this manual must be read carefully and followed by all persons who have or will have the responsibility for using or servicing this equipment. This equipment will perform as designed only if used according to the instructions. Otherwise it could fail to perform as designed, causing personal injury or death.

WARNING
Warranty

Air Systems’ manufactured equipment is warranted to the original user against defects in workmanship or materials under normal use for one year from the date of purchase. Any part which is determined by Air Systems to be defective in material or workmanship will be, as the exclusive remedy, repaired or replaced at Air Systems’ option. This warranty does not apply to electrical systems or electronic components. Electrical parts are warranted, to the original user, for 90 days from the date of sale. During the warranty period, electrical components will be repaired or replaced at Air Systems’ option. No other warranty, expressed or implied, as to description, quality, merchantability, fitness for a particular purpose, or any other matter is given by Air Systems in connection herewith. Under no circumstances shall the seller be liable for loss of profits, any other direct or indirect costs, expenses, losses, or damages arising out of defects in, or failure of the product or any part thereof.

The purchaser shall be solely responsible for compliance with all applicable Federal, State and Local OSHA and/or MSHA requirements. Although Air Systems International believes that its products, if operated and maintained as shipped from the factory and in accordance with our “operations manual”, conform to OSHA and/or MSHA requirements, there are no implied or expressed warranties of such compliance extending beyond the limited warranty described herein. Product designs and specifications are subject to change without notice. Rev. 2, 12/98

Air leaks are not covered under warranty except when they result from a defective system component, i.e. an on/off valve or regulator or upon initial delivery due to poor workmanship. Air leaks due to poor delivery or damage will be covered under delivery claims. Minor air leaks are part of routine service and maintenance and are the responsibility of the customer just as are filters and oil changes.
The monitor will analyze the air sample and display the CO concentration in parts per million (ppm). The system’s green “NORMAL” operation light will illuminate and the red “HIGH CO” light will flicker approximately every second when the CO level is below 10ppm (5ppm Canadian). If 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. Once the CO concentration levels drop below the alarm set point, all alarm indicators will deactivate and the unit will return to “NORMAL” operation.

### Carbon Monoxide Monitor Overview

**Test Circuit**: Manually activated  
**Sensor Type**: Sealed electrochemical sensor for Carbon Monoxide  
**Accuracy**: +/-1% full scale  
**Response**: 90% in 10-15 seconds  
**Detectable Range**: 0-200 ppm CO  
**Calibration**: Manual CO zero and span adjustments  
**Alarm Setting**: 10 ppm CO (5 ppm - Canadian)  
**Warning Signals**: Normal operation - Green Light  
High CO - Red Light  
High CO - Audible Alarm  
Low Battery - Amber Light  
**Warranty**: 2 years from original date of purchase

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Circuit</th>
<th>Sensor Type</th>
<th>Accuracy</th>
<th>Response</th>
<th>Detectable Range</th>
<th>Calibration</th>
<th>Alarm Setting</th>
<th>Warning Signals</th>
<th>Warranty</th>
</tr>
</thead>
</table>
| Size                   | Manually activated | Sealed electrochemical sensor for Carbon Monoxide | +/-1% full scale | 90% in 10-15 seconds | 0-200 ppm CO | Manual CO zero and span adjustments | 10 ppm CO (5 ppm - Canadian) | Normal operation - Green Light  
High CO - Red Light  
High CO - Audible Alarm  
Low Battery - Amber Light | 2 years from original date of purchase |
| Weight                 | 2.8 LBS. (1.27kg.) | Voltage 115 VAC and/or 9-16 VDC | 250 VAC/1 amp fast acting |
| Case                   | Extruded Aluminum - anodized black | Shielding Internal RFI/EMI filters | 4° to 113° Fahrenheit  
(-15.5° to 45° Celsius) | 10% to 90% relative humidity | Flow Requirement 50 - 100 cc/min |
| Display                | 3 digit LCD CO concentration | Display 3 digit LCD CO concentration |

### 15 Pin Connector Wiring Diagram

**CO-91**

**CO-91ACR**

- **J1**
  - P1 (RED)
  - (WHT)
  - (BLU)
  - (YEL)
  - (GRN)
  - (BRN)
  - (ORG)
  - (BLK)

- **3955 CO**
  - (BLK)
  - (GRN)
  - (BRN)
  - (ORG)
  - (BLK)

- **DC REMOTE ALARM JACK**
  - 1
  - 2
  - 3
  - 4

- **AC REMOTE ALARM SIGNAL**
  - 1
  - 2
  - 3
  - 4
Carbon Monoxide Monitor System Components
<table>
<thead>
<tr>
<th>ITEM #</th>
<th>DESCRIPTION</th>
<th>PART #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD Display</td>
<td>MONC703</td>
</tr>
<tr>
<td>2</td>
<td>Span Potentiometer</td>
<td>MONC702A</td>
</tr>
<tr>
<td>3</td>
<td>Alarm Set Point Potentiometer</td>
<td>MONC702A</td>
</tr>
<tr>
<td>4</td>
<td>Zero Potentiometer</td>
<td>MONC702</td>
</tr>
<tr>
<td>5</td>
<td>Air Sample Inlet Socket</td>
<td>MONC001</td>
</tr>
<tr>
<td>6</td>
<td>Air Sample Plug</td>
<td>MONC002</td>
</tr>
<tr>
<td>7</td>
<td>Air Exhaust Port</td>
<td>MONC003</td>
</tr>
<tr>
<td>8</td>
<td>On/Off/Test Switch</td>
<td>MONC007</td>
</tr>
<tr>
<td>9</td>
<td>Recessed Plug With Fuse Holder</td>
<td>MONC020</td>
</tr>
<tr>
<td>10</td>
<td>1 Amp Fast Acting Fuse, 5 X 20Mm</td>
<td>ELF001</td>
</tr>
<tr>
<td>11</td>
<td>15 Pin Socket</td>
<td>MONC520</td>
</tr>
<tr>
<td>12</td>
<td>Faceplate/Endplate Screw</td>
<td>MONC023</td>
</tr>
<tr>
<td>13</td>
<td>Main Circuit Board Assembly</td>
<td>CO-91PCB</td>
</tr>
<tr>
<td>14</td>
<td>Power Supply Board</td>
<td>CO-91PSB</td>
</tr>
<tr>
<td>15</td>
<td>Sensor Connector (Soldered To PCB)</td>
<td>MONC509</td>
</tr>
<tr>
<td>16</td>
<td>Battery Box</td>
<td>MONC006</td>
</tr>
<tr>
<td>17</td>
<td>9 Volt Battery</td>
<td>ELB9V</td>
</tr>
<tr>
<td>18</td>
<td>Calibration Tool</td>
<td>MONC028</td>
</tr>
<tr>
<td>19</td>
<td>End Plate</td>
<td>CO-91BEP</td>
</tr>
<tr>
<td>20</td>
<td>Aluminum Housing</td>
<td>CO-91HOU</td>
</tr>
<tr>
<td>21</td>
<td>Led Socket</td>
<td>MONC009LA</td>
</tr>
<tr>
<td>22</td>
<td>Yellow Led</td>
<td>MONC008NS</td>
</tr>
<tr>
<td>23</td>
<td>Led Socket And Yellow Led</td>
<td>CO-91LED</td>
</tr>
<tr>
<td>24</td>
<td>PPM/Serial No. Sticker</td>
<td>MONC031</td>
</tr>
<tr>
<td>25</td>
<td>Battery Box Connector (Soldered To PCB)</td>
<td>MONC516</td>
</tr>
<tr>
<td>26</td>
<td>Led Connector (Soldered To PCB)</td>
<td>MONC511</td>
</tr>
<tr>
<td>27</td>
<td>12 VDC Power Socket</td>
<td>MONC522</td>
</tr>
<tr>
<td>28</td>
<td>12 Volt Power Plug (Optional)</td>
<td>ELJP018</td>
</tr>
<tr>
<td>29</td>
<td>12 Volt Cable (Order By The Foot)</td>
<td>ELCB035</td>
</tr>
<tr>
<td>30</td>
<td>CO Sensor</td>
<td>CO-91NS</td>
</tr>
<tr>
<td>31</td>
<td>CO Sensor Holder</td>
<td>MONC810</td>
</tr>
<tr>
<td>32</td>
<td>CO Sensor Electrical Leads</td>
<td>CO-91SL</td>
</tr>
<tr>
<td>33</td>
<td>90° Hose Barb</td>
<td>MONC811</td>
</tr>
</tbody>
</table>
Set-Up/Operation

STEP 1)
Check and replace 9 volt batteries if necessary. These batteries provide a bias voltage to the CO sensor and power the monitor in the event of AC power loss. If AC and DC power are removed from the monitor for 2 hours or more, a 1 hour restabilization period is required before use.

STEP 2)
Connect remote signal cable, power plug, and air sample hose to the monitor.

STEP 3)
Place the “ON/OFF/TEST” switch in the “ON” position. Allow 30 seconds for the display to stabilize. If a reading other than “00” is displayed, calibration of the monitor may be necessary. See calibration procedure beginning on page 8.

STEP 4)
Place the “ON/OFF/TEST” switch in the “TEST” position. All local and remote alarms should activate. If not see the troubleshooting chart below.

STEP 5)
Adjust flowmeter so flow ball hovers between 50 and 100 cc/min.

Troubleshooting

<table>
<thead>
<tr>
<th>Monitor does not turn on</th>
<th>Check and replace 9 volt batteries. Check power cord for damage. Make sure power cord is plugged into 115 VAC. Check and replace fuse in recessed plug, 1 amp fast acting, 5 x 20mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lights and alarms do not activate</td>
<td>Check for loose connections on 15 pin connector. Check for loose connections on the indicators.</td>
</tr>
<tr>
<td>Lights are flashing randomly</td>
<td>Remove left endplate and check sensor connections.</td>
</tr>
</tbody>
</table>
Sensor Replacement

Replacement sensors are shipped with a metal spring installed between the electrodes. Do not remove the clip until the sensor is to be installed into the monitor.

Step 1) Disconnect all external connections.
Remove CO monitor from the unit.

Step 2) Remove the four screws from the monitor's left endplate.

Step 3) Remove endplate to gain access to the sensor cup.

Step 4) Remove sensor from sensor cup and remove leads. Take the new sensor and remove the metal spring. Reattach leads to the proper colored terminals on the new sensor. Install new sensor into sensor cup.

Step 5) Reassemble monitor and reinstall in unit.
Connect all cables and air sample hose. Allow monitor to stabilize 30 minutes to 1 hour and recalibrate.
**Calibration Procedure**

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

**CO Monitor Zero Adjustment**

To zero the monitor, follow the steps below. Zero calibration gas should be used to properly “zero” the monitor 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 steps, allow time for the changes to stabilize.*

**STEP 1)**
Place the “ON/OFF/TEST” switch in the “ON” position.

**STEP 2)**
Allow 30 seconds for the readout to stabilize. The green indicator will illuminate.

**STEP 3)**
Hold the “ON/OFF/TEST” switch in the “TEST” position. The following will occur:
- Audible alarm will sound
- Green LED will flash
- Amber Low Battery indicator on monitor will illuminate
- Red LED will be on
This test ensures the circuitry is operable and continuity to the sensor is proper. Release the switch.

**STEP 4)**
Remove the air sample inlet tube.

**STEP 5)**
Install regulator on the zero air cylinder reference gas.

**STEP 6)**
Turn the knob on the regulator counterclockwise to allow the flow of gas thru the hose. Verify flow of gas thru the hose via touch or sound.

**STEP 7)**
Attach the clear tubing with the male plug to the air sample inlet on the monitor.

**STEP 8)**
Allow digital readout to stabilize approximately 15-30 seconds.

**STEP 9)**
Adjust the “zero” adjustment screw (clockwise to increase or counterclockwise to decrease) until a reading of “00” is obtained.

**STEP 10)**
Turn the regulator off and disconnect the regulator from the zero gas cylinder.
Calibration Procedure

**CO Monitor Span Adjustment**

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

**STEP 1)**
Install regulator on the CO calibration gas cylinder.

**STEP 2)**
Turn the knob on the regulator counterclockwise to allow the flow of gas thru the hose. Verify flow of gas thru the hose via touch or sound.

**STEP 3)**
Connect the plug to the air sample inlet on the monitor.

**STEP 4)**
Allow digital readout to stabilize 15-30 seconds.

**STEP 5)**
Adjust the “span” adjustment screw (clockwise to increase or counterclockwise to decrease) until the digital readout reads the same as the concentration (ppm) as printed on the calibration gas cylinder.

**STEP 6)**
Turn the regulator off and repeat the “zero” adjustment procedure. The digital readout should return to a “00” reading.

*The monitor is now calibrated and should be recalibrated monthly or if accuracy is questionable. Check local requirements and recalibrate as required.*