Installation
Operation
Maintenance

Trane TruSense™ SD Refrigerant Monitor - Sensor Module

Models: RMWG (Shown above with optional alarm beacon)

RMWG-SVX01C-EN

Table of Contents

General Information

NOTICE:
Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

WARNING -Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION -Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION –Indicates a situation that may result in equipment or property-damage-only accidents.

Warning
Improper Installation Hazards!

It is important to observe all of the installation recommendations provided in this manual. Pay particular attention to the recommendations provided below in the General Installation Section. Failure to follow all safety precautions could result in death or serious injury or equipment or property-only-damage.

General Warnings and Cautions

1. The monitor 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 monitor must not be installed in outdoor areas or in locations where explosive concentrations of combustible gasses or vapors might occur in the atmosphere: Class 1, Group A, B, C and D area as defined by the NEC. Because the monitor is not explosion proof, it must be located in non-hazardous areas.
3. The RMWG Refrigerant Monitor is designed to detect particular refrigerant gas or vapor at ambient atmospheric pressures. The unit will not detect refrigerant gas at temperatures outside the range specified in this manual.
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 RMWG system. Also, do not paint near any of the sensor inlets to ensure paint is not deposited on the sensor inlet of the unit. Such paint deposits would interfere with the sampling process, whereby a sample of the atmosphere being monitored migrates into the RMWG system.

General Information

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 as a routine inspection of the system.
7. Use only genuine Trane 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 RMWG system, beyond the scope of these maintenance instructions or by anyone other than qualified Trane 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.
8. Avoid any installation where condensation may form. Condensation may possibly clog or block the sensor inlet; this will prevent the instrument from receiving new or fresh gas samples from the area being monitored.
9. The RMWG Refrigerant 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.
10. The RMWG Refrigerant Monitor must be connected to proper main voltages. Connection of improper voltages will cause the unit to fail.
11. Protect the RMWG Refrigerant Monitor from vibration and heating; otherwise, improper operation may result, which can result in personal injury or death.

General Information

Unit Model Number

For service and replacement purposes, the Trane Model RMWG Refrigerant Monitor is assigned a multiple-character alphanumeric model number that precisely identifies each unit. The model number key is shown here.

Use of the model number will enable the owner/operator, installing contractor, and service technician to define the characteristics of any RMWG unit. Be sure to refer to the model number when ordering replacement parts or requesting service.

Model Number Description

R	M	W	G	3	B	0	A	1	A	0	A
1	2	3	4	5	6	7	8	9	10	11	12

Digit 1,2,3,4
- Model
- RMWG= Monitor G development

Digit 5
- Type
  - 1= Control module 0 port
  - 2= Pump module four port
  - 3= Sensor single port
  - 4= Control module single port
  - 5= Control module 4 port

Digit 6
- Gas type
  - A= None
  - B= R-11
  - C= R-123
  - D= R-12
  - E= R-134a
  - F= R-22

Digit 7
- Not used
  - 0= Digit not used

Digit 8
- Power supply
  - 0= Without power supply (24 Vac/24 Vdc operation)
  - A= With power supply (110/240 Vac operation)
  - B = With Transformer (110 Vac input/24 Vac output for powering sensor modules)

Digit 9
- Agency
  - 0= No agency
  - 1= CUL (UL CSA United States Canada)
  - 2=
  - 3= CE (European)

Digit 10, 11
- Design sequence
  - A0= 1st design sequence

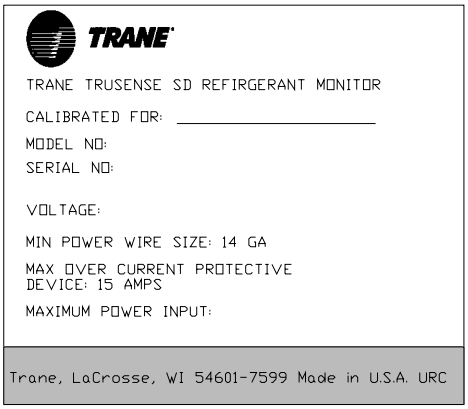
Digit 12
- Options
  - 0= None
  - A= Beacon
  - B= 110 decibels horn
  - C= Beacon & 110 decibels horn

General Information

Nameplates

The Model RMWG unit nameplate is located on the right side of the monitor (when facing the front). The nameplate includes the service model number, unit serial number and electrical information. Refer to this information whenever making inquiries or ordering replacement parts. A typical nameplate is shown in Figure 1.

Figure 1. Typical unit nameplate data



General Information

Literature Change History

RMWG-SVX01C-EN (April 2003)

- Changes to text to include requirements to meet UL certification.

RMWG-SVX01B-EN (January 2003)

- Minor changes to text

RMWG-SVX01A-EN (October 2002)

- Original issue of the manual.

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. Unit must be stored in a dry, secure place prior to its installation and use. Store in the original shipping carton.

Unpacking

Carefully remove the monitor from the shipping container. Inspect it for signs of visible shipping damage. If any damage is found, report it to the shipper immediately. Do not install or operate a damaged unit without sales office approval.

Confirm all the loose items shipped with the monitor have been received. Each carton should contain:

Qty	Item
(1)	Refrigerant Monitor Single Point Diffusion Sensor Module
(1)	Installation, Operation, and Maintenance Manual
(1)	Calibration cap
(1)	Optional Unit Mounted Beacon

Report any shortages immediately to the local Trane office. Retain the original packing for reuse in the event the unit must ever be returned for service.

General Information

Unit Description

The Trane model RMWG Refrigerant Monitor provides a continuous indication of a refrigerant concentration in the air. It is intended for indoor use in mechanical equipment rooms which house air conditioning or refrigeration equipment or in areas where bulk refrigerants are stored. The monitor utilizes infrared photo-acoustic sensing technology, allowing accurate measurement of refrigerant vapors with minimum interference from other chemicals in the vicinity. The instrument is compound-specific and factory calibrated for the specific refrigerant of interest. It is capable of measuring refrigerant concentrations from 0-1,000 parts-per-million (ppm). The monitor can signal alarms at three different concentration levels. These alarms are factory set, but can be easily adjusted in the field. A unit trouble alarm indicates internal problems with the instrument. 4-20 mA analog output is provided for connection to a data recorder or building management system. The analog output is scaled at 0-1000 ppm. The unit is also equipped with an RS-485 output for communicating with a TruSense™ SD Control Module. The unit is designed to monitor one zone. When connected to a TruSense SD Control Module, up to eight sensor modules can be connected in series to monitor up to eight zones.

The TruSense SD Refrigerant Monitor:

- Provides a continuous indication of a refrigerant gas concentration
- Operates on the photo acoustic principle, and measures the concentration of a refrigerant in a complex mixture of background gases.

In the photo acoustic principle, sample gas is delivered to an enclosed chamber which is periodically bombarded with infrared (IR) radiation. If the target gas is present, it absorbs IR with each pulse of light. These pulses are miniature sound waves which are picked up by a microphone. The sound level is directly proportional to the target gas concentration present in the gas chamber.

- Is capable of measuring a refrigerant 0 to 1000 ppm full scale.
- (standard model) is housed in a rugged plastic enclosure.
- Has a standard 4 to 20 mA and RS-485 output.
- Has five LEDs to indicate power, fault, and alarm conditions
- Is highly selective to enable operation in areas with varying humidity or in areas containing other contaminants. It may be used for applications requiring long-term stability and low maintenance.

General Information

Introduction

This manual provides instructions for the:

- RMWG Refrigerant Monitor Sensor Module

The instruments can provide continuous refrigerant gas monitoring (See Table 1 for Operating Specifications).

All units listed below are under evaluation by Underwriters Laboratories, Inc.

RMWG Monitors Evaluated by Underwriter's Laboratories, Inc.	R-11
	R-12
	R-113
	R-123
	R-22
	R-134a

General Information

Table 1. RMWG sensor module system general performance specifications

Linearity	20 to 100 ppm ± 5 ppm 100 to 1000 ppm ± 6% of reading
Repeatability	± 8 ppm
Warm-up Time	10 minutes
Response Time	50% of a step-change in <70 seconds
Operating Temperature	0 to 40 °C (32 to 113 °F)
Temperature Effect	<4% per 10 °C
Relative Humidity	0 to 95%, RH non-condensing
Operating Specifications	
Power Requirements	24 Vdc, +10%, -0%, 0.85 amps 24 Vac, ± 10%, 50/60 Hz, 0.80 amps 100 to 240 Vac, 50/60 Hz, 0.3 amps
Analog Output	4 to 20 mA
Default Alarm Values	R123: 50, 150, 300 ppm other applications: 50, 150, 1000 ppm
Maximum Output Signal Load	500 ohms
Dimensions	7.1” high x 10” wide x 4.25” deep (188 mm high x 110 mm wide x 70 mm deep)
Weight	3.7 pounds (1.678 kg)
Transport and Storage Conditions	
Temperature	-40 to +70 °C (-40 to +158 °F)
Humidity	0 to 99% relative humidity
Pollution Degree	2
Installation Category	II
Altitude	2000 meters maximum

General Information

The RMWG Monitor is intended for indoor use in mechanical equipment rooms housing air conditioning or refrigeration equipment or for use in areas where bulk refrigerants are stored.

The monitor uses infrared sensing technology, allowing accurate measurement of refrigerant vapors with minimum interference from other vapors. Your RMWG Refrigerant Monitor unit is factory calibrated for a specific refrigerant. 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 software selectable gas concentration values. There is also a trouble indication to alert the operator when something is wrong with the unit.

Identifying Your Unit

The RMWG Refrigerant Monitor is capable of monitoring different types of refrigerants. However, each unit is factory calibrated to detect only one type of refrigerant. Check the label on the side of the cabinet to determine what gas your unit is designed to detect (Figure 1).

Beacon

The optional beacon is mounted on top of the unit. It is powered by the monitor's internal dc voltage (See Figure A-1).

General Information

Terminology

Become familiar with the following terminology.

Zero- A zero (0) output usually indicates fresh air (no refrigerant gas present).

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

Span- Full-scale or upscale 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 upscale value. This value is printed on the calibration gas cylinder containing the gas.

Exhaust Gas- Sample gas after it passes through the sensor.

Alarms- The RMWG System has three alarms to alert the user at specific, user adjustable refrigerant 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.

Fresh Air- Air that has no possibility of containing refrigerant gas.

Temperature Effect- The gas response displayed by the instrument (ppm) can change ±0.3% for each degree (C) that instrument is operating above/ below the temperature at which the instrument was last calibrated.

Sensor Selectivity*

The RMWG Refrigerant Monitor is factory calibrated for your particular refrigerant gas (See Table 1). The system is highly selective to refrigerant gases in air; however, the system also responds to other gases (interferants). See Tables 2 through 6***** for typical cross sensitivities. Actual cross sensitivities vary from instrument to instrument.

* Typical cross sensitivities not verified or investigated by UL.

General Information

Table 2. Typical RMWG system for R-11 cross sensitivity response data

Gas	Concentration (ppm)	Equivalent ppm R-11
Acetone	100	14
Methyl Ethyl Ketone	100	32
Methanol	1000	130
Iso-Propanol	500	400
Methylene Chloride	100	0
Xylene	100	0
Ammonia	50	0
R-113	100	25
R-11	100	100
R-22	100	30
R-12	983	490
R-134a	100	20
R-123	100	3
Propane	0.6%	18
Ethylene	500	20
Test Conditions: Calibrated 0-1000 ppm R-11 in N_2 Temperature: 25°C		

General Information

Table 3. Typical RMWG system for R-12 cross sensitivity response data

Gas	Concentration (ppm)	Equivalent ppm R-12
Acetone	100	3
Methyl Ethyl Ketone	1000	25
Methanol	1000	2
Methylene Chloride	1000	14
Trichloroethylene	1000	167
Ethyl Acetate	1000	22
Xylene (Ortho-Xylene)	1000	5
R-113	100	35
R-11	100	5
R-22	100	1
R-12	100	100
R-134a	100	2
R-14	100	45
Test Conditions: Calibrated 0-1000 ppm R-12 in N_2 Temperature: 25°C		

General Information

Table 4. Typical RMWG system for R-22 cross sensitivity response data

Gas	Concentration (ppm)	Equivalent ppm R-22
Acetone	100	<1
R-11	100	16
R-123	100	35
R-134a	100	25
R-132a	100	40
R-22	100	100
R-113	100	39
Test Conditions: Calibrated 0-1000 ppm R-22 in N_2 Temperature: 25°C		

General Information

Table 5. Typical RMWG system for R-123 cross sensitivity response data

Gas	Concentration (ppm)	Equivalent ppm R-123
Acetone	100	22
Methyl Ethyl Ketone	500	48
Methanol	100	2
Iso-Propanol	100	5
Methylene Chloride	1000	14
Trichloroethylene	1000	4
Ethyl Acetate	100	42
Xylene (Ortho-Xylene)	1000	5
Ammonia*	910	7
Natural Gas	1000	5
R-113	100	80
R-11	100	<1
R-22	100	4
R-12	100	8
R-134a	100	140
R-123	100	100
Test Conditions: Calibrated 0-1000 ppm R-123 in N_2 Temperature: 25°C		

General Information

Table 6. Typical RMWG system for R-134a cross sensitivity response data

Gas	Concentration (ppm)	Equivalent ppm R-123
Acetone	100	15
Methyl Ethyl Ketone	500	30
Methanol	100	1
Iso-Propanol	100	3
Methylene Chloride	1000	10
Trichloroethylene	1000	3
Ethyl Acetate	100	28
Xylene (Ortho-Xylene)	1000	3
Ammonia	910	5
Natural Gas	1000	3
R-113	100	55
R-11	100	<1
R-22	100	3
R-12	100	6
R-134a	100	100
R-123	100	70
Test Conditions: Calibrated 0-1000 ppm R-134a in N_2 Temperature: 25°C		

Installation

Infrared Photoacoustics

Increased industrialization together with a growing concern for human safety and the environment have stimulated the demand for sensitive and reliable methods of detecting trace amounts of gases. The advantages of infrared photoacoustic gas detection, which the Trane Model RMWG refrigerant monitor uses, include greater sensitivity, high immunity to interferents, fast response time and low maintenance.

The Trane Model RMWG refrigerant monitor detects toxic gases by a process called infrared photoacoustic spectroscopy. The photoacoustic effect is the emission of sound by an enclosed sample on the absorption of pulsed infrared light. *(Portions of the Infrared Photoacoustics section reprinted with permission from Bruel and Kjaer Instruments, Inc.)*

When a gas is irradiated with light, it absorbs some of the incident light energy, proportional to the concentration of the gas. The absorbed light energy is immediately released as heat and this causes the pressure to rise. When the incident light is modulated at a given frequency, the pressure increase is periodic at the modulation frequency. Pressure waves, or sound waves as they are commonly known, are easily measured with a microphone. They are audible if their frequency is between 20 Hz and 20 kHz.

The intensity of the sound emitted depends on the nature and concentration of the substance and the intensity of the incident light.

The selectivity which can be achieved in spectroscopy is due to the fact that substances absorb light of specific wavelengths which are characteristic of that substance.

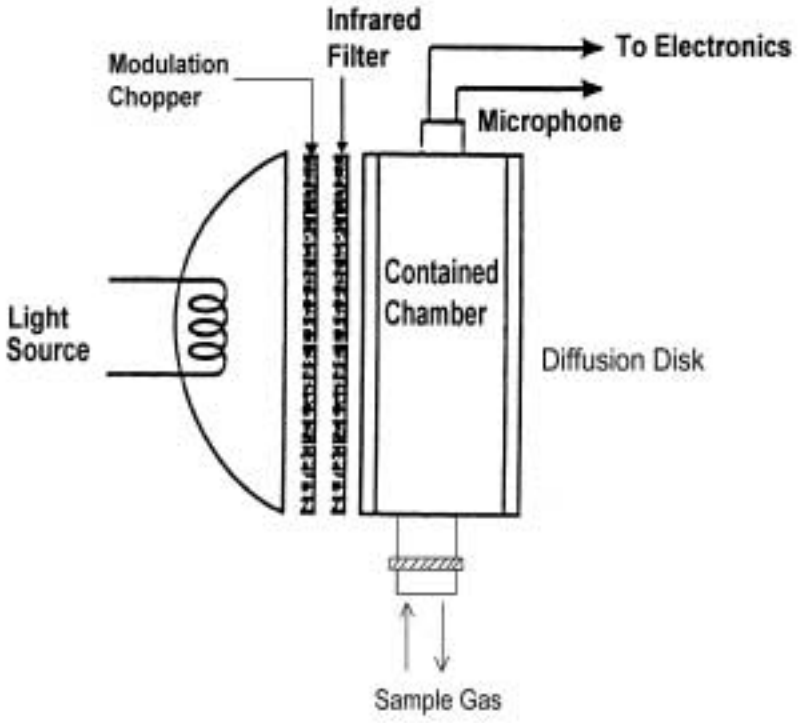
The sequence of events in this process are:

- gas sample is sealed in measurement chamber
- chamber is irradiated with pulsed, narrow-band light
- gas absorbs light proportional to its concentration and converts it to heat
- gas heats and cools as the light is pulsed
- temperature fluctuations generate pressure waves,
- pressure waves are detected by microphone

The main parts of a photoacoustic setup (see Figure 2) are a chamber to contain the gas sample, a pulsing light source, a detector to measure the sound (usually a microphone) and a method of processing the signal. The signal is interpreted by the electrical components into a parts per million (ppm) display.

Installation

Figure 2. RMWG infared photoacoustic setup



Location of the Monitor Sensor Module

⚠ WARNING!
Hazard of Explosion

Unit must not be located in areas that may contain a flammable mixture of gas and air. Failure to follow this requirement could result in death, serious injury or equipment or property-only-damage.

The monitor performance is dependent on its location. Follow the guidelines listed below before mounting the monitor. Due to the wide variation in equipment room layouts, each situation must be analyzed individually. A sensing point should be located in an area where refrigerant vapors are most likely to leak or accumulate (See Figure 3).

Instrument Location Guidelines

1. When possible select a location where personnel will see the front panel LED's 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.

Installation

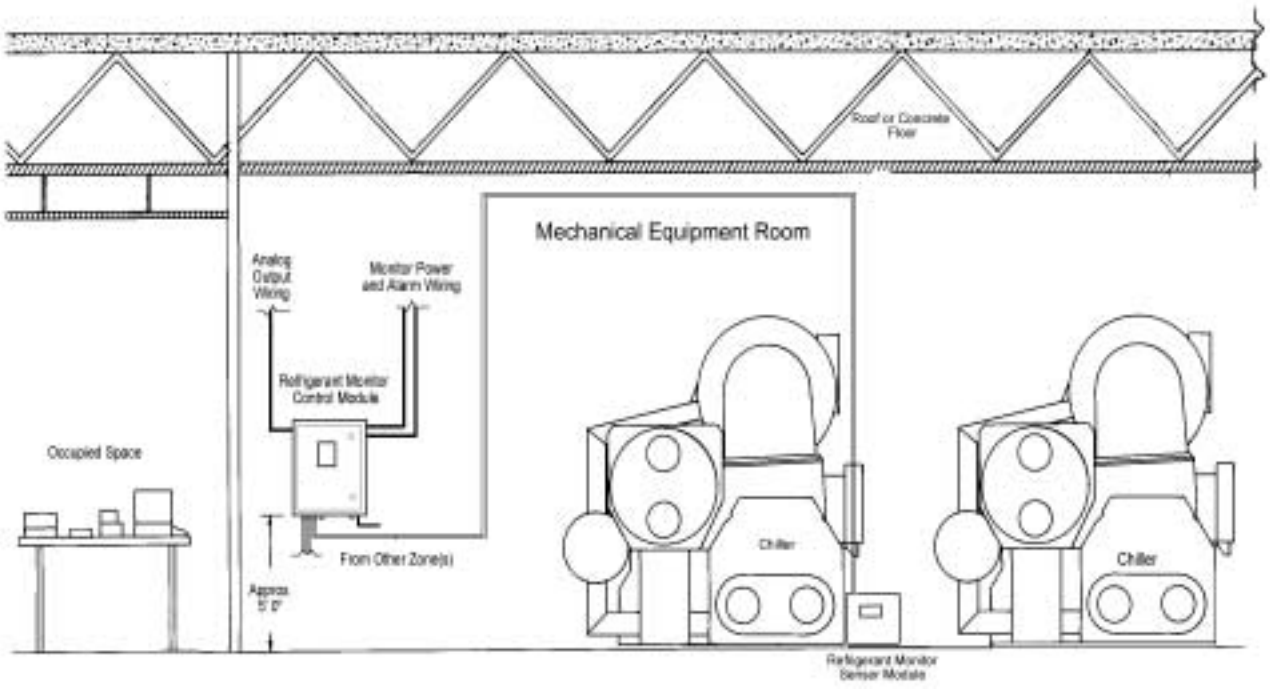
3. Do not locate the unit near an excessive heat source or in wet and damp locations.
4. Do not mount the unit where it will be exposed to direct solar heating.
5. For proper cooling, allow at least three inches clearance around all surfaces except for the mounting surface.
6. Mount the unit so the front panel is easily seen and accessed for service and calibration.

Equipment Configuration

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

- If there is one chiller in the room, sample at the perimeter of the unit.
- For two chillers, sample between them.
- With three or more chillers, multiple monitors or a single monitor with a multi-point sampling system should be used. Typically, a sensing point can handle a radius of 50 feet; however airflow patterns must always be considered.

Figure 3. Typical RMWG refrigerant monitor installation



Installation

Room Configuration

Since all fluorocarbon refrigerants are three to five times heavier than air, they will concentrate near the floor and in low areas such as pits and stairwells. Large pits and stairwells should be ventilated and monitored.

Airflow Patterns

Airflow patterns can cause areas of the room to become stagnant and refrigerant vapors to accumulate. The sampling point should be between the refrigerant source (typically the chiller) and the ventilation exhaust inlet. Smoke tubes are useful in determining the ventilation patterns.

Activity in the Room

The expected activities in the room must also be considered when determining the sensing point. Refrigerants will concentrate near the floor. Typically, sampling 12-18 inches above the floor is sufficient for early warning and to provide adequate protection for someone working close to the floor. If it is expected that an occupant's breathing zone may be less than 12-18 inches off the floor, locate the sampling point accordingly.

For more information on equipment room design and monitoring, refer to Trane Application Engineering Manual REF-AM-3, Refrigerant System Equipment Room Design available from your local Trane office.

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

1. Most refrigerants are heavier than air and sink to the floor or accumulate in low areas.
2. Place the sensor module in an area that provides the instrument with a representative sample.
3. Ensure the sampling area is free of particulate matter and condensing moisture.
4. Ensure the sampling port is unobstructed to allow the sample to flow freely to the instrument.

Installation

Unpacking the System

To unpack the TruSense™ SD Refrigerant Monitor:

1. Carefully remove the unit from it shipping container(s) to prevent damage to sensitive electrical and gas sensing components.
2. Search through packing material and inside of the containers to prevent inadvertently discarding usable or valuable parts.
3. Remove the plastic screws holding the cover to the enclosure
4. Remove the front cover from the TruSense SD Refrigerant Monitor to expose the electrical printed circuit board.

Initial Inspection

With the front cover open, carefully inspect the components and assemblies inside the enclosure. If damage or shortage is noted, promptly make the proper claim with the carrier.

Mounting the Unit

Once mounting locations have been determined using the methods outlined in the “Location of Monitor Sensor Module” section, the unit can be permanently attached to the wall or the optional mounting plate as follows:

1. Open the unit by removing the plastic screws securing the lid to the enclosure.
2. Using #10 mounting screws or bolts, securely mount the TruSense SD Refrigerant Monitor to a wall or flat mounting surface via the four holes in the back of the instrument. The holes are located in the four corners of the module, and are accessible from the front side when the cover is off.

See Figure A-1 in Appendix A for hole locations.

3. Reinstall the cover to the unit

Electrical Connections

Wiring Connections

See Appendix A, “Installation Outline Drawings” for wire entry hole locations. All wiring to the TruSense™ SD Refrigerant Diffusion style Monitor is made via the access ports on the bottom of the unit.

CAUTION
Component Damage!

Monitor components must be protected from splashing, spraying, or dripping water. Failure to do so may cause damage to internal components.

Wiring

The RMWG Refrigerant Monitor is factory wired with either a universal power supply for 110/220 Vac operation or no power supply for 24 Vac/dc operation.

The following steps outline the procedure for connecting the wiring

1. Determine the power supply for your RMWG Refrigerant Monitor (From the nameplate model number as shown in Figure 1).

   All wiring is done via the access ports (openings) in the bottom of the enclosure. Do not drill new holes through the enclosure - serious damage to the instrument could result.

CAUTION
Instrument Damage!

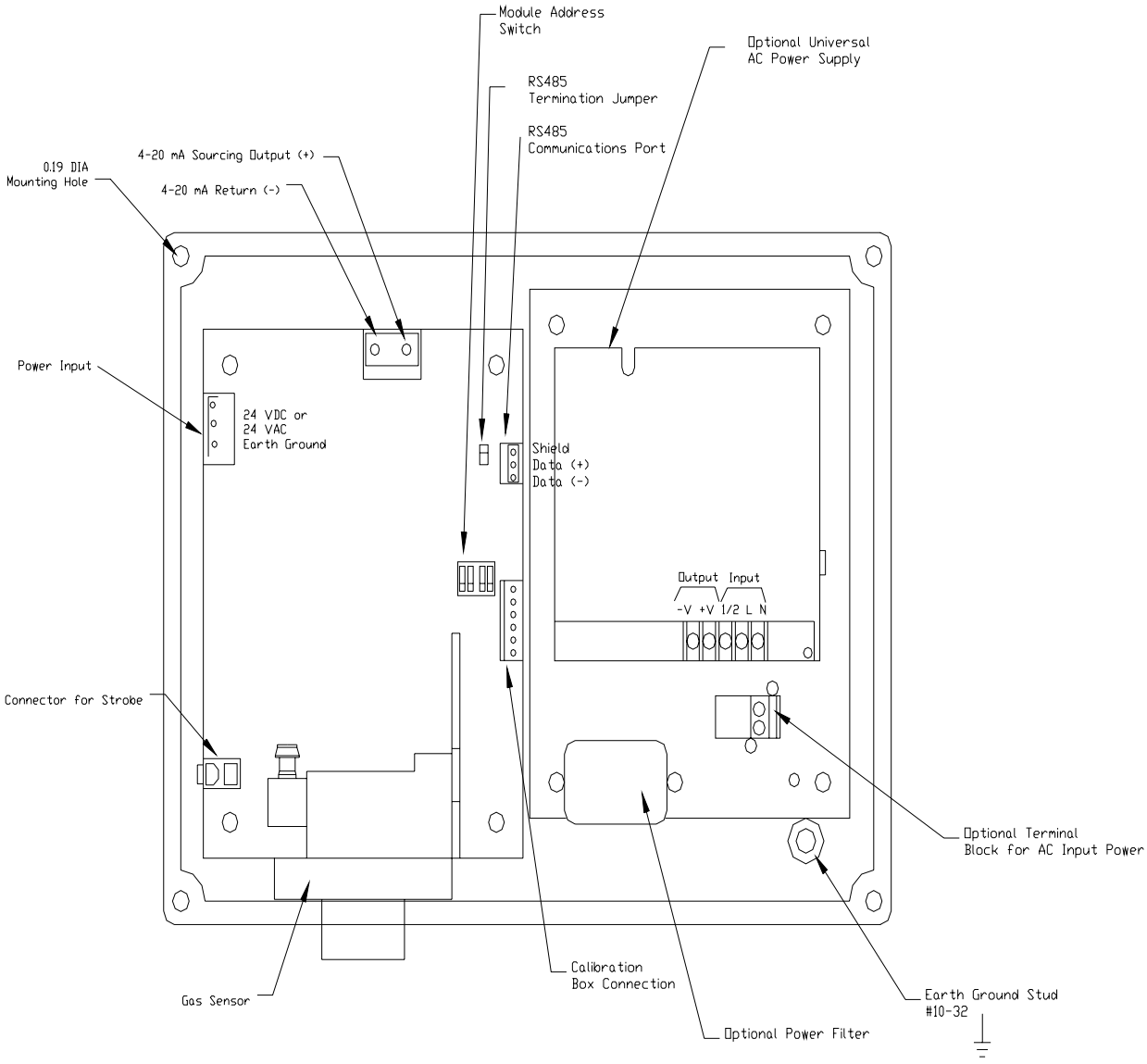
Correct power voltage must be connected to the instrument. Failure to use correct voltage may result in instrument damage.

Note: External overcurrent shall be included in the building installation, shall be in close proximity to the equipment, within easy reach of the operator, and shall be marked as the disconnecting device for the equipment.

All power wiring is connected to the terminal block, see Figure 4.

Electrical Connections

Figure 4. Terminal diagram



Electrical Connections

For 24 V dc or ac wiring

All power wiring is connected to the terminal block for 24 V dc/ac input shown in Figure 4.

Note: The 24-volt power source used with this equipment must be separated from mains by double or reinforced insulation.

For 110/220 Vac Wiring

All power wiring is connected to the two-position terminal block shown in Figure 4.

2. Connect the “HOT” ac wire to terminal with the black wire (or brown wire for instruments with a line filter).
3. Connect the “NEUTRAL” or acn lead to the terminal with the white wire (or blue wire for instruments with a line filter).
4. Connect a ground wire on the ground stud (Figure 4). The supply earth ground should be installed first, then all component earth grounds are connected afterward.
5. Route the power wiring and the ground wire through electrical entry holes in the case bottom.

Note: When connecting modules to 110/220 Vac power, the power wiring must be separated from the output signal wiring; do not run 110/220 Vac wire in the same conduit as communication output wiring.

Analog Signal Output Wiring

The TruSense™ SD Refrigerant Monitor is factory-configured with an analog output. The analog output for the TruSense SD Refrigerant Monitor (Figure 1) is 4-20 mA, current sourcing type (standard) (4 mA = 0 ppm gas, 20 mA = 1000 ppm gas).

The output connections are located on the sensor board. Terminals (+) and (-) are available for the signal output and ground (Figure 4).

RS 485 Communication Wiring

If connecting the sensor module to a TruSense SD control module via RS485 communication link, refer to the Control Module IOM (the latest version of RMWG-SVX02_-EN) for proper wiring procedures, dip switch settings, and termination jumper settings. RS485 wiring termination points for the sensor module are shown in Figure 4.

Operation and Start-up

Operation

This section describes the following procedures for TruSense™ SD Refrigerant Monitor operation:

- Startup procedures
- Placing the system into operation
- Initial instrument calibration

Start-Up

The following steps outline the procedures to power ON the TruSense SD Refrigerant Monitor:

1. Before applying power to the unit, verify that the power to be applied matches the electrical requirements of the unit.
2. Turn the instrument ON at the circuit breaker or fuse that supplies power to the instrument. (The instrument does not have a power switch).

Note: A green LED indicates that power is ON.

After power ON, allow for unit stabilization (about 10 minutes) before calibrating instrument.

General Calibration (All Models)

The TruSense SD Sensor Module is pre-calibrated at the factory. Calibration check is recommended at time of installation.

Introduction

The calibration procedure should be performed regularly and a log kept of calibration adjustments. Increase the calibration frequency when any calibration differs as much as 10% from the test concentration. More frequent calibrations may be required when the RMWG Refrigerant Monitor is new. Calibration frequency depends on the operating time and chemical exposures of the instrument.

Also perform the calibration procedure when installing or changing the power source of the control instrumentation.

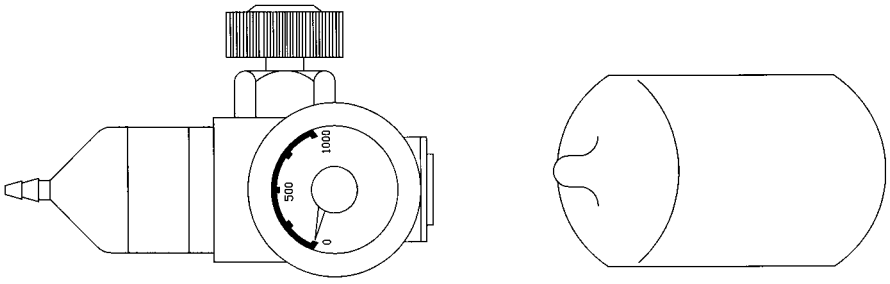
If this calibration procedure cannot be performed at any step:

- See “Troubleshooting” section
- Localize the problem
- Replace the inoperative component

Calibrate newly installed instruments on a frequency until calibration records prove instrument stability. Calibration frequency is then reduced in accordance with a schedule established by the safety officer or facility manager.

Calibration

Figure 5. Calibration equipment



Calibration of the monitor requires a supply of:

- ZERO GAS (air or nitrogen) It may be possible to use ambient air if you are sure it does not contain any possible interferent gases or contaminants.
- SPAN GAS (a known refrigerant concentration) that measures anywhere between 3-100% of the full-scale calibration of the unit.

Both ZERO gas and SPAN gas must be carefully applied to the unit to avoid pressurizing the internally mounted optical bench. Listed in Table 7 are calibration parts and calibration gases available for the TruSense™ SD Refrigerant Monitor.

Table 7. Refrigerant concentrations

Description	Concentration	Part #
R-11 in Nitrogen	990 PPM	TOL00414
R-123 in Nitrogen	50 PPM	TOL00416
R-134a in Nitrogen	990 PPM	TOL00413
R-22 in Nitrogen	990 PPM	TOL00415
Zero Air	100%	TOL00175
R-11 in Nitrogen	30 PPM	TOL00171
R-12 in Nitrogen	30 PPM	TOL00195
R-123 in Nitrogen	30 PPM	TOL00173
R-134a in Nitrogen	30 PPM	TOL00174
R-22 in Nitrogen	30 PPM	TOL00172

Calibration

Initial Calibration Procedures

During the initial calibration procedures, alarm relays of any connected control instrumentation may activate. Disconnect or disable any equipment or alarms.

- The following equipment is required for initial calibration:
- Tubing assembly with calibration adapter
- Calibration gas
- Flow Controller (0.25 LPM) (Figure 6)
- Meter capable of monitoring the module output in milliamps
- TruSense™ SD Refrigerant Monitor Control Module or Calibration Box (TOL01852)

Preparation for Calibration

To verify the instrument is operating properly and to make initial calibration adjustments, perform the following:

1. Remove the enclosure cover.

CAUTION
Component Damage!

Monitor components must be protected from splashing, spraying, or dripping water. Failure to do so may cause damage to internal components.

2. Deactivate the equipment connected to the outputs, or disconnect the wiring to the outputs.

Important: If any control instruments connected to the TruSense SD Refrigerant Monitor are wired to external devices (e.g. horns, exhaust fans, and fire suppression systems), these devices may activate while adjustments or repairs are performed during the following procedures.

To prevent activating these devices while adjusting the TruSense SD Refrigerant Monitor, disconnect the wiring from the relay. Return all wiring to the relay when the calibration procedure is completed.

Initial Calibration

See Figure 6 for applying calibration gas to sensor module.

1. Using the tubing and calibration adapter, place zero gas on the unit.
2. Using a multimeter to read the 4-20 mA output, use the RMWG Control Module or Calibration Box to move the zero up or down, until the unit output reads 4.0 mA with the zero gas applied.
3. Apply span gas to the unit for a minimum of five minutes.

Calibration

4. Using a multimeter to read the 4-20 mA output, use the RMWG Control Module or Calibration Box to move the span up or down, until the unit analog output is proportional to the concentration of the span gas applied (see Table 8).

Figure 6. Applying calibration gas to sensor module

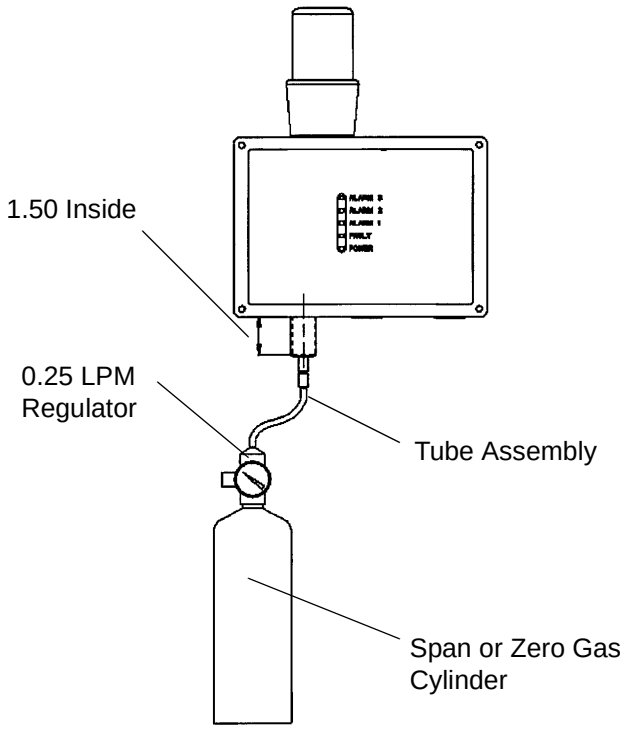


Table 8. mA output vs. span value

mA	ppm	mA	ppm
4	0	12	500
4.48	30	13	563
5	63	14	625
5.60	100	15	688
6	125	16	750
7	188	17	814
8	250	18	875
9	313	19	938
10	375	20	1000
11	438		

Calibration

Calibration Check

(Calibration Box or Control Module is not needed for the Check procedure)

1. Using the tubing and calibration adapter, place zero gas on the unit.
2. With the zero gas applied, use a multimeter to read the 4-20 mA output.
3. If the reading differs significantly from the reading obtained during the “Initial Calibration” procedure, perform the “Initial Calibration” procedure again.
4. Apply span gas to the unit for a minimum of five minutes.
5. With the span gas applied, use a multimeter to read the 4-20 mA output.
6. If the reading differs significantly from the reading obtained during the “initial Calibration procedure, perform the “Initial Calibration” procedure again.

Periodic Field Calibration Guidelines

Once the TruSense™ SD Refrigerant Monitor is operating, perform periodic calibration checks to ensure proper instrument operation. Calibration checks should be performed at least once per year to verify proper sensing values.

Perform calibration to monitor long-term changes (drift) in both the ZERO and SPAN readings. If there is an unacceptable change in either of these readings, make adjustments to obtain proper readings.

When routine calibration does not restore proper readings, perform the procedures outlined under “Initial Calibration.”

If following Calibration procedures fails to restore proper reading of the instrument, see “Troubleshooting Guidelines” for guidelines to correct the instrument.

Keep the written records of the calibration readings obtained and any adjustments made. Analysis of these records enables review and control of the time between checks.

Check a new TruSense SD Refrigerant Monitor installation at least once a week by performing the steps outlined in the following section.

Periodic Field Calibration Equipment

Calibration of the monitor requires a supply of:

- ZERO GAS (nitrogen): It may be possible to use ambient air if you are sure it does not contain any possible interferent gases or contaminants.
- SPAN GAS: A known gas concentration that measures anywhere between 3-100% of the full-scale calibration of the unit.

Calibration

Carefully apply both ZERO gas and SPAN gas to the unit to avoid pressurizing the internally mounted sensing cell. See Table 7, “Refrigerant Concentrations” for the appropriate calibration gases available for the RMWG Refrigerant Monitor.

The following equipment is required to perform the Calibration Check procedure on the unit:

- Calibration Gas
- Meter capable of monitoring the output in milliamps.

Field Calibration Check Procedure

The calibration procedure involves checking the SPAN and ZERO reading on the instrument.

During the calibration check procedure, any control instrumentation connected to the TruSense™ SD Refrigerant Monitor may activate. Disconnect or disable any equipment or alarms connected to the monitor during the calibration check procedure.

Applying Calibration Gas to the Instrument

Arrange SPAN and ZERO gas cylinders with regulator, tubing, and cal cap as shown in Figure 6.

1. Connect the mA current meter to the instrument output, terminals (+) and (-).

⚠ WARNING
Refrigerant Hazard!

During calibration, the RMWG Refrigerant Monitor is not sampling and monitoring the intended area. Exercise caution in the area as appropriate. Failure to do so may result in death or serious personal injury.

2. Connect the ZERO gas Connect the ZERO gas
3. Open the regulator valve and remove the ZERO gas to flow freely to the instrument. Supply the instrument with gas for at least five minutes.
4. Close the regulator valve and remove the ZERO gas cylinder from the sample tubing.
5. Connect the SPAN gas cylinder to the sample tubing.
6. Open the regulator valve to allow the SPAN gas to flow freely to the instrment. Supply the instrument with gas for at least five minutes.
7. Close the regulator valve and remove the SPAN gas cylinder from the sample tubing.

Calibration

8. Remove tubing from the sensing cell on the unit.
9. Re-connect or enable all equipment and alarm devices connected to any control equipment monitoring the RMWG Refrigerant Monitor.
10. Reinstall the enclosure cover.

⚠ CAUTION
Equipment Failure!

Do not leave any alarm device or equipment disabled or disconnected during normal operation of the instrument; otherwise, the equipment will not function as intended when the instrument detects an alarm situation. Failure to do so may result in serious personal injury.

Service and Replacement Parts

Troubleshooting Guidelines

The TruSense™ SD Refrigerant Monitor is designed to provide long and trouble-free monitoring.

If repairs are indicated, it is possible the user can diagnose and correct the problem using the following:

- Troubleshooting Guidelines (Table 9)
- Replacement Parts Lists (Table 10)

⚠ WARNING
Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Table 9. Troubleshooting guidelines

Symptom	Solution
No output/Power LED does not light	Check and correct input power. Check wiring. Replace Power Supply. Replace LED board.
Beacon will not light	Check that plug is connected to the circuit. Replace beacon assembly.
No analog output	Check connection on board to 4-20mA output. Check board output with meter. Replace circuit board.
No RS-485 Communication	Check connection on board to RS-485 output. Check and correct dip switch address. Replace circuit board.
Calibration box does not communicate with unit	Check connection to circuit board. Replace calibration box.
Noisy output	Check input power Check tubing connection between optical bench and sound dampening element. Replace optical bench.
Calibration has significantly changed from previous reading	Check that gas is properly applied. Clear inlet of particle matter. Replace optical bench.

Service and Replacement Parts

Table 10. Replacement parts list

Component/Assembly	Part Number
Power Filter	FLR04696
R-11 Optical Bench	SEN01131
R-12 Optical Bench	SEN01132
R-22 Optical Bench	SEN01133
R-123 Optical Bench	SEN01134
R-134a Optical Bench	SEN01135
Diffusion Sound Dampening Element	ELM03137
Calibration Cap	CAP00939
Power Supply	SWT02471
Diffusion Sensor PCB Assembly	SEN01126
LED Display	BRO02798
LED Cable Assembly	CAB00999
Four-Point Manifold Assembly	MFD01018
Strobe	UT00883
Filter	FLR04743
Pump Sound Dampening Element	ELM03149
Pump	PMP01604

Service and Assistance

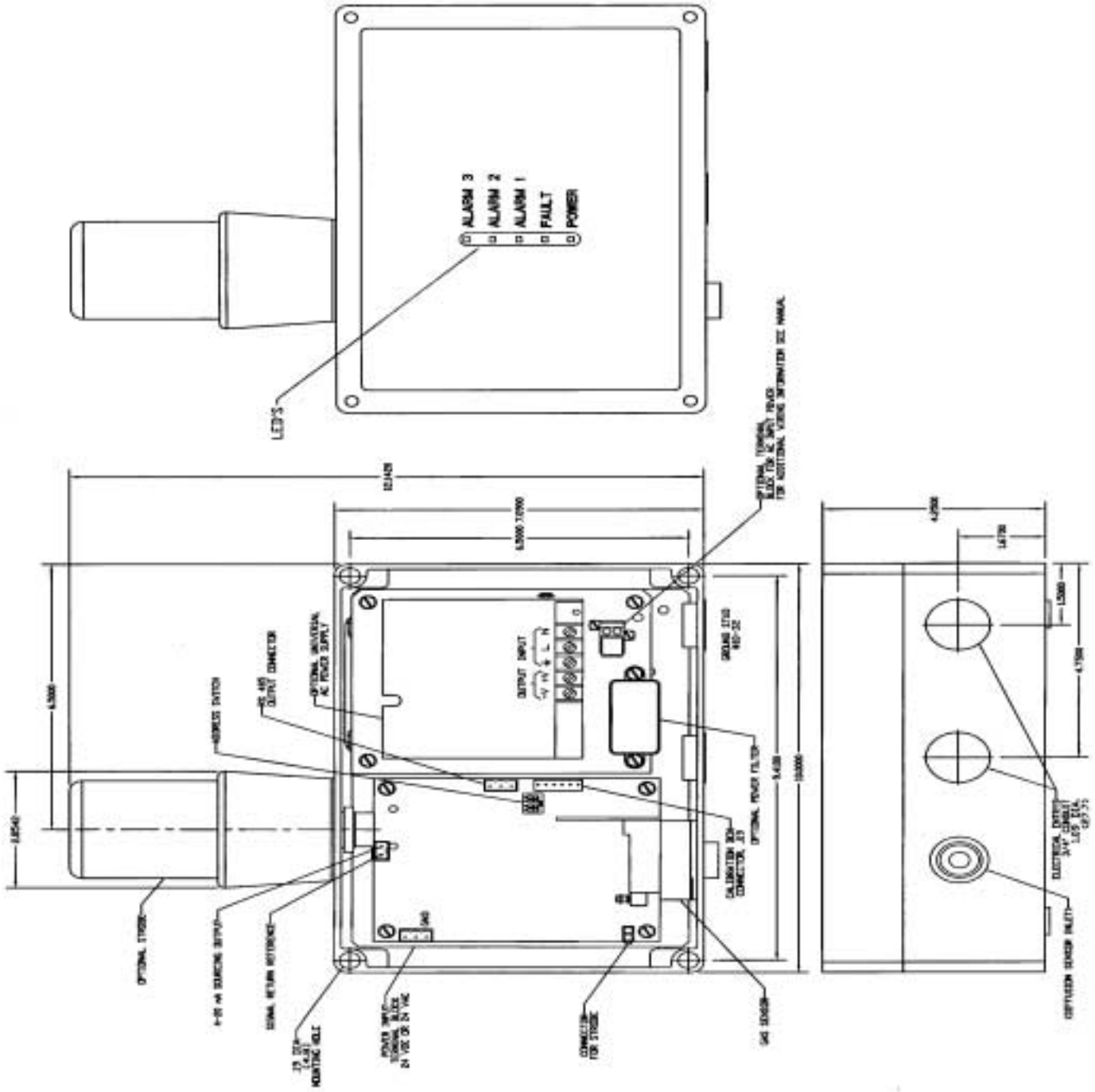
When ordering replacement parts or to obtain assistance regarding any problem with the TruSense™ SD Refrigerant Monitor, please provide the following information (found on the Trane nameplate label located on the side of the instrument):

- Serial Number
- Model Number

To obtain parts and/or assistance, contact the nearest Trane Parts or Service Center.

Appendix A

Figure A-1. Installation outline drawing



Appendix B

RS-485 Output

When set-up to communicate with a TruSense™ SD Control Module, the sensor module uses an RS-485 serial interface with Modbus protocol. The baud rate is 19,200 baud with RTU format sent. Each byte has eight bits with no parity and two stop bits. Each exchange has a two-byte CRC 16 check value.

The sensor unit has an ID range of 100 - 107. The dip switch positions 1 through 3 are binary encoded and read on startup.

Further explanation on setting DIP switches is available in the TruSense SD Control Module installation manual.

Table B-1. Dip switch positions

ID	DIP SWITCH			
	1	**2**	**3**	**4**
100	0	0	0	--*
101	1	0	0	--
102	0	1	0	--
103	1	1	0	--
104	0	0	1	--*
105	1	0	1	--
106	0	1	1	--
107	1	1	1	--
	Note: 1 indicates closed			
	***** Indicates valid address for a four-point pumped unit.			

Two functions supported:

- Read Holding Registers - Function #3
- Preset Multiple Registers - Function #16

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Literature Order Number	RMWG-SVX01C-EN
File Number	SV-CAP-Tools & Test Equipment-RMWG-SVX01C-EN-0403
Supersedes	RMWG-SVX01B-EN
Stocking Location	Inland