



UNI-TRAN BASIC
Non-Latching
COMBUSTIBLE GAS TRANSMITTER

User Manual

UT-B-NL-SC1100



ISO 9001:2000



Part Number: MAN-0065-00 Rev 1
June 2003

IMPORTANT INFORMATION

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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.

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Net Safety Monitoring Inc., warrants its sensors against defective parts and workmanship for a period of 24 months from date of purchase; other electronic assemblies for 36 months from date of purchase.

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Contact Net Safety Monitoring Inc., or an authorized representative for details.

We welcome your input at Net Safety Monitoring. If you have any comments please contact us at the phone/address below or visit our web site and complete our on-line customer survey: www.net-safety.com.

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Unit I GENERAL INFORMATION

DESCRIPTION

The Uni-Tran SC1100 (UT-B-NL-SC1100) micro-controller based LEL gas detector provides fast, accurate, continuous and cost effective monitoring of combustible gases in harsh industrial environments.

The SC1100 is a proven, poison resistant, pellistor sensor utilizing active and reference catalytic beads in a Wheatstone Bridge configuration. The Wheatstone Bridge generates a temperature compensated differential voltage, that is proportional to a gas concentration when exposed to a wide range of hydrocarbon gases.

The use of advanced micro-controller technology provides a user interface, that is comprehensive yet very simple to use. Pellistor type, catalytic sensors are highly reliable, but in conventional systems the sensing element is damaged when exposed to high concentrations of combustible gas. SensorGuard is a proprietary technology that provides effective protection against this type of damage, thus reducing the need for frequent calibration and enhancing reliability.

FEATURES

- ▶ Widely proven Poison Resistant Catalytic Bead sensor technology
- ▶ SensorGuard software based protection
- ▶ Low power consumption that works with 12 or 24 V dc systems
- ▶ Sensor can be remotely mounted up to 100 feet from the display module
- ▶ Gas specific colour coded enclosure
- ▶ Microprocessor based smart transmitter
- ▶ Conformal coated circuit boards

SENSOR SPECIFICATIONS

- ▶ **Operating Temperature:**
-40°C to +85°C (-40F to +185F)
- ▶ **Range of Detection:**
0 to 100% LEL of most hydrocarbons and hydrogen
- ▶ **Accuracy:**
±3% LEL up to 50% LEL
±5% LEL above 50% LEL.
- ▶ **Response Time to 90% (100% LEL applied):**
<10 seconds to T50
<30 seconds to T90
- ▶ **Linearity:**
±3% LEL
- ▶ **Repeatability:**
± 2% LEL
- ▶ **Dimensions:**
Refer to Figure 1
- ▶ **Weight:**
0.1 Kg (0.2 lb)
- ▶ **Approvals and Certifications**
CSA and NRTL/C certified for hazardous locations. Class I, Division 1,
Groups B, C and D. IEC Rating Ex d IIB+H2 T5, NEMA 3R. Performance
certified to CSA 22.2 No. 152

- ▶ **Enclosure Material:**
Aluminum (Optional Stainless Steel)

CONTROLLER SPECIFICATIONS

- ▶ **Operating Voltage Range:**
10.5 to 32.0 V dc
- ▶ **Power Consumption (at 24 V dc):**
Nominal (100 mA, 2.4 Watts) Maximum (200 mA, 4.8 Watts)
- ▶ **Operating Temperature:**
-40°C to +85°C (-40F to +185F)
- ▶ **Weight:**
0.9 Kg (2.0 lb)
- ▶ **Approvals and Certifications:**
CSA and NRTL/C certified for hazardous locations. Class I, Division 1, Groups C and D. IEC Rating Ex d IIB T5
Option Housing for Class 1, Division 1, Group B - UT-B2-NL-SC1100
NOTE: Electronics only - CSA and NRTL/C certified for hazardous locations Class I, Division 2 Groups B, C and D pending.

► **Current Output:**

4 to 20 mA - Into a maximum loop impedance of 800 Ohms at 32 V dc or 150 Ohms at 10.5 V dc. Isolated or non-isolated loop supply

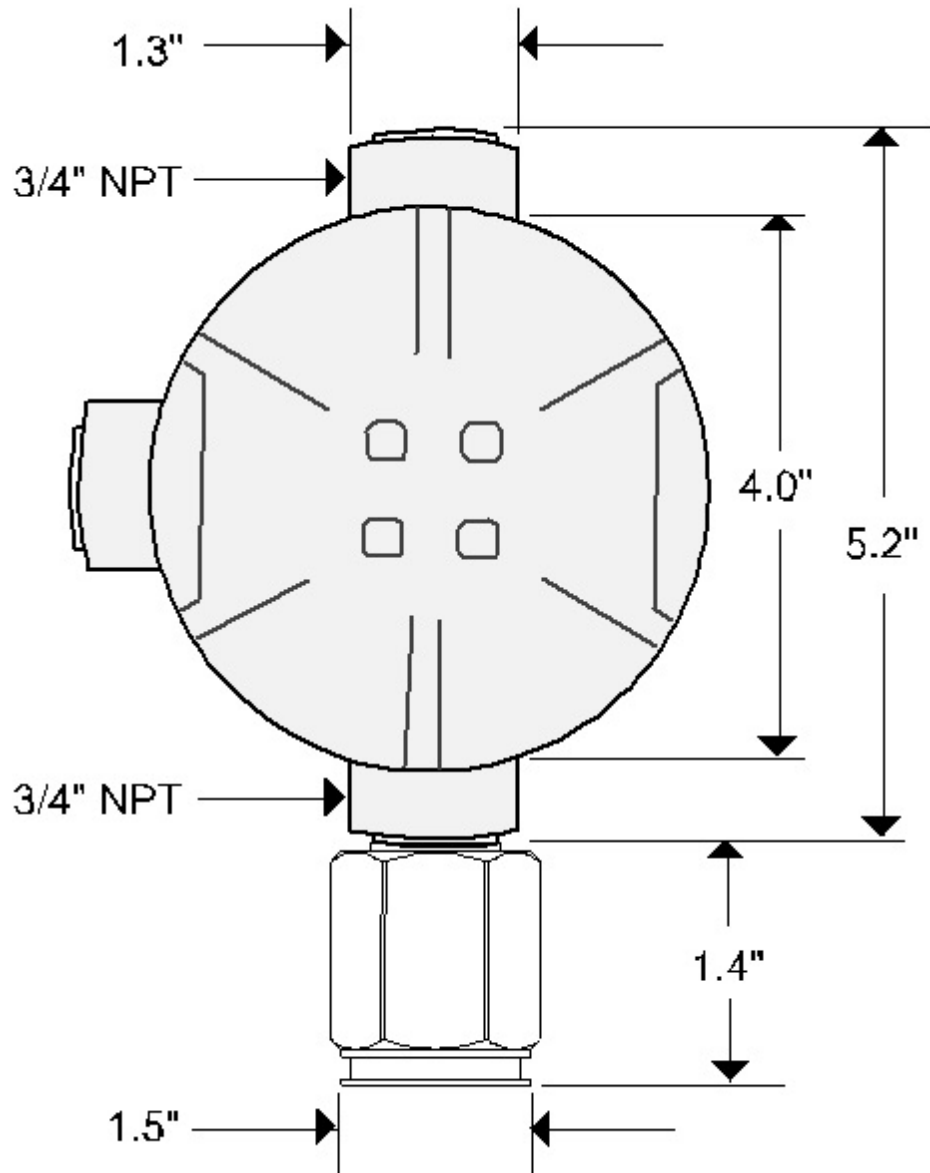


Figure 1 - Enclosure Dimensions

Unit II SYSTEM INSTALLATION

INSTALLATION

Location of Sensors

There are no absolute rules for determining the quantity and location of gas detection heads to protect any particular facility. Locate the sensors carefully in all areas where gas may escape and where it is desirable to detect the presence of unwanted gas. Use redundancy where enhanced protection or reliability is desired. Light gases such as methane tend to rise while heavy gases such as propane tend to accumulate in low areas. Seek advice from experts who know the characteristics of the gas being detected, air movement patterns and the facility. Use common sense and refer to various publications that discuss general guidelines for your industry.

Unpacking

The housing and terminal board are a single assembly to which the sensor is wired.

Mounting

The housing should be oriented so that the sensor is on the under-side of the housing. Use a conduit seal and conduit loop or trap on the field wiring side to prevent water or condensation from entering the housing through the conduit or its threaded connection.

Wiring

NOTE: Before opening the detector ensure that the area has been declassified, or remove power from the unit.

NOTE: Since all modern electronic equipment can be damaged by static electricity discharge it is important to discharge static electricity from your body by touching a grounded metal object before handling the module.

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 current outputs; relay outputs do not require shielded cable. In applications where the wiring cable is installed in conduit, the conduit **must not** be used for wiring to other electrical equipment.

The maximum distance between the sensor and controller is limited by the resistance of the connecting wiring, which is a function of the gauge of the wire being used. Refer to the manuals on the sensors used (and transmitters if used) for maximum wiring distances and wiring instructions.

NOTE: The controller 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, taking care not to touch the terminals or electronic components. For more information on proper handling, refer to the Appendix.

Water-proof and explosion-proof conduit seals 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. Conform to local wiring codes.

When pouring a seal, use a fibre dam to assure 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 drains and conduit 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. 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. When the wiring and voltages have been verified remove power from the system. Set the Display board back in place and tighten the two retaining screws.

Sensor Separation

The sensor can be installed and wired directly to the Uni-Tran housing and terminal board as per the wiring diagram or it may be remotely mounted using a sensor separation kit (CB4) which is composed of a junction box and terminal strip. The sensor and kit are then connected to the Uni-Tran. **Use a minimum of 18 AWG shielded copper instrument wire for separations up to 50 feet and 16 AWG for separations up to 75 feet.** Consult factory if greater separations are required (see *Figure 5*).

Current Output

With power applied during the first 90 seconds the analog output will be at 3.0 mA and then change to 4.0 mA. If after the 90 seconds warm-up the current is at 2.5 mA or any value other than 4.0 mA then the sensor requires calibration and the calibration procedure must be initiated. Observation of the output current levels aid the operator when calibrating the sensor/transmitter as described below under CALIBRATION.

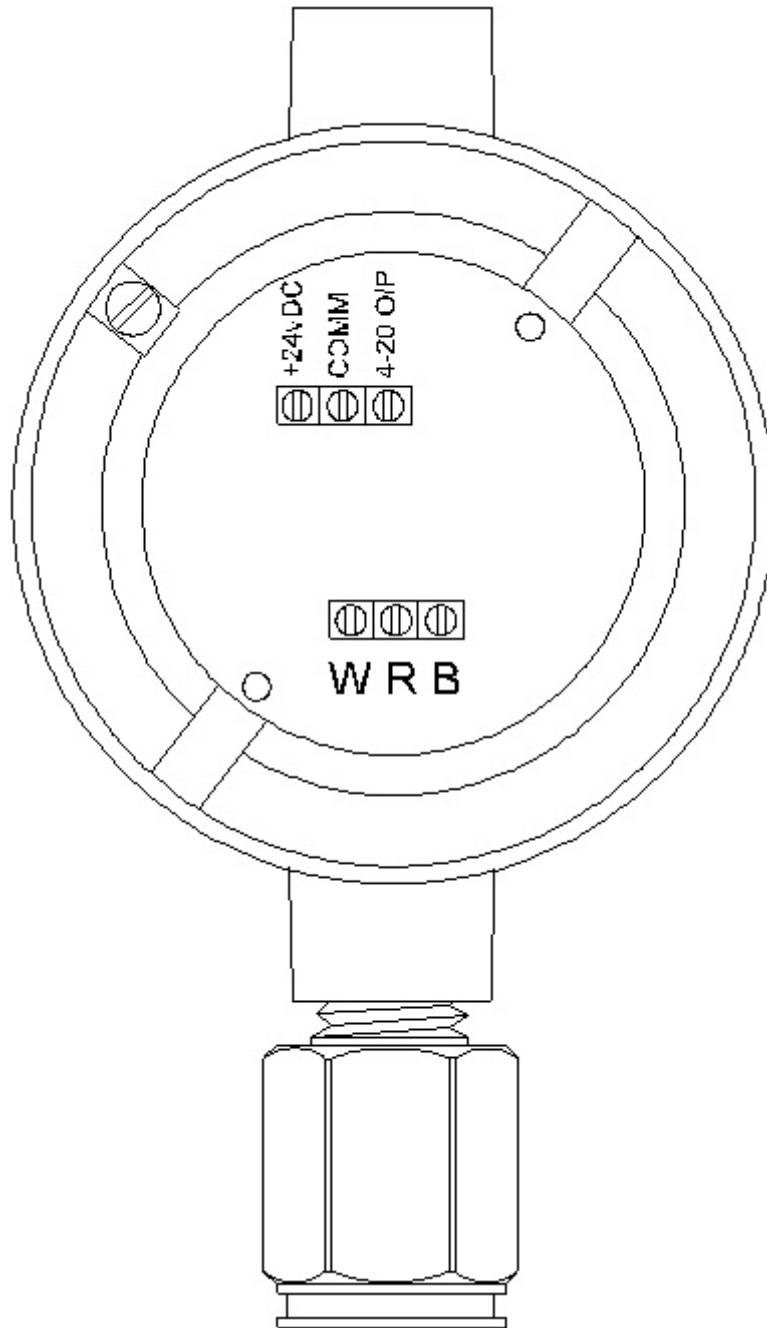


Figure 2 - Uni-Tran Basic Terminal Arrangement

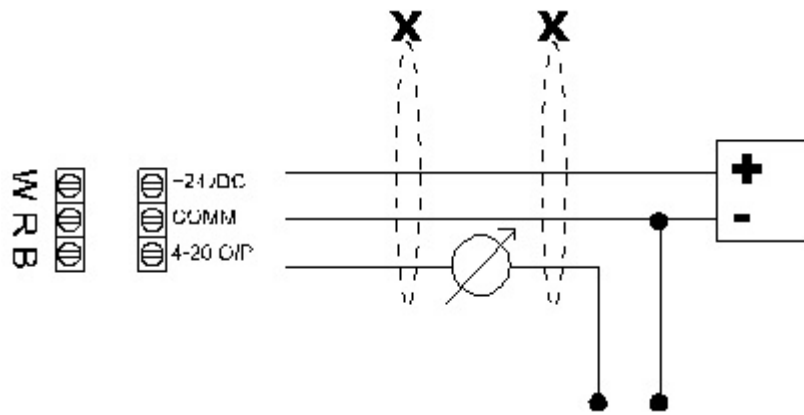


Figure 3 - Uni-Tran Terminal Connection for Non-isolated Current Output

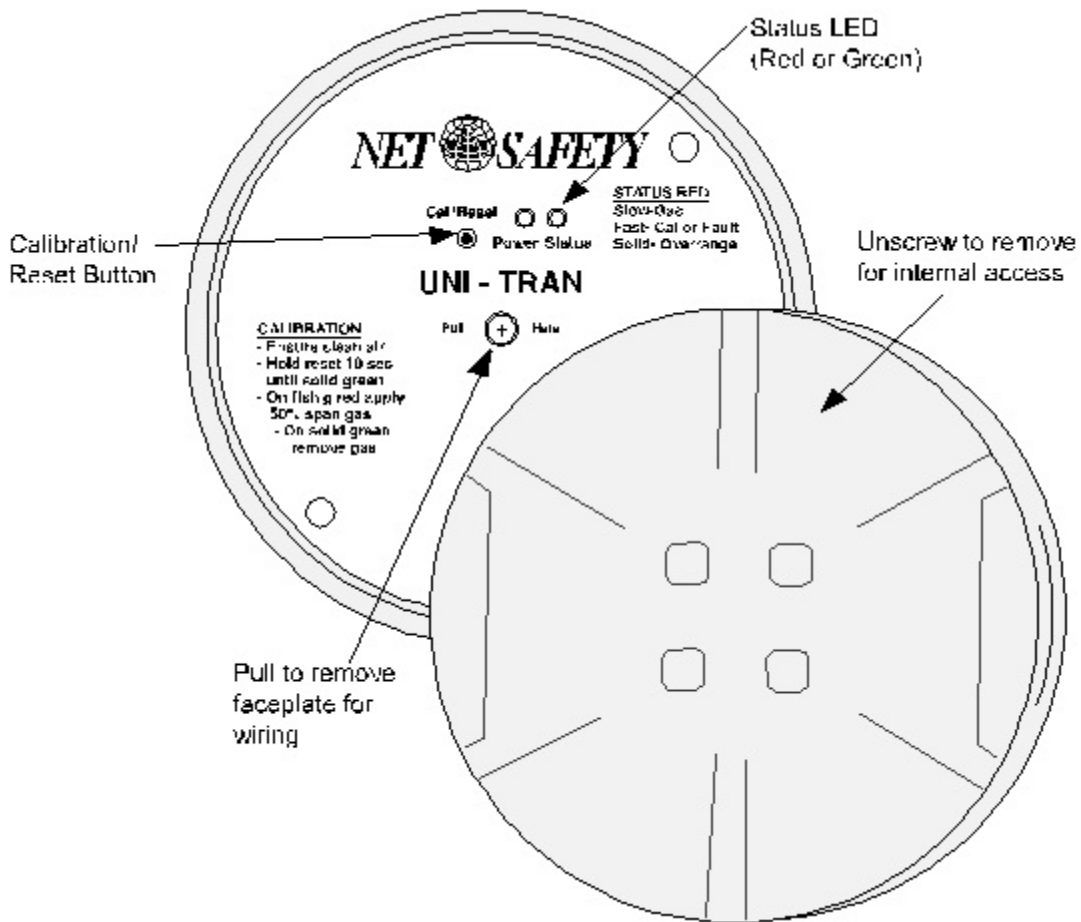


Figure 4 - Uni-Tran Basic Functionality

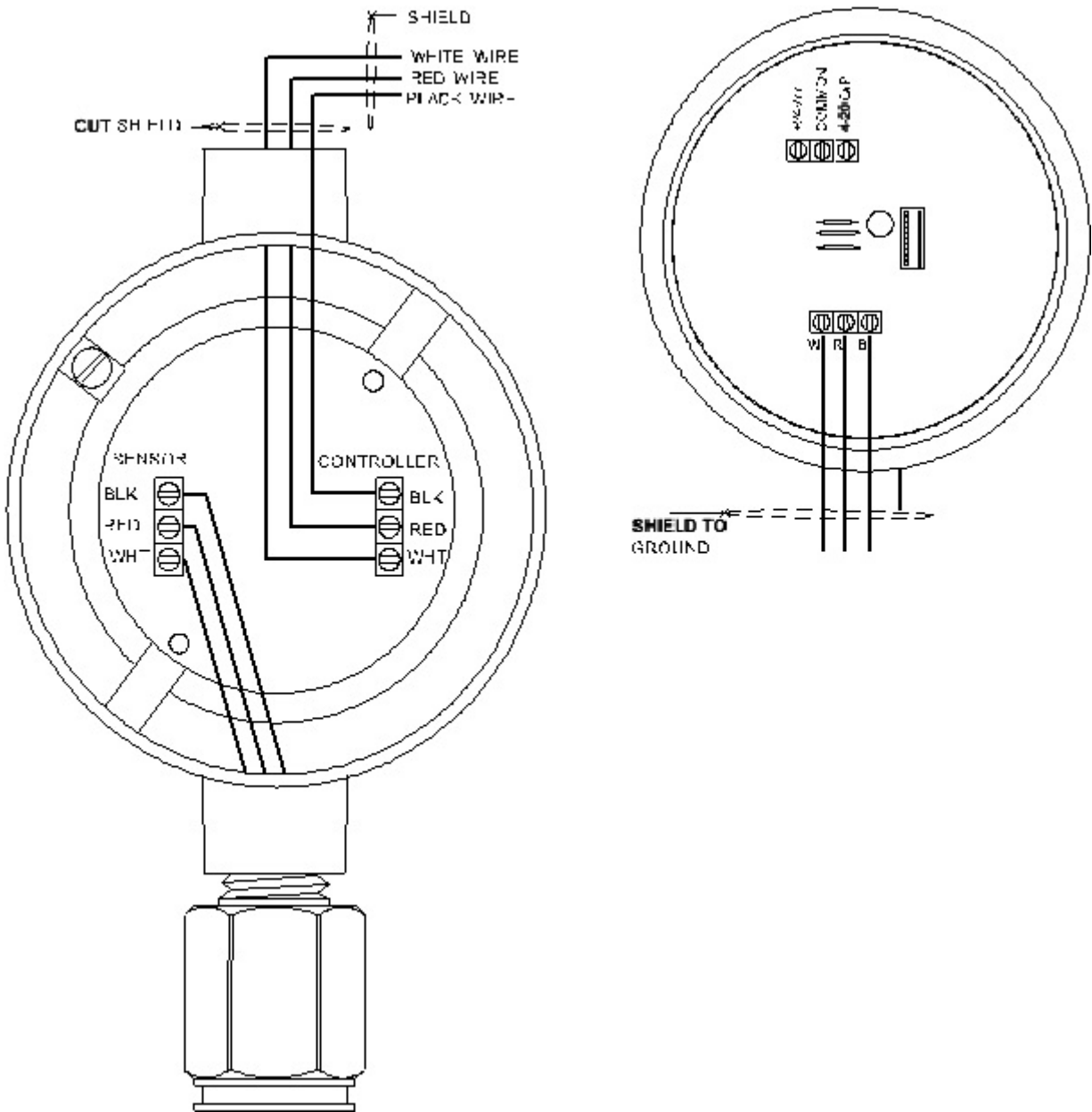


Figure 5 - Wiring Diagram with Sensor Separation

ANALOG OUTPUT

The analog output is precisely controlled by the internal micro-processor and digital to analog converter. Digital control provides the means to include extra features such as the automatic calibration, latching output signals and SensorGuard feature.

IMPORTANT:

When exposed to very high concentrations of combustible gas, Pellistor type LEL sensors initially respond to a level greater than 60% LEL. The response can then return to zero due to oxygen deprivation even though dangerous concentrations of gas remain present. For this reason it is important that external monitoring devices have an alarm latching function when connected to non-latching LEL sensors. The latching alarm must be set to latch at a level not greater than 60% LEL. The latched monitor must remain latched until manually reset.

When the gas signal exceeds 100% LEL the analog output is latched at 20 mA and the status LED is showing solid red until manually reset. At the same time the SensorGuard feature is activated to protect the sensor from damage that can be caused by the oxidation of high gas concentrations. This protective feature extends the useful lifetime of the sensor and reduces or eliminates disruption of its calibration. As an extra safety precaution the system should be checked for accuracy after such over-range exposure and if necessary re-calibrate.

Reset of the latched output is performed by either of 2 methods.

- ▶ press the internal reset button for 1 second
- ▶ momentarily interrupt power to the unit

SENSOR DRIFT

It is a normal characteristic of catalytic bead type sensors to exhibit a slow drift from zero. When the amount of drift exceeds 10% since the last calibration, the analog output switches to a value of 2.5 mA or 4.4 mA and the LED flashes red until manually reset and the system re-calibrated. When switched to 2.5 mA or 4.4 mA due to drift, the sensor will still respond and transmit reasonable analog signals if gas is present.

SENSOR LIFE

Sensor life is substantially extended and calibrations reduced by the SensorGuard software feature. Actual life is dependant on individual application conditions. In clean air applications sensor life can often exceed 5 years.

Sensor response normally deteriorates slowly over a period of several years, depending on exposure, until there is no longer sufficient signal. When this condition occurs, calibration will not be possible, the analog output will lock at 2.5 mA and the status LED flashes red. Install a new sensor and re-calibrate. The calibration function automatically adjusts span amplifier gain across a broad range without any need for manual adjustment of potentiometers or jumpers.

UNIT III SYSTEM CALIBRATION

CALIBRATION

The UNI-TRAN (UT-B-NL-SC1100) was calibrated before shipping from the factory and *may* not require adjustment, however, **accurate response to gas must be verified prior to using the device in service.**

When used with a Net Safety controller/monitor it *may* not be necessary to calibrate the UNI-TRAN analog output since system calibration can be accomplished at the controller which accepts and adjusts to a range of deviations in a **nominal** 4 to 20 mA signal.

Response should be checked and *if necessary* calibration should be performed whenever either of the following occur;

- ▶ sensor is exposed to contaminants
- ▶ excess sensor drift is indicated by 2.5 mA output
- ▶ sensor is replaced
- ▶ sensor is exposed to gas concentration above 100% LEL (SensorGuard protected)

When it is necessary to calibrate the UNI-TRAN LEL or if it is used as a stand-alone device connected to other monitoring equipment requiring a precise 4 to 20 mA signal then the following calibration procedure should be followed to ensure an accurate correlation between the 4 to 20 mA signal and the gas concentration at the sensor.

CALIBRATION PROCEDURE

(use 50% LEL, certified calibration gas)

1. Be sure the UNI-TRAN (UT-B-NL-SC1100) is powered-up and is not indicating a fault; FAULT/CAL LED is showing a short green flash every 2.0 seconds (Confidence blip).
2. Ensure that the sensor is in a clean air environment before beginning the calibration procedure. It is recommended to flow certified ZERO AIR at a rate of 0.5 litres per minute through the barbed tubing connector on the end of the sensor calibration cup accessory for one minute to ensure clean air is present.
3. Press and hold the internal Reset button for 10 seconds to begin the CALIBRATION sequence. The output current will drop to 3.0 mA, the FAULT/CAL LED will be GREEN steady. Release the Reset button and the micro-controller immediately begins ZERO readings. When ZERO readings are complete the output current rises to 3.3 mA and the LED will flash fast RED to indicate readiness to start the flow of SPAN gas.
4. At 3.3 mA and a fast RED flash rate, begin flowing 50% LEL of the correct calibration gas (span gas) at 0.5 litres per minute through the barbed fitting of the calibration cup. Within about 2 to 3 minutes the FAULT/CAL LED stops flashing and is steady green and the output current rises to 3.6 m.

(If span setting does not complete successfully within five minutes of starting the calibration sequence the status LED alternates flashes of RED and GREEN and the analog output changes back and forth from 3.0 to 3.3 mA. The unit remains in this state until acknowledged by a manual Reset. After manual Reset the program will return to the normal operation mode using previous calibration values. Since the calibration was unsuccessful another attempt may be made or replace the sensor and re-try calibration.)

5. When the status LED is solid green and the analog output switches to 3.6 mA span setting is complete. Stop the flow of calibration gas and disconnect the hose from the barbed fitting of the calibration cup. When sensor response level falls to about 7% LEL (5.2 mA), the output current is restored to normal operation and the LED is returned to its normal confidence blip; fast red flash every 2.0 seconds changing to fast green flash when sensor response returns to zero. Release the Reset button and the micro-controller immediately begins its calibration sequence.

SENSOR POISONS and INHIBITORS

The Net Safety sensor provides excellent resistance to poisoning but any catalytic sensor may be adversely affected when exposure is prolonged or intense.

Poisoning can be caused by compounds containing lead, sulphur, silicones and phosphates which can permanently reduce sensitivity of the sensor.

Temporary inhibition of response can be caused by compounds such as H₂S and halogenated hydrocarbons. Recovery can occur after a period of operation in clean air.

When a known exposure to poisons or inhibitors occurs, the sensor/transmitter should be checked for accurate response and if necessary re-calibrate.

TABLE 1 STATUS LED RESPONSES

CONDITION	Current O/P (mA)	Status LED RED	Status LED GREEN
Start-up delay	3.0	Slow Flash	
White sensor lead open	2.5	Fast Flash	
Black sensor lead open	2.5	Slow Flash	
Red sensor lead open	2.5	Slow Flash	
Excess drift (>10%)	2.5	Blip/ blink	
Auto Zero set	3.0		Solid
Apply calibration gas	3.3	Fast Flash	
Span is set, remove gas	3.6		Solid
Return to normal operation	3.6		Solid
Normal	4.0		Blip/ blink
Gas Present	>4.0 - 20.0	Blip/ blink	
Over 60% LEL range exceeded	>13.6	Blip/ blink	
Over-range (>100%) LEL	20.0 (latched)	Solid	

IMPORTANT NOTICE

Because all catalytic type combustible gas sensors require normal oxygen levels to be present in order to give accurate readings, there could be situations where the sensor indicates safe gas levels when in fact there is a dangerously high level of gas present at the sensor.

The Net Safety UNI-TRAN LEL is equipped with a proprietary signal processor to prevent the user from being presented with such false and potentially dangerous signals.

If the signal exceeds 20 mA or 100% LEL, the current is latched at 20 mA until manually reset. *When this high level signal is present it is mandatory that the area around the sensor be considered **dangerous** even though there is a possibility that the atmosphere has returned to a safe condition.*

It is necessary that reliable monitoring and indicating devices or systems be connected to the transmitter. These devices must be designed to produce clear visual and audible danger signals when high signal levels occur. Operating personnel must consider the area to be dangerous until a careful survey of the area has been conducted with a separate and reliable gas indicating device. *Only after the area is confirmed to free of dangerous gas levels is it allowable to RESET the combustible gas transmitter to resume normal operation.*

CAUTION

Any catalytic type combustible gas sensor is susceptible to damage when exposed to high levels of gas, therefore, check the sensor for accurate response and if necessary perform a calibration or replace the sensor after any high level alarm. If the high level response resulted in a latched 20 mA alarm signal then the sensor/transmitter will require a normal warm-up period after it is reset before its accuracy can be assessed and a calibration performed.

SENSOR PROTECTION

To minimize damage to the sensor that can be caused by extended exposure to high concentrations of gas, the Net Safety combustible gas transmitter is equipped with a proprietary signal processor which invokes SensorGuard when detected levels exceed 100% LEL and the output signal is latched at 20 mA until manually reset (after verifying the area is safe).

CAUTION: FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

ATTENTION: POUR DES RAISONS DE SECURITE, CET EQUIPMENT DOIT ETRE UTILISE, ENTRETENU ET REPARE UNIQUEMENT PAR UN PERSONNEL QUALIFIE. ETUDIER LE MANUEL.

How to Return Equipment

A Material Return Authorization number is required in order to return equipment. Please contact Net Safety Monitoring at (403) 219-0688 before returning equipment or consult our Service Department to possibly avoid returning equipment.

If you are required to return equipment, include the following information:

1. A Material Return Authorization number (provided over the phone to you by Net Safety).
2. A detailed description of the problem. The more specific you are regarding the problem, the quicker our Service department can determine and correct the problem.
3. A company name, contact name and telephone number.
4. A Purchase Order, from your company, authorizing repairs or request for quote.
5. Ship all equipment, prepaid to:

Net Safety Monitoring Inc

2721 Hopewell Place NE

Calgary, Alberta, Canada

T1Y 7J7

6. Mark all packages: RETURN for REPAIR

Waybills, for shipments from outside Canada, must state:

Equipment being returned for repair

All charges to be billed to the sender

Also, please ensure a duplicate copy of the packing slip is enclosed inside the box indicating item 1-4 along with the courier and account number for returning the goods.

All Equipment must be Shipped prepaid. Collect shipments will not be accepted.

Pack items to protect them from damage and use anti-static bags or aluminum-backed cardboard as protection from electrostatic discharge.

Appendix A **ELECTROSTATIC SENSITIVE DEVICE (ESD)**

Electrostatic discharge (ESD) is the transfer, between bodies, of an electrostatic charge caused by direct contact or induced by an electrostatic field.

The most common cause of ESD is physical contact. Touching an object can cause a discharge of electrostatic energy—ESD! If the charge is sufficient and occurs near electronic components, it can damage or destroy those components.

In some cases, damage is instantaneous and an immediate malfunction occurs. However, symptoms are not always immediate—performance may be marginal or seemingly normal for an indefinite period of time, followed by a sudden failure.

To eliminate potential ESD damage, review the following guidelines:

Handle boards by metal shields—taking care not to touch electronic components

Wear grounded wrist or foot straps, or ESD shoes or heel grounders to dissipate unwanted static energy

Prior to handling boards, dispel any charge in your body or equipment

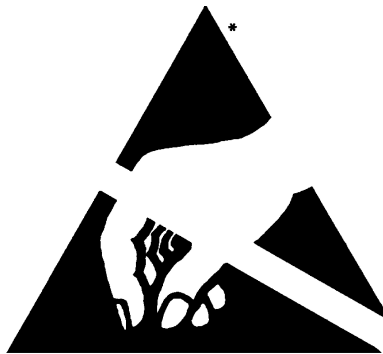
Ensure components are transported and stored in static safe packaging

When returning boards, carefully package in the original carton and static protective wrapping

Ensure ALL personnel are educated and trained in ESD Control Procedures

In general, exercise accepted and proven precautions normally observed when handling electrostatic sensitive devices.

A warning label is placed on the packaging, identifying product using electrostatic sensitive semiconductor devices.



*Published in Accordance with EIA standard 471

Appendix B 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	0.40	0.25	0.16	0.10	0.06
200	2.03	1.28	0.80	0.51	0.32	0.20	0.13
300	3.05	1.92	1.20	0.76	0.48	0.30	0.19
400	4.06	2.55	1.61	1.01	0.64	0.40	0.25
500	5.08	3.20	2.01	1.26	0.79	0.50	0.31
600	6.09	3.83	2.41	1.52	0.95	0.60	0.38
700	7.11	4.47	2.81	1.77	1.11	0.70	0.44
800	8.12	5.11	3.21	2.02	1.27	0.80	0.50
900	9.14	5.75	3.61	2.27	1.43	0.90	0.57
1000	10.20	6.39	4.02	2.53	1.59	1.09	0.63
1250	12.70	7.99	5.03	3.16	1.99	1.25	0.79
1500	15.20	9.58	6.02	3.79	2.38	1.50	0.94
1750	17.80	11.20	7.03	4.42	2.78	1.75	1.10
2000	20.30	12.80	8.03	5.05	3.18	2.00	1.26
2250	22.80	14.40	9.03	5.68	3.57	2.25	1.41
2500	25.40	16.00	10.00	6.31	3.97	2.50	1.57
3000	30.50	19.20	12.00	7.58	4.76	3.00	1.88
3500	35.50	22.40	14.10	8.84	5.56	3.50	2.21
4000	40.60	25.50	16.10	10.00	6.35	4.00	2.51
4500	45.70	28.70	18.10	11.40	7.15	4.50	2.82
5000	50.10	32.00	20.10	12.60	7.94	5.00	3.14
5500	55.80	35.10	22.10	13.91	8.73	5.50	3.46
6000	61.00	38.30	24.10	15.20	9.53	6.00	3.77
6500	66.00	41.50	26.10	16.40	10.30	6.50	4.08
7000	71.10	44.70	28.10	17.70	11.10	7.00	4.40
7500	76.10	47.90	30.10	19.00	12.00	7.49	4.71
8000	81.20	51.10	33.10	20.20	12.70	7.99	5.03
9000	91.40	57.50	36.10	22.70	14.30	8.99	5.65
10 000	102.00	63.90	40.20	25.30	15.90	9.99	6.28

NOTE: RESISTANCE SHOWN IS ONE WAY. THIS FIGURE SHOULD BE DOUBLED WHEN DETERMINING CLOSED LOOP RESISTANCE.



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