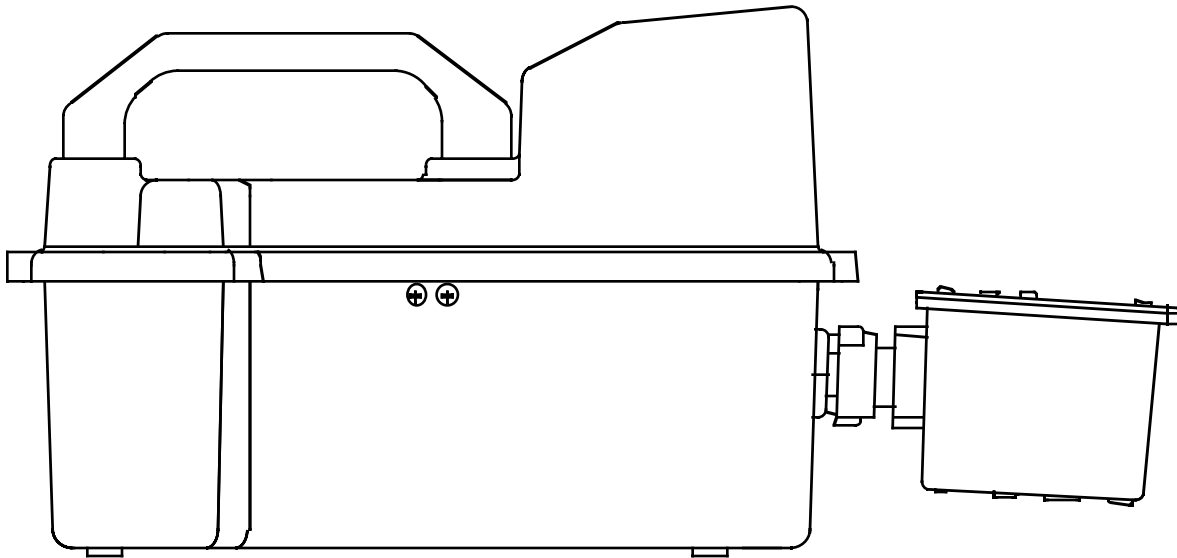# Instruction Manual
Standard Diffusion Eagle Series

Portable Multi-Gas Detector

Part Number: 71-0042RK

Revision: 0

Released: 2/11/03

Warranty

RKI Instruments, Inc., warrants gas alarm equipment manufactured by RKI and sold by RKI to be free from defects in materials and workmanship 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 items that are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced routinely. Those items include, but are not limited to the following:

absorbent cartridges	filter elements
pump diaphragms and valves	batteries
lamp bulbs and fuses	

This warranty is voided by mechanical damage, misuse, alteration, rough handling, or repairs not in accordance with the operator's manual. This warranty indicates the full extent of our liability. 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 IN LIEU OF ANY 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 end users by authorized distributors, dealers, and representatives of RKI Instruments, Inc.

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

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Introduction

Overview

The RKI Standard Diffusion Eagle is the most advanced portable gas detection system available. The Eagle is built for rugged reliability and ease of use and includes the latest innovations in gas detection technology:

- Simultaneous detection of one-to-four gases. Standard target gases include combustible gas (% LEL and ppm), oxygen deficiency, carbon monoxide, and hydrogen sulfide.

- Dot-matrix liquid crystal display (LCD) for complete, understandable information at a glance.

- Microprocessor control for all functions, including data logging (the Data Logger Board is optional) and user-adjustable alarms.

- Visible and audible alarms for hazardous conditions and malfunctions.

- CSA classified. Intrinsic safety for Class I, Division I, Groups A, B, C, and D hazardous atmospheres.

- Tough case with a balanced, light-weight design.

- Optional Data Logger board.

- Remote four-gas sensor detector box.

- Standard twenty-foot extender cable; fifty-foot extender cable optional.

- Recharging cable.

WARNING: The Eagle detects a combination of combustible gas, oxygen deficiency, hydrogen sulfide and carbon monoxide. Users must follow the instructions and warnings in this manual to assure proper and safe operation of the Eagle.

About this Manual

This manual is intended for use with the Eagle portable gas detection system. Examples used in this manual cover combustible gas, oxygen, carbon monoxide, and hydrogen sulfide. This manual is organized as follows:

- The main section of the manual describes the Eagle's specifications and internal and external components. It also describes the operation, calibration, and maintenance of the Eagle.

- Appendix A lists part numbers for the Eagle's replacement parts and accessories.

- Appendix B describes the Eagle's methane elimination feature.

- Appendix C describes the procedure to install the Eagle's optional Data Logger board.

Specifications

Table 1 lists physical and environmental specifications for the Eagle. Table 2 lists specifications for the Eagle's standard sensors.

Table 1: Eagle Specifications

Target Gases	Combustible gas; Oxygen (O_2), Carbon monoxide (CO); Hydrogen sulfide (H_2S)
Case	High-impact polycarbonate-polyester blend
Safety/Regulatory[1]	CSA/NTRL classified intrinsically safe (Class I, Division 1, Groups A, B, C, and D)
Dimensions	10.5 in. x 5.9 in. x 7.0 in. (26.7 cm x 15.0 cm x 17.8 cm)
Weight	4.4 lbs. (1.99 kg)
Power	Four D-size batteries (alkaline or Ni-Cd)
Continuous Operating Hours	Alkaline: 36 hours (minimum) Ni-Cd: 20 hours (minimum)[2]
Operating Temperature	14°F to 104°F (-10°C to 40°C)
Humidity	0 to 95% (non-condensing)
Standard Accessories	Remote Detector with four gas sensors; 50-foot extender cable; four D-size alkaline batteries
Optional Accessories	Remote alarm; Data Logger board; data logging cable; Ni-Cd batteries; battery charger (115 VAC); continuous operation adapter (115 VAC or 12 VDC);

1 Consult RKI Instruments, Inc., for regulatory classifications of versions other than the four standard gases.

2 Based on RKI part number 49-1240RK.

Table 2 lists specifications for the Eagle's standard sensors. Your Eagle model may not include all of the sensors listed below. The alarm settings are user-adjustable (see "Updating the Alarm Point Settings" on page 36.)

Table 2: Standard Sensor Specifications

	Combustible Gas (%LEL[1])	Combustible Gas (PPM[2])	Oxygen	Hydrogen Sulfide	Carbon Monoxide
Range	0 to 100% LEL	Depends on target gas[4]	0 to 40% O_2	0 to 100 ppm	0 to 500 ppm
Alarm 1	10% LEL	5000 ppm	19.5% O_2 (decreasing)	10.0 ppm	25 ppm
Alarm 2	50% LEL	25,000 ppm	23.5% O_2 (increasing)	30.0 ppm	50 ppm
TWA Alarm	N/A	N/A	N/A	10.0 ppm	25 ppm
STEL Alarm	N/A	N/A	N/A	15.0 ppm	400 ppm
Detection Principle	Catalytic combustion	Catalytic combustion	Electro-chemical	Electro-chemical	Electro-chemical
Response Time (to 90%)	15 seconds	15 seconds	20 seconds	40 seconds	55 seconds
Accuracy (of full-scale)	± 5%	± 5%	± 5%	± 5%	± 5%

1 LEL (Lower Explosive Limit)

2 PPM (Parts Per Million)

3 Alarms settings are user adjustable. See "Updating the Alarm Point Settings" on page 36.

4 The PPM range represents the same range as 0 to 100% LEL for that gas. For example, 100% LEL for methane = 5% by volume = 50,000 PPM. Therefore, the PPM range for methane is 0 to 50,000.

Description: Eagle and Remote Detector

Eagle Case

The Eagle has a plastic case with a full-sized handle. The high-visibility case is shielded to reduce radio frequency and electromagnetic interference (RFI/EMI). The system is light-weight and balanced, which makes the Eagle easy to carry and use for extended periods. A foam rubber gasket between the top and bottom case components is water- and dust-resistant. You can set the case into 2.5 in. of water without damage.

Control Panel

The control panel is at the top of the Eagle. The touch-pad buttons reduce the risk of accidental activation. The dot matrix display simultaneously shows the gas reading for all installed sensors. The display also shows information for each of the Eagle's program modes.

Buttons

The control panel includes the following six buttons.

Table 3: Eagle Button Functions

Button	Function(s)
POWER/ENTER	• turns the Eagle on and off. • used during setup and calibration.
RESET/SILENCE	silences and resets audible alarm if the Eagle is programmed for latching alarms and the Alarm Silence option is on [1]
DISP/ADJ	• activates display modes • enters instructions into the Eagle's microprocessor
LEL/PPM	switches combustible gas detection ranges between %LEL (lower explosive limit) and PPM (parts per million)[2]
AIR/▲	• activates the demand-zero function (automatically adjusts the Eagle in fresh-air conditions) • scrolls through the display and settings modes
SHIFT/▼	• scrolls through the calibration and settings modes • enters instructions into the Eagle's microprocessor

[1] The Eagle's alarms are user-adjustable. See "Setup Mode" on page 27.

[2] The LEL range is commonly used for safety applications; the PPM range can be used for environmental or other special applications.

Alarm Lights

Two ultra-bright, red, light-emitting diodes (LEDs) provide visual alarms for gas concentrations and malfunctions. They are mounted on the top rear of the case for greatest visibility.

Battery Charger Connector

The battery charger connector is mounted on the top right rear of the case. The external battery charger connects to this connector to recharge nickel-cadmium (Ni-Cd) batteries. The continuous operation adapter also connects to the battery charger connector.

Interface Port

The interface port is for optional data logging or for the remote buzzer. The port is mounted on the top left rear of the case. When the data logging option is installed, the Eagle records gas concentrations at programmed intervals and stores data on gas detected. You can download these measurements through the interface port to a PC-compatible computer for use in data analysis programs. Data retrieval requires the Eagle Data Down Loader Kit (with PC connection cable and software).

The optional remote buzzer or remote buzzer/strobe also connect to the interface port, and are for use in applications in which a remote alarm indication is required.

Buzzer

A solid-state electronic buzzer is mounted inside the top of the case. The buzzer sounds for gas alarms, malfunction, low battery voltage, and as an indicator during use of the Eagle's many display and adjustment options.

Circuit Boards

The Eagle circuit boards analyze, record, control, store, and display the information collected.

The analog PCB is mounted perpendicular to the base of the instrument case. The sensor leads connect to the analog PCB.

The main PCB is mounted in the top half of the case. It includes the methane elimination and CAL/SETUP switches.

CAUTION: The circuit boards should be serviced only by authorized repair personnel.

Methane Elimination Switch

The methane elimination switch (SW1) is mounted near the top right corner of the main PCB.

For applications where methane is an interfering gas, you can set the methane elimination switch to eliminate most response to methane (see "Appendix B: Methane Elimination" on page 58). An external methane elimination switch is available as an option.

CAL/SETUP Switch

The CAL/SETUP switch (SW2) is mounted near the middle left edge of the main PCB. This switch controls the Eagle functions available to the user by disabling the SHIFT/▼ button. Without the use of this button, the user is unable to enter Calibration or Setup mode. (Display mode is available with either switch setting.) See "Setting User Access" on page 18 to change the switch setting.

Remote Detector

This section describes the Eagle's Remote Detector. The Remote Detector is used to detect combustible gas, oxygen, carbon monoxide, and hydrogen sulfide using four sensors mounted inside a durable plastic case. These sensors are connected to a printed circuit board, which is also located inside the case. The Remote Detector includes a buzzer that sounds for gas alarms and sensor malfunction. The Remote Detector can be connected either directly to the Eagle, or it can be connected to the Eagle via a 50-foot extender cable.

Case

The Remote Detector has a durable plastic case with a removable lid secured by four screws. A removable rubber o-ring gasket mounted in the lid helps protect the sensors, buzzer, and PCB from water, dust, and the corrosive effects of gas and vapor.

Combustible, Shown
w/out Bracket

Oxygen

H2S

CO

CN4
(H2S)

CN1
(CO)

CN5
(Buzzer)

Interconnect
PCB

CN6

CN2 (Oxygen)

CN3 (Combustible)
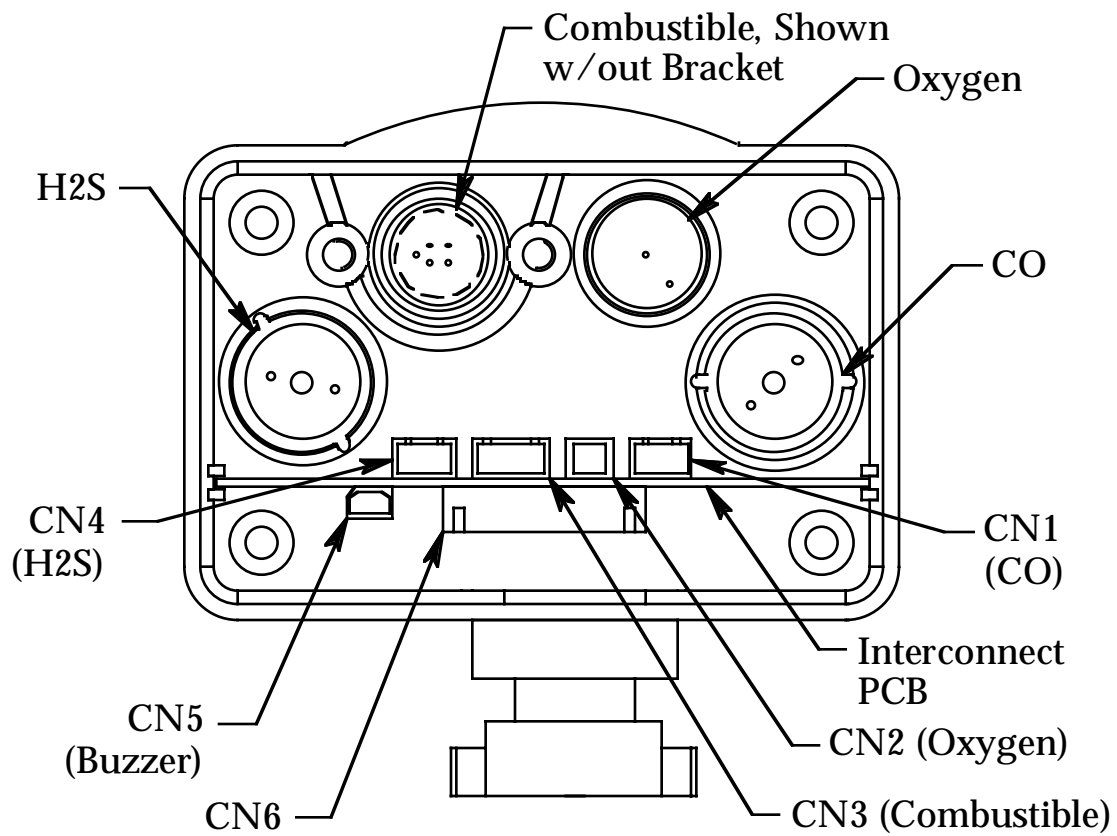
Interconnect Circuit Board

The Remote Detector has a printed circuit board (PCB) located inside its
case, the interconnect PCB. The PCB is mounted perpendicular to the base of
the Remote Detector's case. It is positioned near the connector used to attach
the Remote Detector to the Eagle. The PCB provides connection points for
the Remote Detector's four sensors, described below, and a connection point
for the Remote Detector's buzzer.

Sensors

Under normal conditions, the Eagle's standard sensors have an operating life of approximately two years. To replace the sensors, open the case by unscrewing the four screws that secure the lid to the case. (See "Replacing Sensors" on page 52 for more details.)

Combustible gas sensor

The combustible gas (LEL) sensor is mounted with the flame arrestor extending outside the case to allow the ambient air to diffuse into the sensor. Five pins extend from the top of the sensor. The sensor cable connects to the pins on one end and terminates in a four-position connector, which plugs into the COMB (CN3) socket on the interconnect printed circuit board (PCB) inside the Remote Detector.

The LEL sensor detects combustible gas and vapors in the atmosphere with a catalytic platinum element. The reaction of gas with oxygen on the catalyst causes a change in the resistance of the element, which is converted by the Eagle into a reading of combustible gas concentration.

Oxygen sensor

The oxygen (O_2) sensor is mounted with its face behind a perforated hole pattern covered by a hydrophobic membrane to allow the ambient air to diffuse into the sensor. A multi-pin plug connects the O_2 sensor to the OXY (CN2) socket on the interconnect PCB. This socket sticks up higher than the rest.

The O_2 sensor is an electrochemical cell, which reacts to the oxygen in the atmosphere and produces a voltage proportional to the oxygen concentration. This voltage is converted by the Eagle into a reading of oxygen concentration.

Standard toxics (CO and H2S) sensors

The carbon monoxide (CO) and hydrogen sulfide (H_2S) sensors are physically very similar. They both have cylindrical bodies and they are mounted with their faces behind a perforated hole pattern covered by a hydrophobic membrane to allow the ambient air to diffuse into the sensors. The CO sensor connector connects to the CO (CN1) socket and the H_2S sensor connector connects to the H_2S (CN4) socket on the interconnect PCB.

The toxics sensors are electrochemical cells, which react to the target gas in the atmosphere, producing a current proportional to the concentration of gas. The current is converted by the Eagle into a reading of target gas concentration.

Buzzer

A solid-state electronic buzzer is mounted inside the lid of the Remote Detector's case. The buzzer sounds for gas alarms, malfunction, low battery voltage, and as an indicator during use of Eagle's many display and adjustment options.

Connector

The Remote Detector has a single, 18-pin male connector with a retaining ring. The connector is attached to the Remote Detector's case by three screws. The connector allows the Remote Detector to be attached to the Eagle in two ways, as stated above. (To attach the Remote Detector to the Eagle, see "Starting Up the Eagle" on page 11.)

Operation

The Eagle has four operating modes: normal operating mode, display mode, setup mode, and calibration mode. This section describes the Eagle in normal operating mode. It includes procedures to start up the Eagle, set various detection options for the combustible gas channel, and shut down the Eagle.

NOTE: The screens illustrated in this section are intended as examples only. The screens displayed by your Eagle model may be slightly different.

Starting Up the Eagle

1. Connect the Remote Detector either directly to the Eagle or use the 20-foot or 50-foot extender cable. To make this connection, follow these steps:

   • Find the connector for the Remote Detector on the front end of the Eagle's bottom case assembly.
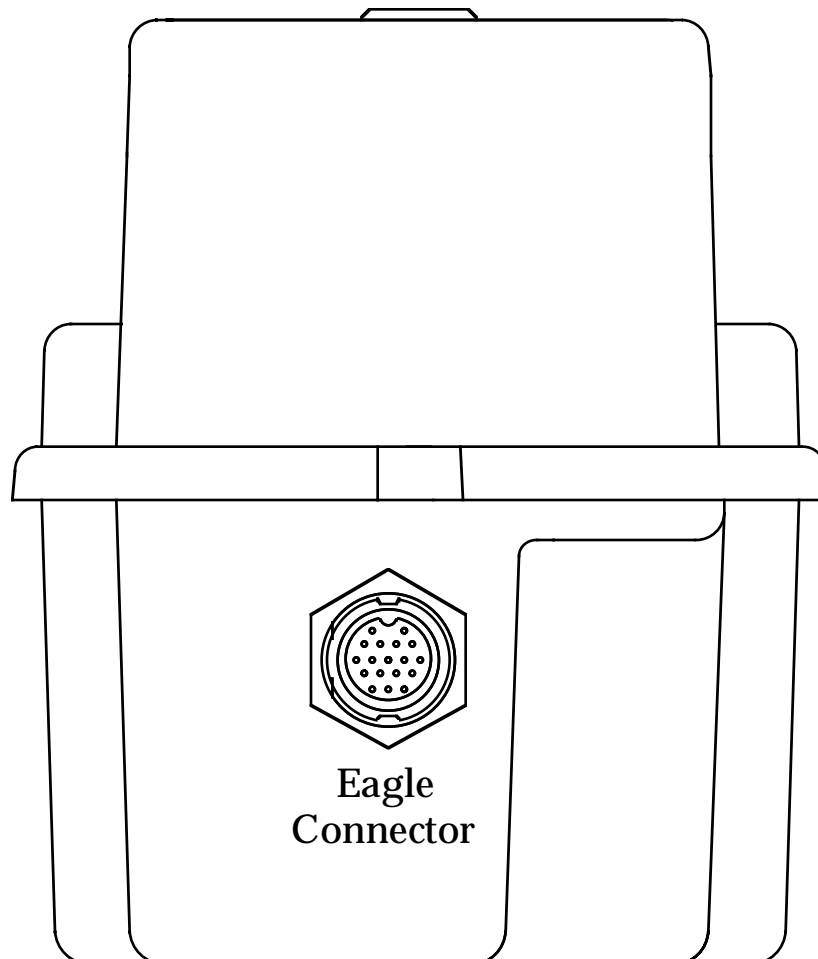
Eagle
Connector

• To attach the Remote Detector directly to the Eagle, position the Remote Detector coupling in the unlocked position as shown below. Then line up the tab inside the connector on the Remote Detector with the notch inside the connector on the Eagle. Gently push the Remote Detector toward the Eagle. Turn the coupling clockwise on the connector of the Remote Detector to secure the Remote Detector to the Eagle's bottom case assembly.

Locked Position

Coupling shown in
Unlocked Position,
Counterclockwise to Locked

Locked Position
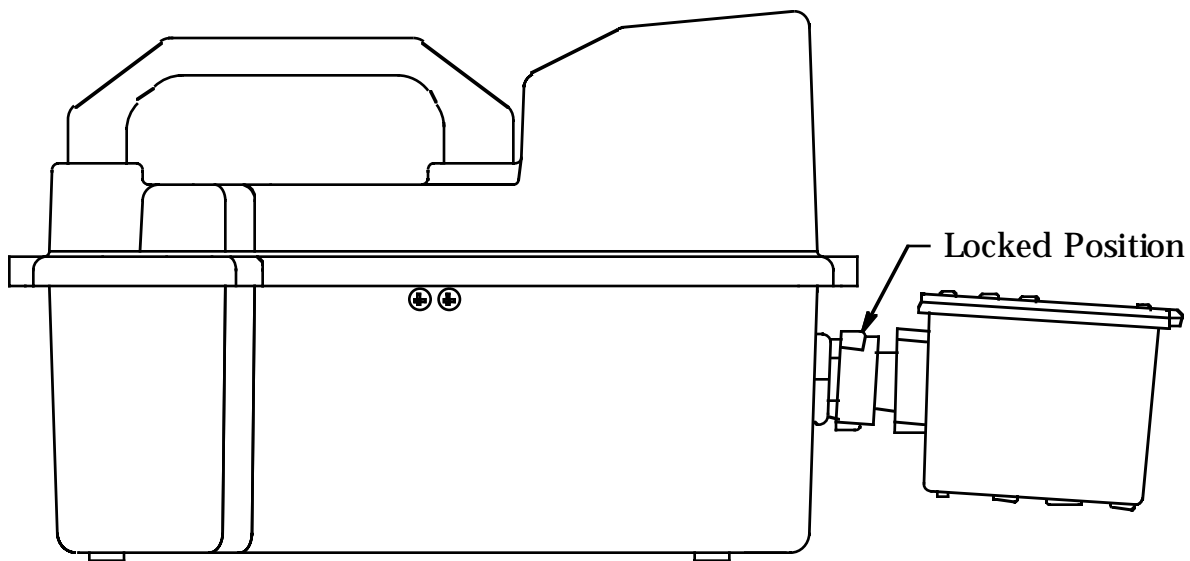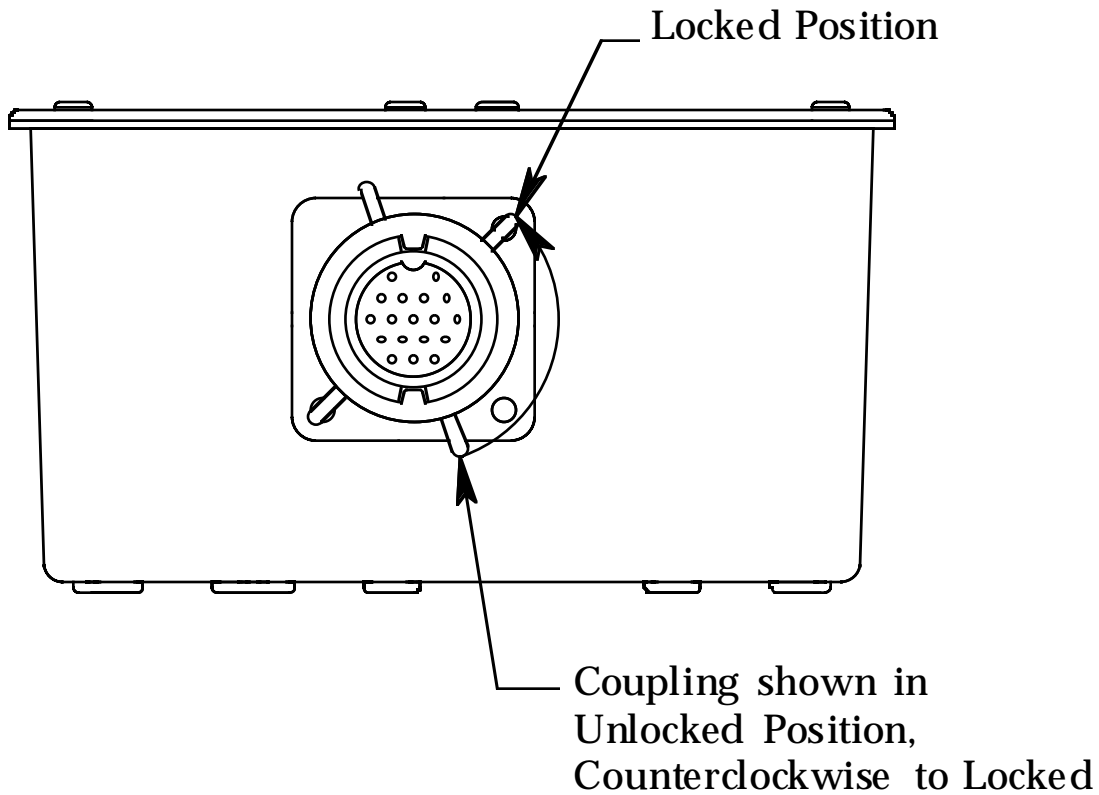
NOTE: If the Remote detector has been disconnected from the Eagle for more than a few minutes, such as during shipment, wait 15 minutes after connecting the Remote detector before turning on the Eagle to allow the CO and H_2S sensors to stabilize.

• To attach the Remote Detector using an extender cable, carefully fit the end of the extender cable that has a coupling to the Eagle's connector. Make sure to line up the tabs inside the coupling with the matching notches in the cable connector as shown below. Then line up the tab on the extender cable connector with the notch inside the connector on the Eagle. Gently push the extender cable toward the Eagle. Turn the coupling clockwise on the extender cable to secure the cable to the Eagle's bottom case assembly. Next, carefully fit the other end of the extender cable to the connector on the Remote Detector. Position the Remote Detector coupling in the unlocked position as shown above. Then line up the tab inside the Remote Detector connector with the notch inside the connector on the Eagle. Gently push the extender cable toward the Remote Detector. Tighten the coupling on the Remote Detector connector to secure the extender cable to the Remote Detector.

Align Keys in Key Way For Assembly

Rotate to Lock

Eagle Connector

Cable End Connector

—Extender Cable
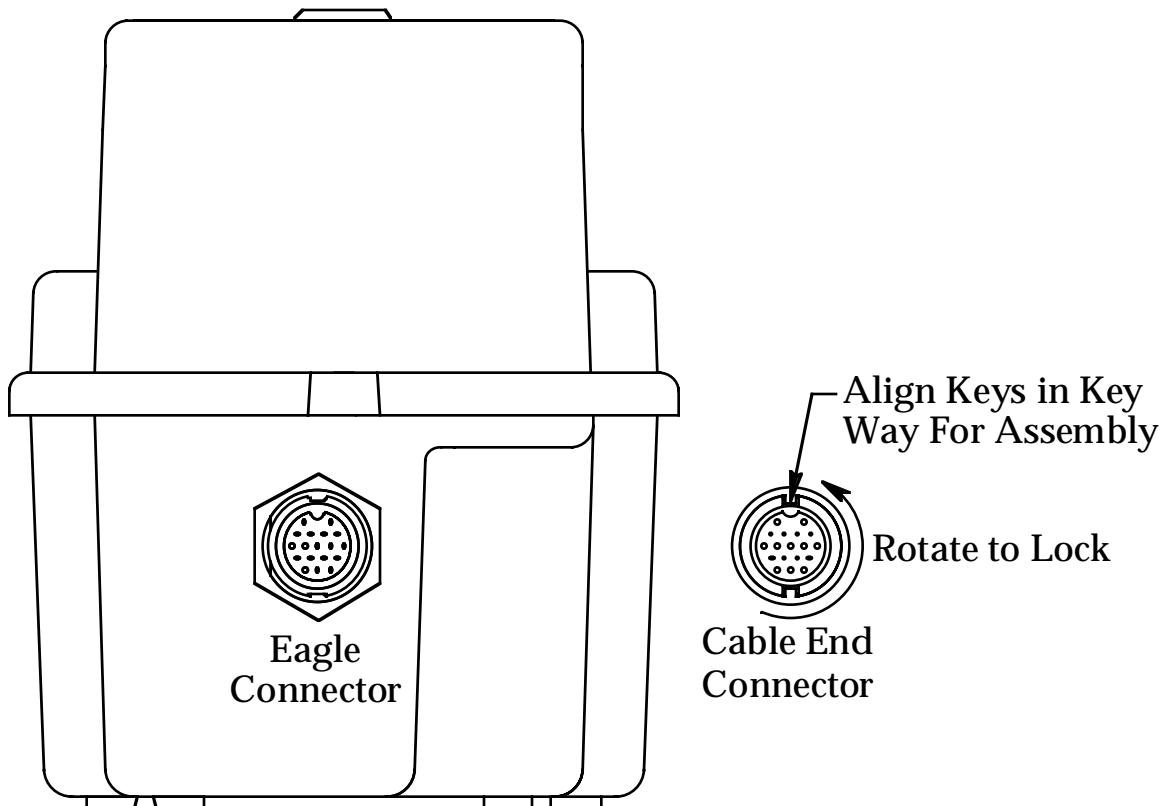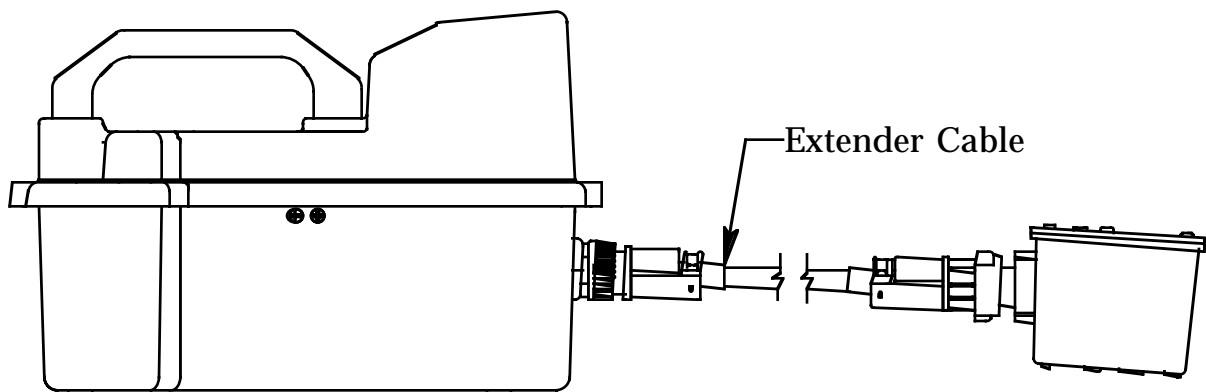
2. Press and briefly hold down the POWER/ENTER button. If the Lunch Break feature is on (see page 38), the Resume Datalog screen displays. (If the Lunch Break feature is off, the Battery Voltage screen displays.)

```
RESUME  DATALOG  ?
              5
YES:  AIR
NO  :  DISPLAY
```

• Press the AIR/▲ button to continue accumulating time-weighted average (TWA) and PEAK readings from the last time the Eagle was used. (The short-term exposure limit [STEL] reading is reset each time the Eagle is turned on.) The Battery Voltage screen displays.

• Press the DISP/ADJ button to restart these measurements. The Battery Voltage screen displays.

If you do not press the AIR/▲ or DISP/ADJ button within 5 seconds, the Eagle automatically resumes datalog readings and displays the Battery Voltage screen.

The Battery Voltage screen displays the minimum usable and actual battery voltage (for example, 6.0V). If the battery voltage is too low, the Eagle will not continue.

```
BATTERY
MIN.  4.5V
BATTERY
NOW   6.0V
```

NOTE: The following screen only displays if the data logging option is installed. If the data logging option is not installed, the Self Diagnosis screen displays after the Battery Voltage screen.

This message displays the date and time as set in Setup mode. The data logging option uses this information to record the time and date of sample and alarm events.

```
       A P R   1 7   1 9 9 8
           1 4 : 3 0
```

The following two screens display while the Eagle checks itself for proper operation. The Eagle alerts you if a malfunction occurs.

```
            S E L F
       D I A G N O S I S
       1 0   S E C O N D S
            T O   G O
```

```
       S T A N D   B Y

       < C H 4 > < O X Y >
       < H 2 S > < C O >
```

When the Eagle successfully completes its self check, the OK message displays in place of the STAND BY message, then the normal operating screen displays. The normal screen displays fresh-air concentrations for all gases. The Eagle sounds a double tone to indicate it is in normal operation.

```
       C H 4          0   L E L %
       O X Y     2 0 . 9   V O L %
       H 2 S      0 . 0   P P M
       C O            0   P P M
```

CAUTION: Do not use gas from a cigarette lighter to test response to combustibles. Exposing the combustible gas sensor to uncontrolled high concentrations of gas will reduce response and sensor life.

3. Verify that the Eagle is operating correctly. Use the RKI Bump Test Kit to easily verify correct operation of the Eagle.

WARNING: If the Eagle does not respond to verification, take it to a known "fresh-air" environment, then perform the demand zero procedure described in "Preparing for Calibration" on page 46. Repeat step 3 before using the Eagle in a potentially hazardous location. If readings are not within 10% of the gas concentrations, calibrate the Eagle as described in "Calibrating the Eagle" on page 47.

Normal Operation

The Eagle continuously monitors the atmosphere around the Remote Detector and displays the gas concentrations present for its target gases. In a low-light environment, press any button to turn on the display backlight. (See "Updating the Back Light Setting" on page 41 to program backlight duration.) If the Confirmation Beep option is turned on, the Eagle beeps once every 15 minutes to verify that it's on the job.

To use an extender cable, see "Starting Up the Eagle" on page 11, insert the Remote Detector into the monitoring area, then wait a few seconds for a response.

Monitoring Combustible Gas in the PPM Range

1. Start the Eagle in the LEL range as described in "Starting Up the Eagle" on page 11.

2. Allow the combustibles sensor to stabilize (3 to 5 minutes). This stabilization period is required for the PPM range only.

3. Press the LEL/PPM button. The Eagle displays PPM in place of LEL% for combustible gas, and the gas reading displays in parts per million.

4. If the PPM reading is not zero, take the Eagle to a fresh air environment, then perform the demand zero procedure as described in "Preparing for Calibration" on page 46.

NOTE: For the data logging option, combustible gas readings are logged in %LEL regardless of the LEL/PPM setting.

Monitoring Combustible Gases Other than Methane

If the combustible gas sensor is calibrated to methane (CH_4), use Table 4 to determine the concentration of combustible gases other than methane. This table is based on Eagles in full response mode (methane elimination switch set to CH4) and calibrated to methane. Multiply the display reading by the factor in the appropriate column in the table. For example, if you are using the Eagle to detect hexane and the display reads 10% LEL, the actual hexane reading is

10% x 3.00 = 30% LEL hexane.

WARNING: The Eagle's alarms are initiated by the DISPLAY reading not the FACTORED reading. If you are monitoring for hexane as in the example above and the low alarm is set for 10% LEL, the Eagle will initiate a low alarm at 30% LEL hexane (display reading of 10% LEL).

To determine the concentration of other combustible gases with the Eagle in methane elimination mode, see Table 7 on page 59.

Table 4: Full Response Mode Conversion Factors (Methane Calibration)

Target Gas	LEL Factor (Methane Calibration)	PPM Factor (Methane Calibration)
Benzene	2.80	0.67
Ethane	1.40	0.84
Ethanol	2.25	1.5
Ethylene	1.58	0.4
Hexane	3.00	0.67
Hydrogen	1.65	1.4
IPA	2.83	1.13
Isobutane	1.93	1.21
MEK	3.00	1.08
Methane	1.00	1.00
Methanol	2.33	2.57
Propane	2.30	0.92
Propylene	2.00	0.80
Toluene	2.80	0.67

Setting User Access

The CAL/SETUP switch controls the Eagle functions available to the user. The switch setting does not affect the Eagle's ability to display gas readings and indicate gas and malfunction alarms.

1. Turn off the Eagle.

2. Unscrew the two large screws on the top of the case.

3. Turn over the top half of the case, and locate the CAL/SETUP switch (SW2) near the middle along one edge of the main processor board.

CAUTION: The Methane Elimination switch (SW1) is on the opposite edge of the board near the front end. DO NOT confuse these two switches.

4. Place the CAL/SETUP switch in the appropriate position.

   • To give the Eagle access to all modes, place the switch in the ON position.

   • To limit the Eagle to normal operating and display modes, place the switch in the OFF position. (The Eagle prevents access to the setup and calibration modes by disabling the SHIFT/▼ button.)

5. Place the top of the case in its original position, then secure it with the large screws you loosened in step 2.

6. Turn on the Eagle.

NOTE: Make sure the Eagle's calibration is current and the setup options appropriate and safe for the operating environment before placing the CAL/SETUP switch in the OFF position.

Turning Off the Eagle

To turn off the Eagle, press and hold down the POWER/ENTER button until GOOD-BYE displays, then release the button. (You must wait for GOOD-BYE to disappear before you can turn on the Eagle again.)

Alarms

Alarm Indications

This section describes the Eagle's audible and visual alarm indications for gas, over range, low battery, and sensor failure alarms. This section also describes how to reset gas alarms.

The default alarm settings are listed in Table 2, "Standard Sensor Specifications" on page 4. The alarm settings are user-adjustable as described in "Updating the Alarm Point Settings" on page 36.

NOTE: The screens illustrated in this section are intended as examples only. The screens displayed by your Eagle model may be slightly different.

First gas alarm

If a channel's gas reading exceeds the first alarm setting (falls below for the oxygen channel):

```
CH4        10   LEL%ALM1
OXY      20.9   VOL%
H2S       0.0   PPM
CO          0   PPM
```

- ALM1 displays in the alarm field for that channel.
- The channel's display line flashes.
- The buzzer sounds a pulsed tone.
- The alarm lights flash.

Second gas alarm

If a channel's gas reading exceeds the second alarm setting:

```
CH4        50   LEL%ALM2
OXY      20.9   VOL%
H2S       0.0   PPM
CO          0   PPM
```

- ALM2 displays in the alarm field for that channel.
- The channel's display line flashes.
- The buzzer sounds a pulsed tone.
- The alarm lights flash.

STEL alarm (toxics only)

If a toxic gas channel's average gas reading for the past 15 minutes exceeds the STEL alarm setting:

```
CH4          0  LEL%
OXY      20.9  VOL%
H2S      15.0  PPM  STEL
CO           0  PPM
```

• STEL displays in the alarm field for that channel.

• The channel's display line flashes.

• The buzzer sounds a pulsed tone.

• The alarm lights flash.

TWA alarm (toxics only)

If a toxic gas channel's average gas reading for the past 8 hours exceeds the TWA alarm setting:

```
CH4          0  LEL%
OXY      20.9  VOL%
H2S      10.0  PPM  TWA
CO           0  PPM
```

• TWA displays in the alarm field for that channel.

• The channel's display line flashes.

• The buzzer sounds a pulsed tone.

• The alarm lights flash.

Over range alarm

If a channel's gas reading exceeds that channel's full-scale setting:

```
CH4          0  LEL%
OXY      40.0  VOL%OVER
H2S       0.0  PPM
CO           0  PPM
```

• OVER displays in the alarm field for that channel.

• The channel's display line flashes.

• The buzzer sounds a pulsed tone.

• The alarm lights flash.

Low battery alarm

When the battery charge drops near the lower limit, the Eagle displays the following screen (BAT flashes). For alkaline batteries, you have approximately 3 hours of use remaining; for Ni-Cd batteries you have approximately 15 minutes of use remaining.

```
B   CH4          0   LEL%
A   OXY      20.9   VOL%
T   H2S       0.0   PPM
•   CO           0   PPM
```
**Low Battery
Warning**

When the battery voltage drops to the minimum limit, the following screen displays, the alarm lights are on continuously, and the buzzer sounds a steady tone. The Eagle is not operational as a gas monitoring device when this screen displays.

```
        BATTERY
        MIN.  4.5V
        CHANGE
        BATTERY
```
**Low Battery
ALARM**

NOTE: If you are using the optional data logging accessory and the Eagle goes into Low Battery ALARM, shut off the Eagle in order to save the current data logging session.

Sensor failure alarm and emergency operation

The Eagle continuously monitors itself for proper operation. If a malfunction occurs, the Eagle alerts you with audible and visual alarms.

If a sensor fails during start-up or normal operation:

```
            FAIL
          SENSOR
     <        ><OXY>
     <        ><       >
```

- The message FAIL SENSOR displays.
- The failed sensor displays in parenthesis.
- The buzzer sounds a steady tone.
- The alarms lights flash.

If the sensor failed during start-up, the Eagle continues with the normal start-up sequence after the fail screen displays. When the normal screen displays, the Eagle replaces the gas reading for the failed sensor with xxxxx.

If the sensor fails during normal operation and you want to continue monitoring for the remaining target gases, turn the Eagle off, then follow the appropriate start-up sequence. When the normal screen displays, the Eagle replaces the gas reading for the failed sensor with xxxxx.

```
CH4          0   LEL%
OXY   xxxxx   VOL%
H2S        0.0  PPM
CO           0   PPM
```

Resetting Gas Alarms

You can set the Eagle's gas alarms for latching or self-resetting alarms (see "Updating the Alarm Latching Setting" on page 38).

Self-resetting alarms

Self-resetting alarms automatically shut off and reset when the gas reading falls below (or rises above for oxygen) the alarm setting. You cannot silence or reset self-resetting alarms.

Latching alarms

You can set latching alarms with or without Alarm Silence (see "Updating the Alarm Silence Setting" on page 39).

With Alarm Silence on:

When the Eagle goes into gas alarm, press the RESET/SILENCE button to silence the buzzer. The LEDs continue to flash, and the Eagle continues to display the current alarm level.

The gas reading must fall below (or rise above for oxygen) the low alarm (ALM1) setting before you can reset the alarm. Press the RESET/SILENCE button to reset the alarm. The LEDs turn off and the Eagle returns to the normal screen.

With Alarm Silence off:

The gas reading must fall below (or rise above for oxygen) the low alarm (ALM1) setting before you can reset the alarm. Press the RESET/SILENCE button to reset the alarm. The LEDs and buzzer turn off, and the Eagle returns to the normal screen.

NOTE: With Alarm Silence off, you cannot silence the buzzer while the gas reading is above (below for oxygen) the low alarm (ALM1) setting.

Display Mode

The Eagle has four operating modes: normal operating mode, display mode, setup mode, and calibration mode. With the Eagle in display mode, you can:

- set user and station IDs
- display peak readings
- display elapsed time
- display TWA and STEL readings (toxic gases only)
- display battery voltage
- display date and time (data logging option only)
- clear the data log (data logging option only)
- display remaining log time (data logging option only)

To enter display mode, from the normal screen press the DISP/ADJ button. To scroll from one screen to the next press the DISP/ADJ button.

NOTE: Each screen displays for 20 seconds. If you do not press the DISP/ADJ button to scroll to the next screen within 20 seconds, the Eagle automatically returns to the normal operating screen.

User and Station ID Screen

This screen displays only if the user ID function is activated (see "Turning the User ID Function On or Off" on page 39). Each ID contains 10 characters. Uppercase letters, numbers, asterisks (*) and a blank space are available characters.

Use this screen to identify user, location, or other information. If your Eagle has the data logging option, the User and Station ID provides a way to identify the user and location of exposure. The User and Station ID are saved to the Data Logger when you turn off the Eagle, so you can update the IDs for each data logging session.

```
 USER  ID
      * * * * * * * * * *
 STATION  ID
        * * * * * * * * * *
```

To enter a user and station ID:

To scroll to the next screen at any time, press the DISP/ADJ button.

1. Press the POWER/ENTER button. The first character under USER ID flashes (* is default).

2. Press the AIR/▲ and SHIFT/▼ buttons to scroll through the available characters. (The asterisk and blank space are between the set of letters and numbers.)

3. When the desired character displays, press the POWER/ENTER button to enter the character and go to the next character.

4. Repeat steps 2 and 3 for the remaining 19 characters.

After you enter the last character, the Peak screen displays.

Peak Screen

The Peak screen displays the highest (lowest for O_2) concentrations detected since the Eagle was turned on. Peak readings are stored in the Eagle's memory until a higher level is detected or the Eagle is turned off.

The Lunchbreak "RESUME" option enables the Eagle to remember peak readings when it is turned off. See "Starting Up the Eagle" on page 11.

```
P  CH4          0  LEL%
E  OXY      20.9  VOL%
A  H2S        0.0  PPM
K  CO           0  PPM
```

Elapsed Time Screen

The Elapsed Time screen displays the time in minutes since the Eagle was last turned on.

```
        TIME IN
      OPERATION
         240
       MINUTES
```

TWA/STEL Screen

The TWA/STEL screen displays the time-weighted average (TWA) and the short-term exposure limit (STEL) readings for toxic gases only.

The TWA reading is the average reading during the last 8 hours. If 8 hours have not elapsed since the last time the TWA/STEL reading was cleared, the average is still calculated over 8 hours. The missing time is assigned a 0 value for readings.

The STEL reading is the average reading during the last 15 minutes.

```
                TWA      STEL
H2S           0.0      0.0   PPM
CO              0        0   PPM
```

Battery Voltage Screen

The Battery Voltage screen displays the minimum operating voltage and present battery voltage. New alkaline batteries typically measure 6.0 V; fully-charged Ni-Cd batteries typically measure 5.2 V. This screen also displays when you turn on the Eagle.

```
          BATTERY
          MIN.  4.5V
          BATTERY
          NOW   6.0V
```

NOTE: The remaining screens only display if your Eagle includes the data logging option. If your Eagle does not include the data logging option, press the DISP/ADJ button to return to the normal screen.

Date/Time Screen

The date/time screen displays the current date and time. You can set the date and time in Calibration or Setup mode (see page 43).

```
        APR  17  1998
            14:30
```

Clear Data Logger Screens

CAUTION: Once you clear the Data Logger, you cannot retrieve any data previously stored in the Data Logger.

The Clear Data Logger screens allow you to clear the Data Logger storage to accept new data. (Press the DISP/ADJ button to go to the Remaining Log Time screen). You can set the Eagle to overwrite the oldest data when the data log is full (see page 42).

```
┌─────────────────────────┐
│        C L E A R   D A T A       │
│          L O G G E R   ?         │
│        Y E S :   A I R           │
│        N O   :   D I S P L A Y   │
└─────────────────────────┘
```

To clear the data log:

1. With the above screen displayed, press the AIR/▲ button.
    A confirmation message displays.

```
┌─────────────────────────┐
│          A R E   Y O U           │
│            S U R E   ?           │
│        Y E S :   A I R           │
│        N O   :   D I S P L A Y   │
└─────────────────────────┘
```

2. Press the AIR/▲ button to confirm that you want to clear the data log.

    The Eagle displays CLEARING DATA, then displays CLEARED OK. The data log is cleared and the remaining log time value is reset.

Remaining Log Time Screen

The Remaining Log Time screen displays the time remaining until the Data Logger memory is full. The remaining time depends on how often the Eagle stores data to the data log and how many channels are active.

```
┌─────────────────────────┐
│        L O G   T I M E           │
│          3 0 0 . 0               │
│          H O U R S               │
│        R E M A I N I N G         │
└─────────────────────────┘
```

Press the DISP/ADJ button once more to return to the normal screen.

Setup Mode

NOTE: The screens illustrated in this section are examples only. The screens displayed by your Eagle model may be slightly different.

The Eagle has four operating modes: normal operating mode, display mode, setup mode, and calibration mode. This section describes the setup mode. In setup mode, you can:

- update the battery type setting
- update channel settings
- update the combustible gas channel's units of measure
- update the alarm point settings
- update the Eagle's serial number
- turn the lunch break function on or off
- update the alarm latching setting
- update the alarm silence setting
- turn the user ID function on or off
- update the auto calibration settings
- update the back light setting
- turn the auto fresh air function on or off
- update the data interval time setting (data logging option only)
- update the log data over write setting (data logging option only)
- update the time calibration setting (data logging option only)
- update the date and time settings (data logging option only)
- turn the zero follower on or off for each channel
- turn the confirmation beep on or off
- return to default settings (three default options)

The Eagle is pre-set to suit most applications. Follow these instructions only if required.

Tips for Using Setup Mode

- To select a menu option, use the AIR/▲ or SHIFT/▼ button to place the prompt next to the menu option, then press the POWER/ENTER button to select the menu option.

- To exit setup mode, from the main menu place the prompt next to the last menu option, START MEASUREMENT, then press the POWER/ENTER button. The Eagle begins its normal start-up sequence.

Entering Setup Mode

WARNING: The Eagle does not detect gas or display readings while in setup mode. The CAL/SETUP switch (SW2) must be in the ON position to enter setup mode.

1. Take the Eagle to a non-hazardous location, and turn the power off.

2. Press and hold down the AIR/▲ and SHIFT/▼ buttons, then press the POWER/ENTER button. The main menu displays. It displays four menu options at a time. Press the AIR/▲ or SHIFT/▼ button to view additional menu options.

```
>BATTERY  TYPE
 GAS  COMBINATIONS
 LEL%  OR  VOL%  (HC)
 ALARM  POINTS
```

Updating the Battery Type Setting

This setting allows you to select between alkaline and Ni-Cd batteries. The Eagle uses this setting to make sure adequate time is given between the low battery warning and low battery alarm. This setting has no effect on battery charging.

1. From the main menu, select the BATTERY TYPE menu option.

```
        BATTERY  TYPE


        ALKALINE
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

CAUTION: This setting should always match the type of batteries (alkaline or Ni-Cd) installed in the Eagle. If this setting does not match the installed batteries, the time between low battery warning and low battery alarm may be less than expected.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating Channel Settings

This procedure describes how to update channel settings for the combustible gas, oxygen, and toxic gas channels.

CAUTION: Verify that the correct sensor is installed before you update a channel's settings.

Updating combustible gas channel settings

This section describes how to update the target gas label, set a custom gas label, and update the full-scale PPM setting for the combustible gas channel.

Updating the target gas label

1. From the main menu, select the GAS COMBINATIONS menu option.

```
>   C H 4
    O X Y
    H 2 S
    C O
```

2. Use the AIR/▲ or SHIFT/▼ button to place the prompt next to the combustible gas channel (in this example CH4).

3. Press the POWER/ENTER button. The combustible gas target gas label flashes. This indicates that this setting can now be updated.

4. Press the AIR/▲ or SHIFT/▼ buttons to display the available combustible gas target gas labels (CH4, HEX, H2, ***, and NOT USED).

NOTE: Select the HEX or *** setting for Methane Elimination (see "Appendix B: Methane Elimination" on page 58 for more information.)

5. Press the POWER/ENTER button to enter the new target gas label.

A screen displays that shows the full-scale PPM setting, which corresponds to 100% LEL, and display increments for the target gas label you selected. If you select *** as the gas label, you must update the full-scale PPM setting to correspond to 100% LEL for the target gas.

The number in parenthesis indicates the display increment for that portion of the PPM range. In the example below, the PPM reading would display in increments of:

- 5 from 0 to 100 ppm

- 50 from 100 to 1000 PPM and 1000 to 10,000 PPM

- 250 from 10,000 to 50,000 PPM

```
>    * * *
     5 0 0 0 0   P P M
     1 0 0   ( 5 )   1 0 0 0 0   ( 5 0 )
   1 0 0 0 ( 5 0 )   5 0 0 0 0 ( 2 5 0 )
```

If you entered a label other than ***, continue with step 6. If you entered ***, go to the next section, "Setting a custom target gas label."

6. Press the POWER/ENTER button to return to the Gas Combinations menu.

7. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays.

8. Press the POWER/ENTER button. The message SAVING DATA displays, then the main menu displays.

Setting a custom target gas label

1. With the prompt next to the target gas label setting (***), press the POWER/ENTER button. The first asterisk flashes.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired character. Available characters are A through Z, 0 through 9, and a blank space.

3. Press the POWER/ENTER button to enter the displayed character. The next character flashes.

4. Repeat steps 2 and 3 to enter the remaining characters. When you enter the last character, the prompt flashes.

Updating the full-scale PPM setting

CAUTION: The full-scale PPM setting must correspond to 100% LEL for the target gas in order for the Eagle to display accurate PPM readings for the combustible gas channel.

1. Press the SHIFT/▼ button to place the prompt in the second line, then press the POWER/ENTER button to update the full-scale setting. The full-scale setting flashes.

    The maximum full-scale setting for the combustible gas channel is 50,000 PPM; the minimum setting is 1000 ppm. The default setting is 50,000 ppm.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired full-scale setting (see Table 5), then press the POWER/ENTER button to enter the setting. The prompt flashes.

**Table 5: full-scale PPM Readings
Equivalent to 100% LEL**

Target Gas	full-scale Setting
Methane (CH_4)	50,000 ppm
Hexane	11,000 ppm
Hydrogen	40,000 ppm
Pentane	15,000 ppm
Styrene	9,000 ppm
IPA	20,000 ppm
Isobutane	18,000 ppm
Propane	21,000 ppm
Propylene	20,000 ppm
Toluene	11,000 ppm
Ethane	30,000 ppm
Ethanol	33,000 ppm
Benzene	12,000 ppm

Returning to the main menu

1. Press the SHIFT/▼ button. The ESCAPE message displays. (Press the AIR/▲ button to return to the previous screen.)

2. Press the POWER/ENTER button to save the new setting. The OTHER GAS SET message displays, then the Gas Combinations menu displays.

3. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press SHIFT/▼ again. The ESCAPE message displays.

4. Press the POWER/ENTER button. The message SAVING DATA displays, then the main menu displays.

Updating oxygen channel settings

This section describes how to update the target gas label, full-scale setting, and display increment setting for the oxygen channel.

Updating the target gas label

1. From the main menu, select the GAS COMBINATIONS menu option.

```
      C H 4
>     O X Y
      H 2 S
      C O
```

2. Use the AIR/▲ or SHIFT/▼ button to place the prompt next to the oxygen channel (in this example OXY).

3. Press the POWER/ENTER button. The oxygen target gas label flashes. This indicates that this setting can now be updated.

4. Press the AIR/▲ or SHIFT/▼ buttons to display the available oxygen target gas labels (OXY, ***, and NOT USED).

CAUTION: The *** setting is not intended for customer setup. Contact RKI Instruments, Inc., before using this setting for the oxygen channel.

5. Press the POWER/ENTER button to enter the new target gas label.

6. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays.

7. Press the POWER/ENTER button. The SAVING DATA message displays, then the main menu displays.

Updating the full-scale setting

1. Press the SHIFT/▼ button to place the prompt in the second line, then press the POWER/ENTER button to update the full-scale setting. The full-scale setting flashes.

   The maximum full-scale setting for the oxygen channel is 40.0 VOL%; the minimum setting is 25.0 VOL%. The default setting is 40.0 VOL%.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired full-scale setting, then press the POWER/ENTER button to enter the setting. The prompt flashes.

Updating the display increment setting

1. Press the SHIFT/▼ button to place the prompt in the third line, then press the POWER/ENTER button. The display increment setting flashes. The allowable settings are 0.2 VOL% (default) and 0.5 VOL%.

2. Press the AIR/▲ or SHIFT/▼ button to display the desired display increment setting, then press the POWER/ENTER button to enter the setting. The prompt flashes.

Returning to the main menu

1. Press the SHIFT/▼ button. The ESCAPE message displays. (Press the AIR/▲ button to return to the previous screen.)

2. Press the POWER/ENTER button to save the new settings. The OTHER GAS SET message displays, then the Gas Combinations menu displays.

3. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays.

4. Press the POWER/ENTER button. The message SAVING DATA displays, then the main menu displays.

Updating toxics channel settings

This section describes how to update the target gas label, set a custom gas label, and update the full-scale and display increment settings for a toxic gas channel.

Updating the target gas label

1. From the main menu, select the GAS COMBINATIONS menu option.

2. Press the POWER/ENTER button to display the Gas Combinations menu.

```
      C H 4
      O X Y
  >   H 2 S
      C O
```

3. Use the AIR/▲ or SHIFT/▼ button to place the prompt next to the toxic gas channel (in this example H2S or CO).

4. Press the POWER/ENTER button. The toxic target gas label flashes. This indicates that this setting can now be updated.

5. Press the AIR/▲ or SHIFT/▼ buttons to display the available target gas labels for the toxic gas channel (H2S, CO, SO2, Cl2, NH3, CO2 (5.00%), CO2 (10000 PPM), CO2 (5000 PPM), ***, and NOT USED).

6. Press the POWER/ENTER button to enter the new target gas label.

If you entered a label other than ***, continue with step 7. If you entered ***, go to the next section, "Setting a custom target gas label."

7. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays.

8. Press the POWER/ENTER button. The message SAVING DATA displays, then the main menu displays.

Setting a custom target gas label

```
  >    * * *
       1 0 . 0      P P M
        0 . 1       P P M
```

1. With the prompt next to the target gas label setting (***), press the POWER/ENTER button. The first asterisk flashes.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired character. Available characters are A through Z, 0 through 9, and a blank space.

3. Press the POWER/ENTER button to enter the displayed character. The next character flashes.

4. Repeat steps 2 and 3 to enter the remaining characters. When you enter the last character, the prompt flashes.

Updating the full-scale setting

1. Press the SHIFT/▼ button to place the prompt in the second line, then press the POWER/ENTER button. The full-scale setting flashes.

    The maximum full-scale setting for a toxic gas channel is 1000 PPM; the minimum setting is 1.00 PPM. The default setting is 10.0 PPM.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired full-scale setting, then press the POWER/ENTER button to enter the setting. The prompt flashes.

NOTE: The display increment setting automatically updates its default setting as you change the full-scale setting.

Updating the display increment setting

1. Press the SHIFT/▼ button to place the prompt in the third line, then press the POWER/ENTER button. The display increment setting flashes.

    The minimum display increment setting is 0.1 PPM; the maximum display increment setting is 2.5 PPM.

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired display increment setting, then press the POWER/ENTER button to enter the setting. The prompt flashes.

Returning to the main menu

1. Press the SHIFT/▼ button. The ESCAPE message displays. (Press the AIR/▲ button to return to the previous screen.)

2. Press the POWER/ENTER button to save the new settings. The OTHER GAS SET message displays, then the Gas Combinations menu displays.

3. To exit the Gas Combinations menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays.

4. Press the POWER/ENTER button. The message SAVING DATA displays, then the main menu displays.

Updating Combustible Gas Channel Units of Measure

This setting allows you to display the combustible gas reading in percentage of LEL or percentage of volume. The detection range remains the same. If 100% LEL equals 5% by volume, then full-scale on the volumetric display is 5%.

1. From the main menu, select the LEL% OR VOL% (HC) menu option.

```
┌──────────────────────────────────┐
│   LEL%  OR  VOL%  (HC)            │
│                                  │
│            LEL%                  │
└──────────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

NOTE: The data logging option logs all combustible gas readings in LEL% regardless of this setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Alarm Point Settings

Each of the Eagle's gas detection channels includes low and high gas alarms. The combustible gas channel also includes low and high alarms for PPM readings; the toxic gas channels also include STEL and TWA alarms.

This screen allows you to update one or more alarm points (the reading at which the Eagle recognizes the alarm).

1. From the main menu, select the ALARM POINTS menu option.

```
┌──────────────────────────────────┐
│ >   CH4                          │
│     OXY                          │
│     H2S                          │
│     CO                           │
└──────────────────────────────────┘
```

2. Select the channel of the alarm point you want to update. The channel's Set Low Alarm Point screen displays (in this example for the combustible gas channel).

```
┌──────────────────────────────────┐
│          SET  ALARM              │
│        < CH4 > LEL               │
│        LOW  ALARM                │
│           10  LEL%               │
└──────────────────────────────────┘
```

NOTE: The Eagle displays the set alarm point screens for each channel in the following sequence: low alarm, high alarm, TWA alarm (toxics only), and STEL alarm (toxics only).

If this is the alarm point you want to update, continue with step 3. If not, continue pressing the POWER/ENTER button until the correct set alarm point screen displays, then continue with step 3.

3. Use the AIR/▲ and SHIFT/▼ buttons to display the desired setting.

4. Press the POWER/ENTER button to enter the new alarm point and scroll to the next set alarm point screen. (Repeat step 3 and 4 to update another alarm point for this channel.)

5. Press the POWER/ENTER button to scroll to the last set alarm point screen for this channel, then press the POWER/ENTER button again to return to the Set Alarm Points menu.

6. Repeat steps 2 through 5 until all desired alarm points are updated. Make sure you return to the Set Alarm Points menu to continue.

7. To exit the Set Alarm Points menu, press the SHIFT/▼ button until the prompt is next to Channel 4, then press the SHIFT/▼ button again. The ESCAPE message displays. (Press the AIR/▲ button if you want to return to the Set Alarm Points menu.

8. Press the POWER/ENTER button to save the settings and return to the main menu.

Updating the Eagle's Serial Number

Every Eagle is programmed with a unique serial number. The data logging option includes the serial number in its log data for identification purposes. The serial number setting accepts numeric (0 through 9) and alpha (A through Z) characters.

NOTE: The serial number is factory set and should not need to be changed. However, if you "reset all defaults," the serial number is reset to ******.

1. From the main menu, select the SERIAL NO. menu option.

```
         S E T
  S E R I A L   N o

     X # # # # #
```

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired character, then press the POWER/ENTER button to enter the character. The next character flashes.

3. Repeat step 2 to enter the remaining characters. The main menu displays after you enter the last character.

Updating the Lunch Break Setting

With Lunch Break OFF (default), the Eagle automatically starts new TWA and PEAK reading collection at start up.

With Lunch Break ON, the RESUME screen displays during start up. From this screen, you can choose to continue accumulating TWA and PEAK readings from the last time the Eagle was used or start collecting new readings.

1. From the main menu, select the LUNCH BREAK menu option.

```
┌─────────────────────────────┐
│                             │
│      L U N C H   B R E A K   │
│                             │
│            O F F            │
│                             │
└─────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Alarm Latching Setting

With Alarm Latching ON, the Eagle remains in alarm condition until the alarm condition passes and the RESET/SILENCE is pressed.

With Alarm Latching OFF, the Eagle automatically resets its alarm when the alarm condition passes.

1. From the main menu, select the ALARM LATCHING menu option.

```
┌─────────────────────────────┐
│                             │
│   A L A R M   L A T C H I N G │
│                             │
│             O N             │
│                             │
└─────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Alarm Silence Setting

NOTE: This feature works only when Alarm Latching is turned on.

With Alarm Silence ON, pressing the RESET/SILENCE button silences the buzzer when the Eagles goes into alarm. The LEDs continue to flash, and the display continues to show the level of alarm.

With Alarm Silence OFF, you cannot silence the buzzer.

1. From the main menu, select the ALARM SILENCE menu option.

```
+---------------------------+
|                           |
|      ALARM  SILENCE       |
|                           |
|            ON             |
|                           |
+---------------------------+
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

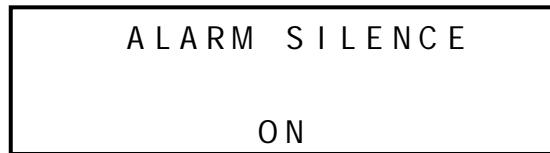3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Turning the User ID Function On or Off

With User ID Input ON, the User and Station ID screen displays during start up. From this screen, you can enter user, location, or other information at the beginning of each gas detection session (see page 23).

With User ID Input OFF (default), the User and Station ID screen does not display during start up.

1. From the main menu, select the USER ID menu option.

```
+---------------------------+
|                           |
|      SET  USER   ID       |
|          INPUT            |
|                           |
|          OFF              |
|                           |
+---------------------------+
```
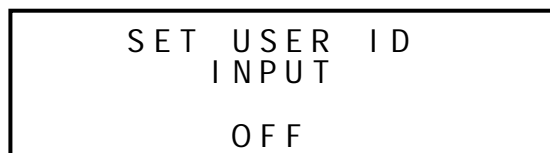
2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Auto Calibration Settings

The Eagle stores default calibration settings. This allows you to calibrate all Eagle channels simultaneously with a calibration cylinder that contains all required target gases (for example the RKI four-gas calibration cylinder).

The Eagle includes default auto calibration settings for most target gases. For gases without default auto calibration, the setting is 0.

NOTE: You can also update auto calibration settings in Calibration mode. If you update auto calibration settings in Calibration mode, you must continue with the calibration procedure. Updating these settings in Setup mode allows you to update the settings without calibrating the sensors.

1. From the main menu, select the AUTO CALIBRATION menu option. (To display the combustible gas channel in PPM, press the LEL/PPM button.)

```
C  CH4        50  LEL%
A  OXY      12.0  VOL%
L  H2S      25.0  PPM
.  CO          50  PPM
```

2. Press and hold the SHIFT/▼ button, then press the DISP/ADJ button. The Auto Calibration screen for the combustible gas channel displays.

```
AUTO    CALIBRATION
        <CH4>

        50  LEL%
```

3. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

4. Press the POWER/ENTER button to enter the new setting. The Auto Calibration screen for the next channel displays.

5. Repeat steps 4 and 5 for the remaining channels. (You must scroll through all remaining channels before you can exit the Auto Calibration screen.)

6. When the Auto Calibration screen for the last channel displays, press the POWER/ENTER button to return to the main Auto Calibration screen.

7. Press the POWER/ENTER button to return to the main menu.

Updating the Back Light Setting

This setting indicates the length of time the LCD illuminates when you press any button. The minimum setting is off; the maximum setting is 10 minutes. The default setting is 15 seconds.

1. From the main menu, select the LCD BACK LIGHT TIME menu option.

```
L C D   B A C K   L I G H T
        T I M E

        1 5   S E C
```

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Turning the Auto Fresh Air Function On or Off

WARNING: If Auto Fresh Air Adjust is ON, you must start the Eagle in a "fresh-air" environment. If this setting is ON and the Eagle is started in the presence of a target gas, the readings and alarms will not be accurate or reliable.

With Auto Fresh Air Adjust ON, the Eagle automatically set the fresh air reading for all channels during the start-up sequence.

With Auto Fresh Air Adjust OFF (default), you must press the AIR/▲ button to set the fresh air reading for all channels.

1. From the main menu, select the AUTO FRESH AIR/▲ ADJ. menu option.

```
A U T O   F R E S H   A I R   A D J .


        O F F
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Interval Time Setting (data log option)

This setting indicates how often the Eagle records readings into the Data Logger. The minimum setting is 10 seconds; the maximum setting is 5 minutes. The default setting is 5 minutes.

1. From the main menu, select the INTERVAL TIME menu option.

```
┌─────────────────────────────────┐
│        SET  DATA  LOGGER         │
│         INTERVAL  TIME           │
│                                  │
│             5  MIN               │
└─────────────────────────────────┘
```

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating Log Data Over Write Setting (data log option)

With Data Over Write ON, the Eagle writes over the oldest data with new data when the Data Logger memory is full.

With Data Over Write OFF, the Eagle stops writing data when the Data Logger memory is full.

1. From the main menu, select the LOG DATA OVER WRITE menu option.

```
┌─────────────────────────────────┐
│        LOGGER  DATA              │
│        OVER  WRITE               │
│                                  │
│             ON                   │
└─────────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Time Calibration Setting (data log option)

This setting indicates how often the Eagle alerts you to needed calibration. The minimum setting is 1 day; the maximum setting is 180 days. The default setting is "off".

Tip: Press and hold the AIR/▲ or SHIFT/▼ button to rapidly scroll through settings.

1. From the main menu, select the TIME CALIBRATION menu option.

```
┌─────────────────────────────┐
│    SET  CALIBRATION         │
│    REQUEST  TIME            │
│                             │
│          off  DAYS          │
└─────────────────────────────┘
```

2. Press the AIR/▲ and SHIFT/▼ buttons to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Updating the Date and Time Settings (data log option)

The Data Logger uses the data and time to identify entries.

1. From the main menu, select the DATE/TIME menu option.

```
┌─────────────────────────────┐
│                             │
│       APR  17  1998         │
│          14:30              │
│                             │
└─────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired month.

3. Press the POWER/ENTER button to enter the setting. The day setting flashes.

4. Repeat steps 2 and 3 to enter the day, year, hours, and minutes settings. The main menu displays after you enter the minutes setting.

Updating the Zero Follow Settings

The Zero Follow setting is not intended for customer setup. The default setting for most target gases is ON. The default setting for carbon dioxide sensors and some configurations of non-standard toxic gas sensors is OFF. The oxygen sensor does not include this feature.

CAUTION: Contact RKI, Instruments Inc., before changing this setting.

Updating the Confirmation Beep Setting

With Confirmation Beep ON, the Eagle beeps once every 15 minutes to verify that it is operating.

With Confirmation Beep OFF (default), the Eagle does not sound a confirmation beep.

1. From the main menu, select the CONFIRMATION BEEP menu option.

```
┌─────────────────────────────┐
│  CONFIRMATION  BEEP         │
│                             │
│          OFF                │
└─────────────────────────────┘
```

2. Press the AIR/▲ or SHIFT/▼ button to display the desired setting.

3. Press the POWER/ENTER button to enter the setting and return to the main menu.

Returning to Default Settings

Each of the parameters in Setup mode has a default setting. The Eagle includes three different options for returning default settings: reset all default settings, reset the default alarm point settings only, and reset the default oxygen zero setting only.

CAUTION: If you reset all default settings, any changes made in setup mode or normal operation, including calibration settings, will be lost.

To reset all default settings:

1. From the main menu, select the DEFAULT menu option.

2. Press the POWER/ENTER button to display the Set Default All screen.

```
┌─────────────────────────────┐
│     SET  DEFAULT            │
│          ALL                │
│     YES:  AIR               │
│     NO  :  DISPLAY          │
└─────────────────────────────┘
```

3. Press the AIR/▲ button to reset all parameters to their default settings. The messages SAVING DATA and END display, then the main menu displays.

To reset all default alarm point settings:

1. From the main menu, select the DEFAULT menu option. The Set Default All screen displays.

2. Press the DISP/ADJ button to display the Set Default Alarm screen.

```
SET  DEFAULT
    ALARM
YES:  AIR
NO  :  DISPLAY
```

3. Press the AIR/▲ button to reset all alarm points to their default settings. The messages SAVING DATA and END display, then the main menu displays.

To reset the oxygen zero setting:

1. From the main menu, select the DEFAULT menu option. The Set Default All screen displays.

2. Press the DISP/ADJ button. The Set Default Alarm screen displays.

3. Press the DISP/ADJ button to display the Set Default Oxygen Zero screen.

```
SET  DEFAULT
   OXY  ZERO
YES:  AIR
NO  :  DISPLAY
```

4. Press the AIR/▲ button to reset the oxygen zero setting to its default value. The messages SAVING DATA and END display, then the main menu displays.

Calibration

Calibrate the Eagle when you replace a sensor. Also calibrate the Eagle periodically to assure proper sensor response.

You can program the Eagle to notify you when it is due for calibration (see "Updating the Time Calibration Setting" on page 43). The frequency of calibration depends upon the amount and type of use. A typical calibration frequency is once per month.

Calibration Supplies and Equipment

To calibrate the Eagle, you need the following:

- Known calibrating samples of combustible and the appropriate toxic gases. The samples should have concentrations in approximately the middle of the range of detection.

- An oxygen-free source, such as 100% nitrogen or CO in a nitrogen balance

- A regulator to provide adequate sample gas flow

For one-source, auto-calibration, you can use the RKI Four-Gas Cylinder to adjust all the sensors at the same time, automatically, with no need for a zero-oxygen source. This section includes instructions for calibration with a fixed-flow regulator, RKI Four-Gas Cylinder, and Remote Detector calibration cup. This section also includes instructions for calibration with individual gas sources.

Preparing for Calibration

1. Take the Eagle to a non-hazardous location with fresh-air conditions.
2. Attach the Remote Detector to the Eagle, either directly or with an extender cable. (See "Starting Up the Eagle" on page 11 for more details.)
3. Turn on the Eagle and allow one minute for warm up.
4. Press and hold the AIR/▲ button until a tone sounds.

   The Eagle automatically sets the combustible gas and toxics circuits to zero and the oxygen circuit to 20.9%.

5. Connect the calibration tubing to the regulator.
6. Connect the calibration tubing to the calibration cup.
7. Stand the Eagle up on its bottom end (if the Remote Detector is directly connected).
8. Fit the calibration cup over the bottom end of the Remote Detector case. The cup is indexed to fit the Remote Detector.

Calibrating the Eagle

Press and hold the SHIFT/▼ button, then press the DISP/ADJ button. The Calibration menu displays.

NOTE: The following screens illustrate a four-gas Eagle with the data logging option and are intended as examples only. Your Eagle may display slightly different screens.

```
AUTO    CALIBRATION
        < C H 4 >

        5 0   L E L %
```

The Eagle's Calibration menu includes two methods of calibration: Auto Calibration and Single Calibration.

- Auto Calibration: This method allows you to calibrate all four sensors simultaneously. It is designed for use with the RKI Four-Gas Calibration Cylinder and is the quickest and easiest method to calibrate the Eagle.

- Single Calibration: This method allows you to calibrate one sensor at a time. Use this method if you are only calibrating one or two sensors, or if you are using single gas calibration cylinders.

Calibrating with the Auto Calibration method

This section describes calibration using the Auto Calibration method. To calibrate using the Single Calibration method, see "Calibrating with the Single Calibration method" on page 49.

1. Use the AIR/▲ and SHIFT/▼ button to place the prompt next to the AUTO CALIBRATION menu option.

2. Press the POWER/ENTER button to display the Calibration Values screen.

```
C   C H 4        5 0   L E L %
A   O X Y      1 2 . 0  V O L %
L   H 2 S      2 5 . 0  P P M
.   C O          5 0   P P M
```

The gas concentrations displayed in the Calibration Values screen must match the gas concentrations listed on the Four-Gas Calibration Cylinder. If all concentrations match, go to step 7. If one or more concentrations do not match, continue with step 3.

3. To adjust the values on the screen, hold down the SHIFT/▼ button, and press the DISP/ADJ button. The Auto Calibration screen for the combustible gas channel displays.

```
C  CH4        50   LEL%
A  OXY      12.0   VOL%
L  H2S      25.0   PPM
.  CO          50   PPM
```

4. Use the AIR/▲ (increase) and SHIFT/▼ (decrease) buttons to set the correct combustible gas value.

5. Press the POWER/ENTER button to enter the new setting. The Auto Calibration screen for the next channel displays.

6. Repeat steps 4 and 5 to set the correct values for the remaining channels and return to the Calibration Values screen.

NOTE: The RKI Four Gas Cylinder contains approximately 12% O_2 by volume. Be sure to set the "OXY" reading to agree with the concentration listed on the cylinder's label, not zero.

7. With the Calibration Values screen displayed, press the POWER/ENTER button. The gas readings flash.

8. With the Eagle and Remote Detector properly set up for calibration (see "Preparing for Calibration" on page 46), screw the fixed-flow regulator to the calibration cylinder to begin a flow of gas at 1.0 liters per minute. The gas starts to flow a soon as you screw on the fixed-flow regulator. (A fixed-flow regulator with an on/off valve is also available.) Let the gas flow for 90 seconds.

9. Press the POWER/ENTER button to set the calibration to the programmed values.

   If a sensor(s) cannot calibrate to the proper value, FAIL PUSH AIR/▲ KEY displays and the Eagle lists the sensor(s) that failed to calibrate. (The other sensors calibrate normally.) The buzzer and alarm lights activate. Press the AIR/▲/▼ button to reset the alarm and return to the Calibration menu. Replace the failed sensor(s), then repeat calibration.

10. AUTO CALIBRATION END displays, then the Calibration menu displays.

11. Unscrew the regulator from the cylinder and remove the calibration cup from the Remote Detector. Then remove the clear tubing from the regulator and from the calibration cup.

12. Press the SHIFT/▼ button to place the prompt next to the NORMAL OPERATION menu option, then press the POWER/ENTER button to return to the normal screen.

Calibrating with the Single Calibration method

This section describes calibration using the Single Calibration method. To calibrate using the Auto Calibration method, see "Calibrating with the Auto Calibration method" on page 47.

CAUTION: The single calibration method does not have a "FAIL" notification. Replace sensors that cannot be set to agree with the calibration source, then recalibrate.

1. Use the AIR/▲ and SHIFT/▼ buttons to place the prompt next to the SINGLE CALIBRATION menu option.

```
  AUTO  CALIBRATION
 >SINGLE  CALIBRATION
  DATE / TIME
  NORMAL  OPERATION
```

2. Press the POWER/ENTER button to display the Single Calibration menu.

```
 >  CH4
    OXY
    H2S
    CO
```

3. Use the AIR/▲ or SHIFT/▼ button to place the prompt next to the channel to calibrate (in this example the combustible gas channel).

4. Press the POWER/ENTER button. The Single Calibration screen displays for the channel you selected. The gas reading flashes.

```
  AUTO  CALIBRATION
 >SINGLE  CALIBRATION
  DATE / TIME
  NORMAL  OPERATION
```

5. With the Eagle and Remote Detector properly set up for calibration (see "Preparing for Calibration" on page 46), screw the regulator onto the calibration cylinder to begin a flow of gas at 1.0 liters per minute. Let the gas flow for 90 seconds.

NOTE: The combustible gas sensor is a general hydrocarbon sensor that responds to most flammable vapors and gases; the response will vary depending upon the substance. For best results, calibrate the Eagle to the target gas or vapor.

6. If necessary, use the AIR/▲ (increase) and SHIFT/▼ (decrease) buttons to adjust the reading to match the concentration listed on the calibration cylinder.

7. Press the POWER/ENTER button to set the span value. SINGLE CALIBRATION END displays, then the Single Calibration menu displays.

8. Unscrew the regulator from the cylinder.

9. Repeat steps 3 through 8 for any other channels you want to calibrate. Make sure you use an appropriate calibration cylinder for each channel.

CAUTION: When calibrating the oxygen channel, verify the concentration of oxygen listed on the cylinder's label. For oxygen-free samples (100% nitrogen for example), set the oxygen setting to 0.0%.

10. After the last channel is calibrated, unscrew the regulator from the cylinder, remove the calibration cup from the Remote Detector, then remove the clear tubing from the regulator and from the calibration cup.

11. With the Single Calibration menu displayed, press the SHIFT/▼ button until the prompt is next to the last channel, then press the SHIFT/▼ button again. The ESCAPE message displays.

12. Press the POWER/ENTER button to return to the Calibration menu.

13. Press the SHIFT/▼ button to place the prompt next to the NORMAL OPERATION menu option, then press the POWER/ENTER button to return to the normal screen.

Maintenance

Displaying the Battery Voltage

Check the battery voltage periodically. Replace or recharge the batteries before the voltage drops to 4.5 V.

WARNING: Take the Eagle to a non-hazardous location before replacing or recharging the batteries.

To display the battery voltage:

1. From the normal screen, press the DISP/ADJ button to enter display mode.
2. Press the DISP/ADJ button until the Battery Voltage screen displays.

```
BATTERY
MIN.  4.5V
BATTERY
NOW   6.0V
```

3. To exit display mode, press the DISP/ADJ button until the normal screen displays.

Replacing Alkaline Batteries

1. Turn off the Eagle.
2. Unscrew the two large screws on the top of the case, then carefully lift the top of the case and lay it aside.
3. Remove the batteries and verify that the battery compartment and electrical contacts are clean.
4. Insert fresh batteries following the label on the inside of the case.
5. Place the top of the case in its original position, then secure it with the large screws you loosened in step 1.

Recharging Ni-Cd Batteries

1. Turn off the Eagle.
2. Plug the cord from the charger into the Eagle's battery charger connector.
3. Plug in the AC line cord or 12 VDC supply to the charger. A full charge takes approximately 8 to 12 hours.
4. Unplug the supply and the charger before using the Eagle. See the charger label for directions.

WARNING: Use only the Eagle battery charger to charge batteries. The

Eagle battery charger can determine if alkaline batteries are installed and will stop charging them automatically. Using any other battery charger can result in alkaline battery leakage or explosion if alkaline batteries are accidentally charged.

NOTE: Setup mode allows you to select between alkaline and Ni-Cd batteries. The two types of batteries have unique low battery alarm characteristics. To prevent unexpected low battery alarms, always make sure the battery type setting in Setup mode matches the type of batteries installed in the Eagle.

Replacing Ni-Cd Batteries

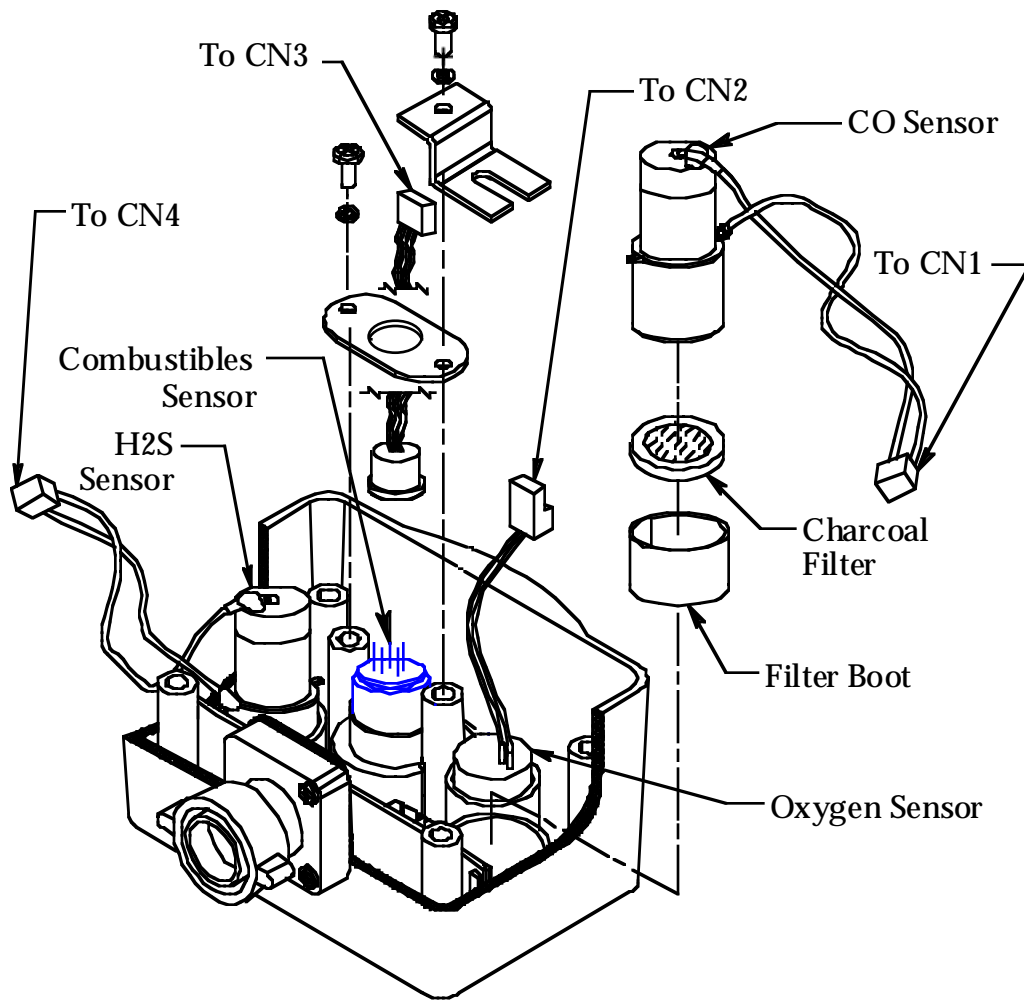**NOTE:** Ni-Cd batteries should only be replaced when they no longer hold a charge.

1. Turn off the Eagle.
2. Unscrew the two large screws on the top of the case, then carefully lift the top of the case and lay it aside.
3. Remove the batteries and verify that the battery compartment and electrical contacts are clean.
4. Insert fresh batteries following the label on the inside of the case.
5. Place the top of the case in its original position, then secure it with the large screws you loosened in step 1.

Replacing Sensors

Electrochemical sensors (O_2, H_2S, and CO) gradually deteriorate, regardless of use, and require periodic replacement. Combustibles sensor life is typically related to usage, but certain conditions may affect duration.

The Eagle sensors are easy to replace but do not contain user-serviceable components. For genuine RKI sensors, call RKI or your local distributor. All sensors are covered by a limited warranty; see warranty for details.

CAUTION: Avoid pulling on sensor wires. Always unplug at the connector.

To CN3

To CN2

CO Sensor

To CN4

To CN1

Combustibles
Sensor

H2S
Sensor

Charcoal
Filter

Filter Boot

Oxygen Sensor

Replacing the combustibles sensor

Replace the combustibles sensor when:

- The combustibles channel cannot be calibrated correctly.
- The LEL reading cannot be set to 0 by the Demand Zero command.

To replace the combustibles sensor:

1. Take the Eagle to a non-hazardous location, and turn the power off.

2. Remove the Remote Detector from the Eagle.

3. On the Remote Detector, unscrew the four screws on top of the case using a flat blade screwdriver. Carefully lift the top of the case and place it to one side. Be careful not to pull hard on the top because a two-wire cable connects the top to the circuit board inside the case.

4. Inside the Remote Detector case, unscrew the two screws that secure the retainer plate to the case using a screwdriver.

5. Locate the combustibles sensor. With the external connector pointing toward you, the combustibles sensor is at the top left corner of the Remote Detector case.

6. Unplug the four-wire connector (red/white/green/black) from the circuit board. Hold the circuit board down when pulling up on the connector.

7. Remove the sensor. Retain the O-ring for use with the replacement sensor.

8. Install the replacement sensor in reverse order. When plugging in the four-wire connector into the circuit board, make sure to line up the tabs on the end of the four-wire connector with the notches on the connector of the circuit board. Be very careful not to bend the pins.

Replacing the oxygen sensor

Replace the oxygen sensor when:

- The O_2 channel cannot be set to 00.0% on an oxygen-free sample.

- The O_2 display cannot be set to 20.9% by the Demand Zero command.

- The O_2 reading drifts noticeably. For example, if the O_2 reading varies from 20.5 to 21.5 while you view the display for a few seconds.

To replace the oxygen sensor:

1. Take the Eagle to a non-hazardous location, and turn the power off.

2. Remove the Remote Detector from the Eagle.

3. On the Remote Detector, unscrew the four screws on top of the case using a flat blade screwdriver. Carefully lift the top of the case and place it to one side. Be careful not to pull hard on the top because a two-wire cable connects the top to the circuit board inside the case.

4. Inside the Remote Detector case, unscrew the two screws that secure the retainer plate to the case using a screwdriver.

5. Locate the oxygen sensor. With the external connector pointing toward you, the oxygen sensor is at the top right corner of the Remote Detector case.

6. Unplug the two-wire connector from the circuit board. Hold the circuit board down when pulling up on the connector.

7. Remove the sensor.

8. Install the replacement sensor in reverse order. When plugging in the wire connector into the circuit board, make sure to line up the tabs on the end of the wire connector with the notches on the connector of the circuit board. Be very careful not to bend the pins.

Replacing the H2S or CO sensor

Replace the H_2S or CO sensor when:

- The H_2S or CO channel cannot be calibrated correctly.

- The H_2S or CO reading cannot be set to 00 by the Demand Zero command.

NOTE: Allow up to 1/2 hour after you replace the H_2S or CO sensor, or if charged batteries have not been installed for an extended period, for the channel to show a normal response, then calibrate the sensor.

To replace the H_2S or CO sensor:

1. Take the Eagle to a non-hazardous location, and turn the power off.

2. Remove the Remote Detector from the Eagle.

3. On the Remote Detector, unscrew the four screws on top of the case using a flat blade screwdriver. Carefully lift the top of the case and place it to one side. Be careful not to pull hard on the top because a two-wire cable connects the top to the circuit board inside the case.

4. Locate the toxic gas sensor you intend to replace. With the external connector pointing toward you, the hydrogen sulfide (H_2S) sensor is located at the right rear corner of the Remote Detector case. The carbon monoxide (CO) sensor is located at the left rear corner of the Remote Detector case.

5. Unplug the appropriate sensor connector from the circuit board. Use the color of the leads to determine the appropriate connector. The H_2S sensor has orange and black leads, and the CO sensor has red and black leads.

6. Remove the sensor.

7. Install the replacement sensor in reverse order. When plugging in the wire connector into the circuit board, make sure to line up the tabs on the end of the wire connector with the notches on the connector of the circuit board. Be very careful not to bend the pins.

NOTE: Verify that you installed the H_2S or CO sensor in the correct position. If the sensors are not installed in the correct position, the top of the Remote Detector will not close correctly when it is replaced.

Appendix A: Parts List

Table 6 lists part numbers for the Eagle's replacement parts and accessories.

Table 6: Parts List

Part Number	Description
07-7016RK	O-ring, 0.614 ID x 0.070, Buna N
07-7156RK	O-ring, 4.237 ID x .103 for Remote Detector Lid
13-0100RK	Shoulder Strap
33-0157RK	Filter Disk for Remote Detector Sensor Openings
47-1650RK	Extender Cable, Diffusion, 20ft.
47-1652RK	Extender Cable, Diffusion Eagle, 50 ft.
47-5000RK	Datalogging Cable Only
49-1140RK	Alkaline Battery, D-Size, (Total of 4 Required)
49-1240RK	Ni-Cd battery, D-size (Total of 4 Required)
49-2149RK	Battery Charger, 220 VAC
49-2150RK	Battery Charger, 115 VAC (With Alkaline Battery Recognition)
49-2152RK	Continuous Operation Adaptor, 12V DC (With Cigarette Lighter Plug)
52-0206RK	Lapel Buzzer
52-2034RK	Remote Audible Alarm (With 20-Foot Cable)
52-2035RK	Remote Audible Alarm and Strobe Light (With 20-Foot Cable)
57-0012RK	Datalogging Board (Also Requires 82-5007RK)
62-0125RK	Sensor, Combustible Gas (Hydrocarbon)
65-0613RK	Sensor, Oxygen
65-2005RK	Sensor, Carbon Monoxide
65-2035RK	Sensor, Hydrogen Sulfide
71-0042RK	Standard Diffusion Eagle Instruction Manual
81-1123RK	Calibration Cup, Diffusion Eagle
82-5007RK	Datalogging Software and Cable (Also Requires 57-0012RK)

Appendix B: Methane Elimination

For applications where methane is an interfering gas, you can set the Eagle to eliminate most response to methane. The methane elimination switch is a standard feature on the circuit board inside the top of the Eagle's case. An external switch is available as an option. For this type of detection, the combustible gas channel must be programmed to display HEX or *** (see "Updating Channel Settings" on page 29.) Eagles with the external methane elimination switch are factory-set with the correct display.

Setting up for methane elimination mode

1. Take the Eagle to a fresh-air environment. Set the internal methane elimination switch to the HEX ON position or the external switch to Methane Response Off.

CAUTION: If the Eagle is equipped with an external methane elimination switch, do not adjust the internal switch. The internal switch should always be in the CH4 position.

2. Allow 2 minutes for the combustibles sensor to stabilize.

3. Perform the demand zero procedure as described in "Preparing for Calibration" on page 46.

WARNING: DO NOT adjust the switch after re-zeroing the Eagle. Response to CH_4 is greatly reduced when the internal switch is set to "HEX ON" or the external switch is set to "Methane Response Off". If used for methane detection, the internal switch must be set to "CH4" or the external switch set to "Methane Response On".

Operating with methane response off

Monitor for combustible gas as you normally would. When the Eagle is operating in Methane Elimination mode, response to methane is reduced by 90% or more. Response to hexane is reduced slightly (approximately 15%). To convert readings for most common combustible gases, see Table 7 on page 59.

Returning to methane response mode

1. Take the Eagle to a fresh-air environment. Set the internal methane elimination switch to the CH4 position or the external switch to Methane Response On.

2. Allow 2 minutes for the combustibles sensor to stabilize.

3. Perform the demand zero procedure as described in "Preparing for Calibration" on page 46.

Monitoring combustible gases other than hexane

Use Table 7 to determine the concentration of combustible gases other than hexane. This table is based on Eagle's in methane elimination mode (methane elimination switch set to HEX ON) and calibrated to hexane. Multiply the display reading by the factor in the appropriate column. For example, if you are using the Eagle to detect toluene and the display reads 10% LEL, the actual toluene reading is 10% x 0.90 = 9% LEL toluene.

To determine the concentration of other combustible gases with the Eagle in full response mode, see Table 4 on page 17.

Table 7: Methane Elimination Mode Conversion Factors (Hexane Calibration)

Target Gas	LEL Factor (Hexane Calibration)	PPM Factor (Hexane Calibration)
Benzene	0.90	0.98
Ethane	Low response	Low response
Ethanol	0.75	2.25
Ethylene	0.53	0.57
Hexane	1.00	1.00
Hydrogen	0.55	2.00
IPA	0.98	1.77
Isobutane	0.74	1.21
MEK	0.91	1.49
Methane	No response	No response
Methanol	0.91	4.56
Propane	Low response	Low response
Propylene	0.69	1.26
Toluene	0.90	0.98

WARNING: The Eagle's alarms are initiated by the DISPLAY reading not the FACTORED reading. If you are monitoring for toluene as in the above example and the low alarm is set for 10% LEL, the Eagle will initiate a low alarm at 9% LEL toluene (display reading of 10% LEL).

Appendix C: Installing the Optional Data Logger Board

Appendix C describes the procedure to install the Eagle's Data Logger board. The data logging feature is an optional accessory.

NOTE: Although the Data Logger board may be installed in the field, RKI Instruments, Inc., recommends that you return the Eagle to the factory for Data Logger board installation.

1. Take the Eagle to a non-hazardous location, and turn the power off.

2. Unscrew the two large screws on the top of the case., then carefully lift the top of the case and lay it aside.

3. Unplug the ribbon cable from the main circuit board in the top case.

4. Remove the two screws, flat washers, and lock washers that hold the main circuit board in the top case.

5. Slowly pull the main circuit board from the top case far enough to allow room to install the Data Logger board. Avoid pulling so far that you disconnect any of the four cables on the main circuit board.

6. Plug the Data Logger board into the main circuit board at CN1A, CN1B, CN1C, and CN1D.

7. Reassemble the main circuit board to the top case with the screws and lock washers removed in step 4.

8. Plug in the ribbon cable.

9. Reassemble and secure the top case to the bottom case.

10. Start the Eagle and program the Data Logger functions as described in "Setup Mode" on page 27.