# 65-2433RK
# Carbon Monoxide Detector
# Operator's Manual

***Part Number: 71-0090RK***

***Revision: P1***

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## Product Warranty

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a) Absorbent cartridges

b) Pump diaphragms and valves

c) Fuses

d) Batteries

e) Filter elements

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in accordance with the operator's manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

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We do not assume indemnification for any accident or damage caused by the operation of this gas monitor, and our warranty is limited to the replacement of parts or our complete goods.

# Table of Contents

## Overview

This manual describes the carbon monoxide (CO) detector. This manual also describes how to install, start up, maintain, and calibrate the detector when it is used with a gas monitoring controller. A parts list at the end of this manual lists replacement parts and accessories for the CO detector.

## Specifications

Table 1 lists specifications for the CO Detector.

**Table 1: Specifications**

| | |
|---|---|
| Target Gas | Carbon monoxide (CO) |
| Area Classification | Explosionproof for Class I, Groups B, C, and D |
| Sampling Method | Diffusion |
| Detection Range | 0 to 100 PPM (parts per million) |
| Response Time | 90% in 30 seconds |
| Signal Output | mA |

# Description

This section describes the components of the CO detector. The detector consists of the CO sensor, charcoal filter with rubber boot, detector housing, detector housing cap, and cap gasket.

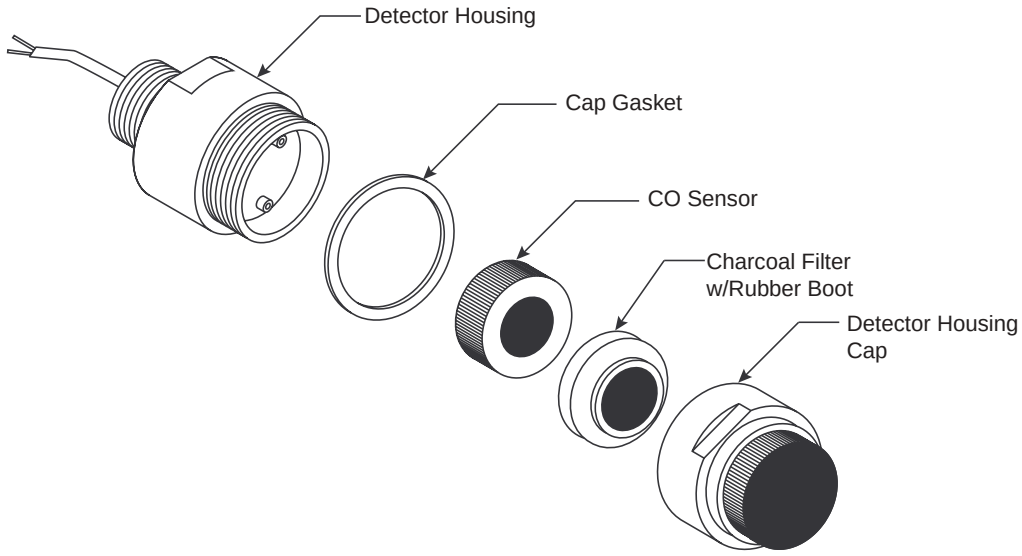


**Figure 1: CO detector Component Location**

## Detector Housing, Housing Cap, & Cap Gasket

The detector housing protects the sensing components within the housing. Use the 3/4" NPT mounting threads at the top of the housing to screw the CO detector into one of the bottom conduit hubs of a controller or into a junction box. Use the removable cap near the bottom of the housing to access the sensor for maintenance or replacement. The cap protects the sensor from damage and includes a flame arrestor which contains any sparks which may occur within the detector housing. A cap gasket seals the interface between the housing and cap.

Two wires extend from the top of the detector housing. Use these wires to connect the CO detector to a controller. The housing includes a four-socket pattern. This socket pattern accepts the sensor's four pins to secure the sensor within the detector housing. A pre-amplifier, located between the sockets and two interconnect wires, conditions the sensor's signal before the signal reaches the controller.

## Sensor

The sensor is secured within the sensor housing by four pins. Through a series of chemical and electrical reactions, the sensor produces an electrical output that is proportional to the detection range of the detector.

## Charcoal Filter

The disc-shaped charcoal filter is secured to face of the CO sensor with a rubber boot. The charcoal filter prevents interference gases (hydrogen sulfide [$H_2S$] and certain hydrocarbons) from producing false CO readings.

# Installation

**NOTE:** Normally, the CO detector is shipped already installed in one of the bottom conduit hubs of a controller and factory wired to the controller. If your detector is already installed, use this section for reference only.

This section describes procedures to mount the CO detector in the monitoring environment and wire the detector to a controller.

## Mounting the CO Detector

1. Whether you will mount the detector directly to a controller or to a junction box, select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.
   - Select a site where the detector is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.
   - Select a site where the target gas is likely to be found first.

**NOTE:** If your application does not require a specific mounting site, mount the detector at approximately breathing level.

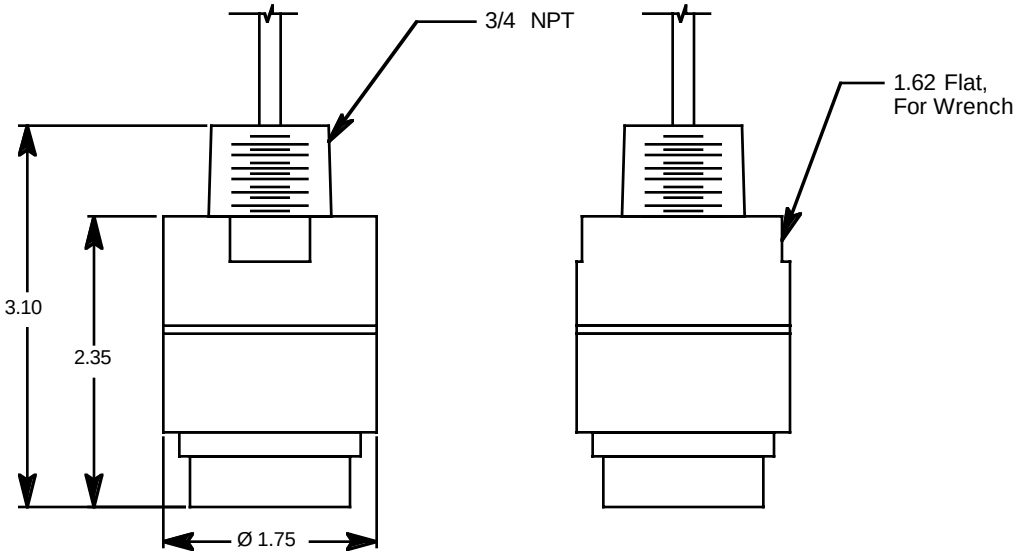


**Figure 2: Outline & Mounting Dimensions**

2. At the monitoring site, mount the detector in one of the following two ways:
   - Screw the detector's 3/4" NPT mounting thread into an empty conduit hub on a controller.

     OR
   - Screw the detector's 3/4" NPT mounting thread into an appropriately rated junction box.

***CAUTION:*** *Mount the CO detector with the detector facing down (see Figure 2).*

## Wiring the CO Detector to a Controller

***WARNING: Always verify that the power source is OFF before you make wiring connections.***

1. Turn off the controller.
2. Turn off or unplug incoming power at the power source end.
3. If the detector is mounted remotely from a controller using a junction box, skip to step 4.

   If the detector is mounted directly to a controller, connect the detector's red and black wires to the appropriate controller detector terminals and skip to the Startup Section.
4. Remove the junction box cover
5. Guide a two-conductor, shielded cable or two wires in conduit through an unused conduit hub of the junction box.
6. Connect the two wires to the detector using an appropriate terminal block.

***CAUTION:*** *If using shielded cable, leave the drain wire insulated and disconnected at the detector. You will connect the opposite end of the cable's drain wire at the controller.*

7. Secure the junction box cover to the junction box.
8. Route the cable or wires leading from the CO detector through one of the conduit hubs at the controller housing.

***CAUTION:*** *Do not route power and detector wiring through the same conduit hub. The power cable may disrupt the transmission of the detector signal to the controller.*

9. Connect the wires to the applicable controller terminal strip. See the controller operator's manual and the controller's detector head specification sheet.

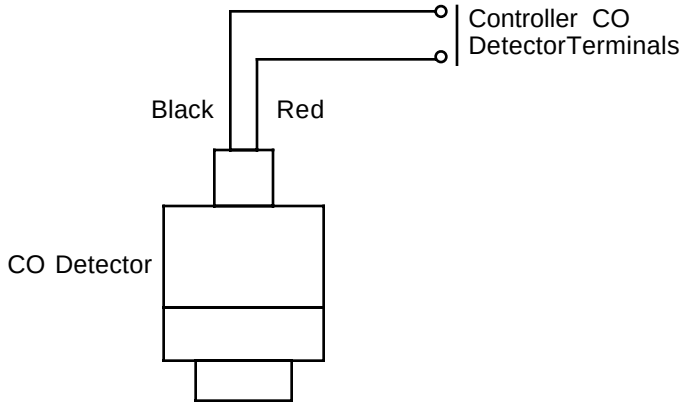


**Figure 3: Wiring the CO Detector to a Controller**

10. Connect the cable's drain wire to an available chassis ground at the controller.

# Start Up

This section describes procedures to start up the CO detector and place the detector into normal operation.

## Introducing Incoming Power

1. Complete the installation procedures described earlier in this manual.
2. Verify that the power wiring to the controller is correct and secure. Refer to the controller operator's manual.
3. Turn on or plug in the incoming power at the power source end, then turn on the controller.
4. Verify that the controller is on and operating properly. Refer to the controller operator's manual.

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***CAUTION:*** *Allow the detector to warm up for 5 minutes before you continue with the next section, "Setting the Zero Signal."*

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## Setting the Zero Signal

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***CAUTION:*** *If you suspect the presence of the target gas in the monitoring environment, use the calibration kit and the zero air calibration cylinder to introduce "fresh air" to the sensor and verify an accurate zero setting.*

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1. Verify that the detector is in a fresh air environment (environment known to be free of carbon monoxide, other toxic and combustible gases, and of normal oxygen content, 20.9%).
2. Verify a reading of 0 ppm CO at the controller.

   If the display reading is 0 ppm CO, start up is complete. The detector is in normal operation. If the display reading is not 0 ppm CO, continue with step 3.
3. Perform a zeroing operation at the controller. See the controller operator's manual for directions.

# Maintenance

This section describes maintenance procedures. It includes preventive maintenance, troubleshooting, and component replacement procedures.

## Preventive Maintenance

This section describes a preventive maintenance schedule to ensure the optimum performance of the CO detector. It includes daily, monthly, and quarterly procedures.

### *Daily*

1. Verify a display reading of 0 PPM CO at the controller. Investigate significant changes in the display reading.

### *Monthly*

This procedure describes a test to verify that the CO detector responds properly to carbon monoxide. It describes a test using a fixed flow regulator which has no on/off knob and allows sample to flow as soon as it is screwed into a cylinder. RKI Instruments, Inc. recommends using a 0.5 LPM (liters per minute) fixed flow regulator

**NOTE:** Performing a response test on the CO detector may cause alarms. Be sure to put the controller into its calibration program or disable external alarms before performing this test.

*Preparing for the response test*

1. Place the controller into its calibration program or disable external alarms.
2. Verify that the controller display reading for the channel you are testing is 0.

   If the display reading is not zero, set the zero reading of the detector as described in the Start Up section of this manual, then continue this procedure.
3. Screw the calibration cup onto the bottom of the CO detector.
4. Use the sample tubing to connect the regulator to the calibration cup.

**NOTE:** Do not screw the regulator into the calibration cylinder at this time.

*Performing the response test*

1. Screw the regulator into the calibration cylinder. The sample will begin to flow
2. Allow the gas to flow for two minutes, then verify that the reading is within ± 10% of the cylinder gas concentration.

**NOTE:** If the reading is not within ± 10% of the correct response reading, calibrate the detector as described in the Calibration section of this manual.

3. Unscrew the regulator from the calibration cylinder.
4. Unscrew the calibration cup from the CO detector.
5. When the controller display reading falls below the alarm setpoints, return the controller to normal operation.

### *Quarterly*

Calibrate the CO detector as described in the Calibration section of this manual.

## Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the CO detector.

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**NOTE:** This troubleshooting guide describes detector problems only. See the controller operator's manual for problems you may encounter with the controller.

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### *Fail condition*

*Symptoms*

- The controller indicates a fail condition.

*Probable causes*

- The detector wiring is disconnected or misconnected.
- The detector's zero reading is low enough to cause a fail condition.
- The detector is malfunctioning.

*Recommended action*

- Verify that the detector wiring is correct and secure.
- Calibrate the detector.
- If the fail condition continues, replace the CO sensor as described later in this section.
- If the fail condition continues, contact RKI for further instruction.

### *Slow or no response/difficult or unable to calibrate*

*Symptoms*

- The detector responds slowly or does not respond during the monthly response test.
- Unable to accurately set the zero or response reading during the calibration procedure.
- The detector requires frequent calibration.

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**NOTE:** Under "normal" circumstances, the detector requires calibration once every three months. Some applications may require a more frequent calibration schedule.

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*Probable causes*

- The calibration cylinder is low, out-dated, or defective.
- The detector is malfunctioning.

*Recommended action*

1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample.
2. If the calibration / response difficulties continue, replace the CO sensor as described later in this section.
3. If the calibration / response difficulties continue, contact RKI Instruments, Inc., for further instruction.

## Replacing Components of the CO Detector

This section includes a procedure to replace the CO sensor and one to replace the entire detector assembly. In most cases, it is not necessary to replace the entire detector assembly.

### *Replacing the sensor*

1. Turn off the controller.
2. Turn off or unplug incoming power at the power source end.
3. Unscrew the bottom section of the CO detector housing from the top section.
4. Unplug and remove the CO sensor with the boot and charcoal filter attached
5. Remove the rubber boot and charcoal filter from old sensor.
6. Install the rubber boot with charcoal filter onto the replacement sensor's face. Carefully plug the replacement sensor into the socket pattern that is located in the top section of the detector housing.

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**NOTE:** Match the sensor's male pins with the four female sockets as you plug the sensor into the socket.

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7. Screw the bottom section of the detector housing onto the top section.
8. Turn on or plug in incoming power at the power source end.
9. Turn on the controller.

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***CAUTION:*** *Allow the replacement sensor to warm up for 5 minutes before you continue with the next step.*

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10. Calibrate the replacement sensor as described in the Calibration section of this manual.

### *Replacing the charcoal filter*

1. Turn off the controller.
2. Turn off or unplug incoming power at the power source end.
3. Unscrew the bottom section of the CO detector housing from the top section.
4. Unplug and remove the CO sensor with the boot and charcoal filter attached
5. Remove the rubber boot that secures the charcoal filter to the CO sensor.
6. Remove the charcoal filter from the rubber boot.
7. Place the replacement filter in the rubber boot in the same position as the filter you removed in the previous step.
8. Reinstall the rubber boot with charcoal filter to the CO sensor.
9. Carefully plug the replacement sensor into the socket pattern that is located in the top section of the detector housing.

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**NOTE:** Match the sensor's male pins with the four female sockets as you plug the sensor into the sockets.

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10. Screw the bottom section of the detector housing onto the top section.
11. Turn on or plug in incoming power at the power source end.

12. Turn on the controller.

### *Replacing the CO detector*

**NOTE:** In most cases, it is only necessary to replace the CO sensor.

1. Turn off the controller.
2. Turn off or unplug incoming power at the power source end.
3. If the detector is installed directly on a controller, open the controller door.

   If the detector is installed remotely from controller in a junction box, remove the junction box cover.
4. If the detector is installed directly on a controller, disconnect the detector leads from the detector terminal strip in the controller. Note the position of the color-coded leads as you remove them.

   If the detector is installed remotely from a controller in a junction box, disconnect the detector leads from the terminal block in the junction box. Note the position of the color-coded leads as you remove them.
5. Unscrew the detector from the controller conduit hub or junction box hub.
6. Guide the detector leads of the replacement detector through the controller conduit hub or junction box hub then screw the mounting threads of the detector into the hub.
7. If the detector is installed directly on a controller, connect the detector leads to the appropriate detector terminal strip terminals. See the controller operator's manual and the controller's detector head specification sheet.

   If the detector is installed remotely from a controller in a junction box, connect the detector leads to the terminal block the same way the old detector was wired. See the controller operator's manual and the controller's detector head specification sheet to verify the connections are correct.
8. If the detector is installed remotely from a controller in a junction box, reinstall the junction box cover.
9. Turn on or plug in incoming power at the power source end.
10. Turn on the controller.

***CAUTION:*** *Allow the replacement detector to warm up for 5 minutes before you continue with the next step.*

11. Calibrate the replacement detector as described in the Calibration section of this manual.

# Calibration

This section describes how to calibrate the CO detector. It includes procedures to prepare for calibration, set the zero reading, set the response reading, and return to normal operation. It describes calibration using a fixed flow regulator which has no on/off knob and allows sample to flow as soon as it is screwed into a cylinder. RKI Instruments, Inc. recommends using a 0.5 LPM (liters per minute) fixed flow regulator.

## Preparing for Calibration

1. Screw the calibration cup onto the bottom of the CO detector.
2. Use the sample tubing to connect the fixed flow regulator to the calibration cup.

**NOTE:** Do not screw the regulator into the zero air calibration cylinder at this time.

3. Put the controller into its calibration program.

## Setting the Zero Reading

**NOTE** If you can verify that the CO detector is in a fresh air environment, you do not need to apply zero air to the detector before adjusting the zero reading.

1. Follow the directions in the controller operator's manual for setting the zero reading.
2. When the instructions call for applying zero air to the detector, screw the regulator into the zero air calibration cylinder. Gas will automatically begin to flow.
3. Allow the gas to flow for two minutes.
4. Set the zero reading according to the controller operator's manual.
5. Unscrew the regulator from the zero air calibration cylinder.

   Leave the sample tubing connected to the regulator and the calibration cup.

## Setting the Response Reading

1. Follow the directions in the controller operator's manual for setting the response reading (span).
2. When the directions call for exposing the detector to gas, screw the regulator into the gas cylinder and allow the gas to flow to the detector for 2 minutes before continuing with the directions.
3. After setting the response reading, unscrew the regulator from the cylinder and remove the calibration cup from the detector.

**NOTE:** For convenience, leave regulator and calibration cup connected by the sample tubing.

4. Allow about 45 seconds for the gas reading to decrease below the alarm points and then return the controller to normal operation.

**NOTE**: If you do not allow the gas reading decrease below the alarm points, then unwanted alarms may occur.

5. Verify that the controller display reading decreases and stabilizes at 0 ppm CO.
6. Store the components of the calibration kit in a safe and convenient place.

## Parts List

Table 5 lists replacement parts and accessories for the CO detector.

**Table 2: Parts List**

| Part Number | Description |
|---|---|
| 06-1248RK | Sample tubing (order by the foot) |
| 07-0033RK | Detector housing cap gasket |
| 07-0203RK | Rubber retaining boot (for charcoal filter) |
| 33-7101RK | Charcoal Filter Disk |
| 65-2433RK | CO replacement detector assembly (includes sensor) |
| 71-0090RK | *CO Detector Operator's Manual* (this document) |
| 81-0064RK-01 | Calibration cylinder (50 PPM CO in air; 34 liter steel) |
| 81-0076RK-01 | Zero air calibration cylinder (34 liter steel) |
| 81-1003RK | Regulator (for 34 liter steel calibration cylinders) |
| 81-1117RK | Calibration cup |
| ES-1531-CO | CO replacement sensor |