GENERAL MONITORS

Model 4802A

Zero Two Series Control Module
For Combustible Gas Applications

Instruction Manual **07/07**

MAN4802A

Part No. MAN4802A

Revision G/07-07

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Warranty Statement

General Monitors warrants the Model 4802A to be free from defects in workmanship or material under normal use and service within two (2) years from the date of shipment. General Monitors will repair or replace without charge any such equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective or damaged equipment will be made by General Monitors' personnel.

Defective or damaged equipment must be shipped prepaid to the General Monitors' plant or the representative from which the shipment was made. In all cases, this warranty is limited to the cost of the equipment supplied by General Monitors. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

All warranties are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without General Monitors' approval or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

Except for the express warranty stated above, General Monitors disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of General Monitors for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.

Special Warnings

Combustible & flammable gases and vapors are very dangerous. Extreme caution should be used when combustible & flammable gases and vapors are present.

All Zero Two Series Modules contain components, which can be damaged by static electricity. Special care must be taken when wiring the system to ensure that only the connection points are touched.

Only catalytic bead sensors designed by General Monitors will work with the Model 4802A. Any attempt to use a sensor that has not been designed by General Monitors will void the warranty.

Installation and maintenance must be carried out by suitably skilled and competent personnel only.

Full backward compatibility can be specified at the time of order. If this configuration is specified, the rear terminal output designations will be identical to the previous generation of Zero Two Series Modules.

This generation of product can be distinguished from the previous generation by the lack of a door on the front panel. Adjustments are not necessary on the current generation of this product.

System Integrity Verification

General Monitors' mission is to benefit society by providing solutions through industry-leading safety products, services and systems that save lives and protect capital resources from the dangers of hazardous flames, gases and vapors.

The safety products you have purchased should be handled carefully and installed, calibrated, and maintained in accordance with the respective product instruction manual. Remember, these products are for your safety.

To ensure operation at optimum performance, General Monitors recommends that certain maintenance items are performed.

Commissioning Safety Systems

Before power up, verify wiring, terminal connections and stability of mounting for all integral safety equipment including, but not limited to:

- Power supplies
- Control modules
- Field detection devices
- Signaling / output devices
- Accessories connected to field and signaling devices

After the initial application of power (and any factory specified warm-up period) to the safety system, verify that all signal outputs, to and from devices and modules, are within the manufacturers' specifications. Initial calibration / calibration checking / testing should be performed per the manufacturers' recommendations and instructions.

Proper system operation should be verified by performing a full, functional test of all component devices of the safety system, ensuring that the proper levels of alarming occur.

Fault/Malfunction circuit operation should be verified.

Periodic Testing/Calibration of Field Devices

Periodic testing/calibrating should be performed per the manufacturers' recommendations and instructions. Testing/Calibrating procedures should include, but not be limited to:

- Verify zero reading
- Apply a known concentration of gas, or a simulated test device provided by the manufacturer
- Verify integrity of all optical surfaces and devices.

When testing produces results outside of the manufacturers' specifications, re-calibration or repair/replacement of the suspect device(s) should be performed as necessary. Calibration intervals should be independently established through a documented procedure, including a calibration log maintained by plant personnel, or third party testing services.

1.0 Quick-Start Guide

1.1 Control Module Installation

A rack or panel mounted chassis will be required when installing any Zero Two Series Module. These chassis' should be mounted in non-hazardous, weather-protected locations and should be subjected to minimal shock and vibrations. The rack and panel mounted chassis are available in 4, 8, and 16 channel sizes. Multiple 16-channel chassis may be connected to each other to form larger systems.

In installations where two or more module types are to be mixed in the same chassis, ensure that the individual coding strips match the channel application. The coding strips are pre-configured at the factory and the male portion is already on each module.

The female portion, if un-mounted, must be fastened into position on the mounting strip of the desired chassis channel so as to mate with its counterpart on the module (Figure 1).

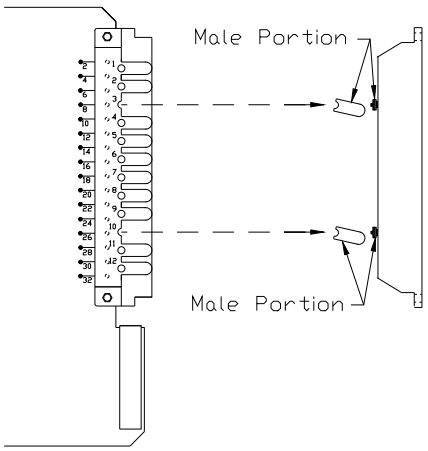

Figure 1: Control Module Coding Strip

NOTE: Zero Two Series Modules require air circulation to avoid excessive heat build-up. If chassis are stacked vertically within an enclosure, forced air circulation may be required. The control modules are, to a great extent, immune to electromagnetic interference (EMI). However, they should not be mounted in close proximity to radio transmitters or similar equipment.

1.2 Rear Terminal Connections

All wire connections to the Model 4802A are made to the terminal block located at the rear of the chassis. The terminal block accepts 16 AWG to 20 AWG, stranded or solid core wire.

14 AWG wire may be used if it is properly stripped according to Figure 2.

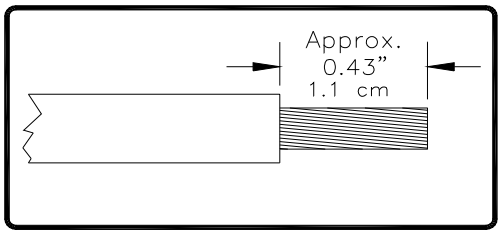

Figure 2: Wire Strip Length

CAUTION: Contact with PC Board components should be avoided in order to prevent damage by static electricity.

To connect wires to the terminal block on the Model 4802A, loosen the desired screw, insert the stripped end of the wire and tighten.

For the rear terminal designations refer to Figure 3 below: For the rear terminal designations refer to Figure 9 below:

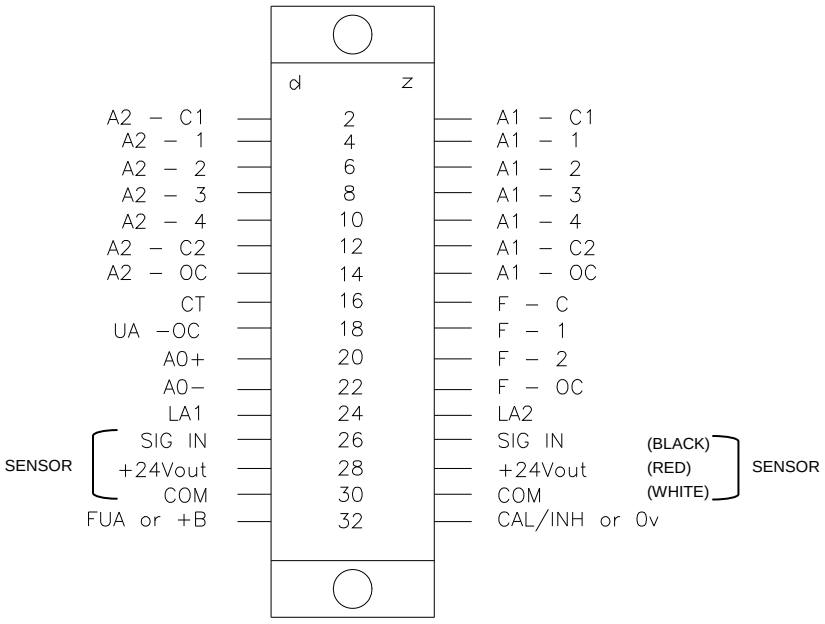

Figure 3: Rear Terminal Designations

1.3 Sensor Connections

The terminal designations for the sensor wires are:

Label	Term	Description
BLK	26d,z	Black Sensor Wire
RED	28d,z	Red Sensor Wire
WHT	30d,z	White Sensor Wire

Table 1: Terminal Designations for Sensor Wires

NOTE: Only 1 sensor may be connected to a Model 4802A.

Figure 4 illustrates the Sensor/Controller connections.

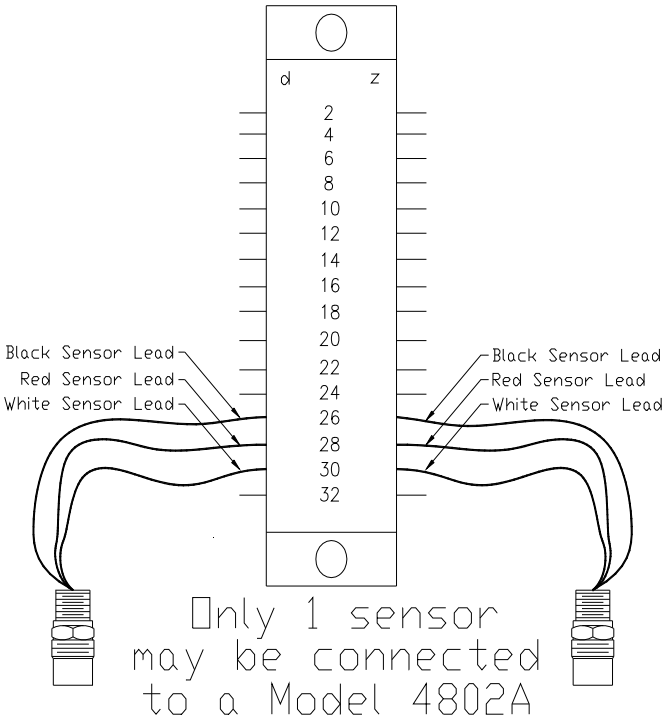

Figure 4: Sensor/Controller Connections

1.4 Applying Power

Zero Two Series Modules do not have an **ON/OFF** power switch. Each module in the Zero Two Series operates from 24Vdc. Current requirements will vary according to the number and type of modules in the system, as well as the number and type of field devices.

NOTE: If the application of power does not turn **ON** the unit, check fuse, F1 on the control board. If the unit displays an F4 condition upon power-up first try to clear this condition by calibrating the sensor. If this condition persists, replace the sensor.

Figure 5 indicates where the power connections for the chassis are made.

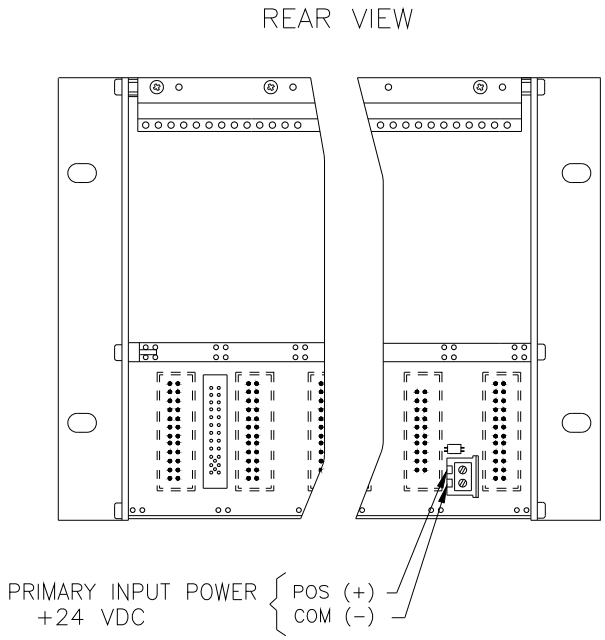

Figure 5: Rear Power Connections

The instrument is now ready to operate. Please consult the manual for more information on the instrument's many features.

2.0 Introduction

This chapter provides a brief description of the Model 4802A, its features & benefits, and a list of some of its applications. More detailed information on the features and benefits listed in Section 2.2 will be presented in later chapters.

WARNING: Installation and Maintenance must be carried out by suitably skilled and competent personnel only.

2.1 General Description

The General Monitors' Model 4802A (Figure 6) is a single channel combustible gas detection control module designed for use in Zero Two Series Gas and Flame Detection Systems. This module connects to the wires from a field mounted General Monitors' catalytic bead sensor and monitors the presence of combustible gases and vapors. The 4802A is electrically and physically compatible with the other gas detection, flame detection, and system modules in the Zero Two Series. It is distinguished from the other modules by its blue border and "4802A" in the upper right corner of the front panel. The 4802A is designed for use in non-hazardous environments.

Figure 6: Model 4802A

2.2 Features & Benefits

Automatic Calibration

The unit's display indicates simple automated calibration prompts to the operator with no calibration adjustments.

Calibration Check Mode

Verifies the integrity of the sensor by allowing the operator to apply a test gas and view the response on the display.

Calibration Level

The user specifies the gas concentration to be used for calibration.

Microprocessor Based Electronics

Monitors fault conditions; sensor inputs and provides outputs in the form of display codes, analog signal, relay contact and open collector activation.

Setup Mode

Allows the user to set parameters such as alarm output options, test options, etc. These parameters are viewed on the display during the Setup Mode.

Password Option

Prevents unauthorized alteration of the setup parameters (can be disabled).

Setup Check Mode

Allows the user to view the setup parameters, which have been set by the factory and/or operator.

LED Test

Tests the integrity of each LED and each segment of the digital display on the front panel.

Card Test

Tests the functionality of the card through the microprocessor, ramping the signal from 0 to full-scale.

Live Insertion/Removal

Allows the user to insert or remove a module while power is applied to the system, without damage to any of the components in the system.

2.3 Applications

The 4802A is a Combustible Gas Control Module designed for Zero Two Series Applications. Below is a partial list of applications:

- Refineries
- Drilling platforms and rigs
- Gas and oil production platforms
- Gas collection facilities
- Oil well logging operations
- LPG/LNG processing and storage
- Gas Turbines
- Solvent Vapors
- Hydrogen Storage
- Wastewater treatment plants
- Chemical plants

3.0 Installation

This chapter discusses what to do when a Model 4802A is received, the terminal connections & designations, sensor location considerations, and what to be aware of when applying power.

3.1 Upon Receipt of Equipment

All equipment shipped by General Monitors is packaged in shock absorbing containers, which provide considerable protection against physical damage. The contents should be carefully removed and checked against the packing slip. If any damage has occurred or if there is any discrepancy in the order, notify General Monitors as soon as possible. All subsequent correspondence with General Monitors must specify the equipment part and serial numbers.

Each Model 4802A is completely checked at the factory; however, a complete checkout is necessary upon initial installation and start-up to ensure system integrity.

3.2 Control Module Installation

A rack or panel mounted chassis will be required when installing any Zero Two Series Module. These chassis should be mounted in non-hazardous, weather-protected locations and should be subjected to minimal shock and vibrations. The rack and panel mounted chassis are available in 4, 8, and 16 channel sizes. Multiple 16-channel chassis may be connected to each other to form larger systems.

In installations where two or more module types are to be mixed in the same chassis, ensure that the individual coding strips match the channel application. The coding strips are pre-configured at the factory and the male portion is already on each module.

The female portion, if un-mounted, must be fastened into position on the mounting strip of the desired chassis channel so as to mate with its counterpart on the module (Figure 7).

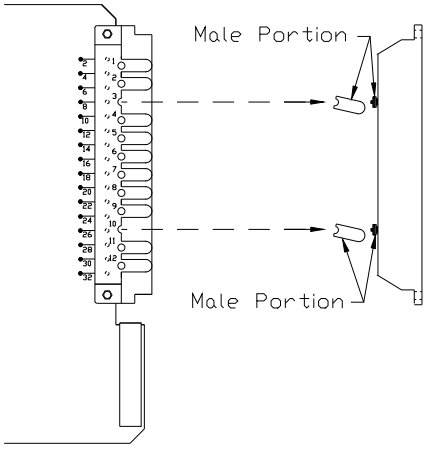

Figure 7: Control Module Coding Strip

NOTE: Zero Two Series Modules require air circulation to avoid excessive heat build-up. If chassis are stacked vertically within an enclosure, forced air circulation may be required. The control modules are, to a great extent, immune to electromagnetic interference (EMI). However, they should not be mounted in close proximity to radio transmitters or similar equipment.

3.3 Rear Terminal Connections

All wire connections to the 4802A are made to the terminal block located at the rear of the chassis. The terminal block accepts 16 AWG to 20 AWG, stranded or solid core wire.

14 AWG wire may be used if it is properly stripped according to Figure 8.

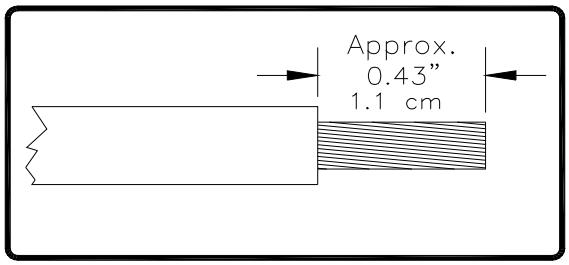

Figure 8: Wire Strip Length

CAUTION: Contact with PC Board components should be avoided in order to prevent damage by static electricity.

To connect wires to the terminal block on the 4802A, loosen the desired screw, insert the stripped end of the wire, and tighten.

For the rear terminal designations refer to Figure 9 below:

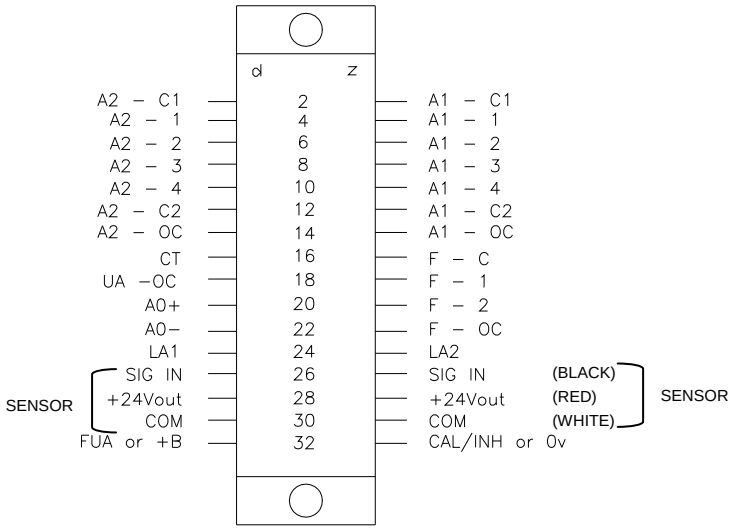

Figure 9: Rear Terminal Designations

3.3.1 A2 Alarm

The terminal designations for the **A2** alarm outputs are:

LABEL	TERM	DESCRIPTION
A2-C1	2d	Relay Common (1 & 2)
A2-1	4d	Relay Contact
A2-2	6d	Relay Contact
A2-3	8d	Relay Contact
A2-4	10d	Relay Contact
A2-C2	12d	Relay Common (3 & 4)
A2-OC	14d	Open Collector (OC)
LA2	24z	OC Logic for A2 LED

Table 2: Terminal Designations for A2 Alarm Outputs

The **A2** alarm outputs are DPDT relays, 1 open collector output (**A2-OC**) that follows the logic of the relays and 1 open collector output (**LA2**) that follows the blinking pattern of the front panel LED. The A2-C1 designation is common for A2-1 & A2-2. The A2-C2 designation is common for A2-3 & A2-4. The normally open (**NO**) and normally closed (**NC**) contacts depend on a user selectable option (Chapter 5). The table below refers to the proper open and closed **A2** alarm relay contacts while the unit is on power:

User Selected Relay State	Normally Open	Normally Closed
Normally Energized	A2-C1 & A2-1, A2-C2 & A2-4	A2-C1 & A2-2, A2-C2 & A2-3
Normally De-Energized	A2-C1 & A2-2, A2-C2 & A2-3	A2-C1 & A2-1, A2-C2 & A2-4

Table 3: A2 Alarm Relay Contacts

3.3.2 A1 Alarm

The terminal designations for the **A1** alarm outputs are:

Label	Term	Description
A1-C1	2z	Relay Common (1 & 2)
A1-1	4z	Relay Contact
A1-2	6z	Relay Contact
A1-3	8z	Relay Contact
A1-4	10z	Relay Contact
A1-C2	12z	Relay Common (3 & 4)
A1-OC	14z	Open Collector (OC)
LA1	24d	OC Logic for A1 LED

Table 4: Terminal Designations for A1 Alarm Outputs

The **A1** Alarm outputs are DPDT relays, 1 open collector output (**A1-OC**) that follows the logic of the relays and 1 open collector output (**LA1**) that follows the blinking pattern of the front panel LED. The A1-C1 designation is common for A1-1 & A1-2. The A1-C2 designation is common for A1-3 & A1-4. The normally open (**NO**) and normally closed (**NC**) contacts depend

on a user selectable option (Section 5.0).The table below refers to the proper open and closed **A1** alarm relay contacts while the unit is on power:

User Selected Relay State	Normally Open	Normally Closed
Normally Energized	A1-C1 & A1-1, A1-C2 & A1-4	A1-C1 & A1-2, A1-C2 & A1-3
Normally De-Energized	A1-C1 & A1-2, A1-C2 & A1-3	A1-C1 & A1-1, A1-C2 & A1-4

Table 5: A1 Alarm Relay Contacts

3.3.3 Fault Alarm

The terminal designations for the **Fault** outputs are:

Label	Term	Description
F-C	16z	Relay Common
F-1	18z	Relay Contact (NO)
F-2	20z	Relay Contact (NC)
F-OC	22z	Open Collector (OC)
FUA	32d	Open Collector (OC)

Table 6: Terminal Designations for Fault Outputs

The **Fault** outputs are SPDT relays, 1 open collector output (**F-OC**) that follows the logic of the relays and 1 open collector output (**FUA**) dedicated to new fault indications.

NOTE: If the backward compatible configuration is ordered, the FUA will not be present (pin 32d will be for +B).

The fault outputs are always normally energized when power is applied to the module.

The contact ratings for the A2 & A1 alarm and fault relays are 4A @ 250 Vac, 3A @ 30 Vdc, resistive, maximum.

Inductive loads (bells, buzzers, relays, etc.) on dry relay contacts must be clamped down. Unclamped inductive loads can generate voltage spikes in excess of 1000 volts. Spikes of this magnitude may cause false alarms and contact damage. Figure 27 shows recommended relay protection circuits for AC and DC loads, respectively.

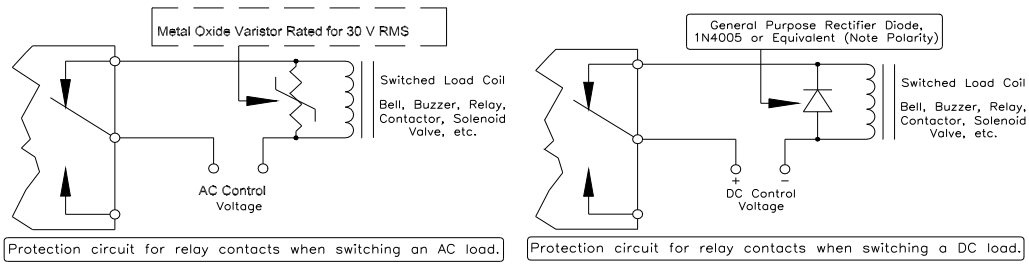

Figure 10: Recommended Relay Protection Circuits

3.3.4 Other Open Collector Outputs

The terminal designation for the **Un-accept** and the Discrete **Calibration / Inhibit** Mode outputs are:

Label	Term	Description
UA-OC	18d	Un-accept Output
CAL/INH	32z	CAL-Inhibit Mode Output

Table 7: Terminal Designations for Un-accept and Calibration/Inhibit Mode

NOTE: If the backward compatible configuration is ordered, the CAL/INH will not be present (pin 32z will be for 0v).

The electrical rating for all open collector outputs is 100mA @ 35Vdc.

Figure 11 illustrates some typical open collector external circuits.

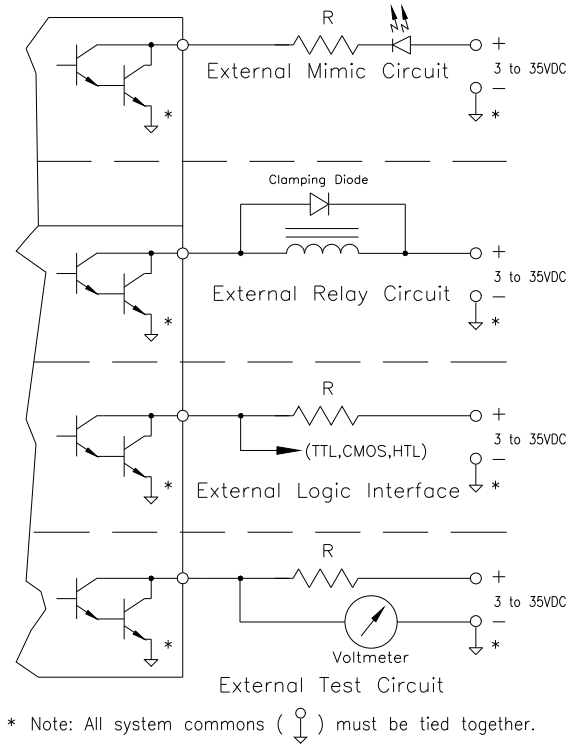

Figure 11: Open Collector External Circuits

3.3.5 Sensor Connections

The terminal designations for the **sensor wires** are:

Label	Term	Description
BLK	26d,z	Black Sensor Wire
RED	28d,z	Red Sensor Wire
WHT	30d,z	White Sensor Wire

Table 8: Terminal Designations for Sensor Wires

NOTE: Only 1 sensor may be connected to a Model 4802A.

Figure 12 illustrates the sensor/controller connections.

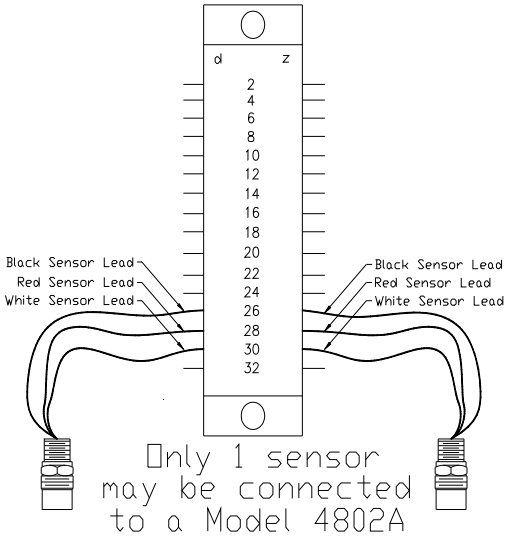

Figure 12: Sensor/Controller Connections

3.3.6 Card Test Switch

The terminal designation for the **card test** input is:

Label	Term	Description
CT	16d	Switch Connection

Figure 32 – Terminal Designation for Card Test Input

Figure 13 is a block diagram that shows the switch connections for the card test feature.

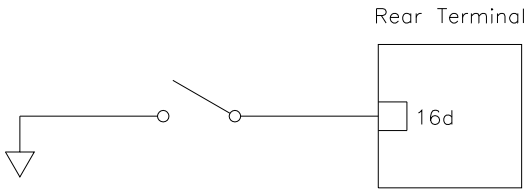

Figure 13: Switch Connections for Card Test Feature

The card test input is provided so that the user can access the card test feature remotely. One end of a normally open SPST switch is connected to this termination. The other end is connected to system common. To activate the feature, simply press and hold the switch for as long as the test time is to be run.

3.3.7 Analog Output Signal

The terminal designations for the **analog output** signal are:

Label	Term	Description
AO+	20d	Analog Signal (plus)
AO-	22d	Analog Signal (minus)

Table 9: Terminal Designations for Analog Output

NOTE: If the analog signal is not used, a jumper must be placed between 20d & 22d.

Figure 14 is a diagram of the analog signal connections.

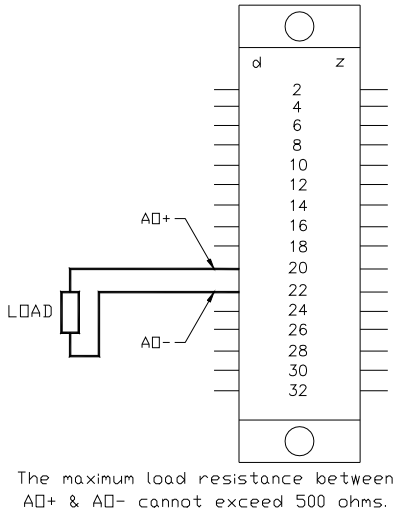

Figure 14: Analog Signal Connections

Figure 15 indicates where the power connections for the chassis are made.

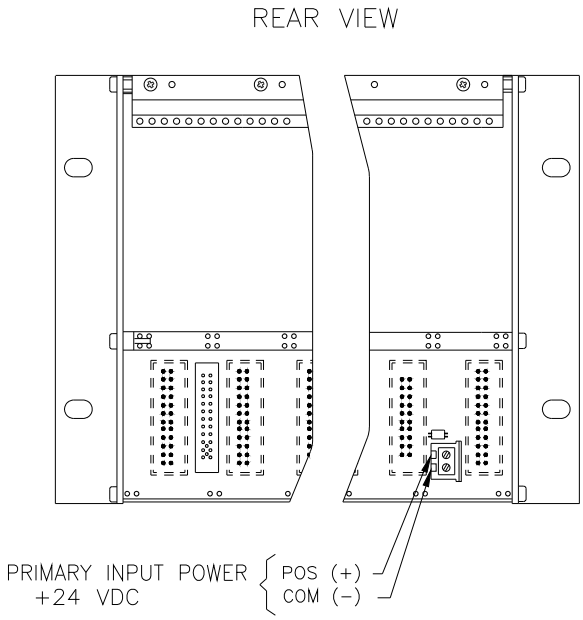

Figure 15: Power Connections

3.4 Sensor Location Considerations

There are no standard rules for sensor placement, since the optimum sensor location is different for each application. The customer must evaluate conditions at the sensor site in order to make this determination.

3.4.1 General Sensor Location Considerations

The sensor should be easily accessible for calibration checks. Ensure that sufficient clearance exists to allow the use of field calibration devices such as the Remote Calibrator (Model RC-3) or a Portable Purge Calibrator for combustible gas applications.

The sensor head should always be pointing down to prevent water build up on the sensing element. Remember that some combustible gases are heavier than air; however, do not rely too heavily on this fact when selecting a sensor position.

The sensor should be located in areas where leaks are suspected (i.e. near valves & pipe connections, etc.).

The sensor should not be placed where contaminating substances may coat it.

3.5 Sensor Poisons

Sensors may be adversely affected by prolonged exposure to certain atmospheres.

The more important poisons are:

- Prolonged exposure to Hydrogen Sulfide (H_2S) Gas
- Halides (compounds containing Fluorine, Chlorine, Bromine and Iodine)
- Heavy Metals (e.g. Tetraethyl lead)

Silicones contained in greases or aerosols are the most common “coating” agents. These are not true sensor poisons, but reduce sensor response. Other damaging materials, which attack the sensor physically, include mineral acids and caustic vapors.

The presence of such poisons and vapors does not exclude the use of General Monitors’ Catalytic Bead Sensors. A careful analysis of ambient conditions should be undertaken and the customer should be aware that sensor calibration might need to occur at more frequent intervals.

3.6 Applying Power

Zero Two Series Modules do not have an **ON/OFF** power switch. Each module in the Zero Two Series operates from 24Vdc. Current requirements will vary according to the number and type of modules in the system, as well as the number and type of field devices.

NOTE: If the application of power does not turn ON the unit, check fuse, F1 on the control board. If the unit displays an F4 condition upon power-up first try to clear this condition by calibrating the sensor. If this condition persists, replace the sensor.

4.0 Operation

This chapter discusses what general maintenance to perform, describes the electrical inputs, outputs, accepting & resetting alarm & fault conditions and fault diagnostics.

4.1 General Maintenance

Once the Model 4802A has been installed, very little maintenance is required other than periodic checks to verify the integrity of the system.

- The user should evaluate conditions at the sensor site to determine how frequent calibration checks should be performed.
- A functional test of the system should be performed at least once each year. This test should include full operation of stand-by systems or back up power for the prescribed period.
- The power, sensor and output wiring should be checked for tightness, verifying that all of the components and devices are connected correctly.
- If the “Password” is disabled, periodic checks of the setup parameters should be performed.

4.2 Field Calibration

4802A Zero Two Series Control Module needs to be calibrated in field upon installation. Therefore, please adhere to the following instructions upon receipt and installation of your system.

- The 4802A should be calibrated using the proper calibration equipment (GMI part# 1400150-X) (X=50% LEL of the type of gas being detected) after its initial installation. All alarm outputs should also be checked to ensure the integrity of the end-users system.
- There is no set timeframe for calibrating a system after its initial (start-up) calibration. Each and every application’s calibration time can vary depending on a number of different parameters. To best determine the calibration frequency for your application; the accuracy of your system should be checked every 2 weeks after the system’s initial calibration until the sensor’s readings fall outside of your company’s acceptance. However, no system should go more than 90 days between calibrations.

4.3 Electrical Inputs

There are two electrical inputs to the Model 4802A.

- General Monitors' catalytic bead sensor (field device)
- Card test input

Both of these input connections (sensor and card test) are made to the rear terminal block (see Chapter 3 for more detailed installation information).

- The catalytic bead sensor input consists of the standard three lead connections used with General Monitors' catalytic bead sensors, see Figure 31.
- The card test input consists of a single termination for remote testing of the Model 4802A's functions. For detailed information on the card test, refer to Figure 33.

4.4 Electrical Outputs

The electrical outputs on the 4802A consist of relay contacts, open collectors and an analog current signal.

The following outputs have rear terminal relay contacts:

Output	Rear Terminal Relay Contacts
A1 Alarm	DPDT relay contacts
A2 Alarm	DPDT relay contacts
Fault	SPDT relay contacts

Table 10: Rear Terminal Relay Contacts

All of the relay contacts on the Model 4802A have a maximum rating of:

- 4A @ 250Vac, 3A @ 30Vdc resistive

The following outputs have rear terminal open collectors:

- A1 Alarm & LED Mimic
- A2 Alarm & LED Mimic
- Fault
- UA - Unaccepted Alarm
- FUA - Unaccepted Fault
- CAL/INH - Inhibit, Calibration & Calibration Check Modes

All of the open collector outputs on the 4802A have a maximum rating of:

- 100mA @ 35Vdc

The analog output signal is used for sending gas concentrations and status information to remote devices. The maximum analog load may not exceed 500 ohms including the wire/cable that the signal is sent on.

The analog output is a 0 to 20mA current signal with 4 to 20mA being proportional to 0 to 100% of full scale.

When the 4802A is placed in calibration, calibration check, setup, setup check, or inhibit mode a 1.5mA signal is generated by this output. During calibration mode, the digital display will indicate prompts associated with the calibration procedure. During calibration check mode, the digital display will indicate the gas concentration with a flashing digit or pair of digits.

When the Model 4802A enters into a fault condition a 0mA signal is generated by this output. During a fault, the display will indicate a fault code ("**F**" followed by a digit).

If the sensor attached to the Model 4802A is seeing gas in excess of 100% of full scale, this output will generate a signal between 20 and 21.7mA (not proportional). An over range condition is indicated by a flashing digital display reading full-scale (**99**).

4.5 Accepting Alarm Conditions

Whenever a new alarm condition occurs, the front panel LED and open collector associated with that alarm (LA1 or LA2) would begin to flash. In addition, the associated alarm outputs and the un-accept outputs (4802A UA open collector & FM002A UA relay) will activate, unless they are already activated. The flashing front panel alarm LED and rear terminal open collector indicate that a new alarm has been activated. New alarms should be acknowledged, or accepted. This is accomplished with the **Master Accept** button located on the Facilities Module.

Pressing the **Master Accept** button de-activates the UA outputs and causes the associated front-panel alarm LED, and rear terminal open collector to stop flashing and energize.

NOTE - Alarms that latch must be accepted before they can be reset (Section 5.5).

There is a unique situation that may occur with some frequency in certain applications. An alarm may occur and the operator will accept this alarm by pressing the **Master Accept** Button. If the alarm output is latching and the condition at the sensor returns to normal (safe) the alarm output will need to be reset, as previously stated in Section 4.4. If, however, the alarm output is not reset and that alarm set point is exceeded again, the front panel LED, the associated mimic open collector, and the un-accept outputs will re-flash or re-activate. This gives the operator an indication of a new alarm condition that must be re-accepted.

A type of alarm, other than the A1 & A2 alarms, is the fault alarm. The fault alarm can be accepted similarly to the A1 & A2 alarms. The front panel **Fault** LED will flash and the fault un-accept (FUA) open collector will energize when a fault is detected. By pressing the **Accept** button on the front panel, the FUA output will de-energize and the **Fault** LED will stop flashing. It will stay illuminated until the fault condition is corrected.

4.6 Resetting Latched Alarms

The user may select a “latching” or “non-latching” alarm output for A1 and/or A2. If an alarm output activates and the condition that caused that activation is no longer present, a non-latching alarm output will reset automatically. A latched alarm output needs to be reset manually.

Resetting latched alarm outputs is accomplished with the Master Reset button located on the Facilities Module (FM002A). Pressing the Master Reset button will reset any latched conditions that are no longer valid.

NOTE: Latched alarm conditions cannot be reset until they have been accepted (Section 4.4).

EXAMPLE: The sensor detects a gas concentration in excess of an alarm set point (trip level). The associated alarm outputs will activate. After a few moments, the gas concentration drops below the alarm set point. If the alarm outputs are latched and accepted, the operator can press the Master Reset button and the latched alarm outputs will return to their normal (safe) state.

4.6.1 LED Test

The Master Reset button performs another function. If the operator presses and holds the Master Reset button for two or more seconds, all of the LED’s and LED segments in the digital display will illuminate for as long as the operator presses the button. This is called the LED test. The LED test cannot be performed while the unit is in alarm or fault, or during a card test.

4.7 CAL/INH Open Collector

There is an open collector that will energize anytime the unit is put in the:

- Calibration
- Calibration check
- Setup
- Setup check
- Inhibit mode

This open collector output is referenced to the system’s ground/common. Energizing this output merely provides a path to ground as is the case with all energized open collector outputs. De-energized, this output will be in a high impedance state.

4.8 Card Test Feature

The Card Test Input is provided so that the user can access the card test feature remotely. One end of a normally open SPST switch is connected to this termination and the other end is connected to system common (Figure 13).

To activate the card test feature, simply press and hold the switch. The front panel LED's and digital display will begin ramping up at the start of the card test. They will continue to ramp-up for the software selectable ramp time specified by the operator (3 or 10 seconds) during setup mode (Section 5.4). Each alarm level (A1 & A2) will trip when the alarm set point is exceeded. The analog output signal will ramp from 4 to 20mA during the test, if the active option has been selected during setup mode. At the conclusion of the card test, the A1 & A2 outputs will automatically reset (overriding any latching option). A card test cannot be initiated if the unit is in alarm or fault or during an LED test.

NOTE: There is an option that allows active outputs during a card test. If this option has been selected the relays (A1 & A2) and open collector outputs are active, and will trip during the card test.

4.9 Fault Diagnostics

In addition to the Fault LED on the front panel, the Model 4802A provides a fault code on the digital display whenever a fault condition occurs. The fault codes that can appear on the digital display are summarized below.

FAULT CODE	DESCRIPTION	SOLUTION
F1	Open analog output signal	Check connections on rear terminal pins 20d & 22d.
F2	Failed to complete calibration	If this fault occurs, remove the gas and allow the sensor to see clean air for at least five minutes. Then attempt another calibration. If the second attempt fails, replace the sensor. If this fault continues to occur after the sensor has been replaced, consult the factory or your GMI Representative.
F3	Software checksum error	This fault occurs during initial power-up of the unit. If this fault occurs, remove and reapply power to the unit. If the fault continues to occur, replace the unit and consult the factory or your GMI Representative.
F4	Sensor connections are open or short-circuited or there is excessive zero drift	Make sure the sensor wires are connected properly (in the field and at the rear of the unit) and re-calibrate if necessary. If this fault continues to occur, replace the sensor.
F5	Not used at this time	This code has been reserved for future use.
F6	Low supply voltage	Make sure the supply voltage level at the chassis is 24Vdc.
F7	EEPROM verification failure	This fault will occur if the microprocessor cannot store calibration or setup information in the EEPROM. If this fault occurs consult the factory or your GMI Representative.

F8	Failed to complete setup	This fault may occur during or immediately after the Setup Mode. Press the Master Reset Switch on the Facilities Module to clear this fault.
F9	Calibration check period exceeded	If the calibration checks gas is left on the sensor for more than 6 minutes, this fault will occur. Remove the gas and allow the sensor to see clean air.

Table 11: Fault Codes

In each of the fault cases listed, when the fault occurs, the FUA output is activated. Pressing the **ACCEPT** button on the Facilities Module (FM002A) will acknowledge the fault, de-activate the FUA output and the fault LED will stop flashing and remain **ON** until the fault is corrected.

5.0 User Interfaces

This chapter discusses the user interfaces along with the Calibration Check Mode, the Calibration Mode, the Setup Check Mode and the Setup Mode.

5.1 Types of User Interfaces

User interfaces are provided so that the operator may interpret and direct the Model 4802A in the performance of its various functions. User interfaces (Figure 16) consist of a digital display, status indicators, and a mode/select switch.

- The digital display provides the user with the gas concentration at the sensor site, fault diagnostic codes, calibration prompts, and setup parameters.
- The status indicators provide the user with an indication of the current mode of operation (alarm, fault, ready, calibration, and setup).
- The Mode/Select switch provides the user access to the Calibration, Setup/Inhibit, Calibration Check and Setup Check modes.

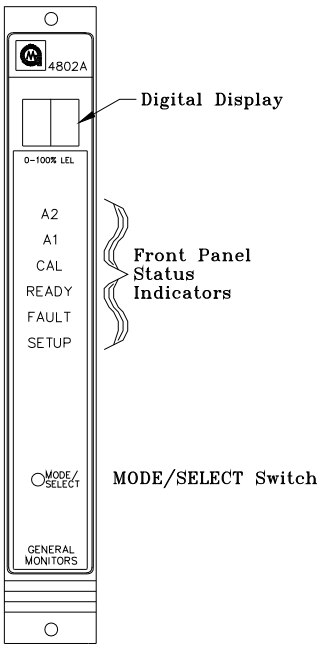

Figure 16: Front Panel Display

5.2 Calibration Check Mode

To perform a calibration check, follow the procedure listed below:

1. Place the cup from the portable purge calibrator over the sensor (Figure 17).

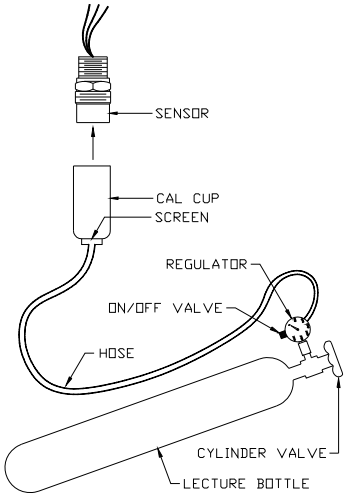

Figure 17: Portable Purge Calibrator

* The Calibration Check Mode cannot be entered if the 4802A is in alarm.

2. Enter the Calibration Check mode by pressing and holding the Mode/Select switch until the **CAL** LED begins to flash (about ten seconds). When the **CAL** LED begins to flash, release the Mode/Select switch. The unit is now in the Calibration Check mode (Figure 18).

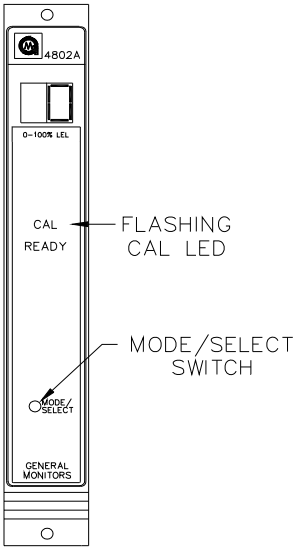

Figure 18: Entering CAL Check Mode

3. When the Mode/Select switch is released, the display will indicate a flashing pair of bars (**- -**) for about ten seconds.

4. When the display indicates a flashing **0**, apply the test gas to the sensor (open the valve on the cylinder and the ON/OFF valve) and wait for a few seconds. The display will begin to go up scale as the sensor sees the gas. If the display does not change after 6 minutes, the unit will return to the normal operating mode.

5. If the sensor does see the gas, the read-out on the display will be flashing for as long as the unit remains in the Calibration Check mode.

6. The reading will stabilize after 30 to 60 seconds of exposure to the test gas. This response time may increase due to the presence of the TGA-1, RC-3, Dust Guard, Splash-Guard or other sensor accessories.

7. The operator should compare the reading with the gas concentration applied and determine if it is necessary to calibrate the sensor.

8. The A1 & A2 alarms are disabled during the Calibration Check Mode. Use the Inhibit Mode to verify the alarm set points for A1 and A2.

9. If the reading is acceptable remove the gas and allow the sensor to see clean air.

10. If the operator determines that a calibration is necessary, do one of the following:

    - If the applied gas concentration is equivalent to the user specified calibration level, place the unit in the calibration mode by pressing the Mode/Select switch, or

    - If the applied gas concentration is not equivalent to the user specified calibration level, remove the gas, allowing the sensor to see clean air, and then follow the calibration procedure listed in Section 5.3 of this chapter.

NOTE: If the 3-Liter Calibration Chamber is used with vapors or fumes from a volatile liquid/solvent, use the procedures listed in Section 6.8.

5.3 Calibration Mode

To calibrate the Model 4802A, follow the procedure listed below:

1. Make sure the calibration gas is the same concentration as the user specified calibration level.

2. Make sure the sensor is seeing clean air.

3. Place the cup from the portable purge calibrator over the sensor (Figure 19).

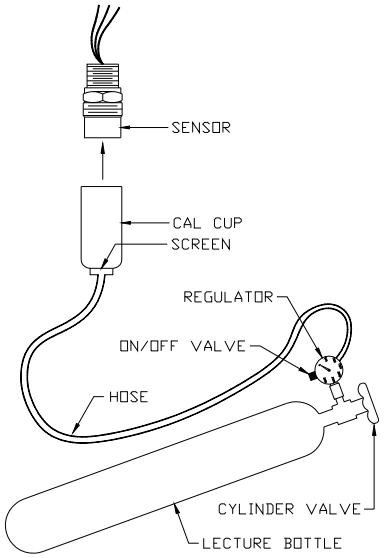

Figure 19: Portable Purge Calibrator

4. Enter the Calibration Mode by following the procedure for entering the Calibration Check Mode, continuing to press and hold the Mode/Select switch until the **CAL** LED turns on steady, about fifteen seconds (Figure 20).

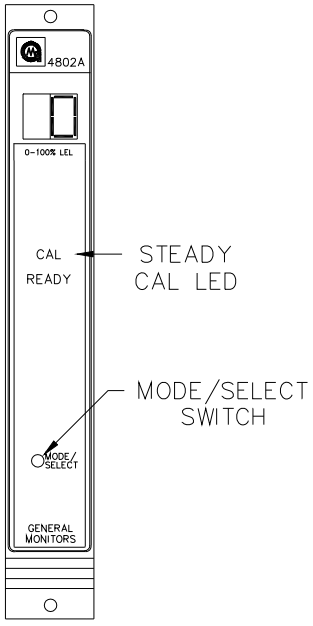

Figure 20: Entering CAL Mode

5. When the **CAL LED** is on steady, release the Mode/Select switch. The display will show flashing bars (**- -**) for about ten seconds, then an **AC** indication on the display. The unit is now in Calibration Mode (Figure 21).

Figure 21: AC Display during CAL Mode

6. Apply the gas by opening the valve on the cylinder and the ON/OFF valve and watch the display change from AC to CP as the sensor sees gas (Figure 22). If the display does not change from AC to CP after six minutes, the Model 4802A will return to normal operation.

Figure 22: CP Display during CAL Mode

7. Wait for the display to change from **CP** to **CC** when the calibration routine is complete (about 1 minute, Figure 23). If the display indicates **F2** remove the gas and recalibrate after 5 minutes.

Figure 23: CC Display during CAL Mode

8. Remove the gas and watch the display return to normal operation, **0**, when the new calibration values have been stored in the EEPROM. If the unit cannot store the new calibration values in the EEPROM, the Model 4802A will display an "**F7**" fault code (EEPROM verification failure, Figure 24). If an **F7** calibration fault occurs, it will be necessary to replace the Model 4802A.

If the Model 4802A fails to calibrate, the unit will use the previously stored calibration values.

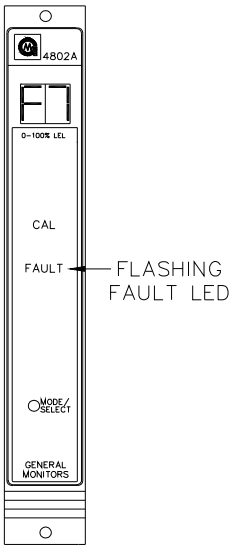

Figure 24: F7 Display during CAL Mode

5.4 Setup & Setup Check Modes

The Setup Check Mode allows the operator to view the selected options for the module without allowing any changes to be made. Once this mode has been entered, the module will automatically display each of the selected options for a short period of time and then it will return to normal operation. The Setup Mode allows the operator to change the operating parameters by making choices for selected options.

The Setup Check & Setup Modes display identical information with the following exceptions:

- The Setup Check Mode allows the user to view the operating parameters of the Model 4802A, whereas the Setup Mode allows the user to change the operating parameters of the Model 4802A.
- Entering the optional password is only available in the Setup Mode.
- The Inhibit Mode may only be entered from the Setup Mode. If the Inhibit Mode is entered, the A1 & A2 outputs will be inhibited until the Mode/Select switch is pressed.

NOTE: The Setup and Setup Check Modes cannot be entered if the unit is in alarm or fault.

During the Setup Mode the operator will be allowed to select options.

The selection procedure is the same for most of the options. Pressing the Mode/Select switch toggles the available choices. When the display has indicated a choice for five consecutive seconds, without the operator pressing the Mode/Select switch, the Setup routine will accept that selection and move on to the next option available.

NOTE: Before entering the Setup Mode to make changes, the user should fill out the form and become familiar with the block diagram in Section 5.6, of this manual. This will aid the user during the selection process in the Setup Mode.

The password, the A1 & A2 alarm set points, and the calibration level options offer the operator more than two choices. While these options are being selected, pressing the Mode/Select switch repeatedly will sequence the display to the next available choice for that option.

To enter the Setup Check Mode or the Setup Mode, follow the procedure for entering the Calibration Mode. Press and hold the Mode/Select switch until the SETUP LED begins flashing (about twenty seconds). When the SETUP LED is flashing, release the Mode/Select switch to enter the Setup Check Mode (Figure 25). Continuing to press and hold the Mode/Select switch until the SETUP LED stops flashing (about five seconds more) will allow the operator to enter the Setup Mode. When the SETUP LED stops flashing and stays on, release the Mode/Select switch and the unit will enter the Setup Mode (Figure 25).

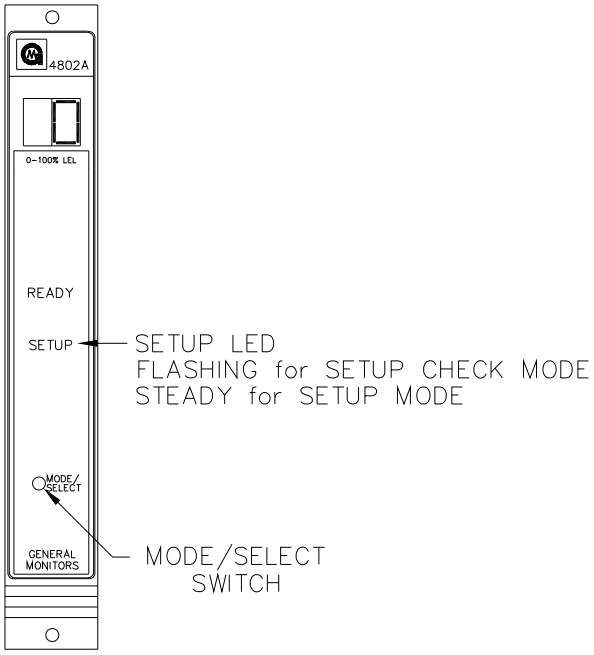

Figure 25: Entering Setup and Setup Check Modes

5.4.1 Entering the Password

This option applies to the Setup Mode only:

- If the password option is enabled, the right digit of the display will be blank and a 0 will appear in the left digit on the display (Figure 26). Press the Mode/Select switch until the first number of your password is displayed and then wait about five seconds.

- The left digit of the display will then blank out and a 0 will appear in the right digit on the display (Figure 26). Press the Mode/Select switch until your correct password number is displayed and then wait about five seconds. If the password is correct the unit will proceed to the inhibit option. If the password is incorrect the user will not be able to proceed and the unit will return to the normal operating mode. Once in the operating mode the user may attempt to re-enter the Setup Mode. The factory default password is 00.

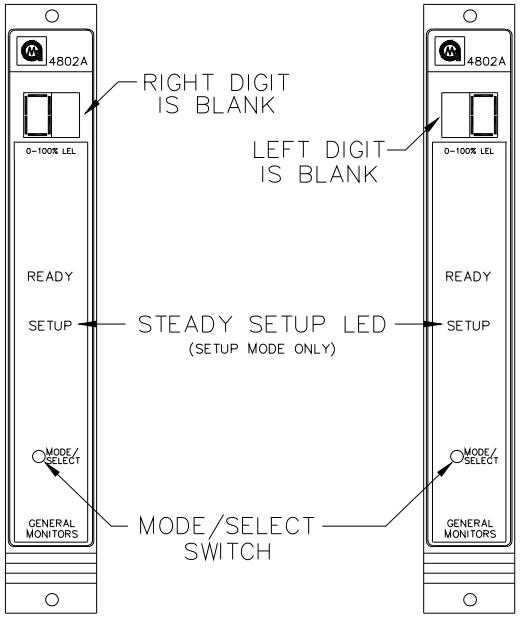

Figure 26: Entering the Password

5.4.2 Inhibit Mode

This option applies to the Setup Mode only:

If the password option is disabled, or after the correct password has been entered, the display will indicate "**In**" for five seconds (Figure 2). Pressing the Mode/Select switch while "**In**" is displayed will cause the unit to enter Inhibit mode by inhibiting the alarm outputs. As the unit enters Inhibit mode, the 4802A will automatically return to normal operation. If it is desired to enter Setup Mode, do not press the Mode/Select switch for the five seconds that "**In**" is displayed.

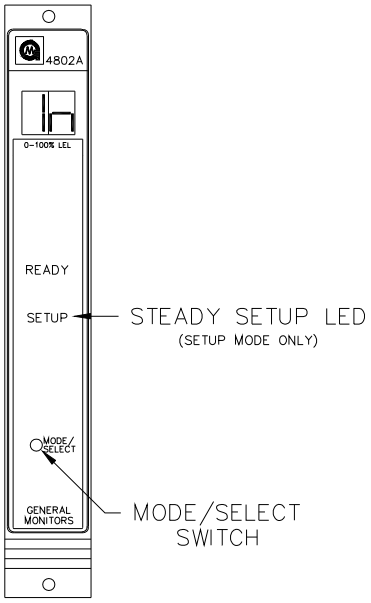

Figure 27: Entering Inhibit Mode

5.4.3 A2 Alarm Options

Next, the A2 LED will be flashing while the energized/de-energized option is displayed (Figure 28). The display will indicate the current selection, (En or dE). Press the Mode/Select switch to toggle the selection. De-energized is the factory default for this selection.

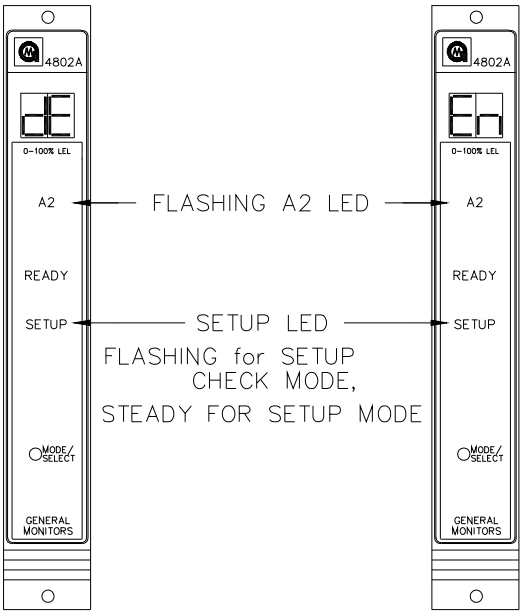

Figure 28: Energized/De-Energized Alarm Option

The A2 LED on the front panel will be flashing while the latching/non-latching option is displayed (Figure 29). The display will indicate the current selection, (nL or LA). Press the Mode/Select switch to toggle the selection. Latching is the factory default for this selection.

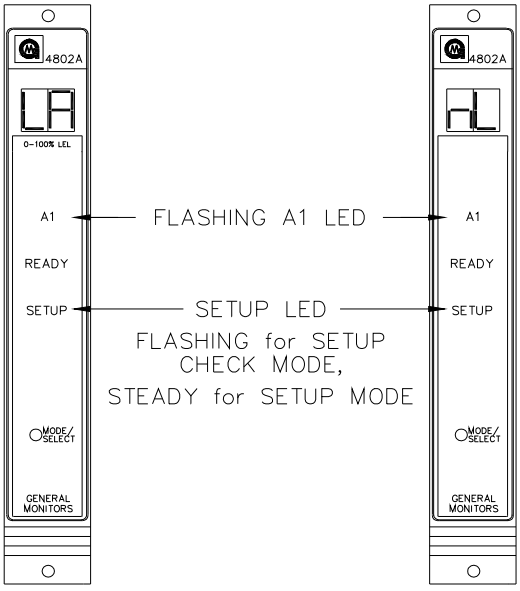

Figure 29: A2 Latching/Non-Latching Alarm Option

The last A2 alarm option to appear on the display will be the alarm set point (trip level). If this level is reached or exceeded, the A2 alarm outputs will activate. The display (Figure 30) will indicate the current A2 alarm set point (10 to 60 in increments of 5). Press the Mode/Select switch repeatedly, until the desired A2 alarm set point appears on the display. 60 is the factory default for this selection.

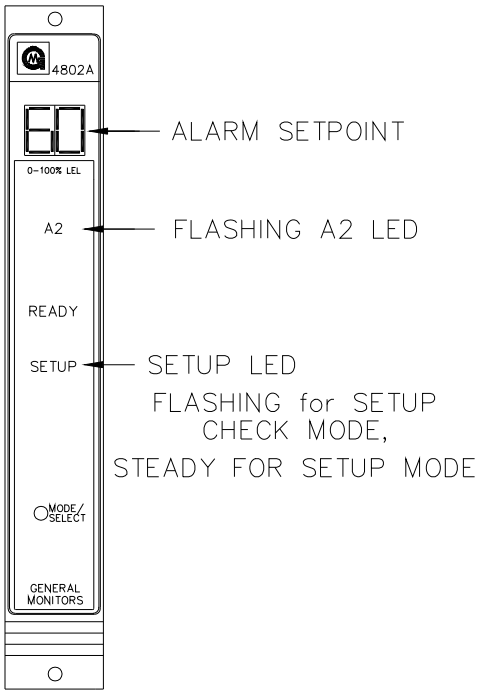

Figure 30: A2 Alarm Set Point Option

NOTE: The A2 set point cannot be set lower than the current A1 set point. To accomplish this, you will need to go through Set-up twice. The A1 set point should be set lower than the desired A2 set point, then re-enter the Setup Mode and set the A2 set point.

5.4.4 A1 Alarm Options

Next, the A1 LED will be flashing while the energized/de-energized option is displayed (Figure 31). The display will indicate the current selection, (En or dE). Press the Mode/Select switch to toggle the selection. De-energized is the factory default for this selection

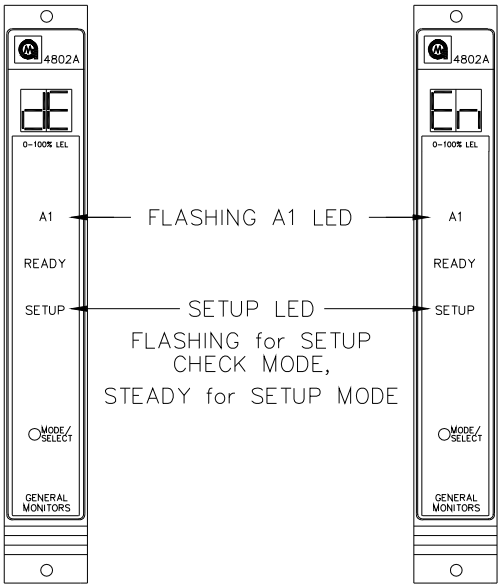

Figure 31: A1 Energized-De-Energized Alarm Option

The A1 LED on the front panel will be flashing while the latching/non-latching option is displayed (Figure 32). The display will indicate the current selection, (nL or LA). Press the Mode/Select switch to toggle the selection. Non-latching is the factory default for this selection.

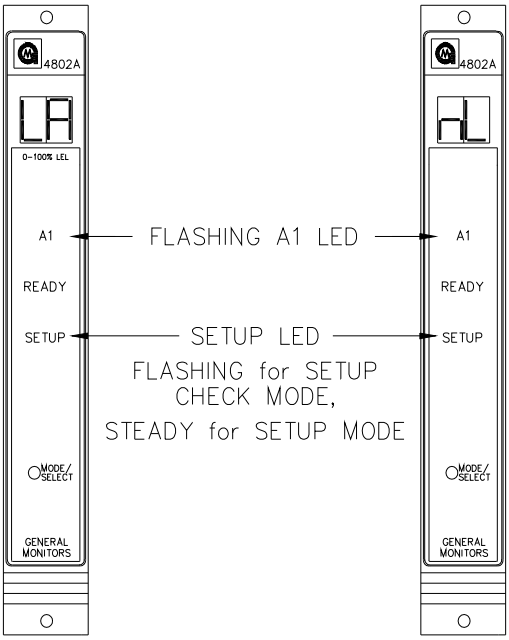

Figure 32: A1 Latching/Non-Latching Alarm Option

The last A1 alarm option to appear on the display will be the alarm set point (trip level). If this level is reached or exceeded, the A1 alarm outputs will activate. The display will indicate the current A1 alarm set point (Figure 33). Press the Mode/Select switch repeatedly, until the desired A1 alarm set point appears on the display (10 to the A2 set point in increments of 5). The A1 set point cannot be set higher than the A2 set point. 30 is the factory default for this selection.

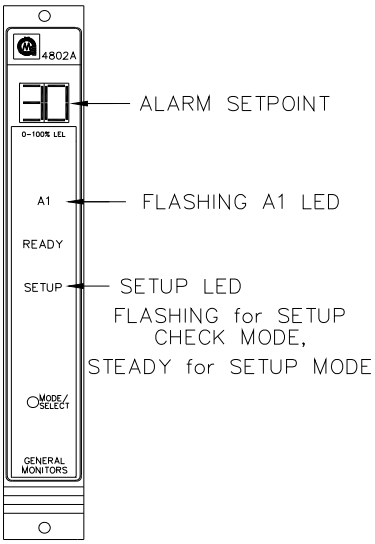

Figure 33: A1 Set Point Option

5.4.5 Calibration Level Option

After the A1 alarm options have been selected, the user will choose the calibration level (Figure 34). The display will indicate “CL” for 5 seconds, then the current calibration level. The acceptable range of calibration level, in % LEL (lower explosive limit), is between 25 and 90, inclusive. 50 is the factory default for this selection.

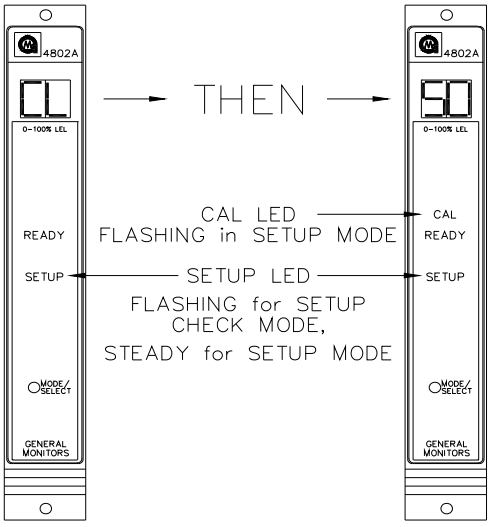

Figure 34: Calibration Level

5.4.6 Fault/Inhibit Option

Next, the user will select the fault/inhibit option. The FAULT LED on the front panel will be flashing while the display indicates “Ac” (active) or “nA” (not active) (Figure 35). An “Ac” selection specifies that the 4802A will activate the fault circuit while the unit is in the Inhibit Mode. A “nA” selection specifies that the 4802A will not activate its fault circuit when the unit is placed in the Inhibit Mode. A “nA” selection will not disable the fault circuit; therefore, if a fault occurs during the Inhibit Mode, the unit will activate the fault circuit. Not active is the factory default for this selection.

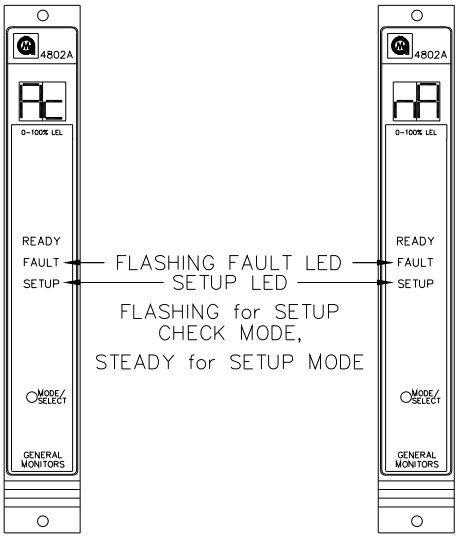

Figure 35: Fault / Inhibit Option

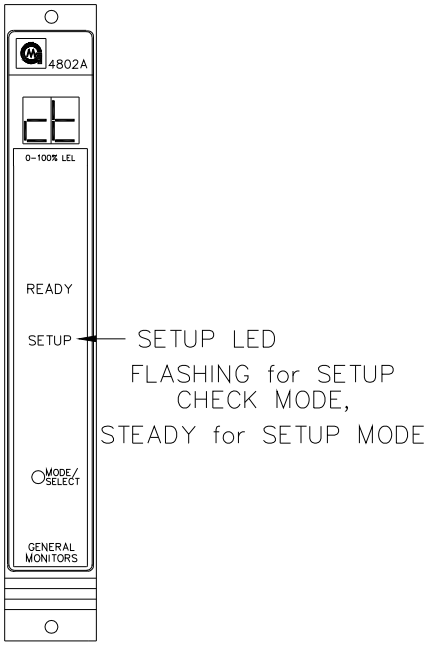

Figure 36: Entering Card Test Options

5.4.7 Card Test Options

After the fault/inhibit option has been selected, the user will select the ramp time (3 or 10 seconds) and whether or not the alarm outputs will activate during a card test. The display will indicate “ct” for about five seconds (Figure 36) followed by the ramp up time (3 or 10) during the card test (Figure 37). 3 is the factory default for this selection.

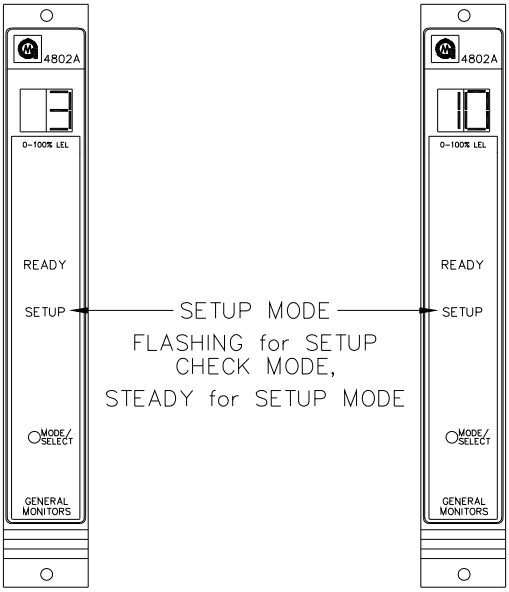

Figure 37: Card Test Ramp Time

Next, the display will indicate the alarm output option during a card test as either “Ac”, active or “nA”, not active (Figure 38). Not active is the factory default for this selection.

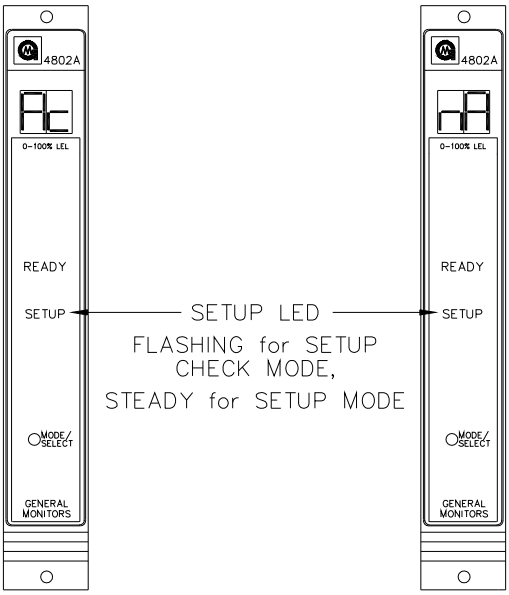

Figure 38: Alarm Output during a Card Test

NOTE: Selecting nA option for the card test will not inhibit the fault or A1/A2 alarm circuits in the event of a malfunction or gas condition.

5.4.8 Password Options

Once the card test options have been selected, the user will either enable or disable the password option (Figure 39). The display will indicate either “PE”, for enabled or “Pd”, for disabled. Password disabled is the factory default for this selection.

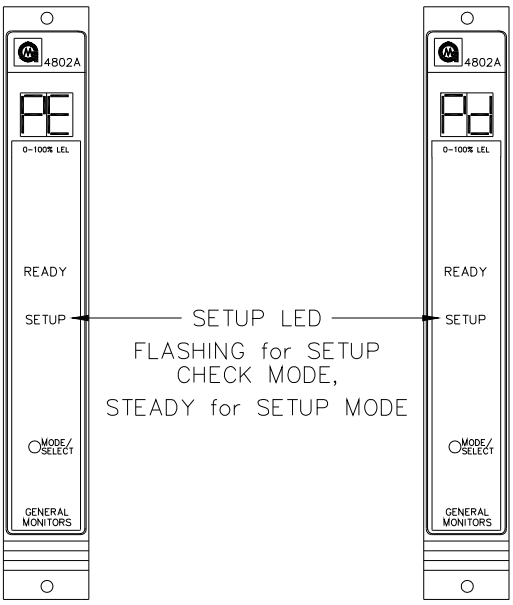

Figure 39: Password Enabled/Disabled Option

This option applies to the Setup Mode only:

If the password is disabled, the unit will return to normal operation. If the password is enabled, the user will be able to enter a new password (Figure 40). The unit will display the left digit of the existing password (flashing on the display). The right digit will be blank until the left digit has been selected. Press the Mode/Select switch repeatedly until the desired value is displayed. Once the left digit is correct, wait for five seconds and the right digit of the display will begin flashing and the left digit will be blank. Press the Mode/Select switch repeatedly, until the desired value is displayed. Wait about five seconds and the unit will execute the Setup Check Mode and then return to normal operation. See Section 5.4 for default password.

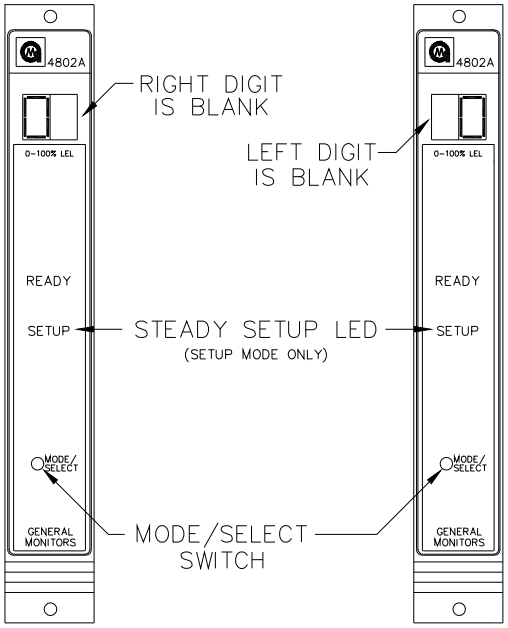

Figure 40: Entering A New Password

5.5 Inhibit Mode

Whenever the Inhibit Mode is entered, the A1 and A2 alarm outputs are inhibited. The front panel LED's will still function normally in cases where sufficient gas is present at the sensor. Once this mode has been entered, the user may exit the Inhibit Mode by pressing the Mode/Select switch.

NOTE: Any latched alarms must be reset before exiting the Inhibit Mode.

There is a user selectable option that will place the unit in fault every time the Inhibit Mode is entered. If the user does not select this option, the fault circuit will function normally during Inhibit Mode.

While the unit is in the Inhibit Mode, the display will indicate "IN" for 5 seconds, then the gas concentration will be displayed for 5 seconds. This sequence will repeat for as long as the unit is in Inhibit Mode.

The Inhibit Mode is provided so that the operation of the Model 4802A can be verified without tripping external devices that are connected to the A1 and A2 alarm outputs.

5.6 Setup Mode Selection Block Diagram

This section is provided to aid the operator in making selections during Setup Mode. It is recommended that the operator fill-in the selections in the proper blanks and then use this page as a reference while programming the Model 4802A. The blocks shown below indicate the order of options in Setup Mode. To the right of each block is a description of the choices that are available for that option. More information about making each selection is provided in Section 5.4.

OPTION	DESCRIPTION	ENTER SELECTION
Password	Enter the Password, if the Password is enabled	
Inhibit Mode	Enter the Inhibit Mode, if desired	
A2 Alarm	Set the Energized (En) / De-Energized (dE) Option Set the Latching (LA) / Non-Latching (nL) Option Set the A2 alarm set point (from 10 to 60, in increments of 5)	_____ _____ _____
A1 Alarm	Set the Energized (En) / De-Energized (dE) Option Set the Latching (LA) / Non-Latching (nL) Option Set the A1 alarm set point (from 10 to the A2 set point	_____ _____ _____
Calibration Level	Set the calibration level, LEL (from 25 to 90, in increments of 1)	_____
Fault/Inhibit	Set the Fault Activate (Ac) or not (nA) during Inhibit Mode	_____
Card Test	Display will indicate "**ct**" for 5 seconds Set the ramp time for the Card Test Mode (3 or 10 seconds) Set the Alarm outputs for Active (**Ac**) or not Active (**nA**)	_____ _____
Password	Set the Password to be Disabled (Pd) or Enabled (PE) If the Password option to be changed from Disabled to Enabled: Set the password digits	_____ _____ Left_____ Right_____

Table 12: Setup Display Options

After all of the options have been selected, the 4802A will enter the Setup Check Mode.

6.0 Customer Support

6.1 General Monitors' Offices

Area	Phone/Fax/Email
UNITED STATES	
	Toll Free: +1-800-446-4872
Corporate Office: 26776 Simpatica Circle Lake Forest, CA 92630	Phone: +1-949-581-4464 Fax: +1-949-581-1151 Email: info@generalmonitors.com
9776 Whithorn Drive Houston, TX 77095	Phone: +1-281-855-6000 Fax: +1-281-855-3290 Email: gmhou@generalmonitors.com
UNITED KINGDOM	
Heather Close Lyme Green Business Park Macclesfield, Cheshire, United Kingdom, SK11 0LR	Phone: +44-1625-619-583 Fax: +44-1625-619-098 Email: info@generalmonitors.co.uk
IRELAND	
Ballybrit Business Park Galway, Republic of Ireland	Phone: +353-91-751175 Fax: +353-91-751317 Email: info@gmil.ie
SINGAPORE	
No. 2 Kallang Pudding Rd. #09-16 Mactech Building Singapore 349307	Phone: +65-6-748-3488 Fax: +65-6-748-1911 Email: genmon@gmpacifica.com.sg
MIDDLE EAST	
LOB12, #G20 P.O. Box 61209 Jebel Ali, Dubai United Arab Emirates	Phone: +971-4-8815751 Fax: +971-4-8817927 Email: gmme@emirates.net.ae

Table 13: GM Locations

7.0 Appendix

7.1 Principle of Operation

General Monitors uses a low temperature catalytic bead to detect the presence of combustible gases and vapors. These gases and vapors are found in many applications. The catalytic bead converts the combustible gases and vapors to heat. This change in heat results in a change in the electrical resistance of the bead.

By taking a matched pair of catalytic beads and coating one, so that it does not respond to the presence of combustible gases and vapors, we can compare the change in resistance between the two beads. The bead that is coated is called the reference bead and the other bead is the active bead (Figure 41). Environmental factors can also influence the temperature of the catalytic beads. Because the beads are matched pairs, they will respond to changes in ambient temperature, humidity and pressure equally.

By connecting one end of each catalytic bead together, a series circuit is formed. This circuit is supplied with a constant current. The voltage drop across each bead will be identical in the absence of combustible gases and vapors. As combustible material is converted to heat, the resistance across the active bead increases causing the voltage drop across each bead to be different. This difference is proportional to the amount of combustible gas or vapor that is present at the sensing elements (catalytic beads).

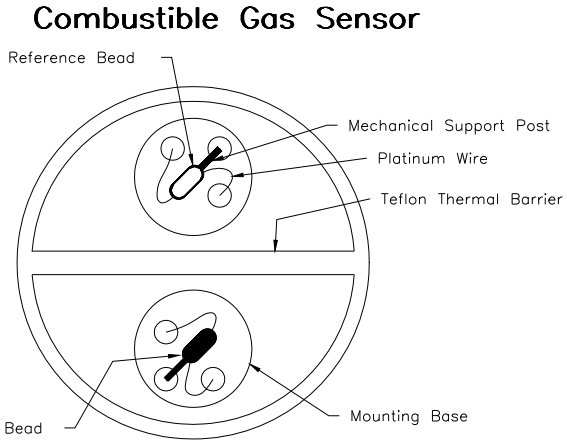

Figure 41: Catalytic Sensor Diagram

7.2 Spare Parts and Accessories

This chapter provides a description of the types of field devices (sensors), and the accessories, which can be used with the Model 4802A.

7.2.1 Sensors

General Monitors offers a variety of Catalytic Bead Sensors with sensor bodies and flame arrestors:

10001-1*	General Purpose, Aluminum Body, Wire Screen Arrestor, CSA, FM approved
10014-1*	High Temperature (200ºC, 400ºF), Aluminum Body, Wire Screen Arrestor, CSA Approved
10015-1	High Temperature (max 120ºC), Aluminum Body, Sintered Flame Arrestor, CESI, BASEEFA, CSA approved
10022-1	Industrial Aluminum Body, Sintered Flame Arrestor, CESI, PTB, CSA and BASEEFA approved.
10058-1*	General Purpose, Stainless Steel Body, Wire Screen Arrestor, CSA, FM
10059-1	Stainless Steel Body, Sintered Flame Arrestor, CESI, PTB, CSA and BASEEFA approved
10084-1	High Temperature (max 120ºC), Stainless Steel Body, Sintered Flame Arrestor, CESI, BASEEFA approved
10102-1	Sensor Simulator
10164-1	Hydrogen Specific, Aluminum Body, Wire Screen Arrestor, CSA
10387-4	Super Poison Resistant, Alum., Body, Wire Screen Arrestor, BASEEFA approved
10391-1	High Temperature, industrial hydrocarbons, Stainless Steel Body, Wire Screen Arrestor
11159-1	Stainless steel, CSA, ATEX, GOST approved, (120ºC max)
11159-2	Stainless steel, CSA, ATEX, GOST approved, (180ºC max)
11159-1L	Standard industrial hydrocarbon (w/lugs) stainless steel, ATEX
11159-2L	High temperature hydrocarbon (w/lugs), stainless steel, ATEX

* = Poison resistant sensors are available

7.2.2 Sensor Housing

General Monitors offers an explosion proof housing that is rated for use in Class I, Division 1, Group B, C & D hazardous locations (Figure 42).

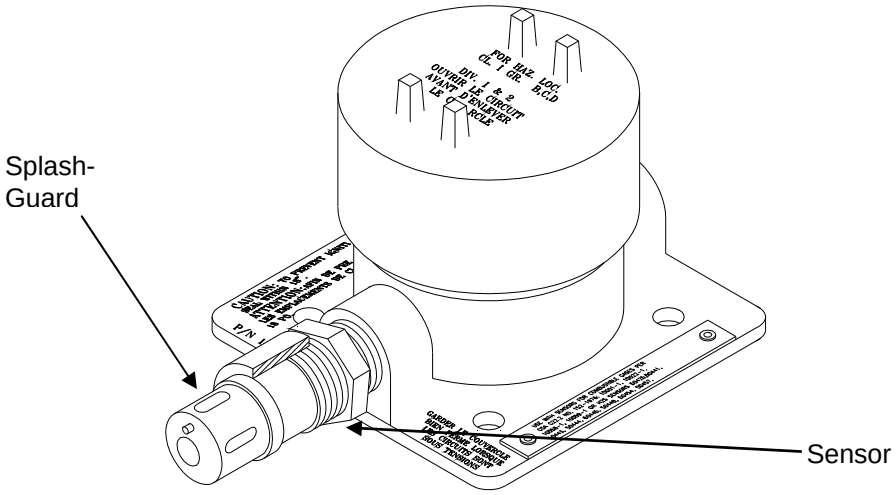

Figure 42: Universal Sensor Housing with Sensor and Splash-Guard

Both housing entries are tapped for — NPT threads. The sensor connects to one of these entries, while the other entry is for conduit runs. The lid of the housing is also threaded to allow the user to gain entry to the sensor connections in the field. Once the sensor is installed/operating in the field, no attempt should be made to disconnect the sensor, the conduit of the housing lid without removing power from the Model 4802A; as such an act would compromise the explosion proof integrity of the field device.

7.2.3 Splash-Guard & TGA-1

General Monitors produces a universal Splash-Guard, P/N 10395-1 that has been designed for use on all General Monitors' combustible gas and hydrogen sulfide gas sensors (Figure 43). In addition to the Splash-Guard, a Test Gas Applicator (TGA-1) is available for delivering a test gas to remotely located sensors, P/N 10460-2.

The Splash-Guard prevents water from rain or equipment wash-downs from being forced into the sensor cavity and affecting the response of the sensing element. Constructed of rugged Valox plastic, it has a series of internal baffles to deflect water down and away from the sensor. This guard (and the TGA-1) is threaded for simple screw-on installation. The Splash-Guard and TGA-1 are recommended for outside applications where rain or frequent hose downs occur, such as offshore platforms.

Figure 43: Splash-Guard Picture

7.2.4 Dust Guard Assembly

The Dust Guard Assembly (Figure 44) is a simple, threaded stainless steel cylinder with a wire-screen at one end. It is easily removed for cleaning and/or replacement of the disposable screen.

This General Monitors' accessory is specifically designed to prevent dust and particulate matter from reaching the sensor flame arrestor. Such debris can plug the screen and limit the amount of gas reaching the active surface of the sensor.

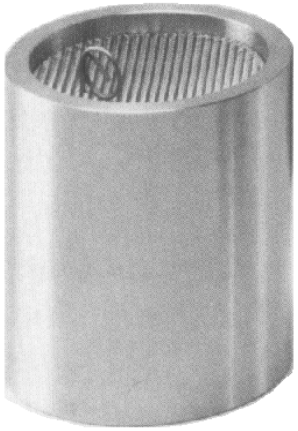

Figure 44: Dust Guard Picture

The Dust Guard is also available in a kit with twelve replaceable screens (Figure 45). It can also be used as an effective windscreen and is recommended for corrosive, windy, or high temperature environments.

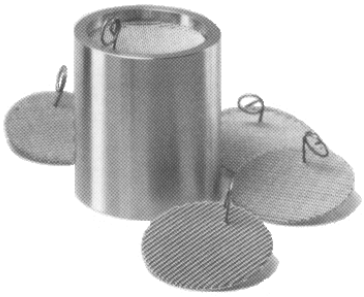

Figure 45: Dust Guard Assembly Kit Picture

7.2.5 Duct Mounting Plates

General Monitors produces a Duct Mounting Plate (P/N 10041) for applications that require the sensor to be mounted in air-conditioning or a heating duct. The Duct Mounting Plate is easy to install (Figure 46).

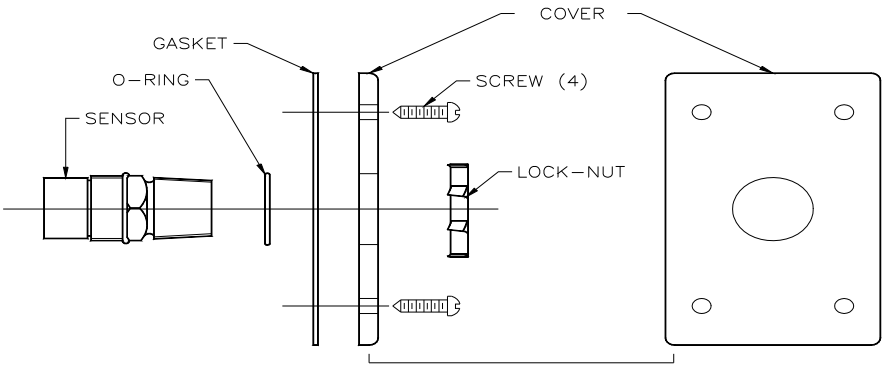

Figure 46: Duct Mounting Plate, Assembly Drawing

Read and understand the bulleted list below before mounting the sensor into a duct.

- Select a location on the duct and cut out a hole, large enough for the sensor to be inserted into the duct.
- Place the O-Ring over the sensor threads, against the 1¼-inch hex on the wiring side of the sensor.
- Insert the wiring side of the sensor through the gasket and cover.
- Screw the lock nut onto the wiring side of sensor.
- Use the four screws to attach the mounted sensor to the duct. The sensor should be oriented so that when the plate is attached to the duct the sensing element is inside the duct.

7.2.6 Calibration Equipment

The Model 4802A uses a Portable Purge Calibrator (Figure 47) or the 3 Liter Chamber (Figure 48), to accomplish calibration. The calibration and calibration check procedures and use of the Portable Purge Calibrator are explained in Sections 5.2 and 5.3.

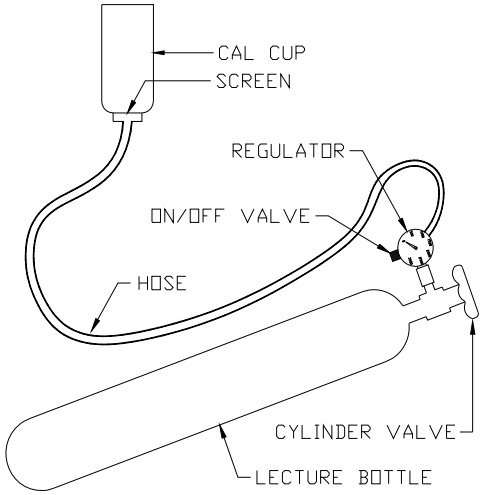

Figure 47: Portable Purge Calibrator

The procedure using the 3-Liter Chamber (Figure 48) is explained below:

The 3-Liter Chamber is used when the 4802A is calibrated with liquid or solvent vapors.

Before the Model 4802A is calibrated with any solvent or volatile liquid, consult the listing in Appendix B to determine the volume of solvent/liquid required to produce a 50% LEL concentration in the 3-Liter Chamber. However, if the user specified calibration level is not 50% LEL, consult the factory for the correct volume. Let the factory know the calibration level (25 to 90% LEL) and the solvent/liquid being used to calibrate the sensor.

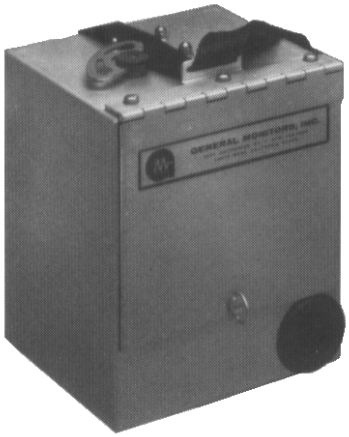

Figure 48: 3-Liter Chamber

Before using the 3-Liter Chamber, make sure the following is present:

1. 3-Liter Chamber
2. Dish
3. 250 micro-liter syringe
4. Correct volume of solvent/liquid for calibration and calibration checks.

- Orient the chamber so that the lid and sensor hole is on top.
- It will be necessary to wind up the fan using the turnkey on the outside of the chamber.
- If the fan begins to turn, locate the switch underneath and behind the fan blades on the inside of the chamber and turn the fan off.
- Insert the sensor into the sensor hole, open the lid and place the dish at the bottom of the chamber.
- Draw the correct amount of solvent or liquid into the syringe, according to the listing in Section 6.6.
- Place the Model 4802A in the Calibration Check or Calibration Mode, following the instructions listed in Sections 5.2 and 5.3.

7.2.7 Calibration Check Mode

1. When **0** is flashing on the display (Calibration Check Mode) inject the solvent/liquid into the dish, reach underneath and behind the fan blades on the inside of the chamber, locate the fan switch; turn it on and close the lid on the 3-Liter Calibration Chamber.
2. As the sensor begins to respond to the combustible vapor in the chamber, the concentration will begin flashing on the display.
3. The reading will stabilize after one or two minutes.
4. Remove the sensor from the chamber and allow it to see clean air. When the display has stopped flashing and indicates a few % LEL and then zeros (**0**), the Model 4802A has returned to normal operation.

7.2.8 Calibration Mode

1. When AC (Calibration Mode) appears on the display, inject the solvent/liquid into the dish, reach underneath and behind the fan blades on the inside of the chamber, locate the fan switch; turn it on and close the lid on the 3-Liter Calibration Chamber.
2. As the sensor begins to respond to the combustible vapor in the chamber, the display will indicate CP (Calibration in Progress).

3. After one or two minutes the display will indicate CC (Calibration Complete).

4. Remove the sensor from the chamber and allow it to see clean air. When the display indicates a few % LEL and then zeros (0), the Model 4802A has returned to normal operation.

7.2.9 Calibration Check & Calibration Modes

Remove the Dish from the 3-Liter Chamber and clean thoroughly before using it again.

7.2.10 Calibration Equipment and Part Numbers

7.2.10.1 Portable Purge Calibrator Assembly

50% LEL Methane Gas	1400150-M
50% LEL Hydrogen Gas	1400150-H
50% LEL Ammonia Gas	1400150-A
50% LEL Butadiene Gas	1400150-BD
50% LEL Butane Gas	1400150-B
50% LEL Ethane Gas	1400150-E
50% LEL Ethylene Gas	1400150-EY
50% LEL Propane Gas	1400150-PR

7.2.10.2 Portable Purge Replacement Cylinder

50% LEL Methane Gas	1400155-M
50% LEL Hydrogen Gas	1400155-H
50% LEL Ammonia Gas	1400155-A
50% LEL Butadiene Gas	1400155-BD
50% LEL Butane Gas	1400155-B
50% LEL Ethane Gas	1400155-E
50% LEL Ethylene Gas	1400155-EY
50% LEL Propane Gas	1400155-PR

7.2.10.3 Replacement Parts

Small Calibration Cup	1400152-1
Large Calibration Cup	1400154
Pressure Gauge Regulator	922-009

7.2.10.4 Cylinder Refills

50% LEL Methane Gas	140015-M
50% LEL Hydrogen Gas	140015-H

7.2.10.5 Liter Chamber Replacement Parts

3 Liter Chamber with syringe	1400200
Dish for 3 Liter Chamber	928-700
250 micro-liter syringe	928-718
Motor for 3 Liter Chamber	1400204
Fan for 3 Liter Chamber	1400207

7.3 System Specifications

Application:	Combustible & Flammable Gas and Vapor Detection
Sensor Type:	General Monitors Low Temperature, Diffusion Limited, Catalytic Bead Sensor
Typical Sensor Life:	3 to 5 years, in normal service
Measuring Range:	0 to 99% LEL
Zero Drift:	Less than 5% of span, per year
Stability:	Adheres to FM Class 6310 & Class 6320 and CSA 22.2 No. 152-M1984. Stabilization occurs in approximately two (2) minutes.
Response Time:	T50 < 10 seconds with 100% LEL concentration of Methane (CH_4) applied. T90 < 30 seconds with 100% LEL concentration of Methane (CH_4) applied.
Warm-up Time:	The catalytic bead sensor warm-up time is fifty (50) seconds
Approvals:	CSA certified to CSA 22.2 No. 152-M1984 and ATEX
Warranty:	2 Years

7.3.1 Converting Test and Calibration Gas Concentrations for % LFL to % Volume

Using %LFL as described in *NFPA 325 Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids 1994 Edition* it is then used as 100% volume fraction. Example Hydrogen has a 4% LFL is then used as 100% volume fraction, so that when an environment that has 2% LFL would indicate 50% volume

7.3.2 Accuracy

The accuracy the 4802A is limited by the accuracy of the standard used to calibrate the system. For many combustible gases, obtaining a high accuracy standard that is suitable for field calibration use may be difficult (about the best accuracy of gas concentration achievable is 5%, using a permeation system with good temperature control). For this reason, no fixed accuracy statement is possible. The accuracy cannot be better than the accuracy of the calibration gas.

The best accuracy to be expected, assuming a perfect standard, is ± 3% LEL up to 50% LEL and ± 5% LEL $\geq$ 51% LEL, at reference ambient conditions and when the unit has been calibrated using 50% LEL.

7.3.3 Relative Sensitivities

Methane	100.0
Hydrogen	64.7
Ammonia	132.8
Butadiene	84.6
Butane	66.4
Ethane	86.2
Ethylene	87.1
Propane	77.6

Beyond the standard gases the sensor is configured for. Each gas sensor can be configured to be gas specific. General Monitors, Inc. can conduct an evaluation study to custom configure a gas sensor.

7.3.4 Poisons and Interfering Gases

Sensors require a minimum of 5% oxygen for continuous and reliable operation.

Sensors operating in conditions of less than 5% oxygen will provide erroneous or unstable concentration data.

Fluctuating oxygen concentration during calibration will result in erroneous concentration readings during system operation. For optimal sensor performance, the oxygen level during calibration should be consistent with the expected normal ambient atmosphere.

The presence of certain gases and vapors may interfere with sensor operation. General Monitors has tested and documented some of the known interferents. These include but are not limited to, low vapor silicon, H2S, heavy hydrocarbons, and light chlorinated products.

7.3.5 Storage

Place the 4802A in the original storage container that was shipped with the unit. This container guards against contamination from solvents, lubricants, humidity, etc. In the case of long-term storage, the 4802A should be stored as above in a cool, dry, place, preferably between 0 and 20 degrees C.

7.4 Mechanical Specifications

Weight:	11.2 oz. (318 grams)
Length:	9.9 inches (251 mm)
Height:	6.825 inches (173 mm)
Width:	1 inch (25 mm)

7.5 Electrical Specifications

Input Power Requirement:	20 to 35Vdc, (24Vdc @ 250mA, 4.8W nominal) (300 mA max)
Electrical Classification:	Class I, Division 1, Groups B, C & D, designed for use in non-hazardous environments.
Relay Contact Rating:	4A @ 250Vac, 3A @ 30Vdc resistive. DPDT for A1 & A2, SPDT for Fault.
Open Collector Rating:	100mA @ 35Vdc for A1, A2, Fault, UA, FUA, CAL-OC, LA1 & LA2

7.5.1 Cable Parameters

Recommended 3-wire shielded. Maximum cable lengths allowable between module and sensor with one way resistance of 20 Ohms per sensor lead (40 Ohms loop) @ 24Vdc nominal:

AWG	Feet	Meters
14	7600	2320
16	4800	1460
18	3000	910
20	1900	580

Table 14: Recommended Maximum Cable Lengths between Module & Sensor

The maximum allowable cable lengths between the analog output connections on the control module with a remote device in series (maximum loop resistance of 500 Ohms between AO+ & AO-):

AWG	Feet	Meters
14	9000	2740
16	5200	1585
18	3800	1160
20	2400	730

Table 15: Maximum Allowable Cable Lengths between Analog Output Connections

7.6 Environmental Specifications

Operating Temperature Range:	Sensor	-67°F to +200°F (-55°C to +93°C)
	4802A	0°F to +150°F (-18°C to +66°C)
Storage Temperature Range:	Sensor	-67°F to +185°F (-55°C to +85°C)
	4802A	-40°F to +150°F (-40°C to +66°C)
Pressure Limits:	1/2ATM to 3ATM with no impact on performance on operation	
Operating Humidity Range:	5% to 100% Relative Humidity, non-condensing	

7.7 Engineering Specifications

7.7.1 Zero Two System

Each system utilizes modules capable of monitoring gas sensing elements, or a 0 to 21.7mA analog signal from gas or flame detection transmitters. The system chassis is available in 4, 8, and 16 channels. Each chassis contains a bus for the following independent signals:

- A1 Alarm
- A2 Alarm
- Fault
- Master Reset
- Master Accept
- Un-accept
- CAL
- +24Vdc
- System Common

Module signals are capable of being bussed from one chassis to another, so that up to 100 modules can comprise a single system. The gas and flame detection modules are electrically and physically compatible and capable of being used in the same chassis to form combined fire and gas detection systems. The system consists of Zero Two Series component modules as manufactured by General Monitors, Lake Forest California, U.S.A. or General Monitors, Galway, Ireland.

7.7.2 4802A Control Module

The control module, with sensor, meets the performance requirements of CSA 22.2 No. 152-M1984 & FM Classes 6310 & 6320. It is capable of monitoring 0 to 100% LEL concentration of combustible gases/vapors. The control module has an interface panel, providing a mode/select switch and the following indications:

- 2 discrete alarm threshold level indicators
- Fault or malfunction indicator
- Ready indicator
- Calibration mode indicator
- Setup mode indicator
- 2 digit digital display

All alarm parameters and user options are software selectable. A functional card test and a front panel LED test are switch capable without interrupting normal on-line services.

The control module is capable of insertion and removal during power on conditions without damage to any component module in the system. The control module meets level 3 for severity and complies with BS 6667 Part 3 / IEC 801-3 for Radio Frequency Interference (RFI) susceptibility. The control module generates display codes associated with fault conditions whenever a fault or malfunction occurs. A mode/select switch provides the operator front panel access to:

- Calibration check mode
- Calibration mode
- Setup check mode
- Setup mode
- Inhibit mode

The control module has a 100% backward compatible option available at the time of order. The control module, with sensor, is capable of calibration with the following display prompts during the calibration routine:

AC = Calibration routine activated,

CP = Calibration in progress and

CC = Calibration complete.

The control module has a password protected setup routine capable of having the password disabled.

7.8 Volatile Liquids and Solvents

Volatile liquids and solvents are not supplied by General Monitors. This page provides a listing of volatile liquids and solvents and the respective volumes required (in micro-liters) to produce a 50% LEL vapor concentration in the 3 Liter Chamber (Section 6.7).

Reference: NFPA 325, 1994 Edition

Acetaldehyde	136
Acetic Acid	140
Acetone	112
Acetonitrile	96
Acrylonitrile	120
Amyl Acetate	100
Amylamine	156
Benzene	65
Butyl Acetate	137
Butyl Acrylate	148
Butyl Alcohol	78
sec-Butyl Alcohol	95
tert-Butyl Alcohol	138
Butyl Cellosolve	88
Butyraldehyde	102
Cyclohexane	86
Decane	95
Diethyl Ketone	103
Diisobutyl Ketone	82
Dimethylformamide	104
p-Dioxane	104
Dodecane	83
Ethyl Alcohol (Ethanol)	118
Ethyl Acetate	119
Ethyl Amine	140
Ethyl Benzene	60
Ethyl Ether	120
Ethylene Oxide	89
Gasoline 100 Octane	107
Heptane, Normal	94
Hexane, Normal	86

The volatile liquids and solvents listed in this section are intended for use in the 3-Liter chamber for calibrating General Monitors Catalytic Sensors (not the Model IR2000).

Isopentane	99
Isoprene	89
Isopropyl Alcohol	93
Isopropyl Ether	120
JP-4, Jet Fuel	183
Laktane	76
Methanol	148
Methyl Ethyl Ketone (MEK)	76
Methyl Metacrylate	111
Naptha (Petroleum Ether)	96
Octane	99
Pentane, Normal	105
Propanal	114
2-Propanol	93
Propyl Acetate	106
Propylamine	103
Propylbenzene	68
Propylene Oxide	98
Styrene	63
Tetradecane	79
Tetrahydrofuran	99
Tetrahydrofurfuryl Alcohol	89
Toluene	78
1,1,1-Trichlorethane	456
Trichloroethylene	438
Triethylamine	102
Vinyl Acetate	152
Vinyl Ethyl Ether	99
o-Xylene	83
p-Xylene	83
Xylenes	83

7.9 Engineering & Technical Drawings

7.9.1 Outline & Terminal Connections

Reference Drawing # 11221

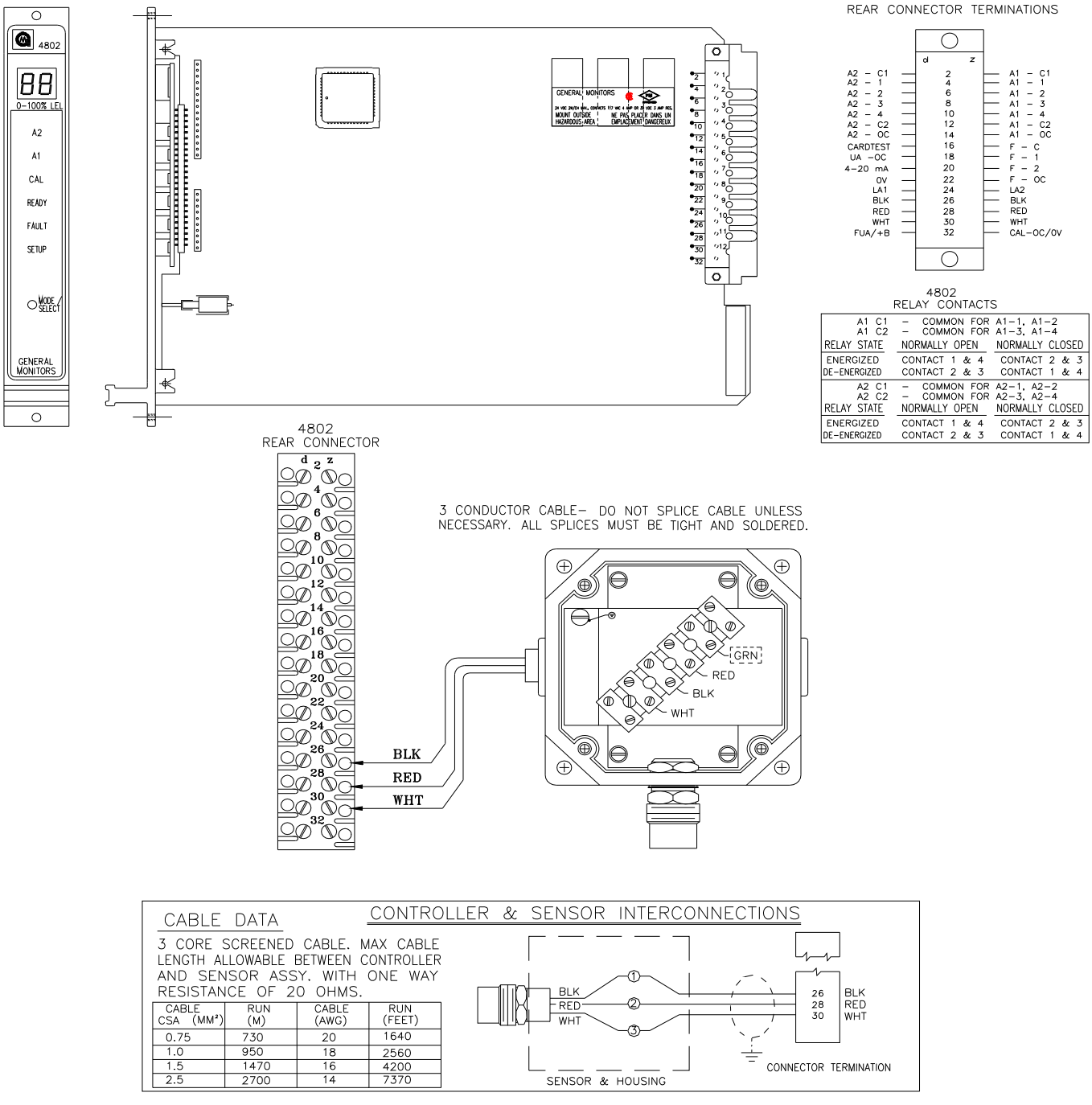

Figure 49: Outline and Terminal Connections 4802A

7.9.2 Final Assembly

Reference Drawing # 11220-1

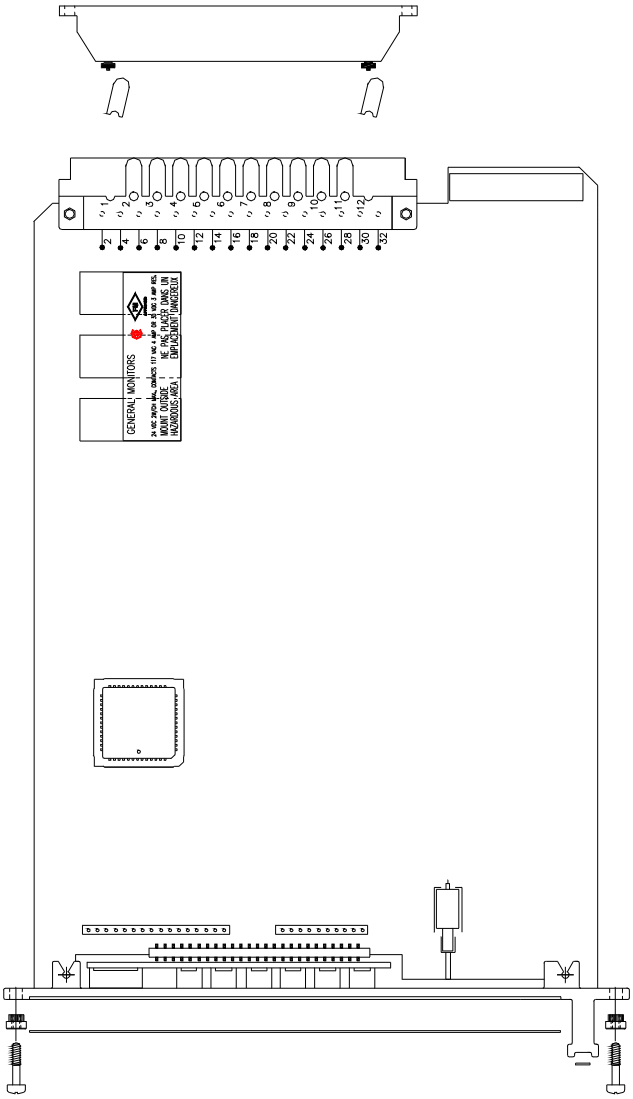

Figure 50: Final Assembly, 4802A

7.10 Zero Two Series Modules

Model 2602A

Zero Two Series Control Module for Hydrogen Sulfide Gas Applications

Model 4802A

Zero Two Series Control Module for Combustible Gas Applications

Model TA102A

Zero Two Series Trip Amplifier Module for Combustible Gas Applications

Model TA202A

Zero Two Series Trip Amplifier Module for Hydrogen Sulfide Gas Applications

Model TA402A

Zero Two Series Trip Amplifier Module for Flame Detection Applications

Model FM002A

Zero Two Series Facilities Module Performs Common Functions for Zero Two Systems

Model RL002

Zero Two Series Relay Module Provides Extra Output Capacity for Zero Two Systems

Model ZN002A

Zero Two Series Zone Control Module Performs Zoning and Voting Functions for Zero Two Systems

Model MD002

Zero Two Series Driver Card for Monitoring / Driving High-Current Output Devices

Model IN042

Zero Two Series Four Zone Input Card for Call points, Smoke & Thermal Detectors

Model PS002*

Zero Two Series Power Supply Module for Zero Two Systems

***** = Non-European Countries Only.

ADDENDUM
Product Disposal Considerations

This product may contain hazardous and/or toxic substances.

EU Member states shall dispose according to WEEE regulations. For further General Monitors' product WEEE disposal information please visit:
www.generalmonitors.com/customer_support/faq_general.html

All other countries or states: please dispose of in accordance with existing federal, state and local environmental control regulations.