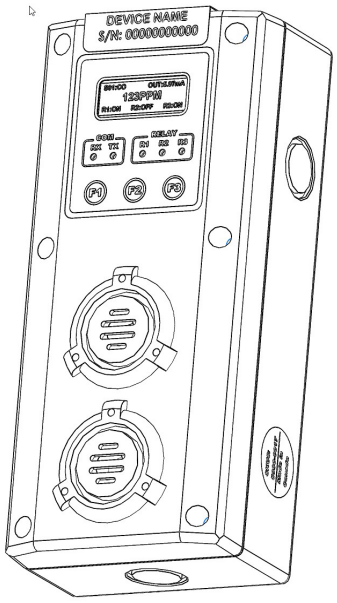
GREYSTONE
ENERGY SYSTEMS INC

Q7
Dual-Sensor Gas Monitor



INSTALLATION
OPERATION AND MAINTENANCE
MANUAL

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READ BEFORE OPERATING

All personnel responsible for using, maintaining, or servicing this product must thoroughly read this manual. The product will function as intended only when used, maintained, and serviced according to the manufacturer's instructions.

Q7 is an advanced dual-sensor gas monitor designed for standalone operation or integration into a larger system. It connects digitally to the GES Q-Controller, M-Controller, or any PLC/DCS via Modbus RTU, or building systems via BACnet MS/TP as a master or slave node. Setup is streamlined with intuitive touch buttons and LCD menus.

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.
(AC power must not be grounded when connected to an M-Controller with full-wave rectifier Terminal Blocks)

Fuse: F1 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)

Sampling: Diffusion or Pump-through

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 backlight

Keypad: 3 capacitive touch sensing Keys: F1, F2, F3

Relays: 3 Relays SPDT, Dry contacts

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

Buzzer: 55 dB at 10 feet, 2700 Hz
Buzzer 1, 2, 3: Programmable tone
Tone: chirp once / chirp twice / 50% duty cycle / constant ON

Output Signal:	RS-485 with GES Controller Protocol • Available Controller: M-Controller, Q4 Controller and Q-Controller RS-485 with Modbus RTU protocol RS-485 with BACnet MS/TP master or slave protocol
Enclosure Rating:	IP 66 & NEMA 4, 4X, 12 & 13
Operating Temperature:	-40°C to 50°C, depends on sensor specification
Ambient Humidity:	5% to 95% RH (non-condensing)
Storage Temperature:	0°C to 25°C, depends on sensor specification
Size:	200mm X 90mm X 65mm
Weight:	Less than 0.5lbs

1.2 Sensor Specifications

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
16	Methane	CH4	Lighter	0 - 100%LEL	-10°C to +50°C
17	Propane	C3H8	Heavier	0 - 100%LEL	-10°C to +50°C
18	Hydrogen	H2	Lighter	0 - 100%LEL	-10°C to +50°C
*19	Combustible	LEL		0 - 100%LEL	-10°C to +50°C
*20	Ethylene	C2H4	Slightly Lighter	0 - 100%LEL	-10°C to +50°C
*21	Iso-Butane	C4H10	Heavier	0 - 100%LEL	-10°C to +50°C
*22	Iso-Pentane	C5H12	Lighter	0 - 100%LEL	-10°C to +50°C
*23	Methanol	CH3OH	Lighter	0 - 100%LEL	-10°C to +50°C
*24	Benzene	C6H6	Lighter	0 - 100%LEL	-10°C to +50°C
*25	Acetone	CH3CO	Lighter	0 - 100%LEL	-10°C to +50°C
*26	Butanol, n-Butane	BUTAN	Heavier	0 - 100%LEL	-10°C to +50°C

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
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
107	Formaldehyde	CH2O	Heavier	0 – 10ppm	-20°C to +50°C

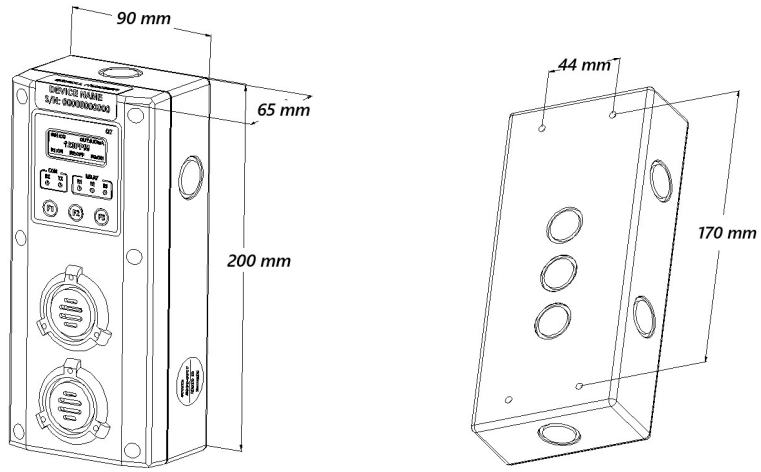
Code	Gas	Symbol	Gas Density	Span	Operating Temperature
15	Carbon Dioxide	IR-CO2	Heavier	0 – 5000ppm	-20°C to +50°C
15	Carbon Dioxide	IR-CO2	Heavier	0 – 5%VOL	-20°C to +50°C
15	Carbon Dioxide	IR-CO2	Heavier	0 – 20%VOL	-20°C to +50°C
15	Carbon Dioxide	IR-CO2	Heavier	0 – 100%VOL	-20°C to +50°C
16	Methane	IR-CH4	Lighter	0 – 100%LEL	-20°C to +50°C
16	Methane	IR-CH4	Lighter	0 – 100%VOL	-20°C to +50°C

Code	Gas	Symbol	Gas Density	Span	Operating Temperature
112	Sulfur Hexafluoride SF6	IR-SF6	Heavier	0 – 1000ppm	-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

2.1 Enclosures Physical Dimensions



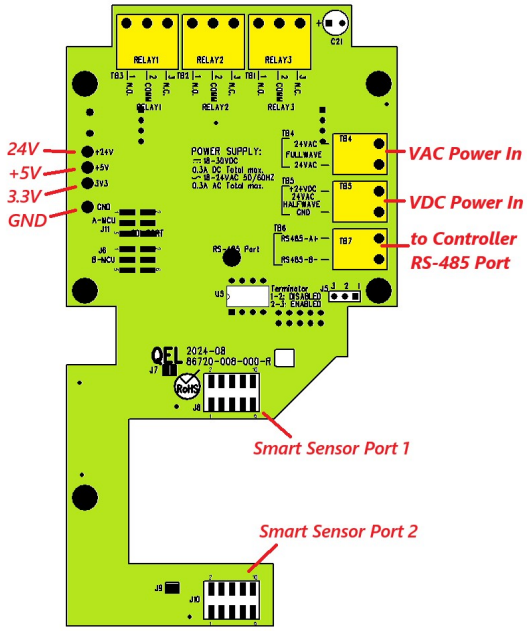
The enclosure is a NEMA 4 rated enclosure and can be wall mounted with 4 screws. To maintain the NEMA rating, it is important that the conduit opening is sealed upon installation.

2.2 Location Guidelines

The Q7 gas monitor should be installed where the target gas is most likely to accumulate, based on its source and density relative to air. Consider air circulation and mixing when selecting the location.

- **Carbon Monoxide (CO) Placement**: As CO is lighter than air, mount the Q7 on walls, at least 2 feet below ceiling height. For optimal visibility of the digital display, position at eye level.
- **Accessibility**: Ensure the location allows easy access for routine recalibration and periodic sensor replacement. Provide sufficient space to remove the enclosure cover, connect the calibration adapter to the sensor chamber, and extract the sensor board assembly.
- **Limited Outdoor Use**: The Q7 can be installed in semi-outdoor environments not directly exposed to weather elements (e.g., wind, rain, sleet, snow). Suitable locations include parking garages, construction complexes, sports venues, boats, or recreational vehicles.
- **Interference Precautions**: Avoid mounting near 600 VAC switchgear or other sources of radio frequency interference (RFI) or electromagnetic interference (EMI). Although Q7 includes RFI/EMI protection, excessive interference may destabilize the output signal.

2.3 Terminals



2.3.1 Wire and Cable

Terminal blocks TB1 to TB7 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.

2.3.2 Power Requirements

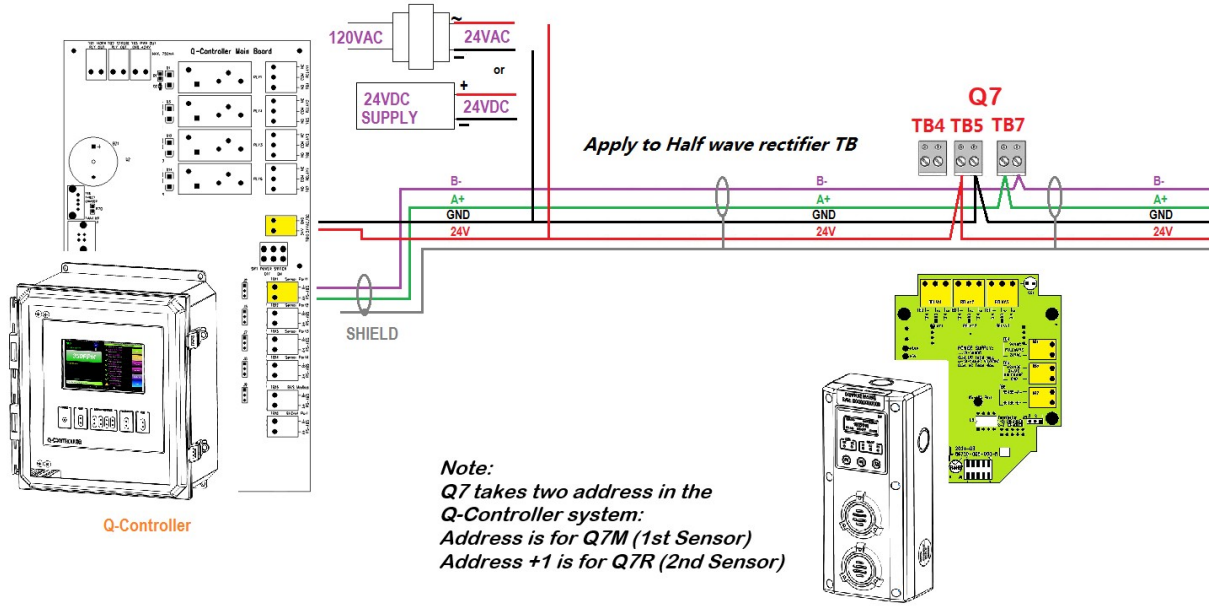
The Q7 operates on a nominal 24VAC or 24VDC power supply and features both full-wave and half-wave rectifiers onboard.

Standalone Operation: When used independently, the Q7 can be powered by 24VAC or 24VDC connected to either the full-wave or half-wave rectifier terminals.

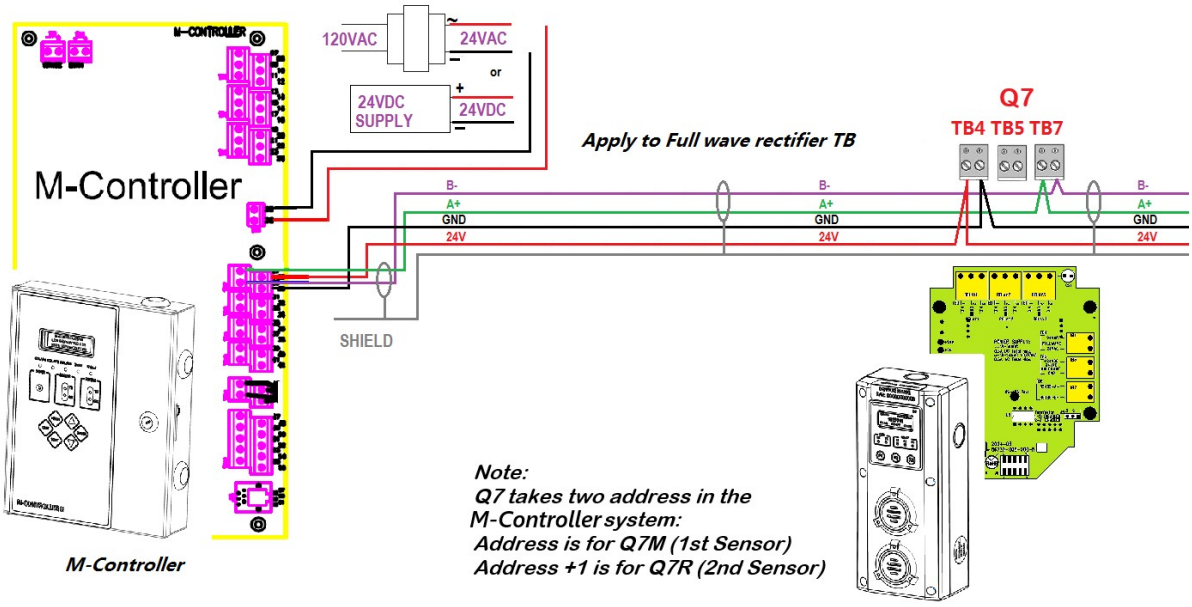
Connected to Controllers: When connecting Q7 to controllers, avoid mixing full-wave and half-wave rectifiers on the same AC source, as this can damage devices. Exercise extreme caution when sharing a common AC source. Sharing a common DC source is generally safer and less likely to cause issues.

- GES Q-Controller uses half-wave rectifier only, M-Controller uses full-wave rectifier only, so the Q7 can work with both controllers.
- When Q7 shares a common AC source with a Q-Controller, use the half wave rectifier connector Q7 TB5.
- When the Q7 shares a common AC source with an M-Controller or Q4 Controller, use the full wave rectifier connector Q7 TB4.

2.3.3 Q7 Connection with Q-Controller



2.3.4 Q7 Connection with M-Controller



2.3.5 Q7 BACnet MS/TP Network Configuration

- **Network Compatibility**: The Q7 supports BACnet MS/TP protocol and can be networked to create a BACnet MS/TP network.
- **Default Baud Rate**: 38400 bps.
- **Unique Identifiers**: Each Q7 on the MS/TP network requires a unique BACnet MAC address and Device Instance Number (Object ID).
- **MAC Address**:
  - Master node: 0–127
  - Slave node: 0–254
  - Default: 3
- **Device Instance Number (Object ID)**: Default is 4005.
- **Wiring Precautions**: Avoid running communication or sensor input wires alongside AC power or relay output wires, as these can introduce noise and degrade signal quality.
- **AC Power Considerations**: When using AC power, ensure all devices on the network use the same rectifier circuit. The Q7 is equipped with both full-wave and half-wave rectifiers. Mixing full-wave and half-wave rectifiers on the same AC source can damage devices.

2.3.6 RS-485 Terminator

Factory default setting is disabled terminator.

The Q7 supplies this resistor on the main board, and it is chosen using a jumper at J5.

- J5 1-2: Terminator Disabled / OFF (default)
- J5 2-3: Terminator Enabled / ON

2.3.7 RS-485 Driver Replacement

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 (U5) has a socket on the circuit card for ease of replacement in the field.

2.3.8 Relays Output

The Q7 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

3. Function and Configuration

3.1 Indicators

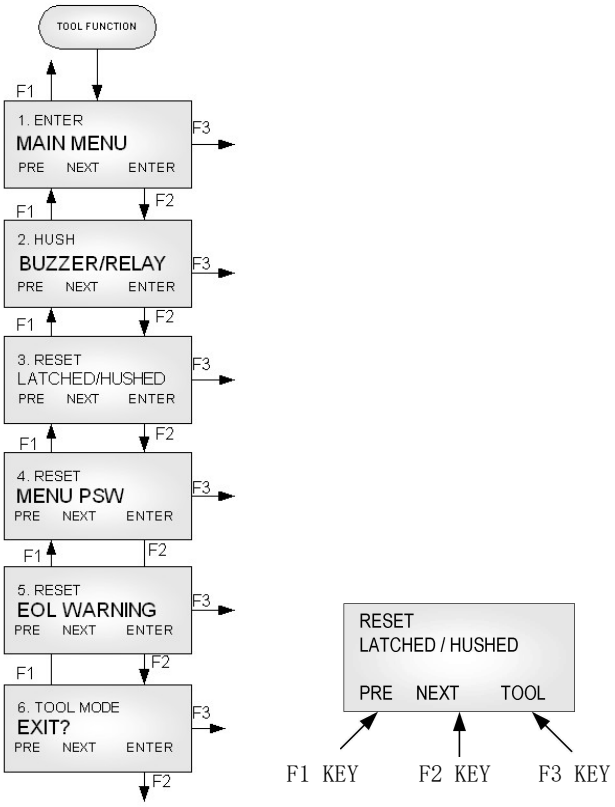
The indicators consist of five LED's – two to indicate RS-485 digital communication, three to indicate the status of relays 1-3.

- **RS485-TX/RX**
  When the Q5C 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 Q5C.
  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 functions that might be used frequently in the field.

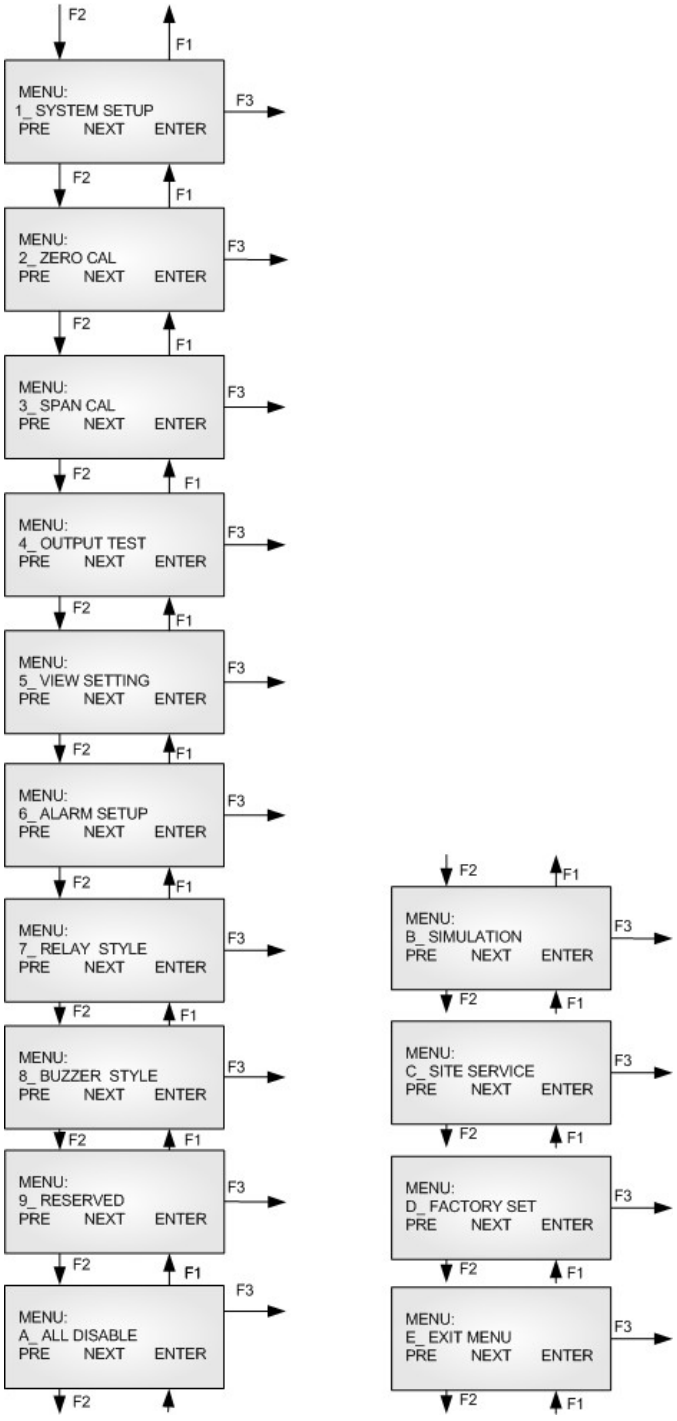


- **Enter Main Menu**
  Press key [F1] to browse previous item of the current menu.
  Press key [F2] to browse next item of the current menu.
  Press key [F3] to enter the main menu for more configuration and settings.
- **Hush Buzzer and Relay**
  Press key [F3] to silence the buzzer and buzzer-style relays.
- **Reset Latched/Hushed**
  To acknowledge a latched condition or a hushed condition, press key [F3] to reset latched relays and hushed buzzer 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.
- **Reset MENU Password**
  If you forgot the main menu password, you could reset the menu password to default password “4321” by entering a correct active code. For the active code, contact GES.
- **Reset End-of-Life Warning**
  When the Q7 displays "Warning: Sensor End of Life," you can reset the warning for 48 hours and must contact the manufacturer within 30 days to replace the sensor or smart sensor module. After 30 days, the sensor will fail, and the warning cannot be reset.
- **Exit Tool Mode**
  Press key [F3] to return to monitoring mode.

3.3 Main Menu Tree

The Q7 main menu is password-protected. Entering the correct password grants access to the menu tree.

- **Default Password**: 4321 (factory setting).
- **Note**: While navigating the menu tree, normal monitoring operations are paused, the alarm status remains unchanged.



3.4 Menu "1_SYSTEM SETUP"

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

3.4.1 System Settings

Password:	Default password is 4321.
MAC Address:	Q7 MAC address range: 0 to 255 (Default: 3). • OptoMux and Modbus protocol: Q7 is treated as 2 sensors: o 1st sensor: Assigned the configured MAC Address, o 2nd sensor: Assigned the configured MAC Address +1. • BACnet protocol: Q7 is treated as a single device, using only the configured MAC Address
Object ID:	BACnet Device Instance Number. Default: 4005. *** Exclusive to BACnet protocol**
Baud rate:	Define baud rate for RS-485 communication: • OptoMux and Modbus Protocols, (Default: 4800 bps) • BACnet Protocol: (Default: 38400 bps)
Scroll Rate:	In normal operation, the sensor and relay/buzzer status scroll automatically. Set the number of seconds for each item to be displayed. Default value is 3 seconds.
Backlight:	• Always Off: Backlight remains off. • Always On: Backlight remains on. • Auto Power Saving: Backlight activates for 10 seconds after any key press. Default: Auto Power Saving mode.

UTC Offset	Q7 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). *** Exclusive to BACnet protocol**
Daylight Saving	It indicates whether daylight saving time is in effect (Enabled) or not (Disabled) at the Q7 location in UTCTimeSynchronization service. Default is Enabled. *** Exclusive to BACnet protocol**
New Password:	The new password can be any combination of four digits. Default password is 4321. **Warning: Record the new password in a secure location to avoid loss of access!**
Protocol:	The Q7 Default protocol is OptoMux. Supported protocols: • OptoMux: it's a proprietary protocol for GES controllers. • Modbus: responds as a Modbus Slave using RTU protocol. o Parity options: EVEN, ODD or No Parity. • BACnet MS/TP: supports BACnet MS/TP master or slave protocol.

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
	• Display A-Out mA: Not Available for Q7
	• Display A-Out VDC: Not Available for Q7

	• Display Clock: displays real time clock (Default is no clock display) If there is nothing to display, the unit will display "Running…"
Auto Zero:	Settings for both Q7 1st sensor and 2nd sensor 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.**
Key Beeper:	ON: Beeping when keypad is touched OFF: No beeping when keypad is touched
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, -Scroll rate, -Backlight, -Display mode, -Key beeper, -LCD contrast, **-Gas type on the Sensor Board, -**Alarm settings, -Relay/Buzzer settings. Zero and span calibrations are needed.
ADJ Clock:	Adjust real time clock. *Q7 supports the execution of the TimeSynchronization service and UTCTimeSynchronization service. The clock can be adjusted remotely when the protocol is set to BACnet.
ADJ Contrast:	Adjust the LCD contrast. Valid values are between 10 (light) and 50 (dark). Default is 21.
Sensors Enable:	If one of the two smart sensors in Q7 is not installed, it can be disabled here. Disable detection of an uninstalled smart sensor to prevent offline fault reporting. Both default values are ON, assuming two sensors are installed.

Output **Priority:**	Alarm output (BV) present_value and relay output (BO) present_value support command prioritization. The Q7 has priority #12 as default. The lower the priority number the more critical the nature of the output. Priority #1 is considered the highest priority. Priority #16 is the lowest priority. *** Exclusive to BACnet protocol**

3.5 Menu "2_ZERO CAL"

Sensor Selection: Choose the sensor to calibrate, either **1st** or 2nd sensor. The calibration process will apply to the selected sensor.

Calibration Method: Utilizes a two-point calibration process:

- Zero Point: Calibrate using a "Zero Gas" (e.g., clean air or nitrogen).
- Second Point: Calibrate using a "CAL Gas" with a known concentration of a standard reference gas.

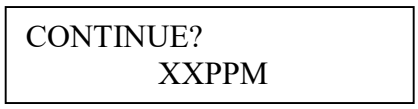
Equipment Required

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

Zeroing Calibration Procedure

- "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.



- Apply 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 shown up, the sensor may be expired.
- Remove the gas.
- Exit the menu to Monitoring Mode.

3.6 Menu "3_SPAN CAL"

Sensor Selection: Choose the sensor to calibrate, either **1st** or 2nd sensor. The calibration process will apply to the selected sensor.

- "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.

CAL GAS: > XXX

- 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.

CONTINUE? XXPPM

- 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.

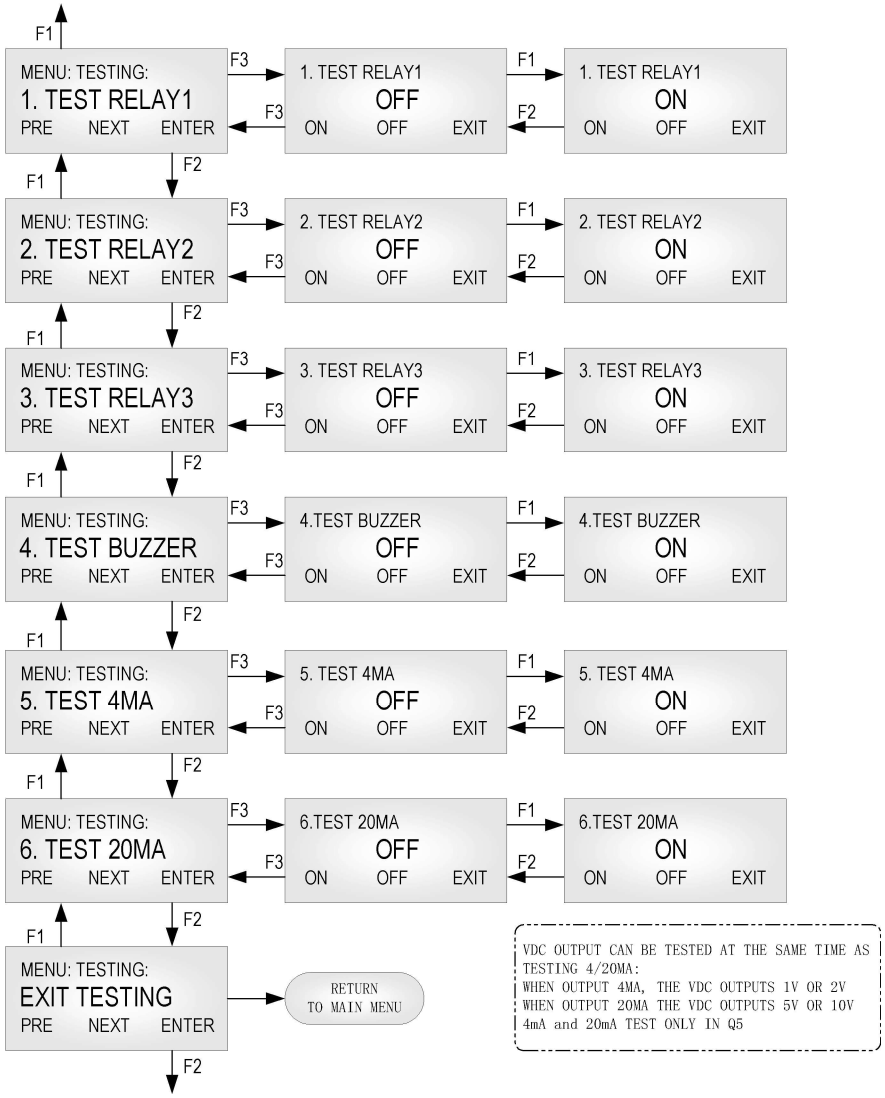
3.7 Menu "4_OUT TEST"

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.

According to UL2075 standard for safety, the Q7 Endurance Test will automatically perform 6000 cycles of Relay/Buzzer On and Off operation at a rate of not more than 15 cpm.

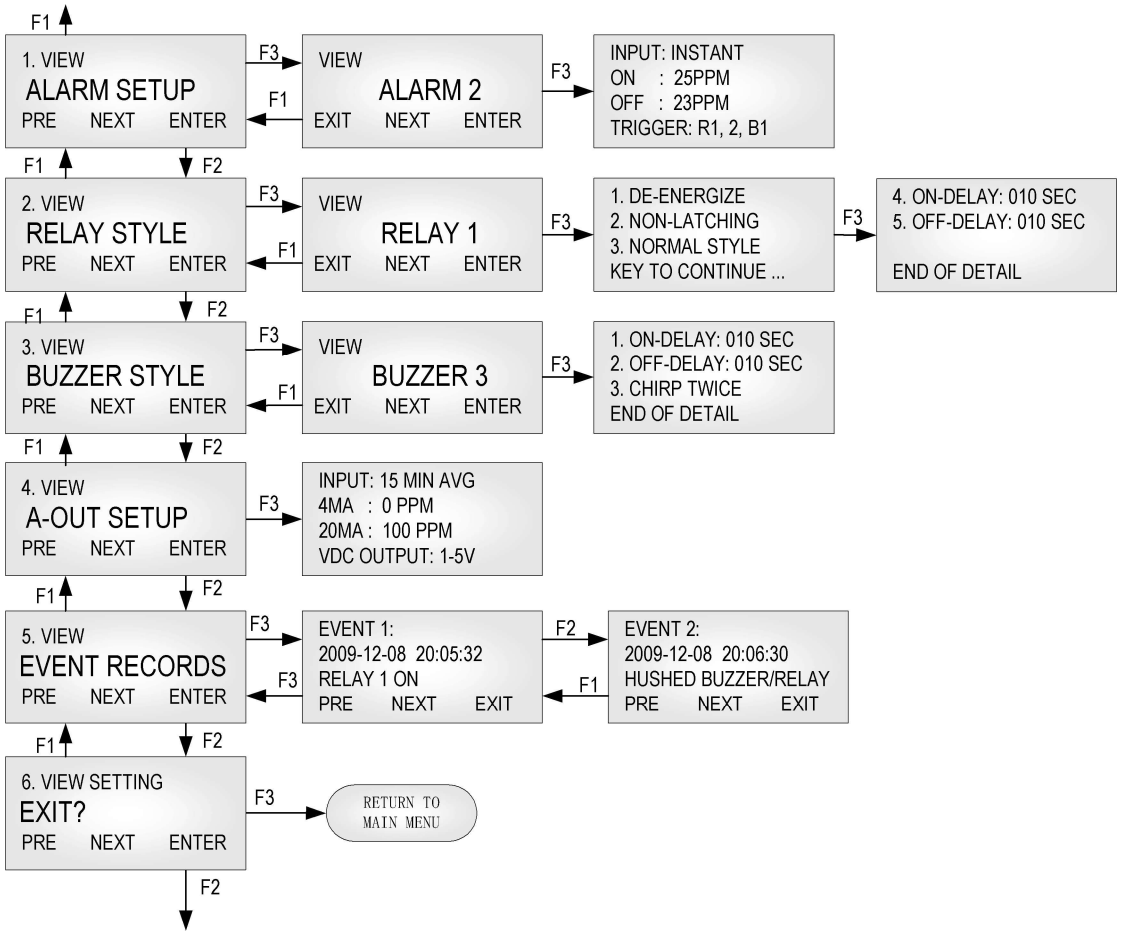
Note: The 4mA (1VDC/2VDC) and 20mA (5VDC/10VDC) outputs are not available for Q7.



3.8 Menu "5_VIEW SETTING"

This function is to verify the settings for the alarms, relays, buzzers and analog outputs.

Note: The View of A-Out Setup is not available for Q7.



3.9 Menu "6_ALARM SETUP"

Sensor Selection: Choose the sensor to setup, either **1st** or 2nd sensor. The setup process will apply to the selected sensor.

Q7 1st sensor supports alarm 1 to alarm 8 on its sensor. The Q7 2nd sensor supports alarm 1 to alarm 8 on its sensor too.

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"

The buzzer style is almost identical to that of the relays, except the style that represents the buzzer tone options:

- Tone 1: Chirp once.
- Tone 2: Chirp twice.
- Tone 3: Intermittent 50% duty cycle.
- Tone 4: Continuous.

The menus are identical to those for the Relay Style.

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"

Sensor Selection: Choose the sensor to set, either **1st** or 2nd sensor. The simulation process will apply to the selected sensor.

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. 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. MODBUS Protocol Supported By Q7

For Modbus protocol, please contact GES for "85940-001-000 Rx (Q5_Q6_Q7_Q8 Modbus Protocol)".

5. BACnet PIC Statement Supported By Q7

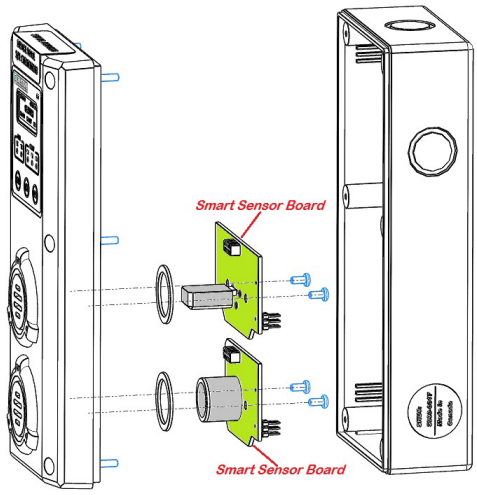
For Modbus protocol, please contact GES for "86750-003-000 Rx (Q7 PIC Statement)".

6. Maintenance

6.1 Smart Sensor Assembly Replacement

6.1.1 Disassembling

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



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

6.1.2 Replacement Procedure

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

1. Power down the monitor.

2. Remove the screws securing the enclosure lid assembly to the base enclosure and remove the enclosure lid assembly.

3. Remove the two screws securing the smart sensor board and remove the smart sensor board from the lid assembly

4. Feed the O-ring over the sensor on the new smart sensor assembly

5. Plug the new smart sensor assembly and secure with two screws. Ensure that the connectors are correctly matched. Incorrect installation may damage the sensor assembly and/or the display board.

6.1.3 Replacement Parts

Code	Gas	Symbol	Span	Smart Sensor Assembly
0	Oxygen	O2	0 - 25%VOL	85930-916-000

Code	Gas	Symbol	Span	Smart Sensor Assembly
16	Methane	CH4	0 - 100%LEL	85930-917-016
17	Propane	C3H8	0 - 100%LEL	85930-917-017
18	Hydrogen	H2	0 - 100%LEL	85930-917-018
*19	Combustible	LEL	0 - 100%LEL	85930-917-019
*20	Ethylene	C2H4	0 - 100%LEL	85930-917-020
*21	Iso-Butane	C4H10	0 - 100%LEL	85930-917-021
*22	Iso-Pentane	C5H12	0 - 100%LEL	85930-917-022
*23	Methanol	CH3OH	0 - 100%LEL	85930-917-023
*24	Benzene	C6H6	0 - 100%LEL	85930-917-024
*25	Acetone	CH3CO	0 - 100%LEL	85930-917-025
*26	Butanol, n-Butane	BUTAN	0 - 100%LEL	85930-917-026

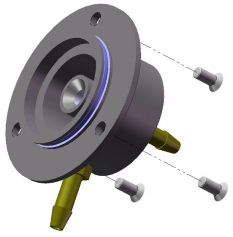
Code	Gas	Symbol	Span	Smart Sensor Assembly
1	Carbon Monoxide	CO	0 – 250ppm	85930-918-001
1	Carbon Monoxide	CO	0 – 1000ppm	85930-918-201
2	Hydrogen Sulfide	H2S	0 – 25ppm	85930-918-002
2	Hydrogen Sulfide	H2S	0 – 100ppm	85930-918-202
3	Sulphur Dioxide	SO2	0 – 6ppm	85930-918-003
5	Nitrogen Dioxide	NO2	0 – 10ppm	85930-918-005
6	Hydrogen	H2	0 – 1000ppm	85930-918-006
6	Hydrogen	H2	0 – 2000ppm	85930-918-206
7	Hydrogen Cyanide	HCN	0 – 50ppm	85930-918-007
9	Ammonia	NH3	0 – 100ppm	85930-918-009
9	Ammonia	NH3	0 – 1000ppm	85930-918-209
11	Ozone	O3	0 – 1ppm	85930-918-011
13	Chlorine	Cl2	0 – 5ppm	85930-918-013
14	Chlorine Dioxide	ClO2	0 – 2ppm	85930-918-014
96	Arsine	AsH3	0 – 1ppm	85930-918-096
97	Phosphine	PH3	0 – 5ppm	85930-918-097
97	Phosphine	PH3	0 – 1ppm	85930-918-297
98	Silane	SiH4	0 – 50ppm	85930-918-098
99	Germane	GeH4	0 – 2ppm	85930-918-099
100	Diborane	B2H6	0 – 2ppm	85930-918-100

Code	Gas	Symbol	Span	Smart Sensor Assembly
4	Nitric Oxide	NO	0 –100ppm	85930-918-004
8	Hydrogen Chloride	HCl	0 – 30ppm	85930-918-008
12	Ethylene Oxide	ETO	0 – 20ppm	85930-918-012
101	Hydrogen Bromide	HBr	0 – 30ppm	85930-918-101
107	Formaldehyde	CH2O	0 – 10ppm	85930-918-107

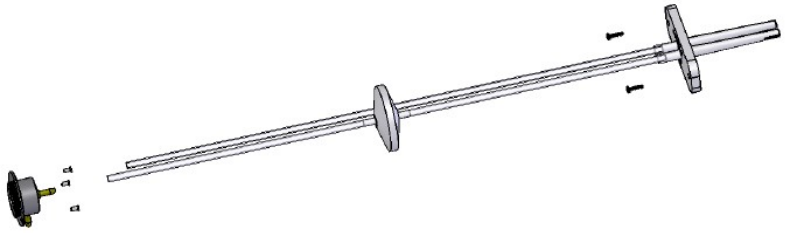
Code	Gas	Symbol	Span	Smart Sensor Assembly
15	Carbon Dioxide	IR-CO2	0 –5000ppm	85930-919-015
15	Carbon Dioxide	IR-CO2	0 – 5%VOL	85930-919-215
15	Carbon Dioxide	IR-CO2	0 – 20%VOL	85930-919-315
15	Carbon Dioxide	IR-CO2	0 – 100%VOL	85930-919-415
16	Methane	IR-CH4	0 – 100%LEL	85930-919-016
16	Methane	IR-CH4	0 – 100%VOL	85930-919-216

Code	Gas	Symbol	Span	Smart Sensor Assembly
112	Sulfur Hexafluoride SF6	IR-SF6	0 – 1000ppm	85930-916-112
15	Carbon Dioxide	IR-CO2P	0 –5000ppm	85930-916-015

6.1.4 Accessories



Pump-thru & Calibration Cap Kit, SKU#: 85930-006-000



Duct Mount Adapter Kit, SKU#: 85930-040-000

Note: For Duct Mount Installation, Q7 needs both the Pump-thru Kit and Duct Mount Kit

7. 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 a problem • RS-485 driver U6 is damaged • Controller side RS-485 driver has problem	• Disconnect the cable to isolate the problem • Replace U6 IC on main board • Replace the RS-485 driver on the controller
No response to gas	• Sensor screen is dirty • Sensor has 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 of interfering gas • Check that grounding and shielding is correct
No signal at controller	• Maximum distance reached • Controller does not operate	• Verify loop resistance, change wire AWG • Troubleshoot controller

8. 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.

For further information or assistance, contact:

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