GENERAL MONITORS

Model 2602A

Zero Two Series Control Module
For Hydrogen Sulphide Gas Applications

Instruction Manual **11/06**

Part No. MAN2602A-EU
Revision M/11-06

Warranty Statement

General Monitors warrants the Model 2602A 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 General Monitors' plant or the representative from which 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.

Warnings

Hydrogen Sulphide is an extremely toxic gas, and exposure may result in a loss of consciousness or death.

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 MOS sensors designed by General Monitors will work with the Model 2602A. Any attempt to use a sensor that has not been designed by General Monitors will void the warranty.

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

The display range must be selected at the factory and cannot be changed in the field. If the display range on the Model 2602A needs to be changed, it will be necessary to return the module to the factory.

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.

E C Declaration of Conformity in accordance with EC Directives

We at General Monitors Ireland Ltd., Ballybrit Business Park, Galway, Republic of Ireland, hereby declare that the equipment described below, both in its basic design and construction, and in the version or versions marketed by us, conforms to the relevant safety and health related requirements of the appropriate EC Directives, only as follows:

a) Conforms with the protection requirements of Council Directive 89/336/EEC, + Amd 92/31/68/EEC relating to Electromagnetic Compatibility, by the application of:

   A Technical Construction File No: GM 95005 and Competent Body Certificate No. 4473-95-106 and Report No. 4473/1K8

And

b) Conforms with the protection requirements of IEC 1010-1:1990 + Amd 1: 1992 (+ Amd 2:1995 as applicable) relating to safety by the application of:

   A Technical Construction File No: GM 95005 and Competent Body Certificate No 4146/699L-6870, 4146/1119/9150 and 4146/1119/9507 issued by:

   ERA Technology Ltd. Cleeve Road, Leatherhead Surrey KT22 7SB, England. Tel: +44 1372 367000

This declaration shall cease to be valid if modifications are made to the equipment without our approval.

PRODUCT: Zero two series Module for Hydrogen Sulphide Gas Applications.
MODEL: 2602A

It is ensured through internal measures and our ISO9001:2000 certifications, that series production units conform at all times to the requirements of these current EC Directives and relevant standards.

Responsible Person: _____ Date: 15-07-97

General Manager European Operations

The signatory acts on behalf of company management, and with full power of attorney

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Introduction

Protection for Life

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.

This manual provides instruction for installing and operating the General Monitors' Model 2602A for Hydrogen Sulfide Gas Applications. While the 2602A system is easy to install and operate, this manual should be read in full and the information contained herein understood before attempting to place the system in service.

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.

Special Warnings

Hydrogen Sulfide (H_2S) is an extremely toxic gas, and exposure may result in a loss of consciousness or death.

All Zero Two Series Modules contain components that 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 MOS (Metal Oxide Semiconductor) sensors designed by General Monitors will work with the Model 2602A. 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.

The display range must be selected at the factory and cannot be changed in the field. If the display range on the Model 2602A needs to be changed, it will be necessary to return the module to the factory.

Full backwards 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.

Customer Support

For additional product information not contained in this manual, please contact General Monitors Customer Support.

NOTE: Each H_2S sensor is shipped with a red plastic cap fitted over the sensor head. Inside the cap is a desiccant. **DO NOT** remove this cap until you are ready to power the system. **SAVE** the cap and **RE-CAP** the sensor anytime the system power is off for more than one hour.

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 specifies 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.

1.0 Before installation

This chapter provides a brief description of the Model 2602A features & benefits and a list of some of its applications. More detailed information on the features and benefits listed in Section 1.2 will be presented in later chapters.

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

1.1 General Description

The General Monitors Model 2602A (see Figure 1) is a single channel Hydrogen Sulphide 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 MOS Sensor and monitors levels of Hydrogen Sulphide Gas.

The Model 2602A 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 yellow border and “2602A” in the upper right corner of the front panel. The Model 2602A is designed for use in non-hazardous environments.

Figure 1 – Model 2602A

1.2 Features & Benefits

Single Point, Autocalibrate
The Unit's display indicates simple automated calibration prompts to the operator.

Microprocessor Based Electronics:
Monitor's fault conditions, sensor inputs and provides outputs in the form of display codes, analogue signal, relay contact and open collector activations.

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.

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

Password Option:
Prevents unauthorized alteration of the setup parameters (can be disabled)

Setup Check Mode:
Allows the user to view the parameters that have been set by the factory and/or an 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 up 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.

1.3 Applications

The General Monitors Model 2602A is a Hydrogen Sulphide Gas Control Module designed for Zero Two Series Applications. Below is a partial list of applications:

- Refineries
- Gas and oil production platforms
- Mud-logging operations
- Desulphurisation facilities
- Chemical plants
- Drilling platforms and rigs
- Gas collection facilities
- Sulphur recovery plants
- Sewage disposal/treatment plants

2.0 Specification

This chapter provides detailed specifications for the Model 2602A Zero Two Series Control Module System, mechanical, electrical and environmental specifications present the Model 2602A in technical terms that can be inserted into another written specification by architects and engineers.

2.1 System Specifications

Application:
Hydrogen Sulphide (H_2S) Gas Detection.

Sensor Type:
General Monitors MOS, diffusion, adsorption, H_2S specific sensor.

Typical Sensor Life:
3 to 5 years in normal service

Measuring Ranges (in parts per million):
0 to 99ppm, 0 to 50ppm or 0 to 20ppm

Approvals:
CSA Certified

Warranty:
Two Years

Accuracy:
±2ppm or ±10% of applied gas, whichever is greater at reference ambient conditions.
LED – Integrity of LED's & Display

Temperature Variation:
±4ppm or ±10% of applied gas, whichever is greater over a -40°C to +60°C temperature range.

Humidity Variation:
±4ppm or ±10% of applied gas whichever is greater over a 15% to 90% relative humidity range.

Long Term Stability:
±4ppm or ±10% of applied gas whichever is greater over 21-day period.

Response Time:
T50≤2 minutes with full-scale concentration applied to sensors with sintered flame arrestors.

2.2 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)

2.3 Electrical Specifications

Input Power Requirement:
20 to 35Vdc @ 200mA max. (24Vdc, 4.8W nominal). PSU noise and ripple voltage 1.0Vpp max. The customer supplied PSU must comply with IEC 1010-1, limiting current to 8A under Fault conditions, in order to comply with CE Marking requirements.

Electrical Classification:
The Sensor is rated for use in Class I, Division 1, Groups B, C & D in North America, and Group II applications in Europe. The Model 2602A is designed for use in non-hazardous environments.

Relay Contact Rating:
4A @ 30V RMS/42.4V Pk, 3A @ 30 VDC, Resistive, maximum.
DPDT for A1 & A2, SPDT for Fault.

Open Collector Rating:
100mA @ 35Vdc for A1, A2, Fault, UA, FUA, CAL-INH, LA1 & LA2.

Cable Parameters:
Recommended four wire screened or screened and armoured, to BS5308 or equivalent. Maximum cable lengths allowable between module and sensor with one way resistance of 10 Ohms, black and white sensor leads (20 Ohms loop resistance, black and white sensor leads) @ 24VDC nominal.

Maximum cable lengths allowable between module and sensor

mm^2	AWG	Feet	Meters
2.5	14	3375	1029
1.5	16	2250	686
1.0	18	1350	411
.75	20	900	274

The maximum allowable cable lengths between the analogue output connections on the control module with a remove device in series (maximum loop resistance of 500 Ohms between A0+ & A0-):

Maximum allowable cable lengths between the analogue output connections

mm^2	AWG	Feet	Meters
2.5	14	9000	2740
1.5	16	5200	1585
1.0	18	3800	1160
.75	20	2400	730

2.4 Environmental Specifications

Operating Temperature Range:
-18°C to +66°C (0°F to 150°F)

Storage Temperature Range:
-40°C to +66°C (-40°F to 150°F)

Operating Humidity Range:
5% to 100% Relative Humidity, non-condensing

EMC Susceptibility:
10V/m max.

2.5 Engineering Specifications

Zero Two System

Each system shall utilize modules capable of monitoring gas sensing elements, or a 0 to 22mA analogue signal from gas or fire detection transmitters. The system chassis available in 4, 8 and 16 channels. Each chassis shall contain a bus for the following independent signals:

- A1 Alarm
- A2 Alarm
- Fault Alarm
- Master Reset
- Master Accept
- Unaccept
- CAL/INH
- +24Vdc
- System Common

Module signals shall be 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 shall be electrically and physically compatible and capable of being used in the same chassis to form combined fire and gas detection systems. The system shall consist of Zero Two Series component modules as manufactured by General Monitors, Lake Forest California, U.S.A. or General Monitors, Galway, Ireland.

2602A Control Module

The control module with sensor, meets the performance requirements of ISA S12.15 Part I, 1990 and is capable of monitoring 0 to 100 parts per million (ppm) 0 to 50 ppm or 0 to 20 ppm of hydrogen sulphide gas. The control module has an interface panel providing a mode/select switch and the following indicators: 2 discrete alarm threshold level indicators, a fault or malfunction indicator, a ready indicator, a calibration mode indicator, a setup mode indicator a 2 digit digital display and a sensor range indicator. Alarm parameters and user options are software selectable. A functional card test and front panel LED test can be performed 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 generates display codes associated with fault conditions whenever a fault or malfunction occurs. A mode/select switch provides the operator front panel access to a calibration check mode, a calibration mode a setup check mode, a setup mode and inhibit mode. 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

CC – Calibration complete

3.0 Installation

This chapter discusses what to do when a Model 2602A 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 provides 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 2602A 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 chassis must be connected to Safety Earth. 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 (see Figure 2.

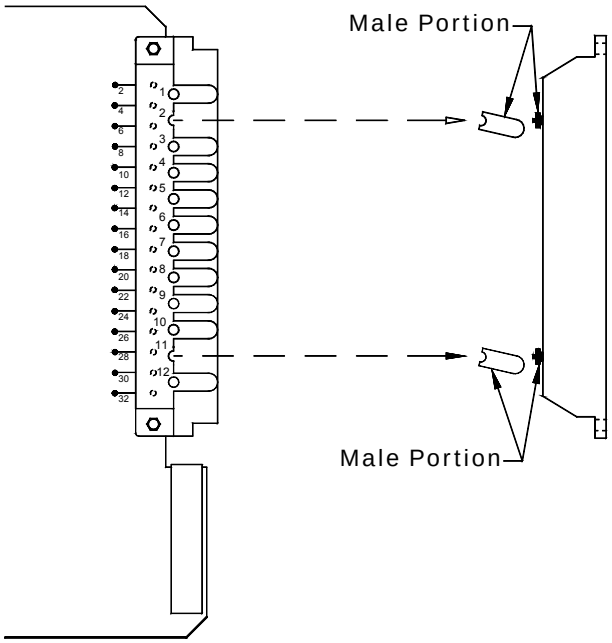

Figure 2 – Control Module Coding Strip

Equipment is to be installed in Rack system or Cabinet meeting the fire enclosure requirements of IEC 1010-1

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.

Permissible performance loss the user can expect in the presence of a Radio Frequency Electromagnetic Field.

If the installation is subjected to a strong Radio Frequency Electromagnetic Field (10V/m @ 27-1000Mhz), the Control Module may respond with a display deviation of ±10% FSD. This deviation will disappear following removal of the field. Functionality is otherwise unaffected.

3.3 Rear Terminal Connections

All wire connections to the Model 2602A are made to the terminal block located at the rear of the chassis. The terminal block accepts 1.5mm^2 to 0.75mm^2 (16 to 20 AWG) stranded or solid core wire. 2.5mm^2 (14 AWG) wire may be used if it is properly stripped according to the figure below.

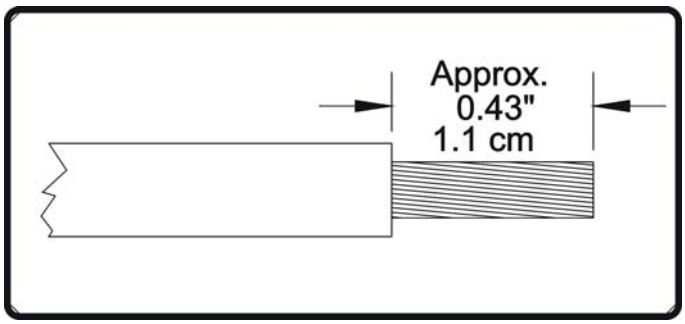

Figure 3 – Wire Strip Length

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 2602A, loosen the desired screw, insert the stripped end of the wire and tighten. (Alternate connector styles available – contact the factory)

For the rear terminal designations refer to Figure 4 below:

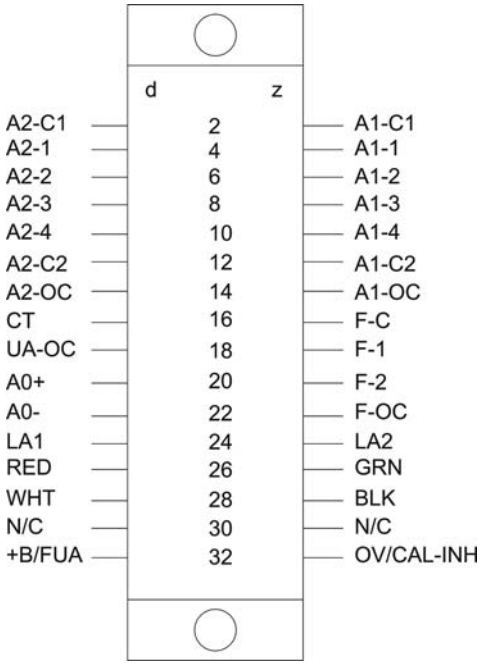

Figure 4 – Rear Terminal Designations

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 (mimic)

The **A2** Time Delayed 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 (see Chapter 5). The table below refers to the proper open and closed A2 alarm relay contacts while the unit is on power:

A2 alarm relay contacts

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

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	24z	OC Logic for A1 LED (mimic)

The **A1** Immediate 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 (see Chapter 5). The table below refers to the proper open and closed **A1** alarm relay contacts while the unit is on power:

A1 **alarm relay contacts**

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

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)

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 +24VDC).

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 @ 30V RMS/42.4V Pk, 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 5 shows recommended relay protection circuits for AC and DC loads, respectively.

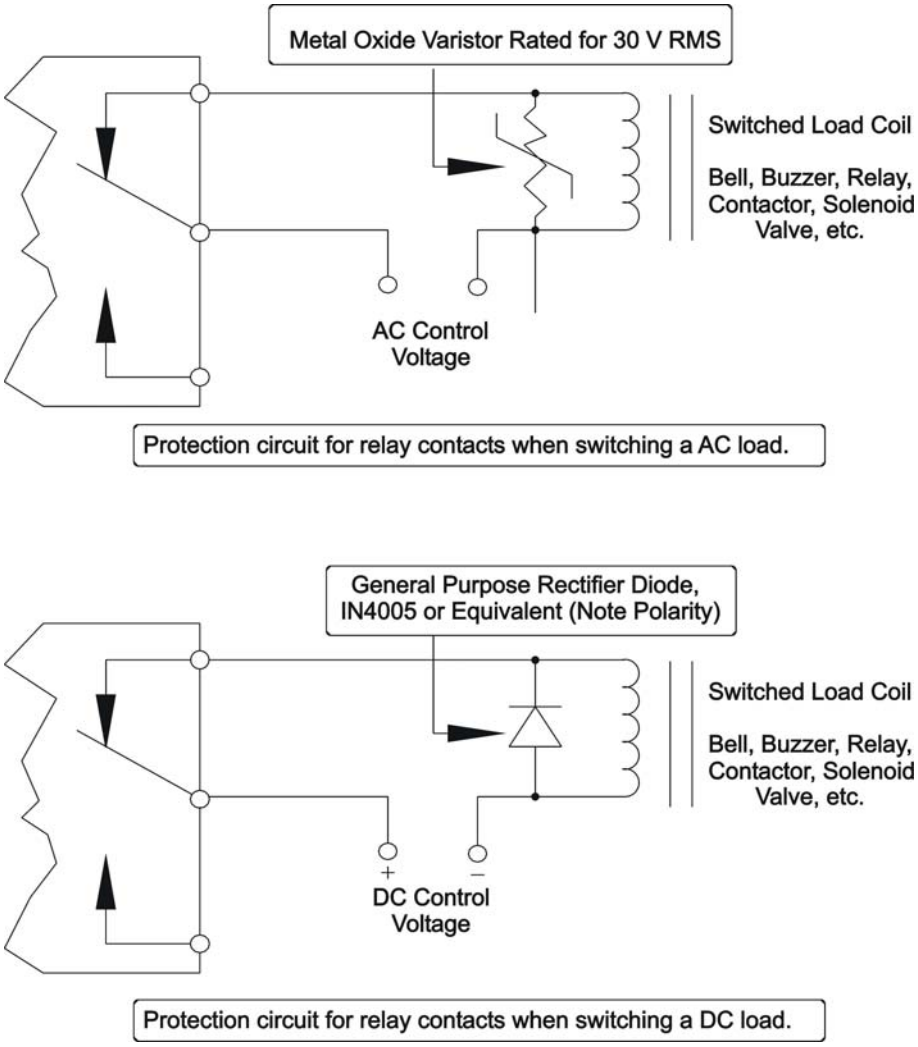

Figure 5&6 – Relay Protection Circuits for A/c & D/C Loads

The terminal designations for the Unaccept **and** Calibration / Inhibit **Mode outputs are:**

Label	Term	Description
UA	18d	Open Collector Output
CAL/INH	32z	Open Collector Output

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 7 illustrates some typical open collector external circuits.

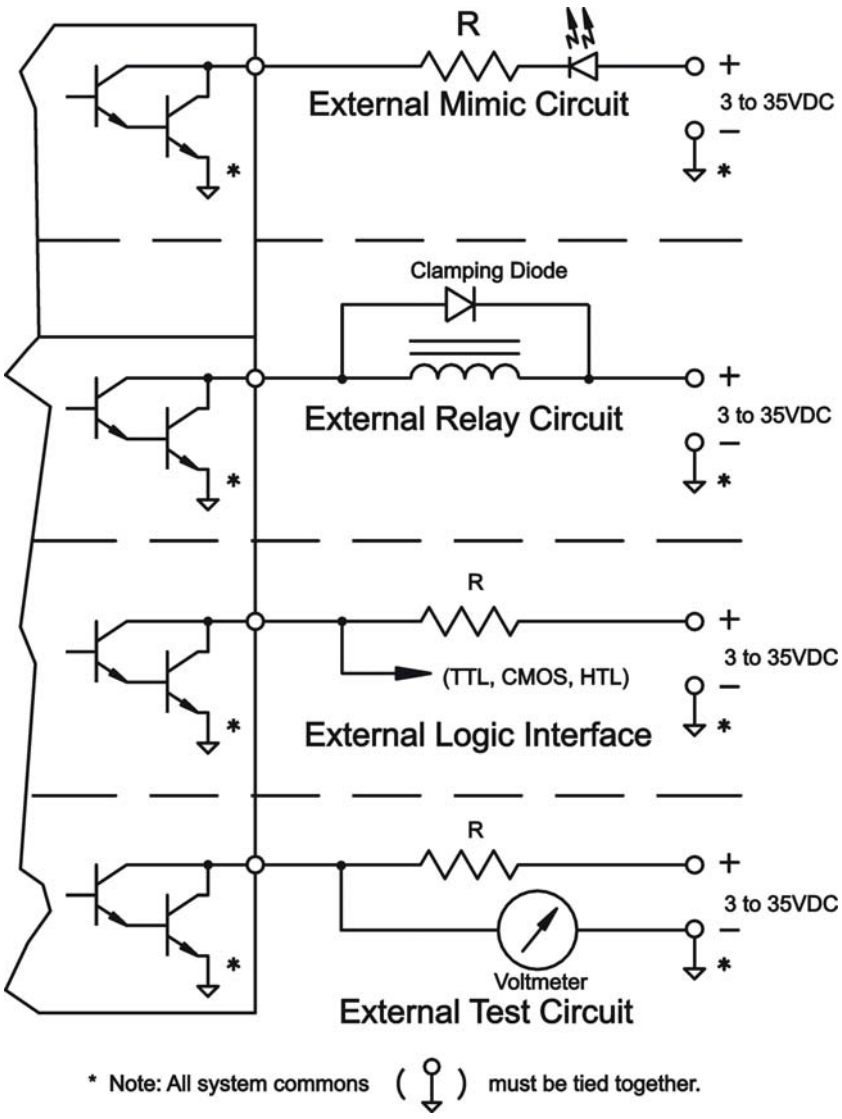

Figure 7 – Typical External Circuits for Open Collectors

The terminal designations for the Sensor wires are:

Label	Term	Description
RED	26d	Red Sensor Wire
GRN	26z	Green Sensor Wire
WHT	28d	White Sensor Wire
BLK	28z	Black Sensor Wire

Figure 8 illustrates the Sensor/Controller connections.

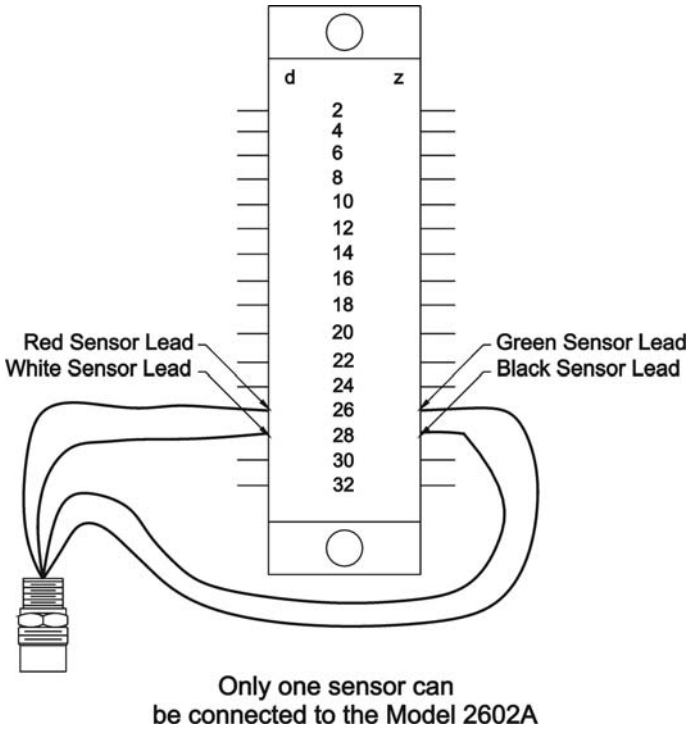

Figure 8 – Sensor/Controller Connections

Card Test Switch
The terminal designation for the Card Test **Input is:**

Label	Term	Description
CT	16d	Switch Connection

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 Figure 9 is a block diagram that shows the switch connections for the Card Test feature.

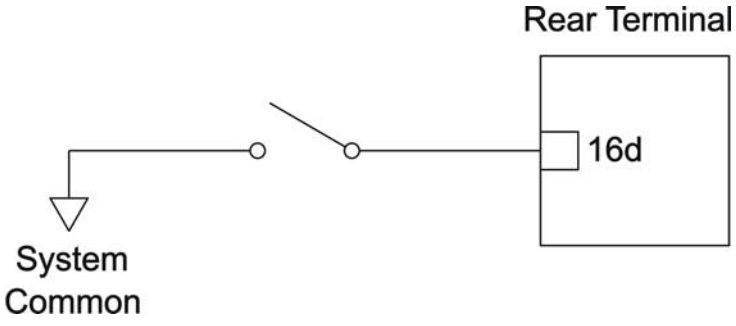

Figure 9 – Card Test Switch Wiring

The terminal designations for the Analogue Output **Signal are:**

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

NOTE – If the Analogue Signal is not used a shorting jumper must be placed between 20d & 22d.

Figure 10 is a diagram of the Analogue Signal connections.

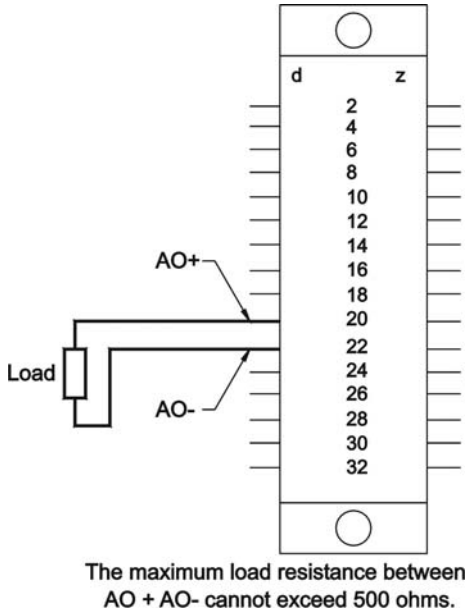

Figure 10 – Analogue Signal Connections

3.4 Sensor Location Consierations

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.

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

Considerations

- The sensor should be easily accessible for calibration checks. Ensure that sufficient clearance exists to allow the use of field calibration devices such a Breaker Bottle with Ampoules or a Portable Flow Calibrator for hydrogen sulphide applications.
- The sensor head should always be pointing down to prevent water build up on the sensing element. Remember that hydrogen sulphide is heavier than air; however, do not rely on this fact when selecting a sensor position.

- The sensor should be located in areas where leaks are suspected (i.e. near valves and pipe connections, etc.).
- The sensor should not be placed where it may be coated by contaminating substances.

3.5 Sensor Poisons

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

The more important poisons are:

Halides (F_2, $C1_2$, Br_2, I_2)

Glycol

Sulphur

Heavy Metals (e.g. Tetraethyl lead)

Silicones contained in greases or aerosols are the most common “coating” agents, which 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 GM MOS sensors, however a careful analysis of ambient conditions should be undertaken and the customer should be aware that sensor calibration may need to occur at more frequent intervals.

The Red Cap, complete with desiccant, must be replaced when sensor is off power for prolonged periods.

3.6 Applying Power

Zero Two Series Modules do not have an ON/OFF power switch. Each module is 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. Do not daisy chain +24V and Common chassis. Apply separate power to each chassis.

NOTE - If the application of power does not turn **ON** the Model 2602A, check fuse F1.

Figure 11 indicates where the power connections for the chassis are made.

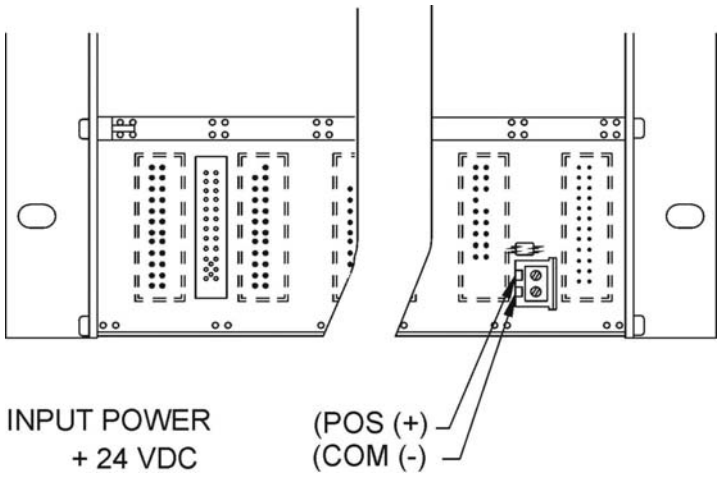

Figure 11 – Power Connections Rear Chassis

3.7 Installation Instructions for the Sensor

The interconnecting cable should have an overall screen or screen and armour. Cables to BS5308 or equivalent are suitable. Note that the terms “screen” and “shield” are equivalent for the purposes of this manual.

Interconnecting cables should be segregated from power and other “noisy” cables. Avoid proximity to cables associated with radio transmitters, welders, switch mode power supplies, inverters, battery chargers, ignition systems, generators, switchgear, arc lights and other high frequency or high power switching process equipment. In general, maintain a separation of at least 1m between instrument and other cables. Greater separations are required where long parallel cable runs are unavoidable. Avoid running instrument cable trenches close to lightning conductor earthing pits.

General Monitors do not recommend the use of cable shoes or crimps on any junction box or housing wiring terminals. Poor crimping can cause bad connection when unit experiences temperature variations. We therefore recommend good practice is to just terminate cable or sensor wires as is, especially in remote sensor applications. Complete all cable insulation testing before connecting the cable at either end.

Ensure that approved Ex"e" cable glands are used in the junction box and that these are correctly installed according to the manufacturer's instructions. The cable glands must be electrically connected to the continuity plates by means of suitable nuts. The cable armour must be terminated in the glands so as to ensure positive electrical connections.

A ferrite sleeve (P/N 363-005) must be placed over all cores and the screen drain wire immediately adjacent to the junction box, as shown in the illustration.

Connect the corresponding conductors of the interconnecting cable to the appropriate terminals in the function box.

The cable screens (drain wires) are interconnected in the housing as shown in Figure 12.

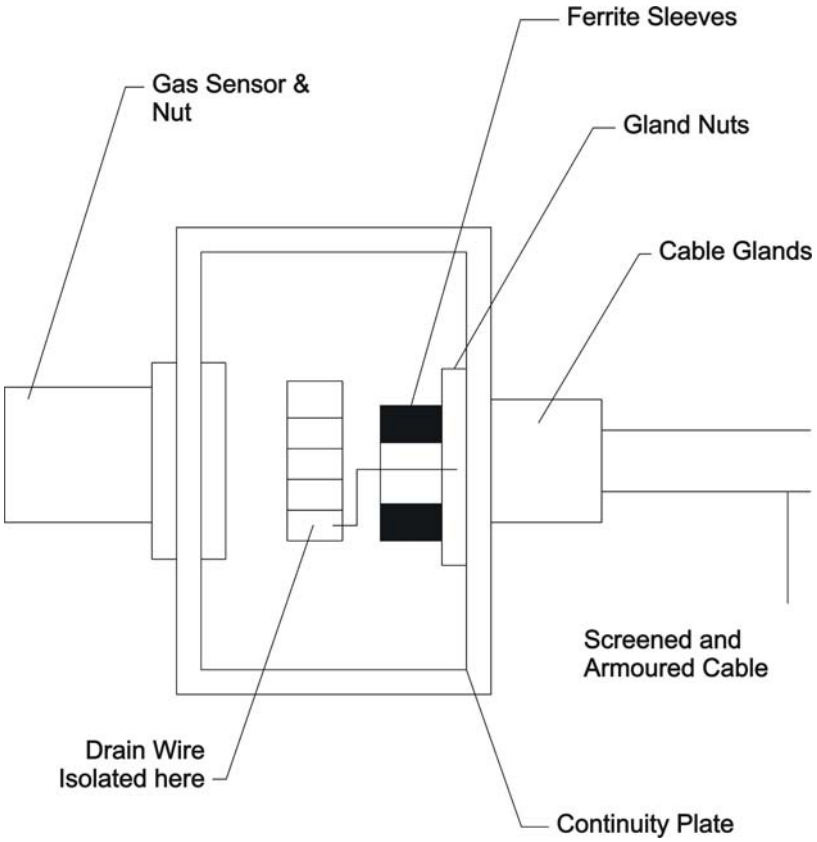

Figure 12 – Sensor Connections

The drain wire entering the junction box must be terminated on the Screen terminal to isolate it form all other circuits. It must be not connected to the sensor circuitry at any point.

Connect the external earth stud in accordance with local practices if required.

Screw the lid down tightly to the base in order to ensure electrical continuity.

4.0 Operation

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

4.1 General Maintenance

Once the Model 2602A 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 every 90 days. 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.
- GM recommends the use of the password to prevent unauthorized changes to set-up parameter.

4.2 Electrical Inputs

There are two electrical inputs to the Model 2602A. They are the:

- General Monitors MOS Sensor (field device) and
- 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 GM MOS Sensor input consists of the standard four lead connections used with General Monitors MOS Sensors. The black and white leads are dedicated to the heater circuit while the red and green leads are dedicated to the sensing electrodes.

- The Card Test input consists of a single termination for remote testing of the Model 2602A's functions. For detailed information on the Card Test, refer to Figure 9.

4.3 Electrical Outputs

The electrical outputs on the Model 2602A consist of relay contacts, open collectors and an analogue 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

All of the relay contacts on the Model 2602A have a maximum rating of:

- 4A @ 30V RMS/42.4V Pk., 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 – Discrete Inhibit Indication

All of the open collector outputs on the Model 2602A have a maximum rating of:

- 100mA @ 35Vdc

The Analogue Output Signal is used for sending gas concentrations and status information to remote devices. The maximum analogue load may not exceed 500 Ohms including the wire/cable that the signal is sent on.

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

When the Model 2602A is placed in the calibration or calibration check mode a 1.5mA signal is generated by this output. During the calibration mode the digital display will indicate prompts associated with the calibration procedure. During the calibration check mode the digital display will indicate the gas concentration with a flashing digit or pair of digits.

During the Setup/Setup Check modes, the options will be displayed.

When the Model 2602A 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 2602A 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 (20, 50 or 99).

4.4 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 unaccept outputs (2602A, 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 an alarm has been activated. New alarms should be acknowledged, or accepted. This is accomplished with the **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 (see Section 4.5).

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 detector returns to normal (safe) the alarm output will need to be reset. If, however, the alarm output is accepted but not reset and that alarm condition occurs again, the front panel LED, the associated mimic open collector, and the unaccept 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 unaccept (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.

4.5 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 (see Section 4.4).

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.

4.6 CAL/INH Open Collector

There is an open collector that will energize anytime the unit is put in the Calibration, Calibration Check, Inhibit, Setup or Setup Check Modes. This open collector output is referenced to the system’s ground or 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.

4.7 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 (see Figure 9).

To activate the Card Test feature, simply press and hold the switch. If this option has been selected the relays (A1 & A2) and open collector outputs **are active** and **will trip** during the Card Test. This should be treated as a functional test of a Zero Two System.

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. This should be treated as a functional test of a Zero Two System.

4.8 Fault Diagnostics

In addition to the Fault LED on the front panel, the Model 2602A 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.

F1 – Open analogue output signal. Check connection on rear terminal pins 20d and 22d. Check fuse F2 on the control board.

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. Press mode/select switch to place card back in normal mode. 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 GM 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 your GMI Representative or the factory.

F4 – Sensor heater open circuited. Make sure the black and white sensor wires are connected properly (in the field and at the rear of the unit). If this fault continues to occur, replace the sensor.

F5 – Sensor heater open circuited. Make sure the black and white sensor wires are connected properly (in the field and at the rear of the unit). Make sure the black and white sensor wires do not come in contact with each other and that there is no short across them. If this fault continues to occur, replace the sensor.

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 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. If this fault occurs consult the factory or your GM Representative. Press the Master Reset button to clear this fault (the previous values for the setup options will be valid).

F9 – Calibration check period exceeded. Remove the gas and allow the sensor to see clean air for at least five minutes. Attempt another Calibration check. If the fault continues to occur, consult the factory of your GM representative.

In each of the fault cases listed on this page, 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, Setup Mode and Inhibit Mode.

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

5.1 Types of User Interfaces

User interfaces are provided so that the operator may interpret and direct the Model 2602A in the performance of its various functions. User interfaces (Figure 13) 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 and setup parameters.
- The status range is indicated by the illuminated LED located beneath the digital display.
- 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.

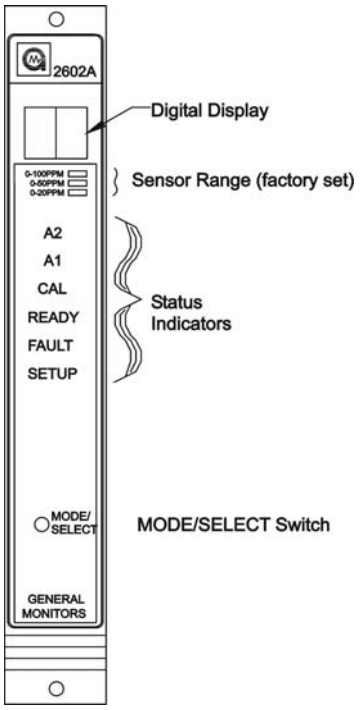

Figure 13 – Front Panel Display

5.2 Calibration Check Mode

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

Place an H2S ampoule (50% of scale is recommended) into a breaker bottle; do not place the breaker bottle over the sensor until display shows a flashing Zero.

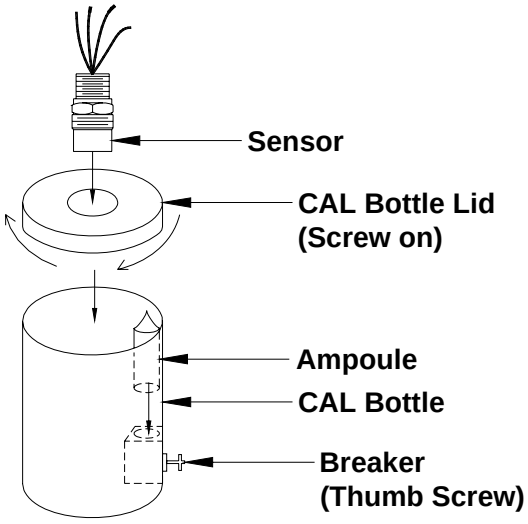

Figure 14 – Breaker Bottle Operation

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 15).

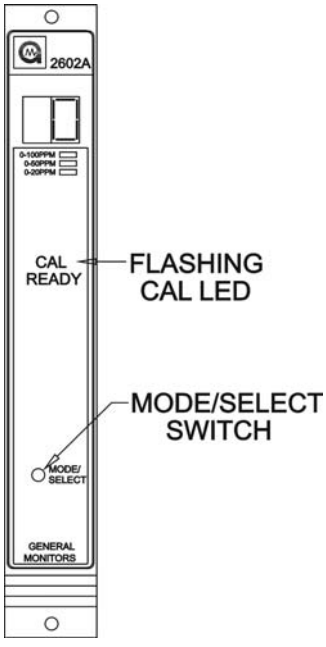

Figure 15 – Entering CAL Check Mode

- When the Mode/Select switch is released, the display will indicate a flashing **0**.

If the Portable Flow Calibrator for Hydrogen Sulphide is used instead of ampoules, modify this procedure as follows:

1 Before placing the unit in the CAL check mode, prepare the Portable Flow calibrator. Place the ON/OFF knob on the regulator in the ON position then securely fasten the regulator to the Portable Flow cylinder.
2 Place the unit in the CAL Check Mode per the instructions on page 17 of this instruction manual (figure 15).
3 Do not place the cup attached to the Portable Flow cylinder over the sensor until the display shows a flashing Zero, then follow the rest of the procedure.

- Apply the test gas to the sensor (break the ampoule) 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 12 minutes the unit will return to the normal operating mode.
- 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.
- The reading will stabilize after a minute or two.
- The operator should compare the reading with the gas concentration applied and determine if it is necessary to calibrate the sensor.
- If the reading is acceptable, remove the gas and allow the sensor to see clean air.
- If the operator determines that it is necessary to recalibrate, do one of the following:

If the applied gas condition is 50% of full scale, place the unit in the calibration mode by pressing the Mode/Select switch

Or

If the applied gas concentration if not 50% of full scale, remove the gas, allowing the sensors to see clean air for at least 5 minutes, then follow the calibration procedure listed in section 5.3 of this chapter.

5.3 Calibration Mode

- To calibrate the Model 2602A, follow the procedure listed below:

- Make sure the sensor is seeing clean air.

- Place H_2S ampoule (50% of scale is recommended) into a breaker bottle; do not place the breaker bottle over the sensor (figure 16) until display shows flashing AC.

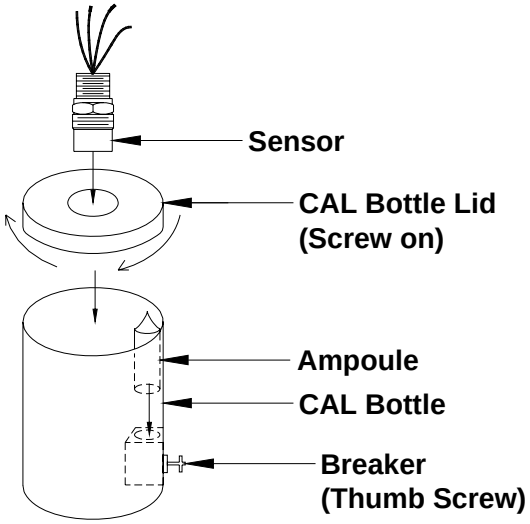

Figure 16 – Breaker Bottle Operation

- 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 17).

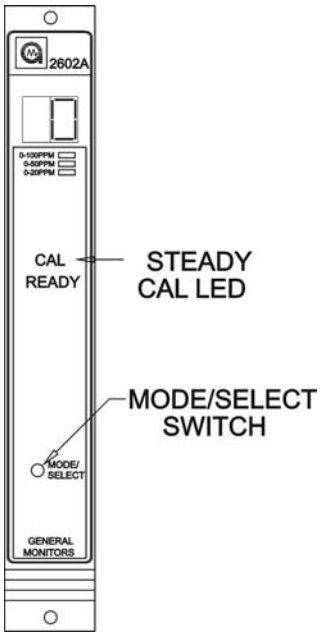

Figure 17 – Entering the CAL Mode

- When the **CAL** LED is on steady, release the Mode/Select switch and wait for an **'AC'** indication on the display. The unit is now in the Calibration Mode (figure 18).

NOTE: If the Portable Flow calibrator for Hydrogen Sulphide Applications is used in place of ampoules, modify this procedure as follows.

Figure 18 – AC Display during CAL Mode

1. Before placing the unit in the CAL Mode, prepare the portable Flow Calibrator. Place the ON/OFF knob on the regulator in the ON position then securely fasten the regulator to the Portable Flow cylinder.
2. Place the unit in the CAL Mode per the instruction on pages 24 & 25 of this instruction manual (figure 17).
3. Do not place the cup attached to the portable Flow cylinder over the sensor until the display shows AC, then follow the rest of the procedure.

- Break the Ampoule and watch the display change from **'AC'** to **'CP'** as the sensor see gas (figure 19)

  If the display does not change from **'AC'** to **'CP'** after twelve minutes, the Model 2602A will return to normal operation. Display not changing means sensor is not seeing gas. Check wiring and gas source for problem. If it still does b=not change to **CP**, change sensor.

Figure 19 – CP Display during CAL Mode

- Wait for the display to change from '**CP**' to '**CC**' when the calibration routine is complete (about 2 minutes, figure 20). If the display does not change from **'CP'** to '**CC'** after twelve minutes, the Model 2602A will indicate a Fault condition (F2). Attempt another calibration.

Figure 20 – CC Display during CAL Mode

- Remove the gas and watch the display return to normal operation, **'0'**, when the new calibration values have been stored in EEPROM.

  If the unit cannot store the new calibration values in the EEPROM, the Model 2602A will display an **'F7'** fault code (EEPROM verification failure, figure 21). If an **'F7'** calibration fault occurs, it will be necessary to replace the Model 2602A

  If the Model 2602A fails to calibrate, the unit will use the previously stored calibration values

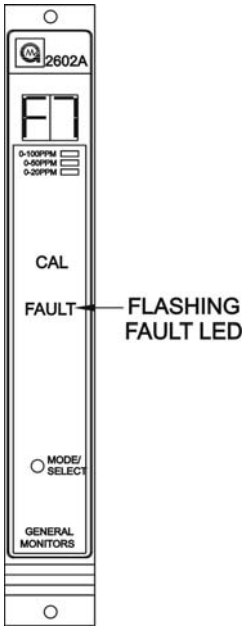

Figure 21 – F7 Display during CAL Mode

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 2602A, whereas the **Setup** Mode allows the user to change the operating parameters.
- 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 unit will remain in the Inhibit Mode until the Mode/Select switch is pressed.
- After the Setup Mode is complete the 2602A will execute the Setup Check Mode to view the selected parameters.

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. These modes will activate the CAL/INH output and the CALBUSS.

NOTE - Before entering the **Setup** Mode to make changes, the user should fill out the form and become familiar with the block diagram. This will aid the user during the selection process in the **Setup** Mode.

NOTE: The Password and the A2 Alarm time delay options offer the operator more than two choices. While these options are being selected, pressing the Mode/Select Switch will sequence the display to the next available choice for that option

Entering the Setup Mode

To Enter the **Setup Check** Mode or the **Setup** Mode. Press and hold the Mode/Select switch until the **SETUP** LED begins flashing (about ten seconds). When the **SETUP** LED is flashing, release the **Mode/Select** switch to enter the **Setup Check** Mode (Figure 13). Continuing to press and hold the Mode/Select switch until the **SETUP** LED stops flashing (about fifteen 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 22)

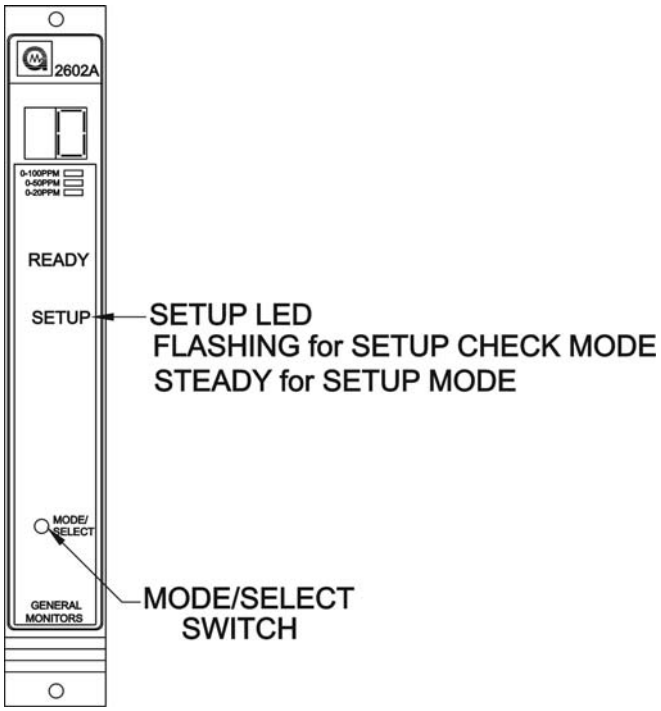

Figure 22 – Entering the Setup & Setup Check Modes

Entering the Setup Mode

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 (**-**) will appear in the left digit on the display (Figure 14). 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 bar (**-**) will appear in the right digit on the display (Figure 23). Press the **Mode/Select** switch until your correct password number is displayed, 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**.

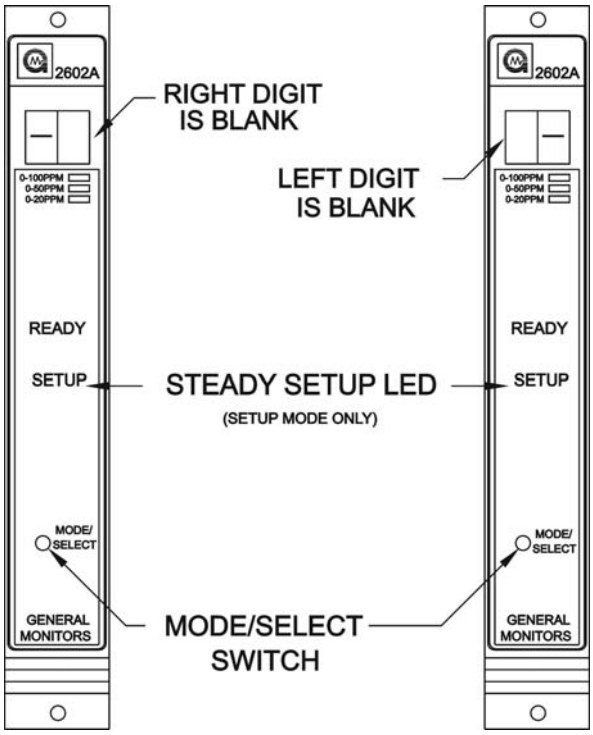

Figure 23 – Entering the Password

Entering the 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 24). Pressing the **Mode/Select** switch while **In** is displayed, will cause the unit to enter the **Inhibit** mode by inhibiting the alarm outputs. After the Model 2602A has entered the Inhibit mode, pressing the Mode/Select switch causes the unit to return to normal operation (see section 5.3). If it is desired to enter the **Setup** Mode, do not press the **Mode/Select** switch for the five seconds that **In** is displayed.

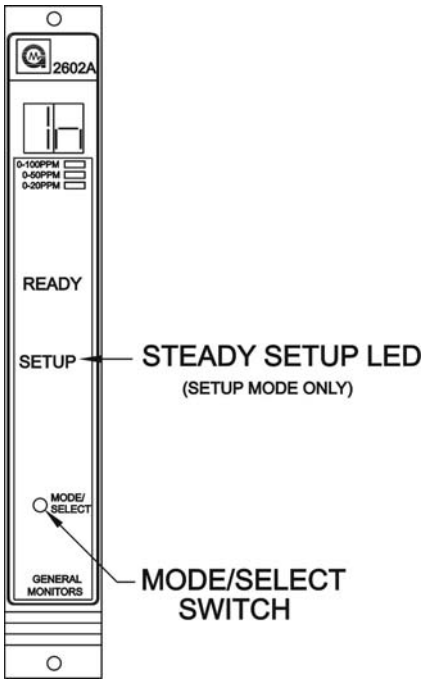

Figure 24 – Entering the Inhibit Mode

A2 Alarm Options

After the Inhibit mode option, the **A2** LED on the front panel will be flashing while the Energized/De-Energized option is displayed (Figure 25). The display will indicate the current selection, (**En** or **dE**). Press the **Mode/Select** Switch until the desired option is displayed. **De-Energized** is the factory default for this selection.

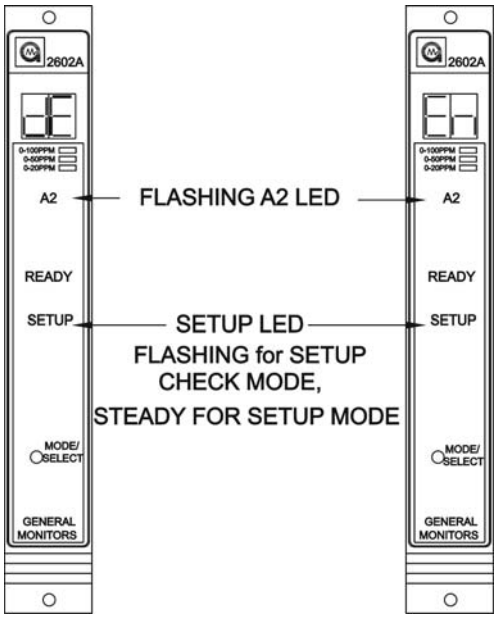

Figure 25 – A2 Energised/De-Energised Alarm Option

The **A2** LED on the front panel will be flashing while the latching/non-latching option is displayed (Figure 26). The display will indicate the current selection, (**nL** or **LA**). Press the **Mode/Select** Switch until the desired option is displayed. **Latching** is the factory default for this selection.

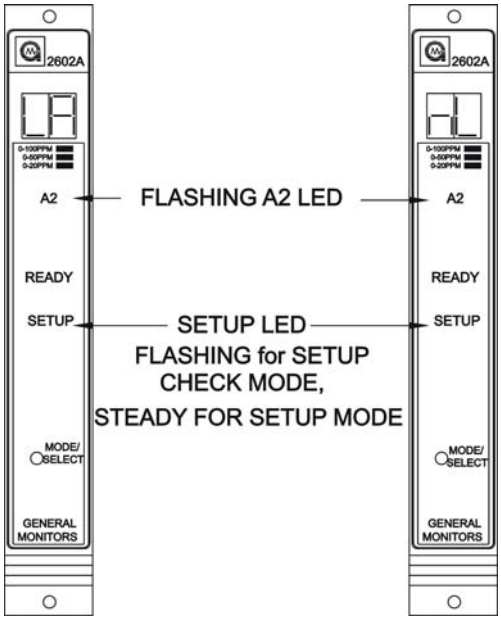

Figure 26 – A2 Latching/Non-Latching Alarm Option

The last A2 alarm option to appear on the display will be the alarm time delay. If the A1 Alarm is activated continuously for the amount of time specified by this option the A2 alarm outputs will activate. The display will indicate the current A2 alarm time delay in seconds (figure 27). Press the Mode/Select switch repeatedly, until the desired A2 alarm time delay (1,2,4, or 8 seconds) appears o n the display, **4** is the factory default for this selection.

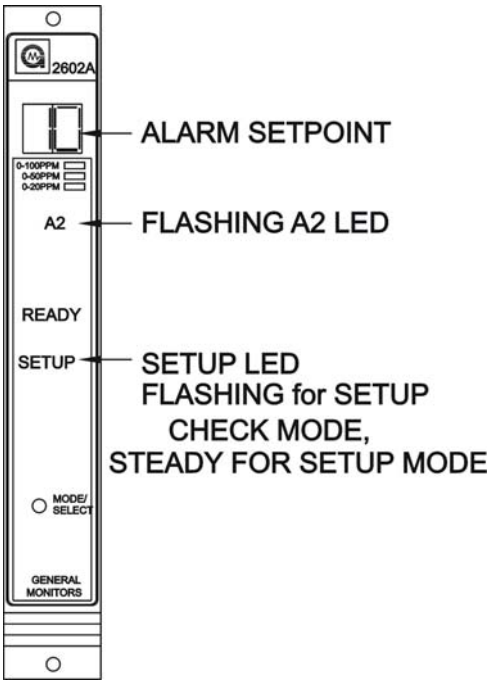

Figure 27 – A2 Alarm Setpoint Option

Next, the **A1** LED on the front panel 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 until the desired option is displayed. **De-Energized** is the factory default for this selection.

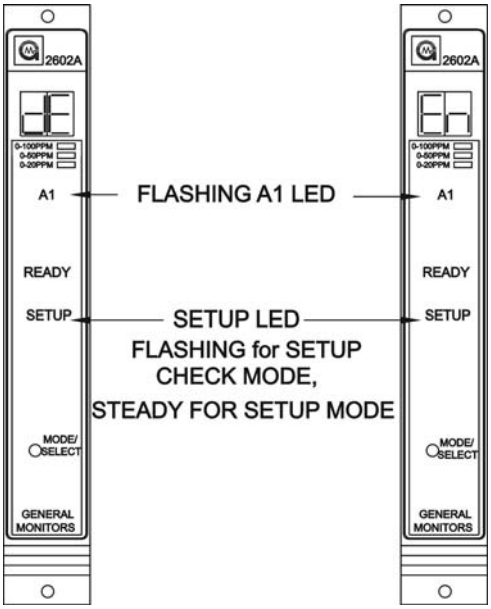

Figure 28 – A1 Energised/De-Energised Alarm Option

The **A1** 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. **Non-Latching** is the factory default for this selection.

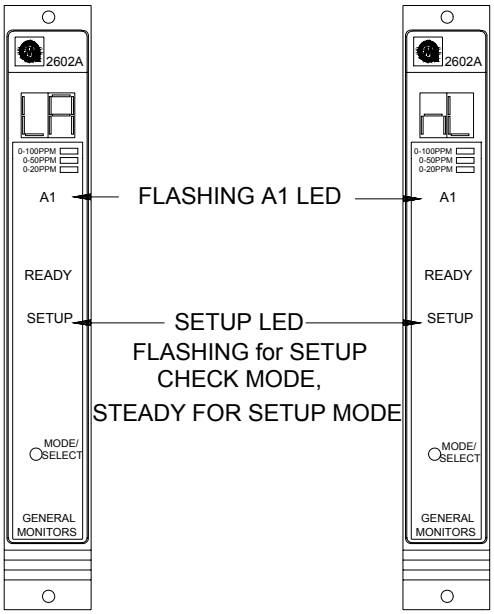

Figure 29 – A1 Latching/Non-Latching Alarm Option

Alarm Setpoint 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 30). Press the Mode/Select switch repeatedly until the desired A1 alarm set point appears on the display. **5 is the factory default for 0 to 20 pm scale for this selection.**

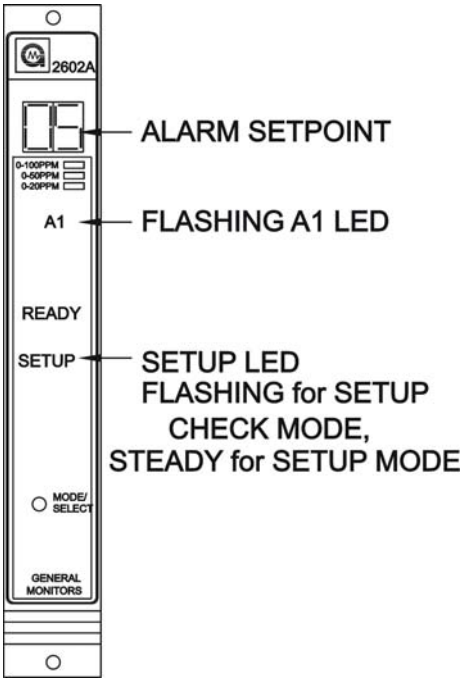

Figure 30 – A1 Alarm Setpoint Option

Fault/Inhibit Option

After the A1 alarm options have been selected, the user will select the Fault/Inhibit option. The **FAULT** LED on the front panel will be flashing while the display indicates **Ac** or **nA** (Figure 31). An **Ac** selection specifies that the Model 2602A will activate the **Fault** circuit while the unit is in the Inhibit Mode. A **nA** selection specifies that the Model 2602A will not activate its **Fault** circuit when the unit is placed in the **Inhibit** Mode (see section 5.3). 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.

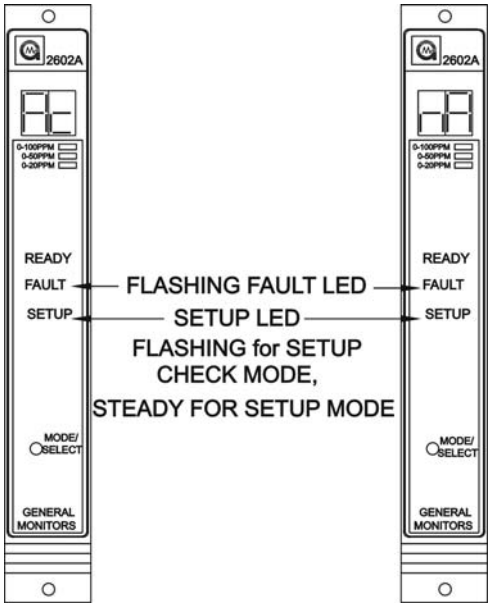

Figure 31 – Fault/Inhibit Option

Card Test Options

After the **Fault/Inhibit** option has been selected, the user will select whether or not the alarm outputs will activate during a Card Test. The display will indicate **ct** for about five seconds (figure 32).

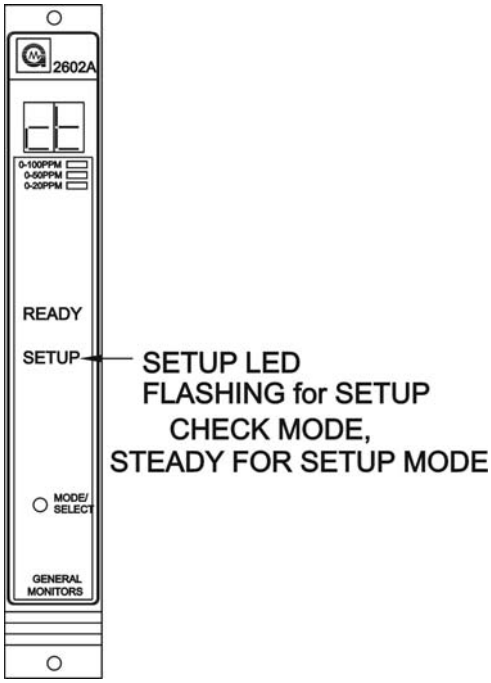

Figure 32 – Entering the Card Test Options

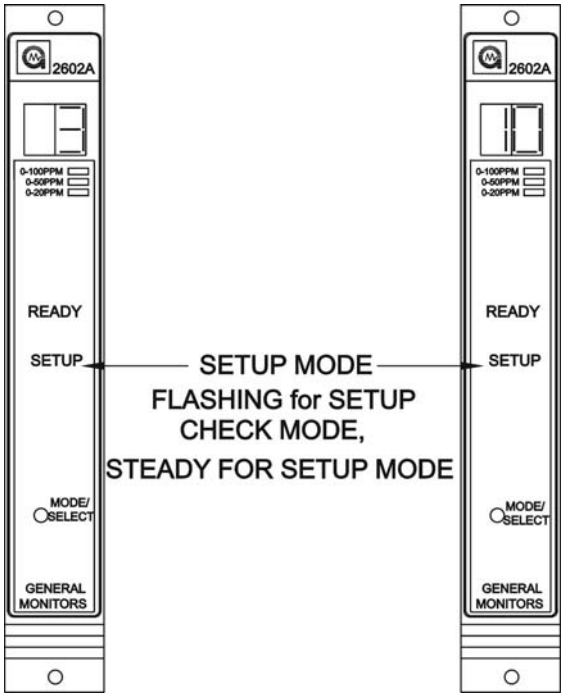

Figure 33 – Card Test Ramp Time, 3/10 Seconds

Following **ct**, the display will indicate the alarm output option during a Card Test as either **Ac**, active or **nA**, not active (figure 34). Press the Mode/Select switch until the desired option is displayed. Not Active is the factory default for this selection.

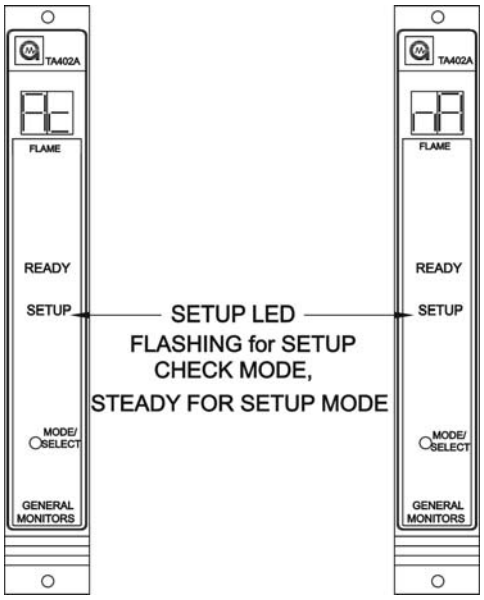

Figure 34 – Alarm Output option during a Card Test, Ac/nA

Password Option
Once the Card Test options have been selected, the user will either enable or disable the password option (Figure 35). The display will indicate either PE, for enabled or Pd, for disabled. Password Disabled is the factory default for this selection.

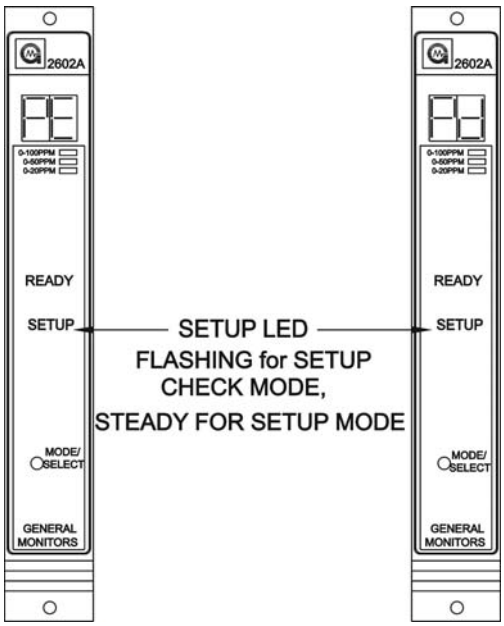

Figure 35 – Password Enabled/Disabled Option

Entering a New Password
This option applies to the **Setup Mode** only:
If the Password is disabled, the unit automatically enters the setup check mode. If the Password is enabled, the user will be able to enter a new password. The unit will display the left digit of the Password on the display. The right digit will be blank until the left digit has been selected, wait for five seconds. Next, the right digit will be displayed and the left digit will be blank until the right digit has been selected. Once the right digit has been selected, wait for five seconds (figure 36).

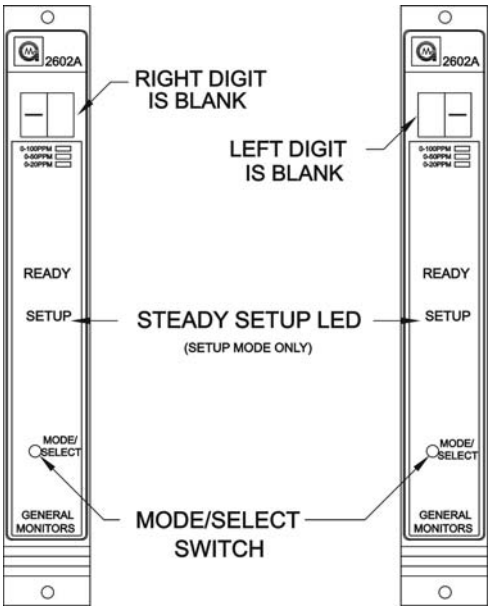

Figure 36 – Entering a New Password

When the Setup Mode is complete, the Model 2602A will automatically enter the Setup Check Mode. This allows the operator to view the newly selected options. The unit will return to normal operation after completing the Setup Mode and the Setup Check Mode.

5.5 Inhibit Mode

Whenever the **Inhibit** Mode is entered (see section 5.2), the **A1** and **A2** rear terminal alarm outputs are inhibited. The front panel A1 and A2 LED's will still function normally in cases where sufficient UV/IR radiation is present. If the password option is disabled, or after the correct password ahs been entered, the display will indicate **In** for five seconds (figure 15 on page 19). Pressing the Mode/Select switch while **In** is displayed, will cause the unit to enter the Inhibit mode by inhibiting the alarm outputs. After the Model 2602A has entered the Inhibit mode, pressing the Mode/Select switch causes the unit to return to normal operation. If it is desired to enter the Setup Mode, do not press the Mode/Select switch for the five seconds that **In** is displayed.

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 the **Inhibit** Mode.

While the unit is in the **Inhibit** Mode, the display will indicate **IN** for 5 seconds, and then be blank for 5 seconds. This sequence will repeat for as long as the unit is in the Inhibit mode.

The **Inhibit** Mode is provided so that the operation of the Model 2602A can be verified without tripping external devices that are connected to the **A1** and **A2** outputs. This type of verification usually occurs during “Initial Start-Up” and/or “Commissioning”

5.6 Setup Mode Selection Block Diagram

This section is provided to aid the operator in making selections during the 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 2602A. The blocks shown below indicate the order of options in the **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 5.3/5.4 of this Manual.

Password	Enter the Password, if the Password is enabled.	
Inhibit Mode	Enter the Inhibit Mode, if desired.	ENTER SELECTION
A2 Alarm Options	Set the Energized (**En**) / De-Energized (**dE**) Option Set the Latching (**LA**) / Non-Latching (**n**L) Option Set the A2 Alarm Set Point in parts-per-million (95 is maximum) (10 to 95ppm, in increments of 5 for 0 to 100ppm sensors) (10 to 45ppm, in increments of 5 for 0 to 50ppm sensors) (1 to 19ppm, in increments of 1 for 0 to 20ppm sensors)	_____ _____ _____
A1 Alarm Options	Set the Energized (**En**) / De-Energized (**dE**) Option Set the Latching (**LA**) / Non-Latching (**nL**) Option Set the A1 Alarm Set Point in parts-per-million (10 to 60ppm, in increments of 5 for 0 to 100ppm sensors) (10 to 45ppm, in increments of 5 for 0 to 50ppm sensors) (1 to 19ppm, in increments of 1 for 0 to 20ppm sensors) **The A1 Set Point cannot be higher than the A2 Set Point**	_____ _____ _____
Fault/Inhibit Options	Set the Fault Activate (**Ac**) or not (**nA**) during Inhibit Mode	_____
Card Test Options	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 Options	Set the Password to be Disabled (**Pd**) or Enabled (**PE**) If the Password is Enabled: Set the password digits Left _____ Right _____	_____
Setup Check Mode	After all of the options have been selected, the 2602A will enter the Setup Check Mode.	

6.0 Customer Support

6.1 General Monitors' Offices

Area	Phone/Fax/Email
UNITED STATES	
Corporate Office: 26776 Simpatica Circle Lake Forest, CA 92630	Toll Free: +1-800-446-4872 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

GM Locations

6.2 Other Sources of Help

General Monitors provides extensive documentation, white papers, and product literature for the company's complete line of safety products, many of which can be used in combination with the 2602A. Many of these documents are available online at the General Monitors website at http://www.generalmonitors.com

7.0 Sensor Assembly/Accessories

This chapter provides a description of the types of filed devices (sensors) and accessories that can be used with the Model 2602A.

7.1 Sensing Elements

A hydrogen sulphide (H_2S) specific sensor is the primary filed device for the Model 2602. General Monitors uses a proprietary Metal Oxide Semiconductor (MOS) film on the sensor for detecting the presence of H_2S gas. The MOS film is deposited on to a substrate between two electrodes (figure 37).

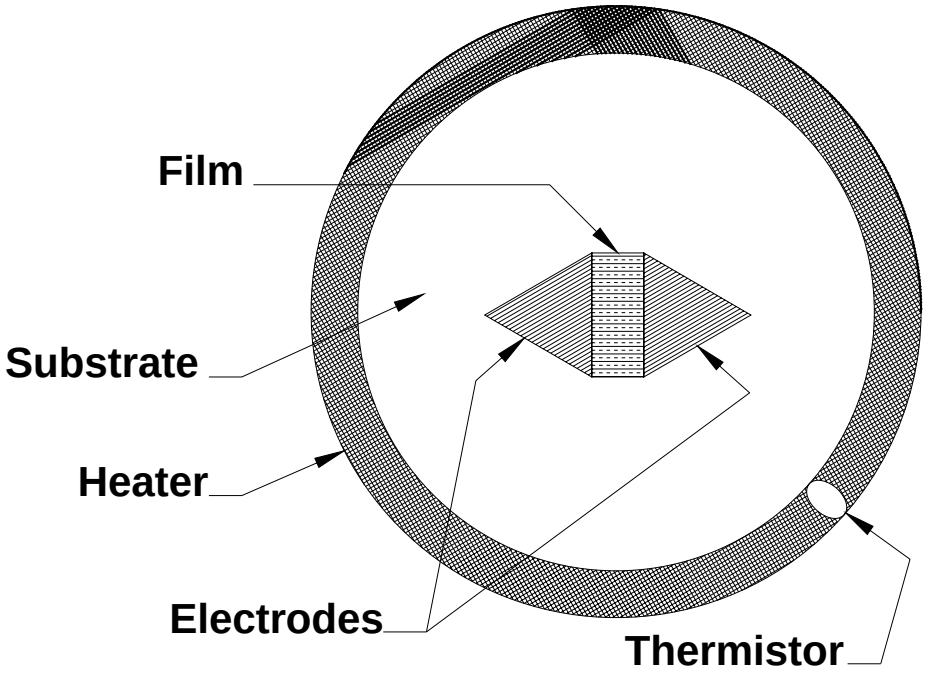

Figure 37 – MOS Sensor Diagram, Top View

With no gas present, the electrical resistance between these two electrodes is very high (in mega-ohms). As H_2S adsorbs on to the film the resistance between the electrodes decreases (to kilo-ohms). This decrease in resistance is logarithmically proportional to the concentration of H_2S that is present.

The process of H_2S adsorbing onto the MOS film is most effective at an elevated temperature. On the outer edge of the substrate is a heater ring. The temperature of this heater ring is measured with a thermistor and kept constant by a circuit located inside the body of the sensor.

As H_2S adsorbs onto the MOS film, electrons move more freely from one electrode to the other (figure 37). This is represented by a decrease in resistance. The process of H_2S adsorbing onto the MOS film is completely reversible. As the concentration of H_2S decreases (as H_2S desorbs), the resistance between the electrodes will increase.

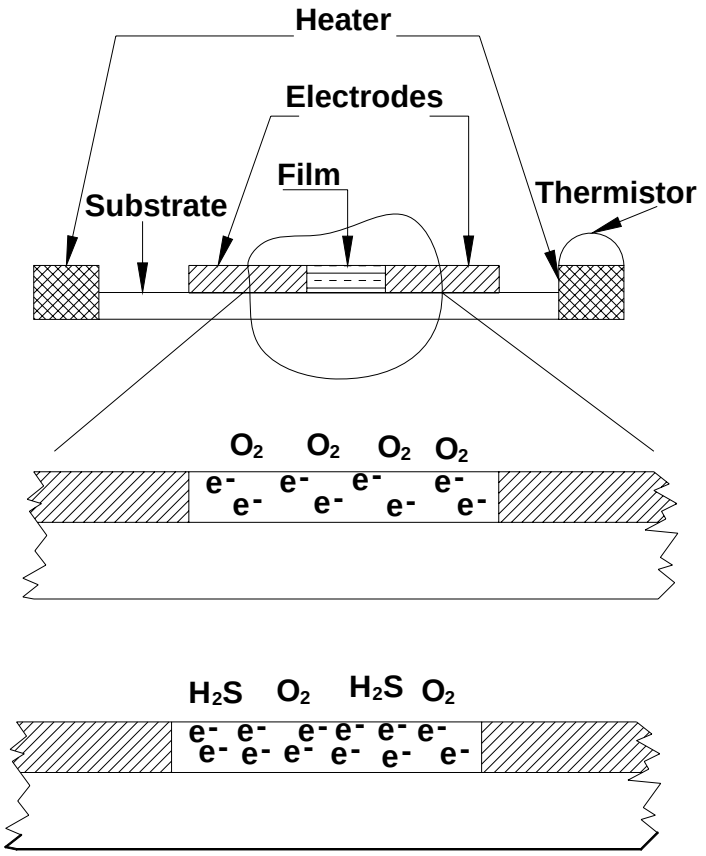

Figure 38 – MOS Sensor Cut-away, Side View

General Monitors offers a variety of hydrogen sulphide specific sensors with different detection ranges and sensor bodes.

The Red Cap, complete with desiccant, must be replaced when a sensor is off power for a prolonged period.

50454-1	0 to 100ppm, Aluminum Body, Sintered Arrestor
50454-5	0 to 50ppm, Aluminum Body, Sintered Arrestor
50454-9	0 to 20ppm, Aluminum Body, Sintered Arrestor
50475-1	0 to 100ppm, Stainless Steel Body, Sintered Arrestor
50457-5	0 to 50ppm, Stainless Steel Body, Sintered Arrestor
50457-9	0 to 20ppm, Stainless Steel Body, Sintered Arrestor
51457-1	0 to 100ppm, Universal Sensor, Stainless Steel Body, Sintered Arrestor
51457-5	0 to 50ppm, Universal Sensor, Stainless Steel Body, Sintered Arrestor
51457-9	0 to 20ppm, Universal Sensor, Stainless Steel Body, Sintered Arrestor

7.2 Sensor Housing

General Monitors offers a variety of housings that is rated for use in hazardous locations (see figure 39).

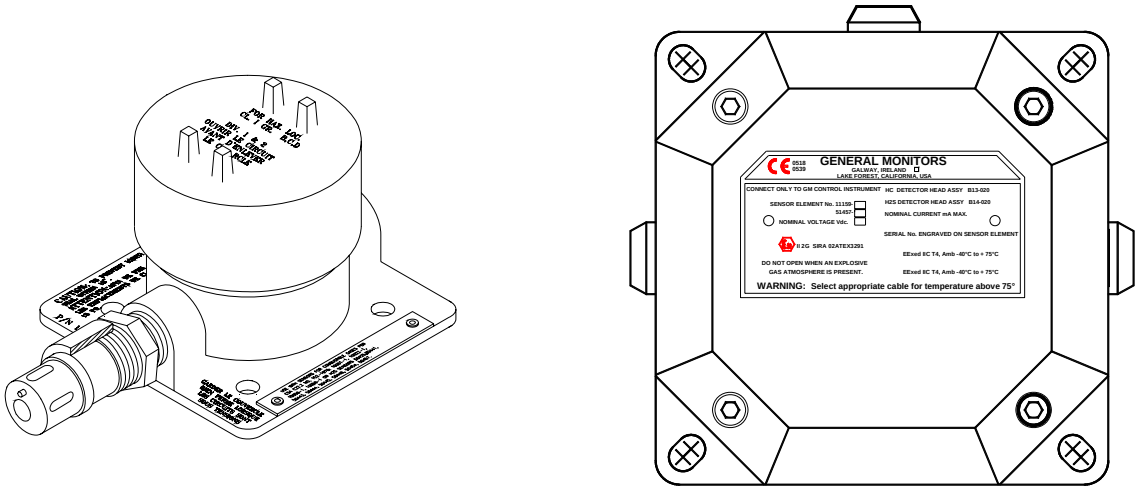

Figure 39 – Universal Sensor Housings

Housing entries are tapped and threaded

7.3 Splash-Guard

General Monitors produces a universal Splash-Guard, P/N 10395-1, that has been designed for use on all General Monitor's combustible gas and hydrogen sulfide gas sensors (Figure 40).

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 is also threaded for simple screw-on installation. The Splash-Guard is recommended for outside applications where rain or frequent hose downs occur, such as offshore platforms.
Sensor response is essentially not affected by this splash guard.

Figure 40 – Splash Guard

7.4 Dust Guard Assembly

The Dust Guard Assembly (Figure 67) 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. When the dust guard is installed, this problem is eliminated and sensor response is unchanged.

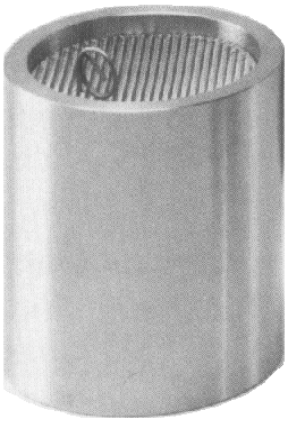

Figure 41 – Dust Guard

The Dust Guard is also available in a kit with twelve replaceable screens (Figure 42). It can also be used as an effective windscreen, and is recommended for corrosive, windy or high temperature environments.

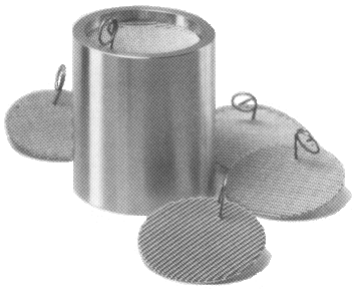

Figure 42 – Dust Guard Assembly Kit

Safety Warning

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

7.5 Duct Mounting Plates

General Monitors produces a Duct Mounting Plate (P/N 10041-1 & 2) for applications that require the sensor to be mounted in air-conditioning or heating duct. The Duct Mounting Plate is easy to install (Figure 43). Dash 2 version has sensor installed on other side of cover.

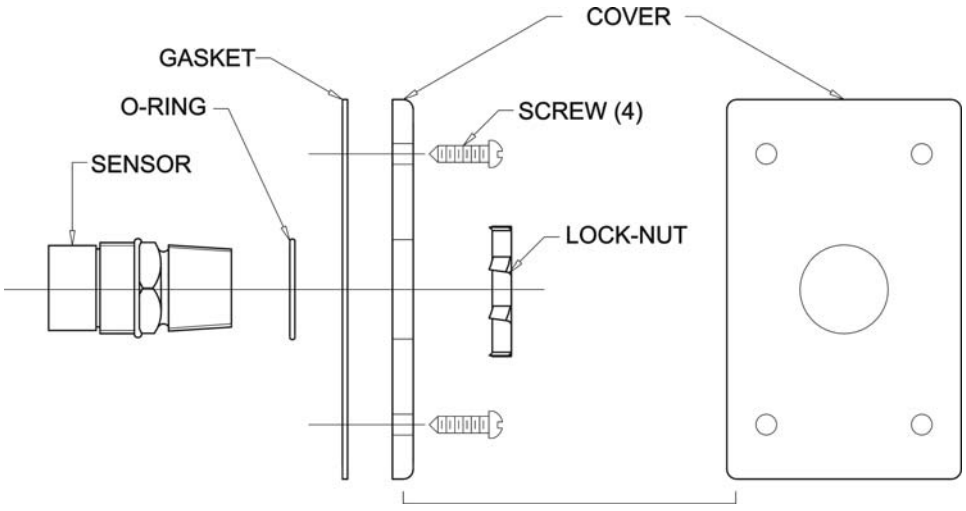

Figure 43 – Duct Mounting Plate

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.

7.6 Calibration Equipment

General Monitors 2602A uses a Breaker Bottle (Calibration Jar) and Ampoules to accomplish calibration.
The calibration procedure and the use of the Breaker Bottle and Ampoules are explained in section 5.2 & 5.3 on page 17 through 20 of this Manual. The Portable Flow Calibrator of hydrogen sulphide gas applications is an alternative piece of calibration equipment for use in special applications.

General Monitors recommends using Ampoules for calibrating H_2S gas detection instruments. The Portable Flow Calibrator is available for applications where a calibration method of flowing H_2S gas to the sensor might provide a better calibration source (e.g. high humidity environments).

The procedure for using the Portable Flow Calibrator is explained in section 5.2 and 5.3 on pages 18 and 19 of this instruction manual.

The following items are a list of calibration equipment and part numbers.

Description	**Part No.**
4ppm Ampoules	50004-25
5ppm Ampoules	50004-11
20ppm Ampoules	50004-9
25ppm Ampoules	50004-21
50ppm Ampoules	50004-13
100ppm Ampoules	50004-5
Breaker (Cal) Jar	COO-000

Ampoules are packed in boxes of 25

10ppm Flow Calibrator Assy	1400250-1
20ppm Flow Calibrator Assy	1400250-2
25ppm Flow Calibrator Assy	1400250-3
35ppm Flow Calibrator Assy	1400250-4
50ppm Flow Calibrator Assy	1400250-5
70ppm Flow Calibrator Assy	1400250-6
100ppm Flow Calibrator Assy	1400250-7
10ppm Replacement Cylinder	1400255-1
20ppm Replacement Cylinder	1400255-2
25ppm Replacement Cylinder	1400255-3
35ppm Replacement Cylinder	1400255-4
50ppm Replacement Cylinder	1400255-5
70ppm Replacement Cylinder	1400255-6
100ppm Replacement Cylinder	1400255-7
Case (holds two cylinders)	914-135
Regulator (200ml flow rate)	922-016
Teflon Hose	925-430
Cup with Screen	1400152
Cable Tie	960-331

Glossary of Terms

Adsorb – To use the physical and chemical property of a solid surface to take and hold molecules of gas, not to be confused with Absorb.

Analogue – Continuous, without steps.

Ambient Temperature – Surrounding or background Temperature

AWG – American Wire Gauge

Calibration – Applying a known level of gas to a sensor and making adjustments so that the output signal matches the level of applied gas.

Canadian Standards Association – CSA is an approval agency. Testing laboratories will test Gas Detection Instruments to the standards set by approval agencies such as CSA. CSA certification is required for selling such equipment in Canada. CSA standards are recognized by many organizations outside Canada.

Class I, Division 1 – This is a National Electric Code (NEC)(in North America) classification dealing with hazardous locations and the degree with which the hazard is present. Class I, Division 1 is defined as any location where ignitable concentrations of flammable gases or vapours may be present under normal operating conditions. For more information on hazardous locations, refer to the NEC Handbook, Article 500.

COM – Common

DC – Direct Current

Desorb – To free from an adsorbed state, reverse the adsorption process

Digital – Stepped in specific increments.

Diffusion – A process by which molecules or other particles intermingle as a result of random thermal motion.

Drain Loop – The purpose of a drain loop is to collect condensation so as to prevent moisture from entering the housing.

EEPROM – Electrically Erasable Programmable Read Only Memory.

FMRC – Factory Mutual Research Corporation

Group B – Atmospheres containing more than 30% Hydrogen or gases/vapours of equivalent hazard.

Group C – Atmospheres such as cyclopropane, ethyl ether, ethylene, or gases/vapours of equivalent hazard.

Group D – Atmospheres such as acetone, ammonia, benzene, butane, ethanol, gasoline, hexane, methanol, methane, natural gas, naptha, propane, or gases/vapours of equivalent hazard.

H_2S – Hydrogen Sulphide

Halogen Free Solvent – Solvent that does not contain any of the following: astatine, bromine, chlorine, fluorine, or iodine.

mA – Milliampere, one thousandth (.001) of an amp.

Microprocessor Base Electronics – All of the input signal processing, fault monitoring, calibrating routines, setup routines, and the outputs are under the control of a microprocessor unit (MPU)

MOS – Metal Oxide Semiconductor

MV – Millivolt, one thousandth of a volt.

PCB – Printed Circuit Board

PLC – Programmable Logic Controller

Potentiometer – An adjustable resistor

PPM or ppm – Parts per million

T50 – Amount of time it takes sensor to read 50% of final reading.

TB – Terminal block.

Engineering Documentation

Outline & Terminal Connections

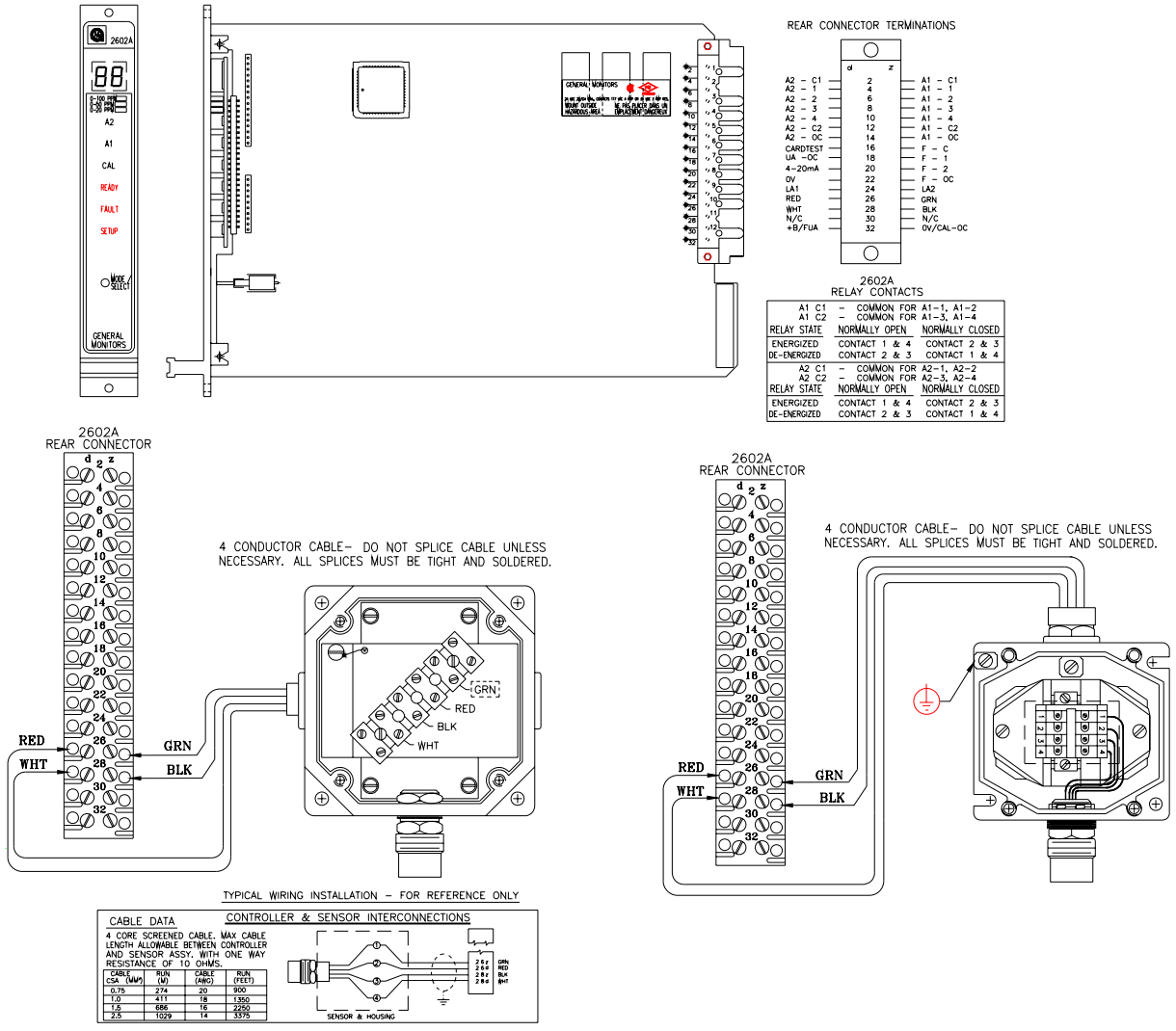

Figure 44 – Outline & Terminal Connections

Final Assembly Drawing

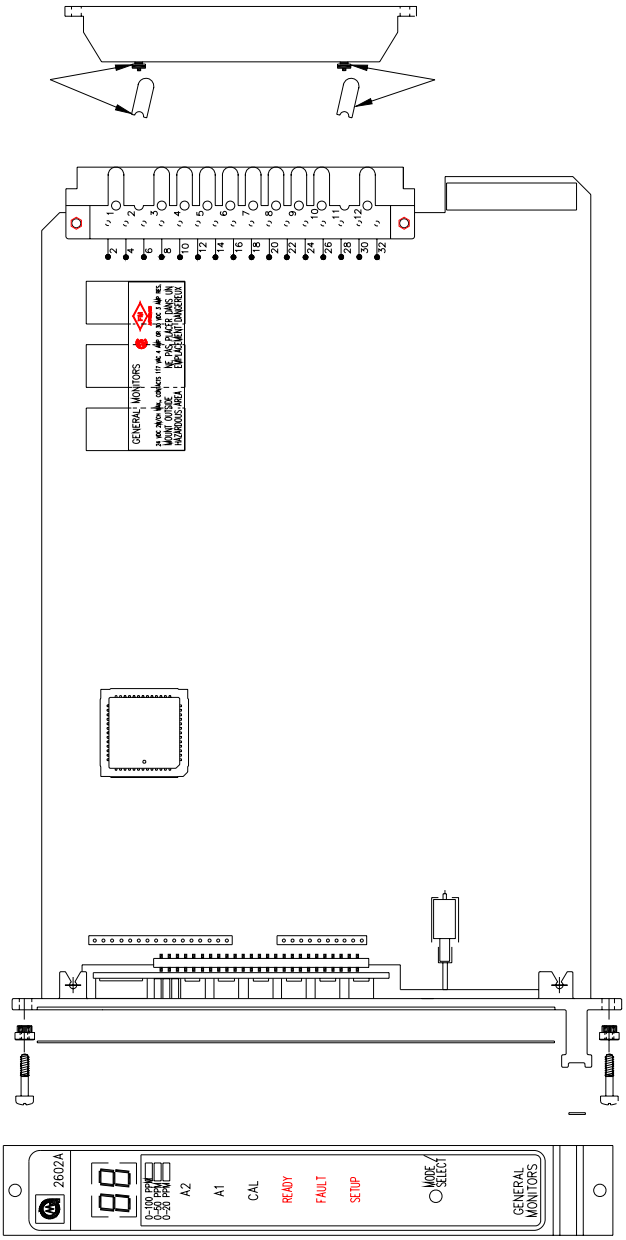

Figure 45 – Final Assembly

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 TA502A – 3 DIGIT
Zero Two Series 3 Digit A flexible multipurpose module for a variety of GM products.

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 Callpoints, Smoke & Thermal Detectors

Model PS002*
Zero Two Series Power Supply Module for Zero Two Systems

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

Customer Satisfaction Questionnaire

Attention Field Operations:

We would appreciate your help in assessing and thus improving the quality of our Equipment and Service and would therefore be grateful if you would complete the Questionnaire below and return it to:

General Monitors Ireland Ltd,
Ballybrit Business Park,
Galway,
Republic of Ireland.

Thank you for your assistance

Client _____

Client Order No. _____

General Monitors Sales Order No. _____

(Please tick appropriate box)	Yes	No
1. Was the equipment the correct option?	☐	☐
2. Are sensors correct type and range?	☐	☐
3. Is mechanical assembly good? (everything proper fit and tight)	☐	☐
4. Did you receive the necessary accessories to commission the equipment?	☐	☐
5. Has the equipment been commissioned?	☐	☐
6. Any problems encountered during commissioning?	☐	☐
7. Is the equipment functioning correctly at present?	☐	☐

If you have answered **NO** to any of the above, please provide further details overleaf. **Thank you.**

Completed by: _____ Date: _____