

CO Guardian LLC  
1951 E. AIRPORT DRIVE  
TUCSON, AZ. 85706

Document No. 03-452-201  
Date: 8-20-2004  
REV F



CO Guardian LLC  
1951 E. Airport Dr.  
Tucson, AZ 85706

## OWNERS MANUAL

### **CARBON MONOXIDE DETECTOR MODEL 452-201 REMOTE UNIT**

CO Guardian LLC  
1951 E. AIRPORT DRIVE  
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### LOG OF REVISIONS

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A	1 thru 20	03/20/03	Initial Release	ASH VIJ
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## **FORWARD**

This document provides information intended for use by persons who, pursuant to current regulatory requirements, are qualified to install this equipment. Because equipment and system installations vary depending on a particular aircraft, this document is intended only as a guideline. If further information is required, contact:

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We welcome your comments concerning this document. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the document number, the paragraph/figure/table number, and the page number. Send your comments to the address above.

## DESCRIPTION

### 1.0 GENERAL

This section gives a physical and functional description of the CO Guardian CO Detector indicator as installed in a typical reciprocating engine type aircraft.

### 2.0 PHYSICAL DESCRIPTION

Remote mounted CO Detector part numbers are listed in Table 1.

PART NUMBER	SERVICE LIFE	Pressure Relay*	POWER	CONNECTOR	DATA BUSS**
452-201-001	7 Years	No	14 VDC	8 pin & 9 pin	RS-232 Data Buss
452-201-002	7 Years	No	28 VDC	8 pin & 9 pin	RS-232 Data Buss
452-201-003	7 Years	No	14 VDC	8 pin	No Data Buss
452-201-004	7 Years	No	28 VDC	8 pin	No Data Buss
452-201-005	7 Years	No	14 VDC	9 pin	RS-232 Data Buss
452-201-006	7 Years	No	28 VDC	9 pin	RS-232 Data Buss
452-201-007	7 Years	NO	14 VDC	9 pin	RS-232 Data Buss
452-201-008	7 Years	NO	28 VDC	9 pin	RS-232 Data Buss
452-201-009	7 Years	Yes	14 VDC	9 pin	RS-232 Data Buss
452-201-010	7 Years	Yes	28 VDC	9 pin	RS-232 Data Buss

**TABLE 1 - Part Numbers**

The Detector must be returned to CO Guardian at the end of Service Life for replacement and calibration of the CO sensor to maintain airworthiness of the unit.

\*Pressure relay is designed for information purpose. The relay is activated at 10,000 feet for 5 seconds and remains on after 12,500 feet using the pressure sensor built in the 452 models.

\*\* RS-232 data is transmitted to MFD Displays like the Garmin G1000 and Garmin GNS480 that displays CO Level, Cabin Temperature, Cabin Pressure and has the capability of being remotely reset able using RS232 input into the detector. See the Manufacturers installation manual for hookup and data display capabilities.

### **3.0 LEADING PARTICULARS**

Table 2 lists the CO Detector leading particulars. Model 452-201 Series CO Detectors are approved to TSO C48A.

**LEADING PARTICULARS**

<b>PARAMETER</b>	<b>SPECIFICATION</b>
<b>PHYSICAL</b>	
Dimensions (approximate)	3.35 in. X 2.25 in. X 1.50 in.
Weight (actual)	3.5 oz.
<b>ENVIRONMENTAL</b>	
Cooling	Passive
Temperature and Altitude	DO-160D, Category B1
Temperature	(DO-160D Category B1)
Non-operating high temperature	+85 °C
Non-operating low temperature	-55 °C
Operating high temperature	+55 °C
Operating low temperature	-20 °C
Temperature Variation	DO-160D, Category B
Altitude	(DO-160D, Category B1) 25,000 feet
Decompression	DO-160D, Category B1
Overpressure	DO-160D, Category B1
Humidity	(DO-160D Category A) 95percent
Operational Shock and Crash safety	DO-160D Category B
Vibration	DO-160D: Category S, Curve M
Magnetic Effect	DO-160D, Category Z
Power Input	DO-160D, Category B
Voltage Spike	DO-160D, Category B
Radio Frequency Emission	DO-160D, Category B
Electrostatic Discharge	DO-160D, Category A
<b>POWER REQUIREMENTS</b>	
Power - 14 VDC Models	+14 VDC (Nominal 9.0 vdc to 15.1 vdc)
Power - 28 VDC models	+ 28 VDC (nominal 18.0 vdc to 30.3 vdc)
Dissipation (nominal)	
14 and 28 vdc models	<1 watt
Dissipation (maximum)	
14 vdc models (heater ON)	9 watts
28 vdc models (heater ON)	10 watts
Keep Alive circuit Power	< 8 MA

**TABLE 2 - Leading Particulars**

#### 4.0 SCOPE

The Model 452-201 Series Carbon Monoxide Detectors are designed to detect, measure, and provide a visual alert to the crew of Reciprocating Engine type aircraft before the cockpit level of carbon monoxide (CO) reaches a critical level.

The installation consists of a single carbon monoxide detector indicator operating on aircraft DC power. The aircraft supplied power and aircraft wiring is protected by a 2 ampere, resettable, trip free, type circuit breaker. The Carbon Monoxide Detector recommended location is behind the existing aircraft instrument panel.

The CO Detector installation consists of the CO Detector, a Test/Reset button, and a required amber ALERT annunciator light mounted on the cockpit instrument panel.

The carbon monoxide alarm level is calibrated to provide a visual alert within 5 minutes or less whenever the carbon monoxide level reaches 50 parts per million (PPM) by volume or greater per TSO C48A. The warning time is shortened at higher levels of CO concentrations and becomes approximately instant should the carbon monoxide level reach 400 parts per million by volume (PPM) or greater.

In case of a carbon monoxide alert, the pilot will receive an amber Alert annunciator light that is mounted on the Pilot's instrument panel. The visual alert will remain until the carbon monoxide level is reduced below the alert level. The indicator is automatically reset when the CO level drops below 50 PPM. There is a three-minute delay in the -001 through -010 part number units at startup to stabilize the sensor before the unit will accurately sense CO levels.

#### 5.0 SERVICE FACILITIES

With the exception of the Model 452-201-\* CO Detectors, the operator can service all other components of the installation at an FAA certified Repair Station. CO Detectors must be returned to CO Guardian for repair or overhaul.

#### NOTE

**The sensor requires special gases for testing and calibration. If any discrepancies are found with the unit during installation or during the operational service life, the unit must be returned to CO Guardian for repair or replacement. The CO Detector unit must be returned to the manufacturer for CO sensor replacement and re-calibration at the end of the service life applicable to the units part number.**

## 6.0 INSTALLATION

The following documents the installation criteria of the Model 452-201 Remote Carbon Monoxide Detector Installation:

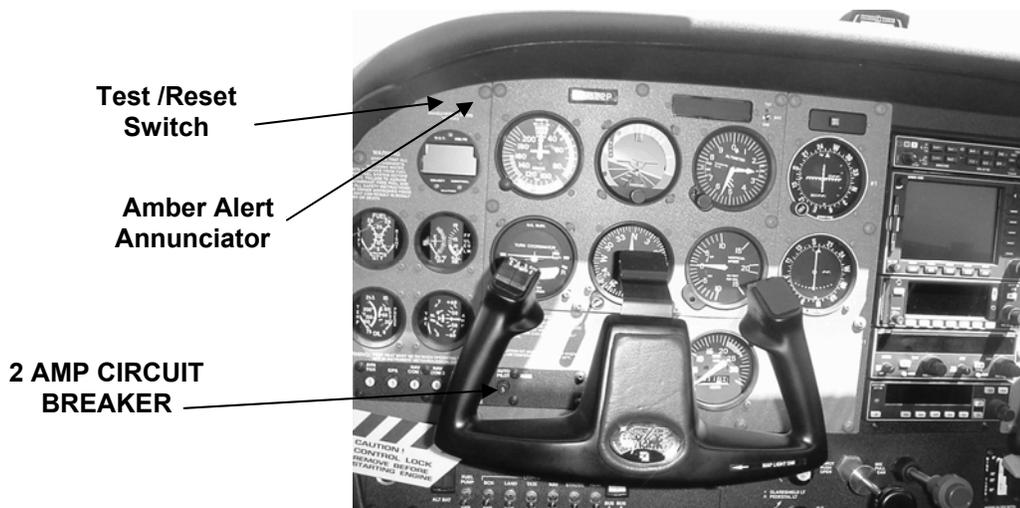
- a. Choose a location behind the instrument panel for the installation of the CO Detector. Choose a location with space available that also meets the following criteria. A typical installation is shown in drawing 01-2510-02 rev. C or later. The unit can be installed on any side of the instrument panel.
- b. Insure that the area around the CO Detector panel location will permit unrestricted airflow through the unit.
- c. Install in a cockpit area not exposed to excessively dusty or dirty conditions.
- d. Insure that the air intake on the front of the CO Detector is not obstructed in any manner.
- e. Install the CO Detector in a location without high or disturbed airflow movement. The CO Detector will detect the presence of CO more effectively if the unit does not have air blowing over it.
- f. Insure that the CO Detector installation area meets the temperature and humidity ranges listed in the List of Particulars specifications. Temperature and humidity conditions outside the specification may affect the sensitivity of the detector.
- g. Install the TEST/RESET and the amber ALERT annunciator in a location within the pilot's direct field of vision and within normal pilot's reach. Note: see MFG MFD installation manual if TEST/RESET and the amber ALERT annunciator unit will not be installed and the data will be displayed thru the RS232 interface with MFD.
- h. The unit can be remotely installed behind the instrument panel up to six inches from the panel air sampling holes. Verify there are no bends that may obstruct air flow to the unit.

### 6.1 RECOMMENDED INSTALLATION AREAS

- Typical installation areas are depicted below in Figures 1 and 2.



**FIGURE 1 - TYPICAL RIGHT HAND INSTRUMENT PANEL SHOWN**



**FIGURE 2 - TYPICAL PILOT INSTALLATION SHOWN**

## 6.2 INSTALLATION INSTRUCTIONS

### 6.2.1 INSTALLATION INSTRUCTIONS (PART NUMBERS 452-201-001 through -004)

- a. Install the CO Detector in accordance with drawing 01-2510 Rev. C or later. Note the 'salt-shaker' and 'open' air intake hole pattern option on drawing. Placards above and below the air intake hole/s/, in accordance with Flag Note 11, as shown drawing.
- b. Install the CO Detect 2 amp circuit breaker in accordance with drawing Section A-A and D-D. It is recommended that the circuit breaker be installed on the Essential or Avionics Buss that is not subject to emergency electrical load shedding. Placard or engrave the circuit breaker as **CO DETECT** in accordance with drawing, Flag Note 11.
- c. Install the remote Amber Alert annunciator on the L/H instrument panel in accordance with drawing Section C-C. Placard or engrave the Amber Alert annunciator as **CO ALERT** in accordance with Flag Note 11.
- d. Install the CO Alert momentary Test/Reset switch on the L/H instrument panel in accordance with drawing 01-2510-02 Section C-C. Placard or engrave the TEST/RESET switch as **CO TEST/RESET** in accordance with drawing Flag Note 11.
- e. Wire the CO Detector installation in accordance with applicable drawing wiring diagram.

452-201-001 through 452-201-004	
PIN	FUNCTION
1	14 or 28 VDC Power Input
2	Power Ground
3	CO Alert Relay-Wiper Contact A
4	CO Alert Relay -NO Contact A
5	CO Alert Relay-Wiper Contact B
6	CO Alert Relay -NO Contact B
7	Remote Test/Reset Switch
8	Remote Test/Reset Switch

### CO DETECTOR CONNECTOR PINS AND FUNCTION

Observe the following items:

- Twist the power and ground return wires together approximately 6 turns per foot in accordance with drawing 01-2510-02 Note 7.
- Connect Pin 1 to +14 VDC or to +28 VDC power as applicable to the installation aircraft and the CO Detector voltage rating.
- Ground power return wire (Pin 2) to suitable aircraft structure ground near circuit breaker panel.

### 6.2.2 INSTALLATION CHECKS (PART NUMBERS 452-201-001 through -004)

- a. With the CO Detector disconnected from the aircraft harness, conduct a continuity check of the added aircraft wiring.
- b. Turn ON the aircraft Battery Switch. Close the CO DETECT circuit breaker and measure aircraft voltage between pins 1 and 2 of the CO Detector connector. Pull the CO DETECT circuit breaker. Verify the voltage between pins 1 and 2 is OFF.
- c. Connect the CO Detector connector to the aircraft harness. Turn aircraft Battery Switch ON. Close CO DETECT circuit breaker.
- d. Operational check the unit by depressing the CO TEST/RESET switch and verifying the remote alert light operation. Remote Amber Alert light should flash twice.
- e. Verify the unit can be shut off with the CO DETECT circuit breaker.
- f. Determine the moment arm for the installed CO Detector location and record in aircraft weight and balance manual. CO Detector weight is 3.5 oz.

### 6.2.3 INSTALLATION INSTRUCTIONS (PART NUMBERS 452-201-005 through -010)

- a. Install the CO Detector in accordance with drawing, Section B-B, Section E-E, and Section F-F.

Note the 'salt-shaker' and 'open' air intake hole pattern option in drawing , Section E-E. Install placards above and below the air intake hole/s/, in accordance with Flag Note 11, as shown in drawing Section B-B.

- b. Install the CO Detect 2 amp circuit breaker in accordance with drawing, Section A-A and D-D. It is recommended that the circuit breaker be installed on the Essential or Avionics Buss that is not subject to emergency electrical load shedding. Placard or engrave the circuit breaker as **CO DETECT** in accordance with drawing, Flag Note 11 and drawing, Section A-A. Pull and open the circuit breaker.
- c. Install the remote Amber Alert annunciator on the L/H instrument panel in accordance with drawing 5 Section C-C. Placard or engrave the Amber Alert annunciator as **CO ALERT** in accordance with drawing, Flag Note 11. NOTE 11. Remote light not required if "Alert Light" is shown on Multi Function Display. See MFG installation Manual.

- d. Install the CO Alert momentary Test/Reset switch on the L/H instrument panel in accordance with drawing, Section C-C. Placard or engrave the TEST/RESET switch as **CO TEST/RESET** in accordance with drawing, Flag Note 11. Remote reset is not required if remote reset is capable by Multi Function Display. See MFG installation Manual.
- e. Wire the CO Detector installation in accordance with applicable drawing wiring diagram.

452-201-005 through 452-201-010	
PIN	FUNCTION
1	14 or 28 VDC Power Input
2	Remote Test/Reset Switch
3	Remote Test/Reset Switch/Ground for RS232 Displays
4	CO Alert Relay -Goes to Ground
5	Power Ground
6	Not Used
7	RS-232 TX Output
8	RS-232 RX Input
9	Pressure Relay -Goes to Ground

CO DETECTOR CONNECTOR PINS AND FUNCTION

#### 6.2.4 INSTALLATION CHECKS

- a. With the CO Detector disconnected from the aircraft harness, conduct a continuity check of the added aircraft wiring.
- b. Turn ON the aircraft Battery Switch. Close the CO DETECT circuit breaker and measure aircraft voltage between pins 1 and 5 of the CO Detector connector. Pull the CO DETECT circuit breaker. Verify the voltage between pins 1 and 5 is OFF.
- c. Close the CO DETECT KEEP ALIVE circuit breaker and measure aircraft voltage between pins 9 and 5 of the CO Detector connector. Turn aircraft Battery switch OFF. Measure aircraft voltage between pins 9 and 5 of the CO Detector connector. Pull the CO DETECT KEEP ALIVE circuit breaker. Verify the voltage between pins 9 and 5 is OFF.
- d. Connect the CO Detector connector to the aircraft harness. Turn aircraft Battery Switch ON. Close CO DETECT circuit breaker.
- e. Operational check the unit by depressing the CO Test/Reset switch and verifying the remote alert light operation. Remote Amber Alert light should flash twice.

- f. Verify the unit can be shut off with the CO DETECT circuit breaker.
- g. Determine the moment arm for the installed CO Detector location and record in aircraft weight and balance manual. CO Detector weight is 3.5 oz.

## 7.0 MAINTENANCE INSTRUCTIONS

The carbon monoxide detector and associated equipment consist of certain parts, which do not require periodic scheduled servicing or periodic scheduled preventive maintenance. At every power up the system will go through a self-diagnostic check.

**WARNING: If the Model 452-201 unit shows a flashing remote Amber light every 4 seconds, return the unit to CO Guardian for repair or replacement. See MFG Manual if Remote light is displayed on the MFD.**

**Field repair or service is allowable on all of the installed system components except for the CO Detector Indicator itself. The CO Detector must be returned to CO Guardian, LLC for all service.**

The aircraft wiring harness, circuit breaker, Alert annunciator, and Test/Reset switch shall be included maintenance instructions for general visual inspections for system integrity, installation security, corrosion and chaffing.

## 8.0 CARBON MONOXIDE DETECTOR SCHEDULED MAINTENANCE

Scheduled Maintenance Program tasks to be added to the aircraft operator's appropriate airplane maintenance program are as follows:

MAINTENANCE TASK	INTERVAL
a. Recommended Periodic Scheduled Servicing Tasks:	None Required.
b. Recommended Periodic Scheduled Preventative Maintenance test/checks to determine system condition and/or latent failures:  <b>Note:</b> Be sure the vent on the faceplate is free of obstructions. Any failures of the system are evident to the pilot through a flashing remote Amber light approximately every 4 seconds.	Each time the unit is turned ON.
c. Recommended Periodic Inspections:	None Required.
d. Recommended Periodic Structural Inspections	None Required.
e. Required CO Sensor replacement and calibration.	At end of Service Life (Reference Par. 2.0)

### NOTE

The unit must be returned to the manufacturer for sensor replacement and recalibration at the end of the unit service life.

**NO FIELD SERVICE OR OVERHAUL OF MODEL 452 IS AUTHORIZED.**

## 9.0 WEIGHT AND BALANCE / EQUIPMENT LIST

The Aero 452-201 CO Detector installation weighs 0.109 lbs. Reference the aircraft weight and balance manual for moment arm.

## **10.0 LIMITATIONS**

The Aero 452-201 CO Detector may not replace any existing instrument or indicator required by the type design or operating limits.

## **11.0 NORMAL PROCEDURES**

When the airplane master battery switch is selected ON, the Aero 452-201 Remote CO Detector goes through a self-test routine. The self-test checks for functionality of critical components such as the CO sensor, temperature sensor, pressure sensor, and integrity of the system.

### **10.1 SELF TEST SEQUENCE**

You will notice the following test sequence:

- The Amber CO ALERT light will flash twice and then remain OFF until there is a CO ALERT, a failure of the unit, or another self-test is performed.

A self-test can be performed when desired by depressing the TEST/RESET button.

## **12.0 PERFORMANCE**

No Change

### 13.0 EMERGENCY PROCEDURES

If the CO Detector ALERT annunciator activates in flight, press the TEST/RESET button to reset the alert annunciator. If the ALERT light continues to illuminate:

- Shut off the heater, air conditioning or any other opening to the engine compartment.
- Open a fresh air source immediately.
- Don't smoke.
- Use 100% oxygen, if possible.
- Land as soon as conditions permit.
- Be sure the source of the contamination is corrected before further flight.

**NOTE: The remote Amber light will stay on until the CO level goes below 50 parts per million (PPM) by volume of carbon monoxide concentration. SEE MFD manual if the "ALERT" display is integrated with the Manufacturers MFD.**

**DO not recycle the unit through the circuit breaker. A three-minute delay is required for the CO sensor to stabilize after each power-up in the -001 through -004 P/N units.**

#### **14.0 UNIT FAILURE INDICATION:**

A failure of the CO Sensor, Temperature Sensor, or the Micro-controller will result in the following failure indications:

- The remote Amber light will flash at an approximate rate of one flash each four (4) seconds until the failure is cleared or power is removed from the unit. NOTE: SEE MFG manual if the fault data is integrated with the MFG MFD for fault analysis.

In case of a failure indication, attempt to clear the failure condition by resetting the CO Detector. Should the failure condition continue, remove the CO Detector power by pulling the CO Detector circuit breaker.

#### **15.0 RS-232 DATA BUSS OPTION**

The RS-232 Data Buss option is currently available on numerous MFD units like the Garmin GNS480 and Garmin G1000. The RS-232 data buss output will couple CO Detector status information to electronic display systems with RS-232 input capability. The unit transmits CO Level, Cabin Temperature, Cabin pressure and is remotely reset able via RS232.

See Multi-Function display manufacturers Installation Manual for interface guidance.

## 16.0 Warranty

WARRANTY COVERAGE: CO GUARDIAN LLC. WARRANTS TO THE ORIGINAL CONSUMER PURCHASER, THAT THIS DETECTOR WILL BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM DATE OF PURCHASE. THE MANUFACTURER'S LIABILITY HEREUNDER IS LIMITED TO REPLACEMENT OF THE PRODUCT, REPAIR OF THE PRODUCT OR REPLACEMENT OF THE PRODUCT WITH A REPAIRED PRODUCT AT THE DISCRETION OF THE MANUFACTURER. THIS WARRANTY IS VOID IF THE PRODUCT HAS BEEN DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLIGENCE, TAMPERING OR OTHER CAUSES NOT ARISING FROM DEFECTS IN MATERIAL OR WORKMANSHIP. THIS WARRANTY EXTENDS TO THE ORIGINAL CONSUMER PURCHASER OF THE PRODUCT ONLY.

Warranty Disclaimers: Any implied warranties arising out of this sale, including but not limited to the implied warranties of description, merchantability and fitness for a particular purpose, are limited in duration to the above warranty period. In no event shall the Manufacturer be liable for loss of use of this product or for any indirect, special, incidental or consequential damages, or costs, or expenses incurred by the consumer or any other user of this product, whether due to a breach of contract, negligence, strict liability in tort or otherwise. The manufacturer shall have no liability for any personal injury, property damage or any special, incidental, contingent or consequential damage of any kind resulting from gas leakage, fire or explosion.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above limitations or exclusions may not apply to you.

Legal Remedies: This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

Warranty Performance: During the above warranty period, your product will be replaced with a comparable product if the defective product is returned, postage prepaid, to CO Guardian, Customer Service Department, 1951 East Airport Drive, Tucson, AZ 85706, together with proof of purchase date. Please include a note describing the problem when you return the unit. The replacement product will be in warranty for the remainder of the original warranty period or for six months whichever is longer. Other than the cost of postage, no charge will be made for replacement of the defective product.

Important: Do not attempt to open unit. If unit is opened, warranty will be void.

Your Carbon Monoxide Alarm is not a substitute for property, disability, life or other insurance of any kind. Appropriate insurance coverage is your responsibility. Consult your insurance agent.



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**NOTE:** The warranty will be void if the unit is opened or tampered with.