ECE411 Group 6 -- Voice Modulator Device

**Authors:** Philip Arola, Aaron Chan, Ryan Writz, Jordan Bergmann, Stephen Johnston

# Revision History

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

Table of Contents

[Revision History 1](#_Toc531178669)

[1 Introduction 2](#_Toc531178670)

[1.1 Objective 2](#_Toc531178671)

[1.2 Reference Material (datasheets) 2](#_Toc531178672)

[2. Test Equipment 2](#_Toc531178673)

[2.1 Equipment Setup 2](#_Toc531178674)

[3. Test Procedures 3](#_Toc531178675)

[3.1 Power-on Test 3](#_Toc531178676)

[3.2 Functional Test 3](#_Toc531178677)

[3.3 Human Ear Test 3](#_Toc531178678)

[4 Appendix: Test Records 4](#_Toc531178679)

[4.1 Functional Test 4](#_Toc531178680)

[4.2 Human Ear Test 5](#_Toc531178681)

# 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
   1. 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
   2. 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
   1. 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
   1. 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 | | | |  |  |  |  | |