OLED LIFETIME SYSTEM

USER MANUAL

Manual version: 2.0.F
Product code: T2004 / T2005
Product Version: 2.0
Software version: 2.1

Contents

1. Overview

The Ossila OLED Lifetime System is a low-cost solution for reliable current-voltage measurements of light emitting diodes. The system is controlled by specially designed software which can perform multiple I-V measurements, measure the current and relative light intensity over long periods of time.

2. EU Declaration of Conformity

We

Company Name: Ossila BV

Postal Address: Biopartner 3 building, Galileiweg 8

Postcode: 2333 BD Leiden

Country: The Netherlands

Telephone number: +31 (0)71 3322992

Email Address: info@ossila.com

declare that the DoC is issued under our sole responsibility and belongs to the following product:

Product: Ossila OLED Lifetime System – Manual (**T2004A2/T2004B2/T2004C2**), Ossila OLED Lifetime System – Automated (**T2005A2/T2005B2/T2005C2**)

Serial number: T2004A2-xxxx, T2004B2-xxxx, T2004C2-xxxx, T2005A2-xxxx, T2005B2-xxxx, T2005C2-xxxx

Object of declaration:

Ossila OLED Lifetime System – Manual (**T2004A2/T2004B2/T2004C2**), Ossila OLED Lifetime System – Automated (**T2005A2/T2005B2/T2005C2**)

The object of declaration described above is in conformity with the relevant Union harmonisation legislation:

EMC Directive 2014/30/EU

RoHS Directive 2011/65/EU

Signed:

Name: Dr James Kingsley

Place: Leiden

Date: 16/11/2021

Декларация за съответствие на ЕС
Производител: Ossila BV, Biopartner 3 building, Galileiweg 8, 2333 BD Leiden, NL.
Декларира с цялата си отговорност, че посоченото оборудване съответства на приложимото законодателство на ЕС за хармонизиране, посочено на предходната(-ите) страница(-и) на настоящия документ.

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3. Safety

3.1 Warning

- The absolute maximum input voltage is ±12 V.
- Do NOT apply input while not powered.

3.2 Use of Equipment

The Ossila OLED Lifetime System is designed to be used as instructed. It is intended for use under the following conditions:

- Indoors in a laboratory environment (Pollution Degree 2)
- Altitudes up to 2000m
- Temperatures of 5°C to 40°C; maximum relative humidity of 80% up to 31°C.

The unit is supplied with a 24 VDC power adapter, in accordance with European Commission regulations and British Standards. Use of any other electrical power cables, adaptors, or transformers is not recommended.

3.3 Hazard Icons

The following symbols can be found at points throughout the rest of the manual. Note and read each warning before attempting any associated operations associated with it:

Table 3.1. Hazard warning labels used in this manual.

Symbol	Associated Hazard
	Electrical shock

3.4 General Hazards

Before installing or operating the Ossila OLED Lifetime System there are several health and safety precautions which must be followed and executed to ensure safe installation and operation.

3.5 Power Cord Safety

Emergency power disconnect options: use the power cord as a disconnecting method and remove from wall. To facilitate disconnect, make sure the power outlet for this cord is readily accessible to the operator.

3.6 Servicing

If servicing is required, please return the unit to Ossila Ltd. The warranty will be invalidated if:

- Modification or service has been carried out by anyone other than an Ossila engineer.
- The Unit has been subjected to chemical damage through improper use.
- The Unit has been operated outside the usage parameters stated in the user documentation associated with the Unit.
- The Unit has been rendered inoperable through accident, misuse, contamination, improper maintenance, modification, or other external causes.

3.7 Health and Safety – Servicing

Servicing should only be performed by an Ossila engineer. Any modification or alteration may damage the equipment, cause injury, or death. It will also void your equipment's warranty.

4. Requirements

Table 4.1 details the power requirements for the OLED Lifetime System, and the minimum computer specifications for the Ossila LED I-V software.

Table 4.1. Ossila OLED Lifetime System requirements.

Power	24 VDC (supplied with the system)
Operating Systems	Windows 10 (32-bit or 64-bit)
CPU	Dual Core 2 GHz
RAM	2 GB
Available Hard Drive Space	120 MB
Monitor Resolution	1440 x 960
Connectivity	USB 2.0 or Ethernet (requires DHCP)

5. Unpacking

5.1 Packing List

The standard items included with the Ossila Lifetime System are:

- The Ossila OLED Lifetime System.
- 24 VDC power adaptor.
- USB-B cable.
- USB memory stick pre-loaded with the user manual, USB drivers, QC data, and software installer.
- LED and resistor test devices.

5.2 Damage Inspection

Examine the components for evidence of shipping damage. If damage has occurred, please contact Ossila directly for further action. The shipping packaging will come with a shock indicator to show if there has been any mishandling of the package during transportation.

6. Specifications

The Ossila OLED Lifetime System specifications are shown in **Table 6.1**.

Table 6.1. Ossila OLED Lifetime System specifications.

Voltage range	±333 µV to ±10 V
Current range	±10 nA to ±200 mA
Substrate Size	20 mm x 15 mm
Substrate Compatibility – T2004A/T2005A	S101 (OLED substrates)
Substrate Compatibility – T2004B/T2005B	S211 (PV substrates)
Substrate Compatibility – T2004C/T2005C	S171 (Pixelated cathode substrates)
Overall Dimensions – T2004	**Source Measure Unit:** Width: 125 mm; Height: 55 mm; Depth: 185 mm **Test Board:** Width: 105 mm; Height: 40 mm; Depth: 125 mm
Overall Dimensions – T2005	Width: 155 mm Height: 73 mm Depth: 320 mm

7. System Components

The Ossila OLED Lifetime System is comprised of three items: the Ossila OLED Lifetime System (**Figure 7.1**), and the Ossila LED I-V Software (**Figure 7.2**).

Figure 7.1. The Ossila OLED Lifetime System.

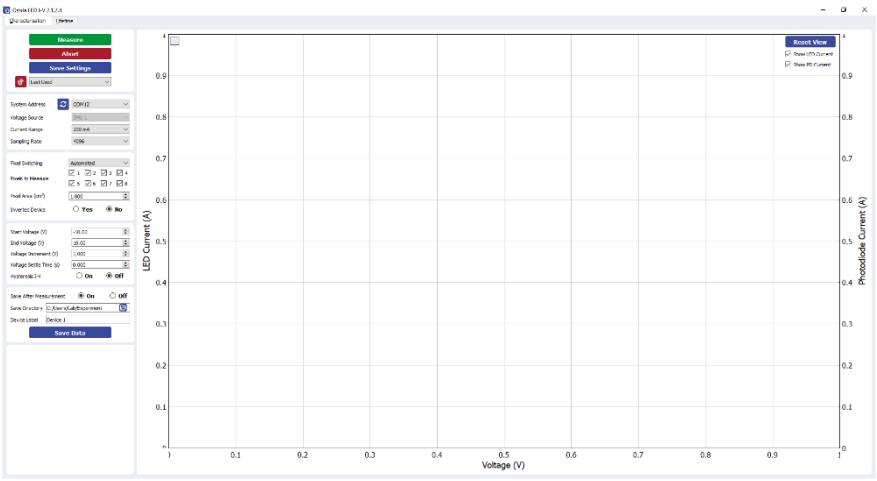


Figure 7.2. The Ossila LED I-V software.

8. Installation

1. Install the Ossila LED I-V software on your PC.
    I. Run the file 'Ossila-LED-IV-Installer-vX-X-X-X.exe' on the USB memory stick provided.
    II. Follow the on-screen instructions to install the software.
2. Connect the 24 VDC power adaptor to the power socket on the rear of the unit.
3. Connect the unit to your PC using the provided USB-B cable, or an Ethernet cable if preferred.
    I. If the unit is not detected, or driver installation fails, please refer to the SMU USB Driver Installation Guide found on the USB memory stick.

Note: The Ossila LED I-V software and Source Measure Unit USB drivers can also be downloaded from ossila.com/pages/software-drivers

9. Operation

9.1 Measurement Types

The Ossila LED I-V software can perform 2 different types of measurements. Each measurement type can be selected using the tabs at the top of the window. The available measurements are:

1. Characterisation (**Section 9.1.1**).
2. Lifetime (**Section 9.1.2**).

Each measurement type requires several settings to be selected before it can be performed. Settings that are shared between all measurements are detailed in **Section 9.3**. Measurement-specific settings are detailed in **Sections 9.3.3**, and **9.3.4**.

9.1.1 Characterisation

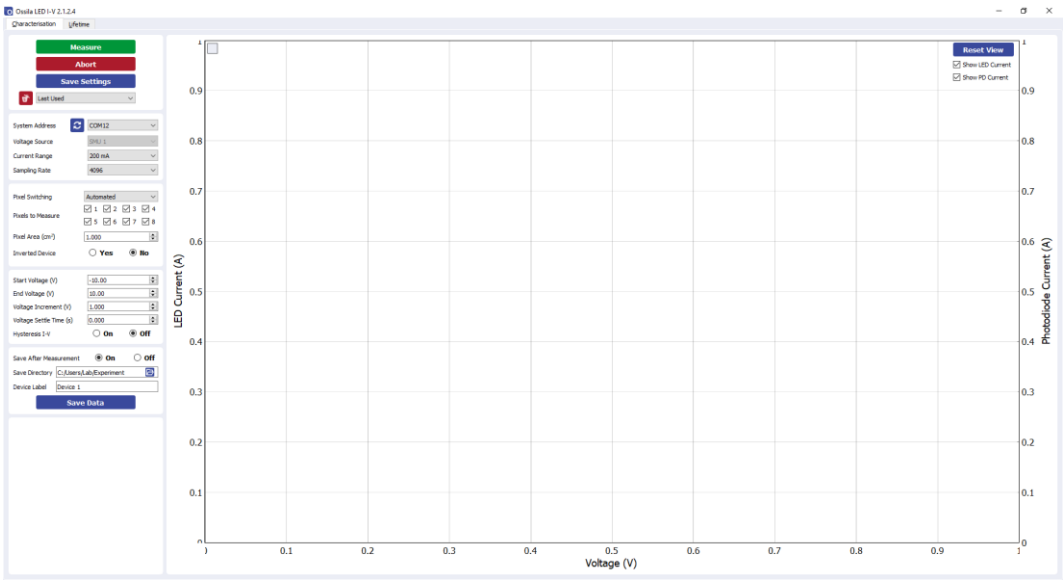


Figure 9.1. Ossila LED I-V software: Characterisation tab.

The Characterisation tab is used to perform I-V measurements of LEDs, whilst measuring the current response of the photodiode lid.

9.1.2 Lifetime

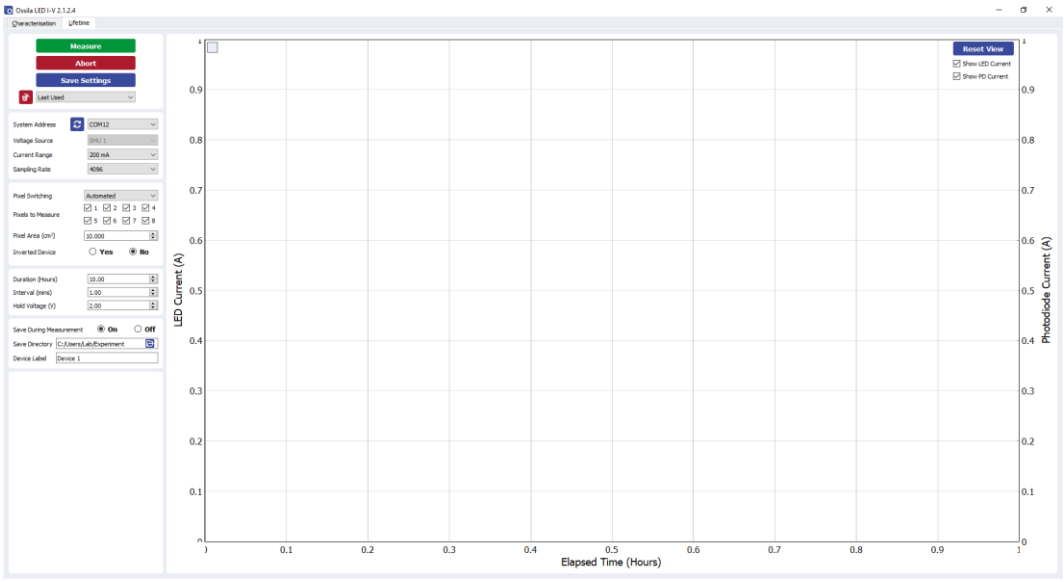


Figure 9.2. Ossila LED I-V software: Lifetime tab.

The Lifetime tab is used to perform long-term measurements of LEDs by holding them at a specified voltage and periodically measuring the current of the LED and photodiode lid.

9.2 Quick Start Guide

1. Start the Ossila LED I-V software. The window shown in **Figure 9.1** will open.
2. Choose a measurement type as described in **Section 9.1**.
3. Place your device in the test board.
4. Attach the photodiode lid to the test board.
5. Set the appropriate settings in the software (explained in more detail in **Section 9.3**).
6. Click the 'Measure' button.
    I. For each pixel, measurements are performed using the chosen measurement settings.
    II. Data will be plotted as it is measured, using a solid line for LED current (left y-axis) and a dashed line for photodiode current (right y-axis).
    III. This process is repeated until all pixels have been measured.
7. If automatic saving is turned on, the measurement data and settings will then be saved.

9.3 Software Settings

There are several settings in the program which must be filled in before taking a measurement. These are found in the column on the left of the window, as shown in **Figure 9.1**.

9.3.1 System Settings

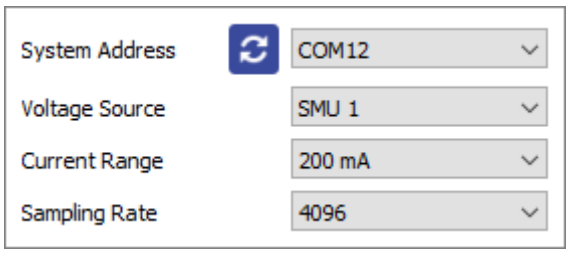


Figure 9.3. System settings.

(I) System Address

- Select the COM port or IP address of the connected unit you intend to use (USB and Ethernet connection respectively).
    I. This box will be populated automatically with the addresses of any units connected to the computer or network.

(II) Voltage Source

- Select whether 'SMU 1' or 'SMU 2' on the Source-Measure Unit is connected to the test board.
    I. 'SMU 1' will be automatically selected when pixel switching is set to 'Automated'.

(III) Range

- Select the range of currents to be used for the measurement.
    I. This defines the upper limit and accuracy of current measurements that can be performed by the unit. The values for each range are given in **Table 9.1**.
    II. Automatic range selection will start on the lowest current range and automatically switch to higher ranges if the current increases above the maximum for a range.

Table 9.1. Maximum current and accuracy for the different ranges of the Ossila OLED Lifetime System.

Maximum Current	Accuracy
±200 mA	±500 µA
±20 mA	±10 µA
±2000 µA	±1 µA
±200 µA	±100 nA
±20 µA	±10 nA

(IV) Sampling Rate

- Select the number of samples to be taken for each data point.
    I. A higher number of samples per point will improve the accuracy and precision of the measurement. However, this will increase the time taken for the measurement to be performed.

9.3.2 Device Settings

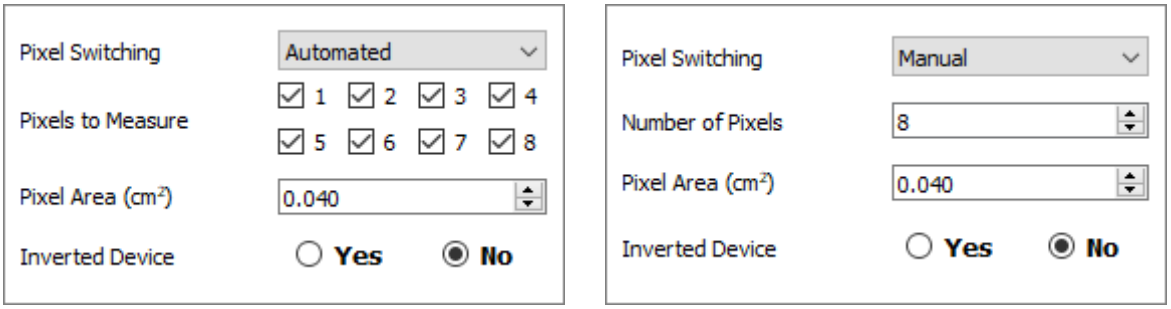


Figure 9.4. Device settings.

(I) Pixel Switching

- Select whether pixel switching will be done manually or automatically.

(II) Number of Pixels / Pixels to Measure

- Set the number of pixels to be measured (manual) or select which pixels to measure (automated).
    I. For automated systems the pixel numbers are labelled on the test board.

(III) Pixel Area

- Set the area in cm^2 of each pixel in the device.

(IV) Inverted Device

- Set whether the device to be measured is inverted.
    I. This option should be on if the anode of your device connects to the 'cathode' pins in the device holder.

9.3.3 Characterisation Settings

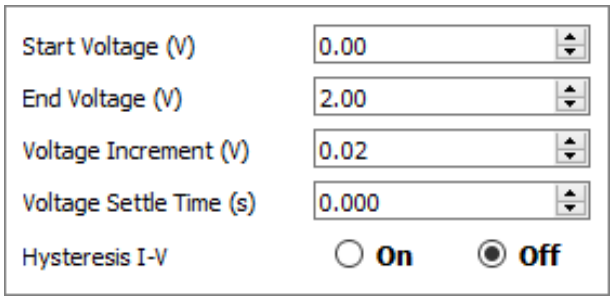


Figure 9.5. Characterisation settings.

(I) Start Voltage

- Set the voltage in volts at which to start the current-voltage measurement.
    I. This can be set between -10 V and +10 V.

(II) End Voltage

- Set the voltage in volts at which to end the current-voltage measurement.
    I. This can be set between -10 V and +10 V.

(III) Voltage Increment

- Set the step size in volts for changing the voltage during current-voltage measurement.

(IV) Voltage Settle Time

- Set the time in seconds between applying a voltage and measuring the current.
    I. This has a maximum of 10 seconds.

(V) Hysteresis I-V

- This option performs a reverse current-voltage measurement after the forward current-voltage measurement has completed.
    I. This reverses the set start and end voltages and uses the same voltage increment and settle time as the forward measurement.

9.3.4 Lifetime Settings

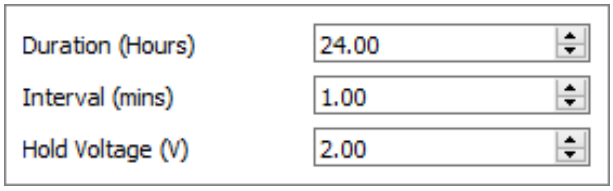


Figure 9.6. Lifetime settings.

(I) Duration

- Set the total duration in hours of the lifetime measurement.

(II) Interval

- Set the time interval in minutes between performing repeat current-voltage measurements of the device.

(III) Hold Voltage

- Set the voltage that all pixels will be held at between measurements.
    I. This can be set between -10 V and +10 V.

9.3.5 Saving and Loading Settings

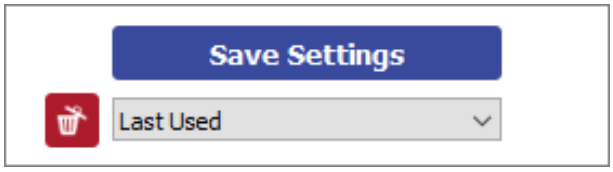


Figure 9.7. Controls for saving and loading settings profiles.

(I) Save Settings

- Saves the current settings as a profile that can be loaded quickly for use at another time.
- When clicked, you will be prompted to name the settings profile.
    I. If the name is already in use, you will be asked if you wish to overwrite the previous profile.

II. The name cannot contain the characters: \ / : * ? " < > |

- The settings profile will be added to the drop-down box using the given profile name.

(II) Settings Profiles

- Select a saved settings profile from the drop-down box.
  I. The settings fields will be populated with the saved values from the selected profile.
- Settings profiles can be deleted by selecting the profile and then clicking the red 'delete' icon next to the drop-down box.

9.3.6 Measurement Controls

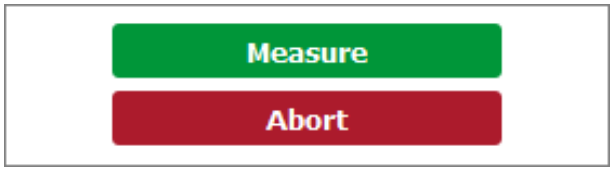


Figure 9.8. Controls to start and stop the measurement.

(I) Measure

- Clicking this button will start the measurement using the chosen settings.
- This button cannot be clicked if the software has not detected a unit

(II) Abort

- Stops a measurement that is currently in progress.

9.3.7 Plot Controls

(I) Plot Display Controls

By default, the axes of the plot will automatically scale to display all the data within it. The view can be controlled manually using the following mouse controls:

- Left/Middle click and drag – pan the axes.
- Right click and drag – scale the axes (left-right for x-axis, up-down for y-axis).
- Scroll wheel – scale the axes centred on the cursor location.

A specific axis can be controlled by using these controls on the axis labels. The axes can be reset by clicking the "Reset View" button shown in **Figure 9.9**.

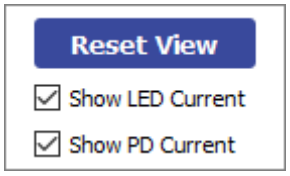


Figure 9.9. Controls for the plot.

(II) Show LED Current

- Controls whether LED current data are displayed in the plot.

(III) Show PD Current

- Controls whether photodiode current data are displayed in the plot.

9.3.8 Saving Data

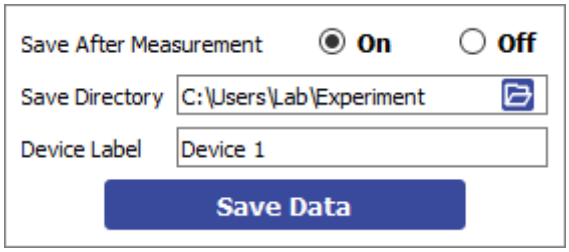


Figure 9.10. Settings and controls for saving data.

(I) Save After Measurement

- The program allows for data to be saved automatically, as well as manually once the measurement is complete.
    I. For automatic saving, the 'Save Directory' and 'Device Label' fields must be filled in before the measurement can start, these are detailed below.

Warning: Automatic saving can be turned off for lifetime measurements. However, **manual saving is unavailable** for lifetime measurements, so you will not be able to save your data if it is turned off.

(II) Save Directory

- Sets the location in which to save the results.
- This can be set either by:
    I. Manually typing the directory into the field.
    II. Copying and pasting it from your file explorer.
    III. Clicking the folder icon in the field, which will open a dialog box to allow the selection of a folder to save to.

(III) Device Label

- Sets the name of the comma-separated values (.csv) file in which the data will be saved.
    I. The name cannot contain the characters: \ / : * ? “ < > |

(IV) Save Data

- Clicking this button will manually save the measurement results of the active curve.

10. Test Device

The system is shipped with a pair of test devices that can be used to verify the correct operation of the system. One has 100 kΩ resistors that can be used to check the calibration of the system. The other has semiconductor LEDs to test the response of the photodiode. Both are arranged in the geometry of the substrate pixels, and the appearance of the test device will depend on the substrate system being used.

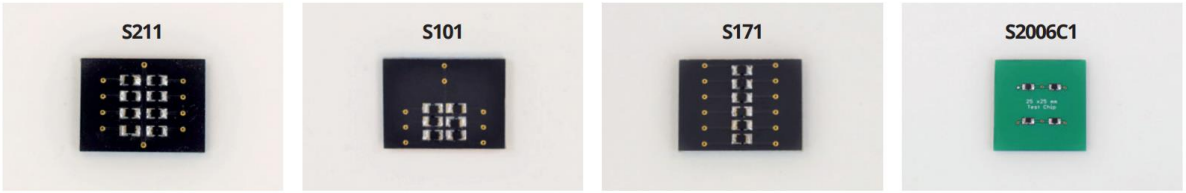


Figure 10.1. Test device configurations.

10.1 Taking a Measurement

1. Plug in and switch on the system.
2. Allow at least 30 minutes for the system to warm up.
3. Place the test device in the device holder with the resistors or photodiodes facing upwards.
4. Start the LED I-V software and enter the following settings in **Figure 10.2**.
    I. These settings can be used with any current range except for the 20 µA range. For this range the start and end voltages must be lowered to -2 V and 2 V respectively.
    II. The 'Pixels to Measure' checkboxes should match the device configuration you have.

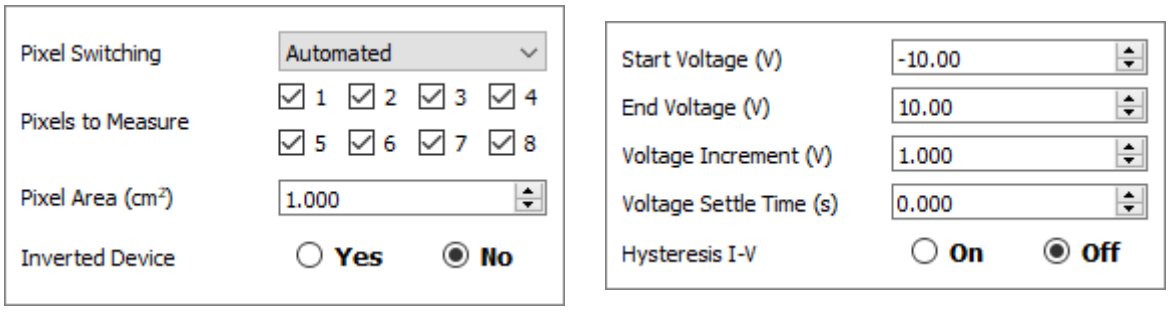


Figure 10.2. Measurement settings for the resistor test device.

5. Click the 'Measure' button.
6. The system should measure straight line resistor responses from -100 µA to 100 µA (or -20 µA to 20 µA for the 20 µA current range) as shown in **Figure 10.3**.
7. To check the calibration of the system, use the I-V data to calculate the measured resistance at -10 and 10 V (-2 and 2 V for the 20 µA current range).
    I. Resistance can be calculated using: R = V / I

II. For the 200 mA current range the calculated resistance should be between 98 and 102 kΩ (within 2% of the resistor value).
III. For all other ranges the calculated resistance should be between 99 and 101 kΩ (within 1% of the resistor value).

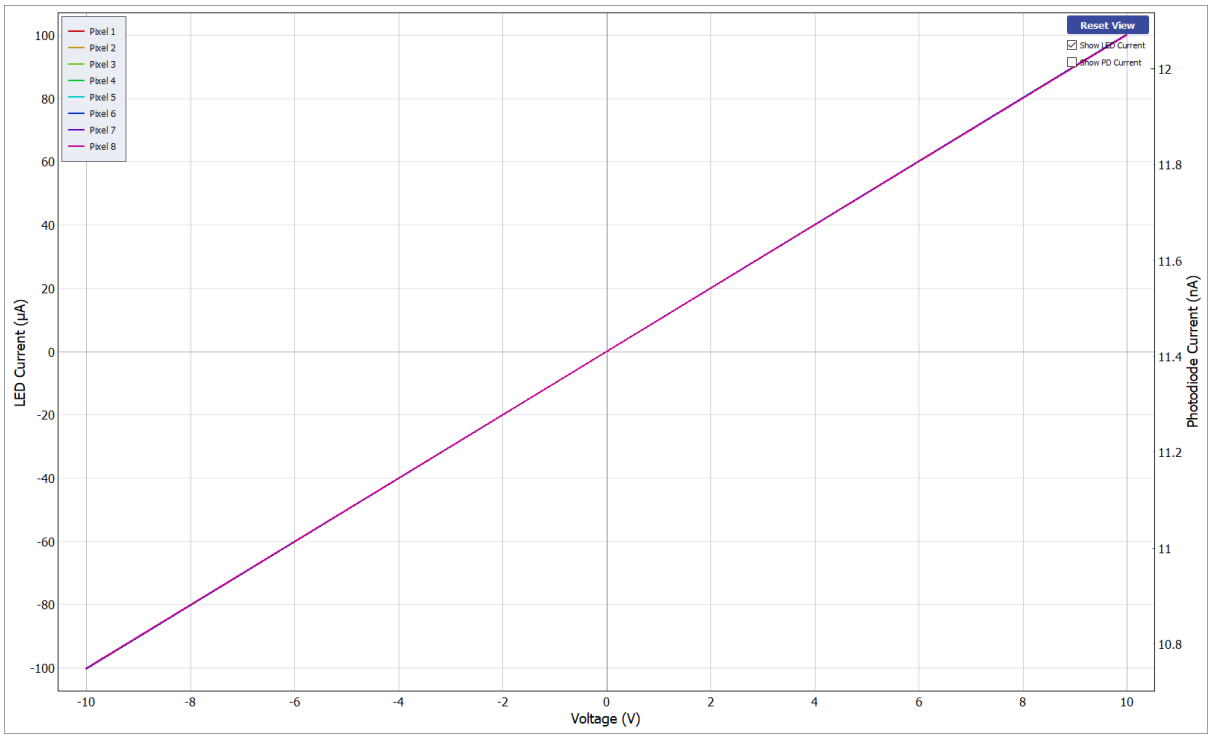


Figure 10.3. Example measurement of resistor test device using the 200 µA current range.

11. Troubleshooting

Most of the issues that may arise will be detailed here. However, if you encounter any issues that are not detailed here, then contact us by email at info@ossila.com. We will respond as soon as possible.

Problem	Possible Cause	Action
No power/display	The power supply may not be connected properly.	Ensure the system is firmly plugged into the power supply, and that the plug is connected to both the adaptor and a working power socket.
	The power supply adaptor has a fault.	Contact Ossila for a replacement power supply adaptor.
Software does not start	The wrong version of Windows is installed on the computer.	Install the software on a computer with Windows Vista or newer.
	The software has not installed properly.	Try reinstalling the software.
Cannot connect to the system via USB	The USB cable may not be connected properly.	Ensure the USB cable is firmly plugged in at both ends.
	The USB cable may not be connected to a working USB port.	Try connecting the unit to a different USB port on the computer.
	The USB drivers may not be installed or may not have installed properly.	Try installing or reinstalling the USB drivers. If the drivers on the USB provided are not working, try following the Windows 7 installation instructions found in the Installation Guide.
	The USB cable is defective.	Try using a different USB-B cable, and contact Ossila if necessary.
Cannot connect to the system via network	The MAC address of the unit is not registered with the internal network.	Register the system on the network using the MAC address obtained via a USB connection (see Source Measure Unit manual).
	The Ethernet cable may not be connected properly.	Ensure the Ethernet cable is firmly plugged in at both ends.
	The Ethernet cable is defective.	Try using a different Ethernet cable.

12. Related Products

12.1 Related Consumables

ITO Coated Substrates

Our range of ITO substrates for OPV, OLED, and sensing applications.

Product codes: S111 / S101 / S211 / S281 / S171

Flat Tip Tweezers

Provides a good substrate grip without scratching.

Product code: C121

FTO Coated Substrates

Designed to be used as transparent electrodes for thin-film photovoltaics.

Product codes: S301 / S302 / S303 / S304

Substrate Cleaning Rack

Holds 20 substrates for a variety of processing techniques.

Product code: E101

12.2 Related Equipment

Spin Coater

Product high-quality coatings without any substrate warping. Perfect for busy labs with limited space.

Product code: L2001A3

Syringe Pump

High-precision, programmable single and dual syringe pumps for automatic dispensing of solutions.

Product codes: L2003S1 / L2003D1

UV Ozone Cleaner

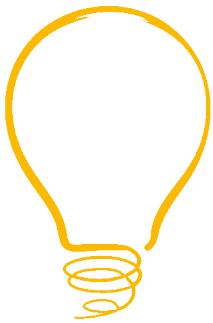
For removing contamination on the surface of samples, providing you with ultraclean surfaces within minutes.

Product code: L2002A2

Source Measure Unit

Source voltage, measure current, get data. Simplify and accelerate your data collection!

Product code: P2005A2



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