

ULI Microphone

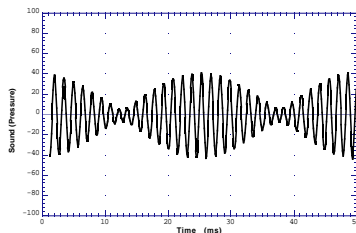
(Order Code MCA-ULI)

This Microphone can be used with the Universal Lab Interface (ULI). It can also be used with the Texas Instruments Calculator-Based Laboratory™ (CBL™) System. (More information on using it with the CBL is included later in this booklet.)

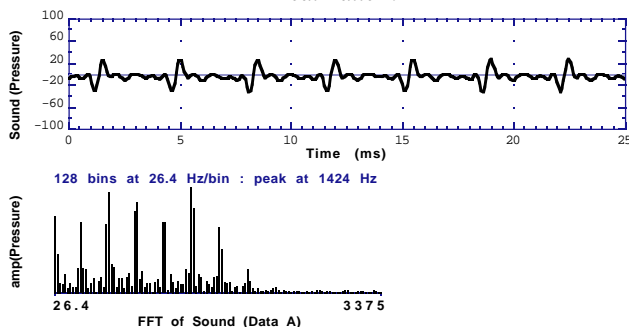
This microphone can be used for a variety of activities with sound waves, such as

- 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.

Here are some sample graphs made using this microphone and a ULI:



Beat Pattern



256-Hz Trumpet Sound

Plug the ULI Microphone into the DIN1 connector of the ULI. Use it with the Sound program or the Logger *Pro* program. Refer to the Universal Lab Interface manual and the Sound program manual for information on how to use the ULI and the Microphone.

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

How the Microphone Works

The ULI Microphone uses an electret microphone that has a frequency response covering essentially the range of the human ear. This microphone is mounted at one end of the box. An op-amp circuit amplifies the signal and sends it to the lab interface. The signal is centered at 2.5 volts. Contact Vernier Software for a complete schematic of this microphone.

Specifications

Frequency range: approximately 20 Hz to 16,000 Hz. Note that the maximum sample rate of the ULI is 11,000 Hz; therefore, to collect 10 points per cycle the maximum usable signal frequency is about 1,000 Hz.

Power: 7.5 mA @ 5 VDC

Using the ULI Microphone with the CBL System

You can use this microphone with the CBL System if you use a CBL-DIN adapter. The adapter is available from Vernier Software for \$5 (order code CBL-DIN).

Here are some suggestions for using the ULI Microphone with the CBL System:

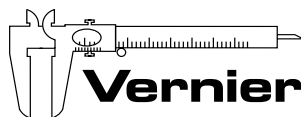
- Connect the CBL unit to a TI graphing calculator using the link ports located on each unit. Be sure to push both plugs in firmly.
- Using a CBL-DIN adapter, connect the ULI Microphone to one of the analog ports on the top or left side of the CBL unit (CH1, CH2, or CH3). Usually CH1 is used.
- Run a program to monitor the signal from the sensor. We strongly recommend using programs developed specifically for use with this sensor. Vernier Software has a number of programs which support this sensor. One program we recommend is PHYSICS from the Vernier Software collection of programs.

The Vernier programs for the CBL are available on the Internet or they can be obtained in disk form. Once you have these programs, it is a simple matter to load them into a calculator using TI-GRAPH LINK™.

- To obtain our programs through the World Wide Web, download the files from our web site:
www.vernier.com
- These programs can also be obtained on disk. The programs are a part of our *CBL Made Easy!* Package, which includes Macintosh and IBM-compatible disks and our *CBL Made Easy!* user's guide (order code CMEP, \$12).

Other notes for using this sensor with the CBL System

- This probe should be used with the CBL set for the 0 to +5 volt range (operation 1 in command 1).
- For more information on writing programs for TI calculators and the CBL, see your calculator manual and the *CBL System Guidebook*.



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