



GA3000 Range Gas Analyser

Operating Manual



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1.0 Manual Guidelines

1.1 Document History

Issued By	Issue Date	Change Control ID	Issue No.	Reason for Change
LA	Aug 2010	OMGA3KN	1.01	New Instructions.
LA	Oct 2010	OMGA3KN	1.02	New Instructions.
LA	Nov 2010	OMGA3KN	1.03	Twisted pair cable for outputs and Technical Specification update

1.2 Safety Symbol

Information in this manual that may affect the safety of users and others is preceded by the following symbol:

 **Warning**

Failure to follow this information may result in physical injury which in some cases could be fatal.

1.3 Notes

Important/useful information and instructions are shown clearly throughout the manual in a note format.

For example:

- ✎ Note: For further information please contact Technical Support at Geotech (UK) Limited on +44(0)1926 338111 or email technical@geotech.co.uk

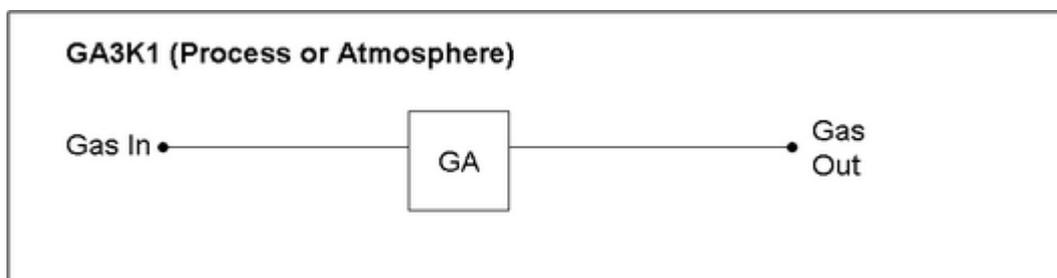
2.0 Introduction

This manual explains how to use the GA3000 range of gas analysers for the following model types listed below:

- GA3000 (GA3K1) - No H₂S
- GA3000 (GA3K2) - H₂S vent to atmosphere
- GA3000 (GA3K3) - H₂S vent to process

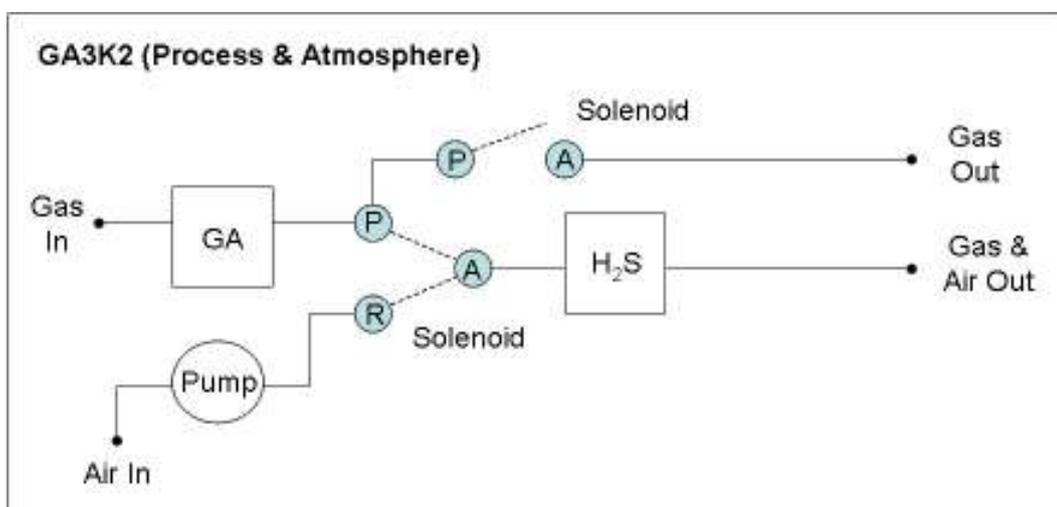
2.1 GA3000 Model Types

The GA3K1 measures CH₄, CO₂ and O₂ by drawing the sample in and out to process or atmosphere.



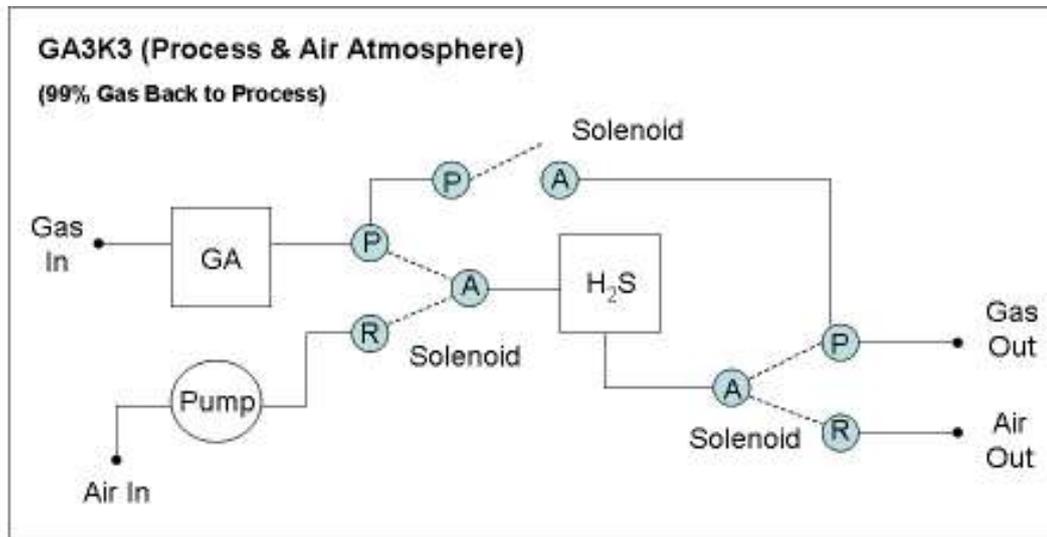
If an H₂S measurement is required there are two options available which are defined by the outlet from the H₂S module, which is separate from the main exhaust for CH₄, CO₂ and O₂ measurement.

The GA3K2 will switch gas to the H₂S sensor at the intervals the operator defines and run a sample through for three minutes to obtain a stable reading. At the end of the three minutes the reading is displayed on screen and output as a 4 – 20mA signal. This reading is then valid until the next sample is taken. After this three minute period the H₂S module will be purged with clean air. This means that the exhaust from the H₂S module is separate and can be vented to atmosphere or process. However, if you choose to return the sample to process this will mean a small amount of air (five minutes worth of sampling, approximately 1.5 litres per sample) is inserted in to your gas line.



The GA3K3 adds in another solenoid valve which will switch such that when the H₂S reading is taken the exhaust will go into the same line as the main exhaust from the CH₄,

CO₂ and O₂ readings, which can be put back into the gas system. Once the clean air purge begins, this will switch over such that the exhaust is then to atmosphere, avoiding the issues with putting air into the main gas system, or venting gas to atmosphere.



Note: Letters P, A and R indicate tubing connection points to the solenoids. These letters can be found on each solenoid within the system.

All models use a single sample point system. Gas analysers are a sensitive piece of scientific equipment, and should be treated as such.

2.2 Safety Instructions

<p>⚠ Warning</p>	<p>The GA3000 range of gas analysers can be used for measuring gases in a wide range of environmental applications as described in this manual.</p> <p>Inhaling toxic gases may be harmful to health and in some cases may be fatal. It is the responsibility of the user to ensure that he/she is adequately trained in the safety aspects of the gases being used and appropriate procedures are followed. In particular, where hazardous gases are being used the gas exhausted from the analyser must be piped to an area where it is safe to discharge the gas, or returned to the process if the option was purchased at time of manufacture. Hazardous gas can be expelled from the instrument including when purging with clean air.</p> <p>The amount of vented gas is typically 300-400 ml/min when not returned to the process. If in any doubt consult an appropriately qualified person about the dangers of the gas you are measuring.</p>
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- The equipment is only for use in ambient temperatures in the range -5 °C to +40 °C and should not be used outside this range.
- Installation shall be carried out in accordance with the applicable code of practice by suitably trained personnel.
- Repair of this equipment shall be carried out in accordance with the applicable code of practice.

- If the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions, e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

⚠ Warning	It is the responsibility of the operator to ensure that they maintain the functionality of the GA3000 by regularly draining the catchpots. When opening the cabinet great care must be taken as mains voltages are present. It is the responsibility of the user of the equipment to ensure that all personnel are adequately trained.
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⚠ Note: It is vital the instructions in this manual are followed closely.

2.3 Instructions For Safe Use

(Reference European ATEX Directive 94/9/EC). This equipment is ATEX certified according to the following designation.

The GA3000 gas analyser has been certified to Hazardous Area Classification

⚠ II 3 G Ex nA nL nC d IIA T1 Gc (-5 ≤ Ta ≤ 40)

It is the responsibility of the user to determine the protection concept and classification required for a particular application.

2.4 Range of Environmental Conditions

The GA3000 is designed for use outdoors with an IP rating of 54. The operating temperature range is -5°C to +40°C. The mains voltage can fluctuate up to ±10% of the nominal voltage.

2.5 Safety Symbols Used on the GA3000

The following safety symbols are used on the GA3000 range of analysers:

	Earth (ground) Terminal
	Protective Conductor Terminal
	Caution, risk of electric shock
	Caution, risk of danger

3.0 The GA3000 Range Gas Analyser

3.1 The GA3000



The GA3000 range of gas analysers builds on field-proven gas analysis technology to offer effective on-line monitoring with local data outputs.

Features:

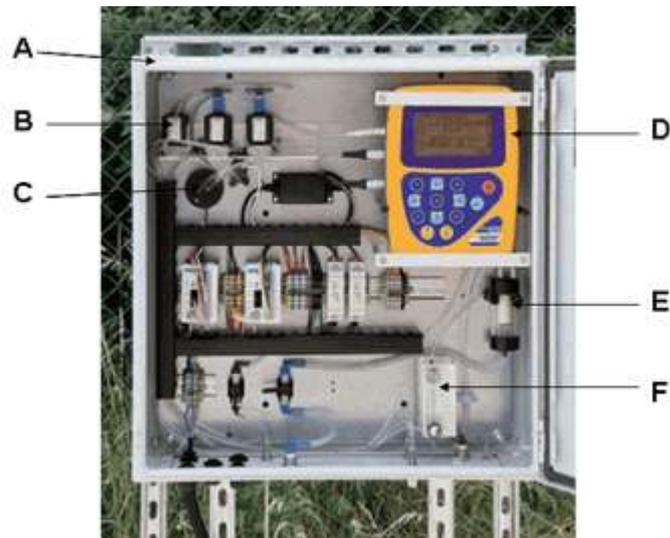
- 3 gases standard CH₄, CO₂ and O₂
- H₂S measurement 0-5,000ppm (optional)
- H₂S clean air purge
- Large, clear, backlit display
- 4-20mA outputs for each gas
- Alarm relays - user configurable
- Gas return-to-process option
- User replaceable H₂S sensor
- IP54 rated weather-proof enclosure

Benefits:

- Low cost of ownership
- Calibration accredited to ISO 17025 (CH₄, CO₂ and O₂)
- Quick and easy self-installation
- Compact, self-contained system
- Gas conditioning included as standard
- Zero service downtime – 'Hot Swap' capability
- Clear servicing schedules
- Field proven, industry standard equipment
- Start-up configuration wizard
- Simple user calibration

Main Application:

- Landfill and Biogas
- Anaerobic digestion projects
 - Waste water treatment
 - Food processing plants
 - Food and animal waste
- Clean Development Mechanism (CDM)

3.2 Instrument Components – Standard Product

GA3000 (GA3K3) Standard Product

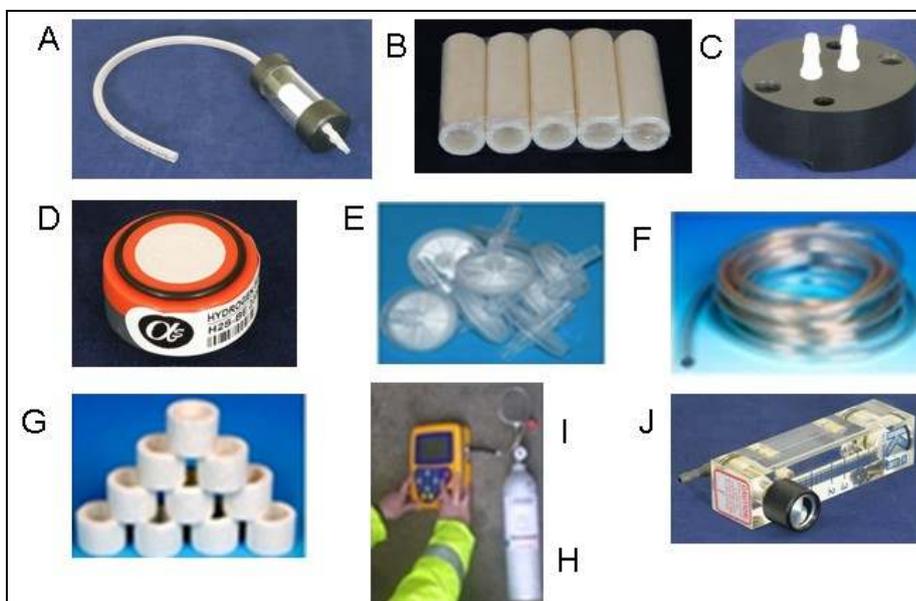
Reference:

- | | |
|---|--|
| A | Instrument Enclosure Unit |
| B | Solenoids (GA3K2 & GA3K3) |
| C | H ₂ S Cell (Optional – GA3K2 & GA3K3) |
| D | Gas Analyser Instrument |
| E | GA3000 Catchpot assembly with drainage |
| F | Flow Meter |

GA3000 Range Operating Manual
(Located in a clear pocket inside the front door of the enclosure unit).

4.0 GA3000 Accessory Products

Optional accessory and replacement parts may be purchased for the GA3000 range from Geotech (UK) Limited directly. Please refer to the website www.geotech.co.uk for further details on pricing and how to order.



Ref	Description	Mfr Order Code
A	GA3000 Catchpot with Drainage Tubing	GA3K-S2
B	Coalescing Filter for GA3000 Catchpot x 5	GA3K-S1
C	H ₂ S Sensor Manifold	GA3K-S4
D	H ₂ S Sensor for GA3000 with O-ring	GA3K-S3
E	In-line Water Trap Elements – Barbed Fittings (Pack of 10) In-line Water Trap Elements – Barbed Fittings (Pack of 30)	GA4.9 GA4.9(30)
F	5m length 4mm I.D. tubing	GA3K-S6
G	Inlet Port Filters (pack of 10) Inlet Port Filters (pack of 30)	GA4.1 GA4.1(30)
H	Gas, 60% CH ₄ , 40% CO ₂ (58L Cylinder) FLAMMABLE PRODUCT Gas, 1,400ppm H ₂ S	GA4.3B-58 GA3.4C-58
I	Check Gas Regulator (For all GA analysers). Used in conjunction with calibration gas canisters. This valve controls the flow of gas – supplied c/w safety valve.	GA6.8
J	Gas flow control meter for GA3000	GA3K-S5

5.0 GA3000 Range Instrument Features**5.1 Physical Characteristics of the Instrument Panel****Front View:****Reference:**

- A Main Gas Read Screen
- B Key 2 – Scroll Up
- C Key 4 – Scroll Left
- D Key 8 – Scroll Down
- E Key 0
- F On/Off Key
- G Key 6 – Scroll Right
- H Enter Key
- I General Option Keys
- J Backspace/ Delete/ Pump
- K Instrument Label

Back View:**Reference:**

- L Inlet Port Filter
- M Serial Number
- N Product Option Number

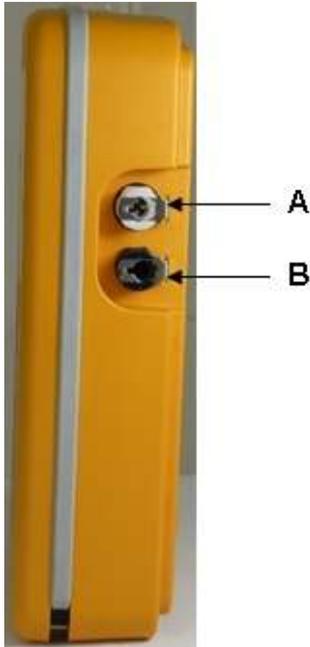
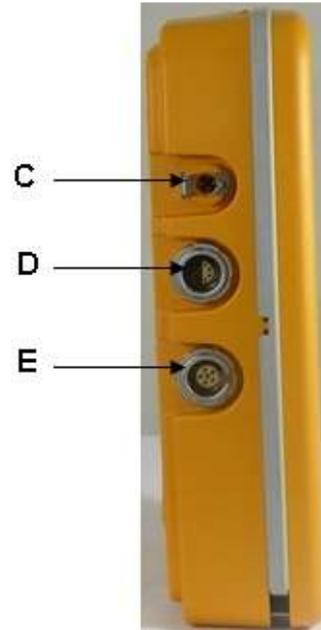
5.2 Panel Key Functions

Front Panel:

	Keys	Function
A	Main Read Screen	Start and end screen when using the instrument.
B	Scroll Up Key	Also 'Key 2'. Press scroll up to display more information.
C	Scroll Left Key	Also 'Key 4'. Enables the operator to scroll left to display more information.
D	Scroll Down Key	Also 'Key 8'. Enables the operator to scroll down to display more information.
E	Backlight	Also 'Key 0'. Backlight is always on and cannot be turned off.
F	On/Off Key	Hold the 'On/Off' key for two seconds to switch the instrument on and off.
G	Scroll Right Key	Also 'Key 6'. Press scroll right to view further information on the instrument read screen.
H	Enter Key	The 'Enter' key accepts/confirms choices made by the operator to various functions and operations. Also required to confirm numeric data entry and enable edit mode in certain menu options.
I	General Option Keys	Keys 1, 2, 3, 4, 5, 6, 7, 8, 9
J	Pump Key	The pump is always operational and cannot be controlled by the operator in normal use. Also backspace and delete.
K	Instrument Label	Instrument Label

Back Panel:

L	Inlet Port Filter	The inlet port filter acts as a particulate filter. The grey cover houses and protects the inlet port filter. Use a 50p coin to undo the cover when changing the filter. Be careful not to over tighten when replacing the cover.
M	Serial Number	Unique identification for the instrument. Verification of the serial number will be required if Technical Support assistance is needed.
N	Product Option Number	Records analyser internal configuration at the time of manufacture, e.g. GA3K3.

5.3 Instrument Connection Points**Right Side View:****Left Side View:****Right Side View:**

A Inlet Port

Attach the sample tube to this port to take a gas sample.

B Unused Port

This port is NOT used on a GA3000.

Left Side View:

C Gas Outlet Port
(Yellow Port)

The gas outlet port is the point at which the sample gas is expelled.

D Connector D (Half Moon)

Communications port used to connect the instrument to the master PLC.

E Connector E

Used to attach the external supply to the instrument.

6.0 Installation

6.1 Pre-Installation Requirements

In order to effectively install the GA3000 system it is important that the site is ready and in a fit state. In particular, the following points should be noted.

- A suitable mains supply as detailed in this manual is installed.
- A suitable location is determined for the installation of the instrumentation.
- There are no health and safety problems on site – a risk assessment may be required.
- The gas sample point is installed.
- The GA3000 system has been received on site, unpacked and checked for obvious damage.
- 4 – 20mA cable has been installed to the instrument location

⚠ Note: Failure to comply with any of the above may result in additional time on site and additional costs.

 Warning	Power should NOT be applied before all plumbing and wiring has been completed and tested.
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6.2 Mounting the Cabinet

The system is contained in one cabinet. The cabinet is weatherproof with a rating to IP54. The cabinet must be fixed to a suitable wall or framework capable of holding the weight of the system.

Although the cabinet is weatherproof, consideration should be given to mounting it in an area that is protected from the worst of the weather. For example, maintenance of the analyser will be made easier if it is not exposed to driving rain, and positioning the cabinet in direct sunlight in hot countries should be avoided as this may increase the internal temperature of the cabinet.

The weight of the cabinet and contents will depend on the options that are fitted, but will be approximately 29 Kg; it is therefore recommended that the installation is undertaken by a minimum of two persons.

Four Mounting fixings are supplied fitted to each corner of the GA3000. Suitable nut & bolt or raw bolt arrangements will have to be defined by the operator for fixing to the wall or framework. Dimensions of the cabinet are provided in the technical specification.

6.3 Mains Wiring

GA3000 systems are suitable for use in 110V to 230V applications.

A switched and fused mains supply must be provided local to the unit. The mains switch should be clearly marked as the switch for the unit and positioned in an easy to operate position.

⚠ Note: This equipment should only be connected by a suitably qualified electrician.

 Warning	The use of alternative fuse types could affect the safety of the apparatus. Do NOT remove or replace fuses when energised.
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Please refer to the following table for the designation and location of each fuse together with its type and rating and refer to section 6.6 - 4-20mA for a table of conductor types.

Designation	Circuit	Rated Voltage (V)	Rated Current (A)	Type
FS1	Mains input	250	3.15	20mm Time delay, LBC T3.15AL250V
FS2	Relay 1, 2, 3, 6 coils	250	1	20mm Time delay, LBC T1AL250V
FS3	Solenoid 1 coil	250	1	20mm Time delay, LBC T1AL250V
FS4	Solenoid 2 coil	250	1	20mm Time delay, LBC T1AL250V
FS5	Solenoid 3 coil	250	1	20mm Time delay, LBC T1AL250V
FS6	Relay 4, 5, 7, 8 coils	250	1	20mm Time delay, LBC T1AL250V

6.3.1 Protective Earthing

The safety of the equipment depends on there being effective earthing of the apparatus via the mains supply.

⚠ Warning	<p>This equipment must be earthed. It must be connected to an earthed mains supply.</p> <p>Failure to connect a suitable earth to the analyser could result in serious injury.</p>
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The mains requirement for the system is:

Type	AC
Voltage	100 - 250VAC
Frequency	50/60Hz
Current	3A

The fuse rating is 3.15A.

The mains cable must enter the cabinet via a metal EX 'e' gland and is connected to reference point A on diagram 1. Please also refer to diagram 2 - Mains Wiring.

⚠ Warning	<p>Use of a non Ex 'e' gland may invalidate the ATEX certification.</p> <p>This equipment must be provided with a switched and fused mains supply. The switch must be mounted close to the equipment and clearly identified as the disconnecting device for the equipment.</p> <p>Failure to connect a suitable earth to the analyser could result in serious injury.</p>
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6.3.2 How to Wire the Mains Supply



Diagram 1

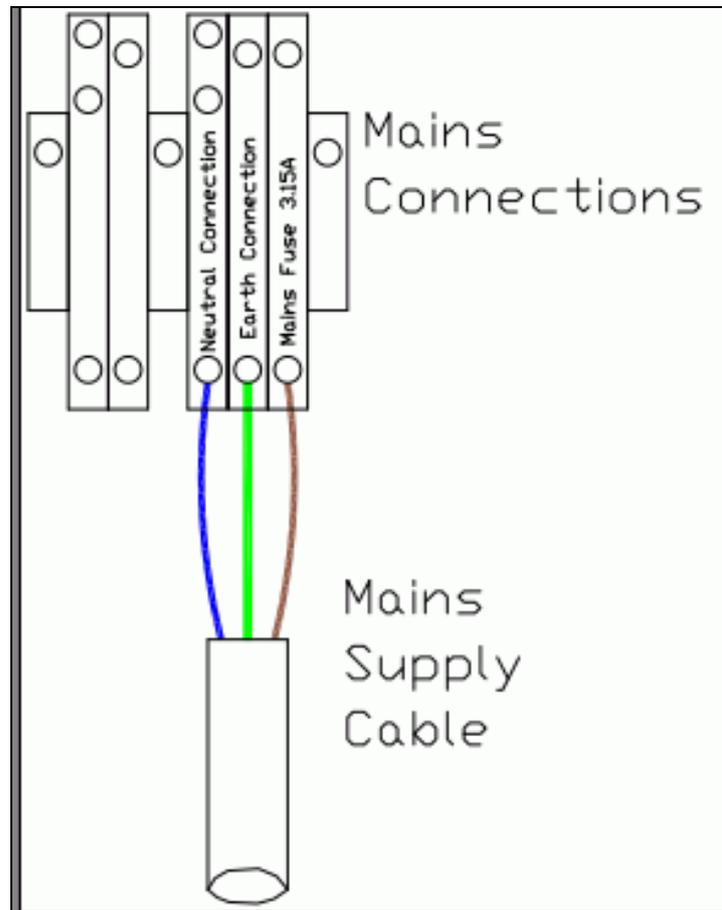
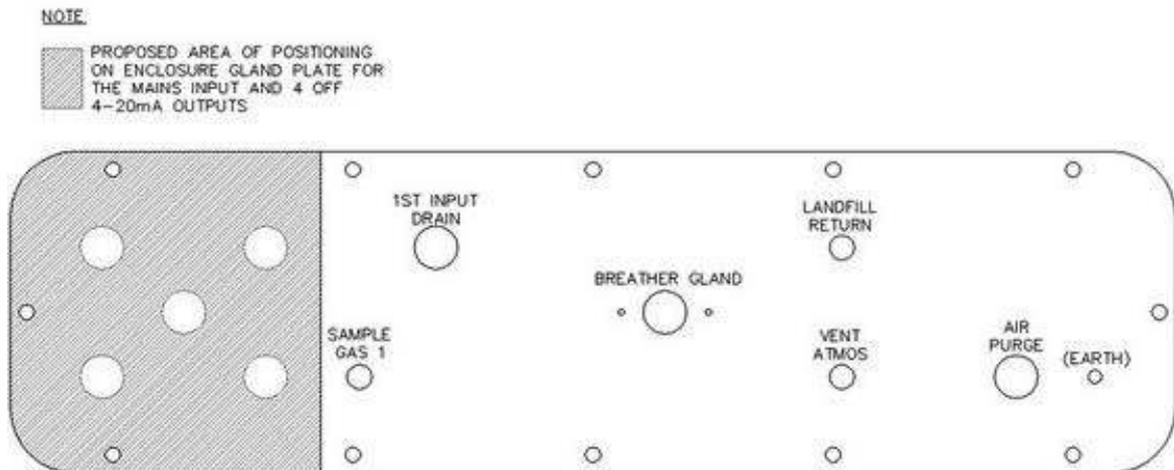


Diagram 2 - Mains Wiring

6.4 Gland Plate Drilling Template

It is a requirement for the operator to drill the required holes for the mains supply and any outputs you wish to use. The mains and output cables must enter the cabinet via a metal EX 'e' gland. A diagram has been supplied below for recommendations for where holes should be placed.



⚠ Note: This procedure requires suitably qualified personnel. Before commencing make sure the unit is disconnected from the mains.

⚠ Warning

The mains and output cables must enter the cabinet via a metal EX 'e' gland and the mains supply should be isolated.

6.5 Alarm/Fault Relays

The system has three available relays, two for user definable alarms and one for a fault condition. The relays are volt free normally open or normally closed. If the two alarms / fault relay outputs are being used, drill the gland plate using a suitable hole saw for the size of gland being used. A metal EX 'e' gland must be used. Wire the relays in the order of Alarm 1; Alarm 2 and Fault from left to right (refer to reference point D on diagram 1). The connections for each relay are as follows:-

- Connection 11 = Relay Common
- Connection 12 = Relay Normally Closed
- Connection 14 = Relay Normally Open

⚠ Note: Fail safe always energised then de-energised upon alarm condition or fault.

6.6 4 – 20mA Outputs

If analogue outputs are being used, drill the gland plate using a suitable hole saw for the size of gland being used. A metal EX 'e' gland must be used. Wire the outputs in accordance with diagram 3.

⚠ Note: The outputs 'Current Sink' into the GA3000, labels identify the appropriate outputs namely from left to right CH₄, CO₂, O₂ and H₂S; refer to reference point E on diagram 1.

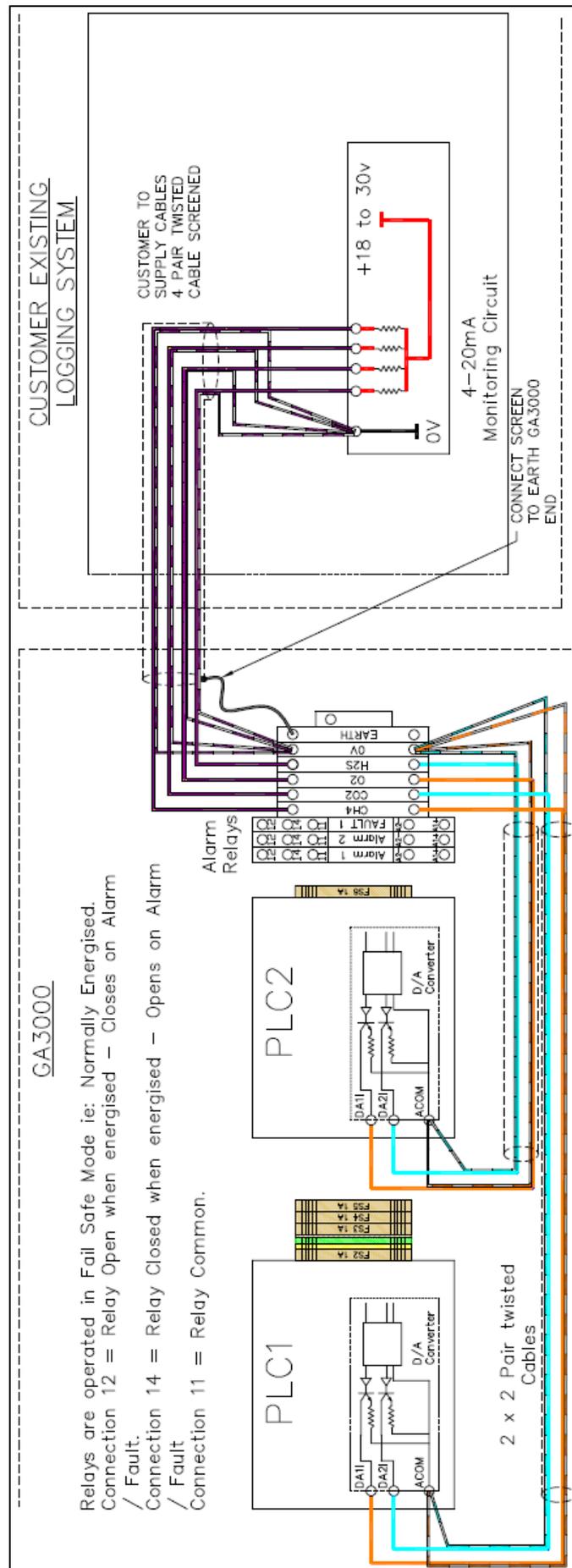
For optimum performance it is recommended that screened twisted pair cable is used.

For the mains and 4 – 20mA terminals the conductor size must be as in the table below:

Conductor type	Allowed conductor size (mm²)
Solid H07V-U mm ²	0,5...4
Stranded H07V-R mm ²	1,5...4
Flexible H07V-K mm ²	0,5...4
Flexible H07V-K and AEH DIN 46 228/1 mm ²	0,5...2,5
Flexible H07V-K and AEH with plastic insul. collar mm ²	0,5...2,5

⚠ Warning	The use of conductors outside of the specification could affect the safety and ATEX certification of the apparatus.
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Diagram 3 – 4-20mA and Relays



6.7 Connecting the Sample Point and Return to Process/Atmosphere Lines

- The sample should be taken and returned to suitable locations at the required monitoring point. It is recommended that a valve is incorporated in the assembly so that the gas can be shut off if the sample line is removed.
- The line should connect to the upper surface of a horizontal pipe. This will prevent excessive amounts of water entering the sample line.
- The gas connections on the analyser are 6mm stainless steel bulkhead connectors, suitable for 6mm o/d stainless steel tubing.
- The sample tube should be connected to the bulkhead connector labelled 'sample gas'.
- Ensure all tube connections are tight and free from leaks.



Sample Gas Conditioning

Care should be taken in routing the sample line, especially in cold environments. The sample line may need insulating or even trace heat to prevent freezing of water within the pipe. This is not part of the GA3000 range and is the responsibility of the operator. The system incorporates a catch pot for removal of liquid and filters to help prevent water from entering the analyser. However, additional water filtering may be required where the sample is heavily contaminated with water.

Periodic inspection of the catchpot is required to check if water has been collected. To drain the water, pause the system (please refer to section 7.7.2), close the sample valve (reference point B on diagram 1 in the horizontal position) and open the catchpot drain valve (reference point C on diagram 1 in the vertical position). After the liquid has drained close the catchpot drain valve, open the sample valve and resume monitoring.

Air Purge Inlet

The H₂S sensor requires uncontaminated air for the purge line. If uncontaminated air cannot be guaranteed at the location of the analyser, a pipe should be connected to the Air purge inlet and terminated at a point where uncontaminated air is present. The connection on the cabinet is a ¼" BSP Female Bulkhead.

Landfill Return

This line is where gas from the exhaust of the analyser is vented. It can be returned to the process or vented to atmosphere (if vented to atmosphere it should be run to a position where it is safe to do so). The connection is a 6mm stainless steel bulkhead connector.

Vent Atmosphere

This line is only used on GA3K2 and GA3K3 systems. Gas from the H₂S sensor is vented at this point as detailed in section 2.1. For a GA3K2 this line can be returned to the process but will introduce air to the sample. For a GA3K3 air during the air purge is vented from this line, meaning it can be left open to atmosphere. The connection is a 6mm stainless steel bulkhead connector.

Drain

The Drain line should be run to a position where it is safe to discharge the small amount of water that is removed from the sample gas. The water may be contaminated. The connection is a ¼" BSP Female Bulkhead.

✍ Note: This line may also vent sample gas for a brief period during each draining operation if the inlet tap is not closed.

6.8 Ventilation Requirements

There are two breathers fitted to the GA3000, one situated at the top and one at the bottom of the enclosure. Ensure there is a free circulation of air around the cabinet.

6.9 Final Checks

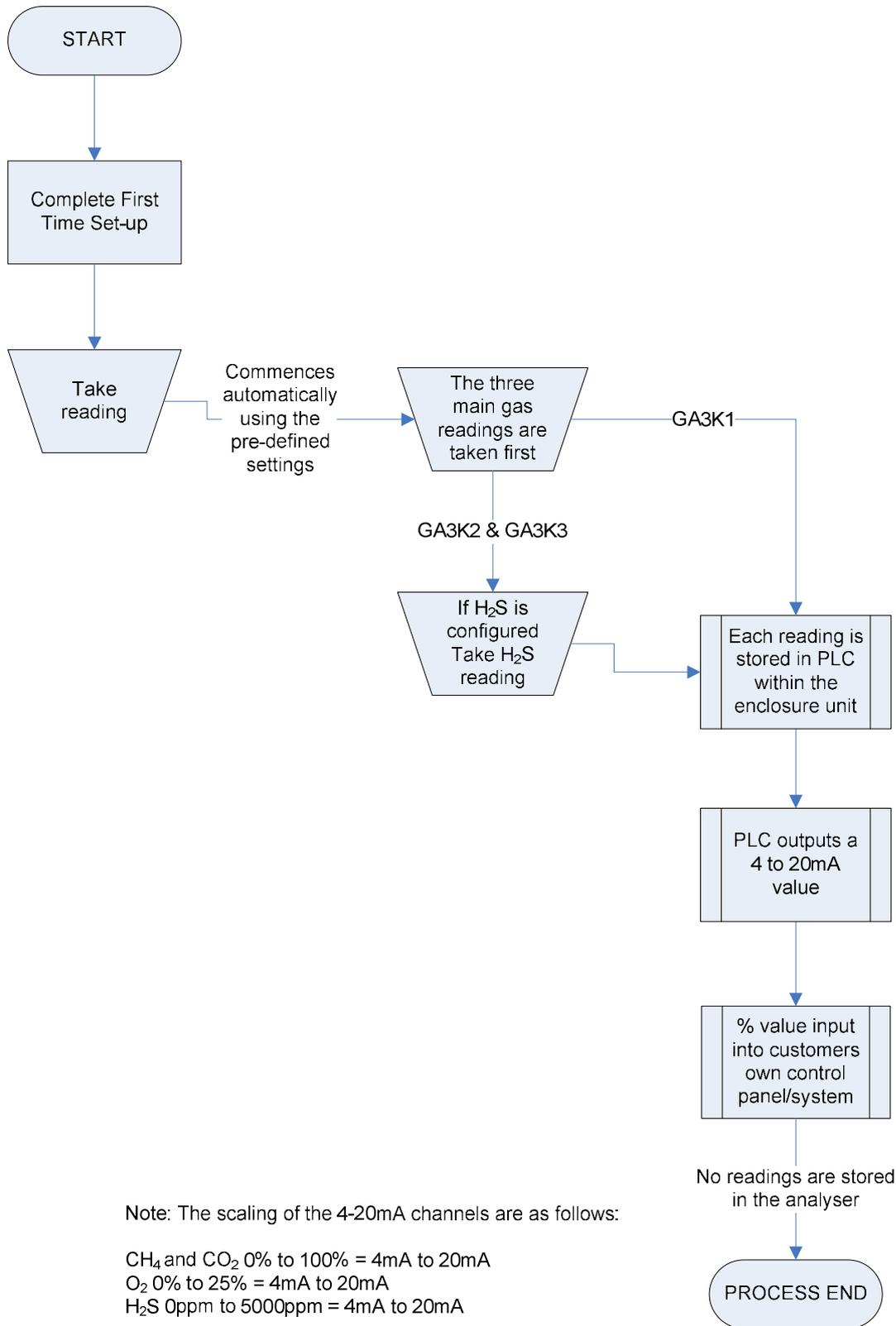
Ensuring the sample valve is open (reference point B on diagram 1 in the vertical position) and the catchpot drain is closed (reference point C on diagram 1 in the horizontal position), power up the system. Five seconds after power is applied the analyser should start-up, displaying the logo and Power-On Self-Test message. The first time the analyser is started after the self-test has successfully completed the 'first time run set up wizard' will begin. Please refer to section 7.3 in this manual for details of this process.

6.10 Cleaning and Decontamination

The equipment must be isolated from the mains supply prior to cleaning or decontamination. The enclosures can be cleaned externally using a mild soapy water and non-abrasive cloth.

Should the need arise for the gas analyser section of the system to be returned for service, it is the responsibility of the owner to ensure that the analyser has been decontaminated or that Geotech has been made aware of any contaminants that may be present.

6.11 GA3000 Sampling Process



7.0 General Operational Instructions

7.1 Switching the Instrument On

- 1) The instrument will automatically turn on 5 seconds after power is connected. If not, check the connections and press the 'On/Off' key. A long beep will be emitted followed by the Geotech (UK) Limited logo display.
- 2) The 'Power On Self Test' will then commence. Refer to the message 'Self-test mode, please wait' at the bottom of the analyser read screen.

7.2 Power On Self Test (POST)

When switched on the read-out will perform a pre-determined self-test sequence taking approximately 30 seconds. The logo remains on screen until the POST has finished. 'Performing Power On Self Test...' is displayed on the bottom line.

During this time many of the analyser's functions are tested, including:

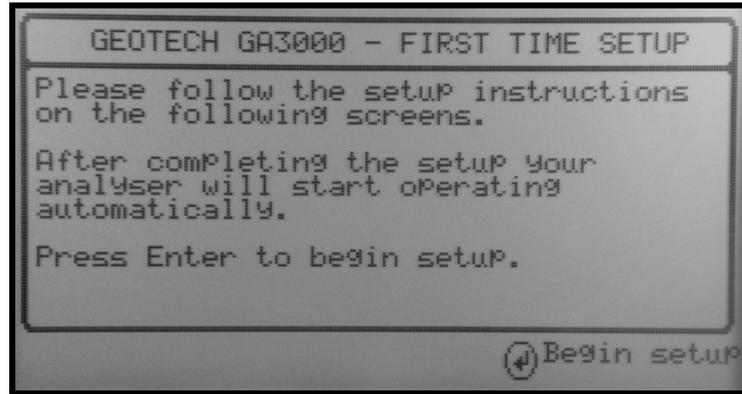
- Test the CH₄, CO₂, O₂, Ref, Baro and 5PSI channel. The test is performed continuously over a short period of time to test faults and stability.
- Switch on the pump, wait 5 seconds and check for blockages.
- Turn off pump.
- Check clock time.
- Check next service due date.
- Test for valid communications to the PLC.
- Test for 'First Time Run Set-up' required.

 **Note:** After completion the splash screen is removed. If any failures occur then the 'Self Test Summary' screen is shown. The self test will automatically re-attempt up to a maximum of three times. If no faults are found then the first time set-up or monitoring will begin. After three failed attempts user intervention is required.

If the fault is 'Service Overdue' or 'Clock Not Set', then you can continue to the next stage by pressing Key 1. The GA3000 will continue automatically after 30 seconds if 'Key 1' is not pressed.

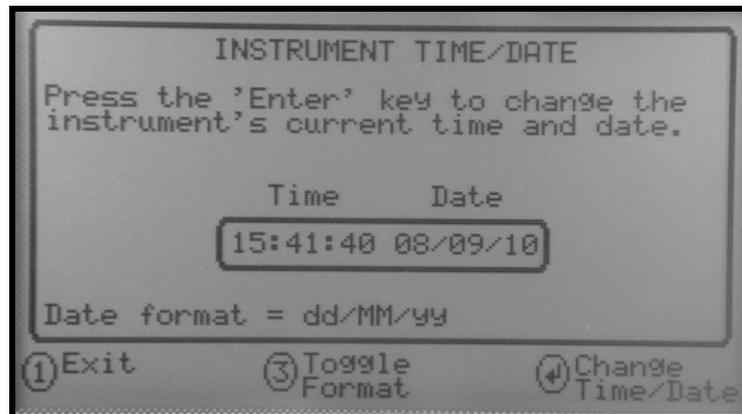
7.3 First Time Run Set-up

- 1) When switching on the instrument for the first time the instrument will detect the first run conditions and run set-up mode. The GA3000 is designed to be fully configurable by the end-user without Geotech support or configuration.
- 2) The following screens are shown in this order:



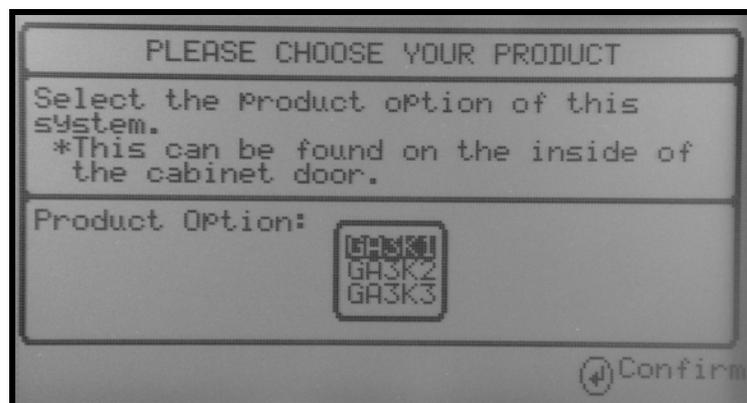
First Time Setup

- 3) Press the 'Enter' key to continue.
- 4) Set the instrument time and date. For more information about this screen, please refer to section '7.8.4 – Set Instrument Time and Date' of this operating manual.



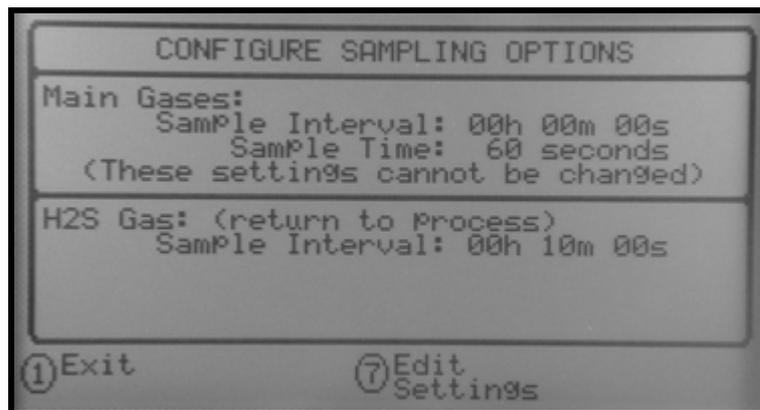
Instrument Time/Date

- 5) Select the instrument model type and press the 'Enter' key. The model type can be found on the inside of the cabinet door.



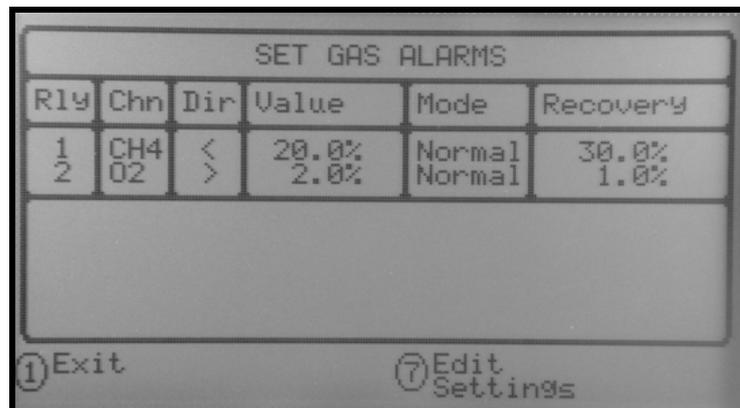
Please Choose Your Product

- 6) Configure H₂S sample interval (where fitted). For more information about this screen, please refer to section '7.8.5 – Sampling Options' of this operating manual.



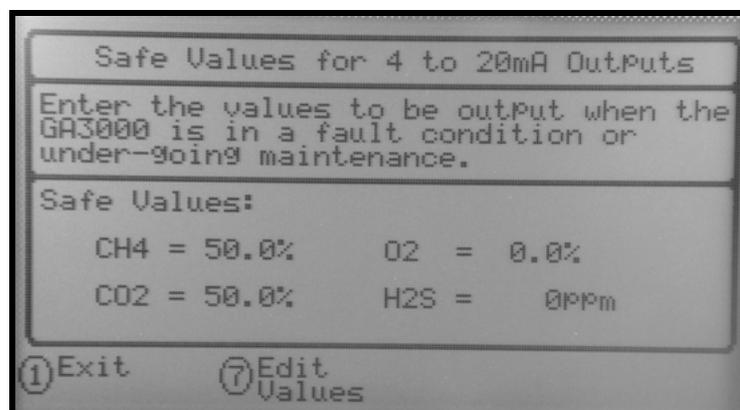
Configure Sampling Options

- 7) Set-up alarm levels (optional - this option can be skipped). For more information about this screen, please refer to section '7.8.2 – Alarm Setup' of this operating manual.



Set Gas Alarms

- 8) Set safe values (Maintenance Mode, optional - this option can be skipped). For more information about this screen, please refer to section '7.7.3 – Safe Values' of this operating manual.



Safe Values

- 9) Once the first time run setup is complete monitoring will begin after approximately 1 minute.

7.4 Switching the Analyser Off

- 1) To switch off the analyser, press and hold down the 'On/Off' key for approximately two seconds. This will close all solenoids and switch off the pumps. Power remains on to the rest of the system. The system fault signal is energised when the analyser is switched off.
- 2) If for any reason the analyser 'locks up' and will not switch off in this manner, press and hold the 'On/Off' key for 15 seconds; this will force the instrument to switch off.
- 3) The instrument can also be turned off by the mains power supply.

✍ Note: If the analyser does not communicate with the PLC for 15 minutes or is switched off via the on/off button for 15 minutes, then the PLC will automatically attempt to restart the analyser.

7.5 Cold Start

A cold start should only be carried out to correct an instrument fault if no other course of action has proved successful, as this function will clear the alarm settings, reset all factory settings and reset the internal time and date to a default setting.

✍ Note: This function should only be used as a last resort. For gas calibration error messages ensure a factory setting and user calibration have been carried out first.

7.5.1 Perform a Cold Start

✍ Note Please contact Technical Support at Geotech (UK) Limited on +44(0)1926 338111 before performing this operation.

- 1) Turn the analyser on and during the self-test continue to hold the 'Enter' key until the passcode entry screen appears. If the self test completes then switch off the analyser and try again.
- 2) At this point release the 'Enter' key.
- 3) Enter the code '12345' and press the 'Enter' key to confirm.
- 4) After the passcode entry has been accepted the instrument's serial number will be displayed along with the hours of operation and six options.
- 5) Only select 'Option 1' if a cold start is to be carried out.
- 6) After selection, 'Key 9' will require pressing again to confirm this operation.
- 7) Following a successful cold start a self-test will automatically begin.

✍ Note: After a cold start, a 'First Time Run' will have to be completed.

7.6 Storage of the Gas Analyser

The analyser should not be exposed to extremes of temperature.

7.7 Instrument Main Gas Read Screen

The 'Main Gas Read Screen' is considered to be the normal operating screen and all operations are carried out from this starting point.

The actual data shown on this display will depend on the version of the instrument and the options that have been selected.

Example – GA3000 with H₂S:



Instrument Main Gas Read Screen

The time and date update continuously, if the service is overdue this will be displayed here periodically with the time and date. The reading display is updated every time a new reading is received and the time including seconds will be displayed.

Balance = 100.0% - CH₄% - CO₂% - O₂% - (H₂S ppm / 10000.0)

H₂S:

H₂S appears in the bottom right quarter, only when fitted. Because H₂S is only sampled periodically the following messages are displayed below the reading:

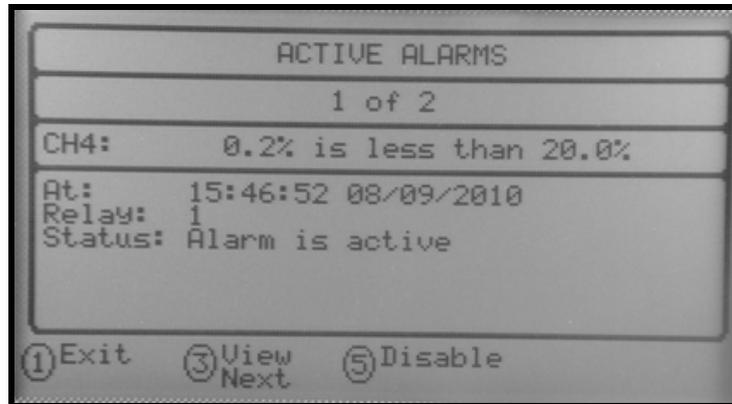
- 'Next: mm:ss' shows when the next sample is to be taken.
- 'Sampling' shows when the H₂S is currently being sampled.
- 'Purging with Air' shows when the H₂S sensor is being clean air purged.

Alarm Indications:

- A flashing bell symbol near the channel indicates which channel is exceeding the alarm condition.
- A static bell symbol indicates that the channel is between the recovery value and trigger value.
- 'L' indicates that the alarm is or was active and is latched until the user clears it.
- 'D' indicates that the alarm has been disabled by the user. A disabled alarm causes the associated alarm relay to be energised.

7.7.1 View Alarms

Select 'Key 3 - View Alarms' from the 'Main Gas Read Screen' to view active alarms. An audible warning from the gas analyser will also accompany the alarm; however this will not be audible with the main cabinet door closed.



View Active Alarms

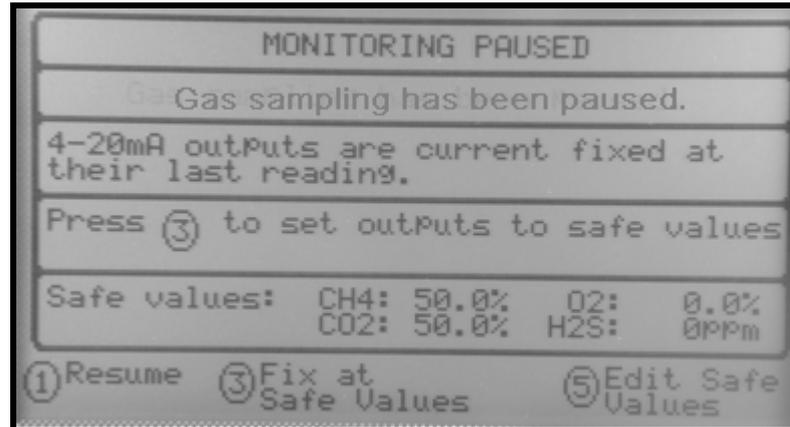
Options:

- 1) Select 'Key 1 - Exit' to exit and return to the previous screen.
- 2) Select 'Key 3 - Next' to display the next alarm if there is one.
- 3) Select 'Key 5 - Disable' which allows the alarm relay to be switched off until it is manually re-enabled by the operator. The alarm is only disabled until the current alarm condition clears. To permanently disable the alarm use the 'Alarm Set-up' option from the 'Main' menu.
- 4) Select 'Key 7 - Clear' to clear the selected alarm settings. Only for latched alarms that are no longer active. This turns off the relay.

7.7.2 Pause Sampling

Selecting 'Key 5 - Pause Sampling' from the 'Main Gas Read Screen' during normal operation will cause the pause screen to display which will immediately stop sampling until the screen is exited. In addition, it locks the 4-20mA outputs at their last level.

Selecting this option causes the sampling to stop until the user manually resumes operation. When sampling is paused the following screen is displayed:



Pause Sampling

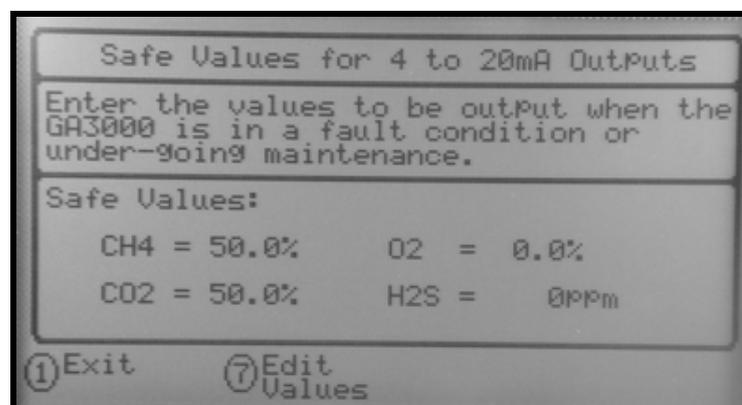
- 1) Select 'Key 1 – Resume' to resume normal operation.

7.7.3 Safe Values

Safe values allow you to set the 4-20mA outputs to preset values suitable to prevent erroneous error or alarm conditions in your remote systems whilst maintenance is being performed on the GA3000 or the receiving logging system. You can easily change the safe values from the 'Pause' screen.

- 1) Select 'Key 3 – Fix at Safe Values' to fix the values at the nominated safe value.
- 2) The default safe values are shown in the screen shot above.
- 3) Select 'Key 5 – Edit Safe Values' to change the current values. See 'Edit Safe Values'.
- 4) After editing the values they are automatically set to the new levels.
- 5) If the user edits the default values they are saved so that when the instrument is restarted it uses the last specified values.
- 6) After fixing to the specified safe level the message 'fixed at their last reading' changes to 'fixed to the specified safe values'.

Edit Safe Values:



Safe Values Editor

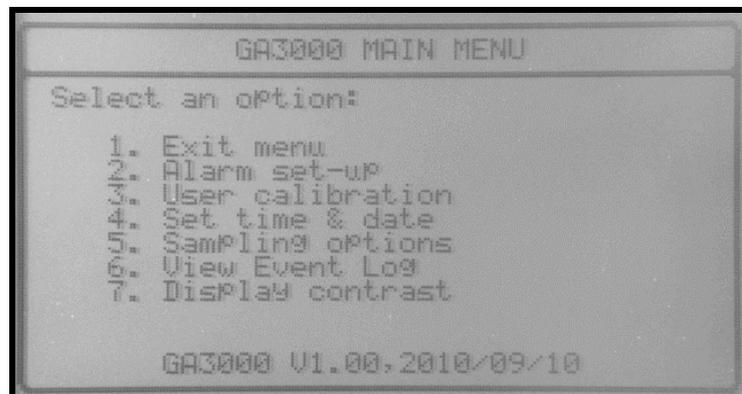
- 1) From the 'Pause Sampling' screen press 'Key 5 – Edit Safe Values'.
- 2) Select 'Key 1 - Exit' to exit the screen without saving the changes. The screen displays 'Exit' when not in edit mode or if changes have not been made and returns to the 'Pause Sampling' screen.
- 3) Select 'Key 7 – Edit Values' to enter edit mode highlighting CH₄ in inverse.

✍ Note: 'Key 7' now becomes 'Save Changes'.
- 4) Select the 'Enter' key to 'Edit Values'. This option is only displayed when in edit mode and not editing a field.
- 5) Select the 'Enter' key to 'Save Changes'. This option is only displayed when in edit mode and editing a field.
- 6) The cursor keys move around the fields when in edit mode.
- 7) Select 'Key 7 – Save Changes' to save new changes and return to the 'Pause Sampling' screen.

7.8 Main Menu

The 'Main' menu enables the operator to select options to set up specific parameters and perform operational tasks.

- 1) From the 'Main Gas Read Screen' select 'Key 1' to display the 'Main' menu and the following screen is displayed:



GA3000 Main Menu

- 2) Use the numerical keypad to select the required option.
 - 3) To exit this menu, select 'Key 1 - 'Exit Menu'.
- ✍ Note: The keyboard is scanned continuously. The menu is displayed for 30 seconds. If no further options are chosen the main reading display screen reappears.

Each alarm relay output can be configured independently.

For each relay the following parameters can be specified by using the 'Enter' key to edit.

- Gas Channel
 - Trigger direction (above or below specified value)
 - Trigger Value
 - Mode: Latching or Normal
 - Recovery value
- 5) Once in 'Edit' mode 'Key 3 – Enable/Disable', 'Key 7 – Save & Exit' and 'Key 1 – Cancel' are available to the user.
- 6) Select 'Key 3 – Enable/Disable' to toggle between enable and disable the alarm setting for the selected channel. An 'X' to the left of the channel indicates that the channel is disabled.

Alarm Modes:

Latching	Relay output remains on until the user selects the option to cancel alarm.
Normal	Relay output remains on until the value falls below (or above) the recovery value.

7.8.3 User Calibration

The ability has been provided to perform a calibration on each gas channel. This calibration ensures the accuracy of the analyser in its current operating condition. To ensure optimum performance please ensure your analyser is returned for service and calibration on time.

From the 'Main' menu select 'Key 3 - User Calibration'.

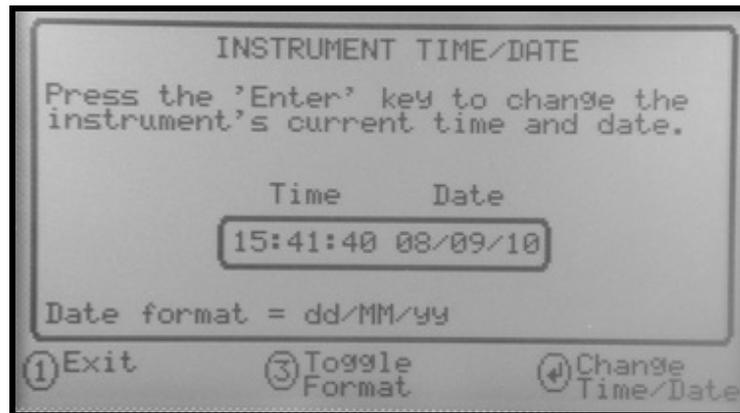
 Note: For more information on User Calibration, please refer to section 8.0 Calibration of this operating manual.

7.8.4 Set Instrument Time and Date

This option enables the operator to set the instrument date and time clock.

- 1) From the 'Main' menu select 'Key 4' – Set Time & date'.

The following screen is displayed:



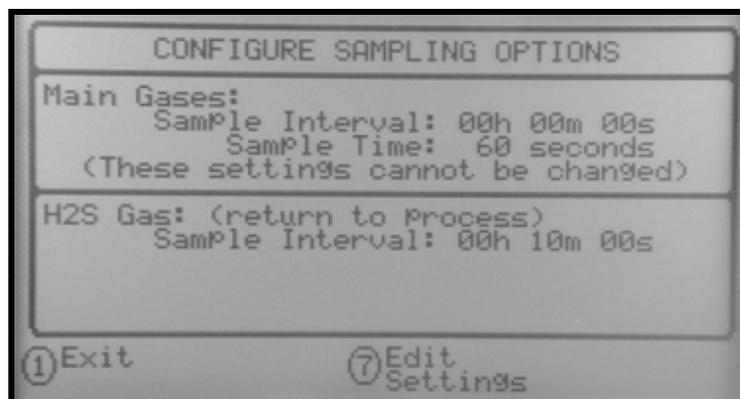
Instrument Time/Date

- 2) Select 'Key 3' to toggle between date formats dd/mm/yy or mm/dd/yy.
- 3) Press the 'Enter' key to edit the time/date. Use the instrument key pad to enter the correct date and time followed by the 'Enter' key to accept the changes.

7.8.5 Sampling Options

- 1) From the 'Main' menu select 'Key 5' – Sampling Options'.

The following screen is displayed:



Configure Sampling Options

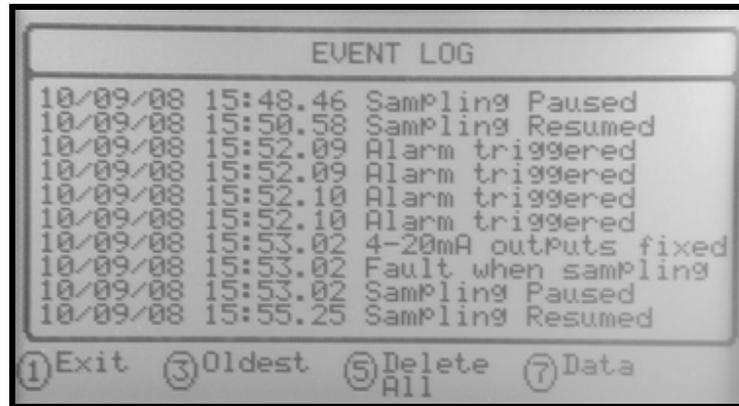
✍ Note: The only sampling option that is configurable is H₂S.

- 2) Select 'Key 1 - Exit' to exit the screen without saving the changes.
- 3) Select 'Key 7 – Edit Settings' to enter edit mode. The H₂S sample can be refined by pressing the 'Enter' key. H₂S sample intervals are shown from a preset list. Select your chosen time using the 'Enter' key and save settings using 'Key 7'.

7.8.6 View Event Log

This option enables the operator to view the Event Log if required for problem solving and fault detection.

- 1) From the 'Main' menu select 'Key 6 – Event Log' and the following screen is displayed:



Event Log

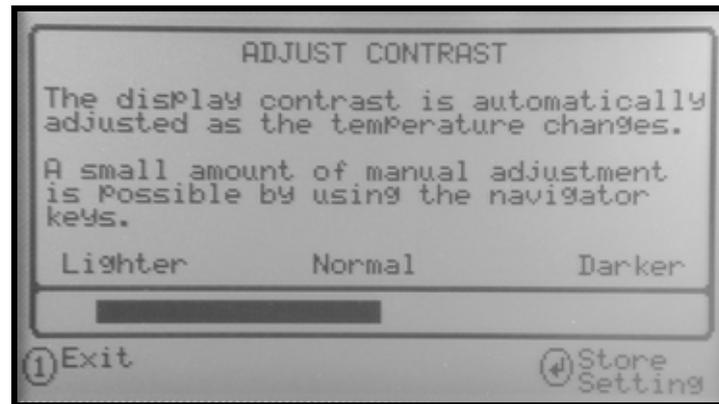
- 2) Select 'Key 1 – Exit' to exit the event log display.
- 3) Select 'Key 3 – Oldest' to display oldest records first.
- 4) Select 'Key 5 – Delete All' to delete all the event log records.
- 5) Select 'Key 7 – Data' to view more data.

✍ Note: For more information, please refer to section '13.0 Event Log' of this operating manual.

7.8.7 Display Contrast

The GA3000 range of instruments automatically adjusts the screen contrast to maintain a normal viewing contrast according to the current read-out temperature, but can also be adjusted by the user.

- 1) From the 'Main' menu select 'Key 7 – Display Contrast'.
- 2) Manual adjustment of the contrast is available via this option and can be carried out with use of 'Key 4 - Arrow Left' (<) and 'Key 6 - Arrow Right' (>).



Adjust Contrast

- 3) Select the 'Enter' key to store the setting.

✍ Note: The manually set contrast setting is retained when the read-out is switched off and may require resetting when next switched on.

8.0 Calibration

8.1 Calibration Introduction

The GA3000 range of gas analysers are carefully calibrated at manufacture and when returned for service. However, it is sometimes desirable to be able to carry out a calibration process between services.

This section outlines the correct procedures to enable the site engineer to field calibrate the gas analyser.

⚠ Note: This does not replace the factory service and calibration. If this calibration is completed incorrectly it may decrease the accuracy of the gas analyser.

CH₄, CO₂ and O₂ can be measured by all GA3000 range analysers as standard; these channels can be user calibrated. The GA3K2 and GA3K3 models also have an H₂S gas channel, which is specified at manufacture; this too can be calibrated. This section will describe in detail how to calibrate the three standard gas channels plus the H₂S channel.

The GA3K2 and GA3K3 have a H₂S channel. This option requires that H₂S is used in the calibration process and is also set out within this section.

Two important terms that are used within this section are 'Zero' and 'Span'.

Zero: The point at which the gas analyser is calibrated when there is none of the target gas present.

Span: The point at which the gas analyser is calibrated when a known quantity of the target gas is present.

8.2 Calibration Gases

User calibration of a gas analyser will greatly improve the data accuracy in the range of the calibration gases used. This may cause less accurate readings of concentrations outside this calibrated range. Users should select the correct calibration gas for the expected gas levels on their particular application.

The following table indicates the different gas mixture canisters used for calibration:

Calibration gas	CH ₄	CO ₂	O ₂
CH ₄ CO ₂ O ₂	60%	40%	0%

Calibration Gas for H ₂ S	H ₂ S 1,400ppm
--------------------------------------	---------------------------

These are for general use but other gas concentrations can be used.

⚠ Note: The above gases and most other gas concentrations can be supplied by Geotech (UK) Limited. For further information please contact Sales on +44(0)1926 338111 or email sales@geotech.co.uk.

 Warning	Calibration gases can be dangerous. For each gas used the appropriate material safety data sheet must be read and understood before proceeding.
--	--

8.3 Calibration Set-Up

The regulator supplied with the calibration kit has been configured to deliver a fixed flow.

Important	Do NOT attach the gas supply to the gas analyser before putting it into the 'Check Calibration Screen' by selecting 'CH ₄ , CO ₂ and O ₂ Calibration' from the 'Calibration Options' menu.
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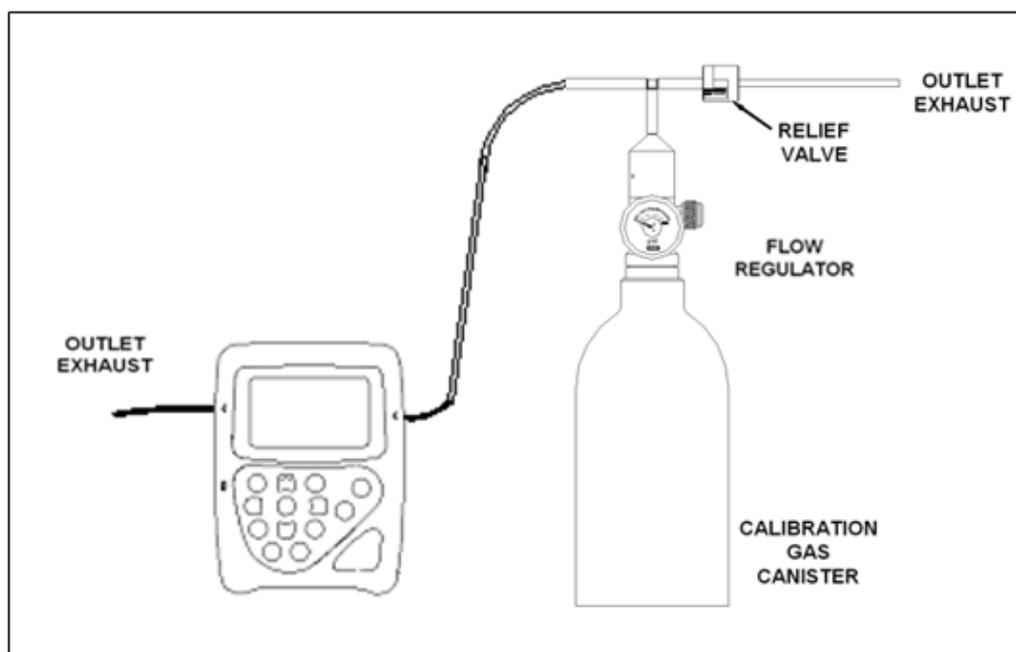
As the regulator's flow is factory set, it only requires a few turns to open, but no adjustment is necessary.

⚠ Note: If not using a regulator provided by Geotech, please ensure the flow rate is set to a maximum of 300 ml/min.

⚠ Warning	<p>Exhaust port</p> <p>When the gas analyser is being calibrated, in cases of over-pressurisation the 1/16" port on the pressure relief valve will release gas to protect the analyser.</p> <p>It is recommended that both ports have exhaust tubing attached.</p> <p>The exhaust tubing must emerge in a well-ventilated area. Ensure there are no leaks in the tubing and connections.</p> <p>The calibration of the gas analyser should be carried out in a safe area with all necessary precautions taken when using potentially dangerous, explosive or toxic gases.</p>
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8.4 Calibration Equipment

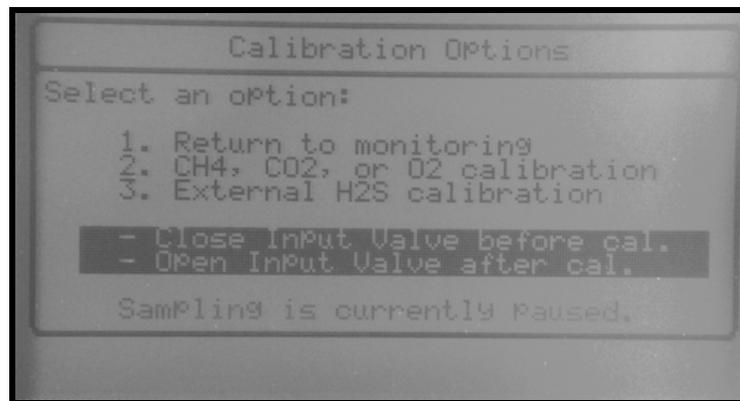
The diagram below displays the regulator and tubing equipment for user calibration:



- Certified calibration gas in 58 litre gas canisters is supplied with the Geotech calibration kit. Please refer to the Geotech website www.geotech.co.uk for further information.
- The regulator supplied with the calibration kit is recommended as flow and pressure rates are factory set.

8.5 Gas Analyser

- 1) From the 'Main' menu select 'Key 3 - User Calibration', the following menu will be displayed.
- 2) At this point sampling is paused and 4-20mA outputs are locked at their last value.

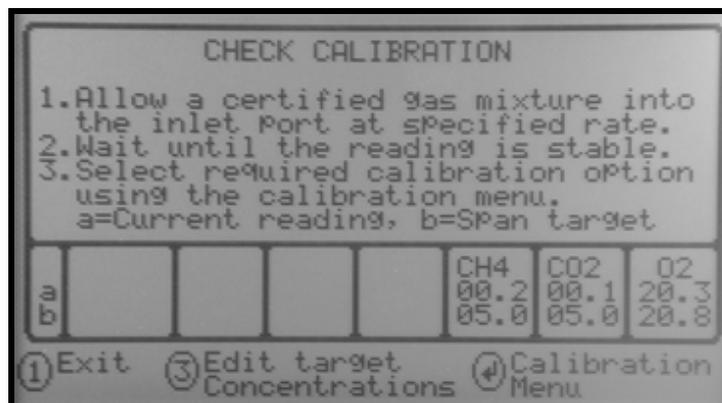


Calibration Options

CH₄, CO₂ and O₂ Calibration:

- 3) Selecting 'Key 2' allows calibration of the CH₄, CO₂ and O₂ gases.

The following screen will be displayed.



Calibration Options

Readings on the line 'a' are the current gas measurements of the unit. The figures displayed in line 'b' are the span calibration gas levels that will need to be set to the concentration of the calibration gas. Refer to section 8.6.1 for information on how to

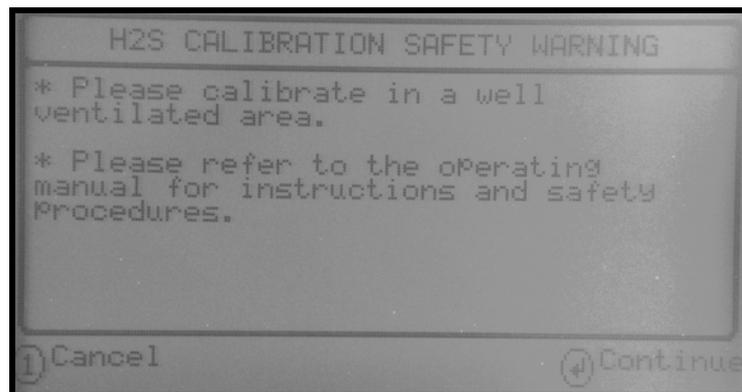
calibrate these channels.

- ✍ Note: Ensure the unit is stabilised at its working temperature before performing any of the calibration operations.

H₂S Calibration:

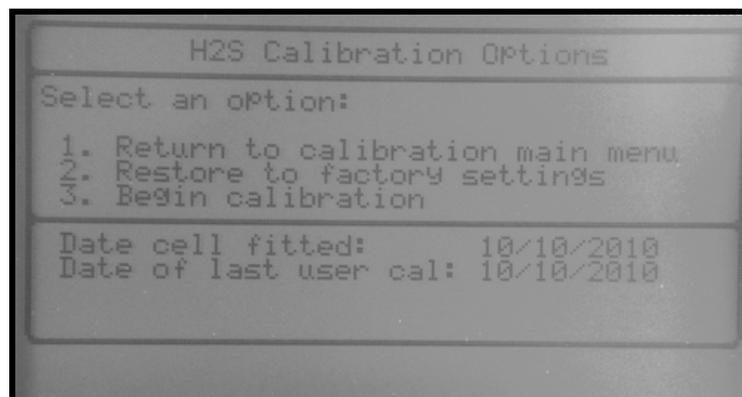
- 4) Selecting 'Key 3' allows external calibration of the H₂S gas.

The following screen is displayed:



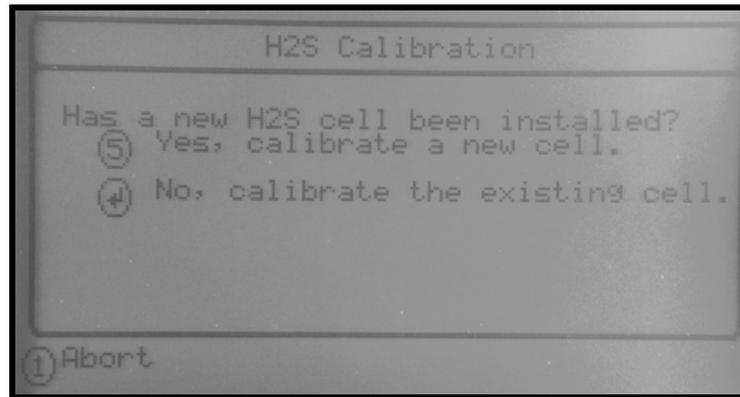
H₂S Calibration Safety Warning

- 5) After the H₂S Calibration Safety Warning screen the user may choose 'Key 1 - Return to the calibration main menu', 'Key 2 - Restore the H₂S to factory settings', or 'Key 3 - Begin calibration'.



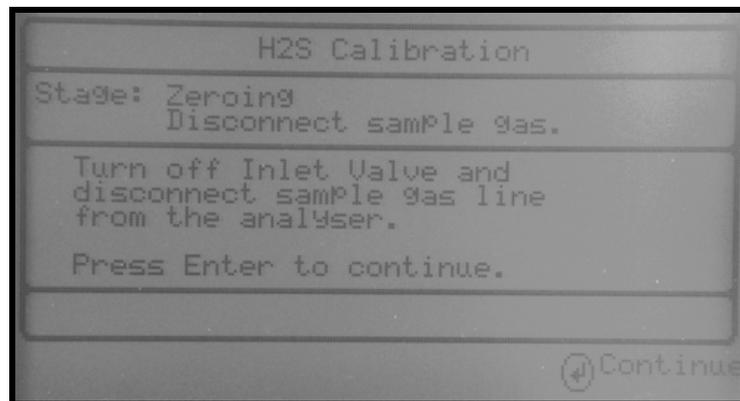
H₂S Calibration Options

- 6) Select 'Key 3 - Begin calibration' and the operator must confirm whether they are calibrating a brand new cell (Key 5) or the existing cell (Enter Key).



H₂S Calibration

- 7) Once this decision is made the calibration begins, refer to section 8.6.2 and follow the instructions displayed on the analyser and press the 'Enter' key to continue.



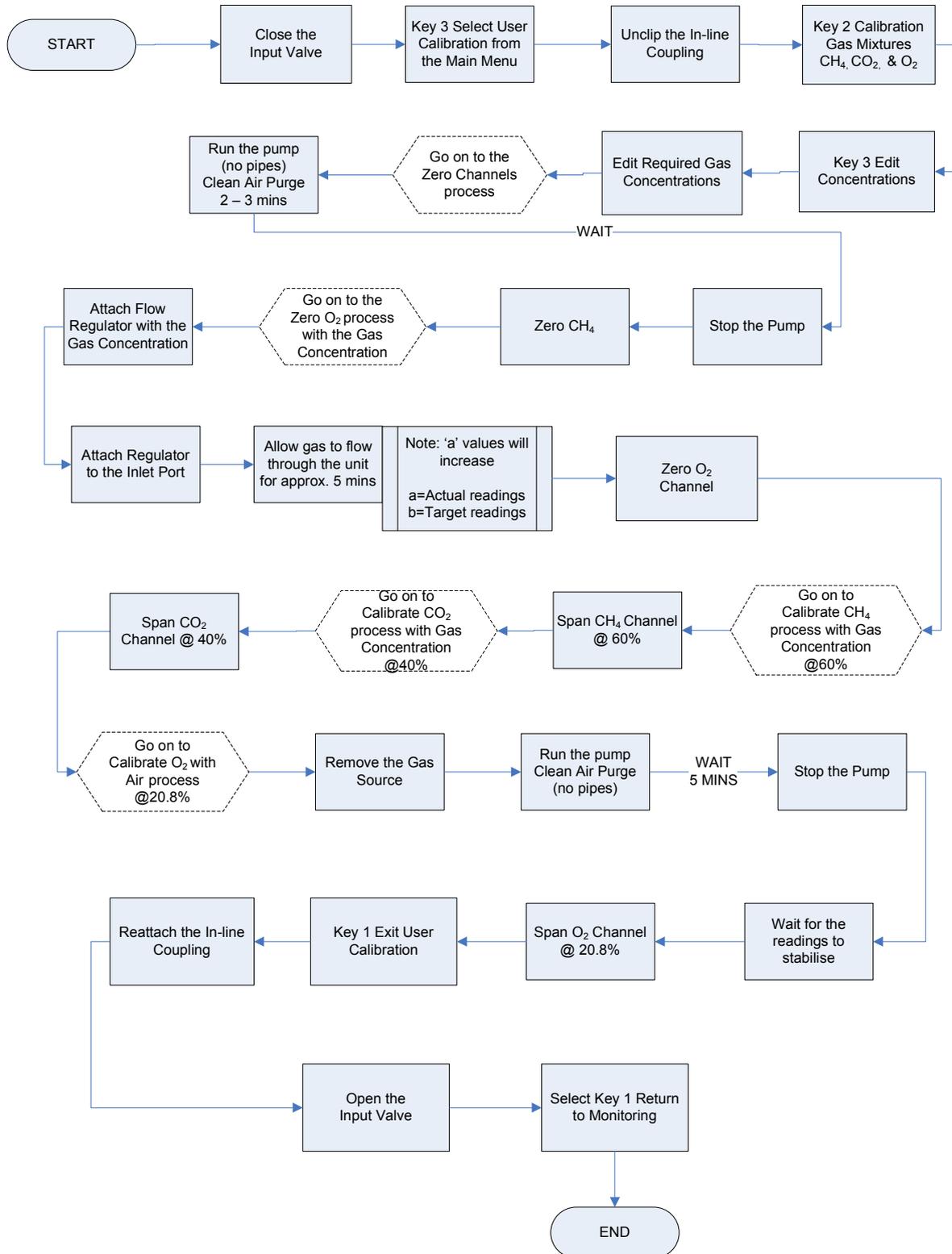
H₂S Calibration

8.6 Calibration Mixture Processes – Best Practice

The following process diagrams outline the calibration steps for each of the gas mixtures.

8.6.1 CH₄, CO₂ and O₂ Calibration

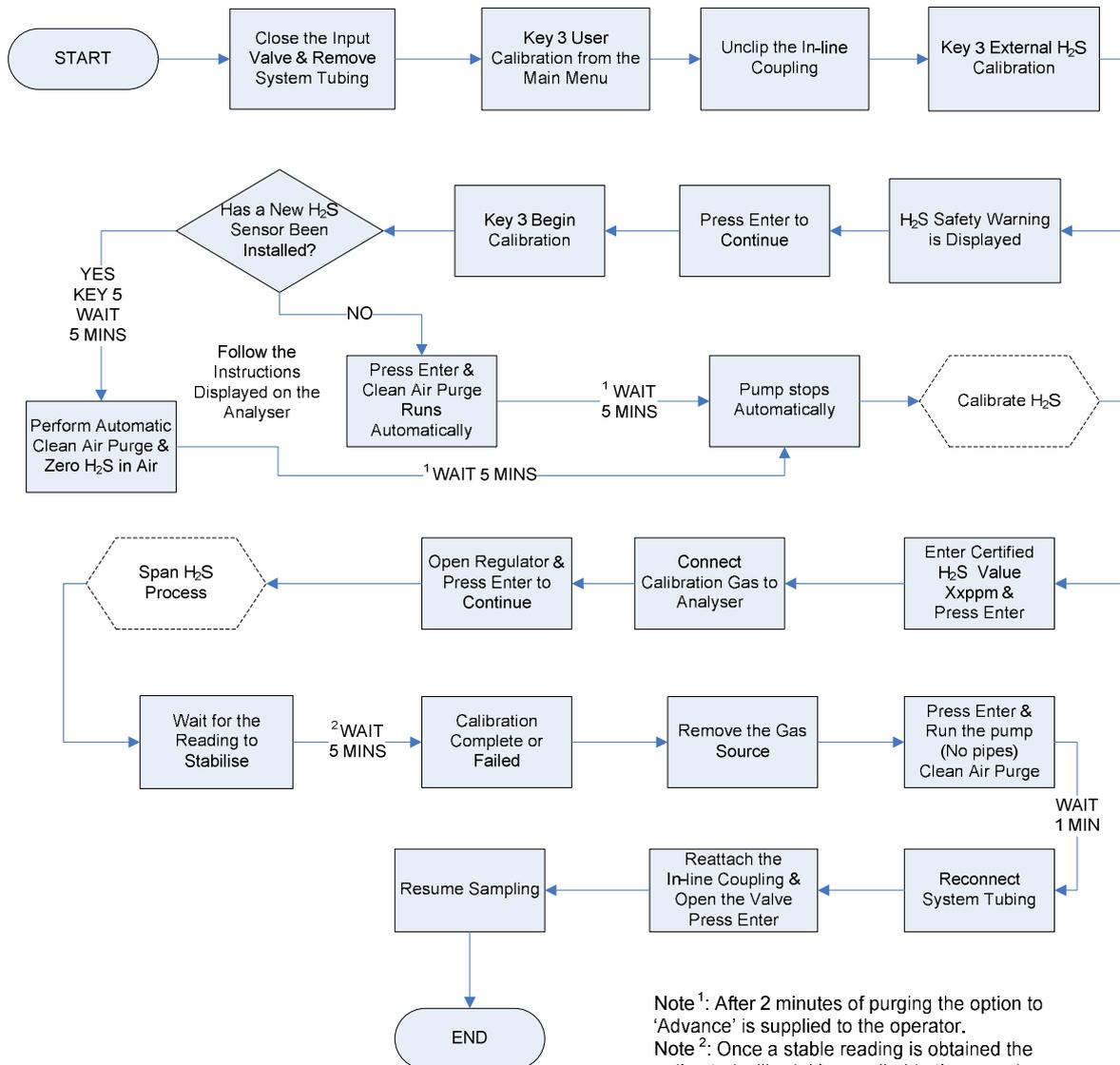
(All GA3000 Models)



⚠ Note: The 'Zero' and 'Span' calibration options can be found from the menu in the 'Check Calibration' screen.

8.6.2 H₂S Calibration

(GA3K2 and GA3K3)



Note ¹: After 2 minutes of purging the option to 'Advance' is supplied to the operator.
 Note ²: Once a stable reading is obtained the option to 'calibrate' is supplied to the operator.

8.7 CH₄/CO₂/O₂ Factory Settings

This option will reset the gas analyser to all of its factory programmed settings and will clear ALL the user defined calibration points.

If in any doubt please contact Technical Support at Geotech (UK) Limited on +44(0)1926 338111

From the main 'Check Calibration' screen:

Press  to enter the 'Calibration Menu'.

Scroll using   to 'Factory Settings'.

Press  to select 'Factory Settings'.

Two messages will follow, 'Resetting please wait.' and 'Factory settings restored.'

8.8 Last Field Calibration

This option can be found in the calibration menu of the 'Check Calibration' screen. When selected, this option will display the time and date that the last field calibration was performed on the instrument.

8.9 H₂S Last Calibration

This option can be found on the H₂S Calibration options screen, along with the date that the H₂S sensor was fitted.

8.10 H₂S Factory Settings

This option will reset the H₂S settings to the parameters programmed at manufacture. Select 'Option 2 – Restore to Factory Settings' from the H₂S Calibration Options screen.

9.0 Problem Solving and Maintenance

This section outlines various warning and error messages which the operator may receive during general operation of the instrument, and instructions for user replaceable components. For further assistance please contact Technical Support at Geotech (UK) Limited on +44(0)1926 338111 or email technical@geotech.co.uk.

9.1 Warning and Error Display

When switched on the instrument will perform a pre-determined self-test sequence taking approximately 30 seconds. During this time many of the instrument's working parameters and settings are checked.

If any operational parameters are out of specification or the pre-programmed recommended calibration/service date has passed, errors or warnings will be displayed.

Use the 'Scroll Up' and 'Scroll Down' keys to move through the list if required. The instrument also performs background tests in normal operation.

Warnings Displayed:

There are two types of warning that may be displayed:

1. General warnings that may not affect the instrument's function and those where the self-test has detected a function that is outside the usual programmed operating criteria, e.g. incorrect time/date.
2. Operational parameters that could affect the performance of the analyser: Cell out of calibration, CH₄ out of calibration, CO₂ out of calibration.

The most likely reason for the errors is either an incorrect user calibration or sensor failure. If an incorrect user calibration has caused the warning it should be correctable by way of returning the instrument to factory settings, zeroing or carrying out a user calibration as necessary for the relevant function.

Under and Over Range Codes

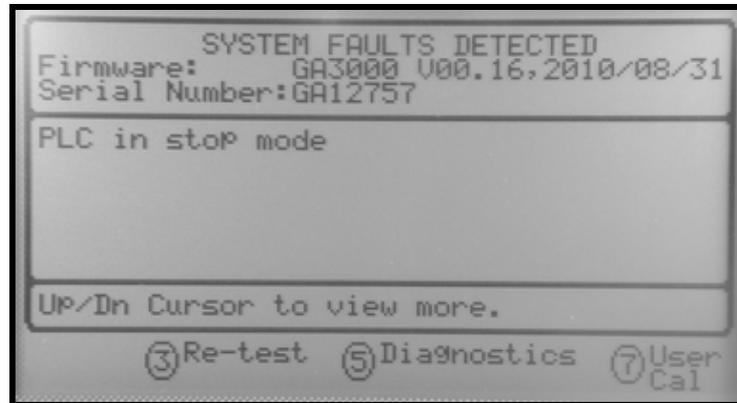
If a reading is under range (i.e. below zero) it will be displayed with 'less than' chevrons (<<). This can occur if a channel has been incorrectly calibrated.

If a reading is over range (i.e. above the maximum allowed reading) it will be displayed with 'more than' chevrons (>>).

A number displayed as an asterisk (*) indicates an error and a hash (#) indicates where no data is available.

9.2 Fault Detection

If a fault occurs the following 'System Faults Detected' screen will be displayed detailing the error.



View Faults

- At this point the PLC will recognise the error and pause the systems monitoring.
- Faults are indicated to the PLC by setting a relay output.
- Faults remained latched until the fault disappears or is overridden.
- The self test will automatically re-attempt up to a maximum of three times. If no faults are found then the monitoring will continue. After three failed attempts user intervention is required.

9.3 Replacing the Coalescing Filter

We recommend that the coalescing filter is replaced if it becomes damp or dirty. When replacing the filter ensure that power to the system is isolated or the GA3000 sampling is paused.

1



2



3



4



5



6



- 1 The coalescing filter is housed within the catchpot.
- 2 Remove catchpot from clip.
- 3 Remove the bottom Herbie Clip with a flat blade screw driver.
- 4 Unscrew the catchpot housing from its top.
- 5 Remove the filter stopper.
- 6 Replace the filter.
 - Replace the filter stopper.
 - Replace the catchpot housing and replace the Herbie Clip.
 - Clip the catchpot back into place within the enclosure unit.

 Note: Tighten the Herbie Clip with pliers to get a good fit.

9.4 Replacing the Water Trap Filter

We recommend the water trap filter is replaced if it becomes wet. When replacing the filter ensure that power to the system is isolated or the GA3000 sampling is paused.

1



2



3



- 1 The water trap filters are situated at the inlet to the GA and Air In (GA3K2 & GA3K3)
- 2 Remove the tubing.
- 3 Replace the filter.
 - o Replace the tubing.

9.5 Replacing the H₂S Sensor

We recommend that the H₂S sensor is replaced every 18 months. When replacing the sensor ensure that power to the system is isolated or the GA3000 sampling is paused.

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- 1 The H₂S Sensor is located within the H₂S sensor manifold.
- 2 Unscrew the two slotted screws.
- 3 Remove the manifold.
- 4 The sensor may be removed with the manifold. Remove the old sensor.
- 5 Fit the new sensor to the PCB. To fit correctly take care to align the pins.
- 6 Replace the manifold. Take care to align and position the groove over the terminals correctly.
 - Replace the screws.
 - Perform user calibration for the H₂S, ensuring 'Key 5 - New Cell Fitted' is selected.

 Note: Depending upon exposure levels/times the replacement frequency may be subject to change.

9.6 Replacing the Inlet Port Filter

We recommend that the Inlet Port (Particulate) Filter is replaced when dirty. When replacing the filter ensure that power to the system is isolated or the GA3000 sampling is paused.

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- 1 Locate the GA analyser in the enclosure unit. The Inlet Port Filter is located at the back of the GA analyser.
- 2 Remove the GA Analyser by removing the bottom fixing plate.
- 3 Detach the cabling and tubing and remove the GA analyser from the enclosure unit
- 4 Turn the analyser over and locate the rear bung. Use a coin to unscrew the bung.
- 5 Replace the filter.
- 6 Replace the bung. Take care not to over tighten the screw fitting.
 - Replace the cabling and tubing.
 - Replace the analyser to the enclosure unit.
 - Replace the bottom fixing plate.

9.7 Hot Swap

The 'Hot Swap' facility enables the operator to return the GA3000 analyser to Geotechnical Instruments for servicing and receive a temporary replacement analyser until their own GA is returned.

✂ Note: For further information please contact Service Department at Geotech (UK) Limited on +44(0)1926 338111 or email service@geotech.co.uk

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When removing the instrument ensure that power to the system is isolated.

- 1 Locate the GA Analyser in the enclosure unit.
- 2 Remove the bottom fixing plate.
- 3 Detach the cabling and tubing and remove the GA analyser from the enclosure unit.
 - Replace with temporary unit, turn the power on and complete 'First Time Run'.
 - Return the GA analyser to Geotechnical Instruments.

10.0 Service

The GA3000 range of gas analysers should be regularly serviced to ensure correct and accurate operation. Geotech (UK) Limited recommends a service and recalibration every **6 months**.

It is recommended that the instrument is serviced only by qualified engineers. Failure to observe this will result in the warranty becoming invalid. The GA3000 has been designed to avoid unnecessary downtime and a replacement instrument can be supplied during instrument service upon request. Please refer to section 9.7 – Hot Swap' of this operating manual.

⚠ Warning	If the GA3000 analyser is serviced by unqualified engineers the instrument may be unsafe for use in a potentially explosive atmosphere.
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User serviceable parts:

There are no user serviceable parts inside the gas analyser instrument.

The following system parts can be user serviced:

In-line water filter	This should be regularly inspected for obstructions or damage and changed if needed. The instrument should never be operated without the in-line water filter as this may result in water entering the instrument.
Inlet port filter	The inlet port (particulate) filter is located on the underside of the instrument and is accessed by removing the plastic plug. This can be removed by unscrewing using a suitable sized coin. The filter should be replaced if it is contaminated. Never operate the instrument without the particulate filter. When replacing the plug be sure not to over-tighten it - finger tight is adequate.
Sample tubing	Always ensure that sample tubes are not contaminated or damaged.
H ₂ S Cell	It is recommended that the H ₂ S cell is replaced every 18 months.
Coalescing Filter	This should be regularly inspected for obstructions or damage and changed if needed. The instrument should never be operated without the coalescing filter.
Gas Flow Control Meter	This should be inspected to ensure the float moves freely up and down the meter. Insufficient movement could cause low flow to the instrument.

11.0 Warranty Policy

This instrument is guaranteed, to the original end user purchaser, against defect in materials and workmanship for a period of **12 months** from the date of the shipment to the user.

During this period Geotech (UK) Limited will repair or replace defective parts on an exchange basis.

The decision to repair or replace will be determined by Geotech (UK) Limited.

To maintain this warranty, the purchaser must perform maintenance and calibration as prescribed in the operating manual.

Normal wear and tear, and parts damaged by abuse, misuse, negligence or accidents are specifically excluded from the warranty.

 Note: Please contact Technical Support at Geotech (UK) Limited for further information.

12.0 Technical Specification

GA3000 Technical Specification

GENERAL SPECIFICATION

Number Of Sampling Points	1
Gases To Be Monitored	CH ₄ , CO ₂ , O ₂ , H ₂ S (optional)
Reading Intervals	Continuous For CH ₄ , CO ₂ , O ₂ Configurable For H ₂ S
Operating Temperature Range	-5°C to +40°C

POWER

Mains Options	110 - 230 VAC 50/60Hz
Consumption	0.1A ± 5%
Instrument Backup Memory	Lithium Manganese Backup Battery For Memory Retention)

GAS RANGES

Gases Measured	CH ₄ & CO ₂	By dual wavelength infrared cell with reference channel			
	O ₂	By internal electrochemical cell			
	H ₂ S	By external module (electrochemical cell)			
Range	CH ₄	0 -70% to specification, 0-100% reading			
	CO ₂	0 -60% to specification, 0-100% reading			
	O ₂	0 -25%			
	H ₂ S	0 -5000ppm			
Typical Accuracy	Gas	0-5% vol	5-15% vol	15%-FS	FS
	CH ₄	±0.5% (vol)	±1.0% (vol)	±3.0% (vol)	70%
	CO ₂	±0.5% (vol)	±1.0% (vol)	±3.0% (vol)	60%
	O ₂	±1.0% (vol)	±1.0% (vol)	±1.0% (vol)	25%
	H ₂ S	0 -5000ppm	±100ppm or ±5% of reading (if greater)		
Response Time, T90	CH ₄ CO ₂ O ₂ H ₂ S	≤20 seconds ≤20 seconds ≤20 seconds ≤60 seconds			
Oxygen Cell Lifetime	Approximately 3 years in air				
H2S Cell Lifetime	Approximately 2 years in air				

PUMP

Flow	350 ml/min typically
Flow-Fail Point	-375mbar Vacuum
Maximum Vacuum Restart	-375mbar

GA3000

Technical Specification

COMMUNICATIONS

Output Channels	Up to Four 4-20mA Output Channels (outputs are current sink)
Alarm Notifications	2 user definable alarms which can be triggered when above or below a set value. Alarms can be latched to advise user if an alarm has occurred. Recovery values can also be defined.
Relay Outputs	3 single pole changeover 6A 250V relays volt free. Two relays for alarms and one for fault condition.

PHYSICAL

Weight	29 Kilograms
Size	650 x 600 x 210mm
Enclosure	Painted Steel 600 x 600 x 210 mm IP54
Operation Keys	Membrane Panel Keypad
Display	Liquid crystal display, 40 x 16 characters Fibre optic woven red back-light for low light conditions
Gas Conditioning Filters	User replaceable microfibre filter

CERTIFICATION RATING

ISO17025	Calibrated Under UKAS Accreditation (Certificate Number 4533)
ATEX	 II 3 G Ex nA nL nC d IIA T1 Gc (-5<= Ta <=40)
BS EN 61010	Safety Requirements for electrical equipment for measurement, control, and laboratory use.
BS EN 50270:2006	Electromagnetic compatibility – Electrical Apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.

Important Note

The information in this document is correct at the time of generation, we do however, reserve the right to change the specification without prior notice as a result of continuing development.

13.0 Event Log

The GA3000 range incorporates the facility to log significant events performed on the analyser via the 'Event Log'. This can be used as an aid to monitoring the use of the instrument and used as a diagnostic tool if there is a problem with the instrument.

The log holds up to 1000 of the most recent system events. Applicable events are stored in the event log automatically. No user intervention is required. When the event log is full, events are wrapped, for example event 0001 becomes 1001 and so on. The log is also cleared when the analyser is cold started.

The result is displayed as a table.

Displayed Message	Message Description
Start-up	Instrument has been started
Shutdown	Instrument has been shut down
Sampling started	Following start-up the sampling process has begun
Sampling Paused	Sampling has been paused and 4-20mA outputs set at last value
Sampling Resumed	Sampling has resumed after pause
Cold Start	Instrument has been cold started and user settings defaulted
Event log deleted	Event log cleared
Sensor error	Primary sensor has been recognised as having an error
Clock not set	Setting of clock has been skipped and time & date could be incorrect
Service overdue	Instrument service is overdue, please contact our service department
PLC comms error	Communications between the master PLC and the GA have been lost
Config error	Generated at start-up if the alarm settings have corrupted data or the H ₂ S Mode is invalid or the language is invalid or the maximum cell range value > 2%
Low flow	Instrument has not got enough gas flow OR there is a blockage on the gas inlet
Over pressurised	Instrument has been over-pressurised, the gas outlet could be blocked
Clock set	Instrument time and date has been set
User zero	Operator has performed a zero calibration of a non-H ₂ S channel.
User span	Operator has performed a span calibration of a non-H ₂ S channel. with a known gas concentration
Factory cal restored	User calibration settings have been restored to factory default values
Date format changed	The format of the date has been altered to dd/mm/yy OR mm/dd/yy
FAU comms changed	The communications speed of the GA has been altered
Agent svc date set	The approved distributor has set the next agent service date, this does not overwrite Geotech's next service date
Service date set	The date the instrument is next due for a factory service has been set
Serial number set	The instruments serial number has been defined and programmed in to the GA
EEPROM defaulted	All settings on the instrument have been set to a factory default prior to calibration, the unit will need returning for service
Internal cells setup	The configuration of additional gases has been set
Contrast Changed	The display contrast has been altered
First run detected	The instrument first run has been detected and set-up has begun
Alarm set	The operator has set an alarm condition
Latched alarm cleared	The operator has cleared a latched alarm
User disabled alarm	The operator has disabled a live alarm condition
Displayed Message	Message Description

H ₂ S Safety Msg Ack	The H ₂ S safety warning prior to a calibration has been acknowledged by the operator
H ₂ S Cal Aborted	The operator has aborted the calibration of the H ₂ S sensor
H ₂ S Cal Rest.Factory	H ₂ S user calibration settings have been restored to factory default values
H ₂ S Cal Timed out	The H ₂ S reading was unstable during a calibration and timed out
4-20mA outputs fixed	The outputs of the system were fixed to there last known value
Fault when sampling	A fault has been recorded by the instrument
Invalid command	The operator has attempted a sequence of button presses which has not been acknowledged by the GA
FAU Comms Checksum	Only shows during calibration if there is a comms problem.
Alarm re-enabled	The operator has enabled a disabled active alarm
Factory Cal Span	Recorded during factory calibration of H ₂ S.
Factory Cal Zero	Recorded during factory calibration of H ₂ S.
Alarm triggered	An alarm condition has been triggered
Safe values set	The operator has set the safe values of the 4-20mA outputs for maintenance mode
New H ₂ S Cell Fitted	Recorded whenever the user chooses New H ₂ S Cell fitted option.

14.0 Sample Certificate of Calibration

This is a sample certificate of calibration supplied at the time of purchase and updated when the instrument is serviced.

CERTIFICATION OF CALIBRATION		
 ISSUED BY: GEOTECH LABORATORY Date Of Calibration: 8 September, 2010 Certificate Number: GA12765_2/6256		
GEOTECHNICAL INSTRUMENTS (UK) LTD Sovereign House, Queensway, Leamington Spa, Warwickshire, CV31 3JR United Kingdom Tel: +44 (0) 1926 338111 Fax: +44 (0) 1926 338110 E-mail: service@geotech.co.uk Web site: www.geotech.co.uk		 No. 4533 Page 1 of 2 Pages Approved by Signatory  Dave Herring Laboratory Inspector
Customer:	Geotechnical Instruments (UK) Ltd Sovereign House (Sales Demo) Queensway Leamington Spa Warwickshire CV31 3JR UNITED KINGDOM	
Description:	GA3000	Model: GA3000 Serial Number: GA12765
UKAS Accredited results:		
Methane (CH ₄)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
50.13	49.44	0.94
15.01	15.10	0.64
5.01	5.10	0.41
Carbon Dioxide (CO ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
49.87	49.90	1.11
15.01	14.80	0.70
5.00	4.80	0.43
Oxygen (O ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
20.93	20.93	0.31
All concentrations are molar. CH ₄ , CO ₂ readings recorded at: 30.9°C O ₂ reading recorded at: 21.0°C Barometric Pressure: 0994mb Method of Test: The analyser is calibrated in a temperature controlled chamber using reference gases. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.		
<small>This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and in some cases to measurement realised at the National Physical Laboratory or other recognised national standards laboratories. Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.</small>		

SAMPLE

CERTIFICATION OF CALIBRATION
UKAS ACCREDITED CALIBRATION LABORATORY NO. 4533

Certificate Number
GA12765_2/6256
Page 2 of 2 Pages

Non-UKAS Accredited results:

Barometer (mb)	
Reference	Reading
0994mb	0995mb

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
H2S	1404	1402

End of Certificate

SAMPLE

15.0 Important Notice to All Customers**WEEE COMPLIANT**

The wheeled bin symbol now displayed on equipment supplied by Geotechnical Instruments (UK) Limited signifies that the apparatus must not be disposed of through the normal municipal waste stream but through a registered recycling scheme.

The Waste Electrical and Electronic Equipment directive (WEEE) makes producers responsible from July 1st 2007 in meeting their obligations, with the fundamental aim of reducing the environmental impact of electrical and electronic equipment at the end of its life.

Geotech (UK) Limited is now registered with the Environmental Agency as a producer and has joined a recycling scheme provider who will manage and report on our electrical waste on our behalf.

Our Producer Registration Number is WEE/GB0052TQ

When your instrument is at the end of its life, please contact the Sales team at Geotech (UK) Limited who will advise you on the next step in order to help us meet our obligations.

16.0 Declaration of Conformity – English Language

Products	• GA3000 Range
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Geotechnical Instruments (UK) Limited declares that the item(s) described above are in compliance with the following standards:

ATEX Directive 94/9/EC

BS EN 60079-15:2005	Electrical apparatus for explosive gas atmospheres.
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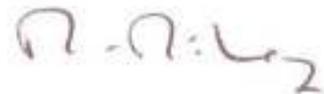
EMC Directive 89/336/EEC

EN 61326-1:2006	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements.
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Low Voltage Directive

BS EN 61010-1:2001	Safety requirements for electrical equipment for measurement, control, and laboratory use.
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Signed:



Dr. Roger Riley
NPI Manager and Authorised Person

17.0 Glossary of Terms

Analyser error messages	Operational errors are prefixed on the analyser by the word ERROR followed by an error code. Refer to the list of standard error codes for more information.
Analyser warning	Analyser warnings are followed by a relevant brief description. There are two types of warning messages displayed; general warnings that may not necessarily affect the instrument's function, for example, battery power low and operational parameters that could affect the performance of the analyser, for example, CH ₄ out of calibration.
Backlight	The analyser has a built-in backlight for low ambient light conditions. This is permanently on.
Barometric pressure	The atmospheric pressure at the given location.
Calibration	The Geotech range of gas analysers is carefully calibrated against known standards.
CH₄	Methane
Chemical cells	A method of gas detection that works on the basis of a chemical reaction with the target gas.
Clean air purge	Process used to clear out gas from the sample tube and analyser prior to taking a new reading.
CO₂	Carbon Dioxide
Cold start	A cold start should only be carried out to correct an instrument if no other course of action has proved successful. This function will clear the instrument memory completely remove any user calibration settings and reset the internal clock to a default value.
Connector D	(Half moon) Communications port to the PLC. Upper connector on left hand side of instrument.
Connector E	(Full moon) External power supply socket. Lower connector on left hand side of instrument.
Contrast	The difference between light and dark areas on the display.
Current sink	The GA3000 'sinks' the 4-20mA into its output terminals therefore, the customer must supply a circuit that sources current.
Dual beam infrared absorption	Method of gas detection by measuring how much infrared is absorbed by the target gas.

Event log	Used as an aid to monitoring the use of the analyser. It can also be used as a diagnostic tool.
Exhaust port	The usual manner for the gas to exit the analyser is via the exhaust port located on the left hand side of the analyser. This port should have an exhaust tube attached.
Exhaust tube	Clear plastic tubing used to expel gases from the exhaust port.
Factory settings	Default settings preset at time of manufacture or service.
Firmware	Firmware is the term by which the internal analyser software is known and is not accessible by the client. This firmware is updated to the latest version when the analyser is returned to UK for servicing.
GA3000	A 3 gas analyser for measuring CH ₄ CO ₂ O ₂ with optional H ₂ S.
Gas channels	The gases that are analysed by the instrument.
General warnings	Displayed throughout the documentation with a warning symbol. Warning information may affect the safety of users.
H₂S	Hydrogen Sulphide
Incorrect user calibration	An error made by the user during 'field calibration'. This can be reversed by using the 'factory settings' option.
Inlet port	Port located on the top right hand side of the analyser to which the sample tube is attached.
In-line water filter	The component used to help protect the instrument from water ingress.
LCD display	Liquid Crystal Display
Main Gas Read Screen	The main analyser screen for normal operations and all operations are carried out from this screen.
Material data sheet	Document from which information about a certain substance can be obtained.
O-rings	Located on the QRC gas connectors creating a seal at the interface.

Over range codes	Over range codes are the symbols displayed to signify an event where the reading obtained is above the full scale of the particular channel. The symbols used for this event are 'greater than' chevrons in the following formats (>>.> or >>>>).
Particulate filter	<p>Also referred to as the Inlet Port Filter. The particulate filter is located on the underside of the instrument and is accessed by removing the plastic plug. Its purpose is to stop any particles entering the instrument.</p> <p>Never operate the instrument without the particulate filter.</p> <p>When replacing the plug be sure not to over tighten it - finger tight is adequate.</p>
PLC	Programmable Logic Unit
Power on self-test	Pre-determined self-test sequence to test the analyser functions which takes place after the analyser is switched on and lasts approximately 30-40 seconds.
ppm	Parts per million
pump	<p>Used to draw the gas sample from the sample point to the analyser.</p> <p>A second pump is also used to Clean Air Purge the H₂S sensor.</p>
Sample tube	The tube used to obtain a sample of gas from the sample point to the analyser.
Span	The point at which the gas analyser is calibrated when a known quantity of the target gas is present.
Under range codes	Under range codes are the symbols displayed to signify an event where the reading obtained is below the zero point of the particular channel. The symbols used for this event are 'less than' chevrons in the following formats (<<.< or <<<<).
User calibration	The facility for performing a 'field calibration'.
Volume flow rate	The volume of a gas that passes through a given surface per unit of time e.g. m ³ /hr
Warranty	The instrument is under guarantee against

defect in materials and workmanship for a period of 12 months from the date of shipment to the user and is subject to the recommended service and recalibration requirements.

Water trap

Device used to protect the instrument from water or moisture ingress.

Zero

The point at which the gas analyser is calibrated when there is none of the target gas present.

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