Beacon 110 Rig Monitor
Operator's Manual

Part Number: 71-0232RK

Revision: B

Released: 7/18/14

WARNING

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

Periodic calibration and maintenance of the rig monitor is essential for proper operation and correct readings. Please calibrate and maintain this rig monitor 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:

    a) Absorbent cartridges   d) Batteries

    b) Pump diaphragms and valves   e) Filter elements

    c) Fuses

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

Chapter 1: Introduction

Overview

This chapter briefly describes the Beacon 110 Rig Monitor. This chapter also describes the *Beacon 110 Rig Monitor Operator's Manual* (this document). Table 1 at the end of this chapter lists the specifications for the Rig Monitor.

About the Beacon 110 Rig Monitor

The Beacon 110 Rig Monitor is a fixed mount, hydrogen sulfide monitoring controller designed for use at oil drilling sites. All user adjustable parameters may be accessed using push button switches. A direct connect hydrogen sulfide (H_2S) detector is connected to the Beacon 110.

The Rig Monitor displays the current gas reading on an LCD display which is visible through a window in the housing door. It includes audible and visual alarms that warn you of hazardous gas conditions. The alarm circuit includes two levels of gas alarms. The fail circuit alerts you to failures in the gas detector head or controller. The Rig Monitor provides a 4 - 20 mA signal proportional to the target gas reading for use by a recording device. Two sets of relay contacts, one controlled by Alarm 2 and one by the fail alarm, rated at 10 amps 115 VAC, 10 amps 220 VAC, and 10 amps 30 VDC are available for controlling devices such as lights or horns or for controlling higher rated relays. The alarm 1 relay is factory wired to the strobe/horn.

Two operating modes allow you to display and change setup and calibration settings. They are Calibration Mode and Configuration Mode.

About this Manual

The *Beacon 110 Rig Monitor Operator's Manual* uses the following conventions for notes, cautions, and warnings.

NOTE: Describes additional or critical information.

CAUTION: *Describes potential damage to equipment.*

WARNING: *Describes potential danger that can result in injury or death.*

Specifications

Table 1 lists specifications for the Beacon 110 Rig Monitor.

Table 1: Beacon 110 Rig Monitor Specifications

Input Power	10.8 - 14.5 VDC, 1A VDC
Construction (housing)	Fiberglass/polyester with lexan window (NEMA 4X)
Dimensions	19 in. H x 7.2 in. W x 5.6 in. D (483 mm H x 183 mm W x 142 mm D)
Weight	13 lbs.
Environmental Conditions	• For indoor or outdoor locations (Type 4X) • -20°C to 50°C (-4°F to 122°F) ambient • Maximum relative humidity of 80%
Relays	• Relay contacts rated for 10A @ 115/220V~ resistive or 10A @ 30V⎓ resistive • SPDT Form C except for Alarm 1 relay contact (factory wired to alarm strobe/horn)
User Controls	• Three push button control switches • One ON/OFF toggle switch • One push button reset switch
Signal Output	• 4 to 20 mA, 500 ohms impedance max
Sampling Method	Diffusion
Detection Range	0 to 100 PPM (parts per million) H_2S
Response Time	90% in 30 seconds
Accuracy	± 5% of reading or ± 2 ppm H_2S (whichever is greater)

WARNING: *When using the Beacon 110 Rig Monitor, you must follow the instructions and warnings in this manual to assure proper and safe operation of the Beacon 110 Rig Monitor and to minimize the risk of personal injury. Be sure to maintain and periodically calibrate the Beacon 110 Rig Monitor as described in this manual.*

Chapter 2: Description

Overview

This chapter describes external and internal components of the Beacon 110 Rig Monitor.

HORN/STROBE

MAIN PCB

CONTROL PCB

POWER CONVERTER
(UNDER CONTROL PCB)

POWER SWITCH

RELAY (3X)

DC FUSES

DETECTOR/
TRANSMITTER
TERMINAL
STRIPS

DC IN
TERMINAL STRIP

CONTROLLER
TERMINAL STRIP

ALARM TERMINAL STRIP

CABLE BUSHING (2X)

12 VDC BATTERY
CABLE

DETECTOR CABLE
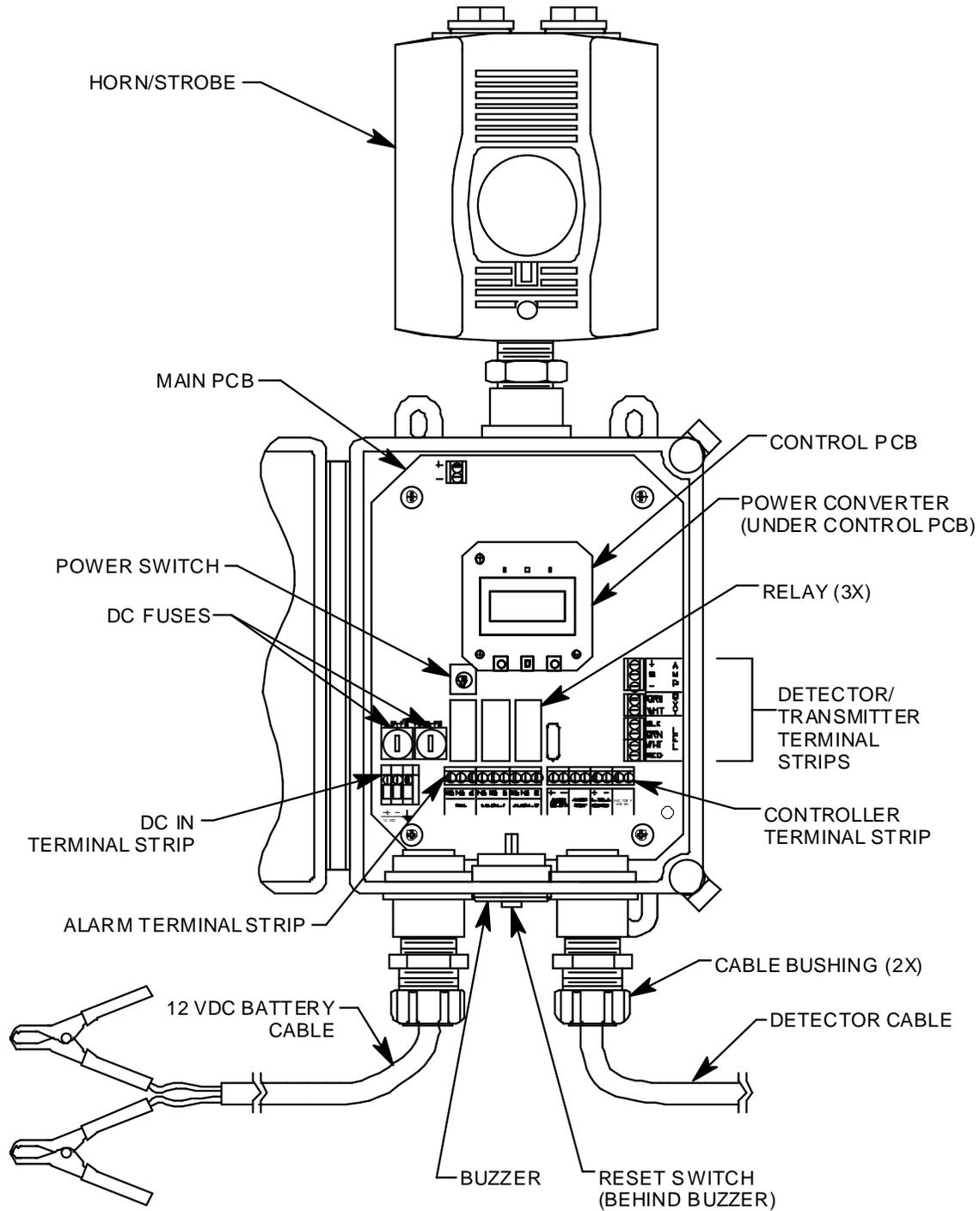
BUZZER

RESET SWITCH
(BEHIND BUZZER)

Figure 1: Beacon 110 Rig Monitor Component Location

External Description

This section describes the housing and all external components of the Beacon 110 Rig Monitor. For the purposes of this description, the housing door is considered the front of the monitor.

Housing

The Rig Monitor's fiberglass housing is weather- and corrosion-resistant. It is suitable for installation where general purpose equipment is in use. The housing door is hinged on the left side and is secured by two latches on the right side. The display screen and status lights are visible through a window in the housing door. Four mounting feet are attached to the back of the housing (one at each corner). The mounting feet allow installation to a vertical surface. Two cable bushings on the bottom of the housing are for wiring connections. One cable bushing is for the 12 VDC battery connection. The other is for the direct connect H_2S detector connection. Both are factory wired.

Buzzer

The buzzer is on the bottom center of the housing in front of the reset switch. The buzzer sounds audible alarms to warn you of gas alarms and instrument failures.

Reset Switch

The reset switch is on the bottom of the housing behind the buzzer. The reset switch serves four functions:

- You can reset the alarm circuits for "latched" alarms after an alarm 1 or alarm 2 condition passes.

- You can silence the buzzer during an alarm 1 or an alarm 2 condition. You cannot silence a fail condition.

- You can turn off the strobe/horn in an alarm 1 condition once the condition has passed.

- You can display and reset the minimum and maximum readings that the Rig Monitor has experienced since the last min/max reset or startup.

Alarm Strobe/Horn

The Rig Monitor has a red alarm strobe light/horn installed on the top of the housing. The Rig Monitor retains its NEMA 4X rating with the strobe installed. Strobe/horn operation is controlled by the Alarm 1 relay contacts. The relay action settings can be changed in Configuration Mode.

H$_2$S Detector and Cable

The H$_2$S detector consists of a junction box with a mounting bracket, the detector, and the calibration cup/splash guard.
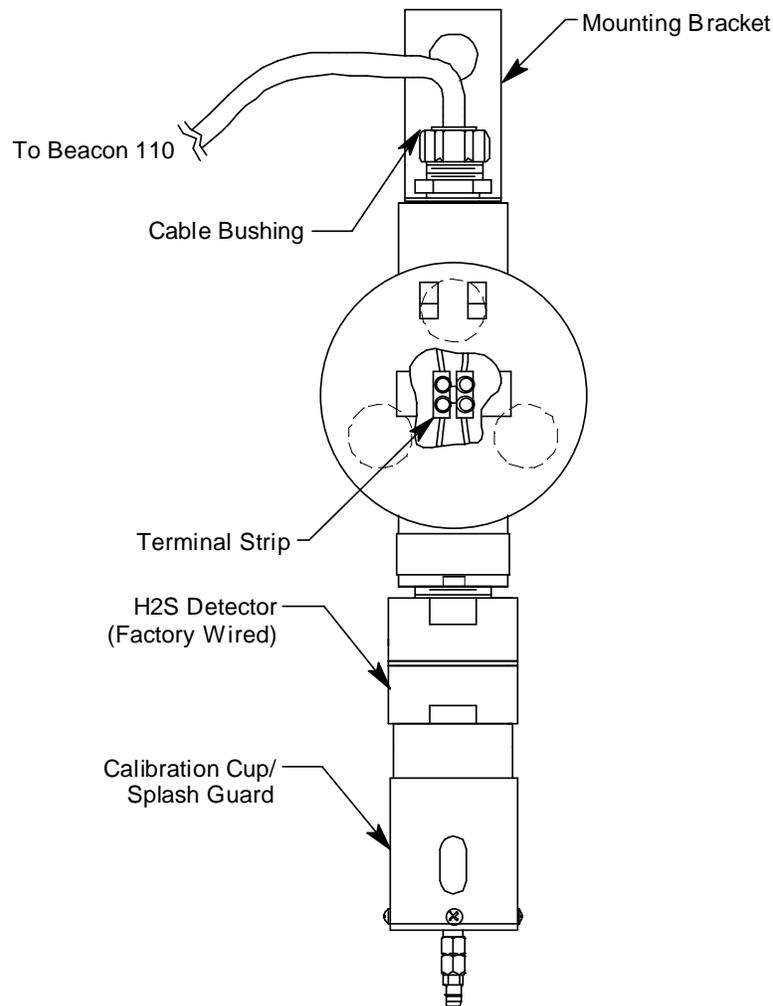

Figure 2: H$_2$S Detector Component Location

The H$_2$S detector is factory wired through the right cable bushing of the Beacon 110 controller and has a 25 foot cable for remote installation. The mounting bracket at the top of the junction box is used to mount the junction box. The junction box protects the detector wiring connections. Three spacers installed on the back of the junction box control the distance of the junction box from a mounting surface and ensure that there is enough room to perform a calibration. A cover on the front of the junction box allows access to the interior of the junction box.

The detector housing body protects the sensing components within the housing. 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.

The calibration cup/splash guard is screwed onto the bottom of the flame arrestor guard.
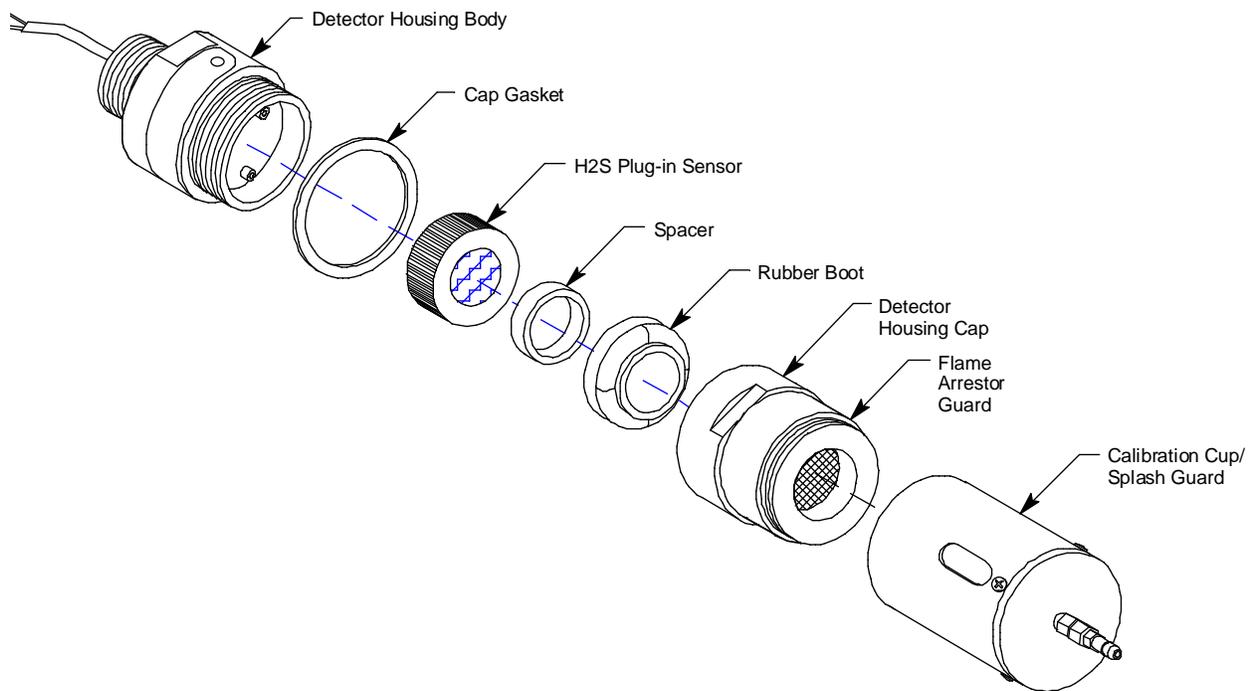
Detector Housing Body

Cap Gasket

H2S Plug-in Sensor

Spacer

Rubber Boot

Detector
Housing Cap

Flame
Arrestor
Guard

Calibration Cup/
Splash Guard

Figure 3: H$_2$S Detector Component Location

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 corresponds to the detection range of the detector. A pre-amplifier, located between the sockets and two interconnect wires, conditions the sensor's signal before the signal reaches the controller. A rubber boot and spacer are installed on the sensor face to ensure that the sensor remains plugged into the detector housing body.

12 VDC Battery Cable

A 50 foot cable with clamps for connection to a 12 VDC battery (customer supplied battery not included) is factory-wired through the left cable bushing of the Beacon 110. One end of the cable is connected to the Beacon 110 terminal strips.

Internal Description

This section describes the internal components of the Beacon 110 Rig Monitor

Power Converter

The power converter is located underneath the control PCB. It takes 12 VDC voltage supplied to the Rig Monitor and converts it to 24 VDC which is used to run the Rig Monitor.

Main Printed Circuit Board (PCB)

The main PCB is mounted inside the housing. The main PCB includes the terminal strips, relays, fuses, and power switch.

Terminal Strips

The Rig Monitor includes terminal strips for field and factory wiring connections. See "Wiring the Beacon 110 Rig Monitor" on page 13 for detailed wiring procedures.

- **12 VDC In Terminal Strip.** The 12 VDC In terminal strip is a 3-point terminal strip located in the lower left corner of the main PCB. It facilitates wiring from a 12 VDC battery with the factory supplied battery cable. Table 2 lists the function of each terminal.

Table 2: Terminal Assignments for the DC In Terminal Strip

Terminal	Connects to:
12 VDC +	Positive (white) wire from 12 V battery.
12 VDC -	Negative (black) wire from 12 V battery.
⏚	Earth ground, factory wired

- **Alarm Terminal Strip**. The 9-point alarm terminal strip is located along the bottom edge of the main circuit board to the right of the DC In terminal strip (see Figure). It facilitates wiring external alarm devices (horn, strobe, etc.) to the alarm relay contacts and includes common (C), normally closed (NC) and normally open (NO) terminals for fail, alarm 1, and alarm 2. The factory installed strobe/horn is factory wired to the NO contact of the Alarm 1 relay and to the (-) contact of the external DC terminal.

- **Controller Terminal Strip.** The 8-point controller terminal strip is located along the bottom edge of the main circuit board to the right of the alarm terminal strip (see Figure). The controller terminal strip facilitates various internal and external wiring connections. Table 3 lists the function of each terminal.

Table 3: Terminal Assignments for the Controller Terminal Strip

Terminal	Connects to:
Alarm Buzzer + & -	Factory installed buzzer (factory-wired)
Alarm Reset (2)	Reset switch (factory-wired)
4 - 20 mA Output +	+ connection of 4 - 20 mA output
4 - 20 mA Output -	- connection of 4 - 20 mA output
FACTORY WIRED (TB9) (right terminal)	not used
FACTORY WIRED (TB9) (left terminal)	- connection from 12 VDC strobe, factory wired

- **Detector/Transmitter Terminal Strips.** Three adjacent terminal strips are located along the right side of the main circuit board above the controller terminal strip (see Figure). These three terminal strips labelled **LEL, Oxy,** and **AMP** facilitate wiring connections to a detector or a 4 - 20 mA transmitter. The Beacon 110 Rig Monitor only uses the top terminal strip, labelled **AMP**, for wiring to the H_2S detector. The **LEL** and **Oxy** terminal strips are not used.

Ground Stud

The threaded ground stud is used for making connections to earth ground. It is connected through the main PCB to the ⏚ (earth) terminal on the 12 VDC In terminal strip. A kep nut on the stud may be removed for installation of one or more lugs to make wiring connections. The detector cable shield's drain wire is connected to the stud.

Relays

The Rig Monitor includes three alarm relays located above the alarm terminal strip. They are from left to right Fail, Alarm 1, and Alarm 2. The relays are form C, single-pole, double-throw (SPDT) and rated for 10 amps at 250 VAC (resistive). The Rig Monitor uses the Alarm 1 relay to control the factory installed strobe/horn. Only the Fail and Alarm 2 relays are available for customer use.

NOTE: You can select normally energized (N.EN) or normally de-energized (N.DE-EN) settings for the alarm 1 and alarm 2 relays. See "Chapter 5: Configuration Mode" on page 22.

The fail relay is factory set as normally energized and is not user adjustable.

DC Circuit Protection

Two DC fuses are used in the Rig Monitor. The two fuses are located on the left side of the main PCB, above the 12 VDC power terminal strip. They cut off the incoming 12 VDC power in the event of a short circuit or other electrical fault which causes a high current draw in the Rig Monitor. They are housed in vertical fuse holders and are held in the holder by a quarter turn cover. They are labelled as F1 (left fuse) and F2 (right fuse) on the PCB silk-screen and are rated at 3 A, 250 V.

Power Switch

The power switch is located to the right of the power supply and above the relays (see Figure). The power switch turns the incoming 12 VDC power source on and off at the Rig Monitor. When the switch is up, the power switch is on.

Control PCB

The LCD display and control buttons are located on the control PCB. It is installed on the main PCB with three standoffs. The control PCB is connected to the main PCB with the display cable which is a ribbon cable terminated with 20 position rectangular connectors on each end. The display cable connects to the control PCB on the back of the top edge and to the main PCB directly below the control PCB.
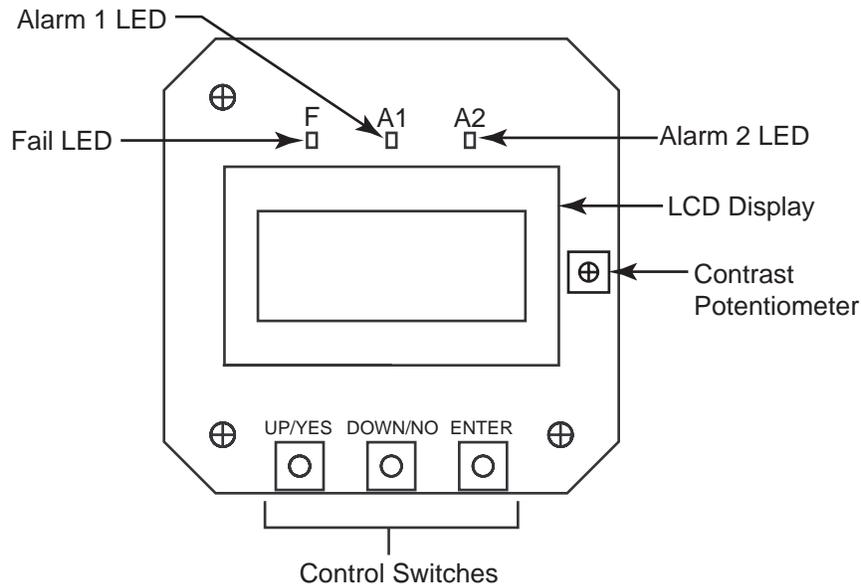
Figure 4: Control PCB Component Location

LCD Display

The LCD display is located at the top of the control PCB. It indicates the current gas reading and displays messages and parameters in the Rig Monitor's operating modes.

Contrast Potentiometer

The contrast potentiometer is located to the right of the LCD display. It is used to adjust the contrast of the LCD. If the background of the LCD appears so dark that the characters are not visible or if the characters are too dim, turn the adjustment screw on the potentiometer clockwise or counterclockwise until the desired visibility is obtained.

Control Buttons

The Rig Monitor includes three push button switches that allow you to enter the Rig Monitor's operating modes, navigate through the modes, update settings, and save changes to the settings. The push button switches are located along the bottom edge of the control PCB (see Figure 4). The UP/YES button is on the left, the DOWN/NO button is in the middle, and the ENTER button is on the right.

Table 4: Beacon 110 Rig Monitor Control Button Functions

Switch	Function
UP/YES	• Saves settings • Changes the displayed setting • Enters Calibration Mode • Enters Configuration Mode (press with ENTER button)
DOWN/NO	• Cancels setting changes • Changes the displayed setting • Displays the Information Screen

Table 4: Beacon 110 Rig Monitor Control Button Functions

Switch	Function
ENTER	• Initiates operations • Enters Configuration Mode (press with UP/YES button) • Accepts displayed parameters

Status LEDs

The Rig Monitor includes three active status LEDs that are located above the display (see Figure). Two LEDs, labelled RX and TX, to the right of those described below, are not active.

• Fail LED

  The fail LED turns on when the Rig Monitor is experiencing a fail condition. A fail condition can be caused by a detector failure or low detector signal.

• Alarm 1 LED

  The alarm 1 LED is on when the Rig Monitor is experiencing an alarm 1 condition.

• Alarm 2 LED

  The alarm 2 LED is on when the Rig Monitor is experiencing an alarm 2 condition.

Chapter 3: Installation & Startup

Overview

This chapter describes procedures to mount the Beacon 110 Rig Monitor, make wiring connections to the monitor, and start up the monitor.

WARNING: ***Perform all installation and start-up procedures in a "fresh air" environment (environment known to be free of toxic gas, and of normal oxygen content). The Beacon 110 Rig Monitor is not in operation as a gas monitoring system until the start-up procedure is complete.***

Mounting the Beacon 110 Rig Monitor

Perform the following procedure to install the instrument housing at the mounting site.
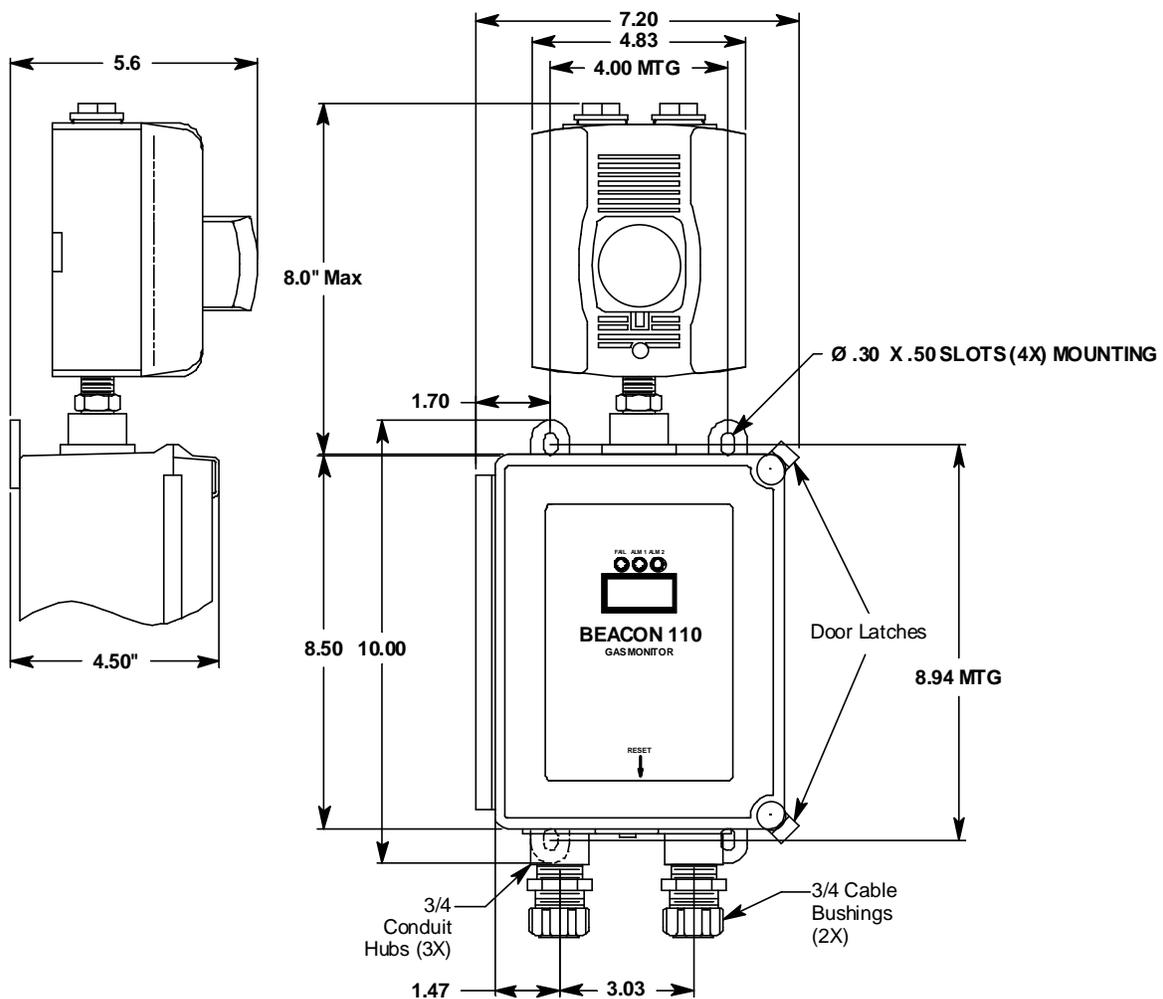

Figure 5: Beacon 110 Rig Monitor Outline & Mounting Dimensions

1. Select the mounting site. When you select the mounting site consider the following factors:

    •   Is a DC power source available?

    •   Is there enough room to open the housing door and make wiring connections through the cable bushings at the bottom of the housing?

    •   Are the display screen and status lights on the Rig Monitor visible?

2. If necessary, close and latch the Rig Monitor housing door.

3. Position the monitor on a vertical surface at eye level (4 1/2 to 5 feet from the floor).

4. Insert 1/4 in. or 5/16 in. screws through the slots in the Rig Monitor mounting feet at each corner of the housing to secure the housing to the mounting surface.

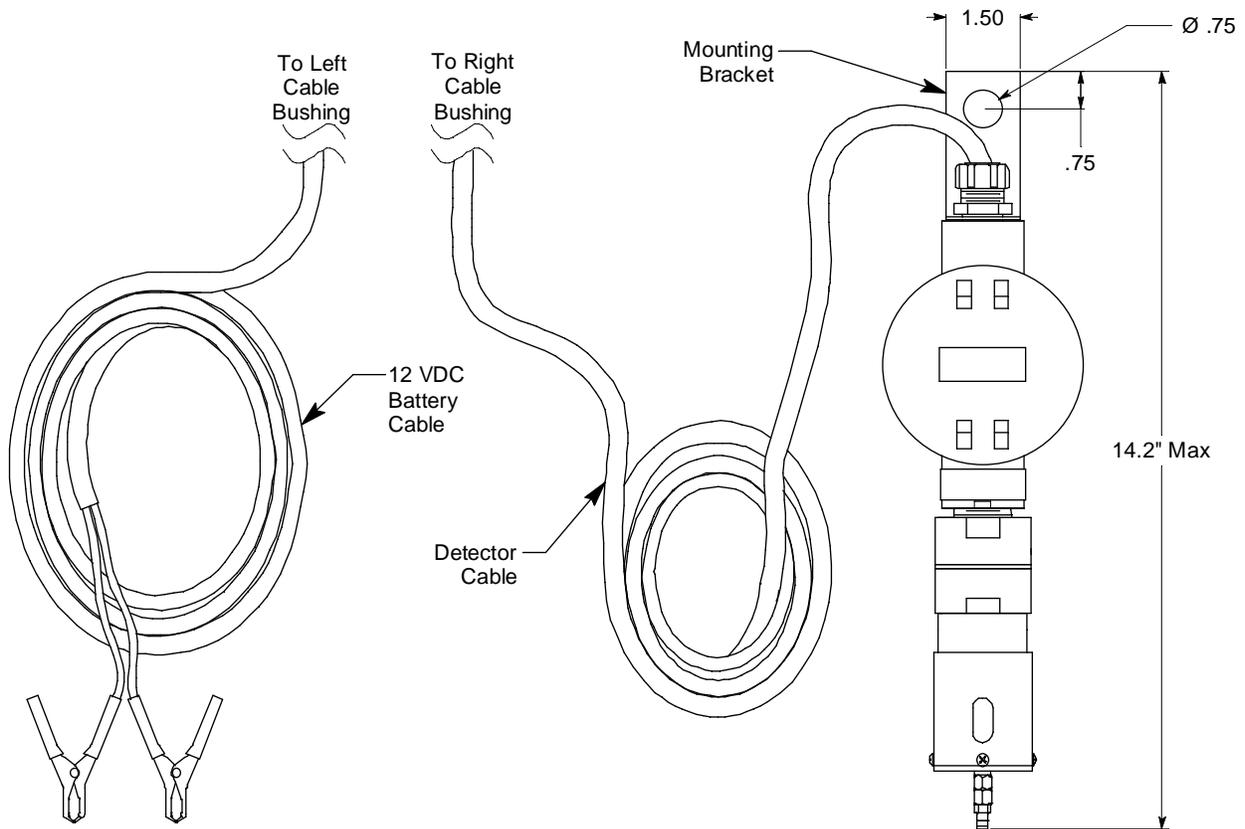5. Use the mounting bracket to hang the H_2S detector at approximately breathing level.

Figure 6: Junction Box Outline & Mounting Dimensions

6. At the monitoring site you select, hang the junction box with the detector facing down (see Figure 6).

Wiring the Beacon 110 Rig Monitor

This section describes procedures to connect external alarm(s) and a recorder to the Rig Monitor. The power, detector, and strobe/horn wiring are all factory wired as shown below.
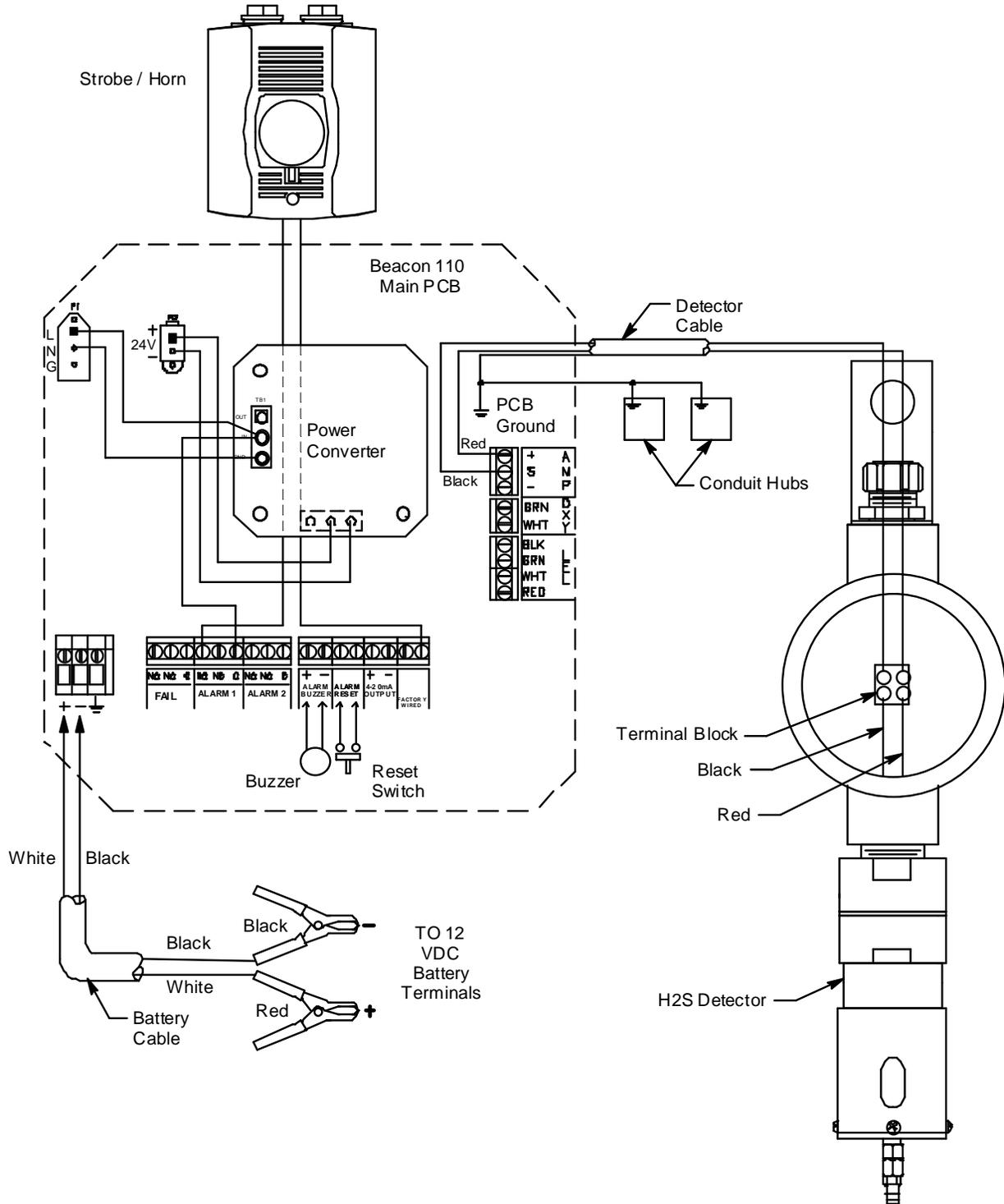

Figure 7: Rig Monitor Factory Wiring

Connecting DC Power

Perform the following functions to connect the Rig Monitor to DC power. One end of the battery cable is already factory wired to the appropriate terminals at the Rig Monitor housing. Use the other end to connect a 12 VDC battery.

NOTE: Be sure to turn off the Beacon 110 Rig Monitor before connecting or disconnecting it from the 12 VDC battery.

1. Turn off, unplug, or disconnect all incoming power to the Rig Monitor.

2. Open the housing door, then place the power switch in the OFF position.

3. Connect the red battery clamp to the (+) terminal of the 12 VDC battery.

4. Connect the black battery clamp to the (-) terminal of the 12 VDC battery.

Connecting External Alarms

Perform the following procedure to connect external alarms to the Rig Monitor's Fail or Alarm 2 terminals. The Alarm 1 terminals are factory wired and are not available for field use.

1. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

2. Open the housing door, then place the power switch in the OFF position.

3. Locate the alarm terminal strip. See Figure 1 to assist you in locating the alarm terminal strip.

4. Install an appropriately rated cable bushing in the Rig Monitor housing. Both factory supplied conduit hubs are used in the Rig Monitor, so you will need to drill a hole in the housing for a conduit hub and cable bushing.

5. Guide the wiring of the external alarm through the new cable bushing.

6. Connect the leads from the external alarm to the appropriate terminals on the alarm terminal strip as shown in Figure 8 to obtain the desired operation.
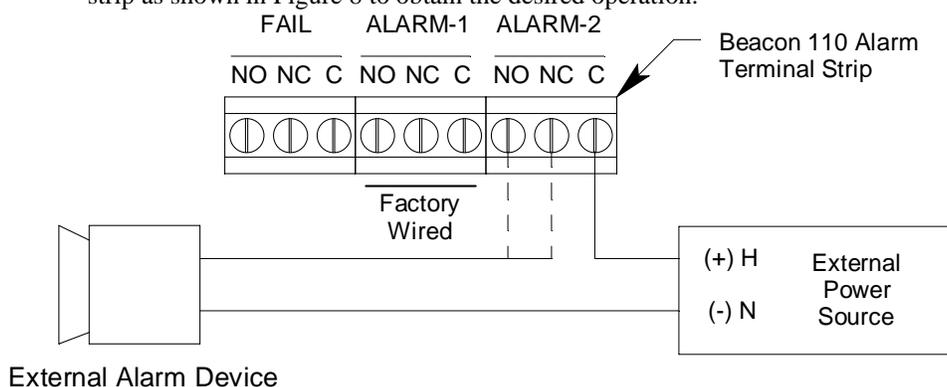

Figure 8: Typical Alarm Device Wiring

7. Repeat steps 5 and 6 for an additional alarm device.

Connecting Recorders

Perform the following procedure to connect an analog signal recording device to the Rig Monitor. The output at the recorder output terminals is a 4 - 20 mA signal that is proportional to the detection range of the H_2S detector head connected to the Rig Monitor's Fail or Alarm 2 terminals. The Alarm 1 terminals are factory wired and not available for field use.

1. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

2. Open the housing door, and locate the recorder output terminals on the controller terminal strip. See Figure 1 to assist you in locating the recorder output terminals. They are labelled **4 - 20 mA OUTPUT** + and **4 - 20 mA OUTPUT -.**

3. Place the power switch in the off position.

4. Install an appropriately rated cable bushing in the Rig Monitor housing. Both factory supplied conduit hubs are used in the Rig Monitor, so you will need to drill a hole in the housing for a conduit hub and cable bushing.

5. Guide the wiring from the recording device through the new cable bushing.

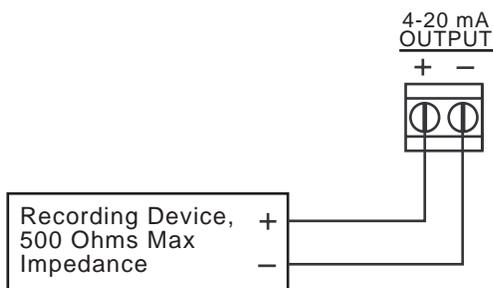6. Connect the leads from the recording device to the analog output terminal strip as shown in Figure 9 below.

Figure 9: Recorder Output Wiring

Start Up

Introducing Incoming Power

Perform the following procedure to place the Rig Monitor into normal operation.

1. Complete the mounting and wiring procedures described earlier in this chapter.

2. Verify that all wiring connections are correct and secure and that the Rig Monitor's power switch is in the OFF position.

3. If not already connected, connect the battery clamps to the + and - terminals of the 12 VDC battery.

4. Turn on the power switch.

5. The LCD display will indicate the firmware version when the Rig Monitor is first powered up and will then count down a one minute warm-up period before normal operation begins. During normal operation, the display will indicate the current gas reading and target gas. Verify that the display is indicating the current gas reading and target gas after the warm-up period is complete and normal operation begins, for example:

```
        H2S
       0 ppm
```

NOTE: To prevent unwanted alarms during warm up, the alarm circuits are not active during the warm-up period.

6. The H_2S detector will begin operating once power is introduced to the Rig Monitor.

Chapter 4: Operation

Overview

This chapter describes the Beacon 110 Rig Monitor in normal operation. This chapter also describes the Rig Monitor in alarm 1, alarm 2, and fail conditions and suggests response to these conditions.

Normal Operation

Normal operation is defined as follows:

- The start-up procedure is complete.

- The Rig Monitor is not indicating an alarm 1, alarm 2, or fail condition.

- The Rig Monitor is not in Calibration or Configuration Mode.

During normal operation, the Rig Monitor simultaneously displays the current gas reading, unit of measure, and target gas.

```
H2S
0 ppm
```

Information Screen

The Information Screen displays the Rig Monitor's operating voltage and firmware and hardware information. To display the Information Screen, do the following:

1. Press and hold the DOWN/NO button for 3 seconds. The Information Screen will appear.

```
24.2V
v5.0   2A
```

2. Continue holding the DOWN/NO button to keep the Information Screen on the display. The top line indicates the operating voltage that the power converter is providing to the Rig Monitor. The second line indicates the firmware that is running, version 5.0 in this example, and the Rig Monitor's hardware version, version 2A in this example. This information may be useful if you need to contact the factory with questions about the Rig Monitor.

3. Release the DOWN/NO button when you are done viewing the Information Screen. The display will return to the normal operation screen within a couple of seconds.

NOTE: The Information Screen is not a good indicator of battery life because the power converter will operate as normal and have an output of 24 volts until the 12 VDC battery dies.

4 - 20 mA Signal Output Operation

The output at the 4 - 20 mA output terminals is a 4 - 20 mA signal that is proportional to the detection range of the Rig Monitor. During normal operation, this signal tracks the gas concentration on the LCD.

There are several circumstances where the signal output will not track the display reading but will behave as follows:

• When the Rig Monitor is in its warm-up period, the signal output will be fixed at 4 mA (zero).

• If you enter Calibration Mode or Configuration Mode, the signal output will be fixed at 3.5 mA until the Rig Monitor returns to normal operation.

• If the Rig Monitor's input power decreases below 10 volts so that the Rig Monitor is in a low power alarm, the signal output is fixed below 2.4 mA until the low power alarm is cleared.

NOTE: Under typical operating conditions, there will be no low power alarm. The 12 VDC battery that is recommended for operation will die before the power converter recognizes a low power condition.

• If the Rig Monitor goes into a fail condition, after a 30 second delay, the signal output is fixed below 2.4 mA until the fail alarm is cleared. During the 30 second delay, the output follows the detector output. In the case of a downscale reading, the displayed gas reading will only go as low as -10% of full scale but the signal output will continue to track the reading even if it's lower than -10% of full scale.

Viewing and Resetting Min/Max Readings

The reset switch may be used to view and reset the minimum and maximum gas readings.

NOTE: Minimum and maximum readings are reset if the instrument is turned off.

1. While the Rig Monitor is in normal operation, press and hold the reset switch button for 5 seconds.

2. The display will indicate the minimum reading on the bottom display line and the maximum reading on the top display line for about 3 seconds before indicating **<RESET> TO CLEAR**.

3. To return to normal operation without resetting the minimum and maximum readings, do not press the reset switch button and allow the unit to return to normal operation. It will return to normal operation in about 5 seconds.

To reset the minimum and maximum readings, press and hold the reset switch button while the **<RESET> TO CLEAR** message is on the display until the display indicates **Min/MAX Is RESET.** Release the reset switch button.The unit will then return to normal operation in about 5 seconds.

Alarm Indications

Table 5: Visual and Audible Alarm Indications

Condition	Cause	Visual Indication(s)	Audible Indication
Alarm 1[1]	Increasing gas reading at or above the alarm 1 setpoint	• Alarm 1 LED is on • Gas reading alternates with **ALARM-1** message • Strobe/horn turns on	• Pulsing tone • Strobe/horn turns on
Alarm 2[1]	Increasing gas reading at or above the alarm 2 setpoint	• Alarm 2 LED is on • Gas reading alternates with **ALARM-2** message	• Pulsing tone
Fail	• Disconnected or misconnected detector head wiring • Display reading at -10% of full scale or lower • Defective components	• Fail LED is on • **FAIL** message replaces gas reading *NOTE: There is a 30 second delay on the fail indications.*	• Steady tone
Low Power	Dead 12 VDC battery	• Fail LED is on • **LowPower** message	• None

NOTE: Under typical operating conditions, there will be no low power alarm. The 12 VDC battery that is recommended for operation will die before the power converter recognizes a low power condition.

* **[1]If the Beacon 110 Rig Monitor is in both an alarm 1 and an alarm 2 condition, both alarm LEDs are on and the display alternates between the gas reading and the ALMS 1&2 message.**

NOTE: You can select normally energized (N. EN) or normally de-energized (N. DE-EN) alarm 1 and alarm 2 relay action settings in Configuration Mode. The following sections describe the standard factory setting for these relays which is N. DE-EN.

The fail relay is set as normally energized in the firmware and is not user-adjustable.

CAUTION: Changing the relay action setting for the Alarm 1 relay in Configuration Mode will cause the strobe/horn to be on during normal operation.

Alarm 1 Condition

Alarm 1 Condition Indications

When the gas reading reaches the alarm 1 setpoint, the Rig Monitor senses an alarm 1 condition. The Rig Monitor alerts you to an alarm 1 condition as follows:

• The alarm 1 LED turns on.

• The gas reading alternates with the **ALARM-1** message.

• The buzzer sounds a pulsing tone.

• The alarm 1 relay energizes and the strobe/horn activates.

Responding to an Alarm 1 Condition

1. Follow your established procedure for a toxic gas condition.

2. The alarms are factory set as latching. After the gas reading falls below the alarm 1 setpoint, press the reset switch to reset the alarm 1 circuit. Resetting the alarm 1 circuit silences the buzzer, turns off the alarm 1 LED, returns the LCD to the normal operation screen, de-energizes the alarm 1 relay, and turns off the strobe/horn.

NOTE: If the reset switch is pressed while the Beacon 110 Rig Monitor is in an alarm 1 condition, the buzzer will be silenced and the alarm 1 LED will flash.

You cannot de-energize the alarm 1 relay and consequently turn off the strobe/horn until the gas reading falls below the alarm 1 setpoint.

Alarm 2 Condition

Alarm 2 Condition Indications

When the gas reading reaches the alarm 2 setpoint, the Rig Monitor senses an alarm 2 condition. The Rig Monitor alerts you to an alarm 2 condition as follows:

• The alarm 2 LED turns on.

• The gas reading alternates with the **ALARM-2** message.

• The buzzer sounds a pulsing tone.

• The alarm 2 relay energizes and the strobe/horn will remain activated.

NOTE: If the Beacon 110 Rig Monitor is in both an alarm 1 and alarm 2 condition, both the alarm 1 and alarm 2 LEDs will be on, the gas reading will alternate with the **ALMS 1&2** message, and both alarm relays will energize.

Responding to an Alarm 2 Condition

1. Follow your established procedure for a toxic gas condition.

2. The alarms are factory set as latching. After the gas reading falls below the alarm 2 setpoint, press the reset switch to reset the alarm circuit. Resetting the alarm circuit silences the buzzer, turns off the Alarm 2 LED, returns the LCD to the normal operation screen, and de-energizes the alarm 2 relay.

NOTE: If the reset switch is pressed while the Rig Monitor is in an alarm 2 condition, the buzzer will be silenced and the alarm 2 LED will flash but all other indications will remain unchanged.

You cannot de-energize the alarm 2 relay until the gas reading falls below the alarm 2 setpoint.

Fail Condition

Fail Condition Indications

The Rig Monitor indicates a fail condition for any of the following:

*   The detector head wiring is disconnected or incorrectly connected.

*   The display reading is -10% of full scale or lower.

When the Rig Monitor senses a fail condition, it alerts you as follows:

*   The fail LED turns on.

*   The gas reading is replaced by the **FAIL** message.

*   The buzzer sounds a steady tone.

*   The fail relay de-energizes.

NOTE: The fail alarm has a 30 second delay.

Responding to a Fail Condition

NOTE: A fail condition cannot be reset using the reset switch.

---

1. Verify that the detector head wiring is correctly and securely connected.

2. Verify that the replaceable plug-in sensor is properly installed.

3. If necessary set the zero reading for your detector head as described in "Calibration Mode" on page 25.

Low Power Condition

The 12 VDC battery that is recommended for operation of the Rig Monitor is typically dead before the power converter recognizes a low power condition. As a result, when the Rig Monitor is used with a 12 VDC battery, there may be no low power alarm and the unit will instead shut off once the battery is dead.

Chapter 5: Configuration Mode

Overview

This chapter describes how to view and change Beacon 110 Rig Monitor parameters using Configuration Mode. It is accessed using the program buttons.

Configuration Mode includes a 5-minute time-out feature. If you do not press a control button for 5 minutes, the Rig Monitor automatically returns to normal operation.

NOTE: If the Beacon 110 Rig Monitor returns to normal operation because of a time-out, it enters a warm-up period just as it does when it is first turned on.

If you are installing a new Rig Monitor, it has been set up at the factory. Use Configuration Mode only if you want to change the Rig Monitor's setup.

Viewing & Changing Beacon 110 Rig Monitor Parameters

1.   While in normal operation, simultaneously press and hold the UP/YES and ENTER buttons for 5 seconds to enter Configuration Mode. Release the buttons when the following screen appears.

```
┌──────────┐
│ Enter    │
│ Config?  │
└──────────┘
```

2.   If you want to exit Configuration Mode, press and release the DOWN/NO button and the Rig Monitor will return to normal operation.

If you want to continue in Configuration Mode, press and release the UP/YES button. The target gas and the full scale will be displayed for a few seconds before the first adjustable parameter, the alarm 1 setpoint, is displayed.

3.   If you want to change the currently displayed parameter, use the UP/YES and DOWN/NO buttons to adjust it to the desired setting, then press ENTER to continue to the next parameter.

If the currently displayed parameter is OK, press the ENTER button to proceed to the next parameter.

Table 6 lists the Rig Monitor parameters you can set. Table 6 also lists the factory set value for each parameter.

Table 6: Configuration Parameters

Parameter (Factory Set Value)	Description
ALARM-1 (10 ppm)	The gas reading at which the Rig Monitor initiates an alarm 1 condition.
ALARM-1 (activation) (Increase)	Indicates if the alarm 1 circuit is activated by gas readings increasing (**Increase**) or decreasing (**Decrease**) to the ALARM-1 Level. • *Note: Changing this parameter will affect the operation of the factory installed strobe/horn. Do not change this parameter from the factory setting.*
ALARM-1 (relay action) (N. DE-EN)	If set as **N. DE-EN**, the alarm 1 relay is de-energized in normal operation and energizes when an alarm 1 condition is initiated. If set as **N. EN**, the alarm 1 relay is energized in normal operation and de-energizes when an alarm 1 condition is initiated. • *Note: Changing this parameter will affect the operation of the factory installed strobe/horn. Do not change this parameter from the factory setting.*
ALARM-1 (relay reset) (LATCH)	If set as **LATCH**, you must press the reset switch to reset the alarm 1 circuit after the alarm 1 condition passes. If set as **SELF-RST**, the Rig Monitor automatically resets the alarm 1 circuit after the alarm 1 condition passes.
A1Strobe	The strobe controlled by this parameter is not installed in the Rig Monitor.
A1 OnDy (alarm 1 on delay) (1 secs)	The amount of time the Rig Monitor delays activation of the alarm 1 circuit once an alarm 1 condition is initiated.
A1 OffDy (alarm 1 off delay) (0 sec.)	The amount of time the Rig Monitor delays turning off the alarm 1 circuit once an alarm 1 condition passes. This parameter appears only if the alarm 1 relay reset setting is set to **SELF--RST**.
ALARM-2 (50 ppm)	The gas reading at which the Rig Monitor initiates an alarm 2 condition.
ALARM-2 (activation) (Increase)	Indicates if the alarm 2 circuit is activated by gas readings increasing (**Increase**) or decreasing (**Decrease**) to the ALARM-1 Level.
ALARM-2 (relay action) (N. DE-EN)	If set as **N. DE-EN**, the alarm 2 relay is de-energized in normal operation and energizes when an alarm 2 condition is initiated. If set as **N. EN**, the alarm 2 relay is energized in normal operation and de-energizes when an alarm 2 condition is initiated.
ALARM-2 (relay reset) (LATCH)	If set as **LATCH**, you must press the ENTER button to reset the alarm 2 circuit after the alarm 2 condition passes. If set as **SELF-RST**, the Rig Monitor automatically resets the alarm 2 circuit after the alarm 2 condition passes.
A2Strobe	The strobe controlled by this parameter is not installed in the Rig Monitor.
A2 OnDy (alarm 2 on delay) (1 secs)	The amount of time the Rig Monitor delays activation of the alarm 2 circuit once an alarm 2 condition is initiated.
A2 OffDy (alarm 2 off delay) (0 sec.)	The amount of time the Rig Monitor delays turning off the alarm 2 circuit once an alarm 2 condition passes. This parameter appears only if the alarm 2 relay reset setting is set to **SELF-RST**.

Table 6: Configuration Parameters (Continued)

Parameter (Factory Set Value)	Description
ZeroSupp (2 ppm)	The zero suppression feature helps prevent "jumpy" readings near the fresh air reading. For example, if the zero suppression setting for the H_2S detector is **2 ppm,** the Rig Monitor will display a reading of 0 ppm for gas readings from -2 ppm to 2 ppm.
FILTER (5 secs)	The filter feature helps "smooth out" jumpy or noisy signals from the detector. You can set the filter from 0 seconds to 60 seconds in 5 seconds increments. The displayed gas reading is the average reading over the previous time period defined by the filter setting. So if the filter is set to 5 seconds, the displayed gas reading is the average over the past 5 seconds.
CAL Time (15 mins)	The calibration time-out sets the amount of time after the last button push while in Calibration Mode that the Rig Monitor will wait before returning to normal operation. If the calibration time-out is set to **15 mins**, then the Rig Monitor will return to normal operation automatically 15 minutes after the last button push.

4. When you have scrolled through all the adjustable parameters, **SAVE IT? YES/NO** appears on the display.

5. To save the adjustments made, press and release the UP/YES button. **Config Saved** is indicated on the display for a few seconds and the Rig Monitor returns to normal operation.

   If you do not wish to save the adjustments, press and release the DOWN/NO button. The **DO OVER? YES/NO** message will display. Press and release the DOWN/NO button. The **ABORT? YES/NO** message will display. Press the UP/YES button to return to normal operation.

Chapter 6: Maintenance

Overview

This chapter describes how to calibrate the Beacon 110 Rig Monitor using Calibration Mode, replace the DC fuses, and preventive maintenance procedures for the Rig Monitor. It includes a troubleshooting guide for problems you may encounter with the Rig Monitor.

Calibration Frequency

Although there is no particular calibration frequency that is correct for all applications, a calibration frequency of every 3 to 6 months is adequate for most Rig Monitor applications. Unless experience in a particular application dictates otherwise, RKI Instruments, Inc. recommends a calibration frequency of every 3 months.

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

If an application is very demanding, for example if hydrogen sulfide is present often and in significant concentrations or the environment is not well controlled, then more frequent calibration than every 3 months may be necessary.

Calibration Mode

Calibration Mode is used to calibrate the Rig Monitor's detector head. All calibration adjustments are made at the Rig Monitor housing after calibration gas is applied to the detector.

Calibration Gas Response Memory Feature

The Rig Monitor has the capability to "remember" the detector's response to the calibration gas after the gas is removed from the detector during the fresh air or span adjustment procedure. This feature enables one person to perform calibration if the detector is mounted remotely from the Rig Monitor. When zero air is applied to the Rig Monitor during a fresh air adjustment, the Rig Monitor will freeze the display reading at the lowest response and the Rig Monitor will continue to display this reading and retain it in its memory until the fresh air adjustment procedure is completed. When calibration gas is applied to the Rig Monitor during a span adjustment, the Rig Monitor will freeze the display reading at the highest response to the calibration gas. The calibration gas can then be removed and the Rig Monitor will continue to display this reading and retain it in its memory until the span adjustment procedure is completed.

Calibration Program Flow

Figure 10 below illustrates the general flow of the Calibration Program for a direct connect detector. See the next section, "Preparing for Calibration", for instructions to enter Calibration Mode. In general, if a question mark, "?", is part of the display text, use the UP/YES or DOWN/NO button to respond. Use the UP/YES and DOWN/NO buttons to increase or decrease a displayed gas reading when performing a span (zero for oxygen) operation, and use the ENTER button to accept a displayed value and continue.
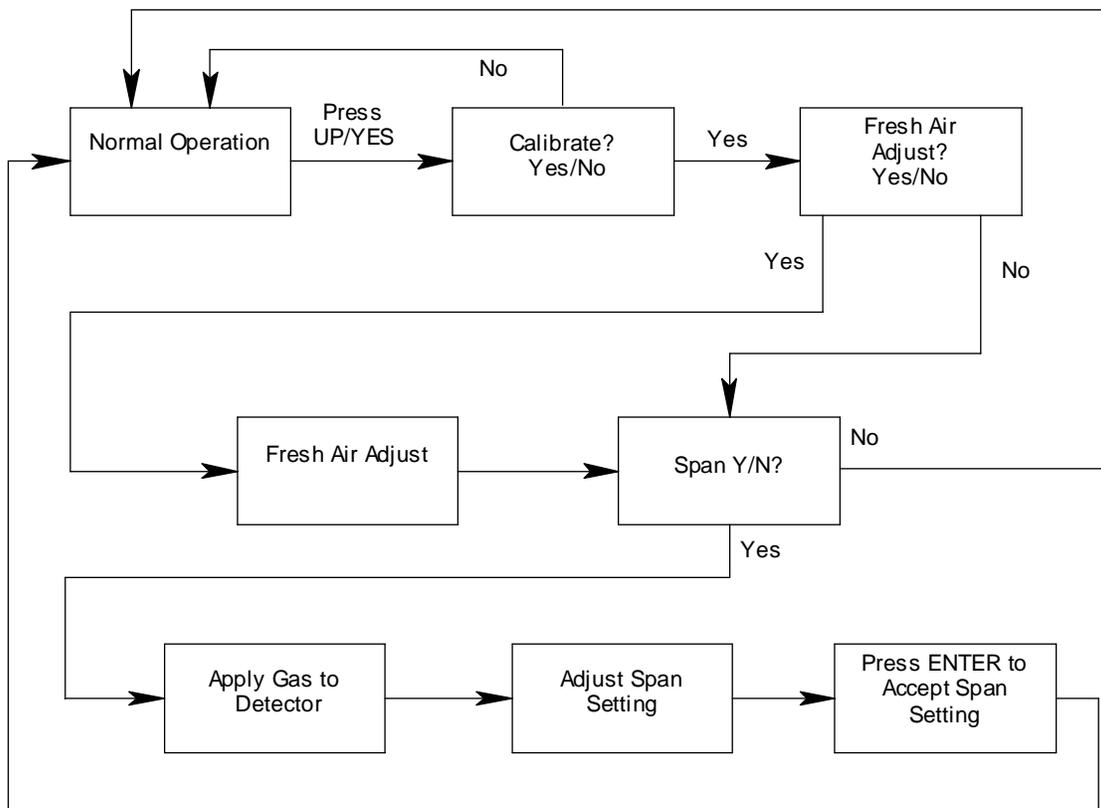

Figure 10: Direct Connect Detector Head

This section describes how to calibrate the H_2S 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/splash guard, 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

WARNING: **The Beacon 110 Rig Monitor is not an active gas monitoring device during the calibration procedure. The 4-20 mA output signal will "freeze" at 3.5 mA and all relays will remain in their non-alarm state while the Rig Monitor is in Calibration Mode. The 4 - 20 mA output signal will not indicate current readings and the relays will not resume operating normally until the Rig Monitor is in normal operation again.**

1. While in normal operation, press and hold the UP/YES button for 5 seconds to enter Calibration Mode. Release the button when the following screen appears.

```
Calib?
YES/NO
```

2. If you want to exit Calibration Mode, press and release the DOWN/NO button. The Rig Monitor will indicate **Leaving CAL Mode** and the Rig Monitor will return to normal operation.

   If you want to continue with calibration, press and release the UP/YES button. The display will indicate the target gas and **CAL Mode** for a few seconds before showing **FreshAir Adjust?**.

Setting the Zero Reading

1. The display will indicate **FreshAir Adjust?** as described above in "Preparing for Calibration".

2. If you want to skip adjusting the fresh air reading, press and release the DOWN/NO button. The display will indicate **SPAN w/Cal Gas?**. Skip to Step 11.

   If you want to continue with adjusting the fresh air reading, press and release the UP/YES button. **ENTER** will alternate with **FreshAir** on the top display line and the current gas reading will be on the bottom display line.

3. If the detector is in a fresh air environment, press and release the ENTER button. The Rig Monitor will perform a fresh air adjustment and the display will indicate **SPAN w/Cal Gas?**. Continue to the next section, Setting the Response Reading.

   If you suspect the detector area is not a fresh air environment, continue with Step 4.

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

5. Use the calibration kit sample tubing to connect the fixed flow regulator to the calibration cup/ splash guard.

6. Turn the regulator's on/off knob counterclockwise to open it. The Rig Monitor will freeze the display reading at the lowest level reached while applying zero air.

7. Allow the gas to flow for two minutes.

8. Turn the regulator's on/off knob clockwise to close it. The Rig Monitor will continue to display the minimum gas response on the display and retain the response level in its memory.

9. Press and release the ENTER button on the Rig Monitor controller. The Rig Monitor will perform a fresh air adjustment and the display will indicate **SPAN w/Cal Gas?**.

10. If you applied zero air to the detector, unscrew the regulator from the zero air calibration cylinder.

11. If you applied zero air to the detector, leave the sample tubing connected to the regulator and the calibration cup/splash guard.

    If you did not apply zero air to the detector, use the calibration kit sample tubing to connect the fixed flow regulator to the calibration cup/splash guard.

NOTE: Depending on the size of your zero air cylinder, it is possible that you will have a different regulator for the zero air cylinder and the H_2S gas cylinder. If necessary to fit the H_2S calibration gas cylinder, change the regulator.

Setting the Response Reading

1. Screw the regulator into the calibration gas cylinder.

2. If you want to skip adjusting the span setting, press and release the DOWN/NO button. The display will indicate **Leaving Cal Mode** and the Beacon 110 Rig Monitor will return to normal operation.

    If you want to continue with adjusting the span setting, press and release the UP/YES button. **APPLY** will alternate with **SPAN Gas** on the top display line and the current gas reading will be on the bottom display line.

3. Turn the regulator's on/off knob counterclockwise to open it.

    When calibration gas is applied, the Rig Monitor will freeze the display gas reading at the highest level reached while the gas was applied.

4. Allow gas to flow for 2 minutes.

5. Turn the regulator's on/off knob clockwise to close it. The Rig Monitor will continue to display the maximum gas response on the display and retain the response level in its memory.

6. Adjust the gas reading up or down to match the calibration gas cylinder concentration by using the UP/YES and DOWN/NO buttons, then press and release the ENTER button.

7. The Rig Monitor will perform a span operation. The display will indicate **SPAN Gas PASS** for a few seconds, then indicate **SPAN Gas SAVED** before indicating **Leaving CAL Mode** for a few seconds.

8. Unscrew the regulator from the cylinder and disconnect the sample tubing from the calibration cup/splash guard hose barb.

NOTE: For convenience, leave regulator connected to the sample tubing.

Returning to Normal Operation

1. The display will now alternate between the normal operation screen and the message **REMOVE CAL GAS** for 1 minute. If the calibration gas has not been removed from the detector, remove it now to avoid unwanted alarms.

    During this 1 minute period, the 4 - 20 mA output will remain fixed at 3.5 mA and the relays will remain in their non-alarm state to avoid unwanted alarms while the calibration gas clears from the detector. At the end of the 1 minute period, the **REMOVE CAL GAS** message will stop appearing and the Rig Monitor will return to normal operation.

2. Store the components of the calibration kit in a safe place.

Adjusting Strobe/Horn Volume

The horn volume on the strobe/horn can be adjusted by doing the following:

1. Open the housing door of the Rig Monitor, then place the power switch in the OFF position.

2. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

3. Loosen the captive screw at the bottom front of the strobe/horn.

4. Grasp the top and bottom of the strobe/horn and push up and out in order to remove the cover.
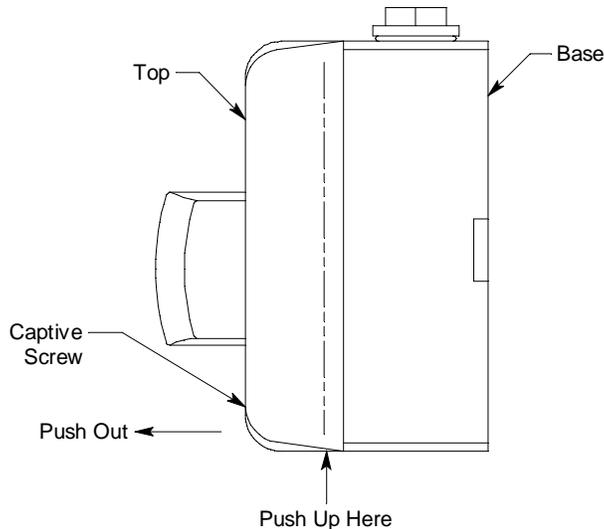

Figure 11: Top Case Removal

5. Turn the cover over and locate the Audio Select switch at the top of the cover as shown in the figure below.
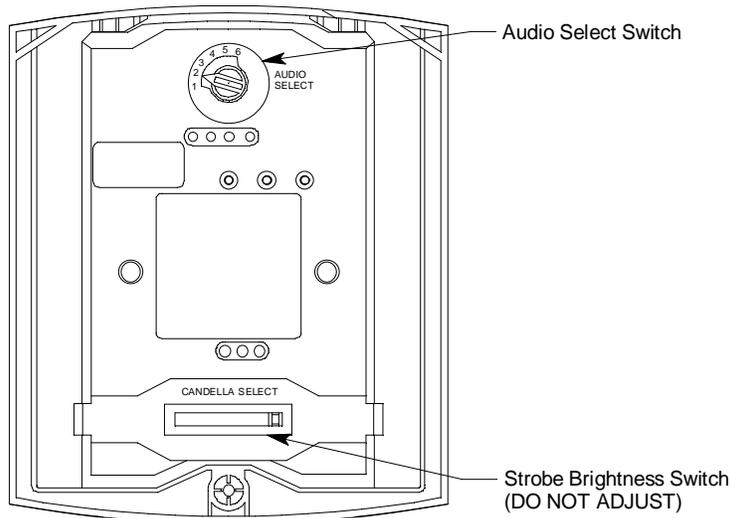

Figure 12: Strobe/Horn Cover

6. The Audio Select switch can be set at any number between 1 and 6. Numbers 1-3 all produce an intermittent buzzing sound with 1 being the loudest and 3 being the quietest. Numbers 4-6 all produce a steady buzzing sound with 4 being the loudest and 6 being the quietest. The factory setting is 2.

7. Turn the Audio Select switch so that the selection arrow is pointing to the desired number.

8. Place the cover over the base and push in and down in order to reinstall the cover. Make sure that the cover is sealed to the base by the gasket.

9. Screw the captive screw at the bottom front of the strobe/horn back in.

Replacing Components of the Rig Monitor

This section describes how to replace the fuses, the H_2S sensor, and the entire detector assembly. In most cases, it is not necessary to replace the entire detector assembly.

Replacing the Fuses

The Rig Monitor has two replaceable DC fuses.

NOTE: To replace other components of the Beacon 110 Rig Monitor, contact RKI Instruments, Inc. for further information.

---

1. Open the housing door of the Rig Monitor, then place the power switch in the OFF position.

2. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

3. Locate the vertical fuse holders above the 12 VDC In Terminal Strip. The DC fuses are labelled F1 and F2 on the main PCB silkscreen.

4. Use a flat-blade screwdriver to rotate the applicable fuse holder 1/4 turn counterclockwise. The fuse holder releases from the socket.

5. Remove the fuse holder from the socket, then remove the fuse from the fuse holder.

CAUTION: *Verify that the replacement fuse is the same type and rating as the fuse you are replacing. See the "Parts List" on page 36 for correct fuse.*

---

6. Install the appropriate replacement fuse in the fuse holder, then place the fuse holder in the socket.

7. Push the fuse holder into the socket, then turn the holder 1/4 turn clockwise to secure it in the socket.

8. Connect the battery clamps to the + and - terminals of the 12 VDC battery.

9. Place the Rig Monitor's power switch in the ON position, then verify that the Rig Monitor completes its warm-up sequence and enters normal operation.

10. Close and secure the housing door.

Replacing the Plug-In H_2S 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 Rig Monitor.

2. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

3. Unscrew the calibration cup/splash guard from the detector housing cap.

4. Unscrew the detector housing cap from the detector housing body. Make sure not to lose the

cap gasket.

5. Unplug and remove the H_2S sensor with the rubber boot and spacer attached.

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

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

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

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

10. Screw the calibration cup/splash guard back onto the detector housing cap.

11. Connect the battery clamps to the + and - terminals of the 12 VDC battery.

12. Turn on the Rig Monitor and place into normal operation.

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

---

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

Replacing the H_2S Detector

NOTE: In most cases, it is only necessary to replace the H_2S sensor.

---

1. Turn off the Rig Monitor.

2. Disconnect the battery clamps from the + and - terminals of the 12 VDC battery.

3. Remove the junction box cover.

4. 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 calibration cup/splash guard from the detector housing cap.

6. Unscrew the detector from the junction box hub.

7. Guide the detector leads of the replacement detector through the junction box hub then screw the mounting threads of the detector into the hub.

8. Connect the detector leads to the terminal block the same way the old detector was wired. See Figure 7 to verify the connections are correct.

9. Screw the calibration cup/splash guard onto the new detector's housing cap.

10. Reinstall the junction box cover.

11. Connect the battery clamps to the + and - terminals of the 12 VDC battery.

12. Turn on the Rig Monitor and place into normal operation.

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

---

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

Preventive Maintenance

This section describes a preventive maintenance schedule to ensure the optimum performance of the H$_2$S detector. It includes daily, monthly, and quarterly procedures.

Daily

Verify a display reading of 0 PPM H$_2$S at the controller. Investigate significant changes in the display reading.

Monthly

This procedure describes a test to verify that the H$_2$S detector responds properly to hydrogen sulfide. It describes a test using a fixed flow regulator with an on/off knob. RKI Instruments, Inc. recommends using a 0.5 LPM (liters per minute) fixed flow regulator.

NOTE: Performing a response test on the H$_2$S detector may cause alarms. Be sure to put the Rig Monitor into its calibration program or disable external alarms before performing this test.

Preparing for the response test

1. While in normal operation, press and hold the UP/YES button for 5 seconds and press the UP/YES button again when asked if you would like to enter Calibration Mode.

2. Verify that the Rig Monitor display reading is 0.

    If the display reading is not zero, set the zero reading of the detector as described in the Start Up section of this manual, then continue this procedure.

3. Screw the regulator into the calibration cylinder.

4. Use the calibration kit sample tubing to connect the regulator to the calibration cup/splash guard.

Performing the response test

1. Turn the regulator's on/off knob counterclockwise to open the regulator. Gas will begin to flow.

2. Allow the gas to flow for two minutes, then verify that the reading is within ± 20% of the cylinder gas concentration.

NOTE: If the reading is not within ± 20% of the correct response reading, calibrate the detector as described in the Calibration section of this manual.

---

3. Turn the regulator's on/off knob clockwise to close the regulator.

4. Unscrew the regulator from the calibration cylinder.

5. When the Rig Monitor display reading falls below the alarm setpoints, return it to normal operation.

6. Store the components of the calibration kit in a safe place.

Quarterly

Calibrate the H$_2$S detector as described in the Calibration section of this manual.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the Beacon 110 Rig Monitor.

Table 7: Troubleshooting the Beacon 110 Rig Monitor

Condition	Symptom(s)	Probable Causes	Recommended Action
No Power	• The display backlight is off and the display screen is blank.	• The power wiring at the Rig Monitor is disconnected or misconnected. • One or both DC fuses is blown. • The display cable is disconnected or misconnected. • The battery is dead or at a very low voltage.	1. Verify that the wiring to the power source is correct and secure. 2. At the Rig Monitor, verify that the wiring to the DC terminals is correct and secure. 3. Check the continuity of the DC fuses. 4. Verify that the display cable is connected. The display (ribbon) cable plugs into a connector on the top edge of the control PCB and on the main PCB below the control PCB. 5. If the power difficulties continue, contact RKI for further instruction.
Frequent or Suspect Alarms	• The Rig Monitor alerts you to frequent or suspect alarms while the detector head's fresh air readings remain on zero.	• The Rig Monitor is experiencing false readings due to RFI or EMI. • The H_2S detector head wiring is disconnected, misconnected, or intermittent.	1. Verify that the H_2S detector head wiring is properly shielded. 2. Verify that the H_2S detector head wiring is correct and secure. 3. If power is routed through the Alarm 2 or Fail contacts to power a device, confirm it is not routed through the detector conduit hub. 4. Increase the alarm on delay setting in Configuration Mode. 5. If the frequent or suspect alarm difficulties continue, contact RKI for further instruction.
Flickering Display	• The display reading flickers often.	• The Rig Monitor is experiencing false readings due to RFI or EMI. • The noise filter setting is too low. • The zero suppression setting is too low. • The display screen is malfunctioning.	1. Verify that the H_2S detector head wiring is properly shielded. 2. Verify that the H_2S detector head wiring is correct and secure. 3. If power is routed through the Alarm 2 or Fail contacts to power a device, confirm it is not routed through the detector conduit hub. 4. Increase the filter setting in Configuration Mode. 5. Increase the zero suppression setting in Configuration Mode. 6. If the display difficulties continue, contact RKI for further instruction.

Table 7: Troubleshooting the Beacon 110 Rig Monitor (Continued)

Condition	Symptom(s)	Probable Causes	Recommended Action
Buzzer Not Working	• The buzzer does not sound an audible alarm during alarm conditions. • The buzzer sounds weak or broken.	• The buzzer is disconnected or misconnected. • The buzzer is malfunctioning.	1. Verify that the wiring to the **ALARM BUZZER +** & **-** terminals of the Controller Terminal Strip is correct and secure. 2. If the buzzer difficulties continue, contact RKI for further instruction.
Reset Switch Not Working	• The buzzer does not silence when you press the reset switch. • The alarm 1 or alarm 2 circuit does not reset when you press the reset switch after the alarm condition passes.	• The reset switch is disconnected or misconnected. • The reset switch is malfunctioning.	1. Verify that the wiring to the **ALARM RESET** (2) terminals of the Alarm/ Controller Terminal Strip is correct and secure. 2. If the reset switch difficulties continue, contact RKI for further instruction.
Strobe/Horn Not Working	• The strobe/horn does not activate when an alarm 1 condition occurs.	• The strobe/horn is malfunctioning. • The strobe/horn wiring is disconnected or misconnected.	1. Verify that the strobe/horn is wired properly to the alarm terminal strip. The red wire goes to the + terminal and the black wire goes to the - terminal. 2. If the strobe/horn difficulties continue, contact RKI for further instruction.
Fail Condition	Rig Monitor indicates a fail condition.	• The H_2S detector wiring is disconnected or misconnected. • The plug-in H_2S sensor is not properly plugged into the sockets in the detector housing body. • The detector's zero reading is low enough to cause a fail condition. • The detector is malfunctioning.	1. Verify that the H_2S detector wiring is correct and secure. 2. Confirm that the plug-in H_2S sensor is installed properly. 3. Perform a zero adjustment. A full calibration is recommended. 4. If the fail condition continues, replace the plug-in sensor as described later in this section. 5. If the fail condition continues, contact RKI for further instruction.

Table 7: Troubleshooting the Beacon 110 Rig Monitor (Continued)

Condition	Symptom(s)	Probable Causes	Recommended Action
Slow or No Response/ Difficult or Unable to Calibrate	• Detector responds slowly or does not respond during response test. • Unable to accurately set the zero or response reading during calibration. • Detector requires frequent calibration. ***Note:*** *Under "normal" circumstances, the detector 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 calibration gas is not an appropriate concentration. • The detector is malfunctioning.	1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample. 2. Check the detector housing cap to determine if the flame arrestor is wet or dirty. Clean if necessary. 3. Verify that the calibration gas concentration is appropriate for the detector. Zero emission air (0 ppm H_2S) is normally used for a zero adjustment if the environment is suspect and 25 PPM H_2S in nitrogen is normally used for a response adjustment. 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.

Parts List

Table 8 lists replacement parts and accessories for the Beacon 110 Rig Monitor.

Table 8: Parts List

Part Number	Description
06-1248RK-03	Sample tubing for calibration, 3 foot length
07-0033RK	Detector housing cap gasket
07-0203RK	Rubber retaining boot
14-2101RK	Spacer between H_2S sensor and rubber boot
18-0061RK	Cable bushing
18-0107RK	Conduit hub (3/4 in)
18-0400RK-01	Junction box with rubber spacers
43-0440RK	Reset Switch
43-4165RK	Fuse, 1/4" x 1 1/4", fast acting, 3A, 250 V
51-0096RK	Strobe/horn, 10-33 VDC, NEMA 4X
52-1016RK	Buzzer
65-2423RK-05	H_2S detector (with plug-in sensor)
65-2427RK-05	H_2S sensor with j-box (does not include cable and cable bushing)
71-0232RK	Beacon 110 Rig Monitor Operator's Manual (this document)
81-0151RK-02	Calibration cylinder, 25 PPM H_2S in nitrogen, 58 liter steel
81-0064RK-04	Calibration cylinder, 25 PPM H_2S in nitrogen, 34 liter steel
81-0076RK	Zero air calibration cylinder, 17 liter steel
81-0076RK-01	Zero air calibration cylinder, 34 liter steel
81-0076RK-03	Zero air calibration cylinder, 103 liter steel
81-1050RK	Regulator with gauge and knob, 0.5 LPM, for 17 liter and 34 liter steel calibration cylinders
81-1051RK	Regulator with gauge and knob, 0.5 LPM , for 34AL/58/103 liter calibration cylinders
81-1116RK	Calibration cup/splash guard
ES-1537-H2S	H_2S replacement sensor

Appendix A: Control Button Quick Reference Guide

The Beacon 110 Rig Monitor's control buttons and reset switch allow access to operational modes, resetting of alarms, and display of the Information Screen. Table 9 shows which button combinations perform these functions and which parameters are available for adjustment while in the operational modes. While in these modes, display prompts showing a "?" require you to respond by pressing either the UP/YES (for yes) or DOWN/NO (for no) button. To change parameter settings, use the UP/YES and DOWN/NO buttons to get the desired setting, then press and release the ENTER button to accept the setting.

Table 9: Control Button Quick Reference Chart

Mode Entered or Function Performed	Button Combination	Adjustable or Viewable Parameters
Alarm Reset	Press and Release the Reset Switch	n/a
Min/Max	Press and Hold the Reset Switch for 3 seconds	Minimum and maximum readings can be viewed and reset.
Show Information Screen	Press and Hold DOWN/NO	• Operating DC Voltage. • Beacon 110 Rig Monitor Version/Revision Information
Calibration Mode	Press and Hold UP/YES for 5 seconds	• Fresh Air Adjust • Span Adjust with Calibration Gas
Configuration Mode	Press and Hold UP/YES & ENTER for 5 seconds	• Alarm Levels • Increasing or Decreasing Alarms • Normally Energized or Normally De-energized Relays • Latching or Self-resetting Alarms • Strobe operation (if installed) • Alarm On Delay • Alarm Off Delay (if self-resetting) • Zero Suppression • Noise Filter • Calibration Time-out Period