



OWNERS MANUAL

MODEL 451 (-101 & -201)



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Record of Amendments

Revision No	Page No.	Date	Description	Approved by
A	1 - 21		Initial Release	Ash Vij

Foreword

This owners manual is intended to be used by persons who, pursuant to current requirements, are qualified to install the MODEL 451, cockpit carbon monoxide monitoring and warning system. Since different aircraft have differing cockpit layouts and have differing installment specifications, this document is not designed to be a type specific installation manual but a generic installation guideline.

In case you require any specific information about the MODEL 451, please contact us at the address below -

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While every care has been taken in the preparation of this document, any errors, inconsistencies or suggestions may be forwarded to us at the address given above. Please refer to the document page number and name. List the details of the error and / or inconsistency and suggested changes to the document.

Basic Functions

Feature	Description
Carbon Monoxide (CO) Detection	The system alerts when the CO level rises above 50 parts per million (PPM) and stays above this level for 3 min 30 seconds. The alarm operates without any delay in case the CO level rises above 400 PPM.
CO Warning Light	When the CO level is detected above the designated threshold, the on-unit amber warning light on the 451-101 will be switched on. A recommended remote amber warning light/annunciator will be switched on on the 451-201.
Aural Warning	MODEL 451 generates an on unit aural alarm at 85 dB that when the CO level is detected above the designated threshold.

System Description

1.0 General

Carbon Monoxide (CO) can be dangerous in an enclosed space such as an aircraft cockpit. The MODEL 451 is designed to be installed in the instrument panel of an aircraft. It is designed to detect the presence of CO concentrations before they reach life threatening levels. The device comes in two versions, Model 451-101 – which is mounted on the instrument panel and the Model 451-201 which is mounted remotely behind the instrument panel or elsewhere in the cabin.

2.0 Physical Description

451-101 Panel Mount Frontal View



451-201 Remote Mount Frontal View



3.0 Specifications

Parameter	Value / Specification
Dimensions	3.75 (length) x 1.2 (height) x 1.5 (width) (inches)
Weight	4 oz
Cooling	Passive
Temperature range	
Non operational temperature range	-55° C to +85° C
Operational temperature range	-20° C to +55° C
Humidity range	Up to 95% (non-condensing)
Power requirements	
14 V DC Model	+14 V DC (nominally 9.0 V to 15.1 V DC)
28 V DC Model	+28 V DC (nominally 18.0 V to 30.3 V DC)
Consumption (both 14 V and 28 V models)	<1 Watt
System start up and stabilization time	Three (3) minutes

4.0 Scope

The Model 451 family of 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 (14v or 28v). The aircraft supplied power and aircraft wiring is protected by a 1 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 an optional (not included) 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. 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 located on the unit itself on the -101 panel mount and remotely installed within sight of the pilot in the -201 remote mount. 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 at power up to stabilize the sensor before the unit will accurately sense CO levels.

5.0 Carbon Monoxide level monitoring and warning

The system monitors the carbon monoxide content in the air in the cockpit and generates an alert under the following conditions –

- If the carbon monoxide concentration reaches 50 parts per million (PPM) or more, an alert/alarm is generated within 5 minutes
- The alert/alarm delay is reduced at higher concentrations of carbon monoxide. At 400 PPM, the alert/alarm is nearly instantaneous.
- The visual alert LED is displayed either on the -101 panel unit or in a remotely mounted instrument panel LED or annunciator light for the -201 remote unit. An aural alarm also is generated from the detector unit.

The alert will stay ‘ON’ on until the level of CO concentration drops below 50 PPM.

6.0 Service Facilities (all models)

Installation must be performed by an FAA certified Repair Station or by an A&P mechanic. CO Detectors must be returned to CO Guardian for repair, calibration or overhaul. The sensor life is 7 years from date of installation.

Note -

The sensor requires special gases for testing. 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 as applicable to the specific unit in use.

Pin Layout MODEL 451

Model 451 has four pins. These are labeled 1,2,5,4. The pin layout of the MODEL 451 is as under –

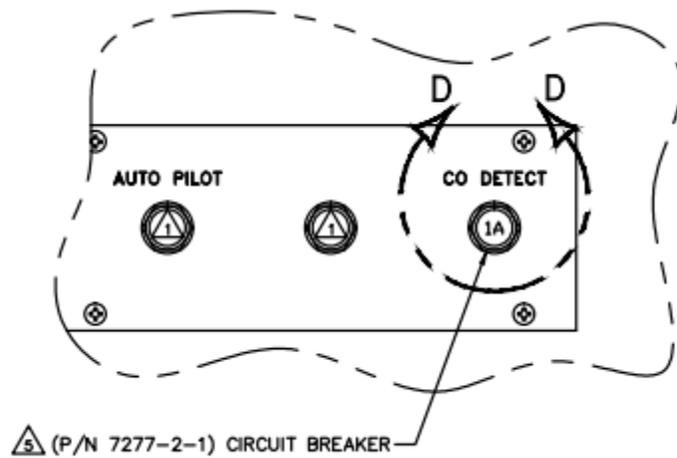
PIN	FUNCTION
1	14 or 28 VDC Power Input
2	Remote Test/Reset Switch
3	Remote Test/Reset Switch (-201 only)
4	CO Alert Light Relay (-201 only)
5	Power Ground
6	CO Alert Relay 2

Installation of 1 Amp CB

A 1 Amp circuit breaker will need to be installed for the MODEL 451. A typical install is shown in the figure.

The CB should ideally be mounted on the Essential Bus that will not be automatically isolated in the event of a generator failure.

The CB must be properly annotated or labeled as shown in the figure. Ensure that the power and ground return wires are twisted together at 6 or more turns per foot.



Connect Pin 1 of the MODEL 451 unit to +14 V DC or +28 V DC as applicable to the aircraft and the type of MODEL 451 voltage rating through the 2 Amp CB installed for the unit. Connect the ground return wire (Pin 5) to a suitable aircraft structure near the CB panel. The CB will provide power supply to three components – Pin 1 of MODEL 451, the CO warning light and the optional cabin altitude warning light. The circuit diagram is shown in detail in the Supplement to this manual.

Installation of MODEL 451-101

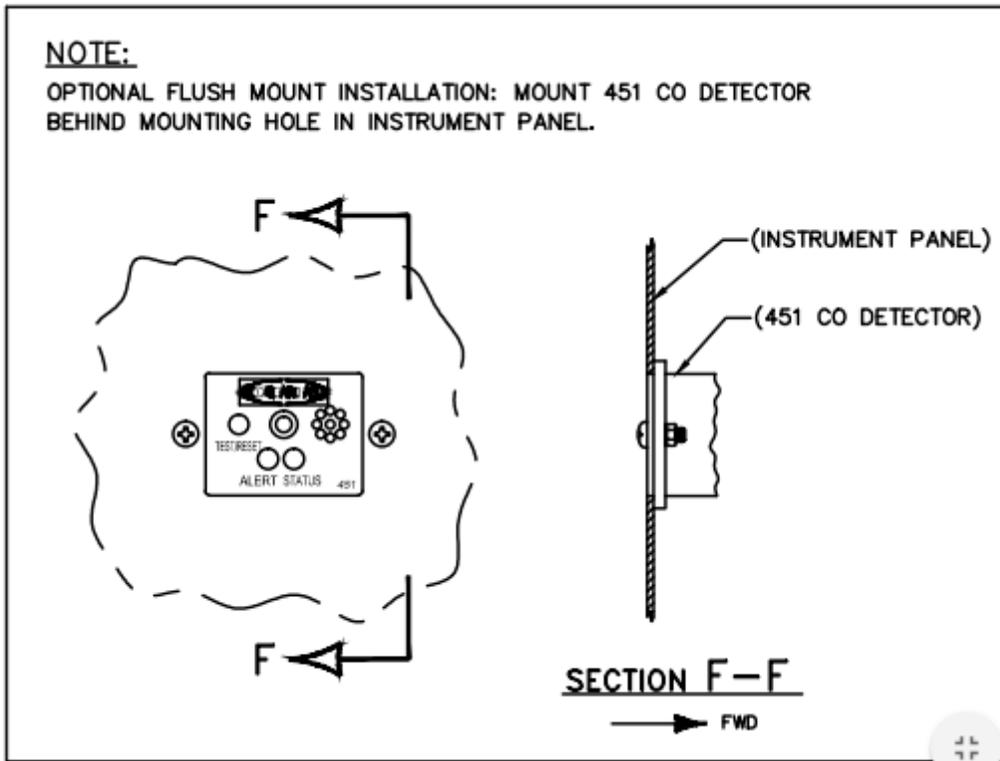
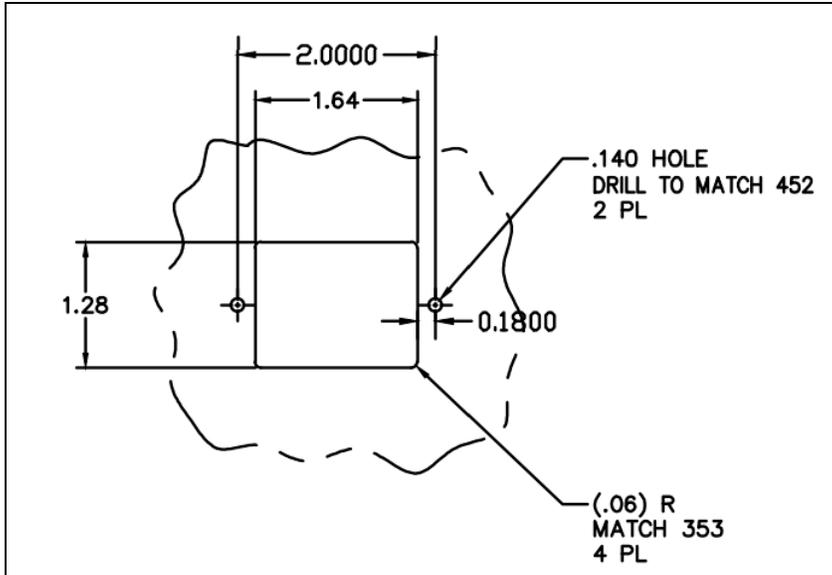
7.0 Basic Requirements

The following basic requirements have to be insured while installing MODEL 451

- Choose a location on the instrument panel that can be accessed by both pilot and co-pilot
- Ensure that the airflow to the unit is not restricted
- Ensure that the location selected for installation is not subjected to dust or dirt
- Ensure that the air intake on the front of the unit is not obstructed or blocked in any manner
- Ensure that the unit is not exposed to a strong airflow. The sensor performs better if it is not subjected to strong airflow
- Ensure that the unit is used within the temperatures and humidity restrictions as mentioned in the leading particulars.

8.0 Mounting MODEL 451-101

MODEL 451 is to be mounted behind the instrument panel as shown below.



Installation of MODEL 451-201

9.0 Basic Requirements

The following basic requirements have to be insured while installing MODEL 451

- Choose a location behind the instrument panel. The unit can be installed on any side of the Instrument panel.

- Ensure that the airflow to the unit is not restricted
- Ensure that the location selected for installation is not subjected to dust or dirt
- Ensure that the air intake on the front of the unit is not obstructed or blocked in any manner
- Ensure that the unit is not exposed to a strong airflow. The sensor performs better if it is not subjected to strong airflow
- Ensure that the unit is used within the temperatures and humidity restrictions as mentioned in the leading particulars.

10.0 Install the TEST/RESET and the amber ALERT annunciator light in a location within the pilot's direct field of vision and within normal pilot's reach.

11.0 Post Installation Checks

- With the CO Detector disconnected from the aircraft harness, conduct a continuity check of the added aircraft wiring.
- 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.
- Put aircraft Battery Switch OFF. Connect the CO Detector connector to the aircraft harness. Turn aircraft Battery Switch ON. Close CO DETECT circuit breaker.
- Verify the unit can be shut off with the CO DETECT circuit breaker.
- Determine the moment arm for the installed CO Detector location and record in aircraft weight and balance manual. CO Detector weight is 4 oz approximately.

Maintenance Instructions

The CO Detector unit has its own internal built in test mechanism and every time it is powered up, it conducts a self diagnostic test. In case the device fails the test, this is indicated by the warning lamp blinking red after the equipment is switched ON. If the equipment clears the built in test the warning lamp will stay green.

Field repairs are permissible on all components of the CO Detector except on the CO Detecting element and its indicator. In case these components are found faulty, the unit must be returned to CO Guardian, LLC for service / repair.

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

12.0 Scheduled Maintenance

The following scheduled maintenance program tasks are to be added to the aircraft operator's airplane maintenance program -

Maintenance Task	Periodicity
Recommended Periodic Scheduled Servicing Tasks:	None required
Recommended Periodic Scheduled Preventative Maintenance test/checks to determine system condition and/or latent failures: Note: Be sure the vent on the faceplate is free of obstructions.	Each time the unit is turned ON
Recommended Periodic Inspections:	None required
Recommended Periodic Structural Inspections	None required
Required CO Sensor replacement and calibration.	At the end of service life (5 years from date of installation).

The Unit must be returned to Guardian Avionics at the end of Service Life for replacement and calibration of the CO sensor to maintain airworthiness of the unit. The main reason for replacement of the sensor is the degradation of the sensor and dirt accumulation over the years. **Field service or overhaul of models is NOT authorized.**

13.0 Weight and Balance

MODEL 451 weighs 4 oz. The moment arm for the equipment will need to be calculated from the aircraft weight and balance manual.

14.0 Limitations

MODEL 451 is not designed to replace any existing instrument or indicator required by the type design or operating limits.

15.0 Self Test

When power is applied to the co detector, a self-test routine begins. The test checks for functionality of the critical components such as the CO sensor, temperature and pressure sensors, and the integrity of the total CO Detector system, 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. The status lamp (green) will stay ON with a functional unit.

16.0 Emergency Procedures

If the CO Detector ALERT annunciation activates in flight:

- 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 alert message will stay ON till the CO level stays above 50 parts per million (PPM) by volume of carbon monoxide concentration.

DO NOT recycle the unit via the circuit breaker since MODEL 451 will need three minutes for the CO sensor to stabilize after each power up.

17.0 Unit Failure

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

- 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.

In case of failure indications, attempt to clear the failure by resetting MODEL 451 via the CB. If the failure indication persists or recurs, remove the power supply to the unit by pulling the circuit breaker for the system.

Warranty

WARRANTY COVERAGE: CO GUARDIAN LLC. WARRANTS TO THE ORIGINAL CONSUMER PURCHASER, THAT THE MODEL 451 CO 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 85756, 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.

NOTE

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

For installation see latest installation drawing @ www.GuardianAvionics.com

