Pioneer Gas Monitor Operator's Manual

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Warranty

RKI Instruments, Inc., warranties 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:

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

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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Chapter 1: Introduction

Overview

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

About the Pioneer Gas Monitor

The Pioneer is a fixed-mounted, continuous-monitoring instrument. This multiple channel gas monitor is capable of detecting gas at up to four locations. The display screen simultaneously displays the gas readings of all active channels.

The Pioneer includes audible and visual alarms that warn you of hazardous gas conditions. The alarm circuit includes three levels of alarms: alarm 1, alarm 2, and alarm 3. The fail circuit alerts you to failures in the detector(s) or monitor.

Four instrument programs allow you to display and change instrument, channel, and calibration settings.

About this Manual

The *Pioneer Gas Monitor Operator's Manual* is organized as follows:

- **Chapters 1 through 5** describe components of the Pioneer and procedures to install, start up, operate, and maintain the Pioneer.

- **Appendix A** lists the part numbers and descriptions for replacement parts and accessories offered for the Pioneer.

- **Appendix B** includes manual inserts for the gas detection channels originally shipped with your Pioneer. If you add an additional gas detection channel at a later date, make sure you add the applicable manual insert to Appendix B to keep your manual up to date.

The *Pioneer Gas 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 1-1 lists specifications for the Pioneer. See the applicable detection insert in Appendix B, Gas Detectors, for specifications that apply to the detectors supplied with the Pioneer.

Table 1-1: Specifications

Input Power	• 100 to 125 VAC, 50/60 Hz • 200 to 250 VAC, 50/60 Hz (optional) • 11 to 22 VDC or 23 to 60 VDC
Construction (housing)	Fiberglass/polyester with lexan window (NEMA 4X)
Dimensions	12.0 in. H x 10.0 in. W x 6.0 in. D
Weight	8 lbs. (without analyzer cards or AC line cord)
User Controls	• Reset switch • Program buttons (ESCAPE, UP/YES, DOWN/NO, and ENTER)
Relays	Rated for 8 amps at 250 VAC resistive, Form C
Standard Accessory	Operator's manual (this document)

Chapter 2: Description

Overview

This chapter describes external and internal components of the Pioneer Gas Monitor.

External Description

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

Housing

The Pioneer'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 you to install the housing to a vertical surface. Four conduit hubs on the bottom of the housing are for external wiring connections.

CAUTION: *To avoid electrical interference, do not route detector and power wiring through the same conduit hub. Always install a 3/4 in. NPT conduit plug in any unused hub. See Appendix A. Parts List, for ordering information.*

Buzzer

The buzzer is on the bottom of the housing. It is behind 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. It is in front of the buzzer. The reset switch serves three functions:

- You can reset the alarm circuits for "latched" alarms after an alarm 1, alarm 2, or alarm 3 condition passes.

- If the alarm silence setting is ON in the Instrument Setup program, you can silence the buzzer during an alarm 1, alarm 2, or alarm 3 condition. You cannot silence failure alarms.

  You can adjust the alarm silence setting in the Instrument Setup program (see Chapter 4, Operation).

- You can run the Display Setpoints and Readings program (see Chapter 4, Operation).

Internal Description

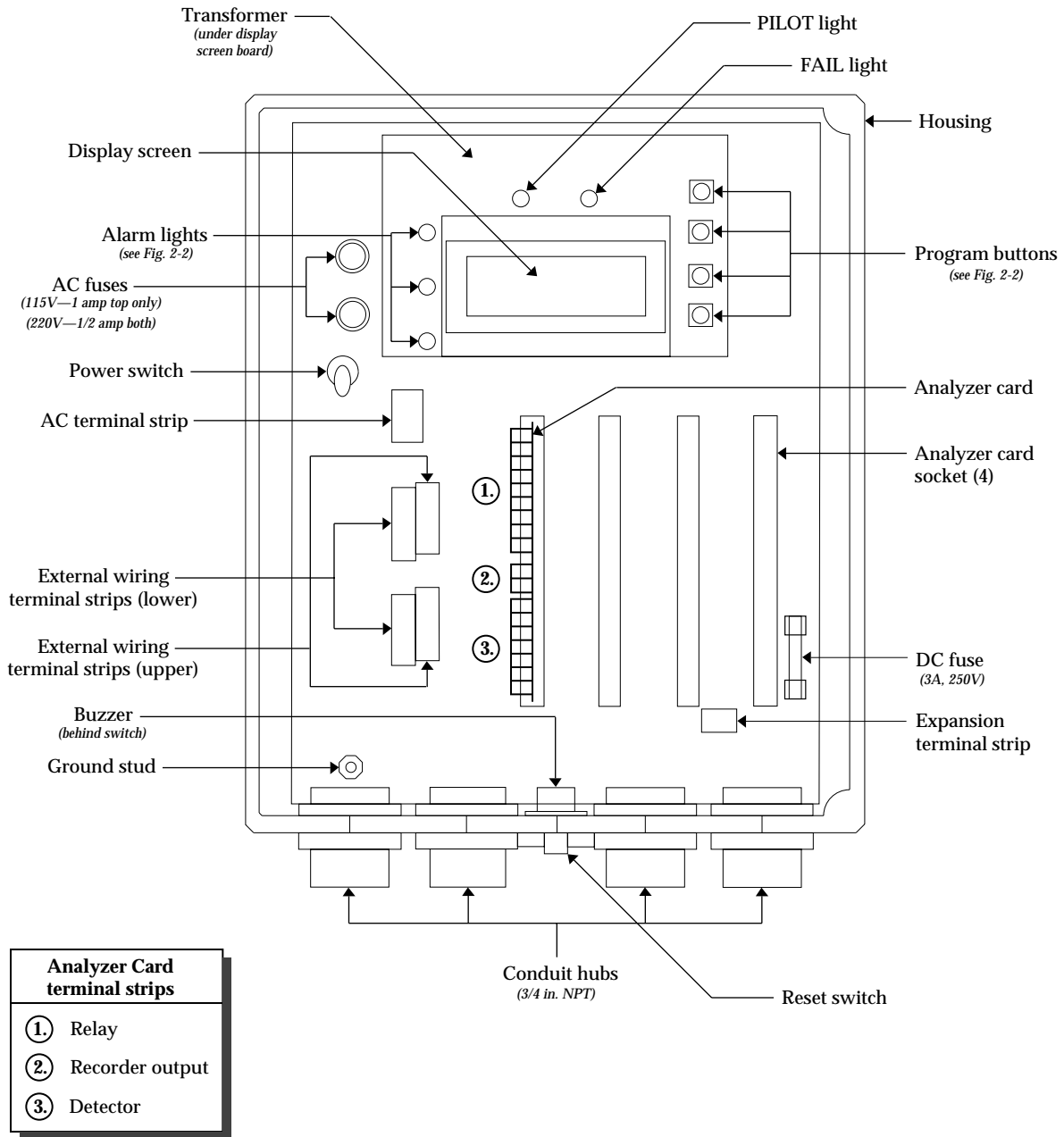This section describes the internal components of the Pioneer.

Transformer
(under display screen board)

PILOT light

FAIL light

Housing

Display screen

Alarm lights
(see Fig. 2-2)

AC fuses
(115V—1 amp top only)
(220V—1/2 amp both)

Program buttons
(see Fig. 2-2)

Power switch

Analyzer card

AC terminal strip

Analyzer card socket (4)

External wiring terminal strips (lower)

External wiring terminal strips (upper)

DC fuse
(3A, 250V)

Buzzer
(behind switch)

Expansion terminal strip

Ground stud

Conduit hubs
(3/4 in. NPT)

Reset switch

Analyzer Card terminal strips

1. Relay
2. Recorder output
3. Detector

Figure 2-1: Pioneer Gas Monitor Component Location

Fuses

The Pioneer includes up to two AC fuses and one DC fuse.

AC fuse(s)

Two AC fuse holders are above the power switch (near the upper left corner of the main circuit board). The AC fuse(s) protects the AC line circuitry from short circuit or overload.

For a 115 VAC power source, a 1-amp fuse is installed in the top fuse holder. For a 220 VAC power source, two 1/2-amp fuses are installed in the top and bottom fuse holders.

NOTE: The **standard** configuration is for 115 VAC operation. 220 VAC operation is an **optional** configuration and must be specified when ordering.

DC fuse

The DC fuse is to the right of the fourth analyzer card socket (near the lower right corner of the main circuit board). The DC fuse protects the DC line circuitry from short circuit or overload. The DC fuse is rated at 3 amps.

Power Switch

The power switch is directly below the AC fuse. The power switch turns the incoming power source on and off at the Pioneer. When the switch is up, the power switch is on. A round polycarbonate guard is mounted to the switch bushing to protect against accidental contact with live parts on the circuit board near the switch.

Transformer

The transformer is to the right of the AC fuse (under the display screen). The transformer receives the incoming AC voltage and converts it to a nominal DC voltage.

Ground Stud

The ground stud extends from the bottom left corner of the main circuit board. Remove the nut to install a ground wire terminated with a #10 lug, then replace the nut.

CAUTION: *Do not use the **GND** terminal to connect the ground wire. Use the ground stud described above.*

Terminal Strips

The Pioneer includes four terminal strips for external wiring connections. See Chapter 3, Installation and Start Up, for wiring procedures.

NOTE: The analyzer card also includes three terminal strips. They are described at the end of this chapter.

AC terminal strip

The 3-point AC terminal strip is below and to the right of the power switch. You connect the incoming AC power source to the AC terminal strip. The AC terminal strip is labeled **TB1** on the main circuit board. A polycarbonate terminal cover protects against accidental contact with the live terminal screws once power to the unit is turned on.

External wiring terminal strips

Two external wiring terminal strips are below the AC terminal strip and to the left of the relays. Each 12-point terminal strip includes a lower (terminals 1 through 6) and upper (terminals 7 through 12) row of terminals. The external wiring terminal strips are labeled **TB2** and **TB3** on the main circuit board. Table 2-1 lists the function of the external wiring terminal strips.

Table 2-1: Terminal Assignments for the External Wiring Terminal Strips

Terminal	Number	Wire to:
TB3	1	Not currently used
	2, 3	RS-485 connection to a personal computer (PC)
	4	Shield
	5, 6	RS-232 connection to a PC
	7 - 9	External alarm for common alarm 3 relay
	10 - 12	External alarm for common alarm 2 relay
TB2	1, 2	DC power source (You can use DC power as a primary or backup power source.)
	3, 4	The buzzer (factory-wired)
	5, 6	The reset switch (factory-wired)
	7 - 9	External alarm for common alarm 1 relay
	10 - 12	External alarm for common fail relay

Expansion terminal strip

The 3-point expansion terminal strip is below and between the third and fourth analyzer card sockets (near the bottom right corner of the main circuit board). You can network up to four Pioneers together by using the expansion terminal strip. The expansion terminal strip is labeled **TB4** on the main circuit board.

Relays

NOTE: Each analyzer card also includes alarm 3, alarm 2, and alarm 1 relays that are dedicated to the channel that the analyzer card is plugged into.

Four relays are to the right of the external wiring terminal strips. The relays are single-pole, double-throw (SPDT) and are rated for 8 amps at 250 VAC (resistive). The relays are from top to bottom alarm 3, alarm 2, alarm 1, and fail. The relays are common for all channels. For example, the alarm 1 relay energizes when **any** active channel goes into an alarm 1 condition.

NOTE: You can select normally energized or normally de-energized relays in the Instrument Setup program. This section describes the default setting: normally de-energized. The fail relay is factory-set as normally energized and is not user-selectable.

Display Screen

NOTE: The display screen, status lights, and program buttons are mounted to a small circuit board. The circuit board is mounted to the main circuit board by standoffs.

The display screen is mounted to a circuit board that is installed in front of the main circuit board. The display screen simultaneously displays the target gas, measuring unit, and current gas reading of all active channels.

The display screen also displays messages, settings, and other data when you are operating the instrument programs (see Chapter 4, Operation).
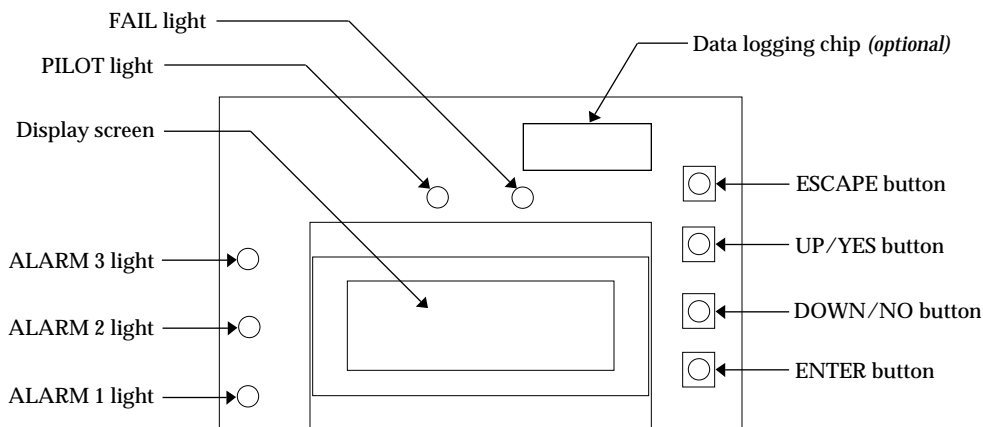

Figure 2-2: Display Screen Component Location

Status Lights

The Pioneer includes six status lights that indicate the current status of the monitor.

POWER light

The POWER light is on the main circuit board near the top edge. The green POWER light is on when the Pioneer has live power connected and the power switch is in the ON position.

PILOT light

The PILOT light is above the display screen and to the left of the FAIL light. The green PILOT light is on when the monitor is receiving incoming power. The PILOT light flashes when the alarms are disabled. The alarms are disabled during instrument warm up and when you enter one of the Pioneer's various programs.

FAIL light

The FAIL light is above the display screen and to the right of the PILOT light. The FAIL light turns on when the Pioneer is experiencing a fail condition. A fail condition can be caused by a failure within the monitor or detector(s) wired to the monitor. See Chapter 5, Maintenance, or the troubleshooting section in the applicable detection insert to respond to a fail condition.

ALARM 3 light

The ALARM 3 light is to the left of the display screen. The ALARM 3 light turns on when the Pioneer is experiencing an alarm 3 condition (see Chapter 4, Operation).

ALARM 2 light

The ALARM 2 light is to the left of the display screen and below the ALARM 3 light. The ALARM 2 light is on when the Pioneer is experiencing an alarm 2 or alarm 3 condition.

ALARM 1 light

The ALARM 1 light is to the left of the display screen and below the ALARM 2 light. The ALARM 1 light turns on when the Pioneer is experiencing an alarm 1, alarm 2, or alarm 3 condition.

Program Buttons

The Pioneer includes four program button that allow you to enter the instrument programs, navigate through the programs, update instrument and channel settings, and save changes to the program settings.

ESCAPE button

The ESCAPE button is above and to the right of the display screen. Use the ESCAPE button to:

- move backward through the instrument programs
- cancel changes you make in the instrument programs
- enter the Instrument Setup program (when pressed with the ENTER button)

UP/YES button

The UP/YES button is to the right of the display screen and below the ESCAPE button. Use the UP/YES button to:

- change settings within the instrument programs
- enter the Calibration program (when pressed with the ENTER button)

DOWN/NO button

The DOWN/NO button is to the right of the display screen and below the UP/YES button. Use the DOWN/NO button to:

- change settings within the instrument programs
- enter the Channel Setup program (when pressed with the ENTER button)

ENTER button

The ENTER button is to the right of the display screen and below the DOWN/NO button. Use the ENTER button to:

- move forward through the instrument programs
- save changes you make in the instrument programs
- enter the Instrument Setup program (when pressed with the ESCAPE button)
- enter the Calibrate program (when pressed with the UP/YES button)
- enter the Channel Setup program (when pressed with the DOWN/NO button)

Analyzer Card

The analyzer card plugs into one of four u-shaped sockets near the bottom right corner of the main circuit board. Each channel of detection includes an analyzer card. The analyzer card includes the detector terminal strip, analog output terminal strip, external alarms terminal strip, pilot light, and three relays.

The terminals unplug from the terminal strips to give better access to the terminals when you make wiring connections.

Detector terminal strip

The 7-point detector terminal strip (terminals 1 through 7) is the terminal strip closest to the bottom of the analyzer card. You connect wiring from the detector to the detector terminal strip.

NOTE: See the applicable detection insert in Appendix B, Gas Detectors, to wire the detector to the analyzer card.

Analog Output terminal strip

The 2-point analog output terminal strip (terminals 8 and 9) is directly above the detector terminal strip. You connect wiring from a recording device (if applicable) to the analog output terminal strip.

The output at the analog output terminal strip is 4 to 20 mA or 0 to 1 V. The output is selectable by jumpers on the analyzer card. The standard (default) output is 4 to 20 mA.

External alarms terminal strip

NOTE: The Pioneer also includes two common external alarm terminal strips. These common terminal strips activate external alarms for **all** active channels.

The 9-point external alarm terminal strip is above the analog output terminal strip. You connect wiring from external alarms (if applicable) to the external alarm terminal strip. This terminal strip has common (C), normally closed (NC) and normally open (NO) terminals for alarm 1, alarm 2, and alarm 3 connections.

Pilot light

The pilot light is between the external alarms terminal strip and analog output terminal strip. The pilot light flashes when the analyzer card is receiving power and operating normally. The pilot light does not flash or is off when a failure occurs.

Relays

NOTE: The Pioneer also includes four common relays (to the left of the analyzer card sockets). The common relays activate for **all** active channels.

Three relays are behind the external alarm terminal strip. The relays are single-pole, double-throw (SPDT) and are rated for 8 amps at 250 VAC (resistive). The relays are from top to bottom alarm 1, alarm 2, and alarm 3. The relays are dedicated to the channel that the analyzer card is plugged into only. For example, the alarm 1 relay energizes only when the channel that the card is plugged into goes into an alarm 1 condition.

NOTE: You can select normally energized or normally de-energized relays in the Instrument Setup program. This section describes the default setting: normally de-energized.

Chapter 3: Installation and Start Up

Overview

This chapter describes procedures to mount the Pioneer Gas 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 (known to be free of combustible gas, toxic gas, and of normal oxygen content). The Pioneer is not in operation as a gas monitoring system until the start-up procedure is complete.***

Mounting the Pioneer Gas Monitor

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

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

    •   Is an AC or DC power source available?

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

    •   Are the display screen and status lights visible?

2. If necessary, close and latch the 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 mounting feet at each corner of the housing to secure the housing to the mounting surface (see Figure 3-1).
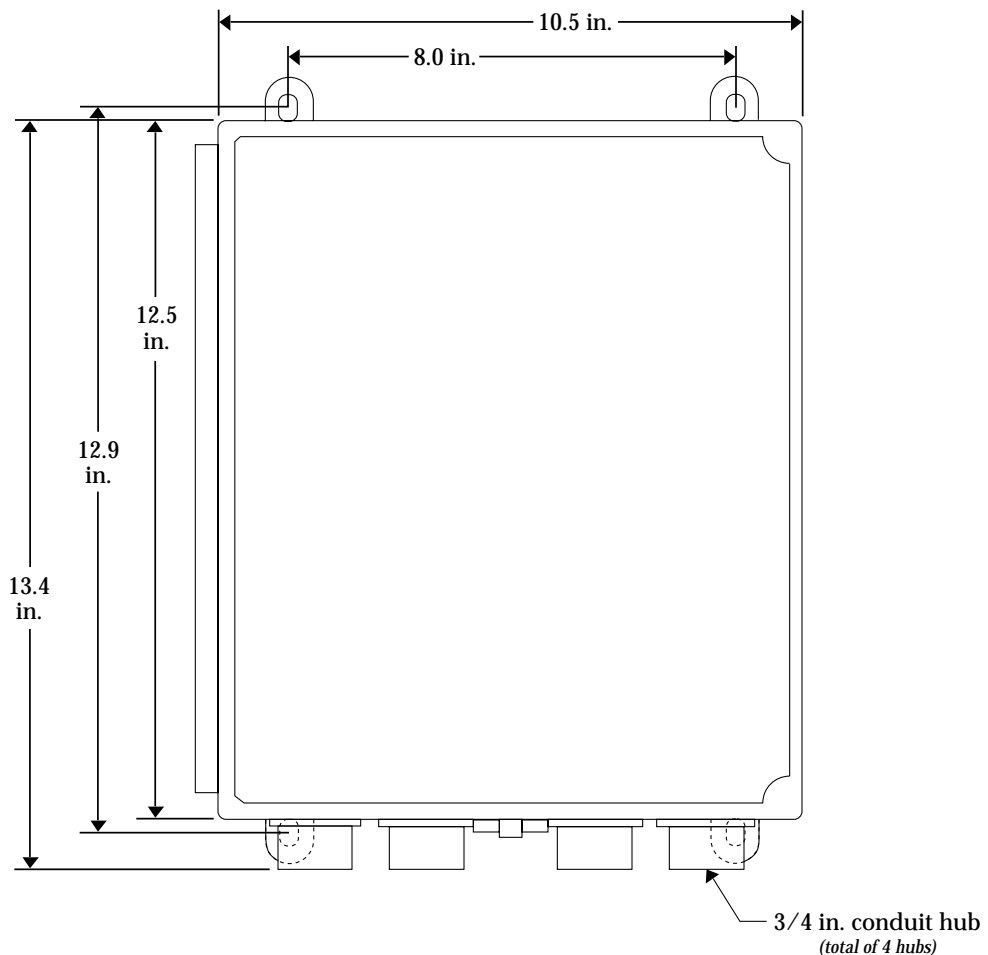

Note: The housing is 6.25 in. deep.

Figure 3-1: Pioneer Gas Monitor Outline and Mounting Dimensions
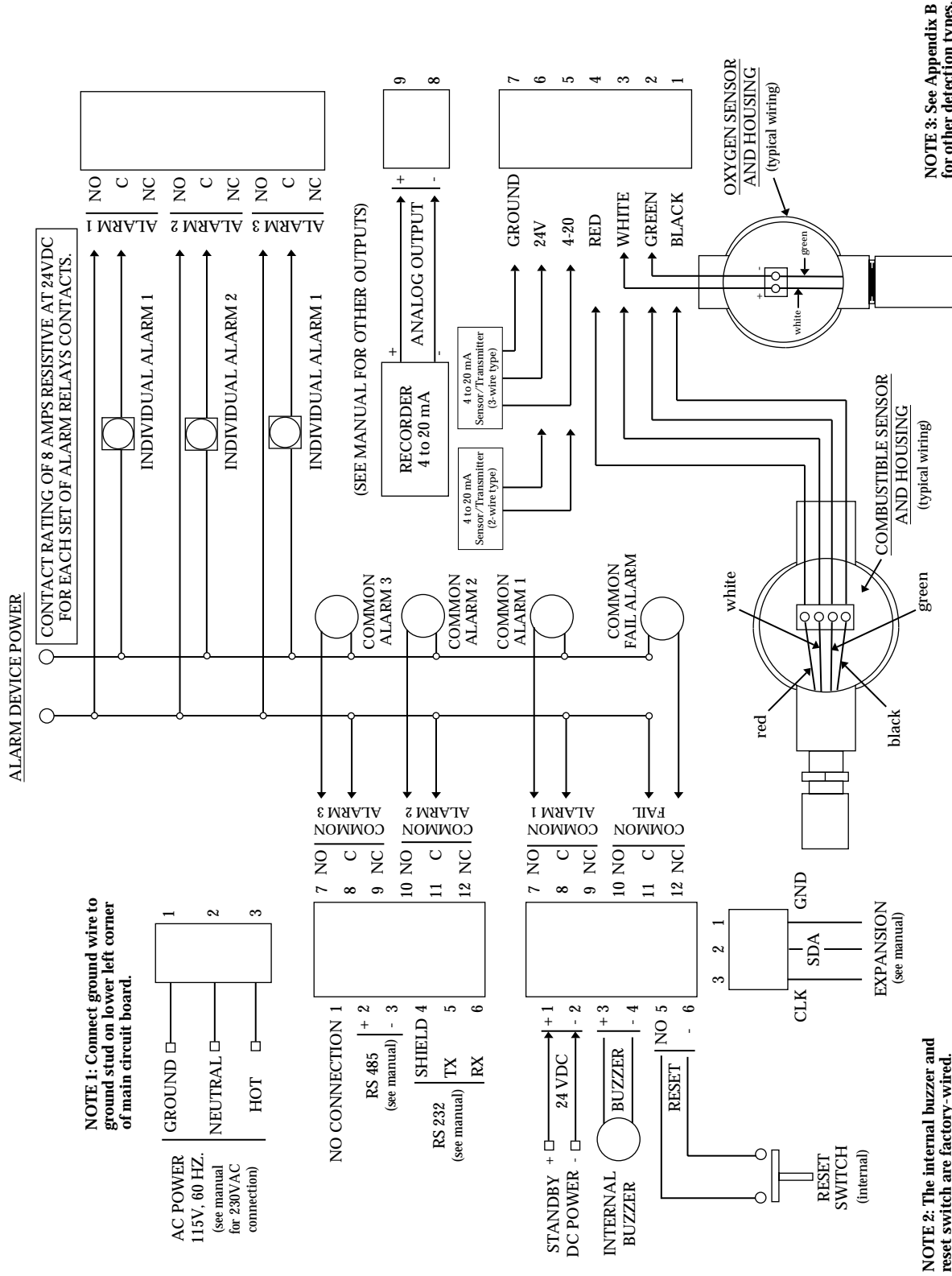
Figure 3-2: Pioneer Gas Monitor External Wiring Diagram

NOTE 3: See Appendix B for other detection types.

NOTE 2: The internal buzzer and reset switch are factory-wired.

NOTE 1: Connect ground wire to ground stud on lower left corner of main circuit board.

Wiring the Pioneer Gas Monitor

This section describes procedures to connect the AC power source, DC power source, external alarm(s), recorder, and detector(s). See Figure 3-2 for a general wiring diagram of all external wiring to the Pioneer. *After completing all wiring connections, install 3/4 in. NPT conduit plugs in all unused conduit hubs. See Appendix A. Parts List, for ordering information.*

WARNING: **Make all connections to the Pioneer before you plug in or turn on the AC or DC power source. Before you make any wiring adjustments, always verify that all power sources are not live.**

Connecting the AC Power Source

NOTE: If you are using DC power as the primary power source, go to the next section, "Connecting the DC Power Source" on page 15.

Perform the following procedure to connect the AC power source to the Pioneer.

WARNING: **Verify that the power source is unplugged or turned off at the power source end before you continue with this procedure.**

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1. Open the housing door, and locate the AC terminal strip (TB1). See Figure 2-1, Pioneer Gas Monitor Component Location, to assist you in locating the AC terminal strip.

2. Remove the AC terminal cover by removing the two screws that retain it.

3. Guide the AC power cord through the leftmost conduit hub on the bottom of the Pioneer housing.

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

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4. Connect the AC line to the AC terminal strip as shown in Figure 3-3. (Connect the ground wire to the ground stud on the lower left corner of the main circuit board.)

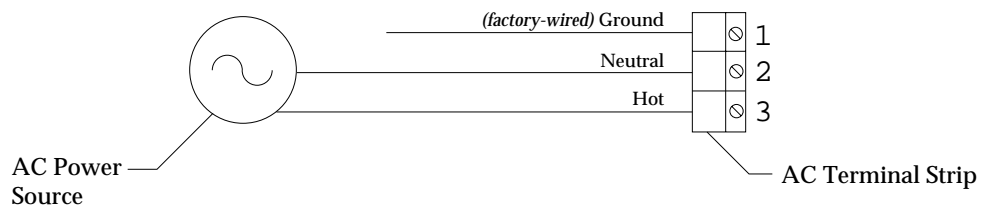5. Replace the AC terminal cover.

(factory-wired) Ground   1
Neutral   2
Hot   3

AC Power Source

AC Terminal Strip

Figure 3-3: AC Power Wiring

Connecting the DC Power Source

WARNING: *Verify that the power source is unplugged or turned off at the power source end before you continue with this procedure.*

Perform the following procedure to connect the DC power source to the Pioneer.

NOTE: A jumper block located at the middle upper edge of the main circuit board allows you to configure the Pioneer to operate from either 12 VDC **or** 24 VDC.

          To select 12 VDC operation (input range of 11 to 22 VDC), install the jumper block over the right two pins. **To select 24 VDC operation** (input range of 23 to 60 VDC), install the jumper block over the left two pins. The factory default configuration is for 24 VDC operation.

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1. Open the housing door, and locate the bottom external wiring terminal strip (TB2). See Figure 2-1, Pioneer Gas Monitor Component Location, to assist you in locating the bottom external wiring terminal strip.

2. Guide a DC power cord through one of the conduit hubs on the bottom of the Pioneer housing.

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

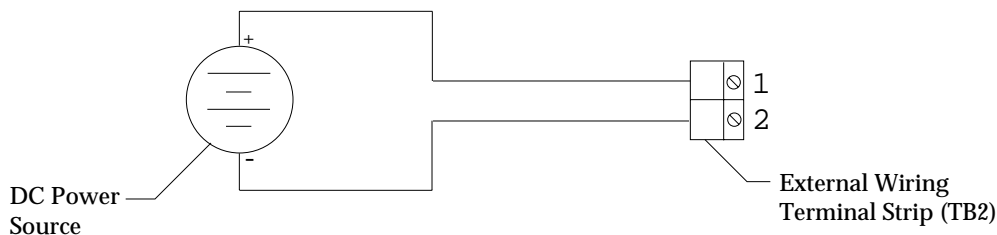3. Connect the DC line to the lower row of terminals on the external wiring terminal strip as shown in Figure 3-4.

Figure 3-4: DC Power Wiring

Connecting External Alarms

Perform the following procedure to connect external alarms to the Pioneer.

NOTE: The analyzer card includes external alarm connections that are dedicated to the applicable channel only. See Appendix B, Gas Detectors, to wire external alarms to the analyzer card.

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1. Open the housing door, and locate the external wiring terminal strips (TB2 and TB3). See Figure 2-1, Pioneer Gas Monitor Component Location, to assist you in locating the external wiring terminal strips.

2. Guide the wiring of the external alarm through one of the conduit hubs on the bottom of the Pioneer housing.

3. Connect the leads from the external alarm to the terminals on the appropriate external wiring terminal strip as shown in Figure 3-5. See Table 2-1, Terminal Assignments for the External Wiring Terminal Strips, to determine the applicable external alarm terminals.
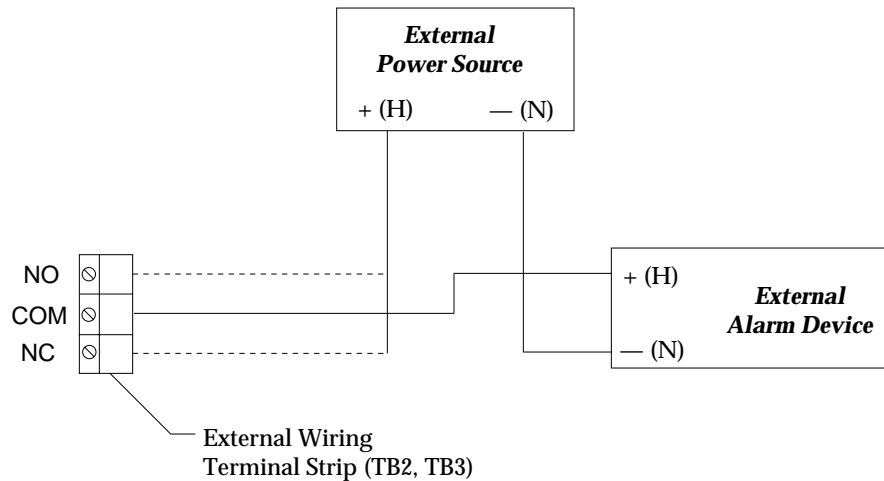

Figure 3-5: External Alarm Wiring

4. Repeat steps 2 and 3 for additional external alarms.

Connecting Recorders

Perform the following procedure to connect a recording device to the Pioneer. The output at the analyzer card's analog output terminal strip is a 4 to 20 mA **or** 0 to 1 V signal that is proportional to the detection range of the applicable detector. Unless specified, the analyzer card is set up at the factory for 4 to 20 mA output.

1. Open the housing door, and locate the analog output terminal strip on the applicable analyzer card. (The analog output terminal strip is the 2-point terminal strip between the detector terminal strip and the external alarm terminal strip.)

2. Guide the wiring from the recording device through one of the conduit hubs on the bottom of the Pioneer housing.

3. Connect the leads from the recording device to the analog output terminal strip as shown in Figure 3-6.
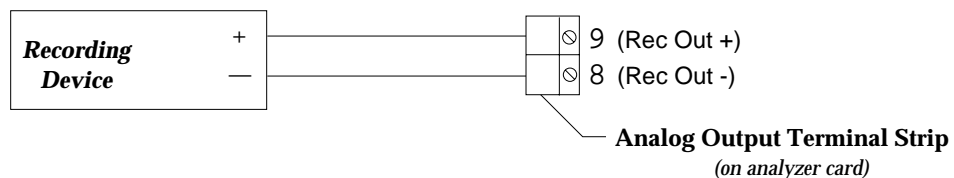

Figure 3-6: Recorder Output Wiring

Connecting RKI Detectors

See the manual insert(s) in Appendix B, Gas Detectors, to wire the detector(s) supplied by RKI Instruments, Inc., to the Pioneer.

Connecting User-Supplied 4 to 20 mA Transmitters

NOTE: **:**See the manual insert, "Generic 4 to 20 mA Transmitter," in Appendix B, Gas Detectors, for more detailed information related to the use of user-supplied 4 to 20 mA transmitters with the Pioneer.

Perform the following procedure to connect a 4 to 20 mA transmitter (that you supply) to the Pioneer.

1. Open the housing door, and locate the detector terminal strip on the applicable analyzer card. (The detector terminal strip is the 7-point terminal strip that is below the analog output terminal strip.)

2. Route the cable leading from the transmitter through one of the conduit hubs on the bottom of the Pioneer housing.

CAUTION: *Do not route power and transmitter wiring through the same conduit hub. The power wiring may disrupt the transmission of the transmitter's signal to the Pioneer.*

---

3. Connect the wires to the detector terminal strip of the applicable analyzer card as shown in Figure 3-7. The detector is the 7-point terminal strip (terminals 1 through 7) on the card.
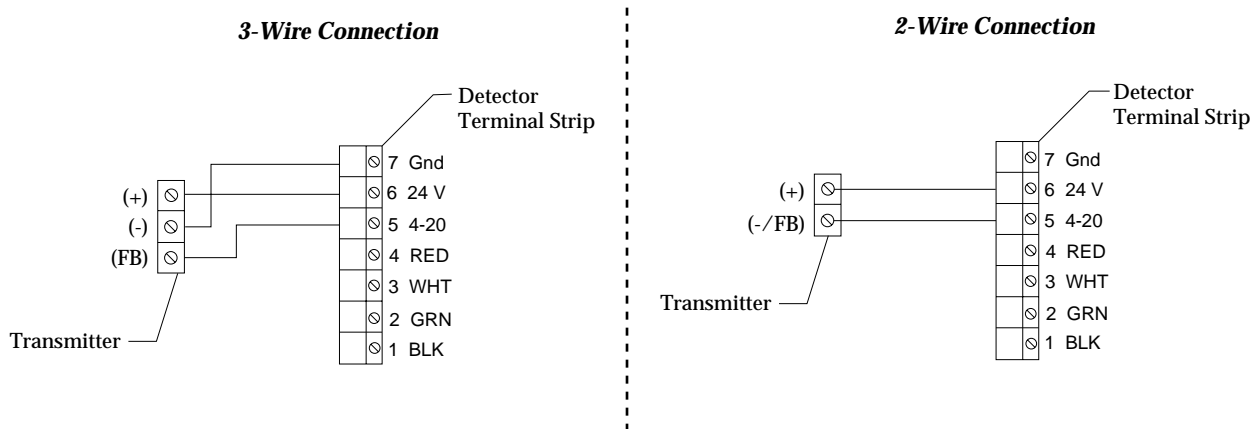
Figure 3-7: Generic 4 to 20 mA Transmitter Output Wiring

Starting Up the Pioneer Gas Monitor

Perform the following procedure to place the Pioneer into normal operation.

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

2. Complete all installation procedures described in Appendix B, Gas Detectors.

3. Verify that all wiring connections are correct and secure and the Pioneer's power switch is in the OFF position.

4. Plug in or turn on the incoming power source (AC or DC) at the power source end.

5. Place the Pioneer's power switch in the ON position.

NOTE: To prevent unwanted alarms during warm up, the alarm circuits are not active for 20 seconds to 2 minutes (depending on warm up) from the time you turn the power switch on.

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6. Verify the following:

   - The PILOT light above the display screen is on.

   - The POWER light on the main circuit board is on.

   - The pilot light on each analyzer card is flashing.

   If the pilot lights are not on or flashing, see the troubleshooting guides in Chapter 5, Maintenance, and Appendix B, Gas Detectors.

7. Perform the start-up procedure for each detector as described in Appendix B, Gas Detectors.

Chapter 4: Operation

Overview

This chapter describes the Pioneer Gas Monitor in normal operation. This chapter also describes the Pioneer in alarm 1, alarm 2, alarm 3, and fail conditions and suggests response to these conditions. The Instrument Setup program and Display Setpoints and Readings program are described at the end of this chapter.

Normal Operation

Normal operation is defined as follows:

*   the start-up procedure is complete.

*   the Pioneer is not indicating an alarm 1, alarm 2, alarm 3, or fail condition.

*   the Pioneer is not running the Instrument Setup, Channel Setup, Calibrate, or Display Setpoints and Readings program.

During normal operation, the Pioneer simultaneously displays the target gas, unit of measure, and current gas reading for all active channels. The Pioneer displays the readings horizontally for each channel. If all four channels are installed, channel 1 is the top reading, and channel 4 is the bottom reading.

```
CH 1              0   %LEL      COMB
CH 2         20.9    %VOL       OXY
CH 3              0   PPM         CO
CH 4              0   PPM        H2S
```

The PILOT light near the display screen, the POWER light on the main circuit board, and the pilot light on each analyzer card are on during normal condition indicating that the monitor and analyzer cards are receiving incoming power. The output at terminals 8 and 9 of the analyzer card's output terminal strip is 4 to 20 mA **or** 0 to 1 V and is proportional to the detection range of the detector that is wired to the analyzer card. (The standard output at terminals 8 and 9 is 4 to 20 mA.)

Alarm Indications

This section describes the Pioneer in alarm 1, alarm 2, alarm 3, and fail conditions and suggests response to these conditions. Table 4-1 lists the alarm indications for each condition.

NOTE: The Pioneer includes alarm on and alarm off delay settings. The alarm indications described in this section operate according to the default delay settings. See the Channel Setup program section in the applicable detection insert (Appendix B, Gas Detectors) to display or change the alarm on and alarm off delay settings.

Table 4-1: Visual and Audible Alarm Indications

Condition	Cause	Visual Indication	Audible Indication
Alarm 1	Increasing (decreasing for O_2) gas reading at or above the alarm 1 setpoint	• ALARM 1 light is on • Gas reading flashes	Pulsing tone
Alarm 2	Increasing (decreasing for O_2) gas reading at or above the alarm 2 setpoint	• ALARM 1 and ALARM 2 lights are on • Gas reading flashes	Faster pulsing tone than Alarm 1
Alarm 3	Increasing gas reading at or above the alarm 3 setpoint	• ALARM 1, ALARM 2, and ALARM 3 lights are on* • Gas reading flashes	Faster pulsing tone than Alarm 2
Fail	• Disconnected or misconnected detector wiring • Disconnected or misconnected analyzer card • Display reading below fail setpoint • Defective components	• FAIL light is on	Steady tone

*   *The ALARM 1 and ALARM 2 lights are not on for oxygen channels.*

NOTE: You can select normally energized or normally de-energized relays in the Channel Setup program. The following sections describe the default setting for the relays: normally de-energized. The fail relay is factory-set for normally energized and is not user-selectable.

Alarm 1 Condition

This section describes the audible and visual indications for an alarm 1 condition and suggests response to an alarm 1 condition.

Alarm 1 condition indications

When the gas reading of an active channel reaches the alarm 1 setpoint, the Pioneer senses an alarm 1 condition. The Pioneer alerts you to an alarm 1 condition as follows:

*   the ALARM 1 light turns on
*   the gas reading in alarm 1 condition flashes
*   the buzzer sounds a pulsing tone
*   the common alarm 1 relay energizes
*   the alarm 1 relay on the applicable analyzer card energizes

Responding to an alarm 1 condition

This section suggests response to an alarm 1 condition.

1. Follow your established procedure for a low level combustible or toxic gas condition or a decreasing oxygen content condition.

2. 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 light, and de-energizes the common and analyzer card alarm 1 relays.

NOTE: To silence the buzzer while in an alarm 1 condition, press the reset switch. You cannot de-energize the alarm 1 relays until the gas reading falls below (above for oxygen) the alarm 1 setpoint.

Alarm 2 Condition

This section describes the audible and visual indications for an alarm 2 condition and suggests response to an alarm 2 condition.

Alarm 2 condition indications

When the gas reading of an active channel reaches the alarm 2 setpoint, the Pioneer senses an alarm 2 condition. The Pioneer alerts you to an alarm 2 condition as follows:

- the ALARM 2 light turns on

- the gas reading in alarm 2 condition continues to flash

- the buzzer sounds a faster pulsing tone than an alarm 1 condition

- the common alarm 2 relay energizes

- the alarm 2 relay on the applicable analyzer card energizes

Responding to an alarm 2 condition

This section suggests response to an alarm 2 condition.

1. Follow your established procedure for a mid level combustible or toxic gas condition or a severe decreasing oxygen content condition.

2. After the gas reading falls below the alarm 2 setpoint, press the reset switch to reset the alarm circuit. Resetting the alarm circuit turns off the ALARM 2 light, and de-energizes the common and analyzer card alarm 2 relays.

NOTE: To silence the buzzer while in an alarm 2 condition, press the reset switch. You cannot de-energize the alarm 2 relays until the gas reading falls below (above for oxygen) the alarm 2 setpoint.

Alarm 3 Condition

This section describes the audible and visual indications for an alarm 3 condition and suggests response to an alarm 3 condition.

Alarm 3 condition indications

When the gas reading of an active channel reaches the alarm 3 setpoint, the Pioneer senses an alarm 3 condition. The Pioneer alerts you to an alarm 3 condition as follows:

- the ALARM 3 light turns on

- the gas reading in alarm 3 condition continues to flash (the gas reading for O_2 channels begins flashing)

- the buzzer sounds a faster pulsing tone than an alarm 1 or alarm 2 condition

- the common alarm 3 relay energizes

- the alarm 3 relay on the applicable analyzer card energizes

NOTE: The alarm 3 relay does not energize if you elect to use it as the channel's fail relay in the Channel Setup program (see the "Channel Setup Program" section of the applicable detection insert in Appendix B, Gas Detectors.)

Responding to an alarm 3 condition

This section suggests response to an alarm 3 condition.

1. Follow your established procedure for a high level combustible or toxic gas condition or an increasing oxygen content condition.

2. After the gas reading falls below the alarm 3 setpoint, press the reset switch to reset the alarm 3 circuit. Resetting the alarm 3 circuit turns off the ALARM 3 light, and de-energizes the common and analyzer card alarm 3 relays.

NOTE: To silence the buzzer while in an alarm 3 condition, press the reset switch. You cannot de-energize the alarm 3 relays until the gas reading falls below the alarm 3 setpoint.

Fail Condition

This section describes the audible and visual indications for a fail condition and suggests response to a fail condition.

Fail condition indications

The Pioneer senses a fail condition for any of the following:

• the detector wiring is disconnected or incorrectly connected

• the analyzer card is disconnected or incorrectly connected

• the display reading is below the fail setpoint

• the monitor or detector is malfunctioning

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

• the FAIL light turns on

• the gas reading in fail condition flashes

• the buzzer sounds a steady tone

• the common fail relay de-energizes

NOTE: If you elected to use the analyzer card's alarm 3 relay as an individual fail relay in the Channel Setup program, the relay de-energizes in a fail condition. (See the "Channel Setup Program" section of the applicable detection insert in Appendix B, Gas Detectors.)

Responding to a fail condition

This section suggests response to a fail condition.

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

2. Verify that the analyzer card is securely and correctly installed. (The components of the analyzer card face left when the analyzer card is correctly installed.)

3. See the troubleshooting guide in the applicable detection insert (Appendix B, Gas Detectors).

Instrument Setup Program

This section describes the Instrument Setup program. You can display and change the following instrument settings with the Instrument Setup program.

- Alarm On Delay
- Alarm Off Delay
- Relay Action
- Alarm Logic
- Alarm Silence
- Alarm Hysteresis
- Calibration Time Out
- Instrument ID (RS-232 or RS-485 address)
- Noise Filter
- Maximum Number of Channels (for use when connecting to other Pioneers)
- Zero Suppression
- Instrument Label

Navigating through the Instrument Setup Program

Use the program buttons to the right of the display screen to enter the program, move forward or backward through the program, change settings within the program, and save or cancel changes to the program settings. Table 4-2 lists the function of each program button.

Table 4-2: Program Button Functions for the Instrument Setup Program

Button	Function
ESCAPE	• Moves you backward through the program • Cancels changes made to the program settings • Enters the program (with the ENTER button)
UP/YES	• Updates the setting that is flashing on the display screen
DOWN/NO	• Updates the setting that is flashing on the display screen
ENTER	• Moves you forward through the program • Saves changes made to the program settings • Enters the program (with the ESCAPE button)

Running the Instrument Setup Program

This section describes how to enter the program, display and change program settings, and save or cancel changes to the program settings.

Entering the instrument setup program

1. Open the housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and ESCAPE buttons simultaneously three times.

   The display screen indicates that you are in the Instrument Setup program.

3. Press the ENTER, UP/YES, or DOWN/NO button to continue.

   The program displays the Alarm ON Delay screen.

Alarm on delay screen

This screen indicates the length of time that the Pioneer delays alarm indications (buzzer and relays) when it senses an alarm 1, alarm 2, or alarm 3 condition. You can choose from a range of 0 Seconds to 60 Minutes. The default setting is **0 Minutes, 1 Seconds**.

```
Alarm  ON  Delay:
0        Minutes
1        Seconds
```

- To accept the alarm on delay setting and continue the program, press the ENTER button.

   The program displays the Alarm OFF Delay screen.

- To update the alarm on delay setting:
   1. Use the UP/YES and DOWN/NO buttons to display the setting you want.
   2. Press the ENTER button to continue the program.

   The program displays the Alarm OFF Delay screen.

Alarm off delay screen

This screen indicates the length of time that the Pioneer delays turning off alarm indications (buzzer and relays) after an alarm 1, alarm 2, or alarm 3 condition passes. You can choose from a range of 0 Seconds to 60 Minutes. The default setting is **0 Minutes, 0 Seconds**.

```
Alarm  OFF  Delay:
0        Minutes
0        Seconds
```

- To accept the alarm off delay setting and continue the program, press the ENTER button.

   The program displays the Relay Action screen.

- To update the alarm off delay setting:
   1. Use the UP/YES and DOWN/NO buttons to display the setting you want.
   2. Press the ENTER button to continue the program.

   The program displays the Relay Action screen.

Relay action screen

This screen indicates how the relays operate in normal and alarm conditions. If the setting is **NORMALLY DE-ENERGIZED**, the relays energize in alarm conditions. If the setting is **NORMALLY ENERGIZED**, the relays de-energize in alarm conditions. The default setting is **NORMALLY DE-ENERGIZED**.

NOTE: The common fail relay and channel fail relay (if assigned) are not affected by this setting. Fail relay(s) are factory-set as normally energized and are not adjustable.

```
RELAYS  NORMALLY
DE-ENERGIZED
```

- To accept the relay action setting and continue the program, press the ENTER button.

  The program displays the Alarm Logic screen.

- To update the relay action setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Alarm Logic screen.

Alarm logic screen

This screen indicates how an alarm circuit is reset after the applicable alarm condition passes. If the setting is **LATCHING**, you must press the reset switch after the alarm condition passes to reset the alarm circuit. If the setting is **AUTO-RESET**, the alarm circuit is automatically reset after the alarm condition passes. The default setting is **LATCHING**.

```
ALARMS
LATCHING
```

- To accept the alarm logic setting and continue the program, press the ENTER button.

  The program displays the Alarm Silence screen.

- To update the alarm logic setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Alarm Silence screen.

Alarm silence screen

This screen indicates how the buzzer operates during alarm conditions. If the setting is **ON**, you can use the reset switch to silence the buzzer during alarm conditions. If the setting is **OFF**, you cannot silence the buzzer until all alarm conditions pass. The default setting is **ON**.

```
┌─────────────────────────────────────┐
│ A L A R M    S I L E N C E           │
│    O N                               │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

- To accept the alarm silence setting and continue the program, press the ENTER button.

  The program displays the Alarm Hysteresis screen.

- To update the alarm silence setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Alarm Hysteresis screen.

Alarm hysteresis screen

This screen indicates when the Pioneer considers an alarm condition passed. The alarm hysteresis feature helps prevent readings that are near an alarm setpoint from frequently going into and out of alarm (relay chattering). For example, if the alarm hysteresis setting is 2.0% of fullscale, fullscale is 10.0 ppm, and the alarm 1 setpoint is 3.0 ppm; then the Pioneer will not consider the alarm 1 condition "passed" until the reading goes below 2.8 ppm. You can choose from a range of 0.0% to 10.0% of fullscale (in 0.1% increments). The default setting is **2.0%**.

```
┌─────────────────────────────────────┐
│ A L A R M    H Y S T E R E S I S     │
│   2 . 0 %   O F   F U L L S C A L E  │
│                                      │
│                                      │
└─────────────────────────────────────┘
```

- To accept the alarm hysteresis setting and continue the program, press the ENTER button.

  The program displays the Calibration Time Out screen.

- To update the alarm hysteresis setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Calibration Time Out screen.

Calibration time out screen

The Pioneer's Calibrate program includes two separate time-out features. The first time-out feature is a general 5-minute time-out. The Pioneer automatically returns to the normal screen if you do not move from one Calibrate screen to another within 5 minutes. You cannot adjust this setting, and it affects all Calibrate screens except the Fresh Air and Calibration screens.

The second time-out feature affects the Fresh Air and Calibration screens only. These are the screens you use during calibration to adjust the zero and span readings (either at the transmitter or the Pioneer). The Pioneer automatically returns to the normal screen if you do not move from the Fresh Air or Calibration screen within the time-out setting specified in the screen below. You can choose from a range of 10 to 100 minutes (in increments of 10). The default setting is **10 Minutes**.

```
Calibration Menu
Time-Out:
   10      Minutes
```

- To accept the calibration time out setting and continue the program, press the ENTER button.

  The program displays the Instrument ID screen.

- To update the calibration time out setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Instrument ID screen.

Instrument ID screen

This screen indicates the ID number (address) for this Pioneer. The instrument ID is recorded in the datalog when the datalog records instrument readings. This setting is useful if you have more than one Pioneer networked together. You can choose from a range of 1 to 255. The default setting is **1**.

```
INSTRUMENT  ID  FOR
RS232  &  RS485:   1
```

- To accept the instrument ID setting and continue the program, press the ENTER button.

  The program displays the Noise Filter screen.

- To update the instrument ID setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Noise Filter screen.

Noise filter screen

This screen indicates the length of time that the Pioneer averages data. You can choose from a range of 0.5 to 15.0 seconds (in increments of 0.5). The default setting is **2.5 Seconds**.

```
Noise   Filter
   2.5     Seconds
```

NOTE: The Pioneer continuously displays gas readings although it averages gas readings according to the noise filter setting.

- To accept the noise filter setting and continue the program, press the ENTER button.

  The program displays the Number of Channels screen.

- To update the noise filter setting:

  1.   Use the UP/YES or DOWN/NO button to display the setting you want.

  2.   Press the ENTER button to continue the program.

  The program displays the Number of Channels screen.

Number of channels screen

This screen indicates the maximum number of channels possible for the Pioneer. The settings are displayed in multiples of 4. For example, if you have three Pioneers networked together, select a setting of 12. You can choose from a range of 4 to16 (in increments of 4). The default setting is **4**.

```
Maximum  #  of  Chans:
4
```

- To accept the number of channels setting and continue the program, press the ENTER button.

  The program displays the Zero Suppression screen.

- To update the number of channels setting:

  1.   Use the UP/YES or DOWN/NO button to display the setting you want.

  2.   Press the ENTER button to continue the program.

  The program displays the Zero Suppression screen.

Zero suppression screen

This screen indicates the zero suppression for the Pioneer. The zero suppression feature helps prevent "jumpy" readings near the normal reading. For example, if the zero suppression setting is 2.0% of fullscale and fullscale is 10.0 ppm, then the Pioneer will display a reading of 0.0 ppm for gas readings from -0.2 to 0.2 ppm. You can choose from a range of 0.0% to 5.0% (in 0.1% increments). The default setting is **2.0%**.

```
┌──────────────────────────────────────┐
│  ZERO  SUPPRESSION                     │
│   2.0%  OF  FULLSCALE                  │
│                                        │
│                                        │
└──────────────────────────────────────┘
```

- To accept the zero suppression setting and continue the program, press the ENTER button.

  The program displays the Instrument Label screen.

- To update the zero suppression setting:

  1. Use the UP/YES or DOWN/NO button to display the setting you want.

  2. Press the ENTER button to continue the program.

  The program displays the Instrument Label screen.

Instrument label screen

This screen indicates the identifying label for this Pioneer. The instrument label is recorded in the datalog when the datalog records instrument readings. This setting is useful if you have more than one Pioneer networked together. You can choose a label of up to 15 characters. Characters can be letters, numbers, symbols, or blank spaces. The default setting is **RKI INSTRUMENTS**.

```
┌──────────────────────────────────────┐
│  Instrument  Label                     │
│  RKI  INSTRUMENTS                      │
│                                        │
│                                        │
└──────────────────────────────────────┘
```

- To accept the instrument label setting and continue the program, press the ENTER button until the Instrument Setup Exit screen displays.

- To update the instrument label setting:

  1. Use the ENTER button to *select* the character you want to change. (The character flashes when it is selected.)

  2. Press the UP/YES or DOWN/NO button to *display* the character you want, then press the ENTER button to select the next character.

  3. Repeat steps 1 and 2 until the label is correct, then press the ENTER button until the Instrument Setup Exit screen displays.

Instrument setup exit screen

This screen saves or cancels any changes you made in the Instrument Setup program.

```
ESCAPE =  Previous
ENTER  =  Store Set-Up

```

- **To save changes** and exit the program, press the ENTER button.

  A confirmation message displays, then the normal screen displays. The Pioneer is in normal operation.

- **To cancel changes** and exit the program, press the ESCAPE button until the following message displays: "INSTRUMENT SET-UP NOT SAVED. USING PREVIOUS VALUES."

  The normal screen displays. The Pioneer is in normal operation.

Display Setpoints and Readings Program

This section describes the Display Setpoints and Readings program. You can display the following in this program. (You can also allow the Pioneer to perform a self check procedure and reset the minimum and maximum readings in this program.)

- Software versions
- Time Weighted Average (TWA) and Short Term Exposure Limit (STEL) readings (for applicable channels)
- Minimum and maximum readings (for each channel)
- Alarm Sets (for each channel)

Navigating through the Display Setpoints and Readings Program

Use the reset switch to begin the program, display the setpoints and readings, and exit the program.

NOTE: This is a display only program. You cannot change settings or gas readings in the Display Setpoints and Readings program.

Running the Display Setpoints and Readings Program

This section describes how to display the various setpoints and gas readings that are included in this program. This section also describes how to display the time and date and begin the self check procedure.

NOTE: Once you display one of the screens, the Pioneer automatically returns to the normal screen in 1 minute if you do not continue or exit the program.

To display software versions:

The Display Setpoints and Readings program displays the version number of the Pioneer's instrument, display, and channel software programs.

1. Press and hold down the reset switch to enter the program.

2. When the DISPLAY VERSIONS screen appears, release the reset switch.

3. Press and release the reset switch to display the remaining software versions and return to the normal screen.

To display TWA and STEL readings:

The Pioneer continuously computes Time Weighted Average (TWA) and Shot Term Exposure Limit (STEL) readings for all active channels.

NOTE: The Pioneer does not calculate or display TWA and STEL setting for oxygen channels or combustible gas channels that have a unit of measure setting of **%LEL**. However, the Pioneer does calculate and display TWA and STEL settings for combustible gas channels that have a unit of measure setting of **PPM/LEL**.

The STEL reading represents a channel's average gas readings for the past 15 minutes. The TWA reading represents a channel's average gas readings for the past 8 hours.

1. Press and hold down the reset switch to enter the program.

2. When the DISPLAY TWA/STEL screen appears on the display screen, release the reset switch.

   The STEL reading displays for the first active channel.

3. Press and release the reset switch to display the TWA reading for the first active channel.

4. Continue pressing and releasing the reset switch to display the STEL and TWA readings for the remaining channels.

5. Press and release the reset switch to return to the normal screen.

To display minimum and maximum readings:

The Pioneer stores the minimum and maximum reading for all active channels since the last time the minimum and maximum readings were reset.

1. Press and hold down the reset switch to enter the program.

2. When the DISPLAY MIN/MAX screen appears on the display screen, release the reset switch.

   The minimum reading displays for the first active channel.

3. Press and release the reset switch to display the maximum reading for the first active channel.

4. Continue pressing and releasing the reset switch to display the minimum and maximum readings for the remaining channels.

5. Press and release the reset switch to return to the normal screen.

To display alarm sets:

The Display Setpoints and Readings program displays the alarm sets for all active channels. The alarm sets include the alarm logic, alarm silence, alarm setpoint, and alarm type settings.

NOTE: You can change the alarm logic and alarm silence settings in the Instrument Setup program. You can change the alarm setpoint and alarm type settings in the Channel Setup program.

---

1. Press and hold down the reset switch to enter the program.

2. When the ALARM SETS screen appears on the display screen, release the reset switch.

   The alarm logic setting (LATCHING or AUTO-RESET) displays for all active channels.

3. Press and release the reset switch to display the alarm silence setting (ON or OFF) for all active channels.

4. Continue pressing and releasing the reset switch to display the setpoint and alarm type for the fail, alarm 1, alarm 2, and alarm 3 alarms of channel 1.

5. Repeat step 4 to display the setpoint and alarm type for the remaining active channels.

6. Press and release the reset switch to return to the normal screen.

To perform the self check:

The Pioneer includes a self check feature that makes sure the analyzer card(s) and microprocessor are operating correctly.

1. Press and hold down the reset switch to enter the program.

2. When the SELF CHECK screen appears on the display screen, release the reset switch.

   The Pioneer performs the self check procedure and returns to the normal screen. This process takes approximately 5 seconds.

To reset Minimum/Maximum readings:

If you reset the minimum and maximum readings, you cannot retrieve the minimum and maximum readings previously stored by the Pioneer.

1. Press and hold down the reset switch to enter the program.

2. When the RESET MIN/MAX screen appears on the display screen, release the reset switch.

3. The message "MIN/MAX RESET DONE" appears on the display screen, then the program returns to the normal screen.

Chapter 5: Maintenance

Overview

This chapter describes corrective maintenance procedures for the Pioneer Gas Monitor. It includes a troubleshooting guide for problems you may encounter with the Pioneer. Procedures to replace components of the Pioneer are at the end of this chapter.

Preventive Maintenance

Preventive maintenance of the Pioneer consists of daily, monthly, and quarterly procedures to ensure that the detectors remain on zero (20.9 for oxygen) in fresh air and are responsive to gas. Appendix B, Gas Detectors, includes preventive maintenance schedules for the detectors supplied with your Pioneer.

Troubleshooting

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

NOTE: This troubleshooting guide describes controller problems only. See the Troubleshooting guide in the applicable manual insert (Appendix B, Gas Detectors) for problems you may encounter with the detectors.

No Power

Symptoms

- All status lights are off.
- The display screen is blank.

Probable causes

- The power wiring is disconnected or misconnected.
- The AC or DC fuse is blown.
- The display cable is disconnected.

Recommended action

1. Verify that the wiring to the power source is correct and secure.
2. At the Pioneer, verify that the wiring to the AC terminal strip is correct and secure.
3. Check the continuity of the applicable (AC or DC) fuse.
4. Verify that the display cable is connected. The display (ribbon) cable plugs into connectors on the bottom of the display board and directly above the transformer.
5. If the power difficulties continue, contact RKI Instruments, Inc., for further instruction.

Frequent or Suspect Alarms

Symptoms

• The Pioneer alerts you to frequent or suspect alarms, but the detector's fresh air readings remain on zero (20.9 for oxygen).

Probable causes

• The Pioneer is experiencing false readings due to Radio Frequency Interference (RFI) or Electromagnetic Interference (EMI).

• The detector wiring is disconnected, misconnected, or intermittent.

Recommended action

1. Verify that the detector wiring is properly shielded (see the Installation section(s) in Appendix B, Gas Detectors.)

2. Verify that the detector wiring is correct and secure.

3. Verify that power and detector wiring is routed through separate conduit hubs on the bottom of the Pioneer housing.

4. Increase the alarm on delay setting in the Instrument Setup program (see Chapter 4, Operation).

5. If the frequent or suspect alarm difficulties continue, contact RKI Instruments, Inc., for further instruction.

Flickering Display

Symptoms

• The display readings flicker often.

Probable causes

• The Pioneer is experiencing false readings due to Radio Frequency Interference (RFI) or Electromagnetic Interference (EMI).

• The noise filter setting is too low.

• The zero suppression setting is too low.

• The display screen is malfunctioning.

Recommended action

1. Verify that the detector wiring is properly shielded (see the Installation section(s) in Appendix B, Gas Detectors.)

2. Verify that the detector wiring is correct and secure.

3. Verify that power and detector wiring is routed through separate conduit hubs on the bottom of the Pioneer housing.

4. Increase the noise filter setting in the Instrument Setup program (see Chapter 4, Operation).

5. Increase the zero suppression setting in the Instrument Setup program (see Chapter 4, Operation).

6. If the display difficulties continue, contact RKI Instruments, Inc., for further instruction.

The Buzzer is not Working Properly

Symptoms

• The buzzer does not sound an audible alarm when the Pioneer goes into an alarm 1, alarm 2, alarm 3, or fail condition.

• The buzzer sounds weak or broken.

Probable causes

• The buzzer is disconnected.

• The buzzer is connected incorrectly.

• The buzzer is malfunctioning.

Recommended action

1. Open the housing door of the Pioneer, then verify that the buzzer wiring to terminals 9 and 10 of the external wiring terminal strip (TB2) is correct and secure.

2. If the buzzer difficulties continue, contact RKI Instruments, Inc., for further instruction.

The Reset Switch is not Working Properly

Symptoms

• The buzzer is not silenced when you press the reset switch.

NOTE: You cannot use the reset switch to silence the buzzer if the alarm silence setting is **OFF** in the Instrument Setup program (see Chapter 4, Operation).

• The applicable alarm circuit is not reset when an alarm condition passes and you press the reset switch.

Probable causes

• The reset switch is disconnected.

• The reset switch is connected incorrectly.

• The alarm silence setting is **OFF**.

• The reset switch is malfunctioning.

Recommended action

1. Enter the Instrument Setup program, and verify that the alarm silence setting is **ON** (see Chapter 4, Operation).

2. Open the housing door of the Pioneer, then verify that the reset switch wiring to terminals 11 and 12 of the external wiring terminal strip (TB2) is correct and secure.

3. If the reset switch difficulties continue, contact RKI Instruments, Inc., for further instruction.

Replacing Components

This section describes procedures to replace the analyzer card and fuses. To replace other components of the Pioneer, contact RKI Instruments, Inc., for further information.

Replacing the Analyzer Card

This section describes the procedure to replace the analyzer card.

CAUTION: *Removing or plugging in an analyzer card with the power on may damage the analyzer card or the Pioneer's main circuit board.*

---

1. Place the Pioneer's power switch in the OFF position.
2. Open the housing door of the Pioneer, then remove the analyzer card from the u-shaped guide.
3. Plug the replacement analyzer card into the guide.

NOTE: The components of the analyzer card face left when the card is installed correctly.

---

4. Place the power switch in the ON position, then verify that the pilot light on the replacement analyzer card is flashing.
5. Close and secure the housing door.

Replacing the AC Fuse

This section describes the procedure to replace the AC fuse.

1. Turn off or unplug all incoming power to the Pioneer at the power source end.
2. Place the Pioneer's power switch in the OFF position.
3. Open the housing door of the Pioneer.
4. Use a flat-blade screwdriver to rotate the 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.*

---

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 fuse 1/4 turn clockwise to secure the fuse holder in the socket.
8. Plug in or turn on all incoming power to the Pioneer at the power source end.
9. Place the Pioneer's power switch in the ON position, then verify that the PILOT light is on.
10. Close and secure the housing door.

Replacing the DC Fuse

This section describes the procedure to replace the DC fuse.

1. Turn off or unplug all incoming power to the Pioneer at the power source end.

2. Place the Pioneer's power switch in the OFF position.

3. Open the housing door of the Pioneer.

4. Remove the DC fuse from the clip holder.

CAUTION: *Verify that the replacement fuse is the same type and rating as the fuse you are replacing.*

---

5. Install the appropriate replacement fuse into the clip holder.

6. Plug in or turn on all incoming power to the Pioneer at the power source end.

7. Place the Pioneer's power switch in the ON position, then verify that the PILOT light is on.

8. Close and secure the housing door.

Appendix A: Parts List

Overview

This appendix lists the part numbers and descriptions for replacement parts and accessories offered for the Pioneer Gas Monitor.

Table A-1: Parts List for the Pioneer Gas Monitor

Part No.	Description
18-0003RK	Conduit Plug (3/4 in. NPT)
18-0107RK	Conduit Hub (3/4 in.)
43-0440RK	Reset Switch
43-4138RK	AC Fuse, 220V (1/2 amp; 250V)
43-4140RK	AC Fuse, 115V (1 amp; 250V)
43-4165RK	DC Fuse (3 amps; 250V)
52-1016RK	Buzzer
57-0004RK	Analyzer Card
71-0027RK	Pioneer Gas Monitor Operator's Manual (this document)

Appendix B: Gas Detectors

Overview

This appendix includes manual inserts for the gas detectors/transmitters originally shipped with your Pioneer Gas Monitor. If you add an additional gas detector/transmitter at a later date, make sure you add the applicable manual insert to this appendix to keep your manual up to date.

Gas Detection Options for the Pioneer Gas Monitor

Table B-1 lists gas detectors and transmitters offered by RKI Instruments, Inc. for the Pioneer Gas Monitor. The table lists the target gas(es), method of detection, part number, and manual insert part number for each detector/transmitter.

Table B-1: Gas Detection Options for the Pioneer Gas Monitor

Detector/ Transmitter	Target Gas(es)	Method of Detection	Det./Trans. Part No.	Manual Insert Part No.
LEL	Combustible gas	Diffusion[1]	61-1000RK	71-0027RK-01
LEL/PPM	Combustible gas	Diffusion[1]	61-1010RK	71-0027RK-01
LEL	Combustible gas	Diffusion[2]	65-2400RK	71-0027RK-10
O_2	Oxygen	Diffusion[1]	65-2502RK[3]	71-0027RK-02
O_2	Oxygen	Diffusion[2]	65-2504RK[3]	71-0027RK-09
CO	Carbon monoxide	Diffusion	65-2430RK	71-0027RK-07
H_2S	Hydrogen sulfide	Diffusion	65-2420RK	71-0027RK-08
GD-K8A	Various toxic gases[4]	Diffusion	GD-K8A-XXXX[5]	71-0027RK-03
GD-K7D	Various toxic gases[4]	Sample-draw	GD-K7D-XXXX[5]	71-0027RK-05

[1] Internal amplifier type.

[2] Remote amplifier type.

[3] Add -01 for the oxygen detector/transmitter that includes a vent patch that prevents water from entering the sensor in case of hosing down or splashing.

[4] See the applicable manual insert for a list of target gases.

[5] Replace "XXXX" with the formula of the target gas. For example, GD-K8A-PH3 for the phosphine version.

Combustible Gas Transmitter

Overview

This detection insert describes the combustible gas transmitter. This insert also describes how to install, start up, maintain, and calibrate the transmitter and run the Channel Setup program. A parts list at the end of this insert lists replacement parts and accessories for the combustible gas transmitter.

Specifications

Table 1 lists specifications for the combustible gas transmitter. See the specifications in Chapter 1, Introduction, for specifications that apply to the Pioneer Gas Monitor.

Table 1: Specifications

Target Gas	Combustible gas
Area Classification	Explosionproof for Class I, Groups B, C, and D
Sampling Method	Diffusion
Signal Output	4 to 20 mA
Detection Range	0 to 100% LEL*
Alarm 1 Setpoint	10% LEL*
Alarm 2 Setpoint	20% LEL*
Alarm 3 Setpoint	50% LEL*
Response Time	90% in 45 seconds

* *These specifications represent RKI standard settings; however, you can adjust them in the Channel Setup program.*

Description

This section describes the components of the combustible gas transmitter. The transmitter consists of the combustible gas detector, amplifier, and junction box.
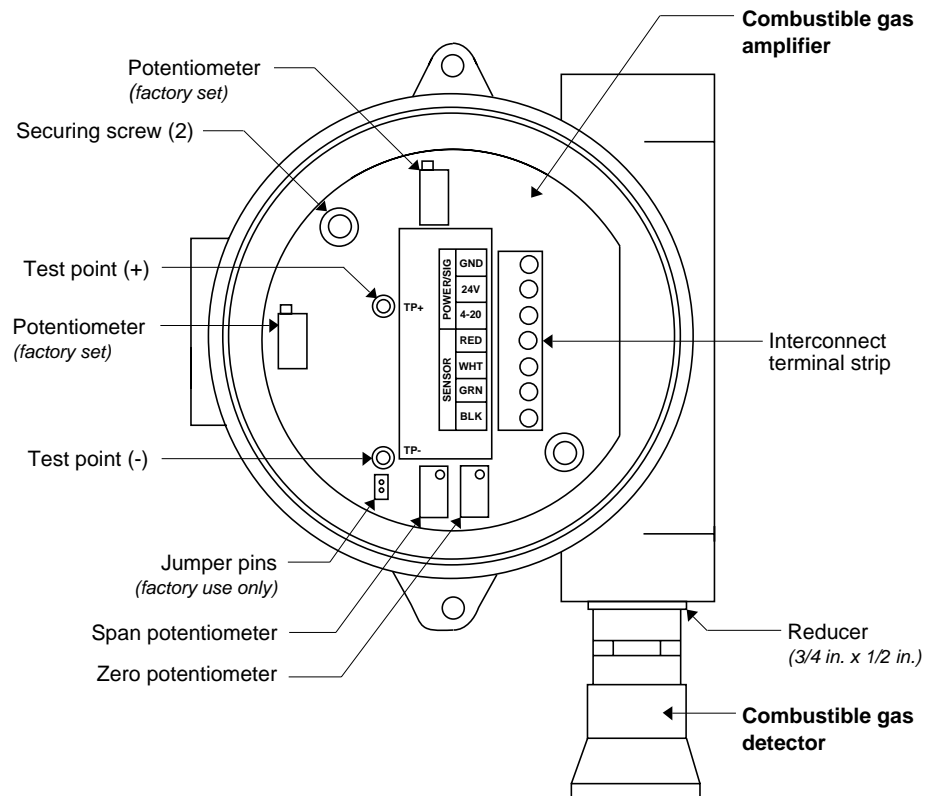

Figure 1: Combustible Gas Transmitter Component Location

Combustible Gas Detector

The combustible gas detector includes the sensing elements, flame arrestor, detector housing, and detector leads.

Sensing elements

Two sensing elements are protected within the detector assembly. Through a series of thermal and electronic reactions, these elements produce an electrical output that is proportional to the detection range of the transmitter.

Flame arrestor

The porous flame arrestor allows the target gas to diffuse into the detector assembly and contact the sensing elements. The flame arrestor also contains sparks within the detector.

Detector housing

The sensing elements and flame arrestor are installed within the detector housing. Mounting threads (1/2 in. NPT) at the top of the detector allow you to mount the combustible gas detector into the bottom conduit hub of the junction box. A rainshield screws onto the bottom of the detector. The rainshield helps protect the detector from debris in the monitoring environment.

Detector leads

Four color-coded leads extend from the top of the detector. The leads allow you to connect the combustible gas detector to the amplifier.

Amplifier

The amplifier converts the electrical output from the detector to a 4 to 20 mA signal (that is proportional to the detection range) and transmits the signal to the Pioneer. The amplifier includes the interconnect terminal strip, span potentiometer, zero potentiometer, and test points (see Figure 1.)

Interconnect terminal strip

The interconnect terminal strip is a seven-point terminal strip. Use the interconnect terminal strip to connect the combustible gas detector to the amplifier and the amplifier to the Pioneer Gas Monitor.

NOTE: The combustible gas detector is factory-wired to the amplifier. See the Installation section of this insert for all wiring procedures related to the transmitter.

Span potentiometer

The span potentiometer is near the bottom of the amplifier. Of the two potentiometers near the bottom of the amplifier, the span potentiometer is farthest to the left. Use the span potentiometer to adjust the transmitter's response output during the calibration procedure.

Zero potentiometer

The zero potentiometer is to the right of the span potentiometer. Use the zero potentiometer to adjust the transmitter's target gas-free output during the start-up and calibration procedures.

CAUTION: *The amplifier includes two additional potentiometers. They are factory-set. Do not adjust them.*

Test points

The test points (labeled **TP+** and **TP**-) are to the left of the interconnect terminal strip. The test points produce a 100 to 500 mV output that is proportional to the transmitter's 4 to 20 mA output. Use the test points and a voltmeter to measure the transmitter's output during the start-up and calibration procedures.

Junction Box

Use the junction box to install the combustible gas transmitter at a mounting site that is remote from the Pioneer. The junction box also protects the amplifier and wiring connections made to the amplifier. Use the two 3/4 in. conduit hubs to mount the detector to the junction box (bottom hub) and connect wiring from the amplifier to the Pioneer (top hub).

NOTE: The combustible gas detector and amplifier are factory-mounted to the junction box.

Use the junction box's two mounting holes to mount the combustible gas transmitter to a vertical surface at the monitoring site. Use the cover on the front of the junction box to access the interior of the junction box.

Installation

This section describes procedures to mount the combustible gas transmitter in the monitoring environment and wire the transmitter to the Pioneer Gas Monitor.

Mounting the Combustible Gas Transmitter

1. Select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.

    •   Select a site where the transmitter is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.

    •   Select a site where the target gas is likely to be found first. For lighter gases, mount the detector near the ceiling; for heavier gases, mount the detector near the floor.
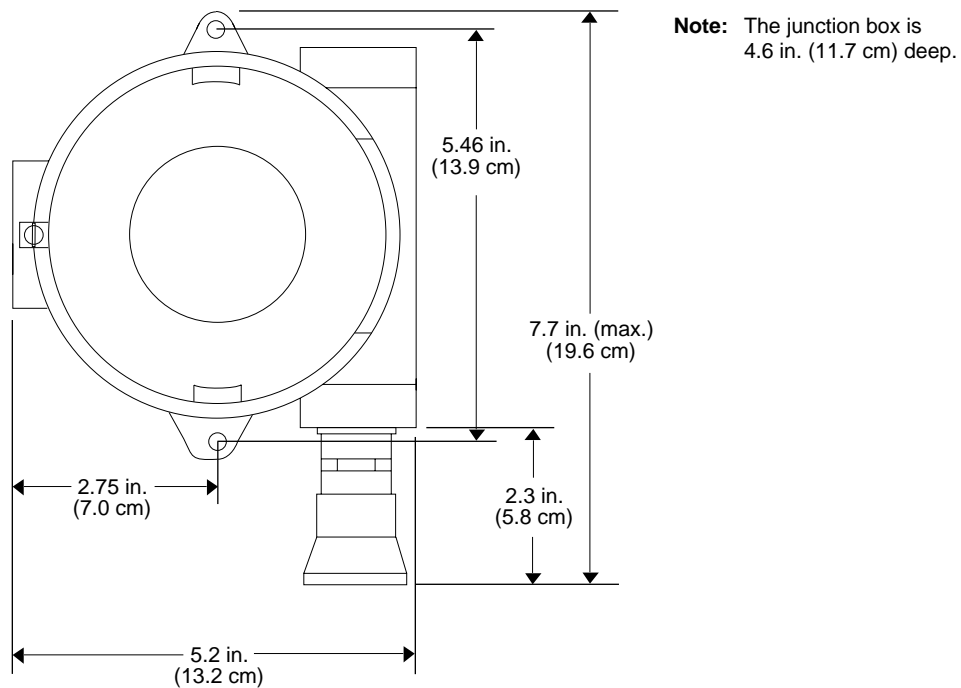
Note: The junction box is 4.6 in. (11.7 cm) deep.

5.46 in. (13.9 cm)

7.7 in. (max.) (19.6 cm)

2.75 in. (7.0 cm)

2.3 in. (5.8 cm)

5.2 in. (13.2 cm)

Figure 2: Mounting the Combustible Gas Transmitter

If the combustible gas detector is mounted to the junction box, skip to step 5. If not, continue with step 2.

2. Remove the junction box cover.

3. Guide the four wires that extend from the top of the combustible gas detector through the bottom conduit hub of the junction box.

4. Screw the combustible gas detector into the bottom conduit hub of the junction box.

5. At the monitoring site, use 1/4 in. screws through the junction box's two mounting holes to secure the junction box to a vertical surface.

CAUTION: *Mount the combustible gas transmitter with the detector facing down (see Figure 2.)*

Wiring the Combustible Gas Transmitter to the Pioneer

WARNING: ***Always verify that the Pioneer's power switch is in the OFF position before you make wiring connections.***

1. Place the Pioneer's power switch in the OFF position.

2. Remove the junction box cover.

3. Verify that the detector leads are wired to the amplifier's interconnect terminal strip. If necessary, connect the detector leads to the interconnect terminal strip as shown in Figure 3.

4. Guide a three-conductor, shielded cable or three wires in conduit through the top conduit hub of the junction box.

5. Connect the three wires to the interconnect terminal strip as follows (see Figure 3.)

   • Connect the positive wire to the terminal labeled **24V +**.

   • Connect the feedback wire to the terminal labeled **4/20 FB**.

   • Connect the negative wire to the terminal labeled **GND**.

CAUTION: *Leave the ground wire insulated and disconnected at the transmitter. You will connect the opposite end of the cable's ground wire at the Pioneer.*

6. Secure the junction box cover to the junction box.

7. Route the cable or wires leading from the combustible gas transmitter through one of the conduit hubs on the bottom of the Pioneer housing.

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

8. Connect the wires to the detector terminal strip of the applicable analyzer card as shown in Figure 3. The detector terminal strip is the 7-point terminal strip (terminals 1 through 7) on the card.
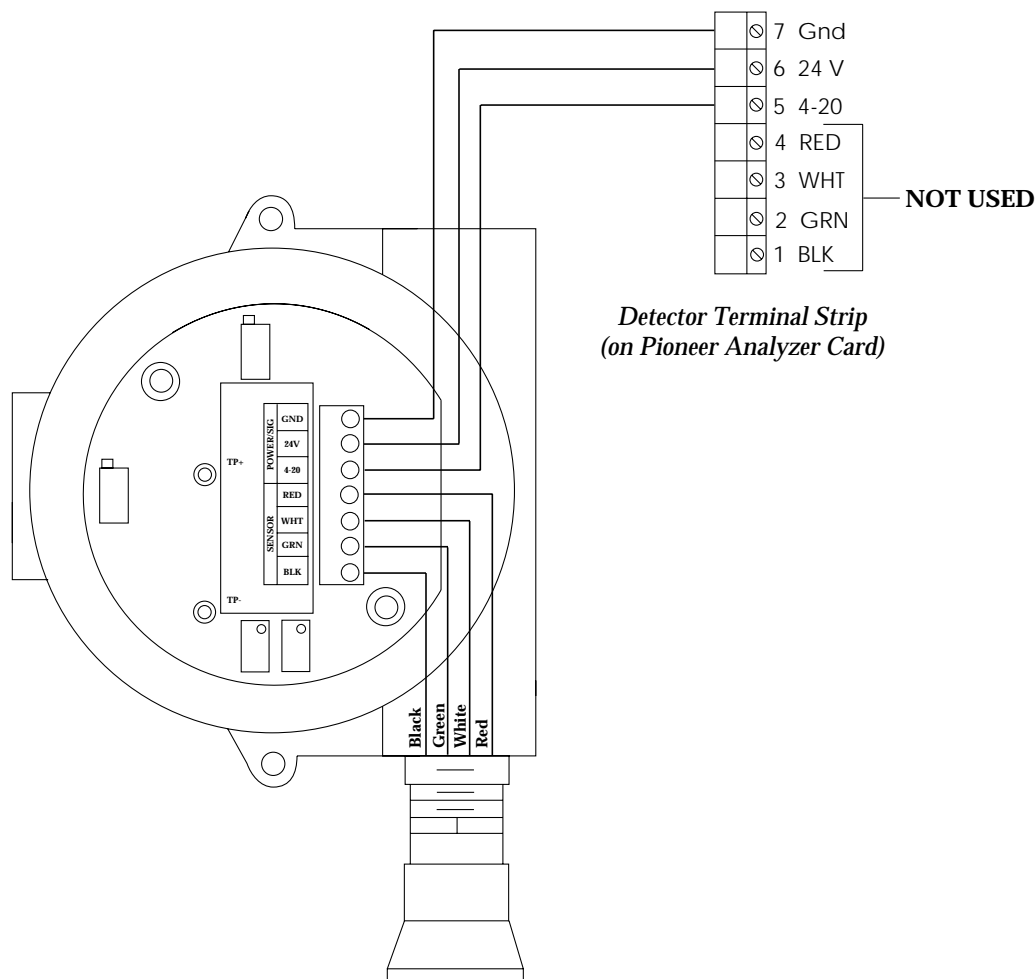
⊘	7	Gnd
⊘	6	24 V
⊘	5	4-20
⊘	4	RED
⊘	3	WHT
⊘	2	GRN
⊘	1	BLK

NOT USED

Detector Terminal Strip
(on Pioneer Analyzer Card)

Figure 3: Wiring the Combustible Gas Transmitter to the Pioneer Gas Monitor

9. At the Pioneer, connect the cable's ground wire to an available chassis ground. The grounding screw on each conduit hub is an example of a chassis ground.

10. At the Pioneer, insert 3/4 in. NPT conduit plugs in any unused conduit hubs. See "Parts List" on page 28 for ordering information.

Start Up

This section describes procedures to start up the combustible gas transmitter and place the transmitter into normal operation.

Introducing Incoming Power

1. Complete the installation procedures described earlier in this insert.

2. Verify that the power wiring is correct and secure (see Chapter 3, Installation and Start Up.)

3. Turn on or plug in the incoming power at the power source end, then place the Pioneer's power switch in the ON position.

4. Verify that the main PILOT light is on and the pilot light for each analyzer card is flashing.

CAUTION: *Allow the detector to warm up for 15 minutes before you continue with the next section, "Setting the Zero Signal."*

Setting the Zero Signal

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

---

1. Verify that the transmitter is in a fresh air environment (environment known to be free of combustible gas).

2. Unscrew and remove the junction box cover from the junction box.

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP**+; plug the negative lead into the test point labeled **TP**-.

5. Verify a voltmeter reading of 100 mV (±2 mV).

6. If necessary, use a flat-blade screwdriver to adjust the zero potentiometer until the voltmeter reading is 100 mV (±2 mV).

7. Secure the junction box cover to the junction box.

Channel Setup Program

This section describes the Pioneer's Channel Setup program for the combustible gas transmitter. You can display and change the following channel settings with the Channel Setup program.

- Channel Status

- Target Gas, Unit of Measure, and Fullscale Setting

- Channel Type and Measuring Options

- Relay 3 Assignment

- Alarm Setpoints and Alarm Type (rising or falling)

NOTE: Channels that are included with the original shipment of the Pioneer are setup at the factory. If you are adding a channel to an existing Pioneer, you need to establish the channel settings in this program.

Navigating through the Channel Setup Program

Use the program buttons to the right of the display screen to enter the program, move forward or backward through the program, change settings within the program, and save or cancel changes to the program settings. Table 2 lists the function of each program button.

Table 2: Program Button Functions for the Channel Setup Program

Button	Function
ESCAPE	• Moves you backward through the program. • Cancels changes made to the program settings.
UP/YES	• Updates the setting that is displayed on the display screen. • Saves changes made to the program settings.
DOWN/NO	• Updates the setting that is displayed on the display screen. • Enters the program (with the ENTER button). • Saves changes made to the program settings.
ENTER	• Moves you forward through the program. • Enters the program (with the DOWN/NO button).

Running the Channel Setup Program

This section describes how to enter the program, display and change program settings, and save or cancel changes to the program settings.

Entering the channel setup program

1. Open the housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and DOWN/NO buttons simultaneously three times.

   The Channel Setup program screen appears.

   ```
   V e r s i o n   X . X X
   C h a n n e l   S e t u p
   E S C A P E   A b o r t
   A N Y   O T H E R   K E Y   N e x t
   ```

NOTE: Once you enter the Channel Setup program, the status lights, buzzer, and relays are disabled until you exit the program.

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The program asks if you want to setup Channel 1.

   ```
   C h a n n e l   1
   E S C A P E   E x i t   S e t - u p
   U P / D N   C h a n g e   C h a n n e l
   E N T E R   S e t - u p   N o w
   ```

4. To display or change settings for Channel 1, press the ENTER button (the program displays the Channel Status screen.) To continue to Channel 2 settings, press the UP/YES button. To go to Channel 4 settings, press the DOWN/NO button.

NOTE: The screens illustrated in this section are examples and describe the Channel Setup program for Channel 1.

Channel status screen

This screen indicates the status of Channel 1. For installed channels the default setting is **ACTIVE/ONLINE**. For empty channels, the default setting is **NO SENSOR/AMP**. The third setting, **SILENCED/OFFLINE**, displays the gas reading as XXXX; and the buzzer, status lights, and relays are disabled for the channel.
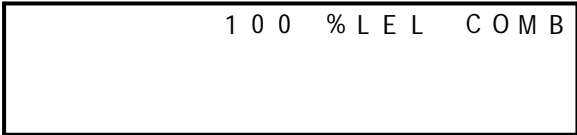
```
Channel 1
ACTIVE/ONLINE


```

- To accept the channel status setting and continue the program, press the ENTER button.

  The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

- To update the channel status setting:
    1. Use the UP/YES and DOWN/NO buttons to change the setting.
    2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

NOTE: If you select a channel status of **NO SENSOR/AMP**, the program continues with the next channel.

Fullscale reading, unit of measure, and target gas screen

This screen indicates the fullscale reading, unit of measure, and target gas for Channel 1. The default settings for the combustible gas channel are **100** (fullscale reading), **%LEL** (unit of measure), and **COMB** (target gas).

```
         100  %LEL   COMB


```

- To accept the settings and continue the program, press the ENTER button three times.

  The program displays the Channel Type and Measuring Options screen.

- To update the target gas, unit of measure, and/or fullscale reading setting:
    1. Use the ENTER and ESCAPE buttons to select the setting you want to change. (The setting flashes when it is selected.)
    2. Use the UP/YES and DOWN/NO buttons to change the setting.
    3. Press the ENTER button until the program displays the Channel Type and Measuring Options screen.

NOTE: If you update the target gas, turn the Pioneer's power switch OFF and then ON again after you return to normal operation.

Channel type and measuring options screen

This screen indicates the channel type and measuring options for Channel 1. The default setting for the channel type (input) setting is **4-20 Remote**. The default setting for the measuring options (range) setting is **LEL ONLY**.

```
INPUT:  4-20  Remote
RANGE:  LEL  ONLY
```

- To accept the settings and continue the program, press the ENTER button.

  The program displays the Relay 3 Assignment screen.

- To update the channel type setting:

  1. Use the UP/YES or DOWN/NO button to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Relay 3 Assignment screen.

NOTE: If the channel type setting is **4-20 Remote**, the measuring options setting is **LEL ONLY** and is not adjustable.

Relay 3 assignment screen

This screen indicates the assignment of the alarm 3 relay for Channel 1. If you select **Alarm 3**, then the alarm 3 relay activates if Channel 1 goes into an alarm 3 condition. If you select **Fail Alarm**, then the alarm 3 relay de-energizes if Channel 1 goes into a fail condition.

NOTE: If you assign the alarm 3 relay as the channel's fail relay, the status light and buzzer still indicate visual and audible alarms for an alarm 3 condition.

```
Channel  1
Relay  3  Assigned  to:
Alarm  3
```

- To accept the relay 3 assignment setting and continue the program, press the ENTER button.

  The program displays the Fail Setpoint screen.

- To update the relay 3 assignment setting:

  1. Use the UP/YES or DOWN/NO button to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Fail Setpoint screen.

Fail setpoint screen

This screen indicates the setpoint and alarm type for the fail alarm. The setpoint is the display reading at which the alarm is activated. The alarm type controls how the alarm is activated (rising or falling readings).

The default setting for the fail setpoint for the combustible gas channel is -**10**. The default setting for the alarm type is **FALL**.

NOTE: If you selected a measuring options setting of **PPM/LEL**, you can select PPM or LEL fail and alarm setpoint settings.

```
Channel 1 Fail Alarm
      -10 %LEL  COMB
FALL
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 1 Setpoint screen.

- To update the fail setpoint setting:
  1. Use the UP/YES and DOWN/NO buttons to change the fail setpoint setting.
  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 1 Setpoint screen.

- To update the alarm type setting:
  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
  2. Use the UP/YES or DOWN/NO button to change the setting.
  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 1 Setpoint screen.

Alarm 1 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 1. The default setting for the alarm 1 setpoint for the combustible gas channel is **10**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  1
        10  %LEL   COMB
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 2 Setpoint screen.

- To update the alarm 1 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 2 Setpoint screen.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
  2. Use the UP/YES or DOWN/NO button to change the setting.
  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 2 Setpoint screen.

Alarm 2 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 2. The default setting for the alarm 2 setpoint for the combustible gas channel is **20**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  2
        20  %LEL   COMB
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 3 Setpoint screen.

- To update the alarm 2 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 3 Setpoint screen.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
  2. Use the UP/YES or DOWN/NO button to change the setting.
  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 3 Setpoint screen.

Alarm 3 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 3. The default setting for the alarm 3 setpoint for the combustible gas channel is **50**. The default setting for the alarm type is **RISE**.

```
Channel 1 Alarm 3
        50 %LEL  COMB
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program begins channel setup for Channel 2.

- To update the alarm 3 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.

  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program begins channel setup for Channel 2.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)

  2. Use the UP/YES or DOWN/NO button to change the setting.

  3. Press the ENTER button to accept the new setting and continue the program.

  The program begins channel setup for Channel 2.

NOTE: To exit the Channel Setup program, press the ESCAPE button. The Channel Setup Exit screen displays.

Channel setup exit screen

This screen saves or cancels any changes you made in the Channel Setup program.

```
ESCAPE  =  Abort  Setup
UP/DOWN=  Save  &  Exit
ENTER=  Next
```

- **To save changes** and exit the program, press the UP/YES or DOWN/NO button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To cancel changes** and exit the program, press the ESCAPE button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To setup another channel**, press the ENTER button.

  The program asks if you want to setup the next channel. Press the ENTER button to continue.

Maintenance

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

Preventive Maintenance

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

Daily

1. Verify that the pilot light on the applicable analyzer card is flashing. If the pilot light is not flashing, see the following troubleshooting guide in this insert.

NOTE: If the Pioneer's main PILOT light is not on, see the Troubleshooting guide in Chapter 5, Maintenance.

---

2. Verify a display reading of 0 %LEL. Investigate significant changes in the display reading.

Monthly

This procedure describes a test to verify that the combustible gas transmitter responds properly to the target gas.

Preparing for the response test

1. Verify that the display reading(s) for the channel(s) you plan to test is 0.

   If the display reading(s) is not zero, set the zero reading of the applicable transmitter(s) as described in the Start Up section of this insert, then continue this procedure.

2. Assemble the calibration kit as described in the Calibration section of this insert.

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

---

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

   Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.

5. Use the following formula to determine the correct test points output for the test sample.

$$Output\ (mV) = (calibrating\ sample/fullscale) \times 400 + 100$$

For example, with a test sample of 50% LEL and a fullscale setting of 100% LEL, the correct output is 300 mV.

$$300\ (mV) = (50/100) \times 400 + 100$$

Entering the Calibrate program

1. Open the Pioneer's housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES button simultaneously three times.

   The Calibrate program screen appears.

   ```
   Version   X.XX
   Calibrate
   ESCAPE    Abort
   ANY OTHER KEY    Next
   ```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the calibration time-out setting in the Instrument Setup program (see Chapter 4, Operation.)

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The Select screen appears. The first line (channel 1) is flashing.

   ```
   CH1   Not   Selected
   CH2   Not   Selected
   CH3   Not   Selected
   CH4   Not   Selected
   ```

NOTE: The example used in this procedure describes a response test for Channels 3 and 4.

---

4. Press the DOWN/NO button two times. The third line (channel 3) is flashing.

5. Press the ENTER button to "select" Channel 3, then press the DOWN/NO button.

6. Press the ENTER button to "select" Channel 4, then press the DOWN/NO button.

NOTE: The description for Channels 3 and 4 changes to **4-20 Monitor** when you "select" Channels 3 and 4.

The Channels Selected screen appears.

```
You  have  Selected
these  Channels:
3,4
ENTER  Next,  ESC  Prev
```

7. Verify that you selected the correct channel(s), then press the ENTER button to continue.

The Choose Calibration screen appears.

```
Choose  Calibration
Zero  Proceed
Span  Proceed
ENTER  Next,  ESC  Prev
```

NOTE: If one or more of the channels you selected on the Select screen is an oxygen channel, then the Choose Calibration screen appears as follows.

```
Choose  Calibration
Zero  (Oxygen  Span)
Span  (Oxygen  Zero)
ENTER  Next,  ESC  Prev
```

8. Verify that the **Span Proceed** line is flashing [or **Span (Oxygen Zero)** if applicable], then press the ENTER button to continue. If the **Span Proceed** line is not flashing, press the DOWN/NO button, then press the ENTER button.

The Calibration screen appears.

```
C   CH1      (Not  Selected)
A   CH2      (Not  Selected)
L   CH3        50  COMB
.   CH4        50  COMB
```

9. Press the ENTER button.

The Apply Gas screen appears.

```
ESCAPE  Previous
ENTER    Apply  Gas
```

10. Press the ENTER button.

The Span screen appears.

```
CH1       XXX  Apply  Gas
CH2       XXX  then
CH3         0*ENTER  to
CH4         0*Span
```

Performing the response test

1. Screw the regulator into the calibration cylinder.

NOTE: Once you introduce the test sample to the transmitter, the Span screen "freezes" and displays each "selected" channel's highest reading. This feature enables you to verify the readings at the Pioneer in addition to the "local" test at the transmitter.

---

2. When the reading on the voltmeter stabilizes, verify that the reading is within ± 10% of the response reading you determined earlier.

NOTE: If the readings are not within ± 10% of the correct response reading, calibrate the affected transmitters as described in the Calibration section of this insert.

---

3. Unscrew the regulator from the calibration cylinder, then disassemble the calibration kit as described in the Calibration section of this insert.

NOTE: If the Pioneer's display reading(s) is above the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the reading(s) of the "selected" channels on the Fresh Air screen in the Calibrate program.

To display the Fresh Air screen, press the ESCAPE button, next press the UP/YES button, then press the ENTER button.

---

4. Press the ESCAPE button until the Save screen appears.

```
ESCAPE  =  Abort  Setup
UP/DOWN =  Save  &  Exit
ENTER =  Next
```

5. Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT  SET-UP
NOT  SAVED,  USING
PREVIOUS  VALUES
```

NOTE: The Pioneer does not save calibration values for remote transmitters. When calibrating the transmitter, you perform calibration at the transmitter; therefore, it is not necessary to save calibration values at the Pioneer.

The purpose of entering the Calibrate program when performing this response test is to disable the status lights, buzzer, and relays and so you can view the response reading(s) on the Span screen.

Quarterly

Calibrate the combustible gas transmitter as described in the Calibration section of this insert.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the combustible gas transmitter.

NOTE: This troubleshooting guide describes transmitter problems only. See the Troubleshooting guide in Chapter 5, Maintenance, for problems you may encounter with the Pioneer Gas Monitor.

Fail Condition

Symptoms

- The FAIL light is on.

- The buzzer is sounding a steady tone.

- The fail relay is de-energized.

- The display reading is flashing.

Probable causes

- The analyzer card is disconnected or misconnected.

- The transmitter wiring is disconnected or misconnected.

- The transmitter is malfunctioning.

Recommended action

1. Verify that the analyzer card is installed correctly and that the pilot light on the analyzer card is flashing. The components of the analyzer card face left when the card is installed correctly.

2. Verify that the transmitter wiring is correct and secure. The Installation section of this insert describes transmitter wiring connections.

3. Calibrate the transmitter as described in the Calibration section of this insert.

4. If the fail condition continues, replace the detector as described later in this section.

5. If the fail condition continues, contact RKI Instruments, Inc., for further instruction.

Slow or No Response/Difficult or Unable to Calibrate

<u>Symptoms</u>

- The transmitter responds slowly or does not respond during the monthly response test.

- Unable to accurately set the zero or response reading during the calibration procedure.

- The transmitter requires frequent calibration.

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

<u>Probable causes</u>

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

- The transmitter is malfunctioning.

<u>Recommended action</u>

1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample.

2. If the calibration/response difficulties continue, replace the detector as described later in this section.

3. If the calibration/response difficulties continue, contact RKI Instruments, Inc., for further instruction.

No Display Reading

<u>Symptoms</u>

- The transmitter is installed, but the display screen is blank for that channel.

NOTE: If the display screen is blank for all channels, see the troubleshooting guide in Chapter 5, Maintenance.

<u>Probable causes</u>

- The channel status setting is set at **NO SENSOR/AMP**.

<u>Recommended action</u>

1. Enter the Channel Setup program, and change the channel status setting to **ACTIVE/ONLINE** or **SILENCED/OFFLINE**.

2. If the display reading difficulties continue, contact RKI Instruments, Inc., for further instruction.

Replacing Components of the Combustible Gas Transmitter

This section includes procedure to replace the combustible gas detector and amplifier.

Replacing the combustible gas detector

1. Place the Pioneer's power switch in the OFF position.

2. Remove the junction box cover.

3. Disconnect the detector leads from the detector terminal strip. Note the position of the color-coded leads as you remove them.

4. Unscrew the detector from the junction box.

5. Guide the detector leads of the replacement detector through the bottom conduit hub of the junction box, then screw the mounting threads of the detector into the conduit hub.

6. Connect the detector leads to the detector terminal strip as shown in Table 3 and Figure 3, Wiring the Combustible Gas Transmitter to the Pioneer Gas Monitor.

Table 3: Reconnecting the Combustible Gas Detector to the Amplifier

Detector Lead	Amplifier Interconnect Terminal Strip
Red	SENSOR RED
White	SENSOR WHT
Green	SENSOR GRN
Black	SENSOR BLK

7. Place the Pioneer's power switch in the ON position.

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

---

8. Calibrate the replacement detector as described in the Calibration section of this insert.

9. Secure the junction box cover to the junction box.

Replacing the amplifier

1. Place the Pioneer's power switch in the OFF position.

2. Remove the junction box cover.

3. Disconnect the detector leads from the interconnect terminal strip.

4. Unscrew and remove the two screws that secure the amplifier to the junction box. The screws are at the top left and bottom right of the amplifier.

5. Remove the amplifier.

6. Place the new amplifier in the same position as the amplifier you removed in the previous step.

7. Use the two screws you removed in step 4 to secure the amplifier to the junction box.

8. Reconnect the wiring from the Pioneer to the interconnect terminal strip as shown in Table 4 and Figure 3, Wiring the Combustible Gas Transmitter to the Pioneer Gas Monitor.

Table 4: Reconnecting the Combustible Gas Amplifier to the Pioneer Gas Monitor

Amplifier Interconnect Terminal Strip	Pioneer Analyzer Card
GND	Gnd (Terminal 7)
4-20	4-20 (Terminal 5)
24V	24 V (Terminal 6)

9. Reconnect the detector leads to the interconnect terminal strip as shown in Table 5 and Figure 3, Wiring the Combustible Gas Transmitter to the Pioneer Gas Monitor.

Table 5: Reconnecting the Combustible Gas Detector to the Amplifier

Detector Lead	Amplifier Interconnect Terminal Strip
Red	SENSOR RED
White	SENSOR WHT
Green	SENSOR GRN
Black	SENSOR BLK

10. Place the Pioneer's power switch in the ON position.

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

---

11. Calibrate the combustible gas transmitter as described in the Calibration section of this insert.

Calibration

This section describes how to calibrate the combustible gas transmitter. It includes procedures to prepare for calibration, enter the Calibrate program, set the zero reading, set the response reading, and return to normal operation.

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

Preparing for Calibration

1. Slide the calibration cup over the bottom of the combustible gas detector, then secure the calibration cup to the detector with the two screws.

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

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

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

    Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP**-.

5. Use the following formula to determine the correct test points output for the calibrating sample.

$$\textit{Output (mV) = (calibrating sample/fullscale) X 400 + 100}$$

For example, with a calibrating sample of 50% LEL and a fullscale setting of 100% LEL, the correct output is 300 mV.

$$\textit{300 (mV) = (50/100) X 400 +100}$$

Entering the Calibrate Program

1. Open the housing door of the Pioneer, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES buttons simultaneously three times.

    The Calibrate program screen appears.

```
Version   X.XX
Calibrate
ESCAPE    Abort
ANY OTHER KEY    Next
```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the calibration time-out setting in the Instrument Setup program (see Chapter 4, Operation.)

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

    The Select screen appears. The first line (channel 1) is flashing.

```
C H 1   N o t   S e l e c t e d
C H 2   N o t   S e l e c t e d
C H 3   N o t   S e l e c t e d
C H 4   N o t   S e l e c t e d
```

NOTE: The example used in this procedure describes calibration for Channels
           1, 2, and 3.

4. Press the ENTER button to "select" Channel 1, then press the DOWN/NO button.
    The second line (channel 2) is flashing.

5. Repeat step 4 to "select" Channels 2 and 3.

NOTE: The description for Channels 1, 2, and 3 changes to **4-20 Monitor** when you
           "select" Channels 1, 2, and 3.

6. Press the DOWN/NO or UP/YES button until the Channels Selected screen appears.

```
Y o u   h a v e   S e l e c t e d
t h e s e   C h a n n e l s :
1 , 2 , 3
E N T E R   N e x t ,   E S C   P r e v
```

7. Verify that you selected the correct channel(s), then press the ENTER button to
    continue.

    The Choose Calibration screen appears.

```
C h o o s e   C a l i b r a t i o n
Z e r o   P r o c e e d
S p a n   P r o c e e d
E N T E R   N e x t ,   E S C   P r e v
```

NOTE: If one or more of the channels you selected on the Select screen is an oxygen
           channel, then the Choose Calibration screen appears as follows.

```
C h o o s e   C a l i b r a t i o n
Z e r o   ( O x y g e n   S p a n )
S p a n   ( O x y g e n   Z e r o )
E N T E R   N e x t ,   E S C   P r e v
```

8. Verify that the **Zero Proceed** line is flashing [or **Zero (Oxygen Span)** if applicable], then press the ENTER button to continue. If the **Zero Proceed** line is not flashing, press the UP/YES button, then press the ENTER button.

The Fresh Air screen appears. The readings displayed on the Fresh Air screen are the current gas readings. The asterisk (*) to the right of each reading indicates that you cannot adjust this reading at the Pioneer.

```
CH 1            0 * ENTER  to
CH 2            0 * Fresh   Air
CH 3            0 * Adjust
CH 4        X X X
```

CAUTION: Do not press the ENTER button at this time.

Setting the Zero Reading

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

2. When the reading on the voltmeter stabilizes, verify a reading of 100 mV (±2 mV). If necessary, use the zero potentiometer on the amplifier to adjust the reading to 100 mV (±2 mV).

3. Unscrew the regulator from the zero air calibration cylinder.

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

Setting the Response Reading

1. Screw the regulator into the calibration cylinder.

2. When the reading on the voltmeter stabilizes, verify that the reading matches the response reading (±2 mV) you determined earlier. If necessary, use the span potentiometer on the amplifier to adjust the reading to match the correct response reading.

3. Unscrew the regulator from the calibration cylinder.

4. Remove the voltmeter leads from the amplifier test points.

Returning to Normal Operation

1. Loosen the two screws that secure the calibration cup to the detector, then remove the cup from the bottom of the detector.

NOTE: For convenience, leave the components of the calibration kit connected by the sample tubing.

---

2. Secure the junction box cover to the junction box.

NOTE: If the reading(s) is above the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the current reading(s) of the "selected" channels on the Fresh Air screen.

---

3. Press the ESCAPE button three times.

    The Save screen appears.

```
ESCAPE   =   Abort   Setup
UP/DOWN=   Save   &   Exit
ENTER=   Next
```

4. Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT   SET-UP
NOT   SAVED,   USING
PREVIOUS   VALUES
```

NOTE: Because you performed calibration at the transmitter, it is not necessary to save calibration values at the Pioneer. The Pioneer does not save calibration values for remote transmitters.

The purpose of entering the Calibrate program is to disable the status lights, buzzer, and relays during calibration and so you can view the current reading(s) on the Fresh Air screen.

---

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

6. Verify that the applicable display reading(s) decreases and stabilizes at 0 %LEL.

Parts List

Table 6 lists replacement parts and accessories for the combustible gas channel.

Table 6: Parts List

Part Number	Description
06-1248RK	Sample tubing (3/16 in. x 5/16 in.; specify length when ordering)
18-0003RK	Conduit plug (3/4 in. NPT)
18-0405RK-01	Junction box (without cover, pre-drilled for amplifier)
18-0406RK	Junction box cover (cover only)
57-0004RK	Analyzer card
57-1050RK	Amplifier (specify target gas when ordering)
61-0140RK	Combustible gas detector (specify target gas when ordering)
65-2400RK	Combustible gas transmitter (includes detector and amplifier; specify target gas when ordering)
71-0027RK-10	*Combustible Gas Transmitter Manual Insert* (this document)
81-0007RK-01	Calibration cylinder (50% LEL Hexane; 34 liter)
81-0012RK-01	Calibration cylinder (50% LEL Methane; 34 liter)
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-1003RK	Regulator, 0.5 liter/minute; continuous flow (for 17 and 34 liter calibration cylinders)
81-1110RK	Calibration cup

Pioneer Hydrogen Transmitter Technical Notice

Although this Pioneer manual insert was written for the combustible gas LEL transmitter, the operational instructions are the same for the hydrogen transmitter with the exception of the sensor wiring and the following specifications:

- Model: Pioneer hydrogen transmitter, 65-2440RK
- Gas: Hydrogen
- Measuring range: 0 - 2000 ppm
- Alarm points: Alarm 1   200 ppm
                      Alarm 2   500 ppm
                      Alarm 3   1000 ppm
- Calibration gas: 1000 ppm Hydrogen
- Sensor: 61-0160RK
- Transmitter: 57-1071RK

Please see the attached wiring diagram for the sensor wiring. The wiring from the transmitter to the Pioneer controller is the same as shown in the following insert.

Beacon 800 Oxygen Detection
65-2507RK Technical Notice

Although this detction insert was written for the standard oxygen transmitter, 65-2504RK, the operational instructions are the same for the 65-2507RK transmitter with the following differences:

- Model: Oxygen transmitter, 65-2507RK
- Measuring range: 0 - 25% (same)
- Sensor: 65-2506RK
- Amplifier: 57-1061RK

The wiring from the sensor to the amplifier and the amplifier to the Beacon 800 controller is the same as shown in this manual.

Oxygen Transmitter

Overview

This detection insert describes the oxygen transmitter. This insert also describes how to install, start up, maintain, and calibrate the transmitter and run the Channel Setup program. A parts list at the end of this insert lists replacement parts and accessories for the oxygen transmitter.

Specifications

Table 1 lists specifications for the oxygen transmitter. See the specifications in Chapter 1, Introduction, for specifications that apply to the Pioneer Gas Monitor.

Table 1: Specifications

Target Gas	Oxygen (O_2)
Sampling Method	Diffusion
Signal Output	4 to 20 mA
Detection Range	0 to 25.0% VOL (by volume)*
Alarm 1 Setpoint	19.5% VOL (decreasing)*
Alarm 2 Setpoint	17.0% VOL (decreasing)*
Alarm 3 Setpoint	23.5% VOL (increasing)*
Response Time	90% in 30 seconds

* *These specifications represent RKI standard settings; however, you can adjust them in the Channel Setup program.*

Description

This section describes the components of the oxygen transmitter. The transmitter consists of the oxygen detector and amplifier. The oxygen detector and amplifier are housed in separate junction boxes. The junction boxes are connected by a 3/4 in. closed nipple.
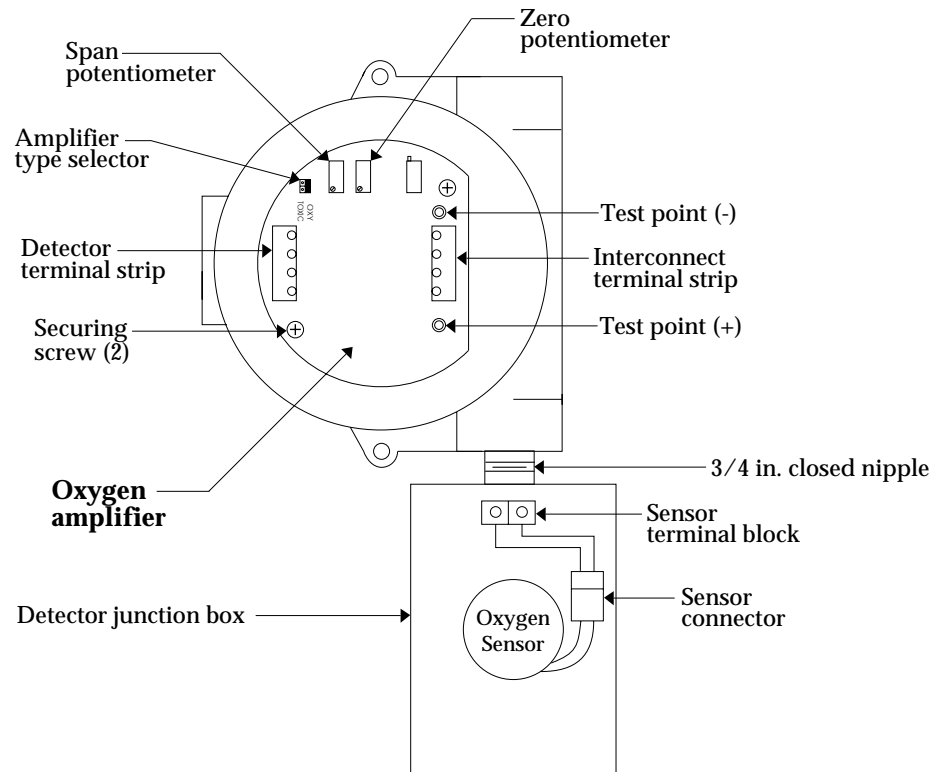

Figure 1: Oxygen Transmitter Component Location

Oxygen Detector

The oxygen detector includes the sensor, sensor connector, sensor terminal block, and detector junction box (see Figure 1.)

Oxygen sensor

The oxygen sensor is installed within the detector junction box. Through a series of chemical and electronic reactions, the cell produces an electrical output that is proportional to the detection range of the transmitter.

Detector connector

The cable that extends from the sensor terminates in a socket. A 7-pin male connector plugs into the socket to complete the detector connector assembly. Two color-coded leads extend from the detector connector.

Sensor terminal block

The sensor terminal block is the two-point terminal block that is located in the detector junction box. Use the sensor terminal block to connect the oxygen detector to the amplifier.

NOTE: The oxygen sensor is factory-wired to the sensor terminal block. See the Installation section of this insert for all wiring procedures related to the transmitter.

Detector junction box

The rectangular junction box allows you to install the oxygen detector at a mounting site that is remote from the Pioneer, and it protects the detector and wiring connections.

A hub at the top of the junction box allows you to route the wiring from the detector to the amplifier. The front of the junction box is the junction box cover. It includes a diffusion port that allows oxygen in the surrounding environment to contact the oxygen sensor. Two slot-head screws secure the cover to the junction box. You can loosen these screws to access the interior of the junction box.

Amplifier

The amplifier converts the electrical output from the oxygen sensor to a 4 to 20 mA signal (that is proportional to the detection range) and transmits the signal to the Pioneer. The amplifier includes the amplifier type selector, detector terminal strip, interconnect terminal strip, span potentiometer, zero potentiometer, and test points (see Figure 1.)

Amplifier type selector

The amplifier type selector is near the top left corner of the amplifier. It is above the detector terminal strip and to the left of the span potentiometer.

The amplifier included with the oxygen transmitter is designed for use with RKI's oxygen and toxic gas transmitters. The amplifier type selector determines for which transmitter the amplifier is intended. For oxygen transmitters, a jumper block is installed over the **OXY** selector (see Figure 1.)

Detector terminal strip

The detector terminal strip is the four-point terminal strip on the left side of the amplifier. Use the detector terminal strip to connect the oxygen detector to the amplifier.

NOTE: The oxygen detector is factory-wired to the amplifier. See the Installation section of this insert for all wiring procedures related to the transmitter.

Interconnect terminal strip

The interconnect terminal strip is the four-point terminal strip on the right side of the amplifier. Use the interconnect terminal strip to connect the amplifier to the Pioneer.

Span potentiometer

The span potentiometer is near the top of the amplifier. Of the three potentiometers, the span potentiometer is farthest to the left. Use the span potentiometer to adjust the transmitter's response output during the start-up and calibration procedures.

Zero potentiometer

The zero potentiometer is to the right of the span potentiometer. Use the zero potentiometer to adjust the transmitter's oxygen-free output during the calibration procedure.

CAUTION: *The third potentiometer is factory-set. Do not adjust it.*

Test points

The test points (labeled **TP**- and **TP**+) are directly above and below the interconnect terminal strip. The test points produce a 100 to 500 mV output that is proportional to the transmitter's 4 to 20 mA output. Use the test points and a voltmeter to measure the transmitter's output during the start-up and calibration procedures.

Amplifier junction box

Use the amplifier junction box to install the amplifier at a mounting site that is remote from the Pioneer. The junction box also protects the amplifier and wiring connections made to the amplifier. Use the two 3/4 in. conduit hubs to connect the detector junction box to the amplifier junction box (bottom hub) and connect wiring from the amplifier to the Pioneer (top hub).

NOTE: The amplifier is factory-mounted to the amplifier junction box.

Use the amplifier junction box's two mounting holes to mount the oxygen transmitter to a vertical surface at the monitoring site. Use the cover on the front of the junction box to access the interior of the junction box.

Installation

This section describes procedures to mount the oxygen transmitter in the monitoring environment and wire the transmitter to the Pioneer Gas Monitor.

Mounting the Oxygen Transmitter

1. Select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.

   • Select a site where the transmitter is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.

   • Select a site that is at normal breathing level.

CAUTION: *Mount the oxygen transmitter with the amplifier junction box above the detector junction box (see Figure 2.)*

---

2. At the monitoring site, use 1/4 in. screws through the two mounting holes on the left side of the *amplifier* junction box to secure the e junction box to the vertical mounting surface (see Figure 2.)

5.25 in.

5.9 in.

10.5 in.

5.0 in.
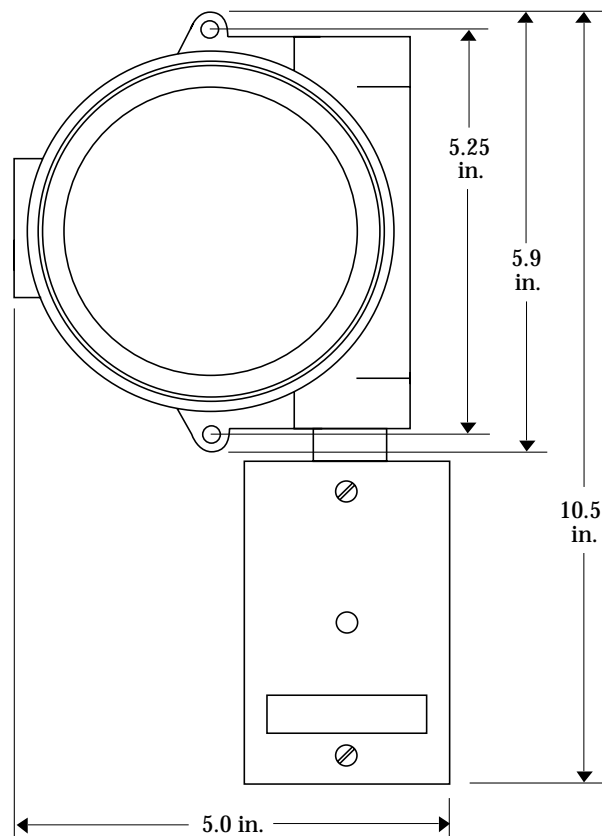
Note: The junction box is 4.63 in. deep.

Figure 2: Mounting the Oxygen Transmitter

Wiring the Oxygen Transmitter to the Pioneer

WARNING: *Always verify that the Pioneer's power switch is in the OFF position before you make wiring connections.*

---

1. Place the Pioneer's power switch in the OFF position.

2. Loosen the two securing screws from the *detector* junction box cover, then remove the cover.

3. Unscrew and remove the *amplifier* junction box cover.

4. In the *detector* junction box, verify that the leads from the sensor connector are wired to the (2-point) sensor terminal block.

5. In the *amplifier* junction box, verify that the wiring from the opposite side of the (2-point) sensor terminal block is wired to the amplifier's detector terminal strip.

   If necessary, connect the sensor terminal block and detector terminal strip as shown in Figure 3.

6. Verify that the jumper block is installed over the **OXY** selector of the amplifier type selector as shown in Figure 3.

7. Guide a two-conductor, shielded cable or two wires in conduit through the top conduit hub of the junction box.

8. Connect the two wires to the interconnect terminal strip as follows (see Figure 3.)

   • Connect the positive wire to the terminal labeled **24V +**.

   • Connect the feedback wire to the terminal labeled **4/20 FB**.

CAUTION: *Leave the ground wire insulated and disconnected at the transmitter. You will connect the opposite end of the cable's ground wire at the Pioneer.*

---

9. Secure the *detector* junction box cover to the junction box with the two screws you removed in step 2.

10. Secure the *amplifier* junction box cover to the junction box.

11. Route the cable or wires leading from the oxygen transmitter through one of the conduit hubs on the bottom of the Pioneer housing.

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

---

12. Connect the wires to the detector terminal strip of the applicable analyzer card as shown in Figure 3. The detector terminal strip is the 7-point terminal strip (terminals 1 through 7) on the card.
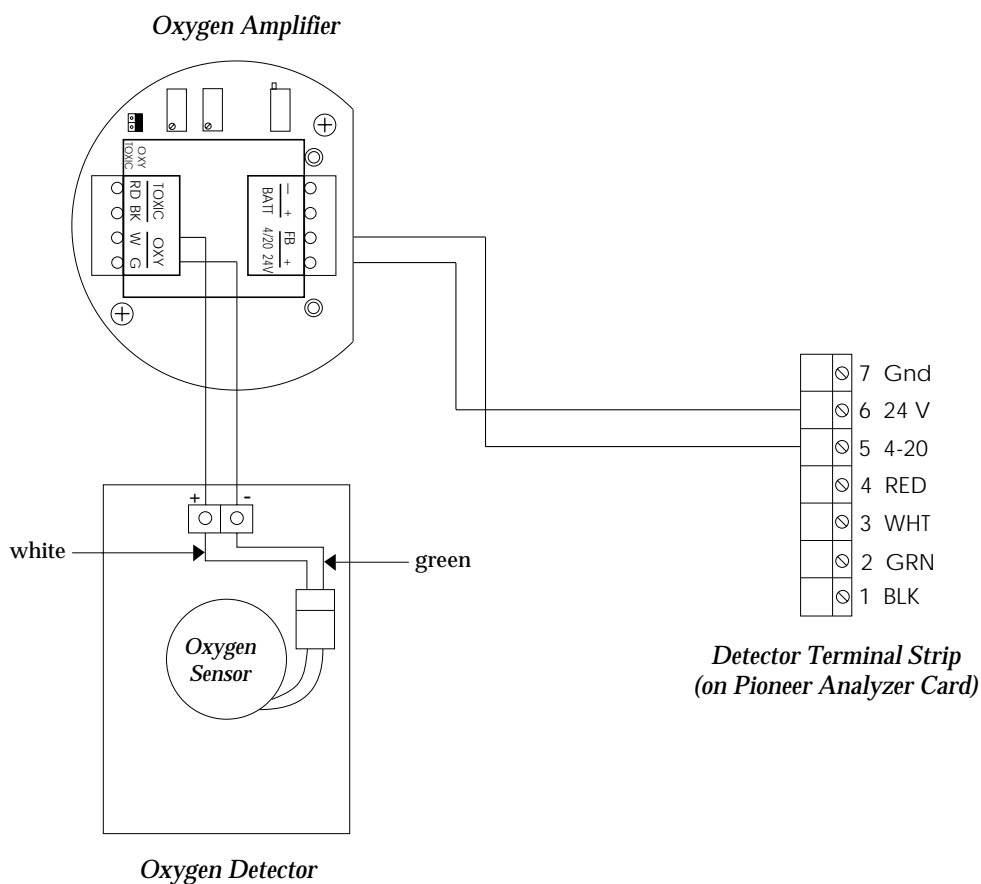
Oxygen Amplifier

7 Gnd
6 24 V
5 4-20
4 RED
3 WHT
2 GRN
1 BLK

*Detector Terminal Strip
(on Pioneer Analyzer Card)*

white →

green →

*Oxygen
Sensor*

Oxygen Detector

Figure 3: Wiring the Oxygen Transmitter to the Pioneer Gas Monitor

13. At the Pioneer, connect the cable's ground wire to an available chassis ground. The grounding screw on each conduit hub is an example of a chassis ground.

Start Up

This section describes procedures to start up the oxygen transmitter and place the transmitter into normal operation.

Introducing Incoming Power

1. Complete the installation procedures described earlier in this insert.

2. Verify that the power wiring is correct and secure (see Chapter 3, Installation and Start Up).

3. Turn on or plug in the incoming power at the power source end, then place the Pioneer's power switch in the ON position.

4. Verify that the main PILOT light is on and the pilot light for each analyzer card is flashing.

Setting the Normal Signal

CAUTION: *If you suspect the monitoring environment is not of normal oxygen content (20.9%), use the calibration kit and the zero air calibration cylinder to introduce "fresh air" to the sensor and verify an accurate normal setting.*

1. Verify that the transmitter is in a fresh air environment (environment known to be of normal oxygen content).

2. Unscrew and remove the *amplifier* junction box cover from the junction box.

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP**+; plug the negative lead into the test point labeled **TP**-.

5. Verify a voltmeter reading of 434.4 mV (±2 mV).

6. If necessary, use a flat-blade screwdriver to adjust the span potentiometer until the voltmeter reading is 434.4 mV (±2 mV).

7. Secure the junction box cover to the junction box.

Channel Setup Program

This section describes the Pioneer's Channel Setup program for the oxygen transmitter. You can display and change the following channel settings with the Channel Setup program.

• Channel Status

• Target Gas, Unit of Measure, and Fullscale Setting

• Channel Type

• Relay 3 Assignment

• Alarm Setpoints and Alarm Type (rising or falling)

NOTE: Channels that are included with the original shipment of the Pioneer are setup at the factory. If you are adding a channel to an existing Pioneer, you need to establish the channel settings in this program.

Navigating through the Channel Setup Program

Use the program buttons to the right of the display screen to enter the program, move forward or backward through the program, change settings within the program, and save or cancel changes to the program settings. Table 2 lists the function of each program button.

Table 2: Program Button Functions for the Channel Setup Program

Button	Function
ESCAPE	• Moves you backward through the program. • Cancels changes made to the program settings.
UP/YES	• Updates the setting that is displayed on the display screen. • Saves changes made to the program settings.
DOWN/NO	• Updates the setting that is displayed on the display screen. • Enters the program (with the ENTER button). • Saves changes made to the program settings.
ENTER	• Moves you forward through the program. • Enters the program (with the DOWN/NO button).

Running the Channel Setup Program

This section describes how to enter the program, display and change program settings, and save or cancel changes to the program settings.

Entering the channel setup program

1. Open the housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and DOWN/NO buttons simultaneously three times.

   The Channel Setup program screen appears.

   ```
   Version    X.XX
   Channel    Setup
   ESCAPE     Abort
   ANY  OTHER  KEY     Next
   ```

NOTE: Once you enter the Channel Setup program, the status lights, buzzer, and relays are disabled until you exit the program.

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The program asks if you want to setup Channel 1.

   ```
   Channel   1
   ESCAPE   Exit   Set-up
   UP/DN   Change   Channel
   ENTER   Set-up   Now
   ```

4. To display or change settings for Channel 1, press the ENTER button (the program displays the Channel Status screen.) To continue to Channel 2 settings, press the UP/YES button. To go to Channel 4 settings, press the DOWN/NO button.

NOTE: The screens illustrated in this section are examples and describe the Channel Setup program for Channel 1.

Channel status screen

This screen indicates the status of Channel 1. For installed channels the default setting is **ACTIVE/ONLINE**. For empty channels, the default setting is **NO SENSOR/AMP**. The third setting, **SILENCED/OFFLINE**, displays the gas reading as XXXX; and the buzzer, status lights, and relays are disabled for the channel.

```
Channel  1
ACTIVE/ONLINE
```

- To accept the channel status setting and continue the program, press the ENTER button.

  The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

- To update the channel status setting:

  1. Use the UP/YES and DOWN/NO buttons to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

NOTE: If you select a channel status of **NO SENSOR/AMP**, the program continues with the next channel.

Fullscale reading, unit of measure, and target gas screen

This screen indicates the fullscale reading, unit of measure, and target gas for Channel 1. The default settings for the oxygen channel are **25.0** (fullscale reading), **%VOL** (unit of measure), and **OXY** (target gas).

```
25.0  %VOL   OXY
```

- To accept the settings and continue the program, press the ENTER button three times.

  The program displays the Channel Type screen.

- To update the target gas, unit of measure, and/or fullscale reading setting:

  1. Use the ENTER and ESCAPE buttons to select the setting you want to change. (The setting flashes when it is selected.)

  2. Use the UP/YES and DOWN/NO buttons to change the setting.

  3. Press the ENTER button until the program displays the Channel Type screen.

Channel type screen

This screen indicates the channel type for Channel 1. The default setting for the channel type (input) setting for the oxygen transmitter is **4-20 Remote**.

```
INPUT:   4-20  Remote
```

- To accept the setting and continue the program, press the ENTER button.

  The program displays the Relay 3 Assignment screen.

- To update the setting:

  1. Use the UP/YES or DOWN/NO button to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Relay 3 Assignment screen.

Relay 3 assignment screen

This screen indicates the assignment of the alarm 3 relay for Channel 1. If you select **Alarm 3**, then the alarm 3 relay activates if Channel 1 goes into an alarm 3 condition. If you select **Fail Alarm**, then the alarm 3 relay de-energizes if Channel 1 goes into a fail condition.

NOTE: If you assign the alarm 3 relay as the channel's fail relay, the status light and buzzer still indicate visual and audible alarms for an alarm 3 condition.

```
Channel  1
Relay  3  Assigned  to:
Alarm  3
```

- To accept the relay 3 assignment setting and continue the program, press the ENTER button.

  The program displays the Fail Setpoint screen.

- To update the relay 3 assignment setting:

  1. Use the UP/YES or DOWN/NO button to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Fail Setpoint screen.

Fail setpoint screen

This screen indicates the setpoint and alarm type for the fail alarm. The setpoint is the display reading at which the alarm is activated. The alarm type controls how the alarm is activated (rising or falling readings).

The default setting for the fail setpoint for the oxygen channel is -**2.0**. The default setting for the alarm type is **FALL**.

```
Channel  1  Fail  Alarm
      -2.0  %VOL  OXY
FALL
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 1 Setpoint screen.

- To update the fail setpoint setting:
  1. Use the UP/YES and DOWN/NO buttons to change the fail setpoint setting.
  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 1 Setpoint screen.

- To update the alarm type setting:
  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
  2. Use the UP/YES or DOWN/NO button to change the setting.
  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 1 Setpoint screen.

Alarm 1 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 1. The default setting for the alarm 1 setpoint for the oxygen channel is **19.5**. The default setting for the alarm type is **FALL**.

```
Channel  1  Alarm  1
      19.5  %VOL  OXY
FALL
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 2 Setpoint screen.

- To update the alarm 1 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.

  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 2 Setpoint screen.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)

  2. Use the UP/YES or DOWN/NO button to change the setting.

  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 2 Setpoint screen.

Alarm 2 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 2. The default setting for the alarm 2 setpoint for the oxygen channel is **17.0**. The default setting for the alarm type is **FALL**.

```
Channel  1  Alarm  2
      17.0  %VOL  OXY
FALL
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 3 Setpoint screen.

- To update the alarm 2 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.

  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program displays the Alarm 3 Setpoint screen.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)

  2. Use the UP/YES or DOWN/NO button to change the setting.

  3. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Alarm 3 Setpoint screen.

Alarm 3 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 3. The default setting for the alarm 3 setpoint for the oxygen channel is **23.5**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  3
       23.5  %VOL  OXY
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program begins channel setup for Channel 2.

- To update the alarm 3 setpoint:

  1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
  2. Press the ENTER button two times to accept the new setting and continue the program.

  The program begins channel setup for Channel 2.

- To update the alarm type setting:

  1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
  2. Use the UP/YES or DOWN/NO button to change the setting.
  3. Press the ENTER button to accept the new setting and continue the program.

  The program begins channel setup for Channel 2.

NOTE: To exit the Channel Setup program, press the ESCAPE button. The Channel Setup Exit screen displays.

Channel setup exit screen

This screen saves or cancels any changes you made in the Channel Setup program.

```
ESCAPE  =  Abort  Setup
UP/DOWN=  Save  &  Exit
ENTER=  Next
```

- **To save changes** and exit the program, press the UP/YES or DOWN/NO button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To cancel changes** and exit the program, press the ESCAPE button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To setup another channel**, press the ENTER button.

  The program asks if you want to setup the next channel. Press the ENTER button to continue.

Maintenance

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

Preventive Maintenance

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

Daily

1. Verify that the pilot light on the applicable analyzer card is flashing. If the pilot light is not flashing, see the following troubleshooting guide in this insert.

NOTE: If the Pioneer's main PILOT light is not on, see the Troubleshooting guide in Chapter 5, Maintenance.

---

2. Verify a display reading of 20.9 %VOL. Investigate significant changes in the display reading.

Monthly

This procedure describes a test to verify that the oxygen transmitter responds properly to oxygen deficiency.

Preparing for the response test

1. Set a voltmeter to measure in the millivolt (mV) range.

2. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.

3. At the Pioneer, verify that the display reading(s) for the channel(s) you plan to test is 20.9.

   If the display reading(s) is not 20.9, set the fresh air reading of the applicable transmitter(s) as described in the Start Up section of this insert, then continue this procedure.

Entering the Calibrate program

1. Open the Pioneer's housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES button simultaneously three times.

   The Calibrate program screen appears.

```
Version   X.XX
Calibrate
ESCAPE     Abort
ANY OTHER KEY    Next
```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the settings in the Instrument Setup program (see Chapter, Operation.)

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The Select screen appears. The first line (channel 1) is flashing.

   ```
   CH1  Not  Selected
   CH2  Not  Selected
   CH3  Not  Selected
   CH4  Not  Selected
   ```

NOTE: The example used in this procedure describes a response test for Channels 3 and 4.

---

4. Press the DOWN/NO button two times. The third line (channel 3) is flashing.

5. Press the ENTER button to "select" Channel 3, then press the DOWN/NO button.

6. Press the ENTER button to "select" Channel 4, then press the DOWN/NO button.

NOTE: The description for Channels 3 and 4 changes to **4-20 Monitor** when you "select" Channels 3 and 4.

The Channels Selected screen appears.

   ```
   You  have  Selected
   these  Channels:
   3 , 4
   ENTER  Next ,  ESC  Prev
   ```

7. Verify that you selected the correct channel(s), then press the ENTER button to continue.

   The Choose Calibration screen appears.

   ```
   Choose  Calibration
   Oxygen  Span  Proceed
   Oxygen  Zero  Proceed
   ENTER  Next ,  ESC  Prev
   ```

NOTE: If one or more of the channels you selected on the Select screen is set up for a target gas other than oxygen, then the Choose Calibration screen appears as follows.

   ```
   Choose  Calibration
   Zero  ( Oxygen  Span )
   Span  ( Oxygen  Zero )
   ENTER  Next ,  ESC  Prev
   ```

---

8. Verify that the **Oxygen Zero Proceed** line is flashing [or **Span (Oxygen Zero)** if applicable], then press the ENTER button to continue. If the **Oxygen Zero Proceed** line is not flashing, press the DOWN/NO button, then press the ENTER button.

The Calibration screen appears.

```
C  CH1      ( N o t   S e l e c t e d )
A  CH2      ( N o t   S e l e c t e d )
L  CH3        0 . 0   O X Y
.  CH4        0 . 0   O X Y
```

9. Press the ENTER button.

The Apply Gas screen appears.

```
E S C A P E    P r e v i o u s
E N T E R      A p p l y   G a s
```

10. Press the ENTER button.

The Span screen appears.

```
C H 1          X X X   A p p l y   G a s
C H 2          X X X   t h e n
C H 3        2 0 . 9 * E N T E R   t o
C H 4        2 0 . 9 * S p a n
```

Performing the response test

1. Exhale into the diffusion port in the oxygen detector's junction box cover.

NOTE: Once you begin exhaling into the diffusion port, the Span screen "freezes" and displays each "selected" channel's lowest reading. This feature enables you to verify the readings at the Pioneer in addition to the "local" test at the transmitter.

---

2. Stop exhaling into the diffusion port, then verify that the readings on the voltmeter decreased from the normal reading (434.4 mV).

NOTE: If the reading(s) does not decrease, calibrate the affected transmitter(s) as described in the Calibration section of this insert.

If the oxygen reading(s) is below the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the reading(s) of the "selected" channels on the Fresh Air screen.

To display the Fresh Air screen, press the ESCAPE button, next press the UP/YES button, then press the ENTER button.

---

3. Remove the voltmeter leads from the amplifier test points.

4. Press the ESCAPE button until the Save screen appears.

```
E S C A P E   =   A b o r t   S e t u p
U P / D O W N =   S a v e   &   E x i t
E N T E R =   N e x t
```

5. Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT  SET-UP
NOT  SAVED,  USING
PREVIOUS  VALUES
```

NOTE: The Pioneer does not save calibration values for remote transmitters. When calibrating the transmitter, you perform calibration at the transmitter; therefore, it is not necessary to save calibration values at the Pioneer.

The purpose of entering the Calibrate program when performing this response test is to disable the status lights, buzzer, and relays and so you can view the response reading(s) on the Span screen.

Quarterly

Calibrate the oxygen transmitter as described in the Calibration section of this insert.

Troubleshooting

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

NOTE: This troubleshooting guide describes transmitter problems only. See the Troubleshooting guide in Chapter 5, Maintenance, for problems you may encounter with the Pioneer Gas Monitor.

Fail condition

Symptoms

- The FAIL light is on.
- The buzzer is sounding a steady tone.
- The fail relay is de-energized.
- The display reading is flashing.

Probable causes

- The analyzer card is disconnected or misconnected.
- The transmitter wiring is disconnected or misconnected.
- The transmitter is malfunctioning.

Recommended action

1. Verify that the analyzer card is installed correctly and that the pilot light on the analyzer card is flashing. The components of the analyzer card face left when the card is installed correctly.
2. Verify that the transmitter wiring is correct and secure. The Installation section of this insert describes transmitter wiring connections.
3. Calibrate the transmitter as described in the Calibration section of this insert.
4. If the fail condition continues, replace the detector as described later in this section.
5. If the fail condition continues, contact RKI Instruments, Inc., for further instruction.

Slow or no response/difficult or unable to calibrate

Symptoms

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

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

Probable causes

- The calibration cylinder is low, out-dated, or defective.
- The *detector* junction box's diffusion port is obstructed.
- The transmitter is malfunctioning.

Recommended action

1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample.
2. Verify that the *detector* junction box's diffusion port is not obstructed.
3. If the calibration/response difficulties continue, replace the detector as described later in this section.
4. If the calibration/response difficulties continue, contact RKI Instruments, Inc., for further instruction.

No display reading

Symptoms

- The transmitter is installed, but the display screen is blank for that channel.

NOTE: If the display screen is blank for all channels, see the troubleshooting guide in Chapter 5, Maintenance.

Probable causes

- The channel status setting is set at **NO SENSOR/AMP**.

Recommended action

1. Enter the Channel Setup program, and change the channel status setting to **ACTIVE/ONLINE** or **SILENCED/OFFLINE**.
2. If the display reading difficulties continue, contact RKI Instruments, Inc., for further instruction.

Replacing Components of the Oxygen Transmitter

This section includes procedure to replace the oxygen sensor, amplifier, and sensor backup battery.

Replacing the oxygen sensor

1. Place the Pioneer's power switch in the OFF position.

2. Loosen the two securing screws from the *detector* junction box cover, then remove the cover.

The sensor is mounted to the back of the junction box cover. A retaining strip secures the sensor to the cover. The retaining strip is secured by two screws in standoffs. One end of the strip has a slot cutout.

3. Loosen one of the screws that secures the retaining strip (cutout end), then rotate the retaining strip so it no longer covers the sensor.

4. Unplug the sensor socket from the male connector, them remove the sensor.

5. Place the replacement sensor in the same position as the original sensor, then rotate the securing strip over the sensor. Tighten the screw you removed in step 3 to secure the sensor to the junction box cover.

6. Plug the socket of the replacement sensor into the male connector.

7. Place the Pioneer's power switch in the ON position.

8. Secure the *detector* junction box cover to the junction box with the two screws you removed in step 2.

9. Calibrate the replacement detector as described in the Calibration section of this insert.

Replacing the amplifier

1. Place the Pioneer's power switch in the OFF position.

2. Remove the *amplifier* junction box cover.

3. Disconnect the wiring from the detector terminal strip.

NOTE: Leave the opposite end of the wiring connected in the *detector* junction box.

---

4. Disconnect the wiring from terminals **4/20 FB** and **24V** + of the interconnect terminal strip.

NOTE: Leave the opposite end of the wiring connected at the Pioneer.

---

5. Unscrew and remove the two screws that secure the amplifier to the junction box. The screws are at the top right and bottom left of the amplifier.

6. Remove the amplifier.

7. Place the new amplifier in the same position as the amplifier you removed in the previous step.

8. Use the two screws you removed in step 5 to secure the amplifier to the junction box.

9. Verify that the jumper block is installed over the **OXY** selector of the amplifier type selector as shown in Figure 3, Wiring the Oxygen Transmitter to the Pioneer Gas Monitor.

10. Reconnect the wiring from the Pioneer to the interconnect terminal strip as shown in Table 3 and Figure 3, Wiring the Oxygen Transmitter to the Pioneer Gas Monitor.

Table 3: Reconnecting the Oxygen Amplifier to the Pioneer Gas Monitor

Amplifier Interconnect Terminal Strip	Pioneer Analyzer Card
4/20 FB	4-20 (Terminal 5)
24V +	24 V (Terminal 6)

11. Reconnect the wiring from the (2-point) sensor terminal block in the *detector* junction box to the amplifier's detector terminal strip as shown in Table 4 and Figure 3, Wiring the Oxygen Transmitter to the Pioneer Gas Monitor.

Table 4: Reconnecting the Oxygen Detector to the Amplifier

Sensor Terminal Block	Amplifier Interconnect Terminal Strip
+ (white)	OXY W
— (green)	OXY G

12. Place the Pioneer's power switch in the ON position.

13. Calibrate the oxygen transmitter as described in the Calibration section of this insert.

Calibration

This section describes how to calibrate the oxygen transmitter. It includes procedures to set the fresh air reading, assemble the calibration kit, enter the Calibrate program, set the zero reading, and return to normal operation.

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

Setting the Fresh Air Reading

1. Verify that the oxygen transmitter is in a fresh air environment (environment known to be of normal oxygen content).

2. Set a voltmeter to measure in the millivolt (mV) range.

3. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

    Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP**-.

4. Verify a voltmeter reading of 434.4 mV (±2 mV).

5. If necessary, use a flat-blade screwdriver to adjust the span potentiometer until the voltmeter reading is 434.4 mV (±2 mV).

Assembling the Calibration Kit

1. Connect one end of the sample tubing to the regulator.

2. Connect the opposite end of the sample tubing to the calibration cup.

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

Entering the Calibrate Program

1. Open the housing door of the Pioneer, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES buttons simultaneously three times.

    The Calibrate program screen appears.

```
Version   X.XX
Calibrate
ESCAPE     Abort
ANY OTHER KEY    Next
```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the settings in the Instrument Setup program (see Chapter, Operation.)

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

The Select screen appears. The first line (channel 1) is flashing.

```
CH1  Not  Selected
CH2  Not  Selected
CH3  Not  Selected
CH4  Not  Selected
```

NOTE: The example used in this procedure describes calibration for Channels 1, 2, and 3.

4. Press the ENTER button to "select" Channel 1, then press the DOWN/NO button. The second line (channel 2) is flashing.

5. Repeat step 4 to "select" Channels 2 and 3.

NOTE: The description for Channels 1, 2, and 3 changes to **4-20 Monitor** when you "select" Channels 1, 2, and 3.

6. Press the DOWN/NO button.

The Channels Selected screen appears.

```
You  have  Selected
these  Channels:
1,2,3
ENTER  Next,  ESC  Prev
```

7. Verify that you selected the correct channel(s), then press the ENTER button to continue.

The Choose Calibration screen appears.

```
Choose  Calibration
Oxygen  Span  Proceed
Oxygen  Zero  Proceed
ENTER  Next,  ESC  Prev
```

NOTE: If one or more of the channels you selected on the Select screen is set up for a target gas other than oxygen, then the Choose Calibration screen appears as follows.

```
Choose  Calibration
Zero  (Oxygen  Span)
Span  (Oxygen  Zero)
ENTER  Next,  ESC  Prev
```

8. Verify that the **Oxygen Span Proceed** line is flashing [or **Zero (Oxygen Span)** if applicable], then press the ENTER button to continue. If the **Oxygen Span Proceed** line is not flashing, press the UP/YES button, then press the ENTER button.

    The Fresh Air screen appears. The readings displayed on the Fresh Air screen are the current gas readings. The asterisk (*) to the right of each reading indicates that you cannot adjust this reading at the Pioneer.

```
CH1      20.9*ENTER  to
CH2      20.9*Fresh  Air
CH3      20.9*Adjust
CH4       XXX
```

CAUTION: Do not press the ENTER button at this time.

Setting the Zero Reading

1. Screw the regulator into the 100% nitrogen calibration cylinder, then hold the calibration cup over the diffusion port of the junction box.

2. When the reading on the voltmeter stabilizes, verify a reading of 100 mV (±2 mV).

3. If necessary, use the zero potentiometer on the amplifier to adjust the reading to 100 mV (±2 mV).

4. Unscrew the regulator from the calibration cylinder.

NOTE: For convenience, leave the components of the calibration kit connected by the sample tubing.

Returning to Normal Operation

1. Remove the voltmeter leads from the amplifier test points.

2. Secure the junction box cover to the junction box.

NOTE: If the oxygen reading(s) is below the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the current reading(s) of the "selected" channels on the Fresh Air screen.

---

3. Press the ESCAPE button three times.

    The Save screen appears.

```
ESCAPE  =  Abort  Setup
UP/DOWN=  Save  &  Exit
ENTER=  Next
```

4. Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT  SET-UP
NOT  SAVED,  USING
PREVIOUS  VALUES
```

NOTE: Because you performed calibration at the transmitter, it is not necessary to save calibration values at the Pioneer. The Pioneer does not save calibration values for remote transmitters.

The purpose of entering the Calibrate program is to disable the status lights, buzzer, and relays during calibration and so you can view the current reading(s) on the Fresh Air screen.

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

6. Verify that the applicable display reading(s) increases and stabilizes at 20.9 %VOL.

Parts List

Table 5 lists replacement parts and accessories for the oxygen channel.

Table 5: Parts List

Part Number	Description
06-1248RK	Sample tubing (1 foot)
18-0300RK	*Detector* junction box (base only)
18-0301RK-01	*Detector* junction box (includes base, cover, and gasket)
18-0402RK-01	*Amplifier* junction box
57-0004RK	Analyzer card
57-1060RK	Amplifier (specify target gas when ordering)
65-0601RK	Oxygen detector
65-2411RK	Oxygen transmitter (includes detector, amplifier, and junction box)
71-0027RK-09	*Oxygen Transmitter Manual Insert* (this document)
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-0078RK	Calibration cylinder (100% nitrogen, 17 liter)
81-0078RK-01	Calibration cylinder (100% nitrogen; 34 liter)
81-1003RK	Regulator (for 17 and 34 liter calibration cylinders)
81-1109RK	Calibration cup

Pioneer Carbon Monoxide Transmitter Specifications

- Model: Carbon Monoxide Transmitter 65-2434RK
- Gas: Carbon Monoxide (CO)
- Measuring range: 0 - 300 ppm
- Alarm points: Alarm 1   25 ppm
                     Alarm 2   50 ppm
                     Alarm 3   100 ppm
- Calibration gas: 50 ppm CO in air or nitrogen (typical)
- Sensor: ES-1531-CO
- Charcoal Filter: 33-7101RK

Please see the attached wiring diagram for the transmitter wiring.

Carbon Monoxide Transmitter

Overview

This detection insert describes the carbon monoxide (CO) transmitter. This insert also describes how to install, start up, maintain, and calibrate the transmitter and run the Channel Setup program. A parts list at the end of this insert lists replacement parts and accessories for the CO transmitter.

Specifications

Table 1 lists specifications for the CO transmitter. See the specifications in Chapter 1, Introduction, for specifications that apply to the Pioneer Gas Monitor.

Table 1: Specifications

Target Gas	Carbon monoxide (CO)
Area Classification	Explosionproof for Class I, Groups B, C, and D
Sampling Method	Diffusion
Signal Output	4 to 20 mA
Detection Range	0 to 300 PPM (parts per million)*
Alarm 1 Setpoint	25 PPM*
Alarm 2 Setpoint	50 PPM*
Alarm 3 Setpoint	100 PPM*
Response Time	90% in 30 seconds

*   *These specifications represent RKI standard settings; however, you can adjust them in the Channel Setup program.*

Description

This section describes the components of the CO transmitter. The transmitter consists of the CO detector, amplifier, and junction box.
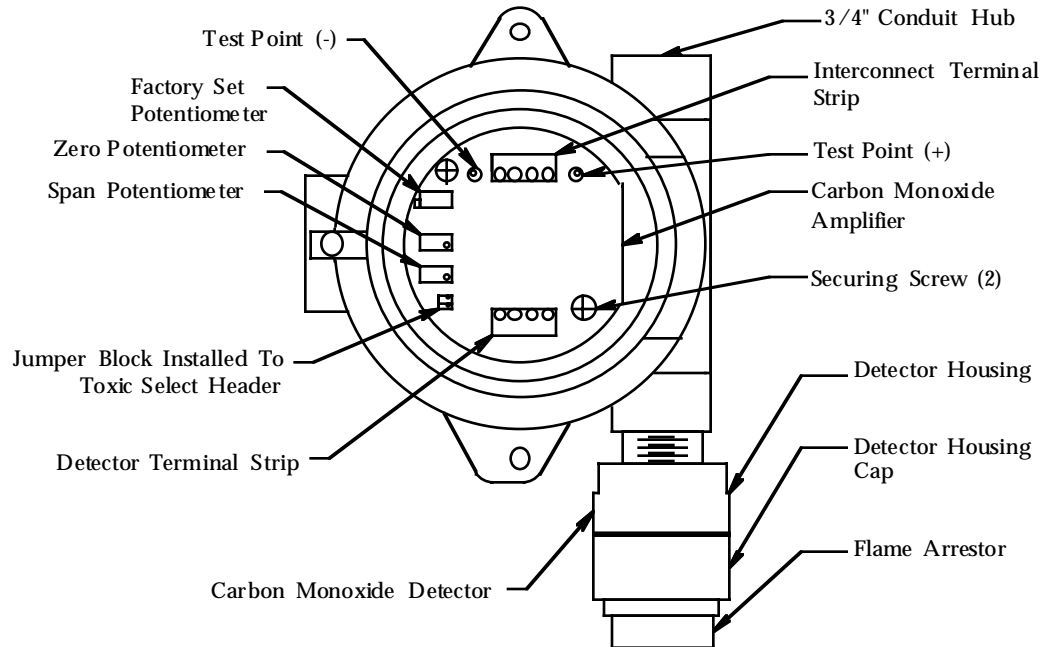

Figure 1: CO Transmitter Component Location

CO Detector

The CO detector includes the detector housing, sensor, and filter.

Detector housing

The detector housing protects the sensing components within the housing. Use the mounting threads at the top of the housing to screw the CO detector into the bottom conduit hub of the junction box. Use the removable cap near the bottom of the housing to access the sensor for maintenance or replacement. The cap protects the sensor from damage and includes a flame arrestor which contains any sparks which may occur within the detector housing.

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

Sensor

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

Filter

The disc-shaped filter is secured to one end of the sensor. The filter prevents interference gases (hydrogen sulfide [H_2S] and certain hydrocarbons) from producing false CO readings. The filter is held in place by a rubber boot.

Amplifier

The amplifier converts the electrical output from the sensor to a 4 to 20 mA signal (that is proportional to the detection range) and transmits the signal to the Pioneer. The amplifier includes the amplifier type selector, detector terminal strip, interconnect terminal strip, span potentiometer, zero potentiometer, test points, and sensor backup battery (see Figure 1.)

Amplifier type selector

The amplifier type selector is near the top left corner of the amplifier. It is above the detector terminal strip and to the left of the span potentiometer.

The amplifier included with the CO transmitter is designed for use with RKI's toxic gas and oxygen transmitters. The amplifier type selector determines for which transmitter the amplifier is intended. For CO transmitters, a jumper block is installed over the **TOXIC** selector (see Figure 1.)

Detector terminal strip

The detector terminal strip is the four-point terminal strip on the left side of the amplifier. Use the detector terminal strip to connect the CO detector to the amplifier.

NOTE: The CO detector is factory-wired to the amplifier. See the Installation section of this insert for all wiring procedures related to the transmitter.

Interconnect terminal strip

The interconnect terminal strip is the four-point terminal strip on the right side of the amplifier. Use the interconnect terminal strip to connect the amplifier to the Pioneer.

Span potentiometer

The span potentiometer is near the top of the amplifier. Of the three potentiometers, the span potentiometer is farthest to the left. Use the span potentiometer to adjust the transmitter's response output during the calibration procedure.

Zero potentiometer

The zero potentiometer is to the right of the span potentiometer. Use the zero potentiometer to adjust the transmitter's target gas-free output during the start-up and calibration procedures.

CAUTION: The third potentiometer is factory-set. Do not adjust it.

Test points

The test points (labeled **TP**- and **TP**+) are directly above and below the interconnect terminal strip. The test points produce a 100 to 500 mV output that is proportional to the transmitter's 4 to 20 mA output. Use the test points and a voltmeter to measure the transmitter's output during the start-up and calibration procedures.

Junction Box

Use the junction box to install the CO transmitter at a mounting site that is remote from the Pioneer. The junction box also protects the amplifier and wiring connections made to the amplifier. Use the two 3/4 in. conduit hubs to mount the detector to the junction box (bottom hub) and connect wiring from the amplifier to the Pioneer (top hub).

NOTE: The CO detector and amplifier are factory-mounted to the junction box.

Use the junction box's two mounting holes to mount the CO transmitter to a vertical surface at the monitoring site. Use the cover on the front of the junction box to access the interior of the junction box.

Installation

This section describes procedures to mount the CO transmitter in the monitoring environment and wire the transmitter to the Pioneer Gas Monitor.

Mounting the CO Transmitter

1. Select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.

    - Select a site where the transmitter is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.

    - Select a site where the target gas is likely to be found first.

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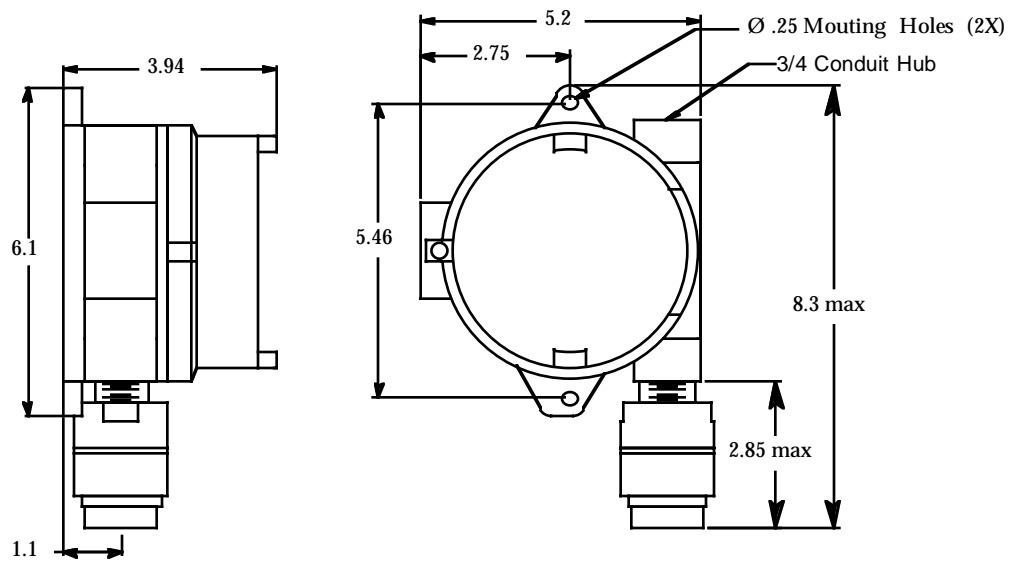

Figure 2: Mounting the CO Transmitter

If the CO detector is mounted to the junction box, skip to step 5. If not, continue with step 2.

2. Remove the junction box cover.

3. Guide the two wires that extend from the top of the CO detector through the bottom conduit hub of the junction box.

4. Screw the CO detector into the bottom conduit hub of the junction box.

5. At the monitoring site, use 1/4 in. screws through the junction box's two mounting holes to secure the junction box to a vertical surface.

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

Wiring the CO Transmitter to the Pioneer

WARNING: Always verify that the Pioneer's power switch is in the OFF position before you make wiring connections.

---

1. Place the Pioneer's power switch in the OFF position.

2. Remove the junction box cover.

3. Verify that the detector leads are wired to the amplifier's detector terminal strip. If necessary, connect the detector leads to the detector terminal strip as shown in Figure 3.

4. Verify that the jumper block is installed over the **TOXIC** selector of the amplifier type selector as shown in Figure 3.

5. Guide a two-conductor, shielded cable or two wires in conduit through the top conduit hub of the junction box.

6. Connect the two wires to the interconnect terminal strip as follows (see Figure 3.)

    •   Connect the positive wire to the terminal labeled **24V +**.

    •   Connect the feedback wire to the terminal labeled **4/20 FB**.

CAUTION: *Leave the ground wire insulated and disconnected at the transmitter. You will connect the opposite end of the cable's ground wire at the Pioneer.*

---

7. Secure the junction box cover to the junction box.

8. Route the cable or wires leading from the CO transmitter through one of the conduit hubs on the bottom of the Pioneer housing.

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

---

9. Connect the wires to the detector terminal strip of the applicable analyzer card as shown in Figure 3. The detector terminal strip is the 7-point terminal strip (terminals 1 through 7) on the card.
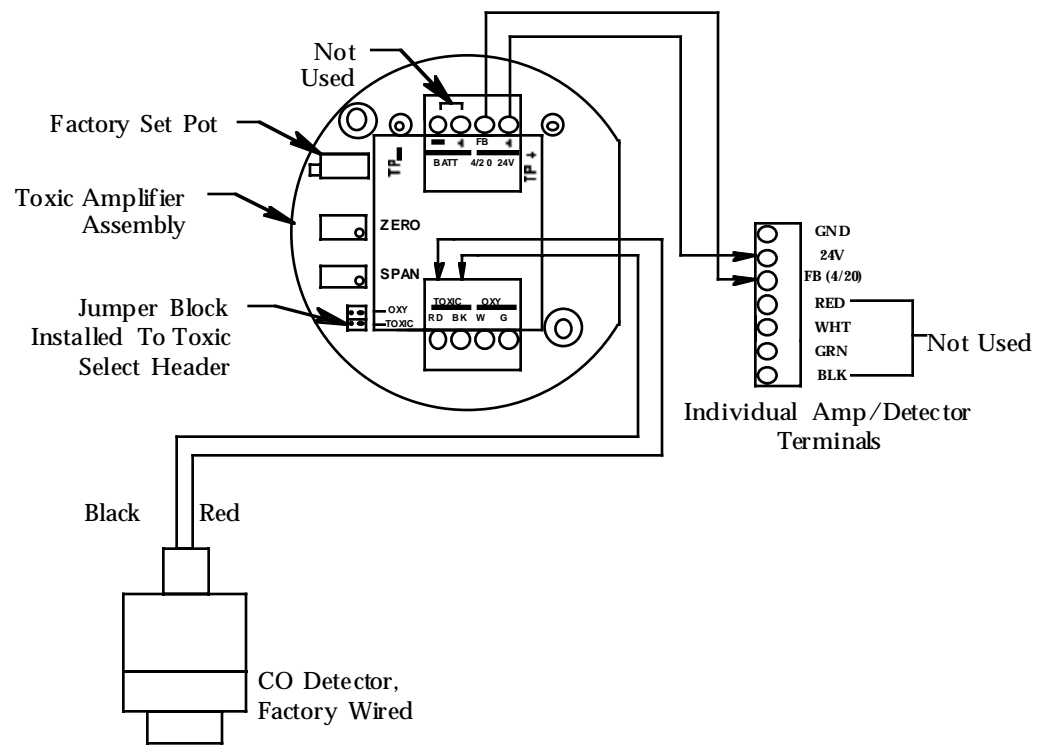

Figure 3: Wiring the CO Transmitter to the Pioneer Gas Monitor

10. At the Pioneer, connect the cable's ground wire to an available chassis ground. The grounding screw on each conduit hub is an example of a chassis ground.

Start Up

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

Introducing Incoming Power

1. Complete the installation procedures described earlier in this insert.

2. Verify that the power wiring is correct and secure (see Chapter 3, Installation and Start Up.)

3. Turn on or plug in the incoming power at the power source end, then place the Pioneer's power switch in the ON position.

4. Verify that the main PILOT light is on and the pilot light for each analyzer card is flashing.

Setting the Zero Signal

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

---

1. Verify that the transmitter is in a fresh air environment (environment known to be free of carbon monoxide).

2. Unscrew and remove the junction box cover from the junction box.

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP**+; plug the negative lead into the test point labeled **TP**-.

5. Verify a voltmeter reading of 100 mV (±2 mV).

6. If necessary, use a flat-blade screwdriver to adjust the zero potentiometer until the voltmeter reading is 100 mV (±2 mV).

7. Secure the junction box cover to the junction box.

Channel Setup Program

This section describes the Pioneer's Channel Setup program for the CO transmitter. You can display and change the following channel settings with the Channel Setup program.

• Channel Status

• Target Gas, Unit of Measure, and Fullscale Setting

• Relay 3 Assignment

• Alarm Setpoints and Alarm Type (rising or falling)

NOTE: Channels that are included with the original shipment of the Pioneer are setup at the factory. If you are adding a channel to an existing Pioneer, you need to establish the channel settings in this program.

Navigating through the Channel Setup Program

Use the program buttons to the right of the display screen to enter the program, move forward or backward through the program, change settings within the program, and save or cancel changes to the program settings. Table 2 lists the function of each program button.

Table 2: Program Button Functions for the Channel Setup Program

Button	Function
ESCAPE	• Moves you backward through the program.
	• Cancels changes made to the program settings.
UP/YES	• Updates the setting that is displayed on the display screen.
	• Saves changes made to the program settings.
DOWN/NO	• Updates the setting that is displayed on the display screen.
	• Enters the program (with the ENTER button).
	• Saves changes made to the program settings.
ENTER	• Moves you forward through the program.
	• Enters the program (with the DOWN/NO button).

Running the Channel Setup Program

This section describes how to enter the program, display and change program settings, and save or cancel changes to the program settings.

Entering the channel setup program

1. Open the housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and DOWN/NO buttons simultaneously three times.

   The Channel Setup program screen appears.

```
Version    X.XX
Channel    Setup
ESCAPE     Abort
ANY  OTHER  KEY    Next
```

NOTE: Once you enter the Channel Setup program, the status lights, buzzer, and relays are disabled until you exit the program.

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The program asks if you want to setup Channel 1.

   ```
   Channel  1
   ESCAPE  Exit  Set-up
   UP/DN  Change  Channel
   ENTER  Set-up  Now
   ```

4. To display or change settings for Channel 1, press the ENTER button (the program displays the Channel Status screen.) To continue to Channel 2 settings, press the UP/YES button. To go to Channel 4 settings, press the DOWN/NO button.

NOTE: The screens illustrated in this section are examples and describe the Channel Setup program for Channel 1.

Channel status screen

This screen indicates the status of Channel 1. For installed channels the default setting is **ACTIVE/ONLINE**. For empty channels, the default setting is **NO SENSOR/AMP**. The third setting, **SILENCED/OFFLINE**, displays the gas reading as XXXX; and the buzzer, status lights, and relays are disabled for the channel.

   ```
   Channel  1
   ACTIVE/ONLINE
   ```

• To accept the channel status setting and continue the program, press the ENTER button.

   The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

• To update the channel status setting:

   1. Use the UP/YES and DOWN/NO buttons to change the setting.

   2. Press the ENTER button to accept the new setting and continue the program.

   The program displays the Fullscale Reading, Unit of Measure, and Target Gas screen.

NOTE: If you select a channel status of **NO SENSOR/AMP**, the program continues with the next channel.

Fullscale reading, unit of measure, and target gas screen

This screen indicates the fullscale reading, unit of measure, and target gas for Channel 1. The default settings for the CO channel are **300** (fullscale reading), **PPM** (unit of measure), and **CO** (target gas).

   ```
   300  PPM    CO
   ```

- To accept the settings and continue the program, press the ENTER button three times.

  The program displays the Relay 3 Assignment screen.

- To update the target gas, unit of measure, and/or fullscale reading setting:

  1. Use the ENTER and ESCAPE buttons to select the setting you want to change. (The setting flashes when it is selected.)

  2. Use the UP/YES and DOWN/NO buttons to change the setting.

  3. Press the ENTER button until the program displays the Relay 3 Assignment screen.

Relay 3 assignment screen

This screen indicates the assignment of the alarm 3 relay for Channel 1. If you select **Alarm 3**, then the alarm 3 relay activates if Channel 1 goes into an alarm 3 condition. If you select **Fail Alarm**, then the alarm 3 relay de-energizes if Channel 1 goes into a fail condition.

NOTE: If you assign the alarm 3 relay as the channel's fail relay, the status light and buzzer still indicate visual and audible alarms for an alarm 3 condition.

```
Channel  1
Relay  3  Assigned  to:
Alarm  3
```

- To accept the relay 3 assignment setting and continue the program, press the ENTER button.

  The program displays the Fail Setpoint screen.

- To update the relay 3 assignment setting:

  1. Use the UP/YES or DOWN/NO button to change the setting.

  2. Press the ENTER button to accept the new setting and continue the program.

  The program displays the Fail Setpoint screen.

Fail setpoint screen

This screen indicates the setpoint and alarm type for the fail alarm. The setpoint is the display reading at which the alarm is activated. The alarm type controls how the alarm is activated (rising or falling readings).

The default setting for the fail setpoint for the CO channel is -**30**. The default setting for the alarm type is **FALL**.

```
Channel  1  Fail  Alarm
        -30  PPM    CO
FALL
```

- To accept the settings and continue the program, press the ENTER button two times.

  The program displays the Alarm 1 Setpoint screen.

- To update the fail setpoint setting:
    1. Use the UP/YES and DOWN/NO buttons to change the fail setpoint setting.
    2. Press the ENTER button two times to accept the new setting and continue the program.

    The program displays the Alarm 1 Setpoint screen.
- To update the alarm type setting:
    1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
    2. Use the UP/YES or DOWN/NO button to change the setting.
    3. Press the ENTER button to accept the new setting and continue the program.

    The program displays the Alarm 1 Setpoint screen.

Alarm 1 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 1. The default setting for the alarm 1 setpoint for the CO channel is **25**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  1
          25  PPM   CO
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

    The program displays the Alarm 2 Setpoint screen.
- To update the alarm 1 setpoint:
    1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
    2. Press the ENTER button two times to accept the new setting and continue the program.

    The program displays the Alarm 2 Setpoint screen.
- To update the alarm type setting:
    1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
    2. Use the UP/YES or DOWN/NO button to change the setting.
    3. Press the ENTER button to accept the new setting and continue the program.

    The program displays the Alarm 2 Setpoint screen.

Alarm 2 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 2. The default setting for the alarm 2 setpoint for the CO channel is **50**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  2
          50  PPM   CO
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

    The program displays the Alarm 3 Setpoint screen.

- To update the alarm 2 setpoint:
    1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
    2. Press the ENTER button two times to accept the new setting and continue the program.

    The program displays the Alarm 3 Setpoint screen.

- To update the alarm type setting:
    1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
    2. Use the UP/YES or DOWN/NO button to change the setting.
    3. Press the ENTER button to accept the new setting and continue the program.

    The program displays the Alarm 3 Setpoint screen.

Alarm 3 setpoint screen

This screen indicates the setpoint and alarm type for Alarm 3. The default setting for the alarm 3 setpoint for the CO channel is **100**. The default setting for the alarm type is **RISE**.

```
Channel  1  Alarm  3
        100  PPM   CO
RISE
```

- To accept the settings and continue the program, press the ENTER button two times.

    The program begins channel setup for Channel 2.

- To update the alarm 3 setpoint:
    1. Use the UP/YES and DOWN/NO buttons to change the setpoint.
    2. Press the ENTER button two times to accept the new setting and continue the program.

    The program begins channel setup for Channel 2.

- To update the alarm type setting:
    1. Press the ENTER button to select the alarm type setting. (The setting flashes when it is selected.)
    2. Use the UP/YES or DOWN/NO button to change the setting.
    3. Press the ENTER button to accept the new setting and continue the program.

    The program begins channel setup for Channel 2.

NOTE: To exit the Channel Setup program, press the ESCAPE button. The Channel Setup Exit screen displays.

Channel setup exit screen

This screen saves or cancels any changes you made in the Channel Setup program.

```
ESCAPE  =  Abort  Setup
UP/DOWN=  Save  &  Exit
ENTER=  Next
```

- **To save changes** and exit the program, press the UP/YES or DOWN/NO button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To cancel changes** and exit the program, press the ESCAPE button.

  The program displays a confirmation message, then the normal screen appears. The Pioneer is in normal operation.

- **To setup another channel**, press the ENTER button.

  The program asks if you want to setup the next channel. Press the ENTER button to continue.

Maintenance

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

Preventive Maintenance

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

Daily

1. Verify that the pilot light on the applicable analyzer card is flashing. If the pilot light is not flashing, see the following troubleshooting guide in this insert.

NOTE: If the Pioneer's main PILOT light is not on, see the Troubleshooting guide in Chapter 5, Maintenance.

---

2. Verify a display reading of 0 PPM. Investigate significant changes in the display reading.

Monthly

This procedure describes a test to verify that the CO transmitter responds properly to carbon monoxide.

Preparing for the response test

1. Verify that the display reading(s) for the channel(s) you plan to test is 0.

   If the display reading(s) is not zero, set the zero reading of the applicable transmitter(s) as described in the Start Up section of this insert, then continue this procedure.

2. Assemble the calibration kit as described in the Calibration section of this insert.

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

---

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

   Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.

5. Use the following formula to determine the correct test points output for the test sample.

   Output (mV) = (calibrating sample/fullscale) X 400 + 100

   For example, with a test sample of 50 PPM CO and a fullscale setting of 300 PPM, the correct output is 167 mV.

   167 (mV) = (50/300) X 400 +100

Entering the Calibrate program

1. Open the Pioneer's housing door, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES button simultaneously three times.

   The Calibrate program screen appears.

   ```
   Version  X.XX
   Calibrate
   ESCAPE    Abort
   ANY OTHER KEY    Next
   ```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

   The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the calibration time-out setting in the Instrument Setup program (see Chapter 4, Operation.)

---

3. Press the UP/YES, DOWN/NO, or ENTER button to continue.

   The Select screen appears. The first line (channel 1) is flashing.

   ```
   CH1  Not  Selected
   CH2  Not  Selected
   CH3  Not  Selected
   CH4  Not  Selected
   ```

NOTE: The example used in this procedure describes a response test for Channels 3 and 4.

---

4. Press the DOWN/NO button two times. The third line (channel 3) is flashing.

5. Press the ENTER button to "select" Channel 3, then press the DOWN/NO button.

6. Press the ENTER button to "select" Channel 4, then press the DOWN/NO button.

NOTE: The description for Channels 3 and 4 changes to **4-20 Monitor** when you "select" Channels 3 and 4.

The Channels Selected screen appears.

```
You  have  Selected
these  Channels:
3 , 4
ENTER  Next,  ESC  Prev
```

7. Verify that you selected the correct channel(s), then press the ENTER button to continue.

   The Choose Calibration screen appears.

```
Choose  Calibration
Zero  Proceed
Span  Proceed
ENTER  Next,  ESC  Prev
```

NOTE: If one or more of the channels you selected on the Select screen is an oxygen channel, then the Choose Calibration screen appears as follows.

```
Choose  Calibration
Zero  ( Oxygen  Span )
Span  ( Oxygen  Zero )
ENTER  Next,  ESC  Prev
```

---

8. Verify that the **Span Proceed** line is flashing [or **Span (Oxygen Zero)** if applicable], then press the ENTER button to continue. If the **Span Proceed** line is not flashing, press the DOWN/NO button, then press the ENTER button.

   The Calibration screen appears.

```
C   CH1      ( Not  Selected )
A   CH2      ( Not  Selected )
L   CH3        50  CO
.   CH4        50  CO
```

9. Press the ENTER button.

   The Apply Gas screen appears.

```
ESCAPE   Previous
ENTER    Apply  Gas

```

10. Press the ENTER button.

The Span screen appears.

```
CH 1        XXX  Apply  Gas
CH 2        XXX  then
CH 3          0 * ENTER  to
CH 4          0 * Span
```

Performing the response test

1. Screw the regulator into the calibration cylinder.

NOTE: Once you introduce the test sample to the transmitter, the Span screen "freezes" and displays each "selected" channel's highest reading. This feature enables you to verify the readings at the Pioneer in addition to the "local" test at the transmitter.

---

2. When the reading on the voltmeter stabilizes, verify that the reading is within ± 10% of the response reading you determined earlier.

NOTE: If the readings are not within ± 10% of the correct response reading, calibrate the affected transmitters as described in the Calibration section of this insert.

---

3. Unscrew the regulator from the calibration cylinder, then disassemble the calibration kit as described in the Calibration section of this insert.

NOTE: If the Pioneer's display reading(s) is above the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the reading(s) of the "selected" channels on the Fresh Air screen in the Calibrate program.

To display the Fresh Air screen, press the ESCAPE button, next press the UP/YES button, then press the ENTER button.

---

4. Press the ESCAPE button until the Save screen appears.

```
ESCAPE   =  Abort  Setup
UP/DOWN =  Save  &  Exit
ENTER =  Next
```

5. Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT  SET-UP
NOT  SAVED,  USING
PREVIOUS  VALUES
```

NOTE: The Pioneer does not save calibration values for remote transmitters. When calibrating the transmitter, you perform calibration at the transmitter; therefore, it is not necessary to save calibration values at the Pioneer.

The purpose of entering the Calibrate program when performing this response test is to disable the status lights, buzzer, and relays and so you can view the response reading(s) on the Span screen.

Quarterly

Calibrate the CO transmitter as described in the Calibration section of this insert.

Troubleshooting

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

NOTE: This troubleshooting guide describes transmitter problems only. See the Troubleshooting guide in Chapter 5, Maintenance, for problems you may encounter with the Pioneer Gas Monitor.

Fail condition

Symptoms

- The FAIL light is on.
- The buzzer is sounding a steady tone.
- The fail relay is de-energized.
- The display reading is flashing.

Probable causes

- The analyzer card is disconnected or misconnected.
- The transmitter wiring is disconnected or misconnected.
- The transmitter is malfunctioning.

Recommended action

1. Verify that the analyzer card is installed correctly and that the pilot light on the analyzer card is flashing. The components of the analyzer card face left when the card is installed correctly.

2. Verify that the transmitter wiring is correct and secure. The Installation section of this insert describes transmitter wiring connections.

3. Calibrate the transmitter as described in the Calibration section of this insert.

4. If the fail condition continues, replace the sensor as described later in this section.

5. If the fail condition continues, contact RKI Instruments, Inc., for further instruction.

Slow or no response/difficult or unable to calibrate

Symptoms

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

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

Probable causes

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

Recommended action

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

No display reading

Symptoms

- The transmitter is installed, but the display screen is blank for that channel.

NOTE: If the display screen is blank for all channels, see the troubleshooting guide in Chapter 5, Maintenance.

Probable causes

- The channel status setting is set at **NO SENSOR/AMP**.

Recommended action

1. Enter the Channel Setup program, and change the channel status setting to **ACTIVE/ONLINE** or **SILENCED/OFFLINE**.
2. If the display reading difficulties continue, contact RKI Instruments, Inc., for further instruction.

Replacing Components of the CO Transmitter

This section includes procedure to replace the CO sensor, amplifier, filter, and sensor backup battery. A procedure to replace the entire detector assembly is at the end of this section. In most cases, it is not necessary to replace the entire detector assembly.

Replacing the sensor

1. Place the Pioneer's power switch in the OFF position.

2. Unscrew the bottom section of the CO detector housing from the top section.

3. Unplug and remove the CO sensor.

4. Carefully plug the replacement sensor into the socket pattern that is located in the top section of the detector housing.

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

---

5. Screw the bottom section of the detector housing into the top section.

6. Place the Pioneer's power switch in the ON position.

7. Calibrate the replacement sensor as described in the Calibration section of this insert.

Replacing the amplifier

1. Place the Pioneer's power switch in the OFF position.

2. Remove the junction box cover.

3. Disconnect the detector leads from the detector terminal strip.

4. Unscrew and remove the two screws that secure the amplifier to the junction box. The screws are at the top right and bottom left of the amplifier.

5. Remove the amplifier.

6. Place the new amplifier in the same position as the amplifier you removed in step 5.

7. Use the two screws you removed in step 4 to secure the amplifier to the junction box.

8. Verify that the jumper block is installed over the **TOXIC** selector of the amplifier type selector as shown in Figure 3, Wiring the CO Transmitter to the Pioneer Gas Monitor.

9. Reconnect the wiring from the Pioneer to the interconnect terminal strip as shown in Table 3 and Figure 3, Wiring the CO Transmitter to the Pioneer Gas Monitor.

Table 3: Reconnecting the CO Amplifier to the Pioneer Gas Monitor

Amplifier Interconnect Terminal Strip	Pioneer Analyzer Card
4/20 FB	4-20 (Terminal 5)
24V +	24 V (Terminal 6)

10. Reconnect the detector leads to the detector terminal strip as shown in Table 4 and Figure 3, Wiring the CO Transmitter to the Pioneer Gas Monitor.

Table 4: Reconnecting the CO Detector to the Amplifier

CO Detector Lead	Amplifier Interconnect Terminal Strip
Black	TOXIC BK
Red	TOXIC RD

11. Place the Pioneer's power switch in the ON position.

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

---

12. Calibrate the CO transmitter as described in the Calibration section of this insert.

Replacing the filter

1. Place the Pioneer's power switch in the OFF position.
2. Remove the rubber sleeve that secures the filter to the CO detector.
3. Remove the filter from the rubber sleeve.
4. Place the replacement filter in the rubber sleeve in the same position as the filter you removed in the previous step.
5. Attach the rubber sleeve to the bottom of the CO detector.
6. Place the Pioneer's power switch in the ON position.

Replacing the CO detector

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

---

1. Place the Pioneer's power switch in the OFF position.
2. Remove the junction box cover.
3. Disconnect the detector leads from the detector terminal strip. Note the position of the color-coded leads as you remove them.
4. Unscrew the detector from the junction box.
5. Guide the detector leads of the replacement detector through the bottom conduit hub of the junction box, then screw the mounting threads of the detector into the conduit hub.
6. Connect the detector leads to the detector terminal strip as shown in Table 5 and Figure 3, Wiring the CO Transmitter to the Pioneer Gas Monitor.

Table 5: Connecting the Replacement CO Detector to the Amplifier

CO Detector Lead	Amplifier Interconnect Terminal Strip
Black	TOXIC BK
Red	TOXIC RD

7. Place the Pioneer's power switch in the ON position.

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

---

8. Calibrate the replacement detector as described in the Calibration section of this insert.
9. Secure the junction box cover to the junction box.

Calibration

This section describes how to calibrate the CO transmitter. It includes procedures to prepare for calibration, enter the Calibrate program, set the zero reading, set the response reading, and return to normal operation.

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

Preparing for Calibration

1. Screw the calibration cup onto the bottom of the CO detector.

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

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

---

3. Set a voltmeter to measure in the millivolt (mV) range.

4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

   Plug the positive lead into the test point labeled **TP**+; plug the negative lead into the test point labeled **TP**-.

5. Use the following formula to determine the correct test points output for the calibrating sample.

   $$Output\ (mV) = (calibrating\ sample/fullscale)\ X\ 400 + 100$$

   For example, with a calibrating sample of 50 PPM CO and a fullscale setting of 300 PPM, the correct output is 167 mV.

   $$167\ (mV) = (50/300)\ X\ 400 + 100$$

Entering the Calibrate Program

1. Open the housing door of the Pioneer, and locate the program buttons to the right of the display screen.

2. Press the ENTER and UP/YES buttons simultaneously three times.

   The Calibrate program screen appears.

   ```
   Version  X.XX
   Calibrate
   ESCAPE    Abort
   ANY OTHER KEY    Next
   ```

NOTE: Once you enter the Calibrate program, the status lights, buzzer, and relays are disabled until you exit the Calibrate program.

The Pioneer automatically exits the Calibrate program if you do not exit the program before the calibration time-out setting expires. You can display and change the calibration time-out setting in the Instrument Setup program (see Chapter 4, Operation.)

---

3.   Press the UP/YES, DOWN/NO, or ENTER button to continue.

The Select screen appears. The first line (channel 1) is flashing.

```
CH1  Not  Selected
CH2  Not  Selected
CH3  Not  Selected
CH4  Not  Selected
```

NOTE: The example used in this procedure describes calibration for Channels 1, 2, and 3.

4.   Press the ENTER button to "select" Channel 1, then press the DOWN/NO button. The second line (channel 2) is flashing.

5.   Repeat step 4 to "select" Channels 2 and 3.

NOTE: The description for Channels 1, 2, and 3 changes to **4-20 Monitor** when you "select" Channels 1, 2, and 3.

6.   Press the DOWN/NO or UP/YES button until the Channels Selected screen appears.

```
You  have  Selected
these  Channels:
1,2,3
ENTER  Next,  ESC  Prev
```

7.   Verify that you selected the correct channel(s), then press the ENTER button to continue.

The Choose Calibration screen appears.

```
Choose  Calibration
Zero  Proceed
Span  Proceed
ENTER  Next,  ESC  Prev
```

NOTE: If one or more of the channels you selected on the Select screen is an oxygen channel, then the Choose Calibration screen appears as follows.

```
Choose  Calibration
Zero  (Oxygen  Span)
Span  (Oxygen  Zero)
ENTER  Next,  ESC  Prev
```

8. Verify that the **Zero Proceed** line is flashing [or **Zero (Oxygen Span)** if applicable], then press the ENTER button to continue. If the **Zero Proceed** line is not flashing, press the UP/YES button, then press the ENTER button.

    The Fresh Air screen appears. The readings displayed on the Fresh Air screen are the current gas readings. The asterisk (*) to the right of each reading indicates that you cannot adjust this reading at the Pioneer.

```
CH 1            0 * ENTER   to
CH 2            0 * Fresh   Air
CH 3            0 * Adjust
CH 4        X X X
```

CAUTION: *Do not press the ENTER button at this time.*

Setting the Zero Reading

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

2. When the reading on the voltmeter stabilizes, verify a reading of 100 mV (± 2mV). If necessary, use the zero potentiometer on the amplifier to adjust the reading to 100 mV (± 2mV).

3. Unscrew the regulator from the zero air calibration cylinder.

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

Setting the Response Reading

1. Screw the regulator into the calibration cylinder.

2. When the reading on the voltmeter stabilizes, verify that the reading matches the response reading (± 2mV) you determined earlier. If necessary, use the span potentiometer on the amplifier to adjust the reading to match the correct response reading.

3. Unscrew the regulator from the calibration cylinder.

4. Remove the voltmeter leads from the amplifier test points.

Returning to Normal Operation

1. Unscrew the calibration cup from the bottom of the detector.

NOTE: For convenience, leave the components of the calibration kit connected by the sample tubing.

---

2. Secure the junction box cover to the junction box.

NOTE: If the reading(s) is above the alarm 1 setpoint when you return to the normal screen, the Pioneer will initiate the appropriate alarm condition. You can view the current reading(s) of the "selected" channels on the Fresh Air screen.

3.	Press the ESCAPE button three times.

    The Save screen appears.

```
ESCAPE  =  Abort  Setup
UP/DOWN=  Save  &  Exit
ENTER=  Next
```

4.	Press the ESCAPE button. A confirmation message displays, then the normal screen appears.

```
INSTRUMENT  SET-UP
NOT  SAVED,  USING
PREVIOUS  VALUES
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NOTE:	Because you performed calibration at the transmitter, it is not necessary to save calibration values at the Pioneer. The Pioneer does not save calibration values for remote transmitters.

The purpose of entering the Calibrate program is to disable the status lights, buzzer, and relays during calibration and so you can view the current reading(s) on the Fresh Air screen.

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

6.	Verify that the applicable display reading(s) decreases and stabilizes at 0 PPM.

Parts List

Table 6 lists replacement parts and accessories for the CO channel.

Table 6: Parts List

Part Number	Description
06-1248RK	Sample tubing (order by the foot)
18-0405RK-01	Junction box (without lid)
33-7101RK	Filter (charcoal)
07-0203RK	Retaining boot (for filter)
57-0004RK	Analyzer card
57-1060RK	Amplifier (specify target gas when ordering)
ES-1531-CO	CO replacement sensor
65-2432RK	CO transmitter (includes detector and amplifier)
71-0027RK-07	*CO Transmitter Manual Insert* (this document)

Table 6: Parts List (Continued)

Part Number	Description
81-0064RK	Calibration cylinder (50 PPM CO in air; 34 liter)
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-1003RK	Regulator (for 17 and 34 liter calibration cylinders)
81-1117RK	Calibration cup