

## Toxic and Explosive Smart Gas Monitor

**PN# 151022/151023**

### Installation and User Manual



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## WARNING!

THIS USER'S GUIDE MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING OR SERVICING THIS PRODUCT. LIKE ANY PIECE OF COMPLEX EQUIPMENT, THIS PRODUCT WILL PERFORM AS DESIGNED ONLY IF INSTALLED, USED AND SERVICED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Quest Controls, Inc. with respect to these Products are voided if the products are not installed, used and serviced in accordance with the instructions in this User Manual. Please protect yourself and others by following all instructions. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repair.

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## GENERAL WARNINGS AND CAUTIONS!

1. The Toxic and Explosive Gas Monitor described in this User Manual should be installed, operated, and maintained in strict accordance with their labels, cautions, warnings, instructions, and within the limitations stated.
2. This equipment must be isolated or disconnected before opening; more than one disconnect may be required. For MODEL Toxic and Explosive, the Amphenol connector is not suitable as a disconnecting means.
3. The Toxic and Explosive Gas Monitor is a non-explosion proof design. It must not be installed in an open area or location where explosive concentrations of combustible gases or vapors might occur in the atmosphere in Class 1, Groups A, B, C, and D areas, as defined by the National Electrical Code (NEC). Since this monitor is not explosion proof, it must be located in a non-hazardous general-purpose area.
4. The Toxic and Explosive Gas Monitor is designed to detect gases in air. It cannot measure the concentration of gases in steam or inert or oxygen deficient atmospheres.
5. As with all gas sensors high levels of, or long exposure to certain compounds in the tested atmosphere can contaminate sensors. In atmospheres where a gas sensor may be exposed to such materials, calibration should be performed frequently to ensure that the sensor operation is dependable and indications are accurate readings.
6. The Toxic and Explosive Gas Monitor must not be painted. If painting is being done in an area where gas monitors and sensors are located, paint deposits will interfere with the diffusion process, whereby a sample of the atmosphere being monitored diffuses into the sensor head.
7. The only absolute method to ensure the proper overall operation of gas sensors is to check the sensors with a known concentration of the gas for which they have been calibrated. Consequently, calibration checks should be included as part of the routine inspection of gas sensors.

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## Section 1 Specifications

**Table 1 Toxic and Explosive Smart Gas Monitor Specifications**

Description	Specification
Input Power	18-72 VDC /0.3 A, 24 VDC nominal or 18-36 VAC /10A, 24 VAC nominal
Output Power	24 VDC/60mA, for connection to smoke detector
Output Relays	<b>K1</b> -SPDT: normally de-energized for CO Toxic Gas Alarm <b>K2</b> -SPDT: normally de-energized for CH4 Explosive Gas Alarm <b>K3</b> -DPDT: normally de-energized for Power Fault Sensor Alarm <b>K4</b> -DPDT <sup>1</sup> : normally de-energized for Ventilation Fan Control
Output Relay Rating	SPST: 10A, 1/8 H.P., 277VAC (Resistive) DPDT: 5A, 1/8 H.P., 277VAC (Resistive)
Sensors	Carbon Monoxide (CO), Methane (CH4)
Alarm Thresholds	CO: 0 – 250 ppm, preset to 35ppm CH4: 0 – 100% LEL, preset to 10% (5,000 ppm)
Front Panel Indicators	Five (5) Status LEDs: RS485 TX – green indicates good communications RS485 RX – green indicates good communications R1- red indicates CO alarm level has been exceeded R2- red indicates CH4 alarm level has been exceeded R3 - red indicates the Ventilation Fan is on due to a CO or CH4 alarm
Front Panel Push Buttons	F1: Press to test the CO sensor alarm F2: Press to test the CH4 sensor alarm F3: Press to test the Ventilation Fan sensor alarm
Front Panel Display	LCD Graphic Display with backlight
Buzzer	2.7 KHz Buzzer with three programmable tones; 80 dB at 10 cm
Signaling and Outputs	RS-485 with Modbus and two (2) additional outputs: <ul style="list-style-type: none"> <li>• Output #1: 2 - 10 VDC, 4-20 mA</li> <li>• Output #2: Analog, 1 - 5 VDC, 4 - 20 mA</li> </ul>
Operating Temperature	-40 to 158°F (-40 to 70°C) - based on sensor, 5 - 95% RH, noncondensing
Storage Temperature	32 to 104°F (0 to 40°C), 5 - 95% RH, noncondensing
Dimensions	12.4” w x 13.3” h x 5.3” d 315 w x 338 h x 135 d mm
Weight	Approx. 8 lbs., 3.6 kg

<sup>1</sup> K5 provides a common connection to all sensor alarms; the common connection is fused with a 4A Fastblo fuse.

## Section 2 General Description



Figure 1 Toxic and Explosive Smart Gas Monitor

The Toxic and Explosive Smart Gas Monitor (Smart Gas Monitor) is designed to monitor potentially hazardous and toxic gas levels. The instrument employs Electrochemical and Catalytic Bead sensors for monitoring Carbon Monoxide (CO) and Methane (CH<sub>4</sub>).

The Smart Gas Monitor features two LCD displays. The front panel display, shown in Figure 2. Provides status LED indicators for each gas sensor, an LED indicating power status of the unit and TX/RX LEDs to provide RS-485 communication status. The front panel also houses a local audible device.

The Smart Gas Monitor consists of a main board housing the input and output connections and two display boards. Each display board provides the following:

- Five (5) status COM and RELAY indicators
- Three (3) front panel push buttons for navigation thru the display menus
- An audible alarm device

A discrete relay is assigned for each of the gas sensor. The CO and CH<sub>4</sub> sensors are factory set with default alarm thresholds; however, the alarm set points are adjustable to any value between 0 and 90% of the operating range.



Figure 2 COM and RELAY LEDs

### Hardware Configuration & Options:

The Smart Gas Monitor is available with the following configurations:

#### Standard Enclosure

- Includes a single entry port connector for power cable
- Allows for a user to identify a conveniently located punch-out entry port for connecting external monitoring cables

#### Optional Amphenol Connector

- Includes a 24-pin round Amphenol connector, pre-wired to the relay board; for use with an existing mating connector/cable

## 2.1 Front Panel LEDs and Indicators

### RS-485 LED Indicators

- Two LEDs, RX and TX, are provided for monitoring RS-485 communications to and from the unit
- When the Smart Gas Monitor is connected to a remote controller system via RS-485, the RX and TX communication channels can be monitored visually. The RX LED blinks to indicate receive communications (data from the remote controller), the TX LED blinks to indicate transmit communications (data from the gas monitor to the remote controller)
- During normal communications, the TX and RX LEDs will constantly blink; if the TX or RX LED is ON steady, there may be an interruption of communications

### Status Relay Indicators:

- Three LEDs are provided for monitoring the status of Relays 1-3
  - R1
  - R2
  - R3
- The relays are programmable as follows:
  - Alarms 1 – 8 can be configured to trigger any or all of the Relays based on set points
  - Normally Closed - the relay is configured as activated; the corresponding LED will turn ON during a non-alarm state and turn OFF during an alarm state
  - Normally Open - the relay is configured as de-activated; the corresponding LED will turn OFF during a non-alarm state and turn ON during an alarm state

## 2.2 Features

### Front Panel Push Buttons:

- Push buttons F1, F2 and F3 are used to navigate thru the display menus

### Outputs:

- An external 2-10 VDC, 4 – 20mA output voltage is provided for connecting to peripheral equipment such as a smoke detector
- RS-485 ModBus protocol output

### Alarm Sensor Thresholds

- Alarm sensor thresholds are user adjustable
- CO sensor alarm threshold is factory set at 35ppm
- CH4 sensor alarm threshold is factory set at 10% (5,000 ppm)

### Remote Monitoring

- The RS-485 interface provides for remote access to the Smart Gas Monitor using a HyperTerminal or ProComm application. The user has the ability to set alarm point thresholds and verify calibration and operational parameters and operating parameters

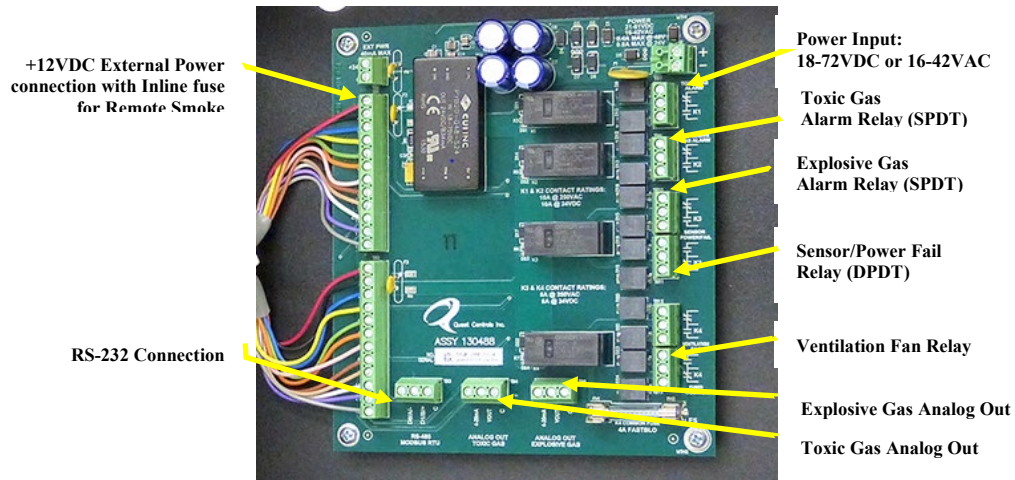


Figure 3 Toxic and Explosive Smart Gas Monitor Main Circuit Board

**Alarm Scheme:**

- Dedicated alarm relay contacts on each gas monitor’s display will transfer state when the gas level exceeds the set trip point.
- LEDs and buzzers are user-configurable for activation when pre-set limits are reached; the alarm relay will activate the associated LED which will illuminate, and the associated buzzer which will sound local audible device will alert personnel of the impending danger.
- Pressing the F3 button will deactivate (and silence) the audible alarm. Note – the buzzer relay must be re-activated when the alarm condition is over.
- The system features an automatic reset when gas levels fall below the alarm trip points. The alarm thresholds are factory set at 35 ppm for CO and 10%LEL for Methane. These settings can be adjusted as described in the sections below.

**Remote Interface Connections:**

- Terminal blocks are available for remote monitoring of sensor or power failure, input power, and alarm relays.

**RS485 Communication Port:**

- An RS-485 interface is provided on the main circuit board for remote configuration of each module’s settings.

## Section 3 Installation and Power Up

The Smart Gas Monitor must be mounted on a wall or structure that is free from shock or vibration. The monitor should be protected against physical damage, water, extreme temperature variations, direct heat and direct sunlight. The monitor should be easily accessible for operating the displays and opening the unit for servicing and installing remote connections. All wiring and conduit installation must be installed in accordance with the National Electrical Code (NEC) and the Authority Having Jurisdiction (AHJ).

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**NOTE:** All wiring and conduit installation must be installed in accordance with the National Electrical Code (NEC) and the Authority Having Jurisdiction (AHJ).

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The Smart Gas Monitor is available with two wiring options:

**Factory Provided Pre-Wired Amphenol Connector** - provides a single 24 pin connector on the outside of the enclosure for access to all output signals and alarm points.

**No wiring Connector** – provides the ability for the installer to wire direct to the terminal blocks.

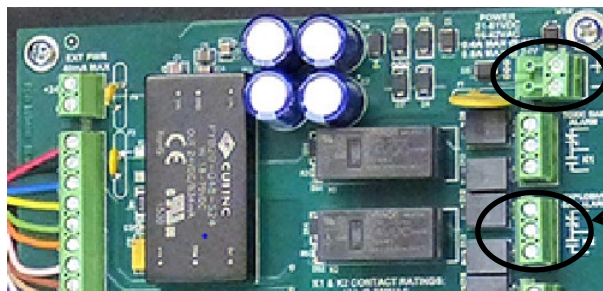
### 3.1 Installation

1. Mount the enclosure on a wall or structure using 4 screws suited for the weight of the module and the material makeup of the wall or structure.
2. If using the optional factory provided pre-wired Amphenol connector, connect the site's external Amphenol connector to the mating connector located on the left-side of the enclosure; wire the mating connector as outlined in Appendix B.
3. If wiring the site's monitor cables directly to the terminal blocks on the relay board:
  - a. Locate a convenient port of entry and use a punch tool to punch a hole thru the enclosure; take care to protect all displays, boards and components from debris and dust while punching the hole.



**IN AN EFFORT TO MINIMIZE INTERFERENCE, ROUTE THE POWER CABLE ALONG THE TOP OF THE MAIN CIRCUIT BOARD AWAY FROM ALL MONITORING CABLES LOCATED ON THE BOTTOM OF THE BOARD.**

- b. Connect the site's external monitor wiring directly to the terminal blocks as indicated below. Refer to Table 2 and Figure 4.
  - Terminal Blocks accept 12 - 24 AWG wire
  - Use 16 – 18 AWG for input power runs longer than 1 KM (.6 mile)
  - Use twisted pair wire for RS-485 communications; add terminating resistors at each end of the wire for long wire runs and place jumper J4 on the Display Boards across pins 2-3 (activating an internal terminator resistor)



**Power Connection:**  
Positive (+) terminal on top  
Negative (-) terminal on bottom

**TB Connections:**  
NC – top connection  
C – middle connection  
NO – bottom connection

Figure 4 Main Circuit Board – TB Connections

4. Route the input power cable in thru the round silver connector located on the upper left side of the enclosure and connect the power source to TB-7 located on the top-right side of the main circuit board as shown in Table 2 and Figure 4.

Table 2 Main Circuit Board Terminal Block Connections

Terminal Block	Description	Notes
TB1	Carbon Monoxide (CO) connections	Pre-wired at the factory
TB2	Methane (CH4) connections	Pre-wired at the factory
TB3	RS-485/ModBus	<ul style="list-style-type: none"> <li>• Twisted pair wire</li> <li>• Add terminating resistors at each end of the wire for long wire runs and place jumper J4 (located on the Display Circuit Boards) across pins 2-3</li> </ul>
TB4	Toxic Gas Output; 4- 20 mA, 2 – 10VDC	
TB5	Explosive Gas Output; 4-20 mA, 2-10VDC	
TB6	N/A	N/A
TB7	Input Power: 21 – 61 VDC (.4A max) or 16 – 41 VAC (.8A max)	Positive (+) terminal on top Negative (-) terminal on bottom
TB8	Toxic Gas Alarm	K1, SPDT – normally de-energized
TB9	Explosive Gas Alarm	K2, SPDT – normally de-energized
TB10 & TB11	Sensor/Power Fail	K3, DPDT – normally de-energized
TB12 and TB13	Ventilation Fan (fused, 4A)	K-4, DPDT – normally de-energized



**DO NOT EXCEED THE CONTACT RATINGS MARKED ON THE RELAYS.**

5. Verify the power source is OFF.
6. Connect wires to the provided power connector as follows:
  - a. Connect the positive terminal of the power source to the top connection.
  - b. Connect the negative terminal of the power source to the bottom connection.
7. Insert the power connector to TB-7.
8. Turn the power source ON; when the Toxic and Explosive Gas Monitor is first powered up, it may go into alarm for a few minutes until the sensors have stabilized. This is normal whenever the sensors have been turned off for a while or when a sensor has been replaced.

## Section 4 Operation

### 4.1 Front Panel Push Button Functions

The Quest Controls Smart Monitor includes front panel push buttons to navigate the display menus for viewing, configuring and testing the CO and CH4 modules and silencing the alarm buzzers.



**Figure 5 Default Display Screen**

#### Front Panel Navigation

The <F1>, <F2>, <F3> Function Buttons are used for navigating thru the display screens as follows:

- F1: Press the F1 button to return to the previous screen
- F2: Press the F2 button to advance to the next screen
- F3: Press the F3 button to enter the main menu for access to additional configuration and settings

When idle, the front panel screen will display the CO or CH4 Default Status. Navigate thru the screens as follows:

- A. From the Default Display Screen:
  1. Press the **F1 or F2 button** to navigate to the previous or next display screens:
    - Day, Date and Time
    - Fault Status
    - Average Alarm Conditions based on configured period
    - Status of Relays 1, 2 and 3 (On/Off)
    - Status of Alarm Buzzers 1, 2 and 3 (On/Off)
    - 4 - 20 mA Output Status (mA)
    - 1- 5 VDC Output status (mV)
  2. Using the **F2 button (NEXT)**, scroll thru the menu categories:
    - Main Menu
    - Buzzer/Relay
    - Latched/Hushed
    - Menu PSW
    - Exit
  3. Press the **F3 button (Enter)**, to access a sub-category.
  4. Using the **F2 button (Next)**, scroll thru the sub-category menu to view the selections for that category.
  5. Press the **F3 button (Enter)**, to select the desired sub-category.
  6. Use the **F1, F2 and F3 buttons** as described above to scroll thru and select an option.

#### **Example:**

Category: Output Test  
 Sub-categories: Test Relay1  
 Setting: On/Off

7. Press the **F2 Button (Next)**, to scroll thru the complete list of options, at the end of each category, sub-category and other selections, the screen will offer an “EXIT” screen; pressing the F3 key on the EXIT screen will bring you back to the previous level of selections.

**Alarms – Silence and Reset from the Default Display:**

1. **Silence the alarm** - When an alarm is sounding, press the F3 button to silence the alarm.
2. **Reset the alarm** - After an alarm condition has been resolved, press the F3 button again to reset the appropriate alarm relay. If the alarm condition (such as high gas concentration) remains present, the relay(s) will notreset.



**PUSHING THE F3 BUTTON TO SILENCE THE ALARM WILL ACTIVATE THE ALARM RELAY; ONCE THE ALARM CONDITION HAS BEEN REMOVED THE ALARM RELAY MUST BE RESET BY PUSHING THE F3 BUTTON AGAIN**

**4.2 Tools Function:**

The Tools Functions provides the user access for viewing settings, configuration and setup of the module. The Tools Functions are password protected; the user must input a valid password to access the Tools menu tree. When shipped from the factory, the Toxic and Explosive Monitor is set to the default password. Refer to the instructions listed below to change the password. If the password is changed and subsequently forgotten, contact Quest Controls for a code to reset the unit back to the factory default password.

**Factory default password: 4321**

**NOTE:** While in the menu tree, all normal monitoring operations are halted. The alarm status of the module does not change.

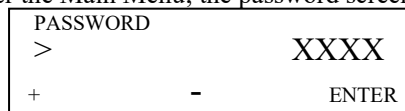
Use the F1, F2 and F3 buttons as described in the previous sections to navigate thru the menus.

1. On the Default Display Screen, press the **F3 button**; the Main Menu for the Tool Functions will appear.



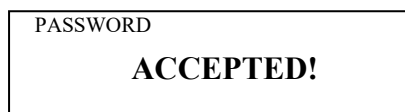
**Figure 6 Tools Function Main Menu**

2. Press the **F3 button** to enter the Main Menu; the password screen will appear.



**Figure 7 Enter a Password**

3. Input a password as follows:
  - a. Use the F1 button to increase or the F2 button to decrease the value for the left-most digit of the password.
  - b. Press Enter when the left-most digit is correct; the digit will stop blinking and the next digit will blink.
  - c. Repeat the above steps for each digit of the password, being careful to select Enter as each digit is set.
  - d. The screen will display ACCEPTED! When the correct password is entered.



**Figure 8 Accepted Password**

4.2.1 TOOL Menu


1. SYSTEM SETUP

The system setup sub-category contains the general settings for monitoring, communications, 4 – 20 mA calibrations and screen aesthetics. Use the F1, F2 and F3 buttons as described in previous sections to navigate thru the menus described in Table 1.




Figure 9 ZERO CAL Menu Display

Table 3 System Settings

Setting	Description
<b>Password</b>	Default password is 4321.
<b>Address</b>	Input an RS-485 address: 0 to 255. The default address for the left module is 3; the default address for the right module is 4. Note: In ModBus protocol, the address 0 is for broadcast.
<b>Baud rate</b>	Define the baud rate for RS-485 communication with ModBus or BACnet protocol. The default baud rate is 9600 bps.
<b>Scroll Rate</b>	In normal operation, the sensor and relay status information scrolls automatically. Set the number of seconds for each item to be displayed. The default value is 5 seconds.
<b>Backlight</b>	The LCD backlight can be set to Off, On and Auto Power Saving mode. In Auto Power Saving mode, the backlight will remain on for 10 seconds after any key has been pressed. The default setting is Auto.
<b>4mA Cal 20mA Cal 1V Cal 2V Cal 5V Cal 10V Cal</b>	<p>The CAL values are established and set during factory calibration for the 4 mA and 20 mA and analog outputs. The CAL settings should not require recalibration. Do not attempt to modify these settings. Changing the factory set CAL values will change the scaling of the analog output signal.</p> <hr/> <div style="display: flex; align-items: center;">  <p><b>CALIBRATION IS PART OF THE FACTORY SETUP. IN MOST CIRCUMSTANCES IT WILL NOT BE NECESSARY TO RE-CALIBRATE THE MODULES IN THE FIELD. CALIBRATION REQUIRES THE USE OF PRECISION INSTRUMENTATION.</b></p> </div> <hr/>

<p><b>New Password</b></p>	<p>The new password can be any combination of up to four digits. Default password is 4321.  <b>Record the new password in a safe and secure location!</b>          If necessary, contact Quest Controls for a code to reset the unit back to the factory default password.</p>
<p><b>Protocol</b></p>	<p>The optional communications protocols are ModBus and OptoMux.          The default setting is ModBus.          In Modbus, the modules respond as a ModBus Slave using RTU protocol. When set to ModBus, the parity bit can be defined as EVEN, ODD or None (No Parity).          The default parity is None.</p>
<p><b>Display Setup</b></p>	<p>Display Set up is an On/Off selection for the following:</p> <ul style="list-style-type: none"> <li>• Display Instant:             <ul style="list-style-type: none"> <li>○ Displays instantaneous gas concentration</li> </ul> </li> <li>• Display Average:             <ul style="list-style-type: none"> <li>○ Displays STEL (15 min average reading)</li> <li>○ Displays TWA (8-hour average reading)</li> <li>○ Displays daily peak</li> </ul> </li> <li>• Display Alarm: displays alarm status (Alarms 1 – 8)</li> <li>• Display Relay: displays relay status (Relays 1 – 3)</li> <li>• Display Buzzer: displays buzzer status (Buzzer 1 – 3)</li> <li>• Display A-Out mA: displays 4-20 mA output</li> <li>• Display A-Out VDC: displays VDC output</li> <li>• Display Clock: displays real time clock</li> </ul> <p>If there is nothing to display, the unit will display “Running...”</p>
<p><b>Auto Zero:</b></p>	<p>When AutoZero is set to ON, the module will gather the lowest reading in the previous 7-day period and set the unit into Zeroing Calibration mode. Zero Calibration mode sets the lowest reading to zero.          When AutoZero is set to OFF, the module will not adjust its own zero; rather, it will reference off the last manual or factory calibration.          The default value is OFF.  <b>NOTE: AutoZero works best in situations where the building purges at night (or over a weekend) to a zero concentration of target gas.</b></p>
<p><b>Key Beeper:</b></p>	<p>Setting the Key Beeper to ON results in a beeping.          Sound when the keypad is touched.          The default value is OFF (no beeping).</p>

<p><b>Restore Default:</b></p>	<div style="text-align: center;">   <b>Warning</b> </div> <p style="text-align: center;"><b>DO NOT SELECT THE RESTORE DEFAULT OPTION UNLESS YOU HAVE CALIBRATION GAS AND PRECISION REFERENCE INSTRUMENTATION TO CALIBRATE THE MODULE.</b></p> <hr/> <p>Selecting Restore Default will load the following factory default settings into the module:</p> <ul style="list-style-type: none"> <li>• Password: 4321</li> <li>• Address: 003 or 004 (module dependent)</li> <li>• Baud Rate: 9600</li> <li>• Scroll Rate: 5 seconds</li> <li>• Backlight: AUTO</li> <li>• Display Mode: ON</li> <li>• Key Beeper: OFF</li> <li>• LCD contrast: N/A</li> <li>• Alarm settings: ON</li> <li>• Relay settings: ON</li> <li>• Buzzer settings: OFF</li> <li>• 4-20mA settings*: per factory calibration</li> <li>• 1-5VDC settings*: per factory calibration</li> </ul> <p>*The analog output 4-20mA and the 1-5VDC are factory calibrated</p>
<p><b>ADJ Clock</b></p>	<p>Adjusts date, day and time.</p>
<p><b>ADJ Contrast</b></p>	<p>Adjusts the LCD contrast.            Values are between 10 (light) and 50 (dark).            The default value is 21.</p>
<p><b>Check Battery</b></p>	<p>The modules are each equipped with a flat coin battery.            Enabling the Battery Check provide an audible beep when the battery level is low.            The default value is ON.</p>

**2. ZERO CAL**

The **Toxic and Explosive Monitor** must periodically be recalibrated. There are two options for calibrating the unit:

1. Remove the old sensor and replace it with a new factory provided calibrated sensor (recommended).
2. Calibrate the unit using the two-point calibration process listed in this section:
  - a. Start the calibration with “Zero Gas” to set the first point of reference.
  - b. Complete the calibration using a “CAL Gas”, containing a known concentration of a standard reference gas, to set the second point of reference.

**Calibration Equipment Required**

- A cylinder of Zero Gas, (clean air or nitrogen).
- A cylinder of Cal Gas
- Flow Limiting Regulator(s) **0.2 to 1.0 lpm**
- Tubing

**Zeroing Calibration Procedure**

Navigate to the ZERO CAL menu:

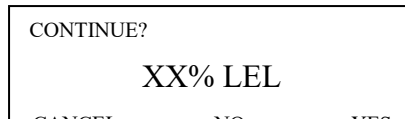
1. On the default status screen, press the F3 button to access the Tool menu.
2. Press F3 again to access the Main Menu.

3. Input the Password.
4. Use the F2 button to scroll to the ZERO CAL menu.



**Figure 10 ZERO CAL Menu Display**

5. Press F3; the following will occur:
  - The screen will display a 3-step calibration notice
  - After approximately 5 seconds, the display will ask if you want to continue. The middle line will display the current concentration, as shown in Figure 11.



**Figure 11 ZERO CAL – Display**

6. Apply the Zero Gas.
7. Wait approximately 3 minutes until the reading is stable.
8. Press F3 to confirm Zeroing Cal.
  - It will take up to 20 seconds to complete the Zeroing CAL mode
  - When the Zeroing CAL is complete, the device will display “Accepted” and then will return to the ZERO CAL main menu screen
9. Verify a CAL ERROR not displayed; if a CAL ERROR is reported, repeat the steps above. If the CAL ERROR remains, the sensor may be expired and may need to be replaced.
10. Remove the gas.
11. Press F3 to EXIT the ZERO CAL menu.

**3. SPAN CAL**

Navigate to the SPAN CAL menu:

1. On the default status screen, press the F3 button to access the Tool menu.
2. Press F3 again to access the Main Menu.
3. Input the Password.
4. Use the F2 button to scroll to the SPAN CAL menu.



**Figure 12 SPAN CAL Menu Display**

5. Press F3; and the display will ask for the CAL GAS, input the concentration of the calibration gas.



**Figure 13 CAL GAS – Display**

6. Press F3; the following will occur:
  - The display will show the calibration notice
  - The display will show the flow rate for the span calibration
  - The device will ask you if you want to continue. The middle line will display the current gas concentration.



**Figure 14 SPAN CAL – Display**

7. Press F1, F2 or F3 to continue.
8. Apply the calibration gas.
9. Wait approximately 3 minutes or until the reading is stable.
10. Press F3 to confirm SPAN CAL.
  - It will take up to 1 minute to complete the SPAN CAL.
  - When the SPAN CAL is complete, the device will display “Accepted” and will then return to the SPAN CAL main menu screen
11. Verify a CAL ERROR not displayed; if a CAL ERROR is reported, repeat the steps above. If the CAL ERROR remains, the sensor may be expired and may need to be replaced.
12. Remove the gas.
13. Press F3 to EXIT the SPAN CAL menu.

**4. OUTPUT TEST**

The OUT TEST selection provides the ability for the operator to activate and deactivate the relays and buzzer alarms during installation and system test.

The following Relays and Buzzers can be tested using the OUTPUT TEST function:

- TEST RELAY1
- TEST RELAY2
- TEST RELAY3
- TEST BUZZER
- TEST 4MA
- TEST 20 MA
- TEST BUZZER

**TEST RELAY**

When selected, the “TEST RELAY1”, “TEST RELAY2” and “TEST RELAY3” functions force the activation of the associated relay. Selecting these functions will either turn the relay on or off depending upon the configuration of the relay.

For example: If Relay1 is configured to be OFF in the normally closed position, selecting the “Test Relay1” function will cause Relay1 to open and turn its alarm to “ON”.

Follow the steps below to test the relays:

1. From the Tools Menu, navigate to the MAIN MENU as described in Section XXXXXXXX.
2. Using the F2 (Next) button, navigate to the OUTPUT TEST menu.



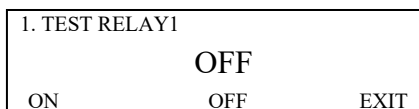
**Figure 15 OUTPUT TEST Menu Display**

3. Press the F3 button to access the OUTPUT TEST menu; the TEST RELAY1 menu will open.
4. Press F3 again to access the TEST RELAY1 menu.



**Figure 16 TEST RELAY1 Menu Display**

5. Turn Relay1 ON by selecting the F1 (ON) button; as the relay is activated, the RED LED will illuminate indicating an alarm condition.



**Figure 17 Turn RELAY1 ON or OFF**

- Return the relay back to its normal condition by selecting the F2 (OFF) button; the relay will deactivate, the RED LED will turn off and the alarm condition will go away.
- Navigate to TEST RELAY2 and TEST RELAY3 and repeat the steps above to test their corresponding alarms.

### **TEST BUZZER**

Following the steps outlined in previous sections, use the **F1** (PREV), **F2** (NEXT) and **F3** (ENTER/EXIT) to test the BUZZER.

Menu: TESTING:		
4. TEST BUZZER		
PRE	NEXT	ENTER

**Figure 18 TEST BUZZER Menu Display**

4. TEST BUZZER		
OFF		
ON	OFF	EXIT

**Figure 19 Turn BUZZER ON or OFF**

### **5. TEST 4MA**

Following the steps outlined in previous sections, use the **F1** (PREV), **F2** (NEXT) and **F3** (ENTER/EXIT) to test the 4mA (1VDC/2VDC) output.

Menu: TESTING:		
5. TEST 4MA		
PRE	NEXT	ENTER

**Figure 20 TEST 4MA Menu Display**

5. TEST 4MA		
OFF		
ON	OFF	EXIT

**Figure 21 Turn 4MA ON or OFF**

### **6. TEST 20MA**

Following the steps outlined in previous sections, use the **F1** (PREV), **F2** (NEXT) and **F3** (ENTER/EXIT) to test the 20mA (5VDC/10VDC) output.

Menu: TESTING:		
6. TEST 20MA		
PRE	NEXT	ENTER

**Figure 22 TEST 20MA Menu Display**

6. TEST 20MA		
OFF		
ON	OFF	EXIT

**Figure 23 Turn 20MA ON or OFF**

**4.2.2 VIEW SETTING Menu**

The VIEW SETTING menu displays the current configuration settings for the alarms, relays, buzzers and analog outputs.

Use the **F1** (PREV), **F2** (NEXT) and **F3** (ENTER/EXIT) to view the configuration settings listed below. Note: The display settings will vary depending on the alarm and the setting for each alarm; some alarms may display “DISABLED”.

**1. ALARM SETUP:**

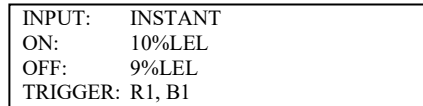
Alarm 1-8



**Figure 24 View Alarm 1 Menu**



**Figure 25 View Alarm 1 Menu**



**Figure 26 View Alarm 1 Display**

**2. RELAY STYLE:**

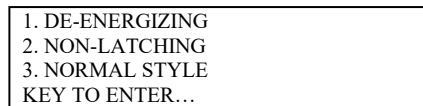
Relay 1 - 3



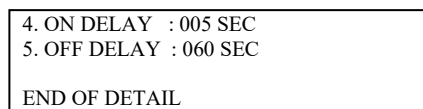
**Figure 27 View Relay Style Menu**



**Figure 28 View Relay 1 Menu**



**Figure 29 View Relay 1 Display p1**



**Figure 30 View Relay 1 Display p2**

**3. BUZZER STYLE**

Buzzer 1 - 3

3. View		
BUZZER STYLE		
PRE	NEXT	ENTER

**Figure 31 View Buzzer Style Menu**

View		
BUZZER 1:		
EXIT	NEXT	ENTER

**Figure 32 View Buzzer 1 Menu**

1. DELAY : 005 SEC
2. OFF DELAY : 060 SEC
3. 50% DUTY ON
END OF DETAIL

**Figure 33 View Buzzer 1 Display**
**4. A-OUT SETUP**

4. View		
A-OUT SETUP		
PRE	NEXT	ENTER

**Figure 34 View A-Out Setup Menu**

INPUT:	INSTANT
4MA:	0%LEL
20MA:	100%LEL
VDC OUTPUT:	1 – 5VDC

**Figure 35 View A-Out Setup Display**
**5. EVENT RECORDS**

5. View		
EVENT RECORDS		
PRE	NEXT	ENTER

**Figure 36 View Event Records Menu**

EVENT 1:		
2016-02-22	17:03:08	
RELAY 2 ON		
PRE	NEXT	EXIT

**Figure 37 Typical Event Records Display**

## 6. ALARM SETUP

Modify Alarms 1 - 8

Alarm settings are programmable based on receiving selectable inputs and triggering relays and buzzers.

MENU:
6. ALARM SETUP
PRE                  NEXT                  ENTER

Figure 38 Alarm Setup Menu

MODIFY?
ALARM 1:
EXIT                  NEXT                  ENTER

Figure 39 Modify the Alarm Setup

ALARM 1:
ENABLED
PRE                  MODIFY                  NEXT

Figure 40 Alarm Setup Display

ALARM 1:	INPUT	
INSTANT		
PRE	MODIFY	NEXT

Figure 41 Alarm Setup Display p1

ALARM ON AT:		
>	0010	
+	-	NEXT

Figure 42 Alarm Setup Display p1

ALARM OFF AT:		
>	0009	
+	-	NEXT

Figure 43 Alarm Setup Display p2

TRIGGER RELAY1?		
YES OR NO?		
NO	NO	YES

Figure 44 Trigger Relay1

TRIGGER RELAY2?		
YES OR NO?		
NO	NO	YES

Figure 45 Trigger Relay2

TRIGGER RELAY3?		
YES OR NO?		
NO	NO	YES

Figure 46 Trigger Relay3

TRIGGER BUZZER1		
YES OR NO?		
NO	NO	YES

Figure 47 Trigger Buzzer1

**Table 4 Alarm Settings**

Setting	Description
<b>Disabled or Enabled:</b>	<p>Each alarm may be individually set to be enabled or disabled. If the alarm is disabled, the alarm will not be used to calculate or trigger anything.</p> <p><b>Default: Alarm 1 to Alarm 4 is enabled. Alarm 5 to Alarm 8 is disabled.</b></p>
<b>Input:</b>	<p>One of five inputs is selected to calculate the alarm condition status to trigger the selected outputs:</p> <ul style="list-style-type: none"> <li>• <b>INSTANT:</b> instantaneous gas reading.</li> <li>• <b>15 MIN AVG (STEL):</b> Short Term Exposure Limit, average reading over 15 minutes.</li> <li>• <b>8 HOURS AVG (TWA):</b> 8-hour Time Weighted Average, average reading over hours.</li> <li>• <b>DAILY PEAK:</b> daily peak reading.</li> <li>• <b>FAULT:</b> If the unit reports any faults, no matter the gas concentration, it will trigger the selected outputs.</li> </ul>
<b>Alarm On and Alarm Off Reading:</b>	<p><b>If Alarm On is greater than or equal to Alarm Off:</b></p> <ul style="list-style-type: none"> <li>➤ Alarm On: Sets the concentration at or above which the relay will actuate.</li> <li>➤ Alarm Off: Sets the concentration at or below which the relay will de-actuate.</li> </ul> <p><b>If Action On is less than Action Off:</b></p> <ul style="list-style-type: none"> <li>➤ Action On: Sets the concentration below that the relay will actuate.</li> <li>➤ Action Off: Sets the concentration above that the relay will de-actuate.</li> </ul>
<b>Trigger:</b>	<p>Trigger Outputs: Relay 1, Relay 2, Relay 3, Buzzer 1, Buzzer 2, Buzzer3</p>

**7. RELAY STYLE**

Configure Relays 1 - 3

```

MENU:
      7. RELAY STYLE
PRE      NEXT      ENTER
    
```

**Figure 48 Relay Style Menu**

```

MODIFY?
      RELAY 1:
EXIT      NEXT      ENTER
    
```

**Figure 49 Modify the Relay Style**

```

RELAY 1:
      ENABLED
PRE      MODIFY      NEXT
    
```

**Figure 50 Relay Style Display**

```

RELAY 1:      NORMAL
      DE-ENERGIZE
PRE      MODIFY      NEXT
    
```

**Figure 51 Relay De-Energize or Energize**

```

RELAY 1: WITH
      NON-LATCHING
PRE      MODIFY      NEXT
    
```

**Figure 52 Trigger Relay2**

```

RELAY 1:  ON DELAY
>          0005
+          -          ENTER
    
```

**Figure 53 Alarm Setup Display p1**

```

RELAY 1:  OFF DELAY
>          0060
+          -          ENTER
    
```

**Figure 54 Alarm Setup Display p2**

```

RELAY 1:  STYLE
      NORMAL
    
```

**Figure 55 Trigger Relay1**

```

DATABASE
      FINISHED
    
```

**Figure 56 Trigger Relay2**

Table 5 Relay Settings

Setting	Description
<b>Enabled:</b>	<p>Each relay may be individually set to be enabled or disabled. If it's disabled, the relay will always de-actuate no matter what the current gas concentration.</p> <p><b>Default is Enabled.</b></p>
<b>Normally De- energized:</b>	<p>Each relay may be individually set to be normally energized or normally de-energized.</p> <p><b>Default is normally de-energized.</b></p>
<b>Latching:</b>	<p>Each relay may be set to latch in actuate status until acknowledged by a front-panel action.</p> <p><b>Default is Non-Latching.</b></p>
<b>ON Delay:</b>	<p>“Delay on Actuation” or “Delay on Make”. For each relay a separate time delay may be set from 0 to 990 seconds before an alarm condition will cause the relay to actuate.</p> <p><b>Default is 5 seconds.</b></p>
<b>OFF Delay:</b>	<p>“Delay on De-Actuation” or “Delay on Break”. For each relay a separate time delay may be set from 0 to 990 seconds before a return to a non- alarming signal condition will cause the relay to de-actuate.</p> <p><b>Default is 5 seconds.</b></p>
<b>Style:</b>	<p>Normal Relay Style: Work as normal relay.</p> <p>Buzzer Style Relay: When the relay is used to control a buzzer or horn. Working as a buzzer style will make the relay have the same function as the buzzer. It will be switched off when performing the Hush Buzzer/Relay function in the Tool Menu.</p> <p><b>Default is OFF.</b></p>

**8. BUZZER STYLE**

Configure Buzzer 1 - 3

The buzzer style represents the buzzer tone options:

- Tone 1: Chirp once.
- Tone 2: Chirp twice.
- Tone 3: Intermittent 50% duty cycle.
- Tone 4: Continuous.

```

MENU:
      8. BUZZER STYLE
PRE      NEXT      ENTER
    
```

**Figure 57 Relay Style Menu**

```

MODIFY?
      BUZZER 1:
EXIT      NEXT      ENTER
    
```

**Figure 58 Modify the Relay Style**

```

BUZZER 1:
      ENABLED
PRE      MODIFY      NEXT
    
```

**Figure 59 Relay Style Display**

```

BUZZER 1:  ON DELAY
>          0005
+          -          ENTER
    
```

**Figure 60 Alarm Setup Display p1**

```

BUZZER 1:  OFF DELAY
>          0060
+          -          ENTER
    
```

**Figure 61 Alarm Setup Display p2**

```

BUZZER 1:  SOUND
      50% DUTY ON
PRE      MODIFY      NEXT
    
```

**Figure 62 Trigger Relay1**

```

DATABASE
      FINISHED
    
```

**Figure 63 Trigger Relay2**

9. A-OUT SETUP

The Smart Gas Monitor will compare the gas concentration at 4mA and the concentration at 20mA. A larger concentration may be assigned for 4mA than that assigned for 20 mA; the Toxic Gas Monitor will convert the assigned gas reading and display the reading as an analog output.

MENU:		
9. A-OUT SETUP		
PRE	NEXT	ENTER

Figure 64 Relay Style Menu

A-OUT INPUT:		
INSTANT		
PRE	MODIFY	NEXT

Figure 65 Modify the Relay Style

OUTPUT 4MA AT		
>	0000	
+	-	ENTER

Figure 66 Relay Style Display

OUTPUT 20MA AT		
>	0100	
+	-	ENTER

Figure 67 Alarm Setup Display p1

VDC OUTPUT:		
1 – 5VDC		
PRE	MODIFY	NEXT

Figure 68 Alarm Setup Display p2

DATABASE		
FINISHED		

Figure 69 Trigger Relay2

---

**NOTE:** The analog output cannot be disabled.

---



---

**NOTE:** When the sensor has a fault, the output will be 2.5mA to indicate fault status.

---

Table 6 A-Output Settings

Setting	Description
<b>Input:</b>	One of four inputs is selected to calculate the analog outputs: <ul style="list-style-type: none"> <li>• <b>INSTANT:</b> instantaneous gas reading.</li> <li>• <b>15 MIN AVG (STEL):</b> Short Term Exposure Limit, average reading over 15 minutes.</li> <li>• <b>8 HOURS AVG (TWA):</b> 8-hour Time Weighted Averages, average reading over 8 hours.</li> <li>• <b>DAILY PEAK:</b> daily peak reading.</li> </ul>
<b>Out 4mA at Conc:</b>	Input the gas concentration at which 4mA is output.
<b>Out 20mA at Conc:</b>	Input the gas concentration at which 20mA is output.
<b>VDC Output:</b>	VDC Output can be selected from: <ul style="list-style-type: none"> <li>• 1-5VDC or 2-10VDC</li> </ul>

**A. ALL DISABLE**

The ALL DISABLE function is used for calibration, system testing and maintenance. When the All DISABLE is ON, the status of the relays, buzzers and analog outputs will remain in their current state. When the All DISABLE is OFF, the relays, buzzers and analog outputs activate and deactivate in accordance with their setting configurations.

The ALL DISABLE default setting is OFF.



Figure 70 Relay Style Menu

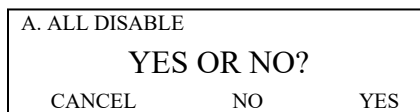


Figure 71 Relay Style Menu

**B. SIMULATION**

SIMULATION is used when testing the installation such as the activation of the valve, fan speed, relay, buzzer and 4-20mA set points. When SIMULATION is enabled, the unit will not detect gas concentrations; rather, a simulated value will be displayed and used to calculate the status of relays, buzzers, and 4-20mA analog output.

Any concentration between 0 ppm and 9999 ppm can be simulated.



Figure 72 Relay Style Menu

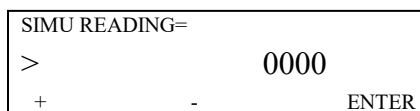


Figure 73 Relay Style Menu

**C. SITE SERVICE**

The SITE SERVICE menu is used to review diagnostics and troubleshooting; the menu is password protected for access by a trained factory technician.

**D. FACTORY SET**

The FACTORY SET menu is for configuring the factory default settings; the menu is password protected for access by a trained factory technician.

## Section 5 Calibration Requirements

The Toxic and Explosive Gas Monitor has been calibrated at the factory and setup with factory default setting. However, the unit can be manually calibrated and custom alarm trip points can be defined for site specific operation.

Refer to the ZERO CAL and SPAN CAL sections in 4.2.1 TOOL Menu for detailed steps to manually calibrate the Toxic and Gas Monitor.



**THE TOXIC AND EXPLOSIVE MUST ALWAYS BE RECALIBRATED AFTER REPLACING ANY OF THE SENSORS.**



**PERFORM CALIBRATION CHECKS REGULARLY AS PART OF A ROUTINE INSPECTION AND MAINTENANCE PROCEDURE.**



**THE TOXIC AND EXPLOSIVE SENSORS MUST BE CALIBRATED WITH A HUMIDIFIED CALIBRATION GAS. THIS CAN BE ACCOMPLISHED BY PASSING THE CALIBRATION GAS THROUGH THE VAPOR SPACE INSIDE A BOTTLE OF DISTILLED WATER AT A FLOW RATE OF 0.25 L/M.**

### 5.1 Calibration Guidelines

The following guidelines list the calibration requirements:

- The toxic and explosive must always be recalibrated after replacing any of the sensors
- Perform calibration checks regularly as part of a routine inspection and maintenance procedure
- Use calibration gases of known and certified concentrations.
- Check the expiration date on the gas cylinders
- The Toxic and Explosive sensors must be calibrated with a humidified calibration gas. This can be accomplished by passing the calibration gas through the vapor space inside a bottle of distilled water at a flow rate of 0.25 L/M

### 5.2 Calibration Equipment

- Flow controller 0.25 liters/minute and tubing
- Appropriate Calibration Gas
- Container of Distilled water with inlet and outlet tubing, required for humidifying the calibration gas.

## Section 6 Maintenance

### 6.1 DVM connection for 4-20mA measurement

1. Cause a fault by interrupting the 4-20 mA signal going from the Q5 to the external controller:
  - a. Switch the DVM to measure DC current, on the main board plug the negative probe into GND and plug the positive probe into SIG -.
2. Monitor the 4-20mA signal going from the Q5 to the controller (not causing a fault):
  - a. Switch the DVM to measure DC current, on the main board plug the negative probe into SIG - and plug the positive probe into SIG +.

### 6.2 4mA and 20mA Output Calibration

The 4 mA and 20 mA outputs are set during the factory 4-20mA output calibrations and should not require recalibration in the field. Do not attempt to modify these settings in the field. Changing the 4 and 20 mA values will change the analog output signal scale.

Verify the 4 mA and 20 mA outputs as follows:

1. Navigate to System Setting
2. Choose [Out 4mA CAL]:
  - a. Press key [F3] to output the 4mA signal.
  - b. Connect the DVM to the unit as described above.
  - c. Press key [F1] or key [F2] to adjust the current to 4.00mA to 4.05mA.
  - d. Press key [F3], then the settings will be accepted and saved.
3. Choose [Out 20mA CAL]:
  - a. Press key [F3] to output the 20mA signal.
  - b. Connect the DVM to the unit as described above.
  - c. Press key [F1] or key [F2] to adjust the current to 20.00 to 20.05mA.
  - d. Press key [F3], then the settings will be accepted and saved.

### 6.3 Smart Sensor Assembly Replacement

#### 6.3.1 Disassembling

Observe all safety and electrical codes and regulations before removing enclosure lid.

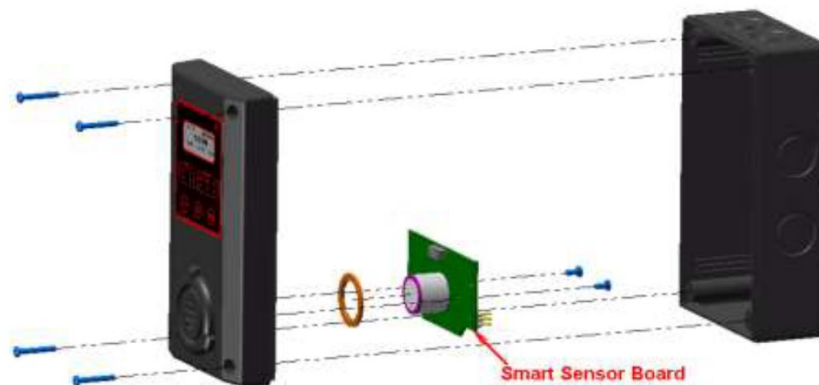


Figure 74 Removing the Sensor Assembly



**THE APPROPRIATE GAS MONITOR MUST BE CALIBRATED WHENEVER A COMPONENT IS REPLACED. HOWEVER, IF A SMART SENSOR ASSEMBLY WITH A SENSOR ONBOARD IS REPLACED AS A UNIT FROM QUEST CONTROLS, THE GAS MONITOR DOES NOT NEED TO BE RECALIBRATED; CALIBRATION DATA IS STORED IN THE SMART SENSOR BOARD DURING THE FACTORY CALIBRATION PROCESS.**

### 6.3.2 Replacement Procedure

Follow the steps outlined below when replacing the Smart Gas Sensor assembly:

1. Power down the Smart Gas Monitor.
2. Remove the four screws securing the display assembly to the front panel of the enclosure and remove the enclosure lid assembly.
3. Remove the two screws securing the smart sensor board and remove the smart sensor board from the lid assembly.
4. Feed the O-ring over the sensor on the new smart sensor assembly.
5. Secure the new smart sensor assembly with two screws. Ensure that the connectors are correctly matched. Incorrect installation may damage the sensor assembly and/or the display board.
6. Reconnect power to the Monitor.

## Section 7 Troubleshooting

This steps outlined below for troubleshooting are guide intended to assist in identifying basic issues that have resulted in unexpected behavior of the Smart Gas Monitor, and provide guidance with determining whether the observed issue is a result of normal operation or an issue with the monitor unit.

It is highly recommended the user contact Quest Controls Technical Support prior to troubleshooting and/or removing any internal connections within the Smart Gas Monitor.

**Table 7 Troubleshooting Guide**

SYMPTOMS	PROBABLE CAUSE	POSSIBLE RESOLUTION
RS-485, RX LED or TX LED constantly ON	<ul style="list-style-type: none"> <li>• RS-485 bus connection has a problem</li> <li>• RS-485 driver may damaged</li> <li>• External controller may have RS-485 issue</li> </ul>	<ul style="list-style-type: none"> <li>• Disconnect the cable to isolate the problem</li> <li>• Replace RS-485 IC on main board</li> </ul>
No response to gas	<ul style="list-style-type: none"> <li>• Sensor screen is dirty</li> <li>• Sensor has expired</li> </ul>	<ul style="list-style-type: none"> <li>• Clean sensor opening</li> <li>• Replace smart sensor assembly</li> </ul>
Apparent false alarm	<ul style="list-style-type: none"> <li>• Puff of gas</li> <li>• Sensor out of calibration</li> <li>• Solvent fumes or interference from high levels of interfering gas</li> <li>• Radio frequency interference</li> </ul>	<ul style="list-style-type: none"> <li>• Recalibrate Sensor</li> <li>• Remove source of interfering gas</li> <li>• Verify grounding and shielding wires and connections</li> </ul>
No signal at controller	<ul style="list-style-type: none"> <li>• Maximum wire length RS-485 exceeded</li> <li>• Controller does not operate</li> </ul>	<ul style="list-style-type: none"> <li>• Verify loop resistance, change wire AWG</li> <li>• Troubleshoot external wiring to controller</li> </ul>

## APPENDIX A MENU FLOW CHARTS

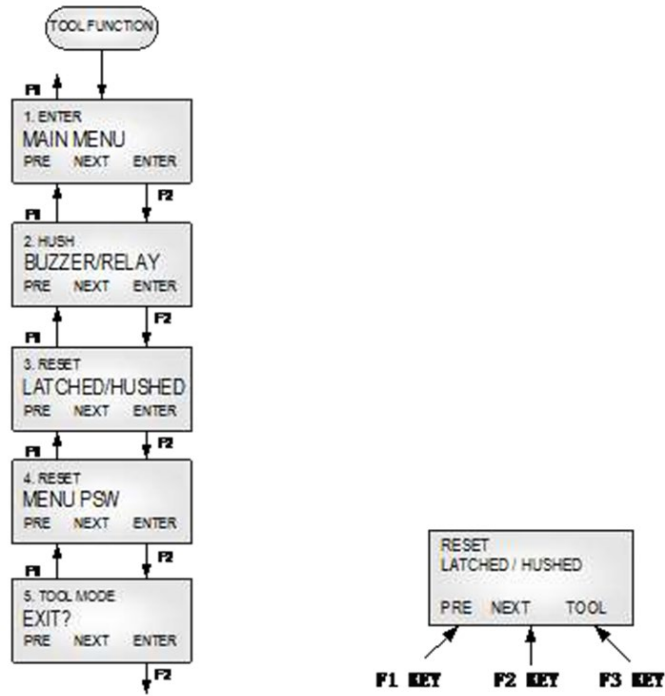
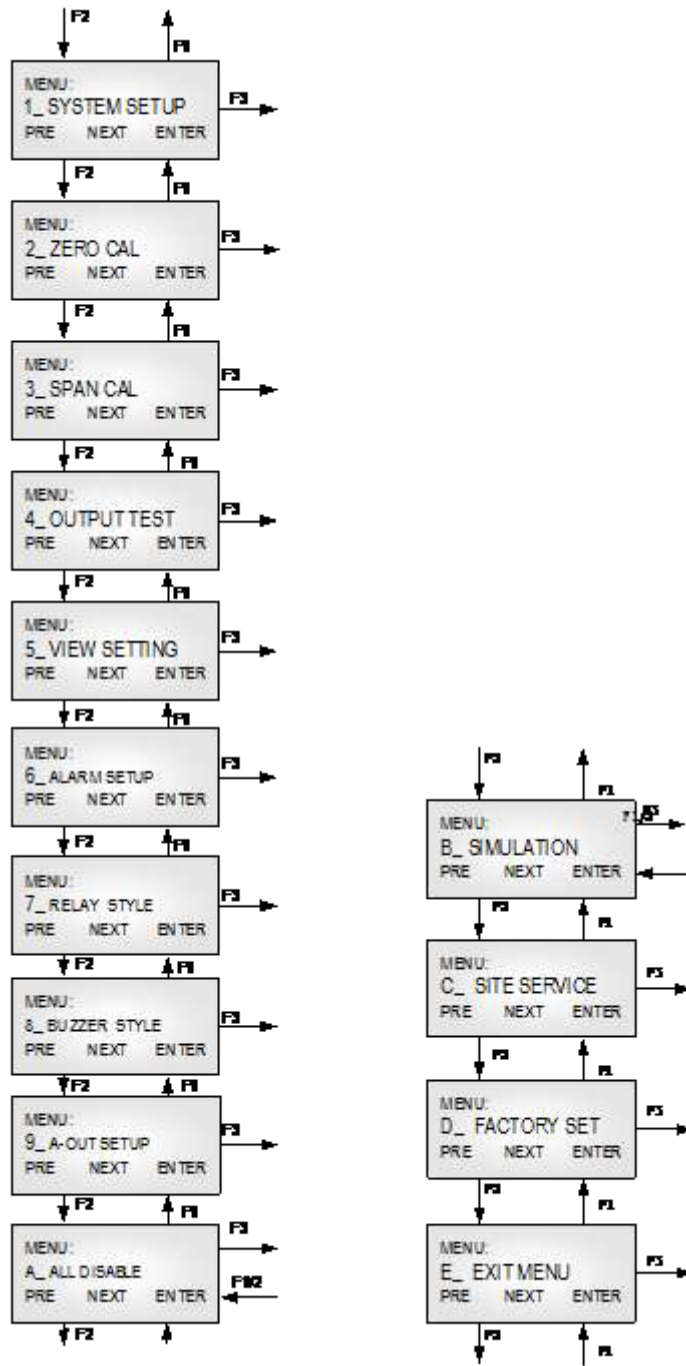


Figure 75 Tool Function Flow Chart



**Figure 76 System Setup Flow Chart**



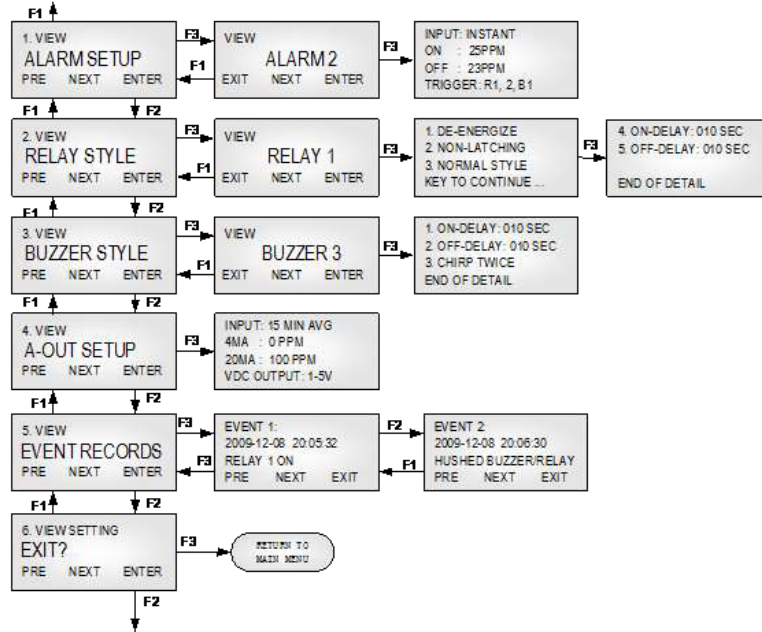


Figure 78 Alarm Setup Flow Chart

## APPENDIX B AMPHENOL CONNECTOR WIRING

The Toxic and Explosive Smart Gas Monitor is available with the following configurations:

### Standard Enclosure, PN 151022

- Includes a single entry port connector for power cable
- Allows for a user to identify a conveniently located punch-out entry port for connecting external monitoring cables

### Optional Amphenol Connector, PN 151023

- Includes a 24-pin round Amphenol connector, pre-wired to the relay board; for use with an existing mating connector/cable

### Amphenol Connector Pinouts

Refer to Figure 79, Figure 80 and

Table 8 to identify the pinout connections and termination points for the (optional) Amphenol connector.

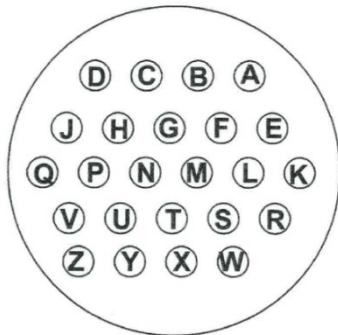


Figure 79 Optional Amphenol Connector

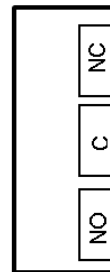


Figure 80 Relay NO/C/NC Pinout

Table 8 Smart Gas Monitor (optional) Amphenol Connector Pinouts

Pin #	Connection	Description	Notes
A	TB-10 NO	Sensor Power/Fail	
B	TB-10 Common		
C	TB-10 NC		
D	TB-13 NO	Fused Common	
E	TB-13 Common		
F	TB-13 NC		
G	TB-9 NC	Explosive Gas Alarm	
H	TB-9 Common		
J	TB-9 NO		
K	TB-8 NC	Toxic Gas Alarm	
L	TB-8 Common		
M	TB-8 NO		
N	TbB-6 +24V	EXT PWR 40 mA MAX	Located on top left corner of main board
P	TB-6 Common		
Q	Not Connected		
R	Not Connected		
S	Not Connected		
T	Not Connected		
U	Not Connected		
V	Not Connected		
W	Not Connected		
X	TB-11 NC	Ventilation Fan	Jumpered to TB-12 NC
Y	TB-11 Common		Jumpered to TB-12 Common
Z	TB-11 NO		Jumpered to TB-12 NO

