



PERSONAL FOUR GAS MONITOR

Gas Detection For Life

GX-2009 Model



Actual Size

**World's Smallest and Lightest
4 Gas Monitor**

Features

- Simultaneous detection of 4 gases
 - LEL, O₂, H₂S & CO
- Smallest/Lightest 4 gas monitor on the market
 - 2.7" H x 3" W x 1" D, 4.6 oz.
- Dual audible alarm ports (95 db @ 30 cm)
- 3 visual alarm LED's
- Vibration alarm
- IP-67 Water resistant/dustproof design
- Calibration and bump test lock out or reminder controls
- Large capacity data logging standard
 - 8 alarm trends
 - Log time range of 10 to 300 hours
 - 100 calibration records stored
- 20 hours of operation (NiMH batteries)
- Large LCD display screen
- Automatic backlighting at alarm
- Impact resistant rubber over-mold body
- STEL and TWA readouts
- Intrinsically safe, CSA, C/US classified IECEx / ATEX approved (optional MSHA version available)
- 2 year warranty

Applications

- | | |
|----------------------------|--------------------|
| • Personal monitoring | • Oil and Gas |
| • Confined spaces | • Water/wastewater |
| • Refineries/petrochemical | • Fire services |
| • Utilities | • Construction |

RKI is proud to offer the smallest and lightest 4-gas monitor in the world, the GX-2009. Weighing only 4.6 ounces, it fits in the palm of your hand (2.75" H x 2.95" L x .98" D). The GX-2009 simultaneously monitors and displays combustibles, oxygen, carbon monoxide, and hydrogen sulfide. The GX-2009 represents the latest evolution of gas detection technology. Advancements include dual audible alarm ports and alarm LED's on 3 sides of the instrument, so that alarm conditions are obvious from multiple perspectives especially in high noise environments. Other features include a water resistant and dustproof design with IP 67 rating, an impact resistant rubber over-mold body that is RFI resistant, and a large capacity data logging system included as standard.

Other standard features are vibration alarm, auto-calibration, calibration and bump test lock out or reminder control, STEL / TWA readings, peak hold, auto backlighting at alarm on a large LCD display, and it even tells the time! All of these controls and features are operated through 2 simple glove friendly buttons. The NiMH battery set will operate for 20 hours and will fully charge in 3 hours.

A huge capacity data logging function is a standard feature on all GX-2009 instruments. The data logging software will store up to 100 calibration records and is Windows XP, 7, 8, and 10. The GX-2009 is also functional with the SDM-2009 single calibration station and the Data Cal 2000 instrument maintenance system.

The GX-2009 is designed around RKI's compact and proven sensors, utilizing catalytic combustion, electrochemical and galvanic sensor technologies. Each miniaturized sensor is manufactured with the same high quality control that has made RKI sensors and instruments the most reliable and long lasting monitoring devices in the industry.

RKI Instruments, Inc. • 33248 Central Ave. Union City, CA 94587 • Phone (800) 754-5165 • (510) 441-5656 • Fax (510) 441-5650

World Leader In Gas Detection & Sensor Technology
www.rkiinstruments.com

GX-2009 Model

Gas Detected	Combustible Gases (Methane as standard)	Oxygen (O2)	Hydrogen Sulfide (H2S)	Carbon Monoxide (CO)
Detection Principle	Catalytic combustion	Galvanic cell	Electrochemical cell	
Detection Range (Increments)	0 ~ 100% LEL (1% LEL)	0 ~ 40.0% Vol. (0.1% Vol.)	0 ~ 100.0 ppm (0.5 ppm)	0 ~ 500 ppm (1 ppm)
Accuracy Statement	± 5% of reading or ± 2% LEL (whichever is greater)	± 0.5% O2	± 5% of reading or ± 2 ppm H2S (whichever is greater)	± 5% of reading or ± 5 ppm CO (whichever is greater)
Sampling Method	Diffusion sampling standard / hand aspirator or motorized pump optional			
Display	Digital LCD displays all four gases simultaneously, with auto backlight			
Preset Alarms (User Adjustable) Overscale alarm (Non-adjustable)	1st alarm 10% LEL 2nd alarm 50% LEL Over alarm 100% LEL	Low alarm 19.5% High alarm 23.5% Over alarm 40.0%	1st alarm 10 ppm 2nd alarm 30 ppm TWA alarm 1.0 ppm STEL alarm 5.0 ppm Over alarm 100 ppm	1st alarm 25 ppm 2nd alarm 50 ppm TWA alarm 25 ppm STEL alarm 200 ppm Over alarm 500 ppm
Types of Alarms	Gas Alarm: 2 Increasing alarms, STEL, TWA, overscale alarm. O2 decreasing/increasing. Trouble alarm: Sensor disconnection, low battery, circuit error, calibration range error			
Display of Alarm	Gas Alarm: Flashing LEDs, intermittent buzzer (95 db @ 30 cm), flashing gas value, vibration Trouble alarm: Flashing LEDs, intermittent buzzer (95 db @ 30 cm), display of error message			
Operating Temp. & Humidity	-4°F to 122°F (-20°C ~ +50°C), 0 to 95% RH, non-condensing (splash resistant)			
Response Time	Within 30 seconds (T90)			
Continuous Operation	20 hours after a 3 hour full charge (14 hours after 90 min charge)			
Power Source	Direct charging NiMH batteries, set of 2			
Safety Design / Approvals	IECEx zone 0 Ex ia IIC T4; ATEX II 1G Ex ia IIC T4; (optional MSHA version also available) c CSA US classified, as intrinsically safe. Class I, Division 1, Groups A, B, C, D			
Dimension & Weight	2.7" H x 3" W x 1" D (Approx. 70 H x 75 W x 25 D mm), 4.6 ounces (approx. 130 g)			
Case Material	High impact over molded rubber. Dust and water resistant with IP-67 approval.			
Controls	Two buttons: POWER / MODE, AIR			
Datalogging	Standard with all instruments. Stores 8 alarm trend sessions where readings are recorded 30 minutes before and after an alarm event. 3,600 data point capacity with a log time range of 10 to 300 hours (based on programmable interval times); and stores up to 100 calibration records.			
Required Accessories	Battery charger			
Standard Accessories	Alligator clip 13-0116RK NiMH batteries (set of 2) 49-1609RK Charging station with 115/220 VAC power supply (also available without power supply, 49-2170RK) 49-2170RK-01 Product CD (includes datalogging software) 71-8002RK			
Optional Accessories	Belt Clip 13-0117RK Padded carrying case for GX-2009 and accessories 20-0112RK-01 Charging station, 115/220 VAC powered for 2, 3, 4, or 5 instruments 49-2170RK-XX Charging station with 12 VDC power supply and vehicle adapter plug 49-2171RK 12 VDC adapter with vehicle plug (does not include charger base) 49-2020RK RP-2009 pump with 4" rubber nipple, 10' hose and probe (up to 30' hose available) 81-1177RK Hand aspirated sample draw with 10' hose and probe (up to 40' hose available) 81-1160RK USB to IrDA downloading cable 47-5084RK-01 SDM-2009 single calibration station 81-SDM2009-01			
Configurations	• 4 gas, LEL / O2 / H2S / CO • 3 gas, LEL / O2 / H2S • 3 gas, LEL / O2 / CO • 2 gas, LEL / O2 • 2 gas, O2 / H2S • 2 gas, O2 / CO • Single gas LEL, O2, CO, H2S			
Warranty	Two years material and workmanship			

Specifications subject to change without notice.



Toll Free: (800) 754-5165 • Phone: (510) 441-5656
Fax: (510) 441-5650 • www.rkiinstruments.com

Authorized Distributor:

Quick Reference Guide For Model GX-2009

Turn on and adjust the GX-2009 gas monitor in a known fresh air area.

1. Turning the GX-2009 On

- a. Press and briefly hold down the POWER MODE button. The backlight will turn on and activate all LCD segments. Release the button when you hear a beep.
 - i. If Cal C-LIMIT is displayed, unit is past due for calibration. Press and release the POWER button to confirm and continue use.
 - ii. If FAIL C-LIMIT is displayed, unit is past due for calibration and cannot be used without calibrating.
- b. The instrument will go through a brief warm up showing date, number of days to next calibration, time of day, battery power, alarm latch setting, full scale values for all channels, warning alarm setting and high alarm setting for all channels, STEL alarm set point for H₂S and CO and TWA alarm set point for H₂S and CO channels.
- c. If the battery level is low or the battery icon is flashing and the unit's buzzer sounds, recharge the GX-2009 before use.

2. Measuring Mode Screen

- a. After warm-up the GX-2009 will display the current O₂, H₂S, CO and % LEL gas readings.
- b. If the readings are not displaying fresh air values, it is necessary to perform a Fresh Air adjustment.

3. Performing a Fresh Air Adjustment

- a. Find a fresh-air environment free of toxic or combustible gases and of normal oxygen content (20.9%).
- b. Press and hold the AIR button for about three seconds. The display will indicate Air CAL HOLD AIR. Continue to hold until ADJ and RELEASE are displayed. Release the AIR button. The GX-2009 will set to fresh air values, 0% LEL CH₄, 20.9% O₂, 0.0 ppm H₂S and 0 ppm CO.

4. Performing a Breath Test

- a. Performing a breath test quickly tests the GX-2009 oxygen sensor, audible, visual and vibratory alarms for proper operation. Performing a breath test is not a substitute for calibration or performing a bump test on all sensors.
- b. Cup hands over O₂ sensor opening and gently exhale over the sensor.
- c. The oxygen sensor output will drop below the alarm point of 19.5% and activate alarms.
- d. If alarms are set to latching, press the POWER MODE button to reset alarms once oxygen reading is above 19.5%.
 - i. Note: You may also see slight response on the CO gas sensor when performing a breath test.

Quick Reference Guide For Model GX-2009

5. Sensor Failure

- a. If the GX-2009 experiences a sensor failure during start up, the LCD will indicate FAIL and indicate the sensor that has failed. Example: FAIL CO ppm SENSOR. To continue operation press and release the POWER MODE button to acknowledge the failure. Gas readings for that sensor will be replaced by dashes.
- b. It is necessary to replace sensor and calibrate as soon as possible.

6. Display Mode

- a. Press and release the POWER MODE button to access PEAK readings.
 - i. This will display the highest LEL, CO and H2S and lowest O2 readings encountered while the instrument has been in operation.
 - ii. To Reset PEAK readings, press and hold the AIR button until CLEAR RELEASE is displayed.
- b. Press the POWER MODE button again to move to the STEL screen.
 - i. STEL is a 15 minute average exposure for CO and H2S.
- c. Press the POWER MODE button again to move to the TWA screen.
 - i. TWA is an 8 hour average exposure for CO and H2S.
- d. Press the POWER MODE button again to display the full scale readings of each channel.
- e. Pressing the POWER MODE button again will return you to the normal measuring screen.

7. Resetting Alarms

- a. If the GX-2009 alarms are set up to latch, press and release the POWER MODE button to reset alarms once alarm condition has cleared.
- b. If the GX-2009 alarms are set up for self-resetting, the alarms will automatically reset once the alarm condition has cleared.

8. Turning off the GX-2009

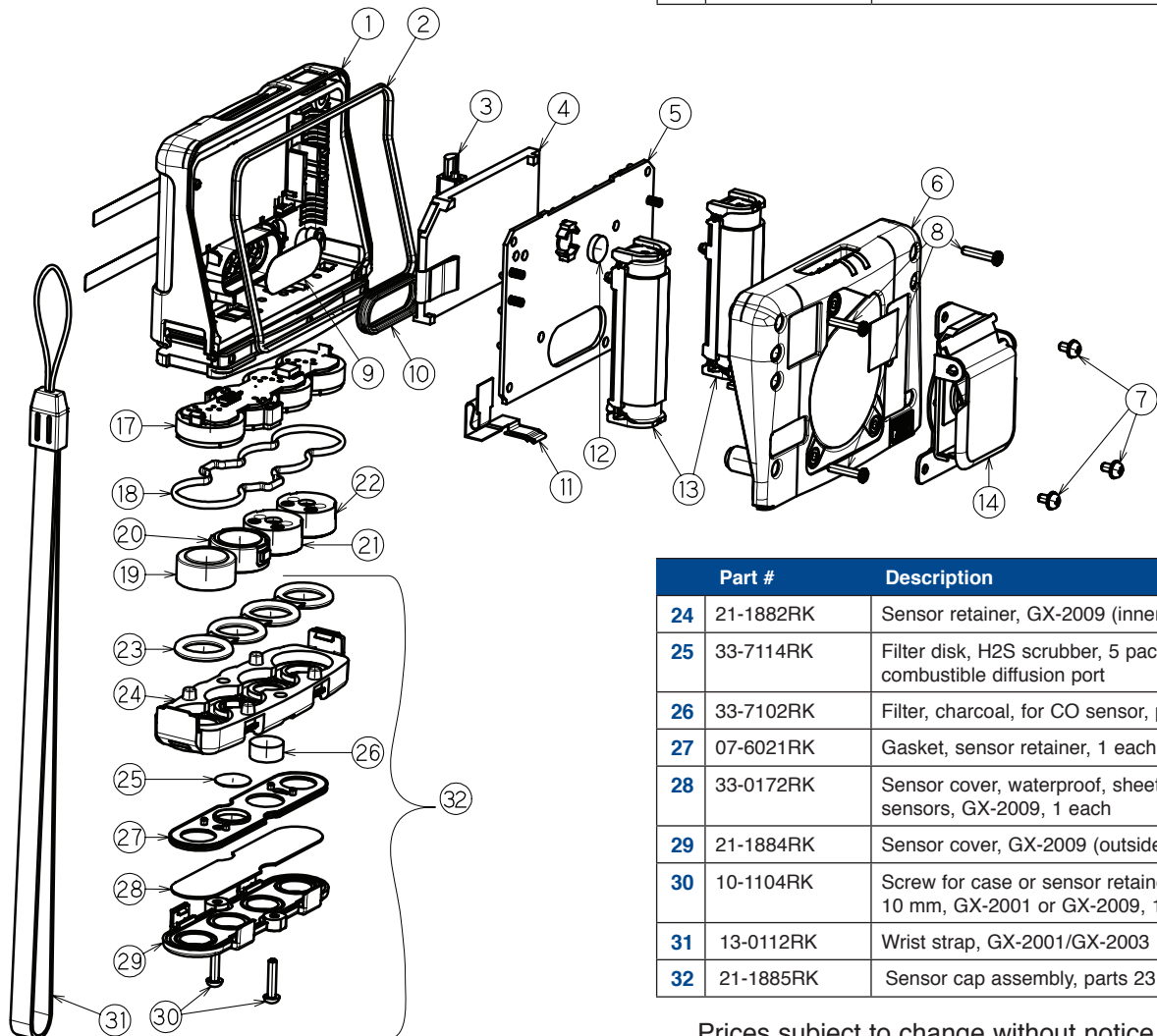
- a. Press and hold the POWER MODE button.
- b. TURN OFF will be displayed and the instrument will beep three times before shutting down.

9. Consult the operator's manual for further information.

GX-2009 SPARE PARTS

Part #	Description
1	21-1880RK Front case, GX-2009
2	07-6017RK Gasket for GX-2009 case, 1 each
3	30-1054RK Vibration motor for the GX-2009
4	51-1119RK LCD module assembly with flat cable for GX-2009
5	57-2052RK PCB main assembly, GX-2009
6	21-1881RK Case, rear, GX-2009
7	10-1098RK Screw with split lock and flat washers for alligator or belt clip, GX-2009, 1 each
8	10-1104RK Screw for case or sensor retainer, M2 x 10 mm, GX-2001 or GX-2009, 1 each
9	33-1113RK Metal mesh filter for buzzer hole, GX-2009, 1 each
10	07-6018RK Gasket for buzzer hole, GX-2009
11	24-5000RK Flexible printed circuit (FPC), GX-2009
12	49-1050RK Battery, silver oxide, SR 616, 1.55 volts, GX-2009

Part #	Description
13	49-1609RK NiMH battery set with hardware for GX-2009, set of 2 batteries
14	13-0116RK Alligator clip, GX-2009
17	21-1883RK Sensor case with PCB assembly, GX-2009
18	07-6008RK O-ring gasket for sensor case, GX-2009, 1 each
19	OS-BM2 Sensor, Oxygen (O2) for GX-2001/ GX-2003/GX-2009/GasWatch 2/OX-01
20	NC-6264A Sensor, LEL, for GX-2001/GX-2003/ GX-2009/GP-01
21	ES-1821 Sensor, Carbon Monoxide (CO) for GX-2001/GX-2003/GX-2009/GasWatch 2/CO-01
22	ES-1827i Sensor, Hydrogen Sulfide (H2S) for GX-2009
23	07-6019RK Sensor chamber gasket, for sensor retainer, GX-2009, 1 each



Part #	Description
24	21-1882RK Sensor retainer, GX-2009 (inner piece)
25	33-7114RK Filter disk, H2S scrubber, 5 pack, for combustible diffusion port
26	33-7102RK Filter, charcoal, for CO sensor, pack of 5
27	07-6021RK Gasket, sensor retainer, 1 each
28	33-0172RK Sensor cover, waterproof, sheet for 4 sensors, GX-2009, 1 each
29	21-1884RK Sensor cover, GX-2009 (outside piece)
30	10-1104RK Screw for case or sensor retainer, M2 x 10 mm, GX-2001 or GX-2009, 1 each
31	13-0112RK Wrist strap, GX-2001/GX-2003
32	21-1885RK Sensor cap assembly, parts 23 to 30

Prices subject to change without notice. 12/8/08



GX-2009



Service Training Module

•1



Scope

- **Modes**
 - Display/User Setup/Factory
- **Maintenance**
 - Inlet filter/Battery replacement
 - Scrubber/Sensor Replacement
 - Internal component replacement
- **Calibration**
- **Common troubleshooting techniques**



Display Mode

From Normal Operation, press POWER MODE button to cycle through

- PEAK: Peak sensor readings
 - This is since the unit has been on; these reset once unit turned off then back on
- STEL: short term exposure limit since turning unit on (CO/H₂S only)
 - 15 minute exposure time
- TWA: time weighted average since turning unit on (CO/H₂S only)
 - 8 hour exposure time
- FS: Full scale of the sensors

•3



User Setup Mode

- With unit turned OFF, press and hold the AIR button, then press and hold the POWER MODE button. Continue to hold buttons.
- Release when you hear 2 beeps

•4



User Setup Mode

- If password is set to on, then 0000 PASSWORD will be displayed
 - Enter password
 - Backdoor password is **9002**
- If password is off, then DATE will be displayed

•5



User Setup Mode

- DATE
- AIR CAL
- AUTO CAL
- ONE CAL
- ALARM-P
- REFRESH (Discharge batteries)
- PASSWORD
- START



Factory Mode

- With unit turned OFF, press and hold the AIR button, then press and hold the POWER MODE button. Continue to hold buttons.
- Release after you hear 3 beeps
- The display will indicate 0000
 - Enter PASSWORD 1994



7



Factory Mode

- The display will indicate 0000
 - Enter PASSWORD 1994

WILL BE DELETING THIS SLIDE

•8



Factory Mode

- DATE
- GAS COMB – Turn channels on/off
 - For LEL channel: select CH4 %LEL / CH4 %vol / HC %LEL
- ALARM-P
- LATCHING
- AIR CAL
- AUTO CAL
- ONE CAL
- ROM/SUM
- A/D VAL
- REFRESH - Discharge batteries
- DEFAULT: This action sets unit back to JAPAN settings which effects operation
 - You will need an IrDA cable and the Factory Config software to reset back to RKI settings
- START

•9



GX-2009 Calibration



•10



Calibration Mode

- Date: Set the date and time
- AIR CAL: Perform a fresh air adjustment
- AUTO CAL: Perform a span adjustment (all channels simultaneously)
- ONE CAL: Perform a span adjustment (one channel at a time)
- BUMP: Perform a bump test (factory set to off)
- REFRESH: Discharge batteries

•11



Accessing Calibration Mode

- Begin with the GX-2009 off.
- Press and hold the AIR button, then press and hold the POWER MODE button. When you hear a beep, release the buttons.



•12



Auto Calibration

- Auto Calibration adjusts all active sensors simultaneously.
 - Use AIR to scroll to the AUTO CAL screen then press POWER MODE
 - All calibration values will be displayed:
 - CH4 50% LEL
 - OXY 12% Vol
 - CO 50 ppm
 - H2S 25.0 ppm

•13



Auto Calibration

- If the calibration values displayed do not match the gas cylinder values:
 - Press and hold the AIR button, then press the POWER button, CH4 % LEL --- will be displayed.
 - Press the POWER button, 50% LEL will be displayed and blinking.
 - Press the AIR button to change the value. To reverse the direct of change, press AIR and POWER MODE at the same time then press AIR again
 - Set to required value for each sensor, accordingly.

•14



Auto Calibration

- Applying gas to the GX-2009
 - Attach regulator to top of calibration gas cylinder.
 - Attach tubing with calibration cap to regulator.
 - Press the POWER button to begin Auto Calibration.
 - Attach the calibration adapter plate onto the GX-2009's sensor face and turn on the regulator.
 - Allow gas to flow for two minutes or until the readings stabilize.
 - Press and release the POWER button.
 - The GX-2009 will attempt to calibrate all four sensors. If calibration is successful, PASS will be displayed. If not FAIL will be displayed.

•15



Auto Calibration

- Auto Cal PASS
 - Turn the gas regulator off.
 - Remove the calibration adapter plate.
 - The GX-2009 will indicate AUTO CAL.
 - Press the AIR button until START is displayed then press the POWER button to return to normal operation.

•16



Maintenance



•17



Filter Maintenance

- Scrubbers are used to protect the LEL and CO sensor from H₂S exposure.
- Replacement of the scrubbers depends on how often the instrument is exposed to H₂S.
- To replace the scrubbers, use a small Philips screwdriver to remove the two sensor cap screws

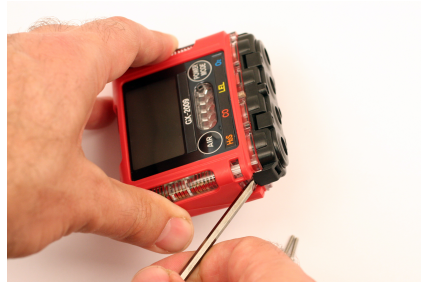


18



Filter Maintenance

- Using small flat blade screwdriver, gently pry up the tabs on each end of the sensor cap to remove.



19



Filter Maintenance

- Remove sensor cap to gain access to sensors.

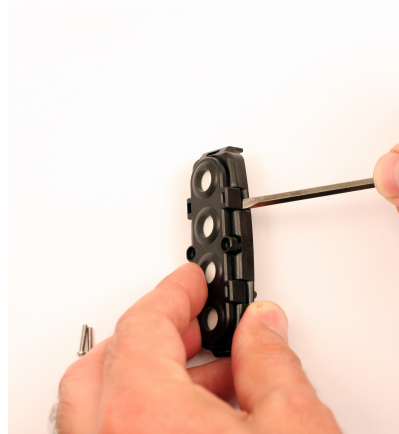


20



Filter Maintenance

- Using a small flat blade screwdriver, remove sensor cover retainer exposing waterproof sensor cover and scrubber filters.



21



Filter Maintenance

- Sensor filter kit: P/N 33-7117RK-01,
 - Includes: 1 charcoal scrubber (33-7102RK, 5/pk) and 1 H2S scrubber (33-7114RK, 5/pk), 1 waterproof sensor cover (33-0172RK). Replace when white scrubber becomes discolored.



22



Sensor Replacement

- O2 Sensor
P/N OS-BM2
- LEL Sensor
P/N NC-6264A
- CO Sensor
P/N ES-1821
- H2S Sensor
P/N ES-1827i
- Average life: 2+ Years

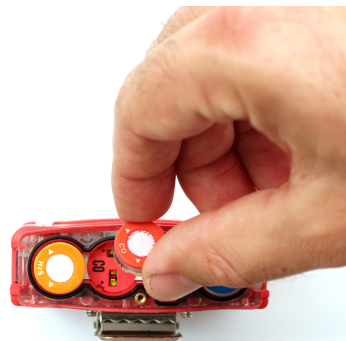


23



Sensor Replacement

- Replace sensors when you are unable to calibrate or if reading becomes unstable.
- Note alignment tabs on H2S and CO sensor and holder.

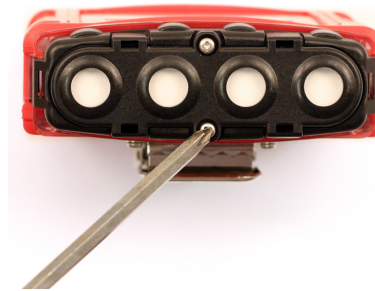


24



Sensor Replacement

- After replacing a sensor, snap sensor cover back in place and secure retaining screws.
- Always calibrate the GX-2009 after replacing a sensor.



25



Alligator Clip Removal

- Unscrew the three Phillips screws to remove the alligator clip.
- Replacement Alligator Clip: P/N 13-0119.



26



Disassembly

- Turn the GX-2009 off.
- Using a small Phillips screwdriver remove the four screws securing the case halves together.
- Grasp the case and separate.

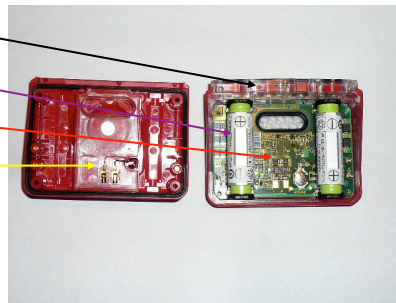


27



Disassembly

- Internal Components
 - Sensor PCB
 - NiMH batteries
 - Main PCB
 - Buzzer

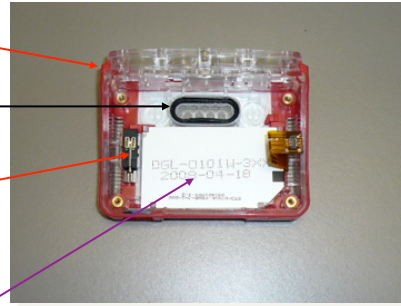


28



Front Case & Components

- Body case, front:
P/N 21-1880RK
- Gasket for buzzer hole:
P/N 07-6018RK
- Vibration motor:
P/N 30-1054RK
- Flexible PCB:
P/N 24-5000RK
- LCD Assembly:
P/N 51-1119RK

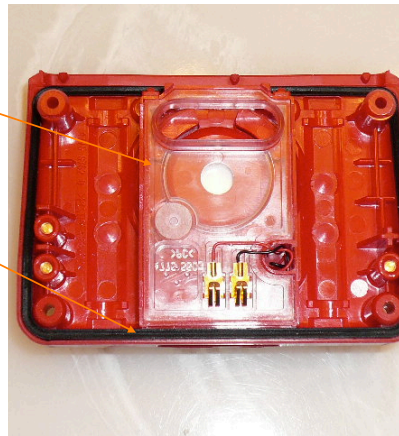


29



Rear Case

- Body case, rear
P/N 21-1881RK,
buzzer included.
- Gasket (10 pack)
P/N 07-6017RK



30



Batteries

- NiMH Batteries
 - 49-1609RK (2 ea)
 - Average life: 2 years
 - Simple to replace

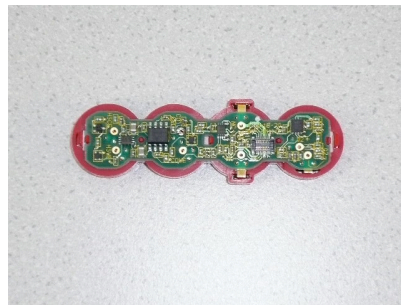


31



Sensor PCB Assy.

- Sensor Case with PCB P/N 21-1883RK.
- Sensor PCB connected to Main PCB by Flexible Printed Circuit Board P/N 24-5000RK- Take care to unplug flexible PCB before removing Sensor Case or damage to flexible PCB will result.

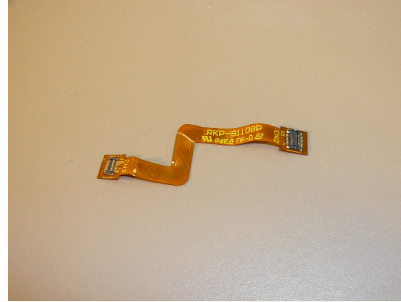


32



Flexible PCB

- Flexible PCB, P/N 24-5000RK connects Sensor case with PCB to Main circuit board.
- There are sockets on both sides of the PCB that must be unplugged prior to removal.

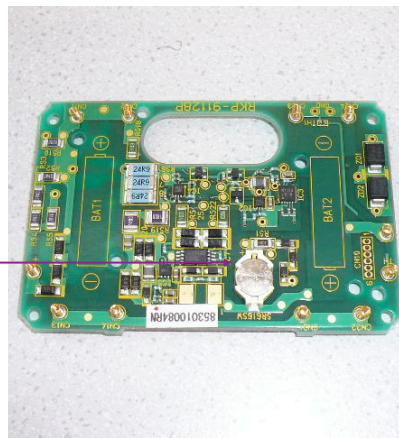


33



Main PCB Assembly

- P/N 57-2052RK
- Has 1.55 volt silver oxide battery to maintain memory
 - Replacement battery P/N 49-1050RK

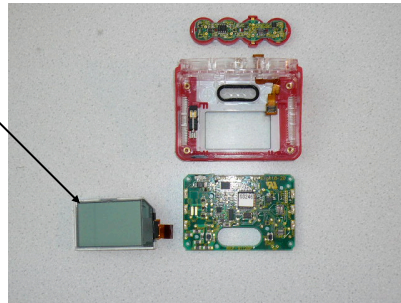


34



LCD Assembly

- LCD (P/N 51-1119RK) is keyed for easy installation
- Ribbon cable has built in connector that is easily unplugged from the main PCB



35



Common troubleshooting techniques

- Fail cal
 - Gas expired
 - Old sensor
 - Old filter
 - Auto cal value
 - Correct regulator
- Clock won't reset / Fail clock
 - Replace memory retention battery
- Cal interval not reset
 - Replace memory retention battery
- Batteries won't charge
 - Old batteries
 - Bent contact springs
 - Clean charge contacts
 - Corrosion/tarnish on contacts



Questions?



•37



GX-2009 Hands-on Worksheets

Objective:

To increase students ability to properly troubleshoot and repair the GX-2009.

Tools Required:

Small Philips and Standard screwdrivers, digital volt meter and calibration kit.

- 1) A GX-2009 is returned for service and the complaint is that when charging the instrument the red charge light does not come on when the instrument is put into the charger. What would you do to troubleshoot this problem?

- 2) What will happen to the GX-2009 if the user performs a "Default?"

- 3) You need to calibrate a GX-2009 and you only have test gas with the following components, 50% LEL Methane, 50 ppm CO, 25 ppm H₂S, 20.9% O₂ balance N₂. Can you perform a Auto Cal?

- 4) You have a GX-2009 that the customer complains that the instrument will fail calibration on combustibles channel. How would you go about troubleshooting this?

- 5) You get an OS-BM2 oxygen sensor back from a customer and measure the output and it is 300mV. Is this okay? Yes / No Why?

6) You receive a 2009 back for repair and the instrument will not power up even with freshly charged batteries. What would you need to replace?

7) Customer returns a GX-2009 with the comment that it fails H2S upon start-up. You open up the unit and see that the sensor gold contacts are silver and green. What has happened? _____

8) You replace the H2S sensor and it still fails, what is the most likely cause of the problem and what has to be done to correct the fault?

9) You receive a GX-2009 and the customer wants it calibrate to Hexane on the LEL channel. What do you need to do before calibrating?

10) Why does is the CO sensor scrubber black and what is its purpose?



This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.