MGS SERIES

Multi-Channel Input
Single- and Dual-Alarm
Controllers

Installation and Operation Manual
Instruction 6709-9000
Revision 1 – October 25, 2012

Product Leadership • Training • Service • Reliability

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NOTICES

TECHNICIAN USE ONLY

THIS UNIT MUST BE INSTALLED BY A SUITABLY QUALIFIED TECHNICIAN WHO WILL INSTALL THIS UNIT IN ACCORDANCE WITH THESE INSTRUCTIONS AND THE STANDARDS IN THEIR PARTICULAR INDUSTRY/COUNTRY. OPERATORS OF THE UNIT SHOULD BE AWARE OF THE REGULATIONS AND STANDARDS IN THEIR INDUSTRY/COUNTRY FOR THE OPERATION OF THIS UNIT. THESE NOTES ARE ONLY INTENDED AS A GUIDE AND THE MANUFACTURER BEARS NO RESPONSIBILITY FOR THE INSTALLATION OR OPERATION OF THIS UNIT.

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HAZARDOUS AREA 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.

Table of Contents

Section 1. Introduction

1.1. Overview

The MGS Series controllers provide local alarm status indications (via multi-colored, per-channel LEDs) as well as single-level or dual-level digital (relay) alarm outputs based on 1, 2, 4, or 6 input signals and 1 or 2 user-definable set-points.

1.2. 2-Channel and 6-Channel Models

MGS Controllers support multiple input sensors/transmitters (1, 2, 4, or 6 channels) based on the model of the controller. Inputs are standard 4-20 mA signals from MGS-series sensors or any standard, linear, 4-20 mA transmitter.

NOTE: The smaller MGS Controller supports up to two input channels (see Figure 1). The larger controller supports up to six channels (see Figure 2). The number of alarm LEDs on your controller will vary based on the flavor of device that is ordered (see Figure 3).

IMPORTANT: If you are NOT using the maximum number of available channels (2 for the smaller controller, and 6 for the larger controller), you must connect a 3300 Ω resistor across pins 1 and 2 for each unused input channel.

1.3. Alarming

Regardless of the number of channels supported, each controller contains either 1 or 2 adjustable potentiometers (pots) for setting the alarm value(s). Single-level alarm controllers contain one pot which sets the controller's alarm threshold. Dual-level alarm controllers contain two pots which are used to set the low-level and high-level alarm thresholds.

As an individual channel's input signal exceed the controller's alarm threshold (set by the programmable pot(s)), the corresponding channel's alarm LED is illuminated, allowing a technician to visually inspect the controller for any alarm conditions on a channel-by-channel basis. Refer to Figure 3.

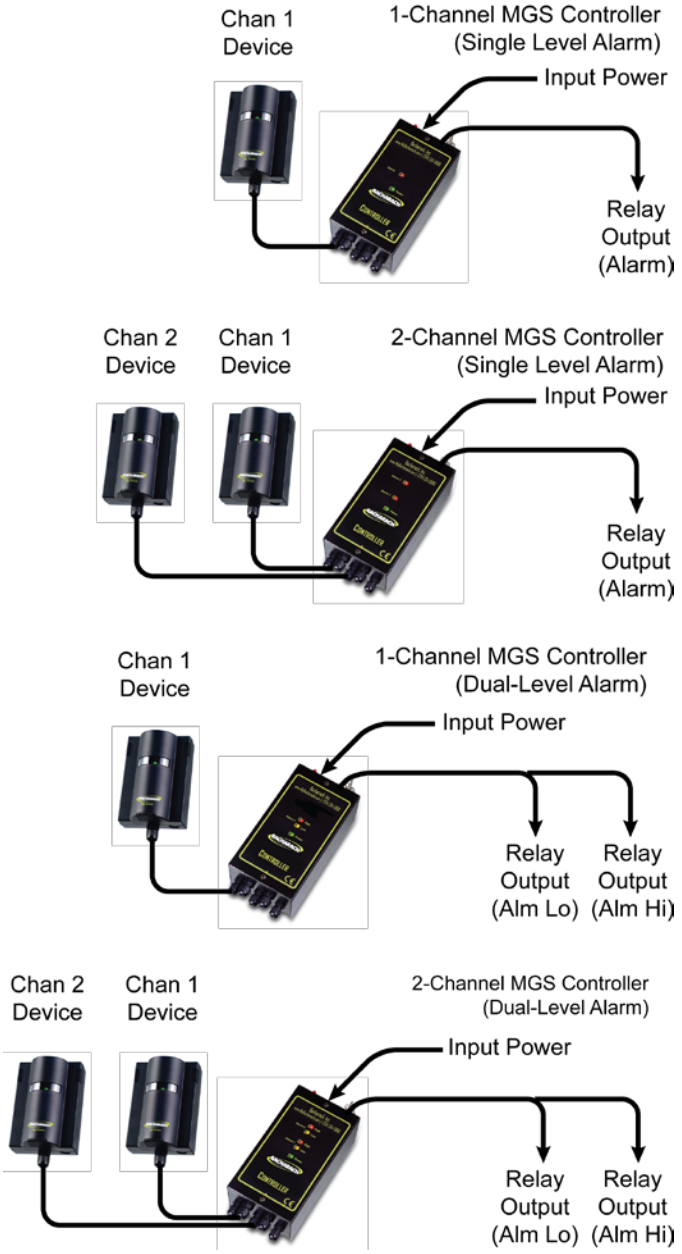


Figure 1. Sample Configurations (1,2-Channel)

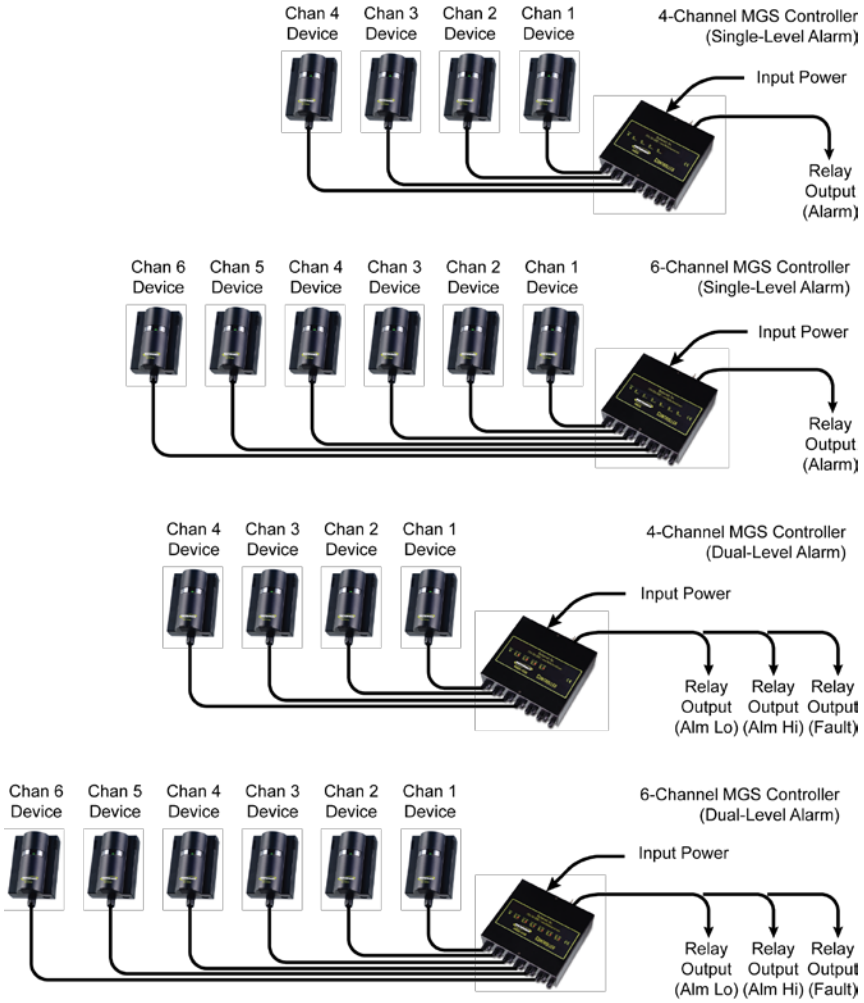


Figure 2. Sample Configurations (4,6-Channel)

MGS Controllers have either one or two relay outputs: one for single-level alarm controllers ("Alarm"), and 2 for dual-level alarm controllers ("Alarm High" and "Alarm Low"). Unlike the alarm LEDs that provide a channel-by-channel alarm status of each incoming transmitter's signal, the relay output "trips" or "energizes" if *any* of the inputs exceed the alarm threshold set by the pot (that is, if *any* of the alarm LEDs is energized). Alarm relays can be used to activate warning lights, sirens, ventilation fans, etc.

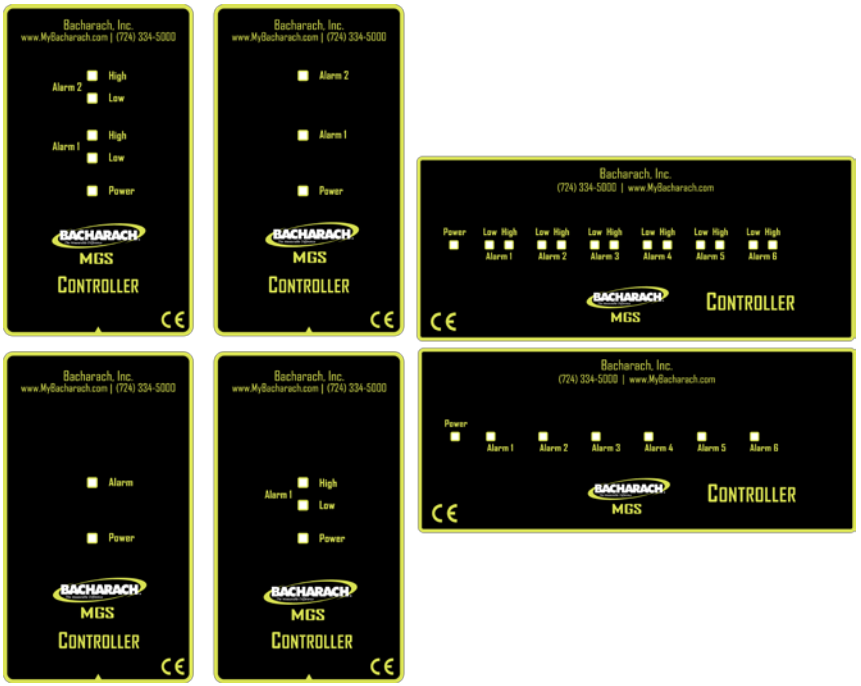


Figure 3. Sample Front Panels Showing Status LEDs

For dual-alarm configurations, the Alarm Low relay output "trips" or "energizes" if *any* of the inputs exceed the alarm threshold set by the low alarm pot. Similarly, the Alarm High relay output "trips" or "energizes" if *any* of the inputs exceed the alarm threshold set by the high alarm pot.

All controllers have a green power LED that is on when the unit has power. The 4- and 6-channel 2-level units have a fault relay which "trips" or "energizes" if the controller experiences a fault condition. Like the alarm relays, the fault relay can be use to activate warning lights, sirens, ventilation fans, etc.

1.4. Components

The following is a summary of the MGS Controller's hardware components. Note that features vary based on model and features (e.g., 1-2 channel units vs. 4-6 channel units, single-level alarms vs. dual-level alarms, etc.).

Components	Descriptions			
Power input	Provides power to the MGS Controller			
Power LED	Power status indicator			
Channels (max)	1-2 Channel Units		4-6 Channel Units	
Sensor input(s) max	2 max		6 max	
Alarm levels	Single	Dual	Single	Dual
Set point POT(s)	1	2	1	2
Alarm relay output(s)	1	2	1	2
Alarm LED(s) (max)	2	4	6	12
Fault relay output	N/A	N/A	N/A	1

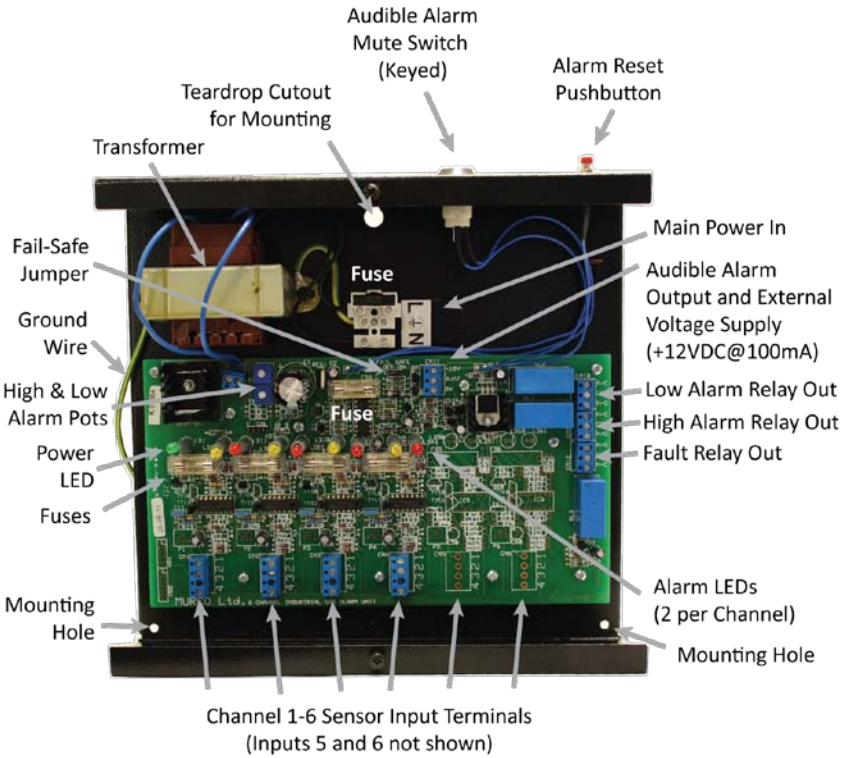


Figure 4. 6-Channel, Dual-Alarm MGS Controller

NOTE: Figure 4 shows components associated with a dual-alarm configuration. For single-alarm configurations, the Low Alarm LEDs are not present. JP1 on the single-alarm configuration is the delay jumper.

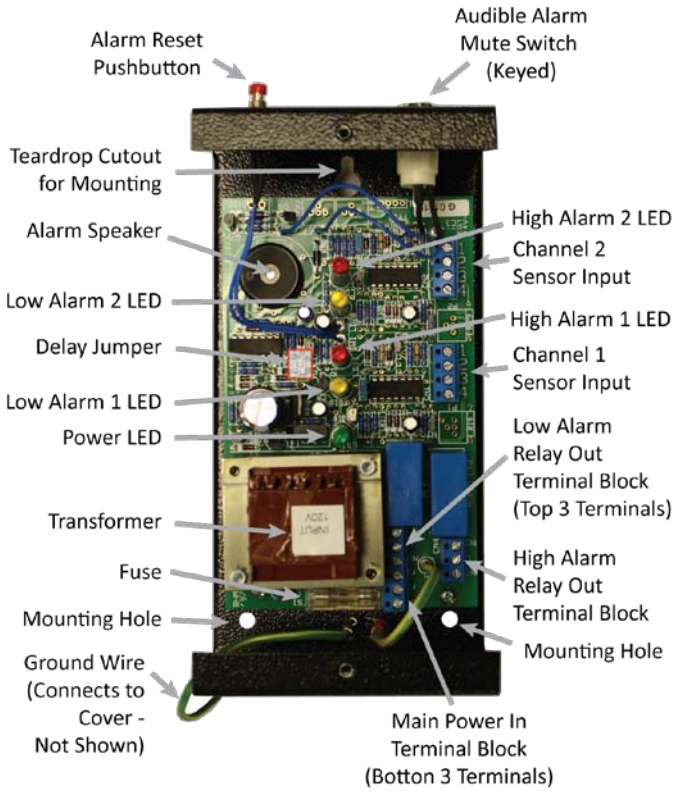


Figure 5. 2-Channel, Dual-Alarm MGS Controller

NOTE: Figure 5 shows components associated with a dual-alarm configuration. For single-alarm configurations, the Low Alarm LEDs are not present, and the Delay Jumper will be present. The Delay Jumper is not available on dual-alarm configurations, though its location is highlighted above.

1.5. Specifications

Specification	1-2 Channel	4-6 Channel
Product Type	1-2 channel alarm controller	4-6 channel alarm controller
Max Channels	2	6
Inputs	4-20 mA	4-20 mA
Display	LED alarm indicators	LED alarm indicators
Ambient Temperature Range	-20 to +50 degrees C	-20 to +50 degrees C
Power Supply	<20W Specify at time of order: • 110 VAC (60 Hz) • 240 VAC (50 Hz) • 12 VDC	<20W Specify at time of order: • 110 VAC (60 Hz) • 240 VAC (50 Hz) • 12 VDC
Audible Alarm	Integrated	12 VDC
Alarm Set points	User selectable. Common to all channels. Alarm level set point is based on 4-20 mA input signal.	User selectable. Common to all channels. Alarm level set point is based on 4-20 mA input signal.
Alarm Relays	One 10-A 30 VDC or 250 VAC resistive Form C relay. Two for dual-alarm configurations. Common low alarm and high alarm across channels.	One 10-A 30 VDC or 250 VAC resistive Form C relay. Two for dual-alarm configurations. Common low alarm and high alarm across channels. Common fault relay on dual-level alarm configurations.
Housing	NEMA 1 wall mount	NEMA 1 wall mount
Approvals	UL/CSA/IEC/EN 61010 (Pending)	UL/CSA/IEC/EN 61010

Section 2. Mounting Instructions

2.1. Installation Warnings

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

CAUTION: The MGS Controller contains sensitive electronic components that can be easily damaged. Do not touch nor disturb any of these components.

NOTE: The mounting location of the MGS Controller should allow it to be easily accessible for visual monitoring and servicing.

NOTE: The MGS Controller must be connected by a marked, suitably located and easily reached switch or circuit-breaker as means of disconnection.

NOTE: Connect power and signaling terminals using wiring that complies with local electrical codes or regulations for the intended application.

CAUTION: The MGS controller contains sensitive electronic components that can be easily damaged. Do not touch nor disturb any of these components

2.2. Location Recommendations

NOTE: The MGS Controller should be installed plumb and level and securely fastened to a rigid mounting surface.

At a minimum, the MGS Controller must be located within the appropriate wire lengths from the sensors being monitored. In addition, consider environmental conditions and accessibility. Refer to Section 3 for more information on sensor wiring lengths.

Sensors must be located within the appropriate wire lengths from the central control unit (if used).

In all cases the sensor supplied is designed for maximum sensitivity to a particular gas. However, in certain circumstances false alarms may be caused by the occasional presence of sufficiently high concentrations of other gaseous impurities. Examples of situations where such abnormalities may arise include the following:

- Plant room maintenance activity involving solvent or paint fumes or refrigerant leaks.
- Accidental gas migration in fruit ripening/storage facilities (bananas - ethylene, apples - carbon dioxide).
- Heavy localized exhaust fumes (carbon monoxide, dioxide, propane) from engine-driven forklifts in confined spaces or close to sensors.

Bacharach recommends setting the alarm delay to minimize false alarms. See Section 4.7 for more information.

2.3. Mounting Dimensions

The controllers contain a single teardrop cutout at the top center of the enclosure. Two smaller holes are located in the bottom corners of the enclosure. Refer to the mounting dimension figures that follow.

Each enclosure base provides a ½" standoff from the mounting surface to allow use of a power line knockout in back of enclosure base. Power wiring may also enter the enclosure via one of the input holes on the bottom of the enclosure.

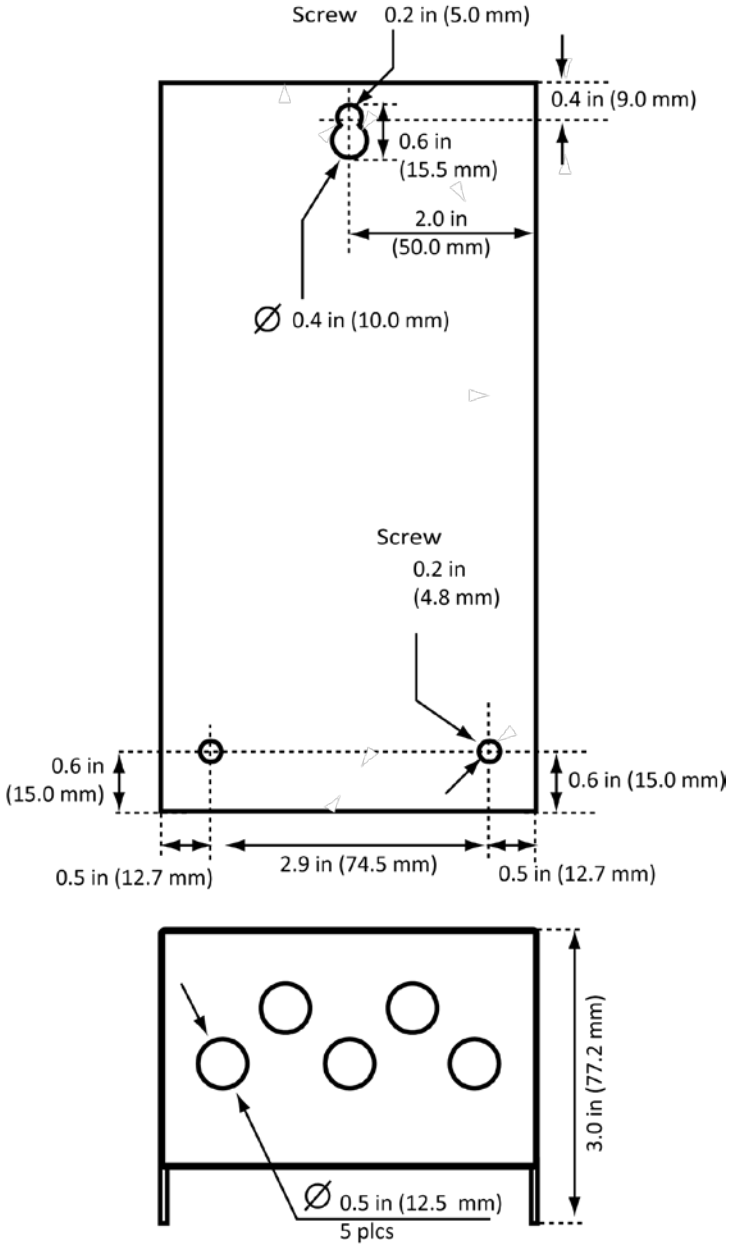


Figure 6. Mounting Dimensions (2-Channel Unit)

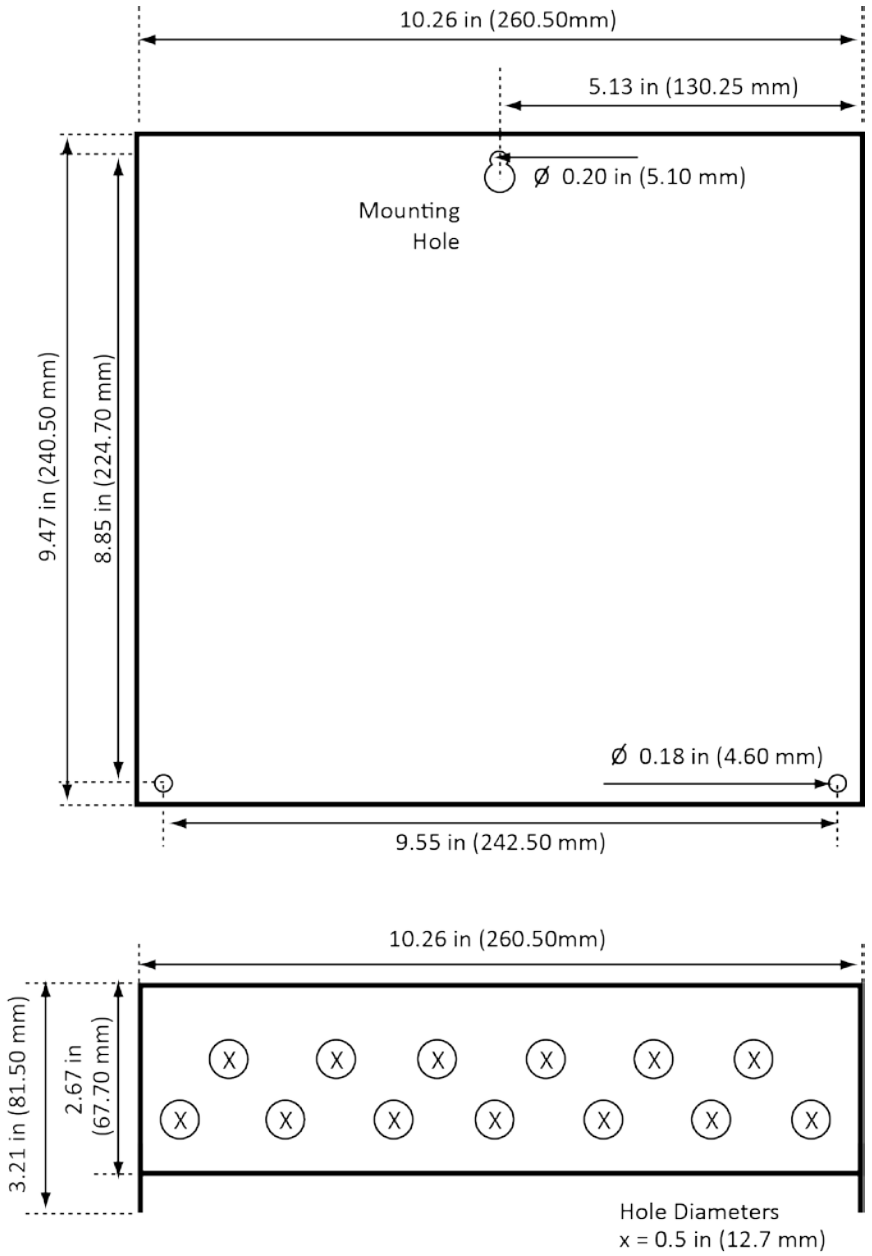


Figure 7. Mounting Dimensions (6-Channel Unit)

Section 3. Wiring

3.1. 1- and 2-Channel Units (Single- and Dual-Alarm)

Wiring to Sensors/Transmitters

Controller Terminal Block	Controller Pin Number	Signal	Sensor/ Transmitter
CN1	1	+Ve supply	+V in
	2	4-20 mA signal	4-20 mA out
	4	-Ve input	GND in
CN2	1	+Ve supply	+V in
	2	4-20 mA signal	4-20 mA out
	4	-Ve input	GND in

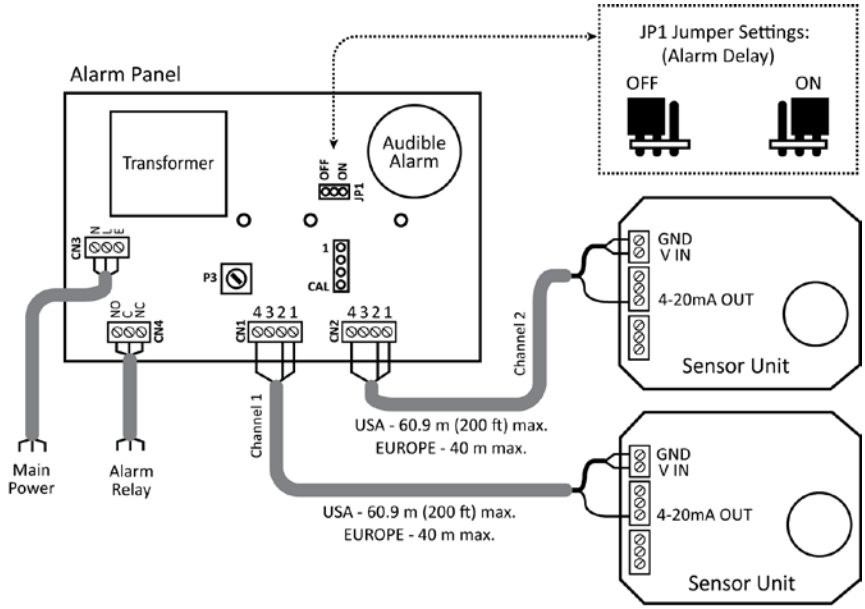


Figure 8. Wiring (2-Channel, Single-Alarm Unit Shown)

NOTE: The potential from -Ve to +Ve is approximately 15 VDC.

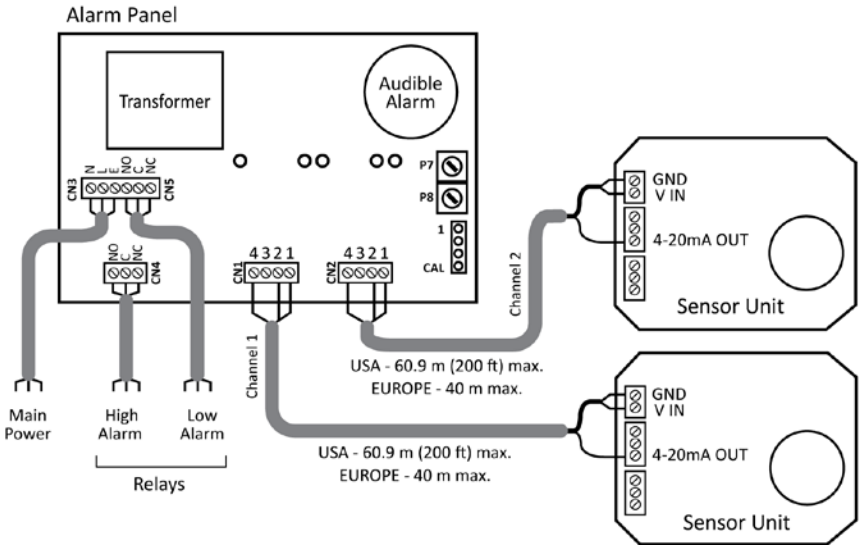


Figure 9. Wiring (2-Channel, Dual-Alarm Unit Shown)

3.2. 4- and 6-Channel Units (Single- and Dual-Alarm)

Wiring to Sensors

Controller Terminal Block	Controller Pin Number	Signal	Sensor/ Transmitter
CN1 – CN6	1	+Ve supply	+V in
	2	4-20 mA signal	4-20 mA out
	4	-Ve input	GND in

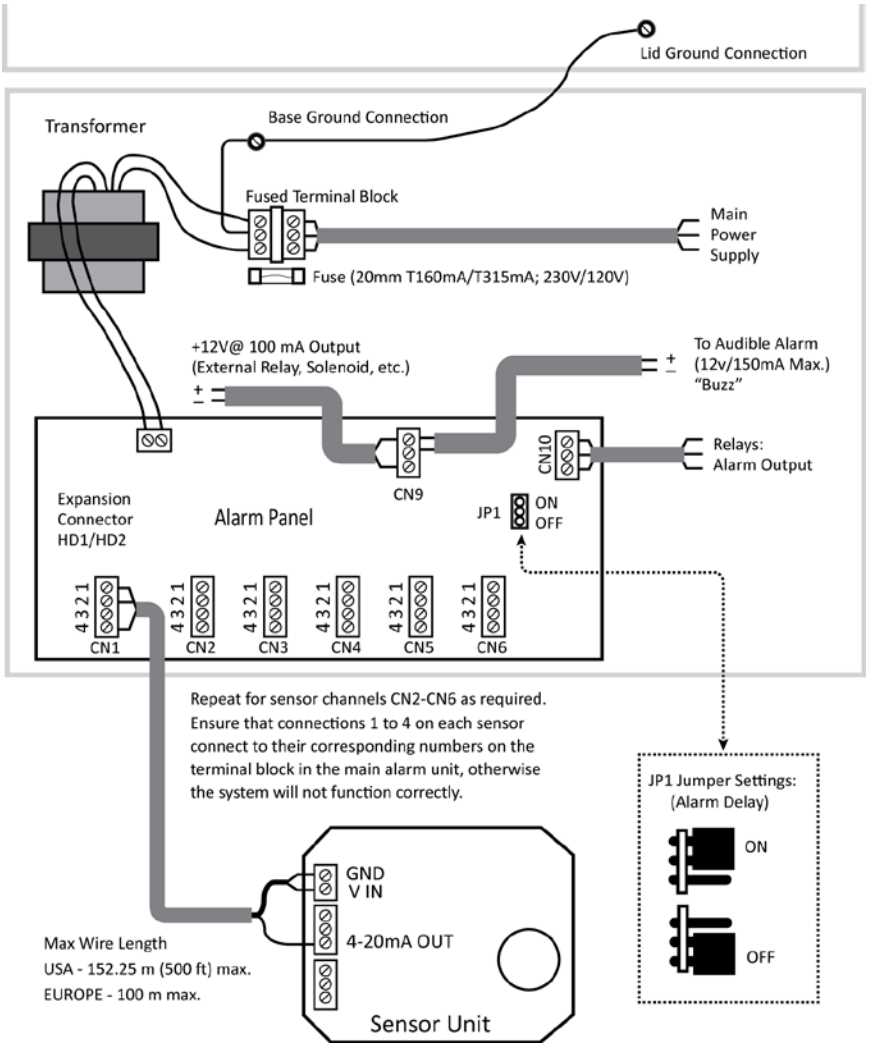


Figure 10. Wiring (6-Channel, Single-Alarm Unit Shown)

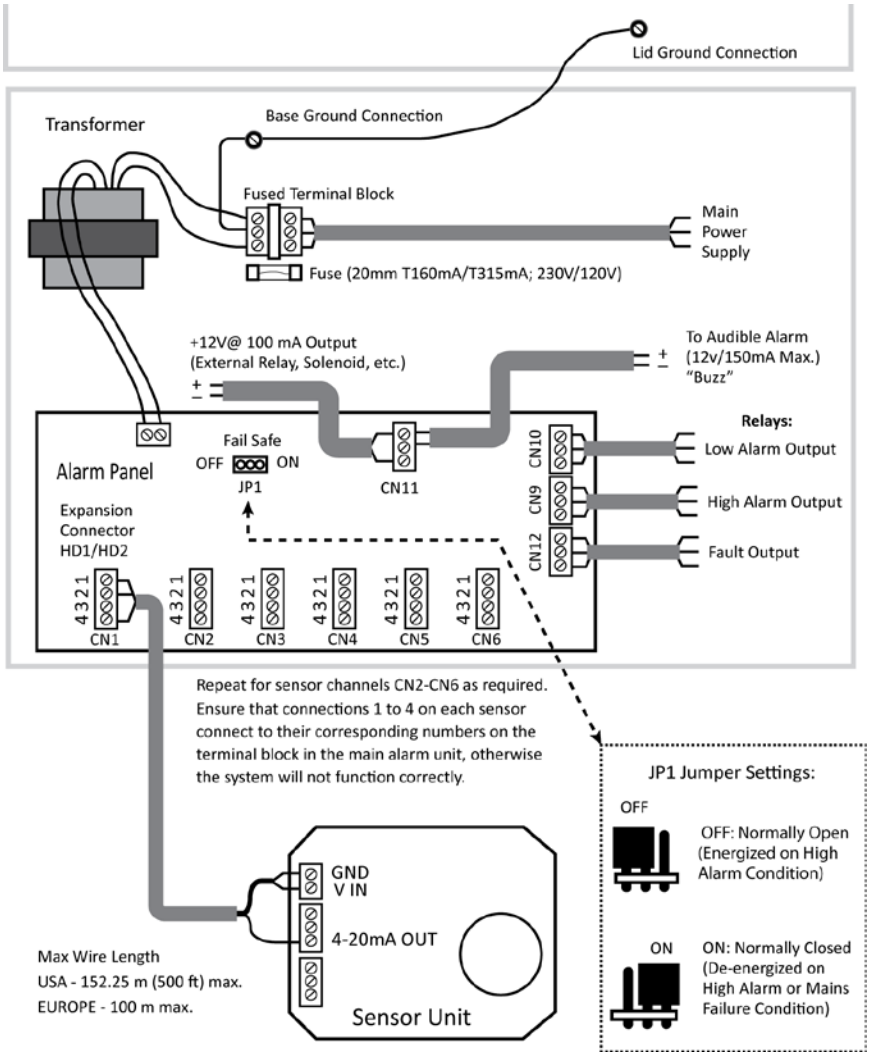
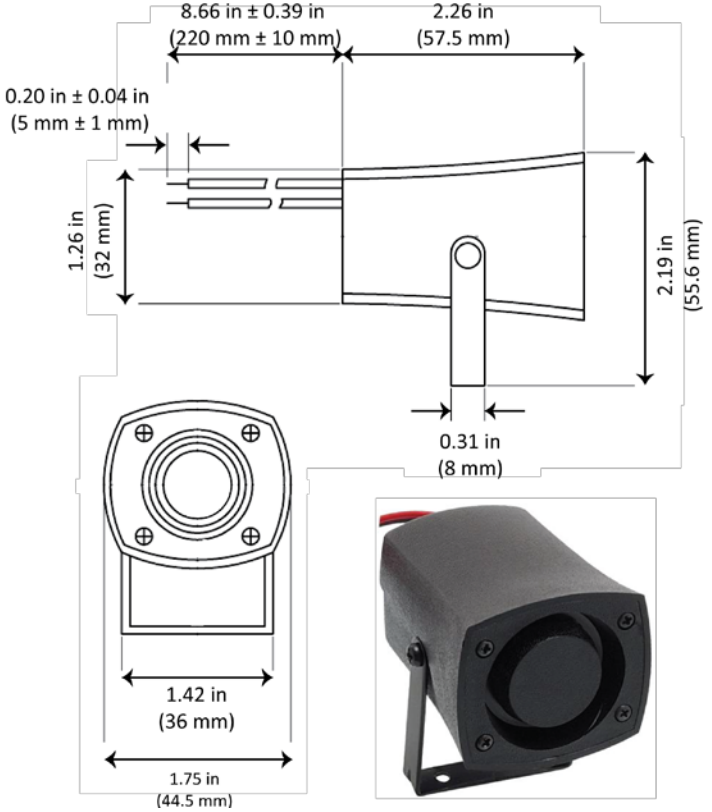


Figure 11. Wiring (6-Channel, Dual-Alarm Unit Shown)

NOTE: An external horn is provided with 4- and 6-channel units. Refer to the next section for details.

3.3. External Horn (for Audible Alarms)



Horn Specifications (Test Conditions at 25˚C)

Specification	Description
Housing	Black ABS
Power Rating	10 W (RMS), 15 W (peak)
Voltage	12 VDC (Rated), 6-16 VDC range
Current	200 mA max (@ 12 VDC)
Sound Pressure Level	Minimum 100 dB at 1 meter (@ 12 VDC)
Connections	Red: +12 V, Black: Ground
Weight	2.3 ± 0.2 oz (65 ± 5 g)

Section 4. Configuration and Operation

4.1. Overview

The following topics are explained in this section:

- Changing alarm limits (pots and CAL header)
- Setting output delays (jumper)
- Fail-safe operation (jumper)
- Muting the audible alarm (key)
- Resetting high alarms (button)

4.2. Introduction to Changing Alarm Level(s)

Items needed:

- voltmeter
- small flat-blade screwdriver

To monitor and adjust the alarm set point level(s), connect the voltmeter to the appropriate pins of the CAL header. Then adjust the appropriate potentiometer (POT) using the flat-blade screwdriver until the desired alarm level is displayed on the voltmeter.

The pins of the CAL header are used to monitor the alarm levels of the controller. See table below.

CAL Pins

CAL Pin	Description
1	High Level Alarm Set point
2	Low Level Alarm Set point
3	Not Used
4	Zero volts (-Ve)

NOTE: Locations of CAL headers and POTs vary based on your controller's model. Use the POT table (below), board layout diagrams (that follow), and PCB silk-screens to determine component locations and how to adjust your controller's alarm limit(s).

POTs Used to Set Alarm Limits

Max # Input Chans	Number of Alarms	Alarm Type	P3	P7	P8
2	1	High	x		
	2	Low			x
		High		x	
6	1	High		x	
	2	Low			x
		High		x	

The alarm range is set over the voltage range of 0.4 V to 2.0 V. A voltage of 0.4 V equals 0 ppm and 2.0 V equals full scale such as 1000 ppm.

Calculation Example:

Desired Alarm Set Point = 500 ppm. Full scale range = 1000 ppm.

$$\mathrm{V} = 0.4\mathrm{v} + \left[\frac{\text{Alarm Voltage Range}}{\text{Full Scale PPM Range}}\right] \times \text{Desired Alarm SP}$$

$$\mathrm{V} = 0.4\mathrm{v} + \left[\frac{2.0\mathrm{v} - 0.4\ \mathrm{v}}{1000\ \text{ppm}}\right] \times 500\ \text{ppm}$$

$$\mathrm{V} = 1.2\ \mathrm{V}\ (\text{for a } 500\ \text{ppm alarm level})$$

4.3. Changing Alarm Level for 2-Channel, 1-Alarm Units

Step	Instructions
1	Connect voltmeter leads to pin 4 (-Ve) and pin 1 (+Ve) on the CAL header. 
2	Using the flat-blade screwdriver, adjust potentiometer P3 until the reading on the DC voltmeter corresponds to the desired input alarm level. **P3** 

NOTE: When adjusting the alarm level, a 0.4 to 2.0 VDC reading on the voltmeter corresponds to a 4 to 20 mA value for the input alarm threshold.

NOTE: Both channels have the same alarm threshold.

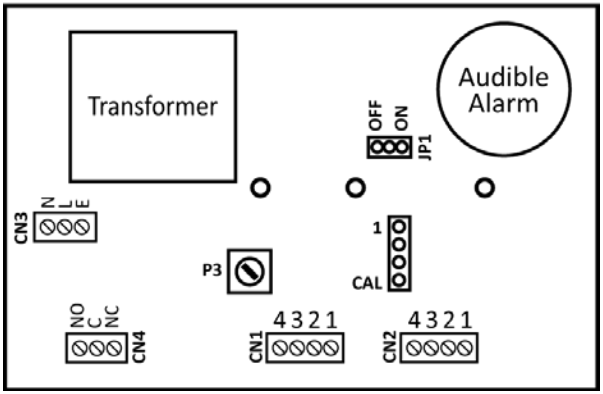


Figure 12. Hardware PCB Layout (2 Channel, 1 Alarm)

4.4. Changing Alarm Level for 2-Channel, 2-Alarm Units

Step	Instructions
1	Connect voltmeter leads to pin 4 (-Ve) and pin 1 (+Ve) on the CAL header. 
2	Using the flat-blade screwdriver, adjust potentiometer P7 until the reading on the DC voltmeter corresponds to the desired input high alarm level. **P7** 
3	Connect voltmeter leads to pin 4 (-Ve) and pin 2 (+Ve) on the CAL header. 
4	Using the flat-blade screwdriver, adjust potentiometer P8 until the reading on the DC voltmeter corresponds to the desired input low alarm level. **P8** 

NOTE: When adjusting the alarm level, a 0.4 to 2.0 VDC reading on the voltmeter corresponds to a 4 to 20 mA value for the input alarm threshold.

NOTE: Both channels have the same alarm thresholds.

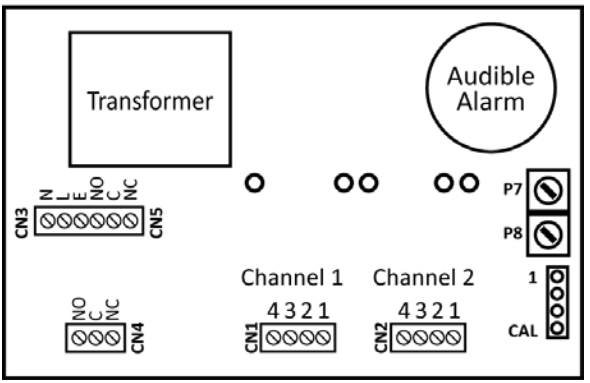


Figure 13. Hardware PCB Layout (2 Channel, 2 Alarm)

4.5. Changing Alarm Level for 6-Channel, 1-Alarm Units

Step	Instructions
1	Connect voltmeter leads to pin 4 (-Ve) and pin 1 (+Ve) on the CAL header. 
2	Using the flat-blade screwdriver, adjust potentiometer P7 until the reading on the DC voltmeter corresponds to the desired input alarm level. **P7** 

NOTE: When adjusting the alarm level, a 0.4 to 2.0 VDC reading on the voltmeter corresponds to a 4 to 20 mA value for the input alarm threshold.

NOTE: All channels have the same alarm threshold.

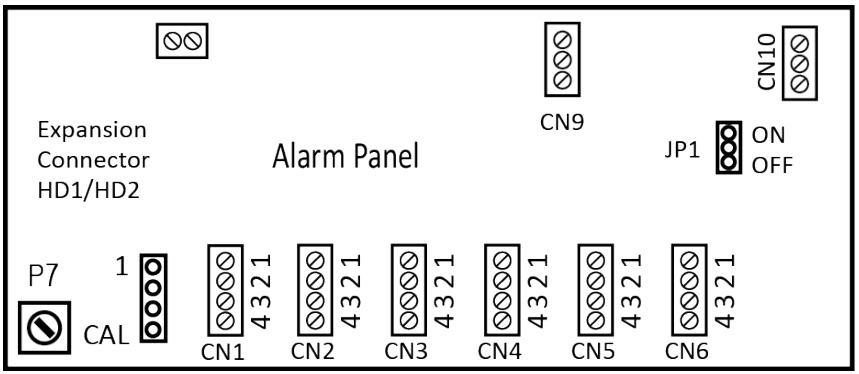


Figure 14. Hardware PCB Layout (6 Channel, 1 Alarm)

4.6. Changing Alarm Level for 6-Channel, 2-Alarm Units

Step	Instructions
1	Connect voltmeter leads to pin 4 (-Ve) and pin 1 (+Ve) on the CAL header. 
2	Using the flat-blade screwdriver, adjust potentiometer P7 until the reading on the DC voltmeter corresponds to the desired input high alarm level. **P7** 
3	Connect voltmeter leads to pin 4 (-Ve) and pin 2 (+Ve) on the CAL header. 
4	Using the flat-blade screwdriver, adjust potentiometer P8 until the reading on the DC voltmeter corresponds to the desired input low alarm level. **P8** 

NOTE: When adjusting the alarm level, a 0.4 to 2.0 VDC reading on the voltmeter corresponds to a 4 to 20 mA value for the input alarm threshold.

NOTE: All channels have the same alarm thresholds.

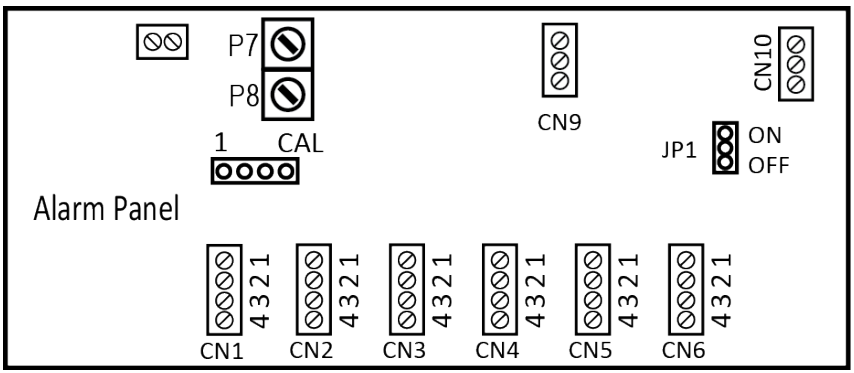


Figure 15. Hardware PCB Layout (6 Channel, 2 Alarm)

4.7. Output Delays

Controllers with only single-level alarm capabilities use jumper JP1 to enable/disable a 3-minute output delay for the input level alarm. This delay provides a hysteresis preventing nuisance toggling of the alarm. The delay is enabled when the jumper is in the ON position, and disabled when in the OFF position. The delay for single-level systems is approximately 3 minutes. Refer to Figure 12 for locations of the JP1 jumper and Figure 16 for a graphic representation of the alarm responses when the delay is enabled and disable (via JP1).

Output Delay Jumper JP1 Position	Description
OFF 	Output delays are off.
ON 	Wait after input exceeds alarm level before triggering alarm relay.

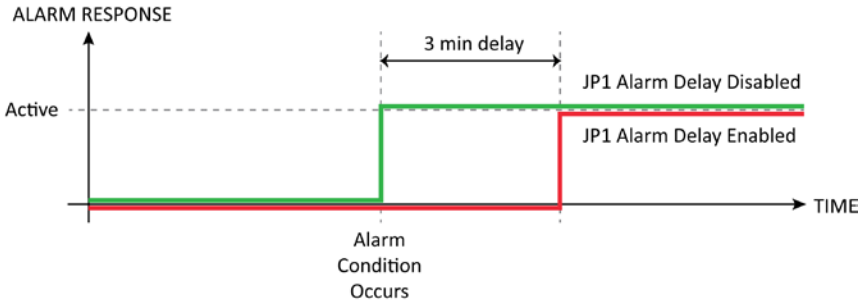


Figure 16. Alarm Response (Single-Level Alarms)

The delays for dual-level systems are about 25 seconds for the low level and then another 25 seconds for the high level. Refer to Figure 17 for a graphic representation of the alarm response showing the 25-second delays that are imposed.

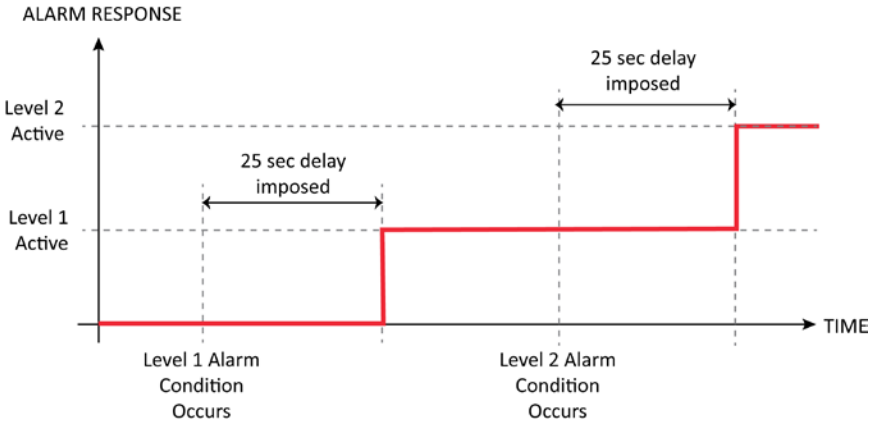


Figure 17. Alarm Response (Dual-Level Alarms)

4.8. Fail Safe Operation

The JP1 jumper on the 6-channel controller with dual-level alarm capabilities is used to enable/disable the high-level alarm relay (RL1) to operate in fail-safe mode.

Fail-Safe Jumper JP1 Position	Description
OFF 	Relay RL1 is normally open. It is energized on a high alarm condition.
ON 	Relay RL1 is normally closed. It is de-energized on high alarm condition OR power failure.

4.9. Muting the Audible Alarm (Key Switch)

If service is being carried out on the system or the user does not require a local audible alarm then it can be muted using the key switch. In the default position, the audible alarm is enabled. In the other position, the audible alarm is off/muted.

NOTE: The key switch can also be used to turn off the local audible alarm during bump tests.

4.10. Resetting High Alarms (Dual-Level Units Only)

The red pushbutton on the controller is used to acknowledge (reset) high alarms. Once the unit goes into a high alarm state the alarm latches. After the gas has cleared the reset button must be pushed to clear the alarm(s).

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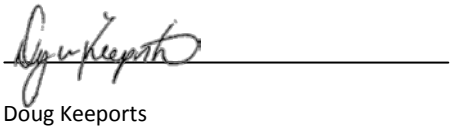
DECLARATION OF CONFORMITY

The manufacturer of the products covered by this declaration:	Bacharach, Inc. 621 Hunt Valley Circle New Kensington, PA 15068
Year conformity is declared:	2012
Product(s):	MGS
Model(s):	MGS Controller

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):

UL 61010-1 CSA C22.2 No. 61010-1 IEC 61010-1: 2010 EN 61010-1: 2010	Safety Standards	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements

Signature: 

Name: Doug Keeports
Title: VP of Product Development
Date: 5 October 2012

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

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