



# Single Zone Gas Monitors

HGM-SZ (Halogen) and AGM-SZ (Ammonia)

## Instruction 3015-4256

Installation / Operation / Maintenance

Rev 14 – May 2014



Patent 6,590,690

UL 61010-1  
CSA 22.2 No. 61010-1  
EN 14624

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## **NOTICE**

Effective as of revision 4, this instruction manual refers to the current "new style" of Single-Zone leak monitoring equipment (which has its pump mounted on the inside *bottom* of the cabinet). For information on the older style of monitoring equipment (pump mounted to the inside *top* of the cabinet), refer to Rev 3 of this manual. Contact Bacharach for additional information.

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Patent 6,590,690

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## SECTION 1. INTRODUCTION

### 1.1. How to Use This Manual

Thank you for investing in a **BACHARACH** Single Zone Monitor. This manual provides important information on how to install, operate, and service the SZ monitoring unit.

To assure operator safety and the proper use of the monitor, please read, understand, and follow the contents of this manual.

If you have a working knowledge of gas monitors, you will find this manual useful as a reference tool. If you are new to the use of gas monitors, you can educate yourself about the principles of gas detection and the proper operation of this device by reading this manual thoroughly.

### 1.2. Warning Statements

The use of the word **WARNING** in this manual denotes a potential hazard associated with the use of this equipment. It calls attention to a procedure, practice, or condition, or the like, which if not correctly performed or adhered to, could result in personal injury or death.

### 1.3. Caution Statements

The use of the word **CAUTION** in this manual denotes a potential hazard associated with the use of this equipment. It calls attention to a procedure, practice, condition, or the like, which if not correctly performed or adhered to, could result in damage to the equipment.

### 1.4. Hazard Symbols Located on the Monitor



This symbol indicates the need to consult this manual when opening the enclosure.

**WARNING:** A potential risk exists if the operating instructions are not followed.



This symbol indicates the presence of electric shock hazards when enclosure is opened.

**WARNING:** To avoid risk of injury from electric shock, do not open the enclosure without first disconnecting AC power.

### 1.5. Safety Precautions



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



**WARNING:** This is NOT a safety device. Some gases which this instrument can detect may be combustible/flammable. When properly configured, this instrument is designed to alarm at concentrations that are lower than the explosive limit of the gas. As such, it is the buyer's responsibility to initiate an immediate planned response to any gas leaks as soon as they are detected. This equipment should NEVER be used to measure or sample gases at or above their respective lower explosive limits.



**WARNING:** The Single Zone gas monitor is not to be used in any application that is beyond its intended purpose or beyond the scope of its specifications. Failure to follow this warning can result in personal injury or damage to the equipment. For details on appropriate use, refer to the general description, application, and operation discussions in this manual.

### 1.5.1. AC Power Supply



**IMPORTANT:** The Single Zone monitor uses a universal power supply that is capable of accepting inputs of 100 to 240 VAC, 50/60 Hz. The monitor's power consumption is 15 Watts. It is highly recommended that the monitor be connected directly to the AC power source, preferably on its own circuit (with UPS or surge protection).



**WARNING:** A switch or circuit breaker rated 1.0 A, 250 VAC, with a minimum terminal spacing of 3.0 mm must be attached to the monitor's AC power leads. This switch must also be located in close proximity to the monitor, and be in easy reach of the operator. This switch should also be clearly marked as the monitor's main AC disconnect device.

### 1.5.2. Protective Grounding



**WARNING:** Under no circumstances should the SZ unit be operated without connection to a protective ground. Doing so poses a potential shock hazard and is also a violation of electrical safety standards applicable to this type of equipment.

### 1.5.3. Explosive Atmosphere



**WARNING:** Do not operate this equipment in the presence of flammable liquids, vapors or aerosols. Operation of any electrical equipment in such an environment constitutes a safety hazard.

### 1.5.4. Proper Exhaust Venting



**WARNING:** It is imperative that the monitor's exhaust port be vented as described in this manual. Failure to do so may constitute a safety hazard.

### 1.5.5. Accessing the Interior of the Monitor



**WARNING:** Extreme care should be exercised when accessing the interior of the monitor. Only qualified electrical maintenance personnel should perform connections and adjustments. Always remove AC power before performing work inside the monitor.

### 1.5.6. Misuse and Modifications to the Monitor



**WARNING:** The protection provided by the monitor may be impaired if the monitor is used in a manner not specified by Bacharach, Inc. Modifications to this monitor, not expressly approved, will void the warranty.



**NOTE:** Use ONLY the provided knockouts for electrical and communications wiring. Drilling into the box will void the warranty.

### 1.5.7. In Case of Malfunction



**WARNING:** Do not continue to use this equipment if there are any symptoms of malfunction or failure. In the case of such occurrence, de-energize the power supply and contact a qualified repair technician or the nearest Bacharach Service Center.

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### 1.5.8. Fusing



**WARNING:** This device uses type “F” fuses (F1 and F2) rated at 1.0 A, 250 VAC. Replace ONLY with Bacharach-approved fuses.

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### 1.5.9. Installation Category



**IMPORTANT:** This device is classified as Installation Category II, Pollution Degree II, as defined by UL.

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### 1.5.10. Altitude Limit



**IMPORTANT:** This device is designed for operation at or below an altitude of 6,562 ft (2,000 m). Do not operate this device above this altitude limit.

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### 1.5.11. Cleaning



**NOTE:** To clean the outside of the case use a dry cloth. To avoid shock hazard and/or equipment damage, DO NOT use soap and water.

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## 1.6. Functional Overview

### 1.6.1. General Description and Use

Single zone gas monitors are specified to support compliance to federal, state and local safety codes governing gas emissions. Avoiding significant loss reduces equipment replacement costs, maintains equipment efficiency, promotes safety, and protects the environment.

The Bacharach SZ is designed to continuously test for the presence of gas in an area that is located up to 500 ft (152.4 m) away from the monitor. The SZ monitor displays the type of gas being monitored, along with displaying both the current gas level and the peak gas level detected in that area on its front panel LCD. The monitor retains a log of previous readings that can be easily accessed for analysis.

An audible alarm and front panel indicators are provided to signal alarm and fault conditions, and relay contacts are provided that can be used to trigger external alarm devices in the event of a system fault, or if a leak (small), spill (medium), or evacuation (large) level of gas is detected. The system also includes a 4–20 mA current loop interface that can be connected to remote monitoring equipment.

The SZ requires only minor periodic maintenance such as the occasional replacement of filters. The monitor incorporates active diagnostics that continuously check the system for proper operation. A front panel indicator is provided to alert an operator of system malfunctions, and fault codes are generated that enable the operator to identify the cause of the fault.

### 1.6.2. Understanding Monitoring Levels

Effective use of this monitor requires an understanding of what constitutes reasonable alarm set points for the type of gas being monitored. Most systems leak some gas. In a good “tight” installation these background levels will be acceptably low and often do not require corrective action. You can reduce nuisance alarms and needless service calls if the alarm levels are set at practical limits. Bacharach has developed recommended monitoring levels based on compliance to ANSI/BSR ASHRAE 15-2007 and ASHRAE Safety Code 34-2007. These reference levels are listed in the Appendix.

The SZ monitor is shipped with its leak, spill, and evacuate alarm levels set at 100, 300 and 500 ppm respectively. Setting the monitor at these recommended alarm levels will satisfy the needs of most users. However, the ppm levels generated by system leaks into the environment are greatly influenced by the volume of air in the sampling area, air circulation, size of the leak, distance to the monitoring point, and a host of other variables. In some cases the alarm set points may need to be adjusted either up or down to achieve effective monitoring.

### 1.6.3. Suggested Location of Sampling Point

At the point of a gas leak, the gas is nearly pure. As gas is dispersed into the air, the gas molecules diffuse, causing a dilution of the original concentration. The SZ monitor measures the gas concentration at the point the sample is collected. Therefore, if the termination of the collection line is not at the exact point of the gas leak, then the monitor will read a diluted mixture of gas and air.

It should be noted that when refrigerant and ammonia gases are cold, they are heavier than air and settle below the leak point. When the gas warms to room temperature, it becomes lighter than air and tends to collect above the leak point. Consequently, the sampling point should be located as close as possible to the source of a potential leak. If this is impractical, then the alarm set points should be adjusted to compensate for the dilution of the gas.

The SZ monitor should be mounted outside of the mechanical room or just inside a doorway to the room. This is the “split architecture design” for safety of the operator. The monitor should be readily accessible for easy visual monitoring and servicing. The total length of the sample line + exhaust line can be up to 500 ft (152.4 m). If the area around the monitor is not well ventilated, then an optional exhaust line and purge line can be run to an outside location. The total length of the exhaust line + the purge line cannot exceed 200 ft (61.0 m).

It may be necessary to perform a “smoke” test of the mechanical room to determine the best monitoring point. The smoke test would provide the pattern of air currents present in the room.

The SZ monitor should be kept dry. When used in a wet or humid area, it is highly recommended to use the optional water stop accessory to avoid internal damage.

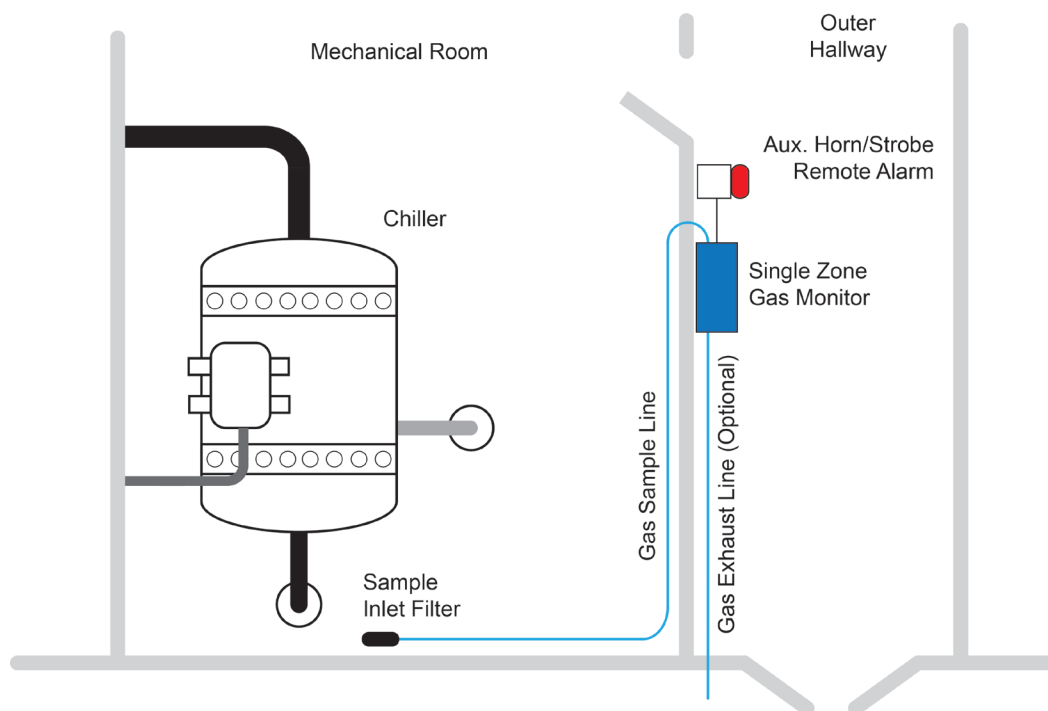


Figure 1-1. Aerial View of Example Single Zone Leak Monitor Placement in a Mechanical Room

## 1.7. Specifications

Category	HGM-SZ Specifications
<b>Product Type</b>	Single-zone infrared monitoring system for low level continuous monitoring of CFC, HCFC and HFC refrigerant gasses used in most commercial refrigeration systems. System design supports compliance to the refrigerant monitoring requirements of ANSI/BSR ASHRAE 15-2007 and ASHRAE Safety Code 34-2007.
<b>Gas Library:</b>	
CFC	HFP, R-11, R-113, R-114, R-12, R-502
HFC	R-125, R-134a, R-236FA, R-245Fa, R-32, R-404a (HP62), R-407a, R-407c (AC9000), R-407f, R-410a (AZ20), R-422a, R-422d, R-427a, R-507 (AZ50), R-508b (SUVA95)
HCFC	R-123, R-124, R-21, R-22, R-227, R-23, R-401a (MP39), R-402a (HP80), R-402b (HP81), R-408a, R-409a, R-500, R-503
HALON	H1211, H1301, H2402
Other	FA188, FC72, HFO1234YF, HFO1234ZE, N1230, N7100, N7200, N7300, N7600, R-420a, R-424a, R-426a, R-427a, R-438a
<b>Sensitivity</b>	All gasses 1 ppm
<b>Measuring Range</b>	All gasses 0 to 10,000 ppm
<b>Accuracy</b>	±1 ppm ±10% of reading from 0-1000 ppm (R11, R22, R113: ±10 ppm ±15% of reading 0-1000 ppm)
<b>Response Time</b>	105 seconds maximum (dependent on sample line length)

Category	AGM-SZ Specifications
<b>Product Type</b>	Single zone infrared monitoring system for low level continuous monitoring of ammonia refrigerant gas used in most commercial refrigeration systems.
<b>Gas Library</b>	Ammonia / NH <sub>3</sub> / R-717
<b>Sensitivity</b>	20 PPM (minimum detection limit)
<b>Measuring Range</b>	25-10,000 PPM
<b>Accuracy</b>	±10 ppm ±10% of reading from 25 to 1,000 ppm
<b>Response Time</b>	180 seconds maximum (dependent on sample line length)

## Single Zone Gas Monitor

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Category	General Single Zone Specifications
Coverage	Single zone
Detector Type	Infrared, Non-Dispersive
Warm-up Time	15 minutes
Front Panel	3 Indicator lights: <ul style="list-style-type: none"><li>• Green Monitor is powered on. LED glows during normal operation; flashes when unit is in warm-up mode</li><li>• Red Alarm. LED flashes when any point has exceeded the alarm setting.</li><li>• Yellow Fault. LED flashes when there is a system fault</li></ul>
Size (HxWxD)	7.5" x 13.5" x 3.625" (190.5 mm x 343 mm x 92 mm)
Weight	5.5 lbs (2.5 kg)
Temperature Drift	Less than 1 ppm per °C between purge cycles
Sampling Mode	Automatic (continuous)
Re-Zero	Automatic (approximately every 5 minutes)
System Noise	Less than 50 dB(A) @ 10 feet (3m)
Monitoring Distance	500 ft. (152 m) maximum
Conditioned Signal	4-20 mA DC non-isolated output (ppm)
Alarms	Four SPDT alarm contacts are provided rated 2A at 250 VAC (inductive), 5 A at 250 VAC (resistive) Three assigned to PPM level alarms, one assigned to system faults
Power Safety Mode	Fully automatic system reset. All programmed parameters retained.
Operating Temp	32 to 122 °F (0 to 50 °C)
Ambient Humidity	5% to 90% RH (non-condensing)
AC Power	100 to 240 VAC, 50/60 Hz, 15 Watts
Certification	UL 61010-1, CAN/CSA 22.2 No. 61010-1 and CE Mark
Warranty	2 years from date of shipment
Altitude Limit	6,562 ft (2,000 m) maximum
Sensor Life	7-10 years

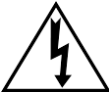
## SECTION 2. INSTALLATION

### 2.1. Installation Considerations

#### 2.1.1. Warnings and Cautions



**WARNING:** Explosion hazard! Do not mount the SZ monitor in an area that may contain flammable liquids, vapors or aerosols. Operation of any electrical equipment in such an environment constitutes a safety hazard.



**WARNING:** Shock hazard! Always disconnect AC power before working inside the monitor.



**CAUTION:** Drilling holes in the SZ enclosure may damage the unit and will void the warranty. Please use knockouts provided for electrical connections.



**CAUTION:** The SZ unit contains sensitive electronic components that can be easily damaged. Be careful not to touch or disturb any of these components.

#### 2.1.2. Inspection

The SZ monitor has been thoroughly inspected and tested prior to shipment from the factory. Nevertheless, it is recommended that the monitor be re-checked prior to installation. Inspect the outside of the enclosure to make sure there are no obvious signs of shipping damage. Open the enclosure and inspect the interior of the monitor for loose components that may have become dislodged during shipment. If damage is discovered, please contact the nearest Bacharach Service Center for assistance.

#### 2.1.3. Location of the Monitor

Place the monitor in a location that will require no more than 500 ft (152.4 m) of tubing (total of sample line + exhaust) to reach the sampling area. The ammonia monitor typically requires a purge air line (maximum of 100 feet). The halogen monitor uses ambient air to zero its gas sensor, so the monitor should be located in an area that normally does not contain gas. If an exhaust line is not used, locate the monitor in a well ventilated area so that the exhaust gas does not accumulate around the monitor's ventilation holes. An exhaust line can be up to 100 feet in length.

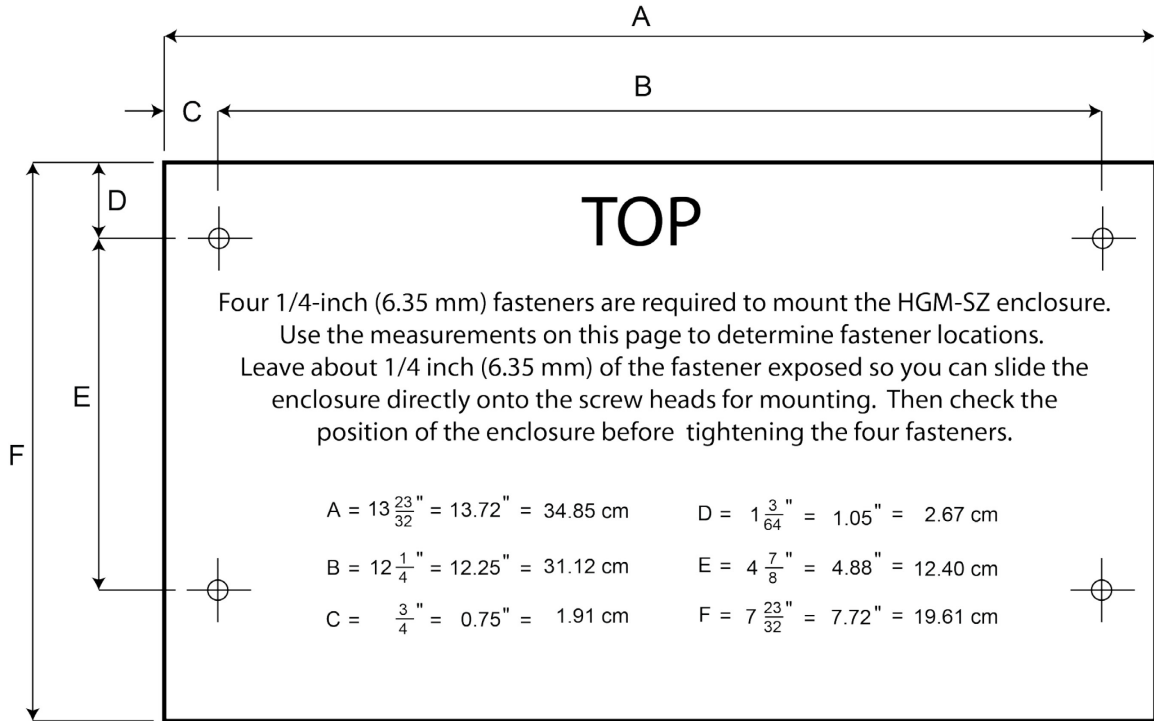
The SZ unit should be operated in an environment that is between 32 and 122°F (0 and 50°C); has a relative humidity that is from 5 to 90% non-condensing; and is at an altitude of no more than 6,562 ft (2,000 m). The area should also be relatively free of dirt, grease, and oils that could adversely affect the operation of the monitor.

The location should allow the monitor to be easily accessible for visual monitoring and servicing.

## 2.2. Mounting Instructions

The SZ monitor should be installed plumb and level and securely fastened to a rigid mounting surface.

The enclosure utilizes keyhole mounting designed for ¼ inch fasteners. Install the four screws as displayed in the diagram below or by using the provided mounting template. Allow the screw heads to protrude approximately ¼ inch.



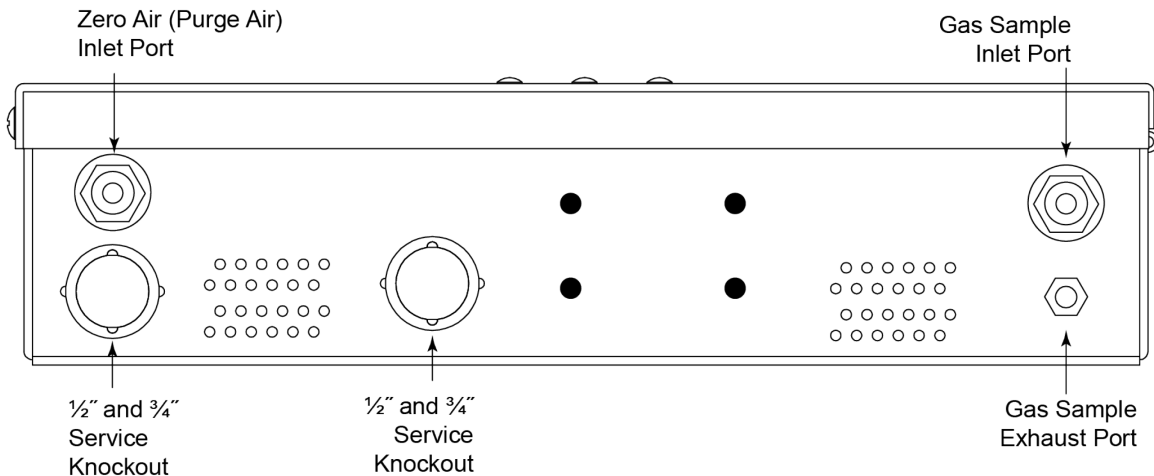
**Figure 2-1. Enclosure Mounting Specs**

Hold the monitor flat against the mounting surface and allow it to slide down engaging the screw heads in the keyhole slots of the mounting brackets. Adjust the screws as necessary to hold the monitor securely against the mounting surface.

## 2.3. Connecting Gas Sample and Exhaust Lines

### 2.3.1. Overview

A single gas-sample line must be run from the SZ unit to the area of the facility to be monitored. An optional exhaust line can be installed to vent the sample gas away from the monitor. All tubing connections are made on the bottom of the enclosure as displayed in the illustration below.



**Figure 2-2. HGM-SZ Monitor Bottom View**

\* There is an additional service knockout on top of the case.

### 2.3.2. Tubing Considerations

Use ¼ in. outside diameter (0.040 in. wall) flex tubing for all air lines (P/N 0304-2743 or equivalent for HGM; P/N 0304-2742 or equivalent for AGM). The tubing should be clean and free of moisture or other contaminants. The tubing should be cut cleanly with a sharp knife and care should be taken not to distort the tubing end.



**IMPORTANT!** Due to the reactive nature of refrigerant and ammonia gasses, it is important to use materials that will not absorb the gas as it passes through the sampling system. The use of unauthorized tubing or any other materials in the gas-sampling stream may lead to erroneously low readings.

All tubing bends should have a radius of no less than 5" (127 mm) to ensure proper airflow. If kinks or obstructions occur in the line, the monitor may not function properly.

### 2.3.3. Connecting the Gas Sample Line

Please refer to the section titled *Suggested Location of Sampling Point* (page 4) to learn more about where to take a gas sample.

The gas-sample line can be up to 500 ft (152.4 m) in length. The combined length of the sample line and exhaust line (if one is used) should not exceed 500 ft (152.4 m). The end of this line should be placed near the potential leak source and positioned to reduce the possibility of mists, aerosols, oil, water, dust, or other contaminants from being drawn into the monitor. For added protection, a termination filter (P/N 3015-3420) supplied with the monitor must be attached to the end of this line.



**CAUTION:** The introduction of contaminants through the gas-sample line can result in serious and permanent damage to the monitor.

Depending on type of use and location of lines, the optional end-of-line water stop filter assembly can be used to prohibit moisture from entering the intake lines. Place the end of the intake line into the blue receiver of the end-of-line water stop and tighten sufficiently.



**NOTE:** Only one filter assembly, either the line-end filter or end-of-line water stop, should be used for each line.

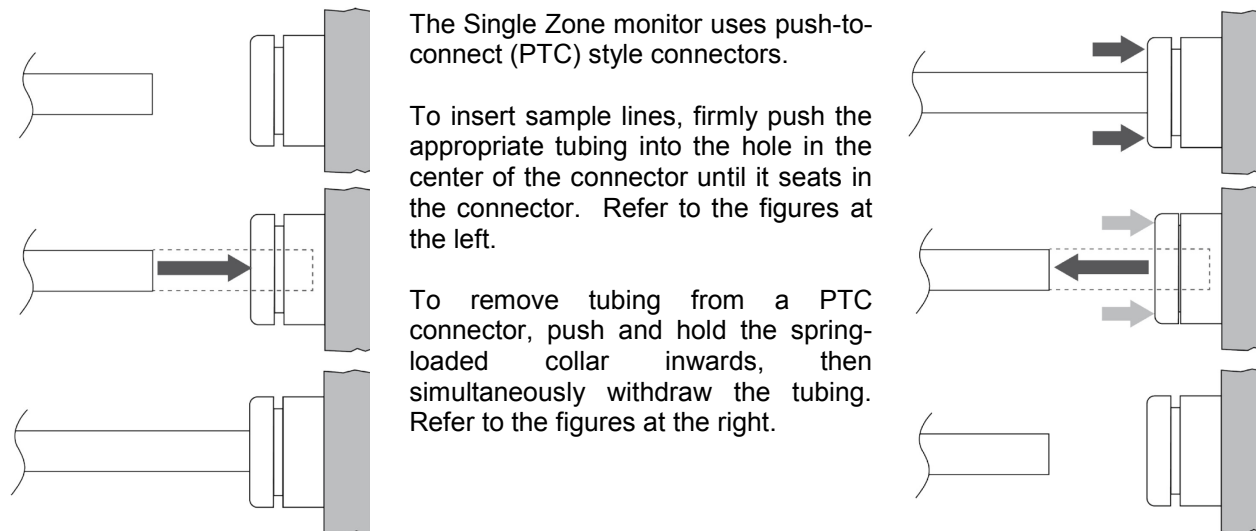


Figure 2-3. Using PTC Connectors: Connecting (Left) and Disconnecting (Right)

### 2.3.4. Connecting the Exhaust Line

The exhaust line carries the exhausted gas sample away from the monitor and is required if the monitor is located in a confined, poorly ventilated area. If no purge line is used (ammonia monitor) you must vent the exhausted gas sample away from the monitor to prevent erroneous readings due to improper zeroing of the detector. Note that if the monitor is exposed to an unusually high level of gas for prolonged periods of time, its charcoal filter (Halogen Gas Monitor Only) will quickly become saturated and no longer able to clean the purge-air of refrigerant gas.

The exhaust line can be up to 100 ft (30.52 m) in length. Ideally, this line should terminate outdoors in a location that is not exposed to the elements. Connect the exhaust line to the monitor by firmly pushing the tubing onto the barbed fitting. If the exhaust line terminates outside the building, position the tubing so that no water or moisture can enter the line. Note that this line does not require a termination filter.

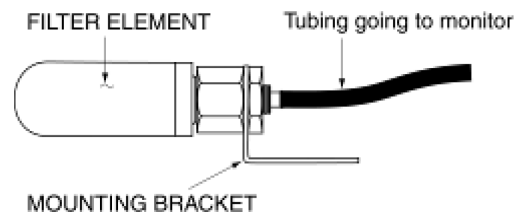


Figure 2-4. Termination Filter (P/N 3015-3420)

### 2.3.5. Connecting the Purge Line

The purge is an intake line that draws fresh air *into* the instrument. It should not exceed 100 feet (30.48 m) in length. It is advisable to terminate the purge line outdoors, provided the input is not exposed to rain, snow, ice, exhaust fumes, or other airborne contaminants. If an outdoor installation is impractical, the line should be run to an area inside the facility that you are certain is not contaminated with ambient gas. If this is not possible, an optional charcoal filter assembly (P/N 3015-3125) can be used with the monitor to filter refrigerant from the purge line. It may be mounted adjacent to the monitor. (Use upgrade kit 3015-5716 to convert an SZ with an internally mounted filter to an SZ with an externally mounted filter.) A line-end filter (P/N 3015-3420) should be attached to the end of the purge line when the charcoal filter is not used.

### 2.3.6. Installing Optional Splitter Kit

Splitter Kits are made available which allow the SZ unit to take gas sample readings from several sample points. These kits are designed for use **ONLY** in confined/defined spaces with high potential for leaks, such as food cases, cold rooms, refrigeration rack rooms, etc. Bacharach's SZ 2-way (P/N 3015-5404) and 3-way (P/N 3015-5405) splitter kits are available as an optional accessory. Refer to instruction 3015-5415 (supplied with kit) for detailed installation instruction.

### 2.3.7. Connecting the Water Trap

The water trap (P/N 0007-1655) is an optional accessory for applications that result in water or condensation frequently entering the intake lines. Install the trap close to the unit for the most effective results. The intake line may be cut where the user finds appropriate (preferably close to monitor). Each side of the intake line should be inserted into the receivers on either side of the water trap. Secure tightly. A replacement filter (P/N 0007-1656) for the water trap is available and is replaced by unscrewing the clear plastic cup of the water trap, pulling the filter directly out (do not unscrew), and inserting the new filter into place. Replace the cup of the water trap. If desired, an optional mounting bracket (0007-1657) may be used to secure the water trap in place.



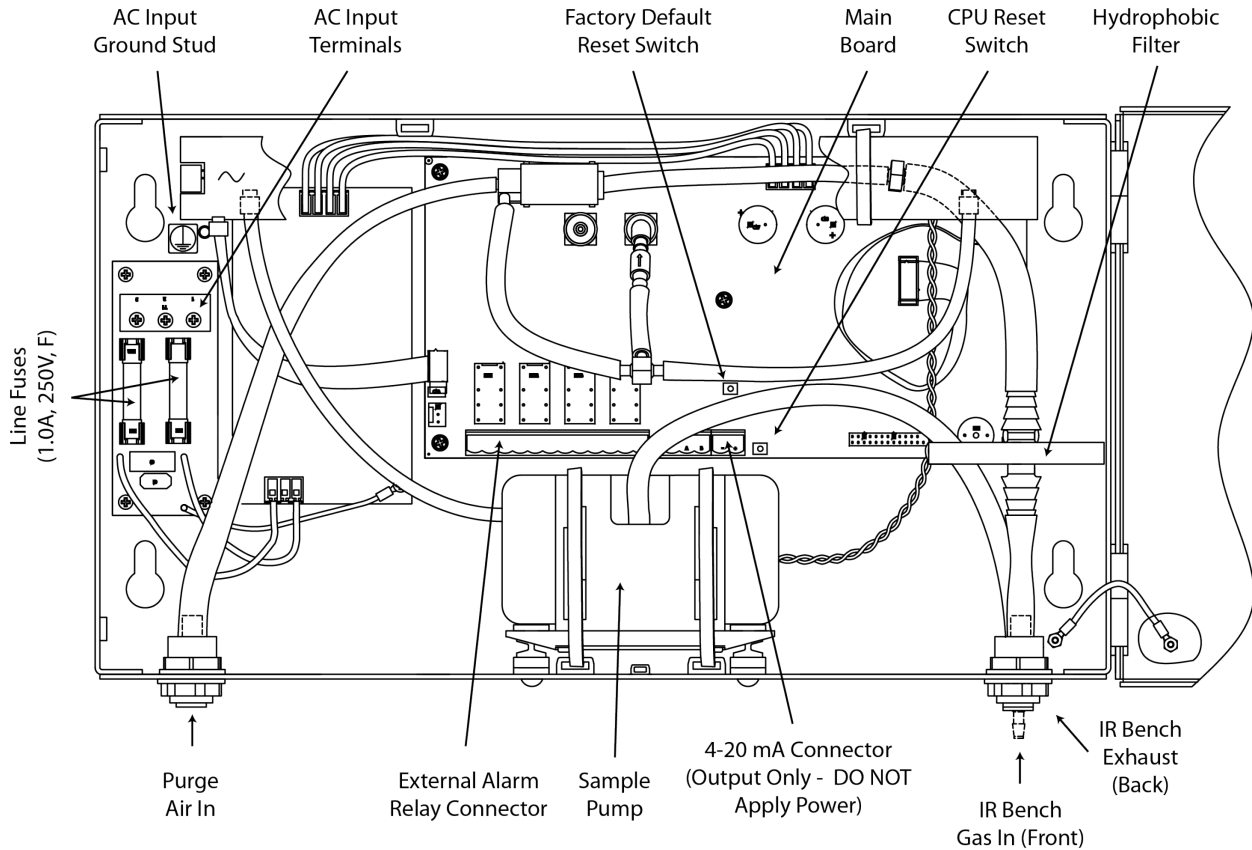
**NOTE:** The termination filter (P/N 3015-3420) or end-of-line water stop filter (P/N 3015-5512) should be used, regardless of the presence of a water trap.



**WARNING:** Extreme temperatures and/or humid conditions may cause water to condense in the tubes. A water trap is highly recommended for use in these scenarios.

---

## 2.4. Interior Schematic (Halogen HGM)



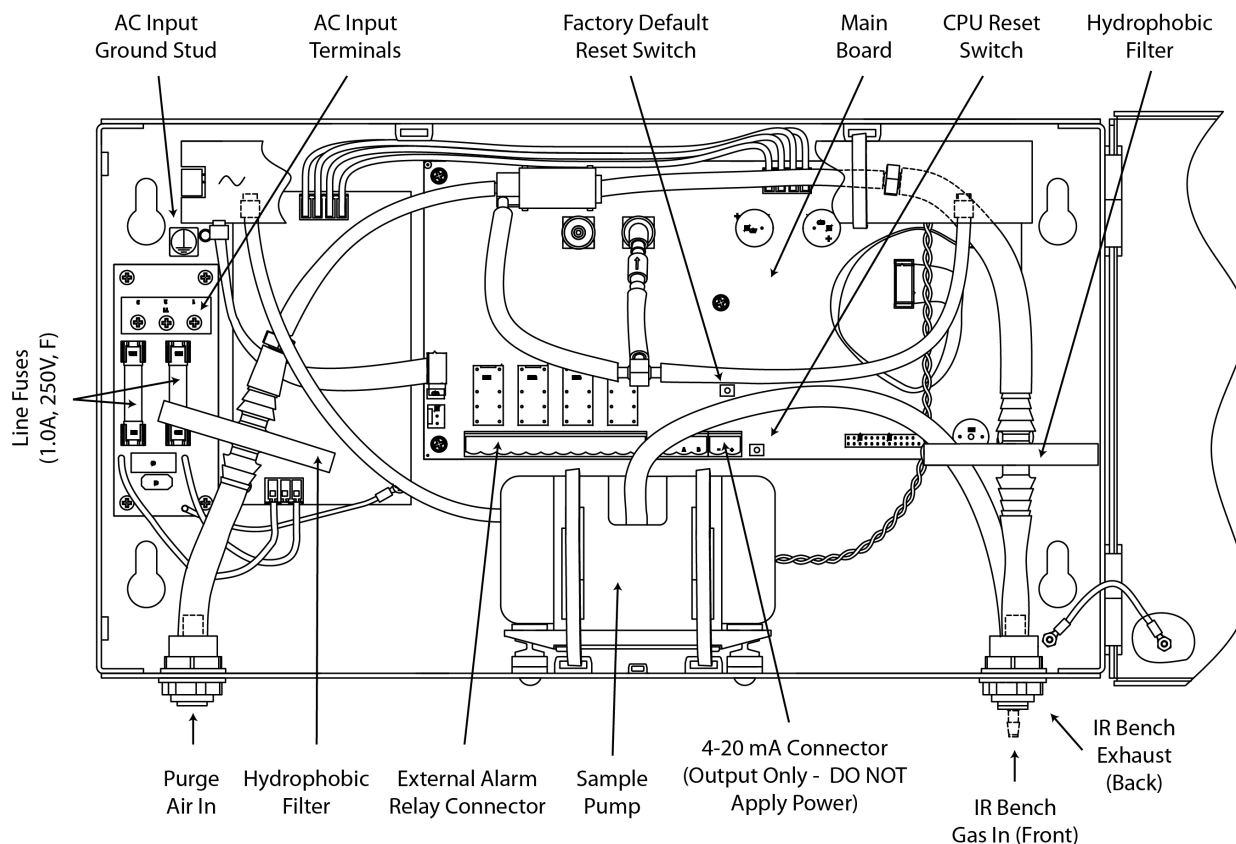
**Figure 2-5. Interior Assembly of the Single Zone Halogen Gas Monitor**



**NOTE:** The plastic cable tie surrounding the pump is for stability during shipping. Please remove before operating. If the unit gets shipped to Bacharach for service, reinstall a plastic cable tie around the pump to prevent damage during shipping.

\*\*For IR Bench Gas In/Out, see SZ bottom view drawing on page 8.

## 2.5. Interior Schematic (Ammonia AGM)



**Figure 2-6. Interior Assembly of the Single Zone Ammonia Gas Monitor**



**NOTE:** The plastic cable tie surrounding the pump is to ensure safe handling during shipping. Please remove before operating. If the unit gets shipped to Bacharach for service, reinstall a plastic cable tie around the pump to prevent damage during shipping.

\*For IR Bench Gas In/Out, see SZ bottom view drawing on page 8.

## 2.6. Electrical Wiring

The SZ unit uses a universal power supply that is capable of accepting inputs of 100 to 240 VAC, 50/60 Hz. The monitor's power consumption is 15 Watts (maximum). It is highly recommended that the monitor be connected directly to the AC power source, preferably on its own circuit. The connection should be completed with UL listed multi-conductor wire (minimum 16 AWG), rated 300 VAC at 105°C.

Locate a convenient service knockout and install electrical conduit in the typical manner. Locate the AC Input Terminals and Ground Stud on the inside of the monitor (page 11). Secure the incoming AC power neutral (white) and live (black) wires to the LINE 1 and LINE 2 terminals.

Using the supplied crimp-on ring terminals, washers, and nuts, connect the incoming AC power ground wire (green) to the monitor's AC Input Ground Stud, and then install a separate wire between the ground stud and the GND terminal.

Using the supplied crimp-on ring terminals, washers, and nuts, connect the incoming AC power ground wire (green) to the monitor's AC Input Ground Stud, and then install a separate wire between the ground stud and the GND terminal.

A switch or circuit breaker rated 1.0 A, 250 VAC, with a minimum terminal spacing of 3.0 mm must be attached to the monitor's AC power leads. This switch must also be located in close proximity to the monitor, and be in easy reach of the operator. This switch should also be clearly marked as the monitor's main AC disconnect device.

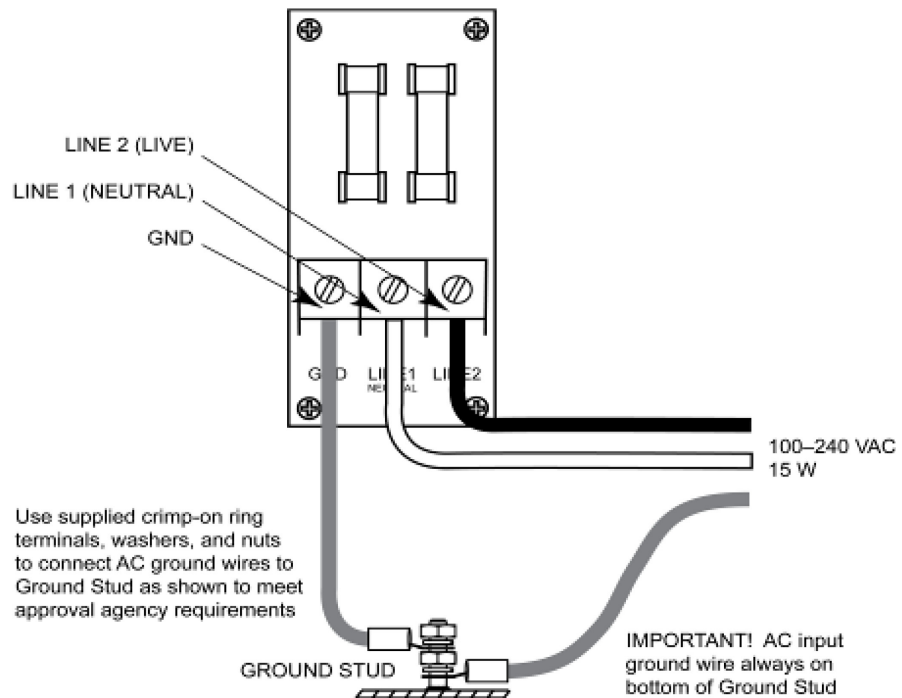


Figure 2-7. AC Power Connections



**WARNING:** Electrical installation should be performed by a certified electrician, and should comply with all applicable NEC/CEC and local electrical safety codes.



**WARNING:** The AC power ground wire must first be connected to the monitor's ground stud. Under no circumstances should this monitor be operated without a protective ground. Doing so poses a potential shock hazard, and is also a violation of electrical safety standards applicable to this type of equipment.



**WARNING:** Copper conductors for connection to supply mains must be made in accordance with NEC/CEC and local codes.



**CAUTION:** Drilling holes in the SZ enclosure may damage the unit and will void the warranty. Please use knockouts provided for electrical connections.

## 2.7. Connecting External Alarms

### 2.7.1. Overview

The SZ monitor includes four SPDT relays whose contacts are rated 2 A at 250 VAC (inductive) and 5 A at 250 VAC (resistive). These relays are used for the connection of external alarm devices that are activated when the relay is energized. The relays are factory assigned to energize under the following conditions:

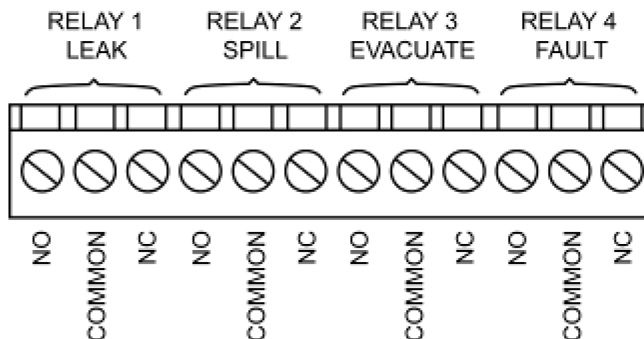
Relay #1	Leak	Alarm Point 100 ppm
Relay #2	Spill	Alarm Point 300 ppm
Relay #3	Evacuate	Alarm Point 500 ppm
Relay #4	Fault	System Fault Event



**NOTE:** Alarm points of relays #1, #2, and #3 are set using the monitor's **LEAKLVL**, **SPILLLVL**, and **EVACLVL** function screens (page 22).

### 2.7.2. Connection

Use any of the service knockouts to gain cable access to the interior of the monitor. Locate the External Alarm Relay Connector (page 11). Secure the leads from the external alarm device and its power source to the connector as shown in the diagram below.



**Figure 2-8. External Alarm Relay Connector**

Each relay may be connected as normally open (NO), or normally closed (NC).

The relay contacts are rated 2 A at 250 VAC (inductive) and 5 A at 250 VAC (resistive).

Power for the alarm devices connected to the relay contacts may be supplied by an external 24 V DC power source or the monitor's AC input terminals.

In Figure 2-9, power to this device is being tapped off the monitor's AC input. In Figure 2-10, power is supplied from an external power source

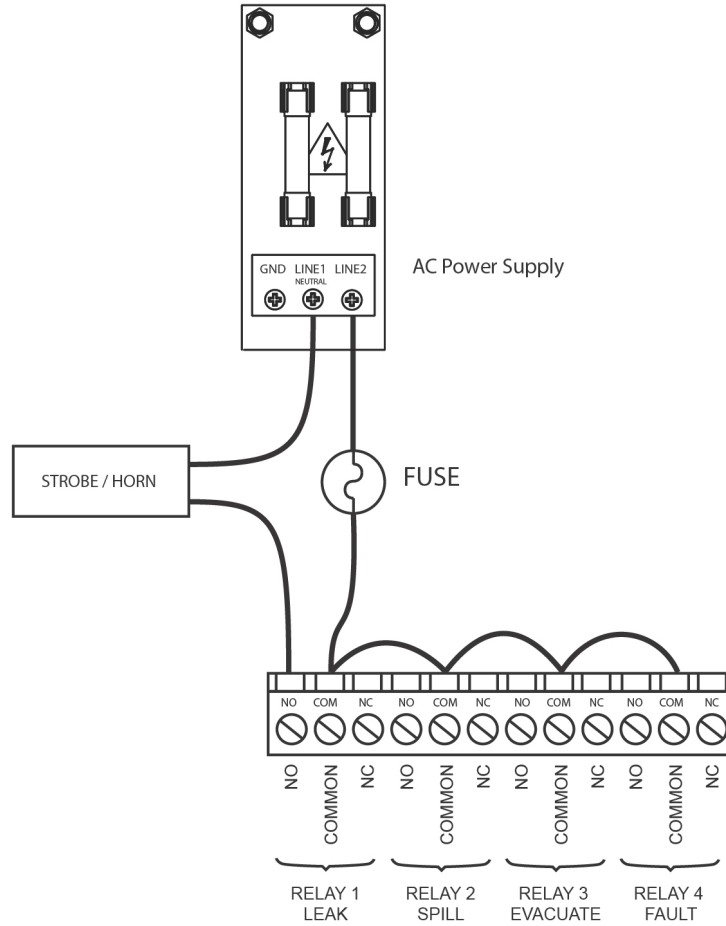


Figure 2-9. Typical AC External Alarm Relay 1 Wiring

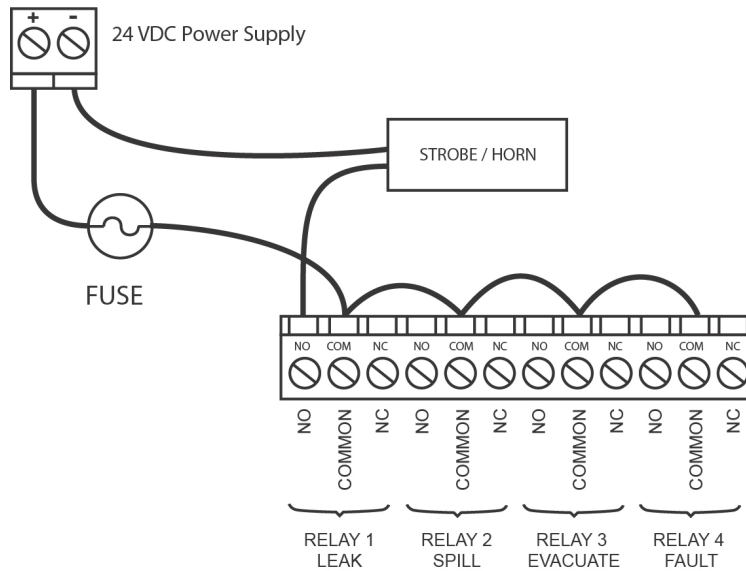


Figure 2-10. Typical DC External Alarm Relay 1 Wiring

Jumper the 'Live/Positive' line of an external power source (DC devices) or the monitor's AC input (AC devices) to the 'Common' terminal on the relay connector.

Connect the 'Live/Positive' end of the strobe or horn to the 'NO' terminal of whichever level of alarm is appropriate for the application.

For protection, install an in-line fuse of the appropriate size and design for the external alarm device being used.

The other end of the strobe or horn is connected to the 'Neutral/Negative' leg of the external power source (DC devices) or monitor's AC input (AC devices).

### 2.8. 4–20 mA Current Loop Interface

An external 4–20 mA monitoring device (e.g., chart recorder) can be connected to the SZ monitor using a shielded-twisted-pair cable. Use any of the service knockouts to gain access to the interior of the monitor. Locate the 4–20 mA Connector (page 11), remove it from the circuit board, and then remove the resistor or shorting wire from its terminals.



**IMPORTANT!** The monitoring device must be isolated from ground (floating).

---



**NOTE:** A 100 Ohm, ¼ W resistor must be connected to the 4–20 mA connector if no external monitoring device is used. Failure to install this resistor may cause a loop fault code <0010> to occur (page 24).

---

Secure the wire leads from the external monitoring device to the 4–20 mA connector as shown in the diagram below, making sure that the polarity at this connector matches the wiring at the monitoring device.

The default current-to-ppm factor is set to 0.016 mA = 1 ppm, providing a measurement range 0 ppm (4 mA) to 1,000 ppm (20 mA). Note that the current-to-ppm factor can be changed using the monitor's **LOOP** function (page 22).

To facilitate loop zero and span checking, note that when the **LOOP** function is selected the loop output is set to 20 mA, and upon exiting this function the loop output is set to 4 mA.

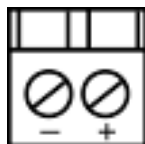


Figure 2-11. 4–20 mA Current Loop Connector



**CAUTION:** Never apply power to the 4–20 mA Current Loop Connector from an external power supply. Connect only a load resistor and/or a floating measurement device.

---

## SECTION 3. OPERATION

### 3.1. Front Panel Display and Controls



#### Keypad

Use these buttons to:

1. Enter function mode, then move arrow (>) on screen to the desired function
2. Scroll through data
3. Change a function's value

#### Monitor On LED (Green)

Flashes during warm-up  
Lights steady during normal operation

#### System Fault LED (Yellow)

Flashes when one or more faults occur

#### Alarm LED (Red)

Flashes when detected gas level exceeds any of three preset alarm points.

#### Display Screen

Displays current readings, menus, and parameters.

#### Enter Button

Press this button to:

1. Clear peak reading
2. Save a function screen's displayed value

#### Silence/Quit Button

Press this button to:

1. Acknowledge a system fault or gas alarm by turning OFF the internal audible alarm and de-energizing the corresponding fault/alarm relay.
2. Return to the previous screen without saving data when in the function mode.

Figure 3-1. Front Panel Display and Controls

### 3.2. General Operation

Once the SZ monitor has been installed, set up, and powered ON, the monitor will make measurements in the area being sampled for desired gas without further operator intervention. The results of those measurements are shown on the front panel display.

MEASURE 00485 pk 45ppm R134A
---------------------------------

In the example shown above, **MEASURE** indicates that the SZ unit is actively monitoring for refrigerant gas, and that currently 45 ppm of R-134A (refrigerant gas) is being detected. This display also indicates that a peak measurement of 485 ppm has been made.

An operator can reset the peak value to zero by pressing the **ENTER** button.

A log of up to 200 previous measurements can be viewed using the **PPM LOG** function (page 22).

If the detected gas level exceeds the preset Leak, Spill, or Evacuate alarm point, then the monitor responds by turning ON the front panel **ALARM** (red) light and energizing the corresponding alarm relay. If the internal audible alarm is turned ON, it too will activate (**AUDALRM** page 22). Optional external alarm devices can be connected to the alarm relays to alert personnel that a Leak, Spill, or Evacuate alarm condition has occurred (page 14). Pressing the front panel **SILENCE** button will acknowledge an alarm and turn OFF all alarm indicators with the exception of the front panel **ALARM** light. The alarm circuit will reactivate, however, if the alarm condition is not cleared within the time period set by the **SILENCE** function (page 22). The **ALARM** light will turn OFF after the detected gas level goes below the lowest alarm point and after the **SILENCE** button is pressed.

If a system fault occurs (see Fault Code list on page 24), the monitor responds by turning ON the front panel **SYSTEM FAULT** (yellow) light and energizing the fault relay. If the internal audible alarm is turned ON, it too will activate (**AUDALRM** page 22). An optional external alarm device can be connected to the fault relay to alert personnel that a system fault has occurred (page 14). Pressing the front panel **SILENCE** button will acknowledge the fault and turn OFF all alarm indicators with the exception of the front panel **SYSTEM FAULT** light. The alarm circuit will reactivate, however, if the fault condition is not cleared within the time period set by the **SILENCE** function (page 22). The **SYSTEM FAULT** light will turn OFF only after the cause of the fault has been eliminated.

A log of the alarm and fault events can be viewed using the monitor's **ALARMS** and **FAULTS** function (page 22).

### 3.3. Display Screens

#### 3.3.1. Initial Power Up

When the SZ monitor is first powered up all front panel lights are turned ON, and a splash screen appears showing the monitor's firmware revision level. After a brief moment the **Warm Up** screen is display along with the front panel **MONITOR ON** light (green) blinking.

```
BACHARACH
VERSION x.xx
```

The monitor takes 15 minutes to warm up; after which, the **MONITOR ON** light glows steadily and the **Data Display** screen is displayed.

```
WARM UP
```

#### 3.3.2. Data Display Screen

During normal operation, the **Data Display** screen shows when the monitor is performing the following three functions:

**MEASURE** indicates that the monitor is actively measuring for selected gas. In the example screens shown above, the monitor is currently detecting 0 ppm of R-134A (refrigerant gas), and that a peak measurement of 485 ppm has occurred.

```
MEASURE 00485pk
0ppm R134A
```

To reset the peak value to zero, press the **ENTER** button.

```
PURGE 00485pk
0ppm R134A
```

**PURGE** is displayed when the monitor is resetting its infrared detector to a baseline of 0 ppm using fresh (zero) air that is being drawn in through the Purge Air Inlet Port. This purging process is performed on an "as needed" basis, which is normally once every 6 to 8 minutes.

```
PRES CHK 00485pk
0ppm R134A
```

**PRES CHK** is displayed when the monitor is performing an atmospheric pressure check, which is done to ensure the accuracy of the gas measurement under varying atmospheric conditions. This pressure check is performed every 30 minutes.

#### 3.3.3. Function Screens

The Function screens are used to display stored data and to set up the monitor.

From the **Data Display** screen, press any **Keypad** button to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) on the display until it is next to the desired function, and then press the **ENTER** button to select that function.

```
>PPM LOG FAULTS
ALARMS DIAGNOS

>LOG INT AUDALRM
LOOP CLOCK

>P-CHK
ALM ACK

>GASTYPE SPILLVL
LEAKLVL EVACLVL

>SILENCE ZONETMP
SQUELCH CAL
```

Once a function has been selected, use the **Keypad** to scroll through the displayed data or to change a parameter associated with that function. Press **ENTER** to save newly entered parameters. Press the **QUIT** button to return to the previous screen without saving.

Note that if no buttons are pressed within 90 seconds after selecting a function, the monitor returns to the **Data Display** screen.

**PPM LOG** – Contains records of the last 200 measurements. Each record shows the measurement's date, time, and ppm level. Note that the interval at which the measurements are logged is determined by the **LOG INT** function.

```
#025      425PPM @  
11/07/10  15:35
```

Use the **Keypad Up** and **Down** buttons to change the record number by a factor of 1. Use the **Right** and **Left** buttons to change the record number by a factor of 10. Press **QUIT** to return to the previous screen.

In the example on the right, record #025 shows that a level of 425 ppm was measured on 11/07/10 at 15:35.

Note that the PPM Log can be cleared as described on page 25.

**ALARMS** – Contains records of the last 30 alarm events, with the monitor's most recent alarm being shown when the **Alarm** screen is first displayed. After 30 events have been recorded, the newest record overwrites the oldest. Each record displays either LEAK, SPILL, or EVAC including the date and time the alarm occurred. Use any of the **Keypad** buttons to scroll through the other alarm records. Press **QUIT** to return to the previous screen. Refer to page 22.

```
#03      SPILL @  
11/10/10  15:06
```

Note that the ppm levels at which alarms occur are set using the **LEAKLVL**, **SPILLLVL**, and **EVACLVL** functions.

In the example on the right, record #03 shows that a spill event occurred on 11/10/10 at 15:06.

**FAULTS** – Contains records of the last 30 fault events, with the monitor's current fault status being shown when the **Fault** screen is first displayed. After 30 events have been recorded, the newest record overwrites the oldest. Each record lists an event's numeric fault code plus the date and time the fault occurred. Use any of the **Keypad** buttons to scroll through the other fault records. Press **QUIT** to return to the previous screen. Refer to *System Faults* (page 23).

```
#15 <1000> @  
11/10/10  12:37  
4.26500v <0000>  
24.5cD  14.00psi
```

In the example on the right, record #15 shows that a Purge Flow Fault <1000> occurred on 11/10/10 at 12:37.

**DIAGNOS** – Enters the diagnostic function. Press the **Up Arrow Keypad** button to toggle between the monitor's two diagnostic screens. Refer to (page 26).

```
0.4ppm  0.00  
0.00002au 4.260v
```

**GAS TYPE** – Used to select of any one of the gas types listed for monitoring. (See the gas library in the Specifications section.) Use the **Keypad** to select the desired gas type, and then press **ENTER** to save the selection and return to the previous screen.

```
SELECT GAS TYPE  
R134A
```

**LEAKLVL** – Sets the Leak Alarm level, adjustable from 1 to 300 ppm. Factory default is 100 ppm. Note that the Leak Alarm level cannot be set higher than either the Spill or Evacuate Alarm levels. Refer to Appendix for recommended alarm settings for other gases. Use the **Keypad** to set the desired Leak Alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT LEAK LEVEL  
0100 PPM
```

**SPILLVL** – Sets the Spill Alarm level, adjustable from no lower than the Leak Alarm level to a maximum value of 500 ppm, but not higher than the Evacuate Alarm level. Factory default is 300 ppm. Refer to Appendix for recommended alarm settings for other gases. Use the **Keypad** to set the desired Spill Alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT SPILL LEVEL
  0300 PPM
```

**EVACVL** – Sets the Evacuate Alarm level, adjustable from no lower than the Spill Alarm level to 9999 ppm. Factory default is 500 ppm. Refer to Appendix for recommended alarm settings for other gases. Use the **Keypad** to set the desired spill level alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT EVAC LEVEL
  0500 PPM
```

**LOG INT** – Sets the interval at which measurements are logged to memory from 1 to 9999 minutes. Factory default is 10 minutes. Note that the logged measurements can be viewed using the **PPM LOG** function. Use the **Keypad** to enter the desired value, and then press **ENTER** to save that value and return to the previous screen.

```
LOG INTERVAL IS
  0010 min
```

**LOOP** – Adjusts the loop factor of the 4–20 mA current loop. Factory default is 0.016 mA per ppm, which provides an output range of 0 ppm (4 mA) to 1,000 ppm (20 mA). Use the **Keypad** to set the desired loop factor, and then press **ENTER** to save that value and return to the previous screen.

```
EDIT LOOP FACTOR
  0.016 mA/PPM
```

To facilitate loop zero and span checking, note that when the **LOOP** function is selected the loop output is set to 20 mA, and upon exiting this function the loop output is set to 4 mA.

**AUDALRM** – Allows the monitor's internal audible alarm to be associated with any function of the monitoring system. Factory default is OFF. Use the **Keypad** to select the desired audible alarm function, and then press **ENTER** to save that value and return to the previous screen.

```
AUDIBLE ALARM IS
  OFF
```

**Audible Alarm Settings:** OFF, ANY ALARM, SYSTEM FAULT, LEAK ALARM, SPILL ALARM, EVAC ALARM, MONITOR STOPPED



**NOTE:** MONITOR STOPPED indicates there is a critical system fault, and the monitor is no longer functioning correctly.

**CLOCK** – Sets the monitor's date and time. Use the **Keypad** to enter the correct date and time, and then press **ENTER** to save those values and return to the previous screen. Note that time is displayed in a 24 hour format, while the date is displayed as mm/dd/yy.

```
SET DATE & TIME
11/10/10  15:30
```

**SILENCE** – Used to enter a length of time for which the internal audible alarm and the external alarm are turned OFF when the front panel **SILENCE** button is pressed. The factory default is 300 seconds (5 minutes). If the cause of the alarm/fault has not been cleared at the end of this time period, the internal audible alarm and the external alarm device are reactivated. Use the **Keypad** to enter the desired time period, and then press **ENTER** to save that value and return to the previous screen.

```
SILENCE TIMEOUT
  0300 sec
```

**SQUELCH** – Sets a value of between 0.0 and 99.9 ppm that prevents the display of measurements below that value. Factory default is 0 ppm. For example, if the squelch setting is set to 50 ppm, then the monitor will not display measurements that are below that value. Use the **Keypad** to enter the desired value, and then press **ENTER** to save that value and return to the previous screen.

```
SQUELCH BELOW
50.0ppm
```

**ZONETEMP** – Used to enter the temperature of the area being monitored in °C, thus giving a more accurate ppm reading. The factory default is 25°C. Use the **Keypad** to enter the desired temperature, and then press **ENTER** to save that value and return to the previous screen.

```
TEMP AT ZONE =
25 degC
```

**CAL** – Used to change the monitor's calibration factor. This function is to be used **ONLY** with instructions from a Bacharach Service Center. Factory default is 1.000.

```
R134A CALFACTOR
1.000
```

**P-CHK** – This **Pressure Check** function displays the current manifold pressure and the stored ambient pressure in psia, along with the difference between these two pressures and the current fault code.

```
14.72 * AMB14.81
0.0
```

**ALM ACK** – The **ALM ACK** (alarm acknowledgement) function programs the alarm light and audible alarm for latching or non-latching operation. Use the up and down arrow keys to toggle between the two settings.

```
ALM ACK MODE
MANUAL
```

**AUTO:** Non-latching (The alarm light and buzzer will automatically shut off when the gas level drops below its alarm set point).

**MANUAL:** Latching (The alarm light and buzzer remain on and will not shut off until the alarm condition has been manually acknowledged.)

## 3.4. Gas Alarms

### 3.4.1. Overview

If the selected gas ppm level in the area being monitored exceeds its preset Leak, Spill, or Evacuate Alarm level (page 22), the SZ unit will detect this alarm condition and turn ON the front panel **ALARM** light. Additionally, an external alarm device may activate and the monitor's internal audible alarm may sound if those features have been enabled (pages 14 and 22).

### 3.4.2. Clearing / Silencing a Latching Gas Alarm

Once the gas-alarm circuit has been triggered, all alarm indicators remain turned ON (even after the detected gas level returns to normal) if the **ALM ACK** function is set to **MANUAL**. Press the **SILENCE** button to clear all gas-alarm indicators after the cause of the alarm has been cleared and the detected gas level has dropped below all alarm levels. If the **ALM ACK** function is set to **AUTO**, the alarm relay will automatically de-energize when the gas level drops below its alarm set point.

Pressing the **SILENCE** button while a gas-alarm condition still exists causes the internal audible alarm and all external alarm devices that are connected to the relays to turn OFF for a period of time as set by the **SILENCE** function. This will allow ventilation equipment tied to the SPILL and EVAC relays to continue operating. The front panel **ALARM** light remains ON, however, as an indication that an alarm condition still exists, but will automatically turn OFF once the gas level returns to normal. The alarm circuit will reactivate at the end of the silence period if the detected gas level is still above an alarm level.

### 3.4.3. Viewing the Gas Alarm Log

From the **Data Display** screen, use the **Keypad** buttons to place the arrow (>) on the display next to the **ALARMS** function. Then press **ENTER** to display the alarm log.

The alarm log shows the type of alarm (LEAK, SPILL, or EVAC), plus the date and time it occurred. If CLEAR is displayed, this indicates that an alarm was acknowledged at the date and time shown.

Immediately after selecting the **ALARM** function, the most recent alarm event is displayed. In the example below, record #03 shows that a Spill Alarm occurred on 11/10/10 at 15:06. Note that if more than 30 alarm events have occurred, then the newest event overwrites the oldest. The Alarm Log can be cleared as described on page 25.

```
#03      SPILL @
11/10/10 15:06
```

## 3.5. System Faults

### 3.5.1. Overview

If a system malfunction occurs, the SZ monitor will detect the problem and turn ON the front panel **SYSTEM FAULT** light. Additionally, an external alarm device may activate and the monitor's internal audible alarm may sound if those features have been enabled (pages 14 and 22).

### 3.5.2. Clearing / Silencing a Fault Alarm

The **SYSTEM FAULT** light and all other fault indicators will automatically turn OFF after the cause of the fault has been eliminated.

Pressing the **SILENCE** button while a fault condition still exists causes the internal audible alarm and the external alarm device that is connected to the fault relay to turn OFF for a period of time as set by the **SILENCE** function (page 22). The front panel **SYSTEM FAULT** light remains ON, however, as a reminder that a fault condition still exists. The alarm circuit will reactivate at the end of the silence period if the cause of the fault has not been corrected. The **SYSTEM FAULT** light will automatically turn OFF once the fault has been cleared.

### 3.5.3. Viewing the Fault Log

From the **Data Display** screen, use the **Keypad** buttons to place the arrow (>) on the display next to the **FAULTS** function. Then press **ENTER** to display the fault log.

```
#03 <0800> @
11/12/10 08:17
```

```
#04 <0000> @
11/12/10 08:30
```

The fault log shows the monitor's current fault status. If the fault is still present when the **FAULTS** function is selected, then the current cause of the fault is displayed along with the date and time it occurred. If the cause of the fault has been cleared, then the fault log will show <0000> along with the date and time the fault was cleared. Use the **keypad** buttons to scroll through the fault log. In the examples shown to the left, record #03 shows that a Zone Flow Fault (fault code <0800>) occurred on 11/12/10 at 08:17, while record #04 shows that the fault was cleared on 11/12/10 at 8:30.

```
FAULT CODE<1800>
12      ZONE FLOW
```

```
FAULT CODE<1800>
13      PURGE FLOW
```

The cause of the fault is identified by a numeric fault code. To convert the fault code into a text description of the fault, first press the **ENTER** button and then use the **Keypad** buttons to scroll through the display until the text description of the fault appears. If the fault code is a combination of two or more faults, then continue to use the **Keypad** buttons until all fault text descriptions have been displayed. For example, the fault code <1800> represents the combination of both a Zone Flow <0800> and a Purge Flow <1000> fault as shown to the left.

Note that the Fault Log can be cleared as described on page 25.

### 3.5.4. Fault Codes

**FAULT CODES ARE ADDITIVE.** For example: A fault code of <1800> indicates that both a Purge Flow Fault <1000> and a Zone Flow Fault <0800> have occurred.

Code	Name	Description
<0001>	Box Temperature Fault	Enclosure temperature is outside normal range (or IR detector has failed). Check that the monitor is not being subjected to extreme temperatures. Verify that the ventilation holes are not obstructed. Use the <b>DIAGNOS</b> function (page 26) to check the Box Temperature.
<0002>	Bench Temperature Fault	Optical bench is outside normal operating range (or IR detector has failed). Check that the monitor is not being subjected to extreme temperatures.
<0004>	Manifold Pressure Fault	The manifold pressure is outside normal operating range (or IR detector has failed). Enter the <b>DIAGNOS</b> function (page 26) and record ALL data. Call the factory with this information for further instructions.
<0010>	Loop Fault	The 4–20 mA current loop is open, or there is a high resistance in the circuit. Check the wiring to the load/monitoring circuit. If this feature is not being used, a 100 ohm resistor must be connected to the 4–20 mA connector (page 16).
<0100>	Zero Filter Fault	Indicates contamination in the purge air, or (if a charcoal filter is in use) the filter may need to be changed. Refer to page 7.
<0200>	Gain Set Fault	The digipot autotune sequence has failed. This fault will only occur on first boot up or after a firmware upgrade. Call the factory for further instructions.
<0400>	A/D Fault	A fault has occurred in the analog-to-digital circuitry. Contact the factory with this information for further instructions.
<0800>	Zone Flow Fault	Check for: A kink in the gas-sample line or exhaust line; a blocked external termination filter; a blocked internal hydrophobic filter (page 11); a failed pump.
<1000>	Purge Flow Fault	Check for: A kink in the purge line; a blocked external termination filter; a blocked internal hydrophobic filter (page 11); a failed pump. Once the blockage has been cleared, the monitor will return to normal operation after the monitor completes a purge cycle.
<4000>	Zero Fault	The IR detector's output voltage is out of tolerance. Enter the <b>DIAGNOS</b> function (page 26) and record ALL data. Call the factory with this information for further instructions.
<8000>	Clipping Fault	The detector voltage may be out of tolerance. Use the <b>DIAGNOS</b> function (page 26) to check the IR detector voltage. Call the factory with this information for further instructions.

### 3.6. Clearing the Stored PPM Log, Alarm and Fault Data

Up to 200 gas measurements, and 30 alarm and fault events are stored by the monitor.

To clear stored data, first display the data to be cleared by using the **PPM LOG**, **ALARMS** or **FAULTS** function (page 22). Next, press the **Right Arrow Keypad** and **ENTER** buttons at the same time. A single, long tone should be heard when the data has been successfully cleared.

### 3.7. Reset to Factory Default Settings



**IMPORTANT!** Performing this function will delete all program parameters, alarms, faults, and ppm log files.

With AC power removed from the monitor, press and hold down the Factory Default Switch (pages 10 and 11). Apply AC power and listen for a beep and then a long tone. Release switch. At this time the monitor will purge the IR bench and auto set the IR detector voltage to its baseline 0 ppm value.

After warming up, reprogram the SZ monitor to the desired settings as needed.

### 3.8. The P-CHK Function

#### 3.8.1. Overview

The **P-CHK** function (Pressure Check Function) (page 22) is useful to a service technician for troubleshooting a flow fault problem. The monitor will trigger a flow fault if the pressure drop from ambient is less than 0.02 psi during a purge cycle, and 0.06 psi during a measurement cycle.

#### 3.8.2. Keypad Functions

From the **Data Display** screen, use the **Keypad** buttons to place the arrow (>) on the display next to the **P-CHK** function. Then press **ENTER** to display the **Pressure** screen.

The **Left Arrow Keypad** button toggles the purge valve open and closed. Note that an asterisk (\*) appears when the purge valve is open (purging).

The **Down Arrow Keypad** button toggles the pump ON and OFF.

Pressing the **ENTER** button stores the current manifold pressure shown on the left to the ambient pressure shown on the right (must be done with the pump OFF).

#### 3.8.3. Screen Display

14.72 * AMB14.81	Manifold Pressure * Stored Ambient Pressure
0.09dif <0000>	Pressure Difference Fault Code

**Manifold Pressure** – Current manifold pressure in psia.

**Stored Ambient Pressure** – Stored ambient pressure in psia.

**Pressure Difference** – The difference between the current manifold pressure and the stored ambient pressure.

**Fault Code** – Current fault code (page 24).

**Purge Valve Asterisk (\*)** – When viewing the **Pressure** screen, the purge valve can be opened and closed by pressing the **Left Arrow Keypad** button. An asterisk appears on the display when the purge valve is *open*.

### 3.9. The DIAGNOS Function

#### 3.9.1. Overview

The **DIAGNOS** function displays sensor data and status information useful to a service technician for troubleshooting various fault conditions. Explanations of the data shown in these screens are given below.

#### 3.9.2. Keypad Functions

From the **Data Display** screen, use the **Keypad** buttons to place the arrow (>) on the display next to the **DIAGNOS** function. Then press **ENTER** to display the first of two **Diagnostic** screens.

Press the **Up Arrow Keypad** button to toggle between the **First** and **Second Diagnostic** screen.

#### 3.9.3. First Diagnostic Screen

4.26500v <0000> 24.5cD* 14.72psi	Bench Voltage                      Fault Code Detector Temperature °C * Manifold Pressure
0.00250n <0000> 29.5cB* 14.72psi	Noise                                      Fault Code Box Temperature °C                      * Manifold Pressure

In the first diagnostic screen, the user can toggle between displaying the Bench Voltage / Noise and Detector Temperature / Box Temperature by pressing the **Right Arrow Keypad** button.

**Bench Voltage** – This is the current peak-to-peak output of the IR detector. In the absence of gas this value can range from 3.90000V to 4.50000V.

**Noise** – The Noise value is a 16 point running average of the noise portion of the IR detector’s output. This reading is valuable mainly when refrigerant is NOT present.

**Detector Temperature** – This is the current detector temperature in °C.

**Box Temperature** – This is the current internal enclosure temperature in °C.

**Fault Code** – Current fault code. A value of <0000> indicates that no faults are being detected.

**Manifold Pressure** – Current manifold pressure in psia.

**Purge Valve Asterisk (\*)** – The purge valve can be opened and closed by pressing the **Left Arrow Keypad** button. An asterisk appears on the display when the purge valve is *open*.

#### 3.9.4. Second Diagnostic Screen

0.4ppm 0.00 0.00002au*4.260v	PPM Level                                      μMole/Liter Avg. Absorption Unit                      * Detector Voltage
---------------------------------	--

**PPM Level** – Parts Per Million Level is the current detected gas level, and is the volume concentration referenced to standard temperature and pressure.

**Average Absorption Unit** – This is the optical absorbency. In the absence of gas the absorbency is 0.00000 au. When sampling selected gas, its value varies proportionally with the concentration.

**μMoles/Liter** – This is the absolute concentration in micro-moles per liter of gas.

**Detector Voltage** – This is a running average of the IR detector’s bench voltage as displayed in the **First Diagnostic** screen.

**Purge Valve Asterisk (\*)** – When viewing the diagnostic screen, the purge valve can be opened and closed by pressing the **Left Arrow Keypad** button. An asterisk appears on the display when the purge valve is *open*.

## 3.10. The Calibration Function

### 3.10.1. Overview

If greater than standard accuracy is desired, the factory's default calibration factor of 1.000 may be adjusted by performing the calibration procedure as described below, and then selecting the monitor's **CAL** function to enter the new calibration factor.



**IMPORTANT!** Changing the calibration factor will VOID the factory calibration. Typically, the monitor will remain within the factory-calibrated accuracy indefinitely and no calibration is required. Complex software algorithms adjust for temperature drift, IR source aging, and pressure changes in order to keep the unit within factory accuracy specifications.

### 3.10.2. Calibration Procedure

The calibration factor is determined by sampling a known dilution of gas. The sample must be prepared to less than half the desired accuracy and the concentration must be corrected for ambient temperature and pressure at the time of measurement.

Calibration is best performed at or near full scale, it can however, be done at any concentration and ideally in the range where maximum accuracy is desired down to, but not below, 100 ppm.

A cylinder of a certified calibration gas must be used to ensure sampling occurs at ambient conditions. A minimum sample size of 5 liters is required.

The SZ unit should be operating for at least one hour prior to performing a calibration.

Prepare the SZ for sampling by using the **CAL** function to set the calibration factor to 1.000. Also, use the **LOG INT** function to set the log interval to 1 minute.

With the SZ monitor operating normally, connect the gas-sample bag directly to the gas-inlet port and allow the monitor to sample the entire bag. When sampling is complete, view the logged ppm values using the **PPM LOG** function. If the bag was large enough for multiple samples, average the most stable ones. The new calibration factor is computed by dividing the known gas concentration value by the measured value. Typically this number will be between 0.95 and 1.05. Use the **CAL** function as described below to enter the new calculated calibration factor.

### 3.10.3. Adjusting Calibration Factor

From the **Data Display** screen, use the **Keypad** buttons to place the arrow (>) on the display next to the **CAL** function. Then press **ENTER** to display the **Calibration** screen.

```
R134A CALFACTOR
  1.000
```

With the **Calibration** screen displayed, use the **Keypad** buttons to enter the new calibration factor.

Press **ENTER** to save this value.

## SECTION 4. MAINTENANCE

### 4.1. Warnings and Cautions



**WARNING:** Shock Hazard! Always disconnect AC power before working inside the monitor.



**WARNING:** Before performing any operation or maintenance, verify connection of the AC power ground wire to the monitor's ground stud. Under no circumstances should this monitor be operated or serviced without a protective ground. Doing so poses a potential shock hazard and is also a violation of electrical safety standards applicable to this type of equipment.



**WARNING:** Electrical installation should be performed by a certified electrician and must comply with all applicable NEC/CEC and local electrical safety codes.



**CAUTION:** When working inside the monitor, be very careful not to dislodge any electrical wiring or pneumatic tubing. The SZ monitor contains sensitive electronic components that can be easily damaged. Be careful not to touch or disturb any of these components.

### 4.2. Charcoal Filter (Halogen Gas Monitor Only)

During normal operation, the Single Zone monitor performs a purge cycle during which fresh air is drawn in from the purge line to flush internal components of any residual refrigerants. Purge lines should draw in fresh outside air to perform the purge function. When access to outdoor air is impractical, purge lines may begin indoors, however a charcoal filter must be used on the purge line to ensure that no contaminated air is drawn into the system during purge cycles. The charcoal filter (which is mounted outside of the enclosure using the included bracket) removes refrigerant gas from the purge-air stream during the internal purging process.



*External Filter Includes  
Mounting Bracket*

Use upgrade kit 3015-5716 to convert an SZ with internally mounted filter to an SZ with an external filter.

Replace the charcoal filter (P/N 3015-3125) about every 6 months, when a zero filter fault occurs (fault code <0100>), or after the monitor itself has been exposed to unusually high levels of refrigerant gas, such as after an evacuation alarm.

### 4.3. Hydrophobic Filters

Hydrophobic Filters (see Figure 2-5 on page 11 and Figure 2-6 on page 12) located in both the gas-sample and purge lines prevent water from entering the IR detector. A zone flow fault will occur (fault code <0800>) if the gas-sample filter becomes blocked, while a purge flow fault will occur (fault code <1000>) if the purge filter becomes blocked. Replace the appropriate filter as required (P/N 0007-1650).

### 4.4. Servicing Air Lines and Termination Filters

The gas-sample line and the optional purge and exhaust lines should be periodically checked for obvious signs of kinks, damage, and contamination. Replace the tubing as required.

The gas-sample line and purge-line termination filters prevent dust and dirt from entering the monitor. Both of these filters should be periodically checked and replaced when there are obvious signs of contamination. A zone flow fault will occur (fault code <0800>) if the gas-sample line filter becomes blocked, while a purge flow fault will occur (fault code <1000>) if the purge-line filter becomes blocked. To service the filter, simply remove it from the line and replace it with a new one (P/N 3015-3420).

## 4.5. Fuses

The SZ monitor is protected from electrical damage by two, 1 A, 250 V, type “F” fuses (page 11). Carefully remove the fuses from their fuse clips and visually inspect each fuse for damage. Replace the fuses as required (P/N 0004-2620).

## 4.6. Sample Pump

The Sample Pump (page 11) draws the gas sample into the monitor, through the IR detector, and discharges the sample out the monitor’s exhaust port. When replacing the pump, remove its inlet and outlet tubing, disconnect the AC power wires from the pump itself, and remove pump from monitor. Install a new sample pump (P/N 3015-5176).

## 4.7. End-of-Line Water Stop (Optional)

The end-of-line water stops (P/N 3015-5512) prevent contaminants and moisture from entering the monitor. This filter should be checked regularly and replaced when signs of contamination are obvious.

## 4.8. Water Trap (Optional)

The water trap removes moisture that enters tubing before allowing it to enter the internal components of the SZ unit. The water trap should be emptied often as condensate accumulates. The water trap filter should be periodically checked and replaced when there are obvious signs of contamination.

## 4.9. Clock Battery

The Clock Battery (page 11) maintains the correct date and time when AC power is not applied to the monitor. Replace this battery about every 5 years (P/N 0204-0020).

## 4.10. Replacement Parts and Optional Accessories

REPLACEMENT PARTS		P/N	OPTIONAL ACCESSORIES		P/N	
<b>General</b>		<b>P/N</b>	<b>General</b>		<b>P/N</b>	
HGM-SZ complete assembly		3015-4200	Splitter Kit (2-way)		3015-5404	
AGM-SZ complete assembly		3015-4280	Splitter Kit (3-way)		3015-5405	
Panasonic CR2032, 3V Battery		0204-0020*	Variable Flow Regulator		3015-3849	
Fuse: 1.0 A, 250 V, Type "F"		0004-2620	Annual Maintenance Kit		3015-5529	
IR Bench Replacement Kit (HGM)		3015-4572	<b>Surge Protectors</b>		<b>P/N</b>	
IR Bench Replacement Kit (AGM)		3015-4492	120 V		3015-4121	
Display Board		3015-5520	230 V		3015-5530	
Universal Power Supply		3015-5523	4-20 mA		3015-4123	
Power Entry PC Board		3015-5524	<b>Water Traps and Options</b>		<b>P/N</b>	
Main PCB Board Replacement		3015-5478	Water Trap, Manual Drain		0007-1655	
Replacement Pump		3015-5176	Replacement Filter		0007-1656	
<b>Filters</b>		<b>P/N</b>	Mounting Bracket		0007-1657	
Charcoal, Zero Air (HGM Only)	If external, use...	3015-3125	End of Line Water Stop Filter		3015-5512	
	If internal, use...	3015-5716**	<b>Alarms</b>		<b>P/N</b>	
Hydrophobic		0007-1650	120 VAC		3015-3076	
Termination, Line End Assembly (gas sample line)		3015-3420	Audible/ Visual	9-28 VDC	Surface Mount	3015-5490
Line End (Filter Only)		3015-2906		Panel Mount		3015-5491
<b>Tubing</b>		<b>P/N</b>	Audio Alarm	9-28 VDC	Surface Mount	3015-5492
¼ in OD - (for HGM) by the foot		0304-2743			Panel Mount	
¼ in OD - (for AGM) by the foot		0304-2742	<b>Gases</b>		<b>P/N</b>	
			Gas Cylinder 1031 (100 PPM)	R-22	3015-3850	
				R-134a		3015-3851
				R-123		3015-3852
			Gas Verification Kit	R-22	3015-3430	
				R-134a		3015-3437
				R-123		3015-3438

\* See Warning below.

\*\* 3015-5716 is a conversion kit for older-style internal filters



**WARNING:** In compliance with agency approvals and safety regulations, the battery must be replaced with the specified Bacharach replacement part.

## 4.11. Service Centers

Replacement parts and service can be obtained by contacting one of the following Bacharach Service Centers.

### United States

Bacharach, Inc.  
621 Hunt Valley Circle  
New Kensington, PA 15068-7074  
Phone: 724-334-5000, 800-736-4666  
Fax: 724-334-5723  
Email: [help@MyBacharach.com](mailto:help@MyBacharach.com)

### Canada

Bacharach of Canada, Inc.  
20 Amber Street Unit #7  
Markham, Ontario L3R 5P4  
Canada  
Phone: 905-470-8985  
Fax: 905-470-8963  
Email: [support@BachCan.ca](mailto:support@BachCan.ca)

### Europe

Murco Limited – a Bacharach Company  
114a Georges Street Lower  
Dun Laoghaire  
Co. Dublin  
Ireland  
Phone: 353 1 284 6388  
Fax: 353 1 284 6389  
Email: [sales@murco.ie](mailto:sales@murco.ie)

## APPENDIX A. DATA TABLES

### A.1. Recommended Alarm Settings

Refrigerant	Alarm Setting (PPM)		
	Leak PPM	Spill PPM	Evacuate PPM
R11	100	300	500
R12	100	300	500
R22	100	300	500
R23	100	300	500
R32	100	300	500
R113	100	300	500
R114	100	300	500
R123	25	35	50
R124	100	300	500
R134A	100	300	500
R401A	100	300	500
R402A	100	300	500
R402B	100	300	500
R404A	100	300	500
R407A	100	300	500
R407C	100	300	500
R407F	100	300	500
R409A	100	300	500
R410A	100	300	500
R500	100	300	500
R502	100	300	500
R503	100	300	500
R507	100	300	500
R508B	100	300	500
H1301	100	300	500
R408A	100	300	500
FA188	100	300	500
R236FA	100	300	500
N1230	100	300	500
R227	100	300	500
HFP	100	300	500
FC72	100	300	500
R21	100	300	500
R125	100	300	500
H1211	100	300	500
H2402	100	300	500
N7100	75	200	300
N7200	25	50	100
N7300	10	20	50
N7600	3	5	8
R245FA	100	300	500
R422A	100	300	500
R422D	100	300	500
R427A	100	300	500
HFO01234YF	100	300	500
HFO1234ZE	100	300	500
R424A	100	300	500
R426A	100	300	500
Ammonia/NH3/R717	100	300	500

## A.2. Response Time/Flow Rate

Gas-Sample Line Feet (Meters)	Response Time Seconds (HGM)	Response Time Seconds (AGM)
0	0	0
100 (30.5)	20	40
200 (61)	40	60
300 (91.4)	56	90
400 (123)	80	120
500 (152.4)	105	180

Dependent on gas-sample line length; 0.25" OD x 0.17" ID tubing.

## APPENDIX B. AGENCY APPROVALS



### CE DECLARATION OF CONFORMITY

<b>The manufacturer of the products covered by this declaration:</b>	Bacharach, Inc. 621 Hunt Valley Circle New Kensington, PA 15068
<b>Year conformity is declared:</b>	2010 (EN 14624), 2008 (all others)
<b>Product(s):</b>	Refrigerant Monitors
<b>Model(s):</b>	HGM-SZ and HGM-MZ (Single and Multi Zone Refrigerant Monitors) (EN 14624 only) HGM-SZ, AGM-SZ, CO2-SZ, HGM-MZ, AGM-MZ, CO2-MZ and MZ-RD.

The undersigned hereby declares that the above referenced products are in conformity with the provisions of the following standard(s) and is in accordance with the following directive(s).

**Standard(s):**

EN 14624	Performance of mobile leak detectors and of room controllers of halogenated refrigerants
EN 61326-1:2006	Electrical equipment for measurement, control, and laboratory use—EMC requirements: Part 1 General Requirements
EN 61010-1:2001	Safety requirement for control, measurement, and laboratory equipment

**Directive(s):**

2004/108/EC	EMC Directive
2006/95/EC	Low Voltage Directive

**Signature:**  \_\_\_\_\_

**Name:** Doug Keeperts  
**Title:** VP of Product Development  
**Date:** 06 December 2010

The technical documentation file required by this directive is maintained at the corporate headquarters of Bacharach, Inc.

European Standard EN14624: 2005 testing with R-134a (Halogen Gas Monitor Only).

Min. Sensitivity Threshold	1 ppm
Max. Sensitivity Threshold (within 1 ppm ± 10% reading accuracy range)	1,000 ppm
Max. Sensitivity Threshold within Instrument Reading Range	10,000 ppm
Zeroing Time from 1,000 ppm*	<12 seconds
Zeroing Time from 10,000 ppm*	<25 seconds
Reaction Time for detection of minimum threshold*	≤12 seconds
Min. Sensitivity threshold once max. threshold has been measured	1 ppm
Repeatability at 500 ppm	± 1% of reading

\* Based on a minimum tubing length of one foot

# MET LABORATORIES, INC. CERTIFICATION RECORD



*The applicant named below has been authorized by MET Laboratories, Inc. to represent the product(s) listed in this record as "MET Certified" and to mark this/these product(s) according to the terms and conditions of the MET Mark Utilization Agreement, MET Listing Reports, and the applicable marking agreements. Only the product(s) bearing the MET Mark and under a follow-up service are considered to be included in the MET Certification program. This certification has been granted under a System 3 program as defined in ISO Guide 67.*

**FILE NUMBER:** E113096

**APPROVAL DATE:** November 30, 2010

**REVISED:** -

PRODUCT(S)	MODEL(S)	ELECTRICAL RATINGS
Refrigerant Monitors and Remote Display Monitors	HGMSZ, AGMSZ, CO2SZ, HGM-MZ, Emerson, RLM, CIR, AGM-MZ, CO2-MZ, MZ-RD	Models HGMSZ, AGMSZ, and CO2SZ: 100-240Vac, 15 Watts, 50/60Hz
		Models HGM-MZ, Emerson, RLM, CIR, AGM-MZ, CO2-MZ: 100-240Vac, 20 Watts, 50/60Hz
		Model MZ-RD: 100-240Vac, 20 Watts, 50/60 Hz

STANDARD NUMBER	STANDARD TITLE	EDITION
UL61010-1/CSA C22.2 No. 61010-1	Standard for Safety for Electrical Equipment for Measurement, Control and Laboratory Use: Part 1: General Requirements	Second

MET LABORATORIES, INC. requires that any and all changes proposed in the previously identified product(s), that affects the information contained in the above referenced listing report, must be submitted to MET for evaluation prior to implementation to assure continued MET Certification status.

The above identified product(s) has/have been submitted by the applicant:

**APPLICANT:**

Bacharach, Inc.  
621 Hunt Valley Circle  
New Kensington, PA 15068

The covered products shall be subjected to follow-up inspections to ensure that the Certified product(s) are identical to the representative product sample evaluated by MET LABORATORIES, INC. and that all manufacturer's responsibilities are being fulfilled as specified in the MANUFACTURING RESPONSIBILITY section of the Certification report.

Rick Cooper  
Director of Laboratory Operations,  
Safety Laboratory



*MET Laboratories, Inc. is accredited by OSHA and the Standards Council of Canada.  
The Nation's First Nationally Recognized Testing Laboratory*





Headquarters:

621 Hunt Valley Circle, New Kensington, PA 15068-7074

Toll Free: 800-736-4666 • Tel: +1-724-334-5000 • FAX: +1-724-334-5001

Website: [www.MyBacharach.com](http://www.MyBacharach.com) • E-mail: [help@MyBacharach.com](mailto:help@MyBacharach.com)



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1.888.610.7664

 [www.calcert.com](http://www.calcert.com)

[sales@calcert.com](mailto:sales@calcert.com)