
OxyCorder
for O₂ (gas) measurement

User's Guide

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1. GENERAL DESCRIPTION

The polarographic measurements of dissolved oxygen by a Clark electrode is the primary application. The OxyCorder provides an adjustable polarizing voltage (-1 to +1V; -0.7V for oxygen) to the electrode and measures the electric current with a high accuracy and stability. Three input channels are adapted for different electrode types including a bare electrode for fast measurements. The signal is digitized and transferred via a serial port to a computer. The software displays the measured curves on the computer screen and helps to evaluate the rates of oxygen concentration changes. The programmable auxiliary TTL outputs are designed to control external light sources as LED panels, shutters or flash lamps in synchrony with a user-defined measuring protocol.

As the OxyCorder serves primarily to facilitate the polarographic measurements of dissolved oxygen in photosynthesis research, impedance of 3 independent electrode input channels is pre-set for various electrode sizes: 4 M Ω (channel 1), 1.3 M Ω (channel 2), and 33 k Ω (channel 3 - for large electrodes as bare platinum-silver). The fourth input channel enables a voltage reading (\pm 200 mV, e.g., fluorescence signal from a fluorometer). The PC **OxyWin** software controls polarization voltage of the electrodes (0 to 1000 mV, two 10 bit D/A converters), other parameters and features of the instrument, and displays and analyses the data.

Any of the 3 input channels may be configured for a voltage reading (maximally 10 measurements per second in one channel mode) and the instrument can be also used to replace chart recorders. Three TTL outputs (minimal timing step is 1 ms) allow controlling external devices as shutters or flash lamps. The reading of data can be synchronized with the controlling signals. For example, the oxygen bursts occurring in the organisms of oxygenic photosynthesis after an exposure to actinic flashes can be measured with a pre-set delay between the flash and the measurement.

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Free software upgrades can be downloaded from our homepage (<http://www.psi.cz>). The homepage also offers mailing and E-mail addresses for inquiries and technical support as well as for pricing information and information on our newest products.

2. CONFIGURATION OF YOUR INSTRUMENT

pc	Item
1	OxyCorder 301S control unit
1	Serial port cable
1	2-pin BNC plug
1	220V AC / 7 - 19V DC power adapter
1	Installation diskette
1	User's Guide

3. HARDWARE ASSEMBLY

Front and back panels of the OxyCorder control unit are shown in Fig. 1 and Fig. 2, respectively.

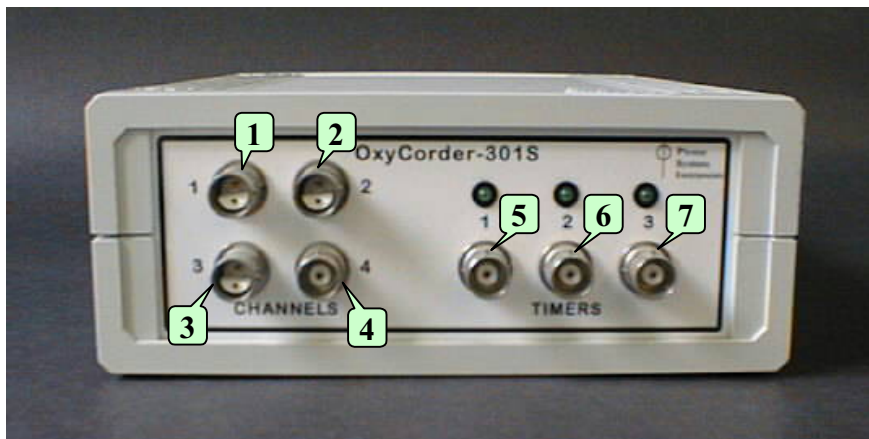


Fig.1. - Front panel of the OxyCorder control unit. Three input channels for electrodes with impedance $4M\Omega$ (1), $1.3M\Omega$ (2), and $33k\Omega$ (3) and one input channel for voltage reading ($\pm 200mV$) (4). Three TTL outputs for controlling of external devices (5, 6, 7).

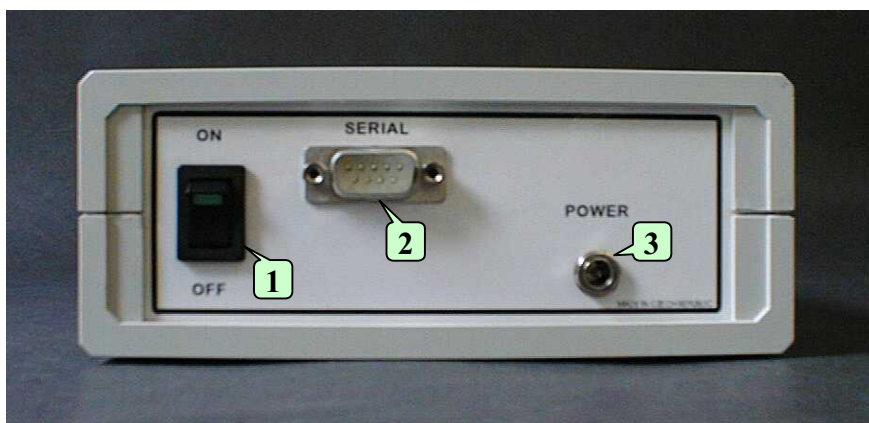


Fig.2. - Back panel of the OxyCorder control unit. Switch On / Off button (1), the plug for the serial port cable (2) and the plug for the AC/DC power adapter (3).

To assemble the instrument, follow the steps below:

- a) Check if the delivered components match the configuration of your instrument printed above.
- b) Connect the AC/DC adapter to the plug at the back part of the OxyCorder control unit (**3** in Fig. 2) and to the 110-220V AC.
- c) Using the serial port cable, connect the 9-pin connectors to the plug at the back part of the OxyCorder control unit (**2** in Fig. 2) and to either COM1 or COM2 of your computer.
- d) Using the 2-pin BNC plug mounted to the cables of you electrode, connect it to input channel (**1 - 3** in Fig. 1) with appropriate pre-set impedance.
- e) If you require an additional voltage reading from another instrument (e.g., a fluorometer), connect the instrument to the input channel 4 of the OxyCorder control unit (**4** in Fig. 1) by the standard BNC cable (optional equipment).
- f) To control function of external device (e.g., a flash lamp), connect it to the TTL output of the OxyCorder control unit (**5 - 7** in Fig. 1) by the standard BNC cable (optional equipment).
- g) Switch on the instrument (**1** in Fig. 2) and the computer and go to the Windows environment.
- h) Start Menu of Windows operating system to install the software package on your computer. Click the **OxyWin** icon to start the program. From the **Setup / Communication** menu, select the serial port (COM1 or COM2) to which you have connected the OxyCorder. Click the **Control / Device Id** in the menu to activate the communication. The status info in the lower left corner of the **OxyWin** window should appear and the device info in the lower right corner should give you the instrument name.

4. OXYWIN SOFTWARE

OxyWin software controls polarization voltage of the electrodes, other parameters and features of the instrument, and displays and helps to analyze the data.

There are three main windows in the software - **Graph**, **Channel Properties** and **Description** window that can be seen by selecting them in the **View** menu (see 4.4.2) or by clicking appropriate icon of the **Page** toolbar (see 4.5).

4.1 Graph window

The positions of two cursors in the **Graph** window (Fig. 3) are indicated by two triangles at the top of the graph area and by two dashed lines. The cursor can be moved by a mouse click (left or right). The coordinates of the nearest data points to the left (**X1**, **Y1**) and right (**X2**, **Y2**) cursors of the **Selected** curve are shown for in the bottom left part of the **Graph** window. **DeltaX** and **DeltaY** define difference between **X2** and **X1** and between **Y2** and **Y1**, respectively, while **Slope** is defined as $\text{DeltaY} / \text{DeltaX}$.

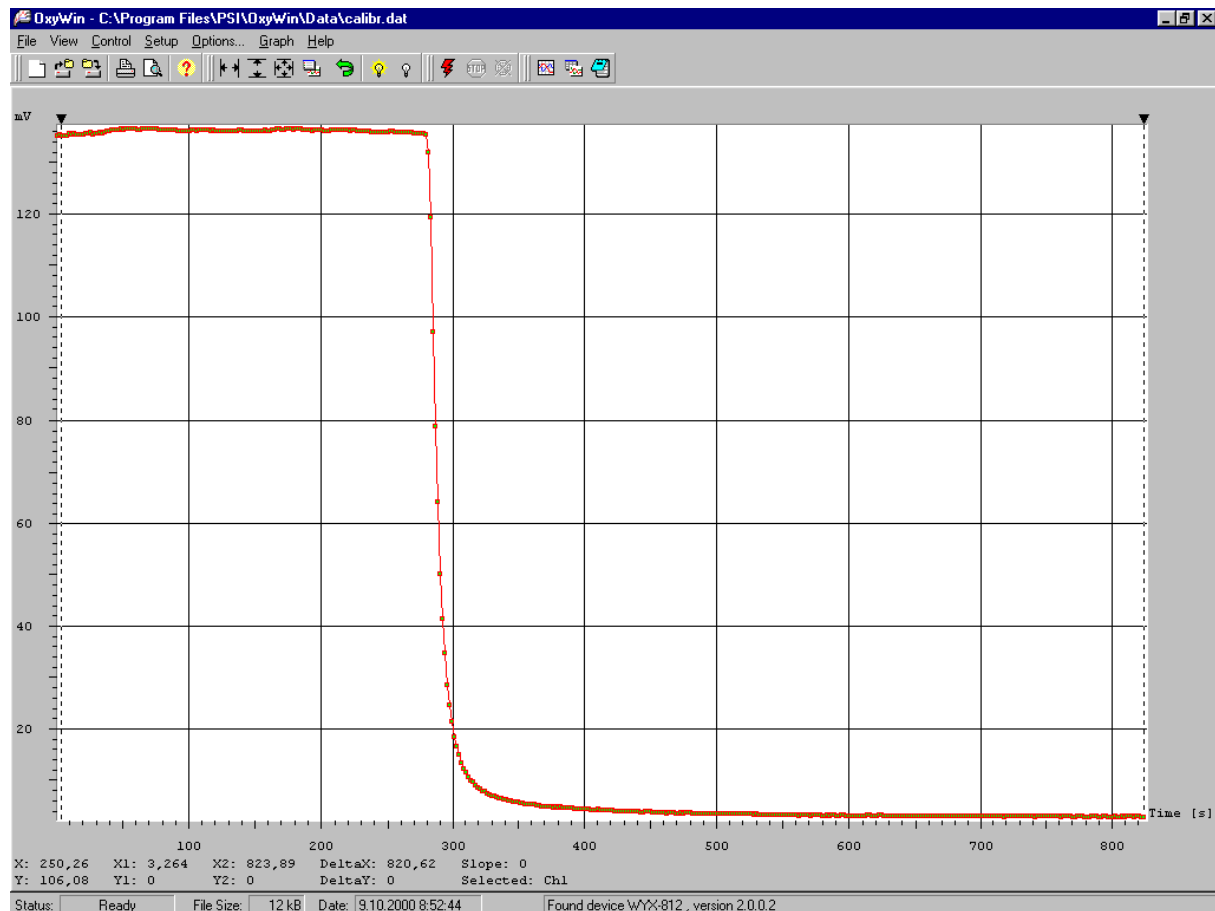


Fig.3. - The Graph window with a result of the calibration.

4.2 Channel Properties window

The graphical presentation of measured curves can be customized in the **Channel Properties** window (Fig. 4) by changing **Style**, **Mark**, **Mark size**, **Line style**, **Line width**, **Color**, and **Brush** parameters by double clicking the left mouse button. Any curve can be displayed or

hidden by a double clicking the left mouse button in **Show** column. The **Caption** of each curve can be modified for easier identification of the objects. Numerical values in each curve can be multiplied (**Multiplication**) or shifted along the y-axis (**YShift**) by double clicking the left mouse button in the corresponding column. **Points** give the number of measured data points in the experiment.



Fig.4. - The Channel Properties window.

4.3 Description window

In the **Description** window (Fig. 5) you can give the **Title** to the experiment and describe the results.

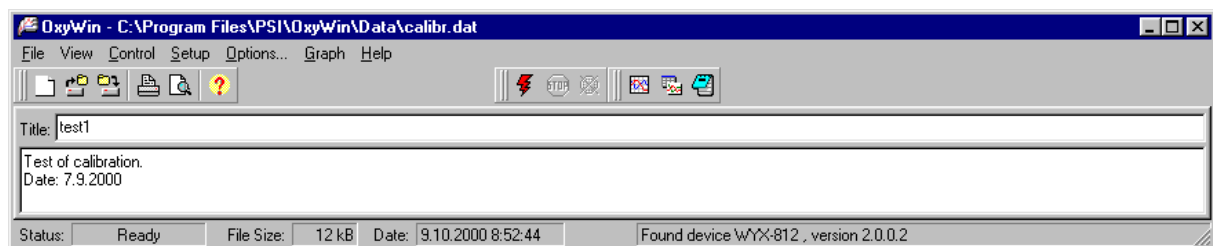


Fig.5. - The Description window.

4.4 Menu

4.4.1 File menu

The **File** menu includes following items: **New** (creates new experiment), **Open..** (opens saved experiment), **Save** (saves the experiment), **Save As..** (saves the experiment as) **Export..** (exports the data as text file), **Preview** (shows the page layout before printing), **Print..** (prints the page), **Print Setup..** (setups the printing), **Page Setup..** (setups the page layout) and **Exit** (exits the **OxyWin** software).

4.4.2 View menu

Clicking on the items in the **View** menu (**Graph**, **Channel Properties**, **Description**) opens the appropriate software window whereas particular toolbars (**Main**, **Graph**, **Control**, **Page**, see 4.5) became visible when selected in the **View / Toolbar** menu.

4.4.3 Control menu

Clicking on the **Monitor** item in the **Control** menu opens a new window where you can see measured voltage in two selected input channels. Meaning of the **Start**, **Stop** and **Pause** items of the **Control** menu is obvious. When the communication port is set in the **Setup / Communication** menu, clicking on **Device Id** item in the **Control** menu activates the communication (see 3h). Clicking on the **Test 1-st (2-nd, 3-rd) Generator** in the **Control** menu only tests the signal in the first (second, third) TTL output.

4.4.4 Setup menu

Clicking on the **A/D and generators..** item in the **Setup** menu opens a new window (Fig. 6).

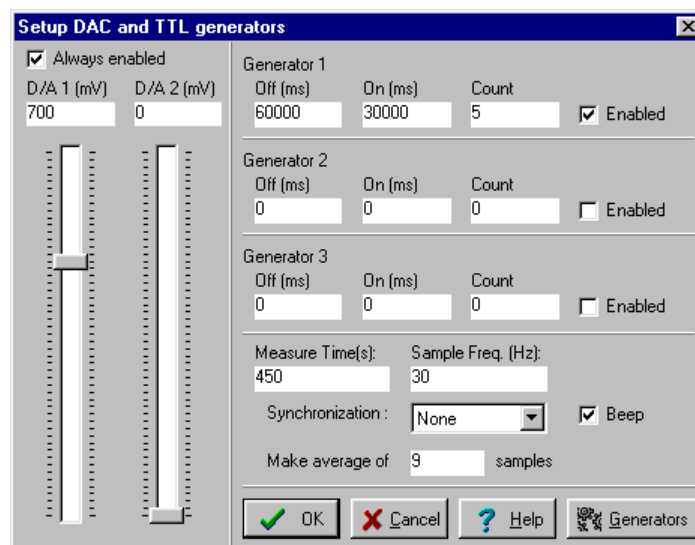


Fig.6 - The Setup DAC and TTL generators.. window.

Using the two vertical scroll bars in the left part of the window, the voltage range for the D/A converters can be set. By defining parameters of the **Generator 1 - 3** in the upper right part of the window, parameters of the three TTL outputs are set. **On [ms]** and **Off [ms]** define for how long (in milliseconds) there will be a signal on and off, respectively, in the particular

TTL output. **Count** defines how many times the signal on and off will be repeated. The settings of the generators are **Enabled** by checking the checkboxes. When external devices for which the generators were defined are connected to the OxyCorder, the setting of the generators can be checked before the measurement by clicking the **Generators** button in the bottom right part of the window. Total **Measure Time** in seconds is defined in bottom right part of the window. **Sample Frequency** only informs you about the rate of data measurement (in the range of 5 - 30 Hz). The start of the measurement can be synchronized with the timing of the appropriate generator by its selection in **Synchronization**. To improve signal / noise ratio, experimental data points can be averaged (**Make average of samples**). Checking the **Beep** checkbox causes the beep signal when any measurement is performed.

Clicking on the **Setup / Scale..** opens a new window (Fig. 7) where voltage scales of the four input channels are set and a signal from particular input channel is **Enabled** to be recorded.

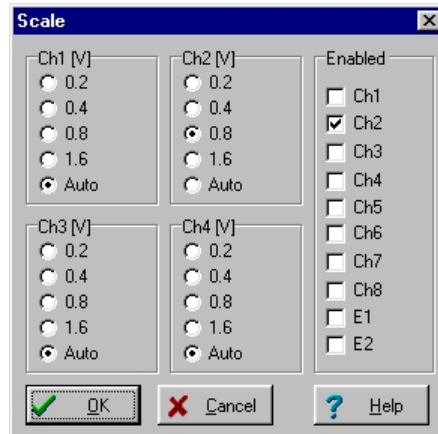


Fig.7 - The Scale window.

The **Input mode..** and **Out ports..** items are not supported by a standard version of the OxyCorder instrument. By clicking the **Setup / Communication**, the communication port is set in the **Communication** window. Also in this window, checking the **Ask device on startup** checkbox automatically enables the communication between the **OxyWin** software and the OxyCorder instrument when the software is started (i.e., it is not necessary to click on the **Device Id** item in the **Control** menu).

4.4.5 Options menu

When clicking on the **Options..** menu, new window opens where you can check whether you want to **Confirm actions** and **Print description** in printing. By checking the **Graph follows**

data checkbox in the menu, the measured curve is displayed online on the screen, otherwise auto scale functions (from the **Graph** menu or the particular icon) must be used.

4.4.6 Graph menu

The items in the **Graph** menu have following meaning: **Log Scale X** (shows the x-axis in logarithmic scale), **Auto Scale X** (autoscales the x-axis), **Auto Scale Y** (autoscales the y-axis) and **Auto Scale XY** (autoscales the x- and y-axes). Clicking on the **Manual Scale..** in the **Graph** menu opens a new window when you can **Set** the scale of x- and y-axes manually. Clicking on the **Trim Left (Right)** of the **Graph** menu deletes all the data points on the left (right) from the left (right) cursor. Fonts used in the graph are set in the window that opens by clicking on **Graph / Font..** The fonts can be **Saved as default** by clicking this item in the **Graph** menu.

4.5 Toolbars

There are four toolbars - **Main**, **Graph**, **Control** and **Page** (Fig. 8) that can be visualized by selecting them in the **View / Toolbar** menu.



Fig.8 - The toolbars.

The **Main** toolbar contains following icons: **New Experiment** (creates new experiment), **Open Experiment** (opens saved experiment), **Save Experiment** (saves the experiment), **Print** (prints the page), **Print Preview** (shows the page layout before printing) and **Help**.

The **Graph** toolbar contains following icons: **Auto Scale X** (autoscales the x-axis), **Auto Scale Y** (autoscales the y-axis), **Auto Scale XY** (autoscales the x- and y-axes) and **Undo** (undoes the last action). Clicking the **Select Signal** icon of the **Graph** toolbar opens a new window where you **Select Curve**, parameters of which are shown below the graph. The **Show All** and **Hide All** icons of the **Graph** toolbar show all curves in the graph and hide all curves, respectively.

Clicking on the **Start**, **Stop** or **Pause** icons of the **Control** toolbar starts, stops or makes a pause, respectively, in the experiment.

The **Page** toolbar contains the **Graph**, **Channel Properties** and **Description** icons, clicking of which opens the **Graph** window, **Channel Properties** window and **Description** window, respectively.