

# Go Direct<sup>®</sup> Radiation Monitor (Order Code GDX-RAD)



Go Direct Radiation Monitor detects alpha, beta, gamma, and X-ray radiation. It directly connects via Bluetooth<sup>®</sup> wireless technology or wired via USB to your platform.

**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 Radiation Monitor
- Micro USB Cable

## Compatible Software

See [www.vernier.com/manuals/gdx-rad](http://www.vernier.com/manuals/gdx-rad) for a list of software compatible with the Go Direct Radiation Monitor.

## Getting Started

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

[www.vernier.com/start/gdx-rad](http://www.vernier.com/start/gdx-rad)

### Bluetooth Connection

1. Install Graphical Analysis 4 on your computer, Chromebook<sup>™</sup>, or mobile device. See [www.vernier.com/ga4](http://www.vernier.com/ga4) for software availability.
2. Charge your sensor for at least 2 hours before first use.
3. Turn on your sensor by pressing the power button once. The Bluetooth<sup>®</sup> LED will blink red.
4. Launch Graphical Analysis 4.
5. Click or tap Sensor Data Collection.
6. Click or tap 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

### USB Connection

1. Install Graphical Analysis 4 on your computer or Chromebook. If using LabQuest 2, make sure LabQuest App is up to date. See [www.vernier.com/ga4](http://www.vernier.com/ga4) for software availability or [www.vernier.com/downloads](http://www.vernier.com/downloads) to update LabQuest App.
2. Connect the sensor to the USB port.
3. Launch Graphical Analysis 4 or turn on LabQuest 2. You are now ready to collect data.

blink green when it is successfully connected.

7. Click or tap Done to enter data-collection mode.

## Charging the Sensor

Connect Go Direct Radiation Monitor to the included Micro USB Cable and any USB device for two hours.

You can also charge up to eight Go Direct Radiation Monitors using our Go Direct Charge Station, sold separately (order code: GDX-CRG). An LED on each Go Direct Radiation Monitor 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 flashes when unit is on. Red LED next to radiation symbols starts to flash as counts come in.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Red LEDs stop flashing when sleeping.

## Connecting the Sensor

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

[www.vernier.com/start/gdx-rad](http://www.vernier.com/start/gdx-rad)

### 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. Red LED next to radiation symbols flash as counts come in.
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

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

The  $\alpha\beta\gamma$  LED will flash for each alpha, beta, or gamma particle detected. Turn on/off the optional audio signal using the small switch on the base of the box, next to the GM tube.

To measure gamma and X-rays, hold the tip of Go Direct Radiation Monitor toward the source of radiation. Low-energy gamma radiation (10–40 keV) cannot penetrate the side of the GM tube, but may be detected through the end window.

To detect alpha radiation, position the monitor so the suspected source of radiation is next to the GM window. Alpha radiation will not travel far through air, so put the source as close as possible (within 1/4") to the screen without touching it. Even a humid day can limit the already short distance an alpha particle can travel.

To detect beta radiation, point the end window toward the source of radiation. Beta radiation has a longer range through air than alpha particles, but can usually be shielded (e.g., by a few millimeters of aluminum). High energy beta particles may be monitored through the back of the case.

To determine whether radiation is alpha, beta, or gamma, hold the tip of the monitor toward the specimen. If there is an indication of radioactivity, it is most likely gamma or high energy beta. Place a piece of aluminum about 3 mm (1/8") thick between the case and the specimen. If the indication stops, the radiation is

most likely beta. (To some degree, most common radioactive isotopes emit both beta and gamma radiation.) If there is no indication through the back of the case, position the end window close to, but not touching, the specimen. If there is an indication, it is probably alpha or beta. If a sheet of paper is placed between the window, and the indication stops, the radiation is most likely alpha. In order to avoid particles falling into the instrument, do not hold the specimen directly above the end window.

The Radiation Monitor does not detect neutron, microwave, radio frequency (RF), laser, infrared, or ultraviolet radiation. Some isotopes it will detect relatively well are cesium-137, cobalt-60, technicium-99m, phosphorus-32, and strontium-90.

Some types of radiation are very difficult or impossible for this GM tube to detect. Beta emissions from tritium are too weak to detect using the Radiation Monitor. Americium-241, used in some smoke detectors, can overexcite the GM tube and give an indication of a higher level of radiation than is actually present.

## Displaying data

Click or tap the view icon and select Meter. The instantaneous sensor readings are all displayed. Click or tap any meter to zero or calibrate that sensor.

## Graphing data

Click or tap the view icon and choose the number of graphs you wish to display. For each graph, click or tap on the y-axis label to select which sensor data you would like displayed on that graph. Change data-collection parameters (duration, sampling rate) by clicking or tapping on graph options. When ready to collect data, click or tap collect.

## Calibration

Calibration is not required for this device. However, you may want to collect background radiation data before performing your experiment.

Go Direct Radiation Monitor measures total counts during the data-collection period, including any background radiation. A simple way to estimate the background radiation in your location is to run the Go Direct Radiation Monitor without any radioactive source nearby for the same duration as your experimental trials. The total counts during that time interval will give you an idea of how much background radiation you can expect during each of your experimental trials.

## Specifications

Sensor	LND 712 (or equivalent) halogen-quenched GM tube with a mica end window, 1.5 to 2.0 mg/cm <sup>2</sup> thick
Gamma sensitivity	18 cps/mR/he referenced to Co-60

Temperature range	-20 to 50°C
Operating range (CPS)	0 to 3,500
USB specification	USB 2.0 full speed
Wireless specification	Bluetooth v4.2
Maximum wireless range	30 m (unobstructed)
Battery	300 mAh Li-Poly Rechargeable
Battery life (single full charge)	About 24 hours continuous data collection
Battery life (long term)	About 300 full charge cycles (several years, depending on usage)

## Care and Maintenance

Clean sensor with a soft, damp cloth.

### Battery

Go Direct Radiaton Monitor contains a small lithium-ion battery. The sensor 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

To store Go Direct Radiaton Monitor 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

Go Direct Radiaton Monitor 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

Go Direct Radiaton Monitor senses ionizing radiation by means of a Geiger-Mueller (GM) tube. The tube is fully enclosed inside the instrument. When ionizing radiation or a particle strikes the tube, it is sensed electronically and monitored by a computer and by a flashing count light. There is an optional audio signal. Radiation is measured in counts in a time interval, as configured in data-collection software.

**Note:** About 5 to 25 counts at random intervals (depending on location and altitude) can be expected every minute from naturally occurring background radiation.

The end of the GM tube has a thin mica window. This mica window is protected by the screen at the end of the sensor. It allows alpha particles to reach the GM tube and be detected. The mica window will also sense low energy beta particles and gamma radiation that cannot penetrate the plastic case or the side of the tube.

**Note:** Some very low energy radiation cannot be detected through the mica window. The tube is fragile and physical damage to the window is not covered by the warranty.

## Troubleshooting

Connect Go Direct Radiaton Monitor and start Graphical Analysis. Verify that the Radiation Monitor is automatically identified. Next, place the Radiation Monitor near a radioactive source and collect data. Look at the LED, labeled  $\alpha\beta\gamma$ , on the body of the Radiation Monitor—it will flash with each count; optionally turn on the audio signal to listen for counts. The total counts will accumulate in the data-collection software.

For additional troubleshooting tips and FAQs, see [www.vernier.com/tit/3901](http://www.vernier.com/tit/3901)

## Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Go Direct Radiaton Monitor, contact Vernier Technical Support at [support@vernier.com](mailto: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

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. This warranty covers educational institutions only.

## 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](http://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 toute interférence radioélectrique, même si cela résulte à un brouillage susceptible d'en compromettre le fonctionnement.

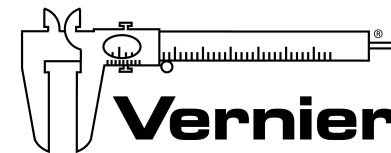
Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel interférent-brouilleur: "Appareils Numériques," NMB-003 édictée par Industrie Canada. L'utilisation est soumise aux deux conditions suivantes:

- (1) cet appareil ne peut causer d'interférences, et
- (2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un dysfonctionnement du dispositif.

Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle façon que l'équivalent de puissance isotrope émise (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 jumelée 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.



**MEASURE. ANALYZE. LEARN.™**

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