

Noise-Level Alarm

Introduction

Noise is a serious environmental problem that affects us in our daily life. There is scientific evidence supporting that noise exposure can cause hearing loss, hypertension, heart disease, annoyance, sleep disturbance and decreased performance in schools. Sound-level indicators like the one presented here can help address this problem. This sound-level indicator monitors the sound level and indicates through an LED when the level is above the preset value.

A sound level meter or sound meter is an instrument that measures sound pressure level, commonly used in noise pollution studies for the quantification of different kinds of noise, especially for industrial, environmental and aircraft noise. However, the reading from a sound level meter does not correlate well to human-perceived loudness, which is better measured by a loudness meter. The current international standard that specifies sound level meter functionality and performance is the IEC 61672-1:2013.

Circuit and working

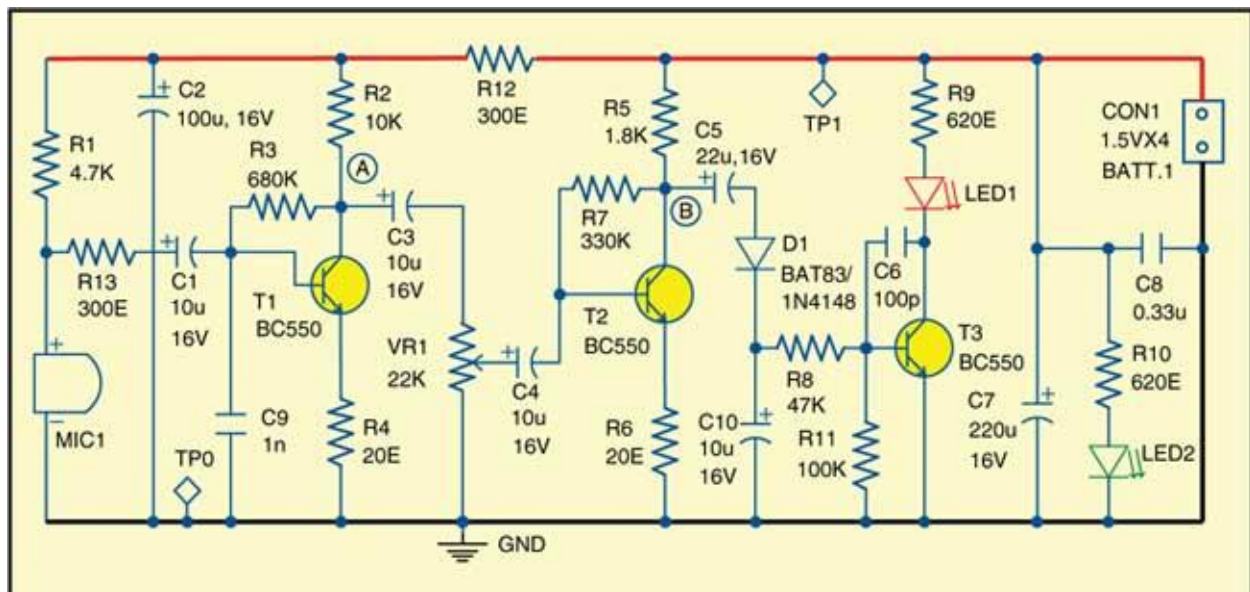


Fig. shows the circuit of noise-level alarm. The circuit is built around three BC550 npn general-purpose transistors (T1 through T3), electret microphone (MIC1), two LEDs (LED1 and LED2) and a few other components. The sound is captured by

microphone MIC1 and amplified by first-stage high-gain transistor T1. Trimmer potentiometer VR1 is used to adjust the threshold level. the signal is amplified again with second-stage transistor T2. This amplified signal is rectified by diode D1 and the charge is stored in capacitor C10. Diode D1 should preferably be a small-signal Schottky diode such as BAT81, BAT82, BAT83, BAT85 or better. You can use 1N4148 and 1N914 also but the signal from the input should be stronger. When the voltage across capacitor C10 is high enough, transistor T3 conducts and LED1 glows to indicate that the sound level is higher than the set level. LED2 indicates power supply is available to the circuit. Transistors T1, T2 and T3 should be high-gain type, such as BC550C, BC109C and BC108C. For powering the circuit, you can use 6V from four AA-size batteries or 6V from a regulated wall adaptor

PARTS LIST

Semiconductors:

D1	- BAT83 or 1N4148 signal diode
LED1	- 5mm red LED
LED2	- 5mm green LED
T1-T3	- BC550 npn transistor

Resistors (all 1/4-watt, ±5% carbon):

R1	- 4.7-kilo-ohm
R2	- 10-kilo-ohm
R3	- 680-kilo-ohm
R4, R6	- 20-ohm
R5	- 1.8-kilo-ohm
R7	- 330-kilo-ohm
R8	- 47-kilo-ohm
R9, R10	- 620-ohm
R11	- 100-kilo-ohm
R12, R13	- 300-ohm
VR1	- 22-kilo-ohm potentiometer

Capacitors:

C1, C3, C4, C10	- 10 μ F, 16V electrolytic
C2	- 100 μ F, 16V electrolytic
C5	- 22 μ F, 16V electrolytic
C6	- 100pF ceramic disk
C7	- 220 μ F, 16V electrolytic
C8	- 0.33 μ F ceramic disk
C9	- 1nF ceramic disk

Miscellaneous:

MIC1	- Electret microphone
CON1	- 2-pin connector
BATT.1	- 1.5V×4 cells

Components/IC/Specification

<i>Parts</i>	<i>Parts type</i>	<i>Value</i>	<i>Quantity</i>
<i>Diode</i>	<i>D1</i>	<i>BAT83</i> <i>or 1N4148</i>	<i>2</i>
<i>LED</i>	<i>RED LED</i>	<i>5mm</i>	<i>1</i>
	<i>Green LED</i>	<i>5mm</i>	<i>1</i>
<i>Transistor</i>	<i>T1-T3</i>	<i>BC550npn</i>	<i>2</i>
<i>Resistance</i>	<i>All ¼-watt, +-5% carban</i>	<i>R1-4.7k-ohm</i>	<i>1</i>
		<i>R2-10k-ohm</i>	<i>1</i>
		<i>R3-680k-ohm</i>	<i>2</i>
		<i>R4,R6-20-ohm</i>	<i>1</i>
		<i>R7-330-k-ohm</i>	<i>1</i>
		<i>R8-47-k-ohm</i>	<i>2</i>
		<i>R9,R10-620-ohm</i>	<i>2</i>
		<i>R12,R13-300-ohm</i>	
<i>Potentiometer</i>	<i>VR1</i>	<i>22-k-ohm</i>	<i>1</i>

<i>Capacitors</i>	<i>c1,c3,c4,c10</i>	<i>10 mu-F,16mu-F</i>	<i>8</i>
<i>Battery</i>	<i>6cell</i>	<i>1.5 v</i>	<i>4</i>
<i>Connector</i>	<i>CON1</i>	<i>2-pin</i>	<i>1</i>
<i>Microphone</i>	<i>MIC1</i>		<i>1</i>

Diode



In electronics, a diode is a two-terminal electronic component with asymmetric conductance; it has low (ideally zero) resistance to current in one direction, and high (ideally infinite) resistance in the other. A semiconductor diode, the most common type today, is a crystalline piece of semiconductor material with a p–n junction connected to two electrical terminals. A vacuum tube diode has two electrodes, a plate (anode) and a heated cathode. Semiconductor diodes were the first semiconductor electronic devices. The discovery of crystals' rectifying abilities was made by German physicist Ferdinand Braun in 1874. The first semiconductor diodes, called cat's whisker diodes, developed around 1906, were made of mineral crystals such as galena. Today, most diodes are made of silicon, but other semiconductors such as selenium or germanium are sometimes used.

LED



A light-emitting diode (LED) is a two-lead semiconductor light source that resembles a basic pn-junction diode, except that an LED also emits light.^[7] When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energyband gap of the semiconductor.

TRANSISTOR

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

RESISTANCE

Resistance is a series of first-person shooter and third-person shooter video games developed by Insomniac Games and published by Sony Computer Entertainment for the PlayStation 3, PlayStation Portable and PlayStation Vita video game consoles. The series takes place in an alternate history around the year 1950, in which an alien civilization known as the Chimera have invaded and conquered Earth, expanding their armies by capturing humans and transforming them into monster-like supersoldiers to fight for them. The player takes the role of one of the remaining human armed forces as they fight against the Chimera invasion. The series is noted for its use of both conventional and futuristic weaponry, reflecting

Insomniac's previous work on the *Ratchet & Clank* series. All games in the series have all been rated M by the ESRB.

POTENTIOMETER

A potentiometer /pəˌtɛnʃiˈɒmɪtər, informally a pot, is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider.^[1] If only two terminals are used, one end and the wiper, it acts as a *variable resistor* or *rheostat*.

A potentiometer measuring instrument is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

CAPACITOR

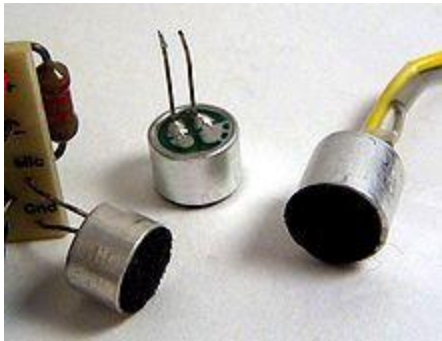
A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electrostatically in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e., insulator). The conductors can be thin films of metal, aluminum foil or disks, etc. The 'nonconducting' dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, a capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

BATTERY

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work.

Primary (single-use or "disposable") batteries are used once and discarded; the electrode materials are irreversibly changed during discharge. Common examples are the alkaline battery used for flashlights and a multitude of portable devices. Secondary (rechargeable batteries) can be discharged and recharged multiple times; the original composition of the electrodes can be restored by reverse current. Examples include the lead-acid batteries used in vehicles and lithium ion batteries used for portable electronics. Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.

Electret Microphone



An **electret microphone** is a type of condenser microphone, which eliminates the need for a polarizing power supply by using a permanently charged material. An *electret* is a stable dielectric material with a permanently embedded static electric charge (which, due to the high resistance and chemical stability of the material, will not decay for hundreds of years). The name comes from *electrostatic* and *magnet*; drawing analogy to the formation of a magnet by alignment of magnetic domains in a piece of iron. Electrets are commonly made by first melting a suitable dielectric material such as a plastic or wax that contains polar molecules, and then allowing it to re-solidify in a powerful electrostatic field. The polar molecules of the dielectric align themselves to the direction of the electrostatic field, producing a permanent electrostatic "bias". Modern electret microphones use PTFE plastic, either in film or solute form, to form the electret.

connector

An **electrical connector** is an electro-mechanical device for joining electrical circuits as an interface using a mechanical assembly. Connectors consist of plugs (male-ended) and jacks (female-ended). The connection may be temporary, as for portable equipment, require a tool for assembly and removal, or serve as a permanent electrical joint between two wires or devices.^[1] An adapter can be used to effectively bring together dissimilar connectors.

There are hundreds of types of electrical connectors. Connectors may join two lengths of flexible copper wire or cable, or connect a wire or cable or optical interface to an electrical terminal.

Conclusions

The following apps were found to be inadequate: Decibel Pro II, dB, Sound Meter, NoiseAlarm, SPL, Audio Tool, Noise Meter, Decibel Ultra, dB Meter Pro, Decibel 10th, Decibel Meter, Sound Level Meter and Noise Sniffer. They lacked key features and were inaccurate. We thought it would be a waste of time to publish their test results. Our highest rated app is the SPLnFFT app (see below image) for \$3.99. During the four tests we conducted, this was the only app to absolutely nail the results each and every time. It passed all four tests with flying colors. In fact, this app's results were so close to the results obtained using the \$2,000 noise meter that the tiny differences between the two are probably due to sampling error. We do have one major concern about this app – it will only measure noise up to a maximum of 94 decibels!

The SoundMeter+ app for \$1.99 is our second highest rated app (passed three tests). It's not as accurate on the higher frequencies as the SPLnFFT app is, but it will record sound levels up to at least 116dB (maybe higher, but 116dB was as high as we cared to test). Also, this app offers the most features. The SPL Meter app came in at third place (passed two tests). We found it difficult to reset, lacking some features, and it also had trouble with the higher frequencies. While the remaining apps shown below all had the key features we like to see in a sound measurement app, none of these apps came close on even a single test to the results attained with the 3M/Quest Model 2200 sound level meter. We would have no use for any of these apps. Please keep in mind that our testing was done using an iPad-4. Results may be different if either another iPad model or an iPhone were used.

Features:

- Continuous Monitoring of Sound Level
- Ideal for industrial, hospital, auditoriums, schools and other areas where there is a need for being alerted when sound level reaches set point
- Meets ANSI Type 2 and EN 60651 accuracy. specs compliant to OSHA
- User settable high or low limit (30 to 130dB) indication with output to drive external relay module
- Wall, desk or tripod mount
- Microphone rotates 180° for desired placement. Optional 15ft (5m) microphone extension cable for remote monitoring
- Complete with AC adaptor, microphone wind cover, wall, desk or tripod mount (optional Tripod TR100)

Applications:

- Industrial, Hospitals, Classrooms, and special quiet zones – When the sound level exceeds the HI set point the RED LEDs flash and can be seen from 100 ft (30m).
- Speakers/Educators/Instructors, Auditoriums and Theaters – The user can set the SL130 so the RED LEDs flash when the sound level is below the LO set point where people in the audience may not be able to hear. When the sound level is above the LO set point, the GREEN LEDs indicate the sound level is acceptable. The user can reverse the Red and Green LEDs activation per user color preference.