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PID-GUARD
Compressed Air Line
Hydrocarbon Monitor
Manual

Manual Part Number
80002-050
MCN-383, 11/05/07

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Reference Information:

NOTE: [important information about use of instrument]

CAUTION: [affects equipment – if not followed may cause damage to instrument, sensor etc...]

WARNING: [affects personnel safety – if not followed may cause bodily injury or death.]



Earth Ground

1.0 Introduction

The **PID-GUARD** is a compressed air monitoring instrument that measures and detects Hydrocarbons in industrial compressed air systems utilizing a photoionization sensor. Hydrocarbons (HC) are limited to gases with an ionization potential of 10.6 eV or less. See Appendix A for a list of gases and IPs. The **PID-GUARD** is *NOT* in an enclosure rated for use in a Class I, Div 1, Groups B, C, D classified area and *CAN NOT* be installed in a hazardous location.

Features of the **PID-GUARD**:

- continuous monitoring of the sample air
- continuous LCD display of gas and vapor concentrations
- menu driven operational and maintenance controls
- menu driven calibration procedure
- audio and visual alarms indicate unsafe conditions
- alarm relay contacts available on terminals
- a fault relay and visual fault alarm
- low air flow fault indication and display
- alarm acknowledgement capability including audio defeat
- mA outputs for target gas

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

1.1 Unpack

Unpack the **PID-GUARD** 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 our company 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. 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 Corporation
680 Fairfield Court
Ann Arbor, MI 48108
734-761-1270 734-761-3220 Fax

1.2 Check Order

Check the contents of the shipment against the purchase order. Verify that the **PID-GUARD** is received as ordered. Each **PID-GUARD** is labeled with its target gas. 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 **PID-GUARD** is serialized. These numbers are on tags on the equipment and are on record in an **ENMET** database.

2.0 Components of the PID-GUARD

2.1 PID-GUARD elements

See Figure 1 for location of elements:

Feature	Description
Enclosure	A polycarbonate box, approximately 7 x 5 x 3, with a detachable front cover. 4 holes for mounting the enclosure to a vertical surface. Located at the corners of the bottom of the enclosure, directly beneath the 4 front cover retaining screws. See Figure 3
Input Port	The entrance for the air sample and calibration gas. The quick release fitting mates with one on the optional Sample air hose and the calibration adapter.
Front Cover	Detachable front cover of PID-GUARD with Display Panel. See Section 2.2 and Figure 1 There are 4 Screws that hold the front cover in place.
Sample Air Hose (Optional)	A five foot long hose to conduct a sample of the air from the source to the instrument. The hose has a Female quick release fitting and regulator. See Figure 1a
Regulator (Optional)	To connect to the compressed air line. Sample pressure to the PID-GUARD should be set to 55 PSI. See Figure 1a
Output Port	Sampled air out: Luer connection provided to connect to tubing

2.2 PID-GUARD Operational Features

The Display Panel is attached by a cable and is released by unscrewing the 4 screws located in the corners. After releasing the panel, it is swung upward, exposing the interior of the enclosure. See **Figure 1** for location of features.

Feature	Description
Display	A single line, 8 character LCD with backlight. Indicates the level of gas detected by sensor. The numerical value of gas concentration and other information is displayed.
Audio Alarm(Horn)	Audio alarm (105 dB at 30cm/12in). The audio alarm is on when the unit is in alarm.
Visual Indicators and Alarms	LED indicators: Power / Fault Indicator LED, Green / Red Alarm (3) Indicator LED, Red
Membrane Switches	2 Pushbutton Switches on front panel control the instrument maintenance functions. The pushbutton switch locations are indicated by: MENU ↓: Advances the instrument display through operation information and maintenance menus SELECT →: Disables audio alarm temporarily and Selects the maintenance menu operations such as, Zero, Span, Exit menu or sets proper calibration values for Zero or Span See Section 4.0 and 5.0 for operational and maintenance flow charts.
Flowmeter	A flow indicator located at the output of the sample flow stream, which indicates quantitatively the flow of sample air or calibration gas through the instrument.

Three alarm points are preprogrammed into the **PID-GUARD**. At each alarm point, an LED on the front panel is activated. These internal alarm settings are independent of the 4-20mA output alarm values that can be set at a controller. An optional relay board is available that will activate 0.5 Amp relay contacts at each alarm point, plus a fault relay.

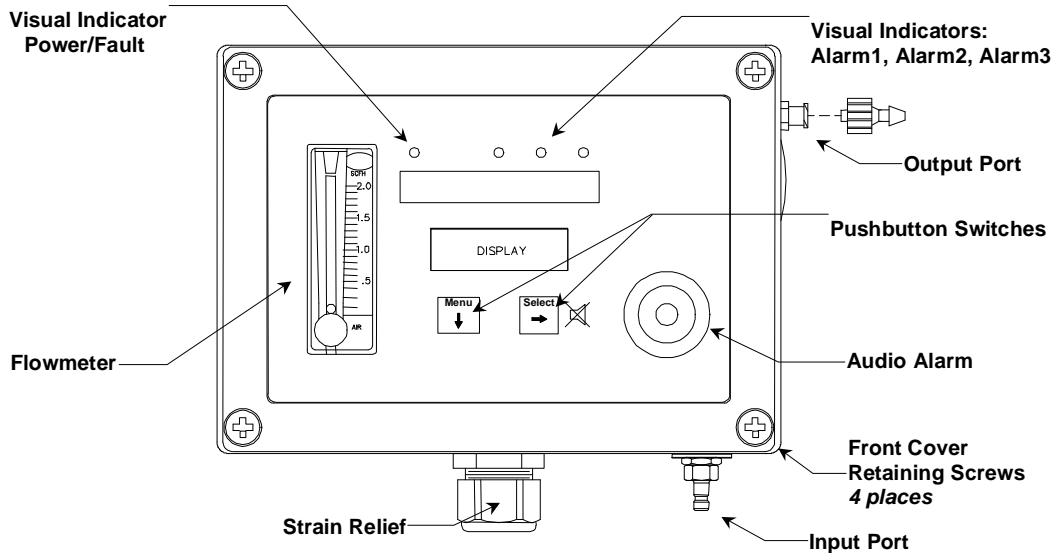


Figure 1: External PID-GUARD Features

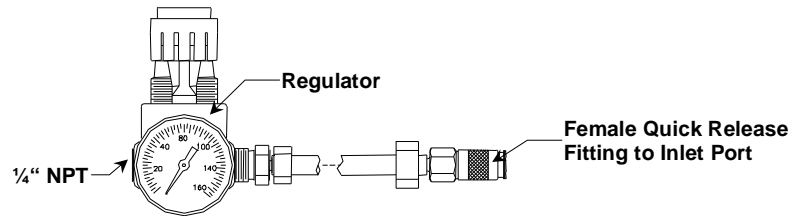


Figure 1a: *Optional* REGULATOR AND SAMPLE AIR HOSE

2.3 Circuit Board Features

The Display Panel is attached by a cable and is released by unscrewing the 4 screws located in the corners. After releasing the panel, it is swung upward, exposing the interior of the enclosure. The Circuit Board is mounted at the back surface of the enclosure interior. Features are shown in **Figure 2**.

Feature	Description
Relay Terminals	This group of terminals is located on the Circuit Board. For the contacts for each of three alarm relays, and for the contacts of a fault relay. See Section 3.2.2
Output Terminals	For the 4-20 mA output.
PCB/Sensor Manifold	The PCB/Sensor manifold. The photoionization sensor located under this housing.

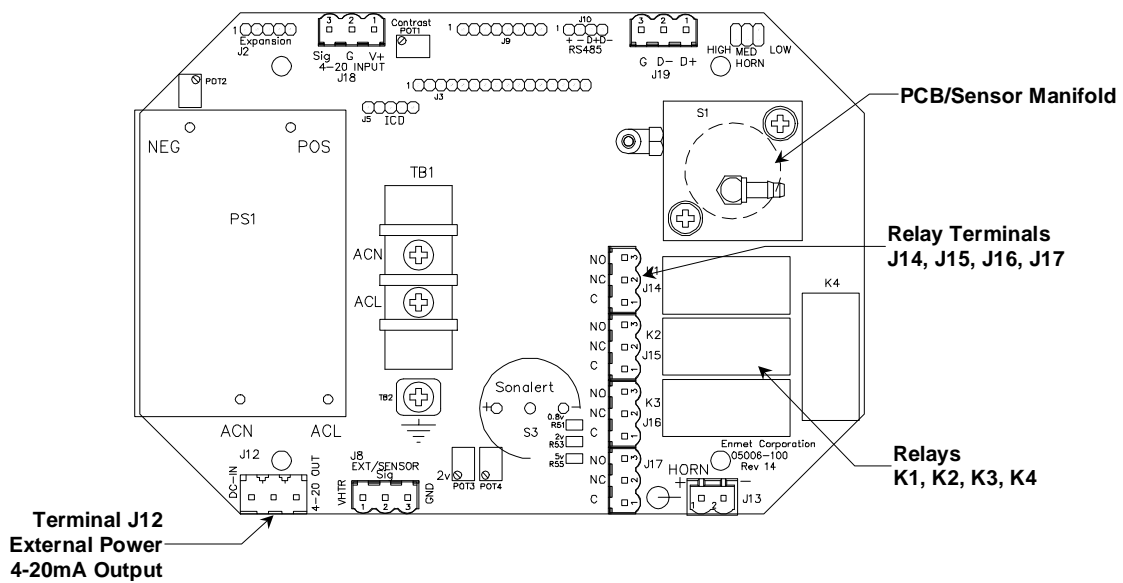


Figure 2: PID-GUARD Circuit Board Features

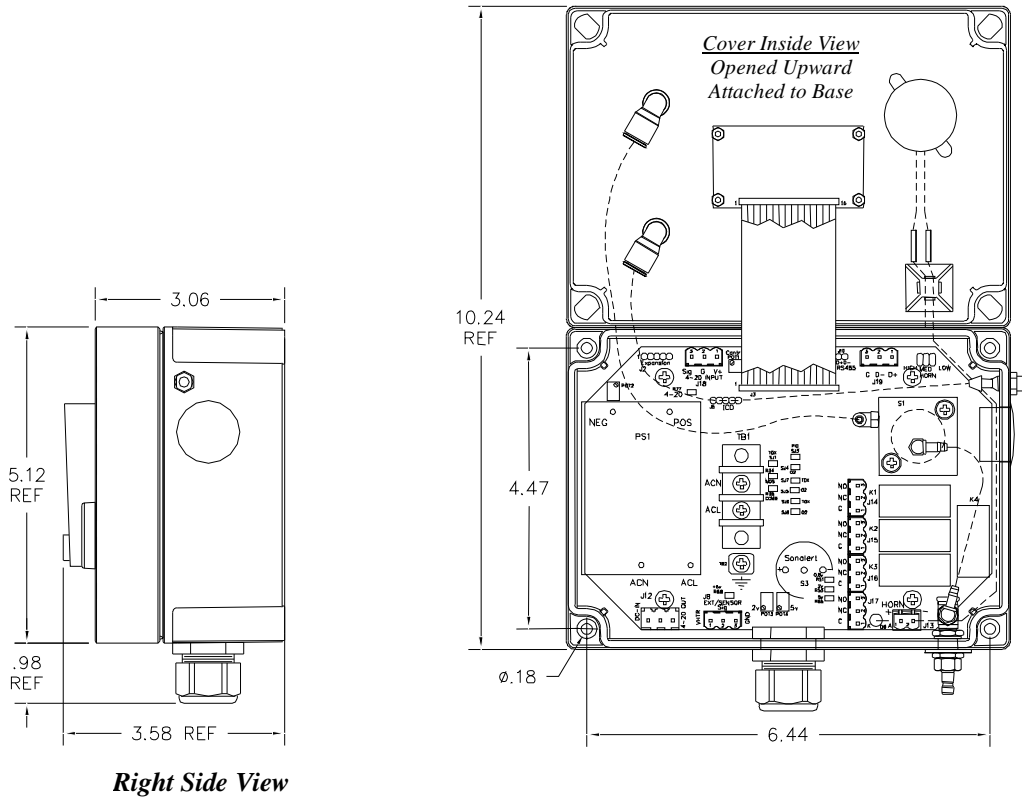
3.0 Installation

The **PID-GUARD** should be located near the pipe or tank containing the air to be monitored, and upstream from where the air is being used. The **PID-GUARD** must be installed such that it samples the compressed air before it reaches the users.

3.1 Mounting PID-GUARD

Mount the **PID-GUARD** instrument on an appropriate vertical surface, leaving room for lid to be opened, using the mounting holes provided. Avoid areas with excessive vibration or temperature extremes. The holes in the bottom of the enclosure are 0.18 inch in diameter and form a 6.44" x 4.47" rectangle. **See Figure 3**

It is recommended to use #8 drywall anchors and screws for mounting the **PID-GUARD** to a drywall/sheetrock surface.



Dimensions are in inches.

Figure 3: Mounting PID-GUARD

3.2 Wiring the PID-GUARD

The electrical installation should conform to appropriate electrical codes, such as the National Electrical Code in the United States.

WARNING: The compliance of the installation to appropriate codes is not **ENMET's** responsibility.

The **PID-GUARD** should be powered through circuit breakers provided for this purpose.

3.2.1 Air Supply

Tap the pipe or tank containing the air and use appropriate fittings to connect the sample input hose. The instrument is designed to operate from an air supply pressure 55 PSIG. The sample input hose length should be as short as possible.

3.2.2 Power Supply

The input power can vary from 100 to 240 VAC, 50/60 Hz. Power should be connected to the Power Input Terminal **TB1** and the **Ground screw**. See **Figure 4** for location.

WARNING: Continuous gas detection and alarm systems (110VAC/220VAC / 24VDC/12VDC powered) become inoperative upon loss of primary power. Contact factory for specifications and pricing of backup battery systems.



Upon supplying air and power to the **PID-GUARD**:

- The green power on LED is lit.
- The display backlight is lit, and instrument will step through a start-up sequence: unit serial number and software revision may be shown on the display.

The instrument may go into alarm briefly, but the sensors stabilize quickly. If the instrument persists in alarm, acknowledge the alarm by pressing the **SELECT** button. If alarm persists longer than 30 minutes, call **ENMET** customer service personnel.

For DC wiring 24Vdc may be wired to J12, (J12-1)position 1 + with ground connected to (J12-2)position 2.

AC Power Supply Terminal: TB1

	Label on PCB	Function
110VAC	TB1 ACN	Neutral
	TB1 ACL	Line
Ground Screw		AC GND
	220VAC	
Optional Ground Screw	TB1 ACN	Neutral
	TB1 ACL	Line
		AC GND

DC Power Supply Terminal: J12

Position	Function
1 +	24 VDC power
2	GND
3	4 - 20 mA out

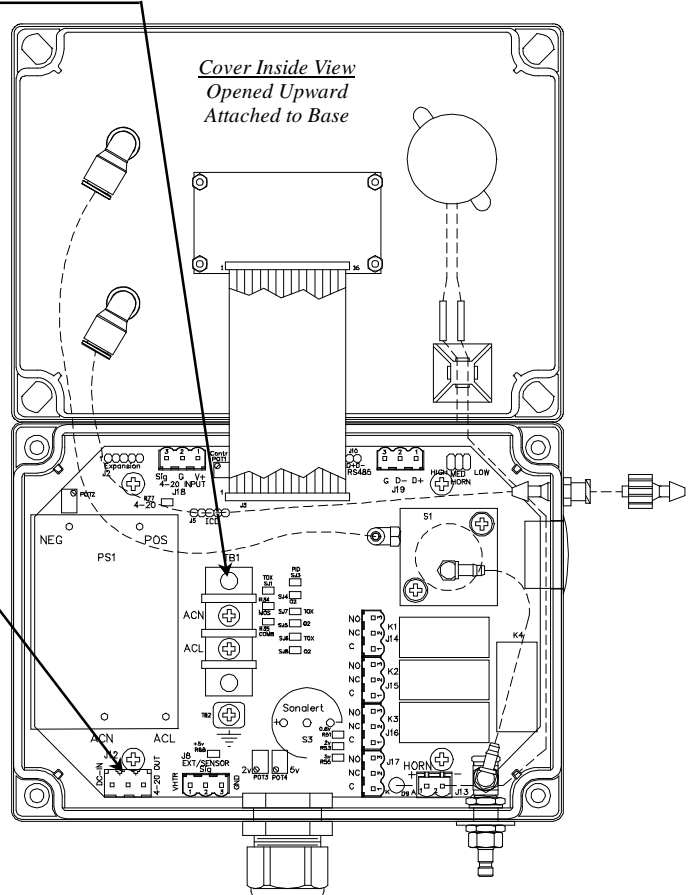


Figure 4: Power Terminal Connections PID-GUARD

3.2.3 Relay Contacts

Relay contacts are available for each alarm; these are SPDT, rated at 10Amp at 110VAC, and may be latching or non-latching as required by the application.

They are accessed on the terminals next to each relay see **Figure 5**. The contact positions are noted on the circuit board next to each terminal.

The following table is for the relays in their un-energized state. This is also the alarm condition state. Non-failsafe configured relays in the alarm state, are the reverse of the PC board labeling. Note that the Fault(FLT) relay cannot be set to operate in a Non-Failsafe mode. Please see **Table 1** below:

Table 1 : Relay Failsafe Settings

Alarm	Position	
Alarm 1	J14 (K1)Relay 1 - NO	Normally Open
	J14 (K1)Relay 1 - NC	Normally Closed
	J14 (K1)Relay 1 - COM	Common
Alarm 2	J15 (K2)Relay 2 - NO	Normally Open
	J15 (K2)Relay 2 - NC	Normally Closed
	J15 (K2)Relay 2 - COM	Common
Alarm 3	J16 (K3)Relay 3 - NO	Normally Open
	J16 (K3)Relay 3 - NC	Normally Closed
	J16 (K3)Relay 3 - COM	Common
Fault Alarm	J17 (K4)Relay 4 - NO	Normally Open
	J17 (K4)Relay 4 - NC	Normally Closed
	J17 (K4)Relay 4 - COM	Common

These relay contacts can be used to operate auxiliary alarms or other functions. Auxiliary alarms should be powered from an independent power source separate from the instrument power to avoid alarm failure due to controller malfunction. Use the existing hole in the enclosure for a wire exit, and use appropriate cable fittings. See **Figure 2**. Be sure to note the location and depth of hardware inside the enclosure.

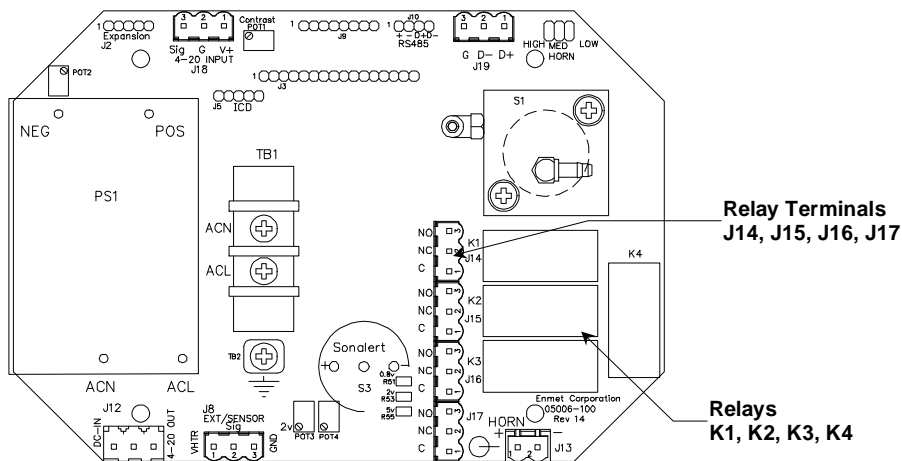


Figure 5: Relay Terminal Connections PID-GUARD

4.0 Operation

When the **PID-GUARD** is installed as described in **Section 3**, and in clean air, the **POWER** green LED is on, the display is lit and the information on the display is measurement of hydrocarbon detected by the **PID-GUARD**. The red alarm and fault LEDs are not lit.

4.1 Start Up PID-GUARD

When the **PID-GUARD** is first powered up, it goes through a series of momentary screens, which identify the instrument model number, serial number and software revision. After all of the momentary screens have been displayed, the instrument arrives at the Main Gas Display showing the gas concentration and unit of measurement.

Depending on instrument configuration and calibration condition, the furthest right character in the display may flash a letter indicating the instrument status. See the Section 4.1.1 below

4.1.1 Typical Start Up

When power is supplied to the **PID-GUARD**, the instrument will display the following sequence of information:

Typical start up sequence of information displayed.

Example of Typical Start Up Display	Function
PID-GUARD	The instrument: Model PID-GUARD
302- 20	The instrument: Serial Number
S/W 6.5F	The instrument: Software Revision
IF the right most character is a flashing W 0 ppW	The instrument is in Warm-up mode <ul style="list-style-type: none"> ▪ This should last about 1 minute ▪ The Signal Output is held at 4mA during warm-up
IF the right most character is a flashing C 0 ppC	The instrument has failed Calibration The last good calibration values are retained, but the sensor may not be responsive to gas A new Calibration should be performed <i>As Soon As Possible</i>
0 ppm	The instrument: Normal Display Mode Measurement of Carbon Monoxide

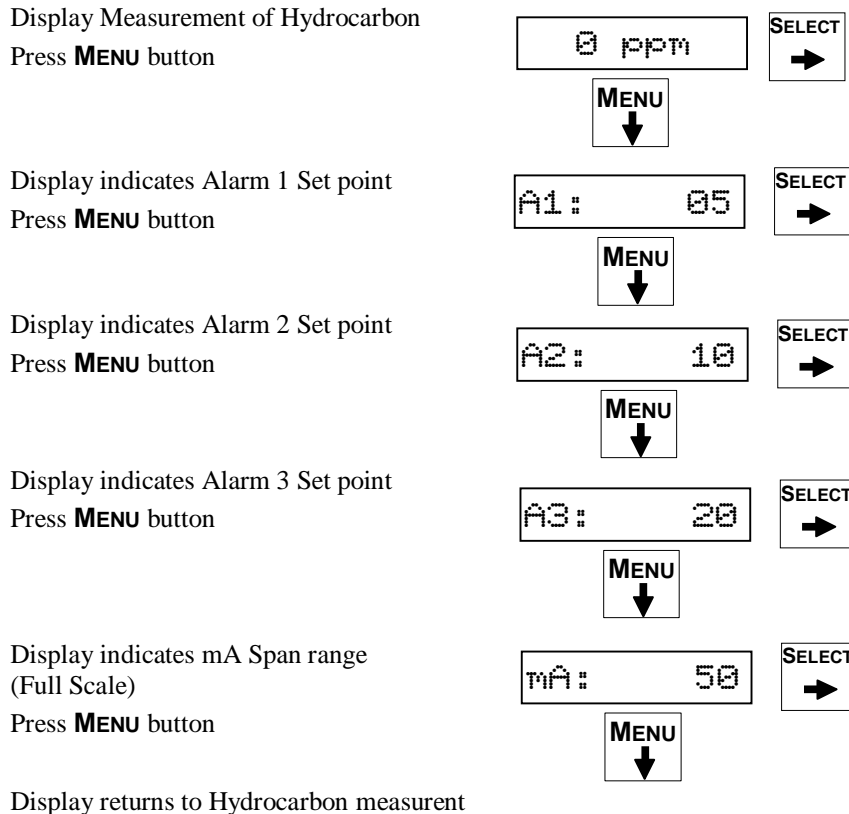
NOTE: Software revision may cause variations of display output.

4.2 Normal Display Mode

When the **PID-GUARD** is installed as described in section 3, and in clean air, the **POWER** green LED is on, the display is lit and the information on the display is measurement of hydrocarbon detected by the **PID-GUARD**. The red alarm and fault LEDs are not lit.

To advance through displays of operational information press the **MENU** button.

Example sequence of operational information below:



Operational Display Flow Chart

4.2.1 Alarm Conditions PID-GUARD

There are three alarm set points for CO. The factory settings of these alarm set points are shown in **Table 2**.

Table 2: Factory Alarm Set Points

Gas	Alarm 1	Alarm 2	Alarm 3
Hydrocarbon	5	10	50

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

If the gas concentration increases above that of the alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.

Pressing the **SELECT** button can temporarily disable the Audio Alarm. The horn will be disabled for about five minutes. If a second alarm condition occurs during this time the horn will re-activate. If the alarm condition(s) have ended during this time the horn will not re-activate.

4.3 Hydrocarbon Sensor Response

Hydrocarbon (HC) sensor is 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.

5.0 Maintenance

The **PID-GUARD** maintenance menus that are accessed by pressing the **MENU** button and entering a valid access code. The access code is set at the factory and may be changed by following the access code menu explained in section 5.5.

5.1 Maintenance Menus

CAUTION: Do Not Attempt A Span Procedure Without Calibration Gas Applied to The Sensor; if this is done, the instrument is forced into a calibration fault mode.

Pushbutton switches control the **MENU** and **SELECT** functions. The **MENU** and **SELECT** button locations are indicated on the display panel, see **Figure 3**. The **MENU** button is used to display the various menu options and make incremental changes to numbers such as alarm points, calibrations gas, etc. The **SELECT** button is used to select that option, set zero or span digit.

To enter the maintenance menu press and hold the **MENU** button for 2 to 4 seconds

Table 3 indicates the maintenance menu sequence see **Figure 7** for a detailed maintenance menu flow chart.

Table 3: PID-GUARD Maintenance Menus Sequence

Example of Display	Function
<div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;">5ppm</div> Normal Display Mode	Measurement of target gas
Press and <i>hold</i> the MENU button for 2 – 4 seconds to enter the Maintenance Menu The Power/Fault LED will flash Green – Red to indicate the PID-GUARD is in Maintenance Mode	
<div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;">Exit</div>	To exit the maintenance Menu and return to the Normal Display Mode: If intended function Press SELECT button
Press the MENU button to advance to the Zero procedure	
<div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;">Zero</div>	For adjusting Zero: If intended function Press SELECT button
Press the MENU button to advance to the Span procedure	
<div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;">Span</div>	For adjusting the Span: Calibration of PID-GUARD If intended function Press SELECT button
Press the MENU button to advance to each Alarm set point procedures	
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Alarm1</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">Alarm2</div> <div style="border: 1px solid black; padding: 5px;">Alarm3</div> </div>	For adjusting the Alarm 1, 2 and 3 set points: If Intended function Press SELECT button
Press the MENU button to advance the mA Span set point procedure	
<div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;">mA Span</div>	For adjusting the mA Span set point: If intended function Press SELECT button

Pressing the **MENU** button without pressing the **SELECT** button will allow you to cycle through the menu options. You must Press the **SELECT** button in order to initiate the desired operation.

5.2 PID-GUARD Maintenance Adjustments

Pushbutton switches control the **MENU** and **SELECT** functions. The **MENU** and **SELECT** button locations are indicated on the display panel, see **Figure 3**. The **MENU** button is used to display the various menu options and make incremental changes to numbers such as alarm points, calibrations gas, etc. The **SELECT** button is used to select that option, set zero or span digit.

To enter the maintenance menu press and hold the **MENU** button for 2 to 4 seconds

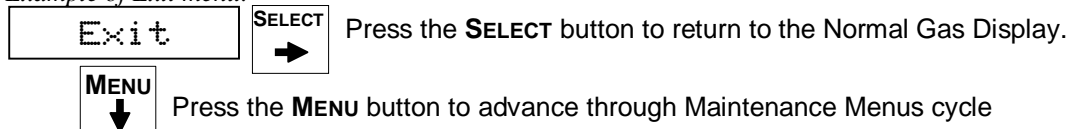
Table 3 indicates the maintenance menu sequence see **Figure 7** for a detailed maintenance menu flow chart.

5.2.1 Advance/Exit Maintenance Menu

To advance to the next sequence in the maintenance menu cycle, when **Exit** appears on the display, press the **MENU** button.

Exit maintenance, by pressing the **Exit** appears on the display. Press the **SELECT** button to return to the instrument Normal Gas Display.

Example of Exit menu:



5.2.2 Zero Adjust

The ZERO function must be performed by exposing the **PID-GUARD** instrument to clean fresh air. If the air at the sensor is in question, use a cylinder of 20.9% oxygen to provide a clean air reference.

Enter the maintenance menu by pressing and holding **MENU** button for 2 to 4 seconds. See **Figure 7, PID-GUARD Maintenance Menu flow chart**.

After entering the maintenance menu, Press the **MENU** button until the Zero menu is displayed.

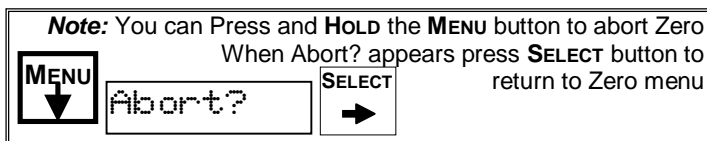
Press the **SELECT** button to perform a Zero.

The display will alternate between Zero and PV: To abort Zero function press and hold **MENU** button for 3 – 4 seconds, Abort? will appear, press **SELECT** button to return to Zero.

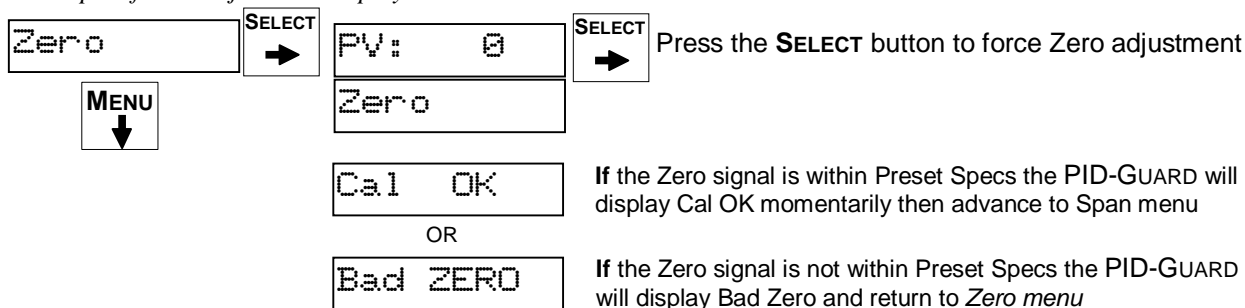
Press the **SELECT** button to initiate a Zero adjustment.

An auto detect sequence is initiated. After 15 seconds, the **PID-GUARD** will monitor the zero reading for stability.

- *If the reading stabilizes*, within the pre-programmed perimeters, an automatic zero adjustment will be made. Cal OK appears on the display and in 1 – 2 seconds, display will change to Span. If you wish to Span the sensor press the **SELECT** button you are now ready to apply gas. **Proceed to gas span step 2**
If you wish to Exit the maintenance menu, press **MENU** button until Exit is displayed, then press **SELECT** button to return to the instrument Normal Gas Display
- *If the reading does not stabilize*, within 255 seconds, the procedure will be aborted. Sensor is outside of safe parameters to be zeroed, the display will read Bad Zero. Repeat Section 5.2.2 Zero Adjust making sure to use a Zero gas of 20.9% Oxygen. **ENMET** part number 03296-209.



Example of Zero adjustment display:



5.2.3 Gas Span Calibration

It is recommended that the Zero Function be performed first.

Do not perform a calibration unless span gas is applied to sensor. Calibration can be aborted by pressing and holding the **MENU** button for 3 – 4 seconds.

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas. The Zero function sets the clean air reference point and the Span function sets the sensitivity of the instrument.

Initial Calibration: Wait 3 – 4 hours after initially supplying power to the **PID-GUARD** instrument before initial calibration. The **PID-GUARD** has been precalibrated at the factory, and initial field calibration should result in only fine tuning to circuit, as well as a way to check that installation is successful. It is not necessary to open the enclosure to make adjustment. The calibration functions are operated with pushbuttons from outside the enclosure through the **MENU** and **SELECT** switches.

Calibration Zero and Span functions are two separate procedures. They operate independently of each other. It is recommended that the Zero procedure be done prior to the Span procedure.

*ENMET Corporation recommends at least quarterly calibration of the **PID-GUARD** instrument.*

Calibration equipment is available from **ENMET** Corporation to calibrate the **PID-GUARD** instrument.

- Calibration adapter, a length of tubing with a regulator for the gas cylinder on one end, and a quick release fitting to connect to the sample input of the **PID-GUARD** on the other.

- Gas cylinder, Zero gas 20.9% oxygen or Span gas, typically 10ppm Isobutylene

Generally, a cylinder of 20.9% Oxygen is used to provide a Zero point or fresh air reference for the calibration.

A cylinder of calibration gas is used to provide the Span reference point for calibration. Calibration and Span point varies depending on target gas and range of instrument, if necessary see special calibration addendum.

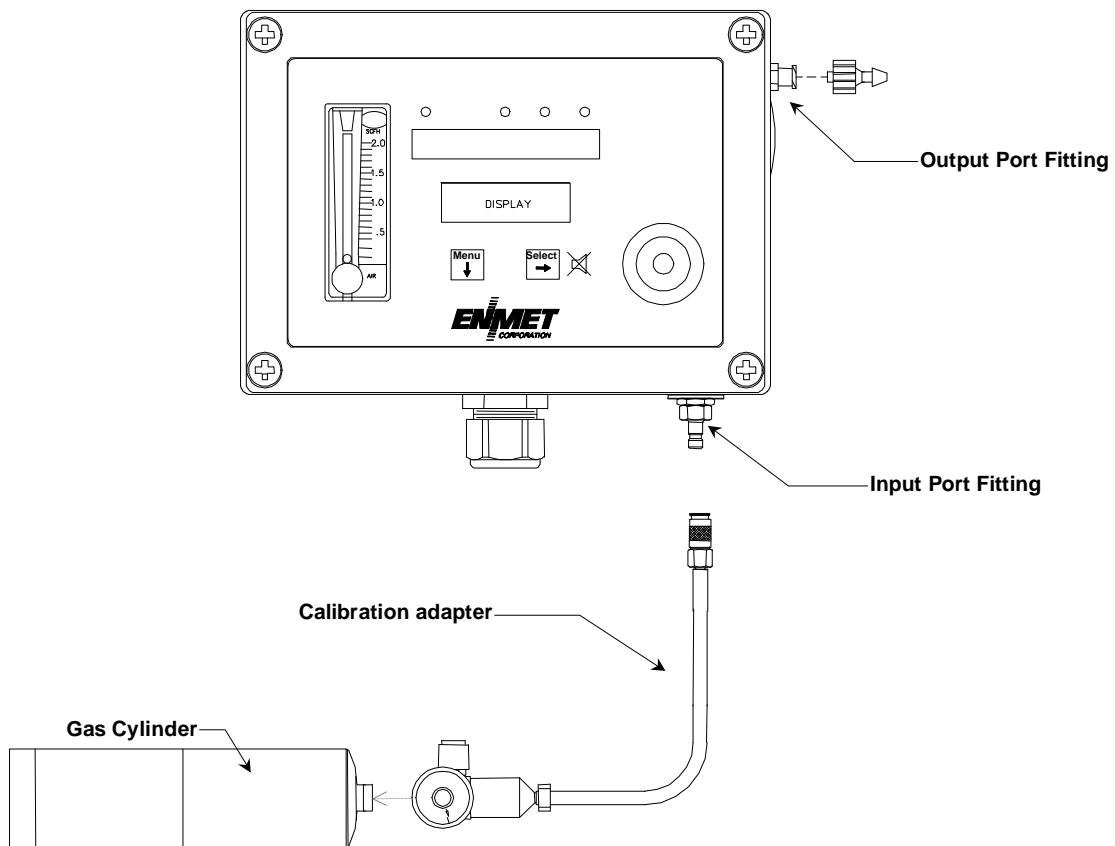


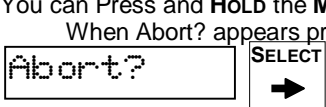
Figure 6: Calibration Adapter

Enter the maintenance menu. See **Figure 7, PID-GUARD Maintenance Menu** flow chart.

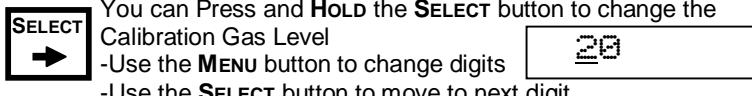
1. Press the **MENU** button until Span display.
2. Press the **SELECT** button to perform a Span procedure.
 The display will alternate between the calibration gas concentration (Cal 20) and a signal level (PV).
 To Abort calibration press and Hold **MENU** button for 3 – 4 seconds, Abort? will appear, press **SELECT** button to return to Span.
 To change calibration gas level to be used, press and Hold **SELECT** button for 3 – 4 seconds, use menu button to change digit and select button to move to next digit.
3. Attach the associated calibration gas cylinder to the calibration adapter. See **Figure 6** calibration adapter.
4. Open the valve to apply the calibration gas to the sensor.
 An auto detect sequence is initiated after 30 seconds, the **PID-GUARD** will monitor the cal reading for stability.
5. Watch for the signal level to stabilize. 1 – 4 minutes.
6. Once the signal level has stabilized,
 - If the Span is successful, Cal OK appears momentarily, then will advance to Alarm1 menu.
 - If the sensor is outside of acceptable parameters, Bad Span is displayed.
 - If the sensor did not respond, an incompatible span gas was applied and the sensor did not respond at all, Same mV is displayed then will return to Span.
 → If calibration is not successful, it is suggested that calibration be attempted again in 30-60 minutes.
 If the sensor will not calibrate See Section 5.4.
7. Remove the calibration gas.
8. Calibration is complete.
 Note: The instrument will return to operation mode in 3 – 5 seconds.
9. Press the **MENU** button to advance to next desired menu

NOTE: To abort calibration or change calibration gas level.

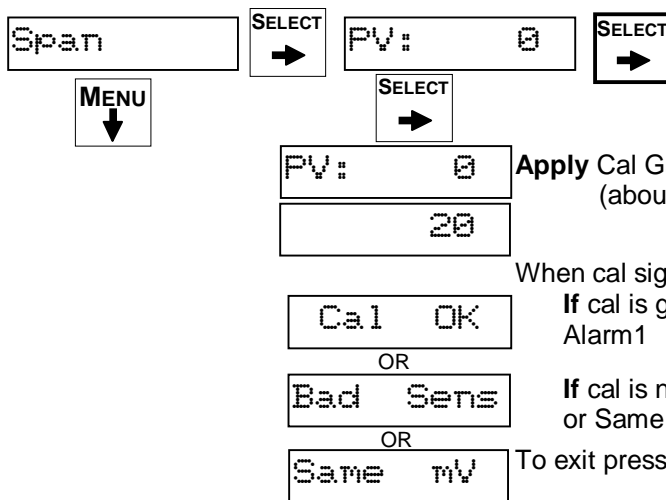
You can Press and **HOLD** the **MENU** button to abort Calibration
 When Abort? appears press **SELECT** button to advance to Alarm1 menu



You can Press and **HOLD** the **SELECT** button to change the Calibration Gas Level
 -Use the **MENU** button to change digits
 -Use the **SELECT** button to move to next digit



Example of Calibration Display:



Apply Cal Gas until signal value becomes stable (about 1 to 4 minutes) See **Figure 7**

When cal signal is stable **PID-GUARD** will automatically update:
If cal is good display will indicate OK or Same and advance to Alarm1

If cal is not within preset “range” display will indicate Bad Sens or Same mV The **PID-GUARD** will return to the Span Menu

To exit press **MENU** button until Exit appears and press **SELECT**

5.2.4 Alarm Set Points

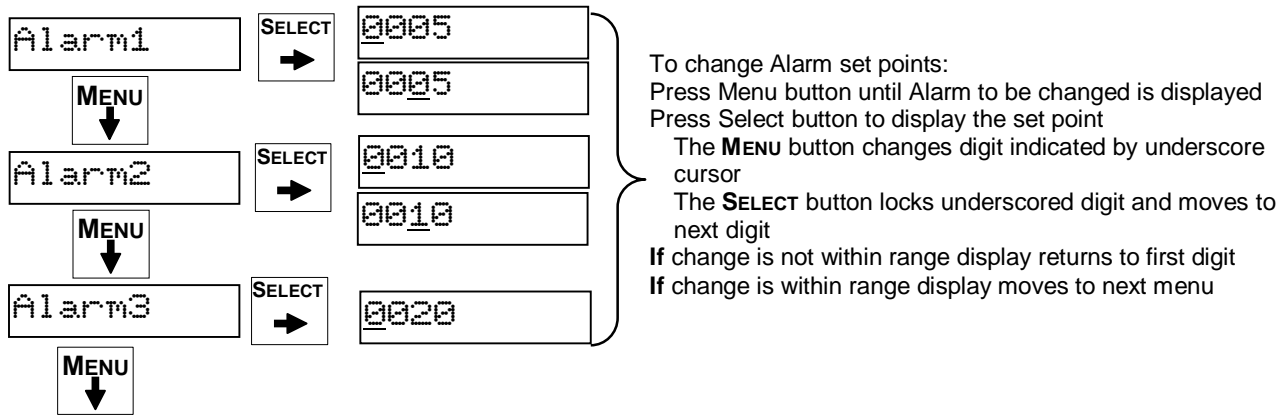
The **PID-GUARD** alarm set points can be changed within limits.

To change any of the three alarm points:

Enter the maintenance menu as shown in **Figure 7 PID-GUARD Maintenance Menu** flow chart.

1. Press the **MENU** button until to display Alarm1 is displayed.
2. Press the **SELECT** button to initiate alarm set point change
3. Press the **MENU** button to change the digit indicated by the underscore cursor
4. Press the **SELECT** button to move the cursor to the next digit
When last digit is entered the **PID-GUARD** will advance to the next menu
5. Press the **MENU** button to advance to the next menu

Example of Alarm Set Point menus:



5.2.5 Span Set

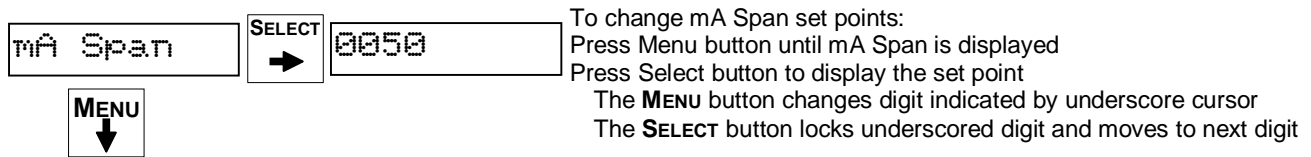
The **PID-GUARD** 4-20mA output full scale span range can be changed within limits.

To change the span range:

Enter the maintenance menu as shown in **Figure 7 PID-GUARD Maintenance Menu** flow chart.

1. Press the **MENU** button until to display Span is displayed.
2. Press the **SELECT** button to initiate the mA Span menu
3. Press the **MENU** button to change the digit indicated by the underscore cursor
4. Press the **SELECT** button to move the cursor to the next digit
When last digit is entered the **PID-GUARD** will advance to the next menu
5. Press the **MENU** button to advance to the next menu

Example of mA Span menu:



Default mA Span

4mA	20mA
0 ppm	50 ppm

Normal Gas Display

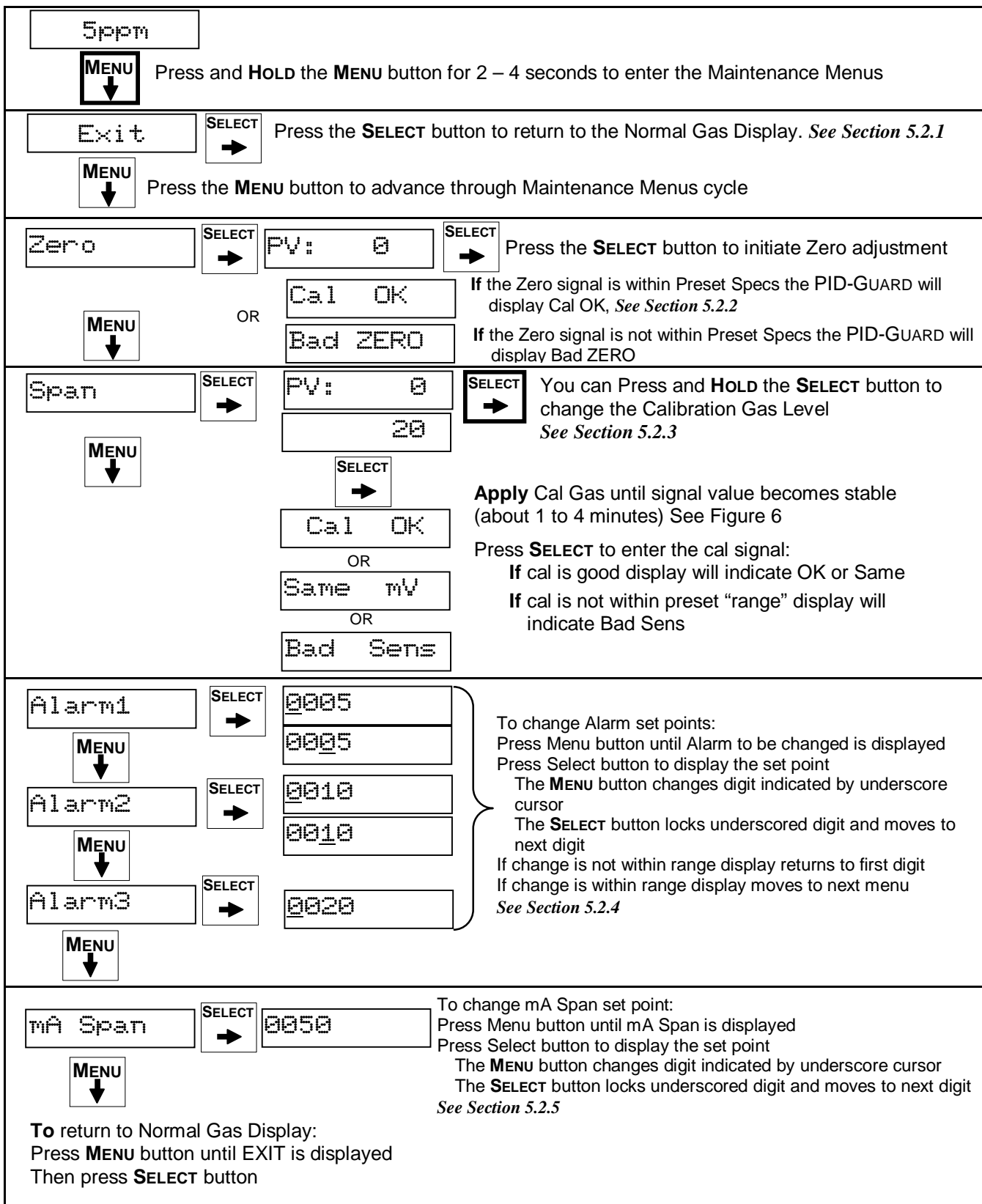


FIGURE 7: PID-GUARD Maintenance Menu Flow Chart

5.4 Sensor Replacement

WARNING: Power must be removed from the PID-GUARD before this or any internal procedure. Failure to do so may cause damage to equipment, bodily injury or death.

Sensors should be replaced when they can no longer be calibrated. Replacement sensor part numbers are listed in **Section 6.0** of this manual. If you do not know the proper part number for your sensor, have the **PID-GUARD** serial number available when contacting your Distributor or **ENMET** Corporation Technical Support.

- Remove, the 4 retaining screws from **PID-GUARD** lid and 2 retaining screws from sensor manifold, see Figure 6
- Remove, the sensor assembly from the PCB/sensor manifold, see **Figure 8**.
- Insert, the new sensor assembly and replace sensor manifold and 2 retaining screws.
- Replace, lid and the 4 retaining screws.
- Re-supply power to the **PID-GUARD**

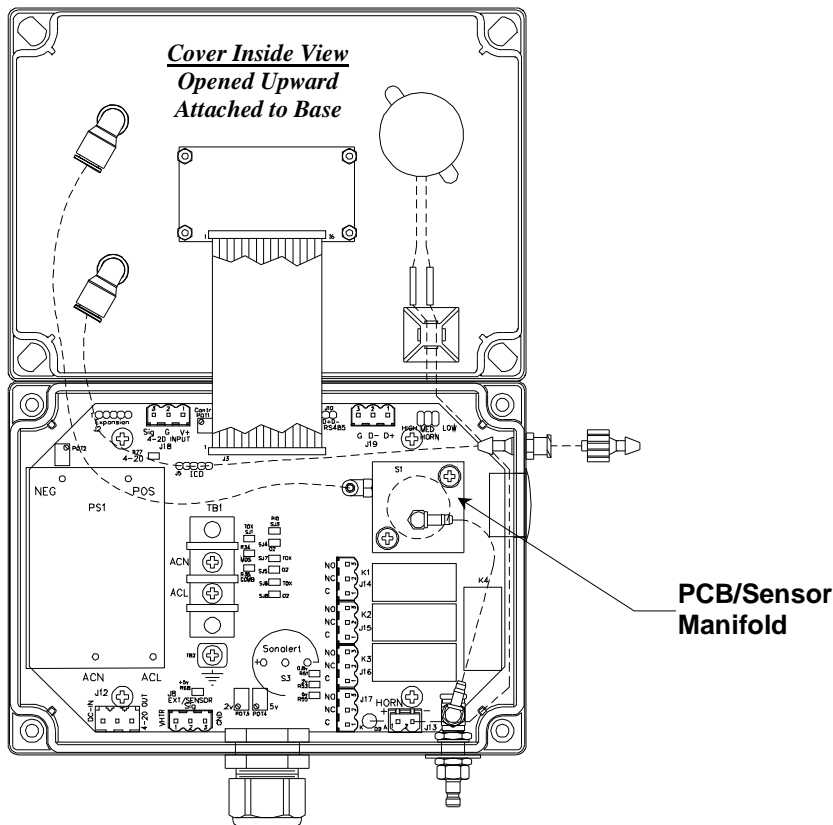


Figure 8: PID-GUARD Sensor Replacement

After the new sensor assembly has been installed, it is suggested to allow the sensor to stabilize for 3 – 4 hours.

A Factory calibration must be performed.

After entering the Maintenance menu, press and hold the **MENU** button for 2-4 seconds while viewing the Zero menu.

After 2-4 seconds, an F will appear on the far right hand side of the display. The F indicates that the instrument is in Factory mode.

Perform the calibration Zero and Span procedures as outlined in **Section 5.2**. Be sure that the F is present when selecting the Zero and Span functions.

The Factory calibration sets a calibration window for future standard instrument calibrations.

6.0 Replacement Parts

ENMET replacement part numbers:

Description of Part	Part Number
Sensor PID	03028-000
Calibration Regulator, for 17 liter, cylinder	03700-500
Zero Gas, 20.9% O ₂ , 17 liter	03296-209
Sampling Regulator w/hose, quick disconnect	03412-003
Sampling Hose w/quick disconnect	03412-004
Horn	62013-007
Calibration Gas, Consult ENMET Distributor or ENMET Corp.	

7.0 Technical Data and Specifications

Electrical Power	15 Amp fused branch circuit	
	100-240 VAC	
	0.45A, 50/60 Hz	
	0.6A, 24VDC	
Storage and Transport	Temperature:	-20° to +60°C (-4° to +140°F)
	<i>preferred</i>	0° to +20°C (32° to 68°F)
	Relative Humidity	10-99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
Operation	Temperature:	0° to +40°C (32° to +104°F)
	Relative Humidity	10-99% RH, non-condensing
	Atmospheric Pressure	20 to 36 inHg (68 to 133 kPa)
Mechanical	Dimensions:	7.1 x 5.1 x 3 in(180x130x75mm)
	Weight:	2 lbs (0.9 kg)
	Material:	Polycarbonate
	Strain relief:	3-6.5mm OD
Outputs	Relays:	SPDT Resistive Load Inductive Load 10A at 110 VAC 7.5A at 110 VAC 10A at 30 Vdc 5A at 30 Vdc
	Analog:	4-20mA
	Digital:	RS-485-modbus
	Audio:	105 dB at 30cm/12in

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

8.0 WARRANTY

ENMET 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 from **ENMET**. The warranty covers both parts and labor excluding instrument calibration and expendable parts such as calibration gas, filters, batteries, etc... Equipment believed to be defective should be returned to **ENMET** within the warranty period (transportation prepaid) for inspection. If the evaluation by **ENMET** 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 by the most economical means, e.g. Surface UPS/FedEx Ground. If an expedient means of transportation is requested during the warranty period, the customer is responsible for the difference between the most economical means and the expedient mode. **ENMET** shall not be liable for any loss or damage caused by the improper use of the product. The purchaser indemnifies and saves harmless the company with respect to any loss or damages that may arise through the use by the purchaser or others of this equipment.

This warranty is expressly given in lieu of all other warranties, either expressed or implied, including that of merchantability, and all other obligations or liabilities of **ENMET** which may arise in connection with this equipment. **ENMET** neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than that which is set forth herein.

NOTE: When returning an instrument to the factory for service:

- Be sure to include paperwork.
- A purchase order, return address and telephone number will assist in the expedient repair and return of your unit.
- Include any specific instructions.
- For warranty service, include date of purchase
- If you require an estimate, please contact **ENMET** Corporation.

There are Return for Repair Instructions and Form on the last pages of this manual. This Form can be copied or used as needed.

Manual Part Number
80002-050
April 2007
MCN-383, 11/05/07

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-Butadiene	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-Dibromoethane	9.45
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	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)
(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
Ethylenimine	9.20
Ethynylbenzene	8.82

Chemical Name	IP (eV)
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-difluoroethane)	11.30
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	11.78
Freon 114 (1,2-dichloro-1,1,2,2-tetrafluoroethane)	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 naphthalene	7.96
1-Methyl naphthalene	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-amyyl 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
Pyrrrole	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 112)	11.30
1,1,1-Trichloroethane	11.00
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	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-Xyldine	7.65
m-Xylene	8.56
o-Xylene	8.56
p-Xylene	8.45



PO Box 979
680 Fairfield Court
Ann Arbor, Michigan 48106-0979
734.761.1270 Fax 734.761.3220

Returning an Instrument for Repair

ENMET instruments may be returned to the factory or any one of our Field Service Centers for regular repair service or calibration. The **ENMET** Repair Department and Field Service Centers also perform warranty service work.

When returning an instrument to the factory or service center for service, paperwork must be included which contains the following information:

- A purchase order number or reference number.
- A contact name with return address, telephone and fax numbers
- Specific instructions regarding desired service or description of the problems being encountered.
- Date of original purchase and copy of packing slip or invoice for warranty consideration.
- If a price estimate is required, please note it accordingly *and be sure to include a fax number.*

Providing the above information assists in the expedient repair and return of your unit.

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 \$30 evaluation fee, even if returned unrepared. 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 unrepared COD with the evaluation fee.

Service centers may have different rates or terms. Be sure to contact them for this information.

Repaired 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.

If a component is purchased and installed in the field, and fails within the warranty term, it can be returned to **ENMET** and will be replaced, free of charge, per **ENMET**'s returned goods procedure.

If the entire instrument is returned to **ENMET** Corporation with the defective item installed, the item will be replaced at no cost, but the instrument will be subject to labor charges at half of the standard rate.



Repair Return Form

Mailing Address:
ENMET Corporation
PO Box 979
Ann Arbor, Michigan 48106

Shipping Address:
ENMET Corporation
Attn: Repair Department
680 Fairfield Court
Ann Arbor, Michigan 48108

Phone Number: 734.761.1270
FAX Number: 734.761.3220

Your Mailing Address:

Your Shipping Address:

Contact Name: _____ **Your Phone:** _____

Your PO/Reference Number: _____ **Your FAX:** _____

Payment Terms: **COD**
(Check one) **VISA / MasterCard** _____
Card number Expiration

Return Shipping Method:

- UPS: Ground 3 Day Select Next Day Air ND Air Saver 2-Day Air
- Federal Express: Ground Express Saver P-1 Standard 2-Day Air
- FedEx Account number: _____

Would you like ENMET to insure the return shipment?

No Yes **Insurance Amount:** \$ _____