



928 Oxygen Measurement System

Demonstration Program

1. Introduction

1.1 The 928 System is the world's first Windows based multichannel dissolved oxygen system. It is simple to use and offers considerable time saving, particularly in respirometry experiments where up to six replicates can be run. Time will also be saved in the automatic calculation and printout of results of experiments.

1.2 The software is based on three types of usage:

- (i) Closed Cell respirometry
- (ii) Flow-through respirometry
- (iii) Situations where monitoring of O₂ level only is required.

1.3 The complete 928 system comprises an interface with inputs for up to 6 microcathode oxygen electrodes; software, power and computer cables, together with an easy to follow instruction manual.

1.4 The demonstration disk contains a complete version of the software so that you can experience setting up, the recording of a simulated experiment and analysing the results.

1.5 This guide offers an introduction to the main features of the program. However more details can be obtained from HELP. The software is provided with context-sensitive HELP so that clicking the HELP button on any dialog box will bring up full explanations about it.

2. Installing the demonstration program

This program requires a Pentium computer with a super VGA monitor and Windows 95 (or later) installed. You will also need 10.5 Mbytes of free hard disk space and at least 32 Mbytes of RAM.

Change to the folder containing 928Demo.exe, the file you downloaded (e.g. by browsing with Explorer). Double click on the file and follow the instructions.

2.2 Uninstalling: When you wish to remove the demonstration package from your computer, either rerun the downloaded program file and select 'Remove' and click the 'Next' button, or use Add/Remove programs in the Windows control panel.

3. Running the demonstration program

Double click on the icon labelled **Strathkelvin 928 Demo**. You will be presented with a Sign-on Screen containing three buttons:

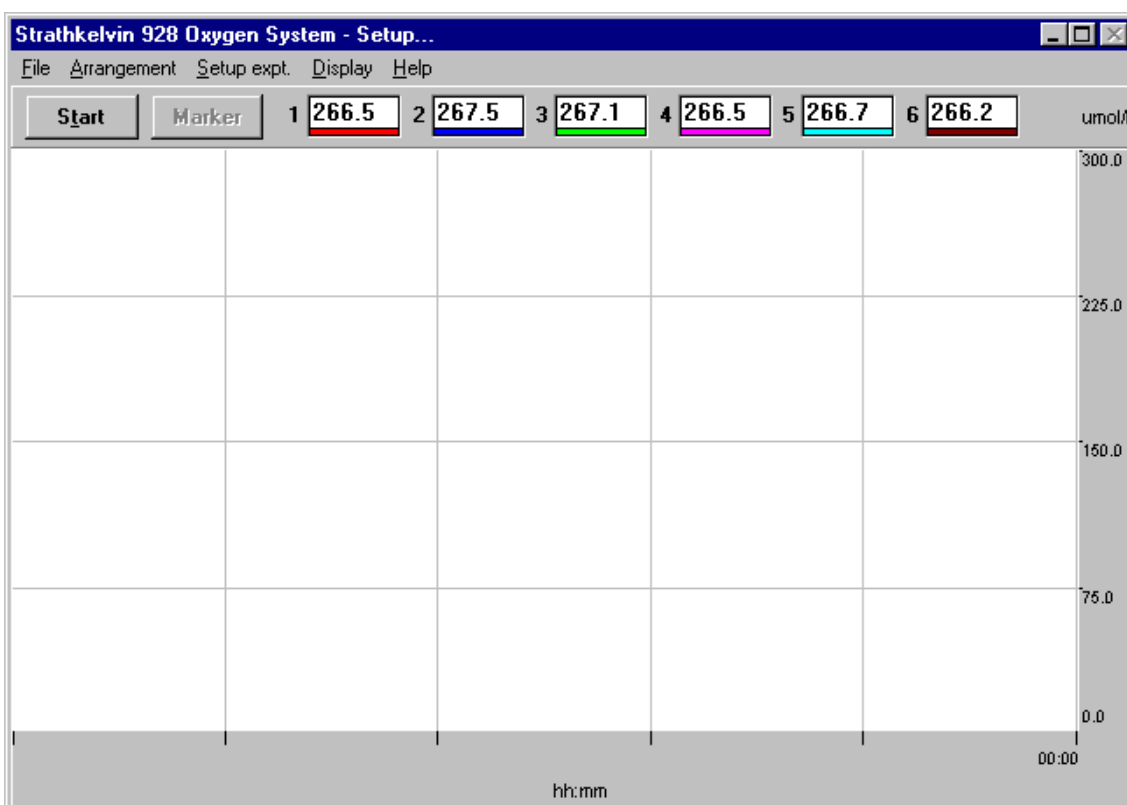
Experiment - To set up and record an experiment.

Analyse - To analyse a previously recorded experiment.

Exit - To exit the program and return to the desktop.

To demonstrate the features of the 928 program, we will follow the steps taken to set up and record a simulated experiment and then analyse it. Click on **Experiment**. This will bring up the screen used to set up your experimental parameters.

4. The Setup Screen

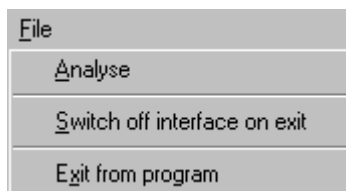


4.1 The **menu bar** has four menu items:

File Arrangement Setup expt. Display Help

Beneath this, the toolbar has a **Start** button which will be used to start the recording of an experiment, and six values boxes which display the readings from each of the electrodes. The color beneath each box shows the color of the trace for that electrode as it appears on the screen.

Returning to the menu bar, click on **File** to reveal the following options:

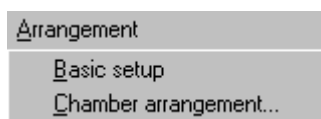


Analyse takes you to the analysis part of the program to analyse a previously recorded experiment.

Switch off interface on exit is a tick box issuing instructions to the interface.

Exit from program returns you to the Sign On screen.

4.2 Click on **Arrangement** to reveal the options **Basic Setup** and **Chamber Arrangement**.



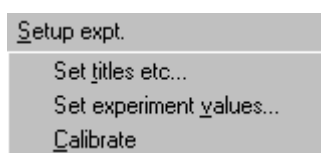
Click on **Basic Setup**. This dialog box allows you to specify the number of electrodes in use, the basic type of experiment, and the recording and respiration rate units. Open the recording and respiration rate list boxes to see the range of units available to you.

Select **Flow through respirometry**. The **Chamber arrangement** button will not now be greyed out. Click it to see different possible chamber/electrode arrangements. You would select the one appropriate for your experimental arrangement. Note that the form of this dialog box varies with the number of electrodes you selected in Basic Setup.

Click **OK** to return to **Basic Setup** and then select the **Closed Chamber** button. (*This is important for the remainder of the demonstration.*) Click **OK**.

The **Chamber Arrangement** option in the **Arrangement** menu is only available when **Flow through** has been selected in the **Basic Setup** dialog box.

4.3 Click on **Setup expt** to reveal the options:



Click **Set titles etc...** This dialog box allows you to enter a title and comments on the experiment which is about to be recorded.

Click **Set experiment values...** This dialog box has three different forms, depending upon whether you have selected 'Closed cell' or 'Flow-through respirometry' or 'Monitor only' in **Basic Setup**. You can append a label

corresponding to each electrode or chamber, and add values for the biomass and water volume (for closed cell respirometry) or biomass and flow rate (for flow-through respirometry). The biomass units are only added if you want to have weight-normalised respiration rates calculated. If you elected to record in units of % saturation, or in partial pressure units, you would have to enter a value for the oxygen concentration at saturation in the box displayed.

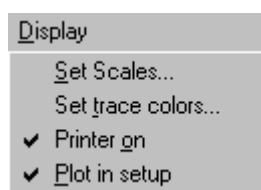
Click **Calibrate**. With the 928 you calibrate your electrodes within the program. This is an interactive dialog box which takes you through the stages of zero calibration and high point calibration. A simulation of this is provided.

When calibrating, you would initially select the electrodes to be calibrated with the numbered tick boxes, and then enter the high point calibration value and the maximum oxygen value expected during the experiment (this is usually the same as the calibration value, except in photosynthesis experiments.)

Click **Calibrate zero**. A message appears instructing you to expose the electrodes to the zero calibrating solution. Click **OK** and you will see a message asking you to wait. After a countdown of 5 seconds in this simulation, but 60 seconds in the actual program, zero values appear in the boxes alongside the electrode numbers. At the same time a **Reset Values** and an **Accept Values** button appear. The **Reset Values** button would be clicked to reset the zero values in the boxes if the electrodes had not completely equilibrated. When the readings had stabilised, you would click the **Accept values** button and this would place ticks beneath the **Z** header, indicating that zero calibration was complete. Do this now.

Click **Calibrate High** and repeat the process. Finally, click **Calibration complete**.

4.4 Next, click **Display** to reveal the options:



Click **Set Scales**. This dialog box allows you to set the maximum and minimum oxygen values that you want to see on the recording screen. (You will see that it already has your selected recording units on the y axis.) The 'x axis' box is used to set the scrolling speed (the equivalent of setting the chart speed on a chart recorder) by selecting the screen width (chart width) in units of time. The computer will then calculate the optimum sampling interval ('Intersample Period') between taking readings from the electrodes and display this in the box. However, you are able to select other intervals if desired.

Click **Set Trace Colors**. This allows you to change the color of the recording traces.

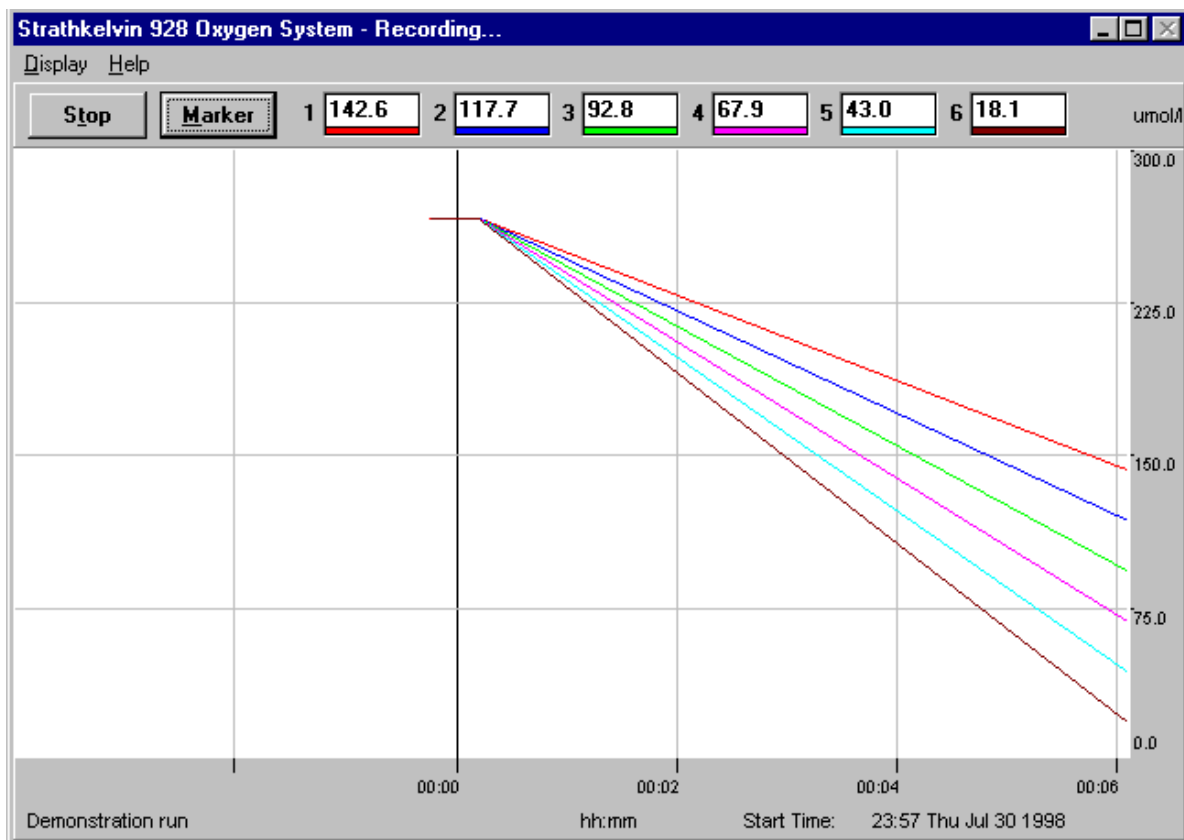
Printer On. This should be ticked if you want to print traces from the recording screen.

Plot in setup. By ticking this option, the traces will scroll across the screen during the setup procedures. If you prefer an uncluttered screen during setup, leave it unticked.

5. Recording

You are now ready to start recording respiration rate. We will take you through the steps of a closed cell respiration run, and then through Analysis. Alternatively, you can follow this by using the flow-through respirometry simulation.

5.1 Click the **Start** button. Notice that this button has now become the **Stop** button and a **Marker** button is available on the toolbar. At the same time a heavy black line appears at time 00.00, the start time appears beneath the screen and the traces begin to scroll.



5.2 Click the **Markers** button. (You are not actually going to use it in this simulation, but click it anyway.) In a real experiment you would use this to indicate an event such as the addition of substrate or inhibitor to the respirometry chamber(s). You would record details of this in the dialog box which has appeared. Click **Cancel**.

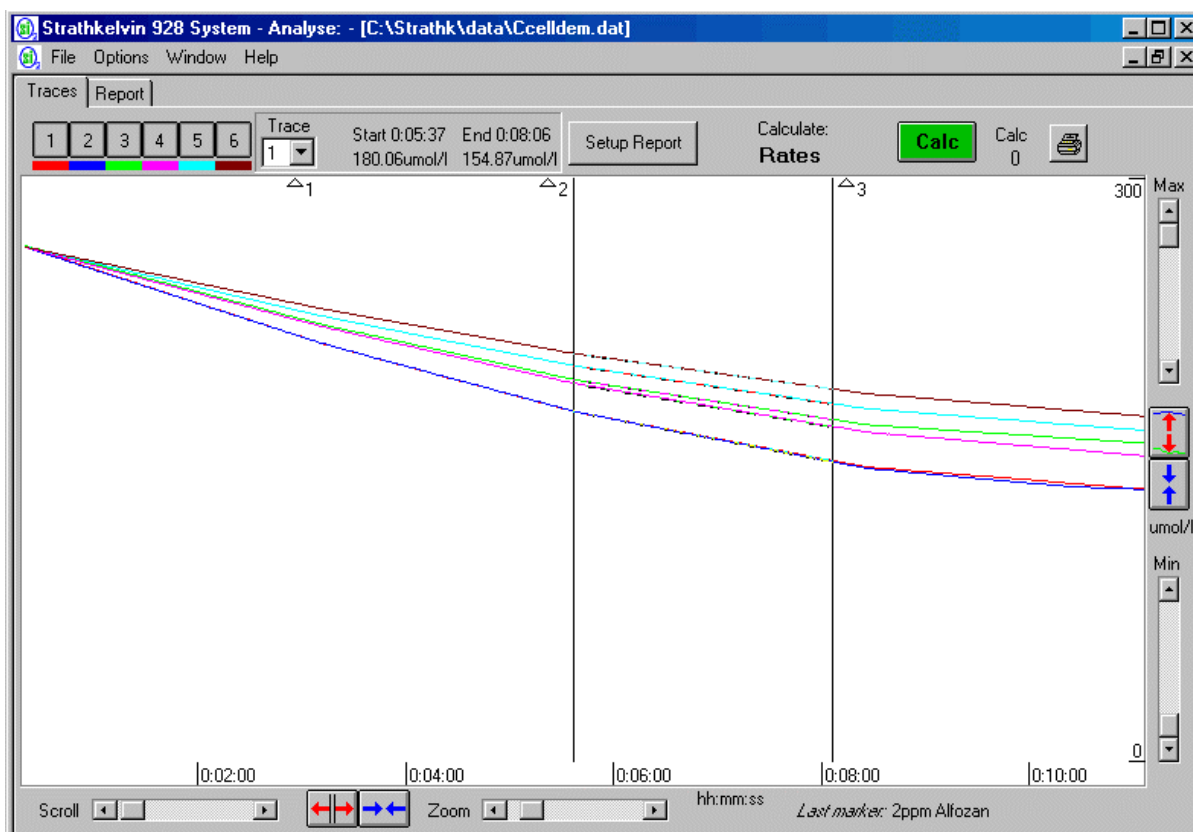
5.3 When the trace for electrode 6 (brown) has reached zero, click the **STOP** button. In the **Save Data File As** dialog, click **OK** to accept the default filename which is based on the current date.

5.4 You will see that you have now been returned to the **Setup** screen. At this stage you could either run another experiment or you could analyse the run that has just been completed.

To see the traces of the simulation that you have just run, go to the **File** menu and select **Analyse**. The analysis screen now opens to show the traces filling the full screen. However instead of analysing this run, we will analyse a more typical experiment by opening the data file of another closed-cell respirometry experiment which was recorded previously. Data files are also provided for a flow-through and a monitor experiment, and these can be analysed subsequently if desired.

6. The Analysis screen

Click **File** and then **Open Respirometry file**. In the **Open Recording** dialog, select Ccelldem.dat and click **Open**. You will see that there are two pages displayed. The lower one is the **Report page**, whilst the one on top is the **Traces page**.



6.1 The **Traces page** shows the traces obtained in an experiment lasting 12 minutes. In this experiment, the electrodes were calibrated to read in μmol O_2/l , and the respiration rate units selected were μmol O_2/h . Only the first ten minutes are currently shown on screen. Later parts can be viewed using the **scroll** slider.

6.2 Changing the appearance of the trace.

The appearance of the traces may be changed by expanding the x axis with the zoom slider or by shifting the maximum and minimum values on the y axis with the max and min sliders. In addition, on the x axis the section of trace between the two vertical selector lines can be expanded to fill the whole width of the screen by clicking the red arrow icon below the x axis. Similarly the traces can be expanded to fill the whole height of the screen by clicking the red arrow icon beside the y axis. In both cases the traces will be restored by clicking the corresponding blue arrow icon.

6.3 The menu bar has three items:



File Options Window

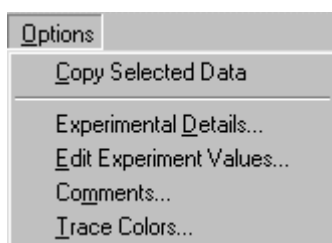
File has just three items: **Open Respirometry file**, **Close** and **Exit**.

Open Respirometry file allows you to open another pair of **Trace and Report** screens on top of those currently open.

Close closes the current window

Exit takes you back to the **Setup** screen

6.4 Click **Options** to reveal



Copy Selected Data copies to the clipboard, the values corresponding to the traces between the selector lines, for further analysis, if required.

Experiment Details allows you to see details of the experiment which were entered in **Setup**.

Edit Experiment Values allows you to add certain missing values if some were not available during Setup.

Comments allows you to enter further details of the experiment to be incorporated in the **Report**.

Trace Colors allows you to change the trace colors.

6.5 Let us now go through the steps in analysing this Closed Cell respirometry experiment.

1. With the mouse, move the pointer to the left hand vertical black selector line. Click and hold down the left mouse button and drag the line to right of the Event Marker 1 symbol where the uniform slope begins. Similarly drag the right hand selector to the centre of Event Marker 2. If **Rates** is showing under Calculate: on the top toolbar, regression lines will be fitted to the traces between the selector lines.
2. Click the **Setup report** button. From the dialog box select **Rates** and **normalised rates**, or leave **absolute rates** if preferred. Click **Save as default** if you wish these settings to be used for the next analysis. Click **OK**.
3. Click the **Calc** button to transfer these rates to the **Report** screen.
4. Drag the right hand selector line to the centre of Event Marker 3 and the left hand line slightly to the right of Event Marker 2. Click the **Calc** button again.

5. Finally drag the right selector to the end of the gradient of the trace, and the left one just to the right of event marker 3. Click the **Calc** button.
6. If you wish to print a copy of the traces on the screen, click the 'Print' icon on the toolbar.
7. Now click the **Report** tab to open the results page.

7. Report

The Report page tabulates the results, together with the information about the experiment that you entered in **Setup** and perhaps also in **Analyse**, together with the date and filename.

The page has three buttons on its top toolbar:

- Print** to allow you to print a hard copy of the Report
- Copy** to enable you to copy the data to the clipboard from where it can be pasted into a word processor, spreadsheet etc
- Save** to enable you to save the results as a spreadsheet file.

Use the Close box to exit. This closes the Analyse screen and its Report page.

Click **Exit Analyse** in the **File** menu. If you wish, you may now try analysing a Flow-through experiment file (**flowdemo.dat**) or a Monitor only experiment (**mondemo.dat**). Note that the Flow through experiment is a recording of a perfused organ preparation. There are no biomass values involved.

[15 March 2001 928DEMO.DOC]