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Heart Rate/Pulse Sensor

Product Number: ENHRT-A155

Overview

Understanding how the heart works is basic to biology studies and is one of the first experiments any science student should learn to perform. The Heart Rate sensor makes these first steps fun and easy. Students can take their pulse simply by slipping the sensor over their finger. This ease of use makes it ideal for use even in large classrooms. The Heart Rate sensor measures heart rate between 0 and 250 bpm (beats per minute).

The Heart Rate sensor can be connected to all types of einstein™ data loggers.

Typical experiments

Human Physiology

- Comparing the heart rates of different individuals
- Comparing the heart rates of athletes and non-athletes
- Effect of exercise on heart rate
- Effect of caffeine on heart rate

How it works

Unlike an electrocardiograph (EKG) which monitors the electrical signal of the heart, the Heart Rate sensor measures heart rate by monitoring the change in infrared transmittance through blood vessels. As the heart forces blood through the blood vessels, the amount of blood changes and the corresponding variation in light intensities changes.

By plotting this signal, the heart rate can be determined, and some details of the pumping action can be seen on the graph. A sample graph is shown below.

Sensor specification

Range Pulse:	0 to 250 bpm (beats per minute)
Range Waveform:	0 to 3 V
Waveform Resolution (12-bit): Pulse resolution:	1.25 mV 1 bpm (beats per minute)
Recommended Sampling Rate:	25 samples/sec
Data Logger Input Type:	Analog
Response Time:	4 sec

Note: sensor cables sold separately

Note: This product is to be used for educational purposes only. It is not appropriate for medical or research applications. **Specifically, it should not be used for patient diagnosis**.

Technical Notes

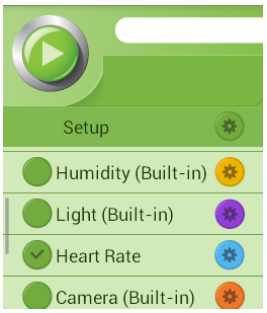
- If readings seem unusual, reposition the Heart Rate clip until you see a smooth heart rate pattern.
- Remain calm with no talking or erratic breathing to obtain accurate readings.
- Nail polish can block the infrared light and therefore interfere with the reading.
- To meaningfully measure heart rate, the user should wait approximately five seconds to allow the sensor to adjust.
- Don't use the sensor in very bright light.
- Strong and direct florescent light **may** affect the readings. You may need to block the florescent light for an accurate reading.
- During the entire measurement, the finger clip must remain connected to the sensor and to the finger; otherwise the data will be inaccurate.

Data logging and analysis

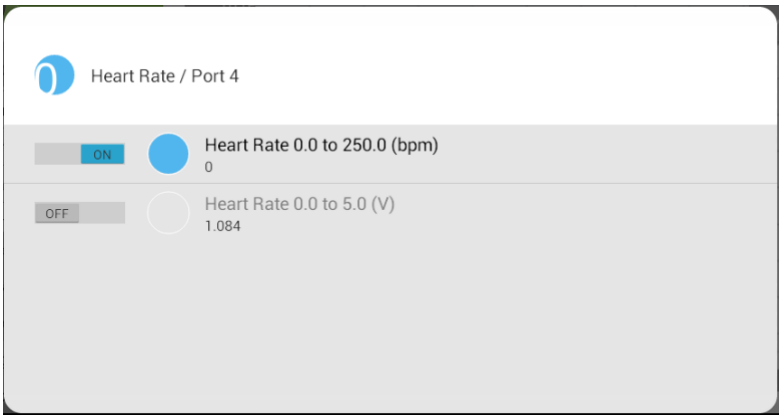
MiLAB™

1. Take your einstein™ Tablet OR pair your einstein™ LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB

4. MiLAB will automatically detect the sensor and show it in the Launcher View

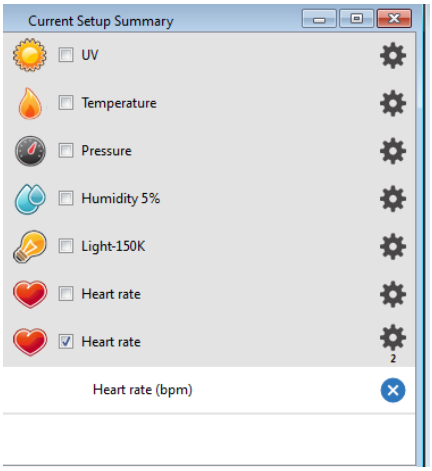


5. Make sure the icon next to the sensor is checked ( ) to enable it for logging
6. Tap the Settings icon to turn waveform (voltage) readings on and off

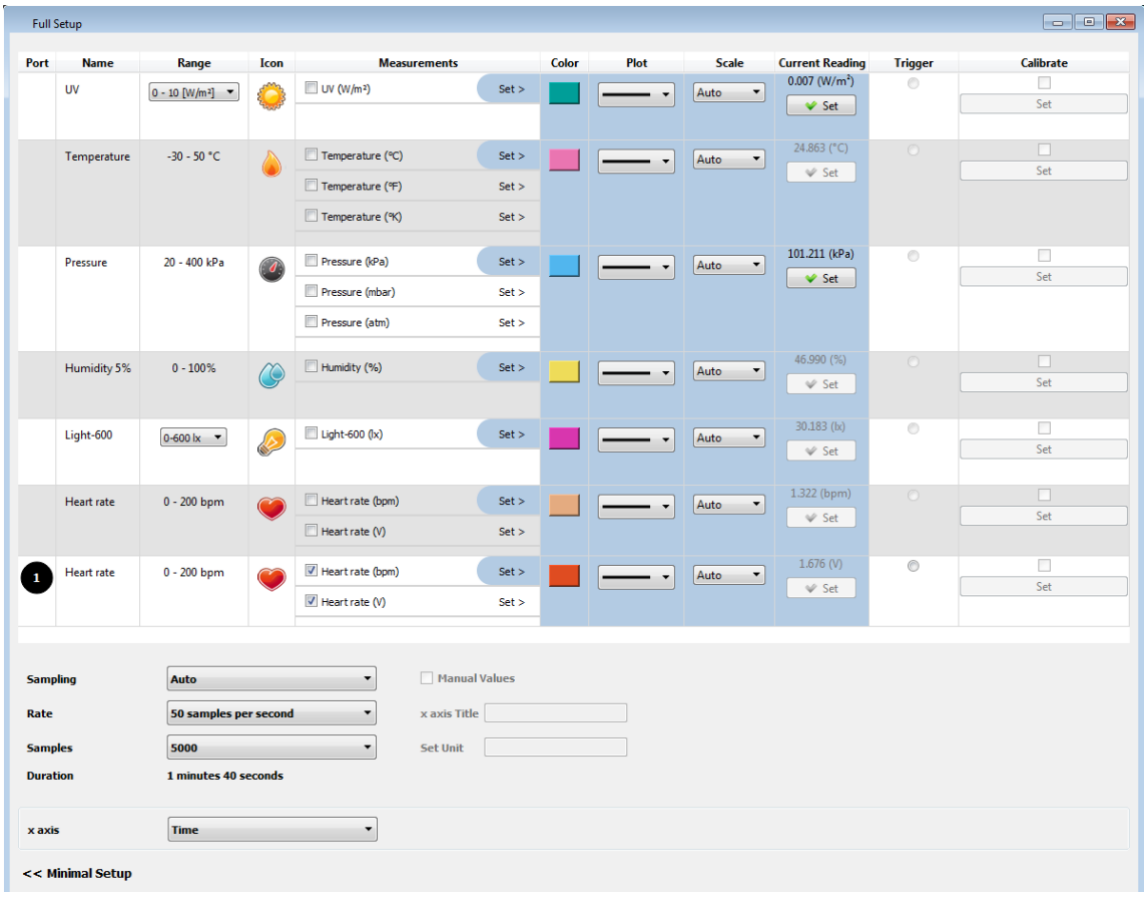


MiLAB™ Desktop

1. Pair your einstein™ LabMate with your PC, MAC, or Linux machine via Bluetooth, or connect it via the USB cable (found in the einstein™ LabMate box).
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MiLAB will automatically detect the sensor and show it in the Current Setup Summary window



5. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's sample rate, number of samples, units of measurement, and other options.



6. Click the Run button ( ) on the main toolbar to start logging

Calibration

The Heart Rate sensor requires no calibration.

Experiment Set-Up

The Heart Rate sensor comes with:

- One Heart Rate sensor
- One Finger clip

An Example of using the Heart Rate Sensor

Monitoring Heart Rate Using Both bpm and Waveform

Below is a typical graph showing data obtained using a Heart Rate sensor:

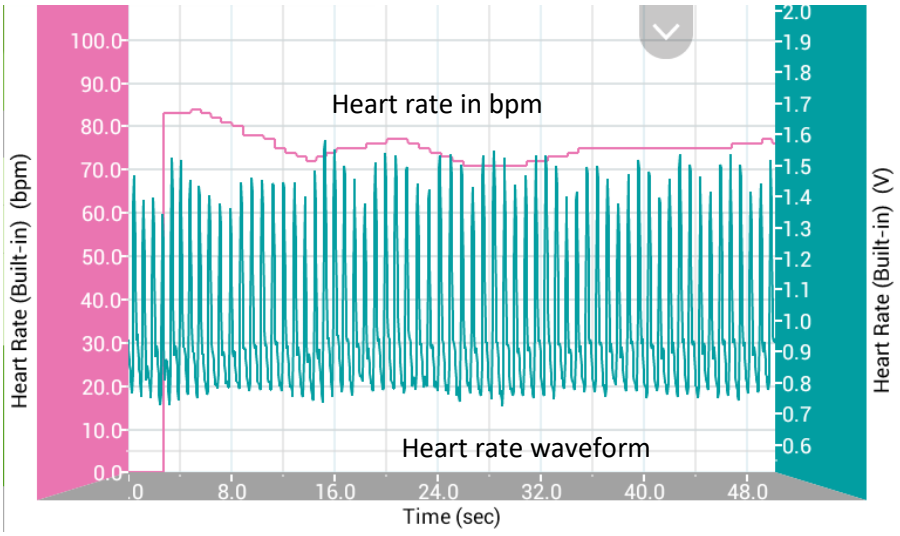


Figure 1: Monitoring both heart rate in bpm and waveform

Troubleshooting

If the Heart Rate sensor isn't automatically recognized by MiLAB, please contact Fourier Education's technical support.

Technical support

For technical support, you can contact the Fourier Education's technical support team at:

Web: www.einsteinworld.com/support

Email: support@fourieredu.com

Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.

This warranty does not cover breakage of the product caused by misuse or abuse.

This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.