm 0.5\%$  of Natural Span for six months.

**Transducer Response Time.** 0.5 second to reach 98% of a step change.

**Temperature Effect.**

Zero. None; corrected by AUTO-zero.

Span. 0.015% of Full Span/ $^{\circ}$ F.

**Mounting Position Effect.** None; corrected by AUTO-zero.

**Span and Zero Adjustment.** Digital, via internally located push-buttons.

**Automatic Zeroing.**

Accuracy. Within 0.1% of calibrated span.

Frequency. Every 1 to 24 hours selectable on 1 hour intervals.

**Low Pass Filtration.** Response time to reach 98% of a step change is adjustable from 2.0 to 256.0 seconds.

**Overpressure and Static Pressure Limit.** 25 psig.

**Temperature Limits.**

-20 to 180 $^{\circ}$ F Storage.

+40 to 140 $^{\circ}$ F Operating.

**Humidity Limits.** 0-95% RH, non-condensing.

### 2.2 – INDICATION

**Displays.** Graphical backlit LCD provides up to five lines of data display.

### 2.3 – INPUTS/OUTPUTS

**Analog Inputs.** Dual inputs are field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. One is reserved for temperature input; the other for use with special function.

**Analog Outputs.** Three standard and one selectable outputs are individually configurable via jumper for 0-5VDC, 0-10VDC or 4-20mADC.

**Digital Inputs.** Dry contacts for AUTO-purge external start command and purge interrupt.

**Digital Outputs.** Dry contacts for AUTO-purge activation and acknowledgment. Contacts rated for:

Maximum 3 amps @ 24 to 120VAC

Maximum 3 amps @ 24VDC

Maximum 0.5 amps @ 48VDC

**Temperature Compensation Selection.** Push-button selection of linearized or non-linear input. Choice of thermocouple or 100 ohm platinum RTD temperature sensor type.

|        |                          |                          |
|--------|--------------------------|--------------------------|
| Type E | -50 to 1750 $^{\circ}$ F | -50 to 950 $^{\circ}$ C  |
| Type T | -50 to 750 $^{\circ}$ F  | -50 to 400 $^{\circ}$ C  |
| Type J | -50 to 2000 $^{\circ}$ F | -50 to 1090 $^{\circ}$ C |
| Type K | -50 to 2000 $^{\circ}$ F | -50 to 1090 $^{\circ}$ C |
| RTD    | -50 to 1500 $^{\circ}$ F | -50 to 815 $^{\circ}$ C  |

**Pressure Compensation.** Absolute pressure (atmospheric or duct static), up to 60 IN Hg.

**Network Communication.** Optional ModBus TCP/IP over Ethernet.

### 2.4 – POWER

**Power Supply.** 24VDC or 24VAC. Optional 120VAC (100-132VAC) via external UL listed transformer.

**Power Consumption.**

24VAC: 85VA (in rush), 73VA (continuous)

24VDC: 37W

120VAC: 106VA (in rush), 92VA (continuous)

**Circuit Protection.** Power input is isolated, fused, and reverse polarity protected.

## 3 – FEATURES

### 3.1 – OPERATOR SETUP MENU

The CAMM microprocessor program contains a Operator Setup menu system for setting Operator selectable parameters. Four pushbuttons, **ESC, UP, DN, ENT** allow the Operator access to the menu for setting configuration modes and values. Refer to the Configuration Programming (Section 5.6) instructions for operation details. Also contained in the Operator Setup menu is all input and output calibration. The calibration method is completely digital and contains no analog potentiometer adjustments which are susceptible to drift. Non-volatile memory is used for storing all setup parameters and calibration values, and will remain unchanged after set, even when power to the unit is off.

### 3.2 – AIR DENSITY CORRECTION

The CAMM is capable of performing both process temperature and process static pressure correction. Temperature input is an analog signal from a remote temperature transmitter; non-linear temperature inputs can be linearized by the microprocessor. Process static pressure is measured by means of an internal absolute pressure transmitter connected to the transmitter static pressure signal input.

### 3.3 – TRANSMITTER HOLD

Certain operations performed by the microprocessor place the unit into a *Hold* mode. This occurs when the Operator Setup menu system is activated, when an AUTO-zero is performed, or when an AUTO-purge cycle is in progress. When in *Hold*, all *Normal* mode processing is halted and outputs and displays are held at their last value prior to *Hold*.

### 3.4 – AUTOMATIC ZEROING

At periodic intervals the microprocessor will automatically execute an AUTO-zero cycle consisting of the following sequence: The transmitter output and display signals are put on *Hold*; a valve is activated which disconnects the process high pressure from the high port of the transducer and connects the process static pressure to both sides of the transducer, creating a true zero differential pressure; after a brief stabilization period, the transducer zero offset signal is measured and stored in memory; the valve is deactivated and after a brief period for process signal stabilization, the *Hold* is released and *Normal* process measurement resumes. During *Normal* operation, the zero offset value stored in memory is subtracted from subsequent transducer readings until the next AUTO-zero cycle occurs and repeats the process. AUTO-zero On/Off and Interval are available and configurable using the Operator Setup menu.

### 3.5 – AUTO-purge MANAGEMENT

The CAMM provides the capabilities of establishing purge frequency and duration, while also giving the Operator a choice of either internally timed cycle frequency or externally triggered purge initiation. During the purge cycle all transmitter outputs and displays are maintained at their last value prior to the start of the purge cycle.

### 3.6 – SPECIAL FUNCTIONS

When used in conjunction with an external input (second transmitter) applied to the special function input terminals, the CAMM can perform one of the Special Functions listed below. Within the Operator Setup menu, both the external input and the internal transmitter signals can be individually scaled to achieve a correct weighted basis. The resulting Special Function output is available as an analog output and/or for the display on the Enhanced Display. When % Deviation is selected as Special Function Type, contact closure is available for alarm/notification. Special Function ON/OFF and Type are available and configurable using the Operator Setup menu.

**%Deviation.** | EXTERNAL – INTERNAL | / | EXTERNAL |. This function has Alarm Setpoint, Deadband, and Delay that are configurable via the Operator Setup menu.

**Summed Flow.** INTERNAL + EXTERNAL

**Averaged Flow.** (EXTERNAL + INTERNAL) / 2

**Delta Flow, Internal - External.** INTERNAL – EXTERNAL

**Delta Flow, External - Internal.** EXTERNAL – INTERNAL

**Low Select.** Selecting the lesser of the INTERNAL and EXTERNAL signals.

**High Select.** Selecting the greater of the INTERNAL and EXTERNAL signals.

### 3.7 – DATA DISPLAY

The integral display is graphical backlit LCD. It is capable of displaying the transmitter flow, process temperature and static pressure signals in Engineering units, plus the Special Function option described in Section 3.6. It can also display a Operator settable I.D. number using any combination of standard ASCII characters. It is also used by the Operator Setup menu for displaying the menu parameters and values. Configuring the display for *Normal* operation is done using the Operator Setup menu.

### 3.8 – K-FACTOR

The CAMM is equipped with a K-factor feature which allows for the introduction of a bias and/or gain factor into the transmitter's flow calculations. The K-factor feature is intended to be used in two types of applications:

1. To adjust for flow measurement error as a result of highly distorted airflow induced by upstream or downstream flow disturbances.
2. To adjust the transmitter's output to bring it into close correlation with field measured flow data.

The K-Factor gain and bias values can be entered directly or the CAMS can calculate these values based on measured and reference values from a 1 or 3 point airflow traverse.

### 3.9 – FLOW/DIFFERENTIAL PRESSURE CALCULATOR

The CAMM is equipped with an integral calculator feature that allows the Operator to determine the maximum flow or differential pressure from the appropriate variables. This feature allows the Operator to determine input or output values at various points of the process or new values if the process parameters have changed. Also, the calculator can be used to implement a single-point density compensation for operating temperature and/or absolute pressure.

### 3.10 – NETWORK (option)

The CAMM can be provided with optional ModBus TCP/IP over Ethernet for serial data communication.

### 3.11 – MULTIPLE OPERATING POWER SELECTIONS

The CAMS can be powered by 24VAC, 24VDC, or 120VAC with optional transformer.

### 3.12 – CONSTRUCTION

The CAMS is housed in a NEMA 4 enclosure, with all wetted tubing, fittings, and valves constructed of copper and/or brass. External connection fittings are stainless steel FPT.

### 3.13 – ENCLOSURE COOLING (option)

An optional enclosure cooler is available for the CAMS. Requires 80-100 psig air supply.

## 4 – INSTALLATION

### 4.1 – RECEIVING AND INSPECTION

- Carefully remove the CAMS from the shipping container taking ESD (electrostatic discharge) precautions.
- Inspect unit for any damage. If damaged, contact freight company.
- Review the Factory Setup Information Sheet provided with the unit and verify the W.O. # and Serial # match those on the unit. Verify that the configuration recorded on the Factory Set-Up Information Sheet is correct for your application. If not, contact Air Monitor's Customer Service Department at 1-800-AIRFLOW for further guidance.

**Note:** The CAMM has been configured and calibrated to customer specified parameters (see "Factory Setup Information Sheet"), and requires no additional calibration/verification prior to installation.

### 4.2 – LOCATION

- The CAMS is housed in a NEMA 4 enclosure which is suitable for outdoor locations.
- The ambient temperature of the selected mounting location must be between 40° – 140°F, unless an appropriate means of heating or cooling are included.
- The selected mounting location should be rigid and free of vibration.
- The CAMS should be mounted as close as possible to its associated flow measuring station or probes. In no case should the distance be greater than 50 feet. See Section 4.4 for appropriate line sizes.

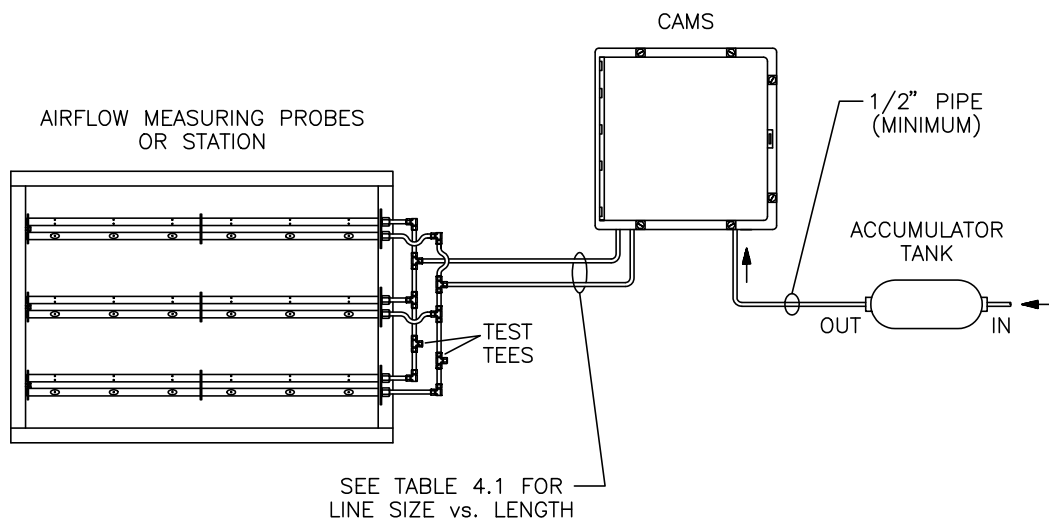


Figure 4.1

### 4.3 – MOUNTING

- The CAMS can be mounted in any position provided it is secured using all four mounting tabs.
- Secure the CAMS utilizing appropriate hardware.

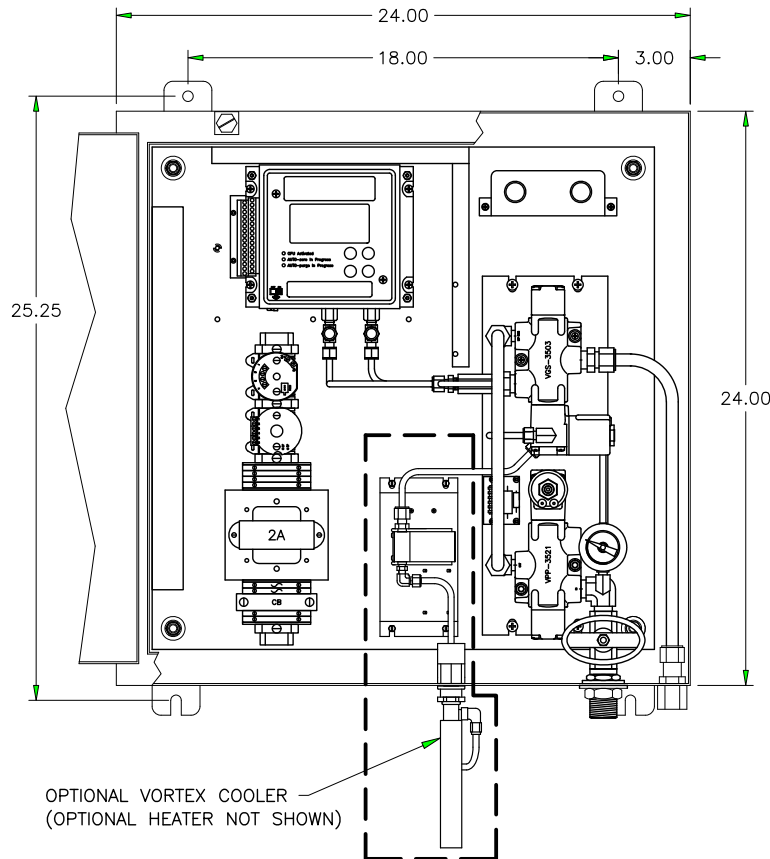
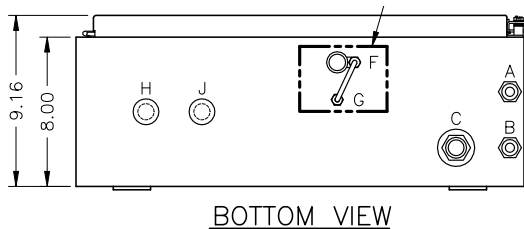


Figure 4.2

### 4.4 – PROCESS CONNECTIONS



**CONNECTION CODE**

|  |                   |
|--|-------------------|
| A. STATIC PRESSURE (LO) SIGNAL FROM FLOW ELEMENT | 1/2" (F)NPT       |
| B. TOTAL PRESSURE (HI) SIGNAL FROM FLOW ELEMENT  | 1/2" (F)NPT       |
| C. SUPPLY AIR 80 – 125 PSIG                      | 1/2" (F)NPT       |
| D. NOT APPLICABLE                                |                   |
| E. NOT APPLICABLE                                |                   |
| F. VORTEX COOLER MOUNTING HOLE                   | N/A               |
| G. VORTEX COOLER AIR SUPPLY                      | N/A               |
| H. ELECTRICAL CONNECTION POWER WIRING            | 1/2" CONDUIT SEAL |
| J. ELECTRICAL CONNECTION SIGNAL WIRING           | 1/2" CONDUIT SEAL |

Figure 4.3

- Figure 4.3 depicts the various bulkhead connections located on the bottom of a standard capacity CAMS.
- To bulkheads A and B install appropriate connection fittings to accommodate the recommended signal tube size in Table 4.1.
- To bulkhead C connect 1/2" Schedule 40 air supply pipe for standard capacity CAMS or 3/4" pipe for high capacity CAMS.

**CAUTION**

Selected connection fittings must be compatible with the bulkhead fittings on the CAMS. Connection fittings must be installed using appropriate thread lubricant/sealant. When installing or removing connection fittings, a wrench should be used on the bulkhead fitting to prevent turning.

### 4.4 – PROCESS CONNECTIONS (con't)

**Static and Total Pressure from Flow Station/Probe (Connection Code A and B).** For tubing sizes versus length, see Table 4.1 below:

| Distance from Flow Measuring Station or Probe to CAMS | Minimum Tube Size |
|---|-------------------|
| Under 25 feet   | 1/2" O.D.*        |
| 25 to 50 feet   | 3/4" O.D.*        |
| Greater than 50 feet                                  | 1.0" O.D.*        |

\*Wall thickness no greater than 0.065".

Table 4.1

**NOTE: Recommended Tubing Wall Thickness:** .035" wall tubing is suitable for compression fittings. If socket weld fittings are substituted, increase wall thickness to .065".

At or near the Flow Station / Probe Array test tees should be installed (see Figure 4.1). These test tees will be utilized in Section 5.

**Supply Air (Connection Code C).** Air should be connected using 1/2" Schedule 40 air supply pipe for standard capacity CAMS or 3/4", Sch. 40, pipe for high capacity CAMS. Air supply must provide 80 to 125 psig at 20 ACFM, oil and dirt free.

**Electrical Connections (Connections Code H and J).** See Section 4.6.

### 4.5 – ACCUMULATOR TANK

For the optimum performance of the CAMS, it is recommended that an accumulator tank be used as a reservoir for purge air (see Figure 4.1). Table 4.2 lists recommended tank sizes.

| Station or Probe Size                                   | Accumulator Tank Size |
|---|-----------------------|
| All CA Stations   | 120 Gallons           |
| VOLU-probes having combined length less than 10 feet    | 80 Gallons            |
| VOLU-probes having combined length greater than 10 feet | 120 Gallon            |

Table 4.2

The accumulator tank should be furnished with pressure regulator, coalescing filter, check valve, and pressure relief valve.

### 4.6 – POWER/SIGNAL CONNECTIONS

Power wiring for the CAMS is to be connected at TB-1 according to Figure 4.4.

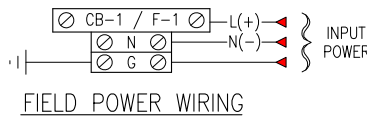


Figure 4.4

All signal wiring is done at the terminal strip at the left side of the CMM. Figure 4.5 below represents the terminal strip and the connections for power input and the various inputs/outputs available.

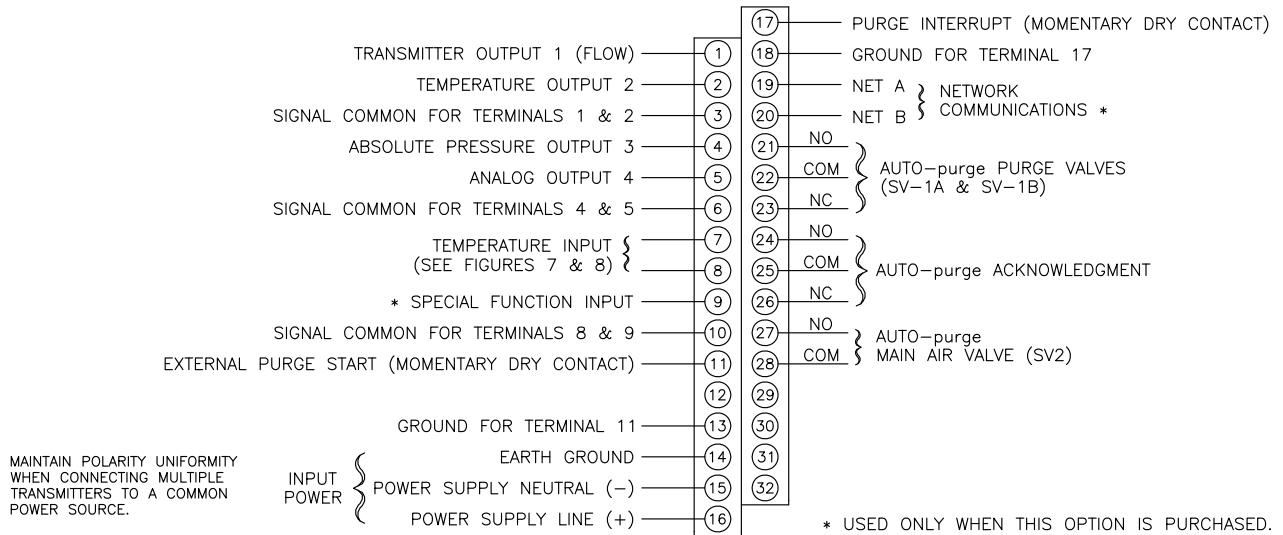


Figure 4.5

**CAUTION:** When connecting or disconnecting any wiring to the CMM, the unit's power switch (see Figure 4.6) must be in the OFF position.

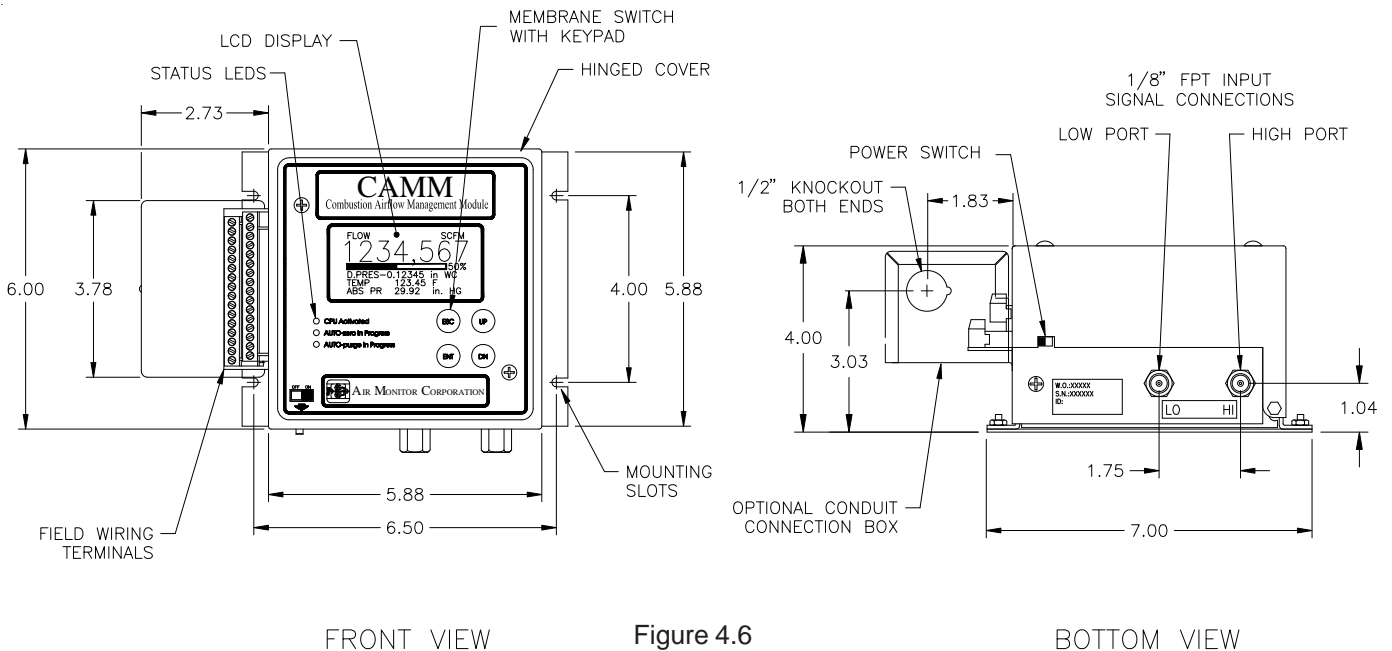


Figure 4.6

### 4.6 – POWER/SIGNAL CONNECTIONS (con't)

**Transmitter Output 1 (Terminals 1 and 3).** This output is sourced (powered) by the CAMM.

4-20mADC: Maximum load resistance is 750 ohms.

0-10VDC: Minimum load resistance is 5000 ohms.

0-5VDC: Minimum load resistance is 2500 ohms.

Review Factory Set-Up Information Sheet for your signal type.

**Temperature Output 2 (Terminals 2 and 3).** This output is sourced (powered) by the CAMM.

4-20mADC: Maximum load resistance is 750 ohms.

0-10VDC: Minimum load resistance is 5000 ohms.

0-5VDC: Minimum load resistance is 2500 ohms.

Review Factory Set-Up Information Sheet for your signal type.

**Absolute Pressure Output 3 (Terminals 4 and 6).** This output is sourced (powered) by the CAMM.

4-20mADC: Maximum load resistance is 750 ohms.

0-10VDC: Minimum load resistance is 5000 ohms.

0-5VDC: Minimum load resistance is 2500 ohms.

Review Factory Set-Up Information Sheet for your signal type.

**Analog Output 4 (Terminals 5 and 6).** This output is sourced (powered) by the CAMM.

4-20mADC: Maximum load resistance is 750 ohms.

0-10VDC: Minimum load resistance is 5000 ohms.

0-5VDC: Minimum load resistance is 2500

Review Factory Set-Up Information Sheet for your signal type.

**Temperature Input (Terminals 7, 8, and 10).** Follow the appropriate figure below for connecting a temperature input signal.

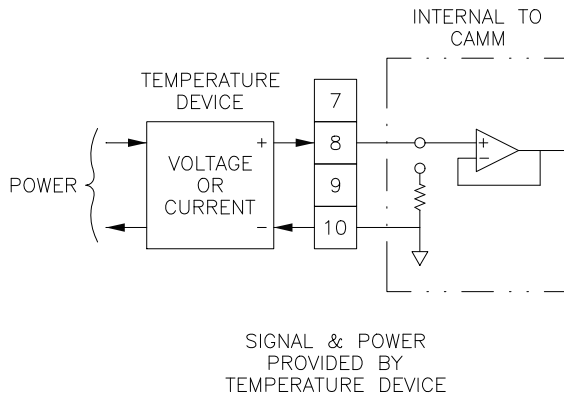


Figure 4.7

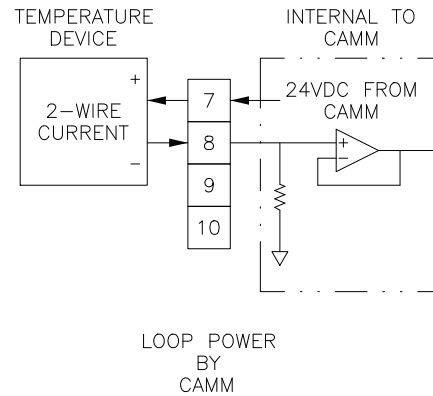


Figure 4.8

**Special Function Input (Terminals 9 and 10).** Input is required to be sourced (powered) from the customer.

Input can be 4-20mA, 0-5V, or 0-10V (refer to Section 4.7 for selection).

**External Purge Start (Terminals 11 and 13).** Customer to provide momentary (0.5 to 10 second unpowered) dry contact to initiate purge cycle.

**Input Power (Terminals 14, 15, and 16).** Power required by CAMM must be connected to terminals 15 and 16. Earth ground should be connected to Terminal 14. When powering multiple units from one power source, polarity must be maintained.

**Purge Interrupt (Terminals 17 and 18).** Customer to provide momentary (0.5 to 10 seconds unpowered) dry contact to interrupt a purge cycle in progress.

**AUTO-purge Purge Valves (SV-1A and SV-1B) (Terminals 21, 22 and 23).** Factory wired.

**AUTO-purge Acknowledgment (Terminals 24 and 25).** Acknowledgment contact for customer use. Contacts close upon AUTO-purge cycle initiation, remain closed through the entire purge cycle (see Section 5.11).

**AUTO-purge Main Air Valve (SV2) (Terminals 27 and 28).** Factory wired.



### 4.7 – INPUT/OUTPUT SELECTION

Selections of input and output signal types are made on the Jumper section of the I/O board, see Figure 5.1. Remove top cover to gain access to the Jumper board. Figure 4.6 depicts the Jumper section and the pins associated with specific input and output signal types.

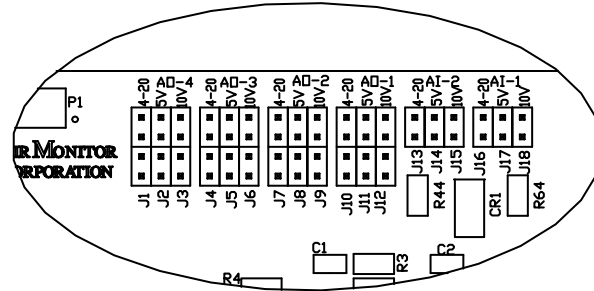


Figure 4.6

Table 4.3 lists the identifier for each row of pins to be jumpered for a specific input or output signal type.

|  | SIGNAL TYPE |              |               |
|--|-------------|--------------|---------------|
|  | 4-20mADC    | 0 to 5 Volts | 0 to 10 Volts |
| Analog Output (AO-1)<br>(Transmitter)              | J10         | J11          | J12           |
| Analog Output (AO-2)<br>(Temperature)              | J7          | J8           | J9            |
| Analog Output (AO-3)<br>(Absolute Pressure)        | J4          | J5           | J6            |
| Analog Output (AO-4)<br>(Selectable)               | J1          | J2           | J3            |
| Analog Input (AI-1)<br>(Temperature)               | J16         | J17          | J18           |
| Analog Input (AI-2)<br>(Special Function<br>input) | J13         | J14          | J15           |

Table 4.3

The necessary jumpers have been installed at the Factory for customer specified inputs and outputs (see Factory Set-Up Information Sheet). To change the signal type of an input or output, remove all jumpers from the present signal type pins and install them on the desired signal type pins. Inputs have a single jumper covering two pins, and outputs have two jumpers covering four pins.

### 4.8 – DISPLAY CONTRAST ADJUSTMENT

To compensate for different ambient lighting conditions and viewing angles, the CAMS display's contrast can be adjusted for optimum visibility.

Contrast is adjusted using potentiometer R1 on CPU board (see Figure 5.1). To gain access to R1:

- Remove the two 10-32 screws on front cover and pull the cover straight and to the right.
- Turn R1 clockwise to increase contrast (darken characters relative to background) and counterclockwise to decrease contrast.

## 5 – OPERATION

### 5.1 – INTRODUCTION

The CAMM has been configured and calibrated at the Factory to customer specified parameters which are recorded on the CAMM Factory Setup Information Sheet, included with the unit. Review this information and verify that the CAMM setup is correct for your applications. If any problems or discrepancies are detected, contact Air Monitor's Customer Service Department at 1-800-AIRFLOW prior to proceeding.

### 5.2 – START-UP

1. After Installation has been verified in accordance with Section 4, turn power switch located at the lower left side to the ON position (see Figure 4.1).
2. Display will briefly indicate:

-- CAMM --  
Thanks for Choosing  
AIR MONITOR

■ ■

with the ■ progressing from left to right.

Followed by:

-- CAMM --  
Performing Auto-Zero

■ ■

After approximately 10 seconds, and then return to *Normal* display mode, and green LED indicating "CPU Activated" will flash rapidly (4 times per second). This is *Normal* operation mode and no further Operator interface is required. If, however, Operator would like to verify configuration or change Operator selectable parameters, continue to Section 5.4 entitled "CONFIGURATION".

### 5.3 – NORMAL OPERATION

Under *Normal* operation the CAMM's display will continuously indicate current process variables.

#### **AUTO-zero**

At periodical intervals\* (see Factory Set-Up Information Sheet) the AUTO-zero cycle will be initiated. When this occurs, the display will be frozen and all outputs will remain constant. During this cycle the "AUTO-zero in Progress" LED will be lit.

This cycle will not occur if AUTO-zero has been turned OFF in configuration programming (see Section 5.10).

The AUTO-zero cycle can be manually activated by user (if ON in configuration programming) by simultaneously pressing **ESC** and **UP**, then scrolling until Perform Auto-Zero is displayed, then press **ENT**.

#### **AUTO-purge**

At periodic intervals\* (see Factory Set-Up Information Sheet) the AUTO-purge cycle will be initiated. When activated, display will be frozen and all outputs will remain constant. During this cycle, the "AUTO-purge In Progress" LED will remain lit. Length of cycle depends on purge duration and after-purge duration (see Factory Set-Up Information Sheet).

This cycle will not occur if AUTO-purge has been turned OFF in configuration programming (see Section 5.11).

The AUTO-purge cycle can be manually activated by user (if ON in configuration programming) by simultaneously pressing **ESC** and **UP**, then scrolling until Perform Auto-Purge is displayed, then press **ENT**.

\*Note: The interval clock for AUTO-zero and AUTO-purge cycles is initiated when the CAMM's power switch is turned on. The time intervals (preset in Operator Set-Up menu) will then start their timing sequence.

To reset the interval clock, turn power off for a minimum of 10 seconds, then turn power back on. Interval clock will then initiate at time zero.

Changing the interval selection in Operator Setup does not reset time clock.

### 5.4 – CONFIGURATION

The CAMM's Onboard Microprocessor Controls Configuration: Operating parameter selection; input/output activation and scaling, display scaling, and transducer calibration.

The customer can verify configuration and change certain parameters (within defined ranges) by entering the CAMM's Configuration mode. This is accomplished using the four pushbuttons located on the CAMM's top cover.

The type (i.e., 4-20mA, 0-5V, 0-10V) of available outputs can also be changed by jumper selections on I/O board (see Section 4.7).

To gain access to the jumpers, remove two 10-32 screws on front cover and pull the cover straight up and swing to the right.

**CAUTION:** With cover removed, ESD (electrostatic discharge) precautions should be observed at all times to protect sensitive components.

Refer to Figure 5.1 for location of pushbuttons: **UP**, **DN**, **ESC**, and **ENT** and location of jumpers.

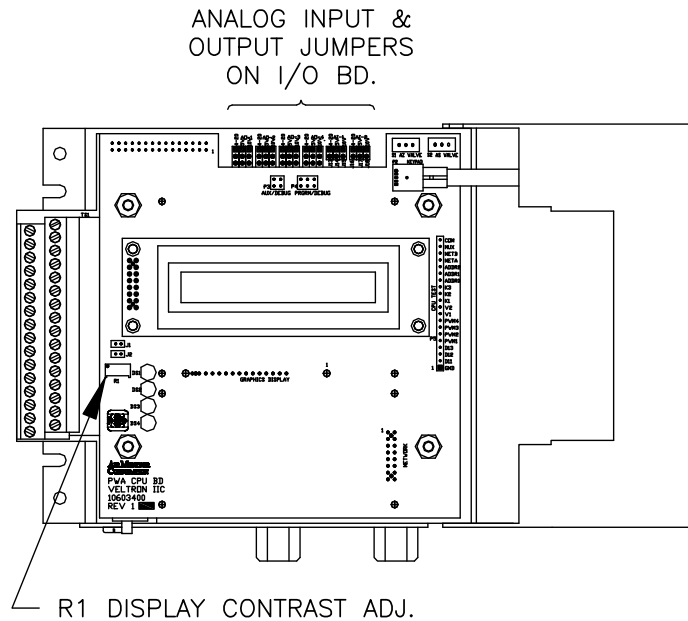


Figure 5.1

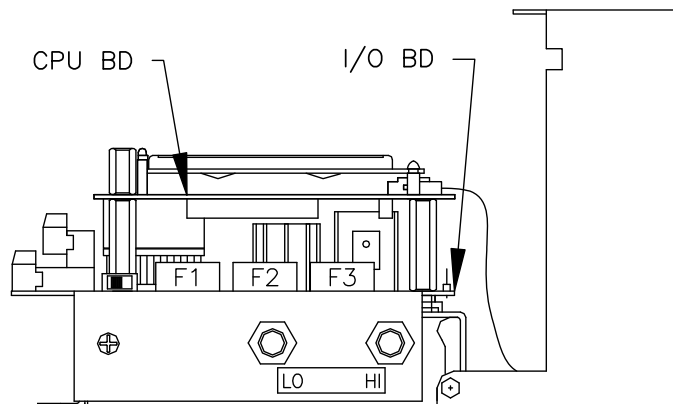


Figure 5.2

### 5.5 – PUSHBUTTON DEFINITION

In addition to Configuration programming, pushbuttons can be used for certain functions when in the *Normal* operation mode. The following list describes the pushbutton function when in the *Normal* operation mode and in the Operator Setup (programming).

**When in Normal Operation Mode.**

- ESC + ENT**     Activates the Operator Setup menu.
- ESC + UP**     Displays a list of Manual Actions available on the top line of the display. Use **UP** or **DN** to scroll through selections.

The following list describes all possible actions. Those available depend on installed options.

- Turn On AutoZero Vlv                     Output not held.
- Perform Auto-Zero                        Output held.
- Perform Auto-Purge                      Output held.

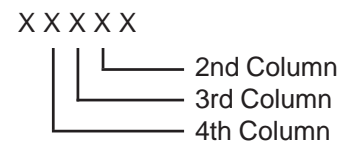
- UP + DN**             Displays software Version, W.O. #, S/N, and ID.

**When in Operator Setup.**

- UP or DN**            Use to scroll to the desired Main Menu item.  
Use to scroll to the value or mode within a Parameter.
- ENT**                 Enters user into specific selection sub-menu from Main Menu Selection.  
Displays current setting of selected Parameter.  
Enters the selected value or mode into memory.
- ESC**                 Use to exit Main Menu selection to avoid scrolling to "Return to MAIN MENU".

The following pushbutton combinations can be used to more quickly set user selected values (i.e. process minimum and maximum, K-factor, Scaling Values, Characterization Values, etc.).

- UP\* + ESC**             Increase the second column digit.
- DN\* + ESC**             Decrease the second column digit.
- UP\* + DN**              Increase the third column digit.
- DN\* + UP**              Decrease the third column digit.
- UP\* + ESC and DN**    Increase the fourth column digit.
- DN\* + ESC and UP**    Decrease the fourth column digit.



\*Must be pressed and held before other button(s) are pressed.

**NOTE**  
 Pushbuttons are momentary type and should be quickly pressed and released to initiate desired change, unless otherwise instructed to press and hold.

## 5.6 – CONFIGURATION PROGRAMMING

**Note:** User selectable parameters are limited to standard features and those available for options purchased and installed at the factory. The following will detail all user parameters, which may or may not be available on your unit.

With power ON and initialization complete (see Section 5.2), simultaneously press **ESC** and **ENT**, and display will indicate:

OPERATOR SETUP

Pressing **ENT** again will enter the user into the Main Menu of configuration programming. The display will indicate:

Operator Password  
Selection

Refer to next page for Main Menu Selections.

## 5.6 – CONFIGURATION PROGRAMMING (con't)

By using **UP** and **DN**, the user can scroll through the following selections:

| MAIN MENU SELECTION                   | DESCRIPTION   |
|---------------------------------------|---|
| Operator Password Selection           | Allows for the selection of a numeric password needed to gain further access to menu items. Also allows for the password to be bypassed.  |
| Transmitter Scaling & Configuration   | Allows for the configuration of process variable such as: Square root, process type, process minimum/maximum/units, duct area, and percent lockdown. Also offers a Flow/D.P. calculator that allows user to calculate maximum flow or differential pressure based on entered variables. |
| Low Pass Filter Selection             | Selects amount of filtering applied to transducer output.   |
| AUTO-zero Configuration               | Turns AUTO-zero function ON or OFF, and selects interval.   |
| AUTO-purge Configuration              | Turns AUTO-purge function ON or OFF, and selects internal/external activation, interval, purge duration, after purge time.  |
| Special Function Configuration        | Turns Special Function ON or OFF, select from the following special functions: % Deviation; Summed Flow; Averaged Flow; Delta: Internal-External; Delta: External-Internal; Low Select; High Select; and Setup parameters specific to Special Function selected.                        |
| K-Factor Configuration                | Turns K-Factor ON or OFF, and allows for the calculation or selection of gain and bias values.  |
| Display Configuration                 | Allows for the configuration of Display Filter and Parameters.  |
| Analog Output Configuration           | Allows for the selection of Analog Output 4 parameters.   |
| Transducer Span Selection             | Allows for displaying the natural span of the installed transducer.   |
| Transmitter Input Calibration         | Allows for the zeroing and spanning of transmitter analog Inputs.   |
| Transmitter Output Calibration        | Allows for the zeroing and spanning of transmitter analog Outputs.  |
| Power Supply Calibration              | Allows for adjustment of power supply voltage.  |
| Transducer Characterization Selection | Allows transducer characterization data to be entered when transducer is replaced.  |
| Network Configuration                 | Turns the Network ON or OFF, selection of input source.   |
| Menu Inactivity Timeout Selection     | Allows for the selection a time after which the unit returns to normal operation if no activity in the Operator Menu.   |
| Exit Operator Setup                   | Returns display to <i>Normal</i> operation.   |

### 5.6 – CONFIGURATION PROGRAMMING (con't)

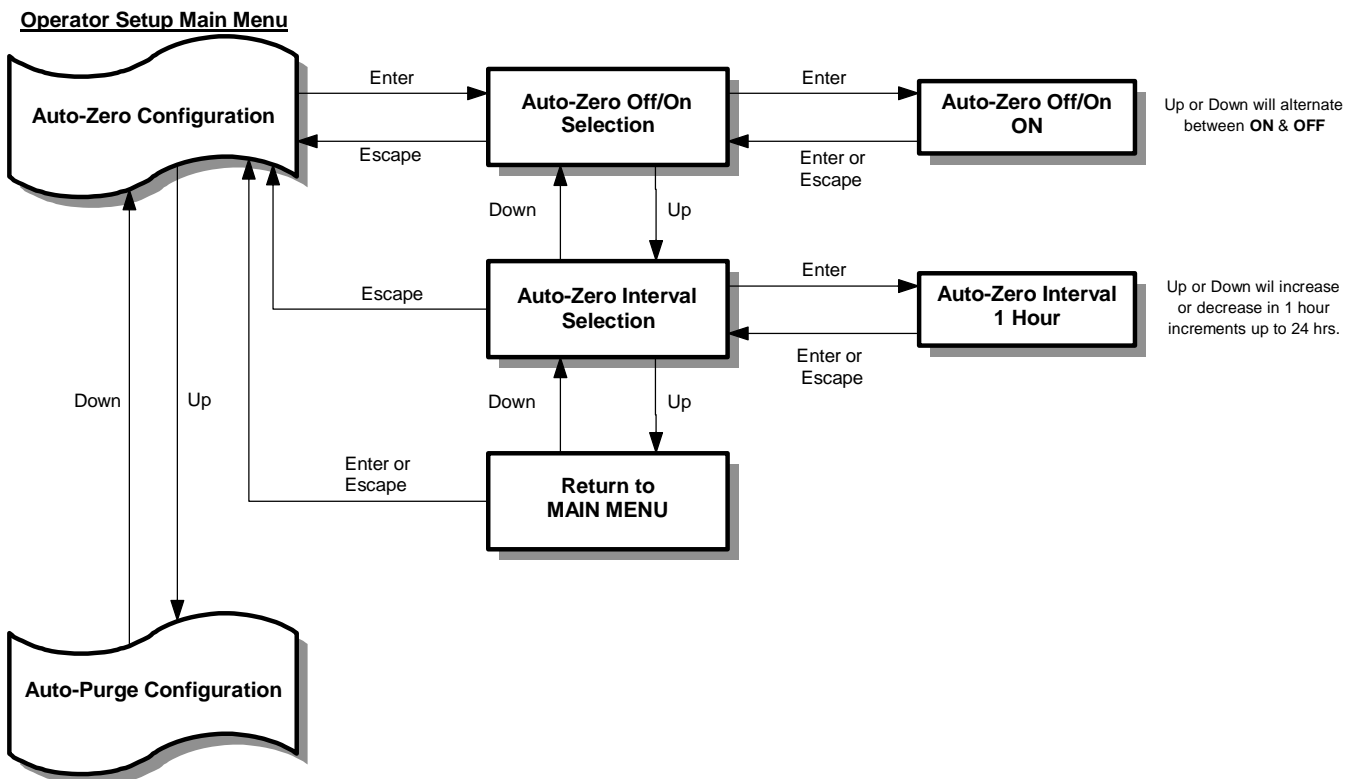
At any time while in the Main Menu, User can return to *Normal* operation mode by pressing **ESC** or scrolling to:



and pressing **ENT**.

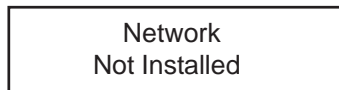
Once the desired Selection is displayed, its sub-menu can be entered by pressing **ENT**.

To better understand the process of Configuration Programming, arrows with pushbutton designations have been included on the following flow chart of AUTO-zero Configuration. This will aid in the navigation of the Configuration Programming Process.



This example of navigation is similar for all Main Menu selections.

Note: All selections that are available for further configuration programming will have an "arrow" symbol displayed in the right side of the display field. Those that are not available for further configuration programming will not have the "arrow" symbol displayed and will display Not Installed beneath the selection description. Example:

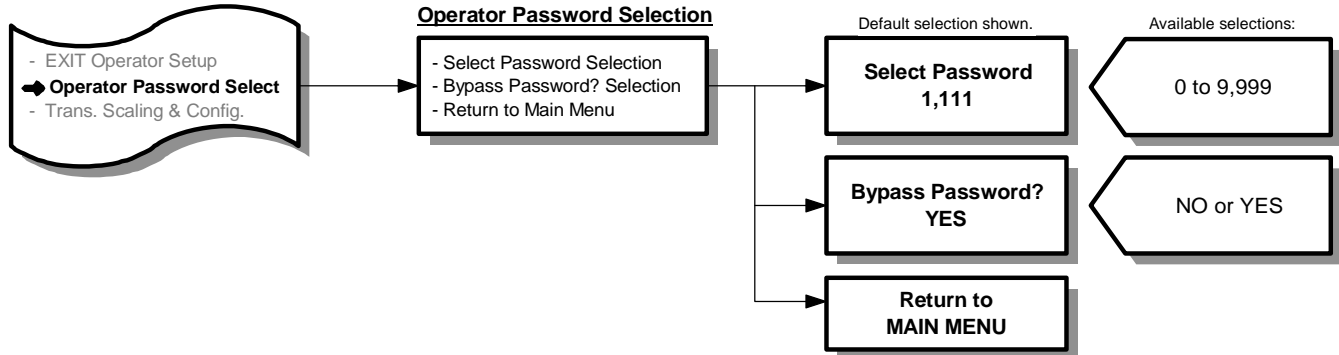


The remainder of this Section details steps to verify or change Configuration Programming of all Main Menu Selections.

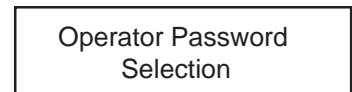


### 5.7 – OPERATOR PASSWORD SELECTION

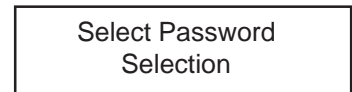
User can select numeric password or bypass password requirement. Note: Units are shipped from the Factory with the password set to 1,111 and bypassed.



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** to enter Operator Password Selection menu. Display will indicate:



3. Press **ENT** and display will indicate current password (1,111).

4. Use **UP** or **DN** to change password. Once desired password is displayed, press **ENT**. New password will be stored in memory and display will return to Operator Password Selection menu as in Step 2.

Note: If user desired not to change the password and return to Operator Password Selection menu, press **ESC**. Unit will remain programmed as it was originally.

5. Use **UP** or **DN** to select remaining parameters to be changed.

6. Follow Step 4 to make any changes to parameters.

7. To return to Main Menu, select Return to MAIN MENU in Operator Password Selection menu and press **ENT**.

## 5.8 – TRANSMITTER SCALING & CONFIGURATION

This Main Menu selection is where all application specific data is entered to configure the CAMM for a unique application. Data is entered in sub-menu, Process Configuration, and as applicable, sub-menus, Temperature Configuration and Absolute Pressure Configuration. Typical data includes: Process Type, Process Minimum/Maximum, Density Compensation Type, Temperature Range, Absolute Pressure Range, Duct Area/Units, etc.

Note: Factory has entered data in this section based on customer supplied information. Data can be reviewed and verified by scrolling through the individual menu items or reviewing the Factory Set-Up Information sheet provided with the unit. Review this information **BEFORE** making any changes, as they can have a significant effect on the operation of the CAMS.

Under a fourth sub-menu, Calculator for Max Diff. Pres. or Flow, Operator can calculate either maximum flow or maximum differential pressure (D.P.) when operating parameters have changed.

Each sub-menu will be addressed separately.

### 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

**Operator Setup Main Menu**

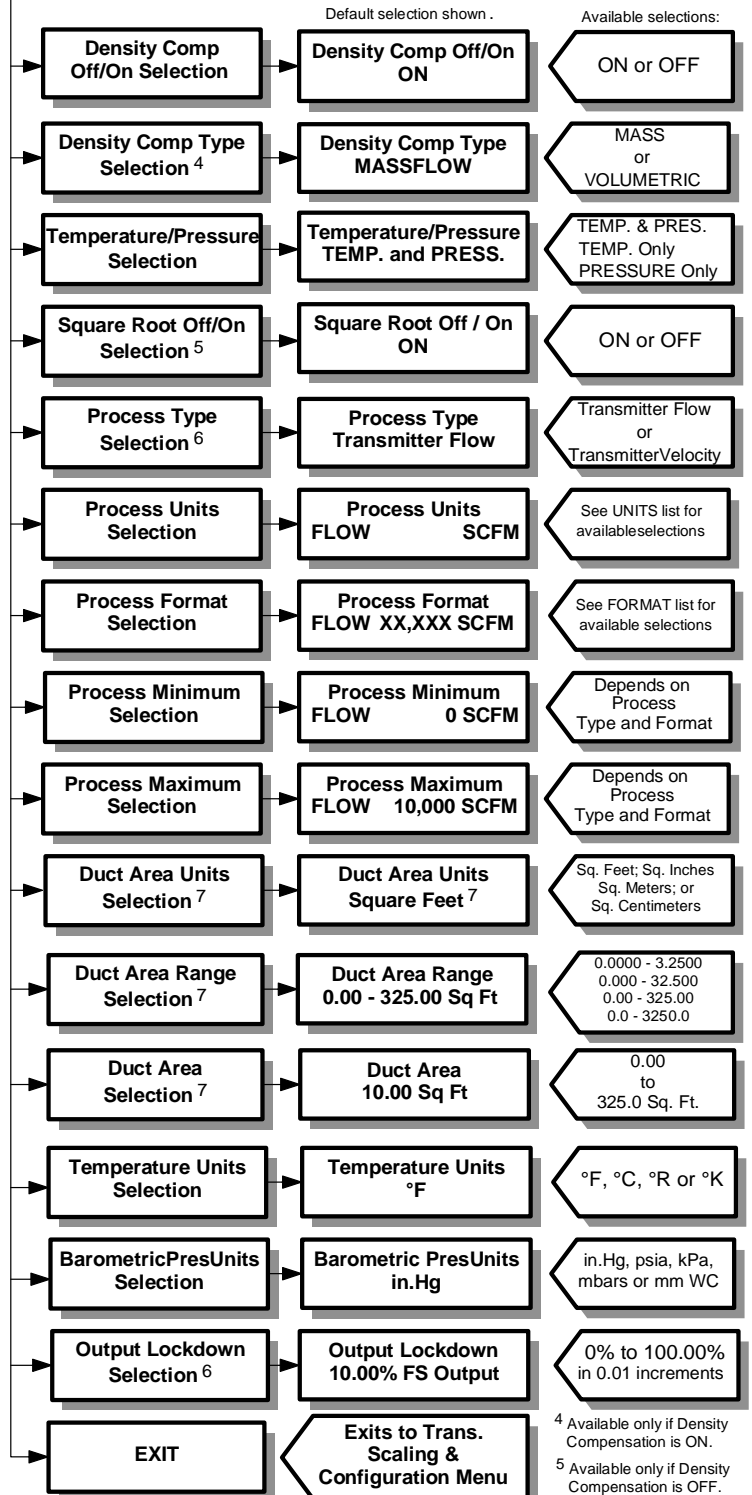
- Operator Password Selection
- ➔ **Trans. Scaling & Config.**
- Low Pass Filter Selection

**Trans. Scaling & Configuration**

- Process Configuration
- Temperature Configuration<sup>1</sup>
- Absolute Pressure Configuration<sup>2</sup>
- Calc. for Max Diff Pres or Flow<sup>3</sup>
- Return to MAIN MENU

<sup>1</sup> Not available if PRESSURE Only is selected in Process Configuration.  
<sup>2</sup> Not available only if TEMPERATURE Only is selected in Process Config.  
<sup>3</sup> Available only if Square Root is ON in Process Configuration.

**Process Configuration**



<sup>4</sup> Available only if Density Compensation is ON.  
<sup>5</sup> Available only if Density Compensation is OFF.  
<sup>6</sup> Not available if Square Root is OFF. If Square Root is OFF, Process Type is Differential Pressure (D.P.).  
<sup>7</sup> Available only if Process Type is Transmitter Flow. Available units depends on Process Type selected.

## 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

1. While in Main Menu, use **UP** or **DN** to scroll to:

|  |
|--|
| Transmitter Scaling<br>and Configuration |
|--|

2. Press **ENT** to enter Transmitter Scaling & Configuration menu. Display will indicate:

|                          |
|--------------------------|
| Process<br>Configuration |
|--------------------------|

3. Press **ENT** to enter the Process Configuration sub-menu. Display will indicate:

|                                   |
|-----------------------------------|
| Density Comp. Off/On<br>Selection |
|-----------------------------------|

4. Press **ENT** and display will indicate current setting of Density Compensation (OFF or ON).

5. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**, new setting will be stored in memory and display will return to Process Configuration sub-menu as in Step 3.

Note: If user desires not to change the setting and return to the Process Configuration sub-menu, press **ESC**. Unit will remain programmed as it was originally.

6. Use **UP** or **DN** to select remaining parameters to be changed within the Process Configuration sub-menu.

See the follow Units Lists for the available Process Units selections for the appropriate Process Type.  
See the following Format List for the available Process Format selections.

7. Follow Step 5 to make any changes to parameters.

8. To return to the Transmitter Scaling & Configuration menu, select EXIT in the Process Configuration sub-menu and press **ENT**.

Note: If Process Minimum is selected to be a value greater than zero (0), Transmitter Output 1 will not increase until the actual process exceeds this selected value. This is known as "Zero Suppression".

Zero Suppression (Process Minimum) can be set up to 60% of the Process Maximum selected.

Display of process is not affected by this selection, and will indicate the actual process value.

If optional Analog Output 4 is selected to represent TRANSMITTER, it will act the same as Transmitter Output 1.

**5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)**

| UNITS LIST for Process Type – Flow |                                  |       |
|------------------------------------|----------------------------------|-------|
| NOTE<br>1                          | cubic feet per second            | CFS   |
|                                    | cubic feet per minute            | CFM   |
|                                    | cubic feet per hour              | CFH   |
|                                    | liters per second                | l/s   |
|                                    | liters per minute                | l/m   |
|                                    | liters per hour                  | l/hr  |
|                                    | cubic meters per second          | m3/s  |
|                                    | cubic meters per minute          | m3/m  |
|                                    | cubic meters per hour            | m3/hr |
| NOTES<br>1 & 2                     | Actual cubic feet per second     | ACFS  |
|                                    | Actual cubic feet per minute     | ACFM  |
|                                    | Actual cubic feet per hour       | ACFH  |
|                                    | Actual liters per second         | Al/s  |
|                                    | Actual liters per minute         | Al/m  |
|                                    | Actual liters per hour           | Al/hr |
|                                    | Actual cubic meters per second   | Am3/s |
|                                    | Actual cubic meters per minute   | Am3/m |
|                                    | Actual cubic meters per hour     | Am3/h |
| NOTES<br>1 & 3                     | Standard cubic feet per second   | SCFS  |
|                                    | Standard cubic feet per minute   | SCFM  |
|                                    | Standard cubic feet per hour     | SCFH  |
|                                    | Standard liters per second       | Sl/s  |
|                                    | Standard liters per minute       | Sl/m  |
|                                    | Standard liters per hour         | Sl/hr |
|                                    | Standard cubic meters per second | Sm3/s |
|                                    | Standard cubic meters per minute | Sm3/m |
|                                    | Standard cubic meters per hour   | Sm3/h |
|                                    | Normal liters per second         | NI/s  |
|                                    | Normal liters per minute         | NI/m  |
|                                    | Normal liters per hour           | NI/hr |
|                                    | Normal cubic meters per second   | Nm3/s |
|                                    | Normal cubic meters per minute   | Nm3/m |
|                                    | Normal cubic meters per hour     | Nm3/h |
|                                    | pounds per second                | lb/s  |
|                                    | pounds per minute                | lb/m  |
|                                    | pounds per hour                  | lb/hr |
|                                    | Tons per hour                    | T/hr  |
|                                    | Tons per day                     | T/day |
|                                    | grams per second                 | gm/s  |
| kilograms per second               | kg/s                             |       |
| kilograms per minute               | kg/m                             |       |
| kilograms per hour                 | kg/hr                            |       |
| Percent                            | %                                |       |

Notes:

1. All units listed are available if Density Compensation is OFF.
2. Only these units are available if Density Compensation is ON and Type is Volumetric.
3. Only these units are available if Density Compensation is ON and Type is Mass.

**5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)**

| UNITS LIST<br>for Process Type – Velocity |                            |         |
|---|----------------------------|---------|
|   | UNIT OF MEASUREMENT        | DISPLAY |
| NOTE<br>1                                 | feet per second            | FPS     |
|   | feet per minute            | FPM     |
|   | feet per hour              | FPH     |
|   | meters per second          | m/s     |
|   | meters per minute          | m/m     |
|   | meters per hour            | m/hr    |
| NOTES<br>1 & 2                            | Actual feet per second     | AFPS    |
|   | Actual feet per minute     | AFPM    |
|   | Actual feet per hour       | AFPH    |
|   | Actual meters per second   | Am/s    |
|   | Actual meters per minute   | Am/m    |
|   | Actual meters per hour     | Am/hr   |
|   | Percent                    | %       |
| NOTES<br>1 & 3                            | Standard feet per second   | SFPS    |
|   | Standard feet per minute   | SFPM    |
|   | Standard feet per hour     | SFPH    |
|   | Standard meters per second | Sm/s    |
|   | Standard meters per minute | Sm/m    |
|   | Standard meters per hour   | Sm/hr   |
|   | Normal meters per second   | Nm/s    |
|   | Normal meters per minute   | Nm/m    |
|   | Normal meters per hour     | Nm/hr   |
|   | Percent                    | %       |

Notes:

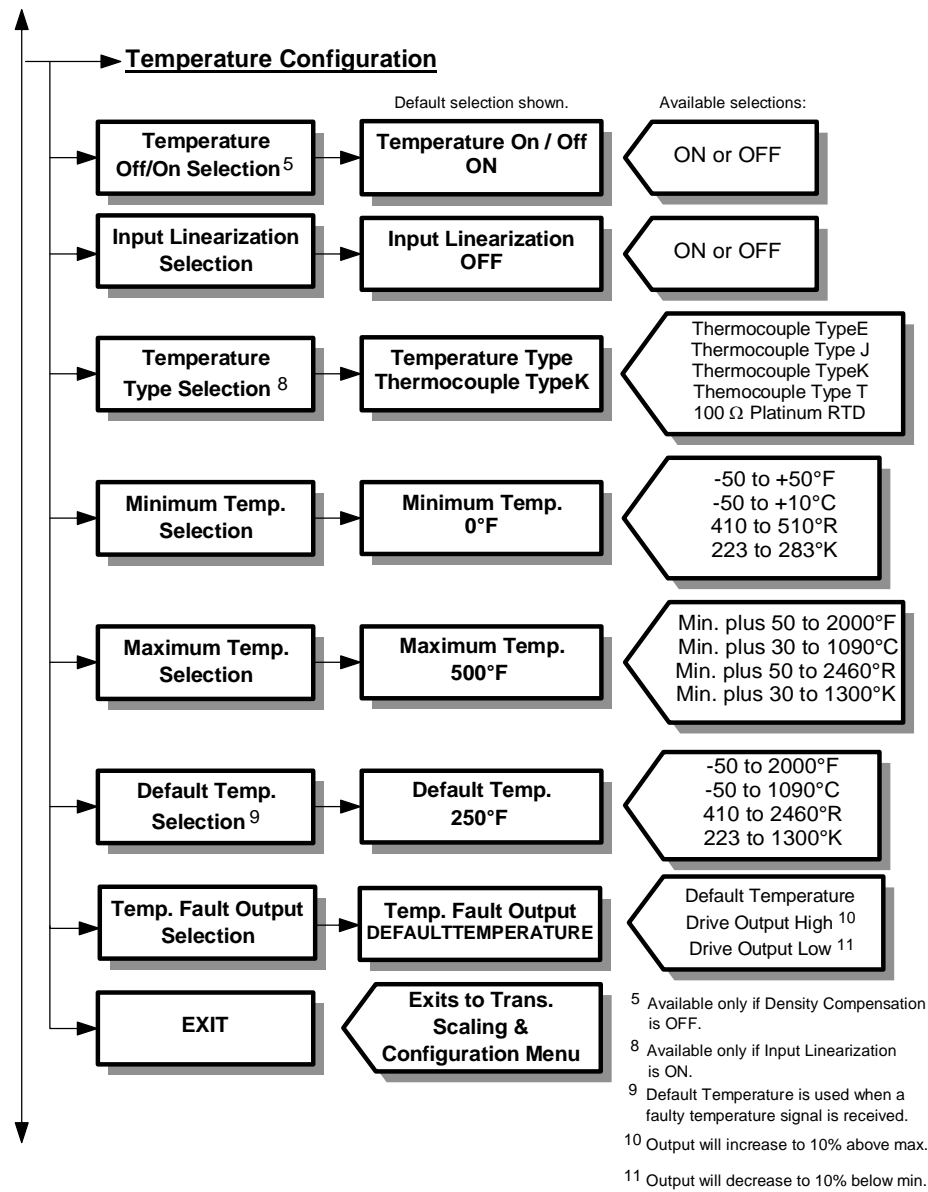
1. All units listed are available if Density Compensation is OFF.
2. Only these units are available if Density Compensation is ON and Type is Volumetric.
3. Only these units are available if Density Compensation is ON and Type is Mass.

**5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)**

| <b>UNITS LIST<br/>for Process Type – Differential Pressure</b> |                   |
|--|-------------------|
| <b>UNIT OF MEASUREMENT</b>                                     | <b>DISPLAY</b>    |
| inches of water column   | in.WC             |
| inches of mercury  | in.Hg             |
| pounds per square inch, gauge                                  | psig              |
| Pascals  | Pa                |
| kilo Pascals   | kPa               |
| bars   | bars              |
| millibars  | mbars             |
| millimeter of water column                                     | mm WC             |
| millimeter of mercury  | mm Hg             |
| kilograms per square meter                                     | kg/m <sup>2</sup> |
| Percent  | %                 |

| <b>FORMAT LIST</b> |                         |
|--------------------|-------------------------|
| .0XXXXX            | (–.025000 to .025000)   |
| 0.XXXXXX           | (–0.25000 to 0.25000)   |
| X.XXXX             | (–2.5000 to 2.5000)     |
| XX.XXX             | (–25.000 to 25.000)     |
| XXX.XX             | (–250.00 to 250.00)     |
| X,XXX.X            | (–2,500.0 to 2,500.0)   |
| XX,XXX             | (–25,000 to 25,000)     |
| XXX,XX0            | (–250,000 to 250,000)   |
| XXXX,X00           | (–2500,000 to 2500,000) |
| XXXX,000           | (–9999,000 to 9999,000) |

### 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)



9. While in Transmitter Scaling & Configuration menu, use **UP** or **DOWN** to scroll to:

Temperature Configuration

10. Press **ENT** to enter the Temperature Configuration sub-menu.

If Density Compensation is ON (see Process Configuration above), display will indicate:

Input Linearization Selection

If Density Compensation is OFF display will indicate:

Temperature Off/On Selection

11. Press **ENT** and display will indicate current selection of applicable menu from Step 10.



### 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

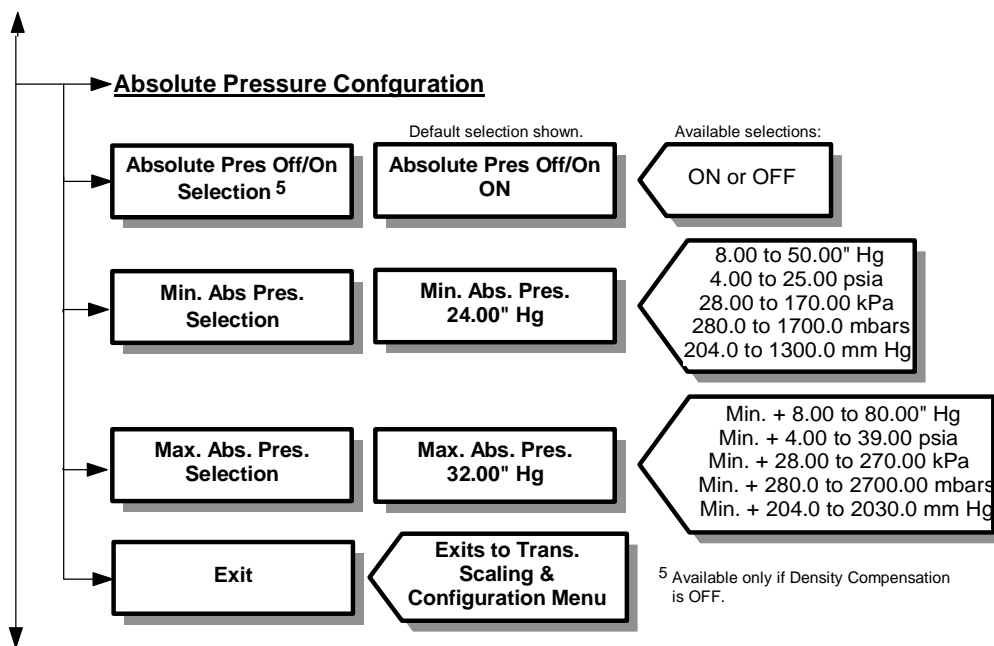
12. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**, new setting will be stored in memory and display will return to the Temperature Configuration sub-menu as in Step 10.

Note: If Operator desires not to change the setting and return to the Temperature Configuration sub-menu, press **ESC**. Unit will remain programmed as it was originally.

13. Use **UP** or **DN** to select remaining parameters to be changed within the Temperature Configuration sub-menu.

14. Follow Step 12 to make any changes to parameters.

15. To return to the Transmitter Scaling & Configuration menu, select EXIT in the Temperature Configuration sub-menu and press **ENT**.



16. While in Transmitter Scaling & Configuration menu, use **UP** or **DN** to scroll to:

Absolute Pressure Configuration

17. Press **ENT** to enter the Absolute Pressure Configuration sub-menu.

If Density Compensation is ON (see Process Configuration above), display will indicate:

Min Abs. Pressure Selection

If Density Compensation is OFF (see Process Configuration above), display will indicate:

Abs. Pressure Off/On Selection

18. Press **ENT** and display will indicate current selection of applicable menu from Step 17.

## 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

19. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**, new setting will be stored in memory and display will return to the Absolute Pressure Configuration sub-menu as in Step 17.

Note: If Operator desires not to change the setting and return to the Absolute Pressure Configuration sub-menu, press **ESC**. Unit will remain programmed as it was originally.

20. Use **UP** or **DN** to select remaining parameters to be changed within the Absolute Pressure Configuration sub-menu.

21. Follow Step 19 to make any changes to parameters.

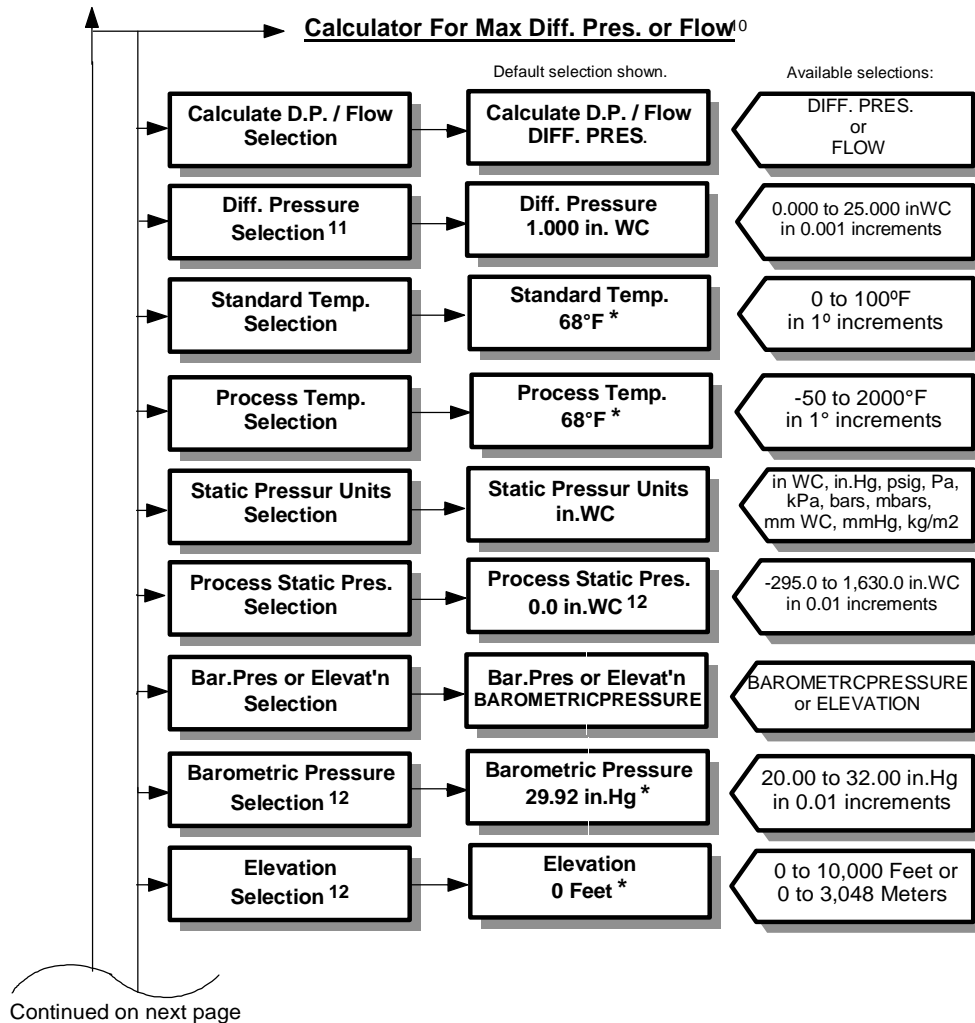
22. To return to the Transmitter Scaling & Configuration menu, select EXIT in the Absolute Pressure Configuration sub-menu and press **ENT**.

### 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

Operator should not need to use the following Calculator unless:

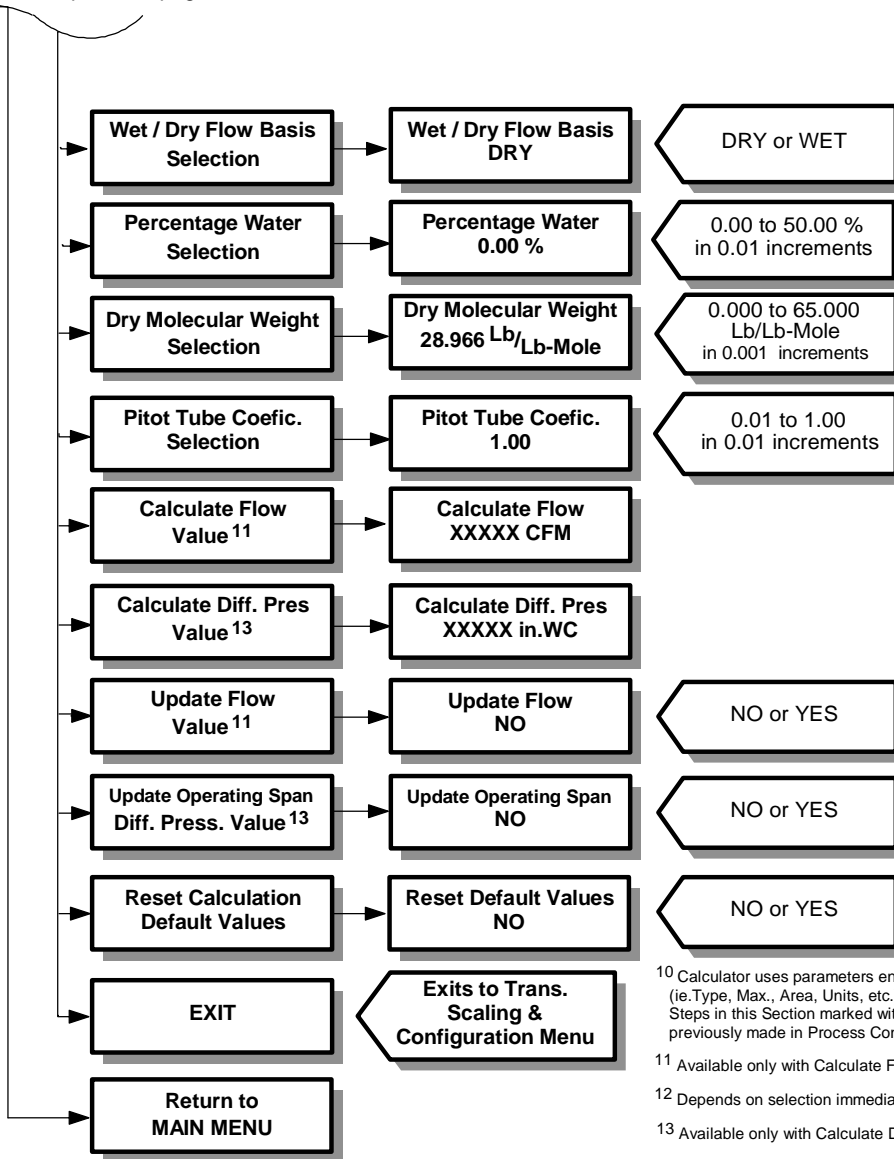
- a. Process parameters have changed and new Differential Pressure or Flow values are needed.
- b. Mid-point operating Differential Pressure or Flow values are wanted.
- c. It is desired to implement a single-point density compensation for process temperature and/or absolute pressure that is significantly different than standard conditions (68°F and 29.92" Hg).

Values entered in this section will have no effect on normal operation unless Operator enters YES in the Update Flow/ Operating Span Value menu item (see below).



**5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)**

Continued from previous page



<sup>10</sup> Calculator uses parameters entered in Process Configuration (ie.Type, Max., Area, Units, etc.) as necessary to perform calculation. Steps in this Section marked with \* indicate values or choices previously made in Process Configuration.

<sup>11</sup> Available only with Calculate Flow.

<sup>12</sup> Depends on selection immediately above.

<sup>13</sup> Available only with Calculate D.P.

## 5.8 – TRANSMITTER SCALING & CONFIGURATION (con't)

As an example of how to utilize the calculator, the following shows how to change the Operating Span if the process temperature is 150°F.

23. While in Transmitter Scaling & Configuration menu, use **UP** or **DN** to scroll to:

Calculator for Max  
Diff. Pres. or Flow

24. Press **ENT** to enter the Calculator for Max Diff. Pres. or Flow sub-menu.  
Display will indicate:

Calculate D.P./Flow  
Selection

25. Press **ENT** and display will indicate:

Calculate D.P./Flow  
DIFF. PRES.

26. Press **ENT** and then **UP** twice and display will indicate:

Process Temperature  
Selection

27. Press **ENT** and use **UP** button until temperature reads 150°F.

28. Press **ENT** and scroll to:

Calculate Diff. Pres  
Value

29. Press **ENT** and a new value for Differential Pressure will be displayed.

30. Press **ENT** and then **UP** and display will read:

Update Operating Span  
Diff. Pres. Value

31. Press **ENT**, scroll to YES and press **ENT**, display will return to that shown in Step 30, and new operating span will be stored in memory.

Note: If during this step, display indicated CAL. SPAN NOT UPDATED NAT. SPAN TOO LOW or HIGH, new span is less than 40% or greater than 100% of the natural span of the transducer installed. User should contact Factory for further assistance (see section 11.0).

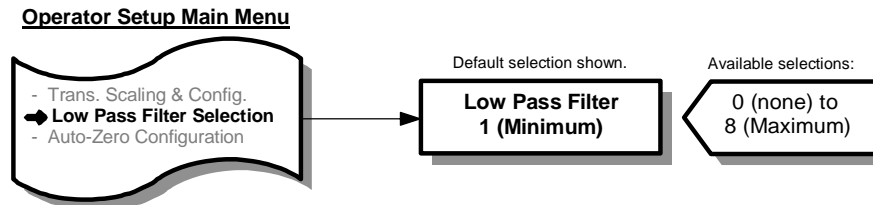
32. To return to the Transmitter Scaling & Configuration menu, select EXIT in the Calculator for Max Diff. Pres. or Flow sub-menu and press **ENT**.

33. To return to the Main Menu, select Return to MAIN MENU in the Transmitter Scaling & Configuration menu and press **ENT**.

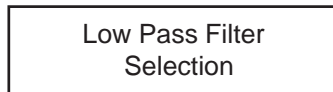
### 5.9 – LOW PASS FILTER SELECTION

User can select level of filtering applied to the transducer output\*. Levels are 0 to 8, with 0 representing no filtering, 1 representing minimal filtering (0.5 sec time constant), and 8 representing maximum filtering (64 sec time constant).

\*This filtering affects all subsequent outputs, displays, special function, alarms, etc., that utilize the transducer output.



1. While in Main Menu, use **UP** or **DN** to scroll to:

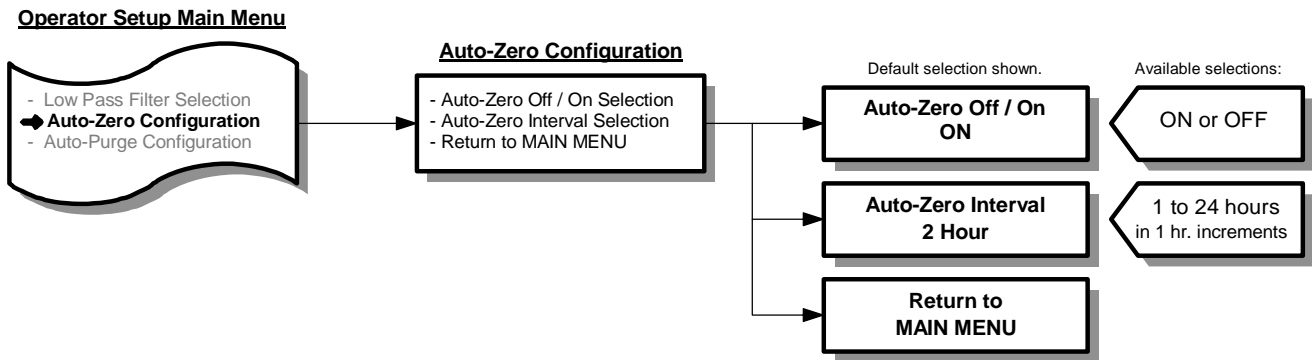


2. Press **ENT** and display indicates current setting of Low Pass Filter; 0 (none) to 8 (Maximum).
3. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT** and new setting will be stored in memory and display will return to Main Menu.

Note: If user desires not to change the setting and return to Main Menu, press **ESC**. Unit will remain programmed as it was originally.

### 5.10 – AUTO-zero CONFIGURATION

User can turn AUTO-zero function ON or OFF, and select activation interval.



1. While in Main Menu, use **UP** or **DN** to scroll to:
 

|                         |
|-------------------------|
| Auto-Zero Configuration |
|-------------------------|
2. Press **ENT** to enter AUTO-zero Configuration menu. Display will indicate:
 

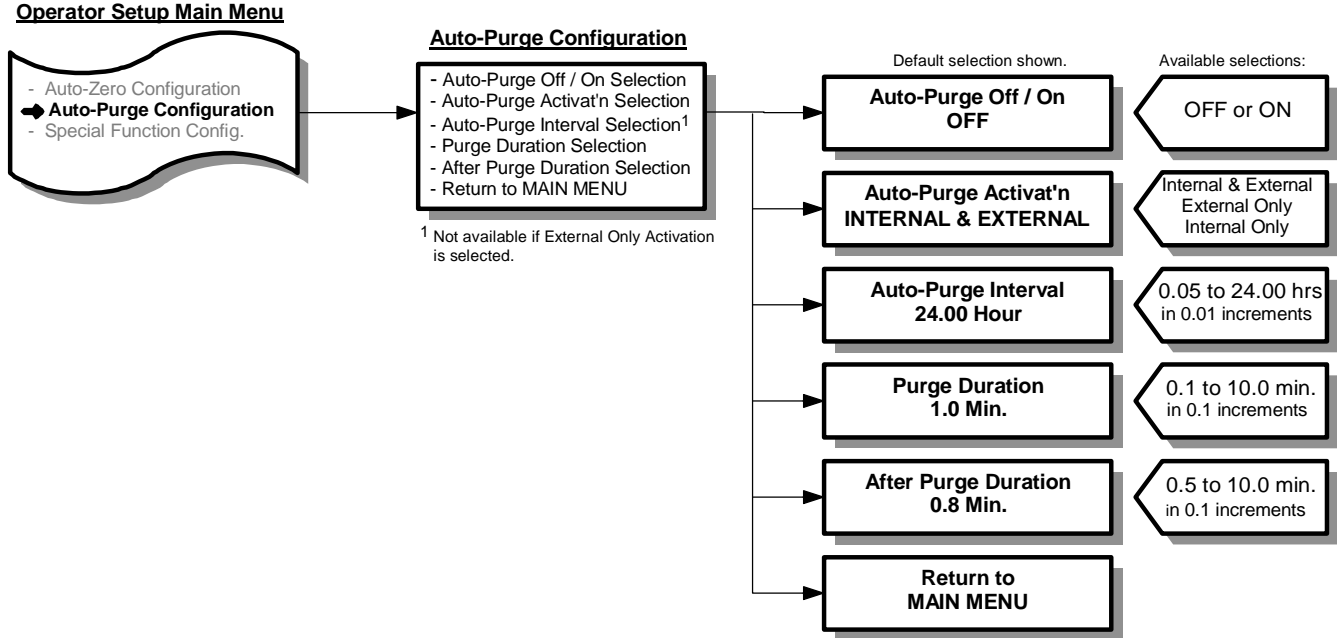
|                            |
|----------------------------|
| Auto-Zero Off/On Selection |
|----------------------------|
3. Press **ENT** and display will indicate current setting of AUTO-zero (OFF or ON).
4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT** and new setting will be stored in memory and display will return to AUTO-zero Configuration menu as in Step 2.

Note: If user desires not to change the setting and return to AUTO-zero Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

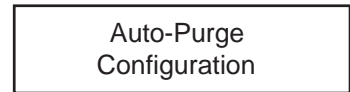
5. Use **UP** or **DN** to select remaining parameters to be changed.
6. Follow Step 4 to make any changes to parameters.
7. To return to Main Menu, select Return to MAIN MENU in AUTO-zero Configuration menu and press **ENT**.

### 5.11 – AUTO-purge CONFIGURATION

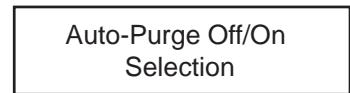
User can turn AUTO-purge function ON or OFF, select method of activation, activation interval, purge duration, and after purge duration.



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** to enter AUTO-purge Configuration menu. Display will indicate:



3. Press **ENT** and display will indicate current setting of AUTO-purge (OFF or ON).

4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to Auto-purge Configuration menu as in Step 2.

Note: If user desires not to change the setting and return to AUTO-purge Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

5. Use **UP** or **DN** to select remaining parameters to be changed.

6. Follow Step 4 to make any changes to parameters.

7. To return to Main Menu, select Return to MAIN MENU in AUTO-purge Configuration menu and press **ENT**.



### 5.12 – SPECIAL FUNCTION CONFIGURATION

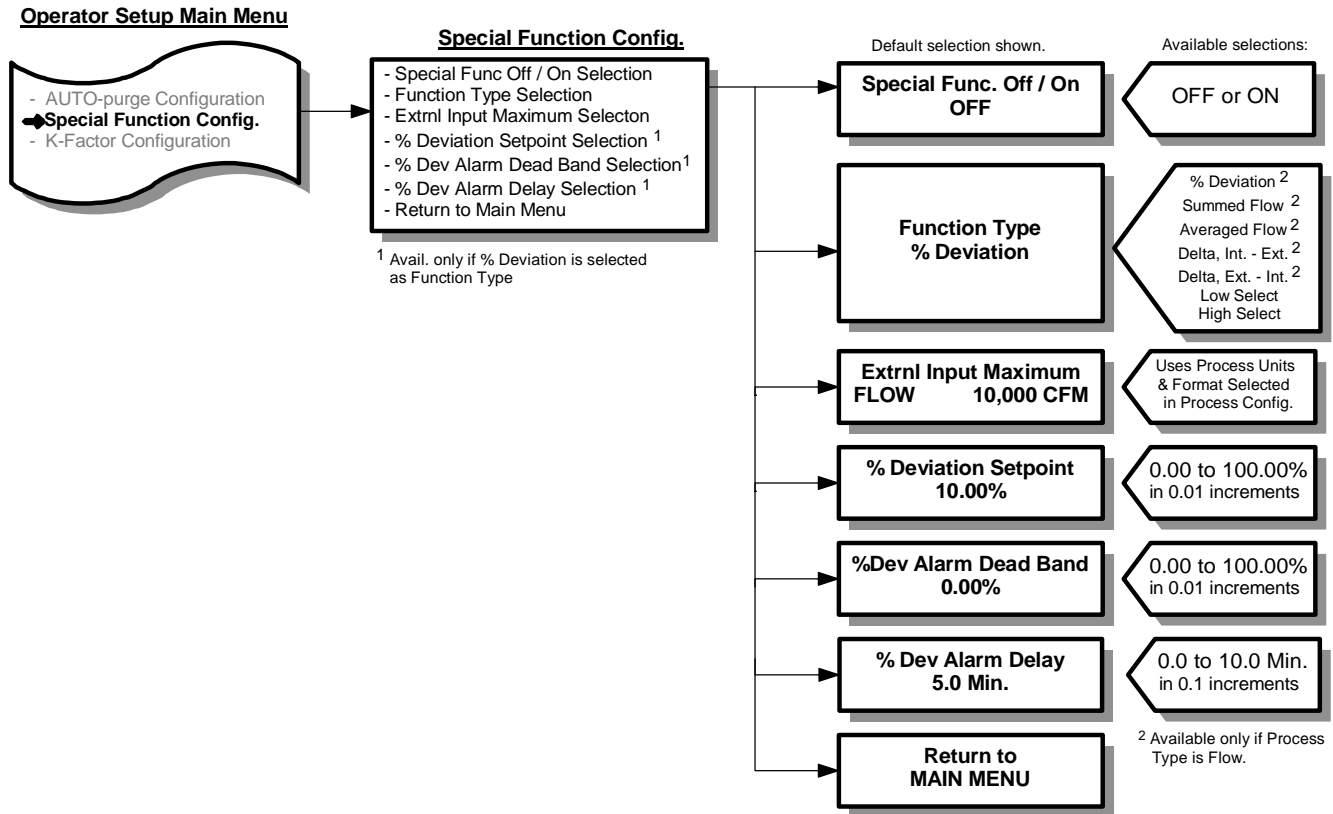
Operator can turn Special Function ON or OFF, select type of function (See Section 3.6 – Features, for description of the different special functions), and set the following values:

**External Input Maximum:** This value represents the maximum value of the external input. This value is used if External Special Function Input is selected as a display parameter.

**Percent Deviation Setpoint:** (Note: Available only if Percent Deviation is selected as Function Type.) The percent difference between the transmitter signal and an external input that will cause an alarm condition when exceeded.

**Alarm Deadband:** (Note: Available only if Percent Deviation is selected as Function Type.) A percentage below the percent deviation setpoint which the deviation must reach to reset an activated alarm.

**Alarm Delay:** (Note: Available only if Percent Deviation is selected as Function Type.) Time between an alarm condition existing and alarm activation. Adjustable between 0.0 and 10.0 minutes in 0.1 minute increments.



## 5.12 – SPECIAL FUNCTION CONFIGURATION (con't)

1. While in Main Menu, use **UP** or **DN** to scroll to:

Special Function  
Configuration

2. Press **ENT** to enter Special Function Configuration menu. Display will indicate:

Special Func. Off/On  
Selection

3. Press **ENT** and display will indicate current setting of Special Function (OFF or ON).
4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to Special Function Configuration menu as in Step 2.

Note: If user desires not to change the setting and return to Special Function Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

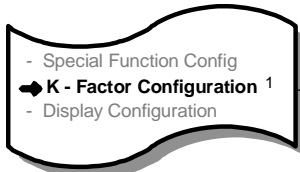
5. Use **UP** or **DN** to select remaining parameters to be changed.
6. Follow Step 4 to make any changes to parameters.
7. To return to Main Menu, select Return to MAIN MENU in Special Function Configuration menu and press **ENT**.

### 5.13 – K-FACTOR CONFIGURATION

**Caution.** In the majority of applications, the use of a K-Factor is neither required nor desirable. Before using the K-Factor feature, contact the Service Department (see Section 11) to review the application and obtain assistance in determining the K-Factor gain and bias values.

Operator can turn K-factor function ON or OFF, calculate a K-Factor gain and bias based on measured data, or select a K-Factor gain value and K-Factor bias value. The K-Factor gain is a number applied as a multiplier to the differential pressure, and the K-Factor bias is an offset added to the differential pressure. Note: If K-Factor is ON, Process displays will have an asterisk (\*) after the description (i.e. FLOW\*).

**Operator Setup Main Menu**

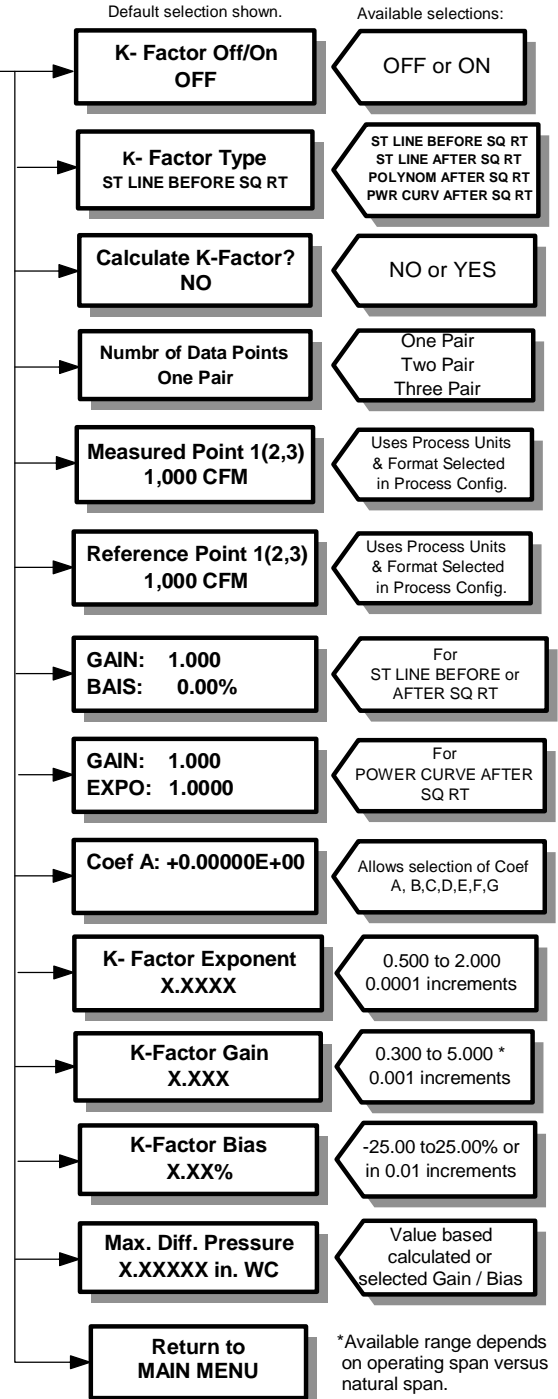


<sup>1</sup> Not available if Process Type is D.P. (see Transmitter Scaling & Config.)

**K- Factor Configuration**

- K - Factor Off/On Selection
- K - Factor Type Selection
- Calculate K-Factor? Selection <sup>2</sup>
- Numbr of Data Points Selection <sup>3</sup>
- Measured Point 1 (2,3) Selection <sup>3</sup>
- Reference Point 1 (2,3) Selection <sup>3</sup>
- Perform Calculation <sup>3</sup>
- Coefficient A (B,C,D,E,F,G) Selection <sup>4</sup>
- K - Factor Exponent Selection <sup>5</sup>
- K - Factor Gain Selection <sup>5</sup>
- K - Factor Bias Selection <sup>5</sup>
- Display Max D.P. <sup>2</sup>
- Return to MAIN MENU

<sup>2</sup> Not available if K-Factor Type is Polynomial.  
<sup>3</sup> Available only if YES is selected in Calculate K-Factor?  
<sup>4</sup> Available only if K-Factor Type is Polynomial.  
<sup>5</sup> Available only if NO is selected in Calculate K-Factor? and depends on Type of K-Factor.



### 5.13 – K-FACTOR CONFIGURATION (con't)

1. While in Main Menu, use **UP** or **DN** to scroll to:

K-Factor  
Configuration

2. Press **ENT** to enter K-Factor Configuration menu. Display will indicate:

K-Factor Off/On  
Selection

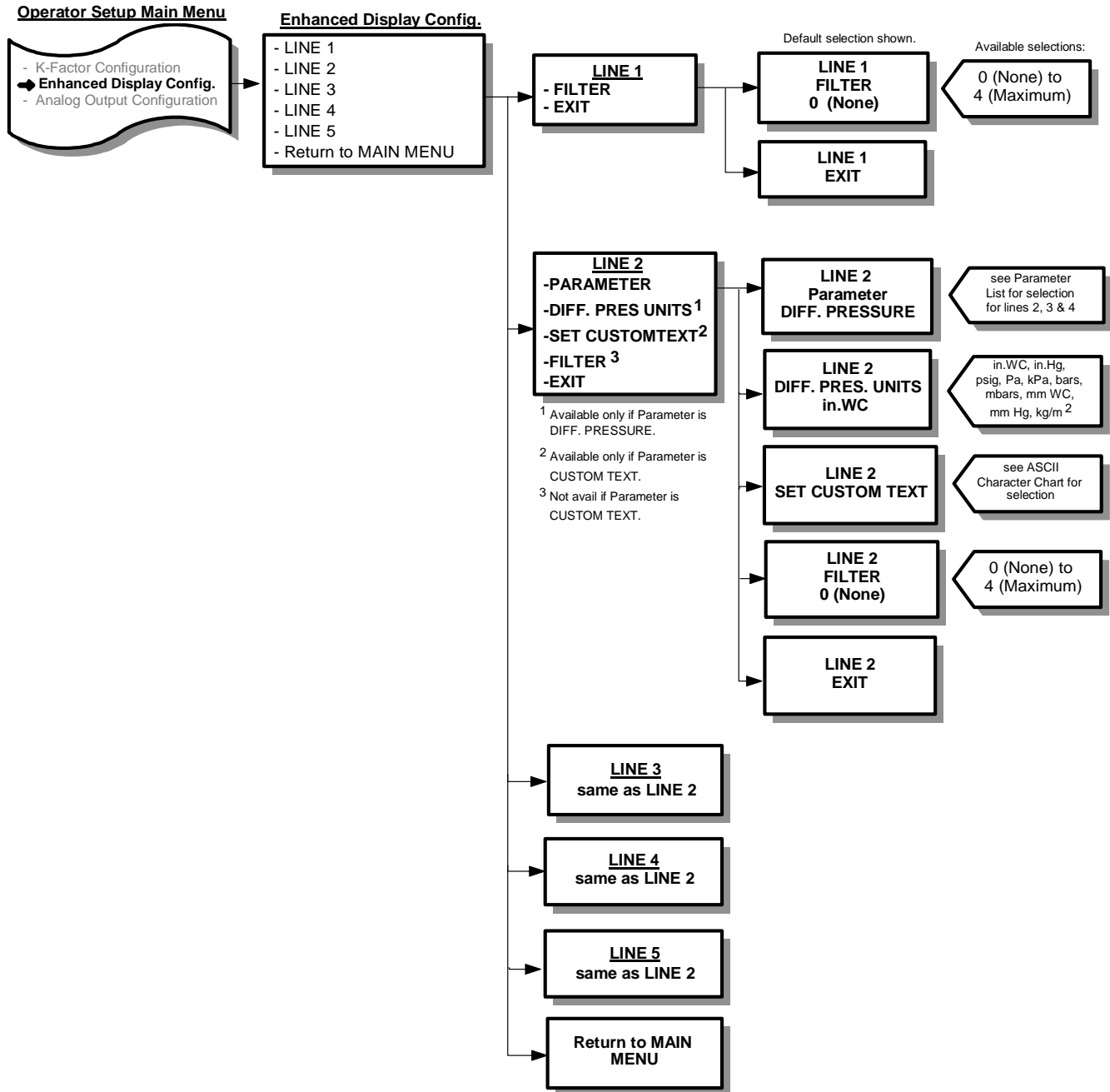
3. Press **ENT** and display will indicate current setting of K-Factor (OFF or ON).
4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to K-Factor Configuration menu as in Step 2.

Note: If user desires not to change the setting and return to K-Factor Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

5. Use **UP** or **DN** to select remaining parameters to be changed.
6. Follow Step 4 to make any changes to parameters.
7. To return to Main Menu, select Return to MAIN MENU in parameter menu and press **ENT**.

### 5.14 – ENHANCED DISPLAY CONFIGURATION

Operator can select display parameter, for lines 2, 3, 4, and 5. Also, each line can have a level of filtering, 0 through 4 (4 is maximum) selected by Operator.



1. While in Main Menu, use **UP** or **DN** to scroll to:

Enhanced Display Configuration

2. Press **ENT** to enter Enhanced Display Configuration menu. Display will indicate:

LINE 1

3. Press **ENT** to enter Setup menu. Display will indicate:

LINE 1 FILTER

### 5.14 – ENHANCED DISPLAY CONFIGURATION (con't)

4. Press **ENT**, and display will indicate current setting of the filter [0 (None), 1 (Minimum), 2, 3, or 4 (Maximum)].
5. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to Enhanced Display Configuration menu as in Step 3.

Note: If user desires not to change the setting and return to Enhanced Display Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

6. Press **UP** and display will indicate:
 

LINE 1  
EXIT
7. Press **ENT** then **UP** and display will indicate:
 

LINE 2
8. Press **ENT** and display will indicate:
 

LINE 2  
PARAMETER
9. Press **ENT** and display will indicate current parameter selected to display on Line 2 (see Parameter List at the end of this section for available selections).
10. Use **UP** or **DN** to scroll to desired parameter. Press **ENT** and parameter will be stored in memory and display will indicate as in Step 8.

Note: If user desires not to change the setting and return to Setup menu, press **ESC**. Unit will remain programmed as it was originally.

11. If CUSTOM TEXT was selected and **ENT** pressed in Step 10, proceed to Step 20. For other parameters, continue with Step 12.
12. Press **UP** and display will indicate:
 

LINE 2  
FILTER

Note: Filter selection will not be available if selected parameter is ALARM SETPOINT.

13. Press **ENT** and display will indicate current Filter setting selected for Line 2 [0 (None), 1 (Minimum), 2, 3, or 4 (Maximum)].
14. Use **UP** or **DN** to scroll to desired filter setting. Press **ENT** and filter setting will be stored in memory and display will indicate as in Step 12.
15. Press **UP** and display will indicate:
 

LINE 2  
EXIT

16. Press **ENT** then **UP** and display will indicate:
 

LINE 3

### 5.14 – ENHANCED DISPLAY CONFIGURATION (con't)

17. Repeat Steps 8 through 16 for Line 3, 4, and 5. The only differences being the change of Line # in the display.

18. After Line 4 has been set, Step 16 will yield a display:

Return to  
MAIN MENU

19. Press **ENT** to return to Main Menu.

20. If Custom Text was selected and **ENT** pressed in Step 10, (for any line 2, 3, 4, 5), press **UP** and display will indicate:

LINE 2  
SET CUSTOM TEXT

21. Press **ENT**, display will indicate:

LINE 2  
SET CUSTOM TEXT

Cursor indicates position to be set.  
There are 20 positions available to hold custom text.

22. Use **UP** or **DN** to scroll through available characters (see ASCII Chart at the end of this section for available characters).

23. When desired character is displayed, press **ENT**, character will be stored and cursor will advance one position to the right.

24. Repeat Steps 22 and 23 for all 20 positions. When position 20 is entered, user will be exited back to display as in Step 20.

25. Press **UP** and display will indicate:

LINE 2  
EXIT

26. Press **ENT** then **UP** and display will indicate:

LINE 3

27. Repeat Steps 8 through 16 for Line 3, 4, and 5. The only differences being the change of Line # in the display.

Note: In "Set Custom Text" mode, the pushbuttons can be used in the following combinations to facilitate programming:

**ESC + UP:** Moves position cursor to the right, one position at a time.

**ESC + DN:** Moves position cursor to the left, one position at a time.

**ESC + ENT:** Exits "Set Custom Text". Does not enter any changes to the display since the last time **ENT** was pressed.

**UP + DN:** Jumps up five characters at a time, to the desired character.

**DN + UP:** Jumps down five characters at a time, to the desired character.

**5.14 – ENHANCED DISPLAY CONFIGURATION (con't)**

| PARAMETER LIST for Lines 2, 3, 4 and 5   |   |
|--|---|
| PARAMETER  | DISPLAY IN "NORMAL" MODE  |
| NONE   |   |
| DIFF. PRESSURE *   | D. PRESS  |
| TRANSMITTER VELO •   | VELO.   |
| TEMPERATURE  | TEMP.   |
| ABSOLUTE PRESSURE  | ABS PR  |
| EXT. SPEC FUNC INPUT   | SF EXT  |
| SPEC FUNCTION OUTPUT   | %DEV.   |
|  | SUM   |
|  | AVG.  |
|  | DELTA   |
|  | LO SEL  |
|  | HI SEL  |
| ALARM %DEV. SETPOINT ♦   | DEV SP  |
| PERCENT OF PROCESS   | (Display will indicate process type selected in Process Configuration.) |
| CUSTOM TEXT  |   |
| * Available only if Square Root Function is ON.<br>• Available only if Transmitter Flow is selected as Process Type.<br>♦ Available only if Percent Deviation has been selected as a Special Function. |   |

| ASCII Character Chart |   |   |   |   |   |   |   |   |   |   |
|-----------------------|---|---|---|---|---|---|---|---|---|---|
| !                     | * | 3 | < | E | N | W | ` | i | r | { |
| "                     | + | 4 | = | F | O | X | a | j | s |   |
| #                     | ' | 5 | > | G | P | Y | b | k | t | } |
| \$                    | - | 6 | ? | H | Q | Z | c | l | u | ↑ |
| %                     | . | 7 | @ | I | R | [ | d | m | v | ↓ |
| &                     | / | 8 | A | J | S | ¥ | e | n | w |   |
| '                     | 0 | 9 | B | K | T | ] | f | o | x |   |
| (                     | 1 | : | C | L | U | ^ | g | p | y |   |
| )                     | 2 | ; | D | M | V | - | h | q | z |   |



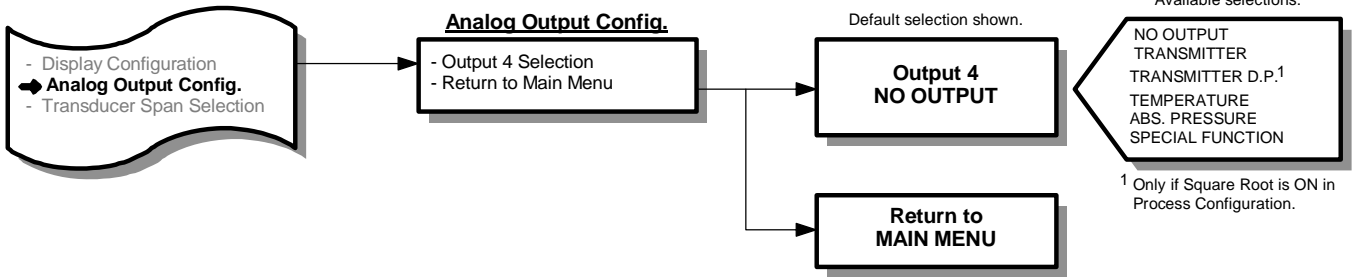
### 5.15 – ANALOG OUTPUT CONFIGURATION

Operator can select which process variable Analog Output 4 represents.

Process variables available for output are:

- Transmitter Differential Pressure
- Transmitter Flow
- Temperature
- Absolute Pressure
- Special Function

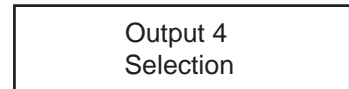
**Operator Setup Main Menu**



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** to enter Analog Output Configuration menu. Display will indicate:



3. Press **ENT** and display will indicate current setting of Analog Output #4 (NO OUTPUT, TRANSMITTER, TRANSMITTER D.P., TEMPERATURE, ABS. PRESSURE, SPECIAL FUNCTION).

4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to Analog Output Configuration menu as in Step 2.

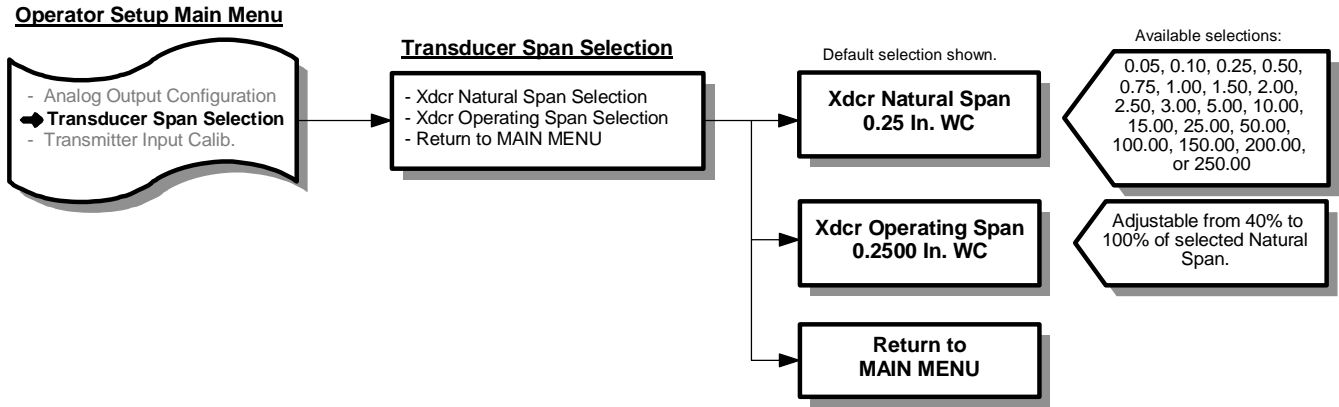
Note: If user desires not to change the setting and return to Analog Output Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

5. To return to Main Menu, select Return to MAIN MENU in Analog Output Configuration menu and press **ENT**.

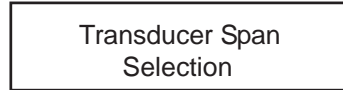
### 5.16 – TRANSDUCER SPAN SELECTION

Displays the transducer's natural span and operating span. The natural span represents the maximum process pressure that the transducer can accept. The displayed natural span is for user/technician reference only and should not be changed unless a new transducer of different natural span has been installed.

The operating span represents the calculated process pressure for a specific application, and can be adjusted 40% to 100% of the natural span.



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** to enter Transducer Span Selection menu. Display will indicate:



3. Press **ENT** and display indicates the natural span of the installed transducer (0.05, 0.10, 0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 2.50, 3.00, 5.00, 10.00, 15.00, 25.00, 50.00, 100.00, 200.00, or 250.00 IN w.c.).

4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT**. New setting will be stored in memory and display will return to Main Menu.

Caution: Only change setting if a transducer of different natural span has been installed.

Note: If user desires not to change the setting and return to Main Menu, press **ESC**. Unit will remain programmed as it was originally.

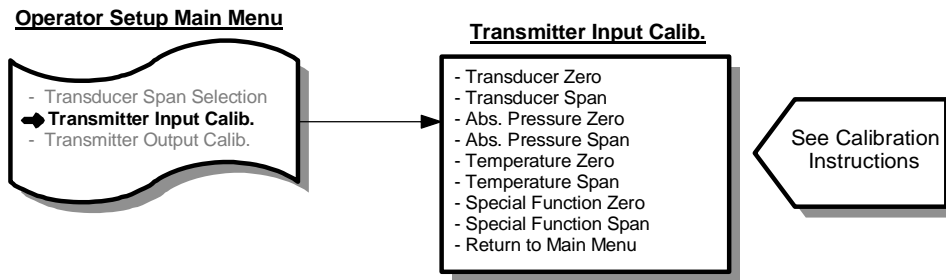
5. Use **UP** or **DN** to select remaining parameters to be changed.

6. Follow Step 4 to make any changes to parameters.

7. To return to Main Menu, select Return to MAIN MENU in Transducer Span Selection Menu and press **ENT**.

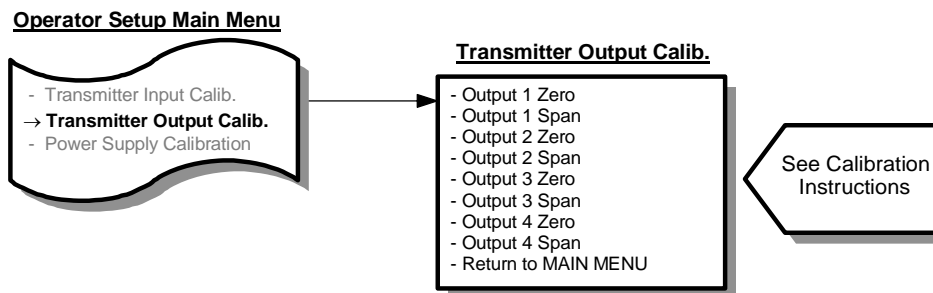
### 5.17 – TRANSMITTER INPUT CALIBRATION

See Section 6.3 – Calibration for details on Transmitter Input Calibration.



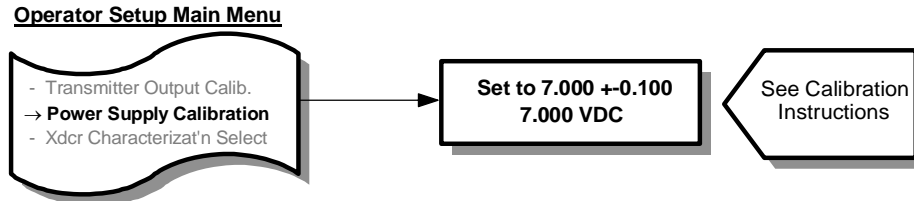
### 5.18 – TRANSMITTER OUTPUT CALIBRATION

See Section 6.4 – Calibration for details on Transmitter Output Calibration.

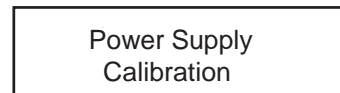


### 5.19 – POWER SUPPLY CALIBRATION

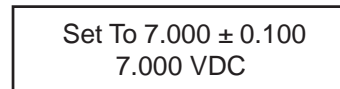
User can adjust power supply voltage to an optimum value. The voltage has been adjusted at the Factory and should not require adjustment.



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** and display will indicate current power supply voltage on line 2.



3. If supply voltage is less than 6.900V or greater than 7.100V, adjust R36 on I/O Board (see Figure 5.2) until acceptable voltage reading is displayed on line 2.

4. When done, press **ENT** to return to Main Menu.

### 5.20 – TRANSDUCER CHARACTERIZATION SELECTION

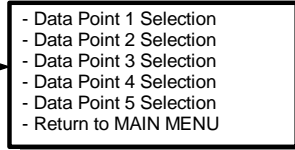
Allows user to enter unique transducer characterization data when the transducer has been changed.

**CAUTION:** – User should not make any changes to the data entered in the following menu items.  
– This data has been entered by the Factory for the specific transducer installed in the unit.  
– Only if the transducer is replaced by the user should new data be entered.  
– This new data along with instructions will be provided with the new transducer from the Factory.

#### Operator Setup Main Menu



#### Xdcr Character. Selection



Default selection shown.

Available selections:

**Data Point 1**  
**0**

-250 to 250 in increments of 1.

**Data Point 2**  
**2,500**

2250 to 2750 in increments of 1.

**Data Point 3**  
**5,000**

4750 to 5250 in increments of 1.

**Data Point 4**  
**7,500**

7250 to 7750 in increments of 1.

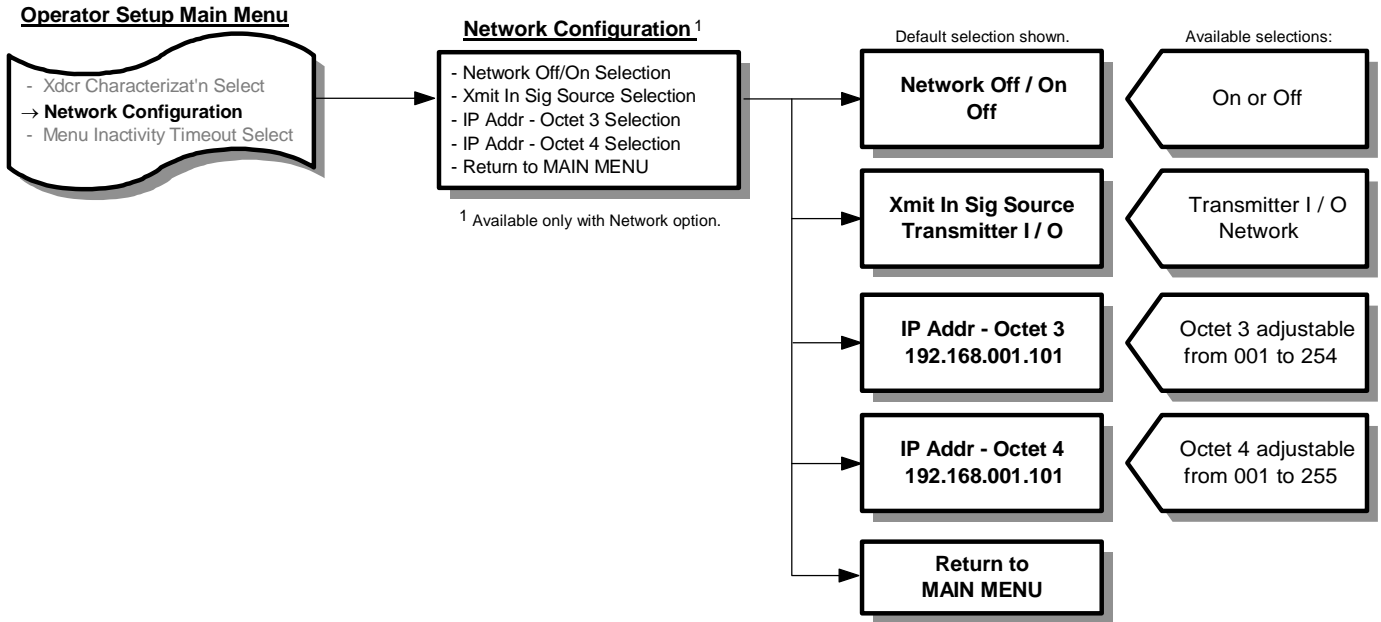
**Data Point 5**  
**10,000**

9750 to 10250 in increments of 1.

**Return to MAIN MENU**

### 5.21 – NETWORK CONFIGURATION

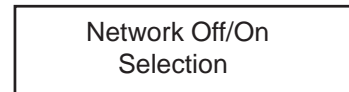
Operator can turn network communications ON or OFF, select source, and assign IP addresses.



1. While in Main Menu, use **UP** or **DN** to scroll to:



2. Press **ENT** to enter Network Configuration menu. Display will indicate:



3. Press **ENT** and display will indicate current setting of Network (OFF or ON).

4. Use **UP** or **DN** to change setting. Once desired setting is displayed, press **ENT** and new setting will be stored in memory and display will return to Network Configuration menu as in Step 2.

Note: If user desires not to change the setting and return to Network Configuration menu, press **ESC**. Unit will remain programmed as it was originally.

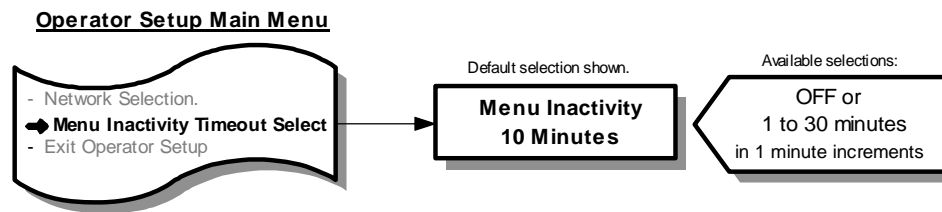
5. Use **UP** or **DN** to select remaining parameters to be changed.

6. Follow Step 4 to make any changes to parameters.

7. To return to Main Menu, select Return to MAIN MENU in Network Configuration menu and press **ENT**.

## 5.22 – MENU INACTIVITY TIMEOUT SELECTION

Allows user to select a time (minutes) after which the unit returns to Normal operation if no activity in the Operator Menu.



1. While in Main Menu, use **UP** or **DN** to scroll to:
 

Menu Inactivity  
Timeout Selection
2. Press **ENT** and display will indicate current timeout value (1 to 30 minutes or OFF).
3. Use **UP** or **DN** to change timeout value. Once desired value is displayed, press **ENT**. New setting will be stored in memory and display will return to Main Menu.

Note: If user desires not to change the setting and return to Main Menu, press **ESC**. Unit will remain programmed as it was originally.

## 5.23 – VERIFICATION OF PURGE PRESSURE

1. Verify there is no purge start command from CAMM or via external signal.
2. Verify supply air valve HV-1 is fully open.
3. Verify air pressure on gauge PI-1 is between 80 and 125 psig. If not, adjust supply air pressure accordingly.
4. To the test tee installed on the total pressure sensing line at the flow station / probe array (see Section 4.4), connect a 0-100 psig pressure gauge.
5. Initiate the AUTO-purge cycle, observe and record the pressure indicated on test gauge. Pressure should be at least 15 psig for the duration of the purge cycle. If not, increase supply air pressure, decrease signal line length between CAMS and flow measuring device, or increase signal line size.
6. Remove gauge installed in Step 4 and seal tee.
7. Initiate a second AUTO-purge cycle, observe and record the pressure indicated on gauge PI-1 in the enclosure. For standard capacity CAMS the pressure must be at least 45 psig for the duration of the purge cycle, and 55 psig for high capacity CAMS. If not, increase the supply air pressure or install an accumulator tank. See Section 4.5.

## 6 – CALIBRATION

This section will detail steps necessary to calibrate the CAMM. Calibration is accomplished using the four programming push buttons detailed in Section 5.

This section can be accomplished with CAMM mounted in its operating location or at a test bench in a calibration lab.

If calibrated at a test bench, CAMM should be positioned in the same attitude as in its operating location.

### 6.1 – REQUIRED EQUIPMENT

1. Digital Manometer capable of reading to the nearest 0.001" w.c.
2. Digital Multimeter.
3. Absolute Pressure gauge capable of reading 0 to 40" Hg.
4. Voltage/Current generator.
5. Source of clean, dry instrument air.
6. Adjustable low pressure regulator, such as AMC "Low Pressure Air Source" or equal.
7. Vacuum pump with regulator.
8. Temperature Simulator.
9. Pressure Regulator.

### 6.2 – PREPARATION

1. Turn CAMM Power switch OFF (see Figure 4.6).
2. Close valves on Total and Static pressure signal lines.
3. Remove test tee caps on Total and Static pressure fittings on CAMM.
4. Remove all signal wires connected to terminals 1 through 10 (see Figure 4.5).
5. Prepare test equipment as shown in Figure 6.1.
6. Turn Power switch ON.

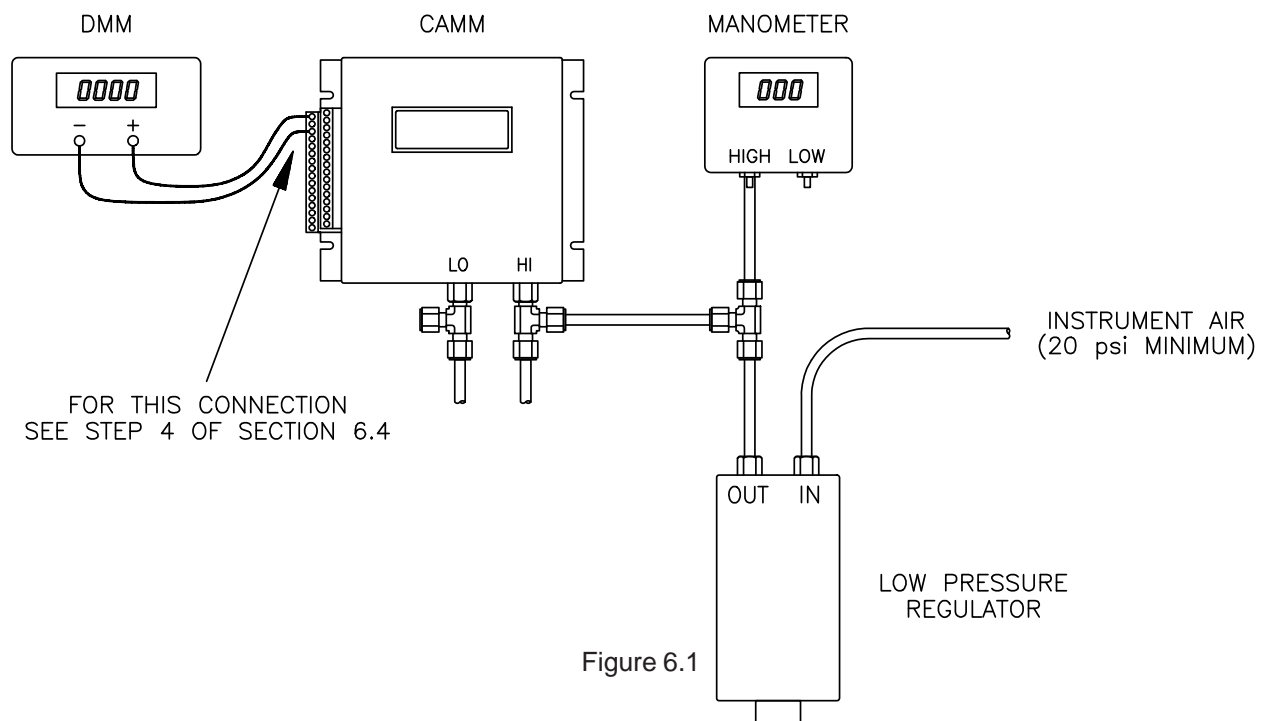


Figure 6.1



### 6.3 – TRANSMITTER INPUT CALIBRATION

#### 6.3.1 Transducer Calibration

Minimum and maximum full scale differential pressure will be applied to the CAMM, unit will be programmed to recognize these pressures as zero and span for transmitter input calibration.

1. While in Main Menu, scroll to:

Transmitter Input  
Calibration

2. Press **ENT**, and display will indicate:

Transducer Zero  
Calib: 0.00 in.WC

3. Press **ENT**, and display will indicate:

Transducer Zero  
-- Push ENTER --

4. Press **ENT**, and display will indicate:

Transducer Zero  
Settle Time:4 Sec

Display will count down to 0, after which it will indicate:

Input Zero Done  
-- Push ESCAPE --

5. Press **ESC** and then **UP**, display will indicate:

Transducer Span  
Calib: X.XX in.WC

6. Apply input pressure (as read on manometer) to the High port of the CAMM. Adjust pressure to equal the transducer natural span value, which is indicated on the display.

7. Press **ENT**, and display will indicate:

Transducer Span  
-- Push ENTER --

8. Press **ENT**, and display will indicate:

Transducer Span  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Span Done  
-- Push ESCAPE --

Note: If pressure input is less than 40% or greater than 110% of transducer's natural span value (see Factory Set-Up Information Sheet), display will indicate:

Bad Input Span  
-- Push ESCAPE --

If this occurs, check input pressure (as read on manometer), and readjust as necessary. Press **ESC** and repeat Steps 6 through 8.

9. Press **ESC**.

10. Remove input pressure from High port on CAMM.

### 6.3 – TRANSMITTER INPUT CALIBRATION (con't)

#### 6.3.2 Pressure Compensation Calibration.

1. Prepare test equipment as shown in Figure 6.2. Have vacuum pump preset to approximately the required minimum pressure (see Factory Set-Up Information Sheet).

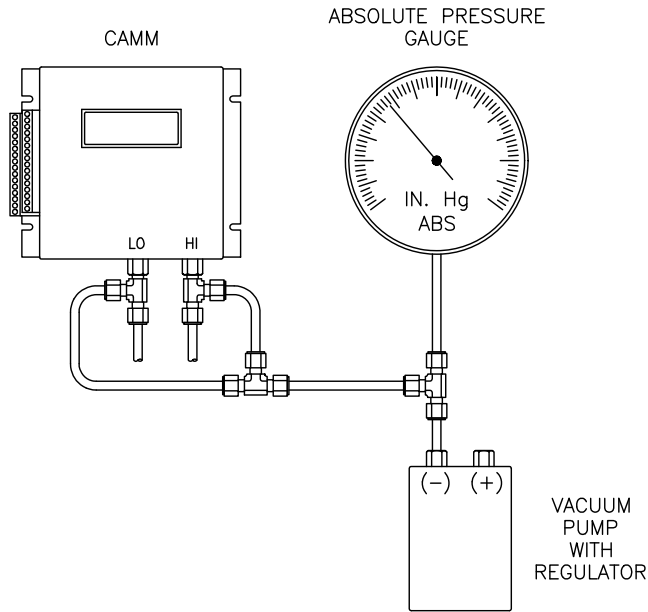


Figure 6.2

2. While in Transmitter Input Calib., scroll to:

Abs. Pressure Zero  
Calib: 24.00 in.WC

3. Start vacuum pump and adjust (as read on gauge) to minimum absolute pressure value, which is indicated on the display.

4. Press **ENT**, and display will indicate:

Abs. Pressure Zero  
-- Push ENTER --

5. Press **ENT**, and display will indicate:

Abs. Pressure Zero  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Zero Done  
-- Push ESCAPE --

### 6.3 – TRANSMITTER INPUT CALIBRATION (con't)

6.3.2 (con't)

Note: If zero input is less than 80% or greater than 120% of Absolute Pressure minimum input (see Factory Set-Up Information Sheet), display will indicate:

Bad Input Span  
-- Push ESCAPE --

If this occurs, check input pressure (as read on gauge), and readjust as necessary. Press **ESC** and repeat Steps 4 through 5.

6. Press **ESC** and then **UP**, display will indicate:

Abs. Pressure Span  
Calib: 36.00 in.Hg

7. Prepare test equipment as shown in Figure 6.3.

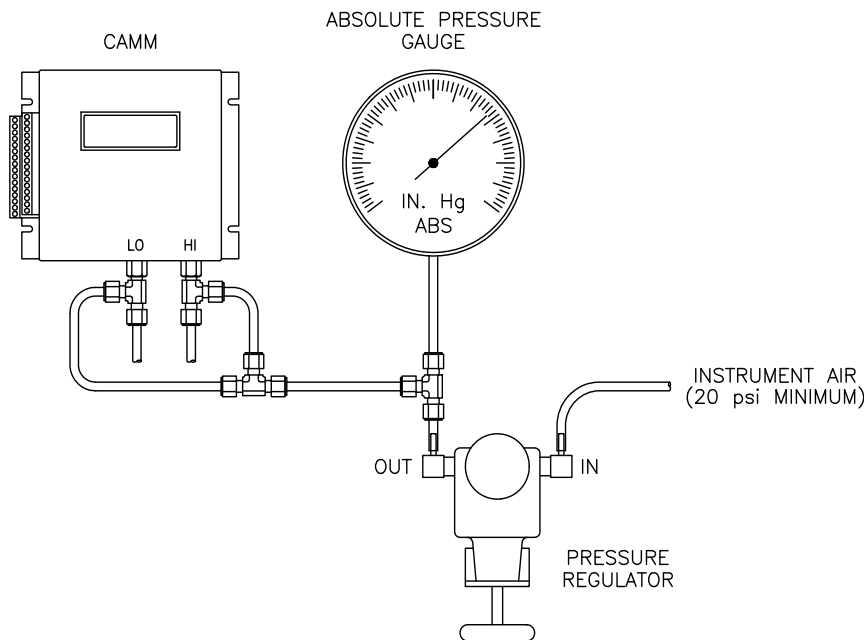


Figure 6.3

9. Adjust input pressure (as read on gauge) to the maximum absolute pressure value, which is indicated on the display.

10. Press **ENT** and display will indicate:

Abs. Pressure Span  
-- Push ENTER --

11. Press **ENT**, and display will indicate:

Abs. Pressure Span  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Span Done  
-- Push ESCAPE --

## 6.3 – TRANSMITTER INPUT CALIBRATION (con't)

### 6.3.2 (con't)

Note: If span input is less than 80% or greater than 120% of Absolute Pressure maximum input (see Factory Set-Up Information Sheet), display will indicate:

Bad Input Span  
-- Push ESCAPE --

If this occurs, check input pressure (as read on gauge), and readjust as necessary. Press **ESC** and repeat Steps 7 through 10.

11. Press **ESC**.

12. Remove test equipment.

### 6.3 – TRANSMITTER INPUT CALIBRATION (con't)

#### 6.3.3 Temperature Compensation Calibration.

1. While in Transmitter Input Calib, scroll to:

Temperature Zero  
Calib: XXX°F

2. If temperature signal is provided by temperature device, connect a voltage/current generator across Terminals 8 and 10 (see Figure 4.7). If temperature signal is powered by CAMM, connect a loop powered temperature simulator across Terminals 7 and 8 (see Figure 4.8).

3. Adjust temperature signal for minimum value of temperature input value which is indicated on the display.

4. Press **ENT**, and display will indicate:

Temperature Zero  
-- Push ENTER --

5. Press **ENT**, and display will indicate:

Temperature Zero  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Zero Done  
-- Push ESCAPE --

6. Press **ESC** and then **UP**, display will indicate:

Temperature Span  
Calib: XXX°F

7. Adjust temperature signal for maximum value of temperature input value which is indicated on the display.

8. Press **ENT**, and display will indicate:

Temperature Span  
-- Push ENTER --

9. Press **ENT**, and display will indicate:

Temperature Span  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Span Done  
-- Push ESCAPE --

Note: If span input is less than 80% or greater than 120% of Temperature maximum input (see Factory Set-Up Information Sheet), display will indicate:

Bad Input Span  
-- Push ESCAPE --

If this occurs, check input signal and readjust as necessary. Press **ESC** and repeat Steps 7 through 9.

10. Press **ESC** .

11. Remove test equipment.

### 6.3 – TRANSMITTER INPUT CALIBRATION (con't)

6.3.4 **Special Function Calibration.** Follow these steps if Special Function is utilized.

1. While in Transmitter Input Calib, scroll to:

Special Func. Zero  
Calib: Aux.2 Minimum

2. Press **ENT**, and display will indicate:

Special Func. Zero  
-- Push ENTER --

3. Connect a voltage/current generator adjusted for minimum value of Special Function input (see Factory Set-Up Information Sheet) across terminals 9 and 10 (see Figure 4.5).

4. Press **ENT**, and display will indicate:

Special Func. Zero  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Zero Done  
-- Push ESCAPE --

5. Press **ESC** and then **UP**, display will indicate:

Special Func. Span  
Calib: Aux.2 Maximum

6. Press **ENT**, and display will indicate:

Special Func. Span  
-- Push ENTER --

7. With voltage/current generator still connected as in Step 2, adjust to maximum value of Special Function input (see Factory Set-Up Information Sheet).

8. Press **ENT**, and display will indicate:

Special Func. Span  
Settle Time:4

Display will count down to 0, after which it will indicate:

Input Span Done  
-- Push ESCAPE --

Note: If span input is less than 80% or greater than 120% of Special Function's maximum input (see Factory Set-Up Information Sheet), display will indicate:

Bad Input Span  
-- Push ESCAPE --

If this occurs, check input signal and readjust as necessary. Press **ESC** and repeat Steps 6 through 8.

9. Press **ESC** and then **UP**, display will indicate:

Return to  
MAIN MENU

10. Press **ENT**, and display will be in Main Menu.

11. Remove test equipment.

### 6.4 – TRANSMITTER OUTPUT CALIBRATION

1. Scroll Main Menu to:

Transmitter Output  
Calibration

2. Press **ENT**, and display will indicate:

Output 1 Zero

3. Press **ENT**, and display will indicate:

Output 1 Zero  
Perform Calibration

4. Connect a DMM set for type and scale of Transmitter Output 1 (see Factory Set-Up Information Sheet) across terminals 1 and 3 on CAMM (see Figure 4.5).

Note: If the output is 4-20mA, a load resistance should be in series with the DMM. This can be accomplished by connecting the actual process load or a resistor of similar value to the actual process load.

DMM should be reading minimum value;  $0.00 \pm 0.01$  volts or  $4.00 \pm 0.01$ mA.

5. If DMM is reading out of tolerance, use **UP** or **DN** to adjust CAMM output for an acceptable DMM reading.

Depending on DMM's selected range, the **UP** or **DN** button may need to be pressed and held for a period of time before any change occurs in the DMM's display. To speed up changes in output, pushbutton combinations can be used. The following chart lists these combinations along with the associated change in output type.

| PUSHBUTTON COMBINATION                 | 4-20mA   | OUTPUT TYPE<br>0-5VDC | 0-10VDC |
|--|----------|-----------------------|---------|
| <b>UP</b> only                         | +0.001mA | +0.3mV                | +0.6mV  |
| <b>DN</b> only                         | -0.001mA | -0.3mV                | -0.6mV  |
| <b>UP*</b> + <b>ESC</b>                | +0.01mA  | +0.003V               | +0.006V |
| <b>DN*</b> + <b>ESC</b>                | -0.01mA  | -0.003V               | -0.006V |
| <b>UP*</b> + <b>DN</b>                 | +0.1mA   | +0.03V                | +0.06V  |
| <b>DN*</b> + <b>UP</b>                 | -0.1mA   | -0.03V                | -0.06V  |
| <b>UP*</b> + <b>ESC*</b> and <b>DN</b> | +1.0mA   | +0.3V                 | +0.6V   |
| <b>DN*</b> + <b>ESC*</b> and <b>UP</b> | -1.0mA   | -0.3V                 | -0.6V   |

\*Must be pressed and held before other button(s) are pressed.

## 6.4 – TRANSMITTER OUTPUT CALIBRATION (con't)

6. Once an acceptable zero reading is obtained, press **ENT** and then **UP** and display will indicate:

Output 1 Span

7. Press **ENT**, and display will indicate:

Transmitter Span  
Perform Calibration

8. With DMM still connected as in Step 4, reading should be at maximum value;  $10.00 \pm 0.01$  volts,  $5.00 \pm 0.01$  volts, or  $20.00 \pm 0.01$  mA.

9. If DMM is reading out of tolerance, use **UP** or **DN** to adjust CAMM output for an acceptable DMM reading.

10. Once an acceptable span reading is obtained, press **ENT** and then **UP** and display will indicate.

Output 2 Zero

11. Repeat Steps 3 through 10 for other Outputs. For Temperature Output 2, connect DMM across terminals 2 and 3; for Absolute Pressure Output 3 across terminals 4 and 6, and for Analog Output 4 across terminals 5 and 6 (see Figure 4.5).

12. Press **UP** until display indicates:

Return to  
MAIN MENU

13. Press **ENT** and scroll Main Menu to:

EXIT  
Operator Setup

14. Press **ENT** and CAMM will return to *Normal* mode of operation.



## 7 – VERIFICATION OF PURGE PERFORMANCE

This Section details a method of determining if the CAMS is effectively keeping total and static sensing ports free from clogging.

At periodic intervals, Steps 4 through 7 of Section 5.23 should be performed. If either the total or static pressure sensing lines indicate an increase in pressure (without any increase in supply air pressure) of 10% or greater than the initial test pressure (recording during initial verification), clogging could be occurring.

Probe should be removed, inspected, and cleaned if necessary. After probe is reinstalled, Steps 4 through 7 of Section 5.23 should be performed and new pressure readings recorded.

To preclude reclogging, one or more of the following steps should be taken.

1. Increase purge frequency.
2. Increase purge pressure.\*
3. Increase compressor or accumulator tank capacity.
4. Increase purge duration.

\*If pressure is increased, Steps 4 through 7 of Section 5.23 must be performed to establish new test pressures for comparison.

## 8 – MAINTENANCE

The CAMS does not contain any parts requiring special periodic maintenance. The following maintenance steps are not requirements, but guidelines for establishing a maintenance program for your specific installation.

Operating experience should be used to set frequency of specific types of maintenance.

### 8.1 – CLEANLINESS

- Verify condensation (or other sources of liquids) are not present inside the CAMS.

### 8.2 – MECHANICAL

- Verify that pressure gauge PI-1 is reading according to Section 5.23.
- Verify pressure signal connections are secure.
- Inspect pressure signal lines for any cracks or leaks.
- Verify mounting hardware is secure.

### 8.3 – ELECTRICAL

- Periodically inspect all wiring to the CAMS for good connections and absence of corrosion.

### 8.4 – CALIBRATION

- CAMM should have calibration verified annually as a minimum.

## 9 – TROUBLESHOOTING

Personnel should be familiar with the operation of the CAMS (see Section 5) before performing any troubleshooting.

| <i><b>Problem</b></i>   | <i><b>Solution</b></i>  |
|---|---|
| No Display and "CPU Activated" LED is not lit.  | <ul style="list-style-type: none"> <li>– Verify input power is present at the correct voltage as listed on label and connected to Terminals 15 and 16.</li> <li>– Verify power switch 1 is in the ON position.</li> <li>– Check fuse F2 inside CMM (see Figure 5.2 for location).</li> <li>– Replace I/O Board.</li> </ul>  |
| No output or incorrect output (Transmitter Output) and display responding correctly with process change.        | <ul style="list-style-type: none"> <li>– Review Factory Set-Up Information Sheet for type of output.</li> <li>– Check terminal strip wiring for proper installation.</li> <li>– Verify jumpers are correct for desired type of output (see Section 4.7).</li> <li>– Perform Transmitter Output Calibration (see Section 6.4).</li> <li>– Replace I/O Board.</li> </ul>  |
| No output or incorrect output (Transmitter Output) and display not responding or correctly with process change. | <ul style="list-style-type: none"> <li>– Verify pressure signal lines are connected correctly.</li> <li>– Check for leaky or obstructed lines between CAMS and process sensor.</li> <li>– Check for kinked internal signal pressure lines in transmitter base.</li> <li>– Replace Transducer.</li> <li>– Replace CPU Board.</li> </ul>  |
| No output or incorrect output. (Temperature, Absolute Pressure, or Special Function).                           | <ul style="list-style-type: none"> <li>– Verify correct input is applied for process application or special function.</li> <li>– Verify jumpers are correct for desired type of output (see Section 4.7).</li> <li>– Check wiring for proper installation.</li> <li>– Verify menu configuration setup is correct for process application or special function.</li> <li>– Replace I/O Board.</li> </ul>  |
| Special Function not working.   | <ul style="list-style-type: none"> <li>– Verify that Special Function is ON and desired type is selected (see Section 5.12).</li> <li>– Verify special function parameters (depends on type selected) are configured properly (see Section 5.12).</li> <li>– Verify any required external input is connected properly (see Section 4.6).</li> <li>– Verify any required external input is calibrated properly (see Section 6.3).</li> <li>– Replace I/O Board.</li> </ul> |
| AUTO-zero Function is not working.  | <ul style="list-style-type: none"> <li>– Verify AUTO-zero is ON and interval is properly set (see Section 5.10).</li> <li>– Replace I/O Board.</li> </ul>   |
| "AUTO-zero in Progress" LED is continuously lit.  | <ul style="list-style-type: none"> <li>– Zero value measured during AUTO-zero cycle is between 90 and 100% of span. Transmitter Input Calibration should be performed as soon as possible (see Section 6.3).</li> <li>– Replace CPU Board.</li> </ul>   |
| "AUTO-zero in Progress" LED is flashing rapidly.  | <ul style="list-style-type: none"> <li>– Zero value measured during AUTO-zero cycle is greater than 100% of span. Transmitter Input Calibration should be performed immediately (see Section 6.3).</li> <li>– Replace Transducer.</li> </ul>  |

If after following the Troubleshooting steps the CAMS continues to operate improperly, contact the Service Department for further assistance (see Section 11).

### 9 – TROUBLESHOOTING (con't)

Personnel should be familiar with the operation of the CAMS (see Section 5) before performing any troubleshooting.

| <b>Problem</b>  | <b>Solution</b>   |
|---|---|
| AUTO-purge Function is not working.   | <ul style="list-style-type: none"> <li>– Verify AUTO-purge is on, interval and activation are properly set (see Section 5.11).</li> <li>– Check for proper terminal strip wiring and connections (see Section 4.6).</li> <li>– Verify pressure at PI-1 is correct (see Section 5.23).</li> <li>– Replace I/O Board</li> </ul> |
| "CPU Activated" LED is not flashing   | <ul style="list-style-type: none"> <li>– Turn power switch on CAMM OFF and back ON.</li> <li>– Replace CPU Board.</li> </ul>  |
| "CPU Activated" LED is flashing, display has characters but is not functioning.       | <ul style="list-style-type: none"> <li>– Replace CPU Board.</li> </ul>  |
| Temperature output and display (if used) are saturated negative.                      | <ul style="list-style-type: none"> <li>– Check Temperature input for open circuit between Temperature Device and CAMM's terminal strip.</li> <li>– Verify Temperature Device is connected correctly (see Figure 4.7 or 4.8).</li> </ul>   |
| Absolute pressure calibration display indicates "Bad Input Zero" or "Bad Input Span". | <ul style="list-style-type: none"> <li>– Verify pressure gauge is an <u>Absolute</u> Pressure Gauge.</li> <li>– Check for signal line leaks.</li> </ul>   |
| Temperature output and display (if used) have an error of $\geq 5\%$ .                | <ul style="list-style-type: none"> <li>– Verify Temperature input signal from temperature device is correct.</li> <li>– Verify correct linearization has been selected (see Section 5.8).</li> </ul>  |
| "Unreliable" is displayed on Line 1 of the display.                                   | <ul style="list-style-type: none"> <li>– Process signal is outside of <math>-10\%</math> to <math>+110\%</math> of the calibrated process range.</li> </ul>   |
| "Unreliable" is displayed on Line selected to display Temperature.                    | <ul style="list-style-type: none"> <li>– Temperature input signal is outside of <math>-10\%</math> to <math>+110\%</math> of calibrated Temperature Range.</li> </ul>   |
| "Unreliable" is displayed on Line selected to display Absolute Pressure.              | <ul style="list-style-type: none"> <li>– Absolute Pressure input signal is outside of <math>-10\%</math> to <math>+110\%</math> of calibrated Absolute Pressure Range.</li> </ul>   |
| Unable to access Operator Setup   | <ul style="list-style-type: none"> <li>– If the password has changed from the factory default of 1,111 and forgotten, Operator can access the Password Selection Menu by sequentially pressing UP, DN, UP, and ESC.</li> </ul>  |

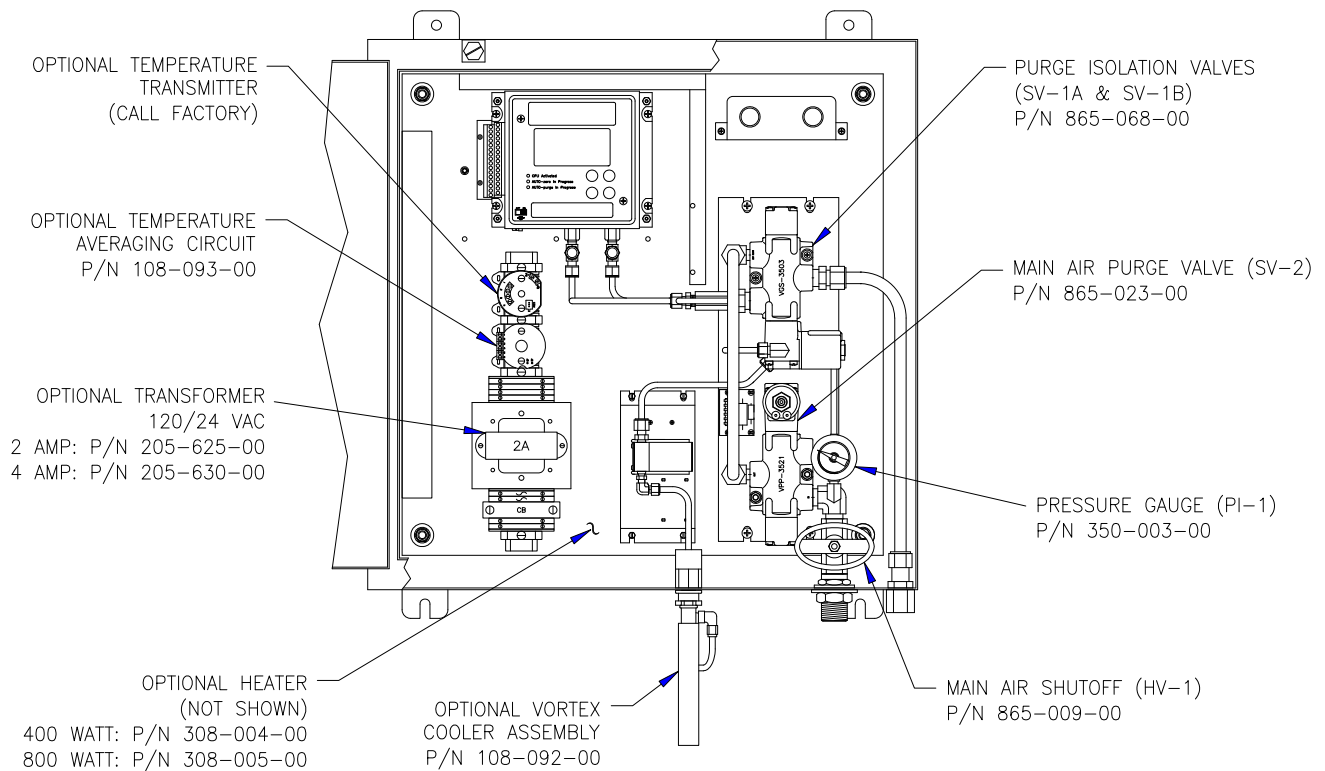
If after following the Troubleshooting steps the CAMS continues to operate improperly, contact the Service Department for further assistance (see Section 11).

# 10 – PARTS LIST

The following drawing with part numbers lists components of the CAMM that are easily replaced by the Operator. When contacting the Customer Service Department about parts, please have the applicable Factory Set-Up Information sheet available for reference. To inquire about price and availability of a specific part number, please contact the Customer Service Department at:

Phone: 1-707-544-2706  
1-800-AIRFLOW

Fax: 1-707-526-2825



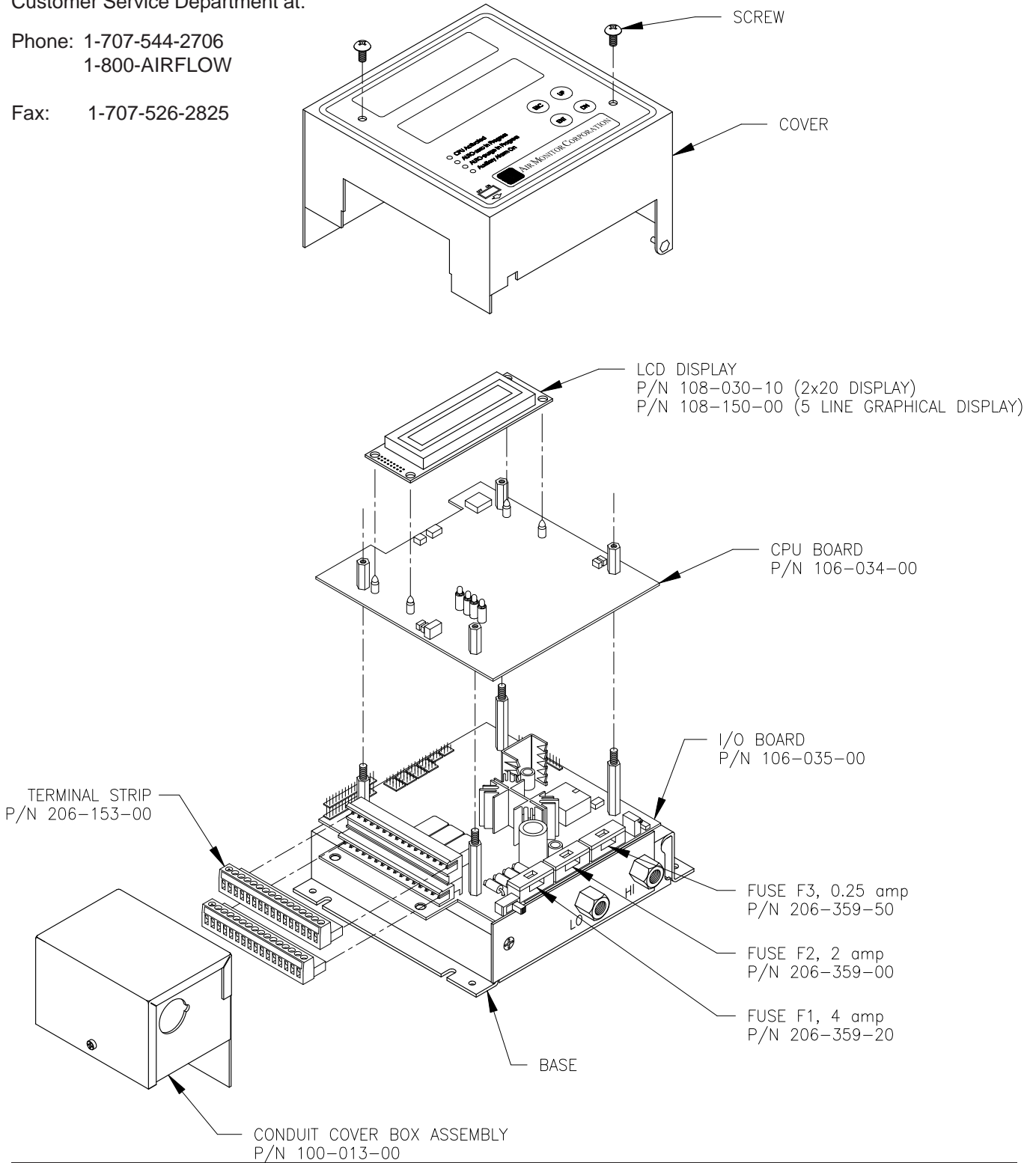
CAMS UNIT WITH 1/2" BRASS VALVE CONSTRUCTION  
\* CALL FACTORY FOR ALL OTHER CONSTRUCTION VARIATIONS \*

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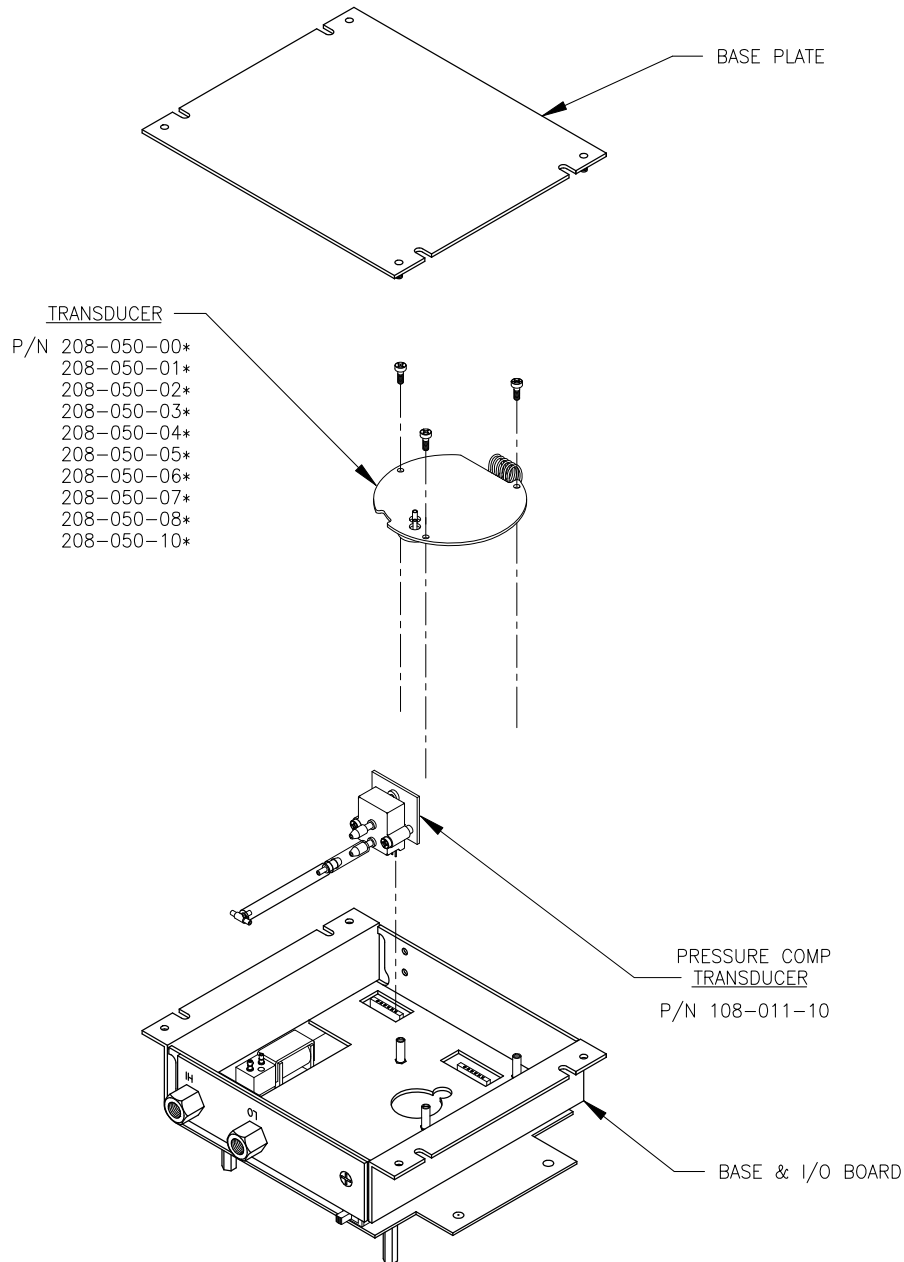


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Phone: 1-707-544-2706  
1-800-AIRFLOW

Fax: 1-707-526-2825



\* NOTE: REFER TO FACTORY SET-UP INFORMATION SHEET TO DETERMINE WHICH TRANSDUCER IS UTILIZED IN YOUR UNIT.

## 11 – CUSTOMER SERVICE

### 11.1 – CUSTOMER SERVICE/TECHNICAL SUPPORT

Air Monitor Corporation provides in-house technical support for our products:

Monday through Friday  
7 am to 5 pm (pst)  
Phone: 707-544-2706 or 1-800-AIRFLOW  
Fax: 707-526-2825

Additionally, on-site technical assistance is available. Before contacting the Customer Service Department, please ensure any applicable troubleshooting steps outlined in Section 9 have been performed.

### 11.2 – REPAIRS/RETURNS

If after contacting the Customer Service Department it is determined that equipment will require return to Air Monitor Corporation for further repair, a Return Authorization number will be issued by the Customer Service Department. A Confirmation of Return Authorization with shipping instructions will be sent via facsimile.

Equipment to be returned to Air Monitor should be returned in its original shipping container if possible. If this is not possible, ensure equipment is packaged sufficiently to protect it during shipment.

**CAUTION**  
**All damage occurring during transit is the Customer's responsibility.**

List the Return Authorization (R/A) number on the packing list and clearly mark this number on the outside of each shipping container.

Costs associated with return of equipment to Air Monitor are the customer's responsibility regardless whether the repair/return is under warranty.

### 11.3 – WARRANTY REPAIRS/RETURNS

Once the Customer Service Department determines that the equipment repair is under warranty, the item will be repaired and returned to the customer at no charge.

### 11.4 – NON-WARRANTY REPAIRS/RETURNS

Customer will be invoiced for all parts and labor required for the repair of equipment. Return shipping charges will also be added to invoice.

### 11.5 – FIELD SERVICE

Requests for field service should be made to the Customer Service Department, who will coordinate sending a technician to customer's site.

Phone: 707-544-2706 or 1-800-AIRFLOW  
Fax: 707-526-2825

Upon completion of work, technician completes a Field Service Report and gives a copy to the customer. Field service is charged on a daily basis and all travel expenses are also added to customer's invoice.