User Manual
for
Application Software Type 7300

From serial number: 1 525 786

December 2003

INNOVA

BB 6004 – 12

Safety Considerations

Warnings

- Switch off all equipment before connecting or disconnecting them. Failure to do so could damage the equipment.
- Never switch off the computer when using the Type 7300. Switching off can damage the database.

About this User Guide

This user manual is structured to guide the first-time user step by step through setting up the measurement system, and using the 7300 to control the system. The table of contents at the front of this guide shows clearly where the information in this user guide can be found. The index at the back enables the user to go directly to the relevant sections when difficulties arise.

Throughout this User Manual, references are made to Innova AirTech Instruments. So as not to write a long list each time, the 1312 Photoacoustic Multi-gas Monitor is quoted. However, the 1412 Photoacoustic Field Gas-Monitor, 1314 Photoacoustic Mult-gas Monitor, Multi-gas Monitor Type 1302, Single-gas Monitor Type 3425 and Dual-gas Monitor Type 3426 can also be used in these applications.

Contents

Chapter 1

Setting Up the Computer

This chapter tells you:

- How to install a National Instruments IEEE 488 interface in your computer
- How to fit the 7300 Security key to the computer
- How to load the 7300 into the computer

1.1 Installing a IEEE 488 Interface

As well as being able to communicate with the 1312 and 1303(s), or 1309, over the RS–232 interface, the 7300 can also communicate with them over the IEEE 488 interface, using the following recommended interface board and driver:

> National Instruments IEEE 488 interface and Software GPIB-PC2A for Windows™

For installation of the interface board and software, use of the configuration program WIBCONF and definitions of parameters refer to the manual supplied with the interface. Please note that the following parameters are recommended when installing and setting up the interface board.

Device map and device names:

The device names used for the 1312 and, 1303(s) or 1309 on the interface board's device map in WIBCONF must be **BK1302**, **BK13031**, and **BK13032**.

Note: if only one multiplexer is connected use **BK13031**.

Note: Before installing the interface board and software, change the 1312 set-up to IEEE communication. For more details about this procedure, refer to the 1312 Instruction Manual.

GPIB0 board characteristics (interface board and GPIB-PC2A software):

Primary GPIB Address	0
Secondary GPIB Address	None
Timeout setting	10 sec
EOS byte	10H
Terminate Read on EOS	Yes
Set EOI with EOS on Writes	Yes
Type of compare on EOS	7-bit
Send EOI at end of Write	Yes
System Controller	Yes
Assert REN when SC	Yes
Enable Auto Serial Polling	No
Bus timing	500 nsec
Parallel Poll Duration	Default
Board Type	PC2A
Interrupt level setting	As on board — Default: 7
Base I/O Address	As on Board — Default: 02E1
DMA channel	As on board — Default: 1

Device characteristics for BK1302, BK13031 and BK13032:

Primary GPIB Address	In accordance with the device's address number
Secondary GPIB Address	None
Timeout setting	10 sec
Serial Poll Timeout	1 sec
Terminate Read on EOS	Yes
Set EOI with EOS on Write	Yes
Type of compare on EOS	7-bit
EOS byte	10H
Send EOI at end of Write	Yes
Enable Repeat Addressing	No

1.2 Fitting the Type 7300 Security Key

Warning! Switch off all equipment before connecting or disconnecting the interface cable or the Type 7300 Security Key. Failure to do so can damage your instruments and the computer.

The Security Key is a protection device that you attach directly to LPT1, the first parallel port of your computer. It ensures that only authorized owners can use the 7300. Without the key the 7300 cannot be used to make measurements.

Note: that the security key must be used even if you are using the IEEE interface to communicate with your system. If you are using printers that are connected to the parallel port, the security key must be connected to the port. The printer cable must be connected to the security key.

To fit the 7300 security key to the computer:

1. Switch off the computer.
2. Locate the computer's parallel port. If you are not sure which port this is, refer to your computer's instruction manual.

   Push the Security Key directly onto the **parallel communication port** (LPT1) of the computer, and tighten the screws fitted to the security key to secure it to the screw-fittings of the port.

NOTE: LOST SECURITY KEYS WILL NOT BE REPLACED BY *INNOVA* AIRTECH INSTRUMENTS.

1.3 Install the 7300 in the Computer

Important! It is recommended to make a backup copy of the existing databases before installing the 7300.

Note: Your existing databases will not be deleted when you uninstall your current software version. See section A.4 for details on how to use your existing databases.

Hardware requirements for the 7300 software:

- Pentium II (333MHz) processor
- Minimum 20 MBytes of free space available on the hard disk
- Minimum 128 MBytes of RAM
- One serial port (RS–232) and one parallel port

  or

  One GPIB IEEE port and a parallel port
- Mouse

Software requirements for the 7300 software:

- Windows® 98, NT 4.0 (SP 6 or above), or Windows 2000 (SP 1 or above) installed

Installing 7300 on a PC

Note: it is recommended to close all Windows programs that are open before starting the installation.

Install 7300

Insert the CD labelled "Type 7300", version 4.0 or above in the PC. The setup starts automatically.

Follow the prompts given on screen to guide you through the installation.

When the installation is complete, a program group is created, "*INNOVA* AirTech Instruments", which contains the 7300 icon.

Chapter 2

Connecting Up the 1312 & 1303(s) or 1309

This chapter tells you:

- How to connect the 1312 and, 1303(s) or 1309 to the computer's RS – 232 communication port, or to an IEEE 488 interface port (if one is installed in the computer)
- How to connect tubing to the 1312 and, 1303(s) or 1309

2.1 Connecting the 1312 and 1303(s) or 1309 to the Computer's RS – 232 Ports

Check if your computer's communication port is 25-pin or 9-pin, then use the following text to decide which *INNOVA* cables to use for connecting the instruments to the computer:

Connecting to a 25-pin COM port: Cable WL0946 (25-pin to 25-pin RS – 232)

Connecting to a 9-pin COM port: Cable WL0945 (25-pin to 9-pin RS – 232)

Connecting the 1312 and 1303(s) or 1309 together (IEEE to IEEE): Cable AO0265 (2m) or WL0845 (0.4m)

To connect the instruments to the computer:

1. Ensure that the computer and instruments are switched off before making any connections.

2. Using the appropriate cable, push one end onto the computer's COM port, and tighten the screws fitted to the cable to secure the connection.

3. Attach the other connector of the cable to the RS – 232 interface port on the rear panel of the 1312.

Connecting 1303(s) or 1309 to the 1312:

1. Push one connector of Cable AO0265 (2m) or WL0845 (0.4m) into the IEEE interface port on the rear panel of the 1312,

and tighten the screws. Push the other connector of the cable into the IEEE interface port of the 1303 or 1309 and tighten the screws.

2. If you have two 1303 units, connect the second cable, AO0265 (2m) or WL0845 (0.4m), to the back of the connector mounted on the *first* 1303 unit. Then connect the other connector of the cable into the IEEE interface port of the second 1303 and tighten the screws, as before.

2.2 Connecting the 1312 and 1303(s) or 1309 to an IEEE488 Interface Port

To do this, you need the following *INNOVA* cable:

Connecting the computer to the instruments: Cable AO0265

Connecting the 1312 and 1303(s) or 1309: 1 or 2 Cables AO0265 (2m) or WL0845 (0.4m)

To connect the instruments to the computer:

1. Ensure that the computer and instruments are switched off before making any connections.

2. Insert the connector of Cable AO0265 into the computer's IEEE interface port, and tighten the screws fitted to the connector to secure the connection.

3. Push the connector at the other end of Cable AO0265 into the 1312's IEEE interface port, and tighten the screws.

4. Push one connector of Cable AO0265 onto the back of the connector already mounted on the 1312's IEEE interface port and tighten the screws. Push the other connector of the cable into the IEEE interface port of the 1303 or 1309 and tighten the screws.

5. If you have two 1303 units, repeat the procedure given in step 4, connecting the second cable to the back of the connector mounted on the *first* 1303 unit.

2.3 Connecting Tubing to the 1312 and 1303(s) or 1309

All of the sampling procedures which the 1312, 1303 and 1309 perform are done via tubing. From each individual measurement location, a tube leads to the 1303's or 1309's sampler channels, so that gas-samples can be drawn from each location ready for delivery to the 1312. The 1303 or 1309 is connected to the 1312, so that the gas-samples can be delivered for analysis.

A full description of how to connect all necessary tubing to the 1312, 1303(s) and 1309, and what kind of tubing to use, is given in the Instruction Manuals for the 1303 and 1309.

Chapter 3

Getting to Know the 7300

This chapter tells you:

- How the 7300 is structured, and the philosophy of using the 7300

3.1 Getting to know the 7300

This section is for inexperienced users of the 7300. It gives a brief introduction to the philosophy of using the 7300. As such, full details of using the 7300's functions are not given in this section. More experienced users should go to Chapter 4 of this manual.

Note: although the dialogues for the different Windows versions appear slightly different, the procedures to and the information from them are the same.

3.1.1 Data Display Windows

Measurement data and operating-status data from the instruments are displayed in the 7300's data display windows. The commands which open these windows are grouped in the **View** menu. There are four types of data display window: the graphic window; the numeric window; the status window; the notepad window. A short introduction to each type of window is given below.

The graphic window.

The graphic window is shown in Fig.3.1. The data displayed can be measurement data (gas-concentrations, temperature, data from external programs), or processed data (weighted/unweighted averaged data). Up to 6 curves of data can be plotted simultaneously on the same axes. In addition, key values calculated from the data can be displayed.

You make the graphs by using the mouse to click on the buttons in the "panel" at the left of the screen. If not on the screen, the panel is displayed using the **Show Panel** function in the **View** menu. As default, the panel is displayed. The buttons activate

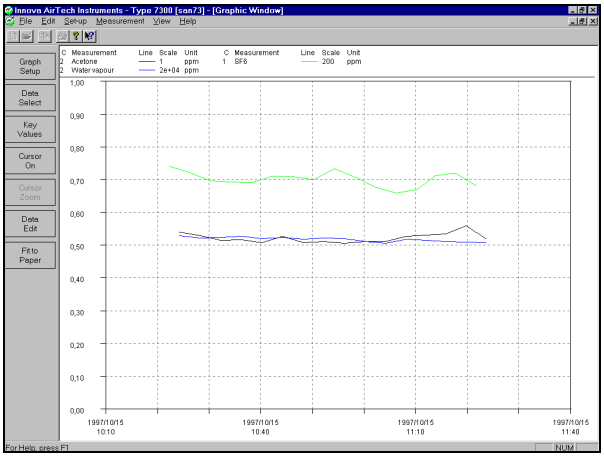

Fig.3.1 The graphic window

dialogues in which you choose the type and style of curve to be plotted. When the curves are plotted, you can use the data on the curves to calculate a range of statistical and ventilation parameters, which can be displayed in the panel at the top of the screen.

The graphic window can be displayed in two forms. The first form, “Fit to Window”, is an overview of the whole graph, which excludes the measurement information. The size of the graph stays the same relative to the size of the graphic window. This is the default display form.

The second form, selected using **Fit to Paper**, includes information about the measurement, and can be thought of as a page of information. To see all of this form, you must use the scroll bars to move the page. This form can be printed/plotted. You can alter the size of the page using the **Printer Setup** function in the **File** menu. You can also change the size and typeface of the text on the page using the **Font** function in the **Set-up** menu – see section 5.5.

The x-axis of the graph is always a time axis. The units for the y-axis depend upon the data plotted on the graph – see section 5.1.1.

The numeric window.

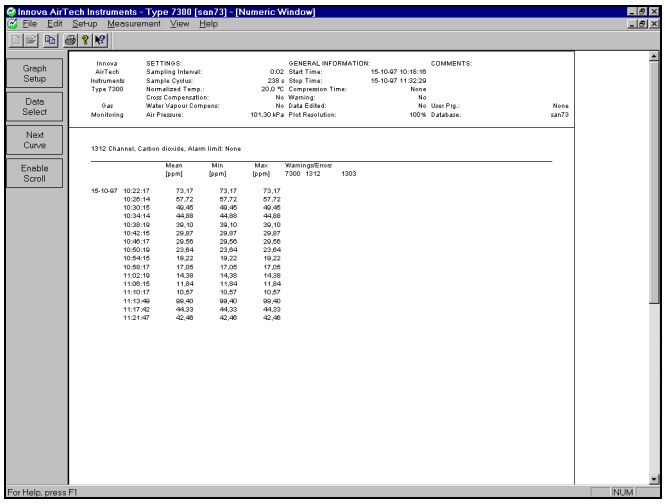

Fig.3.2 The numeric window

The numeric window is shown in Fig.3.2. The data is displayed in table form, with each measurement marked with the time at which it was made. The data displayed can be measurement data (gas-concentrations, temperature, data from external programs), or processed data (weighted/unweighted averaged data).

The numeric window also has two forms, and unlike the graphic window, both these forms can be printed/plotted. The first form, “Disable Scroll” includes measurement information. The size of the page can be changed using the **Printer Setup** function in the **File** menu, in the same way as the graphic window. The second form, “Enable Scroll”, allows you to scroll through the measurement results using a specific scroll function.

You select the data to be displayed in the numeric window by using the buttons in the "panel" at the left of the screen. The panel is displayed using the **Show Panel** function in the **View** menu. One set of data, that is, data from one measurement channel, can be seen at one time.

The status window.

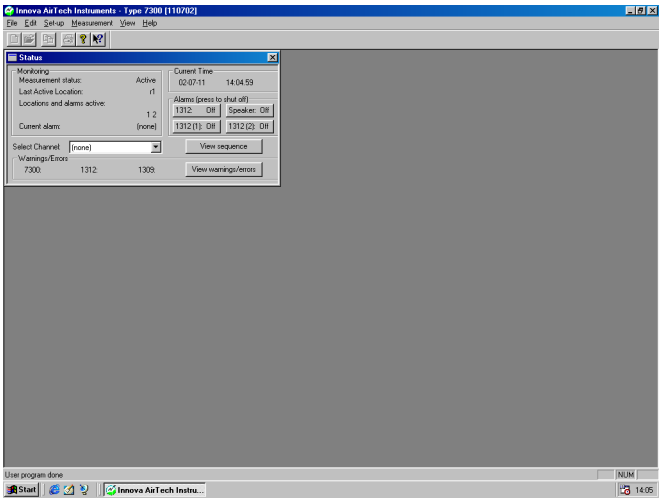

Fig.3.3 The status window

The status window is shown in Fig.3.3. The window shows what type of measurement is currently being performed (top section of the window), and informs you if any operating warnings occurred in the 1312, 1303(s), 1309 or the 7300. If you are in monitoring mode, and an alarm-level is exceeded, the Status window opens on your screen automatically so you can see the data on the alarm situation. This window is also used to shut off alarms that have been triggered.

The status window can also display the most recent measurement results from a chosen measurement channel (lower section of the window). You choose the measurement channel from a dialogue, activated by clicking the mouse button in the **Select**

Channel box. The most recent results from that channel will then be displayed, with each new result replacing the previous one.

The notepad window.

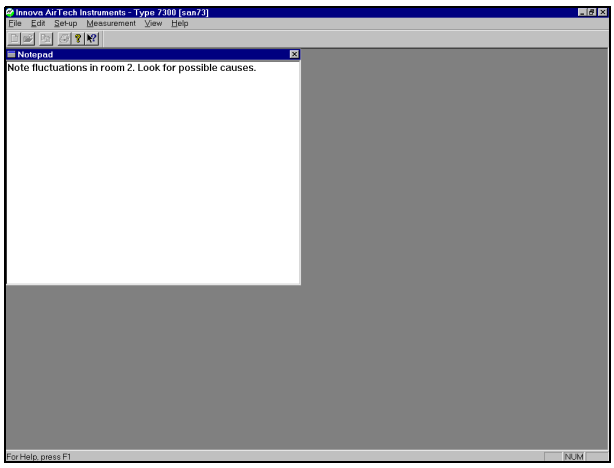

Fig.3.4 The notepad window

The notepad window is shown in Fig.3.4. It is used for storing information that you want to save. The text in the notepad window is stored in the database that you are currently using – a very useful feature as it allows you to store notes on set-ups, and other details. For more information, see section 5.4.

Chapter 4

Using the 7300

This chapter tells you:

- How to make/open a database to receive the data from the measurement you will be performing
- How to configure the 7300 to the instruments in your measurement system, and set the system's communication parameters
- How to use the 7300 to set up and perform the measurements you want
- How to use data from an external program in the 7300

This chapter is structured to guide you, in the correct sequence, through setting up and starting measurements. When you have completed one section, the next section tells you what you should do next. Sections 4.1 to 4.3 deal with making and opening a database, and configuring the 7300 to the instruments. Section 4.4 deals with setting up the measurement. Section 4.5 tells you how to start measurements.

For information on backing up, restoring, deleting, exporting and importing data, see Appendix A.

4.1 Making, Opening and Closing a Database

Before configuring the 7300 to the measurement system, setting up and starting a measurement, you must first open a database in which the data from the measurement can be stored. This is done using either the **New** or the **Open** function in the **File** menu. The **New** function makes a new database. The **Open** function opens an existing database, and simply adds data from the “new" measurement to the data already in the database.

Note: you cannot use the **New** or **Open** functions when a database is already open. You must use the **Close** function in the **File** menu. Quitting the 7300 closes databases automatically.

To close a database that is open:

1. Pull down the **File** menu. Click on **Close**. The Close Database dialogue will be displayed.

2. Click on **OK** to close the database.

To make a new database:

1. Pull down the **File** menu. Click on **New**. The New Database dialogue will be displayed, Fig.4.1.

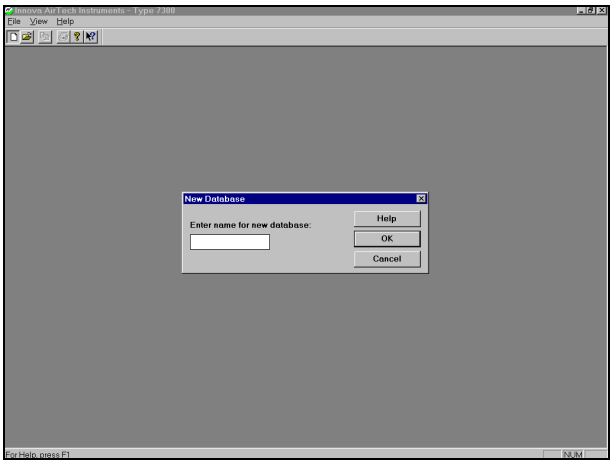

Fig.4.1 The New Database dialogue

2. Type in the name you want for the database (max. 8 characters).

3. Click on **OK** to make and open the new database.

If a database already exists with the name you have typed, an alert will be displayed to tell you this. In this case, repeat the above procedure, using a different name.

Parameters in a new database take on the values they had in the previously opened database with the following exceptions:

- The file names in the User dialogue take on their default values.
- The printer type in the Printer dialogue takes on its default value.

Therefore, if you want to make a new database (e.g. NEWBASE) similar to one which already exists (e.g. OLDBASE):

1. Open the database (OLDBASE) you want to base your new database on with **Open**.
2. Close this database with **Close**.
3. Make your new database (NEWBASE) with **New**.

NEWBASE is now the same as OLDBASE except for the User dialogue file names and the printer in the Printer dialogue which have their default values.

To open an existing database:

1. Pull down the **File** menu. Click on **Open**. The Open Database dialogue will be displayed, Fig.4.2.
2. Locate the database file-name you require by using the scroll arrows at the top and bottom of the list of database files. Click on the file-name to highlight it.
3. Click on **OK** to open the highlighted database file.

If you want to view the data, see Chapter 5.

4.2 Setting the Configuration Parameters

The **Configuration** function in the **Set-up** menu configures the 7300 to the instruments in the measurement system, and selects

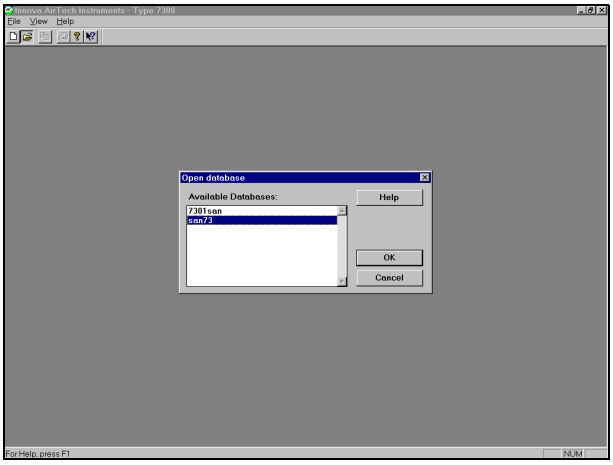

Fig.4.2 The Open File dialogue

the communication channel between the computer and the instruments.

Note: if you are using the IEEE interface between the computer and the 1312, ensure that the 1312 is **not** set up as the system controller of the IEEE interface. Refer to the 1312's Instruction Manual for details of how to check this.

To configure the 7300 to your system:

1. Pull down the **Set-up** menu. Click on **Configuration**. The System Configuration dialogue will be displayed, Fig.4.3.

2. Click on the communication interface port you are using between the computer and the 1312 — either **IEEE**, **COM 1**, or **COM 2**.

3. Select the type and number of sampling units you are using by clicking in the boxes in the *Connected Multiplexers* field.

4. Click on **OK** to store the new configuration.

The configuration you have chosen will be stored by the 7300.

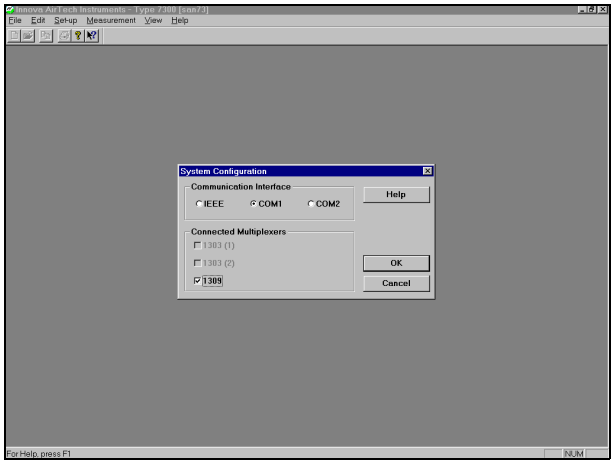

Fig.4.3 The System Configuration dialogue

4.3 Setting the Communication Parameters

The **Communication** function in the **Set-up** menu sets the parameters for communication between the computer and the 1312/1303(s) or 1312/1309. If you are using the IEEE interface in your system, then you must type in the device addresses of the 1312 and 1303 or 1309 units.

The recommended parameter settings are:

IEEE Addresses

Instrument	IEEE Address
1312	14
First 1303 1309	15

Instrument	IEEE Address
Second 1303	16

RS – 232 Communication (default values)

Baud Rate	9600
Data Bits	8
Stop Bits	2
Parity	none

Note: if you are using the RS – 232 interface, you must ensure that there is no IEEE cable connected between the PC and the 1312, and you must set the 1312 so that the values for the baud rate, parity, data bits and stop bits agree with those set in the 7300. Refer to the 1312 Instruction Manual for details of the RS – 232 communication parameters and the 1312's IEEE device address; and to the 1303 or 1309 Instruction Manual for details of the 1303's or 1309's IEEE device address.

Note: the 7300 automatically sets the 1312 to Switched line and Hard-wired.

Note: if you are using the IEEE interface between the computer and the 1312, ensure that the 1312 is **not** set up as the system controller of the IEEE interface. Refer to the 1312 Instruction Manual for details of how to check this.

To set the communication parameters for a system using the IEEE interface:

1. Pull down the **Set-up** menu and click on **Communication**. The Communication Set-up dialogue will be displayed, Fig. 4.4.

   Note: the *Selected Communication* field will show IEEE, and the baud rate, Data Bits, Parity and Stop Bits will be grey, showing that they are unavailable.

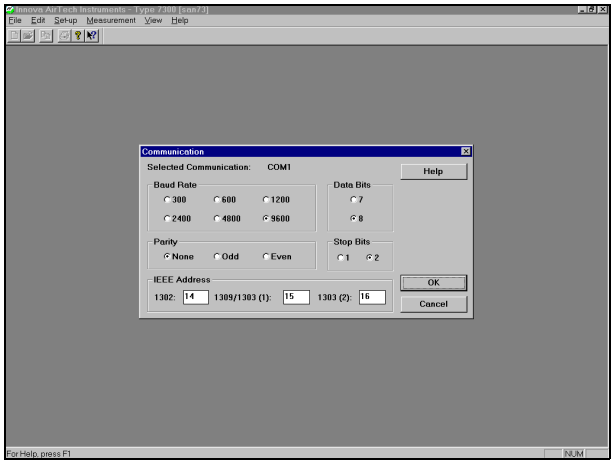

Fig.4.4 The Communication dialogue

2. Type in the correct device addresses for the 1312, 1303 and 1309 units. Note that each must have its own unique address. The device addresses for the 1303 and 1309 units are set using the switches on the back panel, see the Type 1303 or 1309 Instruction Manual for full details.

3. Click on **OK** to store the communication parameters.

To set the communication parameters for a system using the RS–232 interface:

1. Pull down the **Set-up** menu. Click on **Communication**. The Communication Set-up dialogue will be displayed as shown in Fig.4.4.

2. Click on the values for Baud rate, parity, data bits and stop bits that are set in the 1312. Also set up the device addresses for the 1312, 1303 and 1309 units, as described in step 2 for communication parameters for a system using the IEEE interface.

3. Click on **OK** to store the selected communication parameters.

4.4 Multipoint Monitoring Tasks

Multipoint monitoring tasks are for monitoring gas-concentrations in several locations simultaneously. These measurements use only the sampler systems of the 1303 units. The general procedure for performing multipoint monitoring tasks is as follows:

- Set up the 1312 for the gases you will be measuring
- Set up the 1303/1309 unit(s) by selecting which sampling channels you will use in each measurement location
- Set up alarm limits for each gas you will be monitoring

Each of these steps is described in turn in the following subsections.

4.4.1 Setting Up the 1312

The **Monitor** function in the **Set-up** menu lets you set up your 1312 for the measurements you want to perform. You choose how many gases the 1312 will measure, the sampling interval, and if the 1312 should perform water- and cross-compensation.

Note: values displayed in the 1312 Setup dialogue will be downloaded to your monitor when a measurement is started. Therefore, it is recommended that you ensure that the settings and values displayed in this dialogue are correct.

If you are not using 1303 or 1309 units, refer to section 4.4.3 for details of how to set alarm limits and select alarm relays.

To set up the 1312:

1. Pull down the **Set-up** menu. Click on **Monitor**. The Monitor Set-up dialogue will be displayed, Fig.4.5.

   Water compensation lets you choose if you want to compensate for water-vapour interference in your measurements.

   Cross compensation lets you choose if you want cross-compensation for interferents.

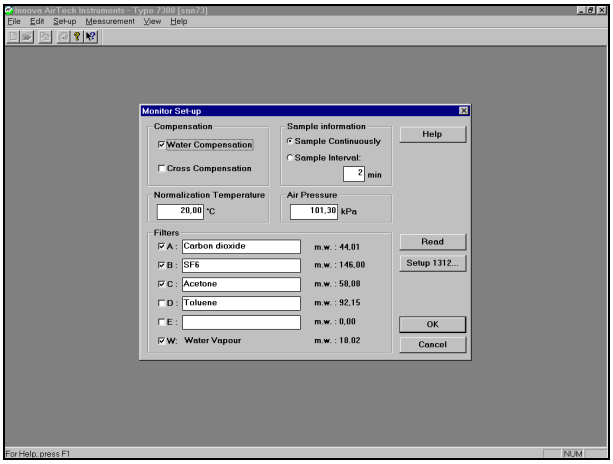

Fig.4.5 The Monitor Set-up dialogue

Normalization temperature is the temperature used to convert the gas-concentrations unit mg/m^3 to ppm.

Air pressure is the actual air pressure at the measurement locations. (This is not displayed when a 1309 is used.)

Sample continuously lets you decide if you want the 1312 to begin a new measurement immediately after finishing the previous measurement.

Sample interval sets the time-interval from the start of one measurement cycle to the beginning of the next for the 1312.

A, *B*, *C*, *D*, *E*, *F* and *W* represent the optical filter positions of the 1312. Alongside each box are two text fields. The first is for the name of the gas being monitored using that filter; the second is for the molecular weight of the gas being monitored.

Read lets you read-out the gas-names and molecular weights resident in the 1312's memory.

Setup 1312... (*only available when a 1312, 1314 or 1412 is used*) opens a new dialogue, see Fig.4.6.

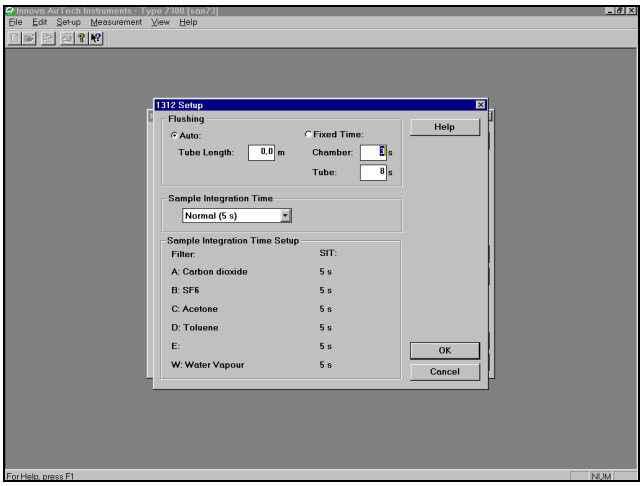

Fig.4.6 The 1312 Set-up dialogue

This dialogue allows you to change certain parameters, which will be transferred to the 1312 when the 7300 starts a measurement. These parameters are:

Flushing: there are two options *Auto* and *Fixed Time*. *Auto* allows you to define the length of sample tubing. The monitor then sets the flushing time automatically. *Fixed Time* allows you define the flushing times for both the measurement chamber and the sample tubing. The default values are Chamber 8s and Tube 3s. The chamber time can be less than the default (tube is fixed at 3s), but the flushing error % increases.

Chamber Time (s)	Error %
3	2
4	0.8
8	0.25

Note: when a multiplexer is connected, only the Fixed Time option is available, where the tube flushing is set automatically.

Sample Integration Time (S.I.T): this allows you to define the integration times for the sampled gases. There are four settings: *Fast (1s)*, *Normal (5s)*, *Low Noise (20s)* and *Advanced*. When Advanced is selected, the S.I.T for each filter can be set individually. The values available are: 0.5, 1, 2, 5, 10, 20 and 50s.

Sample Integration Time Setup: this shows the S.I.T values for the selected filters. This is of particular interest when the Advanced S.I.T option is selected.

For more details about these parameters, refer to the 1312 Instruction Manual.

2. Click in the *Water compensation* and *Cross-compensation* fields if you want the 1312 to compensate for water-vapour, and to cross-compensate for interferents.

3. If you want the 1312 to sample continuously, click in the *Sample continuously* field. However, if you do not want continuous sampling, click on in the *Sample interval* field, and type in the sampling interval (a value between 1 and 59 mins.) in the field below.

4. In the *Normal temperature* field, type in the temperature used to convert the gas-concentrations unit mg/m^3 to ppm.

5. In the *Air pressure* field, type in the air-pressure at the measurement locations. (This is not displayed when a 1309 is used.)

6. Click on **Read**. All the names and molecular weights for the gases entered in the 1312 memory are displayed in the appropriate fields.

   If the name is too long or you want another name, you can edit it here. The new name will be stored in the 7300 database, but it will not affect the 1312's memory.

   When reading out the names and weights from the 1312's memory, you also check whether you can communicate with

the 1312 over the interface. If they can't be read, check that the cable is connected properly and that the addresses and communication parameters are correct.

Note: filter position *W* is always for measuring water vapour.

7. Click in the boxes to select the filters you want to measure with.

8. When using a 1312, 1314 or 1412, click on **Setup 1312...**. Define the Flushing parameter and the Sample Integration Times for the selected filters. When you have set these parameters, click on **OK**.

9. When you have set up the 1312, click on **OK** to store the data.

The set-up you have made for the 1312 will be stored in the 7300's database.

4.4.2 Setting Up the 1303 or 1309 Units

The Multiplexer function in the Set-up menu lets you set up your 1303 or 1309 units for the monitoring tasks you are to perform. You choose which sampler channels will draw the samples from each measurement location.

To set up the 1303 or 1309 units:

1. Pull down the **Set-up** menu. Click on **Multiplexer**. The Multiplexer dialogue will be displayed, Fig.4.7.

   Sequence field allows you to select the manner in which the active channels are sampled:

   Normal: samples the channels in the order shown in the *Current sequence* field. When the last channel has been measured, the multiplexer loops back to the first channel.

   Alarm: enables you to closely monitor channels where the alarm limit has been reached. When an alarm is reached, the sequence in the *Current sequence* field is overridden,

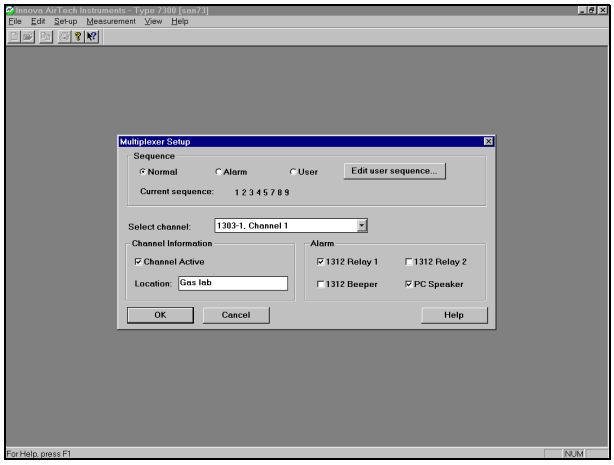

Fig.4.7 The Multiplexer Set-up dialogue

every second measurement is now made on the channel showing the alarm.

User: this allows you to define the measurement sequence, using the **Edit user sequence** soft-key. When this soft-key is pressed the following dialogue is displayed, see Fig.4.8.

By highlighting the desired channel in the Active Channels: field, the **Add** soft-key can be used to create a user-defined sequence. If you need to edit the list in the Current Sequence field, highlight the desired entry in the list, this can now be removed using the **Remove** soft-key or an entry made in front of it using the **Insert Before** soft-key. The Current Sequence field can have a maximum of 20 entries.

Select Channel allows select the sampling channel on the multiplexer. If you are using one 1303 unit, only 6 channels are available, while if you are using two 1303 units or one 1309 12 channels are available.

Channel Information allows you to make the channel shown in the *Select channel* field active and provide this sample channel with a descriptive label in the *Location* field.

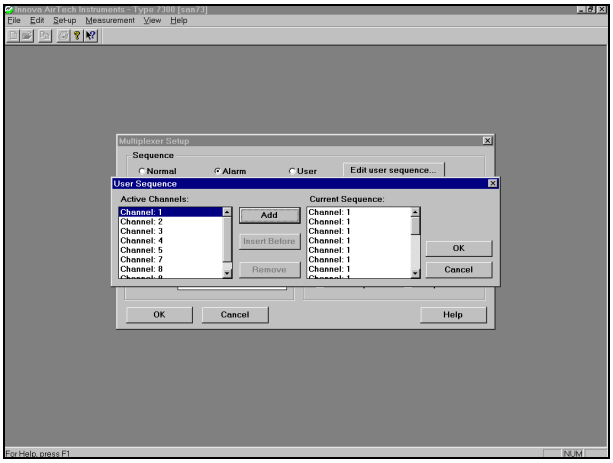

Fig.4.8 The User Sequence dialogue

Alarm lets you select the relay, beeper or speaker, through which an alarm signal is sent.

2. Select the type of sampling sequence desired.

   If you are using the **User** option, use the **Edit user sequence** to define the sampling sequence. When the list is complete, press **OK** and go to step 8.

3. Pull down the *Select channel* list and click on the desired sampling channel.

4. Click on *Channel Active* to activate the channel

5. In the *Location* field, type in the name of the location from which the selected sampling channel is taking samples.

6. In the *Alarm* field, click on the types of alarm you want to use.

   If you select 1312 Relay 1, any alarm signal will be sent via that relay. If you select 1312 Relay 2, any alarm signal caused by an upper alarm limit (see section 5.7.3) being

exceeded will be sent via that relay. With 1312 Beeper or PC Speaker, any alarm signal will be audible via the 1312 or the PC, respectively.

7. Repeat steps 2 to 6. for each sampling channel that you want to use.

8. When you have set up the 1303 or 1309 units for your measurements, click on **OK**.

The set-up you have made for the 1303 or 1309 units will be stored in the 7300's database.

4.4.3 Setting Alarm Limits

The Alarms dialogue in the Set-up menu lets you set alarm limits for the gases you are monitoring. You can set an alarm limit for each gas that you are monitoring. Using **Alarm** factor, you can set a "warning" and a "danger" level, to notify you of an increase in gas levels before it becomes dangerous. This dialogue also sets up the alarm relays that will be used to trigger alarms when you are not using 1303 or 1309 units.

To set alarm limits:

1. Pull down the **Set-up** menu and click on **Alarms**. The Alarms dialogue is displayed, Fig.4.9.

   Alarm limits: these text fields on the right of the dialogue contain the alarm limits for each named gas you are monitoring using each optical filter.

   Alarm factor: lets you set a "warning" and a "danger" alarm limit, in conjunction with 1312 alarm relays 1 and 2. If gas-concentrations exceed one of the alarm limits that you have typed-in, a signal will be given through 1312 alarm relay number 1, the 1312 beeper or the PC speaker. If gas-concentrations exceed the alarm limit multiplied by the alarm factor, a signal will be given through 1312 alarm relay number 2. For example, if the "warning" level is 10 ppm, and the "danger" level is 15 ppm, the alarm factor should be 1.5. It is not possible to do this using the PC speaker and 1312 beeper.

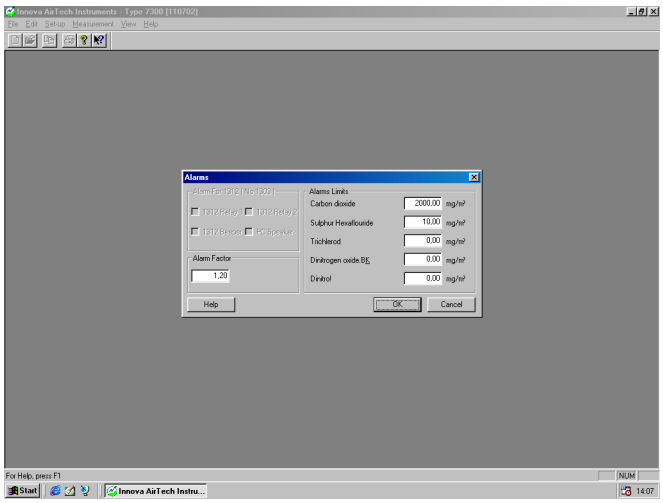

Fig.4.9 The Alarms dialogue

Alarm for 1312 (No 1303): lets you select alarm relays when you are using the 1312 without 1303 or 1309 units. If you are using 1303 or 1309 units, you cannot use this function.

2. In each of the *Alarm limits:* text-fields, type in the alarm limit for the named gas.

3. In the *Alarm factor:* field, type in the alarm factor. Note that the alarm factor must be at least 1.0.

4. If you are not using 1303 or 1309 units, click on the type of alarm you want to use in the *Alarm for 1312 (No 1303):* box.

5. When you have entered the alarm limits you require, click on **OK**.

The alarm limits you have set will be stored in the 7300's database. If one or more of these limits is exceeded, alarms will be activated via the relays you have chosen.

4.5 Starting Up and Stopping a Measurement

When you have set up the measurement you want to perform, you can start it. This is done with the **Start** function in the **Measurement** menu. The **Stop** function stops a started measurement.

Note: when you have started a measurement, many of the 7300's functions cannot be used until the measurement is stopped. These functions are written in the menus in grey type.

To start a measurement:

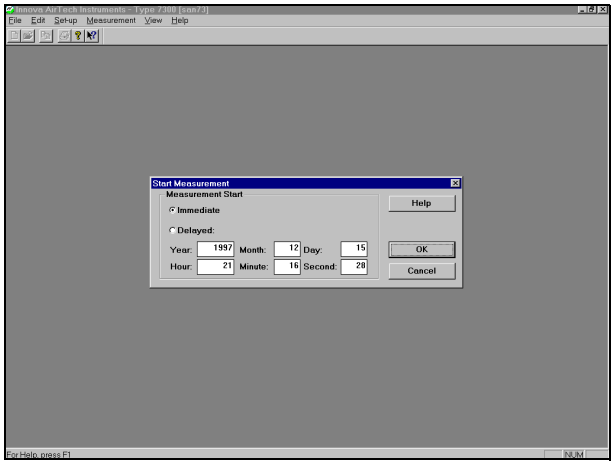

Fig.4.10 The Start Measurement dialogue

1. Pull down the **Measurement** menu and click on **Start**. The Start Measurement dialogue will be displayed, Fig.4.10. You can start a measurement immediately, or at a given date and time.

2. To start a measurement immediately, click on **Immediate**. To start a measurement at a fixed time. Click on **Delayed**,

then type in the start date and time you require in the respective fields.

3. Click on **OK**. According to your choice, the measurement will start immediately, or the delayed-start time is stored and the measurement started at that time.

When the measurement is started, the following text is shown on the display of the 1312 Monitor:

REMOTE CONTROL BY 7300
MONITORING MEASUREMENT RUNNING

Now refer to Chapter 5 of this manual for details of how to see your measurement results, using the 7300's data windows.

To stop a measurement:

1. Pull down the **Measurement** menu and click on **Stop**. The Stop Measurement dialogue is displayed.

2. To stop the measurement, click on **OK**. If you have accidentally selected this function, and do not want the measurement to stop, click on **Cancel**.

4.6 Setting Up Units of Measurement

The Units dialogue in the **Set-up** menu lets you choose the units of measurement that the 7300 will use when displaying data, and in prints/plots of screens.

To select the units of measurement:

1. Pull down the **Set-up** menu. Click on **Units**. The Select Units dialogue will be displayed, Fig.4.11.

2. Click on the units that you want to use.

3. Click on **OK**.

   The units you have selected will be adopted for all screen displays.

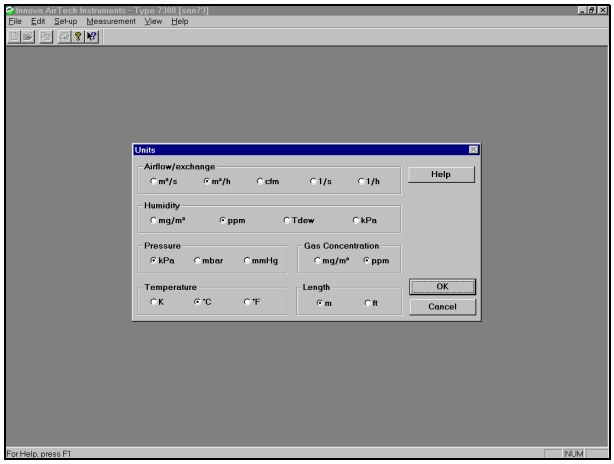

Fig.4.11 The Select Units dialogue

Chapter 5

Displaying Measurement Data

This chapter tells you:

- How to use the data display windows of the 7300 to display measurement results

5.1 Using the Graphic Data Window

The graphic data window displays data in graph form. You can plot up to 6 curves on the same axes. The data you can plot can be gas-measurement results, data from an external program, or averaged data.

5.1.1 Setting up and Plotting Curves

The following text takes you step-by-step through plotting graphs of your measurement results.

To set up the x-interval and style of the graph:

1. Pull down the **View** menu and click on **Graphic window**. The Graphic window will be displayed in Fit to Window mode, Fig. 5.1.

   A panel of "buttons" is displayed on the left side of the graphic window. These buttons are dedicated to the graphic window, and are used to set up the graphs you want to see or plot. Show Panel is a toggle function: to remove the panel, pull down the **View** menu and click on **Show Panel**.

2. Click on Graph Set-up in the panel. The Graph Parameters dialogue will be displayed, Fig. 5.2.

   X-interval selects the time-period which the graph will cover.

   Y-axis type selects if the y-axis will be scaled linearly or logarithmically.

   Grid mask selects the background to the graph: a crossed (**X-Y**) grid; vertical lines (**X**); horizontal lines (**Y**); or no grid.

   Grid style selects if the grid will be drawn in dotted lines or solid lines.

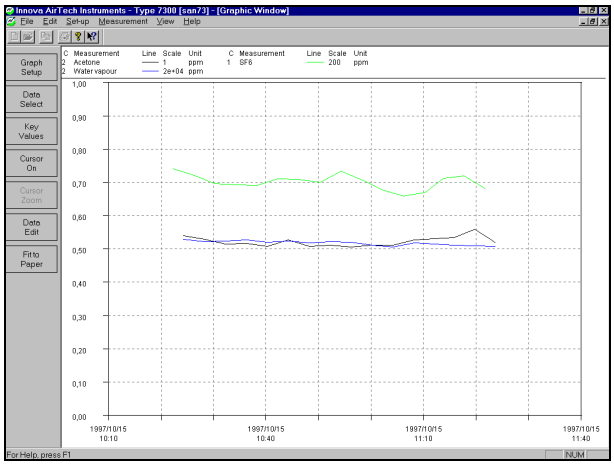

Fig.5.1 The graphic window

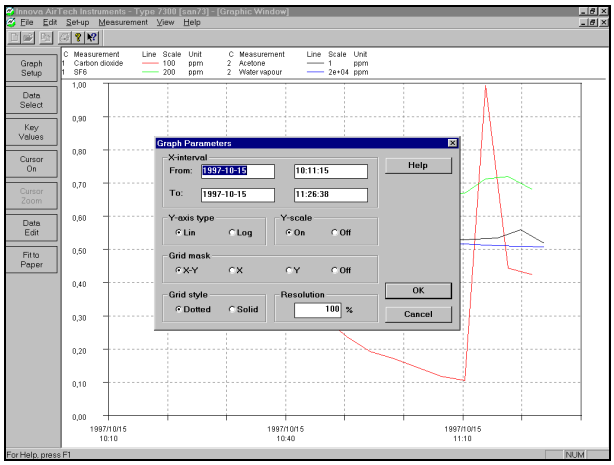

Fig.5.2 The Graph Parameters dialogue

Y-scale lets you choose the type of y-axis: either showing actual values (**Off**); or scaled from 0 to 1, with a scaling factor and the unit of measurement displayed (**On**). The **On**

option is used when you have several different types of data plotted on the same graph.

Resolution lets you choose the x-axis resolution of the graph from 1 to 100%. 100% means that there is one point per mm. 50% means that there is one point per 2 mm. 33% means that there is one point per 3 mm. Thus, the resolution of the x-axis is from one point per mm to one point per 100 mm.

3. In the first *X-interval: From:* field, type in the date from which you want the graph's x-axis to start, in the format YYYY-MM-DD. In the second *X-interval: From:* field, type in the time from which you want the graph's x-axis to start, in the format HH:MM:SS. Repeat this procedure to type in the date and time at which you want the graph's x-axis to finish, in the two *X-interval: To:* fields.

4. Choose the style of the graph by selecting the y-axis type, grid mask and grid style, according to your requirements.

5. When you have entered the x-interval you require and chosen the style of the graph, click on **OK**.

The Graph Parameters dialogue will disappear from the screen, and the graph in the graphic window will be re-drawn in accordance with the x-interval and style you have chosen.

Now you are ready to set up the curves to be displayed on the graph.

5.1.2 Choosing Data to be Plotted and the Style of the Curves

1. Click on **Data Select** in the panel. The select data to show on graph dialogue will be displayed, Fig.5.3.

   The 6 text-fields on the left of the dialogue indicate which of the 6 available curves you are setting up. These are also used to activate the curves you want displayed. When you have chosen the data you require, these text-fields show the type of data you have selected. "**W**" and "**UW**" indicate the

weighted and unweighted averages of the curve, respectively. "**+**" and "**–**" indicate the maximum and minimum values of the curve, respectively. For example, if you select data from sampling channel 2, which is being used to measure Carbon Dioxide, the text-fields for the curve you are setting up will show **2 Carbon Dioxide**. If you select data from a user program, the text-fields for the curve you are setting up will show the set-up text in the header file (see section B.2.1). With a new database, the default data type chosen here is Channel 1, Filter A.

Type selects the type of data you want to plot. The three types of data are measurement results from each sampling channel (**Chan**), data from a user program (**User**), and averages of measurement results taken from two or more sampling channels (**Mean**).

Data lets you select the actual data you want to plot as curves. It displays a dialogue specific to the type of data you want to plot (chosen in the **Type** field).

Color selects the color of a specific curve.

Line selects the type of line used for a specific curve.

Style selects the style of the curve. Choose between **Line**, **Step** and **Bar**.

2. Click in a text-field to the left of the dialogue so that a pointer is displayed in the box. This activates the curve, so that you can select the type of data and the line-styles to make this curve. The arrow also indicates which data can be seen in the Numeric Data window — see section 5.2.

3. Select the color that you want for the curve by clicking on **Color**. Select the line-type by clicking on **Line** and select the line style: solid, dash, dot, dash dot, or dash dot dot. Select the style of curve by clicking on either **Line**, **Step**, or **Bar**.

4. In the *Type* field, click on the type of data to be plotted in this curve — either **Chan**, **User**, or **Mean**. Then, click on **Data**. This will display the Select Channel Data, Select User Data, or the Select Mean Data dialogue, depending upon

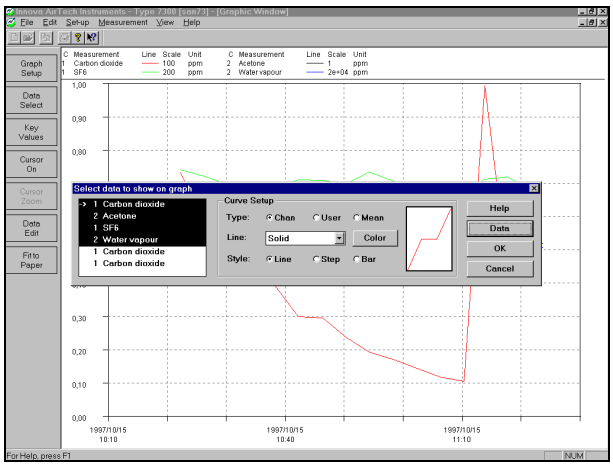

Fig.5.3 The Select data to show on graph dialogue

which type of data you want to plot. From these dialogues, you choose the actual data to be plotted.

The use of each dialogue is explained in turn below.

The Channel Data dialogue

In the Select data to show on graph dialogue, select **Chan** and then click on **Data**. The Channel Data dialogue is displayed, see Fig.5.4.

Channel represents the sampling channels (therefore, the measurement locations in which sampling is being done) of the 1303 or 1309 units. For 1309 units, box number **1** is sampling channel number 1, and so on. While for 1303 units, box number **1** is sampling channel number 1 of 1303 unit number 1, and so on. Box number **7** is sampling channel number 1 of 1303 unit number 2, and so on.

Location gives the name of the measurement location from which each sampling channel takes its samples — see section 4.4.2.

Filter is the name of the gas measured by the filter.

Filter lets you choose which data from the chosen sampling channel (and therefore, measurement location) will be plotted. You can choose: the gas-concentrations measured by the 1312 using a particular optical filter (represented by the boxes **A** to **W**); or results from the temperature transducer at that measurement location (represented by **Temperature**). The name of the gas measured with the selected filter (defined in the 7300 setup) is shown next to *Filter* (top line).

Min gives the minimum value of the displayed curve (if compressed or averaged).

Mean gives the average value of the displayed curve (if compressed or averaged).

Max gives the maximum value of the displayed curve (if compressed or averaged).

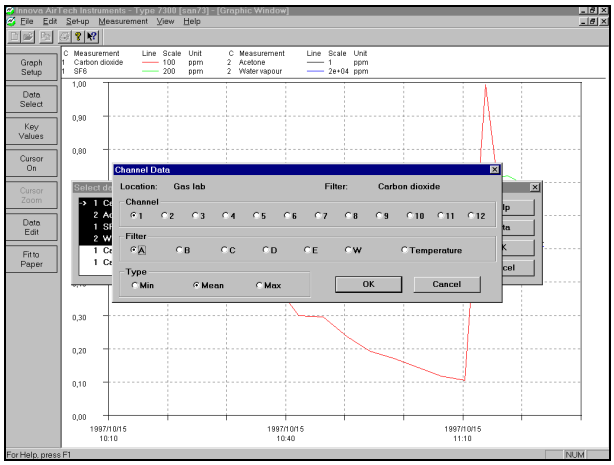

Fig.5.4 The Channel Data dialogue

1. Click on the sampling channel number from which you want data to be plotted.

The name of the measurement location that this selects will be displayed in the *Location* field and the chosen gas shown in the *Filter* field (top line).

2. Now select the data you want to plot from the chosen sampling channel.

   If you click on one of the boxes **A** to **W**, the data displayed will be the gas-concentrations measured by the 1312 using the optical filter you have chosen.

   If you click on **Temperature**, the data displayed will be the results from the temperature transducer at the chosen measurement location.

3. When you have selected the data you want, click on **OK**.

The dialogue will be removed from the screen, and you will return to the Select data to show on graph dialogue. The type of data (gas-measurement, temperature measurement, etc.) you have chosen will be shown in the text-field for the curve you were setting up, on the left of the dialogue. The data you have selected is now ready for plotting on screen.

The User Data dialogue

In the Select data to show on graph dialogue, select **User** and click on **Data**. The User Data dialogue is displayed, see Fig.5.5.

Data Index represents the specific data from the external program that you want to use.

1. Click on the index number to select the data you want to use.

2. Click on **OK**.

The dialogue will be removed from the screen, and you will return to the Select data to show on graph dialogue. The type of data you have chosen will be shown in the text-field for the curve you were setting up, on the left of the dialogue. The data you have selected is now ready for plotting on screen.

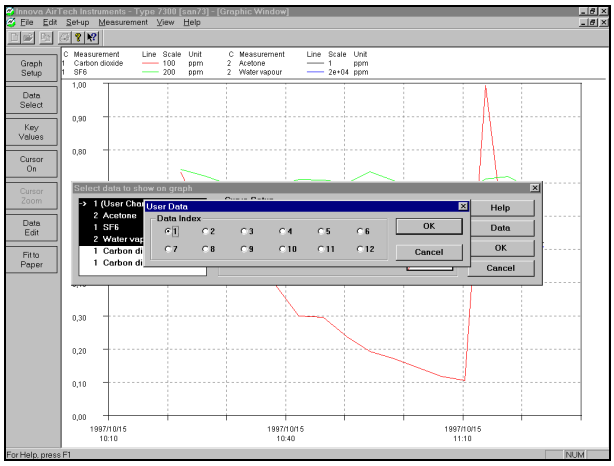

Fig.5.5 The User Data dialogue

The Select Mean Data dialogue

In the Select data to show on graph dialogue, select **Mean** and click on **Data**. The Select Mean Data dialogue is displayed, see Fig.5.6.

Filter: is the name of the gas measured by the filter.

Channels lets you select the sampling channels (therefore, the measurement locations) from which measurement data will be averaged. For 1309 units, box number 1 is sampling channel number 1, and so on. While for 1303 units, box number **1** is sampling channel number 1 of 1303 unit number 1, and so on. Box number **7** is sampling channel number 1 of 1303 unit number 2, and so on.

Filter lets you select which type of data will be averaged from the sampling channels you choose. You can choose the gas-concentrations measured by the 1312 using a particular optical filter (represented by the boxes **A** to **W**); or results from the temperature transducer at that measurement location (represented by **Temperature**). The name of the gas measured with the selected filter (defined in the 7300 setup) is shown next to *Filter* (top line).

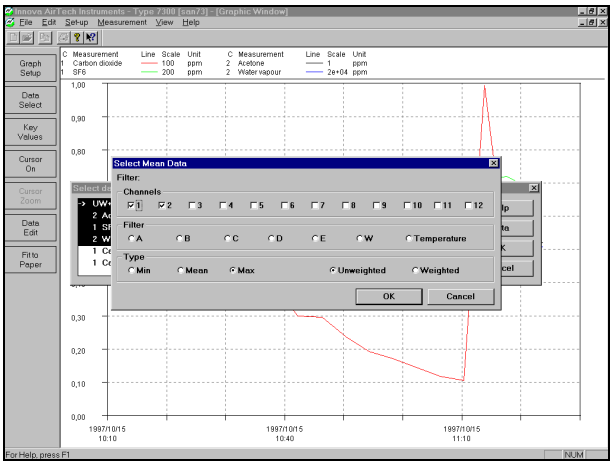

Fig.5.6 The Select Mean Data dialogue

Type lets you choose to weight the averaged results with the volume of the measurement location chosen under *Channels*.

1. You can also select the type of data you want to average: the min, mean or max values of the selected data.

   If you click on one of the boxes **A** to **W**, the data averaged will be the gas-concentrations measured by the 1312 using the optical filter you have chosen, from the sampling channels you select.

   You can weight these results for the volume of the measurement location: click on **Weighted**. If you click on **Temperature**; the data averaged will be the results from the temperature transducer at the selected measurement locations.

2. Now select the channels from which you want to average results, by clicking on the channel numbers.

   For example, if you select channels **1**, **2**, and **3**, and the type of data you want to average is gas-concentrations measured using filter A of the 1312, then the 7300 will calculate a

single set of average gas-concentrations from the three original sets. The averages can then be plotted on screen.

3. Select **min**, **mean** or **max**.

4. Click on **OK**.

   The dialogue will be removed from the screen, and you will return to the Select data to show on graph dialogue. The type of data you have chosen will be shown in the text-field for the curve you were setting up, on the left of the dialogue. The data you have selected is now ready for plotting on screen.

You have now set up the first curve, ready for plotting. To plot more than one curve, click in another text-field to display the pointer in that field, and then repeat the above procedure, and so on until you have set up all the curves you require.

To select a curve for plotting, ensure that its text-field is highlighted in the Select data to show on graph dialogue (white text on a black background). Double click on the desired text-field with the pointer to select the curve.

To de-select a curve so that it is not plotted, ensure that its text-field is not highlighted in the Select data to show on graph dialogue (black text on a white background). Double click on the desired text-field with the pointer to de-select the curve.

When you have set up and selected all the curves you wish to plot, click on **OK**. The dialogue will disappear from the screen, and the curves will be plotted on the axes. An example is shown in Fig. 5.7.

Above the graph itself, when it is in Fit to Window mode, there is an information section which shows the number of the sampling channel from which the data for each curve was taken (1, 2, 3, etc.); the type of measurement (SF_6, Temperature), the line-style of the graph, the scale of the y-axis, and the unit of measurement.

You can now process the curves of data to calculate measurement parameters — see section 5.1.3.

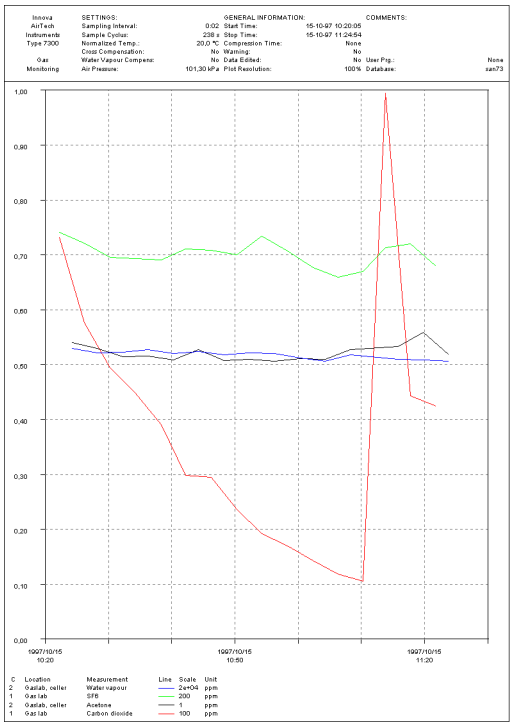

Fig.5.7 An example of a complete graph showing information on each curve plotted

The Contents dialogue

Pull down the **File** menu and click on **Contents**. The Contents dialogue is displayed, see Fig.5.8.

Chan is the number of the channel (from 1 to 12 plus one for the User Program).

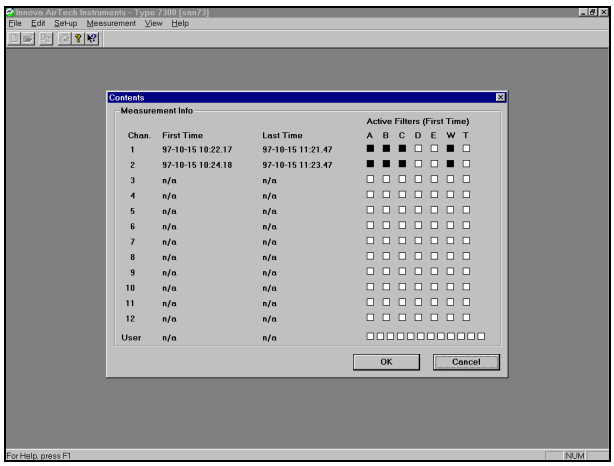

Fig.5.8 The Contents dialogue

First time is the date and time when measurements using that channel were started for the first time. If a channel has not yet been used in the database, *n/a* is shown.

Last time is the date and time when measurements using that channel were stopped for the last time. If a channel has not yet been used in the database, *n/a* is shown.

Active Filters (First Time) shows, using a black box, which filters were used (**A**, **B**, **C**, **D**, **E**, **W** and Temperature (**T**) when a channel was first used in a measurement in the database. In the same way, it shows which of the 12 available channels for the User Program were used when it was first used in a measurement in the database.

The start and/or end times for the numeric or graphic displays can be chosen by clicking on them followed by clicking on **OK**. These times will then be transferred to the Graph Parameters dialogue (see section 5.1.1).

5.1.3 Using the Graphic Window to Calculate Measurement Parameters

When you have plotted curves of your measurement results, you can use the 7300 to process the data in the curves, and calculate desired parameters. This is done by defining a region on your curves of data using two cursors (allowing you to eliminate untypical measurements), and choosing the parameters you want to calculate.

Before continuing with this section, make sure that the graphic window is displaying the data you require, and that the panel is displayed in the graphic window. If it is not, pull down the **View** menu, and click on **Show Panel**.

Note: see Appendix C for further information about the parameters described below, and for details of how the 7300 performs the calculations to obtain values for these parameters.

To define a region on the curves using the cursors:

1. If the complete graph is not shown in the graphic window, click on **Fit to Window** in the panel.

   The entire graph will be fitted into the size of the window. This makes it easier to position the cursors on the curves.

2. Click on **Cursor On** in the panel.

   Two vertical cursors will be displayed, Fig.5.9. To remove the cursors, click on **Cursor Off**.

3. Move the mouse arrow onto the left cursor, and press and hold the mouse button. Then drag the cursor to the position you require. Repeat this procedure for the right cursor.

4. Click on **Cursor Zoom**.

   The data-interval between the cursors will now be the entire data-interval that can be seen.

You are now ready to select, and calculate, the parameters you want.

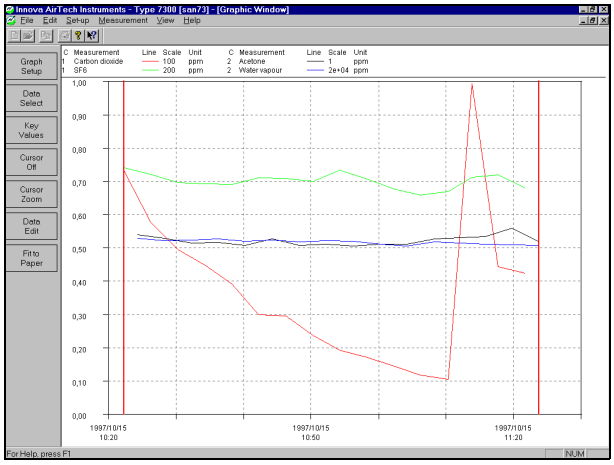

Fig.5.9 The cursors as they appear on the graphs

To define a region on the curves using the mouse:

1. Move the mouse arrow onto the upper left-hand corner of the region you wish to zoom and press and hold the mouse button. Then drag the arrow to the bottom right-hand corner of the region you wish to zoom.

   A box will be formed with one corner at the original position of the mouse arrow when the button was pressed and the opposite corner at the current position of the mouse arrow.

2. If you don't wish to zoom on this area, move the mouse arrow back to the left or over its original starting position and release the mouse button. The rectangle will disappear and the mouse zoom function is cancelled.

   Otherwise, release the button at the desired position for the bottom right-hand corner of the region. The region of the graph enclosed by the box will now be the entire graph that can be seen.

3. To cancel the mouse zoom function, type in the original start and end times in the Graph Set-up dialogue.

Note: the mouse zoom will not function if the cursors are on.

To select parameters for calculation:

1. Click on **Key Values** in the panel. The Key Values dialogue will be displayed, Fig.5.10. Parameters which cannot be selected are indicated in grey.

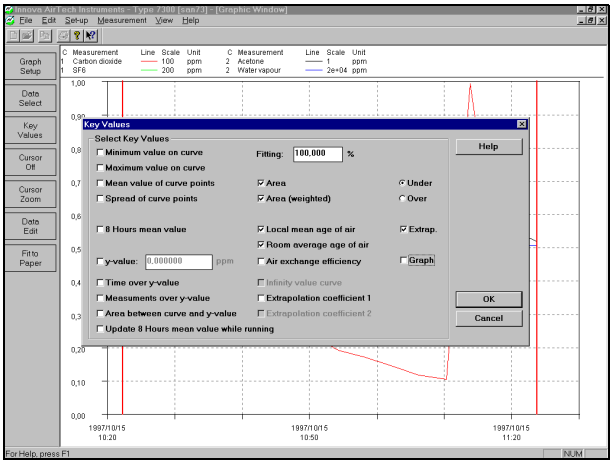

Fig.5.10 The Key Values dialogue

This dialogue shows a list of parameters for which the 7300 can calculate values, using the data you have defined on your curves of measurement results. You can select a maximum of 4 parameters at one time. The parameters in the Key Values dialogue are explained in Appendix C.

2. Click on the parameters for which you want to calculate values. The parameters you select will be identified by a pointer.

   Fitting chooses how much of the curve between the cursors is used for calculating the extrapolation coefficient. If you choose 33%, only the last third of the curve between the cursors is used.

If you select any of **Time over y-value**, **Measurements over y-value**, **Area between curve and y-value**, type-in the y-value that you require in the **y-value** field.

Under is used when you want to calculate the area under a concentration-decay curve.

Over is used to calculate the area above a concentration-growth curve.

Extrap extrapolates concentration-decay or concentration-growth curves to infinity, allowing calculation of area, local mean age-of-air, room average age-of-air, and air-exchange efficiency from the extrapolated graph.

Graph bases the calculations of the key values on the entire graph and not, as otherwise, on the section of the graph between the cursors. It also allows you to display the key values you choose, and their corresponding values, in prints/plots of the graphic window.

3. When you have selected the parameters you want, click on **OK**.

   The Key Values dialogue will be removed from the screen.

You can now calculate values for the parameters you have selected.

To calculate values for the parameters you have selected:

1. Pull down the **View** menu. Click on **Show Values**.

   The Values Panel will be displayed at the top of the graphic window, Fig.5.11.

   The top section of the Panel displays the Key Values you have selected. The lower section shows the x- and y-values of where each cursor intersects the curves.

   There is a Values Panel specific to each curve shown in the graphic window. Each is labelled with the channel number, measurement type and color for the curve. To see the values display for another curve, click on **Next** to go forward, or **Prev** to go backward.

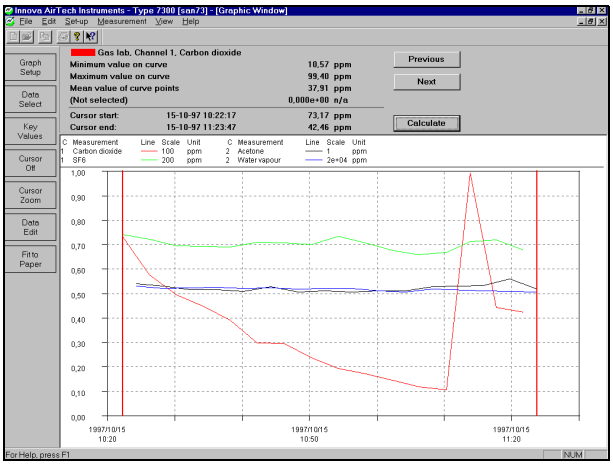

Fig.5.11 The Values Panel in the graphic window

To remove the Values Panel, pull down the **View** menu and click on **Show Values**.

2. In the Values Panel for each curve, click on **Calculate**.

   The 7300 will calculate the values of the parameters displayed in the Values Panel. Refer to Appendix C for details of how the 7300 calculates values for each of the parameters.

You can also "edit" data on the curves, to remove untypical data from parameter calculations.

To edit data on the curves:

1. Move the two cursors to define the region of data that you want to edit from the active curve (the one displayed in the numeric window). The active curve is indicated in the Values Panel, or by the arrow in the Select data to show on graph dialogue.

2. Click on **Data Edit** in the panel. The Edit Data dialogue will be displayed: click on **Erase**. If you want to restore the data, click on **Data Edit** to display the Edit Data dialogue,

then click on **Unerase**. If you want to restore all the data in the database, click on **Data Edit** to display the Edit Data dialogue, then click on **Unerase All**.

You can change the display mode of the graph to Print mode in preparation for future printing.

To change the display mode of the graph:

1. Click on **Fit to Paper** in the panel. The display mode changes to Print mode and a section of the graph is displayed in the window. A graph must be in Print mode if it is to be printed. Only that which can be viewed through the window will be printed. If the text in the graphic window is overlapping, this means that the page-size is too small, or the type-size is too big. You can change these using the **Printer Setup** in the **File** menu and **Font** function in the **Set-up** menu.

2. To return to the Fit to Window mode to view the entire graph, click on **Fit to Window**.

5.2 Using the Numeric Data Window

The numeric data window shows data in table form. It can show the same types of data as the graphic window, but cannot be used for calculating measurement parameters, etc.

To use the numeric window to display the data you require:

1. Pull down the **View** menu and click on **Numeric window**. The numeric window will be displayed, Fig.5.12. Now make the numeric window larger, using either the Size Box or the Full Box icons on the numeric window.

2. Pull down the **View** menu again. Click on **Show Panel**.

   A panel of "buttons" will be displayed on the left side of the numeric window, Fig.5.12. These buttons are dedicated to the numeric window, and are used to set-up the numeric window to display the data you want. **Show Panel** is a

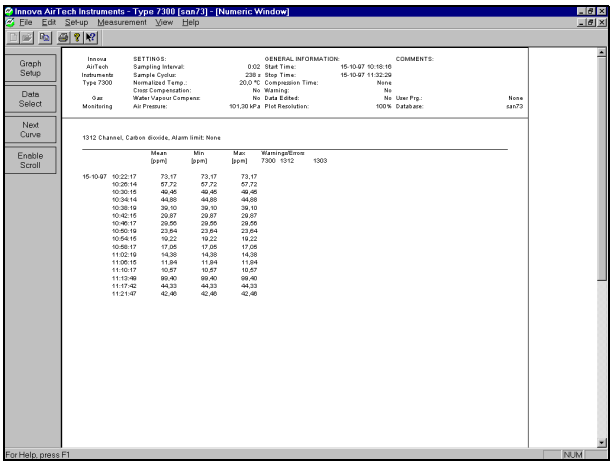

Fig.5.12 The numeric window showing measurement information

toggle function: to remove the panel, pull down the **View** menu and click on **Show Panel** again.

3. Click on **Graph Set-up** in the panel. The Numeric Data Interval dialogue will be displayed, see Fig.5.13.

   X-interval selects the time-period which the display will cover.

4. Type in the period of time that you want the numeric data window to cover as described in step 3 of **To set up the x-interval and style of the graph**, section 5.1.1.

Now proceed to select the data you want to display in the same way as for the graphic window, using the **Data Select** button in the panel. This is described in section 5.1.2. The arrow in the selected text-fields in the Select Data dialogue indicates which data will be displayed in the numeric window. To show different data, click in another field to select it.

In addition to gas-measurement results which are always displayed, you can also display temperature data.

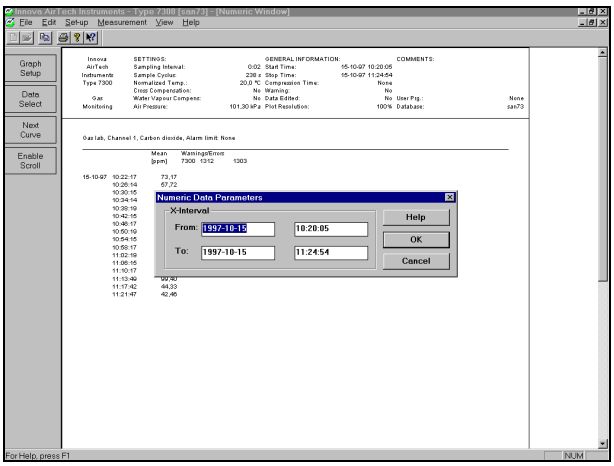

Fig.5.13 The Numeric Data Parameters dialogue

To use the scroll function of the numeric window:

Click on **Enable Scroll** in the numeric window's panel, see Fig.5.14.

This enables you to move through the data 10 records at a time. To remove the scroll function, click on **Disable Scroll** in the panel.

5.3 Using the Status Data Window

The status data window shows the current operating status of the system. It informs you; what type of measurement is currently being performed; if any warnings or errors have occurred; of the current date and time; and shows which alarms are active. The status window can be displayed in two forms, a reduced form and an extended form.

In the Status window, you can shut off alarms that have been triggered by high gas concentrations.

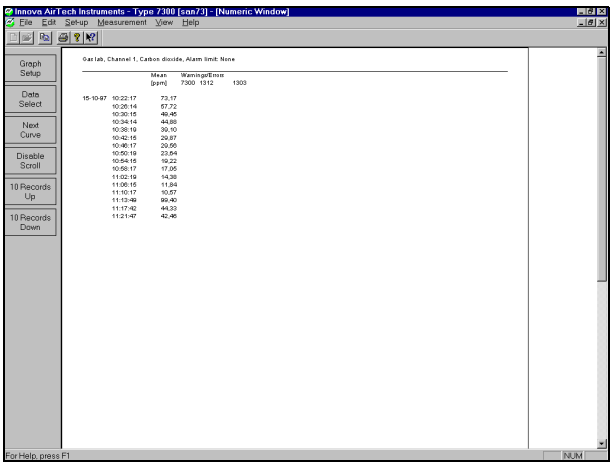

Fig.5.14 The numeric window with a panel showing the numeric scroll bar

In its extended form, the status window displays the most recent measurement results from a single or all measurement channels (lower section of the window).

To activate the Status window:

1. Pull down the **View** menu and click on **Status window**. The Status window will be displayed in reduced form. The Status window for ventilation mode is shown in Fig.5.15.

2. To show the most recent measurement results from a particular measurement location, click on **Select Channel**. Click on the number of the measurement channel from which you want to display data. If you want to show data from each active channel, as it is received from the instruments, click on **ALL CHANNELS**.

   The Status window will show the most recent measurement results from the chosen measurement channel, or from each active channel as the data is received, according to your choice. The results are updated as each new result is re-

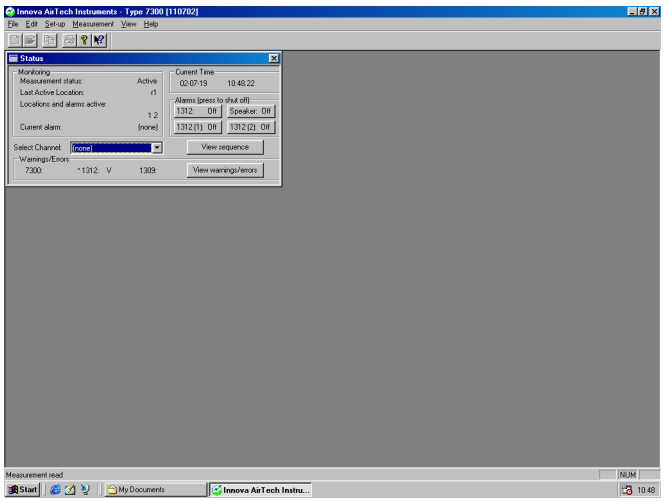

Fig.5.15 The Status window

ceived from the instruments. The extended Status window is shown in Fig.5.16.

The extended form has the following fields:

Monitoring: shows if a measurement is currently active and the name of the last active measurement location.

Select Channel: enables measurement results for a particular location to be displayed. Activating this function produces the extended form of the Status window.

The lower section indicates which channel is active; when the measurement was made; when the next measurement in that channel will start; the result and alarm limits for each of the named gases; and the temperature.

Warnings/Errors: informs of any operating errors in the current measurement. If an operating error has occurred, a letter (Flag) is displayed. By clicking on **View Warnings/Errors**, a short explanation (Flag-name) is given. For full details about these Flags and Flag-names, see section D.1.

Current Time: shows the current time and date.

Alarms (press to shut off): shows if the alarms in the monitor and multiplexer(s) are activated. To shut off alarms, see the procedure described below.

To close the Status dialogue, use the normal Windows procedure for closing windows.

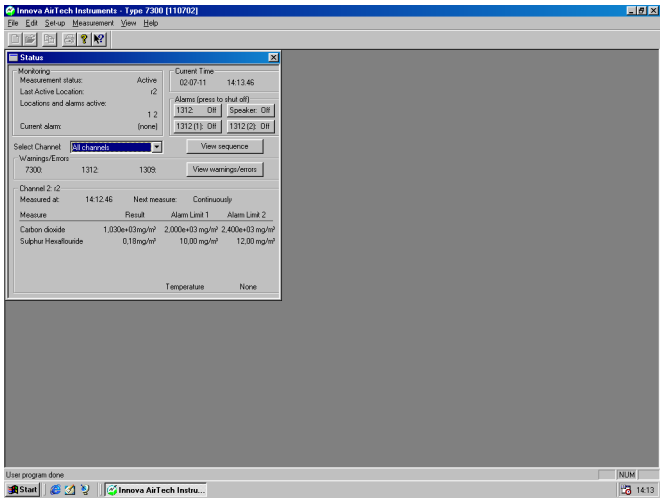

Fig.5.16 The extended Status window

To shut off alarms that have been activated:

In the **Alarm (press to shut off)** area, click on the alarms that are active (On). This deactivates the alarms.

The alarms you click on will be shut off. An alarm that has been shut off cannot be activated for the next 5 mins., even if the lower alarm limit (the "warning" level) for that gas has been exceeded. If, however, the upper alarm limit (the "danger" level) is exceeded for any gas, the alarm will be activated.

5.4 Using the Notepad Window and the Comments Function

The notepad window allows you to make short notes about the measurement in progress, the measurement set-up, and so on. The text in the window is stored in the currently-open database of the 7300.

You can also add a short text to the graphic window, using the Comments function. The text you enter is transferred automatically to the top right corner of the window, and is useful for adding notes, observations etc. to printed/plotted documentation.

To use the notepad window:

1. Pull down the **View** menu. Click on **Notepad window**. The notepad window will be displayed, Fig.5.17.

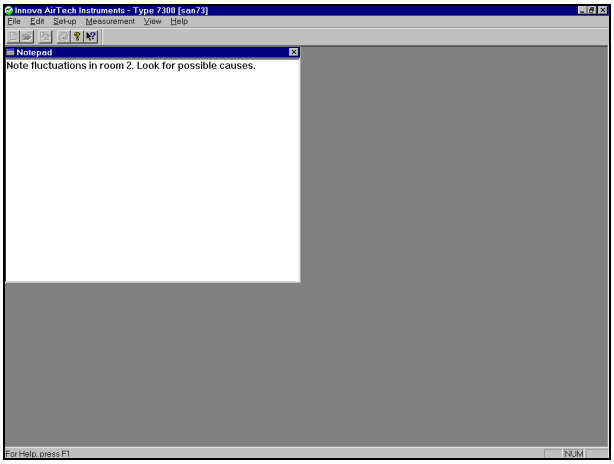

Fig.5.17 The Notepad window

2. To edit existing or enter new text, position the cursor using the mouse and type in the text you want.

3. When you have typed the text you require, close the window using the normal windows procedures. The text is automatically stored in the database.

To use the comments function:

1. Pull down the **View** menu. Click on **Comments**. The Comments dialogue will be displayed, Fig.5.18.

   The Comments dialogue has 4 lines, of maximum 32 characters each. Type in the text you want. You can move the cursor using the mouse.

2. When you have typed the text you require, click on **OK**.

   The Comments dialogue will be removed, and the text you have entered will be transferred automatically to the upper right-hand corner of the graphic window when it is in the "fit to paper" mode.

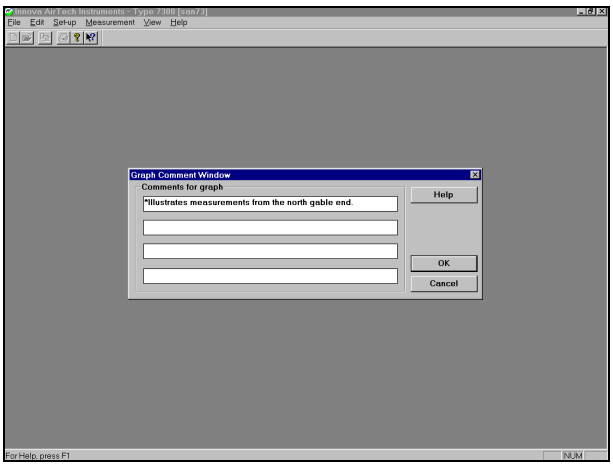

Fig.5.18 The Comments dialogue

5.5 Printing/Plotting the Data Windows

The 7300's graphic and numeric windows can be printed/plotted on a variety of devices. These are setup using normal Windows procedures i.e. pull down the **File** menu and click on **Printer Setup**.

Use the Print icon or pull down **File** and click on **Print** to produce hard copies of the graphic and numeric windows.

Note: in order to plot/print graphic windows, the "Fit to Paper" function must be selected in the graphic window.

If you wish to change the size or style of text used in the windows, use the **Font** function.

Changing the Style and Size of Text:

1. Pull down the **Set-up** menu. Click on **Font**. The Select Font dialogue will be displayed, Fig.5.19.

   Font selects the typeface you want to use. A sample field shows the current typeface and size.

   Size selects the size of the chosen typeface. Choose the size according to the page-size chosen in the Printer dialogue — the larger the page size you have selected, the larger the font you can use.

   Note: the size of the text may be too large, resulting in some of the words being overwritten.

2. Select the typeface and size that you want to use on-screen and in prints/plots. An example of the typeface and size you select is shown.

3. When you have selected the typeface and size you want, click on **OK**.

The typeface and size you have selected will be used in the graphic and numeric windows.

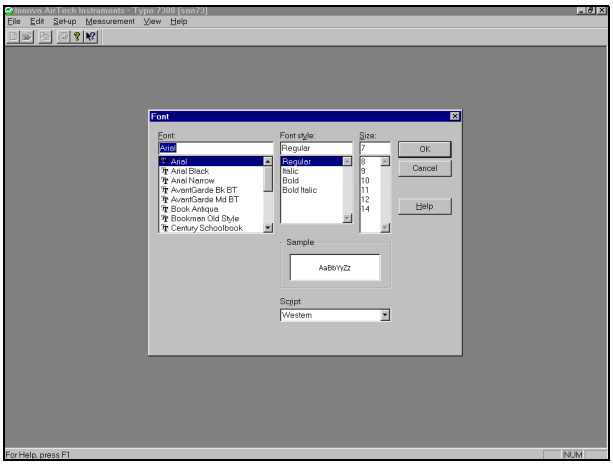

Fig.5.19 The Select Font dialogue

The 7300 is now setup ready to print/plot the *active* graphic or numeric window or the notepad which is open on the screen.

Chapter 6

Specifications

COMPUTER REQUIREMENTS:
Hardware:
A Pentium II (333 MHz) processor or better
Min. 128 Mbyte RAM
Min. 20 Mbyte free space available on hard-disk
One serial port (RS–232) and one parallel port
or
One GPIB IEEE port and a parallel port
Mouse

Software:
Windows® 98, NT (SP4.0 or above), Windows 2000 (SP1 or above)

DATA DISPLAYS:
Graphic:
Up to 6 curves, showing: gas concentrations; temperatures; and data from external sources.
Numeric:
All measurement data can be displayed as tables.

DATA EXCHANGE CAPABILITY:
Data can exported to Database and Spreadsheet programs, either using comma delimited files or using Open Database Connectivity (ODBC) e.g. Microsoft Access® and Microsoft Excel™

CALCULATION OF VALUES:
The 7300 can calculate the values of the following parameters from the curves plotted from measurement results:

Mean value of curve points
Spread of curve points
Minimum/maximum values on curve
Area under the curve
Weighted area under the curve
Time that the curve is over a given y-value
No. of measurements over a given y-value
Area under curve and over a given y-value.
Total area under extrapolated curve
Extrapolation coefficients
Air-exchange efficiency
Air-exchange efficiency with extrapolation
Local-mean age-of-air
Local-mean age-of-air with extrapolation
Room-average age-of-air
Room-average age-of-air extrapolation
8-hour mean value of curve points

BASIC SYSTEM REQUIREMENTS:
Gas Monitor (1 of)..... 1312/1312-1/1312-2/1314
1309 or 1303 Multipoint Sampler
Air Temperature Transducer (upto12)..MM 0034
Personal Computer
Teflon Tubing
Cables:
From computer to monitor:
RS-232 cable 25/9 pin ..... WL 0945
RS-232 cable 25/25 pin ..... WL 0946
or
IEEE 488 cable ..... AO 0265
From monitor to sampler:
IEEE 488 cable (0.4 m)..... WL 0845/0.4

Appendix A

Management of Databases and Data

This appendix tells you:

- How to delete existing databases from the 7300
- How to export data from, and import data to, the 7300
- How to back up databases, and restore databases to the 7300

A.1 Deleting Databases from the 7300

The **Delete** function in the **File** menu lets you delete databases from the 7300.

Note: if you want to remove databases from the 7300, you *must* use only *this* function. Otherwise, the 7300 cannot keep a record of which databases are available to it.

Note: databases deleted from the 7300 cannot be undeleted. Be sure that you want to delete the database before proceeding with the **Delete** function.

To delete a database:

1. Ensure that all databases are closed.
2. Pull down the **File** menu. Click on **Delete**. The Delete Database dialogue will be displayed, Fig.A.1.
3. Locate the file-name of the database you want to delete by using the scroll arrows at the top and bottom of the list of database files. Click on the file-name to highlight it.
4. Click on **OK** to delete the highlighted database.
5. Click on **Yes** to confirm or **No** to cancel.

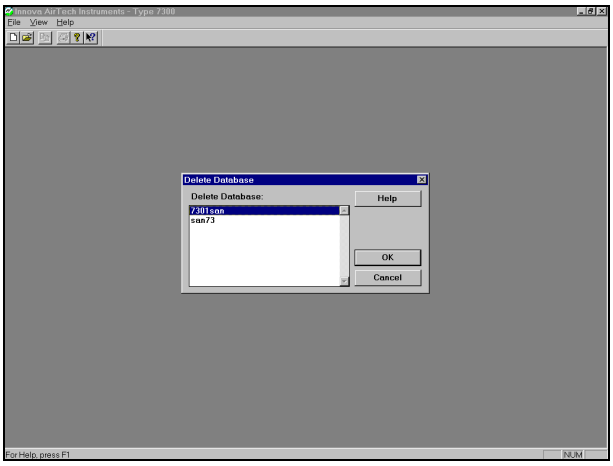

Fig.A.1 The Delete Database dialogue

A.2 Exporting and Importing Data

The 7300's **Export** and **Import** functions are used for transferring data out of, and into, the 7300. Each function is dealt with below.

A.2.1 Exporting Data Directly – using ODBC

Measurement data in the 7300 database is stored as a Microsoft Access database. This is directly available to Microsoft Access 2000 or other software programs that support Open Database Connectivity (ODBC).

The following programs can read the 7300 database:

Programs	Database Availability
Microsoft Access 2000	After measurements are completed

Programs	Database Availability
Microsoft Query 2000	While measurements are being made
Microsoft Excel 2000	Using "Get external data" function in Excel and while measurements are being made
Products that support ODBC	Refer to the individual programs instruction manuals

7300 Database Structure

The following measurement data is contained in the 7300 database. It is structured in a table format:

Monitoring Measurements:

`monalrms` : alarm data
`monrec01 – airrec14` : measurement data channel 1–12 + 2 user channels
`monsetrec` : setup data
`monsumrec` : internal calculation table for SUM values
`montxtrec` : text data

Measurement data in `monrecXX` have the following format:

`meas_0 – meas_5` : measurement filter A – W (mg/m^3)
`min_0 – min_5` : min. measurement filter A – W (mg/m^3)
`max_0 – max_5` : max. measurement filter A – W (mg/m^3)
`Temp` : temperature 10×°K
`Tim` : time format; number of seconds from 01/01/1970 00:00 (see section B.3)

A.2.2 Exporting Data – using ASCII Files

The **Export** function in the **File** menu enables you to produce files ready for exporting from the 7300, for use according to your requirements. The files produced are ASCII files, with data sep-

arated by a character which you choose. The files to be exported are placed in the directory of the chosen database. See section B.2.2 of Appendix B for details of export file structures and file names.

Note: this option is only available when measurements are not running

To export data from the 7300:

1. Ensure that all databases are closed.

2. Pull down the **File** menu. Click on **Export**. The Export Data dialogue will be displayed, Fig. A.2.

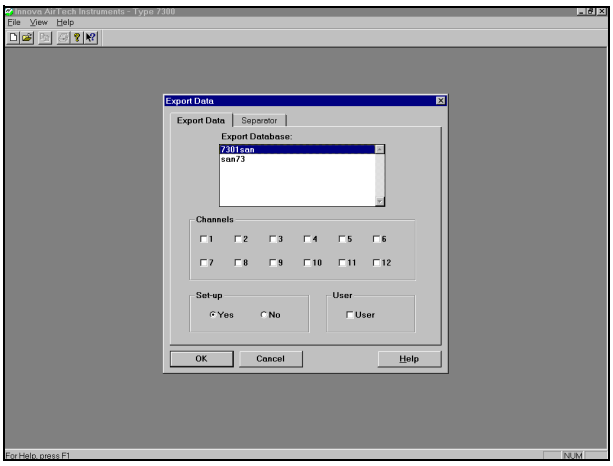

Fig. A.2 The Export Data dialogue

Database lets you select the database from which you want to export data. The databases you can select depend upon the current measurement mode.

Channels lets you choose the data you want to export by selecting the appropriate sampling channels, therefore the measurement locations. The boxes **1** to **12** represent the

sampling channels of the 1303(s) or 1309. **User** represents the data in the database from a user-program.

Separator selects the data-separator to be used in the files that are to be exported.

Set-up lets you choose if set-up data is to be included in the files to be exported.

3. Click on the name of the database from which you want to export data. Then select the data to be exported from that database by clicking on the appropriate box numbers.

4. Click on the type of data separator you want to use in the export files. Choose if you want set-up data to be included in the export file by clicking on either **Yes** or **No**.

5. Click on **OK** to begin exporting the data.

The data you have selected will be exported from the 7300 into the directory of the chosen database. You can then use this data according to your requirements. See section B.2.2 of Appendix B for details of the file location and structures created by the Export function.

A.2.3 Importing Data into the 7300

The **Import** function in the **File** menu lets you import data (e.g. wind speed measurements) into the 7300 when no measurement is running. The 7300 imports data from two ASCII files, the header and the data file, and are the same type as those which are used in the User Program function.

The files are imported by using an “item selector”, which lets you choose the path to the files.

To import data to the 7300:

1. Pull down the **File** menu. Click on **Import**. The Import Data dialogue will be displayed, Fig.A.3.

   Import to Database lets you select the database into which you want to import data, using the Items box.

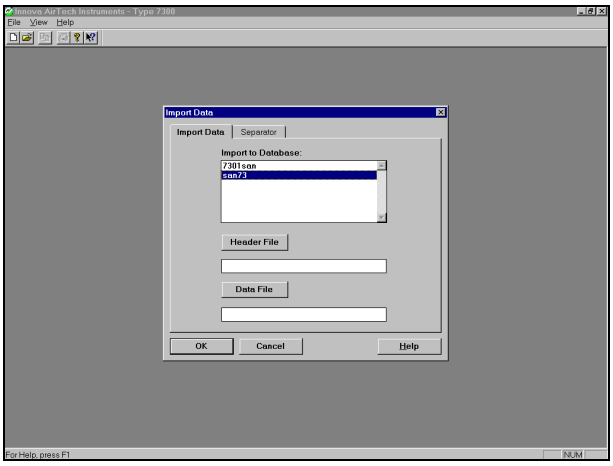

Fig.A.3 The Import Data dialogue

Header File lets you choose the header file (see Appendix B) to be imported. Clicking on this displays an item selector, which you use to select the header file you want.

Data File lets you choose the data file (see Appendix B) to be imported. Clicking on this displays an item selector, which you use to select the data file you want.

Separator selects the data-separator used in the file to be imported.

2. Click on the name of the database into which you want to import data.

3. Click on **Header File**.

   The Item Selector is displayed, Fig.A.4.

   The **Open** dialogue shows the directories and files in the same format as the operating systems File Manager. The default extension of the type of file to be imported is ".TXT".

   Using the mouse, click on the drive and directories in the path to the file name.

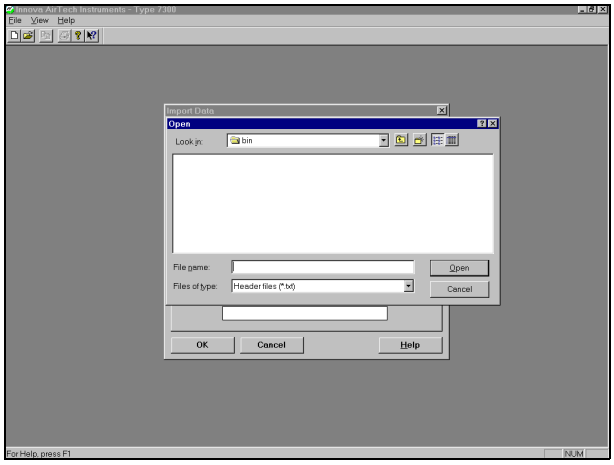

Fig.A.4 The Header file/Data file item selector

When you have the correct path and have selected your file, as shown in the *File Name* field. Click on **OK**.

4. Click on **Data file**. Repeat the procedure in step 3 to select the data file you want to import.

5. Click on the **Separator** "index card" and select character separator used in the files to be imported.

6. Click on **OK** to begin importing the files you have selected.

The files you have selected will be imported into the database you have chosen. The data you have imported can then be seen in the data display windows as User Data (section 5.1.2).

A.3 Backing Up and Restoring Data

To safeguard data that you wish to keep and to save disk-space in the computer, it is recommended that you back up databases of older measurement results onto disks. You can also use this function to store databases with special set-ups. You can restore

the data from the disks if you want to use this data again. This section tells you how to do this using the 7300's **Backup** and **Restore** functions.

A.3.1 Backing up Data From the 7300

The **Backup** function in the **File** menu lets you back up databases from the 7300. Note that a single database can contain several disks-full of data, so before you begin backing up, ensure that you have several formatted disks ready.

Note: Never back up more than one database on one disk or drive.

To back up databases from the 7300:

1. Pull down the **File** menu. Click on **Backup**. The Backup Data dialogue will be displayed, Fig.A.5.

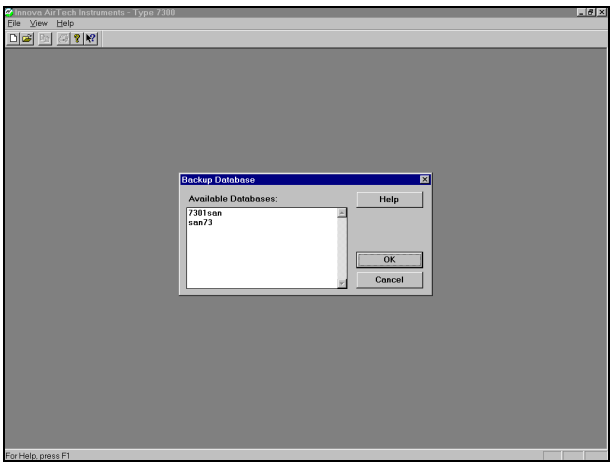

Fig.A.5 The Backup Data dialogue

2. Click on and highlight the database to be backed up.

3. Click on **OK**. The Path dialogue is then displayed.

4. Using the mouse, click on the destination drive.

5. Click on **OK** to start backing up the chosen database.

The database will be backed up to the chosen destination. As the back-up proceeds, the 7300 will display an alert telling you when (if necessary) to change the back-up disks.

A.3.2 Restoring Data to the 7300

The **Restore** function in the **File** menu lets you restore backed up databases to the 7300. Note that there must be enough space on the computer's hard disk to accept the restored database. It is recommended that you ensure you have enough space before proceeding with this function.

This function makes it easier to set up a database with a standard set-up for a particular type of measurement by restoring an empty database with the required standard set-up.

Important! You can only restore one database from one disk or one drive.

To restore a backed up database to the 7300:

1. Pull down the **File** menu and click on **Restore**. The Restore Data dialogue will be displayed, Fig.A.6.

2. Using the mouse, click on the drive of the database to be restored.

3. Click on **OK**.

The database will be restored to the 7300. Note that you cannot restore a backed up database to an existing database in the 7300 which has the same name. The existing database must be removed if you wish to restore the backed up database to a database with that name.

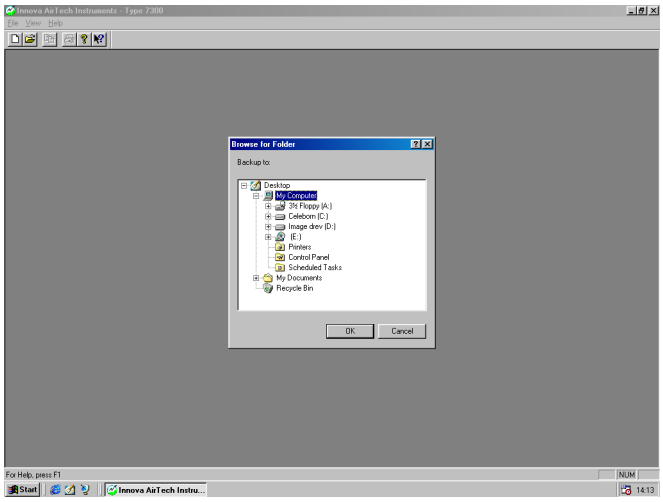

Fig.A.6 The Restore Data dialogue

A.4 Handling Databases from other 7300 versions or after Re-installing the Software

The instructions in this section should be followed if you have databases from other versions of the 7300 software, or you have re-installed the current version, or if databases are moved from one computer to another where the 7300 software is installed.

Note: these instructions apply to 7300 versions which run under Windows™ and not older versions which run under GEM®Desktop™. Databases from GEM®Desktop™ versions can not be used with the 7300 software supplied with this manual.

DO NOT COPY DATABASE FILES DIRECTLY INTO THE 7300 FILE STRUCTURE AS THIS PREVENTS YOU FROM CREATING THE NEW DATABASE WITH THE SAME NAME.

Databases are stored in the file structure as follows:

`drive X:/.../7300/dbm/`*`database name`*

After a new installation of the 7300, the software can not "see" the existing databases in *dba* and *dbm* directories.

Restoring Existing Databases

If you are re-installing or updating the software, move your databases out of the 7300 database file structure before continuing. To enable the newly installed software to "see" the existing databases, use the following instructions:

1. Pull down the **File** menu. Click on **New**. The New Database dialogue will be displayed.

2. Type in the name of the existing database (max. 8 characters).

3. Click on **OK** to make and open the new database.

4. Pull down the **File** menu. Click on **Close**.

5. Repeat steps 1 to 4 if you want to restore some more databases.

6. Pull down the **File** menu. Click on **Exit**.

7. Start Windows file manager.

8. Check that the newly created databases exist in the file structure:

   `drive X:/.../7300/dbm/`*`database name/files`*

9. Copy the "original" database files into the newly created databases in 7300 file structure.

   The newly created files are overwritten by the "original" ones, making the database files available to the 7300 software.

   Note: It may be necessary to set up the configuration and the communication parameters again (see section 4.2 and 4.3).

A.5 Using the Compress Data Function

The **Compress Data** function in the **File** menu is used to compress data in the current database. Compression is done by reducing the measurement results in the database, and storing these results in the place of the full set of data.

You can compress data from previous measurements in order to release storage space in a database while keeping a record of the measurement results. Thus, further measurements can be added to the database. You can also compress data during a measurement, when the available disk-space is full.

The compressed values are calculated as shown below:

Each 1312 optical filter:	The average, and the maximum and minimum measured gas-concentrations are stored.
Temperature:	The average temperature measured by each transducer.
Error flags:	All error flags are stored.
Edited results:	All edited results are ignored.
Time markers:	The time marker given to the compressed measurement result is that for the last measurement result within the time period.

Note:

- Data compression cannot be reversed once done. If you want to keep all the original data, you must first make a back-up of the database before doing the compression. See section A.3.1 for details of how to do this.

- Compressing data does *not* create more disk space. It merely creates space within the database for further measurement results.

To use the data compression function:

1. Pull down the **File** menu and click on **Compress Data**. The Data Compressing dialogue will be displayed, Fig.A.7.

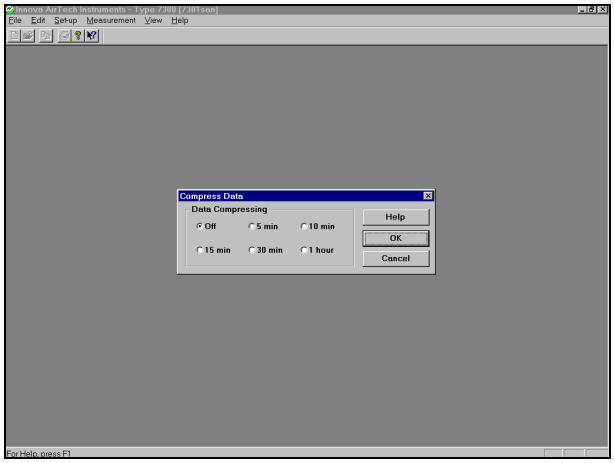

Fig.A.7 The Data Compressing dialogue

2. Click on the time period over which you want to reduce data.

   For example, if you select **10 min.**, the measurement results in the database will be "cut" into 10-minute sections, and the results in each 10-minute period will be reduced as described above. The reduced values will then be stored in place of the full set of data for each 10-minute period.

3. Click on **OK** to begin compressing the data in the database.

Appendix B

Using External Programs, and File Structures for Data Transfer

This appendix tells you:

- How to use the 7300's User Program function to import additional data into the 7300 from an external program during a measurement
- The structures of the files which are used for transferring data into and out of the 7300

B.1 The User Program Function

The **User Program** function in the **Set-up** menu lets you run a program separate from the 7300, and import data from this program into the 7300 while measurements are running. In this way, you can import relevant data, such as air-velocity or humidity, into the 7300 from a program which calculates such values. **User Program** lets you select the program to be used, and the header and data files into which the program writes the data (therefore, the files from which the 7300 reads the data). Details of the file structure to be used if the 7300 is to import data generated by another program are given in section B.2.1 of this Appendix.

When the **User Program** function is active, the 7300 creates one ASCII file (the Export file) for each active measurement channel (maximum 12 files) and creates or updates a single ASCII file (the Info file) for all measurement channels after each channel measurement is completed. Export Files contain the most recent measurement results from each channel, and are placed in the directory of the current database. The Info File contains information about the relevant export file and is placed in the 7300 directory. The external program is then activated by the 7300. The program can then read the data from the ASCII files (if necessary) and add the external data to the 7300 data. Using this data, the external program must then create two ASCII files – a header file and a data file – which are read by the 7300, and the data imported into the current database as User Data (up to 12 values).

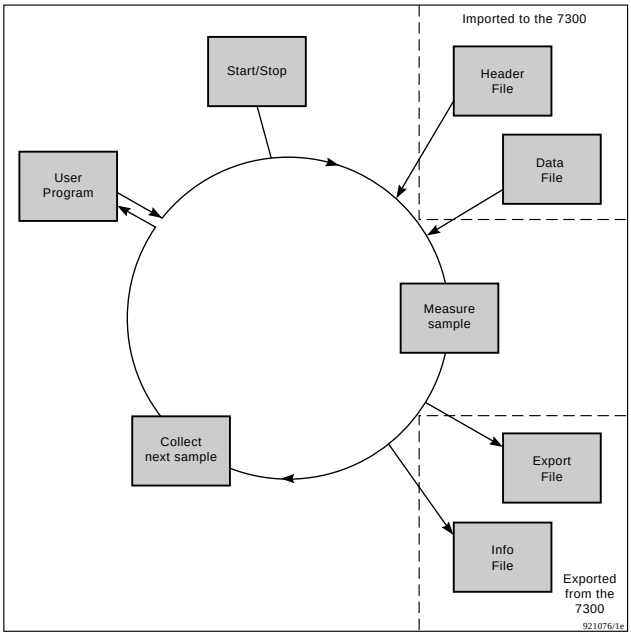

Fig.B.1 Use of the User Program function

To use the User Program function:

1. Pull down the **Set-up** menu. Click on **User Program**. The User Program dialogue will be displayed, see Fig.B.2.

   Program enables you to choose the user program, and the path to the program.

   Header enables you to choose the header-file into which the user program writes header information. The header-file must exist before the 7300 is started, otherwise it cannot be chosen.

   Data enables you to choose the data-file into which the user program writes the measurement data. The data-file must exist before the 7300 is started, otherwise it cannot be chosen.

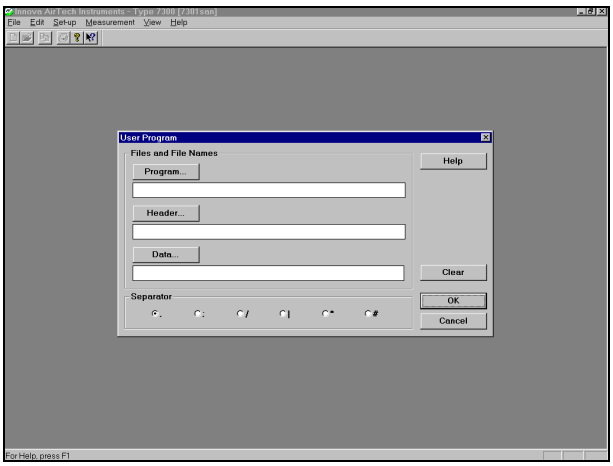

Fig. B.2 The User Program dialogue

Separator lets you select the data-separator character used in the files generated by the user program.

2. Click on **Program**.

   Directories displays the current directory, and shows the default extension of the user program and the type of file to be imported (.EXE, .COM or .BAT). Using normal windows procedures, browse through the file structure to find the user program.

3. Click on **OK** when you have selected the program you require. The path and the name of the user program you have selected will be displayed in the field under **Program**.

4. Click on **Header**.

5. Click on **OK** when you have selected the file you require. The path and the name of the file you have selected will be displayed in the field under **Header**.

6. Click on **Data**.

7. Click on **OK** when you have selected the file you require. The path and the name of the file you have selected will be displayed in the field under **Data**.

8. Click on the separator character used in the data to be imported.

9. Click on **OK** to store the user program set-up you have made.

When measurements begin, the 7300 will run the chosen program, and import data from the files created by the program as described above, after each sampling channel measurement. The data will be placed in the database as User Data (section 5.1.2).

B.2 File Structures for Data Transfer

The **User Program**, **Import**, and **Export** functions of the 7300 allow data to be transferred to and from the 7300. **User Program** allows transfer while measurements are running. **Import** and **Export** are used when no measurements are running (see section A.2). The 7300 uses ASCII files to exchange data. The structures of these files are described in the following text: first, the structures of the files used by the **User Program** function and the **Import** function; secondly, the structures of the files used by the **Export** functions.

B.2.1 File Structures Used by the User Program Function and the Import Function

The **User Program** function uses two types of import files (Header and Data files) and two types of export files (Info and Export files). The **Import** function uses the same types of import files as the **User Program** function but does not use export files.

Export files:

The **User Program** function creates an ASCII Export file for each active measurement channel (therefore, a maximum of 12

files). These files are always in the directory of the database currently in use, i.e.:

`Drive:\7300\dbm\`Database name

The files always have the same name:

BKMONM1.EXP, BKMONM2.EXP,....BKMONM12.EXP

If a measurement channel is not being used, no file will be generated for that channel.

Export files:

Export files contain the following data in the following order. All the data is contained in the same line, separated by the chosen separator character:

6 real values (measurement results from the 6 filter positions of the 1312)

1 whole number (temperature as measured by temperature transducer)

1 whole number (time of the measurement in Excel™ time format), see section B.3

Example (separator character: ","):

2.300000,2.500000,0.000000,0.000000,10.200000,2.480000,24,35314.438727

Note that each time the 7300 receives new data from the 1312 and 1303 or 1309, the data in these files is deleted and replaced by the new data. Therefore, the files always contain the most recent measurement results for use by the user program.

Info file:

The **User Program** function also creates an ASCII Info file (7300.EXP) in the 7300 directory which can be used by the User Program to identify the Export file. The Info file has the following format:

Export file name,n/a,database name,[FIRST]

Export file name is the name of the current Export file.

n/a the value displayed is not applicable here.

Database name is the name of the database where the Export file is to be found.

FIRST appears if this is the first time that this Export file has been used in this measurement.

Example:

BKMONM6.EXP,1,BUILDX,FIRST

The current Export file is BKMONM6.EXP in the BUILDX database. FIRST shows that this is the first time the file has been used since starting the measurement. The number 1 is not applicable.

When the user program has performed its function, it must create two files so that the 7300 can read the data: the header-file and the data-file. The header-file tells what, and how much is in the data-file; the data-file contains the data itself. The 7300 reads the information from these files. The files, like the user program, can be placed in any directory on the computer's hard disk, as the User Program function sets a path to the program and the files. The formats given below are also appropriate when using the **Import** function, section A.2.2.

The files are written in the following format.

Header file:

time-format,n,unit 1, ... ,unit x,set-up text

time-format gives the format in which the time is written in the data file. There are two time formats:

"S", in which the time is written as a 16-character string, for example:

"19900716143035" ("YYYYMMDDHHMMSS")

"N", in which the time is written in Excel™ time format (see section B.3)

n is the number of measurements (channels) in the data file, from 0 (if nothing is being imported) to 12.

unit x is the unit of measurement number x, as shown in Table B.1.

set-up text is a text-string describing the data. The string is enclosed by " " marks, and has a maximum of 15 characters.

Example:

"N",2,12,12,"Wind-speed"

The time is written in Excel™ time format. There are 2 measurements in the data file. The unit for each measurement is m/s.

Data file:

measurement 1,measurement 2,measurement 3,...,measurement n,time

measurement x is the value of measurement x.

time is the time for the data in the data file, written in the format given by *time-format* above.

Example:

3.5,4.2,35314.438727

The value from the first measurement is 3.5. The value from the second measurement is 4.2. The time is in "N" format and is 1996-09-06 10:31:46.

The header and data file are read by the 7300 after each channel measurement, and the data is placed in the currently-open database as User Data. The files can also be read-in to the 7300 using the Import function, and are placed in the chosen database in the same way.

Note: more than one line at a time can be read-in to the 7300 using the Import function.

B.2.2 File Structures Used by the Export Function

The **Export** function creates ASCII files, containing measurement data and set-up data (if chosen) from a database, which can then be used by other programs. **Export** creates one file for each measurement channel (maximum 14 files, as two files for User Data can be made) and a file for the complete measurement

Value	Unit of Measurement
0	No unit
1	ppm
2	mg/m^3
3	g/m^3
4	kPa
5	mBar
6	mmHg
7	K
8	C
9	F
10	m
11	feet
12	m/s
13	dewpoint
14	vapour pressure
15	relative humidity
16	W/m^2
17	%
18	PMV
19	W
20	kWh
21	l/s
22	m^3/s
23	m^3/h
24	ft^3/min
25	degrees
26	dB
27	LUX
28	N/A

Table B.1 The units of measurement represented by the value of "unit x"

set-up (if chosen) of that database. The export files are placed in the directory of the database from which the data is taken.

The files always have the same name:

BKMMALSE.TXT (set-up data); BKMONM1.TXT ... BKMONM14.TXT (measured data)

Note: a file for the database's set-up data is made only if you chose to do so in the Export dialogue, section A.2.1.

Structure for set-up data files:

The structure of set-up data files is as follows.

Name of database.
Type of measurements:
5 or 6 → Monitoring
Filter A used/unused. (0 if unused, 1 if used)
Filter B used/unused. (0 if unused, 1 if used)
Filter C used/unused. (0 if unused, 1 if used)
Filter D used/unused. (0 if unused, 1 if used)
Filter E used/unused. (0 if unused, 1 if used)
Filter W used/unused. (0 if unused, 1 if used)
Gas-name from 1312 for optical filter A
Gas-name from 1312 for optical filter B
Gas-name from 1312 for optical filter C
Gas-name from 1312 for optical filter D
Gas-name from 1312 for optical filter E
Molecular weight of gas A
Molecular weight of gas B
Molecular weight of gas C
Molecular weight of gas D
Molecular weight of gas E
Molecular weight of gas W
$K_{i,c}$ (const. conc. 1)
K_p (const. conc. 1)
$K_{i,n,v}$ (const. conc. 1)
K_d (const. conc. 1)
$K_{i,n,s}$ (const. conc. 1)
K_L (general)
MAXACH (const. conc. 1)
I_0 (const. conc. 1)
T_a (general)
C_b (general)
$K_{i,c}$ (const. conc. 2)
K_p (const. conc. 2)
$K_{i,n,v}$ (const. conc. 2)
K_d (const. conc. 2)
$K_{i,n,s}$ (const. conc. 2)
K_L (general)
MAXACH (const. conc. 2)
I_0 (const. conc. 2)
T_a (general)

C_b (general)
Measurement Location text (location 1)
Measurement Location text (location 2)
Measurement Location text (location 3)
Measurement Location text (location 4)
Measurement Location text (location 5)
Measurement Location text (location 6)
Measurement Location text (location 7)
Measurement Location text (location 8)
Measurement Location text (location 9)
Measurement Location text (location 10)
Measurement Location text (location 11)
Measurement Location text (location 12)
Not applicable
Not applicable
Not applicable
Not applicable
Not applicable
Not applicable
Alarm limit for filter A (from Alarms dialogue)
Alarm limit for filter B (from Alarms dialogue)
Alarm limit for filter C (from Alarms dialogue)
Alarm limit for filter D (from Alarms dialogue)
Alarm limit for filter E (from Alarms dialogue)
Alarm factor (from Alarms dialogue)
Path to User Program
Location Room-vol., location 1 (from Multiplexer dialogue)
Location Room-vol., location 2 (from Multiplexer dialogue)
Location Room-vol., location 3 (from Multiplexer dialogue)
Location Room-vol., location 4 (from Multiplexer dialogue)
Location Room-vol., location 5 (from Multiplexer dialogue)
Location Room-vol., location 6 (from Multiplexer dialogue)
Location Room-vol., location 7 (from Multiplexer dialogue)
Location Room-vol., location 8 (from Multiplexer dialogue)
Location Room-vol., location 9 (from Multiplexer dialogue)
Location Room-vol., location 10 (from Multiplexer dialogue)
Location Room-vol., location 11 (from Multiplexer dialogue)
Location Room-vol., location 12 (from Multiplexer dialogue)
Pressure (from Monitor dialogue)
Temperature (from Monitor dialogue)
Compensation:
    1 = cross-compensation

16 = water compensation
17 = cross + water compensation
Time between measurements
Number of 1303 units in the system
Target concentration for tracer-gas A
Target concentration for tracer-gas B
Molecular weight of tracer-gas A
Molecular weight of tracer-gas B
Unit code for imported data (see table B.1, user data 1)
Unit code for imported data (see table B.1, user data 2)
Unit code for imported data (see table B.1, user data 3)
Unit code for imported data (see table B.1, user data 4)
Unit code for imported data (see table B.1, user data 5)
Unit code for imported data (see table B.1, user data 6)
Text for imported data

Structure for measured data files:

The structure of measured data files is as follows:

Average gas-concentration measured by Filter A
Average gas-concentration measured by Filter B
Average gas-concentration measured by Filter C
Average gas-concentration measured by Filter D
Average gas-concentration measured by Filter E
Average concentration measured by Filter W
Minimum concentration measured by Filter A
Minimum concentration measured by Filter B
Minimum concentration measured by Filter C
Minimum concentration measured by Filter D
Minimum concentration measured by Filter E
Minimum concentration measured by Filter W
Maximum concentration measured by Filter A
Maximum concentration measured by Filter B
Maximum concentration measured by Filter C
Maximum concentration measured by Filter D
Maximum concentration measured by Filter E
Maximum concentration measured by Filter W
Accept/no accept of results from Filter A
0 → accept
1 → no accept
Accept/no accept of results from Filter B
Accept/no accept of results from Filter C
Accept/no accept of results from Filter D

Accept/no accept of results from Filter E
Accept/no accept of results from Filter W
Accept/no accept of air value
Accept/no accept of temperature
Temperature measured
Time of measurement, expressed in Excel™ time format
Status information

B.3 Description of Time and Date Formats in the 7300

The 7300 software uses two time formats: database time format and data file time format.

B.3.1 Database Time Format

Databases use a time format that shows the time as the number of seconds since 01-01-1970 00:00.

For example: 842005734 = 14033429 mins. = 233890.5 hours = 26.7 years since 01-01-1970 00:00
= **06-09-96 10:28**

B.3.2 Data File Time Format

Data files use the Excel™ time format. This is a decimal number, where the whole number is the number of days from 01-01-1900, while the decimal part is the relationship to the total number of seconds in 24 hours.

Example:

34632.6423843	
34632/365 = 94.88 years	0.6423843×86400 = 55502 seconds = 925.03 mins = 15.41 hours
= **25-10-94**	**15:25:02.0**

B.3.3 Converting the Time Formats using Excel

The time data formats produced by the 7300 program can be easily converted in to calendar dates by a Spreadsheet program, in this case Excel™, using the following procedure.

1. Make a spreadsheet similar to that in Fig.B.3.

2. In cell A2 type in the time in seconds from 01-01-1970

3. In cell B2, the seconds are converted to Excel™ time format using the formula shown in Fig.B.3 and presented as a numeric (**Format**, **Cells**, **Number**).

4. In cell C2, enter again the formula line shown in Fig.B.3. The Excel time format is then displayed as a calendar date by selecting **Format**, **Cells**, **Custom** and **dd-mm-yy hh:mm**.

Note: If you have problems converting the time, check that the Regional Settings are the same as those in the system computer.

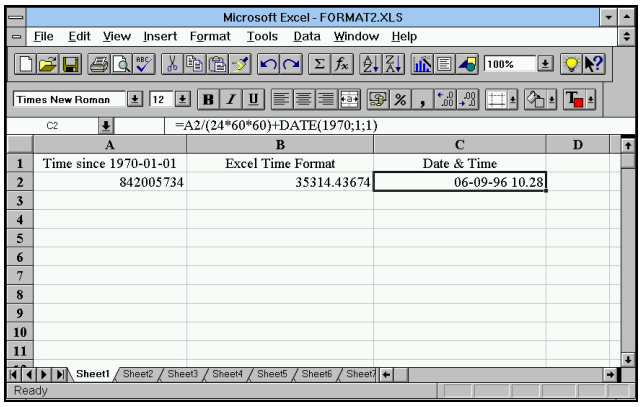

Fig. B.3 Converting Time formats using Excel

Appendix C

Calculating Key Values

C.1 Calculating Key Values

This section shows the methods used by the 7300 to calculate values for the parameters in the Key Values dialogue (see Fig.C.1). The 7300 uses data displayed in the Graphic Window (see section 5.1.3). Two cursors are used to define the interval of the curves that will be used for calculating values for the parameters. If the cursors are not used, calculations are performed using all of the data that can be seen on the curve if Graph is activated on the Key Values dialogue. If Graph is not activated on the Key Values dialogue and the cursors are not used, no calculations are performed.

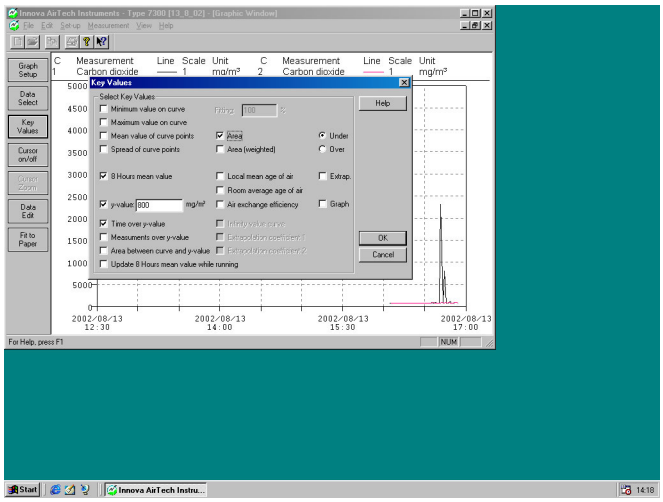

Fig.C.1 The Key Values dialogue

There are three typical gas-concentration vs. time curves. These are shown in Fig.C.2.

The following symbols, denoting points on the curves of measurement results, are used in the following calculations:

C_{-1} refers to the gas concentration immediately to the left of cursor number 1

T_0, C_0 refer to the first measurement time and gas concentration in the cursor interval, respectively

T_i, C_i refer to a measurement time and gas concentration within the cursor interval, respectively

T_{N-1}, C_{N-1} refer to the last measurement time and gas concentration in the cursor interval, respectively

t=0, t_{end} are the times at the first and second cursors, respectively

Δt_i is the time interval between two consecutive measurements (i.e. $T_{i+1} - T_i$)

The calculations performed by the 7300, using the data from the three typical curves, are described in the following three sections.

C.1.1 Values Calculated for All Types of Curves

The following can be calculated irrespective of the type of curve.

Minimum value in the cursor interval:

Minimum value = minimum (C_i)

Maximum value in the cursor interval:

Maximum value = maximum (C_i)

If the cursors are not placed directly over a measured value on the time axis, the 7300 uses the value of the measurement immediately to the left of the cursors, as shown in Fig.C.3

Mean value of points in the cursor interval:

$$\text{Mean} = \sum_{i=0}^{N-1} (C_i / N)$$

where N = Number of valid measurements within the cursor interval

Calculating Key Values

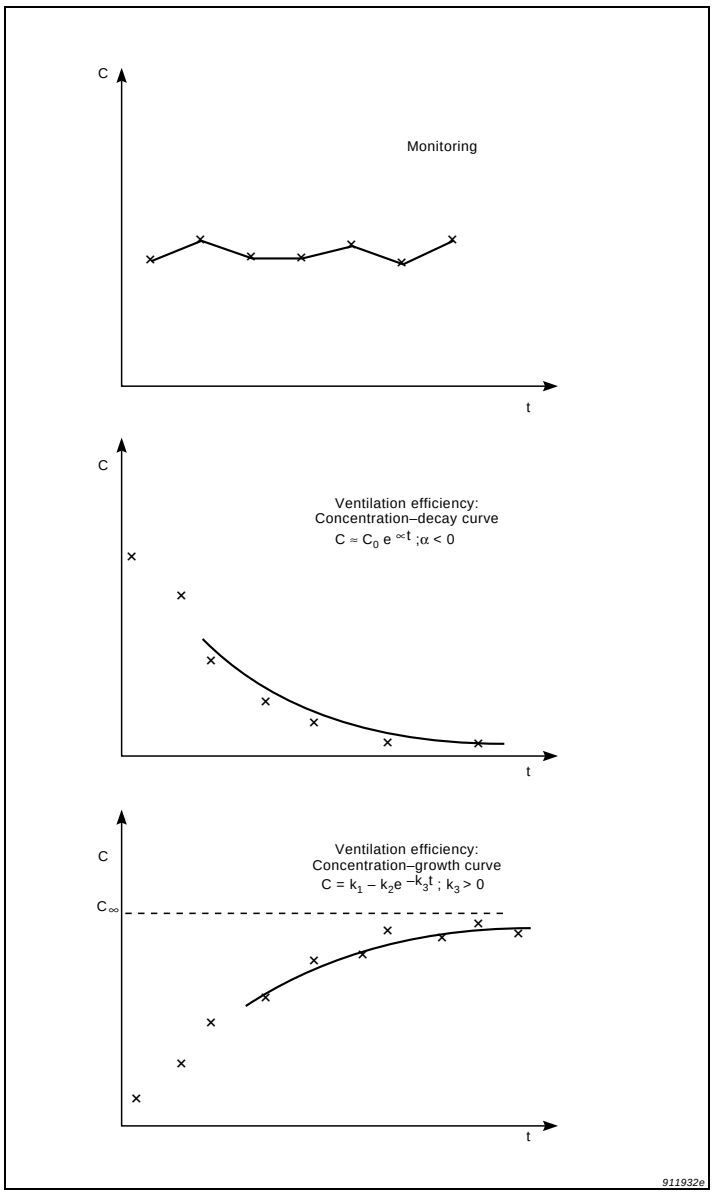

Fig.C.2 The three types of gas-concentration/time curve from which the 7300 can calculate Key Values

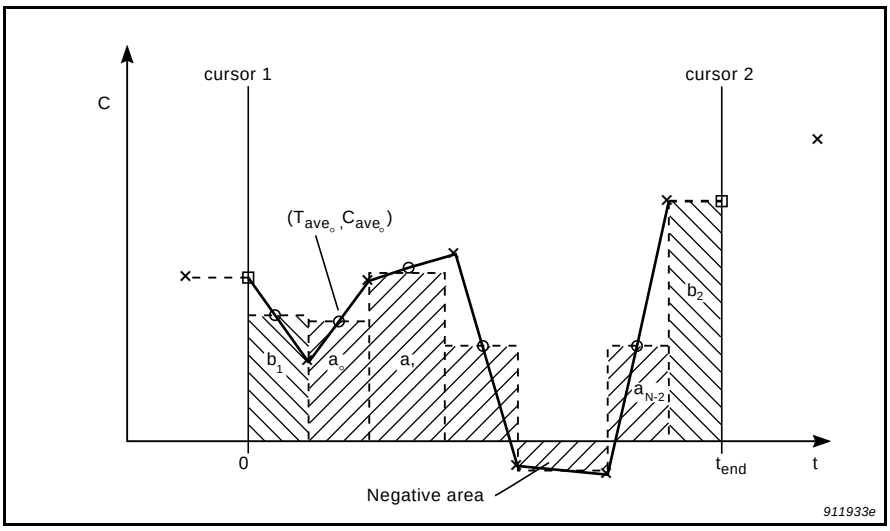

Fig.C.3 Correcting for the positions of the cursors and definitions for the calculations of areas

Spread of values:

$$\text{Standard Deviation} = \sqrt{\frac{N \cdot \sum_{i=0}^{N-1} C_i^2 - \left(\sum_{i=0}^{N-1} C_i\right)^2}{N(N-1)}}$$

8 hours mean value:

This value is only calculated for **Channel Data** (one sampling channel) and not for **Mean Data** (average of several channels)

$$8 \text{ hours mean} = \left(\sum_{T_{N-1} - 8 \text{ hours}}^{T_{N-1}} C \right) / N_8$$

where:

C = Gas concentration

N_8 = Number of valid measurements in the 8 hour interval

Total time where C is greater than or equal to the y-value, C_{level}:

$$\text{Time} = \sum_{C > C_{level}} \Delta t_i$$

Number of measurements over or equal to the y-value, C_{level}:

$$\text{Number} = M$$

Area between curve and a given y-value, C_{level}:

$$\text{Area} = \sum_{C > C_{\text{level}}} (C_{\text{ave}\,i} - C_{\text{level}}) \cdot \Delta t_i$$

"Area" under the curve (negative for any part of the curve below y =0):

$$\int_0^{t_{\text{end}}} C(t) \cdot \text{dt} \approx \sum_{i=0}^{N-2} a_i + b_1 + b_2$$

where b_1 ($C_{-1} \cdot T_0$) and b_2 ($C_{N-1} \cdot (t_{end} - T_{N-1})$ are the end correction factors defined in Fig.C.3.

$$\text{Area} = \sum_{i=0}^{N-2} C_{ave_i} \cdot \Delta t_i + C_{-1} \cdot T_0 + C_{N-1} \cdot (t_{end} - T_{N-1})$$

Weighted area under the curve (1st moment):

$$\int_0^{t_{end}} C(t) \cdot t\,dt \approx \sum_{i=0}^{N-2} a_i \cdot \left(T_i + \frac{1}{3}\Delta t_i + \frac{1}{3}\frac{C_{i+1}}{C_{i+1} + C_i} \cdot \Delta t_i \right) + b_{1,w} + b_{2,w}$$

where $b_{1,w}$ is $\frac{1}{3} C_{-1} \cdot T_0 \cdot T_0 \cdot \left(1 + \frac{C_0}{C_0 + C_{-1}}\right)$

and $b_{2,w}$ is $\frac{1}{2} C_{N-1} \cdot (t_{end} - T_{N-1}) \cdot (t_{end} + T_{N-1})$ are the weighted end correction factors corresponding to b_1 and b_2, respectively.

$$\text{W.Area} = \sum_{i=0}^{N-2} C_{ave_i} \cdot t_{ave_i} \cdot \Delta t_i + \frac{1}{3} C_{-1} \cdot T_0 \cdot T_0 \cdot \left(1 + \frac{C_0}{C_0 + C_{-1}}\right) + \frac{1}{2} C_{N-1} \cdot (t_{end} - T_{N-1}) \cdot (t_{end} + T_{N-1})$$

$$\text{where } t_{ave_i} = T_i + 1/3\Delta t_i + 1/3\frac{C_{i+1}}{C_{i+1} + Ci} \cdot \Delta t_i$$

C.1.2 Special Calculations for Concentration-decay Curve

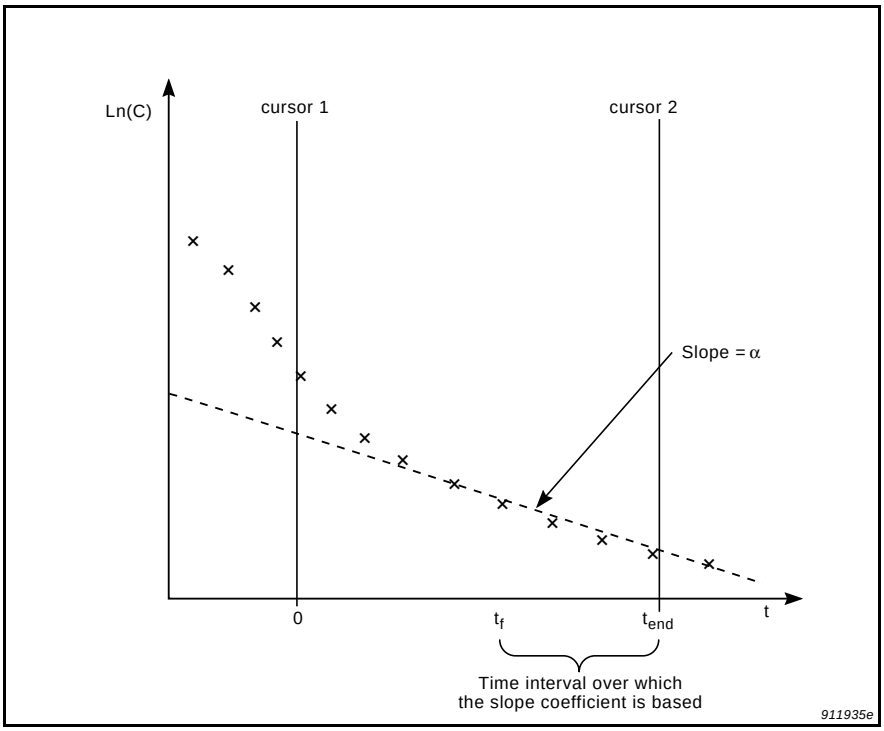

Fig.C.4 Concentration-decay curve

"Area" under the extrapolated curve (negative for any part of the curve below y=0):

$$\text{Area}_{ex} = \int_{t_{end}}^{\infty} C_0 e^{\alpha t} \text{dt} + \text{Area}$$

where α is the slope of the concentration decay based on the decay between t_f and t_{end}

This can also be expressed as: $\text{Area}_{ex} = |1/\alpha| \cdot C_{N-1} + \text{Area}$

Weighted area under the extrapolated curve:

$$\text{W.Area}_{ex} = \int_{t_{end}}^{\infty} C_0 e^{\alpha t} \cdot t\,dt + \text{W.Area}$$

This can also be expressed as:

$$\text{W.Area}_{ex} = |1/\alpha| \cdot C_{N-1} \cdot (t_{end} + |1/\alpha|) + \text{W.Area}$$

Local age-of-air without extrapolation:

$$\text{Local age} = \frac{\text{Area}}{C_{-1}}$$

Local age-of-air with extrapolation:

$$\text{Local age} = \frac{\text{Area}_{ex}}{C_{-1}}$$

Room-average age-of-air without extrapolation:

$$\text{Average age} = \frac{\text{W.Area}}{\text{Area}}$$

Room-average age-of-air with extrapolation:

$$\text{Average age}_{ex} = \frac{\text{W.Area}_{ex}}{\text{Area}_{ex}}$$

Air-exchange efficiency without extrapolation:

$$\text{Efficiency} = \frac{\text{Local age}}{2 \cdot \text{Average age}}$$

Air-exchange efficiency with extrapolation:

$$\text{Efficiency}_{ex} = \frac{\text{Local age}_{ex}}{2 \cdot \text{Average age}_{ex}}$$

Extrapolation coefficient 1 in the last part of the cursor interval defined by Fitting:

$$\text{Slope coefficient} = \alpha = \frac{N \cdot \sum t \cdot \ln(C) - \sum t \cdot \sum \ln(C)}{N \cdot \sum t^2 - (\sum t)^2}$$

where all summations are made from t_f to t_{end}

$$t_f = t_{end} - \frac{\text{Fitting}}{100} t_{end}$$

where Fitting is obtained from the Select Key Values dialogue

Note: the part of the cursor interval on which the extrapolation coefficient is based is determined by the actual cursor positions and the Fitting %, and not by T_0 and T_{N-1}, respectively the first and last measurements within the cursor interval.

Fitting:

See section 5.1.3.

C.1.3 Special Calculations for Concentration-growth Curves

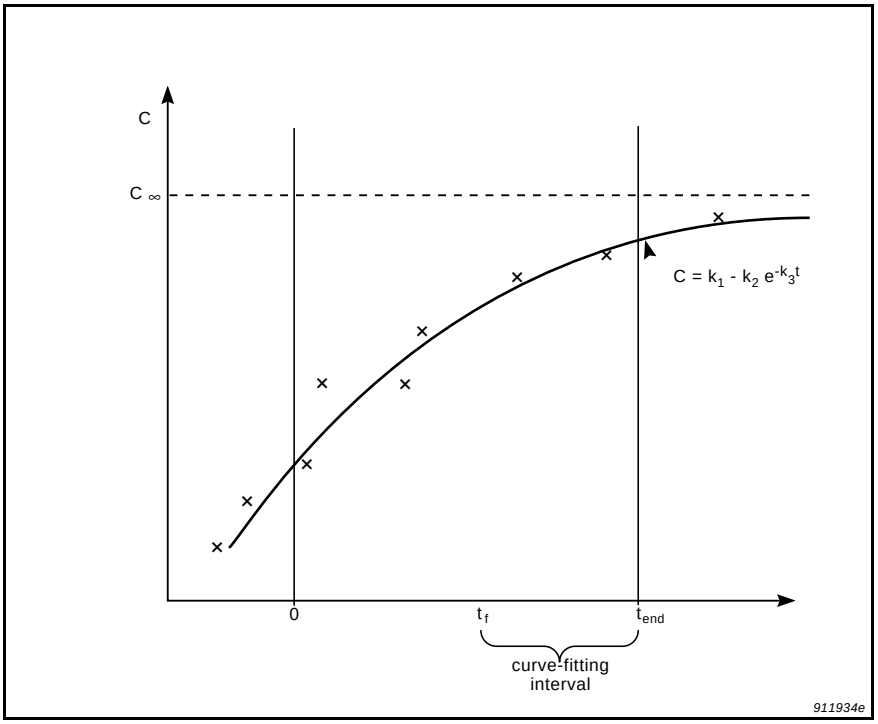

Fig.C.5 Concentration-growth curve

k_1, k_2 and k_3 are estimated from the curve in the curve fitting interval (see Fig.C.5) using curve fitting for non-linear expressions.

k_1 is equivalent to C_∞ , the Infinity Value Curve on the Select Key Values dialogue.

k_2 is equivalent to Extrapolation Coefficient 1 on the Select Key Values dialogue.

k_3 is equivalent to Extrapolation Coefficient 2 on the Select Key Values dialogue.

"Area" above the curve, until C_{N-1} (negative for any part of the curve below y=0):

$$\text{Area over} = \int_0^{t_{\text{end}}} (C_{N-1} - (k_1 - k_2 e^{-k_3 t}))\, dt$$

which can be expressed as:

$$\text{Area over} \approx C_{N-1} \cdot t_{\text{end}} - \text{Area}$$

where Area is the area under the curve (see section C.1.1).

Area above the curve and extrapolated curve, until $C_\infty(k_1)$:

$$\text{Area over}_{\text{ex}} = k_1 t_{\text{end}} - \text{Area} + \int_{t_{\text{end}}}^{\infty} (k_1 - (k_1 - k_2 e^{-k_3 t}))\text{dt}$$

which can expressed as:

$$\text{Area over}_{\text{ex}} \approx k_1 t_{\text{end}} - \text{Area} + (k_2 / k_3) e^{-k_3 t_{\text{end}}}$$

Weighted area above the curve, until C_{N-1}:

$$\text{W.Area over} = \int_0^{t_{\text{end}}} (C_{N-1} - (k_1 - k_2 e^{-k_3 t}))\, t\text{dt}$$

therefore $\text{W.Area over} \approx 1/2 C_{N-1} \cdot t_{\text{end}}^2 - \text{W.Area}$

where W.Area is the weighted area under the curve (1st moment, see section C.1.1).

Weighted area above the curve and extrapolated curve, until C_∞ (k_1):

$$\text{W.Area over}_{ex} = 1/2k_1 \cdot t_{end}^2 + \int_{t_{end}}^{\infty} (k_1 - (k_1 + -k_2 e^{-k_3 t}))t\,dt - \text{W.Area}$$

where W.Area is the weighted area under the curve (1st moment, see section C.1.1).

therefore

$$\text{W.Area over}_{ex} \approx 1/2k_1 \cdot t_{end}^2 + (k_2/k_3) \cdot e^{-k_3 t_{end}} \cdot (t_{end} + 1/k_3) - \text{W.Area}$$

Local age-of-air without extrapolation:

$$\text{Local age over} = \frac{\text{Area over}}{C_{N-1}}$$

Local age-of-air with extrapolation:

$$\text{Local age over} = \frac{\text{Area over}_{ex}}{k_1}$$

Room-average age-of-air without extrapolation:

$$\text{Average age over} = \frac{\text{W.Area over}}{\text{Area over}}$$

Room-average age-of-air with extrapolation:

$$\text{Average age over}_{ex} = \frac{\text{W.Area over}_{ex}}{\text{Area over}_{ex}}$$

Air-exchange efficiency without extrapolation:

$$\text{Efficiency} = \frac{\text{Local age over}}{2 \cdot \text{Average age over}}$$

Air-exchange efficiency with extrapolation:

$$\text{Efficiency}_{ex} = \frac{\text{Local age over}_{ex}}{2 \cdot \text{Average age over}_{ex}}$$

Infinity value curve:

Infinity value curve = k_1 (C_∞)

Extrapolation coefficient 1:

Extrapolation coefficient 1 = k_2

Extrapolation coefficient 2:

Extrapolation coefficient 2 = k_3

Appendix D

Warning/Error/Status Flags

D.1 Warning/Error/Status Flags

The flags used by the 7300 to indicate the system's operating status can be seen in the 7300's status window and the numeric window. The flags are divided into 7300, 1312 and 1303 or 1309 flags. These are defined as follows:

Flag	Flag-name	Flag Priority	Generated by	Bit no.
7300:				
D	**D**ata Edit flag	No priority		0
A	**A**larm limit exceeded	1 (Mon. mode only)		1
C	**C**ommunication error	2		2
R	**R**eboot	3		3
1312:				
A	**A**irway error	5*		4
B	**B**ad result	6		5
E	**E**quipment failed	1		6
W	Equipment **W**arning	2		7
M	**M**echanical error	3		8
P	**P**ower failure	7	S2	9
V	**V**ibration too high	4		10
1303 or 1309:				
D	**D**osing pump weak	2 (Vent. mode only)	W7	11
E	**E**quipment failed	1	E1;E2;E3;E7;W2	12
G	**G**as pressure	4 (Vent. mode only)	E5	13
P	**P**ower failure	5	W1; W3	14
S	**S**ample channel blocked	3*	E4	15

Table D.1 The Warning/Error/Status flags used in the 7300

Note: The 7300 flag is not shown in the numeric window or in the Warnings/Errors view in the status window, but the status

window opens automatically and the alarms are activated when the alarm limits are exceeded.

When a flag is set, the relevant bit is set to 1. When a flag is not set, the relevant bit is set to 0. A series of these bit settings makes up a binary word with the most significant bit being no. 15. The decimal equivalent, made up from this binary word, is used as the status information in the 7300 Export function (see Appendix B.2.2).

The priority of the flag is used in the Status window, where there is room to display two simultaneous errors for each of the 7300, 1312 and 1303 or 1309. If there are more errors than this, the two flags of highest priority are displayed. A full list of errors can be seen in the Numeric window.

The notation used in Table D.1 is as follows:

E1, E2, E3, E4, E5, E6 and E7 refer to bits 1 to 7 of the 1303 or 1309 Error Flags, see section D.1.3 and D.1.4.

W1, W2, W3, and W7 refer to bits 1, 2, 3 and 7 of the 1303 or 1309 Warning Flags, see section D.1.3 and D.1.4.

S2 refers to bit 2 of the 1312 Status Byte, see section D.1.2.

* means that if these errors arise, you will hear a beep from the PC-speaker, and three beeps from the 1312 speaker. This is because these errors are hard to identify unless the Error/ Warning flags are read, and are errors which can affect measurements.

The meaning of each individual flag is described in the following three sections.

D.1.1 The 7300 Flags

Data Edit is generated when you have edited measurement results using the 7300's Data Edit function. This flag is not shown in the status window.

Alarm Limit ex. is generated by the 7300 when a gas-concentration exceeds the specified alarm limits. This flag is not shown in the numeric window or in the Warnings/Errors view in the

status window. But the status window opens automatically and the alarms are activated when the alarm limits are exceeded.

Communication Error is generated by the 1303 Error flag "Job Specification Error" E6, or if the 7300 has aborted communication with the instruments.

Reboot is generated by the 7300 if it registers that power was cut off during a measurement.

D.1.2 The 1312 Flags

Note: for further information about the 1312 Warning and Error flags mentioned below, please refer to the 1312 Instruction Manual.

Airway Error is generated by the "Air Shunt Blocked. Sample aborted" A2, "Air Flow Too Low" or "Airway System Blocked" incidents. These errors cause the PC speaker to beep, and give three beeps from the 1312's speaker.

Bad Result is generated by the 1312 when corrupted measurement results are read from the 1312 to the 7300. The results are set to 0 and are automatically edited out to ease calculation of the Key Values. They can be edited back in again.

Equipment Failed is generated by the "A/D Interrupt Failed", "Internal Temperature Out Of Range", "Internal Program Error Found", "No Index-Mark from Filter Carousel" or "Power Supply Voltage Out Of Range" incidents.

Equipment Warning is generated by the "Back-up Battery Low", "Error Detected In Clock Settings", "Error Detected in Calibration Factors", "Error Detected in Source Memory", "Error Detected in Background Memory", "Error Detected in Config./ Format Parameters", "Error Detected in Task-Setup Parameters" or "Error Detected In Internal Memory" incidents.

Mechanical Error is generated by the 1312 Error flags "Chopper Failed", "IR-Source Temperature Out Of Range", "Microphone Test Failed" or "Pump Test Failed" incidents.

Power Failed is generated by the 1312 Error flag “Reset Activated”, which is set when power has been cut to the 1312.

Vibration Too High is generated by the 1312 Error flag “Vibration Level Too High”.

D.1.3 The 1303 Flags

Note: for further information about the 1303 Warning and Error flags mentioned below, please refer to the 1303 Instruction Manual.

Equipment Failed is generated by one or more of the 1303 Error flags “ADC flag” E1, “RAM Flag” E2, “PROM Flag” E3, “Software Error Flag” E7, or the Warning flag “Temperature Flag” W2.

Gas Pressure is generated by the 1303 Error flag “Dosing Pressure Flag” E5.

Power Fail is generated by the two 1303 Warning flags “Reset Done Flag” W1 or “Power Fail Flag” W3.

Sampling Chan. Blocked is generated by the 1303 Error flag “Sampling Channel Flag” E4.

D.1.4 The 1309 Flags

Note: for further information about the 1309 Warning and Error flags mentioned below, please refer to the 1309 Instruction Manual.

Equipment Failed is generated by one or more of the 1309 Error flags “ADC flag” E1, “RAM Flag” E2, “PROM Flag” E3, “Software Error Flag” E7, or the Warning flag “Temperature Flag” W2.

Gas Pressure is generated by the 1309 Error flag “Dosing Pressure Flag” E5.

Power Fail is generated by the two 1309 Warning flags “Reset Done Flag” W1 or “Power Fail Flag” W3.

Sampling Chan. Blocked is generated by the 1309 Error flag “Sampling Channel Flag” E4.

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