Voltage (Multi-Range) Sensor

Product Number: ENVLT019

Overview

This Voltage sensor is a high precision, quick response voltage sensor, designed to measure three ranges for voltage - s: ±1 V, ±10 V and ±25 V. It is a precise differential sensor, capable of measuring both direct and alternating voltages. It is ideal for use in a wide range of experiments in Physics and Chemistry.

The Voltage sensor has floating inputs, meaning you can connect any number of voltage sensors to a circuit without shorting them and durable banana plugs for easy connection.

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

Typical experiments

Electric and magnetic Fields

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

How it works

Electric current flows along the wires running through the sensor. It is amplified then passed through an Analog-to-Digital convertor which produces the voltage count. The Voltage sensor is equipped with buffer units, protecting the sensor from voltages of up to ±200 V.

Senesor Specification

Range:	±1 V	
	±10 V	
	±25 V	
Input Voltage:	AC or DC	
Accuracy:	For ±1 V	1%
	For ±10 V	1%
	For ±25 V	2%
Resolution (12-bit)	For ±1 V	0.5 mV
	For ±10 V	5 mV
	For ±25 V	12.5mV
Sensor Inputs	Floating	
Input Resistance :	›1 MΩ	
Maximum Input Voltage :	200 V	

Note: sensor cables sold separately

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 25 volts, never use for higher voltages

- **Warning** - This sensor is not designed to measure line voltage. Never connect this sensor to a wall socket
- Short the two leads before attaching to the Voltage sensor
- For more accurate measurements connect the sensor's negative input (black) to the power source's negative input (ground).

Calibration

The sensor is shipped fully calibrated.

For better accuracy the sensor can also be calibrated in one of two ways
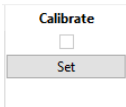
– Set Zero and Two Point Calibration.

Desktop

Set Zero Calibration

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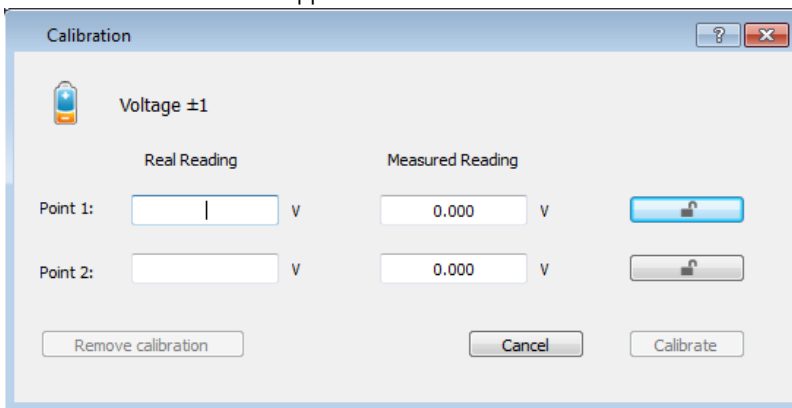
 Reset cancels this action

Two Point Calibration

1. Go to the Full Setup window and in the Calibrate column click Set
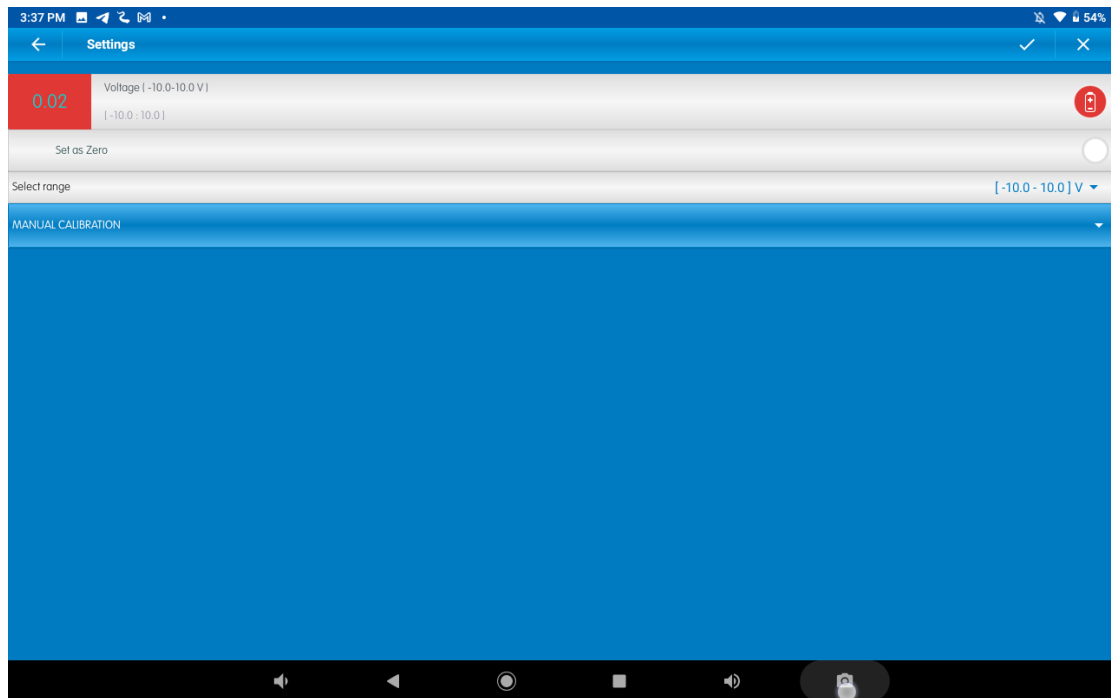

2. The Calibration window will appear

3. Prepare a voltage of known value (e.g. 5 V)
4. Enter this known value in the Point 1, Real Reading field
5. Measure the voltage and wait for the readings to stabilize
6. Click the Lock icon
7. Prepare a second voltage of known value (e.g. 25 V)
8. Enter this known value in the Point 2, Real Reading field
9. Measure the voltage and wait for the readings to stabilize
10. Click the Lock icon
11. Click 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.

Android

1. Tap on sensors
2. Tap on arrow icon of the sensor
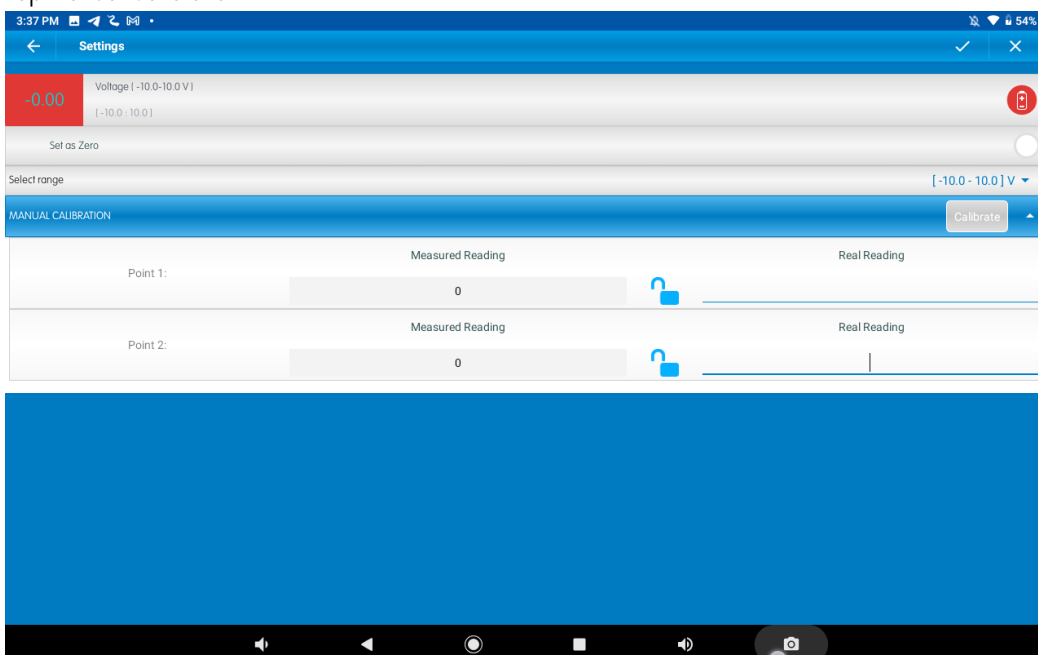3. Select the range you desire to measure with

Set Zero Calibration

1. Check the Set as Zero to set the current value as the zero or base value.

Two Point Calibration

1. Tap Manual Calibration

2. Prepare a voltage of known value (e.g. 5 V)

3. 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 a second voltage of known value (e.g. 25 V)

7. Enter this known value in the Point 2, Real Reading field

8. Measure the voltage and wait for the readings to stabilize.

9. Tap the Lock icon

10. Tap Calibrate.

11. Tap V to save the changes

12. Tap V to save the sensors selection

13. You are ready to start an Experiment

Data logging and analysis

Android

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 MiLAEx and then Tap on LAB Start An Experiment

4. MiLABEx will automatically detect the sensor

5. Tap on Sensors to check the icon next to the sensor to enable it for logging

6. Tap the arrow icon to choose the desired voltage range
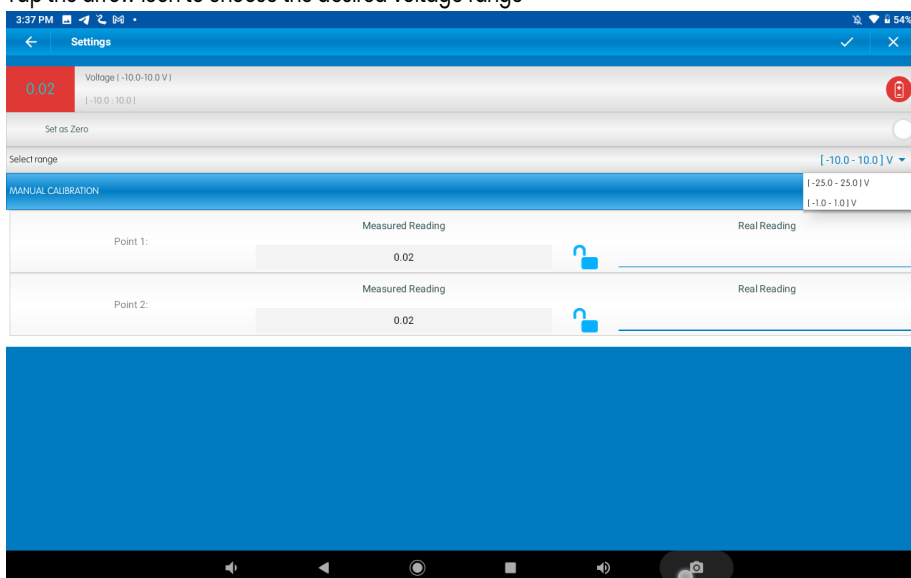

Desktop

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 MiLAEx and then click on LAB Start an Experiment

4. MiLABEx 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 set the desired range, program the data logger's sample rate, number of samples, units of measurement, and other options
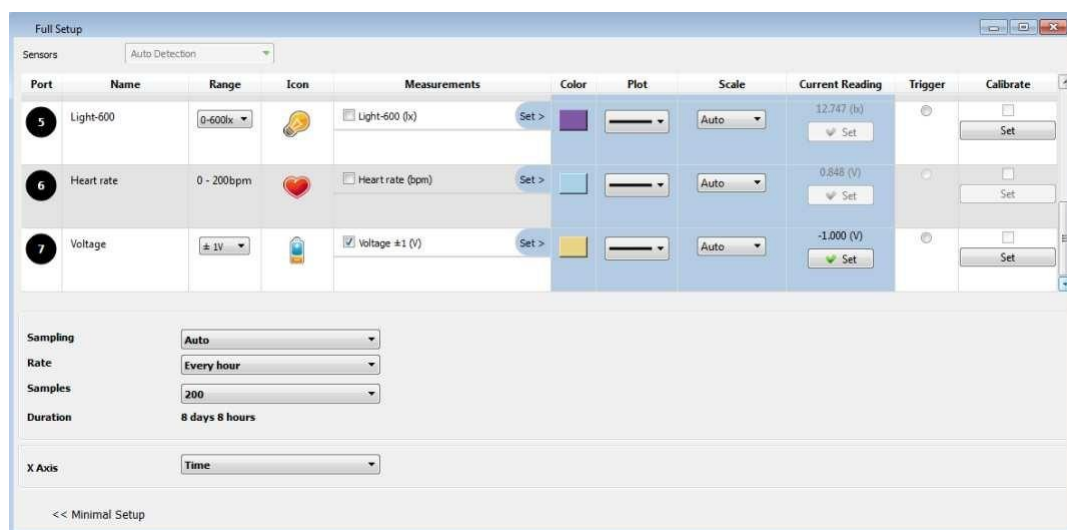
6. Click the Run button on the main toolbar of the Launcher View to start logging

An example of using the Sensor

Charging and Discharging a Capacitor

Build a simple RC circuit and measure the voltage across the capacitor while charging and discharging it.

As a voltage source, it is possible to use a simple 1.5V battery.
Please note that the resistor at your circuit is not larger then 200K Ohm.
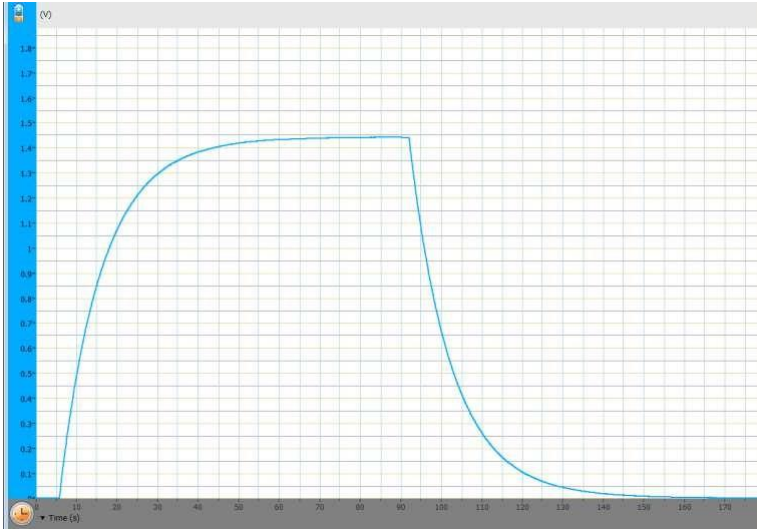
Charging and Discharging a

A typical graph for this experiment with a circuit of 47K Ohm resistor and 220uF capacitor:

Troubleshooting

If the 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

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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