Go Direct® Tris-Compatible Flat pH Sensor

(Order Code GDX-FPH)

The Go Direct Tris-Compatible Flat pH Sensor can be used for any lab or demonstration that can be done with a traditional pH meter, including acid-base titrations, monitoring pH in an aquarium, and investigating the water quality of streams and lakes. It can also be used to measure the pH of semi-solids such as soil slurries.

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 Tris-Compatible Flat pH Sensor (Go Direct Electrode Amplifier connected to a Go Direct Tris-Compatible Flat pH BNC Electrode)
- Electrode storage bottle, containing pH 4/KCl solution
- Micro USB Cable

Compatible Software

See **www.vernier.com/manuals/gdx-fph** for a list of software compatible with the Go Direct Tris-Compatible Flat pH Sensor.

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. Click **DONE**. You are now ready to collect data.

Using other Vernier data-collection apps or want to connect via USB?

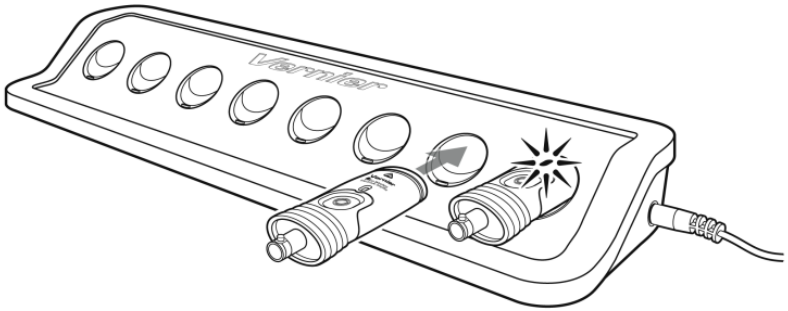
Visit **www.vernier.com/start-go-direct**

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

Charging the Sensor

Connect the Go Direct Tris-Compatible Flat pH Sensor to the included Micro USB Cable and any USB device for two hours. Connecting the Go Direct pH BNC Electrode to the electrode amplifier during charging is optional.

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



Charging	Blue LED on steady while sensor is connected to the Micro USB Cable or Charge Station.
Fully charged	Blue LED is off when charging is complete.

Powering the Sensor

Turning on the sensor	Press button once. Red LED indicator 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-fph

Connected and charging	Blue and Green LED solid when sensor is connected to Graphical Analysis via USB and unit is charging. (Green LED is obscured by the blue one.)
Connected, fully charged	Green LED solid when sensor is connected to Graphical Analysis via USB and the unit is fully charged.
Charging via USB, connected via Bluetooth	Blue LED is solid and green LED is flashing, but the green flashing LED looks white because it is overwhelmed by the blue.

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

1. Remove the storage bottle from the electrode by unscrewing the lid and removing the bottle and lid.
2. Thoroughly rinse the lower section of the probe, especially around the bulb shaped tip, using distilled or deionized water.
3. Connect the sensor following the steps in the Quick Start section of this user manual.
4. When you are finished making measurements, rinse the electrode with distilled water.
5. Slide the cap onto the electrode body, and then screw the cap onto the storage bottle so the tip of the electrode is immersed in the storage solution.

Important: Do not fully submerge the sensor. The BNC connection is not waterproof.

Do not leave the electrode in acids or bases with concentrations greater than 1.0 M for periods longer than 5 minutes. See **www.vernier.com/ph-sensors** for other types of pH electrodes.

By default, the units displayed will be in pH. See **www.vernier.com/til/3984** to change the displayed units.

Calibrating the Sensor

For many experiments, calibrating the Go Direct Tris-Compatible Flat pH Sensor is not required. A calibration equation is stored on each pH Sensor before it is shipped, which is used as a default by Vernier.

For the most accurate measurements with this sensor, we recommend calibration. It is a simple process that takes only a few minutes. For additional calibration information, see **www.vernier.com/til/4011**

To calibrate the sensor in Graphical Analysis, complete the following steps.

1. Click or tap the sensor meter to view sensor options.
2. Select Calibrate and follow the applicable prompts on the Calibrate Sensor screen.

In order to calibrate a pH Sensor, or to confirm that a saved pH calibration is accurate, you should have a supply of pH buffer solutions that cover the range of the pH values you will be measuring. For more information about pH buffer solutions, including recipes for preparation, see **www.vernier.com/til/3625**

Once you have calibrated your Go Direct Tris-Compatible Flat pH Sensor, the calibration is automatically stored to the sensor and will be used each time you connect to your device. You can always choose to restore factory defaults if you feel the custom calibration is invalid.

To restore factory defaults in Graphical Analysis, complete the following steps.

1. Click or tap the live readouts meter and choose Calibrate.
2. Click or tap Reset Calibration.
3. A window will appear warning you that you are about to reset the calibration. Choose Reset Calibration.

Specifications

Type	Double-junction, sealed, gel-filled, polycarbonate body, Ag/AgCl reference
Temperature range	5 to 80°C (readings not compensated)
Range	pH 0–14
Typical accuracy (factory calibration)	± 0.2 pH units
Isopotential pH	pH 7 (point at which temperature has no effect)
Shaft diameter	12 mm OD
Resolution	0.01 pH
USB specification	2.0
Wireless specification	Bluetooth 4.2
Maximum wireless range	30 m
Dimensions	EA: 8.5 cm height × 3 cm wide × 1.75 cm depth pH: 15.5 cm length, 12 mm OD
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

Short-term storage (up to 24 hours): Place the electrode in pH 4 or pH 7 buffer solution. It should never be stored in distilled water.

Long-term storage (more than 24 hours): Store the electrode in a pH 4 buffer/KCl storage solution in the storage bottle. The pH electrode is shipped in this solution. Vernier sells 500 mL bottles of pH Storage Solution (order code PH-SS), or you can prepare additional storage solution by adding 10 g of solid potassium chloride (KCl) to 100 mL of pH 4 buffer solution. Vernier sells a pH Buffer Capsule kit (PH-BUFCAP) that includes a buffer solution preservative. Storing the electrode in this solution contributes to electrode longevity and retains electrode response time when the unit is placed back into service.

If the electrode is inadvertently stored dry for a short period of time, immerse the tip in the pH 4 buffer/KCl storage solution for a minimum of 8 hours prior to use.

If the readings are still not accurate after calibration or if the response is slow, try shocking the sensor as described in the Troubleshooting section.

Battery Information

The Go Direct Tris-Compatible Flat pH Sensor contains a small lithium-ion battery in the handle. 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 Tris-Compatible Flat pH Sensor 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 Tris-Compatible Flat pH Sensor 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

pH is measured potentiometrically when using an electrode. In other words, your measurement is based on an electrical signal. A potential develops across the glass membrane of a pH electrode when it comes in contact with a solution. This potential varies as the pH varies, but requires a constant second potential to compare the changes against. This is the function of the reference electrode, to provide a constant potential, regardless of pH.

In acidic or alkaline solutions, the voltage on the outer membrane surface changes proportionally to changes in hydrogen ion activity by the Nernst equation:

$$E = E_o + (2.3RT/nF) \log [H^+]$$

Where:

E = total potential difference (measured in mV)
E_o = standard potential
R = gas constant
T = temperature in Kelvin
N = number of electrons
F = Faraday's constant
$[H^+]$ = hydrogen ion activity

Troubleshooting

The Vernier gel-filled Go Direct Tris-Compatible Flat pH Sensor is designed to make measurements in the pH range of 0 to 14. The gel-filled reference half cell is sealed; it cannot be refilled.

The pH Sensor is designed to be used in aqueous solutions. The polycarbonate body of the sensor can be damaged by many organic solvents. Do not use the sensor with hydrofluoric acid or in acid or base solutions with a concentration greater than 1.0 molar.

When testing a Go Direct Tris-Compatible Flat pH Sensor, it is best to measure a buffer solution because it is easier to determine if the sensor is reading correctly. Do not test your sensor by measuring distilled water. Distilled water can have a pH reading in the range of 5.5–7.0, due to varying amounts of dissolved carbon dioxide. Furthermore, due to a lack of ions, the pH values reported with the sensor in distilled water will be erratic.

If your pH Sensor is reading differently from the pH of a buffer solution (e.g., reads 6.7 in a buffer 7), you may simply need to calibrate the sensor. See the Calibrating the Sensor section for more information.

If your readings are off by several pH values, the pH readings do not change when moved from one buffer solution to a buffer solution of different pH, the sensor was stored dry for an extended period of time, or the sensor's response seems slow, the problem may be more serious. A method called "shocking" can be used to revive pH electrodes. To shock your pH Sensor, perform the following:

1. Soak the pH Electrode for 4–8 hours in an HCl solution of 0.1 M–0.5 M.
2. Rinse off the electrode and soak the tip in freshly prepared long term storage solution (recipe above) for 30–60 minutes.
3. Rinse the electrode and test it with buffer solutions of known pH.

Occasionally, mold will grow in the pH 4 buffer/storage solution. Mold will not harm the electrode and can easily be removed using a mild detergent solution. Mold growth in the storage solution can be inhibited by adding a buffer preservative.

For additional troubleshooting and FAQs, see **www.vernier.com/til/3965**

Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Go Direct Tris-Compatible Flat pH Sensor, 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
Electrode Storage Solution, 500 mL	PH-SS
pH Buffer Capsules (3×10) kit	PH-BUFCAP
Storage Solution Bottles, pkg of 5	BTL
Go Direct Flat pH BNC Electrode	GDX-FPH-BNC
Go Direct Electrode Amplifier	GDX-EA
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-fph**

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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