Operating Manual

PGM-IR Halogen Monitor

Portable Gas Monitor for Halogen Gases (Refrigerants)

Order No.: 3015-4584/13

Print Spec: 10000005389 (EO)

CR: 800000067749

US

MSAsafety.com

WARNING!

These instructions must be provided to users before use of the product and retained for ready reference by the user. Read this manual carefully before using or maintaining the device. The device will perform as designed only if it is used and maintained in accordance with the manufacturer's instructions. Otherwise, it could fail to perform as designed, and persons who rely on this device could sustain serious injury or death.

The warranties made by MSA with respect to the product are voided if the product is not installed and used in accordance with the instructions in this manual. Please protect yourself and your employees by following the instructions.

Please read and observe the WARNINGS and CAUTIONS inside. For additional information relative to use or repair, call 1-800-MSA-2222 during regular working hours.

For countries of Russian Federation, Republic of Kazakhstan and Republic of Belarus, the gas detector will be delivered with a passport document that includes valid approval information. On the CD with manual instruction attached to the gas detector the user will find the documents "Type Description" and "Test Method" - appendixes to Pattern Approval Certificate of Measuring instrument, valid in the countries of use.

MSA
The Safety Company

1000 Cranberry Woods Drive
Cranberry Township, PA 16066
USA
Phone 1-800-MSA-2222
Fax 1-800-967-0398

For your local MSA contacts, please go to our website www.MSAsafety.com

Contents

1 Safety Information

⚠ WARNING!

- Read, understand, and follow all operating instructions. A potential risk exists if the operating instructions are not followed.
- To avoid risk of injury from electric shock, do not open the enclosure when power is applied.
- 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.
- 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.
- 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.
- 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.
- This device is designed for operation at or below an altitude of 6,562 ft (2,000 m). Do not operate this device above this altitude limit.
- To clean the outside of the case use a dry cloth. DO NOT use soap and water.

Failure to follow these warnings can result in serious personal injury or death.

2 Unpacking and Initial Checks

The PGM-IR Halogen Refrigerant Monitor was carefully inspected at the factory before shipment, and packed so as to be highly resistant to damage while in transport. Upon receipt,unpack it promptly and make a visual inspection to make sure that no damage has occurred during shipment. Ensure the following items have been received.

Item	Quantity	Part Number
Refrigerant Monitor	1	3015-4484
External Filter Assembly	1	3015-5324
Soft Carrying Case with Shoulder Strap	1	3015-5700
Battery Pack and Charger	1	3015-5743
Stainless Steel Probe	1	3015-5326
Instruction Manual	1	3015-4584
Elbow	1	3015-3234
Tubing (3 ft)	1	00030-6182

If damage was found, immediately file a claim with the carrier. If an item is missing, contact MSA Customer Service for assistance (6.3 Service Centers).

2.1 Shipping Precaution

When shipping the instrument by air, deflate the purge-air bag to prevent it from bursting due to changes in air pressure. Deflate the bag by selecting the EMTYBAG function (see 4.9 Display Screens, EMTYBAG).

2.2 Features and Capabilities

- Detects and measures CFC, HCFC, HFC, HFO, and halogen gases
- Measures all gases up to 10,000 ppm with a sensitivity of 1 ppm
- Automatically logs up to 200 gas readings that can be recalled later for analysis
- Eliminates false alarms with use of non-dispersive IR source and sample draw system
- Visual and audible gas alarm indictors 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

3 Specifications

Product Type	Portable refrigerant gas monitor
Gas Library	
CFC	R-11, R-12, R-113, R-114, R-502, HFP
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, R227, R-420A
HFC/HFO Blend	R-448A, R-449A, R-452A, R-452B, R-463A
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 and R-438A
HFO	R-1234yf, R-1234ze, R-454A, R-454B, R-454C, R-455A, R-513A, R-514A, R-515B
HALON	H1301,H2402, H1211
Other	FA-188, FC-72, N1230, H1234ZE, N7200, N7300, N7600, N4710, N7100
Measuring Range	All gases 0 to 10,000 ppm
Warm-Up Time	5 minutes (300 seconds)
Detector Type	Infrared, Non-Dispersive
Sensitivity	1 ppm
Accuracy	±1 ppm ±10% of reading from 0-1000 ppm (For R11, R22, R113: ±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 °C between purge cycles
System Noise	Less than 40dB (A) at 10 ft (3 m)
Operating Temperature	32°F to 122°F (0°C to 50°C)
Ambient Humidity	5 to 90% RH (non-condensing)
Altitude Limit	6,562 ft (2,000 m)
Power	DC power pack, provides a minimum of 8 hours of operation
Power Consumption	15 Watts maximum
Front Panel	3 indicator lights
ON	Green LED flashes during warm-up, then glows steadily 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 Alarm	Internal audible alarm programmable for any of the following conditions: OFF, FAULT/ALARM, ALARM

Dimensions (D x L x W)	9.0 x 14.5 x 5.0 inches (229 x 368 x 127 mm)
Weight	Less than 9 lbs (4 kg) including battery
Valid Calibration Period to Specifications	12 months
Warranty	2 years from date of shipment

4 Operation

4.1 Connecting Gas-Sample and Exhaust Lines

4.1.1 Overview

A single gas-sample line needs to be run from the HM unit to the area to be monitored. An optional purge-air line can also be installed to bring fresh air into the monitor for the purpose of resetting its infrared detector to a baseline of 0 ppm during the purge cycle. Also, an optional exhaust line can be installed to vent refrigerant gas away from the monitor.

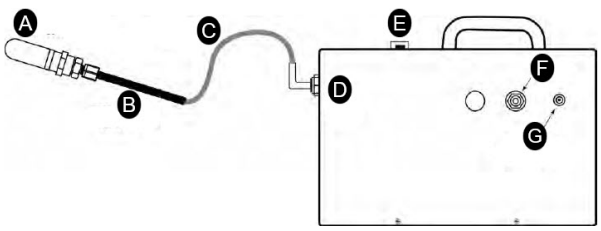
4.1.2 Connecting the Gas-Sample Line

To connect the gas-sample line to the monitor, push the tubing onto the elbow connector and attach the elbow onto the Gas Sample Port on the front of the monitor (see Figure 1).

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 ensure proper airflow. If kinks or obstructions occur in the line the monitor may not function properly.

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 contaminates being drawn into the monitor.

An external filter (P/N 3015-5324) should be attached to the end of this line (see Figure 1).



A - Filter Element Assembly (PN 3015-5324)
B - Stainless Steel Probe Tube
C - Gas Sample Tubing (50 ft max)
D - Gas Sample Port
E - Power Switch
F - Exhaust Port
G - Battery Pack Connector

Figure 1

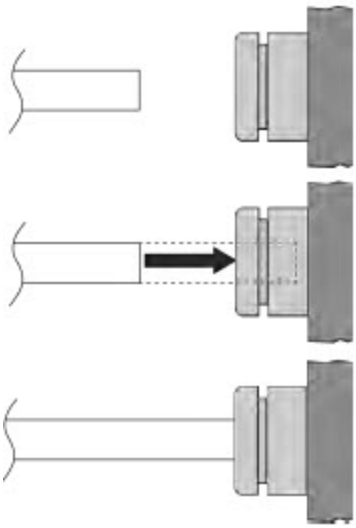
4.1.3 Connecting the Exhaust Line

The exhaust line carries the exhausted gas sample away from the monitor, and is required if the monitor is located in a confined, poorly ventilated area.

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.

Connect the exhaust line to the monitor by firmly pushing the tubing into the Exhaust Port’s push-to-connect (PTC) fitting (see Figure 2).

NOTE: If the exhaust line terminates outside the building, position the tubing so that no water or moisture can enter the line. 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.

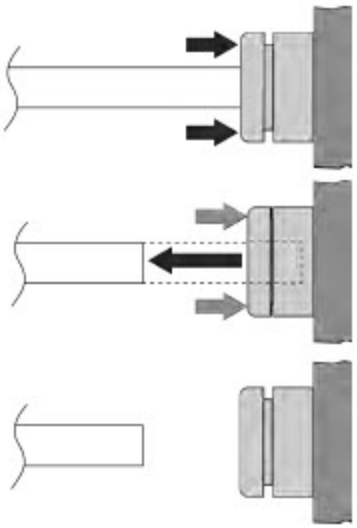


Figure 2 Placeholder Caption

4.2 General Operation

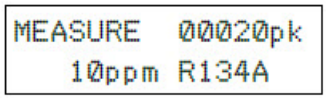
⚠ WARNING!

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.

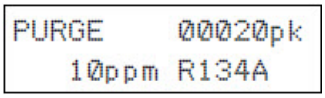
Failure to follow this warning can result in serious personal injury or death.

To turn ON the monitor, lift up the shield located in front of the handle and press the red power ON/OFF toggle switch.

When the monitor has been powered ON, allow it to warm up for 5 minutes.



MEASURE indicates when the monitor is actively measuring gas. The screen to the left shows that currently 10 ppm of R-134A refrigerant gas is being detected, and that a peak measurement of 20 ppm has been made. The operator can reset the peak value to zero by pressing the **ENTER** button. The measurement cycle runs for 4 minutes. A log of up to 200 previous measurements can be viewed using the **PPM LOG** function (4.9 Display Screens, PPM LOG).



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

If the detected gas level exceeds a preset gas-alarm point, the unit will respond by turning ON the front panel ALARM (red) light. If the AUDALRM function is activated (4.9 Display Screens, AUDALRM), the audible alarm will also turn ON. Pressing the front panel SILENCE button turns OFF the audible alarm, but the ALARM light will continue to flash 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 (4.9 Display Screens, SILENCE).

If a system fault occurs (4.11.4 Fault Codes), the monitor responds by turning ON the front panel FAULT (yellow) light. If the AUDALRM function is activated (4.9 Display Screens, AUDALRM), the audible alarm will also turn ON. Pressing the front panel SILENCE button turns OFF the audible alarm, but the FAULT light will continue to flash 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 (4.9 Display Screens, SILENCE). 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 (4.9 Display Screens, FAULTS).

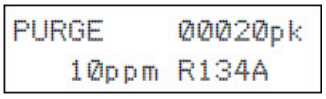
4.3 Time Weighted Average (TWA) Operation

4.3.1 Overview

In addition to displaying the current gas level, the monitor can also calculate and display a **T**ime **W**eighted **A**verage ppm value. This value is available in two formats, 8 Hour or Continuous. This provides users with the most appropriate data on their average ppm exposure in the working environment.

TWA operation is selected by using the **2ndUNIT** function.

The two TWA formats are identified by the appearance of either “TWA” or ‘twa” in the upper-right corner of the **Data Display** screen.

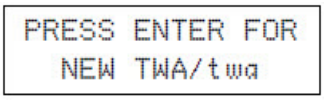


TWA (upper case letters) is calculated over an 8-hour period. This format is designed to show the uers’s average ppm exposure level during a typical work day. After 8 hours has expired, an asterisk (*) will be displayed but the TWA will continue to be updated.

twa (lower case letters) is continuously calculated over the operating time of the monitor. This mode is useful for monitoring an area for a few minutes or more and is the preferred mode of operation for checking operating room atmospheres.

4.3.2 Starting a New or Continuing TWA/twa

When the monitor is turned ON the following message appears if the monitor is set up to display TWA/twa.

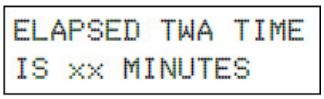


Press either . . .

- **ENTER** to start a new TWA/twa
- **ESC** to continue with the current TWA/twa.

  NOTE: If NO button is pressed within 60 seconds the monitor automatically continues with the current TWA/twa.

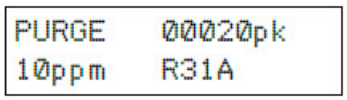
NOTE: During the time the monitor is OFF, the gas measurement is assumed to be zero and will be factored into the TWA/twa calculation.



After selecting whether to start or continue a TWA/twa, the next screen shows the current elapsed TWA/twa time.

Where: xx is the accumulated time used by the monitor in calculating the TWA/twa.

4.4 Peak Reading Operation



In addition to displaying the current halogen level, the monitor can also be set up to display its peak ppm measurement. The peak reading display is selected by using the **2ndUNIT** function.

The display above shows that currently the monitor is detecting 100 ppm R31A and that a peak measurement of 500 ppm has occurred.

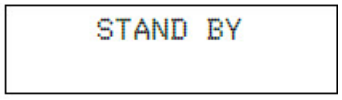
The peak reading is reset by pressing the **ENTER** button.

4.5 Leak Detector Operation

The monitor can be configured to operate as a Leak Detector by setting the **AUDALRM** function (4.9 Display Screens, AUDALRM) to **LEAK DETECTOR**.

When configured as a Leak Detector, the monitor will produce a leak detector type of audible feedback. At zero ppm there will be a tic every 2 seconds with the tic rate increasing up to 20 tics/second when the ppm level reaches the **ALRMLVL** setting.

4.6 Standby Mode

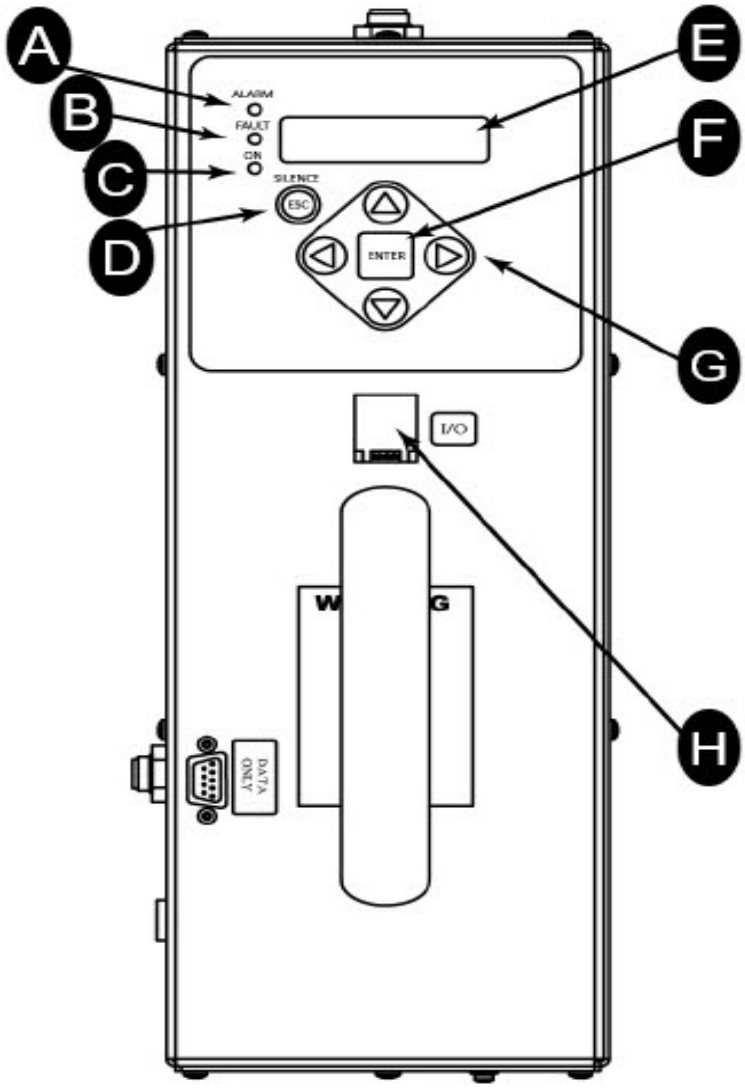


After becoming operational, the monitor can be placed into a Standby Mode. When taken out of standby the monitor is ready for operation without waiting an additional 15 minutes to warm up. While in standby the monitor will stop taking gas samples and stops purging itself from the purge-air bag.

Place the monitor into its Standby Mode by pressing both the **ENTER** and **ESC** buttons at the same time.

Take the monitor out of standby by again pressing both the **ENTER** and **ESC** buttons.

4.7 Front Panel Display and Controls



A - ALARM (Red LED)

B - SYSTEM FAULT (Yellow LED)

C - MONITOR ON (Green LED)
(Flashed during warm-up)

D - SILENCE/ESC Press this button to:
- temporarily silence the audible alarm
- return to the previous screen without saving data

E - DISPLAY SCREEN

F - ENTER KEY
- Press to zero the peak reading
- When in the Control/Setup Menu Mode, press to save a displayed value

G - KEYPAD
- When in the Control/Setup Menu Mode, use these buttons to:
  Move the arrow (>) on the display screen to the desired function
- Scorll through data
- Change a function's value

Enter the Control/Setup Menu Mode by pressing the left and right arrow buttons simultaneously.

H - POWER ON/OFF (Toggle Switch)

4.8 Battery

⚠ WARNING!

- 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 battery and cable.
- Cables and sockets are sized appropriately.
  - Note the initial orientation of your power cable, and
  - Never force a connector into a socket.

Failure to follow these warnings can result in serious personal injury or death.

4.8.1 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 instructions on the battery for proper charging procedure.

4.8.2 Using the Battery

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.

The battery pack provided with the PGM-IR uses a power cable with a straight connector and a 90-degree elbow connector.

NOTE: 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 (see Figure 3).

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

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

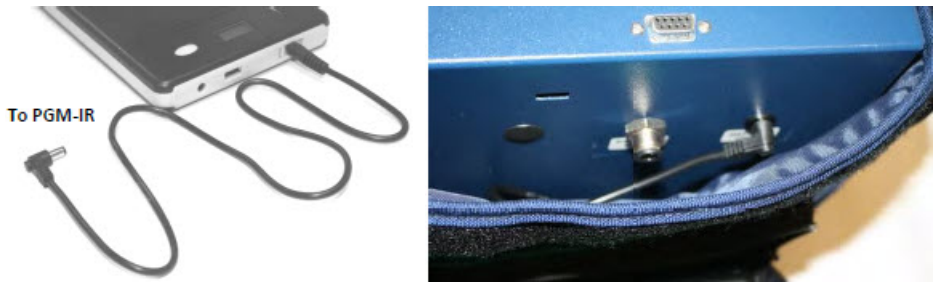
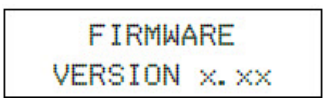
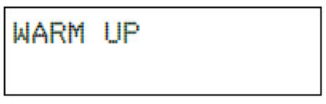


Figure 3 Using the Battery

4.9 Display Screens

4.9.1 Initial Power Up





When the monitor is first powered up, 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; after which, the **ON** light glows steadily and the **Data Display** screen is displayed.

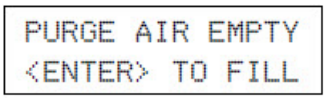
If the monitor is turned OFF and then turned back ON, the latter warm-up time may be less than 15 minutes depending on the temperature of the IR detector.

4.9.2 Filling the Purge-Air Bag

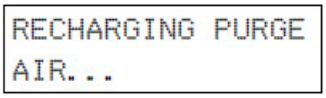
⚠ CAUTION!

Fill the purge-air bag in a clean, fresh-air environment that is at the same temperature and humidity as the area being checked for gas. DO NOT fill the bag in an area that is contaminated with gas.

Failure to follow this caution can result in minor or moderate injury.



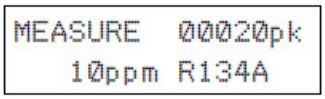
This message is displayed and an audible alarm is sounded when the monitor's purge-air bag is empty. This message appears immediately after warm-up, and approximately every 40 minutes during normal operation. Press the **ENTER** button to start the refill process.



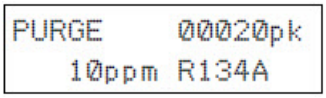
After the air bag has been filled, the monitor starts or resumes normal operation by displaying the **Data Display** screen.

4.9.3 Data Display Screen

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



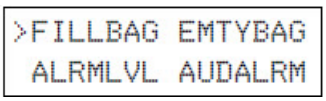
MEASURE indicates that the monitor is actively measuring gas. In this screen, 10 ppm of R-134A gas is currently being detected, and that a peak measurement of 20 ppm has occurred sometime in the past. The measurement cycle runs for 4 minutes.



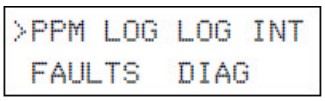
To reset the peak value to zero, press the **ENTER** button.

4.9.4 Function Screens

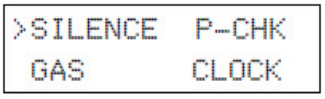
The Function screens are used to set up the monitor and display stored data.



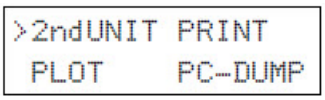
From the **Data Display** screen, press both the **Keypad Left** and **Right** buttons at the same time to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to the desired function, and then press the **ENTER** button to select that function.



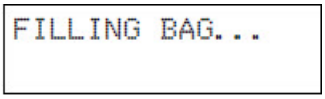
Once a function has been selected, use the **Keypad** to scroll through the displayed data or to change a parameter associated with that function. Press **ENTER** to save any newly entered parameters. Press the ESC button to return to the previous screen without saving.



NOTE: If no buttons are pressed within 90 seconds after selecting a function, the unit returns to the Data Display screen.



FILLBAG



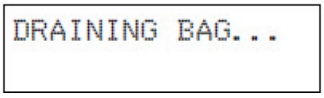
Press **ENTER** to manually fill the purge-air bag.

⚠ WARNING!

Fill the purge-air bag in a clean, fresh-air environment that is at the same temperature and humidity as the area being checked for gas. DO NOT fill the bag in an area that is contaminated with gas.

Failure to follow this warning can result in serious personal injury or death.

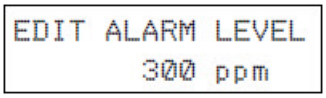
EMTYBAG



Press **ENTER** to manually empty the purge-air bag.

Use this function to drain the bag if it becomes contaminated with gas.

ALRMLVL



Detected gas level that causes the front panel **ALARM** (red) light to turn ON and the audible alarm to sound (if AUDALRM function is set to ALARM or ALARM/FAULT).

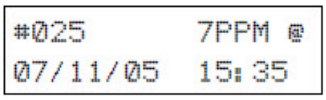
AUDALRM

The internal audible alarm is programmable to function.

- **OFF** – Audible alarm is disabled.
- **ALARM** – Alarm sounds when detected gas level exceeds the ALRMLVL level as evidenced by the front panel ALARM (red) light turning ON.
- **ALARM/FAULT** – Alarm sounds when either the detected gas level exceeds the ALRMLVL value, or if a system fault occurs, as evidenced by the front panel ALARM (red) light or FAULT (yellow) light turning ON.
- **LEAK DETECTOR** – When selected, the monitor will produce a leak detector type of audible feedback. At zero ppm there will be a tic every 2 seconds with the tic rate increasing up to 20 tics per second when the ppm level reaches the ALRMLVL setting.
- **TWA ALARM** – Audible alarm sounds when the TWA or twa, whichever is selected by the **2ndUNIT Function**, exceeds the **ALARMLVL** value.

NOTE: The audible alarm can be temporarily silenced by pressing the **SILENCE** button.

PPM LOG



Record #025 shows that a gas level of 7 ppm was measured on 07/11/2005 at 3:35 PM.

Contains records of the last 200 measurements.

NOTE: Each record shows the measurement's date, time, and ppm level.

Measurements are logged at an interval determined by the LOG INT function.

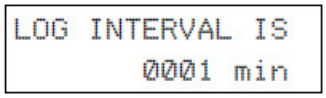
After all 200 locations are filled the newest entries overwrite the oldest entries.

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.

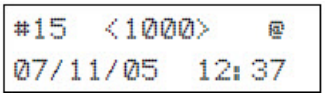
The PPM Log can be cleared using the information in 4.12 Clearing the PPM, Alarms and Faults Data.

LOG INT



- 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.

FAULTS



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

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 (4.11.4 Fault Codes) plus the date and time at which the event occurred.

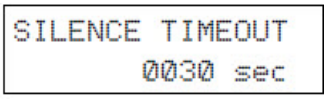
Use any of the **Keypad** buttons to scroll through the other fault events.

Press **ESC** to return to the previous screen.

DIAG

Enters the diagnostic function (4.13 The DIAG Function).

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.

4.10 Gas Alarm

4.10.1 Gas-Alarm Light

If the detected gas level reaches one the gas-alarm levels as set by the **LEAKLVL**, **SPILLLVL**, or **EVACLVL** functions, the front panel **ALARM** light will flash and the audible alarm, if activated (refer to 4.9 Display Screens, AUDALRM), will start beeping. The **ALARM** light and audible alarm will automatically turn OFF once the detected gas level drops below the gas-alarm level.

4.10.2 Silencing a Gas Alarm

Pressing the **SILENCE** button while the alarm circuit is activated causes the internal audible alarm to turn OFF for a period of time as set by the **SILENCE** function (4.9 Display Screens, SILENCE).

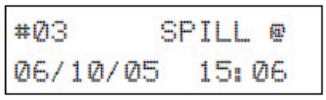
The front panel **ALARM** light will continue to flash as an indication that an alarm condition still exists. The audible alarm will reactivate at the end of the silence period if the detected gas level is still above the gas-alarm level.

4.10.3 Viewing the Gas Alarm 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 **ALARMS** function, and then press the **ENTER** button to display the **Alarm Log** screen.

The alarm log shows the type of alarm (LEAK, SPILL, or EVAC), plus the date and time it occurred. If CLEAR is displayed, this indicates that an alarm was acknowledged at the date and time shown.

Immediately after selecting the **ALARMS** function, the most recent alarm event is displayed.



Record #03 shows that a Spill Alarm occurred on 06/10/05 at 15:06.

NOTE: If more than 30 alarm events have occurred, then the newest event overwrites the oldest.

NOTE: The Alarm Log can be cleared as described in 4.12 Clearing the PPM, Alarms and Faults Data.

4.11 System Faults

4.11.1 Functional Overview

If a system malfunction occurs (4.11.4 Fault Codes), the front panel **FAULT** light will flash and the audible alarm, if activated (refer to 4.9 Display Screens, AUDALRM), will start beeping.

4.11.2 Clearing / Silencing a Fault Alarm

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 (4.9 Display Screens, SILENCE). The front panel **FAULT** light will continue to flash, however, as a reminder that a fault condition still exists. The audible-alarm circuit will reactivate at the end of the silence period if the cause of the fault has not been corrected.

4.11.3 Viewing the Faults Log

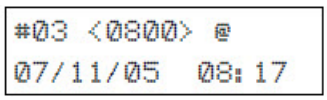
From the **Data Display** screen, press any of the **Keypad** buttons to display the first **Function Menu** screen. Next, use the **Keypad** buttons to move the arrow (>) until it points to the **FAULTS** function, and then press the **ENTER** button to display the Faults Log screen.

The **Faults Log** screen shows the monitor's current fault status.

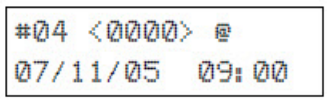
If the fault is still present when the **FAULTS** function is selected, then the current cause of the fault is displayed along with the date and time it occurred.

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.



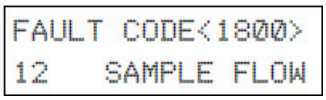
In the screens shown, record #03 shows that a Sample Flow Fault (fault code <0800>) occurred on 07/11/05 at 08:17, while record #04 shows that the fault was cleared on 07/11/05 at 9:00.

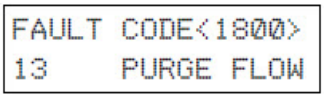


The cause of the fault is identified by a numeric fault code.

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** buttons until all fault text descriptions have been displayed.





The fault code <1800> represents the combination of both a Sample Flow <0800> and a Purge Flow <1000> fault as shown.

NOTE: The Fault Log can be cleared as described in 4.12 Clearing the PPM, Alarms and Faults Data.

4.11.4 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	Fault Name	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 **DIAGNOS** function to check the Box Temperature.
<0002>	Bench Temperature Fault	Optical bench 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 (Sensor 1)	The manifold pressure is outside its normal operating range (or IR detector has failed). Enter the **DIAGNOS** function and record ALL data. Contact MSA with this information for further instructions.
<0020>	Maniforld Pressure (Sensor 2)	See fault code <0004>.
<0040>	Fill Flow Fault	The purge-air bag's pressure drop is outside expected limits. Check for a punctured bag or disconnected tubing.
<0080>	Over Range Fault	Monitor exposed to a gas level that exceeded 65,000 ppm.
<0100>	Zero Filter Fault	The purge-air bag is contaminated with gas. Take monitor to a clean-air area and use the **EMPTYBAG** and **FILLBAG** functions to decontaminate the purge-air bag. If an external filter is used, it may need to be replaced.
<0200>	Gain Set Fault	The digipot autotune sequence has failed. This fault will only occur on first boot up or after a firmware upgrade. Contact MSA for further instructions.
<0400>	A/D Fault	A fault has occurred in the analog-to-digital circuitry. Contact MSA 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.
<2000>	Bag Fill Fault	The purge-air bag did not fill within the expected time allotment. Check for a punctured bag or disconnected tubing.
<4000>	Zero Range	The IR detector's output voltage is out of tolerance. Enter the DIAGNOS function and record all

Code	Fault Name	Description
	Fault	data. Contact MSA with this information for further instructions.
<8000>	Clipping Fault	The detector voltage may be out of tolerance. Use the DIAGNOS function to check the IR detector voltage. Contact MSA with this information for further instructions.

4.12 Clearing the PPM, Alarms and Faults Data

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

To clear stored data, first display the data to be cleared by selecting the **PPM LOG**, **ALARMS** or **FAULTS** function. 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.

4.13 The DIAG Function

4.13.1 Overview

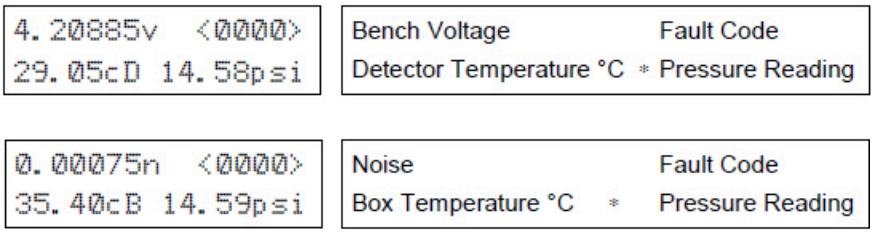
The **DIAG** function displays sensor data and status information useful to a service technician for troubleshooting various fault conditions. Explanations of the data shown in these screens follow.

4.13.2 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.

4.13.3 First Diagnostic Screen



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

Bench 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.

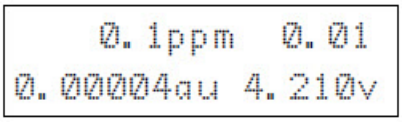
Box Temperature – This is the current internal enclosure temperature in °C.

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 open causing the monitor to draw air from its purge-air port.

4.13.4 Second Diagnostic Screen



PPM Level		µMole/Liter
Avg. Absorption Unit	*	Detector Voltage

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 bench 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 open causing the monitor to draw air from its purge-air port.

4.14 The Calibration Function

If greater than standard accuracy is desired, the factory's default calibration factor of 1.000 may be adjusted by performing the calibration procedure as described below, and then selecting the monitor's CAL function to enter the new calibration factor.

Changing the calibration factor will VOID the factory calibration. Typically, the monitor will remain within the factory-calibrated accuracy indefinitely and no calibration is required. Complex software algorithms adjust for temperature drift, IR source aging, and pressure changes in order to keep the unit within factory accuracy specifications.

4.14.1 Calibration Procedure

The calibration factor is determined by sampling a known concentration of R-134A refrigerant gas. A cylinder of a certified calibration gas must be used to ensure that the gas sample is a known concentration at ambient conditions. A minimum sample size of 5 liters is required.

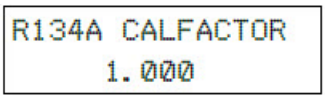
Calibration is best performed at or near full scale (1,000 ppm). It can, however, be done at any concentration and ideally in the range where maximum accuracy is desired down to, but not below, 100 ppm.

The monitor should be operating for at least one hour prior to performing a calibration.

Prepare the monitor for sampling by using the **CAL** function to set the calibration factor to 1.000. Also, use the **LOG INT** function to set the log interval to 1 minute.

With the monitor operating normally, connect the gas-sample bag directly to the gas-inlet port and allow the monitor to sample the entire bag. When sampling is complete, view the logged ppm values using the **PPM LOG** function. If the bag was large enough for multiple samples, average the most stable ones. The new calibration factor is computed by dividing the known gas concentration value by the measured value. Typically this number will be between 0.95 and 1.05. Use the **CAL** function as described below to enter the new calculated calibration factor.

4.14.2 Adjusting Calibration Factor



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 **CAL** function, and then press **ENTER** to display the **Calibration** screen.

With the **Calibration** screen displayed, use the **Keypad** buttons to enter the new calibration factor. Press **ENTER** to save this value.

4.15 The P-CHK Function

4.15.1 Overview

The **P-CHK** function (Pressure Check function) 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.

4.15.2 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.

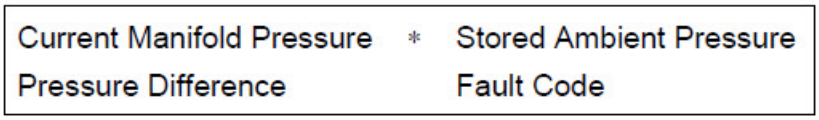
The **Keypad Left** button toggles the purge valve open and closed.

NOTE: An asterisk (*) appears when the purge valve is *open* causing the monitor to draw air from the purge-air bag.

The **Keypad Dow**n 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).

4.15.3 Screen Display



Current Manifold Pressure – Current manifold pressure in psia.

Stored Ambient Pressure – Stored ambient pressure in psia.

Pressure Difference – The difference between the current manifold pressure and the stored ambient pressure.

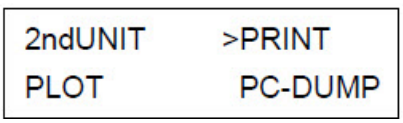
Fault Code – Current fault code (see page 15).

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 open causing the monitor to draw air from the purge-air bag.

4.16 Print/Plot Logged Gas Levels

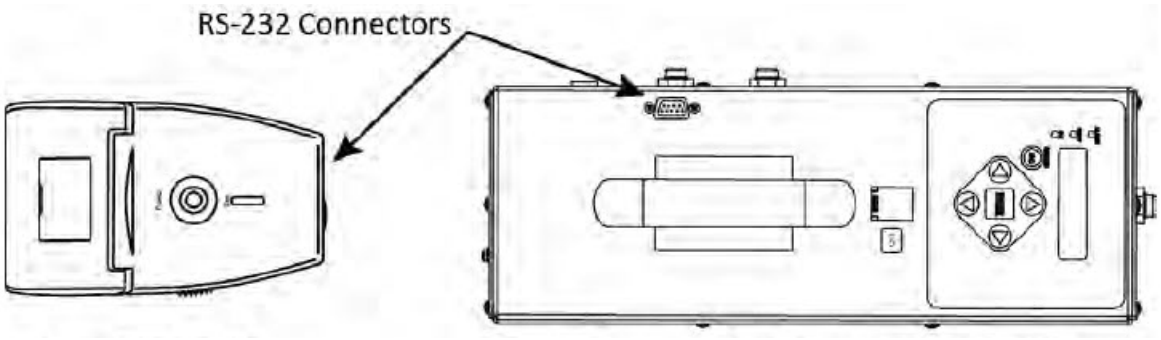
A printout or plot of the last 200 ppm measurements can be made by connecting the optional MSA printer and printer cable to the monitor as follows. (Refer to 6.1 Replacement Parts for printer and cable part numbers).

1. For a printout or plot to be made, the monitor must have been set up to record gas measurements using the LOG INT function.
2. Interconnect the RS-232 connectors located on the printer and monitor.
3. 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



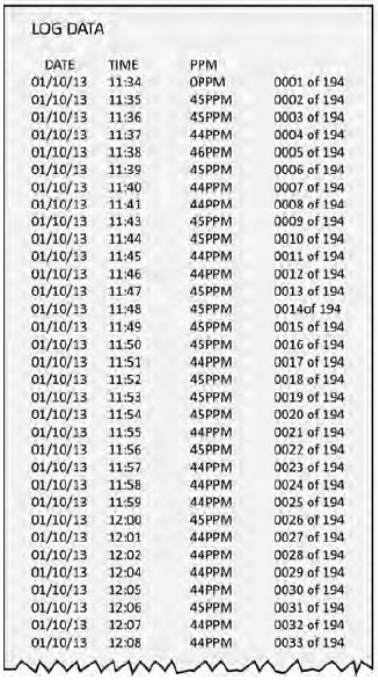
4. From the **Data Display** screen, press any **Keypad** button to display the first Function Menu screen.
5. Use the **Keypad** buttons to move the arrow (>) until it points to either **PRINT** to produce a printout, or **PLOT** to generate a plot.

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



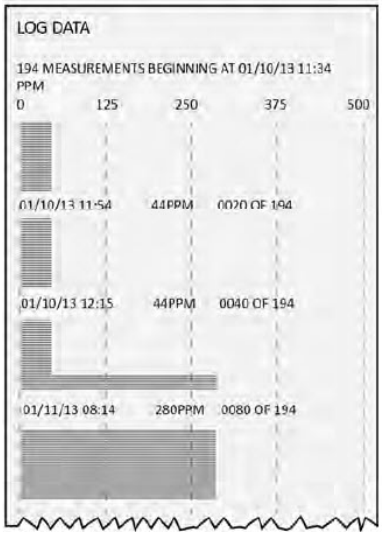
Printer 0024-1400 PGM-IR Top View (soft carrying case not shown)

Example PrintOut	Example Plot
Date / Time / PPM / Reading Number	**Date / Time / PPM Bar Graph**



LOG DATA

DATE	TIME	PPM	
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	0014of 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



4.17 Downloading Stored Data to a Personal Computer

Using the monitor's PC DUMP feature, the last 200 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, 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 monitor.

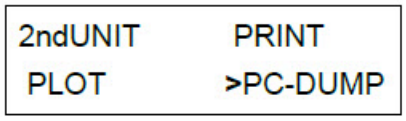
- If HyperTerminal has never been run in association with the monitor, then a new HyperTerminal connection needs to be made as follows:
  a. Click **Start**; click **Run**. In the Run box, type “hypertrm.exe” and click **OK**. The **New Connection** dialog box should appear.
  b. Type in a New Connection Name. 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 on **Connect** from the 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
  e. Click OK to display HyperTerminal’s main window.
  f. Click **File**; click **Save**.

     NOTE: 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.

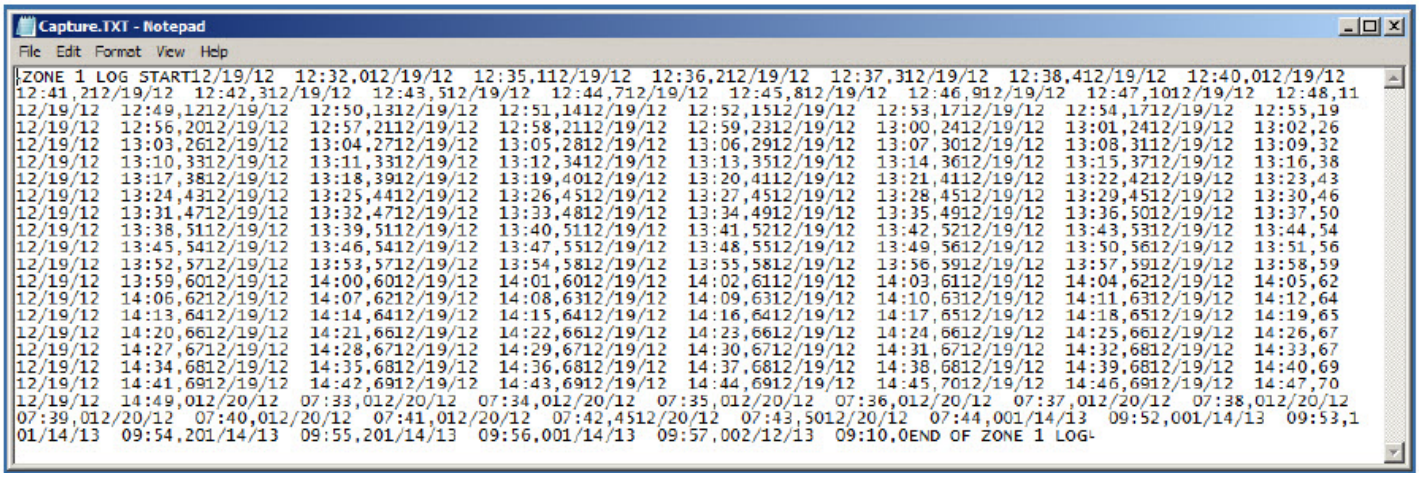
3. After HyperTerminal is running: click **Transfer**, click **Capture Text**, and click **Start** to accept the default drive\directory\filename to which all received data will be stored as an ASCII text file.

   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.

   NOTE: 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.
5. 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.
6. Observe that the 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.
7. To stop capturing data and save it, click **Transfer**, click **Capture Text**, click **Stop**.
8. HyperTerminal and the connection to the monitor can now be closed.



4.18 Importing Saved Data to a Spreadsheet

A text file that was created as described in 4.17 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 or a different version of Excel, refer to its instruction manual for information on how to import comma-delimited text files.

Instructions	
Start Microsoft Excel.	
For Excel version 2003: Click Data, Import External Data, and Import Data to display the “Select Data Source” dialog box.	**For Excel versions 2007-2013:** Click the DATA tab, then click the FROM TEXT button. The IMPORT TEXT FILE dialog box is displayed.
Locate file saved earlier.	
For Excel version 2003: Select file, then click “Open” to display Excel’s “Text Import Wizard.”	**For Excel versions 2007-2013:** Select file, then click the “IMPORT” button.
Choose the “Delimited” data option and click Next.	
Check the “Tab,” “Comma,” and “Space” delimiters and click Finish.	
Choose “Existing worksheet” or “New worksheet” and click OK to create spreadsheet.	

NOTE: A worksheet must be open in order to import data.

Sample Spreadsheet

	A	B	C	D
1	ZONE	1	LOG	START
2	12/19/2012	12:32	0	
3	12/19/2012	12:35	1	
4	12/19/2012	12:36	2	
5	12/19/2012	12:37	3	
6	12/19/2012	12:38	4	
7	12/19/2012	12:40	0	
8	12/19/2012	12:41	2	
9	12/19/2012	12:42	3	
10	12/19/2012	12:43	5	
11	12/19/2012	12:44	7	
12	12/19/2012	12:45	8	
13	12/19/2012	12:46	9	
14	12/19/2012	12:47	10	
15	12/19/2012	12:48	11	
16	12/19/2012	12:49	12	
17	12/19/2012	12:50	13	
18	12/19/2012	12:51	14	
19	12/19/2012	12:52	15	
20	12/19/2012	12:53	17	
21	12/19/2012	12:54	17	
22	12/19/2012	12:55	19	
23	12/19/2012	12:56	20	
24	12/19/2012	12:57	21	
:	:	:	:	:
145	12/20/2012	7:42	45	
146	12/20/2012	7:43	50	
147	12/20/2012	7:44	0	
148	1/14/2013	9:52	0	
149	1/14/2013	9:53	1	
150	1/14/2013	9:54	2	
151	1/14/2013	9:55	2	
152	1/14/2013	9:56	0	
153	1/14/2013	9:57	0	
154	END	OF	ZONE	1
155				

5 Maintenance

5.1 Disassembly

Required Tools

- Medium Phillips head screwdriver

When servicing the parts inside the HM unit, disassemble the monitor's metal chassis as follows:

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 (Figure 4)
4. Carefully separate the metal chassis.

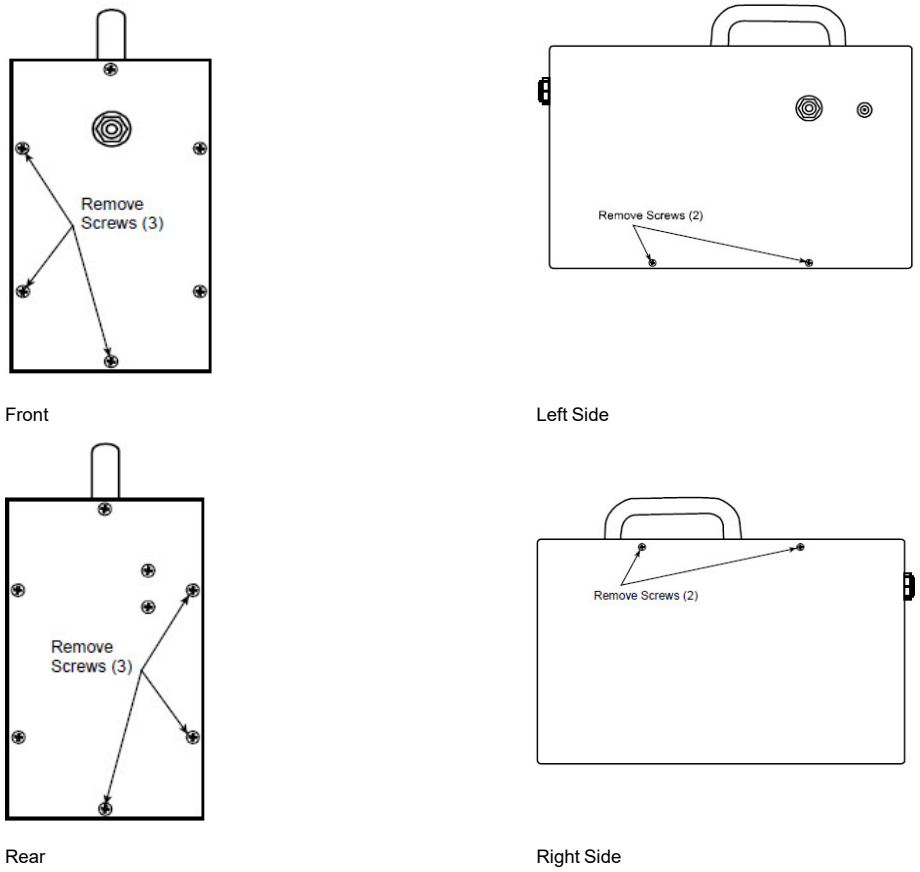


Figure 4 Removing Screws

5.2 Internal Particulate / Hydrophobic Filter Replacement

Required Items

- Replacement filter (P/N 0007-1654)
- Medium Phillips head screwdriver

Replacing the Filter

1. Disassemble the monitor's metal chassis (5.1 Disassembly).
2. Locate the internal particulate / hydrophobic filter to be replaced (see Figure 5).
3. Pull off tubing from both ends of filter and remove filter from instrument.
4. Attach tubing to new filter
5. Reassemble monitor.

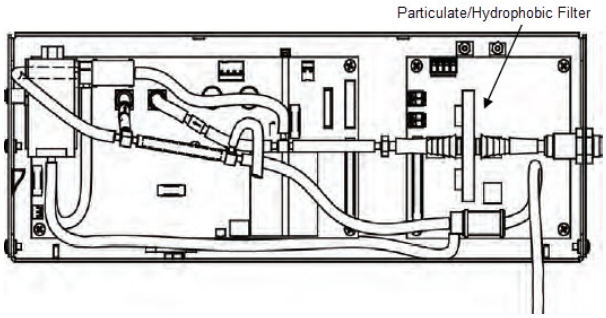


Figure 5 Location of the Particulate/Hydrophobic Filter

5.3 Updating Firmware

An RS-232 connector, located on the top panel, is used to update the monitor's firmware.

⚠ WARNING!

Reprogramming the instrument with updated firmware should be done by qualified service technicians only using instructions provided by MSA. Contact MSA Customer Service for assistance.

Failure to follow this warning can result in serious personal injury or death.

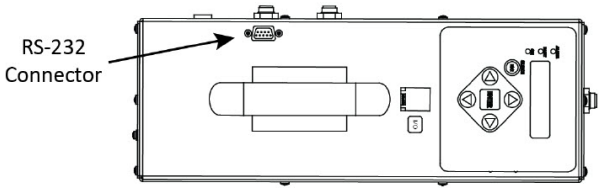


Figure 6 Location of the RS-232 Connector

6 Parts and Service

6.1 Replacement Parts

Part Number	Description
3015-5743	Replacement Battery Kit
3015-5847	Replacement Battery Charger (for 87 Wh battery 3015-5743)
3015-5757	Replacement Cable (connects battery to PGM-IR)
3015-5700	Soft Carrying Case with Shoulder Strap
3015-5325	Bladder Bag Kit
3015-5326	Stainless Steel Probe
3015-2906	External Filter (fits onto probe tip)
0007-1654	Hydrophobic Filter (internal)
3015-5324	External Filter Assembly
0003-6182	Probe Tubing (3ft)
3015-4239	Replacement Pump
0204-0020	Battery (for main PCB board)
3015-4721	Replacement Bench Kit
0304-3469	Replacement Power Cord (AUS)
0304-3471	Replacement Power Cord (UK)
0304-3470	Replacement Power Cord (EU)
0304-3466	Replacement Power Cord (US)

6.2 Optional Accessories

Part Number	Description
0024-1400	IrDA Printer (includes printer, roll of thermal paper, 4 x AA batteries, manual)
0006-8733	Thermal printer paper, 1 roll
0024-1310	Thermal printer paper, 5 rolls
3015-4214	Cable (DB9 to RJ-45)
0104-4027	Computer Communications Cable (DB9 male to DB9 female)

6.3 Service Centers

Service and replacement parts can be obtained by contacting the MSA Service Centers listed below. Access https://us.msasafety.com/service/bacharach on the web for return materials authorization.

Location	Contact Information
United States	Phone: 1-800-736-4666 x 2 Email: RMA@msasafety.com
Europe	Phone: 1-800-736-4666 x 2 Email: RMA@msasafety.com
Canada	Phone: 1-800-328-5217 Email: BachCan.Support@msasafety.com

7 Warranty

MSA, the Safety Company warrants that these products will be free from mechanical defect or faulty workmanship for a period of two (2) years from the date of delivery, provided it is maintained and used in accordance with MSA's instructions and/or recommendations.

This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year, such as, but not limited to, nonrechargeable batteries, filament units, filter, lamps, fuses, etc. MSA shall be released from all obligations under this warranty in the event that repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee, or representative of MSA has any authority to bind MSA to any affirmation, representation, or warranty concerning the goods sold under this contract. MSA makes no warranty concerning components or accessories not manufactured by MSA, but will pass on to the Purchaser all warranties of manufacturers of such components. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedy

It is expressly agreed that the Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of the Seller, or for any other cause of action, shall be the repair and/or replacement at the Seller's option of any equipment or parts thereof, which after examination by the Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to the Purchaser, F.O.B. Seller's Plant. Failure of the Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.

Exclusion of Consequential Damage

The Purchaser specifically understands and agrees that under no circumstances will the Seller be liable to the Purchaser for economic, special, incidental, or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct, or any other cause of action against the Seller.

Liability Information

MSA accepts no liability in cases where the device has been used inappropriately or not as intended. The selection and use of the device are the exclusive responsibility of the individual operator. Product liability claims, warranties, and guarantees made by MSA with respect to the device are voided if the device is not operated, serviced, and/or maintained in accordance with the instructions in this manual.

The warranties made by MSA with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repairs.

Register your warranty by visiting www.MSAsafety.com.