Model 2602

Zero Two Series Control Module
for Hydrogen Sulfide Gas
Applications

Instruction Manual 11/95

Part No. MAN2602A
Revision D/11-95

D/11-95

Warranty Statement

General Monitors warrants the *Model 2602* 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 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 SULFIDE 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 2602. Any attempt to use a sensor that has not been designed by General Monitors will void the warranty.
- **SAFETY 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 2602 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.

- **IMPORTANT: 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 an hour.**

C/08-95

Page Number

Illustrations

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

1.1 General Description

The General Monitors Model 2602 (see figure 1) is a single channel Hydrogen Sulfide 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 Sulfide Gas.

The Model 2602 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 "2602" in the upper right corner of the front panel. The Model 2602 is designed for use in non-hazardous environments.

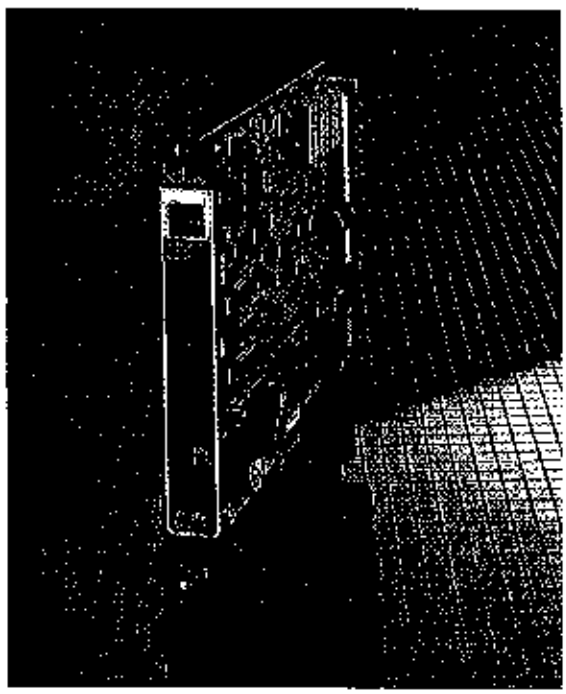


Figure 1

1.2 Features & Benefits

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

Microprocessor Based Electronics: monitors fault conditions, sensor inputs and provides outputs in the form of display codes, analog 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 the 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 back lit LED and each segment of the digital display on the front panel.

Card Test: test 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 2602 is a Hydrogen Sulfide 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
- Mud-logging operations
- Sulfur recovery plants
- Desulfurization facilities
- Sewage disposal/treatment plants
- Chemical plants

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

2.1 System Specifications

Application: Hydrogen Sulfide (H_2S) gas detection.

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

Typical Sensor Life: 2 to 6 years in normal service.

Measuring Ranges (*in parts-per-million*):

0 to 99 ppm, 0 to 50 ppm or 0 to 20 ppm

Approvals: CSA certified, FM approval is pending.

Warranty: Two Years.

Accuracy: ±2ppm or ±10% of applied gas, whichever is greater at ambient conditions.

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 a 21 day period.

Response Times: T50 ≤ 1 minute with full scale concentration applied to sensors with wire screen flame arrestors. T50 ≤ 2 minute 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 Requirements: 20 to 35 Vdc @ 200mA max. (24 Vdc, 4.8W nominal).

Electrical Classification: The Sensor is rated for use in Class I, Division 1, Groups B, C & D. The Model 2602 is 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/INH, LA1 & LA2.

Cable Parameters: Recommended 4 wire shielded, maximum cable lengths allowable between module and sensor with one way resistance of 10 Ohms on black and white sensor leads (20 Ohms loop resistance on black and white sensor leads) @ 24Vdc nominal:

AWG	Feet	Meters
14	3375	1029
16	2250	686
18	1350	411
20	900	274

Cable Parameters (*continued*)

The maximum allowable cable lengths between the analog output connections and 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

2.4 Environment Specifications

Operating Temperature Range:

Sensor -40°F to +140°F
-40°C to +60°C

2602 0°F to +150°F
-18°C to +66°C

Storage Temperature Range:

Sensor -67°F to +185°F
-55°C to +85°C

2602 -40°F to +150°F
-40°C to +66°C

Operating Humidity Range:

5% to 100% Relative Humidity, non-condensing

2.5 Engineering Specifications

Zero Two System - Each system shall utilize modules capable of monitoring gas sensing elements or a 0 to 21.7mA analog signal from gas or flame detection transmitters. The system chassis shall be available in 4, 8 and 16 channels. Each chassis shall contain a bus for the following independent signals: A1 Alarm, A2 Alarm, Fault, Master Reset, Master Accept, Unaccept, CAL/INH, +24Vdc and 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 in Lake Forest, California, U.S.A. or General Monitors, Galway, Republic of Ireland.

2602 Control Module - The control module, with sensor, shall meet the performance requirements of ISA S12.15 Part I, 1990 and be capable of monitoring 0 to 99 parts per million (ppm), 0 to 50 ppm or 0 to 20 ppm of hydrogen sulfide gas. The control module shall have an interface panel, providing a mode/select switch and the following indications: 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 sensor range indicator. All parameters and user options shall be software selectable. A functional card test and a front panel LED test shall be switch capable without interrupting normal on line services. The control module shall be capable of insertion and removal during power ON conditions without damaging any component or module

Engineering Specifications (*continued*)

in the system. The control module will generate display codes associated with fault conditions whenever a fault or malfunction occurs. A mode/select switch shall provide the operator front panel access to a calibration mode, a calibration check mode, a setup mode, a setup check mode and an inhibit mode. The control module, with sensor shall be 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 shall have a password protected setup routine capable of having the password disabled.

C/08-95

This chapter discusses what to do when a Model 2602 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 2602 is completely checked at the factory, however, a complete check-out 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 unmounted, 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 below).

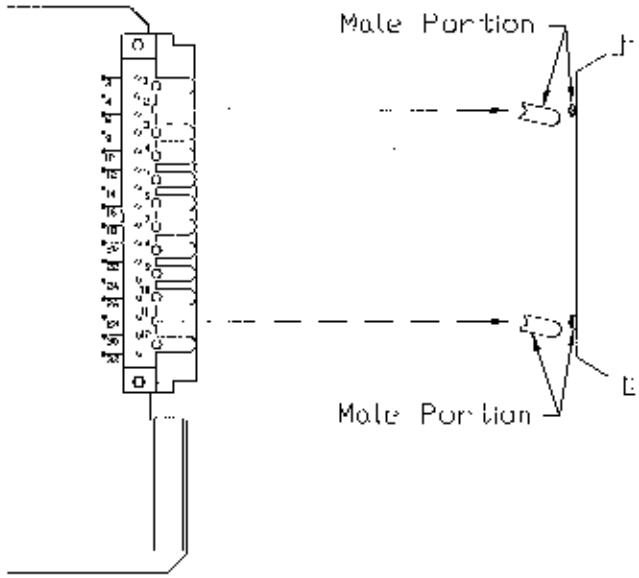


Figure 2

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 Model 2602 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 the figure below.

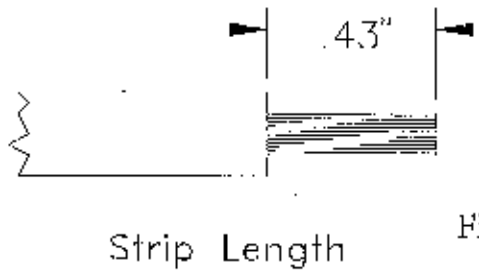


Figure 3

Rear Terminal Connections (*continued*)

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 2602, loosen the desired screw, insert the stripped end of the wire and tighten.

For the rear terminal designations refer to figure 4 below:

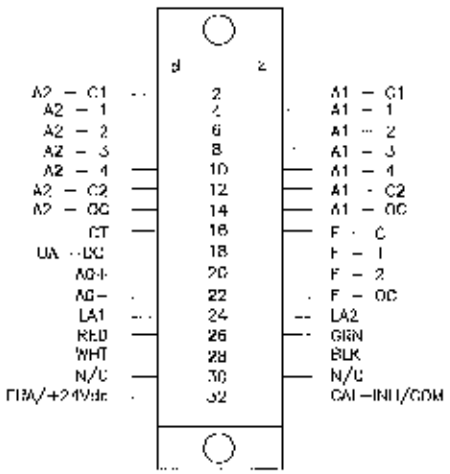


Figure 4

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

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 (see 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

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

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 (see chapter 5). The table at the top of page 9 refers to the proper open and closed A1 alarm relay contacts while the unit is on power.

C/08-95

Rear Terminal Connections (*continued*)

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. If the Backwards 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 @ 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. Figures 5 & 6 show relay protection circuits that are recommended for AC and DC loads.

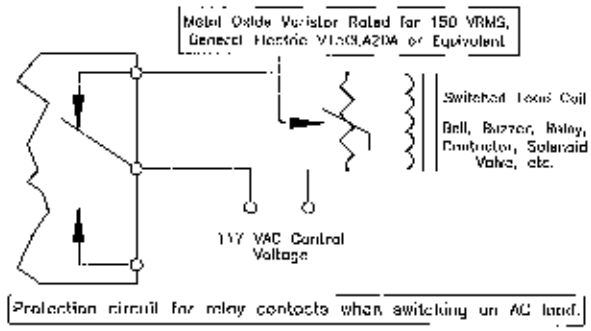


Figure 5

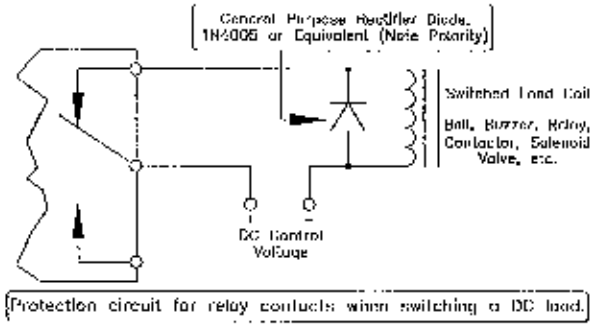


Figure 6

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

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

If the Backwards Compatible configuration is ordered, the CAL/INH output will not be present (pin 32z will be for COM).

The electrical rating for all open collector outputs is 100mA @ 35 Vdc. Figure 7 illustrates some typical open collector external circuits.

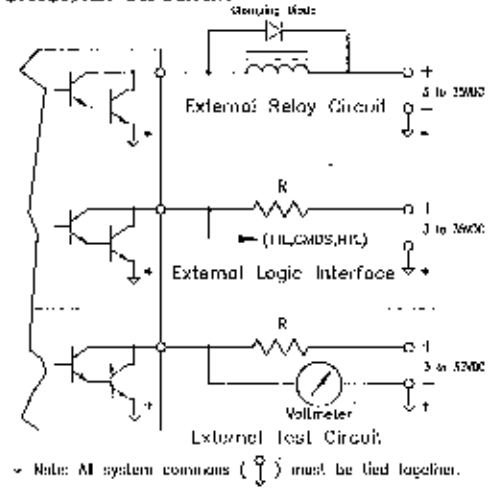


Figure 7

Rear Terminal Connections (*continued*)

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.

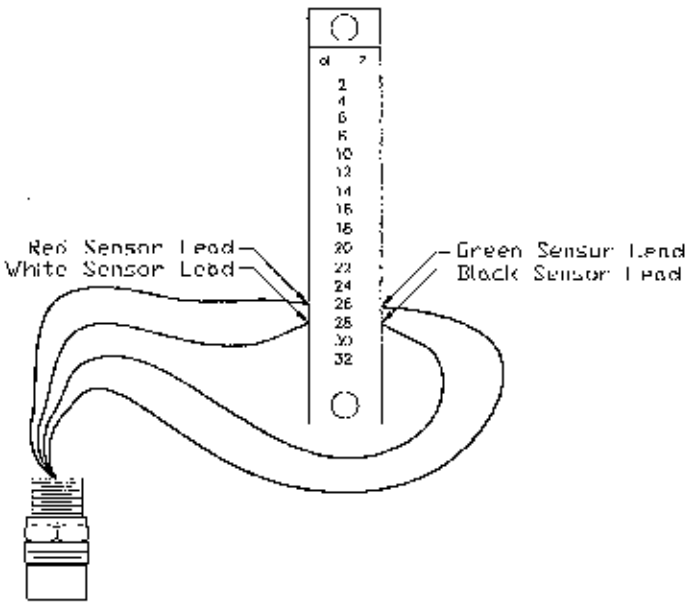


Figure 8

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 and 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.

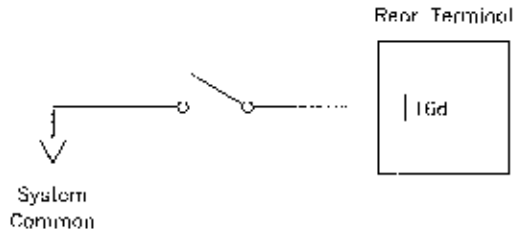


Figure 9

The terminal designations for the Analog Output Signal are:

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

If the Analog Signal is not used a jumper must be placed between 20d & 22d.

Figure 10 is a diagram of the Analog Signal connections.

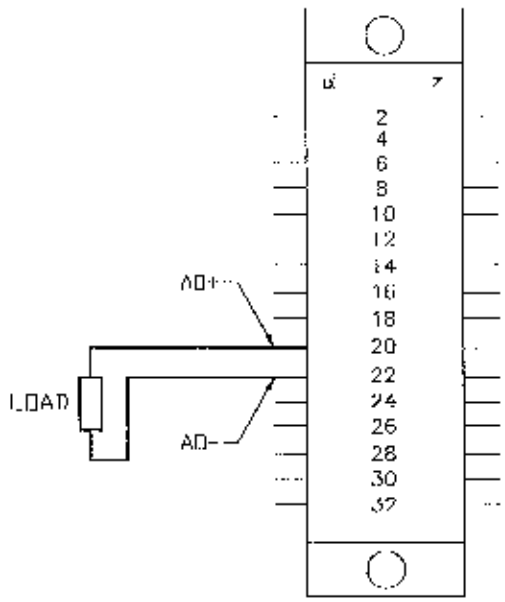


Figure 10

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.

Generally:

- The sensor should be easily accessible for calibration checks. Ensure that sufficient clearance exists to allow the use of field calibration devices such as a Breaker Bottle with Ampoules or a Portable Purge Calibrator for hydrogen sulfide applications.
- The sensor head should always be pointing down to prevent water build up on the sensing element. Remember that hydrogen sulfide gas is 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 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, Cl_2, Br_2, I_2)
- Glycol
- 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 reponse.

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 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.

IMPORTANT: 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 this cap and RE-CAP the sensor anytime system power is off for more than an hour.

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 24 Vdc. 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.

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

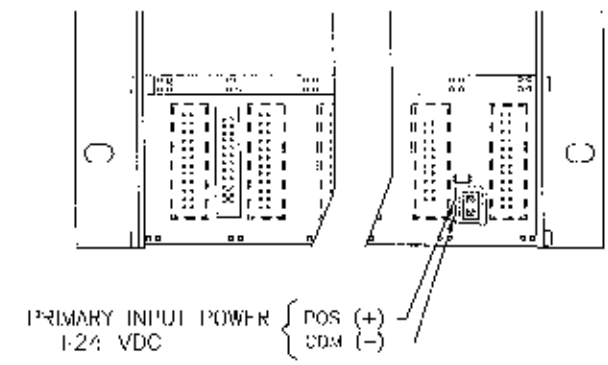


Figure 11

NOTE: If the application of power does not turn ON the Model 2602, check fuse F1 on the control board.

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 2602 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.
- SAFETY WARNING: Installation and Maintenance must be carried out by suitably skilled and competent personnel only.

4.2 Electrical Inputs

There are two electrical inputs to the Model 2602. They are the General Monitors MOS Sensor (field device) and the 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 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 2602's functions. For detailed information on the Card Test, refer to figure 9 on page 10 of this manual.

4.3 Electrical Outputs

The electrical outputs on the Model 2602 consist of relay contacts, open collectors and an analog current signal.

- The following outputs have 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 2602 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, Cal/Cal Check/Setup/Setup Check/Inhibit Modes

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

100mA @ 35Vdc

Electrical Outputs (*continued*)

- 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 Model 2602 is placed in the calibration mode, calibration check mode, setup mode or setup check mode, the analog signal drops to 1.5mA. During the calibration mode the digital display will indicate prompts associated with the calibration procedure. During the calibration check mode the digital display will show the gas concentration with a flashing pair of digits. During the setup and setup check modes the options will be displayed.

  When the Model 2602 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 2602 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) will begin to flash. In addition, the associated alarm outputs and the unaccept outputs (2602, UA open collector & FM002, 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 (see 4.5 of this chapter).

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 unaccept outputs will reflash 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 with 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. If the operator presses the accept button the front of the Facilities Module (FM002), the FUA output will de-energize and the Fault LED will stop flashing, but 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, whereas a latched alarm output will need to be reset manually.

Resetting latched alarm outputs is accomplished with the Master Reset Button located on the Facilities Module (FM002). 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 of this chapter).

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.

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 LEDs and LED segments in the digital Display will illuminate for as long as the operator presses the button. This is called the LED Test.

4.6 CAL/INH Open Collector

There is an open collector that will energize anytime the unit is put in the Calibration, the Calibration Check or 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.

4.7 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 on page 10).

To activate the Card Test feature, simply press and hold the switch. The front panel LEDs and digital display will begin ramping up at the start of the card test and will continue to ramp up for the software selectable ramp time specified by the operator (3 or 10 seconds) during the Setup Mode (see section 5.4). Each alarm level (A1 & A2) will trip when the alarm setpoint is exceeded.

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. The analog output signal will ramp from 4 to 20mA during the test if the alarms are active. 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 2602 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 on this page.

- **F1** - Open analog output signal. Check connection 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 5 minutes. Press the Mode/Select switch to clear the fault. 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 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 short 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 can not 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 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.

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 (FM002) will acknowledge the fault, de-activate the FUA output and the fault LED will stop flashing and remain **ON** until the fault is corrected.

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 2602 in the performance of its various functions. User interfaces consist of (figure 12):

- The digital display provides the user with the gas concentration at the sensor site, fault diagnostic codes, calibration prompts and setup parameters.
- The sensor range is indicated by the illuminated LED located beneath the digital display.
- 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.

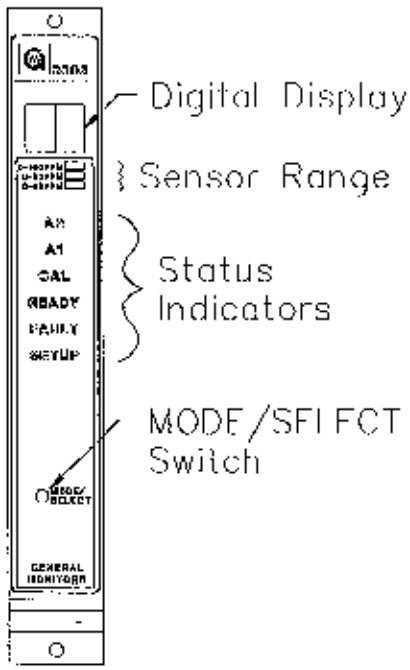


Figure 12

5.2 Calibration Check Mode

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

- Place an H_2S ampoule (50% of scale is recommended) into a breaker bottle and place the breaker bottle over the sensor (figure 13).

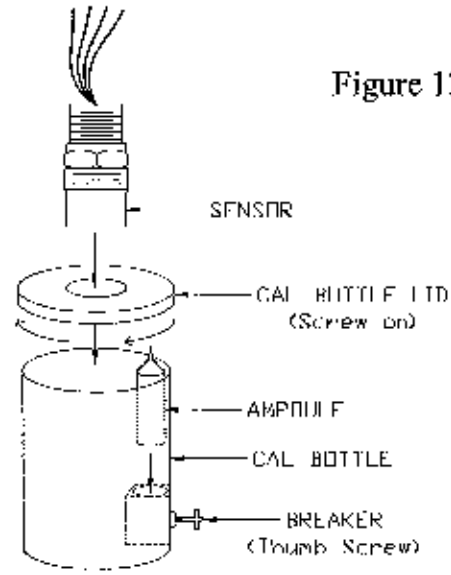


Figure 13

- 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 14).

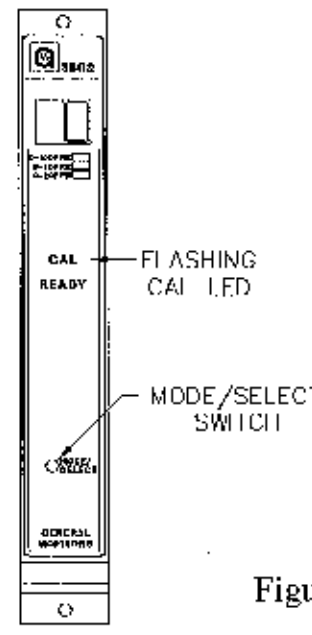


Figure 14

Calibration Check Mode (*continued*)

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

If the Portable Purge Calibrator for Hydrogen Sulfide Applications is used, modify this procedure as follows:

1. Before placing the unit in the CAL Check Mode, make sure the Portable Purge Calibrator contains a gas concentration that does not exceed full scale for the sensor.
2. Place the unit in the CAL Check Mode per the instructions on page 17 of this instruction manual (figure 14).
3. Place the cup attached to the Portable Purge cylinder over the sensor and follow the rest of the procedure.

- Apply the test gas to the sensor (break the ampoule or turn the regulator knob ON) 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.
- If the sensor does see the gas the read-out on the display will be flashing until the gas concentration drops below 5% of full scale. If the sensor continues to see the calibration check gas for twelve minutes, an **F9** fault will be displayed.
- 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 concentration is 50% of full scale, place the unit in the calibration mode by pressing the Mode/Select switch or

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

5.3 Calibration Mode

To calibrate the Model 2602, follow the procedure listed below.

- Make sure the sensor is seeing clean air.
- Place an H_2S ampoule (50% of scale is recommended) into a breaker bottle and place the breaker bottle over the sensor (figure 15).

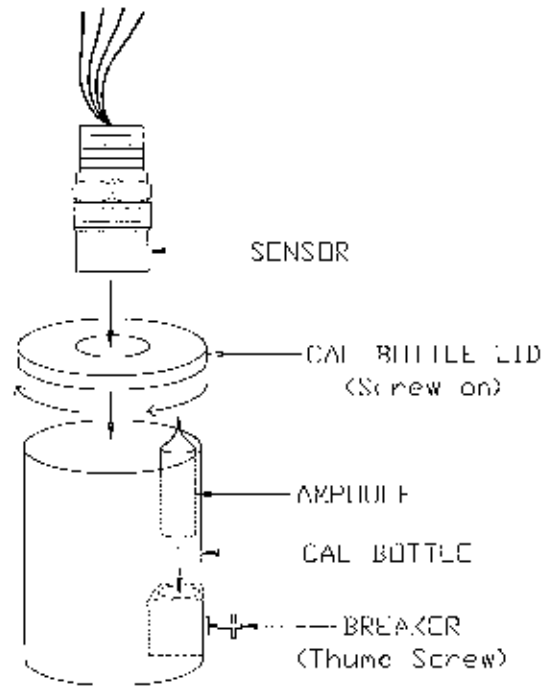


Figure 15

Calibration Mode (*continued*)

- 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 16).

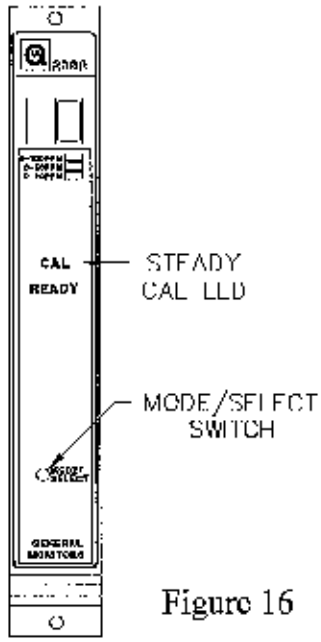


Figure 16

- 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 17).

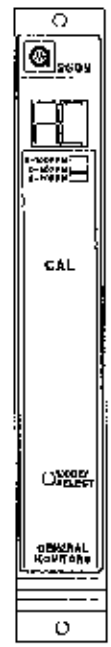


Figure 17

NOTE: If the Portable Purge Calibrator for Hydrogen Sulfide Applications is used, modify this procedure as listed at the top of this page (right column).

1. Before placing the unit in the CAL Mode, make sure the gas concentration of the Portable Purge Calibrator equals 50% of full scale for the sensor being calibrated.
2. Place the unit in the CAL Mode per the instructions on pages 18 & 19 of this instruction manual (figure 16).
3. Place the cup attached to the Portable Purge cylinder over the sensor and follow the rest of the procedure.

- Break the Ampoule or turn ON the regulator knob and watch the display change from **AC** to **CP** as the sensor sees gas (figure 18).

  If the display does not change from **AC** to **CP** after six minutes, the Model 2602 will display an **F2** fault code. After 90 seconds the user can abort.

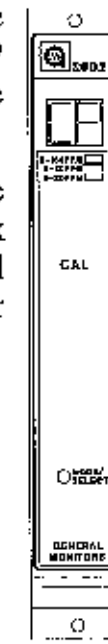
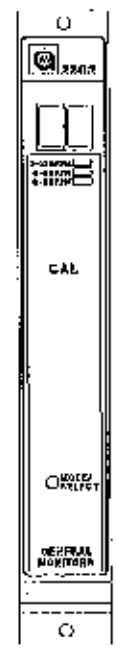


Figure 18



- Wait for the display to change from **CP** to **CC** when the calibration routine is complete (about 2 minutes, figure 19). If the display does not change from **CP** to **CC** after six minutes, the Model 2602 will indicate a fault condition (**F2**). Attempt another calibration.

Figure 19

Calibration Mode (*continued*)

- 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 2602 will display an **F7** fault code (EEPROM verification failure, figure 20). If an **F7** calibration fault occurs, it will be necessary to replace the Model 2602.

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

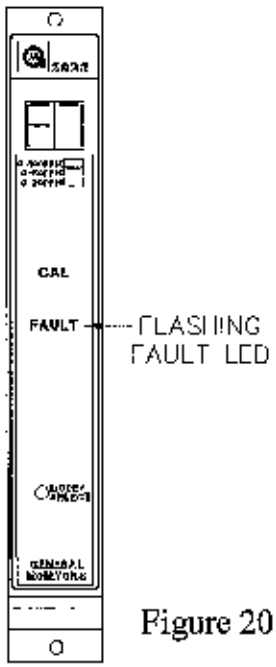


Figure 20

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. 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 2602, whereas the Setup Mode allows the user to change the operating parameters of the Model 2602.
- 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 on page 26 of this manual. This will aid the user during the selection process in the Setup Mode.

The Password and the A1 & A2 Alarm set point 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.

Setup Check & Setup Modes (*continued*)

To Enter the Setup Check Mode or the Setup 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 21). 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 21).

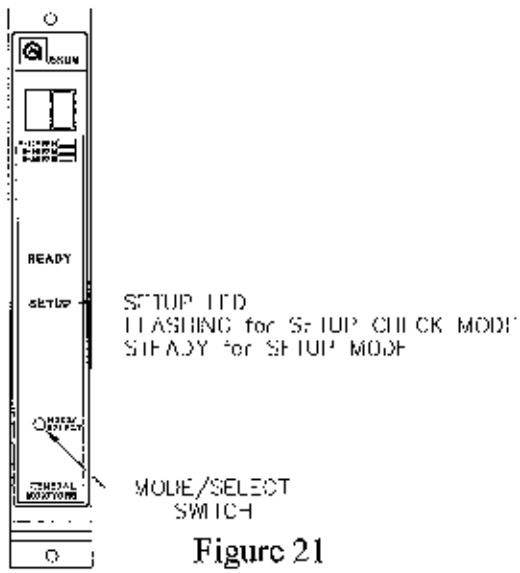


Figure 21

- **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 bar (-) will appear in the left digit on the display (figure 22). Press the Mode/Select switch until the correct number is displayed, then wait about five seconds.

The left digit of the display will be blank and a bar (-) will appear in the right digit on the display (figure 22). Press the Mode/Select switch until the correct number is displayed, then wait about five seconds. If the password is correct the user will proceed with 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**.

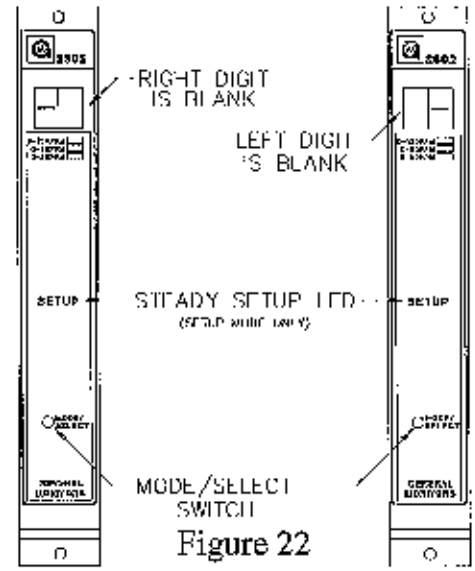


Figure 22

- **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 23). 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 unit has entered the Inhibit mode, the Model 2602 will 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.

Setup Check & Setup Modes (*continued*)

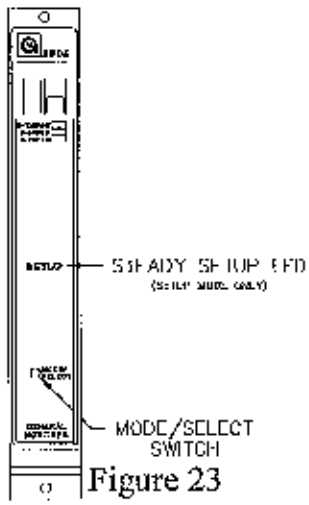


Figure 23

- After the Password and Inhibit mode, the **A2** LED on the front panel will be flashing while the Energized/De-energized option is displayed (figure 24). 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.

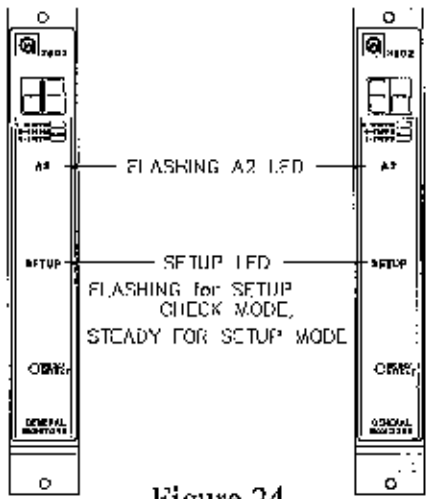


Figure 24

- The **A2** LED on the front panel will be flashing while the latching/non-latching option is displayed (figure 25). 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.

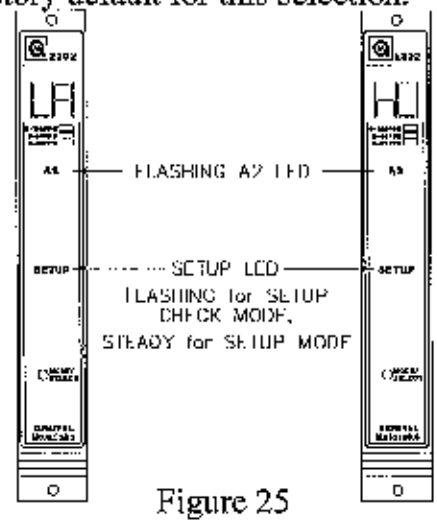


Figure 25

- 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 will indicate the current A2 alarm set point (figure 26). Press the Mode/Select switch repeatedly, until the desired A2 alarm set point appears on the display. **60** is the factory default for 0 to 99ppm scale for this selection. The default for 0 to 50ppm is 30 and for 0 to 20ppm the default is 10.

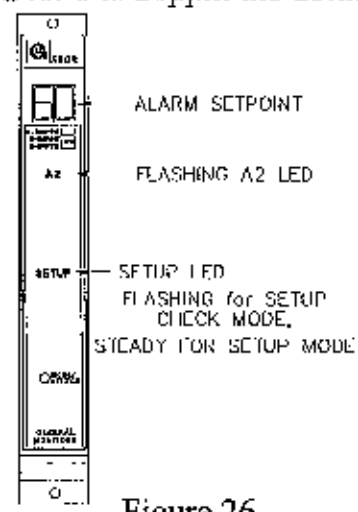


Figure 26

Setup Check & Setup Modes (*continued*)

- Next, the **A1** LED on the front panel will be flashing and the Energized (En), De-energized (dE) option will be displayed (figure 27). 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.

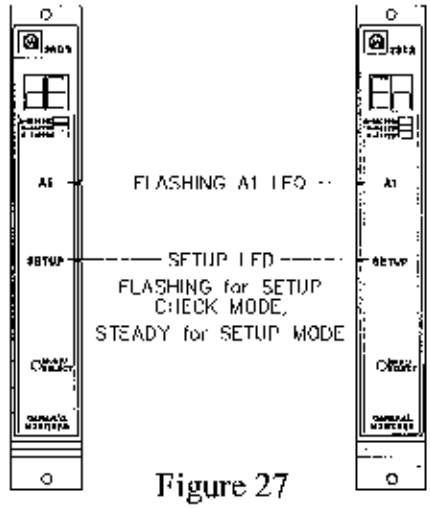


Figure 27

- The **A1** LED on the front panel will be flashing while the latching/non-latching option is displayed (figure 28). The display will indicate the current selection, (**nL** or **LA**). Press the Mode/Select switch until the desired option is displayed. Non-Latching is the factory default for this selection.

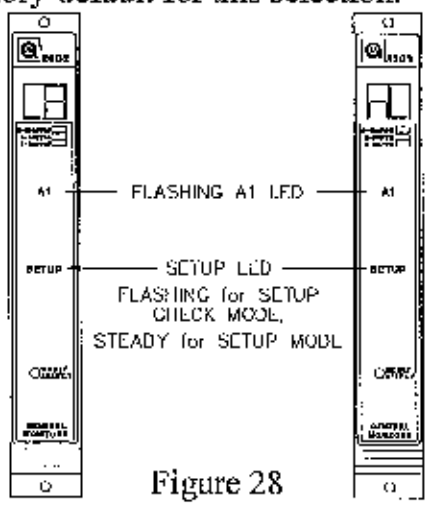


Figure 28

- 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 29). Press the Mode/Select switch repeatedly, until the desired A1 alarm set point appears on the display. **30** is the factory default for 0 to 99ppm scale for this selection. The default for 0 to 50ppm is 15 and for 0 to 20ppm the default is 5.

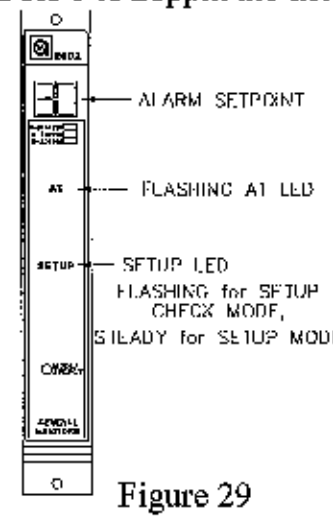


Figure 29

- Next, 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 30). An **Ac** selection specifies that the Model 2602 will activate the Fault circuit while the unit is in the Inhibit Mode. An **nA** selection specifies that the Model 2602 will not activate its Fault circuit when the unit is placed in the Inhibit Mode. An **nA** selection will not disable the Fault circuit, therefore, if a Fault occurs during the Inhibit Mode, the unit will activate the Fault circuit. Press the Mode/Select switch until the desired option is displayed. Not Active is the factory default for this selection.

Setup Check & Setup Modes *(continued)*

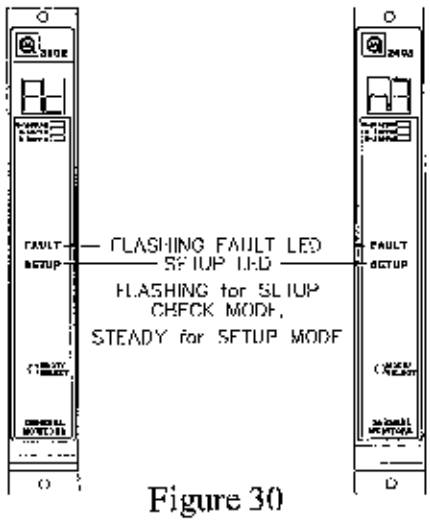


Figure 30

- 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 31) followed by the ramp up time (**3** or **10**) during the card test (figure 32). Press the Mode/Select switch until the desired option is displayed. **3** is the factory default for this selection.

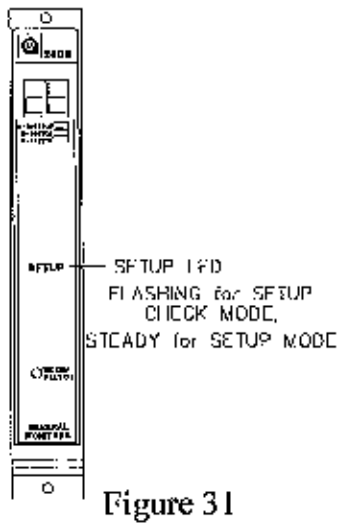


Figure 31

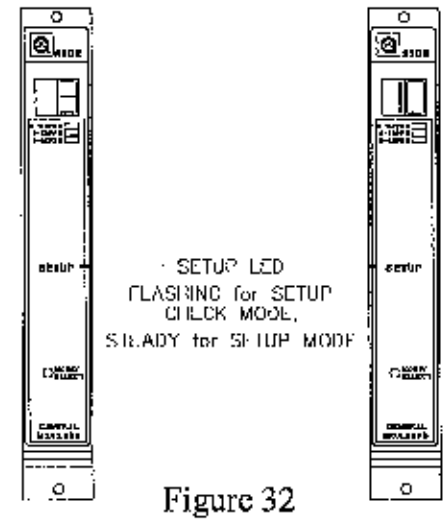


Figure 32

- Next, the display will indicate the alarm output option during a Card Test as either **Ac**, active or **nA**, not active. (figure 33). Press the Mode/Select switch until the desired option is displayed. Not Active is the factory default for this selection.

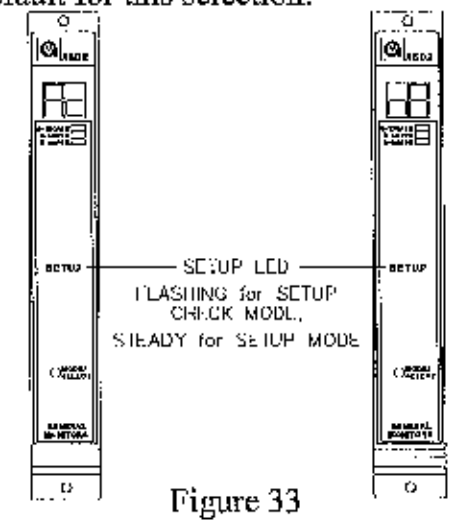


Figure 33

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.*

D/11-95

Setup Check & Setup Modes (*continued*)

- Once the Card Test options have been selected, the user will either enable or disable the password option (figure 34). The display will indicate either **PE**, for enabled or **Pd**, for disabled. Press the Mode/Select switch until the desired option is displayed. Password Disabled is the factory default for this selection.

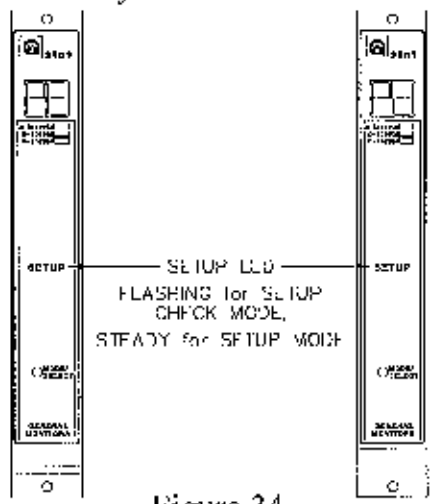


Figure 34

- **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. 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 return to normal operation, completing the Setup Mode (figure 35).

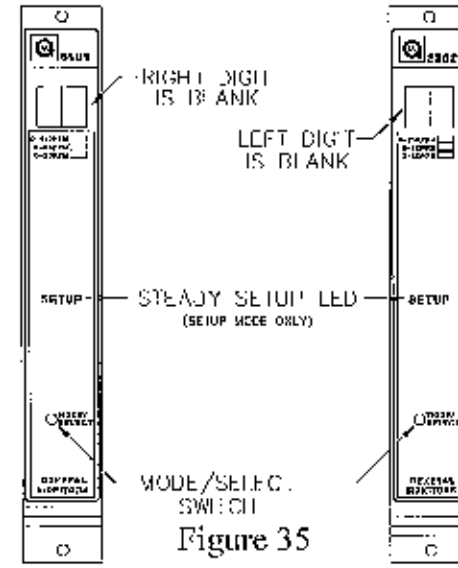


Figure 35

5.5 Inhibit Mode

Whenever the Inhibit Mode is entered, the A1 and A2 alarm outputs are inhibited. The front panel LEDs 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.

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, then the gas concentration will be displayed 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 2602 can be verified without tripping/activating external devices that are connected to the A1 and A2 alarm outputs.

Setup & Setup Check Modes (*continued*)

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 2602. The blocks shown 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 5.4 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 (nL) Option Set the A2 Alarm Set Point in parts-per-million (10 to 95ppm, in increments of 5 for 0 to 99ppm sensors) (5 to 45ppm, in increments of 5 for 0 to 50ppm sensors) (1 to 19ppm, in increments of 1 for 0 to 20ppm sensors) **The A2 Set Point cannot be lower than the current A1 Set Point.**	_____ _____ _____
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 95ppm, in increments of 5 for 0 to 99ppm sensors) (5 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 current A2 Set Point.**	_____ _____ _____
Fault / Inhibit Options	Set the Fault to Activate (Ac) or not (nA) during Inhibit Mode	_____
Card Test Options	The 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 2602 will enter the Setup Check Mode.	

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

6.1 Sensing Elements

A hydrogen sulfide (H_2S) specific sensor is the primary field 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 onto a substrate between two electrodes (figure 36).

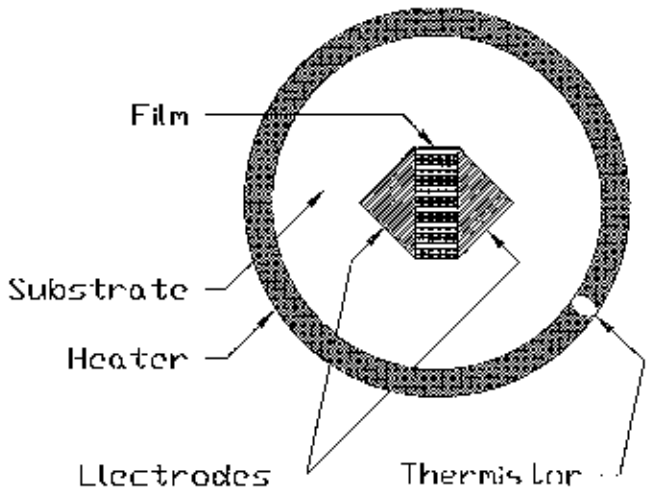


Figure 36

With no gas present, the electrical resistance between these two electrodes is very high (in the mega-ohms). As H_2S adsorbs onto the film, the resistance between the electrodes decreases (to kilo-ohms). This decrease in resistance is logrithmically 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.

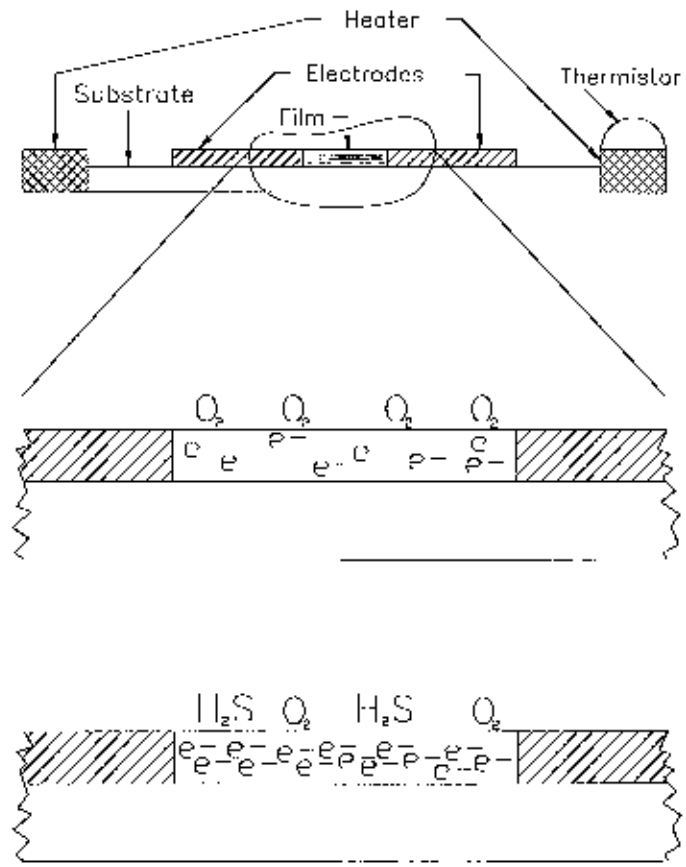


Figure 37

Sensing Elements (*continued*)

General Monitors offers a variety of hydrogen sulfide specific sensors with different detection ranges, sensor bodies and flame arrestors:

50445-1	0 to 100ppm, Aluminum Body, Wire Screen Arrestor
50445-5	0 to 50ppm, Aluminum Body, Wire Screen Arrestor
50445-9	0 to 20ppm, Aluminum Body, Wire Screen Arrestor
50448-1	0 to 100ppm, Stainless Steel Body, Wire Screen Arrestor
50448-5	0 to 50ppm, Stainless Steel Body, Wire Screen Arrestor
50448-9	0 to 20ppm, Stainless Steel Body, Wire Screen Arrestor
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
50457-1	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

6.2 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 (see figure 38).

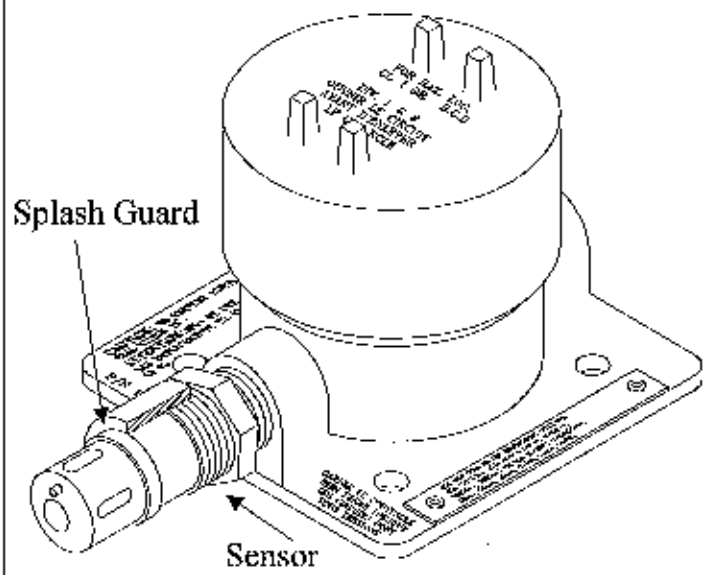


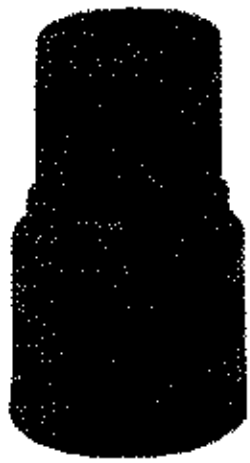
Figure 38

Both housing entries are tapped for 3/4 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 connection in the field. Once the sensor is installed/operating in the field, no attempt should be made to disconnect the sensor, the conduit or the housing lid without removing power from the Model 2602, as such an act would compromise the explosion proof integrity of the field device.

6.3 Splash Guard

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 39). The Splash Guard prevents water from rain or equipment washdowns 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 hosedowns occur, such as offshore platforms.

Figure 39

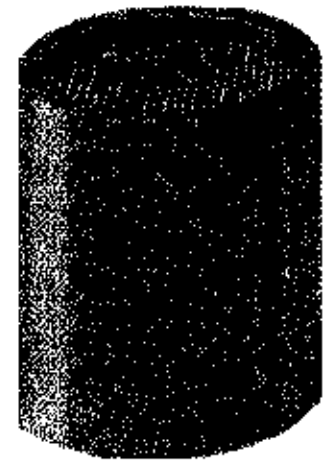


6.4 Dust Guard Assembly

The Dust Guard Assembly (figure 40) 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 40



The Dust Guard is also available in a kit with twelve replaceable screens (figure 41). It can also be used as an effective wind screen, and is recommended for corrosive, windy or high temperature environments.

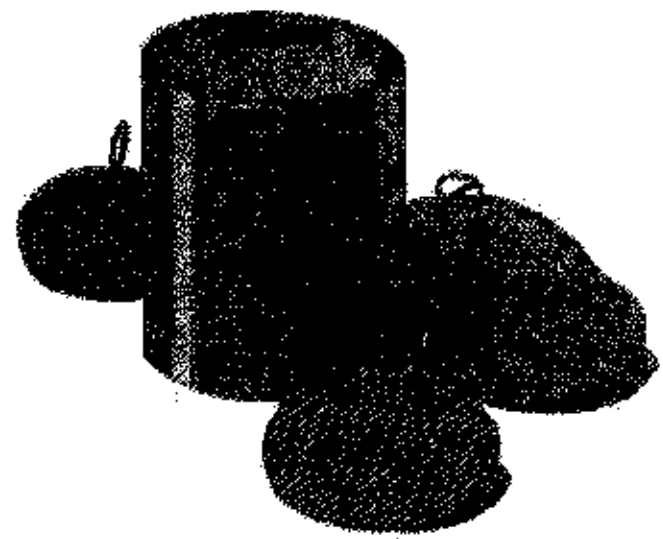


Figure 41

C/08-95

6.5 Duct Mounting Plate

General Monitors produces a Duct Mounting Plate (P/N 10041) for applications that require the sensor to be mounted in an air-conditioning or heating duct. The Duct Mounting Plate is easy to install (figure 42).

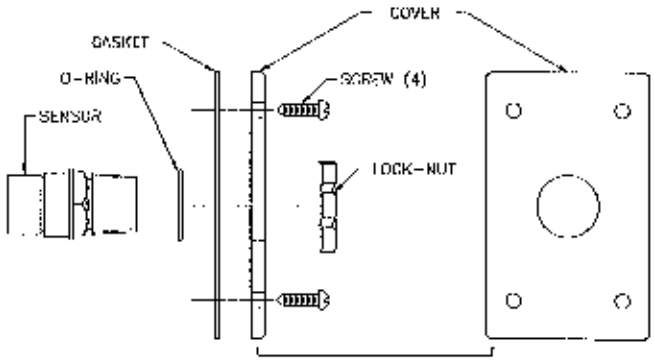


Figure 42

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 1 & 1/4 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.

6.6 Calibration Equipment

The Model 2602 uses a Breaker Bottle and Ampoules filled with hydrogen sulfide gas to accomplish calibration. The calibration procedure and the use of the Breaker Bottle and Ampoules is explained in sections 5.2 & 5.3, on pages17 through 20 of this Manual. The Portable Purge Calibrator for hydrogen sulfide 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 Purge 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 Purge Calibrator is explained in sections 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 Number
Breaker Bottle (Single)	50000
Breaker Bottle (Double)	50020
10 ppm Ampoules (Each)	50004-3
10 ppm Ampoules (Box of 12)	50008-10
20 ppm Ampoules (Each)	50004-9
20 ppm Ampoules (Box of 12)	50008-15
25 ppm Ampoules (Each)	50004-21
25 ppm Ampoules (Box of 12)	50008-16
50 ppm Ampoules (Each)	50004-13
50 ppm Ampoules (Box of 12)	50008-9
100 ppm Ampoules (Each)	50004-5
100 ppm Ampoules (Box of 12)	50008-14

Calibration Equipment (*continued*)

Description	Part Number
10ppm Purge Calibrator Assy	1400250-1
20ppm Purge Calibrator Assy	1400250-2
25ppm Purge Calibrator Assy	1400250-3
35ppm Purge Calibrator Assy	1400250-4
50ppm Purge Calibrator Assy	1400250-5
70ppm Purge Calibrator Assy	1400250-6
100ppm Purge 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

AC - Alternating Current.

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.

Analog - Continuous, without steps.

Ambient Temperature - Surrounding or background Temperature.

AWG - American Wire Gauge.

BASEEFA - British Approvals Service for Electrical Equipment in Flammable Atmospheres.

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 of Canada.

Class I, Division 1 - This is a National Electric Code (NEC) 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 vapors may be present under normal operating conditions. For more information on hazardous locations, refer to the NEC Handbook, Article 500.

COM - Common.

Conduit - Tubing, piping or a protected trough for electrical wires.

DC - Direct Current.

DCS - Distributed Controls System.

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.

EMI - Electro-Magnetic Interference.

FMRC - Factory Mutual Research Corporation.

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

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

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

H_2S - Hydrogen Sulfide.

Halogen Free Solvent - Solvent that does not contain any of the following: astatine, bromine, chlorine, flourine, 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).

Glossary of Terms (*continued*)

MOS - Metal Oxide Semiconductor.

mV - Millivolt, one thousandth (.001) of a volt.

PCB - Printed Circuit Board.

PLC - Progammable Logic Controller.

Potentiometer - An adjustable resistor.

PPM or **ppm** - Parts per million.

RFI - Radio Frequency Interference.

T50 - This is the amount of time it takes the sensor to reach the 50% level of the applied gas.

TB - Terminal Block.

Engineering & Technical Drawings

Reference Drawing # 11145-2

Schematic Diagram - Input Circuit

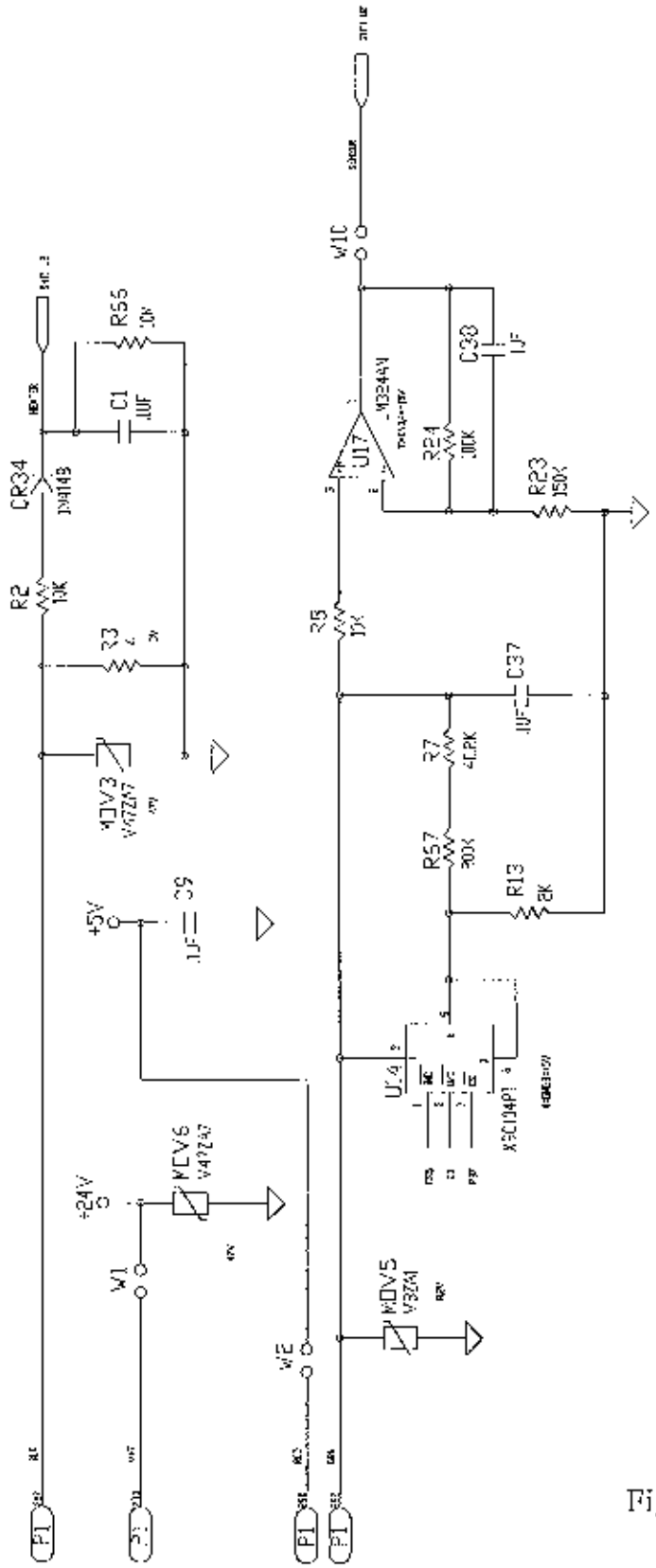


Figure 43

Engineering & Technical Drawings

Reference Drawing # 11145-1 Schematic Diagram - Control Board

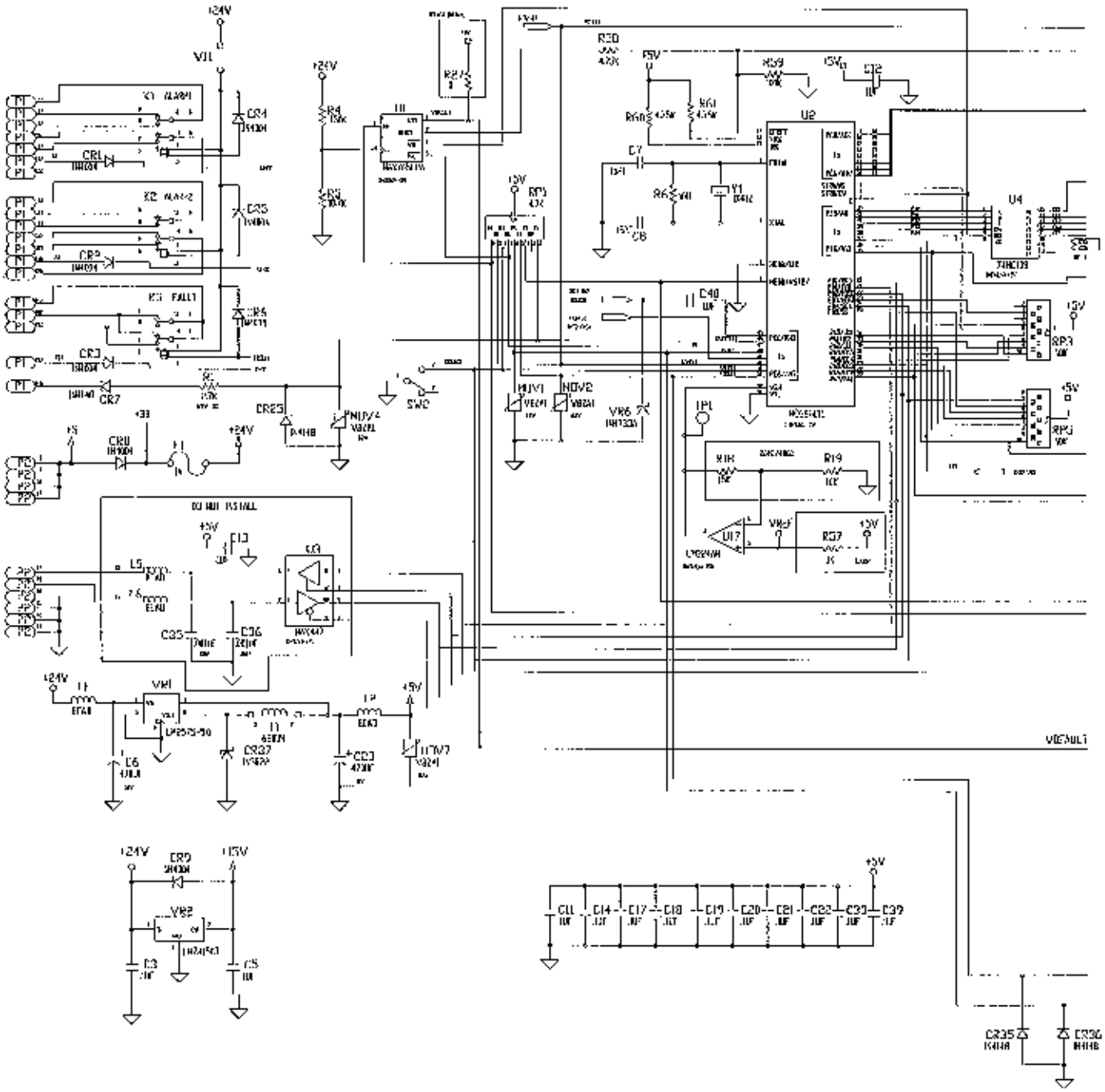


Figure 44

Left Side

Engineering & Technical Drawings

Reference Drawing # 11145-1 Schematic Diagram - Control Board

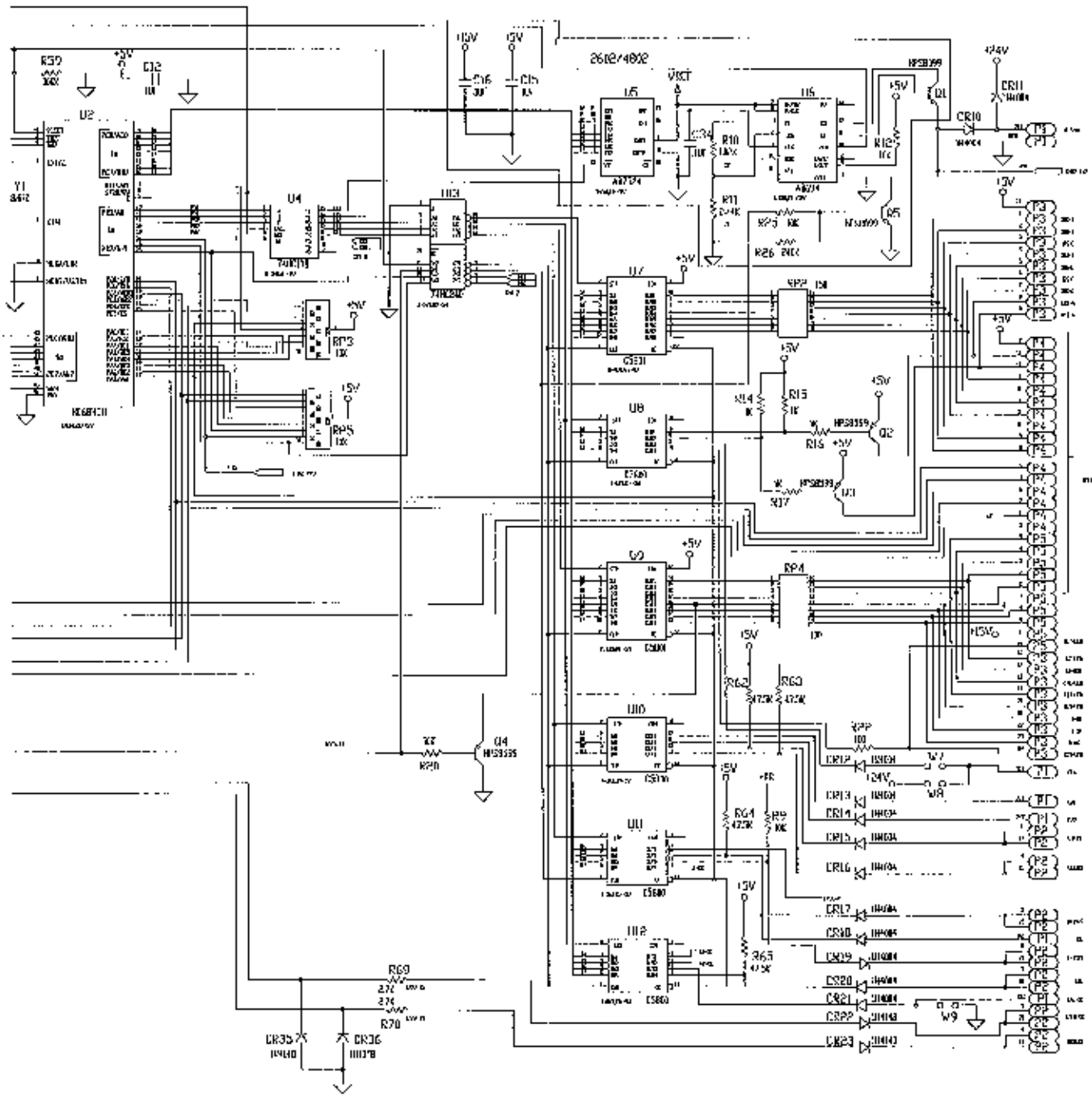


Figure 44

Right Side

Engineering & Technical Drawings

Reference Drawing # 11150-2 Schematic Diagram - Display Board

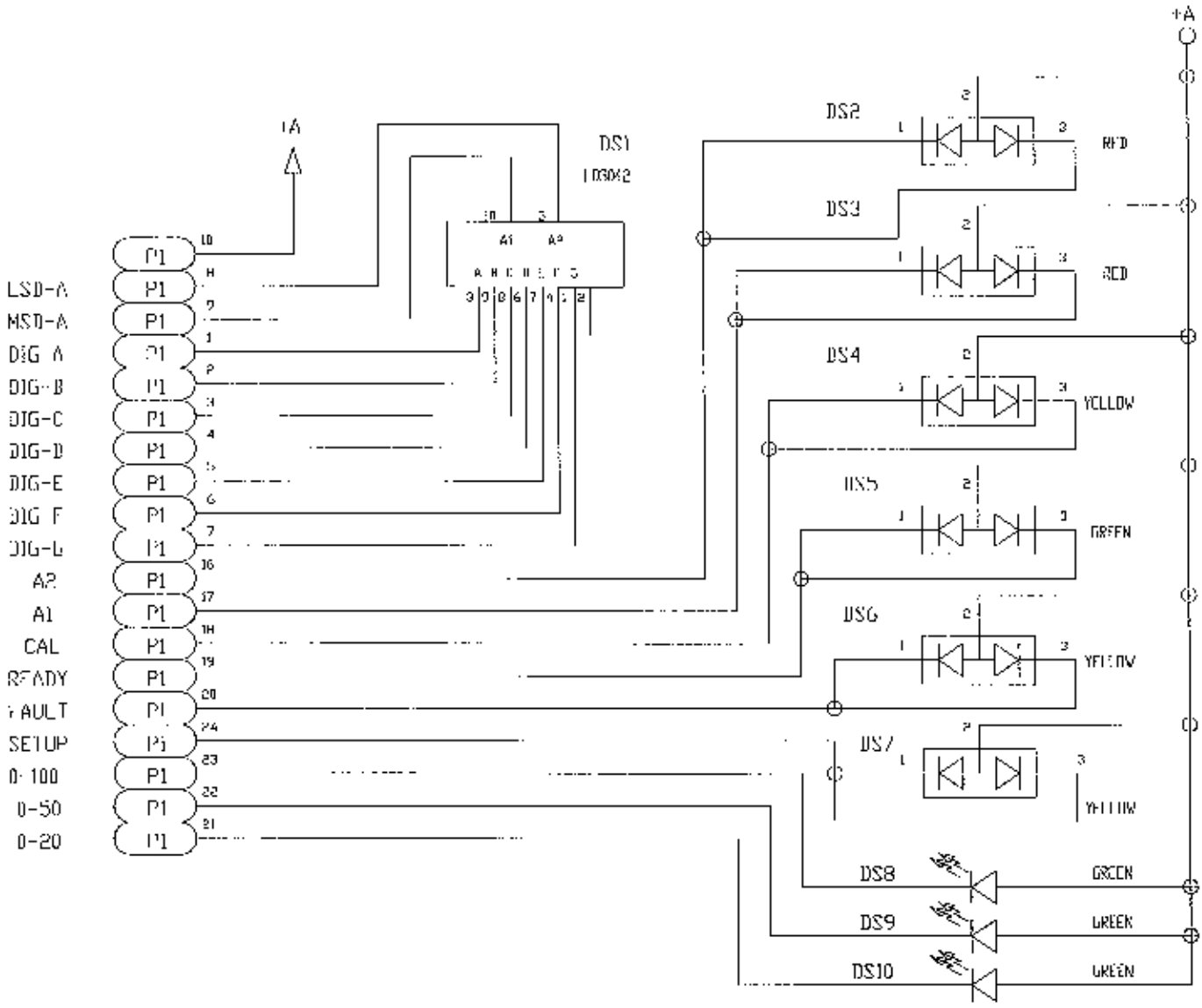


Figure 45

Engineering & Technical Drawings

Reference Drawing # 11146-3 Circuit Card Assembly - Control Board

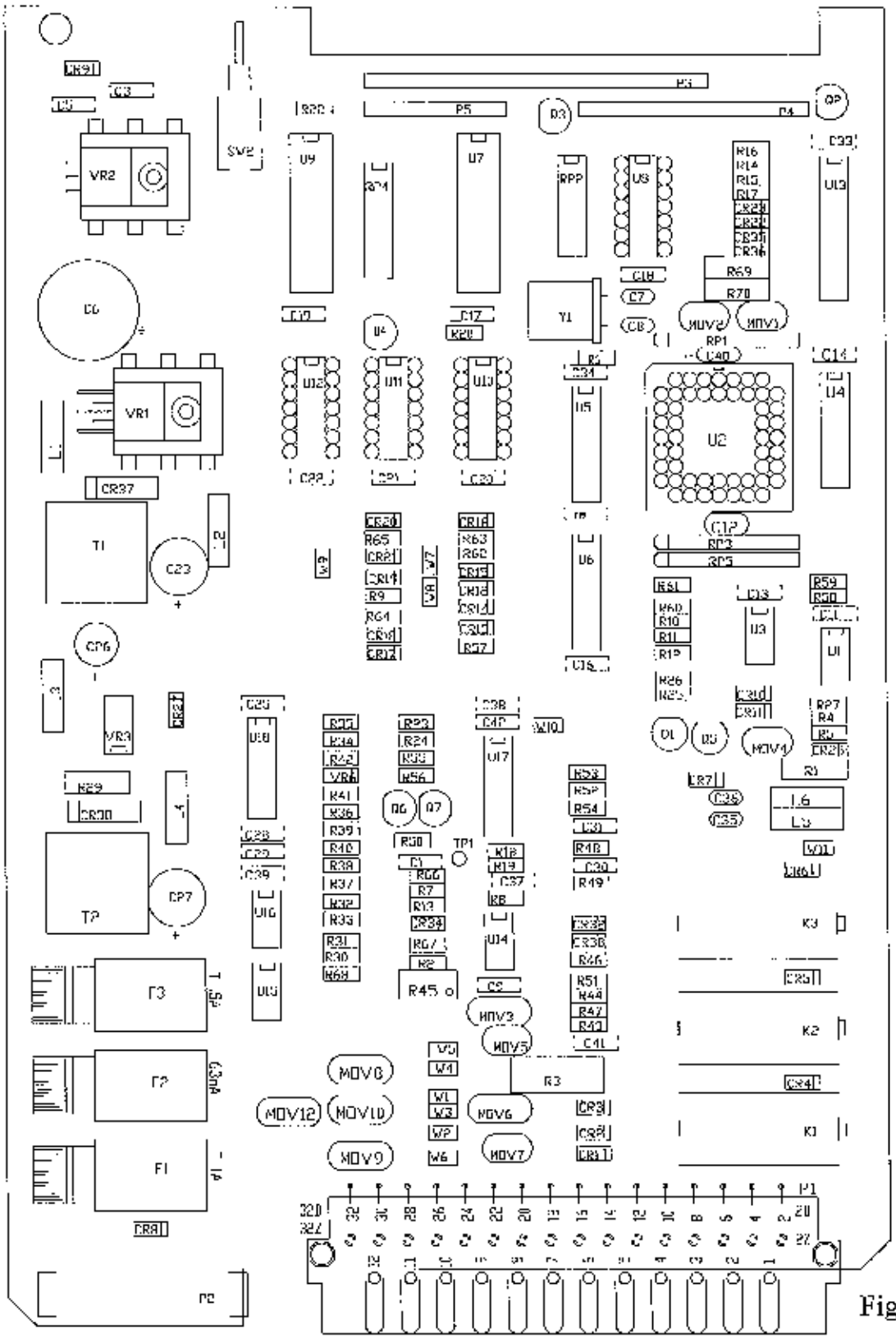


Figure 46

Engineering & Technical Drawings

Reference Drawing # 11151-3

Circuit Card Assembly - Display Board

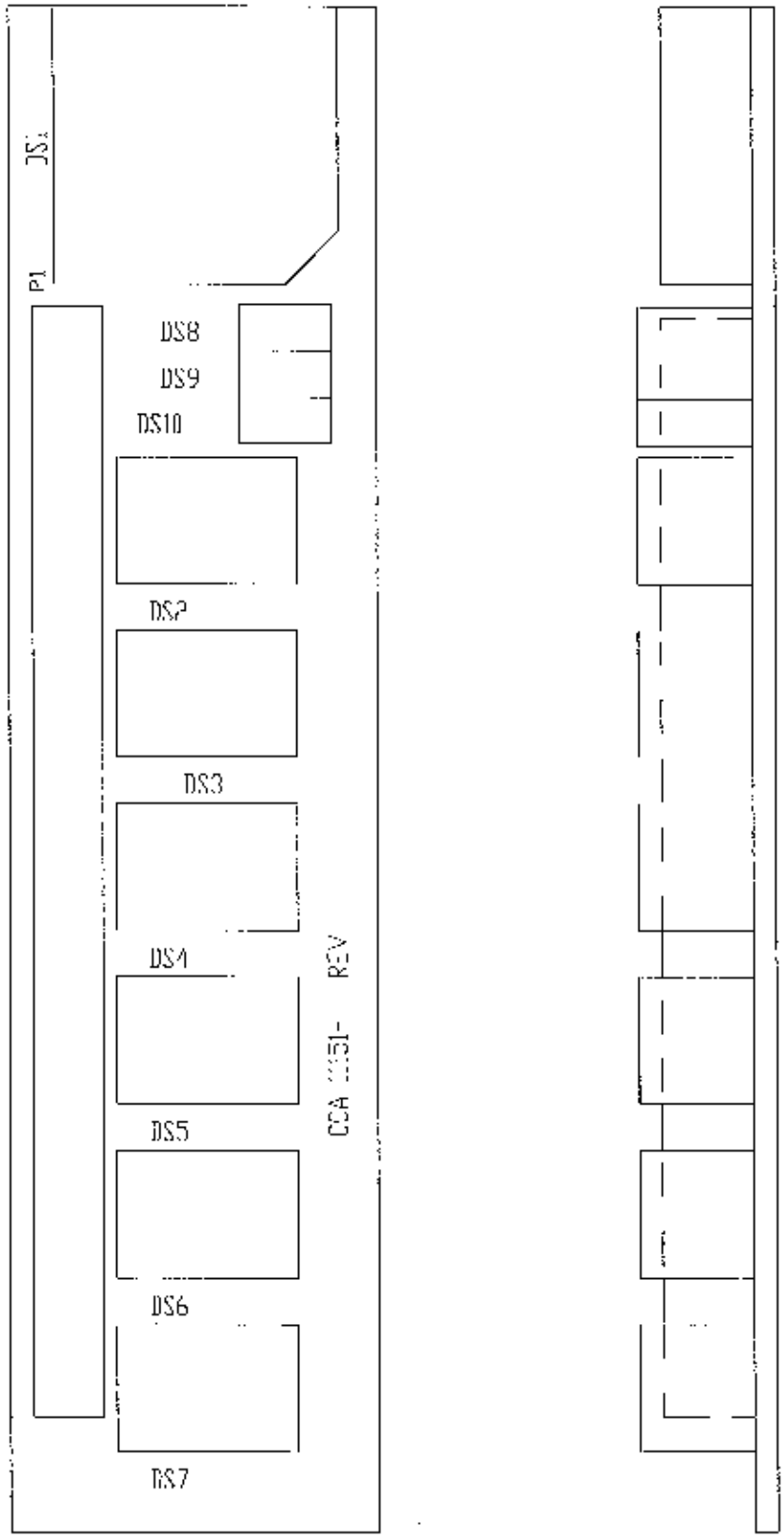


Figure 47

Engineering & Technical Drawings

Reference Drawing # 11141 Outline & Terminal Connections

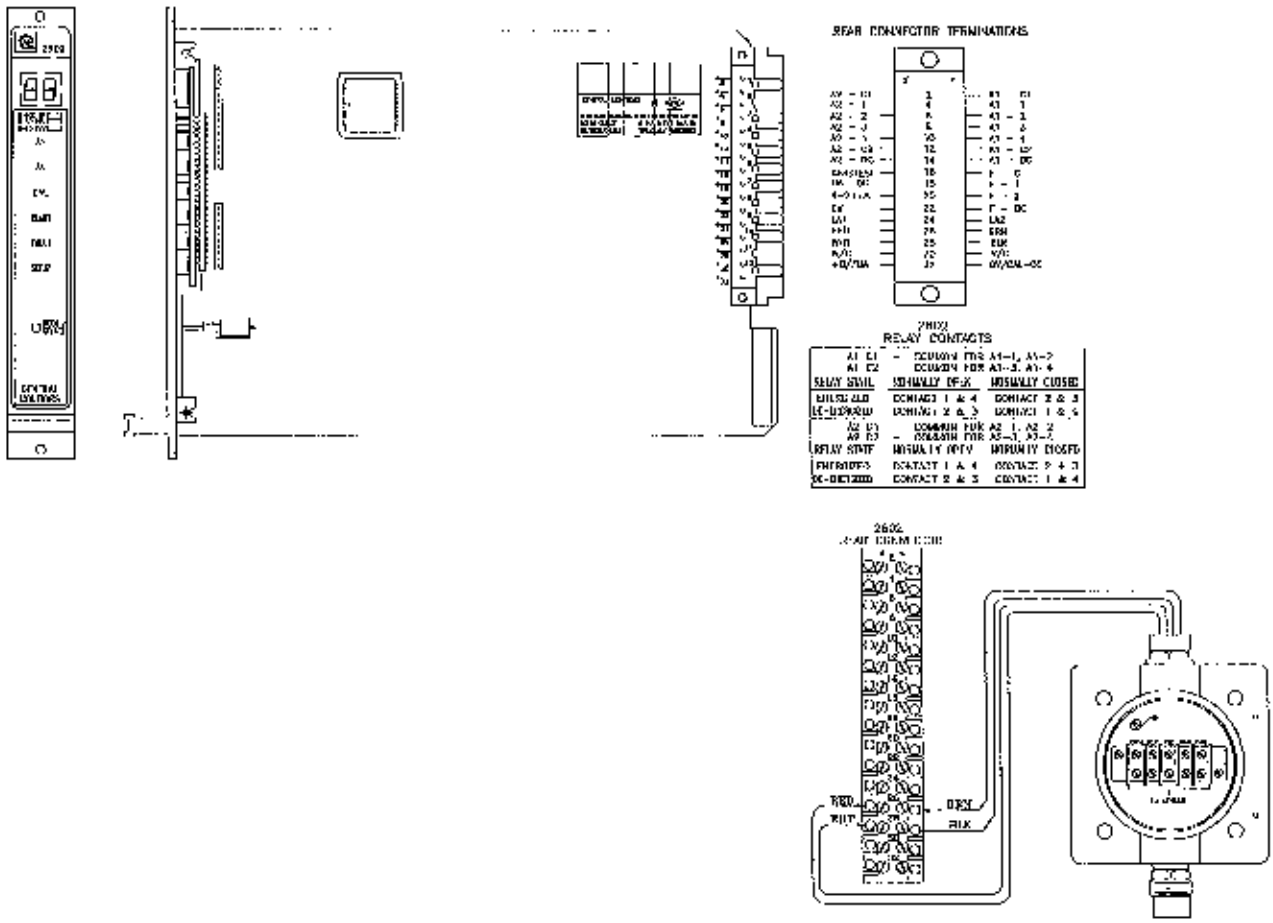
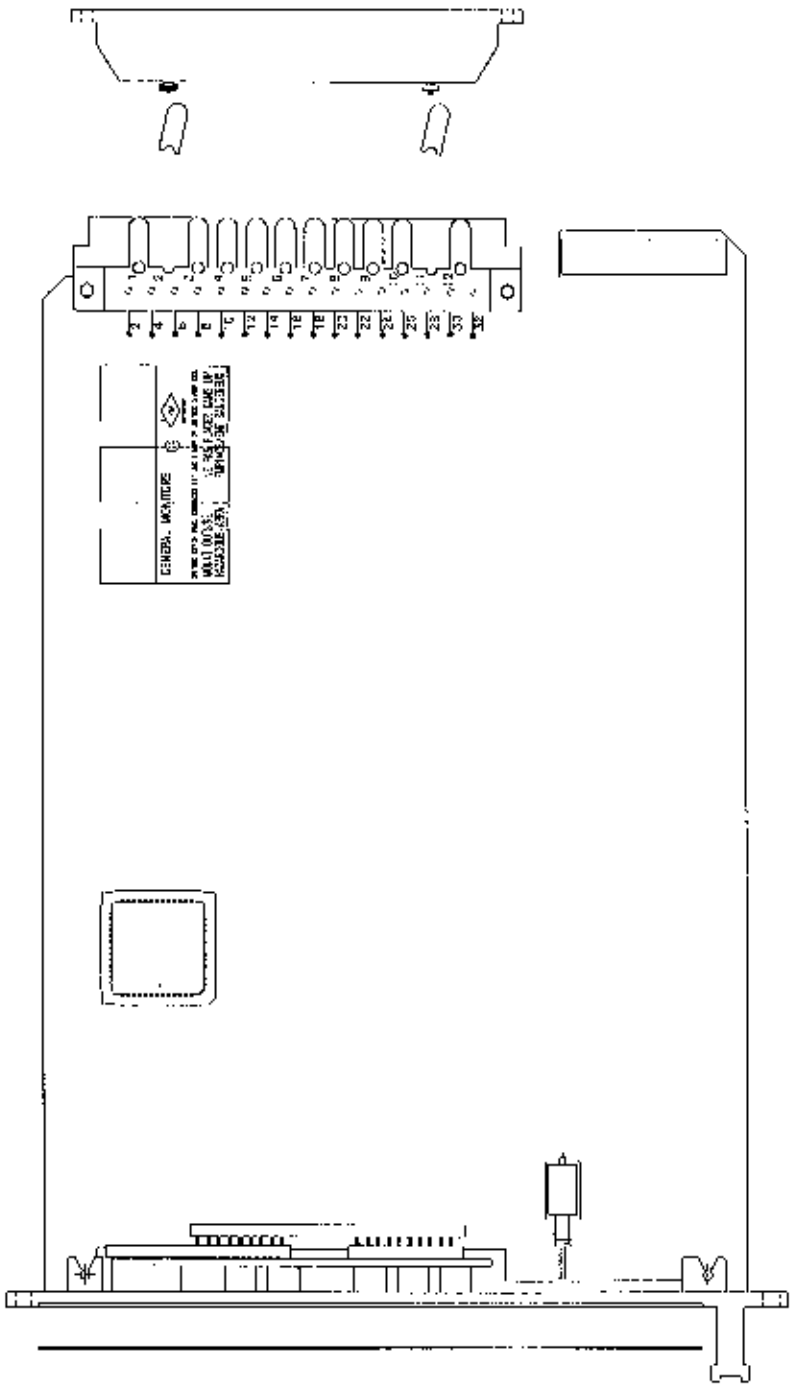


Figure 48

Engineering & Technical Drawings

Reference Drawing # 11140-1 Final Assembly



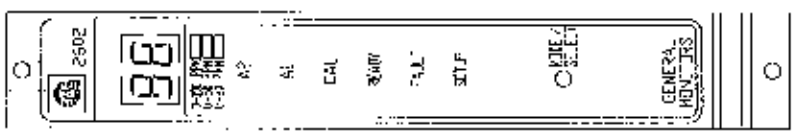


Figure 49

C/08-95

Ordering Information

The standard configuration for the Model 2602 is:

2602A - 3 2 1 - 1 00 - 1 3 3

2602A - 3 2 □ - 1 □□ - □ □ □

- **Inhibit Mode / Compatibility**
  - 3 = Fault Not Active / CAL, FUA (standard)
  - 4 = Fault Not Active / Compatible
  - 5 = Fault Active / CAL, FUA
  - 6 = Fault Active / Compatible
- **Card Test / Ramp Time**
  - 3 = Relays Inhibited / 3 Second Ramp (standard)
  - 4 = Relays Inhibited / 10 Second Ramp
  - 5 = Relays Active / 3 Second Ramp
  - 6 = Relays Active / 10 Second Ramp
- **H_2S Display Scale**
  - 1 = 0 to 99ppm Scale (standard)
  - 2 = 0 to 50ppm Scale
  - 3 = 0 to 20ppm Scale
- **Sensor**
  - 00 = No Sensor (standard)
  - 01 = 50445-1, 0 to 100ppm, Aluminum
  - 02 = 50445-5, 0 to 50ppm, Aluminum
  - 03 = 50445-9, 0 to 20ppm, Aluminum
  - 04 = 50448-1, 0 to 100ppm, Stainless Steel
  - 05 = 50448-5, 0 to 50ppm, Stainless Steel
  - 06 = 50448-9, 0 to 20ppm, Stainless Steel
  - 07 = 50454-1, 0 to 100ppm, Aluminum, PTB
  - 08 = 50454-5, 0 to 50ppm, Aluminum, PTB
  - 09 = 50454-9, 0 to 20ppm, Aluminum, PTB
  - 10 = 50457-1, 0 to 100ppm, Stainless Steel, PTB
  - 11 = 50457-5, 0 to 50ppm, Stainless Steel, PTB
  - 12 = 50457-9, 0 to 20ppm, Stainless Steel, PTB
  - 13 = Consult the factory for other options
- **Relay State**
  - 1 = A2 Latch/A1 Non-Latch, De-Energized (standard)
  - 2 = A2 Latch/A1 Non-Latch, Energized
  - 3 = A2 Latch/A1 Latch, De-Energized
  - 4 = A2 Latch/A1 Latch, Energized
  - 5 = A2 Non-Latch/A1 Non-Latch, De-Energized
  - 6 = A2 Non-Latch/A1 Non-Latch, Energized
  - 7 = A2 Non-Latch/A1 Latch, De-Energized
  - 8 = A2 Non-Latch/A1 Latch, Energized
  - 9 = Consult the factory for other options

C/08-95

Zero Two Series Modules

Model 2602
Zero Two Series Control Module
for Hydrogen Sulfide Gas
Applications

Model 4802
Zero Two Series Control Module
for Combustible Gas
Applications

Model TA102
Zero Two Series Trip Amplifier Module
for Combustible Gas
Applications

Model TA202
Zero Two Series Trip Amplifier Module
for Hydrogen Sulfide Gas
Applications

Model TA402
Zero Two Series Trip Amplifier Module
for Flame Detection
Applications

Model FM002
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 ZN002
Zero Two Series Zone Control Module
Performs Zoning and Voting Functions
for Zero Two Systems

Model MS002
Zero Two Series Solenoid Card
for Monitoring / Driving High Current
Output Devices

Model IN042
Zero Two Series Three Zone Input Card
For Callpoints, Smoke & Thermal Detectors

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

* For Use In Non-European Countries Only

A

B

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