Operation & Maintenance Manual

GDS-IR
Infrared Detector
Gas Sensor

For Detection of Combustible and other IR-absorbing Gases

Important: Read and understand contents prior to first use.
Improper use or operation could result in instrument malfunction or serious injury.

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SECTION 1 – SAFETY INFORMATION

1.1 Safety Information – Read Before Installation & Applying Power

IMPORTANT

Users should have a detailed understanding of GDS-IR operating and maintenance instructions. Use the GDS-IR only as specified in this manual or detection of gases and the resulting protection provided may be impaired. Read the following **WARNINGS** prior to use.

WARNINGS

- Do not paint the sensor assembly.
- Do not use the GDS-IR if its enclosure is damaged or cracked or has missing components.
- Make sure the cover and field wiring are securely in place before operation.
- Periodically test for correct operation of the system's alarm events by exposing the monitor to a targeted gas concentration above the High Alarm setpoint.
- Do not expose the GDS-IR to electrical shock or continuous severe mechanical shock.
- Protect the GDS-IR from dripping liquids and high power sprays.
- Use only for applications described within this manual.

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

ATTENTION: POUR DES RAISONS DE SÉCURITÉ, CET ÉQUIPEMENT DOIT ÊTRE UTILISÉ, ENTRETENU ET RÉPARÉ UNIQUEMENT PAR UN PERSONNEL QUALIFIÉ. ÉTUDIER LE MANUE D'INSTRUCTIONS EN ENTIER AVANT D'UTILISER, D'ENTRETENIR OU DE RÉPARER L'ÉQUIPEMENT.

1.2 Contacting Global Detection Systems Corp.

To contact Global Detection Systems Corp, please call 409-927-2980, FAX 409-927-4180 or visit us on the web at www.gdscorp.com For sales information, send email to sales@gdscorp.com or for technical support email us at tech@gdscorp.com Our headquarters are located at 2513 Hwy 6 in Santa Fe, TX 77510.

SECTION 2 – GDS-IR SPECIFICATIONS

Model: Global Detection Systems Corp. GDS-IR Infrared Hydrocarbon Gas Detector

Available gases:

Methane	Hexane	Jet A
Ethane	Diesel	Ethanol
Ethylene	Gasoline	Methanol
Ethylene Oxide	Green Earth	Butane
Propane	DF 2000	Hexane

NOTE: *This list is not all-inclusive. The GDS-IR can be calibrated for most hydrocarbons, provided a calibration gas is available. For more please contact Global Detection Systems Corp.*

Detection Method: Diffusion

Output (analog): 4-20 mA (Source type), max. 1000 Ohm load at 24 VDC supply voltage

Response Time: T50 < 5 seconds
T90 < 10 seconds

Operating Temperature Rating: -40° to +70°C at 0 to 99% RH (non-condensing)

Operating Voltage: 18 to 32 VDC measured at the detector head

Power Consumption: 5 Watts Max (at 24 VDC) Average: 210 mA Peak: 400 mA

Construction: 316 stainless steel.

Approvals: CSA Class 1, Division 1, Groups B, C and D
Performance Tested For -40C to +50C operation per CSA 22.2 #152

SECTION 3 - GENERAL DESCRIPTION

3.1 GDS-IR Infrared Detector Gas Sensor

The GDS-IR Infrared gas detector is a microprocessor based intelligent gas detector that continuously monitors combustible hydrocarbon gases and vapors within the Lower Flammable Limit (LFL).

The GDS-IR is ideally suited for use in harsh environments and where the cost of required maintenance for conventional catalytic detectors is prohibitive. The GDS-IR Infrared gas 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.

3.2 Features (Installed in GDS-48 Remote Sensor Housing)

- Standard 4 to 20 mA output (current source)
- Requires no routine span calibration to ensure proper operation; “Auto Zero” pushbutton for periodic zero
- Continuous self-test automatically indicates a fault, with fail to safe operation
- A multi-layered filtering system protects optics from dirt and water ingress
- Straight optical path eliminates the need for mirrors or reflective surfaces
- Performs well in the presence of high concentrations or constant background levels of hydrocarbons and in oxygen-depleted atmospheres
- Highly resistant to poisoning and etching
- Explosion proof housing certified for explosive environments
- Smart Calibration AutoAC™ circuit

3.3 Features (Installed with GASMAX II Gas Monitor)

- All above features plus the following
- Graphic alphanumeric display in engineering units with alarm LEDs
- Optional isolated 4-20mA output, MODBUS digital serial output
- Optional alarm relay contact closure (2 separate levels + Fault)
- Magnetic interface allows setup without declassifying hazardous area
- Second GASMAX channel supports simultaneous monitoring of toxic gas using electrochemical sensor
- Operation from 18 – 30 VDC

3.4 Infrared Detection Technology

The GDS-IR Infrared gas detector uses infrared absorption technology for detecting combustible hydrocarbon gases. Gases absorb infrared light only at certain wavelengths. The concentration of a gas can be measured by the difference of two channels (wavelengths), a reference and a measurement channel. The GDS-IR uses a collimated infrared light source that passes through a waveguide; at the end of the waveguide is a dual channel receiver. The dual channel receiver measures the intensity of two specific wavelengths, one at an absorption wavelength and another outside of the absorption wavelength. The gas concentration is determined by a comparison of these two values.

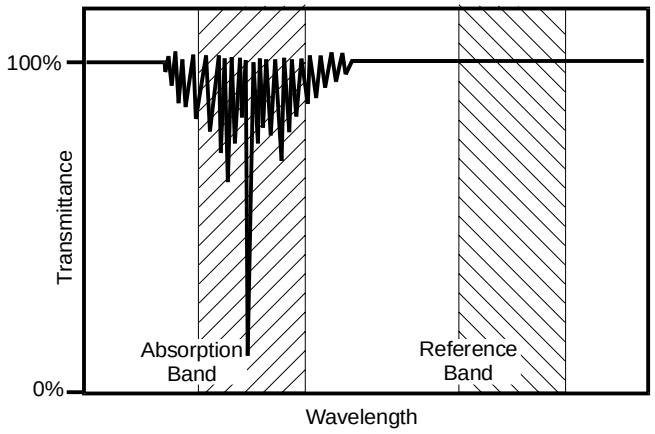


Fig. 1 - Infrared Absorption Spectrum for Methane

The dual channel receiver is a single wafer, double filtered, dual receiver with an internal optical barrier. The elements are perfectly matched resulting in overall stability and superior performance throughout the entire temperature range.

Using a dual channel receiver there is no need to use any special lenses or beam splitters to achieve the different measurement bands.

The GDS-IR utilizes a unique patent pending feature, the AutoAC™ circuit. The AutoAC™ circuit is an automatic analog control circuit, which allows the GDS-IR to be calibrated for any combustible hydrocarbon,

provided that a calibration quality level of the gas is available. This eliminates setting dipswitches or changing out sensors for different types of hydrocarbons; simply calibrate the unit with a calibration gas of the specific gas to be detected.

The optics can be easily disassembled for cleaning. This does not require powering the unit down and does not compromise the units' explosion-proof rating. The device will self-compensate for dirty optics until a point is reached at which the optical surfaces are completely obscured.

There are no consumable components contained in this product.

SECTION 4 - OPERATION

4.1 Installation and Startup

Warning: The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

The first step in the installation process is to establish a mounting location for the GDS-IR. Select a location that is typical of the atmosphere to be monitored or close to the anticipated source of a dangerous gas.

It is very important that the GDS-IR be properly located to enable it to provide maximum protection. The most effective number and placement of sensors vary depending on the conditions of the application. When determining where to locate sensors the following factors should be considered.

- What are the characteristics of the gas that is to be detected? Is it lighter or heavier than air? If it is lighter than air the sensor should be placed 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. Note that air currents can cause a gas that is heavier than air to rise. In addition, if the temperature of the gas is hotter than ambient air or mixed with gases that are lighter than air, it could also rise.

- How rapidly will the gas diffuse into the ambient air? Select a location for the sensor that is close to the anticipated source of a gas leak.

- Wind or ventilation characteristics of the immediate area must also be considered. Movement of air may cause gas to accumulate more heavily in one area than in another. The detector should be placed in the areas where the most concentrated accumulation of gas is anticipated. For outdoor applications with strong wind conditions, it may require the sensors to be mounted closer together and on the down wind side, to the anticipated area of a gas leak. Also take into consideration for indoor applications, the fact that many ventilation systems do not operate continuously.

- The sensor should be accessible for maintenance.

- Excessive heat or vibration can cause premature failure of any electronic device and should be avoided if possible.

- Follow all national and local installation codes and practices**.**

A user-supplied junction box can be used providing it has the appropriate sized NPT conduit entries. The junction box must be suitable for use in the application and location in which it is being installed. After the device has been installed, a calibration is required. Refer to the Calibration section of this manual.

Wiring connections

Red wire: 18 to 32 VDC
Black wire: DC Common
Blue wire: 4 to 20 mA output
White wire: Smart Calibration Wire (data wire)
Earth Ground: Male 10-32 Stud on GDS-IR cap

Wire sizing

0 to 500 feet, recommended wire gauge size 16 AWG
501 to 1000 feet, recommended wire gauge size 14 AWG

Shielded cable is recommended. Wiring should be installed in metal conduit with no other cabling in the same conduit.

4.2 Warm-up

When power is applied to the detector, it enters a one (1) minute warm-up mode. The output current will be 0.8 mA during the warm up time period. At the end of the warm-up period with no faults present, the detector automatically enters the normal operating mode (4 mA). If a fault is present after warm-up, the detector current output will indicate a fault. See the following chart for fault code status.

Current Output	Status.
0-20 mA	Normal measuring mode
0.0 mA	Unit Fault
0.2 mA	Reference channel fault
0.4 mA	Analytical channel fault
0.8 mA	Unit warm up
1.0 mA	Optics fault
1.2 mA	Zero drift fault
1.6 mA	Calibration fault
2.0 mA	Unit spanning
2.2 mA	Unit zeroing
4.0 mA	Zero gas level (0%LEL)
5.6 mA	(10%LEL)
8.0 mA	(25%LEL)
12 mA	(50%LEL)
16 mA	(75%LEL)
20 mA	Full scale (100% LEL)
20.1- 23 mA	Over-range (> 100% LEL)

Table 1 - Current Output and Corresponding Status

4.3 Normal Operation

In the normal operating mode, the 4-20 mA signal levels correspond to the detected gas concentration. The detector continuously checks for system faults or initiation of calibration and automatically changes to the appropriate mode. Once a fault is cleared the GDS-IR will atomatically resume normal operation.

The 4-20 mA output of the GDS-IR is a *non-isolated* current source.

SECTION 5 - CALIBRATION

5.1 GDS-IR Calibration

The GDS-IR is factory calibrated for zero and span. *Unlike catalytic sensors the GDS-IR does not require routine span gas calibration to ensure proper operation.*

The GDS-IR can be calibrated for almost any hydrocarbon using a calibration gas of the hydrocarbon that is to be detected (target gas). The GDS-IR is required to be spanned with gas only one time with the target gas. Typically this is done at the factory, but it is possible to field span the device by connecting the GDS-IR to a computer and using a software package provided by GDS Corp. Please contact the factory for further details.

A typical field calibration only requires the use of zero air (or 99.99% nitrogen). *If the sensor is located in an area that is known to be free of the hydrocarbon gases then ambient air can be used as a zero reference.*

If zero air is used for the calibration, there is a fitting on the bottom of the sensor for a 1/8" ID tubing connection.

Before beginning calibration use the GDS-IR Insulation tube to cover outer cylinder holes and connect a clean air source to the sensor's calibration port for a minimum of 3 minutes. To enter the calibration mode the calibration (white) wire must be connected to negative (common of the power supply) for ten seconds; upon release the sensor will automatically enter the zero calibration routine. When the GDS-IR is supplied with either the GASMAX II or the GDS-48 Universal Sensor Assembly, a calibration pushbutton is provided. Apply zero or ambient air and press and HOLD the 'set zero' button for 10 seconds. The electronics will automatically adjust the sensor's signal to the new zero reference level. During the zero calibration routine, the current output of the GDS-IR will go to 2.2 mA. If after 20 seconds the calibration lead has not been removed from common, the GDS-IR will ignore the signal and continue operation as normal.

NOTE - The GDS-IR can be spanned in the field if the customer wishes to change the target hydrocarbon gas. Please contact factory for additional equipment information and pricing for GDS-IR PC IR Link Package)

SECTION 6 - MAINTENANCE

6.1 GDS-IR Maintenance

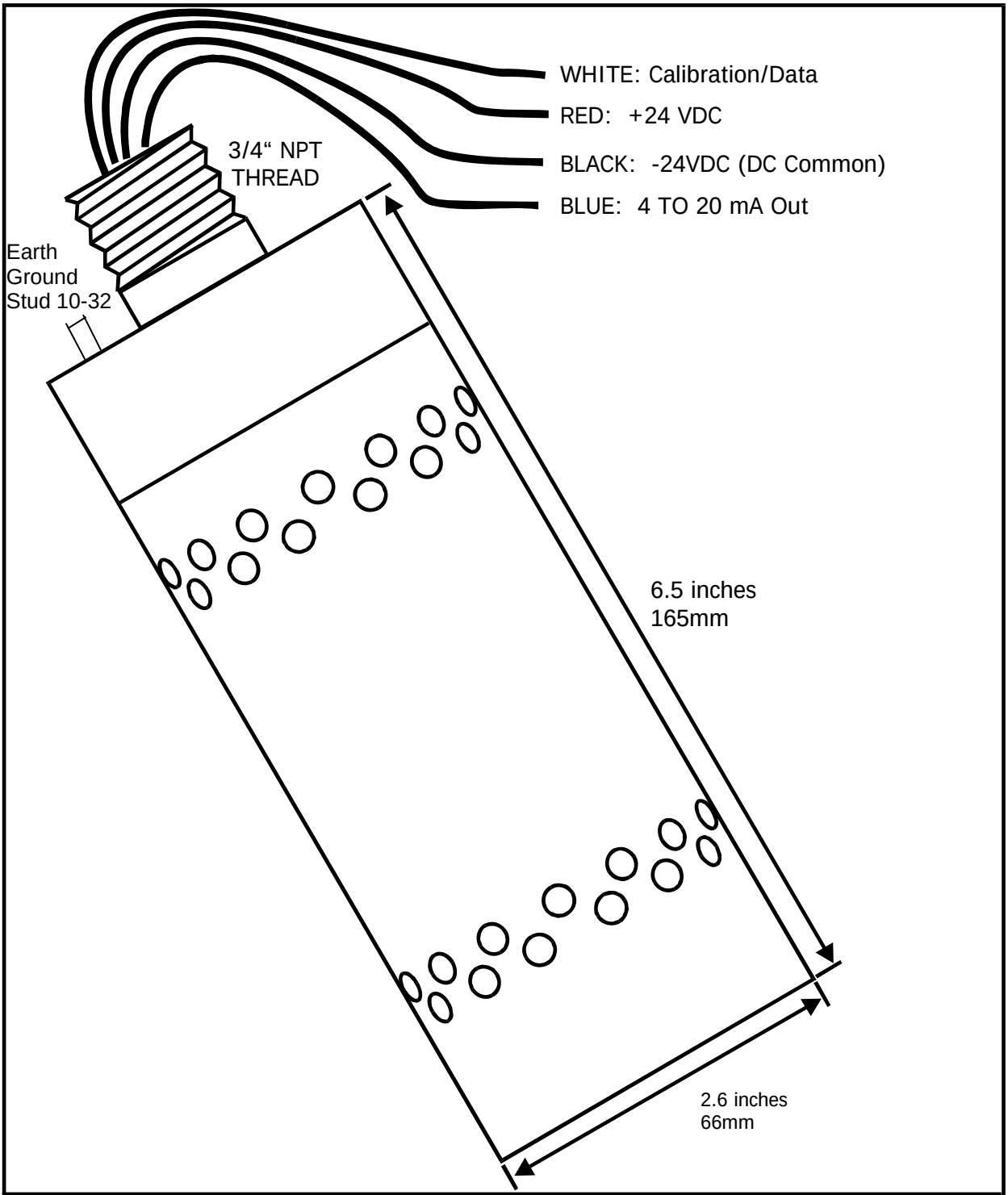
The GDS-IR does not normally require cleaning of the optics. However if the unit is operating in a very dirty or dusty environment the optical path might become obscured. If the obscuration is severe enough to affect the data accuracy, the unit will activate an “Optics Fault”.

OPTICS FAULT - To clear an Optics Fault, first try a zero calibration. If the calibration does not correct the fault condition, clean the optics. The outer barrel (tube with two sets of holes) can be removed (unscrewed) to inspect the cleanliness of the hydrophobic filter. The hydrophobic filter is a Teflon coated stainless steel mesh that keeps moisture and particulates out of the optical path. A setscrew holds the filter to the GDS-IR housing. Once the hydrophobic filter is removed, the internal waveguide tube should be inspected for cleanliness. The waveguide and waveguide collar can be removed by inserting rigid instruments such as Allen wrenches into one hole of the waveguide and one hole of the collar. Turning the two instruments in opposite directions will loosen the waveguide allowing the collar to be screwed down on to the waveguide until it can be removed from the GDS-IR housing. This will allow the windows of the GDS-IR to be cleaned. Dust can be removed using compressed air. Hard or oily deposits can be removed using Isopropyl alcohol and cotton tipped swabs. Wipe any film or residue or film left by the alcohol on the windows with a clean dry cotton swab. The internal electro polished wave-guide tube can be cleaned the same way. Be careful not to leave any particles of the cleaning swab in the waveguide. The waveguide holes can collect pieces of the cleaning swab. After reassembling the unit (the waveguide and collar should be very tight to both ends of the GDS-IR housing after installation. Once the unit is completely reassembled and power is reapplied, the GDS-IR must be calibrated. Refer to the calibration section of this manual.

SECTION 7 – PARTS LISTS & DRAWINGS

Part Number	Description
142-0280	Replacement Sensor GDS-IR
190-1001	GDS-IR Sensor Separation Kit
142-0877	GDS-IR Insulation Tube
142-0497	GDS-IR Replacement Hydrophobic Filter
142-0297	GDS-IR Wave Guide Tube
142-0570	GDS-IR Wave Guide Tube Collar
142-0636	GDS-IR PC IR Link Kit

Fig. 4 - GDS-IR Wiring Diagram



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WIRING DIAGRAM
GDS-IR SENSOR

FIGURE 1