

# Instructions

95-8444

Infiniti® Gas Transmitter  
U9500



# Table Of Contents

APPLICATION .....	1
FEATURES.....	1
SPECIFICATIONS.....	1
DESCRIPTION .....	3
IMPORTANT SAFETY NOTES .....	4
INSTALLATION .....	4
Wiring Requirements .....	4
Wiring Procedure.....	4
Typical System Wiring .....	9
Controller/Signal Receiver Options .....	10
Sensor Separation.....	10
DISPLAY AND CONTROLS, OPTIONS, DEFAULTS .....	13
Display and Controls .....	13
Programming Options.....	13
Infiniti Sensor Compatibility .....	16
Infiniti Outputs.....	16
MODES OF OPERATION .....	16
INSTALLATION CHECKLIST .....	20
STARTUP PROCEDURE .....	20
SETPOINT DISPLAY MODE.....	20
SETUP PROCEDURE.....	21
CALIBRATION.....	21
Calibration Recommendations.....	21
Auto Calibration Procedure .....	25
Manual Calibration Procedure .....	27
Calibration Procedure for Infiniti with C7065E O2 Sensor .....	27
TROUBLESHOOTING .....	29
MAINTENANCE .....	31
Sensor and Hydrophobic Filter Replacement.....	31
SPARE PARTS.....	33
DEVICE REPAIR AND RETURN .....	33
APPENDIX A — FM APPROVAL DESCRIPTION.....	A-1
APPENDIX B — CSA CERTIFICATION DESCRIPTION.....	B-1
APPENDIX C — CE MARK / ATEX CERTIFICATION.....	C-1

*Note: For information regarding MOS H2S please refer to form: 95-8532*

## APPLICATION

The model U9500 Infiniti® Transmitter family is designed for use with Det-Tronics gas sensors for detection of hazardous gases.

Gas concentrations are displayed on an alphanumeric display in %LFL or ppm, depending on the type of gas being detected. The transmitter provides a user selectable isolated/non-isolated 4 to 20 milliampere output signal that corresponds to the detected gas concentration. An optional relay package is available to provide contact outputs for alarm and fault conditions.

The electronics of the Infiniti transmitter is contained in an explosion-proof housing. The transmitter is used with a single sensor, which may be either coupled directly with the Infiniti housing, or remotely located using a sensor termination box. The Infiniti offers non-intrusive calibration by actuating a magnetic reed switch with a hand-held magnet. It is not necessary to remove the housing cover to actuate the magnetic reed switch.

Typical Infiniti applications include:

- Confined spaces where gas/vapor leaks can concentrate to explosive or toxic levels or where oxygen levels need to be monitored (enclosed processing areas).
- Known high risk leak locations (points within processing areas, compressor buildings).
- General open area coverage (storage areas).

## FEATURES

- Non-intrusive calibration using the internal magnetic reed switch, or an externally located pushbutton (not included).
- Automatic fault diagnostics and graphic message annunciation.
- Optional relay package provides three alarm relays (high, low, and auxiliary) and one fault relay.
- Models available for use with catalytic combustible sensor, point infrared combustible, electrochemical (EC) H<sub>2</sub>S, and CO, CL<sub>2</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>2</sub> electrochemical sensors.
- Variety of multi-port enclosures available.



## SPECIFICATIONS

### INPUT VOLTAGE—

24 vdc. Operating range is 16 to 32 vdc including ripple.

### POWER CONSUMPTION WITH SENSOR—

See Table 1.

### CURRENT OUTPUT—

Linear 4 to 20 mA output.

Maximum loop resistance is 600 ohms at 20 to 32 vdc.

Selectable isolated or non-isolated operation.

Factory set 2.0 mA output indicates unit is in Calibration mode (field adjustable).

Less than 1.0 mA output indicates fault condition.

### DISPLAY—

Eight character alphanumeric display indicates power on, gas concentration, alarm and fault conditions. It also enables field adjustment of alarm setpoints, calibration gas concentration, full scale measurement range and gas type to be detected.

Table 1—Power Consumption with Sensor

Type	Infiniti with alarm relays (sensor connected, +24 vdc input)		Infiniti without alarm relays (sensor connected, +24 vdc input)	
	Nominal	Maximum	Nominal	Maximum
Toxic and Oxygen	3 Watts	5 Watts	2.1 Watts	2.4 Watts
Combustible	4.6 Watts	6.5 Watts	3.5 Watts	4 Watts
PIR 9400 PointWatch	8.1 Watts	10.1 Watts	7.0 Watts	7.5 Watts
PIRECL PointWatch Eclipse	7.6 Watts	12.4 Watts	6.5 Watts	9.9 Watts

**DETECTION RANGE—**

Hydrocarbon: 0 to 100% LFL for PointWatch IR detector. (FM/CSA verified)  
 Catalytic: 0 to 100% LFL.  
 Hydrogen Sulfide (electrochemical): 0 to 100 ppm, 0 to 50 ppm, 0 to 20 ppm. (FM/CSA verified)  
 Chlorine: 0 to 10 ppm.  
 Oxygen: 0 to 25% by volume.  
 Carbon Monoxide: 0 to 100 ppm, 0 to 500 ppm, 0 to 1000 ppm.  
 Nitrogen Dioxide: 0 to 20 ppm.  
 Sulfur Dioxide: 0 to 100 ppm.

**Special Conditions for Safe Use (X):**

The Infiniti Transmitter types U9500A and U9500H have an ambient temperature rating for performance of -40°C to +75°C.

The performance of the Infiniti Transmitter types U9500B, U9500C, U9500D, U9500E, U9500F and U9500G as a safety device in accordance with harmonized gas performance standards is not covered by this certificate.

Russian: 1Ex d IIC T6 (Tamb = -60°C to +50°C),  
 T5 (Tamb = -60°C to +65°C),  
 T4 (Tamb = -60°C to +75°C)

**RELAY CONTACTS (OPTIONAL)—**

Three Alarm relays: Form C, 5 amperes at 30 vdc. Selectable normally energized or de-energized as a group. Low, auxiliary and high alarm relay contacts are selectable as a group for latching or non-latching.

**WIRING—**

Power: 18 AWG minimum is recommended for power wiring to the transmitter. Larger diameter wire may be required to maintain a minimum of 16 vdc at the transmitter for all operating conditions for all sensors except PointWatch. A minimum of 18 vdc is required at the transmitter for all operating conditions for the PointWatch sensor. Maximum wire size for terminals is 12 AWG.

**WARNING**

*When in non-latching mode, the control device must latch the alarm output.*

One Fault relay: Form C, 5 amperes at 30 vdc. Normally energized for no fault condition with power applied to device.

**SHIPPING WEIGHT (Transmitter and Junction Box)—**

Aluminum: 4.15 pounds (1.88 kilograms).  
 Stainless steel: 10.5 pounds (4.76 kilograms).

**TEMPERATURE RANGE—**

Operating: -40°F to +167°F (-40°C to +75°C).  
 Storage: -67°F to +185°F (-55°C to +85°C).

**ENCLOSURE MATERIAL—**

Epoxy coated 356 alloy aluminum or 316 stainless steel. (Standard with two conduit entries.)

**CERTIFICATIONS—**

FM: Refer to Appendix A for details.  
 CSA: Refer to Appendix B for details.  
 CENELEC/CE: Refer to Appendix C for additional details.  
 CE 0539 II 2 G  
 EEx d IIC T5-T6  
 DEMKO 02 ATEX 131327 X  
 T6 (Tamb = -55°C to +60°C)  
 T5 (Tamb = -55°C to +75°C)  
 IP66.

U9500 Infiniti enclosures are available with (2) conduit entries at 90 degree "L" orientation, (2) conduit entries at 180 degree "straight thru" orientation, (3) conduit entries, and 5 conduit entries. Contact factory for additional information on enclosure options.

**DIMENSIONS—**

See Figure 1.

## DESCRIPTION

The U9500 is a single channel gas detection device. In addition to the standard 4-20 mA analog signal output, the U9500 offers 4 optional relay outputs for fault and alarm indications. The 4 outputs are: fault, high alarm, low alarm, and auxiliary alarm. The relays have form C (SPDT) contacts. Low, auxiliary and high alarm relay contacts are selectable as a group for latching or non-latching operation. During normal operation, the fault relay is non-latching, but for initialization faults, the fault relay latches. The alarm relays are also selectable, as a group, for normally energized or de-energized with no alarms. The fault relay is always normally energized for no fault.

## NOTE

*Since the relays can be programmed to be either energized or de-energized on alarms, the term "actuate" is used to indicate that the output is in an alarm condition.*

The U9500 provides an eight character, single line, alpha-numeric LCD display. The U9500 has four switches located on the display. The visible three switches are single pole, normally open push buttons, and are designated as: Setup/accept, increase, and decrease. The fourth switch is a magnetic reed switch, designated cal/reset, which is used by the customer for non-intrusive calibrations and for resetting of the U9500.

Two additional options are available for resetting the transmitter. A user supplied switch can be wired to the transmitter terminal block and used to reset the device

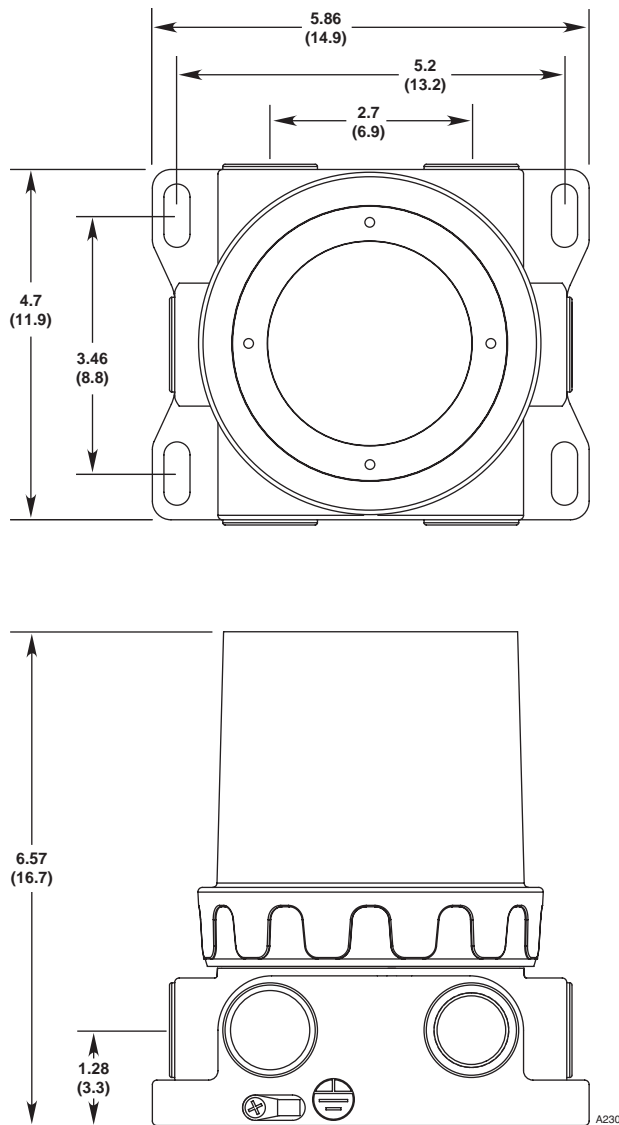


Figure 1—Infiniti Transmitter Dimensions in Inches (Centimeters)

from a remote location. In addition, Detector Electronics offers a special optional enclosure with a pushbutton pre-installed within a multi-port electrical enclosure for customers who do not prefer magnetic switches.

The U9500 is compatible with the entire Detector Electronics sensor family. In some cases, special personality cards are required to ensure proper operation with a specific sensor, including the Det-Tronics Combustible Gas sensors. The proper U9500 model must be ordered by the customer to ensure proper operation and markings for the desired sensor type. Refer to Appendix C for combustible gas sensor CE/ATEX ratings and installation details. Refer to form 90-1041 for specification details.

### Modes of operation

The U9500 has three main operating modes:

- Normal
- Calibrate
- Setup (also called Configuration).

Normal mode is the default mode, no buttons pushed.

Three minor modes also exist:

- Setpoint display
- Reset
- Power up.

## IMPORTANT SAFETY NOTES

### WARNING

*Do not apply power to the system with the enclosure cover removed unless the area has been de-classified. Do not open the enclosure in a hazardous area when power is applied.*

### CAUTION

*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 Infiniti 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. Observe the normal precautions for handling electrostatic sensitive devices.*

*To minimize the risk of damage, handle the transmitter module by the edges only. Do not touch the circuit board, or electronic components.*

*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 that they are operational.*

*Exercise caution if an over-range reading is indicated, since a dangerous condition could exist. The hazardous area should be checked with a portable detection instrument to determine the actual level of gas present.*

## INSTALLATION

### WIRING REQUIREMENTS

- Install per local installation practices and in accordance with local authority having jurisdiction.
- See Figures 2 and 3 for wiring size and maximum distance from the power supply to the transmitter.

### IMPORTANT

*Proper installation practices must be followed to ensure that condensation does not enter the junction box and interfere with the electronic circuitry. Refer to local installation codes.*

### WIRING PROCEDURE

The following procedure should be used for installing and wiring the Infiniti Transmitter.

Refer to these figures and table when installing and wiring the Infiniti:

- Figure 1 — Infiniti Mounting Dimensions
- Figure 2 — Transmitter Wiring Requirements for Toxic and Oxygen Models with Relays
- Figure 3 — Transmitter Wiring Requirements for Combustible Models with Relays
- Figure 4 — Field Wiring Entries
- Figure 5 — Infiniti Field Wiring Terminal with Relay Option
- Figure 6 — Infiniti Field Wiring Terminal without Relay Option
- Table 2 — Wiring Size and Maximum Distance from Transmitter to Sensor (for applications where a sensor termination box is used)

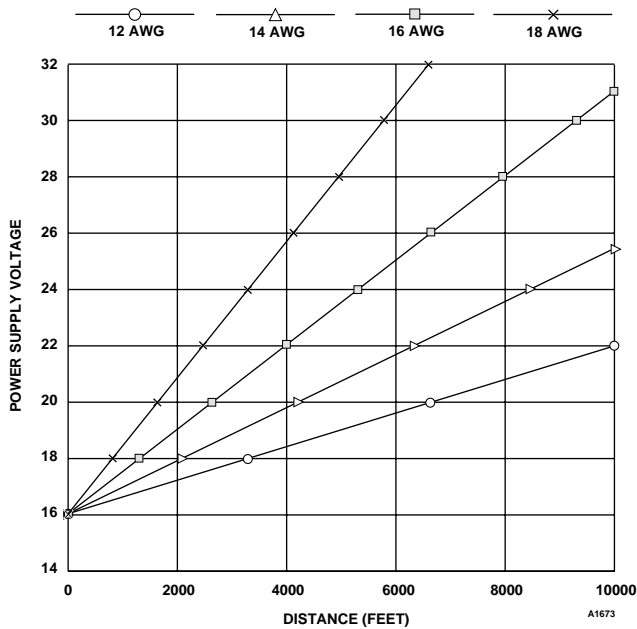


Figure 2—Transmitter Wiring Requirements for Toxic and Oxygen Models with Relays

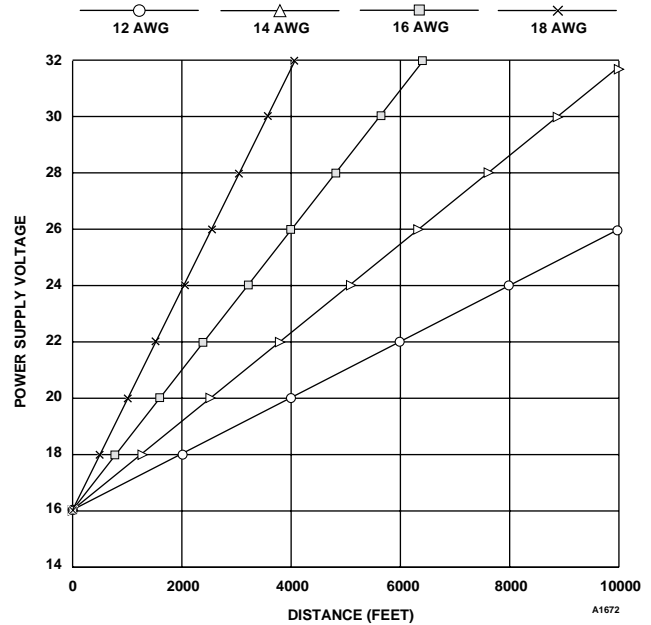


Figure 3—Transmitter Wiring Requirements for Combustible Gas Model with Relays

1. Install the unit in a location that is best suited to cover the area to be protected. Whenever practical, the Infiniti should be placed where it is easily accessible for calibration. For proper operation, sensors should be pointing down, except for PointWatch, which can be mounted down or sideways. See Figure 1 for mounting dimensions.

**NOTE**

*When used with the PointWatch infrared hydrocarbon gas detector, a 1/4 inch spacer is required between the enclosure and the mounting surface to allow adequate room for the detector and calibration windshield, if required.*

2. Remove the transmitter from its packing material and note the location of the field wiring terminals and (on the catalytic sensor transmitters only) the location of a small sensor connection plug on the side opposite the field wiring terminals.
3. Remove the cover from the enclosure. One conduit entry is used for mounting the sensor and the other is for field wiring. The transmitter module slides into the mounting bracket within the enclosure and all field and sensor wiring connects to this module.
  - For catalytic combustible gas transmitters, the sensor connects to a small plug on one side of the transmitter and all field wiring connects to terminals on the other side.
  - For all other gas transmitters, the sensor and field wiring all connect to the terminal block on one side of the transmitter module.

See Figure 4 for left and right field wiring entry. Make sure that the display is oriented correctly, then proceed with transmitter wiring.

4. Connect the transmitter enclosure to the field wiring conduit. The enclosure should be electrically connected to earth ground.
5. Attach the sensor to the other entry on the transmitter enclosure. First route the wires through the entry, then tighten the sensor to the enclosure to ensure an explosion-proof installation. **Do not overtighten.**

**IMPORTANT**

*To ease maintenance, periodically apply a generous amount of Lubriplate grease (part number 102868-001) to the internal threads on the junction box cover using an application tool. DO NOT use other lubricants, since some materials can cause irreversible damage to the sensing element in the gas sensor.*

6. Slide the transmitter module into the bracket, being careful to route field and sensor wires to the appropriate location within the enclosure for easy connection to the transmitter module. Ensure that the transmitter display and pushbuttons (at the top) are oriented correctly.

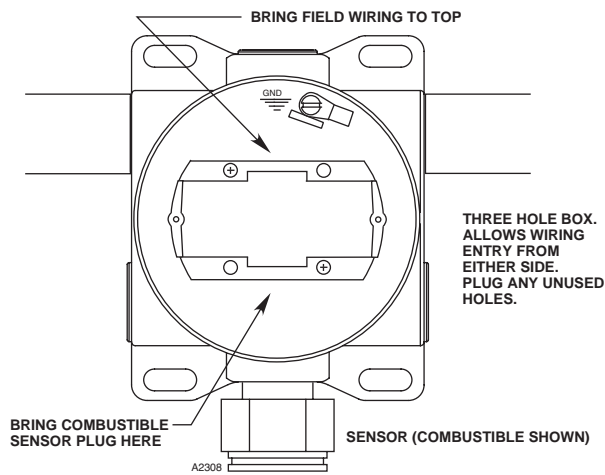
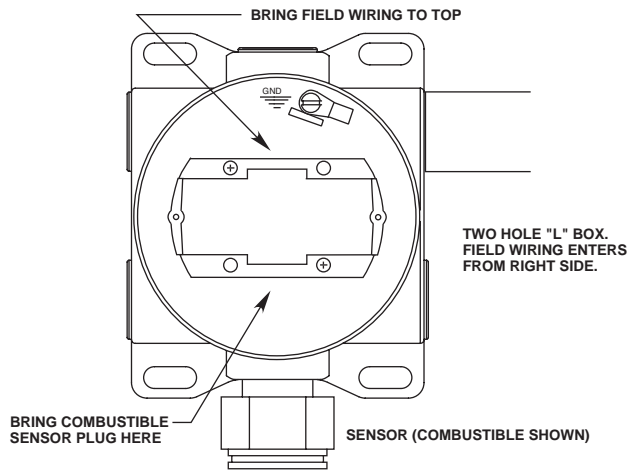


Figure 4—Field Wiring Entries

**CAUTION**

*Wires can become pinched between the cover and base if they are not properly tucked down inside the enclosure.*

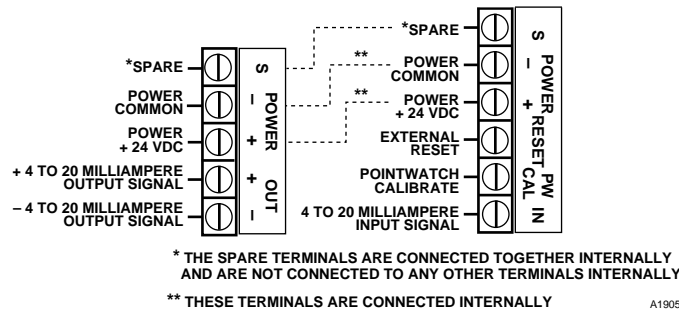


Figure 6—Field Wiring Terminals, Transmitter without Relays

7. Fasten the transmitter module to the mounting bracket with the two captive screws located inside the notch on either side of the top of the transmitter. Remove the wire clip and set it aside.
8. See Figures 5 and 6 for field wiring terminal designation.
  - On combustible gas transmitters, attach the sensor plug to the transmitter module on the side opposite the field wiring terminals.
  - On all other transmitter types, connect sensor wires to the designated terminals. If a sensor termination box is being used, refer to the "sensor separation" section that follows this section.
9. Connect the power and current output leadwires to the screw terminals on the plug that is provided. See Figures 7, 8, 9 and 10 for examples of transmitter wiring. Connect the shield to earth ground at the power supply. Under normal conditions, the panel or field end of the shield should **not** be grounded at the transmitter.
10. For Relay models, refer to Figures 7 and 8 when connecting external loads to the relay outputs. For models without relays, proceed to step 11.

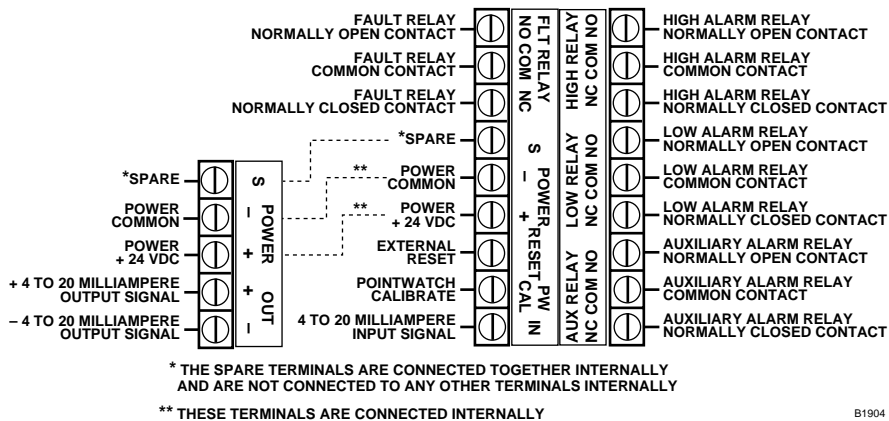


Figure 5—Field Wiring Terminals, Transmitter with Relays

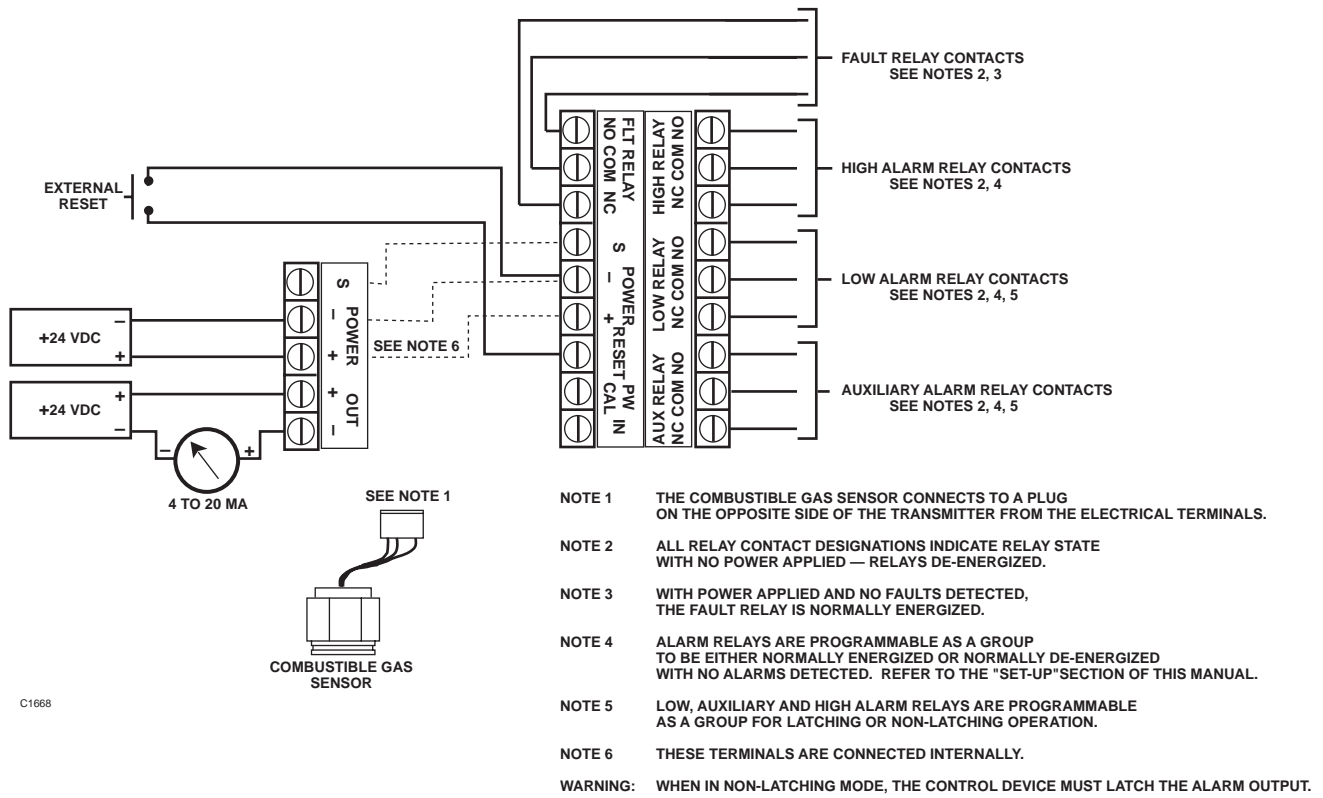


Figure 7—A Typical System - Infiniti Transmitter with Combustible Gas Sensor, Isolated Current Output and Relay Outputs

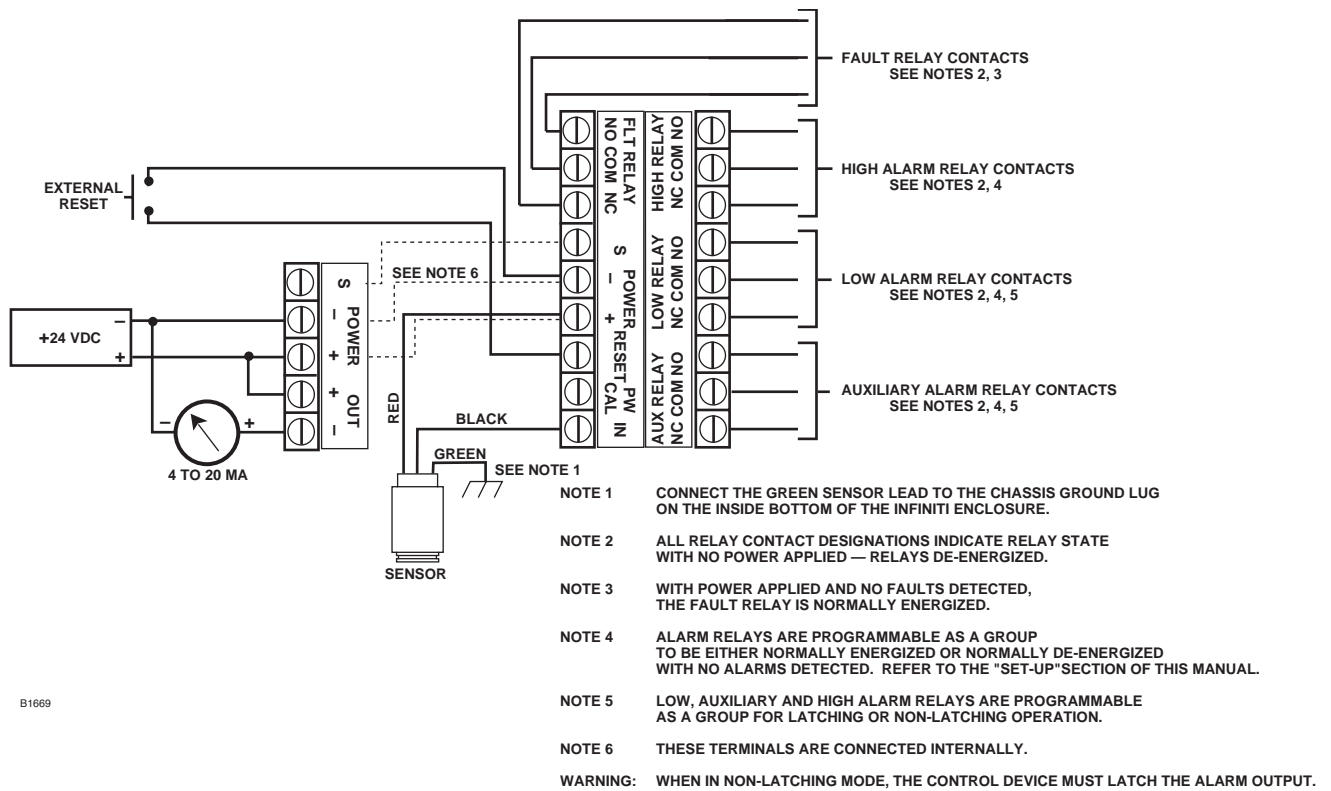


Figure 8—A Typical System - Infiniti Transmitter with a Toxic Gas / Oxygen Sensor, Non-Isolated Current Output and Relay Outputs

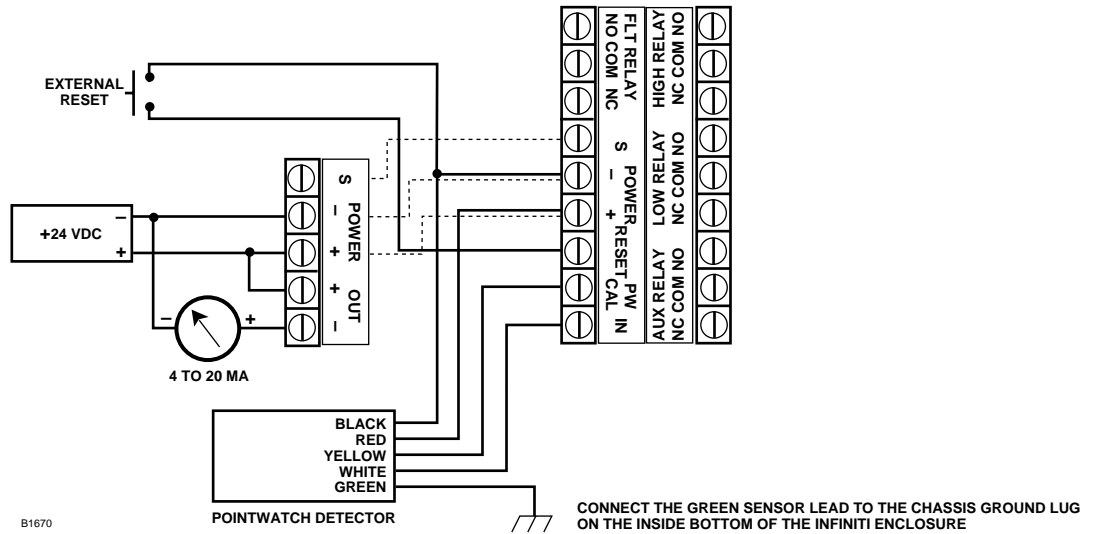


Figure 9—A Typical System - Infiniti Transmitter with a PointWatch Detector and Non-Isolated Current Output

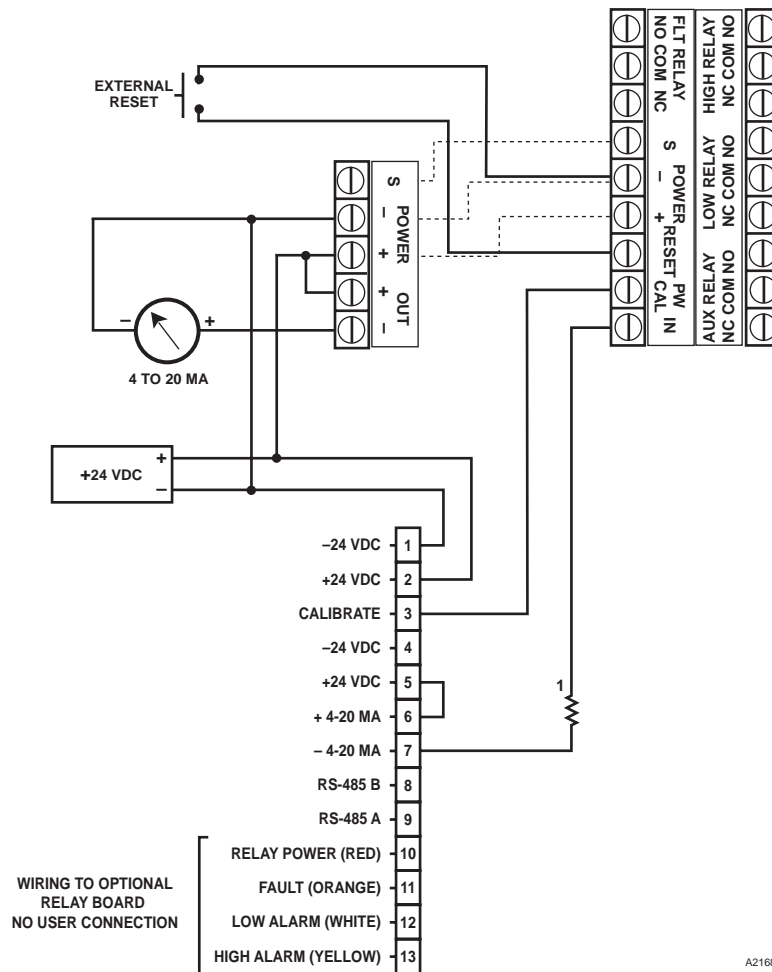


Figure 10—A Typical System, Infiniti Transmitter with a PIRECL PointWatch Eclipse Detector and Non-Isolated Current Output

### IMPORTANT

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.

External relays, solenoids, motors, or other devices that can cause inductive transients should be transient suppressed. Place a diode across the coil for dc devices. See Figure 11.

11. An external reset switch can be wired as shown in Figures 7, 8, 9 and 10. The use of shielded wire is recommended for wiring the switch.
12. Check all field wiring to ensure that the proper connections have been made. Refer to local codes to be sure wiring and conduit seals are installed properly.

### WARNING

When in non-latching mode, the control device must latch the alarm output.

### CAUTION

Wires can become pinched between the cover and base if they are not properly tucked down inside the enclosure. The wire clip will prevent this problem when installed correctly.

13. Replace the wire clip and place the cover back on the transmitter enclosure.

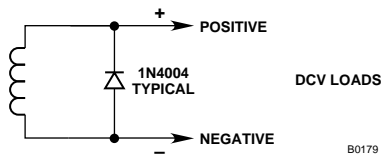


Figure 11—Transient Suppression for Inductive Loads

### TYPICAL SYSTEM WIRING

Refer to these typical system wiring diagrams for guidance when installing and wiring the Infiniti:

- Figure 7 — A Typical System, Infiniti Transmitter with a Combustible Gas Sensor, Isolated Current Output and Relay Outputs
- Figure 8 — A Typical System, Infiniti Transmitter with a Toxic Gas/Oxygen Sensor, Non-Isolated Current Output and Relay Outputs
- Figure 9 — A Typical System, Infiniti Transmitter with a PointWatch Detector and Non-Isolated Current Output
- Figure 10 — A Typical System, Infiniti Transmitter with a PIRECL PointWatch Eclipse Detector and Non-Isolated Current Output
- Figure 11 — Transient Suppression for Inductive Loads

## CONTROLLER/SIGNAL RECEIVER OPTIONS

All Model U9500 Series transmitters offer an analog 4 to 20 mA output, which is configurable for electrically isolated or non-isolated operation. The analog signal is capable of driving a maximum 600 ohm resistance load. Typical controllers used with the U9500 Series include the family of R8471 Controllers, or the Model 8000 eight channel controller for % LFL flammable gas monitoring. It is also acceptable to use the U9500 with other devices or systems capable of accepting 4 to 20 mA signal inputs. The following illustrations provide examples of recommended interconnecting wiring between the U9500 and analog signal receivers:

Figure 13 — A Typical System, Infiniti Transmitter with PointWatch Wired to R8471 Controller, Non-Isolated Current Output

Figure 14 — A Typical System, Infiniti Transmitter with PointWatch Wired to a Model 8000 Controller, Isolated Current Output

Figure 15 — A Typical System, Infiniti Transmitter used with PLC Analog Input Module, Isolated/Non-Isolated Current Output

## SENSOR SEPARATION

Det-Tronics sensor termination boxes (STBs) enable the installation of the sensor separately from the Infiniti transmitter module. Three conductor shielded cable must be used to prevent possible nuisance EMI/RFI. Contact the factory for ordering information. (See Appendix C for CE/ATEX rating details.) Refer to these typical system wiring diagrams for guidance:

Table 2 — Wiring Size and Maximum Distance from Transmitter to Sensor

Figure 16 — Sensor Separation with Combustible Gas Sensor and Infiniti Transmitter

Figure 17 — Sensor Separation with PointWatch and Infiniti Transmitter

Figure 18 — Sensor Separation with Toxic and Oxygen Gas Sensors and Infiniti Transmitter

Figure 19 — Sensor Separation with Chlorine Gas Sensor, Intrinsically Safe barrier and Infiniti Transmitter

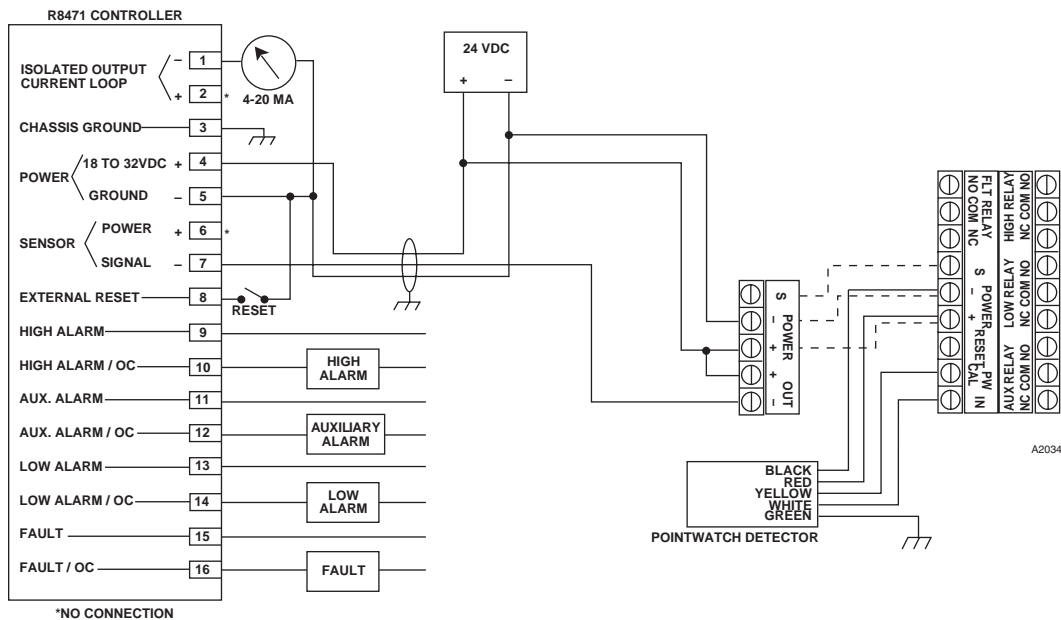


Figure 13—A Typical System, Infiniti Transmitter with PointWatch Wired to R8471 Controller, Non-Isolated Current Output

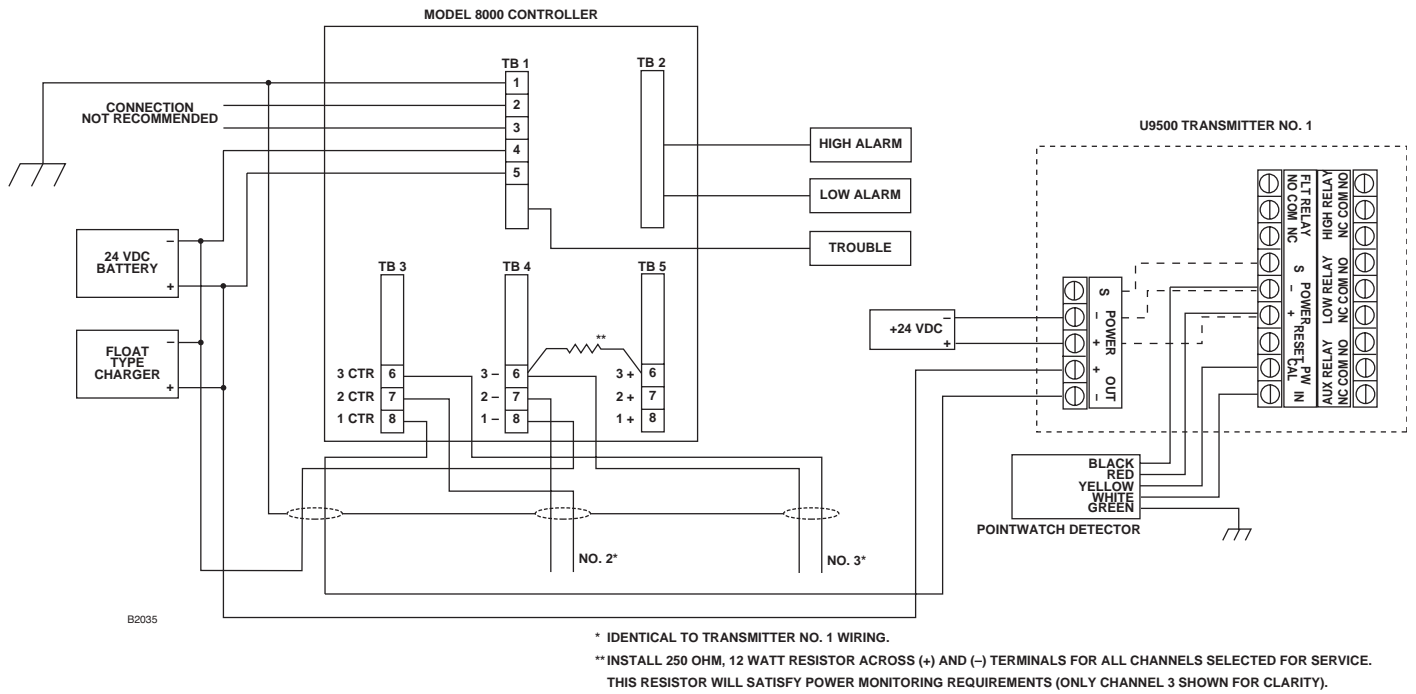


Figure 14—A Typical System, Infiniti Transmitter with PointWatch Wired to a Model 8000 Controller, Isolated Current Output

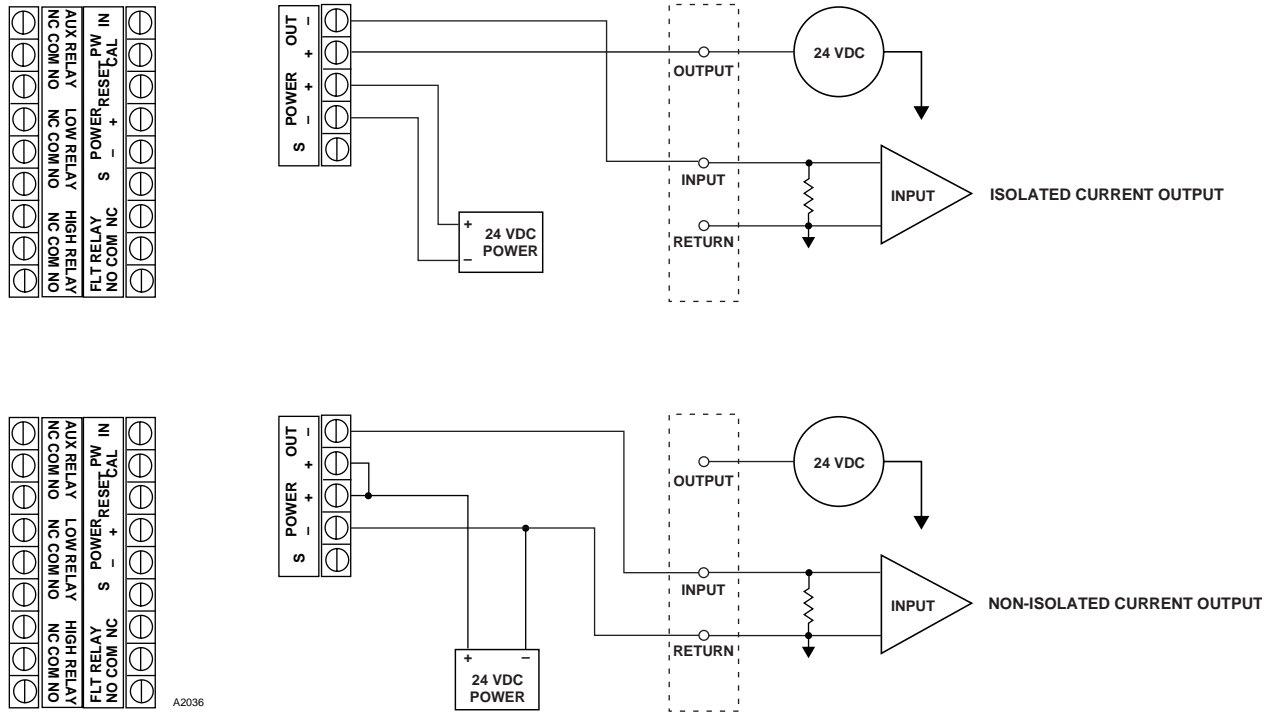


Figure 15—A Typical System, Infiniti Transmitter used with PLC Analog Input Module, Isolated/Non-Isolated Current Output

Table 2—Maximum Sensor Separation Distance

		Maximum Transmitter to Sensor Distance					
		Combustible		Toxic and Oxygen		Point Infrared	
Wire Size (mm <sup>2</sup> )	Wire Size (AWG)	Feet	Meters	Feet	Meters	Feet	Meters
1.0	18	100	30	12,000	3,600	700	210
1.5	16	150	45	20,000	6,100	1100	335
2.5	14	250	75	32,000	9,700	1800	545
4.0	12	400	120	50,000	15,000	2800	850

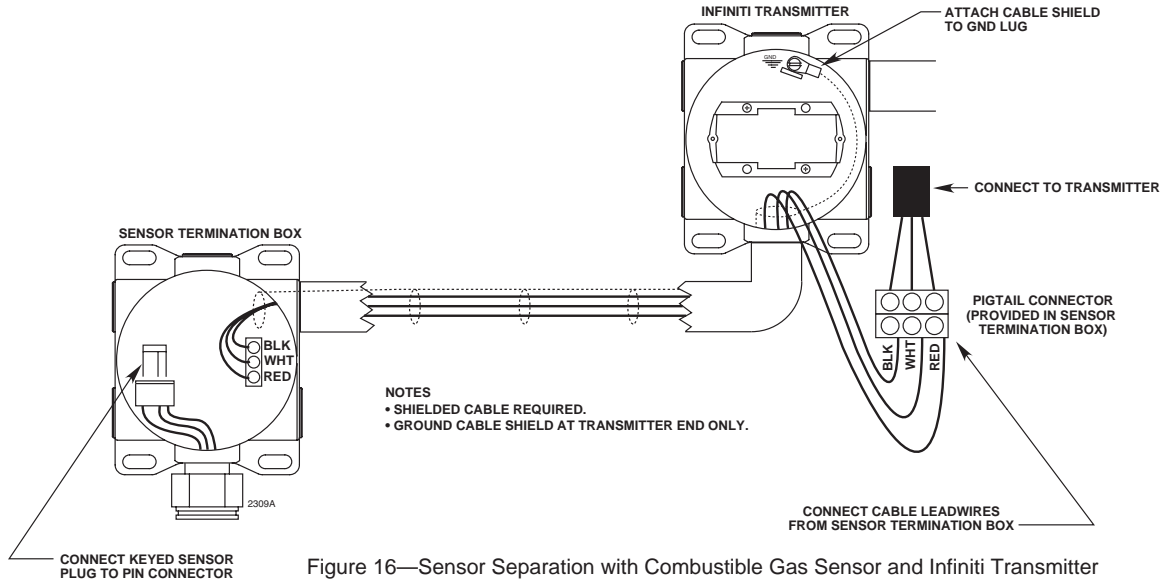


Figure 16—Sensor Separation with Combustible Gas Sensor and Inifiniti Transmitter

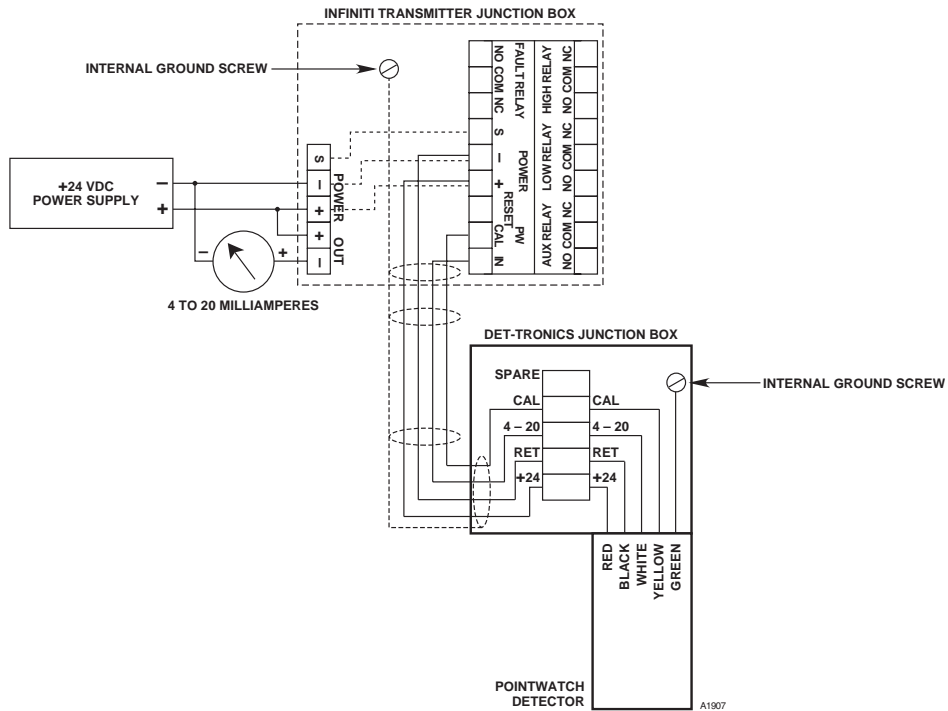


Figure 17—Sensor Separation with PointWatch and Inifiniti Transmitter

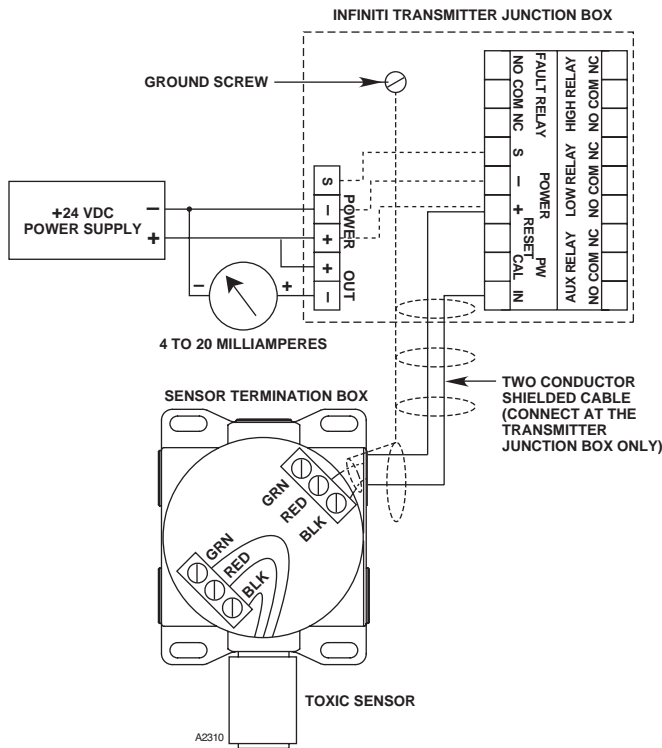
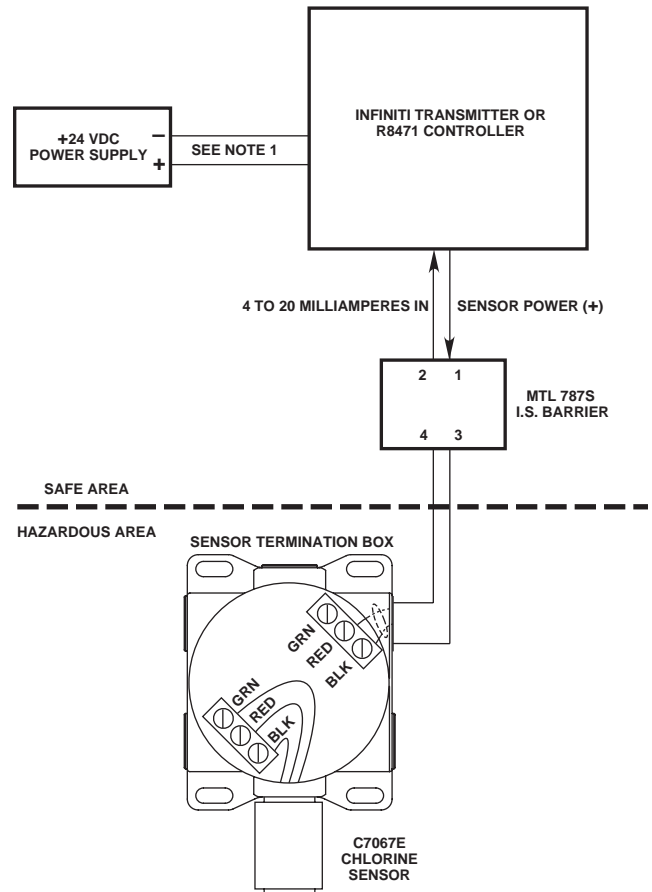


Figure 18—Sensor Separation with Toxic\* and Oxygen Gas Sensors and Infiniti Transmitter

\* Excluding Chlorine sensor, see Figure 19.



- NOTES:
1. NEVER EXCEED 25.5 VOLTS DC POWER SUPPLY INPUT VOLTAGE OR BARRIER DAMAGE WILL RESULT.
  2. MAXIMUM TOTAL FIELD WIRING SIGNAL LOOP IMPEDANCE IS 130 OHMS (EXCLUDING BARRIER).
  3. INTRINSICALLY SAFE WIRING AND INSTALLATION PRACTICES MUST BE FOLLOWED.
  4. INTRINSICALLY SAFE BARRIERS ARE NOT COMPATIBLE WITH "GROUND-FAULT" MONITORED POWER SUPPLIES.
  5. INTRINSICALLY SAFE BARRIER MAY BE FIELD INSTALLED WITHIN AN APPROVED JUNCTION BOX.

A2311

Figure 19—Sensor Separation with Chlorine Gas Sensor, Intrinsic Safe Barrier and Infiniti Transmitter

## DISPLAY AND CONTROLS, OPTIONS, DEFAULTS

### DISPLAY AND CONTROLS

The Infiniti display contains an eight character display for identifying system status conditions and sensor input, a magnetic reed switch for resetting the unit and entering different operating modes, and pushbuttons for programming and calibrating the system. See Figure 20 for the location of indicators and pushbuttons and Tables 3 and 4 for descriptions.

#### External Reset

The external reset input terminal, when grounded momentarily, normally initiates a relay/display reset only. See Figure 9. However, if the "EXT" "CAL" option is programmed "YES" during the Infiniti setup procedure, the external reset duplicates the magnetic reed switch (Cal Magnet) and can be used to perform calibration.

### PROGRAMMING OPTIONS

#### Operating Range

The available operating range settings and the corresponding default setpoints and calibration gases are shown in Table 5. Note that not all U9500s support selectable operating range.

#### **IMPORTANT**

*The range setting of the transmitter must match the output range of the sensor being used or the system will fail to operate correctly. For example, if a carbon monoxide (CO) sensor with a range of 0 to 500 ppm is being used, the range setting for the transmitter must be 0 to 500 ppm. Refer to the "Specifications" section for a listing of available sensors and ranges.*

Table 3—Display And Controls

Display/Indicator	Description
Ex %LFL / ppm	<p>This display is always on and functions as a power indicator. The display provides a continuous reading of the sensor input in both the Normal and Calibrate modes.</p> <p>In the event of a fault, it identifies the nature of the fault with a fault message.</p> <p>In other operating modes it shows the alarm setpoints and programmed calibration gas concentration.</p> <p>A negative zero drift condition is indicated by a minus (–) sign in the left hand digit.</p> <p>In the event of an over-range condition, the display will continue to track the sensor output as long as the over-range condition exists. Combustible gas transmitters will latch the display at the highest detected gas concentration.</p>
*	<p>Asterisk indicates an alarm (any one) has activated since last reset.</p> <p>Blank indicates no alarm has energized since last reset.</p>
■	<p>Solid black square indicates that the high alarm threshold has been exceeded. For relay models, this means that the relay output has activated.</p> <p>Blank indicates no alarm.</p>
■	<p>Solid black square indicates that the auxiliary alarm threshold has been exceeded. For relay models, this means that the relay output has activated.</p> <p>Blank indicates no alarm.</p>
■	<p>Solid black square indicates that the low alarm threshold has been exceeded. For relay models, this means that the relay output has activated.</p> <p>Blank indicates no alarm.</p>
	<p>INCREASE ○▲</p> <p>Used to move to next higher setting during system programming.</p>
	<p>SETUP ○ ACCEPT</p> <p>Used to initiate Setup routine, to accept reading displayed, and cycle to the next programming step during Setup (system programming).</p>
	<p>DECREASE ▼○</p> <p>Used to move to next lower setting during system programming.</p>
	<p>CAL/RESET</p> <p>Used for non-intrusive calibration and transmitter reset.</p> <p>Activated by Cal Magnet from outside the Infiniti enclosure.</p>

Table 4—CAL/RESET Switch and Calibration Magnet Function

Duration of CAL/RESET Switch Activation	Function
1 Second	Resets the Infiniti transmitter
2 - 3 Seconds	Enters the Setpoint Display Mode
7 Seconds	Enters the Calibration Mode

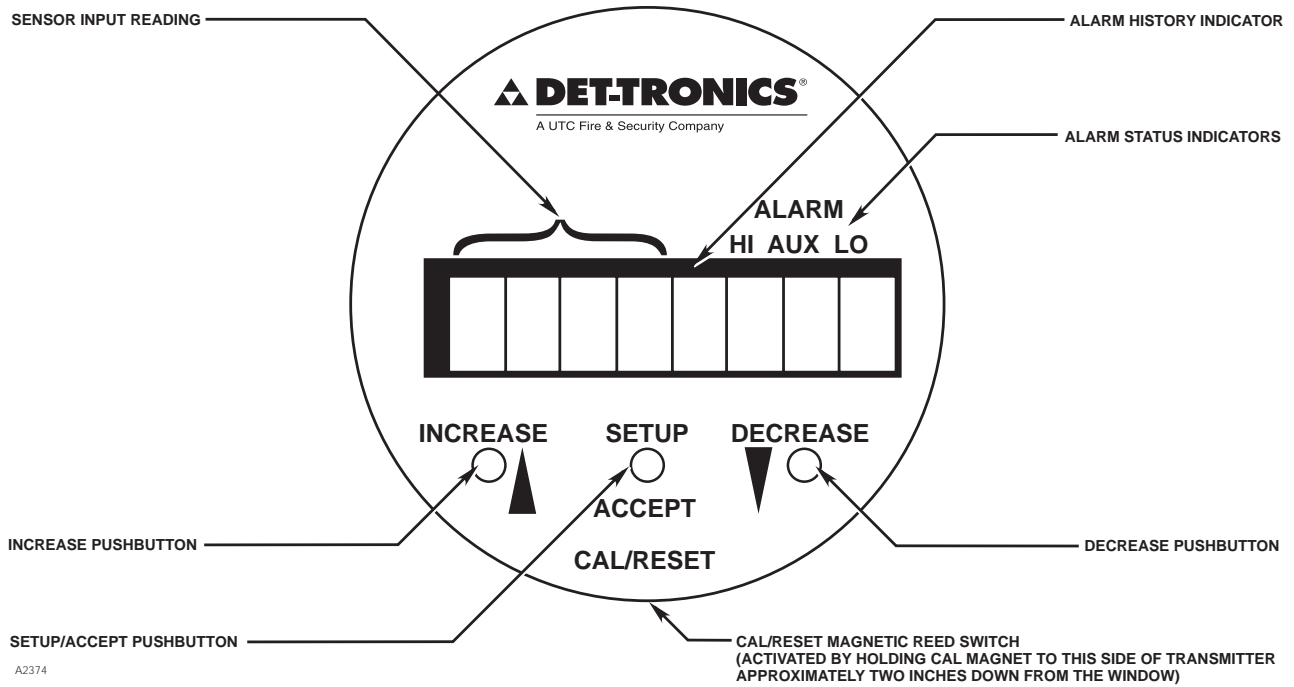


Figure 20—Infiniti Transmitter Controls and Indicators

Table 5—Range Select Settings And Corresponding Default Settings

Sensor Type	Measurement Range	Default Settings ***				Range Limits			
		High	Low	Aux	Cal Gas	High	Low	Aux	Cal Gas
Electrochemical Toxic *	0-10 ppm	2	1	2	5	1-9	0.5-5	0.5-9	3-9
	0-20 ppm	4	2	4	10	1-18	0.5-10	0.5-18	6-18
	0-50 ppm	10	5	10	25	2-45	1-25	1-45	15-45
	0-100 ppm	20	10	20	50	10-90	5-50	5-90	30-90
	0-200 ppm	40	20	40	100	20-190	5-100	5-190	60-180
	0-500 ppm	100	50	100	250	50-450	25-250	25-450	150-450
	0-1000 ppm	200	100	200	500	100-900	50-500	50-900	300-900
Catalytic Combustible	0-100 % LFL (Fixed)	50	20	50	50	10-60	5-50	5-90	30-99
PointWatch (HC)	0-100 % LFL (Fixed)	50	20	50	50	10-60	5-50	5-90	50
Oxygen **	0-25% (Fixed)	23	18	18	20.9	22-25	16-20.5	5-25	8-23.5

\* Changing the Toxic Measurement Range will reset all alarms and the Cal Gas to the default setting for the selected range.

\*\* For oxygen deficient applications, use the LOW and/or AUX alarms.  
For oxygen enrichment applications, use the HIGH and/or AUX alarms

\*\*\* Default settings for all Infiniti relay operation is normally de-energized with non-latching contacts (except fault alarm, which is normally energized with no faults). Default settings for optional External Reset Pushbutton is "No External Cal" enabled. Default settings for calibration mode (automatic or manual) is automatic mode. Manual calibration mode is recommended when using the U9500D chlorine or U9500F Sulfur Dioxide Transmitters.

## Setpoints

The Infiniti Transmitter has three independent alarm outputs (low, high and auxiliary), with field selectable setpoints. For both relay and non-relay models, these setpoints correspond to the HI, AUX, and LO ALARM indicators on the display.

## Calibration Gas Concentration

The programmed calibration gas concentration is also displayed and adjustable. This known concentration (typically one half of the instrument's full scale detection range) of the actual gas or vapor that is expected to be detected should be used to calibrate the system. Det-Tronics calibration gas should be used to ensure proper system calibration performance and accuracy.

### **IMPORTANT**

*The calibration gas concentration setting typically matches the concentration of the gas used to perform the calibration (printed on label of calibration gas cylinder). Refer to the "Calibration" section of this manual for details.*

## Latching or Non-latching Relays

The Low, Auxiliary and High alarm relays are programmable as a group for either latching or non-latching operation. "LATCH" indicates that they will latch upon alarm and the unit must be reset to clear. "nonLATCH" indicates that they will automatically clear when the alarm clears.

## Alarm Relays Normally Energized or Normally De-Energized

The three alarm relays (High, Low and Auxiliary) are programmed as a group. "DE-ENERG" indicates that the three alarm relays will be normally de-energized and will energize upon alarm. "ENERG" indicates that the three alarm relays will be normally energized and will de-energize upon alarm.

## Automatic or Manual Calibration

Manual calibration requires that the operator use the Cal magnet to activate the CAL/RESET switch, signaling an acceptance of the present calibration reading. Auto Cal is described in the "Calibration" section of this manual.

## External Calibration

Calibration procedures are normally initiated and executed using the Cal Magnet to activate the CAL/RESET switch. Choose "YES EXT CAL" during the setup procedure to allow the additional use of the external reset input terminal for initiating and executing a calibration procedure. See Figure 9 for switch wiring.

## 4-20 Milliampere Calibration

The 4 to 20 mA current loop is factory calibrated. Perform the "YES 4-20 CAL" function in the Setup procedure if a recalibration is required. A current meter must be placed in the loop to perform this function.

## Calibration Current

The current output during Calibration and while in the Setup mode is factory set for 2 mA. Perform the "SET CAL CURRENT" function in the Setup procedure if an output current other than 2 mA is required.

Refer to the "Setup Procedure" section for complete instructions.

## INFINITI SENSOR COMPATIBILITY

Refer to Table 6 for a list of acceptable sensor inputs to the Infiniti by model.

## INFINITI OUTPUTS

Refer to Table 7 for a description of Infiniti standard 4 to 20 mA outputs and relay output programming options.

## MODES OF OPERATION

Refer to Table 8 for a description of Infiniti modes of operation.

<b>Infiniti Model</b>	<b>Accepts</b>
Combustible • U9500A	Accepts inputs from Det-Tronics Catalytic Combustible gas sensor only.
Toxic and Oxygen Models • U9500B Hydrogen Sulfide • U9500C Oxygen • U9500D Chlorine • U9500E Carbon Monoxide • U9500F Sulfur Dioxide • U9500G Nitrogen Dioxide	Accepts 4 to 20 mA inputs only. • C7064E Hydrogen Sulfide Sensor • C7065E Oxygen Sensor • C7067E Chlorine Sensor * • C7066E Carbon Monoxide Sensor • C7068E Sulfur Dioxide Sensor • C7069E Nitrogen Dioxide Sensor
Hydrocarbon (HC) • U9500H	Accepts inputs from the Det-Tronics PointWatch infrared hydrocarbon gas detector only.
* External intrinsically-safe barrier required for hazardous area approval (I.S. barrier not available from Det-Tronics).	

Table 7—Infiniti Outputs

<b>Output</b>	<b>Description</b>
4 to 20 Milliampere (Standard)	<ul style="list-style-type: none"> <li>The linear 4 to 20 mA output: <ul style="list-style-type: none"> <li>– corresponds to the field-programmed gas range.</li> <li>– can be calibrated in the field for maximum accuracy.</li> <li>– is user selectable for isolated or non-isolated use.</li> </ul> </li> </ul> <p>Refer to the “Setup ” section for programming information.</p>
4 to 20 mA with Relays (Optional) • Option includes a set of four relays: – High Alarm – Low Alarm – Auxiliary Alarm – Fault	<ul style="list-style-type: none"> <li>The High, Low and Auxiliary Alarm relays are programmable as a group for either normally energized or normally de-energized operation.</li> <li>Low Alarm, Auxiliary Alarm, and High Alarm relays are programmable as a group for either latching or non-latching operation.</li> <li>Fault relay is normally energized with no faults. Faults are generally non-latching, but faults that occur during calibration and warmup must be reset.</li> <li>Latching relays are reset using either the Cal magnet or an external reset switch (field installed, user supplied).</li> </ul>

Table 8—Infiniti Modes of Operation

Operating Mode	Description
Warmup	<ul style="list-style-type: none"> <li>• When power is applied to the transmitter, it enters a Warmup mode to allow the sensor output to stabilize before beginning normal operation. During this time the:               <ul style="list-style-type: none"> <li>– Fault relay is de-energized.</li> <li>– Alarm relays go to non-alarm state (either energized or non-energized, as programmed)</li> <li>– Display alternates between “WARM-UP” and “Ex” or “Toxic” or “PTIR” or “Oxygen” depending on specific model.</li> <li>– Current output indicates a fault condition (less than 1.0 mA).</li> </ul> </li> <li>• The transmitter will stay in the Warmup mode for at least six seconds.               <ul style="list-style-type: none"> <li>– If the detected gas at the end of the six second warmup period is higher than the lowest alarm setting or if faults are present, the transmitter will remain in the Warmup mode until the detected gas falls below the lowest alarm setting and no faults are present, or five minutes, whichever is shortest.</li> <li>– If an alarm condition exists at the end of the five minute warmup, the transmitter will enter the Normal operating mode and the alarm(s) will be annunciated.</li> <li>– If a fault is present after the five minute warmup, the transmitter will indicate the fault, the fault relay will remain de-energized, and the current output will be less than 1.0 mA.</li> </ul> </li> <li>• At the end of the warmup period with no faults or alarms present, the transmitter automatically enters the Normal operating mode (fault relay energizes, alarm relays remain in non-alarm state), and the current output will rise to 4.0 mA.</li> </ul>
Normal	<ul style="list-style-type: none"> <li>• <b>In Normal operating mode with no alarm condition:</b> <ul style="list-style-type: none"> <li>– Display is on and indicates the detected gas concentration.</li> <li>– Alarm relays (on relay models) are in their normal state (energized or de-energized as programmed).</li> <li>– 4 to 20 mA output signal level corresponds to the detected gas concentration.</li> <li>– Fault relay (on relay models) is energized.</li> </ul> </li> <li>• <b>In the Normal operating mode with an alarm condition occurring:</b> <ul style="list-style-type: none"> <li>– Display indicates the detected gas concentration.</li> <li>– Low, Auxiliary or High display shows a black square, indicating alarm condition.</li> <li>– Affected relay changes state (on relay models).</li> <li>– 4 to 20 mA output signal level corresponds to the detected gas concentration.</li> <li>– Fault relay output energized (on relay models).</li> <li>– Relay History Indicator display shows an asterisk to indicate an alarm was activated.</li> </ul> </li> <li>• <b>When the signal decreases below setpoint:</b> <ul style="list-style-type: none"> <li>– Display and 4 to 20 mA output continues to track the detected gas concentration.</li> <li>– With latching operation programmed, no change to display indication or to alarm relay outputs.</li> <li>– With non-latching operation programmed, low, auxiliary and/or high display goes blank and Alarm relay outputs return to their normal state.</li> <li>– Asterisk in Alarm History Indicator display stays on to indicate an alarm since last reset.</li> </ul> </li> <li>• <b>In the event of a system fault:</b> <ul style="list-style-type: none"> <li>– The normally energized Fault output is de-energized and the corresponding fault message is displayed.</li> <li>– 4 to 20 mA output drops to less than 1.0 mA.</li> </ul> </li> <li>• <b>In the event of an alarm condition and a system fault both occurring:</b> <ul style="list-style-type: none"> <li>– In most cases, the first condition that occurs will be indicated by the current and relay outputs and on the display.</li> <li>– The exceptions are “CAL ABORTED” and “SENSOR E.O.L.” faults which both may occur during the calibration procedure. If an alarm occurs with these faults, the alarm will over-ride the fault and will be indicated.</li> </ul> </li> </ul>

Table 8—Infiniti Modes of Operation (Continued)

Operating Mode	Description
Reset	<p>The Reset mode is entered by holding the Cal magnet to the side of the transmitter enclosure next to CAL/RESET on the display face of the unit.</p> <ul style="list-style-type: none"> <li>• Standard – When the Cal magnet is held there for <b>less than one second</b>, the alarm indicators turn off and all relay outputs return to their normal condition if no alarms or faults are occurring.</li> <li>• Forced – When the Cal magnet is held there for <b>1 to 2 seconds</b>, the alarm indicators turn off and the relay outputs return to their normal condition even if an alarm or fault condition still exists.</li> <li>• Remote – Activating the remote reset switch for less than 2 seconds initiates a forced reset. If “YES EXT CAL” was selected during the setup procedure, the external reset input initiates the setpoint display cycle when activated for over two seconds.</li> </ul>
Setpoint Display	<p>When the Cal magnet is held to the side of the transmitter enclosure next to CAL/RESET for more than two seconds, the transmitter enters the Setpoint Display mode. Once in this mode, the Cal magnet can be removed. The Setpoint Display sequence will complete automatically. (The external reset input terminal can also be used to initiate the setpoint display and calibration mode if “YES EXT CAL” was selected during the setup procedure.) In this mode:</p> <ul style="list-style-type: none"> <li>• The display sequentially shows the programmed alarm setpoints and calibration gas concentration.</li> <li>• Each value is displayed for approximately 1.5 seconds.</li> <li>• After completing the sequence, the transmitter automatically returns to the Normal operating mode if the Cal magnet is no longer being held to the unit (or the external reset input is not activated).</li> </ul> <p style="text-align: center;"><i>NOTE</i></p> <p><i>If the CAL/RESET switch (or external reset input) is still activated at the end of this cycle, the transmitter automatically enters the Calibrate mode. If a calibration is not performed, a CAL ABORTED fault will occur. To exit the Calibrate mode without performing the calibration, cycle power or wait for the calibration fault message, then reset the unit.</i></p> <p>The Setpoint Display mode is used only for displaying the setpoints. Use the “Setup” mode for changing setpoint and calibration gas values.</p>
Auto Calibration	<p>Auto calibration is the default setting and the recommended calibration method for all sensors except for Chlorine (Cl<sub>2</sub>) and Sulfur Dioxide (SO<sub>2</sub>). Auto calibration is required for use with PointWatch.</p> <ul style="list-style-type: none"> <li>• Auto Cal is an automatic calibration procedure that requires no adjustments by the operator. The Calibrate mode is entered by holding the Cal magnet to the CAL/RESET magnetic switch until completion of the “Setpoint Display” sequence described above (approximately 7 seconds). (The external reset input terminal can also be used to enter the calibrate mode if “YES EXT CAL” was selected during the Setup procedure. Activate the input until completion of the “Setpoint Display” sequence.)</li> <li>• For calibration of the Infiniti with the C7065E O<sub>2</sub> sensor, there are two modes of Auto Calibration available: <ol style="list-style-type: none"> <li>1. Initial / Sensor Replacement Calibration</li> <li>2. Routine Calibration</li> </ol> <p>Use Option #1 for new sensor start-up or after replacing a sensor. Use Option #2 for all subsequent calibrations after Option #1 has been completed.</p> </li> <li>• The transmitter 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 transmitter automatically returns to the Normal operating mode.</li> <li>• If the operator fails to complete the calibration procedure, if an error in calibrating occurs, or if a successful calibration cannot be completed, the transmitter will automatically return to the Normal mode and continue to use the previous calibration data (after 10 minutes or when the gas level drops below the lowest alarm setpoint). A fault indication will be displayed until a reset occurs.</li> <li>• If the microprocessor determines that the sensor cell is approaching the end of its useful life, the message “SEN AT EOL” will be indicated on the display. A fault indication will be displayed until a reset occurs.</li> <li>• While in the Calibrate mode, all transmitter outputs are inhibited and the dc current output goes to a preset level (adjustable from 0 to 20 mA, with a default value of 2.0 mA). See “Setup” section for complete calibration procedure.</li> </ul>

Table 8—Infiniti Modes of Operation (Continued)

Operating Mode	Description
Manual Calibration	<p>Use the manual calibration mode when calibrating the Chlorine (Cl<sub>2</sub>) and Sulfur Dioxide (SO<sub>2</sub>) sensors.</p> <ul style="list-style-type: none"> <li>• Manual Calibration must be selected during the initial set up of Infiniti.</li> <li>• Manual calibration is similar to Auto Calibration, except that when the Zero and Span (calibration gas concentration) readings are displayed and judged stable by the operator, they must be manually accepted as calibration points by holding the Cal magnet to the CAL/RESET magnetic switch (or activate the external reset input if “YES EXT CAL” was selected during the Setup procedure.)</li> </ul>
Setup	<p>In the setup mode, the range (for some gases), alarm setpoints, calibration gas level, current loop levels, relay operation (latching/non-latching, energized/de-energized), and calibration mode (auto/manual) are programmed into the transmitter.</p> <p style="text-align: center;"><i>NOTE</i></p> <p><i>When used with PointWatch only 50% LFL gas may be used for span concentration. PointWatch will not read accurately if other concentrations are used.</i></p>

## INSTALLATION CHECKLIST

The following checklist is provided as a means of 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. (Some PointWatch models must be mounted horizontally. Refer to the PointWatch manual for details.)
2. Ensure that local wiring and installation codes are met.
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 termination box is used, shielded interconnecting wiring is correctly installed.
6. All cable shields are properly connected.
7. Optional sensor accessories (dust/splash guards, sample draw devices, etc.) are installed, clean, and in good condition.
8. O-ring is in good condition and the junction box cover is tightly installed.
9. Monitoring devices and/or response equipment is operational.

## STARTUP PROCEDURE

1. Remove power from all output devices to prevent actuation.
2. Apply power to the system. If the proper “type of sensor” indication does not appear in the display during warmup, consult the factory.
3. When the Warmup period is completed, perform the Setup procedure.
4. Perform the Calibration procedure.
5. Restore power to the output devices.

## SETPOINT DISPLAY MODE

In this mode, the display sequentially shows the programmed alarm setpoints and calibration gas concentration, then returns to the Normal operating mode (see Table 9). Remove power from all output devices to prevent actuation.

Table 9—Setpoint Display Cycle

Display Indicates	Duration and Description
Normal Mode	To enter the Setpoint Display mode, activate the CAL/RESET magnetic switch for 2 to 3 seconds (hold the Cal magnet to the side of the transmitter enclosure next to CAL/RESET). If "YES EXT CAL" was selected during the "Setup Procedure," the external reset input can also be used to initiate the Setpoint Display Cycle when activated for 2 to 3 seconds.
Low Alarm Setpoint	1.5 seconds
High Alarm Setpoint	1.5 seconds
Auxiliary Alarm Setpoint	1.5 seconds
Calibration Gas Concentration	1.5 seconds  <b>IMPORTANT</b> <i>For catalytic sensors only, whenever the type of calibration gas that is used differs from the gases to be detected, a Conversion K - Factor must be applied to ensure proper operation. Refer to "Catalytic Sensor Calibration" section in this manual for details.</i>
Normal Mode	Remains in Normal mode until another mode is activated.

## SETUP PROCEDURE

1. Determine the required alarm setpoint levels, calibration gas concentration, and other settings such as range (Table 5), auto/man calibration, normally energized/de-energized relays, latching/non-latching relays.

### CAUTION

*Changing the range selection will cause the alarm setpoints and the calibration gas settings to default to the setting shown in Table 5. Catalytic combustible, PointWatch infrared, and oxygen sensors have preset ranges that are automatically selected by the Ininiti and cannot be changed.*

2. Remove the enclosure cover to access the transmitter display and controls.

### CAUTION

*While in the Setup Mode, the current loop output will drop to less than 1 mA. For models without relays, this is the only remote indication that the unit is not in the Normal operating mode. For models with relays, the fault relay indicates a fault. In either case, the transmitter will remain in the Setup mode until Setup is complete. The transmitter must be manually stepped through the sequence below in order to return to the Normal operating mode.*

3. Press and hold the SETUP/ACCEPT button for 1 second using a small screwdriver, then release. This initiates the Ininiti Setup Mode. Refer to Table 10 to perform setup. Once a programming option has been accepted, the transmitter will automatically cycle to the next option.

## CALIBRATION

### CALIBRATION RECOMMENDATIONS

The Ininiti can accommodate automatic or manual calibration and for many sensors either of these methods are effective. Certain sensors, however, require either automatic or manual calibration only. The sensors and method of calibration required and/or recommended are listed in Table 11. Refer to this table before proceeding with calibration.

### Perform Calibration

- When a new system is initially put into service.
- When the sensor is replaced.
- Periodically to verify proper performance for combustible, toxic and oxygen detectors - typically at 90 day intervals, however, this frequency is dependent upon the requirements of each application. Refer to the PointWatch manual for calibration recommendations specific to that device. Refer to Table 12 for the recommended calibration frequency for DEC sensors.

Table 10—Infiniti Setup

Display	Function	Description/Action
<p>Left portion displays the present range setting. Right portion displays alternating: "RNG" "SET"</p> <p>Note: Not present for PointWatch.</p>	<p>Select the Range (see Table 5).</p> <p>Note: Not all U9500 models support selectable full scale range.</p>	<ul style="list-style-type: none"> <li>• Range must match that of the sensor being used</li> <li>• Press the INCREASE button to increase the range setting or the DECREASE button to decrease the setting (see Table 4 for available ranges).</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>
<p>Left portion displays the low alarm setpoint. Right portion displays alternating: "LO" "SET"</p>	<p>Select the Low Alarm Setpoint</p>	<ul style="list-style-type: none"> <li>• Press the INCREASE button to increase the setpoint or the DECREASE button to decrease the setpoint.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setpoint into the transmitter.</li> </ul>
<p>Left portion displays the high alarm setpoint. Right portion displays alternating: "HI" "SET"</p>	<p>Select the High Alarm Setpoint</p>	<ul style="list-style-type: none"> <li>• Press the INCREASE button to increase the setpoint or the DECREASE button to decrease the setpoint.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setpoint into the transmitter.</li> </ul>
<p>Left portion displays the auxiliary alarm setpoint. Right portion displays alternating: "AX" "SET"</p>	<p>Select the Auxiliary Alarm Setpoint</p>	<ul style="list-style-type: none"> <li>• Press the INCREASE button to increase the setpoint or the DECREASE button to decrease the setpoint.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setpoint into the transmitter.</li> </ul>
<p>Left portion displays the calibration gas concentration setting . Right portion displays alternating: "CAL" "SET"</p>	<p>Select the Calibration Gas Concentration</p>	<ul style="list-style-type: none"> <li>• The calibration gas concentration must match that of the gas being used to calibrate (unless K factors for combustible sensors are being applied - refer to "Catalytic Sensor Calibration" section).</li> <li>• Press the INCREASE button to increase the setting or the DECREASE button to decrease the setting.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>
<p>"LATCH" or "NonLATCH"</p>	<p>Select Non-Latching or Latching Relays</p>	<ul style="list-style-type: none"> <li>• Press INCREASE or DECREASE to change the setting.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>
<p>"DE-ENERG" or "ENERG"</p>	<p>Select De-Energized or Energized relays.</p>	<ul style="list-style-type: none"> <li>• Press INCREASE or DECREASE to change the setting.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter. Factory default setting is for de-energized operation.</li> </ul>

Table 10—Infiniti Setup (Continued)

Display	Function	Description/Action
"YES AUTO" "YES CAL" or "NO AUTO" "NO CAL"	Select Automatic or Manual Calibration	<ul style="list-style-type: none"> <li>• Press INCREASE or DECREASE to change the setting.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter. Factory default setting is for auto calibration.</li> </ul>
"YES EXT" "YES CAL" or "NO EXT" "NO CAL"	Option to allow external reset button to be used for calibration in addition to or instead of Cal Magnet. When "Yes" is selected, the external reset input functions exactly like the Cal Magnet.	<ul style="list-style-type: none"> <li>• Press INCREASE or DECREASE to change the setting.</li> <li>• When the desired setting is displayed, press the SETUP/ACCEPT button to program the setting into the transmitter. Factory default setting is for no - external reset button is not used for calibration.</li> </ul>
"NO 4-20" "NO CAL"	Option to select a Current Loop Output other than factory calibrated 4 to 20 mA.	<ul style="list-style-type: none"> <li>• Press the SETUP/ ACCEPT button to bypass the 4 to 20 mA calibration procedure and exit the SETUP mode.</li> <li>• Press DECREASE or INCREASE to change the display to read "YES 4-20 CAL."</li> <li>• Press the SETUP/ACCEPT button to program the current loop.</li> </ul>
<p><b>IMPORTANT</b></p> <p><i>A dc current meter capable of measuring 4 to 20 mA must be connected to the current loop output for the following three current loop adjustments. 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: <math>current (I) = voltage/load\ resistance</math>.</i></p> <p><i>Do not press INCREASE or DECREASE pushbuttons during Current Loop Cal without a current meter or voltmeter connected to the current loop output as described above. Doing so will result in an uncalibrated current loop.</i></p>		
"SET 4mA" "CURRENT"	Set the current output zero level.	<ul style="list-style-type: none"> <li>• Press the INCREASE or DECREASE button to change the zero level current output (indicated on the dc current meter).</li> <li>• When the desired output is indicated, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>
"SET 20mA" "CURRENT"	Set the current output full scale level.	<ul style="list-style-type: none"> <li>• Press the INCREASE or DECREASE button to change the full scale current level output (indicated on the dc current meter).</li> <li>• When the desired output is indicated, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>
"SET CAL" "CURRENT"	Set the current output during calibration and setup modes.	<ul style="list-style-type: none"> <li>• Press the INCREASE or DECREASE button to change the calibration current level output (indicated on the dc current meter).</li> <li>• When the desired output is indicated, press the SETUP/ACCEPT button to program the setting into the transmitter.</li> </ul>

Table 11—Recommended Sensor Calibration Methods

Sensor	Calibration Method	
	Auto	Manual
Combustible Catalytic (Ex)	X	
H <sub>2</sub> S	X	
CO	X	
PointWatch (HC)	X only	
NO <sub>2</sub>	X	
O <sub>2</sub>	X only	
Cl <sub>2</sub>		X only
SO <sub>2</sub>		X only

### Calibration Gas Sources

For optimum performance, only use Det-Tronics calibration gases.

#### **IMPORTANT**

*The calibration gas concentration setting must match the concentration of the gas used to perform the calibration (printed on label of calibration gas cylinder).*

**For PointWatch calibration,** use only 50% LFL concentration calibration gas of the same type as selected by the PointWatch gas selection switch. Refer to the PointWatch instruction manual for details.

**For catalytic sensor calibration,** most applications require the use of 50% LFL calibration gas matching the type of gas to be detected. If a matching calibration

gas type is not available, a conversion K-factor must be used. Refer to the “Catalytic Sensor Calibration” section in this manual for details.

**For toxic gas sensor calibration,** the calibration gas type must match the sensor cell type. The calibration gas concentration should be one half of the full scale measurement range of the sensor in use.

**For oxygen sensor calibration,** normal ambient air may be used for span calibration if it is known to be clean and not depleted of O<sub>2</sub> (21% vol.). Compressed clean air is available from Det-Tronics if required. It is not necessary to utilize an O<sub>2</sub> free gas such as compressed nitrogen to calibrate the O<sub>2</sub> sensor zero level. An electronic zero switch is provided within the C7065E sensor housing for this function. Refer to the O<sub>2</sub> sensor instruction manual for details.

### Important Calibration Notes

- Ensure that the transmitter is properly programmed for the gas concentration being used for calibration. (See the “Setup” section.)
- Ensure that only clean air is present at the sensor prior to entering the calibration mode. If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.

Table 12—Recommended Frequency of Calibration for DEC Sensors

Sensor Type	After 1 Hour Warm-up	After 24 Hours	After 1 Week	Every 90 Days
PointWatch	*	Opt	Opt	Opt
Catalytic	Req	Req	Req	Opt
H <sub>2</sub> S Electrochemical	Req	Opt	Opt	Opt
Chlorine	Req	Req	NR	Req
Oxygen	Req	Opt	Opt	Opt
Carbon Monoxide	Req	Opt	Opt	Opt
Nitrogen Dioxide	Req	Opt	Opt	Opt
Sulfur Dioxide	Req	Opt	Opt	Opt

Req = Required

Opt = Optional

NR = Not Recommended

\* = Optional for methane only. **Must** be calibrated if gas selection setting other than methane is used.

- Ensure that the concentration of the calibration gas matches the calibration gas setting. Typically, calibration gas concentration equal to 50% full scale is used.
- If the calibration procedure is not completed or if the sensitivity of the sensor has deteriorated to the extent that calibration cannot be successfully completed, a fault will be generated and the system will automatically revert back to the former calibration settings (after 10 minutes or when the gas level drops below the lowest setpoint). If a successful calibration cannot be accomplished, replace the sensor and the hydrophobic filter (if used) and recalibrate.
- Inspect the sensor. Loss of sensitivity can be caused by various factors. One common cause is by clogging of the hydrophobic or sintered filters by dirt, oil, paint, etc. Problems of this nature will not be detected by the transmitter's diagnostic circuitry when used with catalytic or electrochemical sensors. If the filter or the sensor are dirty or plugged, they should be replaced. When the transmitter is used with the PointWatch Infrared detector, contamination of its optical surfaces will be annunciated.
- When calibrating a C7065E O<sub>2</sub> Sensor, the initial "zero" calibration requires activation of a switch located inside the sensor housing. Subsequent calibrations of the sensor do not require switch activation. Always calibrate the sensor using 20.9% O<sub>2</sub> if ambient air is less than 20.9% O<sub>2</sub>.

## AUTO CALIBRATION PROCEDURE

In the Auto Cal mode, all adjustments are made automatically by the transmitter once calibration has been initiated. Auto Cal mode is recommended for all sensors except Cl<sub>2</sub> and SO<sub>2</sub>. Refer to Table 13 for the Automatic Calibration Procedure.

### O<sub>2</sub> Sensor Calibration

Initial calibration of the U9500C/C7065E O<sub>2</sub> detector requires removal of the C7065E sensor housing for access to the zero selection switch. Subsequent calibrations of the sensor will not require removal of the sensor housing, nor nitrogen purging. The U9500C will automatically set the zero cal level even with normal levels of O<sub>2</sub> displayed during the zero calibration process. Refer to "Calibration Procedure for Infiniti with C7065E Oxygen Sensor" for details.

## Catalytic Sensor Calibration

Catalytic sensors respond to many combustible gases. While it is highly recommended that a sensor be calibrated to detect a single gas, the fact remains that only a few calibration gas types are available. In addition, multiple gas hazards may exist.

A known concentration (typically one half of the full scale detection range of the instrument) of the actual gas or vapor type that is expected to be detected should be used to calibrate the system. Det-Tronics calibration gas should always be used to ensure proper system calibration performance and accuracy. Calibration gas should not be used if the Oxygen concentration within the gas is listed at less than 20% by volume.

A conversion K-factor must be used in the calibration of the system whenever detection of gases/vapors other than the gas used in the actual calibration process will occur. Refer to the "Det-Tronics K-factor Tech Note" for the current list of Det-Tronics K-factors. The K-factor represents the relative sensor response ratio of the calibration gas to the detected gas. The K-factor is used within the "K-factor equation" to determine the proper transmitter output level (span setpoint) when the sensor is exposed to the calibration gas. The K-factor equation is as follows:

$$C \times K = S$$

- C = Concentration of the calibration gas in % LFL
- K = Conversion K-factor for the gas to be monitored with the given calibration gas
- S = Corrected combustible gas transmitter calibration span output level (span setpoint)

Example: Gas to be detected: Gasoline vapors  
 Calibration gas: 50% LFL Propane in air  
 K-factor: 1.04

$$\begin{aligned} \text{Equation:} \quad & C \times K = S \\ & 50 \times 1.04 = \mathbf{52} \end{aligned}$$

For proper system sensitivity to gasoline vapors, the Infiniti transmitter calibration gas concentration setpoint should be adjusted to read 52% LFL. When the sensor is calibrated with 50% LFL propane in air calibration gas mixture, the sensor will provide an accurate measurement of gasoline vapors.

Table 13—Automatic Calibration Procedure

Description	Display	Operator Action
Normal operation/no gas present	Indicates the detected gas concentration	<ul style="list-style-type: none"> <li>If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.</li> </ul>
Initiate calibration – Catalytic, PIR9400 & all toxic sensors	Sequences through the Setup settings  Enters the Calibration mode - Display shows detected gas concentration and alternating message:	<ul style="list-style-type: none"> <li>Hold the Cal magnet to the CAL/RESET magnetic switch for 7 seconds. See Figure 16 for CAL/RESET switch location. (The external reset input can also be used to enter the calibration mode if “YES EXT CAL” was selected during Setup procedure).</li> </ul>
New sensor cal – O <sub>2</sub>	“ZERO” “CAL”	New O <sub>2</sub> sensor cal – First remove C7065E cover and select “Zero”.
Existing sensor cal – O <sub>2</sub>		No zero gas action necessary.
Zero calibration complete	Display shows detected gas concentration and alternating message:  “APLY” “GAS”	<ul style="list-style-type: none"> <li>Apply the calibration gas to the sensor by placing the calibration cup over the sensor (or installing the direct inject fitting and hose on the PointWatch detector) and opening the valve on the calibration gas cylinder.</li> </ul>
New sensor cal – O <sub>2</sub>		Select switch to “ON”. Replace C7065E cover.
Span calibration	Display shows rising gas concentration and alternating message:  “GAS” “ON”	<ul style="list-style-type: none"> <li>None.</li> </ul>
Span calibration complete	Display shows decreasing gas concentration when gas is removed and alternating message:  “CAL” “OK” then “RMV” “GAS”  then, if the calibration is successful: “XXXX SPAN”	<ul style="list-style-type: none"> <li>Remove the calibration gas. When the gas level falls below the lowest alarm setpoint, and if no faults are present, the transmitter automatically exits the Calibrate mode.</li> <li>A sensitivity reading that can be used to track sensor life (except PointWatch) is displayed for seven seconds with the “SPAN” reading and prior to the transmitter returning to normal operation. Any reading over 100 indicates that the sensor is good.</li> <li>At the successful completion of the calibration, all outputs and indicators return to normal operation.</li> <li>If faults are present, the unit will exit after the remainder of 10 minutes.</li> </ul>
Calibration fault indication	Display shows alternating messages indicating the fault, then  “RMV” “GAS”	<ul style="list-style-type: none"> <li>If a fault occurs, remove the gas and correct the fault. After the fault has been cleared, begin calibration again. See Table 15 - Fault Messages, Explanations and Corrective Action.</li> </ul>

If more than one calibration gas type and K-factor is listed for a gas that will be detected, generally the best calibration gas to use is that which provides a K-factor closest to the value of 1.0 (one). Note that the presence of Methane gas as a potential detectable gas is an exception. Always use Methane calibration gas if Methane is expected to be present within the protected area.

If a specific gas/vapor and K-factor is not listed within the "Det-Tronics K-factor Tech Note", a K-factor can be determined by Det-Tronics Sensor Engineering department. Contact the factory for details.

## MANUAL CALIBRATION PROCEDURE

In the Manual Cal mode, the CAL/RESET switch must be activated using the Cal magnet to accept a reading as a calibration point. (The external reset input can also be used to accept a reading if "YES EXT CAL" was selected during the Setup procedure.)

The Ininiti must be programmed for manual calibration prior to initiating the manual calibration procedure (refer to the Setup section). Refer to Table 14 for the Manual Calibration Procedure.

### IMPORTANT

*The Manual Calibration Procedure must be used for chlorine (Cl<sub>2</sub>) and sulfur dioxide (SO<sub>2</sub>) sensors. Use the Auto Calibration Procedure for all other sensors.*

## CALIBRATION PROCEDURE FOR ININITI WITH C7065E OXYGEN SENSOR

There are two calibration procedures for the U9500/C7065E:

1. **Initial/Replacement Sensor Calibration.** This procedure should be used on new product initial calibration, or any time an existing sensor has been replaced with a new or different sensor. This procedure requires removal of the sensor housing. Live DC circuits will be exposed to the surrounding environment during this procedure.
2. **Routine Calibration.** This procedure should be used for subsequent calibrations after the initial/replacement sensor calibration procedure has been performed. This procedure does not require removal of the sensor housing, and no live circuits will be exposed.

Before performing either procedure:

1. Ensure that the device is properly installed and wired.
2. Ensure that the electrochemical cell is installed properly.
3. Ensure that the U9500/C7065E is powered-up and displays normal operating mode without fault indication. In not, clear all faults before attempting to enter calibration mode.
4. Ensure that the U9500/C7065E has been programmed for "auto calibration" mode. Manual calibration mode is not compatible with the C7065E sensor.
5. For best results, allow the U9500/C7065E to warm up for one hour before performing the calibration procedure.

## Initial/Replacement Sensor Calibration Procedure

1. Remove the C7065E aluminum sensor cover. Leave the sensor cell plugged in.
2. Apply the calibration magnet to the U9500 calibration target location for nine seconds, or until the U9500 display shows "zero-cal".
3. Move the toggle switch on the electrochemical sensor cell to the "zero" position. See Figure 21 for switch location. This will simulate the "zero" or "no-oxygen" condition necessary to establish a baseline output calibration level. When the U9500 display reads "00", move the toggle switch back to the "on" position. Place the aluminum sensor cover over the cell and reinstall.

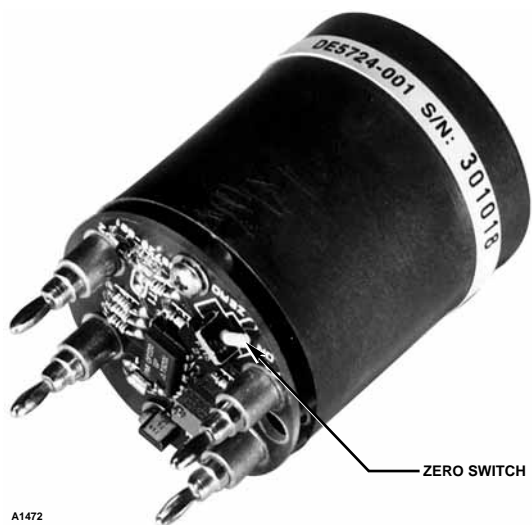


Figure 21—Electrochemical O<sub>2</sub> Sensor Cell

Table 14—Manual Calibration Procedure

Description	Display	Operator Action
Normal operation/no gas present	Indicates the detected gas concentration	<ul style="list-style-type: none"> <li>• Ensure that the unit is set for Manual Calibration. Refer to the “Setup Procedure.”</li> <li>• If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.</li> </ul>
Initiate calibration	Sequences through the Setup settings  Enters the Calibration mode - Display shows detected gas concentration and alternating message:  “ZERO” “CAL”	<ul style="list-style-type: none"> <li>• Hold the Cal magnet to the CAL/RESET magnetic switch for 7 seconds to enter the calibration mode. (The external reset input can also be used to enter the calibration mode if “EXT CAL YES” was selected during the Setup procedure).</li> </ul>
Zero calibration	Display continues showing detected gas concentration and alternating message:  “ZERO” “CAL”	<ul style="list-style-type: none"> <li>• When the zero reading has stabilized, hold the Cal magnet to the CAL/RESET magnetic switch for 2 seconds to accept the displayed reading as the zero point.</li> </ul>
Apply calibration gas	Display shows detected gas concentration and alternating message:  “APLY” “GAS”	<ul style="list-style-type: none"> <li>• Apply the calibration gas to the sensor by placing the calibration cup over the sensor and opening the valve on the calibration gas cylinder.</li> </ul>
Span calibration	Display shows rising gas concentration and alternating message:  “GAS” “ON”	<ul style="list-style-type: none"> <li>• When the reading has stabilized, hold the Cal magnet to the CAL/RESET magnetic switch for 2 seconds to accept the displayed reading as the span point. The display will indicate the selected calibration gas concentration as span.</li> </ul>
Remove calibration gas	Display shows decreasing gas concentration when gas is removed and alternating message:  “CAL” “OK” then “RMV” “GAS” then “XXXX SPAN”	<ul style="list-style-type: none"> <li>• Remove the calibration gas. When the gas level falls below the lowest alarm setpoint, the transmitter automatically exits the Calibrate mode.</li> <li>• A sensitivity reading that can be used to track sensor life (except PointWatch) is displayed for 7 seconds with the “SPAN” display and prior to the transmitter returning to normal operation. Any reading over 100 indicates that the sensor is good.</li> <li>• At the successful completion of the calibration, all outputs and indicators return to normal operation.</li> <li>• If faults are present, the unit will exit after the remainder of 10 minutes. To force an exit from calibration, make sure that the gas concentration is below alarm setpoints and dropping, then activate the CAL/RESET switch for 1 second.</li> </ul>
Calibration fault indication	Display shows alternating messages indicating the fault, then  “RMV” “GAS”	<ul style="list-style-type: none"> <li>• If a fault occurs, remove the gas and correct the fault. After the fault has been cleared, begin calibration again. See Table 15 - Fault Messages, Explanations and Corrective Action.</li> </ul>

4. When the U9500 display shows "aply-gas", the transmitter will begin to record the sensor output level in response to the ambient oxygen concentration. If this is known to be 20.9%, an accurate span calculation will result. If the ambient O<sub>2</sub> level is less than 20.9%, it is recommended to apply 20.9% oxygen using a Det-Tronics O<sub>2</sub> calibration kit.
5. When span calculations are complete, the U9500 display will indicate "cal-OK", and then "rmv-gas". If using a Det-Tronics O<sub>2</sub> calibration kit, remove the calibration cup and close the regulator valve. No actions are necessary if ambient air O<sub>2</sub> is used.
6. The U9500 will automatically exit calibration mode when calibration is complete. The displayed O<sub>2</sub> level should be 20.9% (17.4 mA current level) if ambient conditions are normal.

### Routine Calibration Procedure

1. Do not remove the C7065E sensor cover.
2. Apply the calibration magnet to the U9500 calibration target location for nine seconds, or until the U9500 display shows "zero-cal". The initial zero baseline output level reading will be referenced. Wait until the U9500 display shows "aply-gas".
3. The transmitter will now begin to record the sensor output level in response to the ambient oxygen concentration. If this is known to be 20.9%, an accurate span calculation will result. If the ambient O<sub>2</sub> level is less than 20.9%, it is recommended to apply 20.9% oxygen using a Det-Tronics O<sub>2</sub> calibration kit.
4. When span calculations are complete, the U9500 display will indicate "cal-OK", and then "rmv-gas". If using a Det-Tronics O<sub>2</sub> calibration kit, remove the calibration cup and close the regulator valve. No actions are necessary if ambient air O<sub>2</sub> is used.
5. The U9500 will automatically exit calibration mode when calibration is complete. The displayed O<sub>2</sub> level should be 20.9% (17.4 mA current level) if ambient conditions are normal.

## TROUBLESHOOTING

### Automatic Diagnostics and Fault Messages

The transmitter features self-testing circuitry that continuously checks for problems that could prevent proper system response. When power is applied, the microprocessor automatically tests the unit. If a fault is detected during this warmup mode, it will be indicated on the display and must be reset to clear. In the Normal

operating mode, it continuously monitors the input signal from the sensor to ensure proper functioning.

### In the event of a system fault:

- The display identifies the nature of the fault using a fault message. Refer to Table 15 for an expanded explanation of the messages.
- The normally energized Fault relay (on relay models) is de-energized.
- The dc current output drops to less than 1.0 mA.

### NOTE

*The fault message will be shown for about 1.5 seconds out of every 3 seconds. The gas concentration at the sensor will be displayed during the remaining time. If more than one fault should occur, the highest priority fault will be displayed. (Table 15 lists the faults in order of priority.)*

### In the event of an alarm condition and a system fault both occurring:

- In most cases, the first condition that occurs will be indicated by the current and relay outputs and on the display.
- The exceptions are "CAL ABORTED" and "SENSOR E.O.L." faults, which both can occur during the calibration procedure. If an alarm occurs with these faults, the alarm will over-ride the fault and will be indicated.

### Prioritized Faults

The faults are prioritized, with the highest fault being the only one displayed (see Table 15 for a prioritized listing). If an additional fault exists, it will be displayed after the higher priority fault has been cleared.

### Clearing Faults

Generally, faults that occur while in the normal mode are self-clearing once the fault condition has been corrected. Faults that occur while in the warmup and calibration modes require a manual reset to clear (using either an externally connected reset switch or the Cal magnet). After the fault condition has been corrected, the fault relay automatically switches to the normal (energized) state, the dc current output returns to normal, and the fault message turns off.

### CAUTION

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

Table 15—Fault Messages, Explanations And Corrective Action

Fault Message Display	Explanation and Corrective Action
Blank Display	EEPROM sumcheck failure. Cycle power to clear fault. If fault persists, return the unit to the factory for repair.
<b>COMPUTER ” “FAILURE”</b>	RAM or processor failure. Cycle power to clear fault. If fault persists, return the unit to the factory for repair.
<b>“WDT” “FAILURE”</b>	Watchdog timer failure. Cycle power to clear fault. If fault persists, return the unit to the factory for repair.
<b>“EEPROM” “FAILURE”</b>	Activate the Cal/Reset switch using the Cal Magnet, then perform Setup and Calibration procedures. If fault persists, return the unit to the factory for repair.
<b>“EXT RSET” “PROBLEM”</b>	External reset button has been activated for 15 seconds or longer. Self-clearing when button is released.
<b>“24V P.S.” “FAILURE”</b>	External 24 volt power supply is not in the 15 to 32 volt range. Check and correct input voltage. During normal operating mode, this fault is self clearing when the fault is corrected. If fault occurs during warmup or calibration modes, activate the Cal/Reset switch using the Cal Magnet.
<b>“5V P.S” “FAILURE”</b>	Internal 5 volt analog power supply is not in the 4.75 to 5.35 volt range. During normal operating mode, this fault is self clearing when the fault is corrected. If fault occurs during warmup or calibration modes, activate the Cal/Reset switch using the Cal Magnet. If fault persists, return the unit to the factory for repair.
<b>“SENSOR” “PROBLEM”</b>	Sensor input fault. With 4 to 20 mA output sensors, the current output is below 2 mA or above 35 mA. In normal operating mode, the unit automatically goes through Warmup when this fault clears. If this fault occurs at the end of the warmup period or calibration procedure, recalibrate the sensor. If fault persists, check sensor condition and wiring.
<b>“PTIR CAL” “LINE LOW”</b>	(PointWatch sensor only). The PointWatch has detected that the calibration line is low (active) during power-up.
<b>“PTIR” “VOLT LOW”</b>	(PointWatch sensor only). The PointWatch has detected that its input voltage is below specified level.
<b>“DIRTY” “OPTICS”</b>	(PointWatch sensor only). The PointWatch has detected that its optics are dirty. Refer to the PointWatch manual for cleaning procedure.
<b>“REPLACE” “SENSOR”</b>	(In calibration mode) sensor is defective. Replace sensor and perform calibration procedure.
<b>“CAL” “ABORTED”</b>	(Cal Message) Time ran out while waiting for the gas reading to stabilize. Activate the Cal/Reset switch using the Cal Magnet.
<b>“SENSOR” “E.O.L.”</b>	(Cal Message) Sensor reaching End Of Life. Consider replacement of the sensor in the next 1 or 2 calibrations.
<b>“ZERO” “DRIFT”</b>	Negative zero drift. Sensor input is –9% full scale or lower. Perform sensor calibration.

## Contaminating Gases And Vapors for Catalytic Sensors

Gases and/or vapors that can cause permanent loss of sensor sensitivity:

- Silicone compounds often found in oils, greases and resins.
- Antiknock compounds such as tetra ethyl lead, tetra methyl lead and phosphate esters.

Gases and/or vapors that can cause inhibition (temporary loss of sensitivity) of the sensing element:

- Volatile halogenated compounds.
- Tetrachloroethylene.
- Fluorinated hydrocarbon.
- Vapors that result from hot P.V.C.
- Acids and various solvents may cause a shift in the zero of electrochemical sensor.
- Chlorine and Chlorinated HC.

### NOTE

*The sensor must be periodically inspected and calibrated following prolonged exposure to contaminating gases and vapors.*

## MAINTENANCE

### 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.*

- Periodically apply a generous amount of Lubriplate grease (part number 102868-001) to the internal threads on the junction box cover using an application tool. DO NOT use other lubricants, since some materials can cause irreversible damage to the sensing element in the gas sensor.
- To ensure reliable protection, it is important to check and calibrate the detection system on a regularly scheduled basis. The frequency of these checks is determined by the requirements of the particular installation - 90 days is typical.

- Fault detection circuitry continuously monitors for problems that could prevent proper system response. It does not monitor external response equipment or the wiring to these devices. It is important that these devices be checked initially when the system is installed, as well as periodically during the ongoing maintenance program.
- The system must be checked periodically in the Normal mode to ensure that those items not checked by the transmitter diagnostic circuitry (such as output relays) are functioning properly.

## SENSOR AND HYDROPHOBIC FILTER REPLACEMENT

### 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.*

### Catalytic Sensor Replacement

For catalytic combustible gas sensors, it is necessary to replace the entire sensor assembly when it is defective. Follow the procedure below to replace the sensor.

1. Remove power to the transmitter prior to replacing the sensor.
2. Remove the transmitter cover and the wire shield within the transmitter. If a sensor termination box was used, remove the sensor junction box cover.
3. Unplug the sensor from the transmitter module (if a sensor termination box was used, unplug it from the plug inside the termination box) and unscrew it from the conduit entry.
4. Thread the wires for the replacement sensor through the conduit entry, then screw the sensor into the conduit entry and plug it in. Replace the wire shield.
5. Replace the junction box cover.
6. Re-apply power. Allow time for the unit to warm up and stabilize (approximately 24 hours for best results), then calibrate.

## Electrochemical Sensor Cell Replacement

For sensors with replaceable sensor cells (toxic and oxygen sensors), it may not be necessary to replace the entire sensor housing assembly when the sensor is defective. Follow the procedure below to replace the sensor cell.

1. Remove power to the transmitter prior to replacing the sensor cell.
2. Remove the cap from the sensor base. See Figure 22. (There is no need to remove the sensor housing from the junction box for this operation.)

### NOTE

*Compare part numbers to be sure that the correct replacement cell is being used.*

3. Remove the old sensor cell. The sensor cell contains a small amount of lead – dispose of properly. Check for corrosion or contamination on the terminals of the sensor base, and clean if necessary.
4. Determine proper orientation for the new cell, then **carefully** plug it in.

### NOTE

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

5. Be sure that the O-ring on the sensor housing is in good condition, then place the cap back on the sensor base. Tighten only until snug. **Do not over tighten.**
6. Re-apply power. Allow time for the unit to warm up and stabilize (approximately one hour for best results), then calibrate.

An adequate supply of spare electrochemical cell assemblies should be kept on hand for field replacement. For maximum protection against contamination and deterioration, they should not be removed from the original protective packaging until the time of installation. To ensure maximum storage life, electrochemical cells should be stored in the unopened bag that the sensor is shipped in, at a temperature between 32°F and 68°F (0 to 20°C) and a relative humidity between 15 and 90 percent.

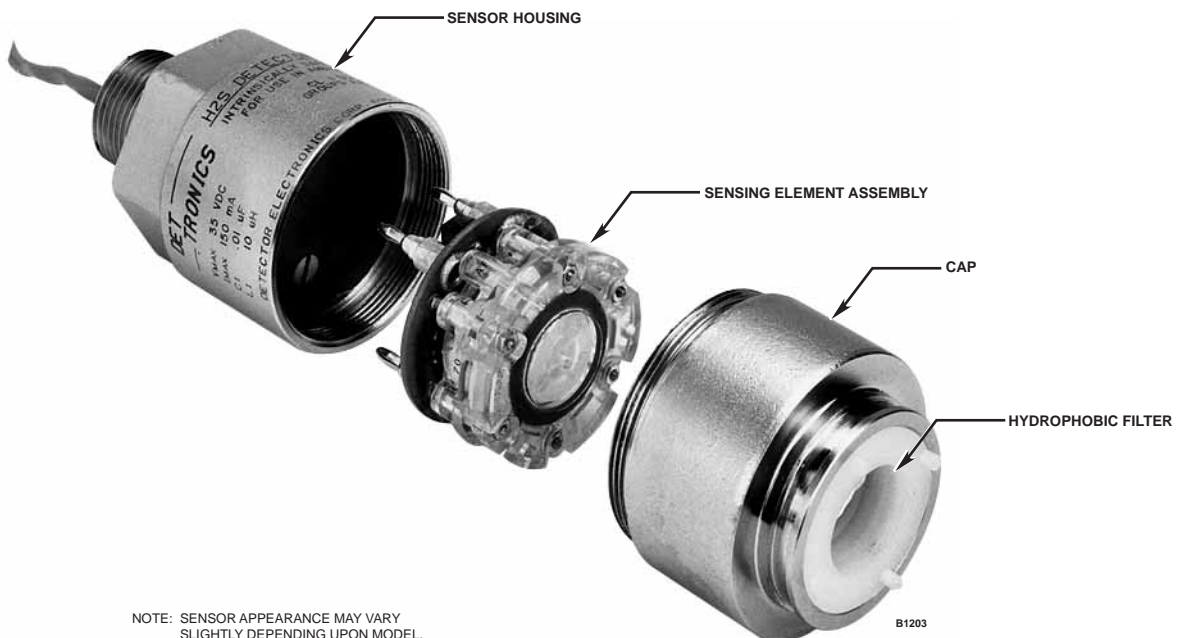


Figure 22—Electrochemical Sensor Parts Identification

## Hydrophobic Filter Replacement

The hydrophobic filter on the front of some of the electrochemical sensor housings protects the sensor cell from contaminants in the environment, and also enables the operation of the cell in "wet" environments without plugging its screen. The operator should frequently inspect the hydrophobic filter for cleanliness. A dirty filter can significantly reduce the amount of gas that is able to reach the sensor cell, thereby impairing the ability of the system to respond to a hazardous condition. If the filter becomes dirty or if it is damaged, it must be replaced.

To replace the hydrophobic filter, simply unscrew the existing filter from the housing, then replace it with a new filter. Use care not to over tighten.

### NOTE

*A dirty hydrophobic filter can adversely affect the response of the sensor by blocking the flow of gas to the sensor cell. If the detector cannot be calibrated or responds slowly to the calibration gas, check the condition of the hydrophobic filter before replacing the sensor cell. The hydrophobic filter should be clean and squarely seated in the housing.*

## PointWatch Detector Replacement

Refer to Figure 9 in this manual for wiring diagram and the PointWatch manual for installation and replacement instructions.

## SPARE PARTS

- Electronic Module - Specify gas sensor type and with or without optional relay package when ordering.
  - Catalytic Combustible Gas
  - PointWatch Hydrocarbon Gas
  - Hydrogen Sulfide – Electrochemical
  - Carbon Monoxide (specify range)
  - Oxygen
  - Chlorine
  - Sulfur Dioxide
  - Nitrogen Dioxide
- Sensors
  - Catalytic Combustible Gas
  - PointWatch IR Hydrocarbon Gas
  - Hydrogen Sulfide – Electrochemical
  - Carbon Monoxide (specify range)
  - Oxygen
  - Chlorine
  - Sulfur Dioxide
  - Nitrogen Dioxide
- Calibration Gas Kits and spare cylinders - Specify gas and concentration when ordering.
- H<sub>2</sub>S Ampoule Calibration Kits.
- Spare 40 ppm H<sub>2</sub>S Ampoules
- Sensor Termination Box
- Lubriplate grease for threads
- There are many other accessories available for use with various sensors. Contact your local representative or the factory for information.

## DEVICE REPAIR AND RETURN

Prior to returning devices, contact the nearest local Detector Electronics office so that a Service Order number can be assigned. A written statement describing the malfunction must accompany the returned device to expedite finding the cause of the failure.

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

Return all equipment transportation prepaid to the factory in Minneapolis.



# APPENDIX A

## FACTORY MUTUAL (FM) APPROVAL DESCRIPTION

Refer to drawing 006722-001 (Figure A-1) for applicable area classification and installation details.

### COMBUSTIBLE

**Transmitters:** U9500A1001, U9500A1004, with Junction Box P/N 006264-013, -014, -017 or -018.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per FM 3611.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per ANSI/NEMA 250. (For use with Sensor Termination box.)
- Performance verified up to 100% LFL methane-in-air atmospheres per FM 6320.

**Hydrocarbon Gas Transmitters:** U9500H6002 or U9500H6004, with Junction Box P/N 006264-013, -014, -017 or -018.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per FM 3611.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per ANSI/NEMA 250. (For use with Sensor Termination box.)
- Performance verified up to 100% LFL methane-in-air atmospheres per FM 6320.

**Sensor Termination Box:** Model STB Series, used with Combustible units above:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per FM 3611.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per ANSI/NEMA 250.

**Combustible Gas Sensors:** Model CGS:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.

### Hydrocarbon Sensors:

Model PIR9400:

- Explosion-proof for Class I, Division 1, Groups B, C and D (T5) Hazardous (Classified) Locations.
- Class I, Division 2, Groups A, B, C and D (T3C) Hazardous (Classified) Locations, Tamb = -40°C to +75°C, conduit seal not required.

Model PIRECL:

- Explosion-proof for Class I, Division 1, Groups B, C and D (T4) Ta = 75°C with intrinsically safe output for HART Communications in accordance with control drawing 0072783-001, conduit seal not required.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4) Ta = 75°C Hazardous (Classified) Locations.

Stand-alone 4-20 mA FM Approved Gas Sensor/Transmitter:

- See specific detector rating.

## ELECTROCHEMICAL

**Transmitters:** U9500B2002 and U9500B2004 (Hydrogen Sulfide), U9500C (Oxygen), U9500D (Chlorine), U9500E (Carbon Monoxide), U9500F (Sulfur Dioxide) and U9500G (Nitrogen Dioxide) with junction boxes P/N 006264-013, -014, -017 or -018 and direct mounted electrochemical sensor:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per FM 3611.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per ANSI/NEMA 250. (For use with Sensor Termination box.)
- Performance verified up to 100 ppm H<sub>2</sub>S-in-air atmospheres per FM 6341 (Draft).

**Sensor Termination Box:** STB Series, used with Electrochemical units above:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per FM 3615.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per FM 3611.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per ANSI/NEMA 250.

### Sensors:

C7064E5014 (H<sub>2</sub>S):

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615.

Sensors C7064E4012 or C7064E5012 (H<sub>2</sub>S):

- Explosion-proof for Class I, Division 1, Groups C and D Hazardous (Classified) Locations per FM 3615.

Stand-alone 4-20 mA FM Approved Gas Detector:

- See specific detector rating.

## U9500A SERIES SENSOR CONFIGURATIONS

- Model CGS Series Combustible Gas Sensors

### NOTE

*Sensor cross sensitivity has not been verified by FM.*

### NOTE

*The high temperature characteristic has not been FM verified above +75°C.*

### NOTE

*Detector Electronics combustible gas detection K-Factors are not FM verified.*

## U9500B THROUGH U9500H INFINITI SERIES SENSOR CONFIGURATIONS

- Models C7064E4012 and C7064E5012 Hydrogen Sulfide (H<sub>2</sub>S) Sensors (U9500B)
- Model C7065E Oxygen (U9500C)
- Model C7067E Chlorine (U9500D)
- Model C7066E Carbon Monoxide (U9500E)
- Model C7068E Sulfur Dioxide (U9500F)
- Model C7069E Nitrogen Oxide (U9500G)
- Model PIR9400 or PIRECL Hydrocarbon (U9500H)

### NOTE

*FM Approval of the 4 to 20 mA input does not include or imply Approval of the gas detection apparatus such as sensors, transmitters, or devices connected to the system. In order to maintain FM Approval of the system, all 4 to 20 mA gas detection instruments connected to the input must also be FM Approved.*

### NOTE

*Metric straight thread types are for use in non-North American applications.*

## Calibration

- Calibration of the above listed sensors has been FM verified using the respective U9500 Transmitter with the Det-Tronics 225130-001 (50% Methane) and 227115-001 H<sub>2</sub>S Calibration Kits.
- The U9500B through U9500H Series Transmitters can be used with any FM Approved 4 to 20 mA device.



## APPENDIX B

### CANADIAN STANDARDS ASSOCIATION (CSA) CERTIFICATION DESCRIPTION

Refer to drawing 006880-001 (Figure B-1) for applicable area classification and installation details.

#### COMBUSTIBLE

**Transmitters:** U9500A1001, U9500A1004, with Junction Box P/N 006264-013, -014, -017 or -018.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per CSA C22.2 #25.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per CSA C22.2 #213.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per CSA C22.2 #94. (For use with Sensor Termination box.)
- Performance verified up to 100% LFL methane-in-air atmospheres per CSA C22.2 #152.

**Hydrocarbon Gas Transmitters:** U9500H6002 or U9500H6004, with Junction Box P/N 006264-013, -014, -017 or -018.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per CSA C22.2 #25.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per CSA C22.2 #213.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per CSA C22.2 #94. (For use with Sensor Termination box.)
- Performance verified up to 100% LFL methane-in-air atmospheres per CSA C22.2 #152.

**Sensor Termination Box:** Model STB Series, used with Electrochemical units above.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per CSA C22.2 #25.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per CSA C22.2 #213.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per CSA C22.2 #94.

**Combustible Gas Sensors:** Model CGS:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.

#### Hydrocarbon Sensors:

Model PIR9400:

- Explosion-proof for Class I, Division 1, Groups B, C and D (T5) Hazardous (Classified) Locations
- Class I, Division 2, Groups A, B, C and D (T3C) Hazardous (Classified) Locations, Tamb = -40°C to +75°C, conduit seal not required.

Model PIRECL:

- Explosion-proof for Class I, Division 1, Groups B, C and D (T4) Ta = 75°C with intrinsically safe output for HART Communications in accordance with control drawing 007283-001, conduit seal not required.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4) Ta = 75°C Hazardous (Classified) Locations.

Stand-alone 4-20 mA CSA Approved Gas Sensor/Transmitter:

- See specific detector rating.

## ELECTROCHEMICAL

**Transmitters:** U9500B2002 and U9500B2004 (Hydrogen Sulfide), U9500C (Oxygen), U9500D (Chlorine), U9500E (Carbon Monoxide), U9500F (Sulfur Dioxide) and U9500G (Nitrogen Dioxide) with junction boxes P/N 006264-013, -014, -017 or -018 and direct mounted electrochemical sensor:

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per CSA C22.2 #25.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per CSA C22.2 #213.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per CSA C22.2 #94. (For use with Sensor Termination box.)

**Sensor Termination Box:** Model STB Series, used with Electrochemical units above.

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.
- Dust ignition-proof for Class II/III, Division 1, Groups E, F and G Hazardous (Classified) Locations per CSA C22.2 #25.
- Non-incendive for Class I, Division 2, Groups A, B, C and D (T4A); Class II/III, Division 2, Groups F and G (T4A) Hazardous (Classified) Locations per CSA C22.2 #213.
- Enclosure Rating NEMA/Type 4X (Indoor/Outdoor) per CSA C22.2 #94.

### **Sensors:**

C7064E5014 (H<sub>2</sub>S):

- Explosion-proof for Class I, Division 1, Groups B, C and D Hazardous (Classified) Locations per CSA C22.2 #30.

C7064E4012 or C7064E5012 (H<sub>2</sub>S):

- Explosion-proof for Class I, Division 1, Groups C and D Hazardous (Classified) Locations per CSA C22.2 #30.

Stand-alone 4-20 mA CSA Approved Gas Detector:

- See specific detector rating.

## U9500A SERIES SENSOR CONFIGURATIONS

- Model CGS Series Combustible Gas Sensors

### NOTE

*The high temperature characteristic has NOT been CSA verified above +75°C.*

### NOTE

*Detector Electronics combustible gas detection K-factors are not CSA verified.*

## U9500B THROUGH U9500H INFINITI SERIES SENSOR CONFIGURATIONS

- Models C7064E4012 and C7064E5012 Hydrogen Sulfide (H<sub>2</sub>S) Sensors (U9500B)
- Model C7065E Oxygen (U9500C)
- Model C7067E Chlorine (U9500D)
- Model C7066E Carbon Monoxide (U9500E)
- Model C7068E Sulfur Dioxide (U9500F)
- Model C7069E Nitrogen Oxide (U9500G)
- Model PIR9400 or PIRECL Hydrocarbon (U9500H)

### NOTE

*CSA Approval of the 4 to 20 mA input does not include or imply Approval of the gas detection apparatus such as sensors, transmitters, or devices connected to the system. In order to maintain CSA Approval of the system, all 4 to 20 mA gas detection instruments connected to the input must also be CSA Approved.*

### NOTE

*Metric straight thread types are for use in non-North American applications.*

## Calibration

- Calibration of the above listed sensors has been CSA verified using the respective U9500 Transmitter with the Det-Tronics 225130-001 (50% Methane) and 227115-001 H<sub>2</sub>S Calibration Kits.
- The U9500B through U9500H Series Transmitters can be used with any CSA Approved 4 to 20 mA device.



# APPENDIX C

## CE MARK

### DIRECTIVE CONFORMITY

Low Voltage – 73/23/EEC.

Electromagnetic compatibility – 89/336/EEC.

ATEX – 94/9/EC.

The U9500 Gas Transmitter was tested and found to be compliant with EN50270 when wired in conduit or with shielded cable. All screen drains shall be terminated to the chassis.

The U9500 Gas Transmitter was tested to EN50270 and are compliant for Type 1 equipment. To meet Type 2 requirements, additional transient suppression is provided for installation.

## ATEX CERTIFICATION

### INFINITI U9500 GAS TRANSMITTER

CE 0539  II 2 G

EExd IIC T5-T6

DEMKO 02 ATEX 131327 X

T6 (Tamb = -55°C to +60°C)

T5 (Tamb = -55°C to +75°C)

IP66.

Combustible gas performance certified per EN 61779-4: 2000 when used with Model CGS or any 4-20 mA stand alone combustible gas detector.

Read and understand instruction manual before operating.

To obviate the risk of hot spots and capacitor energy storage, the enclosure must not be opened, even when isolated, when an explosive gas atmosphere is present.

All cable entry devices and blanking elements shall be certified in type of explosion protection flameproof enclosure "d", suitable for the conditions of use and correctly installed. Unused apertures shall be closed with suitable certified blanking elements.


For ambient temperatures above 60°C, use field wiring suitable for maximum ambient temperature.

#### Special Conditions for Safe Use (X):

The Infiniti Transmitter types U9500A and U9500H have an ambient temperature rating for performance of -40°C to +75°C.

The performance of the Infiniti Transmitter types U9500B, U9500C, U9500D, U9500E, U9500F and U9500G as a safety device in accordance with harmonized gas performance standards is not covered by this certificate.

## **CATALYTIC COMBUSTIBLE GAS SENSOR (CGS)**

CE 0539  II 2 G  
EEx d IIC T3, T5  
DEMKO 02 ATEX 131323 X  
T5 (T<sub>amb</sub> = -40°C to +75°C)  
T3 (T<sub>amb</sub> = -55°C to +125°C).

### **Special Conditions for Safe Use of CGS —**


The performance ambient temperature rating is limited to -40°C to +75°C.

The CGS Combustible Gas Sensor can withstand repeated exposures to 125°C for periods up to 12 hours. Sensor replacement is recommended after a maximum of 500 hours of exposure to the 125°C temperature condition.

The CGS Combustible Gas Sensor must be used in conjunction with a CENELEC certified Detector Electronics Corp. combustible gas detector control unit for compliance with EN 61779 series standards.

Performance verified up to 100% LFL methane-in-air atmospheres per EN61779-4.

## **SENSOR TERMINATION BOX (STB)**

CE 0539  II 2 G  
EEx d IIC T4-T6  
DEMKO 02 ATEX 131324  
T6 (T<sub>amb</sub> = -55°C to +60°C).  
T5 (T<sub>amb</sub> = -55°C to +75°C).  
T4 (T<sub>amb</sub> = -55°C to +125°C).  
IP66.





X3301 Multispectrum  
IR Flame Detector



PointWatch Eclipse®  
IR Combustible Gas Detector



Eagle Quantum Premier®  
Safety System



Eagle Logic Solver  
Safety System

Detector Electronics Corporation  
6901 West 110th Street  
Minneapolis, MN 55438 USA

T: 952.941.5665 or 800.765.3473  
F: 952.829.8750

W: <http://www.det-tronics.com>  
E: [detronics@detronics.com](mailto:detronics@detronics.com)