ENMET
680 Fairfield Court
Ann Arbor, MI 48108
734.761.1270 Fax 734.761.3220
www.enmet.com

Creative Gas Detection Solutions

Matrix Medical Monitor
Operation and Maintenance Manual

Table of Contents

List of Figures

List of Tables

1.0 Introduction

The MATRIX instrument allows verification/certification personnel to evaluate Medical Air Systems as well as system designated piping applications for O2, N2, CO2 and N2O levels. The instrument is available with up to 8 internal sensors. Available sensors include, but are not limited to, anesthesia gases, carbon monoxide (CO), carbon dioxide (CO2), oxygen (O2), methane (CH4), nitrous oxide (N2O) trace Hydrocarbons (HC), and for dew point. The sensors can be used alone or up to four sensors can be used together on each of the two main circuit boards inside the MATRIX. In the instrument, the gas sample is passed over each sensor and the resulting electrical outputs are used to evaluate the air for the target gases.

Some features of the instruments are as follows:

- LCD display of gas and vapor concentrations
- visual alarms indicate target gas levels
- low air flow fault indication and display
- alarm acknowledgement
- fused power supply

NOTE: *All specifications stated in this manual may change without notice.*

1.1 Unpack

Unpack the ***MATRIX*** and examine it for shipping damage. If such damage is observed, notify both ***ENMET*** customer service personnel and the commercial carrier involved immediately.

Regarding Damaged Shipments

NOTE: *It is your responsibility to follow these instructions. If they are not followed, the carrier will not honor any claims for damage.*

- This shipment was carefully inspected, verified and properly packaged at ***ENMET*** and delivered to the carrier in good condition.
- When it was picked up by the carrier at ***ENMET***, it legally became your company's property.
- If your shipment arrives damaged:
  - Keep the items, packing material, and carton "As Is." Within 5 days of receipt, notify the carrier's local office and request immediate inspection of the carton and the contents.
  - After the inspection and after you have received written acknowledgment of the damage from the carrier, contact ***ENMET*** Customer Service for return authorization and further instructions. Please have your Purchase Order and Sales Order numbers available.
- ***ENMET*** either repairs or replaces damaged equipment and invoices the carrier to the extent of the liability coverage, usually $100.00. Repair or replacement charges above that value are your company's responsibility.
- The shipping company may offer optional insurance coverage. ***ENMET*** only insures shipments with the shipping company when asked to do so in writing by our customer. If you need your shipments insured, please forward a written request to ***ENMET*** Customer Service.

Regarding Shortages

If there are any shortages or questions regarding this shipment, please notify ***ENMET*** Customer Service within 5 days of receipt at the following address:

ENMET
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 Fax 734-761-3220
Toll Free: 800-521-2978

1.2 Check Order

Check, the contents of the shipment against the purchase order. Verify that the ***MATRIX*** is received as ordered. If there are accessories on the order, ascertain that they are present. Check the contents of calibration kits. Notify ***ENMET*** customer service personnel of any discrepancy immediately.

1.3 Serial Numbers

Each ***MATRIX*** is serialized. These numbers are on tags on the equipment and are on record in an ***ENMET*** database.

2.0 Instrument Features

2.1 Exterior Features

The exterior features are as follows:

Feature	Description
Enclosure	An engineered polypropylene-copolymer case, approximately 19x15x8, with hinged cover.
Input Ports	The entrance for the air sample. The quick release fitting mates with one on the sampling hose.
Enclosure Cover Latch	A quick-release latch that holds the cover in place, and is capable of being padlocked if desired.
Sample Air Hose(s)	Polypropylene tube for Dew Point sampling, 8 foot with quick disconnect and ¼ NPT male fitting. 2, Teflon lined vinyl tubes with fitting to connect Side A and Side B, 1 foot. 1, Teflon lined vinyl tube with quick disconnect for use with optional sample pump, 2 foot. 1, Teflon lined vinyl tube for user supplied air sample connection, 2 foot See **Figure 1**

2.2 Display Panel Features

The display panel, shown in **Figure 1**, is accessed by opening the cover. Features are as follows:

Feature	Description
Display	Dual, 2 line, 16 character per line, LCD with backlight. (4 channels each) The numerical values of gas concentrations and other information are displayed.
Power Switch	Top right of panel, On/Off switch with recessed guard.
Visual Alarms & Indicators	On either side of the display: A red alarm LED for each sensor installed in the instrument, Low level alarm. The top center of the panel: A red alarm LED for all sensors installed in the instrument, High level alarm. Near the center of the panel: A green power indicator LED A red fault alarm indicator LED
Charge Indicator	LED on top center of panel, status indications: Off – AC power not connected to unit Green Blinking – Charging Green Steady On – Charge Complete Red Blinking – Error: shorted terminals, invalid pack chemistry
Pushbutton Switches •**OPTION Switch** •**SELECT Switch** •**Audio Defeat / Alarm Acknowledge Switch**	There are three of these, located near the center of the panel; they are yellow rectangular membrane switches. They are: The top left switch.  Directly to the right of the OPTION switch.  Directly below the OPTION switch. 

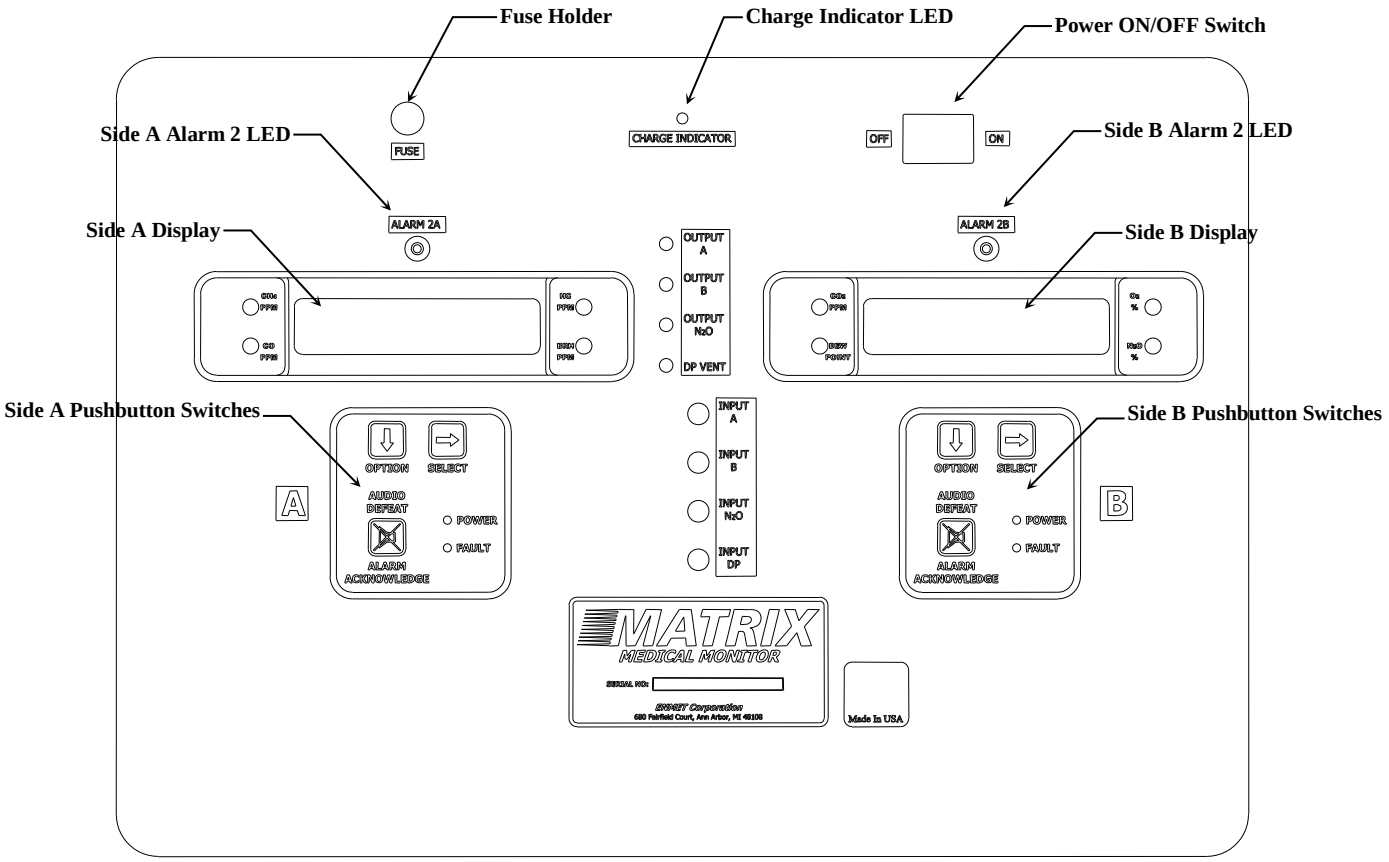
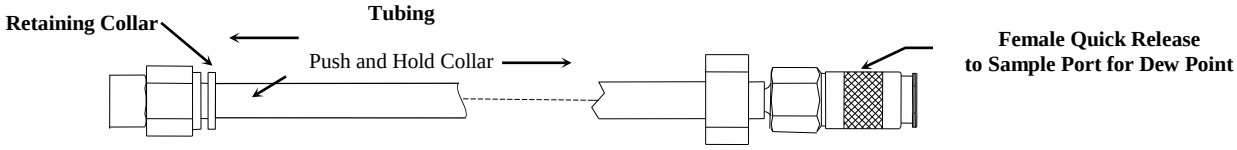
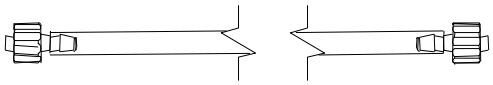


Figure 1: External Features of the MATRIX

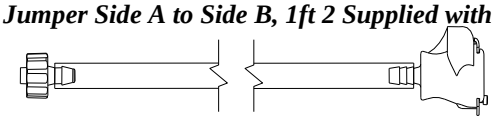
NOTE: *When connecting to a standard 55 PSI USA Medical air system, Regulator is Not required.*



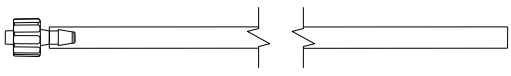
Sample Air Hose, 8ft Supplied with MATRIX



Sample Jumper Side A to Side B, 1ft 2 Supplied with MATRIX



Sample Pump, 2ft Supplied with MATRIX



Sample Hose User supplied Connection, 2ft Supplied with MATRIX

2.3 Circuit Board Features

The ***MATRIX*** circuit boards are mounted on the underside of the front panel. Features are shown in **Figure 2**.

Feature	Description
Sensor Manifold	The sample manifold, the carbon monoxide, carbon dioxide and oxygen sensors are located under this housing.
Dew Point Manifold	The dew point sensor is installed into this housing.
Dew Point Sensor	
N2O Manifold	The nitrous oxide sensor is installed into this housing.
N2O Circuitry	

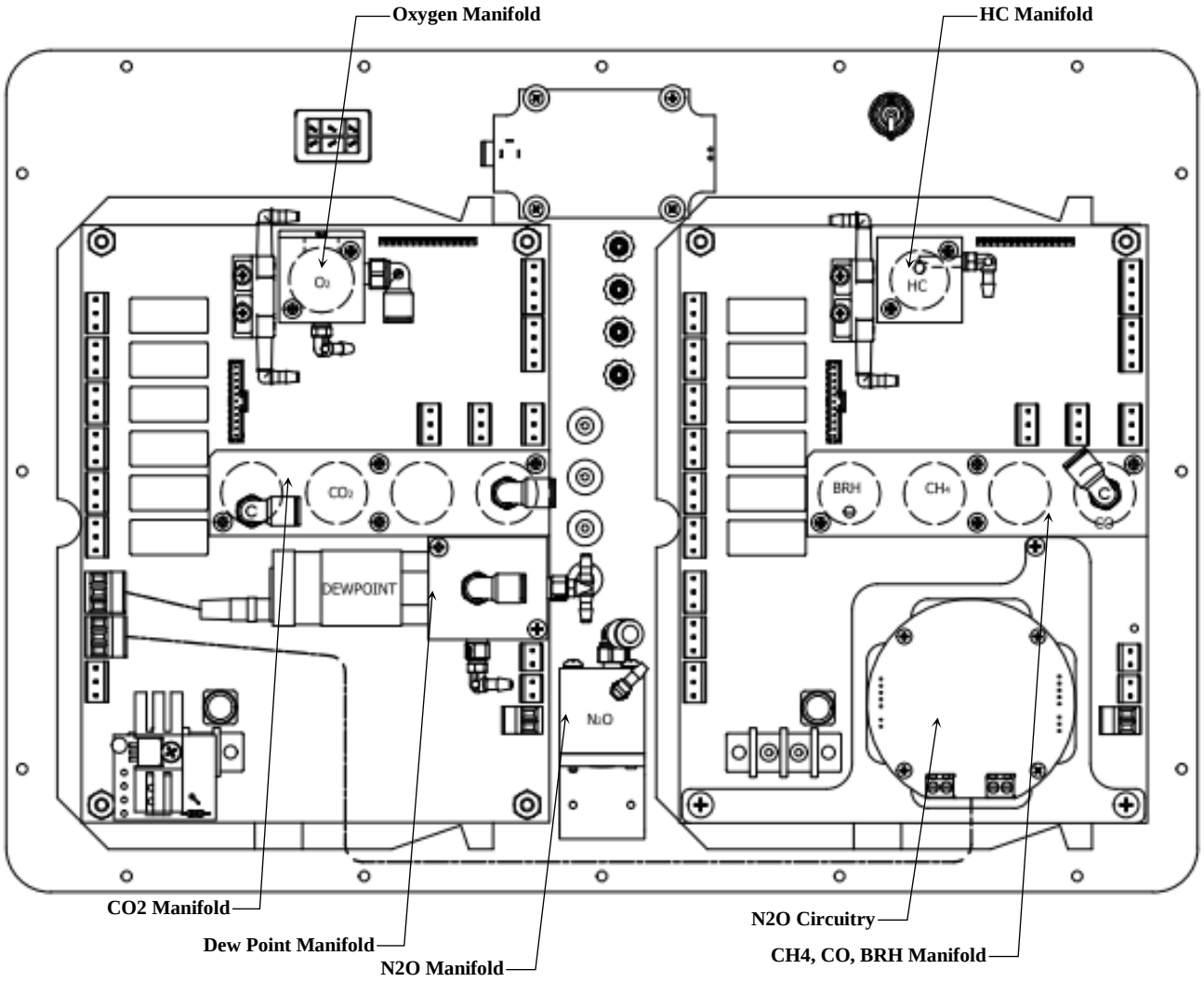


Figure 2: MATRIX Circuit Board Features

3.0 Air and Power Supply

3.1 Sample Air Supply

Sampling of target gases is accomplished by either connecting the ***MATRIX*** unit to a compressed air/gas line or for ambient air monitoring by a sampling system (sampling pump) capable of flowing a air/gas sample through the sensor manifold associated with Side A or Side B of the ***MATRIX***. Due to the variations of sampling connection possibilities the ***MATRIX*** unit is only supplied with the proper connection(s) to the ***MATRIX*** unit.

Dew Point: Connect the supplied sampling hose to the compressed air line and ***MATRIX*** unit. Set the inlet pressure to 55±5 PSIG.
For inputs A, B and N_2O connect the supplied sampling hose and adjust the flow rate to 0.5 lpm (1 SCFH).
For all sensors except dew point do not exceed flow rate of 1 lpm. Flow rates should be kept constant during all gas/vapor measurements.

3.2 Power Supply

The ***MATRIX*** is powered by a 15.2 VDC rechargeable Lithium Ion battery. The battery is recharged by an internal battery charging circuitry that is powered through the 110 VAC socket on the side of the enclosure. A 110 VAC line cord is supplied with the ***MATRIX.***

CAUTION: *The Lithium Ion battery cannot be substituted. Replacing the Lithium Ion battery with other power sources will cause damage to the **MATRIX** unit.*

Status of the Lithium Ion battery is indicated by an LED located at the top center of the display panel.

- LED Not lit, Instrument is off or 110 VAC line cord is not connected.
- LED Green and Steady, the battery is charged.
- LED Green and Blinking, the battery is charging.
- LED Red Blinking, indicates a power supply problem, contact ***ENMET***.

NOTE: *Federal regulation require that an approved "Lithium handling label" be attached to outer surface of the shipping package before tendering for shipment via commercial carriers.*

3.2.1 Circuit Protection, Fuse:

The power supply system is protected by a 5.0Amp Slo-Blo fuse located on the front panel of the ***MATRIX***.

CAUTION: *The Fuse, 5.0Amp Slo-Blo protection of the electronic circuitry, must be removed from the **MATRIX** prior to offering the **MATRIX** unit for shipment through commercial carriers.*

NOTE: *The fuse holder on top left of the Matrix Monitor must have the proper fuse inserted and the fixture rotated to lock the fuse into the charging circuit. The below comments apply only when fuse is properly inserted.*

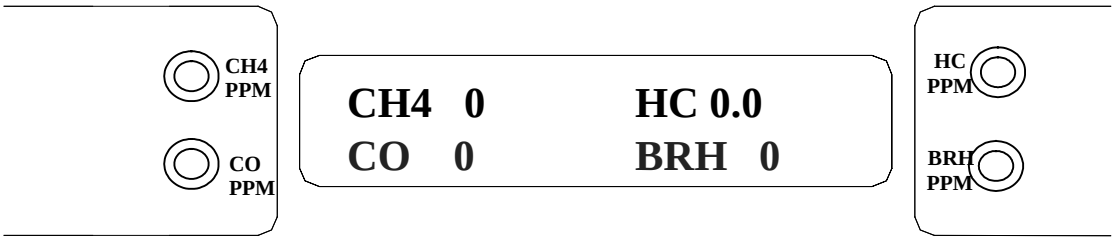
[If the fuse is defective or not installed and the power cord is connected to a 120Vac, the charger light flashes yellow/red/green. After a few seconds the Matrix shuts off side A and side B completely.]

Operation Mode	**Comments**
Power cord inserted into live 110Vac circuit/Matrix monitor power switch "OFF"	No LCD Displays or alarms actuated for any gas levels Green charging LED on front panel flashes when charging; steady green when charging is complete
Power cord inserted into live 110Vac power outlet/Matrix monitor power switch "ON"	After one minute warm-up, LCD, gas levels, flow and alarm lights activated Green charging light on front panel flashes while charging and goes to steady green when charging is complete
No power cord in use but the Matrix power switch is "ON" (full portable mode)	After one minute warm-up, LCD gas levels, flow, and alarm lights activated The Matrix green charging LED indicator is <u>not</u> activated in the battery only mode Side "A" and Side "B" power on lights will be activated

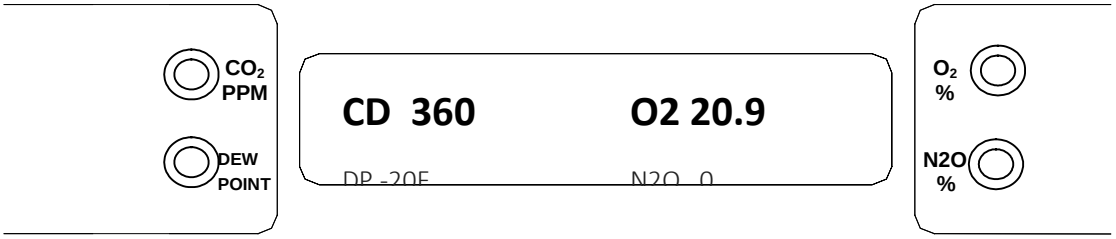
4.0 Operation

4.1 Normal Operation Condition

Turn on the ***MATRIX*** by, the power ON/Off switch, a green LED, above Side A and Side B display is lit and examples of the information on the display is as shown in **Figure 3 Operational Display**, for the sensor(s) installed in the ***MATRIX***.
If an air sample is not supplied to the ***MATRIX*** a flow fault will be indicated in the display area.



*Example of **Side A** display with CH_4 (ch 1), CO ((ch 2), HC (ch 3) and BRH (ch 4) options installed*



*Example of **Side B** display with CO_2 (ch 1), Dew Point ((ch 2), Oxygen (ch 3) and N_2O (ch 4) options installed*

Figure 3: *MATRIX* Operational Display

CAUTION: *CO_2 Information for Matrix Users*

Ambient air (Fresh Air) levels of CO_2 can be 350 to 400 part per million (ppm) in most parts of the planet. Human respiration, industrial processes and winter heating equipment can lead to indoor air quality CO_2 levels in the 550 to 1500 ppm in many locations. Even well-maintained air compressors can yield over 500 to 600 ppm CO_2 in compressed air streams. As a result of the above, your Matrix unit can easily have over 500 ppm CO_2 trapped in its internal pneumatics and sensor housing. You may require 15 to 30 minutes of flow of a CO_2 free gas stream to "purge" this trapped CO_2 from your Matrix instrument prior to some critical measurements.

4.2 Channel Configuration

The ***MATRIX*** Instrument is typically configured with 8 channels of gas detection. Example of channel configuration, type of sensor and span (range of delectability) are shown in **Table 1**.

Table 1: Typical Factory Configuration of Channels

Board A	Gas	Sensor Type	Span	Alarm 1	Alarm 2	Calibration Gas
Channel 1	CO_2	IR	0 – 5000 ppm	1000	2000	1000 ppm CO_2
Channel 2	DP	XMTR1 DMT142	-112 to +68° F	+35	+50	N/A
Channel 3	HC	PID	0 – 20 ppm	5	10	10 ppm Isobutylene
Channel 4	CO	EC	0 – 50 ppm	10	20	20 ppm CO

Board B	Gas	Sensor Type	Span	Alarm 1	Alarm 2	Calibration Gas
Channel 1	N_2O	IR	0 – 100% by Vol	95	90	100% N_2O
Channel 2	CH_4	XMTR1	0 – 5000 ppm	500	1000	2% LEL CH_4 = 1000ppm
Channel 3	O_2	KE25	0 – 100% by Vol	19.5%	17.0%	20.9% O_2
Channel 4	CO_2	XMTR1	0 – 100% by Vol.	95	90	100% CO_2

4.3 Alarms

Alarm set points can be changed within limits; see the maintenance section of this manual for the procedure.

- Channels containing CH4, CO HC, BRH, CO2 and DP are configured to have alarm points that activate as the detected concentration of gas increases.
- The Oxygen channel is configured to have alarm activation when the oxygen concentration is depleted.
- The N2O channel is configured to be in alarm anytime the concentration is below 90% by volume.

4.4 Audio Defeat

The ***MATRIX*** instrument is not provided with an audio alarm making the audio defeat portion of the switch non-operable. The alarm acknowledge is in effect, and is used to clear the alarm LED indicator following a gas level detection.

4.5 Display

In clean air an example of a display is shown in **Figure 3**. This position of the display is termed the "**operational display**". As explained below, the display can be used to view other information by using the **OPTION** and **SELECT** switches.
Examples, concentrations of CO and CO_2 are given in PPM (parts per million parts of air). Dew point is given in degrees Fahrenheit at 55 PSIG; *this can be changed to degrees Centigrade by pressing the SELECT switch*. Oxygen concentration is given in percent by volume.

When sample flow is reduced below a limit, the bottom line of the display flashes “Low Flow Alarm”.

4.6 Operational Menu

The operational menu allows the user to:

- View alarm set point concentration values
- View alarm ascending/descending trigger, latching and delay configurations
- Enter the maintenance menu with the proper Password.

The operational menu is accessed with the **OPTION** and **SELECT** switches. The operational menu flow chart is shown in **Figure 3**,

- Pressing the **OPTION** switch is indicated with a "**O**"
- Pressing the **SELECT** switch is indicated with a "**S**".

If the instrument is left at any location in the operational or maintenance menus, other than the operational display, with no action taken for a period of 45 seconds, it returns to the operational display.

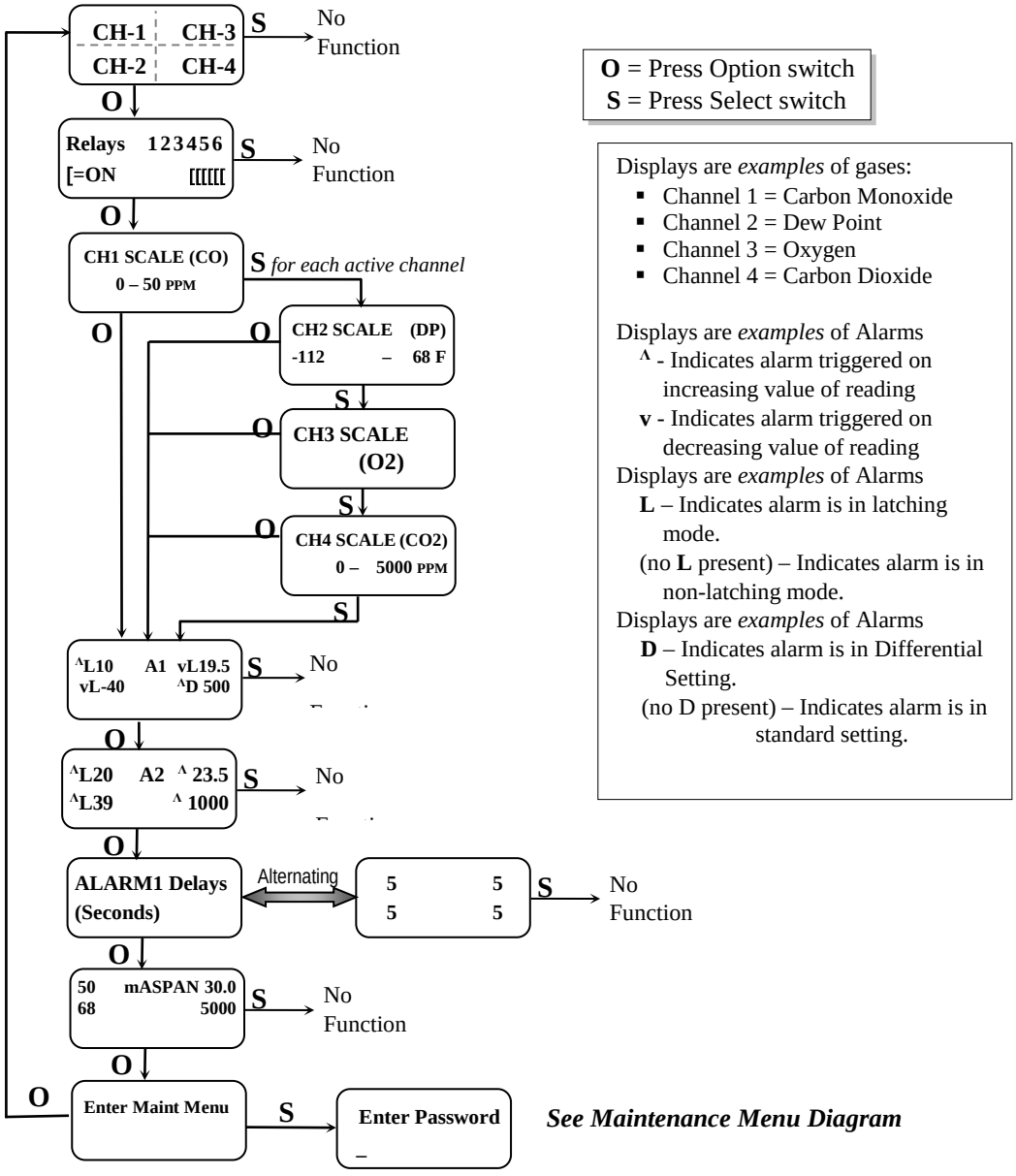


Figure 3: MATRIX Operation Menu Flow Chart

4.7 Fault Indications

4.7.1 Low Flow Indication

A flow sensor is used to furnish a low flow indication. When the sample air pressure drops below approximately 0.3 LPM, the fault light and audio alarm are activated, and the display flashes “Low Flow Alarm”.

4.7.2 Other Fault Indications

Other fault indications are associated with sensor zero and calibration activities, and are described in the maintenance **Section 5.0** of this manual.

4.8 Dew Point Sensor Response

It is a characteristic of the ***MATRIX*** that it takes more time to extract moisture from a sample by passing dry air through it, than it does to add moisture to a sample by passing moist air through it. Therefore, the time response of the instrument to a step change from moist to dry air is slower, then the response to a step change from dry to moist air.

It is the nature of most materials to absorb and release moisture at different rates. In general, it typically takes longer for a system to establish moisture equilibrium when going form a high to low humidity than it does to go from low to high. The ***MATRIX*** is no different. The sensor T90 response time is 10 seconds for a –40° to +50°F step change and 240 seconds for a +50° to –40°F step change. The delivery apparatus such as regulators, piping and tubing account for the additional response time of the instrument as a system.

4.9 Hydrocarbon Sensor Response

If a Hydrocarbon (HC) sensor is supplied with the ***MATRIX*** instrument, it operates by the photo-ionization principle (PID) and it designed to detect hydrocarbon gases and vapors with an ionization potential (IP) of 10.6 eV or less. Hydrocarbons with an IP of greater than 10.6 eV will NOT be detected. Please see Appendix A for a list of common gases and vapors and their respective IP rating.

Unless otherwise noted Isobutylene is used as a calibration and reference gas for their PID sensor.

5.0 Cleaning Instructions

CAUTION: Never spray a cleaning solution on the surfaces of the ***MATRIX*** devices.

Clean the exterior of the ***MATRIX*** enclosures with a mild soap solution on a clean, damp cloth. Do not soak the cloth with solution so that moisture drips onto, or lingers on, external surfaces.
Under no circumstances should organic solvents such as paint thinner be used to clean instrument surfaces.

5.1 Maintenance

The ***MATRIX*** requires periodic sensor calibration and replacement. To insure proper operation ***ENMET*** recommends users follow International Safety Equipment Association (ISEA) Guidelines for validation of operation for direct reading portable gas monitors.

Regular 'bump' testing of the sensor is recommended prior to each use, with occasional recalibration as required to meet the performance specification. Oxygen, Dew Point and CO sensors have an estimated lifetime of 1 – 2 years. The HC, BRH, N2O and CO_2 sensor has an estimated lifetime of 3 years.

See ISEA guidelines **Appendix C**
ISEA guidelines link: https://safetyequipment.org/wp-content/uploads/2015/09/calibration_statement-2010-Mar4.pdf

5.1.1 MATRIX Calibration Program

Factory calibration and service:

- ***ENMET*** recommends that the ***MATRIX*** be calibrated per ISEA at regular intervals not to exceed one year and more often in extreme conditions.
- ***ENMET*** offers a factory calibration and certification service to insure accurate performance. Please contact ***ENMET*** for information.

5.1.2 MATRIX Factory Service

- When contacting ***ENMET*** regarding service questions on your ***MATRIX*** unit, please provide the exact model number and serial number of your unit.
- The ***MATRIX*** instrument should be shipped back to the ***ENMET*** factory, prepaid by the instrument owner.
- ***ENMET's*** standard calibration procedure for the ***MATRIX*** consists of:
  - Documented sensor response prior to calibration
  - Testing of all components
  - Update of features and software where applicable
  - Calibration and documentation of calibration of all sensors*****
- Please contact ***ENMET*** for current pricing on calibration and repair service fees.
- Shipping: After service/calibration, the ***MATRIX*** instrument will be returned to the customer prepaid FedEx-ground shipping. If customer requires another shipping option, then their FedEx or UPS account number needs to be supplied to ***ENMET***.
- Instrument returned will include certificate of conformance for the dew point sensor and a certificate of calibration noting the traceability of calibration gases to NIST.

Dew Point: When applicable, the Dew Point sensor was calibrated by the manufacturer based upon temperature and pressure measurements that are traceable to NIST and European standards and the output was verified using ***ENMET*** procedures.

5.2 Maintenance Menu

5.2.1 Accessing Maintenance Menu

The ***MATRIX*** maintenance menu is accessed by entering the proper password with the **OPTION** and **SELECT** switches. See **Section 5.2.2 Figure 4** for full Maintenance Menu flow chart.

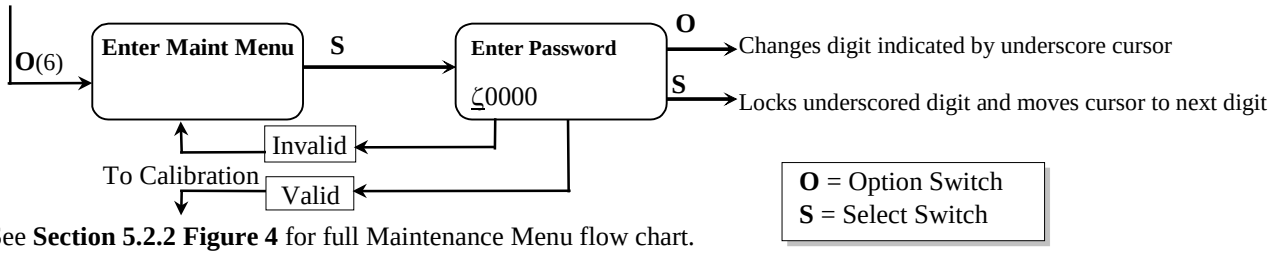
Entrance to the maintenance menu is guarded with a four-digit Password. The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.
To enter the maintenance menu. Press the **OPTION** switch until "Enter Maint Menu" is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described below.

In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
  - In the ζ000 position, the underline cursor is under the left digit.
  - Press the **OPTION** switch to change the left digit; select the correct digit.
  - Press the **SELECT** switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted, you are returned to the Enter Maint Menu display.

Example: Password Display (*with factory installed password entered*) and Flow Chart below.



See **Section 5.2.2 Figure 4** for full Maintenance Menu flow chart.

5.2.2 Maintenance Menu Flow Chart

The maintenance menu diagram is shown in **Figure 5 Maintenance Menu Flow Chart**. From the operational display, press the **OPTION** switch 6 times; "Enter MAINTENANCE Menu" is displayed.

NOTE: *Some of the Options found in the maintenance menu are not applicable to the **MATRIX** instrument. Don Not enter (select) these options.*

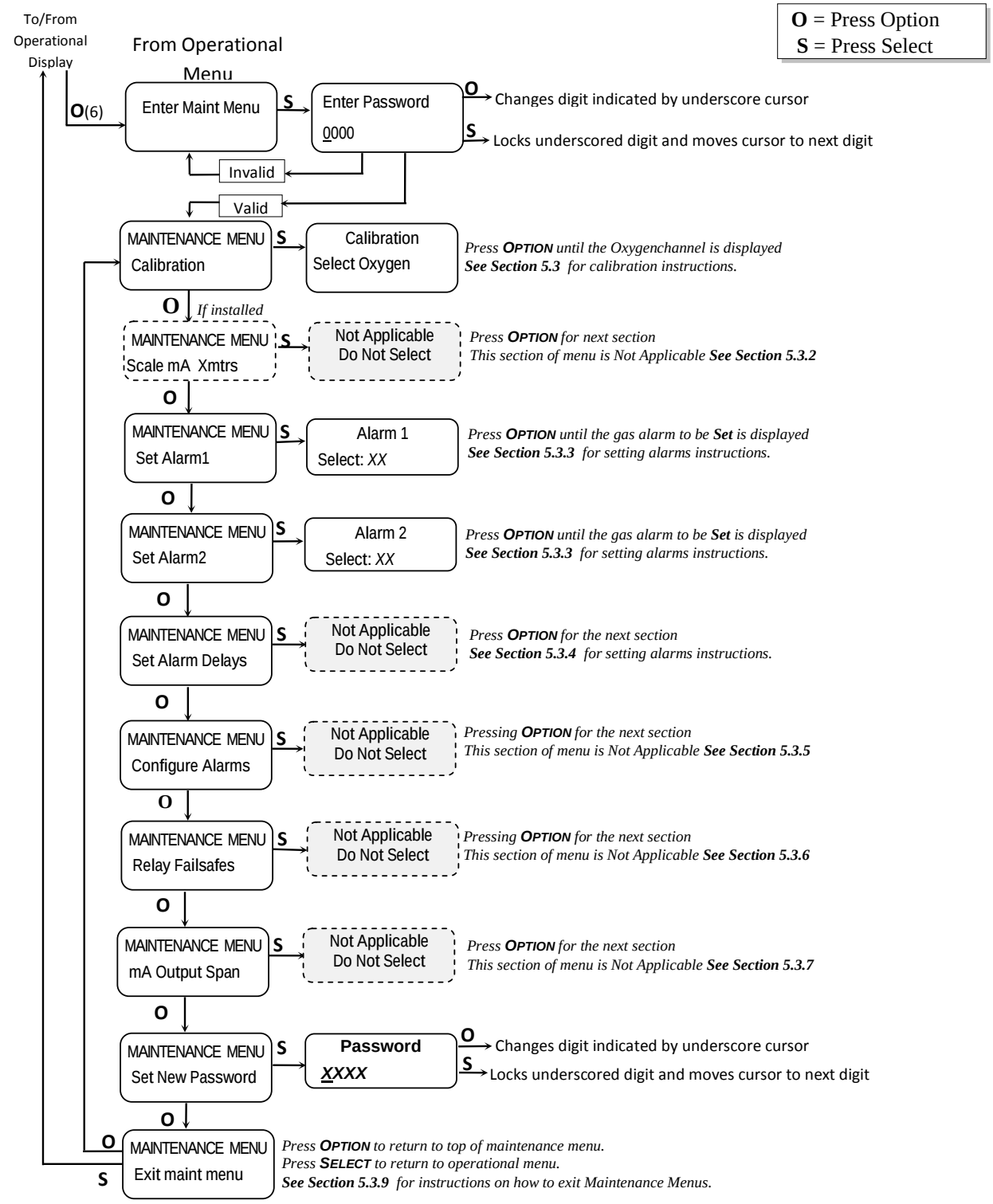


Figure 4: MATRIX Maintenance Menu Flow Chart

5.3 Calibration for Oxygen Channel

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas.
Calibration equipment is available from ***ENMET*** to calibrate the Oxygen channel.
You may exit the calibration section, at any time, by *pressing and holding* the **OPTION** switch for 3 seconds, if entering calibration section by mistake or calibration gas is not available.

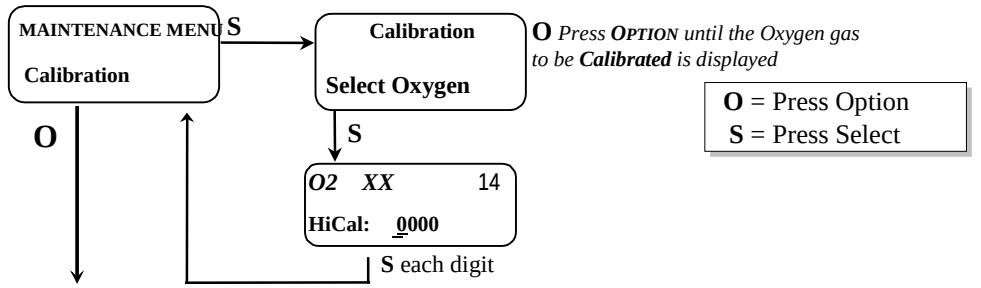
It is not necessary to open the Front Panel to make adjustment. The calibration functions are operated through the **OPTION** and **SELECT** switches on the front panel.

After entering a valid password to maintenance menu, see **Section 5.2.1**, the calibration section is the first menu section; enter by pressing the **SELECT** switch.

Due to the complexity of the ***MATRIX*** unit ***ENMET*** does not recommend field calibration of the instrument except for the oxygen channel. Please refer to the

- Press **OPTION** switch until "Exit Maint Menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Full Calibration Flow Chart, for Oxygen
From Valid Password Entry



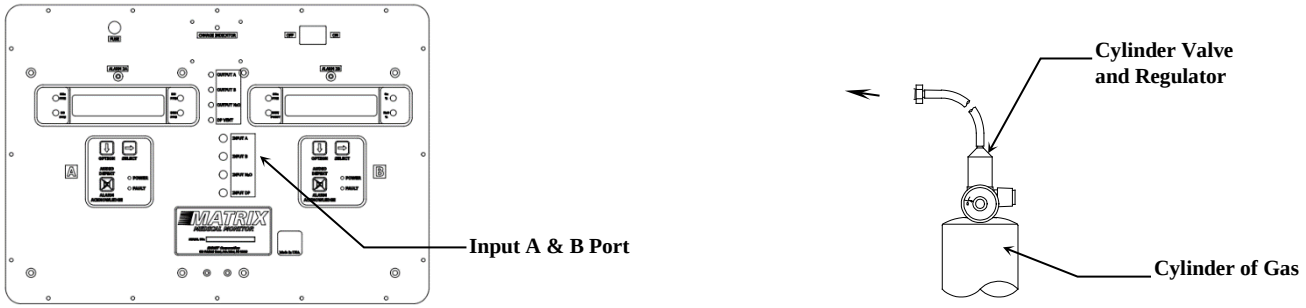


Figure 5: Connection of Calibration Gas Cylinder

5.3.1 High Cal/SpanGas Adjust

An unsuccessful calibration will result in an error message being displayed, *Example*: Offset Err, Cal Slope Err If Any Err messages appear the channel needs to be re-calibrated. Repeat Section 5.3.1 Low Cal/ZeroCal Adjust making sure to use a cylinder of 20.9% Oxygen.

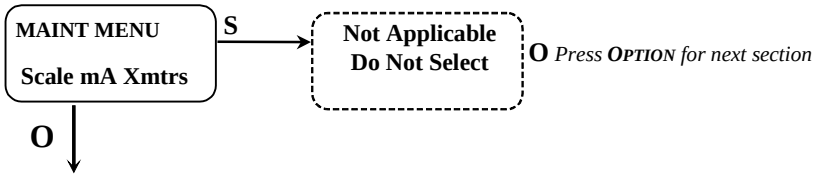
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display will move to "HiCal xx" gas calibration. *xx* = the level of gas to be used for calibration. The mV reading is shown in the upper right hand corner of the display.
- Apply calibration gas to sensor. See **Figure 5**. After about 1 minute and mV reading has stabilized.
- Press the **SELECT** switch, that moves the cursor one digit to the right, when the last digit is accepted and the calibration is successful the display will momentarily show Cal OK then slope and off set readings, before returning to the Calibration Menu

To continue to next section, press the **OPTION** switch.

- Press **OPTION** switch until "Exit Maint Menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

5.3.2 Set 4 –20mA Transmitter Scale

Not Applicable to Matrix, Do Not enter



5.3.3 Set Alarm Points

Factory alarm set points are discussed in Section 4.2, See Table 1. To change the alarm points, you must enter the maintenance menu.

Entrance to the maintenance menu is guarded with a four-digit Password. The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.

In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password ζ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the ζ000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch, which locks the digit in place and moves the cursor one digit to the right.

Continue this process until the four-digit password is complete. When a valid password is inserted in this manner, the display is transferred to the "Calibration" portion of the menu. If an invalid password is inserted, you are returned to the Enter Maint Menu display.

After entering a valid password:

- Press the **OPTION** switch until; "Maintenance Menu Set Alarm1" appears on display.
- Press the **SELECT** switch, "ALARM1 Select: *XX*" is displayed. *XX* = the gas of alarm point to be changed.
- Press the **OPTION** switch until, desired gas is displayed.
- Press the **SELECT** switch; "ALARM 1 **V**" is displayed, with the flashing placeholder underscore cursor, under the left most character, **Λ** for ascending trigger point or **V** for descending trigger point indicator.
- Press the **OPTION** switch to toggle between **Λ** and **V**; select the correct indicator.
- Press the **SELECT** switch to lock in the correct indicator. "ALARM 1 **STD**" is displayed
- Press the **OPTION** switch to toggle between **STD** and **DIFF**; select the correct indicator.
- Press the **SELECT** switch to lock in the correct indicator.

If **STD** is selected, "ALARM 1 **V L** " is displayed.

- The next character is the latching indicator **L** or **NO L** press the **OPTION** switch to toggle the latching mode.
- The next character is the negative sign **–** press the **OPTION** switch to toggle the negative sign.
- The next characters are the alarm 1 value, press the **OPTION** switch to select each digit of the value
  When the last digit is accepted display returns to the "Set Alarm1" position.

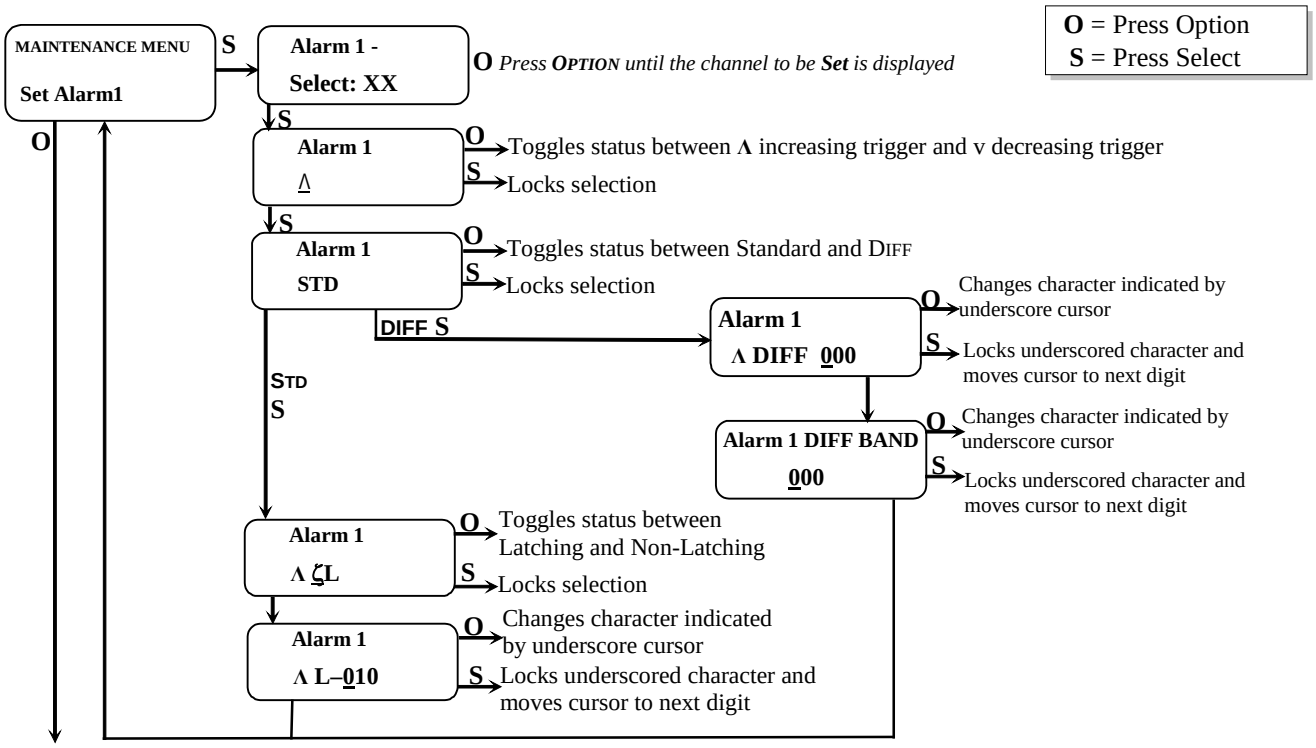
If **DIFF** is selected, "ALARM 1 **DIFF Λ 000**" is displayed.

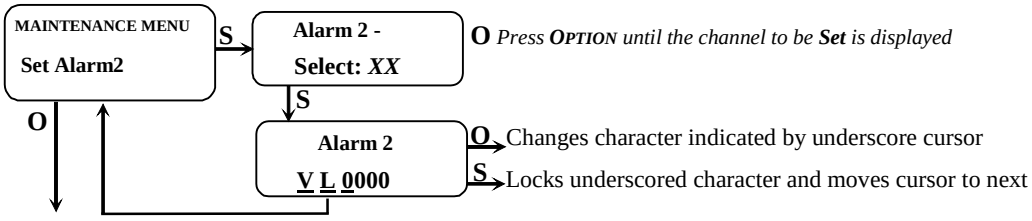
- The next characters are the alarm 1 value, press the **OPTION** switch to select each digit of the value
- Press the **SELECT** switch to lock in the correct character and move the cursor to the right.
- "ALARM 1 **DIFF BAND 000**" is displayed, press the **OPTION** switch to select each digit of the value.
- The next characters are the alarm 1 differential value, press the **OPTION** switch to select each digit of the value
- Press the **SELECT** switch to lock in the correct character and move the cursor to the right.
  When the last digit is accepted, display returns to the "Set Alarm1" position.

NOTE: *The Alarm 1 differential value is the delay of the **MATRIX** staying in alarm condition until after the measured reading has returned past the alarm point by the differential value. Example: If the alarm set point is **Λ** 10 and the differential is 2, the **MATRIX** will go into alarm at 10 and stay in alarm until the reading has dropped below 8.*

- Repeat for each sensor alarm 1 to be changed.
- Press the **OPTION** switch to move to alarm 2, "Set ALARM2" is displayed.
- Repeat as for alarm 1 using the **STD** section.
- Press **OPTION** switch until "Exit Maint Menu" appears, then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Alarms Flow Chart
Displays are *examples* of Alarms
Λ - Indicates alarm triggered on increasing value of reading
v - Indicates alarm triggered on decreasing value of reading
L- Indicates alarm is set for latching
NOL- Indicates alarm is set for non-latching
STD – Indicates alarm in standard setting, can be set in latched or non-latched mode
DIFF – Indicates alarm in differential setting, instrument will stay in alarm beyond the alarm set point by the differential value

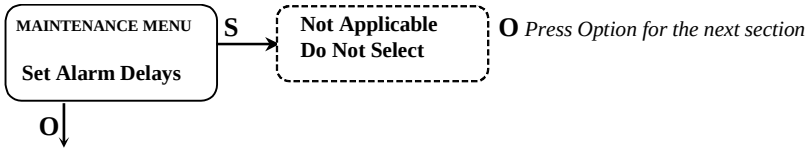




See **Section 4.2 Table 1** for factory alarm set points.

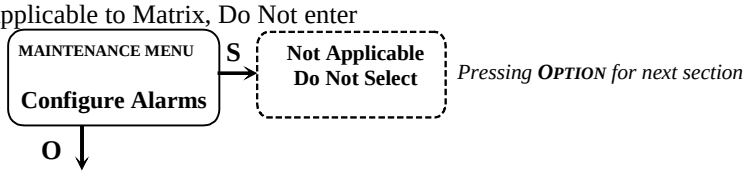
5.3.4 Set Alarm Delay

Not Applicable to Matrix, Do Not enter



5.3.5 Relay Configuration

Not Applicable to Matrix, Do Not enter

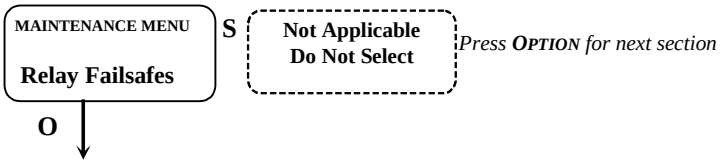


5.3.6 Failsafe Configuration

Not Applicable to Matrix, Do Not enter

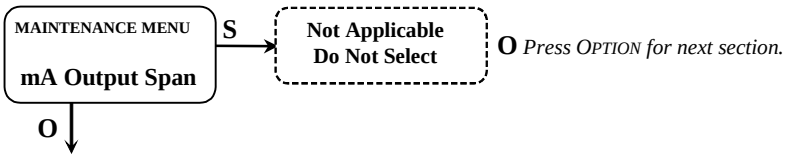
Example: Set Relay Failsafe Configuration Flow Chart

Not Applicable to Matrix, Do Not enter



5.3.7 Set Output Span Range

Not Applicable to Matrix, Do Not enter



5.3.8 Set New Password

To change the password, you must enter the maintenance menu. Press the **OPTION** switch until "Enter Maint Menu" is displayed then press **SELECT** switch for the Enter Password menu. Enter the valid password as described in Section 5.2.1.

- Press the **OPTION** switch until; "Set New Password" is displayed.
- Press the **SELECT** switch; "Password ζ1270" is displayed, with the underscore cursor under the left digit.
- Use the **OPTION** switch to change the left digit, when the desired digit is displayed.
- Press the **SELECT** switch to lock the digit in place and move the cursor one digit to the right.

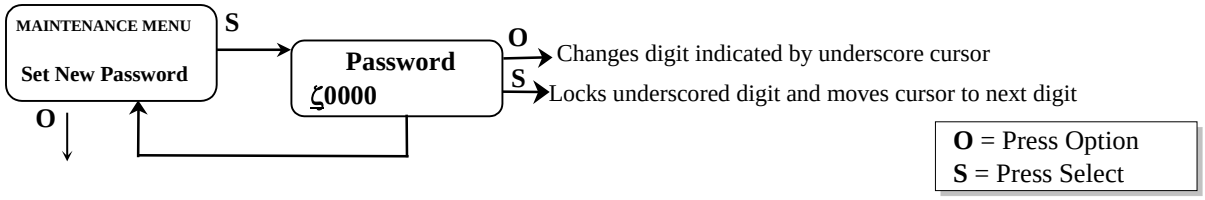
When all four digits of the new password have been selected, "Set New Password" is displayed.

Record the new password; without it, the maintenance menu cannot be reentered once you exit the Maintenance Menu. If the password is lost, call ***ENMET*** customer service personnel.

From the "Password *XXXX*" position,

- Press the **SELECT** switch to return to Set New Password section.
- Press the **OPTION** switch; to continue to "exit MAINTENANCE Menu"

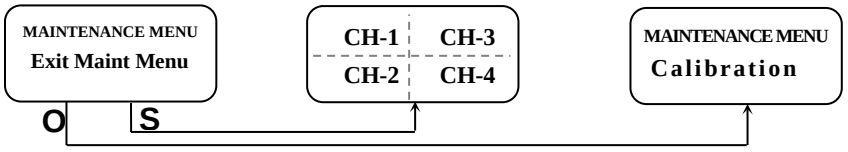
Example: Set Password Flow Chart



5.3.9 Exit Maintenance Menu

- Press the **SELECT** switch to resume the operational display.
- Press the **OPTION** switch to reenter the maintenance menu at the "Calibration" position.

Example: Exit Maintenance Menu Flow Chart



5.4 Sensor Replacement

The ***MATRIX*** requires periodic sensor calibration and replacement. Due to the complexity of the ***MATRIX*** unit ***ENMET*** does not recommend field calibration of the instrument with the exception of the oxygen channel. Oxygen, Dew Point and CO sensors have an estimated lifetime of 1 – 2 years. The HC, BRH, N2O and CO_2 sensor has an estimated lifetime of 3 years.

Sensor life and response can be tracked by ***ENMET*** when the ***MATRIX*** Calibration Program is utilized. Sensor replacement is an, as needed, situation. Cost would be per sensor replacement and is in addition to the ***MATRIX*** calibration Program fee.

6.0 Technical Data and Specifications

The ***MATRIX*** technical data and specifications:

Electrical Power	14.4 to 15.2 Vdc Lithium Ion Battery	
	110Vad Battery Charging Circuit	
Storage & Transport	Temperature:	-20° to +60°C (-4° to +140°F)
	preferred	0° to +20°C (32° to 68°F)
	Relative Humidity	0 - 99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
	NOTE: *Federal regulation requires that an approved "Lithium handling label" be attached to outer surface of the shipping package before tendering for shipment via commercial carriers.*	
Operation	Temperature:	0° to +40°C (32° to +104°F)
	Relative Humidity	0 - 99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
	Air Line Pressure: To Dew Point	55 PSI (± 5 PSI)
	Air Inlet Pressure: Side A	Do Not Exceed 3 PSI
	Air Inlet Pressure: Side B	Do Not Exceed 3 PSI
	Air Inlet Pressure: N_2O	Do Not Exceed 3 PSI
Mechanical	Dimensions:	20 in x 16 in x 8 in
	Weight:	21 lbs

Sensors	**Type**	**Range**	**Response Time**	**Life**
	CO	0 – 50 ppm	T_{90} = 30 seconds	1 – 3 years
	Dew Point*****	-112 - +68°F	T_{90} = 10 seconds for –40°F to 50°F step change	5+ years
	O_2	0 – 30%	T_{90} = 15 seconds	1 – 2 years
	CO_2	0 – 5000 ppm	T_{90} = 30 seconds	3 – 5 years
	HC	0 – 100 ppm	T_{90} = 30 seconds	1 – 2 years

Delivery regulators and hoses must "Dry Out" prior to accurate dew point measurements.

NOTE: *All specifications stated in this manual may change without notice.*

7.0 Replacement Part Numbers

7.1 ENMET part numbers:

Part number	Description
64002-5000	Fuse, Slo-Blo 5.0Amp
03296-209	Gas Cylinder, 20.9% oxygen in nitrogen (Steel Cylinder 34L)
03700-500	Calibration Adapter, CO, O_2 (for Steel Cylinder, 34L)
03700-033	Calibration/Connector Tube Sample Pump, assembly (2 ft)
03700-043	Sample Jumper Side A to Side B Hose, assembly (2 ft)
03700-044	Dew Point Sample Air Hose, assembly (8 ft)
04539-934	Label, Shipping Lithium Ion Battery

Notes:

Appendix A: Gas Ionization Potentials

Chemical Name	IP (eV)
A	
2-Amino pyridine	8.00
Acetaldehyde	10.21
Acetamide	9.77
Acetic acid	10.69
Acetic anhydride	10.00
Acetone	9.69
Acetonitrile	12.20
Acetophenone	9.27
Acetyl bromide	10.55
Acetyl chloride	11.02
Acetylene	11.41
Acrolein	10.10
Acrylamide	9.50
Acrylonitrile	10.91
Allyl alcohol	9.67
Allyl chloride	9.90
Ammonia	10.20
Aniline	7.70
Anisidine	7.44
Anisole	8.22
Arsine	9.89
B	
1,3-Butadiene (butadiene)	9.07
1-Bromo-2-chloroethane	10.63
1-Bromo-2-methylpropane	10.09
1-Bromo-4-fluorobenzene	8.99
1-Bromobutane	10.13
1-Bromopentane	10.10
1-Bromopropane	10.18
1-Bromopropene	9.30
1-Butanethiol	9.14
1-Butene	9.58
1-Butyne	10.18
2,3-Butadione	9.23
2-Bromo-2-methylpropane	9.89
2-Bromobutane	9.98
2-Bromopropane	10.08
2-Bromothiophene	8.63
2-Butanone (MEK)	9.54
3-Bromopropene	9.70
3-Butene nitrile	10.39
Benzaldehyde	9.53
Benzene	9.25
Benzenethiol	8.33
Benzonitrile	9.71
Benzotrifluoride	9.68
Biphenyl	8.27
Boron oxide	13.50
Boron trifluoride	15.56
Bromine	10.54
Bromobenzene	8.98
Bromochloromethane	10.77
Bromoform	10.48
Butane	10.63
Butyl mercaptan	9.15
cis-2-Butene	9.13
m-Bromotoluene	8.81
n-Butyl acetate	10.01
n-Butyl alcohol	10.04
n-Butyl amine	8.71
n-Butyl benzene	8.69
n-Butyl formate	10.50
n-Butyraldehyde	9.86
n-Butyric acid	10.16
n-Butyronitrile	11.67
o-Bromotoluene	8.79

Chemical Name	IP (eV)
p-Bromotoluene	8.67
p-tert-Butyltoluene	8.28
s-Butyl amine	8.70
s-Butyl benzene	8.68
sec-Butyl acetate	9.91
t-Butyl amine	8.64
t-Butyl benzene	8.68
trans-2-Butene	9.13
C	
1-Chloro-2-methylpropane	10.66
1-Chloro-3-fluorobenzene	9.21
1-Chlorobutane	10.67
1-Chloropropane	10.82
2-Chloro-2-methylpropane	10.61
2-Chlorobutane	10.65
2-Chloropropane	10.78
2-Chlorothiophene	8.68
3-Chloropropene	10.04
Camphor	8.76
Carbon dioxide	13.79
Carbon disulfide	10.07
Carbon monoxide	14.01
Carbon tetrachloride	11.47
Chlorine	11.48
Chlorine dioxide	10.36
Chlorine trifluoride	12.65
Chloroacetaldehyde	10.61
α□-Chloroacetophenone	9.44
Chlorobenzene	9.07
Chlorobromomethane	10.77
Chlorofluoromethane (Freon 22)	12.45
Chloroform	11.37
Chlorotrifluoromethane (Freon 13)	12.91
Chrysene	7.59
Cresol	8.14
Crotonaldehyde	9.73
Cumene (isopropyl benzene)	8.75
Cyanogen	13.80
Cyclohexane	9.80
Cyclohexanol	9.75
Cyclohexanone	9.14
Cyclohexene	8.95
Cyclo-octatetraene	7.99
Cyclopentadiene	8.56
Cyclopentane	10.53
Cyclopentanone	9.26
Cyclopentene	9.01
Cyclopropane	10.06
m-Chlorotoluene	8.83
o-Chlorotoluene	8.83
p-Chlorotoluene	8.70
D	
1,1-Dibromoethane	10.19
1,1-Dichloroethane	11.12
1,1-Dimethoxyethane	9.65
1,1-Dimethylhydrazine	7.28
1,2-Dibromoethene	9.45
1,2-Dichloro-1,1,2,2-tetrafluoroethane	12.20
1,2-Dichloroethane	11.12
1,2-Dichloropropane	10.87
1,3-Dibromopropane	10.07
1,3-Dichloropropane	10.85
2,2-Dimethyl butane	10.06
2,2-Dimethyl propane	10.35
2,3-Dichloropropene	9.82
2,3-Dimethyl butane	10.02
3,3-Dimethyl butanone	9.17
cis-Dichloroethene	9.65

Chemical Name	IP (eV)

Chemical Name	IP (eV)

(D continued)	
Decaborane	9.88
Diazomethane	9.00
Diborane	12.00
Dibromochloromethane	10.59
Dibromodifluoromethane	11.07
Dibromomethane	10.49
Dibutylamine	7.69
Dichlorodifluoromethane (Freon 12)	12.31
Dichlorofluoromethane	12.39
Dichloromethane	11.35
Diethoxymethane	9.70
Diethyl amine	8.01
Diethyl ether	9.53
Diethyl ketone	9.32
Diethyl sulfide	8.43
Diethyl sulfite	9.68
Difluorodibromomethane	11.07
Dihydropyran	8.34
Diiodomethane	9.34
Diisopropylamine	7.73
Dimethoxymethane (methylal)	10.00
Dimethyl amine	8.24
Dimethyl ether	10.00
Dimethyl sulfide	8.69
Dimethylaniline	7.13
Dimethylformamide	9.18
Dimethylphthalate	9.64
Dinitrobenzene	10.71
Dioxane	9.19
Diphenyl	7.95
Dipropyl amine	7.84
Dipropyl sulfide	8.30
Durene	8.03
m-Dichlorobenzene	9.12
N,N-Diethyl acetamide	8.60
N,N-Diethyl formamide	8.89
N,N-Dimethyl acetamide	8.81
N,N-Dimethyl formamide	9.12
o-Dichlorobenzene	9.06
p-Dichlorobenzene	8.95
p-Dioxane	9.13
trans-Dichloroethene	9.66
E	
Epichlorohydrin	10.20
Ethane	11.65
Ethanethiol (ethyl mercaptan)	9.29
Ethanolamine	8.96
Ethene	10.52
Ethyl acetate	10.11
Ethyl alcohol	10.48
Ethyl amine	8.86
Ethyl benzene	8.76
Ethyl bromide	10.29
Ethyl chloride (chloroethane)	10.98
Ethyl disulfide	8.27
Ethyl ether	9.51
Ethyl formate	10.61
Ethyl iodide	9.33
Ethyl isothiocyanate	9.14
Ethyl mercaptan	9.29
Ethyl methyl sulfide	8.55
Ethyl nitrate	11.22
Ethyl propionate	10.00
Ethyl thiocyanate	9.89
Ethylene chlorohydrin	10.52
Ethylene diamine	8.60
Ethylene dibromide	10.37
Ethylene dichloride	11.05
Ethylene oxide	10.57
Ethylenelmine	9.20
Ethynylbenzene	8.82

F	
2-Furaldehyde	9.21
Fluorine	15.70
Fluorobenzene	9.20
Formaldehyde	10.87
Formamide	10.25
Formic acid	11.05
Freon 11 (trichlorofluoromethane)	11.77
Freon 112 (1,1,2,2-tetrachloro-1,2-	11.30
Freon 113 (1,1,2-trichloro-1,2,2-	11.78
Freon 114 (1,2-dichloro-1,1,2,2-	12.20
Freon 12 (dichlorodifluoromethane)	12.31
Freon 13 (chlorotrifluoromethane)	12.91
Freon 22 (chlorofluoromethane)	12.45
Furan	8.89
Furfural	9.21
m-Fluorotoluene	8.92
o-Fluorophenol	8.66
o-Fluorotoluene	8.92
p-Fluorotoluene	8.79
H	
1-Hexene	9.46
2-Heptanone	9.33
2-Hexanone	9.35
Heptane	10.08
Hexachloroethane	11.10
Hexane	10.18
Hydrazine	8.10
Hydrogen	15.43
Hydrogen bromide	11.62
Hydrogen chloride	12.74
Hydrogen cyanide	13.91
Hydrogen fluoride	15.77
Hydrogen iodide	10.38
Hydrogen selenide	9.88
Hydrogen sulfide	10.46
Hydrogen telluride	9.14
Hydroquinone	7.95
I	
1-Iodo-2-methylpropane	9.18
1-Iodobutane	9.21
1-Iodopentane	9.19
1-Iodopropane	9.26
2-Iodobutane	9.09
2-Iodopropane	9.17
Iodine	9.28
Iodobenzene	8.73
Isobutane	10.57
Isobutyl acetate	9.97
Isobutyl alcohol	10.12
Isobutyl amine	8.70
Isobutyl formate	10.46
Isobutyraldehyde	9.74
Isobutyric acid	10.02
Isopentane	10.32
Isophorone	9.07
Isoprene	8.85
Isopropyl acetate	9.99
Isopropyl alcohol	10.16
Isopropyl amine	8.72
Isopropyl benzene	8.69
Isopropyl ether	9.20
Isovaleraldehyde	9.71
m-Iodotoluene	8.61
o-Iodotoluene	8.62
p-Iodotoluene	8.50
K	
Ketene	9.61
L	
2,3-Lutidine	8.85
2,4-Lutidine	8.85
2,6-Lutidine	8.85

Chemical Name	IP (eV)
M	
2-Methyl furan	8.39
2-Methyl napthalene	7.96
1-Methyl napthalene	7.96
2-Methyl propene	9.23
2-Methyl-1-butene	9.12
2-Methylpentane	10.12
3-Methyl-1-butene	9.51
3-Methyl-2-butene	8.67
3-Methylpentane	10.08
4-Methylcyclohexene	8.91
Maleic anhydride	10.80
Mesityl oxide	9.08
Mesitylene	8.40
Methane	12.98
Methanethiol (methyl mercaptan)	9.44
Methyl acetate	10.27
Methyl acetylene	10.37
Methyl acrylate	9.90
Methyl alcohol	10.85
Methyl amine	8.97
Methyl bromide	10.54
Methyl butyl ketone	9.34
Methyl butyrate	10.07
Methyl cellosolve	9.60
Methyl chloride	11.28
Methyl chloroform (1,1,1-trichloroethane)	11.00
Methyl disulfide	8.46
Methyl ethyl ketone	9.53
Methyl formate	10.82
Methyl iodide	9.54
Methyl isobutyl ketone	9.30
Methyl isobutyrate	9.98
Methyl isocyanate	10.67
Methyl isopropyl ketone	9.32
Methyl isothiocyanate	9.25
Methyl mercaptan	9.44
Methyl methacrylate	9.70
Methyl propionate	10.15
Methyl propyl ketone	9.39
□ □-Methyl styrene	8.35
Methyl thiocyanate	10.07
Methylal (dimethoxymethane)	10.00
Methylcyclohexane	9.85
Methylene chloride	11.32
Methyl-n-amyl ketone	9.30
Monomethyl aniline	7.32
Monomethyl hydrazine	7.67
Morpholine	8.20
n-Methyl acetamide	8.90
N	
1-Nitropropane	10.88
2-Nitropropane	10.71
Naphthalene	8.12
Nickel carbonyl	8.27
Nitric oxide, (NO)	9.25
Nitrobenzene	9.92
Nitroethane	10.88
Nitrogen	15.58
Nitrogen dioxide	9.78
Nitrogen trifluoride	12.97
Nitromethane	11.08
Nitrotoluene	9.45
p-Nitrochloro benzene	9.96
O	
Octane	9.82
Oxygen	12.08
Ozone	12.08
P	
1-Pentene	9.50
1-Propanethiol	9.20
2,4-Pentanedione	8.87

Chemical Name	IP (eV)
(P continued)	
2-Pentanone	9.38
2-Picoline	9.02
3-Picoline	9.02
4-Picoline	9.04
n-Propyl nitrate	11.07
Pentaborane	10.40
Pentane	10.35
Perchloroethylene	9.32
Pheneloic	8.18
Phenol	8.50
Phenyl ether (diphenyl oxide)	8.82
Phenyl hydrazine	7.64
Phenyl isocyanate	8.77
Phenyl isothiocyanate	8.52
Phenylene diamine	6.89
Phosgene	11.77
Phosphine	9.87
Phosphorus trichloride	9.91
Phthalic anhydride	10.00
Propane	11.07
Propargyl alcohol	10.51
Propiolactone	9.70
Propionaldehyde	9.98
Propionic acid	10.24
Propionitrile	11.84
Propyl acetate	10.04
Propyl alcohol	10.20
Propyl amine	8.78
Propyl benzene	8.72
Propyl ether	9.27
Propyl formate	10.54
Propylene	9.73
Propylene dichloride	10.87
Propylene imine	9.00
Propylene oxide	10.22
Propyne	10.36
Pyridine	9.32
Pyrrole	8.20
Q	
Quinone	10.04
S	
Stibine	9.51
Styrene	8.47
Sulfur dioxide	12.30
Sulfur hexafluoride	15.33
Sulfur monochloride	9.66
Sulfuryl fluoride	13.00
T	
o-Terphenyls	7.78
1,1,2,2-Tetrachloro-1,2-difluoroethane (Freon	11.30
1,1,1-Trichloroethane	11.00
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon	11.78
2,2,4-Trimethyl pentane	9.86
o-Toluidine	7.44
Tetrachloroethane	11.62
Tetrachloroethene	9.32
Tetrachloromethane	11.47
Tetrahydrofuran	9.54
Tetrahydropyran	9.25
Thiolacetic acid	10.00
Thiophene	8.86
Toluene	8.82
Tribromoethene	9.27
Tribromofluoromethane	10.67
Tribromomethane	10.51
Trichloroethene	9.45
Trichloroethylene	9.47
Trichlorofluoromethane (Freon 11)	11.77
Trichloromethane	11.42
Triethylamine	7.50
Trifluoromonobromo-methane	11.40

Chemical Name	IP (eV)
(T continued)	
Trimethyl amine	7.82
Tripropyl amine	7.23
V	
o-Vinyl toluene	8.20
Valeraldehyde	9.82
Valeric acid	10.12
Vinyl acetate	9.19
Vinyl bromide	9.80
Vinyl chloride	10.00
Vinyl methyl ether	8.93

Chemical Name	IP (eV)
W	
Water	12.59
X	
2,4-Xylidine	7.65
m-Xylene	8.56
o-Xylene	8.56
p-Xylene	8.45

Appendix B: Examples Sample Hose Connection

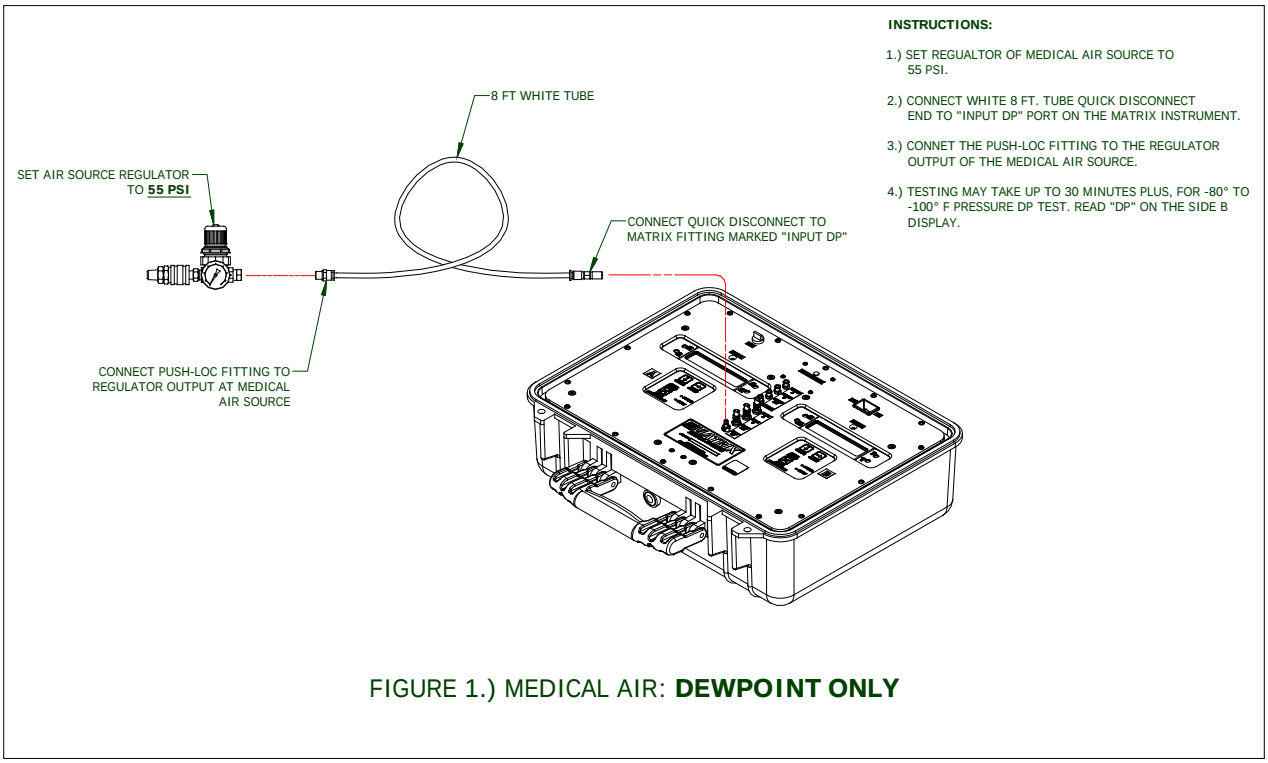


FIGURE 1.) MEDICAL AIR: **DEWPOINT ONLY**

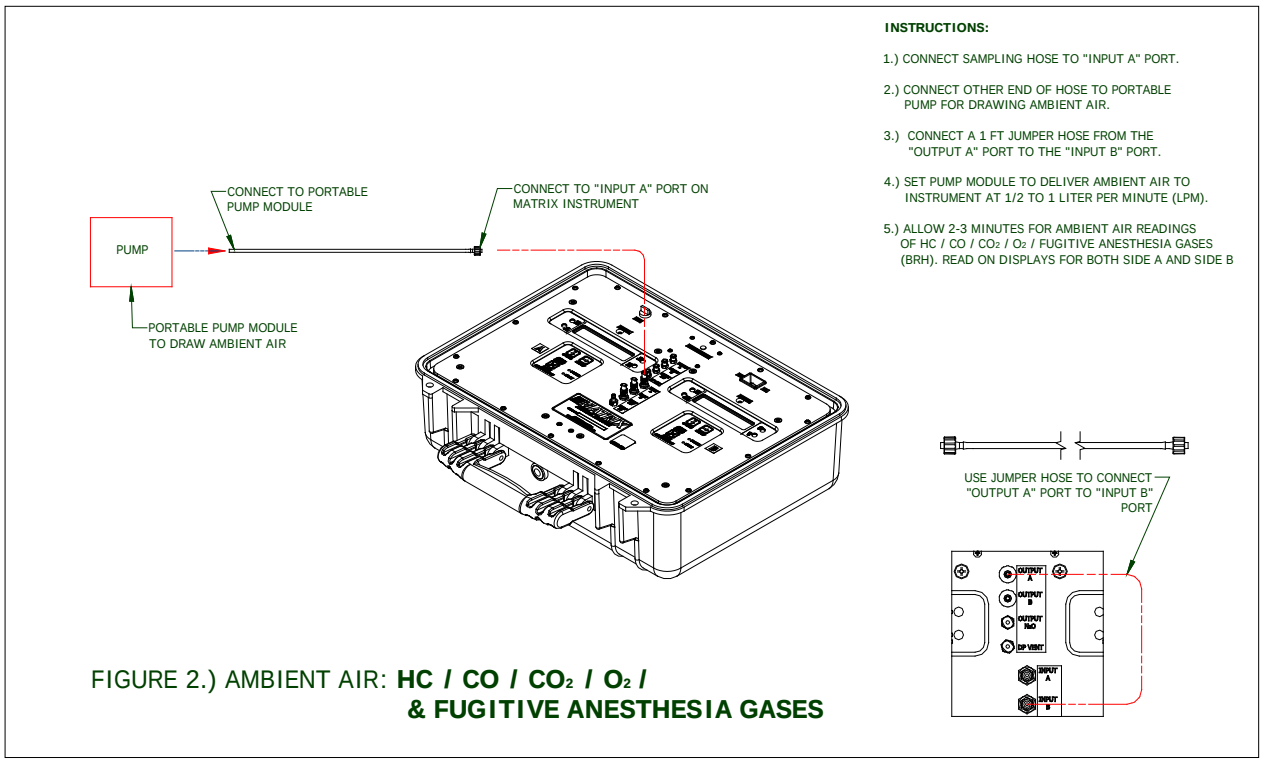


FIGURE 2.) AMBIENT AIR: **HC / CO / CO_2 / O_2 / & FUGITIVE ANESTHESIA GASES**

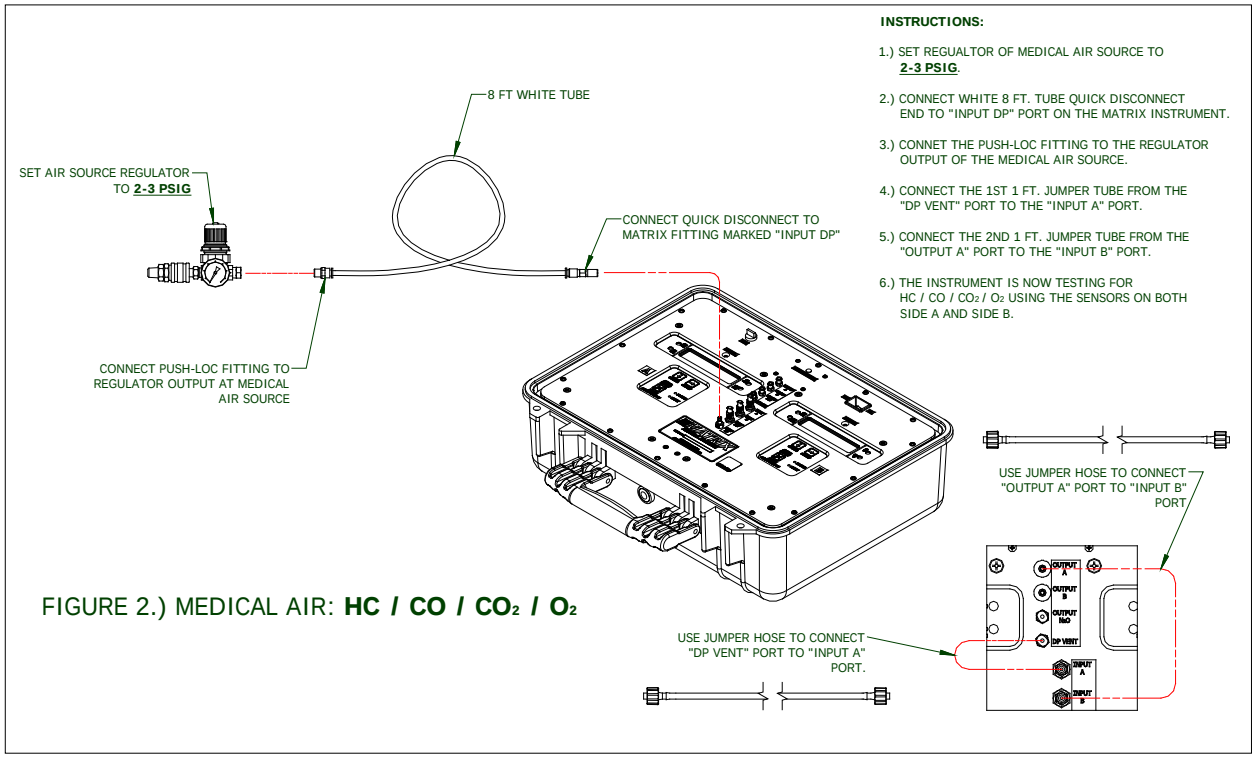


FIGURE 2.) MEDICAL AIR: **HC / CO / CO_2 / O_2**

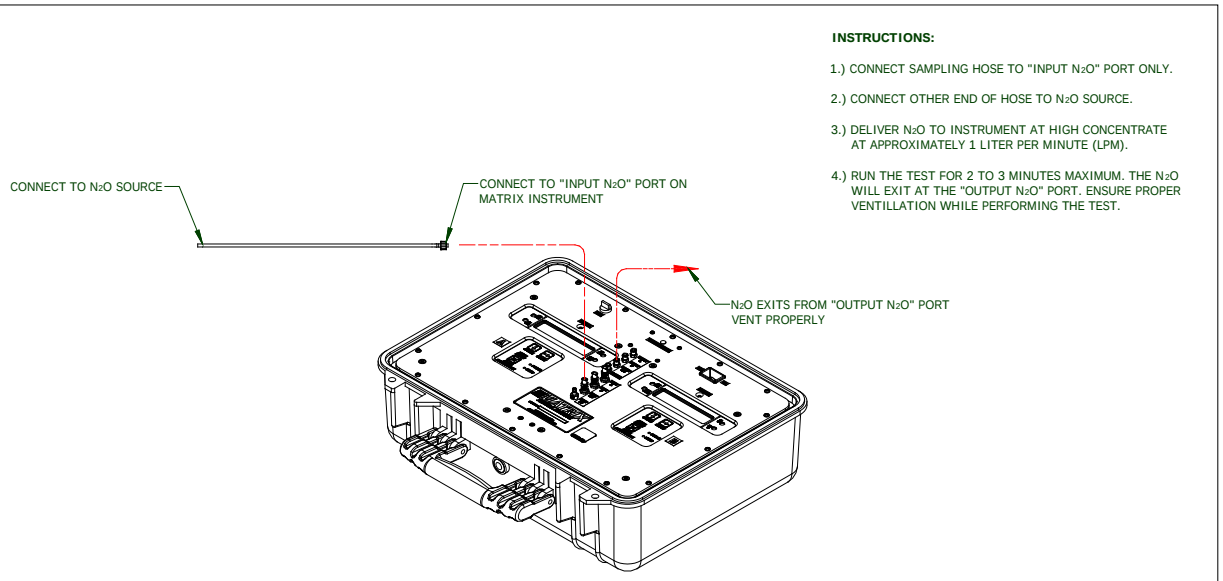


FIGURE 3.) MEDICAL AIR: **NITROUS OXIDE (N_2O) ONLY**

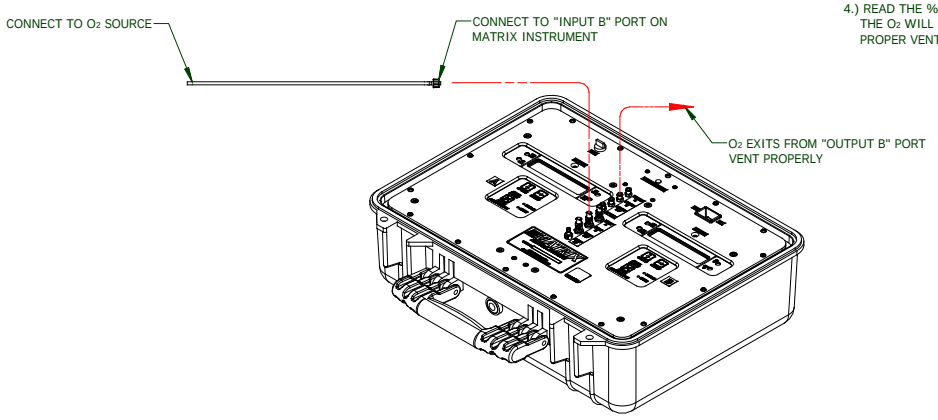


FIGURE 4.) MEDICAL AIR: **MEDICAL GRADE OXYGEN (O_2)**

Appendix C: ISEA Statement

ISEA Statement on Validation of Operation for Direct Reading Portable Gas Monitors

The International Safety Equipment Association (ISEA) is the leading national organization of manufacturers of safety and health equipment including environmental monitoring instruments. ISEA is dedicated to protecting the health and safety of all workers through the development of workplace standards and the education of users on safe work practices and exposure prevention.
ISEA has developed this statement to ensure definition consistency in all documentation, and to emphasize the need to validate the operational capability of portable gas monitors. The statement reflects current instrumentation technologies and monitoring practices.

Specifically, the statement intends to:

a. Define and clarify the differences between bump test (function check), calibration check, and full calibration;
b. Clarify when these validation methods are to be performed; and
c. Reemphasize to users, regulatory agencies and standards writing bodies the importance of validating the operational capabilities of portable gas monitors used to examine the atmosphere in potentially hazardous locations.

1. Definitions

a. **Bump Test (Function Check) -** A qualitative function check where a challenge gas is passed over the sensor(s) at a concentration and exposure time sufficient to activate all alarm indicators to present at least their lower alarm setting. The purpose of this check is to confirm that gas can get to the sensor(s) and that all the alarms present are functional. This is typically dependent on the response time of the sensor(s) or a minimum level of response achieved, such as 80% of gas concentration applied. Note this check is not intended to provide a measure of calibration accuracy.
b. **Calibration Check** - A quantitative test utilizing a known traceable concentration of test gas to demonstrate that the sensor(s) and alarms respond to the gas within manufacturer's acceptable limits. This is typically ±10-20% of the test gas concentration applied unless otherwise specified by the manufacturer, internal company policy, or a regulatory agency.
c. **Full calibration** – The adjustment of the sensor(s) response to match the desired value compared to a known traceable concentration of test gas. This should be done in accordance with the manufacturer's instructions.

2. Recommended Frequency

a. A bump test (function check) or calibration check of portable gas monitors should be conducted before each day's use in accordance with the manufacturer's instructions.
Any portable gas monitor which fails a bump test (function check) or calibration check must be adjusted by means of a full calibration procedure before further use, or removed from service.
b. A full calibration should be conducted at regular intervals in accordance with instructions specified by the instrument's manufacturer, internal company policy, or a regulatory agency.
c. Validation of an instrument's operability should be conducted if any of the following conditions or events occurs during use:
   i. Chronic exposures to, and use in, extreme environmental conditions, such as high/low temperature and humidity, and high levels of airborne particulates.
   ii. Exposure to high (over range) concentrations of the target gases and vapors.
   iii. Chronic or acute exposure of catalytic hot-bead LEL sensors to poisons and inhibitors. These include volatile silicones, hydride gases, halogenated hydrocarbons, and sulfide gases.
   iv. Chronic or acute exposure of electrochemical toxic gas sensors to solvent vapors and highly corrosive gases.
   v. Harsh storage and operating conditions, such as when a portable gas monitor is dropped onto a hard surface or submerged in liquid. Normal handling/jostling of the monitors can create enough vibration or shock over time to affect electronic components and circuitry.
   vi. Change in custody of the monitor.
   vii. Change in work conditions that might have an adverse effect on sensors.
   viii. Any other conditions that would potentially affect the performance of the monitor.

International Safety Equipment Association
March 5, 2010
Ref: https://safetyequipment.org/wp-content/uploads/2015/09/calibration_statement-2010-Mar4.pdf

8.0 Terms and Conditions

8.1 Ordering Information

Address orders to:

ENMET
Attention: Customer Service Department
680 Fairfield Court
Ann Arbor, MI 48108

Email Orders: orderentry@enmet.com
Phone: 734-761-1270 Fax: 734-761-3220
You may also contact our customer service department by email info@enmet.com. MINIMUM ORDER IS $50.00.

8.2 Delivery

Unless Seller otherwise specifies, delivery will be made: FOB Ann Arbor, MI and/or FOB Bowling Green, KY. Title and risk of loss shall pass to Buyer at that point. Shipping and handling charges will be Prepaid and Added to Buyer's invoice. Buyer may request shipping be charged to their own account with a preferred carrier. Seller shall have the right to choose means of transportation and to route shipment when specific instructions are not included with Buyer's order. Seller agrees to deliver the goods and services, within the time, in accordance with specifications, at the prices specified on the face hereof. Buyer's orders to this quotation are not subject to cancellation or deferment of delivery without indemnification of loss to the Seller resulting there from. Seller shall not be liable to Buyer for any loss or damage sustained on account of this delay or nonperformance due to causes beyond Seller's control and without his fault or negligence. Where performance of the terms here is contingent upon timely delivery of goods or services by the Buyer and such delivery is in default, Seller shall be indemnified for any damage or loss resulting there from, and/or by extension of Seller's delivery commitment, as applicable.

8.3 Payment Terms

Payment Terms are Net 30 Days from the date of shipment from Seller unless otherwise noted. All shipping and handling costs will be charged to Buyer on a Prepaid and Add basis. Buyer has the option of paying for shipping by charging its own account with a carrier

8.4 Warranty Information and Guidelines

The Seller warrants new instruments to be free from defects in workmanship and material under normal use for a period of one year from date of shipment. The warrant covers both parts and labor excluding calibration and expendable parts such as filters, detector tubes, batteries, etc. If the inspection by the Seller confirms that the product is defective, it will be repaired or replaced at no charge, within the stated limitations, and returned prepaid to any location in the United States. The Seller shall not be liable for any loss or damage caused by the improper use or installation of the product. The Buyer indemnifies and saves harmless the Seller with respect to any loss or damages that may arise through the use by the Buyer or others of this equipment. This warranty is expressly given in lieu of all other warranties, either expressed, implied or statutory, including that of merchantability, and all other obligations, or liabilities of ENMET, LLC for damages arising out of or in connection with the use or repair or performance of the product. In no event shall ENMET, LLC, be liable for any indirect, incidental, special or consequential damages or for any delay in the performance by ENMET, LLC, which may arise in connection with this equipment. ENMET neither assumes nor authorizes any representatives or other persons to assume for it any obligation or liability other than that which is set forth herein. Buyer agrees to indemnify and save harmless Seller for any damage or loss from lawsuits against Seller by reason of manufacture of sale of materials, parts, or use of processes resulting from Buyer's design specifications. Any patent, design, pattern, tool, die, jig, fixture, drawing, test equipment, or process furnished by Seller; whether possessed by the Seller before the date of this quotation, or devised or acquired by Seller during performance of the terms of this quotation, shall remain the property of the Seller except by specific stipulation on the face hereof. Seller reserves the right, without liability, for damage or loss, to destroy Buyer's drawings, specifications, patterns and special tools supplied by Buyer for performance of the terms on the face hereof, unless Buyer gives notice of the disposition of such items.

8.5 Return Policy

All returns for credit must be approved in advance by ENMET, LLC. Such returns are subject to a minimum $50.00 or 20% restocking charge, whichever is greater. **Approval of equipment for return is totally at the discretion of ENMET, LLC.** All requests for return/exchange must be made no later 30 days of the original shipping date from ENMET. The actual amount of any resulting credit will not be determined prior to a complete inspection of the equipment by ENMET. Calibration gas cylinders cannot be returned or restocked.

9.0 Instructions for Returning an Instrument for Service

Contact the ENMET Service Department for all service requests.
Phone: 734-761-1270
Email: repair@enmet.com

Fill out the "Service Request Form" found at the end of this manual and return with your instrument for all needs. Please send your instrument for service to the site in which the product was purchased. A new "Service Request Form" may be requested if the one found in the manual is not available. All instruments should be shipped prepaid to ENMET.
Address for Service:

Michigan Location:

ENMET
Attention: Service Department
680 Fairfield Court
Ann Arbor, MI 48108

Kentucky Location:

ENMET
62 Corporate Court
Bowling Green, KY 42103

Providing the "Service Request Form" assists in the expedient service and return of your unit and failure to provide this information can result in processing delays. ***ENMET*** charges a one hour minimum billing for all approved repairs with additional time billed to the closest tenth of an hour. All instruments sent to ***ENMET*** are subject to a minimum evaluation fee, even if returned unrepaired. Unclaimed instruments that ***ENMET*** has received without appropriate paperwork or attempts to advise repair costs that have been unanswered after a period of 60 days may, be disposed of or returned unrepaired COD and the customer will be expected to pay the evaluation fee. Serviced instruments are returned by UPS/FedEx Ground and are not insured unless otherwise specified. If expedited shipping methods or insurance is required, it must be stated in your paperwork.

NOTE: *Warranty of customer installed components.*

For Warranty Repairs, please reference ***ENMET's*** "Warranty Information and Guidelines" (found earlier in this section).

Mailing/Shipping Address:
ENMET
680 Fairfield Court
Ann Arbor, MI 48108
repair@enmet.com

Phone: 734.761.1270
Fax: 734.761.3220

Service Request Form

Product Name or Number:
Product Serial Number:

Describe Problem or Needed Service:

Warranty Claim? ☐ Yes ☐ No

CUSTOMER INFORMATION

Billing Address:

Shipping Address:

Contact Name: _____ **Phone #:** _____
Email: _____ **Fax #:** _____
PO/Reference #: _____

PAYMENT METHOD

☐ COD ☐ VISA/MasterCard ☐ American Express

_____ _____ _____
Card Number Exp. Date Security Code:

Name as it Appears on Card: _____

RETURN SHIPPING METHOD

☐ UPS Ground ☐ UPS 3 Day Select ☐ UPS Next Day Air ☐ UPS ND Air Saver ☐ UPS 2 Day Air

UPS Account #: _____

☐ FedEx Ground ☐ FedEx Air Express Saver ☐ FedEx Air Overnight Std. ☐ FedEx Air 2 Day ☐ FedEx Air Overnight P-1

FedEx Account #: _____

Insure Shipment: ☐ Yes ☐ No

Insurance Amount: $ _____