# Go Direct® Sound
## (Order Code GDX-SND)

Go Direct Sound can be used for a variety of activities with sound waves.

- Demonstrate how the wave pattern changes when frequency and amplitude are changed.
- Compare the waveforms from various musical instruments.
- Measure the speed of sound by using reflected sound waves in a tube.
- Demonstrate beat patterns.
- Determine the period and then the frequency of a sound by measuring the time between peaks on the waveform.
- Measure sound level in decibels.
- Investigate sound insulation and room acoustics.
- Investigate the logarithmic nature of the decibel scale.

**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 Sound
- USB-C Cable

### Compatible Software
See **www.vernier.com/manuals/gdx-snd** for a list of software compatible with Go Direct Sound.

### Quick Start: Vernier Graphical Analysis® and Bluetooth®
1. Charge your sensor for at least 2 hours before first use.
2. Turn on your sensor. The LED will blink red.
3. Launch Graphical Analysis, then click **Sensor Data Collection**.
4. Select your sensor from the list. The sensor ID is located on the sensor label near the bar code. **Note**: If you don't see a list of available sensors, click **WIRELESS**. After selecting your sensor, click **Pair**.
5. This is a multi-channel sensor. Click **SENSOR CHANNELS** and select the channel(s) you want to use.
6. Click **DONE**. You are now ready to collect data.

### Using other Vernier data-collection apps or want to connect via USB?
Visit **www.vernier.com/start-go-direct**

**Note:** This sensor also works with LabQuest 2 and LabQuest 3; it does not work with the original LabQuest.

### Charging the Sensor
Connect Go Direct Sound to the included USB-C Cable and any USB device for two hours.

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

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

### Powering the Sensor

| | |
|---|---|
| Turning on the sensor | Press button once. Red LED indicator next to Bluetooth icon flashes when 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 stops flashing when sleeping. |

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

**www.vernier.com/start/gdx-snd**

**Connecting via Bluetooth Wireless Technology**

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

### Connecting via USB

| | |
|---|---|
| Connected and charging | Orange LED next to battery icon is solid when 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 battery icon is solid when sensor is connect 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 battery icon is solid when sensor is connected to charger via USB and the unit is charging. Green LED next to Bluetooth icon flashes when sensor is connected via Bluetooth wireless technology. |

## 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 Quick Start section of this user manual.

### Channels

Go Direct Sound has four measurement channels. The channel names are

- Microphone
- Sound Level A-weighted
- Sound Level C-weighted
- Wave Amplitude

### Microphone

The default channel that is active when the sensor is connected is Microphone. This channel is used for capturing sound waveforms. Follow these guidelines to collect good waveforms:

- By default, microphone data-collection parameters are set that sample very quickly for a very brief time, effectively taking a “snapshot” of the sound waves present when data collection is started. With this in mind, start the sound source you wish to investigate before starting data collection.
- Make sure the sound level is in the correct range to produce good wave patterns. If the sound is too loud, the wave pattern will be clipped off at the top or bottom. Move the Microphone farther from the sound source or turn down the volume of the sound.

While capturing waveforms, Go Direct Sound can store up to 5000 data points. It is possible to capture high frequency (>10,000 Hz) sound waves by increasing the data-collection rate. Likewise, it is possible to capture more wave cycles by increasing the data-collection duration. However, Graphical Analysis will not let you select data-collection parameters that will yield more than 5000 data points per run.

**Note:** When connected via Bluetooth® wireless technology, collecting a large number of data points will lead to a delay when the data appear in Graphical Analysis. The transfer rate of data over Bluetooth wireless technology is relatively slow compared to wired connections.

Because of the unique data-collection parameters required to capture a waveform, this channel cannot be active if any of the other channels (sound level or wave amplitude) are selected.

### Sound Level

There are two Sound Level channels: A-weighted and C-weighted. The A-weighted channel applies a filter to the sound level reading that mimics the human ear’s response to loudness and frequency. In most classroom situations, you'll want to measure A-weighted sound levels. For more information on the difference between A- and C-weighted sound levels, see **www.vernier.com/til/3500**

The microphone is located inside the hole in the top of the case. Because the microphone is located inside the sensor, it is helpful to point the microphone hole toward the source of the sounds you are measuring.

When using the sensor, be mindful of the environment around it. Wind blowing across the opening or vibrations from the surface on which it is resting can cause the sensor to read much higher sound levels than it should. When collecting data, place the sensor on a soft surface or hold the sensor in your hand to separate the microphone from extraneous vibrations.

*Example Sound Levels*

| Source | Sound Pressure Level (dBA) |
|---|---|
| Threshold of pain | 130 |
| Construction noise | 110 |
| Subway train | 100 |
| Noisy restaurant | 80 |
| Busy traffic, normal radio | 70 |
| Normal conversation, dishwasher | 60 |
| Quiet office | 50 |
| Soft whisper | 30 |
| Threshold of hearing | 0 |

### Wave Amplitude

The Wave Amplitude channel only reports the amplitude of the waveform, rather than capturing an entire waveform. The wave amplitude is not the same as the sound intensity or sound level, but it is related to them.

If you would like to investigate the logarithmic nature of the decibel scale, collect both sound level and wave amplitude data at the same time. The wave intensity is proportional to the square of the wave amplitude. Plotting sound level *vs.* wave intensity will produce a logarithmic graph.

## Calibrating the Sensor

### Microphone and Wave Amplitude

The Microphone and Wave Amplitude channels are uncalibrated, which means that the vertical axis has arbitrary units on waveform graphs. The voltage from the microphone output is what is graphed. For more information, see **www.vernier.com/til/656**

### Sound Level

The Sound Level channels will never need to be calibrated. Each sensor is carefully calibrated before it ships, and this unique calibration is stored on the sensor.

## Specifications

| | |
|---|---|
| Microphone frequency range | 100–15,000 Hz |
| Typical max frequency | 10,000 Hz |
| Sound level response | A- or C-weight (user selectable) |
| Sound level range | 55–110 dB |
| Sound level accuracy | +/–3 dB |
| Sound level resolution | 0.1 dB |
| Sound level Frequency range | 30–10,000 Hz |
| 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) | ~10 hours continuous data collection |
| Battery life (long term) | ~300 full charge cycles (several years depending on usage) |

## Care and Maintenance

### Battery Information

Go Direct Sound 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 Go Direct Sound 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 Sound 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 Sound uses a MEMS microphone that has a frequency response covering essentially the range of the human ear. When collecting waveforms, the sensor samples the microphone output very quickly. When measuring sound levels, the microphone output is amplified and calibrated to produce a sound level measurement. If the Sound Level A-weighted channel is selected, a filter is applied to the sound level data to mimic the human ear's response to sound level and frequency, either increasing or decreasing the dB reading. Collecting wave amplitude data is similar to that of sound level data, but the sensor skips the calibration to decibels.

## Troubleshooting

Connect the sensor to the Graphical Analysis app and try the following:

- Collect simple waveforms from a whistle or sound generator using the Microphone channel. Do the waveforms look reasonable?
- Collect sound level data using the Sound Level A-weighted channel. Normal classroom levels would be 60–70 dB; a quiet office would be closer to 55 dB. Are the sound level measurements reasonable?

For additional troubleshooting and FAQs, see **www.vernier.com/til/4253**

## Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Go Direct Sound, 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 |
|---|---|
| **Go Direct Charge Station** | GDX-CRG |
| **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-snd**

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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