



PGM-IR Halogen Monitor

“Bagless” Portable Gas Monitor for Halogen Gases (Refrigerants)

Instruction 3015-5466

Operation and Maintenance

Rev. 11 – January 2018



Patent 6,590,690

Product Leadership • Training • Service • Reliability

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1 Introduction

1.1 How to Use This Manual

This manual provides important information on how to operate and service Bacharach's Refrigerant Monitor. To assure operator safety and the proper use of the monitor, please read, understand, and follow the contents of this manual.

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

1.2 Warning Statements

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

1.3 Caution Statements

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

1.4 Hazard Symbols on Monitor

The following symbol indicates the need to consult this operating instruction manual when opening the enclosure.



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

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



WARNING: To avoid risk of injury from electric shock, do not open the enclosure when power is applied.

1.5 Safety Precautions

1.5.1 Explosive Atmosphere

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



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



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

1.5.2 Misuse and Modifications to Monitor

The protection provided by the monitor may be impaired if the monitor is used in a manner not specified by these instructions. Changes or modifications to this monitor will void the warranty.



WARNING: A gas monitor is not to be used in any application that is beyond its intended purpose or beyond the scope of its specifications. For details on appropriate use, refer to the general description, application, and operation discussions in this manual. Before risking equipment damage or personal injury, contact Bacharach if you are unsure of the validity of a particular gas monitor application.

1.5.3 Altitude Limit

6,562 ft (2,000 m)

1.5.4 Cleaning

Clean the outside of the monitor's case using a dry cloth — **DO NOT** use soap and water

1.6 Features and Capabilities

- Detects, measures, and displays the level of refrigerant gas in the area being monitored
- Measures all gases up to 10,000 ppm with a sensitivity of 1 ppm
- Automatically logs up to 200 gas readings that can be printed/plotted for analysis
- Eliminates false alarms with use of non-dispersive IR source and sample draw system
- Visual and audible gas alarm indicators that are turned ON when the detected gas level exceeds a user defined trip-point
- Extensive self diagnostics, providing both visual and audible indications when a fault occurs
- Battery powered, providing a minimum of 8 hours of operation

1.7 Unpacking and Initial Checks

Your Refrigerant Monitor was carefully inspected at the factory before shipment, and packed so as to be highly resistant to damage while in transport. When you receive the instrument, however, please unpack it promptly and make a visual inspection to make sure that no damage has occurred during shipment. Also check that all the following items have been received.

Item	Part No.	Included with Refrigerant Monitor 3015-5420	Included with Refrigerant Monitor 3015-5696
External Filter Assembly (gas sample)	3015-5324	2	-
Soft Carrying Case with Shoulder Strap	3015-5700	1	1
Battery Pack and Charger Kit	3015-5743	1	1
Probe Assembly	3015-5694	-	1
Stainless Steel Tube	3015-5326	1	-
Instruction Manual	3015-5466	1	1
Elbow	3015-3234	1	Part of probe 3015-5694, above
Tubing	0003-6182	3 ft.	
Coalescing Filter	3015-3071	-	
Filter Assembly (zero air sample)	3015-5722	1	-
	3015-5714	-	1

If damage was found, immediately file a claim with the carrier. If an item is missing, please contact the Service Department for assistance (refer to Service Centers on page 29).

1.8 Functional Overview

The Bacharach Refrigerant Monitor is designed to detect, measure, and display the concentration of refrigerant gas in the area being monitored. To ensure accurate gas measurements, the monitor self-zeros every 4 minutes using an external supply of fresh air provided by activated carbon filtering.

During normal operation the Refrigerant Monitor displays both the current gas level and the peak gas level detected on its front panel LCD. The monitor retains a log of previous readings that can be easily accessed at a later time for analysis.

Front panel indicators and an audible alarm are provided to signal gas alarm and instrument fault conditions. The audible alarm can temporarily be silenced by a push of a button, but will reactivate if the gas level is still above the alarm trip point after a user-defined time period has elapsed.

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

2 Specifications

Product Type.....Portable refrigerant gas monitor

Gas Library:

- CFC:** R-11, R-12, R-113, R-114, R-502, HFP
- HFC:** R-404a (HP62), R-407a, R-407c (AC9000), R-134a, R-410a (AZ20), R-507 (AZ50), R-508b (SUVA95), R-236FA, R-125, R-245Fa, R-422a, R-422d, R-427a, R-424a, R-426a, R-438a, R-407F, R-32
- HCFC:** R-22, R-123, R-124, R-500, R-503, R-401a (MP39), R-402a (HP80), R-402b (HP81), R-408a, R-409a, R-23, R-21, R-227
- HALON:** H1301, H2402, H1211
- Other:** FA188, FC72, N1230, H1234YF, H1234ZE, N7100, N7200, N7300, N7600

Measuring RangeAll gases 0 to 10,000 ppm

Warm-Up Time5 minutes

Detector TypeInfrared, Non-Dispersive

Sensitivity.....1 ppm

Accuracy±1 ppm ± 10% of reading from 0-1000 ppm
R11, R22 and R113 are ±10 ppm ±15% of reading from 0-1000 ppm

Response Time.....90% of response within 5 seconds; 100% in 7 seconds

Temperature Drift.....1.5 ppm per degree C between purge cycles

System NoiseLess than 40 dB(A) at 10 ft (3 m)

Operating Temp.....32 to 122° F (0 to 50° C)

Ambient Humidity.....5 to 90% RH (non-condensing)

Altitude Limit6,562 ft (2,000 m)

Power.....DC power pack, provides a minimum of 8 hours of operation

Power Consumption15 Watts

Front Panel 3 Indicator lights:

ON: Green LED flashes during warm-up, and then glows steady during normal operation.

FAULT: Yellow LED flashes when there is a system fault.

ALARM: Red LED flashes when the gas level is above its alarm setting.

Audible AlarmInternal audible alarm programmable for any of the following conditions:
OFF, FAULT/ALARM, ALARM

Dimensions (DxLxW).....9" x 14.5" x 5" (229 x 368 x 127 mm)

WeightLess than 9 lbs (4 kg) including battery

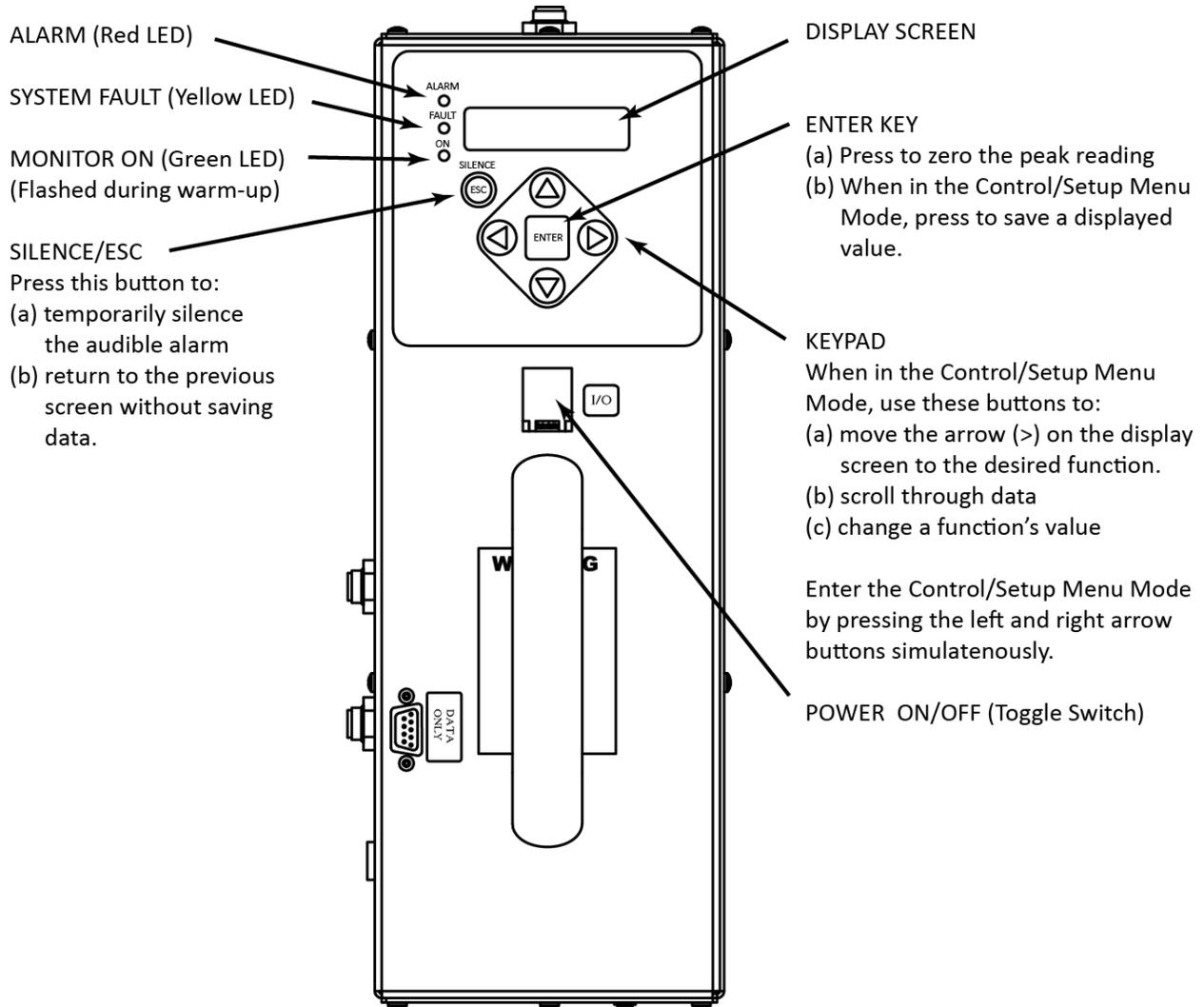
Valid Calibration Period

to Specifications.....12 months

Warranty.....2 years from date of shipment

3 Operation

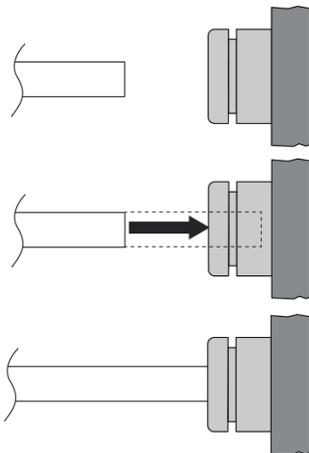
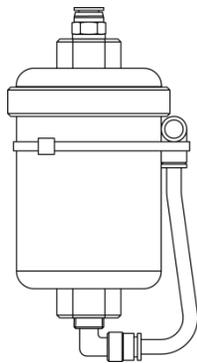
3.1 Front Panel Display and Controls



3.2 Connecting the Zero Air Filter Assembly

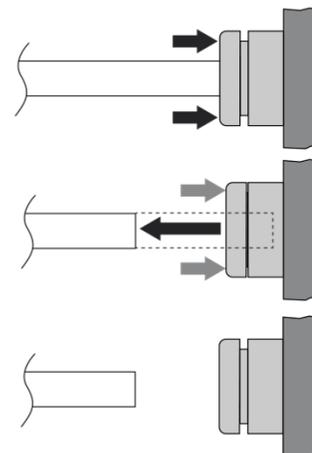
A Zero Air Filter Assembly must be installed to properly use the Bacharach Refrigerant Portable Monitor. The following steps should be taken to install the filter.

1. Unfasten the Velcro on the front of the monitor soft case.
2. Slide the zero air filter into the front pocket. Route the tubing through the hole in the back of the pocket, along the side of the housing.
3. Insert the elbow connector extending from the Charcoal Filter Assembly into the Zero Air Inlet on the monitor.
4. Refasten the Velcro.



To connect the elbow connector to the zero air filter PTC fitting, firmly push the elbow into the hole in the center of the connector until it seats in the connector. Refer to the figures at the left.

To remove the elbow from a PTC connector, push and hold the spring-loaded collar inwards, then simultaneously withdraw the tubing/elbow. Refer to the figures at the right.



3.3 Zero Air Filter Service Life

The monitor will periodically (up to 4 minute intervals) draw clean air from an intake port on the side of the chassis. The external zero air (charcoal) filter (P/N 3015-5722) must be connected to this purge port per Section 3.2 in order to scrub any ambient refrigerant present in the area of operation. When the filter is saturated and can no longer absorb refrigerant, refrigerant can pass thru and create an offset on subsequent measurements, so proper filter maintenance is important. The purge intake filter can operate continuously in a 10 ppm ambient for up to 10 hours before measurement accuracy will be affected. For higher ambient levels the run time is reduced proportionally. To avoid measurement errors Bacharach recommends the following purge filter replacement intervals.

Approximate Ambient Refrigerant Level	Filter Replacement Interval
0 ppm	6 months
5 ppm	250 hrs
10 ppm	200 hrs
20 ppm	150 hrs
100 ppm	100 hrs

The refrigerant monitor can detect a saturated filter during operation by sampling clean (0 ppm) air after the unit has been purged in the presence of ambient refrigerant. A fault will occur (0100) if refrigerant is detected on the purge port.

3.4 Connecting Gas-Sample, Exhaust and Purge Lines

3.4.1 Overview

A single gas-sample line needs to be run from the Refrigerant Monitor to the area to be monitored. If desired, an optional exhaust line can be installed to vent refrigerant gas away from the monitor.

3.4.2 Connecting the Gas-Sample Line or Probe (Model 3015-5420)

To connect the gas-sample line to the monitor, simply push the tubing onto the elbow connector and attach the elbow to the Gas Sample Port on the front of the monitor as shown in the illustration below.

The gas-sample line can be up to **50 ft (15.2 m)** in length. All tubing bends should have a radius of no less than 5" to insure proper airflow. If kinks or obstructions occur in the line the monitor may not function properly.

NOTE: Every foot of tubing added to the sample probe increases the instrument response time by 1 second. For best performance use the tubing provided with the instrument when possible.

The end of this line should be placed near the potential leak source and positioned to reduce the possibility of mists, aerosols, oil, water, dust, or other contaminants being drawn into the monitor.

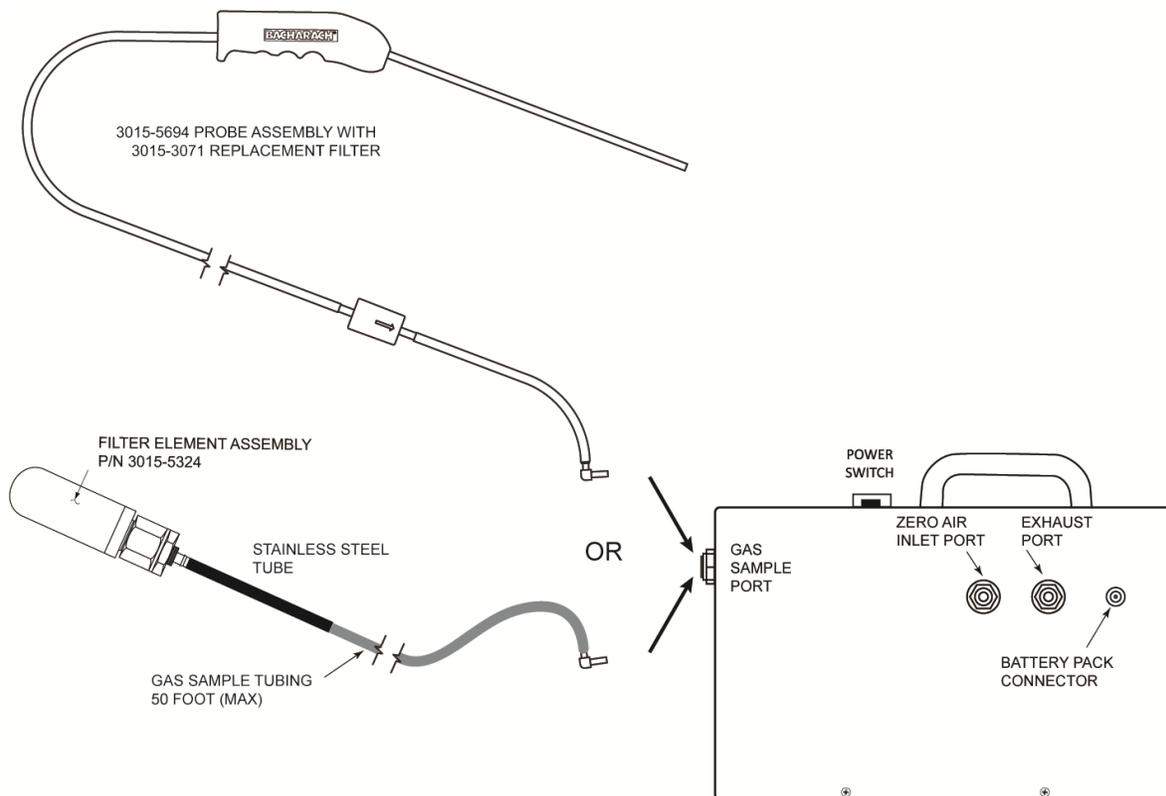
An external filter (P/N 3015-5324) should be attached to the end of this line. See figure on page 11 for details.

3.4.3 Connecting the Gas-Sample Probe 3015-5694

If refrigerant monitor 3015-5696 was ordered the probe assembly is provided pre-assembled. Simply connect the elbow to the gas sample port. See figure on page 11 for details.

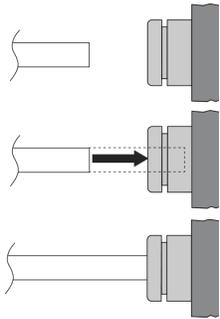
3.4.4 Connecting the Exhaust Line

The optional exhaust line carries the exhausted gas sample away from the monitor. The exhaust line can be up to **50 ft (15.2 m)** in length. Ideally this line should terminate outdoors in a location that is not exposed to the elements.



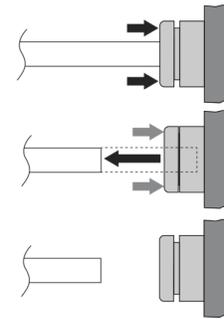
Connecting the Gas Sample Line or Probe

Connect the exhaust line to the monitor by firmly pushing the tubing into the Exhaust Port's push-to-connect (PTC) fitting. See below. If the exhaust line terminates outside the building, position the tubing so that no water or moisture can enter the line. Note that this line does not require a termination filter.



To connect the exhaust line to the exhaust port's PTC fitting, firmly push the appropriate tubing into the hole in the center of the connector until it seats in the connector. Refer to the figures at the left.

To remove tubing from a PTC connector, push and hold the spring-loaded collar inwards, then simultaneously withdraw the tubing. Refer to the figures at the right.



3.4.5 Connecting Zero Air Inlet to an External Purge Line (Optional)

If using the charcoal filter assembly a purge line is not required.

The purge line provides the same function as the charcoal filter, supplying clean air (0 ppm target gas concentration) into the monitor for the purpose of purging the monitor and setting its baseline reading.

The zero air inlet can be up to **50 ft (15.2 m)** in length. This line should terminate in an area known to contain clean (0 ppm) air. To connect the purge line to the monitor, simply push the tubing into the Purge Air Inlet Port. If the purge line terminates outside the building, position the tubing so that no water or moisture can enter the line.

3.5 Gas Detector Operation



CAUTION: Operate the monitor in its horizontal position (handle facing upwards). Tilting the monitor to a vertical position while in operation may cause inaccurate measurements to occur.

Turn ON the monitor as follows:

1. Lift up the shield located in front of the handle
2. Press the green power ON/OFF toggle switch.
3. Observe monitor's firmware version is briefly displayed.
4. Observe the monitor starts counting down its warm-up period of 300 seconds (5 minutes).

Observe the following as the monitor makes gas measurements in the area being sampled:

- **MEASURE** indicates when the monitor is actively measuring the level of refrigerant gas at the sampling point. The measurement cycle runs for 4 minutes.

A log of up to 200 previous measurements can be viewed using the **PPM LOG** function as described on page 14.

- **PURGE** indicates when the monitor is resetting its infrared detector to a baseline of 0 ppm. The purge cycle runs for 10 seconds.

Work with gas alarms and system faults as follows:

ALARM (red) light turns ON if the detected gas level exceeds a programmed alarm point. An audible alarm also sounds if the **AUDALRM** function is activated. Pressing the front panel **SILENCE** button turns OFF the audible alarm, but the **ALARM** light will continue to flash for as long as the detected gas level is above the alarm point. The audible alarm will reactivate if the gas-alarm condition is not cleared within the time period set by the **SILENCE** function (refer to text starting on page 14).

FAULT (yellow) light turns ON if a fault occurs (see Fault Code list on page 18). An audible alarm also sounds if the **AUDALRM** function is activated. Pressing the front panel **SILENCE** button turns OFF the audible alarm, but the **FAULT** light continues to flash for as long as the fault is present. The audible alarm will reactivate if the fault condition is not cleared within the time period set by the **SILENCE** function (refer to page 14). Both the **FAULT** light and audible alarm will automatically turn OFF after the cause of the fault has been eliminated. A log of the last 30 fault events can be viewed using the monitor's **FAULTS** function (page 17).

3.6 Battery Charging and Using



IMPORTANT: If you replace the original PGM-IR battery, refer to the installation instructions included in the replacement kit, as the new replacement battery and cable may differ from the original cable and battery.



IMPORTANT: Cables and sockets are sized appropriately. As general rules of thumb:

- Note the initial orientation of your power cable, and
- Never force a connector into a socket.

3.6.1 Charging the Battery

The monitor is powered by a rechargeable battery pack located in a pouch on the side of the monitor's soft carrying case. The battery pack can be recharged at any time, regardless of the battery's current charge state. The lithium-ion battery will likely be partially charged. However, you should fully charge the battery prior to operating the PGM-IR. Refer to the battery manufacturer's instruction sheet for the proper charging procedure.

3.6.2 Using the Battery

To properly use the battery, follow the steps below.

1. The PGM-IR is designed for a 16VDC input. Set battery voltage output to 16V (refer to the battery manufacturer's instruction sheet for details).
2. The battery pack provided with your PGM-IR uses a power cable with a straight connector and a 90-degree elbow connector. The battery provided with your PGM-IR may differ slightly from the photos shown in this manual, however, the 90-degree elbow connector must ALWAYS be the connector used to supply power to the PGM-IR. Refer to the figure below.



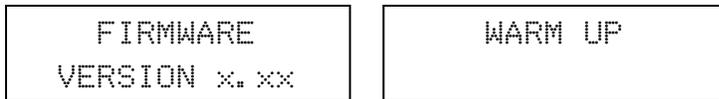
3. Ensure that the battery is powered ON per the instruction label on the battery pack.
4. Verify that the battery is properly connected to the PGM-IR (see above).

A fully charged battery pack will power the monitor for a minimum of 8 hours.

3.7 Display Screens

3.7.1 Initial Power ON

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



The monitor requires 5 minutes to warm up from a cold start; after which, the **ON** light glows steady and the **Data Display** screen appears.

3.7.2 Data Display Screen

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

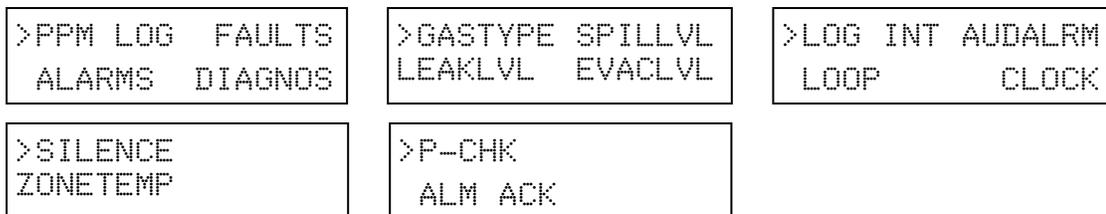
MEASURE indicates that the monitor is actively measuring the refrigerant gas level at the sample point. To reset the peak value to zero, press the **ENTER** button.

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

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

3.7.3 Function Screens

The Function screens are used to set up the monitor and display stored data. From the **Data Display** screen, press any one of the four arrow buttons to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to the desired function, and then press the **ENTER** button to select that function.



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

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

PPM LOG – Contains records of the last 200 measurements. Each record shows the measurement’s date, time, and ppm level. Measurements are logged at an interval determined by the **LOG INT** function. After all 200 locations are filled the newest entries overwrite the oldest entries.

```
#025      7PPM @
07/11/05  15:35
```

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

The PPM Log can be cleared per the Section “Clearing the PPM and Faults Data” on page 19.

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

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

FAULTS – Contains records of the last 30 fault events. The most recent event is displayed when the **Fault** screen is first displayed. After 30 events have been recorded, the newest record overwrites the oldest. Each record lists an event’s numeric fault code (refer to Section 0) plus the date and time at which the event occurred. Use any of the **Keypad** buttons to scroll through the other fault events. Press **ESC** to return to the previous screen.

```
#15 <1000>  @
07/11/05  12:37
```

To the right, record #15 shows that a Purge Flow Fault (fault code <1000>) occurred on 07/11/2005 at 12:37 PM.

DIAGNOS – Enters the diagnostic function. Refer to section 3.12 on page 19.

GAS TYPE – Displays refrigerant gas as the gas being monitored. No other gas types are available for selection.

```
SELECT GAS TYPE
REFRIGERANT
```

LEAKLVL/RANGE – Sets the Leak Alarm level, adjustable from 1 to 1999 ppm. Factory default is 500 ppm. The Leak Alarm level cannot be set higher than either the Spill or Evacuate Alarm levels. Use the **Keypad** to set the desired Leak Alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT LEAK LEVEL
500 PPM
```

When the LEAK DETECTOR option is set in AUDALRM the user menu will display the word RANGE in place of the word LEAKLVL. Adjust the value to correspond to the maximum concentration to be detected. The instrument will beep and blink the ALARM light proportional to the gas concentration present.

SPILLVL – Sets the Spill Alarm level, adjustable from no lower than the Leak Alarm level to a maximum value of 1999 ppm, but not higher than the Evacuate Alarm level. Factory default is 700 ppm. Use the **Keypad** to set the desired Spill Alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT SPILL LEVEL
  700 PPM
```

EVACVL – Sets the Evacuate Alarm level, adjustable from no lower than the Spill Alarm level to 1999 ppm. Factory default is 1000 ppm. Use the **Keypad** to set the desired spill level alarm level, and then press **ENTER** to save that level and return to the previous screen.

```
EDIT EVAC LEVEL
 1000 PPM
```

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

```
LOG INTERVAL IS
   0001 min
```

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

```
AUDIBLE ALARM IS
  OFF
```

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

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

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

```
SET DATE & TIME
07/11/05   15:30
```

SILENCE – Sets the length of time the internal audible alarm is turned OFF when the front panel **SILENCE** button is pressed. The factory default is 30 seconds. If the cause of the gas-alarm has not been cleared at the end of this time period, the internal audible alarm will reactivate. Use the **Keypad** to enter the desired time period, and then press **ENTER** to save that value and return to the previous screen.

```
SILENCE TIMEOUT
   0030 sec
```

SQUELCH - Sets a value of between 0.0 and 100 ppm that prevents the display of measurements below that value. Factory default is 0 ppm. For example, if the squelch setting is set to 5 ppm, then the monitor will not display measurements that are below that value. Use the **Keypad** to enter the desired value, and then press **ENTER** to save that value and return to the previous screen.

```
SQUELCH BELOW
   5 PPM
```

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

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

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

```
CALFACTOR
  1.000
```

P-CHK – The **Pressure Check** function displays the current manifold pressure and the stored ambient pressure in psia, along with the difference between these two pressures and the current fault code. Refer to Section 3.13.

```
14.07 * AMB14.05
-0.02dif <1000>
```

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

```
ALM ACK MODE
MANUAL
```

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

Latching (The alarm light and audible alarm remain on and will not shut off until the alarm condition is manually acknowledged.)

3.8 Working with System Faults

3.8.1 Functional Overview

If a system malfunction occurs (see Fault Code list, Page 18), the front panel **FAULT** light will flash and the audible alarm, if activated (see **AUDALRM** function), will start beeping.

3.8.2 Clearing / Silencing a System Fault

The **FAULT** light and audible alarm will automatically turn OFF after the cause of the fault has been eliminated.

Pressing the **SILENCE** button while a fault condition still exists causes the internal audible alarm to turn OFF for a period of time as set by the **SILENCE** function (refer to Function Screens on page 16). The front panel **FAULT** light will continue to flash as a reminder that a fault condition still exists. At the end of the silence period if the cause of the fault has not been corrected the audible-alarm circuit will reactivate.

3.8.3 Viewing the Faults Log

From the **Data Display** screen, press any of the **Keypad** buttons to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to the **FAULTS** function, and then press the **ENTER** button to display the **Faults Log** screen.

The **Faults Log** screen shows the monitor's current fault status. If the fault is still present when the **FAULTS** function is selected, then the current cause of the fault is displayed along with the date and time it occurred. If the cause of the fault has been cleared, then the **Faults Log** screen will show <0000> along with the date and time the fault was cleared. Use the **Keypad** buttons to scroll through the fault log. In the screens shown to the left, record #03 shows that a Sample Flow Fault (fault code <0800>) occurred on 07/11/2005 at 08:17 AM, while record #04 shows that the fault was cleared on 07/11/2005 at 9:00 AM.

```
#03 <0800> @
07/11/05 08:17
```

```
#04 <0000> @
07/11/05 09:00
```

The cause of the fault is identified by a numeric fault code. To convert the fault code into a text description of the fault, first press the **ENTER** button and then use the **Keypad** buttons to scroll through the display until the text description of the fault appears. If the fault code is a combination of two or more faults, then continue to use the **Keypad**

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

buttons until all fault text descriptions have been displayed. For example, the fault code <1800> represents the combination of both a Sample Flow <0800> and a Purge Flow <1000> fault as shown to the left.

FAULT CODE<1800>
13 PURGE FLOW

The Fault Log can be cleared as described under the heading *Clearing the PPM and Faults Data* (Section 3.11).

3.8.4 Fault Codes

Fault codes are additive. For example, a fault code of <0003> indicates that both a Box Temperature Fault <0001> and a Bench Temperature Fault <0002> have occurred.

Code	Type	Description
<0001>	Box Temperature Fault	Enclosure temperature is outside normal range (or IR detector has failed). Check that the monitor is not being subjected to extreme temperatures. Use the DIAG function to check the Box Temperature.
<0002>	Bench Temperature Fault	Optical sensor is outside normal operating range (or IR detector has failed). Check that the monitor is not being subjected to extreme temperatures.
<0004>	Manifold Pressure Fault	The manifold pressure is outside its normal operating range (or IR detector has failed). Enter the DIAG function and record ALL data. Call the factory with this information for further instructions.
<0080>	Over Range Fault	Monitor exposed to a gas level that exceeded 65,000 ppm.
<0100>	Zero Filter Fault	Indicates contamination in the charcoal filter. The filter may need to be changed.
<0200>	Gain Set Fault	The digipot autotune sequence has failed. This fault will only occur on first boot up or after a firmware upgrade. Call the factory for further instructions.
<0400>	A/D Fault	A fault has occurred in the analog-to-digital circuitry. Contact the factory with this information for further instructions.
<0800>	Sample Flow Fault	Check for a restriction in the gas-sample inlet or exhaust; a blocked internal filter; or a failed pump.
<1000>	Purge Flow Fault	Check for a restriction in the gas-sample exhaust; a blocked internal filter; or a failed pump. Once the purge air stream has been restored, the monitor will return to normal operation after it completes a purge cycle.
<4000>	Zero Range Fault	The IR detector's output voltage is out of tolerance. Enter the DIAG function and record all data. Call the factory with this information for further instructions.
<8000>	Clipping Fault	The detector voltage may be out of tolerance. Use the DIAG function to check the IR detector voltage. Call the factory with this information for further instructions.

3.9 Working with the Gas Alarm (Area Monitoring)

3.9.1 Gas-Alarm Light

If the detected gas level reaches the gas-alarm level as set by the **ALRMLVL** function, the front panel **ALARM** (red) light will flash and the audible alarm, if activated (refer to **AUDALRM** function in the Function Screens section on page 15), will start beeping. The **ALARM** light and audible alarm will automatically turn OFF once the detected gas level drops below the gas-alarm level.

3.9.2 Silencing a Latching Gas Alarm

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

Pressing the **SILENCE** button while the alarm circuit is activated causes the audible alarm to turn OFF for a period of time as set by the **SILENCE** function. The front panel **ALARM** light will continue to flash as an indication that an alarm condition still exists. At the end of the silence period if the detected gas level is still above the gas-alarm level the audible alarm will reactivate.

3.10 Working with the Gas Alarm (Leak Detector Option)

3.10.1 Gas-Alarm Light Plus Audio Feedback

When the LEAK DETECTOR option is selected in the AUDALRM menu, the instrument provides a ticking sound via the internal beeper and flashes the red ALARM LED at a rate proportional to the displayed reading. At 0 ppm the rate is approximately 1 per second. The range over which the tick sound is scaled is set using the "RANGE" menu (taking the place of the LEAKLVL menu option).

During a purge cycle the tic sound is suspended to let the operator know that the instrument is not sampling. Purging typically completes in approximately four seconds.

If power is removed or the product turned off, "Leak Detector Mode" remains set.

It is not possible to silence the Gas Alarm when LEAK DETECTOR operation is selected.

3.11 Clearing the PPM and Faults Data

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

To clear stored data, first display the data to be cleared by selecting the **PPM LOG** or **FAULTS** function per Section 3.7.3 on page 14. Next, press both the **ENTER** and **Keypad Right** buttons at the same time. A single, long tone should be heard when the data has been successfully cleared.

3.12 Working with the DIAG Function

3.12.1 Overview

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

3.12.2 Keypad Functions

From the **Data Display** screen, press any one of the **Keypad** buttons to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it is next to the **DIAG** function, and then press **ENTER** to display the first of two **Diagnostic** screens.

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

3.12.3 First Diagnostic Screen

4.20885v <0000> 29.05cD 14.58psi	Bench Voltage Fault Code Detector Temperature °C * Pressure Reading
0.00075n <0000> 35.40cB 14.59psi	Noise Fault Code Box Temperature °C * Pressure Reading

In the **First Diagnostic** screen, the user can toggle between displaying Sensor Voltage / Detector Temperature, and Noise / Box Temperature by pressing the **Keypad Right** button.

Screen Item	Description
Sensor Voltage	This is the current peak-to-peak output of the IR detector. In the absence of gas this value can range from 3.90000V to 4.50000V.
Noise	The Noise value is a 16 point running average of the noise portion of the IR detector's output. This reading is valuable mainly when gas is NOT present.
Detector Temperature	This is the current detector temperature in °C.
Box Temperature	This is the current internal enclosure temperature in °C.
Fault Code	Current fault code. A value of <0000> indicates that no faults are being detected.
Pressure Reading	This is the pressure as measured every purge cycle with the sample pump off and the gas-sample inlet open. Its value is weather and altitude dependent and can range from 10.0 to 15.5 PSIA.
Purge Valve Asterisk (*)	The purge valve can be opened and closed by pressing the Keypad Left button. An asterisk appears on the display when the purge valve is <i>open</i> causing the monitor to draw air from its purge-air port.

3.12.4 Second Diagnostic Screen

0.1ppm 0.01 0.00004au 4.210v	PPM Level μMole/Liter Avg. Absorption Unit * Detector Voltage
--	--

Screen Item	Description
PPM Level	Parts Per Million Level is the current detected gas level, and is the volume concentration referenced to standard temperature and pressure.
Average Absorption Unit	This is the optical absorbency. In the absence of gas the absorbency is 0.00000 au. When sampling gas, its value varies proportionally with the gas concentration.
μMoles/Liter	This is the absolute concentration in micro-moles per liter of gas.
Detector Voltage	This is a running average of the IR detector's sensor voltage.
Purge Valve Asterisk (*)	The purge valve can be opened and closed by pressing the Keypad Left button. An asterisk appears on the display when the purge valve is <i>open</i> causing the monitor to draw air from its purge-air port.

3.13 Working with the P-CHK Function

3.13.1 Overview

The **P-CHK** function (Pressure Check function) (see section 3.7.3 on page 16) is useful to a service technician for troubleshooting a flow-fault problem. The monitor will trigger a flow fault if the pressure drop from ambient is less than 0.2 psi during a purge cycle, and 0.5 psi during a measurement cycle.

3.13.2 Keypad Functions

From the **Data Display** screen, press both the **Keypad Left** and **Right** buttons at the same time to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to the **P-CHK** function, and then press **ENTER** to display the **Pressure** screen.

The **Keypad Left** button toggles the purge valve open and closed. Note that an asterisk (*) appears when the purge valve is *open* causing the monitor to draw air from the purge-air bag.

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

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

3.13.3 Screen Display

14.59 AMB14.75 -0.16dif <0000>	Current Manifold Pressure * Stored Ambient Pressure Pressure Difference Fault Code
--	--

Screen Item	Description
Current Manifold Pressure	Current manifold pressure in psia.
Stored Ambient Pressure	Stored ambient pressure in psia.
Pressure Difference	Difference between the current manifold pressure and the stored ambient pressure.
Fault Code	Current fault code (Page 18).
Purge Valve Asterisk (*)	The purge valve can be opened and closed by pressing the Keypad Left button. An asterisk appears on the display when the purge valve is <i>open</i> causing the monitor to draw air from the purge-air bag.

3.14 Print/Plot Logged Gas Levels

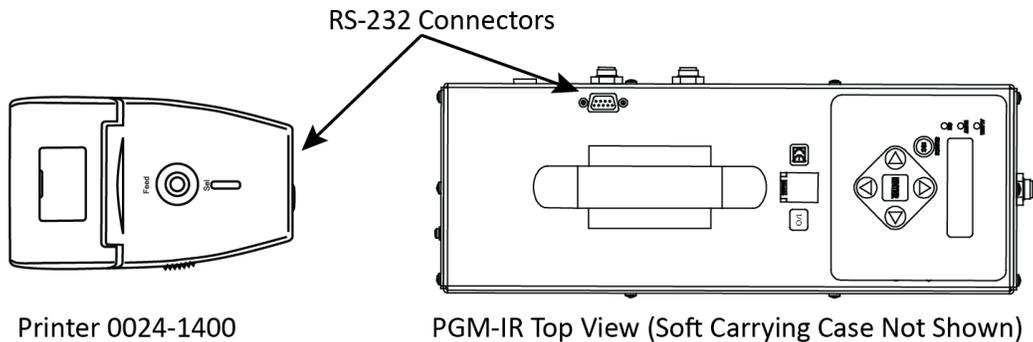
A printout or plot of the last 200 ppm measurements can be made by connecting the optional Bacharach printer and printer cable to the monitor as follows. (Refer to Replacement Parts section on page 28 for printer and cable part numbers).

- For a printout or plot to be made, the monitor must have been set up to record gas measurements using the **LOG INT** function.
- Interconnect the RS-232 connectors located on the printer and monitor.
- If not already done, refer to the printer manual and set the printer's communication parameters to:
 - Data bit = 8
 - Parity = None
 - Baud rate = 19200
 - Handshaking = DTR
- From the **Data Display** screen, press *any Keypad* button to display the first **Function Menu** screen.

2ndUNIT	>PRINT
PLOT	PC-DUMP

Next, use the **Keypad** buttons to move the arrow (>) until it points to either **PRINT** to produce a printout, or **PLOT** to generate a plot.

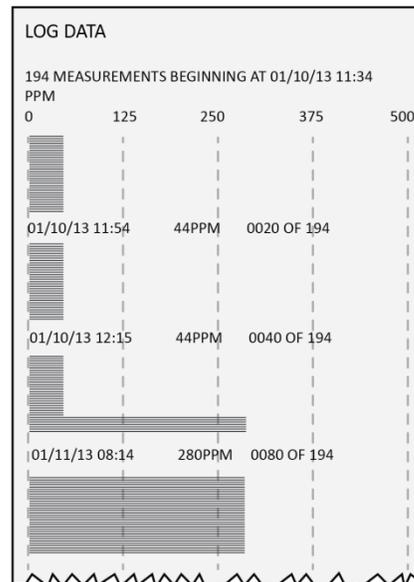
5. Press **ENTER** to start the print/plot process.



EXAMPLE PRINTOUT
Date / Time / PPM / Reading Number

LOG DATA			
DATE	TIME	PPM	Reading Number
01/10/13	11:34	0PPM	0001 of 194
01/10/13	11:35	45PPM	0002 of 194
01/10/13	11:36	45PPM	0003 of 194
01/10/13	11:37	44PPM	0004 of 194
01/10/13	11:38	46PPM	0005 of 194
01/10/13	11:39	45PPM	0006 of 194
01/10/13	11:40	44PPM	0007 of 194
01/10/13	11:41	44PPM	0008 of 194
01/10/13	11:43	45PPM	0009 of 194
01/10/13	11:44	45PPM	0010 of 194
01/10/13	11:45	44PPM	0011 of 194
01/10/13	11:46	44PPM	0012 of 194
01/10/13	11:47	45PPM	0013 of 194
01/10/13	11:48	45PPM	0014 of 194
01/10/13	11:49	45PPM	0015 of 194
01/10/13	11:50	45PPM	0016 of 194
01/10/13	11:51	44PPM	0017 of 194
01/10/13	11:52	45PPM	0018 of 194
01/10/13	11:53	45PPM	0019 of 194
01/10/13	11:54	45PPM	0020 of 194
01/10/13	11:55	44PPM	0021 of 194
01/10/13	11:56	45PPM	0022 of 194
01/10/13	11:57	44PPM	0023 of 194
01/10/13	11:58	44PPM	0024 of 194
01/10/13	11:59	44PPM	0025 of 194
01/10/13	12:00	45PPM	0026 of 194
01/10/13	12:01	44PPM	0027 of 194
01/10/13	12:02	44PPM	0028 of 194
01/10/13	12:04	44PPM	0029 of 194
01/10/13	12:05	44PPM	0030 of 194
01/10/13	12:06	45PPM	0031 of 194
01/10/13	12:07	44PPM	0032 of 194
01/10/13	12:08	44PPM	0033 of 194

EXAMPLE PLOT
Date / Time / PPM Bar Graph



3.15 Downloading Stored Data to a Personal Computer

Using the monitor's **PC DUMP** feature, the last 200 refrigerant gas readings that were stored in memory can be downloaded to a personal computer in ASCII text, comma-delimited format, which can then be imported into most spreadsheet programs for analysis.

The following describes how to download data to a computer using Windows® HyperTerminal as the communications program. If a different operating system and/or communications program is being used, then consult the appropriate instruction manuals for those products.

1. Install serial data cable P/N 104-4027 (straight through, 6 foot, DB9 male to DB9 female) between the computer's COM port and the analyzer's RS-232 connector. (For computers having a 25-pin COM port, either use a 25-pin to 9-pin adapter, or use a serial cable with appropriate connectors on each end.)
2. At the computer, start HyperTerminal by doing one of the following:
 - If HyperTerminal has already been set up to communicate with the Refrigerant Monitor, then click **Start**, point to **Programs**, point to **Accessories**, point to **Communications**, click **HyperTerminal**, and double-click the file name or icon that has been associated with the Refrigerant Monitor.
 - If HyperTerminal has never been run in association with the Refrigerant Monitor, then a new HyperTerminal connection needs to be made as follows:
 - a) Click **Start**; click **Run**. In the Run box type "hypertrm.exe" and click **OK**. The **New Connection** dialog box should appear.
 - b) Type in a New Connection Name such as "C2N2". Click **OK** to select the default icon (if desired, select a different icon before clicking OK). The **Connect To** dialog box should appear.
 - c) Click the **Connect using** drop-down menu and choose the **COM** port to which the analyzer is connected. Then click **OK** to display the **COM Properties** dialog box for that COM port.
 - d) Set Port Settings to:

- Bits per second:	19200
- Data bits:	8
- Parity:	None
- Stop bits:	1
- Flow control:	None

Then click **OK** to display HyperTerminal's main window.
 - e) Click File; click Save. This creates a file with an .ht extension in the folder C:\Program Files\Accessories\Hyper Terminal, using the name that was entered in Step b.
3. After HyperTerminal is running: click **Transfer**, click **Capture Text**, and then click **Start** to accept the default drive\directory\filename to which all received data will be stored as an ASCII text file.

Note: *By default, the captured text file will be stored on the hard drive at C:\Program Files\Accessories\HyperTerminal\CAPTURE.TXT. If desired, click **Browse** to select a different drive, directory and filename. The next time data is captured, it will be stored under the same location and filename.*

Tip: *Changing the filename extension to "CSV" (comma separated variable) will allow the file to be directly opened in the spreadsheet program. For example, double clicking the filename CAPTURE.CSV in Windows Explorer will automatically start Microsoft Excel and load the file.*
4. From the **Data Display** screen, press both the **Keypad Left** and **Right** buttons at the same time to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to **PC-DUMP**, and then press the **ENTER** button to begin the download process.
5. Observe that the Refrigerant Monitor's screen goes blank and that HyperTerminal displays the data as it is being received. After all data has been transmitted, the Refrigerant Monitor re-displays the **Function Menu** screen.
6. To stop capturing data and save it, click **Transfer**, click **Capture Text**, click **Stop**.
7. HyperTerminal and the connection to the Refrigerant Monitor can now be closed.

3.16 Importing Saved Data to a Spreadsheet

A text file that was created as described in Section 3.15 *Downloading Stored Data to a Personal Computer* can be imported into spreadsheet programs that are capable of importing comma-delimited files.

The following describes how to generate a spreadsheet from a comma-delimited text file using Microsoft Excel. If you are using a different spreadsheet program, then please refer to its instruction manual for information on how to import comma-delimited text files.

Tip: *If the text file was saved with the filename extension “CSV” a spreadsheet will automatically be created when that file is opened in Microsoft Excel.*

1. Start Microsoft Excel.
2. Click **File**, and then click **Open** to display the Open dialog box.
3. Change the “Files of type:” to Text Files. Then navigate to the directory containing the text file to be imported.
4. Double-click the desired filename to display the Text Import Wizard – Step 1 of 3 dialog box.
5. Select the Delimited radio button; then click Next to display the Text Import Wizard – Step 2 of 3 dialog box.
6. Under Delimiters, select the Comma check box. Then click Next to display the Text Import Wizard – Step 3 of 3 dialog box.
 - a. Click Finish to create the spreadsheet.
7. The following is a sample spreadsheet showing the Date (month/day/year) and Time (24 hr format) the data was recorded, and the recorded PPM refrigerant gas Level:

5/30/2007	8:00	0
5/30/2007	8:01	74
5/30/2007	8:02	74

5/30/2007	11:17	300
5/30/2007	11:18	300
5/30/2007	11:19	305

4 Maintenance

4.1 Disassembly

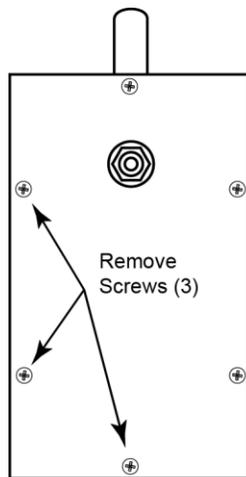
When servicing the parts inside the Refrigerant Monitor, disassemble the monitor's metal chassis as follows:

Items Required:

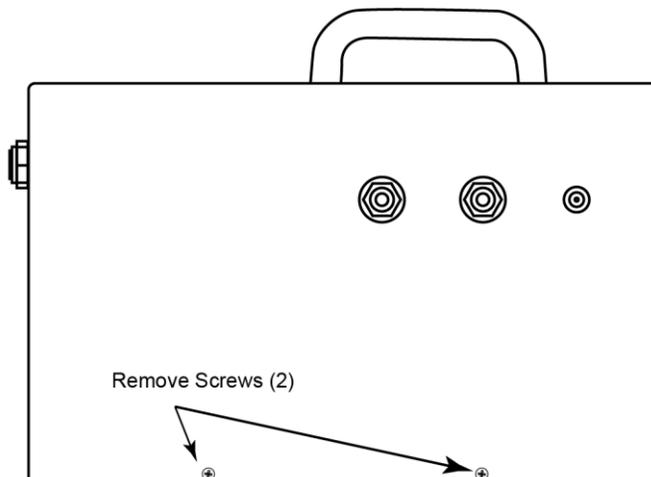
- Medium Phillips head screwdriver

Procedure:

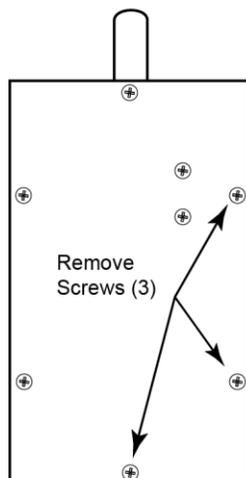
1. Remove monitor and its battery pack from the soft carrying case.
2. Unplug battery pack from monitor.
3. Remove a total of 10 screws from the locations shown in the illustrations below.
4. Carefully separate the metal chassis.



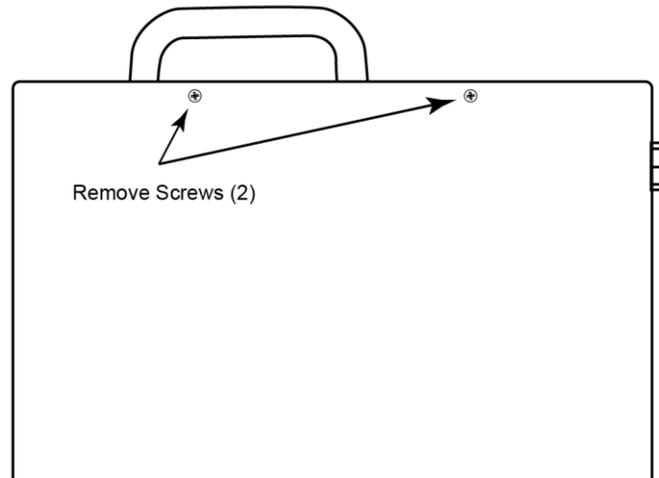
Front



Left Side



Rear



Right Side

4.2 Internal Particulate / Hydrophobic Filter Replacement

Items Required:

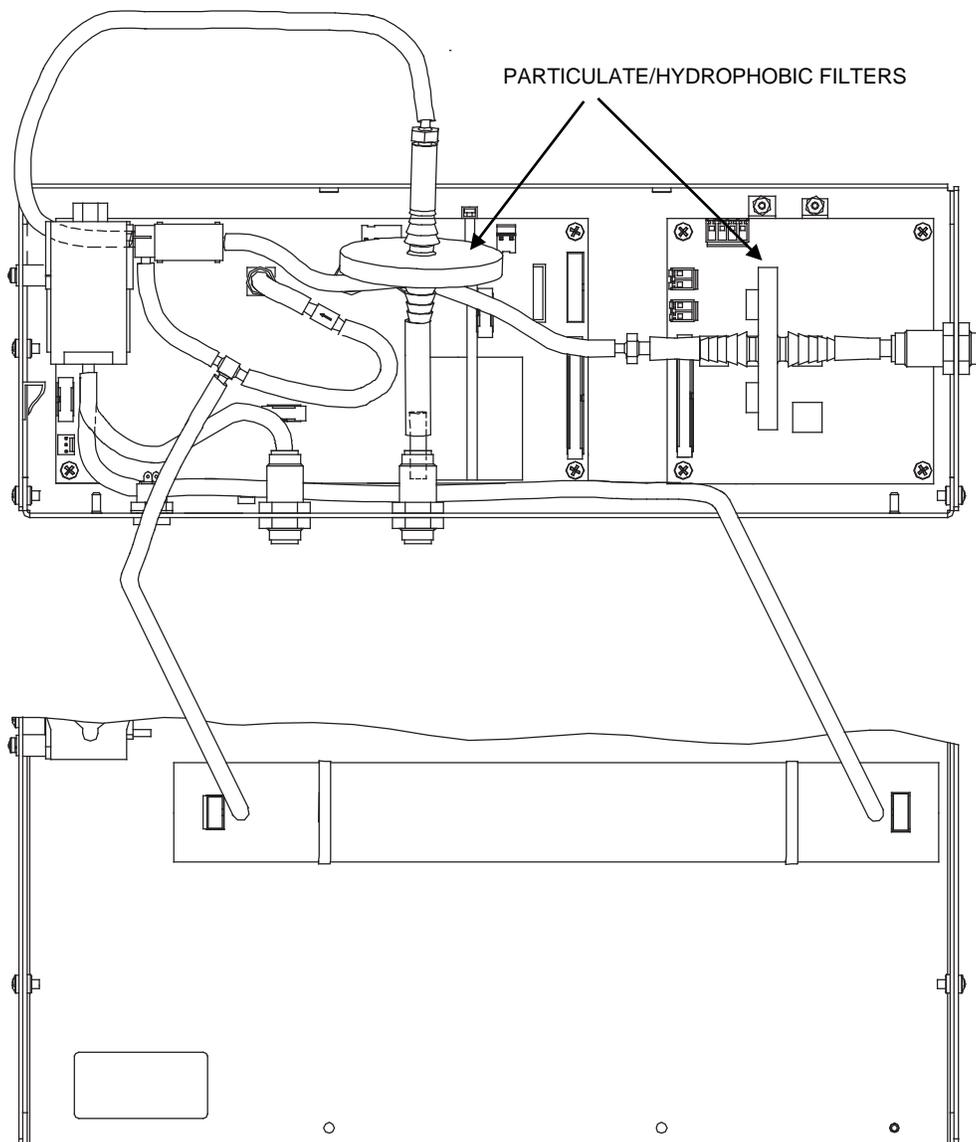
- Replacement filter (P/N 07-1654)
- Medium Phillips head screwdriver

Procedure:

1. Disassemble the monitor's metal chassis per Section 4.1.
2. See illustration below and locate the internal particulate/hydrophobic filters.

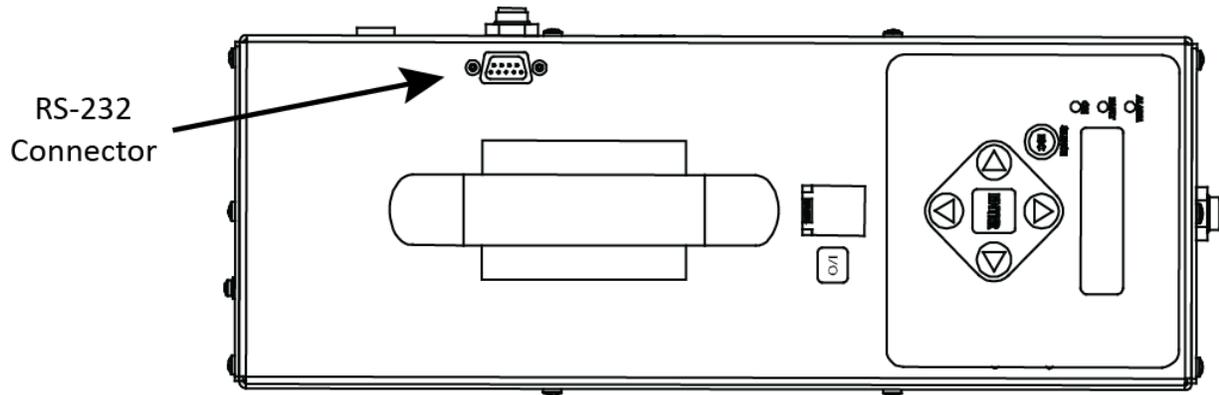
NOTE: The third filter at the pump exhaust does not require periodic replacement.

3. Pull off tubing from both ends of filter and remove filter from instrument.
4. Attach tubing to new filter.
5. Reassemble monitor.



4.3 Updating Firmware

An RS-232 connector, located on the top panel, is used to update the monitor's firmware. Reprogramming the instrument with updated firmware should be done by qualified service technicians only using instructions provided by Bacharach.



4.4 Probe Filter Replacement

Probe assembly 3015-5694 includes an inline coalescing filter 3015-3071. This filter should be replaced after every 50 hours of use, or anytime liquid is drawn into the probe. The filter includes an arrow that indicates the direction of flow. Replace the filter by gently pulling the tubing from each end. Orient the arrow so that it points toward the elbow connected to the refrigerant monitor.



IMPORTANT: If liquid has entered the coalescing filter 3015-3071 to the point where it has soaked it, the internal filters must also be changed. Disconnect the probe and dry it out with clean compressed air. Failure to properly clean and dry the probe, along with changing the internal filter could result in instrument damage and void the warranty.

For refrigerant monitor 3015-5420, replace the external filter 3015-5324 every 50 hours or anytime it becomes contaminated with liquid.

5 Parts and Service

5.1 Replacement Parts and Optional Accessories

Replacement Parts

Part Number	Item Description
3015-2906	External Filter (fits onto probe tip)
0007-1654	Hydrophobic Filter (internal)
3015-5324	External Filter Assembly
3015-5722	Replacement Input Charcoal Filter Assembly (for 3015-5420 Units)
3015-5714	Replacement Input Charcoal Filter Assembly (for 3015-5696 Units)
3015-3071	Replacement Coalescing Filter (for probe 3015-5694)
0103-6105	Probe Tubing (3 ft)
3015-4239	Replacement Pump
0204-0020	Battery (for main PCB board)
3015-4721	Replacement Bench Kit
3015-5743	Replacement Battery Pack/Charger Kit (on Units 3015-5420, 3015-5696, 3015-8000, and 3015-8003)
3015-5847	Replacement Battery Charger (for 87 Wh battery 3015-5743)
3015-5757	Replacement Cable (connects battery to PGM-IR)
0304-3469	Replacement Power Cord (AUS)
0304-3471	Replacement Power Cord (UK)
0304-3470	Replacement Power Cord (EU)
0304-3466	Replacement Power Cord (US)
3015-5326	Stainless Steel Tube
3015-5842	Charcoal Filter Purge Tubing Replacement Kit (Moisture exchange tubing assembly and instructions)

Optional Accessories

Part Number	Item Description
0104-4027	Computer Communications Cable (DB9 male to DB9 female)
0024-1400	IrDA Printer (includes printer, roll of thermal paper, 4 × AA batteries, manual)
0006-8733	Thermal printer paper, 1 roll
0024-1310	Thermal printer paper, 5 rolls
3015-4214	Cable (DB9 to RJ45)
3015-5753	Manifold replacement fitting

5.2 Service Centers

Service and replacement parts can be obtained by contacting the Bacharach Service Centers listed below. Access <http://mybacharach.com/rmaform/> on the web for return materials authorization.

Location	Contact Information	Shipping Address
United States	Phone: 724-334-5000 Toll Free: 800-736-4666 Fax: 724-334-5001 Email: help@mybacharach.com	Bacharach, Inc. 621 Hunt Valley Circle New Kensington, PA 15068, USA <i>ATTN: Service Department</i>
Europe	Phone: +353 1 284 6388 Fax: +353 1 284 6389 Email: help@mybacharach.com	Bacharach, Inc. 114A Georges Street Lower Dun Laoghaire, Dublin, Ireland <i>ATTN: Service Department</i>
Canada	Phone: 905-882-8985 Fax: 905-882-8963 Email: support@bachcan.ca	Bacharach, Inc. 10 West Pearce Street, Unit 4 Richmond Hill, Ontario LB4 1B6, Canada <i>ATTN: Service Department</i>



Bacharach, Inc.

621 Hunt Valley Circle

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