

61-1004RK/61-0191RK CO₂ Detector Operator's Manual

Part Number: 71-0145RK

Revision: P1

Released: 7/10/07

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- b) Pump diaphragms and valves
- c) Fuses
- d) Batteries
- e) Filter elements

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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.

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Overview

This manual describes the 65-1004RK CO₂ (carbon dioxide) detector. This manual also describes how to install, start up, maintain, and calibrate the detector when used with a gas monitoring controller. A parts list at the end of this manual lists replacement parts and accessories for the CO₂ detector.

The 61-1004RK CO₂ detector includes a junction box. This manual may also be used for the 61-0191RK CO₂ detector which does not include a junction box and is normally mounted in one of a controller's conduit hubs and factory wired to the controller. If you are using a 61-0191RK CO₂ detector, disregard all references to the junction box and junction box terminal block.

Specifications

Table 1 lists specifications for the CO₂ detector.

Table 1: 61-1004RK Specifications

Detection Range	<u>With Junction Box</u> 61-1004RK-02: 0 - 5,000 ppm CO ₂ 61-1004RK--03: 0 - 5% volume CO ₂ <u>Without Junction Box</u> 61-0191RK-02: 0 - 5,000 ppm CO ₂ 61-0191RK-03: 0 - 5% volume CO ₂
Area Classification	Explosionproof for Class I, Groups B, C, and D
Sampling Method	Diffusion
Response Time	90% in 45 seconds

Description

The 61-1004RK CO₂ detector has two versions, the 61-1004RK-02 which has a detection range of 0 - 5,000 ppm and the 61-1004RK-03 which has a detection range of 0 - 5% volume. The detector is an infrared type of detector. This section describes the components of the 61-1004RK. They include the infrared CO₂ detector and the junction box.

Infrared CO₂ Detector

The infrared CO₂ detector is made up of a miniature infrared CO₂ detector housed and encapsulated in a pipe nipple. The pipe nipple has 3/4 inch NPT threads on each end and a 1-1/4 inch hex that allows removal or installation of the detector with a wrench. A porous flame arrestor coated with a hydrophobic film that repels liquids is on one end of the detector and allows sample gas to enter the detector. Four color coded leads, red, white, green, and black, extend from the other end of the detector. The leads allow you to connect the detector to the terminal block in the junction box.

To distinguish the 5,000 ppm detector from the 5% detector (in case the replacement detector label that is applied to one of the leads is lost), a short length of black shrink tubing is applied to the white wire of the 5,000 ppm detector near where the wire comes out of the nipple and a short length of green shrink tubing is applied to the white wire of the 5% detector.

The output of the CO₂ detector mimics the output of RKI's standard catalytic LEL detectors. For this reason, the CO₂ detector's wire colors are the same as RKI's catalytic LEL detectors, black, white, green, and red. When the CO₂ detector is wired to an RKI controller, it is wired the same way an LEL detector is wired, to the LEL detector terminals. See "Wiring the CO₂ Detector to a Controller" on page 6 for wiring connections.

Junction Box

The junction box allows you to install the detector at a mounting site that is remote from a controller and it protects the detector wiring connections. Two 3/4" NPT conduit hubs allow you to mount the detector to the junction box and connect the wiring from the detector to a controller. The terminal block within the junction box facilitates the wiring to the detector. A cover on the front of the junction box allows access to the interior of the junction box. Three spacers installed on the back of the junction box control the distance of the junction box from a mounting surface and insure that there is enough room to install a calibration cup on the detector during calibration.

Installation

This section describes procedures to mount the CO₂ detector in the monitoring environment and wire the it to a controller. If you purchased a 61-0191RK detector that is factory installed in and factory wired to a controller, detector installation is not necessary.

Mounting the CO₂ Detector

1. 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.
 - Select a site that minimizes the possibility of someone breathing on the detector. The exhaled CO₂ may cause an alarm.

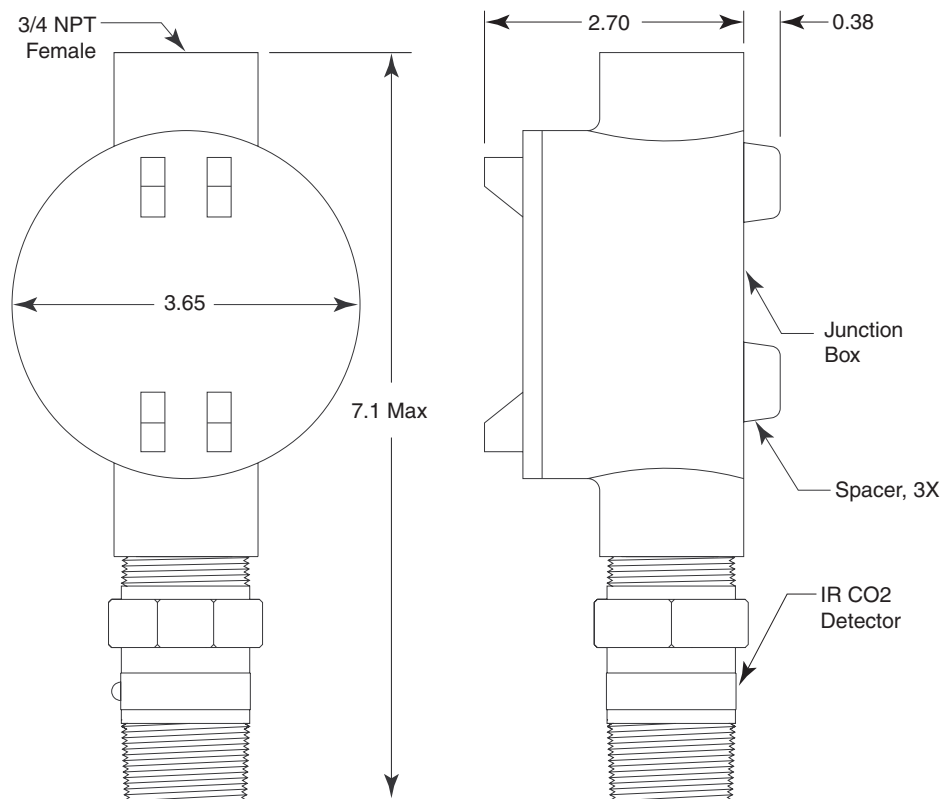


Figure 1: Mounting the CO₂ Detector

2. At the mounting site you select, hang or mount the junction box with the detector facing down (see Figure 1).

Wiring the CO₂ Detector to a Controller

WARNING: Always verify that the power to the controller is off before you make wiring connections.

As mentioned in “Infrared CO₂ Detector” on page 5, the IR CO₂ detector wires to an RKI controller the same way as an RKI LEL detector, to the LEL detector terminals. See Figure 2 below for the wiring connections.

1. Turn off the controller.
2. Turn off or unplug power to the controller.
3. Remove the cover from the junction box.
4. Guide a four-conductor, shielded cable or four wires in conduit through the top conduit hub of the junction box. Connect the wires to the terminals opposite the detector leads.

CAUTION: Leave the shield drain wire insulated and disconnected at the 61-1004RK. You will connect the opposite end of the cable’s drain wire at the controller.

5. Secure the junction box cover to the junction box.
6. Route the cable or wires in conduit leading from the detector through one of the conduit hubs at the controller.

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.

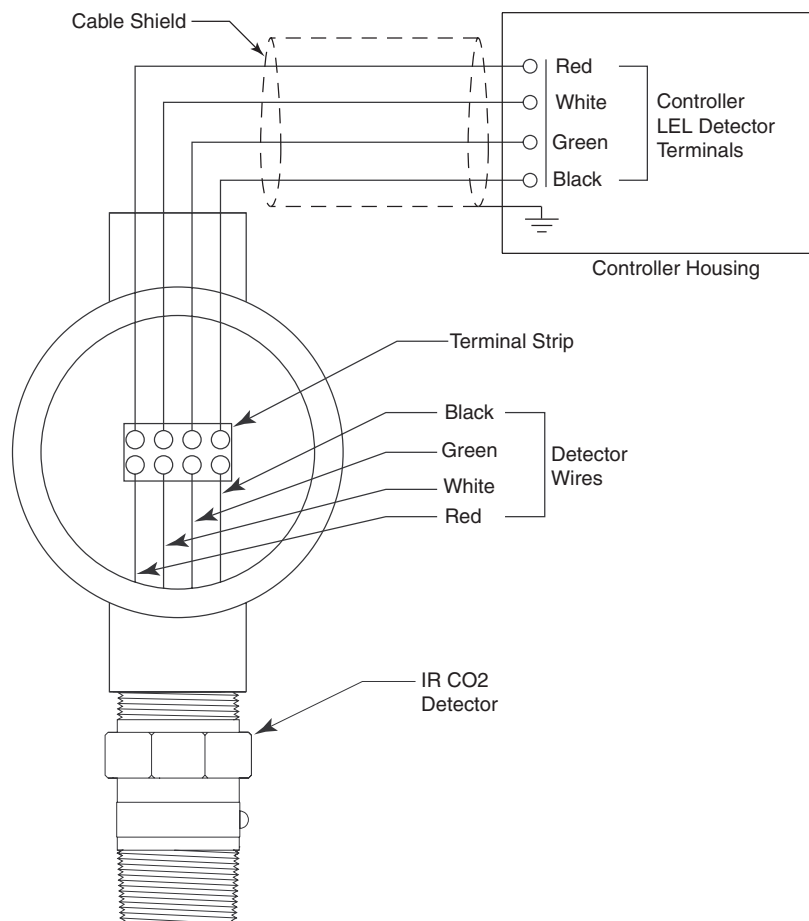


Figure 2: Wiring the CO₂ Detector to a Controller

Start Up

This section describes procedures to start up the CO₂ 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 power to the controller, then turn on the controller.
4. Verify that the controller is on and operating properly. Refer to the controller operator's manual.

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

Confirming the Zero Reading

There is typically between 200 ppm and 400 ppm CO₂ in air depending on the geographic location, so it is necessary to apply a CO₂ free gas to the CO₂ detector when setting the zero reading.

The procedure below describes applying 100% nitrogen to the detector using a calibration kit that includes a calibration cup, a calibration cylinder of 100% nitrogen, sample tubing, and a 0.5 LPM (liters per minute) fixed flow regulator with an on/off knob.

1. Screw the calibration cup onto the bottom of the CO₂ detector.
2. Screw the regulator into the 100% nitrogen calibration cylinder.
3. Use the sample tubing to connect the regulator to the calibration cup.
4. Turn the regulator's on/off knob counterclockwise to open it. Gas will begin to flow.
5. Allow the gas to flow for one minute.
6. Verify a reading of 0% CO₂ or 0 ppm CO₂ depending on the detector you are calibrating at the controller.

If the display reading is 0, the CO₂ detector is in normal operation and start up is complete. Proceed to step 7 to disassemble the calibration kit.

If the display reading is not 0, turn the regulator's on/off knob clockwise to close it, then proceed to "Setting the Zero Reading" on page 12 to set the zero reading.

7. Turn the regulator's on/off knob clockwise to close it.
8. Unscrew the cylinder from the regulator and remove the sample tubing from the regulator.
9. Remove the calibration cup from the detector. You may leave the sample tubing connected to the calibration cup for convenience.
10. Store the components of the calibration kit in a safe and convenient place.

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 CO₂ detector. It includes daily, monthly, and biannual procedures.

Daily

Verify a display reading of around 200 ppm to 400 ppm (0.02% to 0.04%) CO₂ at the controller. Investigate significant changes in the reading.

Monthly

This procedure describes a test to verify that the CO₂ detector responds properly to the target gas.

WARNING: *The controller is not an active gas monitoring device during the response test procedure.*

NOTE: Performing a response test on the CO₂ detector may cause alarms. Be sure to put the controller into its calibration program or disable external alarms before performing this test

The procedure below describes applying CO₂ to the detector using a calibration kit that includes a calibration cup, a CO₂ calibration gas cylinder, sample tubing, and a 0.5 LPM (liters per minute) fixed flow regulator with an on/off knob.

1. Place the controller into its calibration program or disable external alarms.
2. Verify that the controller display reading is around 200 ppm to 400 ppm (0.02% to 0.04%) CO₂.

If the reading is significantly out of this range, set the zero reading then continue this procedure. See “Setting the Zero Reading” on page 12 to set the zero reading.

3. Screw the calibration cup onto the detector.
4. Use the sample tubing to connect the regulator to the calibration cup.
5. Screw the regulator into the calibration cylinder.
6. Turn the on/off knob on the regulator counterclockwise to open the regulator.
7. Apply gas to the detector for one minute.
8. Verify that the reading is within $\pm 20\%$ of the gas concentration.

NOTE: If the reading is not within $\pm 20\%$ of the gas concentration, calibrate the detector as described in “Calibration” on page 11.

9. Turn the on/off knob clockwise to close the regulator.
10. Unscrew the regulator from the calibration cylinder and remove the sample tubing from the regulator.

11. Unscrew the calibration cup from the detector. You may leave the sample tubing connected to the calibration cup for convenience.
12. When the display reading falls below the alarm setpoints, return the controller to normal operation or enable external alarms.
13. Store the components of the calibration kit in a safe place.

Biannually

Calibrate the CO₂ detector every six months as described in “Calibration” on page 11.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the CO₂ detector.

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

Table 2: Troubleshooting the CO₂ Detector

Condition	Symptom(s)	Probable Causes	Recommended Action
Fail Condition	<ul style="list-style-type: none"> Controller indicates a fail condition. 	<ul style="list-style-type: none"> The detector wiring is disconnected or misconnected. The detector zero signal is low enough to cause a fail condition. The detector is malfunctioning. 	<ol style="list-style-type: none"> Verify that the detector wiring is correct and secure. Calibrate the detector. If the fail condition continues, replace the detector. If the fail condition continues, contact RKI for further instruction.
Slow or No Response/ Difficult or Unable to Calibrate	<ul style="list-style-type: none"> Detector responds slowly or does not respond to response test. Unable to accurately set the zero or response reading during calibration. Detector requires frequent calibration. <p>Note: Under “normal” circumstances, the detector requires calibration once every six months. Some applications may require a more frequent calibration schedule.</p>	<ul style="list-style-type: none"> The calibration cylinder is low, out-dated, or defective. The regulator flow rate is not 0.5 LPM The detector is malfunctioning. 	<ol style="list-style-type: none"> Verify that the calibration cylinder contains an adequate supply of a fresh test sample. Confirm that the regulator being used is a 0.5 LPM regulator. If the calibration/response difficulties continue, replace the detector. If the calibration/response difficulties continue, contact RKI for further instruction.

Replacing the CO₂ Detector

1. Turn off the controller.
2. Turn off power to the controller.
3. Remove the junction box cover.

4. Disconnect the detector leads from the terminal block inside the junction box. Note the position of the color-coded leads as you remove them.
5. Unscrew the detector from the junction box.
6. Guide the detector leads of the replacement detector through the bottom conduit hub of the junction box, then screw the mounting threads of the detector into the conduit hub.
7. Connect the detector leads to the terminal block in the same position as the leads you removed in step 4.
8. Secure the junction box cover to the junction box.
9. Turn on power to the controller.
10. Turn on the controller.
11. Calibrate the replacement detector as described in "Calibration" on page 11.

Calibration Frequency

Although there is no particular calibration frequency that is correct for all applications, a calibration frequency of every 6 months is adequate for most infrared CO₂ detector applications. Unless experience in a particular application dictates otherwise, RKI Instruments, Inc. recommends a calibration frequency of every 6 months for the infrared CO₂ detector.

If an application is not very demanding, for example detection in a clean, temperature controlled environment where CO₂ is not normally present, and calibration adjustments are minimal at calibration, then a calibration frequency of every 9 to 12 months is adequate.

If an application is very demanding, for example if the environment is not well controlled, then more frequent calibration than every 6 months may be necessary.

Calibration

This section describes how to calibrate the CO₂ detector. It includes procedures to assemble the calibration kit, set the zero reading, set the response reading and return to normal operation.

WARNING: The controller is not an active gas monitoring device during the calibration procedure.

The following procedure assumes the use of a calibration kit which includes a 100% nitrogen calibration gas cylinder for setting the zero, a CO₂ calibration gas cylinder for setting the response reading, a 0.5 LPM fixed flow regulator with an on/off knob, a calibration cup for the detector, and a short piece of sample tubing to connect the regulator to the calibration cup.

Assembling the Calibration Kit

1. Screw the calibration cup onto the detector.
2. Use the sample tubing to connect the regulator to the calibration cup.
3. Place the controller into its calibration program or disable external alarms.

NOTE: Calibrating the CO₂ detector may cause alarms. Be sure to put the controller into its calibration program or disable external alarms before continuing.

Setting the Zero Reading

1. Follow the directions in the controller's operator's manual for setting the zero reading (sometimes called the fresh air reading).
2. When the directions call for exposing the detector to zeroing gas, screw the regulator into the cylinder, turn the on/off knob counterclockwise to open the regulator, and allow the gas to flow to the detector for 1 minute before continuing with the directions.
3. After setting the zero reading, turn the regulator's on/off knob clockwise to close the regulator.
4. Unscrew the 100% nitrogen cylinder from the regulator.

Setting the Response Reading

1. Follow the directions in the controller's operator's manual for setting the response reading (span).
2. When the directions call for exposing the detector to calibration gas, screw the CO₂ cylinder onto the regulator, turn the on/off knob counterclockwise to open the regulator, and allow the gas to flow to the detector for 1 minute before continuing with the directions.
3. After setting the response reading, turn the regulator's on/off knob clockwise to close the regulator.
4. Unscrew the CO₂ cylinder from the regulator.
5. Remove the sample tubing from the regulator.
6. Remove the calibration cup from the detector. Leave the sample tubing connected to the calibration cup for convenience.
7. Allow the reading at the controller to decrease below the alarm points before returning the controller to normal operation or enabling external alarms.

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

8. Verify that the controller display reading decreases and stabilizes at 0.
9. Store the components of the calibration kit in a safe and convenient place.

Parts List

Table 3 lists replacement parts and accessories for the 61-1004RK and 61-0191RK CO₂ detectors.

Table 3: Parts List

Part Number	Description
18-0400RK-01	Junction box with spacers
61-0191RK-02	0 to 5,000 ppm CO ₂ infrared detector
61-0191RK-03	0 to 5% volume CO ₂ infrared detector
71-0145RK	<i>61-1004RK/61-0191RK CO₂ Detector Operator's Manual</i> (this document)
81-0070RK-01	Calibration cylinder (2,000 ppm CO ₂ in nitrogen, 34 liter)
81-0072RK-01	Calibration cylinder (2.5% CO ₂ in nitrogen, 34 liter)
81-0078RK-01	100% nitrogen calibration cylinder (34 liter)
81-1050RK	Regulator, 0.5 liter/minute, with gauge and knob, for 17- and 34-liter calibration cylinders
81-1103RK	Calibration cup
81-F403RK-LV	Calibration kit, for 3/4" NPT detector, 2.5% CO ₂ , 34 liter
81-F404RK-LV	Calibration kit, for 3/4" NPT detector, 2,000 ppm CO ₂ , 34 liter