

# pH Electrode BNC

## (Order Code PH-BNC)



The Vernier Gel-Filled Combination pH Electrode BNC is designed to be used with the Vernier Electrode Amplifier (order code EA-BTA) to make measurements in the pH range of 0 to 14. Our pH Electrode BNC 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.

**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

- pH Electrode BNC
- Electrode Storage bottle, containing pH 4/KCl solution

### Getting Started

1. Connect the pH Electrode BNC to the Vernier Electrode Amplifier (order code EA-BTA).
2. Connect the Vernier Electrode Amplifier to the interface.
3. Start the data-collection software.
4. The software will identify the pH Sensor and load a default data-collection setup. You are now ready to collect data.

**Important:** Do not fully submerge the sensor. The handle is not waterproof.

### Preparing the Electrode for Use

To prepare the electrode to make pH measurements, follow this procedure:

- 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.
- Connect the pH Electrode BNC to the Vernier Electrode Amplifier. Push the BNC connector of the electrode cable onto the connector on the Electrode Amplifier, then turn the BNC connector about one-half turn clockwise.
- Connect the Vernier Electrode Amplifier to your lab interface and run data-collection software. **Note:** Do not completely submerge the sensor. The handle is not waterproof.

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.

The electrode should never be stored in distilled water. It is a good idea to prepare a quantity of pH 4 buffer/KCl storage solution (see Care and Maintenance for more details) and use it to replace lost solution.

### Calibration

For many experiments, calibrating the pH Electrode BNC is not required. We store a calibration equation on each pH sensor 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.

#### Calibrate the pH Sensor Using Graphical Analysis

1. Connect the pH Electrode BNC with the Vernier Electrode Amplifier. Connect the Electrode Amplifier to the data-collection interface. Start Graphical Analysis.
2. Click the live readouts meter in the lower right corner and choose Calibrate.
3. Remove the storage bottle from the pH Electrode BNC, rinse the tip of the sensor with distilled water. Place the sensor in the first buffer solution so the tip is immersed.
4. Type in pH of the first buffer solution in the edit box. When the voltage reading stabilizes, click Keep.
5. Rinse the pH sensor with distilled water and place it in the second buffer solution
6. Enter the pH of the second buffer solution in the edit box. When the voltage reading stabilizes, click Keep.
7. Click Apply to complete the calibration process.

#### Calibrate the pH Sensor Using LabQuest

1. Connect the pH Electrode BNC with the Vernier Electrode Amplifier to your LabQuest. The pH reading will be displayed.
2. Choose Calibrate ► CH1: Electrode Amplifier from the Sensors menu and tap Calibrate Now.
3. Remove the storage bottle from the pH Electrode BNC, rinse the tip of the sensor with distilled water, and place the sensor in the first buffer solution so the tip is immersed.
4. Enter the pH of the buffer solution as the known value for Reading 1. When the voltage reading stabilizes, tap Keep.
5. Rinse the pH sensor with distilled water and place it in the second buffer solution.
6. In the Reading 2 field, enter the pH of the second buffer solution. When the voltage reading stabilizes, tap Keep.
7. (Optional) If you wish to store the calibration on the sensor itself, tap the Storage tab at the top of the screen. If you wish to use the calibration only for the current experiment, skip to Step 9.

- On the Storage page, tap Save Calibration to Sensor. A message will appear: “Saving this calibration to the sensor will result in it being the new Custom Calibration 1”. Tap OK to proceed.
- Tap OK to complete the calibration process.

After you store a calibration to the Electrode Amplifier, this new calibration will be used automatically, regardless of the interface or pH Electrode BNC to which the Electrode Amplifier is connected.

You can set the pH sensor back to its factory calibration by following these steps:

- Choose Calibrate ► CH1: Electrode Amplifier from the Sensors menu.
- Tap the Storage tab.
- Tap Restore Sensor Factory Defaults.

## Specifications

Type	Sealed, gel-filled, epoxy body, Ag/AgCl
Response time	90% of final reading in 1 second in a buffer
Temperature range	5 to 80°C (readings not compensated)
Range	pH 0–14
Accuracy	± 0.2 pH units
Isopotential pH	pH 7 (point at which temperature has no effect)
Stored calibration values	slope: $-7.78$ intercept: 16.34
Shaft diameter	12 mm OD

## Care and Maintenance

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 pH Electrode BNC 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 pH Electrode BNC, 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 Electrode BNC 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.

If your readings are off by several pH values, the pH readings do not change when moved from one buffer solution to a 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 pH Electrode BNC, perform the following:

- Soak the pH Electrode BNC for 4–8 hours in an HCl solution of 0.1 M–0.5 M.
- Rinse off the electrode and soak the tip in pH 7 buffer for 30–60 minutes.
- 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 pH Electrode BNC 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 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 ( $>80^{\circ}\text{C}$ ) or very low temperatures (near  $0^{\circ}\text{C}$ ) can damage it beyond repair.

## pH Buffer Solutions

In order to calibrate a pH Electrode BNC, 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 4 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](http://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.

## Repair

If you are having trouble with your pH Electrode BNC, 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
Electrode Storage Solution, 500 mL	PH-SS
Buffer Tablets	PHB
Storage Solution Bottles, pkg of 5	BTL

## Warranty

Warranty information for this product can be found on the Support tab at [www.vernier.com/ph-bnc](http://www.vernier.com/ph-bnc)

General warranty information can be found at [www.vernier.com/warranty](http://www.vernier.com/warranty)



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