

Analog Synthesizer

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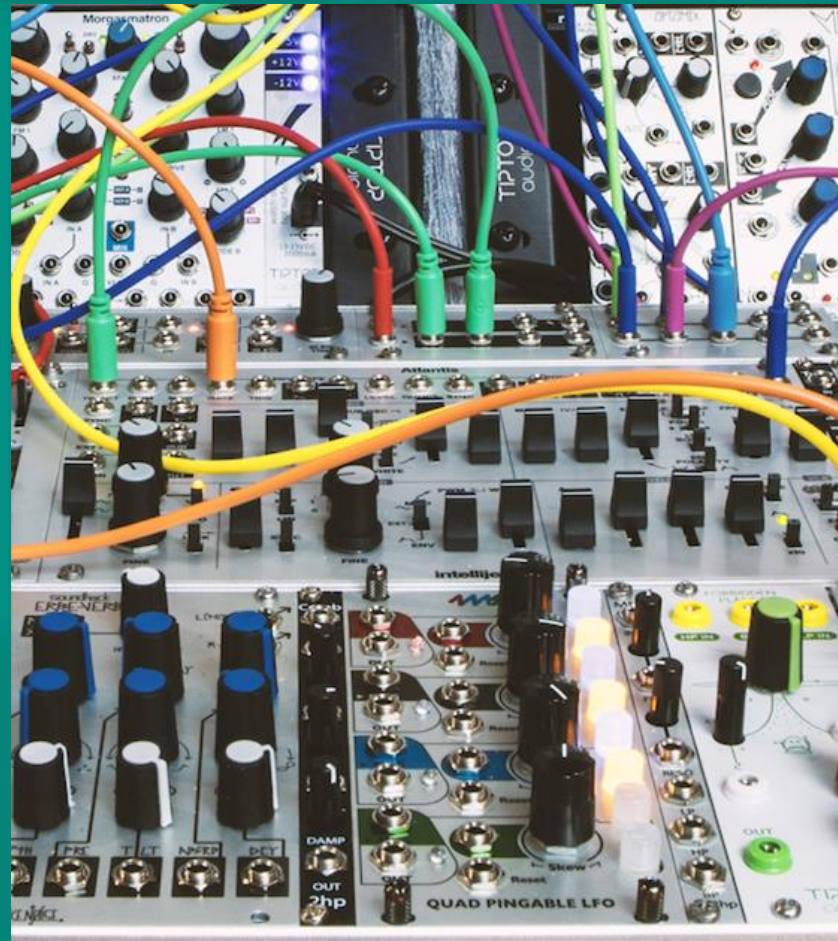
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1. Thesis Review Questions
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Introduction





■ Shapes

■ Forms

■ Warmth

■ Crafty

■ Sonic

My Choice & Objective



Why I Chose Analog Modular

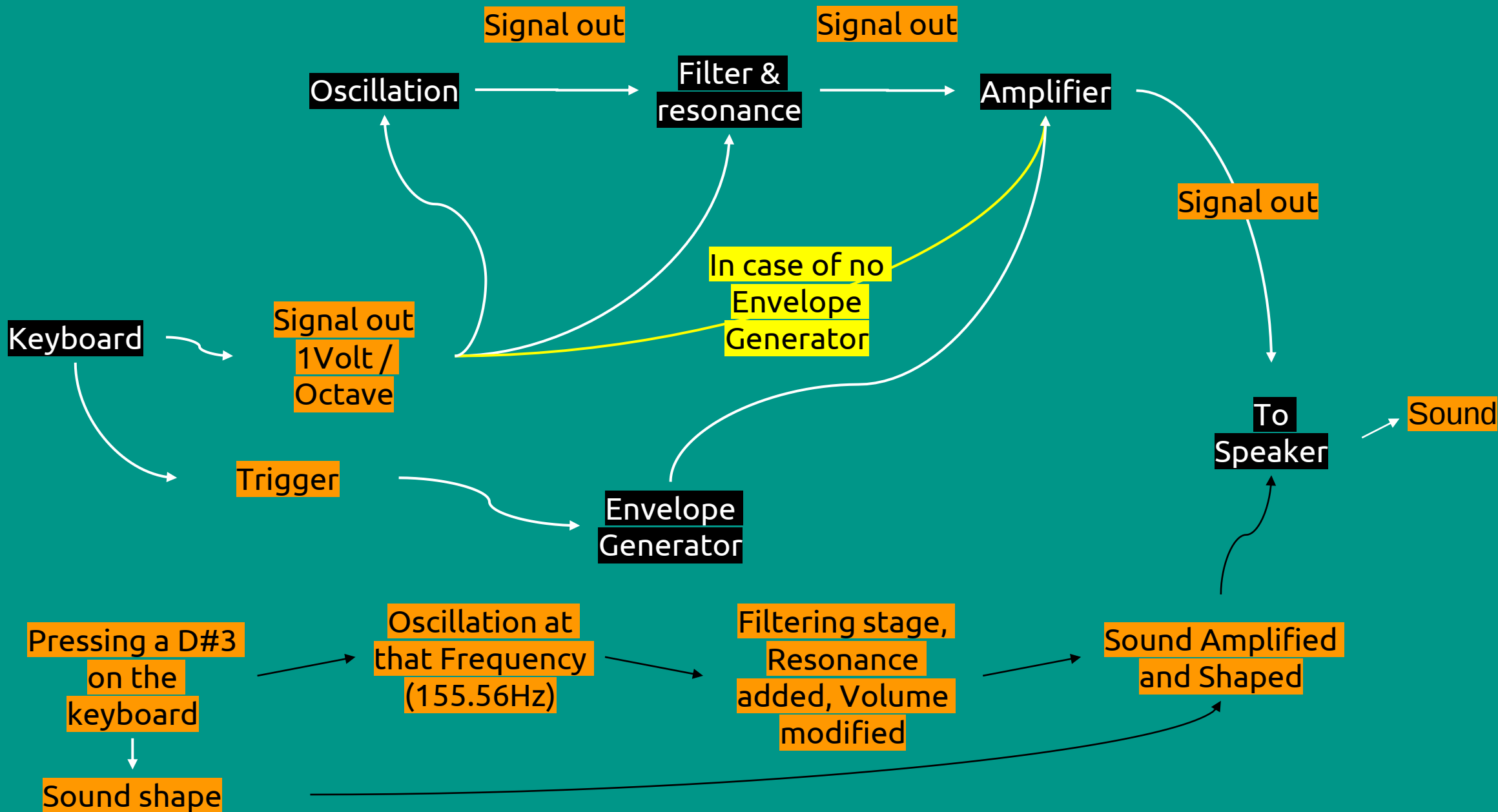
- Strong preference for the analog sound.
- The ultimate "build-your-own-instrument" experience.
- Allows for infinite customization.
- Easy future upgrades and improvements.

Objective

- A 6-waveform analog synthesizer
- Voltage-controlled operation.
- Includes a frequency modulation input.
- Features a filter with a roll-off rate of 12 dB/octave.
- Stable output signal.

Block Diagram





System Design



The project was divided into six key phases:

- 1 - Controller
- 2 - Voltage-Controlled Oscillator
- 3 - Voltage-Controlled Filter
- 4 - Voltage-Controlled Amplifier
- 5 - Envelope Generator
- 6 - Power Supply

Controller



Control voltage ranging from 0V to 5V.

Three independent outputs to control each module individually.

- Pitch For the VCO
- Gate For the VCF
- Mod for the VCA/EG



Control Voltage
Section

Pitch □ VCO

Gate □ VCF

Mod □ VCA

Voltage-Controlled Oscillator



Coarse to adjust the pitch
of the oscillator in
larger increments

Fine to adjust the pitch
of the oscillator in
smaller increments

Frequency Modulation
input

Adjust the Frequency
Modulation Level

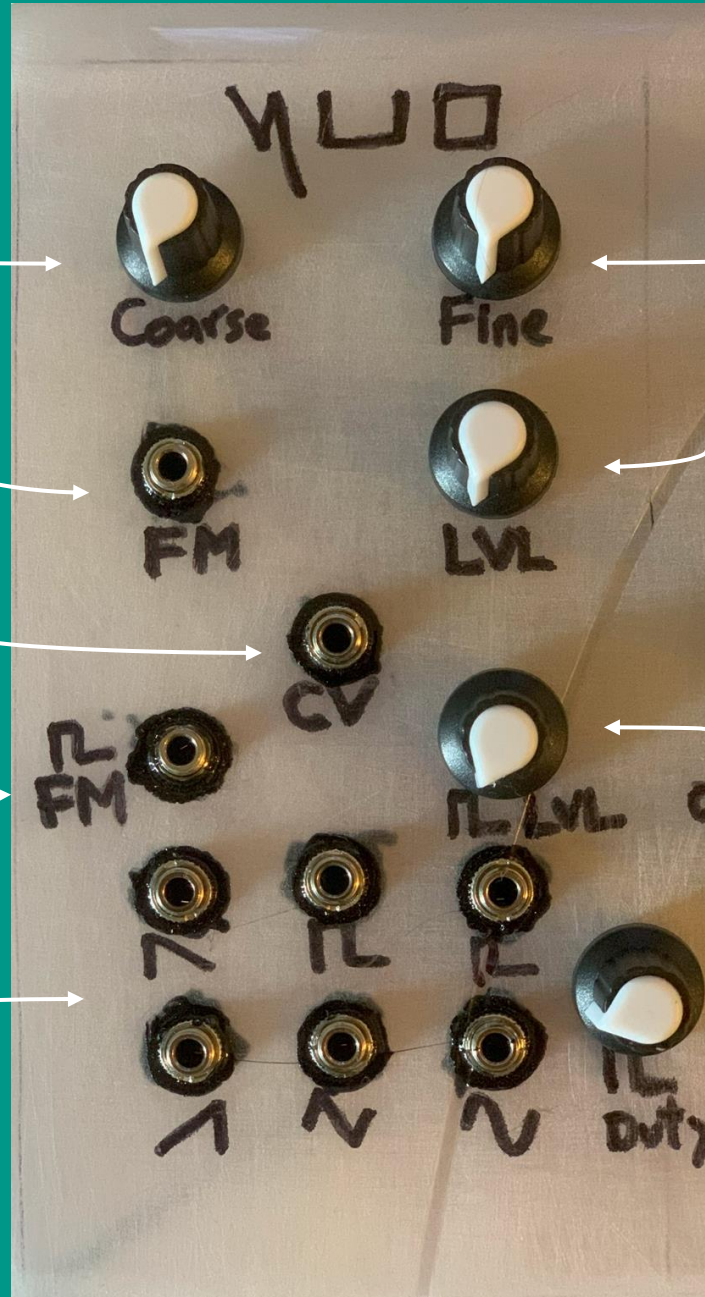
Control Voltage
input

Pulse Width Frequency
Modulation Level

Pulse wave
Frequency Modulation
input

Pulse Width Duty Cycle

6 Waveforms
(Sawtooth, Square, Pulse,
Reverse Saw, Triangle and sine)



Voltage-Controlled Filter



Cutoff Frequency Knob

Resonance Knob

Input signal
From VCO

Adjust The Input Volume

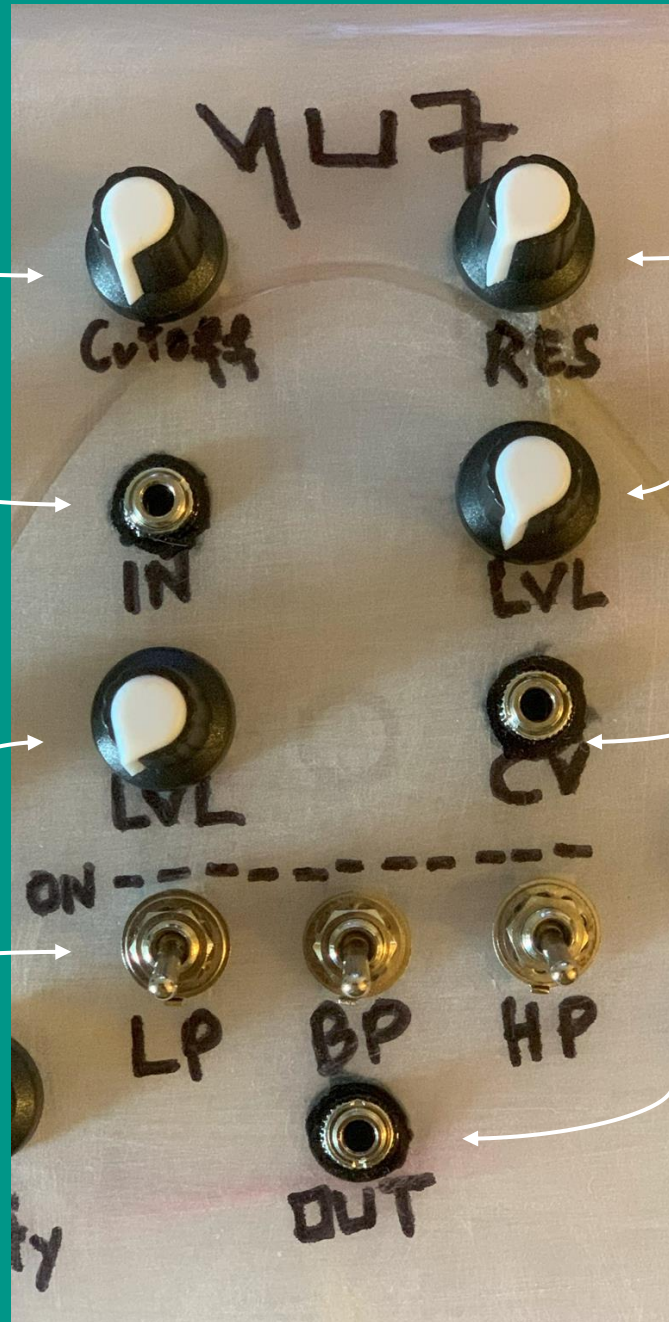
Adjust the Control voltage
Level

Control Voltage input

Type of filter Selection

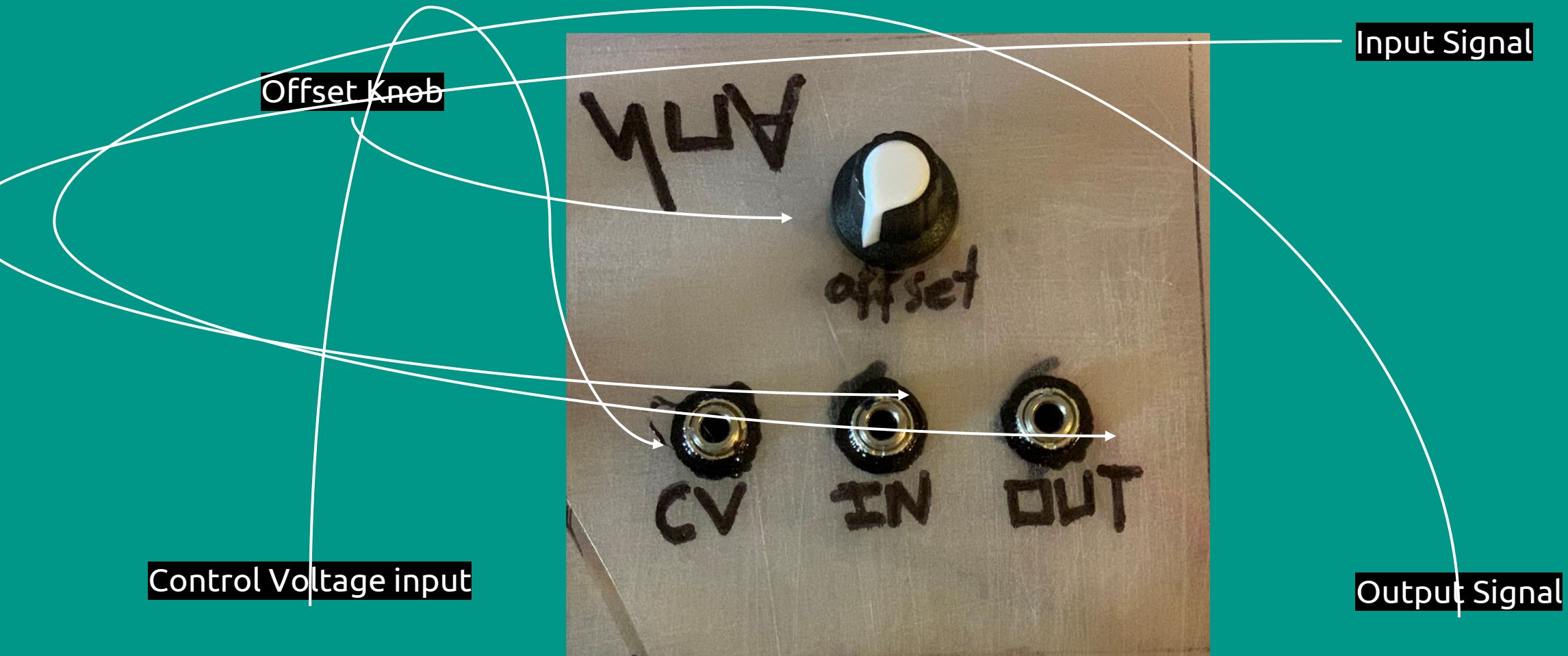
Low pass
Band pass
High pass

Output Signal



Voltage-Controlled Amplifier





Offset Knob

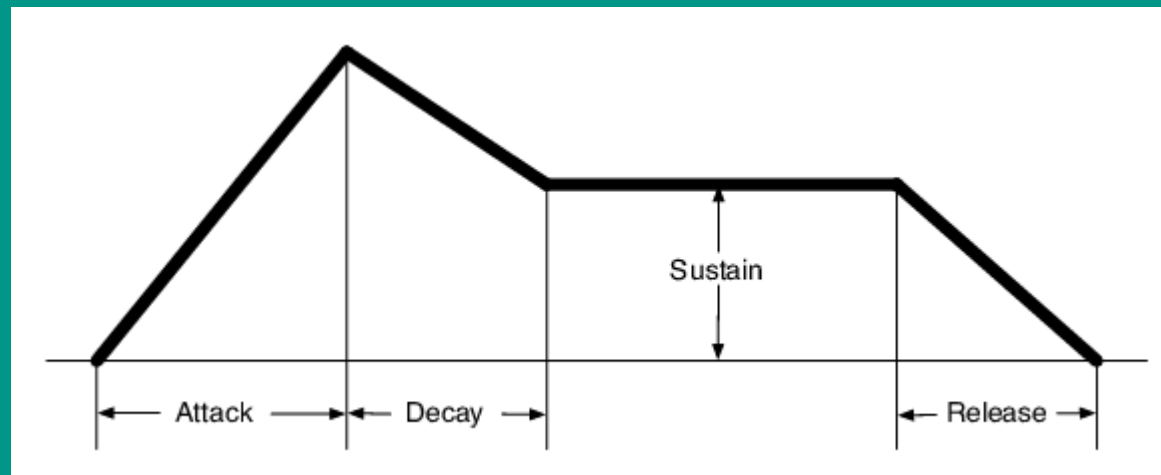
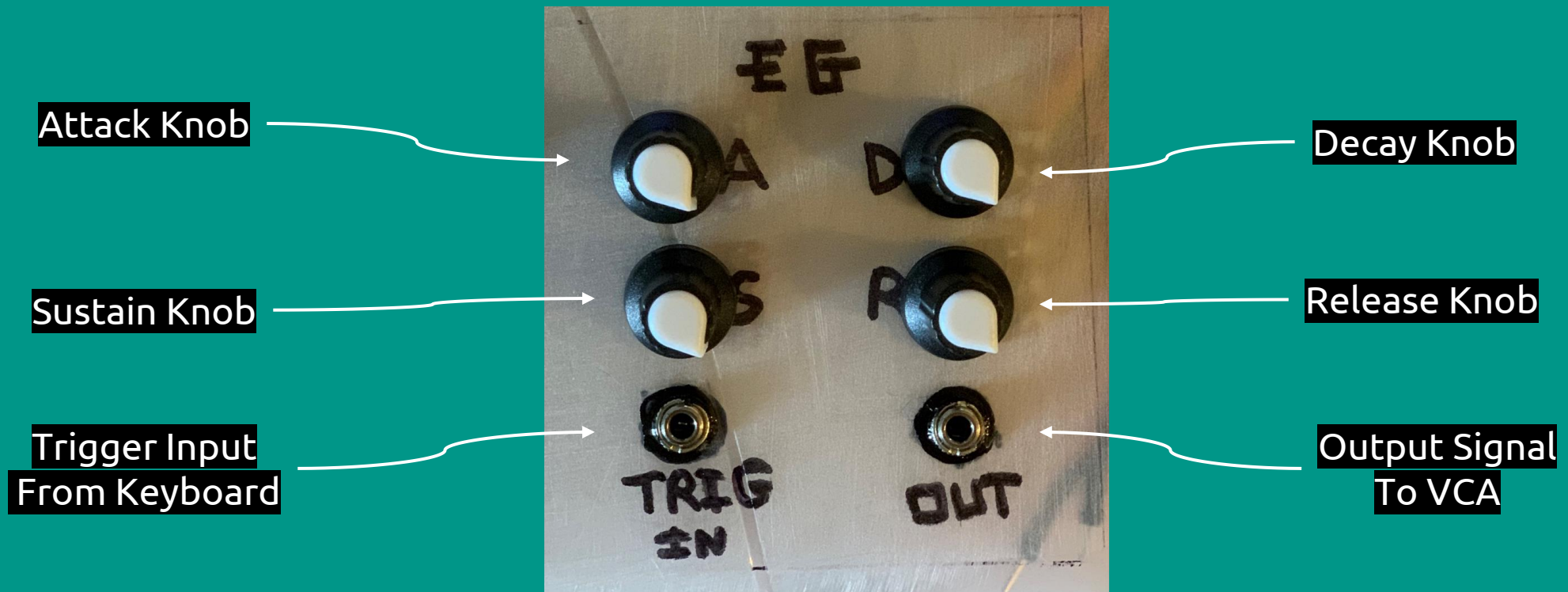
Input Signal

Control Voltage input

Output Signal

Envelope Generator

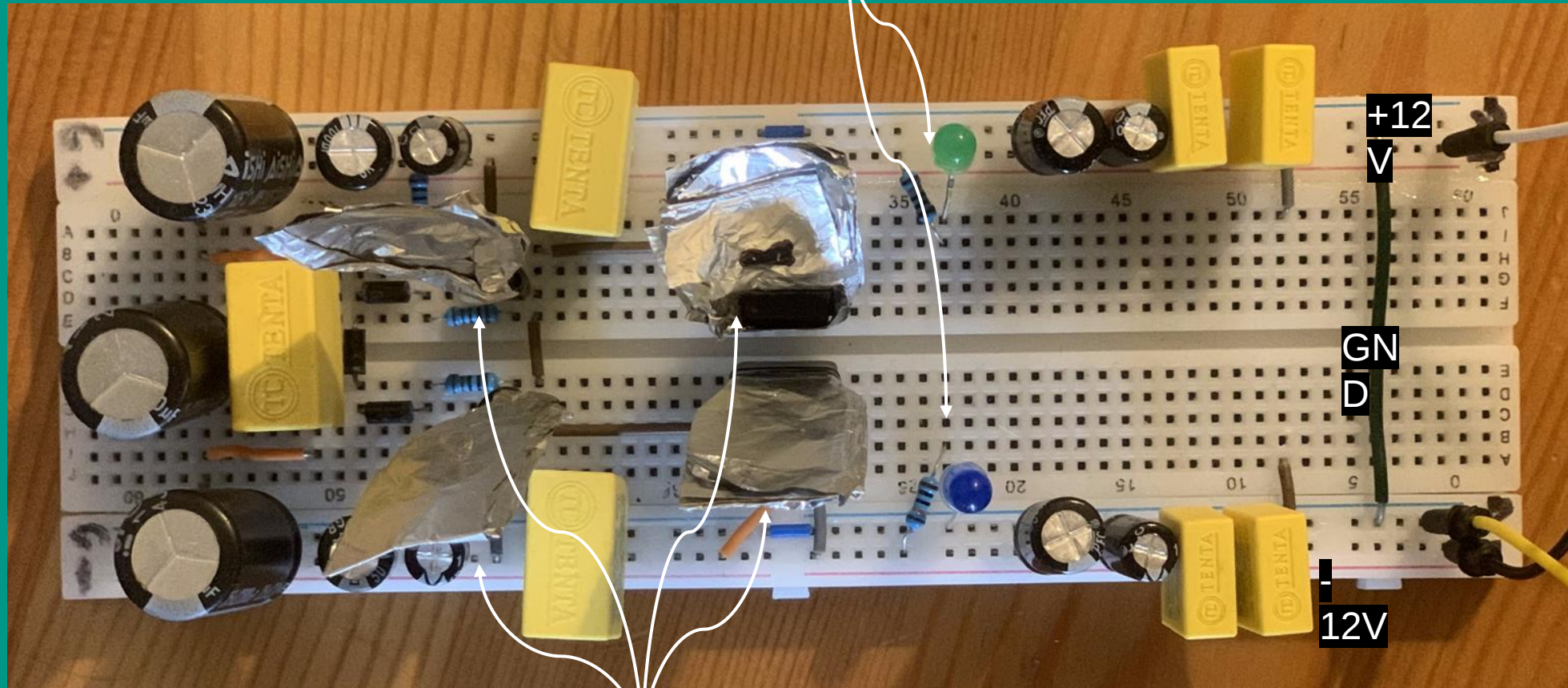




Power Supply



LED
Indicator

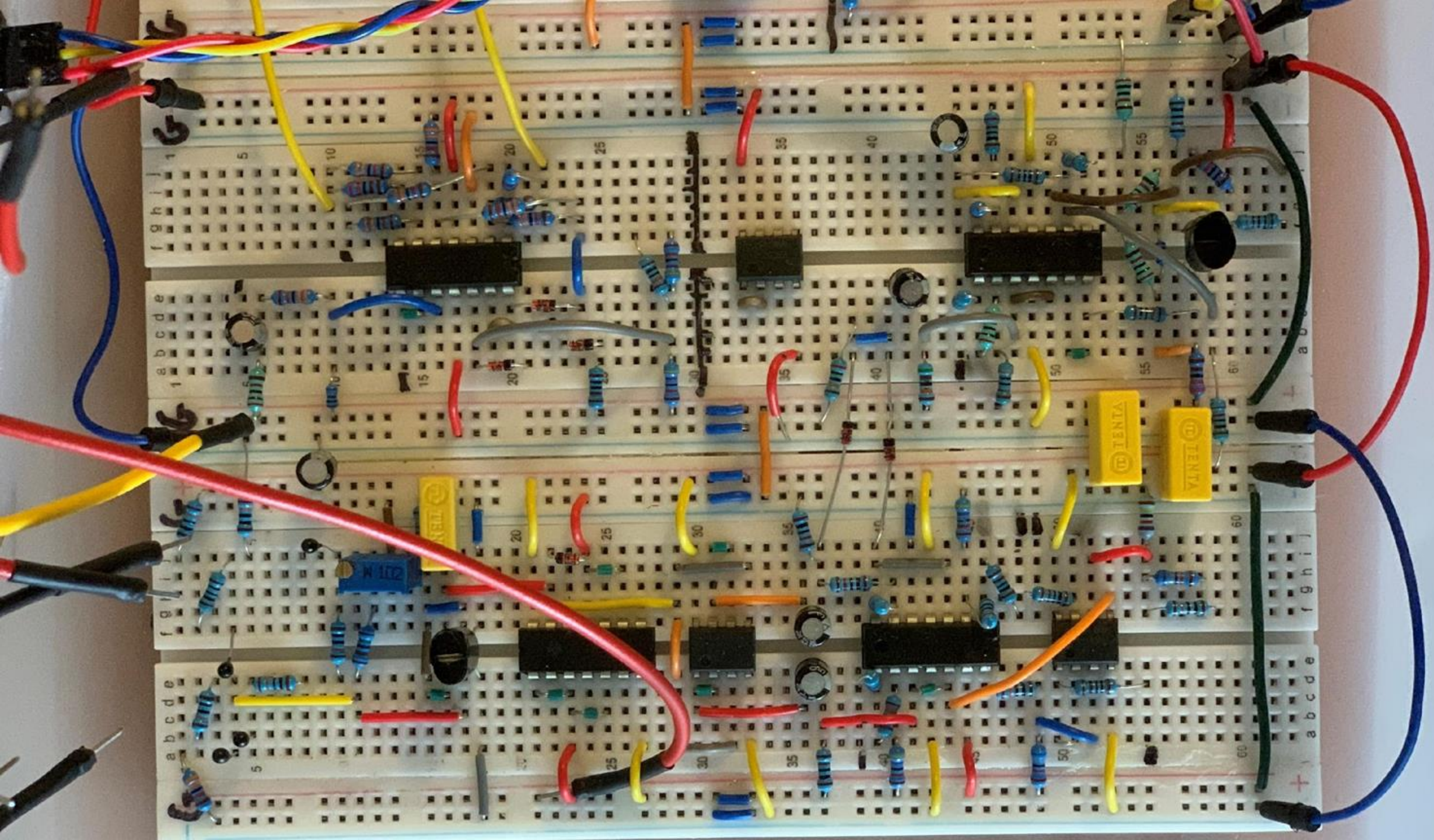


Aluminum Foil + thermal
paste
For heat transfer
(Regulators + Transistors)

Results & Evaluation







The results of the project were promising, with the synthesizer performing well across all designed modules.

Tuned Synthesizer Across the range of 0-5V.

Low, Band and high pass Filter options alongside the ability to use more than one at the same time to have more interesting combinations.

Fully functioning VCA with Envelope/controller input.

Envelope generator to generate numerous combination and play different types of presets such as , plucks or pads or bass.

Conclusion



“In theory, theory and practice are the same. In practice, they are not.”

- Albert Einstein

“What we know is a drop, what we don't know is an ocean.”

- Isaac Newton

Experience without theory is blind, but theory without experience is mere intellectual play.

No matter how much you learn, there is always room for more.

I have learned and mastered a lot of skills while building my analog synthesizer. It was challenging, hard, not easy... but **Fruitful!**

Thank you for your attention



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