Монитор углерода CAGA MKII

Руководство по эксплуатации

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LIST OF CONTENTS

1 PACKAGING AND CONTENTS CHECK

On opening the Analox CAGA MKII, please check you have the following items.

a) Analox CAGA MKII main unit.
b) External power supply cable
c) RS232 Communications Lead
d) Data download disk
e) Battery Charger/Mains Power Pack
f) Spare Minisart Filter
g) Spare Hydrocarbon Filter
h) User Manual
i) Test Certificate

2 ABOUT THE CAGA MKII

The CAGA MKII is a portable monitor designed to detect multiple gases for contamination of compressed breathing air. The CAGA MKII provides continuous real time measurement of carbon dioxide (CO_2), oxygen (O_2), carbon monoxide (CO) and hydrocarbons (HC), each parameter shown on an individual display. Oxygen and CO are detected using electrochemical cells, CO_2 and Hydrocarbons are detected using infra red sensors.

Audible and visual alarms are triggered when any of these gases exceed their alarm threshold, enabling the compressor to be shut down and the source of contamination investigated. Alarms will also activate when the sample flow or battery life is insufficient for the unit to operate adequately. If required the gas alarm set-points can be adjusted by using the external push buttons. The monitor has a built in data logging capability which can be configured for either survey or event analysis. Data can be downloaded to a computer in a Microsoft Excel compatible format.

The CAGA MKII is a water resistant, portable package supplied with an internal pressure reducer, designed to offer much needed flexibility in the field.

3 OPERATION

The CAGA MKII is housed in a waterproof enclosure, however the unit should only be opened in clean, dry environments, this should only be necessary during maintenance see Section 8.

3.1 Start up

The CAGA MKII can be operated from either internal rechargeable batteries, or an external power source. External power can be provided through the battery charger or a regulated 8-40vDC supply.

To turn the unit on using the internal batteries simply turn the switch to the on position. To operate from external power, connect the external power cable to the mating connector on the left-hand side of the unit and move the switch to the on position, as shown in the photo below.

External power connector
Nb. Remove the dust cap before connecting the cable.

The sensors will immediately enter into a warm up phase.

If the unit does not turn on, perform the following checks:

a) check that either the external power supply or batteries are healthy
b) check that the internal fuse in the external supply line is not blown

The CO_2, CO and O_2 sensors require a 40 second warm up period, during this time the alarms are inhibited and the displays will not show correct gas values.

The Hydrocarbon sensor requires a longer warm up period of approximately 30 minutes, during which time 'HEAt' will flash on the hydrocarbon display, during this time the unit will not show correct HC gas levels. Once warm up is complete the 'HEAt' message will disappear and the unit will start an Auto Cal operation. After one minute the Auto Cal should complete and the instrument will start to display a correct HC concentration.

Following warm up the displays are typically updated every second. If the instrument is started from cold it is normal for the Auto Cal operation to be triggered regularly, for the hydrocarbon sensor, as the

temperature inside the instrument stabilises, refer to Section 3.8 for more detail regarding the Auto Cal operation.

3.2 Gas connections

Sample gas is delivered to the instrument via a 6mm OD Push-Fit connector. The pressure at the inlet must not exceed 10 BarG (150 PSI). The sample pressure is internally reduced and sample gas carried to the sensors via internal flow adaptors and tubing. Gas leaves the instrument via the Outlet Port, which is fitted with an exhaust adaptor to reduce the risk of blocking the gas flow. (Refer to Section 7).

Please ensure that the gas inlet ports remain as clean as possible to prevent the internal protective membranes from becoming blocked.

3.3 Alarms

During normal operation the CAGA MKII will flash the green OK light every second, and display the current measured values of gas.

The CAGA MKII has been factory set with the following alarm set points:

Gas	Alarm set point	Information displayed
CO_2	500ppm	CO2.H
CO	10ppm	CO H
HC	20ppm	HC H
O_2	22%	O2 H
O_2	20%	O2 L

If an alarm is triggered an audible alarm will sound, the display backlights will come on and the relevant display will flash between the gas concentration and an alarm state. The alarms are latched, so the operator will be alerted to the alarm condition even if the alarm status no longer exists. A small hysteresis is allowed to prevent alarms continually re-triggering when hovering around the alarm set point.

The alarm set points can be changed using the 4 push buttons on the front panel, see Section 4.

When there is insufficient sample line pressure to generate a sample flow, the flow alarm is activated, 'Lo FLo' is flashed on the displays, the audible alarm will sound and the display backlights will come on.

The internal batteries will enable the unit to operate for approximately 14 hours before re-charging is required. As the battery power is drained the CAGA MKII will activate a low battery alarm. The buzzer will sound and 'Lo bAtt' will flash on the displays, the battery should be recharged using the charger supplied. The Low Battery alarm will not be activated when the instrument is operating from an external supply.

3.4 Backlight/Mute Button

The Audible alarms can be muted by firmly pressing the green mute button once. The mute button is also used to acknowledge and clear latched alarms.

This button also activates the backlight, which when not in alarm will automatically turn off after 10 seconds.

3.5 Faults

If the green OK light stops flashing there is either an alarm (as described in Section 3.3) or a fault with the instrument, this will be indicated by an accompanying error message on one of the displays.

A number of fault messages could appear on the displays, as described below:

FAULT MESSAGE	MEANING	REQUIRED ACTION
'Cal.E' on the oxygen display	A calibration is required for the oxygen sensor	Perform the calibration detailed in Section 5.2
'Cal.E' on the CO_2 display	A calibration is required for the CO2 sensor	Perform the calibration detailed in Section 5.3
'Cal.E' on the CO display	A calibration is required for the CO sensor	Perform the calibration detailed in Section 5.4
'Cal.E' on the Hydrocarbons display	A calibration is required for the Hydrocarbons sensor	Perform the calibration detailed in Section 5.5
'Flt.S' on the CO_2 display	A fault has been identified within the CO_2 sensor	It is possible that the sensor has been subjected to over-range CO_2. Flush through with 'clean gas'. If the fault persists, contact your supplier.
'Flt.S' on the Hydrocarbons display	A fault has been identified within the Hydrocarbons sensor	It is possible that the sensor has been subjected to over-range hydrocarbons. Flush through with 'clean gas'. If the fault persists, contact your supplier.
'Flt.C' on the Hydrocarbons display	A fault has been identified within the Hydrocarbons sensor	Reset the Instrument By turning it off then back on. If the fault persists, contact your supplier.
'Flt.H' on the Hydrocarbons display	A fault has been identified within the Hydrocarbons sensor	Reset the Instrument By turning it off then back on. If the fault persists, contact your supplier.

3.6 Charging the Batteries

The CAGA MKII is powered by an internal rechargeable Lithium-ion battery. The batteries will provide approximately 14 hours operation before recharging is required, indicated by the low battery alarm. The batteries must be charged using the supplied charger; use of a different charger could damage the batteries and leave them inoperable.

The battery charger is designed for indoor use; it should not be exposed to water, excessive dust or temperatures outside the range 0-40°C.

Plug the charger into the socket labelled 'CHARGER', then plug the charger into a mains socket. Do not plug the charger into the mains before connecting to the instrument.

The charger provides 3 modes of charge; status is indicated by the light on the front of the charger.

Red light:	Fast charge. This mode will only be initiated if the battery voltage is below the bulk voltage level.
Orange light:	Normal charge. This will last approximately 4 hours.
Green light:	Charge complete.

When charging is complete, disconnect from the mains before removing the battery connection.

Note that to achieve a full charge of the battery, the main unit should be switched off or powered from an external DC Supply.

3.7 Connecting an External Supply

The external DC power lead supplied with the instrument terminates in a female screw-locking connector that attaches to the mating external power connector on the left-hand side of the unit (this connector is protected by a dust cap that must be unscrewed prior to attaching the external supply lead).

The other end of the cable is presented as stripped ends for you to connect a suitable plug of your choice. The colour coding is shown below:

Core Colour	Signal Name	Connect to
Red	Positive (+ve) Supply	+8 to +40 V DC
Blue	Negative (-ve) Supply	0v

The external supply must be a stable DC supply in the range 8-40V. Typical current consumption figures are shown below

Input Voltage (V DC)	Load Current (mA) @25°C
12.0	700

The instrument can also be powered from a mains AC supply using the supplied charger. The charger should be connected to the CHARGER socket of the main unit. In this setup the battery is charged and the unit powered simultaneously and will run indefinitely, however to attain a full charge of the battery the main unit must be switched off.

3.8 Hydrocarbon Sensor Auto Cal

The Analox Infra Red Hydrocarbon Sensor is fitted with a Hydrocarbon filter which enables the sensor to be periodically zeroed. The Auto Cal operation is performed automatically by the instrument to ensure the zero reference of the sensor is correct. There are a number of circumstances that trigger the Auto Cal event, as detailed in the following table

End of warm-up	At the end of the HC sensors 30 minute warm-up period
Ambient temperature change	Changes in the ambient temperature of the operating environment can cause the sensor reading to drift. The temperature trigger minimises this effect by initiating an Auto Cal if the ambient temperature changes by >1.0°C
Time	If the instrument doesn't perform an Auto Cal for a period of 8hrs, the time trigger activates a periodic Auto Cal operation
User calibration	The user can initiate an Auto Cal by selecting the 'HC 0' option in the Calibration menu as described in Section 5

When the instrument has started from cold it is normal for Auto Cal operations to occur frequently as the internal temperature of the Instrument settles.

4 SETTING THE ALARMS

The alarm set points may be adjusted. To help minimise unauthorised use, access to the Alarm Menu is via a 'hidden' key combination.

Momentarily pressing the ENTER and CANCEL push buttons at the same time instructs the instrument to display an alarm configuration menu in place of the O_2 and CO_2 gas measurement displays. The following picture demonstrates how to access the Alarm Menu.

Initially, the displays will show the message "A.SEt O2 L". Pressing the UP or DOWN buttons will cycle through all of the available menu options as shown in Figure 1.

	A.SEt	02 L	Set Oxygen Low Alarm
UP ↑	A.SEt	02 H	Set Oxygen High Alarm
DOWN ↓	A.SEt	CO2.H	Set Carbon Dioxide High Alarm
	A.SEt	CO H	Set Carbon Monoxide High Alarm
	A.SEt	HC H	Set Hydrocarbon High Alarm

Figure 1, alarm menu options

When the desired option has been selected press ENTER. Alternatively press CANCEL to return to normal operation.

Pressing ENTER will trigger the instrument to request an alarm set point. Refer to the appropriate section below for further details. The CO_2 display will show the current value of the alarm set point, and

you can adjust the value using the UP and DOWN keys. Pressing CANCEL will abort the set point change, and pressing ENTER will request that the set point be changed. Before the change is made, the instrument will require confirmation. Initially the word 'no' will appear on the CO_2 display. This must be changed to 'YES' by pressing UP or DOWN, and then confirmed by pressing ENTER. This instructs the instrument to change the alarm set point. Pressing ENTER while the display shows 'no', or pressing CANCEL at any time, will prevent the set point change from taking place.

After entering the alarm configuration menu feature, if the switches are not pressed for a period of approximately 2 minutes, the instrument will return automatically to normal operation.

The description above is illustrated in Figure 2.

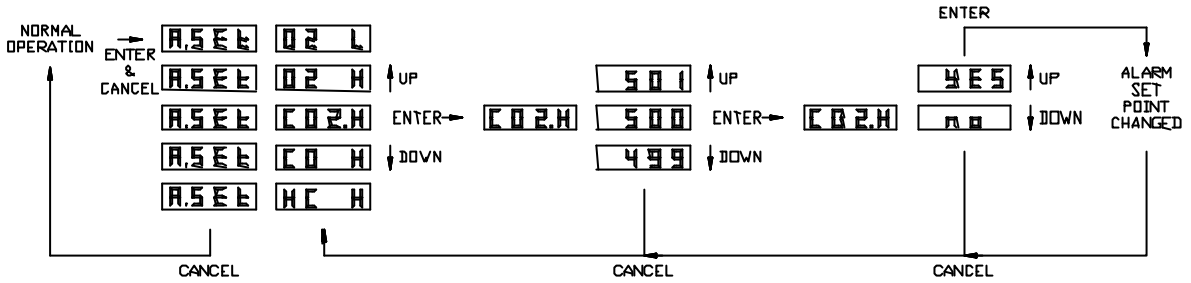


Figure 2, operation of push buttons during alarm set point change.

5 CALIBRATION

The CAGA MKII requires periodic calibration checks to ensure optimal performance (see Section 8). It is also recommended that the instrument is calibrated if it's operating environment changes.

Calibration should only be performed by suitably trained personnel familiar with the handling and use of calibration gas. Any abuse of the calibration features may render the instrument inaccurate and unusable. If this should occur however, there is a facility to restore the instrument to its original factory configuration.

To help minimise unauthorised use, access to the Calibration Menu is via a 'hidden' key combination.

Momentarily pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time instructs the instrument to display a calibration menu in place of the O_2 and CO_2 gas measurement displays, as shown in the picture below.

Initially, the displays will show the message "CAL O2 L". Pressing the UP or DOWN buttons will cycle through all of the available menu options as shown in Figure 3.

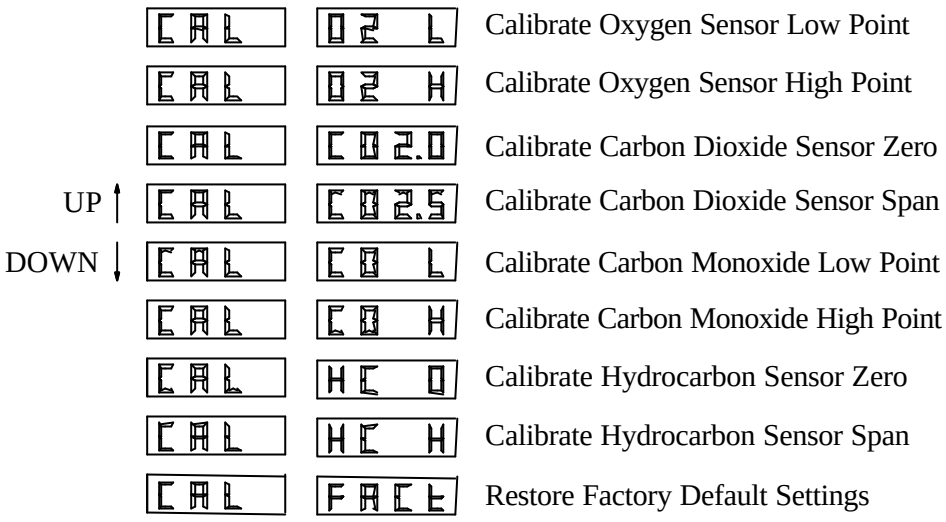


Figure 3, calibration menu options

When the desired option is displayed press ENTER. Alternatively press CANCEL to return to normal operation.

By pressing ENTER you will begin the calibration procedure. Refer to the appropriate gas section for further details.

The CO_2 display will show the current value of the calibration parameter, and you can adjust the value to match your calibration gas by using the UP and DOWN keys.

Press CANCEL to abort the calibration, or ENTER to request the calibration be performed. Before performing the calibration, the instrument will require confirmation. Initially the word 'no' will appear on the CO_2 display. This must be changed to 'YES' by pressing UP or DOWN, and then confirmed by pressing ENTER. This gives the final instruction to calibrate. Pressing ENTER while the display shows 'no', or pressing CANCEL at any time, will prevent the calibration from taking place.

Note that the alarms and backlight do not operate during calibration.

Once entering the calibration menu feature, if the switches are not pressed for a period of approximately 5 minutes, the instrument will automatically return to normal operation.

The description above is illustrated in Figure 4.

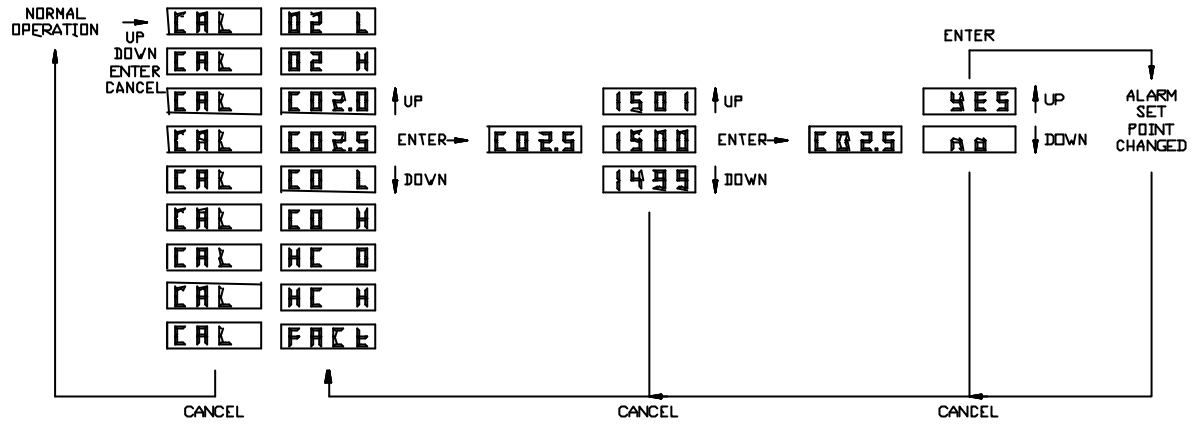


Figure 4, operation of push buttons during calibration

5.1 Use of Calibration Gas

The following sections require the use of calibration gas to calibrate the sensor. The instrument has been designed to allow the use of a wide range of calibration gases from various suppliers.

The descriptions that follow talk of using the following gases:

- Calibration Air
- 100% Oxygen
- Zero Carbon Dioxide
- Span Carbon Dioxide
- 50ppm Carbon Monoxide
- 20ppm N-Heptane

The calibration gas is easily fed to the instrument by connecting a suitable pipe from the gas bottle regulator to the instrument sample inlet (6mm Push Fit). Ensure that the output pressure from the regulator does not exceed 10 BarG (recommended pressure for calibration 1.5 BarG)

Ensure as always that the exhaust port is not blocked.

5.2 Oxygen Sensor Calibration

The oxygen sensor provides a varying millivolt output proportional to the concentration of oxygen in the sample flow. Two calibration points are provided. The instrument calculates the oxygen concentration by linear interpolation between the calibration points. The calibration parameters are defined as the Percentage of oxygen in the calibration gas (e.g. 20.9 or 100.0% for instance).

Ideally the calibration points should be near to the lower and upper ends of the oxygen range. The Low point calibration is expected to be performed using either nitrogen or calibration air. The High point calibration is expected to be performed using 100% Oxygen.

CALIBRATION OF OXYGEN SENSOR USING ZERO AND SPAN GASES (Calibration Air =20.9% O_2 and 100% O_2)	
Zero	
1	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
2	Subject the oxygen sensor to calibration air, using the gas inlet port a bottle of calibration air and a pressure regulator set to approximately 1.5BarG
3	Wait for the instrument reading to settle (allow approximately two minutes)
4	Select 'Cal O2' L by pressing the UP/DOWN buttons
5	Press ENTER
6	Press UP/DOWN until the display reads 20.9 (or appropriate value for the calibration air, this is the percentage concentration of oxygen in the calibration gas)
7	Press ENTER
8	Press UP to change 'no' to 'YES'
9	Press ENTER
10	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
Span	
11	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
12	Subject the oxygen sensor to 100% Oxygen, using the gas inlet port a bottle of calibration Oxygen and a pressure regulator set to approximately 1.5BarG
13	Wait for the instrument reading to settle (allow approximately two minutes)
14	Select 'Cal O2 H' by pressing the UP/DOWN buttons
15	Press ENTER
16	Press UP/DOWN until the display reads 100.0 (or as appropriate for the gas used, this is the percentage concentration of oxygen in the calibration gas)
17	Press ENTER
18	Press UP to change 'no' to 'YES'
19	Press ENTER
20	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
21	Re-subject the sensor to each of the test gases in turn to confirm that the sensor is working correctly

5.3 Carbon Dioxide Sensor Calibration

The carbon dioxide sensor works using an infra red absorption technique. It generates maximum signal when exposed to zero CO_2, and minimum signal when exposed to span CO_2. The microprocessor analyses this signal and applies temperature compensation and linearisation. Two calibration points are provided. The first point must always be at zero CO_2. The second point should be between full scale and half of the instruments full scale (i.e. for a 2500ppm instrument, use CO_2 concentrations between 1250ppm and 2500ppm). The calibration parameter is defined as the parts per million (ppm) of CO_2 in the calibration gas (e.g. 1500ppm for instance).

CALIBRATION OF CO_2 SENSOR USING ZERO GAS AND SPAN GAS (100% nitrogen and typically 1500ppm CO_2)	
Zero	
1	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
2	Subject the CO_2 sensor to zero CO_2 gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG. (e.g. 100% nitrogen, or 100% oxygen or calibration air with CO_2 removed)
3	Wait for the instrument reading to settle (allow five minutes)
4	Select 'Cal CO20' (CO_2 Zero) by pressing the UP/DOWN buttons
5	Press ENTER
6	Press UP to change 'no' to 'YES'
7	Press ENTER
8	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
Span	
9	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
10	Subject the CO_2 sensor to 1500ppm CO_2 gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG
11	Wait for the instrument reading to settle (allow five minutes)
12	Select 'Cal CO2S' (CO_2 Span) by pressing the UP/DOWN buttons
13	Press ENTER
14	Press UP/DOWN until the display reads 1500 (or as appropriate for the gas used- this is the parts per million concentration of CO_2 in the calibration gas)
15	Press ENTER
16	Press UP to change 'no' to 'YES'
17	Press ENTER
18	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
19	Re-subject the sensor to each of the test gases in turn to confirm that the sensor is working correctly

5.4 Carbon Monoxide Sensor Calibration

The carbon monoxide sensor provides a varying Microamp output proportional to the concentration of carbon monoxide in the sample flow. Two calibration points are provided. The instrument calculates the CO concentration by linear interpolation between the calibration points. The calibration parameters are defined as the parts per million (ppm) of CO in the calibration gas (e.g. 50ppm for instance).

Ideally the calibration points should be near to the lower and upper ends of the carbon monoxide range. The Low point calibration is expected to be performed using 100% nitrogen, 100% oxygen or calibration air with CO removed. The High point calibration is expected to be performed using 50ppm CO.

CALIBRATION OF OXYGEN SENSOR USING ZERO AND SPAN GASES (100% Nitrogen and 50ppm CO)	
Zero	
1	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
2	Subject the CO sensor to zero CO gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG. (e.g. 100% nitrogen, or 100% oxygen or calibration air with CO removed)
3	Wait for the instrument reading to settle (allow approximately two minutes)
4	Select 'Cal CO L' by pressing the UP/DOWN buttons
5	Press ENTER
6	Press UP/DOWN until the display reads 0.0 (or appropriate value for the calibration gas, this is the ppm concentration of CO in the calibration gas)
7	Press ENTER
8	Press UP to change 'no' to 'YES'
9	Press ENTER
10	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
Span	
11	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
12	Subject the CO sensor to 50ppm CO gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG
13	Wait for the instrument reading to settle (allow approximately two minutes)
14	Select 'Cal CO H' by pressing the UP/DOWN buttons
15	Press ENTER
16	Press UP/DOWN until the display reads 50.0 (or as appropriate for the gas used, this is the ppm concentration of CO in the calibration gas)
17	Press ENTER
18	Press UP to change 'no' to 'YES'
19	Press ENTER
20	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)

21	Re-subject the sensor to each of the test gases in turn to confirm that the sensor is working correctly

5.5 Hydrocarbon Sensor Calibration

The Hydrocarbon sensor works using an infra red absorption technique. It generates maximum signal when exposed to zero HC, and minimum signal when exposed to span HC. The microprocessor analyses this signal and applies temperature compensation and linearisation. The HC sensors factory linearisation is based on N-Heptane concentration. Two calibration points are provided. The first point must always be at zero HC. The second point should be a known concentration of N-Heptane between 20ppm and the instruments full scale (i.e. for a 100ppm instrument, use HC concentrations of N-Heptane between 20ppm and 100ppm). The calibration parameter is defined as the parts per million (ppm) of N-Heptane in the calibration gas (e.g. 20 ppm for instance). A Zero calibration must always precede a Span calibration.

CALIBRATION OF HYDROCARBON SENSOR USING ZERO AND SPAN GASES (100% Nitrogen and 20ppm N-Heptane)	
Zero	
1	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
2	Subject the HC sensor to zero HC gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG. (e.g. 100% nitrogen, or 100% oxygen or calibration air with HC removed)
3	Wait for the instrument reading to settle (allow approximately 5 minutes)
4	Select 'Cal HC 0' by pressing the UP/DOWN buttons
5	Press ENTER
6	Press UP to change 'no' to 'YES'
7	Press ENTER
8	Press CANCEL to return to normal operation and observe after a few seconds that the instrument starts an Automatic Zero. This process will take 1 minute after which the readout should change to the correct value (it may not have been wrong before)
Span	
9	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
10	Subject the HC sensor to 20ppm N-Heptane gas, using the gas inlet port a bottle of suitable calibration gas and a pressure regulator set to approximately 1.5BarG
13	Wait for the instrument reading to settle (allow approximately 5 minutes)
14	Select 'Cal HC H' by pressing the UP/DOWN buttons
15	Press ENTER
16	Press UP/DOWN until the display reads 20.0 (or as appropriate for the gas used, this is the ppm concentration of N-Heptane in the calibration gas)
17	Press ENTER
18	Press UP to change 'no' to 'YES'
19	Press ENTER
20	Press CANCEL to return to normal operation and observe after a few seconds that the instrument readout changes to the correct value (it may not have been wrong before)
21	Re-subject the sensor to each of the test gases in turn to confirm that the sensor is working correctly

5.6 Select Factory Default Settings

It is possible by the incorrect usage of the calibration features to render the instrument virtually unusable. The situation can be recovered by exercising the calibration options correctly.

It may be beneficial to a technician who is experiencing problems to be able to switch to the original factory default configuration. Each of the sensors may then also require calibration, but the readings displayed by the instrument should make sense.

To select Factory Default settings, proceed as follows:

RESTORING FACTORY DEFAULT SETTINGS	
1	Enter calibration mode by pressing the UP, DOWN, ENTER and CANCEL push buttons at the same time
2	Select 'Cal FACt' (Cal Factory Defaults) by pressing the UP/DOWN buttons
3	Press ENTER
4	Press UP to change 'no' to 'YES'
5	Press ENTER. The instrument will restart, as if it had just been switched on.

6 DATA LOGGING

The data logging option allows the ANALOX CAGA MKII to record up to 3000 sensor readings and to output the stored data to a computer for analysis purposes.

The Analox datalogging programme once installed on your computer allows the instrument to be configured to store any combination of oxygen, carbon dioxide, carbon monoxide or hydrocarbon readings at selected time intervals varying from 10 seconds to 30 minutes.

You could for instance opt to record just the carbon dioxide reading at 30 minute intervals. In this case 3000 readings will provide an endurance of 10 weeks. Alternatively, you could opt to record all four parameters at 10 second intervals, in which case the endurance would be approximately 2 hours.

By choosing an appropriate interval, you can store the maximum amount of information over a chosen time period.

A cable is supplied to connect the Analox CAGA MKII to the serial port on a PC. The cable is fitted with a 9 way female D-type connector. An adaptor will also be required if using a PC with a 25 way D-type connector.

6.1 Installation of Data Logging Software on a PC

The data logging software is compatible with IBM Personal Computers and compatibles running Windows 95, 98 or 2000 software.

1 Insert the floppy disk provided into the floppy disk drive on your computer

2 From the Start Menu on your desktop select RUN.

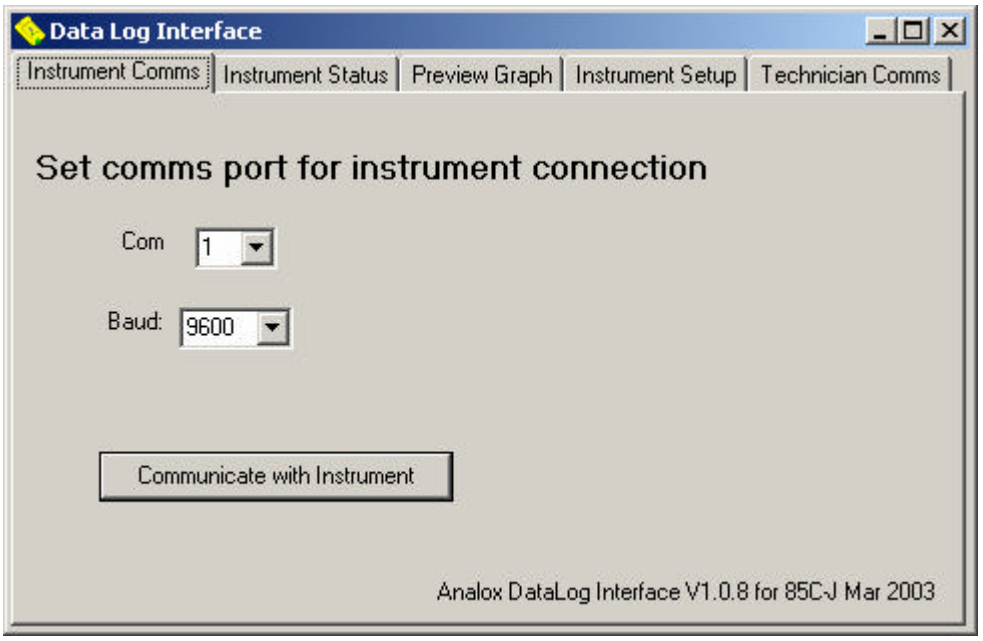
3 Type A:INSTALL.BAT or use the Browse feature to locate the file INSTALL.BAT on the Floppy Disk Drive (assumed to be A:). Whilst the file is installing an MSDos type screen will appear, this will disappear when installation is complete.

4 Install.Bat simply transfers the file DataLogInterface.exe to the directory C:\Analox

5 Now create a shortcut to the programme on your desktop
   a. On your desktop, click with the right hand mouse button and select New, and then Shortcut
   b. Navigate using the Browse button to select the file C:\Analox\DataLogInterface.exe Click OK to select this programme.
   c. Press NEXT
   d. Enter a name by which you would like to refer to the Shortcut, or just leave it as the default name
   e. Click Finish

6 From your desktop now double click on the new shortcut Icon that you have just created

7 The following screen will appear.



8 Now connect the PC to the Analox CAGA MKII using the data lead provided and ensure that the CAGA is switched on. Note whether it is connected into COM1, COM2, COM3 or COM4 on your PC. (Note if you have one of the older 25 way D-type ports on your PC, you will also need a 25 way to 9 way D-type adaptor).

9 Ensure that the correct 'COM' port is selected – press the **?** arrow adjacent to 'Com' and select 1 to 4 as appropriate. This setting will be remembered the next time you start the programme.

10 Always ensure that the Baud rate is set to 9600, to which it will default.

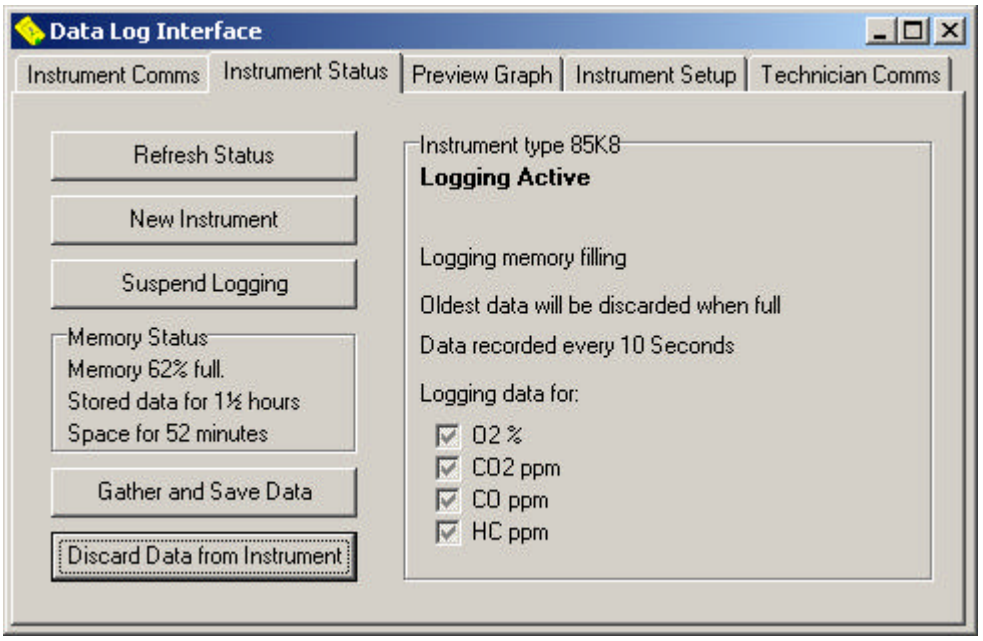
11 Click on the 'Communicate with Instrument' button. You will see a message 'Please wait' and if successful, the 'Instrument Status' tab will be selected.

12 If you get a message 'No Reply from Instrument' check the following:

a. The Analox CAGA MKII is switched on
b. The D-type connector is connected between the CAGA MKII and PC
c. The correct COM port is selected.
d. No other devices are attempting to use the COM port (e.g. mouse)

Now click 'OK' to the No Reply from instrument message and retry communications.

13 When you successfully establish communications, the following screen will appear. You are now ready to use the programme.



6.2 Data Logging Programme Overview

The data logging programme is split into a number of pages or tabs. These are Instrument Comms, Instrument Status, Preview Graph, Instrument Setup and Technician Comms as shown in the diagram below. Additional pages may also be accessed through the Technician Comms page.

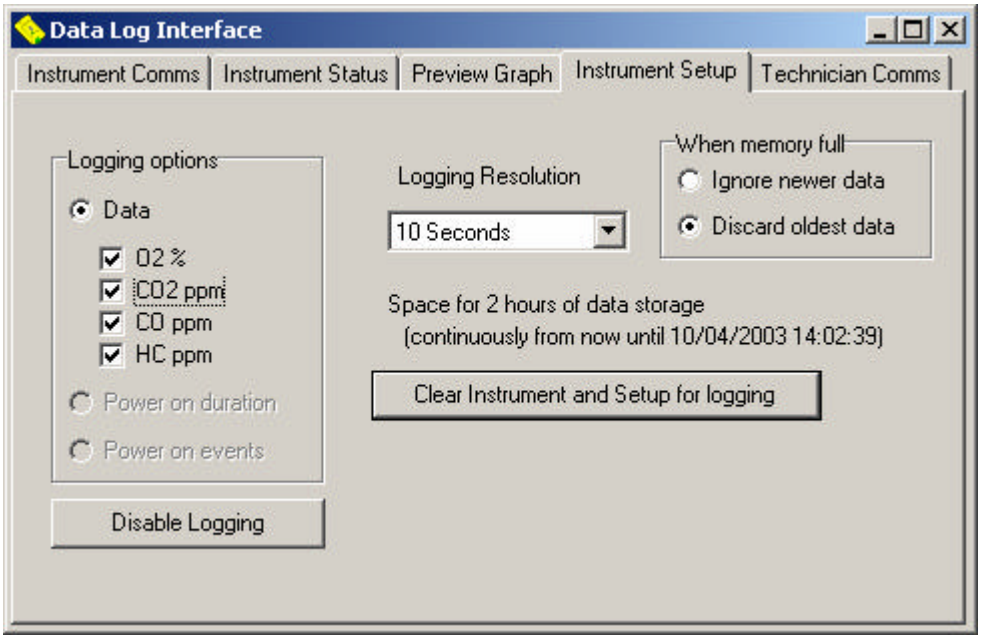
Instrument Comms appears during the installation process, the Instrument Status, Preview Graph and Instrument Setup pages are used during data logging set up, activation and data retrieval. The 'Preview Graph' is a small utility, allowing you an overview of the data that has been logged. It is not intended to replace the need for a spreadsheet. To use the graph select the variable that you wish to view and a graph will be automatically generated. This process will suspend logging; you will therefore need to click on the 'Restart logging' button on the Instrument Status page.

The Technician Comms page should not be used. It is only to be used under guidance from an Analox technician.

The Instrument status page provides a summary of the instruments data logging status and is shown in the diagram above. This page shows the Memory status of the Analox CAGA MKII. The Information Panel to the right of the screen shows us that logging is Active, i.e. the instrument is currently logging. The instrument has been configured to discard the oldest stored data when the memory is full. The instrument is recording all parameters (Oxygen, carbon dioxide, carbon monoxide and hydrocarbons) at 10 second intervals. All of these features are configurable on the Instrument Setup page. The 5 command buttons will be explained in Section 6.4.

6.3 Data Logging Configuration

Click on the 'Instrument Setup' tab and the following screen will appear:



Disable Logging:
If you do not want data logging to take place at all, press the 'Disable Logging' button. 'Logging disabled' will be shown on the Instrument Status page.

Logging Options:
Select the data items that you wish to record from O_2 , CO_2, CO and HC, by clicking on the box next to the parameter you require, if the box has been successfully selected a ✓ will appear.

Logging Resolution:
Select the Logging Resolution you require by clicking on the ? arrow, and then clicking on the time interval you want. This is the time interval between logged readings, which can be set to one of various values between 10 seconds and 30 minutes. Please be aware that the shorter the time interval, the shorter the data storage period. For example logging just CO_2 at 2 minute intervals will give approximately 3 weeks of continuous data storage, whereas logging O_2, CO_2, CO and HC at 10 second intervals will result in approximately 10 hours of continuous data storage. The wording 'continuous' refers to the unit logging whilst left permanently switched on. If the instrument is switched off, e.g. overnight, this time period will be extended.

Note there is a slight overhead every time the instrument is switched on and off, so the number of data points recorded will be slightly reduced each time the instrument is switched off and on. In normal daily use this reduction will not be apparent.

Full Memory:
This option enables you to specify what the instrument should do when its data logging memory is full.

You may choose to 'Ignore newer data' if for example you are conducting a specific test run, using a

short logging resolution, and you only require data from that test. By ignoring new data you will ensure that you retain your test data until you have been able to download it to a PC. You may choose to 'Discard older data' if you want the instrument to essentially keep on logging for ever, and you only intend to download the data following an incident you want to investigate.

Once you have set each of the 3 options described above (Logging Data, Logging Resolution and Memory Full options), press 'Clear Instrument and Setup for Logging'. This transfers the selected options to the instrument. It also transfers the date and time from your PC to the instrument. Make sure the Date and Time on your PC are correct!

You will be asked to confirm whether logging should 'Start Immediately', or the next time the instrument is switched on ('Start at next Power-Up'). This enables you to optimise the data storage time by leaving the instrument switched off until it is required.

6.4 Data Logging Retrieval of Data

1. Start up the Data logging programme by clicking on the shortcut on your desktop.

2. Click on the 'Communicate with Instrument' button. This will automatically take you to the Instrument Status page.

3. The Memory Status will show the Status of the instrument at the present moment in time. If you wish to refresh this status simply click the 'Refresh Status' button.

4. Press the 'Suspend Logging' button if you wish to stop the Analox CAGA MKII storing data temporarily. The CAGA MKII will automatically resume the next time it is switched on, or when the Restart Logging 'button' is pressed.

5. Press the 'Gather and Save Data' button to transfer data from the Analox CAGA MKII to the PC. Note this will automatically Suspend logging if you have not already done so.

6. Please wait patiently while the instrument transfers data to the PC. An estimate is provided of the time required for the data transfer to complete. If no problems occur in the transfer process, a screen will appear inviting you to save the log file.

7. In the Save as type box, select the type of file that you wish to save. Let us assume that we are trying to create a Microsoft Excel spreadsheet. Therefore select an Excel compatible .csv file. (CSV stands for a Comma Separated Variable file, and is a format that most spreadsheet programmes will recognise).

8. Now select the folder and enter the filename that you wish to use for the file. The programme will remember the filenames that you have used previously. Initially the default will be c:\My Documents\0Analox00. If you choose to retain this format, the programme will automatically suggest the next number 0Analox01, 0Analox02 etc for future files. The 0 at the start is meant to signify which instrument you are transferring data from if using multiple instruments.

9. You will then be asked if you want to delete the data already in the instrument. Answer Yes or No as appropriate. Answering 'Yes' will avoid retrieving the same data again at a future date. You will then be asked when you want logging to commence, click 'Start Immediately' or 'Start at next Power-Up' as appropriate.

   You may choose not to discard the data until you have inspected the data for correctness and click No. This will leave the data shown in the Memory Status. You can then use the 'Discard the Data from the Instrument' button to delete the data at your own discretion. You will need to reactivate the logging by clicking the 'Restart logging' button.

10. If you are retrieving data from a number of instruments, connect the PC to the next instrument and press the 'New Instrument' button. Retrieve the data as explained in steps 5 to 9.

6.5 Data Logging Data Analysis

Microsoft Excel is not provided with the Analox system. If you do not have a copy of Microsoft Excel, other spreadsheets will also allow access to the data. These instructions are limited however to the use of Excel. You may choose to access the data in a variety of ways, either via Excel or Windows Explorer. These instructions are based on loading the file from Excel.

1. Start Microsoft Excel from your Start Menu or from your desktop.

2. Select File, Open and then navigate to the folder in which you chose to store the data file (e.g. in c:\My Documents).

3. Select files of Type 'Text Files'. All of the CSV files in the chosen folder will appear. Click on the file that you wish to inspect, and then click on 'Open'

4. The data from the file will then appear in a standard Excel Worksheet.

5. Note that the first column of data is the date and time of the reading. This field is too wide to fit in the standard width of the cell. Click on the 'A' at the top of the column, and then select Format, Column, and Autofit Selection. Or simply drag the column separator between 'A' and 'B' to achieve the right width.

6. Select the right format for the Date and Time. Click on 'A' at the top of Column A, then press Format, Cells. On the 'Number' tab, under category, select 'Date', and then under 'Type' select 03-04-97 13:30 or similar.

7. Now to graph the CO2 reading, click on the 'A' at the top of Column A, then press and hold the CTRL key on the keyboard, and click on the 'C' at the top of the CO2 column. Then click on Insert, Chart (or press the small Chart Icon on the toolbar if you have one).

8. Under 'Chart Type' choose XY scatter, and under 'Chart Sub Type' choose the type of lines that you wish on the chart. (Hint – Use Scatter with data points connected by lines).

9. Now press 'Finish' or choose 'Next' if you wish to refine the appearance of the graph.

10. A graph will appear on the screen with the x-axis showing the date and time, and the y-axis showing the CO2 reading.

11. The basic appearance of the graph can now be edited, but to do so requires familiarity with Microsoft Excel. There are several books available at almost any computer store on this subject.

7 SAFETY INFORMATION

7.1 Gas Outlet Port

The Gas Outlet Port must never be blocked or restricted. The exhaust adaptor minimises the risk of the port being inadvertently blocked. If the port is blocked, internal damage to the sensor arrangement may occur, and the CAGA MKII will not operate correctly.

7.2 Electrochemical sensor handling information

When the life of the O_2 or CO sensor has expired or it is leaking or otherwise damaged it must be disposed of safely in accordance with local regulations.

The O_2 sensor contains Potassium Hydroxide (KOH) solution which is hazardous. In the event of contact, apply the following First Aid procedures:

CONTACT TYPE	EFFECT	FIRST AID PROCEDURE
Skin	Potassium Hydroxide is corrosive. Skin contact could result in a chemical burn.	Wash the affected parts with a lot of water and remove contaminated clothing. If stinging persists get medical attention.
Ingestion	Can be harmful or FATAL if swallowed	Drink a lot of fresh water. Do not induce vomiting. Get medical attention immediately.
Eye	Contact can result in the permanent loss of sight	Get medical help immediately and continue to wash with a lot of water for at least 15 minutes

The CO sensor contains sulphuric acid solution which is hazardous. In the event of contact with the skin or eyes, wash immediately with copious amounts of water and seek medical advice.

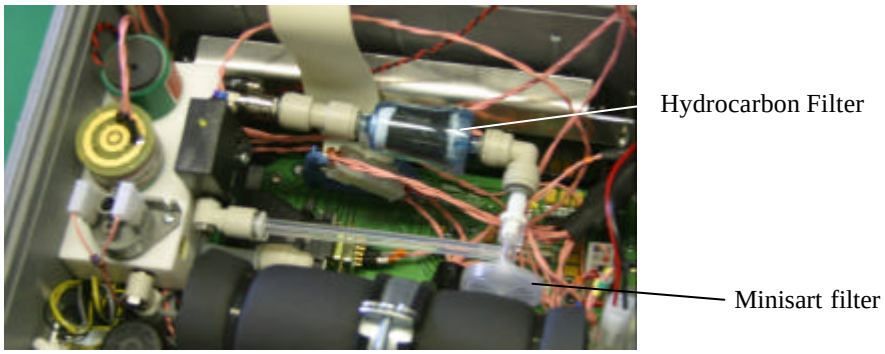
8 MAINTANENCE

Maintenance consists of the following tasks:

FREQUENCY	
Daily	Check that the instrument is maintained in a clean state. Ensure that the gas inlet and outlet ports are unobstructed.
	Check the batteries; recharge them when the low battery message flashes on the display.
Weekly	Check the accuracy of the readings by subjecting the instrument to calibration gas. If necessary, recalibrate the instrument as detailed in Section 5.
Six Monthly	Replace the Minisart and Hydrocarbon Carbon Filters (Section 0).

8.1 Replacing Filters

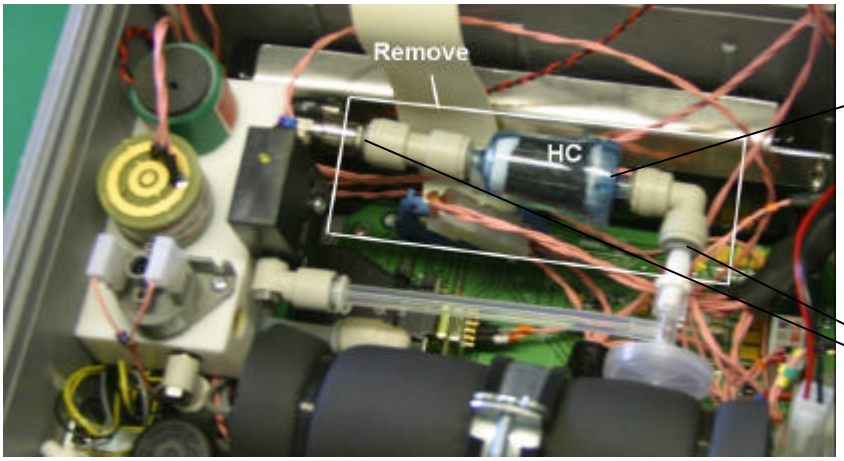
The CAGA MKII has two user replaceable filters, as shown in the photograph below. These filters are accessed by opening the enclosure. The enclosure should only be opened in clean dry conditions to avoid damage to internal components. The filters should only be replaced in the event of heavy hydrocarbon contamination of the instrument or during a six month service.



Hydrocarbon Filter

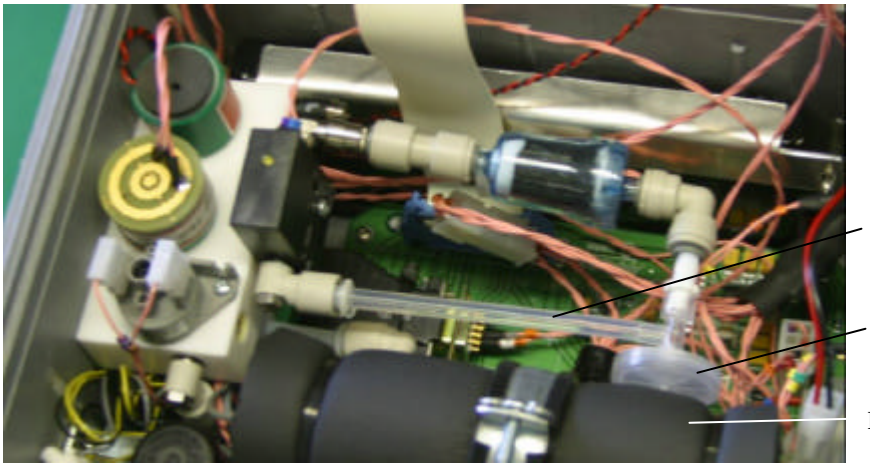
To replace the Hydrocarbon filter, remove the boxed area labeled HC in the photo over the page; this area includes the filter and its tube adaptors. This is done by depressing the grey collet on the cream tube adaptors, and removing the tube at each end of the filter assembly. Remove the tube from the right angled adaptor first. The filter itself is then easily removed from its tube adaptors in the same way.

When connecting the new Hydrocarbon filter make sure the right angle tube adaptor is attached to the larger diameter end of the filter, to ensure the correct direction of gas flow. The filter assembly can then be re installed inside the instrument by simply pushing the tubes firmly back into the push fit fittings.



Minisart Filter

The Minisart filter is screwed directly into the Hydrocarbon sensor body, when changing the filter care should be taken not to over tighten the filter as damage to the HC sensor could result.



Unscrew the filter from the HC sensor (anticlockwise direction to remove) and pull the tubing assembly up. The filter can then be pulled off the luer T-piece by giving the joint a twist. The new filter should then be screwed (clockwise) into the HC sensor, taking care not to over tighten. Lower the tubing assembly and push the Luer T-piece into the filter to complete the installation.

9 QUICK CHECK

Green ok light	Red light	Displays	Buzzer	Condition	Action
Flashing	Off	Showing gas concentration	silent	Safe, gases below alarm levels	None
Flashing	Off	'HEAt'	silent	Hydrocarbon sensor warm up	None
Flashing or Off	On	All '----'	silent	Hydrocarbon sensor Auto calibration	None
Off	Off	CO2.h	Beep	CO2 alarm	Contamination detected. Follow recommended procedures
Off	Off	CO H	Beep	CO alarm	
Off	Off	HC H	Beep	HC alarm	
Off	Off	O2 H	Beep	High O2 alarm	
Off	Off	O2 L	Beep	Low O2 alarm	
Off	Off	Lo Flo	Beep	Low flow alarm	Check gas sample line is not obstructed
Off	Off	Lo bAtt	Beep	Low battery alarm	Recharge batteries
Off	Off	Cal.E on O_2 display	Beep	O_2 calibration warning	Calibrate O_2 sensor
Off	Off	Cal.E on CO_2 display	Beep	CO_2 calibration warning	Calibrate CO_2 sensor
Off	Off	Cal.E on CO display	Beep	CO calibration warning	Calibrate CO sensor
Off	Off	Cal.E on HC display	Beep	HC calibration warning	Calibrate HC sensor
Off	Off	Flt.S on CO_2 display	Beep	CO_2 sensor fault	Flush unit with 'clean gas'. Contact your supplier
Off	Off	Flt.S on HC display	Beep	HC sensor fault	Flush unit with 'clean gas'. Contact your supplier
Off	Off	Flt.C on HC display	Beep	HC sensor fault	Reset unit. Contact your supplier
Off	Off	Flt.H on HC display	Beep	HC sensor fault	Reset unit. Contact your supplier

10 SPECIFICATION

Power Source	External DC supply. 8-40V DC, with regulation of better than +/- 300mV. External AC supply. 100-240V AC, (through Battery charger)	
Batteries	Lithium-Ion rechargeable battery pack: 14 hr life @25°C	
Fuses	One fuse for power supply, 1A-T.	
Display Panel	4 x 4 character LCD displays, character size 8mm x 5mm Oxygen, carbon dioxide, carbon monoxide and hydrocarbons	
Operator controls	5 x pushbuttons to control User interface and display backlight. Backlight times out after 10 seconds when turned on.	
Oxygen Sensors	Analox 9100-9212-9HSUB-1 oxygen sensor with 2-3 year life in air at normal atmospheric pressure.	
	Range	0-100 % O_2
	Resolution	0.1%
	Accuracy	±1% of reading, ±0.2% O_2
CO Sensor	Analox CO Sensor	
	Range	0-50 ppm
	Resolution	1ppm
	Accuracy	+/-3% of range
CO_2 Sensor	Analox BL5 low power, long life infra red sensor with microprocessor applied temperature compensation and linearisation	
	Range	0-2500 ppm
	Resolution	1ppm
Hydrocarbon Sensor	Analox Heated infra red Hydrocarbon sensor with microprocessor applied temperature compensation and linearisation	
	Range	0-100 ppm (N-Heptane)
	Resolution	1ppm
Gas Inlet	6mm O/D push fit connector	
Gas Outlet	6mm O/D push fit connector, fitted with an exhaust adaptor designed to minimise the risk of blocking the outlet.	
Operating Temperature	-5°C to 40°C	
Storage Temperature	-5°C to 50°C	
Charging Temperature	0°C to 40°C	
Dimensions	250 x 280 x 180 mm	
Weight	3.6kg	

По вопросам продаж и поддержки обращайтесь:

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