

BACHARACH®

The Measurable Difference

IAM ♦ 100

Integrated Area Monitor and Optional 16-Channel Controller

Installation and Operation Manual
Instruction 6209-9000
Rev 2 – January 2016



Product Leadership • Training • Service • Reliability

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Section 1. Overview

1.1. Introduction

The IAM-100 is a system that combines sensor and monitoring features in an integrated unit. It is a stand-alone system used to detect gases in an area, room, zone, airspace or airflow.

The IAM-100 can be expanded into large gas detection systems using the optional IAM controller.

Up to 16 IAM-100s can connect to an IAM controller. The controller shows any sensor in alarm and has relays for control purposes. These controllers can be connected to each other enabling the construction of large gas detector systems.

1.2. Applications

The IAM-100 is an ideal solution for gas detection in the following occupied spaces:

- hotel rooms
- conference rooms
- apartment blocks
- office buildings
- air conditioned spaces
- storage facilities
- theaters
- airports
- light industrial spaces
- large systems requiring many sensors.

Typical applications include the following.

Application Category	Gases
Refrigerant gases	R-22, R-407c, R-410a



Figure 1. IAM-100



Figure 2. Optional IAM-100 Controller

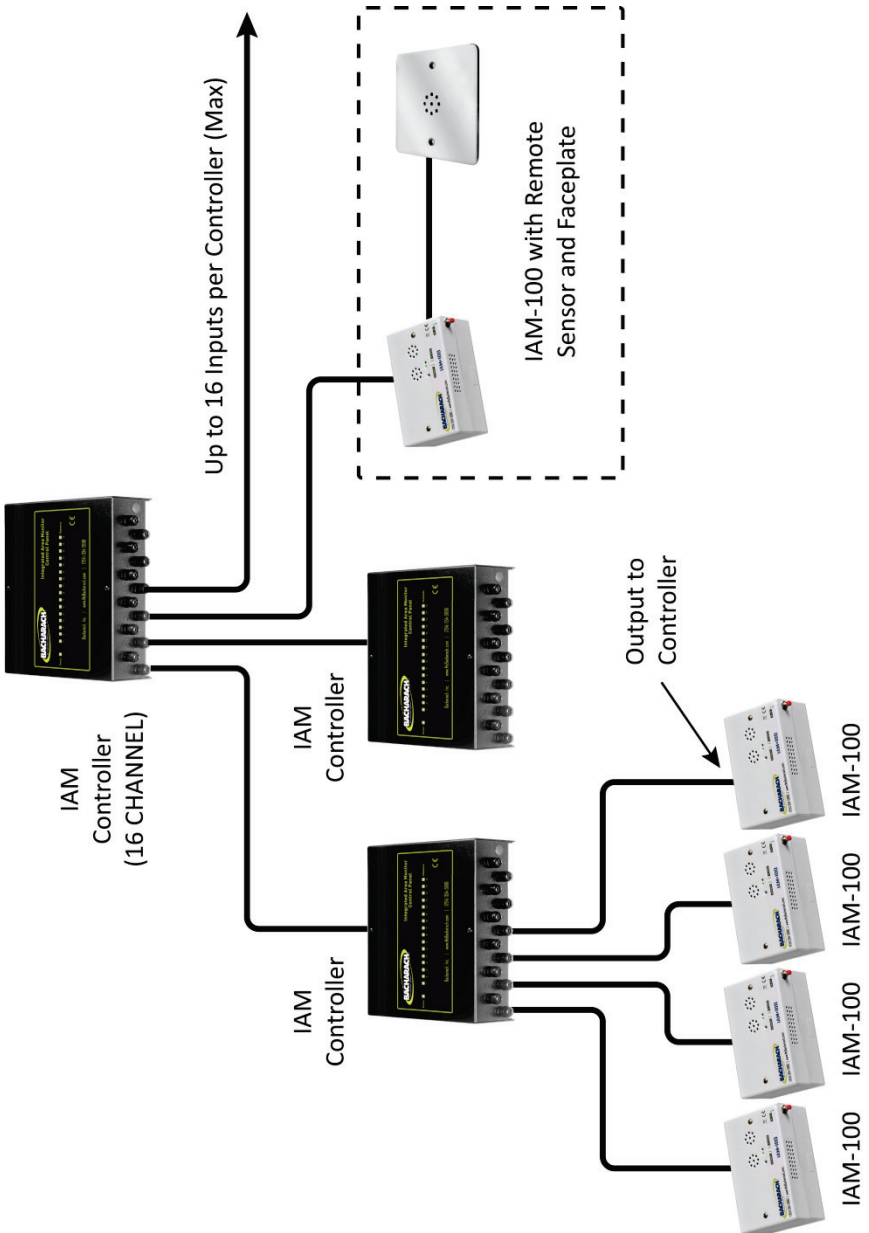


Figure 3. Sample Architecture Diagram

1.3. Specifications

Specification	IAM-100	IAM Controller
Operating Power Supply	120 VAC/60 Hz or 220 VAC/50 Hz; 11 W Max	120 VAC/60 Hz or 220 VAC/50 Hz; 11 W Max
Power Status	Green LED	Green LED
Alarm Status	Red LED	Red LED
Fault Status	Buzzer inactive, Green LED off, and Red LED on	Horn inactive, Green LED off, and Red LED on
Audible Alarms	Internal buzzer with mute button	External horn with mute button
Buzzer/Horn Deactivate	By onboard jumper	By key switch
Alarm Relays (Volt Free)	2 Relays: 3 A @ 24 VDC 3 A @ 120 VAC	2 Relays: 10 A @ 230/120 VAC
Alarm Reset	Selectable manual or automatic	Remote reset, downstream resets any IAM-100 monitor or controller connected to a channel, after gas has cleared
Selectable Alarm Delay	0, 5, 10 or 15 minutes	N/A
Warm-up Delay	5 minutes initially	N/A
Enclosure Rating	Standard: IP30	IP51
Dimensions & Weight	See housings table on page 9	262 x 265 x 84 mm; 2.6 kg [10.3 x 10.4 x 3.3 in; 5.7 lb]
Cable Recommendations	IAM to IAM-C: 16-24 AWG, 2-conductor (7/0.2 mm, 2 conductor) 984.25 ft (300 m) max	IAM-C to IAM-C: 7/0.2 mm, 2 conductor [16-24 AWG, 2-conductor] 300 m [984 ft] max
Approvals	CE UL/CSA 61010-1	CE FCC Part 15, Subpart B UL/CSA 61010-1

IAM-100 Housings	Specifications	
Standard	Size: 147x88x62 mm [5.8x3.5x2.4 in] Weight: 633 g [1.4 lbs]	
Faceplate (Brushed Steel)	Size: 86x86 mm [3.4x3.4 in] Weight: 86 g [0.2 lbs]	

Category	Sensor Characteristics
Measurement Range	1,000 or 10,000 ppm
Temperature Range	-20 to +50°C [-4 to 122°F]
Humidity Range	0 to 95% Non condensing
Sensor Life Time	5 to 8 years (typical) for semiconductor sensors
Typical Time to Alarm	24 seconds (Response times may vary based on temperature of operation, enclosure and environmental conditions)
Calibration Frequency	See local regulations (annual test or calibration typical). Semiconductor sensors are non-selective, but calibrated to a specific gas. Bacharach recommends, at a minimum, an annual test of the unit using calibration gas of known concentration.

Section 2. Placing Sensors

2.1. General Guidelines



NOTE: This instrument is equipped with a semiconductor sensor for the detection of refrigerant gases. Semiconductor sensors are not gas specific and respond to a variety of other gases including propane exhaust, cleaners, and solvents. Changes in temperature and humidity may also affect the sensor's performance.

The IAM-100 and optional controller (where applicable) should be positioned carefully to avoid mechanical damage (from moving machinery, doors, etc.) and thermal extremes (close to heaters). Units should not be placed unprotected in direct or strong drafts/airflows and areas where water, moisture, or steam is present.

Avoid routing sensor cabling outside of premises, or between buildings via overhead cables. Also, sensor wiring should be kept a minimum of 500 mm [20 inches] from the main power supply and telephone cables.

When connecting the main power supply and/or sensor cables ensure a second strain relief is used. As a strain relief, use a cable tie inside the enclosure within 25mm [1 inch] of the cable termination.



NOTE: The IAM-100 and optional controllers 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:

- Room maintenance activity involving solvent or fumes or refrigerant leaks.
- Heavy localized exhaust fumes (carbon monoxide, dioxide, and propane).

An optional response delay may be activated to minimize the possibilities of false alarms.

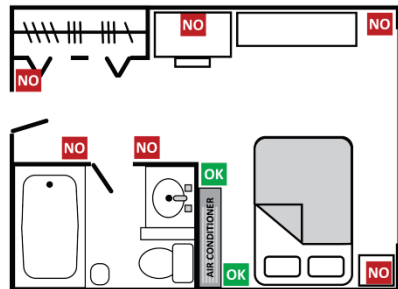
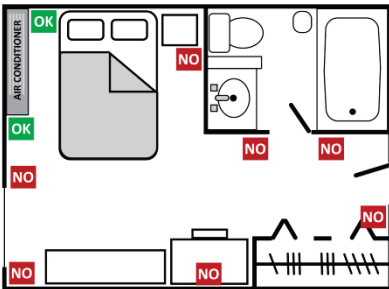
2.2. Air Conditioning (Direct Systems VRF/VRV)

To ensure compliance with EN378 at least one detector should be installed in each occupied space being considered. In this case refrigerants are heavier than air and detectors should have their sensors mounted low, e.g., at less than bed height in the case of a hotel or other similar Category Class A space. Ceiling voids or other voids if not sealed are part of the occupied space.



CAUTION: Monitoring ceiling voids in a hotel room would not strictly comply with EN378.

Do Mount In-Room Sensors...	Don't Mount Sensors...
...at less than the normal heights of the occupants. E.g., in a hotel room this is less than bed height (between 100 and 300 mm [4 and 12 inches] off the floor).	...under mirrors.
...away from drafts and heat sources like radiators, etc.	...at vanity units.
... to avoid sources of steam.	...in or near bathrooms.



IMPORTANT: Carefully consider ramifications of using too few sensors. A few extra sensors could make a significant difference if a gas leak occurs.

Section 3. Housing Dimensions

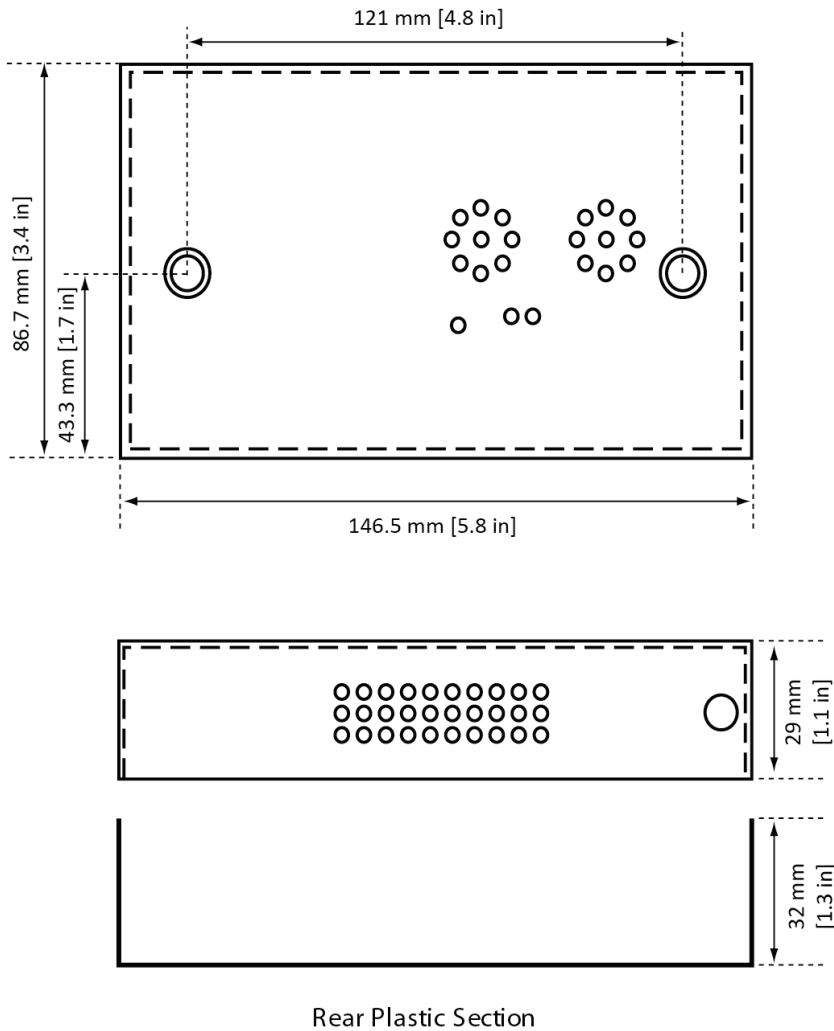


Figure 4. Dimensions of the IAM-100 Housing (Front)

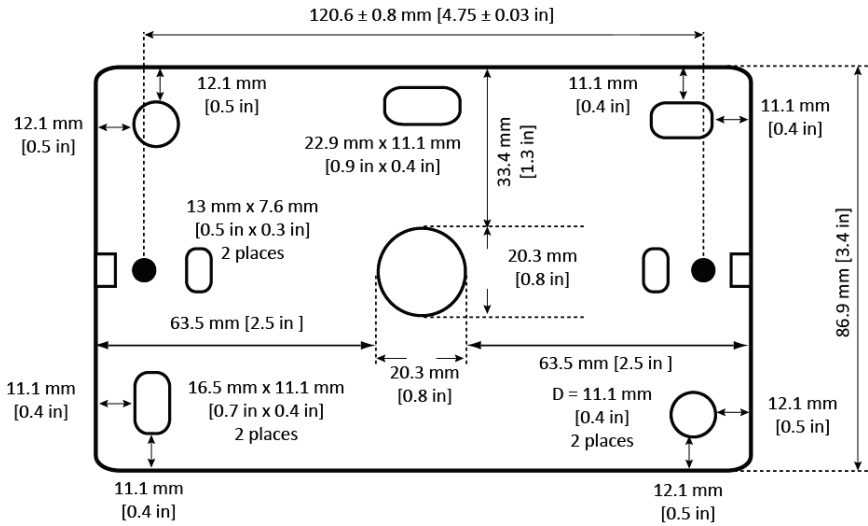


Figure 5. Typical Dimensions of the IAM-100 (Back)

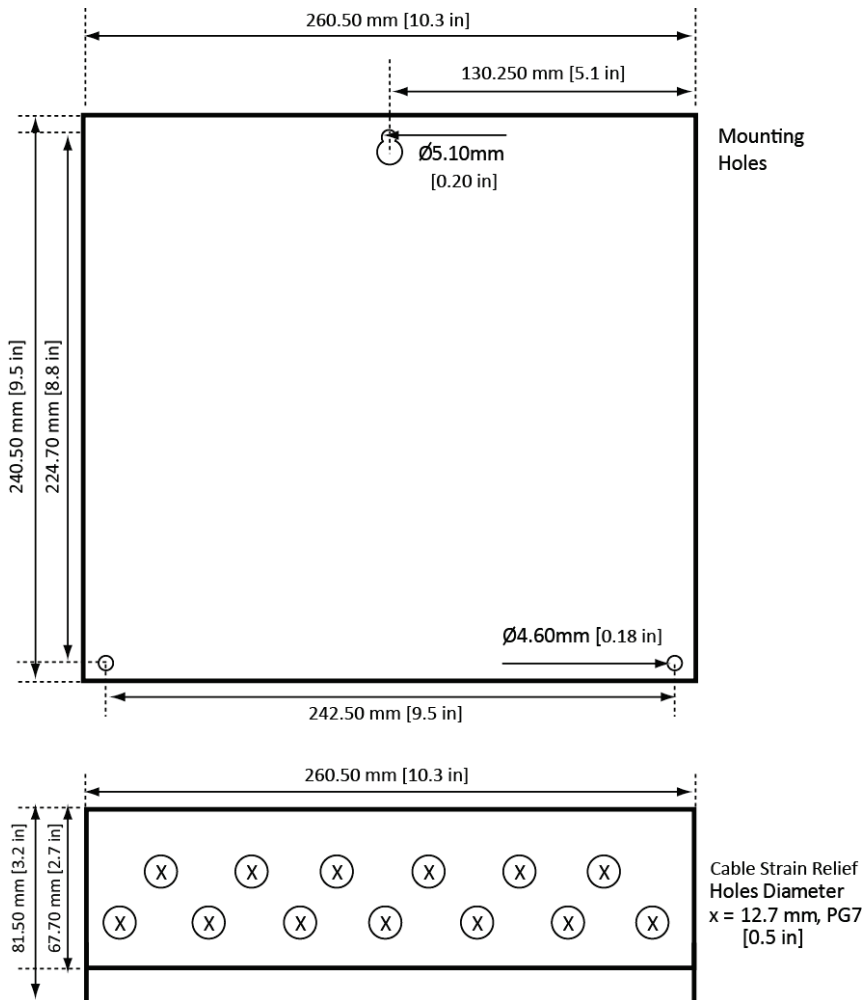


Figure 6. Controller Housing

Section 4. Wiring Instructions

4.1. Wiring the IAM-100

Open the IAM-100 by removing the two front cover screws. Remove the metal faceplate and locate the connection terminals.

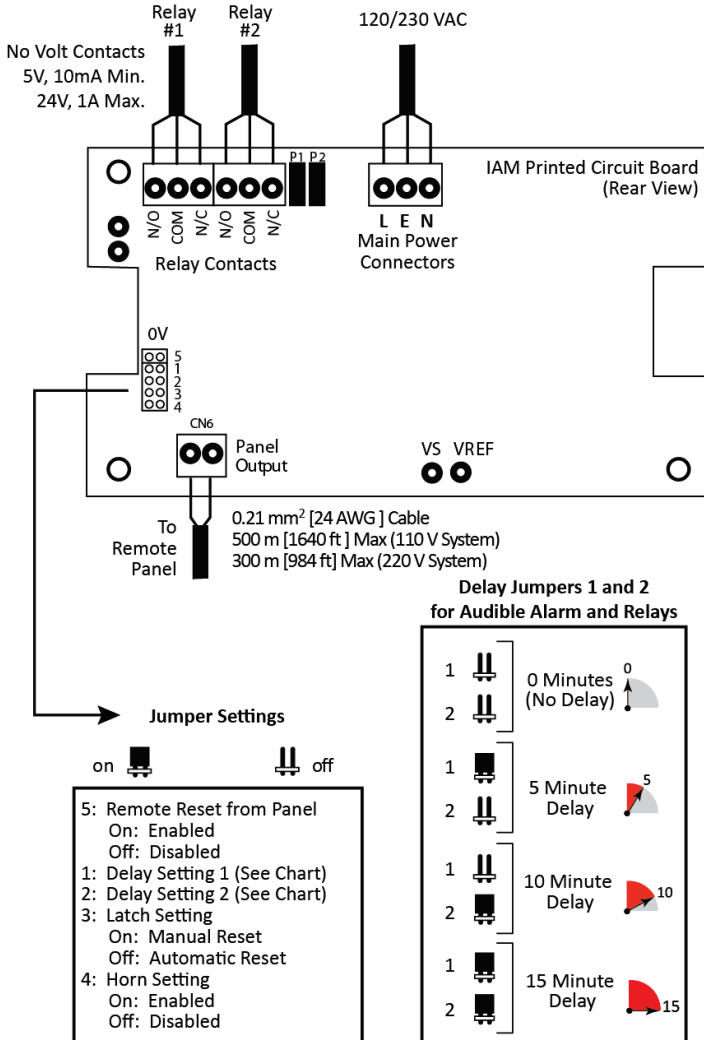


Figure 7. IAM-100 Internal Components



NOTE: The maximum wire size into terminal blocks is 1.5 mm² [16 AWG].

Step	Wiring Instructions for the IAM
1	Where applicable, connect the output to the remote IAM Controller at CN6 (see Figure 7) using two-wire cable. This output is not polarity oriented. If installing a standalone IAM, ignore this step.
2	Relay outputs - connect to NO or NC as required for one or both relay connectors Relay #1 and Relay #2.
3	Set relay and buzzer delay using jumpers on positions 1 and 2 of the multi-pin connector. Factory default is no delay (both jumpers off).
4	Set the latching setting using jumper on the multi-pin connector position 3. Factory default is manual reset.
5	Set buzzer enable/disable using jumper on header HD1 at position 4. Factory default is enabled.
6	Set remote reset setting using jumper on the multi-pin connector position 5. Factory default is enabled.
7	Connect main power to terminal.



NOTE: Review and agree upon end-user requirements before setting buzzer enable/disable, the relay/buzzer delay and manual vs. automatic reset (latching).



NOTE: Connection to main power supply must be done in accordance with local wiring regulations, and should not be longer than 3 meters from the controller. It is recommended to connect to main power through approved, switchable, fused (3A fuse recommended) and easily accessible electrical spur. This should be a part of building installation and be marked as disconnect for the unit.

- The main power cable used should be compliant with local regulations.
- If replacement of the main fuse is required, use a suitable replacement.

4.2. Wiring the IAM-100 Controller

Open the IAM-C by removing the two front cover screws. Remove the metal faceplate and locate the connection terminals. To install the IAM-C, refer to the network drawing (Figure 3) and wiring diagram (Figure 8).

Step	Wiring Instructions for the IAM-C
1	Connect the Remote Panel output to an input of the upstream IAM Controller (see Figure 8 and Figure 3) using two-wire cable. The output is not polarity oriented. If an upstream IAM Controller is not used, ignore this step.
2	Verify proper setting of the remote reset jumper (HD3) on each networked IAM-C. Factory default is enabled. Note that the remote reset jumper MUST be disabled on the master panel.
3	Connect relay contacts to COM and either NO or NC as required for one or both relays.
4	If used in your application, wire the optional alarm horn to connector CN19 using the + and - guides in Figure 8 as a reference.
5	Connect up to 16 IAM sensors (panel output CN6 in Figure 7) to input connectors CN1 through CN16 on the IAM Controller (Figure 8) using two-wire cable. The polarity does not matter. Observe proper wire type and length limits as specified in Figure 8.
6	Disable individual channels by installing a 2.2 K Ω resistor across each unused terminal block. See input CN8 in Figure 8.
7	Ensuring proper polarity, connect main power to terminal CN17. The power cable should have a strain relief fitted. It is recommended for the main power connection to be externally switchable and fused. A 5A fuse rating is recommended.

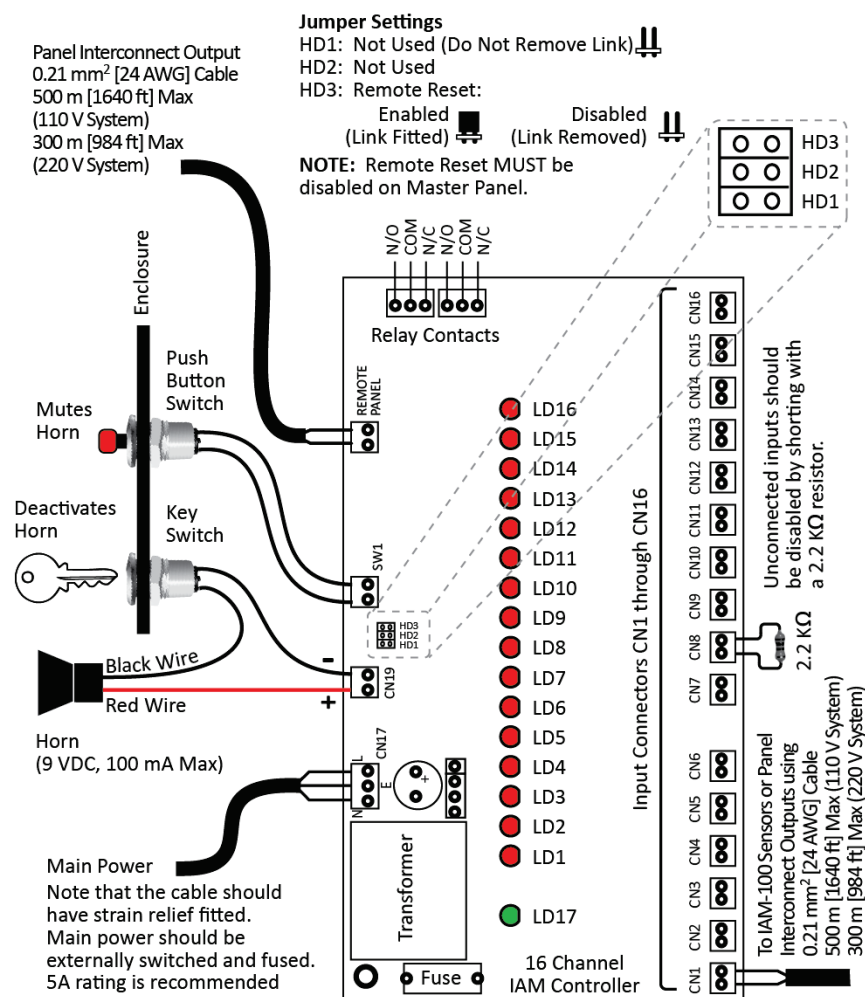


Figure 8. Controller Internal Components



NOTE: The maximum wire size into terminal blocks is 1.5 mm² [16 AWG].



NOTE: Review and agree upon end-user requirements before setting buzzer enable/disable, the relay/buzzer delay and manual vs. automatic reset (latching).



NOTE: Connection to main power supply must be via an approved, readily accessible, switched spur and fused (3 Amp fuse) or as per local wiring regulations which should be within 3 meters (10 feet) of the controller. It should be part of the building installation and be marked as the disconnect for the device.

- The main power cable used should be compliant with local regulations.
 - If replacement of the main fuse is required, use a suitable replacement.
-

4.3. Remote Sensor Installation

If you do not wish to surface mount the IAM or need to match room decor, Bacharach can supply a remote sensor and a decorative faceplate (standard finish is a unit with brushed stainless steel). The remote sensor is mounted in an electrical back box 44 mm [1.73 inches] deep to which the faceplate is fitted.



IMPORTANT: Cleaning the decorative faceplate should be limited to light dusting. It should not be sprayed with cleaning/polishing aerosols.



NOTE: For remote sensor configurations, the sensor element is mounted on a small remote sensor PCB that connects to the IAM-100's main PCB via a 4-wire cable.

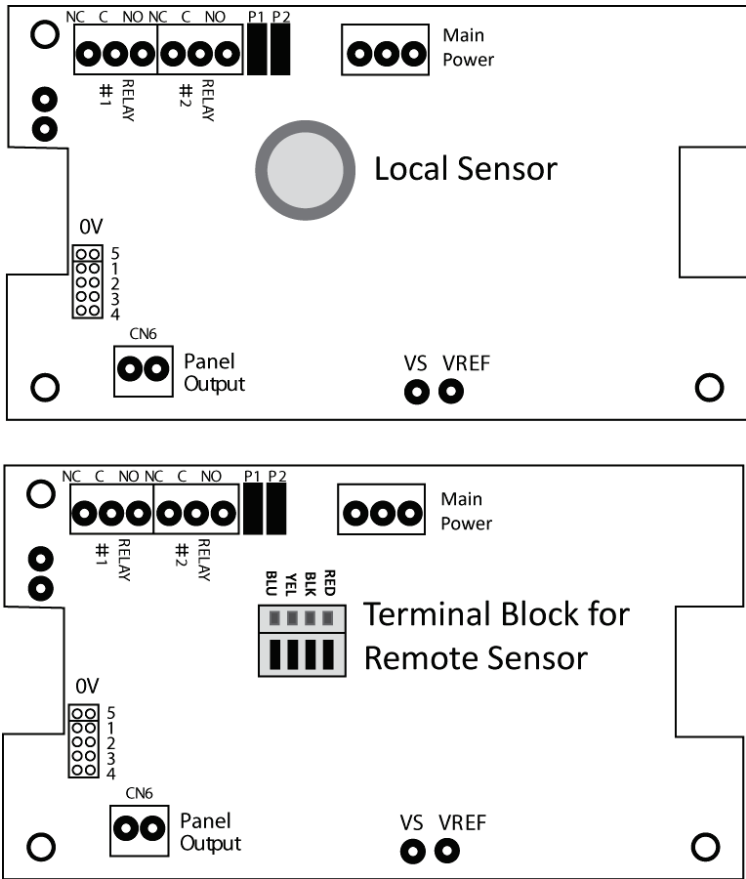


Figure 9. Local vs. Remote Sensor

Step	Instructions
1	Disconnect the cable from the sensor PCB to feed the cable through conduit. Use the IAM-100 enclosure back box knockouts and the remote sensor board back box as needed.

Step	Instructions
2	Immediately refit the connector to the sensor board in the back box. The IAM-100 and its corresponding remote sensor must be kept together as they are calibrated together and are a matched pair. To prevent mix-up, do not remove the sensor boards from a number of units at the same time unless you: • label the individual “pairs”, or • verify that the serial number on the main PCB and the remote sensor PCB are the same before re-installing, otherwise the unit will not work correctly and the calibration of the unit will be questionable.
3	If construction is in process, fit a standard plastic blanking plate immediately after you install the sensor in the back box to avoid dust or damage to the sensor. You can fit the faceplate when construction is completed.

Section 5. Operating Instructions

5.1. IAM-100

Operation State	Operating Instructions
Power Up	On power up there is an initial warm-up delay of 5 minutes, during which the green LED will flash at 1 second intervals. After warm-up, the green LED remains on (constant).
Fault Condition	Fault condition: • the green LED will be off • the red LED will be on • external interface to the optional IAM Controller panel will activate and show the fault condition on that panel
Alarm Condition	In alarm condition: • the green LED stays on. • the red LED will be on. • the buzzer sounds (if it has not been disabled and after a delay if this option has been selected). • the relay output activates (after a delay if this option has been selected). • external interface to the optional IAM Controller will be turned on. • The mute button on the exterior of the case may be pressed. (This will switch the buzzer off if the buzzer disable option is not selected). • The reset button is accessible via a hole in the front panel, to the left of the green LED. This may be pressed to reset the alarm if the manual reset option is enabled (reset is only effective when the gas has cleared from around the sensor, indicated by the red LED turning off). A non-metallic object (e.g., match or toothpick) should be used to operate the reset button. • If automatic reset is enabled, the alarm will reset by itself without user intervention.

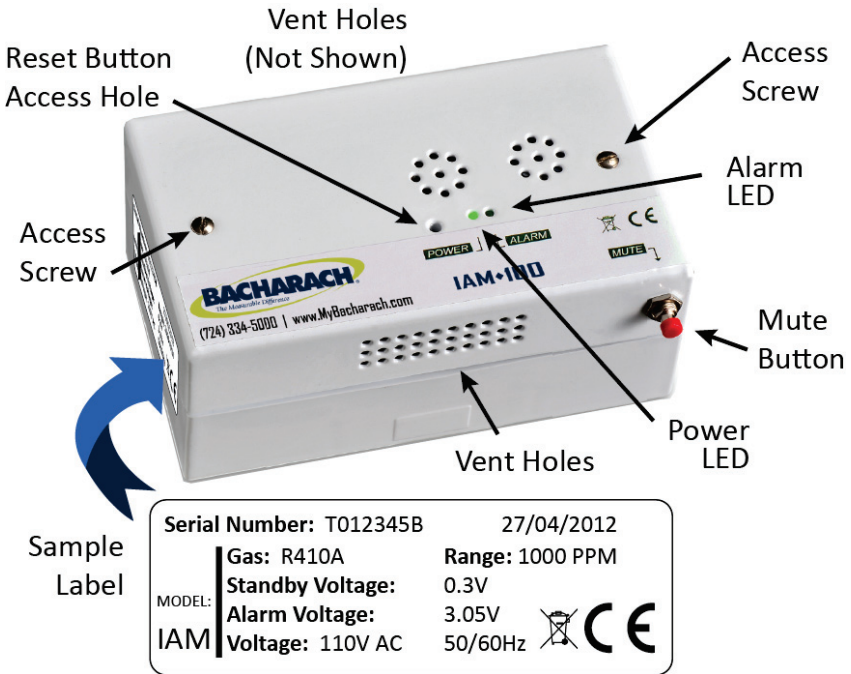


Figure 10. Key External Components of the IAM-100

5.2. IAM Controller

State	Operating Instructions
Power Up	On power up the green LED will flash and will stay on if there are no faults.
Faults	If there are faults in any sensor on the system the green LED will go off and the red led will light indicating the sensor in fault. The output to a master or upstream panel will activate and show the fault condition also on that panel.

State	Operating Instructions
Errors	Should an alarm occur: • the green LED stays on • the red LED on the relevant channel comes on • the relays operate • the horn operates (can be muted by key switch) • the output to a master or upstream panel operates to indicate there is a fault downstream.

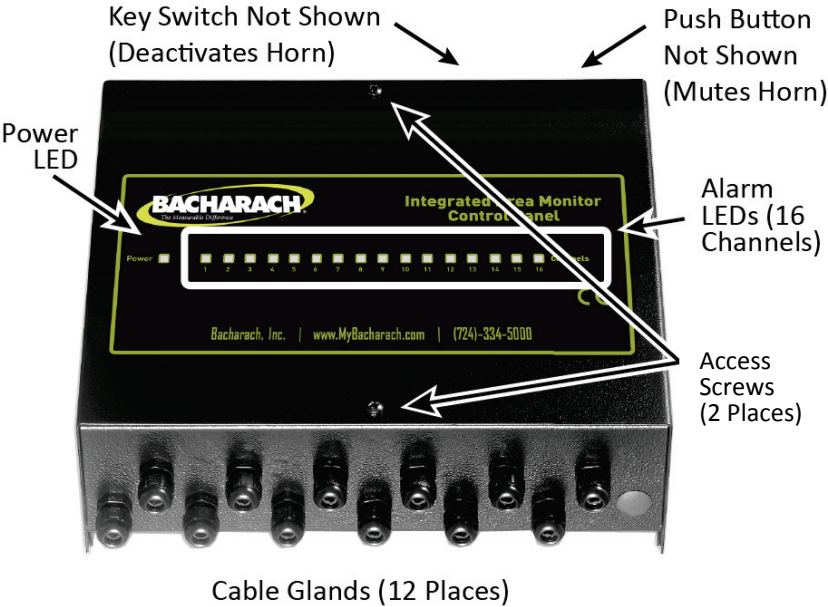


Figure 11. External Components of the Controller

 **NOTE:** If all of the red LEDs are blinking approximately every 5 seconds on a master panel, then remove the link on Jumper position JP3 as this should be in the disabled position on a master panel (factory default setting is disabled).

Section 6. Functional Tests and Calibration

6.1. Overview



NOTE: The IAM-100 is calibrated at the factory. After installation, a zero adjustment maybe required due to differences in environmental conditions.



IMPORTANT: If the IAM-100 is exposed to a large leak it should be tested to ensure correct functionality, and the sensor replaced if necessary.

To comply with the requirements of EN378 and the European F-GAS regulation, sensors must be tested annually. However, local regulations may specify the nature and frequency of this test. After sensor element replacement, recalibration of the unit using known concentration of gas is required.



CAUTION: Check local regulations on calibration or testing requirements.

IMPORTANT: The testing and/or calibration of the unit must be carried out by a suitably qualified technician, and must be done:

- in accordance with this manual
- in compliance with locally applicable guidelines and regulations.



Suitably qualified operators of the unit should be aware of the regulations and standards set down by the industry/country for the testing or calibration of this unit. This manual is only intended as a guide and, insofar as permitted by law, the manufacturer accepts no responsibility for the calibration, testing, or operation of this unit.

The frequency and nature of testing or calibration may be determined by local regulation or standards.

EN378 and the F-GAS Regulation require an annual check in accordance with the manufacturer's recommendation.



IMPORTANT: Failure to test or calibrate the unit in accordance with applicable instructions and with industry guidelines may result in serious injury or death. The manufacturer is not liable for any loss, injury, or damage arising from improper testing, incorrect calibration, or inappropriate use of the unit.



IMPORTANT: Calibration should be done at least once per year.



IMPORTANT: In applications where life safety is critical, calibration should be done quarterly (every 3 months) or on a more frequent basis. Bacharach is not responsible for setting safety practices and policies. Safe work procedures including calibration policies are best determined by company policy, industry standards, and local codes.

There are two concepts that need to be differentiated:

Bump Test Exposing the sensor to a known concentration of target gas and observing its response to the gas. The objective is to establish if the sensor is reacting to the gas and all the sensor outputs are working correctly. There are two types of bump test.

- **Quantified:** A known concentration of gas is used.
- **Non-Quantified:** A gas of unknown concentration is used.

Calibration Exposing the sensor to a calibration gas, setting the “Standby voltage”, the span/range, and checking/ adjusting all the outputs, to ensure that they are activated at the specified gas concentration.



NOTE: For improved accuracy and response, the instrument should be zeroed and calibrated in the environment in which it is being installed.

CAUTION: Before performing the bump test:



- Advise occupants, plant operators, and supervisors.
 - Check if the IAM-100 is connected to external systems then disconnect as instructed by the customer.
 - Deactivate the alarm delay (if active) by removing the alarm delay jumpers per Figure 7.
 - To ensure higher accuracy, the IAM-100 should be powered up for at least 24 hours before any tests/calibration or adjustment are made.
-

6.2. Bump Testing

After installation, it is recommended to perform a bump test to ensure proper functionality of the unit. Expose the sensors to test gas, preferably target gas.

The bump test should put the system into alarm. The red LED will light showing the system is in alarm. The delay will prevent the buzzer from sounding and the relay from switching (if the delay is set).

To test the buzzer and/or relay function, check the delay is set at zero using the multi-pin connector positions 1 and 2 (as shown in Figure 7) and expose to gas as above. You can mute the buzzer using the mute button.

After the gas has cleared and the red LED has switched off you can reset the alarm relay and buzzer by using the reset button (if manual reset has been selected).

Before testing the sensors on site the IAM-100 must have been powered up and allowed to stabilize for several hours, preferably over a period of 24 hours.

When testing the sensors, also ensure that the IAM Controller functions correctly (if installed) per section 6.4.



NOTE: Ideally bump tests are to be conducted at installation site in a clean air atmosphere.



IMPORTANT: After a semiconductor sensor is exposed to a substantial gas leak, the sensor should be checked and replaced if necessary. After sensor element replacement, recalibration of the unit using a known concentration of gas is required.



NOTE: Do not pressurize the sensor.



NOTE: You **MUST** use calibration gas in a balance of air (*not* N₂).



NOTE: Prior to carrying out a bump test, check and adjust the zero setting. Refer to Section 6.3.

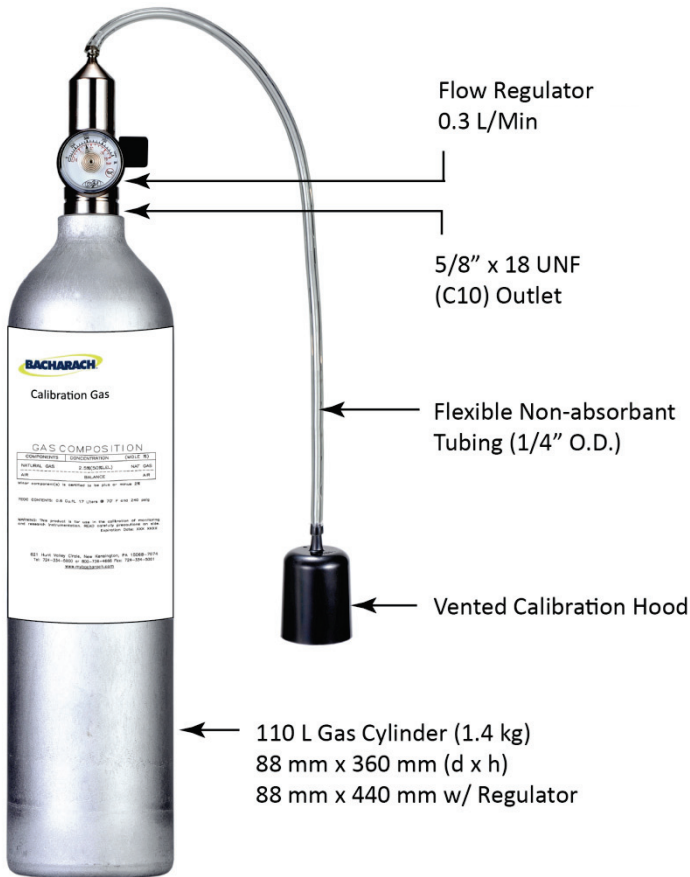


Figure 12. Gas Cylinder and Test Hardware

Step	Bump Testing Using Calibration Gas Cylinders
1	For remote sensor configurations, remove the enclosure lid of the gas detector (not in an exhaust area). For integrated sensor configurations, the calibration cup needs to be mounted on enclosure.
2	Connect a voltmeter to 0V and VS to monitor sensor response.
3	Expose the sensor to gas from the cylinder. Use a plastic hose/hood to direct gas to the sensor. A response of above 80% of full range (as per rating label) is acceptable.

6.3. Checking and Setting the Zero Setting

Checking and setting the zero setting may be required upon initial installation. Ensure the unit was powered up for at least 24 hours before making any adjustment

Tools Required:

- A voltmeter (crocodile clips are recommended)
- Factory standby (zero) voltage from side label
- Screwdriver

Step	Checking and Setting the Zero Setting
1	Ensure that the IAM-100 is stabilized (on for more than 24 hours)
2	Connect the voltmeter between 0V and VS.
3	Compare the reading of the voltmeter to the factory standby voltage. Adjust P1 as necessary until the voltmeter reading matches the factory standby voltage settings. If necessary adjust to ambient conditions.

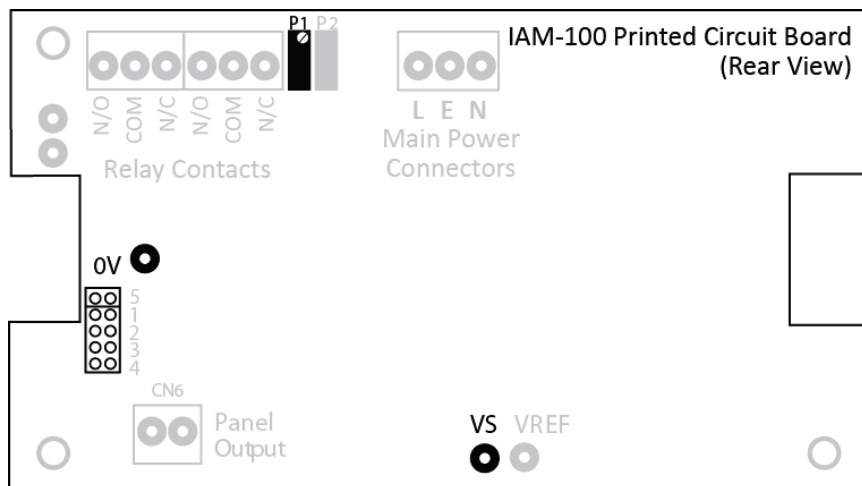


Figure 13. Checking and Setting the Zero Setting

6.4. IAM Controller

If your installation has an IAM Controller, ensure that the controller's functions are activating accordingly when testing the sensors.

Step	Checking the IAM Controller
1	Red LED should illuminate for sensors that are in alarm.
2	Horn should sound if connected and if one or more alarms are present.
3	Relays should function properly if enabled and one or more alarms are present.
4	If enabled, remote reset will reset any downstream IAM monitor or IAM-C connected to a channel, once gas has cleared

Section 7. Troubleshooting

IAM Symptom	Possible Cause(s)
Green and Red LEDs off	• Check power supply. Check wiring. • IAM was possibly damaged in transit. Check by installing another IAM on the same power source to confirm the fault.
Red LED on, green LED off (indicates a fault)	• Sensor may be disconnected from PCB. Check to see sensor element is properly inserted into board. • The sensor has been damaged or has reached the end of life and needs to be exchanged. Contact Bacharach for instructions and support. • Check the remote cable between the main PCB and the remote sensor PCB to ensure the continuity.
Alarms in the absence of a leak	• Ensure there are no background gases present in the ambient air. • Ensure there are no cross-sensitive materials in use during the alarm.

IAM-C Symptom	Possible Cause(s)
Green LED off	• Check power supply. Check wiring. • IAM-C was possibly damaged in transit. Check by installing another IAM-C to confirm.
All 16 red LEDs on a master panel are flashing every 5 seconds	• Remove the link on Jumper position HD3 as this should be in the disabled position on a master panel (factory default setting is disabled).

CE 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:	2010
Product(s):	Fixed Gas Detector/Transmitter
Model(s):	IAM-100

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).

Directive(s):

2004/108/EC	Electromagnetic Compatibility (EMC) Directive
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Standard(s):

EN 55011:2007	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment
EN 61326-1:2006	EMC requirements for electrical equipment for measurement, control and laboratory use – Part 1: general requirements

Signature:  _____

Name: Aaron Kennison
Title: Engineering Manager
Date: 1/3/2013

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

CE 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:	2013
Product(s):	Fixed Monitor Controller
Model(s):	IAM Controller (IAM-C)

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).

Directive(s):

2004/108/EC	Electromagnetic Compatibility (EMC) Directive
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Standard(s):

EN 50270:2006	Electromagnetic compatibility – electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen
EN 55011:2009	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical equipment

Signature:  _____

Name: Aaron Kennison
Title: Engineering Manager
Date: 03/25/2013

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



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