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## CARBON DIOXIDE (CO<sub>2</sub>) DIESEL EXHAUST GAS DETECTOR

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MODEL GVU-CO<sub>2</sub>

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### TYPICAL INSTALLATIONS:

- Parking Garages
- Bus Garages
- Fire Stations
- Warehouses
- Car Dealers
- Vehicle Maintenance & Storage
- Highway Departments
- Utilities
- Public Works
- Tunnels

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### GENERAL DESCRIPTION:

The model GVU-CO<sub>2</sub> Carbon dioxide sensor is designed to interface with a Toxalert Int'l model GVU series control unit. The sensor/transducer consists of a patented solid state infrared CO<sub>2</sub> monitor housed in an attractive plastic case. The GVU-CO<sub>2</sub> has a new state-of-the-art lithium tantalate detector, updated electronics and unique auto-zero function. This results in very stable calibration and longer trouble-free operation in the field. The new IR source is more rugged, operated at 10X derated power and has a life expectancy of 10 years. The new lithium tantalate detector enhances stability, has less ambient temperature sensitivity and faster response time. The GVU-CO<sub>2</sub> has a range of 0 to 2000 ppm with a repeatability of ±20 ppm. The enclosure has louvers to allow free passage of air to the sensing cell inside.



Model GVU-CO<sub>2</sub>

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### FEATURES:

- Microprocessor based
- Power on indication
- 10 year sensing element life
- One calibration gas instead of two
- State-of-the art Infrared Security
- High CO<sub>2</sub> indication
- Low voltage class two (2) wiring
- Operating range meets OSHA standard

## BACKGROUND:

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The composition of diesel exhaust gases vary with the type of engine and with the rate of operation of these diesel engines. The prominent noxious gases of diesel engines are NOX [which is made up of NO (nitric oxide) and NO<sub>2</sub> (nitrogen dioxide)], followed by CO (carbon monoxide), SO<sub>2</sub> (sulfur dioxide) and SO<sub>4</sub> (sulfates).

Carbon monoxide (CO) sensors do a good job of detecting gasoline engine exhaust fumes, but because diesel engines output a smaller amount of carbon monoxide, (less than 1%) CO detection is not recommended for sensing diesel exhaust. There are no stable, inexpensive, or easy to maintain sensors for sensing nitric oxide or nitrogen dioxide which are the poisonous and the dominant diesel exhaust emissions. An investigation R18884\*, done by the U.S. Department of Interior, Bureau of Mines shows that the carbon dioxide (CO<sub>2</sub>) in diesel exhaust is relative to all the noxious gases contained within the diesel exhaust.

The Bureau report states “CO<sub>2</sub> is present in the diesel exhaust gases in the highest concentration of any of the pollutants,” (13%). It further states “CO<sub>2</sub> is the only stable and nonreactive pollutant in the exhaust that is unaffected, to any appreciable extent, by time, emission control devices, or engine wear.” For these reasons CO<sub>2</sub> is chosen to be the surrogate gas to be sensed to indicate dangerous levels of the noxious gases contained in diesel exhaust.

The report “established an estimate level of CO<sub>2</sub> –0.133 pct (percent) at which the other diesel pollutants are considered below harmful levels.” The 0.133 percent would be equivalent to 1330 ppm of CO<sub>2</sub>. Therefore if the CO<sub>2</sub> in environments where diesel exhaust is present is kept at or below 1300 ppm, a safe environment will be maintained.

\* Report of Investigation 8884: Diesels in Underground Mining, A review and an Evaluation of an Air Quality Monitoring Methodology by J. Harrison Daniel, Jr., Staff Engineer, Division of Health & Safety, Bureau of Mines, Washington, D.C.

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## SPECIFICATIONS

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- Operating principle: Non Dispersive Infrared
- Gas sampling method: Diffusion
- Range: 0 to 2000 ppm
- Response time: Less than 1 minute
- Operating temperature range: 32°F to 122°F  
(0°C to 50°C)
- Operating humidity: 0-90% RH (non condensing)
- Dimension: 5.2” x 3.2” x 1.4”
- Weight: .5 lbs. (.35 kg)
- Accuracy: ± 5% of reading or ± 75 ppm, which ever is greater
- Repeatability: ± 20 ppm
- Typical Drift (per year): ± 75 ppm ( @1200 ppm)
- Storage temperature: -22°F to 140°F  
(-30°C to 60°C)
- Input power: 20-30 VAC (provided from GVU Control unit)
- Power Consumption: Less than 2W @24VAC

# INSTALLATION INSTRUCTIONS

## 1. INSTALLATION *(For specific details see sensor manual)*

Locate a mounting location away from direct fresh air intakes, and mount vertically on wall or support column approximately 3 to 6 feet above floor. Refer to figures 1 and 2; Table 1 and 2 and installation instructions in GVV series control unit data sheet and install the GVV-CO<sub>2</sub> sensor as follows.

## 2. COVER REMOVAL

To open the Model GVV-CO<sub>2</sub>, use a coin in the slot on the bottom to release the snap. Lift the cover up slightly to disengage the closure and remove cover with a downward motion to clear the catch at the top of the unit.

The locations of controls and terminals on the main circuit board are shown in Figure 2.

## 3. MOUNTING

The Model GVV-CO<sub>2</sub> is designed for flush mounting with two fasteners. The locations of the mounting points (shown in Figure 1) allow direct mounting on a standard simplex (single circuit) junction box. There is a wiring cutout in the center of the unit near the terminal strips.

## 4. SENSOR WIRING

**WARNING: To prevent fire or shock hazard, turn off power source to control unit before making connections. Comply with all local building codes and ordinances.**

NOTE: Refer to Figure 2 and Tables 1 and 2. Use shield cable to interconnect sensor and control unit if metal conduit is not used, or if conduit also contains AC wiring.

- 1.) Measure distance between sensing unit and control unit and select proper wire or larger wire from Table 1.
- 2.) Run wiring between control and sensing unit and into enclosure through access holes. Connect wires from terminal blocks in sensing unit to control unit per Table 2 and GVV series control unit data sheet.

Figure 1:

Model GVV-CO<sub>2</sub> Mounting Dimensions

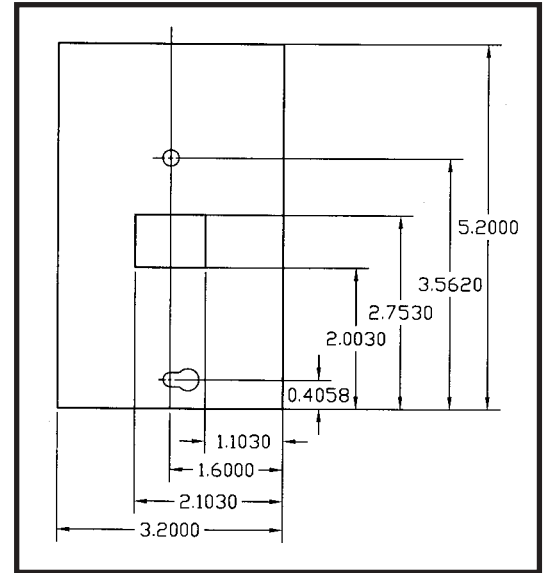
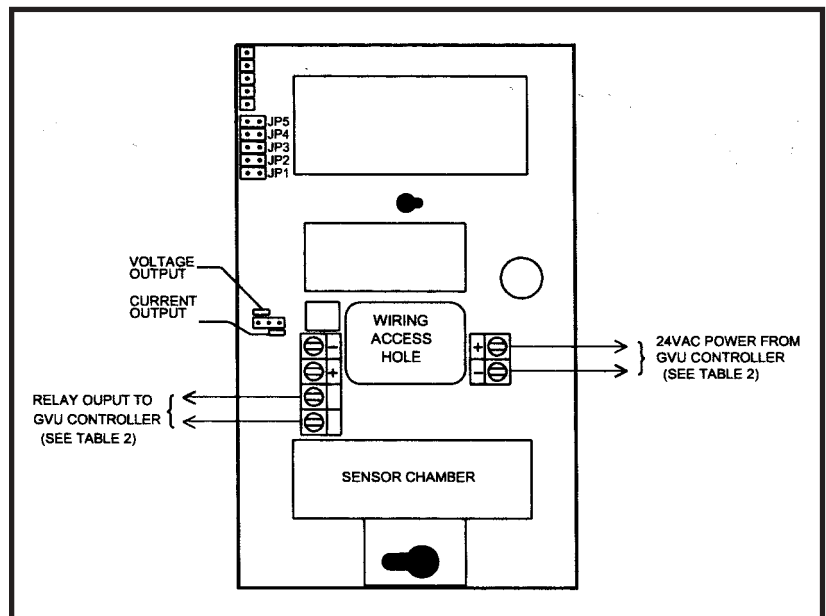


Figure 2:

Model GVV-CO<sub>2</sub> Component Locations



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**TABLE 1**

<b>AWG</b>	<b>DO NOT EXCEED</b>
#22 Wire	500 Ft. Sensor to Controller
#20 Wire	800 Ft. Sensor to Controller
#18 Wire	1300 Ft. Sensor to Controller
#16 Wire	2000 Ft. Sensor to Controller

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**TABLE 2****WIRING CONNECTIONS**

<b>GVU-CO2 Sensor</b>	<b>GVU-1</b>	<b>GVU-3 Expansion Board</b>
Power In (+)	TB11-24 VAC	TB3-H (24VAC)
Power In (-)	TB11-24 VAC	TB3-N (24VAC)
Relay Contact	TB2-1	TB1-A1, B1, C1
Relay Contact	TB2-7	TB1-A7, B7, C7
**	TB2-5	TB1-A5, B5, C5

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\*\* Shield of cable (if used) should be connected at control unit only. Make sure sensor end is taped and isolated from terminals or metal

## 5. START-UP

Reference Installation Manual

- 1.) Verify all wiring connections are correct.
- 2.) Cover Replacement - Engage the top center of the cover under the latch at the top of the base, then press the bottom of the cover onto the bottom of the case until it latches.
- 3.) Apply Power
- 4.) Green power LED should light
- 5.) Allow 5 minutes for warm-up

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## GVU SERIES PRODUCTS:

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### CONTROLLERS -

- GVU-1 Control unit for use with one sensor  
GVU-3 Control unit for use with one to three remote sensors

### REMOTE SENSORS -

- GVU-CO Remote carbon monoxide sensor  
GVU-CO<sub>2</sub> Remote carbon dioxide sensor  
GVU-NO<sub>2</sub> Remote nitrogen dioxide sensor  
GVU-VOC Remote smoke/air quality sensor