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Project name: Functional sound level meter

Introduction:

A sound level meter (SLM) is a device used to measure the intensity of sound in decibels (dB). It is a type of instrument used to measure sound pressure levels in various environments, such as in industrial settings, entertainment venues, and even in homes.

Sound level meters are designed to capture sound pressure level (SPL) and convert it into an electrical signal that can be measured and displayed on a meter or digital screen. The instrument usually consists of a microphone, amplifier, and a display unit. The microphone is used to pick up sound waves, and the amplifier is used to amplify the signal. The display unit typically displays the sound pressure level in db.

Sound level meters are essential tools in monitoring noise pollution levels in workplaces, residential areas, and public spaces. They are used to ensure that the sound levels do not exceed the recommended limits, which can cause hearing damage, annoyance, and other health problems.

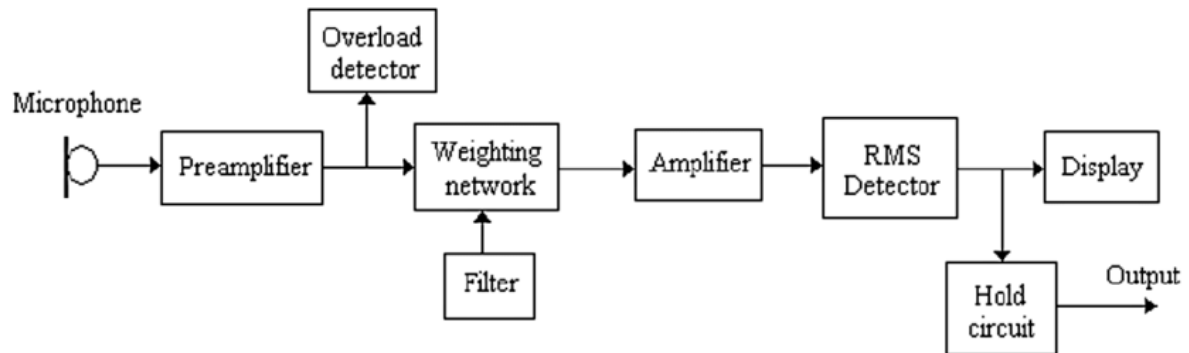
There are various types of sound level meters available, including basic models that provide simple readings and more advanced models with features such as frequency weighting and time weighting, which allow for more accurate measurements of specific types of noise. Some sound level meters are also equipped with data logging capabilities, which allow for the recording and analysis of sound levels over time.

Overall, sound level meters are an essential tool for measuring sound levels accurately, and they play a critical role in ensuring a safe and healthy environment for people.

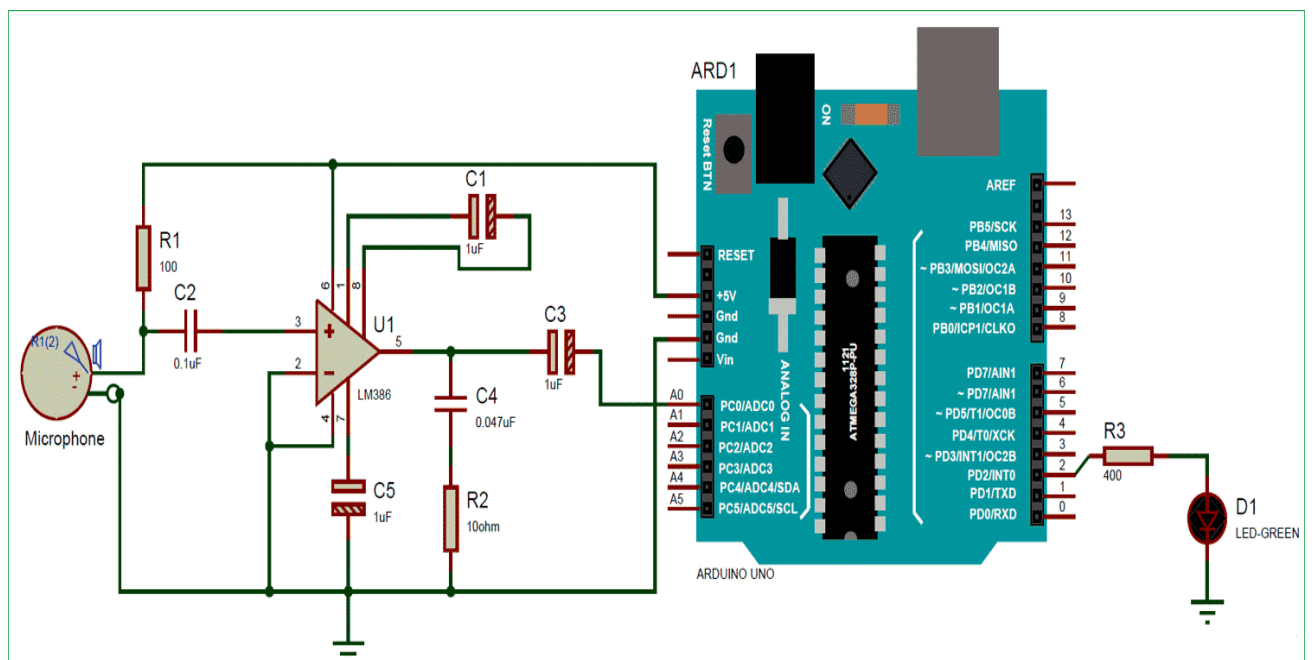
Components Required

1	Microcontroller or Arduino Board
2	Arduino Sound Module
3	16*2LED
4	Ceramic Capacitor
5	Electrolytic capacitors
6	Crystal oscillator
7	resistors
8	Tactile switch
9	Power supply

Block Diagram :



Circuit:



Working :

The working principle of a sound level meter involves converting sound pressure waves into an electrical signal, which is then amplified and displayed as a sound level reading on the meter or digital screen.

The key components of a typical sound level meter are:

1. **Microphone:** The microphone is used to pick up the sound waves and convert them into electrical signals. It is designed to have a flat frequency response and to be sensitive to sound pressure levels in the range of human hearing.
2. **Pre-amplifier:** The pre-amplifier is used to amplify the weak electrical signal generated by the microphone.
3. **Weighting filters:** Weighting filters are used to adjust the sensitivity of the microphone to different frequency ranges. This is necessary because the human ear is more sensitive to some frequency ranges than others. The two most used weighting filters are A-weighting and C-weighting.
4. **Analog-to-digital converter:** The analog-to-digital converter is used to convert the amplified electrical signal into a digital signal that can be processed by the sound level meter's microprocessor.
5. **Microprocessor:** The microprocessor is the brain of the sound level meter. It processes the digital signal and calculates the sound level in decibels (dB) using the following formula:

$$\text{Sound level (dB)} = 20 \log (P/P_0)$$

where P is the root mean square (RMS) pressure of the sound wave being measured, and P₀ is a reference pressure of 20 micro-Pascals (μPa) that corresponds to the threshold of human hearing at a frequency of 1 kHz.

6. **Display unit:** The display unit shows the sound level reading in dB on a meter or digital screen.

In summary, the working principle of a sound level meter involves picking up sound waves with a microphone, amplifying and filtering the electrical signal, converting it to a digital signal, and processing it with a microprocessor to calculate the sound level in decibels. The sound level is then displayed on the meter or digital screen.

Conclusion:

Sound level meters are essential instruments used to measure the intensity of sound in various environments, such as in industrial settings, entertainment venues, and residential areas. They operate by converting sound pressure waves into an electrical signal, which is then amplified, filtered, and processed by a microprocessor to calculate the sound level in decibels (dB). The sound level is then displayed on the meter or digital screen. Sound level meters play a critical role in ensuring a safe and healthy environment for people by monitoring noise pollution levels and ensuring they do not exceed recommended limits, which can cause hearing damage, annoyance, and other health problems.