

NEULOG CURRENT LOGGER SENSOR GUIDE



NeuLog current logger sensor NUL-202

The NeuLog current sensor can be used for any science experiment which utilizes current readings. It is used in the fields of Physics, Electronics, Chemistry, Biology, etc.

The sensor comes pre-calibrated so you can start experimentation right out of the box using this guide.

Just a few of the thousands of possible experimental subjects that can be studied with the NUL-202 sensor are: Van de Graaff generators, fuel cells, battery chemistry, human muscle physiology, parallel circuits and series circuits.

The current sensor's measurement units are:

Amperes (A): Amperes are the SI base unit of electric current.

Quick start procedure:

PC or Mac Computer

Materials needed:

- NUL-202 Current Sensor
- USB-200 USB Module
- USB to mini USB cable (which comes with the USB-200)

Your current sensor needs to be connected to a USB-200 module. The USB-200 module then connects to a computer via a USB to mini-USB cable. Please note that you cannot plug the current sensor directly into the computer.

Resident PC software and browser based application can be downloaded for free at www.neulog.com/Download/SoftwareandApplication.aspx as well as a full software user guide.

Note: Make sure not to download and install both types of software they will conflict on the computer.

Procedure:

1. Install the NeuLog software.
2. Connect the USB-200 module to the PC or Mac.
3. Connect the current sensor to the USB-200 module (they directly plug together). Please note no calibration is required for this sensor.
4. Open the NeuLog software.
5. Once a current sensor logo appears on the left side of the screen, the probe has been automatically identified and you can begin experimentation.
6. If the current sensor is not automatically identified, click the "Search for sensors" icon to find the sensor.
7. Click the "On-line experiment" button; this will open a graph below.
8. Click on the "Module setup" button located on the current sensor icon in the module window to change the sensor's settings if need be.
9. Click on the experiment set up button to change the experiment settings if need be (experiment duration for example).
10. The current sensor will give a live reading in the box to the left of the screen while plugged in.
11. To run an experiment and collect data, click "Run experiment".
12. To end data collection early, click "Stop experiment".

Tablet, smart phone device

Materials needed:

- NUL-202 Current Sensor
- WiFi-201 WiFi module
- BAT-200 Battery Module

Your current sensor needs to be connected to a WiFi-201 module. The WiFi-201 module will create a closed NeuLog WiFi network which will stream the NeuLog data to the device of your choosing. Once your device is wirelessly connected to the NeuLog network you can run experiments and collect data through a browser of your choosing.

Procedure:

1. Connect the current sensor directly to the left side of a WiFi-201 module (no wires required).
2. Connect a BAT-200 module to the right side of the WiFi-201 module.
3. Although not required, we recommend plugging the BAT-200 to an outlet using a USB to mini USB charger (such as a typical cell phone charger). The WiFi-201 module will run for 15-75 minutes (depending on the sensor) without being plugged in.

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- The WiFi-201 can be powered directly using a mini to USB cord and plugging it into your computer or a wall charger. Please note this function is only available on WiFi units with the USB icon on the cover.
 - For further WiFi-201 instructions or the WiFi-201 quick start guide please visit: www.neulog.com/Download/SoftwareandApplication.aspx
- The WiFi-201 indicator lights will flash; take no action until the LED to the far left turns blue; this can take up to one minute.
- Take your tablet or smart phone, go to the Wi-Fi settings and select the NeuLog network which matches the WiFi Module ID found on the back of the WiFi-201 device. (NeuLogXXXX for example).
 - Give your device about 20 seconds to connect to the WiFi-201.
 - Once the device is connected, go to your browser and type the website wifi201.com into the URL bar, then wait for 30-60 seconds.
 - You will see a "Control mode" icon in the browser, click on this icon.
 - The browser will then load a new screen and begin to auto detect the sensor(s); this can take a minute. (You can stop the search when the sensor is found.)
 - If the browser does not auto detect, select "Search for sensors".
 - Once the sensor is found, you will see an icon on the left side of the screen for the current sensor. The icon will display data in real time.
 - To set the current sensor's settings, click on "Module setup" button located on the current sensor icon on the left side of your screen.
 - To change the experimental settings, click the "Experiment setup" button (experiment duration for example).
 - To run an experiment and collect data, select "On-Line" experiment, then select "Run".
 - If you have a newer generation WiFi-201 (with the USB icon on the cover) this can be used as a USB-200, meaning you can tether the probes directly to the computer using the WiFi-201. To engage operation in this fashion, press 3 times on the panel key. Repeating this operation will return the unit to WiFi mode.

Operation with NeuLog viewer

Materials needed:

- NUL-202 Current Sensor
- VIEW-101 Graphic Display Module
- BAT-200 Battery Module

Procedure:

- Connect the current sensor to the left side of the viewer.
- Connect the BAT-200 module to the right side of the viewer.
- The VIEW-101 will auto detect the sensor and you will see it appear on the left side of the screen.
- Once the sensor appears it will be monitoring data in real time.
- To run an experiment and collect data click the run button (little green person).

Off-line experiments

(Off-line experiments are when you do not have a sensor connected directly to a computer, tablet, smartphone, or NeuLog viewer).

Materials needed:

- NUL-202 Current Sensor
- BAT-200 Battery module

Materials needed to configure your offline experiment:

- USB-200 Module, WIFI-201 module or VIEW-101 Viewing Module
- USB to mini USB cable (included with the USB-200 module)

Procedure:

- Connect the current sensor directly to the left side of a charged BAT-200 module.
- When ready to collect data, press the "Start/Stop" button on the current sensor, a red light will turn on for the duration of the experiment.
- To change the experiment settings, first connect to your chosen device (PC, Mac, tablet, smart device) and select the "Module setup" button. (For more information on how to change the experiment settings view the quick start procedure section for your chosen device in this document.)
- After the experiment has concluded (when the "Start/Stop" button is pressed again or the data collection period ends) connect the sensor to your chosen device (you can find full instructions in each device's quick start procedure section).
- Open the NeuLog software.
- Click the "Off-line experiment" button.
- Click the "Load data from sensors" button.
- Select which experimental data to upload. (5 experimental runs can be stored at one time on the NUL-202 current sensor)

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Restoring sensor's factory default settings:

Procedure:

1. Connect the USB-200 to a PC, Mac, tablet, or smart device.
2. Connect the current sensor to a USB-200 module (they directly plug together). Please note no calibration is required for this sensor.
3. Open the NeuLog software.
4. Click the "Tools" icon.
5. Click "Restore sensor's factory defaults" icon.
6. If prompted to clear the graph, click either the "Off-line experiment" or "On-line experiment" button (whichever you are using).
7. Click "Clear experiment results".
8. Resume from step 4.

Included with sensor:

- NeuLog NUL-202 Current Sensor Guide (this document).
- Red (positive probe) and black (negative probe) wires connected directly to the sensor's body.
- 4 mm red and black plugs for the positive and the negative wires.

Sensor specifications

Range and operation modes	±2.5 A
ADC resolution	13 bit
Accuracy	1%
Resolution	0.001 A
Max sample rate (S/sec)	100 for long duration 3000 for short duration

Sensor features:

- Fully digital data.
- Rugged plastic ergonomic case.
- 4 mm power and ground plugs for easy connectivity
- Push button switch for Start/Stop experiments in off line mode.
- LED indicator of experiment status (blinks while collecting data).
- Pre-calibrated sensing equipment.

Note: NeuLog products are intended for educational use.

Videos and experiment examples:

- Videos, literature and other probes can be found at www.NeuLog.com
- <http://www.neulog.com/Products/Currentloggersensor.aspx>
- **Ohm's Law** - <http://www.neulog.com/Portals/3/Users/Experiment P-10 Ohm's Law Ver 3.4.4.pdf>

Technical background:

The philosophy behind NeuLog's plug and play technology is based on each sensor's ability to store its own data due to an internal flash memory chip and micro-controller in each plastic NeuLog body. This technology allows the sensor to collect and then store the digital data in the correct scientific units (°C, °F, Lux, %, ppm, for example).

The sensor is pre-calibrated at the factory. The built-in software in the logger can be upgraded for free at any time using the provided firmware update.

The NeuLog current sensor houses a shunt resistor and an amplifier. The circuit's current passes through the shunt resistor and its electric potential is measured using a very fast, high input impedance differential operational amplifier with protected inputs. Using ohm's law ($I = V/R$) the current is calculated from the known resistance and voltage values.

The shunt resistor is very high power (to protect it in high current) and very small resistance (in order not to affect the circuit conditions). The protection is up to 5 A.

Maintenance and storage:

- Never submerge the NeuLog plastic body in any liquid.
- Do not allow liquid into the current sensor's body.
- After use, gently wipe away any foreign material from the current sensor.
- Store in a box at room temperature out of direct sunlight.

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Warranty:

We promise to deliver our sensor free of defects in materials and workmanship. The warranty is for a period of 3 years from the date of purchase and does not cover damage of the product caused by improper use, abuse, or incorrect storage. Sensors with a shelf life such as ion selective probes have a warranty of 1 year. Should you need to act upon the warranty, please contact your distributor. Your sensor will be repaired or replaced.

Thank you for using NeuLog!



Flexible, simple, fast, forward thinking.

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