



# GDC•150

## Instruction 5209-9000 Operation Manual

Rev. 0 - May 2011



Product Leadership • Training • Service • Reliability

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## **1. OVERVIEW**

### **1.1. General Description**

GDC-150 transmitters are rugged, user-friendly, configurable analog transmitter gas detectors for use in non-hazardous (non-explosion rated) environments for commercial HVAC and light industrial use. It can be configured for either electrochemical toxic gas sensors, solid-state sensors, or catalytic sensors.

A standard transmitter provides a bi-color LED indicating light for power, fault condition, and alarm (option with one dry contact relay). An optional LED digital display is available as well as other enclosure options.

The electrochemical sensors utilized in this device are accurate enough to measure to Occupational Health and Safety hazardous levels for toxic gases and oxygen levels.

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**NOTE:** The GDC-150 analog transmitters operate by diffusion. If a sample draw system is desired, consult a Bacharach authorized distributor or the factory for details.

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### **1.2. Enclosures**



**Figure 1-1. Standard (NEMA 1X) Enclosures**



**Figure 1-2. Optional Water-Tight (NEMA 4X) Enclosure**



**Figure 1-3. Water-Tight Enclosure (Side View) Showing Optional Splash Guard**



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**NOTE:** GDC-150 transmitters utilizing catalytic combustible or electrochemical H<sub>2</sub>S/SO<sub>2</sub> sensors are supplied with the water- and dust-tight NEMA 4X enclosure standard.

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1.3. Key Components

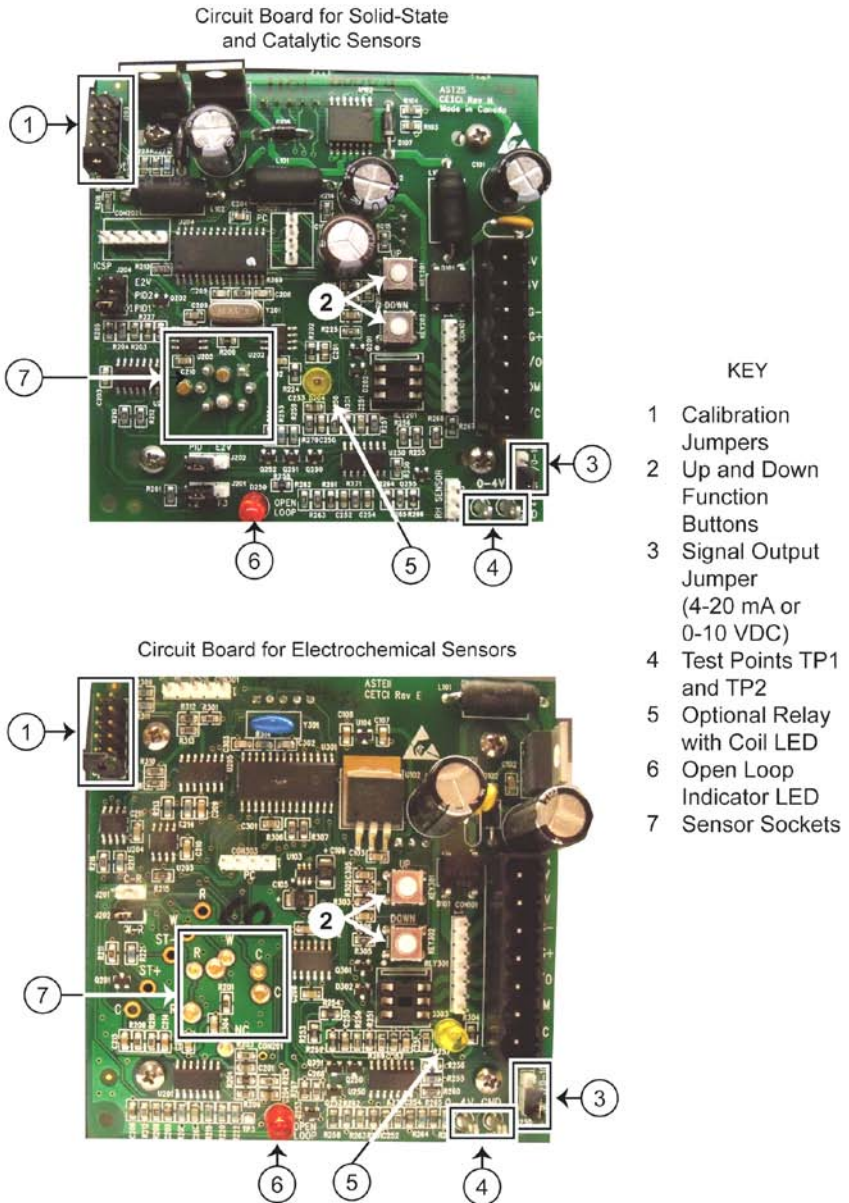


Figure 1-4. Key Components on GDC-150 Circuit Board

**2. SPECIFICATIONS**

**2.1. General**

All Sensor Types	
<b>Power</b>	12 VAC to 30 VAC or 16 VDC to 30 VDC <sup>1</sup>
<b>Current</b>	80 to 120 mA <sup>2</sup>
<b>Indicators</b>	One bi-color LED: <ul style="list-style-type: none"> <li>• Green = Power</li> <li>• Red = Alarm</li> <li>• Flash Green = Warm-up</li> <li>• Flash Red = Fail</li> </ul>
	One amber LED (internal relay coil status indicator) <sup>3</sup>
	One red LED (4-20 mA open-loop indicator for remote transmitter)
<b>Options</b>	<ul style="list-style-type: none"> <li>• LED digital display (3.5 digits)</li> <li>• Relay (one SPDT dry contact relay rated 2A @ 30 VAC)</li> <li>• Water/dust tight enclosure</li> <li>• Splash guard (water-tight enclosure only)</li> </ul>

**2.2. Standard Enclosures**

	Solid-State	Catalytic	Electrochemical
<b>Type</b>	PVC	Polycarbonate	PVC
<b>Dims (HxWxD)</b>	6.5 x 4.4 x 2.5 in 165 x 113 x 65 mm	4.9 x 4.9 x 2.9 in 125 x 125 x 75 mm	6.5 x 4.4 x 2.5 in 165 x 113 x 65 mm
<b>Weight</b>	20 ounces	16 ounces	20 ounces
<b>Construction</b>	Drip-proof overlap with hinged door	Water- & dust-tight with hinged door	Drip proof overlap with hinged door

**2.3. Optional Enclosures**

	Solid-State	Catalytic	Electrochemical
<b>Type</b>	Polycarbonate	[Hatched Pattern]	Polycarbonate
<b>Dims (HxWxD)</b>	4.9 x 4.9 x 2.9 in 125 x 125 x 75 mm	[Hatched Pattern]	4.9 x 4.9 x 2.9 in 125 x 125 x 75 mm
<b>Weight</b>	16 ounces	[Hatched Pattern]	16 ounces
<b>Construction</b>	Water- & dust-tight with hinged door	[Hatched Pattern]	Water- & dust-tight with hinged door

<sup>1</sup> Non ground referenced supply only

<sup>2</sup> For electro-chemical sensors, this depends on the options that are selected.

<sup>3</sup> Only supplied if relay option has been selected

## 2.4. Sensors (Solid-State and Catalytic)

	Solid-State	Catalytic
<b>Type</b>	Solid-state MOS <sup>4</sup>	Catalytic pellistor
<b>Range</b>	Combustible: 0-50% LEL Refrigerant: 0-2000 ppm	0-100% LEL of target combustible gas or vapor
<b>Life Span</b>	Combustible: Approximately 5 to 8 years in clean, ambient conditions Refrigerant: Approximately 5+ years in clean, ambient conditions	Approximately 5 years in clean, ambient conditions
<b>Resolution</b>	Combustible: 1% LEL Refrigerant: 2 ppm	1% LEL
<b>Temperature</b>	-20°C to +40°C (-4°F to +104°F)	-20°C to +40°C (-4°F to +104°F)
<b>Humidity</b>	0-90% non-condensing	0-90% non-condensing
<b>Response</b>	Combustible: T <sub>90</sub> = <60 seconds Refrigerant: T <sub>90</sub> = <120 seconds for most refrigerants	T <sub>90</sub> from air to 50% LEL = <12 seconds
<b>Warm-up</b>	2 minute delay 24 hours for best performance (maximum accuracy)	2 minute delay 1 hour for best performance (maximum accuracy)

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<sup>4</sup> MOS: Metal Oxide Semiconductor

**2.5. Sensors (Electrochemical)**

Sensor	Range	Life Span <sup>5</sup>	Resolution	Temp	RH <sup>6</sup>	Response Time (T <sub>90</sub> )	Warm Up
Ammonia (NH <sub>3</sub> )	0-500 ppm	2	1-2 ppm	-40 TO +50°C <sub>7</sub>	15-90%	<90 sec	2-6 hrs
Carbon Monoxide (CO)	0-200 ppm	5-8	1 ppm, 3 ppm <sup>8</sup>	-20 to +50°C	10-95%	<2 min	1 hr <sup>9</sup>
Hydrogen Sulfide (H <sub>2</sub> S)	0-50 ppm	3	0.5 ppm	-30 to +50°C	15-90%	<35 sec (0-20 ppm)	1 hr <sup>9</sup>
Nitrogen Dioxide (NO <sub>2</sub> )	0-5.0 ppm	3	0.1 ppm	-30 to +50°C	15-90%	<60 sec (0-10 ppm)	1-2 hrs
Nitric Oxide (NO)	0-100 ppm	3	1 ppm	-30 to +50°C	15-90%	<20 sec (0-50 ppm)	1-2 hrs
Oxygen (O <sub>2</sub> )	0-25.0 % vol	2	0.1% vol	-30 to +50°C	5-95%	<15 sec (20.9%-0%)	1 hr <sup>9</sup>
Sulfur Dioxide (SO <sub>2</sub> )	0-20 ppm	2	1 ppm	-30 to +50°C	15-90%	<30 sec (0-20 ppm)	2 hrs
Formaldehyde (HCHO)	0-10 ppm	2	0.2 ppm	-20 to +50°C	15-90%	<80 sec	1 hr

<sup>5</sup> Approximate, in years

<sup>6</sup> Non-condensing

<sup>7</sup> Temperature drift occurs

<sup>8</sup> Without regular calibration

<sup>9</sup> Minimum warm-up time

**2.6. Sensor Cross Sensitivity (Electrochemical)**

Sensor	Cross Sensitivity – Electrochemical Sensors Only		
Ammonia 0-500 ppm	300 ppm CO = 8 15 ppm H <sub>2</sub> S = 30 5 ppm SO <sub>2</sub> = -0.5	10% vol CO <sub>2</sub> = -15 1 ppm Cl <sub>2</sub> = -1 200 ppm H <sub>2</sub> = 4	35 ppm NO = 6 5 ppm HCl = -3 5 ppm NO <sub>2</sub> = -1
Carbon Monoxide	Conforms to UL 2034 performance specification.		
Hydrogen Sulfide	20 ppm SO <sub>2</sub> ≤ 18 10 ppm Cl <sub>2</sub> ≤ -25 400 ppm CO ≤ 4	50 ppm NO ≤ 6 400 ppm H <sub>2</sub> ≤ 1 400 ppm NH <sub>3</sub> ≤ 0.1	10 ppm NO <sub>2</sub> ≤ -30 400 ppm C <sub>2</sub> H <sub>4</sub> ≤ 0.8
Nitrogen Dioxide	50 ppm NO ≤ 0.5 400 ppm H <sub>2</sub> ≤ 0.1 400 ppm C <sub>2</sub> H <sub>4</sub> ≤ 0.1	20 ppm SO <sub>2</sub> ≤ -2 20 ppm H <sub>2</sub> S = -100 20 ppm NH <sub>3</sub> ≤ 0.1	10 PPM Cl <sub>2</sub> = 100 400 ppm CO ≤ 0.1
Nitric Oxide	10 ppm NO <sub>2</sub> ≤ 5 400 ppm H <sub>2</sub> ≤ 0.1 20 ppm NH <sub>3</sub> ≤ 0.1	20 ppm SO <sub>2</sub> ≤ 4 20 ppm H <sub>2</sub> S ≤ 60	10 ppm Cl <sub>2</sub> ≤ 5 400 ppm CO ≤ 0.1
Oxygen	5% volume CO <sub>2</sub> = 0.1    0% to 95% RH @ 40°C ≤ 0.7		
Sulfur Dioxide	50 ppm NO ≤ -3 400 ppm H <sub>2</sub> ≤ 0.1 20 ppm NH <sub>3</sub> ≤ 0.1	10 ppm NO <sub>2</sub> ≤ -100 400 ppm CO ≤ 1	10 ppm Cl <sub>2</sub> ≤ -70 400 ppm C <sub>2</sub> H <sub>4</sub> ≤ 40
Formaldehyde (HCHO)	100 ppm CO <18    100 ppm H <sub>2</sub> ≤ 3 Other reducing gases such as alcohol (Note: Formalin – commercial grade formaldehyde – contains alcohol.)		

**3. INSTALLATION**

**3.1. Mounting Holes and Conduit Ports**

The GDC-150 should be installed on a flat vertical surface with the sensor pointing outwards in a clean, dry environment. If the GDC-150 is to be installed in a potentially wet environment, the optional water-tight enclosure should have been selected. This reference refers to the standard, general purpose PVC enclosure. Four mounting holes are provided in the enclosure base for securing the GDC-150 to the wall. Do not block the front of the enclosure as this is where the sensor is situated and where it monitors the air for the target gas.

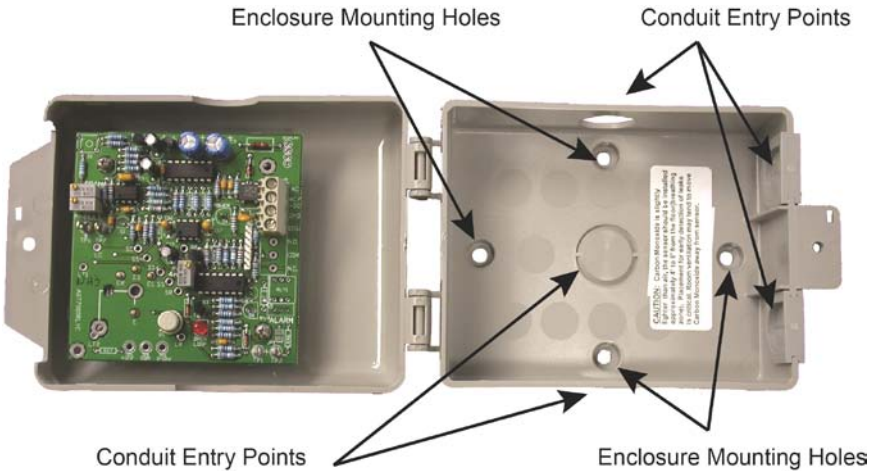
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**NOTE:** Four mounting holes are provided in the enclosure base for securing the GDC-150 to the wall. The mounting holes are 3/16" (4.8 mm) in diameter.

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Conduit entry points are provided for the PVC enclosure.



**Figure 3-1. Standard Enclosure Showing Mounting Holes**

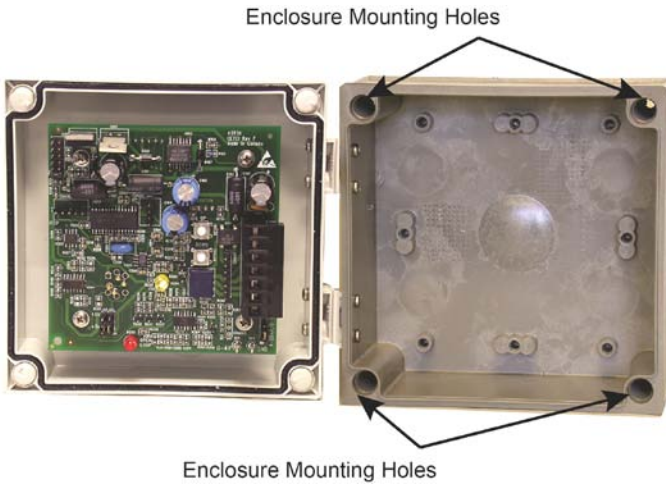
The water-tight enclosure must be installed with the mounting screws passing through the same openings that accommodate the four door securing screws. This ensures the mounting screws are outside of the door gasket and confirms a water-tight installation.

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**NOTE:** No conduit entry points are provided for the water-tight enclosure. The reason is the installer may not want one where we would place it and this would result in unnecessary openings into this enclosure.

---



**Figure 3-2. Water-Tight Enclosure Showing Mounting Holes**



**WARNING:** Do not drill holes in the back of the base of the enclosure for the purpose of mounting the sensor/transmitter. Leak paths can occur. Corrosion damage will not be covered under warranty.



**NOTE:** Use caution when drilling holes in the water-tight enclosure for conduit entry so as not to damage the circuit board inside. Use liquid tight conduit hubs wherever conduit enters the water-tight enclosure. Failure to do so creates a leak path. Water running down the conduit enters the interior of the enclosure and could corrode the circuit board. *This is not covered under warranty.*



**NOTE:** When mounting either enclosure, allow enough room to enable the end user to open the door fully to access the internal adjustments.

### 3.2. Enclosure Door

The standard enclosure has one screw securing the door to the base for electrical safety and provides an opening to allow the user to apply a zip tie if they desire the transmitter to be locked more securely. Refer to Figure 1-1 on page 1.

The door of the standard enclosure can be easily removed to facilitate installation of the base. Simply grasp the lid with one hand, being careful not to make contact with any of the internal components (circuit board), and grasp the base with your other hand. Tug on the base, pulling it towards you. The section of the hinges located on the base should “snap” apart from the part of the hinges located on the door.

After installation, simply locate the lid hinges over the installed base hinges and pull toward you. The hinges should easily “snap” back into place.

By design, the overlapping door of the PVC enclosure makes it inherently drip proof, although it is not water tight or dust tight. The optional water-tight enclosure has four screws for sealing the door to the base. Refer to Figure 1-2 on page 2.

### **3.3. Sensor Mounting Height Recommendations**

Some toxic gases such as ammonia ( $\text{NH}_3$ ) and combustible gases such as methane ( $\text{CH}_4$ ) are lighter than air, therefore the sensor/transmitter should be installed on or near the ceiling.

Some toxic gases such as carbon monoxide are only slightly lighter than air, therefore the sensor/transmitter should be installed at approximately 4' to 6' from the floor.

Oxygen sensors should be installed at approximately 4' to 6' from the floor.

For toxic gases, combustible gases, and vapors that are heavier than air, the sensor/transmitter should be installed with the sensor opening at 6' from the floor.

Although most refrigerants (e.g., Freons) are heavier than air, some applications may be better suited to a slightly higher mounting height for refrigerant sensors.



**NOTE:** If the area to be monitored is a wet environment, water-tight enclosures should be used. The water-tight enclosure must be installed using the indicated holes or it may leak. Damage caused by leaking because of improperly installed enclosures is not covered under warranty. If the area to be monitored has the potential for water spray, a splash guard should be used to protect the sensor.

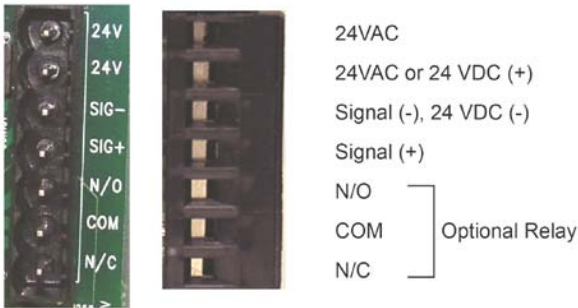
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### **3.4. Wiring the GDC-150 for Power**

If powering the GDC-150 with 24 VAC, use terminals 1 and 2. If powering the GDC-150 with 24 VDC, the positive (red) wire should be connected to terminal 2 and the negative (black) wire should be connected to terminal 3. The signal wire is always connected to terminal 4. See Figure 3-4 for proper wiring examples and Figure 3-5 for improper wiring examples.

Terminals 5, 6, and 7 are used only if the relay option has been supplied. Double check the relay ratings in the specifications section of this manual before operation. For normal operation, the relay control wiring should be connected to N/C and COM (fail-safe operation is used).





**Figure 3-3. Power and Optional Relay Wiring**



**NOTE:** The main wiring terminal strip on the GDC-150 circuit board can be unplugged for easier wiring installation. Grasp the two sides of the terminal strip and lift upward with a slight side to side rocking motion.



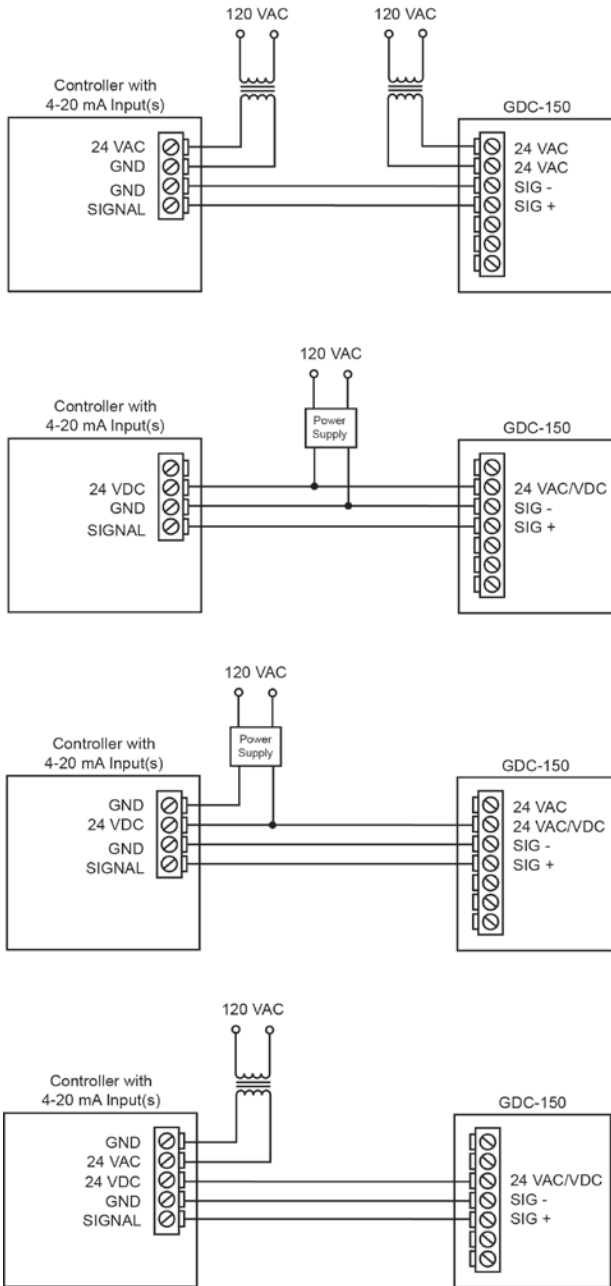
**NOTE:** DO NOT use solid-core wire for connection to wiring terminal strip. Any damage caused by using solid-core wire will void warranty. Use stranded wire ONLY.



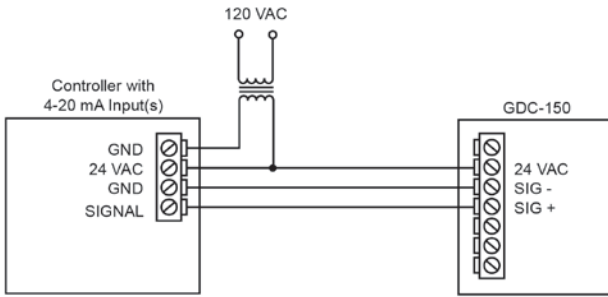
**IMPORTANT:** The GDC-150 is a low voltage powered device. Any application of operating voltages higher than indicated in the manual may result in damage. Double check wiring connections prior to powering the transmitter. Damage from incorrect wiring connections or from too much voltage are not covered under warranty.



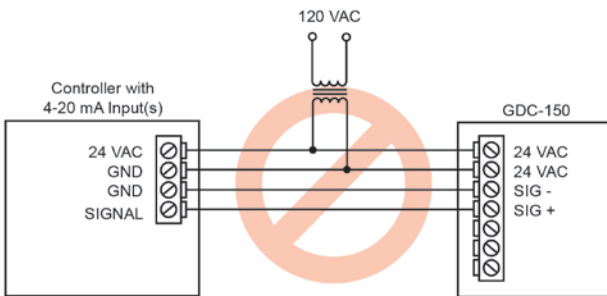
**IMPORTANT:** When providing power to the GDC-150, use non-grounded reference supplies only. Refer to Figure 3-4 for proper wiring examples and Figure 3-5 for improper wiring examples.



**Figure 3-4. Proper Wiring Examples**



**Figure 3-4. Proper Wiring Examples (Continued)**



**Figure 3-5. Improper Wiring Example**

## **4. OPERATION**

### **4.1. General**

After installation, double check wiring prior to applying power to the GDC-150 transmitter. Remember, these are low voltage devices. After power up, the outer LED will flash green indicating the system is in a warm-up period. During the warm-up period, the signal output from the GDC-150 is fixed at 4.0 mA. If the digital display option has been fitted, the LED display will indicate a scrolling decimal “.....” until the warm-up is completed. If the relay option has been selected, the relay is not activated during warm-up. The GDC-150 has been programmed with a 5-minute warm-up period. After the warm-up is completed, the signal output and digital display (if this option has been supplied) will indicate current gas readings (if any).

If the relay option has been supplied, it will have a factory preset alarm set point (this can easily be changed in the field). In a non-alarm state, the outer LED will be illuminated green and the amber relay coil inner LED will be illuminated. The illuminated relay coil LED indicates to the user that the relay coil is energized. The relay option on the GDC-150 has been designed to operate in a fail-safe manner, meaning that the relay coil is energized in non-gas-alarm state and de-energize when a gas alarm is indicated. The device to be controlled should be connected to the N/C (normally closed) and COM (common) terminals. In the event of a sensor failure, anything controlled by the relay is activated continuously until the fail condition has been corrected.

## 4.2. Detecting Gas

Upon detection of the presence of target gas, the signal output increases to a value equal to the amount of gas being detected by the sensor. If the LED display option has been supplied, this value will be displayed. If the concentration of gas is above the preset alarm threshold, the outer LED changes to red, the alarm relay de-energizes and the amber relay coil LED goes out.

As the detected gas level subsides, the output signal will decrease again to a value equal to anything being detected by the sensor and this will be indicated on the LED display (if this option has been selected). The relay will automatically reset after the signal drops below the set point value.

## 4.3. System Failure

In the event of a system failure, the outer LED will flash red, the relay will de-energize, the relay coil LED will go out and the output signal will drop below 4.0 mA. A failure can consist of a burned out sensor element (solid-state or catalytic), a failed or damaged component on the circuit board, or a wiring-related problem.

## 4.4. Sensor Notes

Sensor Type <sup>10</sup>	Operation Notes
Solid-State (Refrigerant)	<ul style="list-style-type: none"><li>• Not gas specific</li><li>• Respond to a fairly wide range of interfering gases and vapors</li><li>• Temperature and humidity compensated to reduce drift in environments where these values change regularly</li></ul>
Solid-State (Combustible)	<ul style="list-style-type: none"><li>• Not gas specific, but are less likely to suffer from false alarms from interfering gases (due to the extremely high measuring range for which they have been calibrated)</li></ul>
Catalytic (Combustible)	<ul style="list-style-type: none"><li>• Specific to combustible gases and vapors</li><li>• Temperature compensated</li></ul>
Electrochemical (E.g., Oxygen)	<ul style="list-style-type: none"><li>• These sensors are quite gas specific</li><li>• Will respond to some other gases (see cross sensitive gases table on page 7 for more information)</li><li>• Temperature compensation to reduce drift in environments where the temperature changes regularly</li></ul>

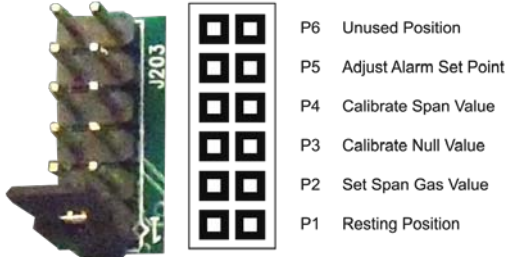
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<sup>10</sup> Sensors require lengthy warm up and stabilization time after installation. Do not perform any calibration functions until the sensors have been operating for at least 24 hours.

**4.5. Open Loop Diagnostic**

The GDC-150 circuit board has been fitted with a red LED located near the bottom center of the circuit board. This is an “open loop” indicator and has been designed as a quick trouble shooting device. If the 4-20 mA signal loop has not been connected properly or has been damaged in some manner between the analog transmitter and the device to which it is sending its signal output, this LED illuminates. At this point, the wiring should be inspected for potential problems.

**4.6. Jumper Functions**



**Figure 4-1. Jumper Functions**

**4.7. Adjusting the Alarm Set Point (For Relay Option Only)**

If the optional relay has been supplied, the alarm set point on the GDC-150 can be adjusted. The alarm set point value is converted to a voltage in the range of 0-4 VDC. This voltage range correlates to the full measurement range of the installed sensor.

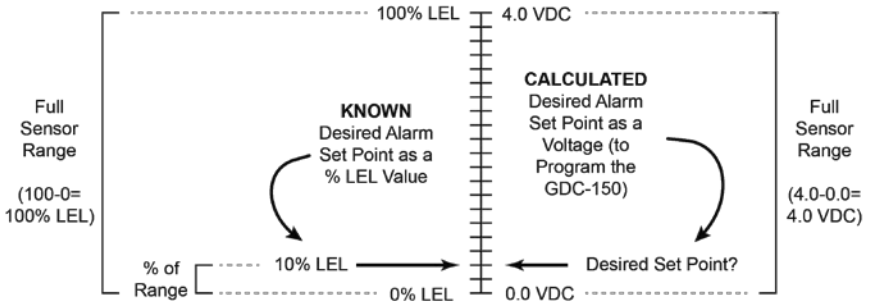
**4.7.1. Calculating the Alarm Set Point Value**

Prior to adjusting the alarm set point, calculate the voltage value required using the following formula.

$$\frac{\text{Desired Set Point}}{\text{Sensor Range}} \times 100 = \% \text{ of Range}$$

**Example:** Catalytic combustible sensors have a standard measurement range of 0-100% LEL. Therefore 4.0 VDC = 100% LEL. Using the values below, 10% of 4.0 VDC = 0.4 VDC. Therefore, the required voltage setting to achieve an alarm set point of 10% LEL is 0.4 VDC.

$$\% \text{ of Range} \times 4.0 \text{ VDC} = \text{___ VDC}$$



**Figure 4-2. Calculating the Alarm Set Point**

**4.7.2. Adjusting the Alarm Set Point**

Step	Description
1.	Move the jumper to position P5. The green outer LED will flash once within 2 seconds for confirmation. The system is now waiting for the user to set the desired value.
2.	Attach volt meter leads to test points TP1 and TP2 (see Figure 1-4 on page 3). Alternatively, if the optional LED digital display has been fitted, read the value indicated on the display.
3.	Use the UP or DOWN push buttons until the calculated voltage is displayed on the volt meter (or on the optional LED digital display).
4.	Move the jumper back to its resting position (P1). At this time the new value is saved and the green LED flashes once for confirmation.

**5. CALIBRATION**

**5.1. Frequency Recommendations**

Sensor Types / Applications	Calibration Frequency
Parking garage detectors	Once every 12 months
OHS (Occupational Health and Safety) applications	Once every 6 months

For the purposes of safety in OHS applications, sensors should be gas tested (bump tested) once every month to confirm response.

Required Equipment:

- Volt meter
- Calibration kit
- Calibration gases.

Users can order the calibration kit, calibration accessories and/or gases from any Bacharach authorized distributor or they can supply their own gas and equipment as long as the gas meets the minimum specifications indicated in this manual.



**NOTE:** It is recommended that a calibration label should be applied after every calibration to confirm work performed and the date it was confirmed. If a controller is involved, the alarm set points should be indicated on a label on the front door of the enclosure so anyone working in the environment will be aware.

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**NOTE:** For best performance and to ensure the sensor meets the indicated specifications, all electrochemical sensors should be calibrated every six months. The sensors may not perform to the listed specifications if they are not maintained regularly.

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## 5.2. Calibration Specifications – Gases

Calibration span gases should be at least  $\pm 5\%$  accuracy and have a current date stamp. Gas generators should have a current dated cell installed. Service personnel should flow zero emissions air or oxygen before attempting to null adjust toxic gas sensors.

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**NOTE:** For most electrolytic sensors, nitrogen ( $N_2$ ) can be substituted for zero air. However, for solid-state and catalytic sensors, nitrogen ( $N_2$ ) **should not** be substituted for zero air because all solid-state and catalytic sensors require at least a small volume of Oxygen to operate. Calibration will be inaccurate.

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## 5.3. Regulators and Flow – Solid-State and Catalytic Sensors

Calibration gases that are lighter than or the same weight as air ( $CH_4$ ,  $H_2$ , etc.) should be flowed at 0.5 LPM. Gases heavier than air ( $C_3H_8$ , etc.) should be flowed between 0.5 and 1.0 LPM. Fixed flow regulators provide more accuracy. Gases should be flowed over the sensor for at least 3 minutes.

The proper calibration adapter should be utilized to allow the gas to properly diffuse around the sensor. They are available from Bacharach (see table on page 21).

A humidification chamber must be utilized for all solid-state sensors. This is also available from Bacharach (see table on page 21).

## 5.4. Regulators and Flow – Electrochemical Sensors

Calibration gases should be flowed at 0.5 LPM. Fixed flow regulators provide more accuracy. Zero air and span gases should be flowed over the sensor for at least 3 minutes.

The proper calibration adapter should be utilized to allow the gas to properly diffuse around the sensor. They are available from Bacharach (see table on page 21).

For best performance and to ensure the sensor meets the indicated specifications, all electrochemical sensors should be calibrated every six months. The sensors may not perform to the listed specifications if they are not maintained regularly.

### 5.5. Calculating the Span Gas Value

To achieve calibration the user must first tell the GDC-150 what concentration of span he is going to flow over the sensor. Within the transmitter, this is a voltage setting. The range of 0-4 VDC is equal to the full measurement range of the sensor. Prior to attempting to calibrate, determine the voltage value required.

Use the following formula to calculate the voltage required.

$$\frac{\text{Calibration Span Gas Value}}{\text{Sensor Range}} \times 100 = \% \text{ of Range}$$

$$\frac{1000 \text{ PPM}}{2000 \text{ PPM}} \times 100 = 50\%$$

Full Range Of Sensor Output	x	% of Range	=	Required Calibration Voltage Setting
4.0 V	x	50%	=	2.0 V

Therefore, in this example, the required voltage setting to calibrate a 0-2000 ppm sensor with 1000 ppm is 2.0 VDC.



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**NOTE:** When calibrating solid-state sensors for combustibles or refrigerants, the span gas must be humidified. The use of a humidification chamber is required. The humidification chamber sits in line between the cylinder of span gas and the calibration adapter. Remove the sponge inside the chamber and wet it under the tap. Squeeze out the excess water so it is not dripping wet and place it back inside the chamber. As gas flows through the chamber, it absorbs water which acts to humidify it and the humidified span gas flows over the sensor. See page 21 for ordering information.

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**NOTE:** Values for **Calibration Span Gas** and **Sensor Range** in the above equations must have the same Engineering Units (e.g., PPM, % of LEL, % vol, etc.).

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**5.6. Setting the Span Gas Value**

Step	Setting the Span Gas Value Procedure
1	Move the jumper to position P2 (see Figure 4-1 on page 15). The green outer LED flashes once for confirmation. The system is now waiting for the user to set the desired value.
2	Attach volt meter leads to test points TP1 and TP2 (see Figure 1-4 on page 3). Alternatively, if the optional LED digital display has been fitted, read the value indicated on the display.
3	Use the UP or DOWN push-buttons (see Figure 1-4 on page 3) until the calculated voltage is displayed on the volt meter (or the optional LED digital display).
4	Move the jumper back to its resting position (P1). At this time the new value is saved and the green LED flashes once for confirmation.

**5.7. Calibrating the Null (Zero) Value**

Step	Calibrating the Null (Zero) Value Procedure
1	Attach a regulator to a cylinder of zero air (or nitrogen).
2	Insert the calibration adapter into the sensor opening in the front of the enclosure door. Use a slight twisting motion as you gently push the calibration adapter into the sensor opening. If the calibration adapter is hard to insert, moisten the "O" ring slightly then try re-inserting it. If the transmitter has been fitted with an optional splash guard, remove the plastic plug from the center of the splash guard to gain access to the sensor opening. To remove the plastic plug, push inward at the center of the plug until the edges lift slightly then slip a small flat blade screwdriver under and pop the plug off.
3	Open the regulator valve fully and allow zero air to flow over sensor.
4	Move the jumper to position P3 (see Figure 4-1 on page 15). The outer LED will change to a steady amber color. The system now waits 30 seconds to ensure the user is flowing zero air.
5	<p>The GDC-150 then enters a count down during which time it adjusts the null value. The length of this count down period is:</p> <ul style="list-style-type: none"> <li>• 90 seconds for catalytic and solid-state sensors</li> <li>• 60 seconds for electrochemical sensors.</li> </ul> <p>If desired, attach the volt meter leads to test points TP1 and TP2 (see Figure 1-4 on page 3). The meter will show 0.0 VDC, climb to a higher value, then slowly descend back to 0.0 VDC indicating the GDC-150 has null adjusted the circuit. Once the count down is finished, the outer LED changes back to green indicating the procedure is complete.</p>
6	Move the jumper back to its resting position (P1) and remove the zero air.



**IMPORTANT:** If the user attempts to null adjust the sensor without applying zero air and the sensor detects background gas the amber LED flashes to advise the user that it is out of tolerance.

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### 5.8. Calibrating the Span Value

Step	Calibrating the Span Value Procedure
1	Attach regulator to cylinder of span gas.
2	Insert the calibration adapter into the sensor opening in the front of the enclosure door. Use a slight twisting motion as you gently push the calibration adapter into the sensor opening. If the calibration adapter is hard to insert, moisten the "o" ring seal slightly then try re-inserting it.
3	Open regulator valve fully and allow span gas to flow over sensor.
4	Move the jumper to J4 position (see Figure 4-1 on page 15). The tri-color outer LED will change to a steady amber color. The system now waits 30 seconds to ensure the user is flowing span gas.
5	The GDC-150 then enters a count down (180 seconds for catalytic and solid-state sensors, 150 seconds for Electrochemical sensors) during which time it adjusts the circuit to the span value which was set earlier (see "Setting the Span Gas Value"). If the user wishes to view this, attach meter leads to test points TP1 and TP2 (see Figure 1-4 on page 3). The meter will show an increasing voltage indicating the GDC-150 sensor is responding to the span gas and the circuit is being adjusted for accuracy. Alternatively, If the optional LED digital display has been fitted, read the value indicated on the outer digital display. Once the count down is finished, the outer LED changes back to green indicating the procedure is complete.
6	Before removing the span gas, move the jumper back to its resting position (J1) and the new value is saved.



**IMPORTANT:** If the user attempts to span adjust the sensor without applying span gas or the proper value of span gas, the sensor will produce a response that is outside of the circuit preset tolerance value. The amber LED flashes to advise the user that it is out of tolerance.

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**6. ACCESSORIES AND REPLACEMENT PARTS**

**6.1. Metal Protective Guards**

GDC-150 series analog transmitters are all supplied in very rugged, non-metallic enclosures. However, in some applications more protection may be desired. Bacharach can provide protective guards made from 16 gauge galvanized metal with a pattern of square perforations to permit air and gas to diffuse easily to the sensor.



**Figure 6-1. Protective Guard**

**6.2. Accessory and Replacement Part Numbers**

<b>Part Number</b>	<b>Description</b>
5209-0002	LED digital display (must be selected when ordering)
5209-0003	Relay (rated 2A @ 30 VAC)
5209-0005	Water- and dust-tight NEMA 4X enclosure
5209-0004	Splash guard (NEMA 4X enclosure only)
5209-0006	Calibration adapter for all other sensors
5209-0016	Calibration adapter for catalytic sensors
5209-0017	Sample draw pump (24 VAC-powered)
5209-0018	Sample draw pump (24 VDC-powered)
5209-0019	Transmitter guard (16 gauge galvanized metal)
5209-0021	Humidification chamber (for calibration of solid-state sensors)





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