MRLDS-450 Refrigerant Gas Detection Installation and Operation Manual
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1 Introduction

1.1. About this Manual

Thank you for investing in an MRLDS-450 Gas Detector. To ensure operator safety and the proper use of the gas detector, please read the contents of this manual for important information about the operation and maintenance of the instrument.

IMPORTANT: Before installing this product, carefully read and strictly follow the instructions in the manual.

1.2. Iconography

<table>
<thead>
<tr>
<th>Alert</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger</td>
<td>☢️</td>
<td>Imminently hazardous situation which, if not avoided, will result in serious injury or death.</td>
</tr>
<tr>
<td>Warning</td>
<td>⚠️</td>
<td>Potentially hazardous situation which, if not avoided, could result in serious injury or death. Potential electrical shock hazard which, if not avoided, could result in serious injury or death.</td>
</tr>
<tr>
<td>Caution</td>
<td>⚠️</td>
<td>Potentially hazardous situation which, if not avoided, could result in physical injury or damage to the product or environment. It may also be used to alert against unsafe practices.</td>
</tr>
<tr>
<td>Important</td>
<td>⚠️</td>
<td>Additional information on how to use the product.</td>
</tr>
</tbody>
</table>

Table 1-1 - Icons
1.3. General Safety Requirements

IMPORTANT: Before using this product, carefully read and strictly follow the instructions in the manual. Ensure that all product documentation is retained and available to anyone operating the instrument.

DANGER! This instrument is neither certified nor approved for operation in oxygen-enriched atmospheres. Failure to comply may result in personal injury or death.

DANGER! This instrument has not been designed to be intrinsically safe for use in areas classified as being hazardous locations. For your safety, DO NOT use it in hazardous (classified) locations.

WARNING! Use this product only for the purposes specified in this document and under the conditions listed.

CAUTION! In the event of an alarm or over-range condition, the sensor must be re-calibrated to ensure continued accuracy.

CAUTION! This product must be re-calibrated if installed in a non-room condition environment (For example, temperature or humidity extremes).

CAUTION! The gas diffusion path can become occluded (moisture, dust, debris, frozen condensation) over time resulting in reduced or complete lack of gas detection and alarming function. Routine visual inspection of the gas detector and bump testing are suggested to ensure proper gas detection and alarm function.

CAUTION! Except for maintenance detailed in this manual, these products should only be opened and/or serviced by authorized Emerson Technical Support personnel. Failure to comply may void the warranty.

CAUTION! Operator assumes responsibility for complying with all laws, rules and regulations governing the use of this product.
CAUTION! Use only genuine Emerson parts and accessories. Failure to comply may impair the operation of the product and/or void the warranty.

CAUTION! Only operate the product within the framework of a risk-based alarm signaling concepts.

WARNING! The gas diffusion path can become occluded (moisture, dust, debris, frozen condensation) over time, resulting in reduced or complete lack of gas detection and alarming function. Routine visual inspection of the gas detector and bump testing are recommended to ensure proper gas detection and alarm function. For information on calibrating the sensor, refer to the “Care and Maintenance” section of this manual.

1.4. Safe Connection of Electrical Devices

WARNING! Before connecting this instrument to electrical devices not mentioned in this manual, consult the manufacturer or a qualified professional. Failure to comply may result in personal injury and/or damage to the product.
2 Product Description

2.1. Intended Uses/Applications

MRLDS-450 Gas Detection Series instruments continuously monitor ambient air (indoor or outdoor) for the following gas types:

- Refrigerants
- Oxygen
- Toxic and combustible gases

The MRLDS-450 refrigerant gas detector is designed for use in refrigeration applications and with the integrated audio-visual alarm indication, can be operated as a stand-alone unit (with additional local alarm signaling as required), or it may be connected to a facility's building management system (BMS). It enables compliance with refrigerant safety codes (ASHRAE 15 and EN378) and alarms to alert personnel in the event of a refrigerant leak.

---

**DANGER!** This instrument is neither certified nor approved for operation in oxygen-enriched atmospheres. Failure to comply may result in EXPLOSION.

---

**DANGER!** This instrument has not been designed to be intrinsically safe for use in areas classified as being hazardous locations. For your safety, DO NOT use it in hazardous (classified) locations.

---

2.2. MRLDS-450

2.2.1. MRLDS-450 Product Overview

The Emerson MRLDS-450 continuously monitors indoor or outdoor ambient air for the following gases:

- Refrigerants
- Oxygen
- Toxic and combustible gases
With the integrated Modbus communication, analog output and relays, the instrument can be operated as a stand-alone unit or as a third-party device capable of accepting digital and/or analog outputs from the gas detectors, such as a Building Management System (BMS) or a Supervisory Controller. The instrument is designed to be installed in non-classified, non-hazardous, permanent locations.

![MRLDS-450](image)

**Figure 2-1 - MRLDS-450**

### 2.2.2. MRLDS-450 Design Features

- Transmitter: IP66 rated ABS enclosure
- Power options:
  - 24VAC
  - 19.5 to 28.5VDC
- Diagnostic/Status LED (3 color): Green, Orange, and Red
- Configurable output signal options
  - 3× Relays (high alarm/low alarm/fault)
  - 1× Analog Output (4 to 20mA, 0 to 5V, 0 to 10V, 1 to 5V, 2 to 10V)
  - Digital Output (Modbus RTU signal)

Bluetooth communication allows for full instrument configuration, initiation of calibration, bump test and functional test mode, and viewing of status information via the corresponding MRLDS-450 iOS/Android app.

Non-intrusive magnetic wand can be used to initiate calibration of the device.
2.2.3. MRLDS-450 Component Overview

![MRLDS-450 Component Locations](image)

Table 2-1 - MRLDS-450 Component Descriptions

<table>
<thead>
<tr>
<th>#</th>
<th>Component Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M16 Cable Glands (x6)</td>
</tr>
<tr>
<td>2</td>
<td>Rubber Gasket</td>
</tr>
<tr>
<td>3</td>
<td>Internal Alarm Buzzer</td>
</tr>
<tr>
<td>4</td>
<td>Power Connections (x2)</td>
</tr>
<tr>
<td>5</td>
<td>Digital Connection (Modbus)</td>
</tr>
<tr>
<td>6</td>
<td>Analog Connection</td>
</tr>
<tr>
<td>7</td>
<td>Tactile Switch #1</td>
</tr>
<tr>
<td>8</td>
<td>Ribbon Cable Connection (To Sensor)</td>
</tr>
<tr>
<td>9</td>
<td>Tactile Switch #2</td>
</tr>
<tr>
<td>10</td>
<td>Relay 3 Connection (FAULT)</td>
</tr>
<tr>
<td>11</td>
<td>Relay 2 Connection (HIGH)</td>
</tr>
<tr>
<td>12</td>
<td>Relay 1 Connection (LOW)</td>
</tr>
<tr>
<td>13</td>
<td>Magnetic (Mag) Switch #1</td>
</tr>
<tr>
<td>14</td>
<td>Magnetic (Mag) Switch #2</td>
</tr>
<tr>
<td>15</td>
<td>M20 Cable Glands (x2)</td>
</tr>
</tbody>
</table>
3 Installation

CAUTION! The manufacturer of this product requires that a bump test or calibration be performed following installation to verify instrument functionality.

3.1. General Information

Every detail of installation site selection is critical to ensure overall system performance and effectiveness. Strict compliance and considerable thought must be given to every detail of the installation process, including, but not limited to the following:

- Regulations as well as local, state, and national codes that govern the installation of gas monitoring equipment.
- Electrical codes that govern the routing and connection of electrical power and signal cables to gas monitoring equipment.
- The full range of environmental conditions to which the instruments will be exposed.
- The physical characteristics of the gas or vapor to be detected.
- The specifics of the application (For example, possible leaks, air movement/draft, etc.)
- The degree of accessibility required for maintenance purposes.
- The types of optional equipment and accessories that will be used with the system.
- Any limiting factors or regulations that would affect system performance or installations.
- Wiring details, including:
  - The MRLDS-450 enclosure provides the following cable gland openings:
    - 2×, M20, supports 10-14mm cable outer diameter
    - 6×, M16, supports 4-8mm cable outer diameter
  - Secondary circuit must be supplied from an isolating source.
  - The wiring for the relays must be selected and fused according to the rated voltages, currents, and environmental conditions.
  - If stranded conductions are used, ferrule should be used.
  - To comply with RFI immunity regulations, it is necessary to ground the shield of the communications cable at the PLC, GDA controller, front-end controller or Building Management System (For example, the chassis, the ground bus-bar, etc.).
3.2. Restrictions

The installation location must have appropriate supply power available for the instrument (For example, 19.5 to 28.5VDC or 24VAC). This ultimately determines the distance the instrument can be mounted from the controller or power supply.

3.3. Mechanical Installation

**WARNING!** DO NOT allow the lid/sensor to hang from the ribbon cable. Failure to comply may result in damage to the product.

1. Using the provided hardware, securely mount the MRLDS-450 Gas Detector according to the product dimensions, maximum wiring lengths and following considerations:
   a. Environment: the full range of environmental conditions when selecting a location.
   b. Application: the specifics of the application (possible leaks, air movement/draft, etc.) when selecting a location.
   c. Accessibility: the degree of accessibility required for maintenance purposes when selecting a location.
   d. Target Gas: the specific gravity of the target gas when selecting the height of the instrument.
2. Using a 5/32” (4mm) hex key/allen wrench (not included) remove the lid and disconnect the ribbon cable from the base.
3. Set the lid and rubber gasket aside to be reinstalled later.

3.4. Electrical Installation

3.4.1. Preparations

**IMPORTANT:** If analog output is configured for 4 to 20mA output, ensure that the current loop is connected to a sinking current loop monitor before powering on the instrument. Otherwise, a fault may be displayed indicating an open loop condition. If analog output is unused, ensure it is configured as a voltage output (1-5V) to prevent an open loop fault condition. The analog output is designed as sourcing.

**WARNING!** Ensure wiring for relays and connections for sensor(s) are made before applying power.
CAUTION! This product uses semiconductors which can be damaged by electrostatic discharge (ESD). When handling the printed circuit boards (PCBs), observe proper ESD precautions so that the electronics are not damaged.

3.4.2. Power and Signal Wiring

The product comes with cable glands and plugs pre-installed. The power entry cable gland is without a gland plug. Use the appropriate cable glands to insert and connect the wires for power and signal to the appropriate terminals as indicated in the figure and wiring table that follow. The PCB terminal blocks are a pluggable type and may be removed to aid termination.

**IMPORTANT:**
- For 24VAC installations sharing a transformer in a daisy-chain configuration, neutral polarity must be maintained for all instruments.
- 24VAC power polarity must not be reversed.
- For a more robust system, a dedicated transformer for each MRLDS is recommended to prevent damage caused by wiring errors.
- Fasten terminal screws.

<table>
<thead>
<tr>
<th>Power</th>
<th>Description</th>
<th>Label</th>
<th>Wiring Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>24VDC/VAC IN</td>
<td>24V IN: -</td>
<td>24VDC/VAC neutral/ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24V IN: +</td>
<td>24VAC neutral</td>
</tr>
<tr>
<td></td>
<td>24VDC/VAC OUT</td>
<td>24V OUT: -</td>
<td>24VDC/VAC neutral/ground</td>
</tr>
<tr>
<td></td>
<td>(power daisy chain terminal)</td>
<td>24V OUT: +</td>
<td>24VAC neutral</td>
</tr>
<tr>
<td>Digital Output</td>
<td>MODBUS Network Communications</td>
<td>MODBUS: B</td>
<td>RS-485 “B” (inverted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MODBUS: A</td>
<td>RS-485 “A” (non-inverted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MODBUS: GND</td>
<td>RS-485 GND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MODBUS: SH</td>
<td>RS-485 Shield</td>
</tr>
<tr>
<td>Analog Output</td>
<td>Voltage or Current Output</td>
<td>ANALOG: -</td>
<td>Analog output ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ANALOG: +</td>
<td>Analog output signal (+)</td>
</tr>
</tbody>
</table>

Table 3-1 - Power and Signal Wiring

3.4.3. Relay Wiring

**WARNING!** Relays are rated for 0 to 30V AC/DC. DO NOT apply main power onto these relays.
Using appropriate cable glands, connect the wires for relay 1, relay 2, and relay 3 to the terminals as indicated in *Table 3-2*.

<table>
<thead>
<tr>
<th>Relay</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Alarm</td>
</tr>
<tr>
<td>2</td>
<td>High Alarm</td>
</tr>
<tr>
<td>3</td>
<td>Fault Alarm</td>
</tr>
</tbody>
</table>

*Table 3-2 - Relay Wiring Configuration*

When configured according to the factory default settings, the relays are de-energized during normal operation (not fail-safe). Fail-safe mode can be configured. When configured for Failsafe operation, relays are energized during normal operation. Failsafe operation ensures relays are triggered in cases of power failure at the instrument. In Failsafe operation, normally open and normally closed terminals are reversed as indicated in *Table 3-3*.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Normal Operation</th>
<th>Failsafe Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>Normally Closed</td>
<td>Normally Open</td>
</tr>
<tr>
<td>COM</td>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>NO</td>
<td>Normally Open</td>
<td>Normally Closed</td>
</tr>
</tbody>
</table>

*Table 3-3 - Relay Wiring Terminal Configuration*

### 3.4.4. Modbus RTU RS-485 Interface

For the Modbus RS-485 network use a 16 to 24 AWG (0.5 to 1mm²) 3-core, 2 twisted pair + ground, shielded cable with 120Ω characteristic impedance.

!! IMPORTANT: Recommended: Belden 3105A (or equivalent). !!

The Modbus address, baud rate, stop bit, parity and slave termination is configured through the setup menu. No jumpers or hardware switch settings are required. Ensure that the communication parameters within the network, including the BMS, are configured identically.

To ensure optimal performance of the Modbus network ensure the following guidelines are implemented:

- Ensure instruments are configured in a single bus topology, connecting multiple buses in parallel or branching multiple units from the main bus, may introduce impedance mismatches, reflections and/or signal distortions.
- Avoid long stubs when connecting instruments to the bus, stubs should be less than one (1) meter in length.
• Ensure A/B signal polarity is maintained throughout RS-485 network.
• Connect cable shield drain to physical earth or ground at the controller only.
• Ensure cable shield integrity is maintained throughout RS-485 network.

For Modbus end-of-line termination, use 150Ω ohm resistor or termination block P/N 537-2711. **Do not use MRLDS 120Ω ohm on-board termination with Site Supervisor or E2.**

**Site Supervisor Setup - Device and COMM**

![Site Supervisor Network Setup](image)

*Figure 3-1 - Site Supervisor Network Setup*
3.4.5. Conclusion

After all wiring is completed, power the transmitter and confirm operation, and then prepare to seal the enclosure.

Align the enclosure gasket (primary transmitter and remote sensor if equipped), replace the lid, and tighten the six (6) screws. Tightening torque should be limited to tightening by hand, and should be uniform in pattern.
3.5. Set Up MRLDS-450 Application in E2

Note: Installing the MRLDS-450 requires version E2E 4.10F01 or later. You must add a description file for version E2 3.10F01 or less.

3.5.1. New Installation: Uploading the MRLDS-450 Description File to E2

The MRLDS-450 requires adding a description file (P/N 527-0754) and license key to E2 version 3.0X or later. Contact Customer Service to obtain this information:
Email: Solutions.CustomerService@Emerson.com
Phone: 770-425-2724 Option 4

Note: UltraSite32 software should be installed to perform a description file upload.

Connect to E2 using UltraSite32

1. Launch UltraSite program and login.
2. View the Directory Level and then Site Level.
3. Right-click Site Level and click Connect.
4. Locate the E2 where the MRLDS_450.dsc will be installed.
5. Right-click the unit and select Upload Description File.
6. Click Browse to select the appropriate description file (5270754.dsc) file for MRLDS-450 from the computer and click Open.
7. Click Upload. A window will display the description file was successfully imported. Click OK. The description file should appear inside the window.
8. Once completed, disconnect from the E2 and reboot the E2 controller.

Device Setup

E2 Serial Port Setup

1. Log into the E2 controller.
2. Press Menu, 7, 3, and 1 (General Controller Information), then press F2 twice to move to the C3: Serial tab.
3. Press the down arrow key to the **COM Connection** where the device is wired.

4. Press **F4** *(LOOK UP)* and select **MODBUS-1, MODBUS-2** or **MODBUS-3**, then press **Enter** to set configuration.

5. Press **F4** to select options and set the MODBUS connection as follows:
   
   COM Baud: 19200 Baud  
   COM Data Size: 8  
   COM Parity: Even  
   COM Stop Bits: 1

6. Press **Enter** to set configuration, then **Save** to save changes.

7. Press **Home** to return to the **Home screen**.

**Adding the MRLDS-450 Application in E2**

1. Press **Menu** then **7**, **7**, and **2** to enter *Connected I/O Boards and Controllers*. 
2. Press \( F2 \) to move to the **C3: ECT** tab. Highlight the **MRLDS-450** application and enter the desired number of devices under **Quantity** up to a maximum of **15**.

![Figure 3-3- ECT Tab](image)

3. Press \( \text{Save} \) to save the changes.

4. Press \( \text{Home} \) to return to the **Home screen**.

**Commissioning the MRLDS-450**

1. Press \( \text{Menu} \) then \( 7 \), \( 7 \), and \( 1 \) to enter the **Network Summary screen**.
2. Highlight the MRLDS-450 to be commissioned and press F4

![Network Summary Screen](image)

**Figure 3-4- Network Summary Screen**

3. If a box with Select Network appears on the screen, select the MODBUS number where you configured the device – either MODBUS-1, MODBUS-2, or MODBUS-3 and press Enter.
4. Select the address for the device and press Enter.

**Figure 3-6- Select Device Address**

*Note: The MODBUS address must be the same as the address assigned on the device.*
5. A window will appear. Press Enter to continue.

![Figure 3-7 Set Physical Address for the MRLDS-450](image)

6. Press J to save the assigned address.

7. Press H to return to the Home screen and press menu then 7, 7, and 1 to enter the Network Summary screen again.
8. After a few seconds, the MRLDS-450 should appear **Online**.

*Figure 3-8: MRLDS-450 Network Summary Screen Online Status*
Viewing the Status

1. Press \textit{Menu} then \% 5, $4, 0 and 0 (this is equivalent to pressing \textit{Menu}, \% 5, $4 0 0) or use the cursor to navigate to MRLDS-450 and press \textit{Enter}.

\textbf{Figure 3-9- Configured Applications}

\begin{itemize}
\item 1. Suction Groups
\item 2. Condensers
\item 3. Circuits
\item 6. Air Handlers (AHUs)
\item 7. HVAC Zones
\item 10. Lighting Control
\item 13. Pulse Accum
\item 14. Flexible Combiner
\item 16. Logging Groups
\item 18. Suction Float
\item 50. Holidays
\item 54. Analog Combiners
\item 55. Digital Combiners
\item 56. Conversion
\item 90. Global Data
\item 98. Rack Simulator
\item 107. Status Display
\item 400. MRLDS-450
\end{itemize}
2. View the status of the detector on the MRLDS-450 Summary screen and press \[ F5 \] to go to Setup.

*Figure 3-10-MRLDS-450 Status Screen*
4 Operation

4.1. Overview of Normal Operation

CAUTION! Before leaving the instrument for normal operation, check the configuration for proper settings and check calibration.

4.1.1. Applying Power and the Start-up Sequence

After applying power, the instrument will go through a start-up sequence (initialization, audible/visual test and self-test sequence). After the start-up sequence completes, the instrument will enter a warm-up period to allow the sensor element to stabilize before reporting a valid output.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Switch power on.</td>
</tr>
</tbody>
</table>
| 2    | Observe start-up sequence and warm-up phase:  
|      | • Green LED will blink at 0.5 Hz for about five (5) minutes  
|      | • Modbus flag for warm-up is set  
|      | • Buzzer is off  
|      | • Relay state is “no alarm”  
|      | • Gas reading invalid |
| 3    | Observe normal operation:  
|      | • Green LED is steady on  
|      | • Modbus flag for warm-up is cleared  
|      | • Buzzer is off  
|      | • Relay state is “no alarm”  
|      | • Gas reading valid |

Table 4-1 - Instrument Start-up Sequence

4.1.2. Verifying Analog Signals

The MRLDS-450 gas detector features a single configurable analog output. During normal operation, the analog output of the instrument is proportional to the detected gas concentration and can be selected from the following:

• 1 to 5V (default)
• 0 to 5V
The MRLDS-450 Gas Detector uses different voltage/current values to indicate various modes of operation. In normal operation the relative gas concentration output is indicated by the analog output level. Output level is proportional to the gas level as shown in Table 4-2:

<table>
<thead>
<tr>
<th>Gas Concentration</th>
<th>1-5V</th>
<th>0-5V</th>
<th>2-10V</th>
<th>0-10V</th>
<th>4-20mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>1V</td>
<td>0V</td>
<td>2V</td>
<td>0V</td>
<td>4mA</td>
</tr>
<tr>
<td>50%</td>
<td>3V</td>
<td>2.5V</td>
<td>6V</td>
<td>5V</td>
<td>12mA</td>
</tr>
<tr>
<td>100%</td>
<td>5V</td>
<td>5V</td>
<td>10V</td>
<td>10V</td>
<td>20mA</td>
</tr>
</tbody>
</table>

Table 4-2 - Gas Concentration Levels

The instrument may also enter several special states, these are indicated by the specific analog output levels indicated in Table 4-3:

<table>
<thead>
<tr>
<th>Mode of Operation</th>
<th>1-5V</th>
<th>0-5V</th>
<th>2-10V</th>
<th>0-10V</th>
<th>4-20mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument Fault</td>
<td>≤ 0.3V</td>
<td>N/A</td>
<td>≤ 0.6V</td>
<td>N/A</td>
<td>≤ 1.2mA</td>
</tr>
<tr>
<td>Offline Mode/Maintenance</td>
<td>0.75V</td>
<td>N/A</td>
<td>1.5V</td>
<td>N/A</td>
<td>3mA</td>
</tr>
<tr>
<td>Drift below zero</td>
<td>0.95V</td>
<td>N/A</td>
<td>1.9V</td>
<td>N/A</td>
<td>3.8mA</td>
</tr>
<tr>
<td>Normal operation</td>
<td>1-5V</td>
<td>0-5V</td>
<td>2-10V</td>
<td>0-10V</td>
<td>4-20mA</td>
</tr>
<tr>
<td>Measuring range exceeded</td>
<td>5.12V</td>
<td>5.12V</td>
<td>10.25V</td>
<td>10.25V</td>
<td>20.5mA</td>
</tr>
<tr>
<td>Fault on analog interface</td>
<td>&gt; 5.25V</td>
<td>&gt; 5.25V</td>
<td>&gt; 10.5V</td>
<td>&gt; 10.5V</td>
<td>&gt; 21mA</td>
</tr>
</tbody>
</table>

Table 4-3 - Analog Output Levels

4.1.3. Verifying the Modbus Signal

The MRLDS-450 Gas Detector provides a Modbus RTU digital interface. All status messages and most parameters that can be accessed and/or configured through the Bluetooth® interface can also be accessed and/or configured via RS485 for Modbus RTU.

4.1.4. Status Indication

The MRLDS-450 gas detections provide external indication of its current operational state via audible and visual feedback. Visual indication of the instrument status is provided by a single tri-color LED (Green/Red/Orange). MRLDS-450 gas detection instruments also provide relays outputs. Instrument states and corresponding outputs are shown in Table 4-4.
<table>
<thead>
<tr>
<th>State</th>
<th>LED</th>
<th>Buzzer</th>
<th>Relay 1 (LOW)</th>
<th>Relay 2 (HIGH)</th>
<th>Relay 3 (Fault)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td></td>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Low Alarm</td>
<td>![Red LED]</td>
<td>![Buzzer]</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>High Alarm</td>
<td>![Green LED] ![Yellow LED] ![Red LED]</td>
<td>![Buzzer]</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Offline</td>
<td>![Orange LED]</td>
<td>![Buzzer]</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Fault</td>
<td>![Orange LED]</td>
<td>![Buzzer]</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Negative Gas Fault</td>
<td>![Orange LED]</td>
<td>![Buzzer]</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Zero Cal. Fault</td>
<td>![Orange LED]</td>
<td>![Buzzer]</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Span Cal. Fault</td>
<td>![Orange LED]</td>
<td>![Buzzer]</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

*Table 4-4 - Status Indicators*

### 4.1.5. Switch Functions

User interaction with the MRLDS-450 gas detector is accomplished through the use of two magnetic switches located on the bottom of each unit. To actuate a magnetic switch, apply the supplied magnetic wand to the relevant switch location as shown in *Figure 4-1*. 
Switch locations above are referred to in this document as MAG#1 and MAG#2. Depending on the duration the switch is held, a short “tap” or long “hold” will be detected.

- To carry out a tap function, tap the relevant switch location for one (1) second, until a single “chirp” is heard and remove the wand to confirm a “tap.”
- To carry out a hold function, do not remove the magnetic wand after the first “chirp” but continue to hold for more than five (5) seconds, until a double “chirp” is heard, and remove wand to confirm a “hold.” If either switch is held for more than 30 seconds, a stuck switch fault will be indicated.
- To interact with the instrument without use of the magnetic wand, two internal push button tactile switches may be used. Remove the lid without removing the ribbon cable to access. Internal switches TACT#1 and TACT#2 mirror the functions of MAG#1 and MAG#2.

The function of each switch depends on the current state of the instrument. Refer to Table 4-5 for switch functions in each instrument state.
### Table 4-5 - Switch Functions

<table>
<thead>
<tr>
<th>State</th>
<th>Switch 1 Tap</th>
<th>Switch 1 Hold</th>
<th>Switch 2 Tap</th>
<th>Switch 2 Hold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>Enable Bluetooth® Connectivity</td>
<td>Start Zero Calibration</td>
<td>Disable Bluetooth® Connectivity</td>
<td>Start Span Calibration</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td>Mute Buzzer</td>
<td>Ack. Latched Alarm</td>
<td></td>
</tr>
<tr>
<td>Low Alarm</td>
<td></td>
<td>Mute Buzzer</td>
<td>Ack. Latched Alarm</td>
<td></td>
</tr>
<tr>
<td>High Alarm</td>
<td></td>
<td>Mute Buzzer</td>
<td>Ack. Latched Fault</td>
<td></td>
</tr>
<tr>
<td>Offline</td>
<td></td>
<td>Mute Buzzer</td>
<td>Start Zero Calibration</td>
<td></td>
</tr>
<tr>
<td>Fault</td>
<td></td>
<td>Acknowledge Fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Gas Fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Cal. Fault</td>
<td></td>
<td>Acknowledge Fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Span Cal. Fault</td>
<td></td>
<td></td>
<td></td>
<td>Acknowledge Fault</td>
</tr>
</tbody>
</table>

#### 4.1.6. Reset System to Factory Default Settings

To reset system to factory defaults, remove lid and hold **TACT#1** and **TACT#2** simultaneously for 30 seconds. Instrument will restart to confirm factory reset. Alternatively, see *Section 4.2.3.4., Reset to Factory Defaults,* for instructions on resetting instrument configuration via the MRLDS-400 Series App.

#### 4.2. MRLDS-400 Series Application

Download the MRLDS-400 Series App.

The companion smartphone application allows users to perform a variety of functions to configure and interact with the MRLDS-450 gas detector, including:

- View real-time measurements
- Configure instrument
- Test outputs
- Calibrate/Bump test instrument
- Generate customizable calibration certificates

#### 4.2.1. Enable Bluetooth® Connection

1. Enable Bluetooth® discovery by tapping **MAG#1** for 1-second. (After 10 seconds, the device will indicate that it is discoverable with audible heartbeat until it has been paired, discovery has timed-out, or has been canceled.)
2. Launch the MRLDS-400 Series App and select the Bluetooth® icon at the bottom of the screen to initiate a scan.
3. Select MRLDS-450 default alias is “18TMAE” from the list of available gas detectors.
4. When prompted, enter the passkey (default is “123456”).

**IMPORTANT:** Default alias, passkey, and unlock code can be changed via the MRLDS-400 Series App’s configuration menu. Default values should be changed after instrument installation for security purposes.

### 4.2.2. Checking Status

Current Instrument status can be viewed from the **Home** tab. The **Home** tab displays the following status information:

![Figure 4-2 - MRLDS-400 Series App Home Tab](image)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alias, user-configured instrument name.</td>
</tr>
<tr>
<td>2</td>
<td>Serial, instrument 8-digit serial number.</td>
</tr>
<tr>
<td>3</td>
<td>Gas, gas type currently detected by instrument.</td>
</tr>
<tr>
<td>4</td>
<td>Status ring, provides visual indication of various instrument states (expanded on Table 4-7)</td>
</tr>
<tr>
<td>5</td>
<td>Live measurement, current measurement in given measurement units.</td>
</tr>
<tr>
<td>6</td>
<td>Measurement unit, displayed measurement unit (PPM/PPB/%LEL/%VOL)</td>
</tr>
</tbody>
</table>

**Table 4-6 - MRLDS-400 Series App Home Tab Features**
<table>
<thead>
<tr>
<th>State</th>
<th>Status Ring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>Green</td>
<td>Gas detector stabilizing after power on or restart.</td>
</tr>
<tr>
<td>Normal</td>
<td>Green</td>
<td>Normal Operation.</td>
</tr>
<tr>
<td>Low Alarm</td>
<td>Yellow</td>
<td>Gas measurement has exceeded low alarm setpoint.</td>
</tr>
<tr>
<td>High Alarm</td>
<td>Red</td>
<td>Gas measurement has exceeded high alarm setpoint.</td>
</tr>
<tr>
<td>Offline</td>
<td>Orange</td>
<td>Gas Detector in maintenance mode and is not actively monitoring gas.</td>
</tr>
<tr>
<td>Fault</td>
<td>Orange</td>
<td>A fault has been detected.</td>
</tr>
<tr>
<td>Negative Gas Fault</td>
<td>Orange</td>
<td>Gas Detector calibration has drifted below zero, requires zero calibration.</td>
</tr>
<tr>
<td>Span Cal. Fault</td>
<td>Orange</td>
<td>Error occurred during span calibration. Span calibration has not be updated. Span calibration required.</td>
</tr>
</tbody>
</table>

*Table 4-7 - Status Ring of Various Instrument States*

### 4.2.3. Instrument Configuration

For security, access to configuration and calibration options are restricted to authorized users only. Access to these functions require use of an unlock code. To unlock instrument configuration, go to the **Configure** tab to set up the device. When prompted, enter unlock code to access device configuration. (The instrument’s default code is “1234”). Instrument will remain unlocked until Bluetooth® connection has ended.

**IMPORTANT:** Default alias, passkey, and unlock code can be changed via the MRLDS-400 Series App’s configuration menu. Default values should be changed after instrument installation for security purposes.

#### 4.2.3.1. Change Alias

To allow easy identification of a given instrument, an alias can be assigned to each instrument. This alias is displayed when searching for an instrument via Bluetooth®, on Calibration Cert and in the **Home** tab. To set the alias:

- On the **Configure** tab select **Alias**. Enter the required alias for instrument and select **OK**.
- The instrument must be restarted for change to take effect. Selecting the **Home** tab then **Restart** will reboot device.
- Reconnect to instrument to confirm the alias has been updated.
4.2.3.2  Change Unlock Code

To prevent unauthorized access to instrument configuration and calibration, the default instrument unlock code should be changed during commissioning. To change unlock code:

- On the Configure tab select Modbus Unlock Code. Enter the new 4-digit unlock code for instrument and select OK.
- The instrument must be restarted for changes to take effect. Selecting the Home tab, then Restart will reboot the device.
- Reconnect to instrument to confirm the unlock code has been updated.

**IMPORTANT:** If the custom unlock code is forgotten, the unlock code may be reset to default value (1234) by resetting system to factory defaults. Refer to Section 4.1.6., Reset System to Factory Default Settings for the system reset procedure. Note that a system reset will return all custom system configurations to defaults.

4.2.3.3  Change Bluetooth® Passcode

To prevent unauthorized access to instrument status, the default instrument Bluetooth® passcode code should be changed during commissioning. To change Bluetooth® passcode:

- On the Configure tab select Bluetooth Passcode. Enter new 6-digit passcode for the instrument and select OK.
- The instrument must be restarted for changes to take effect. Selecting the Home tab, then Restart will reboot the device.
- Reconnect to instrument to confirm the Bluetooth® Passcode has been updated.

**IMPORTANT:** If the custom passcode is forgotten, the unlock code may be reset to default value (123456) by resetting system to factory defaults. Refer to Section 4.1.6., Reset System to Factory Default Settings for system reset procedure. Note that a system reset will return all custom system configurations to defaults.
4.2.3.4. Reset to Factory Defaults

Instrument configuration may be reset to factory defaults via the smartphone application:

- On the Configure tab select Reset to Factory Default and select OK to confirm.
- The instrument will automatically restart and disconnect from the smartphone application.

**WARNING!** Resetting system to factory defaults will remove all custom system configuration including unlock code and Bluetooth passcode. After system reset custom unlock and Bluetooth passcodes should be configured to prevent unauthorized access and reconfiguration of instrument.

4.2.3.5. Alarm Configuration

**Low Alarm Setpoint**

The value above which a low alarm condition occurs. The low alarm setpoint must be less than the high alarm setpoint and greater than the low alarm limit. The low alarm limit is the fixed minimum limit that is sensor–specific and not editable.

Range of acceptable setpoints is displayed when updating the parameter. To update the setpoint:

- On the Configure tab select Alarm then Low Alarm Setpoint. Enter the new setpoint and select OK to confirm.

**IMPORTANT:** In instruments with an oxygen sensor installed, low alarm behavior operates in a depletion mode where gas measurements BELOW the low alarm setpoint initiate a low alarm. This allows monitoring of oxygen displacement and enrichment scenarios.

**IMPORTANT:** To prevent intermittent alarm operation at the setpoint due to measurement noise this instrument implements hysteresis at the setpoint. Once the alarm level is exceeded, the gas measurement must return a fixed percentage below the alarm threshold before the alarm is disabled. Typical hysteresis value is set at 5% of full scale; however, this is sensor-specific and non-editable.

**High Alarm Setpoint**

The value above which a high alarm condition occurs. The high alarm setpoint must be less than the sensor full scale range and greater than the low alarm setpoint.

Range of acceptable setpoints is displayed when updating the parameter. To update setpoint:

- On the Configure tab select Alarm then High Alarm Setpoint. Enter the new setpoint and select OK to confirm.
IMPORTANT: To prevent intermittent alarm operation at the setpoint due to measurement noise, this instrument implements hysteresis at the setpoint. Once the alarm level is exceeded, the gas measurement must return a fixed percentage below the alarm threshold before the alarm is disabled. Typical hysteresis value is set at 5% of full scale; however, this is sensor-specific and non-editable.

Alarm Latching
Enabling alarm latching will maintain alarm or fault condition even after the alarm or fault condition is no longer active. When latched, the alarm or fault condition must be manually acknowledged before the condition will be cleared. This allows transient alarm or fault conditions to be identified.

If an alarm is latched, for example, the condition has occurred but is no longer active, an acknowledgment button will appear on the Home screen. Select this button to acknowledge the latched condition and clear the alarm or fault.

When disabled, the alarm or fault status clears automatically as soon as the condition is no longer active. To configure:

- On the Configure tab select Alarm then Alarm Latching. Select Enable/Disable and OK to confirm.

4.2.3.6. Modbus Configuration

Address
Sets instrument address for connection to RS-485 Modbus interface. (Default: 1).
To set address:

- On the Configure tab select Modus, then Address. Select 1-247 and OK to confirm.

IMPORTANT: Ensure all instruments on RS-485 bus have been configured with unique node addresses. If two instruments have been configured with same address, bus contention will occur preventing communications with these instruments via the RS-485 interface.

Baud Rate
Sets instrument baud rate for connection to RS-485 Modbus interface baud).
To set baud rate:

- On the Configure tab select Modus then Baud Rate. Select 9600/19200 (default) and OK to confirm.
Stop Bits
Sets instrument stop bits for connection to RS-485 Modbus interface (Default: 1 stop bits). To set number of stop bits:

- On the Configure tab select Modus then select Stop Bits. Select 1 or 2 and OK to confirm.

Parity
Sets instrument parity for connection to RS-485 Modbus interface (None, Odd, or Even (default)).
To set parity:

- On the Configure tab select Modus then select Parity. Select None/Odd/Even and OK to confirm.

_IMPORTANT: Stop bits must be set to 1 where parity is Odd or Even._

Enable 120Ω Termination
For optimal communication reliability, in RS-485 Modbus networks the last instrument physically connected to the RS-485 bus must include a 120Ω termination resistor. This is to reduce the potential for electrical signal reflection on long buses due to impedance mismatches. Typically, this requires a physical resistor with the same characteristic impedance of the bus cable to be installed on the bus.
MRLDS-450 instruments include this termination resistor on all instruments and allow this termination to be enabled via this configuration setting without the need for an external physical resistor. To enable this termination resistor:

- On the Configure tab select Modbus then select Enable 120Ω Termination. Select Enable/Disable and select OK to confirm.

_IMPORTANT: Termination resistor should only be enabled on last instrument physically connected to RS-485 bus. An external resistor should not be connected where this is enabled on the instrument._

4.2.3.7. Output Configuration
Analog Output Range
Sets instrument analog output range. Available ranges: 1-5V (default), 0-5V, 0-10V, 2-10V, 4-20mA. To set range:

- On the Configure tab select Outputs, then select Analog Output Range. Select desired range and select OK to confirm.
Buzzer
Enable or disable buzzer. Buzzer provides local audible alarm/fault indication. Buzzer is enabled by default. To enable/disable buzzer:

- On the **Configure** tab select **Outputs**, then **Buzzer**. Select **Enable/Disable** and select **OK** to confirm.

Relay Failsafe
Enable or disable Relay Failsafe operation. When configured for fail-safe operation, relays are energized during normal operation. Failsafe operation ensures relays are triggered in cases of power failure at the instrument. In Failsafe operation, normally open and normally closed terminals are reversed as indicated in *Section 3.4.3., Relay Wiring*. Relays are configured as non-Failsafe by default. To enable/disable relay Failsafe:

- On the **Configure** tab select **Outputs** then **Relay Failsafe**. Select **Enable/Disable** and **OK** to confirm.

Alarm Delay
Sets delay in minutes before instrument will indicate an alarm condition after low or high alarm threshold has been exceeded. May be used to prevent short transient alarm conditions from activating alarms. Alarm delays may be set for 0-15 minutes. Alarm delay is configured as 0 minutes by default. To set alarm delay:

- On the **Configure** tab select **Outputs** then **Alarm Delay**. Enter the desired delay in minutes (0-15) and **OK** to confirm.

Analog Zero Adjust
Analog zero adjust applies a fixed offset to the analog output. This allows removal of small errors in the output between the gas detection instrument and the measurement at the controller due to cable resistance when using voltage outputs. To apply adjustment ensure instrument is outputting fixed voltage (default 1V at zero ppm or use output test function to set specific voltage value), monitor remote measurement and adjust zero offset until remote measurement matches expected voltage output. Adjustment is limited to ±10% full scale. To set analog zero adjustment:

- On the **Configure** tab select **Outputs** then **Analog Zero Adjust**. Use the slider to set desired offset adjustment.
- Alternatively, select “Analog Zero Adjust (X.X%)” text and enter specific offset required (-10 to 10).
Analog Span Range

Analog span range scales the FSD (full-scale deflection) of the analog output. The selected range determines the equivalent gas measurement at the analog output maximum range.

Example: R134A 1000ppm, 0-5V analog output. If Analog Span Range is set to 20%, the full analog output range only covers the first 20% of the gas measurement range, for example, 0-200ppm will output 0-5V, above 200ppm the output will be truncated to 5V. *Note that sensor resolution stays at the value for the max range.*

To set analog span range:

- On the **Configure** tab select **Outputs** then **Analog Span Range**. Use the slider to set desired range.
- Alternatively, select “Analog Span Range (X.X%)” text and enter specific offset required.
5  Care and Maintenance

5.1.  Maintenance Intervals

<table>
<thead>
<tr>
<th>Interval</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Commissioning</td>
<td>Check calibration</td>
</tr>
<tr>
<td></td>
<td>Check LEDs for proper operation*</td>
</tr>
<tr>
<td></td>
<td>Check for proper buzzer and relay operation*</td>
</tr>
<tr>
<td></td>
<td>Check signal transmission to the BMS.BAS (central controller) if connected*</td>
</tr>
<tr>
<td>Every 6-12 Months**</td>
<td>Inspection by trained service personnel.</td>
</tr>
<tr>
<td></td>
<td>Check LEDs for proper operation*</td>
</tr>
<tr>
<td></td>
<td>Check for proper buzzer and relay operation*</td>
</tr>
<tr>
<td></td>
<td>Check signal transmission to the BMS/BAS (central controller) if connected*</td>
</tr>
<tr>
<td></td>
<td>Calibrate the sensor or contact Emerson Technical Support for sensor exchange with factory - calibrated sensor</td>
</tr>
<tr>
<td>As Required</td>
<td>Replace sensor module(s)</td>
</tr>
</tbody>
</table>

Table 5-1 - Maintenance Intervals and Functions

* These can be activated via Modbus commands or via MRLDS-400 Series App.

** Typical maintenance frequency can vary by sensor type.

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Recommended Maintenance Interval</th>
<th>Typical Sensor Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrochemical*</td>
<td>12 months</td>
<td>2-3 years</td>
</tr>
<tr>
<td>Catalytic Bead</td>
<td>Zero calibration -1-3 months</td>
<td>5-7 years</td>
</tr>
<tr>
<td></td>
<td>Span calibration - 6 months</td>
<td></td>
</tr>
<tr>
<td>Semiconductor*</td>
<td>6 months after commissioning</td>
<td>4-6 years</td>
</tr>
<tr>
<td></td>
<td>12 months thereafter</td>
<td></td>
</tr>
<tr>
<td>Infrared</td>
<td>12 months</td>
<td>5-7 years</td>
</tr>
</tbody>
</table>

Table 5-2 - Maintenance Intervals and Functions

* Sensors should be checked after exposure to significant concentrations of gas, which can shorten the sensor lifetime and/or reduce its sensitivity.
5.2. **Adjustments**

5.2.1. **Introduction**

Adjustment of the detector must be performed at regular intervals as required by national standards or regulations *(For example, EN 378, ASHRAE 15, BREEAM, etc.)*.

**Breathing Hazard:** Calibration gas *MUST NOT* be inhaled! See appropriate Safety Data Sheets. Calibration gas should be vented into a fume hood or to the outside of the building.

**Zero First, Then Span:** For proper operation, never adjust the span before completing a zero adjustment. Performing these operations out of order will cause faulty calibration.

**IMPORTANT:** Emerson recommends calibrating detectors within the application-specific condition and with target gas. This method of zeroing the detector in the application environment and performing a target gas calibration is more accurate. A surrogate gas calibration may only be performed as an alternative if a target gas calibration is not possible.

**IMPORTANT:** The sensor should be fully stabilized (at least 2 hours, preferably 24 hours).

**IMPORTANT:** When entering the functions for zero or span adjustment, the detector will automatically enter OFFLINE mode, and will remain OFFLINE until either the OFFLINE mode is canceled by tapping the respective magnetic switch, or the OFFLINE mode times out within 6 minutes (typical) after the adjustment has ended.

5.2.2. **General Calibration Procedure**

**IMPORTANT:** The MRLDS-450 Gas Detector MAY NOT be in an alarm or fault condition during calibration. Acknowledge any alarms or faults BEFORE attempting to begin the calibration process.

**IMPORTANT:** Except for CO_2 or O_2 sensors, calibration gas must be in a balance of air, not nitrogen (N_2).
IMPORTANT: Calibration and/or bump testing requires the MRLDS-450 Calibration Adapter Kit (P/N 809-1190).

IMPORTANT: At elevations higher than 6,560’ (ft) (3,000 m), calibration will result in a lower reading. Above 6,560’ (ft), the instrument should be calibrated in the environment of operation.

1. Fit calibration adapter to the gas detector lid.

![Figure 5-1 - Calibration Adapter Fitting](image)

2. If using a variable flow regulator, adjust the gas flow to approximately 0.3 L/min.

### 5.2.3. Zero Adjustment

Ambient air can be used to zero the sensor instead of synthetic air only if the area is known to be free of the target gas or any gas to which the sensor may be cross-sensitive. In this case, no cylinder or calibration adapter is needed for the zero adjustment.

**IMPORTANT:** The MRLDS-450 MAY NOT be in an alarm or fault condition during calibration. Acknowledge any alarms or faults BEFORE attempting to begin the calibration process.

**IMPORTANT:** Except for CO2 or O2 sensors, ambient air may be used instead of zero gas if the area is known to be free of the target gas or any gases to which the sensor may be cross-sensitive.
1. Begin zero adjustment:
   a. **MRLDS-400 App**: On the Home tab select **Calibrate** then scan the barcode on gas cylinder or manually enter values for zero gas.
   b. **Manual**: Hold MAG#1 for more than five (5) seconds. The LED will blink GREEN-GREEN-RED when the instrument is ready.

2. Apply zero gas (or ambient air per warning above).

3. Confirm the start of calibration:
   a. **MRLDS-400 App**: Press the **Start Zero** button.
   b. **Manual**: Tap MAG#1 within 30 seconds or the instrument will time-out and return to normal operation.

4. Complete zero adjustment:
   a. **MRLDS-400 App**: App will countdown to completion. If calibration is successful, proceed to Step 5. If calibration is unsuccessful, return to the Home screen and press the Acknowledge button to clear the zero calibration fault.
   b. **Manual**: The LED will blink GREEN-RED, GREEN-RED-RED, GREEN-RED-RED-RED, etc. until calibration is complete. To abort, hold MAG#1 for >5-seconds, turn off gas flow and remove the calibration adapter. If calibration is successful (green LED), proceed to Step 5. If calibration is unsuccessful (LED blinks orange @ 2 Hz), tap MAG#1 to discard the calibration attempt.

5. Turn off gas flow from zero gas.


### 5.2.4. Span Adjustment

---

**IMPORTANT**: Except for CO2 or O2 sensors, calibration gas must be in a balance of air, not nitrogen (N2).

---

**IMPORTANT**: At elevations higher than 6,560’ (ft) (2,000 m), calibration will result in a lower reading. Above 6,560’ (ft) the instrument should be calibrated in the environment of operation.

---

1. Begin span adjustment:
   a. **MRLDS-400 App**: Scan barcode on gas cylinder or manually enter values for zero gas.
   b. **Manual**: Hold MAG#2 for more than five (5) seconds. The LED will blink GREEN-GREEN-ORANGE when the instrument is ready.

2. Apply calibration gas at the concentration listed on the calibration gas concentration label (located on top of the instrument).
   - Part Number
   - Serial Number
   - Sensor Type
   - Maximum Range

3. Confirm the start of calibration:
a. **MRLDS-400 App**: Press the **Start Span** button.

b. **Manual**: Tap **MAG#2** within 30 seconds or the instrument will time-out and return to normal operation.

4. Complete zero adjustment:

   a. **MRLDS-400 App**: App will countdown to completion. If calibration is successful, proceed to **Step 5**. If calibration is unsuccessful, return to the Home screen and press the Acknowledge button to clear the zero calibration fault.

   b. **Manual**: The LED will blink GREEN-ORANGE, GREEN-ORANGE-ORANGE, GREEN-ORANGE-ORANGE-ORANGE, etc. until calibration is complete. To abort, hold **MAG#2** for >5-seconds, turn off gas flow and remove the calibration adapter. If calibration is successful (LED blinks green-orange-red), proceed to **Step 5**. If calibration is unsuccessful (LED blinks orange @ 2 Hz), tap **MAG#2** to discard the calibration attempt.

5. Turn off gas flow from calibration gas and remove the calibration adapter.

6. Allow sensor to recover/stabilize before the instrument returns to normal operation (green LED).

### 5.2.5. System Bump Test

A bump test is a live test of the system to verify that the detector responds to gas and all connected alarm devices, BMS, etc. are operating accordingly. It is recommended that all involved persons are informed about the test and certain alarms might have to be inhibited (For example, shutdown valves, notification of authorities, etc.).

**IMPORTANT: The manufacturer of this product requires that a bump test or calibration be performed following installation to verify instrument functionality.**

1. Connect adapter and gas cylinder according to the instructions in the General Calibration Procedure.

2. If desired, disable/silence external annunciators (For example, shutdown valves, notification of authorities, etc.):

   a. **MRLDS-400 App**: On the **Home** tab select **Calibrate** then **Bump**. Toggle **TAKE OFFLINE** to disable communications to external devices.

   b. **Manual**: Inform building personnel of test so that external devices can be disabled/silenced.

3. Apply a sufficiently high concentration of the target gas to trigger alarms, but NOT pure refrigerant or hydrocarbons (For example, do not use a butane lighter).

4. Once thresholds have been exceeded, relays should activate, digital outputs should transmit the gas concentration and:

   a. **MRLDS-400 App**: Gas concentration should be displayed, the instrument status should be **LOW ALARM** or **HIGH ALARM** and alarms states should be **ON**.

   b. **Manual**: LED status should display **LOW ALARM** or **HIGH ALARM**.

5. Turn off gas flow and remove the calibration adapter.
6. Allow sensor to recover/stabilize before the instrument returns to normal operation (green LED).

5.3. Troubleshooting

5.3.1. Hexadecimal Format

All fault codes can be retrieved through the Modbus interface and are shown in hexadecimal (hex) format. A hex digit can represent multiple codes as shown below:

<table>
<thead>
<tr>
<th>Hex Code</th>
<th>Equivalent Error Code(s)</th>
<th>Hex Code</th>
<th>Equivalent Error Code(s)</th>
<th>Hex Code</th>
<th>Equivalent Error Code(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>6</td>
<td>1+2+3</td>
<td>D</td>
<td>1+4+8</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>7</td>
<td>1+2+4</td>
<td>E</td>
<td>2+4+8</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>F</td>
<td>1+2+4+8</td>
</tr>
<tr>
<td>3</td>
<td>1+2</td>
<td>9</td>
<td>1+8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>A</td>
<td>2+8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1+4</td>
<td>B</td>
<td>1+2+8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-3 - Hexadecimal Code Format

5.3.2. Fault Codes

IMPORTANT: If a sensor fault occurs during a gas alarm condition, then the fault overrides the alarm condition.

Sensor faults may be decoded using the following table. Note that several faults may be reported at the same time. For example, fault code “00000003” is a combination of fault codes 00000001 (No sensor signal) and 00000002 (Voltage out of specification 1V).

IMPORTANT: If a “last fault” attribute indicates that a fault has occurred at some point in time, but the corresponding “current fault” attribute shows no fault, then the problem has self-healed and no service action is required.
<table>
<thead>
<tr>
<th>Fault Bit</th>
<th>System Fault</th>
<th>Possible Cause</th>
<th>Required Action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00000001</td>
<td>Software fault</td>
<td>Firmware error (e.g. unexpected state)</td>
<td>Power-cycle. If it re-occurs, call product support</td>
</tr>
<tr>
<td>0x00000002</td>
<td>Voltage out of specification 1V</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000004</td>
<td>Voltage out of specification 3.3V</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000008</td>
<td>Voltage out of specification 5V</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000010</td>
<td>Voltage out of specification 5.4V</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000020</td>
<td>Voltage out of specification 12V</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000040</td>
<td>Voltage out of specification VIN</td>
<td>Voltage rail out of range</td>
<td></td>
</tr>
<tr>
<td>0x00000080</td>
<td>System Flash Memory Read Fault</td>
<td>Error reading from internal Flash</td>
<td></td>
</tr>
<tr>
<td>0x00000100</td>
<td>System Flash Memory Write Fault</td>
<td>Error writing to internal Flash</td>
<td>Power-cycle. If it re-occurs, call product support</td>
</tr>
<tr>
<td>0x00000200</td>
<td>System Flash Memory CRC fault</td>
<td>Error in internal Flash CRC</td>
<td></td>
</tr>
<tr>
<td>0x00000400</td>
<td>System Invalid Configuration</td>
<td>Error in system configuration</td>
<td></td>
</tr>
<tr>
<td>0x00000800</td>
<td>GPIO fault</td>
<td>Error detected on GPIO pin</td>
<td>Call product support</td>
</tr>
<tr>
<td>0x0001000</td>
<td>Modbus Fault</td>
<td>Error detected in Modbus Communications</td>
<td>Power-cycle. If it re-occurs, call product support</td>
</tr>
<tr>
<td>0x0002000</td>
<td>Analog Output Fault (MRLDS-450 Only)</td>
<td>Error updating DAC value</td>
<td></td>
</tr>
<tr>
<td>0x0004000</td>
<td>Bluetooth Fault</td>
<td>Error detected in Bluetooth module</td>
<td></td>
</tr>
<tr>
<td>0x0008000</td>
<td>Stuck switch</td>
<td>Magnetic and/or Tactile switch activated for &gt; 1 minute</td>
<td>Call product support</td>
</tr>
<tr>
<td>0x0010000</td>
<td>Sensor Element Out</td>
<td>Cannot detect sensor element</td>
<td>Check sensor connection</td>
</tr>
<tr>
<td>0x0020000</td>
<td>Sensor Element Fault</td>
<td>Fault detected in sensor element</td>
<td>Replace sensor nodule</td>
</tr>
</tbody>
</table>

Table 5-4 - Sensor Fault Codes
<table>
<thead>
<tr>
<th>Fault Bit</th>
<th>System Fault</th>
<th>Possible Cause</th>
<th>Required Action(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00040000</td>
<td>Sensor ADC Sensor Read Fault</td>
<td>Cannot read from sensor ADC</td>
<td>Check sensor connection/Replace Sensor Module</td>
</tr>
<tr>
<td>0x00080000</td>
<td>Sensor ADC Current Read Fault</td>
<td>Cannot read from current ADC</td>
<td></td>
</tr>
<tr>
<td>0x00100000</td>
<td>Sensor AFE Read Fault (EC only)</td>
<td>Cannot read from EC sensor AFE</td>
<td></td>
</tr>
<tr>
<td>0x00200000</td>
<td>Sensor AFE Write Fault (EC only)</td>
<td>Cannot write to EC sensor AFE</td>
<td></td>
</tr>
<tr>
<td>0x00400000</td>
<td>Sensor AFE Status Fault (EC only)</td>
<td>Error in EC sensor AFE</td>
<td></td>
</tr>
<tr>
<td>0x00800000</td>
<td>Sensor EEPROM Read Fault</td>
<td>Error in reading from sensor EEPROM</td>
<td>Power-cycle/check sensor connection/replace sensor module</td>
</tr>
<tr>
<td>0x01000000</td>
<td>Sensor EEPROM Write Fault</td>
<td>Error in writing to sensor EEPROM</td>
<td>Call product support</td>
</tr>
<tr>
<td>0x02000000</td>
<td>Sensor EEPROM CRC Fault</td>
<td>Error in CRC from sensor EEPROM</td>
<td>Power-cycle/replace sensor module</td>
</tr>
<tr>
<td>0x04000000</td>
<td>Sensor EEPROM Configuration Fault</td>
<td>Error in sensor EEPROM data</td>
<td>Replace sensor module</td>
</tr>
<tr>
<td>0x08000000</td>
<td>Sensor UART Read Fault</td>
<td>Cannot read from sensor UART</td>
<td>Check sensor connection/replace sensor module</td>
</tr>
<tr>
<td>0x10000000</td>
<td>Sensor Temperature Fault</td>
<td>Temperature cannot be read or is out of specification</td>
<td>Ensure sensor is operating within specified temperature range/check sensor connections</td>
</tr>
<tr>
<td>0x20000000</td>
<td>Negative Gas Concentration Fault</td>
<td>Sensor output has drifted too negative</td>
<td>Initiate zero calibration (Via App/Hold MAG#2)</td>
</tr>
<tr>
<td>0x40000000</td>
<td>Zero Calibration failure</td>
<td>Zero calibration failed</td>
<td>Acknowledge failed calibration (Via App/Hold MAG#1)</td>
</tr>
<tr>
<td>0x80000000</td>
<td>Span Calibration failure</td>
<td>Span calibration failed</td>
<td>Acknowledge failed calibration (Via App/Hold MAG#2)</td>
</tr>
</tbody>
</table>

*Table 5-4 - Sensor Fault Codes*
5.4. Sensor Maintenance

CAUTION! This product uses semiconductors that can be damaged by electrostatic discharge (ESD). When handling the PCB, care must be taken so that the electronics are not damaged.

**Figure 5-2 - MRLDS-450 Components**

**Figure 5-3 - IP66 Sensor Configuration**
5.4.1. Replacing Sensor Module

---

**CAUTION!** This product uses semiconductors that can be damaged by electrostatic discharge (ESD). When handling the PCB, care must be taken so that electronics are not damaged.

---

To replace the gas detector’s sensor module:

1. Power-down the gas detector.
2. Using a 5/32” (4mm) hex key/allen wrench (not included), remove the lid and disconnect the ribbon cable from the sensor module.
3. Remove installed sensor module from the lid by holding onto the housing and turning counter-clockwise 90°. Take care not to apply excessive force to the sensor module’s circuit board. When the square tab of the sensor housing is aligned with the lock icon, firmly pull the module to remove it from the housing.
4. Install the new sensor module by aligning the square tab with the lock icon before firmly pressing it into the enclosure. Taking care not to apply excessive force to the sensor module’s circuit board, rotate the sensor module clockwise 90° (or until the triangle icon aligns with the lock icon on the lid).
5. Connect the ribbon cable (to the sensor module and transmitter) and close the lid.
6. Ensure gasket is aligned correctly and tighten the lid using the supplied hardware in an “X” pattern. Tightening torque should be limited to hand tight and should be uniform.
7. Power-up the gas detector.
8. After the start-up sequence has finished, check sensor response (bump test).

5.5. **Cleaning the Instrument**

Clean the detector with a soft cloth using water and a mild detergent. Rinse with water. Do not use any alcohols, cleaning agents, sprays, polishes, detergents, etc.
6 Additional Information

6.1 Sensor Principle

6.1.1 Electrochemical Sensors

Electrochemical sensors measure the partial pressure of gases under atmospheric conditions. The monitored ambient air diffuses through a membrane into the liquid electrolyte in the sensor. The electrolyte contains a measuring electrode, a counter-electrode, and a reference electrode. An electronic “potentiostat” circuit ensures a constant electrical voltage between measuring electrode and reference electrode. Voltage, electrolyte, and electrode material are selected to suit the gas being monitored so that it is transformed electrochemically on the measuring electrode and a current flows through the sensor. This current is proportional to the gas concentration. At the same time, oxygen from the ambient air reacts at the counter electrode electrochemically. The current flowing through the sensor is amplified electronically, digitized and corrected for several parameters (For example, the ambient temperature).

6.1.2 Catalytic Bead Sensors

A catalytic bead sensor measures the partial pressure of combustible gases and vapors in ambient air. It uses the heat-of-combustion principle.

The monitored air diffuses through the sintered metal disc into the sensor. The mixture of combustible gases, vapors, and air are catalytically combusted at a heated detector element (called a pellistor). The oxygen content in the air must be greater than 12 Vol%. Due to the resulting heat-of-combustion, the temperature of the detector element rises. This increase in temperature causes a change of resistance in the detector element, which is proportional to the concentration of the mixture of combustible gases and vapors in the monitored air. In addition to the catalytically active detector element, there is a compensator element. Both elements are parts of a Wheatstone bridge. Thus environmental effects like changes in ambient temperature or humidity are almost entirely compensated.

IMPORTANT: Certain substances in the atmosphere to be monitored may impair the sensitivity of the sensors. Such substances include, but are not limited to:
1. Polymerizing substances such as acrylonitrile, butadiene, and styrene.
2. Corrosive compounds such as halogenated hydrocarbons (releasing halogens such as bromine, chlorine or fluorine when oxidized) and halogen hydride acids as well as acidic gaseous compounds such as sulfur dioxide and nitrogen oxides, Catalyst poisons such as sulfurous and phosphorous compounds, silicon compounds (especially silicones), and metal-organic vapors.
It may be necessary to check the calibration if the sensor has been exposed for a long time to a high concentration of flammable gases, vapors, or the above-mentioned contaminating substances.

The nature of catalytic bead sensor technology means that sensor drift may typically be up to ±5% LEL per month. Instruments using these sensors should be zeroed regularly following the instructions in Section 5, Care and Maintenance.

6.1.3. Semiconductor Sensors

Semiconductor or metallic oxide sensors (MOSs) are among the most versatile of all broad-range sensors. They can be used to detect a variety of gases and vapors in low ppm or even combustible ranges. The sensor is made up of a mixture of metallic oxides. They are heated to a temperature between 302°F and 572°F (150°C and 300°C) depending on the gas(es) to be detected. The temperature of operation as well as the “recipe” of mixed oxides determines the sensor selectivity to various toxic gases, vapors, and refrigerants. Electrical conductivity greatly increases as soon as a diffusion process allows the gas or vapor molecules to come in contact with the sensor surface. Water vapor, high ambient humidity, temperature fluctuations, and low oxygen levels can result in higher readings.

**IMPORTANT:** Certain substances in the environment to be monitored may impair the sensitivity of the sensors:

1. Materials containing silicone or silicone rubber/putty.
2. Corrosive gases such as hydrogen sulfide, sulfur oxide, chlorine, hydrogen chloride, etc.
3. Alkaline metals, saltwater spray.

6.1.4. Infrared Sensors

The infrared (IR) gas sensor is designed to measure the concentration of combustible gases and vapors in the ambient air. The sensor principle is based on the concentration-dependent absorption of infrared radiation in measured gases.

The monitored ambient air diffuses through a sintered metal material into the enclosure of an optical “bench.” The broadband light emitted by an IR source passes through the gas in the optical bench and is reflected by the walls from where it is directed towards a dual-element detector. One channel of the detector measures the gas-dependent light transmission, while the other channel is used as a reference. The ratio between measurement and reference signal is used to determine the gas concentration. Internal electronics and software calculate the concentration and produce an output signal.
6.2. **Disposing of the Instrument**

6.2.1. **Disposing of the Electrical and Electronic Equipment**

EU-wide regulations governing the disposal of electrical and electronic appliances which have been defined in the EU Directive 2012/19/EU and in national laws have been effective since August 2012 and apply to this device.

Common household appliances can be disposed of using special collecting and recycling facilities. However, this device has not been registered for household usage. Therefore it must not be disposed of through these channels. The device can be returned to Emerson for disposal. Please do not hesitate to contact Emerson Technical Support if you have any further questions on this issue.

6.2.2. **Disposing of Sensors**

Dispose of sensors in accordance with local laws.

---

**DANGER!** Do not dispose of sensors in fire due to the risk of explosion and resulting chemical burns.

---

**WARNING!** Do not force open electrochemical sensors.

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**IMPORTANT:** Observe the applicable local waste disposal regulations. For information, consult your local environmental agency, local government offices or appropriate waste disposal companies.
### 6.3. Technical Specifications

#### 6.3.1. General Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signals to Central Controller</strong></td>
<td></td>
</tr>
<tr>
<td>Analog Current</td>
<td>Normal operation: 4 to 20mA&lt;br&gt;Drift below zero: 3.8mA&lt;br&gt;Measuring range exceeded: 20.5mA&lt;br&gt;Instrument fault: ≤ 1.2mA&lt;br&gt;Fault on analog interface: &gt; 21mA&lt;br&gt;Offline mode/Maintenance signal: 3mA steady signal</td>
</tr>
<tr>
<td>Analog Voltage</td>
<td>0 to 5V; 1 to 5V (default); 0 to 10V; 2 to 10V (selectable)&lt;br&gt;During fault condition, 1 to 5V and 2 to 10V outputs are 0V.</td>
</tr>
<tr>
<td>Modbus RTU over RS-485</td>
<td>Baud rate: 9,600 or 19,200 (default) (selectable)&lt;br&gt;Start bits: 1&lt;br&gt;Data bits: 8&lt;br&gt;Parity: None, Odd, Even (default) (selectable)&lt;br&gt;Stop bits: 1 or 2 (selectable)&lt;br&gt;Retry time: 500 ms, min time between retries&lt;br&gt;End of message: Silent 3.5 characters</td>
</tr>
<tr>
<td><strong>Power Supply and Relays</strong></td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td>19.5 to 28.5VDC; 24VAC ± 20%, 50/60 Hz</td>
</tr>
<tr>
<td>Inrush current</td>
<td>1.5 A</td>
</tr>
<tr>
<td>Operating power (max)</td>
<td>MRLDS-450: 4W, 170mA @ 24VDC</td>
</tr>
<tr>
<td>Relay rating</td>
<td>3 SPDT 1 A at 24VAC/VDC, resistive load</td>
</tr>
<tr>
<td>Audible alarm</td>
<td>Internal Buzzer ≥72 dB at 4” (10cm)</td>
</tr>
<tr>
<td>Alarm delay</td>
<td>0 to 15 minutes (selectable)</td>
</tr>
<tr>
<td><strong>Wiring</strong></td>
<td></td>
</tr>
<tr>
<td>Power and analog signal</td>
<td>2-core shielded cable, 16 to 20 AWG (0.5 to 1.5mm²)</td>
</tr>
<tr>
<td>Modbus network</td>
<td>3-core, 2 twisted pair + ground, shielded cable with 120 Ω characteristic impedance, 16 to 24 AWG (0.5 to 1.5 mm²)</td>
</tr>
<tr>
<td>Cable gland</td>
<td>M20, 10-14mm cable outer diameter&lt;br&gt;M16, 4-8mm cable outer diameter</td>
</tr>
</tbody>
</table>

*Table 6-1 - General Specifications*
### Table 6-1 - General Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Specifications</td>
<td>Enclosure protection IP66</td>
</tr>
<tr>
<td></td>
<td>Enclosure Size (W×H×D) (Approx.) MRLDS-450 IP66: 6.5×6.5×3.4” (165×165×87mm)</td>
</tr>
<tr>
<td></td>
<td>Weight (Approx.) MRLDS-450: 1lb, 1oz (480g)</td>
</tr>
<tr>
<td>Environmental</td>
<td>Temperature -40 to 120°F (-40 to 50°C)</td>
</tr>
<tr>
<td></td>
<td>Storage temperature -5 to 100°F (-20 to 40°C)</td>
</tr>
<tr>
<td></td>
<td>Humidity 5 to 90% RH, non-condensing (15 to 90% RH, non-condensing, EC sensors excl. O₂)</td>
</tr>
<tr>
<td></td>
<td>Pressure 23.6 to 32.5 inch Hg/800 to 1,100 mbar</td>
</tr>
<tr>
<td></td>
<td>Elevation 0 to 10,000 ft. (3,000 m) altitude</td>
</tr>
<tr>
<td></td>
<td>Influences For influences on the measurement performance and restrictions of a particular sensor, see sensor data sheet.</td>
</tr>
<tr>
<td>Agency Approvals</td>
<td>CE, EN 50270:2015, UL/CSA/IEC/EN 61010-1</td>
</tr>
</tbody>
</table>

### 7 Ordering Information

<table>
<thead>
<tr>
<th>Emerson P/N</th>
<th>IP66, 3 x Relays, Analog Output, Modbus Output, Audible &amp; Visual Alarms</th>
<th>Emerson P/N</th>
<th>Replacement Sensor</th>
<th>Sensor Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>809-1040</td>
<td>CO₂ 0-5,000ppm</td>
<td>809-1140</td>
<td>CO₂ 0-5,000ppm</td>
<td>IR</td>
</tr>
<tr>
<td>809-1041</td>
<td>CO₂ 0-10,000ppm</td>
<td>809-1141</td>
<td>CO₂ 0-10,000ppm</td>
<td>IR</td>
</tr>
<tr>
<td>809-1047</td>
<td>R404A 0-1,000ppm</td>
<td>809-1147</td>
<td>R404A 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1048</td>
<td>R407A 0-1,000ppm</td>
<td>809-1148</td>
<td>R407A 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1049</td>
<td>R410A 0-1,000ppm</td>
<td>809-1149</td>
<td>R410A 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1050</td>
<td>R22 0-1,000ppm</td>
<td>809-1150</td>
<td>R22 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1056</td>
<td>R448A 0-1,000ppm</td>
<td>809-1156</td>
<td>R448A 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1058</td>
<td>R513A 0-1,000ppm</td>
<td>809-1158</td>
<td>R513A 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1066</td>
<td>R422D 0-1,000ppm</td>
<td>809-1166</td>
<td>R422D 0-1,000ppm</td>
<td>SC</td>
</tr>
<tr>
<td>809-1068</td>
<td>R449A 0-1,000ppm</td>
<td>809-1168</td>
<td>R449A 0-1,000ppm</td>
<td>SC</td>
</tr>
</tbody>
</table>

### Table 7-1 - Part Numbers and Ordering Information
<table>
<thead>
<tr>
<th>Emerson P/N</th>
<th>MRLDS-450 Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>809-1190</td>
<td>Calibration Adapter Kit</td>
</tr>
<tr>
<td>809-1191</td>
<td>Horn + strobe 24VDC; blue lens</td>
</tr>
<tr>
<td>809-1192</td>
<td>Horn + strobe 24VDC; amber lens</td>
</tr>
<tr>
<td>809-1193</td>
<td>Horn + strobe 24VDC; red lens</td>
</tr>
<tr>
<td>809-1194</td>
<td>Horn + strobe; blue lens; MP120K 120VAC adapter</td>
</tr>
<tr>
<td>809-1195</td>
<td>Horn + strobe; amber lens; MP120K 120VAC adapter</td>
</tr>
<tr>
<td>809-1196</td>
<td>Horn + strobe; red lens; MP120K 120VAC adapter</td>
</tr>
</tbody>
</table>

Table 7-2 - Accessory Part Numbers and Ordering Information
For Technical Support call 770-425-2724 or email ColdChain.TechnicalServices@Emerson.com

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