

## Technical Manual

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# Honeywell

## Model IR-148 Infrared Gas Monitor

### Your Uptime Is Our Top Priority

Congratulations on your purchase of the Model IR-148 Infrared Gas Monitor. It will provide you with years of reliable protection.

If a problem occurs, refer to the Troubleshooting Guide. Many common problems can be fixed quickly by following the steps listed in the Troubleshooting Guide.

Because your uptime is our top priority, Honeywell Analytics Inc. provides you with a 24-hour Emergency Service Hotline.

#### During Business Hours:

Honeywell Analytics Inc

Product Headquarters:

(Toll Free) 800-323-2000

847-955-8200

**24-Hour Emergency Hotline:**

**847-634-2840**

Record your Serial Number and Installation Date for easy reference. **To save time when calling for service, please have the Serial Number of your instrument available.**

### General Information

- The input and output signals must be connected by using twisted, shielded wire pairs.
- The shield or its drain wire must be connected to the grounding terminal on the power supply plate (Figure i).
- Each wire pair must have a ferrite around it to meet the CE EMC requirement.
- Each unit is supplied with Thora-Electronic #16-28-9 or equivalent ferrite.
- The shield must also be connected to ground at the receiving equipment.
- The RS 485 communications lines to an expanded relay assembly must be wired in a similar manner.
- Install the unit according to the EMC Considerations at the front of this manual.

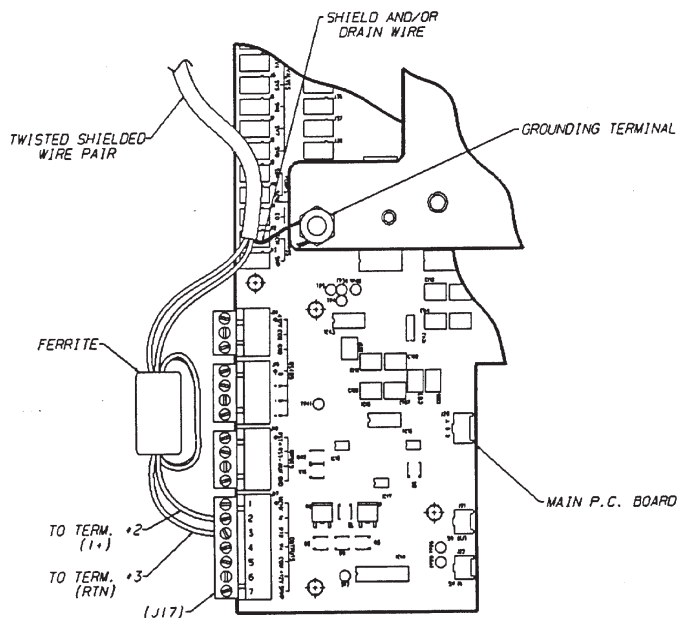


Figure 1-1.

Figure i. Wire Pairs and Ferrite



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### Installation of Systems at the Site for Compliance to EMC Guidelines

- Install an interference-free ground connection or interference-free potential balance for connecting the instrument to mains power.
- According to EMC directives, the operator must guarantee a corresponding power supply free of feedback.
- A shielded power supply line must be used when the instrument is supplied with a DC output source.
- Control lines are to be of shielded design (reset line, acknowledge line, measurement current output, printer lines, etc.)
- Shielded cable must have at least an 80% covering for the shield.
- Control and relay module lines must be locally installed and separated from power supply lines.
- Install shielded lines in one piece; if it is necessary to lengthen lines using terminal boxes:
  - » terminal boxes must be shielded
  - » terminal box connections must be kept as short as possible.
- Do not use unshielded and uninsulated lines. Pigtails must be kept as short as possible and connected to corresponding connection terminals without loops.
- External equipment that is operated with gas warning instruments (relay modules, horns, pumps, motors, etc.) must be shielded and correspond to EMC directives.
- When installing locally-offset EMC instrument filters, the power supply line must be shielded between the filter and the instrument.
- Connect the systems according to the EMC Considerations listed in this manual.






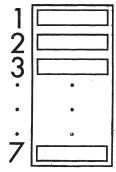

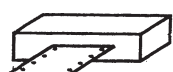
## Symbols Used on Your Instrument







### Overview

Your Honeywell Analytics instrument uses several symbols to provide information. Each symbol provides a graphic representation of equivalent words. The symbols are easily recognizable in any language.

Below is a listing of symbols used on Honeywell Analytics products and a brief description of what the symbols represent. (Your instrument model might not use all of the symbols listed here.)

### Symbols

	Power Switch ON
	Power Switch OFF
	Power Indicator LED
	Locked Keypad LED
	Alarm LED
	Equipment Mounting Position in Rack
	Printer Share Box
	Printer

	<b>Caution</b> – Refer to accompanying documents. Caution statements are used to indicate hazards or unsafe practices which could result in minor personal injury or product or property damage.
	<b>Warning</b> – Refer to accompanying documents. Warning statements are used to indicate hazards or unsafe practices which could result in severe personal injury or death.
	<b>Caution</b> – Risk of electrical shock
	<b>Caution</b> – Hot Surface
	Direct Current (D.C.)
	Ground Terminal

## EMC Considerations

### Overview

Your Honeywell Analytics instrument has been designed to comply with applicable Electromagnetic Compatibility (EMC) standards at the time of manufacture. The design includes filtering, shielding and bypassing techniques. At the time of certification, simulated customer Input/Output (I/O) schemes were tested.

All methods used in your equipment for emission suppression and reduction of susceptibility are interactive. Modifications to the instrument will most likely result in increased emissions and higher vulnerability to other radiated fields.

Following the guidelines in this EMC Considerations section will ensure your instrument maintains the highest degree of EMC integrity. The guidelines listed apply only to I/O emissions and do not apply to A.C. and D.C. instrument power connections

### Cabling

At a very minimum, all cables should include a braided shield. Ideal results have been obtained with twisted pair cabling which has a foil shield surrounding each pair plus foil and 90% braid shielding around the bundle. While this yields the best results, it can be very expensive. In addition, ensure local electrical code requirements are met.

### Cabling Type

The following cable parameters must be considered:

<b>Braid</b>	Must have minimum 90% coverage.
<b>Foil</b>	When used with braid, provides 100% coverage
<b>Note:</b>	Do not use foil alone, it has a tendency to break.
<b>Twisted Pair</b>	Provides for cancelling of magnetic fields
<b>Stranded Pair</b>	Provides the greatest surface area MDA Scientific product testing uses >90% braid with foil (around the bundle); twisted pair; stranded 24 AWG (minimum wiring for all qualification and certification testing.)



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**Shield Termination** Continuation of the shield to the cabinet earth ground is most important.

For discrete wire terminations, pigtailed to the cabinet (connector) ground should be extremely short (absolutely no greater than three inches).

For multiconductor connector terminations, only 360° shielded shells should be used.

### Connectors

All qualification and certification of MDA Scientific products were achieved with high quality connectors, providing 360° shield coverage. These connectors generally had metal shells.

Failure to properly secure the connector to the equipment will result in high emission levels. Also, poorly constructed or improperly assembled connectors can be a high source of radiated noise and provide a path for external signals into the instrument.



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### General Warnings and Cautions

#### Warning

1. The monitor and Relay Module described in this manual must be installed, operated, and maintained in strict accordance with the labels, cautions, warnings, instructions, and within the limitations stated.
2. The Standard Enclosure and Rack Mount monitors are general-purpose units and must not be installed in outdoor areas or in locations where explosive concentrations of combustible gases or vapors might occur in the atmosphere: Class 1, Group A, B, C, and D areas as defined by the NEC. Because the Standard Enclosure and Rack Mount monitors are not explosion-proof, they must be located in non-hazardous areas.
3. This Gas Monitor is designed to detect one particular gas or vapor at ambient atmospheric pressures; it will not detect gas at elevated temperatures.
4. High levels of or long exposure to certain compounds in the tested atmosphere may contaminate the sensor. In atmospheres where the system may be exposed to such materials, perform calibration frequently to ensure dependable system operation and accurate indications.
5. Do not paint the Model IR-148 System. Also, do not paint near any of the sample line inlets to ensure paint is not deposited on the sample inlet fitting of the units. Such paint deposits would interfere with the sampling process, whereby a sample of the atmosphere being monitored is drawn into the Model IR-148 System.
6. The only absolute method to assure the proper overall operation of a gas detection instrument is to check it with a known concentration of the gas for which it has been calibrated. Consequently, a calibration check must be included as part of the installation and routine system inspection.
7. Perform periodic leak checks on all sample lines and all flow system components and fittings of the Model IR-148 System.
8. Use only genuine Honeywell Analytics replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Model IR-148 System, beyond the scope of these maintenance instructions or by anyone other than authorized Honeywell Analytics service personnel, could cause the product to fail to perform as designed, and persons who rely on this product for their safety could sustain serious personal injury or death.
9. Properly vent the exhaust of the Model IR-148 System to a safe area; improper venting may cause serious personal injury or death.
10. Ensure the gas sample to the system is clean and non-condensing. Install end-of-line filters in all sample inlet lines.
11. Avoid any installation where condensation may form. Condensation may possibly clog or block the sampling line; this will prevent the instrument from receiving new or fresh gas samples from the area being monitored.



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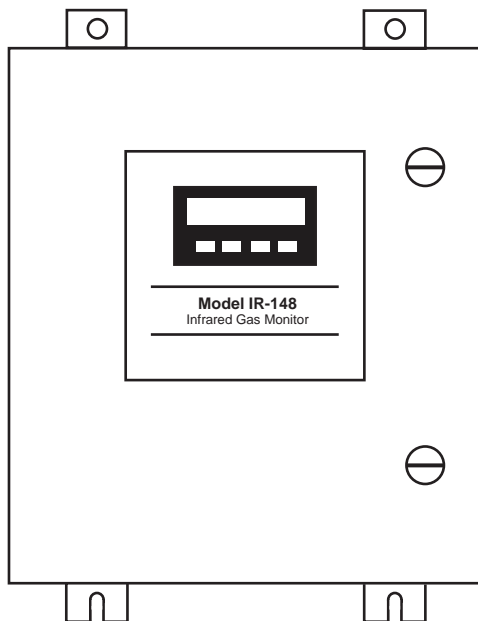
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## Model IR-148 Infrared Gas Monitor

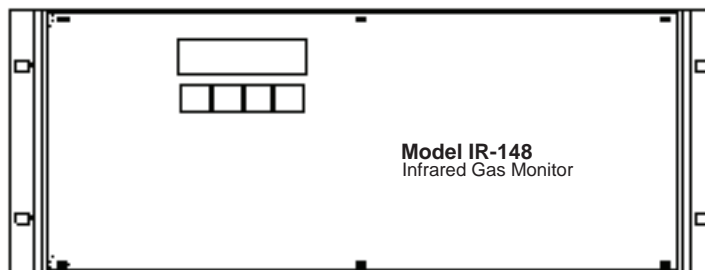
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12. The Model IR-148 Infrared Gas Monitor must be installed, located and operated in accordance to all applicable codes. These codes include, but are not limited to, the National Fire Prevention Code and National Electric Code.
13. The Model IR-148 Relay Module must be connected to proper main voltages. Connection of improper voltages will cause the unit to fail. The Model IR-148 Relay Module uses the same electrical ground as the Model IR-148 Monitor.
14. Protect the Model IR-148 Relay Module from vibration and heating; otherwise, improper operation may result, which can result in personal injury or death.
15. Do not exceed the relay contact ratings listed in Appendix B, TABLE B-1 Otherwise, relay operation may fail, which can result in personal injury or death.
16. Do not attempt to modify or adjust the sensing element.





**Standard Enclosure Model IR-148 Infrared Gas Monitor**



**Rack Mount Model IR-148 Infrared Gas Monitor**

**Note:**

The rack mount version is available only as a special order along with a special order Model CM4 rack cabinet. The rack mount version has not been tested by UL and does not carry any approvals certification. Contact your Honeywell Analytics representative for more information.



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Model IR-148 Infrared Gas Monitor

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## 1 - General Information



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# Honeywell

## Model IR-148 Infrared Gas Monitor

### Introduction

This manual provides instructions for the:

- Model IR-148 Monitor
- Model IR-148 unit with Multipoint Sequencer.

These instruments can provide continuous gas monitoring for solvents, refrigerants and toxics (See **Table 1-1** for Operating Specifications).

#### Note:

Only the R-22 monitor has been evaluated by Underwriters Laboratory, Inc. (UL)

Performance Specifications	
Stability	0-50 ppm, $\pm 1$ ppm; 51-1000 ppm, $\pm 10\%$ of reading for all UL evaluated monitors
	0-100 ppm, $\pm 2$ ppm; 100-1000 ppm, $\pm 2\%$ of reading typically for monitors not evaluated by UL
Short Term Noise	$\pm 1$ ppm peak over a 10 minute period
Linearity	0-50 ppm, $\pm 1$ ppm; 51-1000 ppm, $\pm 10\%$ of reading for all UL evaluated monitors
	0-100 ppm, $\pm 2$ ppm; 100-1000 ppm, $\pm 2\%$ of reading typically for monitors not evaluated by UL
Warm-Up Time	24 hours maximum; typical 20 minutes at 70° ambient
Response Time	90% of a step change in 90 seconds
Operating Temperatures	0°C to 50°C (32°F to 122°F)

Temperature Effect	$\pm 0.3\%/^{\circ}\text{C}$ of reading, 0° to 35°C based on temperature at calibration
	$\pm 0.6\%/^{\circ}\text{C}$ of reading, 35° to 50°C based on temperature at calibration
Relative Humidity	0 to 95%, RH non-condensing - no effect on reading
Sample Flow Rate	0.75 liter per minute - minimum with maximum tubing length.
Maximum Sample or Exhaust Tubing Length	150 feet with 1/8" ID tubing, 1/4" OD (total of inlet and outlet) (standard performance); 500 feet with 0.18" ID tubing (when slower response speed is acceptable)
Operating Pressure	ambient atmospheric
Operating Specifications	
Voltage Rating	100 to 240 VAC, 50-60 Hz
Power Requirements	0.88 amps at 120 VAC; 0.54 amps at 240 VAC
Fault/Trouble Relay	Normally energized, Form C contact: 240 VAC, 8 amps resistive SPDT
Warning Relay	One relay, Form C contacts: 240 VAC, 8 amps resistive SPDT
Caution Relay	One relay, Form C contacts: 240 VAC, 8 amps resistive SPDT
Alarm Relay	One relay, Form C contacts: 240 VAC, 8 amps resistive SPDT
Analog Outputs	4-10 mA sourcing, 1000 ohm load, 0-10 V, 2K ohm load
Maximum Output Signal Load fo 4-20 mA Output	1000 ohms (includes wiring)
Audio Alarm Drive Output	10VDC 20 ohmload maximum (available only with non-beacon models)
Sample Tubing Connections	1/4: OD x 1/8" ID



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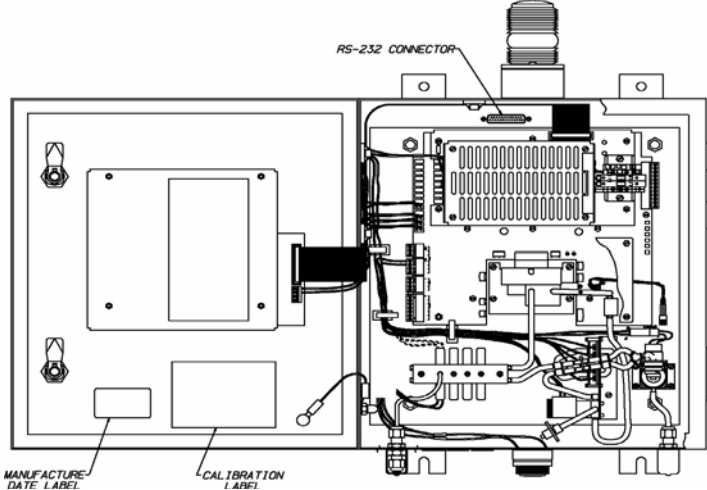
# Honeywell

## Model IR-148 Infrared Gas Monitor

Operating Specifications	
Dimensions	18" H x 16" W x 7" D
	45.72 cm H x 14.64 cm W x 17.78 cm D
Weight with Sequencer	45 pounds (20 kilograms)
Transport and Storage Conditions	
Temperature	-55°C to +70°C (-67°F to 158°F)
Humidity	99% RH non-condensing
Multipoint Sequencer Performance Specifications	
Maximum Sampled Points	Eight (8)
Maximum Sample Tubing Length	150 ft. each (1/4" OD x 1/8" ID tubing)
Rack Mount Enclosure*	<b>Dimensions:</b> 7" H x 17-5/8" W x 15-1/4" D
	<b>Weight:</b> 19 lbs
*Rack Mount Enclosure units do not carry UL or CE certification	

**Table 1-1. Model IR-148 System General Operating Specifications**

The monitor uses infrared sensing technology, allowing accurate measurement of target gas vapors with minimum interference from other vapors. Your Model IR-148 unit is factory-calibrated for a specific gas. It is extremely sensitive, capable of measuring down to 1 part per million (ppm). The unit monitors the signal and can operate three alarm levels at a software-selectable gas concentration values. There is also a fault/trouble indication to alert the operator when something is wrong with the unit.

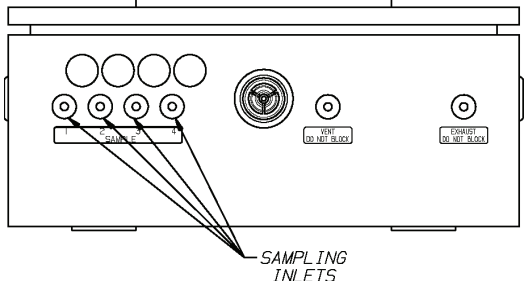


**Figure 1-1. Identifying your Unit**

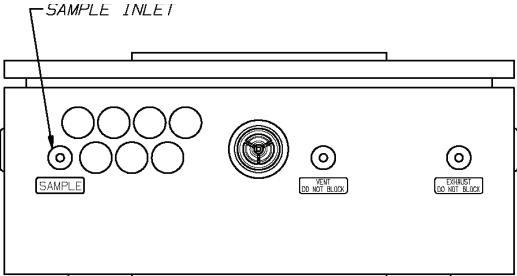
### Identifying Your Unit

#### Standard Enclosure Unit Versions (Figures 1-2 through 1-4)

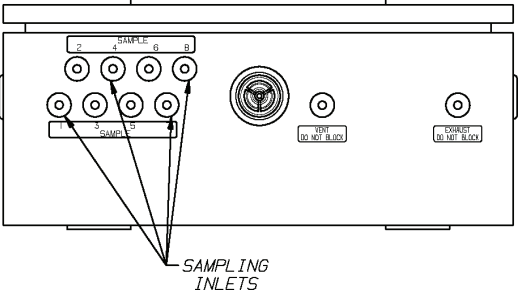
- front-panel, four-button display
- sample line access at enclosure bottom
- electrical access at enclosure side.



**Figure 1-3. Four Point Standard Enclosure Unit**



**Figure 1-2. Single Point Standard Enclosure Unit**



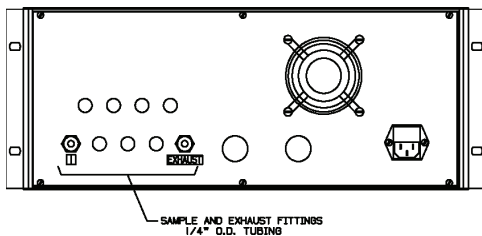
**Figure 1-4. Eight Point Standard Enclosure Unit**

### Rack Mount Version (Figures 1-5 Through 1-7)

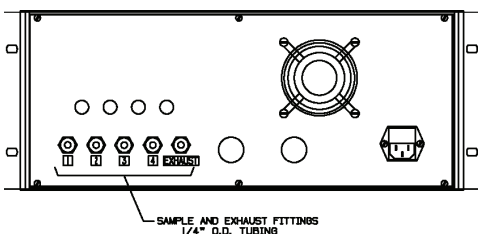
**NOTE:**

The rack mount version is available only as a special order along with a special order Model CM4 rack cabinet. The rack mount version has not been tested by UL and does not carry any approvals certification. Contact your Honeywell Analytics representative for more information.

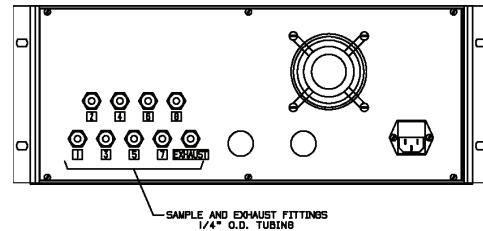
- 19 inch rack mount
- front-panel, four-button display
- sample line and electrical access at enclosure rear



**Figure 1-5. Single Point Rack Mount Unit**



**Figure 1-6. Four Point Rack Mount Unit**



**Figure 1-7. Eight Point Rack Mount Unit**

### Multipoint Sequencer

The Model IR-148 Infrared Gas Monitor is capable of monitoring different types of gases. However, each unit is factory-calibrated to detect one type of gas. Check the label inside the front door to determine what gas your unit is designed to detect (See **Figure 1-1**). For specific guidelines on using the RS-232 function (serial communication port), see [Appendix C](#).

The unit monitors only one zone or location, but your instrument may contain a Multipoint Sequencer capable of monitoring up to four or eight different zones or locations. To determine the number of sampling locations your particular unit is able to monitor, carefully tilt the unit and count the number of inlet ports at the bottom of the case (See **Figures 1-2, 1-3 or 1-4**).



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## Model IR-148 Infrared Gas Monitor

### End of Sample Line Filters

End of sample line filters are required for proper unit operation; they are included in the shipping carton.

If the end of sample line filters are not included, they must be purchased:

Gas Type	End-of-Line Filter P/N
Non-Corrosive	780248

### General Description

#### The Model IR-148 Unit:

- Monitors gases in range of 0 to 1000 parts-per-million (ppm) typical (other ranges available)
- Operates on the photo-acoustic principle, allowing gas concentration measurement in a complex mixture of background gases
- Allows gas detection in applications where contaminants or interferants preclude use of other techniques
- Provides a digital display; if it is a multi-point monitor, it also shows the point number currently being sampled by the unit
- Is also used for applications requiring long-term stability and low maintenance
- Is factory-calibrated to the full scale value of gas

- Is compensated for the relative humidity of the gas to give excellent zero stability and enable alarms at gas levels as low as 3 ppm.
- Operates over a wide temperature range
- Has front-panel windows for viewing:
  - » Gas concentration
  - » Diagnostics
  - » Alarm Conditions
- Is highly selective to enable operation in:
  - » Areas with varying humidity
  - » Areas containing other contaminants.
- Comes standard with:
  - » Four sets of relay contacts
  - » Two completely independent outputs: 0-10V 4-20 mA
- One input: 4-20 mA, assignable to the ALARM relay.
- RS-232 output (See [Appendix C](#) for more information)

#### The Internal Multipoint Sequencer Unit:

- Allows a single Model IR-148 unit to monitor up to four or eight areas or locations, if equipped



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## Model IR-148 Infrared Gas Monitor

- Each point is capable of sampling from remote areas up to 150 feet from the Model IR-148 unit
- Contains all necessary flow components (excluding end-of-line filter and sampling line) to properly sample four or eight areas and indicate the gas or vapor concentrations.

### Terminology

Become familiar with the following terminology.

**ZERO** - A zero (0) indication on the meter display usually indicates fresh air (no target gas present).

**ZEROING** - The process of placing a zero gas on the unit during calibration.

**SPAN** - Full-scale or up-scale reading on meter display.

**SPANNING** - The process of placing a full-scale or span gas on the unit during calibration.

**SPAN GAS VALUE** - The gas concentration that gives the instrument a full-scale or up-scale value. This value is printed on the calibration gas cylinder containing the gas.

**FLOW RATE** - Volume of gas drawn through the sample line per minute.

**EXHAUST GAS** - Sample gas after it passes through the sensor.

**PUMP** - The electric motor driven device that moves

the gas sample to the Model IR-148 Monitor.

**ALARMS** - The Model IR-148 System has three alarms to alert the user at specific, user-adjustable gas concentrations. (Level 1 = Caution, Level 2 = Warning and Level 3 = Alarm.)

**RELATIVE HUMIDITY** - The percent of water vapor saturation in air at a given temperature.

**POINT NUMBER** - The location or area from which a gas sample is drawn. Up to four or eight areas, sequentially numbered from 1 to 8, can be sampled.

**BYPASS** - The Sequencer is a look-ahead system; bypass gas flow is drawn from the next area to be sampled. This feature reduces the monitor response time when long sampling lines are used.

**FRESH AIR** - Air that has no possibility of containing gas.

**TEMPERATURE EFFECT** - The gas response displayed by the instrument (ppm) can change  $\pm 0.3\%$  for each degree (C) that the instrument is operating above/below the temperature at which the instrument was last calibrated.





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## Model IR-148 Infrared Gas Monitor

### Applications

The Model IR-148 Monitor is factory-calibrated for a particular gas. When calibrated, the Model IR-148 System is used in a wide variety of industrial applications, such as:

- detection of gases leaking into the atmosphere
- ambient air monitoring for health and safety purposes

### Sensor Selectivity\*

The Model IR-148 Infrared Gas Monitor is factory-calibrated for your particular gas. The system is highly selective to gases in air; however, the system also responds to other gases (interferants). See **Tables 1-2 to 1-6** for typical cross-sensitivities. Actual cross-sensitivities vary from instrument to instrument.

- Typical cross-sensitivities have not been verified or investigated by UL.

If it is not known whether the gas to be detected is an interferant gas, contact Honeywell Analytics toll-free, at: **1-800-323-2000**.

Interferent Gas	Concentration	C <sub>5</sub> F <sub>8</sub> Reading (PPM)
IPA	100 ppm	<10
Nitrogen Trifluoride	100 ppm	10.8
Methyl Fluoride	50 ppm	9.8
C <sub>4</sub> F <sub>6</sub>	50 ppm	1.8
C <sub>4</sub> F <sub>8</sub>	50 ppm	2.4
SF <sub>6</sub>	50 ppm	1.2
Carbon Monoxide	1000 ppm	0
Propane	0.6%	8
Methane	2.5%	0
Pentane	0.75%	29
Isobutylene	100 ppm	0.3
R11 (CCl <sub>3</sub> F)	100 ppm	1.5
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	2.6
R22 (CHClF <sub>2</sub> )	100 ppm	0.5
R134a (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	100 ppm	3
Test Conditions: Calibrated 0-100 ppm C <sub>5</sub> F <sub>8</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-2. Typical Model IR-148 Cross-Sensitivity Data for C<sub>5</sub>F<sub>8</sub>**



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## Model IR-148 Infrared Gas Monitor

Interferent Gas	Concentration	C <sub>4</sub> F <sub>8</sub> Reading (PPM)
CO	300 ppm	0
C <sub>4</sub> F <sub>6</sub>	50 ppm	20
C <sub>5</sub> F <sub>8</sub>	50 ppm	10
Isobutylene	100 ppm	23.2
Methane	2.5%	3.3
Methyl Fluoride	50 ppm	0
Pentane	0.75%	480
Propane	0.6%	157
SF <sub>6</sub>	50 ppm	>100
R11 (CCl <sub>3</sub> F)	100 ppm	34.5
R22 (CHClF <sub>2</sub> )	100 ppm	2.3
R113 (C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub> )	100 ppm	5
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	6.4
R134a (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	100 ppm	9.6
Test Conditions: Calibrated 0-1000 ppm C <sub>4</sub> F <sub>8</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-3. Typical Model IR-148  
Cross-Sensitivity Data for C<sub>4</sub>F<sub>8</sub>**

Interferent Gas	Concentration	NF <sub>3</sub> Reading (PPM)
CO	300 ppm	0
C <sub>4</sub> F <sub>6</sub>	50 ppm	4
C <sub>4</sub> F <sub>8</sub>	50 ppm	9
C <sub>5</sub> F <sub>8</sub>	50 ppm	2
Isobutylene	100 ppm	4
Methane	2.5%	1
Methyl Fluoride	50 ppm	0
Pentane	0.75%	65
Propane	0.6%	25
SF <sub>6</sub>	50 ppm	>100
R11 (CCl <sub>3</sub> F)	100 ppm	6
R22 (CHClF <sub>2</sub> )	100 ppm	1
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	1
R134a (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	100 ppm	2
Test Conditions: Calibrated 0-100 ppm NF <sub>3</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-4. Typical Model IR-148  
Cross-Sensitivity Data for NF<sub>3</sub>**

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## Model IR-148 Infrared Gas Monitor

Interferent Gas	Concentration	CO Reading (PPM)
Ammonia	880 ppm	0
Carbon Dioxide	1.0%	15
Hydrogen Sulfide	40 ppm	0
Propane	2.0%	110
Methane	2.5%	0
Pentane	0.75%	90
Methanol	1000 ppm	10
Acetone	1000 ppm	40
Isopropanol	100 ppm	1
Toluene	1000 ppm	0
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	0
R11 (CCl <sub>3</sub> F)	100 ppm	6
Test Conditions: Calibrated 0-1000 ppm CO Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-5. Typical Model IR-148  
Cross-Sensitivity Data for CO**

Interferent Gas	Concentration	CH <sub>3</sub> F Reading (PPM)
Ammonia	25 ppm	0
Carbon Monoxide	300 ppm	0
Nitrous Oxide	100 ppm	3
Propane	0.6%	60
Methane	2.5%	4
Pentane	0.75%	103
Isobutylene	100 ppm	2
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	40
R113 (C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub> )	100 ppm	150
R22 (CHClF <sub>2</sub> )	100 ppm	360
R134a (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	100 ppm	155
Test Conditions: Calibrated 0-1000 ppm CH <sub>3</sub> F Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-6. Typical Model IR-148  
Cross-Sensitivity Data for CH<sub>3</sub>F**



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## Model IR-148 Infrared Gas Monitor

Interferent Gas	Concentration	CH <sub>2</sub> Cl <sub>2</sub> Reading (PPM)
Ethanol*	50 ppm	1
IPA*	50 ppm	1
SF <sub>6</sub>	50 ppm	0
CO	50 ppm	0
C <sub>4</sub> F <sub>6</sub>	50 ppm	0
C <sub>4</sub> F <sub>8</sub>	50 ppm	0
C <sub>5</sub> F <sub>8</sub>	50 ppm	0
Difluoromethane (CH <sub>2</sub> F <sub>2</sub> )	50 ppm	0
Methyl Fluoride (CH <sub>3</sub> F)	50 ppm	0
Ammonia (NH <sub>3</sub> )	50 ppm	0
Nitrogen Trifluoride (NF <sub>3</sub> )	50 ppm	0
N <sub>2</sub> O	50 ppm	0
R22 (CHClF <sub>2</sub> )	50 ppm	33
Test Conditions: Calibrated 0-1000 ppm CH <sub>2</sub> Cl <sub>2</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-7. Typical Model IR-148  
Cross-Sensitivity Data for CH<sub>2</sub>Cl<sub>2</sub>**

Interferent Gas	Concentration	CH <sub>2</sub> F <sub>2</sub> Reading (PPM)
Ethanol*	50 ppm	15
IPA*	50 ppm	6
Ammonia (NH <sub>3</sub> )	50 ppm	4
SF <sub>6</sub>	50 ppm	0
CO	50 ppm	0
C <sub>4</sub> F <sub>6</sub>	50 ppm	3
C <sub>4</sub> F <sub>8</sub>	50 ppm	0
C <sub>5</sub> F <sub>8</sub>	50 ppm	3
Methyl Fluoride (CH <sub>3</sub> F)	50 ppm	14
Nitrogen Trifluoride (NF <sub>3</sub> )	50 ppm	0
Methylene Chloride (CH <sub>2</sub> Cl <sub>2</sub> )	50 ppm	0
Nitrous Oxide	50 ppm	0
R22 (CHClF <sub>2</sub> )	50 ppm	17
Test Conditions: Calibrated 0-1000 ppm CH <sub>2</sub> F <sub>2</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-8. Typical Model IR-148  
Cross-Sensitivity Data for CH<sub>2</sub>F<sub>2</sub>**



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## Model IR-148 Infrared Gas Monitor

Interferent Gas	Concentration	Typical C <sub>4</sub> F <sub>6</sub> Reading (PPM)
Ethanol*	50 ppm	3
IPA*	50 ppm	10
SF <sub>6</sub>	100 ppm	0
CO	300 ppm	0
C <sub>4</sub> F <sub>8</sub>	50 ppm	85
C <sub>5</sub> F <sub>8</sub>	50 ppm	90
Difluoromethane (CH <sub>2</sub> F <sub>2</sub> )	50 ppm	3
Methyl Fluoride (CH <sub>3</sub> F)	1000 ppm	11
Nitrogen Trifluoride (NF <sub>3</sub> )	1000 ppm	1
Methylene Chloride (CH <sub>2</sub> Cl <sub>2</sub> )	50 ppm	0
Ammonia (NH <sub>3</sub> )	50 ppm	0
Nitrous Oxide	100 ppm	0
Propane	0.6%	20
Methane	2.5%	>100
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	30 ppm	48
R113 (C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub> )	100 ppm	>100
R22 (CHClF <sub>2</sub> )	100 ppm	6
R12 (CCl <sub>2</sub> F <sub>2</sub> )	100 ppm	10
Test Conditions: Calibrated 0-1000 ppm C <sub>4</sub> F <sub>6</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-9. Typical Model IR-148  
Cross-Sensitivity Data for C<sub>4</sub>F<sub>6</sub>**

Interferent Gas	Concentration	Typical NH <sub>3</sub> Reading (PPM)
IPA	1000 ppm	725
Acetone	1000 ppm	45
MEK	100 ppm	25
Methane	2.5%	5
Pentane	0.75%	100
Propane	0.60%	50
Methylene Chloride (CH <sub>2</sub> Cl <sub>2</sub> )	1000 ppm	12
O-xylene	100 ppm	7
R11 (CCl <sub>3</sub> F)	500 ppm	50
R12 (CCl <sub>2</sub> F <sub>2</sub> )	100 ppm	65
R22 (CHClF <sub>2</sub> )	550 ppm	15
R123 (C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub> )	100 ppm	20
R134a (C <sub>2</sub> H <sub>2</sub> F <sub>4</sub> )	100 ppm	130
Test Conditions: Calibrated 0-1000 ppm NH <sub>3</sub> Temperature: 25°C		
This gas has not been evaluated by Underwriters Laboratories for the Model IR-148		

**Table 1-10. Typical Model IR-148  
Cross-Sensitivity Data for NH<sub>3</sub>**



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Model IR-148 Infrared Gas Monitor

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## 2 - Installation and Setup

### Receiving

Upon receipt of the unit, inspect the shipping carton for signs of visible damage. Report any damage to the carrier and note it on the delivery receipt. The unit must be stored in a dry, secure place prior to its installation and use. Store unit in the original shipping carton.

### Unpacking the System

To unpack the equipment:

1. Carefully remove the Model IR-148 Monitor from its shipping container(s) in order to prevent damage to sensitive electrical components. If any damage is found, report it to the shipper immediately.

### WARNING

**Do not install or operate a damaged unit. It may not function properly and may not alert you to any gas conditions.**

2. Search through all packing material and containers to avoid inadvertently discarding usable or valuable parts. Report any shortages immediately to Honeywell Analytics.

The contents of the shipping carton are:

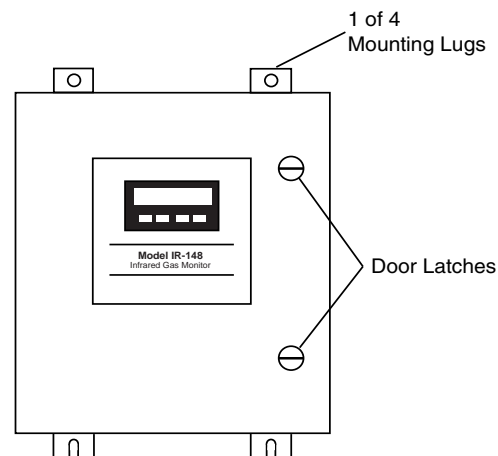
- instrument
- manual
- end-of-line filters (may be purchased separately).

Retain the original packing form for re-use in the event the unit must be returned for service.

3. Using a screwdriver, loosen the two latches on the door of the Standard Enclosure Unit Model IR-148 (See **Figure 2-1**) by turning 1/4 turn counterclockwise.
4. Open the front door.

### Initial Inspection

With the front door open, carefully inspect components and assemblies inside the enclosure. If damage or shortage is evident, advise and promptly file the proper claim with the carrier.



**Figure 2-1. Standard Enclosure Unit Front Door Latches and Mounting Lugs**



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## Model IR-148 Infrared Gas Monitor

### Location of the Monitor



#### WARNING

**This unit must not be located in areas that may contain a flammable mixture of gas and air; otherwise, an explosion may occur.**

The monitor performance depends on its location and sensing pick-up location(s). Follow the guidelines listed below before mounting the monitor.

### Instrument Location Guidelines

1. Select a location where personnel will see the front panel or the optional beacon before they enter the equipment room or the area where the monitoring point is located.
2. Mount the unit vertically; do not mount the unit to structures subject to vibration and shock, such as piping and piping supports.
3. Do not locate the unit near an excessive heat source or in wet and damp locations.
4. Do not mount the unit where it will be exposed to direct solar heating.
5. For proper cooling, allow at least three inches clearance around all surfaces except for the mounting surface.
6. Mount the unit so the front panel is easily seen and accessed for service and calibration.

### Guidelines for Locating the Sampling Point(s)

Due to the wide variation in equipment room layouts, each situation must be analyzed individually. A sampling point may be remotely located up to 150 feet from the monitor (500 feet if 0.180" I.D. tubing is used) in an area where target vapors are most likely to leak or accumulate.

#### NOTE:

The 150 and 500 feet allowances refer to the total sample and exhaust line length for each sample point.

### Equipment Configuration

The equipment arrangement in the room can also have an impact on the most effective place to sample. As a general guideline:

- If the area is small, sample at area perimeter
- In a larger area, use two or more sample ports

In a very large area, multiple monitors or a single monitor with a multi-point sampling system should be used. Airflow patterns must always be considered.





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### Activity in the Room

#### NOTE:

Select sampling locations which result in the shortest possible line length in order to reduce transport time.

Consider the following guidelines when selecting the location for the sampling point(s).

1. Some gases are heavier than air and sink to the floor or accumulate in low areas.
2. Other gases are lighter than air and tend to rise to the ceiling.
3. Place the end of the sampling line in an area that provides the instrument with a representative sample; ventilation Smoke Tubes are useful in determining air flow patterns in ambient sampling areas.
4. Properly exhaust the instrument to a safe area or to outside atmosphere.
5. Ensure the sampling area is free of particulate matter and condensing moisture; ensure sample lines will not draw moisture up into the line.

#### NOTE:

The sample gas must be adequately filtered before entering the instrument. End-of-sample-line filters must be used with the unit. These filters must be installed at the end of all sample lines.

6. Ensure the end of the sampling line is unobstructed to allow the sample to flow freely to the instrument.
7. Keep sample lines as short as possible to reduce transport time.



#### CAUTION

**Ensure that the tubing radii are wide enough to prevent kinking or bending. Otherwise, an obstruction may occur, preventing the instrument from sampling the intended area.**

#### 8. DO NOT:

- back-pressure the exhaust line or
- connect it to a vacuum source or
- install a flow meter in the exhaust line.

#### ALWAYS :

connect an exhaust line that is vented to a safe area or an outside atmosphere.

### Mounting the Unit

- The Standard Enclosure units have four mounting lugs (See **Figure 2-1**).
- The rack mount units have two mounting brackets (See **Figure 2-3**).

Securely mount the unit to a wall or support, using appropriate hardware.



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# Honeywell

## Model IR-148 Infrared Gas Monitor



### WARNING

**Do not mount the unit directly to a source of vibration which may affect the operation of the monitor, resulting in incorrect readings.**

### Flow Sample Installation

Sample System Connection (See Figures 2-2 and 2-4)

- Gas fittings are located on the bottom of the unit and are 1/4" OD bulkhead compression fittings.

### Sample System Installation

1. Remove all caps and fittings on the gas inlets and exhaust of the Model IR-148 Infrared Gas Monitor (See **Figures 2-2 and 2-4**).



### WARNING

**Failure to remove any caps from the unit gas inlet or exhaust fittings prevents gas sampling and may cause an undetected toxic and hazardous gas build-up and a flow trouble indication.**

2. Route the 1/4" OD tubing into the areas to be monitored.

#### NOTE:

Soldered connections on the sample line(s)

should be avoided due to the possibility of the monitor being sensitive to the solvents in the soldering flux paste.

3. After the line(s) are installed and BEFORE they are connected to the monitor:
  - a. Clean lines with compressed air or nitrogen to remove any debris.
  - b. Perform a leak-check to assure they are free of leaks.
  - c. Connect the line(s) to the sample port(s) on the monitor.
  - d. Install the end-of-line filters.
4. Install all tubing ends to the inlet fittings of the unit. Mark the location identity of each individual tubing on the tubing or on the inside of the instrument itself.

#### NOTE:

All unused sample port(s) must be plugged or have an end-of-line filter installed to avoid debris entering the unit.

5. Install an end-of-line filter on each end of the sample tubing at the monitoring location.
6. Connect the other end of the union to the end of the sample tubing at the monitoring location.



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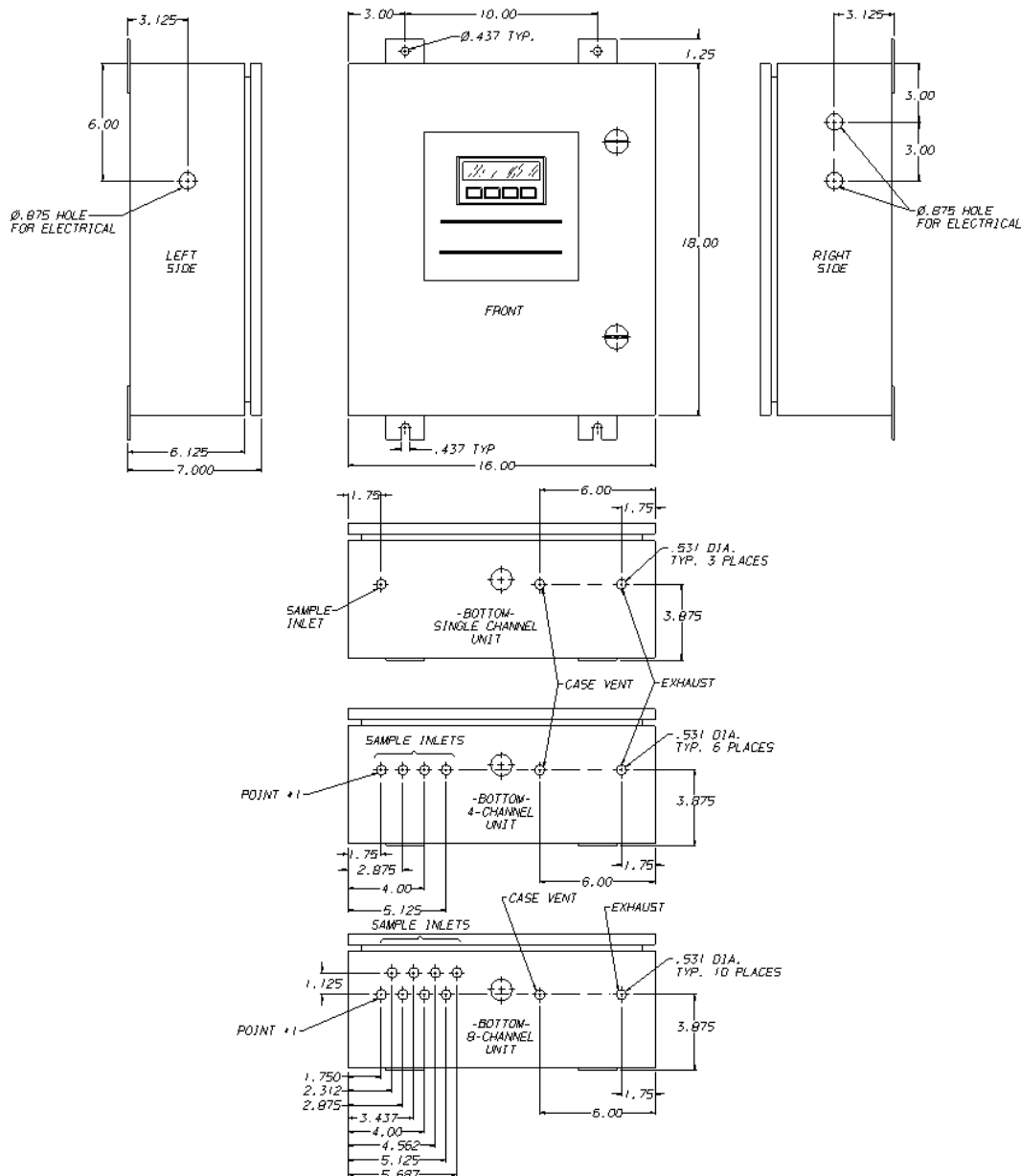
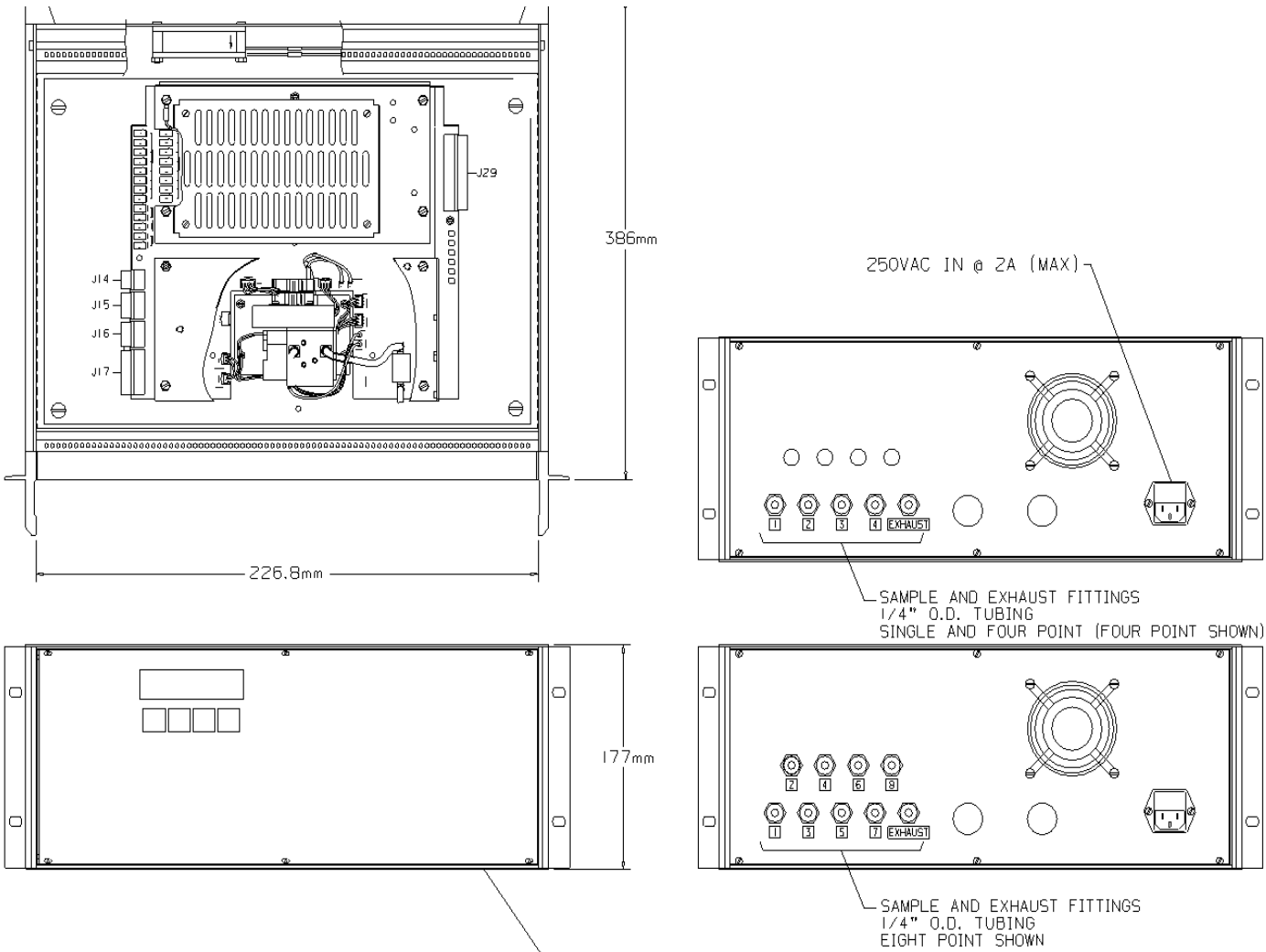


Figure 2-2. Standard Enclosure Unit Mounting Dimensions



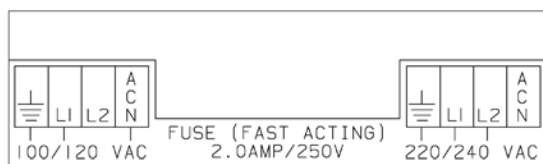
**Figure 2-3. Rack Mount Unit Mounting Dimensions**

**NOTE:**

The rack mount version is available only as a special order along with a special order Model CM4 rack cabinet. The rack mount version has not been tested by UL and does not carry any approvals certification. Contact your Honeywell Analytics representative for more information.

### CAUTION

Ensure that each and every sample tube has an end-of-line filter on it; otherwise, damage to the internal components may result



**Figure 2-4. Primary Power Wiring**  
**Wiring Connections**

### Opening the Unit

All wiring to the Model IR-148 unit is made via the side entries. Open the unit to provide complete access to all wiring connections.

Ensure that all wiring codes are followed. These codes include, but are not limited to, the National Electrical Code.

### CAUTION

Do not open the Model IR-148 unit door unless the equipment is protected from spalshing, spraying or dripping water; otherwise, damage to the internal components may result.

### Unit Power Wiring

A separate, dedicated power source is recommended for the Infrared Gas Monitor to ensure that the unit remains powered when other circuits are shut down for servicing, routine maintenance or shift changes.

The monitor uses a wide range power supply which can accept AC power from 100 to 240 volts, 50 or 60 Hz. The power wiring should enter the unit through one of the openings on the right side of the enclosure. Connections are made to the screw terminals labeled L1, L2, ACN and GND, located in the upper right side of the unit (See **Figure 2-4**). The maximum wire size that these connectors can accept is #12 AWG.

The incoming power provided to the monitor determines the configuration of the fuse(s) and wiring to the main power terminal block. **Figure 2-4** shows the fuse and wire connections for various voltages.

### Power Supply Wiring

1. Using a screwdriver, loosen the two latches on the enclosure door (See **Figure 2-1**).
2. Open the front door.
3. Determine the power requirements for your Model IR-148 unit, ensuring the power is clean and reliable. (Refer to [Section 1, Table 1-1](#) for current capacity specifications.)

### CAUTION

If unsure of your available power, contact your facility engineer or safety officer. If the incorrect power is applied, instrument damage may occur

### Wiring the Model IR-148 Unit

- Route power wiring through one of the entries in the side of the unit.

#### NOTE:

Power wiring should be separated from relay wiring.

- For single fuse 100/120 Volts AC power connection, connect the:
  - power wire to L1
  - neutral wire to ACN
  - ground wire to ↓ terminal
- For double fuse 220/240 Volts AC power connection, connect power wires to L1 and L2 and ground wire to ↓ terminal

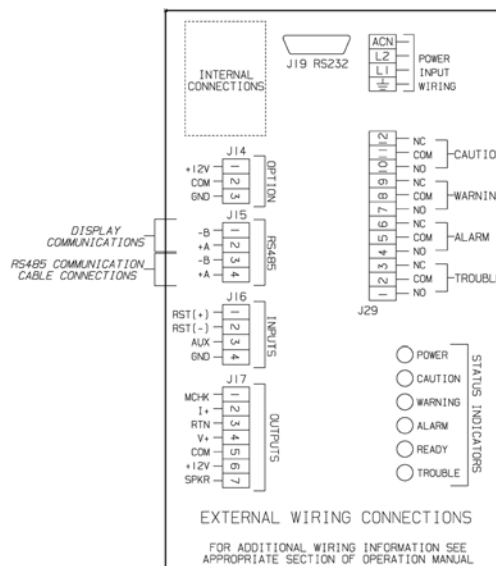


Figure 2-5. Wiring Connections

### Analog Signal Output Wiring (Figure 2-5)

The Model IR-148 unit has two available analog outputs. Each analog output is software-selectable between 10% or 100% of full scale:

- 4-20 mA, isolated, current sourcing
- 0-10 VDC.

These voltage and current outputs are proportional to the displayed gas concentration. Connections are made to terminal strip J17 located on the lower left side of the main circuit board (See **Figure 2-5**). Analog output wiring should enter the unit through the hole provided on the left side of the unit. The terminal portion of the connector can be removed



from the circuit board for easier connection. The maximum wire size that these connectors can accept is Listed #12 AWG; the maximum cable length is 500 feet (166 meters).

It is suggested that Listed #18 AWG, twisted-pair wire be used. If shielded wire is necessary, ground the shields of all cables at the receiving end of the signal. Do not ground or connect the shields at the Model IR-148 Monitor.

### 4-20 mA

The 4-20 mA output sources current to a separate return. Connections are made to terminals 2 (I+) and 3 (RTN) on terminal strip J17.

### 0-10 VDC

The 0-10 VDC output sources voltage to 2 K ohms maximum load. Connections are made to terminals 4 (V+) and 5 (COM) on terminal strip J17. The voltage output can be programmed to correspond to the channel presently being sampled. The front-panel screen shows:

1V/PT IF OUT = 1-10V

(indicating one volt per point if output equals one to 10 volts).

When enabled, and the unit is monitoring from:

- channel 1: voltage output is one volt

- channel 2: voltage output changes to two volts.

### CAUTION

**Bundle low voltage (< 30V) wiring together, separate from high voltage (>30V) wiring.**

## Relay Outputs

### Alarm Relays

There are three alarm relay outputs:

- Caution (factory-set to trip at 9 ppm)
- Warning (factory-set to trip at 29 ppm)
- Alarm (factory-set to trip at 700 ppm)

Each relay can be set up as latching/non-latching and/or normally-energized/normally de-energized. Contacts are Form C at 240 Volts AC 8 Amps resistive. Connect wiring to Terminal Strip J29. User can adjust alarm trip points via the front panel (see [Section 3, Figure 3-13](#)).

### Alarm Relay Connections Wiring

Three level alarm relay outputs are provided. All alarm relays are Form C, SPDT relays which can be wired to either closed or opened contacts in an alarm condition.

Each relay has contacts for:



- NORMALLY OPEN (NO)
- COMMON (COM)
- NORMALLY CLOSED (NC)

The function of each relay connector terminal is indicated on **Figure 2-5**.

Relay wiring should enter the unit through one of the openings on the right side of the unit. Connections are made at the internal terminal strip labeled J29, located on the right side of the circuit board (See **Figure 2-5**). The terminal portion of the connector can be unplugged from the circuit board for easier wire connections.

### NOTE:

The maximum wire size that these connectors can accept is #12 AWG.

## Fault/Trouble Relay

There is one relay (the Fault/Trouble relay) within the unit that indicates that a fault/trouble or start-up condition exists. This relay is configured from the factory and operates differently than the alarm relays. It operates in a normally-energized mode.

This relay is energized when the instrument is:

- normally operating,
- in the calibration mode, or
- in the setup condition.

The relay is de-energized when:

- a fault/trouble is detected,
- the unit is in the start-up state, or
- the main power is lost.

This means that power is no longer provided to the relay coil. It is not possible to change the configuration of the Fault/Trouble relay.

The relay connector function or identification:

- NORMALLY OPEN (NO),
- COMMON (COM),
- NORMALLY CLOSED (NC)

as marked in **Figure 2-5** refers to the relay contacts as if the relay is de-energized or in the fault/trouble condition. A relay contact is provided between the Normally Closed (NC) and Common (COM) position. This contact will be made in the event that main power to the unit is lost or any other fault/trouble condition exists.

## Fault/Trouble Relay Connection Wiring

The Fault/Trouble relay wiring should enter the unit through one of the entries on the right side of the unit. Connections are made at the internal terminal strip labeled J29, positions 1, 2 and 3 (located on the right side of the circuit board - **Figure 2-5**). The terminal portion of the connector can be unplugged





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from the circuit board for easier wire connections. The maximum wire size that these connectors can accept is #12 AWG.

### Remote Reset

The audible alarm and latched gas level alarms can be remotely reset through a switch that has a momentary contact opening (normally closed set of contacts). Connections are made to terminal strip J16, terminals 1 and 2 with the wiring entering the enclosure through the hole on the left side of the instrument. The switch must have signal-level contacts, typically gold plated. The maximum distance from the reset switch to the monitor, using 18 AWG wire, is 250 feet. The maximum wire size that these connectors can accept is #12 AWG.

### Audible Alarm Output

An output is provided to drive the piezo-electric horn on the bottom of the unit. An additional output is available for customer use, provided that the beacon is not installed.

### Auxiliary Input

A 4-20 mA analog input can be made to the monitor from another device such as another Infrared Gas Monitor or an oxygen monitor. The input wiring should be brought into the enclosure through the hole on the left side of the instrument and connected to terminals 3 (AUX) and 4 (GND) on terminal strip J16. It is recommended that Listed #18 AWG, twisted pair wire be used; maximum

wire length is 250 feet. The maximum wire size that these connectors can accept is Listed #12 AWG. Shielded wire is necessary. Ground the shields of all cables at the transmitting end of the signal. Do not ground or connect the shield at the Model IR-148 Infrared Gas Monitor.



### CAUTION

**All field wiring must be done in accordance with local and national electrical codes.**

## Initial Calibration

### NOTE:

Calibrate after installation; otherwise, false or erroneous readings can result.

The initial calibration is the same as the routine calibration. Refer to **Section 4** for this procedure.

## Multipoint Sequencer Operation

Model IR-148 operation with a sequencer has a normal dwell time of 30 seconds per sample line, or four measurement cycles.

To improve monitor performance in noisy environments and eliminate false alarms due to high noise, a user-selectable parameter “threshold” was established.

- The factory value for this threshold is 30%.
- The threshold value is used with the



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## Model IR-148 Infrared Gas Monitor

Caution Alarm setpoint to determine when additional readings must be made on the current sample line to confirm actual concentration at the sample point.

- The allowable adjustment range for the threshold value is 30% to 70%.

The displayed concentration is based on a moving average of nine measurement cycles. After four measurement cycles, the display indicates 4/9 of the final value.

- If this value is greater or equal to the product of the threshold and the Caution Alarm value, the monitor dwells for an additional 60 seconds or eight more measurement cycles.
- Raising the threshold above 30% prevents false alarms but also requires greater gas concentrations to cause the Caution Alarm to trip.

In the sequencer setup screens, unneeded points can be de-activated by using the RIGHT ARROW key and selecting the point to be de-activated.

- When the change key is pressed, the number in the display goes blank.
- After pressing OK, the display shows a dark diamond to indicate which points are de-activated (see [Section 3, Figure 3-11](#)).

In the sequencer setup screens, the monitor can be locked on a single point by pressing CHANGE before the RIGHT ARROW key.

- After pressing the RIGHT ARROW key and OK, only the selected point is indicated.
- After an hour (if no buttons are pushed), the monitor returns to normal sequencer operation (see [Section 3, Figure 3-12](#)).

When calibrating:

- the gas inlet point can be selected.
- an inactive point can be selected.

After leaving calibration:

- the monitor returns to the previous sequencer setup (see [Section 3, Figure 3-4](#)).



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Model IR-148 Infrared Gas Monitor

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## 3 - Display Screens



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## Model IR-148 Infrared Gas Monitor

Before applying power to the Model IR-148 Infrared Gas Monitor, follow the Appendix A check list to ensure proper configuration for operation. All Instrument operation is performed via the front panel which consists of four keys and a two line by 20-character vacuum fluorescent display. There is no reason to open the unit for set-up, calibration or diagnostic testing of the instrument. The most commonly used, self-explanatory screens appear on the following pages. Simply follow the on-screen menus. The step-by-step approach guides you through each operation.

The Display Screen Flow Overview (See **Figure 3-1**) shows a general system function flow. See the following Figures for specific Display Screen details:

- Start-up and Normal Operation Screens (See **Figure 3-2**)
- Calibration Screens (See **Figures 3-4 through 3-6**)
- Information Screens (See **Figures 3-7 through 3-10 and Figures 3-23 and 3-24**)
- Set-up Screens (See **Figures 3-3 and 3-11 through 3-22**)

### Model IR-148 Display Screen Overview

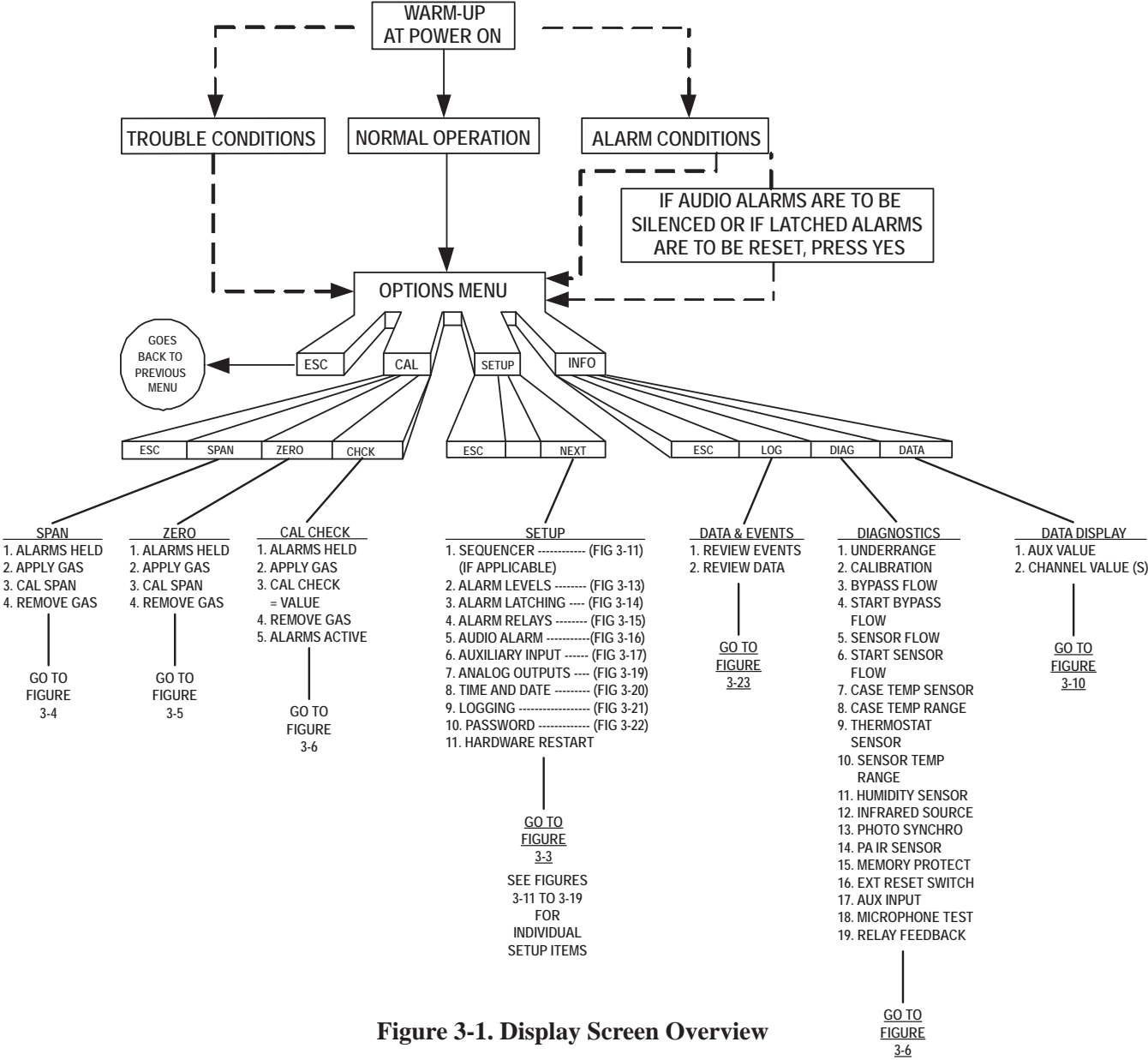


Figure 3-1. Display Screen Overview



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## Model IR-148 Infrared Gas Monitor

### Start-Up and Normal Operation Screens

#### At Power-On ...

TARGET GAS	WARMUP	THIS IS THE FIRST SCREEN THAT WILL APPEAR AFTER A BRIEF HARDWARE AND MEMORY TEST WHEN POWER IS APPLIED. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU"
ANY KEY FOR MENU		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Trouble Condition

TARGET GAS	TROUBLE	THIS SCREEN WOULD APPEAR IF A "TROUBLE" CONDITION OCCURRED. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU". SCREEN WILL FLASH IN THIS CONDITION
ANY KEY FOR MENU		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Only if Audio Alarm is ON ...

RESET ALARMS?	FROM THE ABOVE SCREENS THIS WILL APPEAR BEFORE THE "OPTIONS MENU" IF THE AUDIO ALARM IS ON OR ALARMS ARE LATCHED. "ESC" TO ABOVE SCREENS OR OTHER KEYS TAKE THE USER TO THE "OPTIONS MENU".
ESC NO YES NEXT	
<input type="checkbox"/>	<input type="checkbox"/>

#### Sequencer Warmup Screen

PT: 12345678:	WARMUP	THIS IS HOW A SEQUENCER SCREEN WILL APPEAR DURING WARMUP (4-POINT SEQUENCER ALSO AVAILABLE). NON-ACTIVE POINTS ARE BLANKED OUT. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU".
ANY KEY	TARGET GAS	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Sequencer Alarm Screen

PT: 12345678:	50 PPM	CAUTION, WARNING AND ALARM STATUS APPEAR BELOW EACH POINT. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU". "A" IS FOR AUXILIARY INPUT IF INSTALLED.
AL: CWAAWC--	TARGET GAS	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Normal Operation

TARGET GAS	25 PPM	THIS IS A TYPICAL SCREEN AS IT WOULD APPEAR DURING NORMAL OPERATION. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU"
ANY KEY FOR MENU		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Alarm Conditions

TARGET GAS	150 PPM	SIMILAR SCREENS WILL APPEAR FOR WARNING AND ALARM. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU". SCREEN WILL FLASH IN THIS CONDITION.
ANY KEY	CAUTION	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Options Menu

OPTIONS MENU:	"ESC" BACK TO ABOVE SCREENS. "CAL" FOR CALIBRATION MENU. "SETUP" FOR ALL SETUP PARAMETERS. "INFO" TO CHECK DIAGNOSTICS, TROUBLE CONDITIONS OR FOR ADDITIONAL DATA
ESC CAL SETUP INFO	
<input type="checkbox"/>	<input type="checkbox"/>

#### Sequencer Screen

PT: 12345678:	50 PPM	THIS IS HOW SEQUENCER POINTS NORMALLY APPEAR. THE POINT BEING SAMPLED WILL BE DISPLAYED IN REVERSE VIDEO. NON-ACTIVE POINTS ARE BLANKED OUT. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU".
ANY KEY	TARGET GAS	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Sequencer Trouble Screen

PT: 12345678:	TROUBLE	THIS IS HOW TROUBLE IS INDICATED ON A SEQUENCER SCREEN. "ANY KEY" TAKES THE USER TO THE "OPTIONS MENU".
AL: CWAAWC--	TARGET GAS	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3-2. Start-up and Normal Operation Screens



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### Set-Up Screens

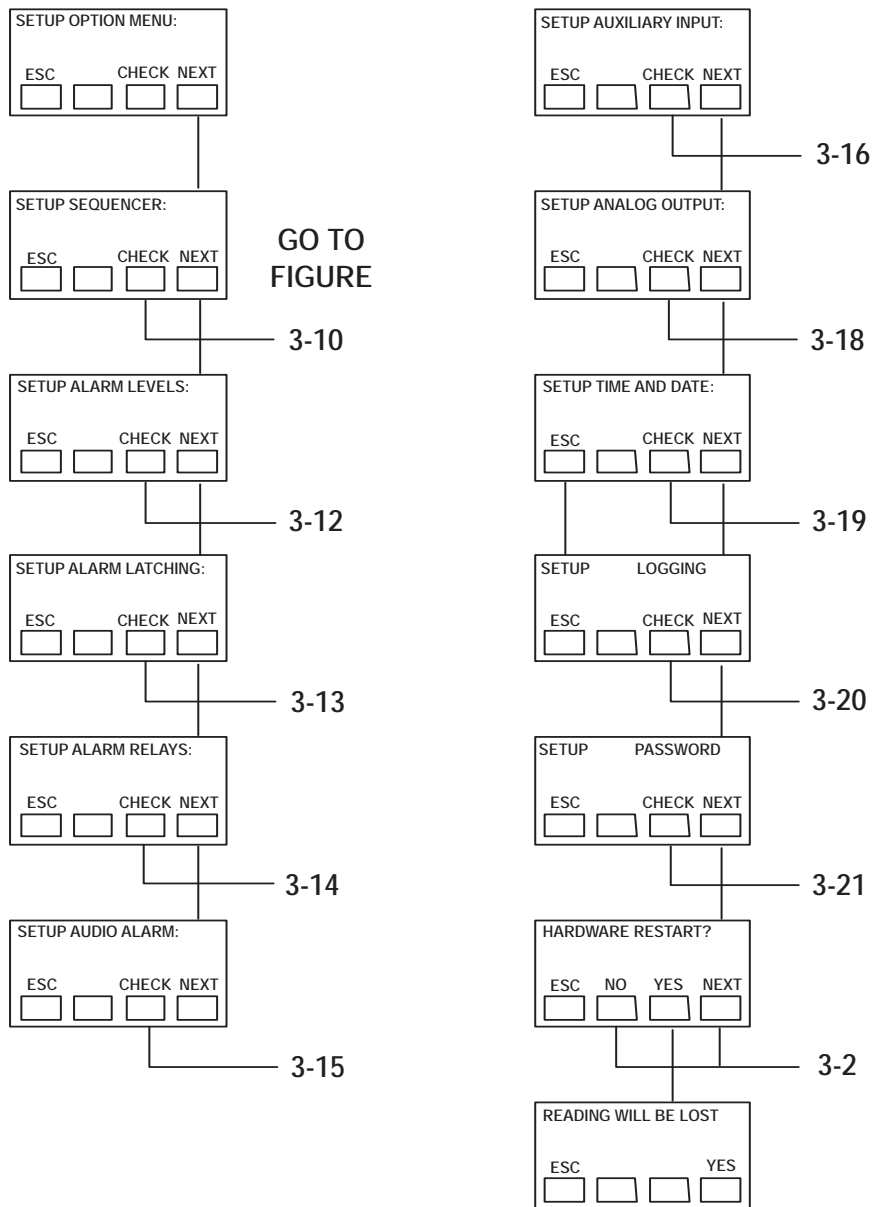
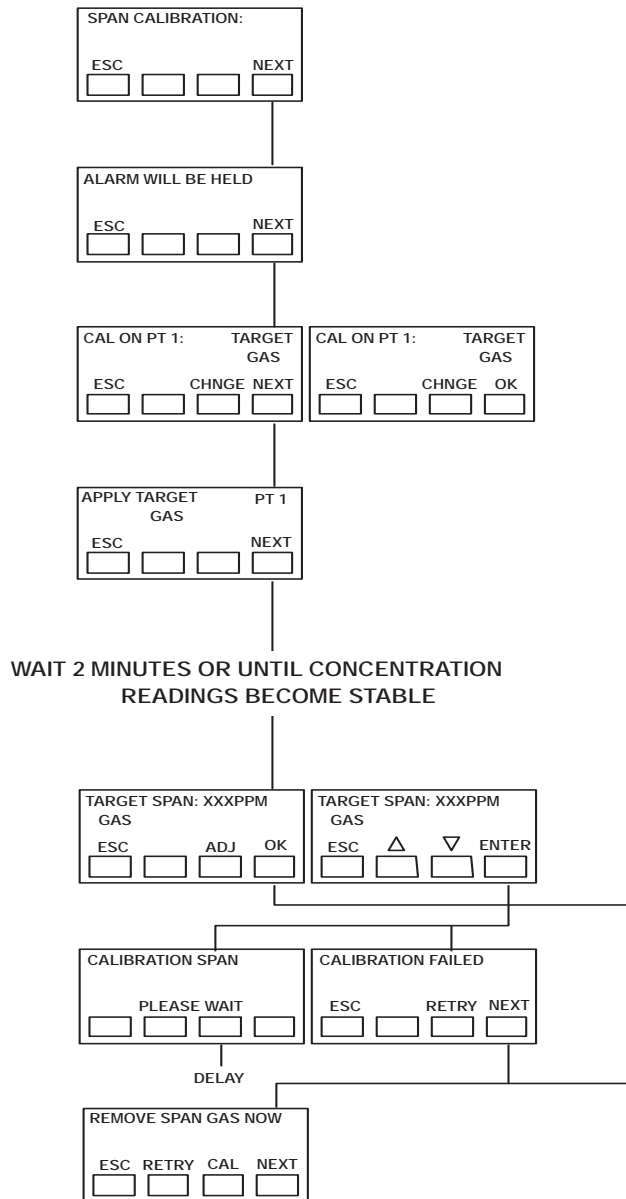


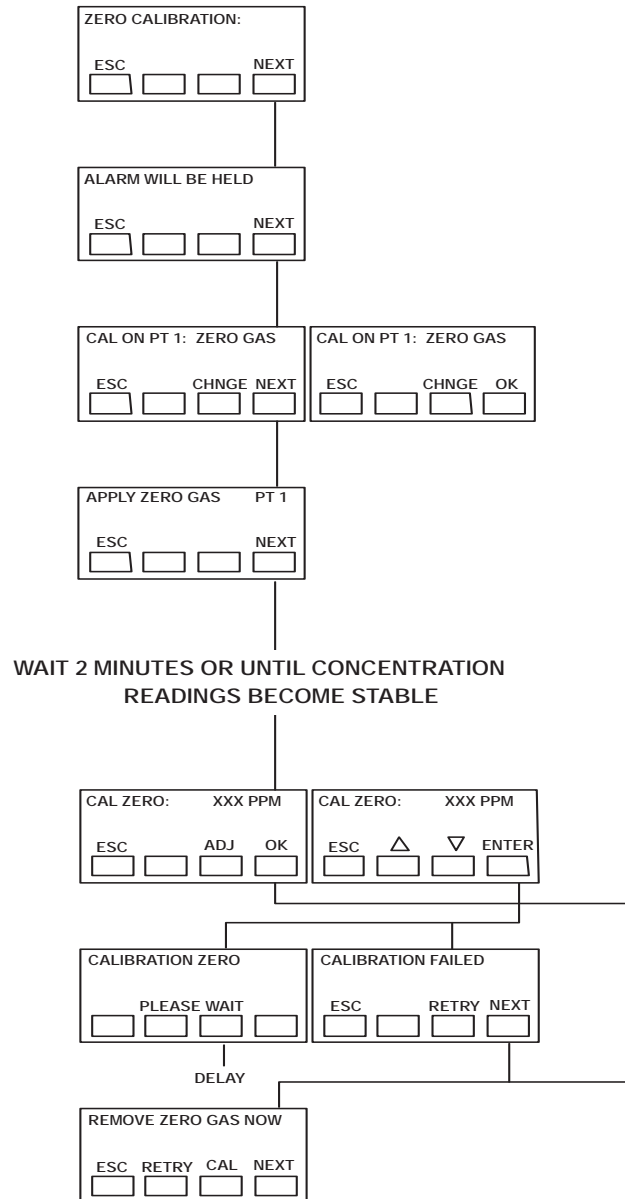
Figure 3-3. Set-up Screens

### Span Calibration



**Figure 3-4. Span Calibration**

### Zero Calibration



**Figure 3-5. Zero Calibration**





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### Check Calibration

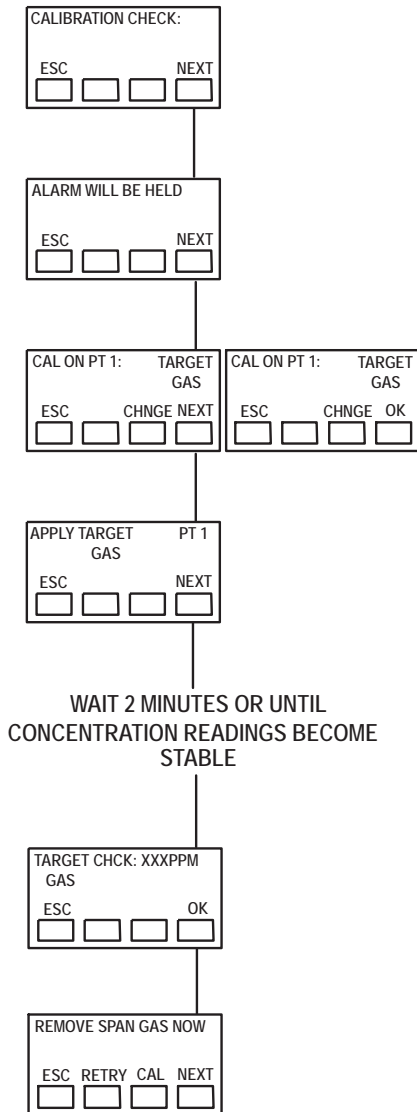
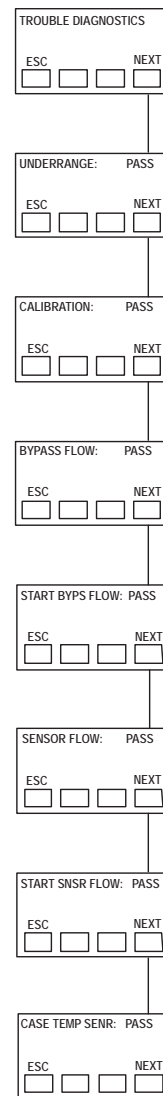


Figure 3-6. Check Calibration

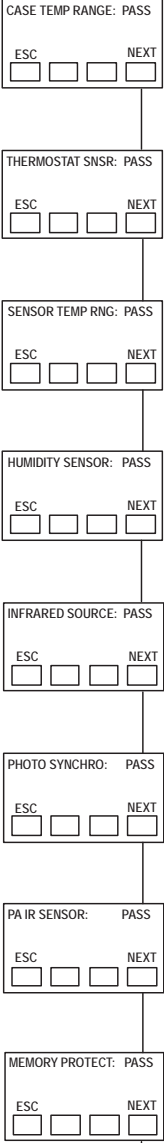
### Diagnostic Screens



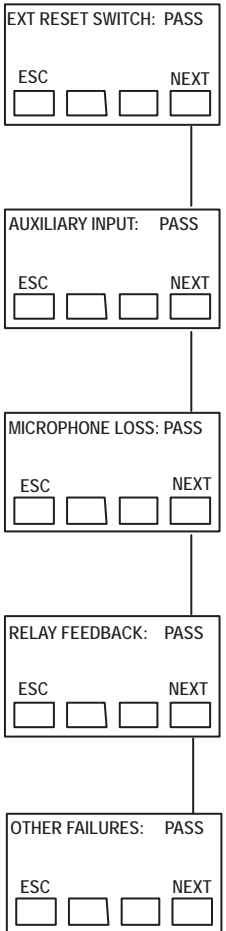
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FIGURE 3-8

Figure 3-7. Diagnostic Screens

### Diagnostic Screens



**Figure 3-8. Diagnostic Screens**



**Figure 3-9. Diagnostic Screens**



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### Data Screens

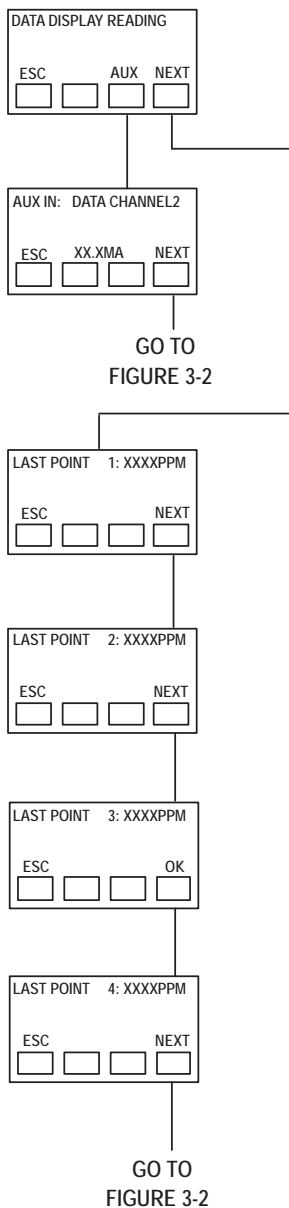


Figure 3-10. Data Screens

### Sequencer Setup Screens

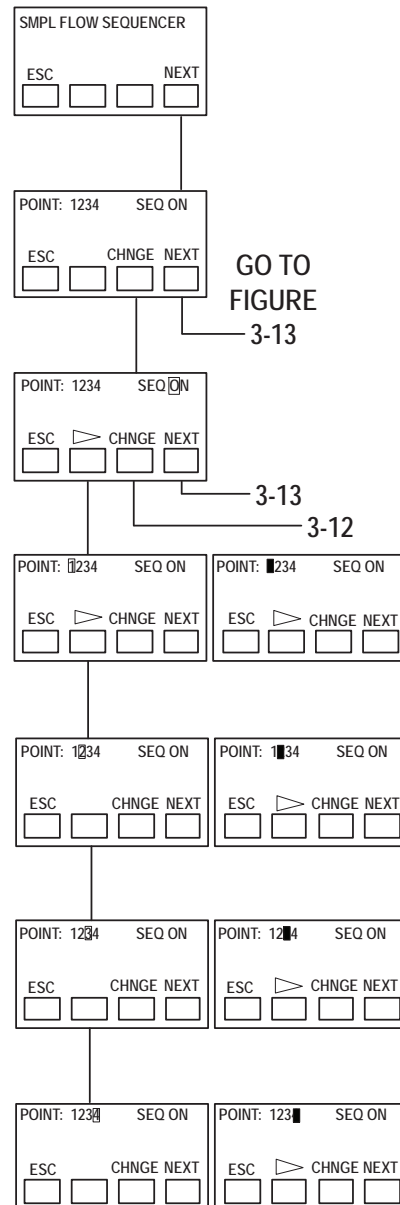


Figure 3-11. Sequencer Setup Screens



## Sequencer Setup Screens

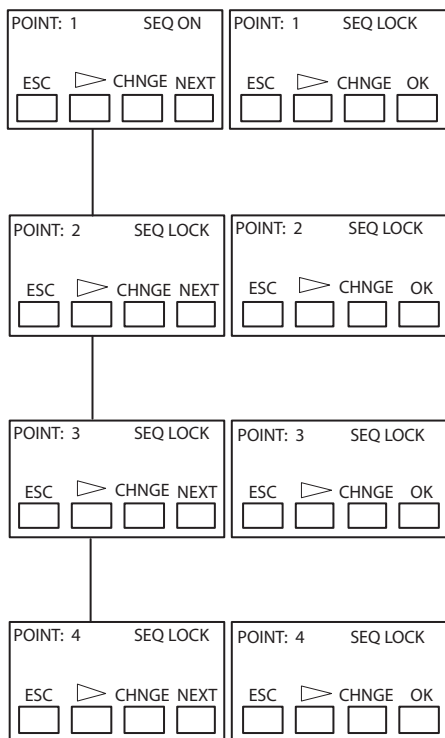


Figure 3-12. Sequencer Setup Screens



## Model IR-148 Infrared Gas Monitor Alarm Level Screens

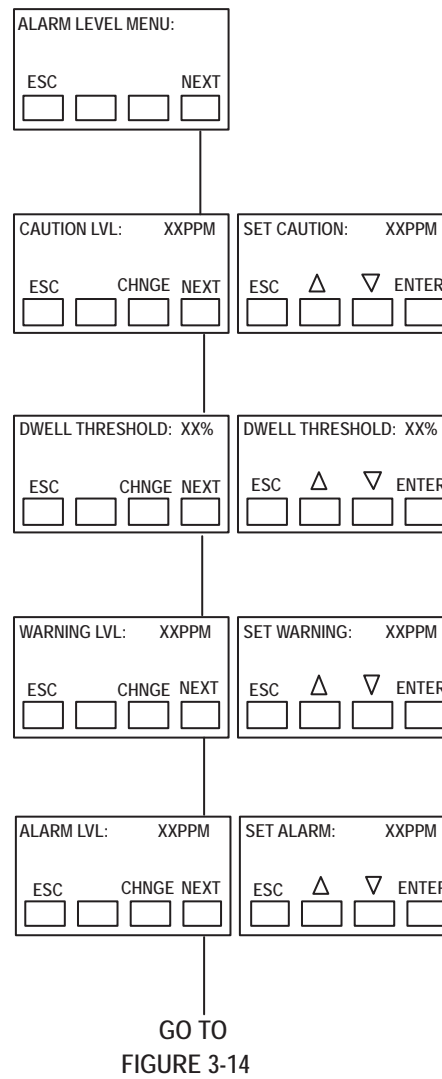


Figure 3-13. Alarm Level Screens

## Alarm Latching Screens

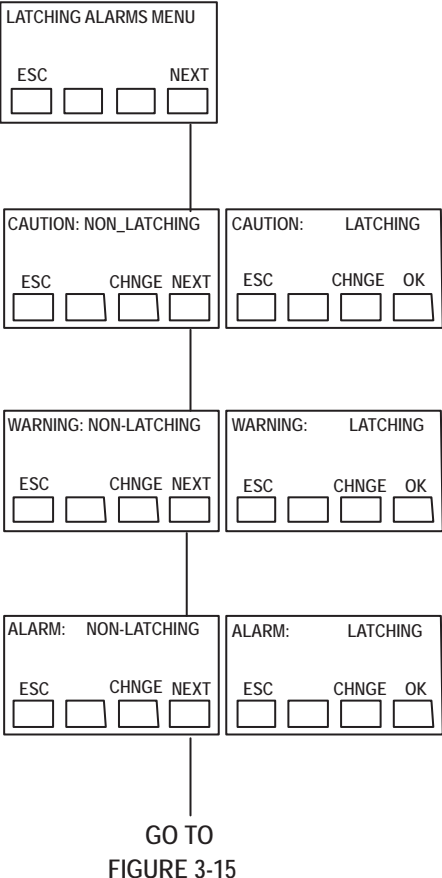


Figure 3-14. Alarm Latching Screens

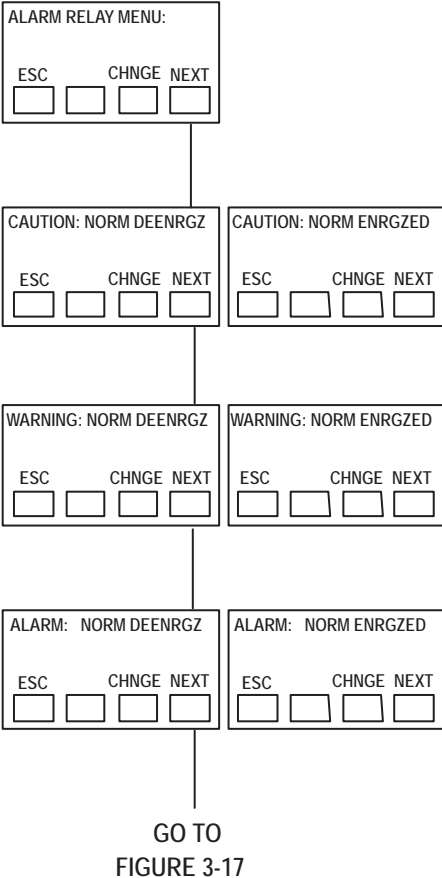
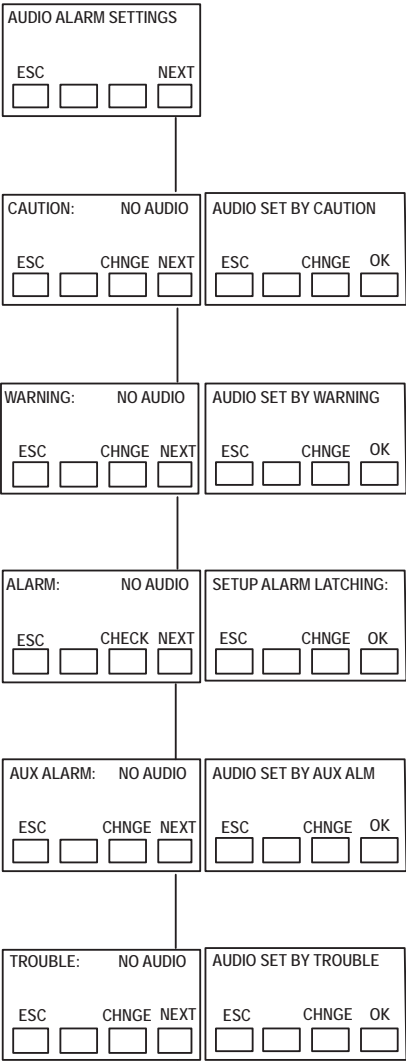


Figure 3-15. Alarm Latching Screens

## Audio Alarm Screens



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FIGURE 3-17

**Figure 3-16. Audio Alarm Screens**



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### Auxiliary Alarm Screens

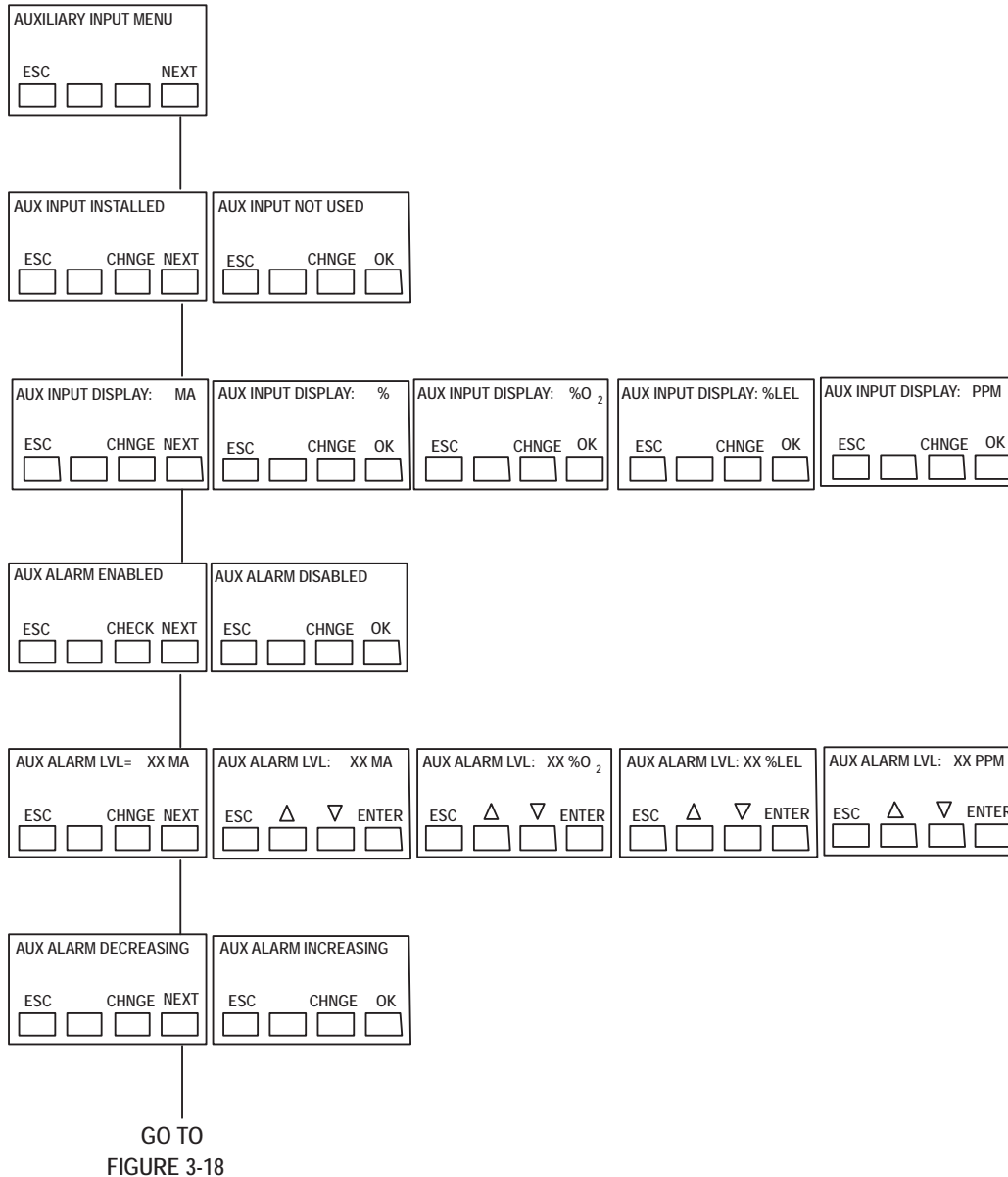


Figure 3-17. Auxiliary Alarm Screens



## Auxiliary Alarm Screens

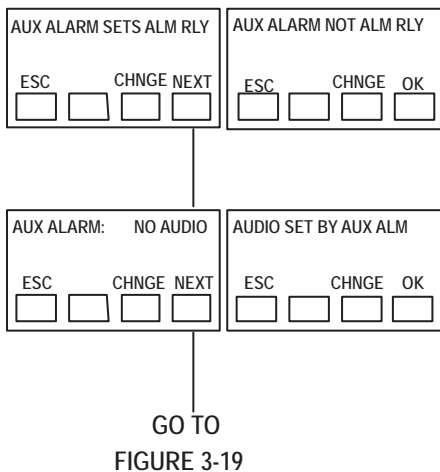


Figure 3-18. Auxiliary Alarm Screens



## Model IR-148 Infrared Gas Monitor Analog Output Screens

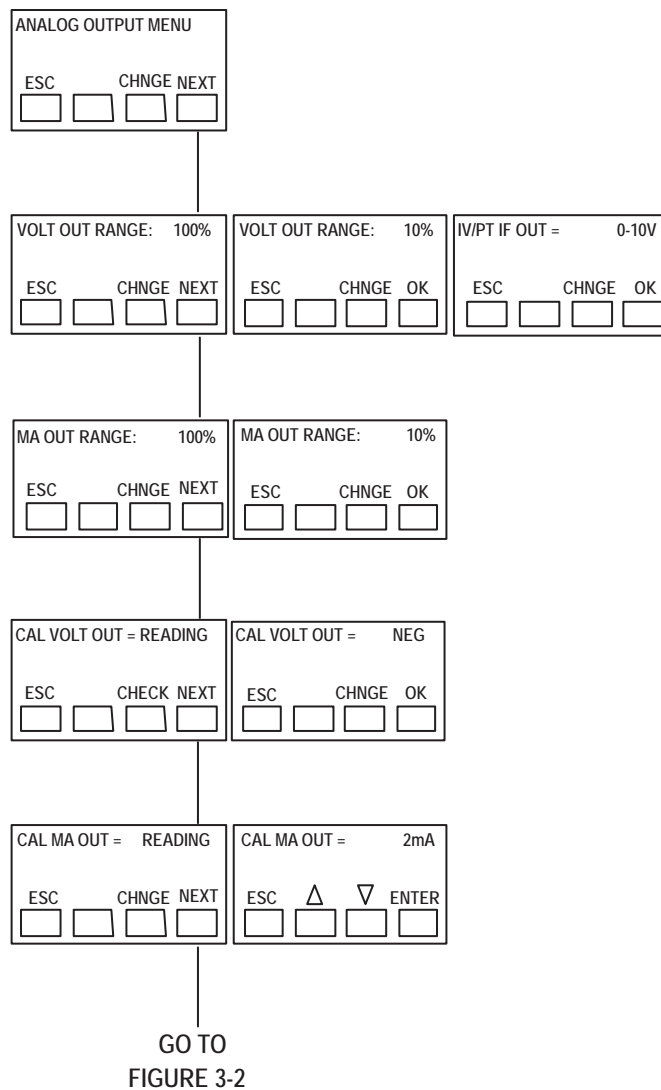


Figure 3-19. Analog Output Screens





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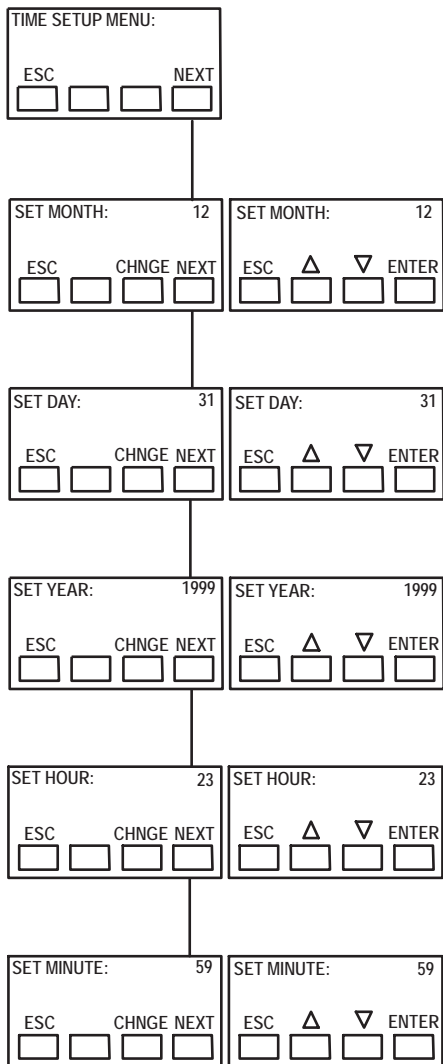


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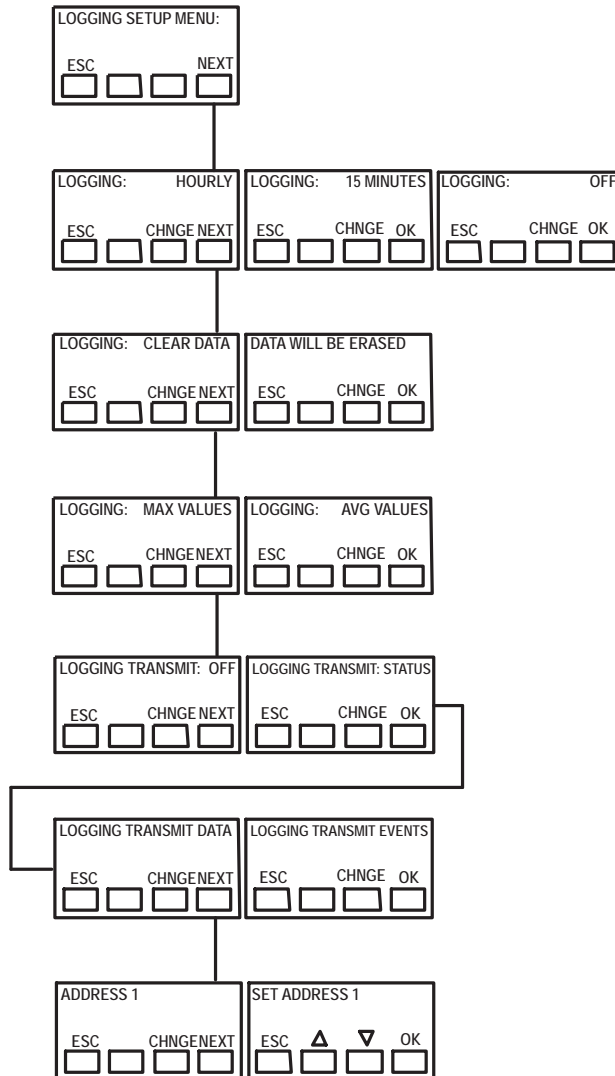
### Setup Time



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FIGURE 3-21

Figure 3-20. Setup Time

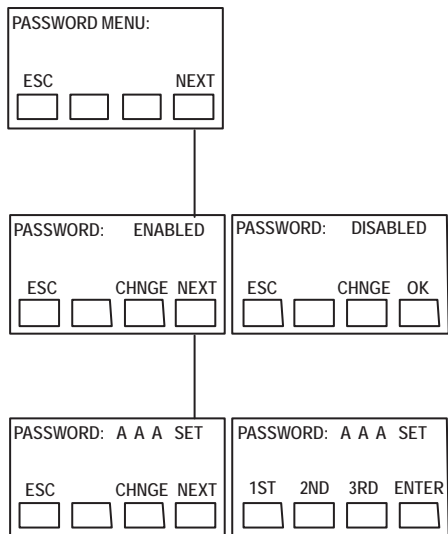
### Setup Logging



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FIGURE 3-22

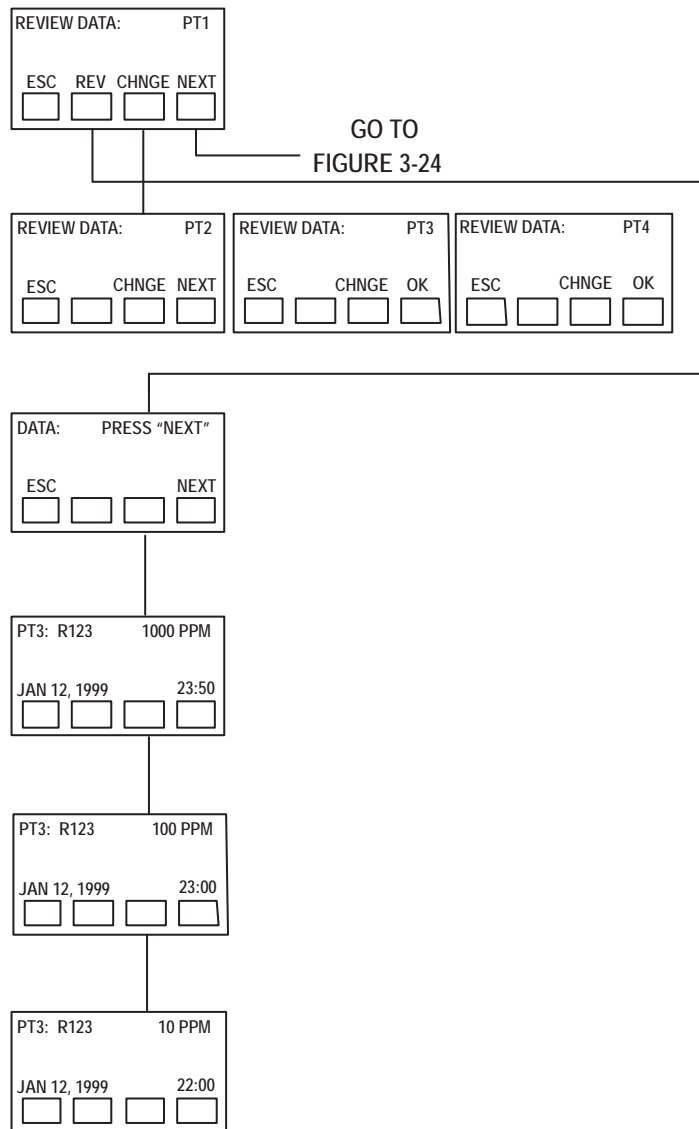
Figure 3-21. Setup Logging

### Setup Password



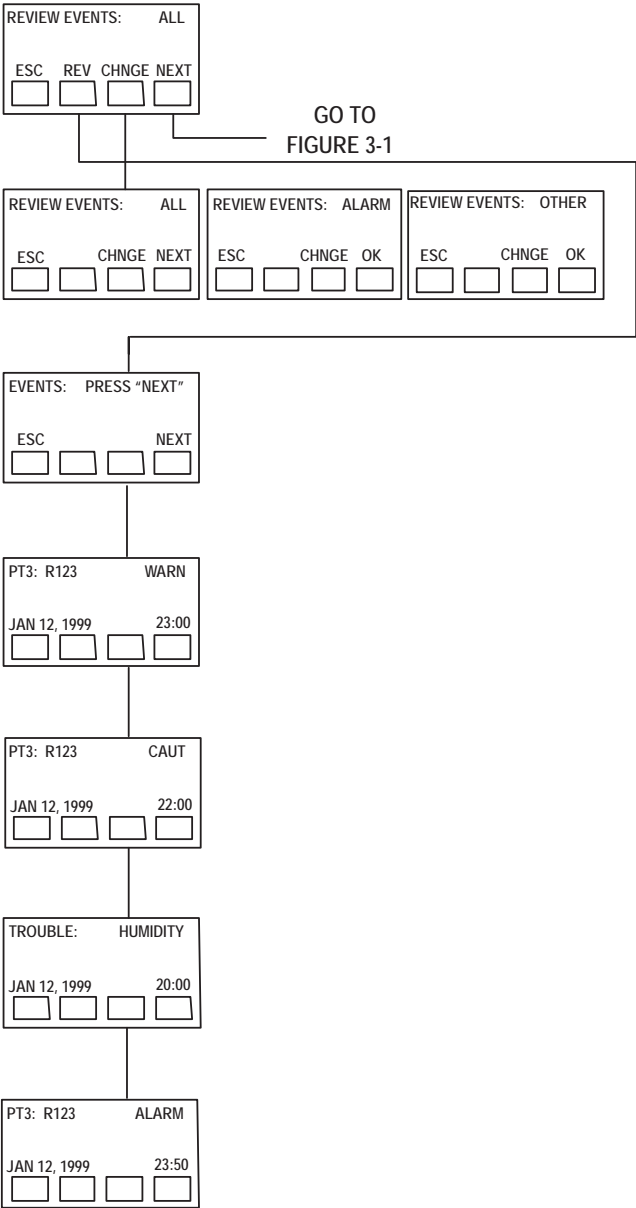
**Figure 3-22. Setup Password**

### Review Data



**Figure 3-23. Review Data**

### Review Log



**Figure 3-24. Review Log**



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Model IR-148 Infrared Gas Monitor

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## 4 - Calibration



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As with any type of gas monitor, the only true check of its performance is to apply gas directly to the sensor. The frequency of the calibration gas tests depends on the operating time and exposure of the sensors. New monitors should be calibrated more often until the calibration records prove stability. The calibration frequency can then be reduced to the schedule set by the safety officer or plant manager. All diagnostics appear on the front panel screen; refer to the screens in Section 3.

### Calibration Equipment

#### Equipment Needed:

- Calibration Kit P/N 1324-0050 (See **Figure 4-1**)
- Zero Gas
- Span Gas
- Contact Honeywell Analytics for calibration cylinder.

The SPAN or ZERO cylinders (if required) may be included in the Calibration Kit; cylinders shown in **Figure 4-1** are available from Honeywell Analytics:

If a synthetic span gas is being used, check the label on the inside of the front door for information on the expected reading for the synthetic span gas. Locate the Calibration Kit and proper span gas cylinder. The Calibration Kit contains some of items

that are not used, such as a zero gas scrubber. If you have a single-point unit, skip to the “Zeroing” section. Become familiar with the Calibration Kit components (See **Figure 4-1**).

Calibration Gas Cylinder	Used to Calibrate	Part Number
100 ppm Carbon Monoxide	CO	1324-0051
100 ppm R22	R22, CH <sub>2</sub> F <sub>2</sub>	1324-0052
30 ppm R134a	R134	1324-0053
100 ppm R123	C <sub>4</sub> F <sub>6</sub>	1324-0055
30 ppm R123	C <sub>4</sub> F <sub>6</sub>	1324-0090
0.75% Pentane	CH <sub>3</sub> F, C <sub>5</sub> F <sub>8</sub> , CH <sub>2</sub> Cl <sub>2</sub> , NH <sub>3</sub>	1324-0056
0.6% Propane	C <sub>4</sub> F <sub>8</sub> , NF <sub>3</sub>	1324-0091
100 ppm Nitrous Oxide	N <sub>2</sub> O	1324-0057
Zero Air		1324-0054

Table 4-1 - Calibration Gas Cylinders

### Model IR-148 Identification

You must identify your unit as a single-point monitor or a multipoint monitor for proper calibration gas connection. Refer to **Figure 4-2** to help identify your unit.



### Calibration Procedures

Before calibrating the Model IR-148 Monitor, leak check the sample line(s) connected to the monitor.

1. Temporarily block the sample inlet at the end-of-line filter(s) and verify that the monitor gives a trouble alarm.
  - If the monitor is a Multipoint Sequencer, the trouble alarm will not activate until the blocked sampling point is selected by the Sequencer.
2. After checking for leaks, remove the sampling line from the Model IR-148 inlet.
  - On Multipoint Monitors, use sample inlet Point 1.
3. Attach the Calibration Kit connector assembly to the inlet.



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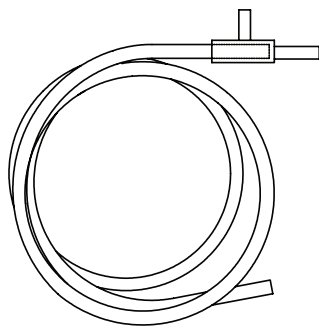
Next



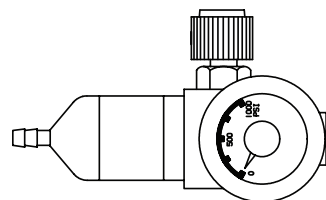
Forward

# Honeywell

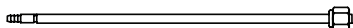
## Model IR-148 Infrared Gas Monitor



**Item 1 - Tube and Tee Assembly**



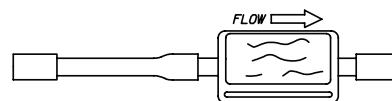
**Item 2 - 1.5 LPM Flow Control**



**Item 3 - Connector Assembly**

**Note:**

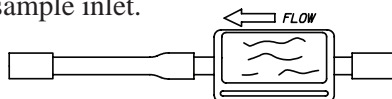
When used with older models of photoacoustic monitors, the nut end of the connector must be cut off to fit into the photoacoustic sample inlet.



**Item 4 - Span Gas Scrubber**

**Note:**

Replace protective caps after use.



**Item 5 - Zero Gas Scrubber**

**Figure 4-1. Kit Components**



# Honeywell

## Model IR-148 Infrared Gas Monitor

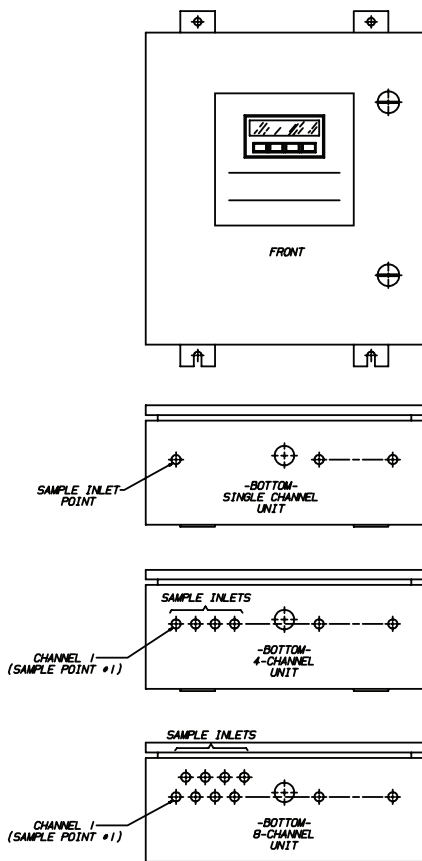


Figure 4-2. Model IR-148 Standard Enclosure Units

4. Before applying gases, familiarize yourself with the calibration screens by stepping the monitor through the whole sequence. Press the keys in the order shown in **Table 4-2**.

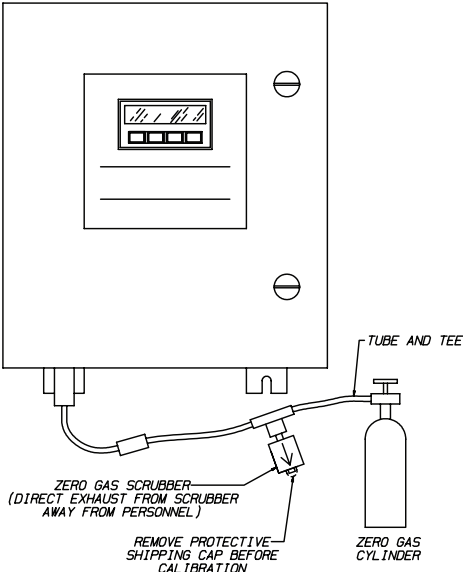
- When this sequence is done with zero and span gases, adjust the zero and span readings (if necessary) in Table 4-2 steps 9 and 15 respectively.

- If adjustments are needed, press ADJ to access the UP, DOWN and ENTER keys; enter the zeroing and spanning adjustments.

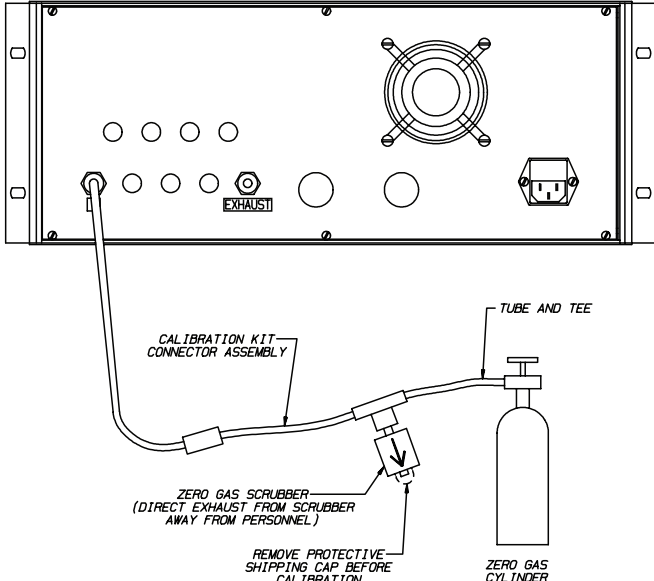
Step #	Press	Result
1	Any Key	Brings up Menu
2	Cal	Brings up Cal Menu
3	User	Allows adjustments
4	Zero	Allows Zero Calibration
5	Next	Prompt: Alarms Are Now Off
6	Next	Prompt: Sample Point 1 to be Used
7	Next	Prompt: Apply Zero Gas
8	Next	Prompt: Adjust or OK Reading
9	OK	Prompt: Remove Zero Gas
10	Span	Prompt: Go Into Span Calibration
11	Next	Prompt: Alarms Are Now Off
12	Next	Prompt: Sample Point 1 to be Used
13	Next	Prompt: Apply Span Gas
14	Next	Prompt: Adjust or OK Reading
15	OK	Prompt: Remove Span Gas
16	Next	Prompt: Alarms are Now Active
17	Next	Returns to Normal Operation

Table 4-2. Calibration Sequence Screens

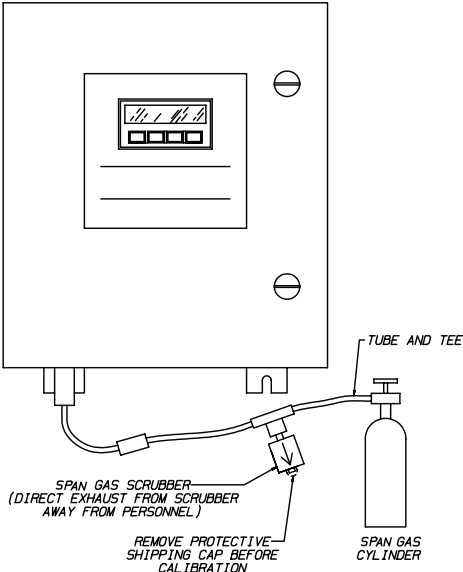




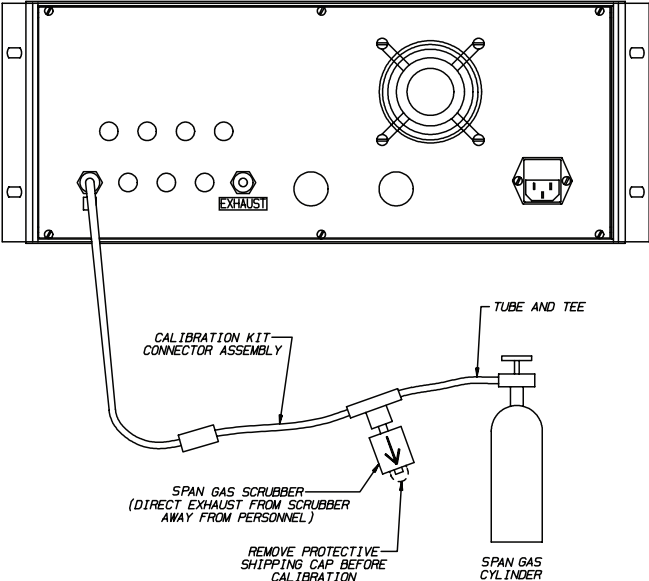
**Figure 4-3. Standard Enclosure Unit ZERO Calibration**



**Figure 4-4. Rack Mount Unit ZERO Calibration**



**Figure 4-5. Standard Enclosure Unit SPAN Calibration**



**Figure 4-6. Rack Mount Unit SPAN Calibration**

### 5. Zeroing the Monitor:

Connect zero gas cylinder to the connector as shown in **Figures 4-3 and 4-4**.

### 6. Spanning the Monitor:

When span gas is required, a span gas cylinder must be attached to the connector as shown in **Figures 4-5 and 4-6**.

#### Note:

The span gas must be appropriate for monitor calibration. If a synthetic span gas is used, refer to the calibration label on the inside of the monitor door (See **Figure 4-7**).

- Set the unit to the value given on the “synthetic span” label (See **Figure 4-7**).

BENCH TYPE	BENCH S/N	UNIT S/N
A ZERO COEFF	H ZERO COEFF	
GAS TYPES		
A SPAN COEFF		
A POLY COEFF		
H COMP COEFF		
T ZERO	T SPAN	T POLY
V ZERO COEFF	V SPAN COEFF	
I ZERO COEFF	I SPAN COEFF	

**Figure 4-7. Unit Calibration Label**

### 7. Perform the Table 4-2 sequence.

- Apply zero gas when requested. Allow enough time for a stable reading.
- Accept (OK) or adjust (ADJ) and enter a zero reading.

- Apply span gas when requested. Allow enough time for a stable reading.
  - Accept (OK) or adjust (ADJ) and enter the correct span reading.
8. Remove connector assembly and re-attach the sampling line to the monitor inlet.

### WARNING

**If the sampling line is not re-attached, the monitor cannot sample from the remote location.**

**During calibration, the alarm relays do not activate; ensure that a hazardous condition does not exist when calibrating the Model IR-148 system.**



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### Zeroing

1. Locate the zero scrubber and attach it with zero gas canister as shown in **Figures 4-3 and 4-4**.



#### CAUTION

Use the zero gas scrubber with the tee to prevent pressurization and resulting damage to the unit.

2. At the CALIBRATION MENU screen, press the button under ZERO.
3. ZERO CALIBRATION screen appears. Press button under NEXT.
4. ZERO CALIBRATION screen appears. This screen alerts you that the alarms will be held during the zeroing of the unit.
5. Press the button under NEXT.
6. Open the flow controller on the zero gas canister to allowing the flow of gas to the unit.
7. Allow sufficient time for the instrument to respond. The next screen that appears shows the actual gas concentration as detected by the instrument. Press the button under ADJUST to increase or decrease the reading.

8. After the adjustment is performed, press the button under ENTER. Please wait as instrument zeros itself. If zeroing is not possible, correct any fault/trouble condition and retry.
9. Remove the zero gas scrubber and zero gas canister from the instrument and apply span gas as shown in **Figures 4-5 and 4-6**.



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## Model IR-148 Infrared Gas Monitor



### CAUTION

Use the span gas scrubber with the tee to prevent pressurization and resulting damage to the unit.

## Spanning

1. Press the SPAN button.
2. Press the button under NEXT to continue with the calibration. The unit will alert you that the alarms will be held.
3. To acknowledge, press the button under NEXT.
4. Open the flow controller on the span gas canister to allowing the flow of gas to the unit.
5. Press the button under NEXT on the front panel.
6. Allow sufficient time for the instrument to read the span gas then press the adjust button.
7. Increase or decrease the reading until it agrees with the value on the span gas cylinder. When finished, press ENTER.
8. Wait while the instrument calibrates itself.
9. If the calibration fails, correct any fault/trouble condition and retry.

10. Turn off the cylinder flow controller and remove the span gas from the instrument.

11. Press EXIT to return to normal operation.



### CAUTION

For Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>) and Nitrous Oxide (N<sub>2</sub>O) Model IR-148 monitors only.

An effect observed on these infrared monitors is a reduction in signal at low relative humidities. The gas sample being drawn into the instrument MUST contain a humidity level greater than 0.3% by volume. At 72°F, this would represent a relative humidity level of approximately 10%.

To ensure the sample is humidified, Honeywell Analytics recommends placing an airtight water bubbler in the sample line. If the humidity level in the sample stream will be above 0.3% by volume at all times, the water bubbler is not necessary. Care MUST be used to ensure that sufficient water is present in the bubbler such that the humidity level is greater than 0.3% by volume at all times, including calibration.



### **WARNING**

**Failure to properly humidify the sample at all times can cause erroneous monitor readings. If the instrument is not properly humidified, the Model IR-148 Monitor may fail to perform as designed and persons who rely on this product for their safety could sustain severe personal injury or death.**

Calibration of the infrared sensor can be achieved by following the calibration procedure in this manual. The sample **MUST** be properly humidified during the calibration procedure.



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Model IR-148 Infrared Gas Monitor

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## 5 - Maintenance



### General Maintenance

Under normal operation conditions the Model IR-148 Monitor requires minimal maintenance. The end-of-sample-line filter(s) should be examined regularly for dirt/dust build-up and replaced when necessary. If the filter(s) become severely clogged with dust, the flow rate will eventually fail and a flow alarm will occur. If the end-of-sample-line filters are used and serviced correctly, the filters installed inside the monitor should rarely require replacement; however, these internal filters must be inspected periodically.

### Obtaining Replacement Parts

**⚠ WARNING**

Use only genuine Honeywell Analytics replacement parts when performing any maintenance procedures. Failure to do so may seriously impair unit performance. Repair or alteration of the Model IR-148 Monitor, beyond the scope of these instructions or by anyone other than authorized Honeywell Analytics service personnel, could cause the product to fail to perform as designed and persons who rely on this product for their safety could sustain serious personal injury or death.

To obtain replacement parts, address the order or inquiry to:

**Honeywell Analytics**  
**405 Barclay Blvd.**  
**Lincolnshire, IL 60069**

or call toll-free: **1-800-323-2000.**

Component	Part Number
2.0 amp, 250V Fuse	1324-0031
Display	1324-0032
Power Supply	1324-0033
Pump Assembly	1324-0034
Low Flow Switch	1324-0035
Polypropylene Tubing 1/8" ID x 150ft Roll	1324-0124

**Table 5-1. Replacement Parts**

Calibration Gas Cylinder	Used to Calibrate	Part Number
100 ppm Carbon Monoxide	CO	1324-0051
100 ppm R22	R22, CH <sub>2</sub> F <sub>2</sub>	1324-0052
30 ppm R134a	R134	1324-0053
100 ppm R123	C <sub>4</sub> F <sub>6</sub>	1324-0055
30 ppm R123	C <sub>4</sub> F <sub>6</sub>	1324-0090
0.75% Pentane	CH <sub>3</sub> F, C <sub>5</sub> F <sub>8</sub> , CH <sub>2</sub> Cl <sub>2</sub> , NH <sub>3</sub>	1324-0056
0.6% Propane	C <sub>4</sub> F <sub>8</sub> , NF <sub>3</sub>	1324-0091
100 ppm Nitrous Oxide	N <sub>2</sub> O	1324-0057
Zero Air		1324-0054

**Table 5-2. Calibration Gas Cylinders**





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## Model IR-148 Infrared Gas Monitor

### Troubleshooting Guidelines

Trouble	Description	Solution
Unit will not turn ON	No Power	Check AC power to unit.
		Verify AC power to unit is wired properly.
		Replace L1 and/or L2 fuse.
		Check for loose wires on terminal barrier input.
		Check wiring to the unit power supply. Remove power supply cover and check fuse; replace if necessary.
		Check input cable to main board on left side of power supply.
		Check for 12VDC power supply output. Connect the DVM negative lead to TP5 and the positive lead to TPSPD1. Adjust Volt 2 pot on the power supply if necessary.
		Move the DVM positive lead to TPSPD3. The voltage should be 5VDC. Adjust Volt 1 pot on power supply if necessary.
Under-range failed	Zero limit is minus 10 ppm	Adjust display zero to 0.0 via the keypad with zero air
		Check the zero air cylinder; replace if necessary
Calibration failed	Coefficients out of range	Change zero air supply
		Check span gas supply
		Check all tubing, filters and fittings for leaks.
		For sequencer units, make sure the unit is locked on the selected sample port used for calibration.
		Leak test the flow system.
		Return to Honeywell Analytics for service.

**Table 5-3. Troubleshooting Guidelines**



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Trouble	Description	Solution
Bypass flow failed	Leaky or blocked bypass line	Remove all input lines to unit. Attach one line at a time to check for bypass input. The line that causes flow failure is the problem; check the line's end-of-line filter.
		Check inlet fitting, tubing, orifices, bypass pressure switch and bypass manifold tubing.
		Check pressure switch for 4VDC ON and OFF switching. Check cable terminals and plug end at BP/SCN. Replace the bypass pressure switch if necessary
		Check operation of all bypass valves in manifold.
Start bypass flow failed	Leaky or blocked bypass line at startup of unit	Leak test the flow system.
		Same as bypass flow unit failure. Check as above, turn unit off and restart unit.
		Leak test flow system

Table 5-3. Troubleshooting Guidelines (cont'd)



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Trouble	Description	Solution
Sensor flow failed	Leaky or blocked sample line	Remove all input lines to unit. Attach one line at a time to check for sample input. Check all end-of-line filters. Sample flow failure is always the present point being sampled.
		Remove the optical bench cover. Check the inlet fitting, tubing, sample filter, tubing to the optical bench inlet fitting, sample pressure switch and sample manifold tubing.
		Check the sample pressure switch for 4VDC ON and OFF switching. Check the cable terminals and plug end at press/sample connector. Replace pressure switch if necessary.
		Check operation of all manifold sample valves. Check the optical bench inlet and outlet valves.
		Check the optical bench inlet and outlet valve connectors on J22 and J21.
		Leak test the flow system.
Start sensor flow failed	Leaky or blocked sample flow line at startup of unit	Same as sensor flow unit failure. Check as above, turn unit off and restart unit.
		Leak test flow system
Case temperature sensor failed	Main board component	Return to Honeywell Analytics for service.
Case temperature range failed	Case temperature is 0 to 90°C	Return to Honeywell Analytics for service.
Thermostat sensor failed	Controls optical bench inside temperature	Replacement of optical bench requires Honeywell Analytics service
Sensor temperature range failed	Checks for temperature range of 45° to 90°C.	Replacement of optical bench requires Honeywell Analytics service

**Table 5-3. Troubleshooting Guidelines (cont'd)**



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Trouble	Description	Solution
Humidity sensor failed	Checks H <sub>2</sub> O sensor output	Return to Honeywell Analytics for service.
Infrared source failed	Checks the current of the source assembly	Return to Honeywell Analytics for service.
Photo synchro failed	Checks the chopper for operation	Return to Honeywell Analytics for service.
PA IR sensor failed	Checks the circuitry microphone for output	Return to Honeywell Analytics for service.
Memory protect	Checks checksum	Return to Honeywell Analytics for service.
External reset failed	Checks the external reset button.	If not used, check for jumper between RST minus and RST plus on J16
		If used, verify switch is wired normally closed.
Display failure	Display communications	Check RS485 connector on J15, terminals 1 and 2.
		Check for broken or cracked display.
		Remove rear panel cover and check cables between the display and the display board.
Audio alarm failure	Audio alarm	Check output terminals 6 and 7 on J17.
		Check for faulty horn buzzer.
Microphone test	Microphone failure or broken connection	Return to Honeywell Analytics for service.
		Restore J27 connection.
Relay feedback	Circuit failure	Return to Honeywell Analytics for service.

**Table 5-3. Troubleshooting Guidelines (cont'd)**



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## 6 - Data Logging



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### Log Size

This data is either the maximum or average of the “last” data calculated. For more information, see [Appendix C, RS-232 Output](#).

### Last Values

The maximum value is always take from the “last” data; this is not always the highest value displayed, but the last valid data taken from a point. The average is an average of “last” data values. Usually, the last data is the fourth reading during normal operation (or the twelfth reading if the monitor is in an extended dwell). Invalid (blank) and under-range data are not recorded. Over-range is recorded as 1000 ppm.

### Number of Data Points Used

If the unit is only a single point monitor or all but one point is inactive, the value is recorded every sixteenth reading; this is 30 values per hour. With four points active, 15 values per point are recorded every hour. The number of values can be considerably lower if the monitor enters extended dwell because of high gas concentraions.

### User Setup Options

When the monitor enters the Ready State, the data array is cleared. Then, four valid concentration values are needed before any data is recorded. Concentrations are recorded either every 15 minutes or hourly. If the logging function is turned OFF, the clock.calendar chip is stopped to save battery energy.

Before the logging is turned ON, the clock.calendar must be set.

Setting any value starts the clock/calendar. Hours or days may be skipped or repeated. The log can be cleared in the Setup Menu.

### Viewing Alarms/Events and Data

From the Review Events screen, the user can view just alarms, just events or both. The latest event is presented first. When the memory is filled, the entries wrap around. From the Review Data screen, the user can view the recorded concentrations. The particular point must be selected. Again, the latest data is presented first; when the memory is filled, the entries wrap around.



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## Appendix A - Checklist



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## Model IR-148 Infrared Gas Monitor

Before applying power to the Model IR-148 Infrared Gas Monitor, check for all items in the following table:

Item	Check For:	Checked or Initialed
1	Proper mounting of Model IR-148 Infrared Gas Monitor on a non-vibrating surface which does not block the front panel. Mounting must be away from direct solar heating.	
2	Correct electrical connections and wiring to Model IR-148 Infrared Gas Monitor. Wiring must be done for proper voltage.	
3	Proper tubing for sample line(s).	
4	Removal of all dust caps and plugs at sample line inlets and exhaust.	
5	Proper end-of-line filters installed.	
6	Disabling of unused sampling points and set alarm limits.	
7	Possession of proper calibration kit and check gases for calibration	
8	An established routine calibration schedule.	





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## Appendix B - Relay Module

### General Description

The Model IR-148 Relay Module is intended to provide discrete relay outputs for the Model IR-148 Infrared Gas Monitor equipped with a multi-point sequencer.

The Model IR-148 Infrared Gas Monitor has three alarm threshold levels (CAUTION, WARNING, and ALARM), each with a corresponding form C relay output. The user can obtain alarm level information via the set of three relay contacts.

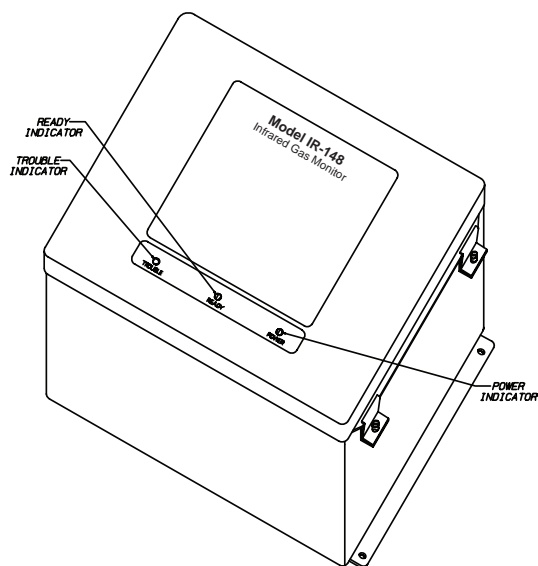
The Model IR-148 Infrared Gas Monitor relays do not convey point-wise alarm level information. These relays provide information at the monitor level only, one set of relay contacts (CAUTION, WARNING and ALARM) per sequencer point. Used as intended, the Model IR-148 Relay Module enables the user to obtain point-wise alarm level information.

The Model IR-148 Relay Module monitors the current state of the Monitor and sets its installed relays according to information received. While the Model IR-148 Relay Module receives its information from the Model IR-148

Infrared Gas Monitor, it is important to note that the Relay Module operates independently with respect to the Reset Switch and Audio operation. Refer to “Operation” later in this appendix for details.

**Note:**

The use of ALARM in capital letters refers to exceeding the specific Model IR-148 Infrared Gas Monitor third alarm threshold level.

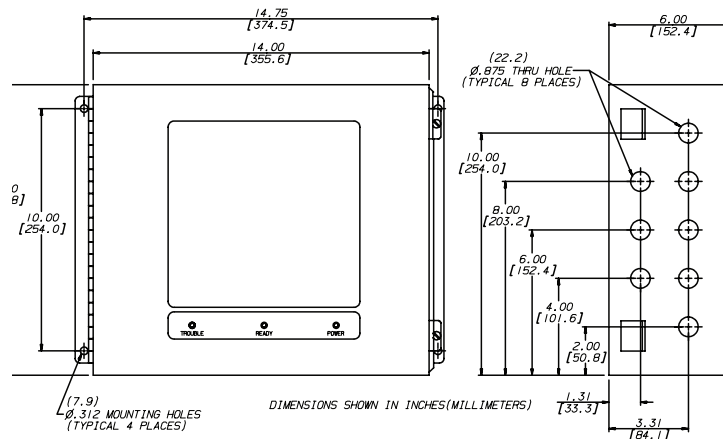


**Figure B-1. Relay Module**

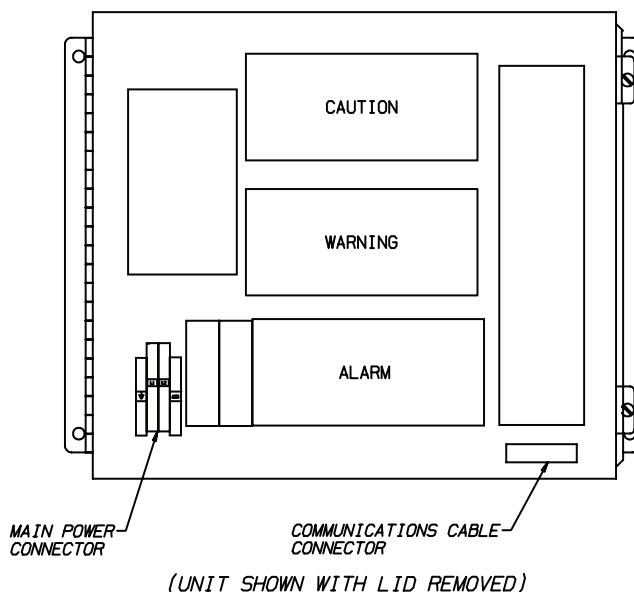
### Specifications

<b>Temperature Range</b>	<b>Operating</b>	0° to 50°C
	<b>Storage</b>	-20° to 60°C
<b>Power</b>	85-264VAC @ 40 watts, 47-63 Hz	
<b>Maximum Warm-up Time</b>	30 seconds	
<b>Humidity</b>	0-99% RH non-condensing	
<b>System Communication</b>	RS-485	
<b>Relays</b>	Common Trouble and Horn Relay	10 amps @ 125, 230VAC 10 amps @ 30VDC
	Caution, Warning and Alarm Relays	4 amps, 1/20 HP @ 125, 230VAC 3 amps @ 30VDC
	Terminal Block	Can accept up to 12 AWG wire
<b>Horn</b>	80 db (2 feet at ambient temperature and pressures)	
<b>Dimensions</b>	12.5" W x 6.5" D x 15" H (317.5mm H x 165mm W x 381 mm H)	
<b>Weight</b>	Approximately 25 lbs (0.453kg)	

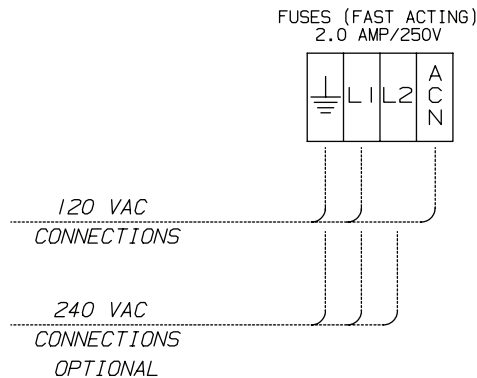
**Table B-1. Specifications**



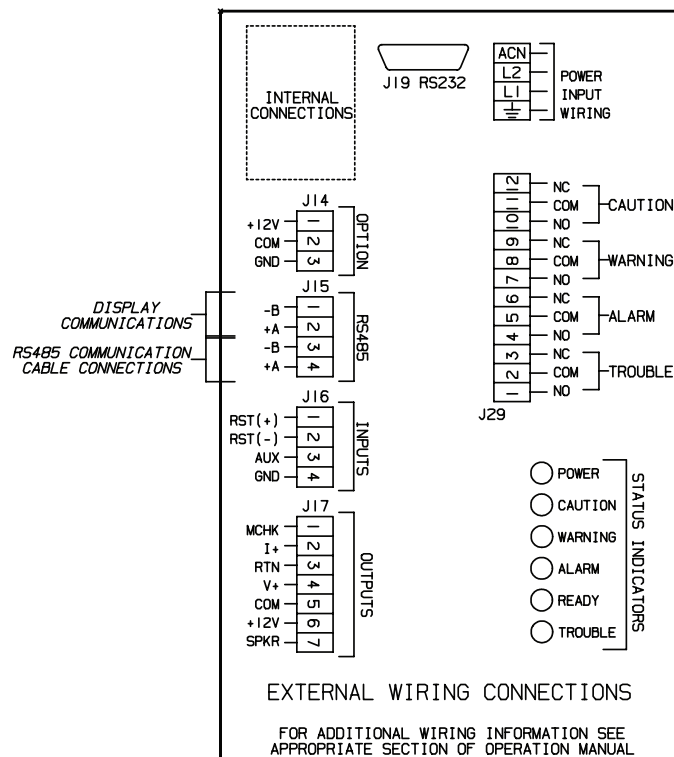
**Figure B-2. Mounting the Relay Module**



**Figure B-3. Relay Module Main Power Connector and Communications Cable Locations**



**Figure B-4. Model IR-148 Relay Module Power Wiring Diagrams for 120 and 240 VAC**



**Figure B-5. Model IR-148 Infrared Gas Monitor Communications Cable Connections**



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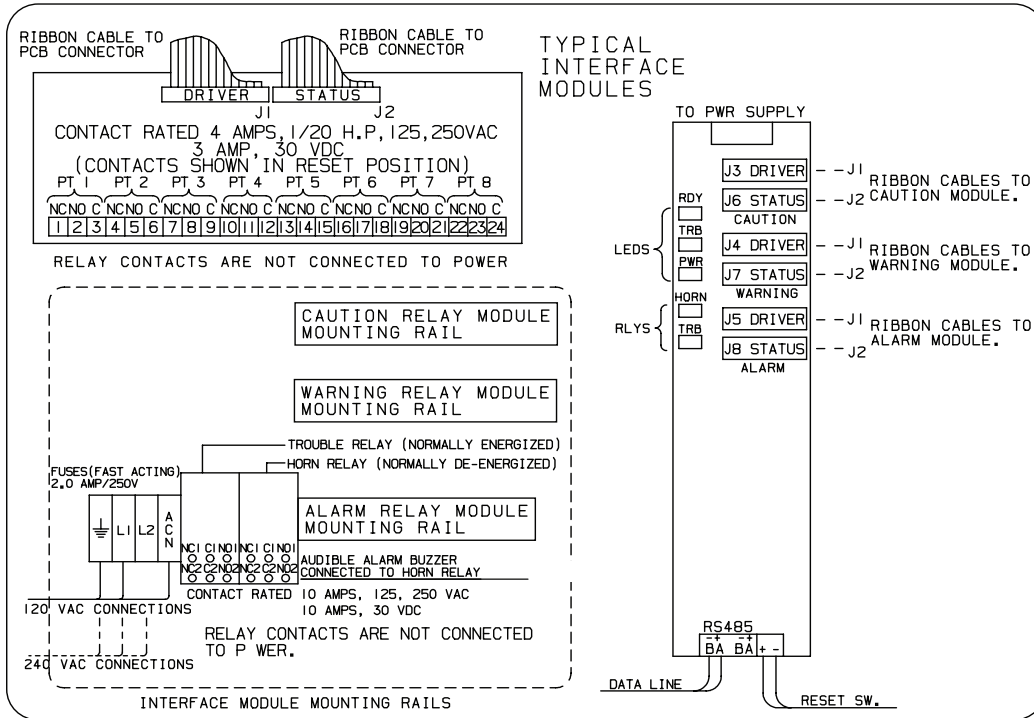
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**Figure B-6. Typical Interface Modules**



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### Unpacking the Shipping Carton

The shipping carton should contain the Model IR-148 Relay Module.

### Identifying the Unit

Each bank of relays (See **Figure B-3**) is assigned to a particular alarm level. Model IR-148 Relay Modules can be purchased with one, two, or three internal relay banks (See **Table B-2**).

Description	Default Relay Assignment
1 Bank of Relays	Alarm
2 Banks of Relays	Warning
	Alarm
3 Banks of Relays	Caution
	Warning
	Alarm

**Table B-2. Supplied Relays**

The default relay assignment may be changed. Consult the factory for more information.

### Mounting Your Model IR-148

Mount the Model IR-148 Relay Module adjacent to the controlling Model IR-148 Infrared Gas Monitor using the four mounting holes as shown in **Figure B-2** (hardware not supplied).

### Electrical Connections for the Model IR-148 Relay Module

Follow all applicable practices and local codes. Use appropriate conduit and cable glands when installing the Model IR-148 Relay Module and Model IR-148 Infrared Gas Monitor.

#### Main Power Connections

Ensure that all primary power is turned OFF at the circuit breaker or fuse. Do not wire the Model IR-148 Relay Module with power ON.



**WARNING**

**Wiring the Model IR-148 Relay Module with the power ON may result in electrocution which may cause injury or death.**

Identify the main power voltage that will power the Model IR-148 Relay Module; if unsure of your primary power, consult an electrician or local power utility.



**CAUTION**

**Application of improper power to the Model IR-148 Relay Module will result in damage to the unit.**

Refer to **Figures B-3, B-4 and B-5** to identify the location of the main power connections within the Model IR-148 Relay Module.

1. Locate the power wiring entry on the lower left hand side of the unit and remove the hole plug.
2. Route the power wiring through the hole using proper hardware/conduit (not supplied).
3. Strip the power wiring conductors.
4. Insert each stripped conductor into its proper location in the power cable connector (See **Figure B-4**).
5. Tighten each screw within the connector to secure each wire.
6. Pull on each wire to ensure that it will remain in place. If a wire comes out of the connector, loosen the screw, reinsert the wire, and re-tighten the screw.
7. The Relay Module must have the same electrical ground as the Monitor unit.

### Communication Cable Connections

Use the factory-recommended RS485 communication cable. Low capacitance wire for RS485 communications, such as Belden #9841, is recommended.

#### CAUTION

**Maximum length of the communication cable is 1000 feet; otherwise, the Model IR-148 Relay Module will not operate properly.**

#### CAUTION

**Use only the recommended cable. Using inferior or wrong communication cable causes improper operation of the Model IR-148 Relay Module.**

**Do not exceed the maximum length of communication cable listed; otherwise, the Model IR-148 Relay Module may not operate properly and may not indicate a trouble condition.**

### Communication Cable Connections to the Model IR-148 Relay Module

1. Locate the RS485 communication cable inside the Model IR-148 Relay Module enclosure.
2. Locate the eight cable entries on the right side of the Relay Module (See Figure B-2). From these eight cable entries, choose one of the three bottom entries and remove the hole plug.
3. Route the communication cable through the hole using proper hardware (not supplied) to secure the cable, a 30mm distance must be maintained between this communication cable and the electronic assembly or power line feeds.



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### Communication Cable Connections to the Model IR-148 Infrared Gas Monitor

1. Route the communication cable to the Model IR-148 Infrared Gas Monitor.
2. Find an unused entry in the Model IR-148 Infrared Gas Monitor enclosure and remove the hole plug.
3. Route the communication cable through the hole using proper hardware (not supplied) to secure the cable.
4. Strip each communication cable conductor.
5. Insert each stripped conductor into its proper location on the communication cable connector (Refer to **Figure B-5** for connector location and function designation). The connector labeled “+” on the Relay Module must be connected to the RS485 connector labeled “+” on the Infrared Gas Monitor. Likewise, the connector labeled “-” on the Relay Module must be connected to the RS485 connector labeled “-” on the Infrared Gas Monitor.
6. Tighten each screw within connector to secure each wire.
7. Pull on each wire to ensure that it will remain in place. If a wire comes out of the connector, loosen the screw, reinsert the wire, and re-tighten the screw.

### Relay Wiring

Before installing any wiring to the relays within the Model IR-148 Relay Module, refer to the manual for the specific equipment being connected to the relays for wiring procedures and requirements. If your unit is a four-point Model IR-148 model, use the first four relays. The remaining four relays within the bank are not used.



#### WARNING

**Use the proper size wire to any equipment connected to the Model IR-148 Relay Module relay; otherwise, a fire or electrical damage may result.**

1. Refer to **Figure B-2** for the relay wiring entries into the Model IR-148 Relay Module.
2. Remove the hole plug(s) required and route the relay wiring through the hole(s) using proper hardware/conduit (not supplied).
3. Strip each relay wiring conductor.
4. Determine the relay functions necessary (see front door label for relay locations and contact information). Insert each stripped relay wiring conductor into the connector for the desired function.
5. Tighten each screw within the connector to secure each wire.





6. Pull on each wire to ensure that it will remain in place. If a wire comes out of the connector, loosen the screw, reinsert the wire and re-tighten the screw.
7. Once wiring is complete, close and secure the front panel of the Model IR-148 Relay Module.

### CAUTION

Do not allow the front panel of the Model IR-148 Relay Module to remain open during use.

## Operation

### Front Panel Indicators (See Figure B-1).

#### Power Indicator

The power indicator shows that power is properly applied to the unit.

- If this indicator is not ON when power is applied, refer to the **Section 4, Troubleshooting Guidelines**.

#### Fault/Trouble Indicator

The Fault/Trouble Indicator turns ON and remains ON when a fault/trouble condition is detected. The fault/trouble condition may exist at the controlling Model IR-148 Infrared Gas Monitor or it may exist locally at the Model IR-148 Relay Module.

Possible fault/trouble conditions:

Model IR-148 Remote Relay Module losing communication with the Model IR-148 Infrared Gas Monitor for longer than two seconds

- Infrared Gas Monitor internal trouble
- Relay Module inoperative relay.

See [Section 5 - Troubleshooting Guidelines](#) for other possible fault/trouble conditions.

#### Ready Indicator

- The Ready Indicator turns ON and stays ON when the controlling Model IR-148 Infrared Gas Monitor is ready and Relay Module is operating properly
- This indicator remains OFF during the initial warm-up
- This indicator remains OFF during the initial Model IR-148 Infrared Gas Monitor warm-up, setup and calibration.

#### Model IR-148 Relay Module Relays

There are three types of relays in the Model IR-148 Relay Module:

- common horn relay
- common fault/trouble relay
- discrete alarm relays



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The Common Horn Relay:

- is a double-pole, double-throw (DPDT) type relay
- contacts are normally connected to equipment to alert personnel of an alarm condition

The Fault/Trouble Relay:

- is a double-pole, double-throw (DPDT) type relay
- is normally-energized during normal operation for fail-safe operation
- de-energizes if power is removed
- contacts may be connected to equipment to alert personnel that a fault/trouble condition exists

The Discrete Caution, Warning and Alarm Relays:

- are single-pole, double-throw (SPDT) type relays.
- their contacts may be connected to equipment to alert personnel that an alarm condition exists.

### Applying Power

Apply power to the Model IR-148 Infrared Gas Monitor and Model IR-148 Relay Module. The Power Indicator on the Relay Module should illuminate.

The Fault/Trouble Relay in the Relay Module will energize when communications from the Model IR-148 Infrared Gas Monitor have been received,

no internal relay faults have been detected, and the Model IR-148 Infrared Gas Monitor is not in the Fault/ Trouble state.

The Ready Indicator will illuminate when the Model IR-148 Infrared Gas Monitor is in the Ready state, and the conditions described above remain valid.

Note that during the Warm-Up state of the Model IR-148 Infrared Gas Monitor, all alarm relays in the Relay Module are cleared.

### Alarm Relay Configuration

#### Latching

The configuration of all alarm relays is controlled by the Model IR-148 Infrared Gas Monitor.

- If the Model IR-148 alarm relay (CAUTION, WARNING, ALARM) is configured as latching, all eight relays of the corresponding bank in the Relay Module are configured for latching operation.
- Likewise, if the Model IR-148 alarm relay (CAUTION, WARNING, ALARM) is configured as non-latching, all eight relays of the corresponding bank in the Relay Module are configured for non-latching operation.



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### Normally Energized/De-energized

While the alarm relays in the Model IR-148 Infrared Gas Monitor can be configured as either normally energized or normally de-energized, all alarm relays in the Model IR-148 Relay Module are magnetically latching; therefore the normally energized/de-energized designations do not apply. The contact labels “normally open,” “normally closed” and “common” are assigned for convenience. The “normally open” contacts close and “normally closed” contacts open to signal an alarm condition. These relays DO NOT change state when power is removed.

### Operation

Proper operation of the alarm relays requires maintaining successful communication between the Relay Module and the controlling Model IR-148 Infrared Gas Monitor since all alarm relay operations are based on cumulative information received from the Infrared Gas Monitor.

Alarm level information for each point of the multipoint sequencer is received from the controlling Model IR-148 Infrared Gas Monitor. This information is used to set the CAUTION, WARNING, and ALARM relays corresponding to each sequencer point.

- In non-latching configurations, relay(s) will reset when information from the controlling Infrared Gas Monitor indicates that the

alarm condition(s) for the specific point has abated.

- In latching configurations, relay(s) remain set (latched) when the condition abates, and do not reset until the Relay Module reset switch is pressed.

### Reset Switch

The reset switches of the Model IR-148 Relay Module and controlling Model IR-148 Infrared Gas Monitor act independently. Pressing the reset switch on the Infrared Gas Monitor does not affect the Relay Module alarm relays, and pressing the reset switch on the Relay Module does not affect the Infrared Gas Monitor alarm relays.

- In non-latching configurations, the Relay Module reset switch does not affect the state of the alarm relays.
- In latching configurations, the reset switch resets the alarm relay only if the alarm condition has abated.

### Fault/Trouble Relay

While a fault/trouble condition in the Model IR-148 Infrared Gas Monitor activates the fault/ trouble relay in the Model IR-148 Relay Module, a fault/trouble condition in the Relay Module does not activate the fault/trouble relay in the controlling Model IR-148 Infrared Gas Monitor.



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### Horn Operation

#### Configuration

The configuration of the horn relay is controlled by the Model IR-148 Infrared Gas Monitor.

- The Horn Relay in the Relay Module is configured by the “Caution sets Audio Alarm,” “Warning sets Audio Alarm,” “Alarm sets Audio Alarm” and “Fault/Trouble sets Audio Alarm” configuration in the Model IR-148 Infrared Gas Monitor.
- The “Aux sets Audio Alarm” and “Fault/Trouble sets Audio Alarm” configurations of the Infrared Gas Monitor apply to the Relay Module Horn relay.
- The Horn relay of the Relay Module is only latching when the alarms are configured latching in the Model IR-148 Infrared Gas Monitor.

#### Reset Switch

The reset switches of the Model IR-148 Relay Module and controlling Model IR-148 Infrared Gas Monitor act independently. Pressing the reset switch on the Infrared Gas Monitor does not affect the Relay Module horn, and pressing the reset switch on the Relay Module does not affect the Infrared Gas Monitor horn.

If the Model IR-148 Relay Module reset switch has been used to silence the Relay Module horn, and any alarm condition (configured to activate the horn) occurs at a new sequencer point, the horn relay will activate to signal the new alarm condition.



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### Maintenance

Under normal operating conditions, the Model IR-148 Relay Module requires no maintenance. However, periodic testing of the relays may be done to ensure that complete system operation is possible.

### Obtaining Replacement Parts

To obtain replacement parts, address the order or inquiry to:

Honeywell Analytix  
405 Barclay Blvd.  
Lincolnshire, IL 60069

or call toll-free: 1-800-323-2000.

Part	
Relay Board (PCB)	1324-0037
Power Supply Board (PCB)	1324-0038
Processor Board (PCB)	1324-0039

Table B-3. Replacement Parts

### Troubleshooting Guidelines

Symptoms	Possible Causes	Corrective Action
Alarms do not activate	Model IR-148 alarms no enabled or communications is lost	Enable alarms at the Model IR-148
		Check wiring
		Check power supply
	Inoperative processor board	replace processor board
Fault/Trouble LED flashes	Loss of communication	Check wiring between Model IR-148 and Relay Module
		Check power wiring or power supply
		Check wiring in Model IR-148 Relay Module
Power LED not ON	Power fault/trouble	Check wiring, power supply and fuse
Fault/Trouble LED ON	Relay fault/trouble or controlling Model IR-148 in Fault/Trouble state	Check relay and relay wiring within Model IR-148 Relay Module

Table B-4. Troubleshooting Guidelines



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Model IR-148 Infrared Gas Monitor

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## Appendix C - RS-232 Output



### Introduction

Your Model IR-148 Gas Monitor is ordered and built for the particular types of gas in use. The monitor full scale range may differ from the standard 0 to 1000 ppm range. Check the calibration label on the reverse side of the front cover (See **Figure C-1**) to determine your instrument's full scale range.

The instrument is ready to monitor; however, it is necessary to configure the unit to your specific requirements. Your Model IR-148 Gas Monitor may contain an internal Multi-Point Sequencer, enabling your unit to sample from up to eight individual sampling locations.

Your unit also contains several other features described in this appendix:

- RS-232 output
- Password protection
- Remote Front Panel capability
- Sampling point identification.

<b>Communication Parameters</b>	9600 Baud
	8 bits
	No parity
	One Stop Bit

**Table C-1. RS-232 Parameters**

The status message is sent every 10 seconds (See **Table C-2**)

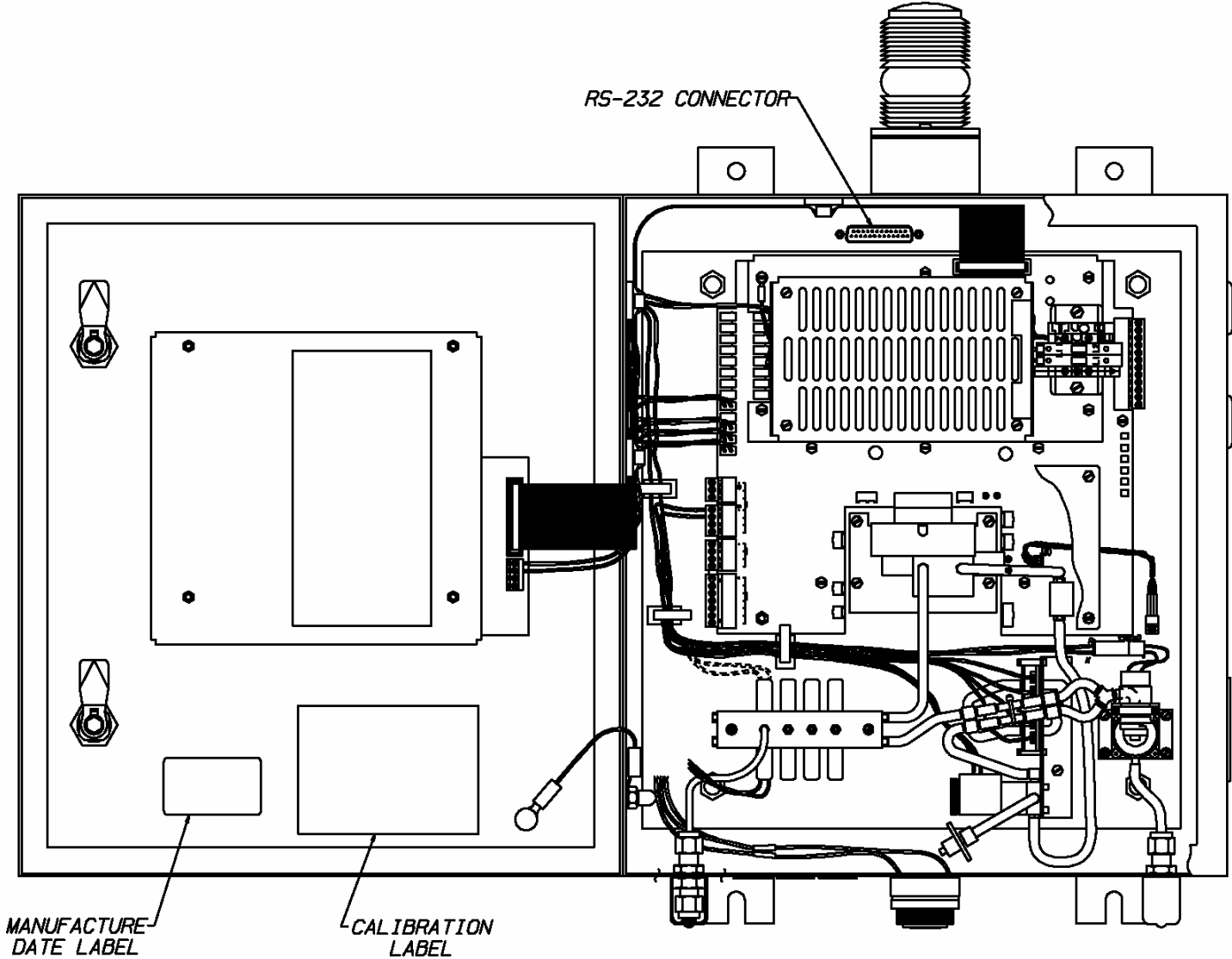


Figure C-1. Label and RS-232 Location





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### Messages

Three types of messages can be transmitted from the RS-232 port:

- status
- data
- events

### Status Messages

Status is the first message.

- The first seven (7) characters are the gas type.
- The next three (3) characters are the point number followed by the concentration and the units.
- The second line is the instrument state and the alarm level.
- The Trouble State shows the type of fault detected. (see **Table C-2**)
- The status message is sent every 10 seconds

### Data Logged Value

The data logged value is the next message.

- The first line indicates the date and time.

- The second line shows the
  - » point
  - » gas type
- logged concentration
- The message is generated for every point and sent every 15 minutes or hourly depending on the setup selection.
- The concentration is an average or the minimum values for the selected time frame (see **Table C-3**)

### Alarm Events

Alarm events is the last message type.

- The first line is the date and time.
- The second line is the:
  - » point
  - » gas name
  - » alarm level (see **Table C-4**)

All of these messages are initiated by the sync character followed by a binary address byte, 40 ASCII character s, and terminated with a line feed and carriage return.



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0	SYNC 0x16																									
1	address 0x01 -> 0xff																									
2	A																									
3	M																									
4	M																									
5	O																									
6	N																									
7	I																									
8	A																									
9																										
10	P																									
11	T																									
12	1	2	3	4	5	6	7	8																		
13																										
14	1																									
15	0																									
16	0																									
17	0																									
18																										
19	P																									
20	P																									
21	M																									
22	W	R	C	T	U																					
23	A	E	A	R	N																					
24	R	A	L	O	K																					
25	M	D	"	U	N																					
26	U	Y	S	B	O																					
27	P		E	L	W																					
28			T	E	N																					
29																										
30																										
31	S S H																									
32	C B T S T C S U P P M R O																									
33	U A Y A E A A C T E M H A E M E T																									
34	C	W	A	A	A	N	L	P	R	N	R	S	A	H	N	I	I	O	M	A	I	L	H			
35	A	A	L	U	U	D	I	A	T	S	T	E	S	E	S	D	R	T	A	O	U	C	A	E		
36	U	R	A	X	X	U	E	B	S	O	E	R	O	O	D	R	X	R	Y	R						
37	T	N	R				N	R	R	S	B	R	S	S	M	R	S	S	Y	I	O					
38	I	I	M	F	A	K	R	A	Y	E	E	R	O	E	E	S	R	L	P	F	F					
39	O	N		A	L	N	A	T	F	P	F	N	N	A	S	T	N	N	Y	A	L	I	H	B	A	
40	N	G		I	A	O	N	I	L	A	L	S	S	N	T	E	S	S	N	N	O	A	O	A	U	
41				L	R	W	G	O	O	S	O	O	O	G	A	M	O	O	C	G	S	R	N	C	L	
42				M		N	E	N	W	S	W	R	R	E	T	P	R	R	H	E	S	Y	E	K	T	
43	CR 0x0d																									
44	LF 0x0a																									

Table C-2. Status Message

J							
A							
N							
.							
3							
1							
,							
2							
0							
0							
5							
2							
3							
:							
5							
9							
P	P	P	P	P	P	P	P
T	T	T	T	T	T	T	T
1	2	3	4	5	6	7	8
A	A	A	A	A	A	A	A
M	M	M	M	M	M	M	M
M	M	M	M	M	M	M	M
O	O	O	O	O	O	O	O
N	N	N	N	N	N	N	N
I	I	I	I	I	I	I	I
A	A	A	A	A	A	A	A
1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
P	P	P	P	P	P	P	P
P	P	P	P	P	P	P	P
M	M	M	M	M	M	M	M

**Table C-3. Data Logging**

sync 0x16		
address 0x01 - 0xffj		
J		
A		
N		
.		
3		
1		
,		
2		
0		
0		
5		
2		
3		
:		
5		
9		
P		
T		
1		
A		
M		
M		
O		
N		
I		
A		
C	W	A
A	A	L
U	R	A
T	N	R
I	I	M
O	N	
N	G	
CR 0x0d		
LF 0x0a		

**Table C-4. Event Logging**

### Identifying Your Unit

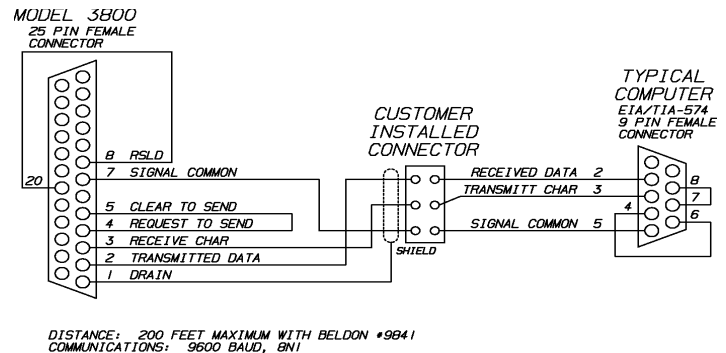
After your unit is mounted, open the front door and locate the Calibration Label (See **Figure C-2**) to help identify your unit. Also see the Manufacturing Date Label (See **Figure C-3**). The Model IR-148 Gas Monitor’s calibration label shows what gases the unit can detect.

BENCH TYPE	BENCH S/N	UNIT S/N
A ZERO COEFF	H ZERO COEFF	
GAS TYPES		
A SPAN COEFF		
A POLY COEFF		
H COMP COEFF		
T ZERO	T SPAN	T POLY
V ZERO COEFF	V SPAN COEFF	
I ZERO COEFF	I SPAN COEFF	

**Figure C-2. Calibration Label**

<b>Factory Performance Test/Verification</b> Calibration Gas Mixture: _____ Synthetic Span: _____ Cylinder Part Number: _____ Cylinder Reading: _____ Certified Sensitivity Range: _____ Certified Accuracy: <u>See Installation Literature Specifications</u> Test Date: _____ Test Reference Number: <u>See Unit Serial Number</u> Instruction Manual Revision Number: _____ Inspector: _____
---

**Figure C-3. Manufacture Date Label**



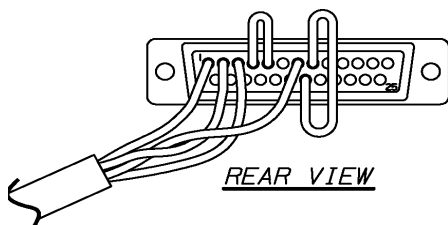
### Installation

Install the Model IR-148 Gas Monitor according to **Section 2**, “Installation and Set-up.”

### RS-232 Output

The RS-232 output broadcasts certain information about the Model IR-148 Gas Monitor (See **Table C-2**). This output conforms to the specification for RS-232 signal levels and is capable of driving its signal up to 200 feet when using low capacitance RS-232 cable. See **Figure C-1** for RS-232 connector location.

Connection to the RS-232 output is via a 25-pin sub “D” female connector. See **Figure C-4** for the wiring definition. To enable this communication, pins 4 and 5 on the sub “D” connector must be connected. **Figure C-4** shows the connector and wiring as it is wired to a computer. **Figure C-5** shows the rear view wiring of the connector.



**Figure C-5. RS-232 Connector**

When connecting RS-232 cable to the instrument:

- The strain relief cover or shell on the 25-pin sub “D” connector must be removed. It is not possible to use a pre-wired or molded cable because its shell or strain relief is not removable. The connector’s shell or strain relief does not fit within the instrument.
- It may be necessary to remove the metal covers from the printed circuit boards to attach the 25-pin sub “D” connector to its mate on the unit. If the metal covers are removed, replace them when the cable’s connector is mated to the connector on the printed circuit board.

## Remote Gas Sampling Channel Identification

Model IR-148 Monitors have two analog outputs:

- 4-20 mA and
- 0-10 Volts.

The voltage output can be programmed to correspond to the channel presently being sampled. The front panel screen indicates:

1V/PT IF OUT = 1-10V

(1 volt per point if output equals one to 10 volts).  
When enabled and the unit is monitoring from:

- channel 1, the voltage output is one volt
- channel 2, the voltage output changes to two volts.

CHANNEL NUMBER	VOLTAGE OUTPUT
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

**Table C-5. Voltage Output Corresponds to Channel**

During unit setup, configure the voltage output to stepping, thus enabling the voltage output to reflect the channel being sampled.

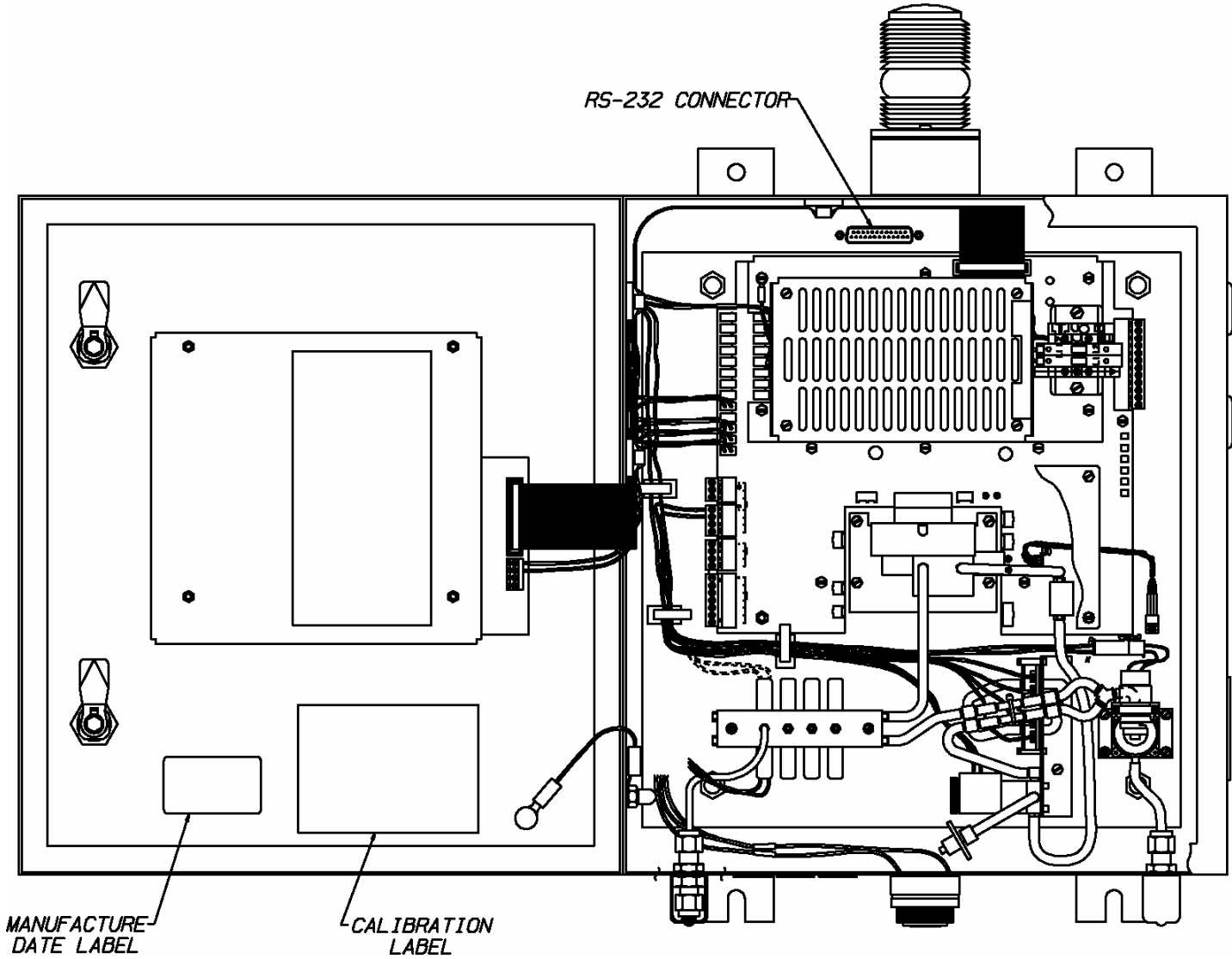


Figure C-6. Access to Switches



### Password Protection

To prevent accidental re-configuration or discourage unit tampering, a password entry can be enabled. This password prevents setup values from being changed. If the password entry is selected, the user must enter three alphabetic characters before any additional information is available.

The password feature is especially useful when a Remote Front Panel is connected to the Model IR-148 Gas Monitor. The Remote Front Panel or the Model IR-148 Monitor may have no password or it may have a different password.

To enable this feature, a switch on the front display card must be set. This switch is under the metal cover. To set this switch:

1. Open the front door of the unit.
2. On the inside of the front door, locate the four front cover screws securing the metal cover (See **Figure C-6**).
3. Unscrew and remove these four front cover screws and lift off the metal cover.
4. Locate the bank of switches on the printed circuit board exposed when the front cover is removed (See **Figure C-7**).
5. Each switch is labeled with its number and its position. **Figure C-8** also shows the switch bank with its numbered switches.

- Each switch in this bank activates a different feature.
  - **Table C-7** describes each switch and its function.
  - Read, mark and initial each function you are going to use.
6. To enable the password option, set switch 1 to the ON position.
  7. To set or change the password, put switch 2 in the ON position.
    - The front panel display shows the word **SET** and the new password.
    - To change the password, press three buttons on the front panel.
    - The password will be the last three letters displayed on the front panel display.
    - The button sequence is stored when ENTER is pressed.
    - After selecting the password, return this switch to the OFF position.



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### NOTE:

The password must be re-entered when:

- the unit is de-energized
- a bad or wrong password is entered
- a loss of communications is detected between the Model IR-148 Gas Monitor and any optional Remote Front Panel
- no password is entered within the last hour

8. Switch position 3 allows the following without entering the password:

- resetting latched alarm relays
- silencing the audio output.

When setting Switch 3 to the ON position while an audio alarm or a latched relay can be reset, the following message displays:

- **MAIN RESET ALARM**

9. Switch 4 enables communication between the Model IR-148 Gas Monitor and a Remote display.



Figure C-7. Password Enabling Switches

- When a loss of communications occurs with the Remote Display within 3.5 seconds, the following message displays:

- **LOSS OF COMMUNICATION**

- This switch position also allows the Remote Display speaker to follow the Model IR-148 Gas Monitor speaker operation.

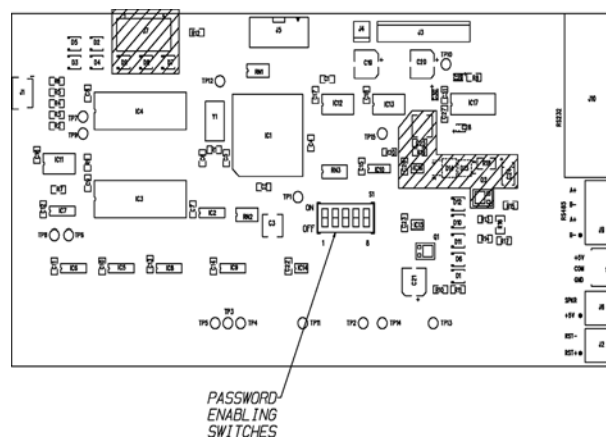


Figure C-8. Switch Bank Location

10. Switch 5, in the ON position, allows the audio output to automatically reset if the Model IR-148 Monitor audio output is reset.

Normally, if the Remote Display audio output is energized, it is latched ON until any panel key is pressed.





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SWITCH	SWITCH POSITION	DESCRIPTION	INITIALS
1	ON	Enable the password option	
	OFF	Disables the password option	
2	ON	Set the password	
	OFF	Normal operation	
3	ON	Resetting alarm without the password	
	OFF	Password is necessary to reset alarms	
4	ON	Remote Front Panel connected	
	OFF	No Remote Front panel connected	
5	ON	Allows the audio output to automatically reset	
	OFF	Manual resetting of the audio output	
6	ON	Not used	
	OFF	Not used	
7	ON	Not used	
	OFF	Not used	
8	ON	Not used	
	OFF	Not used	

**Table C-6. Function of Switches**



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## Appendix D - Model IR-148 Gas Version



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## Model IR-148 Infrared Gas Monitor

Model IR-148 Gas Version
R-123
R-11
R-22
R-134a
Ammonia*
R-12
R-13*
R-113
R-114
R-401A*
R-402A*
R-404A*
R-407C*
R-500
R-502
R-507*
R-404A
R-143C*
R-124*
R-125*
R-152A*
R-218*
R-409A*
R-408A*
Butane*
Carbon Dioxide*
Carbon Monoxide*

Model IR-148 Gas Version
Ethane*
Ethylene*
Halon 1211*
Halon 1301*
Perfluoro Methyl Vinyl Ether*
Propane*
1,2 Dichloroethane*
1,3 Butadiene*
Acetone*
Acrylonitrile*
Benzene*
Cyclopentane*
Diethyl Ether*
Dimethylamine*
Dowtherm J*
Ethyl Alcohol*
Ethylene Oxide*
Heptane*
Hexane*
Methyl Alcohol*
Methyl Ethyl Ketone*
Methyl Isobutyl Ketone*
Methylene Chloride*
Nitrogen Trifluoride*
Nitrous Oxide*
Pentane*
Perchloroethylene*



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Model IR-148 Gas Version
Propylene Oxide*
Styrene*
Toluene*
Trichloroethylene*
Xylenes*
Methane*
Sulfur Hexafluoride*
Chloroform*
Ethyl Acetate*
Ethyl Benzene*
Isopropyl Alcohol*
Octofluorocyclopentene*
Octafluorocyclobutane*
Methyl Fluoride*
Hexafluoro Butadiene.



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