Model GD-K11D
Operator's Manual

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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Overview

The Model GD-K11D sample-draw transmitter is a single-point, fixed-instrument. It continuously monitors for the target gas and alerts you to increasing gas levels with visual alarms. Alarm contacts allow you to connect external alarms. The Model GD-K11D includes a trouble alarm that alerts you to failure in the flow system and detection circuit.

The Model GD-K11D operates in two modes: measuring mode and maintenance mode.

Measuring Mode

Measuring mode is the mode in which the Model GD-K11D detects, measures, and displays the target gas (normal operation).

Maintenance Mode

Maintenance mode allows you to perform maintenance tasks. These tasks include:

*   adjusting the zero setting (see page 11)

*   adjusting the K number when you replace a sensor (see page 18)

CAUTION: *Maintenance mode includes five menus. Only menus 3 and 4 are for customer use. Menus 1, 2, and 5 are for factory use only. The Model GD-K11D does not operate as a gas detection device when you are in maintenance mode.*

To place the Model GD-K11D in maintenance mode, press the MODE button for approximately 3 seconds. The SKIP light flashes until you exit maintenance mode.

Specifications

Table 1 lists specifications for the Model GD-K11D.

Table 1: Specifications

Power Source	115 VAC
Target Gas	Various (see Table 2)
Area Classification	Indoor, non-hazardous locations
Sampling Method	Sample-draw
Signal Output	4 to 20 mA
Response Time	90% in 60 seconds
Accuracy	± 5% of full scale
Flow Rate *(to sensor)*	Approximately 0.5 liters/minute

Table 2 lists the gases that the Model GD-K11D is capable of detecting. Table 2 also lists the detection range, alarm point, and fail point for each target gas.

NOTE: Your Model GD-K11D is calibrated to only **one** of the gases listed below. A label on the front of the instrument indicates the target gas of your Model GD-K11D.

Table 2: Model GD-K11D Target Gases, Detection Ranges, and Alarm Points

Target Gas	Detection Range	Alarm Point
Ammonia (NH_3)	0 to 75.0 ppm	25.0 ppm
Arsine (AsH_3)	0 to 1.00 ppm	0.30 ppm
Carbon monoxide (CO)	0 to 150 ppm	50 ppm
Chlorine (Cl_2)	0 to 3.00 ppm	1.00 ppm
Chlorine trifluoride (ClF_3)	0 to 1.00 ppm	0.30 ppm
Dichlorosilane (DCS)	0 to 15.0 ppm	5.0 ppm
Fluorine (F_2)	0 to 3.00 ppm	1.00 ppm
Hydrogen bromide (HBr)	0 to 9.00 ppm	3.00 ppm
Hydrogen chloride (HCl)	0 to 15.0 ppm	5.0 ppm
Phosphine (PH_3)	0 to 1.00 ppm	0.30 ppm
Silane (SiH_4)	0 to 15.0 ppm	5.0 ppm
Tungston hexafluoride (WF_6)	0 to 9.00 ppm	3.00 ppm

Description

This section describes the components of the Model GD-K11D. The Model GD-K11D consists of the housing, electrical system, flow system, and detection system.
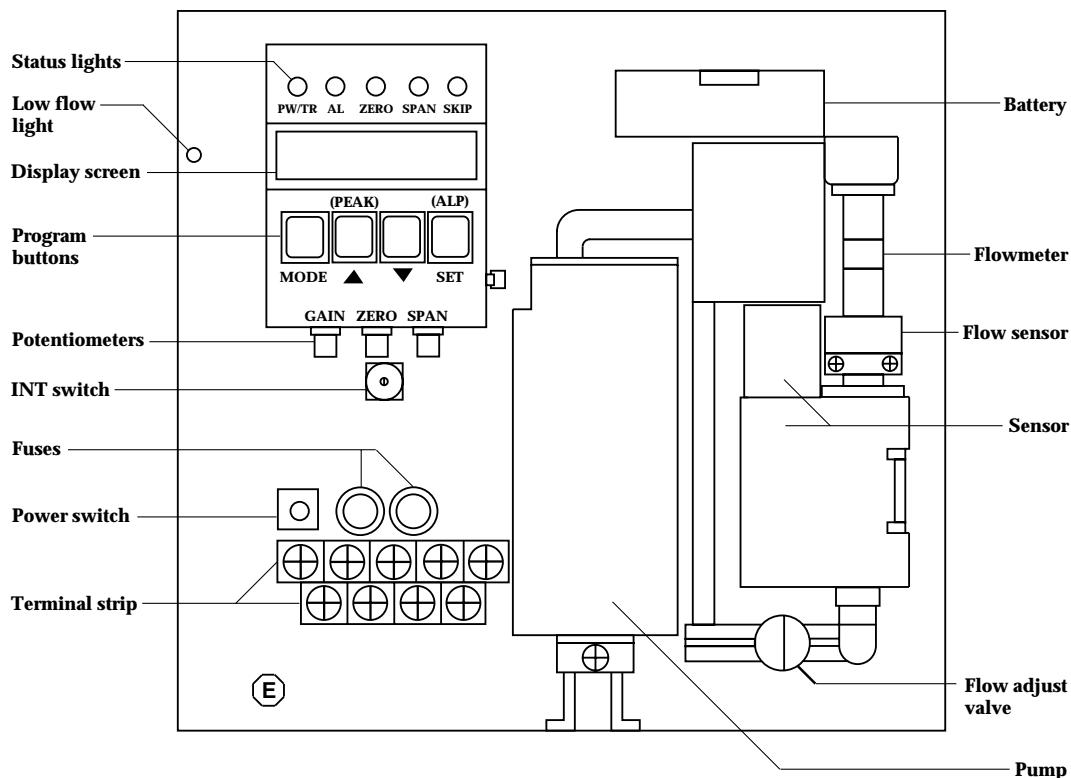

Figure 1: Model GD-K11D Component Location

Housing

The Model GD-K11D's steel housing is radio frequency (RF)-resistant. It is suitable for installation in indoor areas where general purpose equipment is in use.

The housing cover is hinged on the front bottom edge and is secured by a thumbscrew on the top of the housing. The flowmeter, display screen, and status lights are visible through windows in the housing cover. The cover also includes two labels that indicate the target gas and detection range of the Model GD-K11D.

Three 3/8 in. cable fittings on the bottom of the housing allow you to make external wiring connections. The gas out fitting to the right of the cable fittings allows the gas sample to exit the Model GD-K11D after the sample passes through the sample system. The gas in fitting above and to the right of the gas out fitting allows the gas sample to enter the Model GD-K11D. The gas in and gas out fittings accept 6 mm OD x 4 mm ID PTFE tubing.

Two mounting flanges are attached to the back of the housing. The top flange includes two mounting slots; the bottom flange includes two mounting holes. The flanges allow you to install the Model GD-K11D to a vertical surface at the monitoring site.

Electrical System

The Model GD-K11D's electrical system consists of the terminal strip, power switch, and fuses (see Figure 1.)

Terminal strip

The terminal strip allows you make external wiring connections to the Model GD-K11D.

The nine-point terminal strip is divided into two rows. The upper (five-point) terminal strip is for connection to a recorder or a controlling device, which accepts a 4 to 20 mA signal. The lower (four-point) terminal strip is for connection to incoming power and external alarms.

NOTE: See the "Installation" section on page 8 for all wiring procedures.

Power switch

The power switch turns power to the Model GD-K11D on and off. The power switch is ON when the toggle switch is in the UP position.

Fuses

Two extractor-type fuses protect the AC line circuitry from short circuit or overload. The fuses are rated at 1 amp.

Flow System

The Model GD-K11D's flow system consists of the pump, flowmeter, flow adjust valve, flow sensor, low flow light, gas in fitting, and gas out fitting (see Figure 1). The gas in and gas out fittings were described earlier.

Pump

The pump pulls the test sample into the Model GD-K11D.

Flowmeter

The flowmeter measures the flow rate to the sensor. A ball in the flowmeter column indicates the flow rate. Two horizontal lines on the flowmeter mark the acceptable flow rate. Use the flow adjust valve to keep the flowmeter ball between the two lines.

Flow adjust valve

The flow adjust valve allows you to adjust the flow rate to the sensor.

Flow sensor

The flow sensor activates the low flow alarm if the flowmeter ball drops below the visible part of the flowmeter.

Low flow light

The low flow light is near the top left corner of the main circuit board. The low flow light is directly above the 50-pin connector. The main circuit board is behind the amplifier circuit board. The low flow light turns on if the flowmeter ball drops below the visible part of the flowmeter.

Detection System

The Model GD-K11D's detection system consists of the sensor, lithium battery, amplifier, and display board (see Figure 1.)

Sensor

Through a series of electrical and chemical reactions, the sensor produces an electrical current that is proportional to the detection range of the target gas.

Electrodes within the sensor housing are surrounded by liquid electrolyte. The electrical and chemical reactions are facilitated by the electrolyte.

Battery

The 3.6-volt lithium battery maintains the bias voltage on the sensor when the Model GD-K11D is not receiving incoming power.

Amplifier

The amplifier is the circuit board to which the display board is mounted. The power switch, fuses, and terminal strip are also mounted to the amplifier circuit board.

The amplifier converts the output of the sensor to a 4 to 20 mA signal (that is proportional to the detection range of the Model GD-K11D) and converts the signal to a digital reading on the display screen.

CAUTION: *The potentiometers on the amplifier circuit board are factory-set. Do not adjust them.*

Display board

The display board includes the display screen, status lights, program buttons, and adjustment potentiometers. The display board is mounted to the amplifier by standoffs.

NOTE: The display screen and status lights are visible through a window in the housing cover.

Display screen

The display screen displays the current gas reading of the Model GD-K11D's target gas. The display screen also displays operational and error messages.

The display board includes five status lights. Table 3 lists each light and its function.

Table 3: Model GD-K11D Status Lights

Light	Status
PW/TR (power)	• live power is connected to GD-K11D and the power switch is ON (solid light) • fail condition (flashing light)
AL (alarm)	• gas alarm condition (solid light) • over range condition (solid light)
ZERO	• GD-K11D is prepared for adjustment of zero setting (flashing light) • GD-K11D accepted zero setting (solid light)
SPAN	• GD-K11D is prepared for adjustment of span setting (flashing light) • GD-K11D accepted span setting (solid light)
SKIP	GD-11D is in maintenance mode (flashing light)

Program buttons

The display board includes five buttons. The MODE, Δ (PEAK), ∇, and SET (AL.P) buttons are directly below the display screen. The TEST button is the red button near the bottom right of the display board. Table 4 lists each button and its function.

Table 4: Model GD-K11D Program Buttons

Button	Function
MODE	Enters maintenance mode
Δ (PEAK)	• Increases/changes the setting on the display • Displays the peak reading
∇	Decreases/changes the setting on the display
SET (AL.P)	• Prepares a setting to be changed • Enters a new setting • Displays the alarm point
TEST	Enters alarm test mode

The display board includes two potentiometers, which extend from the bottom of the display board. Table 5 lists each potentiometer and its function.

Table 5: Model GD-K11D Adjustment Potentiometers

Potentiometer[1]	Function
ZERO	Adjusts the zero setting
SPAN[2]	Adjusts the span (response) setting

[1] The GAIN potentiometer is for factory-use only. It is for coarse span adjustments.

[2] Only use the SPAN potentiometer if you cannot set the span setting with the Δ and ∇ buttons.

INT switch

The INT switch is a 16-position rotary switch that allows you to perform particular tasks. Use a small, flat-blade screwdriver to adjust the switch. The position that is at the top of the switch is the currently selected position. If you are unsure which position is selected, press the MODE button. If the switch is in any position other than 0, the position number appears on the left side of the display screen.

Table 6 lists switch positions for common tasks. The table also references step-by-step procedures for each task.

CAUTION: *Switch positions not listed in this table are for factory use. Only use the switch positions listed is this table and described later in this manual.*

Switch position "0" is for normal operation (detection mode). If you adjust the INT switch, always return it to the "0" position after you complete the task.

Table 6: Model GD-K11D INT switch positions

| Position	Task	Refer to
0	Detection mode (normal operation)	page 1
1	Calibration with gas sample	page 22
2	Adjust the alarm point	page 13
3	Adjust the alarm delay	page 14
5	Turn on/off peak reading feature	page 13
7	Adjust the alarm type (high/low)	page 15

Installation

This section describes how to install the Model GD-K11D at the monitoring site. This section includes procedures to mount the Model GD-K11D, connect sample lines to the Model GD-K11D, and make power and other wiring connections to the Model GD-K11D.

Mounting the Model GD-K11D

CAUTION: *The Model GD-K11D is suitable for installation in indoor areas where general purpose equipment is in use.*

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 Model GD-K11D is not likely to be bumped or disturbed. Make sure there is sufficient room to make wiring and sample line connections at the bottom of the transmitter. Also make sure there is sufficient room to open the housing cover and perform start-up, maintenance, and calibration procedures.

   • Select a site near the sampling area.

NOTE: If your application does not require a specific mounting site, mount the transmitter at approximately eye level.
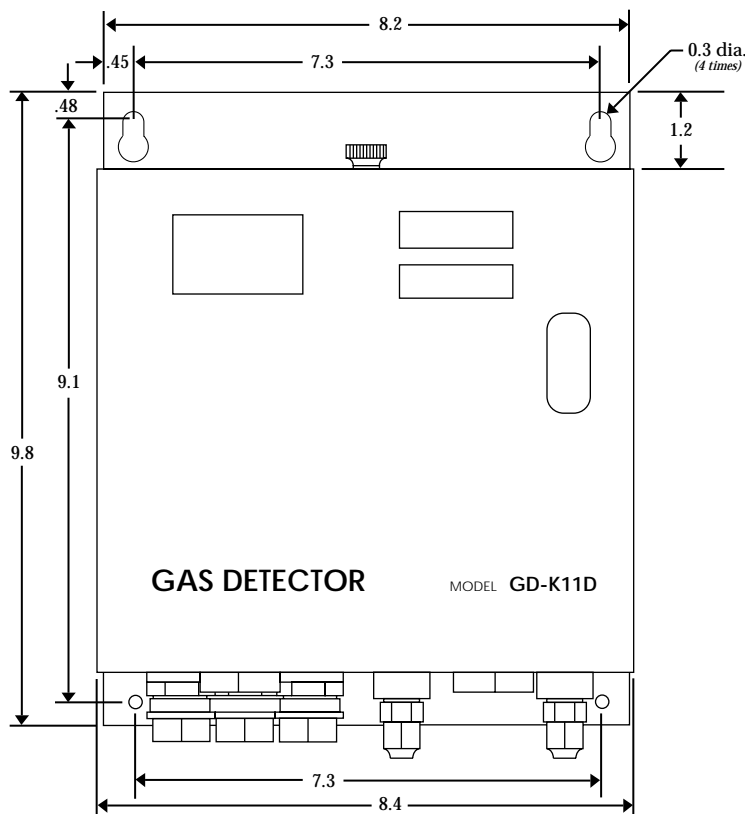
Note 1: All measurements in inches.

Note 2: Model GD-K11D is 4.1 inches deep.

Note 3: Allow at least 2 feet in front of Model GD-K11D to open housing door.

Figure 2: Mounting the Model GD-K11D

2. Use two screws through the slot cutouts at the top of the housing to secure the housing to a vertical surface at the mounting site (see Figure 2.)

3. Use two screws through the mounting holes at the bottom of the housing to support the installation of the Model GD-K11D (see Figure 2.)

Connecting the Sample Lines to the Model GD-K11D

1. Attach 4 x 6 mm PTFE teflon tubing to the gas in fitting. Place the opposite end of the tubing at the sampling area.


CAUTION: *Avoid loops or slumps in the incoming sample line. To reduce response time, keep the incoming sample line as short as possible.*

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2. Attach 4 x 6 mm PTFE teflon tubing to the gas out fitting. Route the opposite end of the tubing to an open area where the sample can safely disperse.

Wiring the Model GD-K11D

This section describes procedures to connect AC power to the Model GD-K11D. This section also describes *optional* procedures to connect a controller or recorder and external alarm device to the Model GD-K11D. Figure 3 illustrates wiring connections to the Model GD-K11D.

WARNING: **Always verify that the Model GD-K11D's power switch is in the OFF position before you make wiring connections to the Model GD-K11D.**
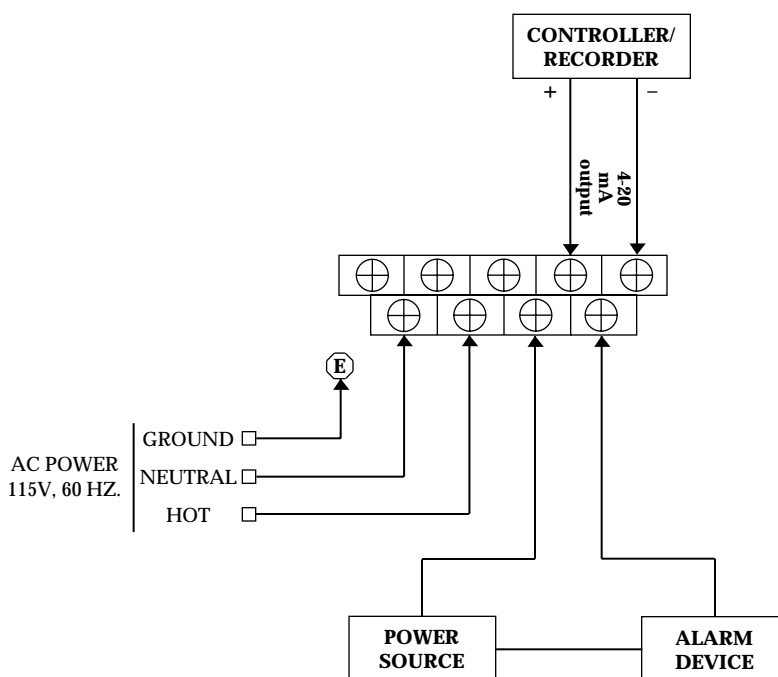
Figure 3: Wiring the Model GD-K11D

Connecting AC power

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the terminal strip.

3. Verify that the Model GD-K11D's power switch is in the OFF position.

4. Unscrew and remove the two screws that secure the terminal strip's protective cover, then remove the protective cover.

5. Guide the AC power cord through an *unused* conduit fitting at the bottom of the housing.

6. Connect the AC line to the lower row of the terminal strip as shown in Figure 3.

7. Connect the AC line's ground wire to the ground screw as shown in Figure 3. The ground screw is below and to the left of the terminal strip.

8. If you do not plan to make any more wiring connections to the terminal strip, position the protective cover over the terminal strip, then secure the cover with the two screws you removed in step 4.

Connecting the Model GD-K11D to a controller or recorder

Perform the following procedure to connect a controller or recording device to the Model GD-K11D. The output at the Model GD-K11D's terminal strip is a 4 to 20 mA signal that is proportional to the detection range.

1. Guide the wiring from the controller or recording device through an *unused* conduit fitting at the bottom of the housing.

CAUTION: *Do not route wiring from the AC power source and the controller or recorder through the same conduit fitting. The power cable may disrupt the transmission of the 4 to 20 mA signal to the controller or recorder.*

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2. Connect the leads to the upper row of the terminal strip as shown in Figure 3.

Connecting the Model GD-K11D to an external alarm device

CAUTION: *The maximum current rating of the normally-open, dry contacts is 1 amp. If the alarm device exceeds this rating, use the alarm contacts to control a relay with an appropriate current rating.*

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1. Guide the wiring of the external alarm through an *unused* conduit fitting at the bottom of the housing.

CAUTION: *If the external alarm device is powered by AC current, do not route wiring from the external alarm and the controller or recorder (if applicable) through the same conduit fitting. The power wiring may disrupt the transmission of the 4 to 20 mA signal to the controller or recorder.*

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2. Connect the leads to the lower row of the terminal strip as shown in Figure 3.

Start Up

This section describes procedures to start up the Model GD-K11D and place the Model GD-K11D into normal operation.

Introducing Incoming Power

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

2. Verify that the power wiring is correct and secure (see the "Installation" section on page 8.)

3. Turn on or plug in the incoming power at the power source end, then place the Model GD-K11D's power switch in the ON position.

4. Verify that the **PW/TR** (power) light is on.

5. Verify that the flowmeter ball is between the two lines on the flowmeter. If necessary, use the flow adjust valve to adjust the flow rate to the sensor, so the flowmeter ball is between the two lines.

6. Verify that the incoming sample line is not leaking. To test the sample line, plug the open end of the sample line with your thumb. If the flowmeter ball drops to the bottom of the flowmeter, the incoming sample line is not leaking.

CAUTION: *Allow the Model GD-K11D to warm up for 30 minutes (2 hours for ammonia transmitters) before you continue with the next section. If the sensor keeper batteries are dead and the Model GD-K11D has been off power for an extended period of time, allow the Model GD-K11D to warm up overnight.*

Setting the Zero Reading

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

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1. Verify that the Model GD-K11D is in a fresh air environment (environment known to be free of toxic gas.)

2. Press and hold down the MODE button until **1.** appears on the display screen (approximately 3 seconds).

    The SKIP light flashes.

3. Press the Δ button twice to display **3.**

4. Press the SET button.

    The ZERO light flashes, and the gas reading appears on the display screen. The Model GD-K11D is prepared to adjust the zero reading.

5. Use the ZERO potentiometer to adjust the display reading to zero.

6. Press the MODE button.

    The ZERO light turns off, and **3.** appears on the display screen.

NOTE: The purpose of this procedure is to set the zero reading only. It is not necessary to set the span (response) reading at this time.

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7. Press the MODE button for approximately 3 seconds to exit maintenance mode and return to the normal screen.

8. Rotate the housing cover up to its original position, then tighten the thumbscrew at the top of the housing to secure the cover to the housing.

Operation

This section describes procedures to display the peak reading, and to adjust the alarm point, alarm delay, and alarm type.

Displaying the Peak Reading

The Model GD-K11D defines the peak reading as the highest reading *above the alarm point* since the last time the peak reading was reset. A reading must remain above the alarm point *for a period longer than the alarm delay* (default is 3 seconds) before the Model GD-K11D compares the gas reading to the current peak reading.

You must also "turn on" the peak reading feature in order for the Model GD-K11D to recognize and save peak readings.

To turn on the peak reading feature:

1. Adjust the INT switch to the "5" position. The INT switch is the rotary switch located on the amplifier circuit board (see Figure 1, Model GD-K11D Component Location.)

    The SKIP light flashes. If **1** appears on the display screen, the peak hold feature is turned on. If not, continue with step 2.

2. Press the MODE button, and make sure **5** appears on the left side of the display screen.

3. Press the Δ button to display **1** on the screen.

4. Press the SET button.

    The SPAN light turns on.

5. Return the INT switch to the "0" position to return to normal operation.

    The SPAN and SKIP lights turns off.

To display the peak reading:

1. From the normal screen, press the Δ (PEAK) button.

    The peak reading displays.

2. To reset the peak reading, press and hold down the Δ (PEAK) and SET buttons until the peak reading is cleared from the display screen.

Adjusting the Alarm Point

The factory-set alarm point is one-third of the fullscale value. Alarm points for the Model GD-K11D's target gases are listed in Table 2, Model GD-K11D Target Gases, Detection Ranges, and Alarm Points. The range of acceptable alarm points is 10% to 100% of the fullscale value.

To display the current alarm point, from the normal screen press and hold down the SET button until the alarm point appears on the display screen. Release the SET button to return to the normal screen.

To adjust the alarm point:

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Adjust the INT switch to the "2" position.

   The current alarm point appears on the display screen, and the SKIP light flashes.

4. Press the MODE button, and make sure **2** appears on the left side of the display screen.

5. Use the Δ and ∇ buttons to adjust the alarm point to the setting you want.

6. Press the SET button to confirm the new alarm point.

   The SPAN light turns on indicating that the Model GD-K11D accepted the new setting.

7. Return the INT switch to the "0" position to return to normal operation.

   The SPAN and SKIP lights turns of.

8. Rotate the housing cover up to its original position, then secure the cover to the housing with the thumbscrew.

Adjusting the Alarm Delay

The factory-set alarm delay is 3 seconds. The range of acceptable alarm delay settings is 0.5 to 60 seconds.

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Adjust the INT switch to the "3" position.

   The current alarm delay appears on the display screen, and the SKIP light flashes.

4. Press the MODE button, and make sure **3** appears on the left side of the display screen.

5. Use the Δ and ∇ buttons to adjust the alarm delay to the setting you want.

6. Press the SET button to confirm the new alarm delay.

   The SPAN light turns on indicating that the Model GD-K11D accepted the new setting.

7. Return the INT switch to the "0" position to return to normal operation.

   The SPAN and SKIP lights turns of.

8. Rotate the housing cover up to its original position, then secure the cover to the housing with the thumbscrew.

Adjusting the Alarm Type

You can program the Model GD-K11D's alarm to activate on increasing readings or decreasing readings. The factory-set alarm type is increasing.

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Adjust the INT switch to the "7" position.

   The current alarm type displays, and the SKIP light flashes. **H** ("high") indicates an increasing setting; **L** ("low") indicates a decreasing setting.

4. Press the MODE button, and make sure **7** appears on the left side of the display screen.

5. Use the Δ or ∇ button to display the alternate alarm type.

6. Press the SET button to confirm the new alarm type.

   The SPAN light turns on indicating that the Model GD-K11D accepted the new setting.

7. Return the INT switch to the "0" position to return to normal operation.

   The SPAN and SKIP lights turns of.

8. Rotate the housing cover up to its original position, then secure the cover to the housing with the thumbscrew.

Alarms

This section describes the Model GD-K11D's visual indications for normal, alarm, and fail conditions. This section also suggests response to these conditions.

Alarm Indications

Table 5 lists the indications for normal, alarm and fail conditions.

The Model GD-K11D includes an alarm delay feature. The alarm indications listed below are delayed by 3 seconds once the Model GD-K11D recognizes an alarm or fail condition.

Table 7: Model GD-K11D Alarm Indications

Condition	Cause(s)	Indications	Alarm Contacts
Normal	• Start up complete • No gas or fail alarms	**PW/TR** light	De-energized
Gas Alarm	Increasing gas reading at or above alarm point	**AL** light	Energized
Fail Alarm	Disconnected sensor	• **E-01** on screen • **PW/TR** light[1] • **AL** light • 0.5 mA output	De-energized
Low Flow Alarm	Low flow rate	• **E-05** on screen • **PW/TR** light[1] • Low flow (red) light on main board • 0.5 mA output	De-energized

[1] The **PW/TR** (power) light flashes.

Responding to Alarms

This section suggests response to gas and fail alarms.

Responding to gas alarms

1. Follow your established procedure for an increasing toxic gas condition.
2. When the display reading falls below the alarm point, the alarm circuit automatically resets itself. The **AL** (alarm) light turns off.

Responding to fail alarms

1. Set the correct flow rate with the flow adjust valve.
2. If you cannot set the correct flow rate, check the sample lines for obstructions or kinks.
3. Calibrate the Model GD-K11D as described on page 21.
4. If the fail condition continues, replace the sensor as described on page 18.
5. If the fail condition continues, contact RKI Instruments, Inc., for further instruction.

Maintenance

This section describes maintenance procedures for the Model GD-K11D. It includes preventive maintenance and troubleshooting procedures.

Preventive Maintenance

This section describes a preventive maintenance schedule to ensure the optimum performance of the Model GD-K11D. It includes daily, quarterly, and biannual procedures.

Daily

1. Verify that the **PW/TR** (power) light is on. If the power light is not on, see the troubleshooting guide in this manual.

2. Verify that the flowmeter ball is between the two lines on the flowmeter. If necessary, use the flow adjust valve to adjust the flow rate, so the flowmeter ball is between the two lines.

3. Verify a display reading of 0 PPM. Investigate significant changes in the reading.

Quarterly

If you **are not** in a sensor exchange program, set the sensor's K number as described on page 19, then calibrate the Model GD-K11D as described on page 21.

Biannually

If you **are** in a sensor exchange program, replace the sensor as described on page 18.

As required

This procedure describes a test to verify that the alarm circuit is operating properly.

NOTE: This test duplicates an alarm condition. Any external alarms wired to the Model GD-K11D will activate during this test.

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1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Press and hold down the TEST button. The TEST button is the red button on the right side of the display panel.

   The SKIP light turns on indicating that the Model GD-K11D is in alarm test mode.

4. While pressing the TEST button, press the Δ button until the display reading is greater than the alarm point.

   After the alarm delay, the **AL** (alarm) light turns on and the relay contacts on the terminal strip energize. Any external alarm devices wired to the relay contact activate when the relays contacts energize.

5. Release the TEST button to return to measuring mode (normal operation).

   The display reading decreases to the normal level, and the alarm circuit automatically resets itself.

6. Rotate the housing cover up to its original position, then tighten the thumbscrew at the top of the housing to secure the cover to the housing.

Troubleshooting

The troubleshooting table describes error messages, symptoms, probable causes, and recommended action for problems you may encounter with the Model GD-K11D.

Table 8: Troubleshooting the Model GD-K11D

Symptoms	Probable Causes	Recommended Action
• **E-00** on display screen	• Memory error	1. Contact RKI Instruments, Inc.
• **E-01** on display screen • PW/TR light is flashing • Output is 0.5 mA	• Sensor is disconnected	1. Verify that the sensor connector is securely connected to the sensor. 2. Calibrate the sensor. 3. If difficulties continue, contact RKI.
• **E-05** on display screen • PW/TR light is flashing • Output is 0.5 mA • Low flow light is on • Flowmeter indicates low flow rate	• Sample line is obstructed • Pump is disconnected • Pump is failing	1. Set the correct flow rate with the flow adjust valve. 2. Check the sample line for obstructions or kinks. 3. Verify that the pump connector is plugged into the pump socket (**PUMP**). 4. If difficulties continue, contact RKI.
• **E-06** on display screen	• Communication error	1. Verify that wiring to the 4-20mA output terminales is correct. 2. If difficulties continue, contact RKI.
• Unable to zero or span reading during calibration	• Calibration cylinder is low, out-dated, or defective • Sample line is obstructed	1. Verify that the calibration cylinder contains an adequate supply of a fresh calibration sample. 2. If necessary, set the correct flow rate with the flow adjust valve. 3. If you cannot set the correct flow rate, check the calibration tubing for obstructions or kinks. 4. If difficulties continue, contact RKI.
• Display screen does not indicate gas reading	• Model GD-K11D is in maintenance mode	1. Verify that the INT switch is in the "0" position. Adjust the switch if necessary. 2. Press the MODE button until the normal screen appears.
• ○○○○ on display screen	• Abnormal indication • LCD (display) not working	1. Set the sensor's zero reading as described on page 11. 2. If difficulties continue, contact RKI.

Replacing Components

The section includes procedures to replace the sensor, pump, and fuse.

Replacing the sensor

This section includes procedures to remove the sensor, install the replacement sensor, enter the new K number, and set the zero reading.

<u>Removing the sensor</u>

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Place the power switch in the OFF position.

4. Pull the metal restraining bracket that secures the sensor in the housing away from the sensor, then rotate the bracket to the right.

5. Slide the sensor to the left (toward the pump), then remove the sensor from the flow chamber.

6. Disconnect the connector from the sensor, then remove the sensor from the housing.

Installing the replacement sensor

1. Connect the connector to the replacement sensor, then install the sensor in the same position as the original sensor.

2. Place the metal restraining bracket in its original position to secure the sensor within the housing.

3. Place the power switch in the ON position.

4. Allow the sensor to warm up for 30 minutes (2 hours for ammonia sensors) before you continue with this procedure.

Entering the new K number

Each sensor is shipped with a K number written on the label. The K number is established at the factory at the time of calibration. The K number allows the Model GD-K11D to automatically set the span setting without introducing calibrating gas.

CAUTION: *The K number is only valid for 3 months after shipment from the factory. If you suspect the replacement sensor is beyond this 3-month limit, calibrate the replacement sensor (see page 21) after you enter the K number.*

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1. Press the MODE button until the SKIP light begins flashing and **1.** appears on the display screen.

2. Press the Δ button three times to display **4.** on the screen.

3. Press the SET button to display the K number of the previous sensor.

4. Use the Δ and ∇ buttons to adjust the value on the display screen to the K number of the replacement sensor.

5. Press the SET button to enter the new K number.

   The SPAN light is on steady (instead of flashing) to indicate the new K number is entered.

6. Press the MODE button to display **4.**

Setting the zero reading

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

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1. Verify that the Model GD-K11D is in a fresh air environment (environment known to be free of toxic gas.)

2. Press the ∇ button to display **3.**

3. Press the SET button.

   The ZERO light flashes, and the gas reading appears on the display screen. The Model GD-K11D is prepared to adjust the zero reading.

4. Use the ZERO potentiometer to adjust the display reading to zero.

5. Press the MODE button.

   The ZERO light turns off, and **3.** appears on the display screen.

6. Press the MODE button for approximately 3 seconds to exit maintenance mode and return to the normal screen (measuring mode).

7. Rotate the housing cover up to its original position, then tighten the thumbscrew at the top of the housing to secure the cover to the housing.

Replacing the pump

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Place the power switch in the OFF position.

4. Disconnect the pump connector from the socket on the amplifier circuit board. The socket is marked **PUMP** and is to the right of the fuses.

5. Loosen the captive screw at the bottom of the pump cover, then rotate the cover toward the top of the housing.

6. Remove the pump.

7. Place the replacement pump in the same position as the original pump.

8. Rotate the pump cover down to its original position, then secure the cover with the captive screw.

9. Connect the pump connector to the socket marked **PUMP** on the amplifier circuit board.

10. Place the power switch in the ON position.

11. Rotate the housing cover up to its normal position, then secure the cover to the housing with the thumbscrew.

Replacing the fuses

1. Loosen the thumbscrew at the top of the housing.

2. Rotate the housing cover toward the bottom of the housing to gain access to the interior of the Model GD-K11D.

3. Place the power switch in the OFF position.

4. Use a screwdriver to slightly push the fuse holder down, then rotate the holder to the left.

5. Remove the fuse holder from the Model GD-K11D, then remove the fuse from the holder.

6. Install the replacement fuse in the fuse holder, then insert the fuse holder into its original position.

7. Use a screwdriver to slightly push the fuse holder down, then rotate the holder to the right.

8. Place the power switch in the ON position.

9. Rotate the housing cover up to its normal position, then secure the cover to the housing with the thumbscrew.

Calibration

This section describes how to calibrate the Model GD-K11D. It includes procedures to prepare for calibration, set the zero reading, set the response (span) reading, and return to normal operation.

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*WARNING: **The Model GD-K11D is not an active gas monitoring device during the calibration procedure.***

Preparing for Calibration

NOTE: This procedure describes calibration using the RKI calibration kit that includes a "demand flow" regulator. A calibration kit that uses a gas collection bag is also available. Contact RKI Instruments, Inc., for more information concerning the gas collection bag accessory.

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

2.   Disconnect the incoming sample line from the Model GD-K11D's gas in fitting, then connect the calibration kit sample tubing to the gas in fitting.

NOTE: Do not connect the tubing from the gas in fitting to the regulator at this time.

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3.   Loosen the thumbscrew on the top of the housing, then rotate the housing cover toward the bottom of the housing.

Setting the Zero Reading

1.   Press and hold down the MODE button until **1.** appears on the display screen (approximately 3 seconds).

     The SKIP light flashes.

2.   Press the Δ button twice to display **3.**

3.   Press the SET button.

     The ZERO light flashes, and the gas reading appears on the display screen.

4.   Connect the tubing from the Model GD-K11D's gas in fitting to the regulator. The Model GD-K11D's pump automatically begins pulling the calibrating sample from the zero air calibration cylinder when you connect the tubing to the regulator.

5.   When the display reading stabilizes, use the ZERO potentiometer to adjust the display reading to zero.

6.   Press the MODE button.

     The ZERO light turns off, and **3.** appears on the display screen.

7.   Disconnect the sample tubing from the regulator, then unscrew the regulator from the zero air calibration cylinder. Leave the tubing connected to the Model GD-K11D.

8.   Press the MODE button for approximately 3 seconds to exit maintenance mode and return to the normal screen.

Setting the Response (Span) Reading

1. Adjust the INT switch to the "1" position. The INT switch is the rotary switch located on the amplifier circuit board (see Figure 1, Model GD-K11D Component Location).

   The display reading, SPAN light, and SKIP light flash.

2. Press the MODE button, and make sure **1** appears on the left side of the display screen.

3. Screw the regulator into the calibration cylinder.

4. Connect the tubing from the Model GD-K11D's gas in fitting to the regulator. The pump begins pull the sample from the calibration cylinder.

   The display reading increases as the sensor begins to sample the calibrating gas. When the display reading reaches 20% of fullscale, the reading stops flashing.

NOTE: The reading must be at least 20% of fullscale before the Model GD-K11D will allow adjustment of the span setting.

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5. When the display reading stabilizes, use the Δ and ∇ buttons to adjust the display reading to match the concentration of the calibration cylinder.

NOTE: If you cannot adjust the display reading to the concentration of the calibration cylinder with the Δ and ∇ buttons, adjust the reading to be in the middle of the adjustment range, then adjust the reading with the span potentiometer.

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6. Press the SET button to set the response (span) reading.

   The SPAN light is on steady indicating that the Model GD-K11D accepted the span setting.

7. Disconnect the sample tubing from the regulator, then disconnect the opposite end of the sample tubing from the Model GD-K11D's gas in fitting.

8. Reattach the sample line to the gas in fitting.

Returning to Normal Operation

1. Unscrew the regulator from the calibration cylinder.

NOTE: If the display reading is above the alarm point when you return to the normal screen, the Model GD-K11D will initiate an alarm condition.

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2. Return the INT switch to the "0" position to return to normal operation.

   The SPAN and SKIP lights turn off.

3. Rotate the housing cover up to its normal position, then secure the cover to the housing with the thumbscrew.

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

5. Verify that the display reading decreases and stabilizes at zero.