ONE TO SIX GAS PORTABLE MONITOR

Gas Detection For Life

EAGLE™ Model

Features

- **Simultaneous detection of up to 6 different gases**
- **Over 400 gas monitoring configurations**
- **Wide range of toxic gases**
- **PPM / LEL hydrocarbon detection**
- **Powerful long-life pump up to 125' range with filters**
- **Low flow pump shut off and alarm**
- **Methane elimination switch for environmental use**
- **Security "Adjustment Lockout Switch"**
- **Up to 30 hours of continuous operation**
- **Alkaline or Ni-Cad capability**
- **IR Sensors available for CO2, % LEL CH4 or HC, % volume CH4 or HC**
- **Transformer testing version available**
- **Datalogging option**
- **Autocalibration / single gas calibration**
- **Dual hydrophobic filters (most versions)**
- **Ergonomic RFI / EMI / chemical / weather resistant enclosure**
- **Intrinsically safe design, CSA (C / US) & UL classified (most versions)**
- **Complies with EPA Method 21**

RKI is proud to offer the most versatile portable gas detector on the market. Equipped with features that are not available on most competitive units, the EAGLE is a powerful instrument that does more than just offer the standard confined space protection for LEL, O2, H2S and CO. Detection combinations never before offered in a portable gas monitor are now available featuring the industry's widest selection of high quality, long life and field proven sensors.

Unique EAGLE features include PPM or LEL hydrocarbon detection at the push of a button; infrared sensors for CO2, methane or hydrocarbons in LEL and % volume ranges; a methane elimination switch for environmental applications, a long list of super toxic gases and measurable ranges, and dual hydrophobic filters that increases its water resistant performance. The EAGLE has a strong internal pump with a low flow auto shut off and alarm, which can draw samples from up to 125 feet even with the dual hydrophobic filters in place. This allows for quick response and recovery from distant sampling locations. The EAGLE will continuously operate for over 30 hours on alkaline batteries or 18 hours on Ni-Cads. A variety of accessories are also available to help satisfy almost any application such as long sample hoses, special float probes for tank testing, datalogging, continuous operation adapters, remote alarms and strobes, and dilution fittings, just to name a few.

With its ergonomic design and large glove friendly buttons, the EAGLE offers easy access to controls such as autocalibration, alarm silence, demand zero, peak hold 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 is the solution for just about any portable gas monitoring situation.

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

EAGLE™ Model

Enclosure	Weatherproof, chemical resistant, RFI / EMI coated high impact polycarbonate-polyester blend. Can operate in rain or set into 2.0" of water without damage. Ergonomically balanced with rugged top mounted handle.
Dimensions	10.5" L x 5.9" W x 7" H
Weight	5 lbs (standard 4 gas with batteries)
Detection Principle	Catalytic combustion, electrochemical cell, galvanic cell, infrared.
Sensor Life	2 years under normal conditions.
Sampling Method	Powerful, long-life pump (over 6,000 hours) can draw samples over 125 feet. Flow rate approximately 2.0 SCFH.
Display	4 x 20 LCD readout. Viewed through window in case top. Displays readings & status of 4 channels simultaneously. Backlight, automatic for alarms and by demand with adjustable time.
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 85 dB at 30 cm, dual high intensity LED's, and flashing display.
Controls	6 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 and many other features.
Continuous Operation	30 Hrs min. using alkaline batteries, or 18 hrs using Ni-Cad.
Power Source	4 Alkaline or Ni-Cad, size D batteries (Charger has alkaline recognition to prevent battery damage if charging is attempted with alkalines).
Operating Temp. & Humidity	-10°C to 40°C (14°F to 104°F), 0 to 95% RH, non-condensing.
Response Time	30 Seconds to 90% (most gases) using standard 5 ft hose.
Safety Rating	Intrinsically Safe, Class I, Division 1, Groups A, B, C, D. CSA (C / US) and UL classified (most versions).
Standard Accessories	Shoulder strap, alkaline batteries, hydrophobic probe and 5 foot hose, Internal hydrophobic filter (most versions) (certain toxic versions equipped with special probe, inlet fitting and 3' teflon hose. For HF and O3 versions, 3' PTFE hose used without probe).
Optional Accessories	• Datalogging of up to 4 gases (No datalogging possible on 5 or 6 gas versions or versions with more than 2 toxic sensors) • Remote alarms • Dilution fitting (50/50) • Ni-Cad batteries • Battery charger, 115 VAC, 220 VAC, or 12 VDC • Continuous operation adapter, 115 VAC or 12 VDC • Extra loud buzzer • Extension probes • Large internal hydrophobic filter
Warranty	Two year material and workmanship

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 - 50,000 ppm	± 25 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 (*)
Super Toxics and Other Gases		
Ammonia (NH_3)	0 - 75 ppm	± 10% of reading or ± 5% of full scale (*)
Arsine (AsH_3)	0 - 1 ppm 0 - 200 ppb	
Chlorine (Cl_2)	0 - 3 ppm	
Chlorine Dioxide (ClO_2)	0 - 1 ppm	
Fluorine (F_2)	0 - 5 ppm	
Hydrogen Fluoride (HF)	0 - 9 ppm	
Hydrogen Chloride (HCl)	0 - 15 ppm	
Hydrogen Cyanide (HCN)	0 - 30 ppm	
Hydrogen Selenide (H_2Se)	0 - 0.2 ppm	
Hydrogen Sulfide (H_2S)	0 - 1 ppm 0 - 30 ppm	
Nitrogen Dioxide (NO_2)	0 - 15 ppm	
Ozone (O_3)	0 - 1 ppm	
Nitric Oxide (NO)	0 - 100 ppm	
Phosphine (PH_3)	0 - 1 ppm	
Silane (SiH_4)	0 - 15 ppm	
Sulfur Dioxide (SO_2)	0 - 6 ppm	
IR Sensors		
Carbon Dioxide (CO_2) (IR Sensor)	0 - 5,000 ppm 0 - 10,000 ppm 0 - 5% Vol. 0 - 20% Vol. 0 - 60% Vol.	± 5% of reading or ± 2% of full scale (*)
Methane (CH_4) (IR Sensor)	0 - 100% LEL 0 - 100% Vol.	
Isobutane (iC_4H_{10}) (IR Sensor)	0 - 100% LEL 0 - 30% Vol.	

Specifications subject to change without notice.

RKI INSTRUMENTS

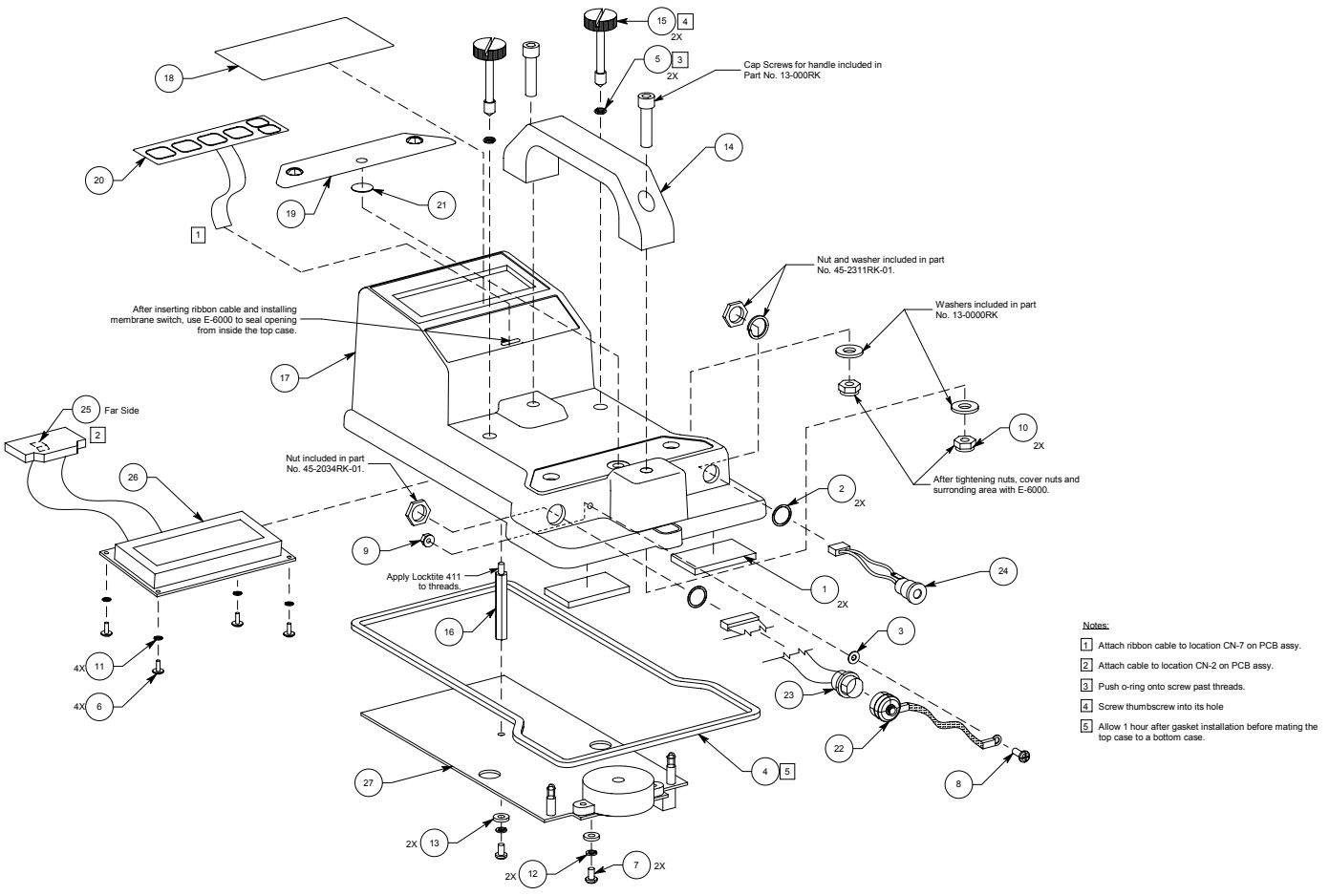
10000363 UL REGISTERED FIRM ISO 9001

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

Authorized Distributor:

EAGLE

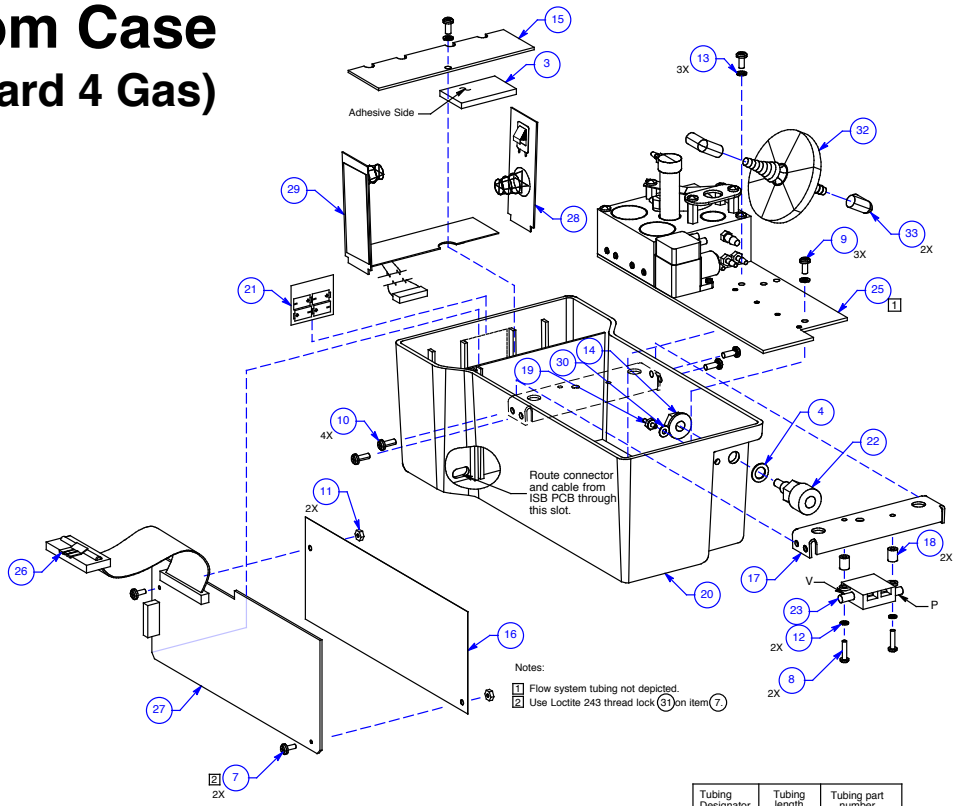
Top Case
(Standard 4 Gas)



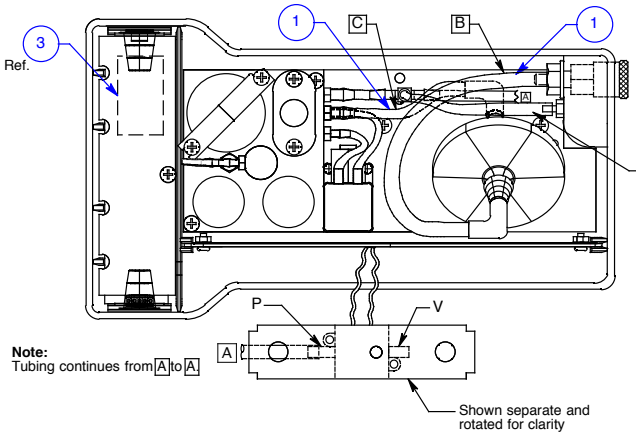
	Part Number
1	07-0009RK
2	07-0101RK
3	07-0102RK
4	07-0104RK
5	07-7008RK
6	10-0027RK
7	10-0194RK
8	10-0209RK-01
9	11-0039RK
10	11-0104RK
11	11-0212RK
12	11-0231RK
13	11-0232RK
14	13-0000RK

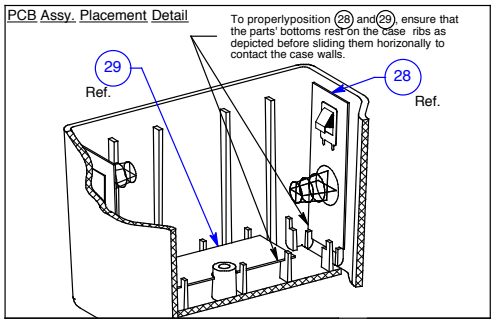
	Part Number
15	13-1080RK
16	14-0578RK
17	21-0601RK
18	29-0035RK
19	29-0041RK-02
20	29-5000RK
21	33-0550RK
22	45-2027RK
23	45-2034RK-01
24	45-2311RK-01
25	45-6150RK
26	51-1100RK-01
27	57-0010RK

EAGLE
Bottom Case
(Standard 4 Gas)



Tubing Designator	Tubing length	Tubing part number
B	7.5" ± .1	06-1200RK
C	3.3" ± .1	06-1200RK





	Part Number
1	06-1200RK
3	07-0009RK
4	07-0103RK
7	10-0109RK
8	10-0129RK
9	10-0200RK
10	10-0209RK-01
11	11-0021RK
12	11-0221RK
13	11-0231RK
14	11-4021RK
15	14-0003RK
16	14-0004RK
17	14-0101RK
18	14-0924RK

	Part Number
19	17-0517RK
20	21-0600RK
21	29-0049RK
22	30-0522RK
23	31-2050RK
25	35-0200RK-00
26	45-6150RK
27	57-0011RK
28	57-0019RK
29	57-0020RK
30	07-0102RK
31	08-0202RK
32	33-0165RK
33	17-0601RK

EAGLE Replacement Parts and Accessories

Part#	Description	Suggested Retail
06-1273RK	Tubing, teflon, semi-rigid, for EAGLE super toxic gas versions, (standard type, order by the foot)	5.00
07-6020RK	O-ring for EAGLE probe	0.90
08-0077RK	E-6000 sealant (for replacing membrane switch)	8.00
13-0100RK	Shoulder Strap with RKI logo, EAGLE / EAGLE 2	28.00
17-0522RK	Exhaust fitting, 1/8" hose barb	10.00
17-0601RK	Rubber elbow for internal filter, EAGLE & others	2.00
17-4807RK	Inlet fitting, plastic for Br2/F2/HCl/HF/CLO3/O3 EAGLEs	4.00
20-0640RK	Carrying case, padded for EAGLE/EAGLE 2 & RX-415/RI-415, with space for instruments and accessories	180.00
20-0642RK	Carrying case, padded for EAGLE / EAGLE 2 instrument with space for calibration kit and accessories	320.00
29-5000RK	Label, Membrane Switch, EAGLE	31.50
30-0522RK	Inlet fitting, standard, metal, quick disconnect, female, EAGLE/1641/GX-4000A	38.00
30-0600RK-01	Pump, internal, with connector, EAGLE/RP-GX-94	195.00
30-0608RK	Pump rebuild kit,for 30-0600RK-01(pump version 7.51.82) (current standard)	50.00
31-2050RK	Sensor, pressure differential for EAGLE, 0 - 10 mm H2O	28.00
33-0156RK-01	Replacement hydrophobic filter element for probe, (pack of 5), EAGLE / EAGLE 2 probe	14.00
33-0156RK-100	Replacement hydrophobic filter element for probe (pack of 100), EAGLE / EAGLE 2 probe	200.00
33-0160RK	Dust filter, internal, plastic, GX-4000 / RX-415	2.40
33-0164RK	Filter, oil mist removal, Balston, 9900-05-BK, EAGLE / EAGLE 2 / marine	40.00
33-0165RK	Filter, Millipore, PTFE, Disc type, hydrophobic, EAGLE, Fixed Systems	27.00
33-0171RK	Filter replacement, AcroPak 300 with PTFE membrane, 0.2 um	140.00
33-0171RK-01	Filter, installed internally, AcroPak 300 with PTFE membrane,0.2 um	140.00
33-0173RK	Filter, internal, hydrophobic, EAGLE 2	10.00
33-1031RK	Cotton balls, filters for probe, bag of 25	4.00
33-1041RK	Rubber cup probe tip, for soil surveys	25.00
33-1200RK	Particle filter replacement, 5 microns, for new style EAGLE 2 probes (not for use with PID sensors)	3.00
33-2002RK-01	Humidifier, 24" for cal kits, with 3/16" tubing on ends, for EAGLE	280.00
33-3015RK	Filter, pleated paper type for 80-0182RK probe	7.00
33-6010RK-01	CO2 Scrubber with fitting and tubing for standard EAGLE / EAGLE 2	48.00
33-6011RK	H2S Scrubber, for SO2 EAGLE	60.00
33-6020RK	Filter, G-92, Zeolite, for ASH3 sensors, fixed systems / EAGLE	40.00
33-6091RK	Charcoal filter replacement, EAGLE	12.00
35-0110RK	Dummy Sensor, H2S/CO, EAGLE	10.00
35-0111RK	Dummy Sensor, O2, EAGLE	12.00
35-0112RK	Dummy Sensor, LEL, EAGLE	12.00
47-5010RK	Cable with connector for LEL, EAGLE/EAGLE 2	21.00
49-1140RK	Size D alkaline battery	2.20
49-1240RK	Battery, Ni-Cad, D size	15.00
49-2149RK	Charger, 220 VAC, EAGLE	115.00
49-2150RK	Ni-Cad battery Charger, -Delta V type, 115VAC, with alkaline recognition, EAGLE	115.00
49-2150RK-01	Charger (115VAC) and Ni-Cads, added to EAGLE	155.00
49-2151RK	Battery charger, 12 VDC, with cigarette lighter plug, EAGLE	115.00
49-2152RK	Continuous operation adaptor/charger, 115VAC, with 20' cable, EAGLE	150.00
49-2153RK	Continuous operation adaptor / charger, 12 VDC, with 20' cable, with cigarette lighter plug, EAGLE	130.00
52-0206RK	Lapel buzzer for high noise areas	135.00
52-1017RK-01	Internal buzzer, extra loud (90 db at 2 feet), added to EAGLE top case	85.00
52-2034RK	Remote audible alarm with 20' cable, EAGLE	95.00
57-0010RK	PCB assembly, main CPU, EAGLE	368.00
57-0011RK	PCB assembly, analog, EAGLE	420.00
57-0012RK	Data logging board for field installation (also need 82-5007RK), EAGLE (check availability)	140.00
57-0012RK-01	Data logging board, factory installed (also need 82-5007RK), EAGLE (check availability)	140.00
57-0019RK	PCB assembly, battery, jumper side, EAGLE	24.00
57-0020RK	PCB assembly, I. S. barrier / battery power, standard EAGLE (No IR sensors)	65.00
71-8000RK	Training CD, EAGLE, GX-2001, GX-2003, GasWatch 2, and -01 series	0.00
75-0001RK	External methane elimination switch added to EAGLE	95.00
80-0101RKE	Floating ball / hose assembly, 25', with EAGLE/EAGLE 2 fitting	120.00
80-0131RK-10	Probe, 10", hydrophobic, standard, with particle filter and metal fittings, EAGLE / EAGLE 2	55.00
80-0132RK-10	Probe, 10", hydrophobic, without particle filter, with plastic fittings for toxic gas versions (HCL/CLO2/etc), EAGLE	54.00
80-0133RK-10	Probe, 30", aluminum, with particle filter and 1641 fittings, EAGLE	95.00

EAGLE Replacement Parts and Accessories

Part#	Description	Suggested Retail
80-0133RK-20	Probe, 30", aluminum, without particle filter and 1641 fittings, EAGLE	95.00
80-0134RK-10	Probe, 4', stainless steel, with particle filter, handle, and 1641 fittings, EAGLE	200.00
80-0134RK-20	Probe, 4', stainless steel, without particle filter, handle, and 1641 fittings, EAGLE	200.00
80-0135RK-10	Probe, 30", stainless steel, with particle filter and 1641 fittings, EAGLE	110.00
80-0135RK-20	Probe, 30", stainless steel, without particle filter and 1641 fittings, EAGLE	110.00
80-0136RK	Probe, 32", extendible (10" collapsed), fiberglass, with dust filter, (cotton ball), EAGLE / EAGLE 2	65.00
80-0137RK	Probe, 10" plastic, with dust filter (cotton ball), for EAGLE	36.00
80-0143RK	Extendible probe, 7' (collapsible to 2'), fiberglass with filter for EAGLE	88.00
80-0160RK-12	Extendible probe, 12', with 1641 fittings, EAGLE	250.00
80-0160RK-18	Extendible probe, 18', with 1641 fittings, EAGLE	250.00
80-0182RK	Probe, with internal paper dust filter, pleated paper type, EAGLE/GX-4000A	84.00
80-0211RK	Water Trap (bowl type) with 1641 fittings with pleated paper filter, EAGLE	85.00
80-0224RK	Filter, hydrophobic, in-line type (ACRO-50), with EAGLE fittings (1641)	70.00
80-0226RK	Hydrophobic filter, external, in-line, for EAGLE supertoxic versions, ACRO-50 with teflon tube, EAGLE	56.00
80-0405RK	Dilution fitting 50:50, for EAGLE only (for use with hose & probe), with 1641 fittings	95.00
80-0406RK	Dilution fitting 3 to 1 for EAGLE only (for use with hose & probe), with 1641 fittings	120.00
80-0505RK	Hose, 5' polyurethane with fittings (standard gas versions only), EAGLE / EAGLE 2	40.00
80-0506RKT	Hose, 6', teflon lined, (for heavy hydrocarbon use), with 1641 fittings, EAGLE/EAGLE 2	100.00
80-0510RK	Hose, 10', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	45.00
80-0515RK	Hose, 15', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	50.00
80-0520RK	Hose, 20', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	55.00
80-0525RK	Hose, 25', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	60.00
80-0530RK	Hose, 30', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	70.00
80-0540RK	Hose, 40', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	80.00
80-0550RK	Hose, 50', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	90.00
80-0560RK	Hose, 60', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	100.00
80-0575RK	Hose, 75', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	115.00
80-0599RK	Hose, 100', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	140.00
80-0599RK-125	Hose, 125', polyurethane (for standard gases only), with 1641 fittings, EAGLE/EAGLE 2	170.00
80-0802RK	Float probe assembly, 12', (without dilution fitting), EAGLE tank tester version	340.00
82-5007RK	Data logging kit, downloading, EAGLE	165.00

Eagle

Service Training Module

Eagle

Section 1: Calibration

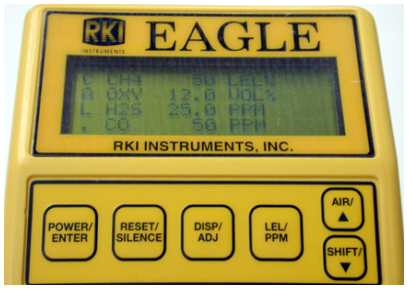
Preparing For Calibration

- Turn the Eagle ON and allow it to warm up
- Perform a Demand Zero
  - Press and hold the **AIR** button until the display indicates "Release Air Key"
  - The Eagle will automatically set to fresh air values
- Connect the probe to the front of the Eagle
  - Place your finger over the end of the probe to block the flow. The Eagle should indicate flow fault. Press the Reset button to restart pump

Calibration Menu

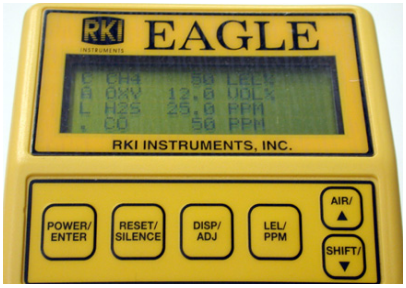
- Press and hold the **SHIFT** button and then press the **DISP/ADJ** button. The calibration menu will show:
  - Auto Calibration
  - Single Calibration
  - Normal Operation

Auto Calibration



- To select AUTO CALIBRATION, move the cursor next to this selection and then press the **POWER/ ENTER** button. The screen will then display the preset calibration gas values

Auto Calibration



- Press the **POWER/ENTER** button again. The instrument will enter the calibration routine and the sensor values will begin to blink.
- Connect the demand flow regulator to the calibration gas cylinder and connect the tubing to the regulator.
- Connect the tubing to the end of the probe allowing the Eagle to draw the gas from the cylinder.

Auto Calibration

- Allow the calibration gas to flow to the instrument until the readings stabilize or a maximum of two minutes.
- Press the **POWER/ENTER** button again to complete Auto Calibration.

Auto Calibration

- If Auto Calibration fails, the instrument will display Auto Calibration Failed and show which sensor failed in brackets.
- Press the AIR button to continue.

Auto Calibration

- If Auto Calibration should fail, check the following:
  - Verify age of calibration gas, if there is sufficient pressure and proper gas concentrations.
  - Make sure that there are no leaks in the sample system.
  - Replace sensor that has failed and try to calibrate again.

Single Calibration

- To enter into Single gas calibration or manual calibration mode, move the cursor next to Single Calibration by using the **AIR** and **SHIFT** buttons and then press the **POWER/ENTER** button.

Single Calibration

- All active channels will then be displayed on the screen. Move the cursor next to the gas that is to be calibrated and then press the **POWER/ENTER** button .

Single Calibration

- The gas value will be displayed on the screen. At this time, the calibration gas should be applied. Let the gas flow until the reading stabilizes or a maximum of two minutes.

Single Calibration

- If the reading does not match the value on the calibration gas cylinder, use the **AIR** or **SHIFT** buttons to adjust the value displayed on the screen to match the value on the cylinder. When the proper value is reached, press the **POWER/ENTER** button to save this setting and return to the gas selection menu.

Single Calibration

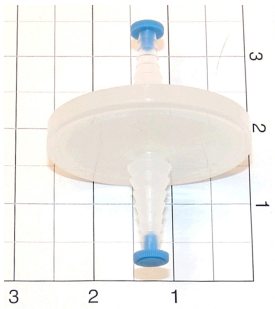
- Once all of the gases have been calibrated, use the **SHIFT** button to scroll to ESCAPE.
- Press the **POWER/ENTER** button and you will be back in normal operation mode.

Eagle

Section 2: Maintenance

Hydrophobic Filter

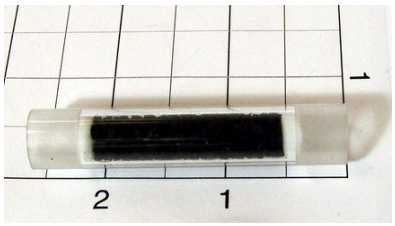
P/N: 33-0165RK



- Used to block water based liquids from entering the sample system.
- Replace when restrictive, visibly dirty or contaminated.

Charcoal Filter

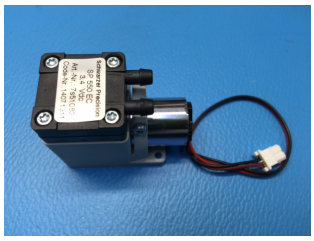
P/N: 33-6091RK



- Replace charcoal filter if contaminated/
- If the CO sensor responds when H2S is applied or
- When replacing the CO sensor.
- If filter will not hold the charcoal inside.

Replacing the Pump

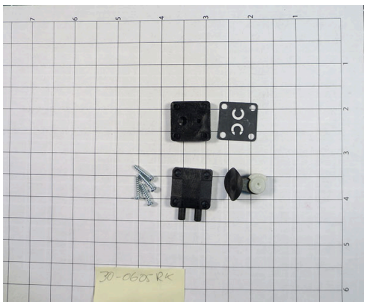
P/N: 30-600RK-01



- Replace pump if flow is insufficient even after cleaning valves and diaphragm.
- Replace pump if contaminated.

Pump Disassembled

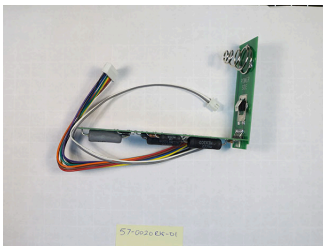
P/N: 30-0605RK



- Clean valves and diaphragm
- Replace pump valves and diaphragm.
- T9 Torx bit required to open pump.

Intrinsic Safety Barrier

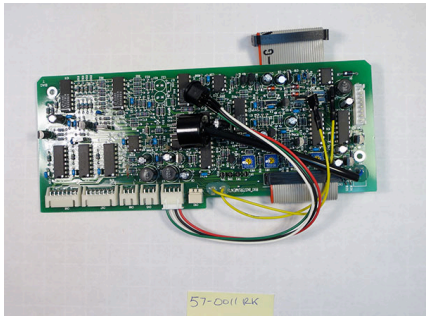
P/N: 57-0020RK, -01 & -03



- Replace I/S barrier if there is no power to the Eagle even with new batteries are installed and the problem is confirmed to be associated with the bottom case.
- There are three I/S barriers, standard, 1 IR and 2 IR sensors.

Analog PCB

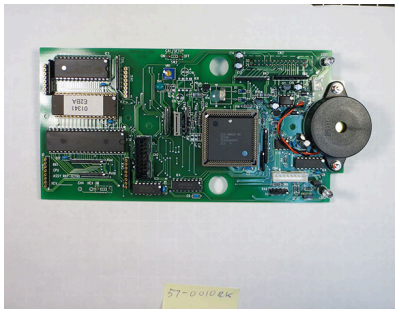
P/N: 57-0011RK



- Replace analog PCB if found to be corroded.
- See procedures for setting up the analog PCB and adjusting LEL sensor voltage.

Main PCB

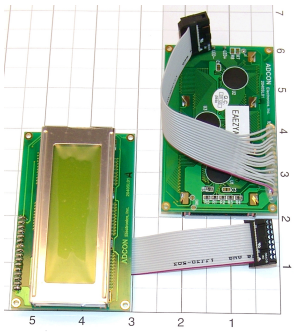
P/N: 57-0010RK



- Replace the Main PCB if corroded or damaged.
- EPROM is specific to instrument type and age of PCB.
- U-10, Sony v.s. Microchip, program specific.

Display PCB

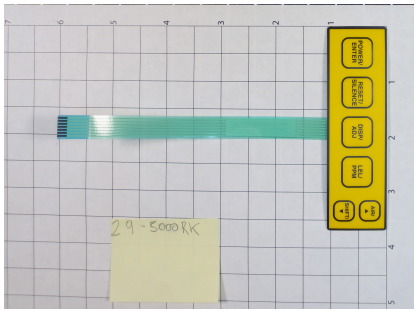
P/N: 51-1100RK-01



- Look for the following:
  - Missing segments
  - Cracked
  - Corroded
  - Damaged ribbon cable
  - Missing cable lock
  - No backlight function
  - Segments too light or dark (See VR1 on Main PCB).

Membrane Switch

P/N: 29-5000RK

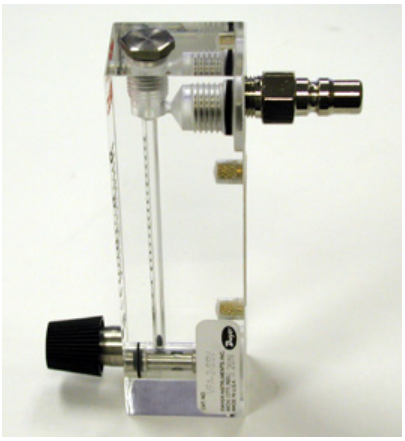


- Replace membrane switch if switch pads do not work.
- Verify switch functions. Replace switch if no click is felt when pressed.
- Seal ribbon cable to case with E6000 sealant.

Eagle

Differential Pressure (DP) Switch Adjustment

DP Switch Adjustment



- Recommended parts:
  - P/N 17-0505RK male quick connect fitting and
  - P/N 31-0023RK 0-2.00 SCFH flow meter

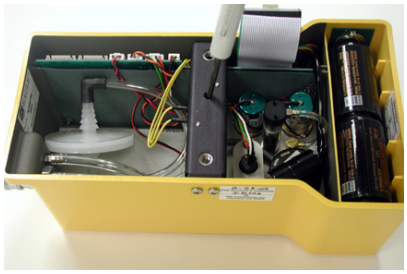
DP Switch Adjustment

- Turn the instrument ON and allow it to warm up. Then perform a Demand Zero.

DP Switch Adjustment

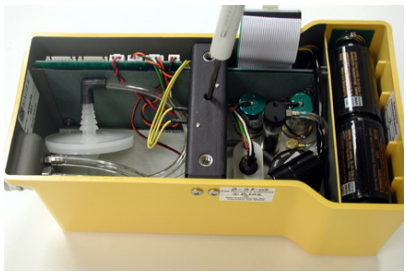
- Connect the flow meter to the front of the instrument
- Unscrew the two thumb screws on the top case and open to expose bottom case

DP Switch Adjustment



- Locate the hole in the black spacer bar on the bottom half of the instrument
- Looking into the hole, you will notice a small screw. This is the adjustment screw for setting the low flow alarm trip point

DP Switch Adjustment

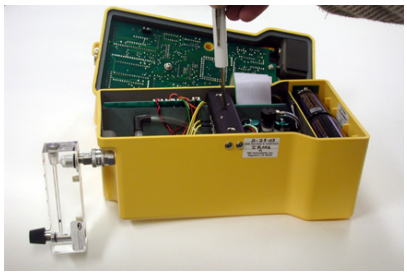


- Turn screwdriver clockwise makes the low flow alarm less sensitive (lowers trip point) and counter clockwise makes it more sensitive (raises trip point)
- Instrument should go into low flow alarm at .6 SCFH +/- .1 SCFH

DP Switch Adjustment

- Adjust the knob on the flow meter until it reads .6 SCFH. At this point, the instrument should go into low flow alarm.

DP Switch Adjustment



- If it does not go into low flow alarm or goes into low flow too early, adjustment of the DP switch is required.
- Make the adjustment and then press the **RESET** switch to restart pump and bring instrument out of low flow alarm

DP Switch Adjustment

- Try readjusting the flow meter back down to see if it will go into low flow alarm at .6 SCFH
- If it does not, adjust the DP switch again. This process may need to be repeated several times for the best accuracy.

Eagle

Set up after replacing a Super Toxic Sensor

SuperToxic Sensor

Contaminated Electrolyte

- Inspect the sensor carefully.
- Look for discolored electrolyte.
- Certain sensors that are not maintained on bias can be damaged.

Setup After Replacing Sensor

- Remove the old super toxic sensor and install the new sensor into the unit.
- Once the new sensor is installed, the zero must be set up properly for the new sensor.
- Note: When changing sensor, you verify proper bias voltage for the sensor you are working on.

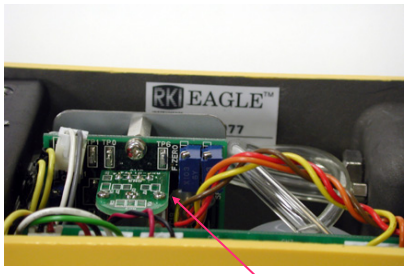
Setup After Replacing Sensor

- With the instrument OFF, press and hold the **LEL/ PPM**, **DISP/ADJ**, and the **RESET/SILENCE** button simultaneously then press the **POWER/ENTER** button
- When instrument beeps, release all of the buttons.

Setup After Replacing Sensor

- Screen will then display millivolt (mV) readings with numbers 0 thru 7 in front of them. We will focus on 6 and 7 at this time

Setup After Replacing Sensor



- Open the instrument and locate the super toxic sensor. You will notice there may be up to three potentiometers, Zero, Span and Gain (depending on sensor type)
- We will focus on the zero potentiometer at this time

Note: This is a CO_2 sensor!

Setup After Replacing Sensor

- Turn the zero potentiometer while watching the millivolt readings on numbers 6 and 7 on the screen. One of the numbers will begin to change as you turn the potentiometer.
- Set this number to 1000mV with fresh air applied to the sensor.

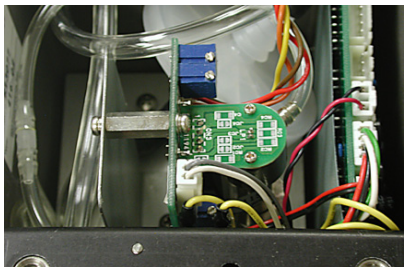
Setup After Replacing Sensor

- Press the **POWER/ENTER** button and the instrument will begin its normal start up sequence. Once the warm up is complete, perform a Demand Zero.

Setup After Replacing Sensor

- Enter calibration mode and select single gas calibration.
- Move the cursor down to the super toxic sensor you just installed.
- Apply the calibration gas to the instrument for a maximum of 2 minutes and then adjust the gas value to the value on the cylinder.

Setup After Replacing Sensor

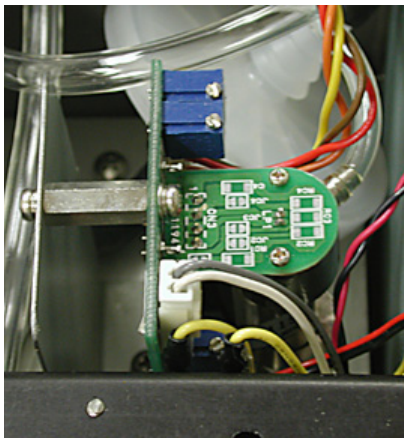


- If you are unable to match the value on the cylinder, the the SPAN potentiometer on the sensor amplifier will need to be adjusted.
- Adjust the value on the display above the calibration set point.

Setup After Replacing Sensor

- After adjusting the SPAN pot on the sensor amplifier, use the AIR or SHIFT buttons to set the span to the proper calibration set point.

Setup After Replacing Sensor



NOTE!

- If the span potentiometer does not have enough range to get to the gas value, then center that potentiometer
- Then adjust the Gain potentiometer on the amplifier (This is a very coarse adjustment)

Setup After Replacing Sensor

- Go back to the span potentiometer and fine tune it a little bit more. Then do the final adjustments again using the AIR or SHIFT buttons on the keypad
- Remove the calibration gas and exit calibration menu.

Setup After Replacing Sensor

- Perform another Demand Zero on the instrument to complete the process.

Troubleshooting Tips

Symptom	Probable Cause	Corrective Action
• Won't power ON or OFF	• Defective membrane switch • I/S barrier open • Defective main PCB	• Replace membrane switch • Replace or repair I/S barrier • Note: There are two types of I/S barriers, one for Standard Eagles and one for Eagles with IR sensors • Replace main PCB
• Charging problems	• I/S barrier diode open (either DA or DB) • Bad battery • Charger bad • Charger socket bad	• Replace defective diode • Replace defective battery • Replace/repair charger • Replace/repair charger socket
• Constant or intermittent Flow Fail	• DP switch out of adjustment • Filters in probe or inside Eagle clogged • Pump bad/dirty • Flow block contaminated • Charcoal filter emptied into flow block	• Adjust DP switch to .6 SCFH +/- .2 Note: for CatTech units flow fail is set to .4 SCFH +/- .2 • Replaced contaminated filters • Replace or rebuild pump. Note: Normal pump flow 1.5 to 2 SCFH. Less than 1 SCFH should be investigated. • Clean or replace flow block. • Replace charcoal filter

Troubleshooting Tips

• Instrument readings unstable/erratic or instrument does not function properly	• Corrosion on main PCB • Incorrect EPROM for existing configuration of instrument.	• Clean off corrosion or replace main PCB. • Replace EPROM for correct configuration.
• Sensor Fail message	• Defective sensor • Corrosion/contamination on the analog PCB • Pots incorrectly adjusted	• Replace defective sensor • Clean corrosion from analog board or replace board. • Adjust pots per specification Note: New sensor now has an offset bridge, voltage must be reset for CH4 elimination.
• LEL Sensor fail after calibration (unable to set span)	• LEL sensor low span • Calibration gas incorrect value • Calibration gas value improperly set	• Replace LEL sensor • Verify concentration of calibration gas • Reset calibration gas value
• Super Toxic gas sensor Fails to zero	• Zero not properly set on amplifier • Sensor bad • Sensor amplifier bad	• Reset amplifier zero per specifications • Replace sensor

Troubleshooting Tips

Symptom	Probable Cause	Corrective Action
• Display inoperative	• Display unplugged • LCD damaged • Corrosion on display	• Plug in display • Replace LCD • Replace display PCB
• CO Sensor responds to H2S	• Charcoal scrubber saturated	• Replace charcoal filter
• Instrument automatically air adjusts upon startup and will turn off with POWER button.	• Shorted AIR key pad	• Replace membrane switch assembly.
• Instrument displays low battery voltage with known fresh batteries	• Bad jumper contact in I/S barrier • I/S barrier open • Analog PCB defective • Main CPU PCB defective	• Inspect and resolder I/S barrier jumper contacts • Replace I/S barrier PCB's • Remove inspect Analog PCB for corrosion, repair or replace as needed • Remove CPU PCB and inspect for corrosion. Repair or replace as required.
• Unable to enter into setup mode by pressing the AIR and SHIFT buttons while instrument OFF then pressing POWER button	• Membrane switch bad, either AIR, SHIFT or both buttons. Problems usually caused by corrosion under switch pads.	• Replace membrane switch assembly.

Troubleshooting Tips

• H2S supression on the LEL sensor. This can be observed after calibrating with a blend with H2S then testing with a blend without H2S and getting a higher LEL reading.	• LEL sensor bad • Sensor voltage incorrect	• Replace LEL sensor • Verify proper voltage setting if you are replacing an old sensor (NC 6260) with a new one NC-6260A.

Questions?

INSTRUMENTS
Gas Detection For Life

Eagle 1
Hands-on Worksheets

Objective:

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

Tools Required:

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

1) Customer claims that your instrument will not respond properly to methane gas. What are your findings?

   A) Sensor Date Code: _____ List the age of your sensor based upon the date code found: _____

   B) Is the sensor under warranty? Yes / No What is the standard warranty of the LEL sensor? _____ years.

   C) What is the span as found? _____

   D) What is the maximum span? _____

   E) Can the instrument be calibrated? Yes / No

   F) What is the maximum time calibration gas should be applied to the Eagle? _____ minutes.

   G) What position is the calibration switch on the main board set? CH4 / HEX.

   H) What happens to the LEL sensor voltage if the switch is placed in the HEX position? _____

2) Customer claims that the Oxygen sensor on their instrument will not set to 12% O2. What could be the cause? (circle correct answers)

A) Oxygen sensor output voltage too high.
B) Incorrect gas being used.
C) Leak in probe or inlet fitting.
D) Inlet filter dirty.

3) What is the output voltage of the O2 sensor in your monitor? _____ mV

4) What is the date code? _____

5) Using RKI Guideline GL-0004, when should the O2 sensor for the Eagle be replaced? After _____ years.

6) What is the flow rate on your Eagle? _____ SCFH

7) Where is the low flow alarm setting on your instrument? _____ SCFH.

8) What should the flow fault alarm be set to? _____ SCFH +/- _____

9) The charcoal filter in the Eagle flow block performs what function?
_____

10) Is it okay to leave the batteries out of an Eagle with a super toxic electrochemical sensor installed? Yes / No Why?
_____

11) You receive an Eagle that you are unable to enter into the calibration mode by pressing the SHIFT and DISPLAY buttons. What could be wrong?
_____

12) Is it okay to use rubber tubing on your demand flow regulator when calibrating with a multi gas blend cylinder? Yes / No

13) You are asked to calibrate an Eagle and it fails when performing a AUTO CAL. What could be happening? Circle correct answer.

A) Cal gas settings incorrect
B) One or more sensors are bad
C) Leak in sample system
D) Cylinder empty
E) All of the above
F) None of the above

14) You have an Eagle that has a very unstable zero on the LEL sensor. What could cause this problem? Circle correct answer.

A) Contaminated flow system (fuel or other flammable substance)
B) Improper sensor voltage
C) Leak in sample system
D) Restrictive exhaust port

15) The customer wants to change the calibration from methane to hexane. Go into the setup mode and change the gas type and range.

16) Calibrate your instrument to hexane. Provide the as found / maximum and as left data below:

as found: _____ maximum span: _____ as left: _____

17) After calibrating to hexane, exit out of the calibration mode and apply 50% LEL methane to the instrument and record the response. Reading: _____

18) Go back into the calibration mode and reset the gas type for methane and recalibrate.

19) What items would you check if your Eagle went into flow fail after warm up?
A) Probe filter
B) Internal filter
C) Pump
D) DP Switch Setting
E) Analog PCB

20) If you have an Eagle that will not power up, what should you look for?
Circle all correct answers
A) Missing or expired sensor
B) Corrosion on battery contact terminals
C) Damaged I/S board assembly
D) Damaged or unplugged main ribbon cable
E) Dead or missing batteries

INSTRUMENTS

Gas Detection For Life

Training Notes