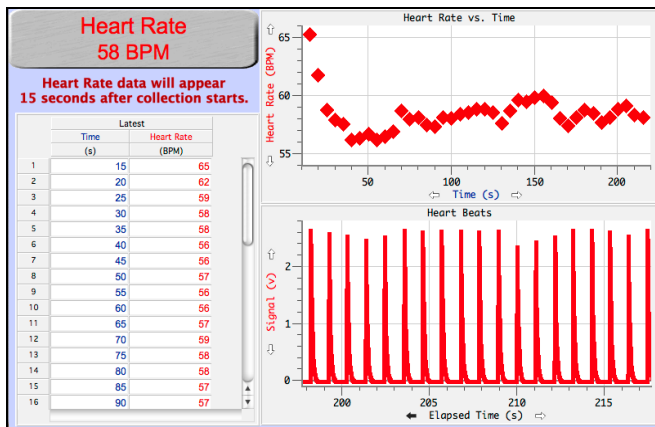


Exercise Heart Rate Monitor

(Order Code EHR-BTA or EHR-DIN)



The Exercise Heart Rate Monitor records a person's heart beat. Similar to an electrocardiograph (EKG), this sensor detects the electrical signal generated for each heart beat. This signal is measured at the surface of the skin by electrodes embedded in the chest belt of the Exercise Heart Rate Monitor. Graphing this signal offers a method to determine heart rate. A sample graph is shown below:



Graph from Logger Pro program

Collecting Data with the Exercise Heart Rate Monitor

This sensor can be used with the following interfaces to collect data.

- Vernier LabQuest[®] 2 or original LabQuest[®] as a standalone device or with a computer
- Vernier LabPro[®] with a computer or TI graphing calculator
- Vernier Go![®] Link
- Vernier EasyLink[®]
- Vernier SensorDAQ[®]
- CBL 2[™]
- TI-Nspire[™] Lab Cradle

Here is the general procedure to follow when using the Exercise Heart Rate Monitor:

1. Connect the Exercise Heart Rate Monitor to the interface.
2. Start the data-collection software.¹
3. The software will identify the Exercise Heart Rate Monitor and load a default data-collection setup. You are now ready to collect data.

Data-Collection Software

This sensor can be used with an interface and the following data-collection software.

- **Logger Pro 3** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **Logger Pro 2** This computer program is used with ULI or Serial Box Interface.
- **Logger Lite** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest 2 or LabQuest is used as a standalone device.
- **DataQuest[™] Software for TI-Nspire[™]** This calculator application for the TI-Nspire can be used with the EasyLink or TI-Nspire Lab Cradle.
- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2, LabPro, and Vernier EasyLink. We recommend version 2.0 or newer, which can be downloaded from the Vernier web site, www.vernier.com/easy/easydata.html, and then transferred to the calculator. See the Vernier web site, www.vernier.com/calc/software/index.html for more information on the App and Program Transfer Guidebook.
- **DataMate program** Use DataMate with LabPro or CBL 2 and TI-73, TI-83, TI-84, TI-86, TI-89, and Voyage 200 calculators. See the LabPro and CBL 2 Guidebooks for instructions on transferring DataMate to the calculator.
- **LabVIEW** National Instruments LabVIEW[™] software is a graphical programming language sold by National Instruments. It is used with SensorDAQ and can be used with a number of other Vernier interfaces. See www.vernier.com/labview for more information.

NOTE: Vernier products are designed for educational use. Our products are not designed nor recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

Specifications

Receiver range:	80–100 cm
Receiver current consumption:	30–55 μ A
Transmitter transmission frequency:	5 kHz \pm 10%
Transmitter operating temperature:	0–60°C

¹ If you are using Logger Pro 2 with either a ULI or SBI, the sensor will not auto-ID. Open an experiment file for the Exercise Heart Rate Monitor in the Probes & Sensors folder.

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, TI-Nspire™ Lab Cradle, EasyLink, or CBL 2™, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

How the Exercise Heart Rate Monitor Works

The Exercise Heart Rate Monitor consists of a transmitter belt with an elastic strap and a plug-in receiver. The transmitter belt is worn just below the chest and held in place by an elastic strap. The plug-in receiver connects to any of the interfaces listed above. The transmitter detects each heartbeat through two electrodes and transmits heart rate information to the plug-in receiver with a low frequency electromagnetic field. The plug-in receiver wirelessly receives the transmission, and passes a 3-volt pulse for each detected heart beat to the Vernier interface. The reception range of the plug-in receiver is 80–100 cm or about 3 feet.

In general, you can use the Exercise Heart Rate Monitor as you would any other sensor connected to your interface. You can plot a pulse for each heart beat and analyze the time between the peaks to determine the heart rate. Often it is more convenient to use a program that simply displays the heart rate in beats per minute on the screen. Our programs do this for all of our interfaces.

Calibration Information

The Exercise Heart Rate Monitor does not need to be, nor can it be, calibrated. Factory calibrations provide very accurate heart rate values.

Suggested Experiments

- Compare the heart rate of different individuals; athletes and sedentary people.
- Check a person's heart rate before, during, and after a short period of vigorous activity doing jumping jacks, a step test, or running flights of stairs.
- Monitor the recovery rate; that is, how fast a person's heart rate returns to normal after exercise.
- Check *baroreceptor reflex response* for changes in a subject's heart rate when reclined, sitting, or standing.
- Check a person's heart rate before and after eating or at different times of the day.
- Monitor a person's heart rate as they hold their breath.

Suggestions for Using the Exercise Heart Rate Monitor

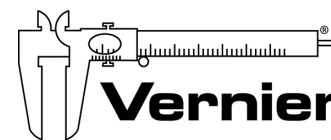
Tips to insure successful data collection with the Exercise Heart Rate Monitor include:

- Make sure that the belt fits snugly around the chest and is resting directly against the subject's skin. You may need to reposition the transmitter left or right, or place it lower or higher on the torso. Make sure to re-wet the skin-belt interface with the saline solution each time the transmitter is repositioned.
- Be sure the receiver is positioned within 80 cm of the transmitter belt. This is the maximum transmission range of the transmitter on the chest belt.

- The receiver of the Exercise Heart Rate Monitor will receive signals from other belt transmitters if they are within range. Maintain a distance of at least 2 m between groups using this sensor.
- Interference from other electrical devices, such as electrical appliances, high voltage wiring, laptops, cell phones, and desktop computers can result in poor or aberrant readings. Keep the receiver of the Exercise Heart Rate Monitor as far away as possible from such equipment.
- Static electricity can also cause electrical interference resulting in unusual readings.
- Salt build-up on the chest transmitter can cause poor readings. Wash and dry the unit regularly after use with water and a mild soap solution. Do not use alcohol or solvent-based detergents.
- With certain individuals, readings from the Exercise Heart Rate Monitor may take a minute or two to stabilize. In those cases, allow the readings to stabilize before starting data collection.
- Start data collection to see heart rate. Live readouts do not display heart rates because that value comes from a calculated column that must be populated.

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.



Measure. Analyze. Learn.™
Vernier Software & Technology

13979 S.W. Millikan Way • Beaverton, OR 97005-2886
Toll Free (888) 837-6437 • (503) 277-2299 • FAX (503) 277-2440
info@vernier.com • www.vernier.com

Rev. 6/18/2012

Logger Pro, Logger Lite, Vernier LabQuest 2, Vernier LabQuest, Vernier LabQuest Mini, Vernier LabPro, Go! Link, Vernier EasyLink and other marks shown are our trademarks or registered trademarks in the United States. TI-Nspire, CBL 2 and CBL, TI-GRAPH LINK, and TI Connect are trademarks of Texas Instruments. All other marks not owned by us that appear herein are the property of their respective owners, who may or may not be affiliated with, connected to, or sponsored by us.



Printed on recycled paper.