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DET _____ ***TRONICS***



INSTRUCTIONS

PointWatch™ Infrared
Hydrocarbon Gas Detector
PIR9400



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APPLICATION

The PointWatch Detector is a diffusion-based point-type infrared gas detector that provides continuous monitoring of combustible hydrocarbon gas concentrations in the range of 0 to 100% LFL. The detector provides a 4 to 20 milliampere output signal, corresponding to the detected gas concentrations. The explosion-proof sensor housing meets FM, CSA and CENELEC requirements for use in hazardous environments.

PointWatch is ideally suited for use in harsh environments and where the cost of required maintenance for conventional catalytic detectors is prohibitive. The PointWatch IR Detector will perform reliably in the presence of silicone and other catalytic poisoning agents and can also operate in oxygen free environments or where high background gas levels are present. There are no known poisons that affect this technology.

The PointWatch detector can be used alone or as part of a larger system such as Det-Tronics' Infiniti Gas Transmitter, R8471 Controller, or Eagle 2000 Hazard Monitoring System.

FEATURES

- Requires no routine calibration to ensure proper operation.
- Continuous self-test automatically indicates a fault or fouled optics condition.
- Unique multi-layered filtering system protects optics from dirt and water ingress.
- Internal heating system minimizes condensation, allowing reliable operation through temperature extremes.
- Performs well in the presence of high concentrations or constant background levels of hydrocarbons and in oxygen depleted atmospheres.
- There are no known poisons, e.g. silicones or hydrides, that compromise the integrity of the measurement.
- Standard 4 to 20 milliampere output (current source).
- Standard 0 to 100% LFL detection range.
- Compact, lightweight, explosion-proof housing is designed for duty in harsh environments.



SPECIFICATIONS

INPUT VOLTAGE—

+24 vdc nominal (range +18 to +32 vdc).

POWER CONSUMPTION (Watts)—

Input Voltage:	18 vdc	24 vdc	32 vdc
Nominal	3.5	4.6	6.2
Maximum	4.0	5.5	7.0

DETECTION RANGE—

0 to 100% LFL.

GASES —

Will respond to most hydrocarbon gases. Outputs linearized for 0 to 100% LFL are provided for methane, ethane, propane/butane, ethylene, propylene.

All devices are shipped with a 0 to 100% LFL linearized output for methane. Other linearized outputs are field selectable by means of a switch.

CURRENT OUTPUT (NON-ISOLATED)—

Linear 4 to 20 ma current source.

- 4 to 20 ma output indicates 0 to 100% LFL detection range (for linearized gases)
- 23.2 ma indicates over-range condition (120% LFL)
- 0 to 2.4 ma levels indicate calibration, fault and fouled optics conditions.

Refer to Table 1 for a detailed description of current outputs.

Maximum loop resistance: 600 ohms at +24 vdc. See Figure 1 for further information.

Table 1—
Current Loop Output Levels and Corresponding Status Indications

Current Level	Status
23.2 ma	Over-range (120% LFL)
20.0 ma	Full scale (100% LFL)
4.0 ma	Zero gas level (0% LFL)
2.2 ma	Zero calibration in progress
2.0 ma	Span calibration in progress
1.8 ma	Calibration complete - remove gas
1.6 ma	Calibration fault
1.0 ma	Fouled optics
0.8 ma	24 vdc line low (less than 17.5 vdc)
0.6 ma	Calibrate input active at power-up (probable wiring fault)
0.4 ma	Active channel fault
0.2 ma	Reference channel fault
0.0 ma	CPU system fault, warmup

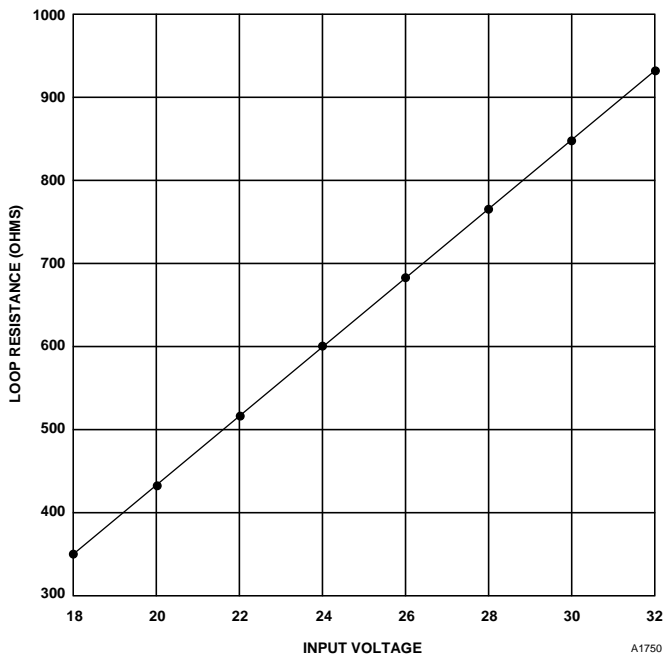


Figure 1—4 to 20 ma Current Loop Resistance

The following specifications for Accuracy, Stability and Repeatability are based on a 0 to 100% LFL methane calibration

ACCURACY (Room Temperature)—
±3% LFL from 0 to 50% LFL, ±5% LFL from 51% to 100% LFL.

RESPONSE TIME (Seconds)—

	T50	T90
Aluminum		
Outside weather baffle only	6	17
All weather protection installed	9	21
Stainless Steel		
All weather protection installed (Det-Tronics verified)	2	5

STABILITY—

Temperature

Zero: ±2% LFL from
-40°F to +167°F (-40°C to +75°C).

Span: ±5% LFL at 50% LFL from
-13°F to +167°F (-25°C to +75°C),
±10% LFL at 50% LFL from
-40°F to -13°F (-40°C to -25°C).

Time (10 months) ±2% LFL (Det-Tronics verified).

REPEATABILITY (Room Temperature)—

Zero: ±1% LFL.

Span: ±2% LFL at 50% LFL.
(Det-Tronics verified)

WIRING—

The PointWatch detector has five 22 AWG wires, 20 inches long for wiring into a junction box or the Infiniti transmitter.

Red = + 24 volts dc
Black = - (common)
White = 4 to 20 milliampere signal output
Yellow = Calibration input
Green = Chassis ground

Power Wiring: 18 AWG minimum is recommended for power wiring. Larger diameter wire may be required to maintain a minimum of 18 vdc (including ripple) at the sensor for all operating conditions (see Figure 2). For maximum EMI/RFI protection, shielded cable is recommended.

OPERATING TEMPERATURE RANGE—

-40°C to +75°C (-40°F to +167°F).

HUMIDITY (Non-Condensing)—

0 to 99% relative humidity (Det-Tronics verified)
5 to 95% relative humidity (FMRC/CSA verified).

RFI/EMI PROTECTION—

EN50081-1. Class B, EN50082-1 (IEC 801-2, 3, 4). (ETL verified -EMC).

Operates properly with 5 watt walkie talkie keyed at 1 meter.

INGRESS PROTECTION—

IP66 (DEMKO certified per EN60529).

ENCLOSURE MATERIALS—

Aluminum (clear anodized) enclosure and weather protection baffles. Content: 0.8% to 1.2% Mg, 0.15% to 0.40% CU.

Stainless Steel (316 electropolished) enclosure, polyphthalamide (PPA) weather protection baffle.

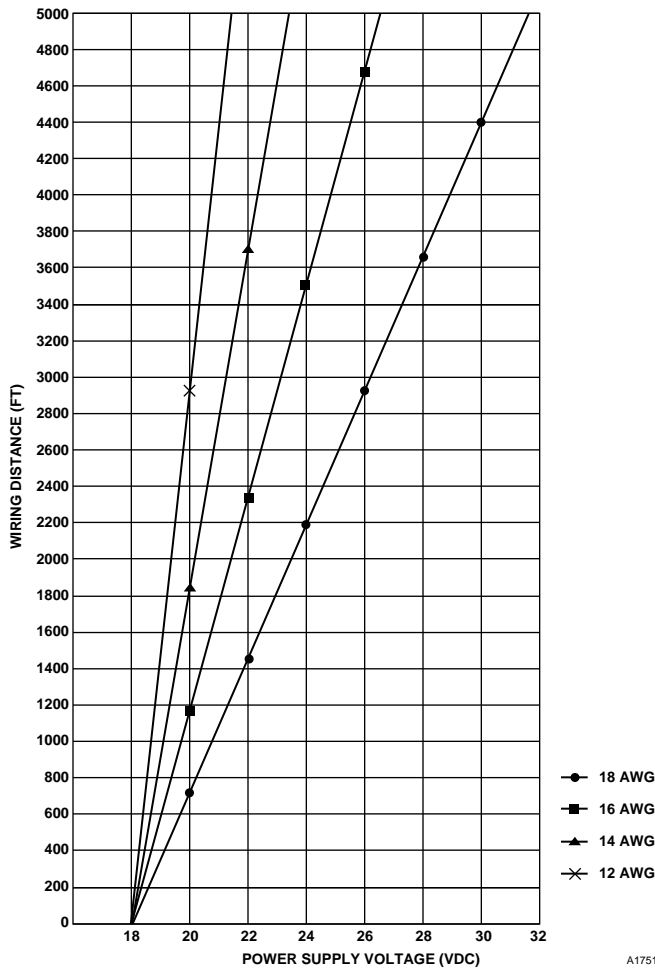


Figure 2—PointWatch Wiring Requirements

CERTIFICATION—

PointWatch	Aluminum	Stainless Steel
CENELEC ¹	X	X
FM ²	X	
CSA ³	X	
Gosstandart ⁴	X	X

- CENELEC: Certificate No. 95D.119043
EEx d IIB + H2 T6 (Tamb -40°C to +40°C)
EEx d IIB + H2 T5 (Tamb -40°C to +75°C).
Ingress protection IP66.
- FM: Explosion-proof for Class I, Div. 1, Groups B, C & D per FM 3615. Performance per FM 6320. (See Appendix for approval description.)
- CSA: Explosion-proof for Class I, Div. 1, Groups B, C & D per CSA C22.2 No. 30. Performance per CSA C22.2 No. 152.
- Gosstandart: Certificate No. A-0272; Performance Certificate No. 1039.
1Ex d IIB T6/H2 (Tamb. -40°C to +40°C)
1Ex d IIB T5/H2 (Tamb. -40°C to +75°C).

Junction Box	Aluminum	Stainless Steel
CENELEC ⁵	X	N/A
FM ⁶	X	N/A
CSA ⁷	X	N/A
Gosstandart ⁸	Pending	N/A

- CENELEC: Certificate No. 96D1115
EEx d IIC T6 (Tamb -60°C to +40°C)
EEx d IIC T5 (Tamb -60°C to +75°C).
Ingress protection IP66.
- FM: Explosion-proof for Class I, Div. 1, Groups B, C & D per FM 3615.
- CSA: Explosion-proof for Class I, Div. 1, Groups B, C & D per CSA C22.2 No. 30.
- Gosstandart:
1Ex d IIC T6 (Tamb -60°C to +40°C)
1Ex d IIC T5 (Tamb -60°C to +75°C).

MOUNTING—

Detector can be threaded into any approved junction box suitable for the specific applications. (Junction box spacers may be required for flush mounting.)
PointWatch thread options:

- 3/4 inch NPT
- M20 (for use outside North America).

SHIPPING WEIGHT—

Aluminum: 2.8 pounds (1.3 kilograms).
Stainless Steel: 4.8 pounds (2.2 kilograms).

DIMENSIONS—

See Figures 3 and 4 for the dimensions of the PointWatch Detector and Figure 5 for dimensions of the PointWatch Junction Box.

TERMINALS—

Terminals UL/CSA rated for 14 to 22 AWG wire; terminals DIN/VDE rated for 2.5 mm² wire.

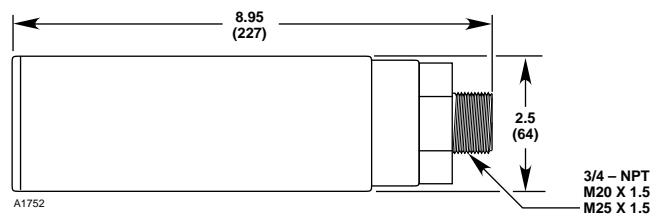


Figure 3—Aluminum PointWatch Unit Dimensions in Inches (MM)

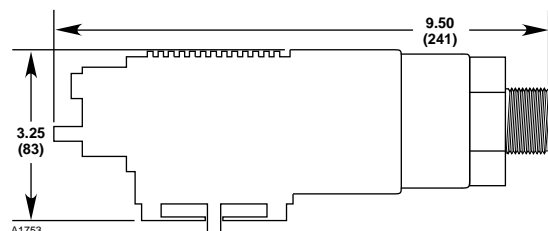


Figure 4—Stainless Steel PointWatch Unit Dimensions in Inches (MM)

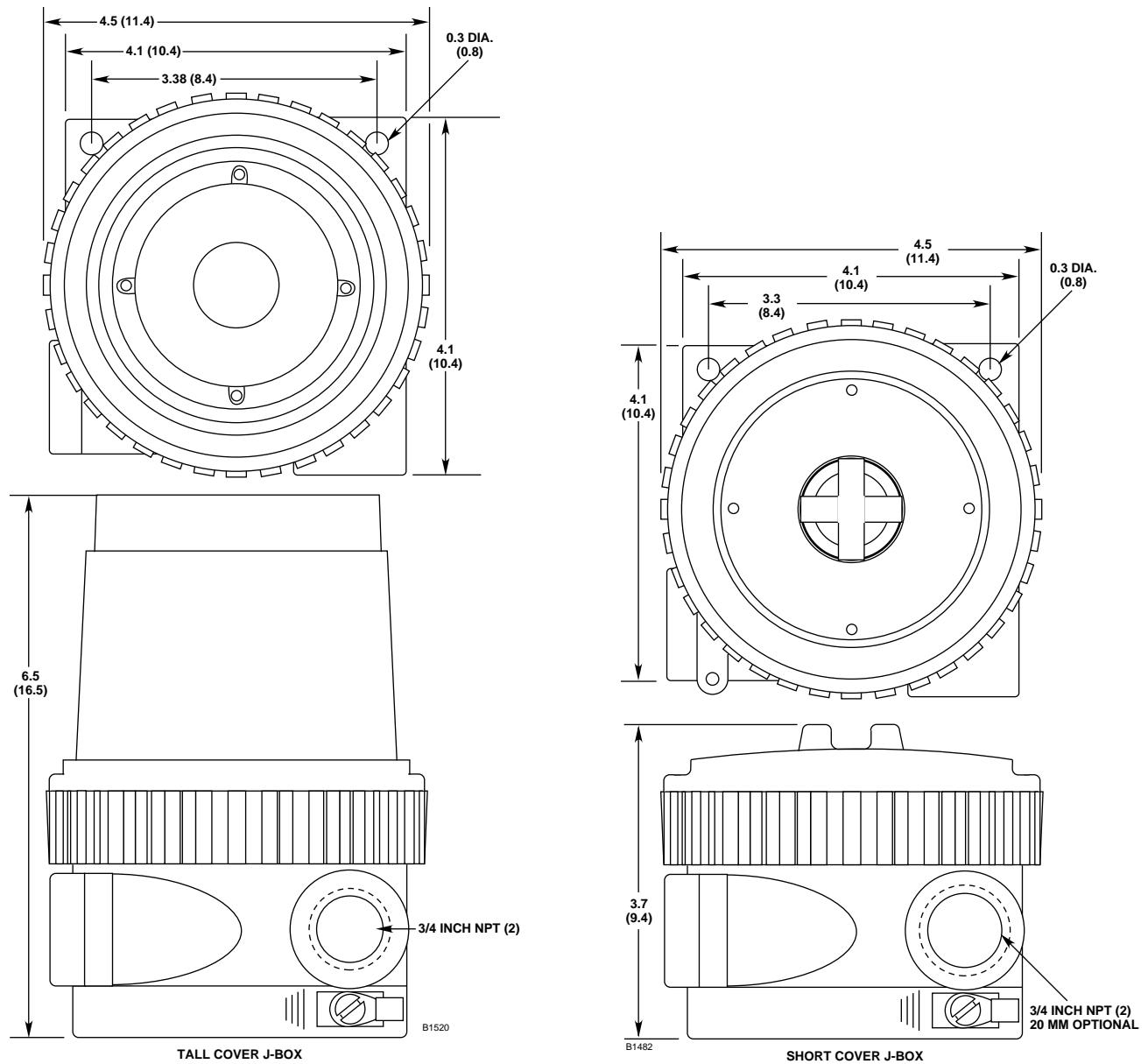


Figure 5—Junction Box Dimensions in Inches (MM)

DESCRIPTION

DETECTION METHOD

PointWatch operates on the infrared absorption principle. A beam of modulated light is projected from an internal infrared source to a reflector, which sends it back to a pair of infrared sensors. One of the sensors is designated reference and the other active, with different optical filters in front of the two sensors to make them selective to different infrared wavelengths. The reference wavelength is unaffected by combustible gases, while the active wavelength is absorbed by combustible gases. The ratio of the active to the reference wavelength is computed within the PointWatch detector to determine the concentration of gas present. This value is then converted into a 4 to 20 milliampere current output for connection to external display and control systems.

CURRENT LOOP OUTPUT

During normal operation, the PointWatch detector has a current output from 4 to 20 milliamperes that is proportional to gas concentrations from 0 to 100% LFL. A current output other than 4 to 20 milliamperes indicates either negative gas level, a fault or over-range condition, or that the unit is in the calibrate mode as indicated in Table 1.

OPERATING MODES

Warmup

When power is applied to the detector, it enters a Warmup mode (for approximately one minute) in which it performs diagnostic checks and allows the sensors to stabilize before beginning normal operation. The cur-

rent output during this period is 0 milliamperes. At the end of the warmup period with no faults present, the detector automatically enters the Normal operating mode. If a fault is present after the warmup, the detector current output will indicate a fault.

Normal

In the normal operating mode, the 4 to 20 milliamperes signal level corresponds to the detected gas concentration. The detector continuously checks for system faults or initiation of calibration, and automatically changes to the appropriate mode.

Fault

Faults detected during warmup, normal operation, or calibration are indicated by the current loop output as shown in Table 1.

Calibration

When the calibration lead is momentarily connected to the negative lead (common) of the power supply, the microprocessor executes the zero and span calibration sequence. The output current during calibration defaults to an inhibited state. See Table 1.

NOTE

The current output during calibration can be set for live operation, however, this method is not usually recommended. Refer to the "Calibration" section for further information.

Two junction box types for use specifically with the PointWatch detector are available from Det-Tronics.

- Tall Cover/Window Junction Box for one person, non-intrusive calibration. This junction box includes a magnetic reed calibration switch, calibration LED and a windowed cover. Activating the magnetic reed switch with the calibration magnet and viewing the LED through the window provides one person, non-intrusive calibration capability. See Figure 6.
- Short Cover Junction Box for PointWatch requires two people to accomplish non-intrusive calibration. This junction box includes a magnetic reed calibration switch, calibration LED and a solid cover. Activating the magnetic reed calibration switch with the calibration magnet or touching the calibration lead to the negative lead (common) of the power supply using an external switch are methods used to initiate calibration. This junction box can also be used for sensor separation. See Figure 7.

INSTALLATION

IMPORTANT

Hydrocarbon-based grease will emit hydrocarbon vapors which will be measured by PointWatch and will result in inaccurate gas level readings. Use only low vapor pressure silicone grease when lubricating threads on the PointWatch detector and associated junction box. Do not get this grease on the optics of the detector. A suitable grease is listed in the "Spare Parts" section at the end of this manual.

IMPORTANT

In applications where both PointWatch and catalytic type sensors are used, ensure that the silicone grease used to lubricate the PointWatch detector threads does not come into contact with the catalytic sensors or poisoning of the catalytic sensors will result. It is strongly recommended that maintenance personnel wash their hands between handling the two types of sensors.



Figure 6—Tall PointWatch Junction Box with Window



Figure 7—Short PointWatch Junction Box

DETECTOR LOCATION

It is essential that the device be properly located to enable it to provide maximum protection. The most effective number and placement of sensors varies depending on the conditions at the job site. The individual designing the installation must rely on experience and common sense to determine the type and quantity of sensors and the best sensor locations to adequately protect the area. The following factors should be considered for every installation:

1. What kind of gas is to be detected? If it is lighter than air, place the sensor above the potential gas leak. Place the sensor close to the floor for gases that are heavier than air or for vapors resulting from flammable liquid spills. However, note that air currents can cause a gas that is heavier than air to rise. In addition, if the gas is hotter than ambient air or mixed with gases that are lighter than air, it could also rise.
2. How rapidly will the gas diffuse into the air? Select a location for the sensor as close as practical to the anticipated source of a gas leak.
3. Ventilation characteristics of the immediate area must also be considered. Movement of air may cause gas to accumulate more heavily in one area than another. The detector should be placed in the areas where the most concentrated accumulation of gas is anticipated. Also take into consideration the fact that many ventilation systems do not operate continuously.
4. Proper orientation is dependent upon the PointWatch model used and the environmental concerns at the installation. See Table 2.
5. The sensor should be accessible for maintenance.
6. Excessive heat or vibration can result in premature failure of any electronic device and should be avoided if possible.

NOTE

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

0 TO 100% LFL LINEARIZED OUTPUT OPTIONS

The PointWatch detector is factory configured for 0 to 100% LFL methane. This configuration can be changed

to other gases in the field by changing the setting on the rotary gas selection switch, which is located on the electronics module, and calibrating the device with the new standard gas selected.

PointWatch has a good response to hydrocarbon gases and to the vapors of hydrocarbon liquids. However, the response varies depending on the structure of the hydrocarbon molecule (see Figure 8). The raw response of PointWatch is linearized to provide a 0 to 100% LFL output for five standard gases: methane, ethane, propane/butane, ethylene, propylene.

Changing Linearized Output Gas Selection

IMPORTANT

Remove power before removing and disassembling the PointWatch detector.

1. Loosen the two captive screws on the flat end of the detector and slide the filter assemblies off. For the aluminum model, use a standard screwdriver. For the stainless steel model, use a 7/64 inch hex driver. See Figure 9 (aluminum) or Figure 10 (stainless steel).
2. Unscrew and remove the electronics mounting cover by rotating it counter-clockwise. See Figure 11.
3. Slide the electronics mounting cover back to the base of the mirror assembly and pull the IR module out of the base as shown in Figure 12.

Table 2—Mounting Orientation

Model	Installation Environment	Orientation
Aluminum	Heavy rain or hose down	Vertical
	Blowing dust or sand	Horizontal
Stainless Steel	All applications	Horizontal

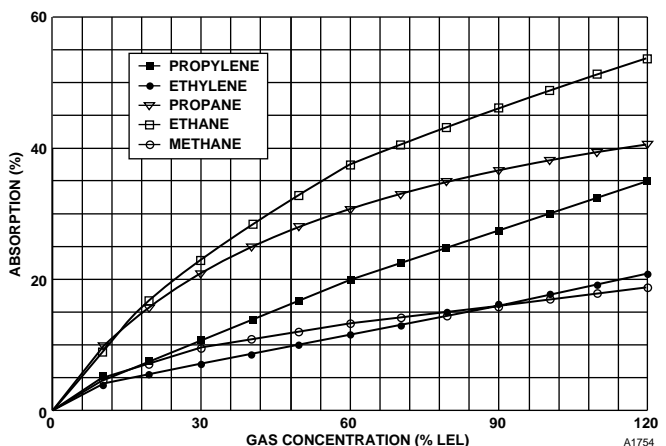


Figure 8—PointWatch Gas Absorption Curves

- Using a small screwdriver, rotate the gas selection switch from position 0 (methane) to the desired position. Refer to Figure 13. Ensure that the tip of the arrow on the switch lines up with the position selected.
- The module is "keyed" using different sized pins on the bottom of the module. Slide the IR module into the base and rotate it until the keyed holes are aligned, then press securely into place.

NOTE

This assembly fits correctly only in one orientation. If it is not seating into place, rotate it 180° and try again.

- Screw the electronics mounting cover clockwise onto the base assembly as shown in Figure 11.
- For the aluminum model, slide the outer filter assembly over the mirror assembly. The outer filter should be oriented with the solid portion toward the base of the unit. If it is not oriented correctly, the filter assembly will not slide onto the unit. Slide the inner filter assembly into the outer filter assembly and rotate until it is seated securely, then fasten the two captive screws using a standard screwdriver. See Figure 9.

For the stainless steel model, slide the stainless steel collar onto the base assembly, then slide the baffle onto the unit. Place the end cap on the baffle and rotate it until it is seated securely, then fasten the two captive screws using a 7/64 inch hex driver. See Figure 10.

- Calibrate the detector with 50% LFL of the gas that matches the calibration gas switch position following the instructions in the "Calibration" section of this manual.

JUNCTION BOXES

The PointWatch detector is designed to be threaded into a junction box, which can be mounted to a solid, vibration free wall or post. A 3/8 inch spacer may be required between the enclosure and the mounting surface to allow adequate room for the sensor and calibration accessory.

Intrusive and Non-Intrusive Calibration

For hazardous locations, it is important to consider the options for calibration of PointWatch. The device can be installed so that calibration can be performed by one person without opening the explosion-proof enclosure (non-intrusive calibration). This is accomplished by incorporating a display or LED that provides information

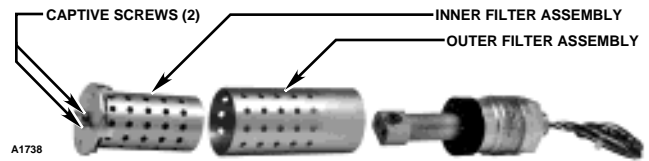


Figure 9—Aluminum PointWatch Disassembly

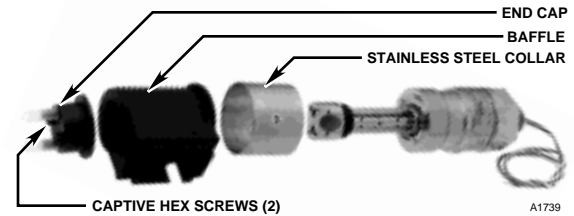


Figure 10—Stainless Steel PointWatch Disassembly

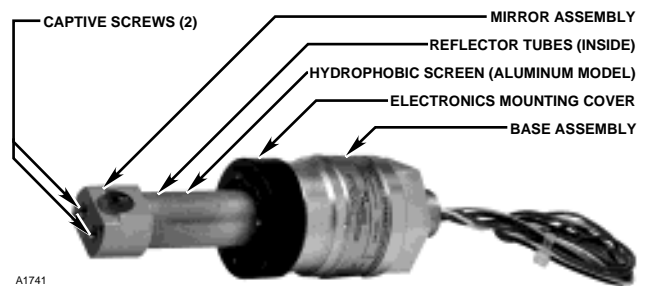


Figure 11—IR Module and Base Assemblies

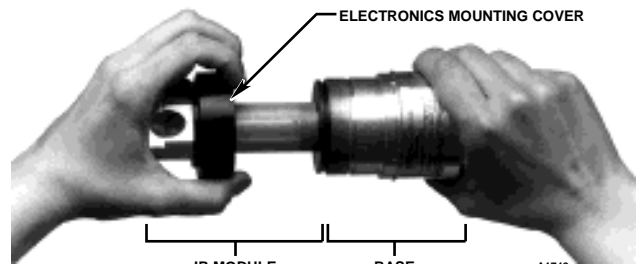


Figure 12—IR Module Removal

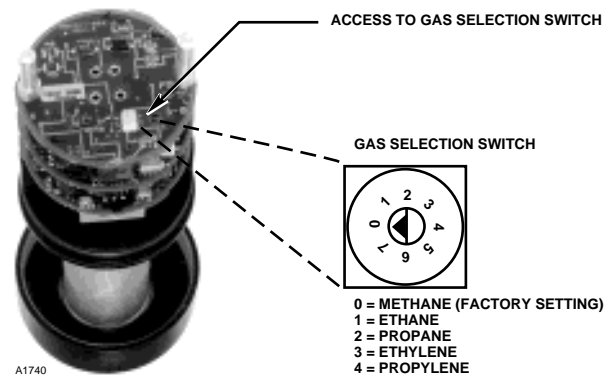


Figure 13—Gas Selection Switch Location at the Bottom of the Electronics Assembly

and/or instructions for calibration. When a display is not used or the LED is not visible from the outside, the enclosure must be opened to observe the LED or to insert a meter to read the output of the device (intrusive calibration). With this type of installation, either a permit must be obtained to open the enclosure or the procedure must be accomplished by two people using walkie talkies for communication.

Depending on the control devices selected, PointWatch can be installed for either intrusive or non-intrusive calibration. See Table 3 for a listing of the installation options.

A user-supplied junction box can also be used, provided it has the appropriate sized entries. This junction box must be suitable for use in the application and location in which it is being installed. Calibration is initiated by touching the calibration lead to the negative lead (common) of the power supply. Although this can be accomplished manually, installation of a switch is recommended. It is recommended that this switch be a momentary contact type to prevent it from inadvertently being left in the calibrate position.

GENERAL WIRING REQUIREMENTS

NOTE

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

The use of shielded cable in conduit or shielded armored cable is recommended for optimum RFI/EMI protection. In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment. To assure proper operation of the detector, the resistance of the connecting wire must be within the specified limits. The maximum distance between the detector and power source is determined by the power supply capability and wire size. See Figure 2 to determine the proper wire size and maximum wiring distance allowed.

It is important that moisture not be allowed to come in contact with the electrical connections of the system.

The use of proper piping techniques, breathers, glands, and seals are required to prevent water ingress and/or maintain the explosion-proof rating.

DETECTOR WIRING PROCEDURE

IMPORTANT

Do not apply power until the wiring procedure is complete and has been verified.

1. Determine the best mounting location for the detector (refer to the "Detector Location" section above). If it is determined that sensor separation is required, see the following section for details.
2. The junction box should be electrically connected to earth ground.
3. Figures 14 through 18 show typical wiring for various system configurations using the PointWatch detector. Refer to the appropriate figure as a guide to system connection. Figure 14 shows typical wiring for standalone operation. Figure 15 shows typical wiring for PointWatch with Det-Tronics supplied junction box. Figure 16 shows the junction box terminals and calibration switch. Figure 17 shows typical wiring for PointWatch/Infiniti transmitter operation. Figure 18 shows typical wiring for PointWatch/Eagle communication module configuration. The PointWatch wiring color code is:

- Red lead = +24 volts dc
- Black lead = - (common)
- White lead = 4 to 20 ma signal output
- Yellow lead* = Calibration input
- Green lead = Chassis ground

* If the calibration wire (yellow lead) is not being used, do not connect this wire to ground. Trim excess length and insulate wire so no shorting can occur.

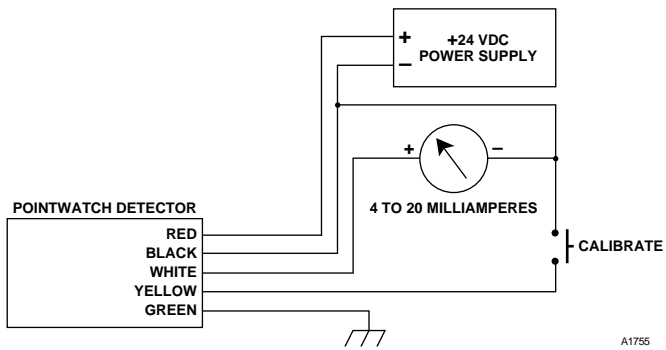
4. Check the detector wiring to ensure proper connections, then pour the conduit seals and allow them to dry (if conduit is being used).

DETECTOR SEPARATION (OPTIONAL)

In applications where the detector must be installed in a different location from the control device, a junction box must be installed at the detector location to make the

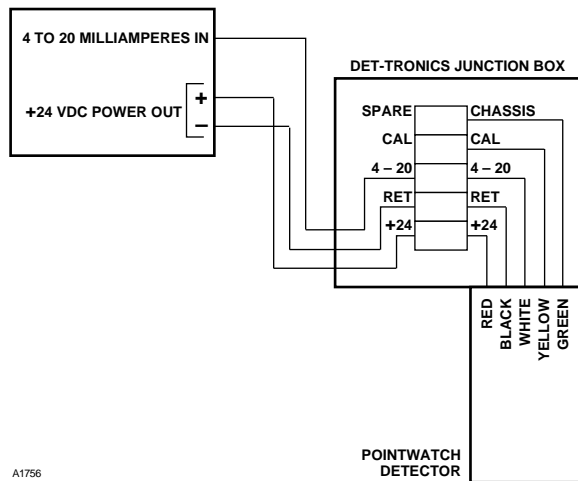
Table 3—
Installation Options for Intrusive and Non-Intrusive Calibration

Control Device	Non-Intrusive & 1 person	Intrusive or 2 person
Infiniti Transmitter	X	
PointWatch Junction Box w/ tall cover/window	X	
PointWatch Junction Box w/ short cover/no window	X	
Eagle 2000 DCU	X	
Eagle 2000 Communication Module		X



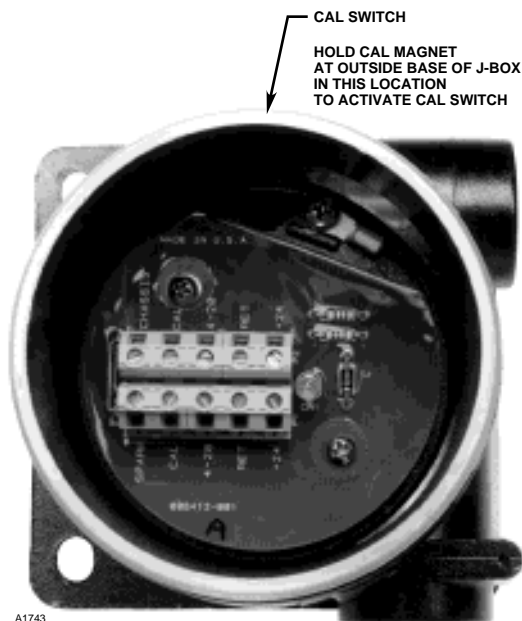
NOTE:
CALIBRATION PUSHBUTTON, CURRENT METER AND POWER SUPPLY ARE NOT SUPPLIED.

Figure 14—Typical PointWatch Wiring, Standalone Configuration



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Figure 15—Typical PointWatch Wiring, PointWatch with Det-Tronics Junction Box



A1743

Figure 16—Junction Box Terminals and Calibration Switch

electrical connection. The control device can be either the Infiniti Transmitter or the tall cover junction box with window. Refer to Figure 19 for a typical separation diagram. For purposes of brevity the following discussion only refers to the Infiniti Transmitter as the control device.

By connecting a length of tubing (1/4 inch O.D.) from the direct inject calibration nozzle back to the control device location, the operator can accomplish calibration from the remote location.

Wiring Requirements for Detector Separation

Shielded four wire cable is recommended for connecting the detector junction box to the transmitter. Cable with a foil shield is recommended. The shield of the cable should be open at the detector junction box and connected to earth ground at the transmitter junction box. Ensure that the shield wire is clipped short and insulated with electrical tape to prevent accidental grounding at the open end.

The maximum distance between the detector junction box and the transmitter is limited by the resistance of the connecting wiring, which is a function of the gauge of the wire being used. Refer to Figure 2 to determine the maximum separation distance for a given wire size.

NOTE

It is important to maintain a minimum of +18 volts dc (including ripple) at the PointWatch detector. When determining the appropriate wire size for the installation, refer to Figure 2. Be sure to take into account the distance from the power supply to the PointWatch or to the Infiniti and then to the PointWatch to ensure that the power requirements are met.

Mounting and Connecting Procedure for Detector Separation

The PointWatch junction box can be mounted to a wall or post, or it can be suspended by the conduit if this does not result in excessive vibration. A 3/8 inch spacer may be needed between the junction box and the mounting surface to allow adequate room for the sensor and calibration accessory. The junction box should be electrically connected to earth ground.

1. Lubricate the sensor threads with low vapor pressure silicone grease, then install the sensor in the conduit entry of the junction box. It should be tight to ensure an explosion-proof installation, however, do **not** overtighten.
2. Connect the detector wires to the terminal strip in the junction box as shown in Figure 20.

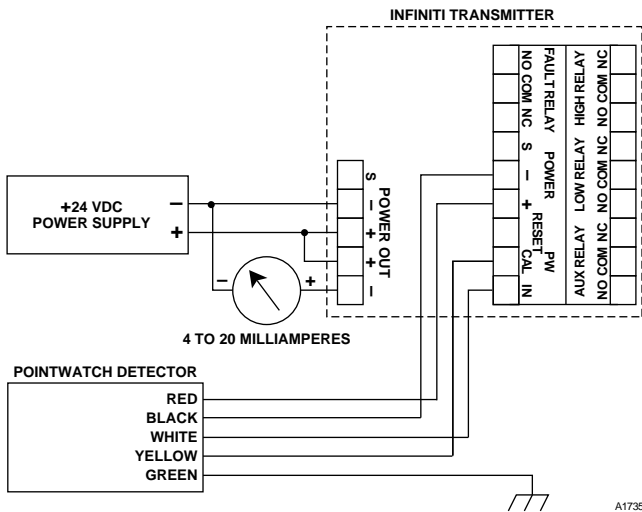


Figure 17—Typical PointWatch Wiring with Det-Tronics Infiniti Transmitter

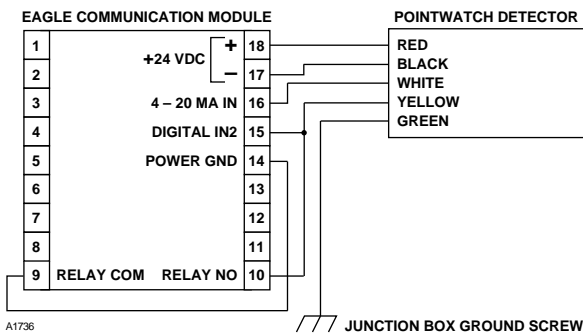


Figure 18—Typical PointWatch Wiring with Eagle Communication Module

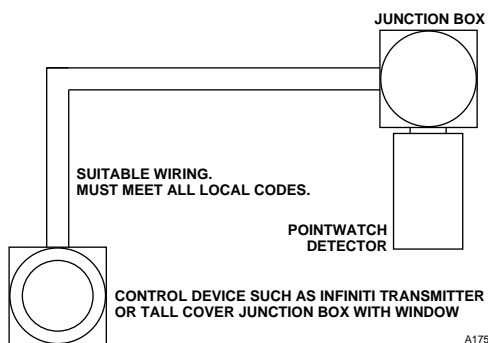


Figure 19—Options for Detector Separation

5. If used with the Infiniti Transmitter, mount and wire the Infiniti Transmitter as shown in Figure 20 and as described in the Infiniti Instruction Manual.

STARTUP PROCEDURE

1. Inhibit the output loads that are actuated by the system to prevent activation of these devices.
2. Check that the detector has been wired properly.
3. Apply power to the system and allow the detector to operate for a minimum of 2 hours, then check zero and verify gas response. Perform a zero and span calibration, if necessary.

NOTE

If the device is being used with a gas other than methane, it must be calibrated with 50% LFL of the gas selected with the calibration switch.

4. Place the system in normal operation by reactivating the output loads.

CALIBRATION

The PointWatch detector is factory calibrated for methane and, unlike catalytic detectors, does not require routine calibration to ensure proper operation. Guidelines for when calibration should be performed or checked are listed in Table 4.

NOTE

To check calibration, inhibit output loads as necessary, then apply 50% LFL calibration gas to the detector using the equipment provided in the calibration kit. Ensure that the correct calibration gas is used. Check the current output for the appropriate response (12 milliamperes).

NOTE

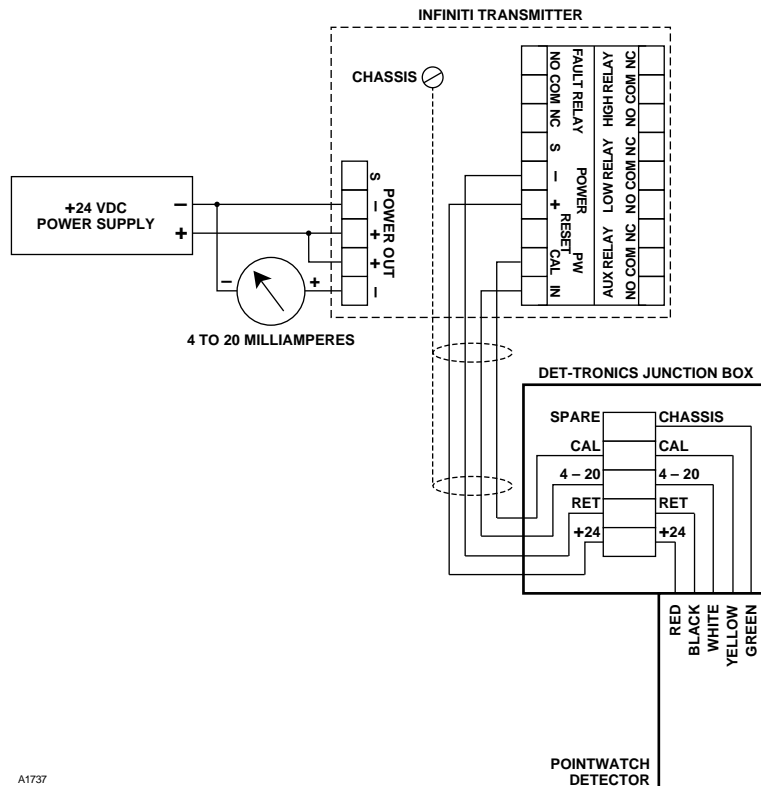
Drift will be indicated by a constant zero offset in one direction either above or below 4 milliamperes. The presence of background gas would be indicated by a small but constantly changing output.

CALIBRATION EQUIPMENT

The following equipment is required to calibrate the PointWatch detector (calibration kits from Det-Tronics contain all items below):

- 50% LFL calibration gas
- Calibration nozzle (for aluminum model)
- Wind shield (for calibration in high wind situations)
- Regulator (minimum 2.5 liter/minute flow rate)
- Three feet of tubing.

3. Connect the cable leadwires from the Infiniti or junction box to the same terminals inside the separated junction box. **Do not** ground the shield at the junction box. Ground the sensor wire shield at the transmitter end only.
4. Check the connections inside the junction box and place the cover on the junction box.



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Figure 20—Sensor Separation with Infiniti Transmitter and PointWatch

CALIBRATION PROCEDURES

The procedures in this section explain calibration sequences for both standalone PointWatch applications (when a user supplied or no J-box is used) and for applications where PointWatch is used with the Det-Tronics supplied J-box (containing a magnetic reed switch and LED). For applications where the PointWatch detector is used with the Infiniti Transmitter or the Eagle System, refer to those instruction manuals for the calibration procedure.

When PointWatch is used as a standalone unit or with transmitters or controllers other than those supplied by Det-Tronics, the current loop output must be monitored in order to calibrate (for both inhibited and live current loop configurations).

Table 4—Calibrate or Check

Function	Calibrate	Check
Startup		X
Gas selection switch changed	X	
Non-standard gas (using linearization other than methane)	X	
Replace any part	X	
Constant zero offset	X	
Periodic Functional Testing (at least once a year)		X

When PointWatch is used with a Det-Tronics J-Box, the magnetic switch and LED in the J-box are used to initiate and annunciate the calibration sequence. The current loop output also indicates the calibration sequence (for both inhibited and live current loop configurations).

IMPORTANT CALIBRATION NOTES

WARNING

- *Ensure that the detector has been operating for at least two hours before calibrating.*
- *Do not open the explosion-proof enclosure when power is applied to the system unless the appropriate permits have been procured.*
- *The calibration gas used must be the same as the gas selected on the Gas Selection Switch. The factory setting is for methane, so use methane to calibrate if the Gas Selection Switch is set in position "0." If the Gas Selection Switch is set in any other position, ensure that the correct gas is used to calibrate. See Figure 13. Only 50% LFL calibration gas can be used to calibrate the PointWatch detector.*
- *If the PointWatch is being used in a standalone configuration, the use of an inhibited current loop is recommended. Live current loop calibration was designed primarily for use with the Infiniti*

Transmitter or the Eagle 2000 system. Accomplishing live current loop calibration manually is possible but not recommended. Instructions for live current loop calibration are provided after the “Calibration Procedure - Inhibited Current Output During Calibration” procedure.

- The calibration sequence is initiated by momentarily connecting the calibration lead to the negative lead (common) of the power supply using the Cal Magnet or an external switch. If the Det-Tronics J-box with magnetic Cal Switch is being used, this is accomplished by holding the Cal Magnet near the side of the J-box for one second. The location of the Cal Switch is shown in Figure 16. An alternate way of accomplishing this is to install a pushbutton switch between the yellow lead and the power supply common (–), as shown in Figure 14. Use of the Cal Magnet to activate the Cal Switch in the J-box will be referred to throughout the following procedures. If an alternate method of initiating calibration is used, substitute that method in all places in which the Cal Magnet/Cal Switch activation are referenced.

- The calibration sequence can be exited at any time during the span calibration by holding the Cal Magnet near the Cal Switch in the J-box for one second.

- At all times other than when calibration is being performed, all calibration ports must be capped. For aluminum models, the allen head plug must be installed in the calibration port or the calibration nozzle must be capped. For stainless steel models, the calibration ports must be capped. This prevents dirt and water from entering the direct path into the optics. Failure to protect the optics can result in a fouled optics fault. If a permanent gas delivery system is used, the delivery tube must be plugged when not in use.

Calibration Procedure - Inhibited Current Output During Calibration

See Table 5 for an overview of the calibration sequence.

1. Be sure that only clean air is present at the sensor. (The microprocessor begins taking zero readings immediately upon entering the Calibrate mode.) If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.
2. There are two methods of applying the calibration gas. For windy situations, a calibration wind shield is supplied in the calibration kit and can be slipped over the sensor to capture the calibration gas for accurate readings. Once in place, tighten the velcro strap and connect the flexible tubing to the nozzle on the wind shield. Otherwise, calibration gas can be applied directly to the sensor through the calibration nozzle. For aluminum models, remove the allen head plug (shown in Figure 21) from the calibration port on the end of the detector and replace it with the calibration nozzle.
3. Initiate calibration by either momentarily activating the Calibrate pushbutton shown in Figure 14 or by holding the Cal Magnet near the Cal Switch in the J-box (if used) for one second.
 - The LED will go on steady (if used).
 - The current output will drop to 2.2 milliamperes.
4. Wait for the zero calibration point to stabilize (typically 1 minute).
After successful zero calibration:
 - The LED will begin flashing (if used),
 - The current will drop to 2.0 milliamperes.
 Proceed to step 5.

Table 5—Calibration Sequence, Inhibited Current Output

Description	Current	LED	Operator Action
Normal operation/no gas present	4.0 ma	Off	If the possibility of background gases exists, purge the sensor with clean air to ensure accurate calibration.
Initiate calibration	2.2 ma	On steady	Use calibration magnet, calibrate pushbutton or manually connect cal lead to power supply common for one second.
Zero calibration complete	2.0 ma	Flashing	Apply 50% LFL calibration gas.
Span calibration complete *	1.8 ma	Off	Shut off and remove calibration gas and cap the calibration nozzle (or replace it with the allen head plug).
Calibration fault indication	1.6 ma	Off	See Troubleshooting Table 6.

* Span calibration can be aborted by using the calibration magnet, the calibrate pushbutton or manually connecting the cal lead to power supply common for one second. The device will revert to live operation using data from the last calibration.



Figure 21—Aluminum PointWatch Detector Calibration Port

If zero calibration fails:

- The LED will turn off,
- The current output will drop to 1.6 milliamperes.

Reset the detector by cycling power to the detector or by holding the Cal Magnet near the Cal Switch in the J-box (if used) for one second. Begin calibration again at step 1.

5. Connect the calibration gas canister, valve and tubing to the direct input nozzle as shown in either Figure 22 (aluminum model) or Figure 23 (stainless steel model) or to the windshield nozzle, depending on the method used.

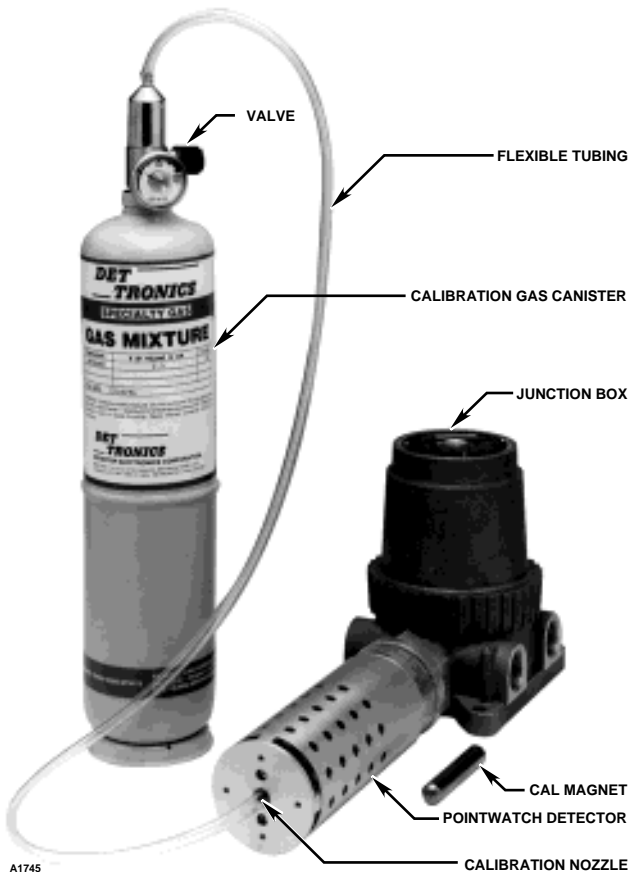


Figure 22—Aluminum PointWatch Detector Calibration Configuration

6. Apply 50% LFL calibration gas to the detector. This is accomplished by opening the valve on the calibration gas canister (see Figure 22 or Figure 23). A 2.5 liter per minute flow rate is recommended.
 - The LED will continue flashing (if used).
 - The current will remain at 2.0 milliamperes as the gas concentration increases.

Proceed to step 7.

7. The detector will automatically accept the span calibration when the detected gas level is stable (typically 1 to 2 minutes).

After successful span calibration:

- The LED will turn off (if used),
- The current will drop to 1.8 milliamperes.

Proceed to step 8.

If for any reason a successful calibration is not accomplished within 10 minutes, a calibration fault will occur:

- The LED will turn off,
- the current output will drop to 1.6 milliamperes.

Turn off the gas, then reset the detector by cycling power to the detector or by holding the Cal Magnet near the Cal Switch (if used). Begin calibration again at step 1.

8. After successful calibration, close the valve on the calibration gas canister, remove the flexible tube from the calibration nozzle and replace the allen head plug (aluminum model) or use the nozzle cap

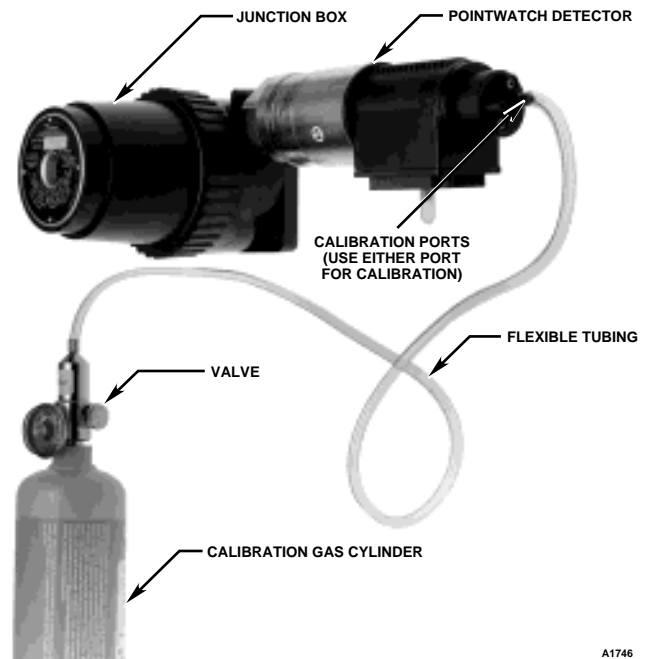


Figure 23—Stainless Steel PointWatch Detector Calibration Configuration

specified in the Spare Parts section to cap the nozzle. If the calibration wind shield was used, remove it from the PointWatch. The detector will return to normal operation after the gas level has returned below 5% LFL.

IMPORTANT

For aluminum models, the allen head plug must be installed in the calibration port or the calibration nozzle must be capped. For stainless steel models, the calibration ports must be capped. This prevents dirt and water from entering the direct path into the optics. Failure to protect the optics can result in a fouled optics fault. If a permanent gas delivery system is used, the delivery tube must be plugged when not in use.

Calibration Procedure - Live Current Output During Calibration

Sequence Summary: During calibration with a live current loop output, the current output drops to 2.2 milliamperes during the zero calibration then rises to reflect the actual gas level for the span calibration. At the end of calibration, the current level locks to indicate that the calibration is complete. These current levels and their significance are summarized below.

4.0 ma	Zero gas level (0% LFL), initial state - normal operation, no gas present
2.2 ma	Zero calibration in progress
12.0 ma	Span calibration lock-in
1.6 ma	Calibration fault - reset unit

IMPORTANT

LIVE CURRENT OUTPUT CALIBRATION NOTES

• If the PointWatch is being used in a standalone configuration, the use of an inactive current loop is recommended. Live current loop calibration was designed primarily for use with the Infiniti Transmitter or the Eagle 2000 system. Accomplishing live current loop calibration manually is difficult because precision timing is required.

• Inhibit alarm outputs before performing this calibration procedure. Alarm levels will be exceeded using the live current output calibration procedure.

• All calibration notes listed at the beginning of the "Calibration Procedures" section also apply to this procedure. Review those notes prior to proceeding.

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

2. There are two methods of applying the calibration gas. For windy situations, a calibration wind shield is supplied in the calibration kit and can be slipped over the sensor to capture the calibration gas for accurate readings. Once in place, tighten the velcro strap. Otherwise, calibration gas can be applied directly to the sensor through the calibration nozzle. For aluminum models, remove the allen head plug (shown in Figure 21) from the calibration port on the end of the detector and replace it with the calibration nozzle.

3. Initiate calibration by either momentarily activating the Calibrate pushbutton shown in Figure 14 or by holding the Cal Magnet near the Cal Switch in the J-box (if used) for one second.

- The LED will go on steady and the current output will drop to 2.2 milliamperes. After the zero is stable (typically 1 minute), the LED will start to flash and the current level changes to 2.0 milliamperes. **When the LED goes off for the first flash, immediately reactivate the calibration switch for one second only.** This places the current loop output in the live mode.
- The current level rises to 4.0 milliamperes and the LED begins flashing.

If unsuccessful at entering live calibration mode, abort calibration by momentarily reactivating the magnetic calibration switch or pressing the calibrate pushbutton. Repeat steps 1 - 3.

Proceed to step 4.

If calibration mode was inadvertently exited:

- The LED will turn off,
- the current output will remain at 4.0 milliamperes (normal operation).

This occurs when the Cal magnet or cal switch is activated for too long when the LED begins flashing. Repeat all of step 3 and proceed.

If zero calibration fails:

- The LED will turn off,
- the current output will drop to 1.6 milliamperes.

Reset the detector by cycling power to the detector or by holding the Cal Magnet near the Cal Switch in the J-box (if used) for one second. Begin calibration again at step 1.

4. Connect the calibration gas canister, valve and tubing to the direct input nozzle as shown in either Figure 22 (aluminum model) or Figure 23 (stainless steel model) or to the windshield nozzle, depending on the method used.

5. Apply 50% LFL calibration gas to the detector. This is accomplished by opening the valve on the calibration gas canister (see Figure 22 or Figure 23). A 2.5 liter per minute flow rate is recommended.
 - The LED will continue flashing.
 - The current output will increase proportionally as the gas concentration increases.

Proceed to step 6.

6. The detector will automatically accept the span calibration when the detected gas level is stable (typically 1 to 2 minutes).

After successful span calibration:

- The LED will turn off steady,
- the current will lock in steadily at 12.0 milliamperes, indicating a successful span calibration.

Proceed to step 7.

If for any reason a successful calibration is not accomplished within 10 minutes, a calibration fault will occur:

- The LED will turn off,
- the current output will drop to 1.6 milliamperes.

Turn off the gas, then reset the detector by cycling power to the detector or by holding the Cal Magnet near the Cal Switch. Begin the calibration sequence again at step 1.

7. After successful calibration, close the valve on the calibration gas canister, remove the flexible tube from the calibration nozzle and replace the allen head plug (aluminum model) or use the nozzle cap specified in the Spare Parts section to cap the nozzle. If the calibration wind shield was used, remove it from the PointWatch. After the detector output falls below 45% LFL, the current loop will unlock and will track the declining gas concentration back to 4 milliamperes.

IMPORTANT

For aluminum models, the allen head plug must be installed in the calibration port or the calibration nozzle must be capped. For the stainless steel models, the calibration ports must be capped. This prevents dirt and water from entering the direct path into the optics. Failure to protect the optics can result in a fouled optics fault. If a permanent gas delivery system is used, the delivery tube must be plugged when not in use.

TROUBLESHOOTING

Use Table 6 to isolate and correct malfunctions with the PointWatch Detector.

MAINTENANCE

It is recommended to have spare IR Modules on hand (see "Spare Parts" section). Use Table 6 to isolate and correct malfunctions.

Table 6—Troubleshooting Table

Current Level	Status	Corrective Action
2.4 to 3.9 ma	Negative Zero Indication (-10% LFL)	NOTE: This fault can be caused by the presence of background gas during calibration. Ensure that background gas is not present and recalibrate the unit. If fault does not clear, perform disassembly and cleaning procedure, then recalibrate. If fault still does not clear, replace electronics assembly.
1.6 ma	Calibration fault	Make sure that the calibration gas being used matches the Gas Selection Switch setting. If these match and the fault is still present, perform disassembly and cleaning procedure, then recalibrate.
1.0 ma	Fouled optics	Perform disassembly and cleaning procedure, then recalibrate.
0.8 ma	+24 vdc line low (less than +17.5 vdc)	Ensure that input voltage is correct and that power connections are good. If fault does not clear, replace the electronics assembly.
0.6 ma	Calibrate input active at power-up	Ensure that calibration line is not shorted and that the calibration switch is open. If fault does not clear, replace the unit.
0.4 ma	Active channel fault	Replace electronics assembly.
0.2 ma	Reference channel fault	Replace electronics assembly.
0.0 ma	CPU system fault, warmup	Ensure that power is applied and that the warmup period is complete (1 minute). If fault does not clear, replace the unit.

IMPORTANT MAINTENANCE NOTES

• Hydrocarbon-based grease will emit hydrocarbon vapors, which will be measured by PointWatch and will cause inaccurate gas level readings. **Use only silicone grease (not hydrocarbon-based grease) when lubricating threads on the PointWatch detector and associated junction box.** A suitable grease is listed in the "Spare Parts" section at the end of this manual.

• In applications where both PointWatch and catalytic type sensors are used, ensure that the silicone grease used to lubricate the PointWatch detector threads does not come into contact with the catalytic sensors or poisoning of the catalytic sensors will result. It is strongly recommended that maintenance personnel wash their hands between handling the two types of sensors.

• It is recommended that spare IR modules be stocked (See "Spare Parts" section) for ease and speed of replacement when conditions warrant it. If cleaning is indicated (fouled optics), the procedure is most easily performed on a bench.

DISASSEMBLY AND CLEANING PROCEDURE

Cleaning of the optical surfaces is required only if an optical fault is indicated (1.0 milliamper current output). This procedure is most easily accomplished on a bench.

Required materials: Clean, flat work surface, cotton swabs, isopropyl alcohol or circuit cleaner.

IMPORTANT

Remove power before disconnecting and removing the PointWatch detector for maintenance.

1. Disassemble the detector as shown in Figure 9 (aluminum) or Figure 10 (stainless steel). For aluminum

models, loosen the two captive screws on the flat end of the detector using a standard screwdriver and slide the filter assemblies off. For stainless steel models, loosen the two captive screws on the end cap using a 7/64 inch hex wrench, then slide the baffle and stainless steel collar off.

2. Unscrew and remove the electronics mounting cover by rotating it counter-clockwise. See Figure 11.
3. Slide the electronics mounting cover back to the base of the mirror assembly and pull the IR module out of the base as shown in Figure 12. Do not grasp the hydrophobic screen (aluminum model only) to pull the IR module from the base as this may damage the screen. Once the IR module assembly is pulled from the base, slide the electronics mounting cover back to the electronics assembly as shown in Figure 24.
4. Loosen the two captive screws on top of the mirror assembly (Figure 11) and slide the mirror assembly, hydrophobic screen (aluminum model only) and reflector tubes away from the electronics assembly and electronics mounting cover. See Figure 24 (aluminum model) and Figure 25 (stainless steel model).
5. Disassemble the mirror assembly, reflector tubes and hydrophobic screen as shown in Figure 24 (aluminum model) and Figure 25 (stainless steel model). Do not remove the electronics mounting cover.
6. Clean the inside of the mirrors (2), reflector tubes (2), and the windows (2) using cotton swabs and isopropyl alcohol or circuit cleaner.
7. Replace the two reflector tubes into the larger holes in the mirror assembly and ensure that they are fully seated. Make sure that the retaining ring that holds the reflector tubes in place is centered on the tubes and not blocking any holes.

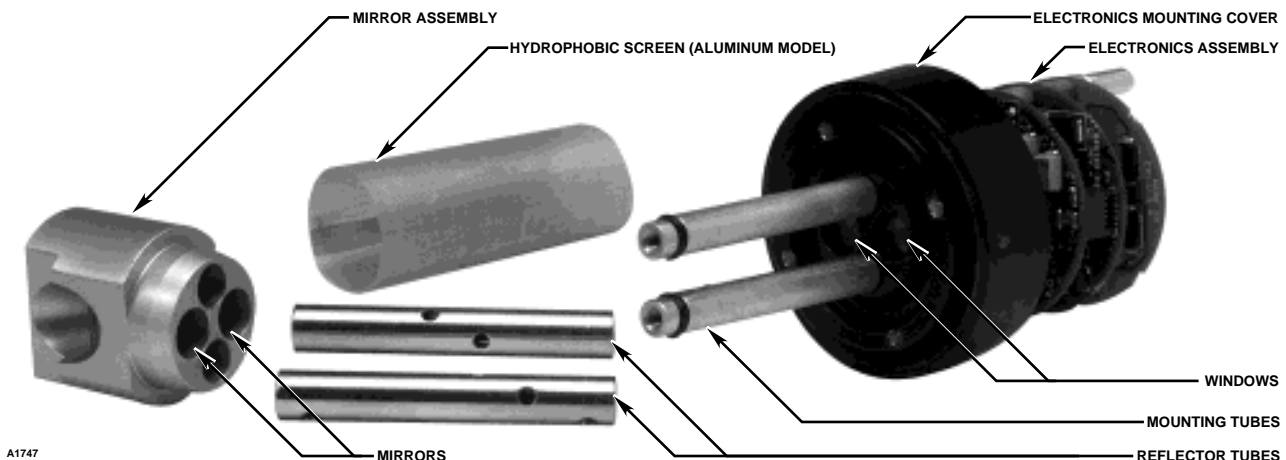


Figure 24—Aluminum PointWatch Detector Disassembly for Cleaning

- For the aluminum model, slide a new hydrophobic screen over the two mounting tubes, being careful not to fold or crumple the screen. It should be centered loosely around the two mounting tubes.

IMPORTANT

The hydrophobic screen in the aluminum model should be replaced whenever the mirror assembly and reflector tubes are cleaned or replaced or when the screen appears fouled upon visual inspection.

- For the aluminum model, carefully slide the mirror/reflector tube assembly into the hydrophobic screen and seat the reflector tubes securely into the windows in the base. Again, be careful not to crumple or fold the hydrophobic screen. For the stainless steel model, slide the reflector tubes into the windows in the base.
- Tighten the two captive screws on the top of the mirror assembly. See Figure 9 (aluminum) or Figure 10 (stainless steel).
- Slide the IR module into the base and rotate it until the keyed holes are aligned, then press securely into place. See Figure 13.

NOTE

This assembly fits correctly only in one orientation. If it is not seating into place, rotate it 180° and try again.

- Screw the electronics mounting cover clockwise onto the electronics assembly as shown in Figure 11.
- For aluminum models, slide the outer filter assembly over the mirror assembly. The outer filter should be oriented with the solid portion toward the base of the unit. If it is not oriented correctly, the filter

assembly will not slide onto the unit. Slide the inner filter assembly into the outer filter assembly and rotate until it is seated securely, then fasten the two captive screws. See Figure 9.

For the stainless steel model, slide the stainless steel collar onto the base assembly, then slide the baffle onto the unit. Place the end cap on the baffle and rotate it until it is seated securely, then fasten the two captive screws using a 7/64 inch hex driver. See Figure 10.

- Calibrate the detector with 50% LFL of the gas that matches the calibration gas switch position following the instructions in the "Calibration" section of this manual.

TO REPLACE THE IR MODULE

Perform steps 1 through 3 in the "Disassembly and Cleaning Procedure" above to remove and replace the IR Module. Perform steps 11 through 14 to replace the IR module.

To Replace Base/Wire Assembly

- Disconnect external PointWatch wiring.
- Unscrew the base from its mounting (junction box, Infiniti, or Eagle).
- Install the new base by screwing it into the junction box.
- Connect the wires (refer to the "PointWatch Wiring" section of this manual).
- Reassemble the unit following the instructions in steps 11 through 14 in the "Disassembly and Cleaning Procedure" above.

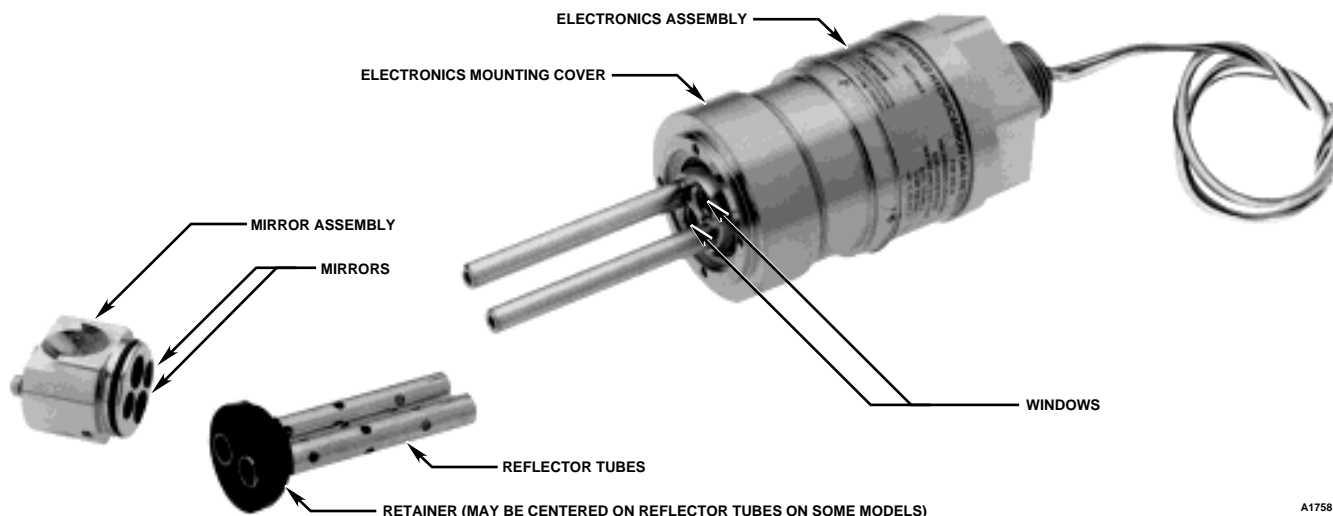


Figure 25—Stainless Steel PointWatch Detector Disassembly for Cleaning

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DEVICE REPAIR AND RETURN

The PIR9400 PointWatch IR Hydrocarbon Gas Detector is not designed to be repaired in the field. If a problem should develop, first carefully check for proper wiring, programming and calibration. If it is determined that the problem is caused by a mechanical or electronic failure, the device must be returned to the factory for repair.

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

Return all equipment transportation prepaid to the Minneapolis location.

OFFICE LOCATIONS

6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665 or (800) 765-FIRE
Facsimile (612) 829-8750
www.detrronics.com
E-mail: detrronics@detrronics.com
Cable Detronics
Telex 6879043 DETEL UW

Detector Electronics Corporation
13949 Williams Road
P. O. Box 1329
Glen Ellen, California 95442 USA
Telephone (707) 996-0196
Facsimile (707) 996-0197
Voice Mail Box Number 930

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

Detector Electronics Corporation
11210 Steeplecrest Drive
Suite 104
Houston, Texas 77065 USA
Telephone (713) 970-2646
Facsimile (713) 970-2667

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

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

Det-Tronics Deutschland
Kidde Deugra GmbH
Postfach 1457
Harkortstrasse 3
D-4030 Ratingen 1
GERMANY
Telephone 49 2102 4050
Direct 49 2102 405152
Facsimile 49 2102 405151
Telex 8589029

Detector Electronics Italy
Fenwal Italia S.p.A.
Viale De Gasperi, 44
20010 Bareggio (Mi)
ITALY
Telephone (39) 2 90 36 16 20
Facsimile (39) 2 90 36 16 27

Detector Electronics
108, Sai Prasad Complex
Opp. Khar Railway Station
Khar (W)
Bombay 400 052
INDIA
Telephone (91) 22 604 6142
Facsimile (91) 22 649 7775

Det-Tronics Benelux
Costerweg 5
NL-6702 AA Wageningen
THE NETHERLANDS
Telephone 31 (0)317 497625
Facsimile 31 (0)317 427308

117333 Moscow
 Gubkina St, d.3
 Gipronii Ran
 Kidde Graviner
 RUSSIA
 Telephone 7 (095) 135 5389
 Facsimile 7 (502) 222 1276

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

Detector Electronics Corporation
 C/O Kidde International Protection Systems
 143 Cecil Street
 #15-01 G. B. Building
 SINGAPORE 0106
 Telephone (65) 220-1355
 Facsimile (65) 226-6305

Det-Tronics Middle East
 P O Box 389
 Dubai
 U.A.E.
 Telephone 971 4 372498
 Facsimile 971 4 375088

Det-Tronics South America.
 Calle 72 con Avenida 3H
 Centro Comercial "Las Tinajitas"
 Local No. 18
 2do. Nivel
 Maracaibo, VENEZUELA
 Telephone 58-61-926885
 Facsimile 58-61-926525

Detector do Brasil
 Avenida Geremario Dantas 493
 Rio de Janeiro 22740-011
 BRAZIL
 Telephone (55) 21 392 9633
 Facsimile (55) 21 392 5568

ORDERING INFORMATION

POINTWATCH DETECTOR

Aluminum	006300-001
3/4 inch threads, 0 to 100%LFL, 4 to 20 ma	
Aluminum	006300-002
M20 threads, 0 to 100%LFL, 4 to 20 ma	
Stainless Steel	006300-003
3/4 inch threads, 0 to 100%LFL, 4 to 20 ma	
Stainless Steel	006300-004
M20 threads, 0 to 100%LFL, 4 to 20 ma	

JUNCTION BOXES

Short Cover Junction Box		
(solid cover - two person calibration)		
3/4 inch entries (2)		006414-001
20 mm entries (2)		006414-002
Tall Cover Junction Box		
(with window - one person calibration)		
3/4 inch entries (2)		006414-003
20 mm entries (2)		006414-004

CALIBRATION EQUIPMENT

PointWatch calibration kits consist of a sturdy carrying case containing two 3.6 cubic foot (103 liter) cylinders of specified gas, a regulator and pressure indicator, three feet of tubing, barbed nozzle for direct application to aluminum models and a calibration wind shield to contain the gas in high wind applications.

Methane, 50% LFL, 2.5% by volume	006468-001
Ethane, 50% LFL, 1.5% by volume	006468-002
Ethylene, 50% LFL, 1.35% by volume	006468-003
Propane, 50% LFL, 1.1% by volume	006468-004
Propylene, 50% LFL, 1% by volume	006468-005

SPARE PARTS

Description	Part Number
Hydrophobic Screen (for aluminum model)	006389-001
IR Module	SP006487-xxx
Base/Wire Assembly	
Aluminum, 3/4 inch threads	SP006298-001
Aluminum, 20 mm threads	SP006298-002
Stainless steel, 3/4 inch threads	SP006298-003
Stainless steel, 20 mm threads	SP006298-004
Threaded Plug	102790-001
(for aluminum model calibration port)	
Direct Inject Calibration Nozzle	102821-001
(for aluminum model calibration port)	
Nozzle Cap	102823-001
Calibration Magnet	102740-002
Silicone Grease for PointWatch threads	006680-001
(6 cc syringe)	
Grease for junction box threads	102868-001

ASSISTANCE

For assistance in ordering a system to meet the needs of a specific application, contact:

6901 West 110th Street
 Minneapolis, Minnesota 55438 USA
 Telephone (612) 941-5665 or (800) 765-FIRE
 Facsimile (612) 829-8750
 www.detronics.com
 E-mail: detronics@detronics.com
 Cable Detronics
 Telex 6879043 DETEL UW

APPENDIX

Factory Mutual Research Corporation (FMRC) Approval Description
(The following items, functions and options describe the FMRC approval.)

APPROVAL

PointWatch Infrared Hydrocarbon Gas Detector Models PIR9400A2L00 (006300-002) and PIR9400A3L00 (006300-001).

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

Performance verified for 0 to 100% LFL Methane-in-air atmospheres per FM 6320.

Model PIR9400 must be used in conjunction with an FMRC approved control device.

PointWatch Junction Box Part Number 006414-XXX

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

NOTE

Approval of the PointWatch and junction box does not include or imply approval of the apparatus to which the PointWatch may be connected and which processes the electronic signal for eventual end use.

ATTACHMENTS/OPTIONS

Aluminum or Stainless Steel Explosion-proof Enclosure.

1/2 inch NPT, 3/4 inch NPT, CM 20, CM 25, Pg 16 Conduit Entry Thread Types. (Metric straight thread types are for use in non-North American applications.)

Calibration Kit (006468-xxx)

50% LFL Calibration Gas (226166-xxx)

Calibration Nozzle (102821-001)

Regulator (162552-xxx)

Tubing (101678-007)

CALIBRATION

The PointWatch Model PIR9400 can be calibrated as a stand-alone device.

PointWatch Junction Box (006414-xxx)

NOTE

It is required that calibration of PointWatch be conducted as well as calibration of the system in which it is installed.