GMI

Gas Measurement Instruments Ltd

GT *series*

User Handbook

GT *series*

Issue 9

08/01/2016

Part Number: 67112

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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.

SOFTWARE

Software supplied on EPROM or similar device for use in a particular product, may only be used in that product and may not be copied without the written permission of GMI. Reproduction or disassembly of such embodied programmes or algorithms is prohibited. Ownership of such software is not transferable and GMI does not warrant that the operation of the software will be error free or that the software will meet the customer's requirements.

DISPOSAL ADVICE

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 13 : 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:

  SIRA 05ATEX ⟨Ex⟩ II 2 G EEx iad IIB T3

  Ⓤ UL 913 Class I, Div 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 instrument batteries only with approved batteries, as follows:

ATEX / IECEx APPROVED INSTRUMENTS:
- See **'SPECIAL CONDITIONS FOR SAFE USE'** on the following page.

UL APPROVED INSTRUMENTS:
- **Alkaline:** Any 'LR14' type
- **Rechargeable NiMH:** Any 'C' type

SPECIAL CONDITIONS FOR SAFE USE

Note: For ATEX / IECEx approved instruments only.

1. When the batteries are replaced, only the following non-rechargeable cells are permitted:

    Energizer No. E93, Alkaline, (Zn/MnO_2), LR14 Size 'C' cell

    Duracell Procell, Alkaline, (Zn/MnO_2), LR14 Size 'C' cell

    Duracell Plus, Alkaline, (Zn/MnO_2), LR14 Size 'C' cell

    Duracell, Alkaline, (Zn/MnO_2), LR14 Size 'C' cell

2. When the batteries are replaced, only the following rechargeable cells are permitted:

    Panasonic 3000mAh Sub-C size, Nickel Metal Hydride cells type HHR300SCP

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. Do not use in areas where explosive concentrations of Hydrogen may be present. 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 instrument is sealed to IP54. 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).

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1

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 on following page:
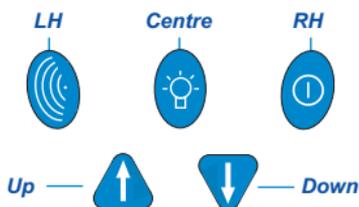
Fig. 1.2 Button References

Button	Text Reference
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 Methane (CH_4) Flammable - Sniffer Range

- 0-100% LEL Methane (CH_4) Flammable

- 0-100% VOL Methane (CH_4) Flammable

- 0-25% Oxygen (O_2)

- 0-2000 ppm Carbon Monoxide (CO)

- 0-100 ppm Hydrogen Sulphide (H_2S)

- 0 to 60 in. Water Gauge (0 to 150mBar)

Note 1: This instrument is calibrated for Methane (CH_4) flammable gas.

PPM & LEL ranges, although calibrated for CH_4, will respond to other flammable gases but will only detect CH_4 accurately.

Avoid exposing the VOL gas range to flammable gases other than CH_4 as this can cause a zero shift on all flammable ranges that may eventually result in a fault alarm.

Note 2: Some sensors respond to gases other than the target gas. Typically, this cross response is not enough to result in operational problems, however, should you have any concerns, please contact GMI.

2

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.

```
LEAK TEST
CONFINED SPACE
BARHOLE
CO
PURGE
SNIFFER
PRESSURE
BUMP TEST        OK
```

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.

2.1 MODES OF OPERATION

Leak Test: This mode is for the technician to investigate odour or leak complaints and to pinpoint the leak.
See 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.
See 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.
See 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 O_2 cell is fitted). Note: Your company may have chosen only certain of these options.
See Chapter 7 for 'CO' mode operation.

Purge: This mode is used in gas and air purging applications.
See 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.
See 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.
See Chapter 10 for 'Pressure' mode operation.

Bump Test: This mode allows the user to set up gases, apply gases, log the readings automatically and view the logged information. By default, this mode is disabled.
See Chapter 11 for 'Bump Test' mode operation.

3

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:
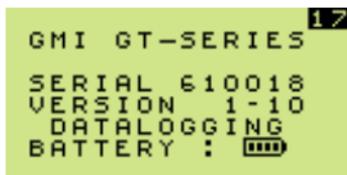
Fig. 3.2   Instrument I/d

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.

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.

100%

75%

50%

25%
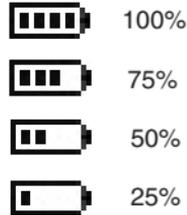
Fig. 3.3 Battery Capacity

3.4 FILTER CHECK / FLOW FAULT TEST

Checking filters are in place and in good condition and performing a regular leak check are pertinent to effective use of the GT instrument, therefore, the user will be asked to confirm these checks before the instrument completes the warm-up sequence. By default, these checks should be performed on a daily basis.

3.4.1 Filter Check

If filters are installed, and in good condition, press 'YES' for instrument warm-up to continue.

If 'NO' is selected, instrument will automatically enter 'switch off' sequence.

Fig. 3.4 Filter Check

3.4.2 Flow Fault Test

To perform a flow fault test, block probe tip inlet with finger for approximately 5 seconds. Pump should flow fault and display screen illustrated in Fig. 3.6.

If 'YES' is selected, instrument warm-up will continue without performing test.

If 'NO' is selected, instrument will automatically enter 'switch off' sequence.
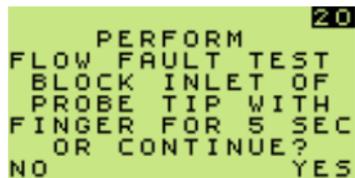
Fig. 3.5 Flow Fault Test

A successful flow fault test is confirmed, as shown in Fig. 3.6, by 'successful' flashing in the display.

If the instrument fails the flow fault test, the screen shown in Fig. 3.5 is displayed.

The instrument stores a log of a successful test. Likewise, if 'YES' was selected, in Fig. 3.5, without performing a flow fault test, a log is also recorded.

On completion, select 'YES' to switch the pump ON and continue warm-up cycle.
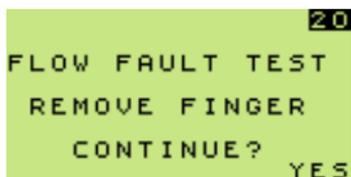
```
                        2 0
FLOW FAULT TEST
  REMOVE FINGER
    CONTINUE?
                  YES
```

alternating with
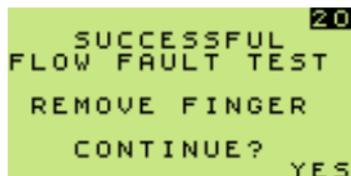
```
  SUCCESSFUL     2 0
FLOW FAULT TEST
  REMOVE FINGER
    CONTINUE?
                  YES
```

Fig. 3.6 Successful Test

3.5 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. 3.7.

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

```
                        1 1
  22 AUG 2005
     16:45
```

Fig. 3.7 Time and Date

3.6 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. 3.8.

```
                        07
       CALIBRATION
            DUE
       22 SEP 2005
```

Fig. 3.8 Calibration Due Date

The screen, shown in Fig. 3.9, is displayed when the Calibration date has expired. i.e. overdue.

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

```
                        08
       CALIBRATION
       EXPIRED ON
       22 SEP 2005
```

Fig. 3.9 Calibration Overdue

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

Calibration due date is displayed as shown in Fig. 3.10.

```
                        07
       CALIBRATION
            DUE
       22 SEP 2005
```

Fig. 3.10 Calibration Due Date

The screen, shown in Fig. 3.11, is displayed when the Calibration date has expired. i.e. overdue.

```
                        09
       CALIBRATION
       EXPIRED ON
       22 SEP 2005

         CONTINUE?
   NO                YES
```

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

<u>*To accept 'extended period' option:*</u>

• *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.

<u>*To reject 'extended period' option:*</u>

• *Press and hold NO* .

The screen, shown in Fig. 3.15, is displayed.

Fig. 3.15 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. 3.16.

Fig. 3.16 Calibration Due Date

The screen, shown in Fig. 3.17, is displayed when the Calibration date has expired. i.e. overdue.

Fig. 3.17 Switch OFF

To proceed with the switch-off sequence.

- *Press and hold both the LH button (((and the RH button ① simultaneously.*

3.7 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. 3.18.

Fig. 3.18 Service Due Date

The screen, shown in Fig. 3.19, is displayed when the Service date has expired. i.e. overdue.

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

Fig. 3.19 Service Overdue

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

Service due date is displayed, as shown in Fig. 3.20.

Fig. 3.20 Service Due Date

The screen, shown in Fig.3.21, is displayed when the Service date has expired, i.e. overdue.

Fig. 3.21 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. 3.22, is displayed.

Fig. 3.22 Switch OFF

• *Press and hold both the LH button* 〜 *and 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. 3.23.

Fig. 3.23 Service Due Date

If overdue but within the 'extended period', the screen, shown in Fig. 3.24, is displayed.
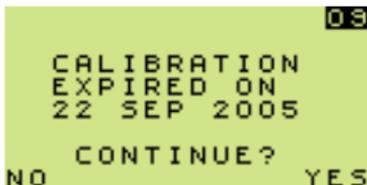

Fig. 3.24 Service Overdue

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. 3.25 is displayed.

Fig. 3.25 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. 3.26.

```
08
        SERVICE
          DUE
    30 AUG 2007
```

Fig. 3.26 Service Due Date

The screen, shown in Fig. 3.27, is displayed when the Service date has expired, i.e. overdue.

```
08
        SERVICE
        REQUIRED
    12 AUG 2005

SWITCH OFF NOW
```

Fig. 3.27 Switch OFF

To proceed with the switch-off sequence:

• *Press and hold both the LH button* and *the RH button simultaneously.*

3.8 SENSORS ZEROING

Before warm-up is completed, the instrument automatically ensures that the sensors are zeroed before operation.

The screen shown in Fig. 3.28 is displayed during this process.

```
07
        SENSORS
        ZEROING . . .
```

Fig. 3.28 Zero Sensors

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.*

3.9 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.

SWITCH INSTRUMENT OFF

Fig. 3.29 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. 3.30.

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.

OFF   3

OFF   2

OFF   1

Fig. 3.30 OFF sequence
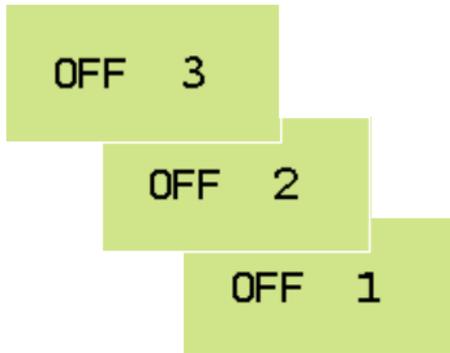
The switching OFF sequence can be aborted at any time by releasing the held buttons which provides access to the Mode menu, shown in Fig. 3.31:


```
LEAK TEST
CONFINED SPACE
BARHOLE
CO
PURGE
SNIFFER
PRESSURE
BUMP TEST         OK
```

Fig. 3.31 Mode Menu

To highlight the required option:

• Press the UP or DOWN buttons, then . .

To select the highlighted option:

• Press and hold OK .

4

LEAK TEST MODE

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

Note: **The instrument pump must be switched ON to measure in Leak Test mode.**

4.1 LEAK TEST RANGES

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

- 0 – 2000 ppm Methane (CH_4) Flammable with following options:
  (to display as LEL with 0.1% resolution up to 9.9%).
  (to display without numerical indication).
  (to display zero until gas reading exceeds 100 ppm).
- 0 – 100% LEL Methane (CH_4) Flammable with option:
  (to display as gas in air).
- 0 – 100% VOL Methane (CH_4) Flammable.
- 0 – 2000 ppm Carbon Monoxide (CO) if fitted.

4.2 LEAK TEST FEATURES

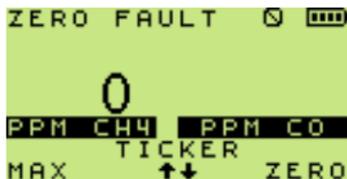Leak Test mode will have the following features available:

- Audible / Visual PPM Ticker (Geiger) Indication
- 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 will indicate any sensor faults.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 4.1.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).

```
ZERO FAULT    Ø  ▥
        0
PPM CH4    PPM CO
       TICKER
MAX      ↑↓     ZERO
```

alternating with

```
LEAK TEST    Ø  ▥
     0      25
PPM CH4    PPM CO
       TICKER
MAX      ↑↓     ZERO
```

Fig. 4.1 Sensor Check

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

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

```
LEAK TEST    Ø  ▥
        34
     PPM CH4
       TICKER
MAX      ↑↓     ZERO
```
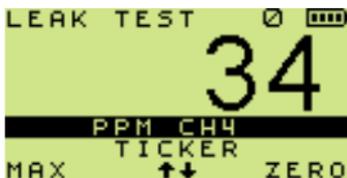
Fig. 4.2 Normal Display Example

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

```
LEAK TEST    Ø  ▥
     0      25
PPM CH4    PPM CO
       TICKER
MAX      ↑↓     ZERO
```

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 disable both audible and visual.

3. Third 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

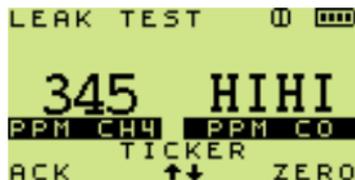*Fig. 4.6 CO Alarm*

To acknowledge the alarm:

• Press and hold ACK .

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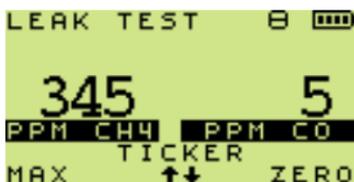

Fig. 4.7 Alarm Acknowledge

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:

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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 disable both audible and visual.

3. Third 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 CH$_4$. In the example opposite, 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.

A configurable option in Leak Test mode enables user to manually select between PPM, and autoranging between LEL & Volume.

By default, the reading will show LEL (autoranging to volume).

- *Press the Centre button , to toggle to PPM.*

If a CO range is present in the GT, and this option is enabled, it is no longer possible to toggle between one and two ranges on the display. It will always be the flammable range and the CO range.

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 of 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.

4.6.1 Select Audible / Visual Ticker (Geiger) Combination Option

The Ticker (Geiger) function can be set for audible and visual combination options as follows: Both ON; Audible OFF / Visual ON; Both OFF; Both ON; etc.

To select required audible / visual combination option:

- Press and hold both UP ⬆ and DOWN ⬇ buttons.

- Repeat operation to cycle through combination options.

Red LED's	PPM Level
Pair 1	100
Pair 2	200
Pair 3	300
Pair 4	400
Pair 5	500
Pair 6	600
Pair 7	700
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 CH_4 ranges (except ppm CH_4). Timed logs will be recorded every minute (default) or as per configuration.

5

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 Methane (CH_4) Flammable
  (EEE Over-range) and option to display up to 9.9% LEL with 0.1% resolution

- 0 – 25% Oxygen (O_2) if fitted

- 0 – 2000 ppm Carbon Monoxide (CO) if fitted

- 0 – 100 ppm Hydrogen Sulphide (H_2S) 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.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 5.1.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).
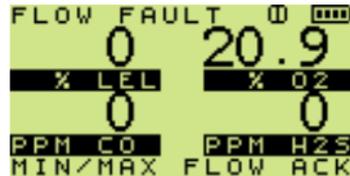
alternating with

5.1 Four Gas Sensor Check

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:
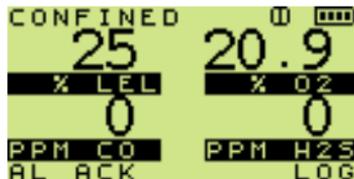
alternating with

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:

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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 O_2 (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 O_2 (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.

<u>To acknowledge for one minute</u>:

- 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.

<u>To enter menu mode</u>:

- 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.

<u>To clear a Flow Fault alarm</u>:

- Press the RH button ⓞ.

5.5.5 Manual Log

A manual log can be taken at any time.

<u>To capture a manual log</u>:

- Press and hold the RH button ⓞ.

Note: When a manual log is taken, the term 'LOG' is inversed 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 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.

6

BARHOLE TESTING MODE

This mode is used to locate underground leaks and on start-up will be ranged to 0-100% LEL Methane (CH_4) Flammable which will autorange to VOL Methane (CH_4) Flammable at 100% LEL.

6.1 BARHOLE RANGES

Barhole testing will have the following ranges available:

- 0 – 100% LEL Methane (CH_4) Flammable with the following option:
  (to display with 0.1% resolution up to 9.9%)
- 0 – 100% VOL Methane (CH_4) Flammable

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.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 6.1.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).

alternating with

Fig. 6.1 Sensor Check

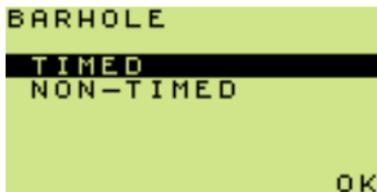Both timed and non-timed modes are available to the user, as shown in display Fig. 6.2.

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: The option initially highlighted will be that previously selected.

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.

```
BARHOLE
TIMED

TIME:  30  SECS


                    OK
```

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.

```
PURGING          Ø  ▥
PURGE TIME:   10 S

                 0
  % LEL      % LEL
  PEAK       ACTUAL
              STOP
```

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 displayed
    as shown in Fig. 6.5.

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.
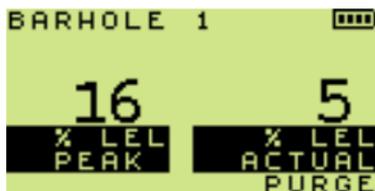
Fig. 6.6 Barhole Numbering

- 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.

```
PURGING          Ø ▥
PURGE TIME:  10 S

              0
% LEL        % LEL
PEAK         ACTUAL
                STOP
```

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:

```
PURGING          Ø ▥
PURGE TIME:  10 S

              0
% LEL        % LEL
PEAK         ACTUAL
                STOP
```

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, as shown in Fig. 6.9

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
    .

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 indication as shown in Fig. 6.11 or Fig. 6.12 respectively.

Fig. 6.11 Flow Fault

Fig. 6.12 Bead Fault

* Refer to paragraph 6.6.3 for explanation of Flow Fault.

** Refer to paragraph 6.6.4 for explanation of Bead Fault.

6.5 BARHOLE OPERATION

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

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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

<u>To view previous barhole results</u>:

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

- Press and hold VIEW .

6.6.2 Lights

<u>To switch ON the backlight</u>:

- Press and hold the Centre button .

<u>To switch ON the flashlight</u>:

- 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 persistent 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 Carbon Monoxide (CO)
- 0 – 25% Oxygen (O_2) if fitted

7.2 CO FEATURES

CO mode has the following features available:

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

- 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 four of the CO sub-modes shown in Fig. 7.1 can be available to the user (See note 3).
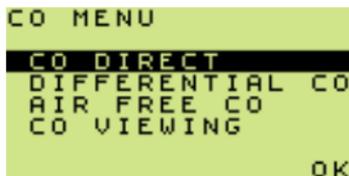
Fig.7.1 CO Menu

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.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 7.2.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).

ZERO FAULT

PPM CO

LOG

alternating with

35

PPM CO

LOG
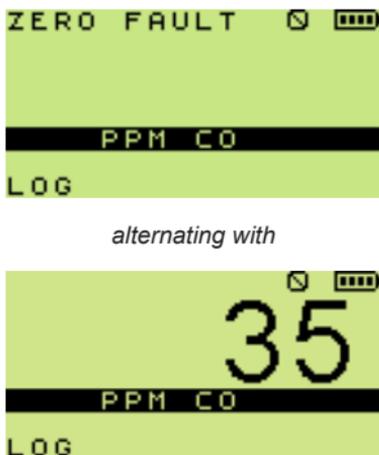
Fig. 7.2 Sensor Fault

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.

Note: It is possible to have negative readings on the display in this mode.

The typical display for this option is shown opposite, 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 O_2 reading, therefore this measurement will only be available when an O_2 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 O_2 reading (only applicable if O_2 sensor is fitted).

CO Air-free = $(20.9 \times CO) / (20.9 - O_2)$.

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

A sample is considered invalid until the Oxygen (O_2) concentration is below 19% Vol.
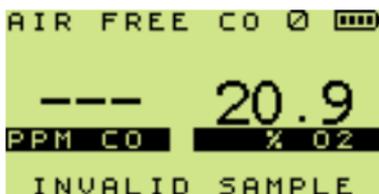
AIR FREE CO 0
--- 20.9
PPM CO   % O2
INVALID SAMPLE

Fig. 7.5 Air-Free CO

Changes to Fig 7.6 when valid sample is taken.

AIR FREE CO
800 10.9
PPM CO   % O2
LOG
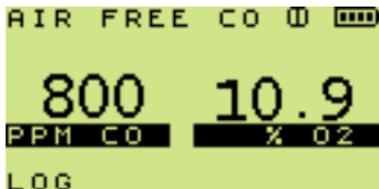
Fig. 7.6 Valid Sample

7.4.4 CO Viewing

This option allows the user to view the six (6) most recent manually logged readings.

If this mode is enabled, a results screen will be displayed, as shown in Fig. 7.7, when entering any of the other three modes.

```
   TIME    CO    PPM
4  01:03   A/F   554
3  01:02   DIF    43
2  01:02   DIFZ   38
1  01:01   DIR    38
-  --:--   ---   ----
-  --:--   ---   ----
CLEAR              OK
```

Fig. 7.7 CO Viewing Display

Note 1: The display briefly flickers each time that a timed log is captured (normally every minute).

Note 2: A proper 'DIF' reading will only be obtained if there is a preceding DIFZ (zeroing).

Note 3: Before viewing logs from the differential mode, a manual 'zero' must be performed as a reference point. If this has not been done, since the last clear, a 'zzz' fault indication will result.

If this option is enabled, the viewing display (Fig. 7.7) will be shown before either CO Direct, Differential CO or Air Free CO.

Once viewed, the user can view the actual CO reading as per mode previously selected.

To view actual CO reading:

- Press and hold OK ⓞ.

Note: If CO Viewing is selected from the CO menu (Fig. 7.1), the display has no OK option.

To exit from this option:

- Press and hold LH (((and RH ⓞ buttons together.

To CLEAR (remove) existing readings from the display:

- Press and hold CLEAR (((.

Note: The values are stored in the datalogging memory for future reference.

7.5 CO BUTTON OPERATION

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

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

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 of 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 inversed 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 and manual logs can also be captured. 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.

A manual zero will also 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% VOL Methane (CH_4) Flammable
- 0 – 25% Oxygen (O_2) 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.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 8.1.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).

alternating with
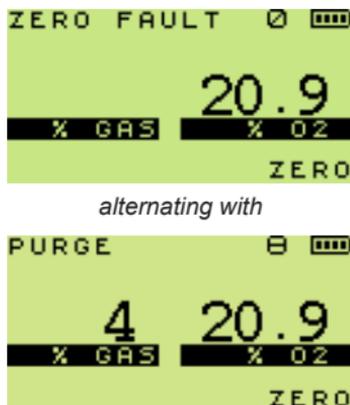
Fig. 8.1 Sensor Check

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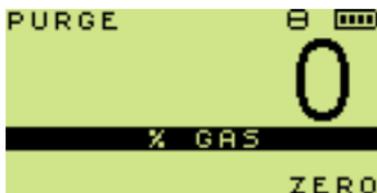
Fig. 8.2 Normal Display

To display both % Gas and % O$_2$:

(as shown in Fig. 8.3)

- Press the Centre button
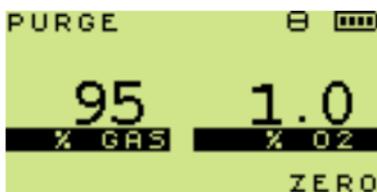
Fig. 8.3 Gas and Oxygen Display

8.4 PURGE BUTTON OPERATION

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

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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 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 % O_2 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.

9

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 Methane (CH_4) Flammable

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.

A positive zero fault is indicated by a flashing gas reading, as illustrated in Fig. 9.1.

A negative zero fault is indicated by a spanner alternating with a zero reading (not illustrated).

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:

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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 disable both audible and visual.

3. 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 CH_4.

9.5.7 Menu / Off

To re-select the Mode Menu:

- Press and hold both the LH button (((and 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 (GEIGER) 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 table (Fig. 9.3), over any 1000 ppm range as explained above.

9.6.1 Select Audible / Visual Ticker (Geiger) Combination Option

The Ticker (Geiger) function can be set for audible and visual combination options as follows: Both ON; Audible OFF / Visual ON; Both OFF; Both ON; etc.

To select required audible / visual combination option:

• Press and hold both UP ⬆ and DOWN ⬇ buttons.

• Repeat operation to cycle through combination options.

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. 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 in ambient atmosphere 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:

  • 0 to 60in Water Gauge (Resolution 0.1in)
  • 0 to 150mBar (Resolution 1mBar)

Note: EEE (Over-range) is displayed if the pressure exceeds 60in. / 150mBar.

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.
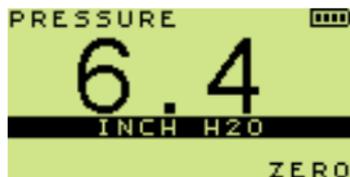
Fig. 10.1 Normal Display

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:

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
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 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.

11

BUMP TEST MODE

This mode is to allow the user to periodically test the instrument against known gas concentrations. This mode is disabled by default.

11.1 BUMP TEST RANGES

All the gas ranges that are present in the GT are available in this mode:

- *0-10000 ppm Methane (CH_4) Flammable*

- *0-100 % LEL Methane (CH_4) Flammable*

- *0-100 % VOL Methane (CH_4) Flammable*

- *0-25 % Oxygen (O_2) if fitted*

- *0-2000 ppm Carbon Monoxide (CO) if fitted*

- *0-100 ppm Hydrogen Sulphide (H_2S) if fitted*

11.2 BUMP TEST FEATURES

If enabled, Bump Test mode will have the following features available:

- *Set-up of gases according to gas cylinder values.*

- *Five (5) Cal gases can be defined.*

- *Date stored when gas set-up changed.*

- *Peak values stored for applied gases.*

- *Ability to view details of previous 32 bump tests, including time and date.*

11.3 BUMP TEST DISPLAYS

On entering bump test mode, the first screen is shown:

Each gas type / concentration is stored using a CalGas number, e.g. PPM may be stored as CalGas 1; LEL as CalGas 2; etc.

Fig. 11-1 CalGas Selection

The CalGas selection number is highlighted. A different gas type (number) can be selected.

To select a different calgas number:

• *Press the UP or DOWN buttons as necessary.*

In the example shown in Fig. 11-2, CalGas 2 is selected and has a 50% LEL value previously stored.

The concentration of a gas range can be entered / edited to suit the gas value shown on the calibration gas bottle to be used.

Fig. 11-2 Enter / View CalGas Value

To enter / edit the gas range concentration:

• *Press and hold NEXT to highlight the gas value, if previously stored. Refer to Fig. 11-3. (50% LEL in example).*

Fig. 11-3 Enter / Edit CalGas Value

- *Press the UP* 🔼 *or DOWN* 🔽 *buttons as necessary to enter / edit value.*

Note 1:   As soon as either the UP or DOWN buttons are touched and when there is no value displayed, a value one unit away from the GMI default value, is automatically displayed. This assists the user to enter the required gas concentration more quickly.

Note 2:   Pressing and holding either of the buttons will perform a fast ramped increase / decrease in value.

At this point, the user can accept the highlighted value and apply the gas, or alternatively, continue defining the other gases.

To accept the highlighted gas range concentration value:

- Press and hold OK ⓞ.

If OK was selected, then the screen, shown opposite, is displayed:

On the left, the gas ranges are displayed. In the middle column, the target for the applicable ranges are displayed and on the right, the (applied gas) peak value.

Fig. 11-4 Applied Gas Peak Values

Gas range values that were not entered in the applied CalGas will display the peak value as a dash (-).

Apply the gas manually, using a balanced flow regulator.

Once the peak reading is high enough, or stabilised, disconnect the gas. At this point the user can EXIT and all values will be stored automatically, or go back to the CalGas set-up to define and apply another gas.

To exit current gas range and return to main menu:

- *Press and hold EXIT* 💡.

To return to CalGas selection display:

- *Press and hold OK* 🔘.

From CalGas set-up screen, Fig. 11-5, the user can also view the previous 32 bump tests.

Fig. 11-5 CalGas Display

To view the previous 32 bump tests:

- *Press and hold LAST* 💡.

The screen, shown opposite, is displayed:

Fig. 11-6 Previously Stored Bump Tests

To highlight required bump test:

- *Press the UP* ⬆ *or DOWN* ⬇ *buttons as necessary to highlight date and time of test.*

To select highlighted option:

- *Press and hold NEXT* .

The screen, shown opposite, displays the previously stored bump test data:

```
20AUG07        08:35
PPM    800       789
LEL    50         49
VOL    100       101
O2     0.1        0.7
CO     500       513
H2S    50         47
                  OK
```

Fig. 11-7 Stored Bump Test Data

To return to CalGas Display:

- *Press and hold OK* .

11.4 BUMP TEST BUTTON OPERATION

A summary of the button operation is detailed in Table 11.1.

ACTION	LH (INVERT)	CENTRE (RANGE)	RH (PUMP)
PRESS	INVERT DISPLAY	—	—
PRESS and HOLD	NEXT	VIEW PREVIOUS 32 BUMP TESTS — EXIT	OK

Table 11.1 Button Operation in Bump Test Mode

11.5 BUMP TEST LOGGING

All bump tests performed will be automatically stored in the datalogging memory if the mode is exited via the EXIT (Centre) button.

Up to 32 different bump tests are stored in chronological order. If any more are done, the oldest will be over-written.

The data can be extracted from the GT using the GT Data Downloading software package (GMI Part no. 67164).

12

ALARMS

12.1 GAS ALARMS

The following gas alarms are available according to gas type and are programmable according to application and / or customer preference. (See Tables 12.1 and 12.2).

12.2 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.

12.3 OXYGEN (O_2) ALARMS

Up to three (3) instantaneous alarm levels are programmable, one (1) rising and two (2) falling (to trigger alarms in O_2 deficient scenarios).

12.4 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 Weighed 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'.

Example 1:

In the following examples, example 1 (Fig. 12.1) shows an instrument in confined space mode signalling a '**LOLO**' Oxygen alarm. The audible alarm warbles and the red LED's ramp.
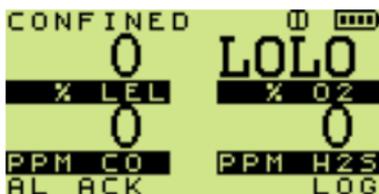
Toggles to
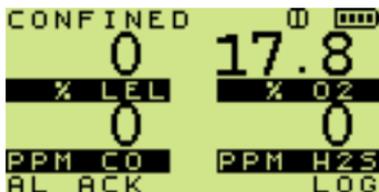
Fig. 12.1 **LOLO** *Oxygen Alarm*

Example 2:

Example 2 (Fig. 12.2) 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.
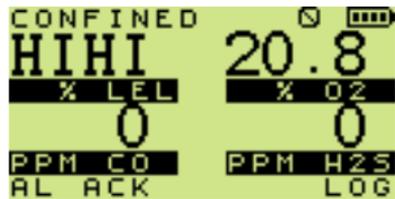
Toggles to
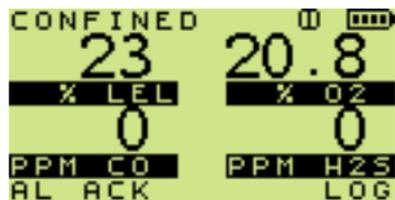
Fig. 12.2 **HIHI** *LEL Alarm*

Example 3:

Example 3 (Fig. 12.3) 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.
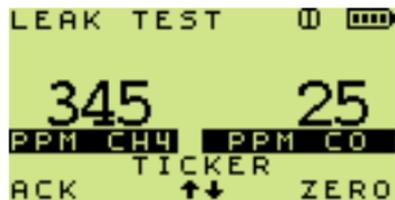
Toggles to

Fig. 12.3 CO Warning Alarm

Example 4:

Example 4 (Fig. 12.4) 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.
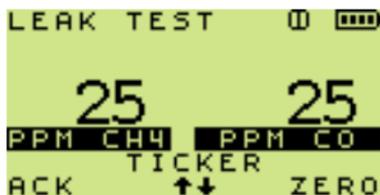
Toggles to

Fig. 12.4 **HI** *LEL Alarm*

Example 5:

Example 5 (Fig. 12.5) shows an instrument in Confined Space Mode with a '**LO**' O_2 alarm. The audible alarm indication is a high pitch tone together with four flashing LED's.
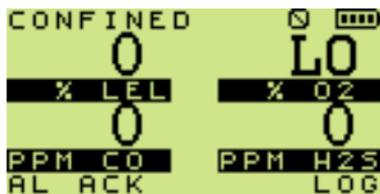
Toggles to
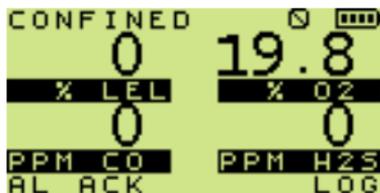
Fig. 12.5 **LO** O_2 *Alarm*

Examples 6 and 7 (Fig. 12.6 and Fig. 12.7) shows an instrument in Confined Space Mode with Time Weighted Average STEL and LTEL H_2S alarms for toxic sensors. In both cases, the audible alarm warbles and eight (8) LED's ramp.

Example 6:

Toggles to

ACTUAL GAS READING
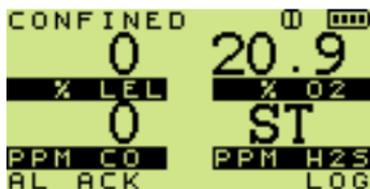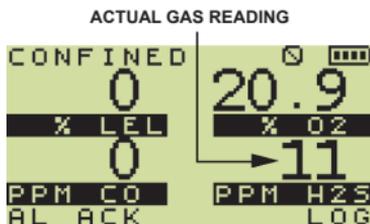
Fig. 12.6 STEL H_2S Alarm

Example 7:

Toggles to

ACTUAL GAS READING
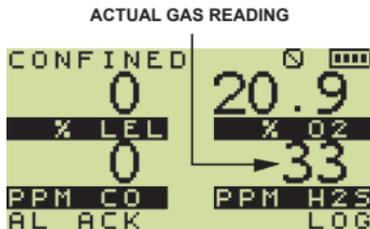
Fig. 12.7 LTEL H_2S Alarm

12-5

12.5 ALARM TYPES

12.5.1 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.

12.5.2 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 12.1 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 12.1.

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_2S Warning	N	N / A	N / A	N / A	Flash Range
H_2S (**HIHI**)	Y	N	High Pitch Warble	(8) Ramping	Toggle Hi Hi / Conc
H_2S (STEL)	Y	N	High Pitch Warble	(8) Ramping	Toggle STEL / Conc
H_2S (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. 12.1 Alarm Indication

The following Table 12.2 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	☐	20			☐	☐	☐	
Hi	☐				☐			
Hi Hi	☐	☐			20	35	15	23
STEL		☐				200	10	
LTEL		☐				30	5	
Lo								☐
Lo Lo								19.5

Table. 12.2 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.

12.6 FAULT ALARMS

Refer to Alarms Table 12.1 to identify the audible / visual indication for any of the following faults.

12.6.1 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.

12.6.2 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. 12.8:

alternating with

Fig. 12.8 Zero Fault

12.6.3 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. 12.9, 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.
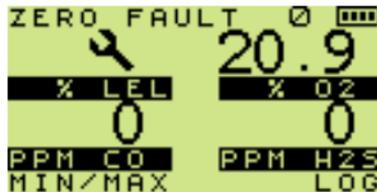
alternating with

Fig. 12.9 Sensor Fault

2) If a "ZERO FAULT" flag and a flashing spanner symbol appear, alternating with a gas value as shown in Fig. 12.10, 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.
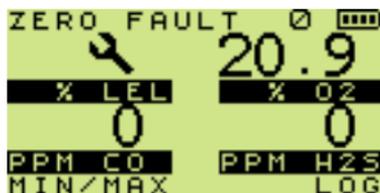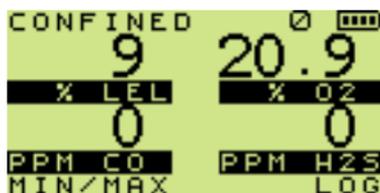
alternating with

Fig. 12.10 Sensor Fault

12.6.4 Sample / Flow Fault

If a 'FLOW FAULT' flag appears, alternating with mode as shown in Fig. 12.11, a 'flow fault' exists. The pump symbol will be extinguished (except in Confined Space mode). The fault LED will also be ON.

Check sample line, sample filter or probe for blockage, if applicable. Clear blockage then restart the pump.
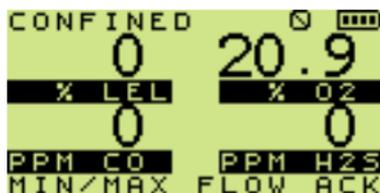
alternating with
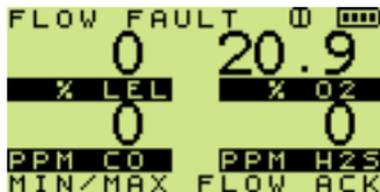
Fig. 12.11 Sample / Flow Fault

<u>To clear the flow fault:</u>

- 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.

12.6.5 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.

12.6.6 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. 12.12 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.

12.6.7 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.

12.6.8 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. 12.13 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

13.1 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.

13.2 FILTER REPLACEMENT

The instrument is fitted with both a dust filter and a hydrophobic type filter protecting the instrument sensors from the ingress of dust and moisture respectively. The filters are located in the probe and should be inspected periodically for signs of contamination and / or damage.

WARNING: It is essential to perform a leak check after instrument filter replacement.

13.2.1 Dust Filter

1) Hold the probe adaptor then unscrew the dust filter holder in a counter clockwise direction to remove the filter holder from the adaptor, as illustrated in Fig. 13.1.

    Note: The dust filter washer is not removed at this stage.

DUST FILTER HOLDER

DUST FILTER WASHER
(Part No. 67189)

PROBE ADAPTOR

DUST FILTER
(Part No. 67163 - Box of 30)

PROBE TUBE
(FLEXIBLE PROBE ASSEMBLY)
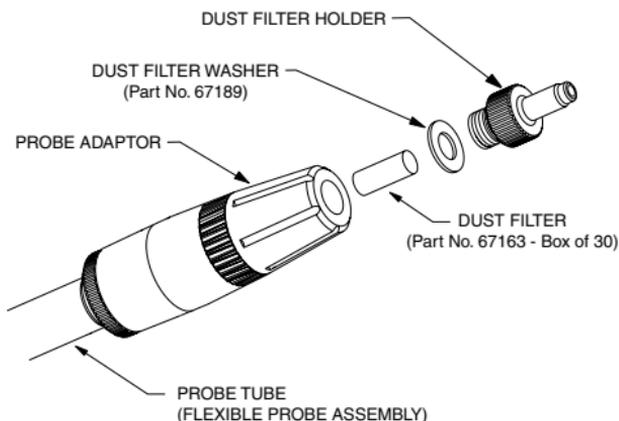
Fig. 13.1 Dust Filter Holder / Filter Removal

2) Hold the dust filter holder then remove and discard the dust filter as illustrated in Fig. 13.1.

Note 1: If also replacing the hydrophobic filter, refer to section 13.2.2 at this stage.

Note 2: Installation is a reversal of the removal procedure therefore, relevant Fig(s). should be referred to.

3) Fit a new dust filter (Part No. 67163 - Box of 30) in the dust filter holder until correctly seated.

4) Before attaching the dust filter holder to the probe adaptor, check the dust filter washer for signs of damage. If damaged, it must be replaced with a new washer (Part No. 67189).

5) Hold the probe adaptor then attach dust filter holder to the adaptor by turning in a clockwise direction until secure.

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

6) Switch the instrument ON then check that a sample / flow fault is displayed when the probe inlet is blocked (with a finger for example) while the pump is running. If fault is not displayed, check tightness of all fittings.

13.2.2 Hydrophobic Filter

Note: When replacing the hydrophobic filter, it is essential to also replace the dust filter.

CAUTION: **When replacing the hydrophobic filter, the pump must not be running and care must be taken to ensure any dust / dirt falls away from the instrument and does not enter the flowpath.**

---

1) Remove then discard the dust filter, as detailed in section 13.2.1 paragraphs 1 and 2.

2) Hold the hydrophobic filter bulb then turn the probe adaptor in a counter clockwise direction to remove adaptor, as illustrated in Fig. 13.2.

3) Hold the probe filter bulb then turn the hydrophobic filter bulb in a counter clockwise direction to release the bayonet connection and remove filter.

PROBE FILTER BULB

PROBE WASHER
(Part No. 12379)

HYDROPHOBIC FILTER BULB
(Part No. 67213)

PROBE ADAPTOR
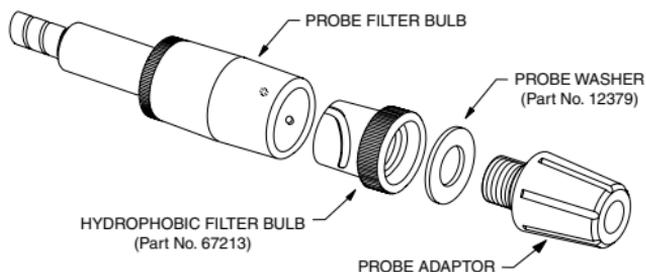
Fig. 13.2 Hydrophobic Filter Bulb Removal

4) Inspect the hydrophobic filter for contamination or damage. If either is evident, replace the filter.

5) Fit a new Hydrophobic Filter Bulb (Part No. 67213), if required.

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

6) Connect the hydrophobic filter bulb to the probe filter bulb so that the bayonet connection locates correctly then turn hydrophobic filter bulb in a clockwise direction until secure.

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

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

8) Hold the hydrophobic filter bulb then attach probe adaptor to the hydrophobic filter bulb by turning adaptor in a clockwise direction until secure.

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

9) Attach the filter holder complete with new dust filter as detailed in section 13.2.1 paragraphs 3 to 5.

10) Switch the instrument ON and check that sample / flow fault is displayed when the probe inlet is blocked (with a finger for example) while the pump is running. If fault is not displayed, check tightness of all fittings.

13.2.3 Chemical Filter (Accessory)

The Chemical Filter assembly (Part No.67142) is available as an accessory and the filter contents can be replaced with either of the following:

  (a) Colour indicated water absorbent silica gel.

   The silica gel, supplied in a bottle, (Part No. 67205), provides the user with a simple visual indication of filter gel saturation by changing colour from gold to green when gel replacement is required.

  or

  (b) NOx absorber, for absorbing Nitric Oxide (NO) and Nitrogen Dioxide (NO_2) from the sample.

   The absorber, supplied in a bottle, (Part No. 67270), provides the user with a simple visual indication of filter absorbent saturation by changing colour from dark purple to brown when absorber replacement is required.

The filter contents replacement procedure is the same, regardless of chemical type.

CAUTION: The contents of this filter must only be replenished with GMI approved chemicals.

  Note: When replacing the chemical filter, it is essential to also replace the dust filter.

  1)   Remove then discard the dust filter, as detailed in section 13.2.1 paragraphs 1 and 2.

  2)   Unscrew the probe adaptor in a counter clockwise direction, then remove the adaptor from the chemical filter assembly as shown in Fig. 13.3.
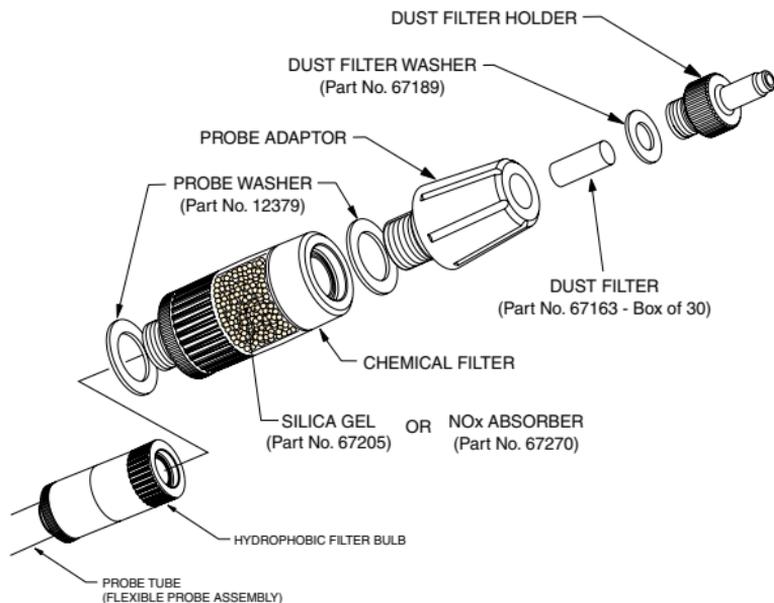
Fig. 13.3 Filter Removal

3)   Hold the hydrophobic filter bulb then unscrew the chemical filter assembly in a counter clockwise direction to remove the filter from the hydrophobic filter bulb, as illustrated in Fig. 13.3.

4)   If the silica gel / absorber is to be replaced, make sure that the filter assembly is positioned in the upright position as shown in Fig.13.4 then unscrew the filter housing adaptor in a counter clockwise direction to remove.

5)   The filter housing can now be inverted and the silica gel / NOx absorber discarded.
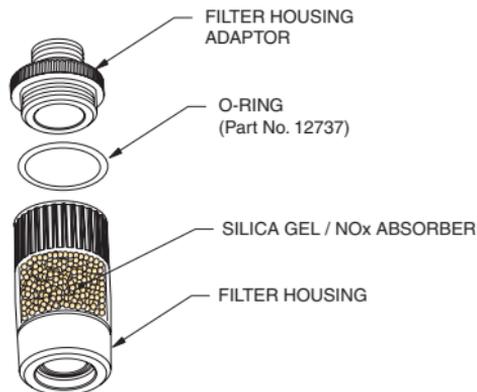
Fig. 13.4 Filter Housing Adaptor Removal

6) 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.13.5, 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.
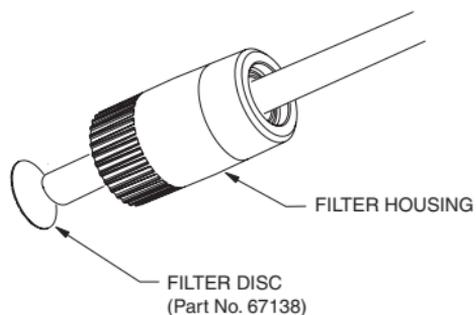
Fig. 13.5 Housing Filter Removal

13-7

7) 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.13.6, then remove and discard the filter.

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

PENCIL (OR SIMILAR)

FILTER HOUSING ADAPTOR

FILTER DISC (Part No. 67199)
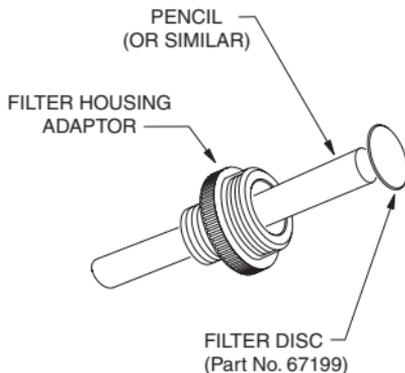
Fig. 13.6 Adaptor Filter Removal

CAUTION: **The contents of this filter must only be replenished with GMI approved chemicals.**

---

8) Fill filter housing with either:

(a) GMI supplied Colour Indicated Silica Gel (Part No.67205),

or

(b) GMI supplied NOx Absorber (Part No.67270).

Fill the filter housing, from the relevant bottle, to a level just below the internal threads. Do not overfill, otherwise the adaptor cannot be assembled.

9) Before attaching the filter adaptor to the filter housing, check the O-ring shown in Fig. 13.4 for signs of damage. If damaged, it must be replaced with a new O-ring (Part No. 12737).

10) Attach filter adaptor to filter housing, in a clockwise direction, then tighten to secure. See Fig. 13.4.

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

11) 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).

12) Hold the hydrophobic filter bulb then attach chemical filter to hydrophobic filter bulb by turning in a clockwise direction until secure. See Fig. 13.3.

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

13) Attach probe adaptor to chemical filter, in a clockwise direction, then tighten to secure. See Fig. 13.3.

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

14) Attach the filter holder complete with new dust filter then perform leak check, as detailed in section 13.2.1 paragraphs 3 to 6.

13.2.4   Cotton Filter (Accessory)

The cotton filter assembly (Part No.67196) contains a cotton filter (Part No.10077 - Box of 10) to protect the instrument sensors from the ingress of dust.

1)   Unscrew the probe in a counter clockwise direction, then remove the probe from the cotton filter housing as shown in Fig. 13.7.
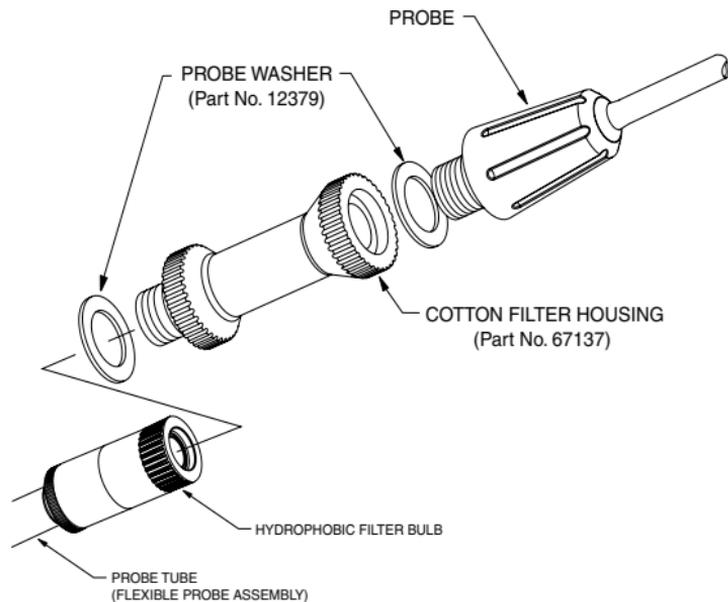
Fig. 13.7 Probe Connector Removal

2)   Hold the hydrophobic filter bulb then unscrew the cotton filter housing in a counter clockwise direction to remove the housing from the hydrophobic filter bulb as illustrated in Fig. 13.7.

3)   Using a pencil or similar, push the cotton filter from the threaded end of the housing as shown in Fig.13.8, then remove the filter.

PENCIL
(OR SIMILAR)

COTTON FILTER
HOUSING

COTTON FILTER
(Part No. 10077)
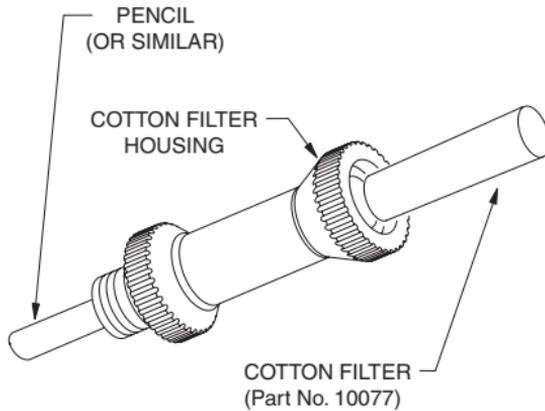
Fig. 13.8 Cotton Filter Removal

4)   If the cotton filter is contaminated or damaged, replace the filter (Part No.10077 - Box of 10).

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

6)   Hold the hydrophobic filter bulb then attach filter housing to the hydrophobic filter bulb by turning in a clockwise direction until secure. See Fig. 13.7.

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

7)   Before attaching the probe 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 to the cotton filter by turning in a clockwise direction until secure. See Fig. 13.7.

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

13.3   BATTERY REPLACEMENT

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

INSTRUMENT HANDLE /
BATTERY COMPARTMENT
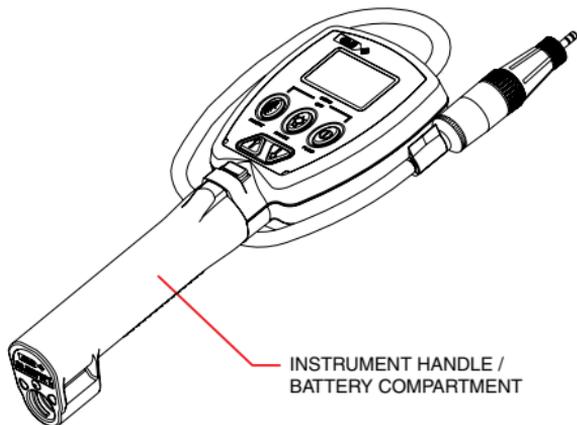
Fig. 13.9 GT Series Battery Location

Two types of battery can be used:

ATEX / IECEx APPROVED INSTRUMENTS:
Refer to **'SPECIAL CONDITIONS FOR SAFE USE'** on page iii.

UL APPROVED INSTRUMENTS:

      Alkaline: Any 'LR14' type
      Rechargeable NiMH: Any 'C' type

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 empty battery symbol ▭ alternates with 'LO' in the display, there is approximately 30 minutes operating time remaining at normal temperatures. The audible alarm sounds once every two seconds and the orange LED flashes.

When the empty battery symbol ▭ flashes in the display, there is approximately 3 minutes operating time remaining. The audible alarm sounds once every second and the orange LED is illuminated constantly. 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.

13.3.1 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 new 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 battery types.

_____

1) Unscrew the captive thumb screw in a counter clockwise direction and then remove from the battery cover assembly. Refer to Fig. 13.10.

PRESS

SECURING CATCH

SLIDE

BATTERY COVER ASSEMBLY

CAPTIVE THUMB SCREW
(Part No. 67360)
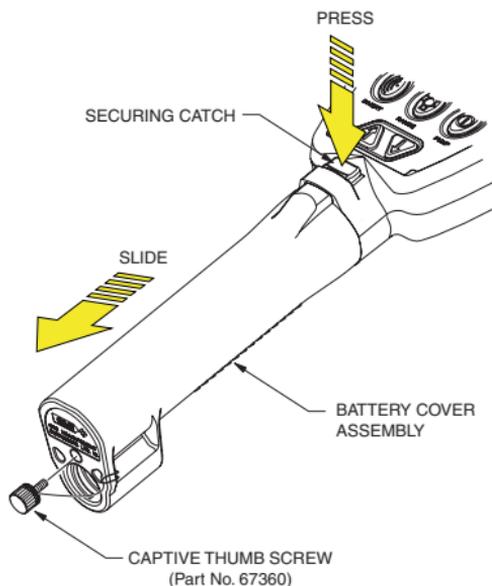
Fig. 13.10 Remove Battery Cover

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. 13.10 until completely removed.

3) Carefully lift then remove the three batteries from the compartment in the instrument handle, as shown in Fig. 13.11.
    Note polarity of batteries for re-fitting.
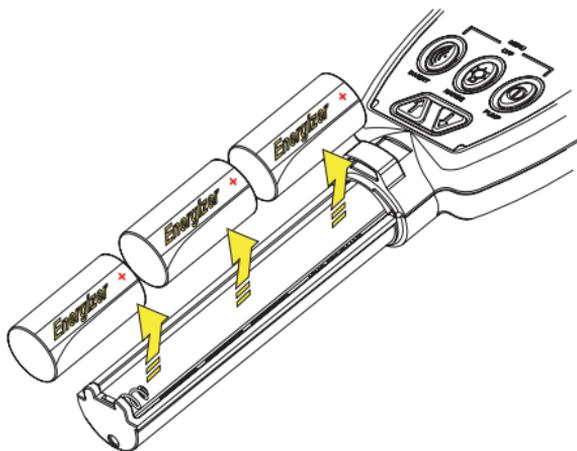
Fig. 13.11 Remove Batteries

4a) RECHARGEABLE:

   Fit three, fully charged, <u>approved</u> rechargeable batteries. Note polarity of batteries as shown in Fig. 13.11.

   Refer to 'Charging (Rechargeable) Batteries in section 13.3.2.

4b) ALKALINE:

   Fit three new <u>approved</u> alkaline batteries. Note polarity of batteries as shown in Fig. 13.11.

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. 13.12.

O-RING
(Part No.76038)

INSTRUMENT HANDLE /
BATTERY COMPARTMENT
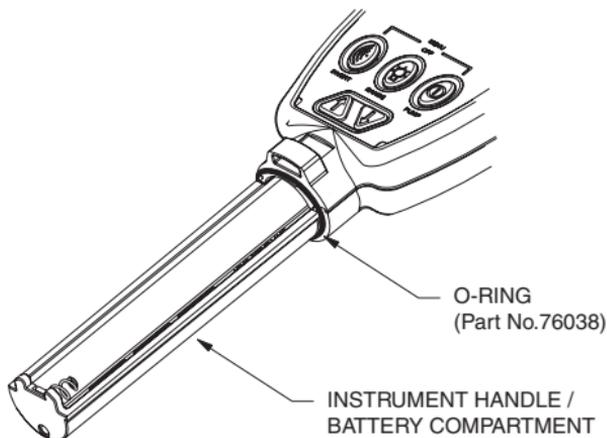
Fig. 13.12 Replace O-Ring

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 captive thumb screw in the battery cover then tighten in a clockwise direction to secure. Do not overtighten the thumb screw.

13.3.2 Charging (Rechargeable) Batteries

WARNING: **Never attempt to recharge non rechargeable cells.**

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

There are four types of battery charger suitable for charging rechargeable batteries, as follows:

- A Standard Instrument Charger (Part No. 67134).

- A Charging Station (Part No.67101), used with Universal Power Supply (Part No.12444), 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 13.3.1, 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. 13.13.

Fig. 13.13 Charging In Progress

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

When charging is complete, the screen shown in Fig. 13.14 is displayed.

Fig. 13.14 Charging Complete

If the instrument displays 'Charging Terminated', as shown in Fig. 13.15, 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. 13.15 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. 13.16.

*Fig. 13.16
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. 13.17.

2) Connect charger to mains supply, as shown in Fig. 13.16, then switch power ON.

Fig. 13.17 Connect Charger to Instrument

Charging Station   (Part No. 67101)

The charging station, shown in Fig. 13.18, is used to locate the instrument securely while charging is taking place.

The charging station is used together with the Universal Power Supply (Part No.12444), 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. 13.18 GT Series Charging Station

To install instrument in charging station:

1) Check that instrument charging contacts, illustrated in Fig. 13.19, and the station charging contacts, illustrated in Fig. 13.20, are clean and free of dirt / grease.

CHARGING CONTACTS

Fig. 13.19 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. 13.18 and Fig. 13.20.

Fig 13.20 Charging Station - Instrument Location

4) Insert probe in location in charging station, as shown in Fig. 13.20.

5) If permanent 12V power supply is not installed, connect power supply, i.e. Universal Power Supply (Part No.12444) or 12V Vehicle Power Supply (Part No.12988), to socket in LH side panel of Charging Station as shown in Fig. 13.21.

CHARGING STATION - LH VIEW

Fig. 13.21 Power Supply to Charging Station

12V / 24V Vehicle Charger
(Part No. 66206)

The 12V / 24V Vehicle Charger, shown in Fig. 13.22, 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. 13.22
Vehicle Charger Lead

14

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.

14.1 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
67213	Hydrophobic Filter Bulb
67163	Dust Filter - Box of 30
76038	O-Ring - Battery Compartment
12480	35cm. (14ins) Solid End Probe
12393	80cm. (32ins) Solid End (Barhole) Probe
67185	Stainless Steel (Flue) Probe
13937	Carbon (Balston) Filter - Box of 5
67142	Chemical Filter Assy.
67205	Bottle of Colour Indicated Silica Gel (use with 67142)
67270	Bottle of NOx Absorber (use with 67142)
67138	Filter Disc - Filter Housing (use with 67142)
67199	Filter Disc - Filter Adaptor (use with 67142)
12737	O-Ring (use with 67142)

67196	Cotton Filter
10077	Filters - Box of 10 (use with 67196)
12712	Sample Line (Tygon) - per metre
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) c/w metric fittings
67102Q	Automatic Calibration Station (Mixed Gases) c/w imperial fittings
67109	Automatic Calibration Station (Individual Gases) c/w metric fittings
67109Q	Automatic Calibration Station (Individual Gases) c/w imperial fittings
12444	Power Supply for Charging / Calibration Station use with 67101; 67102(Q); 67109 (Q)
12988	12V Vehicle Power Supply for Charging / Calibration Station use with 67101; 67102(Q); 67109 (Q)
67233	24V Reduction Box for permanent power supply from car battery use with 67101; 67102(Q); 67109 (Q)
67281	Wall Mount Storage Clip
67160	GT Configuration & Field Calibration CD
67238	GT Cal System Package (including CD and interface)
67164	GT Data Downloading Package (including CD and interface)
67216	GT Set-up Software Package (including CD and interface)
67202	Pressure Tubing Connector

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

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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

A

TYPICAL OPERATING PARAMETERS

Typical operating parameters are as follows:

Gas Range	Range	Resolution
PPM	0 to 10000	1 ppm
LEL (option)	0 to 100%	1%
	0 to 9.9%	0.1%
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_2O or	0.1 in.
	0 to 150 mBar	1 mBar

Dimensions (excluding probe)
290mm (11.4") x 95mm (3.7") x 43mm (1.7").

Weight (including 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 both a dust filter and hydrophobic filter.

Power Source
Three (3) approved alkaline or rechargeable (NiMH) cells providing approximately eight (8) hours runtime at 20°C (68°F).

B

QUICK OPERATING INSTRUCTIONS

The following multi-language instructions provide the user with a quick operation guide for the . .

GMI *GP*series instrument.

Each language and pages reference is as follows:

- **English** - pages B-2 to B-8

CHECKLIST

1. Check the instrument has no obvious faults.
2. Check accessories.
3. Read and understand handbook before use.
4. Switch ON
5. Check battery levels.
6. Check "ZERO" in fresh air.
7. Check that instrument displays sample / flow fault when inlet is blocked (with a finger for example). If fault is not displayed, check tightness of all fittings.

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.

*   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 ⟨Ⓔx⟩ II 2 G EEx iad IIB T3

    Ⓤ UL Class I, Div 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:

ATEX / IECEx APPROVED INSTRUMENTS:
Refer to **'SPECIAL CONDITIONS FOR SAFE USE'** on page iii.

UL APPROVED INSTRUMENTS:
> **Alkaline:** Any 'LR14' type
> **Rechargeable NiMH:** Any 'C' type

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.

Switch Instrument ON:

Press and hold RH button ⓞ, for one second, to switch instrument ON in fresh air.

The instrument now begins its '30 second' warm-up cycle, during which, a countdown timer appears in the top right hand corner of the display. The display backlight illuminates and remains ON until the warm-up cycle is complete and then automatically switches OFF.

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

(Note: By default, all GT series instruments are configured for Datalogging)
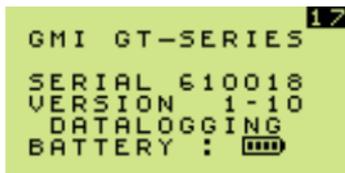
```
GMI GT-SERIES  17

SERIAL 610018
VERSION   1-10
DATALOGGING
BATTERY : ▭▭▭▭
```

The battery capacity level is displayed for approximately five seconds during the warm-up cycle, then on the top of the display during normal operation.

Next, check / confirm filters are in place and in good condition. By default, this check should be performed on a daily basis.

If filters are installed, and in good condition, press 'YES' for instrument warm-up to continue.

If 'NO' is selected, instrument will automatically enter 'switch off' sequence.

```
                  20
     ARE FILTERS
INSTALLED AND IN
GOOD CONDITION?

NO              YES
```

Next, perform a flow fault test by blocking probe tip inlet with finger for approximately 5 seconds. Pump should flow fault and display 'successful' test. By default, this check should also be performed on a daily basis.

If 'YES' is selected, instrument warm-up will continue without performing test.

If 'NO' is selected, instrument will automatically enter 'switch off' sequence.
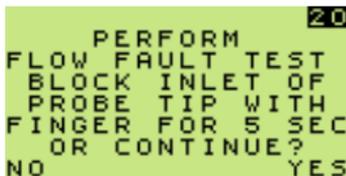
```
                  20
      PERFORM
FLOW FAULT TEST
  BLOCK INLET OF
  PROBE TIP WITH
FINGER FOR 5 SEC
  OR CONTINUE?
NO              YES
```

A successful flow fault test is confirmed by the term 'successful' flashing in the display.

```
                              20
       SUCCESSFUL
FLOW FAULT TEST

REMOVE FINGER

   CONTINUE?
                         YES
```

On completion, select 'YES' to switch the pump ON and continue warm-up cycle.
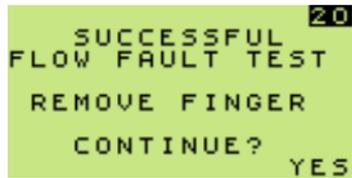
The time and date from the instrument's built-in clock is then displayed on the screen during warm-up.

Next, the Calibration Due Date is displayed (if configured).

This feature has five (5) options:

1. Cal Due Date message is not displayed.

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

3. (Default) Cal Due Date message is displayed with user acknowledge if overdue. If the Calibration date has expired, the user must acknowledge that Calibration is overdue by pressing and holding the RH Button, as indicated on the bottom line of the display. Alternatively, press and hold the LH button to initiate the instrument shut-down sequence.

4. Cal Due Date message is displayed with user acknowledge for extended period option, if overdue. If the Calibration date has expired, the user will have to either press and hold the RH Button to accept the extended period, or press and hold the LH button to proceed with the instrument shut-down sequence.

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

Service Due Date is then displayed (if configured). This feature also has five options similar to Cal Due Date and operate in the same way except that the default is same as Cal Due option 1, i.e. Service Due Date is not displayed.

Before warm-up is completed, the instrument automatically ensures that the sensors are zeroed before operation.

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

Configurable options are available to either start up in any other operational mode or, to start up in the mode last used.

Switch Instrument OFF or Re-enter Mode Menu: Press and hold

both LH (((and RH (O) buttons simultaneously to initiate shut down

sequence.

For the first two seconds, the Mode menu shown below, will be displayed. After this time, the OFF sequence begins and the user will have to keep the buttons pressed for a further three seconds to complete the OFF sequence.

Abort the switching OFF sequence at any time by releasing the held buttons that provide access to the Mode menu.

Note: In Carbon Monoxide and Barhole modes, a sub-menu may be displayed before reaching mode menu. Also, Bump Test mode is disabled by default.

Change Operating Mode:

Press UP or DOWN

buttons to highlight required
operating mode then press and

hold RH (O) button to confirm

choice.

```
LEAK TEST
CONFINED SPACE
BARHOLE
CO
PURGE
SNIFFER
PRESSURE
BUMP TEST        OK
```

Note: When changing mode, it is important that this is only done after the instrument has been purged in FRESH AIR.

Invert Display:

Press LH button (((to invert display and allow ease of reading in

awkward situations.

Pump:

Press RH button (O) to switch pump ON and OFF.

Note: Not applicable in Confined space Mode or Pressure Mode.

Range:

Press Centre button 🔆 to change range.

(refer to Instrument Button Operation table).

ACCESSING THE FOLLOWING OPTIONS

Max / Live or Min / Max:

Press and hold LH button (((to display *Maximum or **Minimum

/ Maximum readings (see note) since current mode was selected.
Press and hold again to return display to live reading.

Note: Only available in *Leak Test Mode and **Confined Space Mode.

Acknowledge Alarm:

Press and hold LH button (((to acknowledge alarm.

Backlight / Flashlight:

Press and hold Centre 🔆 button to switch backlight ON. Press

and hold again to switch flashlight ON. (Flashlight not available in
Pressure Mode). The backlight and flashlight are both timed to switch
OFF after two minutes. Press and hold a third time to switch both
backlight and flashlight OFF.

Zero:

Press and hold RH button Ⓞ to zero displayed range.

Clear Flow Fault / Reset Pump:

Press RH button Ⓞ to reset pump once flow blockage has been
cleared.

Clear Flow Fault (Confined Space Mode):

Press and hold RH button ⊙ to acknowledge flow fault once flow blockage has been cleared.

View Barhole Results:

Press and hold LH button (((• to view this and previous barhole results to a maximum of six barhole tests.

Ticker (Geiger) - PPM Range:

Press and hold UP ⬆ and DOWN ⬇ buttons simultaneously to enable / disable audible Ticker (Geiger), as follows:

Press and hold both buttons - to enable visual only.

Press and hold both buttons again - to disable both audible and visual.

Press and hold both buttons again - to enable both audible and visual.

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Symbols

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