Project Proposal :

Three Channel Audio Mixer Amplifier with a Three-Band Equalizer

Team CircuitPirates

EN2091 Laboratory Practice

August 10, 2025

1 Abstract

A mini-sized analog three-channel audio mixer amplifier with a three-band equalizer will be designed and constructed as the final product. The system will feature three independent input channels, a mixing stage to combine the audio signals, and a three-band active equalizer (bass, mid, and high) for tone control for each input. The final stage will be a power amplifier with volume control to drive a small speaker. This will be a functional, portable, and cost-effective audio solution suitable for personal use or as a learning tool for beginners in the field.

2 Introduction

Today, compact and lightweight sound mixers are in high demand due to the increase in content creation among the entry-level artists and the public. Due to the higher cost factor and bulky nature of professional-level mixers, they are not suitable for this task. So, there is a need for a lightweight and compact size of audio mixers. These devices allow users to combine multiple audio sources for better quality music videos, podcasts, and live streams.

3 Functionality

1. Design a functional three-channel audio mixer. Compact size, light-weight.
2. Implement independent tone control for each audio input.
3. Achieve a high signal-to-noise ratio and low distortion.
4. Mechanisms to avoid signal saturation.
5. Designing the final amplifier stage to drive a small speaker and give output via a audio jack.
6. Construct the final product on a custom PCB.
7. User friendly and entry level sound mixer with a 3D printed enclosure.

4 Functional Block Diagram

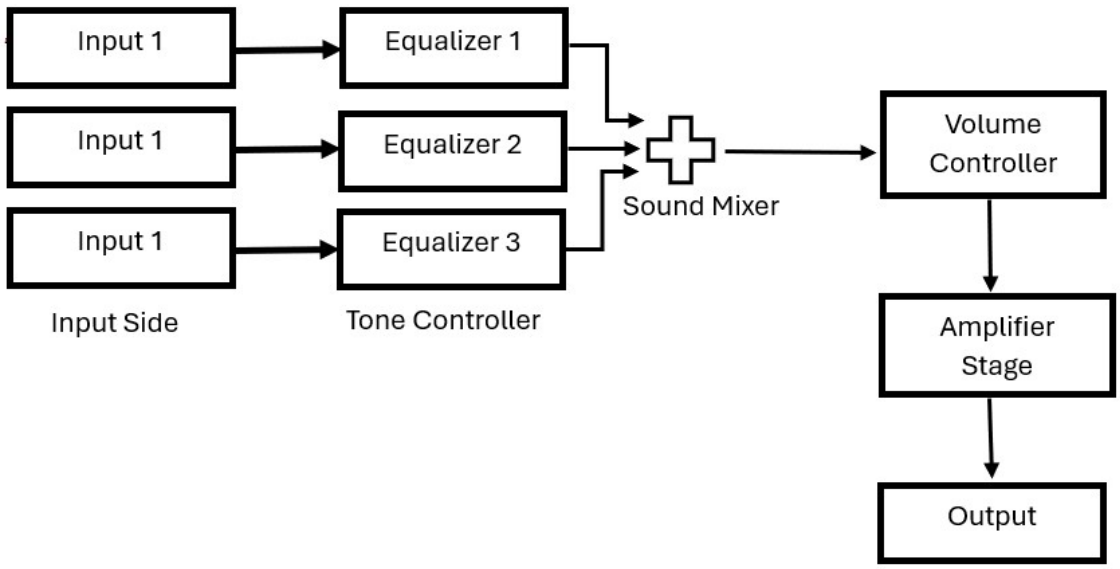

Figure 1: Functional Block Diagram.

5 Methodology

The overall design is broken down into four main sections, each serving a specific purpose:

- Input Stage: This stage will use pre-amplifiers for each of the three audio input channels. Boosting the low-level audio signals from the sources before they are mixed.
- Equalizer Stage: The individual signals will then pass through three separate three-band equalizer circuits. Will use filter circuits to control the amplification of the low (bass), mid, and high frequencies independently.
- Power Amplifier Stage: The final, equalized signal will be sent to a power amplifier circuit. This stage is responsible for providing the final amplification needed to drive a speaker. Final Volume Control will be done here.

6 Micro-Products and Interconnections

Micro-Products:

There will be four main micro-products,

1. Pre-amplifier Circuits
2. Three Equalizer Stages

3. Mixing Stage
4. Power Amplifier Stage

Interconnections and Signal Flow :

The micro-products are connected in a linear, sequential chain that the audio signal follows from the input to the output.

1. Inputs to Pre-amplifiers: Each of the three audio input sources (e.g., microphones, media players) is connected to a dedicated pre-amplifier circuit via audio jacks and signal wires.
2. Pre-amp to Equalizer Stage: The audio signal outputs from the previous stage is connected directly to the inputs of the equalizer stage.
3. Equalizers to Mixing Stage: The output of each of the three equalizer circuits is connected to a separate input on the mixing stage. These are direct signal connections, allowing the mixing circuit to receive all three signals simultaneously.
4. Mixing Stage to Power Amplifier: The mixed signal from the equalizer stage is then routed to the input of the power amplifier stage. This is the final signal path before the output.
5. Power Amplifier to Speaker: The output of the power amplifier is connected directly to the terminals of the speaker. The output will also be supplied to an output audio jack.(3.5mm audio jack or similar).

A single stable power supply will connect to and power all four micro-products.

7 Micro-product allocation among group members

- Input stage and Pre amplifier: D.M.D.P.Dissanayaka 230155J
- Equalizers for 3 separate inputs: K.G.T.N.Dhananjaya 230138K
- Mixer Stage: W.U.Deshan 230130E
- Output Power amplification: W.A.S.Nuwanaka 230449N

8 References

- https://www.linkedin.com/pulse/compact-mini-size-mixer-amplifier-functions-applications
- Audio Mixer Buying Guide- How to Choose the Right One