

# MUSICAL SYNTHESIZER

## A SOUND EFFECT DEVICE FOR MUSICIANS

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### PROBLEM STATEMENTS

In today's world musicians can be put in a difficult spot with high cost of equipment. To address this challenge we set out to:

1. Create a state-of-the-art synthesizer for an affordable amount
2. Strive for major functionalities of a synthesizer
3. Develop a graphical user-interface that wirelessly controls system

### SOLUTION

The designed synthesizer has met our desired expectations. Since, it has all the major modules that appear to be present in industry standards, uses affordable components, and the interface is user-friendly. The user interface is an app that can be downloaded on many pieces of hardware available to musicians. The housing for the synthesizer keeps all of the devices secured as well as provides simple access to the power supply and system output.

### REQUIREMENTS

#### FUNCTIONAL

- All modules function to expectations
- Interface changes with modifications to modules
- Signal integrity is not degraded across system

#### NON-FUNCTIONAL

- Uses a predefined app over WiFi ensuring security of its data is protected
- User interface functions with iPads, iPhones, and Android Phones

#### OPERATING ENVIRONMENTS

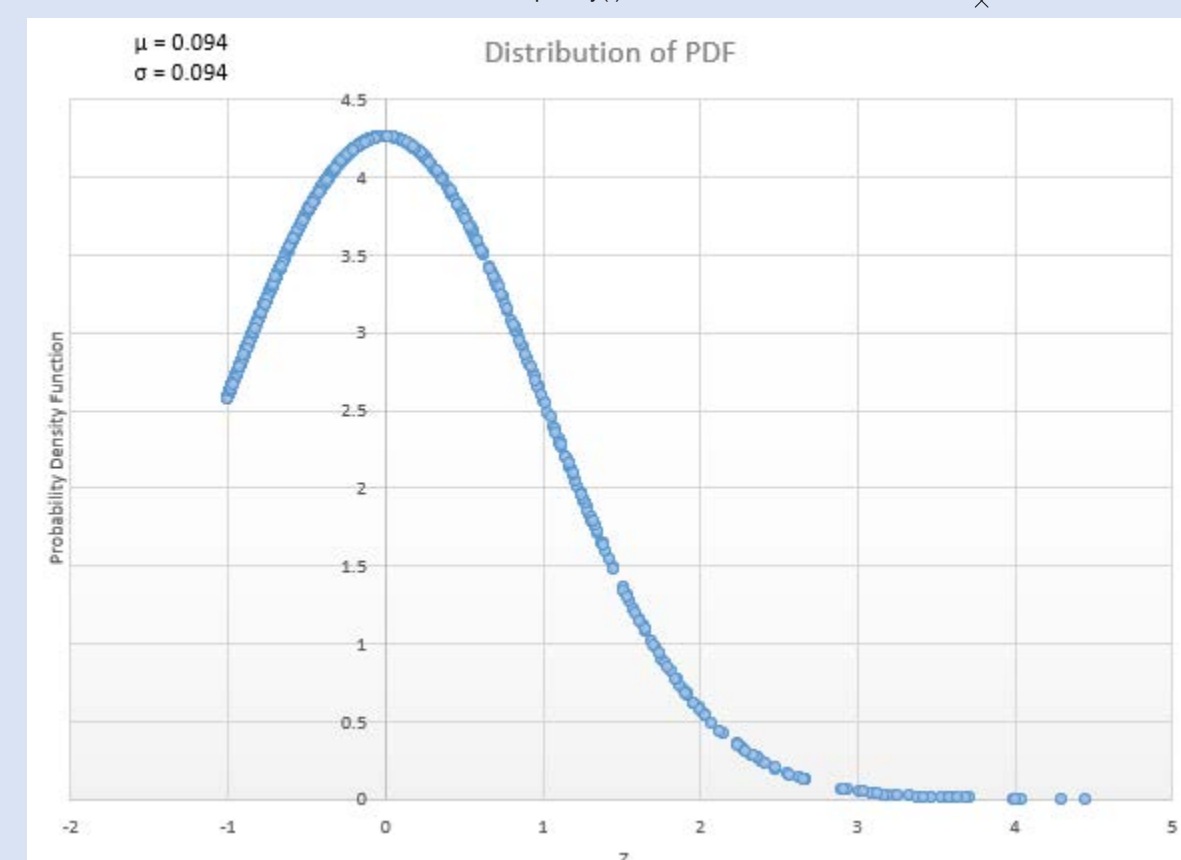
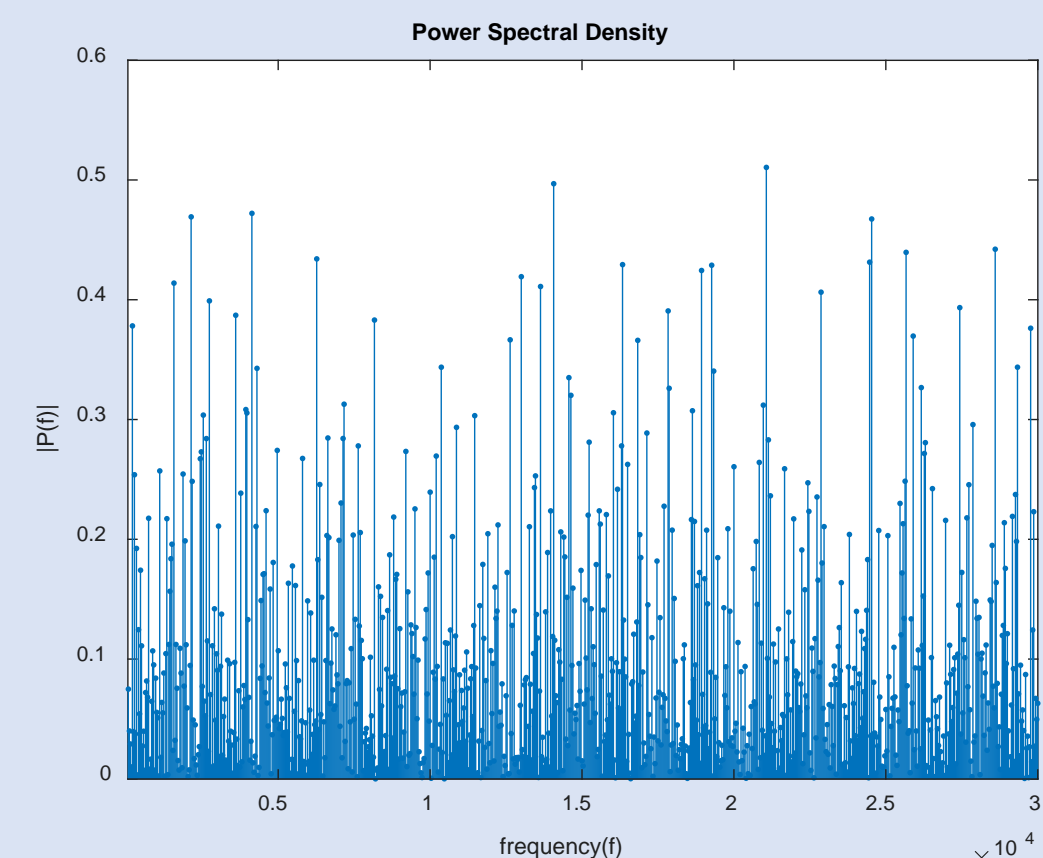
- Studios
- Live performances
- Amateur home use

### TESTING

- All test done in ECpE labs
- Modules tested to meet design specifications
- System testing involves applying the user interface to get expected results out of the system

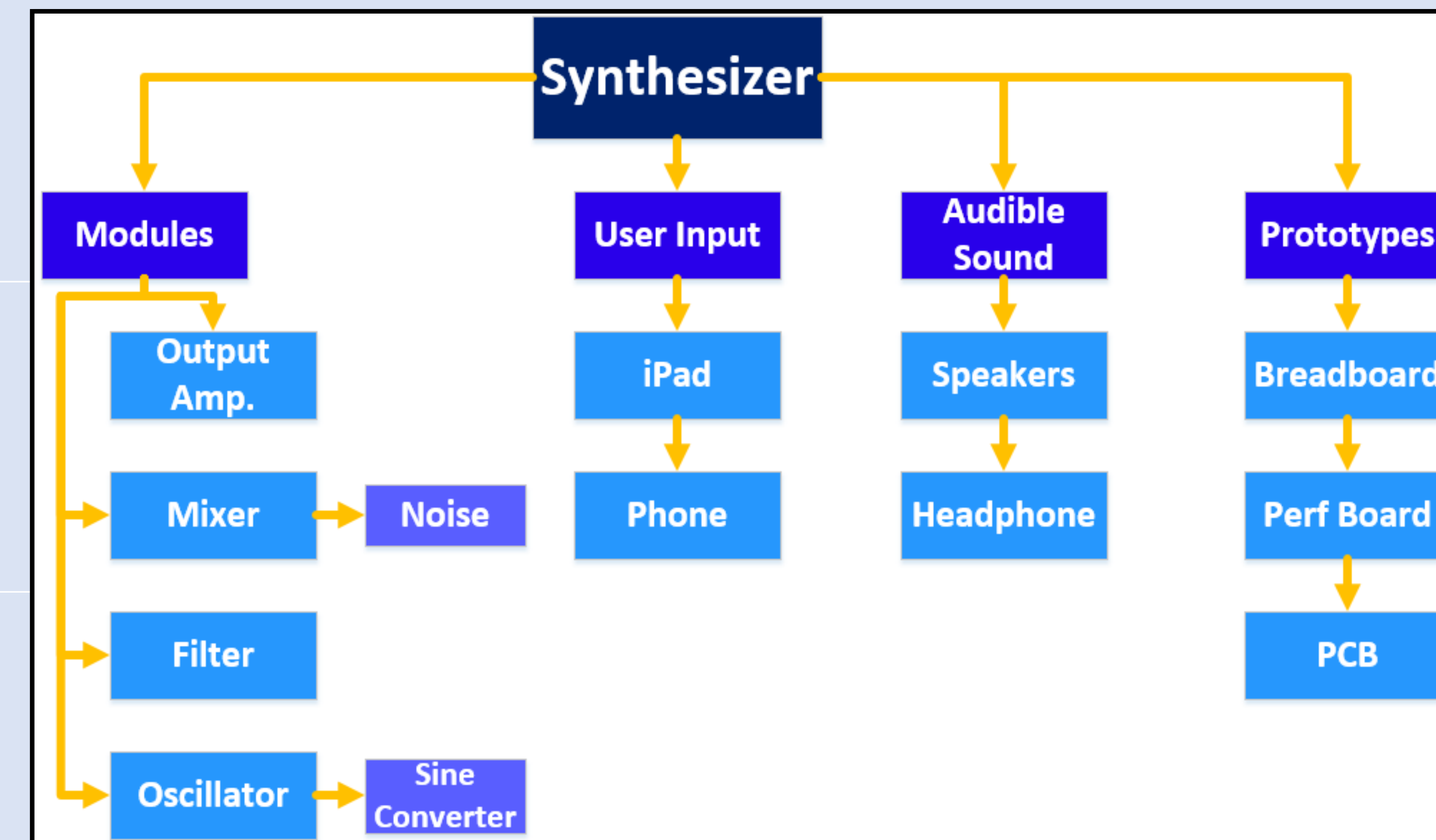
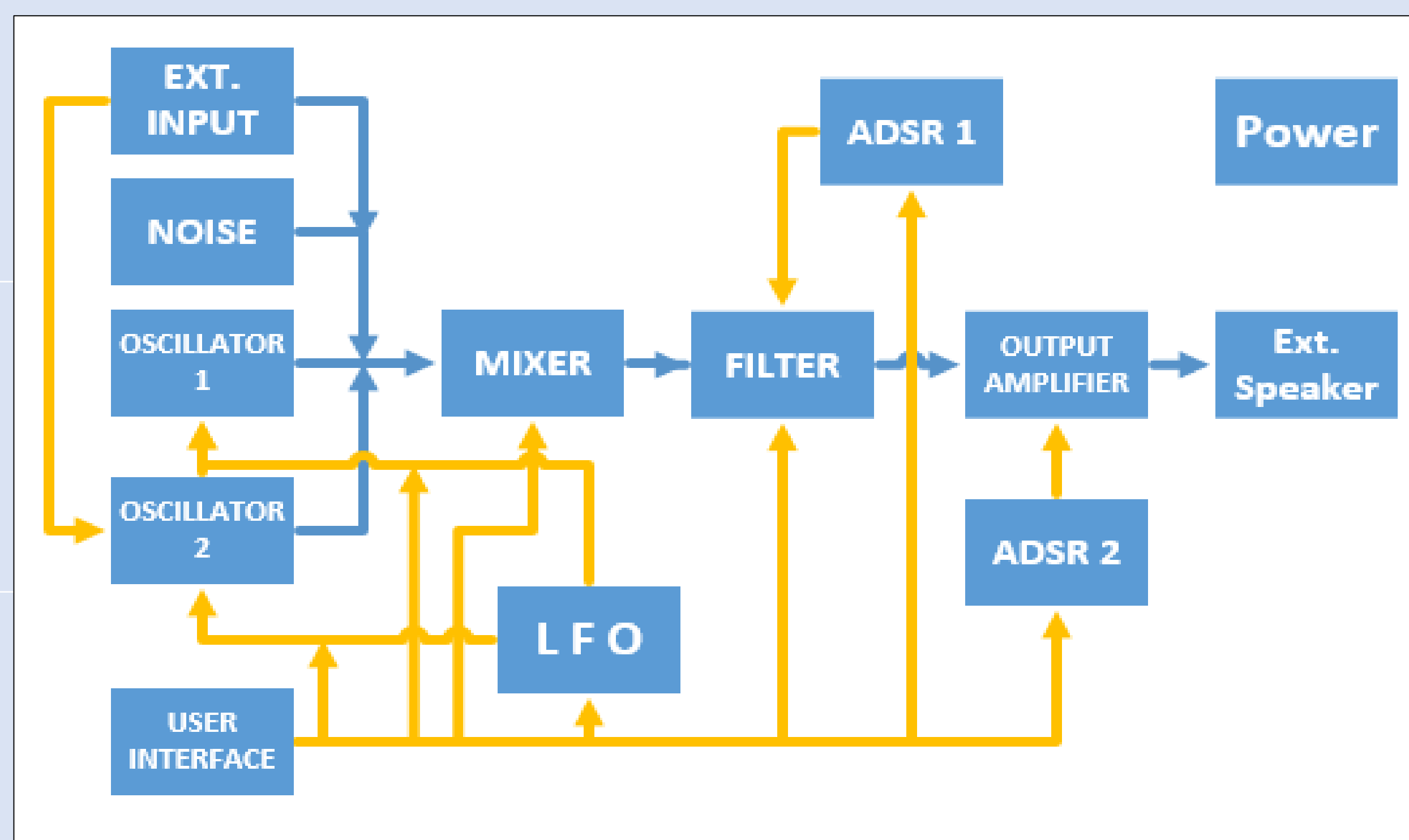
### TEST RESULTS

Each module was tested differently. Below are the results from the noise module.

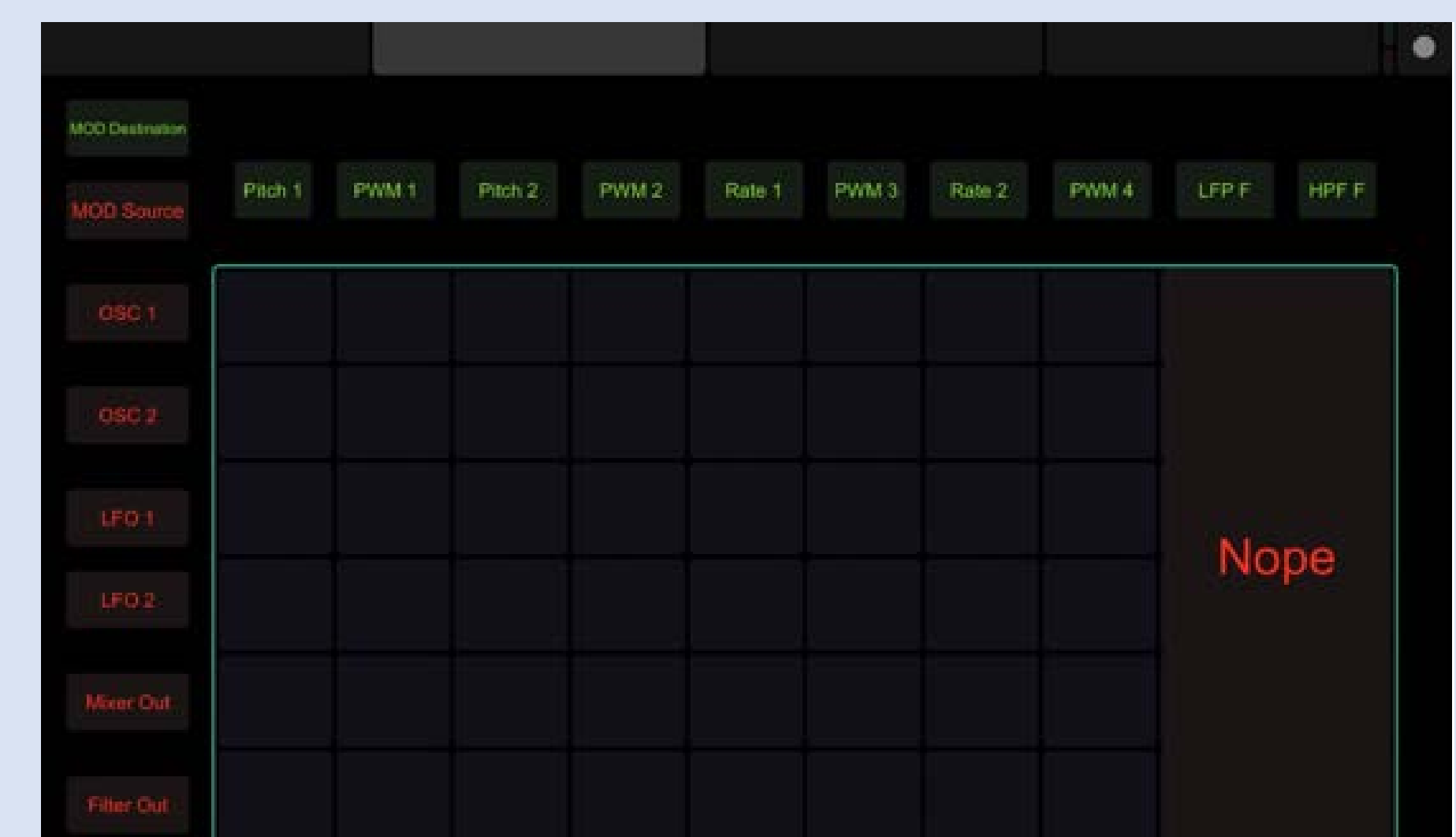


This tests shows a functioning white noise generator since the mean and standard deviation from the power spectral density are equal.

### DESIGN



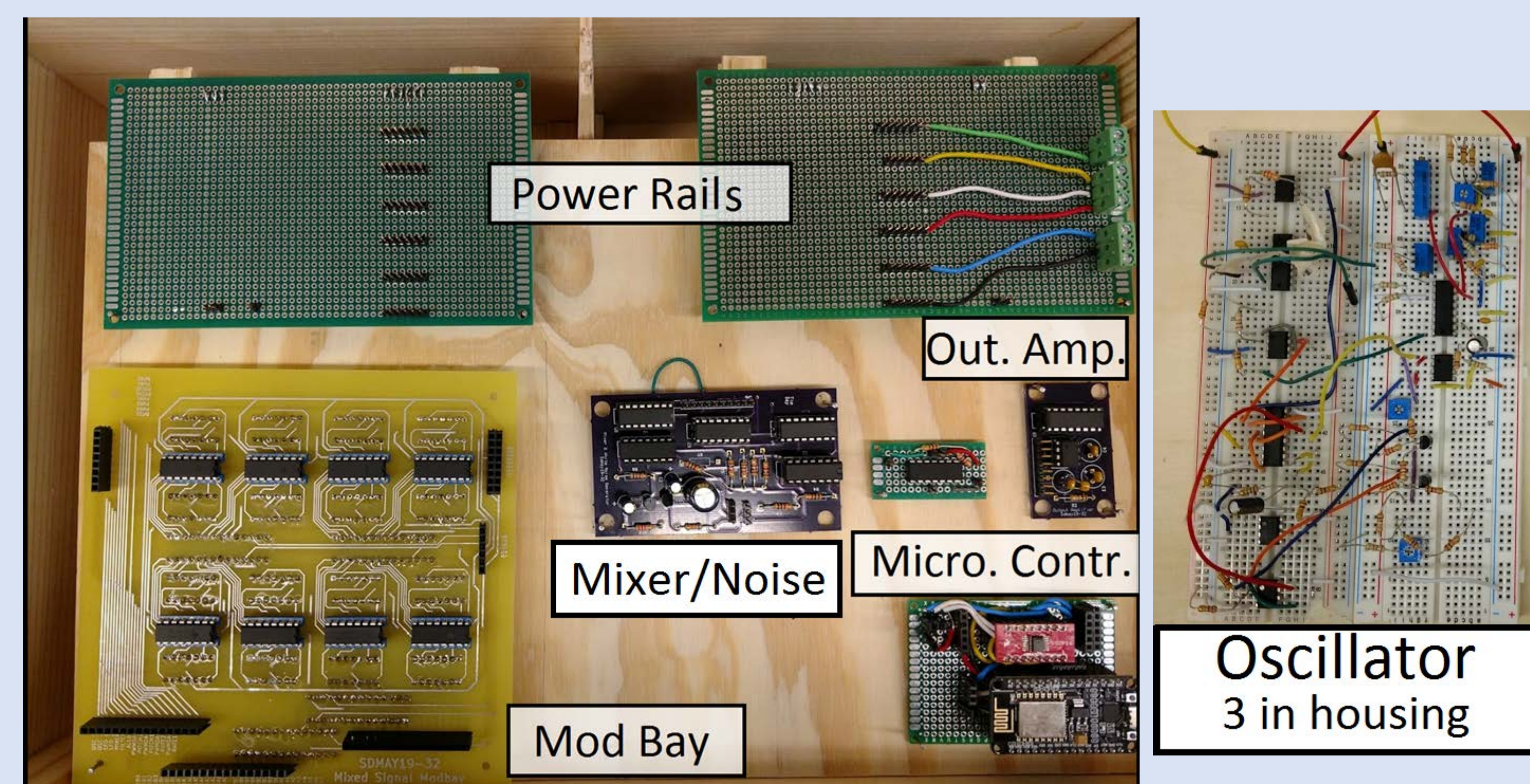
### USER INTERFACE



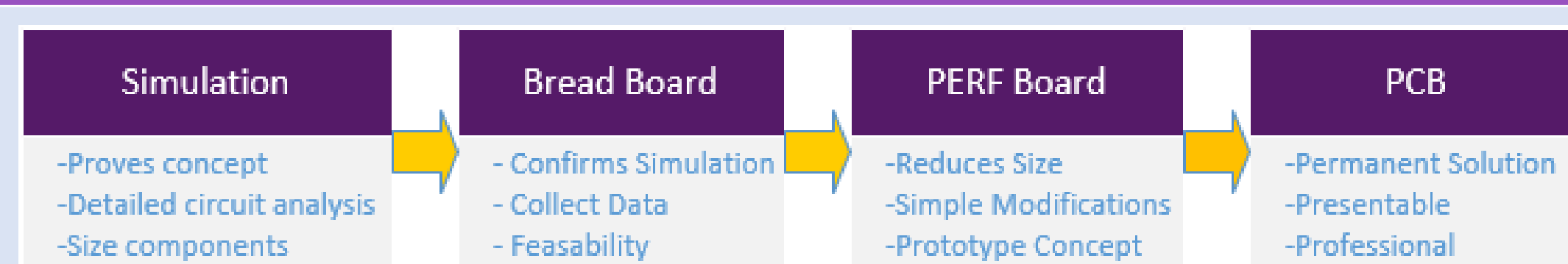
### MODULES

1. **ADNR:** Output signals attack, decay, sustain, and release.
2. **Filter:** User selects passbands.
3. **Low Frequency Oscillator (LFO):** Sub audible oscillator for frequency modulation.
4. **Mixer:** User selects attenuation for every input.
5. **Noise:** Generates a white noise output.
6. **Oscillator:** User selects generation of a sine, triangle, pulse, or saw output.
7. **Output Amplifier:** Controls output volume level.

### FINAL DESIGN



### TEST METHODOLOGY



### SYSTEM IMPLEMENTATION

- User must download TouchOSC on their hand held device. Then upload our program.
- Power supplies need to be properly applied.
- Speaker needs to be connected.

### CONCLUSION

**Accomplished:**

- Completed modules that meet the desired specifications
- Created Graphical user interface that runs on hardware available to most musicians
- Implemented Wifi connection to control hardware devices

**Future Work:**

- Fixing the I2C bus to properly communicate to all devices
- Finish the filter module
- Update the oscillator PCB designs