TELEDYNE
GAS MEASUREMENT INSTRUMENTS
Everywhereyoulook™

User Manual

PS200

PORTABLE GAS MONITOR

64171 Revision 12.1

WARNING: ALL INDIVIDUALS WHO HAVE, OR WILL HAVE, RESPONSIBILITY FOR USING, MAINTAINING, OR SERVICING THIS PRODUCT, MUST READ THIS ENTIRE MANUAL CAREFULLY. FAILURE TO USE THIS EQUIPMENT PROPERLY COULD RESULT IN SERIOUS INJURY OR DEATH.

LEGAL STATEMENT

DESCRIPTION

This User Manual provides information for use only with the PS200 Portable Gas Monitor (or "the monitor").

LIABILITY

Every care has been taken in the preparation of this User Manual, but the Company does not accept any responsibility for errors or omissions and their consequences. Information in this user guide is subject to change without notice. This User Manual does not constitute a specification or basis for a contract.

MODIFICATION NOTICES

The Company aims to notify customers of relevant changes in the product operation and maintain this user guide up to date. Due to continuous product improvement, there may be operational differences between the latest product and this user guide.

This User Manual is an important part of the monitor, and it should be referred to for the life of the product.

SOFTWARE

Any software supplied must only be used in this product and may not be copied without the written permission of the Company. Reproduction or disassembly of such embodied programs or algorithms is prohibited. Ownership of such software is not transferable, and the Company does not warrant that the operation of the software will be error free or that the software will meet the customer's requirements.

DISPOSAL ADVICE

Dispose of the monitor carefully and with respect for the environment. the Company will dispose of the monitor without charge if the monitor is returned to the Company.

AREAS OF USE

Exposure to certain chemicals can result in a loss of sensitivity of the flammable sensor. Where such environments are known or suspected it is recommended that more frequent response checks are carried out. Chemical compounds that can cause loss of sensitivity include silicones, lead, halogens and sulphur.

Environmental factors may affect sensor readings. This includes changes in pressure, humidity and temperature. Note that both pressure and humidity changes can also affect the amount of oxygen present in the atmosphere.

Do not use the monitor in potentially hazardous atmospheres containing greater than 21% oxygen.

SPECIAL CONDITIONS OF USE

The monitor is designed for use in harsh environments. The monitor is sealed to IP67 and, if not subjected to misuse or malicious damage, will provide many years of reliable service.

The monitor may contain electrochemical sensors. Under conditions of prolonged storage, these sensors should be removed. These sensors contain potentially corrosive liquid and care should be taken when handling or disposing, particularly when a leak is suspected.

Table of Contents

1. General Information

WARNING: READ, UNDERSTAND AND FOLLOW THE ENTIRE CONTENT OF THIS GUIDE PRIOR TO USE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

This guide instructs gas detection personnel on the features and usage of the PS200 Portable Gas Monitor (or "the monitor"), including information on operation, configuration, maintenance, specifications and troubleshooting.

This user guide assumes the reader has a basic knowledge of gas detection procedures.

1.1. Guide Conventions

The following visual elements are used throughout this guide, where applicable:

Icon	Description
	WARNING: THIS ICON AND TEXT INDICATE A POTENTIALLY HAZARDOUS SITUATION, WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR INJURY.
	Caution: This icon and text indicate an action or situation, which, if not avoided, could result in damage to the equipment.
	Note: This icon and text designates information of special note to the operator.

1.2. Certifications and Approvals

The monitor has the following approvals available:

Symbol	Notes
ATEX	II 2G Ex ia d IIC T4 Gb (Ta = -20ºC to +50ºC)
IECEx	Ex ia d IIC T4 Gb (Ta = -20ºC to +50ºC) or
ATEX	II 1G Ex ia IIC T4 Ga (Ta = -20ºC to +50ºC)
IECEx	Ex ia IIC T4 Ga (Ta = -20ºC to +50ºC) (when fitted with the SGX VQ548MP sensor)
C US	Combustible Instruments: Class I, Div.1 Groups A, B, C and D T4 Class I, Zone 1 AEx ia d IIC T4 Gb Ex ia d IIC T4 Gb or Class I, Div.1 Groups C and D T4 Class I, Zone 0 AEx ia IIB T4 Ga Ex ia IIB T4 Ga (when fitted with the SGX VQ548MP sensor) **Non-combustible Instruments:** Class I, Div.1 Groups A, B, C and D T4 Class I, Zone 0 AEx ia IIC T4 Ga Ex ia IIC T4 Ga
	MED (Marine Equipment Directive) - A.1 / 3.30 (Module B&E)
CE	European Mark of Conformity
Segurança INMETRO DNV OCP 0017	ATENÇÃO: NÃO RECARREGAR EM AREA CLASSIFICADA DNV 16.0082 XU
KCs	14-AV4BO-0010 Ex ia d IIC T4 Gb (Ta = -20ºC to +50ºC) IECEx SIR11.0019
EAC Ex	TP TC 012/2011 TP TC 020/2

1.2.1 Label

Always refer to the rear label for the actual certification of your monitor (see Figure 1: Identification Label). The label also lists the monitor's serial number, e.g. 241000.

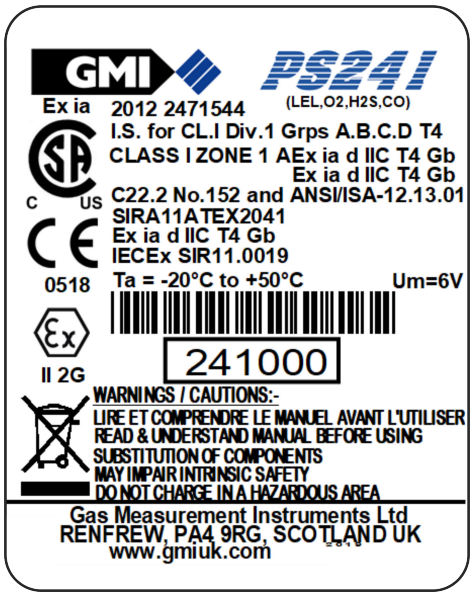

Figure 1: Identification Label

1.2.2 Performance

This monitor complies with:

- EN60079-29-1 (Flammable)*
- IEC60079-29-1 (Flammable)*
- EN50104:2010 (Oxygen)** – Marine instruments.
- ANSI / ISA S12.13.01 – 2000 (Combustible)*
- C22.2 No.152 – M1984 (Combustible)*.

* excludes IR sensor option.

** 2yr O_2 sensor only

1.3. General Safety Information

WARNING: ALL INDIVIDUALS WHO HAVE OR WILL HAVE RESPONSIBILITY FOR USING OR TESTING THIS PRODUCT MUST READ AND UNDERSTAND THE CONTENTS OF THIS MANUAL. THE PRODUCT WILL PERFORM AS DESIGNED ONLY IF USED AND TESTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. FAILURE TO FOLLOW MANUFACTURER'S INSTRUCTIONS WILL RENDER THE WARRANTY AND APPROVALS NULL AND VOID. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY ALSO RESULT IN SERIOUS INJURY OR DEATH.

The Company takes no responsibility for use of its equipment if it is not used in accordance with these instructions. If further operational or maintenance details are required but not provided in this guide, contact the Company or their agent. The Company shall not be liable for any incidental or consequential damages in connection with any modifications, errors or omissions in this guide.

Always observe the latest pertinent state, regional, and local safety regulations when using and disposing of the monitor. For reasons of safety and to assure regulatory compliance, only the manufacturer should perform repairs.

Fully trained personnel must regularly service and calibrate the monitor in a safe area.

Only use replacement parts approved by the Company.

Re-charge the monitor only in a safe area (refer to Section 7. Recharging the Batteries).

If the monitor detects gas, follow your organization's procedures and operational guidelines.

Any right of claim relating to product liability or consequential damage to any third party against the Company is removed if the above warnings are not observed.

1.4. Additional Safety Details - CSA ONLY

Caution: Before each days usage, test on a known concentration of methane, equivalent to 25% – 50% of full-scale concentration. accuracy must be within 0 to +20% of actual. Accuracy may be corrected by calibration (refer to <zX-Refs (online)>Section 9. Calibration.

Mise en garde: avant chaque utilisation journalière, testez la réaction de l'appareil en utilisant une concentration connue en méthane, correspondant à 25% – 50% de la valeur réelle. la précision doit se situer entre 0 et + 20% de la valeur réelle. la précision peut se corriger en étalonnant l'appareil (voir <zX-Refs (online)>Section 9. Calibration).

Caution: Any rapid up-scale readings followed by a declining or erratic reading may indicate a gas concentration beyond the upper scale limit, which may be hazardous.

Mise en garde: Out lecture dèpassant rapidement le maximum de l'êchelle et suivie par une diminution ou une lecture erronée, indique une concetration de gaz supérieure à la valeur maximale de cette échelle. Cette lecture n'est passignificative.

Caution: Substitution of components may impair intrinsic safety.

Mise en garde: Le replacement d' un composant peut porter atteint à la sécurité intrinsèque de produit.

Caution: Do not charge in a hazardous area. Um = 6V.

Mise en garde: Ne pas charger en zone dangereuse. Um = 6V.

Note: CSA have only assessed the LEL combustible gas detection portion of this monitor for performance.

Remarque: CSA a seulement évalué la partie LIE pour la mesure des performances en détection de gaz inflammables.

2. Introduction

2.1. General Description

The PS200 Portable Gas Monitor series combines quality, ruggedness and advanced technology in a user friendly, portable gas detector. It is compact, lightweight, water resistant, extremely robust, and is suitably certified to recognized international standards.

The monitor is suitable for wide range of personal monitoring and confined space applications. If gas levels exceed configured threshold limits, or if the monitor develops a fault, users will be alerted by audible, visible, and vibratory alarms.

The monitor is available as either a pumped or diffusion model and is powered by a fast-charging internal Li-ion (lithium ion) battery.

The monitor is simple to use and is operated via two buttons (refer to Figure 2: PS200 Portable Gas Detector).

Figure 2: PS200 Portable Gas Detector

The monitor can detect up to 4 of the following gases simultaneously:

- LEL Hydrocarbons
- Oxygen (O_2)
- Carbon Monoxide (CO)
- Hydrogen Sulphide (H_2S)

All gases being monitored are displayed. A 4-gas monitor display is illustrated in Figure 3: Display Example (4-Gas).

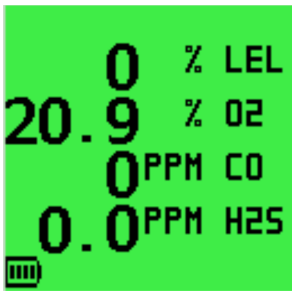

Figure 3: Display Example (4-Gas)

NOTE: Character size increases if fewer sensors are configured, as illustrated in Figure 4: Display Examples.

Figure 4: Display Examples

Instead of displaying current gas readings, the monitor can be configured to display OK, as illustrated in Figure 5: OK Display Example (4-Gas).

Figure 5: OK Display Example (4-Gas)

NOTE: This manual describes the operation of a default 4-gas monitor. Configurable options are available and are detailed in italic text, where applicable.

2.2. Features

- Compact, lightweight and robust.
- Measurement and display of up to 4 gases.
- Simple 2 button operation.
- Audible, visual (hi-viz) flashing LED's and vibrating alarms.
- Audible and visual confidence signal (configurable), confirming monitor operation to the user.
- Green display during normal operation and red during alarm condition.
- Internal pump (optional).
- Manual and automatic data logging.
- Internal Li-Ion (Lithium Ion) rechargeable battery.
- Maximum recharge time of 4 hours.
- Robust clip to allow fitting to belt, pocket, etc.
- Communications interface to allow downloading of stored data.
- Fully certified to international standards.
- Comprehensive range of accessories.
- Quick Configuration Display allows the configuration to be viewed without fully switching the monitor ON.

Typical operating parameters are detailed in Appendix A. Operating Parameters & Sensor Types of this manual.

2.3. Datalogging

Datalogging allows gas measurements, event logs, bump tests, and calibration details to be stored for downloading to a PC / Laptop via a USB connection. Typically, the monitor can store up to 6 months of data (refer to Appendix A. Operating Parameters & Sensor Types).

2.3.1. Accessing Logged Data

Download data from the monitor to a PC/Laptop using the standard charging / comms cable and additional software. Contact Technical Support (refer to Appendix B. Technical Support) for further details.

2.4. Filters

Filters protect the monitor from water and dust ingress. Check filters regularly and replace as necessary (refer to Section 8.2. Replacing the Filters).

3. Operation

Figure 6: Function Buttons

3.1. Operating Procedure

Caution: The monitor can be supplied with a flammable gas sensor. This sensor is designed for use in concentrations of gas not exceeding the Lower Explosive Limit (LEL). Exposing the sensor to concentrations of flammable gas above the LEL will not damage the sensor due to an inbuilt feature. Refer to Section 4. Alarms **for details.**

NOTE: Throughout this document, the buttons will be referred to as L Button and R Button.

Check the following before use:

- The monitor is clean and in good condition.
- The filters are clean and in good condition.
- The sample line (pumped monitors) and any other accessories used are in good condition and leak-free.
- The battery is fully charged.
- There are no faults.
- All ranges are operational and the monitor is zeroed.
- The monitor is within the calibration period.
- The oxygen sensor (if installed) operates correctly. The sensor responds to the user breathing on the front of the monitor by displaying a value below 20.9%.

Additional:

- Perform regular leak checks on pumped instruments by placing your thumb over the sample inlet nozzle and ensuring the monitor displays FLOW FAULT.
- Perform regular bump tests.

3.2. Quick Configuration Display

This allows configuration information to be viewed without fully switching the monitor ON (see Figure 7: Quick Configuration Display).

With the monitor OFF, press the **R** button for less than one second. The monitor will display:

- sensors fitted;
- calibration due date;
- pumped or diffusion;
- LEL calibration gas.

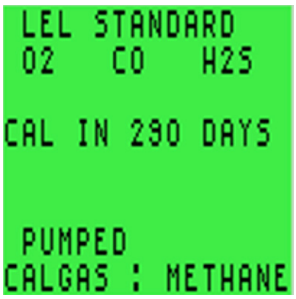

Figure 7: Quick Configuration Display

3.3. Switching the Monitor On

WARNING: ALWAYS SWITCH THE MONITOR ON IN FRESH AIR. FAILURE TO HEED THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH.

Press and hold the **R** button for one second to switch the monitor ON (refer to Figure 6: Function Buttons). The flash screen appears (as shown in Figure 8: Flash Screen) and the monitor begins its warm-up routine. A countdown timer appears in the top right corner of the display.

NOTE: The LCD backlight is green during warm-up and automatically switches off when warm-up is complete.

Figure 8: Flash Screen

3.3.1. Monitor Identification

During warm-up, the LCD identifies the serial number, software version, battery status, and calibration gas information, as illustrated in Figure 9: Monitor Identification Display.

Figure 9: Monitor Identification Display

3.3.2. User Name/Number Only (Option)

This configurable option, disabled by default, allows the user to select a name or identification code, as illustrated in Figure 10: User Name. The monitor will include this name or code with all Bump, Calibration and Event logs.

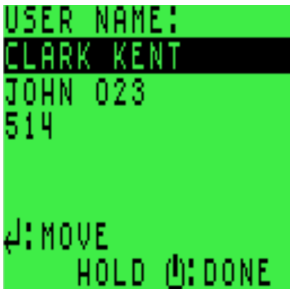

Figure 10: User Name

3.3.3. Date and Time

The monitor's date and time are displayed, as illustrated in Figure 11: Date and Time.

Figure 11: Date and Time

3.3.4. Bump Due Date (Option)

This configurable option is disabled by default but can be configured to:

- indicate briefly that bump test is due (Figure 12: Bump Due Date);
- indicate that bump test is overdue then pause awaiting user acceptance (Figure 13: Bump Overdue);
- force the user to switch monitor OFF when overdue.

This feature also comes with a factory-set option to display the number of days remaining until the next bump is due.

Figure 12: Bump Due Date

Figure 13: Bump Overdue

To continue, press the **R** button once to acknowledge bump test is overdue.

To abort warm-up and automatically switch the monitor OFF, press the **L** button once.

3.3.5. Calibration Due Date

The calibration due date feature (shown in Figure 14: Calibration Due Date) is configurable, including the factory-set option to display the number of days remaining until the next calibration is due.

Refer to Section 5.7. Calibration Required if calibration due date has expired.

Figure 14: Calibration Due Date

3.3.6. Service Due Date (Option)

This Service Due Date option – disabled by default – can be configured to:

- indicate briefly that service is due;
- indicate that service is overdue then pause awaiting user acceptance;
- force the user to switch the monitor OFF when service is overdue.

Options also exist for displaying the service due date, including displaying the number of days remaining. In all instances, if enabled, the monitor only displays the message within 90 days of service due date.

The service due date is illustrated in Figure 15: Service Due Date.

Figure 15: Service Due Date

3.3.7. Select Calibration Gas (Option)

This configurable option improves the accuracy of a reading by allowing the monitor to measure a different flammable gas then the one used to calibrate the monitor.

The default is to select calibration gas in 'Setup'.

When this option is displayed (see Figure 16: Cal Gas Selection), the original gas used to calibrate the monitor is identified between two arrowheads.

NOTE: The calibration certificate also identifies the calibration gas type used.

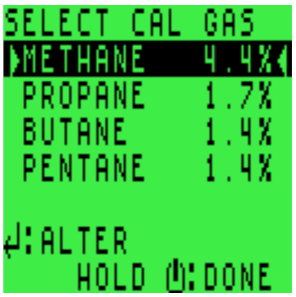

Figure 16: Cal Gas Selection

To select a different gas:

1. Press the **L** button to step through the options.
2. Press and hold the **R** button to select the required option.

NOTE: Accuracy for the re-selected gas type is ± 20%

3.3.8. Sensor Confirmation Check

The ✓ symbol appears next to each sensor type to confirm that the sensor has been zeroed correctly, as shown in Figure 17: Sensor Check Displays. If a wrench symbol is displayed, refer to Section 5.3. Zero Fault and Section 5.4. Sensor Faults

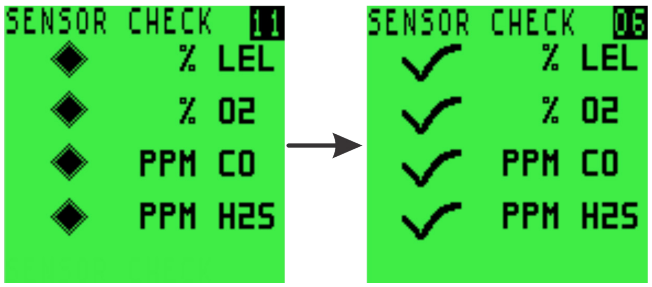

Figure 17: Sensor Check Displays

3.3.9. Normal Operating Display

When warm-up is completed successfully, the backlight switches off and the normal operating screen is displayed, as illustrated in Figure 18: 4-Gas Normal Operating Display.

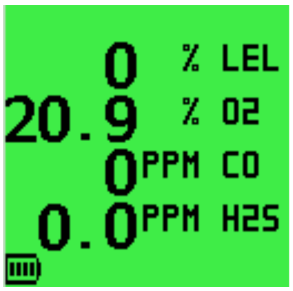

Figure 18: 4-Gas Normal Operating Display

3.4. Switch the Display Backlight On/Off

The display backlight can be manually switched ON when working in poor lighting conditions.

Press the **R** button once to switch ON. After 20 seconds it will automatically switch OFF.

3.5. View MAX/MIN/STEL/LTEL

The monitor records the maximum (MAX) and minimum (MIN) gas values since switch-on. It also evaluates the short-term exposure (STEL) and long-term exposure (LTEL) for CO and H_2S.

To view MAX/MIN/STEL/LTEL:

1. From the normal operating display, press the **R** button once to switch the monitor backlight ON.
2. While the backlight is still ON, press the **R** button once to view the MAX gas values.
3. Press the **R** button a 2nd time to view the MIN gas values.
4. Press the **R** button a 3rd time to display the STEL values.
5. Press the **R** button a 4th time to display the LTEL values.

Figure 19: MAX/MIN/STEL/LTEL Gas Values illustrates the MAX, MIN, STEL, and LTEL values on a 4-gas monitor.

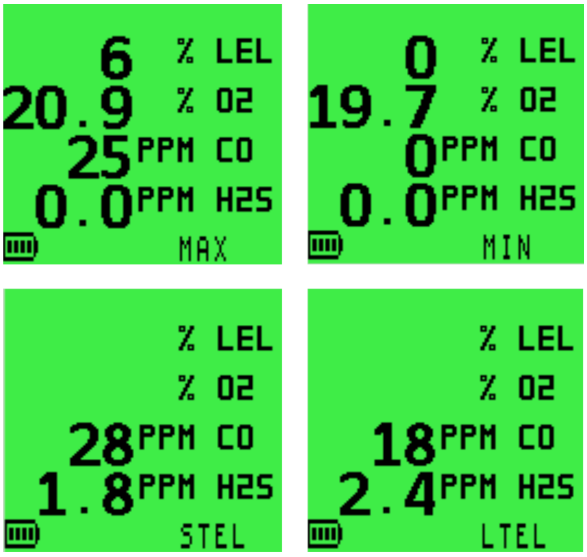

Figure 19: MAX/MIN/STEL/LTEL Gas Values

NOTE: The MIN is only displayed if an Oxygen sensor is fitted in the monitor.

6. MAX/MIN readings can be reset by pressing and holding the **R** button for 2 seconds when either of the MAX/MIN screens are displayed.

   After resetting, the monitor will return to the normal operating screen.

MAX/MIN/STEL/LTEL will be automatically reset during warmup, if the monitor is configured for multi users.

3.6. Manual Datalog

Press the **L** button once to manually store the current gas readings. LOGGING appears on the monitor as shown in Figure 20: Manual Datalog.

Figure 20: Manual Datalog

3.7. Alarms Reset or Acknowledge

When the monitor reaches an alarm set point, the audible, visual, and vibrating alarms will be activated to alert the user.

Alarms are individually programmable to be either:

- Latching - alarms are active until the user resets by pressing and holding the **R** button after the gas readings have returned to a safe level.
- Non-Latching - alarms will reset automatically when the gas readings have returned to a safe level.

The audible alarm on each pre-set alarm can be muted for 60 seconds by pressing and holding the **R** button. After this time, should the gas value remain out with the pre-set alarm limit, the non-latching audible alarm will become active again. If latching, the audible alarm will become active again regardless of gas value.

3.7.1. Confidence Signal

During normal operation, the monitor sounds a confidence beep and illuminates the green LED's briefly every 15 seconds. This function informs the user that the monitor is operating correctly.

NOTE: The operation of the confidence beep and/or LEDs is configurable.

3.8. Sample Line Connection and Use

The monitor has an internal pump for remote sensing. Connect the sample line tubing to the sample line connector, as shown in Figure 21: Sample Line Connection. The pump is OFF after start-up.

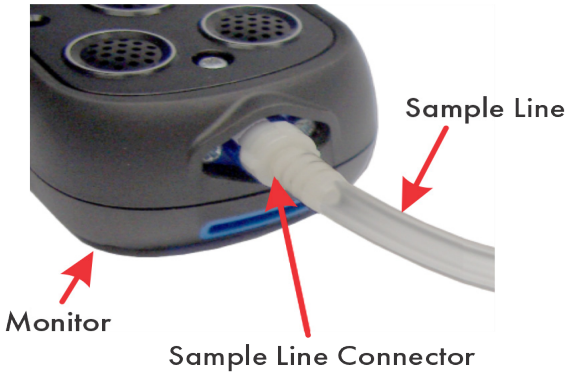

Figure 21: Sample Line Connection

3.8.1. Pump Operation

Press and hold the **R** button to start or stop the pump.

When the pump is running, a pump symbol (as highlighted in Figure 22: Pump Symbol) rotates in the display.

NOTE: It is only possible to switch the pump ON / OFF when monitor alarms are inactive.

NOTE: Pump cannot be switched OFF if monitor is configured with setting 'PUMP ALWAYS ON'.

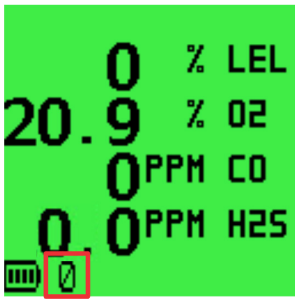

Figure 22: Pump Symbol

3.9. Self Test

To perform a self test at any time during normal operation, press and hold the **L** button.

The monitor tests the buzzer, the LED's, and the vibration function. The flammable gas used for calibration is displayed, as illustrated in Figure 23: Self Test.

The current username, if configured, will appear at the top of the display.

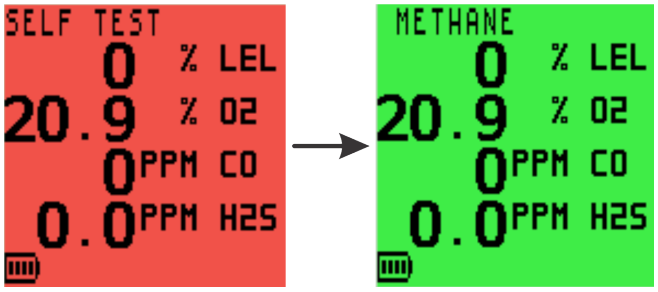

Figure 23: Self Test

3.10. Switch the Monitor OFF

Press and hold both the **L** and **R** buttons to switch the monitor OFF.

The monitor display starts a countdown from 3 to OFF, as shown in Figure 24: Switch OFF).

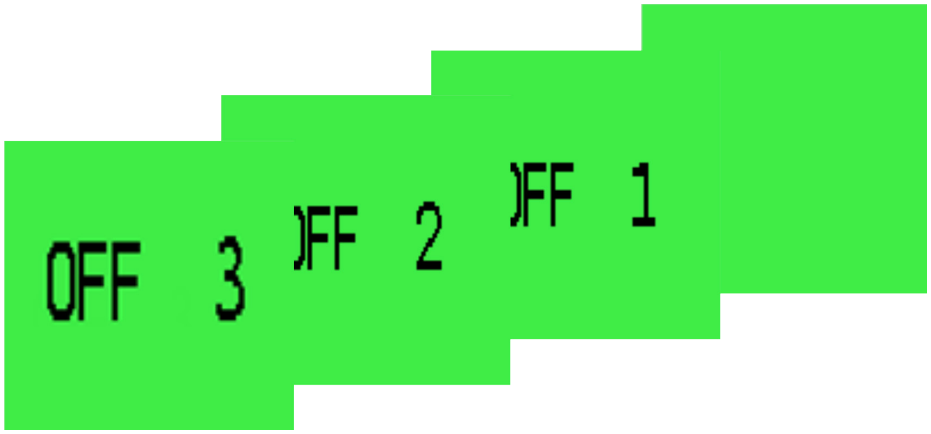

Figure 24: Switch OFF

The audible alarm sounds every second to alert user that the monitor is switching OFF.

4. Alarms

4.1. Gas Alarms

When an alarm set-point has been reached, the audible, visual, and vibrating alarms will activate to alert the users. All gas alarms are configurable to meet the specific needs of users and only operate once the monitor warm-up is complete.

An alarm can be either 'latching' or 'non-latching'. A 'latching' alarm will remain active until reset by the user by pressing and holding the **R** button after the gas readings have returned to a safe level. A 'non-latching' alarm will reset automatically when the gas readings are safe.

4.1.1. Flammable LEL Alarm

Two alarm levels, 'HI' and 'HIHI', are available.

4.1.2. Oxygen (O_2) Alarm

Three alarm levels, HIHI, LO, and LOLO, are available.

4.1.3. Toxic Alarm

The monitor calculates the Short Term Exposure Limit (STEL) and Long Term Exposure Limit (LTEL) – known as Time Weighted Average (TWA) readings – for each toxic gas range. Each toxic range has STEL and LTEL alarms, in addition to HI and HIHI alarms.

NOTE: A TWA value is the mean gas level exposure over a specific period. The STEL is 15 minutes and the LTEL is 8 hours. Usually, TWA alarms mean the monitor is for a single user. For multiple user applications, an option is available to reset the STEL and LTEL after each monitor switch-off.

NOTE: All alarm levels – HI, HIHI, LO, LOLO, STEL, and LTEL – are factory set. The user must set the levels in accordance with their company's procedures and with local health and safety legislation. Alarm levels can be changed via the monitor set up menu.

In the following examples, Figure 25: O2 LOLO Alarm shows a ***LOLO*** Oxygen alarm, and Figure 26: LEL HIHI Alarm shows a ***HIHI*** LEL alarm.

Figure 25: O_2 LOLO Alarm

Figure 26: LEL HIHI Alarm

4.2. Acknowledge Gas Alarms

After the gas readings have returned to a safe level, press and hold the **R** button to clear all alarms.

4.3. Mute Alarms

If configured, muting the alarm will silence the audible alarm for 60 seconds, as follows:

- Non-latching alarm: silences the audible alarm for 60 seconds. If the gas reading during that time falls below the alarm set point, the visual alarm clears automatically.
- Latching alarm: silences the audible alarm for a period of 60 seconds. If the gas reading during that time falls below the alarm set point, the user must acknowledge the visual alarm to clear it.

4.4. High Flammable Gas Over-range Alarm

WARNING: HIGH OFF-SCALE READINGS MAY INDICATE AN EXPLOSIVE CONCENTRATION.

An over-range alarm protects the user and the LEL sensor during exposures to high concentrations of flammable gas. If the LEL reading exceeds 100% LEL (see 4.4.1. 10-Second Switch Off):

- monitor vibrates;
- displayed value changes to 4 rising arrows;
- display turns red;
- audible alarm tone changes;
- LED's flash quickly;
- *DANGER OVERRANGE* flashes on the display.

Figure 27: Over Range Alarm

4.4.1. 10-Second Switch Off

The monitor must be returned to clean air.

NOTE: To avoid accidental switch-off in this dangerous state, the off cycle is increased to 10 seconds.

Switch OFF by pressing and holding both **L** and **R** buttons. A timer counts down from 10 seconds to 0, and the message ***GET OUT*** alternates with ***HIGH GAS***, as shown in Figure 28: GET OUT/ HIGH GAS Timer.

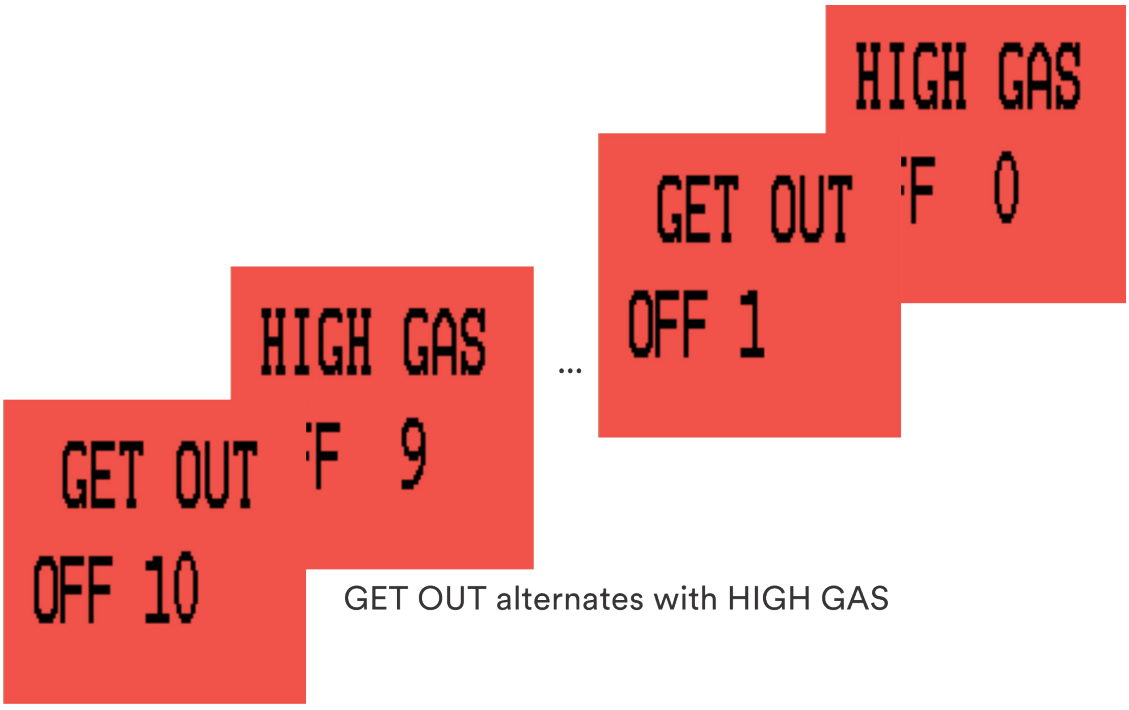

Figure 28: GET OUT/HIGH GAS Timer

5. Warnings & Faults

5.1. LOW BATTERY

LOW BATTERY flashes when approximately 30 minutes of run time remains, as shown in Figure 29: LOW BATTERY Warning. The display turns red, the audible alarm sounds once every two seconds, and the red LED's flash.

NOTE: Gas alarms still operate if a LOW BATTERY warning exists.

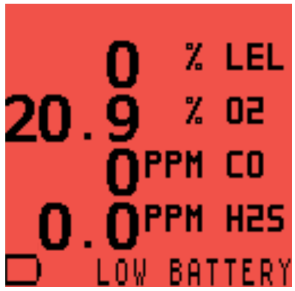

Figure 29: LOW BATTERY Warning

5.2. BAT FAULT

BAT FAULT flashes when approximately 3 minutes of run time remains, as illustrated in Figure 30: BAT FAULT Warning. The display turns red, the audible alarm sounds continuously and the red LED's remain on. After 3 minutes, the monitor automatically switches OFF.

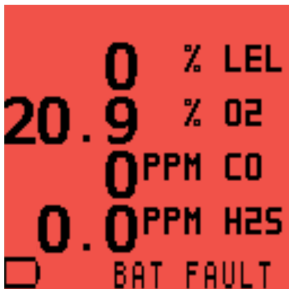

Figure 30: BAT FAULT Warning

5.3. Zero Fault

5.3.1. Zero Fault – At The End Of Warm-up

If the monitor is switched on in gas and a sensor fails to zero correctly, the display turns red and the audible/visual alarms activate. A wrench symbol , alternating with a gas reading, will indicate the faulty sensor, as shown in Figure 31: LEL ZERO Fail.

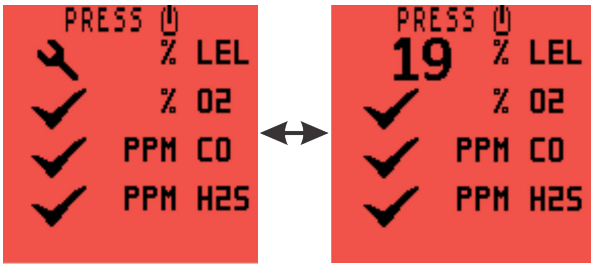

Figure 31: LEL ZERO Fail

To acknowledge this fault, press the R button once. This will clear the audible/visual alarms. The wrench symbol will remain on and ZERO FAULT is displayed as shown in Figure 32: LEL ZERO FAULT.

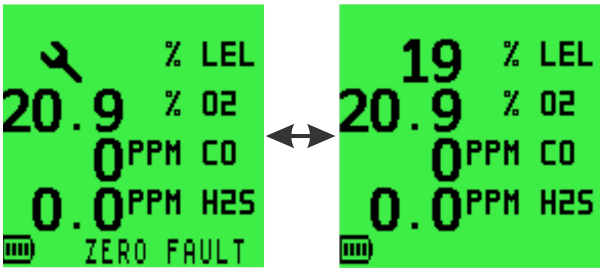

Figure 32: LEL ZERO FAULT

Return the monitor to clean air and switch it OFF then ON. If the ZERO FAULT persists, return the monitor to an approved service/repair facility.

NOTE: The monitor can still detect and alarm on all other sensors.

A configurable option only allows the user to switch the monitor OFF if a ZERO FAULT is detected, as shown in Figure 33: ZERO FAULT – Switch OFF.

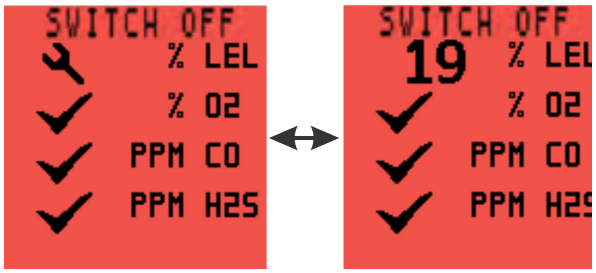

Figure 33: ZERO FAULT – Switch OFF

5.3.2. Zero Fault – During Operation

If ZERO FAULT is displayed during instrument operation, then:

- Leave the monitor ON for 30-60 minutes
- Switch OFF then ON
- If ZERO FAULT persists, recalibrate the monitor
- If ZERO FAULT still persists, return the monitor to an approved service/repair facility

5.4. Sensor Faults

If a sensor fault is detected, the backlight illuminates red, audible/visual alarms are activated, and a wrench symbol is shown next to the faulty sensor.

5.4.1. Sensor Fault - LEL or O_2

If a sensor fault is detected for LEL or O_2, as illustrated in Figure 34: LEL SENSOR FAULT, return the monitor to an approved service/repair facility.

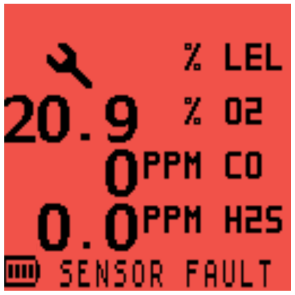

Figure 34: LEL SENSOR FAULT

5.4.2. Sensor Fault - CO or H_2S

If a sensor fault is detected for CO or H_2S, as illustrated in Figure 35: CO/H_2S SENSOR FAULT, allow the monitor to run in clean air for 20 minutes. If the fault persists, return the monitor to an approved service/repair facility.

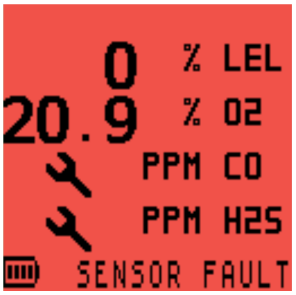

Figure 35: CO/H_2S SENSOR FAULT

5.4.3. Flow Fault (Pumped Monitors Only)

If a sample fault exists, the monitor displays a FLOW FAULT warning, as shown in Figure 36: FLOW FAULT. The display will be red and both the audible alarm and red LED's will be activated.

Check sample line, filter, or probe for blockage. Clear blockage, then restart pump by pressing and holding the R button.

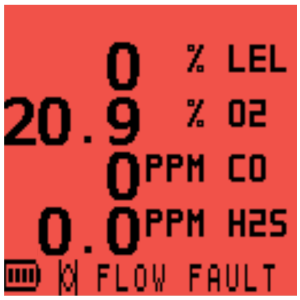

Figure 36: FLOW FAULT

5.5. Memory Fault

During warm-up, if the 'MEMORY FAULT' screen is displayed, as illustrated in Figure 37: Memory Fault, the monitor has detected a memory fault.

The monitor must be returned for service.

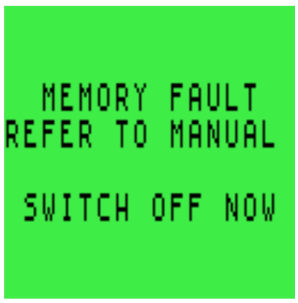

Figure 37: Memory Fault

5.6. Calibration Required

If the monitor requires calibration, CALIBRATION OVERDUE appears during warm-up, as shown in Figure 38: Calibration Overdue. The monitor will still operate but sensor response may have diminished. The monitor should be recalibrated.

Press the L button once to abort the warm-up sequence and automatically switch OFF the monitor.

Figure 38: Calibration Overdue

Alternately, press the R button once to acknowledge the warning, cancel the audible/visual alarm and continue. Every 30 seconds, a CAL EXPIRED warning, will flash as shown in Figure 39: CAL EXPIRED.

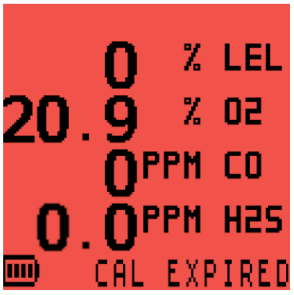

Figure 39: CAL EXPIRED

If calibration is overdue, a configurable option only allows the user to switch the monitor off, as shown in Figure 40: Calibration Required.

Refer to Section 9. Calibration for calibration options.

Figure 40: Calibration Required

6. Manual Bump Test Options

6.1. Bump Testing

A bump test verifies sensor response and alarm operation by exposing the monitor to a known concentration of gas.

The monitor has 2 manual bump test options:

- QUICK bump test validates sensors respond to gas and alarms are working.
- FULL bump test checks the response of all sensors against set limits and alarms are working.

By default, both of these options are disabled.

A bump test kit (Part No. 64051) is available and contains test gas, a regulator, and Tygon® tubing.

WARNING: A QUICK BUMP TEST ONLY CHECKS THE OPERATION OF THE AUDIBLE AND VISUAL ALARMS. IT DOES NOT VALIDATE SENSOR ACCURACY OR RESPONSE TIME.

WHEN PERFORMING A BUMP TEST, THE TEST GAS CONCENTRATION SHOULD BE HIGH ENOUGH TO TRIGGER THE MONITOR'S ALARMS. IF ANY MONITOR FAILS A BUMP TEST, PERFORM A FULL CALIBRATION BEFORE USING THAT MONITOR.

6.2. Initiating a Manual Bump Test

If enabled, switch the monitor ON by pressing the L button.

During warm-up, the BUMP TEST confirmation screen appears, as shown in Figure 41: BUMP TEST Confirmation Screen. Press the R button to continue.

Figure 41: BUMP TEST Confirmation Screen

When warm-up is complete, the APPLY GAS screen appears, as shown in Figure 42: Apply Gas Screen (4-Gas Model).

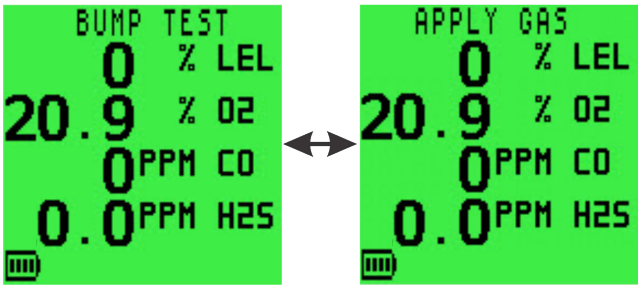

Figure 42: Apply Gas Screen (4-Gas Model)

6.2.1 Pumped Instruments - Regulator Selection

If the monitor has a pump enabled, the user is asked if the pump will be used during the bump test, as illustrated in Figure 43: Regulator Valve Choice.

- YES – use a demand or balanced flow regulator, press the R button.
- NO – use a direct flow regulator, press the L button.

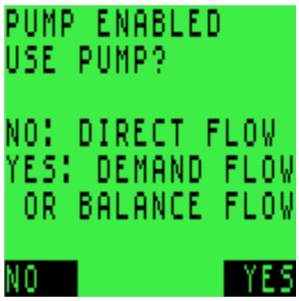

Figure 43: Regulator Valve Choice

6.3. Applying Test Gas

Apply the test gas to the monitor via the direct flow regulator set to 0.5 l/min, as shown in Figure 44: Bump Test Kit.

Figure 44: Bump Test Kit

6.4. Quick/Full Bump Test

Operation now depends on whether QUICK or FULL bump is configured.

6.4.1 Quick Bump Test

As the alarm threshold for each range is exceeded, the audible/visual/vibration alarms will activate and a ✓ symbol will appear, otherwise a 🔧 symbol will be displayed.

6.4.2 Full Bump Test

After a short period of time, the gas readings are checked against configurable limits. The audible/ visual/vibration alarms will activate and a ✓ symbol will appear if the readings are within these limits, otherwise a 🔧 symbol will be displayed.

6.5. Confirm Alarms

The user is prompted to confirm if the audible and visual alarms were activated, as shown in Figure 45: Confirm Alarms

Figure 45: Confirm Alarms

6.5.1 Bump Test – Pass

After selecting **YES**, BUMP TEST PASS is displayed, as shown in Figure 46: Bump Test Pass. The bump test result including date and time is automatically datalogged.

When the gas readings fall below their alarm set-points, or after 60 seconds, the bump test is complete, and the monitor will automatically return to normal operation.

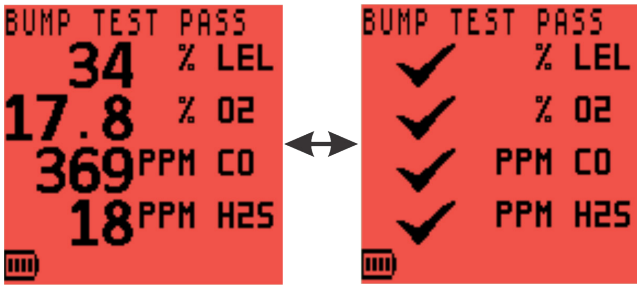

Figure 46: Bump Test Pass

6.5.2 Bump Test – Fail

If any range fails the bump test, the CONFIRM ALARMS display will be red and a symbol will be displayed, as shown in Figure 47: Confirm Alarms - Fail.

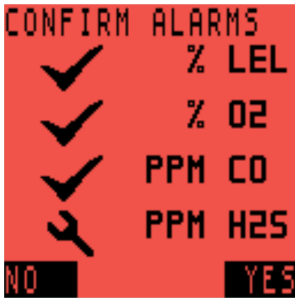

Figure 47: Confirm Alarms - Fail

After selecting **YES** or **NO**, BUMP TEST FAIL is displayed and the user is instructed to switch the monitor off, as shown in Figure 48: Bump Test Fail - Switch Monitor OFF.

Figure 48: Bump Test Fail - Switch Monitor OFF

If a monitor fails a bump test, then a full re-calibration is necessary.

7. Recharging the Batteries

7.1. General

WARNING: NEVER ATTEMPT TO RECHARGE THE BATTERIES IN A HAZARDOUS AREA.

Caution: Switch the monitor off when charging.

Caution: Use only approved chargers to recharge monitor.

The battery should be recharged when:

- 'LOW BATTERY' or 'BAT FAULT' appears on the display.
- The monitor will not switch ON.

7.2. Recharge Monitor Using the Charging/Comms Clip

1. Connect the supplied charging/comms clip to the monitor. Ensure the locating tongue on the clip engages with the monitor locating slot and is firmly seated (refer to Figure 49: Charging/Comms Clip Connection).

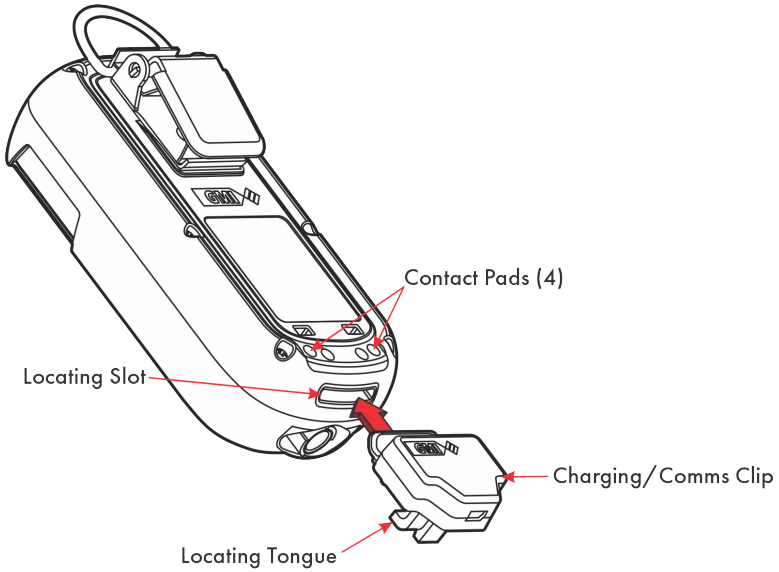

Figure 49: Charging/Comms Clip Connection

2. Connect the supplied MINI-USB to USB Cable to the Charging/Comms Clip (as shown in Figure 50: Connect Cable to Charging/Comms Clip).

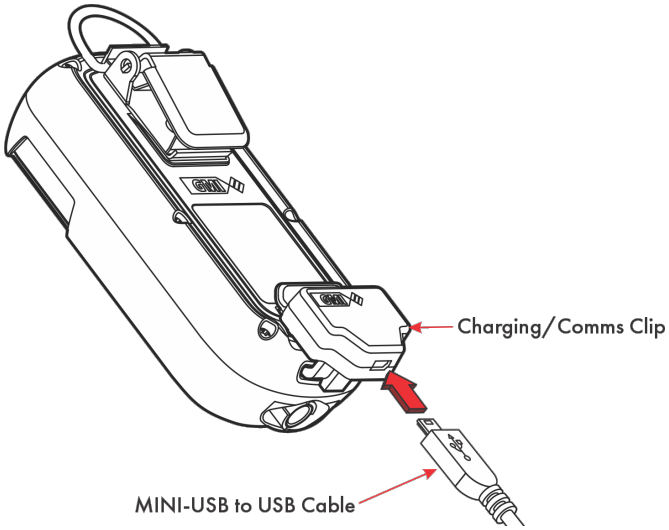

Figure 50: Connect Cable to Charging/Comms Clip

3. Connect the other end of the charging cable to the USB Power adapter (or suitable USB socket).

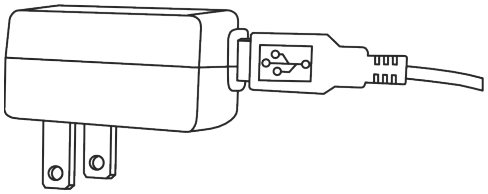

Figure 51: Connecting the Cable to the USB Power Adapter

4. During charging, the battery symbol and 'CHARGING' flash in the display.
5. When charging is complete, the full battery symbol and 'CHARGED' are displayed.

Note: Leaving the monitor connected to the charger will not damage it.

6. Disconnect from the power source.
7. Grip the charging/comms clip and firmly pull it away from the monitor.

8. Operator Maintenance

8.1. Cleaning

Caution: Do not use polishes that contain silicon or solvent to clean the monitor as these may damage the flammable gas sensor (if fitted). Do not use abrasive chemicals or strong, volatile chemical solutions as these could damage the impact-resistant casing.

Clean the outer casing of the monitor using a non-abrasive moist cloth. Use a mild soap solution with a non-abrasive cloth to remove stubborn marks.

8.2. Replacing the Filters

The monitor has 2 filters:

- hydrophobic (water) filter - located behind the filter cover on the front face of the monitor;
- sample inlet (dust) filter - located in the sample inlet connector at the bottom of the monitor.

Inspect these filters periodically for contamination or damage.

8.2.1 Replacing the Hydrophobic (Water) Filter

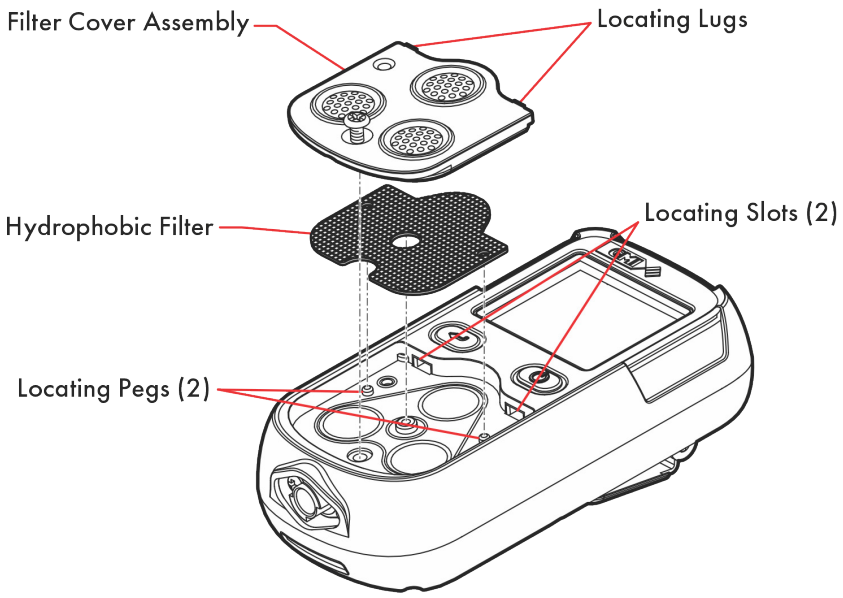

Figure 52: Hydrophobic Filter Replacement

1. Using a No. 1 Pozidriv® screwdriver, unscrew the captive screw.
2. Slide the filter cover away from the display until the locating lugs disengage from the locating slots.
3. Lift the cover away from the monitor.
4. Remove the hydrophobic filter.
5. Insert a new hydrophobic filter.

Note: Make sure that the locating pegs in the monitor filter recess align with the mating pinholes in the hydrophobic filter.

6. Place the filter cover over the recess and slide it towards the display until the locating lugs engage in the locating slots.
7. .Using a No. 1 Pozidriv® screwdriver, tighten the captive screw.

Note: Do not overtighten the captive screw.

8.2.2 Replacing the Sample Inlet (Dust) Filter

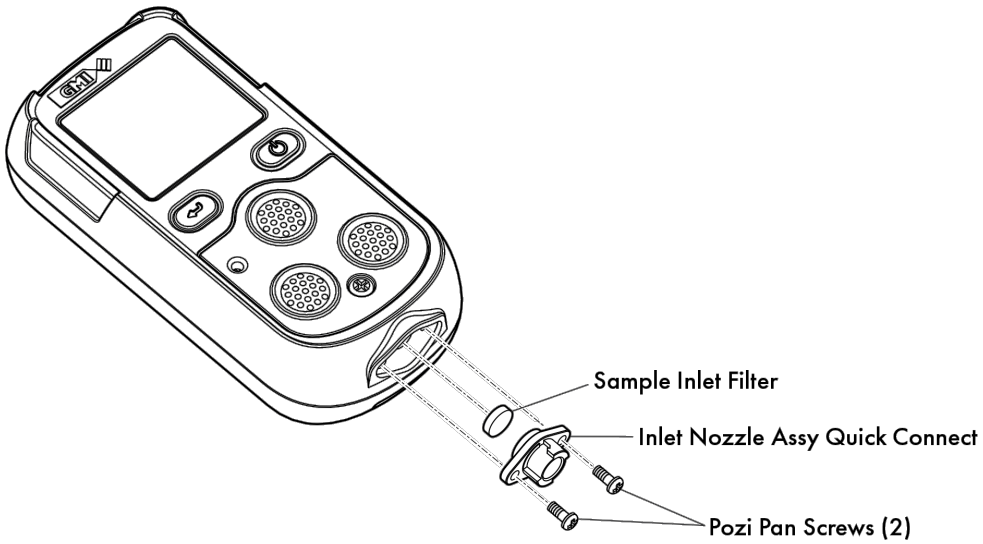

Figure 53: Replacing the Sample Inlet (Dust) Filter

1. Using a No.1 Pozidriv® screwdriver, remove the 2 Pozi Pan screws.
2. Remove the nozzle. The sample inlet filter is located at the rear of the inlet nozzle.
3. Push a matchstick, or similar, into the front of the inlet nozzle and remove the sample inlet filter from the rear of the inlet nozzle.
4. Insert a new sample inlet filter into the rear of the inlet nozzle. Ensure the "rough" surface faces the inlet filter (sample side).
5. Fit the inlet nozzle. The inlet nozzle will only fit in one direction.
6. Using a No.1 Pozidriv® screwdriver, insert the 2 Pozi Pan screws.

Note: Do not overtighten the captive screw.

9. Calibration

WARNING: ONLY AUTHORIZED PERSONNEL MAY CALIBRATE THE MONITOR.

9.1. General Description

The monitor has been calibrated for particular gases. Where any doubt exists, return the monitor to an authorized distributor for calibration.

Various calibration options are available:

1. Quick Calibration (if enabled)
2. Field Calibration (if enabled)
3. Manual Calibration using flexiCal Plus software
4. Automatic Calibration – the GMI Automatic Bump/Calibration Station (shown in Figure 54: PS200 Auto/Bump Calibration Station) provides controlled delivery of gases permitting users to bump test and calibrate the monitor in a controlled manner whilst maintaining a record of calibration results. For further details contact GMI or an authorized distributor.

Figure 54: PS200 Auto/Bump Calibration Station

Note: For further information on options 2, 3, and 4, please contact GMI or an authorized distributor.

9.2. Quick Calibration

This feature, if enabled, allows calibration without using the monitor's set-up menu and passcodes.

Quick Calibration uses predefined calibration gas cylinder values saved in the monitor. The default values are:

- 50% LEL
- 18% O_2
- 100PPM CO
- 25PPM H_2S.

The user must ensure the correct calibration gas and regulator should be used.

Note: These pre-defined cylinder values can only be adjusted via the monitor set-up menu.

1. To access the quick calibration feature, press and hold the **L** button while the monitor is switched ON. The monitor will first enter self-test.
2. Continue holding the button until the self test finishes and the LCD displays ***ZERO CALIBRATION***, as shown in Figure 55: ZERO CALIBRATION Screen.

Figure 55: ZERO CALIBRATION Screen

3. Next, in a clean air environment, press and hold the **R** button to zero calibrate the monitor ranges. Once the zero calibration finishes, the monitor displays ***SPAN CALIBRATION***, as shown in Figure 56: SPAN CALIBRATION Screen.

Figure 56: SPAN CALIBRATION Screen

4. Apply the gas to the monitor via a direct/fixed flow regulator (with a flow set at 0.5 l/min).

Note: The test gas must match the predefined cylinder values stored in the monitor.

5. Once gas is applied, press and hold the **R** button to start the calibration. The 60 second countdown will commence (refer to Figure 57: APPLY GAS Screen). After 60 seconds, the monitor will be calibrated to the predefined values.

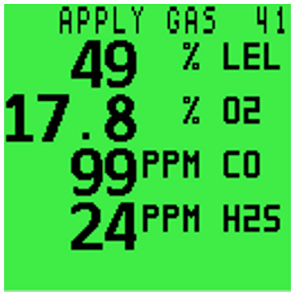

Figure 57: APPLY GAS Screen

6. The timer will count up to 9 seconds, during which time the monitor will adjust the gain to the sensors accordingly. No manual input is required.

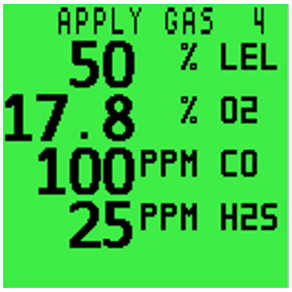

Figure 58: APPLY GAS Screen

7. Once calibration is successfully completed, the user has the option of saving the results (refer to Figure 59: CAL COMPLETE/SAVE RESULTS Screen).

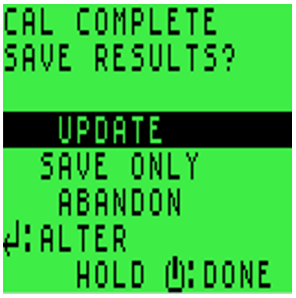

Figure 59: CAL COMPLETE/SAVE RESULTS Screen

8. Using the **L** button, highlight one of the 3 the available options :
   A. UPDATE – saves the calibration data in the memory and automatically updates the calibration due date based on the option stored in the monitor set-up menu.
   B. SAVE ONLY – saves the calibration data in the memory but does not update the calibration due date.
   C. ABANDON – neither saves the calibration data in the memory nor updates the calibration due date.
9. Press and hold the R button to accept this option

9.3. Calibration Validity

Calibration validity remains the responsibility of the user. Individual codes of practice may dictate calibration intervals.

Regular calibration establishes a pattern of reliability and enables the calibration check period to be modified in line with operational experience. As a guide, the higher the risk, the more frequently calibration should be checked.

10. Accessories*

Part Number	Description
64136	3.0 meters (9'-9") PVC Sample Line Tubing & Connector - Pumped monitors Only
64172	Quick Operating Instructions
64247	Power Adapter (c/w USB/mini-USB Cable)
64260	Charging/Comms Clip (mini-USB)
64171	Operation & Maintenance Manual (PDF)
64191	Quick Start Guide (PDF)

Part Number	Description
66123	Hand Aspirator
66478	Hand Aspirator c/w 3.0 meters (9'-9") tubing
66112	Sample Line Extender
66485	In-Line Hydrophobic Filter Assembly
66545	Ball Float
64151	PS200 Confined Space Probe
64100	Carrying Case
64150	PS200 Confined Space Demonstration Kit
64160	PS200 Field Kit

Part Number	Description
64138	5-Way Charger
64248	In-Vehicle Charging Adapter (12V/24V - USB)
64491	In-Vehicle Charging Cradle

Part Number	Description
64051	Manual Bump Kit (c/w Combi Test Gas 99146, Direct Flow Regulator, tubing & sample line connector)
943-000QBK-4M9	Combi-Gas EcoBump Kit

Part Number	Description
64052	Automatic Bump & Calibration Station (6mm fittings; includes PSU/USB/Software)
64052Q	Automatic Bump & Calibration Station (1/4" fittings; includes PSU/USB/Software)
99118	On Demand Flow Regulator

*. Refer to www.teledynegasandflamedetection.com for the complete range of PS200 accessories.

Appendix A. Operating Parameters & Sensor Types

A.1. Typical Operating Parameters

Gas	Range	Resolution	Response Time
LEL	0 to 100%	1%	15 secs. (IEC 60079-29-1)
Oxygen (O_2)	0 to 25%	0.1%	12 secs. (BSEN 50104)
Carbon Monoxide (CO)	0 to 1000 ppm	1 ppm	<20 secs.
Hydrogen Sulfide (H_2S)	0 to 9.9 ppm 10 to 100 ppm	0.1 ppm 1 ppm	<20 secs.

Physical Properties	
Dimensions (H x W x D):	4.8" x 2.3" x 1.3" (121 mm x 59 mm x 32 mm)
Weight with Pump:	8 oz. (230 g)
Weight with Pump:	7.6 oz (215 g)

Environment	
Operating Temperature Limits:	-4ºF to +122ºF (-20ºC to +50ºC)
Storage Temperature Limits:	-40ºF to +149ºF (-40ºC to +65ºC)
Humidity:	0 to 95% R.H non-condensing
Nominal Flow Rate:	0.132 to 0.185 gals / min (0.5 to 0.7 liters / min) Max. 97 ft. (30 m) sample line.
Typical Flow Fail Rate:	0.026 to 0.053 gals / min (0.1 to 0.2 liters / min)

Warm-up/ Stabilization Time
~30 seconds (~90 seconds for monitors with IR flammable sensor options)

Alarms	
Visual:	Highly visible, flashing LED
Audible:	Sounder >90 dB

Display
Green/Red LCD backlit display

Power Source	
Battery:	Rechargeable Lithium-Ion
Runtime:	Up to 14 hours (8 hours pumped)
Runtime Using Lo Power LEL Sensor:	Up to 80 hours (20 hours pumped)
Charging Time:	Up to 4 hours

Construction
High-impact, rubberized polycarbonate case. Can withstand physical impact testing to EN 60079 section 1-5

IP Rating
IP67

Datalogging	
Timed:	Minimum of 6 months datalogging*
Session:	Minimum of 360 logs
Calibration:	Minimum of 8 logs
Bump:	Minimum of 360 logs

*Based on 1 gas event every 1 hour during a typical 8-hour shift, with a datalogging interval of 1 minute.

A.2. LEL Sensor Types

There are several LEL sensor types available for the monitor. The following table shows the benefits of each sensor and the combustible gases it will detect:

LEL Sensor	Benefit	Gas Detected	Certification Gas Group	Division/ Zone
Standard Filtered P/N: 66725	Detects most combustible gases	C1 - C8 Hydrocarbons Includes but not limited to: Methane, Ethane, Propane, Butane, Pentane, Hexane, Heptane, Octane & Hydrogen	IIC A,B,C & D	Class I, Div 1,2 Zones 1,2
Enhanced Filtered P/N: 64825	Enhanced H2S & Silicone poisoning resistance	C1 - C6 Hydrocarbons Includes but not limited to: Methane, Ethane, Propane, Butane, Pentane, Hexane & Hydrogen	IIC A,B,C & D	Class I, Div 1,2 Zones 1,2
Low Power P/N: 66750	Improved battery life	C1 - C5 Hydrocarbons Includes but not limited to: Methane, Ethane, Propane, Butane, Pentane	IIB C & D	Class I, Div 1,2 Zones 0,1,2
Infrared P/N: 66761	Improved battery life, poison / silicone / contamination resistant; Able to detect methane in oxygen depleted atmospheres	Methane only; Will not detect Hydrogen (H_2)	IIC ATEX/IECEx only	Zone 1 ATEX/IECEx only

WARNING: ONLY THE STANDARD FILTERED AND THE ENHANCED FILTERED SENSORS ARE INTERCHANGABLE.

Appendix B. Technical Support

This product is designed to provide you with reliable, trouble-free service. Contact your regional technical support if you have technical questions, need support, or if you need to return a product. Details can be found at:

www.teledynegasandflamedetection.com

Note: When returning a product, contact Technical Support to obtain a Return MaterialAuthorization (RMA) number prior to shipping.

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64171 Revision 12.1