

# Microphone

## (Order Code MCA-BTA)

The Microphone 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
- Have students capture the waveform of the sound of a tuning fork and model the sine wave using a function
- 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
- Display the fast Fourier transform (FFT) of a sound

## Collecting Data with the Microphone

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

- Vernier LabQuest™ as a standalone device or with a computer
- Vernier LabPro® with a computer, TI graphing calculator, or Palm® handheld
- Vernier SensorDAQ™
- CBL 2™

Here is the general procedure to follow when using the Microphone:

1. Connect the Microphone Probe to the interface.
2. Start the data-collection software.
3. The software will identify the Microphone 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** This computer program is used with LabQuest or LabPro
- **Logger Lite** This computer program is used with LabQuest or LabPro.
- **LabQuest App** This program is used when LabQuest is used as a stand-alone device.
- **EasyData App** This calculator application for the TI-83 Plus and TI-84 Plus can be used with CBL 2 or LabPro. We recommend version 2.0 or newer, which can be downloaded from the Vernier web site, [www.vernier.com/easy/easydata.html](http://www.vernier.com/easy/easydata.html), and then transferred to the calculator. See the Vernier web site, [www.vernier.com/calc/software/index.html](http://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.
- **Data Pro** This program is used with LabPro and a Palm handheld.
- **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](http://www.vernier.com/labview) for more information.

**NOTE:** This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

## Specifications

Frequency range		approximately 20 Hz to 16,000 Hz
Maximum frequency		
	LabQuest	10,000 Hz
	LabPro, SensorDAQ, or CBL 2	5,000 Hz
Power		7.5 mA @ 5 VDC
Stored calibration		
	Slope	1
	Intercept	0 (arbitrary units)

**Note:** The maximum data collection rate of the interface affects the maximum frequency you can effectively sample.

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest, LabPro, SensorDAQ, 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 Microphone Works

The Microphone uses an electret microphone that has a frequency response covering essentially the range of the human ear. An op-amp circuit amplifies the signal and sends it to the British Telecom connector. Actually the signal is sent to the interface on two different lines. A signal centered at 2.5 volts is on the Vin-low line and a signal centered at 0 volts is on Vin. More information about the input lines on LabPro and LabQuest is available in their respective manuals.

The best sound sources to use with the microphone are tuning forks, but you may want to investigate a human voice or a whistle, electronic keyboards, and other musical instruments. Try comparing the wave pattern for different sound sources. Try playing two sounds of nearly the same frequency to produce beat patterns.

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 further from the sound source, or turn down the volume of the sound.

## 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.



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