Gas & Environmental Services Ltd

Gas-Tec MK5 FID

User Manual

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Contents

Standards information and hydrogen safety

Before using the Gas-Tec, read and understand the manual in full before use.

Make sure the alarm warnings listed in Section XII of the manual are fully understood.

Do not substitute components as this may impair the IP rating, EMC performance and invalidate warranty.

Pay careful attention to warnings and instructions displayed on the instrument.

Observe site health and safety procedures for gases being monitored and be aware of evacuation procedures.

If this product is not working properly, read the operating manual or contact your local authorised GES service centre.

1.1 Standards

Changes or modifications not expressly approved by GES could void the user's authority to operate the equipment and cause safety implications.

FC CE

1.2 Safety:

WARNING: GAS CYLINDER

Before Gas-Tec is turned off, check the gas cylinder has been closed off by turning the valve, **clockwise**, to the 'OFF' position.

After this is done, the gas pressure registered will drop gradually.

If the valve is left open hydrogen will leak into the enclosed space inside the instrument at 15 ml/minute. In extreme cases a build-up could cause an explosion.

WARNING: USE OF HYDROGEN

As with any apparatus using hydrogen stored under high pressure, certain precautions are prudent. These mainly concern the handling and filling of the hydrogen cylinder and are dealt with in section XII. In addition, the detector uses a hydrogen flame and this point should be considered when the instrument is used in situations where the gas concentrations are likely to be dangerously high (above 10,000 ppm).

1.3 Battery change

Users may not change the battery of this product: it must be replaced at GES or an approved service centre.

1.4 Charging

Use only the charger supplied with the Gas-Tec, or the vehicle charger listed in the accessories section. The unit cannot be turned on while it is being charged.

1.5 Zeroing

Gas-Tec offers the user 2 options to zero the unit every time it is switched on.

- Zero in clean air to measure the presence of gas at any level
- Zero with a background level of gas present if the Gas-Tec is to show additional concentrations only (Offset Zero).

Please note that the zero will not take effect if the background gas reading exceeds 30ppm (parts per million).

1.6 Avoid contamination

Do not use the equipment without a filter assembly installed. Ensure foreign bodies and moisture do not enter the probe.

1.7 What's in the box

1 Gas-Tec
case and fitted foam insert

2 Multiregional power supply

3 Manual

4 Quick Start Guide

5
- Probe handle
- Filter attachment
- Angled ‘coat hanger’ probe
- Skids for ‘coat hanger probe’

6 Spare filters

7 Strap

8 Cylinder*

*Cylinder not supplied in USA.

1 	5 
2 	6 
3 	7 
4 	8 

1.8 Unit orientation

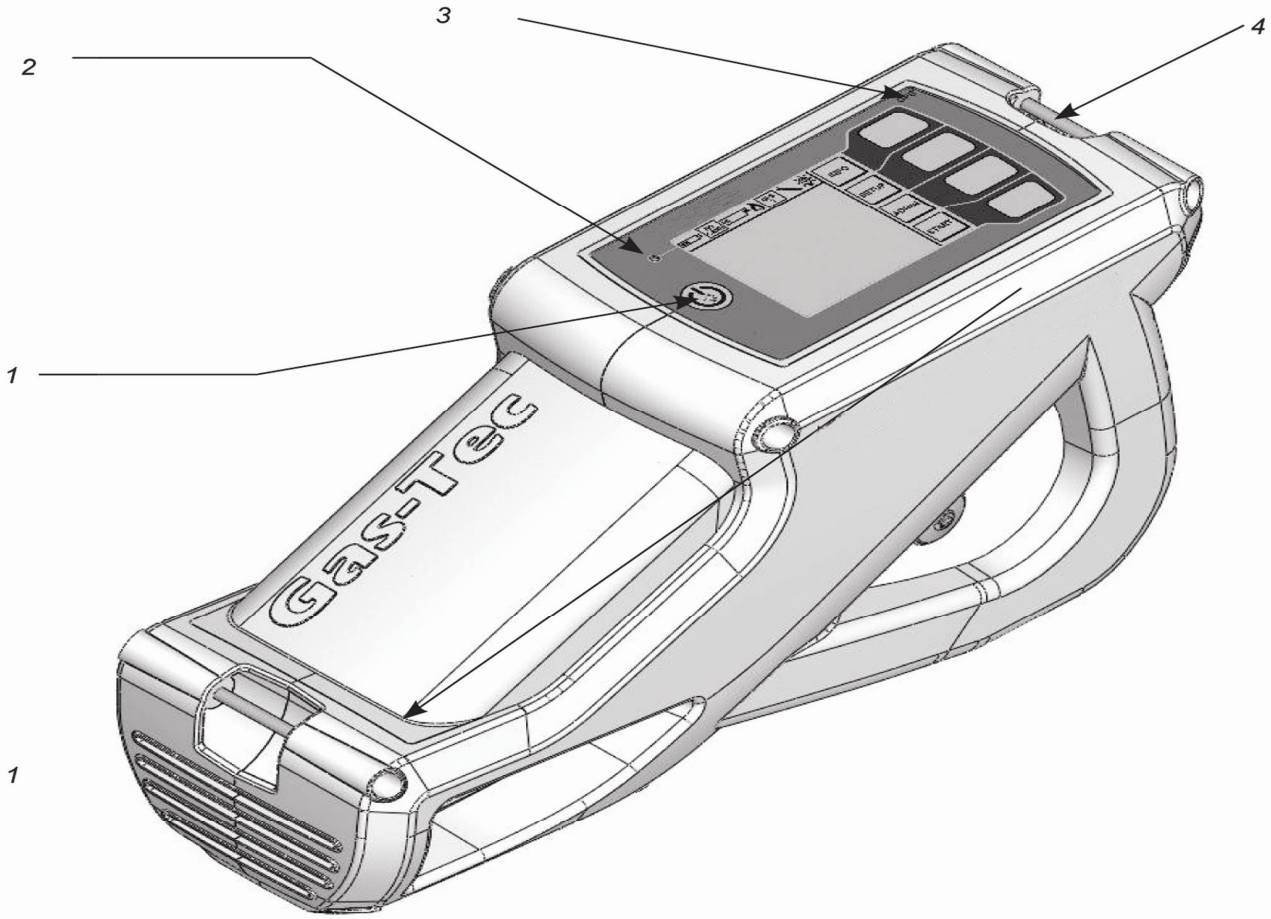


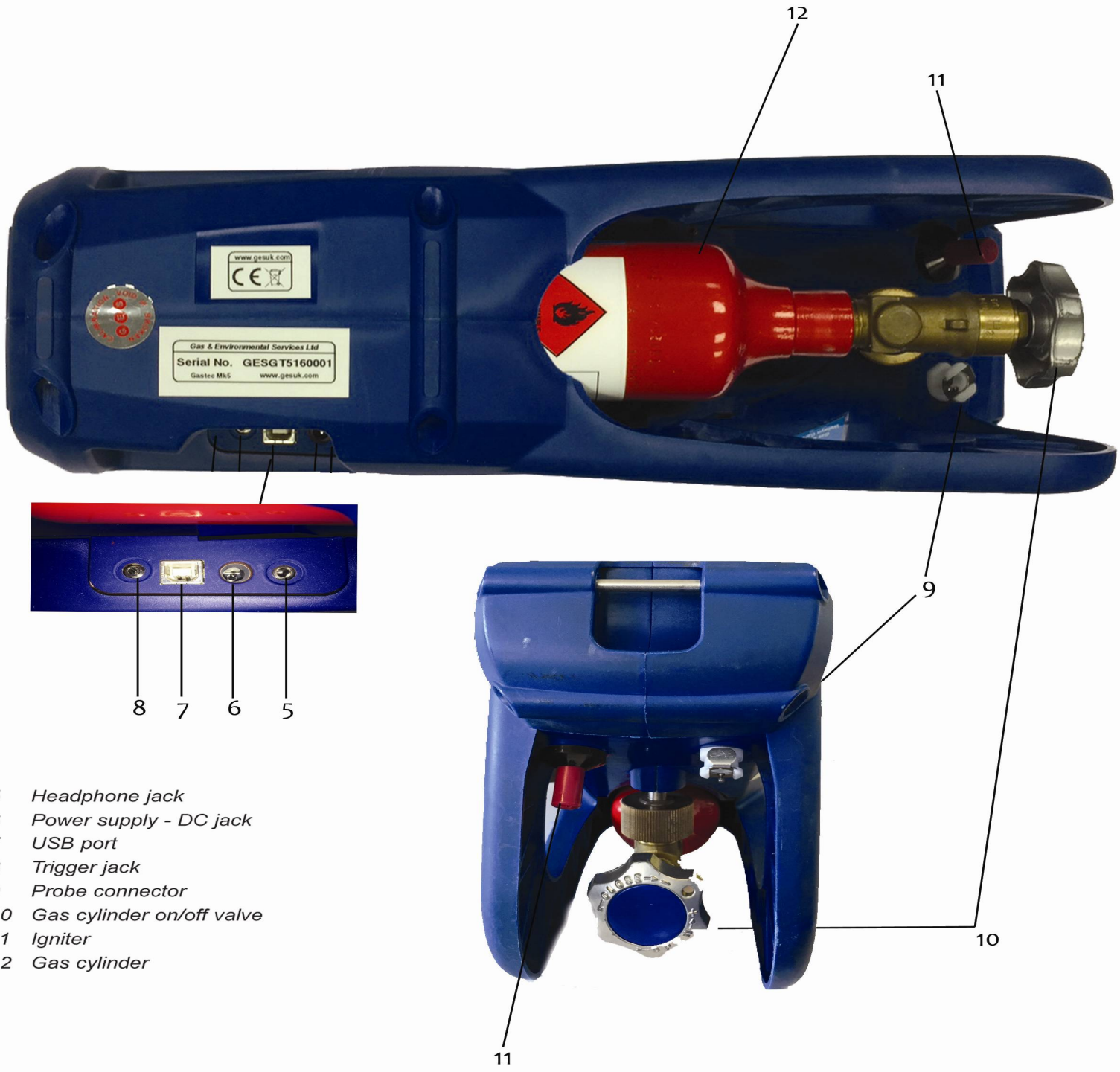
Diagram 1

1 *ON/OFF button*

2 *Battery indication*
Light GREEN = Power OK
Light RED = Power LOW
Flashing GREEN = Charging

3 *GPS antenna*

4 *Strap loops*

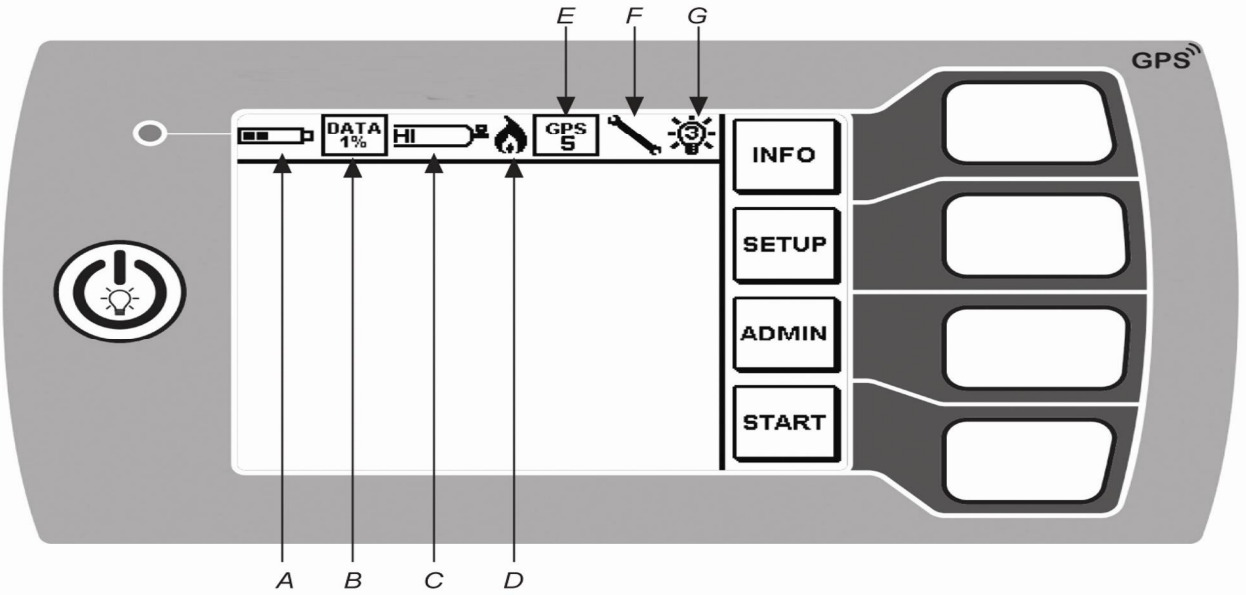


5 *Headphone jack*
6 *Power supply - DC jack*
7 *USB port*
8 *Trigger jack*
9 *Probe connector*
10 *Gas cylinder on/off valve*
11 *Igniter*
12 *Gas cylinder*

Control and monitor the Gas-Tec with the LCD display

Control the Gas-Tec using the 'soft' buttons

The buttons at the right are linked to the labels next to them on the screen. Access a labelled option by pressing the button to the right of it.



Monitor the Gas-Tec using the Status Bar

A. The battery icon shows how much charge the battery is holding. The LED to the left of the icon shows green for Power OK, red for Power Low, and flashes green while the unit is charging.

B. The data icon shows the status of the storage medium.

C. The gas bottle icon shows the pressure level in the gas bottle.

D. Flame icon shows whether the gas is lit.

E. The GPS icon reads 'GPS lock' if the antenna has locked on to available satellites; until lock is achieved a question mark shows as above.

F. If the Gas-Tec needs servicing, the spanner flashes.

G. The number in the bulb indicates the strength of the backlight.

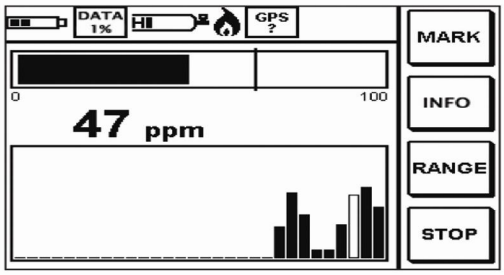
II. Gas-Tec Introduction

2.1 Product description

Gas-Tec is a portable gas detector for rapid survey and leak localisation. GPS, data and event logging allow survey teams to pinpoint and report on areas of significant interest.

Gas-Tec senses hydrocarbons through the use of flame ionisation detection offering an extremely fast detection speed of less than 2 seconds.

Gas-Tec is worn across the body and is supplied with a standard probe. A wide range of other probes and accessories are available (see Sections VII and XI).



2.2 Flame Ionisation Detection (FID)

Flame Ionization Detection (FID) is the fastest, most sensitive and accurate way to detect concentrations of hydrocarbons such as methane, butane or hexane. The FID process uses a hydrogen flame to burn hydrocarbons in an air sample then counting the ions produced by the burnt sample. The instrument then displays an accurate measurement of the concentration of hydrocarbons present in the sample. All samples are destroyed as the measurements are generated. This process takes place in a specially designed chamber.

2.3 Hydrogen Safety

Users of the Gas-Tec will need to handle the hydrogen cylinder correctly. A leak from a full cylinder could result in a build-up of gas that could, in extreme cases, cause an explosion.

Install the cylinder carefully (Section III.1, p10)

Check the cylinder is secured in place before opening the valve. Tighten the cylinder as tightly as possible by hand.

The Gas-Tec LCD display will prompt users through the startup and shut-down procedures ensuring safe use. Gas-Tec will display relevant messages: if the gas pressure is too low

- to let the operator know if the gas pressure is too low.
- to prompt the operator to open the valve to allow gas to flow
- to prompt the operator to close the valve during shut-down
- to let the operator know it is safe to power down the Gas-Tec

See the list of warnings in Section XIII for more details.

The person responsible for providing hydrogen cylinders should read Sections XII and X.1 of this manual.

2.4 What Gas-Tec detects

Most users will be using Gas-Tec to detect methane. The instrument is also sensitive to other hydrocarbon gases such as propane. If other hydrocarbon gases are present, the Gas-Tec reading will reflect their presence.

The Gas-Tec's response to other gases differs from the reading shown for methane.

Correction factors for some common hydrocarbons are shown below:

Gas detected	Divide reading by number shown to obtain actual concentration of gas
Propane	1.8
Butane	2.0
Pentane	2.7
Hexane	3.1
Heptane	2.6
Octane	3.1
Tetrahydrofuran	0.5

III Operation

Prior to SWITCH ON...

3.1 Getting ready

Make these checks before start-up:

- The battery of the Gas-Tec should be charged, indicated by the GREEN LED (see Section X.4, p29 for more details).
- a probe must be connected with a filter inline
- gas pressure in the hydrogen cylinder must be greater than 150 psi (see Section X.1, p28 for more details).

The Gas-Tec will not work if the battery is not sufficiently charged or the pressure in the hydrogen cylinder is too low. Using the LCD display, these requirements can be checked once the machine has been switched on. However, there are a few steps to complete prior to this.

Secure cylinder

Attach the gas cylinder:

Set the hydrogen cylinder in place by pushing the bottom into the 'toe' of the Gas-Tec (below left). Position it so that the cylinder and Gas-Tec connections line up. Then attach the cylinder to the Gas-Tec by screwing the nut until tight.

Attach probe

Attach the probe:

To attach the probe, push the coupling on the end of the probe assembly into the probe connector at the base of the Gas-Tec. It will 'click' into place.

To release push the silver release button on the side of the probe connector and pull gently.

Release probe

Attach the shoulder strap (below).

Attach both ends of the strap to the metal rods at either end of the Gas-Tec.

Using headphones:

Plug the headphones into the headphone jack at the base of the Gas-Tec. This will silence external alarms and notifications of gas detection, leaving only the user to hear the increasing tones.

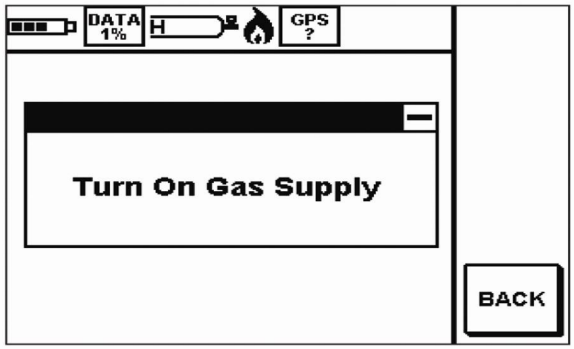
3.2 Start Up

When the hydrogen cylinder and the probe are properly attached, the Gas-Tec can be switched on.

1. Press the ON/OFF button.

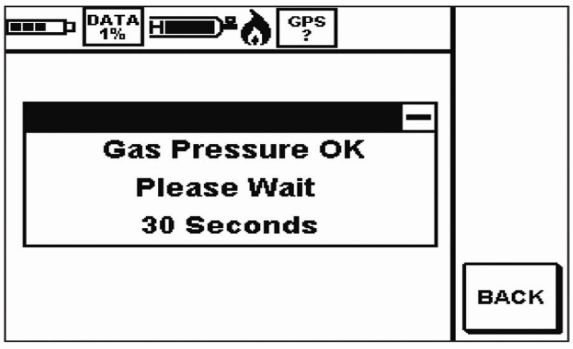
   The LCD display will run a self test and then be ready for use.

2. Press START.



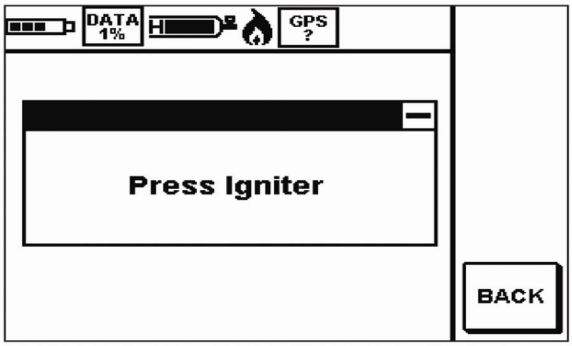
3. The LCD display will show the message ‘Turn on the gas supply’ (if the cylinder is not already turned on).

4. To open up the gas supply, turn the gas cylinder ON/OFF valve on the side of the hydrogen bottle **anticlockwise**. Turn until there is no more resistance.



5. Providing the gas supply is adequate, the pump will start.

6. If the pump does not start, the 'Gas Supply Low' message will display on the LCD display. Check that the valve of the cylinder has been opened. If not, open it. If it is open, the gas pressure is not adequate. Switch the unit off at the ON/OFF switch and replace the cylinder.
7. After the pump starts, hydrogen will begin to flow into the Gas-Tec. The LCD display will monitor progress as the gas builds up inside the chamber. During this process a countdown timer will be visible. When there is enough gas to begin operation, an audible 'beep' will sound.
8. When prompted, press the igniter, (the red cylindrical button under the Gas-Tec). Press it in until it clicks. This should light the hydrogen, and the beeping will stop. If the beeping continues, press the igniter again.

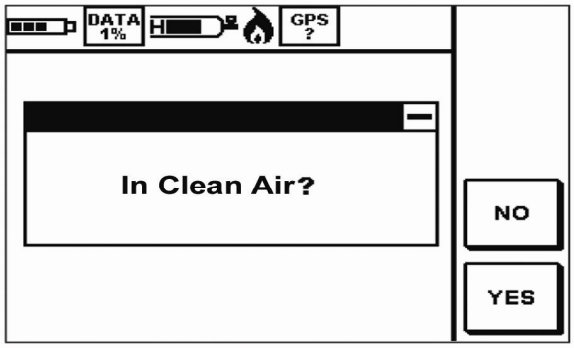


9. When the gas is lit, the flame icon will stop flashing and the audible tone will end to signify that the unit is ready to detect gas.
10. After a short period of time the Gas-Tec will ask if you are 'In Clean Air?' The Gas-Tec offers two options to zero every time the Gas-Tec is started.

    Yes to zero in clean air and measure the presence of gas at any level.

    No to zero with background level of gas present for the Gas-Tec to show additonal concentrations only. (Off Set Zero).

    Please note that the zero will not take effect if the background gas reading exceeds 30ppm (parts per million).



11. The pump will be heard continuously while the unit is in use.
12. We recommend letting the Gas-Tec warm up for at least 5 minutes before use.

3.3 Detecting gas

1. Now the Gas-Tec is ready for use. Place the probe towards the suspected leak or to the survey area and view the display for read-out information. Alternatively attach the Gas-Tec to a Trigger survey unit to use it in a moving vehicle.
2. Gas-Tec continuously records data relating the gas reading to a log which is stored in the internal non-volatile memory. (For further details, see section VI.)

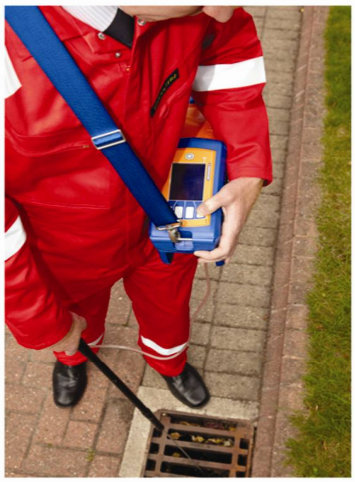
   The Gas-Tec includes a GPS location monitor. Make sure the antenna is not obstructed and monitor the GPS icon on the LCD display for 'lock' information.

   Depending on the coverage in the area, it can take from 30 seconds to 8 minutes for the antenna to lock on to a sufficient number of satellites.

   At this point, the GPS icon at the top of the LCD display will register a lock (see Sections VI.3 and VI.4 on p21 and 23 for further information).

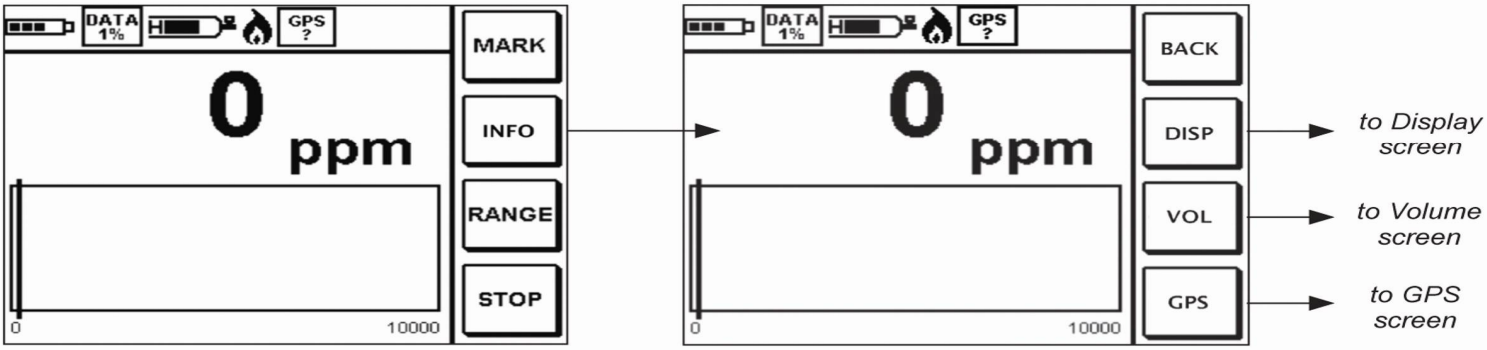
   Providing the GPS is locked on to satellites, details of the instrument's location will be written to the log.

   If using the Gas-Tec for invehicle surveys, it is recommended that a 'lock' is achieved outside of the vehicle before installation to the Trigger survey unit (see Section VIII.2) takes place.



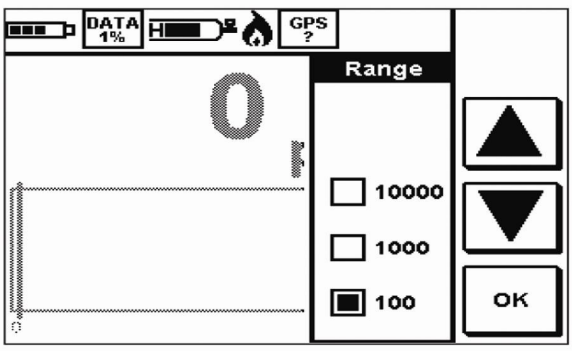
The Gas-Tec in use

3. The Gas-Tec monitors the level of hydrocarbon in the sample. The number on the screen shows the concentration of hydrocarbon gas in parts per million (ppm).

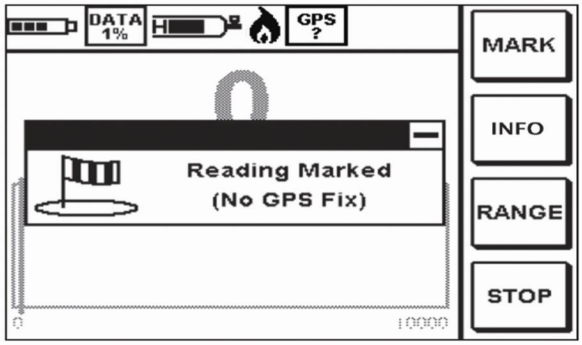


Press the 'Info' button to bring up a choice offering opportunities to change options on the volume of the alarm signal, and the nature of the display. Pressing the 'DISP' button will take you to the screen of the 'Format Menu' shown in section V.2 (p19). Choosing the 'GPS' option will display GPS data such as longitude, latitude, and number of satellites locked onto. The screen you will reach is illustrated in Section 6.2 (p21).

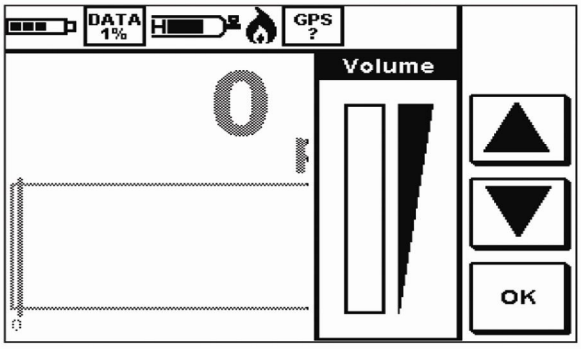
Users have the option of three display formats. All offer ppm numerical readings, with options for moving bar or cityscape, and a screen showing all three. Gas-Tec offers a choice of three ranges 0-100 ppm, 0-1000 ppm and 0-10,000 ppm. The range chosen is indicated just above the graphical output. (See section V, p18 for instructions on how to change between these options).



The 'MARK' button can be pressed to record a significant event. Pressing by 'MARK' will assign a flag into the datalog for retrieval at a later stage. Bars in the display that are clear rather than black indicate 'MARKed' readings in real time.



4. An audible click will sound if the Gas-Tec measures a sudden increase of hydrocarbon gas. The rate of clicking will increase in proportion to the level of hydrocarbon detected. Adjust the volume of the click using the 'VOL' button. This option can be accessed by pressing the 'INFO' button as shown above.

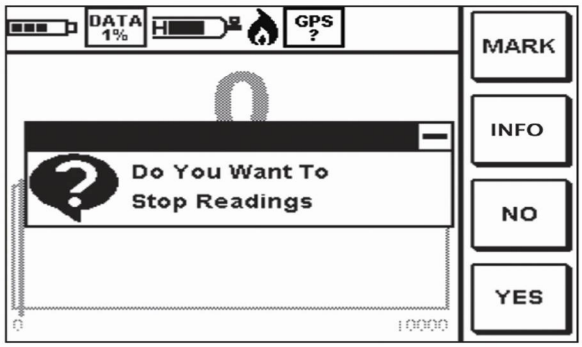


5. Keep the Gas-Tec upright. The Gas-Tec will not detect gas if the unit is tilted more than 30 degrees from the vertical. If this happens, an alarm will sound and a message will display. Restore the Gas-Tec to an upright position. Gas detection will restart automatically, the beep will stop and the message will clear.

   If the Gas-Tec falls sideways, the flame may go out. Check for this by inspecting the flame icon in the middle of the status bar at the top of the LCD display. If the flame icon is flashing, relight the flame by pressing the igniter (see Section III.2, p11).

3.4 Shutting down

1. Press the 'STOP' soft key (see 'Using the soft keys', p8).
2. At the 'Stop reading?' message, press the 'YES' soft key.
3. VERY IMPORTANT: When asked to 'Turn off gas' do this by turning the valve on the gas bottle **clockwise** until tight.
4. Wait for ten minutes to allow the gas to dissipate.
5. Switch off the Gas-Tec by holding down the 'ON/OFF' switch for 3 seconds. Count down on LCD display will show closing down.
6. Before leaving or recharging the Gas-Tec, CHECK that the gas valve has been closed.



   It is very important to close the valve completely. If the valve is open, hydrogen leaks into the enclosed space inside the instrument at 15 ml/minute. A build-up of gas could cause an explosion in extreme cases.

IV Function overview

This section provides an overview of what can be viewed and changed on the Gas-Tec and where to find further information on how to control the instrument.

Start menu (see Chapter III)

Property	Default	Other options
Sound volume	25	5 - 50
Range	Graphical	Analogue or Graphical and Analogue
FID range	1000 ppm	100 ppm 10000 ppm

Set-up menu (see Chapter V)

Property	Default	Other options
Contrast	25	5 - 50
Sound volume	25	5 - 50
Range	Graphical	Analogue or Graphical and Analogue
Date	01/01/09	
Date format	DD/MM/YY	DD/MM/YYYY MM/DD/YY MM/DD/YYYY
Time	00:00:00	
Backlight timeout	30s	1 min 3 min Disable
Pressure units	psi	bar
Speed	mph (miles per hour)	km/h (kilometres per hour) m/s (metres per second) Kts (knots)

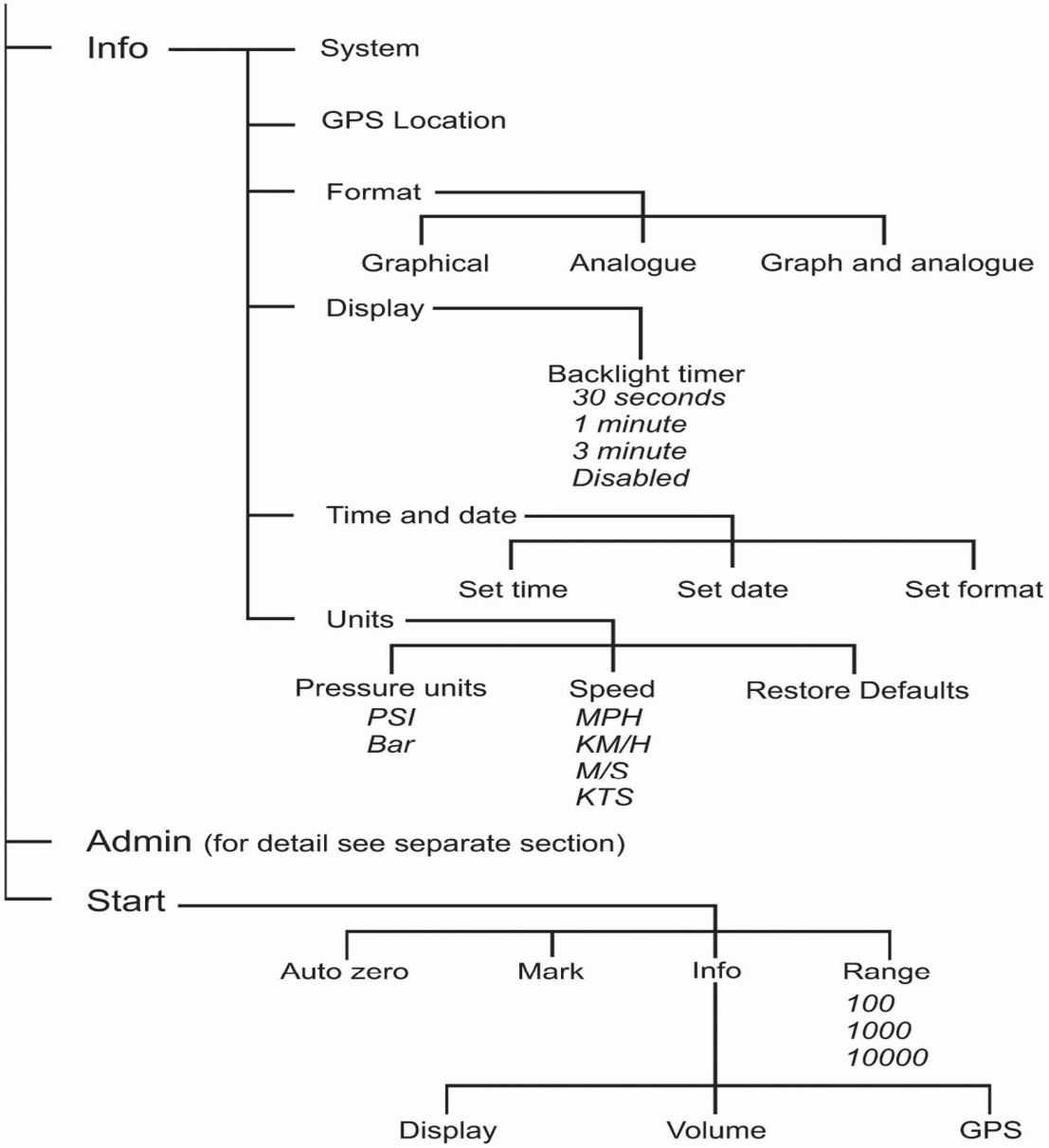
Admin menu (see Chapter VII)

IMPORTANT NOTE: Accepting the option RESET DEFAULTS on this menu may remove calibration and other settings. DO NOT do this unless absolutely sure

Property	Default	Other options
PIN number	1234	User choice (which should be made and used only by senior engineer)
Service Date	06	This figure is the number of months from the time and date entered at set-up This figure is the number of months from the time and date entered at set-up when the unit will go into 'service due'. If the Service Lock is on, the unit will stop working. If the Service Lock is off, the spanner will show on the LCD display. The number can be changed from 6 to any number between 1 and 12.
Service Lock	No	Yes
Error Override	No	Yes

4.2 Menu structure (including range)

Main Screen

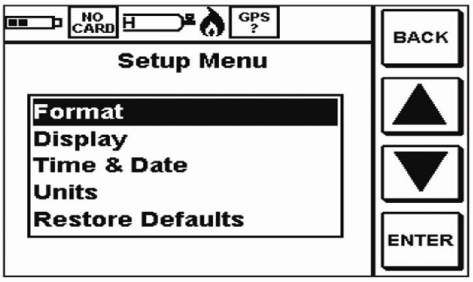


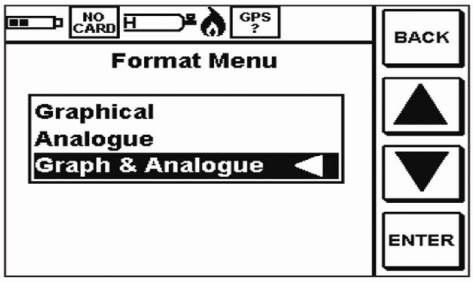
V Set-up

To set the time and date or make some choices about how the data is displayed, use the SetUp menu. To do this, switch the Gas-Tec on and press the 'SETUP' soft key.

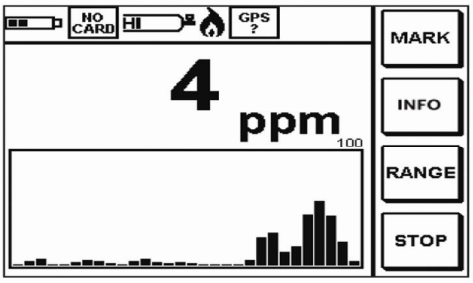
5.1 Choosing how to display the gas reading

Press ENTER when the Format option is highlighted to choose how to see the data.

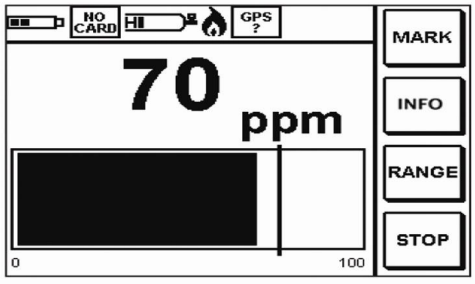




Graphical shows ...

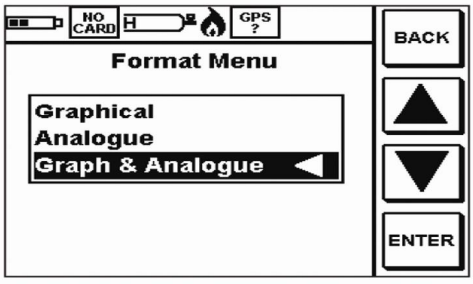


Analogue shows...

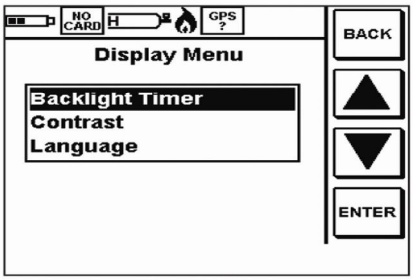


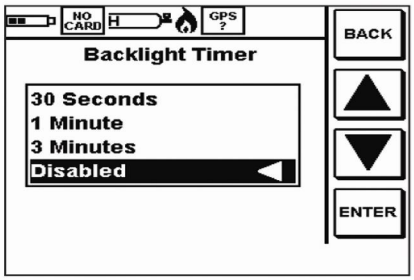
Graph and Analogue shows...

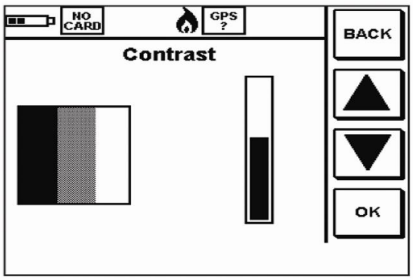
Press the button by BACK to return to the SETUP menu, or allow this to happen automatically.

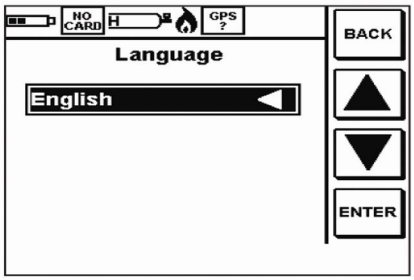


Go into the DISPLAY menu to change the length of time the backlight stays on, the screen contrast, or the language that the LCD display strings will be shown in.



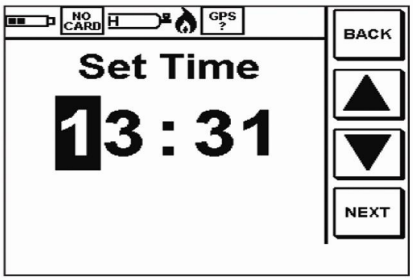


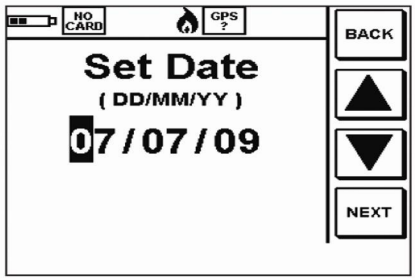


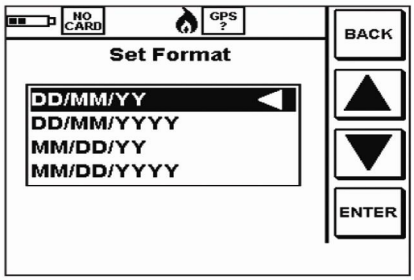


5.2 Setting time, date and units

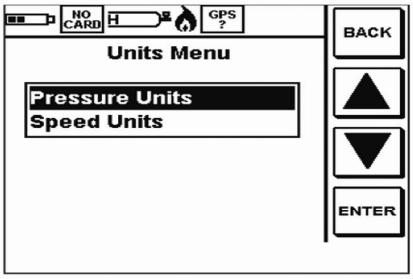
Register when the survey is taking place. Ensure the log entry timestamp is correct by using the Time and Date menu. Choose to display these in a number of different ways.

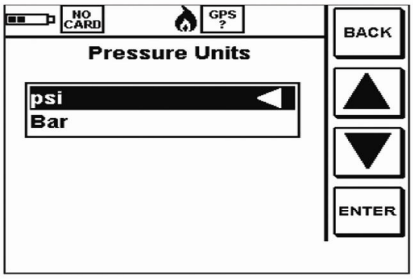


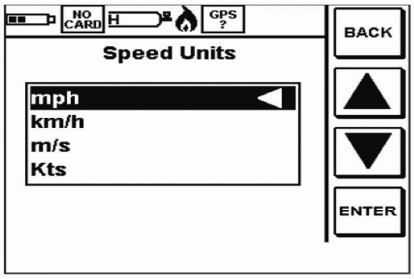




Similarly, there are options for the units to be used when the unit displays pressure and for the unit of speed in the log entry.

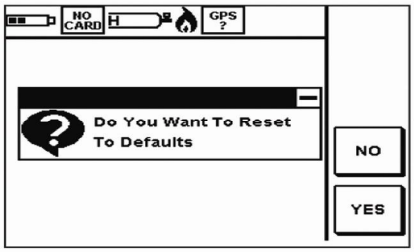






Press 'BACK' to return to the Main Menu after storing appropriate settings.

The option to restore default values for each of the above will be offered after these settings are altered. The default values are listed in Section IV on p17.



VI What the Gas-Tec shows

6.1 Overview

Gas-Tec makes it easy to pinpoint gas leakages so that they can be dealt with quickly. The data can be checked while recording is taking place, or loaded down later.

To find information about the location of the Gas-Tec at a particular time, and other basic aspects of the system, use the 'Info' soft key at any time during operation. A choice of screens is provided: 'System' and 'GPS'.

A record of the concentration of hydrocarbon gases encountered by the probe as it is carried by the operator is stored in date-stamped files in an internal memory. Data is registered every second and is recorded against the time the record is logged. The built-in GPS, (if locked), allows the position to be logged at the same time.

To upload the data, plug the detector's USB connector into a PC (the green led will light on the Gas-Tec when connected). Gas-Tec will be recognised as a memory device, and a folder will open displaying log files in date order.

The files can be manipulated or sent via e-mail to interested parties.

The data collected by Gas-Tec includes:

Column A	Count	An incremental number
Column B	Time	Gas-Tec time
Column C	Absolute	Absolute PPM reading (Before auto zeroing is deducted)
Column D	Relative	Relative PPM reading (After auto zeroing has been deducted)
Column E	Latitude	Latitude of current GPS position
Column F	Longitude	Longitude of current GPS position
Column G	Height	GPS height above sea level
Column H	SOG	GPS Speed Over Ground
Column I	COG	GPS Course Over Ground (Angle measured clock wise from magnetic north)
Column J	Mark	If the Mark button was pressed during the data logging
Column K	Easting	Easting of current GPS location
Column L	Northing	Northing of current GPS location

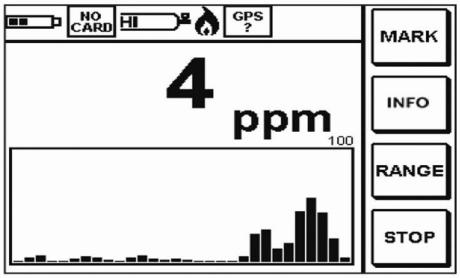
In addition, each report includes the serial number of the Gas-Tec used for the survey.

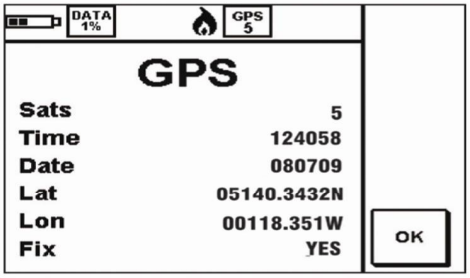
Serial No: GESHIRE00001
Software Version: V1 i1.00 B40
Date: 05/04/18
Speed Units: mph

Count	Time	Absolute	Relative	Latitude	Longitude	Height	SOG	COG	Mark	Eastings	Northings
1	134159	0	0	5147.8861	00010.891	91.2	0.19		0	525495.7	212615.3
2	134200	0	0	5147.8859	00010.893	89.9	0.75	4.45	0	525493.8	212614.9
3	134201	0	0	5147.8858	00010.893	89.1	0.71	358.44	0	525493	212614.7
4	134202	0	0	5147.8856	00010.894	88	0.11		0	525492.4	212614.3
5	134203	0	0	5147.8854	00010.895	86.8	0.2		0	525491.5	212614
6	134204	0	0	5147.8852	00010.895	85.6	0.57	4.68	0	525491	212613.6
7	134205	0	0	5147.8853	00010.896	84.9	0.31	5.74	1	525490.2	212613.7
8	134206	0	0	5147.8853	00010.896	84.5	0.23	8.48	0	525489.5	212613.8
9	134207	0	0	5147.8853	00010.897	83.9	0.14		0	525488.9	212613.7
10	134208	0	0	5147.8853	00010.897	83.5	0.14		0	525488.4	212613.7
11	134209	0	0	5147.8853	00010.898	83.2	0.21	359.03	0	525488	212613.6
12	134210	0	0	5147.8849	00010.898	82.7	0.25	351.69	0	525487.5	212613
13	134211	0	0	5147.8846	00010.899	82.2	0.6	348.47	0	525487.1	212612.4
14	134212	0	0	5147.8846	00010.899	82.3	1.36	341.82	0	525486.7	212612.4
15	134213	0	0	5147.8848	00010.899	82.3	1.43	338.54	0	525486.1	212612.6
16	134214	0	0	5147.8849	00010.899	82.4	0.75	334.97	0	525486	212612.8
17	134215	0	0	5147.8849	00010.900	82	0.31	336.26	0	525485.4	212612.8
18	134216	0	0	5147.8848	00010.900	81.6	0.14		0	525485.2	212612.6
19	134217	0	0	5147.8850	00010.901	81.3	0.85	335.94	0	525484.6	212613.1

6.2 Special events in the record

If, during the survey with the detector, an unusual event occurs, and the 'MARK' button has been pressed. The flag will be visible in the far right hand column of the report.

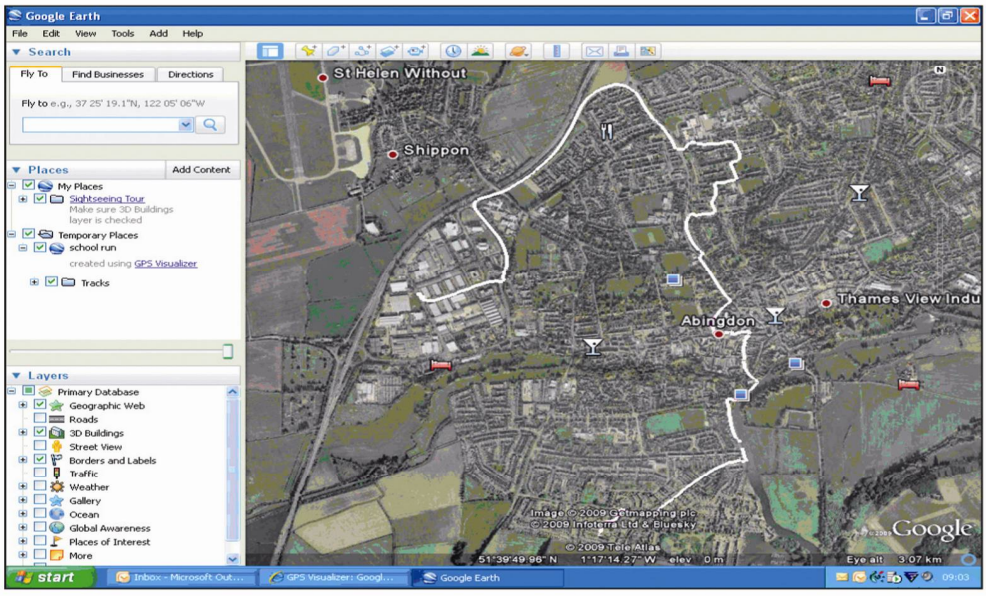




6.3 GPS

Details of the status of the GPS can be accessed by pressing the 'INFO' button shown above left, and then GPS. Read the details on the screen above right.

If GPS data has been recorded, the data can be converted by web-based applications and then displayed on a map. Gas-Tec thus provides a straightforward way to record and pinpoint gas leaks as well as monitoring survey progress and paths.

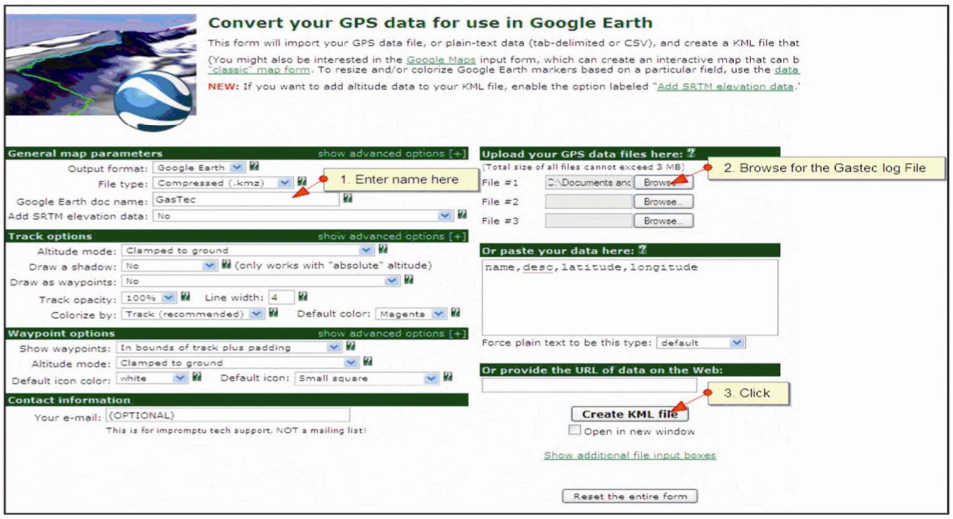


Above is shown an example of a route recorded on a Gas-Tec. It was made using Google Earth software.

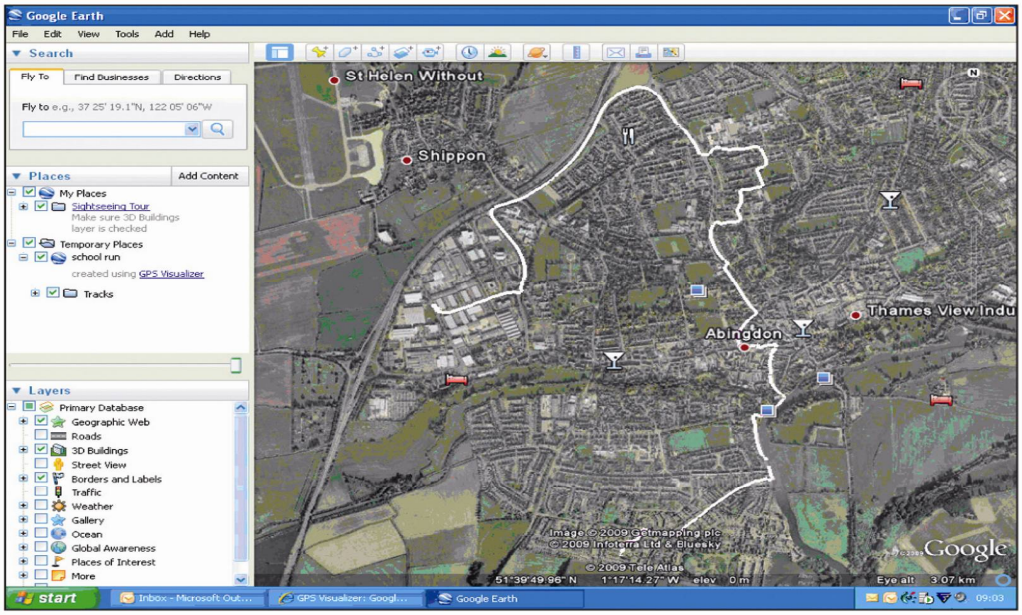
To make a such a map from a .csv file downloaded from a Gas-Tec, Google Earth software must be installed. The software can be downloaded from http://earth.google.co.uk .

Use software available at http://www.gpsvisualizer.com/map_input?form=googleearth .

To convert the data saved from the Gas-Tec onto your PC. Follow the instructions in the screenshot below to process the data and create a file that Google Earth can open and display.



Click on the link to the converted file. Google Earth will display your saved trace/log.



6.4 Acquiring and using data from the Gas-Tec

To save data to a PC, connect the detector to a USB port. A new window will open showing the log files stored on the internal drive. There will be one file for each session of continuous use. The file name contains the date of the survey.

Drop the files to a folder on the PC. Alternatively cut and paste them.

Delete the copied files from the internal drive of the Gas-Tec to free up space for future sessions.

If the files on the folder occupy all of the available space, the earliest log on the drive will be deleted automatically and the new log file will be created.

The files are in .csv format and can be manipulated by standard word-processing applications.

VII Managing the Gas-Tec

Earlier sections provided instructions for day-to-day use of the Gas-Tec. In this section we describe the use of functions intended to assist with the longterm management of the detector, setting alerts for servicing, and finetuning other parameters of this flexible instrument.

7.1 Admin menu

Engineers may wish to set up the Gas-Tec so that they report when a service falls due, and possibly cease to work until servicing is undertaken. Bear in mind that this function depends on the date and time set on the service menu (see Section V.2, p19). The Gas-Tec may report that the service has expired due to a failure of the backup battery for the internal clock. These functions should be used with care, and access to them protected by changing the default password.

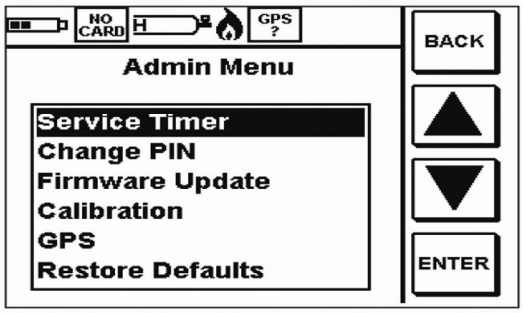
To reach the administration functions of the Gas-Tec switch the unit on and the press the 'ADMIN' soft key (the third button down at the right hand side of the LCD display).

After entering the Admin menu, the Gas-Tec will not detect gas. To use the Gas-Tec, turn it off using the on/off button and then press again to turn it on.

On receipt of a new Gas-Tec the administrator should set a new PIN. (see Section VII.2 below).

The menu can also be used to calibrate the Gas-Tec. This function is described in the Service Manual.

IMPORTANT NOTE: Accepting the option RESET DEFAULTS on this menu may remove calibration and other settings.



7.2 Set up the detector

The screenshots show how to navigate through the menus. The buttons at the right are linked to the labels next to them on the screen. Access a labelled option by pressing the soft key to the right of it.

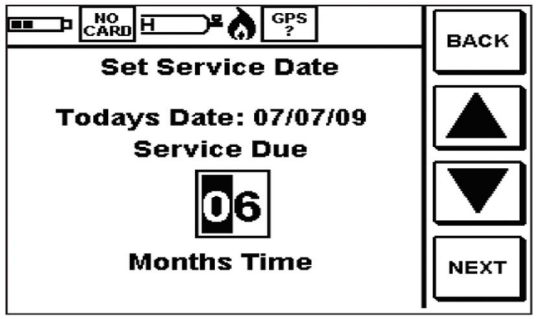
Change the numbers on the screen by using the buttons next to the up and down arrows on the right. To move between the numbers, use the 'NEXT' and 'BACK' soft keys.

To do this, enter the default PIN of 1234 and choose the menu option 'Enter a new Admin PIN'. Ensure a record of the new PIN is kept as this will be needed during set-up and servicing.

After entering the correct PIN, a list of options will be displayed

7.3 Service Timer

Press ENTER to get into the Service Timer menu. Use this to change the Service Date, Service Lock, and Error Override options.



Press ENTER again to use the first option shown to set the time to elapse before the unit is due to be sent for service. When this has been chosen the screen will automatically jump back to the Service Timer menu. Press BACK to go back to the ADMIN menu, or press the down key to select other options as required.

Set the Service Lock to prevent the unit being used after the Service Date entered in the first step.

Choose the last option to allow an Error Override, this allows the Gas-Tec to restart attempting to clear any known failure modes. If the Gas-Tec still reports an error after running this option, please contact your local authorised GES service centre.

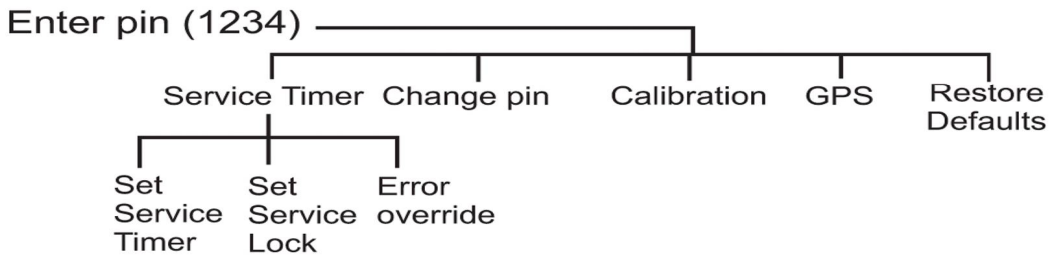
7.4 Change PIN

Use the soft key by the UP and DOWN arrows to select option to change the PIN if this is required (see VII.2, p24).

7.5 Service functions

Instructions for updating firmware and calibrating the Gas-Tec can be found in the Service Manual.

Admin Menu Structure



7.6 Restore Defaults

THINK CAREFULLY before using the Restore Defaults instruction here, as vital data may be lost.

VIII Alternative probes

An insulated probe handle including filter assembly is supplied for gas leak monitoring as standard.

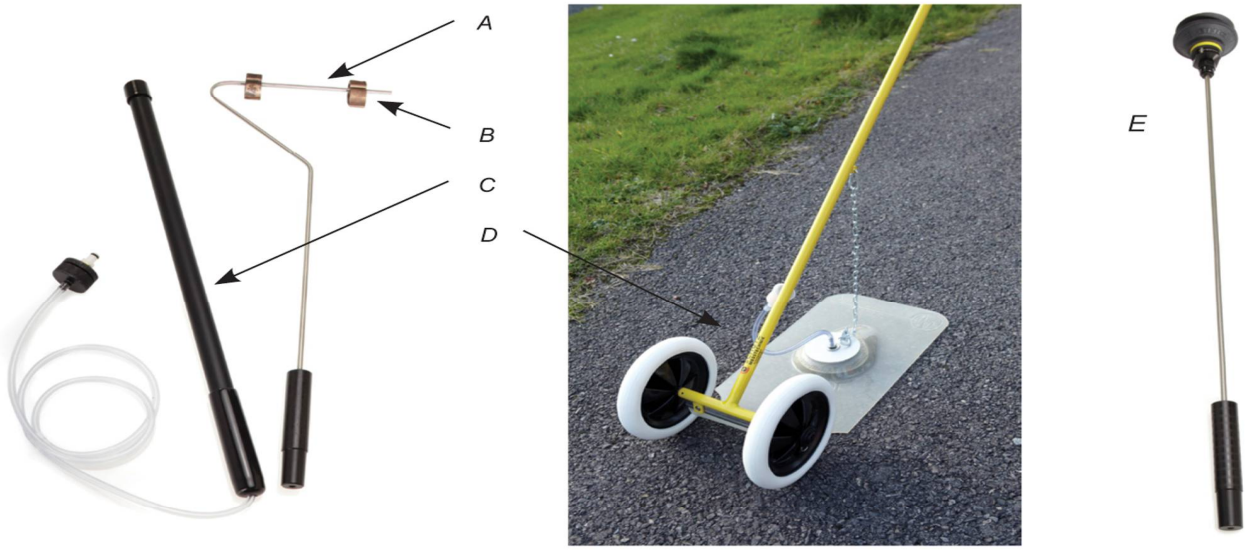
8.1 Alternative probes

Two sampling systems are available:

1. An insulated probe handle system for gas leak monitoring

   A variety of probe ends can be plugged into the insulated probe handle as follows:

   - Standard (coat hanger) probe (A) with a perforated transverse end, which is particularly useful for walking ground level, surveys. This probe is supplied as standard, complete with two skids (B) which maintain a small clearance between the probe and the ground.
   - A straight probe (C) for pinpointing leaks from pipe fittings, inside ducts or through ventilating bricks or other apertures, or general atmospheric sampling.
   - A carpet probe (D) which can be wheeled along over a smooth surface collecting samples at ground level.
   - Bell housing probe (E) for bore hole applications



2. Telescopic Probe with polytetrafluroethylene (PTFE) tubing for monitoring volume organic combustibles. The telescopic probe terminates with a straight length of 5 mm diameter stainless steel tubing to which a variety of probe ends can be fitted. Straight probe extensions are available for collecting bore hole samples.

To order equipment not supplied as standard see the Spares and accessories (Section XI, p30).

8.2 Using Gas-Tec in a moving vehicle

Mount the Gas-Tec on a Trigger survey unit to operate from a moving vehicle.

The Trigger Survey System is an integrated system formed when a Gas-Tec is attached (via quick release fasteners) to a GES Trigger Survey unit. The Trigger unit contains a sample boom pump fitted with monitoring electronics, audible alarms and a Sample Boom Kit.

To order a Trigger Survey unit see the Spares and accessories section (XI, p30).

IX Specification

Description	Hydrocarbon gas detector
Sensor	Flame Ionisation Detection (FID)
Gas	Calibrated to Methane (CH_4) Other correction factors available
Range	0-100 ppm 0-1000 ppm 0-10,000 ppm
Accuracy	+/- 10%
Response time	<2 seconds
H2 Cylinder Life	UK & EU 400 ml = 60 hrs EU 100 ml = 15 hrs USA 300 ml = 45 hrs
Case	High impact resistant UV resistant glass reinforced nylon
Size	385 x 205 x 125 mm (15.2 x 8 x 5 inches)
Weight	2.4 kg without cylinder
Ingress protection	IP54
Audible alarm	Rising tick increasing with presence of gas
Visual alarm	Indication of status on LCD display
Backlight	Adjustable intensity and time off delay
Battery type	Rechargeable Lithium-ion Users may not change the battery of this product: it must be replaced at Crowcon or a service centre.
Battery life	22 hrs
Recharge time	2.5 hrs
Operating temperature range	-5°C to +55°C (23°F to 131°F)
Humidity	5 to 95% RH non-condensing
Sample input	Via quick connect filtered coupling
Outputs	Headphone, USB and Trigger sockets
Data logging	5760 datalogs
Event log	5760 events
GPS	Accurate to within 10 m with 5 satellite lock
EMC & approvals	EN50270 & EN50271:2002
Industry approvals	FCC and CE This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Calibration period	Recommended every 6 months
Warranty	12 months against faulty components or manufacture

X Looking after Gas-Tec

10.1 Gas cylinder

Start with a filled gas cylinder. The ‘gas pressure low’ prompt will show when the pressure is too low for the unit to function properly.

A full 400 ml gas cylinder (150 bar, 2150 psi) should last for approximately 60 hours. The average hourly pressure drop is approximately 2.5 bar (35 psi).

Make sure the cylinder is turned off using the gas cylinder ON/OFF valve after each use.

See also Section XII Hydrogen Safety (p32)

10.2 Filters

The purpose of the filter assembly is to protect the flame chamber from contamination. If water or solid particles enter the chamber, it may cease to function properly. The accuracy of readings may be affected.

The filter assembly consists of a filter backing disc, a 25 mm diameter hydrophobic filter element, an 'O' ring, and a 27 mm diameter paper pre-filter element. Assemble the filter using components in order as shown in the illustration below.

The paper pre-filter should be inspected regularly and replaced when necessary. This will protect the hydrophobic filter from coarse contamination and extend its life. When fitting this filter, the hydrophobic surface should be placed in contact the 'O' ring. The fibrous surface, marked with a red dot, should be placed face down against the backing disc.

If water enters the filter assembly, the hydrophobic surface will prevent moisture entering the flame chamber, but before continuing to use the Gas-Tec, make sure the probe and pre-filters are clear.

Discard the pre-filter.

Shake or blow lightly on the hydrophobic surface.

Reassemble the unit with a new pre-filter.

Dry and clean the probe and tube assemblies thoroughly before reusing.

NOTE: Instruments should not be run without the filter assembly.

10.3 Probes and tubes

Check probes and tubes for damage before use.

The water trap cavity at the bottom of the insulated probe handle should be cleaned out with a clean rag or tissue (do not use volatile solvents). The joint should be opened periodically and any water shaken out. Avoid water passing into the instrument.

Also clean the tapered joint by which the probe attachment is fixed to the handle.

The probes should be kept clean, with any small holes unobstructed. Pricking with a pin and reverse blowing should be adequate.

10.4 Rechargeable battery

Fully charged batteries should last approximately 22 hours.

At low temperatures the charge will not last as long.

The level of charge is displayed using the battery symbol on the LCD display, and as a percentage on the System submenu under the Info menu (see Section VI.1, p20).

As a general guide, each bar on the display will give five hours of operation.

The symbol will flash when the battery needs recharging.

Recharge the battery after each use of the Gas-Tec so it will be ready for the next session.

While the unit is recharging, the battery icon will show. The display will report that the battery is charging. The LED at the left of the LCD display will flash green.

When the unit is fully charged, the message 'CHARGING COMPLETE' will be displayed.

IMPORTANT:

(a) The batteries will slowly discharge if the charger is plugged into the instrument with the mains supply disconnected.

(b) If the instrument is left unused or in storage, the batteries should be charged every month to keep them in good working order.

(c) Due to new shipping regulations, when the Gas-Tec is shipped either from GES or an authorised service centre to you or when sending the instrument in for service, the instrumet must be no more than 30% charged as it contains a lithium-ion battery pack.

(d) Upon receipt of the Gas-Tec, the instrument must be placed on charge until the message 'CHARGING COMPLETE' is displayed.

(e) Failure to comply with the above charging proceedures may result in the battery pack becoming depleated to the point where the instrument will not accept a charge and will need to be sent to GES or an authorised service centre for a chargeable repair.

10.5 Servicing

Contact GES or an authorised service centre.

XI Spares and accessories

Options	*Description*
99F66001	Trigger - Mobile survey system
E011056	Trigger data adapter
99F03001	Hydrogen filling panel - UK attachment as standard
ADA03001	Adapter for EU cylinders for filling panel
CYL99003	UK 400ml cylinder, Empty
CYL99014	UK 400ml cylinder, Full
HYD99001	Hydrogen cylinder refill
CYL64007	EU 100ml cylinder, Empty
CYL64008	EU 400ml cylinder, Empty
Probes	
HND64001	Insulated probe handle
PRB64002	Angled 'coat hanger' probe attachment
C01193	Probe filter assembly kit
FIT99034	Angled probe skids
M01197	Probe converter kit (converts old probes for new Gas-Tec)
PRB64001	Straight probe attachment
PRB99007	Probe - cup attachment
PRB99006	Bore-hole probe attachment
C03192	Wheeled carpet probe (trolley)
PRB99011	Telescopic probe kit
Spares & Accessories	
M07979	Manual (multilingual)
FIL99039	Spare filters (box of 400)
C03452	GES blue strap
M06069	Replacement wheeled ABS case with fitted foam
E011054	Multiregion power supply
C02007	Headphones
E07647	USB lead
C01276	Vehicle Charger
Service Spares	
E011058	Pump assembly
DAM64002	Pulsation damper
C011181	Pressure regulator - UK build
C011182	Pressure regulator - EU build
C011183	Pressure regulator - IMP build

M01195	Pressure transducer assembly
M041036	Top chassis kit (orange cover, screen, membrane and fixings)
S012986	Display PCB assembly
M041041	Left and right blue sides (includes fixings & label)
E011055	Igniter assembly
M04120	Tubing set (comprises full kit for refit of 1 Gas-Tec)
E011059	Battery pack (Li-Ion)
FLM64003	FID and thermocouple
THC64001	Thermocouple assembly
C03453	Probe Coupling
S012985	Main PCB

XII Hydrogen Safety

Safe use of hydrogen cylinders

12.1 General guidelines

It is important to maintain a supply of full hydrogen cylinders if the Gas-Tec is to be used regularly. See Section IX to check how long the cylinders to be used will last.

Hydrogen is not a dangerous gas if released into the air in small quantities. The biggest risk is that hydrogen will build up inside the equipment. Beyond a certain pressure, or rapidly released into air, the gas could ignite. This could cause an explosion.

12.2 Using Hydrogen Gas Cylinders

The following are some safehandling guidelines that have been established to help assure the safety of your hydrogen gas operations.

- It is very important to secure all compressed gas cylinders in an upright position where that they cannot be knocked over.
- Hydrogen gas cylinders should never be used if pressure has not been reduced by a suitable regulator at the cylinder, or at the outlet of the header valve of a cylinder manifold. Use only regulators intended to be used with hydrogen and never force connections that do not readily fit together.
- Never open a hydrogen cylinder valve to remove dust or dirt from fittings prior to attaching a regulator. While this practice may be acceptable for other gases, with hydrogen there is a risk of selfignition.
- Once the regulator is attached, be sure that the regulator adjusting screw is in the closed position before opening the cylinder valve. When opening the valve, turn the hand wheel slowly so that the hydrogen does not enter the regulator suddenly. Never use a wrench, hammer, or other tool to open or close the hand wheel.

12.3 Filling the hydrogen cylinder

When filling hydrogen please follow all safety precautions that are supplied, or use an approved specialist to do this.

Damaged or discarded cylinders should be treated as ‘hazardous waste’.

XIII Troubleshooting

13.1 Troubleshooting guide

Symptom	Diagnosis	Remedy/check
Does not switch on	Battery flat	Recharge battery
Flame goes out	Machine has been tilted	Set machine upright
Flame goes out	Material has entered Gas-Tec	Check filters
Data card 95%	Memory card almost full	Back up log files and delete from card
GPS reading	No lock	Take outside and wait
No card shown on LCD	No card detected	Check if memory card is inserted into the card slot

13.2 Warnings list

Popup Message	*What this means*	*What you need to do*	*Where to find further info*
	Where to find further info		
Please Wait	Wait until next instructions	Do not press any buttons and wait for any new messages.	
Press Igniter	Instruction to press ignitor	Press the igniter.	III.x
Turn On Gas Supply	Device needs Hydrogen gas to continue.	Turn on the Gas by opening the knob on the cylinder.	III.x
Gas Supply Low / No Cylinder attached.	Gas pressure is low or cylinder not attached	Check the bottle pressure and / or replace the cylinder	III.x
System Primed	Prepared for firing	Wait for new messages	III.x
Auto Zero, Place probe in clean Air.	Device prepared to set the zero PPM level.	Make sure that the device is in clean air and / or the background PPM level is less than 30 PPM	III.x
Reading Marked	The current record (with GPS DATA) is flagged in the logs.	Information only.	VI.x
Reading Marked (No GPS Fix)	The current record (without GPS DATA) is flagged in the logs.	Information only. Recommended to achieve GPS lock first.	VI.x
Do you want to stop readings	The Stop button is pressed. User confirmation to stop.	Confirm by pressing the Yes / No button.	III.x
Enter Pin For Access to admin menu	User trying to access protected settings.	Enter a valid pin to continue.	VII.x
PIN Wrong	Invalid PIN entered	Enter a valid PIN	VII.x
Time Not Saved	Back button pressed on Set time page.	Press OK to change time or back button to cancel.	V.x
Date Not Saved	Back button pressed on Set date page.	Press OK to change date or back button to cancel.	V.x
Saved	OK button pressed	The new values updated successfully.	V.x, VII.x
Enter New Admin Pin	Request to enter new admin pin.	Enter a new PIN for admin menu.	VII.x

Powering Down	The device is powering down	Keep holding down the power button until the device counts down to zero and turns off.	X.x
Charging	The device is charging.	Nothing.	X.x
Charge Complete	Device charged completely.	Disconnect the charger from the unit.	X.x
Charging Error	Error in charging device.	Restart the device and repeat the charging process.	X.x
Time Date Failure	The Date/Time on the device is lost.	Contact manufacturer.	V.x
Service Expired	The device needs servicing.	Return to manufacturer.	VII.x
Turn Off Gas	The gas is not required.	Turn off the gas by turning off the knob on the cylinder.	III.x
Plug In Charger	Charger is required to continue.	Plug in the charger and power on the charger.	X.4
Lost GPS Signal	No GPS satellites in view.	Keep the device under open sky to acquire GPS Signals.	VI.x
Memory Card Almost Full	The memory card is running low on free space.	Back up the log files to PC and then delete the log files from the device.	VI.x
Flame Failure	The flame has failed.	Press the igniter again to lit the flame.	III.x
Battery Low	The battery level is low.	Turn off the device and connect the charging unit to the device.	X.4
SYSTEM ERROR	System has reported an error.	Restart the device. If the error reappears, consult manufacturer	
Contact your supplier for service / repair	System has reported an error.	Restart the device. If the error reappears, consult manufacturer	
Tilt Alarm	The Device is tilted	Hold the device upright with the display facing upwards.	III.x

XIV Warranty

This equipment leaves our factory fully tested and calibrated. If within the warranty period of one year from despatch, the equipment is proved to be defective by reason of faulty workmanship or material, we undertake at our option either to repair or replace it free of charge, subject to the conditions below.

Warranty Procedure
To facilitate efficient processing of any claim, contact our customer support team on +44 (0)1707 373751 with the following information:

Your contact name, phone number, fax number and email address.
Description and quantity of goods being returned, including any accessories.
Instrument serial number(s).
Reason for return.

Instruments will not be accepted for warranty without a GES Returns Number. It is essential that the address label is securely attached to the outer packaging of the returned goods.

The guarantee will be rendered invalid if the instrument is found to have been altered, modified, dismantled, or tampered with. The warranty does not cover misuse or abuse of the unit.

Any warranty on batteries may be rendered invalid if the use of an unauthorized charger is proven. Non-rechargeable batteries are excluded from this warranty.

Warranties on sensors assume normal usage, and will be rendered invalid if the sensors have been exposed to excessive concentrations of gas, extended periods of exposure to gas or have been exposed to 'poisons' that can damage the sensor, such as those emitted by aerosol sprays.

Warranty Disclaimer
GES accept no liability for consequential or indirect loss or damage howsoever arising (including any loss or damage arising out of the use of the instrument) and all liability in respect of any third party is expressly excluded.

This warranty does not cover the accuracy of the calibration of the unit or the cosmetic finish of the product. The unit must be maintained in accordance with the Operating and Maintenance Instructions.

Our liability in respect of defective equipment shall be limited to the obligations set out in the guarantee and any extended warranty, condition or statement, express or implied statutory or otherwise as to the merchantable quality of our equipment or its fitness for any particular purpose is excluded except as prohibited by statute. This guarantee shall not affect a customer's statutory rights.

GES reserves the right to apply a handling and carriage charge whereby units returned as faulty, are found to require only normal calibration or servicing, which the customer then declines to proceed with.

For warranty and technical support enquiries please contact:

Customer Support

Tel: +44 (0) 1707 373751
Fax: +44 (0) 1707 373752
Email: customersupport@gesuk.com

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BSI ISO 9001:2008 FS 34909 UKAS QUALITY MANAGEMENT

CoGDEM The Council of Gas Detection and Environmental Monitoring

SAFEcontractor APPROVED