Voltage (±2.5 V) Sensor
Product Number: ENVLT002

Overview

The Voltage sensor measures voltage between -2.5 and 2.5 V. This differential sensor is capable of measuring both direct and alternating voltage and it is ideal for use in a wide range of Physics and Chemistry experiments.

The Voltage sensor has floating inputs, meaning you can connect any number of voltage sensors to a circuit without shorting them.

The sensor has two durable banana plugs for easy connection.

The Voltage sensor can be connected to all types of einstein™ data loggers.

Typical experiments

Electricity

- EMF and internal resistance
- V-I characteristics of a wire, a light bulb and a diode
- Resistance of a wire – Ohm's Law
- Series and parallel circuits
- Charging and discharging a capacitor
- Capacitor in alternating current
- Investigating the transformer

How it works

When a differential voltage is applied to the sensor it is converted to a voltage between 0-3 V and then passed

through an Analog-to-Digital convertor which produces the voltage count.

Sensor specification

Range:	± 2.5 V
Input Voltage:	AC or DC
Accuracy:	±3 % over entire range
Resolution (12-bit):	1.22 mV
Input Resistance:	1 MΩ
Maximum Input Voltage:	60 V

Technical Notes

- **Warning** – extreme caution should be taken when experimenting with electricity. These experiments should only be conducted in the presence of a teacher or supervisor
- **Warning** – Keep all liquids away from any electricity experiments
- **Warning** - This sensor is designed for up to 2.5 volts, never use for higher voltages
- **Warning** - This sensor is not designed to measure line voltage. Never connect this sensor to a wall socket
- **Warning** - The sensor is designed to perform measurements with an equivalent input resistance no larger than 200K ohm.
- The Voltage sensor is protected from input voltages if up to **±60 V.**
- Short the two leads of the Voltage sensor before connecting it to the data logger sensor inputs
- For more accurate measurements connect the sensor's negative input (black) to the power source's negative input (ground).

Calibration

The Voltage sensor requires no calibration. For better accuracy the sensor can also be calibrated in one of two ways – Set Zero and Two Point Calibration.

Calibration – MiLAB™

Set Zero Calibration

1. Tap the Settings button next to the sensor's name
2. Flip the Set as Zero switch to set the current value as the zero or base value.
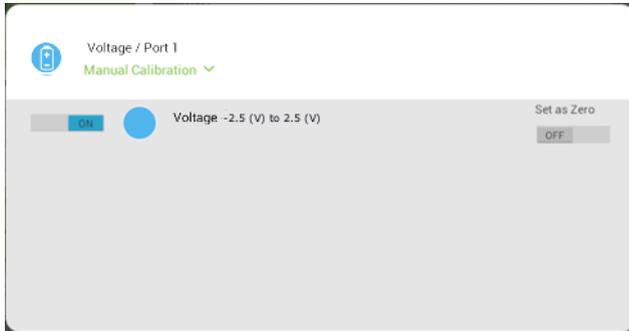
Two Point Calibration

1. Tap the Settings button next to the sensor's name
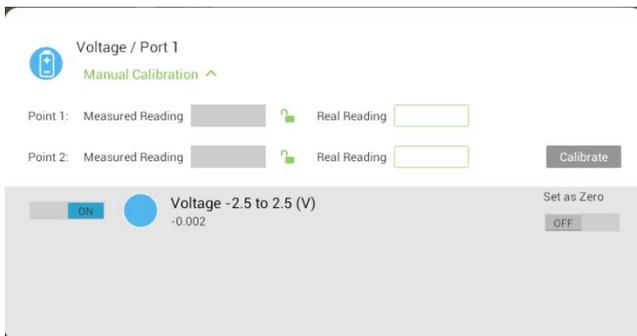
2. Tap Manual Calibration

3. Prepare something of a known voltage. Enter this known value in the Point 1, Real Reading field
4. Measure the voltage and wait for the readings to stabilize.
5. Tap the lock icon
6. Prepare something of a known voltage. Enter this known voltage in the Point 2, Real Reading field
7. Measure the voltage and wait for the readings to stabilize.
8. Tap the lock icon
9. Tap Calibrate.

Note: For the most accurate results try to calibrate the sensor with one Real Reading under the expected results and one Real Reading over the expected results.

Calibration – MiLAB™ Desktop

Set Zero Calibration

In the Current Reading column, click Set [✔ Set] to set the current value as the zero or base value. Reset
[✗ Reset] cancels this action

Two Point Calibration

1. Go to the Full Setup window and in the Calibrate column click Set
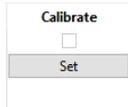
2. The Calibration window will appear
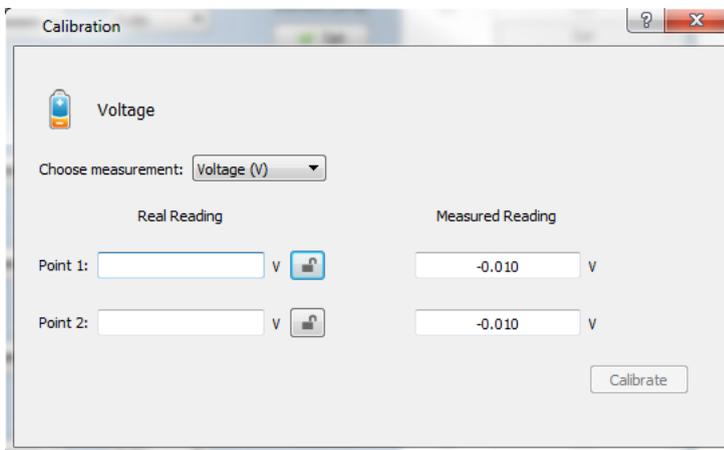
10. Prepare something of a known voltage. Enter this known value in the Point 1, Real Reading field
11. Measure the voltage and wait for the readings to stabilize.
12. Tap the lock icon 🔒
13. Prepare something of a known voltage. Enter this known voltage in the Point 2, Real Reading field
14. Measure the voltage and wait for the readings to stabilize.
15. Tap the lock icon 🔒
16. Tap Calibrate.

Note: For the most accurate results try to calibrate the sensor with one Real Reading under the expected results and one Real Reading over the expected results.

Data logging and analysis

MiLAB™

1. Take your einstein™ Tablet OR pair your einstein™LabMate with your Android or
   iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MiLAB will automatically detect the sensor and show it in the Launcher View

5. Check the icon next to the sensor (✅) to enable it for logging

MiLAB™Desktop

1. Pair your einstein™LabMate with your PC, MAC, or Linux machine via Bluetooth,
   or connect it via the USB cable (found in the einstein™LabMate™ box).
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MILAB will automatically detect the sensor and show it in the Current Setup
   Summary window

5. Click Full Setup, located at the bottom of the Current Setup Summary window to
   program the data logger's sample rate, number of samples, units of
   measurement, and other options
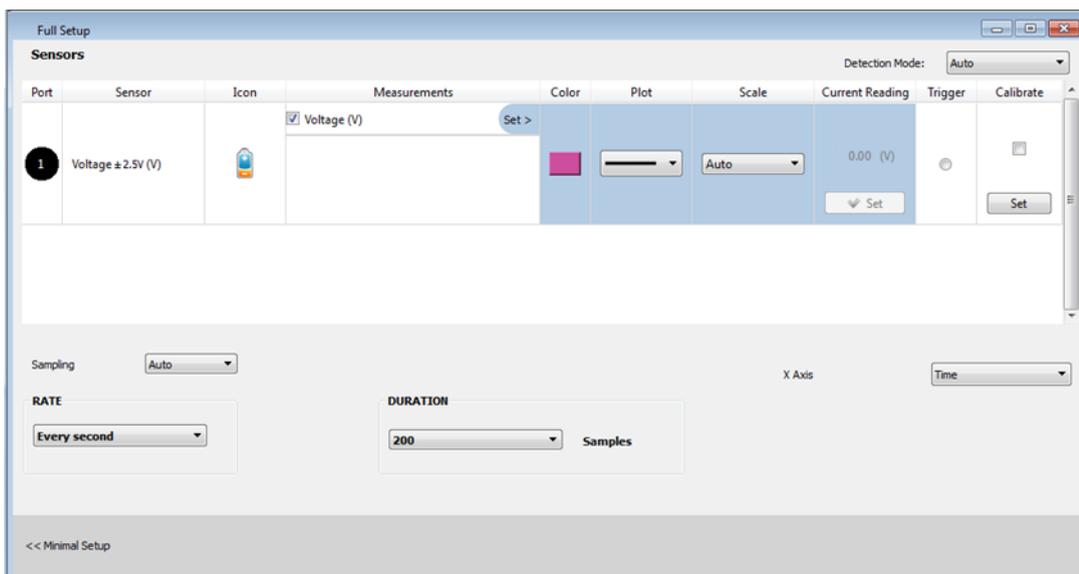
6. Click the Run button (▶)on the main toolbar of the Launcher View to start
   logging

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An example of using the Voltage Sensor
Charging and Discharging a Capacitor

In this experiment we will build a simple RC circuit and measure the voltage across the capacitor while charging and discharging it.
As a voltage source, use a simple 1.5 V battery.
Please make sure the resistor in your circuit is no larger than 200K Ohm.
Below you'll find a typical graph for this experiment with a circuit including a 47K Ohm resistor and a 220uF capacitor:
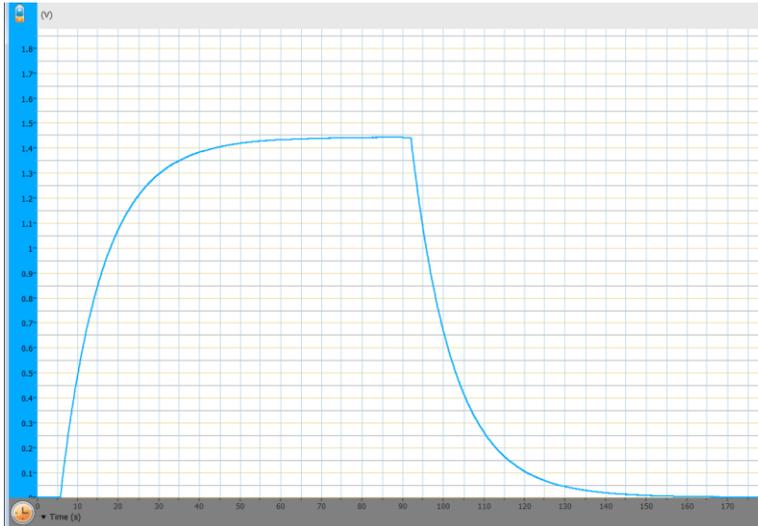
Troubleshooting

If the Voltage sensor isn't automatically recognized by MiLAB, please contact Fourier Education's technical support.

Technical support

For technical support, you can contact the Fourier Education's technical support team at:
Web: www.einsteinworld.com/support
Email: support@fourieredu.com
Phone (in the US): (877) 266-4066

Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.
This warranty does not cover breakage of the product caused by misuse or abuse.
This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.

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