65-2425
Hydrogen Cyanide Detector
Operator's Manual

RKI Instruments, Inc.
www.rkiinstruments.com

WARNING

Read and understand this instruction manual before operating detector. Improper use of the detector could result in bodily harm or death.

Periodic calibration and maintenance of the detector is essential for proper operation and correct readings. Please calibrate and maintain this detector regularly! Frequency of calibration depends upon the type of use you have and the sensor types. Typical calibration frequencies for most applications are between 3 and 6 months, but can be required more often or less often based on your usage.

Product Warranty

RKI Instruments, Inc. warrants gas alarm equipment sold by us to be free from defects in materials, workmanship, and performance for a period of one year from date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Examples of such items are:

- Absorbent cartridges
- Fuses
- Pump diaphragms and valves
- Batteries
- 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.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RKI INSTRUMENTS, INC. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC. BE LIABLE FOR INDIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users by authorized distributors, dealers, and representatives as appointed by RKI Instruments, Inc.

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 65-2425 hydrogen cyanide (HCN) 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 HCN detector.

Specifications

WARNING: Do not use this product in a manner not specified in this instruction manual.

Table 1 lists specifications for the HCN detector.

Table 1: Specifications

Target Gas	Hydrogen cyanide (HCN)
Area Classification*	Explosionproof for Class I, Groups B, C, and D
Temperature Code	T6
Installation Category	Installation Category 1. Signal level, special equipment or parts of equipment, telecommunication, electronic, etc., with smaller transient overvoltages than Installation Category (Overvoltage Category) II (ref. IEC 664).
Sampling Method	Diffusion
HCN Detector Signal Output	0.3 mA at 0 ppm HCN nominal 2.5 mA at 15.0 ppm HCN nominal
Detection Range	0 to 15.0 ppm (parts per million)
Accuracy	± 10% of reading or ± 5% of full scale (whichever is greater)
Response Time	90% in 30 seconds
Operating Temperature	-4°F to 104°F (-20°C to 40°C)

*   *The area classification only applies if the detector is installed using a junction box with an internal volume less than or equal to 69 cubic inches and rated explosion proof for Class I, Groups B, C, and D. The detector is not explosion proof if it is installed in a non-explosion proof enclosure, such as in a conduit hub of a controller like the Beacon 200 or Beacon 800.*

NOTE: The following symbol on the detector label is a caution to the user to refer to this documentation for installation and operation instructions: ⚠

WARNING: *When using the 65-2425, you must follow the instructions and warnings in this manual to assure proper and safe operation of the 65-2425 and to minimize the risk of personal injury. Be sure to maintain and periodically calibrate the 65-2425 as described in this manual.*

Description

This section describes the components of the HCN detector. The detector consists of the detector housing body, housing cap, cap gasket, rubber boot, spacer, and the HCN sensor.
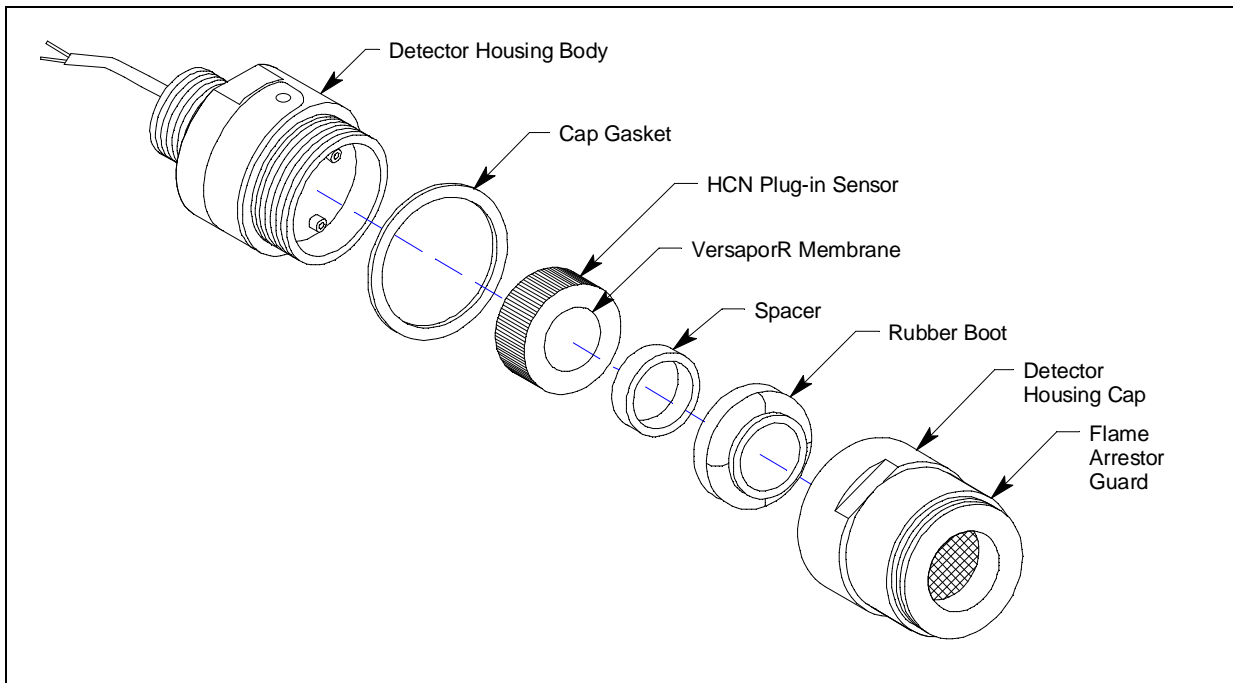

Figure 1: HCN Detector Component Location

Detector Housing Body, Housing Cap, & Cap Gasket

The detector housing body protects the sensing components within the housing. Use the mounting threads at the top of the housing to screw the HCN detector into a 3/4 NPT hub. 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. A flame arrestor guard is permanently bonded to the cap.

Two wires extend from the top of the detector housing. Use these wires to connect the HCN 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.

Rubber Boot and Spacer

A rubber boot and spacer are installed between the detector housing cap and the sensor. They help ensure that the detector remains plugged into the detector housing body.

Plug-In 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. A VersaporR membrane is installed on the sensor face for added protection from water and particulate contaminants.

Installation

NOTE: Normally, the HCN 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 in a controller, use this section for reference only.

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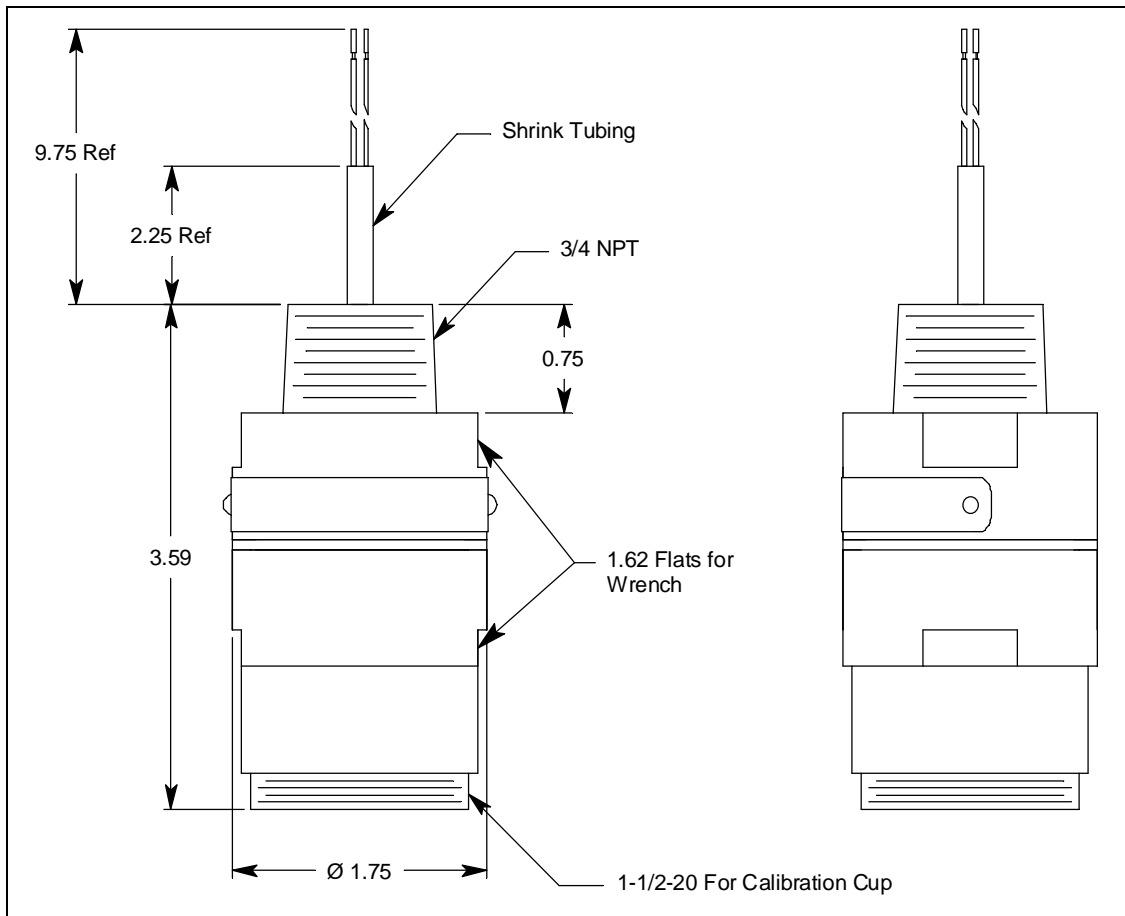
Mounting the HCN Detector

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 HCN detector with the detector facing down (see Figure 2).*

NOTE: If the mounting site requires the detector installation to be explosion proof, you must install the detector in a junction box with an internal volume less than or equal to 69 cubic inches and rated explosion proof for Class I, Groups B, C, and D.

Wiring the HCN 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 power to the controller.

3. If the detector is mounted remotely from a controller using an explosion proof junction box, proceed 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.

   WARNING: **To maintain the explosion proof classification of the HCN detector/junction box combination, a conduit seal must be used within 2 inches of the junction box conduit hub used for wiring to the controller.**

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 HCN 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 for the HCN detector.
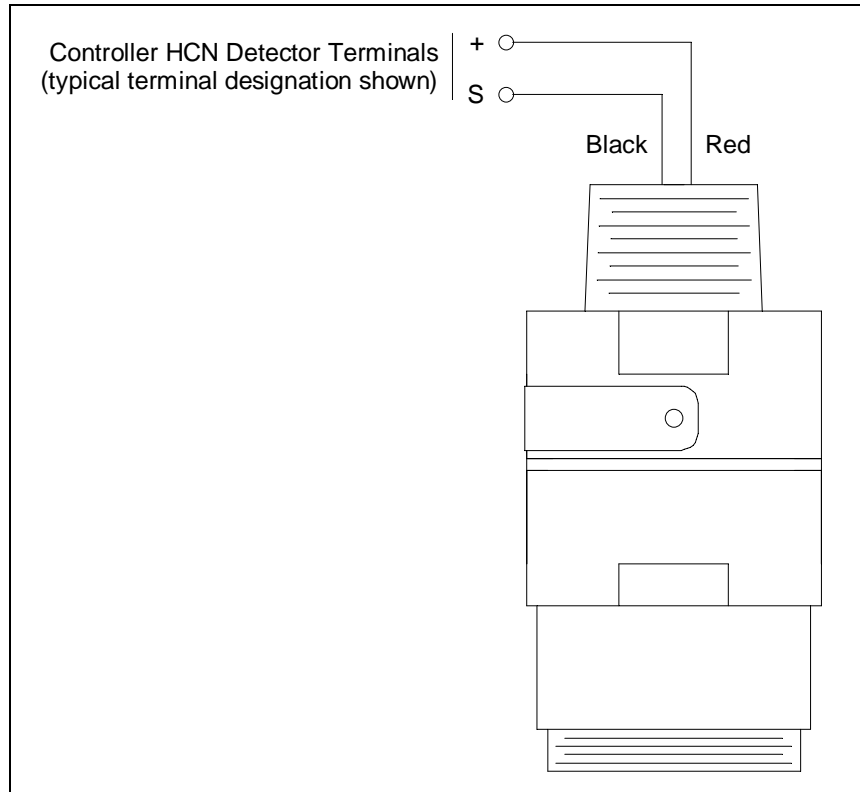
Figure 3: Wiring the HCN Detector to a Controller

10. If shielded cable is used, connect the cable's drain wire to an available chassis (earth) ground at the controller. RKI controllers typically have a ground stud that can be used to ground the cable's drain wire.

11. Reinstall the junction box cover.

Start Up

This section describes procedures to start up the HCN 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.

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

Setting the Zero Signal

WARNING: **If the detector installation is explosion proof, do not remove the sensor cap or junction box cover while the circuits are energized unless the area is determined to be non-hazardous. Keep the sensor cap and junction box cover tightly closed during operation.**

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 hydrogen cyanide, other toxic and combustible gases, and of normal oxygen content, 20.9%).

2. Verify a reading of 0 ppm HCN at the controller.

   If the display reading is 0 ppm HCN, start up is complete. The detector is in normal operation. If the display reading is not 0 ppm HCN, 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 HCN detector. It includes daily and quarterly procedures.

Daily

Verify a display reading of 0 ppm HCN at the controller. Investigate significant changes in the display reading.

Quarterly

Calibrate the HCN detector as described in "Calibration" on page 16.

Troubleshooting

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

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

Condition	Symptom(s)	Probable Causes	Recommended Action
Fail Condition	• Controller indicates a fail condition.	• The transmitter wiring to the controller is disconnected or misconnected. • The transmitter's zero reading is low enough to cause a fail condition. • The detector is malfunctioning.	1. Verify that the detector wiring is correct and secure. 2. Perform a full calibration. 3. If the fail condition continues, replace the plug-in sensor as described later in this section. 4. If the fail condition continues, contact RKI for further instruction.

Condition	Symptom(s)	Probable Causes	Recommended Action
Slow or No Response/ Difficult or Unable to Calibrate	• Unable to accurately set the zero or response reading during calibration. • Detector requires frequent calibration. *NOTE: Under "normal" circumstances, the transmitter requires calibration once every 3 months.* *Some applications may require a more frequent calibration schedule.*	• The calibration cylinder is low, out-dated, or defective. • The flame arrestor in the detector housing cap is wet or clogged with dirt or other particulates. • The VersaporR membrane on the sensor face is blocked by dirt or some other particulate contamination. • The detector is malfunctioning.	1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample. 2. Examine the detector housing cap. If it is only saturated with liquid, dry it out. If it appears dirty, replace it. 3. Examine the VersaporR membrane and replace it if it appears dirty. 4. If the calibration/response difficulties continue, replace the plug-in sensor as described later in this section. 5. If the calibration/response difficulties continue, contact RKI for further instruction.

Replacing Components of the HCN Detector

This section includes a procedure to replace the HCN 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

CAUTION: *The sensor contains electrolyte which is a dilute acid. Do not disassemble the sensor when replacing it with a new one. If sensor electrolyte comes in contact with your skin, wash affected area thoroughly with soap and water.*

1. Turn off the controller.

2. Turn off or unplug power to the controller.

3. Unscrew the detector housing cap from the detector housing.

4. Unplug and remove the HCN sensor with the rubber boot and spacer attached.

5. Remove the rubber boot and spacer from the old sensor.

6. Remove the replacement sensor from its packaging and remove the wire jumper. This wire jumper is installed on the sensor pins for shipment or storage but must be removed for the sensor to operate properly when installed in a detector.

WARNING: The HCN sensor will not operate properly if the wire jumper is not removed.

Remove jumper
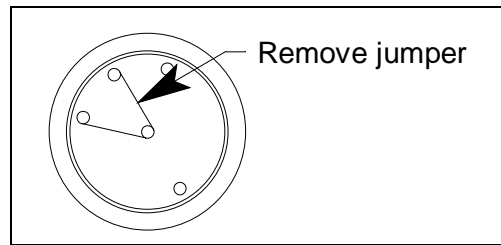
Figure 4: Plug-In Sensor Jumper Removal

7. Install the spacer and rubber boot onto the replacement sensor's face.

8. Carefully plug the replacement sensor into the socket pattern that is located in the detector housing.

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

9. Screw the detector housing cap onto the top section.

10. Turn on power to the controller.

11. Turn on the controller.

   CAUTION: *Allow the replacement sensor to warm up for 15 minutes before you continue with the next step.*

12. Calibrate the detector as described in "Calibration" on page 16.

Replacing the VersaporR Membrane

1. Turn off the controller.

2. Turn off or unplug incoming power to the controller.

3. Unscrew the detector housing cap from the detector housing body.

4. Unplug the plug-in sensor from the four-socket pattern in the detector housing body.

5. Gently pry up the edge of the white VersaporR membrane from the sensor face with a small flat blade screwdriver or a similar tool.

6. Peel off the VersaporR membrane. It may be necessary to clean off the sensor face to remove any residue left from the adhesive backed membrane.

7. Install the new membrane on the face of the plug-in sensor.

8. Plug the sensor back into the four-socket pattern in the detector housing body.

9. Make sure the cap gasket is in place and screw the detector housing cap back onto the detector housing body.

10. Turn on power to the controller.

11. Turn on the controller.

Replacing the HCN Detector

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

1. Turn off the controller.

2. Turn off or unplug incoming power to the controller.

3. If the detector is installed directly on a controller, open the controller door.

    If the detector is installed remotely from a 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 for the HCN detector.

    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 for the HCN detector 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 power to the controller.

10. Turn on the controller.

    CAUTION: *Allow the replacement detector to warm up for 15 minutes before you continue with the next step.*

11. Calibrate the replacement detector as described in "Calibration" on page 16.

Calibration Frequency

Although there is no particular calibration frequency that is correct for all applications, a calibration frequency of every 3 months is adequate for most HCN detector applications. Unless experience in a particular application dictates otherwise, RKI Instruments, Inc. recommends a calibration frequency of every 3 months for the HCN detector.

If an application is not very demanding, for example detection in a clean, temperature controlled environment, and calibration adjustments are minimal at calibration, then a calibration frequency of every 6 months is adequate.

If an application is very demanding, for example if the environment is not well controlled, then more frequent calibration than every 3 months may be necessary.

Calibration

This section describes how to calibrate the HCN 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 calibration kit that includes a calibration cup, calibration gas, sample tubing, and a fixed flow regulator with an on/off knob. 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 HCN detector.

2. Screw the regulator into the zero air calibration cylinder.

3. Use the sample tubing to connect the regulator to the calibration cup.

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

4. Put the controller into its calibration program.

Setting 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, turn the regulator's on/off knob counterclockwise to open it. Gas will 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. Turn the regulator's on/off knob clockwise to close it.

6. 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.

2. For toxic gas cylinders (like HCN), it is important to vent the regulator while installing it onto the cylinder. Venting the regulator during installation helps prevent air from getting into the cylinder and degrading the gas. When the directions call for exposing the detector to gas, open the regulator by turning the knob counterclockwise and then install it onto the cylinder.

3. Allow the gas to flow to the detector for 2 minutes.

4. Set the response reading according to the controller operator's manual.

5. After setting the response reading, unscrew the regulator from the cylinder and remove the calibration cup from the detector.

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

Returning to Normal Operation

1. 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.

2. Verify that the controller display reading decreases and stabilizes at 0 ppm HCN.

3. Store the components of the calibration kit in a safe and convenient place.

Parts List

Table 2 lists replacement parts and accessories for the HCN 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
14-2101RK	Spacer between sensor and rubber boot
33-0157RK	VersaporR membrane for sensor face
65-2049-01	HCN replacement sensor, with membrane
65-2425	HCN replacement detector assembly (includes sensor)
71-0623	*65-2425 HCN Detector Operator's Manual* (this document)
81-0064RK-04	Calibration cylinder, 10 ppm HCN in nitrogen, 34 liter aluminum
81-0076RK	Zero air calibration cylinder, 17 liter
81-0076RK-01	Zero air calibration cylinder, 34 liter steel
81-0076RK-03	Zero air calibration cylinder, 103 liter
81-0196RK-02	Calibration gas cylinder, 10 ppm HCN in nitrogen, 58 liter aluminum
81-0196RK-04	Calibration gas cylinder, 10 ppm HCN in nitrogen, 34 liter aluminum
81-1050RK	Regulator with gauge and knob, 0.5 LPM, for 17 liter and 34 liter steel calibration cylinders (cylinders with external threads)
81-1051RK	Regulator with gauge and knob, 0.5 LPM, for 34 liter aluminum, 58 liter, and 103 liter cylinders (cylinders with internal thread)
81-1117RK	Calibration cup