SOUND SENSOR

Description D015

Figure 1. The Sound Sensor

Short description
The sound sensor is a microphone with an internal amplifier. The sensor measures variations in pressure (of the air).
Because of the high sensitivity, the sensor is very much suited to detect pressure pulses. This offers one to measure the speed of sound from a bouncing ball.
Within a certain range, the sensor can also be used for dB-measurements.
One can do this in one of the following ways:
1.　to determine the average amplitude (rms) and to calculate the decibel-value;
2.　to measure the output of the sensor via a rectifying circuit and to calibrate the readings in decibel.
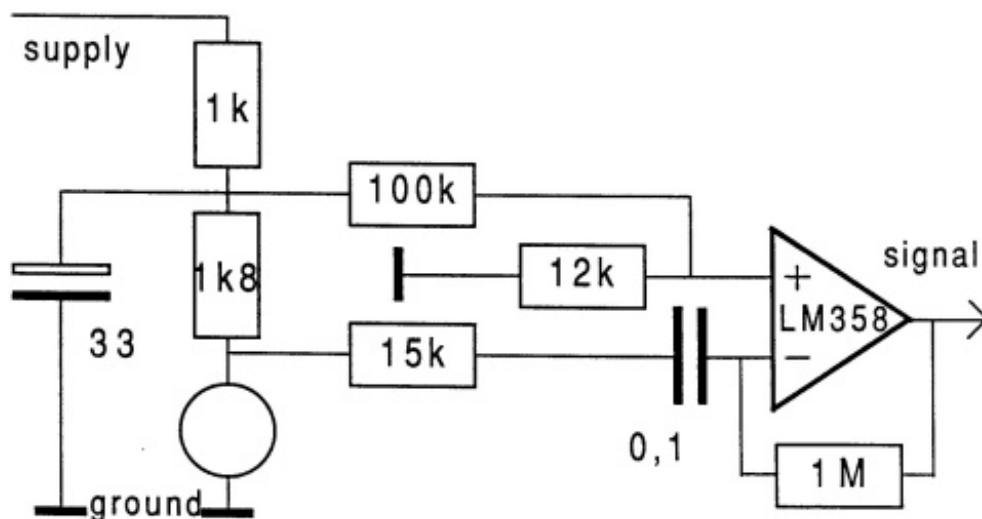The circuitry of the sensor is shown in figure 2.

Figure 2. Circuitry of the sound sensor
The sound sensor is delivered with a BT-plug and can be connected to the following interfaces:
● UIA/UIB through Measuring Console (via 0520 adapter)
● CoachLab
● CoachLab II
● SMI (via 0520 adapter)
● Texas Instruments CBL™ data-logger.
There is an adapter (art. 0520) to connect sensors with BT-plugs to 4-mm inputs.

Suggestion for experiments
Variety of activities with sound waves such as:
- Demonstration of wave patterns.
- Measurements of frequency and amplitude of sound (also for a tuning fork).

- Comparison of the waveforms of different instruments.
- Beat patterns.
- Measure the speed of sound.

Calibration
The calibration graphs are shown in the figures 3 and 4. The sound pressure in mPa has been calculated from the measurement in decibel (dB-A) by means of a calibrated decibel-meter. The source of sound is a noise generator (white noise) in combination with band-pass filter (1000 Hz).
The calculation can also be done via a multimeter, which measures the effective equivalent of the dc-voltage.
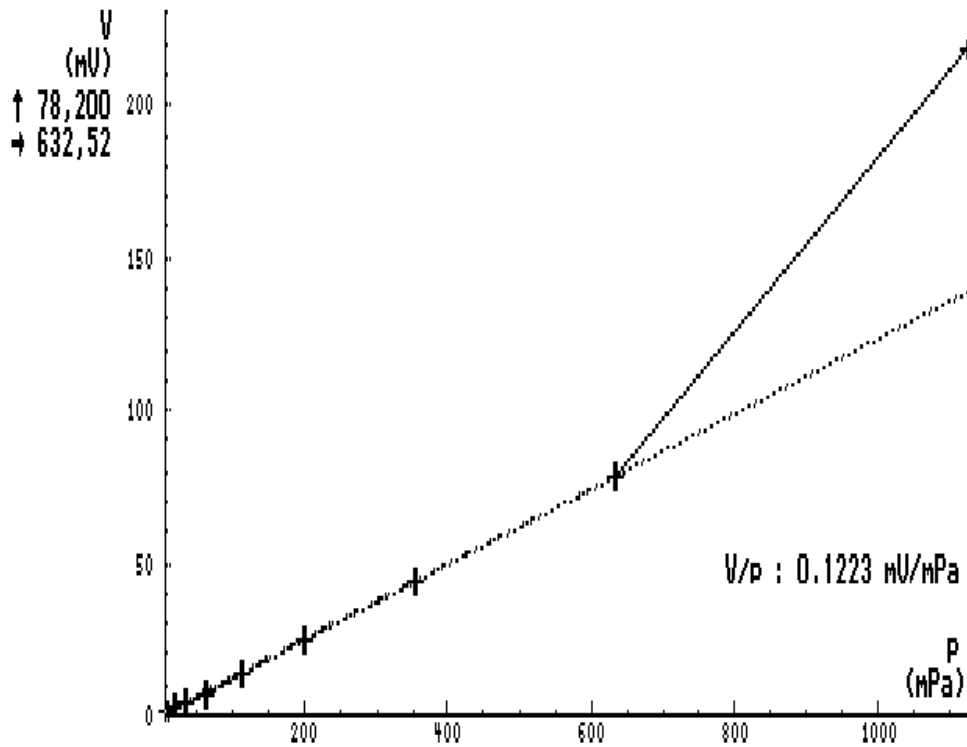
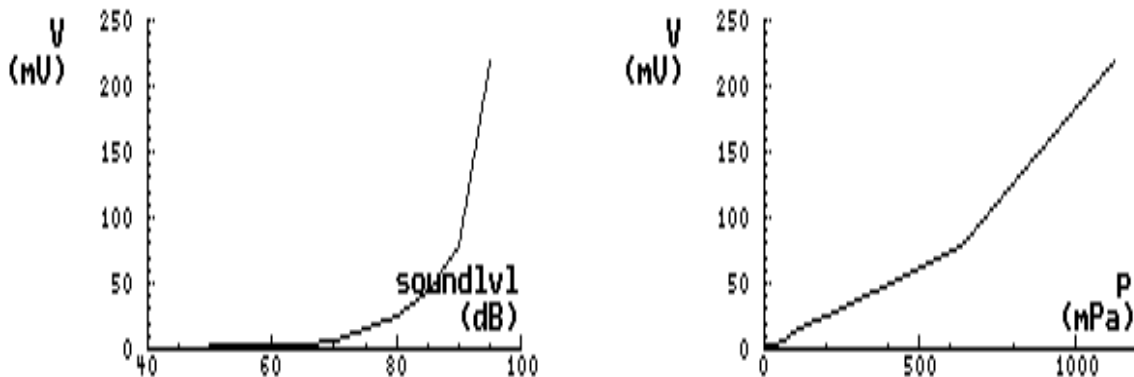**Figure 3**. Calibration graph of the sound sensor (in pascal)

Figure 4. Calibration graph in decibel (dB) and in pascal (Pa)

The name of the sound sensor in the sensor library of Coach 5 program is
Sound sensor (015&bt) (CMA).

Technical data

Sensitivity	0.12 mV/mPa
Output voltage	0 - 1V
Range * Range *	0 - 21 Pa 0 - 105 dB
Resolution using 12 bit 5V A/D converter	10 mPa
DC-offset	0.5 V
Frequency range	100 Hz - 9 kHz
Noise	Less than 4 mV
Tube	Length = 9.3 cm Diameter = 2.5 cm
Connection	BT (British Telecom) plug

*Symmetrically around 0.5 V offset.

Notes
– When no sound is detected the output is 0.5V.
– A signal amplitude of 0.5V corresponds to 94 dB.