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. Data are wirelessly transmitted to a Vernier interface using the Heart Rate Receiver. Sensors purchased after May 2015 can also transmit data directly to devices that are Bluetooth® Smart Ready, such as the LabQuest®2, without the receiver. This sensor is ideal for continuously monitoring heart rate before, during, and after exercise or while a person is stationary.

What is Included with the Hand-Grip Heart Rate Monitor

- Heart Rate Hand Grips
- Polar Transmitter Module (battery included)
- Heart Rate Receiver

NOTE: Vernier products are designed for educational use. Our products are not designed nor are they 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.

Collecting Data using the Heart Rate Receiver

This sensor can be used with the following interfaces to collect data using the Heart Rate Receiver.

- Vernier LabQuest® 2 or original LabQuest as a standalone device or with a computer
- Vernier LabQuest Mini 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

General procedure for using the Hand-Grip Heart Rate Monitor with the Heart Rate Receiver.

1. Ensure that the Polar Transmitter Module is securely attached to the Heart Rate Hand Grips.
2. Connect the Heart Rate Receiver to the interface.
3. Start the data-collection software.
4. The software will identify the Hand-Grip Heart Rate Monitor and load a default data-collection setup. You are now ready to collect data.

Note: The subject's heart rate will not be displayed on the Meter Screen when using the Heart Rate Receiver. Heart rate will be calculated and then graphed during data collection after a short delay.

Data-Collection Software when using the Heart Rate Receiver

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 Lite** This computer program can be 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. Version 2.2.1, or newer, is required if you are using LabQuest 2. Version 1.7.1, or newer, is required if you are using the original LabQuest.
- **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.

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.

Collecting Data using Bluetooth

This sensor can also be used with supported mobile devices[1] that are Bluetooth® Smart Ready and one of our supported apps. **Note**: The Heart Rate Receiver is not used when using Bluetooth.

- **LabQuest 2 App (version 2.5 or newer)**[2]
- **Graphical Analysis for iOS devices (version 2.2 or newer)** Available on the App Store. For more information, see www.vernier.com/ga-app
- **Graphical Analysis for Android devices (version 2.1 or newer)** Available on Google Play in spring 2015. For more information, see www.vernier.com/ga-app

Collecting Data with Bluetooth Smart Devices

To use the Hand-Grip Heart Rate Monitor with Bluetooth Smart Devices, ensure that the Polar Transmitter Module is attached to the Heart-Rate Hand Grips securely. Locate and record the ID on the side of the Polar Transmitter Module. This is a unique sequence of six numbers and/or letters (e.g., ID:XXXXXX). Have the subject grasp the handles of the hand grips to activate the Bluetooth radio in the Polar Transmitter Module. The sensor is now ready for data collection.

Collecting Data with LabQuest 2 App

1. Choose New from the File menu. On the Meter Screen, choose Go Wireless Setup from the Sensors menu.
2. Select the Polar HR with the proper ID from the list of available sensors. Tap OK.
3. The heart rate of the subject will display on the Meter Screen.
4. Collect data as desired.

Note: The sensor will disconnect from the device 30 seconds after letting go of the hand-grips. To reconnect to the sensor, navigate to the Meter Screen. Tap Offline: Heart Rate and select Go Wireless. Tap Reconnect and select your Polar HR sensor.

Collecting Data with Graphical Analysis

1. Open Graphical Analysis.
2. Tap Create Experiment. Choose Wireless Sensors.
3. Select the Polar HR with the proper ID from the list of available sensors.
4. Tap Collect to begin data collection.

Note: The sensor will disconnect from the device 30 seconds after letting go of the hand-grips. To reconnect to the sensor, tap Connect and select your Polar HR sensor.

Specifications

Polar Transmitter Module

Battery type	CR 2025 (user-replaceable)
Battery lifetime	200 hrs
Operating temperature	–10 to 50ºC
Radios	Bluetooth and 5 kHz RF transmission
Wireless range	
RF transmission	80–100 cm
Bluetooth	10 m or more unobstructed

[1] For a full list of supported mobile devices, see www.vernier.com/ga-app

[2] To determine if your LabQuest 2 is Bluetooth Smart Ready, see www.vernier.com/til/3085

How the Hand-Grip Heart Rate Works

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. The Polar Transmitter Module detects each electrical signal from the heart through the electrodes on the hand grips. The heart rate information is then wirelessly transmitted using the Heart Rate Receiver or a Bluetooth radio to supported devices. The Heart Rate Receiver is marked with an alignment arrow. When collecting data using the receiver, it is **important** that the arrow on the receiver is aligned with the hand-grip as shown in Figure 1. **Note:** When using the receiver, make sure that the receiver is held close to the handgrips. The reception range of the plug-in receiver is 80–100 cm or about 3 feet.

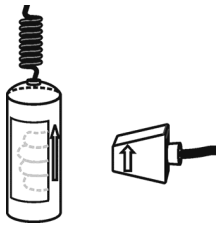

Figure 1

Calibration

The Hand-Grip Heart Rate Monitor does not need to be, nor can it be, calibrated.

Using a Chest Strap

The Exercise Heart Rate Strap, which is ordered separately (order code HR-STRAP), works in place of the hand grips, allowing a hands-free option for measuring heart rate. The Polar Transmitter Module simply snaps into the chest strap. The strap should be located just below the chest muscles. Attach the hook to the other end of the strap to secure the strap. For instructions on how to use the Chest Strap with the Polar Transmitter module, download the user manual for the Exercise Heart Rate Monitor at www.vernier.com/ehr-bta

Helpful Tips

Listed below are some tips to ensure successful data collection.

1. Make sure that the Heart Rate Receiver is aligned with the hand grips as shown in Figure 1.
2. Hold the receiver within 80–100 cm of the hand grips when using the receiver. This is the maximum transmission range of the transmitter when using the receiver.
3. Dirty electrodes on the hand grips can cause poor readings. 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 Heart Rate Receiver can receive signals from other hand grips if they are within range; be sure to maintain a distance of at least 2 m 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 Heart Rate Receiver 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 performing an experiment.

7. If you are using the Heart Rate Receiver, you must 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.
8. If you have a device that is Bluetooth® Smart Ready, such as the LabQuest 2, use the Bluetooth option for data collection.

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), as shown in Figure 2.

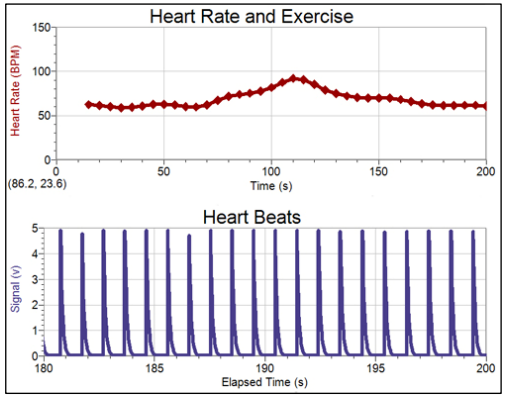

Figure 2

Replacement Parts

Part	Order code
Heart Rate Hand Grips	HR-GRIP
Polar Transmitter Module	HR-TRANS
Heart Rate Receiver	HR-REC

Optional Accessories

Part	Order code
Exercise Heart Rate Strap	HR-STRAP

Disposal Instruction

When disposing of this electronic product, do not treat it as household waste. Its disposal is subject to regulations that vary by country and region. This item should be given to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you help prevent potential negative consequences on human health or on the environment. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, contact your local city office or your disposal service.

The symbol, shown here, indicates that this product must not be disposed of in a standard waste container.

Warranty

Vernier warrants the Hand Grips to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. The Polar Transmitter Module and Heart Rate Receiver are warranted for two years. This warranty does not cover the battery or damage to the product caused by abuse or improper use.

Notes:

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Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference and

(2) this device must accept any interference received, including interference that may cause undesired operation

RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Industry Canada - Class B This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

RF exposure warning: The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes : (1) l’appareil ne doit pas produire de brouillage, et (2) l’appareil doit accepter tout interférence radioélectrique, même si cela résulte à un brouillage susceptible d’en compromettre le fonctionnement.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de ***Classe B prescrites dans la norme sur le matériel interférant-brouilleur: “Appareils Numériques,” NMB-003 édictée par industrie Canada****. L’utilisation est soumise aux deux conditions suivantes: (1) cet appareil ne peut causer d’interférences, et (2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un disfonctionnement du dispositif. Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d’antenne et son gain doivent être choisie de telle façon que l’équivalent de puissance isotrope émis (e.i.r.p) n’est pas plus grand que celui permis pour une communication établie.* ***Avertissement d’exposition RF:*** *L’équipement est conforme aux limites d’exposition aux RF établies pour un environnement non supervisé. L’antenne (s) utilisée pour ce transmetteur ne doit pas être jumelés ou fonctionner en conjonction avec toute autre antenne ou transmetteur.*

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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

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