# Macurco™ AireShield

## Detector, Controller and Transducer

## User Instructions


IMPORTANT: Keep these user instructions for reference.

www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

# 1 General Safety Information

The following instructions are intended to serve as a guideline for the use of the Macurco AireShield Detector. This manual will refer to these devices as AireShield unless content is specific to a model. This manual is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for your facility. If you have any questions about the applicability of the equipment for your situation, consult an industrial hygienist or call Technical Support at 1-844-325-3050.

## 1.1 General Description

The Macurco AireShield is a commercial style Gas Detector/Transducer. It is an electronic detection system used to measure the concentration of multiple types of target gas (per the installed sensor(s)) and provide feedback and response to all types of devices such as automatic exhaust fan control to help reduce gas concentrations in parking garages, maintenance facilities, boiler rooms, chiller rooms and many other commercial applications.

The Macurco AireShield is a low voltage only device. The AireShield is a low-level meter capable of displaying in the range of the given sensor installed (refer to sensor section for individual sensor ranges). The AireShield has two versions: Analog and Digital. The Analog version has a selectable 4-20 mA output, and the Digital has Modbus RTU communication. Both versions have LED notification, dual relays, 24VDC output, digital display and the option of a local buzzer. The AireShield is factory calibrated and 100% tested for proper operation but can also be calibrated in the field.

The AireShield is intended to be a wall mounted device or mounted on a 4 x 4 electrical box using its adapter plate. It can operate in a stand-alone application or can be connected to a Macurco control panel, a building automation system, UL listed Control Panel or Fire Panel, or other control device that accepts 4-20mA analog input, Modbus, a relay input, or 24VDC input. The AireShield is compatible with the Macurco DVP-120M, DVP-120B and DVP-1200 Control Panel family.

## 1.2 List of warnings

| ⚠WARNING |
|---|
| Each person using this equipment must read and understand the information in this user manual before use. Use of this equipment by untrained or unqualified people or use that is not in accordance with this user manual may adversely affect product performance. |
| Use only for monitoring the gas which the sensor and monitor is designed to detect. Failure to do so may result in exposures to gases not detectable and cause serious injury or death. For proper use, see supervisor or user manual, or contact Technical Support at 1-844-325-3050. |
| This equipment may not function effectively below -40°F or above 140°F (-40°C or above 60°C). Using the detector outside of this temperature range may adversely affect product performance. Please refer to sensor chart for specific sensor temperature range. *See table 4.4 Sensor Comparison Chart* |
| This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in |

| |
|---|
| overexposure and cause serious injury or death. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050. |
| High voltage relay terminals (120/240 VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is de-energized from the detector relays prior to servicing the unit. Failure to do so may result in electrical shock. |
| Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair product performance. |
| Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration or verification test (bump test) will produce inaccurate readings. This means that higher levels of gas being monitored may be present and could result in overexposure. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050. |
| The following steps must be performed when conducting a calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance.<br>• When performing a calibration verification test (bump test) only use certified calibration gas at the required concentration level.<br>• Do not test with expired calibration gas.<br>• Do not cover or obstruct display or visual alarm cover.<br>• Ensure sensor inlets are unobstructed and are free of debris<br>Failure to follow instructions outlined in this user manual can result in sickness or death. |

# 2 Use Instructions and Limitations

| ⚠WARNING |
|---|
| Each person using this equipment must read and understand the information in this user manual before use. Use of this equipment by untrained or unqualified people or use that is not in accordance with this user manual may adversely affect product performance. |

## 2.1 Use For

The AireShield provides gas detection for a large variety of applications such as but not limited to automatic exhaust fan control for automotive maintenance facilities, enclosed parking garages, utility rooms, warehouses, chiller rooms, walk in coolers and other commercial applications where the potential for concentrations of the targeted gas exists. The AireShield meets the requirements of the Uniform Building Code and OSHA standards for enclosed garages, maintenance facilities, warehouses, and other commercial applications (depending on target gas). The AireShield can be used as stand alone, paired with a Macurco control panel, a building automation system, UL listed Control Panel or Fire Panel, or other control device that accepts 4-20mA analog input, Modbus, a relay input, or 24VDC input.

| ⚠WARNING |
| --- |
| Use only for monitoring the gas which the sensor and monitor is designed to detect. Failure to do so may result in exposures to gases not detectable and cause serious injury or death. For proper use, see supervisor or user manual, or contact Technical Support at 1-844-325-3050. |

## 2.2 Do NOT use for

The AireShield is not intended for use in hazardous locations or industrial applications such as refineries, chemical plants, etc. Do not mount the AireShield where the normal ambient temperature is below -40°F or exceeds 140°F (-40°C or above 60°C). Refer to sensor chart for specific sensor temperature range *See table 4.4 Sensor Comparison Chart*. The AireShield mounts either directly to the wall or on a type 4S electrical box supplied by the contractor using the supplied adapter plate. Do not install the AireShield inside another box.

| ⚠WARNING |
| --- |
| This equipment may not function effectively below -40°F or above 140°F (-40°C or above 60°C). Using the detector outside of this temperature range may adversely affect product performance. Please refer to sensor chart for specific sensor temperature range. *See table 4.4 Sensor Comparison Chart* |

## 2.3 Features

- Low-level meter capable of displaying a specific gas range based on the installed sensor and sensor profile
- The AireShield complies with safety standards: ASHRAE 15, 34 & CSA-B52
- Configurable Dual Selectable relay activation
- 5 A SPDT Relay 1 controls starters of exhaust fans
- 0.5 A N.O. or N.C. Relay 2 connects to warning devices or control panels
- 24VDC, 250mA Horn/Strobe Driver to connect to horn/strobes
- **Analog I/O Option:** Configurable Analog Current Loop: 4-20mA, 2-10mA
- **Digital I/O Option:** MODBUS RTU Digital Communication
- AireShield is a wall-mounted device, that can also be mounted on a standard 4x4 electrical box with supplied adapter plate
- Supervised system: any internal detector problem can cause either Relay 1 and/or Relay 2 to activate based on programming preferences when an internal detector problem “trouble code” occurs
- Calibration kits are available based on gas and sensor type. Kits are supplied with appropriate regulator, tubing, calibration hood.
- Bluetooth Communication: Pairing with the Macurco Connect App (iOS and Google Play), the user can upload newer firmware versions, configure settings, download events, and obtain detector information.

## 2.4 Specifications

- Power Input: 12 to 24 VAC or 12 to 32 VDC
- Shipping Weight: 1 pound (0.45 kg)
- Size: 8 ¼ x 2 5/8 x 5 ¾ in. (11.4 X 11.4 X 5.3 cm)
- Color: Dark gray
- Connections: plugs/terminals
- Mounting: wall mount or 4x4 electric box mounted
- Relay 1: 5 A, 240 VAC, pilot duty, SPDT
- Relay 1 settings: See sensor profile table for setting range
- Relay 1 & 2 Delay Settings: 0-15 minutes, 0 (default), 1 minute increments
- Relay 1 & 2 Latching or non-latching (default) selectable
- Relay 2: 0.5A 120 V, 60 VA
- Relay 2 actuation: selectable N.O. (default) or N.C.
- Relay 2 settings: See sensor profile table for setting range
- External Buzzer Output: 24VDC, 250mA Horn/Strobe Driver, 200mA output if AireShield has optional local buzzer configuration
- **Analog I/O Option:** Configurable Analog Current Loop: 4-20mA, 2-10mA
- **Digital I/O Option:** MODBUS RTU Digital Communication
- Calibration Period Settings: dis(default), 3-24 (months), 1 month increments
- Optional Buzzer: 90 dBA at 10 ft settable to On (default) or OFF.
- Digital display: 2x8 Digit LED selectable to On (default), In-Use, OFF.
- LED Notification *(refer to Table 4-2 Systems Settings for default values)*:
  - Normal status: selectable (Off/Green)
  - Relay Activation: selectable solid or flashing (Off, White, Amber, Red)
  - Buzzer Activation: selectable solid or flashing (Off, White, Amber, Red)
  - Trouble Condition: selectable solid or flashing (Off, White, Amber, Red)
  - Calibration: Purple
  - Bluetooth connectivity: Blue
- Operating Environment: Temperature range: refer to sensor profile chart,10 to 90% RH non-condensing

### 2.4.1 AireShield

- Power: 4.08 W (max) from 12 to 24 VAC or 12 to 32 VDC
- Power: 7.5 W (max) at 24VDC with Macurco Horn/Strobe connected
- AireShield with Local Buzzer Current @ 24 VDC:
  - Detector No Sensor: Normal Mode: 65 mA, Both Relays Activated: 120 mA
  - Detector Integral Sensor: Normal Mode: 77 mA, Both Relays Activated: 148 mA
  - Detector Integral + Remote Sensor: Normal Mode: 99 mA, Both Relays Activated: 170 mA
  - Detector Dual Remote Sensors: Normal Mode: 109 mA, Both Relays Activated: 179 mA

# 3 Installation Instructions

| ⚠WARNING |
| --- |
| This detector helps monitor for the presence and concentration level of a certain specified airborne gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and cause serious injury or death. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050. |

## 3.1 External Diagram

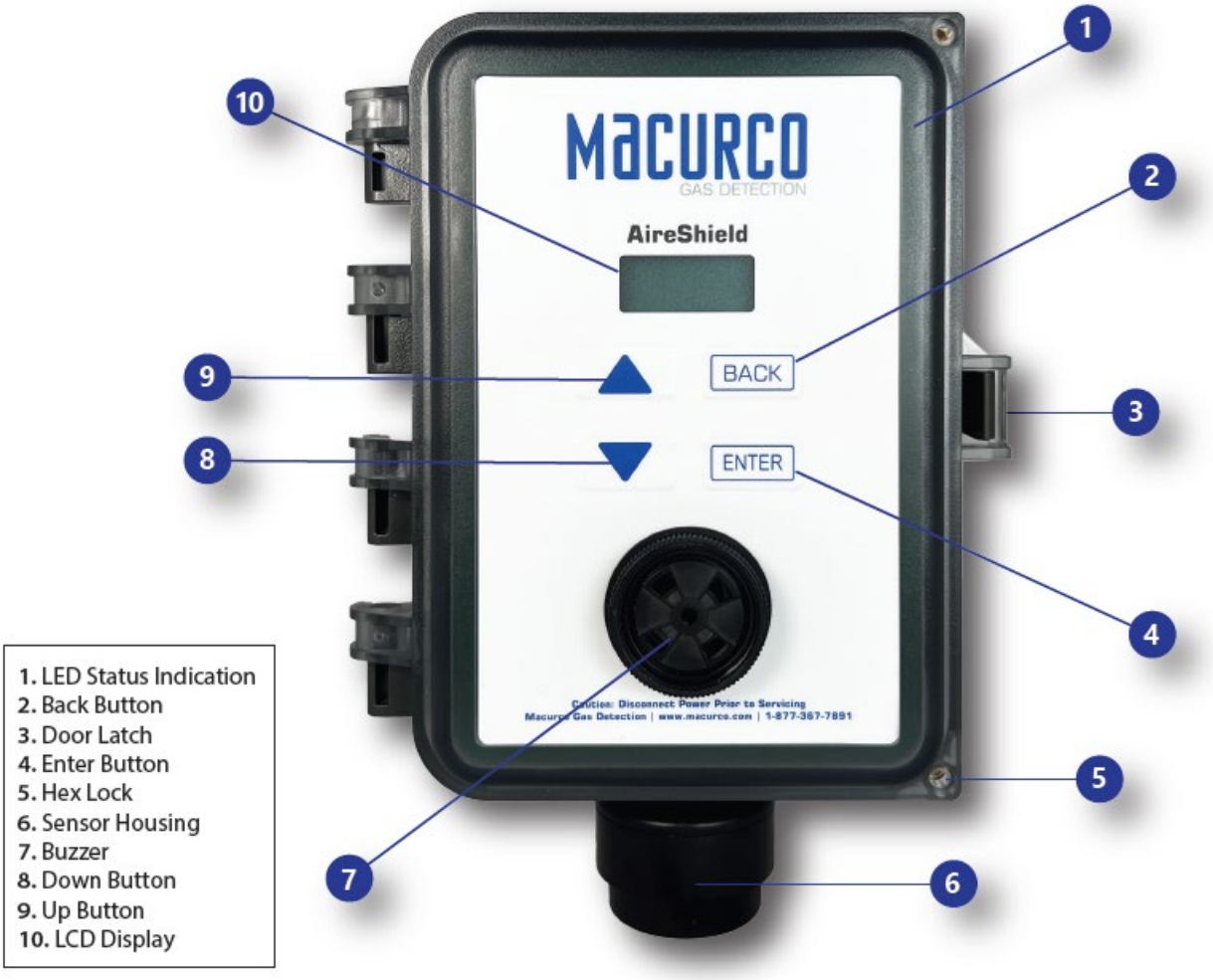



Figure: 3-1 AireShield

## 3.2 Location

An AireShield is normally mounted depending on the target gas and its density (refer to *figure 3-3* for mounting heights). The unit's coverage area is dependent on application and gas specific. It can cover approximately 1,257 sq. ft. (117 sq. meters) to 7,500 sq. ft. (697 sq. meters) mounted centrally depending on gas type. The coverage depends on air movement within the room or facility. Extra detectors may be needed near any areas where people work or where the air is stagnant. Some of the factors that affect the coverage area are application type, personnel work areas and movement, room size, air movement, potential threat, mounting location, along with other site-specific factors that must be considered. Please check local regulations or requirements prior to installation. The AireShield is a wall-mounted device that can also mount on a 4x4 electrical box supplied by the contractor, if the 4x4 adapter plate is used. Do not install the AireShield inside another box. Do NOT mount the AireShield where the normal ambient temperature is below -40°F or exceeds 140°F (below -40°C or above 60°C).

| Gases Detected | Radius | Area Covered |
|---|---|---|
| Carbon Monoxide/ Nitrogen Dioxide | 48.86 ft. | 7,500 sq. ft. (696.77 $m^2$) |
| Carbon Dioxide | 39.89 ft. | 5,000 sq. ft. (464.52 $m^2$) |
| Other Gases | 20 ft. | Up to 1,257 sq. ft. (~117 $m^2$) |

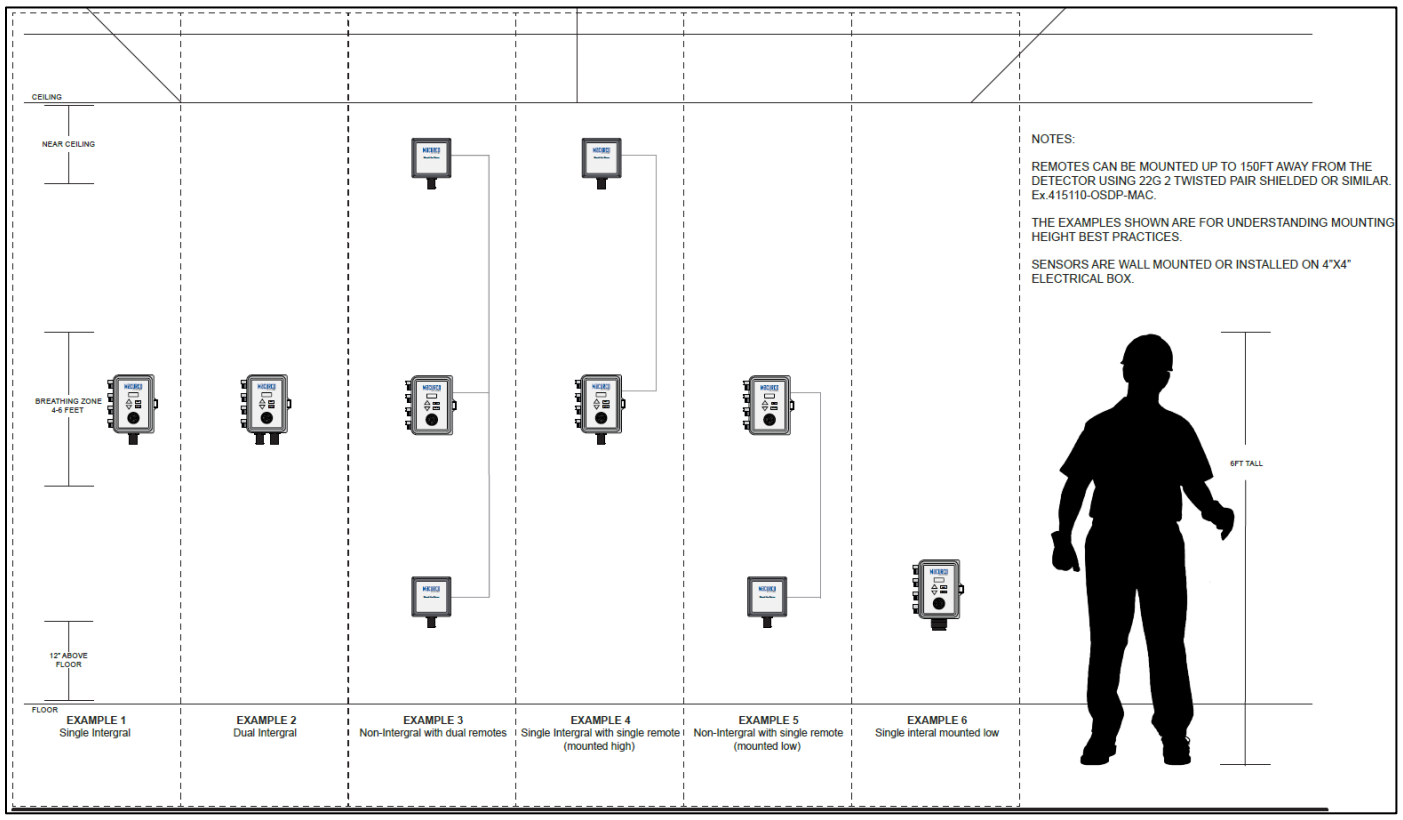



Figure: 3-2 AireShield Mounting Configurations

# Refrigerant Gas Chart

| Gas Type | Chemical Symbol | Safety Classifaction | RCL Values | Vapor Density (Air = 1) | LEL% | UEL% | Risks |
|---|---|---|---|---|---|---|---|
| **R22** | $CHClF_2$ | A1 | 13 lbs. | 3 | NA | NA | Asphyxiants |
| **R-32** | $CH_2F_2$ | A2L | 4.8 lbs. | 3.82 | 14.4 | 31 | Asphyxiants/Flammable |
| **R-125** | $C_2HF_5$ | A1 | 23 lbs. | 4.2 | NA | NA | Asphyxiants |
| **R-134a** | $CH_2FCF_3$ | A1 | 13 lbs. | 3.5 | NA | NA | Asphyxiants |
| **R-143a** | $C_2H_3F_3$ | A2L | 4.4 lbs. | 2.9 | 7.1 | 16.1 | Asphyxiants/Flammable |
| **R-227ea** | $C_3HF_7$ | A1 | 36 lbs. | 5.9 | NA | NA | Asphyxiants |
| **R-290** | $C_3H_8$ | A3 | 0.59 lbs. | 1.56 | 2.1 | 9.5 | Flammable |
| **R-404A** | (R-125/R-143a/R-134a) 44/52/4% | A1 | 31 lbs. | 3.34 | NA | NA | Asphyxiants |
| **R-407A** | (R-32/R125/R134a) 20/40/40% | A1 | 19 lbs. | 2.54 | NA | NA | Asphyxiants |
| **R-407C** | (R-32/R-125/R-134a) 23/25/52% | A1 | 18 lbs. | 3 | NA | NA | Asphyxiants |
| **R-407F** | (R-32/R125/R124a) 30/30/40% | A1 | 20 lbs. | 2.54 | NA | NA | Asphyxiants |
| **R-410A** | (R-32/R-125) 50/50% | A1 | 26 lbs. | 3 | NA | NA | Asphyxiants |
| **R-417A** | (R-125/R-134a/R-600) 46.6/50/3.4% | A1 | 3.5 lbs. | 3.8 | NA | NA | Asphyxiants |
| **R-422D** | (R-125/R-134a/R-600) 65.1/31.5/3.4% | A1 | 16 lbs. | 3 | NA | NA | Asphyxiants |
| **R-448A** | (R-32/R-125/R-134a/R1234yf/R-1234ze) 26/26/21/20/7% | A1 | 22 lbs. | 2.98 | NA | NA | Asphyxiants |
| **R-449A** | (R32/R125/R1234yf/R134a) 24.3/24.7/25.3/25.7% | A1 | 23 lbs. | 3.07 | NA | NA | Asphyxiants |
| **R-450A** | (R-134a/R1234ze) 42/58% | A1 | 20 lbs. | NA | NA | NA | Asphyxiants |
| **R-452B** | (HFC-32/C3H2F4) 30-50/50-70% | A2L | 4.8 lbs. | NA | 11.9 | 23.3 | Asphyxiants/Flammable |
| **R-454A** | (HFC-32/R-1234yf) 35/65% | A2L | 4.4 lbs. | 2.83 | 6.3 | 15 | Asphyxiants/Flammable |
| **R-454B** | (HFC-32/R-1234yf) 68.9/31.1% | A2L | 4.6 lbs. | 2.2 | 7.7 | 22 | Asphyxiants/Flammable |
| **R-454C** | (HFC-32/R-1234yf) 21.5/78.5% | A2L | 4.6 lbs. | 3.1 | 6.2 | 15 | Asphyxiants/Flammable |
| **R-455A** | (CO2/R32/R-1234yf) 3/21.5/75.5% | A2L | 6.8 lbs. | NA | 11.8 | 12.9 | Asphyxiants/Flammable |
| **R-507** | (R-125/R-143a) 50/50% | A1 | 32 lbs. | NA | NA | NA | Asphyxiants |
| **R-513A** | (R-134a/R-1234yf) 30-50/50-70% | A1 | 20 lbs. | NA | NA | NA | Asphyxiants |
| **R-600** | $C_4H_{10}$ | A3 | 0.15 lbs. | 2.0 | 1.8 | 8.4 | Flammable |
| **R-717** | $NH_3$ | B2L | 0.014 lbs. | 0.6 | 15 | 28 | Toxic/Flammable |
| **R-744** | $CO_2$ | A1 | 4.5 lbs. | 1.52 | NA | NA | Asphyxiants/Toxic |
| **R-1233zd** | $C_3H_2ClF_3$ | A1 | 5.3 lbs. | NA | NA | NA | Asphyxiants |
| **R-1234yf** | $C_3H_2F_4$ | A2L | 4.5 lbs. | 4 | 6.2 | 12.3 | Asphyxiants/Flammable |
| **R-1234ze** | $C_3F_4H_2$ | A2L | 4.7 lbs. | 4 | 6.5 | 15 | Asphyxiants/Flammable |

**Color** - Colorless **Smell** - Faint Ethereal Odor **Sensor Type** - NDIR **% in Atmosphere** - NA **Mounting Height** - ~12" Above Floor

Figure: 3-3 Refrigerant Gas Chart



www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

| ⚠WARNING |
| --- |
| High voltage terminals (120/240 VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is de-energized from the detector relays prior to servicing the unit. Failure to do so may result in electrical shock. |

## 3.3 Installation

Wiring Instructions

1. AireShield
    a. The AIRESHIELD is a wall mounted device and can also mount on a 4” square (or 4x4) electrical box supplied by the contractor. Do not mount the AIRESHIELD inside another box.
    b. Use the adapter plate to mount the AireShield to the 4x4 box and knock out the plastic in the adapter plate to allow for wire to come through the back of the unit through the PCBA hole and wire into the terminals

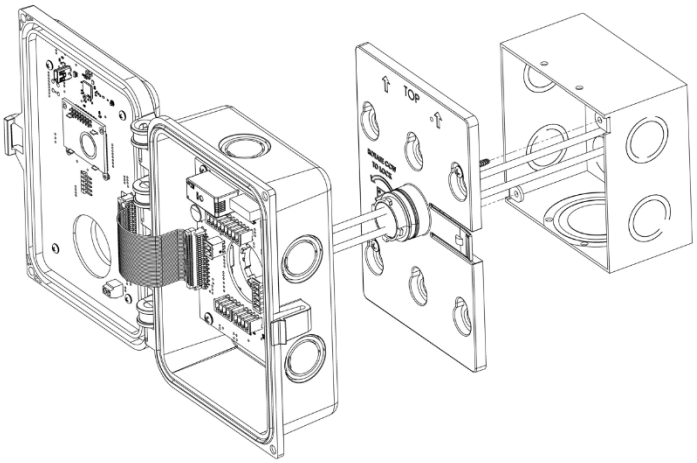



Figure: 3-4 AireShield Transmitter Mounting

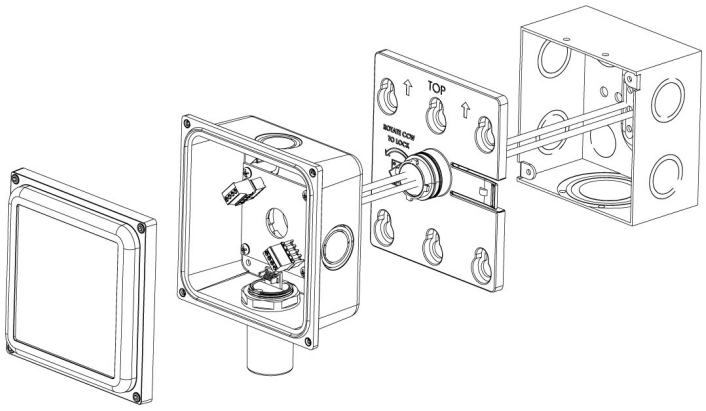



Figure: 3-5 AireShield Remote Mounting

2. Connect the AIRESHIELD to a Class 2 listed power supply only. It is suggested to use a separate transformer for powering the unit or units because of possible interferences from other devices on the same power supply.
3. Connect the AIRESHIELD to the control cables with terminal plugs. When making connections, make sure the power is off.
4. There are two terminals for Power (A, B): 12 to 24 VAC or 12 to 32 VDC, with no polarity preference.
5. The dry contact, SPDT Relay 1 has three terminals. The common (COM.), normally open (N.O.) and the normally closed (N.C.) contact. Relay 1 can switch up to 5.0 A up to 240 VAC. See section 4.5 Configuration "Config" for details on relay settings. Relay 1 will activate if:
    a. If the gas concentration exceeds the Relay 1 Setpoint longer than the Delay time. It will deactivate once the gas concentration drops below the alarm set point. Note that the relay is disabled when the Setpoint is set to 0000.
    b. During a power up test Relay 1 will engage for 58 seconds unless Power Up Test is turned off
    c. When a trouble fault condition is present Relay 1 will engage, (if the Trouble Relay 1 Setting Option is set to "ON").
6. Relay 1 can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds Relay 1 set point). Once latched in, power will need to be interrupted, or go to the active events menu, **BACK** button and press the down arrow until you get to "R1 on by" and if "L" is displayed that means it is Latched. Select the "**ENTER**" button, select "Yes" to reset Latching.
   Relay 1 will engage in trouble fault condition (if the Trouble Relay 1 Setting Option is set to "ON") and will disengage once trouble fault condition is cleared.
7. There are two terminals for the dry Relay 2 contacts, with no polarity preference. Relay 2 can switch up to 0.5 A 120 V, or 60 VA. Relay 2 is activated if gas reaches or exceeds the alarm settings. See section 4.5 Configuration "Config" for details on relay settings.
8. Relay 2 can be configured to normally open (default) (N.O.) or normally closed (N.C.) and will activate:
    a. If the gas concentration exceeds Relay 2 set point longer than the Delay time. It will deactivate once the gas concentration drops below the alarm set point. Note that the relay is disabled when the Setpoint is set to 0000.
    b. During a power up test Relay 2 will engage for 10 seconds unless Power Up Test is turned off
    c. When a trouble fault condition is present Relay 2 will engage, (if the Trouble Relay 2 Setting Option is set to "ON").
9. Relay 2 can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds Relay 2 set point). Once latched in, power will need to be interrupted, or go to the active events menu, **BACK** button and press the down arrow until you get to "**R2 on by**" and if "L" is displayed that means it is Latched. Select the **ENTER** button select "Yes" to reset Latching.
10. For Analog Transmitters: The Current Loop is 4 mA in clean air if 4-20mA is selected (default) or 0 mA in clean air if 0-20mA is selected and scales based on the gas reading and selectable sensor range. There are three terminals, and polarity is marked on the connector: A, B, RTN. A is for Sensor 1 connection and B is for Sensor 2 connection.

**NOTE:** 14 to 24 AWG wire shall be used. Wire used shall meet the temperature range of the detector i.e. -40°F to 140°F (-40°C to 60°C).

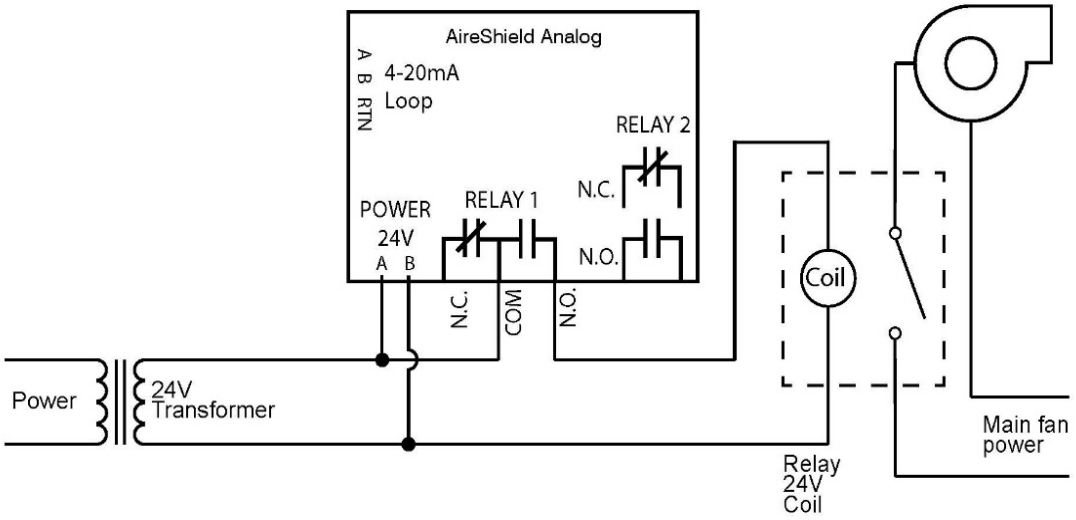



Figure: 3-6 AireShield Standalone Wiring Diagram

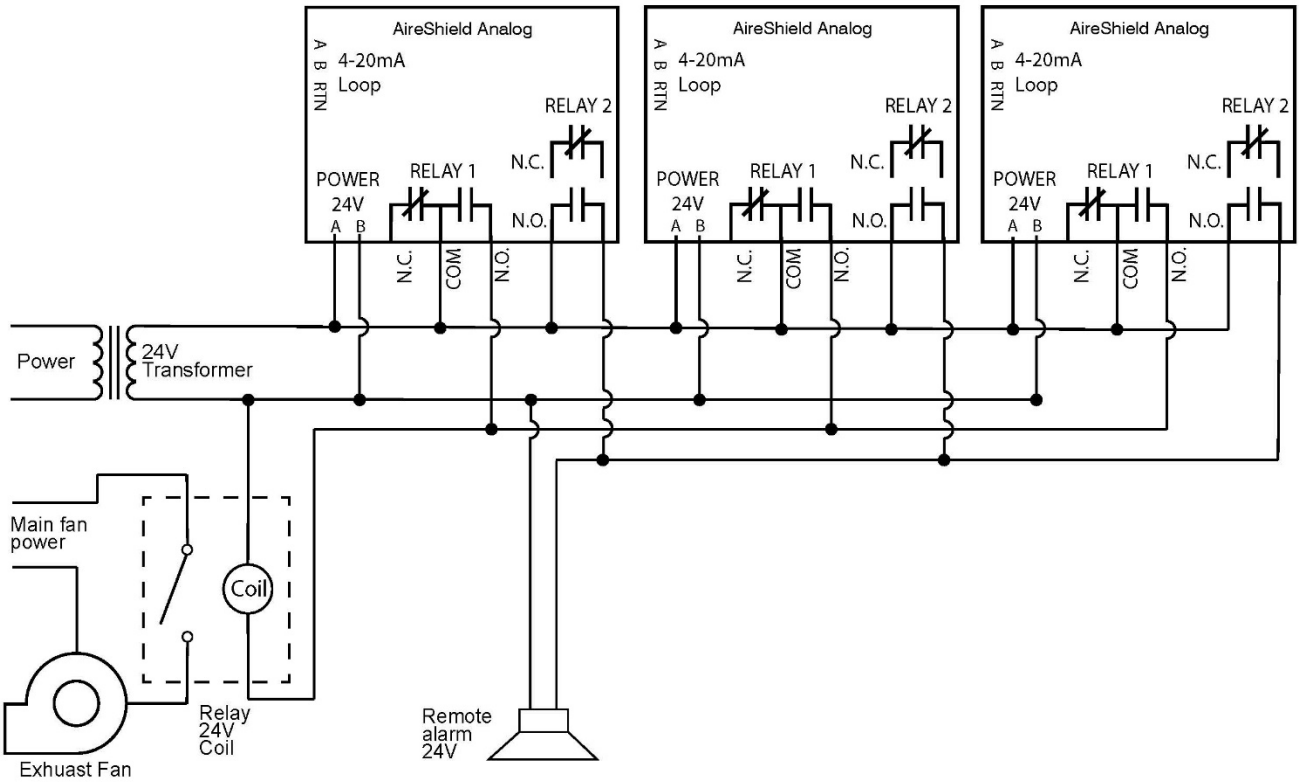



Figure: 3-7 AireShield Multiple Devices Wiring Diagram

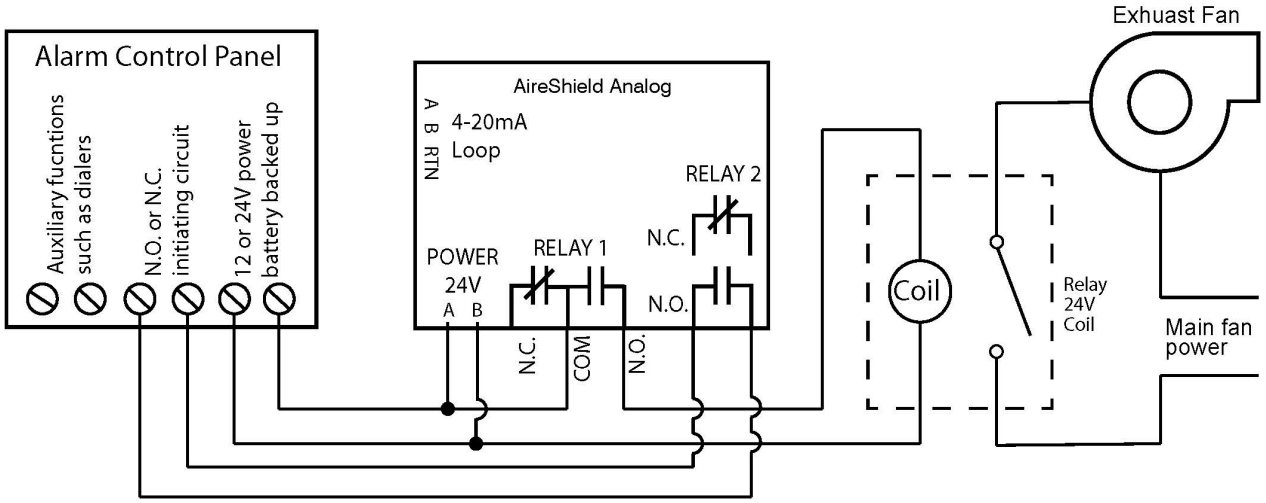



Figure: 3-8 AireShield Alarm Control Panel

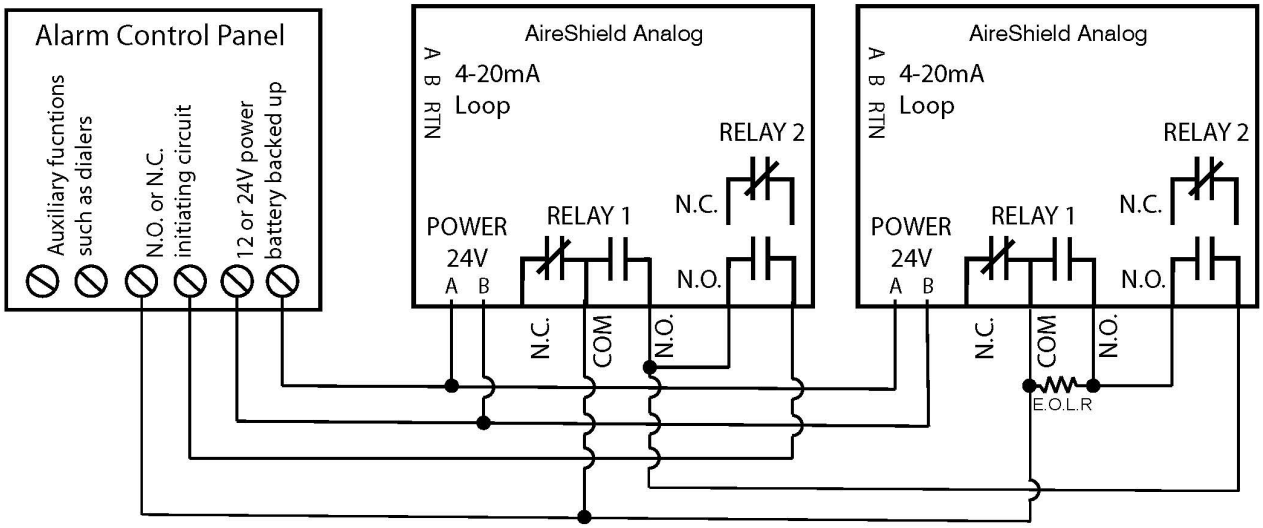



Figure: 3-9 AireShield Alternate Alarm Panel

In this application (above) Relay 1 is used as a low-level alarm notification. Relay 2 is used as a supervisory relay when utilized in the normally closed configuration. The AIRESHIELD monitors all critical functions of the unit through software diagnostics that continually test and verify its operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition. In this error mode, Relay 1 and 2 will be activated indicating the trouble condition (if configured by the user) at panel and the AIRESHIELD display will flash the error.

*See section 4.6.4 System Setting *Trouble Fault Setting* for options.

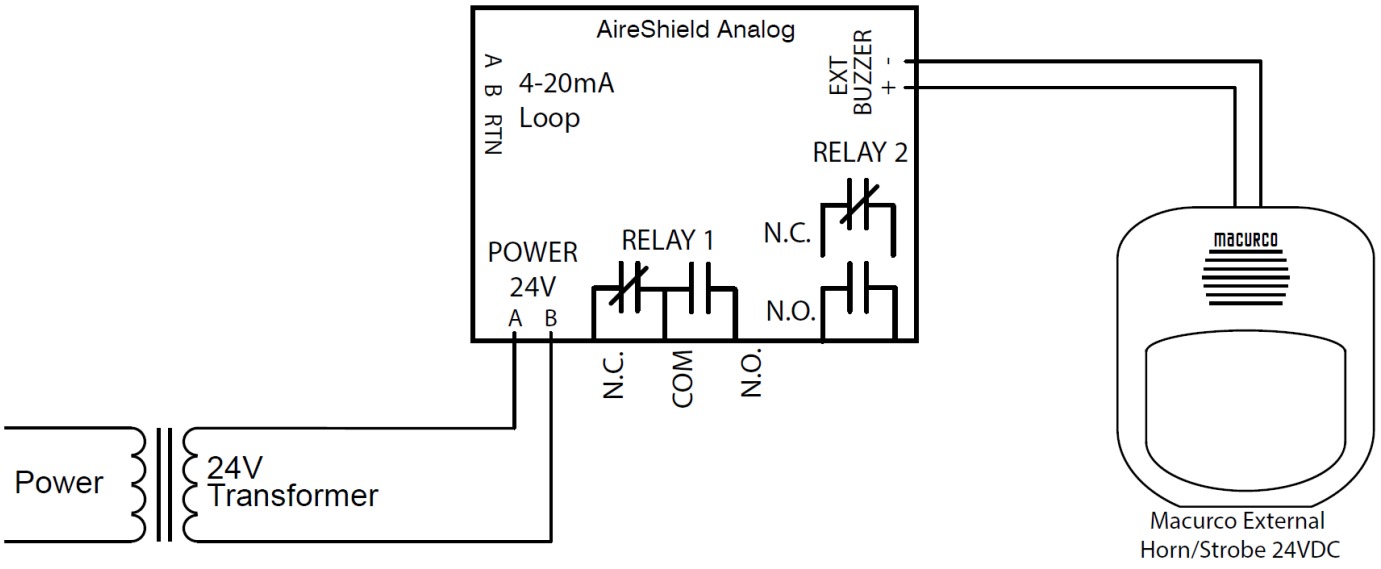



Figure: 3-10 AireShield Horn & Strobe Combo Wiring

Macurco External Horn/Strobe model number is HS-X, where X represents lens color, R for red lens cover, G for green lens cover, B for blue lens cover, A for amber lens cover, C for clear lens cover. Sound pressure for Horn/Strobe model is at least 85dB at 10 feet.

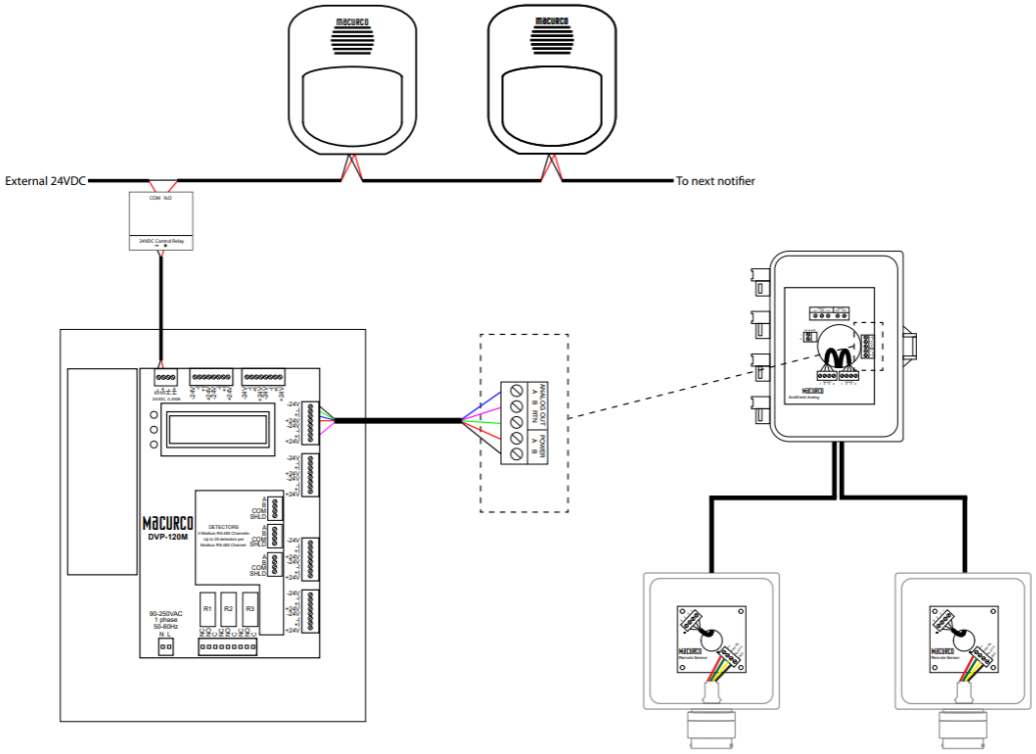



Figure: 3-11 AireShield Analog Dual Remotes Connected With DVP-120M Control Panel

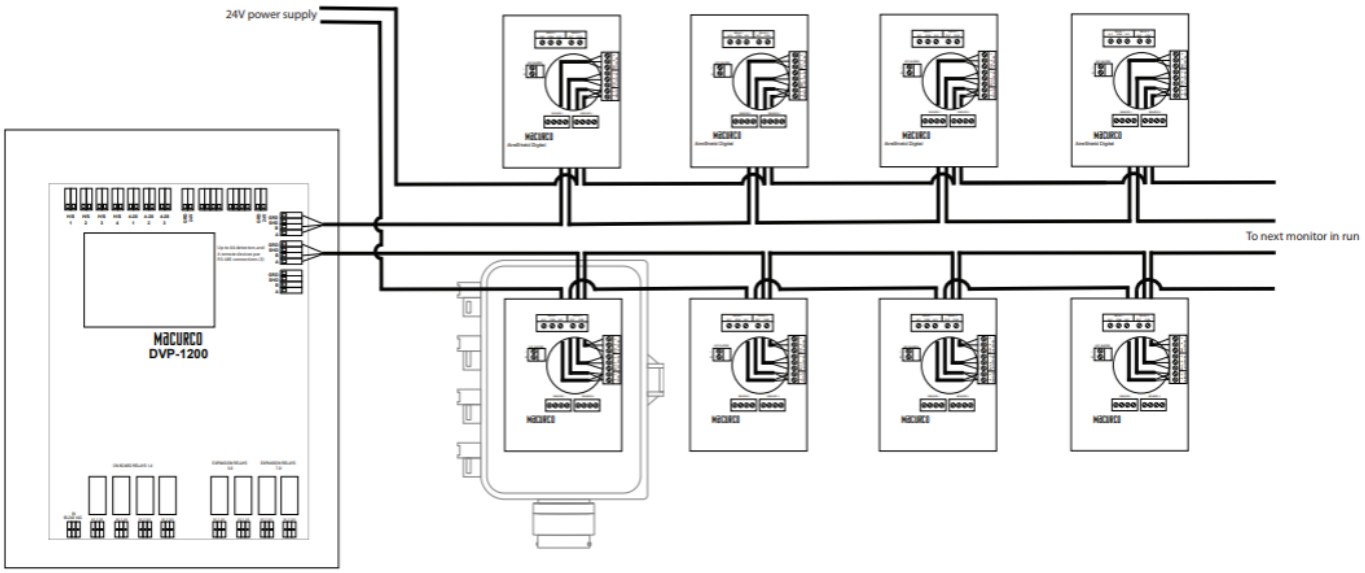



Figure: 3-12 Multiple AireShields wired to DVP-1200

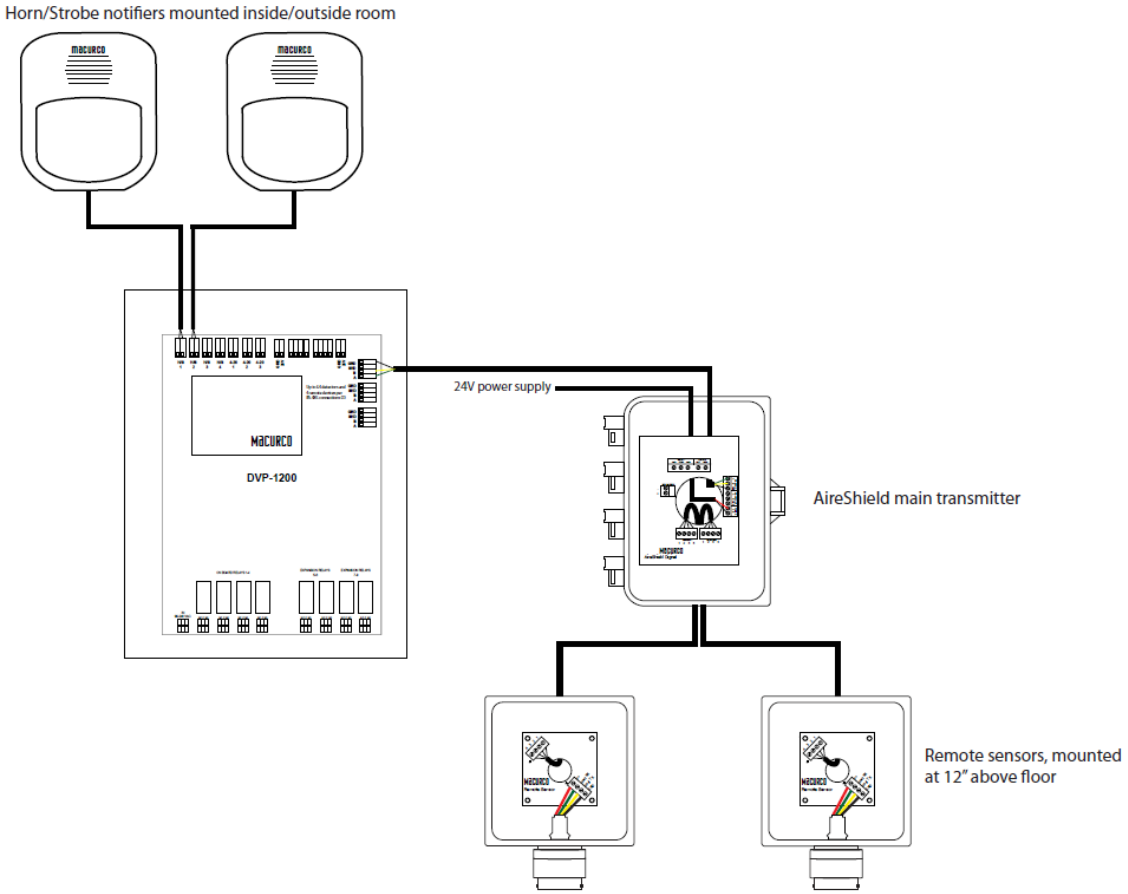



Figure: 3-13 AireShield with Dual Remote Sensors wired to DVP-1200 Control Panel

## 3.4 Terminal Connections

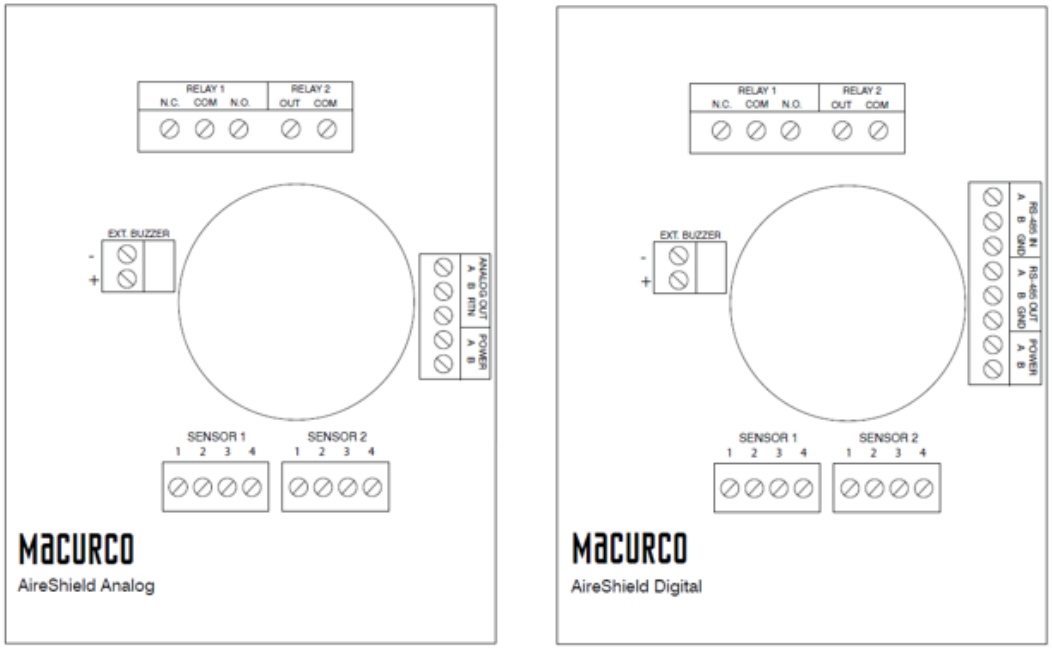



Figure: 3-14 AireShield I/O Terminal Connections

### 3.4.1 AireShield Low Voltage

Except for the safety ground, all field wiring is completed via modular connectors (provided). After wiring, simply plug the modular connectors into the matching connectors on the I/O board of the detector. The AireShield can be ordered via two communications types: Analog or Digital. See *Figure 3-12* above for appropriate reference.

**NOTE**: 14 to 24 AWG wire shall be used. Wire used shall meet the temperature range of the detector, i.e. -40°F to 140° F (-40°C to 60°C).

#### *3.4.1.1 Mains Power Connection*

Connect the AIRESHIELD to Class 2 listed power supply only. It is suggested to use a separate transformer for powering the unit or units because of possible interferences from other devices on the same power supply. Connect the AIRESHIELD to the power terminal plug. When making connections, make sure the power is off. There are two terminals for Power (A, B): 12 to 24 VAC or 12 to 32 VDC, with no polarity preference. The power plug is shared with the analog or digital connector depending on model.

Ensure that the wire cannot be easily pulled from the connector. Plug the modular connection into the appropriate connection and ensure that it latches into the header properly.

#### *3.4.1.2 Relay 1 Connection*

Both version of the AireShield I/O configurations have dual relays and the connection is at the top side of the I/O board. Relay 1 is a SPDT 5 Amp rated relay, terminals are available at the 9 pin Relay 1/Relay 2 modular connector. Each Relay 1 terminal normally open, common, and normally closed (NO, COM and NC), can accommodate a wire size 14 to 24 AWG. To install the wiring for the relays, disconnect the connector from the header. Strip the insulation

of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. Plug the modular connection into the Relay 1/Relay 2 connection and ensure that it latches into the header properly.

#### *3.4.1.3 Relay 2 Connection*

Relay 2 is a SPST 0.5 AMP rated relay, terminals are available at the 9 pin Relay 1/Relay 2 modular connector. Each Relay 2 terminal out and common (OUT and COM) can accommodate a wire size 14 to 24 AWG. To install the wiring for the relays, disconnect the connector from the header. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. There is no polarity for these connections. To install the wiring for the relays, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected, seat the modular connector into the header ensuring that the latch engages.

#### *3.4.1.4 External Horn/Strobe Connection*

The external alarm connections (+/-) are available at the EXT. Buzzer modular connector. This connection outputs 24VDC with a rating of 250mA. When the optional onboard buzzer is installed on the transmitter the external horns/strobe has a rating of 24VDC at 200mA. To install the wiring for the Ext. Buzzer contacts, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected, seat the modular connector into the header ensuring that the latch engages.

#### *3.4.1.5 Analog I/O Signal Connection (model specific)*

With the analog transmitter option the analog terminal connector is shared with the power input connector. The analog connector has 3 terminal connections: A, B, RTN. When you have a single sensor (sensor 1 slot) you will land a wire on “A” & “RTN”. If you have two sensors you will land a wire on “A” for sensor 1 (positive 1 connection) and “B” for sensor 2 (positive 2) and “RTN” for return wire which will connect back to the negative signal at the panel. When connecting to the DVP-120M refer to *Figure 3-7 AireShield connected to DVP-120M*. To install the wiring for the contacts, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected, seat the modular connector into the header ensuring that the latch engages.

#### *3.4.1.6 Digital I/O Signal Connection (model specific)*

With the digital transmitter option the digital terminal connector is shared with the power input connector. The digital connector has 6 terminal connections: 3 for RS-485 IN A, B, GND & 3 for RS-485 OUT A, B, GND. It is recommended to always use twisted wires and shielded cable to reduce noise and allow for reliable data communication over greater distances. Use at least 3-conductor wire with one twisted pair providing a pair for signal (A & B) and common (GND) connections. To install the wiring for the RS-485 contacts, disconnect the connector from the header on the detector. Strip the insulation of each wire back approximately 1/4 in. (6.5 mm), insert the bare wire into the terminal and tighten the screw clamp. Ensure that the wire cannot easily be pulled from the connector. When the wires are connected, seat the modular connector into the header ensuring that the latch engages. With the daisy-chain wiring configuration, connect incoming wiring to *RS-485 In* and wire *RS485 Out* to the next sensor in the daisy-chain.

## 3.5 Remote Sensor Connection

### 3.5.1 Connecting Remote Sensors to AireShield Transmitter

The AireShield Transmitter can have two remote sensors. Remote sensors can be mounted up to 100ft away from the transmitter using 22G 2 twisted pair shielded or similar (Windy City Wire 415110-OSDP-MAC or similar). The sensors can be wall mounted or installed on 4"x4" electrical box. When connecting the remote sensor to the main transmitter ensure wires are terminated appropriately to the correct corresponding numbers listed on the PCBA's: 1:1, 2:2, 3:3, 4:4. The main unit will provide power to the remote sensor.

**NOTE:** It is recommended to twist the 2 power conductors at one end and then measure the full loop resistance at the other end. The maximum resistance for 100ft for the full loop is 3.4 Ohms.

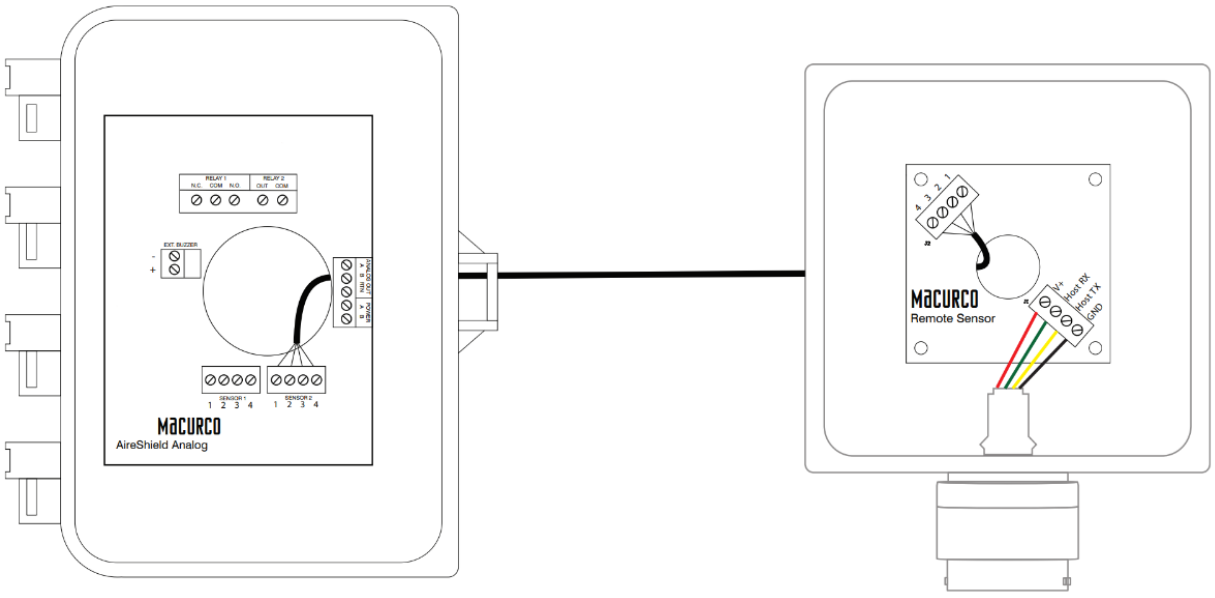



Figure: 3-15 AireShield Remote Sensor Connection

# 4 Operations

## 4.1 Power up

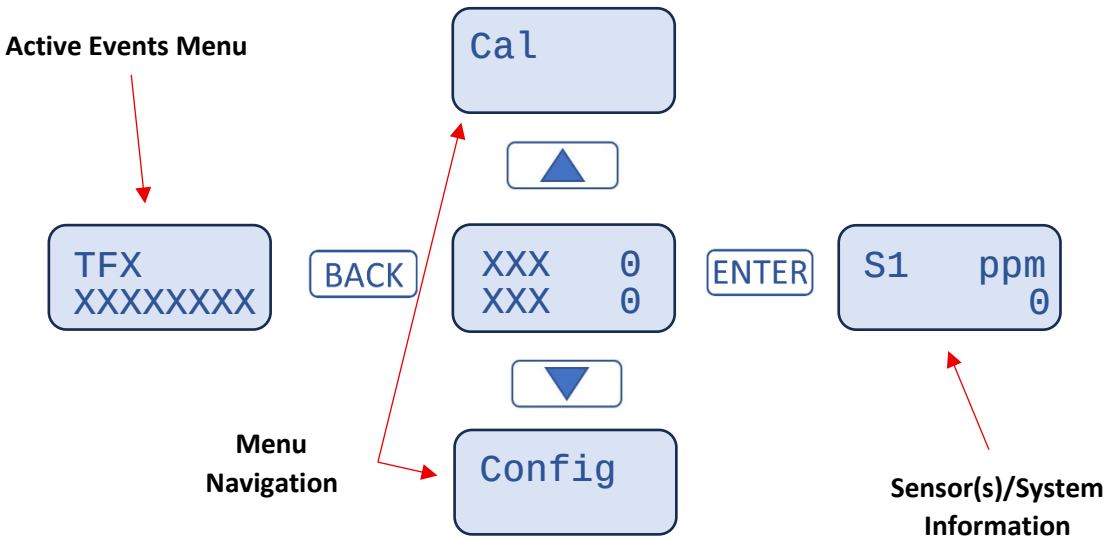
The AireShield cycles through an internal Power-UP Test for the first minute that it is powered. The unit will execute the test cycle any time power is dropped and reapplied (i.e. power failure).

During the self-test cycle the unit will:

- Display the output type (`Anlg` or `Digt`), firmware version number, then count down from 51 to 0 performing a warmup check (if the display setting is "ON").
- The Relay 2 will be activated for 8 seconds and Relay 1 for 58 seconds during the power-up cycle (if "`Power up test`" is "ON" and neither relay Setpoints are set to "0000").
- **Analog I/O Board:** during the power up sequence the 4-20mA will outputs 16mA during the final 20 seconds (if "`Power up Test`" is "ON").
- **Digital I/O Board:** during the power up sequence the unit will output 75% of the full scale of the sensor during the final 20 seconds (if "`Power up Test`" is "ON").
- At the end of the 1-minute cycle, the unit will take its first sample of the air, and the Display will show the gas value to the corresponding sensor(s) (if Display is set to "On").

## 4.2 Home Screen Navigation

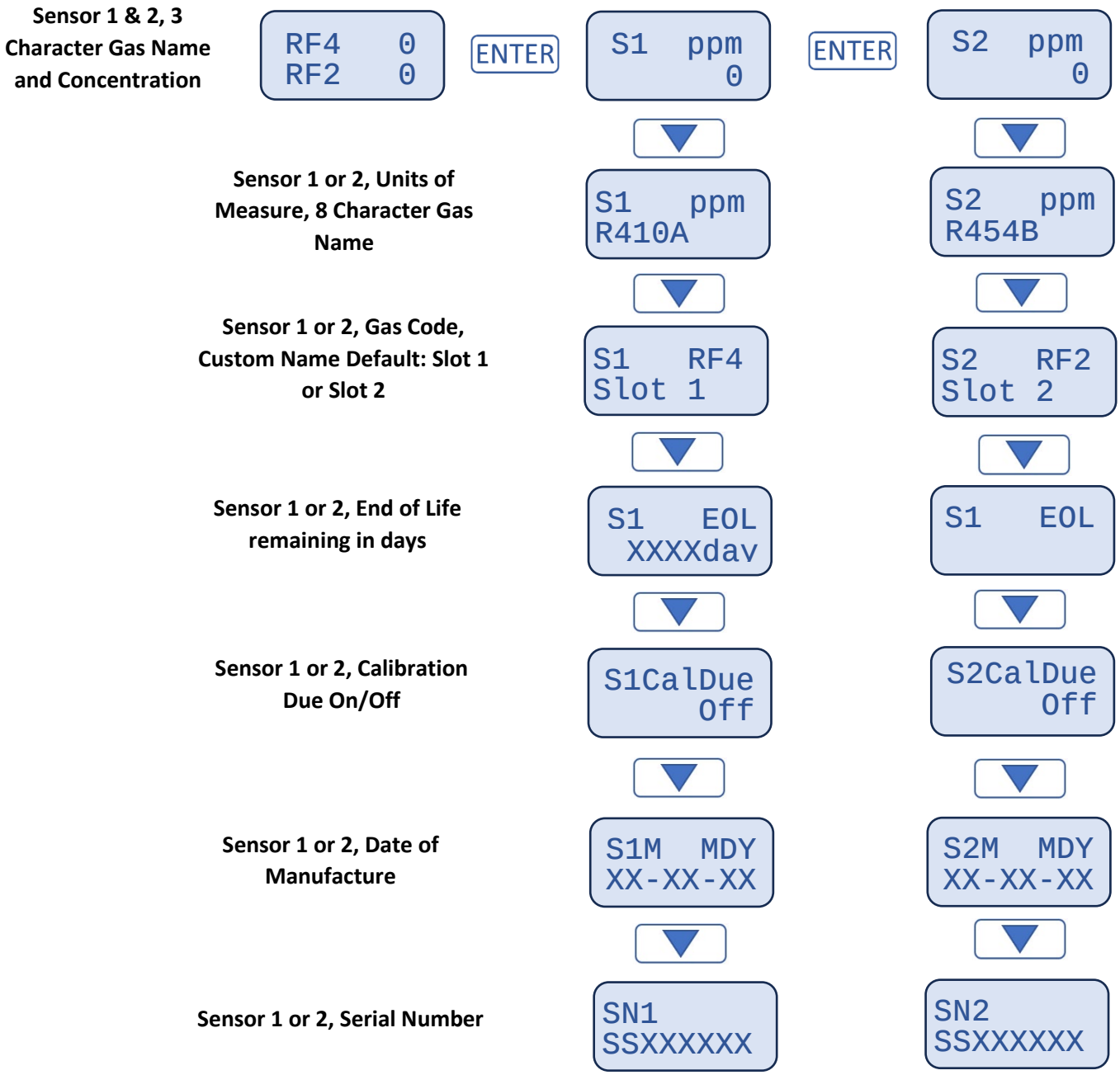
The home screen will display the current sensor(s) 3 digit gas code and gas concentration. From this screen you can select ENTER to obtain more information on the sensor(s) installed in the transmitter, navigate through the menus through the up and down arrows or select the BACK button to view the Active Events menu page.



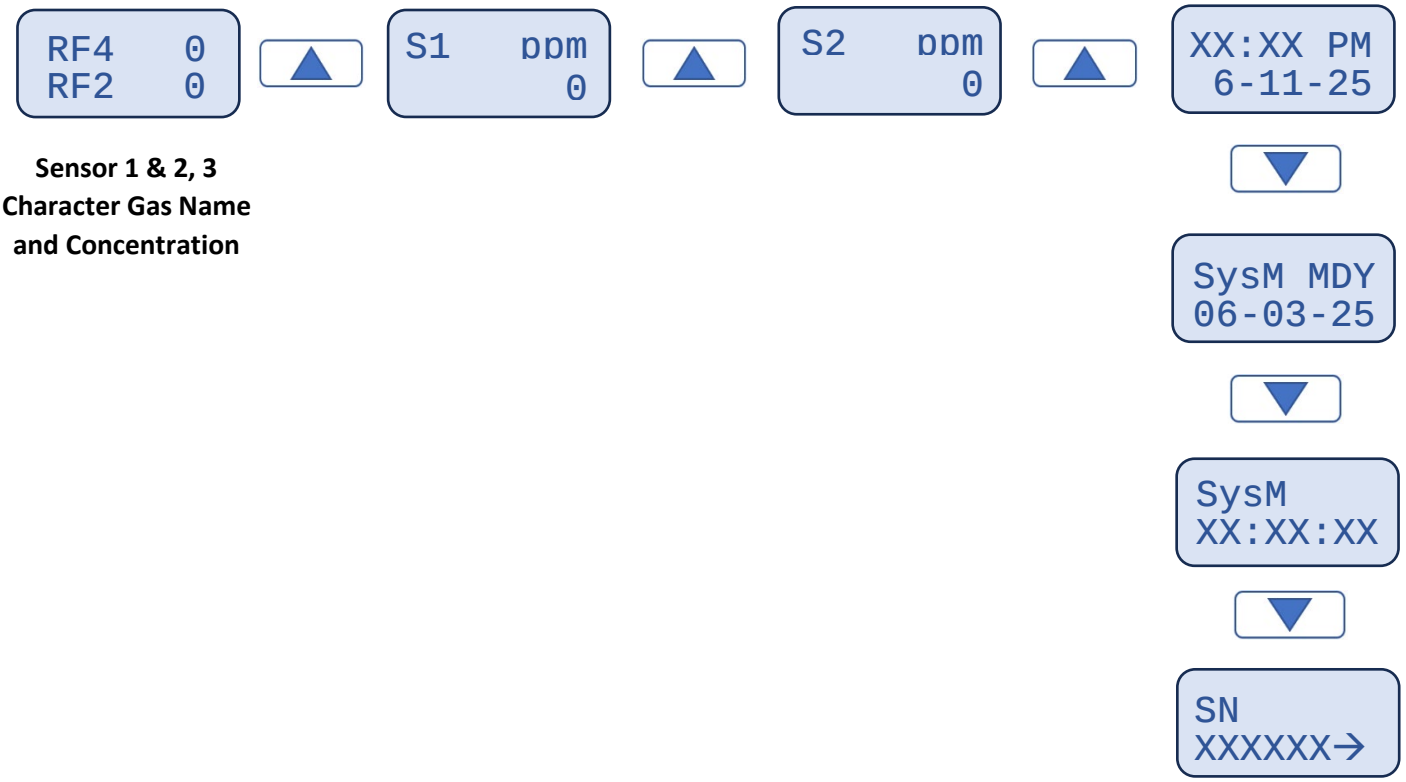
## 4.3 Sensor & System Information

The home screen will show limited information about the sensor(s). It will display the 3 digit gas code and the concentration of the gas. To obtain more information, view the sensor information by pressing **ENTER** once to obtain more details on Sensor 1, **ENTER** twice to obtain more details on Sensor 2 (if populated). Pressing **ENTER** again will provide system information.

### 4.3.1 Sensor Information



### 4.3.2 System Information




**Sensor 1 & 2, 3 Character Gas Name and Concentration**

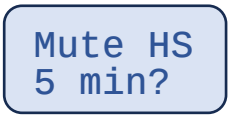
## 4.4 Active Events Menu

The AireShield has an Active Events Menu that provides additional information in the scenario any of the following events are taking place: Buzzer Activation, Horn/Strobe Activation, Trouble Fault Code, Sensor End-of-Life, Relay Activation and Latching, Buzzer Activation, and Horn/Strobe Activation. Some of these active events will not be present unless they are active. Also from this menu, the AireShield can be power cycled. The arrow buttons on the front cover of the AireShield are used to navigate through the menu options, with the BACK and ENTER buttons being used to select or back out of these menus/options. To navigate through these menus use the up and down arrows. To acknowledge an active event press enter and follow the prompts.

**Silence Buzzer:** If the AireShield is configured with the optional buzzer and the buzzer is activated it can be muted. If muted the amount of time will be displayed where "####" is the silence counter count down.



**Silence Horn & Strobe: NOTE:** *This feature is not an option for hardware versions 1.3*. If the horn/strobe circuit is active it can be muted. If muted the amount of time will be displayed where "####" is the silence counter count down.





**Trouble Fault Code:** If there is an active trouble you can see the full code in this menu. TF$ - "$" refers to if the trouble code is either "A" for an Active Trouble or "I" for an inactive trouble. An "A" Active Trouble becomes active when it is present for 5 seconds in a row. "########" displays the hex trouble code. Refer to *Table 5-1 Trouble Code Table* for the description, type of trouble and the resolution.



**Sensor 1 End-Of-Life Warning:** Sensor 1 End-Of-Life Warning alerts the user the sensor is nearing its functional end-of-life period. "S1 EOLW" equals Sensor 1 End-Of-Life Warning and ACK? equals Acknowledge. Pressing the up and down arrow keys an select "Yes" or "No". Selecting the Enter button when the display shows "Yes" will

acknowledge the EOL warning. Once the warning has been Acknowledge the EOLW will show EOLWS plus the number of days until the next warning.



**Sensor 2 End-Of-Life Warning:** Sensor 1 End-Of-Life Warning alerts the user the sensor is nearing is functional end-of-life period. "S1 EOLW" equals Sensor 1 End-Of-Life Warning and ACK? equals Acknowledge. Pressing the Enter button will bring you to the EOLW acknowledge screen. Pressing **Up/Down** arrow keys and selecting "Yes" or "No". Selecting the **Enter** button when the display shows "Yes" will acknowledge the EOL warning. Once the warning has been Acknowledge the EOLW will show EOLWS plus the number of days until the next warning.



**Relay 1 Information:** "R1 on by" indicates what is controlling Relay 1 and the latch status. Relay 1 can be activated by one or multiple of the following: "S1" Sensor 1, "S2" Sensor 2, "TF" Trouble Fault, and "L" Latch Status.



**Relay 1 Latched:** If "L" is displayed, Relay 1 is latched and can be unlatched by pressing the **Enter** button. Pressing **Up/Down** arrow keys and selecting "Yes" or "No". Selecting the **Enter** button when the display shows "Yes" will acknowledge and reset the latch feature for Relay 1.



**Relay 2 Information: "**R2 on by" indicates what is controlling Relay 2 and the latch status. Relay 2 can be activated by one or multiple of the following: "S1" Sensor 1, "S2" Sensor 2, "TF" Trouble Fault, and "L" Latch Status.


**Relay 2 Latched:** If "L" is displayed, Relay 2 is latched and can be unlatched by pressing the **Enter** button. Pressing **Up/Down** arrow keys and selecting "Yes" or "No". Selecting the **Enter** button when the display shows "Yes" will acknowledge and reset the latch feature for Relay 2.



**Previous Relay 2 Activation:** This screen will show you if there was a previous activation of Relay 2 from either of the sensors or both sensors depending on what triggered Relay 2. Options include: S1, S2 or S1S2. Selecting the **Enter** button when the display shows "R2 Activ" will allow you to clear this menu when selecting "Yes" via the up and down arrows and then the **Enter** button to acknowledge.



**Buzzer Information: "**BZ on by" indicates what is controlling the Buzzer. The Buzzer can be activated by one or multiple of the following: "S1" Sensor 1, "S2" Sensor 2, and "TF" Trouble Fault.


**Horn/Strobe Information:** Note: this only pertains to hardware 1.4 and after. **"**HS on by" indicates what is controlling the External Horn Strobe connection. The Buzzer can be activated by one or multiple of the following: "S1" Sensor 1, "S2" Sensor 2, and "TF" Trouble Fault.


**Reset Unit:** Pressing the Back button once and then the up arrow once will take you to the reset menu. Here you can reset the AireShield unit without opening the unit and disengaging the wires. Certain trouble codes can be resolved by resetting the unit through this process.


| 8 Character Gas Name | 3 Character Gas Name | Sensor Ordering Code | Range | Resolution | Default Cal-Gas & Concentration | Expected Life |
|---|---|---|---|---|---|---|
| R22 | RF1 | 739 | 0-2,000 ppm | 5 ppm | R22, 1,000 ppm | 10 |
| R32 | RF1 | 740 | 0-2,000 ppm | 5 ppm | R32, 1,000 ppm | 10 |
| R32 | RF3 | 700 | 0-5,000 ppm | 25 ppm | R32, 5,000 ppm | 10 |
| R32 | EX1 | 720 | 0-100 %LEL | 1% LEL | R32, 50% LEL | 10 |
| R123 | RF2 | 742 | 0-3,000 ppm | 10 ppm | R134a, 1,000 ppm | 10 |
| R125 | RF1 | 741 | 0-2,000 ppm | 5 ppm | R125, 1,000 ppm | 10 |
| R134a | RF1 | 742 | 0-2,000 ppm | 5 ppm | R134a, 1,000 ppm | 10 |
| R134a | RF3 | 701 | 0-5000 ppm | 25 ppm | R134a, 3,000 ppm | 10 |
| R143 | RF1 | 743 | 0-2,000 ppm | 5 ppm | R507, 1,000 ppm | 10 |
| R227ea | RF2 | 741 | 0-3,000 ppm | 10 ppm | R125, 1,000 ppm | 10 |
| R404A | RF2 | 741 | 0-3,000 ppm | 10 ppm | R125, 1,000 ppm | 10 |
| R404A | RF3 | 702 | 0-5,000 ppm | 25 ppm | R404A, 3,000 ppm | 10 |
| R407A | RF2 | 745 | 0-3,000 ppm | 10 ppm | R1234ze, 1,000 ppm | 10 |
| R407C | RF2 | 744 | 0-3,000 ppm | 10 ppm | R1234yf, 1,000 ppm | 10 |
| R407C | RF3 | 703 | 0-5,000 ppm | 25 ppm | R407C, 3,000 ppm | 10 |
| R407F | RF2 | 745 | 0-3,000 ppm | 10 ppm | R1234ze, 1,000 ppm | 10 |
| R410A | RF2 | 745 | 0-3,000 ppm | 10 ppm | R1234ze, 1,000 ppm | 10 |
| R410A | RF4 | 704 | 0-10,000 ppm | 25 ppm | R410, 5,000 ppm | 10 |
| R417A | RF2 | 743 | 0-3,000 ppm | 10 ppm | R507, 1,000 ppm | 10 |
| R422D | RF1 | 741 | 0-2,000 ppm | 5 ppm | R125, 1,000 ppm | 10 |
| R448A | RF2 | 745 | 0-3,000 ppm | 10 ppm | R1234ze, 1,000 ppm | 10 |
| R449A | RF2 | 744 | 0-3,000 ppm | 10 ppm | R1234yf, 1,000 ppm | 10 |
| R449A | RF3 | 705 | 0-5,000 ppm | 25 ppm | R449A, 3,000 ppm | 10 |
| R449A | EX1 | 721 | 0-100 %LEL | 1% LEL | R449A, 50% LEL | 10 |
| R450A | RF1 | 747 | 0-2,000 ppm | 5 ppm | R450A, 1,000 ppm | 10 |
| R452A | RF1 | 748 | 0-2,000 ppm | 5 ppm | R452A, 1,000 ppm | 10 |
| R452A | RF2 | 742 | 0-3,000 ppm | 10 ppm | R134a, 1,000 ppm | 10 |
| R452B | EX1 | 722 | 0-100 %LEL | 1% LEL | R452B, 50% LEL | 10 |
| R454C | EX1 | 723 | 0-100 %LEL | 1% LEL | R454A, 50% LEL | 10 |
| R454B | RF1 | 749 | 0-2,000 ppm | 5 ppm | R454B, 1,000 ppm | 10 |
| R454B | EX1 | 724 | 0-100 %LEL | 1% LEL | R454B, 50% LEL | 10 |
| R454C | EX1 | 725 | 0-100 %LEL | 1% LEL | R454C, 50% LEL | 10 |
| R455A | EX1 | 726 | 0-100 %LEL | 1% LEL | R455A, 50% LEL | 10 |
| R507 | RF1 | 743 | 0-2,000 ppm | 5 ppm | R507, 1,000 ppm | 10 |
| R513A | RF1 | 742 | 0-2,000 ppm | 5 ppm | R134a, 1,000 ppm | 10 |
| R1234yf | RF1 | 744 | 0-2,000 ppm | 5 ppm | R1234yf, 1,000 ppm | 10 |
| R1234yf | RF3 | 706 | 0-5,000 ppm | 25 ppm | R1234yf, 3,000 ppm | 10 |
| R1234yf | EX1 | 727 | 0-100 %LEL | 1% LEL | R1234yf, 50% LEL | 10 |
| R1234zd | RF2 | 745 | 0-3,000 ppm | 10 ppm | R1234ze, 1,000 ppm | 10 |
| R1234ze | RF1 | 745 | 0-2,000 ppm | 5 ppm | R1234ze, 1,000 ppm | 10 |
| R1234ze | RF3 | 707 | 0-5,000 ppm | 25 ppm | R1234ze, 3,000 ppm | 10 |
| R1233ze | EX1 | 728 | 0-100 %LEL | 1% LEL | R1234ze, 50% LEL | 10 |



www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

| 8 Character Gas Name | 3 Character Gas Name | Sensor Ordering Code | Range | Resolution | Default Cal-Gas & Concentration | Expected Life |
|---|---|---|---|---|---|---|
| SF6 | RF1 | 746 | 0-2,000 ppm | 5 ppm | SF6, 1000 ppm | 10 |

Table: 4-1 Sensor Descriptor Chart

| 3 Character Gas Name | RF1 | RF2 | RF3 | RF4 | EX1 |
|---|---|---|---|---|---|
| Type | RF1 | RF2 | RF3 | RF4 | EX1 |
| Sensor ID (Panels) | 11 | 12 | 13 | 14 | 15 |
| Range | 2,000 ppm | 3,000 ppm | 5,000 ppm | 10,000 ppm | 100% LEL |
| Resolution | 5 ppm | 10 ppm | 25 ppm | 25 ppm | 1% LEL |
| Engineering Units | ppm | ppm | ppm | ppm | % LEL |
| Deadband | 65 | 100 | 175 | 350 | 4 |

Table: 4-2 Refrigerant Category Groupings

**Note:** The following sensors have 32mm sensor housing: RF1, RF2, RF3, RF4, EX1.

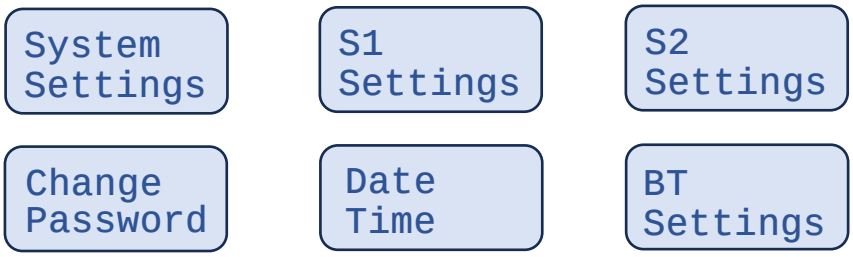
## 4.5 AireShield Menus

The AireShield has four sub menus: Configuration "Config", Test, Events Log, and Calibration "Cal". The arrow buttons on the front cover of the AireShield are used to navigate through the menu options, with the BACK and ENTER buttons being used to select or back out of these menus/options. To navigate through these menus use the up and down arrows. To enter a submenu use the Enter button, and to back out use the back button.


## 4.6 Configuration "Config"

Pressing the down arrow once will display the "Config" menu. Pressing **Enter** will get you to submenus within the Configuration menu.


Configuration Submenus:



### 4.6.1 System Settings

Within the System Settings this is where you can adjust the functionality of the inputs, outputs, and sensor settings.


**Default – Factory Settings**

Refer to *Table 4-2 Default Settings* for the AireShield default settings. The following tables will define System Settings and then Sensor Settings:

**Power Up Test:** When Power Up Test is set to "ON" during a power up cycle the following occurs:

- If the unit is populated with a buzzer it is activated for a few seconds. The Relay 2 will be activated for 8 seconds and Relay 1 for 58 seconds during the power-up cycle (if "Power up test" is "**ON"**).
- **Analog I/O Board:** for the last 20 seconds the unit outputs to 16mA during the warmup (75% of full scale of the sensor range)
- **Digital I/O Board:** for the last 20 seconds the unit will output 75% of full scale of the sensor range

When Power UP Test is set to "OFF" the relays, buzzer and I/O outputs do not engage.

**Relay 2 Contact State:** This setting allows the adjustment of the state of the relay. Default: **"NO" Normally Open**, "NC" Normally Closed.

**Trouble Fault Settings**

*Trouble fault Setting Relay 1:* When this setting is set to "Yes" Relay 1 will activate during a trouble condition. Default is "No".

*Trouble Fault Setting Relay 2:* When this setting is set to "Yes" Relay 2 will activate during a trouble. Default is "Yes".

*Trouble Fault Setting Buzzer:* When this setting is set to "Yes" the buzzer will activate during a trouble. Default is "No".

*Trouble Fault Setting Horn/Strobe:* When this setting is set to "Yes" the external Horn/Strobe output will activate during a trouble condition. Default is "No".

*Trouble Fault Setting Intermittent:* This setting is used for additional trouble shooting. Default is set to "OFF" and should only be turned on when additional trouble shooting is needed.

**Analog Settings (model specific)**

*Sensor Output:* This setting allows for changing the analog scale from **4-20mA** to 0-20mA.

*Sensor Trouble Fault:* This setting allows for what mA output you want to output during a trouble condition.

1. 4-20mA Scale: 2mA or **24mA** trouble options

2. 0-20mA Scale: 24mA trouble option

**Digital Settings (model specific)**

*Protocol:* This setting allows for **Modbus RTU** or disable feature.

*Addressing:* Setting allows for addressing the sensor(s) from 1-247. When two sensors are connected to an AireShield Transmitter both sensors require a unique address. Default is **0**.

*Device ID:* Setting allows for a custom 8 character name to identify the sensor.

*Baud Rate:* Setting allows for adjustment of the baud rate: 110, 300, 600, 1200, 2400, 4800, 9600, **19200**, 38400, 57600, 115200.

*Parity:* Setting allows for adjustment of the parity: **Even** or Odd

**Display Settings**

*Display:* When turned "ON" the display will remain on at all times. When set to "OFF", display only comes on during an alarm or trouble condition or button press, and will remain on until there are 60 seconds of inactivity. Default is "ON".

*Contrast:* Allows for adjustment of the contrast in increments of 5% from 0-100%. Default is 75%.

*Brightness:* Allows for adjustment of the brightness in increments of 5% from 0-100%. Default is 75%.

*Backlight:* Allows for control of the backlight. "Off" means backlight never comes on, "In Use" means backlight only comes on during an alarm, trouble, or button press. It will stay on for 60 seconds past the last alarm, trouble or button press. "ON" means the backlight stays on all the time. Default is "In Use".

**Buzzer**

*Buzzer Pattern:* If buzzer is present and set to activate at a given Setpoint this setting allows selection of either "`Intermit`" Intermittent (Default) or "`Contins`" Continuous sounding.

**LED Settings**

*Normal Mode:* During normal mode, no gas events or troubles, the LED's can be set to "OFF" or set to "Green Solid". Default is "Green Solid".

*Relay 1 Activation:* LED behavior during Relay 1 activation can be set for the following options: OFF, Red Solid or Flashing, Amber Solid or Flashing, White Solid or Flashing. Default is solid red, "Red".

*Relay 2 Activation:* LED behavior during Relay 2 activation can be set for the following options: OFF, Red Solid or Flashing, Amber Solid or Flashing, White Solid or Flashing. Default is flashing red, "F Red".

*Buzzer:* LED behavior during buzzer activation can be set for the following options: OFF, Red Solid or Flashing, Amber Solid or Flashing, White Solid or Flashing. Default is solid white, "White".

*External Horn/Strobe Connection:* LED behavior during external horn/strobe activation can be set for the following options: OFF, Red Solid or Flashing, Amber Solid or Flashing, White Solid or Flashing. Default is solid white "White".

*Trouble Condition:* LED behavior during external horn/strobe activation can be set for the following options: OFF, Red Solid or Flashing, Amber Solid or Flashing, White Solid or Flashing. Default is flashing amber, “F Amber”.

*LED Brightness:* Allows for adjustment of the brightness in increments of 5% from 5-100%. Default is 50%.

*LED Priorities from High to Low:*

1. Calibration
2. LED Test Sequence
3. Gas Test Sequence
4. Trouble Fault
5. Relay 2
6. Horn/Strobe
7. Buzzer
8. Relay 1
9. Bluetooth
10. Normal Mode



www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

| AireShield System Settings | | |
|---|---|---|
| Setting Description | Options | Default Setting |
| Settings Default | Default, Custom | Default |
| Sensor 1 Status | S1 ON or OFF | ON (if present) |
| Sensor 2 Status | S2 ON or OFF | ON (if present) |
| Power up test: | ON or OFF | ON |
| Relay 2 Contact State | NO (normally open) or NC (normally closed) | NO |
| **Trouble Fault Settings** | | |
| Trouble Fault Set R1 | No or Yes | No |
| Trouble Fault Set R2 | No or Yes | Yes |
| Trouble Fault Set BZ | No or Yes | No |
| Trouble Fault Set HS | No or Yes (not an option in hardware 1.3) | No |
| TF Set Intermittent | No or Yes | No |
| **Analog Settings (model specific)** | | |
| Sensor 1 Output | 0-20mA or 4-20mA | 4-20mA |
| Sensor 1 Trouble Fault | 2mA or 24mA | 24mA |
| Sensor 2 Output | 0-20mA or 4-20mA | 4-20mA |
| Sensor 2 Trouble Fault | 2mA or 24mA | 24mA |
| **Digital Settings (model specific)** | | |
| Protocol | Modbus RTU, Disable | Modbus RTU |
| Sensor 1 Address | 0-247 | 0 |
| Sensor 2 Address | 0-247 | 0 |
| Sensor 1 Device ID | Custom up to 8 Characters | Sensor 1 |
| Sensor 2 Device ID | Custom up to 8 Characters | Sensor 2 |
| Baud Rate | 110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 | 19200 |
| Parity | Even, Odd, None | Even |
| **Display Settings** | | |
| Display | ON or OFF | ON |
| Contrast | Contrast XX%, increments of 5 | 75% |
| Brightness | Bright XX% increments of 5 | 75% |
| Backlight In Use | In Use, ON, OFF | In Use |
| **Buzzer Settings** | BZ PTRN Intermit/Continuous | Intermit |
| **LED Settings** | | |
| Normal | Green/Off | Green |
| Relay 1 (solid or flashing) | Off, White, Amber, Red | Red |
| Relay 2 (solid or flashing) | Off, White, Amber, Red | Flashing Red |
| Buzzer (solid or flashing) | Off, White, Amber, Red | White |
| Ext. H/S (solid or flashing) | Off, White, Amber, Red | Flashing Red |
| Trouble (solid or flashing) | Off, White, Amber, Red | Flashing Amber |
| LED Brightness | 5-100%, increments of 5% | 50% |
| **Sensor Naming** | | |
| Sensor 1 | Custom up to 8 Characters | Slot 1 |
| Sensor 2 | Custom up to 8 Characters | Slot 2 |

Table: 4-3 System Settings

### 4.6.2 Sensor Settings

**Default – Factory Settings**

Refer to *Table 4.3 Sensor Setting* for the AireShield Sensor default settings.

*S1 / S2 Settings Default or Custom*

**Sensor Relay 1 Settings**

*Relay 1 Setpoint:* Relay 1 will engage if Relay 1 Setpoint concentration is exceeded for longer than the Relay 1 Delay time. Unless it is configured for latching, Relay 1 will disengage once both conditions have been met:

- The gas concentration has dropped below Relay 1 Setpoint
- Relay 1 Runtime has been exceeded

**Note:** that the Relay 1 Setpoint configured to "0000" will cause the relay to not engage. The relay will engage in trouble fault condition (if the Trouble Fault Setting Option is set to "ON" for Relay 1) and will disengage once trouble fault condition is cleared.

*Relay 1 Delay:* This setting allows for 0-10 minutes of delay prior to Relay 1 engaging once the gas level exceeds Relay 1 Setpoint.

*Relay 1 Runtime:* This setting keeps the relay activated from 0-30 minutes once Relay 1 has engaged.

*Relay 1 Latch:* Relay 1 can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds Relay 1 set point). Once latched in, power will need to be interrupted, or go to the active events menu, **BACK** button and press the down arrow until you get to "**R1 on by**" and if "L" is displayed that means it is Latched. Select the "**ENTER**" button select "Yes" to reset Latching.

**Sensor Relay 2 Settings**

*Relay 2 Setpoint:* Relay 2 will engage if Relay 2 Setpoint concentration is exceeded for longer than the Relay 2 Delay time. Unless it is configured for latching, Relay 2 will disengage once both conditions have been met:

- The gas concentration has dropped below Relay 2 Setpoint
- Relay 2 Runtime has been exceeded

**Note:** that the Relay 2 Setpoint configured to "0000" will cause the relay to not engage. The relay will engage in trouble fault condition (if the Trouble Fault Setting Option is set to "ON" for Relay 1) and will disengage once trouble fault condition is cleared.

*Relay 2 Delay:* This setting allows for 0-10 minutes of delay prior to Relay 2 engaging once the gas level exceeds Relay 2 Setpoint.

*Relay 2 Runtime:* This setting keeps the relay activated from 0-30 minutes once Relay 2 has engaged.

Relay 2 Latch: Relay 2 can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds Relay 2 set point). Once latched in, power will need to be interrupted, or go to the active events menu, **BACK** button and press the down arrow until you get to "**R2 on by**" and if "L" is displayed that means it is Latched. Select the "**ENTER**" button select "Yes" to reset Latching.

**Sensor Buzzer Settings**

*Buzzer Setpoint:* This is the activation level the buzzer will engage. If the setting is set to 0000 this means the buzzer will be disabled.

**Sensor Analog Settings**

*Analog Settings:* This setting allows for the adjustment of the scaling of the analog output. Depending on the sensor the upper range can be lowered to reduce the full scale. Ex. Range is 0-10,000 PPM this setting allows for adjustment to a lower full scale such as 0-2,000 PPM. The unit will prevent values that are now accepted or appropriate.

**Sensor Units**

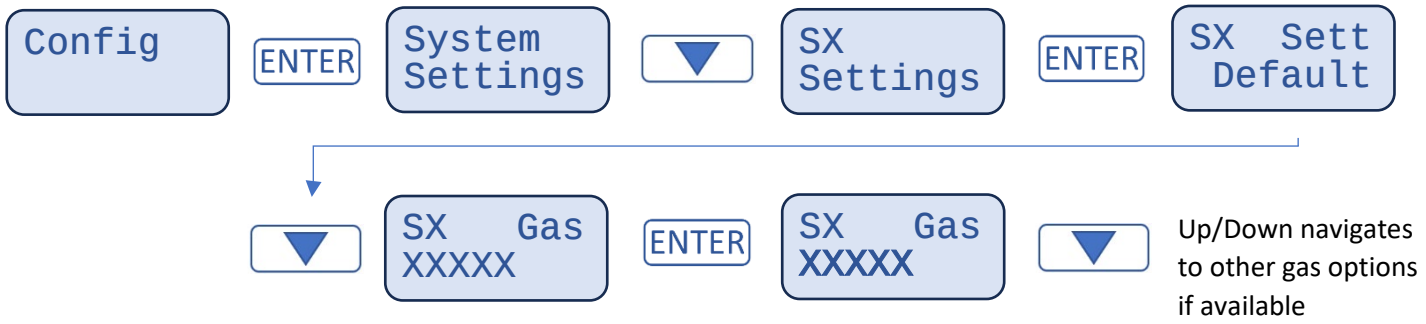
*Units:* This displays the unit of measure for the gas. For some sensor options, the units of measure can be changed. For example, ppm could be changed to v/v for Carbon Dioxide. Only applicable sensors allow for changing the units of measure.

**Sensor Gas Type**

*Sensor Gas Type:* This displays the sensor's gas type.

For certain sensor options there are multiple gas types that can be configured based on cross sensitivity and correction factors that are automatically adjusted in the unit. With any of the profiles listed below the gas can be switched through the following steps below.

| Gas Profile | Default Gas | Other Gas Selections |
|---|---|---|
| 741 | R-125 | R-227ea, R-404a, R-422d |
| 742 | R-134A | R-123, R-452b, R-513a |
| 743 | R-507 | R-143, R-417A |
| 744 | R-1234yf | R-407c, R-449a, R1234yf |
| 745 | R-1234ze | R-407a, R-407f, R-410a, R-448a, R-1233zd |



**Sensor Name**

*Sensor Name:* This is a custom field to name the sensor, up to 8 characters. This is visible in the Sensor/System information menu. From the main screen, Press ENTER, Down Arrow Twice.

| AireShield Sensor Settings | | | | | |
|---|---|---|---|---|---|
| | RF1 Sensors | RF2 Sensors | RF3 Sensors | RF4 Sensors | EX1 Sensors |
| **Sensor Settings** | | | | | |
| Sensor Status | **ON**/OFF | **ON**/OFF | **ON**/OFF | **ON**/OFF | **ON**/OFF |
| Sensor Settings Default | **Default,** Custom | **Default,** Custom | **Default,** Custom | **Default,** Custom | **Default,** Custom |
| **Sensor Relay 1 Settings** | | | | | |
| Relay 1 Setpoint | **250 ppm** Adj. (65-2,000) | **250 ppm** Adj. (100-3,000) | **1,000 ppm** Adj. (200-5,000) | **1,000 ppm** Adj. (200-5,000) | **10% LEL** Adj. (4-25) |
| Relay 1 Delay | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins |
| Relay 1 Runtime | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins |
| Relay 1 Latch | **OFF,** ON | **OFF,** ON | **OFF,** ON | **OFF,** ON | **OFF,** ON |
| **Sensor Relay 2 Settings** | | | | | |
| Relay 2 Setpoint | **500 ppm** Adj. (65-2000) | **500 ppm** Adj. (100-3000) | **2,000 ppm** Adj. (200-5000) | **2,000 ppm** Adj. (200-5,000) | **20% LEL** Adj. (4-25) |
| Relay 2 Delay | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins | **OFF,** 0-10 mins |
| Relay 2 Runtime | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins | **OFF,** 0-30 mins |
| Relay 2 Latch | **OFF,** ON | **OFF,** ON | **OFF,** ON | **OFF,** ON | **OFF,** ON |
| **Sensor Buzzer Settings** | | | | | |
| Buzzer Setpoint | **1,000 ppm,** Adj. (65-2,000) | **1,000 ppm** Adj. (100-3,000) | **3,000 ppm** Adj. (200-5,000) | **3,000 ppm,** Adj. (200-5,000) | **20% LEL** Adj. (4-25) |
| **Sensor Analog Settings** | **0-2,000 ppm,** min (0-1,000) | **0-3,000 ppm**, min (0-1,000) | **0-5,000 ppm**, min (0-2,000) | **0-10,000 ppm,** min (0-2,000) | **0-100% LEL**, min 0-20% LEL |
| **Sensor Units** | **ppm** | **ppm** | **ppm** | **ppm** | **%LEL** |
| **Sensor Gas Type** | **Sensor Specific** | **Sensor Specific** | **Sensor Specific** | **Sensor Specific** | **Sensor Specific** |
| **Sensor Name** | **Slot 1** or **Slot 2,** Custom up to 8 Characters | **Slot 1** or **Slot 2,** Custom up to 8 Characters | **Slot 1** or **Slot 2,** Custom up to 8 Characters | **Slot 1** or **Slot 2,** Custom up to 8 Characters | **Slot 1** or **Slot 2,** Custom up to 8 Characters |

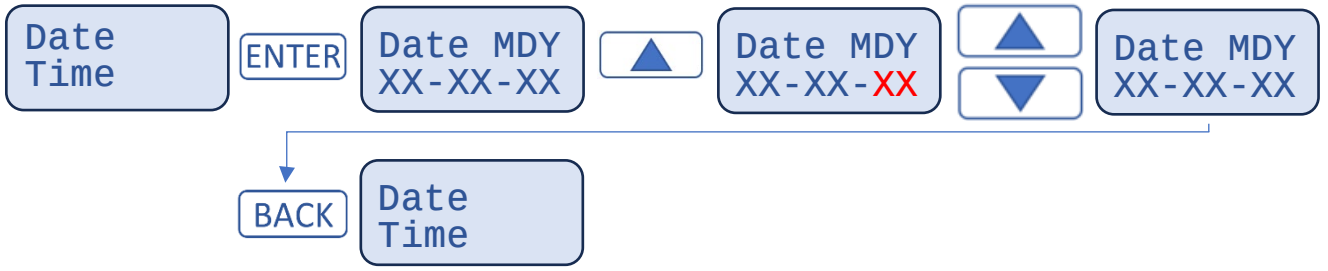
Table: 4-4 Sensor Settings

### 4.6.3 Change Password:


The unit can be password protected via a 4-digit code. Use the **UP** and **DOWN** arrows to change the digit and then select **ENTER** to move to the next digit and then confirm your selection and return to the Config menu by pressing the **ENTER** button. The unit has a backdoor password "1972" that can be entered if the password has been forgotten.

### 4.6.4 Date & Time:

**Date:** The Date can be updated in a Month (MM) – Day (DD) – Year (YY) format. This is important to record data appropriately from the transmitter.

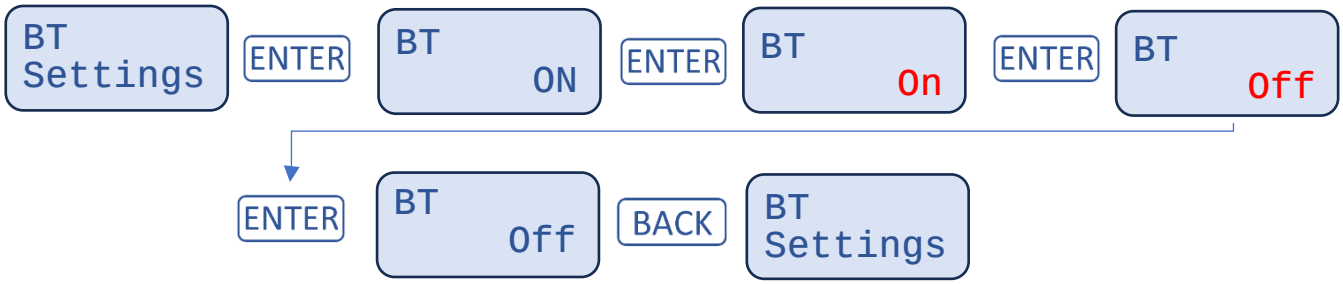



**Time:**


The Time can be updated in an Hour (HH) : Minute (MM) : Second (SS) format. The clock is set up in a 12-hour clock format AM/PM. Selecting the **ENTER** button will navigate through the options. This is important to record data appropriately from the transmitter.

### 4.6.5 Bluetooth Settings “BT Settings”

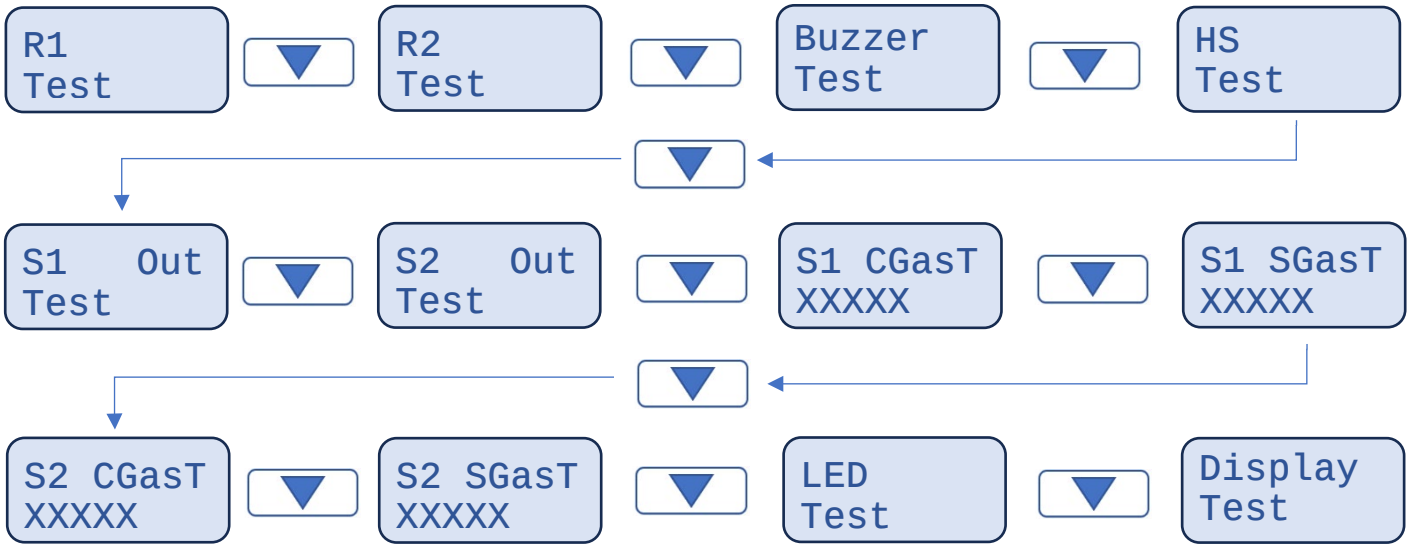
Bluetooth Setting controls the signal to turn ON/OFF the Bluetooth feature. This setting must be set to on to work with the Macurco Connect App that can be downloaded on the iOS or Google App Store.



# 5 Test

Pressing the down arrow twice will display the "Test" menu.


Pressing **the down or up arrow** will navigate you to various test options within the Test menu. Press **Enter** to enter any of the Test submenus. Pressing **BACK** will take you out of the current submenu.




**HS Test is not present if hardware version is 1.3*

***Sensor 2 Settings are not shown if not populated*

**Relay 1 Test:** This is a 40 second test that activates relay 1 from normally open to close for 20 seconds and back to normally open for 20 seconds. While the test is performing, "R1 Test" will flash while showing Close/Open counting down from 20 seconds. Upon completion of the test it will go back "R1 Test" and you can press the **BACK** button to go back to the home screen. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.

**Relay 2 Test:** This is a 40 second test that activates relay 2 from normally open to close for 20 seconds and back to normally open for 20 seconds if the relay is setup as Normally Open. If the unit is setup for Normally closed it will open for 20 seconds and then close for 20 seconds. While the test is performing "R2 Test" will flash while showing Close/Open counting down from 20 seconds. Upon completion of the test it will go back "R2 Test" and you can press the **BACK** button to go back to the home screen. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.

**Buzzer Test:** If there is a buzzer attached on the main transmitter you can test the buzzer. Pressing **ENTER** while "Buzzer Test" is displayed, the buzzer will sound intermittently while flashing ON/OFF in 1 second increments. Upon completion of the test, the display will go back to "Buzzer Test" and you can press the

**BACK** button to go back to the home screen. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.

**Horn/Strobe Test:** Pressing **ENTER** while "HS Test" is displayed it will alternate flashing ON/OFF in 1 second increments. Upon completion of the test it will go back to "HS Test" and you can press the **BACK** button to go back to the home screen. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.
***Note:** This menu screen is hidden if hardware is 1.3*

**Sensor 1 Output Test: "**S1 Out Test**"** is a simulated test for sensor 1 that will ramp up the output with an amount corresponding to 1 mA every 5 seconds from minimum range (0 or 4mA depending on Analog range Setting) to maximum range (20 mA) for analog version (roughly 85 seconds). For the digital version, the unit will increase the gas value in 5% increments every 5 seconds throughout the sensor range. You can press the **BACK** button at any time to exit the test. Upon completion you can press the **BACK** button or the unit will return to the normal screen after 60 seconds.

**Sensor 2 Output Test:** "S2 Out Test" is a simulated test for sensor 2 that will ramp up the output with an amount corresponding to 1 mA every 5 seconds from minimum range (0 or 4mA depending on Analog range Setting) to maximum range (20 mA) for analog version. For the digital version, the unit will increase the gas value in 5% increments every 5 seconds throughout the sensor range. You can press the **BACK** button at any time to exit the test. Upon completion you can press the **BACK** button or the unit will return to the normal screen after 60 seconds.

**Sensor 1 Bump Test:** "S1 CGasT" is a gas test for sensor 1 using calibration/bump gas to bump test the sensor but not trigger a gas alarm. This test verifies the sensor response to measure reading compared to the gas concentration being applied. Upon selecting **ENTER** when the display shows "S1 CgasT" the screen will show "S1 CGasT" & the Gas Value "XXXX". "CGasT" will flash for the duration of the test which is 180 seconds. You can press the **BACK** button at any time to exit the test. Upon completion you can press the **BACK** button or the unit will return to the normal screen after 60 seconds.

> **NOTE:** For certain sensors that have multiple gas types available you can bump test the unit to the target gas but to calibrate the unit you will need to calibrate the unit to the specified calibration gas and value listed in *Table: 4-1 Sensor Descriptor Chart.*

**Sensor 2 Bump Test:** "S2 CGasT" is a gas test for sensor 2 (if present) using calibration/bump gas to bump test the sensor but not trigger a gas alarm. This test verifies the sensor response to measure reading compared to the gas concentration being applied. Upon selecting **ENTER** when the display shows "S2 CgasT" the screen will show "S2 CGasT" & the Gas Value "XXXX". "CGasT" will flash for the duration of the test which is 180 seconds. You can press the **BACK** button at any time to exit the test. Upon completion you can press the **BACK** button or the unit will return to the normal screen after 60 seconds.

> **NOTE:** For certain sensors that have multiple gas types available you can bump test the unit to the target gas but to calibrate the unit you will need to calibrate the unit to the specified calibration gas and value listed in *Table: 4-1 Sensor Descriptor Chart.*

**LED Test:** Pressing **ENTER** while "LED Test" is displayed will test the LED functionality and color. It will count down from 5 seconds displaying each of the following colors: Red, Green, Blue, Amber, Purple. Upon completion of

the test it will go back to "LED Test" and you can press the **BACK** button to go back to the home screen. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.

**Display Test:** Pressing **ENTER** while "Display Test" is displayed the display will turn on all the pixels for 3 seconds in the 2 x 8 format to verify the display is working correctly. Upon completion, the display will show "Display Test" and you can press the BACK button to back out of the menu. If nothing is pressed it will timeout and go back to the home screen after 60 seconds.



www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

# 6 Events

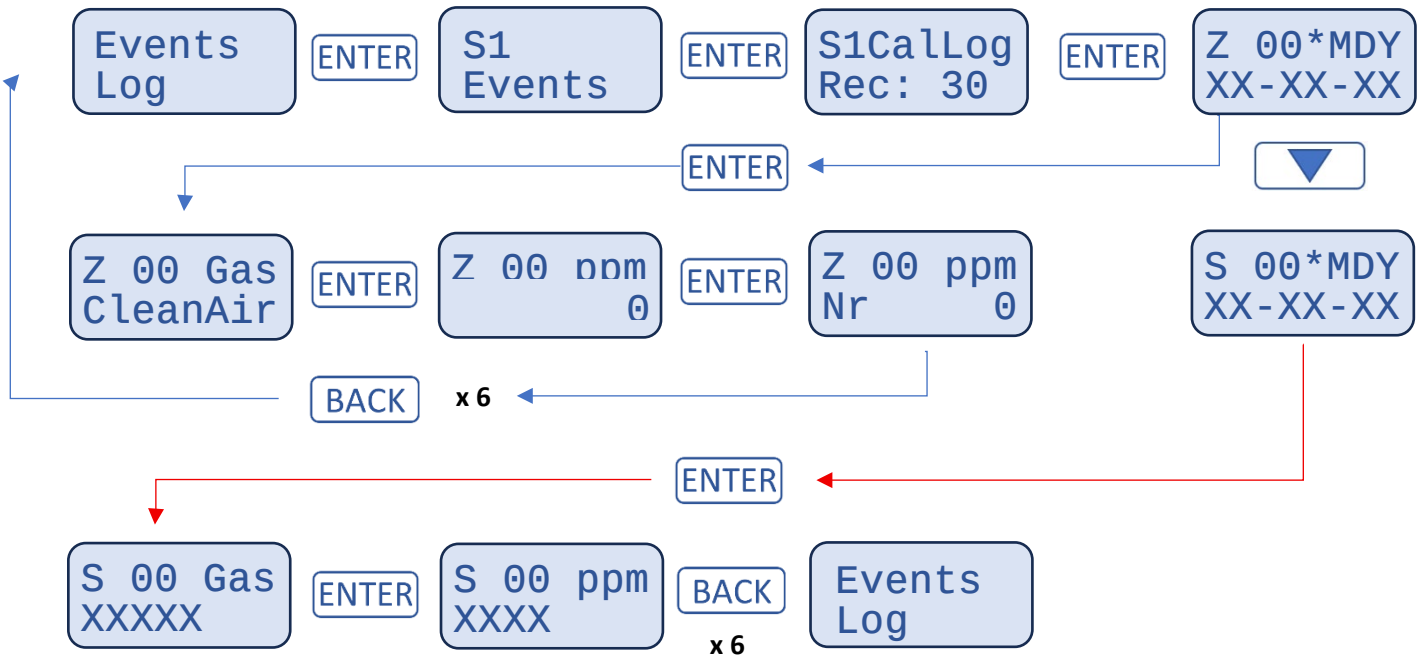
Pressing the down arrow three times will display the "Events" menu. Pressing **Enter** will get you to submenus within the Events menu.

**Sensor 1 Events:** "S1 Events" allows you to view historical data pertaining to sensor 1. You can review the zero and span calibration history.

**Sensor 1 Calibration History:** shows the last 30 zero and span calibrations with date stamps for sensor 1, 00 is the most recent calibration and 29 is the oldest record. If there is less than 30 events recorded the unit will display "X XX MDY XX-XX-XX". X corresponds to either "**Z**" = Zero Cal or "S" = Span Cal. ## is the event number (0-29) and "XX-XX-XX" = MM-DD-YY. If more than 30 calibration have been performed the oldest event "29" will be overwritten by the latest calibration "0". Each event will list: Date of event MDY, Time, Gas Type, Concentration, an Nr.

**Sensor 2 Events:** "S2 Events" allows you to view historical data pertaining to sensor 2. You can review the zero and span calibration history.

**Sensor 2 Calibration History:** shows the last 30 zero and span calibrations with date stamps for sensor 1, 00 is the most recent calibration and 29 is the oldest record. If there is less than 30 events recorded the unit will display "X XX MDY XX-XX-XX". X corresponds to either "**Z**" = Zero Cal or "S" = Span Cal. ## is the event number (0-29) and "XX-XX-XX" = MM-DD-YY. If more than 30 calibration have been performed the oldest event "29" will be overwritten by the latest calibration "0". Each event will list: Date of event MDY, Time, Gas Type, Concentration, an Nr.



# 7 Calibration "Cal"

Pressing the down arrow four times will display the "Cal" menu. Pressing **Enter** will get you to submenus within the Cal menu.

The Calibration Submenus include:




**⚠WARNING**

The following steps must be performed when conducting a calibration verification test (bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance.

- When performing a calibration verification test (bump test) only use certified calibration gas at the required concentration level.
- Do not test with expired calibration gas.
- Do not cover or obstruct display or visual alarm cover.
- Ensure sensor inlets are unobstructed and are free of debris

Failure to follow instructions outlined in this user manual can result in sickness or death.

- When performing a calibration or calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not calibrate with expired calibration gas.
- If the instrument cannot be calibrated, do not use until the reason can be determined and corrected.
- Do not cover or obstruct display or visual/audible alarm indicators.
- Ensure sensor inlet is unobstructed and is free of debris.

A Field Calibration Kit and gas bottles of calibration gas are needed to complete gas test. These are available through local distribution or from Macurco.

**NOTE:** AireShield must be tested or calibrated at regular intervals in accordance with the requirements of the National Fire Protection Association (NFPA) 720 or local code requirements. It is recommended to bump test or calibrate AireShield at least annually.

Contents of the Cal-Kit depending on sensor Type.

All refrigerant sensors utilize Cal-Kit 6 and then choose the appropriate calibration gas via Table: 4-4 Sensor Comparison Chart.

- Cal-Kit 6 (30-0062-1140-2)
  - Calibration Case
  - Two feet of Tygon tubing
  - AireShield Cal Hood

- 0.5 LPM Gas regulator (M)

Also needed are the appropriate calibration gas bottles (Sold Separately). Refer to table below.

| Calibration/Bump Test Cylinders | | | | |
|---|---|---|---|---|
| **Model** | **Part Number** | **Description** | **Cal-Kit Use With** | **Sensors Profile Use With** |
| O2 Zero Air 20.9% | 37-0472-4031-1 | Oxygen O2 Zero Air Calibration 34L 20.9% v/v (M) - Calibration | Cal-Kit 6 | Various |
| R-22 Gas 1000PPM | 37-0801-9234-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-22 (M) - Bump/Calibration | Cal-Kit 6 | 739 |
| R-32 Gas 1000PPM | 37-0661-9134-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-32 (M) - Bump/Calibration | Cal-Kit 6 | 740 |
| R-32 Gas 5000PPM | 37-0662-2134-1 | Ref. Cal Gas Cyl. 34L 5000 ppm R-32 (M) - Bump/Calibration | Cal-Kit 6 | 700 |
| R-32 Gas 50% LEL | 37-0663-0334-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-32 (M) - Bump/Calibration | Cal-Kit 6 | 720 |
| R-125 Gas 1000PPM | 37-0721-9134-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-125 (M) - Bump/Calibration | Cal-Kit 6 | 741 |
| R-134A Gas 1000PPM | 37-0561-9134-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-134A (M) - Bump/Calibration | Cal-Kit 6 | 742 |
| R-134A Gas 3000PPM | 37-0564-9134-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-134A (M) - Bump/Calibration | Cal-Kit 6 | 701 |
| R-134A Gas 5000PPM | 37-0562-2134-1 | Ref. Cal Gas Cyl. 34L 5000 ppm R-134A (M) - Bump/Calibration | Cal-Kit 6 | 701 |
| R-404A Gas 3000PPM | 37-0674-9334-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-404A (M) - Bump/Calibration | Cal-Kit 6 | 702 |
| R-407C Gas 3000PPM | 37-0684-9234-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-407C (M) - Bump/Calibration | Cal-Kit 6 | 703 |
| R-410A Gas 5000PPM | 37-0692-2134-1 | Ref. Cal Gas Cyl. 34L 5000 ppm R-410A (M) - Bump/Calibration | Cal-Kit 6 | 704 |
| R-449A Gas 3000PPM | 37-0814-9234-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-449A (M) - Bump/Calibration | Cal-Kit 6 | 705 |
| R-452B Gas 50% LEL | 37-0813-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-452B (M) - Bump/Calibration | Cal-Kit 6 | 722 |
| R-454A Gas 50% LEL | 37-0733-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-454A (M) - Bump/Calibration | Cal-Kit 6 | 723 |
| R-454B Gas 1000PPM | 37-0743-0264-2 | Ref. Cal Gas Cyl. 34L 1000 ppm R-454B (M) - Bump/Calibration | Cal-Kit 6 | 749 |
| R-454B Gas 50% LEL | 37-0743-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-454B (M) - Bump/Calibration | Cal-Kit 6 | 724 |
| R-454C Gas 50% LEL | 37-0753-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-454C (M) - Bump/Calibration | Cal-Kit 6 | 725 |
| R-455A Gas 50% LEL | 37-0763-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-455A (M) - Bump/Calibration | Cal-Kit 6 | 726 |
| R-507 Gas 1000PPM | 37-0771-9134-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-507 (M) - Bump/Calibration | Cal-Kit 6 | 743 |
| R-1234yf Gas 3000PPM | 37-0704-9234-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-1234yf (M) - Bump/Calibration | Cal-Kit 6 | 706 |
| R-1234yf Gas 50% LEL | 37-0703-0234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-1234yf (M) - Bump/Calibration | Cal-Kit 6 | 727 |
| R-1234ze Gas 1000PPM | 37-0711-9134-1 | Ref. Cal Gas Cyl. 34L 1000 ppm R-1234ze (M) - Bump/Calibration | Cal-Kit 6 | 745 |
| R-1234ze Gas 3000PPM | 37-0714-9234-1 | Ref. Cal Gas Cyl. 34L 3000 ppm R-1234ze (M) - Bump/Calibration | Cal-Kit 6 | 707 |
| R-1234ze Gas 50% LEL | 37-0714-2234-1 | Ref. Cal Gas Cyl. 34L 50% LEL R-1234ze (M) - Bump/Calibration | Cal-Kit 6 | 728 |
| SF6 Gas 1000PPM | 37-0791-9234-1 | Ref. Cal Gas Cyl. 34L 1000 ppm SF6 (M) - Bump/Calibration | Cal-Kit 6 | 746 |

Table: 7-1 Calibration Gas Information

### 7.1.1 Cal-Kit Information

*Macurco Cal-Kit 6*

Several detectors can be calibrated with one cylinder. The only limitation is the amount of gas in the cylinder. The 34-liter cylinder has approximately 68 minutes of continuous calibration run time if using 0.5LPM regulator. The gas cylinder should be replaced when the pressure gauge on the regulator shows 25-psi or less.

**Note:** For optimum test results it is suggested that the unit be in clean air, display showing no gas, and be in a low ambient air flow.

It is critical to perform zeroing of the sensor in clean air. In the situation or application where the absence of target gas cannot be guaranteed, it is suggested to use Zero Air (20.9% $O_2$ balance nitrogen) calibration gas for zeroing of the sensor.

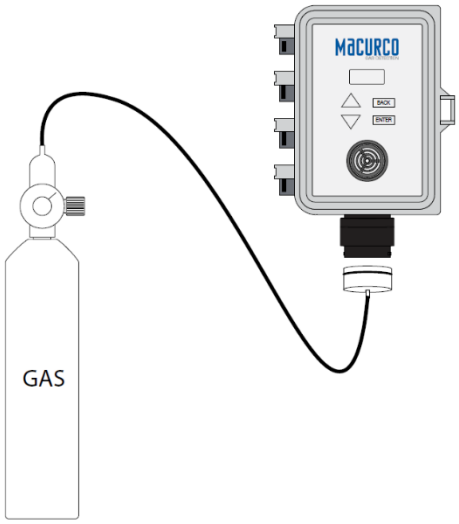



Figure: 7-1 Calibration Kit Transmitter Connection

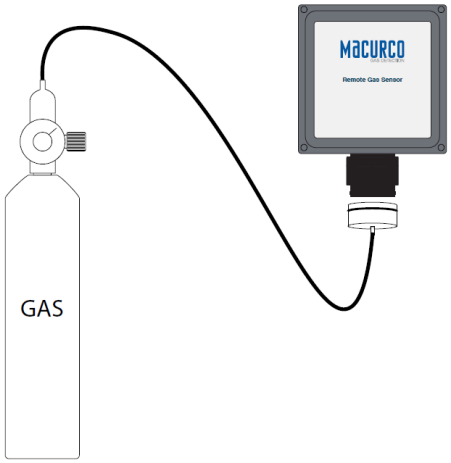
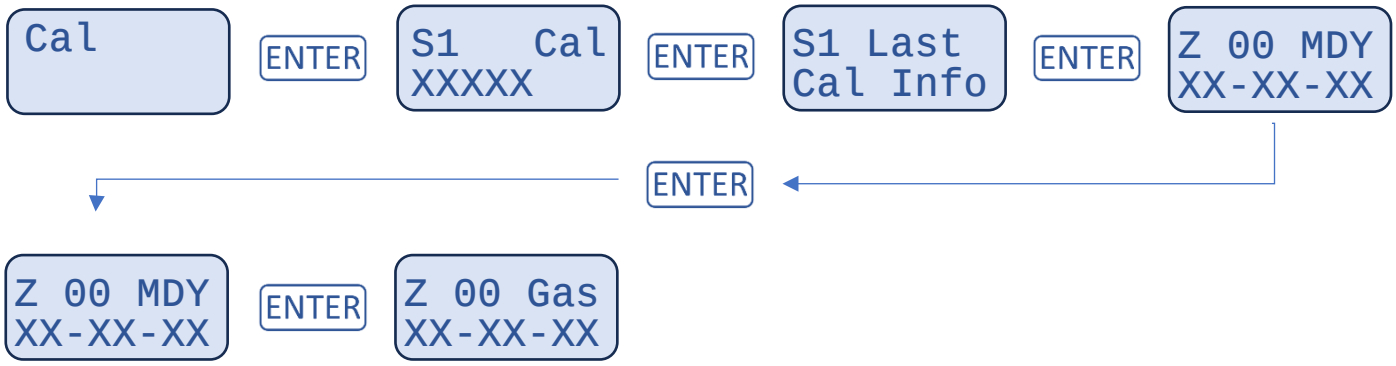



Figure: 7-2 Calibration Kit Remote Sensor Connection

### 7.1.2 Last Calibration Information: "SX Last Cal Info"




### 7.1.3 Performing a Zero & Span Calibration: "SX ZeroSpan":

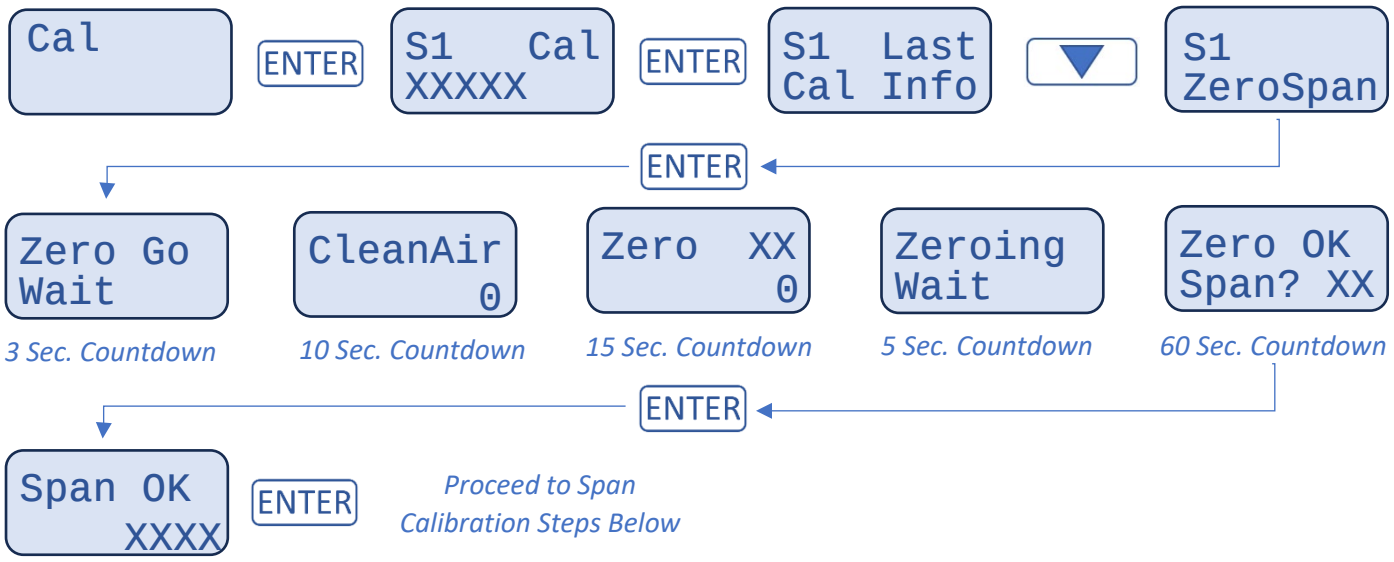
*Zero Calibration:*

**NOTE:** For optimum calibration results the unit should be in clean air and be in a low ambient air flow environment. A zero calibration provides a reference value by exposing the sensor to clean air. A span calibration exposes the sensor to a known concentration of test gas.

During this process the LED's will flash purple and the unit will walk through the Zero Calibration process. While the LED's are lit purple the outputs (R1, R2, Buzzer, Horn/Strobe, Analog and Digital outputs) do not activate any alarms.

To perform a zero calibration for the sensor,

1. Press **Down Arrow** 4 times to get to the "CAL" menu
2. Press **Enter**. The display will show "S1 Cal Gas Type".
3. Press **Enter**. The display will show "S1 Las Cal Info"
4. Press **Down** Arrow once. The display will show "S1 ZeroSpan"
5. Press **Enter**. The display will show "Zero Go Wait" – *LED's begin flashing purple*
    a. Zero Go Wait – 3 Second Duration
    b. CleanAir – 10 Second Duration
    c. Zero "Calibration" – 15 Second Duration
    d. Zeroing Wait – 5 Second Duration
    e. Zero OK, Span? XX, Proceed to Span – 60 Second Duration for Acknowledgement
6. After approximately 35 seconds, the zero calibration is complete. For a successful zeroing, the display will show "Zero OK Span?" and count down from 60 seconds waiting for acknowledgement by pressing the **Enter** button and then proceed to Span. If the zero calibration fails, the display will show FAil.n.




If no acknowledgment occurs the unit will timeout displaying "`Zero Timeout`". After exiting the zero menu prior to Spanning the unit or during a "`Zero Timeout`" the unit will remain in the calibration mode to allow gas to clear out prior to going back to normal mode. During this time the LED's will go solid purple. After 60 seconds the unit will go back to normal mode. If a Span Calibration is not followed by a Zero Calibration the unit will display an active event "#EV" and the LED's will flash if they are programmed to do so in the event of a trouble code. Pressing the **BACK** button from the home screen will show "TFA 20000000" and pressing **ENTER** will show the exact trouble code "Ex. 290819" "S1 last span calibration failed."

*Span Calibration:*

**NOTE:** For optimum calibration results the unit should be in clean air and be in a low ambient air flow environment.

**NOTE:** Before doing a Span Calibration a Zero Calibration has to be performed first.

To perform a span calibration for the sensor,

1. Assemble the gas cylinder and regulator together.
2. Check the pressure gauge on the regulator. If you have 25-psi or less you will need to replace the gas canister.
3. Place the Calibration Hood from the regulator over the sensor once the unit displays "Zero OK Span? XX" Start applying gas to the sensor.
4. Hit **ENTER** to Acknowledge proceeding to Span. Then the display will show "`Span Go Wait`"
5. Then the unit will flash while displaying the gas type and gas span value needed. Ex. "`R410A 5000`"
6. After 10 seconds the unit start the Span process. "`Span`" will flash while counting down from 170 seconds while showing the gas concentration increasing.
   **Note**: The sensor will look for the gas for 170 seconds. If no gas is applied or detected in that time, the display will read "`Span Failed. Reading out of range to start span.`"

7. If Passed the display will show "Span OK" and the final Span concentration "XXXX". Once the calibration has passed, remove the calibration hood and disassemble the cylinder and regulator.
8. Press the BACK button two times to return to the "Cal" menu. Calibration is complete. This information will now be listed in the calibration history log "**Last Cal Info**".

During this process the LED's will flash purple, "Span" will flash, "SSS" is count down timer in seconds while displaying the gas concentration as it changes in real time "CCCC".


### 7.1.4 Calibration Settings "SX Cal Settings"

**⚠WARNING**

Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.

**Calibration Interval**

*Calibration Interval* **"Cal Int X month" –** this feature allows for a forced calibration functionality to ensure the unit is calibrated at a desired frequency. The frequency can be adjusted for 3-24 months in one-month increments.

*Calibration Overdue* is when a sensor has reached or exceeded the calibration period. For Sensor 1 "S1" calibration Overdue trouble code is 290810 for Sensor 2 "S2" is 300810.

**NOTE:** This menu cannot be changed when the sensor is in calibration due or calibration overdue. (Refer to Calibration Interval – "Cal Int X month" for information on calibration due and calibration overdue. To resolve this trouble code the only resolution is with a successful field calibration and the timer is reset based on the calibration interval timeline that is programmed.

**Calibration Gas**

*Calibration Gas* is the type of gas required to calibrate the installed sensor. *Refer to Table 4-4 Calibration Gas Information*

**Calibration Gas Concentration**

*Calibration Gas Concentration* is the concentration of gas required to calibrate the installed sensor.

**NOTE:** It is very important to ensure this value matches the Cal-Gas bottle concentration. *Refer to Table 4-4 Calibration Gas Information*

**Calibration Unit of Measure**

*Calibration Unit of Measure* shows the unit of measure the calibration gas

# 8 Gas Testing

**⚠WARNING**

Using a certified gas with a concentration other than the one listed for this detector when conducting a calibration verification test (bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure. For proper use, see supervisor or User manual, or contact Technical Support at 1-844-325-3050.

All AireShield units are factory calibrated and 100% tested for proper operation. During normal operation the green status indicator LEDs will be on steady (unless turned off in the menu), Relay 1 & Relay 2 will be in standby mode and the 4-20 mA output will be at 4mA (in clean air) for the Analog Transmitters Model. The unit also performs a regular automatic self-test during normal operation. If the unit detects an improper voltage or inoperable component, it will default into Error mode. In this error mode, the Relay 2 will be activated if setup to engage during trouble conditions.

## 8.1.1 Testing Relay 1

1. Open the FCK. Connect the gas cylinder to the regulator.
2. Check the pressure gauge on the regulator. If you have 25-psi or less, you will need to replace the gas canister.
3. Assemble the regulator, hose, and Calibration Hood and place the Calibration Hood over the sensor to be tested. The calibration hood will slide over the sensor housing and then turning it clockwise will create a secure connection.
   **NOTE:** The time to activate Relay 1 depends on the Relay 1 Delay setting.
4. Turn on the regulator to start the gas flow and wait with the gas applied continuously.
5. With the display function turned "On", the AireShield will show the current concentration of gas or "0" (zero) in clean air. When the gas concentration reaches the Relay 1 setpoint, the LED's if set to On will flash or continuously stay lit while showing the sensor and gas concentration. With the display function turned Off, the display does not activate until the relay setpoint has been reached and the LED's will operate as defined while Relay 1 is activated.

**NOTE:** If Relay 1 does not activate within 2 minutes, there are four possibilities:

a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25psi or less.
b. Unit needs to be re-calibrated (go through recalibration and re-test).
c. Detector needs servicing (return unit to factory for servicing).
d. The detector has the Relay 1 set to disable ("000000") or a concentration level higher than the test gas. Set the Relay 1 to a gas concentration lower than the test gas and repeat the test.

6. Remove the gas from the sensor. Proceed to test the Relay 2.

### 8.1.2 Testing Relay 2

1. Connect the gas cylinder to the regulator.
2. Check the pressure gauge. If there is 25psi or less the cylinder should be replaced.
3. Place the Calibration Hood over the sensor.
4. Turn on the regulator to start the gas flow. Relay 2 should activate according to the settings.
5. With the display function turned "On", the AireShield will show the current concentration of gas or "0" (zero) in clean air. When the gas concentration reaches the Relay 2 setpoint, the LED's if set to On will flash or continuously stay lit while showing the sensor and gas concentration. With the display function turned Off, the display does not activate until the relay setpoint has been reached and the LED's will operate as defined while Relay 2 is activated.
6. The buzzer will sound indicating "Alarm" if the buzzer is turned "On". With the display function turned off the display does not activate until the buzzer setpoint has been reached and the LED's will operate as defined while the buzzer is activated.

   **Note**: If the Relay 2 fails to operate within 2 minutes, there are four possibilities:

   a. Gas cylinder is empty. Check the pressure gauge. Replace the gas cylinder if 25-psi or less.
   b. Unit needs to be re-calibrated (go through recalibration and re-test).
   c. Detector needs servicing (return unit to factory for servicing).
   d. The detector has Relay 2 set to disable ("000000") or a concentration level higher than the test gas. Set Relay 2 to a gas concentration lower than the test gas and repeat the test.

7. Remove the gas from the sensor after Test. Proceed to Test the 4-20mA output or replace the top cover.

### 8.1.3 Testing the 4-20mA loop

**Note:** This testing function only pertains to the AireShield Analog Transmitters.

1. Connect the gas cylinder to the regulator.
2. Check the pressure gauge. If there is 25-psi or less the cylinder should be replaced.
3. Place the cap from the regulator over the sensor. Turn on the regulator to start the gas flow.
4. The Relay 1 should activate according to the settings.
5. The Relay 2 should activate according to the settings.
6. The 4-20mA output should ramp up from 4mA in clean air to 20mA at the full range of the corresponding gas being tested.

   **Note:** If the 4-20mA output does not ramp up within 2 minutes, there are four possibilities:

   a. Gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25-psi or less.
   b. Unit needs to be re-calibrated (go through recalibration and re-test).
   c. Detector needs servicing (return unit to factory for servicing).

7. Remove the gas from the sensor. You are done.

| Smart Sensor Description | Sell Code | Gas(es) Detected | Range | Resolution | Sensor Tech. | Temp. range | Sensor Housing Size | Default Cal-Gas & Concentration | Exp. life (years) |
|---|---|---|---|---|---|---|---|---|---|
| Methane | 310 | Methane<br>Acetic Acid<br>Ethane<br>Ethanol | 100% LEL | 1% LEL | NDIR | -40 to 140°F<br>(-40 to 60°C) | 32 mm | TBD | 5 |
| Propane | 311 | Propane<br>Acetone<br>Propylene<br>N-Butane<br>Dimethyl ether<br>Cyclo Hexane<br>MEK Cyclopentane<br>Pentane<br>Isobutane<br>Difluoroethane (R-152a) Isobutylene<br>Methanol<br>Benzene<br>Toluene | 100% LEL | 1% LEL | NDIR | -40 to 140°F<br>(-40 to 60°C) | 32 mm | TBD | 10 |
| Carbon Dioxide | 400 | Carbon Dioxide | 5000 PPM | 10 ppm | NDIR | -40 to 140°F<br>(-40 to 60°C) | 32 mm | CO2, 400 ppm | 10 |
| Carbon Dioxide | 401 | Carbon Dioxide | 0-5% v/v | 0.01% v/v | NDIR | -40 to 140°F<br>(-40 to 60°C) | 32 mm | CO2, 400 ppm | 10 |
| Carbon Dioxide | 402 | Carbon Dioxide | 0-100% v/v | 0.2% v/v | NDIR | -40 to 140°F<br>(-40 to 60°C) | 32 mm | TBD | 10 |
| R32 | 700 | R32 | 10000 ppm | 50 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R32, 5000 ppm | 10 |
| R134a | 701 | R134a | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R134a, 3000 ppm | 10 |
| R404A | 702 | R404A | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R404A, 3000 ppm | 10 |
| R407C | 703 | R407C | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R407C, 3000 ppm | 10 |
| R410A | 704 | R410A | 10000 ppm | 50 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R410A, 5000 ppm | 10 |
| R449A | 705 | R449A | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R449A, 3000 ppm | 10 |
| R1234yf | 706 | R1234yf | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R1234yf, 3000 ppm | 10 |
| R1234ze | 707 | R1234ze | 5000 ppm | 25 ppm | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R1234ze, 3000 ppm | 10 |
| R32 | 720 | R32 | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R32, 50% LEL | 10 |
| R449A | 721 | R449A | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R449A, 50% LEL | 10 |
| R452B | 722 | R452B | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R452B, 50% LEL | 10 |
| R454A | 723 | R454A | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R454A, 50% LEL | 10 |
| R454B | 724 | R454B | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R454B, 50% LEL | 10 |
| R454C | 725 | R454C | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R454C, 50% LEL | 10 |
| R455A | 726 | R455A | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R455A, 50% LEL | 10 |
| R1234yf | 727 | R1234yf | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R1234yf, 50% LEL | 10 |
| R1234ze | 728 | R1234ze | 100%LEL | 1% LEL | NDIR | 14 to 122°F<br>(-10 to 50°C) | 32 mm | R1234ze, 50% LEL | 10 |
| R22 | 739 | R22 | 2000 ppm | 5 ppm | NDIR | -4 to 122°F<br>(-20 to 50°C) | 32 mm | R22, 1000 ppm | 10 |

| Smart Sensor Description | Sell Code | Gas(es) Detected | Range | Resolution | Sensor Tech. | Temp. range | Sensor Housing Size | Default Cal-Gas & Concentration | Exp. life (years) |
|---|---|---|---|---|---|---|---|---|---|
| R32 | 740 | R32 | 2000 ppm | 5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R32, 1000 ppm | 10 |
| R125 | 741 | R125<br>R227ea<br>R404A<br>R422D | R125 - 2000 ppm<br>R227ea - 3000 ppm<br>R404A - 3000 ppm<br>R422D - 2000 ppm | 5 ppm<br>10 ppm<br>10 ppm<br>5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R125, 1000 ppm | 10 |
| R134a | 742 | R134a<br>R123<br>R452B<br>R513A | R134a - 2000 ppm<br>R123 - 3000 ppm<br>R452B - 3000 ppm<br>R513A - 2000 ppm | 5 ppm<br>10 ppm<br>10 ppm<br>5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R134a, 1000 ppm | 10 |
| R507 | 743 | R507<br>R143<br>R417A | R507 - 2000 ppm<br>R143 - 2000 ppm<br>R417A - 3000 ppm | 5 ppm<br>5 ppm<br>10 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R507, 1000 ppm | 10 |
| R1234yf | 744 | R1234yf<br>R407C<br>R449A | R1234yf - 2000 ppm<br>R407C - 3000 ppm<br>R449A - 3000 ppm | 5 ppm<br>10 ppm<br>10 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R1234yf, 1000 ppm | 10 |
| R1234ze | 745 | R1234ze<br>R1233zd<br>R407A<br>R407F<br>R410A<br>R448A | R1234ze - 2000 ppm<br>R1233zd - 3000 ppm<br>R407A - 3000 ppm<br>R407F - 3000 ppm<br>R410A - 3000 ppm<br>R448A - 3000 ppm | 5 ppm<br>10 ppm<br>10 ppm<br>10 ppm<br>10 ppm<br>10 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R1234ze, 1000 ppm | 10 |
| SF6 | 746 | SF6 | SF6 - 2000 ppm | 5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | SF6, 1000 ppm | 10 |
| R450A | 747 | R450a | R450a - 2000 ppm | 5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R450a, 1000 ppm | 10 |
| R452A | 748 | R452a | R452a - 2000 ppm | 5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R452A, 1000 ppm | 10 |
| R454B | 749 | R454b | R454b - 2000 ppm | 5 ppm | NDIR | -4 to 122°F (-20 to 50°C) | 32 mm | R454B, 1000 ppm | 10 |

Table: 8-1 Sensor Comparison Chart

# 9 Troubleshooting

## 9.1 On-Board Diagnostics

The AireShield monitors all critical functions of the unit through software diagnostics that continuously test and verify unit operations. If a problem is found, the unit will switch to a fail-safe/error mode or trouble condition.

In this error mode, Relay 2 will be activated (unless turned off for trouble conditions), the 4-20 mA current loop will go to either 2mA or 24 mA, the unit will display the error code. For Digital transmitter it will output a reading of 125% of the sensor range. Other outputs: Relay 1, Buzzer, Ext. Horn/Strobe, and LED's can be configured to report troubles as well in the configuration menu.

To clear this mode, simply turn off power to the unit for a few seconds or push the **ENTER** button. This will cause the unit to restart the 1-minute self-test cycle. Navigate to the trouble → trouble resolution → reset AireShield through menu prompt.

### 9.1.1 4-20mA troubleshooting

- 0 mA is most likely a connection problem
- 4-20 mA is normal gas reading range (gas range is sensor specific and setting specific if sensor analog range has been adjusted from 4-20mA to 0-20mA)
- 2 mA or 24 mA indicates a Trouble condition if analog range is set to 4-20mA depending on settings
- 24mA indicates a Trouble condition if analog range is set to 0-20mA

### 9.1.2 Installing a New Sensor

- The AireShield has smart sensors that are built into 20mm or 32mm housings that encapsulate the sensor and PCBA.

1. To Replace a sensor, power down the transmitter
2. Open the AireShield Transmitter cover or Remote Housing cover
3. Disconnect the 4 wire pigtail harness from the smart sensor
4. Unscrew the Smart Sensor Assembly via the nut inside the transmitter or remote housing
5. To Install a new sensor,
6. Align the smart sensor keyed ridge closest to you
7. Tighten the smart sensor via the nut
8. Connect 4 wire pigtail wire harness to Smart Sensor
9. Power the transmitter up
10. Follow the menu prompts to ensure the new sensor registers properly with the transmitter

### 9.1.3 Trouble Codes

If the detector encounters an error, a trouble code is displayed. The trouble code is displayed as a number from 1 to 8 digits long “XXXXXXXX”. The following table shows the trouble codes, their description, trouble type, and a solution to potentially fix the trouble.

| Trouble Code | Description | Trouble Type | Resolution |
|---|---|---|---|
| 00 | I/O board type changed. | System Trouble Fault | Reset – Power Cycle |
| 01 | Unknown I/O board. | System Trouble Fault | Reset – Power Cycle |
| 0200 | NVM not formatted. | System Trouble Fault | Format - Yes |
| 0201 | NVM configuration format err: #. | System Trouble Fault | Reset – Power Cycle |
| 0202 | NVM configuration read configuration err: #. | System Trouble Fault | Reset – Power Cycle |
| 0203 | NVM configuration write configuration err: | System Trouble Fault | Reset – Power Cycle |
| 0204 | Firmware and NVM use different version and/or structure_id. | System Trouble Fault | Reset – Power Cycle |
| 0205 | NVM log event not formatted. | System Trouble Fault | Format - Yes |
| 0206 | NVM log event format err:#. | System Trouble Fault | Reset – Power Cycle |
| 0207 | NVM log event read err:#. | System Trouble Fault | Reset – Power Cycle |
| 0208 | NVM log event write err:#. | System Trouble Fault | Reset – Power Cycle |
| 0209 | NVM not all log events are ready. | System Trouble Fault | Reset – Power Cycle |
| 03 | Bad configuration err: #. | System Trouble Fault | Load Default Configuration |
| 04 | S1 is not locked. | System Trouble Fault | ACK? - Yes |
| 05 | S2 is not locked. | System Trouble Fault | ACK? - Yes |
| 0700 | Modbus stack error: Request already in progress. | System Trouble Fault | Reset – Power Cycle |
| 0701 | Modbus stack error: Stack initialization. | System Trouble Fault | Reset – Power Cycle |
| 0702 | Modbus stack error: Response for other sensor | System Trouble Fault | Reset – Power Cycle |
| 08 | S1 bad profile: Missing parameter ID. | System Trouble Fault | Reset – Power Cycle |
| 09 | S1 bad exponent. | System Trouble Fault | Reset – Power Cycle |
| 10 | Sensor async request failed schedule. | System Trouble Fault | Reset – Power Cycle |
| 12 | S1 unit conversion error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 13 | S1 bad install sensor status:#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1400 | S1 not compatible. Profile ID mismatch in current vs local NVM. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1401 | S1 not compatible. Unit mismatch in current vs local NVM. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1402 | S1 not compatible. Cal. gas ID mismatch in local config. vs profile data. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1403 | S1 not compatible. Local NVM settings vs smart sensor settings. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1404 | S1 not compatible. Local NVM vs RO profile ID. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1405 | S1 not compatible. MRS485 sensor type is 0. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1406 | S1 not compatible. struct_id local vs smart sensor. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 1407 | S1 not compatible. Profile vs sensor data. | Trouble Fault Sensor 1 | Call Tech Support |
| 1500 | S2 not compatible. Profile ID mismatch in current vs local NVM. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1501 | S2 not compatible. Unit mismatch in current vs local NVM. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1502 | S2not compatible. Cal. gas ID mismatch in local config. vs profile data. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1503 | S2 not compatible. Local NVM settings vs smart sensor settings. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1504 | S2 not compatible. Local NVM vs RO profile ID. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1505 | S2not compatible. MRS485 sensor type is 0. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1506 | S2 not compatible. struct_id local vs smart sensor. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 1507 | S2 not compatible. Profile vs sensor data. | Trouble Fault Sensor 2 | Call Tech Support |
| 17 | Both sensors are off. | System Trouble Fault | Reset – Power Cycle |
| 18 | S1 high range is 0. | System Trouble Fault | Reset – Power Cycle |
| 19 | S2 high range is 0. | System Trouble Fault | Reset – Power Cycle |
| 20 | S1 firmware and NVM use different structure_id. | Trouble Fault Sensor 1 | Load Def. SSD1 (Yes) |
| 21 | S2 firmware and NVM use different structure_id. | Trouble Fault Sensor 2 | Load Def. SSD2 (Yes) |
| 2200 | S1 MB request failed. Response timeout. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2201 | S1 MB request failed. Response timeout. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2202 | S1 MB request failed. RX request not defined. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2203 | S1 MB request failed. Invalid NVM. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2204 | S1 MB request failed. RX from wrong address. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2205 | S1 MB request failed. Bad RX frame. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2206 | S1 MB request failed. RX MB exception. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2207 | S1 MB request failed. RX MB function not implemented. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2208 | S1 MB request failed. RX length error. | Trouble Fault Sensor 1 | Reset – Power Cycle |

| | | | |
|---|---|---|---|
| 2209 | S1 MB request failed. RX unexpected command. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2210 | S1 MB request failed. RX unexpected status. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2211 | S1 MB request failed. Request refused. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2212 | S1 MB request failed. Mismatch structure_id. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2213 | S1 MB request failed. Requested data not found. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2232 | S1 MB request failed. Flag set at power up and no MB activity. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2300 | S2 MB request failed. Response timeout. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2301 | S2 MB request failed. Response parse failed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2302 | S2 MB request failed. RX request not defined. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2303 | S2 MB request failed. Invalid NVM. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2304 | S2 MB request failed. RX from wrong address. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2305 | S2 MB request failed. Bad RX frame. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2306 | S2 MB request failed. RX MB exception. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2307 | S2 MB request failed. RX MB function not implemented. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2308 | S2 MB request failed. RX length error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2309 | S2 MB request failed. RX unexpected command. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2310 | S2 MB request failed. RX unexpected status. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2311 | S2 MB request failed. Request refused. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2312 | S2 MB request failed. Mismatch structure_id. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2313 | S2 MB request failed. Requested data not found. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2332 | S2 MB request failed. Flag set at power up and no MB activity. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 24 | Not all data from all registered smart sensors. | System Trouble Fault | Load Default Configuration |
| 25 | S2 unit conversion error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 26 | S2 bad profile: Missing parameter ID. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 27 | S2 bad install sensor status:#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 28 | S2 bad exponent. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 2900 | S1 NMV initialized with default data. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2901 | S1 NMV unexpected error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2902 | S1 getting sensor reading and status failed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2903 | S1 sensor specific failure. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2904 | S1 sensor EOL. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2905 | S1 HFXO failed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2906 | S1 HFXO bad. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2907 | S1 sensor communication error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290800 | S1 smart sensor just power up. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290800 | S1 smart sensor is asking to refresh all data. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290801 | S1 smart sensor warm up in progress. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290802 | S1 smart sensor warm up in progress. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290803 | S1 smart sensor is in calibration mode. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080400 | S1 HW status: Last request failed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080401 | S1 Init not performed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080402 | S1 HW status: Sensor error: #. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080403 | S1 HW status: Sensor warning: 0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080404 | S1 HW status: MRS485 unit conv err. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080405 | S1 HW status: New reading available. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080406 | S1HW status: Cross factor err. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080407 | S1 HW status: Unit conversion err. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080408 | S1 HW status: Cal unit conv err. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080409 | S1 HW status: Round error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080410 | S1 HW status: Cal round error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080411 | S1 HW status: MRS485 round error. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080412 | S1 HW status: Over ride concentration. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080413 | S1 HW status: Over ride temperature. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080414 | S1 HW status: Sensor vs profile mismatch. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080500 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080501 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080502 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080503 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080504 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 29080505 | S1 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290806 | S1 sensor warning EOL. | Trouble Fault Sensor 1 | Reset – Power Cycle |

| | | | |
|---|---|---|---|
| 290807 | S1 sensor warning EOL silenced. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290808 | S1 sensor EOL. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290809 | S1 calibration due. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290810 | S1 calibration over due. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290811 | S1 out of min. temperature range. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290812 | S1 out of max. temperature range. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290813 | S1 saving data in NVM in progress. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290814 | S1 profile update in progress. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290815 | S1 smart sensor is asking to be reset. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290816 | S1 reading over range. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290817 | S1 reading under range. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290818 | S1 last zero calibration failed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 290819 | S1 last span calibration failed. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2909 | S1 unknown sensor due to profile issues. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2910 | S1 calibration over due counter unexpected value. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2911 | S1 smart sensor system EOL. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2912 | S1 smart sensor not ready to ship. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2913 | S1 bad smart sensor profile. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 2914 | S1 smart sensor serial number issue. | Trouble Fault Sensor 1 | Reset – Power Cycle |
| 3000 | S2 NMV initialized with default data. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3001 | S2 NMV unexpected error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3002 | S2 getting sensor reading and status failed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3003 | S2 sensor specific failure. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3004 | S2 sensor EOL. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3005 | S2 HFXO failed | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3006 | S2 HFXO bad. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3007 | S2 sensor communication error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300800 | S2 smart sensor just power up. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300801 | S2 smart sensor is asking to refresh all data. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300802 | S2 smart sensor warm up is progress. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300803 | S2 smart sensor is in calibration mode. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080400 | S2 HW status: Last request failed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080401 | S2 Init not performed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080402 | S2 HW status: Sensor error #. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080403 | S2 HW status: Sensor warning: 0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080404 | S2 HW status: MRS485 unit conv err. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080405 | S2 HW status: New reading available. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080406 | S2HW status: Cross factor err. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080407 | S2 HW status: Unit conversion err. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080408 | S2 HW status: Cal unit conv err. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080409 | S2 HW status: Round error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080410 | S2 HW status: Cal round error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080411 | S2 HW status: MRS485 round error. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080412 | S2 HW status: Over ride concentration. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080413 | S2 HW status: Over ride temperature. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080414 | S2 HW status: Sensor vs profile mismatch. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080500 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080501 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080502 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080503 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080504 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 30080505 | S2 smart sensor internal status trouble:0x#. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300806 | S2 sensor warning EOL. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300807 | S2 sensor warning EOL silenced. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300808 | S2 sensor EOL. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300809 | S2 calibration due. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300810 | S2 calibration over due. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300811 | S2 out of min. temperature range. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300812 | S2 out of max. temperature range. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300813 | S2 saving data in NVM in progress. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300814 | S2 profile update in progress. | Trouble Fault Sensor 2 | Reset – Power Cycle |

| | | | |
|---|---|---|---|
| 300815 | S2 smart sensor is asking to be reset. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300816 | S2 reading over range. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300817 | S2 reading under range. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300818 | S2 last zero calibration failed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 300819 | S2 last span calibration failed. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3009 | S2 unknown sensor due to profile issues. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3010 | S2 calibration over due counter unexpected value. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3011 | S2 smart sensor system EOL. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3012 | S2 smart sensor not ready to ship. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3013 | S2 bad smart sensor profile. | Trouble Fault Sensor 2 | Reset – Power Cycle |
| 3014 | S2 smart sensor serial number issue. | Trouble Fault Sensor 2 | Reset – Power Cycle |

Table: 9-1 Trouble Code Table

On the home screen the unit will display #EV and the gas concentration for S1 and S2 if present. To verify the Event select the BACK button to the "Active Events" menu to determine what the Event is. If the Event is a trouble it will list the trouble code and description. In many cases acknowledging the Active Event or trouble condition and resetting the unit will resolve the code. Refer to *Table 5.1 Trouble Code Table* to determine how to resolve the trouble.

If there are multiple trouble codes, once you are in the active events menu you can scroll down to view all the active events (active troubles).

**NOTE**: If the error mode repeats frequently, check for continuous power and proper voltage. If power is not the problem and a unit has repeating error conditions, it may need to be returned to Macurco for service, per these User Instructions.

## 9.2 Sensor Poisons

The sensors in the detector are designed with extreme sensitivity to the environment. As a result, the sensing function may be deteriorated if the detector is exposed to contaminants, including a direct spray from aerosols such as paints, silicone vapors, etc., or to a high density of corrosive gases (such as hydrogen sulfide, sulfur dioxide) for an extended period.

## 9.3 Sensor Expired

The AireShield utilizes replaceable sensor elements. Each sensor has an expected life (refer to the sensor data table for specific life expectancy). After "X" years, the "Sensor expired" signal will be activated indicating that one or both sensors have reached the end of their typical usable life. The "Sensor expired" signal will cause an error code (S1 EOL 2904 code and S2 EOL 3004). *See Table 5-1 Trouble Codes Table*.

The "Sensor expired" signal can be silenced for ten days by pressing the by pressing the BACK button and acknowledging the trouble code or by temporarily dropping power to the unit. The "Sensor expired" signal provides the user an opportunity to test and/or calibrate the sensor assuring that it is still performing within acceptable parameters though the sensor is nearing the end of its expected life.

The silence function will continue to be available for 29 days after the AireShield initiates the initial "Sensor expired" signal. After this 29-day period the AireShield can no longer be silenced, and the sensor must be replace.

Maintenance

The AireShield is low maintenance gas detector that is capable of having up to two sensors. The detector's performance should be tested regularly by using gas as detailed in the Gas Testing and Field Calibration Procedure sections.

All maintenance and repair of products manufactured by Macurco are to be performed at the appropriate Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities.

| ⚠ WARNING |
| --- |
| Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair product performance. |

**CAUTION**

Avoid the use of harsh cleaning materials, abrasives and other organic solvents. Such materials may permanently scratch the surfaces and damage the display window, labels, sensor or instrument housing. High voltage terminals (100-240VAC) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector prior to cleaning the unit. Failure to do so may result in sickness or death.

## 9.4 Cleaning

Cleaning of the external surfaces is best carried out using a damp cloth with a mild detergent or soap. Use a vacuum cleaner with soft brush to remove dust or contamination under the cover. Do not blow out the sensor with compressed air.

# 10 Appendix A – Table of Figures





www.macurco.com 1-844-325-3050 support@macurco.com Sioux Falls, South Dakota, USA

# 11 Macurco Gas Detection Product Limited warranty

Macurco warrants the AireShield gas detector will be free from defective materials and workmanship for a period of two (2) years from the date of manufacture (indicated on a decal on the PCB and on a sticker on the back side of the mounting plate), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. The manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are the return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.


## Macurco Gas Detection

1504 W. 51st Street
Sioux Falls, SD 57105

### Technical Support Contact Information

**Phone:** 1-844-325-3050
**Fax:** 1-605-951-9616
**Email:** support@macurco.com
**Website:** www.macurco.com/support/

### General Contact Information

**Phone :** 1-877-367-7891
**Fax :** 1-605-951-9616
**Email :** info@macurco.com
**Website:** www.macurco.com


Rev – 1.2
Issue Date: 10-17-2025
Document No: 34-2900-0020-2