



User Handbook



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Instrument Service / Repair contact details are also provided inside the back cover of this handbook.

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MODIFICATION NOTICES

GMI aim to notify customers of relevant changes in the product operation and maintain this manual up to date. In view of the policy of continuous product improvement there may be operational differences between the latest product and this manual.

This Handbook is an important part of the **GT series** product. Please note the following points:

- It should be kept with the instrument for the life of the product.
- Amendments should be attached.
- This Handbook should be passed on to any subsequent owner/user of the instrument.
- Although every care is taken in the preparation of this Handbook it does not constitute a specification for the instrument.


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DISPOSAL ADVICE

When no longer in use, dispose of the instrument carefully and with respect for the environment. GMI will dispose of the instrument without charge if returned to the factory.

SAFETY

- The instrument must be regularly serviced and calibrated by fully trained personnel in a safe area.
- **Batteries:** Alkaline or *Rechargeable batteries must be exchanged (*and recharged) in a safe area and fitted correctly before use. Never use damaged batteries or expose to extreme heat. See Chapter 12 : OPERATOR MAINTENANCE.
- Only GMI replacement parts should be used.
- If the instrument detects gas, follow your own organisation's procedures and operational guidelines.
- The combustion chamber is a flameproof assembly and must not be opened in the presence of a flammable atmosphere.
- **GT series** instruments are certified as ATEX  II 2 G EEx iad IIB T3 (-20°C ≤ Tamb ≤ 50°C). UL Class 1 Groups C and D.
- This equipment is designed and manufactured to protect against other hazards as defined in paragraph 1.2.7 of Annex II of the ATEX Directive 94/9/EC

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

WARNING: To prevent ignition of flammable or combustible atmospheres, remove batteries before servicing.

WARNING: To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's live maintenance procedures.

WARNING: To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must be changed only in a location known to be non-hazardous.

WARNING: To reduce the risk of explosion, do not mix old batteries with used batteries or mix batteries from different manufacturers.

WARNING: Never attempt to recharge non rechargeable cells.

CAUTION: Not for use in oxygen enriched atmospheres.

CAUTION: Replace batteries only with approved batteries:

NiMH – GP350

Alkaline – Duracell, Energizer, Rayovac.

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. The chemical compounds that can cause loss of sensitivity include Silicones, Lead, Halogens and Sulphur. Do not use instrument in potentially hazardous atmospheres containing greater than 21% Oxygen. The enclosure material is polypropylene and must not be exposed to environments which are liable to result in mechanical or thermal degradation or to damage caused by contact with aggressive substances. Additional protection may be required in environments where the instrument enclosure is liable to damage.

STORAGE, HANDLING AND TRANSIT

Rechargeable batteries contain considerable energy and care should be taken in their handling and disposal. Batteries should be removed if the instrument is stored for longer than 3 months. The instrument is designed to handle harsh environments. The sensing elements are sealed to IP54 and the rest of the instrument to IP64. If not subject to misuse or malicious damage, the instrument will provide many years of reliable service. The instrument contains electrochemical sensors with a life of 2 years. Under conditions of prolonged storage the sensors should be removed. The sensor contains potentially corrosive liquid and care should be taken when handling or disposing of the sensor, particularly when a leak is suspected.

WARRANTY

The **GT series** instrument has a warranty against faulty goods or workmanship of 5 years. Consumable and Mechanical parts are not included in this. These are covered under GMI standard warranty conditions. For details, please contact GMI Ltd (UK).

REVISION RECORD

Date	Issue	Description Of Change
07/09/2005	1	New Handbook
30/05/2006	2	Instrument Configuration Updates

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INTRODUCTION

The GMI **GT series** instruments are designed to be multifunction, multi-application gas detectors to suit all the needs of a Gas Industry Service Technician.



Fig. 1.1 **GT series** Instrument

In the following procedure, the five instrument buttons shown in Fig 1.2 are referred to as detailed below:

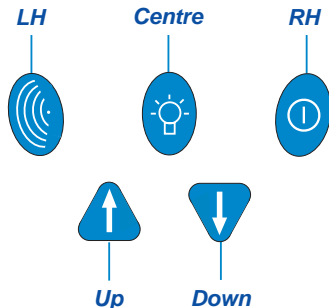


Fig. 1.2 Button References

<u>Button</u>	<u>Text Reference</u>
LH (INVERT):	LH button
Centre (RANGE):	Centre button
RH (PUMP):	RH button
Up:	UP button
Down:	DOWN button

The bottom line of the instrument display may indicate button press options. For example, to select 'Yes' from the following screen option, you would press the RH button. To select 'No', the LH button would be pressed.



Fig 1.3 Option Select

The principle of selecting any one of three options on the bottom line of the instrument display, by pressing either LH, CENTRE or RH buttons, is used throughout the operation of this instrument.

1.1 INSTRUMENT RANGES

The detection ranges, available but which may not all be included in the version of **GT** selected by your company, are:

- 0-10,000 ppm Flammable (Sniffer Range)
- 0-100% LEL Flammable
(Option to display as %Gas)
- 0-100% VOL Flammable
- 0-25% O₂
- 0-2000 PPM CO
- 0-100 PPM H₂S
- 0 to 60 in. Water Gauge (0 to 150mBar)

GENERAL FEATURES

- An integral pump draws the required sample over all of the sensors
- The pump flow is monitored by means of a pressure transducer
- Datalogging is available for some applications
- A 'Bleep' sounds for each button press
- A green LED indicates 'Power ON'

To simplify use in its many applications, the instrument utilises a menu system similar to a (cell) mobile phone, as shown in Fig 2.1.

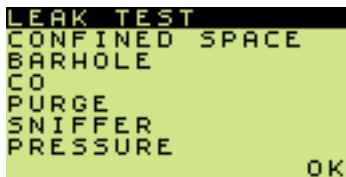


Fig. 2.1 Mode Menu

The bottom line of the LCD can also be used to indicate press and hold button functions available.

By simple selection of the application you need, the appropriate gas(es) are shown on the display and only the necessary button functions and alarms are activated.

Note: Your company may have decided to have its instruments configured only for certain of the aforementioned applications.

2.2 MODES OF OPERATION

Leak Test

This mode is for the technician to investigate odour or leak complaints and to pinpoint the leak.

Refer to Chapter 4 for 'Leak Test' mode operation.

Confined Space

Used for confined space pre-entry testing and for personal monitoring in areas such as basements etc.

Refer to Chapter 5 for 'Confined Space' mode operation.

Barhole

Used to locate underground leaks. This can be timed or non-timed. Your company may have selected only one of these options.

Refer to Chapter 6 for 'Barhole' mode operation.

CO

The CO (Carbon Monoxide) mode allows the user to make either CO Direct, Differential CO, or Air Free CO readings (if an O₂ cell is fitted). **Note:** Your company may have chosen only certain of these options.

Refer to Chapter 7 for 'CO' mode operation.

Purge

This mode is used in gas and air purging applications. Refer to Chapter 8 for 'Purge' mode operation.

Sniffer

This mode is used to find small fitting leaks. Very fast detection rates are achieved using the semiconductor sensor in the probe.

Refer to Chapter 9 for 'Sniffer' mode operation.

Pressure

In this mode, the instrument can be used as a manometer to measure appliance and regulator pressure and to check the system for leaks.

Refer to Chapter 10 for 'Pressure' mode operation.

OPERATING PROCEDURE

Check the following:

- The instrument is clean and in good condition.
- The batteries are in good condition, fully charged and fitted correctly.
- The hydrophobic filter is clean and in good condition.
- The sample line and any other accessories used are in good condition.
- The 'clear bulb' at probe end is screwed tightly.
- Switch instrument ON in fresh air.
- The battery indication provides sufficient capacity for the operation.
- The instrument is within the calibration period you have decided is necessary for your application.
- All applicable ranges are operational.
- There are no fault indications.
- Attach optional accessories, as required.
- The instrument displays a sample / flow fault when inlet is blocked (with a finger for example). If fault is not displayed, check tightness of all fittings.
- After use, allow the instrument to run for 1 – 2 minutes in fresh air before switching the instrument OFF.

Each time you use the instrument, carry out the following procedure:

3.1 SWITCH THE INSTRUMENT ON

To switch the instrument ON in fresh air:

- Press and hold the RH button , for one second.



Fig. 3.1 Switch ON

The instrument begins its warm-up routine, which lasts approximately 30 seconds. During the warm-up cycle, a countdown timer appears in the top right hand corner of the display.

The Power ON LED illuminates when the instrument is switched ON and also during operation. The display backlight illuminates and remains ON during warm-up. When the warm-up cycle is complete, the screen light automatically switches OFF.

The Fault LED illuminates briefly, for approximately five (5) seconds, during the warm-up cycle.

3.2 INSTRUMENT IDENTIFICATION

During the warm-up cycle, the instrument display identifies the model, serial number, software version and battery status information as shown in Fig. 3.2:

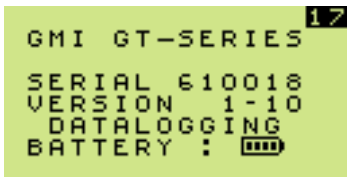


Fig. 3.2 Instrument Identification

3.3 BATTERY STATUS

This feature provides the user with a battery capacity level indicator that displays instrument battery power remaining, as shown in Fig. 3.3.

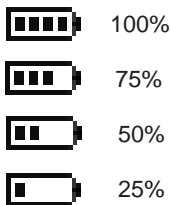


Fig. 3.3 Battery Capacity

This battery symbol will be indicated for approximately five (5) seconds during the warm-up cycle, then on the top of the display during normal operation.

3.4 TIME AND DATE

The time and date from the instrument's built-in clock is displayed on the screen during warm-up, as shown in Fig. 3.4.

If datalogging is being used, the time and date is set from this clock. This may be important when viewing the logged data.

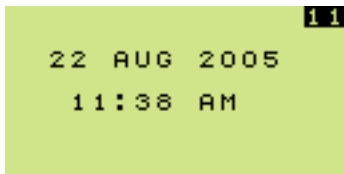


Fig. 3.4 Time and Date

3.5 CALIBRATION DUE DATE

The CAL DUE date can be set by the workshop and is set to 365 days by default. The date can be set from 1 to 400 days.

The CAL DUE is reset when the instrument is successfully calibrated.

The CAL DUE feature has five (5) configurable options:

- 1. Cal Due Date message is not displayed.***

2. Cal Due Date and overdue date messages are displayed.

Calibration due date is displayed, as shown in Fig. 3.5.

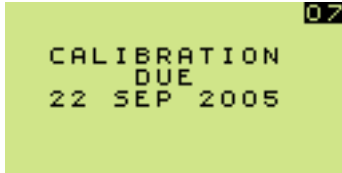


Fig. 3.5 Calibration Due Date

The screen, shown in Fig. 3.6, is displayed when the Calibration date has expired. i.e. overdue.

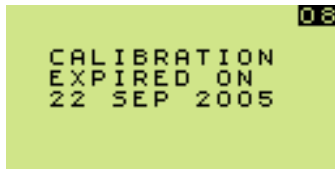


Fig. 3.6 Calibration Overdue

After approximately five (5) seconds, the instrument warm-up continues.

3. **Cal Due Date message is displayed with user acknowledge if overdue (Default).**

Calibration due date is displayed as shown in Fig. 3.7.

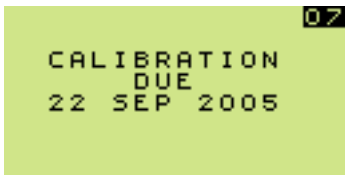


Fig. 3.7 Calibration Due Date

The screen, shown in Fig. 3.8, is displayed when the Calibration date has expired. i.e. overdue.

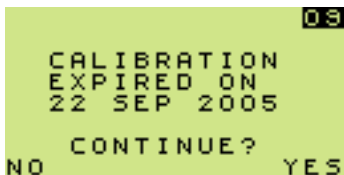


Fig. 3.8 Calibration Overdue

The user must acknowledge that Calibration has expired.

To continue:



- Press and hold YES  for instrument warm-up to continue.

To switch OFF:

- Press and hold NO . The screen, shown in Fig. 3.9, is displayed.



Fig. 3.9 Switch OFF

- Press and hold both the LH button  and the RH button  simultaneously to proceed with the switch-off sequence.

4. Cal Due Date message is displayed with user acknowledge for extended period option, if overdue.

Calibration Due Date message is displayed, as shown in Fig. 3.10.

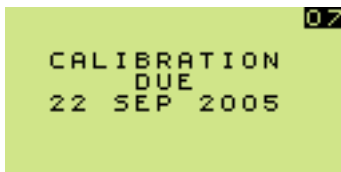


Fig. 3.10 Calibration Due Date

If overdue but within the 'extended period', the screen, shown in Fig. 3.11, is displayed.

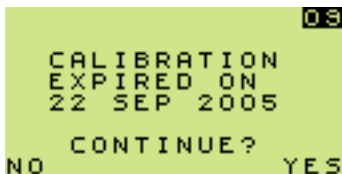


Fig. 3.11 Calibration Overdue

The user must acknowledge that Calibration has expired.

Note: The extended period can be set from 1 to 31 days

To accept 'extended period' option:

- Press and hold YES  and the instrument warm-up continues.



Note: When the extended period option expires, the user will be forced to switch the instrument OFF.

To reject 'extended period' option:

- Press and hold NO . The screen, shown in Fig. 3.12, is displayed.



Fig. 3.12 Switch OFF

- Press and hold both the LH button  and the RH button  simultaneously to proceed with the switch-off sequence.

5. Cal Due Date message is displayed with user shut-down if overdue.

Calibration due date is displayed, as shown in Fig. 3.13.

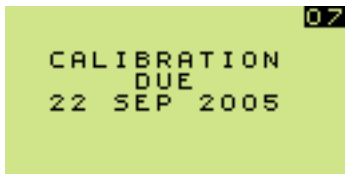




Fig. 3.13 Calibration Due Date

The screen, shown in Fig. 3.14, is displayed when the Calibration date has expired. i.e. overdue.



Fig. 3.14 Switch OFF

To proceed with the switch-off sequence.

- Press and hold both the LH button  and the RH button  simultaneously.

3.6 SERVICE DUE DATE

The Service due date can be set by the workshop and is set to two (2) years by default from last service date. The date can be set over a period of 1 to 36 months in 1 month steps.

Note : The service due date will not normally be displayed at start up but if display is selected, it will be shown at 90 days prior to the preset date, as shown in Fig. 3.15.

The SERVICE DUE feature has five (5) configurable options:

1. ***Service Due Date message is not displayed (Default).***

2. ***Service Due Date and overdue date messages are displayed***, as shown in Fig. 3.15.



Fig. 3.15 Service Due Date

The screen, shown in Fig. 3.16, is displayed when the Service date has expired. i.e. overdue.



Fig. 3.16 Service Overdue

After approximately five (5) seconds, the instrument warm-up continues.

3. **Service Due Date message is displayed with user acknowledge if overdue.**

Service due date is displayed, as shown in Fig. 3.17.



Fig. 3.17 Service Due Date

The screen, shown in Fig. 3.18, is displayed when the Service date has expired. i.e. overdue.

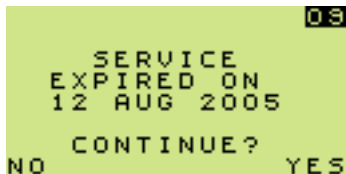


Fig. 3.18 Service Overdue

The user must acknowledge that Service has expired.

To continue:



- Press and hold YES  for instrument warm-up to continue.

To switch OFF:

- Press and hold NO . The screen, shown in Fig. 3.19, is displayed.



Fig. 3.19 Switch OFF

- Press and hold both the LH button  and the RH button  simultaneously to proceed with the switch-off sequence.

4. Service Due Date message is displayed with user acknowledge for extended period option, if overdue.

Service Due Date message is displayed, as shown in Fig. 3.20.



Fig. 3.20 Service Due Date

If overdue but within the 'extended period', the screen, shown in Fig. 3.21, is displayed.

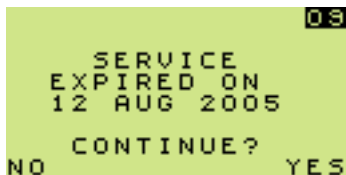


Fig. 3.21 Service Overdue

The user must acknowledge that Service has expired.

Note: The extended period can be set from 1 to 31 days

To accept 'extended period' option:

- Press and hold YES  and the instrument warm-up continues.



Note: When the extended period option expires, the user will be forced to switch the instrument OFF.

To reject 'extended period' option:

- Press and hold NO . The screen, shown in Fig. 3.22, is displayed.



Fig. 3.22 Switch OFF

- Press and hold both the LH button  and the RH button  simultaneously to proceed with the switch-off sequence.
5. **Service Due Date message is displayed with user shut-down if overdue.**

Service due date is displayed, as shown in Fig. 3.23.





Fig. 3.23 Calibration Due Date

The screen, shown in Fig. 3.24, is displayed when the Service date has expired. i.e. overdue.



Fig. 3.24 Switch OFF

To proceed with the switch-off sequence:

- Press and hold both the LH button  and the RH button  simultaneously.

Warm-up Complete



The instrument will now automatically select the Leak Test Mode, as default.

The following configurable options are available:

- a) To start up in specific operational mode.*
- b) To start up in the mode last used.*

3.7 SWITCH THE INSTRUMENT OFF OR RE-ENTER THE MODE MENU

To initiate the shut down sequence:

- Press and hold both the LH  and RH  buttons simultaneously.

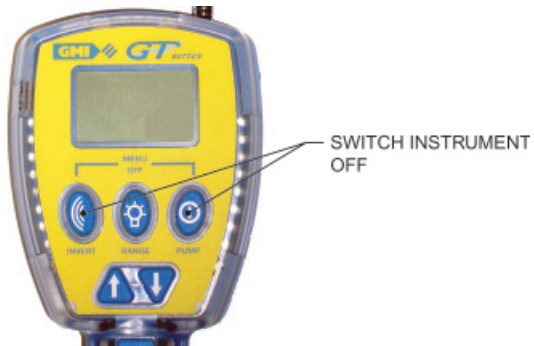




Fig. 3.25 Switch OFF

While both buttons are depressed, the instrument display will step through previous menus, each displayed for approximately two (2) seconds.

After this time, the OFF sequence countdown begins and the user will have to keep the buttons pressed for a further three (3) seconds to switch the instrument OFF. The countdown sequence is shown in Fig. 3.26.

Note: In Confined Space Mode, to prevent inadvertently switching instrument OFF or changing mode while

alarms are active, the user must press and hold both the LH  and RH  buttons simultaneously for an additional five (5) seconds before the mode menu appears.

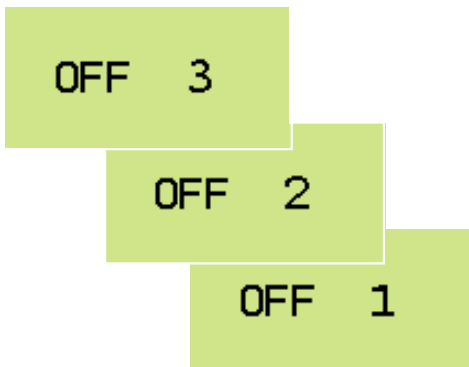


Fig. 3.26 OFF sequence

The switching OFF sequence can be aborted at any time by releasing the held buttons which provides access to the Mode menu, shown in Fig. 3.27:

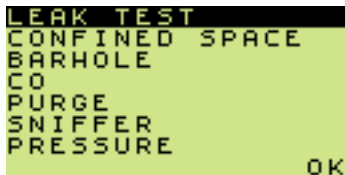



Fig. 3.27 Mode Menu

To highlight the required option:

- Press the UP  or DOWN  buttons, then . .

To select the highlighted option:

- Press and hold OK .

LEAK TEST MODE

This mode is for the technician to investigate odour or leak complaints and to pinpoint the leak.

4.1 LEAK TEST RANGES

Leak Test mode will have the following ranges available for normal operation:

- 0 – 2000 ppm CH₄
- 0 – 100% LEL (option to display as gas in air)
- 0 – 100% Vol Gas
- 0 – 2000 ppm CO (if fitted)

4.2 LEAK TEST FEATURES

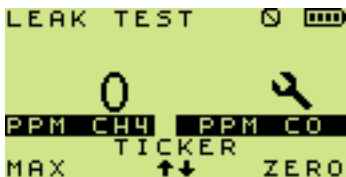
Leak Test mode will have the following features available:

- Audible / Visual PPM Ticker (Geiger) Indication - (Option ON at switch-on)
- Audible / Visual Gas Alarms
- Backlight
- Flashlight
- Pump - can be toggled ON / OFF and will stop if flow fault is detected
- Max Display
- Autoranging from ppm-LEL-Gas

- Manual Range selection between Flam and Flam plus CO (Dual Display)
- Threshold adjustment
- Display Invert
- Automatic datalogging

4.3 LEAK TEST DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display, shown in Fig. 4.1, will indicate any sensor faults.



alternating with

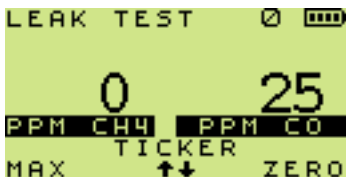


Fig. 4.1 Sensor Check

After the sensors have been checked, the normal display will be as shown in Fig. 4.2.

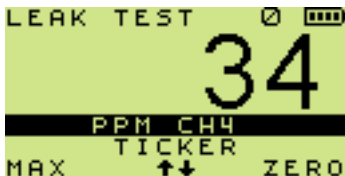


Fig. 4.2 Normal Display Example

Note 1: Any faulty sensor will continue to display a spanner (wrench) symbol alternating with the gas reading and the fault LED will illuminate.

Note 2: Continuous display of both flammable and CO is a configurable option, as shown in Fig. 4.3.

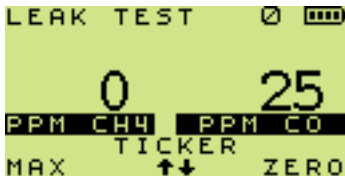




Fig. 4.3 Flammable / CO Display

4.3.1 Ticker (Geiger)

To enable / disable the audible Ticker (Geiger):
(in the PPM range)

- Press and hold the UP  and DOWN  buttons simultaneously, as follows:
 1. First press and hold - to enable visual only.
 2. Second press and hold - to enable both audible and visual.

When the PPM autoranges to LEL, the display changes to the example shown in Fig. 4.4.



Fig. 4.4 LEL Display


If displaying the maximum reading, the display will be as the example shown in Fig. 4.5.

Note: Maximum display only for LEL and VOL.



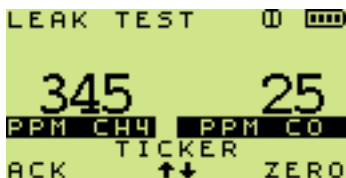
Fig. 4.5 Max Reading

To return the display to normal (live) operation:

- Press and hold LIVE .

Note: If the LH button is not pressed, the display will return to normal after 30 seconds.

If a CO sensor is included in your instrument and the CO concentration rises above a pre-set level, the display will change together with an audible alarm to attract your attention. If alarm is enabled, CO alternates with **HIHI** until cleared.



alternating with

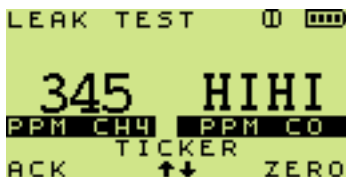



Fig. 4.6 CO Alarm

To acknowledge the alarm:

- Press and hold ACK .

After acknowledgement of the alarm, the screen, shown in Fig. 4.7, is displayed.

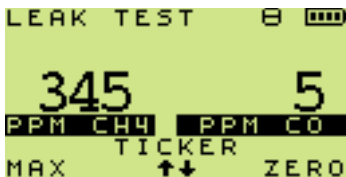



Fig. 4.7 Alarm Acknowledge

When CO levels are below alarm concentration, the Centre button  enables return to flammable only. This button can be pressed at any time to change between Flammable and Flammable + CO.

4.4 LEAK TEST BUTTON OPERATION

A summary of the button operation is detailed in Table 4.1:






	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	RANGE FLAM ↑ FLAM + CO	PUMP ON / OFF CLEAR FLOW FAULT
PRESS and HOLD	MAX / LIVE ACKNOWLEDGE ALARM	BACKLIGHT / FLASHLIGHT	FLAM PPM ZERO

Table. 4.1 Button Operation in Leak Test Mode

4.5 DESCRIPTION OF LEAK TEST BUTTON OPERATION

4.5.1 Ticker (Geiger) ON / OFF

To enable and disable the audible Ticker (Geiger):
(in the PPM range)


- Press and hold the UP  and DOWN  buttons simultaneously, as follows:
 1. First press and hold - to enable visual only.
 2. Second press and hold - to enable both audible and visual.

When PPM autoranges to LEL, the Ticker (Geiger) audible/visual continues until an LEL alarm is reached. The Ticker (Geiger) is then switched off and the LEL alarm will be activated. If no LEL alarm is set, the Ticker (Geiger) will remain activated.

4.5.2 Ticker (Geiger) Adjust

To adjust the Ticker (Geiger) threshold:

To increase

- Press and hold the UP  button.

To decrease

- Press and hold the DOWN  button.

The threshold setting is displayed briefly beneath the PPM CH₄. In the following example, Fig. 4.8, the threshold is 500.

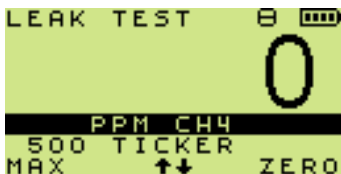


Fig. 4.8 Ticker (Geiger) Threshold

4.5.3 Range Selection

The instrument initially selects the PPM range which autoranges to LEL/VOL.

Note: When CO range is selected the display reverts to the 2-gas display.

4.5.4 Lights

To switch ON the backlight:

- Press and hold the Centre button .

To switch ON the flashlight:

- Press and hold the Centre button  again.


The backlight and flashlight are both timed to switch OFF after two minutes. Both can be switched OFF by a third

press and hold the Centre button .


4.5.5 Max / Live

To show the Maximum readings:

(since the mode was selected)

- Press and hold the LH button .

To return display to the live reading.

- Press and hold the LH button  again.

Note 1: If the instrument is in alarm, the Max function cannot be used until the alarm is Acknowledged.


Note 2: If no button is pressed, after 30 seconds the display reverts to live reading.

4.5.6 Alarm Acknowledge

Non-latching can be muted for one (1) minute or, when the concentration drops below the alarm level, the alarm will automatically cancel.


Latched Alarms can be muted temporarily for one minute or cancelled permanently when the display level is below alarm level.

To acknowledge / mute latched alarms:

- Press and hold the LH button .


4.5.7 Pump

To switch the pump ON and OFF:

- Press the RH button 

4.5.8 Zero

To zero the Flammable PPM range when displayed:

- Press and hold the RH button 


Note: The pump must be switched ON to zero the flammable ppm range.

4.5.9 Flow Fault

If flow fault is detected, the pump stops automatically. The instrument should be checked for water ingress or blockage and the pump reset.



To clear the flow fault:

(Once the blockage has been cleared):

- Press the RH button 

4.5.10 Menu / Off



To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button  simultaneously.

When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

4.6 LEAK TEST TICKER (GEIGER) FUNCTION

The Ticker (Geiger) function is available on flammable ppm range. The Ticker (Geiger) range at start-up is 0-1000 PPM.

For any subsequent PPM concentration, the Ticker (Geiger) audible / visual can be 'backed off' using the UP  or DOWN  buttons.

e.g. 600 PPM Ticker (Geiger) can be 'backed off' to enable tracing to higher concentrations, in which case the Ticker (Geiger) range becomes 600 to 1600 PPM etc, etc.

Note: The display range remains always as 0 to 2000 PPM.

The Ticker (Geiger) visual is such that the lights illuminate in pairs according to Fig. 4.9 over any 1000 PPM range as explained above.



Red LED's	PPM Level	Red LED's	PPM Level
Pair 1	100	Pair 5	500
Pair 2	200	Pair 6	600
Pair 3	300	Pair 7	700
Pair 4	400	Pair 8	800 - 1000

Fig. 4.9 PPM Level / LED Sequence

4.7 LEAK TEST ALARMS

Refer to Chapter 11.

4.8 LEAK TEST LOGGING

Automatic datalogging is active for CO and CH₄ ranges (except ppm CH₄). Timed logs will be recorded every minute (default) or as per configuration.

CONFINED SPACE MODE

This mode is used for confined space pre-entry testing and for personal monitoring in areas such as basements etc.

5.1 CSM RANGES

Confined Space Mode (CSM) will have the following ranges available:

- 0 – 100% LEL (EEE Over-range)
- 0 – 25% O₂ (if fitted)
- 0 – 2000 ppm CO (if fitted)
- 0 – 100 ppm H₂S (if fitted)

5.2 CSM FEATURES

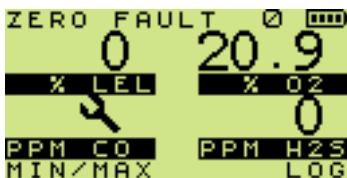
Confined Space mode will have the following features available:

- Audible / Visual Alarms
- Min / Max Display
- Backlight
- Flashlight
- Pump – ON continuously - will not stop if flow fault is detected - flow fault alarm will be activated.
- Datalogging – automatic every 60 seconds

- Manual Logging is also available. This will log all gas concentrations at that instant.
- Time weighted averaging for Alarms
- Confidence signal every 15 seconds.
- Display invert.

5.3 CSM DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display will indicate any sensor faults. This display alternates with the Gas reading display, as shown in Fig. 5.1.



alternating with

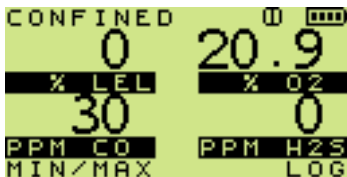
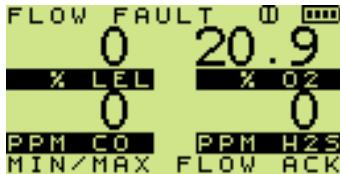


Fig. 5.1 Four Gas Sensor Check

Note: Any faulty sensor will continue to display a spanner (wrench) symbol alternating with the gas reading.

When an instrument has an alarm active, the bottom line of the display changes. A sample fault will change both top and bottom lines, as shown in Fig. 5.2:



alternating with

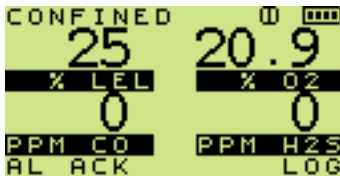


Fig. 5.2 Four-gas Display with Alarm and Sample Fault

When viewing Max in confined space mode, Confined Max identifier is in the top of the display, with the option of selecting Min on the bottom line, as shown in Fig. 5.3:

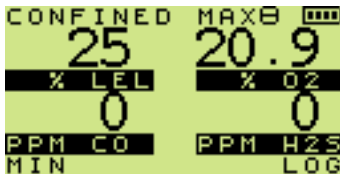


Fig. 5.3 Confined Max Identifier

When viewing Min in confined space mode, Confined Min identifier is in the top of the display, with the option of selecting Live on the bottom line, as shown in Fig. 5.4:

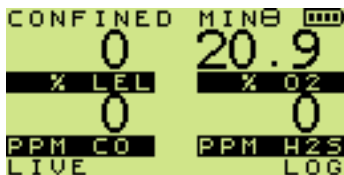


Fig. 5.4 Confined Min Identifier

5.4 CSM BUTTON OPERATION

A summary of the button operation is detailed in Table 5.1:





	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	—	—
PRESS and HOLD	MIN / MAX ACKNOWLEDGE ALARM	BACKLIGHT / FLASHLIGHT	CLEAR FLOW FAULT MANUAL LOG

Table. 5.1 Button Operation in Confined Space Mode


5.5 DESCRIPTION OF CSM BUTTON OPERATION


5.5.1 Lights

To switch ON the backlight:

- Press and hold the Centre button .

To switch ON the flashlight:


- Press and hold the Centre button  again.

The backlight and flashlight are both timed to switch OFF after two minutes or can be switched OFF by a third press and hold the Centre button .

5.5.2 Min / Max

To show the Maximum gas readings:


(since the current mode was selected)

- Press and hold the LH button .

To show the Minimum gas readings:

(since the current mode was selected)

- Press and hold the LH button  again.

A third press and hold the LH button  returns to the live reading.

Note1: If the instrument is in alarm, the Min / Max function cannot be used until the alarm is Acknowledged.

Note 2: If no button is pressed, after 30 seconds the display reverts to live reading.

5.5.3 Alarm Acknowledge


HIHI, **LOLO** for O₂ (if fitted), and Time Weighted Average (TWA) alarms are latching by default. The AL / ACK will only cancel the alarms if all gases have returned to “safe” levels.

An option of **HI**, or **LO** for O₂ (if fitted), non latching alarms are available, as follows:

When the reading drops below the alarm level, the alarm will automatically cancel.

Alarms can also be muted for one minute.



To acknowledge for one minute:

- Press and hold the LH button .

If an alarm occurs in CSM, the user should go into fresh air until the gas concentration falls below the alarm level and is cancelled.

Menu mode can still be entered while an alarm is active in CSM.


To enter menu mode:

- Press and hold the LH button  and the RH button  simultaneously, **for 5 seconds**.

5.5.4 Flow Fault

Before clearing a flow fault alarm the instrument must be checked for water ingress or blockage.


To clear a Flow Fault alarm:

- Press the RH button .

5.5.5 Manual Log

A manual log can be taken at any time.



To capture a manual log:

- Press and hold the RH button .



Note: When a manual log is taken, the term 'LOG' is inverted on the display for one (1) second to provide a visual confirmation that the log has been captured.

5.5.6 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button .


When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

Note: In Confined Space Mode, to prevent inadvertently switching instrument OFF or changing mode while alarms are active, the user must press and hold both the LH  and RH  buttons simultaneously for an additional five (5) seconds before the mode menu appears.

5.6 CSM PUMP

The pump will run continuously for safety reasons. Flow Fault will be flagged and fault LED illuminated.

To clear the flow fault:

- Press and hold the RH button .

5.7 CSM ALARMS

Refer to Chapter 11.

5.8 CSM LOGGING

Automatic datalogging is active for all ranges available. Timed logs will be recorded every minute (default) or as per configuration.

Manual Logging is also available. This will log all gas concentrations at that instant.

5.9 CSM CONFIDENCE SIGNAL

During normal operation, the instrument sounds a confidence beep and illuminates the bottom pair of red LED's briefly every 15 seconds. This function is programmable in the instrument setup software.

The confidence signal function makes the user aware that the instrument is operating correctly:

Note: The confidence beep and / or LED indication can be disabled. Refer to the 'SET-UP SOFTWARE USER HANDBOOK' for further information.

BARHOLE TESTING MODE

This mode is used to locate underground leaks and on start-up will be ranged to 0-100% LEL which will autorange to VOL gas at 100% LEL.

6.1 BARHOLE RANGES

Barhole testing will have the following ranges available:

- 0 – 100% LEL
- 0 – 100% Vol Gas

6.2 BARHOLE FEATURES

Barhole mode will have the following features:

- Timed or Non-Timed Sampling
- Backlight
- Flashlight
- Pump control
- Invert Display
- Six sets of barhole readings with Viewing / Overwriting.

6.3 BARHOLE DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display will indicate any sensor faults. This display alternates with the Gas reading display, as shown in Fig. 6.1, and appears following Timed or Non-Timed mode selection.



alternating with



Fig. 6.1 Sensor Check

Both timed and non-timed modes are available to the user, as shown in display Fig. 6.2.

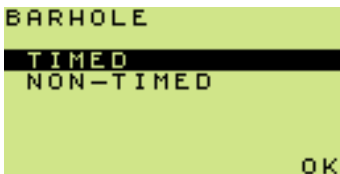



Fig. 6.2 Timed / Non-Timed Mode Selection

To highlight the required option:

- Press the UP  or DOWN  buttons, then . .

To select the highlighted option:

- Press and hold OK .

Note 1: The option initially highlighted will be that previously selected.

Note 2: After the Barhole mode has been selected, the pump will automatically be switched off.

6.3.1 Timed Mode

If TIMED is selected, and the instrument configuration allows user selectable barhole sample time, the screen shown in Fig. 6.3 is displayed. The sample time previously set is displayed.

If the instrument configuration does not allow user selectable barhole sample time, the screen shown in Fig. 6.4 is displayed.

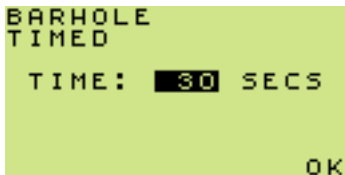


Fig. 6.3 Timed Mode


To change the sample time:

- Press the UP  or DOWN  buttons.

Sample time range = 10 to 300 seconds.

Holding the button will perform a fast ramped change. When 300 is reached, the range rolls over to 10.

To accept:

- Press and hold OK .

When the time is set or has been pre-selected at 30 seconds for example, the instrument performs a purge, as shown in Fig 6.4.




Fig. 6.4 Purge

The minimum purge time is ten (10) seconds, therefore, the 'stop' option is not displayed for the first ten (10) seconds.

Note: The timer starts at 0 and when 999 is reached, the timer rolls over to 0.

Stop purge when the live readings reach zero:

To stop purge:

- Press and hold OK .

The first barhole screen is then displayed:

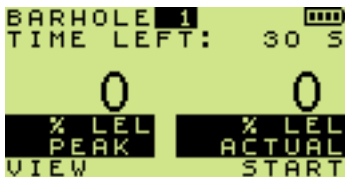





Fig. 6.5 Barhole Timer

Up to six barhole readings can be stored. These are identified as 'Barhole 1' to 'Barhole 6'.

After the first reading is stored (as Barhole 1), the second reading (Barhole 2) will be automatically selected, however, by using the UP  or DOWN  buttons the user can specify where the next reading will be stored. This may be useful if there was a problem with the reading, e.g. sample fault.

The sequence of events will be as follows:

- Press and hold START  to initiate timer and pump. Once started, the user cannot stop a sample.
- Counter decrements from initial value.
- At 'zero-time', the pump switches OFF and the peak and final sustained (actual) readings are displayed as shown in Fig. 6.6.

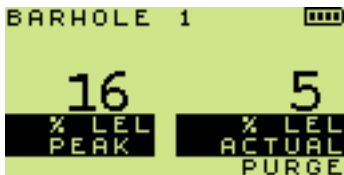


Fig. 6.6 Barhole Numbering

- Between Barhole tests there is a mandatory 'Purge' mode to ensure that any gas in the instrument is cleared before the next barhole is sampled.
- During purge, the peak reading is reset to zero and blanked from display, as shown in Fig. 6.7.



Fig. 6.7 Purge Complete

6.3.2 Non Timed Mode

If NON TIMED is selected or has been pre-selected in configuration then the instrument performs a purge, as shown in Fig. 6.8:




Fig. 6.8 Purge

The minimum purge time is ten (10) seconds, therefore, the 'stop' option is not displayed for the first ten (10) seconds.

Note: The timer starts at 0 and when 999 is reached, the timer rolls over to 0.

Stop purge when the live readings reach zero:

To stop purge:



- Press and hold OK .

The first barhole screen is then displayed:





Fig. 6.9 Non Timed Mode of Operation

Up to six barhole readings can be stored. These are identified as 'Barhole 1' to 'Barhole 6'.

After the first reading is stored (as Barhole 1), the second reading (Barhole 2) will be automatically selected, however, by using the UP  or DOWN  buttons the user can specify where the next reading will be stored. This may be useful if there was a problem with the reading, e.g. sample fault.


The sequence of events will be as follows:

- Press and hold START  to initiate. This will switch the pump ON. (START on bottom line of LCD will change to STOP).
- Counter counts up from zero.
- Press and hold STOP  when sampling is complete. The pump will be switched OFF.
- View as per TIMED MODE.
- Purge mode as per TIMED MODE.
- From switch-on, each barhole is consecutively numbered automatically.

6.4 VIEW BARHOLE RESULTS

To view previous barhole results:


(to a maximum of six barhole tests)

- Press and hold VIEW  .

	PEAK	ACTUAL
1	16%LEL	5%LEL
2	2%LEL	0%LEL
3	5%LEL	5%LEL
4	--	--
5	--	--
6	--	--
LIVE		

Fig. 6.10 View Barhole Results

To return the display to normal operation:

- Press and hold LIVE .

If a 'Flow Fault' or 'Bead Fault' is detected during a barhole test, the pump will stop and the test will be aborted with the indication as shown in Fig. 6.11 or Fig. 6.12 respectively.

	PEAK	ACTUAL
1	1%LEL	1%LEL
2	2%LEL	0%LEL
3	5%LEL	5%LEL
4	FLOW	FAULT
5	--	--
6	--	--
LIVE		

Fig. 6.11 Flow Fault

	PEAK	ACTUAL
1	1%LEL	1%LEL
2	2%LEL	0%LEL
3	5%LEL	5%LEL
4	BEAD	FAULT
5	--	--
6	--	--
LIVE		

Fig. 6.12 Bead Fault

6.5 BARHOLE OPERATION

A summary of the button operation is detailed in the following table:




	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	—	CLEAR FLOW FAULT
PRESS and HOLD	VIEW	BACKLIGHT / FLASHLIGHT	START / STOP / PURGE


Table. 6.1 Button Operation in Barhole Mode

6.6 DESCRIPTION OF BARHOLE BUTTON OPERATION

6.6.1 View


To view previous barhole results:

(to a maximum of six (6) barhole tests)

- Press and hold VIEW .


6.6.2 Lights

To switch ON the backlight:

- Press and hold the Centre button .

To switch ON the flashlight:

- Press and hold the Centre button  again.

The backlight and flashlight are both timed to switch OFF after one minute. Both can be switched OFF by a third press and hold the Centre button .

6.6.3 Flow Fault

If a flow fault is detected, the pump stops automatically. If a sample was in progress then current sample is halted and 'Purge' cycle will be the next part of the sequence. If flow fault is indicated, the instrument should be checked for water ingress or blockage.

To clear the flow fault:

(Once the blockage has been cleared)



- Press the RH button .

6.6.4 Bead Fault

If a bead fault is detected, the pump stops automatically. If a sample was in progress then current sample is halted and 'Purge' cycle will be the next part of the sequence. A bead fault indicates a faulty sensor and therefore the instrument should be returned for service / repair.

6.6.5 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button .

While both buttons are depressed, the instrument display will step through previous menus, each displayed for approximately two (2) seconds.

When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

6.7 BARHOLE ALARMS

There are no Gas Alarms in this mode.

CO (CARBON MONOXIDE) MODE

The CO mode is used to check the interior of premises and appliances for CO leakage.

7.1 CO RANGES

The CO mode can have the following ranges available:

- 0 – 2000 ppm CO
- 0 – 25% O₂ (If fitted)

7.2 CO FEATURES

CO mode has the following features available:

Three possible display options (CO Direct / Differential / Air Free).

- Backlight
- Flashlight
- Datalogging (automatic every 60 seconds)
- Invert Display
- Manual Logging is also available. This will log all gas concentrations at that instant
- Pump ON / OFF

7.3 CO MENU

On selection of CO mode, all three of the CO sub-modes shown in Fig. 7.1 can be available to the user. (See note 3).

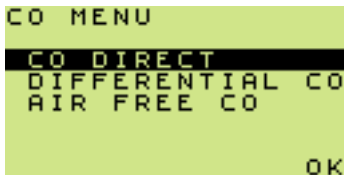





Fig.7.1 CO Menu

To highlight the required option:

- Use the UP  and DOWN  buttons.

To select the highlighted option:

- Press and hold OK .

Note 1: The highlighted option will be that previously used.

Note 2: If an O2 sensor is not fitted then the Airfree Option is automatically unavailable.

Note 3: Your company may have decided to have its instruments configured only for certain of the above options. If only one option is selected, then after selecting CO mode from the main menu, either 7.4.1, 7.4.2 or 7.4.3 will be entered directly.

7.4 CO DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display will indicate any sensor faults. This display alternates with the Gas reading display, as shown in Fig. 7.2.



alternating with



Fig. 7.2 Sensor Fault

7.4.1 CO Direct

In this option, normal atmospheric air is checked for CO content.

The typical display for this mode is shown in Fig. 7.3:



Fig. 7.3 CO Direct

7.4.2 Differential CO

This option enables the user to zero out ambient CO backgrounds and display the differential measurement. This is useful in areas where the ambient CO is high from other sources such as traffic pollution.

The typical display for this option is shown in Fig. 7.4

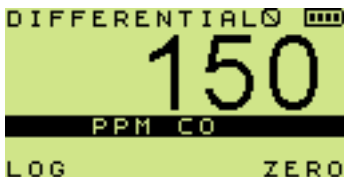



Fig. 7.4 Differential CO

To zero the displayed CO reading:

- Press and hold ZERO .

7.4.3 Air-Free CO

Air-free CO is the CO reading modified by the O₂ reading, therefore this measurement will only be available when an O₂ sensor is fitted. The purpose is to determine whether or not the emissions from an un-ventilated appliance, principally an oven or a stove / cooker, are safe.

This is the CO reading modified by the O₂ reading (only applicable if O₂ sensor is fitted).

$$\text{CO Air-free} = (20.9 \times \text{CO}) / (20.9 - \text{O}_2).$$

The typical display for this mode is shown in Fig. 7.5:

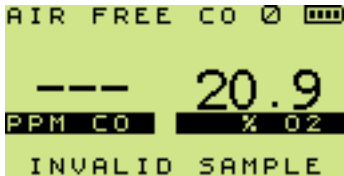


Fig. 7.5 Air-Free CO

A sample is considered invalid until the Oxygen (O₂) concentration is below 19% Vol.

Changes to Fig 7.6 when valid sample is taken

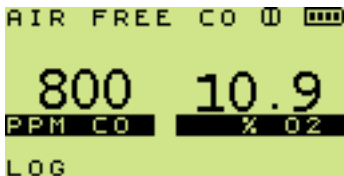


Fig. 7.6 Valid Sample

7.5 CO BUTTON OPERATION

A summary of the button operation is detailed in Table 7.1:





	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	—	PUMP ON / OFF CLEAR FLOW FAULT
PRESS and HOLD	MANUAL LOG	BACKLIGHT / FLASHLIGHT	ZERO

Table. 7.1 Button Operation in CO Mode

7.6 DESCRIPTION OF CO BUTTON OPERATION


7.6.1 Lights

To switch ON the backlight:

- Press and hold the Centre button .

To switch ON the flashlight:


- Press and hold the Centre button  again.

The backlight and flashlight are both timed to switch OFF after two minutes. Both can be switched OFF by a third press and hold the Centre button .

7.6.2 Manual Zero

Only available in differential CO mode.


To zero differential CO:

- Press and hold ZERO .

7.6.3 Manual Log

A manual log can be taken at any time provided that the pump is running.

To capture a manual log:

- Press and hold LOG .


Note: When a manual log is taken, the term 'LOG' is inverted on the display for one (1) second to provide a visual confirmation that the log has been captured.

7.6.4 Flow Fault

If flow fault is detected, the pump stops automatically. The instrument should be checked for water ingress or blockage.



To clear the flow fault:

(Once the blockage has been cleared):

- Press the RH button .

7.6.5 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button .

While both buttons are depressed, the instrument display will step through previous menus, each displayed for approximately two (2) seconds.

When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

7.7 CO ALARMS

There are no alarms in this mode.

7.8 CO LOGGING

Automatic datalogging is active. Timed logs will be taken every minute (default) or as per configuration. For direct CO and differential CO, the direct CO reading will be logged. For the Air Free CO, the calculated reading will be stored.

PURGE MODE

The purge mode is used in gas and air purging applications.

8.1 PURGE RANGES

Purge mode will have the following ranges available:

- 0 – 100% Gas
- 0 – 25% Oxygen (O₂) - if fitted

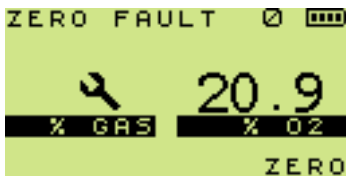
8.2 PURGE FEATURES

Purge mode has the following features available:

- Pump ON / OFF
- Manual zero
- Backlight
- Flashlight
- Display Invert

8.3 PURGE DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display will indicate any sensor faults. This display alternates with the Gas reading display, as shown in Fig. 8.1.



alternating with

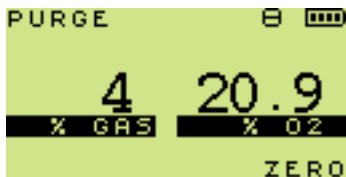


Fig. 8.1 Sensor Check

After the sensor check the normal display will be shown, as in Fig. 8.2:

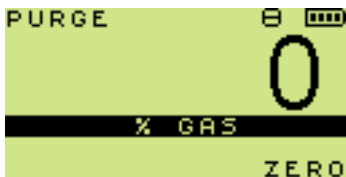


Fig. 8.2 Normal Display

To display both % Gas and % O₂:

(as shown in Fig. 8.3)

- Press the Centre button 

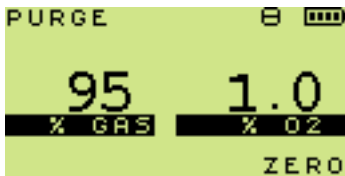


Fig. 8.3 Gas and Oxygen Display

8.4 PURGE BUTTON OPERATION

A summary of the button operation is detailed in Table 8.1:





	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	RANGE	PUMP ON / OFF CLEAR FLOW FAULT
PRESS and HOLD	—	BACKLIGHT / FLASHLIGHT	ZERO

Table. 8.1 Button Operation in Purge Mode


8.5 DESCRIPTION OF PURGE BUTTON OPERATION


8.5.1 Lights

To switch ON the backlight:

- Press and hold the Centre button 


To switch ON the flashlight:

- Press and hold the Centre button  again.

The backlight and flashlight are both timed to switch OFF after two minutes. Both can be switched OFF by a third press and hold the Centre button .


8.5.2 Pump

To switch the pump ON and OFF:

- Press the RH button .

8.5.3 Manual Zero



To zero the reading (in fresh air):

- Press and hold ZERO .

Note: Pump must be switched ON to zero reading.

8.5.4 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button .

When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

8.5.5 Range


The range button allows the selection of the % Gas only display or the % Gas plus % O₂ display.

8.5.6 Flow Fault

If flow fault is detected, the pump stops automatically. The instrument should be checked for water ingress or blockage.

To clear the flow fault:

(Once the blockage has been cleared)

- Press the RH button .

8.6 PURGE ALARMS

There are no alarms in this mode.

SNIFFER MODE

This mode is used to find small fitting leaks. Fast detection rates are achieved using a semiconductor sensor in the probe.

9.1 SNIFFER RANGES

Sniffer mode will have the following ranges available:

- 0 – 10,000 ppm CH₄

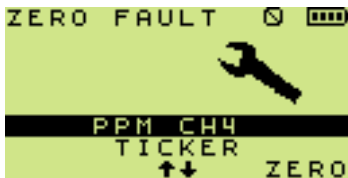
9.2 SNIFFER FEATURES

Sniffer mode will have the following features:

- Audible / Visual Ticker (Geiger) indication
- Ticker (Geiger) back-off
- Manual zero
- Pump ON / OFF
- Display invert
- Backlight
- Flashlight

9.3 SNIFFER DISPLAYS

During the warm-up period, all applicable sensors will be checked and the display will indicate any sensor faults. This display alternates with the Gas reading display, as shown in Fig. 9.1.




alternating with



Fig. 9.1 Sensor Check

To zero the reading (in fresh air)

- Press and hold ZERO .

Note: Pump must be switched ON to zero reading.

After the sensors have been checked, the normal display will be as shown in Fig. 9.2:

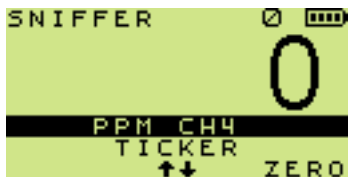


Fig. 9.2 Normal Display

9.4 SNIFFER BUTTON OPERATION

A summary of the button operation is detailed in Table 9.1:





	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	—	PUMP ON / OFF CLEAR FLOW FAULT
PRESS and HOLD	—	BACKLIGHT / FLASHLIGHT	ZERO

Table 9.1 Button Operation in Sniffer Mode

9.5 DESCRIPTION OF SNIFFER BUTTON OPERATION


9.5.1 Lights

To switch ON the backlight:

- Press and hold the Centre button 


To switch ON the flashlight:

- Press and hold the Centre button  again.

The backlight and flashlight are both timed to switch OFF after two minutes. Both can be switched OFF by a third press and hold the Centre button 


9.5.2 Pump

To switch pump ON and OFF:

- Press the RH button 

9.5.3 Zero

To zero the ppm range

- Press and hold the RH button 


Note: The pump must be switched ON to zero the ppm range.

9.5.4 Flow Fault

If flow fault is detected, the pump stops automatically. The instrument should be checked for water ingress or blockage.

To clear the flow fault:

(Once the blockage has been cleared):

- Press the RH button 

9.5.5 Ticker (Geiger) On / Off

To enable / disable the Geiger (Ticker):

- Press and hold the UP  and DOWN  buttons simultaneously, as follows:

1. Press and hold - to enable visual only.
2. Press and hold again - to enable both audible and visual.

9.5.6 Ticker (Geiger) Adjust

To adjust the Ticker (Geiger) threshold:



(after the Ticker (Geiger) feature has been enabled)

- Press the UP  or DOWN  buttons.

The threshold setting is displayed briefly beneath the PPM CH₄.

9.5.7 Menu / Off

To re-select the Mode Menu:



- Press and hold both the LH button  and the RH button .

When the menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

9.6 SNIFFER TICKER (GEGER) INDICATION

The Ticker (Geiger) range at start up is 0-1000 ppm.

For any subsequent PPM concentration, the Ticker (Geiger) audible / visual can be “zeroed” with the DOWN button

. e.g. 600ppm Ticker (Geiger) can be ‘backed off’ with the DOWN button , for example, 600 ppm Ticker (Geiger) can be ‘backed off’ to enable tracing to higher concentrations, in which case the Ticker (Geiger) range becomes 600-1600 ppm etc, etc.

Note: The display range always remains as 0-10,000ppm.

The Ticker (Geiger) visual is such that the LED's illuminate in pairs, according to the following table, over any 1000 ppm range as explained above.



Red LED's	PPM Level
Pair 1	100
Pair 2	200
Pair 3	300
Pair 4	400

Red LED's	PPM Level
Pair 5	500
Pair 6	600
Pair 7	700
Pair 8	800 - 1000

Fig. 9.3 Ticker (Geiger) LED Illumination

PRESSURE MODE

In this mode, the instrument can be used as a manometer to measure appliance and regulator pressure and to check the system for leaks.

Note 1: It is important to zero the pressure mode before taking measurements.

Note 2: Pump is OFF in pressure mode.

10.1 PRESSURE RANGES

Pressure mode will have either of the following configurable ranges available:

- -9.9 to 60in Water Gauge (Resolution 0.1in)
- -99 to 150mBar (Resolution 0.1mBar)

10.2 PRESSURE FEATURES

Pressure mode will have the following features available:

- Backlight
- Display Invert

10.3 PRESSURE DISPLAYS

When pressure test mode is selected from the menu, the normal operating display is shown. See Fig. 10.1.

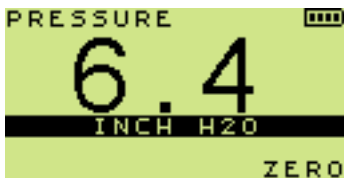


Fig. 10.1 Normal Display

Note: A configurable option is available to measure in Mbar as shown in Fig. 10.2.




Fig. 10.2 mBar Display

10.4 PREPARE INSTRUMENT (PRESSURE MODE)

Zero the instrument before tubing is attached.

To zero the instrument:

- Press and hold ZERO .

Connect the required length of tubing from the appliance to the pressure port on the rear of the instrument, as shown in Fig. 10.3.

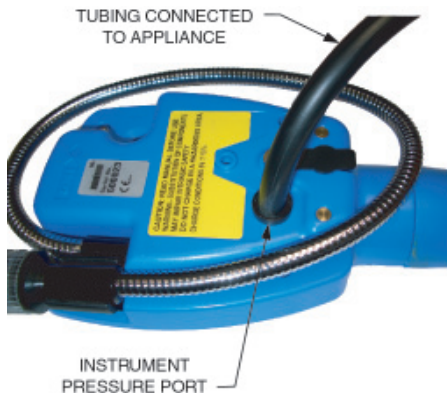


Fig. 10.3 Tubing Connected to Pressure Port

You can now utilise the instrument as a manometer in accordance with your company practice.

10.5 PRESSURE BUTTON OPERATION

A summary of the button operation is detailed in Table 10.1:





	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
ACTION			
PRESS	INVERT DISPLAY	—	—
PRESS and HOLD	—	BACKLIGHT	ZERO

Table. 10.1 Button Operation in Pressure Mode

10.6 DESCRIPTION OF PRESSURE BUTTON OPERATION

10.6.1 Lights

To switch ON the backlight:

- Press and hold the Centre button 


The backlighting is timed to switch OFF after two minutes, or alternatively, it can be switched OFF by a further press

and hold the Centre button .

10.6.2 Zero



To zero the instrument:

(before tubing is attached)

- Press and hold the RH button .

10.6.3 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button  and the RH button .

When menu appears on the screen, release the buttons, otherwise the instrument will proceed into the switch OFF process and will switch OFF after a further three (3) seconds.

10.7 PRESSURE ALARMS

There are no alarms in this mode.

ALARMS

11.1 GAS ALARMS

The following gas alarms are available according to gas type and are programmable according to application and / or customer preference.

(See Tables 11.1 and 11.2).

11.2 FLAMMABLE (LEL) ALARMS

Up to three (3) instantaneous alarm levels are programmable. All three are rising alarms, i.e. if the concentration is above the specific alarm level, the alarm is triggered.

11.3 OXYGEN (O₂) ALARMS

Up to three (3) instantaneous alarm levels are programmable, one (1) rising and two (2) falling (to trigger alarms in O₂ deficient scenarios).

11.4 TOXIC GAS (e.g. CO) ALARMS

When operating normally, the instrument records minimum and maximum readings for each gas. It also 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 as appropriate. Up to two (2) instantaneous rising and two (2) TWA alarms are programmable for each toxic range fitted to the instrument.

Note: A Time Weighted Average (TWA) value is the mean average gas level over a specific period. The STEL is 15 minutes and the LTEL is 8 hours. In accordance with legislation, this requires the time weighted averages to be averaged over a full period whether the instrument is ON or OFF. Such averaging essentially makes the instrument single user applicable. The option is available to restart the averaging after each instrument switch-off, thus allowing for multiple user application.

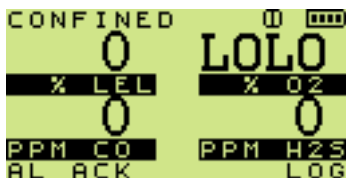
A TWA alarm is intermittent with the actual gas reading, therefore it is possible to get a value of zero (0) and an LTEL or STEL alarm.

All alarms are user configurable to meet the specific needs of different companies.

Note: The gas alarm levels, instantaneous STEL and LTEL, are set at the time of instrument manufacture. It is important that the user ensures that the levels are in accordance with their company's alarm levels and with health and safety legislation. The alarm levels may be changed, if required, as detailed in the 'SET-UP SOFTWARE USER HANDBOOK'.

In the following examples, example 1 (Fig. 11.1) shows an instrument in confined space mode signalling a 'LOLO' Oxygen alarm. The audible alarm warbles and the red LED's ramp.

Example 1:



Toggles to

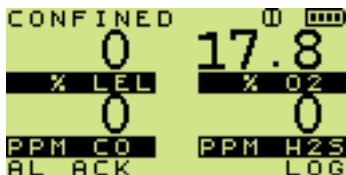
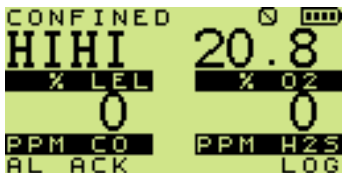


Fig. 11.1 LOLO Oxygen Alarm

Example 2 (Fig. 11.2) shows the instrument signalling a 'HIHI' LEL alarm. Again the alarm warbles and all eight (8) LED's ramp. If more than one gas alarm level is exceeded, the gas value will flash for each type in alarm.

Example 2:



Toggles to

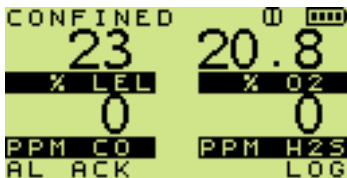
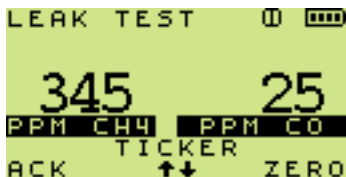


Fig. 11.2 HIHI LEL Alarm

Example 3 (Fig. 11.3) shows an instrument in Leak Test Mode with a Carbon Monoxide warning alarm. There is no audible alarm and the LED's do not ramp. The gas range (ppm CO in this example) will flash.

Example 3:



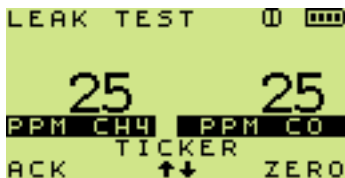
Toggles to



Fig. 11.3 CO Warning Alarm

Example 4 (Fig. 11.4) shows an instrument in Leak Test Mode with a 'HI' LEL alarm. The audible alarm indication is a high pitch tone together with four flashing LED's.

Example 4:



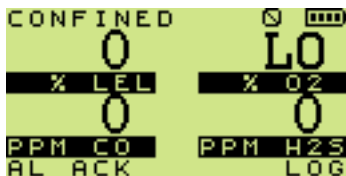
Toggles to



Fig. 11.4 HI LEL Alarm

Example 5 (Fig. 11.5) shows an instrument in Confined Space Mode with a 'LO' O₂ alarm. The audible alarm indication is a high pitch tone together with four flashing LED's.

Example 5:



Toggles to

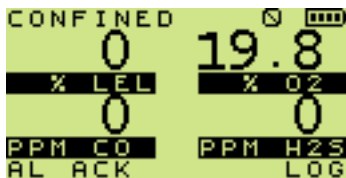
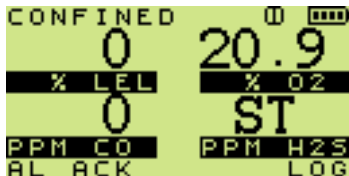


Fig. 11.5 LO O₂ Alarm

Examples 6 and 7 (Fig. 11.6 and Fig. 11.7) shows an instrument in Confined Space Mode with Time Weighted Average STEL and LTEL H₂S alarms for toxic sensors. In both cases, the audible alarm warbles and eight (8) LED's ramp.

Example 6:



Toggles to

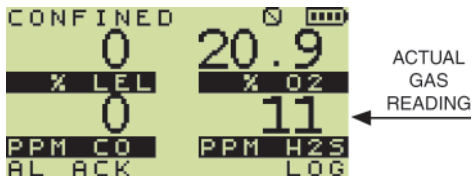
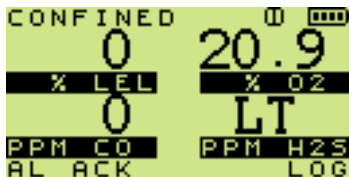


Fig. 11.6 STEL H₂S Alarm

Example 7:



Toggles to

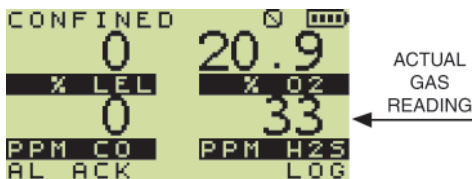


Fig. 11.7 LTEL H₂S Alarm

11.5 ALARM TYPES

11.5.1 Latching / Non Latching

Each alarm can be latching or non latching. Latching alarms must be, and can only be cleared by the user when the gas level returns to within the alarm limits.

Non-latching alarms clear automatically when the gas level returns to within the preset alarm limits.

11.5.2 Muting / Acknowledging

Muting:

Muting of an alarm is achieved by a press and hold of the LH button.

Muting means that the audible alarm will cancel for 60 seconds, after which if the gas concentration is still above the set level (or below for Oxygen) the alarm will reactivate.

Acknowledging:

Only applicable to latching alarms. The audible/visual alarms can only be cancelled after the atmosphere has returned to safe concentrations.

The following Table 11.1 shows the GMI default selections. Latching or non-latching options exist in all allowable alarms.

Alarms are allowed in Leak Test Mode and CSM Mode only.

Any single alarm e.g. LEL **HI**, Toxic Warning etc., can only have one alarm concentration level and either latching/non latching and mute or non mute and the output, i.e. **LO** Pitch / **HI** Pitch with LED's flashing/ramping are preset according to the following Table 11.1.

This means that if a CO **HIHI** Alarm is set at 35ppm and latching and non-muting is selected for leak and/or CSM. The level will be the same in each mode and the type, e.g. latching, will also be common.

If the alarm is disabled, it will not function in any mode.


ALARM TYPE	LATCHING Yes / No	MUTE Yes / No	AUDIBLE INDICATION	VISUAL LED INDICATION	DISPLAY
LEL Warning	N	N / A	N / A	N / A	Flash Range
LEL (HI)	N	Y	High Pitch Tone	(4) Flashing	Toggle Hi / Conc
LEL (HIHI)	Y	N	High Pitch Warble	(8) Ramping	Toggle Hi Hi / Conc
O ₂ (LO)	N	Y	High Pitch Tone	(4) Flashing	Toggle Lo / Conc
O ₂ (LOLO)	Y	N	High Pitch Warble	(8) Ramping	Toggle Lo Lo / Conc
O ₂ (HIHI)	Y	N	High Pitch Warble	(8) Ramping	Toggle Hi Hi / Conc
H ₂ S Warning	N	N / A	N / A	N / A	Flash Range
H ₂ S (HIHI)	Y	N	High Pitch Warble	(8) Ramping	Toggle Hi Hi / Conc
H ₂ S (STEL)	Y	N	High Pitch Warble	(8) Ramping	Toggle STEL / Conc
H ₂ S (LTEL / TWA)	Y	N	High Pitch Warble	(8) Ramping	Toggle LTEL / Conc
CO Warning	N	N / A	N / A	N / A	Flash Range
CO (HIHI)	Y	N	High Pitch Warble	(8) Ramping	Toggle Hi Hi / Conc
CO (STEL)	Y	N	High Pitch Warble	(8) Ramping	Toggle STEL / Conc
CO (LTEL / TWA)	Y	N	High Pitch Warble	(8) Ramping	Toggle LTEL / Conc
LO / 	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'
Low Battery	Y	N / A	Low Pitch Tone	Fault LED On	Fault 'Term'
Zero Fault	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'
Sensor Fault	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'
Flow Fault	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'
Calibration Expired	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'
Service Expired	Y	N / A	Low Pitch Tone	Fault LED Flashing	Fault 'Term'

Table. 11.1 Alarm Indication

The following Table 11.2 shows the alarm options available in the Leak Test and Confined Space Modes.

	LEAK TEST				CSM			
	FLAM	CO	H2S	O2	FLAM	CO	H2S	O2
WARNING	<input type="checkbox"/>	<input type="text" value="20"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hi	<input type="checkbox"/>				<input type="checkbox"/>			
Hi Hi	<input type="checkbox"/>	<input type="checkbox"/>			<input type="text" value="20"/>	<input type="text" value="35"/>	<input type="text" value="15"/>	<input type="text" value="23"/>
STEL		<input type="checkbox"/>				<input type="text" value="200"/>	<input type="text" value="10"/>	
LTEL		<input type="checkbox"/>				<input type="text" value="30"/>	<input type="text" value="5"/>	
Lo								<input type="checkbox"/>
Lo Lo								<input type="text" value="19.5"/>

Table. 11.2 Alarm Options


Note:


1. Where there is a square with a number, it means that the GMI default is to have these alarms active at the gas concentration shown by the number.
2. Where there is a square without a number, it means that this alarm option is available should the user wish to have it activated.
3. The alarm concentrations must, if active, be the same level in both modes.

11.6 FAULT ALARMS

Refer to Alarms Table 11.1 to identify the audible / visual indication for any of the following faults.

11.6.1 Low Battery

The battery symbol  is displayed on the screen intermittently with **LO**. When the instrument's battery power is low, i.e. approximately 30 minutes operating time remaining, the audible alarm sounds once every two seconds and the Orange LED flashes. Recharge the battery or replace the alkaline batteries if using alkaline batteries.

The Low Battery flag  flashes when approximately three (3) minutes operating time remains. The audible alarm sounds once every second and the Orange LED illuminates constantly. After three (3) minutes the instrument automatically switches off.

Note: Both audible and visual gas alarms continue to operate after the low battery warning message appears.

11.6.2 Zero Fault

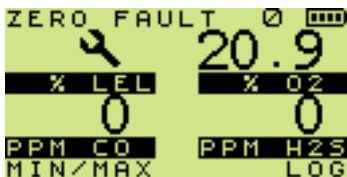
A "ZERO FAULT" flag and a flashing spanner symbol appear after warm-up and after entering a mode if the instrument is switched on in the presence of gas or the instrument has been unable to zero all sensors correctly.

The audible alarm sounds, and the orange fault LED flashes. If the user is in a mode where the faulty sensor is used the orange LED is on, continuously.

It is strongly recommended the instrument is returned to a gas free area. Switch the instrument off and then switch on again in clean air. If the fault persists, return the instrument for service.

The instrument can however still be used to detect and alarm on the other sensor(s) fitted.

The faulty sensor will cause the instrument to display a flashing spanner symbol to warn the user that this sensor is not working correctly, as shown in Fig. 11.8:



alternating with

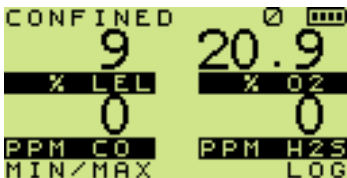


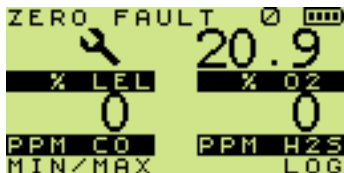
Fig. 11.8 Zero Fault

11.6.3 Sensor Fault

There are two types of sensor fault as illustrated in the following displays:

- 1) If a "ZERO FAULT" flag and a flashing spanner symbol appear, alternating with a zero reading as shown in Fig. 11.9, apply relevant test gas (LEL in example) for two minutes and allow the display to return to zero, then switch instrument Off and On again.

If fault remains, return instrument to an approved Service / Repair facility.



alternating with

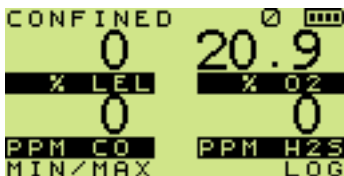
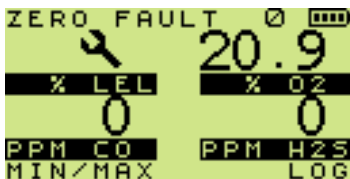


Fig. 11.9 Sensor Fault

- 2) If a “ZERO FAULT” flag and a flashing spanner symbol appear, alternating with a gas value as shown in Fig. 11.10, leave instrument on for 30 to 60 minutes then switch instrument Off and On again.

If fault remains, return instrument to an approved Service / Repair facility.



alternating with

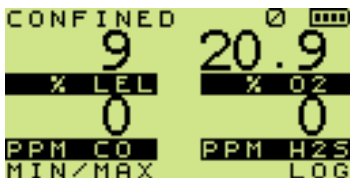
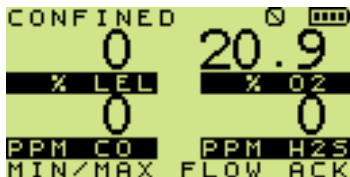


Fig. 11.10 Sensor Fault

11.6.4 Sample / Flow Fault

If a 'FLOW FAULT' flag appears, alternating with mode as shown in Fig. 11.11, a 'flow fault' exists. The pump symbol will be extinguished (except in Confined Space mode). The fault LED will also be ON.



alternating with

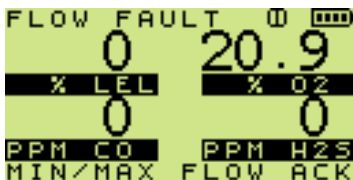




Fig. 11.11 Sample / Flow Fault

Check sample line, sample filter or probe for blockage, if applicable. Clear blockage then restart the pump.

To clear the flow fault:

- Press the RH button .
 - or
 - Press and hold FLOW ACK 
- (in Confined Space Mode only)

Note: In Confined Space mode, the pump will not switch off if a sample fault exists.

11.6.5 Calibration Expired

During the warm up of the instrument, a check is done to verify if the calibration date has expired. If the instrument is configured to pause if calibration is due, the user is asked to continue or not. If yes is selected, the user can continue using the instrument as normal. If no is selected, the user is forced to switch the instrument off and return the instrument for calibration. The calibration due date is only displayed during the warm up of the instrument and there will be no indication during normal operation.

11.6.5 Calibration Required

During warm-up, if the 'CALIBRATION REQUIRED' flag is displayed and an audible alarm and Red LED's are activated, the instrument has detected a fault in the calibration memory during start-up and is unable to continue without re-calibration.



Fig. 11.12 Calibration Required

The instrument must be switched off immediately. Follow appropriate action required by your company for calibration.

An extended period is possible, allowing the user to continue to use the instrument for a set amount of time after the calibration has expired. When this extended period is over, the user will be forced to switch off the instrument and return the instrument for calibration.

11.6.6 Service Expired

During the warm up of the instrument, a check is done to verify if the service date has expired. If the instrument is configured to pause if service is due, the user is asked to continue or not. If yes is selected, the user can continue using the instrument as normal. If no is selected, the user is forced to switch the instrument off and return the instrument for service.

The service due date is only displayed during the warm up of the instrument and there will be no indication during normal operation.

11.6.7 Service Required

During warm-up, if the 'SERVICE REQUIRED' flag is displayed and an audible alarm and Red LED's are activated, the instrument has detected a fault in the service memory during start-up and is unable to continue without re-servicing.



Fig. 11.13 Service Required

The instrument must be switched off immediately. Follow appropriate action required by your company for servicing.

An extended period is possible allowing the user to continue to use the instrument for a set amount of time after the service due has expired. When this extended period is over, the user will be forced to switch off the instrument and return the instrument for service.

OPERATOR MAINTENANCE

12.1 CLEANING

CAUTION: Do not use polishes containing silicon or solvent to clean the instrument as these may damage the flammable gas sensor. Do not use abrasive materials or strong volatile chemical solutions as these could damage the impact resistant casing.

The outer, impact resistant casing of the ***GT series*** instrument may be cleaned using a non-abrasive moist cloth. Rub the cloth over the outer casing to remove any dirt and grime.

In extreme cases, a mild soap solution may be used with a non-abrasive cloth to remove more stubborn marks.

12.2 FILTER REPLACEMENT

The instrument has a hydrophobic type filter protecting the instrument sensors. The filter is located in the probe and should be inspected periodically for signs of contamination and / or damage.

12.2.1 Probe Filter

- 1) Hold the probe filter bulb then unscrew the probe connector in a counter clockwise direction and remove the connector from the probe filter bulb as shown in Fig. 12.1.

Note: The probe washer is not removed at this stage.

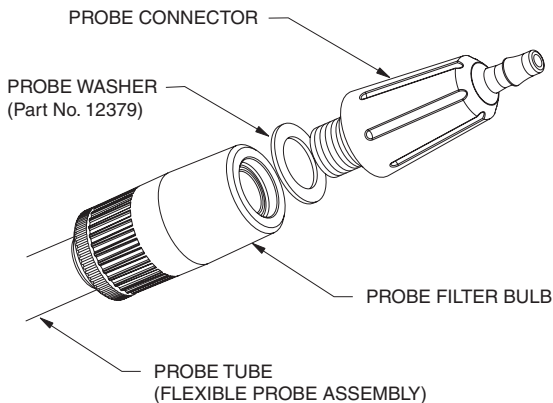


Fig. 12.1 Probe Connector Removal

- 2) Hold the probe tube then unscrew the probe filter bulb in a counter clockwise direction and remove the bulb from the probe sensor assembly as shown in Fig. 12.2.

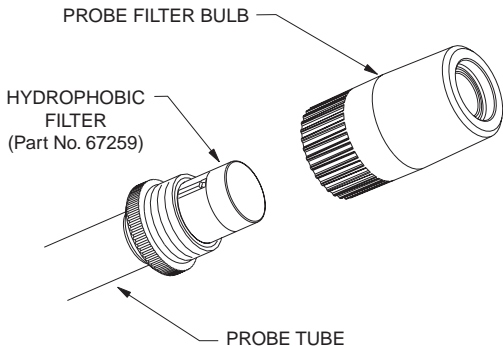


Fig. 12.2 Probe Filter Bulb Removal

- 3) Hold the hydrophobic filter between thumb and forefinger then carefully remove filter from probe tube assembly as shown in Fig. 12.3.

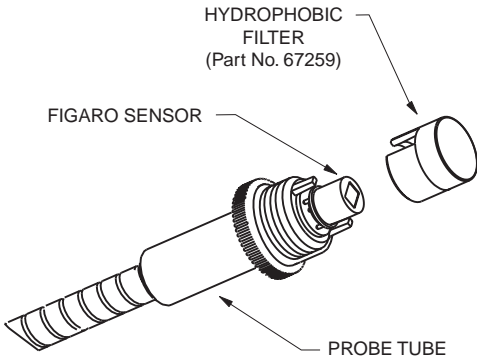


Fig. 12.3 Probe Filter Removal

- 4) Inspect the filter for contamination or damage. If either is evident, replace the filter.
- 5) Fit a new Hydrophobic Probe Filter (Part No. 67259), if required.

Note: Installation is a reversal of the removal procedure and therefore relevant Figs. should be referred to.

- 6) Position hydrophobic probe filter so that slots in filter locate correctly over lugs in probe tube then push filter until correctly seated. Care must be taken not to damage the figaro sensor.
- 7) Hold probe tube then attach probe filter bulb to the flexible probe assembly, in a clockwise direction, and tighten to secure.

Note: Care must be taken not to overtighten the probe filter bulb.

- 8) Before attaching the probe connector to the probe filter bulb, check the probe washer for signs of damage. If damaged, it must be replaced with a new probe washer (Part No.12379).
- 9) Hold probe filter bulb then attach probe connector to the probe filter bulb, in a clockwise direction, and tighten to secure.

Note: Care must be taken not to overtighten the probe connector.

12.2.2 Chemical Filter (Accessory)

The Chemical Filter assembly (Part No.67142) contains water absorbent silica gel and is available as an accessory.

The recommended gel provides the user with a simple visual indication of filter gel saturation by changing colour from gold to green when replacement is required.

CAUTION The contents of this filter must only be replenished with **GMI** recommended Silica Gel

- 1) Unscrew the probe connector in a counter clockwise direction, then remove the connector from the filter assembly as shown in Fig. 12.4.

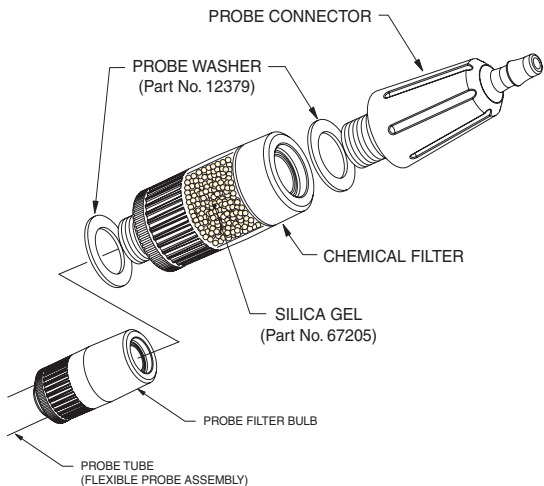


Fig. 12.4 Filter Removal

- 2) Unscrew the chemical filter assembly in a counter clockwise direction, then remove the filter from the filter bulb as shown in Fig. 12.4.
- 3) If the silica gel is to be replaced, make sure that the filter assembly is positioned in the upright position as shown in Fig.12.5 then unscrew the filter housing adaptor in a counter clockwise direction to remove.

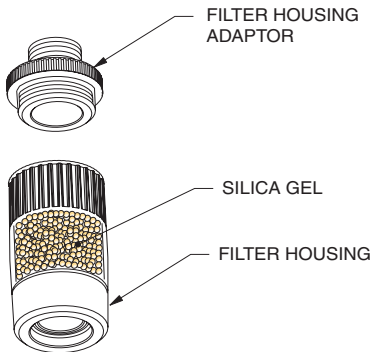


Fig. 12.5 Filter Housing Adaptor Removal

- 4) The filter housing can now be inverted and the silica gel discarded.

- 5) The chemical housing filter disc must be replaced if it is damaged or contaminated.

Using the flat end of a pencil or similar, push the filter from the sample side of the housing as shown in Fig.12.6, then remove and discard the filter.

Insert new filter disc (Part No. 67138) into chemical housing then, using the flat end of a pencil or similar, carefully push filter into housing until correctly seated.

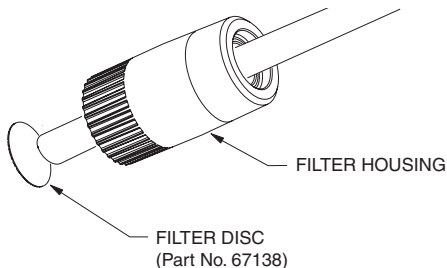


Fig. 12.6 Housing Filter Removal

- 6) The housing adaptor filter must also be replaced if it is damaged or contaminated.

Using the flat end of a pencil or similar, push the filter from the open end of the adaptor as shown in Fig.12.7, then remove and discard the filter.

Insert new filter disc (Part No. 67199) into adaptor recess until correctly seated.

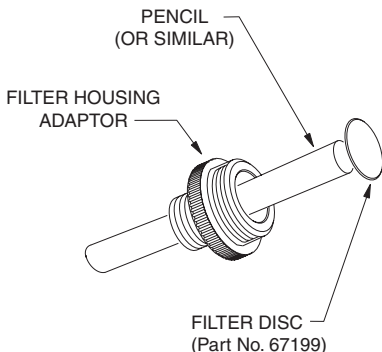


Fig. 12.7 Adaptor Filter Removal

CAUTION The contents of this filter must only be replenished with GMI recommended Silica Gel

- 7) Using GMI recommended silica gel (Part No.67205), fill the filter housing to a level just below the internal threads. Do not overfill, otherwise the adaptor cannot be assembled.
- 8) Attach filter adaptor to filter housing, in a clockwise direction, then tighten to secure. See Fig. 12.5.

Note: Care must be taken not to overtighten the adaptor.

- 9) Before attaching the filter housing to the filter bulb, check the washer for signs of damage. If damaged, it must be replaced with a new washer (Part No.12379).

- 10) Attach chemical filter to filter bulb, in a clockwise direction, then tighten to secure. See Fig. 12.4.

Note: Care must be taken not to overtighten the chemical filter.

- 11) Before attaching the probe connector to the chemical filter, check the probe washer for signs of damage. If damaged, it must be replaced with a new probe washer (Part No.12379).

- 12) Attach probe connector to the chemical filter, in a clockwise direction, then tighten to secure. See Fig. 12.4.

Note: Care must be taken not to overtighten the probe connector.

12.2.3 Cotton Filter (Accessory)

The cotton filter assembly (Part No.67196) contains a cotton filter to protect the instrument sensors from the ingress of dust.

- 1) Unscrew the probe connector in a counter clockwise direction, then remove the connector from the cotton filter housing as shown in Fig. 12.8.

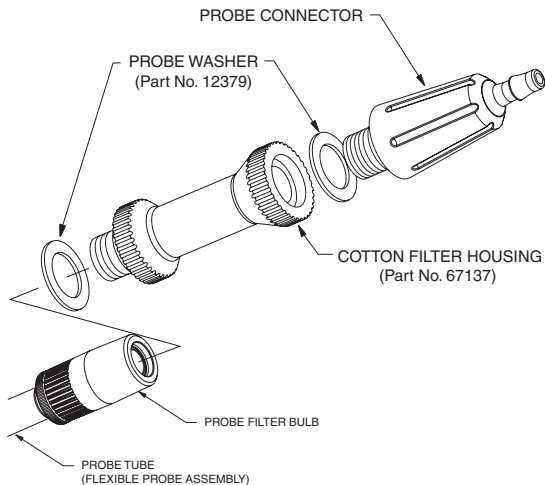


Fig. 12.8 Probe Connector Removal

- 2) Unscrew the cotton filter housing in a counter clockwise direction, then remove the housing from the filter bulb as shown in Fig. 12.8.
- 3) Using a pencil or similar, push the cotton filter from the threaded end of the housing as shown in Fig.12.9, then remove the filter.

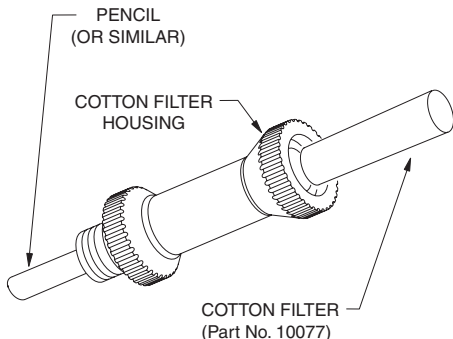


Fig. 12.9 Cotton Filter Removal

- 4) If the cotton filter is contaminated or damaged, replace the filter (Part No.10077).
- 5) Before attaching the filter housing to the filter bulb, check the washer for signs of damage. If damaged, it must be replaced with a new washer (Part No.12379).
- 6) Attach filter housing to the filter bulb, in a clockwise direction, then tighten to secure. See Fig. 12.8.

Note: Care must be taken not to overtighten the housing.

- 7) Before attaching the probe connector to the cotton filter housing, check the probe washer for signs of damage. If damaged, it must be replaced with a new probe washer (Part No.12379).
- 8) Attach probe connector to the cotton filter, in a clockwise direction, then tighten to secure. See Fig. 12.8.

Note: Care must be taken not to overtighten the probe connector.

12.3 BATTERY REPLACEMENT

The **GT series** instrument handle contains three batteries that provide the power required to operate the instrument.

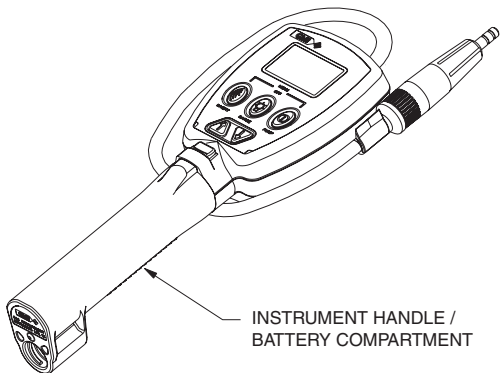



Fig. 12.10 GT Series Battery Location

Two types of battery can be used:

- Alkaline LR 14 (Duracell, Energizer or Rayovac)
- Rechargeable GP 350

Both Alkaline and Rechargeable batteries provide approximately eight (8) hours operation under normal conditions.

The batteries should be recharged (rechargeable batteries), or the batteries replaced (alkaline batteries), in the following situations:

- The 'Low Battery' flag  appears on the display
- The instrument will not switch On

When the 'Low Battery' flag appears on the display, there is approximately 30 minutes operation left at normal temperatures. The instrument will then switch Off automatically.

The RECHARGEABLE batteries can be removed from the instrument and charged, using a commercial type charger (not supplied), or they can be charged while still located in the instrument handle using either the Standard Instrument Charger (Part No.67134), the Charging Station (Part No. 67101) or the 12V/24V Vehicle Instrument Charger (Part No. 66206).

Note 1: The Charging Station can be permanently connected to a 12V power supply or alternatively used together with a 12V wall socket plug connector (Part No.14613) or a 12V vehicle power supply (Part No.12988).

Note 2: A 24V reduction box (Part No.67233) is available if permanently connecting Charging Station directly from the car battery.

12.3.1 Remove and Replace Batteries

- WARNING 1:** To prevent ignition of flammable or combustible atmospheres, remove batteries before servicing.
- WARNING 2:** To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's live maintenance procedures.
- WARNING 3:** To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must be changed only in a location known to be non-hazardous.
- WARNING 4:** To reduce the risk of explosion, do not mix old batteries with used batteries or mix batteries from different manufacturers.
- WARNING 5:** Never attempt to recharge non rechargeable cells.
-
-

- CAUTION 1:** Not for use in oxygen enriched atmospheres.
- CAUTION 2:** Replace batteries only with approved batteries:
NiMH – GP350
Alkaline – Duracell, Energizer or Rayovac.
-

- 1) Using a suitable screwdriver, unscrew in a counter clockwise direction and then remove the securing screw from the battery cover assembly. Refer to Fig. 12.11.
- 2) Using your thumb, press the securing catch to release the battery cover assembly from the instrument body then slide the cover in direction shown in Fig. 12.11 until completely removed.

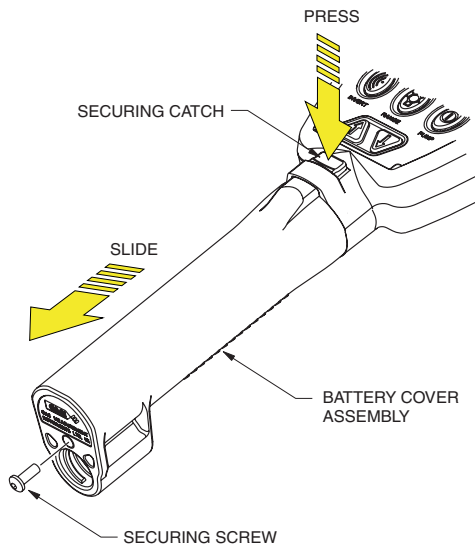


Fig. 12.11 Remove Battery Cover

- 3) Carefully lift then remove the three batteries from the compartment in the instrument handle, as shown in Fig. 12.12.
Note polarity of batteries for re-fitting.

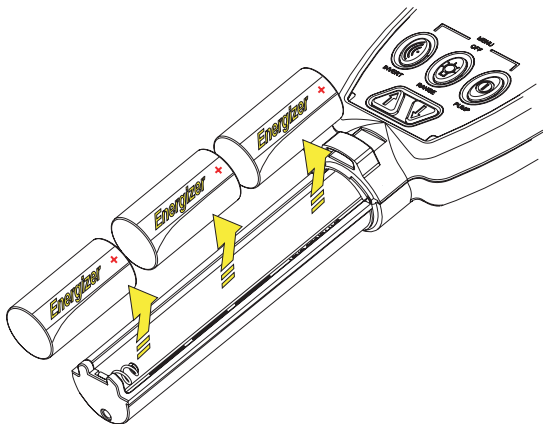


Fig. 12.12 Remove Batteries

4a) RECHARGEABLE:

Replace with three, fully charged, GP 350 rechargeable batteries. Note polarity of batteries as shown in Fig. 12.12.

Refer to 'Charging (Rechargeable) Batteries in section 12.3.2.

4b) ALKALINE:

Replace with three new LR 14 (Duracell, Energizer or Rayovac) alkaline batteries. Note polarity of batteries as shown in Fig. 12.12.

Note: Fitting of the battery cover assembly is a reversal of the removal procedure and therefore the following steps and relevant Figs. should be referred to.

- 5) Before fitting the battery cover, check the O-ring for signs of damage or wear and replace if necessary. Refer to Fig. 12.13.

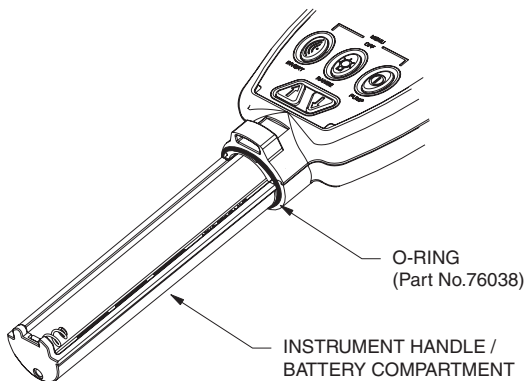


Fig. 12.13 Replace O-Ring

- 6) Slide the battery cover over the instrument handle until the securing catch engages with the instrument body.
- 7) Check that battery cover is secure and catch is properly engaged.
- 8) Replace the securing screw in the battery cover then, using a suitable screwdriver, tighten in a clockwise direction to secure. Do not overtighten the securing screw.

12.3.2 Charging (Rechargeable) Batteries

WARNING: Never attempt to recharge non rechargeable cells.

CAUTION 1: Switch the instrument off when charging rechargeable batteries.

There are four types of battery charger suitable for recharging GP 350 batteries, as follows:

- A Standard Instrument Charger (Part No. 67134)
- A Charging Station (Part No.67101), used with Power Supply (Part No.14613), 12V Power Supply (Part No.12988) or 24V Reduction Box (Part No.67233).
- A 12V/24V Vehicle Instrument Charger (Part No. 66206).

- A Commercial Battery Charger, available from most electrical outlets.

Note: The batteries must be removed from the instrument, as detailed in section 12.3.1, if using a commercial type charger.

During charging, the display indicates 'Charging in Progress' together with the pulsing battery capacity level indicator, as shown in Fig. 12.14.



Fig. 12.14 Charging In Progress

The 'Power' LED on the instrument also illuminates green during charging.

When charging is complete, the screen shown in Fig. 12.15 is displayed.



Fig. 12.15 Charging Complete

If the instrument displays 'Charging Terminated', as shown in Fig. 12.16, then it has detected an excessive charge voltage that may, for example, have been caused by attempting to charge an instrument containing Alkaline batteries. This is accompanied by the orange (fault) LED on the instrument illuminating.



Fig. 12.16 Charging Terminated

Standard Instrument Charger (Universal Plug)

(Part No. 67134)

The instrument should be left overnight connected to the standard charger to recharge discharged batteries. This period may vary depending upon operational conditions such as temperature and the condition of the batteries in terms of capacity. The charger is shown connected to the instrument and mains supply in Fig. 12.17.



Fig. 12.17 Instrument Connected to Standard Charger

To connect Standard Charger to the instrument:

- 1) Lift dust cover from charger socket in rear face of instrument then connect charger plug, as shown in Fig. 12.18.
- 2) Connect charger to mains supply, as shown in Fig. 12.17, then switch power ON.



Fig. 12.18 Connect Charger to Instrument

Charging Station

(Part No. 67101)

The charging station, shown in Fig. 12.19, is used to locate the instrument securely while charging is taking place.

The charging station is used together with the Power Supply (Part No.14613), 12V Vehicle Power Supply (Part No.12988) or the 24V Reduction Box (Part No.67233).

The charging station 'Power ON Indicator' illuminates when the station is connected to the mains supply via a Power Supply Unit (Part No.14613).

The instrument should be left overnight connected to the charging station to recharge discharged batteries. This period may vary depending upon operational conditions such as temperature and the condition of the batteries in terms of capacity.



Fig. 12.19 GT Series Charging Station

To install instrument in charging station:

- 1) Check that instrument charging contacts, shown in Fig. 12.20, and the station charging contacts, shown in Fig. 12.21, are clean and free of dirt / grease.



Fig. 12.20 Instrument Charging Contacts

- 2) Make sure that the instrument is switched OFF.
- 3) Locate extension pole recess in instrument handle over location in charging station then locate instrument handle in storage clip and engage securing strap. Refer to Fig. 12.19 and Fig. 12.21.



Fig 12.21 Charging Station - Instrument Location

- 4) Insert probe in location in charging station, as shown in Fig. 12.19.
- 5) If permanent 12V power supply is not installed, connect power supply, i.e. Power Supply (Part No.14613) or 12V Vehicle Power Supply (Part No.12988), to socket in LH side panel of Charging Station as shown in Fig. 12.22.



CHARGING STATION - LH VIEW

Fig. 12.22 Power Supply to Charging Station

12V / 24V Vehicle Charger

(Part No. 66206)

The 12V / 24V Vehicle Charger, shown in Fig. 12.23, provides the option of charging the instrument from a vehicle cigar lighter socket.

A red LED on the underside of the charger plug indicates 'power on'.

Note: During charging, make sure that instrument is secure and does not cause a hazard when driving.



Fig. 12.23 Vehicle Charger Lead

CALIBRATION

The instrument has been calibrated for particular gases. Where any doubt exists the product should be returned to GMI or an authorised distributor for calibration.

WARNING: The instrument must be calibrated and configured by authorised personnel only.

Four methods of calibration are possible:

- Field Calibration. See Configuration and Field Calibration Handbook (Part No.67160) for further details.
- The GMI **GT series** Calibration software allows the instrument to be linked to a PC running Calibration software and applying gas manually.
- The GMI **GT series** Automatic Calibration System provides controlled delivery of individual / mixed gases, allowing you to calibrate in a controlled manner and maintain a record of calibration results on a PC.
- The GMI Instrument Management System (IMS) provides all the facilities of the Automatic Calibration System with the added feature of instrument database management.

Note: The detailed calibration methods, consisting of both hardware and software, are manufactured by GMI. For more detail contact GMI or an authorised distributor.

13.1 CALIBRATION VALIDITY

Calibration validity is the responsibility of the user. Under normal operating conditions a 12 month period can be expected. This is no guarantee, however, as the precise application of the product is unknown to GMI. Individual codes of practice may dictate shorter periods.

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

ACCESSORIES

Accessories available for the **GT series** instruments are as follows:



Std. Accessories Part Number

Description

67108	Carrying Case
67259	Hydrophobic Filter - Box of 4
76038	O-Ring - Battery Compartment
12480	35cm. (14ins) Solid End Probe
12393	80cm. (32ins) Solid End (Barhole) Probe
67185	Stainless Steel (Flue) Probe
67142	Chemical Filter Assy.
67205	Bottle of Colour Indicated Silica Gel
67138	Filter Disc - Filter Housing (use with 67142)
67199	Filter Disc - Filter Adaptor (use with 67142)
12712	Sample Line (Tygon) - per metre
67196	Cotton Filter Assy.
10077	Cotton Filter - Box of 10 (use with 67196)
67095	Wrist Strap

67120	Protective Rubber Boot
67134	Standard Instrument Charger (Universal Plug)
66206	12V/24V Vehicle Instrument Charger
67101	Charging Station (Requires Power Supply)
67102	Automatic Calibration Station (Mixed Gases)
67109	Automatic Calibration Station (Individual Gases)
14613	Power Supply for Charging / Calibration Station (use with 67101; 67102 ; 67109)
12988	12V Vehicle Power Supply for Charging / Calibration Station (use with 67101; 67102 ; 67109)
67233	24V Reduction Box (for permanent power supply from car battery - use with 67101; 67102 ; 67109)
67281	Wall Mount Storage Clip
67160	GT Configuration System Package (including interface)
67191	GT Cal System Package (including interface)
67164	GT Data Downloading Package (including interface)
67216	GT Set-up Software Package (including interface)
66209	USB Serial Adaptor
67202	Pressure Tubing Connector

For a comprehensive list of probes, accessories and calibration gases, contact your local Distributor or alternatively, GMI Ltd.

ADDITIONAL INFORMATION

Training

Training courses are available on all GMI products. Contact GMI Marketing Department for further details:

Tel: +44 (0) 141 812 3211

Fax: +44 (0) 141 812 7820

e-mail: sales@gmiuk.com

World Wide Web

Visit GMI web site at www.gmiuk.com

TYPICAL OPERATING PARAMETERS

Typical operating parameters are as follows:

Gas Range	Range	Resolution
PPM	0 to 10000	1 ppm
LEL	0 to 10% 10 to 100%	0.1% 1%
Volume Gas	0 to 100%	1%
Oxygen	0 to 25%	0.1%
Carbon Monoxide	0 to 2000 ppm	1 ppm
Hydrogen Sulphide	0 to 100 ppm	1 ppm
Water Gauge	0 to 60 in. H ₂ O or 0 to 150 mBar	0.1 in. 0.1 mBar

Dimensions (excl. probe)

290mm (11.4") x 95mm (3.7") x 55mm (2.2")

Weight (incl. probe & batteries)

0.78kg (1.7lbs.)

Temperature Limits

-20°C to 50°C (-4°F to 122°F)

Humidity

0 – 95% R.H. non-condensing

Construction / Protection Rating

Moulded polycarbonate / ABS case protected to IP54

Display

LCD with backlighting.

Sampling System

Integral pump with pressure sensor for flow fail detection.

Sample path is protected by a hydrophobic filter.

Power Source

3 (LR14) alkaline cells providing approximately 8 hours runtime at 20°C (68°F)..

3 (GP350) Rechargeable (NiMH) cells providing approximately 8 hours runtime at 20°C (68°F).

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