

ScienceCube



sciencecube.com

Wireless Voltage (WL101V) User Guide



Rev. WL101V-02-2024

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

 **KOREADIGITAL**

The Science Cube wireless voltage sensor can measure the difference in potential between two points on an electrical circuit.

The wireless voltage sensors is a sensor that measures the difference in potential between two points on an electrical circuit. The voltage is displayed as a number on the LCD panel via an analog-to-digital conversion circuit. When using this Wireless Voltage Sensor to measure the voltage by decorating the electric circuit using various materials such as dry cell, nichrome wire resistance, carbon resistance, LED, small bulb, etc. Up to 4 sensors can be connected simultaneously, so you can use it easily in complex experiment environments.

Even complex experiments can be designed more easily with simple movement and fixation without the need to connect signal cables during scientific experiments. Additionally, the sensor has a display window so you can immediately check the measured values, and measurements can be made by remotely connecting to a smart device or PC wirelessly or wired without a separate interface.

Suggested experiments

- Ohm's law (relationship between voltage and current).
- Resistance according to sharp core length and cross section.
- Series, parallel connection of resistors.
- Voltage of solar cell.

Composition

The ScienceCube wireless voltage sensor consists of the following.

- Wireless voltage sensor(WL101V)
- USB-A/C cable
- Booklet

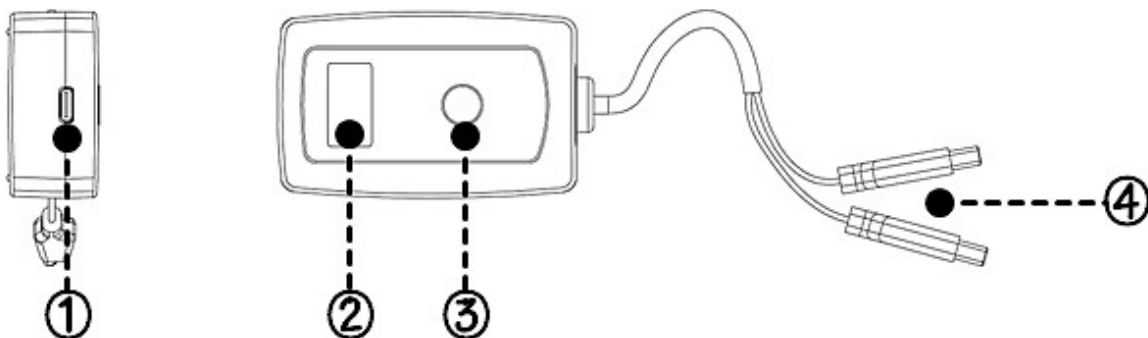
Feature

- Up to four Science Cube wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the **Science#** application.
- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.



Function of wireless sensor

Structure



- ① USB port : Connect the sensor to a PC and use it for experiments or charging.

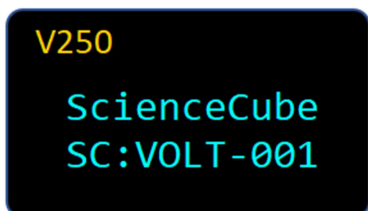
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.
- ④ Sensor detection part: Has a red/black alligator clip that detects voltage and is protected by a plastic cover.

Caution : Do not measure beyond the sensor's measurement range. Doing so can reduce the accuracy of the sensor, cause sensor malfunctions, or result in permanent damage. Please use within the safe measurement range.

Power/Function Button

Status	Turn	Action	Description
When the power is off	Click once	■	A short press turns the sensor on.
	Long click	■■■■■■■■	A long press changes the mode and turns on the sensor.
When it's on	Double click	■■	Performs the zero point setting function. When the zero point is applied, U0 is displayed above the units.
	Long click	■■■■■■■■	Turns off.

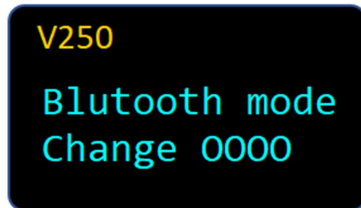
Start screen



V250 : Displays the sensor's firmware version.

SC:NAME-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)


Mode change



When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

Measurement screen

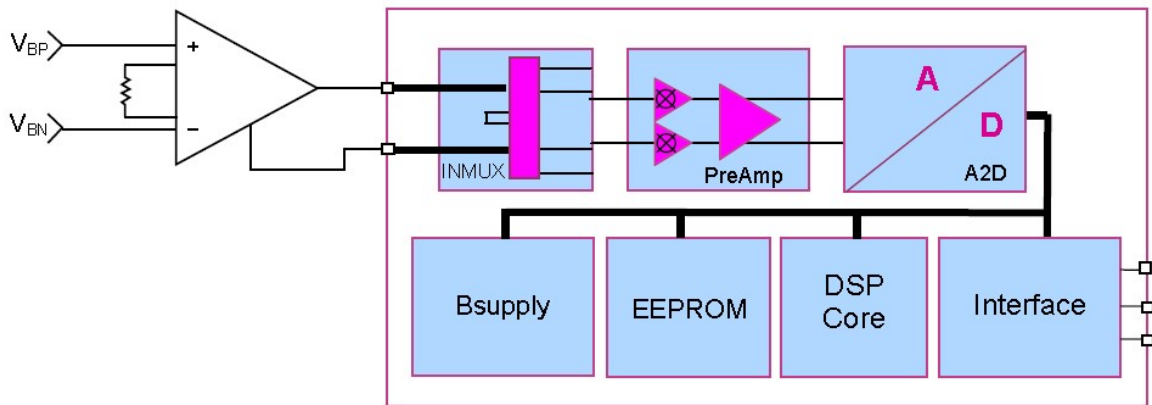


① Connection mode	Mobile : Connecting an Android or iOS. PC : Connecting a Windows-based PC.  : Connected via USB cable.
② Sensor-ID	When connecting wirelessly using the sensor's serial number, this is the sensor name displayed in 'Device Name'.
③ Battery	You can check the battery status, and when you connect the USB charging cable, the display changes to charging.
④ Sensor Value	1) Displays sensor measurement values and units in real time. 2) When using 'Zero Point Setting', U0 is displayed above the unit.

How it Works

Science Cube wireless voltage sensor measures voltage directly by dividing the voltage between resistors connected in series in a circuit.

The divided voltage is converted to a voltage value by a digital signal processor through an operational amplifier and digital converter.



Using the Sensor

The ScienceCube wireless voltage sensor can be measured in the following ways

1. Run 'Science#' and connect the sensor wirelessly or wired.
2. Connect the red clip to the '+' pole and the black clip to the '-' pole of the circuit to be measured.
3. If measurement is required starting from '0', execute [Zero Setting].
4. Set the [Data Collection Interval] and [Experiment Time] in [Experiment Settings].
5. Click [Start] to start the experiment.

For more information on how to use the Science# application, see the help.

Calibration

All sensors are shipped after being precisely calibrated using standard equipment during the manufacturing process, so they can be used right away and do not require a separate calibration process.

However, if you want to display "0" in the current value for a smooth experiment, proceed with **[Zero Point Setting]**. Zero point setting can be done separately in the wireless sensor or program.


[Sensor zero point setting]

1. Press the sensor's Power/Calibrate button twice in succession.
2. **[Zero point setting]** is completed, and the word "U0" is displayed above the unit on the sensor screen.
3. To cancel, press twice again and U0 will disappear and return to the default value.

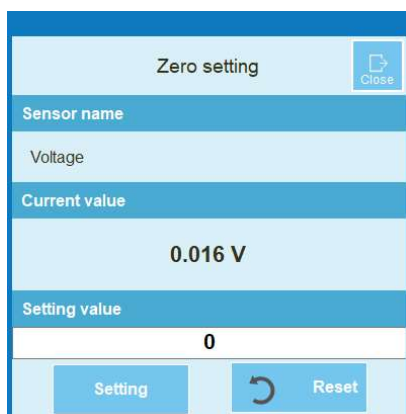
Note : **[Zero point setting]** is reflected temporarily and returns to the default value when the sensor is turned on again.

[Zero setting] in science#

Science#'s zero setting does not affect the sensor's zero setting and is only reflected in the values displayed in the program.

If you press the  icon in the space where the sensor value is displayed in Science #, the **[Zero point setting]** menu will appear.



Here, if you press **[Setting]**, it will change to 0.000V, and if you press **[Reset]**, it will return to the initial value.

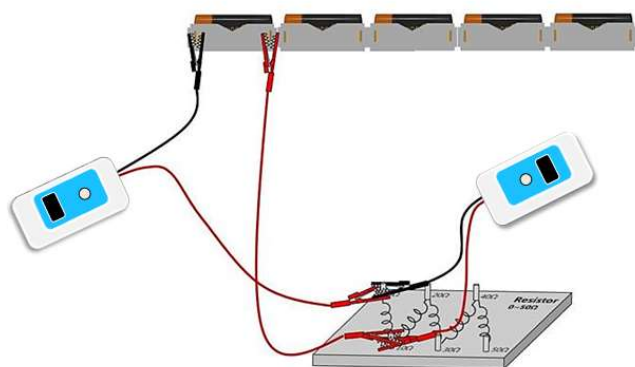


Guide for scientific experiments

Ohm's law

<Experimental Method>

1. Insert all the batteries into the five battery holders and connect one battery.
2. As shown in the picture below, the voltage sensor is connected in parallel to the 10Ω resistor and the current sensor is connected in series to the battery to form the electric circuit.
3. Run Science#, turn on the voltage sensor and connect them to the program.
4. Press  to set [Zero setting] then press START.
5. When the 10Ω resistance is constant, press  [collect] to measure the voltage and current when one battery is connected.
6. Measure and record each voltage and current while connecting up to five batteries in series.
7. Measure and record each current on the 10, 20, 30, 40 and 50Ω nichrome wire repeatedly.
8. Analyze how the current intensity (I) changes when the voltage (V) is increased or decreased when the resistance is constant and analyze what happens when the voltage is constant.



Specifications

Item	Description
Range	-15.0 ~ +15.0 V
Resolution	0.002V (When using <i>Science#</i>) 0.001V (Display digit)
Sampling Time	Max. 100Hz (0.01 sec.)
Condition	-20 ~ 60°C, Max. 85%RH
Wireless Connection	Bluetooth 5.0 or Classic 2.1
Wired Connection	USB-C
Battery	700mAh Li-Polymer rechargeable
Charging Time	within 2 hours
Operating Time	Approximately 12 hours after full charge (depending on usage conditions)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301 Ⓜ202-SMD070

CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

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- The contents of this manual are provided for informational purposes only, and product specifications and functions may be changed without prior notice to improve performance.
- This product is designed for science education. No warranty is provided and no liability is assumed for errors in industrial testing or manufacturing process controls, medical analysis or controls, or commercial design applications.

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