# Hand-Grip Heart Rate Monitor

(Order Code HGH-BTA)

The Hand-Grip Heart Rate Monitor measures a person's heart rate by registering the small electrical signals carried across the surface of a person's skin each time his or her heart contracts. This signal is measured at the surface of the skin by electrodes embedded in the hand grips of the Hand-Grip Heart Rate Monitor. By graphing this signal, the heart rate can be determined. A sample graph is shown below:
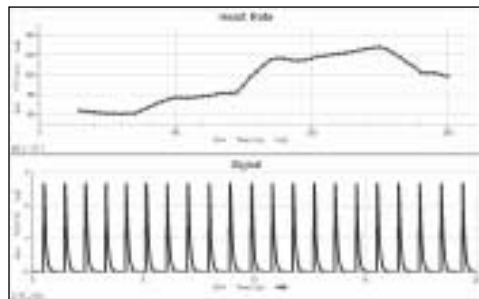
Suggested Experiments

- Compare the heart rate of different individuals.
- Compare the heart rate of athletes and sedentary people.
- Monitor a person's heart rate before, during, and after a short period of vigorous activity (such as doing jumping jacks).
- Monitor how fast a person's heart rate returns to normal after exercise (recovery rate).
- Check for baroreceptor reflex; that is, changes in heart rate for a person when reclined, sitting, and standing caused by the need for the heart to pump blood to different levels.
- Check a person's heart rate before and after caffeine consumption.
- Check a person's heart rate before and after eating.
- Check your own heart rate at different times of the day.
- Monitor a person's heart rate as his or her breath is held.

Collecting Data with the Hand-Grip Heart Rate Monitor

This sensor can be used with the following interfaces to collect data:
- Vernier LabQuest™ as a standalone device or with a computer
- Vernier LabPro® with a computer, TI graphing calculator, or Palm® handheld
- Vernier Go!®Link
- Vernier EasyLink®
- Vernier SensorDAQ™
- CBL 2™

Here is the general procedure to follow when using the Hand-Grip Heart Rate Monitor:
1. Connect the Hand-Grip Heart Rate Monitor receiver to the interface.
2. Start the data-collection software.
3. The software will identify the Hand-Grip 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*** This computer program is used with LabQuest, LabPro, or Go!Link.
- **Logger Lite** This computer program is used with LabQuest, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest is used as a stand-alone device.
- **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.
- **Data Pro** This program is used with LabPro and a Palm handheld.
- **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: This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

Specifications

Receiver range	80–100 cm
Transmitter transmission frequency:	5 kHz ±10%
Receiver current consumption	30–55 µA
Transmitter operating temperature	0–60˚C

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest, LabPro, Go! Link, SensorDAQ, 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 Hand-Grip Heart Rate Monitor Works

The Hand-Grip Heart Rate Monitor consists of a set of hand grips and a plug-in receiver. The hand grips are held, one in each hand, by the individual whose heart rate is being monitored. The hand grips are marked for the right or left hand and each has the necessary markings showing where the individuals' fingers and palms should be placed. The left hand grip and the receiver are both marked with an alignment arrow. When collecting data, it is **important** that the arrow labels on each of these devices be in alignment (see figure).

The plug-in receiver connects to any of the interfaces listed above. The transmitter detects each heart beat through the electrodes on the two hand grips with ECG accuracy and transmits the heart rate information to the plug-in receiver with the help of a low frequency electromagnetic field. The plug-in receiver wirelessly receives the transmission, and passes a 3-volt pulse for each heart beat detected 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 Hand-Grip 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 data-collection programs perform this task for all of our interfaces.

Do I Need to Calibrate the Hand-Grip Heart Rate Monitor? "No."

The Hand-Grip Heart Rate Monitor does not need to be, nor can it be, calibrated. It provides very accurate heart rate values.

Using a Chest Belt Transmitter

The Chest Belt Transmitter, which is ordered separately (Order Code CBT), works in place of the hand grips, allowing a hands-free option of measuring heart rate. The chest belt is worn on or below the chest and held in place by an elastic strap. Make sure that the belt fits snugly around the chest and is resting directly against the subject's skin. Make sure to re-wet the electrodes each time the belt is positioned.

Helpful Tips

Listed below are some tips to insure successful data collection.

1. Make sure that the hand grips and the receiver are in alignment. The arrow symbol on the left hand grip and the receiver should be held in parallel alignment.
2. Be sure to hold the receiver within 80 cm of the hand grips. This is the maximum transmission range of the transmitter in the chest belt.
3. Dirty electrodes on the hand grips can cause poor readings. In between uses, it is a good idea to gently wipe the electrodes clean using alcohol wipes. Do not immerse the hand grips in solution, simply spray or wipe alcohol onto them.
4. The receiver of the Hand-Grip Heart Rate Monitor will receive signals from other hand grips if they are within range; be sure to maintain a distance of at least 2 meters between other individuals that are monitoring heart rate.
5. Interference from electrical devices, such as computer monitors, electronic exercise equipment (treadmills, stationary bicycles, etc.), televisions, TV antennas, and high voltage lines (both above and below ground) can result in poor readings. Keep the receiver of the Hand-Grip Heart Rate Monitor as far away as possible from such equipment.
6. With certain individuals, readings from the Hand-Grip Heart Rate Monitor may take a minute or two to stabilize. In such cases, allow the readings to stabilize before starting data collection.

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

 Printed on recycled paper.