
SECTION THREE
Prototype & Construction
(Week 4 – 5)

SECTION OVERVIEW

In this section, you will first breadboard your USB powered audio amplifier. After verifying the functionality, you will construct the prototype.

PRE-LAB

1. Find a way to measure/calculate **total harmonic distortion** (THD). Give detailed procedure.
2. Construct a parts list for the circuits designed in Section 2. Minimal requirement: location of purchase, vendor parts number, unit cost, total cost.
3. Acquire all parts needed to construct your prototype.

PROCEDURE

Construct

1. Breadboard your designed and simulated circuit by blocks (assume each amplifying stage is a block).
 - Once your circuit is breadboarded, fill in the following table with measurements. Once filled in, have your TA sign off they have seen the measurements.

Frequency	Vin (Peak-to-Peak)	Vout (Peak-to-Peak)	Phase Shift (Degrees)	THD
100Hz				
1kHz				
10kHz				
20KHz				

2. After verifying the functionality of your breadboard circuit, construct the prototype.
 - Once your circuit is constructed, fill in the following table with measurements. Once filled in, have your TA sign off they have seen the measurements.

Frequency	Vin (Peak-to-Peak)	Vout (Peak-to-Peak)	Phase Shift (Degrees)	THD
100Hz				
1kHz				
10kHz				

20KHz				
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A few recommendations on your prototype:

- Construct the system by sections/blocks, and verify that each block functions correctly before proceeding to the next block.
- Avoid having long and/or exposed wires on the prototype.
- Double check places for components before you permanently solder them.

Matching Simulation Results

You need to ensure your prototype matches your simulation as close as possible. For this project, you will be required to match your simulation results within $\pm 10\%$. For example, if your peak to peak voltage is 4 volts, the inconsistency can be ± 0.4 volts.

STUDY QUESTIONS

1. Comparing the output of your breadboard circuit and your simulation, describe the inconsistencies. Please note there WILL be inconsistencies. What might be some of the causes for the inconsistencies? What modifications did you do to match the two outputs? Please give details such as reasoning, calculations, etc.
2. Comparing the output of your breadboard circuit and your prototyped (soldered) circuit, describe the inconsistencies. Please note there WILL be inconsistencies. What might be some of the causes for the inconsistencies? What modifications did you do to match the two outputs? Please give details such as reasoning, calculations, etc.

TURN-IN

- A copy of your design process, include equation used and calculation results with units.
 - a. Equations used to initially calculate all resistors in your design.
 - b. Calculations showing that the circuit still functions for maximum and minimum values of Beta from the datasheet.
- A copy of your simulation result including:
 - a. Input and Output Waveforms (on one graph)
 - b. Magnitude and Phase Plots (on one graph)
 - c. Input and Output Impedance
 - d. The two tables of values based on frequency
- Answers to study questions (typed, with SPICE schematic, equation editor for equations).

- This check off sheet.

PROTOTYPE CHECK-OFF SHEET

<u>Test (from Project Specification)</u>	<u>Measurements</u>	<u>TA signature</u>
7.1.1 – USB Powered		_____
7.1.2 – Components Used		_____
7.1.3 – Signal Source		_____
7.1.4 – Volume Control		_____
7.1.5 – Stereo Output		_____
7.1.6 – Current Consumption		_____
7.1.7 – System THD		_____
7.1.8 – Solid Construction		_____

