

**ENMET Corporation**  
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**ISA-300RAL**  
**Operation and Maintenance**  
**Manual**

**Manual Part Number**  
**80002-043**  
**MCN-437, 08/19/10**

# Table of Contents

<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 Unpack.....	1
1.2 Check Order .....	1
1.3 Serial Numbers .....	1
<b>2.0 INSTRUMENT FEATURES.....</b>	<b>1</b>
2.1 Exterior Features .....	1
2.2 Display Panel Features .....	2
2.3 Circuit Board Features.....	4
<b>3.0 INSTALLATION .....</b>	<b>5</b>
3.1 Mounting of Instrument.....	5
3.2 Sample Air Supply .....	6
3.3 Power Supply .....	6
3.4 Outputs .....	6
3.4.1 Relay Contacts.....	7
3.4.2 Optional 4-20mA Outputs.....	8
3.5 Installation Verification.....	8
<b>4.0 OPERATION.....</b>	<b>9</b>
4.1 Normal Operation Condition .....	9
4.2 Alarm Set Points.....	9
4.3 Alarm Latching.....	10
4.4 Audio Defeat .....	10
4.5 Display.....	10
4.6 Fault Indications .....	10
4.6.1 Low Flow Indication .....	10
4.6.2 Other Fault Indications.....	10
4.7 Operational Menu.....	11
<b>5.0 MAINTENANCE.....</b>	<b>12</b>
5.1 Cleaning Instructions.....	12
5.2 Maintenance Menu .....	12
5.2.1 Accessing Maintenance Menu .....	12
5.2.2 Maintenance Menu Flow Chart.....	13
5.3 Calibration for CO, O <sub>2</sub> and CO <sub>2</sub> .....	14
5.3.1A Low Cal/ZeroCal Adjust .....	15
5.3.1B High Cal/SpanGas Adjust.....	15
5.3.2 Set 4 –20mA Transmitter Scale .....	16
5.3.3 Set Alarm Points.....	17
5.3.4 Set Alarm Delay.....	19
5.3.5 Relay Configuration .....	20
5.3.6 Failsafe Configuration .....	21
5.3.7 Set Output Span Range.....	21
5.3.8 Set New Password .....	22
5.3.9 Exit Maintenance Menu.....	22
5.4 Sensor Replacement .....	23
5.4.1 Gas Sensor.....	23
5.4.2 Oxygen Sensor.....	24
5.5 Flow Control Orifice .....	24
<b>6.0 TECHNICAL DATA AND SPECIFICATIONS .....</b>	<b>25</b>
<b>7.0 REPLACEMENT PART NUMBERS.....</b>	<b>26</b>
7.1 ENMET part numbers for sensors and replacement parts: .....	26
7.2 ENMET part numbers for Calibration equipment: .....	26
<b>8.0 WARRANTY .....</b>	<b>27</b>
<b>APPENDIX A.....</b>	<b>28</b>

## List of Figures

FIGURE 1: FEATURES OF ISA-300RAL EXTERNAL .....	3
FIGURE 1A: REGULATOR AND SAMPLE AIR HOSE .....	3
FIGURE 2: ISA-300RAL INTERIOR FEATURES.....	4
FIGURE 3: ISA-300RAL MOUNTING DIMENSIONS.....	5
FIGURE 2A: RELAY, INPUT AND OUTPUT TERMINALS .....	6
FIGURE 4: ISA-300RAL OPERATIONAL DISPLAY .....	9
FIGURE 5: ISA-300RAL OPERATION MENU FLOW CHART.....	11
FIGURE 6: ISA-300RAL MAINTENANCE MENU FLOW CHART. ....	13
FIGURE 7: CONNECTION OF CALIBRATION GAS CYLINDER .....	15
FIGURE 8: SHORTING CLIP.....	24
FIGURE 9: LOCATION GAS SENSOR MANIFOLD.....	24
FIGURE 10: CARBON MONOXIDE CONCENTRATION .....	28

## List of Tables

TABLE 1 : RELAY FAILSAFE SETTINGS .....	7
TABLE 2: SENSOR OUTPUT.....	8
TABLE 3: FACTORY ALARM SET POINTS .....	9
TABLE 4: FACTORY SET GAS ALARMS DELAY .....	19

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.]



Attention / Warning



Earth Ground

## 1.0 Introduction

The **ISA-300RAL** is a compressed air monitoring instrument that measures and detects certain hazards in industrial compressed air supply systems. The instrument is available with sensors that monitor air for carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and for variations in the oxygen (O<sub>2</sub>) content. The sensors can be used alone or up to four sensors can be used together. In the instrument, a sample of the compressed air 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:

- 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 each target gas

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

### 1.1 Unpack

Unpack the **ISA-300RAL** 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 **ISA-300RAL** 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 **ISA-300RAL** 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

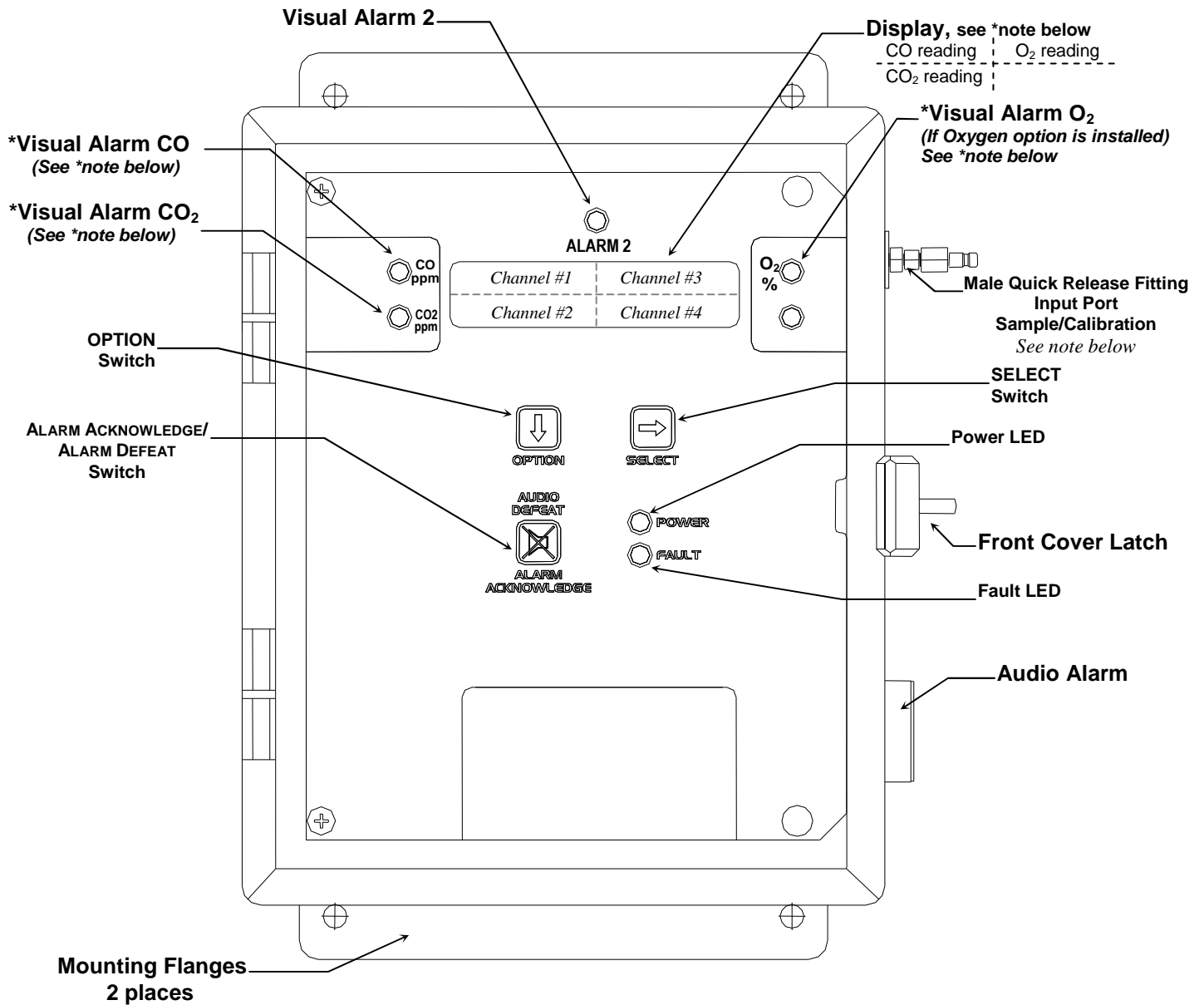
The exterior of the instrument is shown in **Figure 1**. The exterior features are as follows:

Feature	Description
<b>Enclosure</b>	An engineered thermoplastic box, approximately 10x8x6, with a clear hinged front cover.
<b>Input Port</b>	The entrance for the air sample and calibration gas. The quick release fitting mates with one on the calibration adapter.
<b>Front Cover Latch</b>	A quick-release latch that holds the clear front cover in place, and is capable of being padlocked if desired.
<b>Audio Alarm</b>	A loud horn activated by certain alarm conditions.
<b>Mounting Flanges</b>	Flanges with holes for mounting the enclosure to a vertical surface.
<b>Sample Air Hose</b>	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 <b>Figure 1A</b> .
<b>Regulator</b>	To connect to the compressed air line. Sample pressure to the <b>ISA-300RAL</b> should be set to 55 PSI. See note <b>Figure 1A</b> .

## 2.2 Display Panel Features

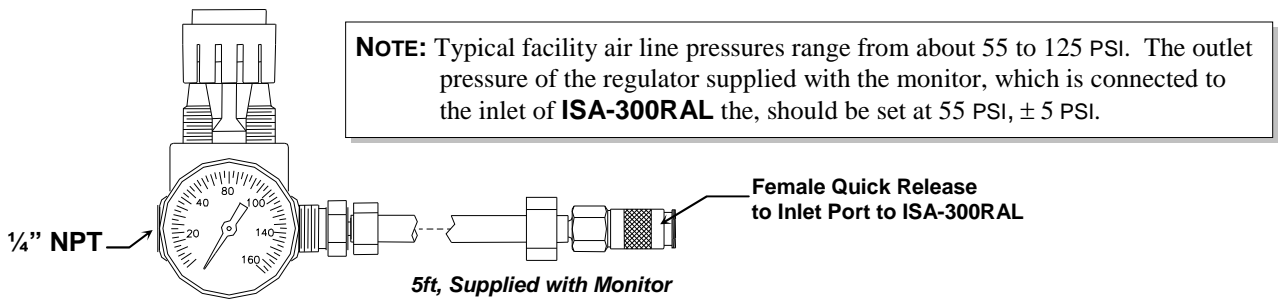
The display panel, shown in **Figure 1**, is viewed through the clear front cover of the enclosure, and is accessed by opening the cover. Features are as follows:

Feature	Description
<b>Display</b>	A 2 line, 16 character per line, LCD with backlight. The numerical values of gas concentrations, and other information are displayed.
<b>Visual Alarms &amp; Indicators</b>	On either sides 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
<b>Pushbutton Switches</b>	There are three of these, located near the center of the panel; they are yellow rectangular membrane switches. They are:
• <b>OPTION Switch</b>	The top left switch. 
• <b>SELECT Switch</b>	Directly to the right of the <b>OPTION</b> switch. 
• <b>AUDIO DEFEAT / ALARM ACKNOWLEDGE Switch</b>	Directly below the <b>OPTION</b> switch. 



**Figure 1: Features of ISA-300RAL External**

**\* NOTE: Typical gas reading & alarm locations, depending on instrument configuration, alarms & readings may be in alternate locations**



**Figure 1A: Regulator and Sample Air Hose**

### 2.3 Circuit Board Features

The Display Panel is hinged on the left and is released by unscrewing the 2 screws located in the right corners. After releasing the panel, it is swung to the left, 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 at the left side of the Circuit Board. For the contacts for each of four alarm relays, and for the contacts of a fault relay.
Output Terminals	One 4-20mA output per active channel. 2 channels/outputs per connector.
Sensor Manifold	The sample manifold, the carbon monoxide, carbon dioxide and oxygen sensors are located under this housing.

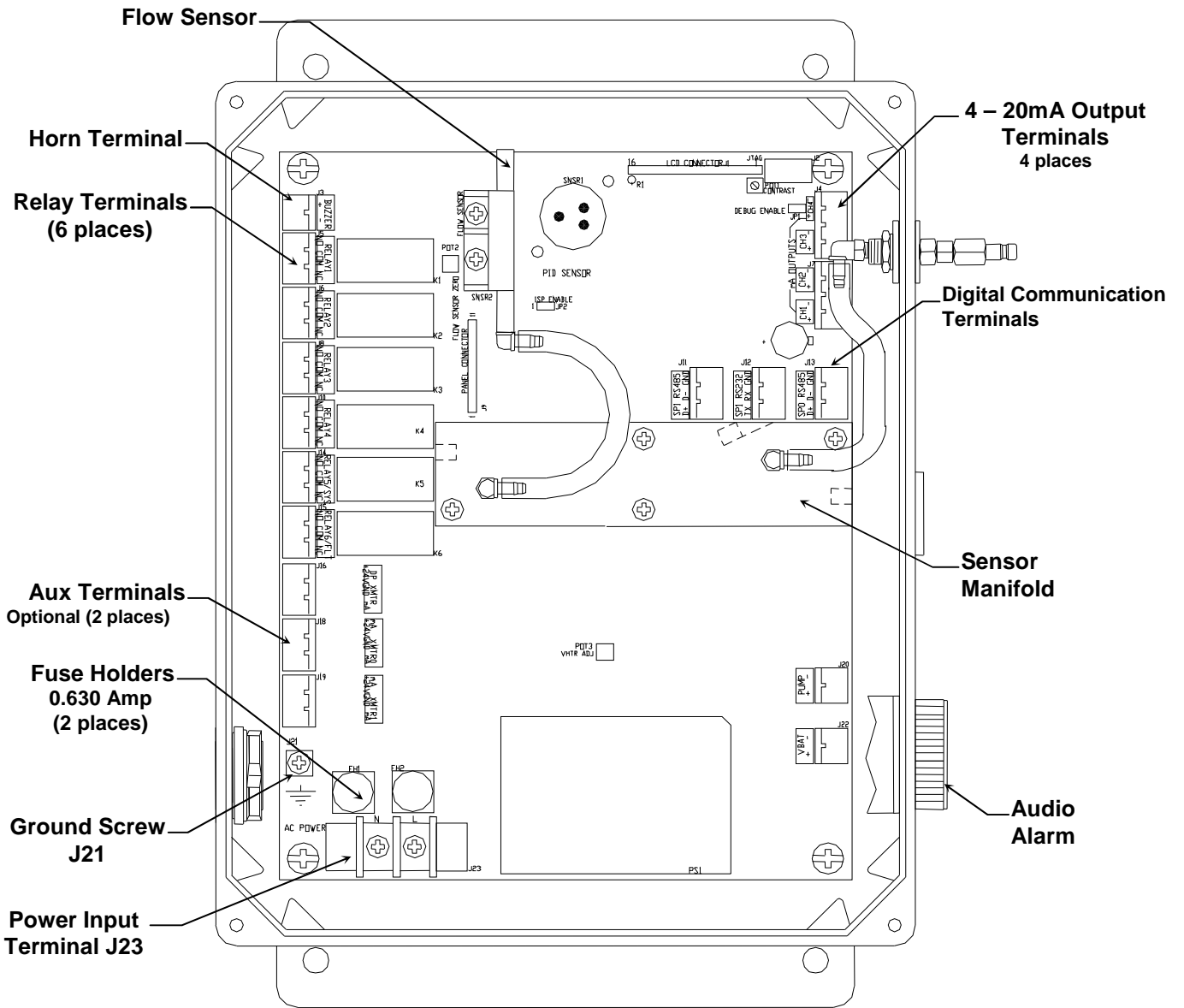


Figure 2: ISA-300RAL Interior Features

### 3.0 Installation

#### 3.1 Mounting of Instrument

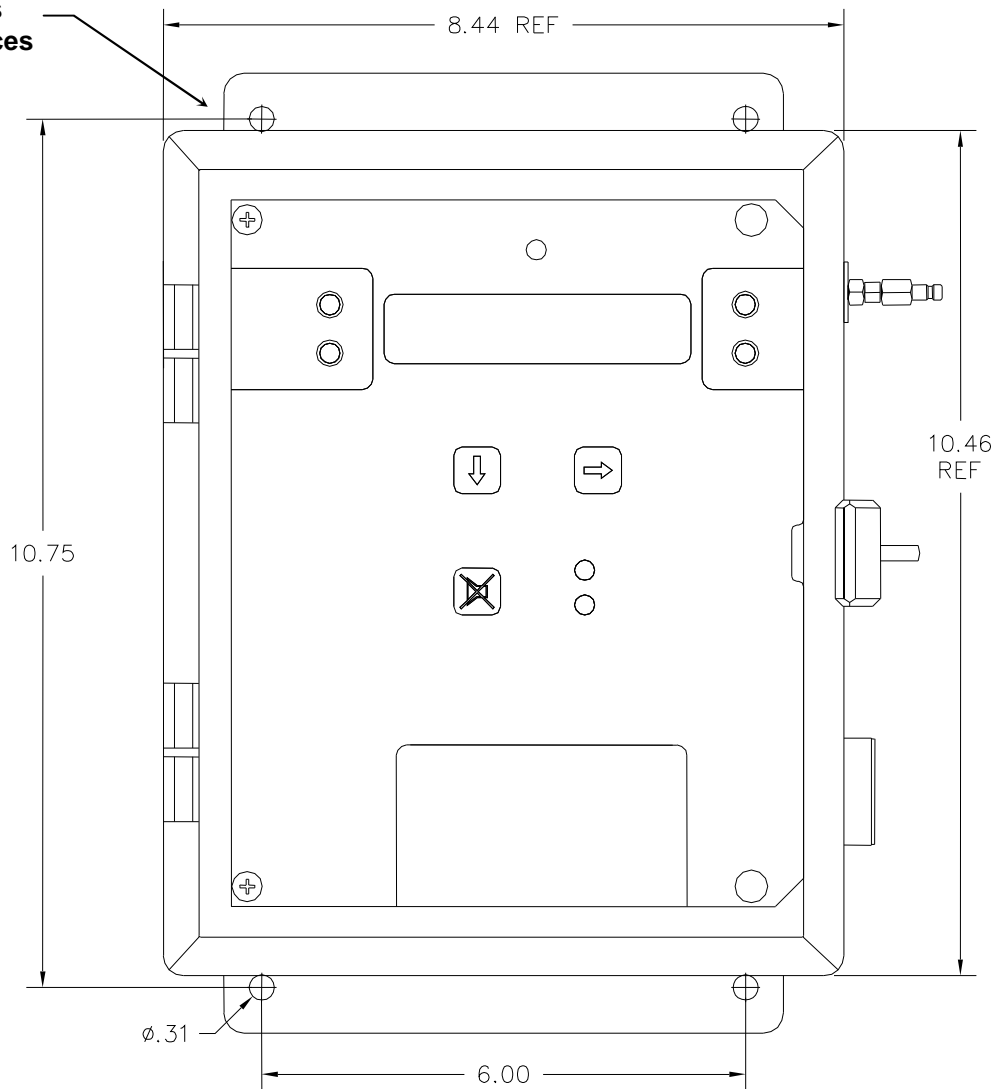
The **ISA-300RAL** should be located near the pipe or tank containing the air to be monitored, and upstream from where the air is being used. The **ISA-300RAL** must be installed such that it samples the compressed air before it reaches the users.

Mount the instrument on an appropriate vertical surface using the mounting flanges provided. Avoid areas with excessive vibration. The holes in the flanges are 0.31 inch in diameter and form a 6 x 10.75 inch rectangle.

See **Figure 3**.

It is recommended to use #8 drywall anchors and screws for mounting the **ISA-300RAL** to a drywall/sheetrock surface.

**Mounting Holes**  
0.31" dia. 4 places



Dimensions are in inches.

**Figure 3: ISA-300RAL Mounting Dimensions**



### 3.2 Sample Air Supply

Tap the pipe or tank containing the breathing air and use appropriate fittings to connect the supplied regulator. The regulator must be set to 55 PSIG. The instrument is designed to operate from an air supply pressure of 55 PSIG ( $\pm 5$  PSI).

The sample air exits the instrument from the hole plug located on the bottom of the enclosure. Take care not to obstruct this exit port.

### 3.3 Power Supply

The input power can vary from 100 to 240VAC, 50/60 Hz. Mains power should be connected to the Power Input Terminal **J23** and the ground screw **J21**. See **Figure 2** for location.

**! WARNING: Continuous gas detection and alarm systems become inoperative upon loss of primary power.**

Upon supplying air and power to the instrument:

- The green power on LED is lit.
- The display backlight is lit, and instrument will step through a start-up sequence: unit serial number, software revision and gases monitored 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 **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch. If alarm persists longer than 30 minutes, call **ENMET** customer service personnel.

### 3.4 Outputs

Two types of alarm outputs are available, relay contacts and 4-20mA outputs.

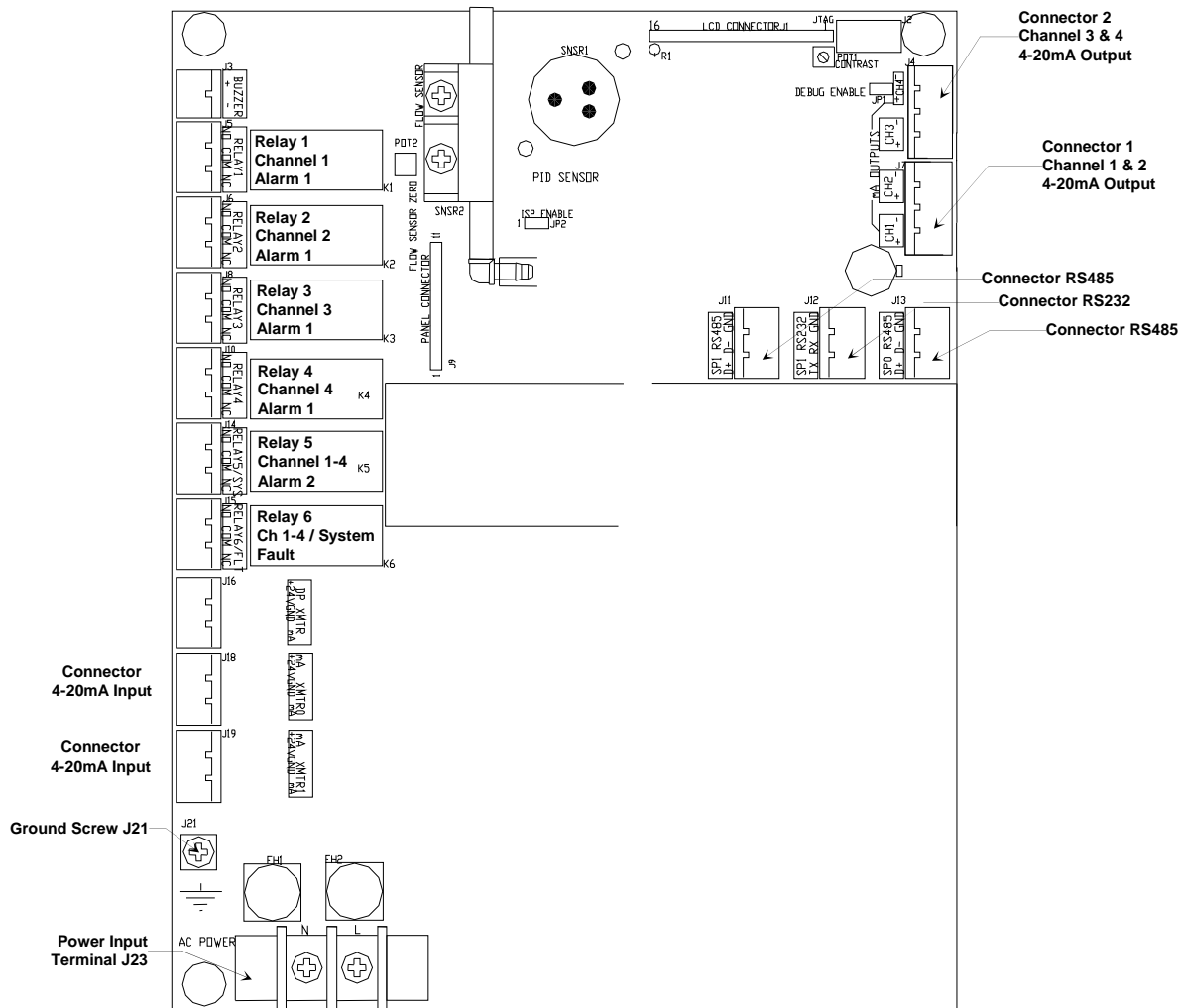


Figure 2A: Relay, Input and Output Terminals

### 3.4.1 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 2 & 2A**. The contact positions are noted on the circuit board next to each terminal.

Relays may also be configured as failsafe or non-failsafe. The default alarm relay configuration is for latching mode, and failsafe. They may be reconfigured in the maintenance menu. **See section 5.3.5 & 5.3.6**

The PC Board is labeled for the relays in their un-energized state. If the relay is configured for failsafe, then 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 the **Table 1** below:

**Table 1 : Relay Failsafe Settings**

Position	Failsafe-Alarm	Non-Failsafe-Alarm
J5 Relay 1 - NO	Normally Open	Normally Closed
J5 Relay 1 - COM	Common	Common
J5 Relay 1 - NC	Normally Closed	Normally Open
J6 Relay 2 - NO	Normally Open	Normally Closed
J6 Relay 2 - COM	Common	Common
J6 Relay 2 - NC	Normally Closed	Normally Open
J8 Relay 3 - NO	Normally Open	Normally Closed
J8 Relay 3 - COM	Common	Common
J8 Relay 3 - NC	Normally Closed	Normally Open
J10 Relay 4 - NO	Normally Open	Normally Closed
J10 Relay 4 - COM	Common	Common
J10 Relay 4 - NC	Normally Closed	Normally Open
J14 Relay 5 - NO	Normally Open	Normally Closed
J14 Relay 5 - COM	Common	Common
J14 Relay 5 - NC	Normally Closed	Normally Open
J15 Relay 6/FLT - NO	Normally Open	N/A
J15 Relay 6/FLT - COM	Common	N/A
J15 Relay 6/FLT - NC	Normally Closed	N/A

Relays can be linked to specific alarms. The table below shows the default relay links. They may be changed in the maintenance menu if required. **See Section 5.0.**

	Channel 1	Channel 2	Channel 3	Channel 4
Relay 1	Low Alarm			
Relay 2		Low Alarm		
Relay 3			Low Alarm	
Relay 4				Low Alarm
Relay 5	High Alarm	High Alarm	High Alarm	High Alarm

In addition, there is a fault relay, which changes state whenever the instrument is in a fault condition. The contact positions are noted on the circuit board next to each terminal. **See Figure 2A**. The coil of this relay is energized when the instrument is in the non-fault state; the contact conditions given on the circuit board next to the terminal, are for the non-energized state, which is identical to the fault state.

These relay contacts can be used to operate auxiliary alarms or other functions. It is recommended that power for auxiliary equipment be supplied from an independent power source, separate for the **ISA-300RAL**. Place a hole in the enclosure for a wire exit, and use appropriate cable fittings. Be sure to note the location and depth of hardware inside the enclosure.

### 3.4.2 Optional 4-20mA Outputs

Isolated 4-20 mA outputs are available for data logging or other purposes. An output is supplied for each sensor supplied in a particular instrument, and can be added when a sensor is added in the field. These outputs are available on the Connector 1 for channels 1 & 2 and Connector 2 for channels 3 & 4.

4mA corresponds to a sensor reading at the bottom of the instrument range and 20mA corresponds to a full scale reading. Standard ranges are shown in **Table 2**.

**Table 2: Sensor Output**

Sensor	4mA	20mA
CO	0	50
O <sub>2</sub>	0	30
CO <sub>2</sub>	0	5000

Wiring requirements are the same as for the relays.

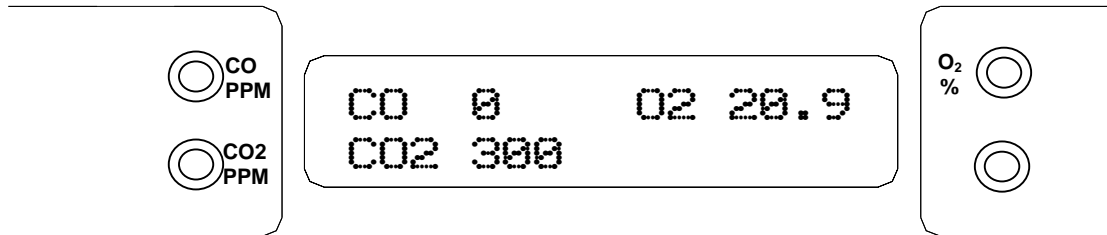
### 3.5 Installation Verification

All instruments are calibrated at the factory. You may, if a calibration kit is available, calibrate the CO, O<sub>2</sub> and CO<sub>2</sub> channels of the instrument 24 hours after installation to verify proper installation and instrument operation. See **Section 5.0, Maintenance**, for calibration instructions. Calibration is also recommended after the first month of operation. Subsequent calibrations should be performed every 3 months.

## 4.0 Operation

### 4.1 Normal Operation Condition

With the **ISA-300RAL** 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 as shown in **Figure 4 Display**, for the sensor(s) installed in the **ISA-300RAL**. The red alarm and fault LEDs are not lit.



*Example of display with CO(ch 1), CO<sub>2</sub>(ch 2) and Oxygen(ch 3) options installed*

**Figure 4: ISA-300RAL Operational Display**

### 4.2 Alarm Set Points

There are two alarm set points for CO, CO<sub>2</sub> and oxygen. The factory settings of these alarm set points are shown in **Table 3**.

**Table 3: Factory Alarm Set Points**

Typical Channel #	Gas	Alarm 1	Alarm 2
1	Carbon Monoxide	10 ppm	20 ppm
2	Oxygen Deficiency	19.5 % by volume	23.5 % by volume
3	Carbon Dioxide	500 ppm	1000 ppm

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

- If the CO 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.
- If the oxygen content of the sample air decreases below the deficiency alarm set point, the associated red LED is lit, the associated relay changes state, and the audio alarm is activated.
- If the oxygen content of the sample air exceeds that of the abundance alarm set point, the associated red LED is lit, the audio alarm is activated, and both the oxygen alarm relay and the oxygen high alarm relay change state.
- The Alarm 1 differential value is the delay of the **ISA-300RAL** 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 **▲** 10 and the differential is 2, the **ISA-300RAL** will go into alarm at 10 and stay in alarm until the reading has dropped below 8.

### 4.3 Alarm Latching

An instrument is shipped with the alarms in the latching mode. The alarms may be independently configured in the non-latching mode or differential setting by use of the maintenance menu.

See **Section 5.3.3**, for setting alarm 1 and alarm 2.

#### Standard Setting

- IN THE LATCHING MODE: at the cessation of the condition which causes an alarm, the alarm indications do not cease, and the alarm relay contacts do not revert to the non-alarm state, until the **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch is pressed. An alarm can also be acknowledged by pressing the switch during the alarm condition; then at the cessation of the alarm condition, alarm indications cease and alarm relays revert to the non-alarm state. After an alarm is acknowledged, alarms in the latching configuration are re-armed to latch at the next alarm condition.
- IN THE NON-LATCHING MODE: at the cessation of the condition that causes an alarm, the alarm indications automatically cease, and the alarm relay contacts revert to the non-alarm state.

#### Differential Setting

- The Alarm 1 differential value is the delay of the **ISA-300RAL** staying in alarm condition until after the measured reading has returned past the alarm point by the differential value. *Example:* If the alarm point is  $\Lambda$  10 and the differential is 2, the **ISA-300RAL** will go into alarm at 10 and stay in alarm until the reading has dropped below 8.

### 4.4 Audio Defeat

Pressing the **AUDIO DEFEAT / ALARM ACKNOWLEDGE** switch during an alarm temporarily silences the audio alarm. Relays and alarm LEDs continue to function, in the alarm state, during an alarm condition. As long as the alarm condition persists, the audio alarm will “chirp” every 20 seconds.

- If after 15 minutes the alarm condition continues the audio alarm will reactivate at full intensity.
- If any other alarm condition occurs while the audio alarm has been silenced it will force the audio alarm to reactivate immediately.

### 4.5 Display

In clean air a display is shown in **Figure 4**. This position of the display is termed the "**operational display**". As explained below, the display can be changed to furnish other information by using the **OPTION** and **SELECT** switches.

Concentrations of CO and CO<sub>2</sub> are given in PPM (parts per million parts of air). 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 Fault Indications

#### 4.6.1 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”.

#### 4.6.2 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.

### 4.7 Operational Menu

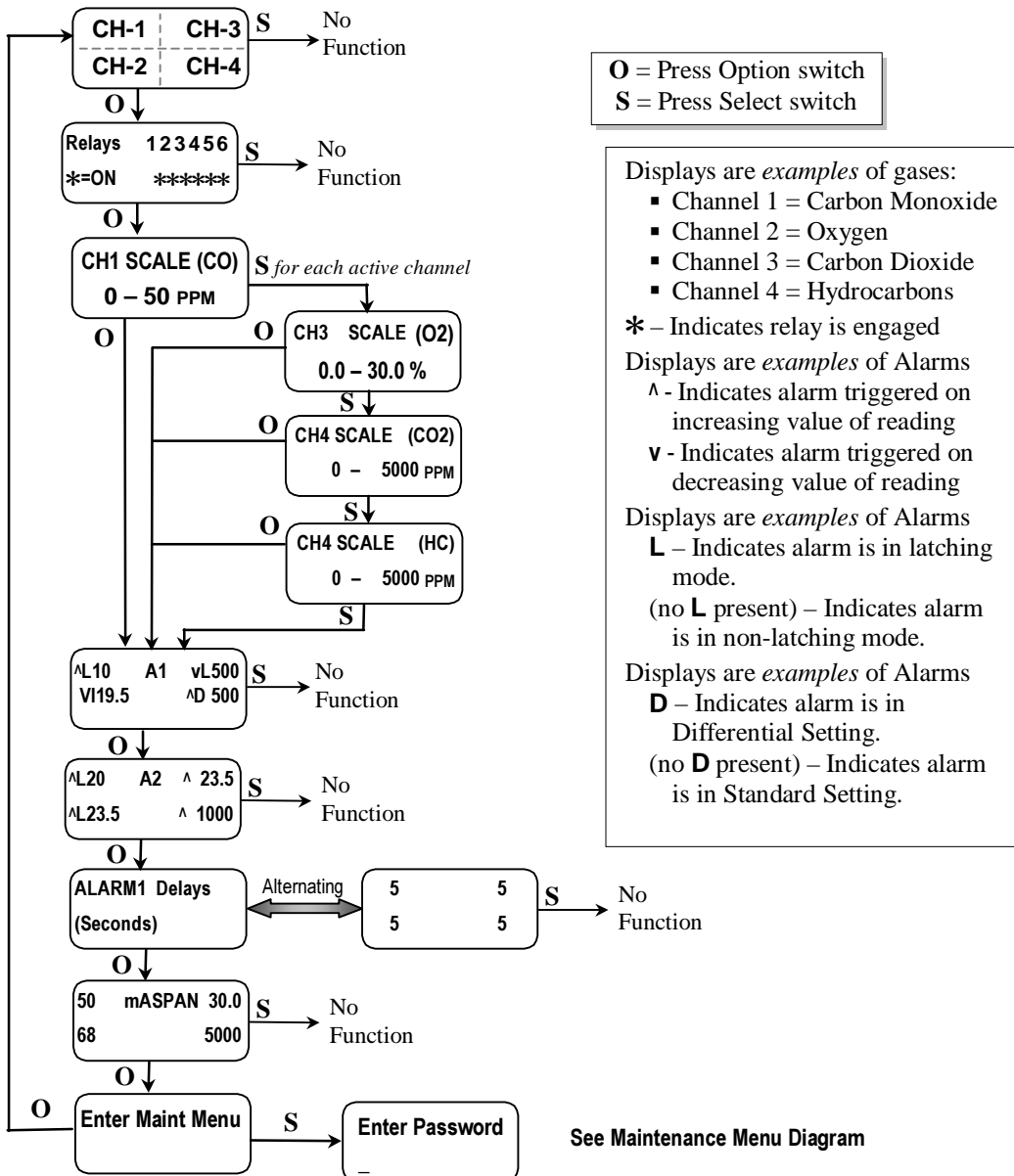
The operational menu allows the user to:

- View alarm set point concentration values
- View alarm latching 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 5**,

- 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 5: ISA-300RAL Operation Menu Flow Chart**

## 5.0 Maintenance

The **ISA-300RAL** requires periodic sensor calibration and replacement. Calibration of toxic gas and oxygen sensor should be performed immediately following installation, one month after installation and every 3 months thereafter. Oxygen and CO sensor have an estimated lifetime of 1 – 3 years. The CO2 sensor has an estimated lifetime of 3 – 5 years. Sensors should be replaced when they will not calibrate or shortly before the end of their estimated lifetime.

### 5.1 Cleaning Instructions

**CAUTION:** Never spray a cleaning solution on the surfaces of the **ISA-300RAL** devices.

Clean the exterior of the **ISA-300RAL** 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.

### 5.2 Maintenance Menu

#### 5.2.1 Accessing Maintenance Menu

The **ISA-300RAL** maintenance menu is accessed by entering the proper password with the **OPTION** and **SELECT** switches. See **Section 5.2.2 Figure 6** for full Maintenance Menu flow chart.

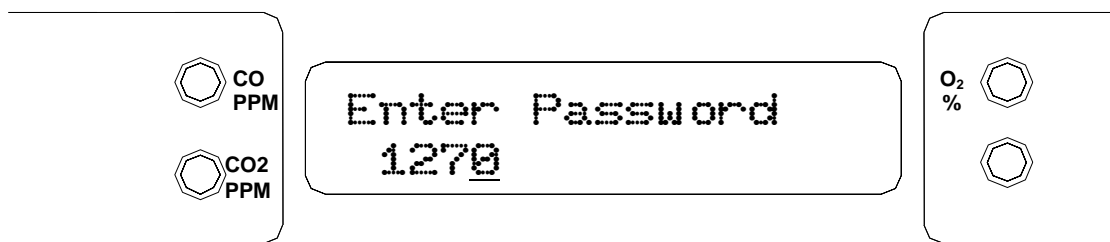
Entrance to the maintenance menu is guarded with a four-digit Password. The factory default setting of the password is 1270. When a valid numerical password is inserted, the user is allowed to enter the maintenance menu.

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.

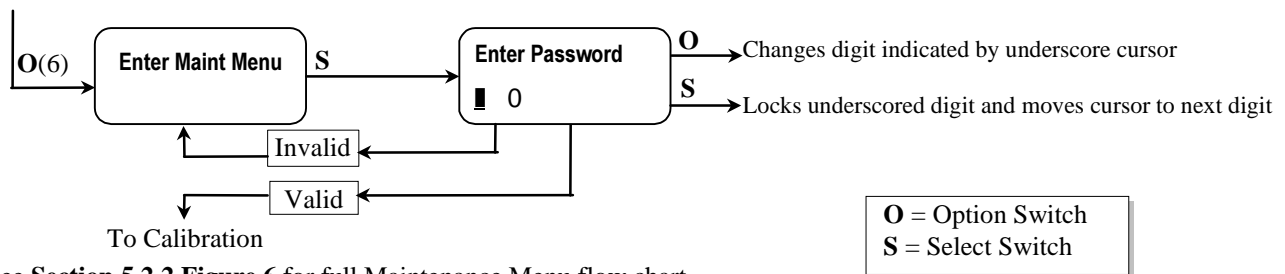
In the "Enter Maint Menu" position

- Press the **SELECT** switch "Enter Password █ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the █000 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.



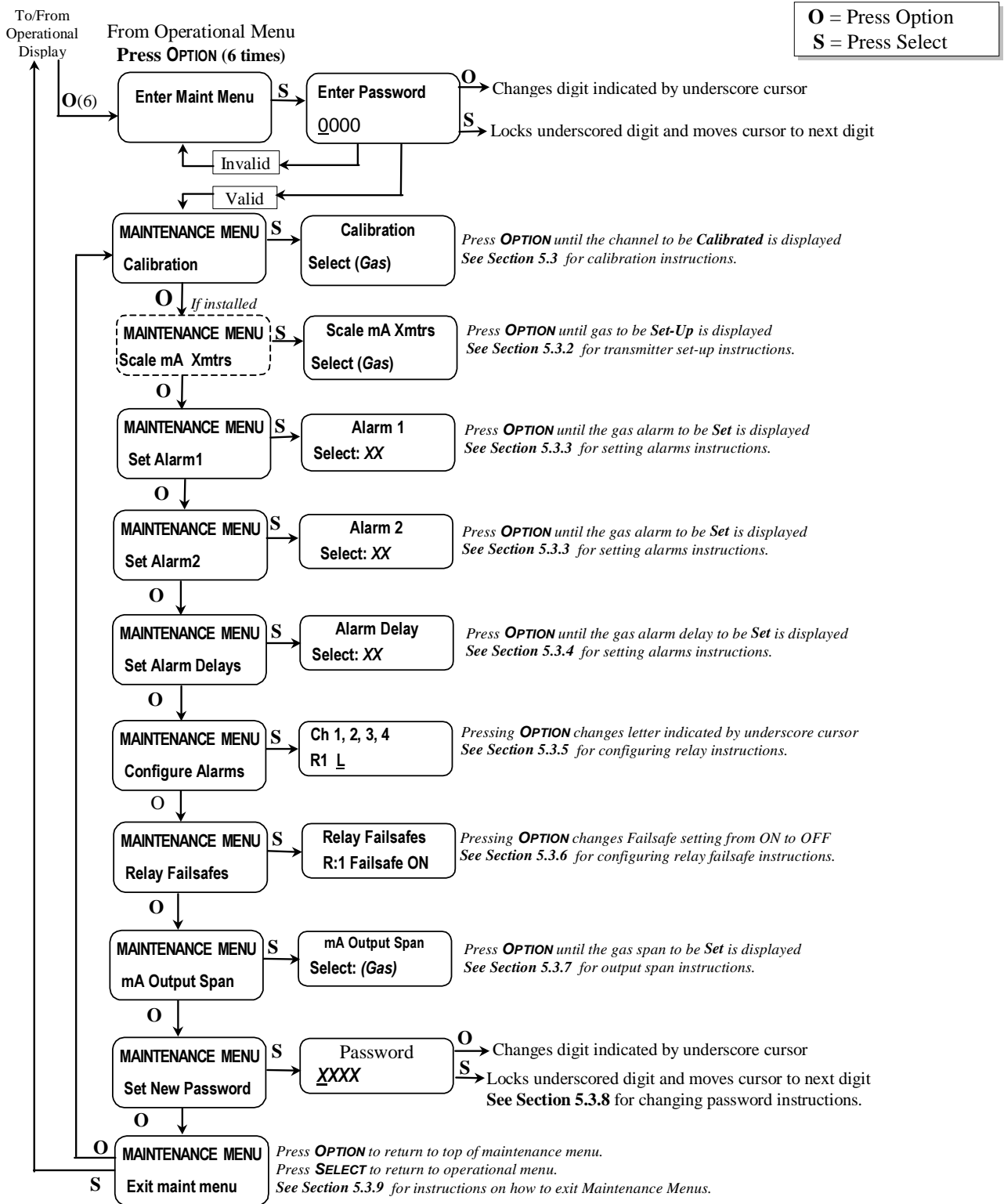
Example: Password Display (with factory installed password entered) and Flow Chart below.



See **Section 5.2.2 Figure 6** for full Maintenance Menu flow chart.

### 5.2.2 Maintenance Menu Flow Chart

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



**Figure 6: ISA-300RAL Maintenance Menu Flow Chart.**



### 5.3 Calibration for CO, O<sub>2</sub> and CO<sub>2</sub>

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas. This is a two step process. A Low Calibration sets clean air reference point and the High Calibration function sets the sensitivity of the instrument.

Calibration equipment is available from **ENMET** Corporation to calibrate the **ISA-300RAL**. A list of needed material is in Section 7.0. A calibration adapter will have a fitting for the gas cylinder on one side, and a quick-disconnect to attach to the instrument on the other.

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.

Wait 24 hours after initially supplying air and power to the **ISA-300RAL** sensor before initial calibration. 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.

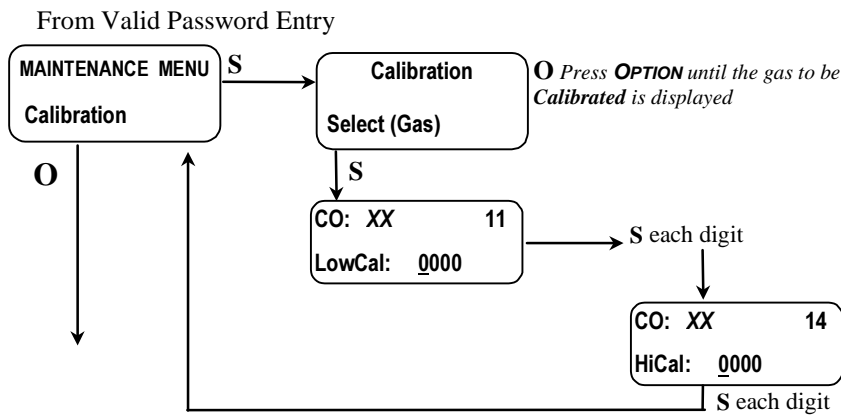
Supply sensor with clean air for LowCal/ZeroCal setting and apply calibration gas for HiCal/SpanGas setting.

- Press the **SELECT** switch "Calibration Select XX" is displayed. XX = the gas to be calibrated
- Press the **OPTION** switch, if needed, to change to the gas to be calibrated.
- Press the **SELECT** switch, the gas & current reading are displayed in upper portion of display. The mV reading & "LowCal Q" is displayed in the lower portion of display. This is the LowCal setting, *usually zero*, clean air must be supplied to the sensor. This reading needs to be at or near zero. If it is not then a cylinder of clean 20.9 air should be used. See Figure 7 if this is required.
- 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 7**. 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

Repeat above steps for each channel to be calibrated.

To continue on too next section Press the **OPTION** switch.

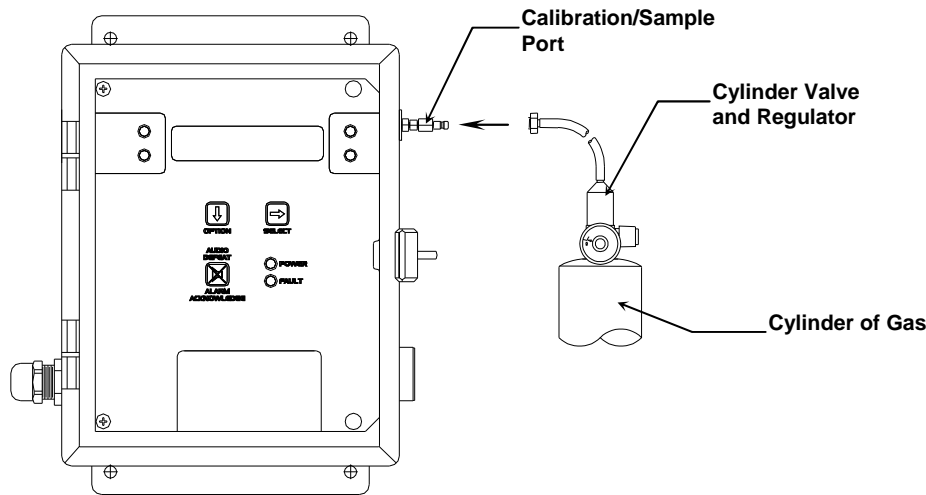
Example: Full Calibration Flow Chart, for CO



#### Default Calibration Points

Gas	LowCal	HiCal
CO	0	20
O2	N/A	20.9
CO2	0	1000

**O** = Press Option  
**S** = Press Select



**Figure 7: Connection of Calibration Gas Cylinder**

### 5.3.1A Low Cal/ZeroCal Adjust

A Low Cal function should be performed only when the **ISA-300RAL** sensor are exposed to clean uncontaminated air. Use a cylinder of 20.9% oxygen to provide a clean air reference if necessary. Attach the cylinder to the calibration adapter, attach the adapter to the instrument and allow gas to flow over the sensor for up to 4 minutes.

Enter the maintenance menu by repeatedly pressing **OPTION** switch, until the maintenance menu is displayed. See **Figure 6, ISA-300RAL Maintenance Menu** flow chart.

The first menu available is the Low Cal/ZeroCal.

Press the **SELECT** switch 4 times to perform a Low Cal.

- *If the Low Cal/ZeroCal is successful*, The display will change to Hi Cal/SpanGas. If you wish to Hi Cal/SpanGas the sensor apply calibration gas. **Proceed to gas calibration Section 5.3.1B**  
If you wish to Exit the maintenance menu, Press and *hold* **OPTION** switch until the Maintenance Menu is displayed then release. Then press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display
- *If the Low Cal/ZeroCal is Not successful*, sensor is outside of safe parameters to Low Cal, a "SLP/Off Set err" will be indicated. Repeat Section 5.3.1 Low Cal/ZeroCal Adjust making sure to use a cylinder of 20.9% Oxygen.

### 5.3.1B High Cal/SpanGas Adjust

A High Cal/Span Gas should only be performed after a successful Low Cal/ZeroCal has been completed.

- 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 7**. 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

Repeat above steps for each channel to be calibrated.

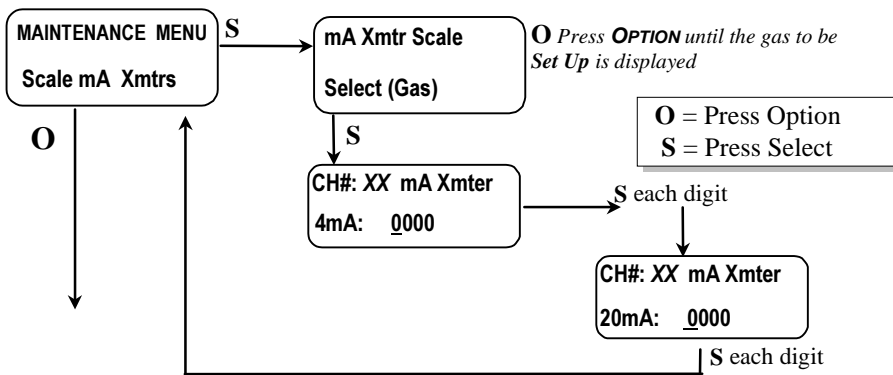
To continue on too next section Press the **OPTION** switch.

### 5.3.2 Set 4 –20mA Transmitter Scale

This section of the maintenance menu is installed when there are 4-20mA style sensors for other gases. This function is normally performed at the factory and is not usually required to be performed in the field unless a new transmitter is installed. After entering a valid password into maintenance menu, the Scale mA Xmtrs section is the second menu section, if it is installed, enter by pressing the SELECT switch

- Press the **SELECT** switch "mA Xmter Scale: Select XX" is displayed. XX = the gas to be set up.
- Press the **OPTION** switch, if needed, to change to the gas to be set up.
- Press the **SELECT** switch, "Ch#: mAXmter: 4mA: 0000" is displayed
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display move to the full Scale mA Xmtrs menu
- Press the **SELECT** switch, "Ch#: mAXmter: 20mA: 0000" is displayed
- Press the **SELECT** switch, that moves the cursor one digit to the right when the last digit is accepted the display will return to the Scale mA Xmtrs menu
- Repeat these steps for each 4 –20mA transmitter.
- Press the **OPTION** switch, to continue on to the next section of the Maintenance Menu.

Example: Sensor/Transmitter Set Up Flow Chart



### 5.3.3 Set Alarm Points

Factory alarm set points are discussed in Section 4.2, See Table 3. 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 █ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the █000 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, **A** for ascending trigger point or **V** for descending trigger point indicator.
- Press the **OPTION** switch to toggle between **A** 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, to *set alarm 1 value*.

- The next character is the latching indicator **L** or **NOL** 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 **A** **DIFF** 000" is displayed, to *set alarm 1 differential*.

- 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 **ISA-300RAL** 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 **A** 10 and the differential is 2, the **ISA-300RAL** 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

**O** = Press Option  
**S** = Press Select

$\wedge$  - Indicates alarm triggered on increasing value of reading

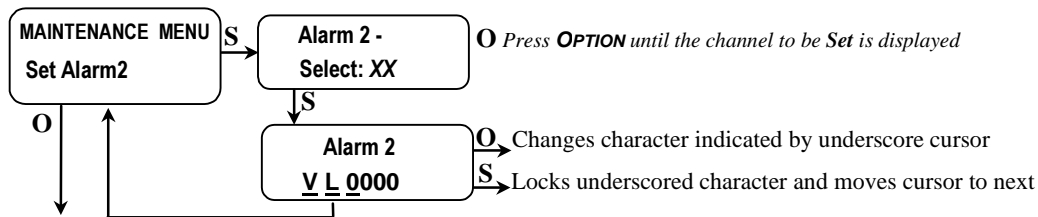
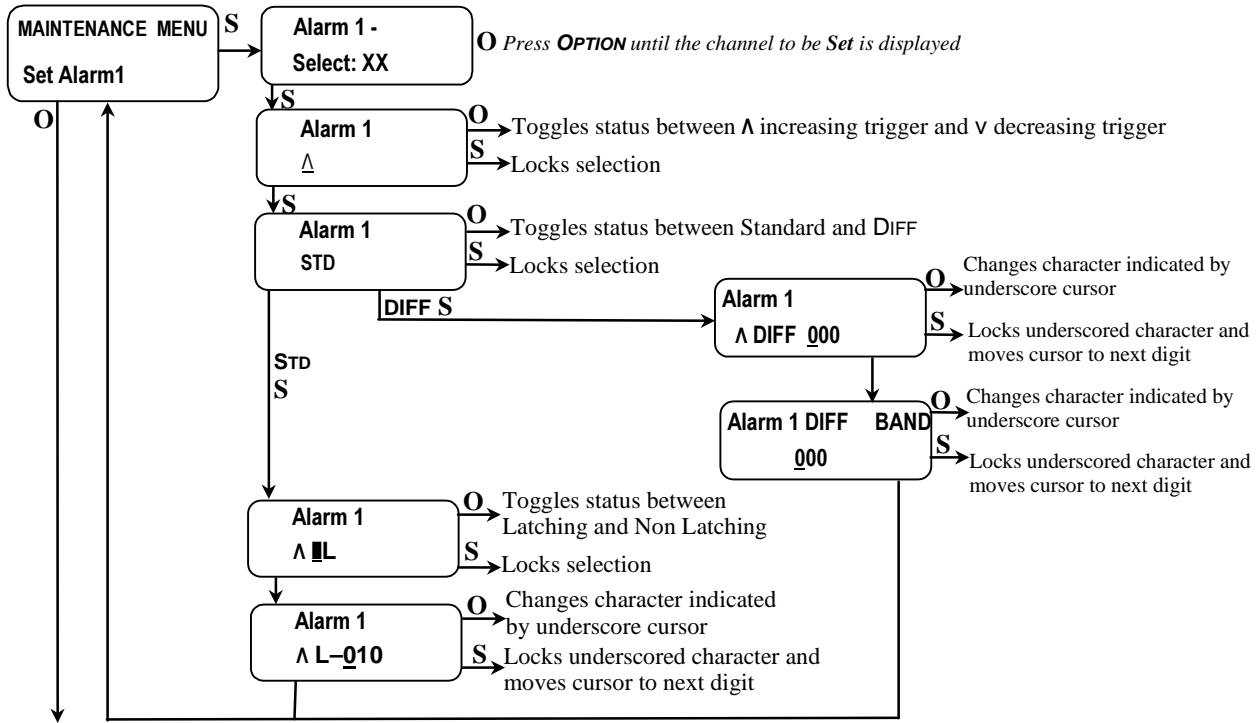
$\vee$  - Indicates alarm triggered on decreasing value of reading

L- Indicates alarm is set for latching

NO L- 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 3 for factory alarm set points.

### 5.3.4 Set Alarm Delay

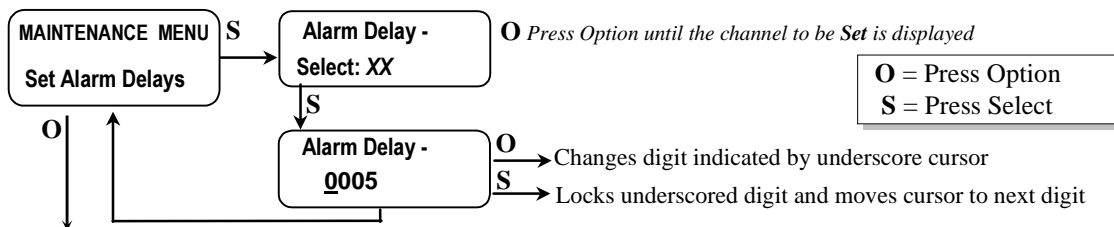
The alarms may be set to delay by 1 second increments, up to 255 seconds. Alarm delays are factory set to 5 seconds.

To change an alarm delay, 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**. See **Table 4** below for factory set delays. A space is provided to record changes.

After entering a valid password:

- Press the **OPTION** switch until; "Maintenance Menu Set Alarm Delay" appears on display.
- Press the **SELECT** switch, "ALARM Delay Select: XX" is displayed. XX = the gas alarm to be changed.
- Press the **OPTION** switch until, desired gas is displayed.
- Press the **SELECT** switch; "ALARM Delay = 0000" is displayed, with the underscore cursor under the left digit.
- Press the **OPTION** switch to change the left digit; select the correct digit.
- Press the **SELECT** switch to lock in the correct digit and move the cursor one digit to the right. When the last digit is accepted display returns to the "Set Alarm Delay" position.
- Repeat for each sensor alarm delay to be changed.
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Alarm Delay Flow Chart



**Table 4: Factory Set Gas alarms Delay**

Gas	Delay ON	
CO	5 sec	
O <sub>2</sub>	5 sec	
CO <sub>2</sub>	5 sec	

### 5.3.5 Relay Configuration

To change a relay configuration 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 below.

In the "Enter Maint Menu" position

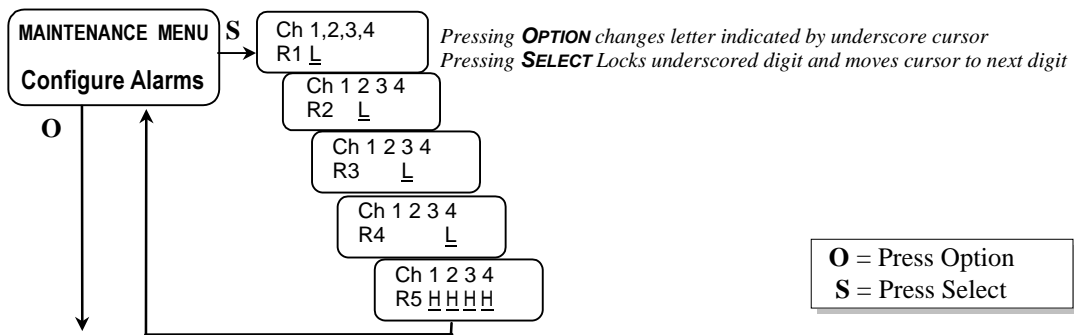
- Press the **SELECT** switch "Enter Password █ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the █000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select 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 “Configure Alarms” is displayed
- Press the **SELECT** switch to enter the Configure Alarms menu
- Press the **OPTION** switch to set relay configuration as needed, see below for indications  
**L** = Low Alarm, **H** = High Alarm, **B** = Both Alarms, **█** = No Relay linked to channel
  - When mapping the relay trigger points  
**L** = Low Alarm = Alarm 1,  
**H** = High Alarm = Alarm 2,
- Press the **SELECT** switch to lock setting and move to next, channel and relay
- Press **OPTION** switch until “Exit maint menu” appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Relay Configuration Flow Chart



The table below shows the default relay links.

	Channel 1	Channel 2	Channel 3	Channel 4
Relay 1	Low Alarm			
Relay 2		Low Alarm		
Relay 3			Low Alarm	
Relay 4				Low Alarm
Relay 5	High Alarm	High Alarm	High Alarm	High Alarm

Relays can be linked to specific alarms.

NOTE: Each operating channel must be linked to at least 1 relay.

### 5.3.6 Failsafe Configuration

To change a relay failsafe configuration 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 below.

In the "Enter Maint Menu" position

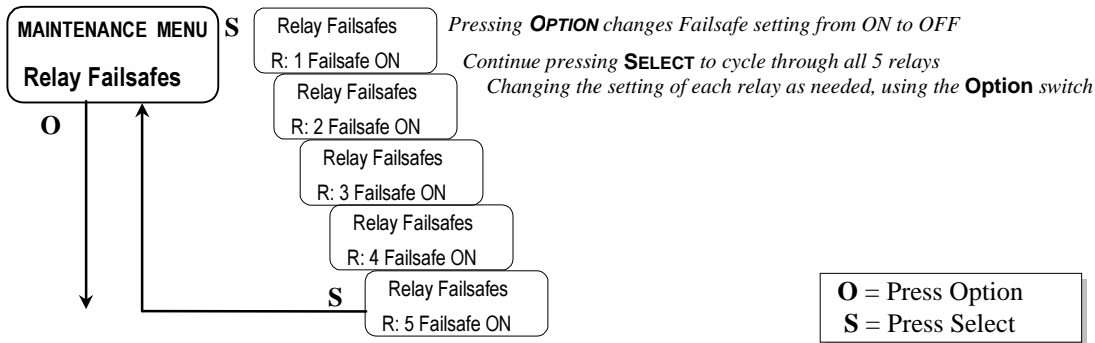
- Press the **SELECT** switch "Enter Password █ 0" is displayed. Press **SELECT** switch once, to move cursor to next digit, this will be the first digit of the password.
- In the █000 position, the underline cursor is under the left digit.
- Press the **OPTION** switch to change the left digit; select 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 "Relay Failsafes" is displayed
- Press the **SELECT** switch to indicate relay to be set.
- Press the **OPTION** switch to set relay indicated, On or Off as appropriate.
- Press the **SELECT** switch to cycle through each of the 5 relays, return to "Maintenance Menu Relay Failsafes"
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Relay Failsafe Configuration Flow Chart

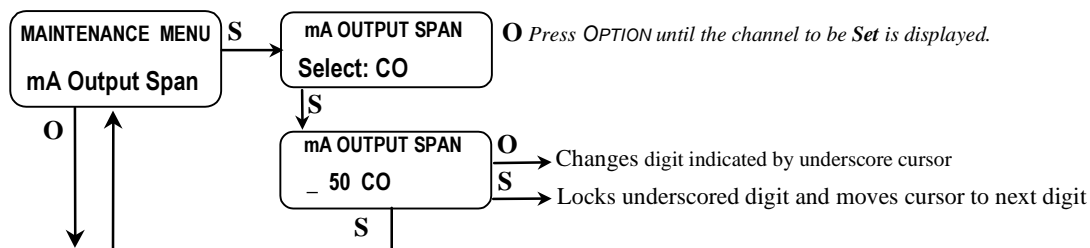


### 5.3.7 Set Output Span Range

To change 4-20 mA output range. This range is set at the factory and should not be changed, contact **ENMET** for information.

- Press the **OPTION** switch to continue to next section of maintenance menu.
- Press **OPTION** switch until "Exit maint menu" appears and then press **SELECT** switch to return the instrument to the Operational Display

Example: Set Output Span Flow Chart





### 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.

To set a new password, after inserting a valid password,

- Press the **OPTION** switch until; "Set New Password" is displayed.
- Press the **SELECT** switch; "Password █0000" 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.

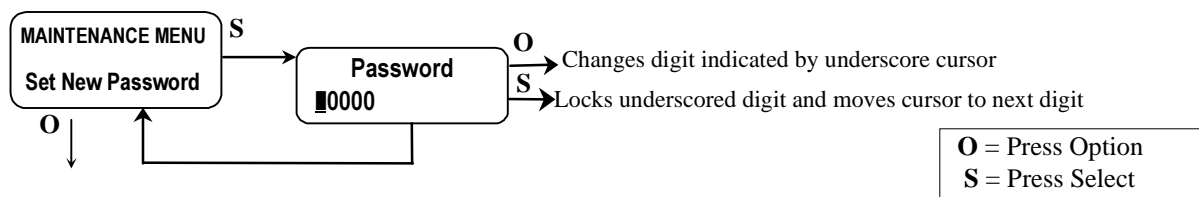
When all four digits of the new password have been selected, "Set New Password" is displayed.

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

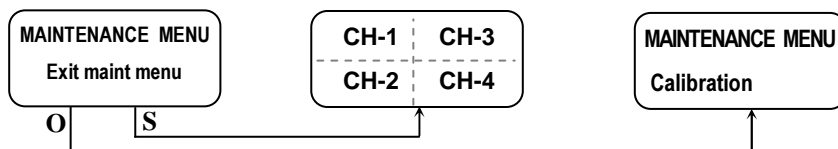


### 5.3.9 Exit Maintenance Menu

From the "exit MAINTENANCE Menu" position

- 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

### 5.4.1 Gas Sensor

A Gas sensor must be replaced when it can no longer be calibrated. To replace a sensor, perform the following steps.

- Turn off the electrical power. The sample air can continue to flow.
- Open the display panel and remove the four manifold retention screws and remove the manifold. See **Figure 9**.
- Remove the old sensor, and replace it with a new sensor.

**CAUTION:** Some new sensors come with a shorting clip that must be removed for proper operation. See **Figure 8**.

- Replace the manifold.
- Turn on the electrical power.
- Recalibrate the sensor and again 1 month after replacement.

Calibration is the process of setting the instrument up to read accurately when exposed to a target gas. This is a two step process. A Low Calibration sets clean air reference point and the High Calibration function sets the sensitivity of the instrument.

Calibration equipment is available from **ENMET** Corporation to calibrate the **ISA-300RAL**. A list of needed material is in Section 7.0. A calibration adapter will have a fitting for the gas cylinder on one side, and a quick-disconnect to attach to the instrument on the other.

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.

Wait 24 hours after installing a new sensor and supplying air and power to the **ISA-300RAL** sensor before initial calibration. 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. Calibration, Select CO is displayed. Press and *hold* the **OPTION** switch until an F appears in the upper right corner of the display.

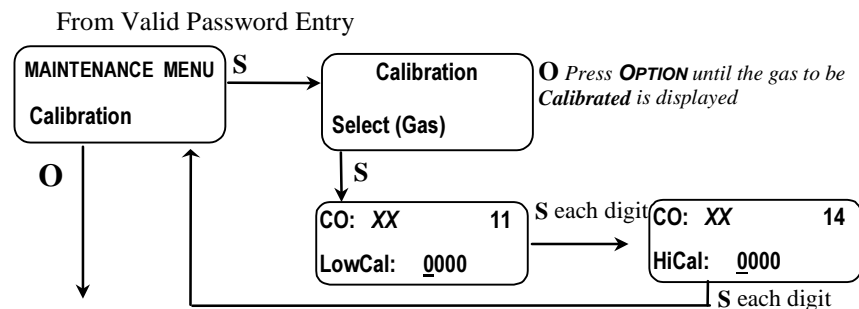
Supply sensor with clean air for LowCal/ZeroCal setting and apply calibration gas for HiCal/SpanGas setting.

- Press the **SELECT** switch "Calibration Select XX" is displayed. XX = the gas to be calibrated
- Press the **OPTION** switch, if needed, to change to the gas to be calibrated.
- Press the **SELECT** switch, the gas & current reading are displayed in upper portion of display. The mV reading & "LowCal 0" is displayed in the lower portion of display. This is the LowCal setting, *usually zero*, clean air must be supplied to the sensor. This reading needs to be at or near zero. If it is not then a cylinder of clean 20.9 air should be used. See Figure 7 if this is required.
- 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 7**. 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

Repeat above steps for each channel to be calibrated.

To continue on too next section Press the **OPTION** switch.

*Example:* Full Calibration Flow Chart, for CO



### Default Calibration Points

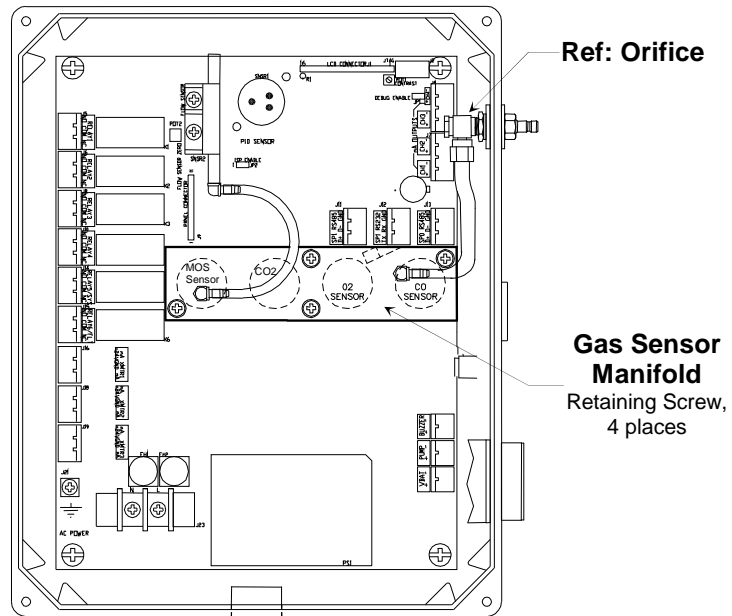
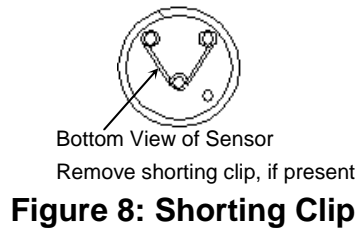
Gas	LowCal	HiCal
CO	0	20
O2	N/A	20.9
CO2	0	1000

**O** = Press Option  
**S** = Press Select

### 5.4.2 Oxygen Sensor

An oxygen sensor must be replaced when it can no longer be calibrated in clean air. To replace the sensor, follow the general steps given for the replacement of a gas sensor, but effect a replacement of the oxygen sensor. After sensor installation, wait four hours before re-calibrating, and again 1 month after replacement.

**CAUTION:** New sensors may come with a shorting clip that must be removed before installation, for proper operation. See **Figure 8**.



**Figure 9: Location Gas Sensor Manifold**

### 5.5 Flow Control Orifice

A 0.006-inch diameter orifice is used to set the flow rate and to drop the air pressure. A pre-filter is in line to help prevent clogging. In well-maintained medical air systems, this orifice should not clog. However, if difficulty is experienced in maintaining flow rate with assured inlet pressure, remove air pressure from the equipment and examine this orifice and pre-filter; replace it if necessary.

Orifice location will depend on instrument sensor configuration. Orifice and pre-filter are located at the output point of the dew point probe manifold or on the inlet line to the gas sensor manifold.

## 6.0 Technical Data and Specifications

<b>Electrical Power</b>	15 Amp fused branch circuit			
	100-240 VAC			
	0.9 A			
	50/60 Hz			
	Board Mounted Fuse FH2, 0.630A, 5 x 20mm			
<b>Storage and Transport</b>	Temperature:		-20° to +60°C (-4° to +140°F)	
	<i>preferred</i>		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)	
<b>Operation</b>	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		55 PSI (± 5 PSI) to the monitor	
<b>Mechanical</b>	Dimensions:		11 x 9 x 6 inches (4.3 x 3.5 x 2.4 cm)	
	Weight:		8 lbs (3.6 kg)	
	Material:		Engineered thermoplastic with hinged front cover	
	Strain relief:		5-12 mm OD	
<b>Outputs</b>	Relays:		SPDT Resistive Load    Inductive Load 10A at 110 VAC    7.5A at 110 VAC 10A at 30 VDC    5A at 30 VDC	
	Analog:		4-20 mA x 3	
	Digital:		RS-232 – Modbus RS-485 – Modbus	
	Audio:		95 db at 2 ft	
<b>Sensors</b>	<b>Type</b>	<b>Range</b>	<b>Response Time</b>	<b>Life</b>
	CO	0 – 50 ppm	T <sub>90</sub> = 30 seconds	1 – 3 years
	O <sub>2</sub>	0 – 30%	T <sub>90</sub> = 15 seconds	1 – 2 years
	CO <sub>2</sub>	0 – 5000 ppm	T <sub>90</sub> = 30 seconds	3 – 5 years

## 7.0 Replacement Part Numbers

### 7.1 ENMET part numbers for sensors and replacement parts:

Part number	Description
03053-000	Sensor, CO <sub>2</sub>
67025-1114	Sensor, Oxygen
67025-1200	Sensor, CO
73540-701	Orifice
73583-700	Orifice, pre-filter
64002-630	Fuse, 0.630 Amp 5x20mm
06008-004	Sensor Gasket
65057-011	Terminal plug, 3 position
65057-012	Terminal plug, 4 position
65057-010	Terminal plug, 2 position

### 7.2 ENMET part numbers for Calibration equipment:

Part number	Description
03219-020	Gas Cylinder, 20 ppm CO in air
03296-209	Gas Cylinder, 20.9% oxygen in nitrogen
03223-1000	Gas Cylinder, 1000 ppm CO <sub>2</sub> in air
03700-500	Calibration Adapter

## 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 is 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

80002-043

January 2006

MCN-344, 03/24/06

MCN-345, 04/13/06

MCN-346, 04/21/06

MCN-351, 09/06/06

MCN-354, 12/22/06

MCN-392, 11/26/07

MCN-437, 08/19/10

## Appendix A

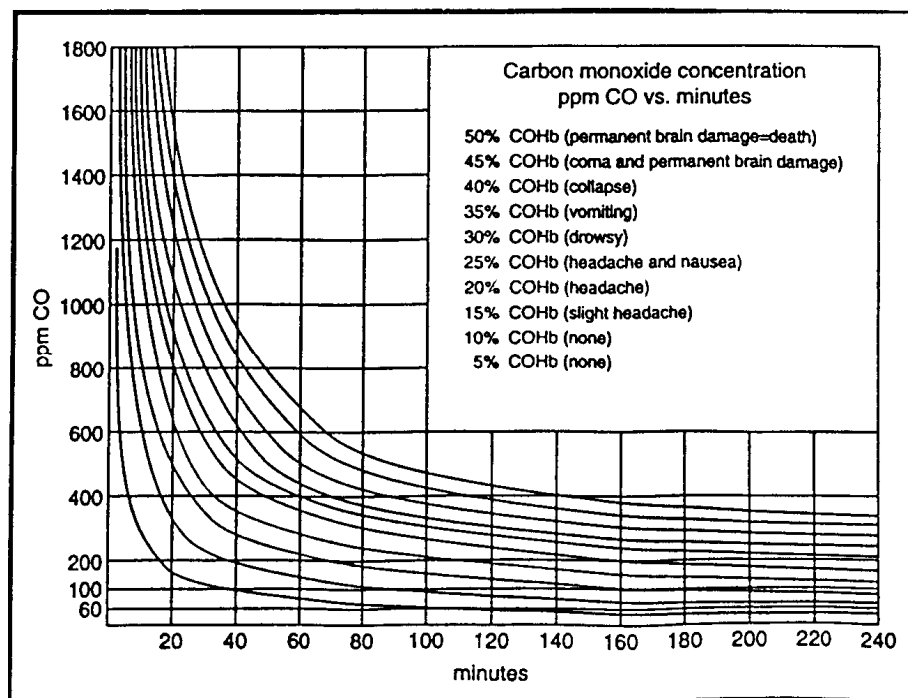
### The Characteristics and Effects of Carbon Monoxide

Carbon monoxide is a colorless odorless toxic gas generated by incomplete combustion of a hydrocarbon fuel in air. It may be present where internal combustion engines, furnaces, boilers, and other combustion devices are present. It is toxic when inhaled because of its great affinity to hemoglobin, the oxygen carriers in the red cells of the blood. CO replaces the oxygen normally carried by the hemoglobin, and thus inhibits the delivery of oxygen throughout the body; the victim suffers from oxygen deficiency, and may die from asphyxiation. The symptoms and degree of danger resulting from exposure to CO depend upon the concentration of the gas and the length of exposure; this is shown in **Figure 8**. The **ISA-300RAL** instrument is employed to warn the user of the presence of CO, and to facilitate the assessment of the degree of danger that he or she is exposed to.

Based upon knowledge of the effects of CO, the Occupational Safety and Health Authority (OSHA) has set limits on exposure to CO in the workplace. These are 35 ppm (parts CO per million parts air) as an time weighted average for an eight hour day, and a maximum exposure of 200 ppm. For compressed air line applications, OSHA requires Grade D breathing air supplied, using a Compressed Gas Association (CGA) definition (G-7.1). Depending on interpretation of the OSHA respiratory standard, 10 ppm and 20 ppm CO have been used as maximum limits and standard instrument alarm points.

The **ISA-300RAL** has two preset alarm set points, at 10 ppm and 20 ppm CO, which are adjustable, but cannot be set below 5 ppm or above 100 ppm.

The curves below are for percent carboxalhemoglobin with 50% being the top curve, 5% the bottom. %COHb is a measure of the amount of hemoglobin occupied by CO rather than oxygen. CO effects upon children, adults engaging in physical activity, and smokers, are more pronounced.



**Figure 10: Carbon Monoxide Concentration**



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 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 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 Card Code

**American Express** \_\_\_\_\_  
Card number Expiration Card Code

**Name as it appears on the credit card** \_\_\_\_\_

Return Shipping Method:

UPS:  Ground  3 Day Select  Next Day Air  ND Air Saver  2-Day Air

UPS Account number: \_\_\_\_\_

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: \$ \_\_\_\_\_