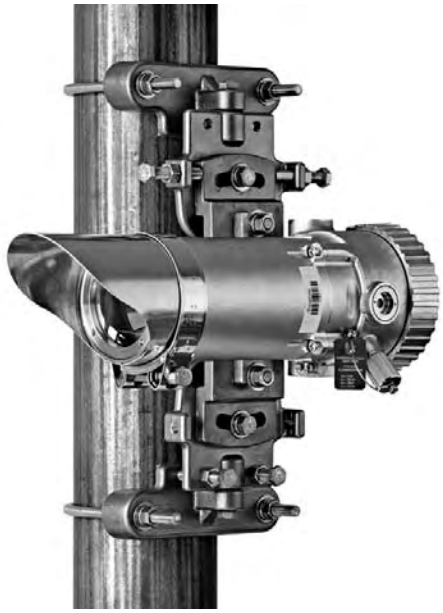
DET-TRONICS®

A UTC Fire & Security Company

Instructions 95-8556

Infrared Hydrocarbon Gas Detector
Open Path Eclipse™
Model OPECL



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INSTRUCTIONS

Infrared Hydrocarbon Gas Detector
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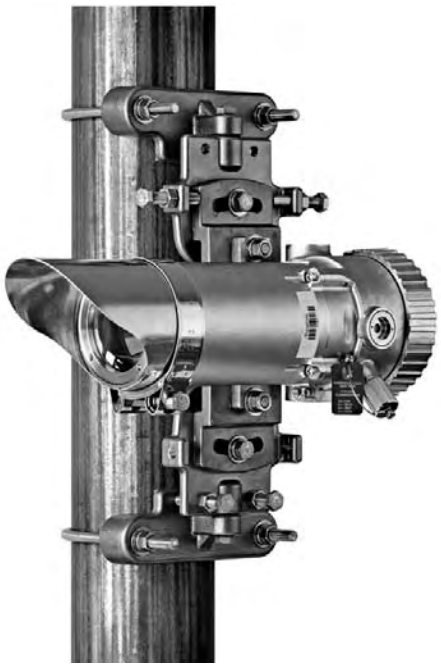
IMPORTANT

Be sure to read and understand the entire instruction manual before installing or operating the gas detection system. This product is intended to provide early warning of the presence of a flammable or explosive gas mixture. Proper device installation, operation, and maintenance is required to ensure safe and effective operation.



APPLICATION

The Open Path Eclipse™ Model OPECL is an open path infrared gas detection system that provides continuous monitoring of combustible hydrocarbon gas concentrations in the range of 0 to 5 LFL-meters, over a distance of 5 to 120 meters. Standard system outputs include an electrically isolated/non-isolated 4-20 mA dc current output, with HART communication and RS-485 MODBUS communication. Alarm and fault relays are available as an option.

The system consists of two stainless steel modules — a transmitter and a receiver, along with mounting fixture hardware. Both modules are powered from an external 24 volt DC supply. The receiver provides the measurement signal outputs, and is furnished with an onboard "status indication" LED and an internal magnetic calibration switch. The transmitter houses dual xenon flashlamps. Both modules are installed at approximately the same elevation and must be aligned to point directly at one another. No direct electrical interconnection between the two modules is required.

The Open Path Eclipse is ideal for use in harsh outdoor environments and is certified explosion-proof for use in Class I, Division 1 and Division 2 hazardous areas. It can be used as a stand-alone detector, or as part of a larger facility protection system using other Det-Tronics equipment such as the Eagle Quantum Premier Fire and Gas Detection/Releasing System.

OPERATION OVERVIEW

THEORY OF OPERATION

The OPECL transmitter module illuminates a direct linear path ending at the OPECL receiver module. As flammable hydrocarbon gases intersect the light beam between the two modules, certain IR wavelengths are absorbed by the gas, while other IR wavelengths are not. The amount of IR absorption is determined by the concentration of the hydrocarbon gas. A pair of optical detectors and associated electronics located in the receiver module measure the absorption. The change in intensity of the absorbed light (active signal) is measured relative to the intensity of light at a non-absorbed wavelength (reference signal). The microprocessor computes the gas concentration and converts the value into a 4 to 20 milliampere current output signal, which is then communicated to external control and annunciation systems. No filter wheel motors or other moving parts are utilized in either module.

The output signal is a 4-20 mA signal, which corresponds to 0-5 LFL-meters. To better understand the concept of LFL-meters, refer to Figure 1, which shows how three gas clouds of different size and concentration would produce the same output of 1 LFL-meter by the open path gas detection system.

NOTE

The system must be configured for less than 60% of the full scale measuring range, with consideration to the accepted gas cloud size and concentration.

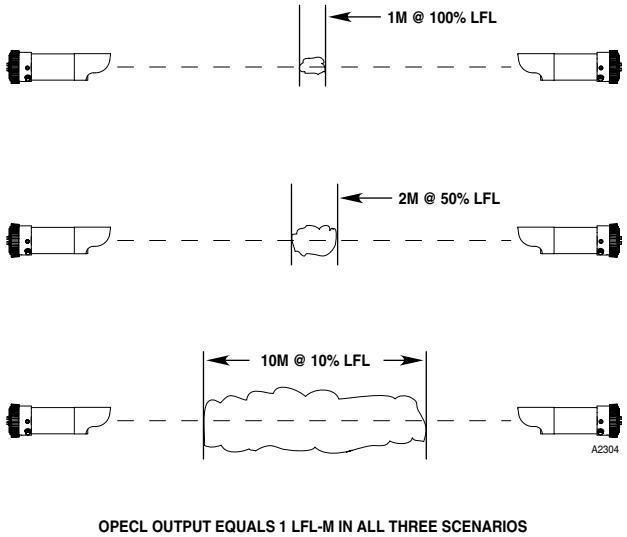


Figure 1—Detector Response to Three Gas Clouds of Different Size and Concentration

DETECTABLE GASES

OPECL is capable of detecting most hydrocarbon gases and vapors including methane, ethane, propane, butane, and propylene. Gas type and other operational parameters are selected via digital communications. The factory calibrated setting is methane.

STANDARD OUTPUT

A 4 to 20 mA current loop corresponding to 0 to 5 LFL-meters is provided for connection to analog input devices such as gas controllers, logic controllers, or distributed control systems (DCS). To convert the mA reading to LFL-meters, use the following formula:

$$\frac{\text{mA Reading} - 4}{16} \times 5 = \text{LFL-Meters}$$

OPTIONAL RELAYS

The Model OPECL can be furnished with a factory installed relay output board that provides two programmable alarm relay outputs and one fault relay output. All relays are sealed and provide form C (NO/NC) contacts. The high and low alarm relays are programmable and can be set for latching or non-latching operation. **When the high alarm relay is configured for non-latching operation, the detector must be connected to an auxiliary system that provides the latching function**. The low alarm cannot be set above the high alarm threshold. Alarm configuration can be done with the HART or MODBUS interface. The onboard multi-color LED indicates a LOW alarm condition via a flashing red color, and a HIGH alarm condition via a steady red color. The OPECL internal magnetic switch or HART Field Communicator can be used to reset latched alarms. A short-duration magnetic switch activation of 1 second will reset latched alarms. Holding the magnetic switch closed for 2 seconds will start the calibration sequence. The external calibration line will not reset latched alarm relays.

When the optional relay output board is installed, the OPECL receiver is certified for EEx d operation.

COMMUNICATION

The standard OPECL system provides an analog 4-20 mA signal output, with HART and RS-485 MODBUS serial communication from the receiver module.

RECORDING CAPABILITY

Non-volatile memory is provided to save the 10 most recent calibrations, alarm/fault events, and minimum/maximum operating temperature history. A real time clock is provided to record operating service time and to time stamp events. This information is accessible using HART and MODBUS communication.

DETECTION RANGE

The standard OPECL system can cover a range of 5 to 120 meters.

OPERATION

MODULE IDENTIFICATION

While the OPECL transmitter and receiver modules appear physically identical, each module is labeled as "transmitter" or "receiver" on the enclosure. The physical mounting requirements for both modules are generally identical. However, there are functional and electrical characteristic differences as identified in Table 1.

Table 1—Functional and Electrical Comparison of Transmitter and Receiver

Characteristic	Transmitter (Tx)	Receiver (Rx)
Functional Description	Contains primary and backup xenon flashlamps, and generates optical energy to enable hydrocarbon detection.	Contains opto-electronics, signal processing and output drivers, and diagnostic electronics.
Power Consumption	5.0 watts nominal @ 24 Vdc. 5.8 watts peak @ 24 Vdc.	6.0 watts nominal @ 24 Vdc (without relays). 6.4 watts nominal @ 24 Vdc (with relays).
Electrical Connections	2 power connections only. (+24 Vdc and –24 Vdc).	From 3-7 connections depending upon specific configuration (separate power and signal cables recommended).
Onboard HART Communication Port	Factory use only.	Connection to handheld HART communicator for system setup, commissioning, and diagnostics.
Onboard LED Indicator	Indicates normal, fault, and backup lamp operation status. Green indicates normal operation. Amber indicates operation in "back-up lamp" mode or other fault condition.	Indicates normal, alarm, fault, and calibration status. Green indicates normal operation. Blinking red indicates low gas alarm condition. Steady red indicates high gas alarm condition. Amber indicates operation in "back-up lamp" mode or system fault. Calibration status is indicated by a steady red indication after Calibration command. LED operation for fault status is non-latching. LED operation for gas alarms is configurable for latching/non-latching.
Magnetic Calibration Switch (See Figure 2 for switch location.)	Momentary activation overrides back-up lamp fault flash coding sequence, permitting normal receiver operation with back-up lamp.	Momentary activation provides reset function for latched alarm outputs. Activation for longer than 2 seconds will initiate zero calibration.
Factory Default Settings	No programmable options	Factory calibrated for methane, 0-5 LFL-meters full scale. See Table 2 for receiver factory default settings. HART communication is required to change the factory default settings.

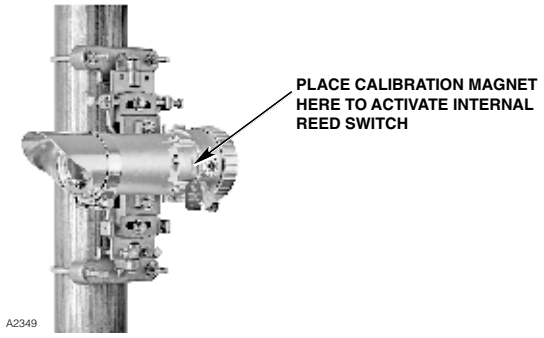


Figure 2—Location of Receiver's Internal Magnetic Switch

OPERATING MODES

The OPECL has four operating modes: warm-up, normal, alignment and calibrate.

Warm-up

Warm-up mode is entered upon application of 24 Vdc operating power. During warm-up, the 4-20 mA current loop output will indicate warm-up, the indicating LED is amber, and the alarm outputs are disabled. The warm-up mode lasts nominally two minutes after power-up.

Normal

After warm-up mode is completed, the device automatically enters the Normal mode, and all analog and alarm outputs are enabled.

Alignment

The OPECL modules must be properly aligned before normal operation is attained. There are two alignment procedures:

1. Basic Alignment requires the OPECL Alignment Kit.

2. Fine Alignment requires the OPECL Alignment Kit and a handheld HART Communicator.

Table 2—Factory Default Settings

	Default	Configurable Options
Gas Type	Methane	Methane, Ethane, Propane, Butane, Propylene, Special
Measurement Range (LFL-M)	0-5	0-2, 0-5
Low Alarm Threshold (LFL-M)	1	0.25 to 3
High Alarm Threshold (LFL-M)	2	1 to 3
Beam Block Delay	60 Seconds	3600 Seconds
Fault Mode	OPGD-Rx	PIR9400, User Defined

Calibrate

After alignment is completed, zero calibration is required. Span calibration of the OPECL is normally not required; however, the user has the option to verify proper calibration or to perform calibration procedures if necessary. It is recommended that the zero calibration procedure be performed annually. Refer to the "Calibration" section in this manual for details.

4 TO 20 MA CURRENT LOOP OUTPUT

OPECL provides a linear current loop output that is proportional to the detected gas level. Fault and calibration status are also indicated by this output.

The factory default for full-scale 5 LFL-meters output is 20 mA. MODBUS interfaces also have the ability to calibrate the 4 mA and 20 mA levels.

FAULT INDICATION

Faults and status conditions are indicated using the 4-20 mA analog signal output. Refer to Table 3. Signaling modes include two predefined and one user defined mode. OPGD-Rx mode (default) is available as well as a user defined mode for third party compatibility.

Table 3—Detector Status Conditions Indicated by Current Level

Status	**4-20 mA Level (±0.1)**	
	OPGD-Rx (Default)	**PIR9400**
Normal Gas: –0.5 to 5 LFL-M	2.4 to 20.0	2.4 to 20.0
Warmup	1.0	1.0
Zero Calibration	1.0	2.2
Calibration Fault	1.0	1.6
Beam Block	2.0	1.0
Tx Lamp Fault*	3.0	2.4
Calibrate Active at Startup	1.0	0.6
EE Error	1.0	1.2
Ref. ADC Saturated	1.0	0.2
Active ADC Saturated	1.0	0.4
24 VDC Fault	1.0	0.8
Zero Drift	1.0	2.4
Flash CRC Error	1.0	1.2
RAM Error	1.0	1.2
Over Range	20.4	20.4

*Device is still functional. Gas overrides this indication.

TRANSMITTER LAMP OPERATION

Dual xenon lamps illuminate the linear detection path from the transmitter to the receiver. Should excessive degradation of the light intensity occur, the transmitter automatically increases the light output of the bulbs. The receiver recognizes this condition by the change in flash pulse coding and responds by initiating a "Tx Lamp Fault" warning signal. Total system operation is maintained, with no loss of sensitivity or detection performance.

In this mode of operation, the following occur:

1. The indicator LED turns amber on both the transmitter and the receiver.

2. HART and MODBUS communication warn of a “Tx Lamp Fault” condition.

3. The 4-20 mA signal drops from a normal 4 mA to 3.0 mA in OPGD-Rx mode (default) or 2.4 mA in PIR9400 mode. The analog output value is overridden if the gas level exceeds 0.5 LFL-meters. All gas alarm signals will occur as normal.

Service should be arranged as soon as possible. A new transmitter module should be installed.

NOTE

The “Tx Lamp Fault” condition indicated by the 4-20 mA output can be acknowledged by applying a magnet to the transmitter module for at least 5 seconds. The coded flash sequence will then return to normal, which causes the 4-20 mA signal at the receiver module to also return to normal. The indicator LED on the receiver will return to green, however, the indicator LED on the transmitter will remain amber to annunciate the lamp fault condition. This condition will continue until power to the transmitter unit is cycled or the lamps no longer operate.

SPECIFICATIONS

INPUT VOLTAGE (Both Modules)—
24 Vdc nominal. Operating range is 18 to 30 Vdc.
Ripple cannot exceed 0.5 volts P-P.

POWER CONSUMPTION (Per Module)—

Transmitter

5.0 watts nominal @ 24 Vdc, 6.9 watts @ 30 Vdc.
5.8 watts peak @ 24 Vdc, 7.5 watts peak @ 30 Vdc.

Receiver Without Relays

6.0 watts nominal @ 24 Vdc, 7.6 watts nominal @ 30 Vdc.

Receiver With Relays

6.4 watts nominal @ 24 Vdc, 8.0 watts nominal @ 30 Vdc.

TRANSMITTER LAMPS
Two xenon flashlamps, field-replaceable module.

WARMUP TIME—
1 minute for transmitter. 30 seconds for receiver from power-up when correctly aligned.

CURRENT OUTPUT—
Linear 4 to 20 mA (isolated/non-isolated) rated at 600 ohms maximum loop resistance @ 24 Vdc operating voltage.

RELAY OUTPUTS (Optional)—
Available on Ex d approved models only.

ALARM RELAYS—
Low and High
Form C Type (NO/NC). De-Energized during Normal mode, Energized on Alarm.
Contact Rating: 5 amperes at 30 VDC.
Programmable for Latching or Non-Latching Operation.
Low Alarm: 0.25 to 3 LFL-meters
(default = 1 LFL-meters, Non-latching).
High Alarm: 1 to 3 LFL-meters
(default = 2 LFL-meters, Non-latching).
Alarm relays are programmable using HART or MODBUS communication.

FAULT RELAY—
Form C Type (NO/NC). Energized during Normal mode, De-Energized on Fault or loss of power.
Contact Rating: 5 amperes at 30 VDC.
Non-Latching Operation only — not programmable.

VISUAL STATUS INDICATOR—
Tri-color LED – Transmitter:
Green = Power on / OK
Amber = Fault / warmup.

Tri-color LED – Receiver:
Red = Low alarm, high alarm, or calibration
Green = Power on / OK
Amber = Fault / warmup.

ALARM RELAY SETPOINT RANGE—
Low Alarm: 0.25 to 3 LFL-meters (default = 1)
High Alarm: 1 to 3 LFL-meters (default = 2).

Alarm setpoint is programmable using HART or MODBUS communication.

DETECTION RANGE—
5 to 120 meters.

CALIBRATION—
OPECL systems are span calibrated for methane at the factory. Span calibration in the field is not required.

Zero calibration is accomplished in the field by one of three methods:

– On-board magnetic reed switch
– MODBUS communication
– HART communication.

RESPONSE TIME—
T90: <5 seconds.

ACCURACY—
±0.25 LFL-meters or ±10% of applied gas concentration, whichever is greater.

TEMPERATURE RANGE—
FM/CSA:
Operating: –40°C to +60°C (–40°F to +140°F).
Storage: –55°C to +85°C (–67°F to +185°F).

CENELEC:
Operating: EEx d [ib] IIC T5
–55°C to +60°C (–67°F to +140°F).
EEx de [ib] IIC T5
–40°C to +60°C (–40°F to +140°F).
Storage: –55°C to +85°C (–67°F to +185°F).

HUMIDITY—
5 to 99% relative humidity; designed for outdoor applications.

OPERATING PRESSURE—
91.5 - 105.5 kPA non-compensated.

MEASUREMENT RANGE—
0-5 LFL-meters.

INTERFERENCE RESISTANCE—
Immune to sun and flare radiation, up to 750 W/m^2 ≥ 3° to optical axis and common contaminants.

SELF-DIAGNOSTIC TEST—
Fail-Safe operation ensured by performing all critical tests once per second.

MODULE HOUSING MATERIAL—
316 stainless steel (CF8M).

CONDUIT ENTRY OPTIONS—
Two entries, 3/4 inch NPT or 25 mm.

HART COMMUNICATION PORT—
An intrinsically safe port is provided on the receiver for connecting HART devices:

- Rosemount Model 275 HART Communicator:
  EEx ia IIC T6.
- Rosemount Model 375 HART Communicator:
  EEx ia IIC T4.
- Maximum separation distance between receiver and communicator is 610 meters.

OPTICS PROTECTION—
Stainless steel brow provides a degree of protection against windblown dirt and rain. Heated optics mitigate against ice and dew formation.

WIRING—
Field wiring screw terminals are UL/CSA rated for up to 14 AWG shielded wire, and are DIN/VDE rated for 2.5 mm^2 wire. Screw terminal required torque range is 3.5–4.4 lb.-in. (0.4-0.5 N·m). Receiver can be wired using 3 or 4 wires. Transmitter requires two wires (power only).

CERTIFICATION—

CSA: Class I, Div. 1, Groups B, C & D (T4) with intrinsically safe output for HART communication in accordance with control drawing 007722-001 (see Appendix B).

Class I, Div. 2, Groups A, B, C & D (T4).

Type 4X.

FM: Class I, Div. 1, Groups B, C & D (T4) with intrinsically safe output for HART communication in accordance with control drawing 007722-001 (see Appendix B).

Class I, Div. 2, Groups A, B, C & D (T4).

Type 4X.

Conduit seal not required.

Performance verified in accordance with FM 6325, ANSI/ISA 12.13.04.

ATEX: CE 0539 Ex II 2 G
DEMKO 06 ATEX 141002X
EEx de [ib] IIC, T5.
T5 (T_{amb} –40°C to +60°C).
IP67.
(Transmitter, Receiver without relays)
--OR--
EEx d [ib] IIC, T5
T5 (T_{amb} –55°C to +60°C).
IP67.
(Receiver with relays)
Performance verified in accordance with EN 50241-1 and EN 50241-2.

Special Conditions for Safe Use ('X'):
The ambient temperature range is limited to –40°C to +60°C for the EEx de IIC T5 version, and –55°C to +60°C for the EEx d IIC T5 version.

The measuring function of the Infrared Hydrocarbon Gas Detector Model OPECL, as a safety device in accordance to Annex II Clause 1.5.5, 1.5.6 and 1.5.7 of the Directive 94/9/EC, is covered in this certificate.

CE: Conforms to:
Low Voltage Directive: 73/23/EEC,
EMC Directive: 2004/108/EC,
ATEX Directive: 94/9/EC.

IECEx: ULD 05.0001X
Ex d [ib] IIC T5 or
Ex de [ib] IIC T5.

INGRESS PROTECTION—
IP67
NEMA 4X

DIMENSIONS—

Module

Length: 11.5 inches (29 cm)
Diameter: 3.5 inches (9 cm) nominal
4.5 inches (11 cm) maximum

Mounting Plate

Height: 11.5 inches (29 cm)
Width: 6 inches (15 cm)
Designed to attach to a 4 inch nominal diameter pipe.

Refer to Figure 3 for mounted dimensions.

SHIPPING WEIGHT—
Transmitter with mounting plate: 35 pounds (16 kg)
Receiver with mounting plate: 35 pounds (16 kg)

WARRANTY—
2 year limited warranty from date of manufacture.

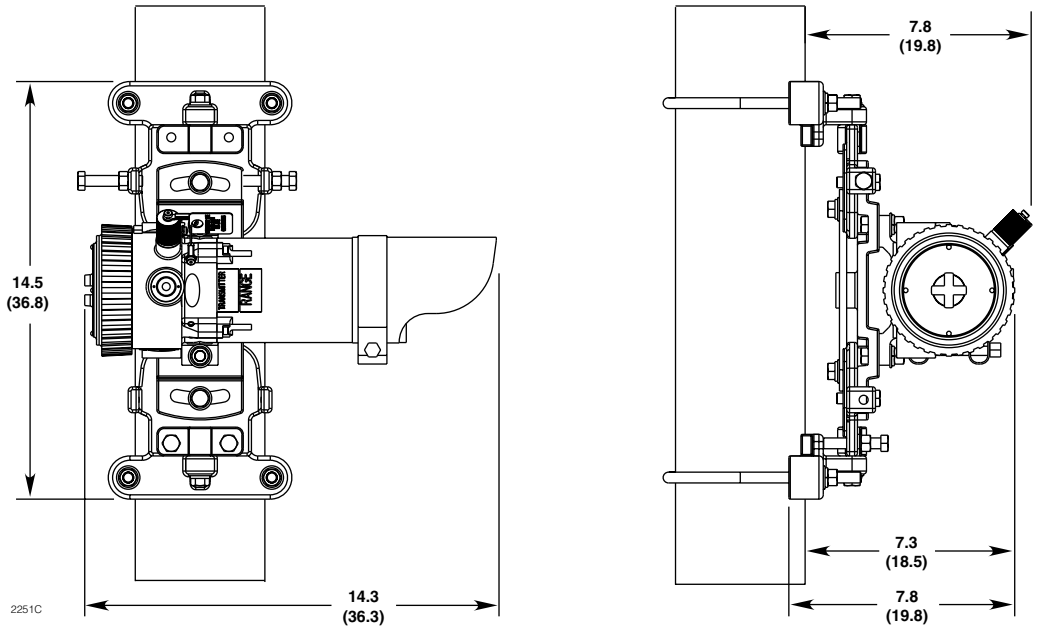


Figure 3—Mounted Dimensions of OPECL in Inches (cm)

IMPORTANT SAFETY NOTES

CAUTION

The wiring procedures in this manual are intended to ensure proper functioning of the system 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 the NEC as well as all local ordinances. If in doubt, consult the authority having jurisdiction before wiring the system. Installation must be done by a properly trained person.

CAUTION

This product has been tested and approved for use in hazardous areas. However, it must be properly installed and used only under the conditions specified within this manual and the specific approval certificates. Any device modification, improper installation, or use in a faulty or incomplete configuration will render warranty and product certifications invalid.

CAUTION

The system contains no user serviceable internal components. Service or repair should never be attempted by the user. Device repair should be performed only by the manufacturer or trained service personnel.

LIABILITIES

The manufacturer's warranty for this product is void, and all liability for proper function of the system is irrevocably transferred to the owner or operator in the event that the device is serviced or repaired by personnel not employed or authorized by Detector Electronics Corporation, or if the system is used in a manner not conforming to its intended use.

CAUTION

Observe precautions for handling electrostatic sensitive devices.

NOTE

The Open Path Eclipse is intended for detection of hydrocarbon vapors only. The device will not detect hydrogen gas.

NOTE

The terminal compartment for OPECL without relays is designed for either an increased safety "e" termination or a flameproof "d" termination of the supply cable. If a flameproof connection is chosen, then a CENELEC certified cable entry device certified to EN50018 must be used. The OPECL with relays requires Ex d cable entry devices only.

INSTALLATION

IDENTIFICATION OF VAPOR(S) TO BE DETECTED

It is necessary to identify the flammable vapor(s) of interest at the job site in order to determine the proper calibration gas setting for OPECL. In addition, the physical and fire hazard properties of the vapor, such as vapor density and flashpoint should be identified and used to assist in selecting the optimum detector mounting locations within the area. The detector must be installed by qualified personnel only, following local electrical equipment installation practices.

SYSTEM LOCATION CONSIDERATIONS

The OPECL system is designed for installation in hazardous industrial areas. Each module is normally installed using a solid vertical steel post or flat surface mounting adapter to support the weight of the module. The modules must be strategically located so that the hydrocarbon vapor(s) to be detected will intersect the light beam generated by the transmitter module. Dispersion characteristics and behavior of the vapor cloud resulting from a gas leak can be difficult to estimate due to the significant number of variables that exist at different applications. Identification of expected gas leakage source(s), leak scenario identification, and onsite leak simulation are the steps generally recommended to provide the most accurate means of identifying optimum system installation locations.

In all cases, the beam path and surrounding area should be kept free of obstructions that could block the infrared beam or hinder the free movement of air within the area. A clear beam path of 20 CM diameter or greater is required. The system is immune to the effects of exposure to both direct and reflected sunlight.

Avoid installation in areas with obstructions such as steam vents and plumes, smoke stacks and chimneys, walkways and personnel areas, splash and sprayed water, parking, loading, cranes, vehicle-related areas such as bus stops, road junctions, and vegetation such as trees, shrubs, grass etc.

Det-Tronics Field Service Engineering group routinely provides jobsite application surveys and analysis for customers, and their services are highly recommended if guidance on optimum installation locations is required. Additional guidance on the positioning of gas detectors for optimum coverage is contained in BS6959 and other national codes. Consult these codes of practice when determining where detectors are to be located.

Consideration of the following system location guidelines is also recommended:

LED Visibility

Select a mounting orientation where the Open Path Eclipse status indication LED is visible to personnel within the area.

Module Separation Distance

The transmitter and receiver modules must be installed directly facing each other across the area to be protected. Physical obstructions in the direct line of sight between the modules are not permitted. The overall line of sight distance between the modules must not fall outside the specified operating distance range (refer to "Specifications" for details).

Multiple System Installations

If multiple OPECL systems are to be installed, ensure that each receiver can view only the intended transmitter.

System Mounting Elevation

In all cases, the modules should be installed at the same elevation above grade to ensure that alignment capability and foul weather performance are not compromised. For detection of lighter than air vapors such as methane, installation of modules at approximately 2 meters above grade minimizes typical beam block conditions due to human activities, while enabling satisfactory detection capability. For detection of heavier than air vapors, installation of detectors below the expected leakage source is generally recommended unless nuisance beam blocks will occur at an unacceptable rate. In this case, identification and analysis of application specific conditions should be completed to determine the optimum installation elevation.

Sources of Heavy Contamination

Avoid locations where high levels of contaminants will persistently be blown onto the detector windows. Potential sources of heavy contamination include generator / turbine exhausts, flarestacks, drilling equipment, process vents / chimneys, etc. If sources of heavy contamination cannot be avoided, consider fitting extra shielding and/or providing good access for routine cleaning.

Snow and Ice in Ambients Below –20°C

The heated optics on both modules will melt snow or ice on the windows in ambient temperatures down to approximately –20°C. Below this temperature, snow or ice blown onto the window will not be melted until the ambient temperature rises. If longterm outdoor operation in very cold climates is intended, extra shielding / covers are recommended to prevent accumulation of snow and ice on the windows.

Deluge and Flooding

The modules are rated IP66 and will not be damaged by occasional deluge or flooding. However, during such an event, the unit will completely lose it's IR signal and will enter the "Beam-Block / Fault" state. In addition, when the deluge / flooding subsides, there is the possibility that contaminants will be left on the windows. Install the modules away from areas prone to deluge or flooding.

Areas Prone to Subsidence and Settling

Avoid installation of the modules in areas where problems with subsidence, settling or thawing of permafrost can occur or cause significant movement. If such locations cannot be avoided, the foundations of the mounting structure should be engineered to minimize any angular movements between the receiver and transmitter.

Areas Prone to Earthquakes

In the event of an earthquake, there is a chance that the modules will become misaligned with respect to each other. As long as the modules do not suffer from direct mechanical impact damage during an earthquake, they should remain undamaged by such events. After an earthquake, it is recommended that the system alignment be checked. Anti-vibration mounts are unlikely to be of any benefit and are not recommended.

Misalignment by Accidental Impact

Locations where there is a significant likelihood of equipment, personnel or moving objects accidentally knocking the modules out of alignment should be avoided where possible. If such locations cannot be avoided, measures including improved mechanical protection and warning notices should be considered.

MODULE MOUNTING RECOMMENDATIONS

OPECL modules must be affixed to a solid, non-vibrating structure capable of supporting a minimum of 100 lbs (46 kg), located within the system's rated separation distance.

When using a vertical post, the post should be absolutely stable and without vibration. In all cases, the maximum movement of the supporting structure under all anticipated operating conditions must be no more than ±0.25 degree. Square stock pole is recommended. If a post is set into the ground, the portion below grade should be set in concrete at least 1 meter deep. Mounting height should not exceed 4 meters.

Module mounting options include:

- A vertical post with a nominal outside diameter of 4.5" (11.43 cm). Acceptable outside diameter range is 4.0 to 5.0 inches. See Figure 4.
- For flat surface mounting, refer to Figure 5.

Mounting Sequence

1. Attach the OPECL module to the pan-tilt mounting plate and tighten the OPECL mounting bolts to 20 lb.-ft. minimum.

2. Install the lower mounting bracket.

3. Place the pan-tilt mounting plate on the lower bracket and install the upper mounting bracket. Tighten the mounting hardware to 20 lb.-ft. minimum. Tighten the alignment bolts/nuts hand tight only.

NOTE

Anti-seize material (provided) must be applied to the U-bolt threads at the time of installation to prevent galling.

24 VDC POWER SUPPLY REQUIREMENTS

Calculate the total gas detection system power consumption rate in watts from cold start-up. Select a power supply with adequate capability for the calculated load. Ensure that the selected power supply provides regulated and filtered 24 Vdc power for the entire system. If a back-up power system is required, a float-type battery charging system is recommended. If an existing source of 24 Vdc power is being utilized, verify that system requirements are met.

NOTE

If disconnection of power is required, separate disconnect capability must be provided.

WIRING CABLE REQUIREMENTS

Always use proper cabling type and diameter for input power as well as output signal wiring. 14 to 18 AWG shielded stranded copper wire is recommended.

Always install a properly sized master power fuse or breaker on the system power circuit.

NOTE

The use of shielded cable in conduit or shielded armored cable is required for ATEX conformance. In applications where the wiring is installed in conduit, dedicated conduit is recommended. Avoid low frequency, high voltage, and non-signaling conductors to prevent nuisance EMI problems.

CAUTION

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

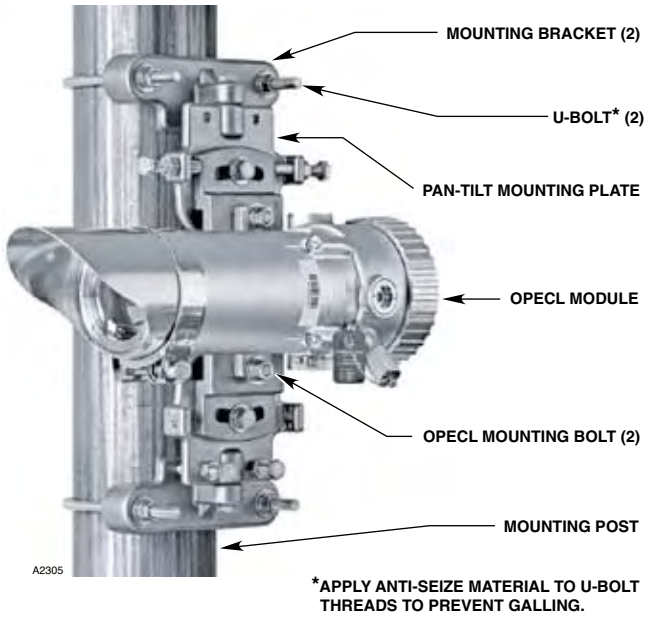


Figure 4—OPECL Gas Detector Mounted to Vertical Post

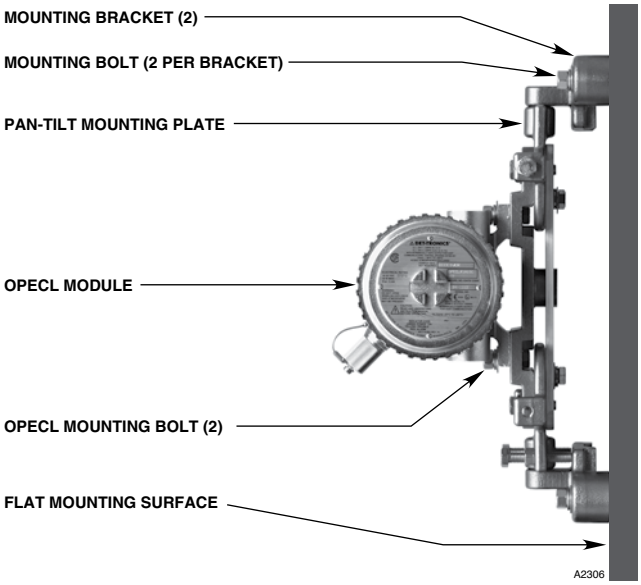


Figure 5—OPECL Gas Detector Mounted to Flat Surface

POWER WIRING SIZE AND MAXIMUM LENGTH

1. To ensure proper operation, OPECL power terminals (terminals 1 and 2 for Rx and Tx) and 4-20 mA terminals (terminals 6 and 7 for Rx) must receive 18 Vdc minimum. 24 Vdc is recommended. Terminals 1 and 4, and terminals 2 and 5 on the OPECL Rx are internally connected (see wiring diagrams).

2. Always determine voltage drops that will occur to ensure that 24 Vdc is delivered to the OPECL.

3. Normally, nothing smaller than 18 AWG (1.0 mm^2) is recommended by Det-Tronics for OPECL power cabling.

Wire size requirements are dependent upon power supply voltage and wire length.

The maximum distance between the OPECL detector and its power supply is determined by the maximum allowable voltage drop for the power wiring loop. If the voltage drop is exceeded, the device will not operate. To determine the maximum power loop voltage drop, subtract the minimum operating voltage for the device (18 Vdc) from the minimum output voltage of the power supply.

To determine the actual maximum wire length:

1. Divide the maximum allowable voltage drop by the maximum current draw of the OPECL (0.35 A),

2. Divide by the resistance of the wire (ohms/foot value available in wire manufacturer's specification data sheet),

3. Divide by 2.

For example: Consider an installation using 18 AWG wiring with a power supply providing 24 Vdc.

Power supply voltage = 24 Vdc,
OPECL minimum operating voltage = 18 Vdc

24 – 18 = 6 Vdc

Maximum Voltage Drop = 6
Maximum Current = 0.35 A
Wire Resistance in Ohms/Foot = 0.006523

6 ÷ 0.35 ÷ 0.006523 ÷ 2 = 1314 feet

OPTIONAL RELAYS

Optional relay contacts are "dry", meaning that the installer must provide the voltage to the common terminal of the relay output.

AC voltage should not be switched directly using the OPECL relays. The use of an external relay is required if AC voltage must be switched by the OPECL relays.

In order to change alarm relay settings from the factory default settings, it is recommended to utilize a HART Field Communicator. Contact the factory for further assistance.

The relay board must temporarily be removed from the OPECL termination compartment to connect the relay output field wiring cables. After the relay wiring is connected, re-install the relay board using the three captive screws. Refer to Figure 6.

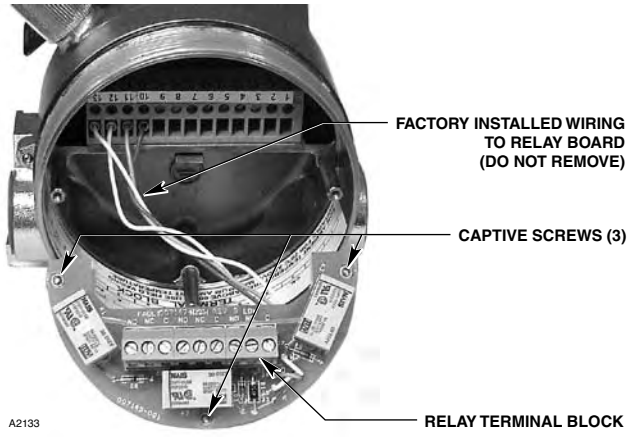


Figure 6—OPECL Wiring Termination Compartment with Optional Relay Board Removed

WIRING PROCEDURE

For systems using conduit, modules must be wired using a short piece of suitable flexible conduit to allow optical alignment of the modules. Ensure that all cables are terminated properly. Open Path Eclipse screw terminal torque range is 3.5–4.4 lb.-in. (0.4–0.5 N·m).

Cable shield, if used, should be properly terminated. If not terminated, clip the shield wire off short and insulate it within the detector housing to prevent the shield wire from accidentally contacting the detector housing or any other wire.

Figure 7 shows the wiring terminal strip located inside the detector's integral junction box.

Figure 8 shows the wiring terminal configuration for the OPECL transmitter. (The transmitter requires only operating power.)

Figure 9 shows the wiring terminal configuration for the OPECL receiver without relays.

Figure 10 shows the wiring terminal configuration for the OPECL receiver with relays.

Figures 11 through 14 show the 4 to 20 mA output of the OPECL receiver in various wiring schemes.

NOTE

The OPECL housing must be electrically connected to earth ground. A dedicated earth ground lug is provided for this purpose.

NOTE

For proper HART communication, it is required that an analog signal loop resistance of 250 to 500 ohms be present at the receiver analog output terminals. See Figure 15 for benchtop test wiring. For OPECL systems using HART communication, the maximum wiring distance is 2,000 feet.

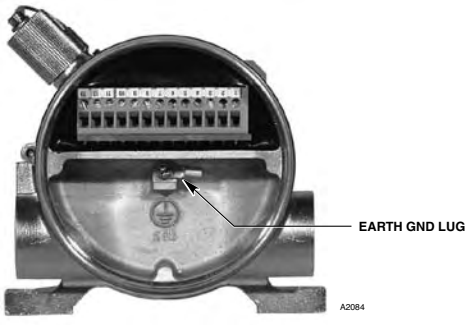


Figure 7—Terminal Strip Located Inside Wiring Compartment

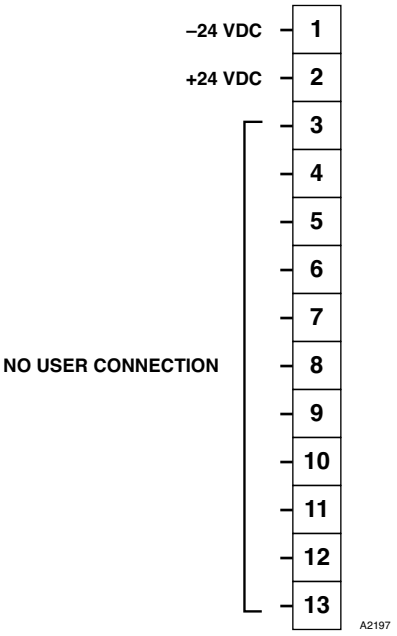


Figure 8—Transmitter Wiring Terminal Identification

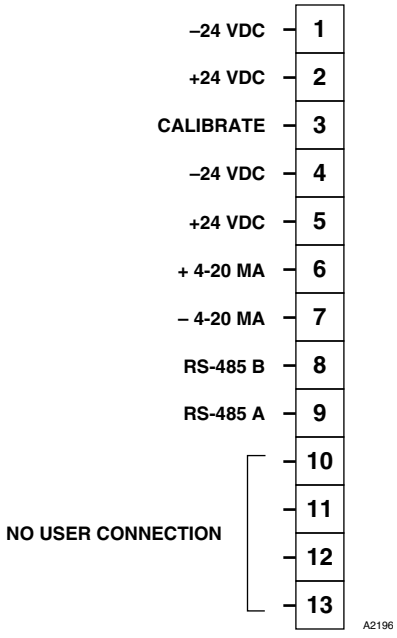


Figure 9—Wiring Terminal Identification for OPECL Receiver without Relays

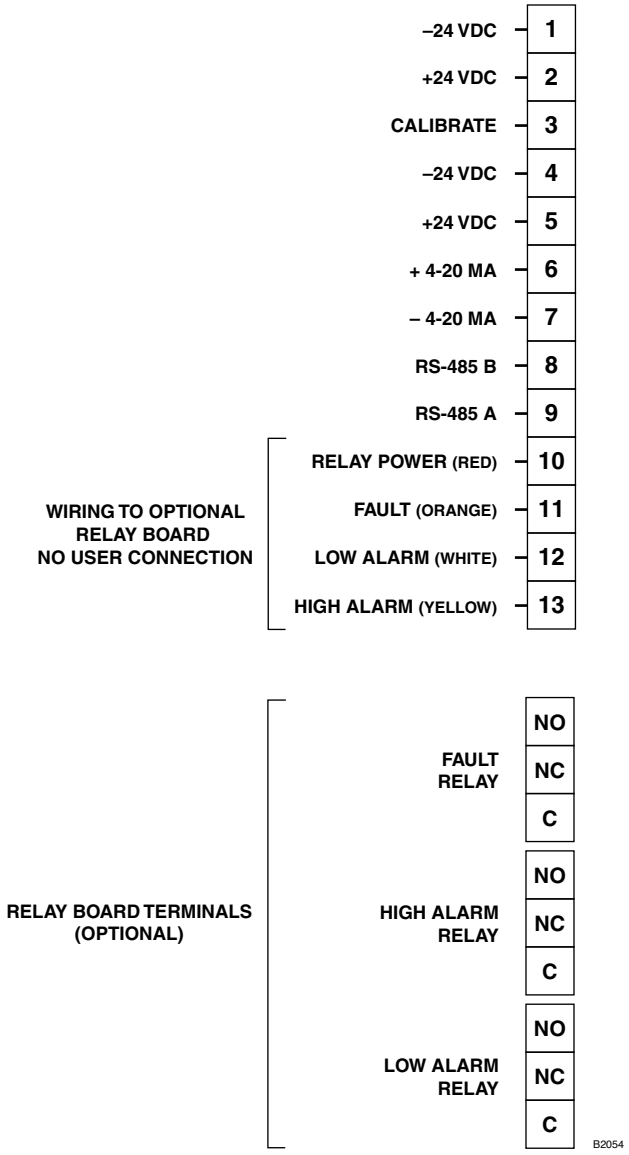
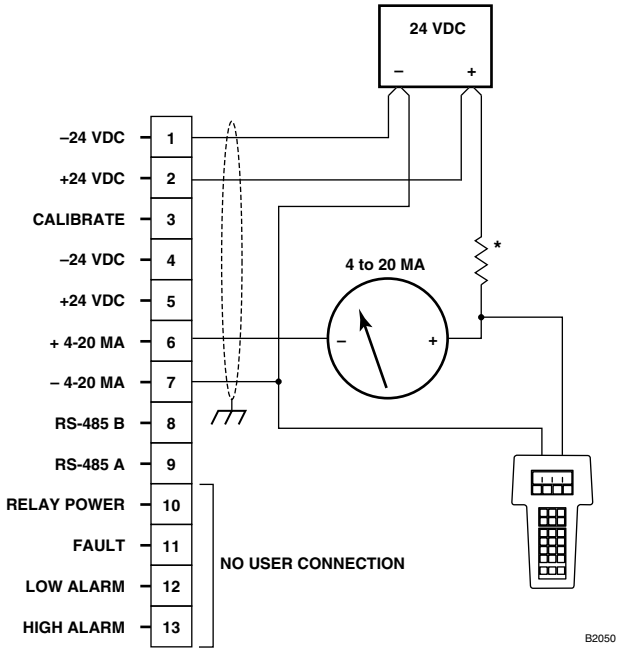
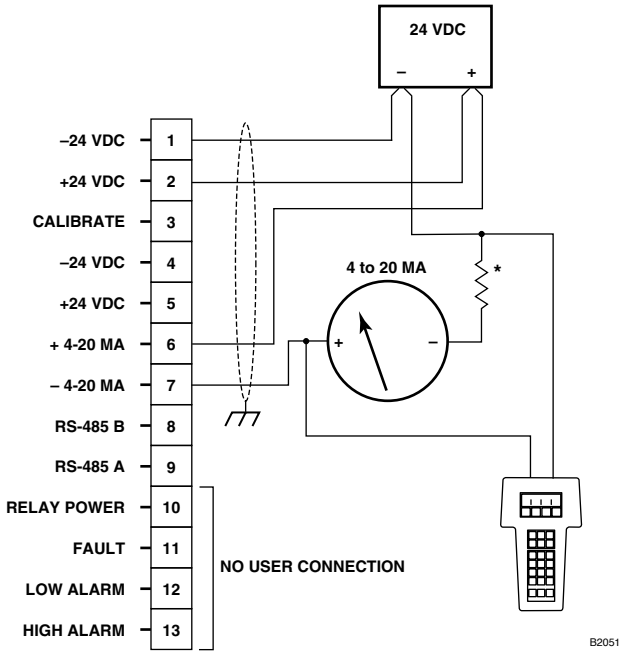


Figure 10—Wiring Terminal Identification for OPECL Receiver with Relays



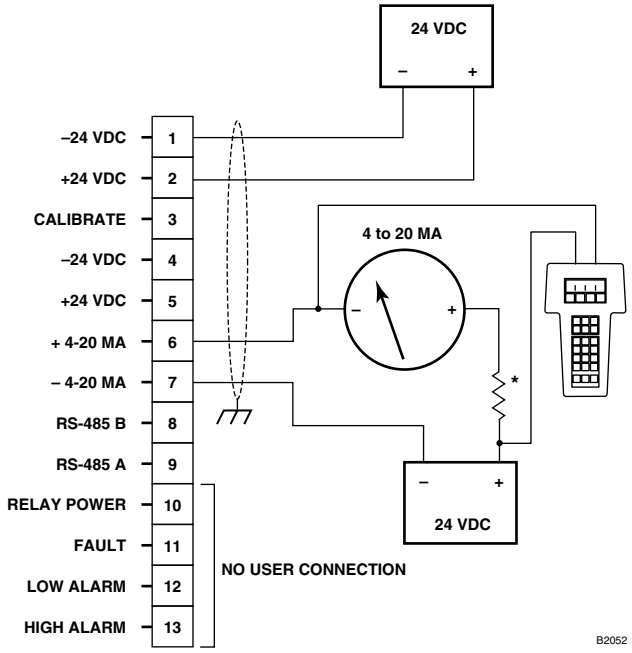
*TOTAL LOOP RESISTANCE = 250 OHMS MINIMUM, 600 OHMS MAXIMUM.

Figure 11—Detector Wired for Non-Isolated 4 to 20 ma Current Output (Sinking)



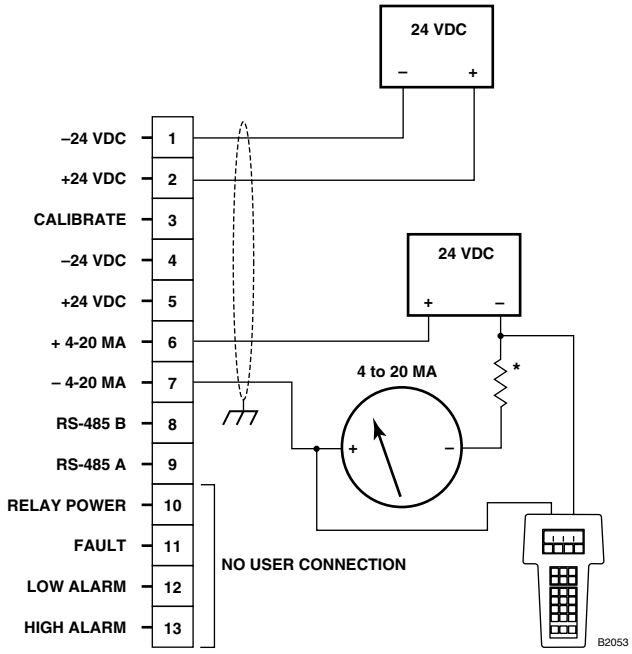
*TOTAL LOOP RESISTANCE = 250 OHMS MINIMUM, 600 OHMS MAXIMUM.

Figure 12—Detector Wired for Non-Isolated 4 to 20 ma Current Output (Sourcing)



*TOTAL LOOP RESISTANCE = 250 OHMS MINIMUM, 600 OHMS MAXIMUM.

Figure 13—Detector Wired for Isolated 4 to 20 ma Current Output (Sinking)



*TOTAL LOOP RESISTANCE = 250 OHMS MINIMUM, 600 OHMS MAXIMUM.

Figure 14—Detector Wired for Isolated 4 to 20 ma Current Output (Sourcing)

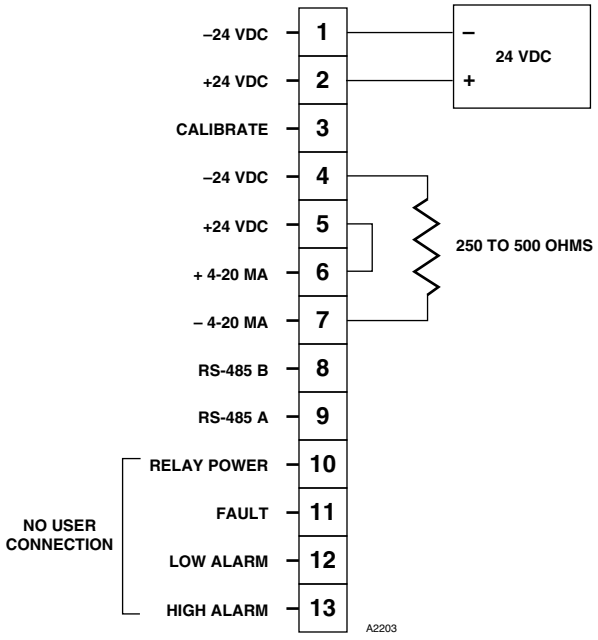


Figure 15—Wiring the Model OPECL for Benchtop Testing/ Programming Using HART Protocol

STARTUP

When the OPECL is installed and wired as described in the "Installation" section, it is ready for commissioning. If the application requires that specific changes be made to the factory settings, HART communication will be required.

NOTE

Ensure that alarm devices are bypassed during commissioning.

NOTE

The safety function (gas input-to-actuation/ notification) must always be verified upon completion of installation and/or modification.

ALIGNMENT

OVERVIEW

The OPECL modules must be properly aligned before normal operation will be attained. Alignment consists of a basic alignment stage and a fine alignment stage:

1. **Basic Alignment Procedure**. This procedure requires the Telescope Alignment Kit p/n 009104-001. It does not require a handheld HART Field Communicator.

2. **Fine Alignment Procedure**. This procedure requires a handheld HART Field Communicator such as the Emerson Model 375 with the OPECL Device Descriptor (DD) software driver (refer to Appendix A). The fine alignment procedure is required whenever maximum optical signal strength is required.

NOTE

Basic Alignment must be successfully completed before attempting Fine Alignment.

NOTE

In order to remain within ±10% of the measuring range, the maximum misalignment is ±0.05 degrees.

BASIC ALIGNMENT PROCEDURE

Equipment Required

1. Properly installed and powered OPECL system (transmitter and receiver). Easy access to both modules is highly recommended.

2. Telescope Alignment Tool p/n 009104-001. The telescope alignment tool is recommended for use in commissioning all OPECL systems. The following instructions cover the use of the Telescope Alignment Tool.

3. Calibration Magnet.

4. For installations with module separation distances between 5 and 30 meters, the range reduction aperture kit (supplied) is required. Refer to "Aperture Kit for Short Range Applications" section in this manual for details.

Remove operating power from the OPECL Transmitter, and then complete the following steps:

1. Ensure that the system modules are located within the specified separation range and securely fixed to the support structures. Bypass all external gas alarm devices that are connected to the receiver outputs.

2. Ensure that the system modules are installed with their windows at approximately the same height above grade. Each module should be roughly aligned to face in the direction of the other module.

3. Loosen the locking nuts on the alignment adjuster bolts so that the bolts can be freely tightened or loosened for alignment purposes. Loosen, then hand-snug the two vertical alignment locking nuts. See Figure 16. At this point, the unit should be easily adjustable in the vertical and horizontal positions with little or no adjustment slop.

4. Hand-tighten all four adjustment bolts until the alignment plate is stabilized.

5. Loosen the sun shade assembly and slide it toward the rear of the transmitter module.

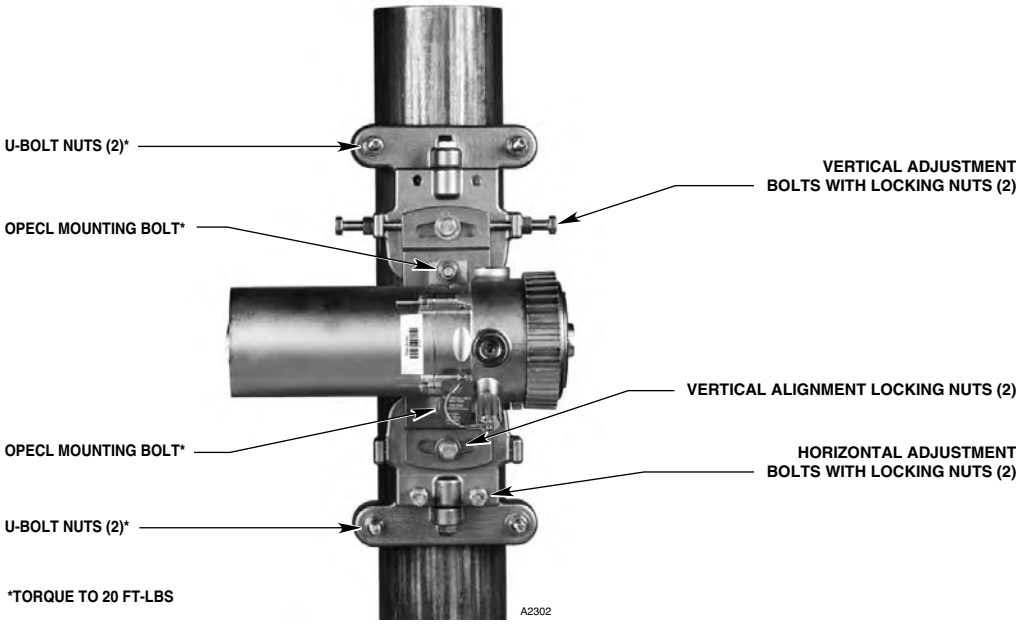


Figure 16—OPECL Mounting and Alignment Hardware

6. Install the Telescope Alignment Tool onto the transmitter module by inserting the captive thumbscrews into the threaded holes on the faceplate. See Figure 17. Ensure that the telescope is properly attached, that the eyepiece is accessible, and that the thumbscrews are completely tightened.

7. Slowly adjust the transmitter module up/down as required using the vertical adjustment bolts until the telescope cross hairs are centered as close as possible to dead center on the window of the receiver module. Tighten the vertical alignment locking nuts so that no movement will occur.

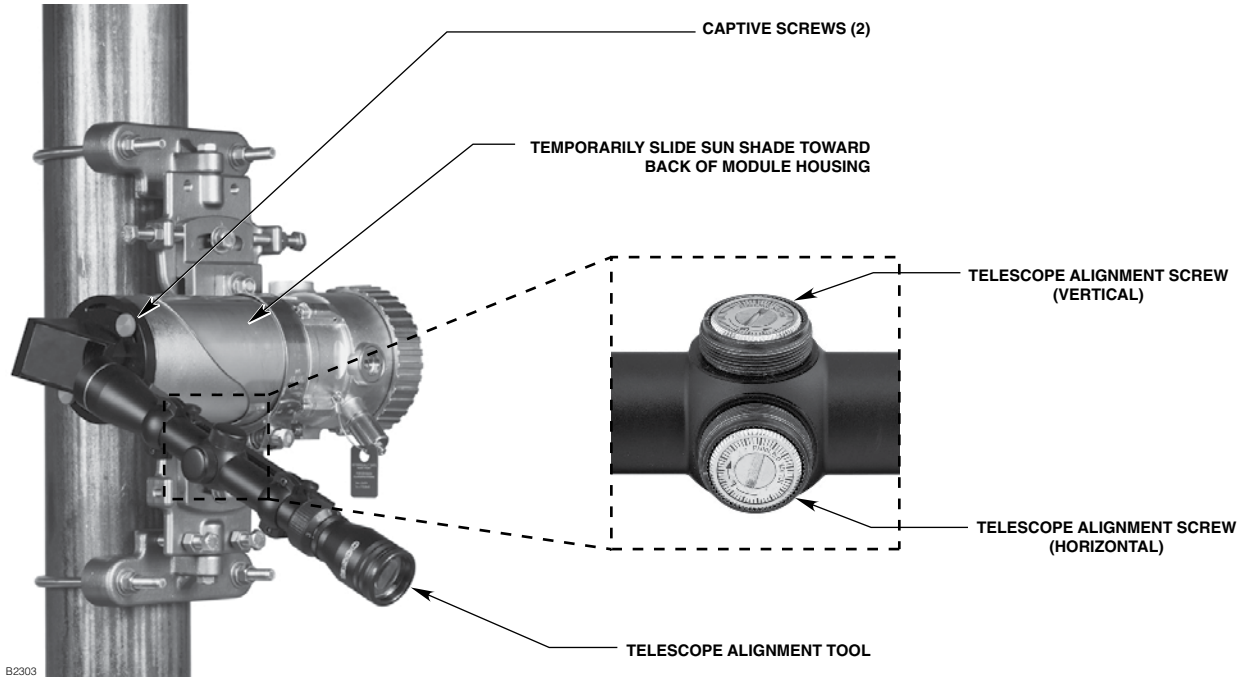


Figure 17— OPECL with Telescope Alignment Tool Installed

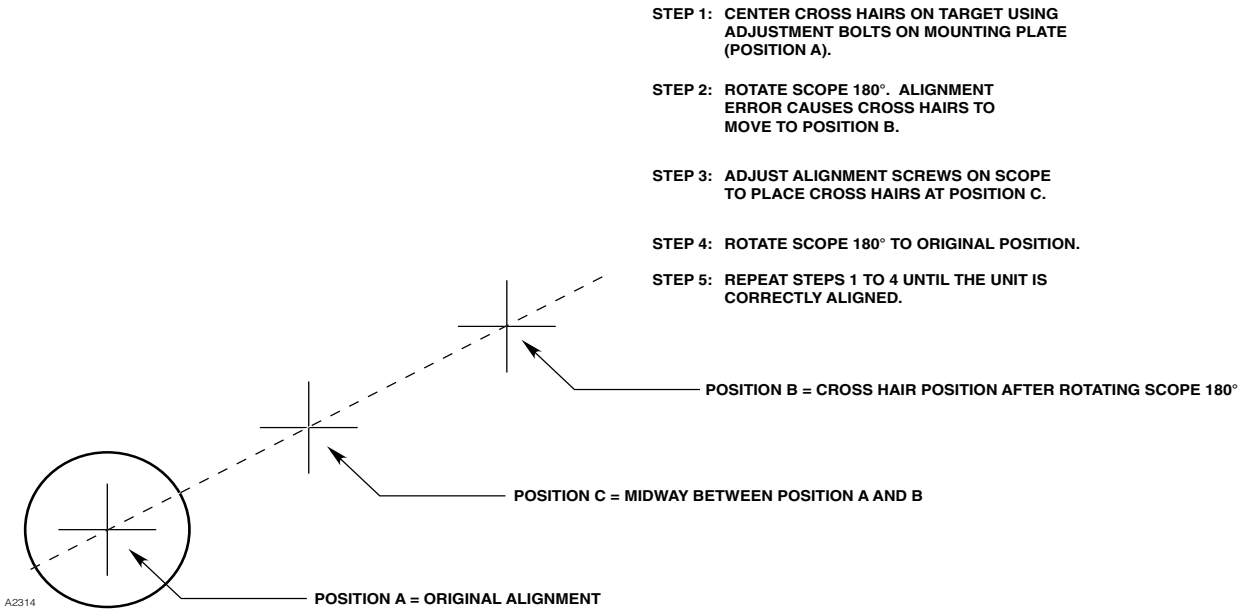


Figure 18—OPECL Alignment using the Telescope Alignment Tool

8. Slowly adjust the transmitter module left/right as required using the horizontal adjustment bolts until the telescope cross hairs are centered as close as possible to dead center on the receiver module window. Tighten the horizontal adjustment bolts and locking nuts so that no movement will occur.

9. Rotate the telescope alignment tool by 180° and verify that the cross hairs are in the same position. If the cross hairs are not in the same position, the telescope alignment screws must be adjusted as follows:

   A. Adjust the telescope alignment screws until the cross hairs are midway between the original position (center of receiver window) and the current position (after the scope was rotated 180°). See Figure 18.

   B. Return the scope to its original position (rotate 180°) and repeat steps 7 through 10 until correct alignment is achieved.

NOTE

No further adjustments are required when the cross hairs are centered on the receiver window with the scope in both 180° positions.

10. Repeat the alignment procedure for the receiver module (steps 6 to 9).

11. Remove the Telescopic Alignment Tool and re-install the sun shades.

12. Bypass all external gas alarm devices that are connected to the receiver outputs, and then apply 24 Vdc power to the modules.

13. Upon completion of warm-up mode (approximately 2 minutes or less), the receiver may display either a green LED (normal mode) or a red LED (alarm mode). An alarm condition is not abnormal and will be cleared by performing a zero calibration.

14 For installations with module separation distances between 5 and 30 meters, install the appropriate aperture as described in the "Aperture Kit for Short Range Applications" section.

15. Perform a zero calibration. (Refer to “Zero Calibration” in the Calibration section of this manual.) Any faults or alarms that may be present as a result of the alignment process will be cleared.

16. When Basic Alignment and Zero Calibration have been successfully completed, a green LED should be displayed on the Rx module and the analog signal output level should be 4.0 milliamperes.

APERTURE KIT FOR SHORT RANGE APPLICATIONS

The Short Range Aperture Kit enables successful application of the OPECL gas detector at distances of approximately 5 to 30 meters. The kit is available in Delrin plastic (included with OPECL receivers) or optional stainless steel.

Two aperture sizes are provided:

- The 0.6" diameter (15 mm dia.) aperture is used for system separation distances of approximately 5 to 15 meters.
- The 1.2" diameter (30 mm dia.) aperture is used for system separation distances of approximately 15 to 30 meters.

NOTE

System separation distances greater than 30 meters should not require apertures.

Procedure for System Commissioning Using the Apertures

1. Align the OPECL system using the Basic Alignment procedure. At the completion of this alignment, the output signal at the Receiver will indicate a fault condition as a result of signal saturation (1.0 mA in OPGD-Rx mode or 0.2 / 0.4 mA in PIR9400 mode).

2. Attach the aperture to the front of the OPECL **Transmitter** module using the captive screws provided.

   NOTE

   The plastic model uses a one-piece aperture without holder. The stainless steel model uses a holder with interchangeable aperture inserts.

   Use the larger aperture for separation distances from 15 to 30 meters and the smaller aperture for distances from 5 to 15 meters. For distances around 15 meters, start with the larger aperture. An output signal of 2.4 mA or higher indicates proper detector operation (no fault condition). If the signal is still saturated (1.0 mA in OPGD-Rx mode or 0.2 / 0.4 mA in PIR9400 mode), the smaller aperture is required.

3. Perform a zero calibration. After performing the zero calibration, the Receiver module should display a normal condition (green LED color) and a steady 4 mA output.

RECOMMENDATIONS FOR USING THE HART FIELD COMMUNICATOR

- Ensure that the HART communicator is certified for use in classified areas.
- The HART communication device must include the OPECL device descriptor (DD) software menu. The use of HART communication devices without the proper DDs may establish generic mode HART communication, but will not enable proper operation with OPECL. Refer to the HART Appendix for additional information.
- A minimum level of understanding with regard to the operation and navigation of the HART communicator is required. Please refer to the appropriate HART communicator instruction manual for basic operating instructions if required. Additional information on the use of the HART communicator is provided within the HART Appendix in this document.
- For proper HART communication to occur, it is required that a 250-500 ohm resistive load be present in the OPECL analog 4-20 mA signal loop output.

NOTE

During alignment adjustment, the HART field communicator may occasionally display a message stating "Non-zero status codes found. Ignore the next 50 occurrences?" When this occurs, enter "Yes", and continue the Fine Alignment procedure.

FINE ALIGNMENT ADJUSTMENT USING PARTIAL BEAM BLOCK TOOL

The Partial Beam Block Tool allows fine tuning of Model OPECL alignment and should be used when the application requires maximum signal strength and low tolerance to potential output drift. Fine tuning the OPECL alignment in this manner ensures that it will operate with maximum immunity from zero drift and false readings.

1. Perform the basic alignment procedure using the Telescope Alignment Tool.

2. Perform a zero calibration on the OPECL receiver. (Zero calibration should be repeated after each alignment adjustment.)

3. Remove the thermal shield from the front of the receiver.

4. Connect the handheld HART communicator to the OPECL receiver module's onboard HART communication port.

NOTE

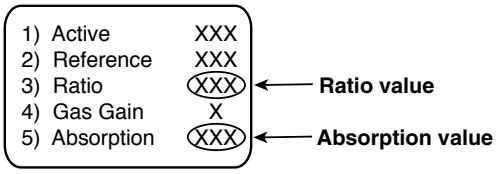
If a HART handheld communicator is not available, the alignment procedure can be performed in a limited way by monitoring the 4-20 mA output. (This method is only partially effective due to the deadband built into the 4-20 mA output.) If the partial beam blocks result in output deflection greater than 4.00 mA +/- 0.1, alignment should be adjusted to eliminate the deflection. The OPECL's status LED can also be observed. The LED should remain green with the beam block in any position.

5. Turn on the HART communicator and check for OPECL device recognition. When HART communication is established, the OPGD Rx Root Menu will be displayed on the communicator display.

6. From the Root Menu, select the Status Menu (selection #2).

7. From the Status Menu, select the Sensor Information Menu (selection #3).

8. The Sensor Information Menu will display the following:



(Absorption and Ratio are the readings of interest while performing the alignment procedure.)

NOTE

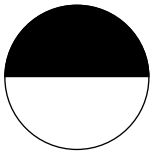
Make alignment adjustments in very small increments. After an adjustment is made, wait for at least 10 seconds for the output level to stabilize. Continue making adjustments, if necessary, until the correct level is achieved.

9. Observe the **Absorption** reading while performing the following steps:

   A. Perform a series of partial beam blocks to half of the receiver lens using the partial beam block tool (009762-001). Block the top, right, bottom, and left halves of the lens individually. Verify that the Absorption level displayed on the HART communicator is as close to zero as possible.

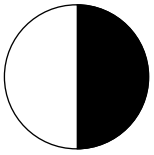
   B. If an absorption reading greater than +/- 5% is realized, fine adjustment is necessary to achieve optimal alignment. See Figure 19.

BEAM BLOCK TOP



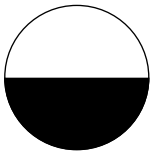
If this block causes Absorption to increase > 5%, move receiver down.

BEAM BLOCK RIGHT



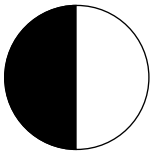
If this block causes Absorption to increase > 5%, move receiver left.

BEAM BLOCK BOTTOM



If this block causes Absorption to increase > 5%, move receiver up.

BEAM BLOCK LEFT



If this block causes Absorption to increase > 5%, move receiver right.

Figure 19—OPECL Beam Block Diagram

C. If adjustments to the receiver were necessary, perform a zero calibration and then repeat the sequence of partial beam blocks. Repeat the adjust, zero calibration, and recheck process until no adjustments to the receiver are necessary, and the partial beam block has little or no effect on the receiver under test.

10. With the beam block tool removed, the **Ratio** reading must be between 0.65 and 0.95. If a reading over 1.0 is indicated, check to make sure that no other transmitters, IR sources, or potential reflections are within view of the receiver. It is possible for multiple transmitters to be viewed by a single receiver. Although each receiver is electronically synchronized to its transmitter, zero drift and/or false gas readings are possible if the rogue IR source continues in the event of a beam block on the primary transmitter. If this situation occurs, a ratio of over 1.0 will be realized. Det-Tronics recommends eliminating any condition that causes a receiver to display a ratio of over 1.0.

11. When correct alignment is achieved, tighten all mounting bolts to 20 lb-ft minimum using care not to disturb the alignment. The telescope can be used during this step to give a visual indication to judge the effects of the tightening process on the alignment. Check the alignment one final time using the beam block tool to verify that the alignment did not change as a result of tightening. If necessary, fine tune the alignment.

12. Upon completion, the OPECL receiver should produce a 4 mA output signal and a green LED indication. If not, ensure that the device has been zero calibrated.

13. Proper operation can be confirmed by bypassing all system alarms and placing an optical test film (sold separately) into the light beam and checking for the appropriate signal output level on the HART field communicator process menu screen. The Low Alarm Test Film (p/n 007902-002) should produce an output of 1.1 to 1.5 LFL-Meters. The High Alarm Test Film (p/n 007902-003) should produce an output of 1.9 to 2.5 LFL-Meters. The alarm condition should clear when the film is removed from the beam.

14. Confirm proper operation by completely blocking the light beam with a solid object such as a piece of cardboard until a beam block fault is generated.

15. Replace the HART port cover and the thermal shield.

16. Restore all system alarms to normal operation.

GAIN LEVEL CHECK (Optional)

It is necessary to complete the alignment procedure before checking the gain level. A handheld HART communication device such as the intrinsically-safe Emerson Model 375 HART communicator is required to check the gain.

Procedure

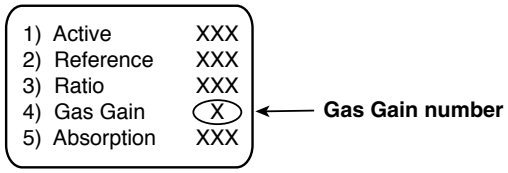
1. Connect the handheld HART communicator to the receiver module's onboard HART communication port.

2. Turn on the HART communicator and check for OPECL device recognition. When HART communication is established, the OPGD Rx Root menu will be displayed on the communicator display.

3. From the Root menu, select the Status Menu (selection #2).

4. From the Status Menu, select the Sensor Information Menu (selection #3).

5. The Sensor Information Menu will display the following screen.
6. Observe the Gas Gain level indicated on the Sensor



Information Menu screen.

7. Table 4 can be used as a guideline for new installations to assess Gas Gain level with proper alignment.

Table 4— Expected Gas Gain Settings for OPECL

Distance (m)	Gain Setting
5	1-3*
20	1*
40	1 - 2
60	2
80	2 - 3
100	3
120	3 - 4

*Use the Aperture Kit to get desired gain settings.

CALIBRATION

CALIBRATION OVERVIEW

Although routine calibration of the OPECL is normally not required, the device supports non-intrusive field zero calibration capability. Span calibration is not required.

Zero Calibration

Zero Calibration is a one-step process consisting of clean air (zero) condition adjustment only, which is performed automatically by the device. This procedure adjusts the "clean air" signal output only, and is normally used if the 4 milliampere signal level has drifted. The cause of drift is typically due to the presence of background gas during calibration. Ensure that the optical path is clear of hydrocarbons prior to calibration initiation to ensure an accurate zero (clean air) condition.

IMPORTANT CALIBRATION NOTES

NOTE

Ensure that the detector has been operating for at least two hours before calibrating.

NOTE

Always ensure that the OPECL optics are totally free of all hydrocarbons before initiating calibration.

CALIBRATION INITIATION

Calibration may be initiated by any of the following means:

- The onboard magnetic calibration switch
- Digital communication via MODBUS communication (consult factory for details)
- Remote calibration line.

Calibration Using Magnetic Switch

The Open Path Eclipse receiver provides an onboard magnetic calibration/reset switch for non-intrusive calibration capability. The magnetic switch is actuated by holding a calibration magnet at the specified location on the device bulkhead. See Figure 2 for switch location. An onboard tri-color LED provides status indication during calibration.

For zero calibration, the magnetic switch must be actuated for 2 seconds to initiate calibration (signaled by a solid red LED). Upon initiation, the OPECL automatically performs the zero calibration adjustment, and then signals with a green LED when this operation is complete.

Digital Communication Calibration

MODBUS communication may be utilized to initiate OPECL calibration (consult factory).

DETAILED CALIBRATION PROCEDURE USING MAGNETIC SWITCH

Zero Calibration

1. Apply magnet for 2 seconds minimum to initiate calibration. (Hold the calibration magnet against the side of the receiver at the location shown in Figure 2.)
   A. The onboard LED turns to steady red.
   B. The current output decreases to 1 mA in OPGD-Rx mode or 2.2 mA in PIR9400 mode.

2. When zero calibration is complete:
   A. The onboard LED changes from steady red to steady green.
   B. Calibration is complete and current output returns to 4 mA.

MAINTENANCE

ROUTINE INSPECTION

The Open Path Eclipse detector should be inspected periodically to ensure that external obstructions such as plastic bags, mud, snow, or other materials do not block the path and thereby impair the performance of the device.

OPTICS CLEANING

Cleaning of the OPECL optical surfaces is normally required only if an optical fault is indicated.

Thoroughly douse both window surfaces using a liberal amount of isopropyl alcohol to clear away contaminant particles. Repeat the alcohol flush to remove any remaining contaminants.

WARNING

Bypass/Inhibit: Volatile organic compounds in cleaning solutions could cause false alarms.

PROTECTIVE CAPS AND COVERS

Ensure that the HART Communication Port cover and the wiring compartment cover are installed and fully engaged.

TROUBLESHOOTING

A Fault status is indicated by an amber LED and also by the 4 to 20 mA output. Refer to Table 5 for assistance in correcting malfunctions with the Open Path Eclipse Detector.

DEVICE REPAIR AND RETURN

The Open Path Eclipse 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 an electronic failure, the device must be returned to the factory for repair.

Prior to returning devices, contact the nearest local Detector Electronics office so that a Return Material Identification (RMI) number can be assigned. **A written statement describing the malfunction must accompany the returned device or component to assist and expedite finding the root cause of the failure.**

Pack the unit properly. Always use sufficient packing material. Where applicable, use an antistatic bag as protection from electrostatic discharge.

NOTE

Inadequate packaging that ultimately causes damage to the returned device during shipment will result in a service charge to repair the damage incurred during shipment.

Return all equipment transportation prepaid to the factory in Minneapolis.

Table 5—Troubleshooting Guide

Fault Condition	Corrective Action
Low 24 volts	24 vdc operating voltage is out of range. Verify proper wiring to the detector and correct voltage output from the power source. Power supply faults are self-clearing when the condition is corrected. If the fault does not clear, consult the factory.
Dirty Optics	Perform cleaning procedure, then recalibrate as required. (Refer to “Maintenance” for details.)
Calibration Fault	If the calibration process is allowed to time-out, the fault is set and can only be reset with a successful calibration.
Negative Signal Output	This fault is indicated when the signal output drops below 0.5 LFL-M. Normally detection capability is not compromised in this condition. The device was probably zero calibrated with background gas present. If the condition persists, purge with clean air and repeat the zero calibration.
Calibration line active at start-up	The only way to clear this fault is to correct the wiring and reapply power. Be sure that the calibration line is not shorted and that the calibration switch is open. If the fault does not clear, consult the factory.
EE Error	If power is interrupted while the unit is updating its internal data logs, an EE Error may occur. Cycling power will correct this fault.
Other Faults	Consult the factory.

ORDERING INFORMATION

When ordering, please refer to the OPECL OS Matrix:

ALIGNMENT EQUIPMENT

Part Number	Description
009104-001	Telescope Alignment Tool kit consists of 32 mm rifle scope with 3-9x zoom magnifier that is factory assembled with precision holder and reflective mirror, and partial beam block tool.
009762-001	Partial Beam Block Tool (included with 009104-001)

ACCESSORIES

Part Number	Description
009296-001	Short Range Aperture kit — Delrin plastic (included with receiver)
008987-001	Short Range Aperture kit — Stainless Steel (optional)
009761-001	Thermal Shield for one module (two shields required per system)
007902-002	System Test Film - Low Alarm (1.1–1.5 LFL-Meters signal output)
007902-003	System Test Film - High Alarm (1.9–2.5 LFL-Meters signal output)
103346-007	Model 375 HART handheld communicator (includes OPECL config software)
009246-001	Low Range OPECL Gas Test Cell
009246-002	High Range OPECL Gas Test Cell

SPARE PARTS

Part Number	Description
102740-002	Calibration Magnet
005003-001	Silicone Free Grease
107427-040	O-Ring, 3.75” i.d., for wiring compartment cover
107427-052	O-Ring, 3.25” i.d., for front flange (internal)
009186-001	Spare Pan-Tilt Mounting Kit (for one OPECL module only)
008925-002	Spare electronics/lamp module for OPECL transmitter
008926-002	Spare electronics module for OPECL receiver
103578-001	Anti-seize Lubricant Packet

ASSISTANCE

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

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Operator: (952) 941-5665 or (800) 765-FIRE
Customer Service: (952) 946-6491
Fax: (952) 829-8750
Web site: www.det-tronics.com
E-mail: detronics@detronics.com

OPECL OS Matrix

MODEL	DESCRIPTION								
OPECL	Open Path Eclipse Infrared Gas Detector								
	TYPE	MATERIAL							
	S	Stainless Steel							
		TYPE	CONDUIT ENTRY THREAD TYPE						
		2N	3/4” NPT - 2 entries						
		2M	M25 - 2 entries						
			TYPE	OUTPUT OPTIONS					
			00	None (Transmitter only)					
			18	4-20 mA, RS-485, HART					
			25	4-20 mA, RS-485, HART, with optional Relay Board					
				TYPE	APPROVALS				
				W	FM/CSA/CENELEC/CE				
					TYPE	CLASSIFICATION			
					1	DIVISION/ZONE Ex de			
					2	DIVISION/ZONE Ex d			
						TYPE	CONFIGURATION		
						S	Complete System		
						T	Transmitter Module Only		
						R	Receiver Module Only		

APPENDIX A

HART COMMUNICATION

Digital communication with the Open Path Eclipse is necessary to monitor internal status and to modify the factory settings. This appendix provides guidance on establishing HART communication, and describes the communication menu structure when using the Open Path Eclipse with the HART Handheld Communicator.

INTERCONNECTING THE HART COMMUNICATOR WITH THE OPEN PATH ECLIPSE

Unscrew the protective cap from the HART communication port on the side of the Open Path Eclipse receiver. Connect the HART Communicator to the two terminals inside the port. Press the "on" key to switch on the HART Communicator. The Online menu is the first menu to appear when the Communicator is properly connected to the Open Path Eclipse. This menu is structured to provide important information about the connected device immediately on powering up the Communicator. This menu displays up-to-date device information including primary variable, analog output, lower range value, and upper range value.

NOTE

The HART protocol incorporates a concept called the "Device Description Language" that enables all suppliers of HART instruments to define and document their products in a single consistent format. This format is readable by handheld communicators, PC's and other process interface devices that support DDL. DDL enables full interoperability of devices, regardless of manufacturer, allowing full functionality from any HART device.

In the event that your Communicator does not establish communications with the Open Path Eclipse, you may need to ensure that the appropriate DDL's for the Open Path Eclipse are included within your Communicator. To review the device descriptions programmed into your HART Communicator:

1. From the Main menu, press to access Offline menu.

2. From the Offline menu, press New Configurations to access the list of device descriptions programmed into your HART Communicator. The Manufacturer menu displays a list of each manufacturer with device descriptions currently installed in your Communicator's Memory Module. The standard 12 MB Memory Module is recommended, as it allows for more device descriptions.

3. Select a manufacturer, and the Model menu displays, containing a list of currently installed device models provided by the selected manufacturer.

4. Review the different manufacturers and models to determine the installed HART-compatible devices in your Communicator.

If you cannot find the Open Path Eclipse device on your Communicator, the device revision you are looking for is not programmed into the Memory Module. In this instance, you are limited to what is available using the generic interface built into your HART Communicator.

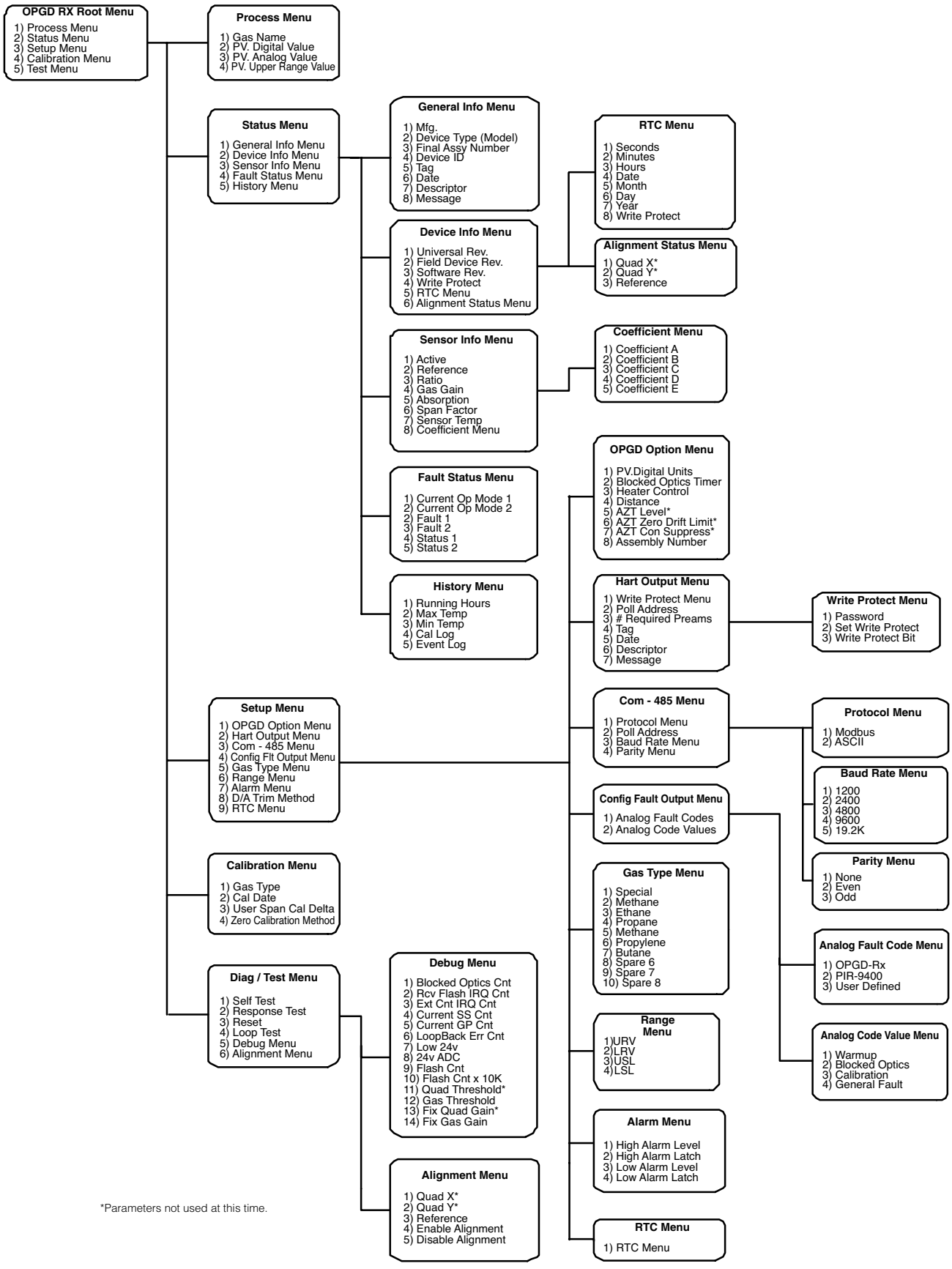
The HART Communication Foundation (www.ccsi.com/hart) manages a library of Manufacturer Device Descriptions, which are distributed to programming sites for inclusion in master devices. A complete listing of the HCF DD Library is available for download in manufacturer and device type sequence.

NOTE

If a device is found, the HART Communicator displays the Online menu. If no device is found, the Communicator displays the Main menu. If no device is found, check the connections, verify the presence of a minimum of 250 ohms load resistance in series in the loop, and retry by selecting 'Online.' To poll multiple devices in the loop, refer to the HART Communicator manual.

OPEN PATH ECLIPSE HART MENU STRUCTURE

This section displays the menu trees for the Open Path Eclipse. The Menu tree shows the primary commands and options available when using menu selections.



*Parameters not used at this time.

CONNECTIONS AND HARDWARE

The HART Communicator can interface with the Open Path Eclipse from the onboard I.S. communication port, from the control room, or from any wiring termination point in the analog output signal loop. To communicate, connect the HART communicator in parallel with the Open Path Eclipse analog signal or load resistor. The connections are non-polarized.

NOTE

The HART Communicator needs a minimum of 250 ohms resistance in the loop to function properly. The HART Communicator does not measure loop current directly.

ONLINE MENU

When HART communication is established with the receiver, the first menu displayed is the OPGD RX Root menu:

OPGD RX Root Menu
1) Process Menu
2) Status Menu
3) Setup Menu
4) Calibration Menu
5) Test Menu

To select any of the 5 menu options shown, highlight the desired option using the up/down arrow key, and then press the “right arrow” key.

COMMONLY USED HART COMMANDS

The most commonly used HART commands for the Model OPECL are:

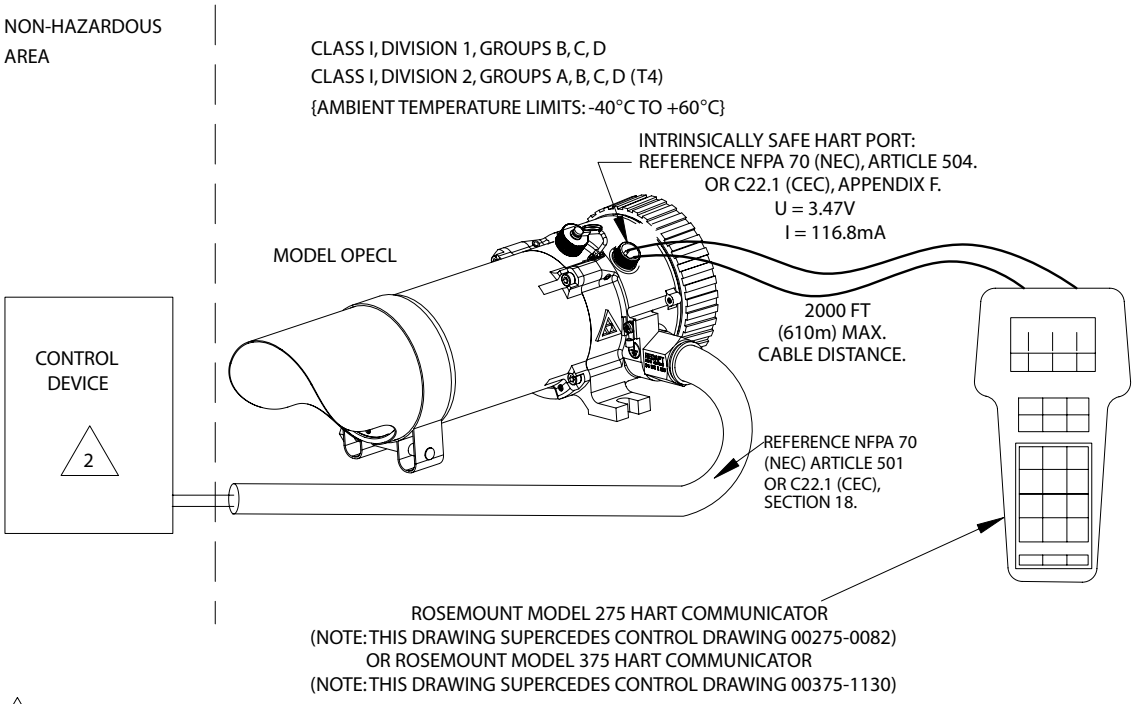
1. Setting the real time clock
2. Setting alarm thresholds & latch/nonlatch functions
3. Setting the analog fault code menu
4. Performing full system alignment
5. Performing zero calibration
6. Assigning a nonvolatile tag name to the receiver
7. Defining a nonvolatile descriptor for future reference
8. Interrogating the history menu for information including total running hours, max/min temperature, calibration and event logs.

APPENDIX B

CONTROL DRAWING

REV
SH
DWG NO

THE MODEL OPECL ECLIPSE OPEN PATH GAS DETECTION SYSTEM PROVIDES A CSA INTERNATIONAL CERTIFIED INTRINSICALLY SAFE OUTPUT FOR CONNECTION WITH THE HART COMMUNICATOR WHEN INSTALLED PER THE NATIONAL ELECTRICAL CODE (NEC), NFPA 70, ARTICLES 501 & 5O4 OR CANADIAN ELECTRICAL CODE (CEC), C22.1, SECTION 18 & APPENDIX F.



2 APPROVAL OF THE MODEL OPECL DOES NOT INCLUDE OR IMPLY APPROVAL OF THE APPARATUS TO WHICH THE DETECTOR MAY BE CONNECTED AND WHICH PROCESSES THE ELECTRONIC SIGNAL FOR EVENTUAL END USE.

1. CSA CERTIFIED DRAWING - NO MODIFICATIONS PERMITTED WITHOUT REFERENCE TO APPROVAL AGENCY.

REV	ECO NO.	DESCRIPTION	DATE	APPROVED
D	7566	ADD FM TO DRAWING TITLE.		
C	7228	ADD HART COMMUNICATOR 375.	3.31.04	KAT
B	7145	ADD I/S OUTPUT DETAIL	1.12.04	KAT
A	6792	NEW RELEASE	2/03	KAT

DRAWN CDS 2/03/03 DATE
CHECKED DATE
APP'D JM 2/03/03 DATE
APP'D DATE

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE :

DIMENSION INCH (MM)	TOLERANCE INCH (MM)	
0.0 (0)	±.02	±(0.5)
0.00 (0.0)	±.01	±(0.25)
0.000 (0.00)	±.005	±(0.13)

ANGLE ±1'
REMOVE ALL BURRS BREAK ALL EDGES AND SHARP CORNERS

DET-TRONICS®
DETECTOR ELECTRONICS CORP.
MINNEAPOLIS, MINNESOTA 55438

FIRST USED ON
BILL OF MAT'L REQ. NO

SHEET 1 OF 1 | DO NOT SCALE DRAWING | SCALE NA | SIZE A | DRAWING NO. 007722-001 | REV D

TITLE CONTROL DRAWING

CADDS NAME: 7722-01d

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

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