

Lab 9

Treble and Bass: Assemble, Troubleshoot, and Evaluate Performance

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Objectives

The objectives of this lab were to implement the treble and bass control subcomponents of the stereo amplifier system. This will be integrated with the amplifier stages you implemented in previous labs, and we will assemble the PCB that you designed in lab 5.

Procedure

Equipment and supplies

- Function Generator, oscilloscope, audio board, treble and bass PCB, soldering station

Procedure

For this lab, we began soldering the proper components onto our treble and bass PCB. After we soldered everything together and could then test our PCBs.

To test them, we used jumpers to make the proper connections then applied an input signal from the function generator and measured using the oscilloscope the output of the function generator and a channel for both treble and bass for when alpha was 1 and 0 at frequencies ranging from 20 to 20k Hz. These measurements can be found below as Figures 1-8 and the table with all the measured values and the calculated gain can be found in Table 1.

The design specifications had desired results of a 12.77 dB gain at high frequencies for the treble with 0 dB at low frequencies. The bass was 10.73 dB for low frequencies and 0 dB for high. I would say the measurements and calculated gain would meet specifications. They should be within 3 dB and all the calculated gains were within 3 dB of the desired results. Sam passed off my board and verified that it functioned properly.

After this, we tested that our PCBs worked properly by playing music. It worked as expected, with alpha=1, the bass had high gain for low frequencies while the treble had a high gain for the high frequencies and vice versa for when alpha=0 for both.

Table 1

	Channel	$f(Hz)$	Treble			Bass		
			V_{in}	V_{out}	$ A_{dB} $	V_{in}	V_{out}	$ A_{dB} $
$\alpha = 0$	Left	20Hz	2V	2V	0	2V	0.7V	9.1
		200Hz	2V	2.2V	0.8	2V	0.8V	8.0
		2k	2V	2.8V	2.9	2V	1.9V	0.4
		20k	2V	6.1V	9.8	2V	2V	0
$\alpha = 1$	Left	20Hz	2V	2V	0	2V	4.9V	7.9
		200Hz	2V	2.1V	0.4	2V	5.5V	8.8
		2k	2V	4.4V	6.8	2V	2.4V	1.6
		20k	2V	11V	14.8	2V	2V	0



Figure 1, Lab Kit



Figure 2, Lab Drawer

Conclusion

This lab gave me very good experience in soldering. I had done it last lab, but the buffer PCB was more spread out and had larger components. It was more challenging in this lab mostly because our footprints were the wrong size and we had larger components than there were footprints. Eventually it all was connected properly and functioned how we expected it to. In addition to just getting it to work how we expected, the design specifications were also met. My gain at both high and low frequencies for both treble and bass for when $\alpha=0$ and 1 was within 3dB of the desired results so the design specifications were met. Sam passed off my board and verified that it functioned properly.