FO26-2012/1000

S2 SENSOR / TRANSMITTER

RKI INSTRUMENTS

Explosion Proof
O2 / CO / H2S

Explosion Proof
LEL

NH3 Sensor

- Available gases include
  - LEL, H2S, CO, PPM H2, and CO2
  - Toxic gases include NH3, AsH3, Cl2, ClO2, HCN, & SO2
- Infrared sensor for combustibles and CO2
- Hydrogen-Specific now available
- Patented water repellent sensor coating
- 4-20 mA output
- Explosion proof construction
- Optional stainless steel junction box

The RKI S2 series gas sensor/transmitters are highly reliable and very cost effective for the detection of common gas hazards. The S2 series are available for LEL, H_2 Specific (LEL, and ppm), Oxygen, H_2S, CO, and for a variety of toxic gases. The transmitters for LEL, H2 Specific, Oxygen, H_2S, CO2, and Carbon Monoxide are explosion-proof with flame arrestors, and approved for use in hazardous areas (Class I, Div 1 Groups B, C, D). An optional non-explosion proof version is available for oxygen, H2S, CO, and CO2 in Class 1 Div 2. LEL sensors are available using catalytic bead and infrared technologies.

The toxic sensors are electrochemical type plug-in sensors, which provide high specificity, fast response, and long life. The plug-in design allows quick replacement in the field with no tools required. Toxic sensors are designed for use in Class I, Div. 2 hazardous locations. Sensors available for NH3, AsH3, Cl2, ClO2, HCN, PH3, and SO2.

The S2 transmitters can be used either indoors or outdoors. The flame arrestors for the explosion-proof versions utilize a patented coating which make them water repellent. Splash guards are also available for use in very wet environments. An optional stainless steel junction box is available for corrosive environments.

All of the S2 transmitters are designed to interface with RKI controllers, or with PLC/DCS systems.

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

www.rkiinstruments.com

Explosion Proof

Class I, Div. 1 , Groups B, C, D

	LEL General Purpose	**LEL** H2 Specific	**H2 PPM** Hydrogen	**O2** Oxygen	**H2S** Hydrogen Sulfide	**CO** Carbon Monoxide	**CH4** Methane IR	**HC** Hydrocarbons IR	**CO2** Carbon Dioxide IR
 **Part #**	65-2405RK	65-2451RK	65-2445-100 65-2445-500 65-2445-1000 65-2445-2000	65-2322RK	65-2331RK	65-2336RK	65-2394RK-CH4	65-2394RK-HC	65-2396RK-02 65-2396RK-03 65-2396RK-05 65-2396RK-10
	65-2405RK-05	65-2451RK-05							
Sensor	Catalytic		Metal oxide semiconductor	Galvanic cell	Electrochemical		Infrared		
Measuring Range	0-100% LEL	0-100% LEL (H2 Specific)	0-100 ppm 0-500 ppm 0-1000 ppm 0-2000 ppm	0-25% Vol.	0-100 ppm	0-300 ppm	0-100% LEL		0 - 5000 ppm 0 - 5% Vol. 0 - 50% Vol. 0 - 100% Vol.
Lower Detectable Limit (LDL)	2% of full scale		6% of full scale	0.1% Vol.	2% of full scale				
Accuracy (whichever is greater)	± 5% of reading or ± 2% LEL		± 10% of full scale	± 0.5% O2	± 5% of reading ± 2 ppm H2S	± 5% of reading ± 5 ppm CO	± 5% of reading or ± 2% of full scale		
Response Time (T-90)	30 Seconds	20 Seconds	45 Seconds	90 Seconds	60 Seconds	90 Seconds	30 Seconds		
Max Current Draw (24VDC)	70 mA (power wires) 25 mA (signal wires) 3 wires			25 mA max, 2 wires			60 mA (power wires) 25 mA (signal wires) 3 wires		
Life Expectancy	2 to 3 years with normal exposure to flammable gas	3-5 years with normal service	5 years plus with normal service	2-3 years with normal service			5 years plus with normal service		
Operating Environment									
Location	Indoor or outdoor. Explosion proof for Class I, Div. 1, Groups B, C, and D.								
Temperature	-40°F to 167°F -40°C to 75°C		-4°F to 104°F -20°C to 40°C	-4°F to 113°F -20°C to 45°C	-40°F to 104°F -40°C to 40°C	23°F to 104°F -5°C to 40°C	-40°F to 122°F -40°C to 50°C		
Humidity	0 - 99% RH, non condensing								
Housing									
Housing J Box	Cast aluminum explosion proof, optional stainless steel J-box available								
Sensor	Stainless steel explosion proof								
Controls									
Zero	Sets transmitter output to 4 mA with zero output from sensor								
Span	Sets transmitter output to proper level when span gas is applied								
Output	4 - 20 mA signal								
Operating Voltage	11 VDC to 30 VDC		19 VDC to 30 VDC	19-30VDC (250 OHMS impedance max)			11 VDC to 30 VDC		
Approvals	65-2405RK UL	65-2451RK UL	65-2445-100 UL 65-2445-500 UL 65-2445-1000 UL 65-2445-2000 UL	CSA NRTL			$_{C}$ UL $_{US}$		
	65-2405RK-05 CSA	65-2451RK-05 CSA	65-2445-100-05 CSA 65-2445-500-05 CSA 65-2445-1000-05 CSA 65-2445-2000-05 CSA						
Controllers	Compatible with the following controllers: Beacon 110, Beacon 200, Beacon 410A, and 800, also PLC and DCS systems								
Warranty	One year materials and workmanship								

Toxic Gas Transmitters

Class I, Div. 2

	O2 Oxygen	H2S Hydrogen Sulfide	CO Carbon Monoxide	Toxics See chart below	CO2 Carbon Dioxide
 **Part #**	65-2320RK 65-2321RK	65-2330RK	65-2335RK	See chart below	65-2397RK-02 65-2397RK-03 65-2397RK-05 65-2397RK-10
Sensor	Galvanic cell Partial Pressure	Electrochemical			Infrared
Measuring Range	0-25% Vol.	0-100 ppm	0-300 ppm	See chart below	0 - 5000 ppm 0 - 5% Vol. 0 - 50% Vol. 0 - 100% Vol.
Lower Detectable Limit (LDL)	0.1% Vol.	2% of full scale			
Accuracy (whichever is greater)	± 0.5% O2	± 5% of reading ± 2 ppm H2S	± 5% of reading ± 5 ppm CO	± 10% of reading or ± 5% of full scale	± 5% of reading or ± 2% of full scale
Response Time (T-90)	20 Seconds	45 Seconds	30 Seconds	60 Seconds	30 Seconds
Max Current Draw (24VDC)	25 mA max, 2 wires				60 mA (power wires) 25 mA (signal wires) 3 wires
Life Expectancy	2 years normal service	2 to 3 years with normal service			5 years plus with normal service
Operating Environment					
Location	Indoor Class I, Div. 2				
Temperature	-4°F to 122°F -20°C to 50°C			14°F to 104°F -10°C to 40°C	-40°F to 122°F -40°C to 50°C
Humidity	0 - 99% RH non condensing			5-95% RH	0 - 99% RH non condensing
Housing					
Housing J-Box	Cast aluminum, explosion-proof				
Sensor	Plastic or aluminum				
Controls					
Zero	Sets transmitter output to 4 mA with zero output from sensor				
Span	Sets transmitter output to 20 mA with full scale output from sensor				
Operating Voltage	19 VDC to 30 VDC				
Output	4-20 mA signal				
Controllers	Compatible with the following controllers: Beacon 110, Beacon 200, Beacon 410A, and 800, also PLC and DCS systems				
Warranty	One year materials and workmanship				

* Partial pressure sensor for helium (He) applications. Consult factory for details.

ESM-01

*** Sensor being phased out, use CT-7 type when possible.**

CT-7

S2 Non Explosion Proof Toxic Assemblies

Part Number With J-Box	Gas	Range	Resolution	Sensor Type
65-2341-NH3-75	Ammonia (NH3)	0 - 75.0 ppm	0.1 ppm	CT-7
65-2341-NH3-1	Ammonia (NH3)	0 - 100 ppm	1 ppm	CT-7
65-2341-NH3-2	Ammonia (NH3)	0 - 200 ppm	1 ppm	CT-7
65-2341-NH3-5	Ammonia (NH3)	0 - 500 ppm	1 ppm	CT-7
65-2340RK-AsH3	Arsine (AsH3)	0 - 1.50 ppm	0.01 ppm	ESM -01
65-2341-CL2-3	Chlorine (Cl2)	0 - 3.00 ppm	0.01 ppm	CT-7
65-2341-CL2-05	Chlorine (Cl2)	0 - 5.00 ppm	0.02 ppm	CT-7
65-2341-CL2-10	Chlorine (Cl2)	0 - 10.0 ppm	0.1 ppm	CT-7
65-2341-CLO2-1	Chlorine Dioxide (ClO2)	0 - 1.00 ppm	0.01 ppm	CT-7
65-2340RK-HCN	Hydrogen Cyanide (HCN)	0 - 15.0 ppm	0.1 ppm	ESM -01
65-2340RK-PH3	Phosphine (PH3)	0 - 1.00 ppm	0.01 ppm	ESM -01
65-2340RK-SO2	Sulfur Dioxide (SO2)	0 - 6.00 ppm	0.01 ppm	ESM -01

***Other ranges available, please consult factory**

S2 SENSOR / TRANSMITTER

AC power supply

Remote horns & lights

Calibration kits

Calibration adaptors

Splash guards

Remote Mount Calibration Adaptor

Flow through adaptors

Dataloggers

Direct Interface with Beacon 110 / 200 / 410A / 800 Controllers

S2 Wiring Matrix				
S2 Transmitter	Number of Wires to Controller	Maximum Distance to Controller		
		18 AWG wire	16 AWG wire	14 AWG wire
LEL / IR / CO2	3	2500 ft.	5,000 ft.	8,000 ft.
Oxygen	2	2500 ft.	5,000 ft.	8,000 ft.
H2S	2	2500 ft.	5,000 ft.	8,000 ft.
CO	2	2500 ft.	5,000 ft.	8,000 ft.
Toxics	2	2500 ft.	5,000 ft.	8,000 ft.

Made in the USA

Authorized Distributor:

INSTRUMENTS
Gas Detection For Life

Quick Reference Guide
S-2 Series

Note: All adjustments should be made in a fresh air area

Required Materials:

- Appropriate calibrate kit for S-2 Series transmitters with .5 lpm fixed flow regulator and appropriate calibration cup and tubing.
- Digital multi meter with millivolt range
- Small flat blade screwdriver

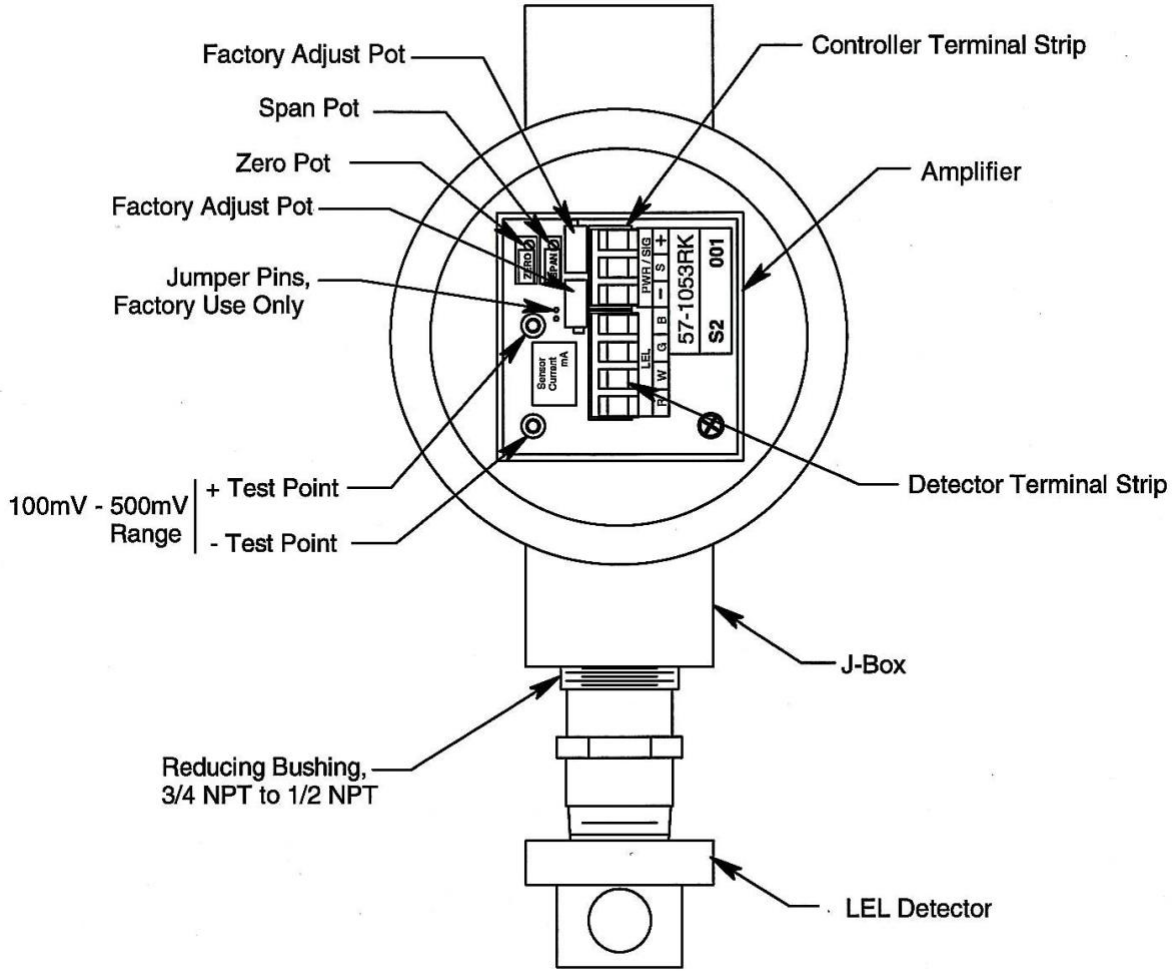
FRESH AIR ADJUSTMENT

- If S-2 transmitter is wired to an RKI Controller, verify that the S-2 transmitter is wired to the appropriate terminals in the RKI Controller.
- Remove the lid from the explosion proof junction box
- Power up the controller and allow the sensor to stabilize for 1 to 2 minutes.
- Using your digital multi meter, set the meter to read millivolts and plug the black meter lead into the black test jack on the amplifier, and the red volt meter lead into the red test jack on the amplifier.
- For LEL and Toxic gas transmitters, the voltmeter should be reading 100 mV in fresh air.
- For an O2 transmitter, the fresh air reading should be 434mV.
- Using a small flat blade screwdriver, locate the ZERO pot (on LEL and Toxic gas transmitters, SPAN on Oxygen transmitters) and adjust the pot for fresh air readings. Please note: if you suspect that the atmosphere may not be gas free, apply zero air to the sensor to achieve a proper fresh air reading.
- To calibrate an S-2 transmitter, assemble the proper calibration kit. The example below assumes you are calibrating a standard combustible gas transmitter to methane.

GAS CALIBRATION

- Assemble the appropriate calibration kit for the S-2 Transmitter used
- Place the RKI controller in calibration mode. Set calibration time out to an appropriate amount of time required to complete the calibration.
- Plug your volt meter into the test jacks on the amplifier.
- Verify the reading is set to 100mV (zero percent LEL methane)
- Attach the calibration cup to the LEL sensor
- Open regulator allowing gas to flow to the sensor
- Allow gas to flow over the sensor for a maximum of 2 minutes.

- When reading stabilizes, adjust the SPAN pot to the proper setting.
- Note: if using 50% LEL methane, then you will need to set the span to 300mV.
- Formula: (Cal Gas/Full Scale) * 400 + 100 = millivolt setting. Example: 50% LEL / 100% LEL = .5 x 400 = 200 + 100 = 300 mV.
- If you are unable to set the SPAN pot to 300mV, then you will need to replace the gas sensor and calibrate again.
- Turn the gas off and remove the calibration cup and remove the regulator from the cylinder.
- If necessary, readjust the zero to 100 mV when completed.



INSTRUMENTS
Gas Detection For Life

Quick Reference Guide
S-2 Series with remote LEL IR sensor

Note: All adjustments should be made in a fresh air area

Required Materials:

- Appropriate calibrate kit for S-2 Series transmitters with .5 or 1.0 lpm fixed flow regulator and 50 % LEL CH4 and zero air cylinders.
- Digital multi meter with millivolt DC range
- Small flat blade screwdriver

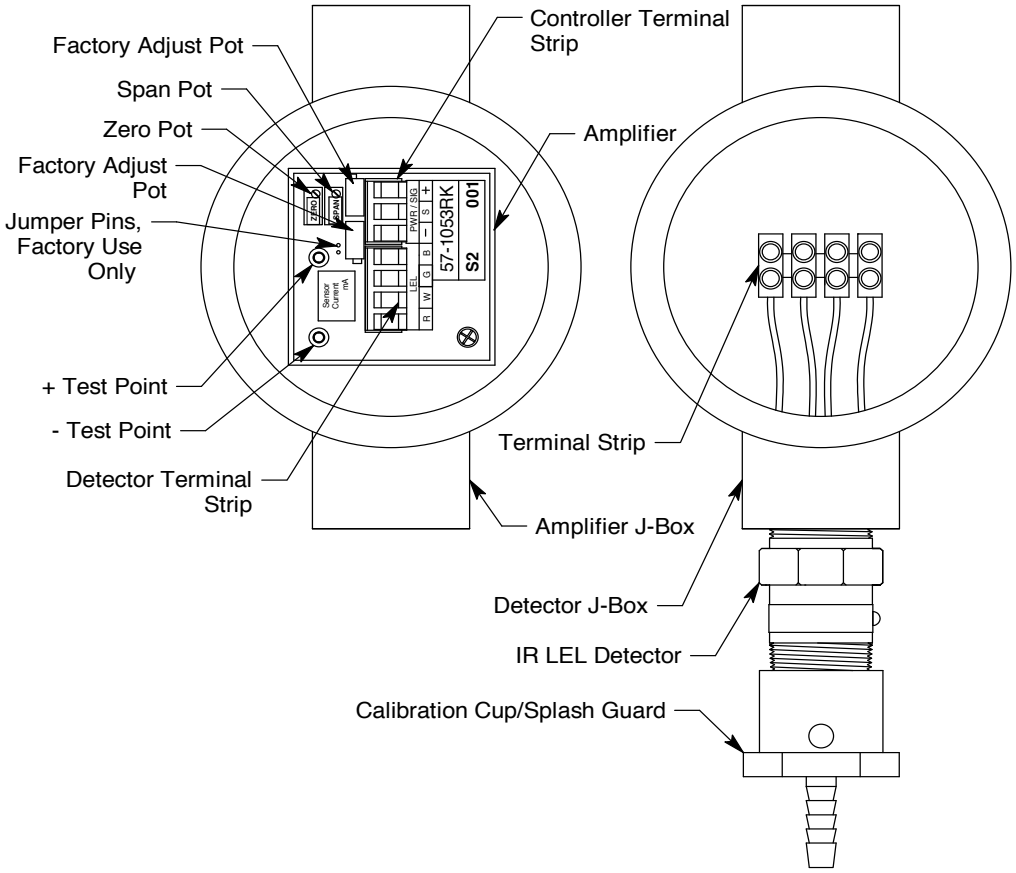
FRESH AIR ADJUSTMENT

- If S-2 transmitter is wired to an RKI Controller, verify that the S-2 transmitter is wired to the appropriate terminals in the RKI Controller.
- Remove the lid from the transmitter junction box
- Power up the controller and allow the sensor to stabilize for 5 minutes.
- Using your digital multi meter, set the meter to read millivolts DC and plug the black (-) meter lead into the black (-) test jack on the amplifier, and the red (+) volt meter lead into the red (+) test jack on the amplifier.
- The voltmeter should be reading 100 mV in fresh air.
- Using a small flat blade screwdriver, locate the ZERO pot and adjust the pot for fresh air readings (100 mV). Please note: if you suspect that the atmosphere may not be gas free, apply zero air to the sensor through the calibration tubing to achieve a proper fresh air reading.

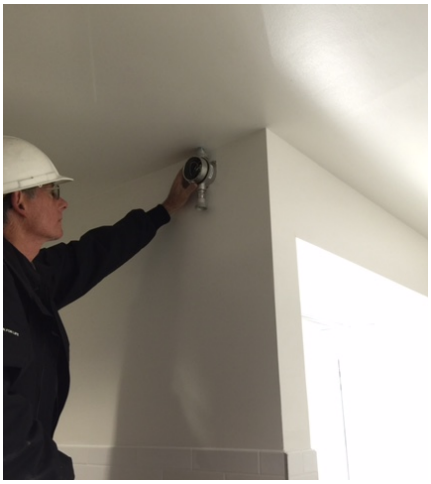
GAS CALIBRATION

- Connect the regulator to the 50 % LEL CH4 calibration gas cylinder.
- Place the RKI controller in calibration mode. Set calibration time out to an appropriate amount of time required to complete the calibration.
- Plug your volt meter into the test jacks on the amplifier.
- Verify the reading is set to 100mV (zero percent LEL methane)
- Attach the regulator to the calibration tubing leading to the LEL sensor
- Open regulator allowing gas to flow to the sensor
- Allow gas to flow over the sensor for a maximum of 2 minutes.
- When reading stabilizes, adjust the SPAN pot to the proper setting.
- Note: if using 50% LEL methane, then you will need to set the span to 300mV.
- If you are unable to set the SPAN pot to 300mV, then you will need to replace the gas sensor and calibrate again.
- Turn the gas off and disconnect the regulator from the tubing.

- Connect the regulator to the zero air cylinder, and connect the regulator to the calibration tubing. Flow zero air until reading returns to 100 mV. If necessary, readjust the zero to 100 mV when completed.



S-2 Gas Transmitters



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S-2 Transmitters

- S-Transmitters are a family of transmitters
  - 4-20mA communication
  - Potted to protect electronics
  - Provided in explosion proof housing
  - Sensor may connect directly to the amplifier or may attach to a preamplifier
  - Can be used on any RKI Controller or wired directly to a PLC or DCS

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S2 Transmitters

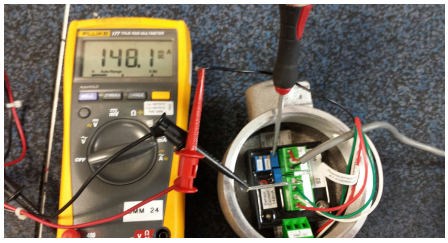
- Available gas/detector:
  - LEL (Cat & IR)
  - CO2 (IR, 5000ppm, 5% Vol, 50% Vol, 100% Vol)
  - O2 (Capillary & Partial Pressure)
  - H2 (Cat, MOS and TC)
- Available gas/detector:
  - H2S
  - CO
  - SO2
  - PH3
  - NH3

LEL/CO2 Detector Wiring

Detector Lead	Detector Terminal Strip
Red	LEL "R"
White	LEL "W"
Green	LEL "G"
Black	LEL "B"

S2 LEL Current Setting

- Current can be adjusted for specific detectors:
  - Standard catalytic detector: 148mA
  - Standard catalytic bead detector calibrated to H2: 130mA
  - H2 specific detector: 115mA



Calibration Formula

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

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

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

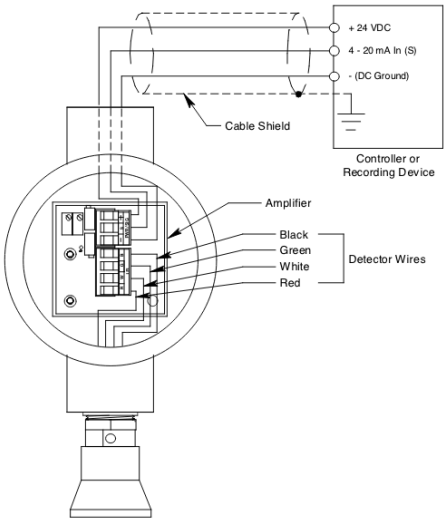
$$300(mV) = (50/100)\ X\ 400 + 100$$

S-2 Transmitter Wiring

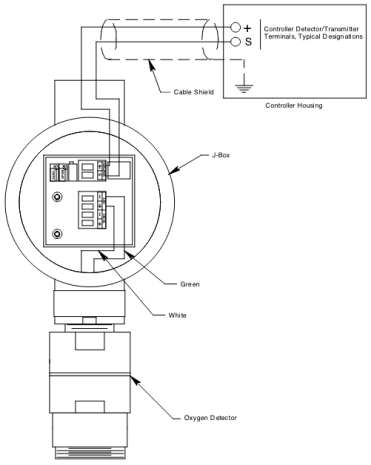
Amplifier Controller Terminal Strip	Controller Transmitter Terminal Strip (typical)
PWR/SIG "-"	- (DC -)
PWR/SIG "S"	S (4 - 20 mA In)
PWR/SIG "+"	+ 24V

Note: Some S-2 transmitters are two wire devices, wiring only to + and S.

S-2 Transmitter, 3-Wire



S2 Transmitter, 2-Wire



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S2 CO Transmitter

- CO Detector uses a charcoal filter to scrub out hydrogen sulfide and heavy hydrocarbons
- Change filter if CO sensor responds to H2S or when replacing the sensor.

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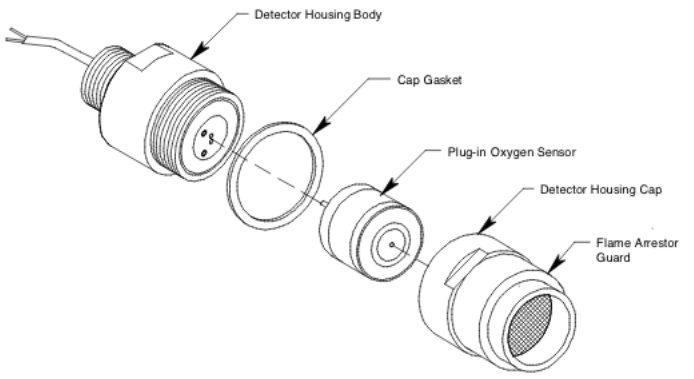
S2 CO Transmitter

- Detector cap is lubricated to keep charcoal filter retainer from sticking

S2 Oxygen Transmitter

- Non Explosion Proof transmitter has plug in capillary O2 sensor.
- Average life span is two years.

S-2 Transmitter, O2 Det. Assy.



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S-2 Transmitter, Toxic Gas

Target Gas	65-2340RK-ASH3: Arsine (AsH_3) 65-2340RK-CL2: Chlorine (Cl_2) 65-2340RK-CL-10: Chlorine (Cl_2) 65-2340RK-HCN: Hydrogen Cyanide (HCN) 65-2340RK-NH3: Ammonia (NH_3) 65-2340RK-SO2: Sulphur Dioxide (SO_2) 65-2340RK-PH3: Phosphine (PH_3)
Sampling Method	Diffusion
Detection Range	AsH_3: 0 - 1.50 ppm Cl_2: 0 - 3.00 ppm Cl_2: 0 - 10.0 ppm HCN: 0 - 15.0 ppm NH_3: 0 - 75.0 ppm SO_2: 0 - 6.00 ppm PH_3: 0 - 1.00 ppm
Accuracy	± 10% of reading or ± 5% of full scale (whichever is greater)
Signal Output	4 to 20 mA
Response Time	• Cl_2 and NH_3: T90 in 90 seconds • All others: T90 in 45 seconds
Operating Temperature & Humidity	• 14°F to 104°F (-10°C to 40°C) • 20% to 90% Relative Humidity

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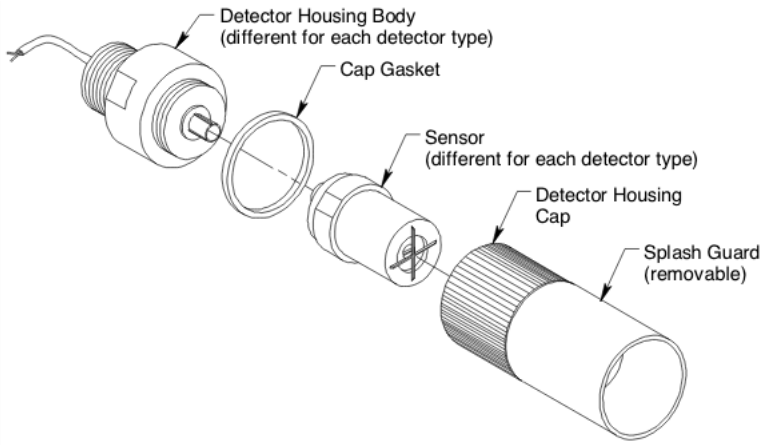
ESM-01 Detector Assy.



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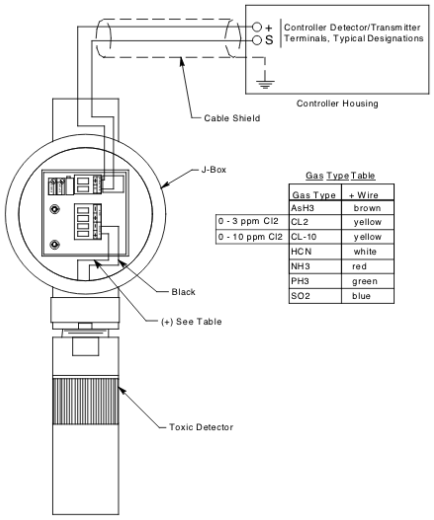
S-2 ESM-01Wiring



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S2 Transmitter Troubleshooting

Condition	Symptom(s)	Probable Causes	Recommended Action
Fail Condition	• Controller indicates a fail condition.	• The transmitter wiring is disconnected or misconnected. • The transmitter's zero reading is low enough to cause a fail condition. • The transmitter is malfunctioning.	1. Verify that the transmitter wiring is correct and secure. 2. Calibrate the transmitter. 3. If the fail condition continues, replace the detector. 4. If the fail condition continues, contact RKI for further instruction.
Slow or No Response/ Difficult or Unable to Calibrate	• Transmitter responds slowly or does not respond to response test. • Unable to accurately set the zero or response reading during calibration. • Transmitter requires frequent calibration. ***Note:*** *Under "normal" circumstances, the transmitter requires calibration once every 3 months.* *Some applications may require a more frequent calibration schedule.*	• The calibration cylinder is low, out-dated, or defective. • The calibration gas flow rate is too low. • The calibration gas is not an appropriate concentration. • The transmitter is malfunctioning.	1. Verify that the calibration cylinder contains an adequate supply of a fresh test sample. 2. Verify that the regulator used for calibration is a 0.5 LPM regulator. 3. Verify that the calibration gas concentration is appropriate for the transmitter. The concentration should be in the detection range, preferably about half of the detection range. 4. If the calibration/response difficulties continue, replace the detector. 5. If the calibration/response difficulties continue, contact RKI for further instruction.

INSTRUMENTS
Gas Detection For Life

Quick Reference Guide
S-2 Series with remote LEL IR sensor

Note: All adjustments should be made in a fresh air area

Required Materials:

- Appropriate calibrate kit for S-2 Series transmitters with .5 or 1.0 lpm fixed flow regulator and 50 % LEL CH4 and zero air cylinders.
- Digital multi meter with millivolt DC range
- Small flat blade screwdriver

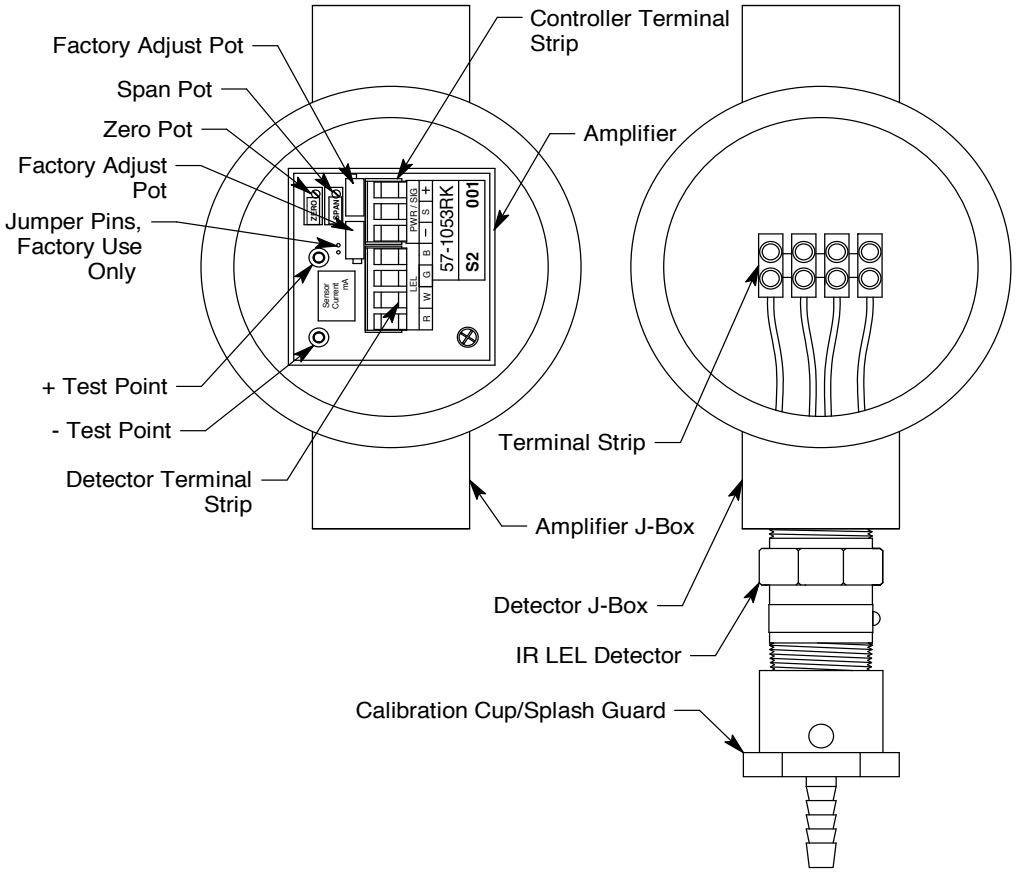
FRESH AIR ADJUSTMENT

- If S-2 transmitter is wired to an RKI Controller, verify that the S-2 transmitter is wired to the appropriate terminals in the RKI Controller.
- Remove the lid from the transmitter junction box
- Power up the controller and allow the sensor to stabilize for 5 minutes.
- Using your digital multi meter, set the meter to read millivolts DC and plug the black (-) meter lead into the black (-) test jack on the amplifier, and the red (+) volt meter lead into the red (+) test jack on the amplifier.
- The voltmeter should be reading 100 mV in fresh air.
- Using a small flat blade screwdriver, locate the ZERO pot and adjust the pot for fresh air readings (100 mV). Please note: if you suspect that the atmosphere may not be gas free, apply zero air to the sensor through the calibration tubing to achieve a proper fresh air reading.

GAS CALIBRATION

- Connect the regulator to the 50 % LEL CH4 calibration gas cylinder.
- Place the RKI controller in calibration mode. Set calibration time out to an appropriate amount of time required to complete the calibration.
- Plug your volt meter into the test jacks on the amplifier.
- Verify the reading is set to 100mV (zero percent LEL methane)
- Attach the regulator to the calibration tubing leading to the LEL sensor
- Open regulator allowing gas to flow to the sensor
- Allow gas to flow over the sensor for a maximum of 2 minutes.
- When reading stabilizes, adjust the SPAN pot to the proper setting.
- Note: if using 50% LEL methane, then you will need to set the span to 300mV.
- If you are unable to set the SPAN pot to 300mV, then you will need to replace the gas sensor and calibrate again.
- Turn the gas off and disconnect the regulator from the tubing.

- Connect the regulator to the zero air cylinder, and connect the regulator to the calibration tubing. Flow zero air until reading returns to 100 mV. If necessary, readjust the zero to 100 mV when completed.



M2A STAND ALONE TRANSMITTER

RKI INSTRUMENTS

- Operates with or without a controller
- Direct digital readout with OLED cold temperature display
- Available gases include
  - LEL, O2, H2S, CO, CO2, and 100% Vol CH4
  - Toxic gases include NH3, AsH3, Cl2, ClO2, HCN, & SO2
- Infrared sensor for combustibles and CO2
- 4-20 mA & digital Modbus outputs standard
- 2 fully programmable alarm relays & fail relay
- Non-intrusive calibration via magnetic wand
- Explosion proof construction
- Patented water repellent sensor cover
- User friendly setup, push buttons & OLED menus
- Long-life sensors (2 + years typical)

The RKI M2A™ is a state-of-the-art transmitter that can operate as an independent, stand-alone monitor or as part of an integrated system. The M2A connects with an analog or digital signal to virtually any controller, PLC, or DCS. Setup procedures are simplified with user friendly push buttons and OLED menus. It utilizes a magnetic wand technique for performing non-intrusive calibration. The M2A provides an automatic zero drift correction feature, which results in more stable readings and reduces the need for adjustments due to sensor aging.

The housing of the M2A does not need to be opened for zeroing or calibration, making it unnecessary to declassify the area for routine maintenance. It is designed so that a complete field calibration can be performed by one person. Sensor construction is rated Class I, Div. 1 Groups B, C, D for flammables, CO, H2S, O2, and CO2, and Class I, Div. 2 for all other toxics.

The transmitter provides a 4-20 mA output in addition to a Modbus digital output. It also has two levels of alarms with relays, plus a fail alarm with relay. A digital display of the gas concentration, as well as alarm and status lights, can be viewed through the front window.

The toxic sensors are electrochemical type plug-in sensors, which provide high specificity, fast response, and long life. The plug-in design allows quick replacement in the field with no tools required. Toxic sensors are designed for use in Class I, Div. 2 hazardous locations. Sensors available for NH3, AsH3, Cl2, ClO2, HCN, PH3, and SO2

The M2A represents the latest leading edge technology in sensor / transmitters today.

World Leader In Gas Detection & Sensor Technology

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

www.rkiinstruments.com

Explosion Proof

Class I, Div. 1 , Groups B, C, D

		Combustibles		LEL	O2	H2S	CO	CH4	HC	CO2
		LEL	PPM	H2 Specific	Oxygen	Hydrogen	Carbon Monoxide	Methane	Hydrocarbons	Carbon Dioxide
Part #	UL	65-2640RK	65-2647RK	65-2641RK	65-2643RK-05	65-2645RK-05	65-2646RK-05	65-2649RK-CH4 65-2658RK-CH4	65-2649RK-HC	65-2660RK-02 65-2660RK-03 65-2660RK-05 65-2660RK-10
	CSA	65-2640RK-05	65-2647RK-05	65-2641RK-05			65-2646RKS-SW			

Sensors	Catalytic			Galvanic cell	Electrochemical		Infrared				
Measuring Ranges	0 - 100% LEL	0 - 9000 ppm CH4	0 - 100% LEL	0 - 25.0% Vol.	0 - 100 ppm	0 - 300 ppm	0 - 100% LEL 0 - 100% Vol.	0 - 100% LEL	-02	0 - 5000 ppm	
									-03 -05	0 - 5% Vol. 0 - 50% Vol.	
									-10	0 - 100% Vol.	
Resolution	1% LEL	20 ppm	1% LEL	0.1% Vol.	1 ppm		1% LEL / 1% Vol.		20 ppm / 0.01% Vol / 0.1% Vol. / 1% Vol.		
LDL	2% of full scale			0.1% Vol.	2% of full scale						
Max Current Draw (24VDC)	160 mA with alarm 1 and alarm 2 active and all relays energized			125 mA with alarm 1 and alarm 2 active and all relays energized			160 mA with alarm 1 and alarm 2 active and all relays energized				
Response Time (T-90)	35 Seconds or less			90 Seconds or less	60 Seconds or less	90 Seconds or less	30 Seconds or less				
Life Expectancy	2 to 3 years with normal service		3 to 5 years with normal service	2 to 3 years with normal service			5 years plus with normal service				
Accuracy (which ever is greater)	± 5% of reading or ± 2% of full scale			± 0.5% Vol. O2	± 5% of reading or ± 2 ppm H2S	± 5% of reading or ± 5 ppm CO (at 20°C)	± 5% of reading or ± 2 % of full scale				
Weather Resistant	Patented water repellent sensor coating										

Alarms

Alarm Settings	Two fully programmable alarm set points, increasing / decreasing, latching / self-resetting, on delays, off delays, normally energized or de-energized
Alarm Indication	Visual LEDs. Alarm 1, Amber; Alarm 2, Red; Fail, Red
Relays	5 amp form 'C' contacts for alarm 1, alarm 2, and fail

Physical

Dimensions	Height: 8.5" (215 mm), Width: 5.2" (132 mm), Depth: 4.5" (114 mm)
Display	Alphanumeric OLED display. 8 characters per line; 2 lines for gas concentration readout, plus user-friendly calibration and setup
Enclosure	Explosion proof for Class I, Div 1, Groups B, C, D.
Enclosure Rating	NEMA 4X, explosion proof, watertight, cast aluminum with o-ring seal and epoxy powder coating
Controls	Magnet used for calibration functions. Calibrates without opening the housing. Internal push-button controls also available for calibration and setup

Operating Environment

Operating Temperature	-40°F to 167°F -40°C to 75°C	-4°F to 113°F -20°C to 45°C	-40°F to 104°F -40°C to 40°C	23°F to 104°F -5°C to 40°C	-40°F to 122°F -40°C to 50°C
				-40°F to 122°F -40°C to 50°C	
Relative Humidity	5 - 95% RH non-condensing				
Location	Indoor or outdoor. Explosion proof for Class I, Div. 1, Groups B, C, D.				

Power	10 VDC - 30 VDC

Outputs

Analog	Linear 4-20 mA signal, into 1000 ohms impedance max (24DC), 0 - 500 ohms max (12VDC) corresponding to 0 - full scale
Digital	Modbus RTU output standard, fully configurable, 2-wire RS-485, 1200 to 19.2k baud

Approvals	65-2640RK UL	65-2641RK UL	C CSA US	C UL US
	65-2640RK-05 C CSA US	65-2641RK-05 C CSA US		

Controllers	Beacon 110, Beacon 200, Beacon 410A, Beacon 800 as well as most DCS / PLC systems
Warranty	One year material and workmanship

Toxic Gas Transmitters

Class I, Div. 2

	O2 Oxygen	H2S Hydrogen Sulfide	CO Carbon Monoxide	Toxics See Chart Below	CO2 Carbon Dioxide
 **Part#**	65-2666RK *65-2644RK	65-2662RK	65-2663RK	See Chart Below	65-2661RK-02 65-2661RK-03 65-2661RK-05 65-2661RK-10
Sensors	Galvanic cell	Electrochemical			Infrared
Measuring Ranges	0-25% Vol.	0-100 ppm	0-300 ppm	See Chart Below	-02 0 - 5000 ppm -03 0 - 5% Vol. -05 0 - 50% Vol. -10 0 - 100% Vol.
Resolution	0.1% Vol.	1 ppm		See Chart Below	20 ppm / 0.01% Vol. / 0.1% Vol. / 1%Vol.
Lower Detectable Limit (LDL)	0.1% Vol.	2% of full scale			
Response Time (T-90)	35 Seconds or less			60 Seconds or less	30 Seconds or less
Max Current Draw (24VDC)	125 mA with alarm 1 and alarm 2 active and all relays energized				160 mA with alarm 1 and alarm 2 active and all relays energized
Life Expectancy	2 to 3 years with normal service				5 years plus
Accuracy (which ever is greater)	± 0.5% Vol. O2	± 5% of reading or ± 2 ppm H2S	± 5% of reading or ± 5 ppm CO	± 10% of reading or ± 5% of full scale	± 5% of reading or ± 2% of full scale
Alarms					
Alarm Settings	Two fully programmable alarm set points, increasing / decreasing, latching / self-resetting, on delays, off delays, normally energized or de-energized,				
Alarm Indication	Visual LEDs. Alarm 1=Amber; Alarm 2=Red; Fail=Red				
Relays	5 Amp form 'C' contacts for alarm 1, alarm 2, and fail				
Physical					
Dimensions	Height: 8.5" (215 mm), Width: 5.2" (132 mm), Depth: 4.5" (114 mm)				
Display	Alphanumeric OLED display. 8 characters per line; 2 lines for gas concentration readout, plus user-friendly calibration and setup				
Sensor Rating	Non explosion proof construction, designed for Class I, Div. 2, Groups B, C, D (no certification)				
Housing J-Box	NEMA 4X, explosion proof, watertight, cast aluminum with o-ring seal and epoxy powder coating				
Controls	Magnet used for calibration functions. Calibrates without opening the housing. Internal push-button controls also available for calibration and setup				
Sensor	Aluminum / Plastic (non explosion proof)				
Operating Environment					
Operating Temperature	-4°F to 113°F -20°C to 45°C	-40°F to 104°F -40°C to 40°C	23°F to 104°F -5°C to 40°C	14°F to 104°F -10°C to 40°C	-40°F to 122°F -40°C to 50°C
Relative Humidity	5 - 95% RH non-condensing				
Location	Indoor or outdoor				
Operating Voltage	10 VDC - 30 VDC				
Outputs					
Analog	Linear 4-20 mA signal, into 1000 ohms impedance max (24DC), 0 - 500 ohms max (12VDC) corresponding to 0 - full scale				
Digital	Modbus RTU output standard, fully configurable, 2-wire RS-485, 1200 to 19.2k baud				
Controllers	Beacon 110, Beacon 200, Beacon 410A, Beacon 800 as well as most DCS / PLC systems				
Warranty	One year materials and workmanship				

*Partial pressure sensor for helium (He) applications. Consult factory for details.

ESM-01

CT-7

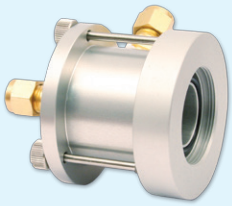
*** Sensor being phased out, use CT-7 type when possible.**

M2A Toxic Transmitter Sensor Ordering Information

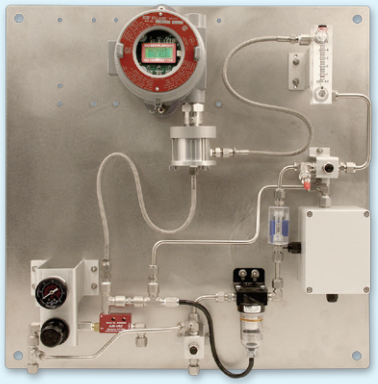
Part Number With J-Box	Gas	Range	Resolution	Sensor Type
65-2670RK-NH3-75	Ammonia (NH3)	0 - 75.0 ppm	0.1 ppm	CT-7
65-2670-NH3-1	Ammonia (NH3)	0 - 100 ppm	1 ppm	CT-7
65-2670-NH3-2	Ammonia (NH3)	0 - 200 ppm	1 ppm	CT-7
65-2670-NH3-5	Ammonia (NH3)	0 - 500 ppm	1 ppm	CT-7
65-2648RK-AsH3	Arsine (AsH3)	0 - 1.50 ppm	0.1 ppm	ESM -01
65-2670RK-CL2-3	Chlorine (Cl2)	0 - 3.00 ppm	0.01 ppm	CT-7
65-2670RK-CL2-10	Chlorine (Cl2)	0 - 10.0 ppm	0.1 ppm	CT-7
65-2670RK-CLO2	Chlorine Dioxide (ClO2)	0 - 1.00 ppm	0.01 ppm	CT-7
65-2648RK-HCN	Hydrogen Cyanide (HCN)	0 - 15.0 ppm	0.1 ppm	ESM -01
65-2648RK-PH3	Phosphine (PH3)	0 - 1.00 ppm	0.01 ppm	ESM -01
65-2648RK-SO2	Sulfur Dioxide (SO2)	0 - 6.00 ppm	0.01 ppm	ESM -01

AVAILABLE ACCESSORIES

Remote Mount Calibration Adaptor



Flow through adaptors



Air aspirator adaptors / panels

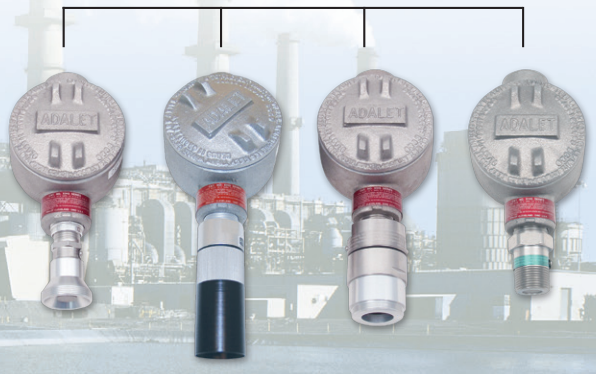
Remote horns & lights

Calibration adaptors

Calibration kits

Direct Interface with Beacon 110 / 200 / 410A / 800 Controllers

M2A Wiring Matrix				
	Number of Wires to Controller	Maximum Distance to Controller		
		18 AWG wire	16 AWG wire	14 AWG wire
M2A Transmitter	3	2500 ft.	5,000 ft.	8,000 ft.



Made in the USA

Authorized Distributor:

INSTRUMENTS
Gas Detection For Life

Quick Reference Guide
M2A Series Programming

TOOLS REQUIRED:

None.

CALIBRATION MODE (Combustible gas version example)

- Press and HOLD the UP/YES button
  - Calib? Will be displayed
  - Press YES to enter Calibration mode or NO to EXIT
  - FreshAir Adjust?
  - Press YES to perform a fresh air adjust
  - FRESH AIR WAIT… will be displayed as fresh air reading is adjusted
  - FreshAir 0% LEL / ENTER will be displayed prompting user to press ENTER button
  - FreshAir PASS will be displayed if M2 is able to set fresh air reading
  - FreshAir SAVED will appear briefly.
  - SPAN W/Cal Gas? Press the YES button to continue with calibrating with gas or NO button to EXIT.
  - APPLY SPAN GAS will be displayed if YES button is pressed
  - 0% LEL will be displayed. Attach calibration cup to sensor, turn on calibration gas and let gas flow to sensor for 1-2 minutes or until reading stabilizes.
    - Use UP or DOWN buttons to increase or decrease span to match value on cylinder.
  - Press the ENTER button to set calibration

CONFIGURATION MODE

- Press and HOLD the UP and ENTER button
  - Enter Config? Press the YES button to enter or NO button to EXIT
  - METHANE 100% LEL will be displayed then,
  - Alarm-1 10% LEL will be displayed.
    - Press the UP or DOWN button to raise or lower alarm point
    - Press the ENTER button to set
  - Alarm -1 Increase will be displayed
    - Press the UP or DOWN button to change from Increase to Decrease
    - Press the ENTER button to set
  - Alarm-1 N. DE-EN (Alarm-1 relay normally de-energized)

- Press the UP or DOWN button to change from N. DE-EN to normally energized relay contacts (Fail Safe)
- Press the ENTER button to set.

- Alarm-1 LATCH will be displayed
  - Press the UP or DOWN button to change from LATCH to SELF-RST (self resetting alarms)
  - Press the ENTER button to set.
- Alarm-1 OnDy 1 secs (alarm on delay set to one second)
  - Press the UP or DOWN button to change from 0 seconds to a maximum of 60 minutes.
  - Press the ENTER button to set.
- Alarm-2 50% LEL will be displayed.
  - Press the UP or DOWN to raise or lower the Alarm-2 set point.
  - Press the ENTER button to set.
- Alarm -2 INCREASE will be displayed
  - Press the UP or DOWN button to change from INCREASE to DECREASE
  - Press the ENTER button to set
- Alarm-2 N. DE-EN (Alarm-2 relay normally de-energized)
  - Press the UP or DOWN button to change from N. DE-EN to normally energized relay contacts (Fail Safe)
  - Press the ENTER button to set.
- Alarm-2 LATCH will be displayed
  - Press the UP or DOWN button to change from LATCH to SELF-RST (self resetting alarms)
  - Press the ENTER button to set.
- Alarm-2 OnDy 1 secs (alarm on delay set to one second)
  - Press the UP or DOWN button to change from 0 seconds to a maximum of 60 minutes.
  - Press the ENTER button to set.
- Zero Supp 2% LEL (zero suppression)
  - Press the UP or DOWN button to increase or decrease zero suppression.
  - Press the ENTER button to set.
- FILTER 5 SEC
  - Press the UP or DOWN button to adjust from 0 to 60 seconds.
  - Press the ENTER button to set.
- CAL TIME 15 MIN will be displayed
  - Use the UP or DOWN button to change from 5 MIN to 30 MIN.
  - Press the ENTER button to set.
- SAVE IT? YES/NO
- Press YES to save and EXIT
- CONFIG SAVED will be displayed.

MODBUS SETUP

- Press and Hold the DOWN/NO and ENTER buttons to enter MODBUS setup mode.
  - Set Up Modbus? Will be displayed. Press the YES button to enter.
  - Modbus DISABLED will be displayed.
    - Press the UP or DOWN button to ENABLE
    - Press the ENTER button to set.
  - Slave ID will now be displayed.
    - Press the UP or DOWN button to set the ID
    - Press the ENTER button to set.
  - BaudRate 9600 will now be displayed.
    - Press the UP or DOWN button to set the BAUD RATE from 1200 to 19200 baud.
    - Press the ENTER button to set.
  - Parity EVEN will be displayed.
    - Press the UP or DOWN button to set to NONE, ODD or EVEN parity.
    - Press the ENTER button to set.
  - Resp Dly 0 mS will be displayed
    - Press the UP or DOWN buttons to set from 0 to 20 mS.
    - Press the ENTER button to set.
  - SAVE IT? YES/NO will now be displayed.
    - Press the YES button to SAVE. Modbus Saved will be displayed.

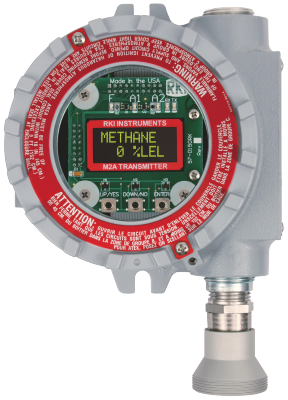
GAS TYPE SELECTION

- Press the UP/YES and DOWN/NO buttons to enter gas type selection mode.
  - Select GasType? Will be displayed.
    - Press the YES button
    - GAS TYPE? METHANE will be displayed
    - Press the NO button to select gas type for HC, METHANE, HYDROGEN or HEXANE. Once selected, press the YES button
  - SAVE IT? YES/NO
  - Press the YES button to save and exit.

4-20 mA ADJUSTMENT

- Press and HOLD the UP, DOWN and ENTER buttons to enter.
  - Tune 4-20mA? Will be displayed.
  - Press the YES button
  - 4 mA OUT Up Dn-ENT will be displayed
    - Press the UP or DOWN button to raise or lower the 4 mA.
    - Note: If necessary, an ammeter can be installed in the Signal (feed back) line to measure the current.
    - For certain installations it may be necessary to set the 4 mA slightly above 4 if connected directly to PLC.
    - Press the ENTER button to set.
  - 20 mA OUT Up Dn-ENT will be displayed
    - Use the UP or DOWN button to set the reading to 20 mA
    - Press the ENTER button to set.
  - 4-20 CAL DONE will be displayed.

M2A Transmitter Service Training



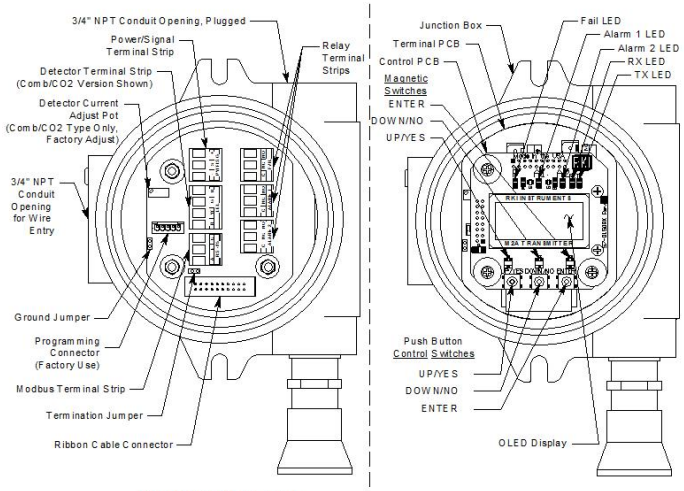
1

Transmitter Specifications

- Input power: 10-30 VDC, 0.160A
- Housing: Explosion Proof Class I Div. 1 Group B,C, and D, epoxy-coated aluminum, NEMA 4X rating
- Dimensions: 8.5” H x 5.2” W x 4.5” D
- Weight: 4.5 lbs.
- Temp Range: -40C to 75C
- Rating: Indoor or outdoor locations Max humidity: 95% RH (non-condensing)
- Relay contact rating: 5A @ 115/220V- Form C contacts
- Signal output: 4-20 mA, 500 Ohms impedance max, and RS-485 Modbus

2

Internal Description

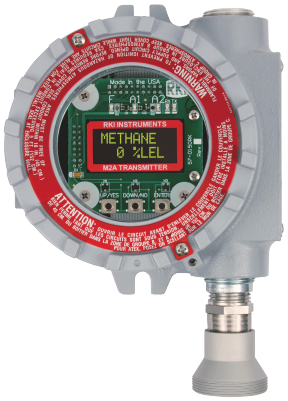


View With Cover and Control PCB Removed

View With Cover Removed

3

Calibration



4

Non Intrusive Calibration

- Using magnetic wand, place magnet over UP/YES Hall effect switch to engage Calibration Mode.

Non Intrusive Calibration

- When Calib? YES/NO is displayed, touch magnet to glass where UP/YES Hall effect switch is located.

Non Intrusive Calibration

- Gas type will be displayed.
- Assemble calibration kit as needed.

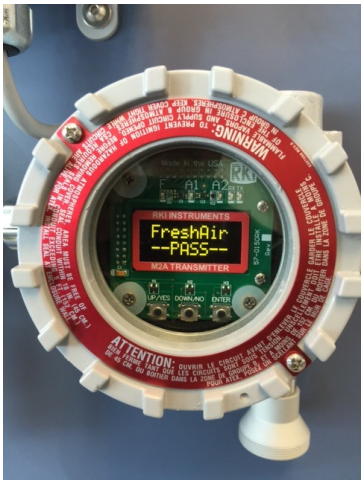
Non Intrusive Calibration

- When FreshAir Adjust is displayed, touch magnet to UP/YES Hall effect switch.
- If you suspect that there may be gas in the atmosphere, use zero air to set FreshAir reading.

Non Intrusive Calibration

- M2A will adjust to fresh air values.

Non Intrusive Calibration



- PASS will be displayed if zero is successful.
- If unable to set to fresh air values, FAIL will be displayed.
- Replace sensor then perform zero again.

Non Intrusive Calibration

- Once FreshAir adjustment is completed, new value will be saved in memory.

Non Intrusive Calibration

- Instrument will ask if you want to SPAN with Cal Gas.
- Place magnet over UP/YES Hall effect switch.

Non Intrusive Calibration

- M2A will indicate SPAN Gas.

13

Non Intrusive Calibration

- Attach span gas cylinder to regulator.
- Attach calibration cup to sensor and turn on regulator.

14

Non Intrusive Calibration

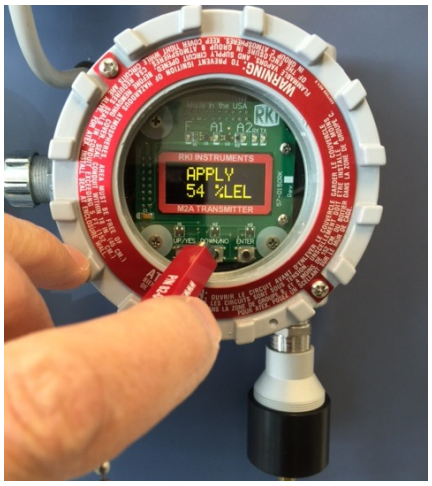
- Allow gas reading to stabilize.
- Maximum of 2 minutes.

Non Intrusive Calibration

- Place magnet over UP/YES Hall effect switch and adjust span for maximum value to determine headroom of the sensor.

Non Intrusive Calibration

- Place the magnet over the DOWN/NO Hall effect switch and adjust reading to calibration point. Then place magnet over ENTER Hall effect switch to set.



Non Intrusive Calibration

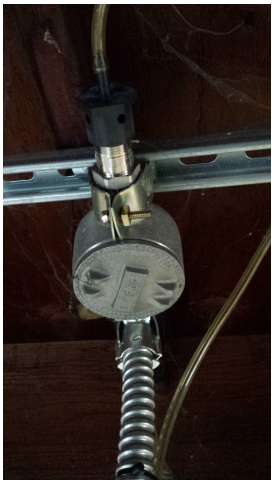
- Once completed, new SPAN value will be saved in memory.
- Remove calibration cup from sensor and turn off regulator.

Non Intrusive Calibration

- M2A will allow sensor reading to stabilize and return to normal operation.

Sensor with Cal Adapter

- IR sensor mounted on ceiling with remote calibration adapter and tubing installed.



Remote Cal Tubing

- Remote calibration tubing provides a convenient way to apply calibration gas to the sensor.

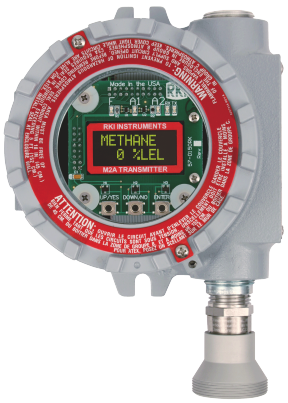
Remote Cal Adapter

- For sensors using a remote calibration adapter, it may be required to use a higher flow regulator, especially in high ventilation areas.
- IR sensor with remote calibration adapter shown.

Remote Cal Adapter

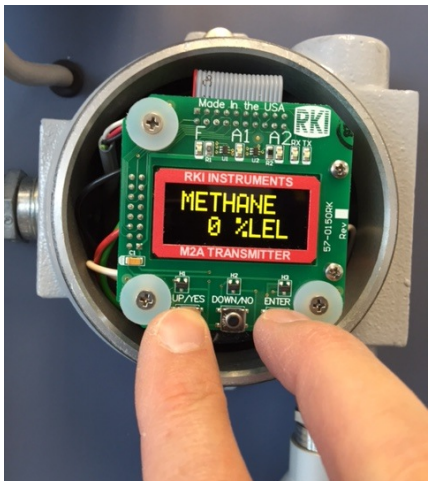
- Remote calibration adapter for catalytic bead LEL sensor shown.

Configuration Mode



Configuration Mode

- Press the UP/YES and ENTER buttons to enter the CONFIG mode.



Configuration Mode

- The Configuration Mode allows the user to change the M2A Transmitter's parameters.
- The Configuration Mode includes a 5 minute time out feature if a control button is not pressed for 5 minutes.

Configuration Mode

- Press the UP/YES button to continue.

Configuration Mode

- Configuration Mode
  - Alarm-1 (Set Point)
  - Alarm-1 (activation-Increase/Decrease)
  - Alarm-1 (relay action N.DE-EN or N. EN)
  - Alarm-1 (relay reset LATCH or SELF-RST
  - A1 OnDY (alarm On delay, 1 sec std.)

Configuration Mode

- ALARM-2 (level)
- ALARM-2 (activation Increase/Decrease)
- ALARM-2 (relay action N. DE-EN / N. EN)
- ALARM-2 (relay reset, LATCH/SELF-RST)
- A2 OnDy (alarm 2 On delay, 1 sec. std.)
- ZeroSupp (0.5% for O2, 2% of scale for others
- Filter (5 sec.) reduces jumpy or noisy signals
- CAL Time (15 minutes) adjustable from 5 minutes to 30 minutes.

Gas Type

- While in normal operation, press and HOLD the YES and DOWN/NO buttons for five seconds.
- Release when display shows Select Gas Type?

Gas Type

- This is dependent on the type of M2A that you have.
- Press the UP/YES button to select gas type.
- Once gas type is selected M2A will ask if you want to save change.
- Press UP/YES button to save changes.

Detector Type

Detector Head Input Type	Description
▪H2S	▪An H2S detector is connected to the M2A Transmitter with 2 wires using the TOX + and - terminals from the detector/transmitter terminal strips.
▪CO	▪A CO detector is connected to the M2A Transmitter with 2 wires using the TOX + and - terminals from the detector/transmitter terminal strips.
▪OXYGEN	▪An oxygen detector is connected to the M2A Transmitter with 2 wires using the OXY + and - terminals from the detector/transmitter terminal strips.
▪LEL	▪An LEL detector head is wired to the M2A Transmitter with 4 wires using the LEL BLK, GRN, WHT, and RED terminals.

4-20 mA Output Operation

- If you enter calibration mode the output is fixed at 3.5 mA or 17.4 mA for O2.
- If the Transmitters input power decreases below 9.5 Volts and is in low power alarm. Output is fixed below 2.4 mA until power alarm clears.
- If the Transmitter goes into fail condition after 30 second delay. Output is fixed below. 2.4 mA until fault alarm clears.

Trouble Shooting

Symptom	Probable Cause	Corrective Action
• No OLED Display on M2A transmitter	• Bad display assembly • Bad terminal relay board	• Replace M2A Display • Replace terminal relay board
• No Modbus on M2A	• Modbus needs to be enabled • Modbus settings incorrect • Modbus function inoperative	• Enable Modbus in setup mode • Correct Modbus settings • Replace terminal relay board
• Unable to access calibration mode using magnetic wand	• Incorrect magnet being used • M2A lid not screwed down tightly • Bad Hall Effect switch	• Use RKI magnet • Tighten lid • Replace OLED assembly
• No 4 to 20 mA signal output on M2A	• Bad terminal relay board	• Replace terminal relay board
• Alarm function on M2A	• Incorrect alarm settings • Excessive alarm delay	• Check and correct alarm set points • Adjust alarm delay to a reasonable setting
• M2A will not power up	• Incorrect voltage to terminal relay board • No voltage applied	• Verify that proper voltage is applied to instrument. • Turn on RKI controller or verify wiring from power source
• Instrument displays incorrect gas type on M2A	• Internal gas settings incorrect	• Reset gas settings to match sensor installed.
• Readings unstable or random alarms on M2A	• May have bad sensor • EMI or RFI interference • Improper grounding • Running from power source that has a negative ground	• Replace sensor • Verify that instrument is properly shielded and grounded. • Verify proper grounding • Use power source with floating ground

Questions?

INSTRUMENTS

Gas Detection For Life

Training Notes