

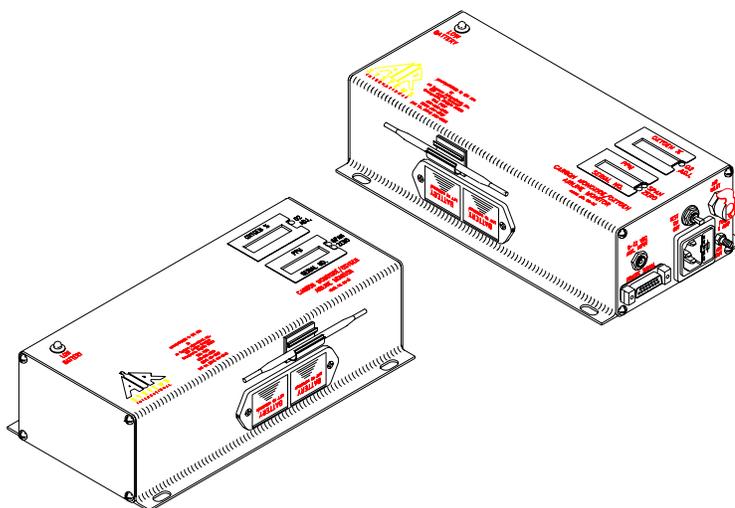


Air Systems International, Inc.
Registered to ISO 9002
Certificate No. A5033

INSTRUCTION MANUAL

CARBON MONOXIDE/OXYGEN AIRLINE MONITOR

MODELS CO2-91 & CO2-91ACR



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OVERVIEW

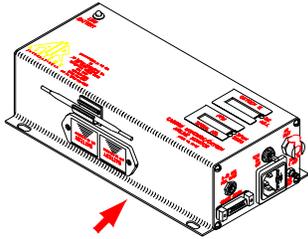
An airline monitoring instrument is used in breathing air applications because CO can be ingested into compressor intakes by external exhaust emissions or from the combustion of hydrocarbons (Reference OSHA standard 1910.134). The oxygen monitor is used to verify O₂ content per CGA G7.1 1989-1998 Grade D & E air quality standards. The CO2-91 series monitors have been developed to continuously monitor CO/O₂ concentrations in breathing air systems. This instrument offers continuous, fast response, accurate (+/- 1% full scale) CO concentration levels displayed in parts-per-million (ppm) and Oxygen levels displayed in percentage. The instruments activate local and remote audible/visual alarms when CO concentrations are detected in the sample stream or the oxygen level drops below 19.5%.

SPECIFICATIONS

Size:	2.75" H x 7.0" L x 5.1" W (6.9cm x 17.7cm x 12.9 cm)
Weight:	2.8 LBS. (1.27KG)
Case:	Extruded aluminum Anodized black
Voltage:	115 VAC and/or 9 - 15 VDC
Shielding:	Internal RFI/EMI filters
Fuse:	115 VAC 1 amp fast acting
Operating Temperature:	4 to 113 degrees F (-20 to 45 degrees C)
Humidity Range:	10% to 90% RH
Flow Requirement:	50 - 100 cc
Display:	3 digit LCD (CO concentration) 3 digit LCD (O2 percentage)
Output Signals:	CO2-91 (DC only) CO2-91ACR (AC / DC) via 15 pin D-subminiature connector
Test Circuit:	Manually activated
Sensor Type:	Sealed electrochemical sensor for Carbon Monoxide Sealed electrochemical sensor for Oxygen
Accuracy:	+/- 1% full scale
Response:	90% in 10-15 seconds
Detectable Range:	0 - 200ppm CO 15 - 23% O2
Calibration:	Manual zero and span adjustments Manual O2 span adjustment
Alarm Setting:	10ppm CO (5ppm Canadian) 19.5% O2
Warning:	*Normal operation - Green light *High CO - Red Light *Low O2 - Red Light *High CO/Low O2 - Audible Alarm Low Battery - Amber Light
Warranty:	2 years from original date of purchase for unit and CO sensor, 1 year warranty on O2 sensor

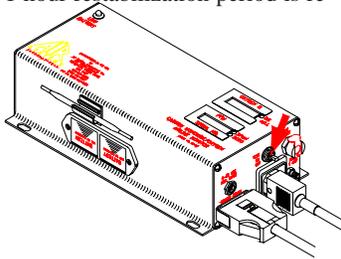
*These indicators/alarms may be installed on the monitor or in a remote location.

SETUP PROCEDURE



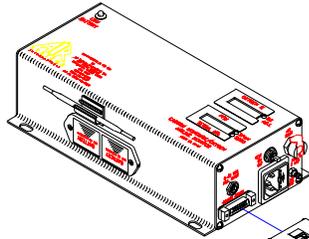
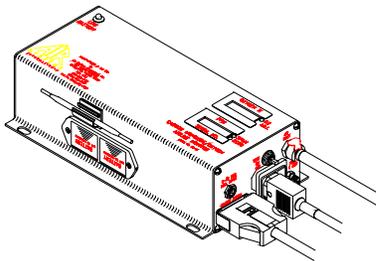
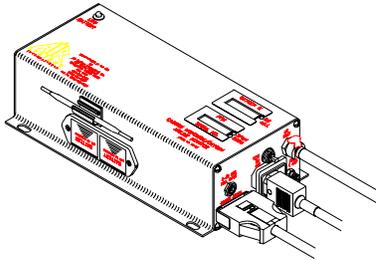
STEP 1)

Install new 9-volt batteries. These batteries continuously provide a required bias voltage to the CO and O₂ sensors and power the monitor in the event of AC power loss. If AC and DC power are removed for a period of 2 hours or more, a 1 hour restabilization period is required.



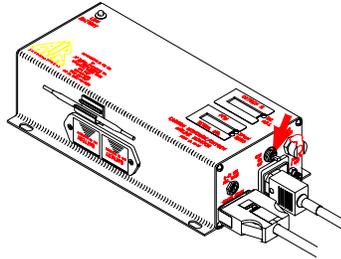
STEP 4)

Place the "ON/OFF/TEST" switch to the "ON" position. Allow 30 seconds for the readout to stabilize. If a reading other than "ZERO" for CO or 20.9% for O₂ is displayed, calibration of the monitor may be necessary. See calibration procedure.



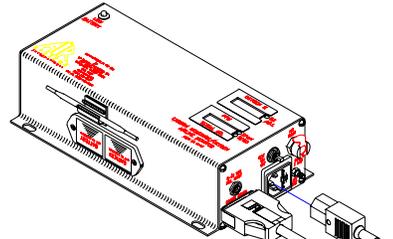
STEP 2)

Connect alarm cable to the remote signal jack.



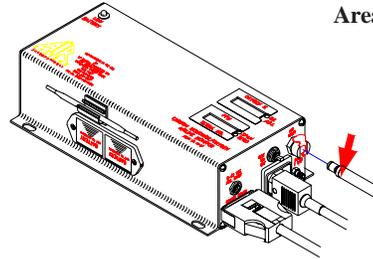
STEP 5)

Hold the "ON/OFF/TEST" switch in the "TEST" position. All local and remote audible/visual indicators will activate. If all indicators do not activate see troubleshooting guide.



STEP 3)

Connect AC power cord to the 115 VAC jack.



STEP 6)

Connect air sample tube from filtration system to the monitor's air sample inlet connect port. Assure that the sample air flow rate is within the 50 - 100cc (green bar area). The monitor is now operational.

Green Bar Area



OPERATION

- 1) The instrument will analyze the air sample and display the CO concentration in parts-per-million (ppm) and O₂ in percentage. The system's green "NORMAL" operation light will illuminate and the red "HIGH CO" light will flicker faintly approximately every second when the CO level is below 10ppm (5ppm Canadian) and above 19.5% O₂ level.
- 2) When the CO concentration level exceeds the alarm set point, the green "NORMAL" light will turn off, the red "HIGH CO" light will illuminate, the audible alarm will sound and the remote alarm connections will energize.
- 3) When the O₂ percentage drops below the alarm set point, 19.5% O₂, the green "NORMAL" light will turn off, the red "LOW O₂" light will illuminate, the audible alarm will sound and the remote alarm connections will energize.
- 4) When CO concentration levels drop below the alarm set point or O₂ levels rise above the alarm set point, all alarm indicators will deactivate and return to "NORMAL" operation.
- 5) An alarm function test can be performed at any time by lifting the "ON/OFF/TEST" switch to the "TEST" position.

SHUTDOWN

- 1) Turn monitor "OFF" at the "ON/OFF/TEST" switch after all workers have disconnected from the breathing air system.
- 2) DO NOT remove 9-volt batteries from the monitor, these are used to maintain bias voltage to the sensors; this keeps the sensor continuously ready for immediate future use.

MAINTENANCE

1) Calibrate the monitor monthly or whenever the reading may be questionable. A calibration sticker should be affixed for future reference. We recommend the use of Air Systems' calibration kits to obtain an accurate calibration.

Note: If the monitor can not be calibrated, sensor replacement may be necessary. Contact factory for further information.

2) Replacement sensors are shipped with a metal spring installed between the electrodes (CO cell only). Do not remove the clip until the sensor is to be installed into the monitor. O₂ cells are shipped in a semipermeable membrane package. Do not remove from package until sensor is to be installed into the monitor.

3) Replace 9-volt batteries when the amber "LOW BATTERY" light illuminates. If the monitor is not used for 90 days, check the 9-volt battery condition and replace if necessary.

ORDERING INFORMATION

CO-91NS - "New" CO replacement sensor

CO2-O2 - "New" O₂ replacement sensor

BBK-20 - Small Calibration Kit for CO monitor; includes 20ppm CO gas, zero air, preset regulator, tubing and case - 17 liter cylinders

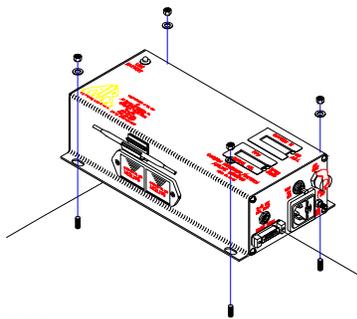
BBK-20103 - Large Calibration Kit for CO monitor; includes 20ppm CO gas, zero air, preset regulator, tubing and case - 103 liter cylinders

BBK-10 - Small Calibration Kit for Canadian CO monitor settings; includes 10ppm CO gas, zero air preset regulator, tubing and case - 17 liter cylinders

BBG-O2 - O₂ Sensor Test Gas - 17 liter cylinder - 18%

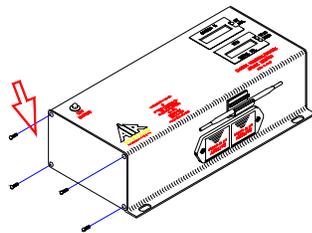
Note: Individual cylinders are available. Consult factory for part numbers and pricing.

SENSOR REPLACEMENT



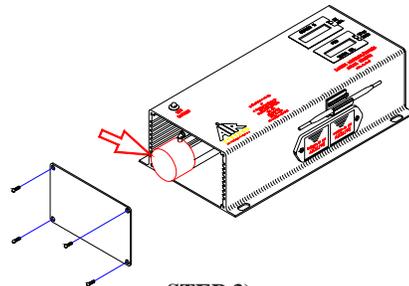
STEP 1)

Disconnect all external connections.
Remove CO/O₂ monitor from system.



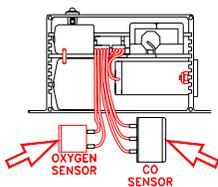
STEP 2)

Remove the four screws from the monitor end plate.



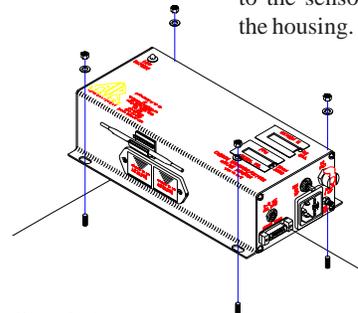
STEP 3)

Remove end plate to gain access to the sensor cups from outside the housing.



CO SENSOR CONNECTIONS
ARE AS FOLLOWS:
RED LEAD-SENSING
BLUE LEAD-REFERENCE
BLACK LEAD-CONTROL

O₂ SENSOR CONNECTIONS
ARE AS FOLLOWS:
GREY LEAD-NEGATIVE
WHITE LEAD-POSITIVE



STEP 5)

Reassemble monitor and install back into system. Connect all external connections. Allow monitor to stabilize and recalibrate.

STEP 4)

Remove sensor from sensor cup and remove leads. Take the new sensor and remove the metal spring (CO sensor only). Reattach leads to the proper terminals on the new sensor. Install new sensor into sensor cup.

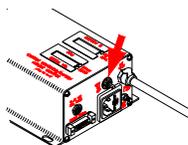
CALIBRATION PROCEDURE

Do not use inert gases to zero the monitor. This will cause premature failure of the sensor.

CO ZERO ADJUSTMENT

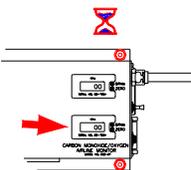
To zero the instrument, follow the steps below. Zero calibration gas should be used to properly “zero” the instrument and assure that a valid calibration is achieved. If zero adjustment cannot be made as indicated, sensor replacement may be necessary. ***After each monitor adjustment outlined in the following steps, allow time for the changes to stabilize.***

1. Place the “on/off/test” switch to the “on” position.



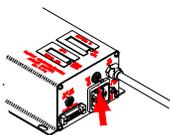
2. Allow 30 seconds for the readout to stabilize.
The green indicator light will illuminate.

Note: Most indicators/alarms may be located on a remote panel or on the monitor.



3. Hold the “on/off/test” switch in the “test” position.
The following will occur:
 - Audible alarm will sound
 - Green indicator LED and the O₂ red indicator will flash. These will alternate with the CO red indicator.
 - Amber low battery indicator LED will illuminate

This test ensures the circuitry is operable and the continuity to the sensor is proper. Release the switch.



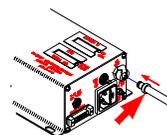
4. Remove air sample inlet tube.



5. Install regulator on the zero air cylinder reference gas.

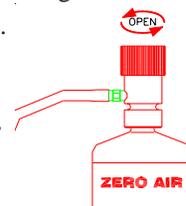


6. Attach the clear tubing with male plug into the monitor air sample inlet.

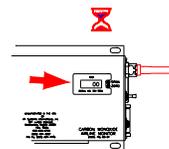


7. Open gas regulator by turning the knob two (2) turns counterclockwise.

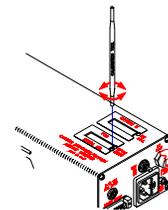
Note: A controlled orifice in the regulator will allow the gas to flow at approximately 300 cc/min.



8. Allow digital readout to stabilize.



9. Adjust "zero" pot adjustment screw (clockwise to increase, counterclockwise to decrease) until a "00" reading is obtained.



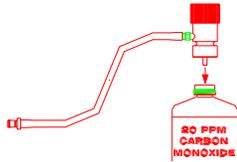
10. Turn off the regulator and disconnect the tubing from the zero air regulator.



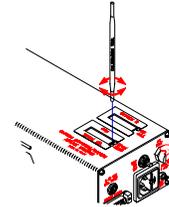
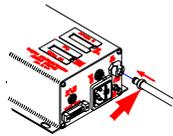
CO/O₂ SPAN ADJUSTMENT

Use only 10 - 20 ppm CO gas for calibration. Using a higher concentration may decrease accuracy on the lower scale. Note: 10ppm gas must be used to satisfy Canadian CO requirements.

1. Install on the CO air cylinder reference gas.
5. Adjust the "span" pot adjustment screw (clockwise to increase, counterclockwise to decrease) until the digital display reads the same concentration (ppm) as the test gas.

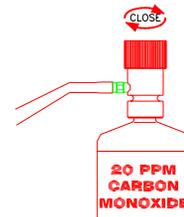


2. Connect the plug to the monitor.



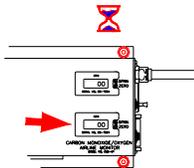
3. Open the gas regulator fully by turning the knob at least two (2) turns counterclockwise.

Note: Calibration gas concentration is located on the cylinder label.



6. Turn regulator off and repeat zero adjustment procedure (display should return to a "00" reading).

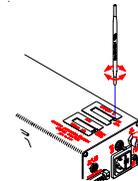
4. Allow digital display to stabilize approximately 15-30 seconds.



O₂ SENSOR ADJUSTMENT

7. Make sure the monitor is not located in an oxygen deficient atmosphere during sensor testing as an "erroneous" reading will result. Turn adjustment screw (clockwise to increase, counterclockwise to decrease) until a 20.9% reading is obtained. An optional method for testing the O₂ sensor is to apply a known concentration of O₂ across the sensor. Order Air Systems' Part Number BBG-02, 18% oxygen cylinder. The O₂ sensor should respond to $\pm 0.2\%$ of the cylinder concentration. The alarm will activate at approximately 19.5% O₂.

Note: Normal ambient oxygen level is 20.9%.



THE MONITOR IS NOW CALIBRATED AND SHOULD BE RECALIBRATED MONTHLY OR IF ACCURACY IS QUESTIONABLE. CHECK LOCAL REQUIREMENTS AND RECALIBRATE AS REQUIRED.