Installation, Operation, and Maintenance Manual

VOLU-flo / OAM
Microprocessor Based
Outside Air Monitor/Controller
Versions 3.0X
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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1 – GENERAL INFORMATION

1.1 – DESCRIPTION

The VOLU-flo/OAM is both a monitor for measurement of minimum outside airflow requirements, and a three-mode controller to maintain the inlet damper at the desired minimum, economizer or external setpoint. The VOLU-flo/OAM has been designed to directly measure inducted outside air, thereby assisting building owners and operators to meet the minimum outside air ventilation requirements of ASHRAE 62-99 and serve as a tool to assist in balancing the diverse demands of providing employee safety and occupant satisfaction while maintaining energy conservation.

1.2 – FEATURES

USER SETUP MENU. The VOLU-flo/OAM microprocessor program contains a User Setup menu system for setting user selectable parameters. Four pushbuttons \( \text{X} \), \( \uparrow \), \( \downarrow \), and \( \text{L} \), allow the user access to the menu for setting configuration modes and values. Refer to the Configuration Programming (Section 4.4) instructions for operation details. Also contained in the User 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.

MULTIPLE OPERATING RANGES. The VOLU-flo/OAM is available in two operating ranges; Standard and Extended. Standard, with a 4:1 Range, is ideal for minimum outside air applications. Expanded, with a 16:1 Range will accurately measure minimum outside air as well as design maximum.

AIR DENSITY CORRECTION. The VOLU-flo/OAM corrects measured inlet airflow for ambient temperature variances and atmospheric pressure by means of its integral 100 ohm platinum RTD temperature sensor, and by entering site altitude into the microprocessor during initial system set-up. Via menu selection, the airflow output can be provided in actual or standard units of measurement.

ALARM. The VOLU-flo/OAM Alarm provides the means for having the process signal compared to user selectable alarm points and automatically activates a Form C relay to generate dry contact alarm signal(s). Individual Low and High Alarm setpoints are configurable via the User Set-Up menu. Alarm Setpoints can be displayed during Normal operating mode.

MULTIPLE CONTROL SETPOINTS. The VOLU-flo/OAM has two user selectable internal setpoints (A & B) switchable via contact closure. Additionally, an external variable setpoint can be utilized by the VOLU-flo/OAM, providing the user the ability to utilize three unique setpoints.

ECONOMIZER MODE. The Economizer Mode feature allows for a Temperature Controller Output to override the VOLU-flo/OAM’s controller output and take control of the outside airflow. This option is user selectable via Configuration menu and dry contact closure.

AUTOMATIC ZEROING. Every hour the microprocessor will automatically execute an AUTO-zero cycle consisting of the following sequence: The VOLU-flo/OAM outputs and display are put on Hold, a valve is activated which disconnects the process signal from the flow sensor, creating a zero flow condition; after a brief stabilization period any offset signal is measured and stored in memory; the valve is deactivated, the Hold is released and Normal flow measurement resumes. During Normal operation, the offset value stored in memory is subtracted from subsequent flow sensor measurements until the next AUTO-zero cycle occurs and repeats the process. For calibration purposes, a switch is provided which allows the user to manually activate the zeroing valve.

DATA DISPLAY. The integral display is a two line by 20 character LCD. It is capable of displaying the outside air flow, ambient temperature and Controller Parameter (as applicable) It is also used by the User Setup menu for displaying the menu parameters and values. Configuring the display for Normal operation is done using the User Setup menu.

MULTIPLE OPERATING POWER SELECTIONS. The VOLU-flo/OAM can be powered by 24VAC, 24VDC, or 120VAC with optional transformer.

CONSTRUCTION. The VOLU-flo/OAM is housed in either a NEMA 1 or NEMA 4 enclosure, with stainless steel external signal fittings.
2 – PERFORMANCE SPECIFICATIONS

2.1 – Monitor

Accuracy. ±5% of actual airflow, over the design operating range:

Temperature Limits.
-20 to 180°F Storage.
+32 to 120°F Operating, standard.
-40 to 120°F Operating, with optional enclosure heater.

Signal Connections. 1/4” compression type, stainless steel.

2.2 – Indication

Display. Standard 2x20 character LCD provides two lines of data display.

2.3 – Digital Inputs/Outputs

Digital Inputs. Three dry contact inputs; fan system status, economizer mode, and external controller setpoint.

Digital Outputs. Dual Form C dry contacts rated for 3 amps at 24VDC for alarm outputs to the BAS.

2.4 – Analog Inputs/Outputs

Analog Input. Dual Inputs are field configurable via jumper for 0-5VDC, 0-10VDC or 4-20mADC. For use as the external controller setpoint and Economizer mode input.

Analog Outputs. Three analog outputs; two 4-20mADC and the other configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. For measured airflow, temperature, and damper controller outputs.

2.5 – Power

Power Supply.
Standard: 24VAC (20-28VAC) or 24VDC (20-40VDC).
Optional: 120VAC (100-132VAC), with enclosure heater.

Power Consumption.
Standard: 18VA at 24VAC; 13VA at 24VDC.
Optional: 336VA @ 120VAC, with enclosure heater.

Circuit Protection. Power input is isolated, fused, and reverse polarity protected.
3.1 – RECEIVING AND INSPECTION

- Carefully open the VOLU-flo/OAM shipping container and remove all equipment.
- Inspect equipment for any damage. If damaged, contact freight company.
- Verify that the following items have been shipped:

  1 each VOLU-flo/OAM enclosure (see Figure 3.1)
  1 each Outside Reference Sensor (2 if ordered for double inlet) and mounting hardware (see Figure 3.2)
  1 each Inlet Airflow Sensor (2 if ordered for double inlet) and mounting hardware (see Figure 3.3)
  1 each temperature probe

![Figure 3.1](image1)

NEMA 1 Enclosure

NEMA 4 Enclosure

NEMA 4 Enclosure with Heater

Figure 3.1

![Figure 3.2](image2)

Outside Reference Sensor

Figure 3.2

![Figure 3.3](image3)

Inlet Airflow Sensor

Figure 3.3
3.1 – RECEIVING AND INSPECTION (con't)

If a VOLU-flo/OAM Station was ordered, verify that it is the correct dimensions for the application (see Figure 3.4)

3.2 – LOCATION

Figures 3.5 and 3.11 show the general arrangement for installing the components of the VOLU-flo/OAM on a variety of different installations.
3.2 – LOCATION (con't)

Single Inlet with Rain Hood
Figure 3.7

Double Inlet with Rain Hood
Figure 3.8

VOLU-flo/OAM Station with Rain Hood
Figure 3.9
3.2 – LOCATION (con't)

3.2.1 ENCLOSURE. The enclosure housing the VOLU-flo/OAM’s electronics should be mounted within the general vicinity of the air handler unit in order to minimize the tubing length to the sensors.

NEMA 4 Enclosure. Since the RTD temperature probe is mounted to the bottom of the enclosure, the enclosure must be mounted outside, near the air handler, in order sense the temperature of the outside air.

NEMA 1 Enclosure. This enclosure must be mounted in an area that provides protection for the elements. This typically means indoors where the temperature is maintained between 32 to 120°F. Because the enclosure will be at a different temperature than the outside air, the RTD temperature probe must be remotely mounted near the outside air intake (see below for mounting details).

Mounting the enclosure slightly higher than the sensors will reduce the risk of any water (from condensation) migrating into the enclosure. If this cannot be done, provisions for drip legs should be installed at the lowest point in the sensing lines.

Note: If the VOLU-flo/OAM is provided without enclosure, unit must be mounted in an area that provides the required protection from the environment.
3.2 – LOCATION (con't)

3.2.2 OUTSIDE REFERENCE SENSOR(S). This sensor must be mounted in the center of the outside air intake, see Figures 3.12 and 3.13.

3.2.3 INLET AIRFLOW SENSOR(S).

A. Air handlers with inlet louvers or mist eliminator (see Figure 3.12). This sensor must be mounted inside the air handler, downstream of the inlet louvers and upstream of any control damper.

B. Air handlers with rain hoods (see Figure 3.13). This sensor must be mounted inside the rain hood.
3.3 – MOUNTING

3.3.1 ENCLOSURE. Once the desired mounting location is identified, secure enclosure by using the appropriate hardware at all four mounting tabs. Note: If VOLU-flo/OAM is provided without an enclosure, mount unit using the 4 supplied sheetmetal screws.

3.3.2 OUTSIDE REFERENCE SENSOR(S).
A. Air handlers with inlet louvers or mist eliminator. Using the four mounting holes, attach the sensor to the louvers with the four supplied sheetmetal screws (1/4” x 1/2”).
B. Air handlers with rain hoods.
   Note: The birdscreen covering the rain hood inlet must be replaced or covered with 68% open area expanded metal before mounting sensor(s).
   Use the four supplied nylon T-bolts and nuts to mount the sensor to the expanded metal.

3.3.3 INLET AIRFLOW SENSOR(S).
A. Air handlers with inlet louvers or mist eliminator. At mounting location, drill a 5/8” diameter center hole and four 3/32” diameter mounting holes (use mounting plate as a template). Secure sensor with gasket using 4 supplied sheetmetal screws (1/4” x 1”).
B. Air handler units with rain hoods. At mounting location, drill a 5/8” diameter center hole and four 3/32” diameter mounting holes (use mounting plate as template). Secure sensor with gasket using the 4 supplied sheetmetal screws (1/4” x 1”).

3.3.4 RTD TEMPERATURE PROBE.
NEMA 4.
– Remove the RTD temperature probe from the enclosure (taped in bag at bottom).
– Remove the compression nut from the unmarked bulkhead fitting at the bottom of the enclosure.
– From outside the enclosure, slip the probe, wires first, into the fitting until it bottoms out.
– Slip compression nut over the probe and thread onto fitting.
– Tighten nut one-half turn past finger tight.

NEMA 1.
– Remove the RTD temperature probe from the enclosure (taped in bag at bottom).
– Locate a convenient mounting location inside the air handler to mount the probe.
– Use the two supplied sheetmetal screws to mount the probe.

Figure 3.14
3.4 – PROCESS CONNECTIONS

Signal tubing between the enclosure and all sensors must be 1/4” OD, either stainless steel or copper.

If air handler is a double inlet, signal tubing from Outside Reference Sensors must be teed together. Similarly, the signal tubing from Inlet Air Sensors must be teed together.

**CAUTION**
When installing or removing signal tubing from either the enclosure or the sensors, a wrench should be used on the bulkhead nut to prevent turning.

Signal tubing from the Outside Reference Sensor must be connected to the fitting labeled "Outside Air Reference" at the bottom of the enclosure, and the Inlet Airflow Sensor must be connected to the fitting labeled "Inlet Air".

Note: If the VOLU-flo/OAM is provided without an enclosure, signal tubing from sensors must transition to 1/8" OD poly tubing to connect to unit. Signal from Outside Reference Sensor must connect to mini-barb labeled "EXT", and signal from Inlet Airflow Sensor must connect to the mini-barb labeled "INT".
3.5 – POWER/SIGNAL CONNECTIONS

It is recommended that any power wiring be 14 awg to 18 awg, and any signal wiring should be 14 awg to 22 awg. 14 awg is the maximum wire gauge that the terminal strip can accommodate.

No more than two wires should be connected to any one terminal. 18 awg is the maximum gauge wire that can be doubled up in one terminal.

Figure 3.15

CAUTION
When connecting or disconnecting any wiring to the VOLU-flo/OAM, the unit’s power switch (See Figure 3.15) must be in the OFF position.
3.5 – POWER/SIGNAL CONNECTIONS (con’t)

If VOLU-flo/OAM is furnished with an internal enclosure heater, the power wiring (120VAC) must be connected to the transformer housing according to Figure 3.16 below. (24VAC to the VOLU-flo/OAM has been factory wired).

![Figure 3.16](image)

If no heater has been supplied, connect power (24VAC/DC) wiring to the VOLU-flo/OAM according to Figure 3.17 below.

![Figure 3.17](image)

Connect the RTD temperature probe wires according to the following:

<table>
<thead>
<tr>
<th>Wire from RTD</th>
<th>Terminal on VOLU-flo/OAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>1 (Ra)</td>
</tr>
<tr>
<td>Red (either)</td>
<td>2 (Rb)</td>
</tr>
<tr>
<td>Red (either)</td>
<td>3 (Rb)</td>
</tr>
</tbody>
</table>

Verify RTD calibration switch is in the NORMAL position.
3.5 – POWER/SIGNAL CONNECTIONS (con’t)

WIRING.

All signal wiring is done at the terminal strip at the left side of the VOLU-flo/OAM. Figure 3.18 below represents the terminal strip and the connections for the various inputs/outputs available.

Switch to Occupied Mode (Terminals 1 (GND) and 2 (DI1))*: Customer to provide continuous (unpowered) dry contact to switch from Unoccupied Mode to Occupied Mode. For this feature to work properly, the Unoccupied Mode option must be enabled in Controller Configuration (Section 4.7). With open contact, Controller will drive output to minimum value if action is reverse or maximum value if action is direct. With open contact, the second line of the display will read Unoccupied Mode, regardless of what parameter was selected to be displayed (see Section 4.5).

If this feature is disabled in Controller Configuration, Controller will operate in Occupied Mode regardless of whether contact closure exists.

Switch to Internal Setpoint B (Terminals 1 (GND) and 3(DI2))*: Customer to provide continuous (unpowered) dry contact to switch from Internal Controller Setpoint A to Setpoint B.

Switch to External Setpoint (Terminals 4 (DI3) and 6 (GND))*: Customer to provide continuous (unpowered) dry contact to switch from Internal Controller setpoint (A or B) to an External Setpoint

When activated, the external setpoint signal at Terminals 15(AI1) and 17 (Com) becomes the Controller setpoint and Controller modulates to maintain outside airflow to this setpoint.

Switch to Economizer Mode (Terminals 5(DI4) and 6(GND)).* Customer to provide continuous (unpowered) dry contact to switch to Economizer Mode.

When activated, the Economizer Mode input at Terminals 16(AI2) and 17(COM) is sent directly to the Controller Output Terminals 19 (AO2) and 21(COM). This allows a Temperature Controller Output to take control of the outside airflow, typical of an Economizer Mode.

With contact closure, the second line of the display will read Economizer Mode, regardless of what parameter was selected to be displayed (see Section 4.5).
3.5 – POWER/SIGNAL CONNECTIONS (con’t)

Low Alarm (Terminals 9(N.O.), 10(Com), and 11(N.C.)). Customer to wire according to desired logic for remote indication of Low Alarm status. Contacts change state 10 minutes after the onset of an alarm condition.

High Alarm (Terminals 12(NO), 13 (COM), and 14(N.C.)). Customer to wire according to desired logic for remote indication of High Alarm status. Contacts change state 10 minutes after the onset of an alarm condition.

External Setpoint Input (Terminals 15(AI1) and 17(Com))*. Input is required to be sourced (powered) from the customer. Input can be 4-20mA, 0-5V, or 0-10V (refer to Section 3.6 for selection). This input will be used as the controller setpoint when contact closure exists across Terminals 4(DI3) and 6(GND).

Economizer Mode Input (Terminals 16(AI2) and 17(COM))*. Input is required to be sourced (powered) from customer. Input can be 4-20mA, 0-5V, or 0-10V (refer to Section 3.6 for selection). This input is sent directly to the controller output Terminals 19(AO2) and 21(COM) when contact closure exists across terminals 5(DI4) and 6(GND).

Monitor Output (Terminals 18(AO1) and 21 (Com)). This 4-20mADC output is sourced (powered) by the VOLU-flo/OAM and represents the velocity/flow of the measured outside air. Maximum load resistance that can be driven is 750 ohms.

Monitor or Controller Output (Terminals 19(AO2) and 21(Com)). If the VOLU-flo/OAM is set up as Monitor only, the output represents the velocity/flow of the measured outside air (identical to output above).

If the unit is set up as a Monitor & Controller, this output will be the controller output and will modulate to maintain outside airflow at desired setpoint.

Regardless of the Type of Monitor, this output is sourced (powered) by the VOLU-flo/OAM and is user selectable for a 4-20mA, 0-5V or 0-10V (refer to Section 3.6 for selection).

The maximum/minimum load resistances are as follows: 4-20mADC - 750 ohms maximum
0-10VDC - 5000 ohms minimum
0-5VDC - 2500 ohms minimum

The VOLU-flo/OAM is supplied from the Factory set for 4-20mADC output.

Temperature or Selectable Output (Terminals 20(AO3) and 21(Com)). If the VOLU-flo/OAM is set up as Monitor only, this 4-20mA output, sourced (powered) by the VOLU-flo/OAM, represents Outside Air Temperature (–50º to 120ºF).

If the unit is configured as a Monitor & Controller, this 4-20mA output is user selectable to represent Monitor Flow, Outside Air Temperature, an additional Controller Output, or none (see Section 4.8).

The maximum load resistance that can be driven is 750 ohms.

*Applicable only if VOLU-flo/OAM is set up as a Monitor & Controller.
3.6 – INPUT/OUTPUT SELECTION

Selection of External Setpoint and Economizer Mode input type is made at jumpers labeled AI1 and AI2 respectively. See Figure 3.19 below.

**AI1**
- For 0-5VDC Input: Install jumper on J11 only.
- For 0-10VDC Input: Install jumper on J12 only.
- For 4-20mADC Input: Install jumpers on J13 and J14 only.

**AI2**
- For 0-5VDC Input: Install jumper J17 only.
- For 0-10VDC Input: Install jumper J18 only.
- For 4-20mADC Input: Install jumpers J19 and J20 only.

Unit is supplied from Factory configured for 4-20mADC inputs.

![Figure 3.19](image)

Selection of Monitor/Controller Output type is made at jumpers labeled AO2. See Figure 3.20 below.

- For 0-5VDC Output: Install jumpers on J15 and to the voltage (V) position of J9 and J10.
- For 0-10VDC Output: Install jumpers on J16 and to the voltage (V) position of J9 and J10.
- For 4-20mADC Output: Install jumpers to the current (I) position of J9 and J10 only.

Unit is supplied from the Factory configured for a 4-20mADC output.

![Figure 3.20](image)

3.7 – DISPLAY CONTRAST ADJUSTMENT

To compensate for different ambient lighting conditions and viewing angles, the VOLU-flo/OAM display’s contrast can be adjusted for optimum visibility.

Contrast is adjusted using potentiometer R22 (see Figure 3.15).
- Turn R22 clockwise to increase contrast (darken characters relative to background) and counterclockwise to decrease contrast.
4 – OPERATION

4.1 – INTRODUCTION

The VOLU-flo/OAM has been configured and calibrated at the Factory to customer specified parameters which are recorded on the Factory Set-Up Information Sheet, provided with the unit. Review this information and verify that the VOLU-flo/OAM 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.

4.2 – START-UP

1. After Installation has been verified in accordance with Section 3, turn power switch (see Figure 3.15) to the ON position, and if supplied with heater, turn power switch on the transformer housing to the ON position.

2. Display will briefly indicate:

   
   VOLU-flo/OAM
   Version 3.00*  
   *Your actual version may be different.

   Followed by:

   
   Thanks for Choosing
   AIR MONITOR

   Then:

   
   VOLU-flo/OAM
   Performing Auto-Zero

   for approximately 10 seconds, and then return to Normal display mode.

   As supplied from the Factory, the Normal display will indicate:

   
   VELO  0 AFPM
   CTL SP  250 AFPM
4.3 – PUSHBUTTON DEFINITION

The four pushbuttons used to interface with the VOLU-flo/OAM are identified by the symbol adjacent to the pushbutton. The symbols are defined as follows:

\[ \uparrow : \text{UP} \quad \downarrow : \text{DOWN} \quad \text{\textbullet} : \text{ENTER} \quad \times : \text{ESCAPE} \]

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 User Setup (programming).

**When in Normal Operation Mode.**

\[ \uparrow^* + \downarrow \quad \text{Displays VOLU-flo/OAM and software version number. Press \times to return to Normal operation mode.} \]

\[ \text{\textbullet} \text{ then } \text{\textbullet} \quad \text{Activates the User Setup menu.} \]

**When in User Setup.**

\[ \uparrow \text{ or } \downarrow \quad \text{Use to scroll to the desired Main Menu item.} \]

\[ \text{\textbullet} \quad \text{Use to scroll to the value or mode within a parameter.} \]

\[ \text{\textbullet} \quad \text{Enters user into specific selection sub-menu from Main Menu Selection.} \]

\[ \times \quad \text{Displays current setting of selected Parameter. Enters the selected value or setting into memory.} \]

\[ \times \quad \text{Use as an escape key to exit Main Menu selection to avoid scrolling to "Return to MAIN MENU".} \]

\[ \times \quad \text{Use as a quick way to advance to the last item selected when USER SETUP MAIN menu is selected if the last item selected was exited using the \times key.} \]

The following pushbutton combinations can be used to more quickly set user selected values (i.e. site elevation, inlet area, Alarm Setpoints, Controller Setpoints, etc.).

\[ \uparrow^* + \times \quad \text{Increase the second column digit.} \]

\[ \downarrow^* + \times \quad \text{Decrease the second column digit.} \]

\[ \uparrow^* + \downarrow \quad \text{Increase the third column digit.} \]

\[ \downarrow^* + \uparrow \quad \text{Decrease the third column digit.} \]

\[ \uparrow^* + \times \text{ and } \downarrow \quad \text{Increase the fourth column digit.} \]

\[ \downarrow^* + \times \text{ and } \uparrow \quad \text{Decrease the fourth column digit.} \]

*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.
4.4 – CONFIGURATION PROGRAMMING

The VOLU-flo/OAM’s onboard microprocessor controls the following configuration items: Monitor type, application specific parameters, controller parameters, alarm setpoints, output selection, and calibration.

With power ON and initialization complete (see Section 4.2), press , and display will indicate:

USER SETUP

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

Monitor Configuration

By using ↑ and ↓, the user can scroll through the following selections:

<table>
<thead>
<tr>
<th>MAIN MENU SELECTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor Configuration</td>
<td>– Allows for configuring unit to a specific application (i.e. Monitor &amp; Controller or Monitor only), Unit’s System, Averaging Filter, Density Compensation Type, Maximum Velocity, Inlet Type, Inlet Area, Site Elevation, Alarms ON or OFF, Parameter to display on Line 2, and Output Lockdown.</td>
</tr>
<tr>
<td>Alarm Configuration</td>
<td>– Allows for the selection of Low and High Alarm Setpoints. Available only if alarms are ON.</td>
</tr>
<tr>
<td>Controller Configuration</td>
<td>– Allows for the selection of the following Controller Parameters: Operation Mode; Action; Outside Air Setpoints A and B, Minimum and Maximum Output Values, and Tuning Values. Available only if Monitor &amp; Controller.</td>
</tr>
<tr>
<td>Analog Output Configuration</td>
<td>– Allows for the selection of which variable Output #3 represents. Available only if Monitor &amp; Controller.</td>
</tr>
<tr>
<td>Field Characterization</td>
<td>– Used to calibrate unit to specific application. Must be performed before accurate monitoring/controlling can be accomplished.</td>
</tr>
<tr>
<td>Transducer Span Selection</td>
<td>– Allows for displaying the transducer’s natural span.</td>
</tr>
<tr>
<td>Technician Parameters</td>
<td>– Allows for the zeroing and spanning of analog inputs and outputs.</td>
</tr>
</tbody>
</table>
4.4 – CONFIGURATION PROGRAMMING (con’t)

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

EXIT
USER SETUP

and pressing ↓.

Once a desired Selection is displayed, its sub-menu can be entered by pressing ↓.

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

This example of navigation is similar for all Main Menu selections. Sections 4.5 through 4.10 detail steps to verify or change Configuration Programming of all Main Menu Selections.
4.5 – MONITOR CONFIGURATION

User can select Monitor Type, Measurement Units, Averaging Filter, Type of Density Compensation, Inlet Type, Inlet Area, Site Elevation, and Parameter to display on Line 2.

- Select Monitor Type
- Select Units System
- Select Averaging Filter
- Select Density Comp. Type
- Select Inlet Type
- Select Maximum Velocity
- Select Total Inlet Area
- Select Site Elevation
- Select Alarms Off/On
- Select Line 2 Display
- Select Output Lockdown
- Return to MAIN MENU

Available selections:
- Monitor Type:
  - MONITOR & CONTROLLER
  - MONITOR ONLY
- Units System:
  - U.S.
  - U.S. or METRIC
- Averaging Filter:
  - 60 SECONDS
  - 1 to 120 seconds or Filter Off
- Density Comp Type:
  - STANDARD CONDITIONS
  - ACTUAL CONDITIONS
- Inlet Type:
  - OTHER
  - OAM STATION - DUCTED
  - OAM STATION - INLET
  - 63% OA EXP. - DUCTED
  - 63% OA EXP. - INLET
- Maximum Velocity:
  - 2,000 SFPM
  - 150 to 10,000 SFPM/AFPM or 45.0 to 3000.0 Sm/m/Am/m
- Total Inlet Area:
  - 10.00 Sq. Ft.
  - 0.00 to 600.00 Sq. Ft. or 0.000 to 60.00 Sq. M.
- Site Elevation:
  - 0 Feet
  - 0 to 15,000 Feet or 0 to 4500 Meters
- Alarms Off/On:
  - ON
  - ON or OFF
- Line 2 Display:
  - MONITOR D.P.
  - MONITOR FLOW
  - AMBIENT TEMPERATURE
  - CONTROLLER OUTPUT 1
  - CONTROLLER SETPOINT 1
  - LOW ALARM SETPOINT 2
  - HIGH ALARM SETPOINT 2
  - NONE
- Output Lockdown:
  - 60 SFPM or 18.0 Sm/m to Maximum Velocity
- Return to MAIN MENU

1 Available only if Type is MONITOR & CONTROLLER.
2 Available only if ALARMS are ON.
4.5 – MONITOR CONFIGURATION (con’t)

1. While in Main Menu, use ↑ or ↓ to scroll to: Monitor Configuration.

2. Press to enter Monitor Configuration menu. Display will indicate: Select Monitor Type.

3. Press ↓ and display will indicate current setting of the Monitor Type (Monitor & Controller or Monitor Only).

4. Use ↑ or ↓ to change setting. Once desired setting is displayed, press , new setting will be stored in memory and display will return to Monitor Configuration menu as in Step 2.

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

5. Use ↑ or ↓ to select remaining parameters to be reviewed or changed.

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

7. To return to Main Menu, select Return to MAIN MENU in Monitor Configuration menu and press .
4.6 – ALARM CONFIGURATION

User can select Low and High Alarm setpoints.

Note: This menu item is only available if Alarms are ON in Monitor Configuration (section 4.5).

1. While in Main Menu, use ↑ or ↓ to scroll to:

2. Press ◄ to enter Alarm Configuration menu. Display will indicate:

3. Press ◄ and display will indicate current setting of Low Alarm Setpoint.

4. Use ↑ or ↓ to change setting. Once desired setting is displayed, press ◄. New setting will be stored in memory and display will return to Alarm Configuration menu as in Step 2.

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

5. Use ↑ or ↓ to select remaining parameters to be reviewed or changed.

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

7. To return to Main Menu, select Return to MAIN MENU in Alarm Configuration menu and press ◄.
4.7 – CONTROLLER CONFIGURATION

User can customize the various controller parameters to their specific application.

Note: This menu item is only available if Monitor & Controller is selected as Monitor Type in Monitor Configuration (Section 4.5).

**Operation Mode Selection.** Select Automatic or Manual operation. In Automatic, controller output modulates as necessary to maintain outside air velocity at setpoint. In Manual, controller output is maintained at a user selectable value (percentage).

**Output Manual Value.** A percentage of controller output (0-100%) that is maintained when manual operation is selected (see above).

**Controller Action Selection.** Select direct or reverse controller action. Direct action, increases controller output when process is higher than setpoint. Reverse action, decreases controller output when process is higher than setpoint.

**Unoccupied Mode Option.** Allows for the use of an external signal (see Section 3.5) to switch from standard (Occupied) mode to Unoccupied Mode. In this mode, Controller will drive output to minimum value if reverse acting and maximum value if direct acting.

**Economizer Mode Option.** Allows for the use of an external Temperature Controller signal (see Section 3.5) to take control of the outside airflow.

**Outside Air Setpoint A.** Selected velocity which Controller will maintain by modulating its output when in standard (Occupied) mode.

**Outside Air Setpoint B.** Selected velocity which Controller will maintain by modulating its output when contact closure is received at Terminals 1 and 3.

**Proportional Band Gain.** Control mode in which controller output is proportional to proportional gain times the input error. Proportional Gain is a dimensionless number between 0.00 and 10.00, adjustable in 0.01 increments. Factory default setting of this variable is 0.20. Increasing the gain will speed up the controller's response to change.

**Integral.** Control mode in which controller output is proportional to time integral of input error, and as long as error exists in reference to time, controller output will increase or decrease as necessary to bring error to zero. Time constant is expressed in seconds. Range is 0.0 to 120.0 seconds adjustable in 0.1 increments. Factory default setting of this variable is 60.0 seconds. Decreasing the time constant will speed up the controller's response to change.

**Inverse Derivative.** Control mode in which controller's proportional mode output response is delayed by inverse derivative function. This special feature is very useful in controlling fast process such as flow. Time constant is expressed in minutes, Range is 0.0 to 20.0 minutes, adjustable in 0.1 increments. Factory default setting of this variable is 10.0 minute. Decreasing the time constant will speed up the controller's response to change.

Note: Generally, a controller cycling several times before settling at setpoint indicates an under-damped system. Slowing of the controller's speed of response is recommended. A controller taking excessive time to reach its setpoint without overshooting indicates an over-damped system. Speed up the controller's response in this case. An optimally tuned (critically damped) system will generally have one overshoot and one undershoot prior to settling at setpoint.

**Controller Minimum Value.** Select between 0.0% and 100.0% as the minimum value controller output will reach. This percentage output is applied to the final output (user selectable at 0-5V, 0-10V, or 4-20mA, see Section 4.6). This feature allows user to match controller output to actuators that may require a minimum value different than the controller's standard 0V or 4mA.

**Controller Maximum Value.** Select between 0.0% and 100.0% as the maximum value controller output will reach. This percentage output is applied to the final output (user selectable at 0-5V, 0-10V, or 4-20mA, see Section 4.6). This feature allows user to match controller output to actuators that may require a maximum value different than the controller's standard 5V, 10V or 20mA.
4.7 – CONTROLLER CONFIGURATION (con’t)

**User Setup Main Menu**
- Alarm Configuration
- Controller Configuration
- Analog Output Configuration

**Controller Configuration**
- Select Operation Mode
- Select Controller Action
- Select Output Manual Value
- Select Controller Action
- Unoccupied Mode Option Enable/Disable
- Economizer Mode Option Enable/Disable
- Enter Outside Air Setpoint A
- Enter Outside Air Setpoint B
- Enter Prop. Band Gain
- Enter Integral
- Enter Inverse Derivative
- Enter Controller Minimum Value
- Enter Controller Maximum Value
- Return to Main Menu

**Operation Mode**
- AUTOMATIC
- MANUAL

**Manual Value**
- 50.0%
- 0.0 to 100.0% in 0.1% increments

**Controller Action**
- REVERSE
- DIRECT

**Unoccupied Mode**
- DISABLED
- ENABLED

**Economizer Mode**
- DISABLED
- ENABLED

**Outside Air Setpt A**
- 150 SFPM

**Outside Air Setpt B**
- 2000 SFPM

**Prop. Band Gain**
- 0.20
- 0.00 to 10.00 in 0.01 increments

**Integral**
- 60.0 seconds
- 0.0 to 120.0 sec. in 0.1 increments

**Inverse Derivative**
- 10.0 Minutes
- 0.0 to 20.0 minute in 0.1 increments

**Minimum Value**
- 0.0%
- 0.0 to 100.0% in 0.1 increments

**Maximum Value**
- 100.0%
- 0.0 to 100.0% in 0.1 increments

**Return to MAIN MENU**

1 Available only if Type is MONITOR & CONTROLLER.
2 Available only if Mode is MANUAL.
3 Depends on Units System, & Density Comp. Type selected.

---

**Available selections:**
- AUTOMATIC or MANUAL
- REVERSE or DIRECT
- DISABLED or ENABLED

**Default selection shown:**
- 60 SFPM or 18.0 Sm/m to Maximum Velocity
- 60 SFPM or 18.0 Sm/m to Maximum Velocity
- 60 SFPM or 18.0 Sm/m to Maximum Velocity
- 60 SFPM or 18.0 Sm/m to Maximum Velocity

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4.7 – CONTROLLER CONFIGURATION (con’t)

1. While in Main Menu, use ↑ or ↓ to scroll to:

2. Press ↓ to enter Controller Configuration menu. Display will indicate:

3. Press ↑ and display will indicate current Operation Mode selection (AUTOMATIC or MANUAL).

4. Use ↑ or ↓ to change selection. Once desired setting is displayed, press ↓. New setting will be stored in memory and display will return to Controller Configuration menu as in Step 2.

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

5. Use ↑ or ↓ to select remaining parameters to be reviewed or changed.

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

7. To return to Main Menu, select Return to MAIN MENU in Controller Configuration menu and press ↓.
4.8 – ANALOG OUTPUT CONFIGURATION

If Monitor & Controller was selected as Monitor Type in Monitor Configuration (Section 4.5), user can select which variable Output #3 represents.

Process variables available for output are:
- Monitor
- Ambient Temperature
- Controller

1. While in Main Menu, use ↑ or ↓ to scroll to:
   - Analog Output Configuration

2. Press ← to enter Analog Output Configuration menu. Display will indicate:
   - Select Output #3
   - Return to Main Menu

3. Press ← and display will indicate current setting of Output #3 (NO OUTPUT, MONITOR, AMBIENT TEMPERATURE, or CONTROLLER).

4. Use ↑ or ↓ to change setting. Once desired setting is displayed, press ←. 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 X. 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 ←.
4.9 – FIELD CHARACTERIZATION

This section outlines the steps necessary to characterize the VOLU-flo/OAM to the installed application. Because each installation is unique, and air velocity measurement is based on pressure drop across a fixed resistance, every VOLU-flo/OAM must be characterized in order for the unit to accurately measure outside air velocity.

**User Setup Main Menu**
- Analog Output Configuration
- Field Characterization
- Transducer Span Selection

**Field Characterization**
- Select Characterization Off/On
- Select Reference Density Comp. Type
- Select Characterization Method
- Calculate Characterization?  1
- Enter Number of Data Points  2
- Enter Measured Point 1  2
- Enter Measured Point 2  2,3
- Enter Measured Point 3  2,3
- Enter Reference Point 1  2
- Enter Reference Point 2  2,3
- Enter Reference Point 3  2,3
- Perform Characterization  4
- Enter Characterization Expo  5
- Enter Characterization Cons  5
- Display Characterization Export & Constant
- Display Maximum Velocity Possible
- Return to MAIN MENU

**Default selection shown.**
- Characterization Off/On
  - OFF

**Available selections:**
- OFF or ON
- Manual or Dynamic

**Density Comp. Type**
- ACTUAL CONDITIONS
- STANDARD CONDITIONS

**Characterization Method**
- DYNAMIC

**Calc. Characterization?**
- NO

**Nmbr of Data Points**
- One Point
- Two Points
- Three Points

**Measured Point 1**
- 200 SFPM

**Measured Point 2**
- 1,000 SFPM

**Measured Point 3**
- 2,000 SFPM

**Reference Point 1**
- 200 AFPM

**Reference Point 2**
- 1,000 AFPM

**Reference Point 3**
- 2,000 AFPM

**Enter Calib Velocity**
- 2000 AFPM

**Characterization Expo**
- 0.5000

**Characterization Cons**
- 1,600.0

**EXPO:**
- 0.5000
- 0.0 to 1.0000

**CONS:**
- 1,600.0
- 0.0 to 3,275.0

**Chrzn Off:**
- XXX SFPM

**Chrzn On:**
- XXX SFPM

**Return to MAIN MENU**

---

1 Available only if Characterization Method is MANUAL.
2 Available only if YES is selected in Calculate Characterization?
3 Depends on Number of Data Points selected.
4 Not available if NO is selected in Calculate Characterization?
5 Available only if NO is selected in Calculate Characterization?
4.9 – FIELD CHARACTERIZATION (con’t)

The characterization must be performed after installation (Section 3) is complete and before VOLU-flo/OAM is commissioned for monitoring and/or controlling outside airflow.

Characterization ON is indicated when the VOLU-flo/OAM is in Normal mode by an asterisk (*) next to VELO in the display.

There are two methods of characterization: DYNAMIC and MANUAL.

- The DYNAMIC method will be the most commonly used during commissioning utilizing a single independent air velocity measurement (such as that supplied by a balancer).

- The MANUAL method is similar to the DYNAMIC method in that it utilizes independent air velocity measurements, but allows for two or three points of measurement for improved accuracy. If the VOLU-flo/OAM is an extended range unit, it is recommended that this method be used with a minimum of two points.

Section 4.9.3 details the DYNAMIC method, and Section 4.9.4 details the MANUAL method.

Additionally, characterization values (exponent and constant) can be entered directly (i.e. when restoring default values). See Section 4.9.5.

4.9.1 Required Equipment

A reference method for measuring outside airflow is necessary. This can be any type of portable airflow measuring system, such as pitot tube or vane anemometer. It is not recommended to use a thermal anemometer, as they are highly sensitive to moisture content in the air. If a thermal anemometer must be used, it should be set to indicate flow in actual conditions (AFPM).

Note: Do not use balance hoods as a reference method, as they will adversely affect the VOLU-flo/OAM's performance.
4.9 – FIELD CHARACTERIZATION (con’t)

4.9.2 Preparation

1. For characterization, the air handler must be operating and the outside air damper, supply air damper, and return air damper must be in a fixed position for the duration of the test in order to maintain a constant outside airflow.

2. Press and the display will indicate:

3. Press and the display will indicate:

4. Use or to scroll to Field Characterization and press . The display will indicate:

5. Press . Use or to scroll to OFF and press .

6. Use to scroll to Select Reference Density Comp. Type and press . The display will indicate current Density Compensation Type (actual or standard).

7. Use or to scroll between ACTUAL and STANDARD conditions. Selection should be the same as the reference method used. Use to make the selection.

8. Use to scroll to Select Characterization Method and press . The display will indicate the characterization method (Manual or Dynamic).

9. Use or to scroll to the desired method and press . Press twice to return to Normal mode.

If Dynamic method was selected, continue to Section 4.9.3.

If Manual method was selected, continue to section 4.9.4.
4.9 – FIELD CHARACTERIZATION (con’t)

4.9.3 Characterization - Dynamic Method

The dynamic method consists of performing and recording a single independent air velocity measurement utilizing a reference method described in 4.9.1. This recorded value is then entered into the VOLU-flo/OAM which references this flow to its internal flow signal.

Adjust outside air velocity to approximately 70% of Maximum Velocity as listed on the Factory Setup Information sheet and allow 5 minutes for stabilization.

Note: It is very important that the airflow remain constant during the airflow measurement.

Once the reference method of velocity measurement has been performed, calculated and recorded, enter USER menu according to Section 4.4 and follow the steps below.

Note: Airflow should remain constant even while entering the menu.

1. Press to enter USER menu. Use or to scroll to:

2. Press to enter Field Characterization. Display will indicate:

3. Use or to scroll to Perform Characterization and press .

4. Press and the display will indicate:

   Use or to scroll to the recorded air velocity value and press .

   If the characterization was successful, the display will indicate:

   Press X and continue to Step 5.

If the data entered resulted in unacceptable results, one of the following messages will be displayed:

Characteriz'n Error
EXPONENT TOO HIGH

or

Characteriz'n Error
EXPONENT TOO LOW

These messages indicate that the difference between the velocity sensed by the VOLU-flo/OAM and the independently measured velocity is too large.

If either message appears, press X and verify that the correct data has been entered above.

If an acceptable characterization cannot be performed, contact the Factory (see Section 7) for further guidance.
4.9 – FIELD CHARACTERIZATION (con’t)

5. Press \[ \uparrow \] and the display will indicate:

   | Display Characterizn  |
   | Exponent \& Constant  |

6. Press \[ \downarrow \] and the display will indicate:

   | Expo: 0.5000 |
   | Cons: 1600.0 |

The listed values of exponent and constant have been calculated from the data input, and are used in the following equation which is used by the VOLU-flo/OAM to determine velocity.

\[
Velocity = Constant \times (DP)^{Exponent}
\]

7. Press \[ \downarrow \] and then \[ \uparrow \] and the display will indicate:

   | Display Maximum |
   | Velocity Possible |

8. Press \[ \downarrow \] and the display will indicate:

   | Chrzn Off: 1000 SFPM |
   | Chrzn On: 1000 SFPM |

The displayed velocities indicate the maximum velocity that can be measured with and without the characterization.

Maximum velocity depends on Density Compensation Type selected in Monitor Configuration - Section 4.5. For standard density compensation, maximum velocity is calculated at maximum differential pressure and 120ºF. Actual density compensation is calculated at maximum differential pressure and –50ºF.

9. Press \[ \downarrow \] and then use \[ \uparrow \] or \[ \downarrow \], to scroll until the display indicates:

   | SELECT |
   | Characterizn Off/On |

10. Press \[ \downarrow \] and display will indicate:

    Press \[ \uparrow \] or \[ \downarrow \] to scroll to ON and press \[ \downarrow \].

    The characterization will now be used for measuring the outside air velocity.

11. Press \[ \uparrow \] or \[ \downarrow \] to scroll until the display indicates:

    | Return to |
    | MAIN MENU |

12. Press \[ \downarrow \] then \[ X \] to return to the Normal mode of operation.
4.9 – FIELD CHARACTERIZATION (con’t)

4.9.4 Characterization - Manual Method

The manual method consists of performing and recording up to three independent air velocity measurements at the same time monitoring and recording the VOLU-flo/OAM's displayed velocity.

A single point of operation (approximately 70% of maximum) can be utilized for this characterization which will yield acceptable results. However, if increased accuracy is desired, two or three points of operation can be preformed and recorded. As an example, two points of operation would be low and high (approximately 30% and 70% of maximum), whereas three points of operation would be low, medium, and high (approximately 30%, 50% and 70% of maximum).

If the VOLU-flo/OAM is an Extended range unit, it is recommended that a minimum of two points of operation be performed for best performance.

Once the data is recorded, it is entered into the VOLU-flo/OAM's microprocessor via the menu. Balancer's data is referred to as Reference Points and the VOLU-flo/OAM's data is referred to as Measured Points.

Enter the USER menu according to Section 4.4 and follow the steps below.

1. Press ↓ to enter USER menu. Use ↑ or ↓ to scroll to: Field Characterization
2. Press ↓ to enter Field Characterization. Display will indicate: Select Characterizn Off/On
3. Use ↑ or ↓ to scroll to Calculate Characterization?
4. Press ↓ and the display will indicate:
   Use ↑ or ↓ to scroll to YES and press ↓.
5. Press ↑ and the display will indicate: Enter Numbr of Data Points
6. Press ↓ and the display will indicate: Numbr of Data Points One Point
7. Use ↑ or ↓ to scroll to the desired number of data points and press ↓.
4.9 – FIELD CHARACTERIZATION (con’t)

The following steps are for One Point selected as the Number of Data Points. Two or three points will have the corresponding increase in data to be entered.

8. Press ↑ and the display will indicate:
   Enter
   Measured Point 1

9. Press ↓ and the display will indicate:
   Measured Point 1
   1,000 SFPM

   Use ↑ or ↓ to scroll to the VOLU-flo/OAM's velocity reading and press ↓.

10. Press ↑ and the display will indicate:
    Enter
    Reference Point 1

11. Press ↓ and the display will indicate:
    Reference Point 1
    1,000 AFPM

    Use ↑ or ↓ to scroll to the Balancer's velocity reading and press ↓.

   Note: Refer to Section 4.3 for pushbutton combinations to speed scrolling.

12. Press ↑ and the display will indicate:
    Press ↓.

    If the characterization was successful, the display will indicate:
    Press X and continue to Step 13.

   If the data entered resulted in unacceptable results, one of the following messages will be displayed:

   Characteriz'n Error
   EXPONENT TOO HIGH

   or

   Characteriz'n Error
   EXPONENT TOO LOW

   These messages indicate that the difference between the measured velocity and the reference velocity is too large.

   If either message appears, press X and verify that the correct data has been entered in steps 9 and 11 above.

   If an acceptable calculation cannot be performed, contact the Factory (see Section 7) for further guidance.
4.9 – FIELD CHARACTERIZATION (con’t)

13. Press ↑ and the display will indicate:

Display Characterizn Exponent & Constant

14. Press ↓ and the display will indicate:

Expo: 0.5000
Cons: 1600.0

The listed values of exponent and constant have been calculated from the data input, and are used in the following equation which is used by the VOLU-flo/OAM to determine velocity.

\[ \text{Velocity} = \text{Constant} \times (\text{DP})^{\text{Exponent}} \]

15. Press ↓ and then ↑, and the display will indicate:

Display Maximum Velocity Possible

16. Press ↓ and the display will indicate:

Chrzn Off: 1000 SFPM
Chrzn On: 1000 SFPM

The displayed velocities indicate the maximum velocity that can be measured with and without the characterization.

Maximum velocity depends on Density Compensation Type selected in Monitor Configuration - Section 4.5. For standard density compensation, maximum velocity is calculated at maximum differential pressure and 120ºF. Actual density compensation is calculated at maximum differential pressure and –50ºF.

17. Press ↓ and then use ↑ or ↓ to scroll until the display indicates:

SELECT Characterizn Off/On

18. Press ↓ and display will indicate:

Characterizn Off/On OFF

Press ↑ or ↓ to scroll to ON and press ↓.

The characterization will now be used for measuring the outside air velocity.

19. Press ↑ or ↓ to scroll until the display indicates:

Return to MAIN MENU

20. Press ↓ then X to return to the Normal mode of operation.
4.9 – FIELD CHARACTERIZATION (con’t)

4.9.5 Characterization - Manual Entry

1. Press \( \text{to enter USER menu. Use } \uparrow \text{ or } \downarrow \text{ to scroll to:} \)

2. Press \( \text{to enter Field Characterization. Display will indicate:} \)

3. Use \( \uparrow \text{ or } \downarrow \text{ to scroll to the following:} \)

4. Press \( \text{and the display will indicate:} \)
   Verify MANUAL is displayed and press \( \text{.} \)

5. Press \( \text{and the display will indicate:} \)

6. Press \( \text{and the display will indicate:} \)
   Verify NO is displayed and press \( \text{.} \)

7. Press \( \text{and the display will indicate:} \)

8. Press \( \text{and the display will indicate:} \)
   Use \( \uparrow \text{ or } \downarrow \text{ to scroll to the desired exponent value and press } \text{.} \)

9. Press \( \text{and the display will indicate:} \)

10. Press \( \text{and the display will indicate:} \)
   Use \( \uparrow \text{ or } \downarrow \text{ to scroll to the desired constant value and press } \text{.} \)
4.9 – FIELD CHARACTERIZATION (con’t)

11. Press ↑ and the display will indicate:

   Display Characterizn
   Exponent & Constant

12. Press ↓ and the display will indicate:

   Expo: 0.5000
   Cons: 1600.0

Verify the values are what was entered in steps 8 and 10.

The listed values of exponent and constant have are used in the following equation which is used by the VOLU-flo/OAM to determine velocity.

\[ \text{Velocity} = \text{Constant} \times (\text{DP})^{\text{Exponent}} \]

13. Press ↓ and then ↑, and the display will indicate:

   Display Maximum
   Velocity Possible

14. Press ↓ and the display will indicate:

   Chrzn Off: 1000 SFPM
   Chrzn On: 1000 SFPM

The displayed velocities indicate the maximum velocity that can be measured with and without the characterization.

Maximum velocity depends on Density Compensation Type selected in Monitor Configuration - Section 4.5. For standard density compensation, maximum velocity is calculated at maximum differential pressure and 120ºF. Actual density compensation is calculated at maximum differential pressure and –50ºF.

15. Press ↓ and then use ↑ or ↓, to scroll until the display indicates:

   SELECT
   Characterizn Off/On

16. Press ↓ and display will indicate:

   Characterizn Off/On
   OFF

   Press ↑ or ↓ to scroll to ON and press ↓.

   The characterization will now be used for measuring the outside air velocity.

17. Press ↑ or ↓ to scroll until the display indicates:

18. Press ↓ then X to return to the Normal mode of operation.
4.10 – TRANSDUCER SPAN SELECTION

Displays the transducer's natural 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.

1. While in Main Menu, use ↑ or ↓ to scroll to:

2. Press ↓ and display indicates the natural span of the installed transducer (0.10, 0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 2.50, 3.00, 5.00, 10.00 or 15.00 IN w.c.).

3. Use ↑ or ↓ to change setting. Once desired setting is displayed, press ↓. 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 X. Unit will remain programmed as it was originally.
4.11 – TECHNICIAN PARAMETERS

This Section allows the user to perform Transducer input calibration, Temperature input calibration, External Setpoint/Controller input calibration, calibration of the three analog outputs, and display the internal temperature of the VOLU-flo/OAM.

4.10.1 Required Equipment

- Digital Multimeter
- Voltage/Current Generator
- Digital Manometer capable of reading to the nearest 0.01" w.c.
- Source of clean, dry instrument air
- Adjustable Low Pressure Regulator

4.10.2 Preparation

1. Turn power switch on the VOLU-flo/OAM to the OFF position (see Figure 3.15).
2. Disconnect all wires installed on Terminals 15 through 20.
3. Slide "AZ VALVE" switch to the ON position (see Figure 3.15).
4. Remove both pressure signal lines to the VOLU-flo/OAM.
5. Turn power switch ON.
4.10.3 Calibration

1. While in Main Menu, use ↑ or ↓ to scroll to: Technician Parameters

2. Press and display will indicate: Perform Input Calibration

3. Press and display will indicate: Input Calibration Transducer Zero

If unit is Extended Range, display will indicate: Input Calibration Lo Range Xder Zero

4. Press and display will indicate: Transducer Zero -- Push ENTER --

5. Press and display will indicate: Transducer Zero Please Wait: 4 Sec.

Display will count down to 0 Sec., after which it will indicate: Input Zero Done -- Push ESCAPE --

6. Press X, then ↑ and display will indicate: Input Calibration Transducer Span

7. Press ↓ and display will indicate: Transducer Span -- Push ENTER --

8. Connect regulated air source and manometer to the "OUTSIDE AIR REF" Port at the bottom of the VOLU-flo/OAM.

9. Slide "AZ VALVE" switch to the OFF position.

10. Adjust input pressure (as read on manometer) to the appropriate value listed below:

11. Press ↓ and display will indicate: Transducer Span Please Wait: 4 Sec.

Display will count down to 0 Sec., after which it will indicate: Input Span Done -- Push ESCAPE --
4.11 – TECHNICIAN PARAMETERS (con’t)

12. Press X, then ↑ and display will indicate:
   - Input Calibration
   - Temperature Zero

13. Press ↓ and display will indicate:
   - Temperature Zero
   -- Push ENTER --

14. Slide RTD Calibration switch to the ZERO position (see Figure 3.15).

15. Press ↓, and display will indicate:
   - Temperature Zero
   Please Wait: 4 Sec.
   Display will count down to 0 Sec., after which it will indicate:
   - Input Zero Done
   -- Push ESCAPE --

16. Press X, then ↑ and display will indicate:
   - Input Calibration
   - Temperature Span

17. Press ↓ and display will indicate:
   - Temperature Span
   -- Push ENTER --

18. Slide RTD Calibration switch to the SPAN position.

19. Press ↓ and display will indicate:
   - Temperature Span
   Please Wait: 4 Sec.
   Display will count down to 0 Sec., after which it will indicate:
   - Input Span Done
   -- Push ESCAPE --

20. Slide RTD Calibration Switch to the NORMAL position.

21. Press X, then ↑ and display will indicate:
   Note: External setpoint calibration is only applicable if unit is configured as Monitor & Controller.
   - Input Calibration
   Ext Setpoint Zero

22. Connect a voltage/current generator adjusted for minimum value of External Setpoint input across Terminals 15 and 17 (see Figure 3.18).

23. Press ↓, and display will indicate:
   - Ext. Setpoint Zero
   -- Push ENTER --

24. Press ↓, and display will indicate:
   - Ext. Setpoint Zero
   Please Wait: 4 Sec.
   Display will count down to 0 Sec., after which it will indicate:
   - Input Zero Done
   -- Push ESCAPE --

25. Press X, then ↑ and display will indicate:
   - Input Calibration
   Ext. Setpoint Span

26. Press ↓ and display will indicate:
   - Ext. Setpoint Span
   -- Push ENTER --
4.11 – TECHNICIAN PARAMETERS (con’t)

27. With voltage/current generator still connected as in Step 22, adjust to maximum value of External Setpoint/Controller input.

28. Press \( \downarrow \), and display will indicate:

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

29. Press \( \times \), then \( \uparrow \) and display will indicate:

Note: External controller calibration is only applicable if unit is configured as Monitor & Controller.

30. Connect a voltage/current generator adjusted for minimum value of External Controller (Economizer Mode) input across Terminals 16 and 17 (see Figure 3.18).

31. Press \( \downarrow \), and display will indicate:

32. Press \( \downarrow \), and display will indicate:

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

33. Press \( \times \), then \( \uparrow \) and display will indicate:

34. Press \( \downarrow \) and display will indicate:

35. With voltage/current generator still connected as in Step 29, adjust to maximum value of External Controller input.

36. Press \( \downarrow \) and display will indicate:

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

37. Press \( \times \), then \( \uparrow \) and display will indicate:

38. Press \( \downarrow \), then \( \uparrow \) and display will indicate:

39. Press \( \downarrow \) and display will indicate:

40. Press \( \downarrow \) and display will indicate:
4.11 – TECHNICIAN PARAMETERS (con’t)

41. Connect a DMM set for mADC across Terminals 18 and 21 (see Figure 3.18). DMM should be reading minimum value; 4.00 ± 0.01mA.

42. If DMM is readout out of tolerance, use ↑ or ↓ to adjust VOLU-flo/OAM output for acceptable DMM reading. Depending on DMM’s selected range, the ↑ or ↓ 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.

<table>
<thead>
<tr>
<th>PUSHBUTTON combination</th>
<th>4-20mA</th>
<th>0-5VDC</th>
<th>0-10VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ only</td>
<td>+0.001mA</td>
<td>+0.3mV</td>
<td>+0.6mV</td>
</tr>
<tr>
<td>↓ only</td>
<td>−0.001mA</td>
<td>−0.3mV</td>
<td>−0.6mV</td>
</tr>
<tr>
<td>↑ + X</td>
<td>+0.01mA</td>
<td>+0.003V</td>
<td>+0.006V</td>
</tr>
<tr>
<td>↓ + X</td>
<td>−0.01mA</td>
<td>−0.003V</td>
<td>−0.006V</td>
</tr>
<tr>
<td>↑ + ↓</td>
<td>+0.1mA</td>
<td>+0.03V</td>
<td>+0.06V</td>
</tr>
<tr>
<td>↓ + ↑</td>
<td>−0.1mA</td>
<td>−0.03V</td>
<td>−0.06V</td>
</tr>
<tr>
<td>↑ + X and ↓</td>
<td>+1.0mA</td>
<td>+0.3V</td>
<td>+0.6V</td>
</tr>
<tr>
<td>* + X and ↑</td>
<td>−1.0mA</td>
<td>−0.3V</td>
<td>−0.6V</td>
</tr>
</tbody>
</table>

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

43. Once an acceptable zero reading is obtained, press ↓, and then ↑ and display will indicate: Output Calibration

44. Press ↓, and display will indicate:

45. With DMM still connected as in Step 33, reading should be at maximum value; 20.00 ± 0.01mA.

46. If DMM is reading out of tolerance, use ↑ or ↓ to adjust VOLU-flo/OAM output for an acceptable DMM reading.

47. Once an acceptable span reading is obtained, press ↓, then ↑ and display will indicate: Output Calibration

48. Repeat Steps 39 through 47 for other Outputs. For Output #2 (Monitor or Controller), connect DMM across Terminals 19 and 21; for Output #3 (Temperature or Selectable) across Terminals 20 and 21 (see Figure 3.18). Note: For voltage outputs reading should be within ±0.01V.

49. When Output #3 Span calibration is complete, Step 47 will yield a display:

50. Press ↓, then ↑ and display will indicate:

51. Press ↓, then ↑ and display will indicate:

52. Press ↓, and VOLU-flo/OAM will return to Normal mode of operation.

Note: If during the performance of the above steps the display on the VOLU-flo/OAM indicates something different than shown above (i.e., a warning), refer to "Section 6 - Troubleshooting" for the corrective action.
4.12 – NORMAL OPERATION

Under *Normal* operation, the VOLU-flo/OAM will continuously monitor and control (if configured) outside airflow.

**AUTO-zero.** Every hour, the VOLU-flo/OAM will initiate an AUTO-zero cycle. When this occurs, the display will be frozen and all outputs will remain constant.

**Controller.** Controller output will continuously modulate (when in automatic mode) its output to maintain outside airflow at the desired setpoint.

**Alarms.** Alarms will initiate when outside airflow drops below the low setpoint or exceeds the high setpoint.
5 – MAINTENANCE

The VOLU-flo/OAM 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.

5.1 – CLEANLINESS

– Verify condensation (or other sources of liquids) are not present inside the VOLU-flo/OAM.

5.2 – MECHANICAL

– Verify signal connections are secure.
– Inspect signal lines for any cracks or leaks.
– Verify mounting hardware is secure.

5.3 – ELECTRICAL

– Periodically inspect all wiring to the VOLU-flo/OAM for good connections and absence of corrosion.

5.4 – CALIBRATION

– VOLU-flo/OAM should have calibration verified annually as a minimum.
### Problem | Solution
--- | ---
Display indicates 0 FPM while in Normal Mode | – Verify fan is operational.
| – Verify flow is above lockdown value.
| – Verify AZ valve switch is in the OFF position.
Display reads "SENSOR OUT OF RANGE" while in Normal mode. | – The differential pressure sensed by the VOLU-flo/OAM is either < −6.25% or > +110.25% of transducer span. Verify air handler is operating correctly. Perform a Field Characterization.
Display reads "MAX FLOW EXCEEDED" while in Normal mode. | – The sensed velocity is > +110% of the maximum velocity possible. Verify air handler is operating correctly.
Display reads "AUTO ZERO OVER RANGE" while in Normal mode. | – Zero value measured during AUTO-zero cycle is greater than 100% of transducer span. Perform Input Calibration.
Display reads "TEMP. OUT OF RANGE" while in Normal mode. | – The ambient temperature is either < −50ºF or > 120ºF.
| – The RTD is disconnected.
Display reads "SENSOR OUT OF RANGE" while in Monitor Calibration. | – The differential pressure sensed is either < −6.25% or > +110.25% of transducer span. Verify air handler is operating correctly.
Display reads "FLOW TOO LOW" while in Monitor Calibration. | – The sensed flow is < 0% of range.
| Verify air handler is operating correctly.
Display reads "BAD INPUT ZERO" while in Temp Calibration. | – Verify the RTD calibration switch (Figure 3.15) is in the ZERO position.
Display reads "BAD INPUT SPAN" while in Temp Calibration. | – Verify the RTD calibration switch (Figure 3.15) is in the SPAN position.
Display reads "BAD INPUT ZERO" while in Ext Setpoint Calibration. | – Signal at terminals 15 and 17 (Figure 3.18) is either < −10% or > +30% of input span.
Display reads "BAD INPUT SPAN" while in Ext Setpoint Calibration. | – Signal at terminals 15 and 17 (Figure 3.18) is either < +80% or > +120% of input span.

If after following the Troubleshooting steps the VOLU-flo/OAM continues to operate improperly, contact the Service Department for further assistance (see Section 7).
7 – CUSTOMER SERVICE

7.1 – 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.

7.2 – 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 or e-mail.

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.

7.3 – 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.

7.4 – 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.

7.5 – 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.