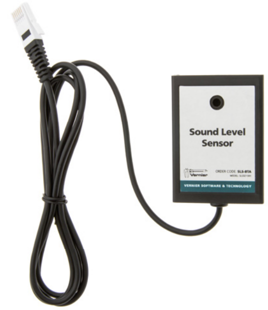
Sound Level Sensor
(Order Code SLS-BTA)



The Sound Level Sensor measures sound level in decibels. It can be used for activities such as

- Environmental noise studies
- Sound level comparisons
- Investigating room acoustics
- Investigating sound insulation

The sensing microphone on the Sound Level Sensor is inside the hole in the top of the case. Because the microphone is inside the sensor, it is helpful to point the microphone hole toward the source of the sounds you wish to measure.

When using the Sound Level Sensor, be mindful of the environment around the sensor. Wind blowing across the opening or vibrations from the surface on which it is resting can cause the sensor to read much higher than it should. When collecting data, place the sensor on its foam feet or hold the sensor in your hand to separate the microphone from extraneous vibrations.

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.

General Procedure

Here is the general procedure to follow when using the Sound Level Sensor:

1. Connect the Sound Level Sensor to the interface.
2. Start the data-collection software.
3. Collect data after the software identifies the Sound Level Sensor and loads a default data-collection setup.

Compatible Interfaces and Software

See www.vernier.com/sls-bta for a list of interfaces and software compatible with the Sound Level Sensor.

Specifications

Sensor:	⅜" electret (prepolarized) condenser microphone
Measurement range:	55 dB to 110 dB
Frequency range:	30 Hz to 10,000 Hz
Resolution:	0.1 dB
Accuracy:	3 dB (ref 90 dB @ 1 kHz)

Stored calibration

Sensor Reading = K0 + K1*voltage + K2*voltage^2

K0:	30.314 dB
K1:	13.858 dB/V
K2:	2.173 dB/V^2

How the Sound Level Sensor Works

The Sound Level Sensor uses an electric condenser microphone mounted inside the sensor case. The output of this microphone is amplified, filtered, and averaged over 50 ms to produce a single sound pressure level measurement.

The Sound Level Sensor is A-weighted, meaning it discriminates against low frequencies, in a manner similar to the response of the ear. With this setting, the meter primarily measures in the 500 to 10,000 Hz range.

Calibration Information

The Sound Level Sensor will never need to be calibrated. Each sensor is carefully calibrated before it ships, and this unique calibration is stored on a smart chip in the sensor. **Note:** There is no method to perform a calibration of this sensor in most of our software programs; however, there is no need to do so. Logger *Pro* does allow for an approximate calibration, but the results would likely be less accurate than the custom factory calibration.

Suggested Experiments

Sound Level Studies

You can collect sound level data in many real-world situations; for example, you can

- Collect sound levels before, during, and after a concert or dance.
- Collect sound levels throughout the day in a school hallway or shopping mall.
- Use the Sound Level Sensor to judge cheering contests at pep rallies.
- Collect data outside and inside a car equipped with a stereo system.
- Make a model of an ear and ear canal. Measure sound levels at the "ear drum" when a headset is placed over the ear. Repeat the experiment, but place an earplug between the headset and the meter.

Reverberation Time

One goal of acoustic engineers is to "tune" a room for a specific purpose. A room tuned for lecture will be tuned differently than a library. One of the indicators of good room acoustics is the reverberation time, the length of time sound stays in the room. Officially, the reverberation time is the time required for the sound level to drop 60 dB. For example, an empty gymnasium would have a longer reverberation time from a library. Use the Sound Level Sensor and an interface to try this experiment:

1. Set up the equipment to collect data for 5 seconds at 10 samples/s.
2. Tune a radio to an unused AM radio station so you only hear loud static. Start data collection and quickly turn off the radio.
3. Examine the graph to determine how long it takes the sound level to fall by 60 dB. Often the sound level could not fall that far because of background sounds. In those situations, determine the slope of the falling sound level (in dB/s) from the graph. The reverberation time can be found by dividing 60 dB by the slope.
4. Repeat the experiment in a different room and compare.

Sound Insulation

Acoustical engineers work with architectural engineers to select materials that attenuate sound. For example, a wall constructed with gypsum board on a wooden frame will attenuate sound differently than a cinder block wall with the same area.

Try the following experiment. Place a radio in a room that has an outside wall and a window. Tune the radio to an unused AM frequency so that you hear only static. Turn the volume up so that you can just hear the sound through the wall. Measure the sound level at the wall. Next measure the sound level at the window, and then measure the sound level within the room. How much did the sound level change?

Example Sound Levels

Source	Sound Pressure Level (dBA)
Threshold of pain	130
Construction noise	110
Subway train	100
Noisy restaurant	80
Busy traffic, normal radio	70
Normal conversation, dishwasher	60
Quiet office	50
Soft whisper	30
Threshold of hearing	0

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. This warranty covers educational institutions only.

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Rev 8/27/2015

Printed on recycled paper.