

Unitized Combustible Gas Transmitter/Controller U8700H

Section I General Information

DESCRIPTION

The U8700H is a unitized combustible gas transmitter/controller that operates in conjunction with a catalytic sensing element to continuously monitor the environment for the presence of combustible gases and vapors. The system operates in the range of 0 to 99% LFL (lower flammable limit) and responds to a variety of combustible gases. All electronic circuitry and status indicators are housed in a metal enclosure, for location at the area of detection.

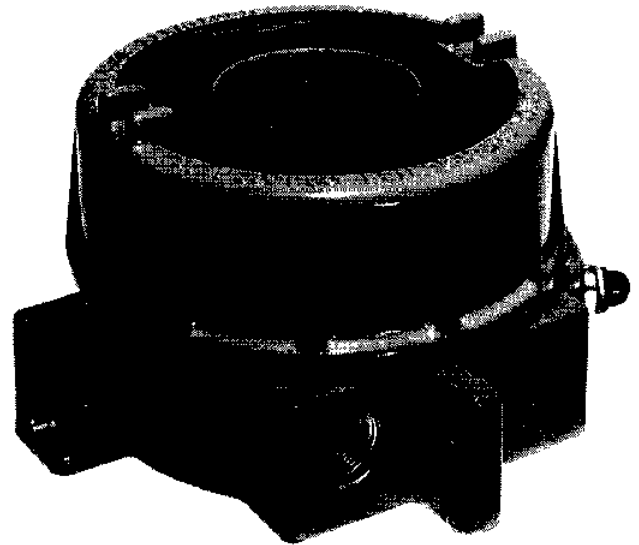
Depending on the application, the U8700H can function as a transmitter and/or a single channel controller. The transmitter output signal is a linear 4 to 20 ma dc current, which corresponds to 0 to 99% LFL concentrations of the gas being detected (standard output). A set of three SPST relay contacts can also be ordered for direct control of external equipment by the U8700H.

LEDs located on the faceplate are illuminated to provide a visual indication when the level of gas exceeds either of two field adjustable alarm setpoints. A digital display indicates the level of gas being detected and uses a numerical code to identify system status.

Fault detection circuitry continuously monitors for proper operation. If a malfunction is detected, the current output drops to less than 1.0 ma.

FEATURES

- Linear 4 to 20 ma output corresponds to gas concentration of 0 to 99% LFL and indicates system status. Output can be field calibrated to ensure accuracy.
- Current output is user selectable for isolated or non-isolated operation.
- Two independently adjustable alarm threshold levels.



- Digital display indicates gas level in both Normal and Calibrating modes.
- LEDs provide visual indication of alarm, fault, and calibration status.
- Microprocessor based circuitry provides continuous self-diagnostics and automatic fault identification.
- Pushbutton self-calibration feature allows 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.
- Output relays (optional) are programmable for latching or non-latching operation.
- Alarm relays are programmable for de-energized or energized (fail-safe) operation.
- "Pre-failure" indication warns when the sensing element is approaching the end of its useful life.

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- Non-volatile memory retains calibration and setpoint data during loss of input power.

- Remote reset capability.

SPECIFICATIONS

SENSOR

RESPONSE TIME—

10 seconds to reach 50 percent of value of applied gas, and 30 seconds to reach 90 percent of value of applied gas.

ACCURACY—

±3 percent full scale up to 2.5 percent methane gas by volume in air (50% LFL), ±5 percent full scale up to 5 percent methane gas by volume in air (100% LFL).

TEMPERATURE EFFECT—

±10% LFL at -40°F to +167°F (-40°C to +75°C).

REPEATABILITY—

±5 percent, full scale.

ZERO DRIFT—Less than 1% LFL per month.

OXYGEN EFFECTS—

The sensor will operate with the oxygen level in the atmosphere down to about 10 percent. Under oxygen enriched conditions the sensor will respond normally, but the user should beware of an increase in the explosive hazard.

HUMIDITY EFFECTS—

±5 percent full scale concentration in 10% to 90% RH.

DIMENSIONS—

See Figure 1.

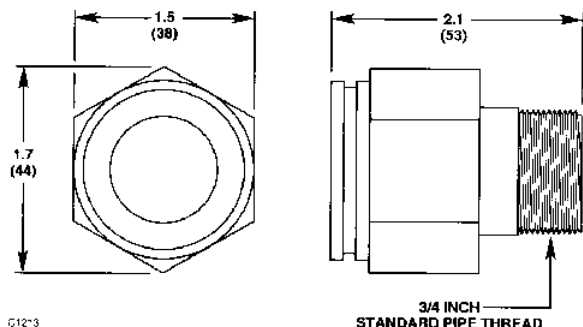


Figure 1—Sensor Dimensions in Inches (Millimeters)

U8700H

OPERATING VOLTAGE—

24 volts dc (18 to 35 vdc), measured at the U8700H.

OPERATING CURRENT—

Startup: 1.0 ampere at 24 vdc (1 second).

Running: 0.25 ampere nominal, 0.5 ampere maximum at 24 vdc.

OPERATING RANGE—

0 to 99% LFL.

TEMPERATURE RANGE—

Operating: -40°F to +167°F (-40°C to +75°C).

Storage: -49°F to +185°F (-45°C to +85°C).

SETPOINT ADJUSTMENTS—

The alarm setpoints are adjustable from 5 to 40% LFL for the low alarm and from 10 to 60% LFL for the high alarm. The calibration gas concentration is adjustable from 30 to 99% LFL.

CURRENT OUTPUT—

Linear 4 to 20 ma dc current is user selectable for isolated or non-isolated operation. The maximum loop resistance is 450 ohms with an input voltage of 18 vdc (measured at the U8700H) and increases at a rate of 50 ohms per volt up to 35 vdc (1350 ohms maximum).

NOTE

FMRC has verified loop resistance up to 600 ohms.

WIRING—

Power wiring to the U8700H must be 18 AWG minimum. As the wiring distance increases, larger diameter wire is required to maintain a minimum of 18 vdc at the U8700H.

RELAY CONTACTS (Optional)—

Normally open or normally closed contacts rated 5 amperes at 24 vdc.

ENCLOSURE RATINGS—

CSA certified for Class I, Division 1, Groups B, C and D. FMRC approved for Class I, Division 1, Groups B, C and D. Designed to meet BASEEFA Group II B.

NOTE

Approval rating does not include or imply approval of devices used in conjunction with the transmitter. To maintain system approval, all equipment connected to the transmitter must have the appropriate approval ratings.

DIMENSIONS—
See Figure 2.

SHIPPING WEIGHT (approximate)—
U8700H: Aluminum - 6.0 lb (2.7 kg)
 Stainless steel - 17.0 lb (7.7 kg)
Sensor: Aluminum - 0.5 lb (0.2 kg)
 Stainless steel - 1.0 lb (0.4 kg)

SYSTEM OPERATION

The U8700H consists of an aluminum or 316 stainless steel (optional) enclosure that contains the signal processing circuitry, status indicators, mode selection pushbutton, and output relays (optional). The sensor contains the sensing element and is attached to the U8700H. The gas detection system is suitable for use in Class I, Division 1, Groups B, C and D hazardous locations.

SENSOR

The combustible gas sensor consists of a matched pair of elements. One is an active catalytic sensing element, and the other functions as a temperature compensating reference element. In the presence of combustible gas, the resistance of the active sensing element increases in proportion to the concentration of the gas being detected. The change in resistance of the active element, relative to the resistance of the reference element, is used as the basis for determining the LFL percentage of the gas at the sensor. This process is also reversible, causing the output to

return to its normal value when the level of gas returns to 0% LFL.

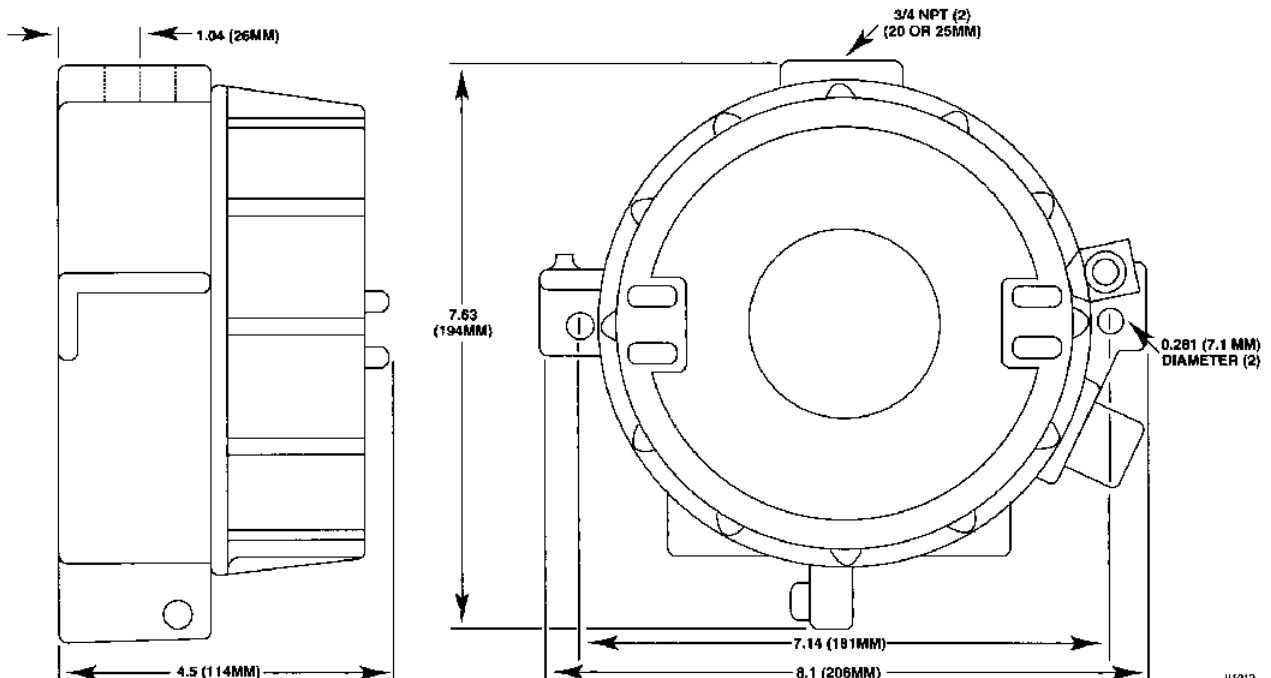
The sensing element is mounted inside an aluminum (316 stainless steel optional) housing that is designed to meet most national and international standards relating to use in hazardous areas.

A choice of two sensing elements is offered - poison resistant and high temperature. The poison resistant sensor has many times the service life of standard catalytic bead sensors in atmospheres containing silicones, halogenated hydrocarbons and organo-metallics. Due to its rugged construction and high performance, it holds up under punishing conditions.

With proper calibration, the sensor can be used to detect a wide variety of combustible gases. Contact the Field Support Group at Detector Electronics for assistance in adapting the sensor to a specific application.

TRANSMITTER ENCLOSURE

The enclosure that houses the electronic circuitry of the transmitter has a clear window to easily view the digital display and indicating LEDs. A removable cover allows access to the wiring terminals and set-point adjustments. Two 3/4 inch NPT threaded conduit entries are provided (20 or 25 mm available on some models). One is used for mounting the sensor, and the other serves as the conduit wiring entrance. If the application involves installation in a location that is inaccessible or too hazardous for safe entry, the



sensor and transmitter can be mounted separately using the optional Sensor Separation Kit. The maximum separation distance is 400 feet (120 meters), using 12 AWG shielded wire. Refer to the "Installation" section of this manual for details.

ALARM SETPOINTS

The U8700H Transmitter has independently adjustable Low and High alarm setpoints. The corresponding LOW and HIGH LEDs are illuminated and the alarm relays are energized when the gas concentration exceeds the setpoints. The adjustment range is 5 to 40% LFL for the low alarm and 10 to 60% LFL for the high alarm. If the operator does not program other values, the microprocessor will automatically use 20% LFL for the low alarm and 50% LFL for the high alarm.

In addition to the alarm setpoints, the transmitter must also be programmed for the calibration gas concentration that will be used. This value must be equal to the LFL percentage of the gas/air mixture that is used for the span adjustment. The adjustment range is from 30 to 99% LFL. (The microprocessor will use 50% LFL unless a different value is programmed.)

The alarm setpoints and calibration gas concentration 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 U8700H provides a dc current output for transmitting system status information to monitoring devices. A linear 4 to 20 ma output corresponds to gas concentrations of 0 to 99% LFL and is user selectable for either isolated or non-isolated operation. When operating in the Calibrate mode, the output drops to less than 2 ma. In the event of a system fault, the current output drops to less than 1.0 ma. The current output can be calibrated in the field to ensure maximum accuracy. (Refer to the "Calibration" section of this manual for details.)

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 dc and can be programmed for either normally open or normally closed operation. The Alarm relays are field programmable for either normally energized (fail-safe) or normally

de-energized operation. The Fault relay is normally energized and is de-energized in the event of a malfunction. Latching or non-latching Alarm relay operation is also programmed at the time of installation.

DIGITAL DISPLAY AND LEDs

A digital display continuously indicates the level of gas at the sensor in both the Normal and Calibrating modes. It operates in the range of 0 to 99% LFL. A negative zero drift condition is indicated by a minus (-) in the left hand digit. At 100% LFL, a blinking "99" latches on to indicate a potentially explosive atmosphere.

If a malfunction should occur, the amber FAULT LED blinks and the digital display identifies the nature of the fault using a numerical code. See Table 1. The left hand digit shows "F" to indicate a fault condition, and the right hand digit displays the code number for the particular problem.

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 gas decreases below the setpoint.

CAUTION

Inaccurate readings in gas concentrations beyond 100% LFL are an inherent problem with catalytic type sensing devices. For this reason, the U8700H does not indicate gas concentrations in excess of 99% LFL. The user must exercise caution if an off scale reading is indicated, since a highly explosive condition could exist. The hazardous area should be checked with a portable detection instrument to determine the actual level of combustible gas present.

Table 1—System Status Codes

Status Display	Condition
F9	Initialization routine failure, microprocessor fault
F5	High/low supply voltage, ground reference fault
F4	Detector fault (bridge/amplifier problem)
F3	Zero drift exceeds -9% LFL
F2	Calibration error
F1	Sensor reaching end of life (Calibrate mode only)

Exposure to a high level of gas can also have an adverse effect on the sensitivity of the sensing element. If the level of gas at the sensor should reach 100% LFL, it is important that it be tested and recalibrated if required. In some cases, it may be necessary to replace the sensor.

FACEPLATE

The faceplate provides LEDs for indicating status conditions, a digital display for indicating the level of gas 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 3 for the location of buttons and indicators.

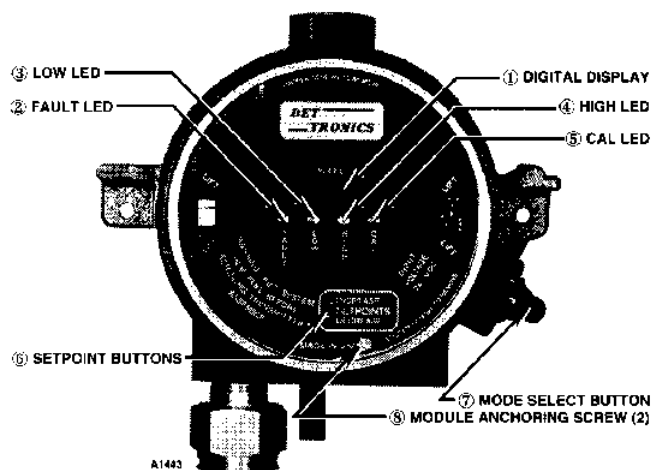


Figure 3—U8700H Detector

1. In the Normal operating mode the **% LFL display** continuously indicates the level of gas at the sensor. In the event of a fault, 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.
2. Illumination or blinking 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** blinks in the Normal mode to indicate that the level of gas at the sensor exceeds the low setpoint. If the transmitter is equipped with alarm relays, illumination of the LOW LED also indicates that the Low Alarm relay has been actuated. In other operating modes, the blinking LOW LED indicates that the reading on the % LFL 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 transmitter 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) must be loosened to remove the electronic module from the enclosure.

AUTOMATIC DIAGNOSTICS AND FAULT IDENTIFICATION

The microprocessor based U8700H features self-testing circuitry that continuously checks for shorts, opens, faulty components, or other problems that could prevent proper response to gas. When power is applied, the microprocessor automatically tests memory. 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 blinks.
2. The digital display shows "F" in the left hand digit and the code number of the fault in the right hand digit. (See Table 1 for fault codes.)
3. The output current drops to less than 1.0 ma.
4. The Fault relay is de-energized.

When the fault is corrected, the system will automatically reset (except "F2" - calibration error).

NOTE

Status codes 1, 2 and 3 are displayed for approximately 1.5 out of each 6 seconds, alternating with display of the gas concentration.

OPERATING MODES

The U8700H can operate in any of the following modes. Operating modes other than normal are selected by pressing the appropriate pushbuttons.

NOTE

The following section is intended to acquaint the operator with the basic operation of the U8700H. For complete step-by-step setpoint programming and calibration procedures, refer to the corresponding sections in this manual.

Normal

In the Normal operating mode, the microprocessor monitors the output signal from the sensor and generates a current output that varies from 4 to 20 ma, depending on the gas concentration. The digital display indicates the LFL percentage of the gas. If the level of gas exceeds an alarm setpoint, the appropriate LED blinks and the corresponding Alarm relay is actuated (optional). If a system fault occurs, the current drops to 0 ma, the FAULT LED is illuminated, and the normally energized Fault relay 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 previously illuminated turn off and the relays return to their normal condition (no alarms or faults occurring).

Remote reset capability is also provided. Remote reset performs a reset function only and cannot be used for entering other operating modes.

Setpoint Display Mode

When the MODE SELECT button is pressed and held until the LOW LED begins to blink slowly (approximately 1.5 seconds), the digital display sequentially shows the programmed alarm setpoints and calibration gas concentration. The low setpoint is displayed for 2 seconds, then the LOW LED goes out, the HIGH LED blinks, and the high setpoint is displayed. Two seconds later the HIGH LED goes out, the CAL LED blinks, 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).

This mode is used only for displaying the setpoints. Use the "Setpoint Adjust" mode for changing setpoint and calibration gas values.

Calibrate

The U8700H uses a fully automatic calibration procedure that requires no manual adjustments by the operator. The Calibrate mode is entered by pressing and holding the MODE SELECT button until completion of the "Setpoint Display" sequence described above (approximately 7.5 seconds). The microprocessor performs the Zero adjustments, then signals the operator when to apply and also when to remove the calibration gas. Upon completion of a successful calibration, the gas detection system automatically returns to the Normal operating mode.

If the operator fails to complete the calibration procedure, if an error in calibrating occurs, or if the sensor is unable to be calibrated, the microprocessor will automatically return to the Normal mode (after 10 minutes) and continue to use the previous calibration data. A fault indication ("F2" 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 % LFL display while in the Calibrate mode to warn the operator of this condition. (See the "Calibration" section of this manual for complete information regarding calibration.)

Setpoint Adjust

The Setpoint Adjust mode is entered by **momentarily** depressing either of the two SETPOINT buttons (see Figure 3). In this mode the alarm setpoints and calibration gas level are sequentially displayed on the digital display for approximately five seconds and the corresponding LED flashes slowly. To change the value, depress the appropriate SETPOINT button to either increase or decrease the displayed value. If no changes are made for 5 seconds, the microprocessor automatically advances to the next setpoint. At the end of the sequence, the microprocessor automatically returns to the Normal operating mode.

DC Current Output Calibration

This mode is used to calibrate the 4 to 20 ma dc output and requires a dc current meter to monitor the actual output. To enter this mode, press and hold either SETPOINT button, then press the MODE SELECT button. First the 0% LFL value (4 ma) is generated for approximately 5 seconds while the LOW LED flashes. Then the 100% LFL value (20 ma) is generated while the HIGH LED flashes. Adjustments

to the current output level are made by pressing the appropriate SETPOINT button. The microprocessor automatically returns to the normal operating mode at the end of the sequence.

Section II Installation

SENSOR POSITIONING

The sensor must be properly located to enable it to provide maximum protection. The formula for determining the most effective number and placement of sensors varies depending on the conditions at the job site. The individual performing the installation must rely on experience and common sense to determine the quantity of sensors and the best sensor locations to adequately protect the area.

The following factors should be considered for every installation:

1. What kind of gas is to be detected? If it is lighter than air (acetylene, hydrogen, methane, etc.), place the sensor above the potential source. Place the sensor close to the floor for gases that are heavier than air (benzene, butane, butylene, propane, hexane, pentane, etc.) or for vapors resulting from flammable liquid spills. However, note that air currents can cause a gas that is heavier than air to rise. In addition, if the gas is hotter than ambient air, it could also rise.
2. How rapidly will the gas diffuse into the air? Select a location for the sensor as close as practical to the anticipated source of a gas leak.
3. Ventilation characteristics of the immediate area must also be considered. Movement of air will cause gas to accumulate more heavily in one area than another. The sensor should be placed in the area where the most concentrated accumulation of gas is anticipated. Also consider the fact that many ventilation systems do not operate continuously.
4. The sensor should be pointed down to prevent the buildup of moisture or contaminants on the filter and to ensure proper operation.
5. The sensor must be accessible for testing and calibration. The use of the Sensor Separation Kit will be required in some installations.
6. The sensor should be located in an area where it is safe from potential sources of contamination that can poison the sensing element.

7. Exposure to excessive heat or vibration can result in pre-mature failure of any electronic device and should be avoided if possible. Shielding the device from intense sunlight will reduce solar heating and can increase the life of the unit.

Remember, the finest gas detector is of little value if the gas cannot readily come into contact with it.

For additional information on determining quantity and placement for sensors in a specific application, refer to Instrument Society of America (ISA) Transaction Volume 20, Number 2, titled "The Use of Combustible Detectors in Protecting Facilities from Flammable Hazards."

GENERAL WIRING REQUIREMENTS

Shielded Cable

The use of shielded cable is recommended for wiring the system to protect against interference caused by extraneous electrical "noise." If a sensor separation kit is used, shielded cable **must** be used between the sensor and the transmitter.

In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.

Conduit Seals

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 become 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 transmitter enclosure as possible. In no case should this seal be located more than 18 inches (46 cm) from the device. When an explosion-proof installation is required, an additional seal may be needed at any point where the conduit enters a non-hazardous area. Always observe the requirements of local codes.

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 can occur through the inside of the shield.

It is recommended that conduit breathers also be used. In some applications, alternate changes in temperature and barometric pressure can cause "breathing," which allows the entry and circulation of moist air throughout the conduit. Joints in the conduit system and its components are seldom tight enough to prevent this "breathing." Moisture in the air can condense at the base of vertical conduit runs and equipment enclosures, and can build up over a period of time. This can be detrimental to electronic devices. To eliminate this condition, explosion-proof drains and breathers should be installed to automatically bleed off accumulated water.

Power Wiring

The wiring to the transmitter must be 18 AWG minimum. As the wiring distance increases, larger diameter wire is required to maintain a minimum of 18 vdc at the transmitter.

Current Loop Wiring

The 4 to 20 ma dc current loop can be wired for either isolated or non-isolated operation. The maximum loop resistance is 450 ohms with an input voltage of 18 vdc (measured at the U8700H) and increases at a rate of 50 ohms per volt up to 35 vdc (1350 ohms maximum).

NOTE

FMRC has verified loop resistance up to 600 ohms.

Relay Wiring

Direct connection of 120/240 vac to the relay terminals inside the transmitter enclosure is not recommended, since switching relay contacts can induce electrical noise into the electronic circuitry, possibly resulting in a false alarm or other system malfunction. If the application requires that ac powered equipment be controlled by the transmitter, the use of externally located relays is recommended.

SENSOR SEPARATION

The Sensor Separation Kit¹ allows the sensor to be mounted apart from the transmitter, thereby permitting installation of the transmitter in a location that is convenient for monitoring the faceplate displays and performing calibration.

Kit Description

The sensor separation kit consists of a junction box with connector board and a calibration cup.

See Figure 4 for an illustration of a typical system using the Sensor Separation Kit.

The aluminum junction box is designed for use in hazardous areas, and when properly installed will provide an explosion-proof installation. The connector board assembly, mounted inside the junction box, contains the terminals for connecting the sensor and external wiring.

By running tubing from the calibration cup back to the transmitter location, the operator can monitor faceplate indicators, press pushbuttons, and control the flow of calibration gas from the same location.

¹ The sensor separation kit is not tested and approved by FMRC.

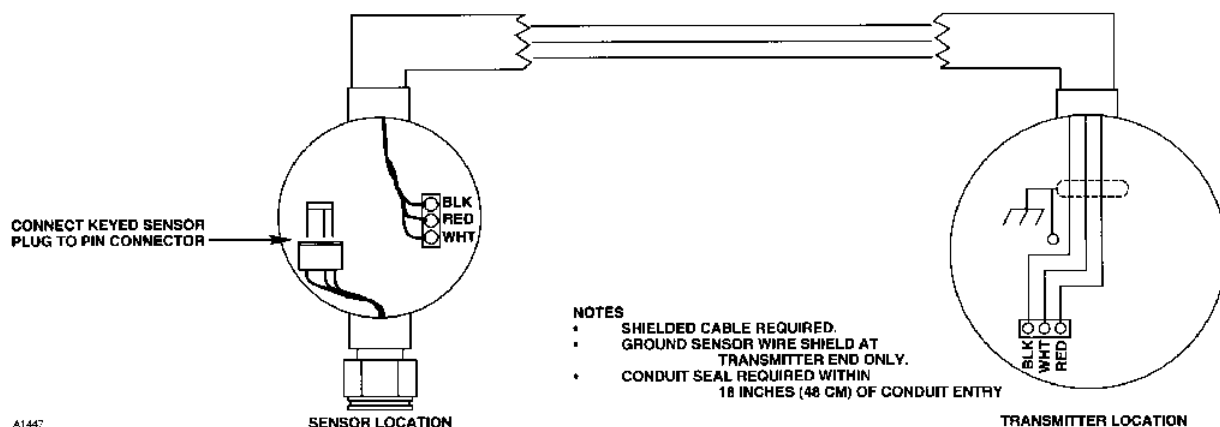


Figure 4—A Typical Installation Using a Sensor Separation Kit with a U8700H Transmitter

IMPORTANT

The operator must frequently inspect the filter on the calibration cup. This filter must be kept clean. If the filter should become clogged by environmental contaminants such as dirt, oil, paint, etc., the flow of gas to the sensing element will be restricted. This can significantly reduce the sensitivity and response time of the sensor, thereby impairing the ability of the detection system to respond to a hazardous condition. Problems of this nature will not be detected by the system's diagnostic circuitry. If the filter becomes dirty and cannot be cleaned properly, the calibration cup must be replaced.

Sensor Installation

For proper operation, the sensor must be oriented with the filter pointing down. Install the sensor in the lower 3/4 inch NPT opening on the junction box. Connect the conduit to the upper opening.

The sensor junction box can be mounted to a wall or post, or it can be suspended by the conduit. A spacer (1/4 to 1/2 inch) may be needed between the junction box and the wall or post to allow adequate room for the sensor and calibration cup. See Figure 5. The junction boxes should be electrically connected to earth ground.

Wiring Requirements

A three wire cable is used for the connection to the transmitter. The use of cable with a foil shield is required to protect against noise interference. The shield of the cable should be open at the sensor junction box and connected to earth ground at the transmitter junction box.

Refer to Table 2 to determine the maximum sensor to transmitter separation distances for a given wire size.

WIRING PROCEDURE

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

1. Locate the sensor where it 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 U8700H contains 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

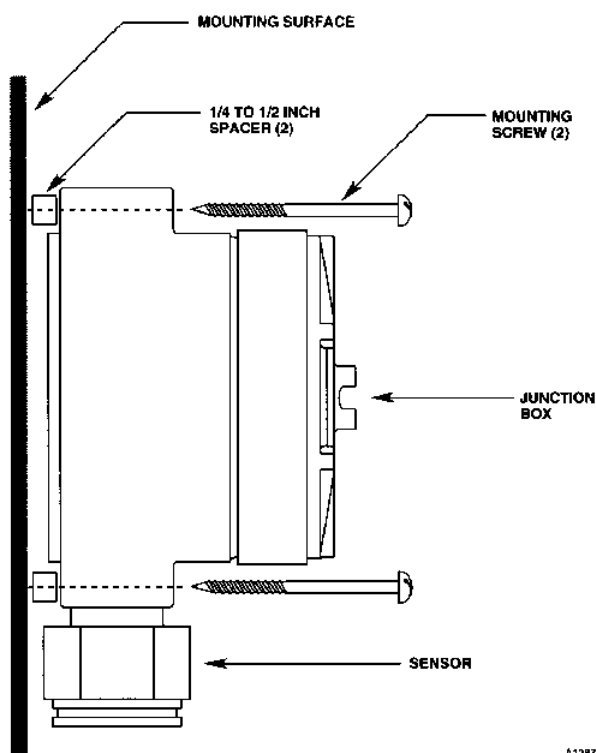


Figure 5—Mounting the Sensor Separation Kit Junction Box

Table 2—Maximum Sensor Separation Distances

Wire Size (AWG)	Maximum Sensor to Transmitter Distance	
	Feet	Meters
12	400	120
14	250	75
16	150	45
18	100	30
20	60	18

Shielded cable required.

touched. Therefore, use caution when handling, taking care not to touch the terminals or electronic components. For more information on proper handling, refer to Service Memo form 75-1005.

2. Remove the cover from the enclosure.

NOTE

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

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

IMPORTANT

If the transmitter is equipped with optional relays, the following steps must be performed to ensure proper operation of the device.

4. If the transmitter is equipped with relays, they must be programmed for either normally open or normally closed operation. This is accomplished by placing a jumper plug on the appropriate pins located on the relay/terminal printed circuit board. See Figure 6. Adjacent to each relay is a row of 3 pins labeled NO, COM, NC. For normally open operation, place the plug on the NO and COM pins. For normally closed operation, place it on the NC and COM pins. Each relay is programmed individually. (Table 3 shows the correct positions for all the jumper plugs on the U8700H.)
5. The alarm relays must also be programmed for normally energized (fail-safe) or normally de-energized operation. This is also accomplished by placing a jumper plug on the appropriate pair of pins on the relay/terminal board. See Figure 6. For normally energized alarm relays, place the plug on the center and NE pins. For normally de-energized operation, place it on the center and ND pins. The low and high alarm relays are programmed together, not individually. The fault relay is unaffected by the setting of this plug.
6. Latching or non-latching alarm relay operation is programmed using jumper plugs on the microprocessor circuit board, which is part of the plug-in electronic module that was removed previously. See Figure 7 to locate the jumper plugs on the microprocessor board. W12 and W13 control the

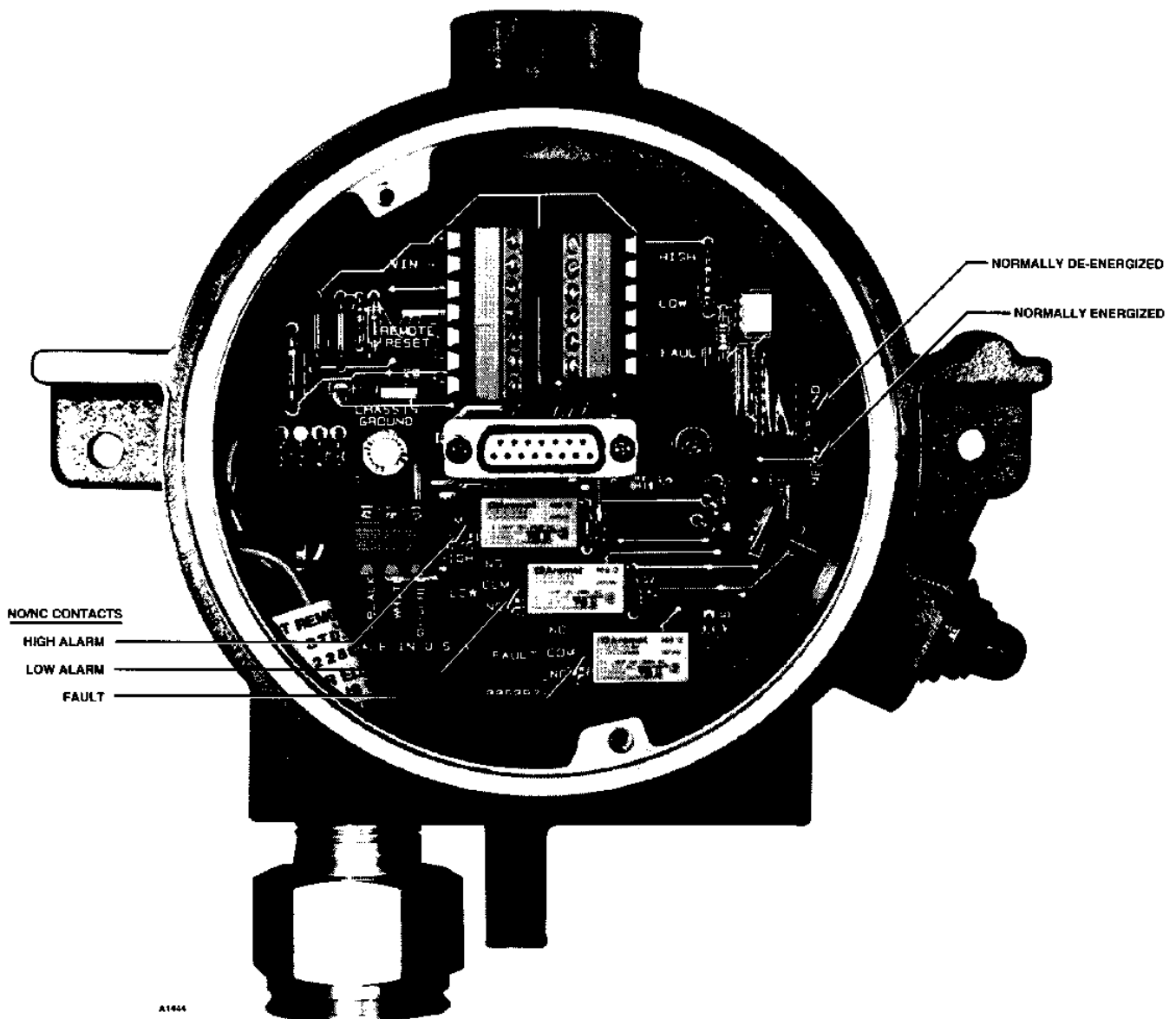


Figure 6—Relay/Terminal Circuit Board

high alarm relay, and W14 and W15 control the low alarm relay. Refer to Table 3 to determine the correct jumper positions.

NOTE

Some approval 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.

7. Connect the transmitter enclosure to the conduit so that the external wiring can be installed and trimmed. For proper operation, the sensor must be oriented with the filter pointing down.
8. Attach the sensor to the transmitter as shown in Figure 8. It must be tight (minimum of five fully engaged threads) to ensure an explosion proof installation. Do not over-tighten. If a sensor separation kit is being used, attach the sensor to the junction box and connect the wires to the termi-

Table 3—U8700H Jumpers

LOCATION	JUMPER POSITION	FUNCTION
Terminal/Relay Board	W1	High Alarm – Normally Open
	W2	High Alarm – Normally Closed
	W3	Low Alarm – Normally Open
	W4	Low Alarm – Normally Closed
	W5	Fault – Normally Open
	W6	Fault – Normally Closed
	W7	Normally De-Energized
	W8	Normally Energized
Plug-in Module	W10	Isolated Current Output
	W11	Non-Isolated Current Output
	W12	High Alarm – Latching
	W13	High Alarm – Non-Latching
	W14	Low Alarm – Latching
	W15	Low Alarm – Non-Latching

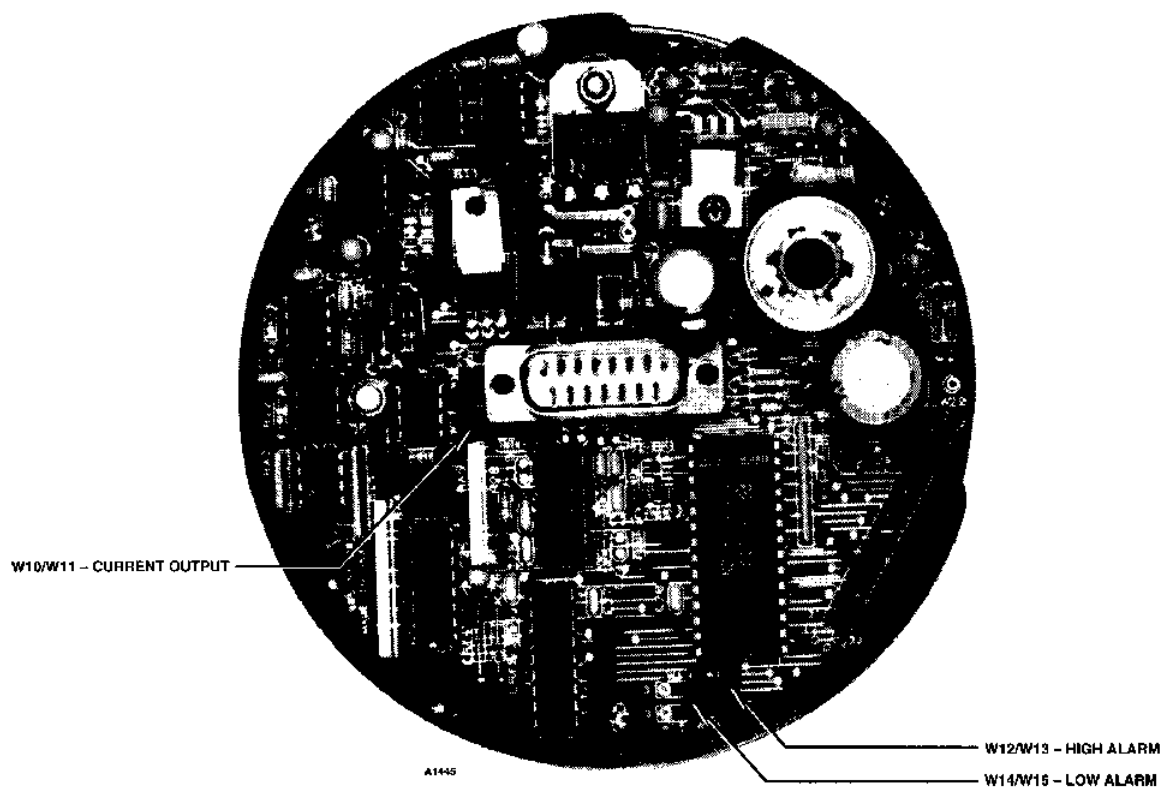


Figure 7—Jumpers on Plug-in Module

nals inside the junction box. See Figure 4. Connect the sensor to the transmitter using a 3 conductor shielded cable. See Table 2 to determine wire size.

CAUTION

The sensor threads can be coated with an appropriate grease (part number 005003-001) to ease both the initial installation and future replacement of the sensor. Also lubricate the cover threads. Detector Electronics offers a silicone free polyalphaolefin grease that is especially suited for use with catalytic type combustible gas sensors. The use of other lubricants is not recommended, since some materials can cause irreversible damage to the sensing element. Silicone based lubricants or compounds must never be used.

9. Two terminal blocks are provided for the sensor connection. See Figure 8. Use the plug-in sensor terminal if the sensor is installed in the conduit entry on the transmitter enclosure. If a sensor separation kit is used, connect the wiring from the sensor junction box to the screw terminals and connect the shield to the grounding post provided. **Do not** ground the shield at the sensor.

10. Connect the power supply leadwires and the current output leadwires to the appropriate points on the terminal block. 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 ground screw inside the enclosure unless such a connection is required by local wiring codes. The transmitter enclosure should also be tied to earth ground.

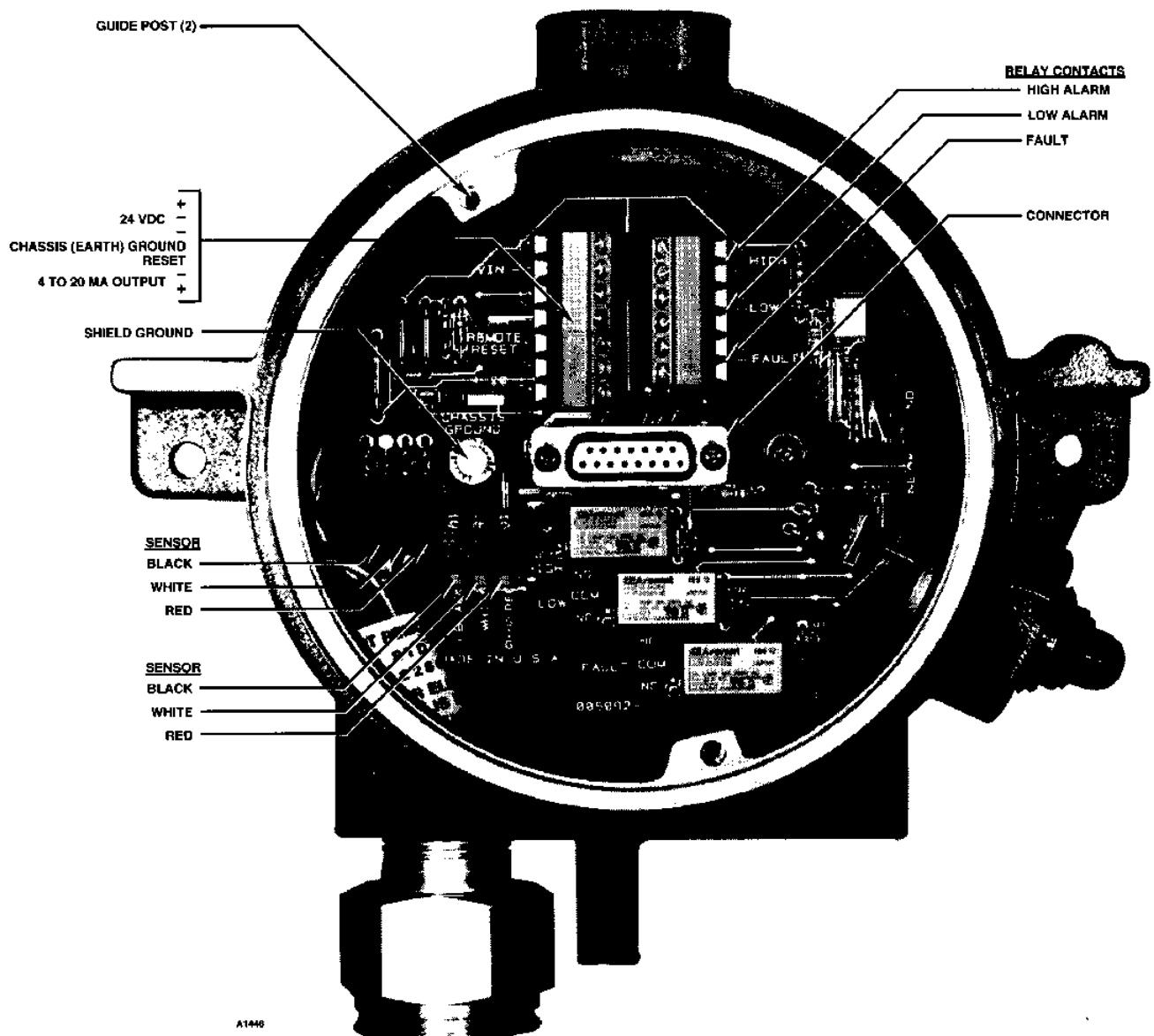


Figure 8—System Wiring

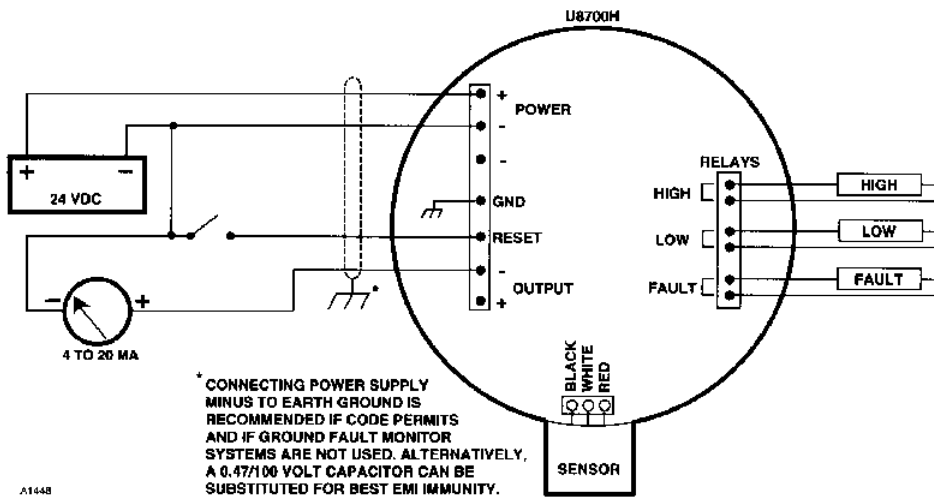


Figure 9—Typical System with Non-Isolated Current Output

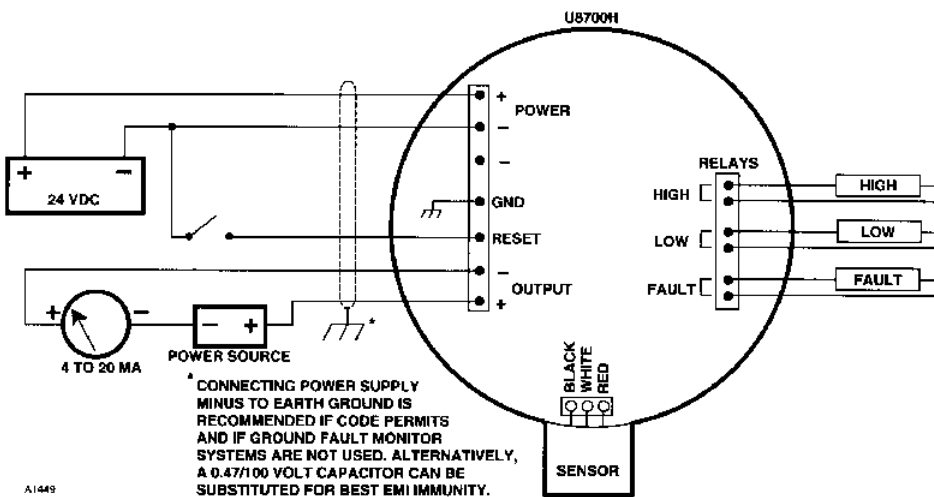


Figure 10—Typical System with Isolated Current Output

Non-Isolated Current Output - If the 4 to 20 ma current loop is to be non-isolated, wire the current loop as shown in Figure 9. Program the unit for a non-isolated current loop by placing the jumper plug on W11 (see Figure 7 for location).

Isolated Current Output - If an isolated current loop is desired, wire the current loop as shown in Figure 10 and place the jumper plug on W10. Note that this wiring scheme requires an external power source for the isolated current output.

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 electromagnetic interference.

11. To allow the U8700H 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.
12. Connect the leadwires from the alarm and fault response devices to the appropriate terminals on the "Relay" terminal block. In the Normal operating mode, the Fault relay is energized and the Alarm relays are energized or de-energized as programmed (no faults or alarms occurring).
13. 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).
14. Align the plug-in module with the guide posts inside the enclosure and press the module into position.

15. Tighten the two screws.
16. Place the cover back on the transmitter 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.

The installation must be made in accordance with the NEC.

INSTALLATION CHECKLIST

The following checklist is provided as a means of double checking the system to be sure that all phases of system installation are complete and have been performed correctly.

1. Enclosure is securely mounted and sensor is pointing down.
2. Conduit seals have been installed at all junction box entries (if conduit is being used).
3. Power wiring is installed and power source is operational.
4. Wiring to external loads and/or monitoring devices is properly connected.
5. If a sensor separation kit is used, interconnecting wiring is correct.
6. All cable shields are properly grounded.
7. Device is programmed as desired. Record this information for future reference.
8. Optional sensor accessories (dust/splash guards, sample draw devices, etc.) are installed, clean, and in good condition.
9. Plug-in electronic module is properly installed.
10. Cover is tightly installed.
11. Response equipment is operational.

Proceed to System Startup and Calibration.

TYPICAL SYSTEM APPLICATION

Figures 9 and 10 illustrate typical systems and are intended to serve as examples only. For assistance in adapting a system to your individual requirements, contact the Field Support Group at Detector Electronics.

Section III System Startup

STARTUP PROCEDURE

1. Output loads that are normally actuated by the gas detection system should be secured (remove power from all output devices) to prevent undesired activation.
2. Be sure that all external wiring has been installed properly and that the sensor 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 U8700H has been designed to "wait" for approximately 45 seconds before beginning normal operation when power is applied to the system. During this time the outputs are inhibited, the FAULT LED is illuminated, and the current output indicates a fault condition. This delay allows time for the sensor output to stabilize before normal operation is begun.

4. Check for correct setting of the alarm setpoints and calibration gas concentration (see "Setpoint Adjustment" section of this manual).

NOTE

Upon power-up of the system, initialization tests are automatically performed to ensure proper operation of the microprocessor and operating program. If a problem is detected, the FAULT LED flashes and "F9" 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 "F9" fault persists, the controller must be returned to the factory for repair. If the problem is corrected, normal system operation is restored. However, resetting the U8700H while a "F9" 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.

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 40% LFL for the low alarm and from 10 to 60% LFL for the high alarm. The calibration gas concentration is adjustable from 30 to 99% LFL. To **check** the setpoint levels, use the "Setpoint Display Mode" described below. To **change** the setpoint or calibration gas values, use the "Setpoint Adjustment Procedure."

SETPOINT DISPLAY MODE

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

NOTE

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

2. At the end of the two second interval, the LOW LED goes out, the HIGH LED begins to blink, and the digital display shows the high setpoint.
3. Two seconds later the HIGH LED goes out and the CAL LED blinks. The digital display now shows the programmed calibration gas concentration.
4. After displaying the calibration gas concentration for two seconds, the transmitter automatically leaves the Setpoint Display mode and returns to the Normal operating mode.
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 alarm setpoint levels and calibration gas concentration. If the system will be used to detect a gas other than the type being used for calibration, a conversion ("K") factor **must** be used to determine the correct value to be programmed into the microprocessor in step 5 below. Refer to the "Calibration" section of this manual for details.
2. Remove the cover from the transmitter housing.

CAUTION

The area must be declassified when the cover is removed with power applied.

3. Momentarily depress either of the two SETPOINT buttons. The % LFL display indicates the low setpoint and the LOW LED blinks. 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 blinks, 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 have been made for 5 seconds, the HIGH LED goes out, the CAL LED blinks, and the % LFL 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 calibrations (typically 30, 60, or 90 day intervals, depending on the conditions). Since each application is different, the length of time between regularly scheduled calibrations can vary from one installation to the next. In general, the more frequently a system is checked, the greater the reliability. The detector **must** be calibrated:

- Before a new system is initially put into service
- If the sensor is replaced
- If the plug-in electronic module is replaced
- If the sensor is exposed to a high level of combustible gas.

CAUTION

Exposure to a high level of gas can have an adverse effect on the sensitivity of the sensing element. If the level of gas at the sensor should reach 100% LFL, it is important that it be tested and recalibrated if required. In some cases, it may be necessary to replace the sensor.

If an over-range condition should occur, the digital display flashes "99" and latches on until reset. The user must exercise caution if an over-range reading is indicated, since a highly explosive condition could exist. The hazardous area should be checked with a portable detection instrument to determine the actual level of combustible gas present.

For best calibration results, allow a **new** sensor to operate for several hours to ensure a stable output before performing calibration. For the highest degree of accuracy, perform a second calibration after 24 hours.

When a sensor is exposed to a different or new environment, calibration should be checked frequently to determine the proper interval between calibrations.

NOTE

Under ideal conditions, some systems can go for extended periods of time 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. One common cause is by clogging of the sintered metal filter by water, dirt, oil, paint, etc. Problems of this nature are capable of totally incapacitating the sensor, but it is only during calibration that the

problem will be discovered. To assure the greatest level of reliability, calibration should be performed at regularly scheduled intervals.

Before performing calibration, the operator should also examine the sintered metal filter of the sensor (flame arrestor) to be sure that it is not missing or damaged. If the filter is defective or missing, the sensor must not be operated, since the exposed sensing element can act as an ignition source. It should also be noted that a dirty cover can significantly reduce the sensitivity of the sensor.

NOTE

The use of a Det-Tronics calibration kit is recommended to ensure accurate calibration.

CALIBRATION FACTOR²

The sensitivity of the sensor to different types of gases can vary considerably. To assure accuracy, it is recommended that calibration be performed using a gas/air mixture of the gas that is intended to be detected. If several different combustible gases can be present, calibrate to the least detectable gas.

If a calibration mixture of the gas to be detected is not available, the system can be calibrated using a standard calibration gas and an appropriate "K" factor. The "K" factor is used to calculate the calibration gas setting that is entered into the microprocessor in place of the standard calibration gas % LFL concentration (typically 50% LFL). The "K" factor represents the relationship between the gas to be detected and the gas type to be used for calibration. A "K" factor value of "1" is optimum.

To calculate the calibration gas setting that will be programmed into the microprocessor, use the following formula.

$$S = C \times K$$

S = Calibration gas setting
C = LFL percentage of gas being used
K = Calibration factor

For example, assume that 50% LFL methane will be used for calibrating a system that will detect a gas with a "K" factor of 1.2. Using the above formula, 50% (C) is multiplied by 1.2 (K) to arrive at a calibration gas setting of 60% (S). The value "60" must then be entered when programming the U8700H for the calibration gas.

²Calibration factors are not verified by FMRC.

IMPORTANT

Accurate calibration depends on the use of the correct K factor. The process of determining the correct K factor involves considering the type and LFL percentage of the calibration gas being used, as well as the type of gas to be detected. In addition, since K factors can vary from one sensor model to the next, the type of sensor must also be considered. Contact Detector Electronics to determine or verify the correct K factor to be used. If a K factor for a specific compound is not available, a K factor can be established using a sample of the material to be detected. Contact the factory for details.

Calibrate the system using the following procedure.

CALIBRATION PROCEDURE

1. Be certain that the transmitter is correctly programmed for the LFL percentage of the gas/air mixture being used for calibration. (See "Setpoint Adjustment" section.) Reprogram the transmitter if required. Failure to do so will greatly impair system response.

NOTE

If a dust cover or splash shield is used, it should be checked to ensure that it is not dirty or plugged. A plugged dust cover can restrict the flow of gas to the sensing element, seriously reducing its effectiveness. For optimum performance, sensor covers/filters should be replaced at each calibration to ensure that they have not been degraded or plugged.

2. Be sure that only clean air (0% LFL) is present at the sensor. (The microprocessor begins taking Zero readings immediately upon entering the Calibrate mode.) If the possibility of background gases exists, purge the sensor with clean air to assure accurate calibration.

NOTE

The practice of placing your hand over the sensor during the zero portion of the calibration procedure is not recommended.

3. Depress and hold the MODE SELECT button until the CAL LED is illuminated **and** the % LFL display starts to blink (approximately 7.5 seconds).
4. When the Zero calculations are complete (30 seconds minimum), the % LFL display stops blinking and reads "00."
5. Apply the calibration gas. The digital display starts to blink, and the value indicated on the %

LFL display rises. (Be sure that the pressure gauge on the calibration gas bottle indicates that there is enough gas in the tank to complete the calibration.)

6. When the microprocessor has completed the Span adjustments (30 seconds minimum), the % LFL display stops blinking. The LFL percentage of the calibration gas is shown on the display.
7. Remove the calibration gas. When the gas level falls to 3% LFL below the lowest alarm setpoint, the transmitter automatically exits the Calibrate mode. All outputs and indicators return to normal operation.

If the operator fails to complete the calibration procedure or if the sensitivity of the sensor has deteriorated to the extent that calibration cannot be successfully completed, a calibration fault ("F2" status) will be generated and the transmitter will automatically revert back to the former calibration settings (after 10 minutes). If a successful calibration cannot be accomplished, replace the sensor and recalibrate.

When the sensing element is approaching the end of its useful life, an "F1" 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 "F1" is flashed on the % LFL display for one out of every five seconds during the time that the calibration gas is removed and the gas level indicated on the digital display returns to zero. The "F1" is no longer displayed after the system leaves the Calibrate mode.

Controllers or other equipment used in conjunction with the U8700 should be calibrated following the manufacturer's recommendations.

CURRENT OUTPUT CALIBRATION

The 4 to 20 ma 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 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:

$$I = \text{voltage/load resistance.}$$

2. Remove the cover from the transmitter housing.

CAUTION

The area must be de-classified 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 % LFL 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 transmitter 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.

Section IV System Maintenance

ROUTINE MAINTENANCE

The gas detection system requires virtually no routine maintenance, except for periodic checks to assure proper system function and calibration. The frequency of these checks is determined by the requirements of the particular installation.

MANUAL CHECK OF OUTPUT DEVICES

Fault circuitry in the U8700H continuously monitors for an open sensing element, excessive negative zero drift, open or shorted sensor wiring, and various other problems that could prevent proper response to a dangerous level of gas. It does not, however, monitor external equipment that is activated by the outputs. It is important that these devices be checked initially when the system is installed, as well as periodically during the ongoing maintenance program.

CHECKOUT IN NORMAL MODE

The system should be checked periodically in the Normal mode to ensure that those items not checked by the diagnostic circuitry are functioning properly.

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 protection against water ingress. Periodically the enclosure should be opened and the O-ring should be inspected 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. (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 re-assembling 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 the same silicone free polyalphaolefin grease that is recommended for lubricating the sensor threads. (Refer to the "Ordering Information" section of this manual for part number.) The use of other lubricants is not recommended, since some materials can adversely affect the performance of the catalytic sensing element. **Under no circumstances** should a lubricant or compound containing silicone be used.*

A test form is supplied in this manual for recording maintenance performed on the system.

TROUBLESHOOTING

Table 4 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 with this manual.

Table 4—Troubleshooting Guide

Problem	Possible Cause
No indicators on faceplate are illuminated.	<ol style="list-style-type: none"> 1. Wiring to external power source. 2. Input power failure.
Blank display, FAULT LED on	<ol style="list-style-type: none"> 1. Warmup period after powerup (45 seconds). 2. If condition exists after warmup, remove power, then power up again. If problem still exists replace electronic module.
F1 Status	<ol style="list-style-type: none"> 1. A successful calibration has been completed, however, the sensor is near the end of its useful life.
F2 Status	<ol style="list-style-type: none"> 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.
F3 Status	<ol style="list-style-type: none"> 1. Excessive zero drift – recalibrate detector.
F4 Status	<ol style="list-style-type: none"> 1. Detector wiring fault. 2. Faulty sensor. 3. Bridge/amplifier circuit failure.
F5 Status	<ol style="list-style-type: none"> 1. Internal operating voltage out of tolerance. 2. Input voltage low.
F9 Status	<ol style="list-style-type: none"> 1. Microprocessor failure or other failure detected during powerup.

LOSS OF SENSOR SENSITIVITY

There are a variety of factors that can cause a decrease in the sensitivity of catalytic type combustible gas sensors. Interfering or contaminating substances that can adversely affect the response of the sensor to combustible gases are as follows:

A. Materials that can clog the pores of the sintered metal flame arrestor and reduce the gas diffusion rate to the sensor are:

1. Dirt and oil.

A dust cover should be installed to protect the flame arrestor whenever these conditions exist.

The dust cover can be cleaned as part of routine maintenance. This can be accomplished using an organic solvent and an ultrasonic bath.

2. Corrosive products.

This occurs when substances such as Cl_2 or HCl are present. A dust cover provides some protection. The dust cover should be replaced as part of routine maintenance.

3. Flame arrestor clogged as a result of painting or house cleaning.

The routine maintenance procedure should include covering the sensor with a plastic bag when painting or cleaning. The bag should be removed as soon as possible when the procedure is complete.

4. Polymer formation in the flame arrestor.

This can occur where monomer vapors like 1-3 butadiene, styrene, isoprene, etc. are present

B. Substances that cover or tie up the active sites on the catalytic surface of the active sensing element.

This occurs in the presence of volatile metal organics, gases, or vapors of hydrides, and volatile compounds containing phosphorous, boron, silicone, etc.

Examples:

RTV silicone sealants
Silicone oils and greases
Tetraethyl lead
Phosphine
Diborane
Silane
Trimethyl chlorosilane
Hydrogen fluoride
Boron trifluoride
Phosphate esters

Significantly longer sensor life can be obtained by using the Det-Tronics poison resistant sensor.³

- C. Materials that remove the catalytic metals from the active element of the sensor.

Some substances react with the catalytic metal forming a volatile compound. This erodes the metal from the surface. With sufficient exposure, most or all of the metal catalyst can be removed from the surface of the active element of the sensor.

Halogens and compounds containing halogen are materials of this nature.

Examples:

Chlorine
Bromine
Iodine
Hydrogen Chloride, Bromide or
Iodide
Organic halides:
Trichloroethylene
Dichlorobenzene
Vinyl chloride
Freons
Halon 1301
(Bromotrifluoromethane)

A brief exposure to one of these materials can temporarily increase the sensitivity of the sensor. This results because the surface of the active element is increased due to etching. Prolonged exposure continues the etching process until the sensitivity of the sensor is degraded, resulting in shortened sensor life.

Significantly longer sensor life can be obtained by using the Det-Tronics poison resistant sensor.⁴

- D. Exposure to high concentrations of combustible gases.

Exposure of the sensor to high concentrations of combustible gases for extended periods of time can introduce stress to the sensing element and seriously affect its performance. After exposure to a high concentration of combustible gas, recalibration should be performed and, if necessary, the sensor should be replaced.

The degree of damage to the sensor is determined by a combination of the type of contaminant, its concentration in the atmosphere, and the length of time the sensor is exposed. When a sensor has been exposed to a contaminant or a high level of combustible gas, it should be cali-

brated at the time, followed by an additional calibration a few days later to determine whether a significant shift in sensitivity has occurred.

REPLACEMENT PARTS

The U8700H is not designed to be repaired by the customer in the field. If a problem should develop, first carefully check for proper wiring, programming and calibration. If it is determined that the problem is caused by a defect within the plug-in electronic module, the module must be returned to the factory for repair.

NOTE

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

The sensing element is mounted in a sealed housing and is not intended to be repaired. When calibration can no longer be properly performed, the sensor must be replaced. The frequency of replacement will be determined by the amount and type of contamination present at the particular installation.

An adequate supply of spare sensors should be kept on hand for field replacement. For maximum protection against contamination and deterioration of the sensing element, the sensor should not be removed from the original protective packaging until the time of installation.

Refer to the "Wiring" procedure in the "Installation" section of this manual when replacing the sensor or electronic module.

Always calibrate after replacing either the electronic module or the sensor.

Refer to the "Ordering Information" section of this manual for a list of part numbers.

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.

³FMRC has verified poison resistance in 1.0 g silicone in 1.0 L of air for 30 minutes.

⁴Halogen resistance not verified by FMRC.

Pack the unit or component properly. Use sufficient packing material in addition to an anti-static bag or aluminum-backed cardboard as protection from electrostatic discharge.

Return all equipment transportation prepaid to the Minneapolis location.

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665 or (800) 765-FIRE
Telex 6879043 DETEL UW
Cable DETRONICS
Facsimile (612) 829-8750

Detector Electronics Corporation
Suite 106
19925 Stevens Creek Boulevard
Cupertino, California 95014 USA
Telephone (408) 973-7812
Facsimile (408) 973-7256
Voice Mail Box Number: 930

Detector Electronics Corporation
466 Conchester Highway
Aston, Pennsylvania 19014 USA
Telephone (610) 497-5593
Facsimile (610) 485-2078

Detector Electronics Corporation
3000 Wilcrest
Suite 145
Houston, Texas 77042 USA
Telephone (713) 782-2172
Facsimile (713) 782-4287

Detector Electronics (UK) Limited
Riverside Park, Poyle Road
Colnbrook
Slough, Berkshire
SL3 0HB
ENGLAND
Telephone 01753 683059
Telex 848124 GRAVIN G
Facsimile 01753 684540

Det-Tronics Deutschland
Deugra GmbH
Postfach 1457
Harkortstrasse 3
D-4030 Ratingen 1
GERMANY
Telephone 49 2102 4050
Direct 49 2102 405152
Facsimile 49 2102 405109
Telex 8589029

Det-Tronics France
La Valette
Rue du Cimetiere
78790 Septeuil
FRANCE
Telephone 33 1 3497 0650
Facsimile 33 1 3497 0648

Detector Electronics
C/O Polydrill Engineers, Pvt., Ltd.
Veers Desai Road, Andheri (West)
Bombay 400 053
INDIA
Telephone (91) 22 632 2374
Facsimile (91) 22 632 2374 (Dial)

Detector Electronics Southern Europe
Ciodue - FSI
Via Stephenson 43/A
20157 Milano
ITALY
Telephone (39) 2 33 20 06 35
Facsimile (39) 2 39 00 11 93

Det-Tronics Scandinavia AB
Costerweg 5
P O Box 46
6700 AA Wageningen
THE NETHERLANDS
Telephone 31 8370 97625
Facsimile 31 8370 27308

FSI Moscow
Flat 25
Leninsky
Pr 37A
Moscow 117334
RUSSIA

Det-Tronics Scandinavia AB
Box 81
S-260 83 Vejbystrand
SWEDEN
Telephone 431-53002/53240
Facsimile 431-52236

Detector Electronics Corporation
C/O Walter Kidde Aerospace
143 Cecil Street
#15-01 G. B. Building
SINGAPORE 0106
Telephone (65) 220-1355
Facsimile (65) 226-16305

Det-Tronics Middle East
P O Box 44026
Abu Dhabi
U.A.E.
Telephone 971 2 313304
Facsimile 971 2 393248

ORDERING INFORMATION

The sensor must be ordered separately from the U8700H. Sensors and plug-in electronic modules are not interchangeable with all U8700 models. When ordering replacements, carefully check the part number on the device being replaced as well as the number of the U8700H with which it will be used to assure compatibility. When replacing a field programmable electronic module, program the new module the same as the old to assure proper system operation. When ordering please specify: U8700H Unitized Combustible Gas Transmitter/Controller

U8700H Without relays

U8700H With programmable SPST relays. Relays are standard on models approved by FMRC.

Conduit Entry Size

- 3/4 inch NPT
- 20 or 25 mm

Enclosure Material

- Aluminum
- 316 Stainless Steel

COMBUSTIBLE GAS SENSORS

Part Number	Description
226530-003	Poison resistant sensor, Aluminum housing
226531-003	Poison resistant sensor, Stainless Steel housing
226931-005	High temperature sensor, Aluminum housing
226931-006	High temperature sensor, Stainless Steel housing

NOTE

FMRC approval covers only U8700H Transmitter, poison resistant sensors, and calibration kits with standard calibration cup.

ACCESSORIES

Part Number	Description
005003-001	Silicone Free Grease
226365-006	Sensor Separation Kit
226349-001	Sensor Rain Shield
225312-001	Sensor Dust Cover (Stainless Steel)
226190-001	Sensor Dust Cover (Porex)
226354-001	Splash Guard
225775-001	Sample Draw Assembly (one "T" fitting)
226053-001	Sample Draw Assembly (two "T" fittings)
226846-001	Duct Mount Assembly
000507-005	Open Frame Power Supply - 24 vdc at 3.6 amperes
000507-006	Open Frame Power Supply - 24 vdc at 12 amperes
005236-001	W4810 Power Supply (24 vdc) mounted in an explosion-proof enclosure

CALIBRATION KITS

Part Number	Gas
225130-001	Methane (50% LFL)
225130-002	Ethane (50% LFL)
225130-003	Ethylene (50% LFL)
225130-004	Propane (50% LFL)
225130-005	Hydrogen (50% LFL)
225130-006	Methane (20% LFL)
225130-007	Methane (25% LFL)
225130-008	Methane (35% LFL)

REPLACEMENT CYLINDERS

Part Number	Gas
226166-001	Methane (50% LFL)
226166-002	Ethane (50% LFL)
226166-003	Ethylene (50% LFL)
226166-004	Propane (50% LFL)
226166-005	Hydrogen (50% LFL)
226166-006	Air (0% LFL)
226166-007	Methane (20% LFL)
226166-008	Methane (25% LFL)
226166-009	Methane (35% LFL)

REPLACEMENT PARTS FOR CALIBRATION KIT

Part Number	Description
162552-001	Regulator
101678-007	3 foot hose
004976-001	Standard calibration cup
225777-001	Modified calibration cup (for sensor separation)

REPLACEMENT PARTS FOR U8700H

107427-033	O-ring for U8700H enclosure
004224-006	Electronic Module

For assistance in ordering a system to fit your application, please contact your local Detector Electronics representative or:

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665 or (800) 765-FIRE
Telex 6879043 DETEL UW
Cable Detronics
Facsimile (612) 829-8750