

## NEULOG PH LOGGER SENSOR GUIDE



### NeuLog pH logger sensor NUL-206

The pH sensor can be used for any science experiment where pH readings are required. Some fields of study include Chemistry, Pharmacology, Biochemistry, Biology, Earth Science, Environmental Science, 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 experiments that can be performed with the NUL-206 sensor are: monitoring of ecological systems, effect of pH on enzymes, static pH measurements, chemical reactions with changing pH such as titrations, waste measurements, water testing, etc.

The unit of measurement for this sensor is the pH scale.

pH: The universal measurement for pH which directly measures the concentration of hydrogen ions using a scale of 0 to 14.

### Sensor offset:

Although the NeuLog pH sensor does not need to be calibrated prior to each use, it is recommended to offset its probe.

### Materials Needed:

- pH 7 Buffer Solution

### Procedure:

1. Connect the pH sensor to a voltage source (USB-200, BAT-200, WiFi-201).
2. Remove the pH sensor probe's tip from the plastic storage solution bottle.
3. Rinse the pH sensor's tip with distilled water.
4. Insert the pH sensor's tip into a pH 7 buffer; if no buffer is available, you can use tap water instead (although it is not as accurate).
5. Press and hold the pH sensor's push button for 3 seconds.

### Quick start procedure:

#### PC or Mac Computer

#### Materials needed:

- NUL-206 pH sensor
- USB-200 USB module
- USB to mini USB cable (included with the USB-200 module)

Your pH 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 pH sensor directly into the computer.

Resident PC software and browser based application can be downloaded for free at [www.neulog.com/Download/SoftwareandApplication.aspx](http://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 pH sensor to the USB-200 module (they directly plug together).
4. Open the Neulog software.
5. Once the pH sensor logo appears on the left side of the screen, the probe has been automatically identified and you can begin experimentation.
6. If the pH sensor is not automatically identified, click the "Search for sensors" icon to find the sensor.
7. Select the "On-line experiment" button; this will open a graph below.
8. Click on the "Module setup" button located on the pH sensor's icon in the module window to change the pH probe settings if need be.
9. Remove the pH sensor's probe from the plastic storage solution bottle.
10. Gently rinse the tip of the pH sensor's probe thoroughly with distilled water. Be careful not to physically come in contact with the glass bulb.
11. Prior to initial use, the Neulog pH sensor needs to be offset; please review the "Sensor Offset" section above.
12. Click on the "Experiment setup" button to change the experiment settings if need be (experiment duration for example).

## NEULOG PH LOGGER SENSOR GUIDE



13. The pH sensor will give a live reading in the box to the left of the screen when running.
14. To run an experiment and collect data click "Run experiment".
15. To end data collection early, click "Stop experiment"

### Tablet, smart phone device

#### Materials needed:

- NUL-206 pH Sensor
- WiFi-201 Module
- BAT-200 Battery Module

Your pH 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 pH sensor directly to the left side of the WiFi-201 module (no wires required).
2. Connect the 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.
4. 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.
5. For further WiFi-201 instructions or the WiFi-201 quick start guide please visit: [www.neulog.com/Download/SoftwareandApplication.aspx](http://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.
6. 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).
7. Give your device about 20 seconds to connect to the WiFi-201.
8. Once the device is connected, go to your browser and type the website [wifi201.com](http://wifi201.com) into the URL bar, then wait for 30-60 seconds.

9. You will see a "Control mode" icon in the browser, click on this icon.
10. 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.)
11. If the browser does not auto detect the sensors, select "Search for Sensors".
12. Once the sensor is found, you will see an icon on the left side of the screen for the pH Sensor. The icon will display real time data.
13. To set the pH probe settings, click on the "Module setup" button located on the pH sensor's icon on the left side of your screen (graph settings for example).
14. Remove the pH sensor's probe from the plastic storage solution bottle.
15. Rinse the tip of the pH sensor's probe thoroughly with distilled water. Be careful not to physically come in contact with the glass bulb.
16. Prior to initial use, the Neulog pH sensor needs to be offset; please review the "Sensor Offset" section above.
17. To change the experimental settings, click on the "Experiment setup" button (experiment duration for example).
18. To run an experiment and collect data, click "On-Line" experiment, then click run.
19. 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-206 pH Sensor
- VIEW-101 Graphic Display Module
- BAT-200 Battery Module

#### Procedure:

1. Connect the pH sensor to the left side of the viewer.
2. Connect the BAT-200 module to the right side of the viewer.
3. The VIEW-101 will auto detect the sensor and you will see it appear on the left side of the screen.
4. Once the sensor appears, it will be monitoring data in real time.
5. Remove pH sensor's probe from the plastic storage solution bottle.
6. Rinse the tip of the pH sensor's probe thoroughly with distilled water. Be careful not to physically come in contact with the glass bulb.

## NEULOG PH LOGGER SENSOR GUIDE



7. Prior to initial use, the Neulog pH sensor needs to be offset, please review the “Sensor Offset” section above.
8. 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-206 PH sensor
- BAT-200 Battery module

#### Materials needed to configure your offline experiment:

- USB-200 USB module, WiFi-201 module or VIEW-101 module
- A USB to mini USB cable (included with the USB-200)

#### Procedure:

1. Connect the pH sensor directly to the left side of a charged BAT-200 module.
2. Remove the pH sensor's probe from the plastic storage solution bottle.
3. Rinse the tip of the pH sensor's probe thoroughly with distilled water. Be careful not to physically come in contact with the glass bulb.
4. Prior to initial use, the Neulog pH sensor needs to be offset, please review the “Sensor Offset” section above.
5. When ready to collect data press the “Start/Stop” button on the pH sensor; a red light will turn on for the duration of the experiment.
6. 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.)
7. 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).
8. Open the NeuLog software.
9. Click the “Off-line experiment” button.
10. Click the “Load data from sensors” button.

11. Select which experimental data to upload (5 experimental runs can be stored at one time on the NUL-206 pH sensor).

#### Restoring sensor's factory default settings:

##### Procedure:

1. Connect the USB-200 module to a PC, Mac, tablet or smart device.
2. Connect the pH sensor to a USB-200 module (they directly plug together).
3. Open the NeuLog software.
4. Click the “Tools” icon.
5. Click the “Restore sensor's factory defaults” icon.
6. If prompted to clear the graph, click either the “Off-line experiment” or “On-line experiment” (whichever you are using).
7. Click “Clear experiment results”.
8. Resume from step 4.

#### Included with sensor:

- Neulog pH Logger Sensor.
- Neulog electrode with storage solution container (attached to the sensor).
- Neulog NUL-206 pH Sensor Guide (This Document).

#### Sensor specifications:

Range and operation modes	0 to 14 pH
ADC resolution	16 bit
Resolution	0.01 pH
Max sample rate (S/sec)	100

## NEULOG PH LOGGER SENSOR GUIDE



### Electrode specifications:

Body diameter	12mm
Overall length	150mm
Cap	16mm OD ± 30mm Long
Construction	Epoxy body, round bulb ASG VIII pH glass, sealed, gel-filled single-junction reference with fiber frit, Ag/AgCl wire, ATC
Range/output	<ul style="list-style-type: none"><li>• 0 – 14 pH</li><li>• mV output with isopotential point at 0 ± mv at 25°C</li></ul>
Response time	98% of full response in 30 seconds at 25°C

### Sensor's features:

- Fully digital data
- Rugged plastic ergonomic case
- Push button switch for Start/Stop experiments in off line mode
- LED indicator of experiment status (blinks while collecting data)
- Attached electrode cased in durable plastic for pH detection

**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)  
<http://www.neulog.com/Products/pHloggerSensor.aspx>
- **Acid Rain** - <http://www.neulog.com/Portals/3/Users/Experiment C-8 Acid rain Ver 6.2.5.pdf>
- **Properties of Sea water and Fresh Water** - <http://www.neulog.com/Portals/3/Users/Experiment E-1 Properties of Sea Water and Fresh water Ver 6.0.2.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).

Building the conversion formula of the pH sensor is done by measuring at least 3 different pH level buffers.

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. In spite of that, the probe needs to be offset to pH 7 prior to initial use; please review the "Sensor offset" guide at the beginning of this document for detailed instructions.

The pH electrode houses a sensitive glass bulb which detects the H<sup>+</sup> concentration in the fluid being tested; this is then translated to a voltage reading and passed along a silver-chloride wire. The voltage reading is compared with the second component, the reference electrode to compare voltage differences. The voltage reading is calculated and translated back into pH.

### Maintenance and storage:

- Never submerge the NeuLog plastic body in any liquid.
- Do not allow liquid into the pH sensor's body.
- After use, gently wipe away any foreign material from the pH sensor.
- When storing your sensor, always keep your pH electrode wet. We recommend that you store your electrode in either a commercially prepared storage solution, or a 1:1 solution of pH 4 buffer and 4M KCl. Do not store the electrode in distilled or deionized water – this will cause ions to leach out of the glass bulb and render your electrode useless. If you do not have a buffer, tap water can be used.
- Store in a box at room temperature out of direct sunlight.

## NEULOG PH LOGGER SENSOR GUIDE



### 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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