ONE TO SIX GAS PORTABLE MONITOR

Gas Detection For Life

EAGLE 2 Model

Features

- **Monitor up to 6 different gases**
- **PPM, % LEL, or % Vol. auto-ranging combustible detection**
- **Specialty Sensors**
  - **PID (Photoionization Detector)**
    - Low or high range for VOC detection
    - Fence Electrode Technology for humidity and contamination resistance
  - **Infrared (IR)**
    CO2, % LEL CH4, % Vol. CH4, % LEL HC, % Vol. HC
  - **Thermal Conductivity (TC)**
    % Vol. H2, % Vol. CH4
  - **Smart toxic, plug and play sensors**
    NH3, AsH3, Cl2, HCN, PH3, & SO2
- **Multilingual (5 languages)**
- **Powerful long-life pump up to 125' range**
- **Low flow pump shut off and alarm**
- **Methane elimination for environmental use**
- **Alkaline 18 hours or NiMH 20 hours capability**
- **Password protection**
- **Datalogging standard**
- **Autocalibration / single gas calibration**
- **Internal hydrophobic dust filter**
- **External probe with hydrophobic filter**
- **Ergonomic RFI / EMI / chemical / weather resistant enclosure**
- **Intrinsically safe design, CSA approval**

RKI is proud to offer the next generation of our popular EAGLE portable gas detector. Equipped with features that are not available on competitive units, the EAGLE 2 is a powerful instrument that does more than just offer the standard confined space protection for LEL, O2, H2S and CO.

The EAGLE 2 available features include a PID sensor for detecting high or low ppm levels (0-50 & 0-2,000) of VOC gases; % volume capability for CH4 and H2 using a TC (thermal conductivity) sensor; PPM or LEL hydrocarbon detection at the push of a button; infrared sensors for CO2 (ppm or % volume), methane or hydrocarbons in LEL and % volume ranges; methane elimination feature for environmental applications; and a variety of super toxic gases. The EAGLE 2 has a strong internal pump with a low flow auto pump shut off and alarm, which can draw samples from up to 125 feet. This allows for quick response and recovery from distant sampling locations. The EAGLE 2 will continuously operate for over 18 hours on alkaline batteries or 20 hours on NiMH. A variety of accessories are also available to help satisfy almost any application such as long sample hoses, special float probes for tank testing, and dilution fittings, just to name a few. Datalogging is a standard feature for all sensors on all versions.

With its ergonomic design and large glove friendly buttons, the EAGLE 2 offers easy access to controls such as autocalibration, alarm silence, demand zero, peak hold, methane elimination, and a wide variety of other features. Each channel has two alarm levels plus TWA and STEL alarms for toxic channels. The two alarm levels are user adjustable and can be latching or self resetting. Rugged, reliable, easy to operate and maintain, the EAGLE 2 is the solution for just about any portable gas monitoring situation. Also, the display can be set to any of 5 languages: English, French, German, Italian, or Spanish.

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

EAGLE 2 Model

Enclosure	Weatherproof, chemical resistant, RFI / EMI coated high impact polycarbonate-PBT blend. Can operate in 2.0" of water without leakage. Ergonomically balanced with rugged top mounted handle. Water & dust resistant equivalent to IP64.
Dimensions	9.5" L x 5.25" W x 5.875" H
Weight	3.8 Lbs (standard 4 gas with batteries).
Detection Principle	Catalytic combustion, electrochemical cell, galvanic cell, infrared, Photoionization detector, and thermal conductivity.
Sampling Method	Powerful, long-life internal pump (over 6,000 hours) can draw samples over 125 feet. Flow rate approximately 2.0 SCFH.
Display	3 display modes: display all gases, large font-autoscroll, or large font-manual scroll. Polyurethane protected overlay. Backlight, illuminates for alarms and by demand, with adjustable time.
Language	Readout can display in 5 languages (English, French, German, Italian, or Spanish).
Alarms	2 Alarms per channel plus TWA and STEL alarms for toxics. The two alarms are fully adjustable for levels, latching or self reset, and silenceable.
Alarm Method	Buzzer 95 dB at 30 cm, four high intensity LED's.
Controls	4 External glove friendly push buttons for operation, demand zero, and autocalibration. Buttons also access LEL/ppm, alarm silence, peak hold, TWA/STEL values, battery status, conversion factors, and many other features.
Continuous Operation	At 70°F, 18 hours using alkaline batteries, or 20 hours using NiMH.
Power Source	4 alkaline or NiMH, size C batteries (Charger has alkaline recognition to prevent battery damage if charging is attempted with alkalines).
Operating Temp. & Humidity	-20°C to 50°C (-4°F to 122°F), 0 to 95% RH, non-condensing.
Environmental	IP-64
Response Time	30 Seconds to 90% (for most gases) using standard 5 ft hose.
Safety Rating	Intrinsically Safe, Class I, Groups A, B, C, D. Approvals: CSA / CE
Standard Accessories	Shoulder strap, alkaline batteries, hydrophobic probe, and 5 foot hose, internal hydrophobic filter.
Optional Accessories	• Dilution fitting (50/50) • NiMH batteries • Battery charger, 115 VAC, 220 VAC, or 12 VDC (charge time 4 hours) • Continuous operation adapter, 115 VAC or 12 VDC • Extension hoses
Warranty	Two year material and workmanship, one year for PID sensor.

Gas	Measuring Range	Accuracy * Which ever is greater
Gases & Detectable Ranges		
Standard Confined Space Gases		
Hydrocarbons (CH_4, std)	0 - 100% LEL	± 5% of reading or ± 2% LEL (*)
	0 - 5% Vol. (CH_4)	
	0 - 50,000 ppm	± 50 ppm or ± 5% of reading (*)
Oxygen (O_2)	0 - 40% Vol.	± 0.5% O2
Carbon Monoxide (CO)	0 - 500 ppm	± 5% of reading or ± 5 ppm CO (*)
Hydrogen Sulfide (H_2S)	0 - 100 ppm	± 5% of reading or ± 2 ppm H2S (*)
Toxics		
Ammonia (NH_3)	0 - 75 ppm	± 10% of reading or ± 5% of full scale (*)
Arsine (AsH_3)	0 - 1.5 ppm	
Chlorine (Cl_2)	0 - 3 ppm	
Hydrogen Cyanide (HCN)	0 - 15 ppm	
Phosphine (PH_3)	0 - 1 ppm	
Sulfur Dioxide (SO_2)	0 - 6 ppm	
IR Sensors		
Carbon Dioxide (CO_2)	0 - 10,000 ppm 0 - 5% Vol. 0 - 60% Vol.	± 5% of reading or ± 2% of full scale (*)
Methane (CH_4)	0 - 100% LEL/ 0 - 100% Vol.	
Hydrocarbons	0 - 100% LEL/ 0 - 30% Vol.	
PID Sensors		
VOC	0 - 2,000 ppm 0 - 50 ppm	–
TC Sensors		
Methane (CH_4)	0 - 100% Vol.	± 5% of reading or ± 2% of full scale (*)
Hydrogen (H_2)	0 - 10% Vol. 0 - 100% Vol.	

The EAGLE 2 can be configured with up to 6 gas sensors from the above list.

Specifications subject to change without notice.

Made in the USA

RKI INSTRUMENTS

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Authorized Distributor:

Quick Reference Guide For Model Eagle 2

Turn on and adjust the Eagle 2 gas monitor in a known fresh air area.

1. Turning the Eagle 2 On

a. Connect the sample hose and probe to the Eagle 2's quick connect inlet fitting.

b. Press and briefly hold down the POWER ENTER RESET button. Release when you hear a beep.

c. The instrument goes through its warm-up sequence and shows screens for battery voltage, active gases, lunch break (if LUNCH BREAK is turned on), low alarm, high alarm, STEL and TWA, calibration reminder (if CAL REMINDER is turned on), date and time, user ID/station ID/serial number (with user ID and station ID only appearing if USER/STATION ID is turned on), and sensor failures. It then goes into measuring mode.

2. Sensor Failure

a. If the Eagle 2 experiences a sensor failure during start-up, a screen indicating which sensor failed appears (for example, FAIL SENSOR <H2S>) and the buzzer sounds a pulsing tone twice per second.

b. To continue, press and release POWER ENTER RESET to acknowledge the failure. The gas reading is replaced by XXX.

c. Replace the sensor as soon as possible.

3. Performing a Demand Zero

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 ▲ YES button. The LCD will prompt you to keep holding the AIR ▲ YES button and the buzzer will pulse. Release when prompted to do so. The Eagle 2 will set the fresh air values (0% LEL CH4, 20.9% O2, 0.0 ppm H2S, and 0 ppm CO.

4. Performing a Flow Integrity Test

Verify there are no leaks in the hose and probe assembly, the pump is operating, and the flow fault circuit is active.

a. With the Eagle 2 in normal operation and with hose and probe attached, place finger over the end of the probe to block flow.

b. The Eagle 2 should indicate FAIL LOW FLOW LEVEL within a few seconds. Press POWER ENTER RESET to restart the pump.

c. If the Eagle 2 does not go into low flow alarm, inspect hose and probe for leaks. If the leakage cannot be resolved, have the Eagle 2 serviced.

5. Performing a Breath Test

Test the oxygen sensor, pump, and audible and visual alarms for proper operation. Not a substitution for calibration or a bump test.

Quick Reference Guide For Model Eagle 2

a. Perform a demand zero.
b. Cup hand over end of probe and gently exhale into probe.
c. In a few seconds, the oxygen reading will drop below the alarm point of 19.5% and activate alarms.

Note: When testing using a hose, allow 1 second of time for each foot of hose length. For example, allow a 5 foot hose 5 seconds for the sample to reach the sensors.

d. Press POWER ENTER RESET to reset alarms.

6. Display Mode

a. To access Display Mode, while the Eagle 2 is in normal operation, press and release DISPLAY ADJUST NO.
b. Use DISPLAY ADJUST NO to scroll through the following screens: peak readings, battery voltage, gas display, methane elimination mode (if unit is configured appropriately), relative response (if RELATIVE RESPONSE is turned on), STEL, TWA, view alarm settings, select user ID (if turned on), select station ID (if turned on), time in operation, date/time, and data logging time remaining (if turned on).
c. Press and release DISPLAY ADJUST NO once more to return to Normal Operation.

7. Switching from LEL to PPM to %VOL

a. The catalytic combustible channel's units can be changed from % LEL (Lower Explosive Limit) to PPM (parts per million) to % VOL (percent volume).
b. While in normal operation, press and release RANGE ▼ SHIFT until the desired unit appears.

8. Resetting and Silencing Alarms

a. If ALARM SILENCE is turned on, press and release POWER ENTER RESET to silence an alarm. The audible alarm will silence and the alarm LED's will continue to pulse.
b. If the Eagle 2 alarms are set to latching, to reset an alarm, press and release POWER ENTER RESET once the alarm condition has cleared.
c. If the Eagle 2 alarms are set to self-resetting, the alarms will automatically reset once the alarm condition has cleared.

9. Turning Off The Eagle 2

a. Press and hold POWER ENTER RESET. The buzzer will pulse for about 5 seconds.
b. Release the POWER ENTER RESET button when you see GOODBYE and the RKI logo. When these disappear, the Eagle 2 is off.

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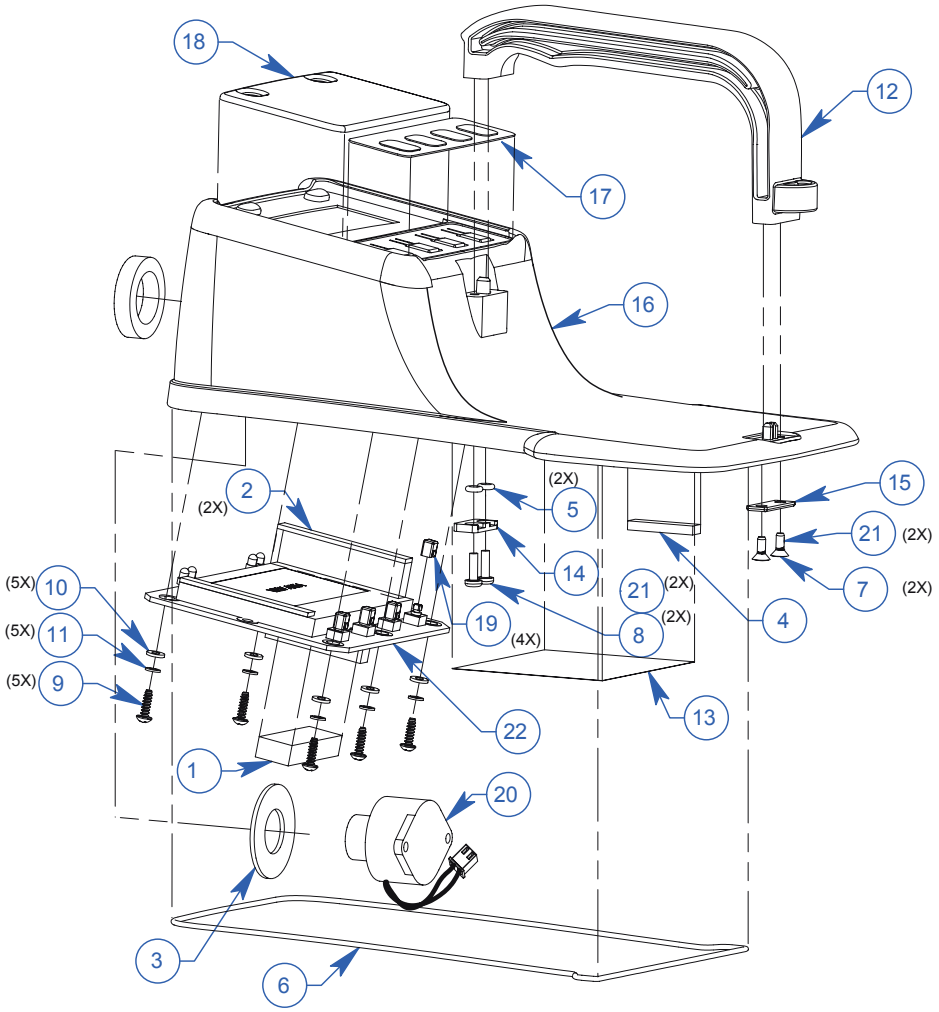
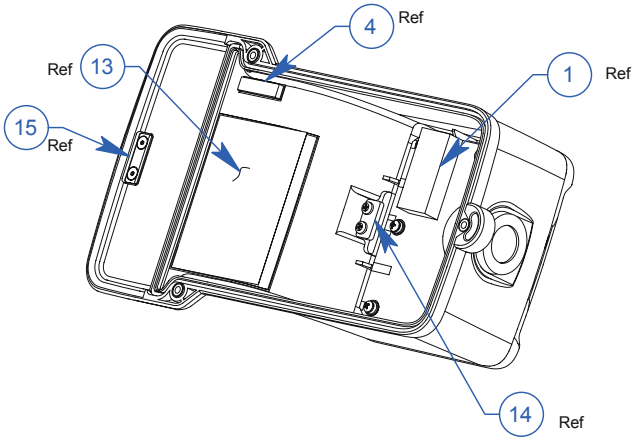
Eagle 2

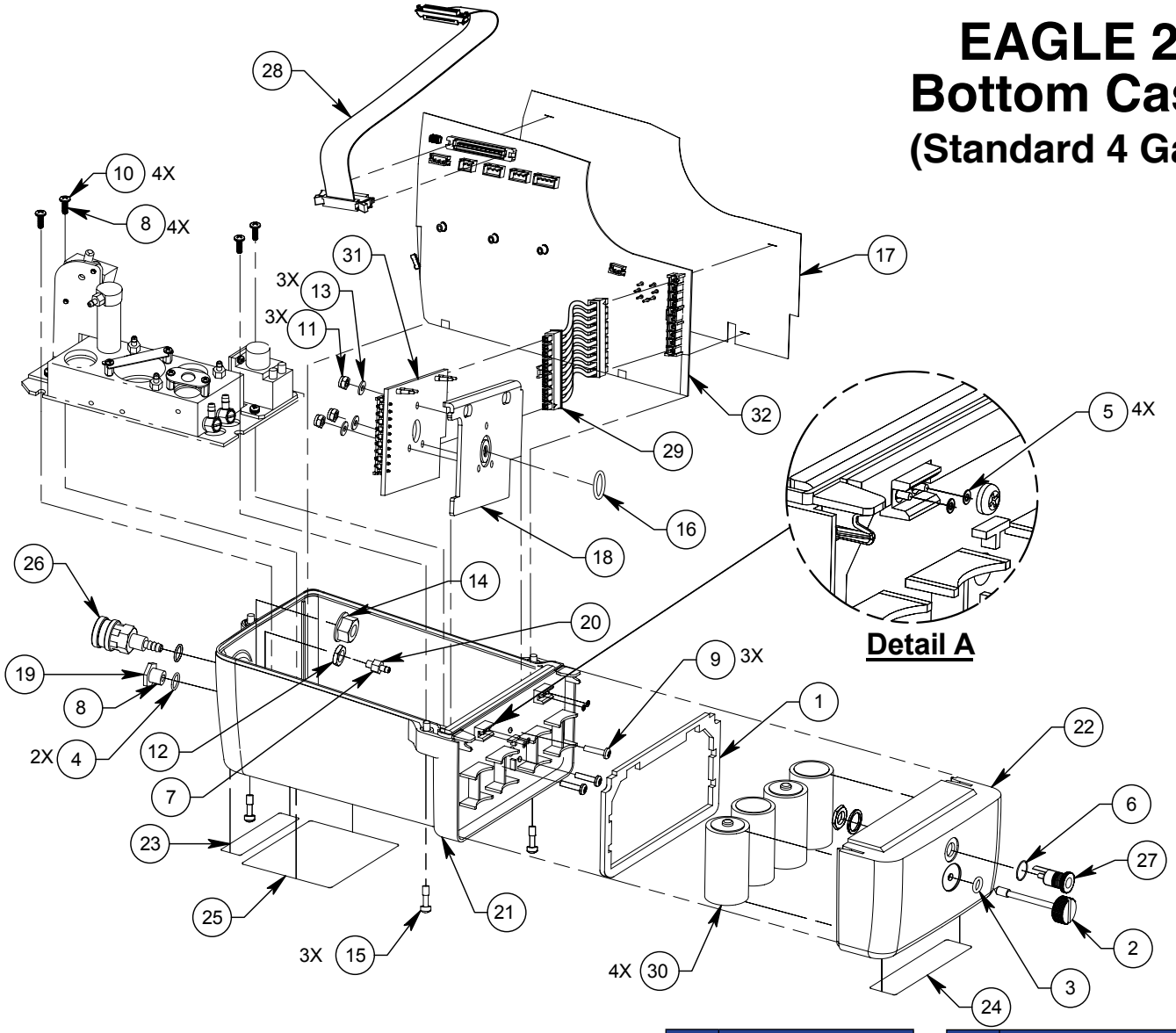
EAGLE 2 Top Case (Standard 4 Gas)





	Part Number
1	07-0017RK
2	07-0132RK
3	07-0133RK
4	07-0134RK
5	07-7005RK
6	07-7070RK-50
7	10-0117RK
8	10-0119RK-01
9	10-0121RK
10	11-0220RK
11	11-0221RK
12	13-0002RK
13	14-0011RK
14	14-0050RK
15	14-0051RK
16	21-0630RK
17	29-0338RK
18	29-0339RK
19	43-0417RK-01
20	52-1019RK-01
21	08-0202RK
22	57-0103RK

EAGLE 2
Bottom Case
(Standard 4 Gas)



	Part Number
1	07-0131RK
2	13-1081RK
3	07-7010RK
4	07-7300RK
5	07-7301RK
6	07-7302RK
7	08-0191RK
8	08-0202RK
9	10-0129RK-01
10	10-0194RK-05
11	110025RK
12	11-0111RK
13	11-0222RK
14	11-4021RK
15	13-1061RK
16	07-7014RK

	Part Number
17	14-0010RK
18	14-0142RK
19	17-0480RK
20	17-0633RK
21	21-0631RK-03
22	21-0642RK
23	29-0335RK
24	29-0336RK
25	29-0337RK
26	30-0522RK
27	45-2311RK
28	47-5057RK
29	47-5059RK
30	49-1130RK
31	57-0100RK
32	57-0102RK-01

Eagle 2

Service Training Module

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Scope

- **MODES** – *normal mode, display mode, leak check, bar hole, inert mode, methane elimination (modes in blue are factory set to off unless requested upon order)*
- **MENUS** – *Set up menu, Factory menu*
- **SERVICE MAINTENANCE**– *Common issues, calibration (auto cal vs single cal), filter replacements, sensor replacement, pump replacement/rebuild, flow adjustment, Main board replacement, sub PCBs, Display PCB replacement, PID cleaning.*

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EAGLE 2 MODES

- Normal Mode
- Display Mode
- Leak Check/Bar Hole

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Normal Mode

- Press and Hold POWER ENTER until unit turns on. The unit will go into warm up and show some instrument parameters.
- Perform fresh air calibration
- Perform a flow integrity test (make sure unit goes into a "fail low flow" alarm) to make sure there is not leaks in the system.

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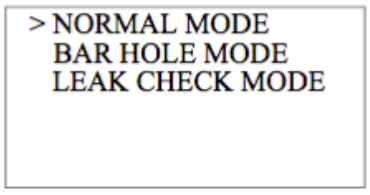
Display Mode

- **Peak reading** (min and max, values will reset when instrument is turned off).
- **Battery info**
- **Gases display** – display all, scroll auto, scroll manual
- **Methane Elimination** (can be off)
- **Relative response** (can be off in set up mode)
- **STEL**
- **TWA**
- **View Alarm Settings**
- **Select User ID**
- **Select Station ID**
- **Operation time**
- **Date and Time**
- **Data log remain**

Leak Check & Bar Hole Mode

If the leak check or bar hole mode is on in SET UP MODE MENU, you should see this mode select screen at start up:



NOTE: Bar hole mode will only show up in the mode select screen if you have a % vol TC methane sensor and LEL sensor installed, both configured to methane.

EAGLE 2 MENUS

- Set up Mode Menu
- Factory Mode Menu

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Setup Mode Menu
(UP+DOWN+POWER)

NOTE: *The Eagle 2 is not a gas monitoring device when it is in Setup Mode*.

To access Setup Mode, follow the steps below:

1.Start with the Eagle 2 OFF.

2.Press and hold the UP (AIR/YES) + DOWN (RANGE/SHIFT) buttons and then hold POWER ENTER. Release when you hear a beep.

3.An “S” on the lower right hand side will show up on the screen. The following list will be displayed six at a time:

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Setup Mode Menu
(UP+DOWN+POWER)

- **Set Date & Time**
- **Set Date Format**
- **Set Battery Type** – *Alkaline or Ni-MH*
- **Configure Channels** – *Turn channels on or off/switch channel sequence*
- **Configure Gases** – *Usually used to change LEL gas name to another combustible gas*
- **Catalytic Units** – *Switch from ppm, LEL, % vol if catalytic sensor is installed.*
- **Relative Response** – *catalytic sensor response chart can be turned on to show up in unit display mode.*
- **Alarm Points** – *change and view alarm points for each gas*
- **Alarm Latching** – *self reset or latching option (factory set: latching)*
- **Alarm Silence** – *on/off. Allows user to silence audible alarm even if alarm is not completely cleared.*

Setup Mode Menu
(UP+DOWN+POWER)

- **User/Station ID** – On/Off in the unit display mode.
- **Adj Autocal Values** - *Change calibration values to match cylinder.*
- **Backlight Delay**
- **Auto Fresh Air Adj** – *fresh air at unit turn on (factory set to off)*
- **Data Log Interval** – *5 sec (10 days) - 10 min (2000 days)*
- **Data Log Overwrite** – *On/Off. Overwrites oldest data if on.*
- **Data Log Memory** – *On/Off for prompt to clear data memory.*
- **Adjust Contrast** – *Change display contrast*
- **Cal Reminder** – *On/Off (cal c-limit)*
- **Cal Past Due Act** – *Confirm to use, must cal, notification only*
- **Cal Interval –** *Amount of time between calibration reminder. Factory setting is 90 days.*

Setup Mode Menu
(UP+DOWN+POWER)

- **LC/BH Mode Select** – *Turns on/off leak check and bar hole modes.*
- **BH Measuring Time** – *Amount of time for each barhole measurement in sec. Factory setting is 30 secs.*
- **Zero Follower**
- **Zero Suppression**
- **Confirmation Alert** – *Beeps/lights up every 15 min to confirm unit is still functioning.*
- **Change Password** – *On/Off*
- **Default Settings –** *Restores to RKI standard configurations*
- **Lunch Break** – *On/off*
- **Span Factor –** *On/off. The range displayed after performing single calibration.*
- **Select Language**
- **Normal Operation**

Factory Mode Menu
(UP+DOWN+DISPLAY+POWER)

To access Factory Mode, follow the steps below:

1.Start with the Eagle 2 OFF.

2.Press and hold the UP (AIR/YES) + DOWN (RANGE/SHIFT) + DISPLAY buttons and then hold POWER ENTER. Release when you hear a beep.

3.An “F” on the lower right hand side will show up on the screen.

4.ROM # and CHECKSUM will appear. Press DISPLAY/NO

5.mV screen will show up. Press POWER ENTER

6.Password: 1994, press POWER to continue

Factory Mode Menu
(UP+DOWN+DISPLAY+POWER)

In Factory mode you can press “AIR/YES” or “DISPLAY/NO” to answer the menu questions:

- Enter or Change serial number?
- Change Methane Elimination Voltage?
- Enter user defined relative responses?
- Set alternate range for standard sensors?
- IR auto range change?
- Eagle 2 logo display?

Factory Mode Menu
(UP+DOWN+DISPLAY+POWER)

- Demand zero set?
- Span factor display in single cal?
- Methane elimination mark display in normal mode?
- Symbol mark display in normal mode?
- Data logging remain display in display mode?
- Data logging remaining time
- Active gases display in warm-up mode?
- Alarm display in warm-up mode?
- Inert select in warm up
- Save default instrument settings?

EAGLE 2 SERVICE MAINTENANCE

Auto Calibration, Single Calibration, Common Issues, Filter replacement, sensor replacement, pump replacement/rebuild, Main board replacement, Display PCB replacement, PID cleaning

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Service Maintenance

- Some maintenance procedures may be performed by the user. Most of these will be covered in this class.
- More complicated procedures must be performed by RKI Instruments, Inc. (i.e. adding new sensors to the unit other than standard 4 gas)
- For all maintenance procedures, be sure that the Eagle 2 is turned off and batteries are removed.

Auto Calibration

NOTE: This describes a standard 4 gas unit LEL/O2/H2S/CO

Auto Calibration

Required Equipment:

1. Calibration cylinder – typically use 50% LEL methane, 12% O2, 25 ppm H2S, 50 ppm CO balance N2. O2 cal gas needs to be 15%vol and below.
2. Demand flow regulator
3. Non-absorbent tubing - P/N 06-1248RK-03

NOTE: Before performing a span calibration with the cylinder bottle, perform a flow test and a fresh air adjustment first.

Auto Calibration

1. Turn on the Eagle 2 unit by pressing the POWER ENTER button.
2. Once warm up is complete and the unit is in Normal Measuring mode, perform fresh air adjustment by pressing and holding the AIR button. The unit will tell you when to release the AIR button.
3. While in Normal Measuring Mode, Go into the calibration mode by pressing and holding the RANGE/SHIFT button, then press the DISPLAY/ADJUST button and release.
   - Note: Backdoor password: 1196
4. The Calibration Mode Screen will be displayed with the cursor next to AUTO CALIBRATION.

Auto Calibration

5. Press the POWER ENTER button to enter Auto Cal. This will allow you to calibrate all standard 4 sensors simultaneously.
6. The auto calibration values will be displayed.

CAL GAS VALUES

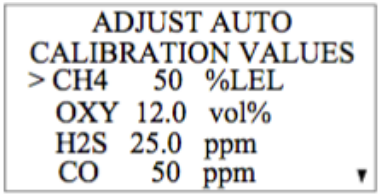
CH4 50% LEL
OXY 12% vol.
H2S 25.0 ppm
CO 50 ppm

ENTER TO BEGIN CAL

NOTE: Make sure that these values match your cylinder, as these are the values that the Eagle 2 will adjust the calibration to.

Auto Calibration

7. If the gas concentrations to be used are different than what is displayed, press and hold the RANGE/SHIFT button then press the DISPLAY button. The LCD will indicate the following:



Auto Calibration

8. Use the AIR YES or RANGE SHIFT buttons to move the cursor to the channel you wish to change and press ENTER.
9. The current value will begin to blink
10. Use the AIR YES or RANGE SHIFT buttons to increase or decrease that value, respectively.
11. To confirm the new calibration value, press ENTER.
12. Follow the same procedure for changing other values.
13. Make sure that the calibration values on the screen match the calibration values on the calibration cylinder.

Auto Calibration

14. To return to the auto calibration screen, scroll down to END and press ENTER.
15. The screen will then ask if you would like to save the changes. Press YES to save them.
16. You will be returned to the auto calibration screen and the new calibration values will be displayed.
17. Press the ENTER button to start the calibration.
18. Attach the demand flow regulator onto the calibration cylinder.
19. Connect the tubing from the demand flow regulator to the rigid tube on the probe.

Auto Calibration

20. Allow readings to stabilize or a maximum of 2 minutes
21. Press the POWER ENTER RESET button to complete calibration
22. Remove calibration gas from probe
23. If all channels passed calibration, the display will prompt you to remove the gas and then it will return to the Calibration Mode Screen.
24. If any channels failed to calibrate, the display will show which sensors failed and the buzzer and alarm LED's activate. Press ENTER to return to the Calibration Mode Screen.

Auto Calibration

25. To return to Normal Operation, use RANGE SHIFT to place the cursor next to NORMAL OPERATION and press ENTER.
26. Remove the regulator from the calibration cylinder.
27. Store the calibration materials in a safe place.

Single Calibration

When do we use Single Calibration?

- Single calibration is used to calibrate each sensor individually.
- To check the sensor life using the span value shown after single calibration. *(NOTE: the wider the range of the span, the better the sensor).*
- When a sensor fails auto calibration.

Single Calibration

1. Enter Calibration Mode by pressing and holding RANGE SHIFT, then pressing DISPLAY and releasing both.
2. Use the RANGE SHIFT button to move the cursor next to SINGLE CALIBRATION and press ENTER.
3. Attach the demand flow regulator to the calibration cylinder and connect tubing.
4. Insert the probe into the Eagle 2.

Single Calibration

5. Select sensor to calibrate:

   >ESCAPE

   CH4 OXY

   H2S CO

6. Use the RANGE SHIFT and AIR YES buttons to move the cursor next to the channel you wish to calibrate and press ENTER.
7. Use the RANGE SHIFT and AIR YES buttons to adjust the calibration value, if necessary.

Single Calibration

8. Use the RANGE SHIFT and AIR YES buttons to adjust the calibration value to match your cylinder, if necessary.
9. Press ENTER to begin calibration; the screen will flash CAL IN PROGRESS.
10. Connect the sample tubing to the probe and allow reading to stabilize.
11. Press ENTER to finish the calibration.
12. If the calibration was successful, the Eagle 2 will display the span value and then return to the sensor selection screen.

Single Calibration

13. If the calibration fails, the display will show the sensor failure and the span. The buzzer and LEDs will pulse.
14. Press ENTER to silence the alarm and return to the sensor selection screen.
15. Repeat the process for any other sensors.
16. When finished, move the cursor to ESCAPE and press ENTER to return to the calibration screen.
17. Move the cursor to NORMAL OPERATION and press ENTER.

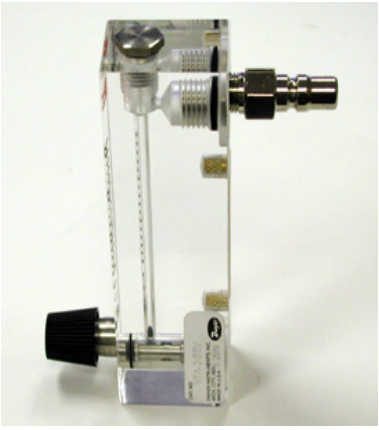
Flow Integrity Test

1. Take the Eagle 2 to a fresh-air environment.
2. Attach probe to the inlet at the front of the instrument. Make sure the filters are all clean on the probe and on the inside of the unit before performing this test.
3. Turn the Eagle 2 on and allow the instrument to warm up.
4. Place your finger over the end of the probe and verify that the Eagle 2 indicates a ”FAIL LOW FLOW” alarm. This verifies that the probe and inlet are leak tight.
5. Press the RESET switch to restart pump.

NOTE: If the Eagle 2 does not go into low flow alarm, check for leaks in the probe, internal tubings, and filters. If these look good, a flow adjustment procedure to reset the differential pressure (DP) switch needs to be performed. See next slide on how to set the DP switch.

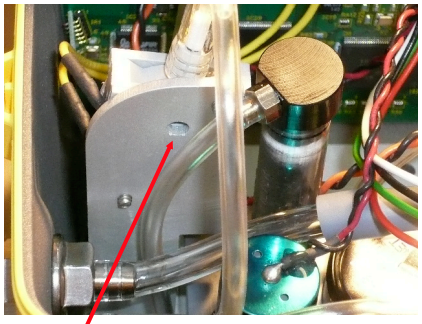
Setting the DP Switch

- Required equipment:
  1. Small flat head screw driver,
  2. 0-2 SCFH flow meter (RKI P/N 31-0023RK)
  3. Male quick connect fitting (RKI P/N 17-0505RK)



Setting the DP Switch

- The DP (differential pressure) switch monitors the flow pressure in the flow system.
- Normal flow for the Eagle 2 is between 1.6 and 2 SCFH, depending on the number of sensors.
- Trip point for the DP switch is .6 SCFH +/- .1.



DP switch adjustment screw

Setting the DP Switch

Before setting the DP switch, check the following first:

•Ensure that the filters are clean as plugged filters can cause the pump flow to decrease and activate the ”fail low flow” alarm.

•Make sure the tubings are clean and that there is no leak on the inside of the system.

NOTE: The goal is to make sure the unit will activate the flow fault alarm and shut down the pump when the flow rate is reduced to 0.6 SCFH +/- 0.1 SCFH.

Setting the DP Switch

1. Turn on the Eagle 2 and allow unit to warm up.
2. Perform a fresh air adjust, if needed.
3. Attach the flow meter to the inlet fitting of the Eagle 2 making sure that the flow meter valve is fully open.
4. Verify that the flow rate is between 1.6 and 2 SCFH.

Setting the DP Switch

5. Adjust the flow meter valve to 0.6 SCFH+/- 0.1.
6. Slowly adjust the DP switch pot, as needed, to activate flow fault alarm at 0.6 SCFH +/- 0.1. (Turning the adjustment ccw raises trip point, cw lowers trip point)

Replacing Batteries

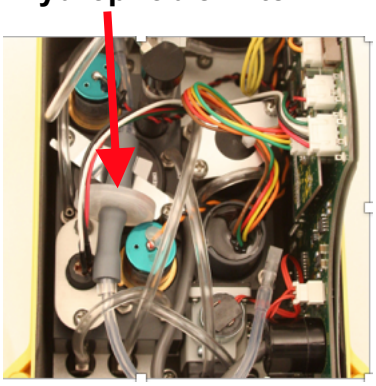
1. To access the battery compartment, unscrew the thumbscrew located at the back of the unit and pull the battery case away from the bottom case.
2. Remove the old batteries and make sure the battery compartment is clean.
3. Carefully put the new batteries into the battery compartment being sure to follow the diagram and push the batteries in all the way.
4. Reinstall the battery case and tighten thumbscrew.
5. After replacing Ni-MH batteries, charge batteries for 4 hours for a complete charge.

NOTE: Fresh alkaline batteries will operate the Eagle 2 for 18 hours. Charged Ni-MH batteries will operate the Eagle 2 for 20 hours at 25C (77F).

Replacing Hydrophobic Filter

1. To access the filter, turn the Eagle 2 upside down and unscrew the 3 screws holding the top case to the bottom case.
2. Carefully lift the top case off and place next to the bottom case.
3. Pull the gray connecting tubes off each end of the filter.
4. Install the new filter with the red RKI logo facing the front of the Eagle 2.

Hydrophobic Filter



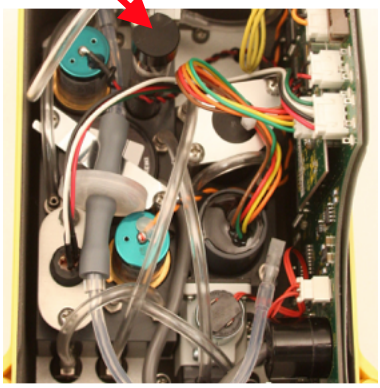
NOTE: Replace the internal hydrophobic filter when it becomes dirty or clogged. Internal filter P/N 33-0173RK.

Replacing Charcoal Filter

1. Grasp the charcoal filter end cap and pull it off the charcoal filter.
2. Grasp the top of the charcoal filter firmly and pull it out of the flow block. (be careful as contents might spill)
3. Insert the new charcoal filter into its position in the flow block and push it in until it bottoms out.
4. Insert the charcoal filter end cap into the end of the new charcoal filter. (Charcoal filter P/N 33-6090RK)

NOTE: Replace filter if exposed to high levels of HC's, when the CO sensor is replaced, or if the CO sensor responds to H2S.

Charcoal Filter



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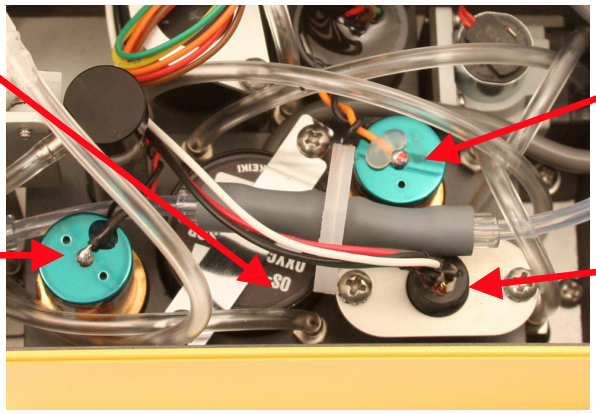
Replacing a Sensor



NOTE : Always recalibrate your instrument after replacing sensors. If you are getting unstable readings, let the Eagle 2 warm up for about 10-15 minutes before recalibrating.

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Replacing LEL Sensor

1. Unscrew and remove the 2 screws holding the LEL sensor retainer.
2. Grasp the LEL sensor connector and gently pull it up until it either disengages from the LEL sensor or the LEL sensor comes out of the flow block.
3. If the sensor came out, remove the sensor from the connector. If the sensor stayed in the flow block, pull it up and remove it.
4. Connect the new LEL sensor and the sensor connector.
5. Insert the LEL sensor into the sensor chamber.
6. Line up the LEL sensor retaining bracket and screw it back into place.
7. Calibrate the Eagle 2 after replacing the LEL sensor.

Replacing Oxygen Sensor

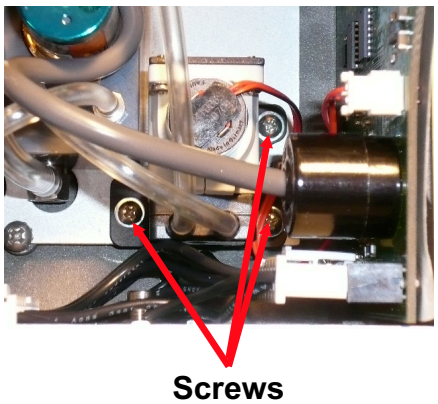
1. Unscrew the 2 screws that hold the oxygen sensor bracket and remove the bracket. Note the routing of the oxygen sensor cable to the main PCB.
2. Move the hydrophobic filter towards the side wall and pull the oxygen sensor out of the flow block.
3. Grasp the connector on the end of the sensor cable and pull it away from the main PCB.
4. Insert the new oxygen sensor face down into the flow block.
5. Route the sensor cable and connect it to the main PCB.
6. Reinstall the oxygen sensor bracket.
7. Calibrate the Eagle 2 after replacing the O2 sensor.

Replacing CO or H2S Sensor

1. Grasp the sensor firmly and rock it back and forth while pulling straight up.
2. Grasp the connector on the end of the sensor cable and pull it away from the main PCB.
3. If sensor becomes difficult to remove from the chamber, lubricate the O-rings with non-silicon based O-ring lubricant.
4. Insert the sensor face down into the sensor chamber.
5. Push the sensor until it bottoms out.
6. Route the sensor cable the same way the old sensor cable was routed and connect it to the main PCB.
7. Calibrate the Eagle 2 unit after replacing H2S/CO sensor.

Replacing the pump

1. Remove the three Phillips screws that hold the pump to the bottom plate.
2. Remove the 2-wire connector from main PCB.
3. Remove pump inlet and outlet tubing, taking care to mark where each tube attaches.

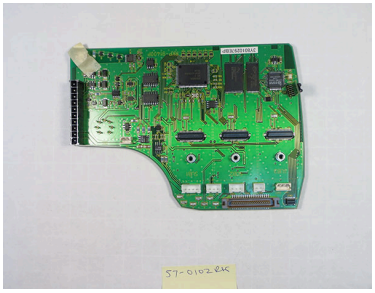


Screws

Removing the Main PCB

1. Make sure you are properly grounded.
2. Remove and note all the connections on the Main PCB.
3. Carefully lift circuit board out of bottom case.

P/N 57-0102RK-01



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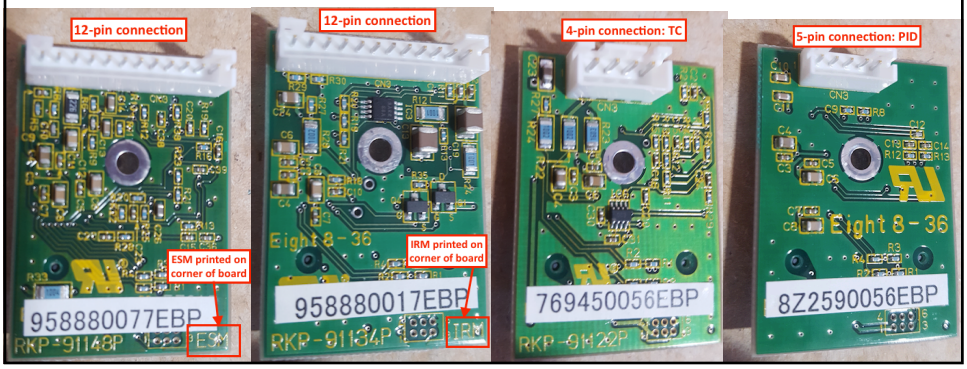
Sub PC Boards

- There are (4) different Sub PCBs pending which sensor you have in the unit:
  - ESM / IR / TC / PID

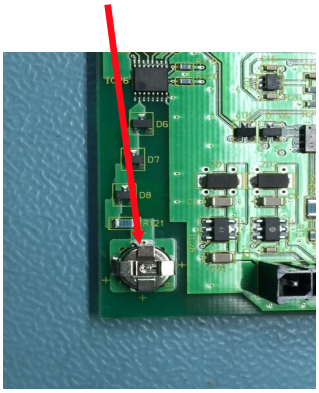


Clock Battery

- Replace the clock battery if Time/Date will not set.
- If battery is leaking or corroded.

NOTE: Memory battery is soldered into the main board.

P/N 49-1405RK



Replacing the Display PCB

- Remove and replace display PCB if damaged, corroded or if back light is not functioning.
- P/N: 57-0103RK

Photo Ionization Detector

Section 2: Maintenance & PID Cleaning

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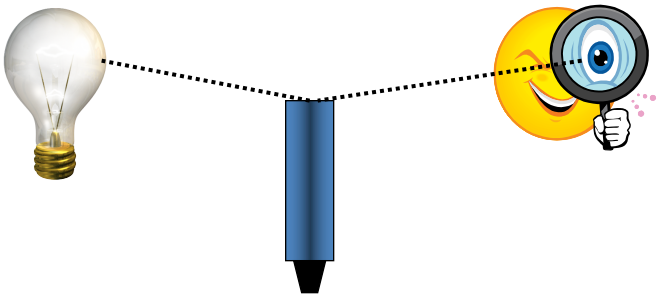
PID Maintenance

- If the EAGLE 2 is having calibration problems that cleaning the lamp could not solve, the lamp may need to be replaced.
- A contaminated or broken electrode stack may also cause calibration problems or PID failure.

PID Cleaning

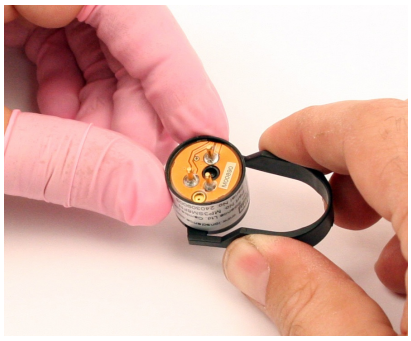
- Inspect the PID for contamination on the detection window. Contamination will appear as a blue hue



PID Lamp

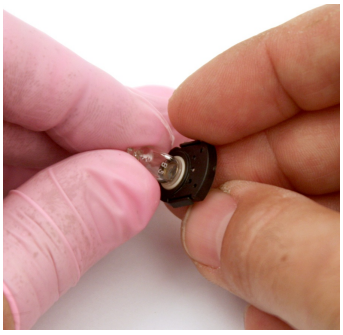
Opening the PID

- Use tool to compress tabs to remove PID Lamp



Removing the PID

- Grasp lamp with fingers and pull out.
- Use finger cots to protect lamp



PID Cleaning

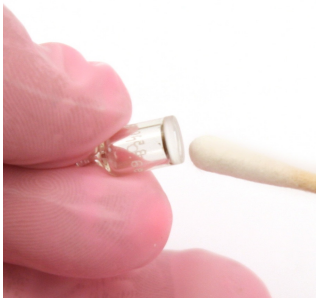
- Use PID lamp cleaning kit 82-0300RK
  - Vial of cleaning compound contains a very fine aluminum oxide powder.
  - Do not breathe vapor or dust.
  - Avoid contact with skin, eyes and clothing.
  - Wear suitable PPE when cleaning or handling the lamp
  - Keep container closed to prevent water adsorption and contamination.

PID Cleaning

- Open vial of aluminum oxide polishing compound.
- Using a clean cotton swab, collect a small amount of compound.
- Use cotton swab to polish the PID lamp window.
  - Use a circular action applying light pressure
  - Never touch the lamp window with fingers!

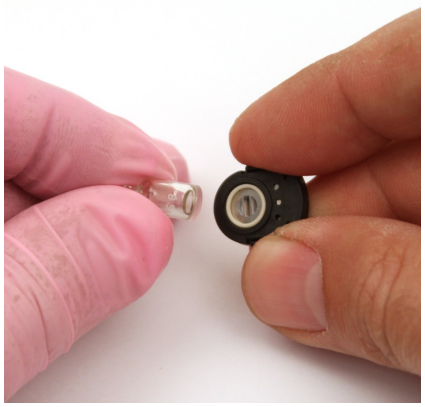
PID Cleaning

- Polish the PID lamp window until a audible “squeaking” is heard.
  - Usually about 15 seconds
- Remove residual powder with clean cotton swab



PID Cleaning

- Ensure lamp is completely dry and any visible signs of contamination are removed before refitting.
- Reinstall lamp into base.



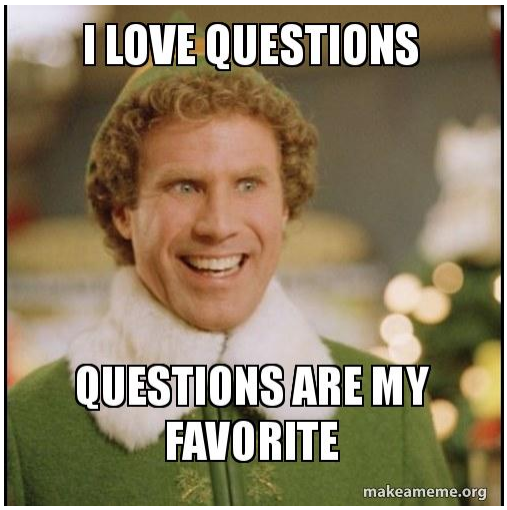
Reassemble PID

- Reassemble PID and calibrate as needed.

Common Troubleshooting

SYMPTOM	FIX
1.Fail Low Flow Alarm/Unit not going into low flow	1.Perform a flow setpoint adjustment
2."XXX" reading on screen	2.This means that the main board is not seeing the sensor. Check the sensor cable and check the sensor connections on the main board.
3.Fail 021	3. This is a microprocessor error. Perform a default factory reset.
4.Unit not turning on	4. Check batteries, battery pack connections, and ISC board.

Questions?



INSTRUMENTS
Gas Detection For Life

Eagle 2
Hands-on Worksheets

Objective:

To increase students ability to properly repair a standard Eagle 2 portable gas detection instrument.

Tools Required:

Phillips and Standard screwdrivers, digital volt meter and calibration kit.

1) How do you enter into the Set-up mode?

   A) Press the DISPLAY and AIR buttons and turn on
   B) Press the ENTER and RANGE buttons
   C) Press the AIR and RANGE buttons and turn on
   D) Press the DISPLAY and RANGE buttons and turn on

2) Enter into the Set up mode and do the following:

   A) Set the Date and Time to current date and time
   B) Set the Date format to DD/MM/YYYY
   C) Set Relative Response Factor to ON
   D) Exit out of Set up mode

3) How do your enter into Factory Mode?
   Press and hold what buttons then power the instrument up.

   A) _____
   B) _____
   C) _____

4) What is the password to enter into the Factory Mode?
   _____

5) You have an Eagle 2 that has low methane gas response but seems to work okay on hexane. What should you look at?
   _____

6) An Eagle 2 is returned that will not charge, what do you suspect and what should be done to correct the problem?

_____

7) An Eagle 2 is received with low capacity Ni-MH batteries installed, what but they seem to work okay. Should you leave them in? Yes / No
Why? _____

8) You have received an Eagle 2 from a customer that has a bad LEL sensor. To repair the instrument you need to replace the sensor but you only have a NC-6260A Eagle 1 sensor in stock, can you use this sensor in the Eagle 2? Yes / No

9) Using a flow meter, measure the flow on your Eagle 2. What is the current flow rate? _____ SCFH.

10) Restrict the flow using the valve on the flow meter and test the low flow alarm. Where is it set? _____ SCFH.

11) When testing the Eagle 2 with 25 ppm H2S, you see the CO sensor start to respond. What is the problem and what should be done to correct it?

Problem: _____ Solution: _____

12) What is the typical output voltage of the oxygen sensor used in the Eagle 2?

_____mV.

13) Why do you need a CO2 scrubber when setting the fresh air zero on an Eagle 2 with 0-10000 ppm CO2 range?

_____

14) You are calibrating an Eagle 2 and find that the oxygen fails to set at 12% by volume. What is the most likely cause of the problem and what should you check?

_____

15) You are calibrating an Eagle 2 with high range PID, what is the calibration gas type and value you should be using?

_____ gas _____ PPM

INSTRUMENTS

Gas Detection For Life

Training Notes

INSTRUMENTS

Gas Detection For Life

Training Notes