Go Direct®
Respiration Belt
(Order Code GDX-RB)

Go Direct Respiration Belt uses a force sensor and an adjustable nylon strap to measure respiration effort and rate. An LED indicator provides feedback so belt tension can be optimized for best results. Respiration rate is reported within the software, which makes comparison studies betweens subjects or experiments easy to do. The sensor can also be used measure steps and step rate. The following are some activities and experiments that can be performed using the Go Direct Respiration Belt:

- Study how respiration rate changes after exercise or holding of breath.
- Study how respiration effort changes after exercise or holding of breath.
- Compare resting respiration parameters of athletes and non-athletes.
- Use the built-in pedometer to compare step rate while walking and running.

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.

What's Included
- Go Direct Respiration Belt
- Micro USB Cable

Compatible Software
See **www.vernier.com/manuals/gdx-rb** for a list of software compatible with the Go Direct Respiration Belt.

Getting Started
Please see the following link for platform-specific connection information:

www.vernier.com/start/gdx-rb

Bluetooth Connection

1. Install Vernier Graphical Analysis™ on your computer, Chromebook™, or mobile device. If using LabQuest®, make sure LabQuest App is up to date. See www.vernier.com/ga4 for Graphical Analysis availability or www.vernier.com/downloads to update LabQuest App.
2. Charge your sensor for at least 2 hours before first use.

USB Connection

1. If using a computer or Chromebook, install Vernier Graphical Analysis. If using LabQuest, make sure LabQuest App is up to date. See www.vernier.com/ga4 for Graphical Analysis availability or www.vernier.com/downloads to update LabQuest App.
2. Connect the sensor to the USB port.

3. Turn on your sensor by pressing the power button once. The Bluetooth® LED will blink red.
4. Launch Graphical Analysis or turn on LabQuest.
5. If using Graphical Analysis, click or tap Sensor Data Collection. If using LabQuest, choose Wireless Device Setup > Go Direct from the Sensors menu.
6. Select your Go Direct sensor from the list of Discovered Wireless Devices. Your sensor's ID is located near the barcode on the sensor. The Bluetooth LED will blink green when it is successfully connected.
7. Click or tap Done. You are now ready to collect data.
8. This is a multi-channel sensor. To change the channel selections, see www.vernier.com/start/gdx-rb

3. Launch Graphical Analysis or turn on LabQuest. You are now ready to collect data.
4. This is a multi-channel sensor. To change the channel selections, see www.vernier.com/start/gdx-rb

Note: This sensor does not work with the original LabQuest. It works with LabQuest 2 or LabQuest 3.

Charging the Sensor
Connect the Go Direct Respiration Belt to the included USB Charging Cable and any USB device for two hours.

You can also charge up to eight Go Direct Respiration Belts using our Go Direct Charge Station, sold separately (order code: GDX-CRG). An LED on each Go Direct Respiration Belt indicates charging status.

Charging	Orange LED next to the battery icon is solid while the sensor is charging.
Fully charged	Green LED next to the battery icon is solid when the sensor is fully charged.

Powering the Sensor

Turning on the sensor	Press button once. Red LED indicator next to the Bluetooth icon flashes when the unit is on.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Red LED indicator next to Bluetooth icon stops flashing when sleeping.

Connecting the Sensor
See the following link for up-to-date connection information:

Connecting via Bluetooth

Ready to connect	Red LED next to the Bluetooth icon flashes when sensor is awake and ready to connect.
Connected	Green LED next to the Bluetooth icon flashes when sensor is connected via Bluetooth.

Connecting via USB

Connected and charging	Orange LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and the unit is charging. LED next to Bluetooth icon is off.
Connected, fully charged	Green LED next to the battery icon is solid when the sensor is connected to Graphical Analysis via USB and fully charged. LED next to Bluetooth icon is off.
Charging via USB, connected via Bluetooth	Orange LED next to the battery icon is solid when the sensor is charging. Green LED next to the Bluetooth icon flashes.

Identifying the Sensor

When two or more sensors are connected, the sensors can be identified by tapping or clicking Identify in Sensor Information.

Using the Product

Place the Go Direct Respiration Belt around the chest or abdomen of the subject. The sensor does not need to rest on the skin; it can be worn over clothing. Secure the sensor to the subject using the strap and clips provided. For best results, position the sensor box so it is located just below the sternum of the subject. The tension indicator light is located in the bottom left corner of the sensor label, just below the checkmark. If the light is not on, tighten the strap until the light turns green. Loosen the strap if the light turns red. A red light indicates too much tension.

Connect the sensor following the steps in the Getting Started section of the user manual.

Channels

Go Direct Respiration Belt has four measurement channels:

- Force
- Respiration Rate
- Steps
- Step Rate

Force

Force is a default channel that is active when the sensor is connected. The force channel measures respiration effort. This is the force exerted by the chest during respiration. Inhalation will be observed as an increase in force. Exhalation will be observed as a decrease in force.

Respiration Rate

Respiration Rate is the other default channel that is active when the sensor is connected. This channel detects inhalations and calculates the number of breaths per minute (BPM). The sample window for the calculation is 30 seconds. The advance interval is 10 seconds. The value will update every 10 seconds.

Steps

The Steps channel reports the number of steps that are detected by the sensor. You should zero this channel before collecting data.

Step Rate

The Step Rate channel steps per minute (SPM). The sample window for the calculation is 10 seconds. The advance interval is 10 seconds. The value will update every 10 seconds.

Videos

View videos related to this product at **www.vernier.com/gdx-rb**

Calibrating the Sensor

Force

The channel is factory calibrated. You should never have to perform a new calibration for the Go Direct Respiration Belt. If you would like to calibrate the sensor, use a one-point calibration. Place the sensor on a flat surface with the label facing upward. Enter 0 N as the known force.

Respiration Rate

The channel is factory calibrated.

Steps

The channel is factory calibrated.

Step Rate

The channel is factory calibrated.

Specifications

Range	0–50 N
Resolution	0.01 N
Response time	50 ms
Respiration rate	Sample window: 30 s Advance interval: 10 s
Step rate	Sample window: 10 s Advance interval: 10 s
Maximum chest circumference	140 cm
Wireless specification	Bluetooth 4.2
Maximum wireless range	30 m
Battery	300 mA Li-Poly
Battery life (single full charge)	~24 hours
Battery life (long term)	~500 full charge cycles (several years depending on usage)

Care and Maintenance

Battery Information
The Go Direct Respiration Belt contains a small lithium-ion battery. The system is designed to consume very little power and not put heavy demands on the battery. Although the battery is warranted for one year, the expected battery life should be several years. Replacement batteries are available from Vernier (order code: GDX-BAT-300).

Storage and Maintenance
To store the Go Direct Respiration Belt for extended periods of time, put the device in sleep mode by holding the button down for at least three seconds. The red LED will stop flashing to show that the unit is in sleep mode. Over several months, the battery will discharge but will not be damaged. After such storage, charge the device for a few hours, and the unit will be ready to go.

Exposing the battery to temperatures over 35°C (95°F) will reduce its lifespan. If possible, store the device in an area that is not exposed to temperature extremes.

Water Resistance
The Go Direct Respiration Belt is not water resistant and should never be immersed in water.

If water gets into the device, immediately power the unit down (press and hold the power button for more than three seconds). Disconnect the sensor and charging cable, and remove the battery. Allow the device to dry thoroughly before attempting to use the device again. Do not attempt to dry using an external heat source.

How the Sensor Works
The Go Direct Respiration Belt uses a force sensor connected to a nylon strap to measure respiration effort (the force exerted by the chest during respiration). The sensor has two straps. The long strap is adjustable and is attached to a plastic loop on the sensor box. The short strap is attached to a second loop that is connected to a force sensor inside the sensor box. The force sensor measures the amount of force that is applied to the small strap. The straps are placed around the chest of the subject and then connected to each other using the clip. The chest cavity expands with each inhalation. This applies tension to the small strap which is measured by the force sensor. During exhalation, the tension decreases on the strap, so a decrease in force is observed.

Troubleshooting
For best results, position the sensor box so it located just below the sternum of the subject. Make sure the tension indicator light is green before collecting data.

The ideal sampling rate for the sensor depends on the task the subject will be performing. The default sampling rate should be used if the subject is at rest, or will be sitting or standing. A sampling rate of 4 samples per second or slower should be used if the subject is walking.

Only the Force and Respiration Rate channels are enabled by default. Use software controls to enable the steps and step rate channels if desired.

For troubleshooting and FAQs, see **www.vernier.com/til/4066**

Repair Information
If you have watched followed the troubleshooting steps and are still having trouble with your Go Direct Respiration Belt, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories/Replacements

Item	Order Code
Micro USB Cable	CB-USB-MICRO
USB-C to Micro USB Cable	CB-USB-C-MICRO
Go Direct 300 mAh Replacement Battery	GDX-BAT-300

Warranty
Warranty information for this product can be found on the Support tab at **www.vernier.com/gdx-rb**

General warranty information can be found at **www.vernier.com/warranty**

Disposal

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.

Battery recycling information is available at **www.call2recycle.org**

Do not puncture or expose the battery to excessive heat or flame.

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

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.

Note: This product is a sensitive measurement device. For best results, use the cables that were provided. Keep the device away from electromagnetic noise sources, such as microwaves, monitors, electric motors, and appliances.
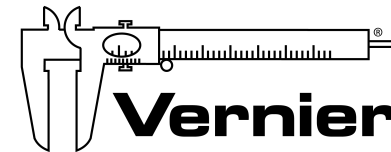
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