

NEULOG PH LOGGER SENSOR GUIDE



NeuLog pH logger sensor NUL-206

The NeuLog pH sensor can be used for any science experiment where pH readings are required. It is used in the fields of 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.

Among hundreds 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. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to a tenfold difference in hydrogen ion concentration.

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 (for qualitative measurements, distilled or even tap water can be used instead)

Procedure:

1. Connect the pH sensor to a voltage source (USB-200 or BAT-200).
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.

The browser based application can be downloaded for free at www.NeuLog.com as well as a full application user guide. Choose "Downloads" on the main menu and then choose "Software and Application".

Procedure:

1. Install the NeuLog application.
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). Please note that no calibration is required for this sensor.
4. Open the NeuLog application by clicking on the shortcut on the screen.
5. Once the pH sensor module box 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. Click on the "On-line experiment" icon; this will open a graph below.
8. Click on the "Module setup" button located in the pH sensor's module box to change the sensor's 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 touch 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" icon to change the experiment settings if need be (experiment duration for example).
13. The pH sensor will give a live reading in its module box while plugged in.
14. To run an experiment and collect data, click the "Run experiment" icon.
15. To end data collection early, click the "Stop experiment" icon.

NEULOG PH LOGGER SENSOR GUIDE



Tablet, smart phone device

Materials needed:

- NUL-206 pH Sensor
- WIFI-201 WiFi 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 60-90 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-201 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; Choose "Products" on the main menu, then choose "WiFi Communication module".
6. 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.
7. Take your tablet or smart phone, go to the WiFi settings and select the NeuLog network (NeuLog0184 for example) which matches the ID found on the back of the WIFI-201 module (0184 for example).
8. Give your device about 20 seconds to connect to the WIFI-201 module.
9. 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.
10. You will see a "Control mode" icon in the application, click on it.
11. The application 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.)
12. If the application does not auto detect the sensors, select "Search for Sensors".

13. Once the sensor is found, you will see a module box on the left side of the screen for the pH Sensor. In this box, real time data will be displayed.
14. Click on the "Module setup" button located in the pH sensor module box to change the pH probe settings if need be.
15. Remove the pH sensor's probe from the plastic storage solution bottle.
16. Rinse the tip of the pH sensor's probe thoroughly with distilled water. Be careful not to touch the glass bulb.
17. Prior to initial use, the NeuLog pH sensor needs to be offset; please review the "Sensor Offset" section above.
18. Click on the "Experiment setup" icon to change the experiment settings if need be (Experiment duration for example).
19. To run an experiment and collect data, click on the "On-Line" experiment icon, then click the "Run experiment" icon.
20. If you have a newer generation WIFI-201 module (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 button. Repeating this operation will return the unit to WiFi mode.

Operation with NeuLog Graphic Display Module (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 the 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 touch the glass bulb.
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 icon (little green person).

NEULOG PH LOGGER SENSOR GUIDE



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

Procedure:

1. To determine the experiment settings, first connect to your chosen device (PC, Mac, tablet, smart device) and click on the “Off-line experiment” icon after the sensor search has ended. (For more information on how to change the experiment settings, view the quick start procedure section for your chosen device in this document.)
2. Connect the pH sensor directly to the left side of a charged BAT-200 module.
3. Remove the pH sensor’s probe from the plastic storage solution bottle.
4. Rinse the tip of the pH sensor’s probe thoroughly with distilled water. Be careful not to touch the glass bulb.
5. Prior to initial use, the NeuLog pH sensor needs to be offset, please review the “Sensor Offset” section above.
6. 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.
7. After the experiment has concluded (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 application.
9. Click the “Off-line experiment” icon.
10. Click the “Load data from sensors” icon.
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 application.
4. Click the “Tools” icon.
5. Click the “Restore sensor’s factory defaults” on the menu.

Included with the 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	15 bit
Resolution	0.01 pH
Max sample rate (S/sec)	100
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"> • 0 – 14 pH • mV output with isopotential point at 0 ± mv at 25°C
Response time	98% of full response in 30 seconds at 25°C

Experiment Duration: 1 second to 31 days.

NEULOG PH LOGGER SENSOR GUIDE



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
- Plastic storage solution bottle

Note: NeuLog products are intended for educational use.

Videos and experiment examples:

- Videos, literature and other probes can be found at www.NeuLog.com.
- In order to access the pH sensor's page, choose "Products" on the main menu and then "pH logger sensor".
- In order to find the science experiments, choose "Experiments" on the main menu of the NeuLog website, then choose "Physics", "Chemistry", "Biology" or "Environmental Science".
- Chemistry Experiments:
 - Acid Rain (C-8)
 - Titration of a Strong Acid and a Strong Base (C-10)
- Environmental Science Experiments:
 - Properties of Sea water and Fresh water (E-1)

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 ($^{\circ}\text{C}$, $^{\circ}\text{F}$, 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^+ 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 plastic body.
- Rinse the electrodes with distilled water before and after measuring a sample. Never wipe the electrode to remove excess water – wiping can create static charges that interfere with correct pH measurement.
- 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.
- If you do not have the pH 4 buffer + 4M KCl solution available, a pH 4 buffer can be used. If you do not have a pH 4 buffer available, a pH 7 buffer can be used.
- 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.
- 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.

W: www.neulog.com

E: info@neulog.com

A: 850 St Paul Street, Suite 15, Rochester, NY 14605

P: 1.866.553.8536

V11042014