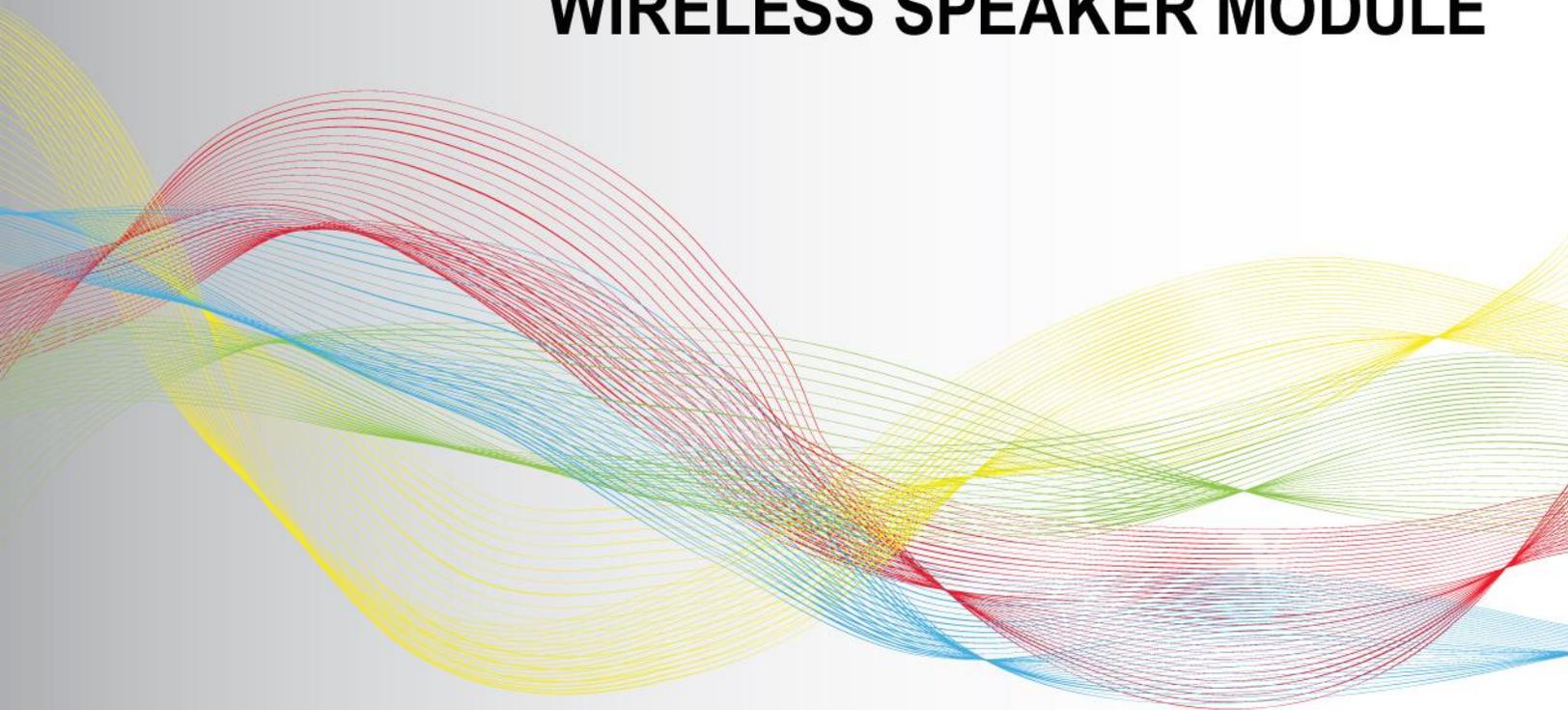




Test Plan

WIRELESS SPEAKER MODULE



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Appendix E: Detailed Test Plans

E.1 Hardware Test Plans

Arimus Audio's SoundHub Evaluation Sheet

Test Summary

Test ID: _____ Prepared By: _____

Review By: _____ Test Date: _____

Additional Notes:

Results

Approved

Conditional approved

Disapproved

Retest

Observations and Comments:

I certify that this test procedure has been performed according to the documentation, and that the results recorded are accurate and complete.

Tester Name: _____ Signature: _____ Date: _____

Witness Name: _____ Signature: _____ Date: _____

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Hardware test case 1: PCB power

Test Method:

Tester will connect the DAC system with ATX power supply to verify all voltages are at correct levels.

Pass Criteria:

The DAC system is able to power up with all voltages at correct level. The power LED on the decoder board should light up.

Test Summary	
12V pad	
-12V pad	
Ground	
+5V	
3.3V	
Results	
Pass	Fail
Observations and Comments:	

Hardware test case 2: Decoder output

Test Method:

Feed the decoder board with an input optical SPDIF signal. Then measure the I2S output from the decoder chip.

Pass Criteria:

The decoder is able to produce the correct digital output with expected target frequencies of the I2S clock signals.

Test Summary	
System Clock Frequency	
Bit Clock Frequency	
LR Channel Clock Frequency	
Data Output	
Results	
Pass	Fail
Observations and Comments:	

Hardware test case 3: DAC output

Test Method:

Feed the audio DAC with a decoded I2S signal, and measure the differential output from DAC chip.

Pass Criteria:

DAC output should produce a pair of differential signals before the op-amp amplification stage.

Test Summary	
Observation:	
Results	
Pass	Fail
Additional Comments:	

Hardware test case 4: Overall audio function

Test Method:

The tester will feed the DAC system with SPDIF signal from any audio source. The line-out switch is set to position 3.

Pass Criteria:

User is able to hear music from the 3.5mm line-out jack of the DAC system. Result is preferably a clean audio signal acceptable for user listening.

Test Summary		
Observation:		
Results: Is there any music playing? Does it sound correct?		
Yes	Yes, with Noise	No
Additional Comments:		

Hardware test case 5: SNR

Test method:

The tester will use laboratory instrument to measure the magnitude of the output audio signal by probing to the output of the differential amplifier. The tester will measure the both output signal magnitude with SPDIF input and without input source. The signal to noise ratio will be calculated based the measured result.

Pass Criteria:

The audio signal coming out from the amplifier is clean such that the calculated signal to noise ratio is above 115dB.

Test Summary	
Expected SNR	Measured SNR
Results	
Pass	Fail
Observations and Comments:	

Hardware test case 6: Line-in switch

Test Method:

The tester will input audio into the 3.5mm line-in audio jack, set the 3PDT switch to position 1, and ensure the input and output signals are the same. The tester will set the 3PDT switch to position 3 and perform Hardware Test Case 1. The tester will set the 3PDT switch to position 2 and hear no audio from the 3.5mm line-out jack.

Pass Criteria:

Position 1: The noise level between two nodes is indistinguishable, and audio is playing from the line-out.

Position 3: See Hardware Test Case 4

Position 2: No audio should be playing from the 3.5mm line-out jack.

Test Summary		
Position 1 Output	Position 2 Output	Position 3 Output
Results		
Pass		Fail
Observations and Comments:		

Hardware test case 7: Volume knob

Test method:

The tester will use an oscilloscope to probe signals A and B from the rotary encoder. The volume knob will be turned clockwise and counter clockwise at constant rates. Special attention should be played to the phase relation between signals A and B.

Pass Criteria:

When the volume knob is turned clockwise, signal B should be low on the rising edge of signal A. When the volume knob is turned counter clockwise, signal B should be high on the rising edge of signal A. There should not be excessive bouncing on the edges of either signal.

Test Summary	
Clockwise rotation	Counter clockwise rotation
Results	
Pass	Fail
Observations and Comments:	



E.2 Firmware Test Plans

Arimus Audio's SoundHub Evaluation Sheet

Test Summary

Test ID: _____

Prepared By: _____

Review By: _____

Test Date: _____

Additional Notes:

Results

Approved

Conditional approved

Disapproved

Retest

Observations and Comments:

I certify that this test procedure has been performed according to the documentation, and that the results recorded are accurate and complete.

Tester Name: _____

Signature: _____

Date: _____

Witness Name: _____

Signature: _____

Date: _____

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Firmware test case 1: network connectivity

Test method:

Through a serial connection the tester will prepare the `/etc/network/interfaces` file have the service set identification (SSID) and password a wireless AP. The tester will then use the `/etc/init.d/networking restart` command to reset the system. Finally the tester will see if the wireless AP has been joined using the `iwconfig` command.

Pass Criteria:

The `iwconfig` command return value should show wlan4 to be connected to the desired wireless AP.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 2: Signal range test

Test method:

Using a known wireless AP, the SoundHub will be started at the distances of 5m, 10m, 20m and 30m from the wireless AP. Once started the tester will see if the wireless AP has been joined using the `iwconfig` command.

Pass Criteria:

The `iwconfig` command return value should show wlan4 to be connected to the desired wireless AP.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 3: Boot time

Test method:

The tester will use a stopwatch to measure time and will be using a known wireless AP. The stopwatch will be started as the SoundHub is plugged in and will be stopped when the status LED indicates that the wireless AP has been joined.

Pass Criteria: The stopwatch reads a time less than 5 minutes.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 4: Volume knob

Test method:

The tester will be playing a constant note through the SoundHub. Next the tester will turn the volume knob clockwise and then counter clockwise.

Pass Criteria:

As the volume knob is turned clockwise, the volume of the note will increase. As the volume knob is turned counter clockwise the volume of the note will decrease.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 5: Streaming one to one

Test method:

Using a mobile device and a SoundHub on the same network, the tester will stream a song from a mobile device to the SoundHub.

Pass Criteria:

The stream should be played with no noticeable differences between the SoundHub's playback and playback locally.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 6: Streaming one to many

Test method:

Using a mobile device and two SoundHubs on the same network, the tester will stream a song from a mobile device to the network of SoundHubs.

Pass Criteria:

Both SoundHubs will play the stream in sync with no noticeable differences between the SoundHubs' playback and playback locally.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Firmware test case 7: Playback functionality

Test method:

Using a mobile device and a SoundHub on the same network, the tester will stream a song from a mobile device to the SoundHub. While playing the tester will use to mobile device to change the volume, seek ahead in the song, pause the song and restart the song.

Pass Criteria:

When the user changes the volume on the mobile device, this change is reflected in the volume coming from the SoundHub.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

E.3 Software Test cases

Arimus Audio's SoundHub Evaluation Sheet

Test Summary			
Test ID: _____		Prepared By: _____	
Review By: _____		Test Date: _____	
Additional Notes:			
Results			
Approved	Conditional approved	Disapproved	Retest
Observations and Comments:			
I certify that this test procedure has been performed according to the documentation, and that the results recorded are accurate and complete.			
Tester Name: _____		Signature: _____	Date: _____
Witness Name: _____		Signature: _____	Date: _____
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Software test case 1: Android compatibility

Test method:

The tester will compile the final version of codes on the Android SDK, and run the application through an Android device which is connected through USB port.

Pass Criteria:

Upon successful installation on the Android device, the application should be running without crashing and the GUI is correctly presented

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Software test case 2: Graphic user interface buttons

Test method:

While the application is running and is in the default state, the tester will click each of the buttons appeared on the GUI.

Pass Criteria:

All buttons should be clickable without crashing the application.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Software test case 3: SoundHub detection and connection

Test method:

The tester turn on the Wi-Fi for both the Android device and SoundHub so they are connected to the identical Wi-Fi network.

Pass Criteria:

The Android device should be able to detect the existence of SoundHub through the application interface and connect to them.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Software test case 4: Other devices detection and connection

Test method:

The tester turn on the Wi-Fi for both the Android device and a separate device other than the SoundHub known to implement the sink protocol so they are connected to the identical Wi-Fi network.

Pass Criteria:

The Android device should be able to detect the existence of the other device through the application interface and connect to them.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Software test case 5: Playback control

Test method:

Once the Android device and SoundHub (or a separate device other than the SoundHub known to implement the sink protocol) is connected on the same Wi-Fi network, the tester will stream a song from the Android device to the SoundHub (or ...). While playing the tester will use to mobile device to pause/continue the song, seek ahead in the song, and restart the song.

Pass Criteria:

The SoundHub (or ...) should be able to recognize the commands and perform the corresponding actions to pause/continue the song, seek ahead in the song, and restart the song.

Test Summary	
Results	
Pass	Fail
Observations and Comments:	



E 4. Integration Test Cases

Arimus Audio's SoundHub Evaluation Sheet

Test Summary			
Test ID: _____		Prepared By: _____	
Review By: _____		Test Date: _____	
Additional Notes:			
Results			
Approved	Conditional approved	Disapproved	Retest
Observations and Comments:			
I certify that this test procedure has been performed according to the documentation, and that the results recorded are accurate and complete.			
Tester Name: _____		Signature: _____	Date: _____
Witness Name: _____		Signature: _____	Date: _____
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Integration test case 1: Music streaming quality

Test method:

The tester streams sample music such as heavy bass and soprano from a mobile device once all components of the system are integrated

Pass Criteria:

The wireless streamed music should retain its quality over different frequency range

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Integration test case 2: Streaming latency

Test method:

The tester streams sample music from a mobile device, and clicks pause/continue while streaming.

Pass criteria:

The wireless streamed music should respond to user's command through the mobile application within five seconds

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Integration test case 3: Power consumption

Test method:

A powermeter will be used to measure the power consumption of SoundHub during streaming

Pass criteria:

The system should not exceed the power rating on the AC converter

Test Summary	
Results	
Pass	Fail
Observations and Comments:	

Integration test case 4: Streaming stress

Test method:

The tester streams a longlast sample music

Pass criteria:

Stream music to the SoundHub for a period of twelve hours and determine the rate of dropped music during that duration

Test Summary	
Results	
Pass	Fail
Observations and Comments:	