

# HYPER-GAS MkII™ DIVING BELL HYDROCARBON MONITOR

## Technical Manual

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## 1 Packaging and Contents Check

On opening your Hyper-Gas MkII™, please check you have the following items.

- a) Analox Hyper-Gas MkII™, Bell Monitor
- b) Connecting cable, 2 metres long
- c) Mounting Kit for Bell Monitor consisting of two M8 stainless steel bolts and nuts
- d) Datalog Interface software CD
- e) Bell Handbook
- f) Technical Manual (this document)
- g) Test Certificate

If your kit includes a Topside Repeater then you should also have:

- h) Analox Hyper-Gas™, Topside Repeater
- i) Mounting kit for Topside Repeater consisting of four M8 stainless steel bolts and nuts
- j) Connecting cable, 2 metres long
- k) RS232 Topside Repeater Datalogging cable

## 2 About the Hyper-Gas MkII™

The Analox Hyper-Gas MkII™ is a purpose designed hydrocarbon gas analyser for use in hyperbaric environments. It has been designed to detect and warn divers of anaesthetic levels of hydrocarbons in the bell atmosphere. Where divers are working on dirty sites there is potential for contamination of the bell atmosphere from vaporisation of contaminants from dive suits and umbilical lines. Vaporisation of hydrocarbons into the bell can occur within minutes and can rapidly rise to anaesthetic concentrations. The Hyper-Gas MkII™ Bell Monitor once mounted in the bell has been designed to rapidly detect the presence of vaporised hydrocarbons. It activates audible and visual alarms well before the anaesthetic threshold is reached. The Topside Repeater is mounted at the surface to relay conditions inside the bell to surface engineers. If there is a blockage in the sample flow for the Hyper-Gas MkII™ a flow alarm will be activated on both units.

The Hyper-Gas MkII™ system is fitted with a datalogging facility as standard. This logs the measured level of hydrocarbons, the depth and the corresponding date and time. Once the logging capacity is exceeded the Hyper-Gas MkII™ will automatically overwrite the oldest data. Data can be downloaded directly from the Bell Monitor with the optional USB cable, or via the Topside Repeater onto a PC using the datalog retrieval programme.

## 3 Introduction

The Analox Hyper-Gas MkII™ system is designed to monitor hydrocarbon gases in diving bells. It will operate at depths down to 600 metres.

The full system consists of two units

- Hyper-Gas MkII™ Bell Monitor containing the infra red hydrocarbon sensor
- Hyper-Gas™ Topside Repeater

Both units are powered by a 24V DC supply, and they are connected together via the dive bell umbilical such that they can communicate with each other over an RS485 link. The Bell Unit analyses and measures the gas content in the diving bell, updates its alarm indicators, and transfers the reading to the Topside Repeater which shows the same information at the surface.

The Bell Monitor analyses the hydrocarbon content in the bell atmosphere. It is calibrated using a propane gas mix. Typical head-space analysis of various crude oils shows the presence of several

narcotic hydrocarbon gases. The range of the instrument has been designed to make the instrument responsive to the typical mixture of gases that could be found in a diving bell (butane, propane, pentane, hexane, xylene, benzene etc).

The Bell Monitor provides four indicators as follows:

INDICATOR	COMMENTS
OK	Flashes at regular intervals to show that the instrument is working, and that the gas levels are below the pre-set alarm level
DANGER	Flashes if the hydrocarbon content in the bell atmosphere exceeds a pre-set limit
SENSOR FAULT	Flashes in the event of an internal sensor fault being detected
FLOW ALARM	Flashes in the absence of a sample flow. This indicator must be OFF for the unit to be operating correctly.

The Mute button on the instrument allows the operation of the indicators to be tested. Pressing the Mute button will cause the indicators to flash and the buzzers to sound.

An audible alarm will also operate in the event of an alarm or fault condition. This may be temporarily muted by pressing the Mute button on the instrument.

The Topside Repeater is updated by the Bell Monitor, and it shows the same information. The Topside Repeater is fitted with an additional indicator 'Bell Comms Alarm' which will illuminate if the two units are not communicating.

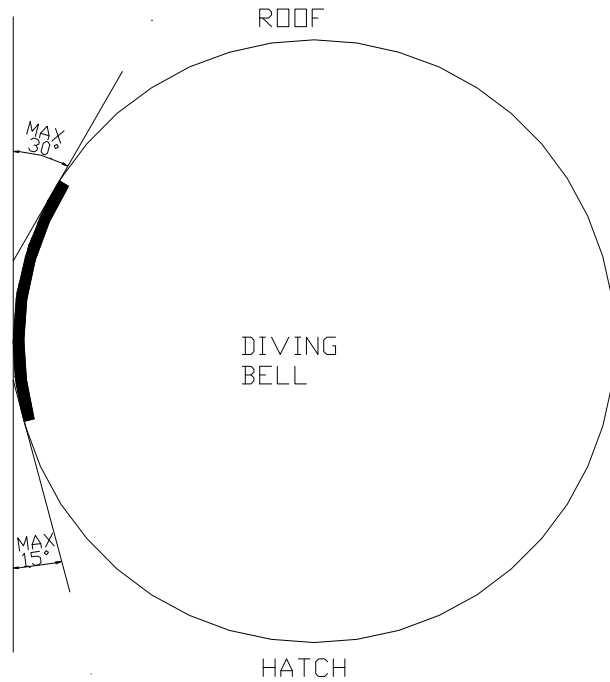
If there are problems with communications interference with other systems, the two units may be factory set to communicate with each other at approximately 15 minute intervals, or whenever an alarm or sensor fault condition changes state. This means that in the event of an umbilical problem, the Topside Repeater could be up to 15 minutes out of date. Pressing the Test Switch will cause an immediate update of status, provided the umbilical communication link has been restored. Normally the two units communicate every 10 seconds.

## 4 Installation

### 4.1 Bell Monitor Installation

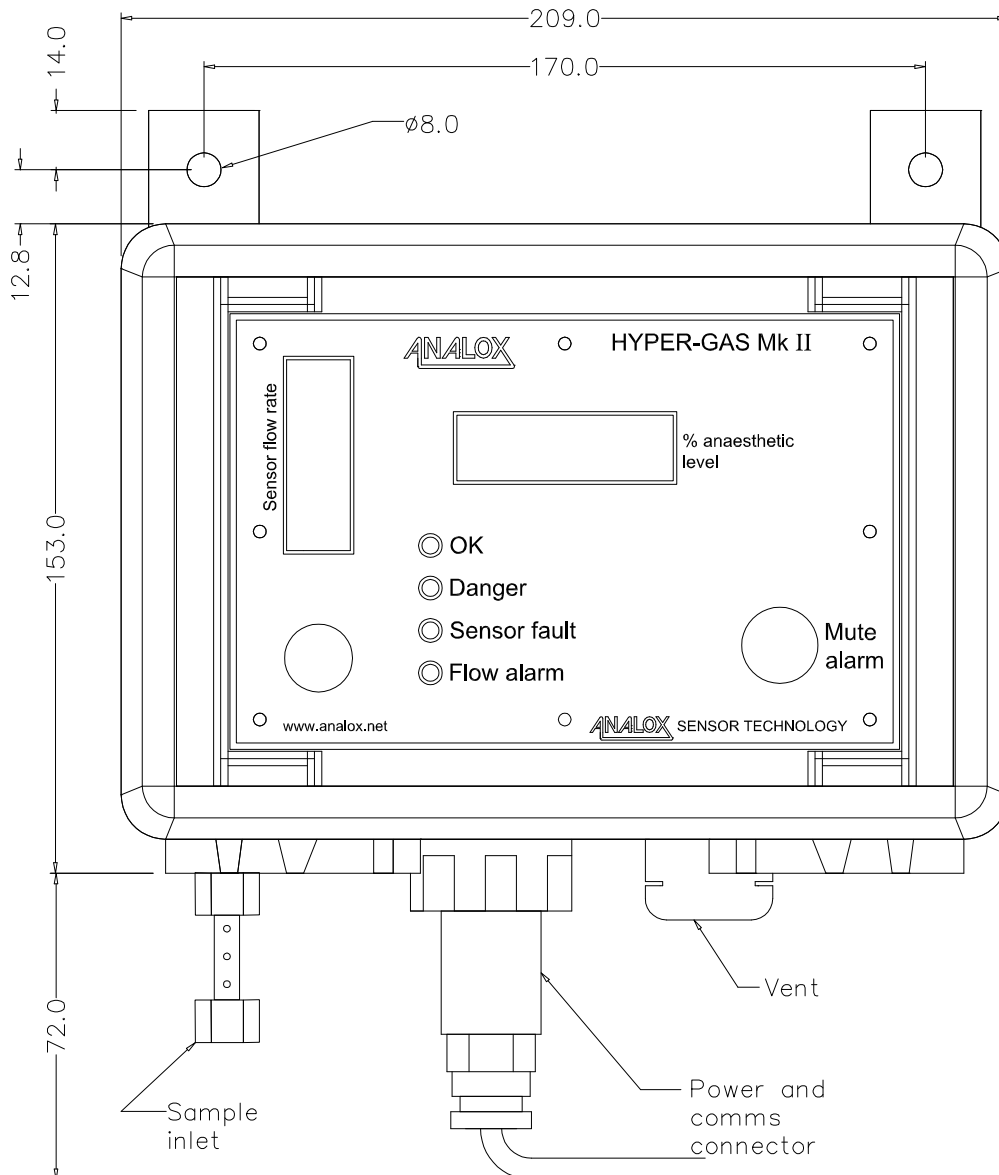
#### 4.1.1 Physical mounting

The Bell Monitor is designed to be wall mounted using the mounting lugs fitted. The unit should be mounted close to vertically, as shown in the diagram below. It should be mounted somewhere where it will not be subject to physical abuse. The instrument is designed to resist the ingress of water but should not have water poured over it or sprayed directly at it.



M8 bolts or studs should be used. Sufficient room must be allowed below the enclosure for the gas inlet and the electrical connection. The sample inlet tube must be used to prevent water and dirt entering the unit.

The sample inlet is on the underside of the enclosure, alongside the electrical connection. Ensure that this port is not obstructed. It is protected by a length of stainless tube with small holes to admit air, take care not to bend this. The air sucked into the sample inlet is exhausted through the vent on the other side of the electrical connector, which also incorporates a sounder. Again, take care not to obstruct this.



#### 4.1.2 Gas connections

The sample gas is drawn through the sample inlet tube and exhausted through the vent. For zero and alarm checking, the sample line inlet adapter is fitted in place of the sample inlet tube. Apart from this there are no gas connections to the unit.

#### 4.1.3 Electrical connections

A mating electrical connector and a short length of cable are provided. There are 4 electrical connections to be made. It is intended that the short length of cable is routed to a junction box inside the Bell.

The Chassis mounted plug connector is a 6 way Bulgin Buccaneer. This has UL, CSA, VDE and Lloyds Ship Register approvals. The mating connector is a Bulgin Buccaneer 6 way Cable Mounting Socket.

Pin allocations are

Pin No	Signal	Cable Colour	Comments
1	24V DC SUPPLY +	RED	
2	0V DC	BLACK	
3	RS485 A+	WHITE	
4	RS485 B-	GREEN	
5	NO CONNECTION	-	
6	NO CONNECTION	-	

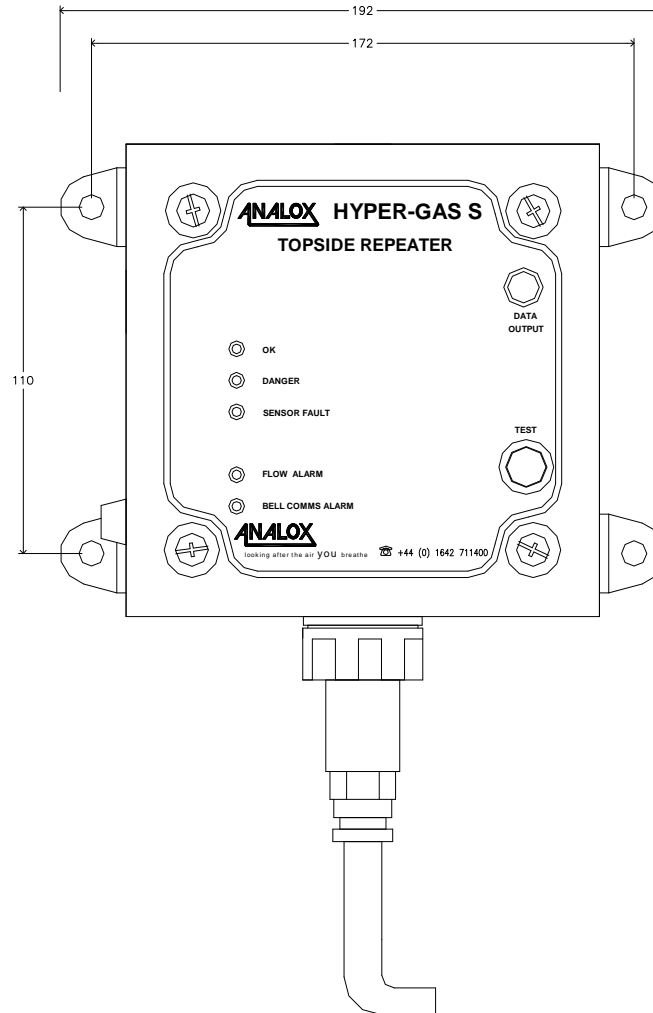
Note that the RS485 terminals are connected to the same connections on the Topside Repeater.

The fuse is a self-resetting polyswitch type which is mounted on the circuit board. In the event of an overload or reverse polarity connection the polyswitch will go open circuit and protect the instrument and the supply. When the fault condition is removed it will automatically reset without user intervention.

## 4.2 Topside Repeater Installation

### 4.2.1 Physical Mounting

The Topside Repeater is designed to be wall mounted using the mounting lugs fitted as shown below. M8 bolts or studs should be used. Note that sufficient room must be allowed below the enclosure for the electrical connection.



### 4.2.2 Gas connections

There are no gas connections to the Topside Repeater.

### 4.2.3 Electrical connections

A mating electrical connector and a short length of cable are provided. There are 4 electrical connections to be made. It is intended that the short length of cable is routed to a junction box adjacent to the Topside Repeater.

The Chassis mounted plug connector is a 6 way Bulgin Buccaneer. This has UL, CSA, VDE and Lloyds Ship Register approvals. The mating connector is a Bulgin Buccaneer 6 way Cable Mounting Socket.

Pin allocations are

Pin No	Signal	Cable Colour	Comments
1	24V DC SUPPLY +	RED	
2	0V DC	BLACK	
3	RS485 A+	WHITE	
4	RS485B-	GREEN	
5	NO CONNECTION	-	
6	NO CONNECTION	-	

Note that the RS485 terminals are connected to the same connections on the Bell Monitor.

The Bell Monitor and the Topside Repeater need not be powered from the same power supply, but the power supplies used must have a common 0V connection, or must both be connected to earth. Differences in 0V level of greater than 7V between the two units will disrupt the communications.

A fuse is fitted to the right hand side of the Topside Repeater enclosure. For the fuse type refer to the Specifications in Section 10.

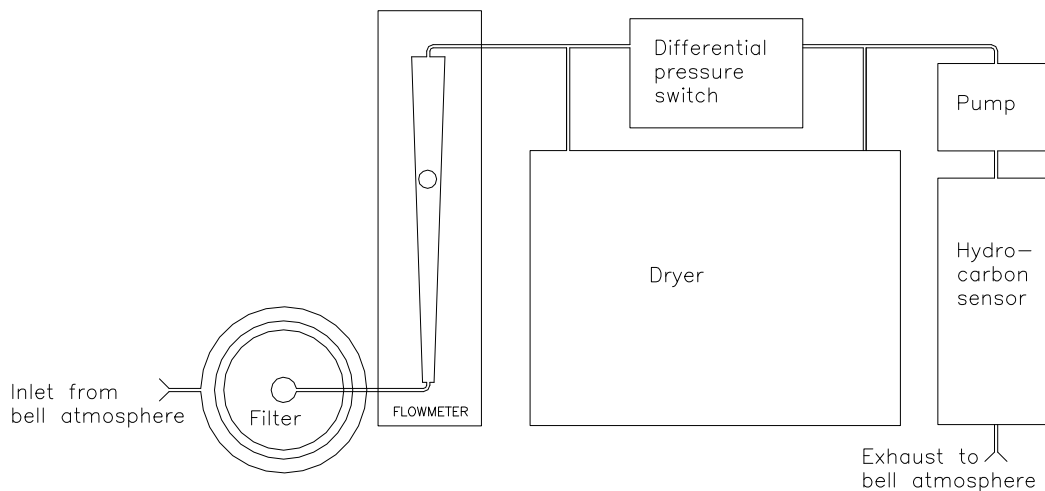
## 5 Operation

### 5.1 User Operation

The Hyper-Gas MkII™ Hydrocarbon monitor and alarm needs no user input for its operation. It simply sucks air from the Bell through an internal manifold with filtration and drying and then pumps it past an infra-red hydrocarbon sensor. If significant levels of hydrocarbon gases are detected then the alarm is triggered. If the alarm is triggered follow your company procedures.

### 5.2 Technical Operation

The internal schematic of the Bell Monitor is shown below:



The Bell atmosphere is sucked in through small holes in the sample tube. This gas is then passed through a filter to remove any particulates and water droplets that may be present in it. Then it goes through a flow meter which provides a visual indication of flow. At atmospheric pressure the flow meter should indicate between 0.5 and 1.5 SCFH, (Standard Cubic Feet per Hour, 1 SCFH = 0.45

litres/minutes) at depth the reading will increase and should reach the maximum value of 2.0 SCFH. See the troubleshooting section if the flow is not within this range.

Next the air passes through a drier which consists of a long length of moisture permeable tube packed in molecular sieve desiccant. A pressure switch monitors the pressure drop across this tube and is used to trigger the flow alarm in the event of a blockage stopping the flow. Then the air is sucked into the pump and expelled into the hydrocarbon sensor. The hydrocarbon sensor shines infra-red light through the air and detects the absorption of certain wavelengths which are absorbed by the chemical bonds found in hydrocarbon gases. Finally the air is expelled back into the Bell. It takes less than fifteen seconds for the air to pass through the instrument.

All the consumable and wearing parts (the filter, drier, pump and sensor) are contained within an acrylic manifold and may be easily removed for maintenance. To ensure reliable operation of the Hyper-Gas MkII™ it is essential that the manifold is returned to Analox every six months for overhaul and re-calibration of the sensor. See the maintenance section for a description of how to change the manifold.

### 5.3 Power-on operation

At switch on the Hyper-Gas MkII™ goes through an internal self test and tests communications with the sensor. All the LEDs and the LCD segments and the backlight are flashed four times to verify correct operation. The display then shows a scrolling message with the name of the unit, the software version and the serial number. It then reads the calibration due date of the sensor (this is effectively the date when the manifold should be returned to Analox for overhaul) and displays the number of days remaining. If calibration is overdue it displays the message “Calibrate” and sounds the buzzer. See below for a full description of the manifold calibration date.

There is then a forty second period in which the display shows “Cold” while the sensor reaches its operating temperature. During this period the OK LED is off and the other LEDs are on. After this the display shows the hydrocarbon level in the Bell atmosphere and the alarms operate normally.

If the power-on self test fails then an error code is displayed ( e.g. “Er:01” – see the troubleshooting in section 8 for a full description of error messages ) and the sensor fault alarm will be triggered in the case of a problem with the sensor.

### 5.4 Alarm Operation

As described above, at switch-on all LEDs flash four times and then the OK LED is off during the forty second warm-up period and the other LEDs are on. Thereafter the alarms operate normally, as described below.

There are three alarms for hydrocarbon, sensor fault and flow. When an alarm is triggered the appropriate LED flashes and the buzzer sounds. For a hydrocarbon alarm the buzzer pulses, for the sensor fault and flow alarms it emits a continuous tone.

The flashing and sounding will continue until the mute button is pressed. Even if the source of the alarm is removed (e.g. the hydrocarbon levels drop back to normal) the alarm will continue. This ensures that the dangerous condition is noticed even if the Bell is unoccupied when it occurs. The effect of pressing the mute button depends on whether the source of the alarm is still present. If it is then the sounder is muted and the LED changes to a steady on rather than the flashing used to indicate an un-acknowledged alarm. After five minutes the alarm will re-trigger and need to be muted again, unless the source stops in which case the LED will go off and the alarm will be cleared. If the source of the alarm is no longer present then pressing the mute button immediately switches off the LED, mutes the buzzer and clears the alarm.

When there is an alarm the OK LED will be off.

In the event of a gas alarm follow your company’s recommended procedures. In the event of a flow or sensor fault alarm see the troubleshooting information in section 8.

Whilst operating, the instrument is storing readings at regular time intervals (refer to Section 6 'Datalogging').

Pressing the mute button causes the buzzer to sound and the LEDs to switch on while the button is depressed. This is lamp test feature.

## **5.5 Manifold calibration date**

The manifolds require service every six months. To help the user keep track of the calibration period, the manifold is electronically tagged with the date of calibration expiry and it has the capability to electronically record the date of first use (this is the date on which the manifold is first pressurised while powered up). These dates are read out of the manifold every time the unit is switched on and the user is informed of the number of days of calibration time remaining (or indeed the number of days by which calibration is overdue). The unit will continue to function once the calibration is overdue but use of an out of calibration manifold is not recommended.

If the calibration of the manifold is overdue, then the buzzer will sound and the message "Calibrate" scrolls across the display during the power on self test sequence.

The manifold calibration is guaranteed for twelve months from factory despatch, or six months from the date of first use, whichever is the sooner.

## 6 Datalogging

There are two methods provided for communication with the Bell Monitor and upload of the datalog stored within it. If your system includes a Topside Repeater then you will have been supplied with a cable which allows connection between the communication socket on the Topside Repeater and the standard 9 way D RS232 connector found on most laptop or desktop PCs. As an accessory a separate cable is available which “breaks in” to the power and comms connection to either the Bell Monitor or the Topside Repeater. This cable is terminated with a USB plug that mates with the standard A type USB outlets found on all modern laptop and desktop PCs.

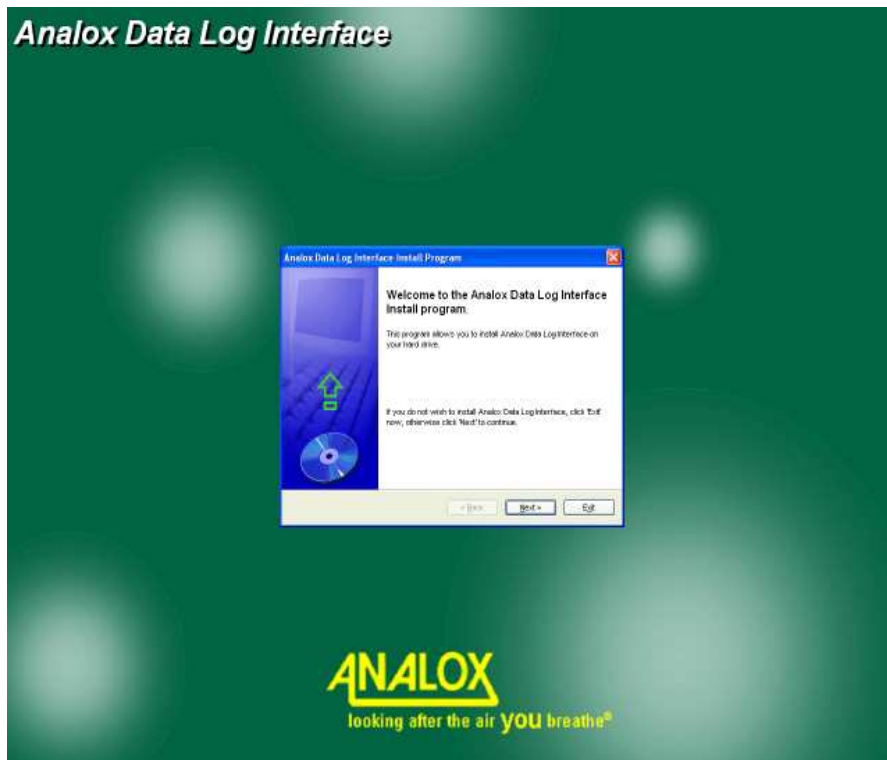
A separate power supply is also available as an accessory so if the unit cannot be conveniently accessed in the Bell, it may be powered up on a workbench and connected to a PC there.

Software provided allows the PC to communicate via the Topside Repeater to the Bell Monitor to retrieve logged data. The unit has been factory set to log hydrocarbon maximum, hydrocarbon minimum, depth and temperature every two minutes. It records the maximum and minimum hydrocarbon concentration seen during the two minute interval. There is sufficient space to record five days worth of data, then the oldest data will be overwritten. In the event of a hydrocarbon alarm, data should be downloaded as soon as possible, but no more than 1 day after the event.

### 6.1 Installation of Data Log Retrieval Software on a PC

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

Insert the software CD. It should automatically start the installation program as shown below:



Follow the default instructions to install the software.

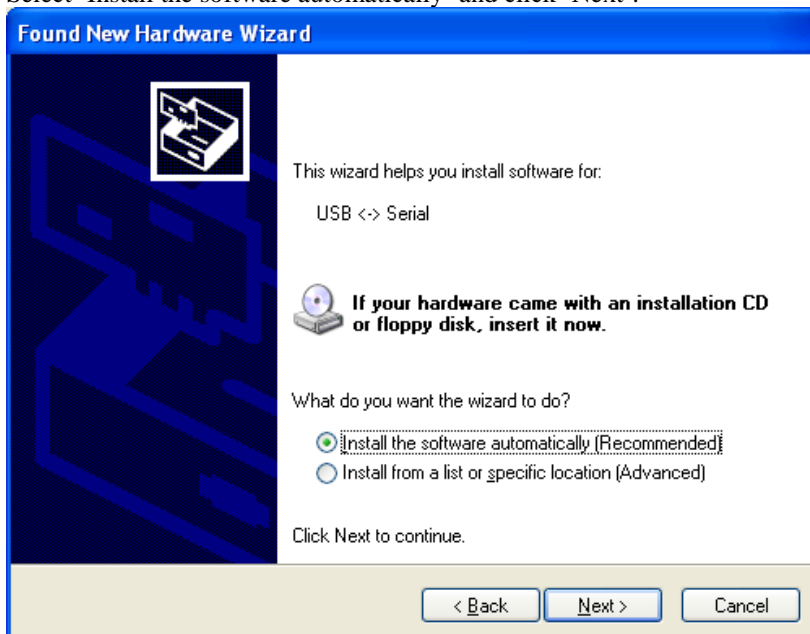
## 6.2 Installation of drivers for the USB cable

The USB cable contains circuitry to convert the USB signals to RS485. This circuitry needs drivers which are on the supplied CD. Follow these instructions to install the drivers:

- Place the CD in your CD drive (it should still be there if you have just installed the Datalog Interface software). If the Datalog Interface installation program starts, and you have already installed it, simply click exit.
- Plug the cable into the USB port of your computer. It is not necessary to connect the cable to the Bell Monitor or Topside Repeater for the purposes of the installation.
- When the 'Found new hardware' wizard appears, select 'No, not this time' and click 'Next', as shown below:



- Select 'Install the software automatically' and click 'Next'.



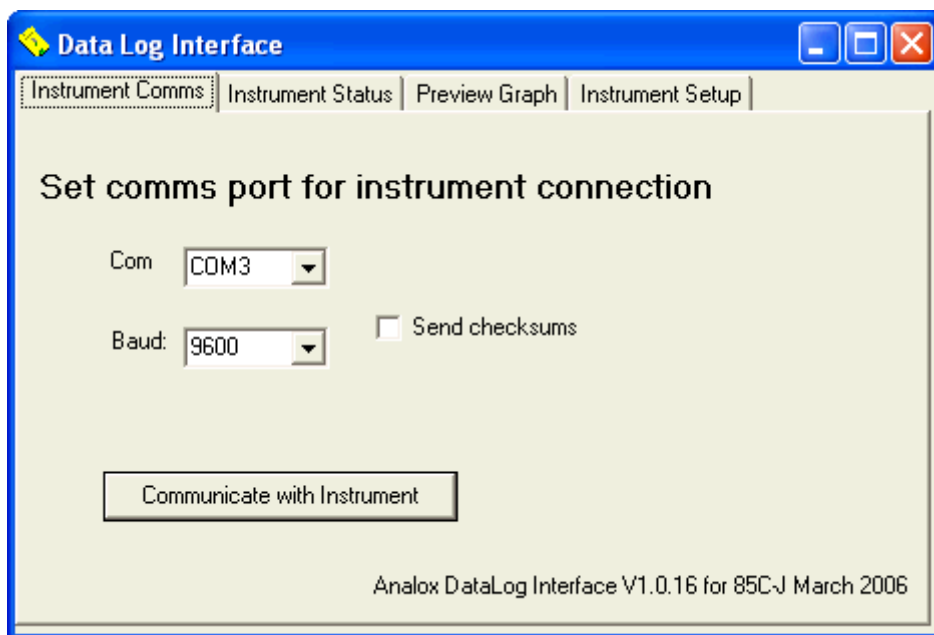
- Click 'Continue anyway' at the unsigned driver warning. Wait while Windows sets a system restore point.

- Click 'Finish' to close the wizard.
- A new driver installation wizard will appear.
- Select 'No, not this time' and click 'Next'.
- Select 'Install the software automatically' and click 'Next'.
- Click 'Continue anyway' at the unsigned driver warning. Wait while Windows sets a system restore point.
- Click 'Finish' to close the wizard.

### 6.3 Introduction to the Datalog Interface software

From your desktop now double click on the new shortcut icon that you have just created, or use the Start menu.

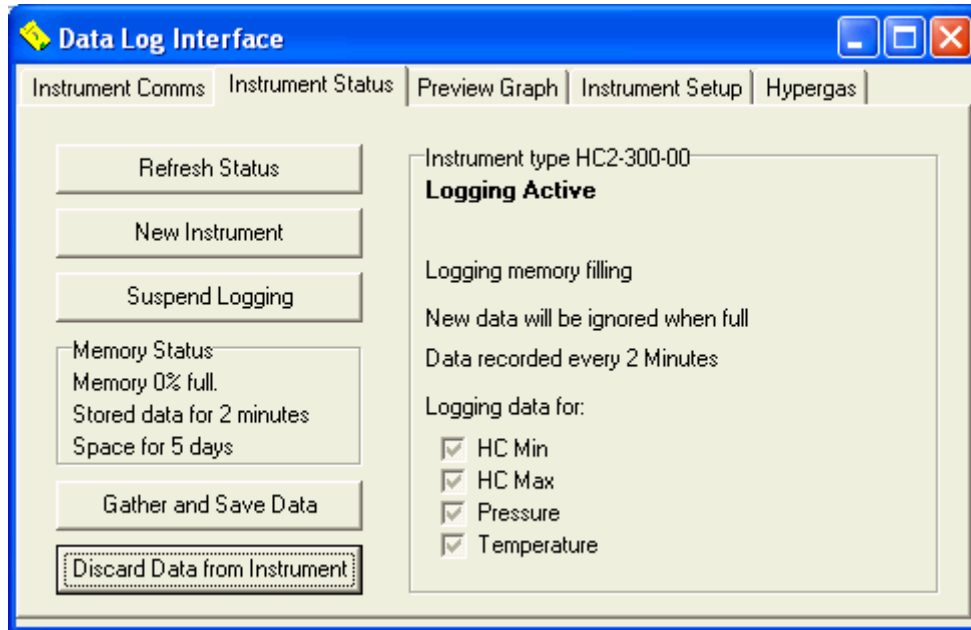
The following screen will appear:



Now connect the PC to either:

- The Topside Repeater using the data lead provided and ensure both the Repeater and Bell Monitor are switched on.
- Or the Bell Monitor using the USB lead.

Select the appropriate COM port from the COM port selection box. Ensure the baud rate is 9600. Click 'Communicate with Instrument'. After a few seconds another tab labelled 'Hypergas' will appear and the display will switch to the 'Instrument Status' tab.



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

- The Topside Repeater is switched on (if using the Topside RS232 cable)
- The Bell Monitor is switched on
- The communication cable is plugged into the PC
- The correct COM port is selected.
- The baud rate is set to 9600

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

When you have achieved communications you can proceed to use the software as described below:

The datalogging 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 above. However the latter 2 pages, Instrument Setup and Technician Comms, can only be accessed with a password. These pages should only be used under guidance from an Analox technician. Improper use of these pages could render the instrument unsuitable for operation.

Instrument Comms appears during the installation process, the Instrument Status and Preview Graph pages are used during datalogging 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 Instrument status page provides a summary of the instruments datalogging status and is shown in the diagram above. This page shows the Memory status of the Bell Monitor. The Information Panel to the right of the screen shows us that logging is Active, i.e. the instrument is currently logging, that the instrument has been configured to discard the oldest stored data when the memory is full, and the logging interval for the data.

The Hypergas page provides Hypergas specific setup facilities, see below.

## 6.4 Data Logging Retrieval of Data

Start up the Datalogging programme by clicking on the shortcut on your desktop.

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

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.

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

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

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.

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).

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.

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.*

If you are retrieving data from a number of instruments, connect the PC to the next Topside Repeater 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.*

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

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

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'

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

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.

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.

Now to graph the HC 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 HC column. Then click on Insert, Chart (or press the small Chart Icon on the toolbar if you have one).

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).

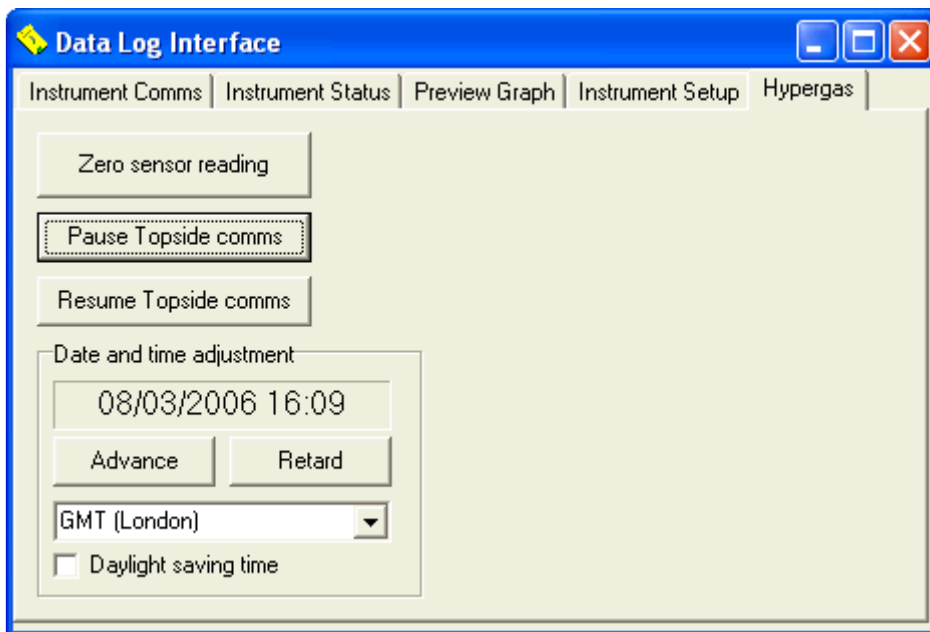
Now press 'Finish' or choose 'Next' if you wish to refine the appearance of the graph.

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

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.

## 6.6 Hypergas MkII™ specific Datalog Interface software features

When the Datalog Interface detects that it is connected to a Hyper-Gas MkII instrument this extra page will appear.



The "Zero reading" button may be used to set the current reading to zero, offsetting any variation in the sensor. It should only be used when a flow of known hydrocarbon-free gas is connected to the inlet bulkhead.

The pause and resume topside comms buttons are used in conjunction with the Datalog Interface technician mode for advanced diagnostics.

The Date and Time adjustment permits the user to set the local time zone and a one daylight saving offset. In addition the unit's internal clock may be adjusted forwards or backwards in one minute increments. There is no facility to set the clock, this is done by Analox during manufacture and any drift should be small.

## 7 Maintenance

The only user intervention that should be required is periodically changing the manifold so it can be returned to Analox for overhaul and re-zeroing of the sensor. Other maintenance instructions are given for information only. The calibration due date is displayed by a scrolling message when the instrument is switched on. If calibration is overdue then the message “Calibrate” is displayed and the buzzer sounds.

### 7.1 Checking correct operation of the instrument

**Checks of alarm operation should not be performed in the bell because it is dangerous to introduce hydrocarbon gases into such a confined space.** A separate power lead is available as an accessory so the unit may be removed from the Bell and powered up on the bench for these checks. Ensure there is good ventilation before starting the alarm check.

The zero should be checked and if necessary corrected as described below before each pressurisation or at least monthly. Likewise the alarm should be checked before each pressurisation and at least monthly.

#### 7.1.1 Zero check / setting



Use the supplied sample line inlet adapter to connect a source of hydrocarbon free gas to the instrument's inlet bulkhead (see photo). Check that the flow rate shown on the flowmeter is around 1.0 SCFH (0.5 litres/min). Leave the flow on until the reading settles, this should take a couple of minutes.

If the reading is between 0.1 and 2.0 then the instrument may be left as it is. If it is 0.0 or more than 2.0 then the instrument should be zeroed.

The instrument may be zeroed by pressing the Mute button three times in quick succession to enter Technician mode (“tech” will be shown on the screen). Then press it four times to select ‘zero’. Then press it twice and observe the thirty second countdown. Within a few seconds of the countdown finishing, press the button twice to trigger the actual zero calibration. The procedure may be aborted by pressing the button once.

Alternatively the Datalog Interface software may be used. Connect up and go to the Hypergas screen. Click the ‘Zero sensor reading’ button.

It is normal for the alarm lights to flash during the zeroing procedure. If they remain on thirty seconds after the procedure has been completed, and after pressing the “Mute” button, then the sensor is out of calibration and the manifold should be returned to Analox for overhaul. If the unit is accidentally zeroed while on test gas (see below) then it will go into sensor fault alarm. Simply repeat the zeroing on a hydrocarbon free gas and it should come out of alarm.

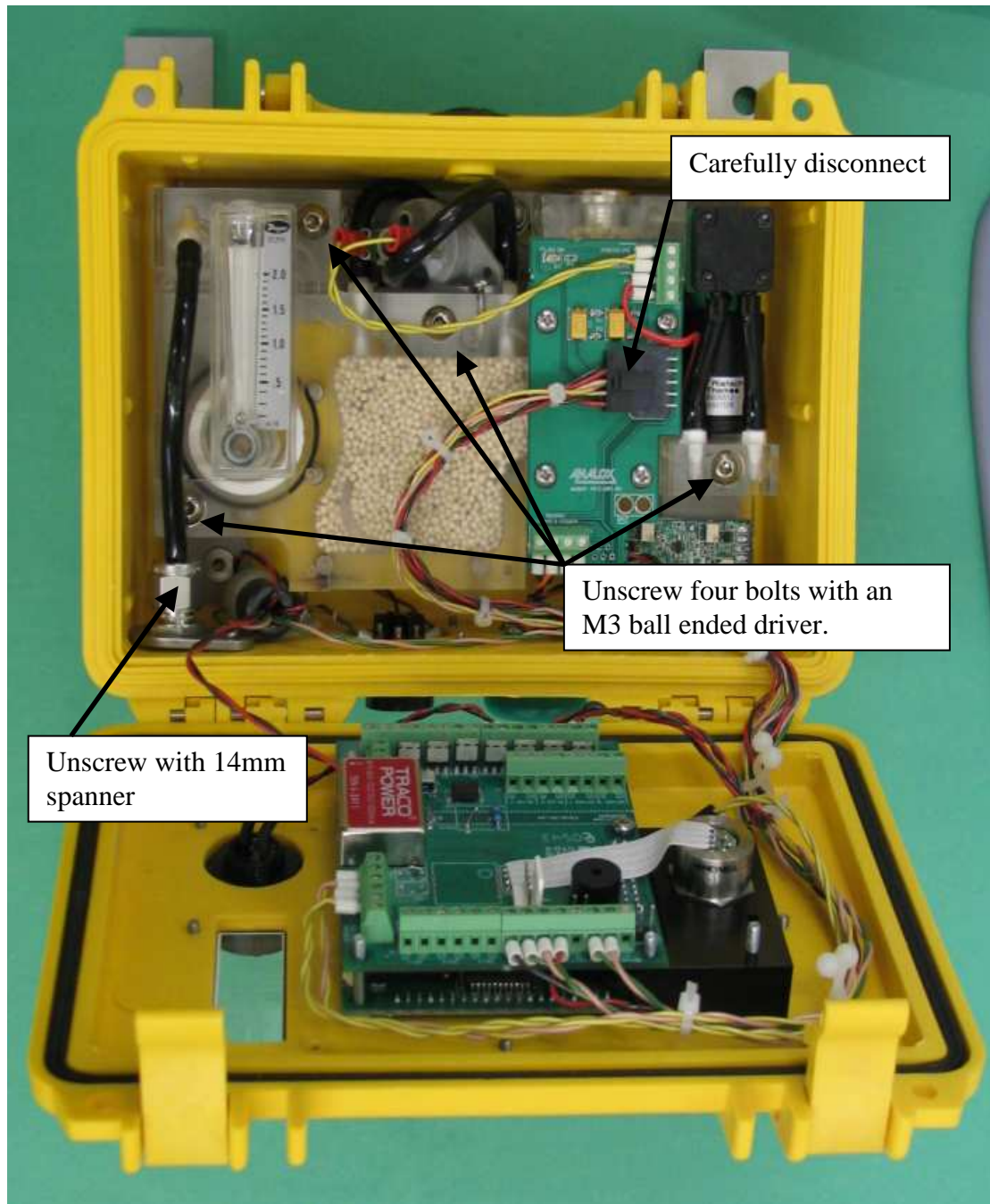
#### 7.1.2 Alarm check

**Remove the instrument from the bell and ensure there is good ventilation.**

Zero the sensor reading as described above in section 7.1.1

Use the supplied sample line inlet adapter to connect a source of 4% Propane in Nitrogen to the instrument's inlet bulkhead. Ensure the flow is set to around 1.0 SCFH (0.5 litres/min). The alarm should trigger within 15 seconds. If the alarm does not trigger then the manifold should be returned to Analox for overhaul.

## 7.2 Changing the manifold



This job requires a ball ended 3mm Allen key and a 14mm spanner.

1. Switch off power to the unit or unplug it.
2. Open the front of the box by releasing the two latches at the top of the box.
3. Using a 14mm spanner undo the Swagelok nut that connects the black flexible tube to the inlet bulkhead.
4. Disconnect the small black connector which plugs into the circuit board on the manifold. **DO NOT PULL ON THE WIRES!**

5. Using the 3mm ball ended Allen key, undo the four M5 bolts which secure the manifold. Remove the bolts and washers from the manifold and keep somewhere safe.
6. It should now be possible to pull the manifold towards you out of the box.

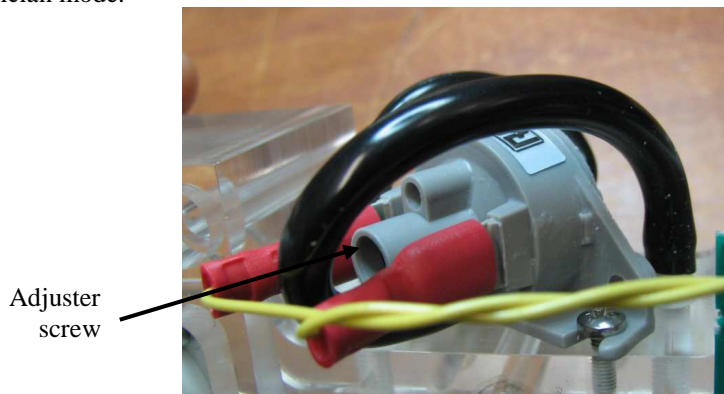
To replace the manifold please do the following:

1. Slot the manifold into the box. The bolts heads on its rear side should locate into holes in the unit's back plate.
2. Using the 3mm ball ended Allen key and the four M5 bolts and washers, secure the manifold to the back plate.
3. Push the black connector into the socket on the circuit board on the manifold.
4. Fit the black flexible tube into the Swagelok inlet bulkhead and do up the nut with the 14mm spanner.
5. Close the door and click the catches shut.
6. Re-energise the unit or plug it back in. You should see four flashes of the LEDs followed by the power on messages. Ensure that the calibration date is indicated and there is no "Sensor fault" message. In the event of a "Sensor fault" message check the black connector and see the troubleshooting section.
7. Return the manifold to Analox in the packing box provided.

### 7.3 Setting the flow switch

If the flow alarm sounds but the flow meter is indicating a flow in excess of 0.5 SCFH (Standard Cubic Feet per Hour, 1 SCFH = 0.45 litres/minutes) and nothing appears to be loose within the unit then it is possible that the flow switch needs to be adjusted.

There is a special technician mode to assist setting the flow switch. To enter this mode, press the Mute button three times. 'tech' will be displayed on the screen. Then press the Mute button seven times. The screen will display a number between 1 and 501. Turn the screwdriver anti-clockwise until the display shows a number that is less than 400, then turn the screwdriver clockwise until the display just goes over 500 (the maximum value is 501). Clockwise increases the number, counter-clockwise decreases it. Verify that when the inlet is blocked (eg. by a finger) the value reduces to 1 and the flow alarm triggers. Unblock the inlet and cancel the flow alarm by pressing the button. This will also exit the technician mode.



## 8 Troubleshooting

### 8.1 Spurious hydrocarbon alarms

Firstly ensure that the alarms are spurious and not real. Unless you have very good reason to do otherwise all hydrocarbon alarms should be acted upon immediately, in a contaminated bell situation there is no time to lose before following your company's procedures. If it is shown by checks as described in section 7.1 that the alarms are spurious then you may re-zero the sensor as described in section 7.1.1. If problems persist the manifold should be swapped out and returned to Analox for overhaul.

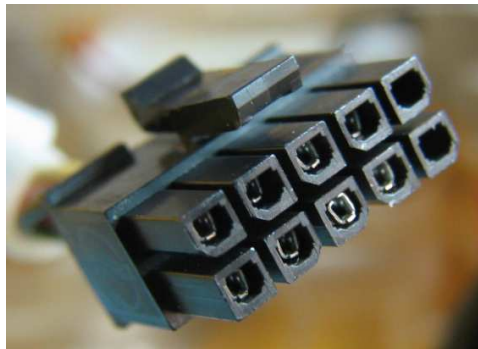
### 8.2 Flow alarms

Check that the front panel flow meter is showing between 0.5 and 2.0 SCFH (Standard Cubic Feet per Hour, 1 SCFH = 0.45 litres/minutes). Check for any blockage or obstruction in the inlet bulkhead or the vent. If there is also a Sensor Fault alarm showing then it is likely that the black connector on to the manifold circuit board has become disconnected, if so plug it back in. If Analox staff suggest that the flow switch may need adjustment, follow the procedure in section 7.3.

### 8.3 Sensor fault

If the sensor fault alarm comes on when the unit is pressurised for the first time, or switched on in the diving bell under pressure for the first time, do not worry. Simply clear the alarm with the 'Mute' button. This should happen only once.

Check that the black connector on to the manifold circuit board has not become disconnected and that the wires within the connector are inserted correctly (see photo below). Try to calibrate the sensor's zero value as described in section 7.1.1. If this is unsuccessful swap out the manifold and return to Analox for overhaul.



### 8.4 Unit does not switch on

Ensure power is correctly connected to the unit. In the case of the Topside Repeater check the fuse.

### 8.5 Bell Comms alarm on Topside Repeater

If the Bell Comms LED is flashing this indicates a problem with the communications between the Topside Repeater and the Bell Monitor. Try pressing the red button on either unit to initiate a communications retry, then check the wiring between the units. Ensure that the connectors are pushed fully home (there should be no gap visible before the locking ring is tightened).

Sometimes the USB comms adapter may disrupt communication between the two units, even if it is not connected to a PC. In this case please remove it.

If the Bell Comms LED is on continuously then this indicates that comms have been suspended while a computer running the Datalog Interface communicates with the Bell Monitor. Wait for the computer to finish and then normal comms should restart automatically. If they do not start automatically, press the red button on the Topside Repeater.

## 8.6 Error codes

The following error codes may be displayed on the LCD. If they are seen then carry out the actions shown.

Code	Meaning	Action
Er:01	Internal failure – no communications with sensor	Check internal black connector. Return manifold to Analox for overhaul.
Er:02	Internal failure – bad data received from sensor	Change manifold or return unit to Analox
Er:03	Internal failure – reply received from the wrong address	Change manifold or return unit to Analox
Er:04	Internal failure – checksum error	Change manifold or return unit to Analox
E1:xx	Internal software errors	Change manifold or return unit to Analox

## 9 Spares

Item	Part No.	
Manifold	SA8HYGMKIIMAN	
Topside repeater RS232 cable	SAEPAS2602	
USB Comms break-in cable / Bell Monitor cable	9300-4025	
Bench power supply (universal AC input)	9300-4010	
Datalogging software	SA2 HCDATA	
Gas check adapter	9300-4000	
User manual (English)		
Installation kit – Bell Monitor	SAEPHC2603	
Installation kit – Topside Repeater	SAEPHC2607	
Hex driver for manifold removal	9428-1578	
20 litre can 4% propane in N <sub>2</sub> plus fine control valve	SA7L20742K	

## 10 Specification

Power Source	External Stabilised 18-30V DC supply with regulation of better than +/- 300mV	
Operating Current	Topside Repeater	100mA
	Bell Monitor	200mA
Fuses	Topside Repeater	T250mA
	Bell Monitor	Internal self-resetting polyswitch
Pressure Sensor	Analox pressure transducer, with bridge output	
	Range	0-60 Bar Absolute
	Accuracy	±1 Bar Absolute
HC Sensor	Analox infra red sensor.	
	Range	0-30% Propane
	Accuracy (0-midscale)	-5% to +10% of range
	Accuracy (mid-fullscale)	<±10% of range
	Response time	Typically 10-15 seconds to alarm in 5% propane gas
Temperature	Operating	5°C to 35°C
	Storage	0°C to 40°C
Dimensions	Bell Monitor	200mm (w) x 215mm (h) x 100mm (d)
	Topside Repeater	190mm (w) x 160mm (h) x 100mm (d)
Weight	Bell Monitor	<2.5 kg
	Topside Repeater	<2.0 kg
IP rating	Bell Monitor	IP66 excluding the gas inlet

## 11 Warranty information

We provide the following Warranties for the Hyper Gas MkII :

A 1 year sensor warranty (assuming this has been returned for calibration at 6 monthly intervals).

A 1 year electronics warranty.

See section 5.5 for more information on the manifold warranty.

In both cases the Warranty period runs from the date of our Invoice.

We warrant that the equipment will be free from defects in workmanship and materials.

The Warranty does not extend to and we will not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire, explosion, misuse, use in any context or application for which the equipment is not designed or recommended, or unauthorised modification.

Following a valid Warranty claim in accordance with the above, the equipment, upon return to us, would be repaired or replaced without cost or charge but in our discretion we may elect instead to provide to you which ever is the lesser of the cost of replacement or a refund of net purchase price paid as per our Invoice on initial purchase from us. We shall have no liability for losses, damages, costs or delays whatsoever. We shall have no liability for any incidental or consequential losses or damages. All express or implied warranties as to satisfactory or merchantable quality, fitness for a particular or general purpose or otherwise are excluded and no such Warranties are made or provided, save as set out in this Clause 7.

In order to effectively notify a Warranty claim, the claim with all relevant information and documentation should be sent in writing to:

Analox Sensor Technology Limited  
15 Ellerbeck Court  
Stokesley Business Park  
Stokesley  
North Yorkshire  
TS9 5PT

Or by e-mail to : [info@analox.net](mailto:info@analox.net)

Or by Fax to : +44 1642 713900

We reserve the right to require from you proof of dispatch to us of the notification of Warranty claim by any of the above alternative means.

The equipment should not be sent to us without our prior written authority. All shipping and Insurance costs of returned equipment are to be born by you and at your risk. All returned items must be properly and sufficiently packed.

## 12 Disposal



According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.