GREYSTONE
ENERGY SYSTEMS INC

MODEL: B8 SERIES
NON-INTRUSIVE CALIBRATION
GAS TRANSMITTER/SENSOR

INSTALLATION
OPERATION AND MAINTENANCE
MANUAL

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READ BEFORE OPERATING

All individuals who have or will have the responsibility of using, maintaining, or servicing this product must carefully read this manual. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

The B8 is a state-of-the-art transmitter that can operate as an independent, stand-alone system or as part of an integrated system. Setup procedures are simplified with user friendly push buttons and LCD menus.

The B8 is the Q8 with BACnet® MS/TP master protocol. Therefore, the B8 does not support the 4-20mA and VDC analog output.

BACnet MS/TP protocol is a peer-to-peer, multiple master protocol based on token passing. Only master nodes are allowed to send and receive tokens on the MSTP network. Passive slave nodes on the other hand may only transmit data frames on the network in response to a request from a master node. Passing the token represents overhead in the sense that the messages used for managing the token do not carry data that is useful to automation or monitoring.

The B8 can be set to be a Master Node or a Slave Node in the field. Factory default is Master Node.

1. Specifications

1.1 Electrical/Mechanical Specifications

Input Power: 24VDC nominal, range 18 to 30VDC, 0.3A DC Total Max.
24VAC nominal, range 15 to 24VAC, 0.3A AC Total Max.

Fuse: F2 on Main Board: Polyswitch 750mA
Polyswitch device resets after the fault is cleared and power to the circuit is removed

Sensor: Combustible gases: Catalytic or NDIR
Toxic gases and Oxygen: Electrochemical
Carbon Dioxide: Non-Dispersive Infra-Red (NDIR)
Volatile Organic Compounds (VOC): Photoionization (PID)

Panel Indicators: 5 Status LED's

- RS-485 TX Status (Green)
- RS-485 RX Status (Green)
- Relay1 Status (Red)
- Relay2 Status (Red)
- Relay2 Status (Red)

Display:	LCD graphic display c/w RGB LED backlight
Keypad:	3 magnetic switches: F1, F2, F3
Relays:	3 Relays SPDT, Dry contacts • 1.0A maximum at 30 VDC (resistive load) • 0.3A maximum at 125VAC (resistive load)
Output Signal:	BACnet® MS/TP master /slave protocol
Enclosure:	Aluminium Pressure Die–Casting Entries: 2X ¾ NPT
Operating Temperature:	-40°C to 70°C, depends on sensor specification
Ambient Humidity:	5% to 95% RH (non-condensing)
Storage Temperature:	0°C to 40°C, depends on sensor specification
Size:	145mm X 190mm X 130mm
Weight:	Less than 1.8kg

1.2 Sensor Specifications

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
0	Oxygen	O2		0 - 25%VOL	-30°C to +55°C

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
15	Carbon Dioxide	IR-CO2	Heavier	0 – 5000ppm	-20°C to +50°C
415	Carbon Dioxide	IR-CO2	Heavier	0 – 5.0%VOL	-20°C to +50°C
216	Methane	IR-CH4	Heavier	0 – 100%LEL	-20°C to +50°C
316	Methane	IR-CH4	Heavier	0 – 100%VOL	-20°C to +50°C

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
00	Volatile Organic Compounds (VOC)	VOC	Various	10ppb – 20ppm	-40°C to +50°C
01	Volatile Organic Compounds (VOC)	VOC	Various	1ppm – 2000ppm	-40°C to +50°C

Code	Gas	Symbol	Span	Operating Temperature
301	Methane	CH4	0-100%LEL	-20°C to +70°C
302	Acetic Acid	C2H4O	0-100%LEL	-20°C to +70°C
303	Acetone	C3H6O	0-100%LEL	-20°C to +70°C
304	Ammonia	NH3	0-100%LEL	-20°C to +70°C
305	Benzene	C6H6	0-100%LEL	-20°C to +70°C
306	Butyl Acetate	C6H12	0-100%LEL	-20°C to +70°C
307	Cyclo-hexane	C6H10	0-100%LEL	-20°C to +70°C
308	Cyclo-pentane	C5H10	0-100%LEL	-20°C to +70°C
309	Decane	C10H2	0-100%LEL	-20°C to +70°C
310	Dioxane	C4H8O	0-100%LEL	-20°C to +70°C
311	Ethane	C2H6	0-100%LEL	-20°C to +70°C
312	Ethanol	C2H6O	0-100%LEL	-20°C to +70°C
313	Ethyl Acetate	C4H8O	0-100%LEL	-20°C to +70°C
314	Ethylene	C2H4	0-100%LEL	-20°C to +70°C
315	Hydrogen	H2	0-100%LEL	-20°C to +70°C
316	Iso-Butyl Methyl Ketone (Iso-BMK)	C6H12	0-100%LEL	-20°C to +70°C
317	Iso-Butane	C4H10	0-100%LEL	-20°C to +70°C
318	Iso-Butyl Alcohol	C4H10	0-100%LEL	-20°C to +70°C
319	Iso-Octane	C8H18	0-100%LEL	-20°C to +70°C
320	Iso-Pentane	C5H12	0-100%LEL	-20°C to +70°C
321	Iso-Propyl Alcahol (IPA)	C3H8O	0-100%LEL	-20°C to +70°C
322	Methanol	CH4O	0-100%LEL	-20°C to +70°C
323	Methyl Ethyl Ketone (MEK)	C4H8O	0-100%LEL	-20°C to +70°C
324	n-Butane	C4H10	0-100%LEL	-20°C to +70°C
325	n-Heptane	C7H16	0-100%LEL	-20°C to +70°C
326	n-Hexane	C6H14	0-100%LEL	-20°C to +70°C
327	Nonane	C9H20	0-100%LEL	-20°C to +70°C
328	n-Pentane	C5H12	0-100%LEL	-20°C to +70°C
329	n-Propanol	C3H8O	0-100%LEL	-20°C to +70°C
330	n-Propyl Alcahol	C3H8	0-100%LEL	-20°C to +70°C
331	Propane	C3H8	0-100%LEL	-20°C to +70°C
332	Propylene	C3H6	0-100%LEL	-20°C to +70°C
333	Styrene Monomer	C8H8	0-100%LEL	-20°C to +70°C
334	Toluene	C7H8	0-100%LEL	-20°C to +70°C
999	Other	LEL	0-100%LEL	-20°C to +70°C

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
1	Carbon Monoxide	CO	Slightly Lighter	0 – 250ppm	-20°C to +50°C
1	Carbon Monoxide	CO	Slightly Lighter	0 – 1000ppm	-20°C to +50°C
2	Hydrogen Sulfide	H2S	Heavier	0 – 25ppm	-20°C to +50°C
2	Hydrogen Sulfide	H2S	Heavier	0 – 100ppm	-20°C to +50°C
3	Sulphur Dioxide	SO2	Heavier	0 – 6ppm	-20°C to +50°C
5	Nitrogen Dioxide	NO2	Heavier	0 – 10ppm	-20°C to +50°C
6	Hydrogen	H2	Lighter	0 – 1000ppm	-20°C to +50°C
6	Hydrogen	H2	Lighter	0 – 2000ppm	-20°C to +50°C
7	Hydrogen Cyanide	HCN	Lighter	0 – 50ppm	-20°C to +50°C
9	Ammonia	NH3	Lighter	0 – 100ppm	-30°C to +50°C
9	Ammonia	NH3	Lighter	0 – 1000ppm	-30°C to +50°C
11	Ozone	O3	Heavier	0 – 1ppm	-20°C to +40°C
13	Chlorine	Cl2	Heavier	0 – 5ppm	-20°C to +50°C
14	Chlorine Dioxide	ClO2	Heavier	0 – 2ppm	-20°C to +40°C
96	Arsine	AsH3	Heavier	0 – 1ppm	-20°C to +40°C
97	Phosphine	PH3	Heavier	0 – 5ppm	-20°C to +40°C
97	Phosphine	PH3	Heavier	0 – 1ppm	-20°C to +40°C
98	Silane	SiH4	Heavier	0 – 50ppm	-20°C to +40°C
99	Germane	GeH4	Heavier	0 – 2ppm	-20°C to +40°C
100	Diborane	B2H6	Slightly Lighter	0 – 2ppm	-20°C to +40°C
4	Nitric Oxide	NO	Slighter Heavier	0 –100ppm	-20°C to +50°C
8	Hydrogen Chloride	HCl	Heavier	0 – 30ppm	-20°C to +40°C
12	Ethylene Oxide	ETO	Heavier	0 – 20ppm	-20°C to +50°C
101	Hydrogen Bromide	HBr	Heavier	0 – 30ppm	-20°C to +40°C

*NOTE: Mounting Heights - Low = 9-18 inches (0.25-0.5 meters) from floor
- Mid = 4-6 feet (1.25-1.75 meters) from floor
- High = 9-18 inches (0.25-0.5 meters) from ceiling

2. Installation

Warnings:

B8 is designed for installation and use in Zone 1 or 2 hazardous areas in many countries including Europe and for Class 1 Division 1 or 2 area applications in North America. Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned.

Access to the interior of the detector, when carrying out any work, must only be conducted by trained personnel.

Before carrying out any work ensure local regulations and site procedures are followed. Appropriate standards must be followed to maintain the overall certification of the detector.

For installations where conduit is used, and the sensor is mounted directly to the B8, there must be a "Seal Fitting" installed for each of the cable gland entries within 18 inches of the B8. For installations where the smart sensor head assembly will be mounted remotely from B8, an additional "Seal Fittings" will be required: One at each of the conduit entries for the power/signal/relay contact outputs and one at the sensor wiring entrance. The total distance of the location of these Seal Fittings is 18 inches. (e.g. If all 3 gland entries are to be used, 3 Seal Fittings should be located, each within 6 inches of the wiring entrance).

If using an anti-seize compound, the threads should be thinly coated with an approved silicone free compound e.g. petroleum jelly.

To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the equipment from the supply circuit before opening the detector enclosure. Keep assembly tightly closed during operation.

Never attempt to open a junction box/enclosure or replace/refit the sensor in potentially hazardous atmospheres while power is still applied to the transmitter.

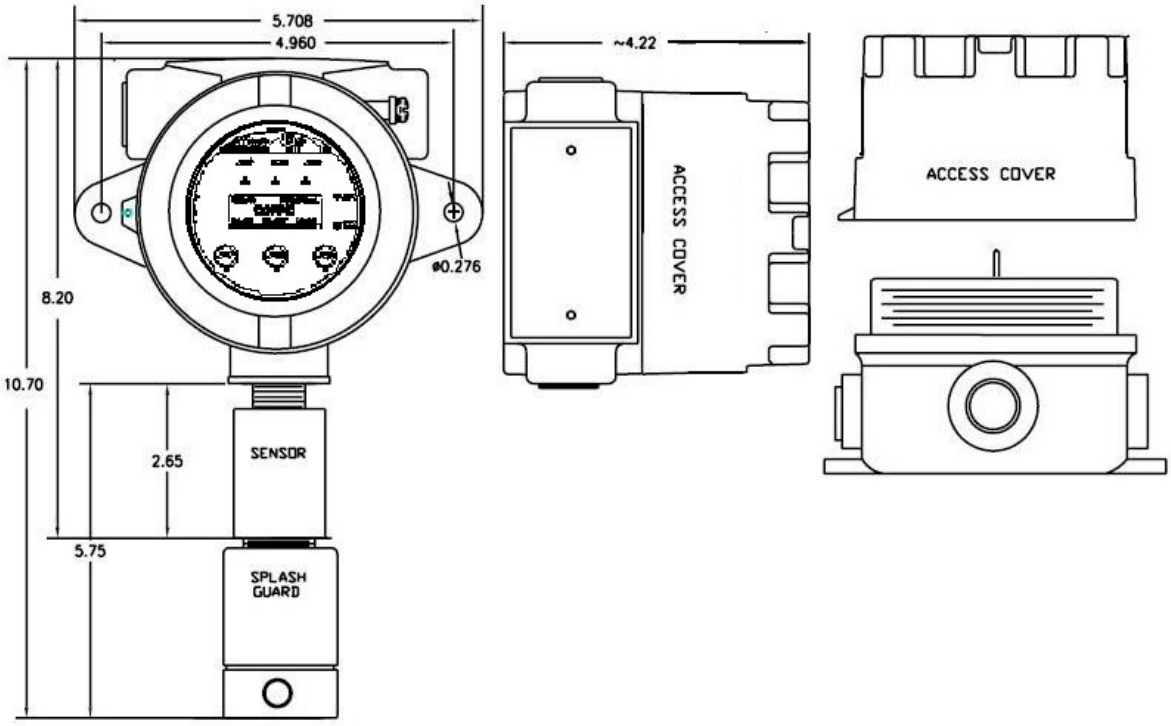
The detector must be earthed/grounded for electrical safety and to limit the effects of radio frequency interference. Earth/ground points are provided inside and outside the unit. Ensure that all screens/instrument earth/clean earth wiring is earthed/grounded at a single point (either at the controller or detector - BUT NOT BOTH) to prevent false alarms due to earth/ground loops.

Take care when handling sensors as they may contain corrosive solutions.

This equipment is designed and constructed to prevent ignition sources arising, even in the event of frequent disturbances or equipment operating faults.

The sensor head must be fitted with the supplied weather protection and mounted so that the sinter is pointing downward to provide ingress protection IPX6.

2.1 Enclosures Physical Dimensions



2.2 Mounting the transmitter

The B8 transmitter has an integral mounting plate consisting of two mounting holes on the transmitter body. The transmitter may be fixed directly to a surface mounting.

The B8 Sensor/Transmitter should be mounted where the gas to be measured is most likely to be present. This location will be dependent on the source of the target gas and whether that gas is lighter or heavier than air. Air circulation and mixture should also be taken into account.

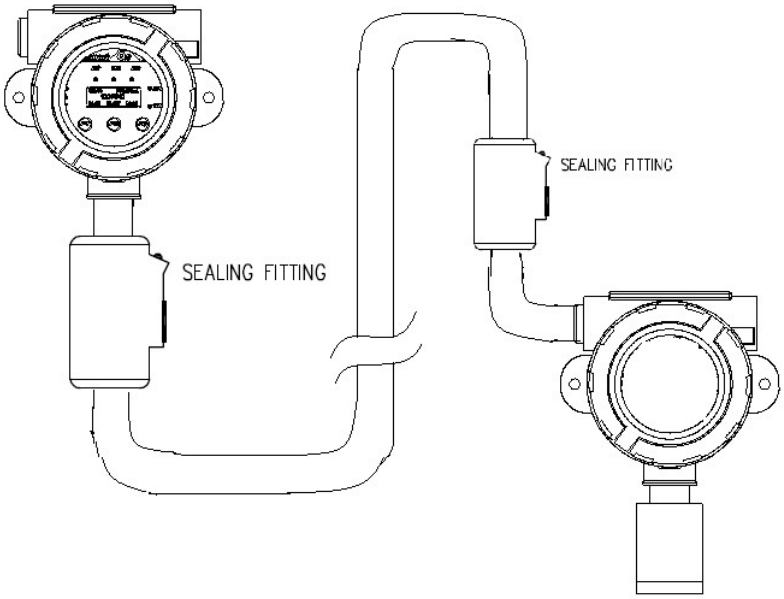
3/4"NPT cable/conduit entries on UL/CSA versions.

Where possible, the sensor/transmitter should be mounted where it is accessible for the purposes of routine re-calibration and **periodic** sensor replacement. Sufficient room should be left to allow the enclosure cover to be removed and the connection of the calibration adapter to the sensor assembly. For sensor element replacement there will need to be enough room to reach into the sensor assembly.

NOTE: Avoid mounting the electronics near 600 VAC switchgear and other sources of radio frequency and/or electromagnetic interference. While RFI/EMI protection is built in to the electronics, excessive levels of interference may cause instability in the output signal.

Warning: GROUNDING - The industrial explosion-proof metal enclosure must be connected to a safety ground, either locally or back at the monitor, in order to provide immunity to Electromagnetic Interference.

2.3 Remote Mounting the Smart Sensor Head Assembly

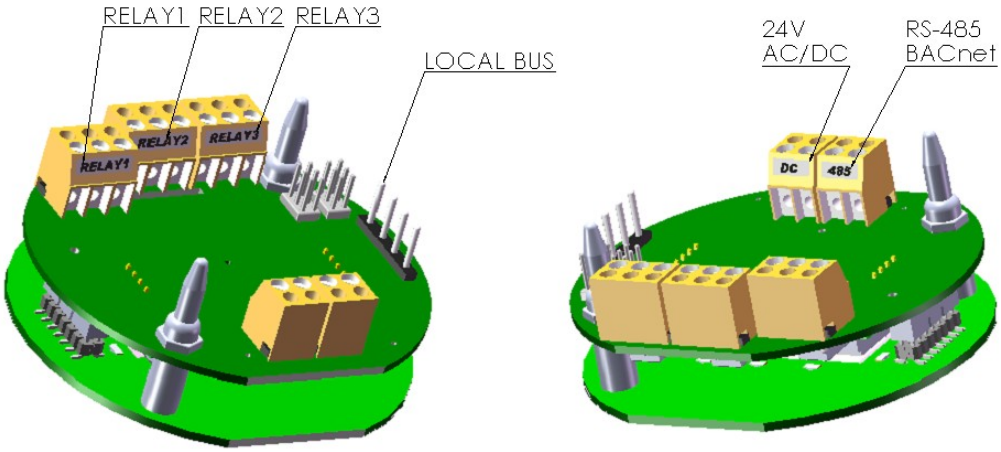


The Smart Sensor Head can be equipped with B8 locally or remotely. For installations where the smart sensor head assembly will be mounted remotely from B8, the max distance between B8 and Remote Smart Sensor Head is 100 meters. The Remote Smart Sensor Head Assembly is not included in the B8 standard package, it must be ordered separately.

NOTE:

- **Conduit or Approved Hazardous Location Cable connecting the remote sensor and Transmitter must have Sealing Fittings at both ends within total distance 18"(350mm).**
- **Hazardous Location Cable and Sealing Fittings must be approved for Class 1. Div 1 Group B, C, D Hazardous Locations.**

2.4 Terminals

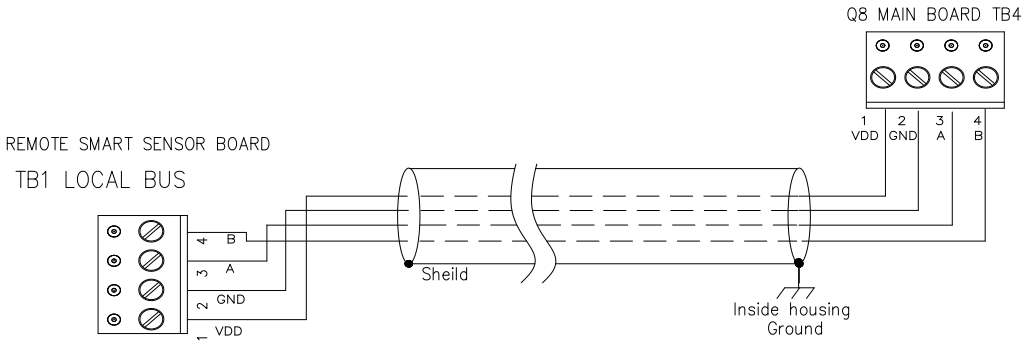


2.4.1 Wire and Cable

Terminal blocks TB1 to TB8 accept 12 AWG to 24 AWG wire, Use 16 AWG or 18 AWG wire for the Power Supply in long wiring runs, which can be up to 1km (1,000 meters) long.

We recommend using BELDEN 9841 for communications. This wire has 120 ohm input impendence, which will eliminate RS-485 communication problems.

2.4.2 Remote Smart Sensor Connection



2.4.3 RS-485 Terminator and Driver Replacement

The terminator on each end of the RS485 run is designed to match the electrical impedance characteristic of the twisted pair wire, and will prevent signal echoes from corrupting the data on the line. The terminator should be enabled on BOTH ends of the RS485 run. Short and medium length ModBus/485 runs can operate without the terminating resistor. Longer runs may require the terminating resistors. But adding terminator dramatically increases power consumption. **Factory default setting is disabled terminator**.

The B8 supplies this resistor on the main board, and it is chosen using a jumper at J3.

- J3 1-2: Terminator Disabled / OFF (default)
- J3 2-3: Terminator Enabled / ON

RS-485 lines in heavy industrial environments are sometimes subjected to magnetic disturbances causing sufficient inducted power surges to damage the driver integrated circuit (IC). This IC (U4) has a socket on the circuit card for ease of replacement in the field.

2.4.4 Relays Output

The B8 has three onboard programmable Single-Pole Double-Throw (SPDT) relays. These relays can be used to control other equipment, such as fans, lights, horns, etc. eliminating the need for a separate controller.

Three terminal blocks (TB1, TB2 and TB3) are located on the main board. Each relay can be programmed individually.

Switching capability of each relay is:

- 1.0 A maximum resistive load at 30 VDC
- 0.3A maximum resistive load at 125VAC

2.5 Note for B8:

The B8 supports BACnet MS/TP protocol and can be networked to form a BACnet MS/TP network.

The B8 default baud rate is 38400bps.

Each B8 on the MS/TP network must have a unique BACnet MAC address and unique Device Instance Number (Object ID).

- B8 valid MAC addresses are 0-127 for master node, 0-254 for slave node.
- B8 default MAC address is 126.
- Default Device Instance Number (Object ID) is 4005.

The B8 power supply and RS-485 connection are similar to the Q8. The B8 doesn't have terminal blocks TB5 and TB7.

Avoid running communication wires or sensor input wires next to AC power wires or the relay output wires. These can be sources of noise that can affect signal quality.

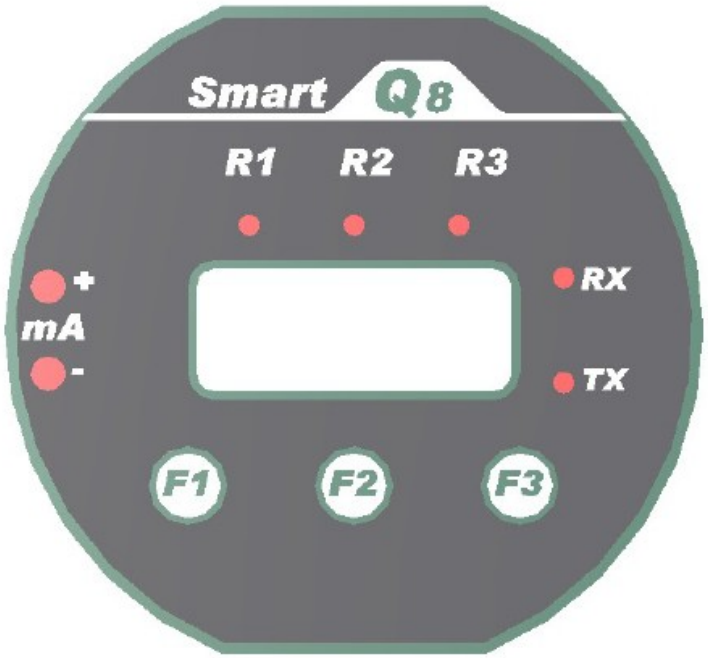
The B8 power supply voltage requirements are nominally 24VAC or 24VDC. The B8 has a half wave rectifier on board, you will damage devices if you mix half wave and full wave rectifiers on the same AC source, Use extreme caution when sharing a common AC source. Sharing a common DC source is less problematic.

When the B8 input power is AC, the 24VAC can be either grounded or non-grounded. Polarization is very important when the B8 is connected to a network. Make sure the Neutral is connected to the GND of TB6.

3. Function and Configuration

3.1 Indicators

The indicators consist of five LED's – two to indicate RS-485 digital communication, three to indicate the status of relay1-3.



- **RS485-TX/RX**

When the B8 is connected to a controller system via RS-485, the traffic of the communication can be monitored visually through the two RS-485 indicators. One is RX LED, which indicates the data stream received in from the controller. The other is TX LED, which indicates the data stream out of the B8.

Note: If the TX LED or the RX LED is always ON, is indicative of a communication problem. See Troubleshooting for RS-485.

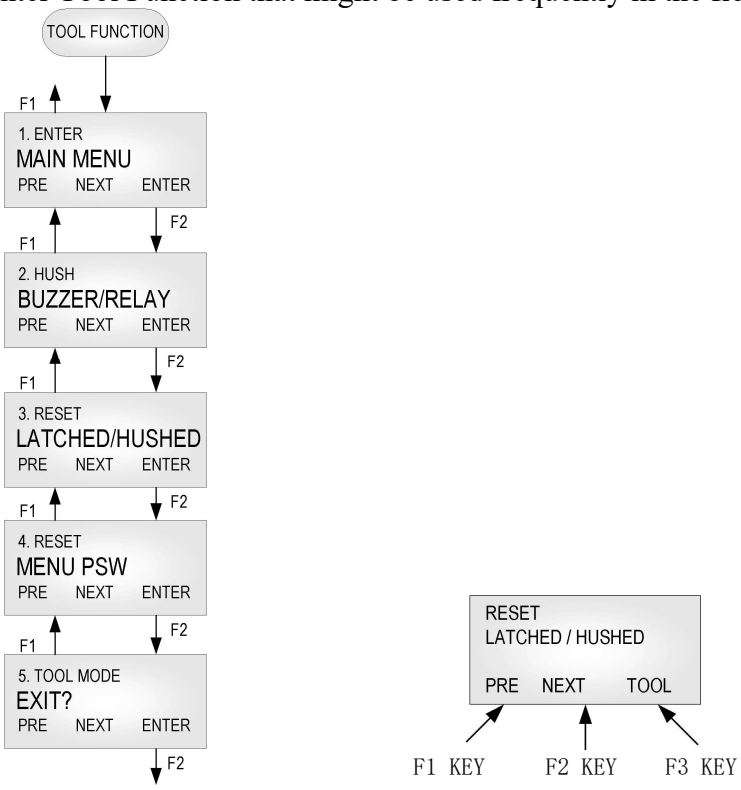
- **Relay 1-3 LED**

Indicate the status of each relay. When the relay is actuated/closed, the relay LED is ON. When the relay is de-actuated/open, the relay LED is OFF.

Note: If you set the relay to be Normally Energized (Fail Safe), the relay LED will turn ON at non-alarm state and turn OFF at alarm state, because the LED reflects the relay coil status.

3.2 Tool Function

Press Key [F3] to enter Tool Function that might be used frequently in the field.



3.2.1 Enter Main Menu

Press key [F1] to browse previous item of the current menu.
Press key [F2] to browse next item of the current menu.
Press key [F3] to enter the main menu for more configuration and settings.

3.2.2 Hush Buzzer and Relay

Press key [F3] to silence the buzzer and buzzer-style relays.

3.2.3 Reset Latched/Hushed

To acknowledge a latched condition or a hushed condition, press key [F3] to reset latched relays and hushed buzzer if equipped for which the alarm condition has been removed. If the alarm condition (e.g. high gas concentration) is still present the relay(s) will not reset.

3.2.4 Reset MENU Password

If you forgot the main menu password, you can reset the menu password to default password “4321” by entering a correct active code. For the active code, contact GES.

3.2.5 Exit Tool Mode

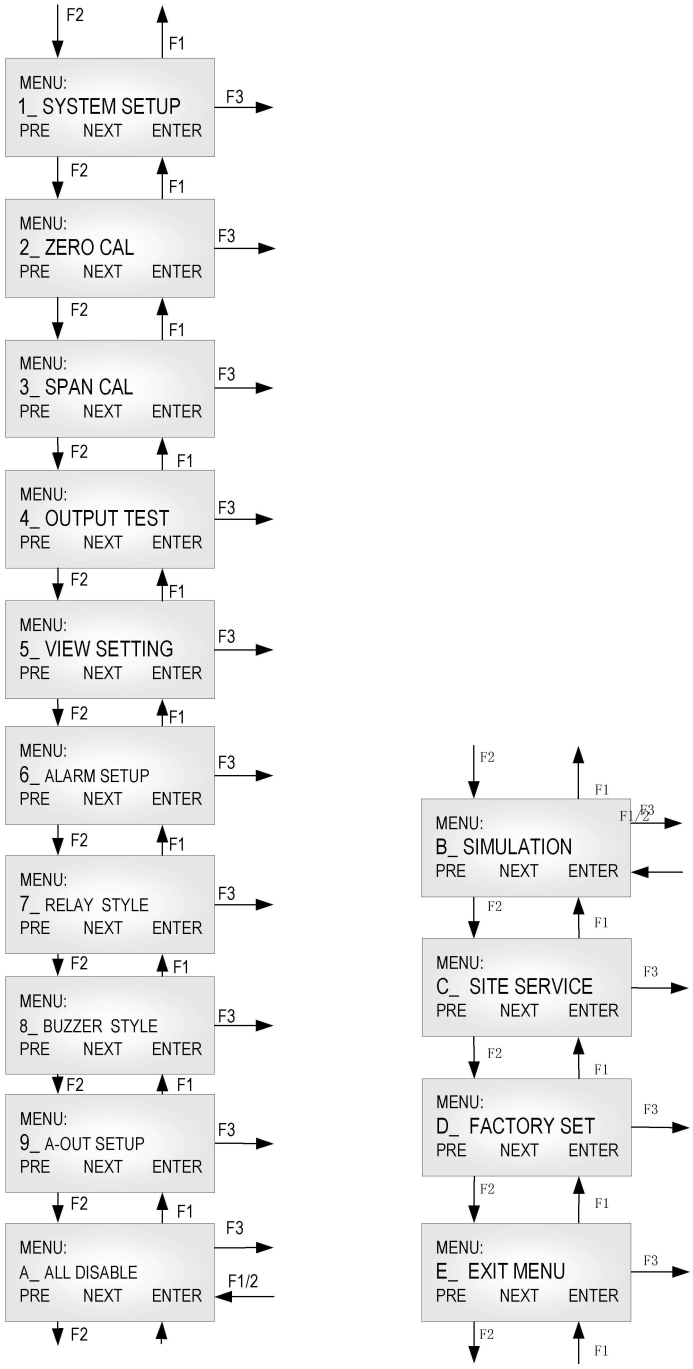
Press key [F3] to return to monitoring mode.

3.3 Main Menu Tree

The main menu is password protected. Once the password is accepted, you are allowed into the main menu tree.

Factory default password is 4321.

Note: While in the Menu Tree, all normal monitoring operations stop. The alarm status does not change.



3.4 Menu "1_SYSTEM SETUP"

The system setup subdivision contains general settings for monitor operations and communications.

3.4.1 System Settings

Password:	Default password is 4321.
MAC Address:	The B8 RS-485 address can be defined from 0 to 255. B8 default address is 126.
Object ID:	BACnet Device Instance Number. Default is 4005.
Baud rate:	Define baud rate for RS-485 communication with BACnet protocol. B8 default baud rate is 38400 bps.
Scroll Rate:	In normal operation, the sensor and relay status information scrolls automatically. Set the number of seconds for each item to be displayed. Default value is 3 seconds.
Backlight:	The LCD backlight can be set to Always Off, Always On and Auto Power Saving mode. In Auto Power Saving mode, the backlight will turn on for 10 seconds after any key has been pressed. Default setting is Auto mode.
UTC Offset	The B8 supports the execution of the TimeSynchronization service and UTCTimeSynchronization service. It indicates the number of minutes (-780 to +780) offset between local standard time and Universal Time Coordinated. Default is +300 (US & Canada Eastern Time).
Daylight Saving	It indicates whether daylight saving time is in effect (Enabled) or not (Disabled) at the B8 location in UTCTimeSynchronization service. Default is Enabled.
New Password:	The new password can be any combination of up to four digits. Default password is 4321. **Warning: Be sure that you record the new password in a safe and secure location!**
Protocol:	The B8 supports BACnet MS/TP master or slave protocol. Default is MS/TP master.

Display Mode:	• Display Instant: displays instantaneous gas concentration
	• Display Average:
	  o Displays STEL (15min average reading)
	  o Displays TWA (8 hour average reading)
	  o Displays daily peak
	• Display Alarm: displays alarm 1-8 status
	• Display Relay: displays relay 1-3 status
	• Display Buzzer: displays buzzer 1-3 status (if equipped)
	• Display Clock: displays real time clock
	If there is nothing to display, the unit will display "Running…"

Auto Zero:	When AutoZero is set to ON, the unit will gather the lowest reading in 7-day period and set the unit into Zeroing Calibration mode so that the lowest reading goes to zero. When AutoZero is set to OFF, the unit will not adjust its own zero and work off the last manual or factory calibration. Default value is OFF. **NOTE: AutoZero works best in situations where the building will purge at night (or over a weekend) to a zero concentration of target gas.**
RESERVED:	TBD.
Restore Default:	**Note: Don't do this if you don't have calibration gas and precision reference instrumentation to calibrate the unit** To load defaults to factory settings, to restore the unit to correct operation. The settings below will be restored to default values: -Password, -Baud rate, -Scroll rate, -Backlight, -Display mode, -LCD contrast, **-Gas type on the Sensor Board, -**Alarm settings, -Relay/Buzzer settings. The unit needs to change the gas type if the sensor on the sensor board is not the default gas type: CO, CH4 or O2. Contact GES for instructions. Zero and span calibrations are needed.

	For IR-CO2 and IR-CH4, this function can reset all the variables into the Factory Defaults and erase all the custom settings that customer have changed like the calibration or the coefficients
ADJ Clock:	Adjust real time clock. The B8 supports the execution of the TimeSynchronization service and UTCTimeSynchronization service. The clock can be adjusted remotely.
ADJ Contrast:	Adjust the LCD contrast. Valid values are between 10 (light) and 50 (dark). Default is 21.
RESERVED:	TBD.

3.5 Menu "2_ZERO CAL"

The B8 is calibrated using a two-point calibration process. First, use a "Zero Gas", then use a "CAL Gas" containing a known concentration of a standard reference gas, to set the second point of reference.

3.5.1 Equipment Required

- A cylinder of Zero Gas, (clean air or nitrogen).
- A cylinder of Cal Gas
- Flow Limiting Regulator(s) **0.2 to 1.0 lpm**
- Tubing

3.5.2 Zeroing Calibration Procedure

- "2_ ZERO CAL:"

2_ ZERO CAL

- Press key [F3] and the device will show the calibration notice and then ask if you want to continue. The middle line will display the current concentration.

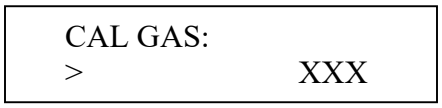
CONTINUE? XXPPM

- Apply the Zero Gas.
- Wait for about 3 minutes or until the reading is stable.
- Press key [F3] to confirm Zeroing Cal.
- When the device is in Zeroing CAL, it will take 3 seconds to 20 seconds to complete.
- When the zeroing CAL operation is over, the device will display "Accepted" and return to "2_ZERO CAL".
- Make sure there is no Cal Error displayed. If Cal Error is reported, repeat the procedures above. If the Cal Error is still showed up, the sensor may be expired.
- Remove the gas.
- Exit the menu to Monitoring Mode.

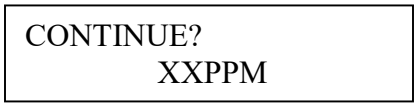
3.6 Menu "3_SPAN CAL"

- "3_ SPAN CAL"

- Press key [F3] and the device will ask for the CAL GAS, input the concentration of the calibration gas.



- Press key [F3] and the device will show the calibration notice and then show the flow rate for the span calibration. Press any key to continue, and then the device will ask you if you want to continue. The middle line will display the current concentration.



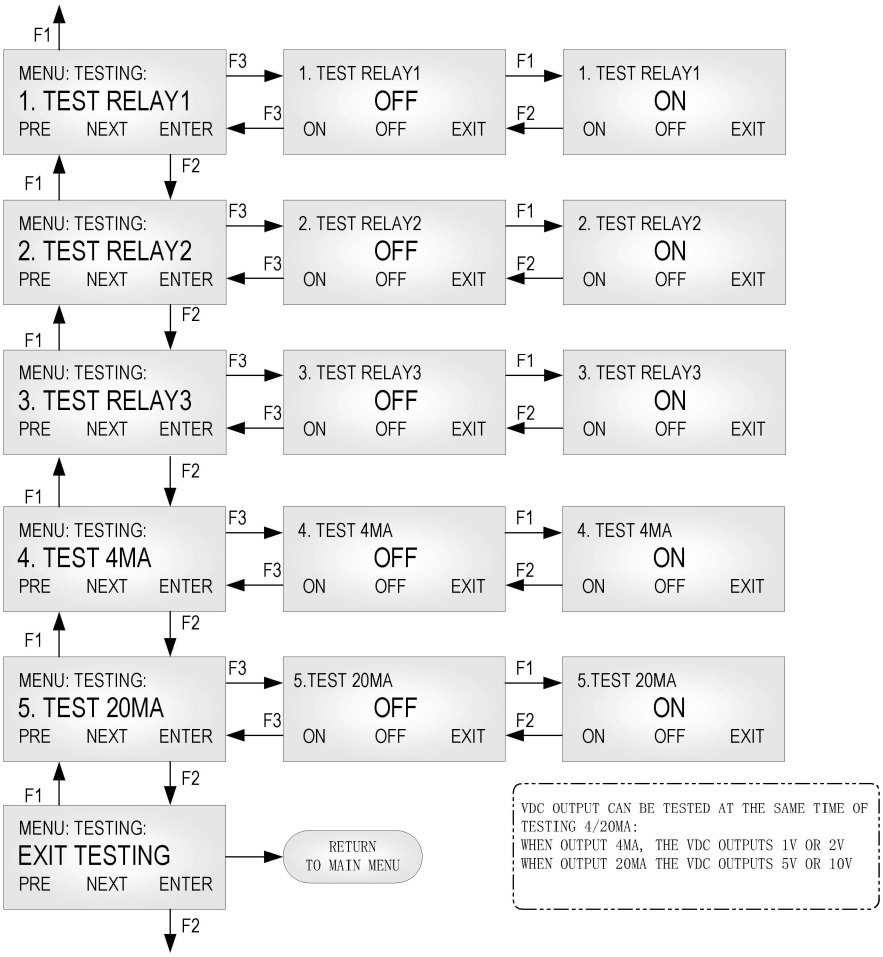
- Apply the calibration gas.
- Wait for about 3 minutes or until the reading is stable.
- Press key [F3] to confirm SPAN CAL.
- When the device is in span cal, it will take 10 seconds to 1 minute to complete.
- When the span cal operation is over, the device will display "Accepted" and return to "3_SPAN CAL".
- Make sure there is no Cal Error displayed. If Cal Error is reported, repeat the procedures above. If the Cal Error is still showed up, the sensor maybe expired.
- Remove the gas.
- Exit menu to Monitoring Mode.

3.7 Menu "4_OUT TEST"

During system installation and testing, it may be necessary to force relays and buzzers on and off.

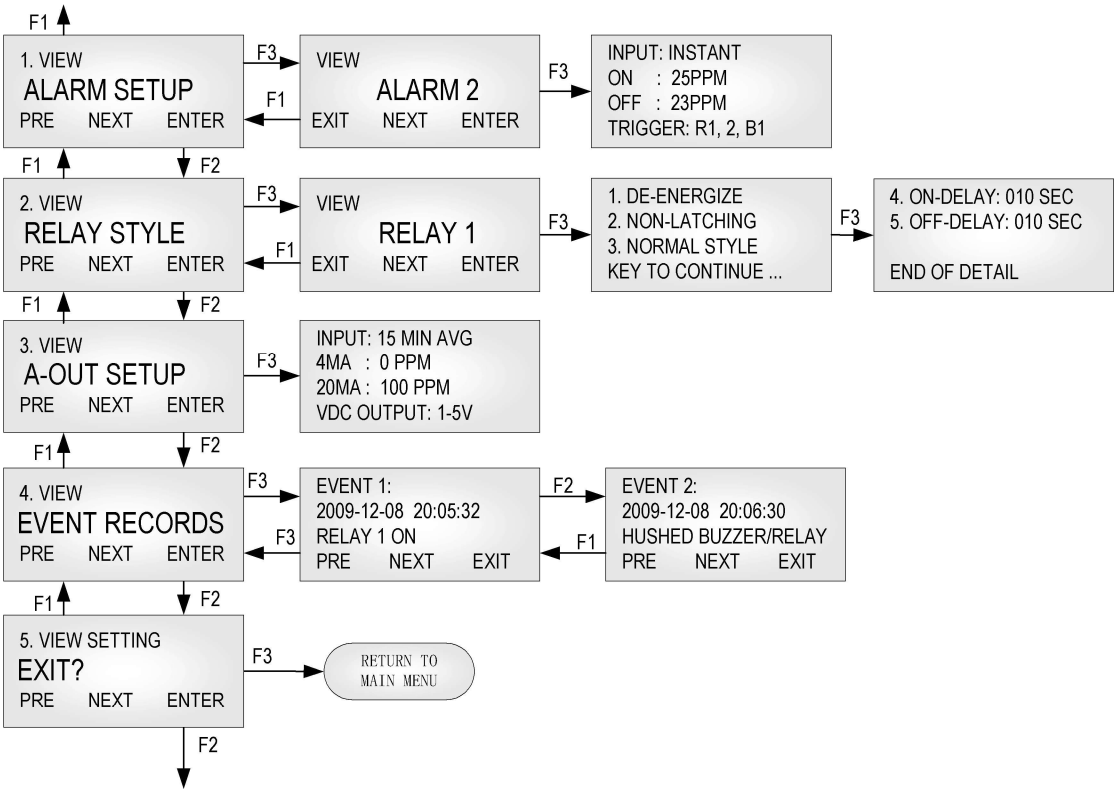
The Relay Testing feature allows the user to force the actuation of each relay. This function forces an Actuate vs. De-actuate action, not an energized vs. non-energized action. Therefore the user must be aware of these relays, which have been defined as normally energized or not normally energized.

The 4mA (1VDC/2VDC) and 20mA (5VDC/10VDC) outputs are not supported in B8.



3.8 Menu "5_VIEW SETTING"

This function is to check the settings for Alarms, Relays, Buzzers and Analog Output.



3.9 Menu "6_ALARM SETUP"

The B8 supports alarm 1 to alarm 8.

Alarm is a programmable condition that can receive a selectable input and trigger relays and buzzers.

Disabled or Enabled:	Each alarm may be individually set to be enabled or disabled. If the alarm is disabled, the alarm will not be used to calculate or trigger anything. **Default: Alarm 1 to Alarm 4 is enabled. Alarm 5 to Alarm 8 is disabled.**
Input:	One of five inputs is selected to calculate the alarm condition status to trigger the selected outputs: • **INSTANT**: instantaneous gas reading. • **15 MIN AVG** (STEL): Short Term Exposure Limit, average reading over 15 minutes. • **8 HOURS AVG** (TWA): 8-hour Time Weighted Average, average reading over 8 hours. • **DAILY PEAK**: daily peak reading. • **FAULT**: If the unit reports any faults, no matter the gas concentration, it will trigger the selected outputs.
Alarm On and Alarm Off Reading:	***If Alarm On is greater than or equal to Alarm Off:*** Alarm On: Sets the concentration at or above which the relay will actuate. Alarm Off: Sets the concentration at or below which the relay will de-actuate. ***If Action On is less than Action Off:*** Action On: Sets the concentration below that the relay will actuate. Action Off: Sets the concentration above that the relay will de-actuate.
Trigger:	Trigger Outputs: Relay 1, Relay 2, Relay 3, Buzzer 1, Buzzer 2, Buzzer 3

3.10 Menu "7_RELAY STYLE"

Enabled:	Each relay may be individually set to be enabled or disabled. If it's disabled, the relay will always de-actuate no matter what the current gas concentration. **Default is Enabled.**
Normally De-energized:	Each relay may be individually set to be normally energized or normally de-energized. **Default is normally de-energized.**
Latching:	Each relay may be set to latch in actuate status until acknowledged by a front-panel action. **Default is Non-Latching.**
ON Delay:	"Delay on Actuation" or "Delay on Make". For each relay a separate time delay may be set from 0 to 990 seconds before an alarm condition will cause the relay to actuate. **Default is 5 seconds.**
OFF Delay:	"Delay on De-Actuation" or "Delay on Break". For each relay a separate time delay may be set from 0 to 990 seconds before a return to a non-alarming signal condition will cause the relay to de-actuate. **Default is 5 seconds.**
Style:	Normal Relay Style: Work as normal relay. Buzzer Style Relay: When the relay is used to control a buzzer or horn. Working as a buzzer style will make the relay have the same function as the buzzer. It will be switched off when performing the Hush Buzzer/Relay function in the Tool Menu. **Default is OFF.**

3.11 Menu "8_BUZZER STYLE"

Not function in the B8.

3.12 Menu "A_ALL DISABLE"

This function is for calibration, system testing etc. When All Disable is ON, the status of the relay, buzzer and analog output, etc., will freeze in their current state.

Default is OFF.

3.13 Menu "B_SIMULATION"

Simulation mode is used to assist in testing the installation before commissioning. When simulation is enabled, the unit will not detect gas concentrations; it will display the simulated value and use it to calculate the status of relays and buzzers, as well as the 4-20mA analog output. This feature is available for evaluating the user settings and testing the installation (e.g.: the activation of the valve, fan speed, relay set points, etc. can be verified.)

Any concentration between 0ppm and 9999ppm can be simulated.

3.14 Menu "C_SITE SERVICE" and "D_FACTROY SET"

Factory service staff access only. The customer has no need to operate it.

4. BACnet PIC Statement Supported By B8

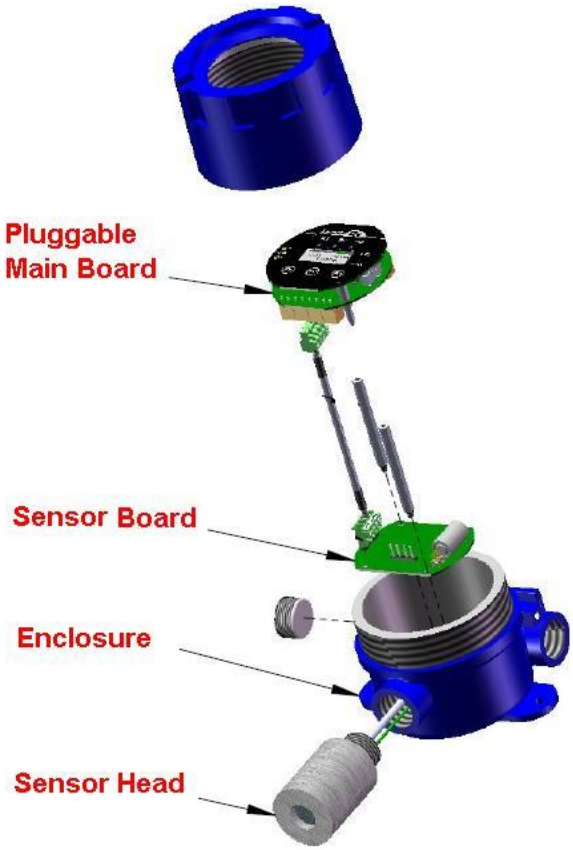
See document: 86350-103-000 (B8 PIC Statement).

5. Maintenance

5.1 Smart Sensor Assembly Replacement

5.1.1 Disassembling

Observe all safety and electrical codes and regulations before removing enclosure lid.



Important: Calibrate the transmitter whenever a component is replaced. But if you replace a smart sensor assembly with a sensor onboard from GES, you don't need to recalibrate the transmitter, as all the calibration information has been stored in the smart sensor board in factory process.

5.1.2 Replacement Procedure

To replace the entire smart sensor assembly, complete the following steps:

1. Power down the transmitter.
2. Unscrew the enclosure lid assembly from the base enclosure
3. Unplug the Main Board CCA
4. Disconnect the sensor cable from the Sensor Board CCA
5. Unscrew the two rods to release the smart sensor board from the base enclosure
6. Unscrew the sensor head from the base enclosure if the sensor head needs to replace too
7. If to only replace electrochemical sensor cell or NDIR sensor cell from the sensor head, unscrew the lid of the sensor head to unplug the sensor cell from the socket
8. Plug the new sensor or replace new sensor head
9. Screw new smart sensor assembly and secure with two rods. Ensure that the connectors are correctly matched each other. Incorrect connection may damage the sensor assembly and/or the Main Board.
10. Plug the Main Board to the two rods
11. Screw back the lid enclosure

6. Troubleshooting

This troubleshooting guide is intended as an aid in identifying the cause of unexpected behavior and determining whether the behavior is due to normal operation or an internal or external problem.

SYMPTOMS	PROBABLE CAUSE	SUGGESTED SOLUTION
RS-485 RX LED or TX LED constantly ON	• RS-485 bus connection has problem • RS-485 Driver U4 is damaged • Controller side RS-485 Driver has problem	• Disconnect the Cable to isolate the problem • Replace U4 IC on main board • Replace RS-485 Driver in Controller
No response to gas	• Sensor screen dirty • Sensor is expired	• Clean sensor opening • Replace smart sensor assembly, see Replacement Parts
Apparent false alarm	• Puff of gas • Not properly calibrated • Solvent fumes or interference from high levels of interfering gas • Radio frequency interference	• Monitor is functioning • Recalibrate • Remove source • Check grounds and shielding are correct
No signal at controller	• Maximum distance reached • Controller does not operate	• Verify loop resistance, change wire AWG • Troubleshoot controller

WARRANTY STATEMENT

The information contained in this manual is based upon data considered accurate; however, no warranty is expressed or implied regarding the accuracy of this data. All GES equipment is warranted against defects in material and workmanship for a period of two years from date of shipment with the following exceptions:

Electrochemical Sensors (Toxic)	Six Months
Catalytic Sensors (Combustible)	One Year

During the warranty period we will repair or replace, at our discretion, any components or complete units that prove, in our opinion, to be defective. We are not liable for consequential or incidental damage to auxiliary interfaced equipment.

A returned material authorization number should be obtained from the factory prior to returning any goods. All return shipments must be shipped freight prepaid and a copy of the maintenance records should accompany the unit concerned.

Warranty should be considered F.O.B. the factory. Labour and travel time are chargeable for any field site visits required for warranty work.

LIMITED LIABILITY

All GES systems shall be installed by a qualified technician/electrician and maintained in strict accordance with data provided for individual systems in the form of installation/maintenance manuals. GES assumes no responsibility for improper installation, maintenance, etc., and stresses the importance of reading all manuals. GES shall not be responsible for any liability arising from auxiliary interfaced equipment nor any damage resulting from the installation or operation of this equipment.

GES's total liability is contained as above with no other liability expressed or implied, as the purchaser is entirely responsible for installation and maintenance of systems.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for GES any liability in connection with the sales of our products other than that set forth herein.

NOTE: Due to on-going product development, GES reserves the right to change specifications without notice and will assume no responsibility for any costs as a result of modifications.

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