NEULOG BLOOD PRESSURE LOGGER SENSOR GUIDE

NeuLog blood pressure logger sensor
NUL-222

The NeuLog blood pressure sensor can be used for any science experiment which involves blood pressure measurements such as in the fields of Exercise Science, Biology, Physiology, Human Health, etc.

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

Among hundreds of possible experimental subjects that can be studied with the NUL-222 sensor are: exercise studies, human health studies, athlete comparisons, blood pressure abnormalities, and many more.

The blood pressure sensor's measurement units are:

- Millimeters of mercury (mm Hg): A standard non-SI pressure measurement unit
- Analog arbitrary units (Arb): An arbitrary value used to demonstrate waveforms without a unit
- Millimeters of mercury and analog arbitrary units (mm Hg + Arb): A combination of both units

The blood pressure sensor measures the gas pressure in a cuff attached to a person's arm. This pressure is equal to the pressure operated on the subject's arm.

The heart beats affect the subject's pressure and thus create very small fluctuations in the gas pressure in the cuff. These fluctuations are what doctors hear when they perform a blood pressure check.

The sensor's hardware and firmware separate the average pressure and the pressure fluctuations. They amplify the fluctuations and then add these amplified fluctuations to the average pressure, creating a signal that enables the calculation of the MAP, the systolic and diastolic pressures.

The three ranges of the sensor show the real measured pressure (with very small fluctuations in mm Hg), only the pressure amplified fluctuations (Arb) and the combined signal of both of them.

In the "mm Hg + Arb" mode you can calculate these parameters:

MAP:

MAP (Mean Arterial Pressure) is the pressure where the fluctuations are maximal.

The firmware starts by checking first the average pressure where the largest fluctuations are.

Systolic:

The pressure exerted by the blood on the arterial walls while the heart is beating (maximum pressure achieved). Ideally this value should be in the 90 to 120 mm Hg range for adults and roughly 100 mm Hg for children aged 6 to 9.

This is the average high pressure where the fluctuations' magnitude is 54% of their magnitude at the MAP.

Diastolic:

The pressure exerted by the blood on the arterial walls while the heart is relaxed, between beats (the minimum pressure achieved). Ideally this value should be in the 60 to 80 mmHg range for adults and around 65 mmHg for children aged 6 to 9.

This is the average low pressure where the fluctuations' magnitude is 72% of their magnitude at the MAP.

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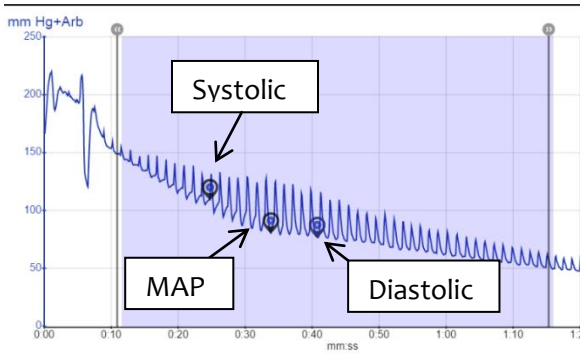

Use of the blood pressure cuff:

To accurately record blood pressure rates, you must first properly attach the blood pressure cuff to the subject being tested.
Note: The cuff works through clothing, however, try to minimize layers for the best readings possible.

1. Unwrap the blood pressure cuff and find the Velcro connection pads.
2. Situate the blood pressure cuff with the Velcro pads facing outwards.
3. Wrap the blood pressure cuff tightly, but without causing discomfort, around the subject's upper arm.
4. Ensure that the rubber tubing (connected directly to the blood pressure cuff) is situated only a couple of centimeters above the inner elbow.
5. Close the air pressure release valve by twisting the metallic knob until it tightens.
6. Using the hand-pump, fill the blood pressure cuff's bladder until it forms a snug but not uncomfortable fit (around 170 mm Hg should be enough).
7. Run an experiment following the General Guide.
8. Loosen the pressure valve to allow a pressure decrease of about 3 to 4 mm Hg per second.

Calculating heart rate, systolic, diastolic, and mean arterial pressure (MAP):

Using the NeuLog software, the systolic, diastolic, and MAP blood pressure values can easily be calculated:

1. Conduct an experiment following the "Using the blood pressure cuff" guide (use the "mm Hg + Arb" mode").
2. After data collection, click the "Cursors" icon underneath the graph.
3. Highlight the region of the data that has a steady decline with visible heart beats by placing the cursors before and after this region.
4. Click on the sensor module box on the left of the screen. .
5. Click on the "Calculate" icon.
6. Markers for systolic, MAP, and diastolic values will appear.
7. Click on each one to see the relevant value.

Included with the sensor:

- NeuLog General Guide
- Blood pressure cuff attached directly to the sensor by flexible rubber tubing
- Hand pump with pressure release valve attached directly to the blood pressure cuff

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Sensor's specifications			
	mm Hg	**Arb**	**mm Hg + Arb**
Range and operation modes	0 to 250	0 to 820	0 to 250
ADC resolution	13 bit		
Resolution	0.12	0.1	0.02 mm Hg
Max sample rate (S/sec)	100		

Experiment Duration: 1 second to 31 days.

Sensor's features:

- Fully digital data
- Rugged plastic ergonomic case
- Blood pressure cuff attached to the sensor's body by a flexible rubber hose
- Hand pump with pressure valve for increasing and decreasing pressure, attached directly to the blood pressure cuff by a flexible rubber hose
- 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.
- In order to access the blood pressure sensor's page, choose "Products" on the main menu and then "Blood pressure logger sensor".
- In order to access the blood pressure sensor's experiments, choose "Example Labs":
  - Blood Pressure (B-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 (^{o}C, ^{o}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 blood pressure sensor uses the piezoresistive effect. The transducer is made of two metal foils separated by silicon; when pressure is applied on the transducer its resistance changes. One side of it is at complete vacuum which enables the measurement of the absolute pressure on its other side.

This transducer is built as a strain gauge with a Wheatstone bridge circuit. Its voltage's output depends on the absolute pressure.

When the user pumps, a pressure is applied directly to the blood pressure monitor cuff's bladder and it is detected by an internal sensing unit. The pressure in the cuff is equal to the pressure operated on the subject's arm.
The heart beats affect the subject's pressure and thus create very small fluctuations in the gas pressure in the cuff. This gives an AC signal reading on a DC signal.

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The pressure is converted into an electrical signal which separates into DC (mm Hg) and AC (Arb.) signals. The AC signal is amplified and added back to the DC signal to create the mm Hg + Arb. signal.

Maintenance and storage:

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

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!

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

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