Product Description Specification

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ECE 411
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TEAM 5
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Unit Tests:

- Test power supply provides 5 volts to the system.
- Test microphone, I2S protocol.
- Test each cell in the LED matrix and verify that each can be individually controlled by ESP32.

Verification Tests:

- ESP32 is able to take in input from the microphone and output a corresponding display on the LED matrix (audio visualizer).
- Switch is able to sever connection between power supply and ESP32 (on PCB).
- Components all attached to PCB instead of a breadboard will still be able to work and have power supplied.

Validation Tests:

- Displayed LEDs should be conveying accurately what kind of sounds it is taking in. The information are:
  - Intense sound would fill a bar up
  - High frequency noises will populate the right side of the matrix
  - Low frequency noises will populate the left side of the matrix

Test Author: Gene								
	Test Case Name:	LED Matrix Interface				**Test ID #:**		01
	Description:	*This test case will be testing the libraries LedMatrix and FastLED to interface with the LED matrix*				**Type:**		□ white box
Tester Information								
	Name of Tester:	Gene				**Date:**		11/12/2023
	HW/SW Version:	1.0				**Time:**		N/A
	Setup:	*The LED matrix needs to be connected to an ESP32 through breadboard or wires, and an appropriate IDE is required to be able to download libraries and upload code to the microcontroller.*						

S T E P	Action	Expected Result	P A S S	F A I L	N / A	Comments
1	Turn on LED (0,0) as red	Bottom right LED is red	x			Make sure delays are adequate so these steps can be seen.
2	Turn on LED (0,7) as blue	Top right LED is blue	x			
3	Turn on LED (31,0) as yellow	Bottom left LED is yellow	x			
4	Turn on LED (31,7) as green	Top left LED is green	x			
5	Turn on all LEDs as red	Entire board lights up to red	x			
6	Turn on all LEDs as yellow	Entire board lights up to yellow	x			
7	Turn on all LEDs as green	Entire board lights up to green	x			
8	Vary the brightness from low to high (0 to 127)	Board ramps up from 0 bright brightness to 50% brightness	x			50% brightness is VERY bright.
9	Turn off LEDs one by one starting from (0,0) to (31,7)	LEDs start turning off starting from bottom to top, right to left	x			
	Overall test result:		x			

Test Author: Aziz							
	Test Case Name:	Basic microphone functionality				**Test ID #:**	02
	Description:	*This test case will be I2S protocol and assures that the microphone works*				**Type:**	□ white box
Tester Information							
	Name of Tester:	Aziz				**Date:**	11/15/2023
	HW/SW Version:	1.0				**Time:**	N/A
	Setup:	*The microphone needs to be connected to an ESP32 through breadboard or wires, and an appropriate IDE is required to be able to download libraries and upload code to the microcontroller.*					

STEP	Action	Expected Result	PASS	FAIL	N/A	Comments
1	Configure pins for I2S	ESP32 recognizes the microphone	x			
2	Make any sort of noise	Should print the input frequency	x			
3	Play 20 kHz sound	Should display the frequency	x			
4	Try to be in a quiet environment	Should display noise	x			
	Overall test result:		x			

Test Author: Meshal						
	Test Case Name:	Audio Visualizer Program		**Test ID #:**		03
	Description:	*This test case will be connecting the microphone and LED matrix programs together such that sound data coming from the microphone will be visualized on the LED matrix in the form of colored bars. The bar height will be based on the intensity of the frequencies.*		**Type:**		□ white box
Tester Information						
	Name of Tester:	Meshal		**Date:**		11/17/2023
	HW/SW Version:	1.0		**Time:**		N/A
	Setup:	*The microphone, LED matrix, and ESP32 need to be connected together on a breadboard. An IDE that can download and use .ino libraries to interface with microphone and LED matrix..*				

T E S T	INPUTS	EXPECTED OUTPUTS	P A S S	F A I L	N / A	Comments
1	Loud sound	Bar heights will be near or at max height.	x			
2	Quiet sound	Bar heights will be near or at the lowest height.	x			Microphone is pretty sensitive. All bars have the lowest LED on due to background noise.

3	High frequency sounds	The population of lit LEDs should be towards the right.	x			
4	Low frequency sounds	The population of the lit LEDs should be towards the left.	x			
5	Middling frequency sounds	The population of the lit LEDs should be in the middle.	x			
6	Varying volume of the sound	The bars should rise up as the volume gets louder.	x			
	Overall test result:		**x**			

	Test Author: Flynn						
	Test Case Name:	Power is Being Supplied		**Test ID #:**		04	
	Description:	*This test case will be testing if the PCB is distributing power correctly. If working, the ESP32, microphone, and LED matrix will be powered on when the power supply is plugged in.*		**Type:**		□Gray box	
	Tester Information						
	Name of Tester:	Flynn		**Date:**		11/28/2023	
	HW/SW Version:	1.0		**Time:**		5:00 pm	
	Setup:	*PCB with all components attached.*					

T E S T	INPUTS	EXPECTED OUTPUTS	P A S S	F A I L	N / A	Comments
1	Voltage from the power supply is plugged into the power terminal.	ESP32 turns on, LED matrix lights up, and microphone is giving data to ESP32.	o	x		GND pin of jack not connected. Jumper was connected to battery tab and ESP boots up
2	+3V VDD supply powering I2S microphone and ADC board	Microphone is able to be detected when connecting via PCB to Arduino program	x			
3	+5V rail to power LED Matrix	LED Matrix should show bottom row of light illuminate when power attached	x			
	Overall test result:		x			

	Test Author: Flynn				
	Test Case Name:	Product Functionality		**Test ID #:**	05
	Description:	This will test the general operations of the device to take in inputs, process the audio and output the audio spectrum on the LED matrix in real time.		**Type:**	☐ white box
Tester Information					
	Name of Tester:	Gene, Aziz, Meshal, Flynn		**Date:**	11/28/23
	HW/SW Version:	1.0		**Time:**	6:00 pm
	Setup:	PCB fully populated with external power to board and			

T E S T	INPUTS	EXPECTED OUTPUTS	P A S S	F A I L	N / A	Comments
1	I2S Microphone.	LED matrix displays FFT of room audio in real time.	o	x		Routing of ESP32 and board found mismatched. Changes to code and pin-pin jumpers resolved issues.
2	3.5mm analog audio (Additional feature)	LED matrix displays FFT of aux cable audio in real time.		x		PCB routing for ADC mirrored. ADC will need to be desoldered, rotated, and retested.
3	Switching between inputs	LED matrix changes which input it is displaying from			x	Since Analog is not working, all that can be tested is that the input changes.
	Overall test result:					