

CARBON DIOXIDE (CO₂) DIESEL EXHAUST GAS CONTROL

MODEL CO220

FEATURES

- 15 year sensing element life
- Low voltage circuits
- Linear 4 to 20 mA output or 0 to 10 vdc output
- Calibrate only once in two years
- Optional digital display
- Relay option available
- One calibration gas instead of two
- Foolproof power hookup
- Interfaces directly to DDC systems

GENERAL DESCRIPTION:

Toxalert's CO220 Carbon Dioxide (CO₂) sensor has a range of 0 to 2000 ppm, with an accuracy of +/- 5% of reading and a repeatability of +/- 20 ppm. The CO220 has multiple outputs. It has a linearized signal of 0 to 10 VDC and 4 to 20 mA over the 0 to 2000 ppm CO₂ range. A relay output with field adjustable set point is available as an option.

These signals may be directly inputted to a TOXALERT controller or any standard direct digital (DDC) controller for the control of ventilation equipment.

Model CO220

SENSING ELEMENT:

The Model CO220 Carbon Dioxide sensor consists of a patented solid state infrared CO₂ monitor housed in an attractive plastic case. The CO220 has a new state-of-the-art lithium tantalate detector, updated digital 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 15 years. The new lithium tantalate detector enhances stability, has less ambient temperature sensitivity, and faster response time. The CO220 space sensor has louvers to allow free passage of air to the sensing cell inside.

BACKGROUND:

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 NO₂ (nitrogen dioxide)], followed by CO (carbon monoxide), SO₂ (sulfur dioxide) and SO₄ (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 (CO₂) in diesel exhaust is relative to all the noxious gases contained within the diesel exhaust.

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The Bureau report states “CO₂ is present in the diesel exhaust gases in the highest concentration of any of the pollutants,” (13%). It further states “CO₂ 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 CO₂ 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 CO₂ – 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 CO₂. Therefore if the CO₂ 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 Under _____

SPECIFICATIONS

- **Method:** Non Dispersive Infrared
- **Gas:** Carbon Dioxide (CO₂)
- **Range:** 0 to 2,000 ppm
- **CO220:** Space Sensor
- **CO222:** Duct Mounting Kit
- **Adjustable Set Point:** SPST relay contacts
2 amp non inductive @ 24 VAC
- **Output Signals:** 0 to 10 VDC and 4 to 20 ma
linearized over full range of 0 to 2000 ppm
- **External Dimensions:** 4.9”H x 2.6”W x 1.6”D
- **Accuracy:** ± 5% full scale
- **Repeatability:** ± 20 ppm
- **Input Power:** 20-30 VAC, 18 to 30 VDC
- **Power Consumption:** Less than 2.5 watts
- **Zero Drift at Constant Temperature:**
75 ppm per 24 hours (random not cumulative)
- **Zero Drift due to Ambient Temperature:**
.5% of full scale per degree Centigrade
- **Weight:** Less than 0.5 lbs.
- **Operating Temperature:** 32°F to 122°F

INSTALLATION INSTRUCTIONS

1. INTRODUCTION

Your TOXALERT Ventilation Control System incorporates the latest in solid state technology to give you maximum reliability and performance. If the 0 to 10 VDC or the 4 to 20 ma outputs are to be used as signal inputs to TOXALERT controllers or other direct digital controllers (DDC), no startup calibration is required. The two analog output signals will provide a linear output over the units calibrated range of 0 to 2000 ppm.

The optional control relay set point adjustable potentiometer located at the bottom right corner of the sensor has a range of 700 to 1300 ppm. Full CCW is 700 ppm, full CW is 1300 ppm setting. Units are shipped with potentiometer set at 1000 ppm relay activation point.

2. INSTALLATION

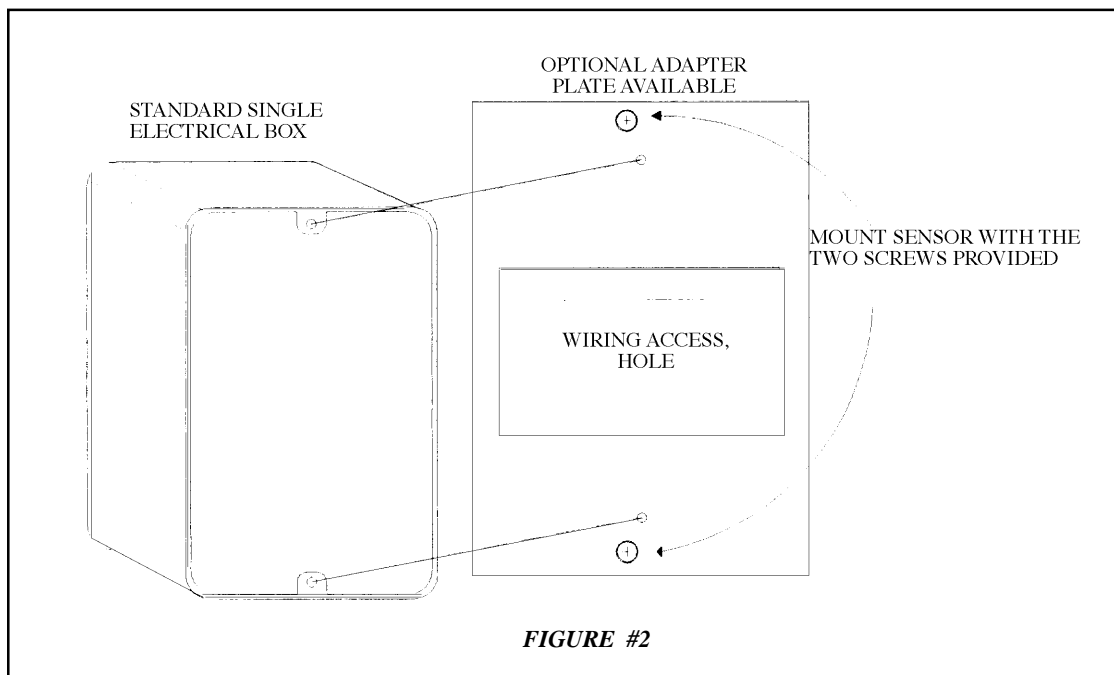
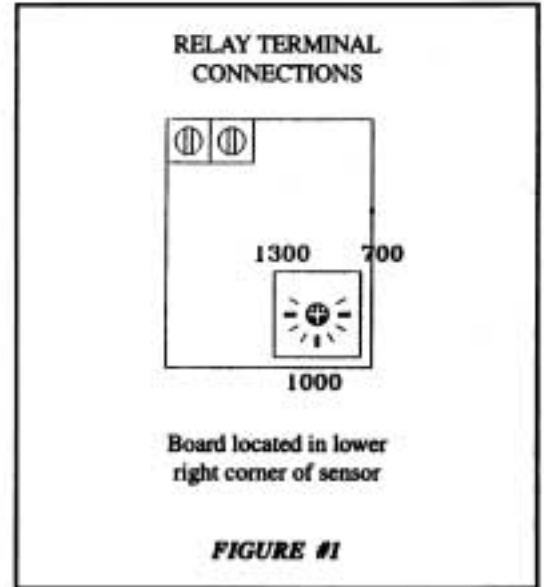
Refer to Figures 2, 3 and 4 and install and connect the TOXALERT system as follows:

(1) CO220 – Locate a flat mounting surface in the area where the presence of carbon dioxide is to be monitored or controlled. Locate away from direct fresh air intakes where a temporary clearing of the CO₂ concentration may occur and mount approximately 5 feet above floor.

(2) The CO220 Space Sensor is designed to be mounted on a standard single gang electrical output box, or directly onto drywall. An adapter plate may be provided with each sensor so that the sensor can be mounted directly onto an electrical box.

Toxalert recommends the use of #18 gauge wire for wiring the CO₂ sensor.

NOTE: For sensors with digital value display the electrical box has to be mounted horizontally.



(3) The sensor analog output terminals (0 to 10 V or 4 to 20 mA) are the left two terminals marked "Out" on the sensor and drawing. The far left terminal is the (+) terminal. The next terminal is the (-) terminal.

The power input terminals marked "VAC" on the sensor are the two terminals to the right of the output terminals. If 24 VAC is used and more than one sensor is powered by the same transformer,

MAKE SURE ALL SENSORS ARE WIRED WITH THE SAME POLARITY. (I.E. "H" TO (+) TERMINAL AND "N" TO (-) TERMINAL).

If 24 VDC is used to power unit apply plus (+) 24 VDC to the left terminal of "VAC" terminals and minus (-) 24 VDC to the right terminal of the "VAC" terminals.

(4) Duct sensor installation. The duct sensor includes a CO220 sensor, a special back plate, 1/4 inch clear plastic tubing and duct pickups.

Mount the sensor and back plate on a single gang electrical box and wire per instructions for the space CO₂ sensor.

The duct sensor comes with approximately 10 feet of tubing for both the inlet side and outlet side of pickups. If all 10 feet is not required disconnect tubing at sensor barbed fittings, cut off excess tubing and reconnect.

Punch approximately 1/2 to 3/4 inch hole in duct for the inlet pickup and outlet pickup. Probes can then be mounted with metal self tapping screws as shown. Make sure the inlet pickup is pointing into the duct air flow as shown in drawing below. Use duct seals provided with duct kit.

FIGURE #3

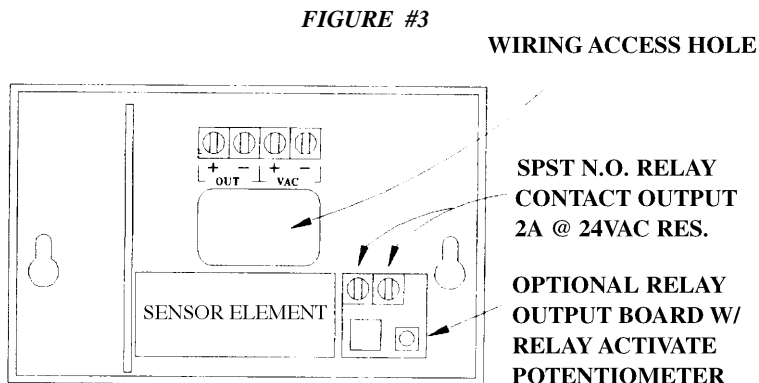
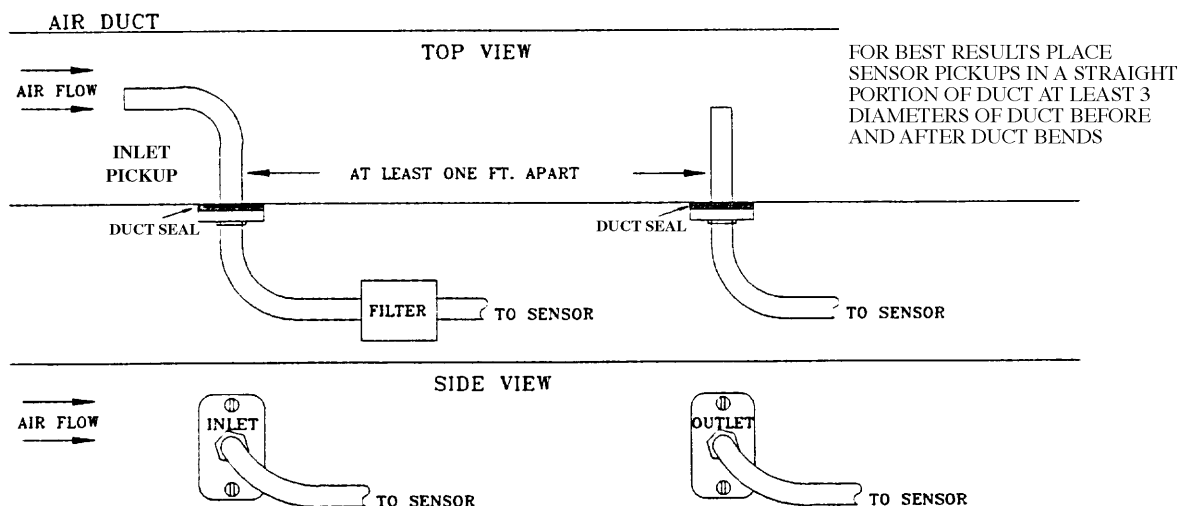


FIGURE #4



3. START-UP - Reference Installation Manual

- (1) Verify all wiring connections are correct.
- (2) Check shorting jumper J51 on left of unit to make sure it is in correct position for 4 to 20 mA or 0 to 10 VDC output.
- (3) Apply 24 VAC or DC power to the unit.
- (4) Allow 5 minutes for warm-up.
- (5) With shorting bar across the right two pins (top left corner of unit) the unit will output 0 to 10V. Connect a multimeter across the (+) and (-) OUT terminals. In fresh outdoor air the reading should be between 1.5V and 2.0VDC. This corresponds to a reading of 300 to 400 PPM carbon dioxide. The indoor air reading will be a function of occupant generated carbon dioxide and ventilation rates in the building. If this initial reading does not fall within a reasonable range of 300 to 1500PPM (1500PPM = 7.5VDC) see Installation Manual.

Replace jumper to proper position for system operation.