
1412
Photoacoustic Field Gas-Monitor

June 2004

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Safety Considerations.

The 1412 Photoacoustic Field Gas-Monitor complies with:

- EN/IEC 61010-1, 2nd (2001): Safety requirements for electrical equipment for measurement, control and laboratory use.
- UL61010A-1 first edition (2002): Electrical Equipment for Laboratory Use; Part 1. General Requirements.
- CAN/CSA – C22.2 No.1010.1-92: Safety requirements for equipment for measurement, control laboratory use.

To ensure safe operation and retain the monitor in safe condition, note the following:

EXPLOSION HAZARD!

**TO AVOID THE POSSIBILITY OF AN
EXPLOSION; MONITORING OF FLAMMABLE
GASES IN EXPLOSIVE CONCENTRATIONS
MUST NEVER BE ATTEMPTED.**

Never operate the 1412 Photoacoustic Field Gas-Monitor in potentially explosive environments.

When monitoring potentially flammable or toxic gases it is essential that:

- The instrument itself is placed in a well-ventilated area outside the potentially hazardous zone.
- A sufficiently long tube is connected to the air-outlet on the back panel so that the sampled gas is carried away to the open air or to an extraction and/or filtration unit.

Warnings!

- Avoid water condensation in the instrument.
- Switch off all equipment before connecting or disconnecting their digital interface. Failure to do so could damage the equipment.
- Whenever it is likely that correct function or operating safety of the apparatus has been impaired, the apparatus must be made inoperative and secured against unintended operation.
- Any adjustment, maintenance and repair of the open apparatus under voltage must be avoided as far as possible and, if unavoidable, must be carried out only by trained personnel.

- If a fault is reported by the monitor that indicates correct function of the instrument may be impaired, consult your local Innova AirTech representative. Under no circumstances should repair be attempted by persons not qualified in service of electronic instrumentation.

Safety Considerations.

APPLYING POWER

Before using the 1412 check that the available mains voltage match the specified voltage and frequency for the instrument.

SAFETY SYMBOLS



The apparatus will be marked with this symbol when it is important that the user refers to the associated warning statement given in the User Guide.

 Frame or Chassis  Protective earth  Dangerous voltage

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Chapter 1

Preliminary Tasks

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When taking delivery of the 1412 Photoacoustic Field Gas-Monitor, five very important and preliminary tasks must be completed before starting to operate it:

Install the Gas Monitoring Software 7304 (to enable operation from via a PC) (see section 1.1).

Connect the Monitor to a PC (see section 1.2).

Check/Change the fuses in the monitor (see section 1.4).

Set the Communication parameters (see section 1.5).

Set-up the password protected user levels (see section 1.6).

1.1 Installing the Gas Monitoring Software 7304.

Before installing the software, the PC must meet the following requirements:

Hardware:	A personal Computer, Pentium 166 MHz or better Min. 64 Mbytes of RAM Min. 40 Mbytes of space available on the hard disk VGA monitor or better One RS-232 port Mouse
Software:	Windows 2000, Windows NT, Windows XP

The software comes complete with an installation program. Insert the disk and use the standard Windows procedure to install the software.

If you are unsure how to install programs, refer to the Windows Help.

After the installation is successfully completed, five icons appear in the Gas Monitoring Software 7304 program menu. These are labelled:



ONLINE



PRESENTATION



CALIBRATION



OFFLINE



DATABASE ADMINISTRATION

These icons can be placed on your desktop for easy access to the programs.

1.2 Connecting the Monitor to the PC.

The monitor comes complete with a 9-pin to 25-pin null modem RS-232 interface cable. If your PC has a 25-pin serial port, an adaptor can be fitted to enable the supplied cable to be used.

1.2.1 Fitting the RS-232 Cable.

Ensure that both the monitor and the PC are switched off at the mains. Failure to do so may result in your equipment being damaged.

Locate the serial port at the back of the PC, refer to your PC manual if in doubt.

Push the connector on the RS-232 cable on to the serial port socket, and secure it firmly using the securing screws. Locate the output labelled “RS-232” at the back of the Monitor.

Push the connector at the other end of the RS-232 cable on to this socket, and secure it firmly using the securing screws.

The instruments can be turned on at the mains now.

1.3 Stand Alone Use.

In some situations, it may be necessary to set up without connecting to a PC.



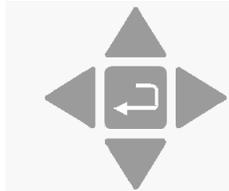
The display above assists you displaying the text on screen and by indicating which of the push-buttons can and should be pressed.

In general, the push-buttons shown above are used to navigate through the various modes possible within the 1412 .



These push-buttons are illustrated as S1, S2 and S3. The numbers correspond to the key and their position on the instrument.

These select push-buttons enable you to select one of the options displayed.



This group of 5 push-buttons are referred to as the direction keys. The symbols below are used to simplify the instruction in this manual.

▲ & ▼ enable you to increase & decrease numbers, respectively, or to go to the Previous & Next Displays, respectively.

◀ & ▶ enable you to move across number fields or go to the Previous & Next gases, respectively.

, depending on the situations, acts as an “Enter” or “Go To Head” key.

1.4 Checking /changing the Fuses in the Monitor.

Unplug the Monitor from the mains power supply and pull out the plug in the AC Mains socket of the Monitor
If the fuses in the monitor are blown it can indicate a serious fault in the instrument, therefore it is advisable to contact your Innova service representative before changing the fuse!

1.4.1 Checking/changing the Fuses in the 1412

Turn the 1412 so that it stands on its back panel and remove the rubber “shoes” mounted on the four “feet” of its base-plate. Using Pozidrive screwdriver No. 1, undo and completely remove the screws located under the rubber “shoes” which have just been removed.

Note: these screws hold the upper and lower covers of the 1412 together. If the screws are not completely undone you will not be able to remove the upper cover .



Undo the upper four screws holding the frame over the back-panel of the 1412 using Pozidrive screwdriver No. 0.



Using the Pozidrive screwdriver No.0 undo the upper four screws which hold the frame over the front panel of the 1412.



Gently lift off the upper cover of the 1412 by pulling it firmly upward.

Use a screwdriver to remove the fuse-holder:



Remove the old fuse from the holder and replace it with a new.



Check that the fuse have the correct rating.
The fuse must be:

Slow-blow (T) fuse with a rating of 2.5 A, 250 VAC, 5x20 mm, UL approved.

Innova order number: VF0087A

Install the fuse-holder and reassemble the 1412 again.

The figure below shows the inside of the top cover of the 1412. Note that the front side of the cover has square flanges . Place the top cover back in its correct position on top of the 1412 and screw in the all screws.



1.5 Setting the Communication Parameters

The Gas Monitoring Software 7304 and the monitor communicate using the RS-232 interface. In order for the communication to be successful, it is essential that the communication parameters in the two instruments are set correctly.

This is a two stage process: the PC communication port is selected via the Gas Monitoring Software 7304 while the baud rate, parity, data bits and stop bits are defined via the monitor.

The communication parameters necessary for the monitor to communicate with the Gas Monitoring Software 7304 are shown below:

Baud rate	9600
Stop bits	1
data bits	7
Parity	Even
Hardwire mode	Leased line
Handshake type	Hardwire

These are set as the default values in the monitor.

To prevent communication errors, the text line terminator, print data log and print error log must be set as shown below.

Text line Terminator	CR-LF
Print Data Log	NO
Print Error Log	NO

1.5.1 Selecting the PC communication Port

It is just a simple case of selecting the correct port on the PC. The software offers four to choose from : COM1, COM2, COM3 and COM4. If you are not sure which port the cable is connected to on your computer, refer to your PC manual.

Start any one of the Gas Monitoring Software 7304 options: Online, Offline or Calibration.

Pull down the **Task** menu. Click on **Communication**. The communication dialogue is displayed.

Click on the radio push-button next to the correct port name.

Click on **OK** to store the selection and exit this dialogue.

1.5.2. Checking/Changing the Communication Parameters

The communication parameters for the serial interface must be set using the push-buttons on the front of the monitor.

1. Press **SET-UP S3 S1 S3 S1** .The screen display now shows the following text.

**SELECT BAUD RATE 9600
PRESS ENTER TO CHANGE VALUE**

If the baud rate displayed is incorrect press  and use **▲** and **▼** to display the correct value. Press  again to store the selection.

If the baud rate displayed is correct, then press **▼** to continue on the next parameter.

Press **S1** to select 1 STOP BIT.

Press **S1** to select 7 DATA BITS

Press **S2** to select EVEN PARITY

Press **S3** to select LEASED-LINE

Press **S3** to select HARD-WIRED HANDSHAKE.

Press **SET-UP** to exit the set-up mode

Press **RESET** and **S1** in order that the new settings are enabled.

The monitor and the Gas Monitoring Software 7304 are now able to communicate together.

1.5.3. Checking/Changing the Text line Terminator.

The Text line Terminator must be set using the push-buttons on the front of the monitor.

Press **SET-UP S2 ▼ S3**

Press **SET-UP** to exit the set-up mode

1.5.4. Checking/Changing the Data Log and Error Log Options.

The Data Log and Error Log must be set using the push-buttons on the front of the monitor.

Press **SET-UP** **S3** **S1** **S1** **S3** **▼** **S1** **S1**

Press **SET-UP** to exit the set-up mode

1.6. Setting-up user Levels

Press the **Lock** function push button on the front of the Monitor.

This enables setting up 3 different user levels, Level 1, Level 2 and Level 3.

These user levels are password protected.

Level 1 is the *Operator* level, which enables start/stop and reading of measurement results. Partial Reset is possible.

Level 2 is the *Expert* level, which in addition to Level 1 access enables set up of parameters. Full Reset is possible.

Level 3 is the *Super-User* level, which allows all possible operations including calibration.

1.6.1 . Default settings for User Level and Password.

Before dispatch from the factory the User Level and the Password are set to the following default setting.

User Level 3

and the default settings for the Password is:

Password : ***** (5 times *)

These settings are to be used to change user level or password the first time.

1.6.2 . Changing the Password

In order to change the Password Press the **Lock** function push button on the front of the Monitor
The following text is displayed.

CURRENT USER LEVEL IS X
CHANGE USER LEVEL CHANGE PASSWORD

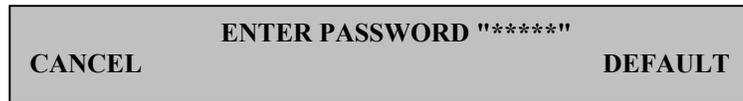
Press **S3** “CHANGE PASSWORD”

The following text appears.

ENTER PASSWORD "***"**
PRESS ENTER TO CHANGE VALUE

1. Enter the old Password.
2. Press 

The following text appears.



3. Type in the new Password using the ▲ and ▼ keys.
4. Press .
5. Press the **Lock** function push button on the front of the Monitor to exit.

1.6.3 . Changing the User Level

In order to change the User Level Press the **Lock** function push button on the front of the Monitor

The following text is displayed.



1. Press  “CHANGE USER LEVEL”

The following text appears.



2. Press .

3. Enter the current Password using the ▲ and ▼ keys.
4. Press .

The following text appears.

**CURRENT USER LEVEL IS X
PRESS ENTER TO CHANGE VALUE**

Press .

Use the ▲ and ▼ keys to change the User level.

Press .

Press the **Lock** function push button on the front of the Monitor to exit.

1.6.4 . User Levels in the Gas Monitoring Software 7304.

When using the Gas Monitoring Software 7304 the software checks the user level setting of the monitor.

Calibration  can only be activated when user Level 3 is selected on the monitor.

If user Level 2 or 1 is defined the following error is displayed on screen.



Chapter 2

Gas Monitoring Software 7304

June 2004

2.1 Introduction.

The Gas monitoring Software 7304 provides 5 separate programs:

After the installation is successfully completed, five icons appear in the Gas Monitoring Software 7304 program menu. These are labelled:



ONLINE



PRESENTATION



CALIBRATION



OFFLINE



DATABASE ADMINISTRATION

These icons can be placed on your desktop for easy access to the programs.

These programs enable you to set-up the gas monitor , start a monitoring task, present measurement data while monitoring, as well as present it after a monitoring task is completed. If post processing of the data is required, this is possible and data can be used in other programs, for example to produce reports or presentation materials, either

by using the clipboard option or by exporting raw data to the desired programs.

2.1.1 Description of Programs.

A description of the individual programs is given below.

Online

This program should be used when a PC can be connected to the monitor before, during and after a monitoring task. This enables you to setup the monitor via the PC and view “real-time” measurement data on the PC screen, both in graphic and tabular formats, while monitoring. Measurement data is stored directly on the computer’s hard disk, enabling extended monitoring periods. During a monitoring task, the Online program always shows the latest data on screen. Should you wish to view measurement data without the screen being continually updated, then the Presentation program can be opened simultaneously.

Offline

This program should be used when a PC can be connected to the monitor to setup the monitoring task, but it is necessary to perform “stand-alone” measurements. During the monitoring task, measurement data is stored in the monitor’s memory. When the monitoring task is completed, the monitor and the PC can be connected again, and the measurement data uploaded from the monitor’s memory and stored in the PC. The presentation program can then be used to view the measured data.

Presentation

This program is used to display measurement data that is already stored in the PC. This program can run simultaneously with the Online, Offline and Calibration programs. Measurement data can be displayed both in tables and as graphs. Without destroying or altering the stored data, units can be changed, averaging intervals introduced or redefined and unwanted gas results removed from the display. The zoom function enables you to look more closely at specific measurement data, while the copy function enables you to copy data to the clipboard for use in other programs. The export function enables you to export “raw data” to be used in other programs e.g. excel.

Calibration

This program enables you to use the PC environment to calibrate the monitor. Once the filters are installed and the calibration gases connected, a normal monitoring task takes place. Once all raw data is collected, this software enables you to use the best raw data to calculate the calibration factors. Once this has been done, you can then download these factors to the desired filter banks. This raw data and calibration factors are stored with unique names, enabling them to be reused.

Database Administration

This program enables you to backup, restore and delete your databases. This provides you with greater security, as both your measurement and calibration data can be stored in a safe place.

Chapter 3

Setting-up a Monitoring Task

June 2004

Before a measurement task can commence, there are a variety of parameters that *must* be defined first. This is called “Setting up the Monitor”.

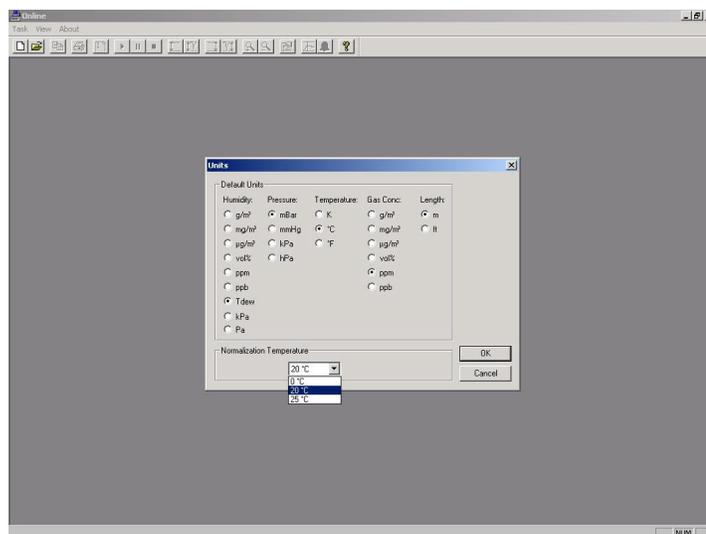
3.1 The Parameters’ Units

3.1.1 Online Unit Set-up

With the Online program running, follow the instructions below.

1. Pull down the **Task** menu. Click on **Units** and the unit dialogue appears, see. Fig. 3.1.

Fig.3.1 The Units dialogue



2. Click on the radio push-buttons to select the desired units.

3. If you have selected the mg/m^3 unit for the gas concentration, click in the *Normalization Temperature* field.
4. Note these temperature values change depending on the temperature units selected, i.e. °C, °F and K.
5. Select the desired value and click on **OK**.

All the parameters' units are now set.

3.1.2 Offline Unit Set-up

With the Offline program running:

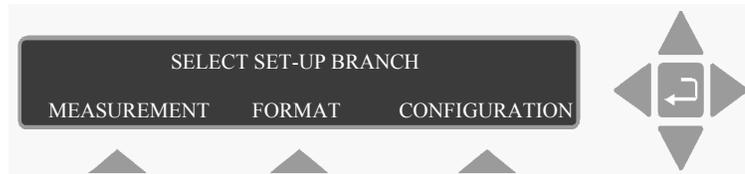
1. Click on the **Units** softkey at the bottom of the dialogue box. The Units dialogue appears, see Fig. 3.1.
2. Click on the radio push-buttons to select the desired units.
3. If you have selected the mg/m^3 unit for the gas concentration, click in the *Normalization Temperature* field.
4. Note these temperature values change depending on the temperature units selected, i.e. °C, °F and K.
5. Select the desired value and click on **OK**.

All the parameters' units are now set.

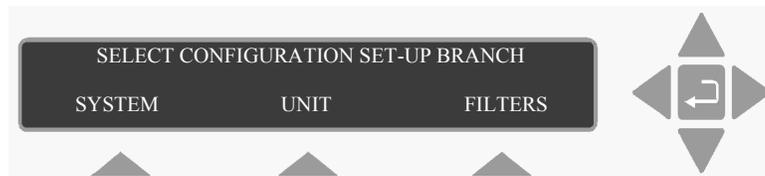
3.1.3 Stand-alone Unit Set-up

For those of you setting up the monitor using these instructions, it may be useful for you to follow the steps taken using the Set-Up Tree.

To enter at the top of the Set-Up Tree, press **SET-UP** and the monitor displays the following screen text.



1. Press **S3** to enter the **CONFIGURATION** branch. The new text displays three branches.



Units branch

2. Press **S2** to enter the **Units** branch.
3. Use the select push-buttons to define the concentration unit.

4. Use the select push-buttons to define the length unit.
5. Use the select push-buttons to define the temperature unit.
6. Use the select push-buttons to define the pressure unit.
7. The humidity unit is displayed. Use the direction push-buttons to change it to the correct value.

When step 7 is completed the display returns to the top of the **Units** branch.

Press ▲ to go to the top of the Set-Up Tree, or press **SET-UP** to exit the set-up mode.

3.2 The Measurement Parameters

3.2.1 Measurement Set-up – PC Use

If you are using the Online program, follow the instructions below. If you are using the Offline program go directly to step 5.

1. Pull down the **Task** menu. Click on **New** if you want to create a new database, or click on **Open** to use an existing database.
2. In the database window:
For new databases: click in *Enter name for* field and type in the desired name.
For existing databases, click on the desired database name.

3. Click **OK**.
A graphic window and an extended menu bar appear.
4. Pull down the **Sequence** menu. Click on **Settings** and the Set-up window appears.

In the new window there are several labelled “index card” separators. Each index card contains several parameters.

Sampling index card

5. Click on the radio-button for the desired sampling mode. If Sample Interval is selected, set the time to the correct value.
6. Click on the radio-button for the desired flushing mode.
 - a. If Auto is selected, set the correct tube length.
 - b. If Fixed Time is selected, set the desired chamber flushing time and the tube flushing time.
7. If water vapour and cross interference are required, click in the appropriate check boxes.
8. If average values are to be displayed on the gas monitors screen, click in the Average check box, and set the interval to correct value.

Gas index card

9. Click on the “Gas” index card.
10. Click in the check box to the left of the desired filter.
11. Click in the field to the right of the selected filter and select the correct gas.

12. Repeat steps 10. & 11. until all the filters which are required for the measurements are selected and the correct names are displayed.
13. Click in the *Sample Integration Time* field and select the desired option.
14. (Advanced settings only). Note that a new field has appeared to the right of the gas names. Click in the field and define the times for the selected filters.

Alarms index card

15. Click on the “Alarms” index card
16. Click in the *Select gas* field to display the list of gas names.
17. Click on the desired gas name.
18. Click in the *Select Limit* field, and type in the desired concentration.
19. *Online Only* – Click on the High Alarm Limit 1 or 2 radio push-button.
20. *Online Only* – Click on the Instantaneous or Rolling Average radio push-button.
If you select Rolling Average, click in the field to the right and define the averaging interval for the alarm.
21. *Online Only* – Click in the desired Action check boxes.
22. Click on **Add New** or **Insert Before** if you want to insert the new entry at the top of the list.
23. Repeat steps 16. to 22. until all the required alarms are set.

Note: if you wish to remove an alarm, select the gas in the *Alarms* field and click on **Remove**.

If you are using the Offline program, go to step 24.

If you are using the Online program, and you have completed all the steps, click on **OK**, the system is now ready to start measuring, see section 3.4.1.

Up/Download index card – Offline Only

24. Click on the Up/Download index card
25. Click on the **Download Settings** softkey. This will download the settings in the Sequence Settings dialogue to the monitor.
26. When the transfer is complete, Click on the **Close** softkey to exit the Offline program.

You are now ready to start measuring, see section 3.4.2.

3.2.2 Measurement Set-up – Stand-alone Use

For those of you setting up the monitor using these instructions, it may be useful for you to follow the steps taken using the Set-up Tree.

To enter the Set-Up Tree, press **SET-UP** and the monitor displays the following screen text.



1. Press **S1** to enter the **MEASUREMENT** branch. The new text displays two branches.

Monitoring Task branch

2. Press **S1** to enter the Monitoring Task branch. The following text is displayed:



3. Up to ten different monitoring tasks can be defined here. These are labelled from 1 to 10. Use the direction push-buttons to select the desired set-up number and move on to the next display.
4. Use the select push-buttons to define if you want to sample continuously:
If you select No (**S1**), go to step 5.
If you select Yes (**S3**), go to step 6.
5. The sampling interval is displayed. Use the direction push-buttons to change it to the correct value.
6. Use the select push-buttons to define if you want to monitor for a pre-set period:
If you select Yes, go to step 7.
If you select No, go to step 8.

7. The monitoring period is displayed. Use the direction push-buttons to change it to the correct value.

The **MONITORING PERIOD** is entered as Days Hours:Minutes. For example, if this particular measurement cycle needs to be performed during 5 days, 4 hours and 30 minutes, the “monitoring period” should be “entered” as 5 14:30. The Monitor will then automatically stop monitoring 5 days, 14 hours and 30 minutes after the measurement cycle with this particular set-up number is started. The range of acceptable values and the default value of the monitoring period is shown in Table 3.1.

Table 3.1 The range of acceptable values and the default value of the monitoring period

Display Text	Acceptable Values	Default Value
ENTER MONITORING PERIOD	days hours:minutes 0 00:01 to 7 00:00	days hours:minutes 0 01:00

The Monitor’s Display Memory has finite storage capacity. The data storage time available depends upon the number of gases being measured, as well as the frequency with which measurements are performed (that is, the sampling interval). Section 7.2 provides information about how you can roughly calculate the length of time the data from a particular monitoring task can be stored in the *Display Memory*.

It is important to realise that once the *Display Memory* has been filled up by the results of a particular monitoring task, the results of any further measurements in the same monitoring task will start to overwrite the data already stored in the memory.

8. Use the select push-buttons to define if you want to compensate for water vapour interference.
9. Use the select push-buttons to define if you want to cross compensate for interferences.
10. Use the select push-buttons to select the filters/gases you want to measure. This step can be repeated up to 5 times if 5 filters are installed.
11. Use the select push-buttons to define if you want to measure water vapour.
12. Use the select push-button to define if you want to store the measurement history.

When step 12 is completed the display returns to the top of the branch.



Environment branch

13. Press S3 to enter the Environment branch.
14. Use the select push-buttons to select the desired flushing mode.

- If you select Auto, go to step 17.
If you select Fixed Time, go to step 15.
15. Use the direction push-buttons to define the Chamber Flushing Time.
 16. Use the select push-buttons to select Tube Flushing.
If you don't want tube flushing, select NO and go to step 18.
If you select tube flushing, use the direction push-buttons to define the flushing time and go to step 17.
 17. Use the direction push-buttons to select the desired sample tube length and move on to the next display.
 18. Use the direction push-buttons to select the desired normalisation temperature.

When step 18. is completed, the display returns to the top of the **MEASUREMENT** branch.

Press ▲ to go to the top of the Set-up Tree.

If you want measurement data presented as averaged concentration values, then go to step 19. If you want your measurement data presented as sample concentration values, then press **SET-UP** to exit the set-up function.

Format branch

If you are starting here, press **SET-UP**:

19. Press **S2** to enter the **FORMAT** branch.

20. Use the direction push-buttons to enter the correct averaging period.
21. Use the select push-buttons to choose if you want to print each gas.
If you select Yes, go to step 22.
If you select No, go to step 23
22. Use the select push-buttons to choose which individual parameters should be printed. Each time one of the select push-buttons are pressed, the next parameter is displayed. This step can be repeated up to 7 times, depending on the number of filters installed.
23. Use the select push-buttons to select the Text line Terminator.
24. The text screen returns to the top of the Set-Up Tree. Press **SET-UP** to exit the Set-Up Tree.

If you want to set Alarm limits for the measured gases, go to section 3.3.

3.3 Setting-up the Monitor's Alarm Levels

The alarm limits of a gas are those concentrations of gas which should activate any alarm relay connected to the Monitor via its back panel “**Alarm Relay**” socket. There are two different alarm relays which function slightly differently. The alarm level parameters are found in the **Filters** branch of the Set-Up Tree.

Warning! If the UA number for any filter is changed here, then all the calibration data for that filter will be lost and the filter will need to be recalibrated.

1. Press **SET-UP** **S3** **S3**. The following text is

displayed

CHECK AND/OR CHANGE SET-UP FOR FILTER A
NO YES

2. Use the select push-buttons to ignore this filter or to select this filter if alarms are to be set.
3. Press ▼ 5 times until the following text is displayed.

GAS A HIGH ALARM LIMIT 1 _____ mg/m³
PRESS ENTER TO CHANGE VALUE

4. Use the direction push-buttons to set the alarm concentration.

If you do not wish to activate the alarm function for a particular gas, select the **DEFAULT**. This will “blank out” the alarm level value for the gas and deactivate the alarm for that gas.

GAS A HIGH ALARM LIMIT 2 _____ mg/m³
PRESS ENTER TO CHANGE VALUE

5. Use the direction push-buttons to set the alarm concentration.

If you do not wish to activate the alarm function for a particular gas, select the **DEFAULT**. This will “blank out” the alarm level value for the gas and deactivate the alarm for that gas.

6. Repeat steps 2 to 5 to set the alarms for the other filters.
7. Press **SET-UP** to exit the alarm set-up.

3.4 Starting a Monitoring Task

Monitoring tasks can be started in two ways. They can be started immediately, or set to start at a pre-set time. The duration of the monitoring sequence can also be determined. A monitoring task can continue until it is stopped manually, or at a pre-set time.

When using the PC and the Online option, there are no limits to the duration of a monitoring task. However, if the measurement results are being stored in the monitor's memory, the duration of the monitoring task should be considered as there is only a finite amount of memory in the monitor. See section 7.2 for full details about the storage capacity of the monitor.

3.4.1 PC Use – using the Online Program

Using the PC, a monitoring task can be paused or stopped and then re-started at your convenience. This means a monitoring task can comprise of one or more monitoring sequences, where each sequence has a distinct name. When sequences are measured consecutively, using the same name, a number appears after the name (starting at 1). This shows the order in which they were measured.

Before a monitoring task is started, the set-up, as described in section 3.2, must be completed.

1. Pull down the **Sequence** menu and click on **Start**. The New Measurement Sequence window opens.
2. In the *Enter sequence description:* field, type in the name of the monitoring sequence. If you do

- not enter a name, the default name is used:
Sequence 1.
3. In the Start Time group:
To start the measurement immediately, click on the Now radio-button.
or
To delay the start, click on the Start at: radio-button and define the start time.
 4. In the Stop Time group:
If no stop time is required, click on the None radio-button. This means the measurement must be stopped manually.
or
To determine the duration of the monitoring sequence, click on the Stop at: radio-button and define the stop time.
 5. Press **OK** to start the monitoring task.

Stopping the Monitoring Task

If no pre-set monitoring period is defined, then to stop the monitoring task, pull down the **Sequence** menu and click on **Stop**.

3.4.2 PC Use – using the Offline Program

Before a monitoring task is started, the monitor should be warmed up and set-up, as described in section 3.2, must be completed and downloaded to the monitor.

1. Press **MEASURE**.

The following text appears on the screen:



Please note: if you do not use one of the “select” keys within a short time after the above text appears, the Monitor will automatically stop operating in **Measure** mode (the light-emitting diode in the **MEASURE** key switches off). If this happens, just press **MEASURE** again.

2. To start the measurement immediately, press **S1**.
To delay the start, press **S2**.
The following warning then appears on the display:



Display Memory is where the Monitor stores the results of all measurements while it is performing a monitoring task. If the monitoring task is stopped and then started again all the data already collected will be deleted from *Display Memory*. However, the data in Display Memory can be copied into and stored in the Monitor’s *Background Memory*. This operation is described in section 7.3.

3. Press **S1**.

Immediate Start

If you selected an immediate start, the following text appears on the screen:

**MEASUREMENT IN PROGRESS
RESULTS NOT YET AVAILABLE**

4. When the first measurement cycle is complete the Monitor will automatically display the results and update them every time a new measurement cycle is completed. An example is shown below:



This display gives the overview of the gas/vapour concentration last measured – in this case the concentration of gas A and humidity of the water vapour are in the units that were selected

Delayed Start

If you selected a delayed start, the following text is displayed:



Press 

The following text is displayed.



The time shown in the TIME: field is the current time. The measurement task will start at 10 16 : 25. At 16:25 the 10th of the Current month. When the monitoring task starts, the monitor's screen will change and display the same messages as those displayed when a monitoring task starts immediately.

Stopping the Monitoring Task

If no pre-set monitoring period is defined, then to stop the monitoring task, press **MEASURE** and **S3**.

3.4.3 Stand-alone Use – using the Front Panel Push-buttons

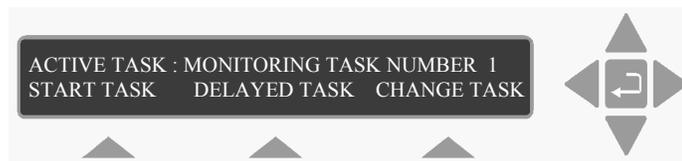
Before a monitoring task is started, the set-up, as described in section 3.2, must be completed:

Before any monitoring task is started, all data stored in the Monitor's *Display Memory* is removed (cleared). The *Display Memory* is where the Monitor stores the results of all measurements while it is performing a monitoring task. However, the data in *Display Memory* can be copied into and stored in the Monitor's *Background Memory*. This operation is described in section 7.3.

When you start a new monitoring task the following warning is displayed **WARNING: DISPLAY MEMORY WILL BE DELETED** to remind you to store any data that is presently stored in the *Display Memory*. If a monitoring task is stopped, any data already stored in *Display Memory* will be deleted when a monitoring task is started.

1. Press **MEASURE**.

The following text appears on the screen:



Please note: if you do not use one of the “select” keys within a short time after the above text appears, the Monitor will automatically stop operating in **Measure** mode (the light-emitting diode in the **MEASURE** key switches off). If this happens just press **MEASURE** again.

The **active** monitoring task number is the number of the monitoring task you wish the Monitor to perform.

2. If the monitoring task number displayed is correct, then go to step 5.
If the number on the display is **not** correct then press **S3** to change the task number.

This changes the display text to the following:



3. Press **S1**.

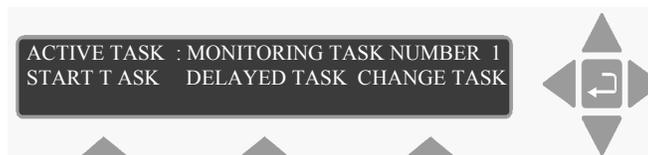
This causes the following text to appear on the display:



The number appearing on the screen will be a number from 1 to 10.

4. Press **S2** and use the direction keys to change the monitoring task number to the desired value.
Then press **S2** again to accept the task number.

The following text appears on the display screen:



- To start the measurement immediately, press **S1**.
To delay the start, press **S2**.

The following warning then appears on the display:



- Press **S1**.

Delayed Start

If you selected a delayed start, the following text is displayed:



Use the direction push-buttons to enter the desired date and start time, e.g. 10 16:25. The following text is displayed.



When the monitoring task starts, the screen will change and display the same messages as those displayed when a monitoring task starts immediately.

Immediate Start

If you selected an immediate start, the following text appears on the screen:

**MEASUREMENT IN PROGRESS
RESULTS NOT YET AVAILABLE**

7. When the first measurement cycle is complete the Monitor will automatically display the results and update them every time a new measurement cycle is completed. An example is shown below:



This display gives the overview of the gas/vapour concentrations last measured – in this case the concentration of gas A and humidity of the water vapour are in the units that were selected.

If no pre-set monitoring period is defined, then to stop the monitoring task, press **MEASURE** and **S3**.

Chapter 4

Viewing Measurement Data – using a PC

June 2004

4.1 Measurement Data

In order for the measurement data to be viewed using the PC software, the data must be stored in the PC. For Offline and Stand-alone use, where the measurement data is stored in the monitor, then the data must be Uploaded to the PC.

All measurement data from the Monitor, regardless of what is being displayed on screen during the measurement, is transferred to the PC and stored in a MS-Access[®] format. This measurement data can be viewed on screen, analyzed and used in other software programs that utilize ODBC.

4.2 Event Marks

When measurement data is displayed on screen, several event marks are also displayed. The significance of these marks is described below.

Communication Errors: are marked by a line with a “C” at the end of it. These indicate when a communication error has occurred between the monitor and the PC.

Alarms: are marked by a line with a small red triangle at the end. These indicate when the alarm was triggered, and which gas triggered the alarm.

User Events: are marked by a cursor with a User event Text at the top of it.

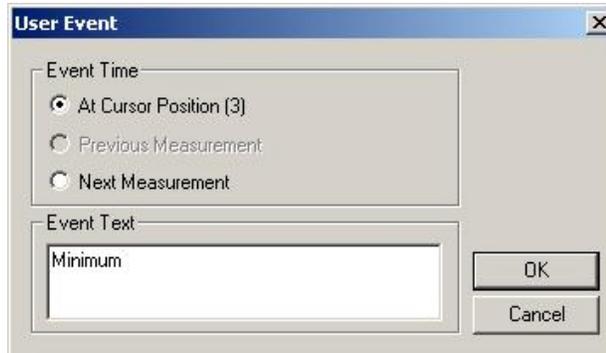
Gas Monitor Warnings/Errors:

Event Marks	Description
Common Marks: apply to all filters	
“P”	The Monitor stopped measuring due to a power failure, but automatically re-started monitoring again after regaining power. The Monitor was “reset” because a fault was detected.
“User event Text”	The measurement was marked by the user when the Event button was pressed.
“W”	An operational error was detected, or a warning was given during the measurement. The accuracy of the measurement cannot be guaranteed.
Gas Marks: apply to individual filters	
“B”	The Monitor was incapable of calculating this gas concentration.
“F”	After this measurement the filter carousel was found to be out of alignment. If the misalignment is only slight, then accuracy of the measurement has not been affected, but the accuracy of such a measurement can not be guaranteed.
“▼”	The gas concentration measured during this measurement cycle exceeded the user-defined alarm limit, resulting in an alarm being triggered.
To see which gas the Common Mark adheres to, open a numeric window.	

4.2.1 Inserting a User Event Marker

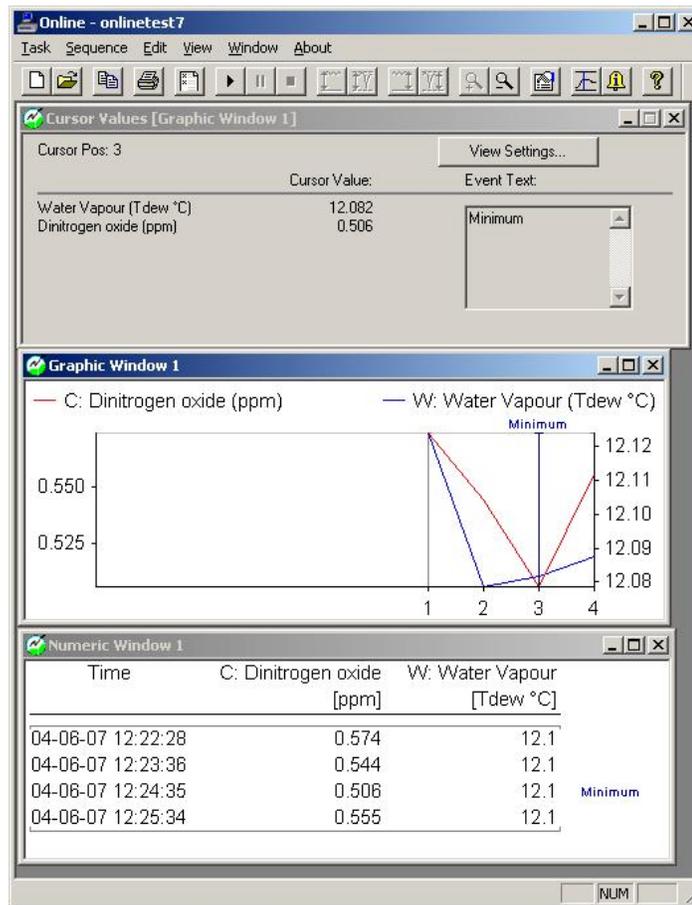
1. If you want to insert a User Event marker at the cursor, position the “single” cursor.
2. Pull down the **Edit** menu. Click on **User Event** and a new dialogue box opens.
3. *Online only* – click on the radio-button for the desired position.

Fig.4.1 The User Event window.



4. Type in any comments you may have in the Events Text field.
5. Click on **OK**.

Fig.4.2 The User Event text in the online graphic and numerical windows.



The user event marker and event text will appear at the designated point.

4.2.2 Alarm Status

If an alarm has been defined in the Sequence Settings dialogue, and that alarm has been triggered, then by opening the sequence settings alarm index card window, you can see which gas triggered it. When an alarm is triggered, a red triangle flashes until the alarm has been confirmed, using the **Confirm** soft-key.

4.3 Using the Cursors

Cursors can be used in both the numeric and graphic windows. The way they are used and the information they provide is the same in both situations. Before the cursors can be displayed, the Cursor Values window must be opened and the window in which you wish to position the cursor(s) must be selected. Once the Cursor Values window is open, you click on the curve (in the graphic window) or on the value (in the numeric window) that you are interested in.

The cursor function is divided into two parts: when a single cursor is displayed and when two cursors are displayed.

4.3.1 “Single” Cursor

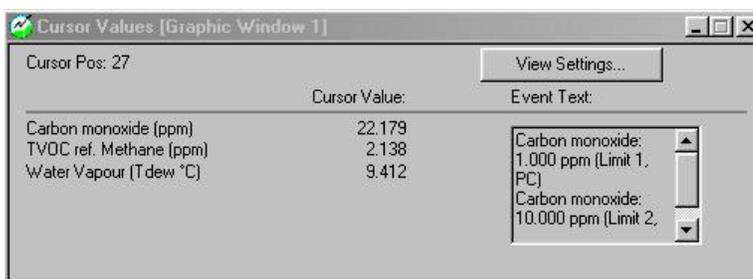
When you click in the window, a single cursor appears in the graphic window while two cursors appear either side of a single value in the numeric window. The Cursor Values dialogue gives several pieces of information:

Cursor Position: this can be given as either a time and date or a measurement number, depending on what was defined in the Window Properties dialogue.

The displayed measurement values (and their display units) are listed on the left-hand side of the dialogue. Opposite each parameter, under the heading Cursor Value, there is a value displayed. This is the measured value for the parameter where the cursor has been positioned.

There is a soft-key, **View Settings**, which enables you to see the measurement's settings for the measurement sequence.

Fig.4.3 The Cursor Value window using a single cursor .



Note: the View Settings soft-key is only available when this "single" cursor is displayed.

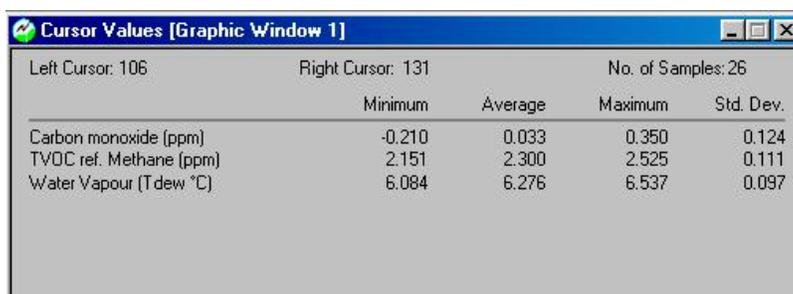
4.3.2 Two Cursors

If you are interested in the measurement data in a particular range, or need to zoom in, then two cursors can be used. The second cursor is displayed when you click on the initial cur-

cursor (either of the cursors in the numeric window), hold the left mouse button down and drag the cursor to the desired position and then release the mouse button. The two cursors are quite easy to see now. The information in the Cursor Values dialogue changes.

When using the Online program, the cursors can be used to look at any of the data more closely. But, note that as soon as a new measurement is available from the monitor, this will be displayed, disturbing your zoomed in view. In this case, it is more convenient to use the Presentation program simultaneously.

Fig.4.4 Cursor Value Window using two cursors.



	Minimum	Average	Maximum	Std. Dev.
Carbon monoxide (ppm)	-0.210	0.033	0.350	0.124
TVOC ref. Methane (ppm)	2.151	2.300	2.525	0.111
Water Vapour (Tdew °C)	6.084	6.276	6.537	0.097

Left Cursor Position: this can be given either as a time and date or a measurement number, depending on what was defined in the Window Properties dialogue.

Right Cursor Position: this can be given as either a time and date or a measurement number, depending on what was defined in the Window Properties dialogue.

The displayed parameters (and their display units) are listed on the left-hand side of the dialogue. Opposite each parameter are several values under the headings:

Minimum: this shows the minimum value for each parameter between the cursors.

Average: this gives the linear average value for all the values for each parameter between the cursors.

Maximum: this shows the maximum value for each parameter between the cursors.

Standard Deviation: this is the standard deviation of a particular gas's measurements from the average value of this parameter.

Note: the **View Settings** soft-key is not displayed when two cursors are displayed.

4.3.3 Zoom Function

When two cursors are displayed, the zoom function can be used. By pulling down the **View** menu and clicking on **Zoom in**. All the measurement data outside the cursors is removed from the screen. By setting new cursors, the zoom can be repeated.

Note: the Cursor Values dialogue updates each time the new cursors are displayed.

There are two ways to zoom out again:

You can pull down the **View** menu and click on **Zoom out**.

or

you can redefine the time “window” or the number of measurements displayed in the Window Properties dialogue.

4.4 Displaying Measurement Results.

Measurement results can be displayed both during a monitoring task, using the Online program, and on completion of a monitoring task using the Presentation program.

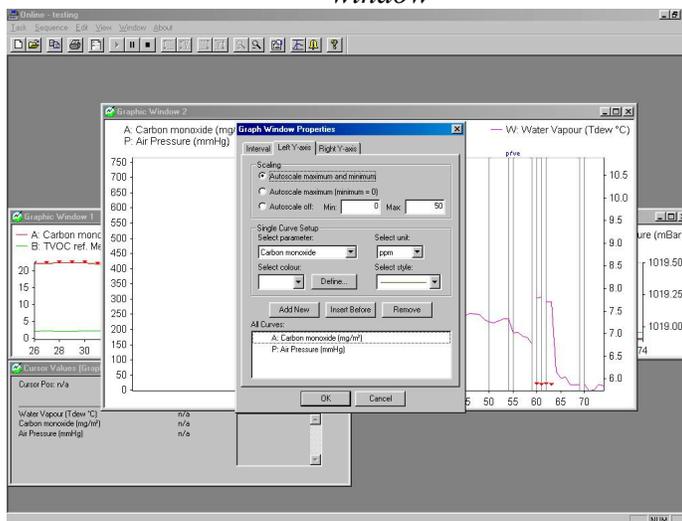
The online program always displays the latest measurement while the presentation program enables you to look at specific measurement data regardless of when it was recorded.

Measurement data can be displayed in both graphic and a numeric window, simultaneously.

With the Online program running and a monitoring task started, or the Presentation program running and a database selected:

1. Open the windows properties dialogue, see figure 4.5.

Fig.4.5 The Window Properties dialogue for a graphic window



Interval index card

2. Presentation only – Click in the Measurement Sequence field and a list of all the sequences in the monitoring task is displayed.
3. *Presentation only* - Select the desired sequence or all sequences.
4. *Presentation only* – If you select all, then you can zoom in on the individual areas using the cursor function (see section 4.3.3).
5. Select the interval units for the x-axis. Click on either the Time or Measurement Number radio-buttons and define the interval length.
6. Select the displayed measurement values.

If you want to display single measurement values, ensure that the check box in the Rolling Average group is not ticked.

If you want to display rolling average values, click in the Rolling average check box and define the averaging interval.

If you have opened a numeric window, go to step 7. If you have opened a graphic window go to step 13.

Column index card

7. Click on the Column index card.
8. If the parameters and their units displayed in the *All Columns* field are not correct, remove the parameter you want to change and add it as a new parameter.
9. If the parameter you want to display is not present in the *All Columns* field, click on Add New or Insert Before.
10. In the Single Column Setup group, click in the *Select Parameter* field and select the desired name.
11. Click in the *Select unit* field and select the desired units.
12. Repeat steps 8. to 11., selecting the other parameters you want to display.
13. Press **OK** to save selections and exit the dialogue box.

The selected parameters will now be displayed in the numeric window as they become available.

Presentation only – Go to step 27. to define the event markers that you want displayed in the numeric window.

Left Y-axis index card

14. Click on the Left Y-axis index card.
15. In the Scaling group, select the desired scaling mode by clicking on the correct radio-button.
16. If the parameters and their units displayed in the *All*

Curves field are not correct, remove the parameter you want to change and add it as a new parameter.

If the component you want to display is not present in the *All Curves* field, click on **Add New** or **Insert Before**.

17. In The Single Curve Setup, click in the *Select parameter* field and select the desired gas name.
18. Select the desired colour, style and units.
19. Repeat steps 16. to 18. until all the component's parameters you want displayed on the left y-axis are in the *All Curves* list.

Right Y-axis index card

20. Click on the Right Y-axis index card
21. In the Scaling group, select the desired scaling mode by clicking on the correct radio-button.
22. If the parameters and their units displayed in the *All Curves* field are not correct, remove the parameter you want to change and add it as a new parameter.
23. If the parameter you want to display is not present in the *All Curves* field, click on Add New or Insert Before.
24. In the Single Curve Setup, click in the *Select Parameter* field and select the desired name.
25. Select the desired colour, style and units.
26. When all your selections are correct, click on **Add New**.
The selected parameter is now displayed in the *All Curves* field. This means it will be displayed on the graph, with its value scale displayed on the right axis.
27. Repeat steps 22. to 26. until all the components you want displayed on the right y-axis are in the *All Curves* list.

Press **OK** to save the selections and exit the dialogue box. The measured data will now be displayed on screen.

Note: you can display the same parameter several times, simultaneously, with different units if desired.

Events index card

28. Click on the Events index card.
29. Click in the desired check boxes to display the different event markers.
30. Press **OK** to save selection and exit the dialogue box.

Although the measurement data may be displayed on screen, you can change any of the parameters, including the averaging value, in the Window Properties dialogue whenever you please without losing any data in the process.

Chapter 5

Viewing Measurement Data – using the Monitor

June 2004

5.1 Displayed Monitoring Task Data

When the Monitor is switched on, but not being operated in any **mode**, the screen display text identifies the data stored in its *Display Memory* by displaying the day and time of the first stored measurement cycle of the monitoring task as well as the day and time of the last measurement cycle of the monitoring task. For example:

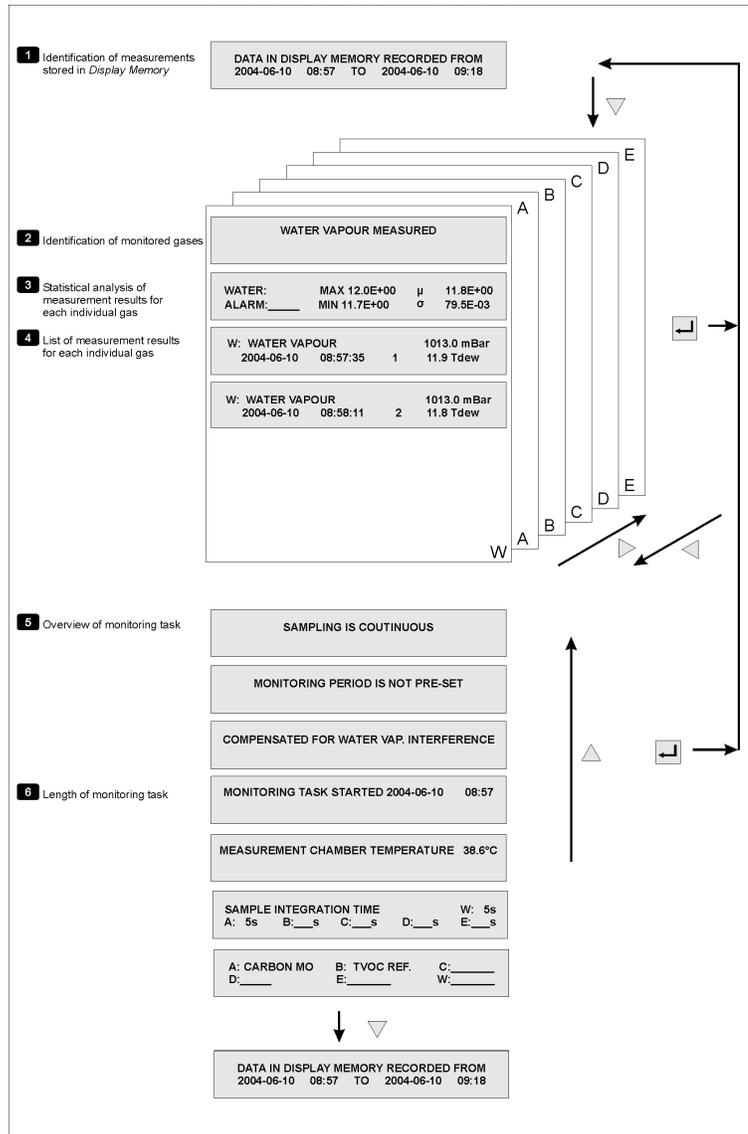
**DATA IN DISPLAY MEMORY RECORDED FROM
2004-01-16 09:50 TO 2004-01-16 10:04**

The Set-up parameters describing a monitoring task and the measurement data collected during the task are stored as a list in the *Display Memory*. You can scroll through the set-up parameters as well as the data collected during the task by using the direction push-buttons, ▼ to scroll “vertically” downwards, and ▲ to scroll “vertically” upwards through the list. Fig.5.1 illustrates how the data is organised:

By using the ► push-button, one can find the names of **all** the gases, which were monitored during the displayed task.

Using the individual measured gas concentration stored in *Display Memory*, when Store Measurement History is selected, a statistical analysis is performed which provides a summary of the stored measurement results. The MAX (maximum), MIN (minimum) gas concentrations are displayed, and the μ (Mean or Linear Average) and σ (Standard Deviation) values are calculated and displayed. During the performance of a monitoring task the statistical analysis is updated constantly.

Fig.5.1 Organisation of monitoring-task data displayed on the monitor's screen.



▶ &◀ Using these push-buttons users can scroll “horizontally” through any vertical level of data. For example, if the statistical analysis of the measurement results for water-vapour are displayed on the screen, then by using ▶ you can read the statistical analysis of Gas A.

5.2 Obtaining Time-weighted Average (TWA) Values

By using the **AVERAGE** button Time-weighted Average concentrations (C_{TWA}) of all the monitored gases can be obtained over any user-defined period of time (T hours). The following steps are involved:

1. Press **SET-UP** and **S2**.
2. “Enter” the period of time required for averaging – this could for example be 8 hours if you are interested in finding out whether the 8 hour Time Weighted Average concentration of gases are in compliance with National Occupational Exposure Limits; or, alternatively, the averaging period could be 15 minute Time-Weighted Average if you are interested in finding out whether the Short Term Exposure Limit (STEL) of the gases complies with National Occupational Exposure Limits.
3. Press **SET-UP** and then **AVERAGE**.

When steps 1 to 3 are complete, scroll through the measurement results displayed on the screen (*Display Memory*). Notice that all measurements have been averaged over the chosen averaging period.

5.3 Symbols used in Displayed Measurement Data

If an asterisk (*) appears on the display alongside any gas concentration, it indicates that something happened during the measurement. You can find out what the asterisk indicates by pressing the **INFO** button. The following display appears for a short period of time:

GAS X: COMMON MARK: PUW	GAS MARK: BFA
EVENT NO: xxxx	TIME: hh:mm

“EVENT NO” will appear on the screen only if the Event Mark button was used during the monitoring task. In this case the letter “E” will also appear as a Common Mark. The symbols which can appear after the text **COMMON MARK** and **GAS MARK** are listed below with a short explanation of what they mean:

Common Marks:

- “**P**” (1) The Monitor stopped measuring due to a power failure but has automatically re-started the monitoring task again after regaining power;
(2) The Monitor has been “reset” either because of a detected fault or because **RESET** was pressed.
- “**E**” The measurement has been marked by the User.
- “**O**” This symbol indicates that an operational error was detected during this measurement. The accuracy of such a measurement cannot always be guaranteed.
- “**W**” This symbol indicates that a warning was detected during this measurement. The accuracy of such a measurement cannot always be guaranteed.

Gas Marks:

- “B” The Monitor was incapable of calculating this gas concentration.
- “F” After this measurement the filter carousel was found to be out of alignment. If the carousel was only slightly out of alignment then the accuracy of the measurement has not been affected. The accuracy of such a measurement cannot always be guaranteed.
- “A” This gas concentration measured during this measurement cycle was found to exceed the user-defined alarm limit for this gas.

5.4 Printing-out Data from the Monitor

Before data can be printed out from the Monitor, the communication parameters must be checked/changed. This is explained in section 5.8.1 for RS-232 communication and section 5.8.2 for IEEE communication. The text line terminator must be set (see section 5.8.3) before printing can proceed.

It is also necessary to define the averaging period if the **AVERAGE** option is selected. Setting the Data Logging function is described in section 5.5.

5.4.1 Starting a Print-out

Press **PRINT** and then one of select push-buttons **S1** **S2** or **S3** depending on which data block you wish to print-out.

5.4.2 Stopping a Print-out which is in Progress

If a print-out is in progress and you wish to stop it, then the following steps need to be followed:

1. Press the **PRINT** button on the Monitor's front panel. The following text will appear on the display:

**PRINT ABORTING
PLEASE WAIT**

The printer will stop printing data.

2. Use the Line Feed function on the printer if the paper is not ejected automatically.

5.5 Data Logging Function

If the Monitor is connected up to a printer, and it is set-up to transmit data to the printer, this function enables measurement data to be printed out, automatically, as soon as it becomes available during a measurement or calibration.

The procedure is as follows:

1. Press the following sequence: **SET-UP** **S3** **S1** **S1**, and the following text is displayed:

**SELECT GENERAL SET-UP BRANCH ?
CLOCK SOUND TESTS**

2. Press **S3** ▼ **S3** **SET-UP**. This activates the data logging function.

5.6 Error Logging Function

If the Monitor is connected up to a printer, and it is set-up to transmit data to the printer, this function enables any warning or error messages that are displayed, to be recorded in the printed error log, automatically.

The procedure is as follows:

1. Press the following sequence: **SET-UP** **S3** **S1** **S1**, and the following text is displayed:

SELECT GENERAL SET-UP BRANCH ?		
CLOCK	SOUND	TESTS

2. Press **S3** **▼** **▼** **S3** **SET-UP**. This activates the error logging function.

5.7 Symbols Used in Print-outs of Measurement Data

Displayed measurements marked with the **COMMON MARKS “O”** and **“W”**, and the **GAS MARKS “A”** and **“F”**, are printed-out with an **“X”** symbol. However, any displayed measurements marked with the **COMMON MARKS “P”** and/or **“E”**, and the **GAS MARK “B”** are not printed-out with these symbols. These measurements are marked in a different way:.

Common Marks:

The symbol “**P**” is replaced by the text “**1412 Restarted**”. This indicates that the Monitor stopped and then started-up again sometime between the previous sample time and the time which appears alongside this message.

The symbol “**E**” is replaced by the text **User Event NumberX**: This indicates that the EVENT button was pressed while this measurement cycle was being performed. The number indicates the total number of “events” which have been marked during this monitoring task, at the time this sample was taken.

Gas Marks:

The symbol “**B**” is replaced by a straight line (_____) which indicates that the Monitor was unable to calculate the concentration of the named gas in this sample.

Other Marks Used:

.....This symbol indicates either: (1) that this gas was not measured; or (2) that this gas was not selected to be printed out .

5.8 Setting-up Communication Parameters

WARNING!: You must perform a **PARTIAL RESET** of the Monitor (press the **RESET** and **S1** buttons) if the **active** value of any parameter in this branch of the Set-Up Tree is changed. If the Monitor is not partially reset, then, the Monitor will not up-date the communication-parameter

data which was used last time data was transmitted via either of its interfaces. By performing a partial reset you ensure that the Monitor has the parameters necessary to enable it to transmit data to the attached printer.

Press **SET-UP** **S3** **S1** **S3** and the following text is displayed:

SELECT COMMUNICATION SET-UP BRANCH ?		
RS 232	IEEE 488	CONNECTIONS

If you are using the RS-232 interface, go to section 5.8.1.

If you are using the IEEE interface, go to section 5.8.2.

5.8.1 RS-232 Interface

A brief description of the communication parameters is given below. A list of the parameters, together with the values available and their default values are shown in Table 5.1.

The parameters in this branch decide how the Monitor communicates via the RS232 interface.

SELECT BAUD RATE gives the rate at which data should be transmitted from the Monitor via its RS-232 interface.

SELECT NUMBER OF STOP BITS gives the number of stop bits, which should be used when data is transmitted from the Monitor to other equipment.

SELECT NUMBER OF DATA BITS gives the number of data bits, which should be used when data is transmitted between the Monitor and other equipment.

SELECT PARITY CHECK The user chooses whether or not transmitted data should be checked for transmission errors using the parity checking system.

SELECT HARDWARE MODE The user chooses which communication line (wire) should be used to control data transmission between the Monitor and other equipment.

SELECT HANDSHAKE TYPE The user chooses which type of “handshake” should be used for transmission via the RS 232 interface.

Table 5.1 The available choices and the default values for each RS-232 communication parameter

Display Text	Acceptable Values	Default Value
SELECT BAUD RATE	300/600/1200/ 2400/4800/9600	9600
SELECT NUMBER OF STOP BITS	1 BIT, 2 BITS	1 BIT
SELECT NUMBER OF DATA BITS	7 BITS, 8 BITS	7 BITS
SELECT PARITY CHECK	NONE, EVEN, ODD	EVEN
SELECT HARDWARE MODE	Three-wire, Switched-line Leashed-line	Leased-line
SELECT HANDSHAKE TYPE	None, X-ON/X-OFF Hard-wired	Hard-wired

REMEMBER to partially reset your Monitor if any of the above parameters are changed! See the WARNING at the beginning of section 5.8.

From the top of the **Communication** branch of the Set-up Tree

SELECT COMMUNICATION SET-UP BRANCH ?		
RS 232	IEEE 488	CONNECTIONS

1. Press **S1**.
2. Use the direction and select push-buttons to select the correct values for the parameters.
If you are in doubt about any of the settings, refer to your printer manual.
3. When you have been through all the parameters, the monitor returns to the top of the **Communication** branch.
4. Press **S3 S1** and then **SET-UP**. This selects the RS-232 port as the communication port for the printer.
Press **RESET** and **S1** to partially reset your Monitor.

5.8.2 IEEE Interface

The parameters in this branch decide how the Monitor communicates via the IEEE 488 interface bus.

Monitors 1412's ADDRESS 14 This enables the Monitor to be addressed via the IEEE 488 interface. The range of acceptable values and the default value of the Monitor's address are shown in Table 5.2.

Table 5.2 The range of acceptable values and the default value of the Monitor's address

Display Text	Acceptable Values	Default Value
1412 ADDRESS	from 0 to 100	14

The other IEEE 488 communication parameters which need to be selected in this branch of the Set-Up Tree are shown in Table 5.3 together with available choices and default values of each parameter.

Table 5.3 The range of acceptable values and the default value of the IEEE 488 communication parameter

Display Text	Acceptable Values	Default Value
IS 1412 SYSTEM CONTROLLER?	NO, YES	YES

IS 1412 SYSTEM CONTROLLER? The user chooses whether or not the Monitor will be the system controller on the IEEE 488 interface bus.

REMEMBER to partially reset your Monitor if any of the above parameters have been changed! See the WARNING at the beginning of section 5.8.

From the top of the **Communication** branch of the Set-up Tree:

SELECT COMMUNICATION SET-UP BRANCH ?		
RS 232	IEEE 488	CONNECTIONS

1. Press **S2**.

2. Use the direction push-buttons to select the correct values for the parameters.
3. If you are in doubt about any of the settings, refer to your printer manual.
4. When you have been through all the parameters, the monitor returns to the top of the **Communication** branch.
5. Press **S3** **S3** and then **SET-UP**. This selects the IEEE port as the communication port for the printer.
6. Press **RESET** and **S1** to partially reset your Monitor.

5.8.3 Additional Parameters Required

The other output parameters which determine the format of print-outs are shown in Table 5.4 together with available choices and default values.

Table 5.4 Parameters which determine the format of print-outs from the monitor

Display Text	Acceptable Values	Default Value
PRINT EACH GAS?	No, Yes	Yes
(if print each gas is no) PRINT GAS N*? PRINT AIR PRESSURE?	No, Yes	No
SELECT TEXT LINE TERMINATOR	CR, LF, CR-LF	CR-LF

If one chooses to **PRINT EACH GAS**, then all gases, which have been measured, will be printed out. If one does not choose to **PRINT EACH GAS** then the user is given the chance to choose which of the gases (A-E) and water (W) should be printed out – **PRINT GAS A?** and so on.

SELECT TEXT LINE TERMINATOR The user chooses which character the Monitor should use as “end of text line” when data is transmitted from the Monitor.

Chapter 6

Data Transfer

June 2004

6.1 Measurement Data

In order for the measurement data to be viewed using the PC software, the data must be stored in the PC. For Off-line and Stand-alone use, where the measurement data is stored in the monitor, then the data must be Uploaded to the PC.

All measurement data from the Monitor, regardless of what is being displayed on screen during the measurement, is transferred to the PC and stored in a MS-Access[®] format. This measurement data can be viewed on screen, analyzed and used in other software programs that utilize ODBC.

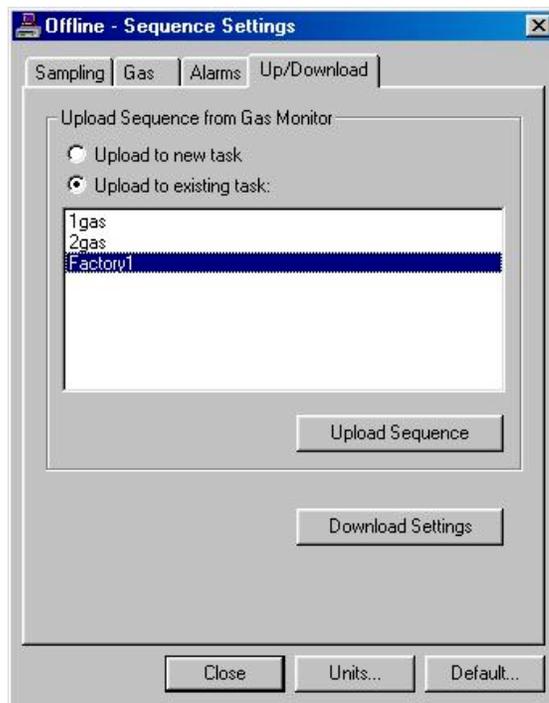
6.1.1 Uploading Measurement Data from the Monitor

Any measurement data that is stored in the Monitor's display memory can be uploaded to a PC. Measurement data can be uploaded either as a new measurement task, which is given a unique name, or it can be uploaded so that it becomes a sequence in an existing measurement task. If **EVENT** was pressed or something happened while monitoring, the uploaded data retains these marks, which can be displayed using the Presentation program.

With the monitor and the PC connected as described in section 1.2 and the Offline program running:

1. Click on Up/Download index card, see Fig.6.1.

Fig.6.1 The Up/Download dialogue



2. Click on the radio-button to either Upload to a new task or Upload to an existing task.

If you are adding data to an Existing Task, select the monitoring task from the list displayed.

3. Click on the **Upload Sequence** softkey.

If you are uploading measurement to a New Task, a New measurement Task dialogue opens, type in the desired monitoring task name now, and click on **OK**.

The measurement data is uploaded to the PC, where it can be viewed using the Presentation program.

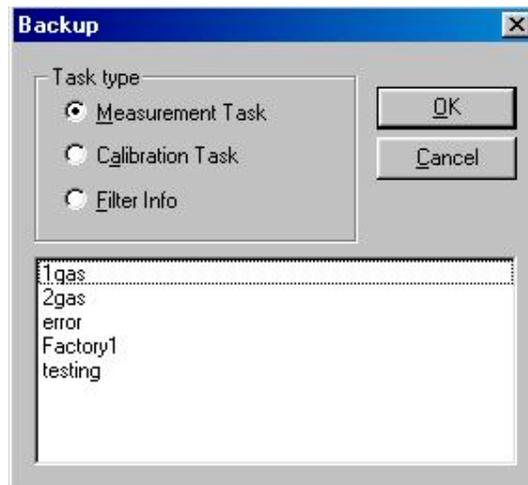
6.2 Backup Databases

This option enables you to make a backup copy of your existing databases. There are three types of files that can be backed up here: Measurement Tasks; Calibration Tasks; and Filter Information.

With the Database Administration program running:

1. Click on **Backup** and the dialogue shown in Fig.6.2 is displayed

Fig.6.2 The Backup dialogue



2. Click on the radio-button to select the type of data to be backed up.
3. Select the correct name from the list displayed and click on **OK**.
4. Now define the destination where the backup should be stored and click on **OK**.

A copy of the selected database is now made. If you want to use this database again, use the Restore option.

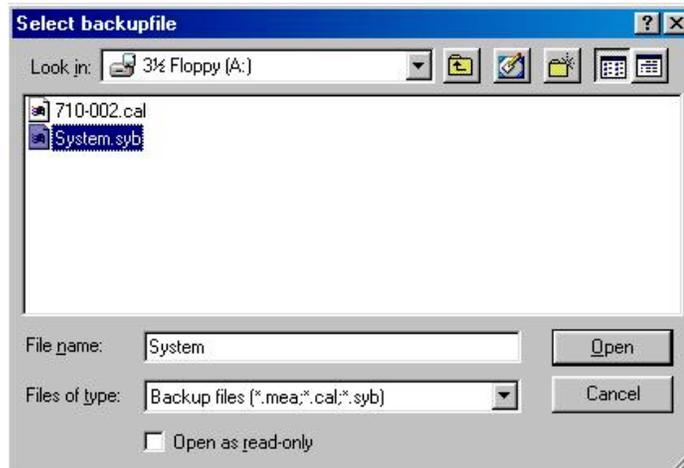
6.3 Restore Databases

This option enables you to restore backup copies of databases, so that they may be used again in the Gas Monitoring Software 7304. All backup files, made using the Backup option, can be restored.

Restored databases can be restored as “read-only” files. This prevents you from adding additional measurement data to the database, or corrupting the existing data. This is of particular use when restoring Calibration databases that must not be changed.

With the Database Administration program running:

1. Click on **Restore** and the dialogue shown in Fig.6.3 is displayed.

Fig.6.3 The Select Backup files dialogue

2. Use the standard Windows browser procedures to select the databases to be restored.
3. If you want to restore the database(s) as a read-only file(s), click in the Open as read-only check box.
4. Click on **Open**. The selected files are restored to the Gas Monitoring Software 7304 working directory.

Click on **Cancel** to exit the Restore dialogue when all the desired databases have been restored.

Chapter 7

Storage of Data in the Monitor's Memory

June 2004

7.1 Storage of Measurement Results

While a monitoring task is being performed measurement data is stored in the Monitor's *Display Memory*. When the monitoring task is complete the data in *Display Memory* is normally copied into the Monitor's *Background Memory* to prevent it from being overwritten (and therefore lost) by measurement data stored during the next monitoring task. The same amount of data can be stored in both the *Background Memory* and the *Display Memory*.

7.2 Storage Space in the Display memory.

Table 7.1 illustrates the space, which is required to store individual measurement results. If 5 gases and water vapour are being measured, then 37 bytes of space are required to store measurement results from one measurement cycle, whereas only 24 bytes of space are required if 3 gases (for example, gas A, E and water vapour (W) are measured. If only one gas (for example, gas A) is being measured, then only 15 bytes of space are required to store measurement results from one measurement cycle.

The total space available in *Display Memory* to store data is 64 000 bytes. If only one gas (for example, gas A) and water vapour is measured, then data from up to

$\frac{64000}{19} = 3368$ measurement cycles can be stored in *Display*

Memory, whereas if 5 gases and water vapour were measured, data from up to only $\frac{64000}{37} = 1730$ measurement cycles

can be stored in *Display Memory*.

The time required to perform a measurement cycle is dependent upon the number of gases/water vapour being measured.

If we take the examples given above we can work out approximately how long the data from a monitoring task can be stored in *Display Memory*:

Table 7.1 Space occupied by results from one measurement cycle when a different number of gases is monitored

Data being stored	Bytes	
Measurement times	4	
Event numbers	2	
Common flags	1	
CRC sum	1	
Flags for gas 1 & gas 2	1	
Atmospheric pressure	4	
Results for gas 1	2	15 bytes
Results for gas 2	4	19 bytes
Flags for gases 3 & 4	1	
Results for gas 3	4	24 bytes
Results for gas 4	4	28 bytes
Flags for gases 5 & 6	1	
Results for gas 5	4	33 bytes
Results for gas 6	4	37 bytes

If a measurement cycle in which gas A and water vapour are measured takes 15s, and if sampling is continuous this means that 3 368 cycles will take $3\,368 \times 15 = 50\,520\text{s} = 14$ hours. If, however this measurement cycle is only performed every 10 mins then data can be stored for $3\,368 \times 10 = 33\,680$ mins = 23 days.

If a measurement cycle where 5 gases and water vapour are measured takes 60 s, and if sampling is continuous this means that 1 730 cycles will take $1\,730 \times 60 = 103\,800$ s = 28.8 hours. If, however this measurement cycle is only performed every 10 mins, then data can be stored for $1\,730 \times 10 = 17\,300$ mins = 12 days.

The maximum time you can set a monitoring period to be is 7 days. If you try to enter a greater number of days, the Monitor will automatically change the period to 7 days. However, if you do not set a pre-defined monitoring period, the Monitor will just store as much data as possible before starting to overwrite the “oldest” stored measurement results.

7.3 Management of Data in Background Memory

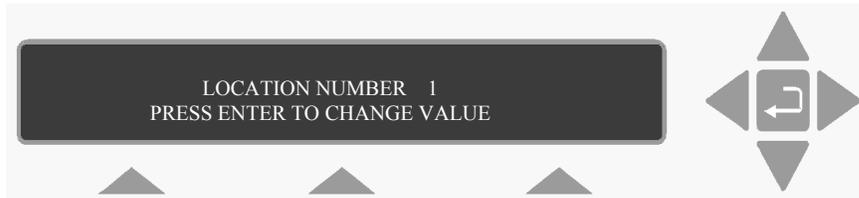
The monitor has to be operated in Memory mode by pressing the **MEMORY** push-button. The following text appears on the screen:



7.3.1 Storing Data in Background Memory

When data is to be copied from *Display Memory* into *Background Memory*:

Press **S1**



If some data has already been stored in the *Background Memory* and you cannot remember which locations have been occupied (used), press the **INFO** push-button to find out which locations are occupied and what percentage of the *Background Memory* has been used. Use the direction keys to select the desired location number. When the chosen location number is on the screen, press **S2** to accept the position.

7.3.2 Recalling Data from Background Memory

To recall data stored in Background Memory to Display Memory:

Press **Memory** **S2**.



Use the direction keys to select the correct location number. The following text is displayed.



If you want to continue, press **S1**, and the following text is displayed.



If you want to Stop, press **S3**, this returns you to the original display showing **SELECT MEMORY FUNCTION** so that you can **STORE** any data which is stored in *Display Memory*.

Press **S2**. If data has not been stored in the chosen location, a message will appear on the Monitor's display to inform the user. Otherwise, the data from the chosen location in *Background Memory* will be copied into *Display Memory*.

7.3.3 Deleting Data from Background Memory

To delete data which has been stored in *Background Memory*:

Press **MEMORY** **S3**.



Use the direction keys to select the location number. After selecting the chosen location number the display will show the starting-time of the oldest data stored in the *Background Memory*:

If the starting-time of the oldest stored data to be deleted corresponds with the starting-time shown on the display screen then press **S1** and then **S2** to accept that the data will be deleted from *Background Memory*.

Chapter 8

Warning and Error Messages

June 2004

When the Monitor is switched on, and while it is being operated, the Monitor regularly performs a series of self-tests which check that the various mechanical, electrical and electronic components of the Monitor are functioning correctly. If any component is found to be functioning outside of its specifications either a “Warning” or a “Operating-error” message will appear on the gas monitor’s screen.

Please note: A “Warning” and/or “Operating-error” message will only be displayed **once**. If the fault is still found to be present during the next regular self-test the message will **not** be displayed again. Messages are only displayed when a fault is first detected. If the fault corrects itself and then is later found to be faulty the message will be displayed again. It is therefore important to note the message before pressing the **INFO** button, which will cause the error message to be removed from the display.

Although the message is removed from the screen, any gas measurements performed while the fault is still present will be marked with an asterisk (*). By pressing **INFO** when such a measurement is displayed, the **Common mark “O” and/or “W”**, and in some cases, the **Gas Mark “F”** and **Gas Mark “A”** will be shown on the display.

On the following pages, all possible “Warning” messages are listed; all possible “Operating-errors” messages are listed; and all possible “Interface-error” messages are listed. There is a description of each fault as well as the possible cause(s) of each fault. The user must evaluate the significance of each message. As long as the fault is de-

tected, all measurements will be marked by an asterisk. Some “faults” are easily corrected.

Error and Warning Messages

The following table gives most of the error and warning messages contained in the test Hierarchy of the Monitor. There is a description of each fault as well as the possible cause of each fault. The user must evaluate the significance of each message.

Error / Warning Message	Description of Fault	Possible Cause
AIR FLOW TOO LOW	The air pressure difference created by the pump in the pneumatic (airway) system (tubes and/or analysis cell) is too low. This means that the tubing and/or analysis cell cannot be properly flushed out and the sample in the analysis cell is therefore not necessarily “new”	<ol style="list-style-type: none"> 1. The length of the sampling tube attached to the Monitor’s inlet has been incorrectly entered. 2. Either the external or internal pneumatic system is not air-tight 3. The pump is defective
ALARM LIMIT EXCEEDED	The Monitor has measured a concentration of gas greater than the alarm limit concentration entered	

<p>NO INDEX MARK FROM FILTER CAROUSEL</p>	<p>The Monitor cannot determine the position of its filter carousel</p>	<ol style="list-style-type: none"> 1. The motor that drives the filter carousel is not working 2. The optical detector that checks the movement of the carousel is not working 3. The filter carousel has not been properly mounted
<p>CLOCK SET TO DEFAULT ERROR DETECTED IN CLOCK SETTINGS</p>	<p>The Monitor's internal clock was found to be incorrectly set so these values have been set to their default values</p>	<p>A new battery has been installed</p>
<p>FACTORS SET TO DEFAULT ERROR DETECTED IN CALIBRATION FACTORS</p>	<p>An error has been found in the data stored in the Calibration Factor part of the Monitor's memory, so these factors have been set to their default values</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Working Memory (RAM) or Source Memory (EEPROM) 3. A Software fault
<p>MEMORY SET TO DEFAULT ERROR DETECTED IN BACKGROUND MEMORY</p>	<p>An error has been detected in the Monitor's Background Memory, so the Monitor automatically deletes all data stored in this Memory</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Working memory (RAM) 3. A software fault

<p>MEMORY SET TO DEFAULT ERROR DETECTED IN DISPLAY MEMORY</p>	<p>An error has been detected in the Monitor's Display Memory, so the Monitor automatically delete all data stored in this memory.</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Working Memory (RAM) 3. A software fault
<p>MEMORY SET TO DEFAULT ERROR DETECTED IN INTERNAL MEMORY</p>	<p>An error has been found in the data stored in the Monitor's internal memory. Data stored in this memory cannot be read or altered by the user, so the Monitor automatically corrects any errors found in this memory</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Working Memory (RAM) 3. A software fault.
<p>MEMORY SET TO DEFAULT ERROR DETECTED IN SOURCE MEMORY</p>	<p>An error has been found in the data stored in the Monitor's source memory, so the Monitor automatically give stored parameters default values.</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Source Memory (EEPROM) 3. A software fault
<p>PARAMETERS SET TO DEFAULT ERROR DETECTED IN CONFIG:/FORMAT PARAMETER</p>	<p>An error has been found in the value parameters stored in the Configura-tion and/or Format branches of the Monitor's set-up tree, and therefore the Monitor has automatically given these para-meters default values</p>	<ol style="list-style-type: none"> 1. A defective back-up battery. 2. A defective Working Memory (RAM) 3. A software fault.

<p>PARAMETERS SET TO DEFAULT ERROR DETECTED IN THE TASK SET_UP PARAMETER</p>	<p>An error has been found in the value parameter stored in the Monitoring Task branch of the Monitor's set-up tree, and has automatically given these parameters default values.</p>	<ol style="list-style-type: none"> 1. A defective back-up battery 2. A defective Working Memory (RAM) 3. A software fault.
<p>A/D INTERRUPT FAILED</p>	<p>A/D converter was not able to collect the necessary number of signal measurements to ensure an accurate concentration measurement.</p>	<p>The analogue card is defective.</p>
<p>AIR SHUNT BLOCKED. SAMPLE ABORTED</p>	<p>The pressure of air in the analysis cell is too high. The microphones risk being damaged by exposed to such pressure.</p>	<p>The air shunt valve is either defective or blocked.</p>
<p>CHOPPER FAILED</p>	<p>The chopper wheel is not running.</p>	<ol style="list-style-type: none"> 1. The chopper motor is not working 2. The optical sensor which checks the chopper's movement is not working.

INTERNAL TEMPERATURE OUT OF RANGE	The temperature in the analysis cell is either too high or too low. As the Monitor is operating outside its temperature specifications, accurate measurements can not be guaranteed.	<ol style="list-style-type: none"> 1. The ventilation fan is defective. 2. The ambient air temperature is either too high or too low. 3. The temperature sensor is defective.
IR-SOURCE TEMPERATURE OUT OF RANGE	The temperature of the infrared light source is either too high or too low. As the IR-source is operating outside its temperature specifications accurate measurements cannot be guaranteed.	The infra-red light source is defective.
MICROPHONE TEST FAILED	The signal received from the microphone during the self-testing procedure is out of range.	<ol style="list-style-type: none"> 1. The analogue card is defective 2. A microphone (s) is defective.
PUMP TEST FAILED	The pump cannot build up the necessary pressure during the self-testing procedure.	<ol style="list-style-type: none"> 1. The pump is defective. 2. The internal pneumatic system is not airtight.

<p>MODULE STATUS ERROR DETECTED</p>	<p>At least one of the modules is not functioning as expected.</p>	<ol style="list-style-type: none"> 1. Module hardware error. 2. Fault in communication cable 3. Wrong module version 4. Fault in the data configuration of the module
<p>IEEE CONTROL TIMEOUT</p>	<p>The Monitor wishes to send data to a printer via IEEE interface, but the Monitor is not the system controller.</p>	<p>There are no other “controllers” on the IEEE bus, so the Monitor should be made the controller.</p>
<p>WARNING: X-ON/X-OFF HANDSHAKE CONFLICT</p>	<p>The Monitor receives the handshake signal from the RS232 CTS (clear to send) line, but it has not been set-up to use this CTS line</p>	<p>The Monitor and RS232 device (printer) do not agree about which handshake signal they should use. Perhaps the wrong interface cable has been used.</p>
<p>TIMEOUT. DEVICE NOT CONNECTED</p>	<p>Monitor wishes to send data (print , data-log or error-log) via the IEEE interface, but there is no response from the device with the address entered in the Monitor set-up</p>	<ol style="list-style-type: none"> 1 No device is connected to the Monitor 2 The device address has been entered incorrectly in the Monitor’s set-up.

<p>WARNING : TIMEOUT. DEVICE NOT READY</p>	<p>Monitor wishes to send data (print , data-log or error-log) but after the start of data transmission , the device stops receiving data.</p>	<ol style="list-style-type: none">1. The device is “ off-line “ (it can not receive data).2. The device is not able to receive data fast enough.3. The device is no longer connected to Monitor.
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