



911154-1
Carbon Monoxide Monitor and
Ventilation Fan Controller



Installation and Operation Manual
Code Version: 10.27.16

1.0 Notices, Warranty, and Return Instructions

A UL Listed, Class 2, Step Down, 120VAC:24VAC Transformer, Installed In Accordance With The National Electric Code, Shall Be The Only Device Used To Energize this Carbon Monoxide Detection System. (CITY OF LOS ANGELES ONLY) – Conspec Controls Part Number: 911154-PS

This Carbon Monoxide Detection System Is Suitable For Installation In Indoor and/or Dry Locations Only.

The 911154-1 uses an electrochemical fuel cell as the carbon monoxide detection element. A normal characteristic of this sensor type is a gradual decrease in output response over time. Periodic calibration of the 911154-1 is necessary to restore accuracy. Under normal conditions of use, the detection element will need to be replaced after five (5) years from date of manufacture.

It is the user's responsibility to insure:

- Correct equipment is specified for the particular application
- Installation follows recommended guidelines
- All applicable safety and electrical codes are met
- Periodic calibration, service, and maintenance schedules are met
- Replacement of inoperative or malfunctioning parts as needed

Every effort has been made in the preparation of this document to ensure correct and pertinent information is included. Conspec Controls, Inc. assumes no responsibility for errors, omissions, or any loss due to said errors or omissions.

Warranty

Conspec Controls, Inc. provides warranty service for one (1) year from the original shipping date covering all electronic and mechanical components. Sensor elements are considered a consumable part subject to varying conditions that may affect their life expectancy. Damage to sensor elements due to overexposure to the target gas, poisoning, or other factors beyond Conspec's control are not covered under warranty. Warranty service is limited to defects in materials and workmanship that occur during normal use. Conspec will repair or replace any unit found to have failed due to defects in materials or workmanship. This warranty is voided if the unit has been misused, damaged due to incorrect installation, or tampered with before return to the factory. Warranty claims that are denied will be billed at the standard rate. Expedited shipping is not covered under warranty. Conspec Controls, Inc. authorizes no additional warranty.

Return Instructions

Prior to returning a product for service, call Conspec Controls at (724) 489-8450 to obtain a Return Authorization Number (RA#). Then, carefully pack the product with a written description of the nature of the return. Send the product to the following address:

Conspec Controls Inc.
6 Guttman Boulevard
Charleroi, Pennsylvania 15022

2.0 General Information

The 911154-1 is a low-voltage Carbon Monoxide (CO) monitor and ventilation fan controller that activates two relays in response to increasing CO concentration.

The Fan Relay is used to turn on an exhaust fan for the purpose of clearing the enclosed space in question of CO build-up from sources such as automobiles and furnaces.

The Alarm Relay is used to activate audible and/or visual indicators at a remote location in the event CO concentration reaches a level of concern.

An electrochemical fuel cell is used to detect the presence of CO in the environment surrounding the monitor.

An on-board micro-controller calculates CO concentration, activates the relays as needed, performs self-check diagnostics, and provides visual indication of device status and CO concentration.

3.0 Specifications

Power:	3 watts maximum from a 24-volt AC, Class 2 transformer
Current:	0.1 amp maximum
Weight:	1.2 pound
Size:	4.5 x 4.0 x 2.5 inches
Mounting:	4 x 4 electric box, not included
Connections:	Single 8-pin screw terminal connector, or Eight - #18 gauge PVC insulated stranded wire
Relays:	Two: 2-amp, 30-VDC rated, 1 Form C (SPDT) relay outputs
Fan Relay:	Activate: > 25 ppm (Factory Default – User Definable) Reset: < 15 ppm, plus minimum run time (Factory Default – User Definable)
Alarm Relay:	Activate: > 200 ppm immediate (Factory Default – User Definable) Reset: < 150 ppm (Factory Default – User Definable)
Operating Temperature:	-20 to +50 degree C
Operating Humidity:	10 to 90 % R.H.
Repeatability:	+/- 2 % at 250 ppm calibration point
Linearity:	+/- 5% over 0 to 500 ppm range
Response Time:	< 30 seconds, 90% final level, using 250 ppm gas

4.0 Installation

Location

Select locations to mount the monitor(s) to best suit the needs of the room or facility. Generally, near the middle of the room, between the exhaust fan and the fresh air inlets is most preferable. In most situations, the monitor should be mounted approximately 5 feet above the floor in an area where air movement is present.

Installation

With AC power turned off, install the 911154-1 in accordance with NEC and local codes. The monitor mounts to a standard 4-inch square electrical outlet box. Electrical connections between the monitor and building wires should be done with wire nuts. The following table identifies the wire color and function.

Connector Pin	Wire Color	Description
1	White	24 VAC Input
2	White	24 VAC Input
3	Orange	Fan Relay, Normally Open *
4	Red	Fan Relay, Common
5	Yellow	Fan Relay, Normally Closed *
6	Green	Alarm Relay, Normally Open
7	Black	Alarm Relay, Common
8	Blue	Alarm Relay, Normally Closed

* - **NOTE:** Relay operates in fail-safe method. See operation section for details.

Refer to the installation diagrams provided in the later sections of this document for typical installation suggestions.

Do not exceed the contact ratings for either relay output. **Under no circumstance is either relay to be used to directly connect AC power voltages or carry high loads.** Low-voltage control wiring should not be run in the same conduit as high-voltage wiring.

5.0 Operation

With no power applied to the 911154-1, the sensor element is kept ready for rapid start-up, both relays are de-energized, and all indicators will be inactive.

When power is applied, a 45-second Power-On Sequence is initiated. During this interval, the sensor element will be energized, the micro-controller will begin taking measurements, and informational messages will be shown on the display.

Following the Power-On Sequence, the monitor will begin normal operation. The fan relay is energized during normal condition (fail-safe operation). In the event of power loss, the fan will be activated. The Alarm relay is energized when an alarm condition is detected.

The fan relay will be called **activated** when de-energized and **reset** when energized.

Fan Relay

When activated, the Fan relay will be maintained for a minimum amount of time before being allowed to reset, regardless of the CO concentration. This prevents undesired cycling of the exhaust fan. The Run Timer is set to 5 minutes and starts once the CO concentration falls below 15 ppm.

Activated By:

1. Power Up Sequence, **OR**
2. CO concentration above 25 ppm, **OR**
3. Loss of Power

Reset By:

1. CO concentration below 15 ppm, **AND**
2. Run Timer elapsed

Alarm Relay

Activation and reset of the Alarm relay is described below.

Activated By:

1. CO concentration above 200 ppm

Reset By:

1. CO concentration below 150 ppm

Audible Sounder

The audible sounder is used to provide local indication of the Alarm relay being active. A repetitive 5-beep cadence will be heard every two-seconds while this condition is present.

Status Indicator

The Status Indicator consists of a bi-color LED. The table on the following page describes the monitor condition and corresponding indication:

Status	Indication
Normal	One GREEN flash, 2-second interval
Fan Relay Active	One RED flash, 2-second interval
Alarm Relay Active	Two RED flashes, 2-second interval
Sensor Fail	Alternating RED-GREEN, 1-second interval
Calibration Mode, Zero	Constant GREEN
Calibration Mode, Span	Constant RED

Test Indicator

The yellow Test indicator flashes each time the self-test diagnostics routine is initiated by the micro-controller.

Liquid Crystal Display

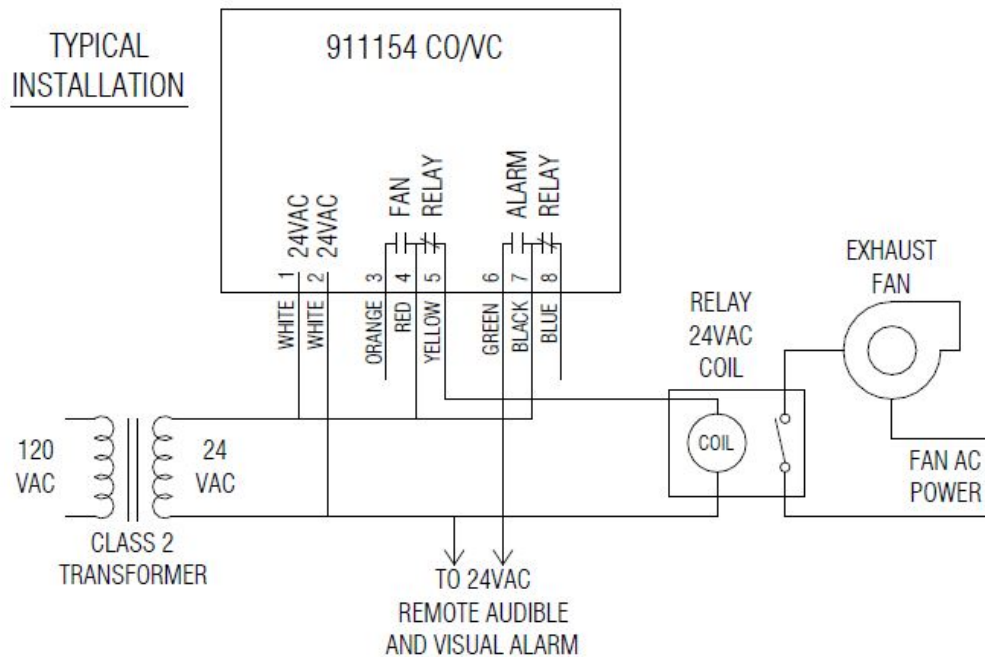
The LCD display provides visual text information of CO measurement and operational status.

The top line indicates status. Once every 24-seconds, each relay status (ON or OFF) will be shown. Following relay status, diagnostic error messages (S Fail 1, S Fail 2, and TEMP_ERR) will be shown if active. When no diagnostic error messages are active, the line will contain "CO".

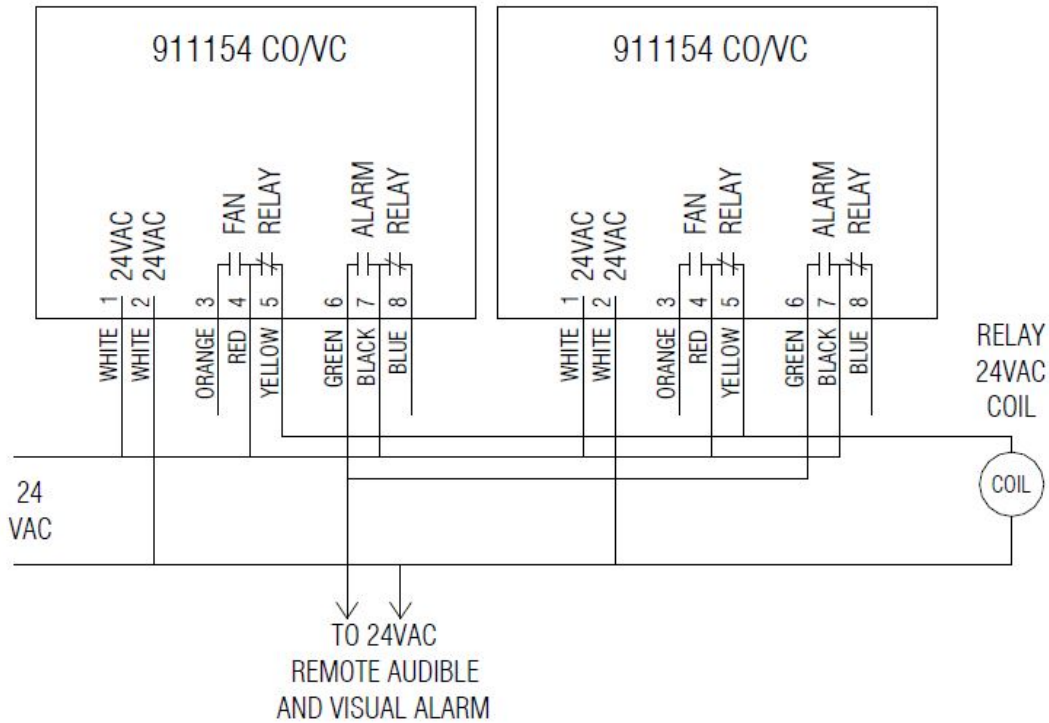
The bottom line indicates the measured CO concentration while the monitor is in Run Mode. During calibration, start-up, and certain user-initiated modes of operation, numeric or text information will be shown on the display.

The display backlight will be on during Power-On Sequence and when the monitor is in the unlocked condition.

6.0 Installation Diagrams



TYPICAL MULTIPLE
UNIT INSTALLATION



7.0 User Interface

The 911154-1 uses an infrared detector to receive operator commands from an Infrared Keypad Encoder (911118-M). This user interface allows viewing of diagnostic information, setting of operational parameters, and calibration of the monitor.

The user enters Command Codes to interact with the monitor. Valid Command Codes consist of a numeric value followed by the ENTER key (labeled 'E').

Unlock Monitor

Command **25** is used to unlock the monitor. When unlocked, operational parameters can be modified, and calibration can be initiated.

After the monitor receives Command 25, it will prompt the user to enter a numeric password followed by the ENTER key. Once unlocked, the monitor will remain unlocked for 15-minutes, then lock itself automatically.

Factory password setting = 1.

Span Setting

Command **100** is used to view or modify the span gas concentration used during calibration. A different value can be entered while the monitor is unlocked.

Factory default = 250.

Calibration

Command **111**, entered while the monitor is unlocked, will initiate a calibration cycle. See Section 9.0 for details.

Alarm Parameters

Command **120**, View when locked. View and modify when unlocked.

AL1-L: Alarm Level 1 low limit (Default = 15)

AL1-H: Alarm Level 1 high limit (Default = 25)

AL2-L: Alarm Level 2 low limit (Default = 150)

AL2-H: Alarm Level 2 high limit (Default = 200)

On Delay: Delay, in seconds, to onset of alarm condition (Default = 1)

Off Delay 1: Delay, in seconds, required to reset Fan Relay (Default = 150 = 5 min.)

Off Delay 2: Delay, in seconds, required to reset alarm relay (Default = 1)

Alarm Type: 8-bit binary word used to define output relay alarm modes (Default = 102)

Sensor Fail Level: Sets limit of live concentration excursion beyond zero and range that defines sensor fail (Default = 3)

Display Contrast

Command **130** allows the liquid crystal display contrast to be adjusted. While unlocked, the display will show the present contrast setting, a value between 0 and 60.

User Password

Command **170** is used to change the User Password. If unlocked, the display will request entry of a new password followed by confirmation. When entered correctly, the new value will take effect. Valid range = 1 to 9999.

Information and Diagnostic Screens

Command **200** allows the user to view a defined set of information. This command does not require the monitor to be unlocked. Following entry, the display will scroll the following information screens for 5-seconds. Entry of the ENTER key will force the next screen immediately.

Version: The firmware code version is shown.

Temp: The present temperature sensed by the circuit is shown.

Raw Zero: The zero gas measurement from the previous calibration is shown.

Slope: The response magnitude from the previous calibration is shown.

POS= , NEG= : The response readings from the last sensor fail test are shown.

Raw Data: Present, live measurement values are displayed for 10-seconds.

8.0 Maintenance

Periodically inspect the monitor and its surroundings to ensure there is no accumulation of dust or moisture on or in near proximity that might inhibit proper operation. Inspect for signs of damage or unauthorized tampering to the monitor, including the application of coatings or paint. Take corrective action as needed.

On a regularly scheduled basis, calibration of the monitor is needed to ensure accuracy as the sensor ages. Conspec recommends calibration be performed at intervals no longer than every 90 days.

Replacement of the sensor element should be completed every five (5) years or when the calibration procedure cannot be completed due to low sensor response. Environments that contain high levels of carbon monoxide for long durations will deplete the sensor element faster than those with low concentrations.

9.0 Calibration

The following items are required to successfully perform calibration of the monitor:

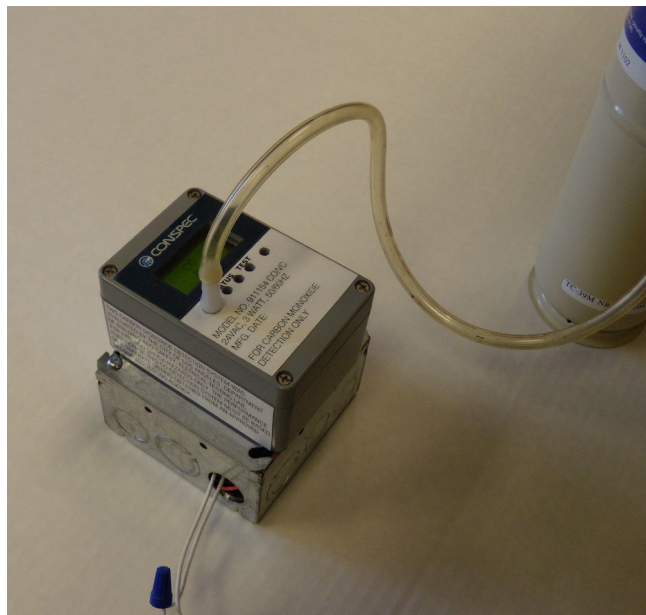
- Calibration Zero Gas canister, adequate pressure
- Calibration Span Gas canister, adequate pressure
- Flow regulators, hoses, and adapters as needed
- Infrared Keypad Encoder
- The Span setting on the monitor matches the Calibration Span Gas canister CO concentration

In addition, read and understand the following procedure.

Calibration Procedure

1. Unlock the monitor using Command 25 and the User Password.
2. Initiate calibration using Command 111.

The display will ask for Zero Gas on the top line. Numeric values will be displayed on the bottom line. The Status indicator will turn constant green.



Monitor with Calibration Adapter and Hose Attached

3. Introduce Zero Gas to the monitor sensor element. Use a calibration adapter that is vented to prevent pressurization of the sensor.

The numeric value shown on the display indicates the measured sensor output. Under normal conditions, Zero Gas should cause the value to stabilize close to 32,800 and the values should not change by more than 25 from one second to the next.

Allow several minutes for the readings to stabilize if needed.

4. Accept the Zero Gas value by hitting the ENTER key on the Infrared Keypad Encoder.

The display will ask for Span Gas and the Status indicator will turn constant red.

5. Turn off the Zero Gas canister and remove from use.

6. Introduce Span Gas to the monitor sensor element in the same manner as with Zero Gas in part 3.

When exposed to span gas, the numeric value shown on the display will increase fairly rapidly, and then slowly begin to stabilize toward a final value. The absolute change will depend on the Span Gas concentration and age of the sensor element.

Again, allow several minutes for the readings to stabilize.

7. When ready, accept the Span Gas value by hitting the ENTER key.

Next, the monitor will use the values for zero and span entered above to compute the response of the sensor. If the values create an acceptable response, the new calibration values will be stored in memory and the display will show “Cal Done”.

If the values create a response outside acceptable limits, the new data will be discarded, the last calibration data will be retained, and the display will show the message “Calib. Error”.

In either case, the monitor will enter a recovery period in which the Span Gas can be purged, minimizing unwanted operation of the output relays.

8. Turn off the Span Gas canister and remove the calibration adapter from the monitor.

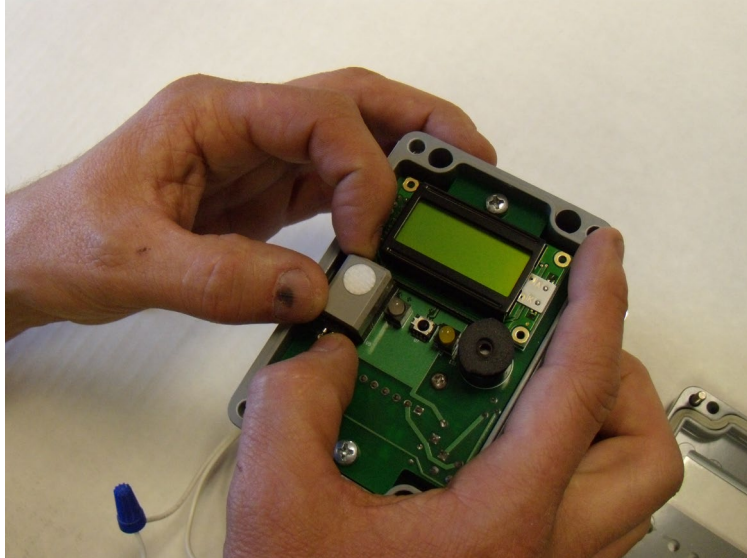
10.0 Sensor Element Replacement

When replacing the sensor element, make sure you have the following:

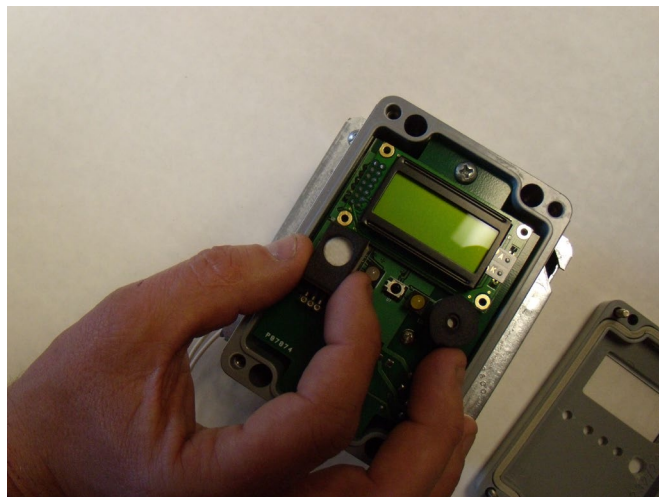
- A complete cell replacement kit.
- All equipment needed to perform calibration. See Section 9.0 for details.

Sensor replacement procedure

1. Open the housing by loosening the four screws on the lid.
2. Gently remove the existing sensor element from the right-angle socket.



3. Seat the new sensor element into the socket. Apply pressure to the bottom of the socket to prevent the pins from bending while the sensor is installed.
4. Peel the adhesive backing from the foam gasket that came with the replacement kit.
5. Attach the foam gasket to the front surface of the sensor element. Make sure to center the gasket hole with the white circle on the sensor.



6. Install the lid back on the enclosure using the four screws.
7. Allow the sensor to operate for at least 15 minutes.
8. Perform a calibration on the monitor per Section 9.0.