E2.05 - Hoover Headphones

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Project Overview

Our project is a headphone amplifier of pre-established design that combines vacuum-tube and solid state circuitry and allows tone shaping of the audio signal. Below are the major milestones of the project.

- Create a Characterization Plan
- Heavily Characterize The Amplifier
- Design a Bass and Treble Tone Control Circuit
- Create a Custom PCB for The Amplifier and Tone Controls

Business Need

According to the January 2021 Infinite Dial Report, an estimated 68% of the United States population over 12 years of age listened to some form of online audio in the month prior to being surveyed.

With this type of consumer behavior comes a demand for audio devices and engineers who are equipped to understand and produce them. Upon completion of this project, our team will provide a budget-friendly product that will introduce students to the field of audio electronics engineering.

Requirements

Features

- Audio-taper Volume Control
- 3.5mm Input
- ¼’ TRS and 3.5mm Output
- Custom PCB
- Shielded Enclosure
- 24VDC Power Supply

Characterizaton Plan Requirements

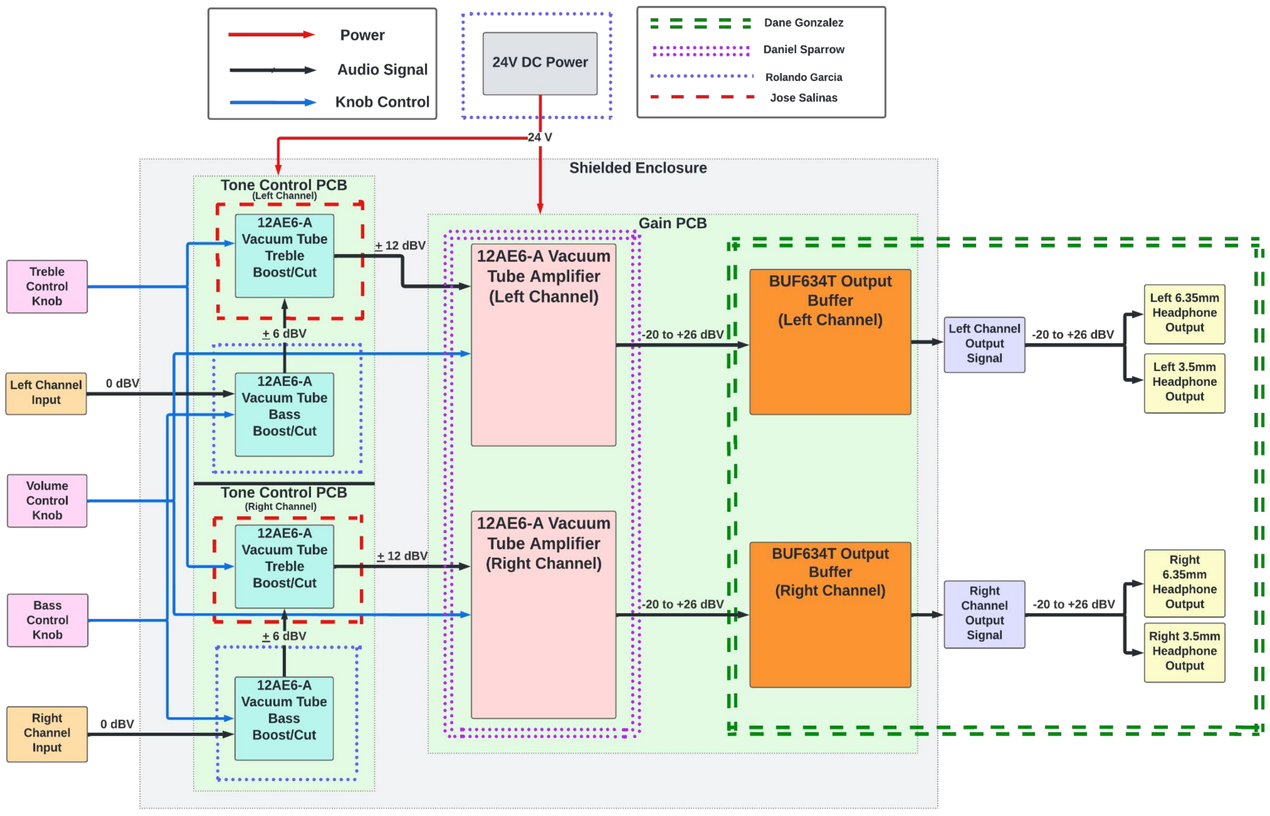
- Current Draw
- Input & Output Impedance
- Signal to Noise Ratio
- Crosstalk
- Using resistive loads of 25Ω, 70Ω, 300Ω, 600Ω :
  - Frequency Response
  - Slew Rate
  - Voltage Gain
  - Power Output @ 1kHz
  - Total Harmonic Distortion @ 1kHz
- Frequency Response to show effects of tone controls

Acknowledgements

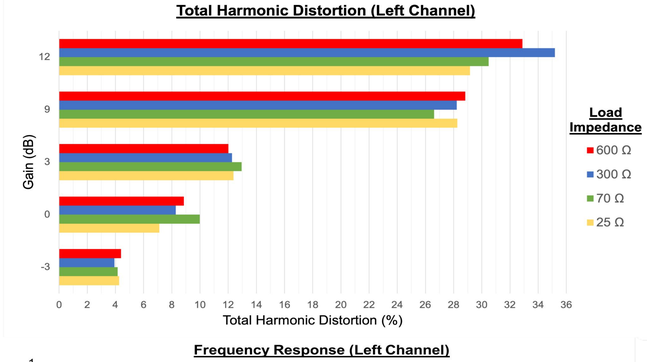
Sponsor: Dr. Richard Compeau
Faculty Advisor: Mr. Jeffrey Stevens

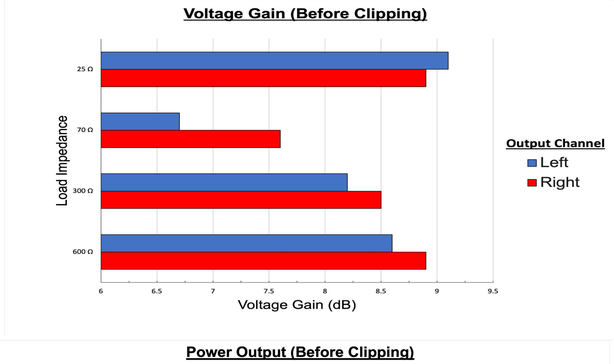
Special Thanks to Dr. Karl Stephan

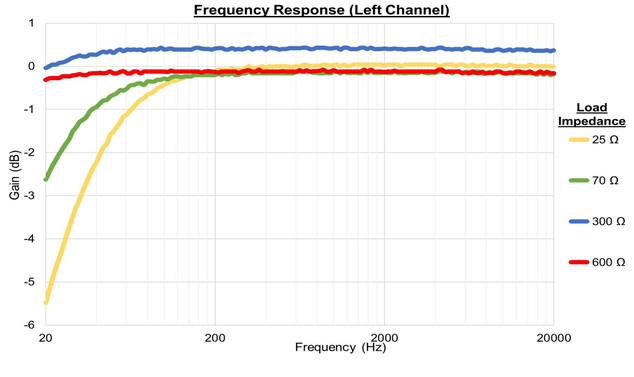
Top Level Block Diagram

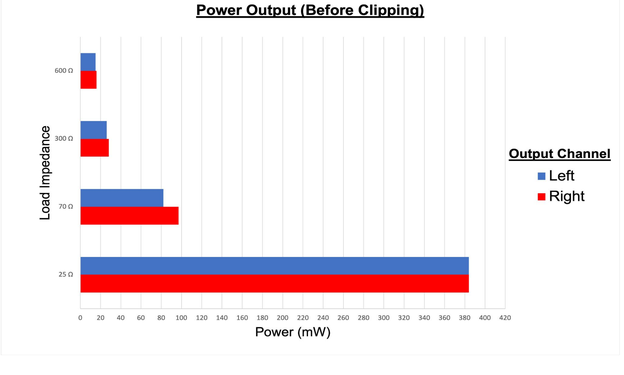


Results





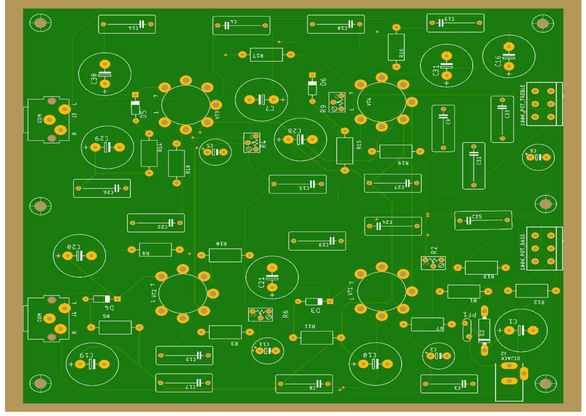




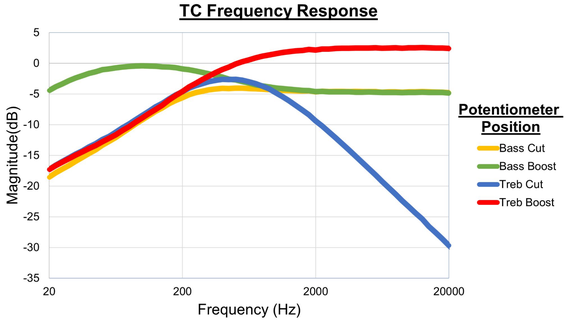
Team Info

Daniel Sparrow Dane Gonzalez Rolando Garcia Jose Salinas

Tone Control PCB



Tone Control Results



Results

Amplifier Current Draw	.18-.27A
Input Impedance	38k Ω
Output Impedance (Left Channel)	8.83 Ω
Output Impedance (Right Channel)	8.87 Ω
Signal to Noise Ratio (SNR) (Left Channel)	~ 80 dB
Signal to Noise Ratio (SNR) (Right Channel)	~ 80 dB
Crosstalk (Left Channel)	-41.9 dB
Crosstalk (Right Channel)	-40.3 dB