Vernier Go Wireless® pH
Order Code GW-PH or GW-PH-NP

The Vernier Go Wireless pH is a rugged, general-purpose, wireless pH sensor. The Vernier Go Wireless pH can be used for any experiment 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.

What is Included with Go Wireless pH

- Go Wireless pH (Go Wireless Electrode Amplifier connected to a Go Wireless pH BNC Electrode)
- pH storage solution bottle with pH storage solution
- USB Charging Cable (not included in GW-PH-NP)
- This user guide
- Graphical Analysis app (free download from the App Store or Google Play)

Charging Go Wireless pH

Connect the Go Wireless Electrode Amplifier to the included USB Charging Cable and any USB device for two hours. Connecting the pH electrode to the electrode amplifier during charging is optional.
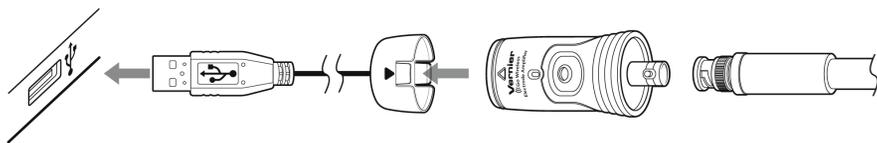

Figure 1

You can also charge up to eight Go Wireless Electrode Amplifiers using our Go Wireless Charging Station, sold separately (order code: GW-CRG). An LED on each Go Wireless Electrode Amplifier indicates charging status. A blue light indicates it is still charging. When the light goes off, it is finished charging.
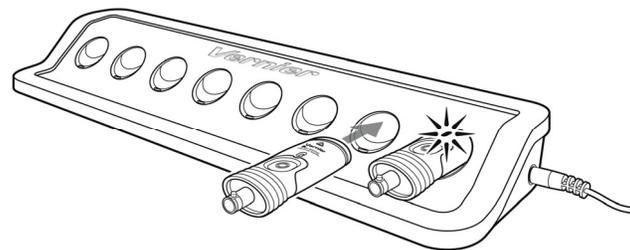

Figure 2

Supported Devices

Go Wireless pH can be used with supported mobile devices[*] that are Bluetooth® Smart Ready and one of our apps.

- iPad® (3rd generation or newer), iPad mini™, and iPad Air®
- iPhone® (4S or newer)
- iPod touch® (5th generation or newer)
- Android™ devices (for support requirements, see www.vernier.com/ga-app)
- LabQuest 2 (for support requirements, see www.vernier.com/til/3134)

Data-Collection Apps

Go Wireless pH can be used with one of the following apps:

- **Graphical Analysis for iOS devices (version 2.2 or newer)** Available as a free download on the App Store, use this app for advanced data collection and analysis. For more information, see www.vernier.com/ga-app
- **Graphical Analysis for Android (version 2.1 or newer)** Available as a free download on Google Play, use this app for advanced data collection and analysis. For more information, see www.vernier.com/ga-app
- **LabQuest 2 App (version 2.4 or newer)** For more information, see www.vernier.com/labq2

> **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.

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

Specifications

pH Electrode

pH range	0–14
Temperature range	5 to 80°C (readings not compensated)
Accuracy	±0.5 pH units (factory calibration when new) ±0.1 pH units (user calibration)
Type	Single junction Sealed, gel-filled, Ag/AgCl
Response time	2 s (to 90% of full reading in buffer)
Shaft diameter	12 mm OD
Shaft material	Polycarbonate plastic

Electrode Amplifier

Radio	2.4 GHz Bluetooth 4.0, Low Energy
Battery	100 mA Li-Poly
Battery life (continuously on, 1 sample per second)	3 days
Input range	±1000 mV
Temperature range	−10 to 45ºC (readings not compensated)
Maximum wireless range	30 m unobstructed

How Go Wireless pH Works

The Go Wireless Electrode Amplifier is a device that allows the standard combination pH electrode to be monitored wirelessly.

The Go Wireless pH will produce a voltage of approximately 0.0 volts in a pH 7 buffer. The voltage will increase by about 60 mV for every pH number decrease. The voltage will decrease by about 60 mV/pH number as the pH increases. It should read approximately 160 mV in pH 4 buffer and −170 mV in pH 10 buffer.

The gel-filled pH electrode 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 Go Wireless Electrode Amplifier has one button and three LEDs.

Button

- Press the button once to turn on the Go Wireless Electrode Amplifier. A red LED indicator flashes when the unit is on.
- Press and hold the button for more than three seconds to put the Go Wireless Electrode Amplifier into sleep mode. The red LED indicator stops flashing when sleeping and LED light is off.
- Press and hold the button for more than eight seconds to reset the system. This should not be necessary in normal operation. **Note:** This does not reset the sensor calibration.

Blue LED

Indicates charging status when the Go Wireless Electrode Amplifier is connected to the Charging Cable or Charging Station.

- On – charging in progress
- Off – charging is complete

Red LED Flashing

Indicates the Go Wireless Electrode Amplifier is awake and ready to connect.

Green LED Flashing

Indicates the Go Wireless Electrode Amplifier is connected and taking data.

Red and Green LED Off

Indicates the Go Wireless Electrode Amplifier is in the lowest power sleep mode.

Collecting Data

Ensure that the BNC connection between the Go Wireless Electrode Amplifier and the pH electrode is secure.
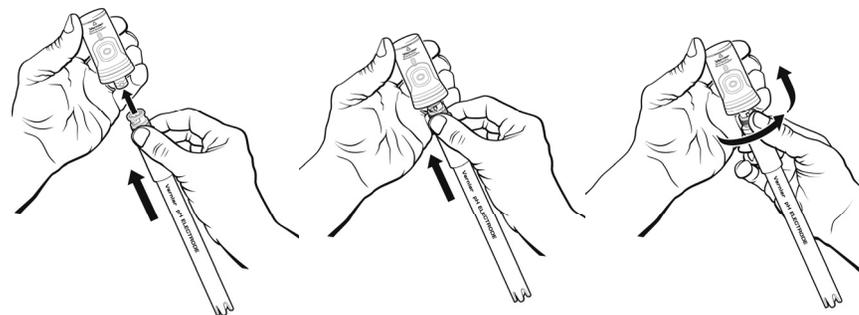
Figure 3

To prepare the electrode to make pH measurements, remove the storage bottle from the electrode by first unscrewing the lid and then removing the bottle and lid. Thoroughly rinse the lower section of the probe, especially around the bulb-shaped tip, using distilled or deionized water. **Note:** Do not completely submerge the sensor. The BNC junction is not waterproof.

Collecting Data with Graphical Analysis for iOS Devices

1. Press the power button on the Go Wireless Electrode Amplifier to turn it on. The LED on the sensor will flash red.
2. Launch the app. Tap Create Experiment, then select Wireless Sensors from the Select Source list. Select your Go Wireless pH from the list of available sensors. When the sensor is paired with the software, the sensor LED will flash green. **Note:** To collect data in mV, tap the radio icon next to your sensor in the Select Source list. Tap mV under Units.
3. Place the sensor tip into a beaker containing your sample. It is recommended that you use a utility clamp or electrode support to fasten the Go Wireless pH to a ring stand, as shown in Figure 4. **Note:** To collect titration data, tap the wrench in the upper right corner of Graphical Analysis, and select Start Titration.
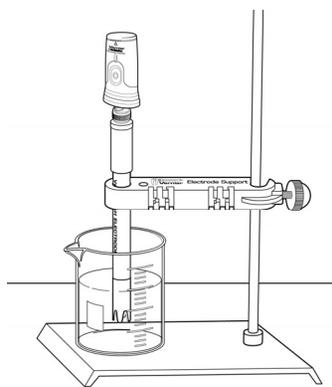
Figure 4

4. Tap Keep to store a data point into the table. You can change the sample description or add a note here. Tap Done.
5. Rinse the tip of the Go Wireless pH with distilled water before reusing it.
6. Collect additional data as desired. Rows will continue to add to the table.

Collecting Data with Graphical Analysis for Android devices

1. Press the power button on the Go Wireless Electrode Amplifier to turn it on. The LED on the sensor will flash red.
2. Launch the app. Tap Create New Experiment, then select Wireless Sensors from the Select Source list. Select your Go Wireless pH from the list of available sensors. When the sensor is paired with the software, the sensor LED will flash green.
3. If you are doing a titration, add the Volume column. **Note:** To collect data as potential (mV), select Details from the overflow menu located on the action bar. Tap Millivolts under UNITS.
4. Start data collection and collect data as desired.

Collecting Data with LabQuest 2 App

1. Press the power button on the Go Wireless Electrode Amplifier to turn it on. The LED on the sensor will flash red.
2. Choose New from the File menu. On the Meter screen, choose Go Wireless Setup from the Sensors menu. Select your Go Wireless pH from the list of available sensors. When the sensor is paired with the software, the sensor LED will flash green. **Note:** To collect data in mV, tap the sensor meter, select Set Units ▶ mV.
3. Collect data as desired.

When you are finished making measurements, rinse the electrode with distilled water. 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. When the probe is not being stored in the storage bottle, it can be stored for short periods of time (up to 24 hours) in pH 4 or pH 7 buffer solution. It should never be stored in distilled water.

Calibration Information

For many experiments, calibrating the Go Wireless pH is not required. We store a calibration equation on each Go Wireless Electrode Amplifier before shipping it, which is used as a default by our software.

For the most accurate measurements with this sensor, we recommend calibration. It is a simple process that takes only a few minutes. You will need two or three buffer solutions.

Calibrate the Go Wireless pH Using Graphical Analysis App

1. Press the power button on the Go Wireless Electrode Amplifier to turn it on. The LED on the sensor will flash red.
2. Launch the app. Tap Create Experiment, then select Wireless Sensors from the Select Source list. Select your Go Wireless pH from the list of available sensors. When the sensor is paired with the software, the sensor LED will flash green.
3. To enter the calibration screen on the app, access the sensor details dialog and choose Calibrate pH.
   iOS: Tap on the radio icon in the upper right corner.
   Android: Select Details from the overflow menu located on the action bar.
4. Remove the storage bottle from the Go Wireless pH, rinse the tip of the electrode with distilled water, pat dry, and place the electrode in the first buffer solution so the tip is immersed.
5. Once the voltage reading has stabilized, tap Add in the box under the appropriate buffer pH. **Note:** If you are using a buffer not shown, tap on the buffer value to change.
6. Repeat this process for two or three buffer solutions. Your stored calibration equation will be shown under the table.
7. Tap Save to save to the amplifier.

This new calibration will be used automatically, regardless of the device to which the amplifier is connected. If a different electrode is used with this amplifier, a new calibration should be performed.

You can set the Go Wireless Electrode Amplifier back to its factory calibration by following these steps:
1. Access the sensor details dialog.
   iOS: Tap on the radio icon in the upper right corner.
   Android: Select Details from the overflow menu located on the action bar.
2. Tap Restore Factory Defaults.

Calibrate the Go Wireless pH Using LabQuest App

1. Press the power button on the Go Wireless Electrode Amplifier to turn it on. The LED on the sensor will flash red.
2. Choose New from the File menu. On the Meter screen, choose Go Wireless Setup from the Sensors menu. Select your Go Wireless pH from the list of available sensors. When the sensor is paired with the software, the sensor LED will flash green. The pH reading will be displayed.
3. Choose Calibrate ▶ GW: pH from the Sensors menu and tap Calibrate Now.
4. Remove the storage bottle from the Go Wireless pH, rinse the tip of the sensor with distilled water, pat dry, and place the sensor in the first buffer solution so the tip is immersed.

5. Enter the pH of the buffer solution as the known value for Reading 1. When the voltage reading stabilizes, tap Keep.
6. Rinse the pH sensor with distilled water, pat dry, and place it in the second buffer solution.
7. In the Reading 2 field, enter the pH of the second buffer solution. When the voltage reading stabilizes, tap Keep.
8. Tap OK to complete the calibration process.

This new calibration is saved onto the amplifier and will be used automatically, regardless of the LabQuest to which the amplifier is connected. If a different electrode is used with this amplifier, a new calibration should be performed.

You can set the Go Wireless Electrode Amplifier back to its factory calibration by following these steps:
1. Choose Calibrate ▶ GW: pH from the Sensors menu.
2. Tap Restore Factory Defaults.

pH Buffer Solutions
In order to calibrate a Go Wireless pH, or to confirm that a saved pH calibration is accurate, you should have a supply of pH buffer solutions that cover the range of pH values you will be measuring. We recommend buffer solutions of pH 4, 7, and 10.
- Vernier sells a pH buffer kit (order code PHB). The kit contains four tablets each of buffer pH 4, 7, and 10 and a small bottle of buffer preservative. Each tablet is added to 100 mL of distilled water to prepare respective pH buffer solutions.
- Flinn Scientific (www.flinnsci.com, Tel: 800-452-1261) sells a wide variety of buffer tablets and prepared buffer solutions.
- You can prepare your own buffer solutions using the following recipes:

pH 4.00	Add 2.0 mL of 0.1 M HCl to 1000 mL of 0.1 M potassium hydrogen phthalate.
pH 7.00	Add 582 mL of 0.1 M NaOH to 1000 mL of 0.1 M potassium dihydrogen phosphate.
pH 10.00	Add 214 mL of 0.1 M NaOH to 1000 mL of 0.05 M sodium bicarbonate.

Maintenance and Storage
Short-term storage (up to 24 hours): Place the electrode in pH 4 or pH 7 buffer solution.

Long-term storage (more than 24 hours): Store the electrode in a pH 4 buffer/KCl storage solution in the storage bottle. The 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. Flinn Scientific (800-452-1261) sells a Buffer Solution Preservative (order code B0175) that can be added to this storage solution. By storing the electrode in this solution, the reference portion of the electrode is kept moist. Keeping the reference junction moist contributes to electrode longevity and retains electrode response time when the unit is placed back into service. If the electrode is inadvertently stored dry, immerse the unit in pH 4 buffer/KCl storage solution for a minimum of eight hours prior to service.

When testing a Go Wireless pH, 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 Go Wireless pH 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.

If your readings are off by several pH values, the pH readings do not change when moved from one buffer solution to another different buffer, the sensor was stored dry, 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 Go Wireless pH, 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 pH 7 buffer 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.

The Go Wireless pH is designed to be used in aqueous solutions. The polycarbonate body of the sensor can be damaged by many organic solvents. In addition, do not use the sensor in solutions containing perchlorates, silver ions, sulfide ions, biological samples with high concentrations of proteins, or Tris buffered solutions.[†] Do not use the sensor with hydrofluoric acid or in acid or base solutions with a concentration greater than 1.0 molar.

The electrode may be used to measure the pH of sodium hydroxide solutions with a concentration near 1.0 molar, but it should not be left in this concentration of sodium hydroxide for periods longer than 5 minutes. Using or storing the electrode at very high temperatures (>80°C) or very low temperatures (near 0°C) can damage it beyond repair.

Battery Information
The Go Wireless Electrode Amplifier 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: GW-BAT-100).

Use only the Vernier Go Wireless Charging Cable (order code: GW-CB) or Go Wireless Charging Station (order code: GW-CRG) to charge the battery.

[†] Vernier offers a Tris-Compatible Flat pH Electrode that features a double junction electrode, so it can be used with proteins, sulfides, and Tris buffers. This electrode can be used with the Go Wireless Electrode Amplifier. Order code FPH-BNC.

Storage and Maintenance of Go Wireless Electrode Amplifier

To store the Go Wireless Electrode Amplifier 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 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 Go Wireless Electrode Amplifier in an area that is not exposed to temperature extremes.

Replacement Parts

Vernier Software & Technology

Part	Order code
Go Wireless Charging Cable	GW-CB
Go Wireless pH (no charging cable)	GW-PH-NP
Go Wireless Battery	GW-BAT-100
Go Wireless pH (electrode only)	GW-PH-BNC

Related Products

Go Wireless Charging Station (order code: GW-CRG)
Multi-sensor charging capability for your Go Wireless Electrode Amplifiers. The Go Wireless Charging Station is the perfect solution for charging and storing your Go Wireless Electrode Amplifier. For more information, see www.vernier.com/gw-crg

Go Wireless pH Teacher Pack (order code: GW-PH-TP)
Includes eight Go Wireless pH sensors and one Go Wireless Charging Station. For more information, see www.vernier.com/gw-ph

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 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. The battery is covered by a one-year warranty.

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.*
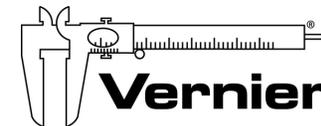
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