NET SAFETY
MONITORING INC.

G.O.L.D.
GAS OPERATIONS LEAK DETECTION
USER MANUAL

ISO 9001:2000

QMI REGISTERED

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This manual is provided for informational purposes only. Although the information contained in this manual is believed to be accurate, it could include technical inaccuracies or typographical errors. Changes are, therefore, periodically made to the information within this document and incorporated without notice into subsequent revisions of the manual. Net Safety Monitoring Inc. assumes no responsibility for any errors that may be contained within this manual.

This manual is a guide for the use of a Combustible Gas Detector and the data and procedures contained within this document have been verified and are believed to be adequate for the intended use of the detector. If the detector or procedures are used for purposes other than as described in the manual without receiving prior confirmation of validity or suitability, Net Safety Monitoring Inc. does not guarantee the results and assumes no obligation or liability.

Net Safety Monitoring Inc. products, are carefully designed and manufactured from high quality components and can be expected to provide many years of trouble-free service. Each product is thoroughly tested, inspected and calibrated prior to shipment. Failures can occur which are beyond the control of the manufacturer. Failures can be minimized by adhering to the operating and maintenance instructions herein. Where the absolute greatest of reliability is required, redundancy should be designed into the system.

Net Safety Monitoring Inc., warrants this sensor and detector against defective parts and workmanship for a period of one year from date of purchase * and other electronic assemblies for one year from date of purchase.

No other warranties or liability, expressed or implied, will be honoured by Net Safety Monitoring Inc.

Contact Net Safety Monitoring Inc. or and an authorized distributor for details.

* Pro-rated warranty on sensor, please consult factory.

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Chapter 1 Introduction

Description

The G.O.L.D. LEL gas detector is designed for Gas production Operations Leak Detection, where the cost of conventional LEL gas detectors is considered excessive. G.O.L.D. responds to industry demand for a low power, reliable and economical gas leak detector suitable for regulatory compliance and enhanced safety.

G.O.L.D. utilizes a pre-calibrated pellistor sensor communicating digitally over a 3-wire cable to a micro- processor based controller, optimized for 12 or 24 Vdc solar systems. Over the one year life of the sensor, conventional periodic zero and span calibration is not normally required although periodic "bump testing" with calibration gas is strongly recommended to verify operation and to confirm external alarm circuits. Expired G.O.L.D. sensors are easily replaced with factory pre-calibrated sensors at a fraction of the cost of conventional catalytic LEL sensors.

A normally closed, fail-safe, solid-state alarm relay is set to trip and latch when the combustible gas level exceeds the alarm set point. Faults identified through self-diagnostics trip a similar relay and both can be remotely or locally reset.

Features

* LED status indication

* Conventional Zero and Span calibration not required

* SensorGuard protects pellistor from extreme levels of gas and extends sensor life

* Sensor can be remotely mounted up to 50 feet from the module

* Fault and Alarm solid state relay outputs

* Temperature compensated circuitry

G.O.L.D. Quick Reference Guide

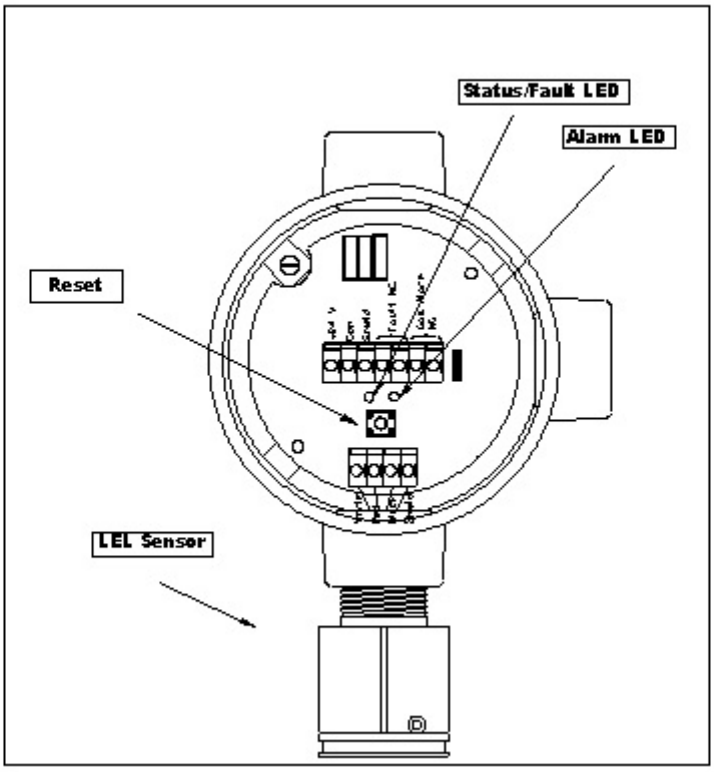

Figure 1 G.O.L.D. Quick Reference Guide

This information will give you a quick explanation of the various parts of the G.O.L.D. Detector.

Status/Fault LED: Indicates the status or the fault condition of the detector.

Alarm LED: Indicates if the detector is in a gas alarm state.

Reset: Is used to reset the detector.

LEL Sensor: Combustible Gas sensor.

Table 1 LED Guide

CONDITION	Status / Fault LED	Alarm LED
Sensor is in the initial start-up sequence	Red Slow Flash	Red Solid
Normal Operation (No gas present)	Green Blip	OFF
Sensor is in a fault condition	Red Slow Flash	OFF
Achieved > 1% LEL	Red Blip	OFF
Achieved 20% LEL	Red Blip	Red Solid

Chapter 2 Installation and Start Up

What's in the package

Carefully remove all the components from the packing box(s). Check components against the packing list. Inspect all components for obvious damage. Notify the carrier and distributor immediately if damage is found or parts are missing.

Location of Sensor(s)

There are no absolute rules for determining the quantity and location of gas detection instruments within a particular facility. Care should be taken to locate the sensors in areas where gas escape may be expected and where it is desirable to detect the presence of unwanted gas. Use redundancy where enhanced protection or reliability is desired. Use common sense and refer to various publications that discuss general guidelines for your industry.

The following factors are important and should be considered for every installation:

- Exposure to excessive heat or vibration can cause premature failure of electronic devices and should be avoided if possible. Shielding electronic devices from intense sunlight and direct radiant heat can increase their life.

- The G.O.L.D. sensor should always face downward.

- The G.O.L.D. sensor should be mounted where gasses are expected. For gasses that are lighter than air (Methane, Ethane, Hydrogen) placement should consider that these gases will tend to rise. For gasses that are heavier than air (Toluene, Hexane, Acetone, Butane, Propane, Pentane, Acetone) placement should consider that these gases will tend to fall.

- If both heavy and light gasses are present in a process area, then sensors should be installed to detect both heavy and light gasses.

- Air flow patterns due to convection and ventilating fans or louvers should also be considered in locating sensors.

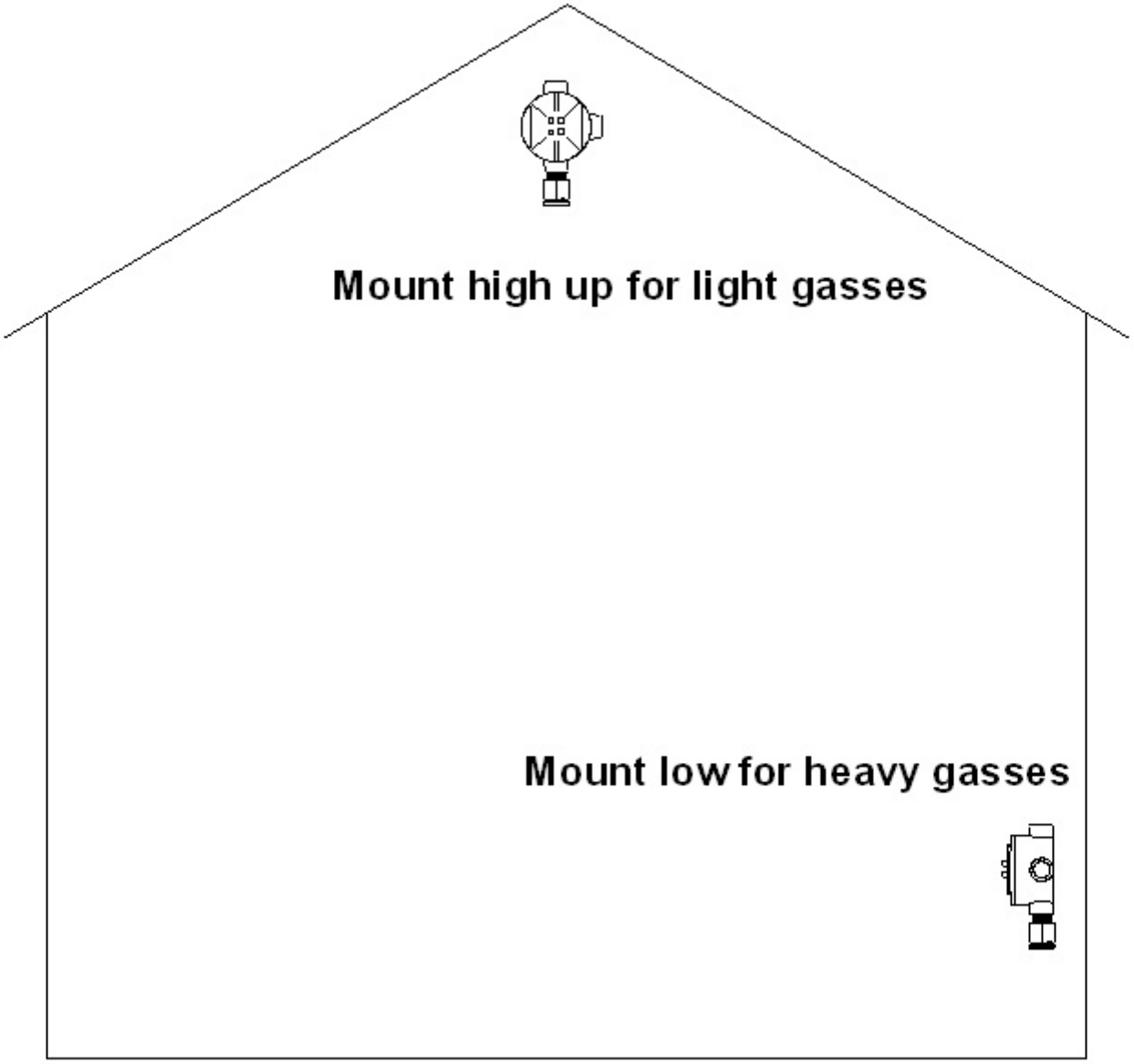

Figure 2 G.O.L.D. Installation Diagram

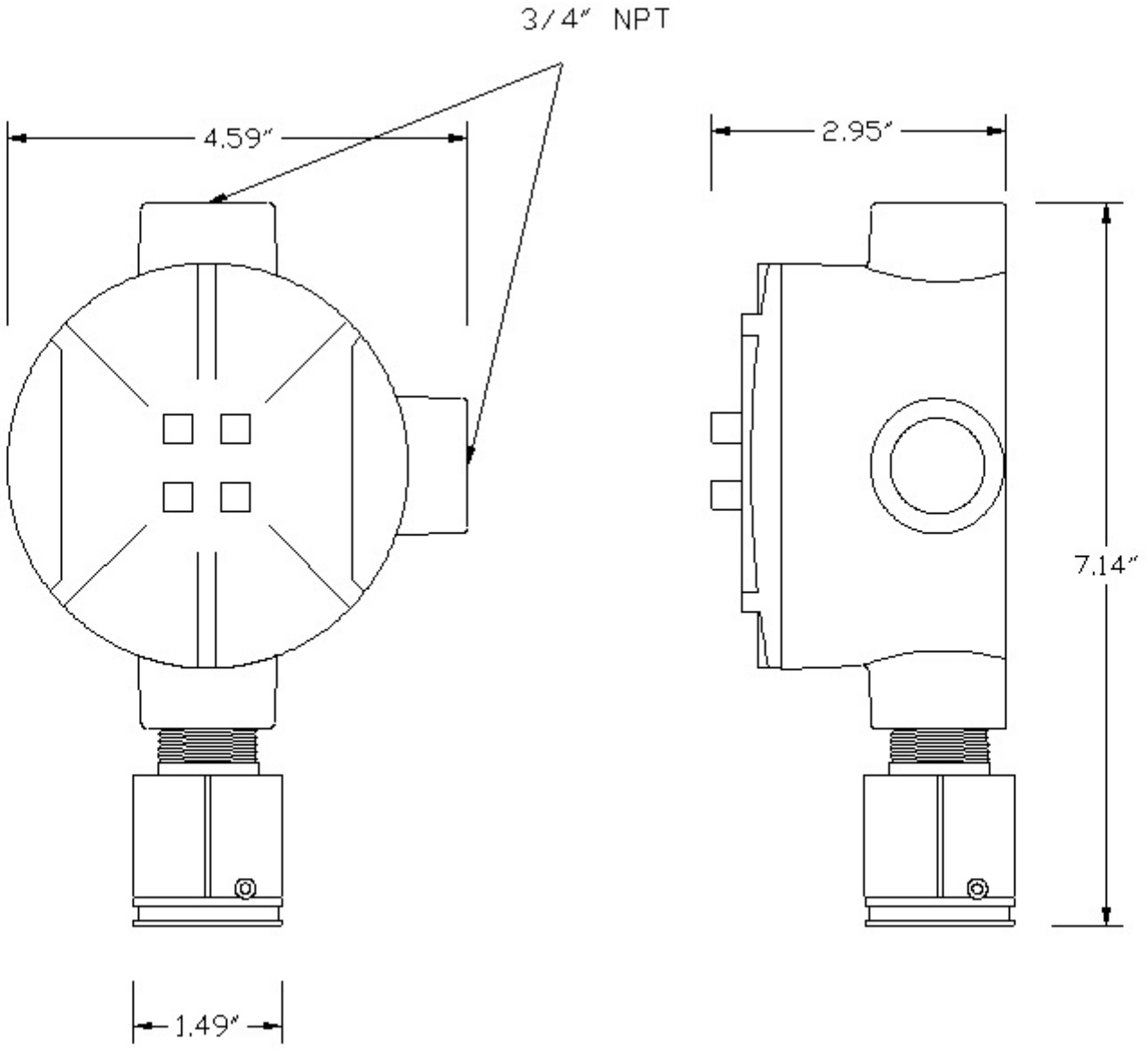

Figure 3 G.O.L.D. Dimensional Diagram

G.O.L.D. Wiring

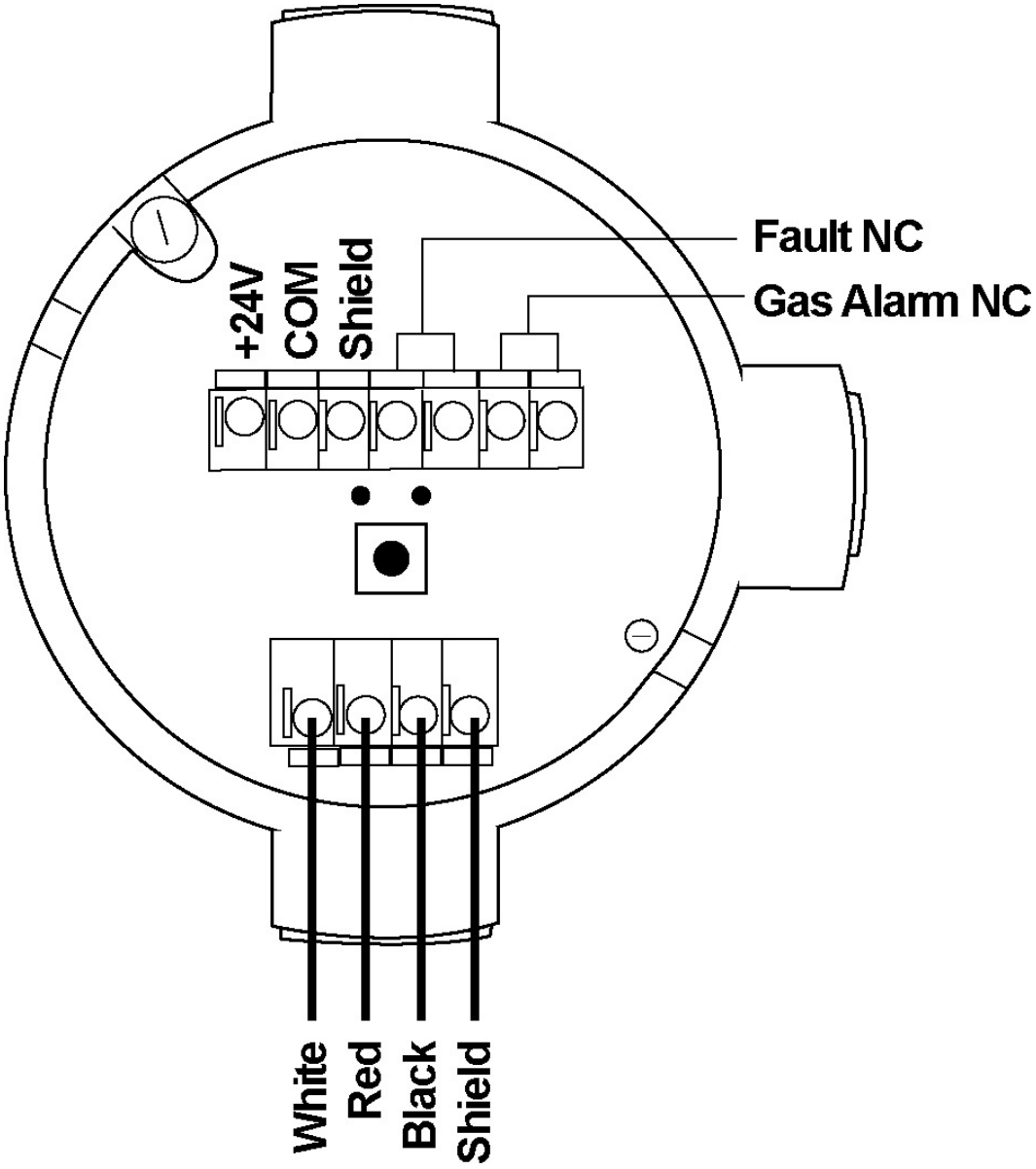

Figure 4 G.O.L.D. Wiring Diagram

NOTE

The G.O.L.D. Detector 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 touched. Therefore, use caution when handling the device, taking care not to touch the terminals or electronic components. For more information on proper handling, refer to 'Electrostatic Sensitive Device Handling Procedure', in Appendix B.

Figure 4 shows the field wiring terminals for typical systems.

NOTE

Before opening the G.O.L.D. enclosure or junction box, ensure that the area has been declassified, or remove power from the unit.

***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 use of shielded cable is highly recommended for any signal wires to protect against interference caused by extraneous electrical “noise”. This includes power and relay outputs. In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.

Water-proof and explosion-proof conduit seals or other means are recommended to prevent water accumulation within the enclosure. Seals should be located as close to the device as possible and not more than 18 inches (46 cm) away. Explosion-proof installations may require an additional seal where conduit enters a non-hazardous area. Always conform to local wiring codes.

When pouring a seal, use a fibre dam to ensure proper formation of the seal. The seals should never be poured at temperatures below freezing.

The jacket and shielding of the cable should be stripped back to permit the seal to form around the individual wires. This will prevent air, gas and water leakage through the inside of the shield and into the enclosure. It is recommended that explosion-proof conduit drains and breathers be used. In some applications, alternate changes in temperature and barometric pressure can cause 'breathing' which allows moist air to enter and circulate inside the conduit. Joints in the conduit system are seldom tight enough to prevent this 'breathing'.

Refer to applicable wiring codes when installing and wiring the G.O.L.D. After the field wiring has been carefully connected, check that the correct wires are connected to the corresponding terminals and that voltage levels do not exceed the specifications.

Installation Checklist

- G.O.L.D. is securely mounted
- **All cable shields are properly grounded (one end only)**
- **Explosion proof conduit seals have been installed at all conduit entries (if conduit is being used)**
- **Power wiring to the G.O.L.D. is installed and power source is operational**
- **External loads are properly connected to the G.O.L.D.**

Periodic Response Test

The detector should be tested as often as practical but preferably not less than every 3 months.

A typical response check involves the application of target gas to the sensor, then the observation of the response LEDs and output signal. See the bump test procedure.

Sensor Poisons and Inhibitors

The GOLD sensor may be adversely affected when exposed to contaminating compounds. Poisoning can be caused by compounds containing lead, sulphur, silicones and phosphates which can permanently reduce sensitivity of the sensor. When a known exposure to poisons or inhibitors occurs, the G.O.L.D. should be checked for accurate response with the Bump Test.

Chapter 3 Operation

Start Delay

When power is applied, check that the Status/Fault LED is Red Slow Flash and the Alarm LED is Red Solid. After 90 seconds the Status/Fault LED will change from Red Flash to Green Slow Blip every 2 seconds and the Alarm LED will turn off.

Detector Status/Fault

CAUTION

The fault detection circuitry does not monitor the operation of external response equipment or the external wiring to these devices. It is important that these devices be checked periodically to ensure they are operational.

The micro-controller-based G.O.L.D. features self-testing circuitry that continuously checks for problems that could prevent proper response. When power is applied, the micro-controller automatically tests the system to ensure that it is functioning properly. During normal operation, it continuously monitors the signal from the sensor. When a system fault is detected, the Status/Fault LED Red Slow Flash and the fault relay changes state.

Power Down Reset

The detector can be reset by a momentary interruption of power. External, normally closed momentary push button in series with DC supply can be used for this purpose.

Hardware

Reset Button

The push button is used to reset the detector (see Figure 1).

Visual Indicators (Light Emitting Diodes)

The G.O.L.D. provides various LEDs for identifying operating conditions. A green/red Status/Fault LED and a green/red Alarm LED (see Table 1 for details).

Outputs
Relays

NOTE:

The fault relay output should not necessarily be used to activate an automatic shutdown procedure. The fault output indicates a potential problem with the G.O.L.D., not an alarm condition.

Two relay outputs are available; one for Fault and one for Alarm. The Fault relay is normally closed, non-latching and the Alarm relay is normally closed, latching. Both relays are factory set and cannot be altered by the operator.

Bump Test Procedure

NOTE

The Detector should always be tested when first installed in the field. We recommend that the detector run for at least 4 hours prior to testing.

The following Bump Test procedure should be followed to verify response of the detector.

Bump Test Procedure for G.O.L.D.

Confirm that the system is powered-up and is not indicating a fault; Status/Fault LED is showing a green blip every 2.0 seconds.

CAUTION

*Confirm that external equipment is bypassed prior to the bump test***.**

Follow the steps in Table 2.

Table 2 Bump Test Procedure

Action	Status / Fault LED	Alarm LED
Apply 30 % LEL Test gas or higher at a rate of 0.5 litres per minute to the calibration cup accessory	Red Slow Blip	Red Solid
Remove gas and wait a few seconds; then press the Reset button. The unit will begin the Start Delay sequence.	Green Slow Blip	OFF

Chapter 4 Troubleshooting

If a problem occurs and it is determined that the problem is caused by an electronic defect, the device must be returned to the factory for repair. The unit is under warranty for one year from the date of purchase. There is a pro-rated warranty on the sensor, please consult the factory.

Net Safety Monitoring Inc. supplies all distributors with advance replacement units. These units are available to you during the warranty period. This allows Net Safety Monitoring Inc. time to repair your unit while you keep your operations running smoothly.

Before returning devices or components, contact the nearest distributor so that an MRA (Material Return Authorization) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to hasten finding the cause of the failure, thereby reducing the time and cost of the repair to you. Use sufficient packing material in addition to an anti-static bag or aluminum-backed cardboard as protection from electrostatic discharge.

Appendix A

Technical Specifications

Operating Voltage Range:
10.5 to 32 V dc

Power Consumption:
0.7 Watts nominal

Operating Temperature Range:
-40˚C to +75˚C (-40F to +167F)

Range of Detection:
0-100% LEL of most hydrocarbons and hydrogen

Response Time:
6 seconds to alarm

Relay Outputs (solid state):
Alarm and fault relays. Gas alarm fixed at 20% LEL. Contacts rated 40 V / 80 mA ac/dc

Weight:
1.0 Kg (2.2 lb)

Certifications:

CSA certified for hazardous locations, Class I, Division 1, Groups C and D; Class I, Division 2, Groups B, C and D. Temperature code T6. Performance certification to CSA C22.2 No. 152

> WARNING:
> Explosion hazard - Substitution of components may impair suitability for Class I, Division 2.

Dimensions:
Refer to *Figure 3*

Appendix B

Electrostatic Sensitive Device Handling Procedure

Electrostatic damage can occur in several ways. The most familiar is by physical contact. Touching an object causes a discharge of electrostatic energy that has built up on the skin. If the charge is of sufficient magnitude, a spark will also be visible. This voltage is often more than enough to damage some electronic components. Some devices can be damaged without any physical contact. Exposure to an electric field can cause damage if the electric field exceeds the dielectric breakdown voltage of the capacitive elements within the device.
In some cases, permanent damage is instantaneous and an immediate malfunction is realized. Often, however, the symptoms are not immediately observed. Performance may be marginal or even seemingly normal for an indefinite period of time, followed by a sudden and mysterious failure.

Damage caused by electrostatic discharge can be virtually eliminated if the equipment is handled only in a static safeguarded work area and if it is transported in a package or container that will render the necessary protection against static electricity. Net Safety Monitoring Inc. modules that might be damaged by static electricity are carefully wrapped in a static protective material before being packaged. Foam packaging blocks are also treated with an anti-static agent If it should ever become necessary to return the module, it is highly recommended that it be carefully packaged in the original carton and static protective wrapping.

Since a static safeguarded work area is usually impractical in most field installations, caution should be exercised to handle the module by its metal shields, taking care not to touch electronic components or terminals.

In general, always exercise all of the accepted and proven precautions that are normally observed when handling electrostatic sensitive devices.

A warning label is placed on the packaging, identifying those units that use electrostatic sensitive semiconductor devices**.**

*** Published in accordance with EIA standard 471**

Appendix C

Wire Resistance in Ohms

DISTANCE (FEET)	AWG #20	AWG #18	AWG #16	AWG #14	AWG #12	AWG #10	AWG #8
100	1.02	0.64	0.4	0.25	0.16	0.1	0.06
200	2.03	1.28	0.8	0.51	0.32	0.2	0.13
300	3.05	1.92	1.2	0.76	0.48	0.3	0.19
400	4.06	2.55	1.61	1.01	0.64	0.4	0.25
500	5.08	3.2	2.01	1.26	0.79	0.5	0.31
600	6.09	3.83	2.41	1.52	0.95	0.6	0.38
700	7.11	4.47	2.81	1.77	1.11	0.7	0.44
800	8.12	5.11	3.21	2.02	1.27	0.8	0.5
900	9.14	5.75	3.61	2.27	1.43	0.9	0.57
1000	10.2	6.39	4.02	2.53	1.59	1.09	0.63
1250	12.7	7.99	5.03	3.16	1.99	1.25	0.79
1500	15.2	9.58	6.02	3.79	2.38	1.5	0.94
1750	17.8	11.2	7.03	4.42	2.78	1.75	1.1
2000	20.3	12.8	8.03	5.05	3.18	2	1.26

NOTE: Resistance shown is one way . This figure should be doubled when determining closed.

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