ECE411 Group 6-- Voice Modulator Device

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Revision History

Revision	Changes	Date	Author
0.1	Initial revision	11/28/18	Philip Arola

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1 Introduction

This device is a voice modulator, designed to be reprogrammable using the ISCP pins, allowing the end user to change the modulation that takes place. It takes in a single microphone input, and outputs a single speaker line. It also has indicator LEDs to indicate power.

1.1 Objective

The objective of this document is to provide a procedure to validate that the device operates properly and safely. We do this by testing the I/O from a black box perspective, and by testing power inputs.

1.2 Reference Material (datasheets)

- Atmel ATmega48 datasheet
- MCP4921 12 bit DAC datasheet
- MCP3208 16 bit ADC datasheet

2. Test Equipment

1. Oscilloscope
2. Function Generator
3. Power supply
4. Test cables and probes

2.1 Equipment Setup

1 Set power supply to a ~5V output, with at least half an amp of allowed output
   a. Hook up a partially stripped USB 3.0 Mini Type-B to the power supply output, and plug in the USB end into the USB header on the board
   b. Alternatively, use a normal, unstripped USB 3.0 Mini Type-B with a USB Type-A connector, and plug into a laptop or cell-phone charger

2 Set function generator to produce frequency sweep from 100 Hz to 20 KHz
   a. Hook up the probes to a partially stripped aux cord, and plug into the microphone input on the board

3 Hook the oscilloscope probes onto the appropriate probe test points on the board

3. Test Procedures

3.1 Power-on Test

1. Ensure power supply is connected as described in 2.1 [Equipment Setup], subsection 1.
2. Turn on the power supply
3. All three power indication LEDs should turn on

3.2 Functional Test

1. Ensure power supply is connected as described in 2.1 [Equipment Setup], subsection 1.
2. Ensure the function generator is connected as described in 2.1 [Equipment Setup], subsection 2.
3. Ensure the oscilloscope is connected as described in 2.1 [Equipment Setup], subsection 3.
4. Turn on the power supply, function generator, and the oscilloscope
5. Observe the oscilloscope measurements, and ensure the frequency of the output roughly matches the input
    a. The match will not be perfect, as the microcontroller purposefully introduces noise/modulation as part of the functionality. The fundamental frequency should remain the same.

3.3 Human Ear Test

This test will simply consist of the user speaking into the microphone and listening to the output. The test passes if the modulation sounds right. This is a very subjective test and should be run alongside Functional Test 3.2 as a supplement.

4 Appendix: Test Records

4.1 Functional Test

Test Writer	Philip Arola				
Test Case Name	Functional test	Test ID	I/O-Waveform		
Description	Ensure the waveform produced by the system is what is expected	Type	Black Box	X	
			White Box		
Test Information					
Name of Tester			Date		
Relevant Version #			Time		
Setup	Ensure power supply is connected as described in 2.1 [Equipment Setup], subsection 1.				
Additional Equipment	Power Supply, Function Generator, Oscilloscope				

Stage	Operation	Expectation	P	F	/	Comment
1	Observe waveforms	Fundamental frequencies match				
2						
3						
Overall results						

4.2 Human Ear Test

Test Writer	Philip Arola				
Test Case Name	Human Ear Test	Test ID	I/O-Audio		
Description	Verify that the output of the device is intelligable to the human ear	Type	Black Box	X	
			White Box		
Test Information					
Name of Tester			Date		
Relevant Version #			Time		
Setup	1. Ensure power supply is connected as described in 2.1 [Equipment Setup], subsection 1. 2. Ensure the function generator is connected as described in 2.1 [Equipment Setup], subsection 2. 3. Ensure the oscilloscope is connected as described in 2.1 [Equipment Setup], subsection 3.				
Additional Equipment	Power Supply				

Stage	Operation	Expectation	P	F	/	Comment
1	Listen to the audio	Voice sounds like a dalek				
2						
3						
Overall results						