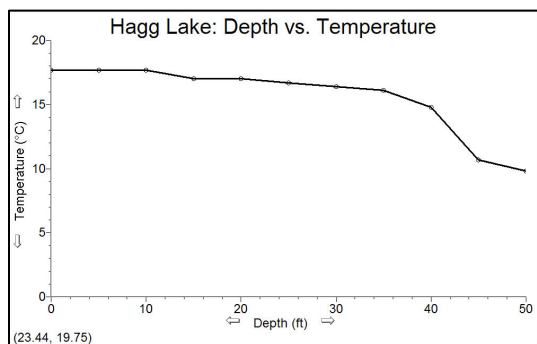# Extra-Long Temperature Probe System

(Order Code TPL-BTA)

This probe is designed for remote, outdoor temperature sensing or for measuring temperature at various depths in lakes and streams. It has a 30m (100 ft) cable. Typical uses of the Extra-Long Temperature Probe include

- Monitoring outdoor temperature using a computer located inside a building.
- Measuring temperature in different parts of a building or classroom.
- Monitoring temperature of a stream or river positioned on shore or from a bridge.
- Taking temperature *vs.* depth readings in a lake or stream (see graph below).

Temperature vs. *Depth data taken using the Extra-Long Temperature Probe*

Collecting Data with the Extra-Long Temperature Probe

This sensor can be used with the following interfaces to collect data.

- Vernier LabQuest® 2 or original LabQuest® as a standalone device or with a computer
- Vernier LabQuest® Mini with a computer
- Vernier LabPro® with a computer or TI graphing calculator
- Vernier Go!®Link
- Vernier EasyLink®
- Vernier SensorDAQ®
- CBL 2™
- TI-Nspire™ Lab Cradle

Here is the general procedure to follow when using the Extra-Long Temperature Probe:

1. Connect the Extra-Long Temperature Probe to the interface.
2. Start the data-collection software.
3. The software will identify the Extra-Long Temperature Probe and load a default data-collection setup. You are now ready to collect data.

Data-Collection Software

This sensor can be used with an interface and the following data-collection software.

- **Logger *Pro* 3** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **Logger Lite** This computer program is used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, or Go!Link.
- **LabQuest App** This program is used when LabQuest 2 or LabQuest is used as a standalone device.
- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2™, LabPro, and Vernier EasyLink. We recommend version 2.0 or newer, which can be downloaded from the Vernier web site, www.vernier.com/easy/easydata.html, and then transferred to the calculator. See the Vernier web site, www.vernier.com/calc/software/index.html for more information on the App and Program Transfer Guidebook.
- **DataMate program** Use DataMate with LabPro or CBL 2™ and TI-73, TI-83, TI-84, TI-86, TI-89, and Voyage 200 calculators. See the LabPro and CBL 2™ Guidebooks for instructions on transferring DataMate to the calculator.
- **DataQuest™ Software for TI-Nspire™** This calculator application for the TI-Nspire can be used with the EasyLink or TI-Nspire Lab Cradle.
- **LabVIEW** National Instruments LabVIEW™ software is a graphical programming language sold by National Instruments. It is used with SensorDAQ and can be used with a number of other Vernier interfaces. See www.vernier.com/labview for more information.

NOTE: Vernier products are designed for educational use. Our products are not designed nor 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.

Specifications

Range:		–50˚C to 150˚C
Typical accuracy:		±0.2°C
13-bit resolution (SensorDAQ):		0.04°C
12-bit resolution (LabQuest 2, LabQuest, LabQuest Mini, LabPro):		0.07°C
10-bit resolution (CBL 2™):		0.3°C
Power:		7.4 mA @ 5 VDC
Response time (time for a 90% change in reading):		
	water (with stirring):	8 to 10 seconds
	water (without stirring):	45 seconds
	moving air:	100 seconds
Stored calibration values		
Celsius	intercept (k_0):	–53.073
	slope (k_1):	58.341
Fahrenheit	intercept (k_0):	–63.531
	slope (k_1):	105.01

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, TI-Nspire™ Lab Cradle, EasyLink, or CBL 2™, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

How the Extra-Long Temperature Probe Works

The Extra-Long Temperature Probe uses an AD590JH Temperature Transducer. This sensor produces a current that is directly proportional to its absolute temperature. The sensor is plugged into a signal conditioning box, producing an output voltage that is linear with temperature over the range of –50 to +150°C.

The temperature sensor itself is at the end of the brass tube. The entire probe is covered with Teflon® FEP heat-shrink tubing. This coating protects the probe from damage in most environments. We have tested probes like this one in a number of chemicals commonly used in labs. Be careful when using the probe in laboratory chemicals over long periods of time.

The probe will not be damaged when placed in any of the following chemicals for several minutes at a time:

acetone	lauric acid
cyclohexane	naphthalene
ethanol	paradichlorobenzene
ethylene glycol (antifreeze)	sodium hydroxide (2M)
glacial acetic acid	sulfuric acid (3M)
household bleach	vinegar
isopropyl alcohol	water

The Extra-Long Temperature Probe is designed so that it can be submerged in a water environment for extended periods of time. If the seal on the probe is damaged, however, liquid may get into the probe and cause errant readings.
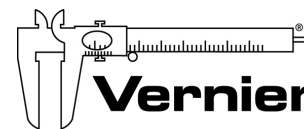
Optional Calibration Procedure

You should not have to perform a new calibration when using the Extra-Long Temperature Probe in the classroom. We have set the sensor to match our stored calibration before shipping it.

For greatest accuracy, this temperature probe can be calibrated. Two water baths are needed for calibration. Follow the instructions on the screen and in the manuals when calibrating. For best results, use constant temperature baths; that is, an ice-water mixture, room temperature water, or boiling water. Also, choose temperatures near the range you will be measuring during your experiment. For example, if you are going to measure outdoor temperatures, calibrate at 0°C and 22°C instead of 0°C and 100°C.

Replacement Temperature Probes

The Extra-Long Temperature Probe System includes a removable probe. If the probe gets damaged, you can replace it with a replacement Extra-Long Temperature Probe, without the signal-conditioning box (order code TPL).

Measure. Analyze. Learn.™
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