Instruction Manual for Oxy-Pro for Windows

(Model: Hb141)

This is the instruction manual for the Windows version of the measurement and display program for the tissue oximeter "Oxy-Pro©".

Oxy-Pro is registered as a trademark, and the measurement algorithm is protected by the patent laws of Japan, the United States, and the United Kingdom, respectively. The shape of the Oxy-Pro and the fixing belt have been applied for and registered as Japanese patents and utility models.

Precautions for handling

1. Do not replace the battery while the power is on.

2. Use the attached fixing belt in direct sunlight. It can block sunlight.

3. The shade is made of elastomer (chemical rubber), and its elasticity will deteriorate if it is pulled unnecessarily.

4. Bluetooth-BLE is used. The range of the radio wave is within 5 meters.

    Bluetooth-SIG member (ID=D047733 Category=Oximeter).

5. This device is not a medical device. If it is to be used for medical treatment, get approval from the ethics committee of the university or hospital before use.

Table of contents

Features of Oxy-Pro

The Oxy-Pro has two measurement modes and a subcutaneous fat correction function.

Real time Mode
Real mode displays the measured values of the Oxy-Pro on your smartphone, tablet, or computer in real time via Bluetooth.

Storage mode
This mode can take measurement separately from a smartphone, tablet, or computer without using Bluetooth, which has a finite range. The measured values are recorded and saved in the built-in flash memory, and the data can be uploaded afterwards via Bluetooth by placing it near the smartphone, tablet, or computer.

Subcutaneous fat correction function (Fat thickness)
In biometric measurements using near-infrared light, the thickness of subcutaneous fat has a significant effect as an error factor. The Oxy-Pro corrects the oxygen saturation value by inputting the thickness of the subcutaneous fat in advance, and outputs an accurate value.

1. Preparation

1-1. Prepare the computer

Unlike iOS and Android, Windows-PC requires Bluetooth pairing in advance, so pair the Oxy-Pro with the computer according to the instruction manual of the PC you are using. Prepare the Oxy-Pro according to the instruction manual included in the package.

The measurement display program is compatible with iOS, Android, and Windows-PC, but this instruction manual is for Windows-PC.

2. Setting display

Turn on the Oxy-Pro, confirm that the indicator light is blinking repeatedly, and then click "Start" in the upper left corner of the setting display.

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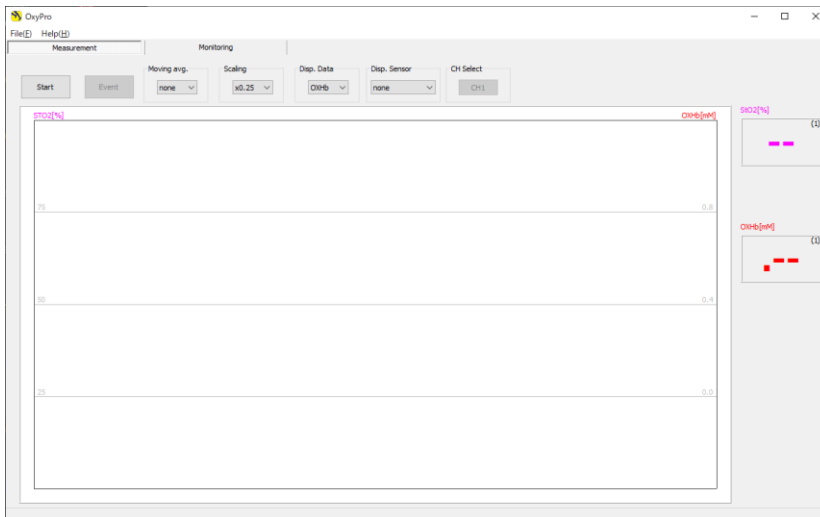
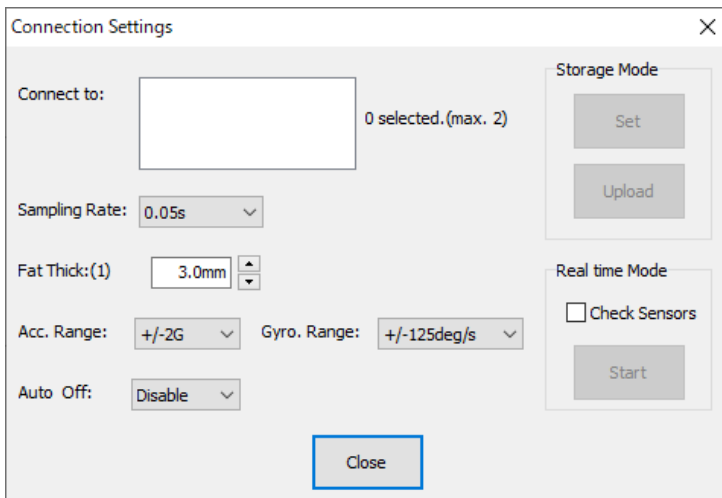When the Oxy-Pro is paired and powered on, the following dialog setting screen will appear. The following is an explanation of each item. Please set the value for each.

2-1. Connect

The IDs (serial numbers) of the Oxy-Pro units that are currently available for communication will be displayed.

To use two Oxy-Pro units at the same time, turn on the power of the two Oxy-Pro units, and the IDs of the two Oxy-Pro units will be displayed. Click on the IDs of the two Oxy-Pro's to select them.

2-2. Sampling rate

Set the sampling rate.

The sampling rate can be set to 0.05 sec, 0.1 sec, 0.2 sec, 0.5 sec, 1.0 sec, or 5.0 sec. When using two units in real mode at the same time, some PCs may not be able to handle sampling as fast as 0.05 sec due to their

capabilities. In addition, the influence of radio wave environment such as Bluetooth cannot be ignored.

2-3. Subcutaneous fat thickness

Among the algorithms for measuring hemoglobin concentration in blood using near-infrared light, the algorithm used in the Oxy-Pro corrects the measured value of oxygen saturation by setting the subcutaneous fat thickness, and displays and outputs a value closer to the actual measurement value. The fat thickness can be set from 1 to 11 mm.

The thickness of inclusions can be set for each unit when two units are used simultaneously. If the thickness of the subcutaneous fat layer is measured with an ultrasound tomography system and the fat thickness is input, a more accurate oxygen saturation measurement value will be output.

2-4. Accelerometer and gyroscope range

Set the range of the mounted 6-axis sensor (3-axis accelerometer, 3-axis gyroscope rate).

Accelerometer: ±2G, ±4G, ±8G, ±16G

Gyroscope: ±125 °/S, ±250 °/S, ±500 °/S, ±1000 °/S, ±2000 °/S

2-5. Auto-off

Time until the power is automatically turned off when the instrument is in standby mode (not under measurement in Real mode or Storage mode).

When "Disable" is selected, the power will not be turned off automatically.

2-6. Storage mode

For details, refer to section 4 "Measurement (Storage Mode)".

The [Set] button sends the settings made in the dialog to the Oxy-Pro. If the Bluetooth connection is not established at this time, the message "Set up xxxx." will not be displayed.

2-7. Upload

Upload the data measured in the stored mode to Windows-PC. When the data has been successfully uploaded, a window for entering a file name will appear, so enter a file name that is easy to recognize. The file will be saved in the data folder "Data".

The file will be saved in the data folder "Data". When finished, the measured values will be displayed as a trend graph as shown below. Please refer to the explanation of each item in the next section 3, "Measurement".

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By dragging the slide bar at the bottom to the left or right, it is possible to move to the area of interest of the measured value for confirmation.
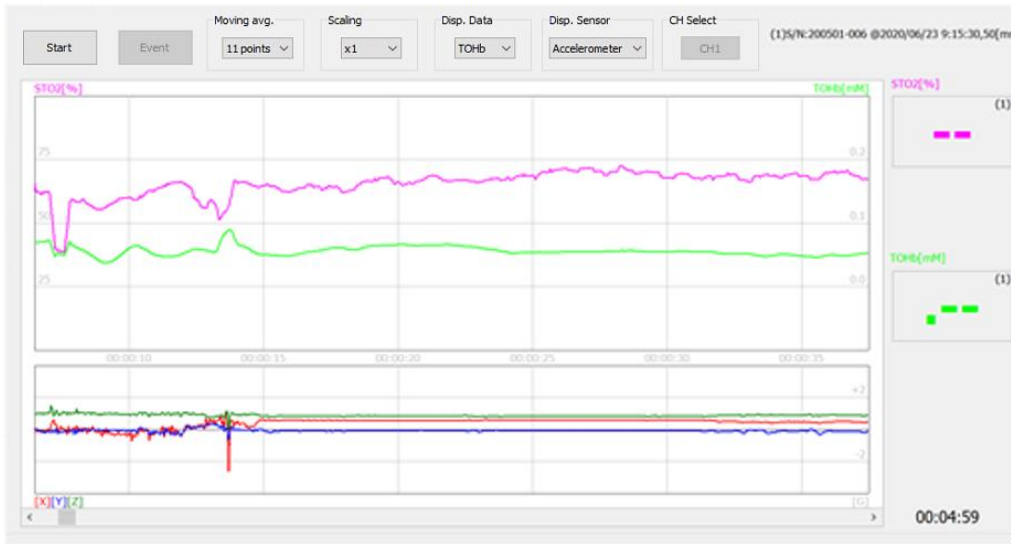
In the upper right corner of the graph, information about the loaded data is displayed. In the upper right corner of the graph, information about the loaded data is displayed, including the measurement start date, device ID, sampling rate, and fat thickness.

The upper part of the trend graph shows the time (JST), the lower part shows the elapsed time since the start of measurement, the left scale of the trend graph shows the oxygen saturation (%), and the right scale shows the unit of hemoglobin (mM).

2-8. Sensor inspection

Two optical sensors are used to measure the tissue oxygen concentration. They are placed at 20 mm and 30 mm from the light source (LED), respectively.

By measuring the readings of these optical sensors (the light source LED is automatically turned off), it can be checked if the Oxy-Pro is properly attached to the skin.

If the Oxy-Pro is lifted off the skin, external light will enter through the gap, so it must be completely attached to the skin for good measurement.

When the sensor confirmation is checked and measurement is started, the measured value of the optical element is displayed as a 16-bit integer in a trend graph with red (20 mm) and blue (30 mm).

When there is no external light from gaps, the measured value is the value of sunlight that has penetrated the living body. Ideally, the two values should be close to zero.

3. Measurement (Real-time mode)

The following is the screen during measurement, and the explanation of each command is given below.
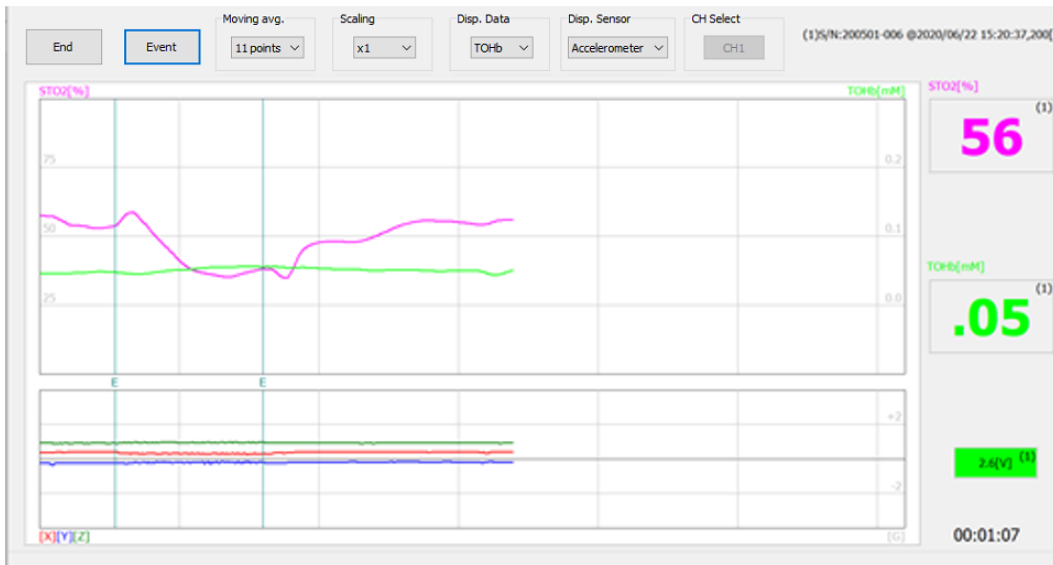
3-1. Disconnect

Click "End" when the measurement is finished. The measurement data will be saved in a file, so enter a file name. The file will be saved in the "Data" folder.

3-2. Event function

This function allows the user to mark the data. Clicking "Event" will mark the data.

3-3. Moving Average

This function performs moving average processing of the displayed data during measurement. However, it is not reflected in the csv file. Selections "None", "3 points", "5 points", "7 points", "9 points", or "11 points".

3-4. Scaling

Set the display magnification of the trend graph of each hemoglobin concentration except for oxygen saturation.

Magnification can be set to x0.25, x0.5, x1, x2, or x4.

3-5. Data display

The value of each hemoglobin is selected and displayed.

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OXHb = oxygenated hemoglobin

DXHb = deoxygenated hemoglobin,

TOHb = total hemoglobin

Unit: millimole mM

3-6. Sensor display

Select "Accelerometer" or "Gyroscope" for the trend displayed in the sensor display area.

3-7. CH display selection

Select the trend display when two units are used.

3-8. Oxygen Saturation Digital Display

The numeric display on the right side of the screen during measurement shows the current measurement digitally. The unit is [%].

3-9. Digital display of the selected hemoglobin concentration

The current measurement value of the hemoglobin selected in 3-5 "Data Display" is displayed.

Red = Oxygenated hemoglobin

Blue = Deoxygenated hemoglobin

Green = Total hemoglobin

Unit : mM

3-10. Battery voltage

Displays the battery voltage of the Oxy-Pro.

2.6 V to 3.1 V   Green → Safe to use.

2.5 V to 2.6 V   Yellow → Measurement is expected to be cut off.

2.5 V or less   Red display → Replace the battery.

3-11. Confirmation of measurement data

Display after completion of measurement or data upload in Real mode and Storage mode

The measured data can be checked on the spot.

Slide the slide bar at the bottom to the left or right to check the data in the area of interest.

3-12. Scale display

The left side of the trend graph shows the oxygen saturation (StO$_2$: %), and the scale is 25 %. The normal StO$_2$ is around 65 %. The right side of the trend graph shows the amount of each hemoglobin in mM (customary notation for m mol/L).

4. Measurement (Storage mode)

In the storage mode, the device is not wirelessly connected to the host device (smartphone, tablet, computer, etc.), so the storage mode is effective in water where radio waves do not propagate, or in exercises where the host device may interfere with the exercise.

4-1. Setting

Click [Set] under [Storage mode] in the upper right corner to apply the settings made in the dialog box to Oxy-Pro.
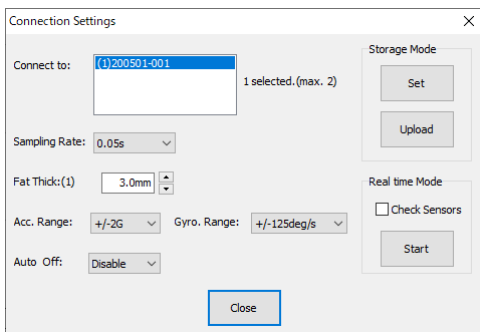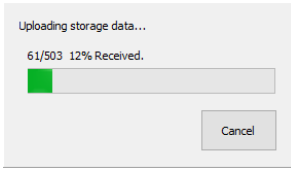

4-2. Measurement

Make sure the green LED on the Oxy-Pro is blinking, and press the power button again. The green LED will change to red. The measurement data is stored in the built-in flash memory while taking the measurement.

4-3. Upload

After completing the measurement, turn off the power of the Oxy-Pro, and then turn it on again to confirm that the green LED is blinking. Download the data from Oxy-Pro to Windows-PC. While Uploading, "Uploading storage data..." and "nn/nnn xx% Received." will be displayed.

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After the file has been uploaded successfully, a screen for entering a file name will appear. Enter a file name that is easy to recognize. The file will be saved in the data folder "Data".

The Oxy-Pro measurement application for Windows allows you to check the acquired data. The Oxy-Pro measurement application for Windows allows you to check the acquired data, and you can also reopen the saved data, but it does not allow you to compare multiple data, so we recommend using the Viewer (Oxy-Pro Data Viewer) program.

5. Monitor display

When selecting a monitor in the measurement and monitor switching tabs, the screen switches to the one shown below.
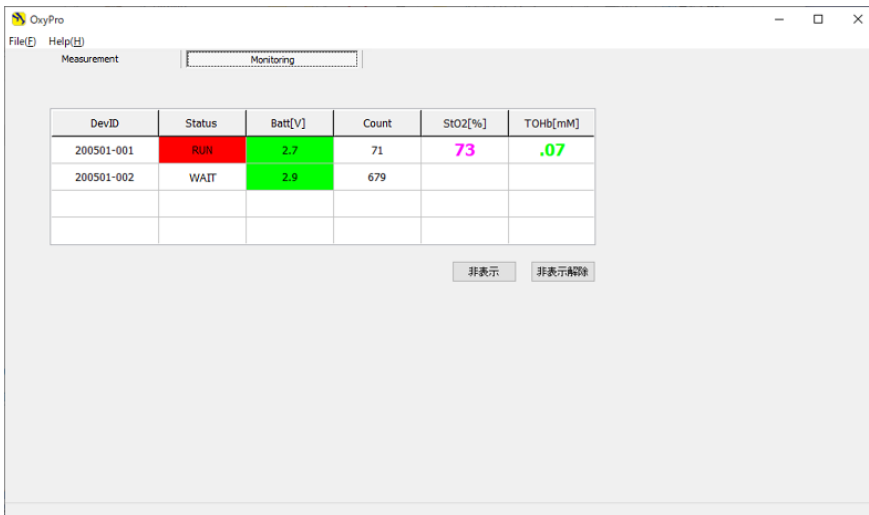
Status: Indicates operation status, standby status, or storage-mode measurement.

Batt[V]:   Indicates the battery voltage.

Count: Indicates the number of stored data recorded in the built-in flash memory of the Oxy-Pro. The number of data increases during the measurement in the storage mode.
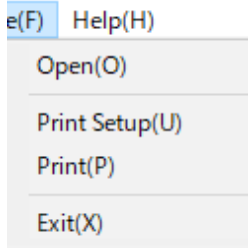
StO2, TOHb: Measured values are displayed during the storage mode measurement.

Hide button: Hides the monitor display of the selected device.

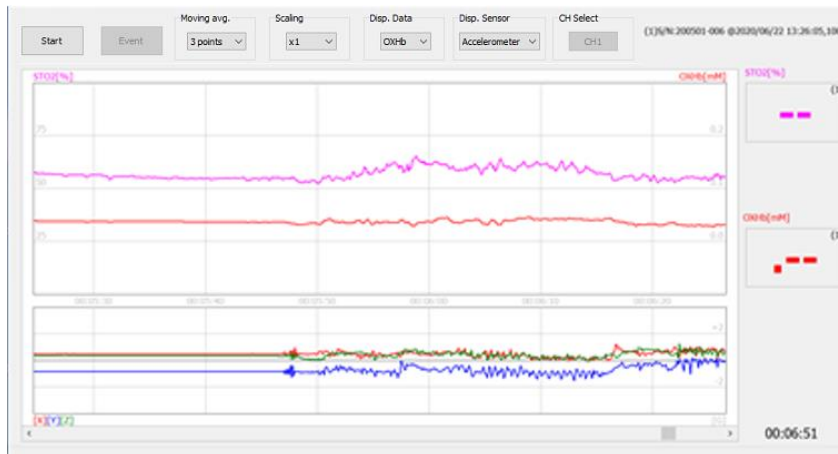Unhide button: Restores all hidden devices to the display status.

6. Menu (File operation)

6-1. File

6-2. Open(O)

Load a CVS file.

Select the CVS file from the menu [File (F)] [Open (O)] to load it and display the trend graph. The upper left corner of the graph and the lower left corner of the screen display the information of the loaded data. The graph in the trend graph display area shows the time at the top and the elapsed time from the start of measurement at the bottom.

6-3. Printing setup(U)

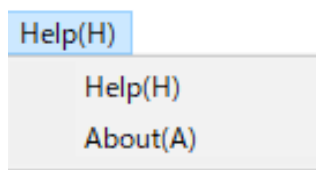Set the printer and paper settings.

6-4. Print(P)

Print the screen image.

6-5. Exit(X)

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Exit the program.

6-6. Help

Help(H)
    Help(H)
    About(A)

Open this instruction manual.

6-7. About(A)

The version information of this program "Oxy-Pro" measurement program will open.

7. Specifications of Oxy-Pro

Measurement method	SR-NIRS (spatially resolved method, near-infrared spectroscopy)
Measurement item	Oxygen saturation (StO$_2$: %) Oxygenated hemoglobin (Oxy-Hb: mM) Deoxygenated hemoglobin (Deoxy-Hb: mM) Total hemoglobin (T-Hb: mM) Accelerometer, Gyroscope
Measurement mode	Real time mode: Measurement data is displayed in real time on a smartphone or other device. Storage mode: Measurement data is stored, and after completion, the data is uploaded to a smartphone or other device for display.
Sampling rate	Single-Mode: 0.05sec/20Hz ,0.1sec/10Hz ,0.2sec/5Hz ,0.5sec/2Hz ,1.0sec/1Hz ,5.0sec/0.2Hz Dual-Mode: 0.05sec/20Hz ,0.1sec/10Hz ,0.2sec/5Hz ,0. 5sec/2Hz ,1.0sec/1Hz ,5.0sec/0.2Hz In Dual-Mode, 0.05sec 0.1sec may not be available depending on the capability of the host device or the surrounding radio wave environment.
Fat layer correction	Setting the oxygen saturation (StO$_2$: %) and subcutaneous fat thickness in

	advance increases the accuracy of the value.
Measurement display program	The iOS version can be installed from the App Store. The Android version can be installed from the Play Store or downloaded from our website. The Windows version and data display program can be downloaded from our website.
Wireless	Bluetooth-BLE, Registration ID=D047733
Battery	Coin cell battery: CR2032R (Murata recommended) / *High current type Continuous measurement time: Approx. 5 hours with 1 second sampling, approx. 30 minutes with 0.05 second sampling
Display device	Coin cell battery: CR2032R (Murata recommended) / *High current type Continuous measurement time: Approx. 5 hours with 1 second sampling, approx. 30 minutes with 0.05 second sampling
Dimensions	Size: Length: 46 mm, Width: 30 mm, Thickness: 8 mm Drip-proof structure (sweat-proof structure) Weight: 11 g (including battery, excluding shade)

8. Notes (Unit description)

The unit of StO_2 (tissue oxygen saturation) displayed by Oxy-Pro is %, which indicates the average oxygenation state of the blood in arteries, veins, and capillaries. The blood volume index, which is also displayed, is a variable indicating the amount of blood contained in the measurement area and is in arbitrary units.

For example, a blood volume index of 0.2 is equivalent to an Hb concentration of 0.2 mmol/L, and an Hb molecular weight of 65,000 is equivalent to 1.3 g/dL. This value means that 1.3 g of Hb exists in 1 dL of biological tissue, not in 1 dL of blood. Since the blood volume index is proportional to the reciprocal of the scattering coefficient of biological tissues, it is necessary to consider the possibility of superimposing a scattering coefficient variation of about 20~30 % when comparing values among individuals.

For StO_2, the error due to the difference in the scattering coefficient is small because the "ratio" of the concentration is calculated.

Hemoglobin 1 mol = 65,000 g

Hemoglobin index 0.2 m mol/L

= 0.2 * 65,000 g * 10^{-3}/L

= 13 g/L = 1.3 g/dL

Note: In the measurement program, the unit m mol/L is shown as mM.

Bluetooth-BLE = Bluetooth Low Energy

A communication method in the 2.4GHz band, a specification added in Ver. 4.0 or later.

Oxy-Pro Data Viewer

The data measured with Oxy-Pro can be checked with Oxy-Pro Data Viewer.

This program is limited to Windows. Please refer to the help of the program for detailed instructions.

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