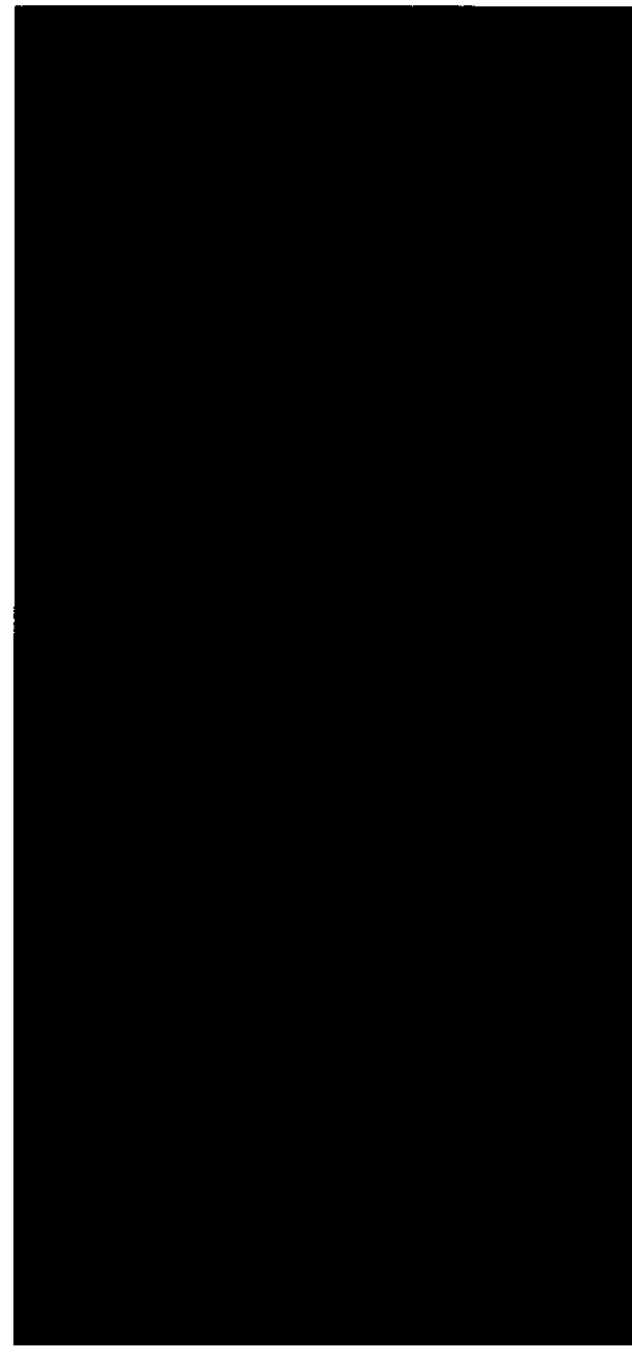
DET TRONICS



INSTRUCTIONS

Unitized H_2S Detection System

U8800 Controller

C7064C Sensor

8/89 Form 95-8334

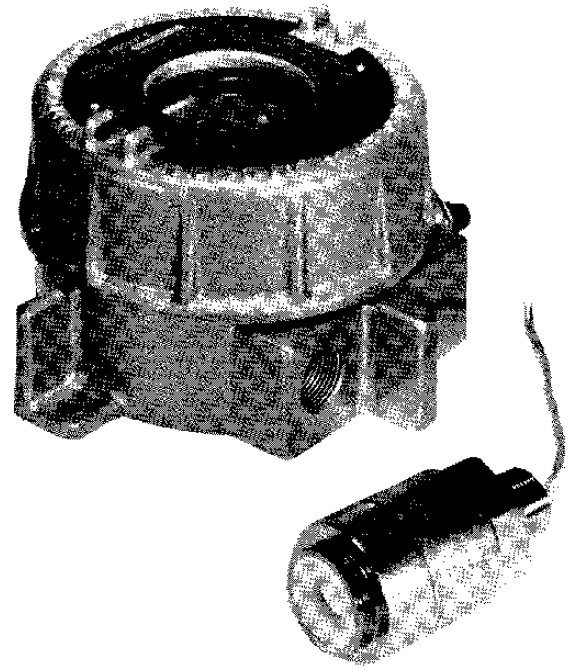
DET TRONICS

INSTRUCTIONS
Unitized H_2S Detection System
U8800 Controller
C7064C Sensor

APPLICATION

The U8800/C7064C Hydrogen Sulfide Detection System is designed to provide early warning of the presence of deadly hydrogen sulfide (H_2S) gas. Microprocessor based circuitry in the U8800 continuously monitors the electrochemical sensor. The output signal consists of a linear 4 to 20 milliampere dc current output that corresponds to H_2S levels from 0 to 100 parts per million (ppm). Relay contacts are available as an option. All electronic circuitry and status indicators are housed in an explosion-proof metal enclosure and are located at the point of detection.

In addition to continuously monitoring sensor output, the U8800 simultaneously checks external wiring and the electronic circuitry of the system to assure that all components are able to respond to the presence of hydrogen sulfide at any time. If a fault should occur in the system, it is indicated by the dc current output, illumination of a faceplate LED, and de-energization of the optional Fault relay.



FEATURES

- Two independently adjustable and field selectable alarm setpoint levels.
- Linear 4 to 20 milliampere output corresponds to H_2S concentration of 0 to 100 ppm and indicates system status. Output can be field calibrated to assure accuracy.
- LEDs provide visual indication of alarm, fault and calibration status.
- Digital display indicates level of H_2S being detected.
- Low and high alarm setpoints can be read on the digital display.
- Microprocessor based circuitry provides continuous self-diagnostics and automatic fault identification.
- Pushbutton self-calibration feature allows field calibration to be performed by one person without opening the housing or declassifying the area.
- System automatically returns to the Normal operating mode if calibration procedure is interrupted.
- Optional relays respond to fault, low alarm or high alarm signals.
- Non-volatile memory retains calibration and setpoint data during loss of input power.

GENERAL APPLICATION INFORMATION

Hydrogen sulfide is a colorless, highly toxic gas. It is frequently found in oil and natural gas, sewage disposal or treatment systems, as well as a variety of industrial processes. Typical operations that encounter H_2S include:

- Oil and natural gas exploration and production
- Refineries
- Sewers
- Sewage treatment plants

©Detector Electronics Corporation 1989

- Chemical plants

- Paper mills.

The actual effects of H_2S on an individual depend on several factors:

1. Concentration level of the exposure

2. Length of time exposed

3. Exposure frequency

4. Ability to tolerate H_2S.

Repeated exposure to concentrations less than 10 ppm usually does not cause adverse effects. When the level is increased to 250 ppm, exposure for one hour can result in death. At 600 ppm, exposure for a short period of time can be fatal.

The ability to electronically monitor the level of H_2S is essential in many potentially hazardous environments. Depending on human senses alone is totally unreliable. H_2S is colorless, and therefore cannot be seen. Even at low levels it deadens the sense of smell.

DESCRIPTION

The U8800 consists of a metal enclosure that contains the signal processing circuitry, status indicators, mode selection pushbutton, and optional output relays. The C7064C Sensor, which contains the sensing element, is connected to the U8800 and can be mounted on the U8800.

C7064C SENSOR

The C7064C uses an electrochemical sensing element to detect the presence of hydrogen sulfide gas. A significant property of the sensing element is its highly specific response to H_2S. Since other gases contacting the sensor have virtually no effect on its electrical response, false indications caused by the presence of other gases are eliminated. In addition, high concentrations of H_2S do not adversely affect the sensor.

The sensing element is mounted inside an intrinsically safe metal housing, which is suitable for use in Class I, Division 1, Groups A, B, C and D hazardous locations.

CONTROLLER ENCLOSURE

The aluminum enclosure of the U8800 has a clear window to easily view the digital display and indicating LEDs. A removable cover allows access to the wiring terminals and setpoint adjustments. Two 3/4 inch NPT threaded conduit entries are provided (25 mm also available). One is used for mounting the C7064C Sensor, and the other serves as the conduit wiring entrance. If the application involves installation of the sensor in a location that is inaccessible or too hazardous for safe entry, the C7064C and U8800 can be mounted apart. Consult the factory for details.

The U8800 is suitable for use in Class I, Division 1, Groups B, C and D hazardous locations.

ALARM SETPOINTS

The U8800 has independently adjustable Low and High Alarm setpoints. The corresponding LOW and HIGH LEDs are illuminated and the optional Low and High Alarm relays are energized when the ppm level exceeds the setpoints. The adjustment range is 5 to 20 ppm for the low alarm and 10 to 90 ppm for the high alarm. If the operator does not program other values, the microprocessor will automatically use 10 ppm for the low alarm and 20 ppm for the high alarm.

In addition to the alarm setpoints, the U8800 must also be programmed for the concentration of hydrogen sulfide gas that will be used for calibration. The unit can be calibrated using 20 to 90 ppm. (The microprocessor will use a default value of 40 ppm unless a different value is programmed.)

The alarm setpoints and calibration gas concentrations can be checked at any time without opening the enclosure by pressing the pushbutton located on the outside of the enclosure. The values can be changed by removing the cover and pressing the adjustment buttons located at the faceplate. See "Setpoint Adjustment" and "Calibration" sections for additional information.

OUTPUTS

The U8800 provides a dc current output for transmitting system status information to monitoring devices. A linear 4 to 20 milliampere output corresponds to concentrations of 0 to 99 ppm. When operating in the Calibrate mode, a 1.5 milliampere output is generated. If a fault develops, the output drops to 0 milliampere.

If the application requires the use of relay contacts, they can be ordered for the fault, low alarm and high alarm output signals. The relays have SPST contacts that are rated at 5 amperes and can be programmed for either normally open or normally closed operation. The Fault relay is normally energized and is de-energized in the event of a malfunction. The Alarm relays are normally de-energized. Latching or non-latching Alarm relay operation is programmed at the time of installation.

DIGITAL DISPLAY AND LEDs

A digital display continuously indicates the level of H_2S at the detector in both the Normal and Calibrate modes. It operates in the range of 0 to 99 ppm. A negative zero drift condition is indicated by a minus (–) sign in the left hand digit. At 100 ppm, the display flashes "99" to indicate an over range condition. If a malfunction should occur, the amber FAULT LED flashes and the digital display identifies the nature of the fault using a numerical code. See Table 1. Alarm conditions are signaled by an amber LOW LED and a red HIGH LED. These LEDs flash when their respective setpoints are exceeded and are on steady after the level of H_2S decreases below the setpoint.

NOTE

The rate of flashing for the LEDs can be either slow (approximately once per second) or rapid (approximately four times per second). The LEDs flash at the faster rate during an alarm or fault condition and at the slower rate while programming or displaying setpoints.

FACEPLATE

The faceplate of the U8800 provides LEDs for indicating status conditions, a digital display for indicating the level of H_2S being detected and for identifying system status, and pushbuttons for adjusting the alarm setpoints. The pushbutton for selecting the mode of operation is located on the side of the enclosure. See Figure 1 for the location of buttons and indicators.

1. In the Normal operating mode the PPM display continuously indicates the level of H_2S at the detector. In the event of a malfunction, the display identifies the nature of the fault using the codes shown in Table 1. In other operating modes the display is able to show the low and high setpoints and the calibration gas concentration that have been programmed.

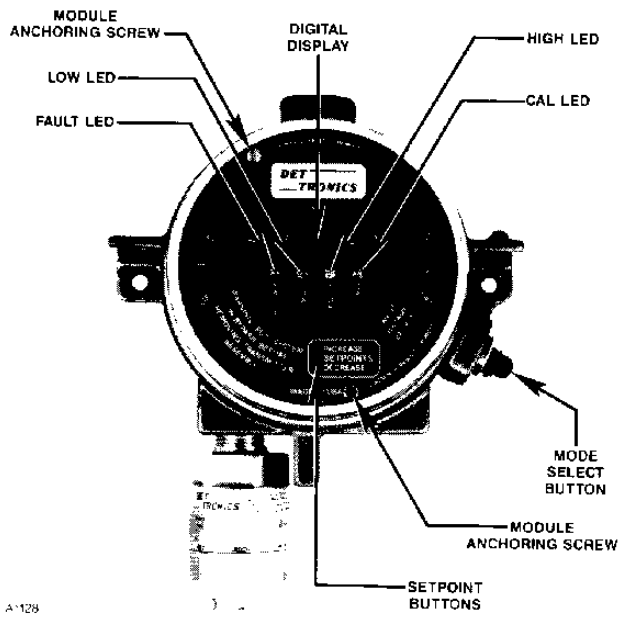


Figure 1—C7064C/U8800 Detection System

Table 1—System Status Codes

Status Display	Condition
9	Initialization routine failure, microprocessor fault.
7	Input voltage out of tolerance.
5	High/low internal voltage, ground reference fault
4	Calibration error, sensor excessively sensitive.
3	Zero drift exceeds –8 ppm.
2	Calibration error, sensor dead.
1	Sensor reaching end of life (Calibrate mode only).

2. Illumination or flashing of the FAULT LED in the Normal operating mode indicates that a malfunction has occurred. The FAULT LED is also illuminated during the initial warmup period.

3. The LOW LED flashes rapidly in the Normal mode to indicate that the level of H_2S at the detector exceeds the low setpoint. If the U8800 is equipped with Alarm relays, illumination of the LOW LED also indicates that the Low Alarm relay has been energized. In other operating modes, the flashing LOW LED indicates that the reading on the PPM display relates to the low setpoint.

4. The operation of the HIGH LED is similar to the LOW LED, but applies to the high setpoint and High Alarm relay.

5. The CAL LED is illuminated in the Calibrate mode, or when the calibration gas concentration is being shown in the Setpoint Display mode.

6. The SETPOINT buttons are pressed to enter the Setpoint Adjust mode and change the alarm setpoints or the calibration gas concentration.

7. The Mode Select button is pressed to put the U8800 in Reset, Setpoint Display or Calibrate mode. The length of time that the button is held determines the mode that will be entered.

8. The module anchoring screws (2) secure the electronic module to the enclosure.

AUTOMATIC DIAGNOSTICS AND FAULT IDENTIFICATION

The microprocessor based U8800 features self-testing circuitry that continuously checks for shorts, opens, faulty components, or other problems that could prevent proper response to H_2S. When power is applied, the microprocessor automatically runs initialization tests on system memory and circuitry. In the Normal operating mode, it continuously monitors the input signal from the sensor to ensure proper functioning. In addition, a "watchdog" timer is maintained to ensure that the program is running correctly. If a malfunction should occur:

1. The FAULT LED flashes.

2. The code number of the fault is indicated on the right hand digit of the digital display.

3. The output current drops to 0 milliampere.

4. The Fault relay is de-energized (optional).

When the fault is corrected, the system will automatically reset (except "2" and "4" faults, which are reset using the Mode Select button).

NOTE

Status codes are displayed for approximately 1.5 out of each 6 seconds, alternating with display of the H_2S level.

OPERATING MODES

The U8800 can operate in any of the following modes. The modes are selected by pressing the appropriate pushbuttons.

Normal

In the Normal operating mode, the microprocessor monitors the output signal from the C7064C Sensor and generates a linear 4 to 20 milliampere current output that corresponds to a 0 to 100 ppm concentration of H_2S. The digital display indicates the ppm level. If the level exceeds an alarm setpoint, the appropriate LED flashes rapidly and the corresponding Alarm relay (optional) is energized. If a system fault occurs, the current drops to zero, the FAULT LED flashes, and the normally energized Fault relay (optional) is de-energized.

Reset

The Reset mode is the first of three modes that are entered by pressing the Mode Select button located on the side of the enclosure. When the Mode Select button is **momentarily** depressed (less than 1.5 seconds), all LEDs that were previsouly illuminated go dark, the relays return to their normal condition (no alarms or faults occurring), and any faults are cleared.

Setpoint Display Mode

When the Mode Select button is pressed and held until the LOW LED begins to flash (approximately 1.5 seconds), the digital display shows the low setpoint. The low setpoint is displayed for two seconds, then the LOW LED goes out, the HIGH LED flashes slowly, and the high setpoint is displayed. Two seconds later the HIGH LED goes out, the CAL LED flashes slowly, and the calibration gas concentration is displayed. After displaying the calibration gas concentration for two seconds, the detector automatically returns to the Normal operating mode (if the Mode Select button is no longer being depressed).

Calibrate

The Calibrate mode is entered by pressing and holding the Mode Select button (approximately 7.5 seconds) until the CAL LED is on steady (stops flashing). The digital display flashes to indicate that the microprocessor is performing the Zero adjustments. When the display stops flashing and shows "00," the operator applies the calibration gas. This causes the display to flash again, while also indicating the level of H_2S. When the Span calculations have been completed, the display stops flashing and indicates the ppm level of the calibration gas. The operator can now remove the gas from the detector. Upon completion of a successful calibration, the system automatically returns to the Normal operating mode (all outputs and indicators are reset).

If the operator fails to complete the calibration procedure, if an error in calibrating occurs, or if the detector is unable to be calibrated (sensing element must be replaced), the microprocessor will automatically return to the Normal mode (when the H_2S level is below the lowest alarm setpoint) and continue to use the previous calibration data. A fault indication ("2" status) will be displayed until a reset occurs. In addition, if the microprocessor determines that the sensing element is approaching the end of its useful life, a "1" will be indicated on the PPM display while in the Calibrate mode to warn the operator of this condition. (See the "Calibration" section of this manual for additional information regarding detector calibration.)

Setpoint Adjust

The Setpoint Adjust mode is entered by **momentarily** depressing either of the two SETPOINT buttons (see Figure 1). The digital display indicates the Low setpoint and the LOW LED flashes slowly. To change the setpoint, depress the appropriate SETPOINT button to either in-

crease or decrease the setpoint value. When no changes have been made for 5 seconds, the microprocessor automatically advances to the High setpoint and the HIGH LED flashes. When no changes are made for 5 seconds, the calibration gas concentration is displayed and the CAL LED flashes. If no changes are made for 5 seconds, the microprocessor saves the programmed data and returns to the Normal operating mode.

SPECIFICATIONS

OPERATING VOLTAGE—
24 vdc. Can operate in the range of 18 to 35 vdc, measured at the U8800.

POWER CONSUMPTION—
1.7 watts nominal, 3.0 watts maximum.

OPERATING RANGE—
0 to 99 ppm.

U8800 TEMPERATURE RANGE—
Operating: −40°F to +167°F (−40°C to +75°C).
Storage: −49°F to +185°F (−45°C to +85°C).

C7064C TEMPERATURE RANGE—
Continuous operation: −40°F to +105°F (−40°C to +40°C).
Intermittent operation: −40°F to +130°F (−40°C to +55°C).
Recommended storage: +32°F to +68°F (0°C to +20°C).

HUMIDITY RANGE—
Continuous: 15 to 90% RH.
Intermittent: 0 to 99% RH.

ACCURACY—
±10 percent of applied gas concentration or ±3 ppm, whichever is greater.

RESPONSE TIME—
20 percent full range within 12 seconds, 50 percent full range within 30 seconds when H_2S concentration equal to full scale is applied.

SETPOINT ADJUSTMENTS—
Adjustable from 5 to 20 ppm for the low alarm and from 10 to 90 ppm for the high alarm.

CURRENT OUTPUT—
4 to 20 milliampere dc current, with a maximum loop resistance of 600 ohms.

RELAY CONTACTS (optional)—
Normally open or normally closed contacts rated 5 amperes at 24 vdc.

WIRING—
The wiring to the system must be a 3 wire shielded cable, 18 AWG minimum. As the wiring distance increases, larger diameter wire is required to maintain a minimum of 18 vdc at the U8800. The maximum wiring length is 2000 feet (600 meters). The use of shielded cable is recommended for all system wiring. See "Installation" section for details.

ENCLOSURE MATERIALS—
U8800: Aluminum.
C7064C: 316 Stainless Steel.

ENCLOSURE RATINGS—
The U8800 is designed to meet FM and CSA explosion-proof requirements for Class I, Division 1, Groups B, C and D, BASEEFA/CENELEC flame-proof requirements for EEx d [ib] IIC T6, and NEMA 4/IP66 (dust-tight, water-tight) enclosure rating. The C7064C is designed to meet FM and CSA intrinsically safe requirements for Class I, Division 1, Groups A, B, C and D and BASEEFA/CENELEC EEx ia IIC T6.

DIMENSIONS—
See Figures 2 and 3.

SHIPPING WEIGHT—
U8800: 6.0 pounds (2.7 kilograms).
C7064C: 1.0 pound (0.4 kilogram).

INSTALLATION

DETECTOR POSITIONING

It is essential that the detector be properly located to enable it to provide maximum protection. Unfortunately, there is no fool-proof formula for determining the most effective number and placement of detectors. No two installations will be exactly alike. Therefore, the individual who is responsible for the installation must rely on experience and common sense to determine the best detector locations for the area to be protected.

Several factors should be considered for every installation:

1. How rapidly will the H_2S gas diffuse into the air? Select a location for the sensor as close as practical to an anticipated source.

2. Since hydrogen sulfide has a density greater than air, it will tend to settle near the floor or ground, if not prevented from doing so by air movement.

3. Ventilation characteristics of the immediate area must also be considered. Movement of air will cause the H_2S gas to accumulate more heavily in one area than another. The sensors should be placed in the areas

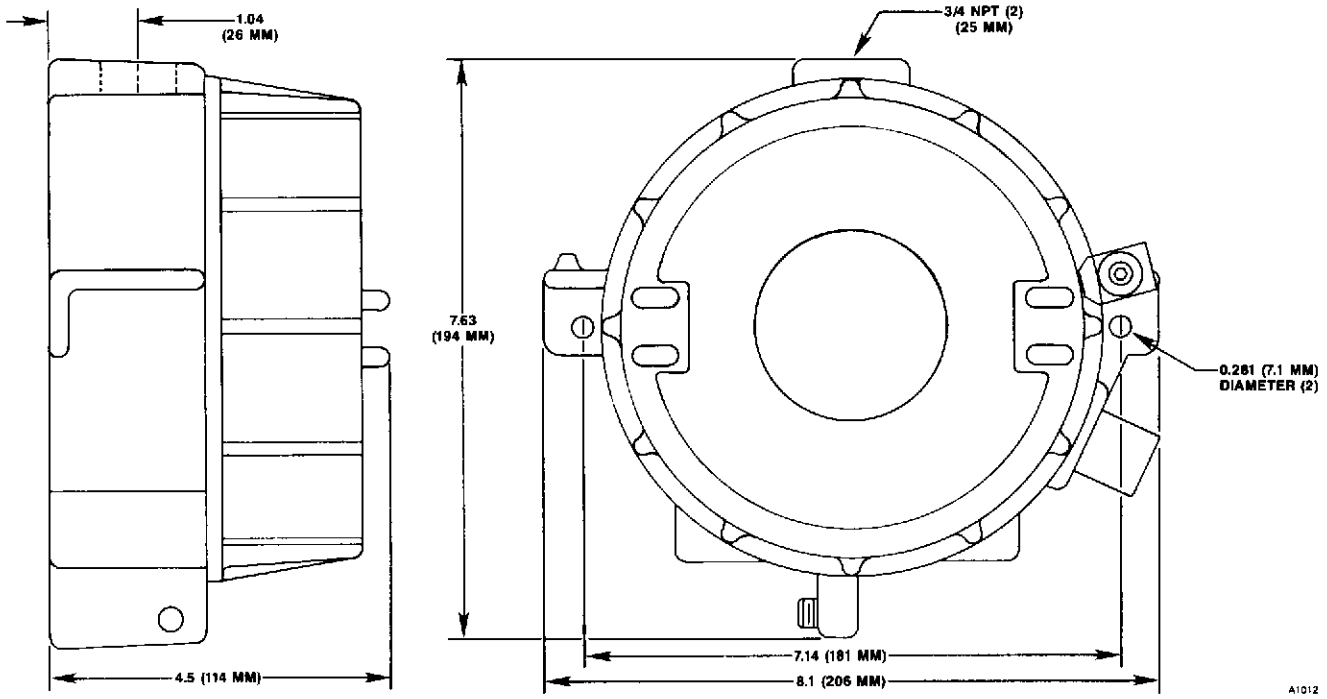


Figure 2—U8800 Dimensions in Inches (Millimeters)

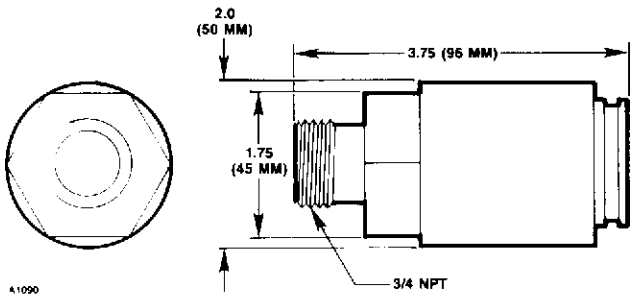


Figure 3—C7064C Dimensions in Inches (Millimeters)

where the most concentrated accumulation of hydrogen sulfide gas is anticipated. Also take into consideration the fact that some ventilation systems do not operate continuously.

4. The sensor should be pointed down to prevent the buildup of moisture or contaminants on the gas inlet.

5. The sensor must be accessible for testing and calibration.

6. The sensor should be located in an area where it is safe from potential sources of contamination.

Remember, the finest detection system is of little value if the H_2S gas cannot readily come into contact with the sensors.

WIRING REQUIREMENTS

A three wire cable must be used to connect the U8800 to the power supply and current monitoring device. The use of shielded cable is highly recommended to protect against interference caused by extraneous electrical "noise." In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.

Since moisture can be detrimental to electronic devices, it is important that moisture not be allowed to come in contact with the electrical connections of the system. Moisture in the air can be trapped within sections of conduit, therefore the use of conduit seals is required to prevent damage to electrical connections caused by condensation within the conduit. These seals must be watertight and explosion-proof and are to be installed even if they are not required by local wiring codes. A seal must be located as close to the U8800 as possible. In no case should this seal be located more than 18 inches (457 mm) from the detector. When local codes require an explosion-proof installation, an additional seal is also required at any point where the conduit enters a non-hazardous area. When pouring a seal, the use of a fiberdam is required to assure proper formation of the seal. The seals should never be poured in temperatures that are below freezing, since the water in the sealing compound will freeze and the compound will not dry properly. Contamination problems can then result when temperatures rise above the freezing point and the compound thaws. The shielding of the cable should be stripped back to permit the seal to form around the individual leads, rather than around the outside of the shield. This will prevent any siphoning action that might occur through the inside of the shield.

WIRING

The following procedure should be used for mounting and wiring the gas detection system.

1. The detector should be installed in a location that is best suited for covering the area to be protected, following the previously discussed guidelines. Whenever practical, it should be placed where it is easily accessible for calibration.

NOTE

The U8800 contains several semiconductor devices that are susceptible to damage by electrostatic discharge. An electrostatic charge can build up on the skin and discharge when an object is touched. Therefore, use caution when handling, taking care not to touch the terminals or electronic components. For more information on proper handling of the U8800, a Service Memo (form 75-1005) has been included.

2. Remove the cover from the enclosure.

3. Loosen the two screws that secure the electronic module to the enclosure. (See Figure 1.) Firmly grasp the electronic module and remove it from the enclosure.

NOTE

Do not remove or plug in the electronic module while power is applied.

4. If the U8800 is equipped with relays, they must be programmed for either normally open or normally closed operation. This is accomplished by placing jumpers (provided) on the appropriate pins of terminals W1, W3 and W5, which are located on the plug-in electronic module that was previously removed. Place the jumper between pins 1 and 2 for normally open operation. Place it between 2 and 3 for normally closed. W1 corresponds to the High Alarm relay, W3 to the Low Alarm relay, and W5 to the Fault relay. See Figure 4. Note that the Alarm relays are normally de-energized and the Fault relay is normally energized in the normal operating mode with no alarms or system faults occurring.

NOTE

These jumpers MUST be installed to assure proper relay operation. If a jumper is missing, the relay output will be disabled.

5. Latching or non-latching relay operation is programmed by placing jumpers on terminals W7 and W8, which are also located on the plug-in electronic module. W7 controls the High Alarm relay and W8 controls the Low Alarm relay. Leave the jumper in for latching relay operation. Remove the jumper for non-latching operation.

NOTE

When programming the U8800, determine whether or not the system must meet the requirements of an approval agency. It should be noted that many

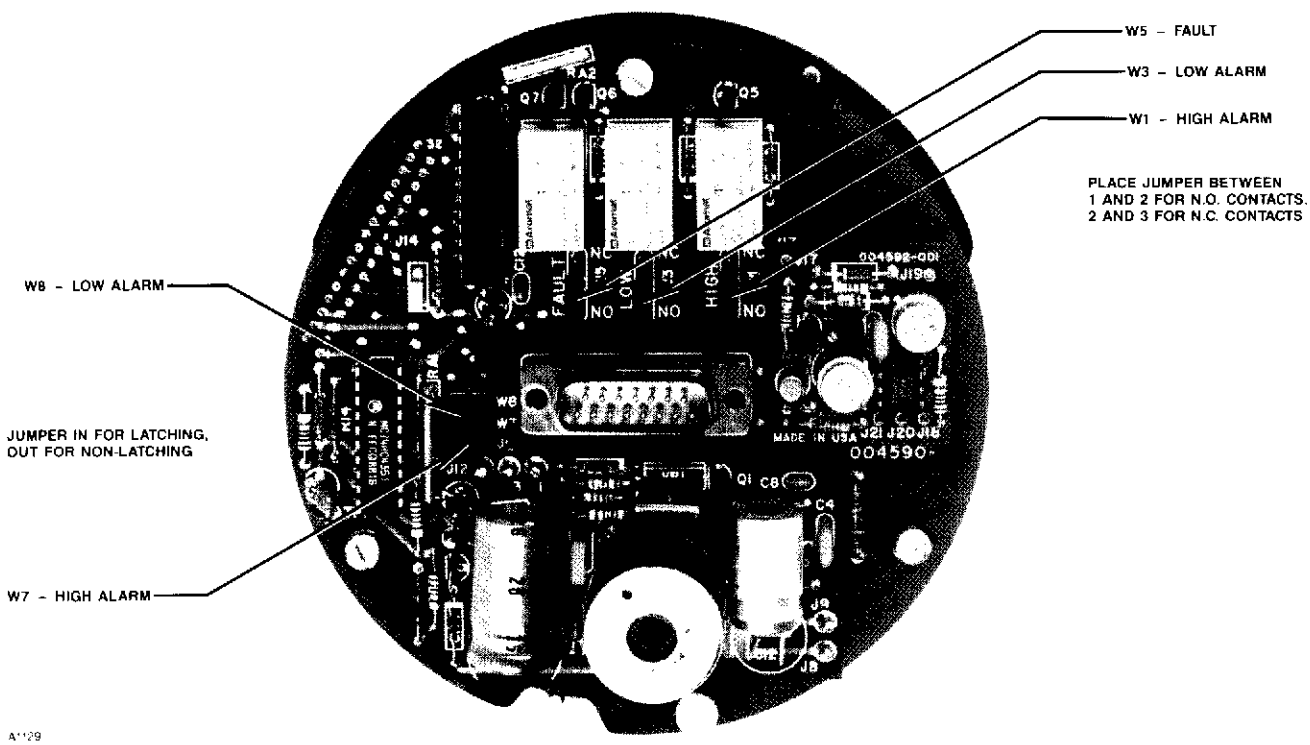


Figure 4—Relay Programming

agencies require that either the system be programmed for latching relay operation, or that it be used in conjunction with an auxiliary device that can perform the same function as latching outputs.

6. Connect the U8800 enclosure to the conduit so that the external wiring can be installed and trimmed.

7. Attach the C7064C Sensor to the U8800 as shown in Figure 5. It must be tight (minimum of five fully engaged threads) to ensure an explosion-proof installation. Connect the leadwires from the C7064C to the screw connectors on the terminal block marked "Sensor."

   Red lead to "+"
   Black lead to "–"

8. Connect the power supply leadwires and the current output leadwire to the appropriate points on the terminal block marked "Power and Signal." Connect the shield to earth ground at the power supply. Under normal conditions, the other end of the shield should **not** be connected to the shield ground screw inside the enclosure unless such a connection is required by local wiring codes. The detector enclosure should also be tied to earth ground.

NOTE

If local wiring codes permit and if a ground fault monitoring system is not being used, it is recommended that the minus side of the dc power source be connected to chassis (earth) ground. Alternatively, a 0.47 microfarad, 100 volt capacitor can be substituted for best immunity against electrostatic discharge.

9. To allow the U8800 to be reset from a remote location, a normally open switch can be connected between the RESET terminal and the negative (–) side of the power source.

10. Connect the leadwires from the alarm and fault response devices to the appropriate terminals on the

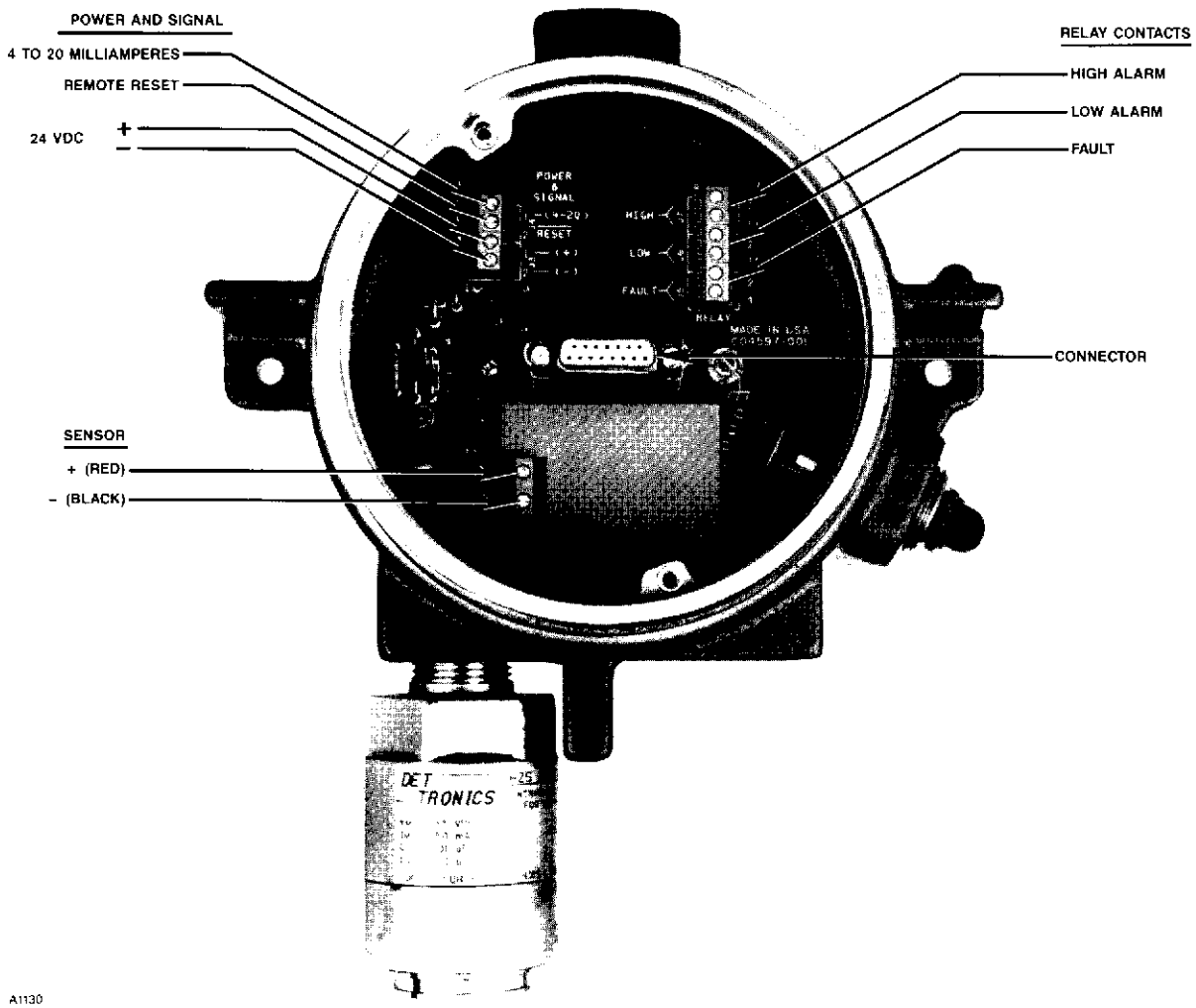


Figure 5—System Wiring

"Relay" terminal block. In the Normal operating mode, the Fault relay is energized and the Alarm relays are de-energized (no faults or alarms).

11. Check all field wiring to ensure that the proper connections have been made, then pour the conduit seals and allow them to dry (if conduit is being used).

12. Align the plug-in module with the guide posts inside the enclosure and press the module into position.

13. Tighten the two screws.

14. Place the cover back on the U8800 enclosure.

NOTE

The wiring procedures in this manual are intended to ensure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance to these ordinances cannot be guaranteed. Be certain that all wiring complies with applicable regulations that relate to the installation of electrical equipment in a hazardous area. If in doubt, consult a qualified official before wiring the system.

TYPICAL SYSTEM WIRING

Figures 6 and 7 illustrate typical C7064C/U8800 systems. For assistance in adapting a system to your individual requirements, contact the Field Support Group at Detector Electronics.

STARTUP PROCEDURE

1. Output loads that are normally actuated by the system should be secured (remove power from all output devices) to prevent undesired activation of these devices.

2. Double check to be sure that all external wiring has been installed properly and that the C7064C has been connected properly. Also be sure that the electronic module has been properly plugged into the connector inside the enclosure.

3. Apply power to the system.

NOTE

The U8800 has been designed to "wait" for approximately two minutes before beginning normal operation when power is applied to the system. During this time, the outputs are inhibited and the FAULT LED is illuminated. This delay allows time for the sensing element to properly "warm up" before normal operation is begun.

NOTE

Upon power-up of the system, initialization tests are automatically performed to ensure proper operation of the microprocessor and operating pro-

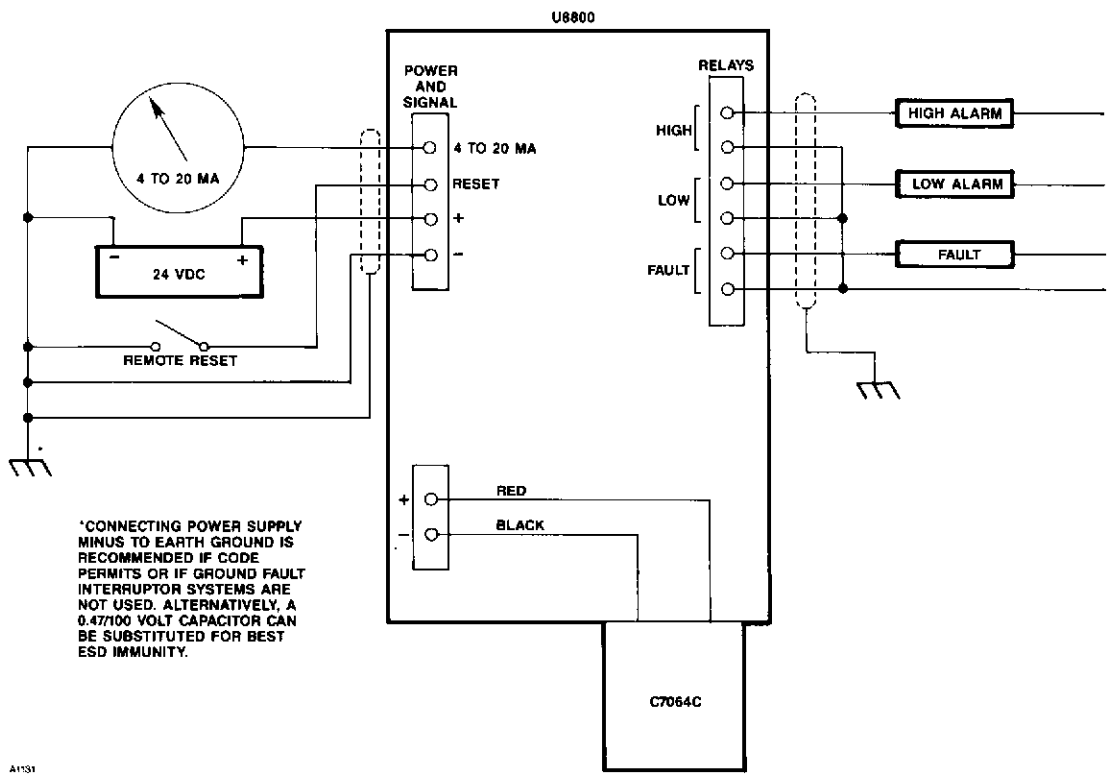


Figure 6—A Typical System

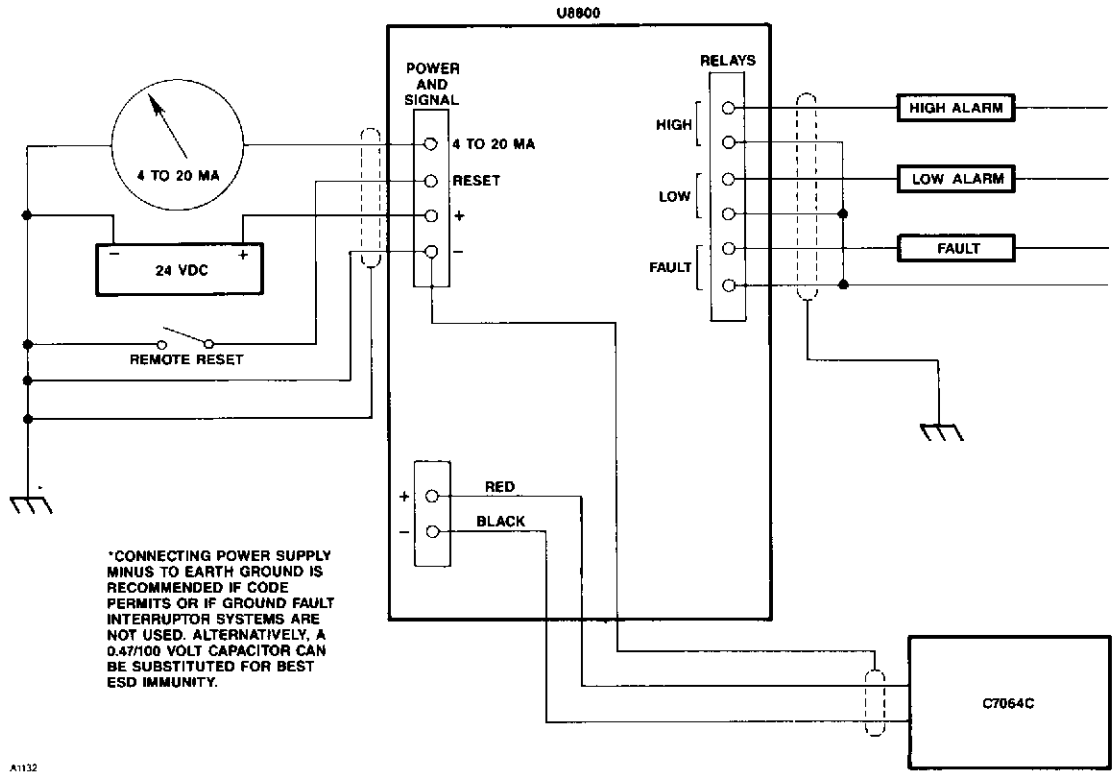


Figure 7—Remotely Mounted Sensor

gram. If a problem is detected, the FAULT LED flashes and a "9" is displayed on the digital display. Some types of initialization failures can be corrected by momentarily pressing the reset (Mode Select) button on the side of the controller. If the "9" fault persists, the controller must be returned to the factory for repairs. If the problem is corrected, normal system operation is restored. However, resetting the U8800 while a "9" fault is occurring causes a loss of ALL field programmed information (controller reverts to factory default values where applicable). A COMPLETE reprogramming and recalibration MUST be performed to ensure proper operation.

4. Check for correct setting of the alarm setpoints and calibration gas concentration (see "Setpoint Adjustments").

5. Perform the calibration procedure.

6. Remove mechanical blocking devices (if used) and restore power to the output loads.

SETPOINT ADJUSTMENT

The alarm setpoints are adjustable from 5 to 20 ppm for the low alarm and from 10 to 90 ppm for the high alarm. The calibration gas concentration is adjustable from 20 to 90 ppm. To check the present setpoint levels, follow the procedure described below.

SETPOINT DISPLAY MODE

1. To enter the Setpoint Display mode, press and hold the Mode Select button (see Figure 1) until the LOW LED begins to flash (approximately 1.5 seconds). Release the Mode Select button. The low setpoint will be shown for two seconds on the digital display.

2. At the end of the two second interval, the LOW LED goes out, the HIGH LED begins to flash, and the digital display shows the high setpoint.

3. Two seconds later the HIGH LED goes out and the CAL LED flashes. The digital display now shows the programmed calibration gas concentration.

4. After displaying the calibration gas concentration for two seconds, the U8800 automatically leaves the Setpoint Display mode and returns to the Normal operating mode.

NOTE

The Mode Select button should be released as soon as the detector has entered the Setpoint Display mode (after 1.5 seconds). If the button is still depressed at the end of the Setpoint Display procedure (7.5 seconds), the detector will automatically enter the Calibrate mode. If the operator is not prepared to perform a calibration, a calibration fault will occur (after 10 minutes).

5. If adjustments to the setpoints are required, perform the setpoint adjustment procedure. When the setpoint levels are acceptable, record this information for future reference and begin the calibration procedure.

SETPOINT ADJUSTMENT PROCEDURE

1. Determine the required setpoint levels.

2. Remove the cover from the U8800 housing. (The area must be declassified when the cover is removed with power applied.)

3. Momentarily depress either of the two SETPOINT buttons. The PPM display indicates the present low setpoint and the LOW LED flashes slowly. Press the appropriate SETPOINT button to either increase or decrease the low setpoint level.

4. When no changes to the setpoint level have been made for 5 seconds, the LOW LED goes out, the HIGH LED flashes, and the digital display shows the high setpoint. Press the appropriate SETPOINT button to obtain the desired reading on the digital display.

5. When no changes are made for 5 seconds, the HIGH LED goes out, the CAL LED flashes, and the PPM display indicates the calibration gas concentration. Press the appropriate SETPOINT button to change the calibration gas concentration as required.

6. When no changes have been made for 5 seconds, the system automatically returns to the Normal operating mode.

7. Place the cover back on the housing.

8. Record the new setpoint levels for future reference.

NOTE

The alarm setpoints, calibration gas concentration, and calibration data are stored in non-volatile memory and are retained in the event of a power loss. However, if power is interrupted while performing the Setpoint Adjustment or Calibration procedure, the entire procedure must be repeated when power is restored.

CALIBRATION

Various factors affect the time interval between periodic recalibrations. Exposure of the sensing element to certain contaminants in the air, exposure to a high concentration of H_2S, or even an extended period of normal operation can cause changes in sensitivity. Since each application is different, the length of time between regularly scheduled recalibrations can vary from one installation to the next. Therefore, no specific recommendations can be made. In general, the more frequently a system is checked, the greater the reliability. The detector **must** be calibrated:

—Before a new C7064C/U8800 System is initially put into service

—If the C7064C Sensor is replaced

—If the plug-in electronic module is replaced.

NOTE

To ensure adequate protection, the H_2S detection system must be calibrated on a regular basis. Under ideal conditions, some systems can go for up to a year without a serious loss of sensitivity. However, it must be noted that only during calibration can the system be tested to assure total function. Loss of sensitivity can be caused by various factors. The most common is clogging of the hydrophobic filter by dirt, oil, or paint. Problems of this nature are capable of totally incapacitating the detector, but it is only during calibration that the problem will de discovered. No manufacturer has yet been able to produce a system that responds to this type of failure. This includes the most sophisticated systems using state of the art microprocessor based fault detection circuitry. As a general rule, calibration should be performed at least every 90 days for detectors in clean environments. In many applications a 30 day interval could be appropriate.

The detector must be calibrated using 20 to 90 ppm hydrogen sulfide mixed with either air or nitrogen. For best results, a calibration gas concentration equal to the high alarm setpoint is recommended. Calibrate the system using the following procedure.

CALIBRATION PROCEDURE

1. Be certain that the concentration of the calibration gas mixture being used is the same as the programmed calibration gas concentration. (See "Setpoint Adjustment" section.) Reprogram the U8800 if required. Failure to do so will greatly impair system response.

2. Be sure that only clean air (0 ppm) is present at the detector. If the ambient atmosphere contains H_2S, clean air must be supplied to the sensor. Failure to do so will cause the system to read a lower level of H_2S than is actually present. The microprocessor begins taking Zero readings immediately upon entering the Calibrate mode.

3. Depress and hold the Mode Select button until the CAL LED is illuminated and the PPM display starts to flash (approximately 7.5 seconds).

4. When the Zero calculations are complete (45 seconds minimum), the PPM display stops flashing and reads "00."

5. Apply the calibration gas. The digital display starts to flash, and the value indicated on the PPM display rises.

6. When the microprocessor has completed the Span adjustments (45 seconds minimum), the PPM display stops flashing. The ppm level of the calibration gas is shown on the digital display.

7. Remove the calibration gas. When the detector reading falls to 3 ppm below the lowest alarm setpoint, the U8800 automatically exits the Calibrate mode. All outputs and indicators return to normal operation and the data is saved in non-volatile memory.

If the operator fails to complete the calibration procedure within ten minutes or if the sensitivity of the sensor is inadequate for a successful calibration, a calibration fault ("2" or "4" status) will be generated and the system will automatically revert back to the former calibration settings. If a successful calibration cannot be accomplished, replace the C7064C Sensor and recalibrate.

When the sensing element in the C7064C Sensor is approaching the end of its useful life, a "1" status (end of life) is displayed during the Calibrate mode. This does not indicate a system malfunction, but is intended simply to make the operator aware of this condition. A successful calibration can still be performed. The "1" is flashed on the PPM display for one out of every five seconds during the time that the calibration gas is removed and the ppm level being indicated on the digital display returns to zero. The "1" is no longer displayed after the system leaves the Calibrate mode.

CURRENT OUTPUT CALIBRATION

The 4 to 20 milliampere output is calibrated at the factory to provide a degree of accuracy that is satisfactory for most applications. However, the highest level of accuracy can be obtained by performing the following procedure.

1. A dc current meter capable of measuring 4 to 20 ma must be connected to the current loop output. This can be accomplished by disconnecting all loads and connecting a dc ammeter between the 4 to 20 ma terminal and power minus, by connecting a dc ammeter in series with the load, or by connecting a digital dc voltmeter across a known load resistance and calculating the current flow using the formula: I = voltage/load resistance.

2. Remove the cover from the U8800 housing. (The area must be declassified when the cover is removed with power applied.)

3. Depress and **hold** either SETPOINT button, then momentarily press the mode select button. Release both buttons. The LOW LED should flash slowly and the PPM display will indicate a reference number between 1 and 99. This number is a reference only and can be ignored by the operator, however, the flashing LOW LED indicates that the system is now generating a 4 ma output.

4. Press the appropriate SETPOINT button to obtain a 4 ma reading on the meter.

5. When no adjustments have been made for 5 seconds, the U8800 automatically switches to a 20 ma output. This is indicated by a flashing HIGH LED. Press the appropriate SETPOINT button to obtain a 20 ma reading.

6. When no changes have been made for 5 seconds, the system automatically returns to the Normal operating mode and saves the data in non-volatile memory.

7. Place the cover back on the housing.

8. Remove the meter from the system output.

MAINTENANCE

The H_2S detection system requires little routine maintenance, however, periodic checks and calibration are needed to assure proper system function. The frequency of these checks is determined by the requirements of the particular installation.

HYDROPHOBIC FILTER

The hydrophobic filter on the front of the sensor housing protects the sensing element from contaminants in the environment. If the filter becomes dirty, clean it (if possible) or replace it. If it is damaged, it must be replaced. DO NOT operate the detection system if the hydrophobic filter is damaged or missing.

NOTE

If the detector cannot be calibrated or responds slowly to the calibration gas, check the condition of the hydrophobic filter before replacing the sensor. A dirty filter can block the flow of gas to the sensing element and adversely affect its response.

MANUAL CHECK OF OUTPUT DEVICES

Fault detection circuitry continuously monitors for an open sensing element, excessive negative zero drift, open or shorted interconnecting wiring, and various other problems that could prevent proper response to a dangerous level of H_2S. It does not, however, monitor external equipment that is activated by the detection system. It is important that these devices be checked intitially when the system is installed, as well as periodically during the ongoing maintenance program.

CHECKOUT IN NORMAL MODE

The entire system should be checked periodically to ensure that the presence of H_2S at the detector will result in the proper system response.

CAUTION

Be sure to secure all output devices that are actuated by the system to prevent unwanted activation of this equipment, and remember to place these same output devices back into service when the checkout is complete.

A rubber O-ring is used to ensure that the enclosure cover will seal tightly and provide a watertight installation. Periodically open the enclosure and inspect the O-ring for breaks, cracks and dryness. To test the ring, remove it from the enclosure and stretch it slightly. If cracks are visible, it should be replaced. If it feels dry, a thin coating of lubricant should be applied. When re-installing the ring, be sure that it is properly seated in the groove on the housing. See Figure 8. Do **not** install the O-ring in the thread relief groove, which is located above the O-ring groove. It is imperative that this O-ring be properly installed and in good condition. Failure to properly maintain it can allow water to enter the enclosure and cause premature failure. A coating of lubricant should also be applied to the threads on the cover before reassembling the enclosure. This will both lubricate the threads and help to prevent moisture from entering the enclosure.

CAUTION

The O-ring should be lubricated with polyalphaolefin grease, such as GRS-450 made by CPI Engineering. Suitability of other lubricants should be evaluated, since some materials can adversely affect the performance of certain sensing elements.* Silicone *based lubricants should* never *be used if catalytic type combustible gas sensors are being used in conjunction with the H_2S sensors, since inadvertent use of a silicone lubricant on or near the combustible gas sensor will cause irreversible damage to the sensing element.

SENSING ELEMENT REPLACEMENT

To replace the sensing element in the C7064C Sensor:

1. Remove power from the U8800/C7064C.
2. Remove the cap from the sensor housing. See Figure 9. (There is no need to remove the C7064C from the U8800.)
3. Remove and discard the old sensing element assembly.
4. Determine proper orientation for the new assembly, then **carefully** plug it in.

NOTE

Handle the sensing element assembly carefully. To avoid possible damage, observe the normally accepted procedures for handling electrostatic sensitive devices. See form 75-1005 for additional information.

5. Place the cap back on the sensor housing. Tighten only until snug. Do not overtighten.
6. Re-apply power to the system.

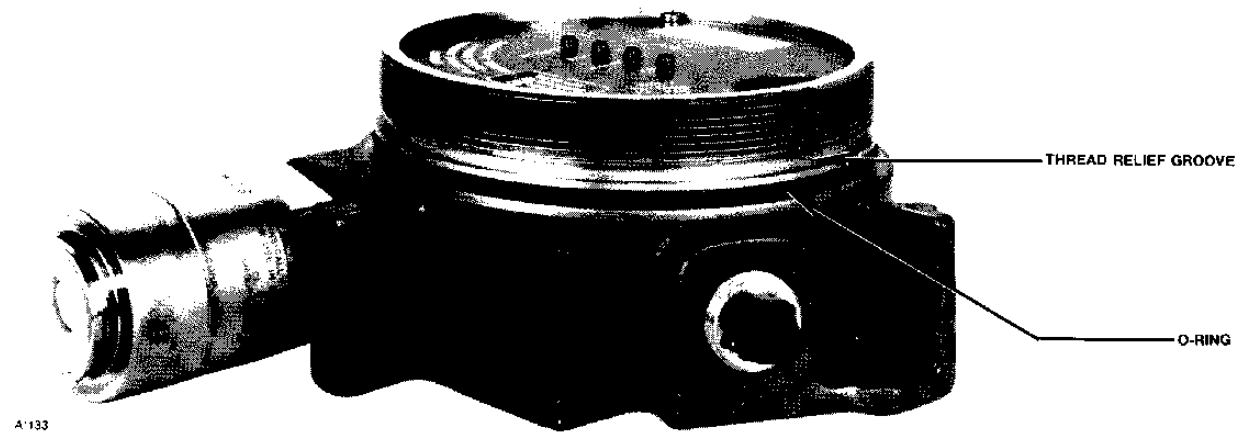


Figure 8—O-Ring on U8800 Enclosure

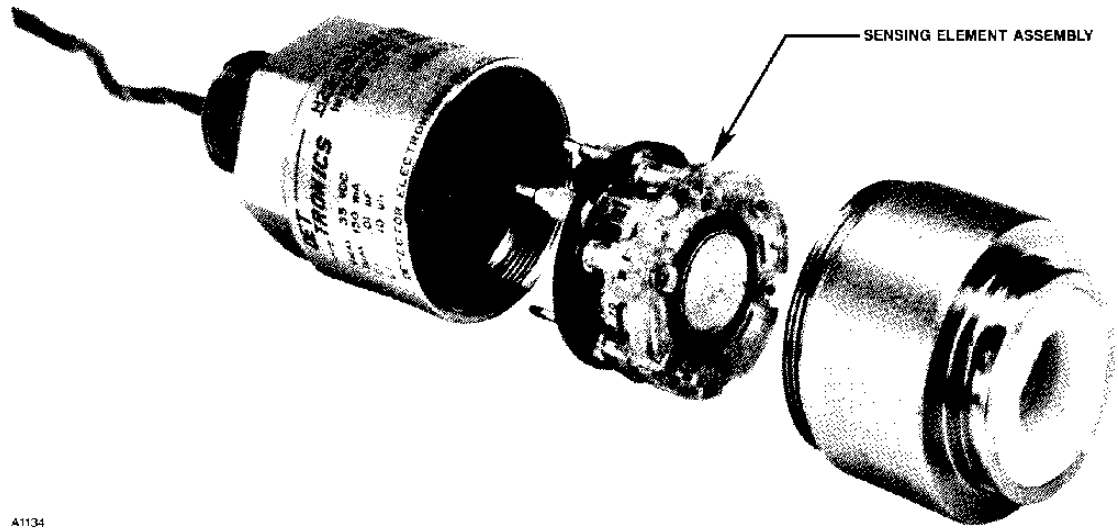


Figure 9—C7064C Sensor

7. When the two minute warmup time is completed, calibrate the system.

A test form is supplied at the rear of this manual for recording maintenance performed on the system.

TROUBLESHOOTING

Table 2 is intended to serve as an aid in locating the cause of a system malfunction.

NOTE

Record all faults on the Fault Record Sheet supplied at the back of this manual.

REPLACEMENT PARTS

The U8800 is not designed to be repaired by the customer in the field. If a problem should develop, first carefully check for proper wiring and calibration. If it is determined that the problem is caused by a defect within the plug-in electronic module, the module must be replaced and returned to the factory for repairs.

NOTE

When replacing the module, be sure that the part number and jumper wires of the replacement are the same as the original. Always remove power before removing or plugging in the module.

An adequate supply of spare sensing element assemblies should be kept on hand for field replacement. For maximum protection against contamination and deterioration, they should not be removed from the original protective packaging until the time of installation. For maximum storage life, sensing elements should be stored at a temperature between 32°F and 68°F (0 to 20°C).

Always calibrate the system after replacing either the electronic module or the C7064C Sensor.

—004646-001 Sensing element assembly for C7064C
—DE4594-xxx Plug-in electronic module
—004532-002 Replacement filter
—107427-030 O-ring for U8800 enclosure.
—227117-001 Gas bottle for 227115-001 Calibration Kit

DEVICE REPAIR AND RETURN

Prior to returning devices or components, contact the nearest local Detector Electronics office so that an RMI (Return Material Identification) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to expedite finding the cause of the failure, thereby reducing the time and cost of the repair to the customer.

Return all equipment transportation prepaid to the Minneapolis location.

Office locations

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665
Telex 6879043 DETEL UW
Cable Detronics
Facsimile (612) 829-8750

Detector Electronics Corporation
3000 Wilcrest
Suite 145
Houston, Texas 77042 USA
Telephone (713) 782-2172

Table 2—Troubleshooting Guide

Problem	Possible Cause
No indicators on faceplate are illuminated	1. Wiring to external power source. 2. Input power failure.
Blank display, FAULT LED on.	1. Warmup period after powerup (2 minutes). 2. If condition exists after warmup, remove power, then power up again. If problem still exists, replace electronic module.
"1" Status	1. A successful calibration has been completed, however, the sensor is near the end of its useful life. Replace sensor soon.
"2" Status	1. Sensor is defective or out of tolerance and must be replaced. 2. Detector was placed in Calibrate mode, but the calibration procedure was not completed.
"3" Status	1. Excessive zero drift - recalibrate detector.
"4" Status	1. Faulty sensor. Replace sensor.
"5" Status	1. Internal operating voltage out of tolerance.
"7" Status	1. Input voltage out of tolerance.
"9" Status	1. Microprocessor failure or other failure detected during powerup. Reset the unit. If it goes to Normal mode, reprogram and recalibrate.

Detector Electronics Corporation
Graviner Limited
Colnbrook
Slough
SL3 OHB
ENGLAND
Telephone 0753683245
Telex 848124 Gravin
Facsimile (0753) 685126

Detronics Scandinavia AB
Box 81
S-260 83 Vejbystrand
SWEDEN
Telephone 431-53002/53240
Telex 72008
Facsimile 431-52236

Detector Electronics Europe S.r.l.
Via Trivulzio n° 30
20146 Milan
ITALY
Telephone 02-4048641 or 02-4048642
Telex 312625

Detronics A/S
Haneborgveien 91
1472 Fjellhamar
NORWAY
Telephone 47-02973050
Telex 47-02971820

ORDERING INFORMATION

When ordering please specify:

—U8800 Unitized H_2S Controller
—C7064C H_2S Sensor
—Conduit entry size
3/4 inch NPT
25 mm.
—227115-001 H_2S Calibration Kit

For assistance in ordering a system to fit your application, please contact:

Detector Electronics Corporation
Field Support Group
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone ([redacted] 941-5665 (952)
Telex 6879043 DETEL UW
Cable Detronics
Facsimile ([redacted] 829-8750 (952)