Leo Leo

The Matrix Programmer

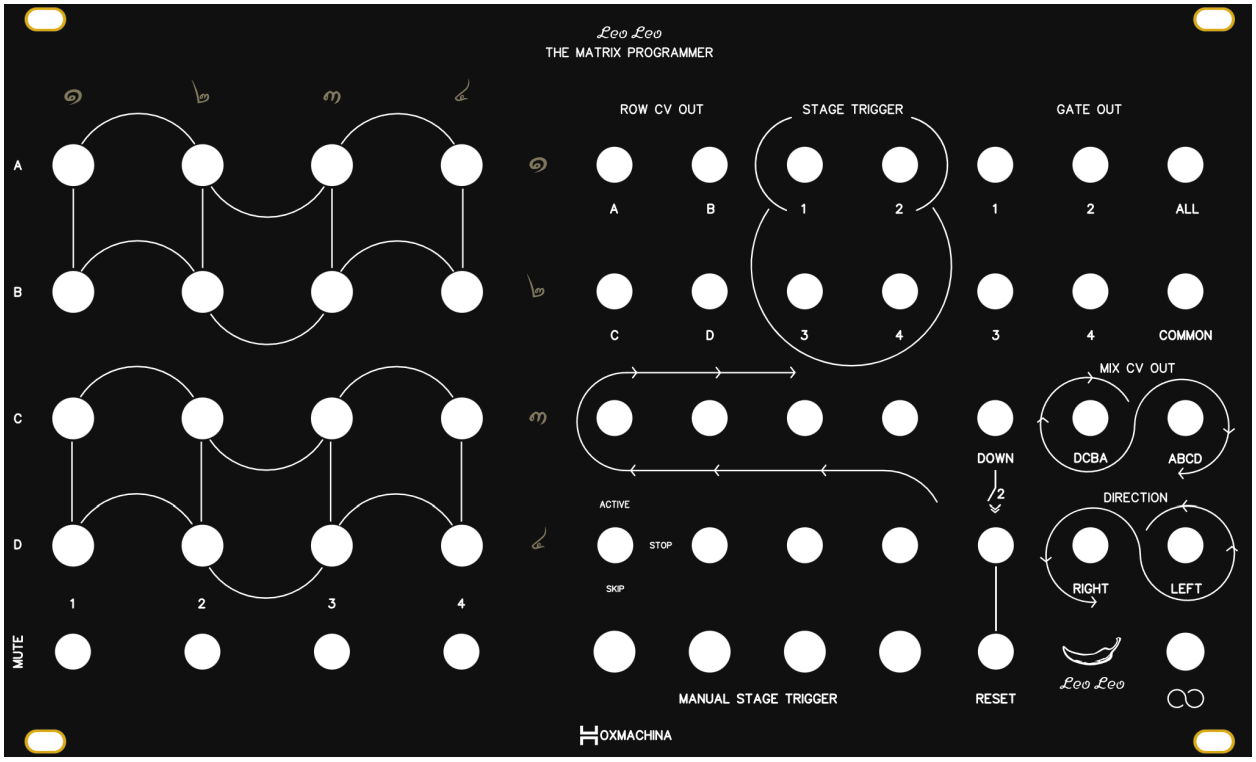
https://www.instagram.com/voxmachina_official/

https://www.youtube.com/VoxmachinaOfficial

Introduction

Leo Leo was born out of inspiration from the original and first Serge Programmer from the 70s, which consisted of four individual stages of a control voltage that you could also trigger independently, very much like the Buchla Sequential Voltage Source.

This module extends this principle by adding more functionality and possibilities; at its core, it consists of those same four independent control voltage channels, now extended to form a matrix of control voltages.



For each stage row (**A**, **B**, **C**, and **D**), you'll have a dedicated control voltage output in the section "**ROW CV OUT**" (0 to ~10v), an independent stage trigger input on "**STAGE TRIGGER**" and also an independent stage gate output in the "**GATE OUT**" section. There are two particular gate outputs, "**ALL**" which outputs on every stage change, except if it's muted, and "**COMMON**" which outputs on either stage change or stage trigger event. You can also as well mute individual stages and also manually trigger them individually on the "**MANUAL STAGE TRIGGER**" button section.

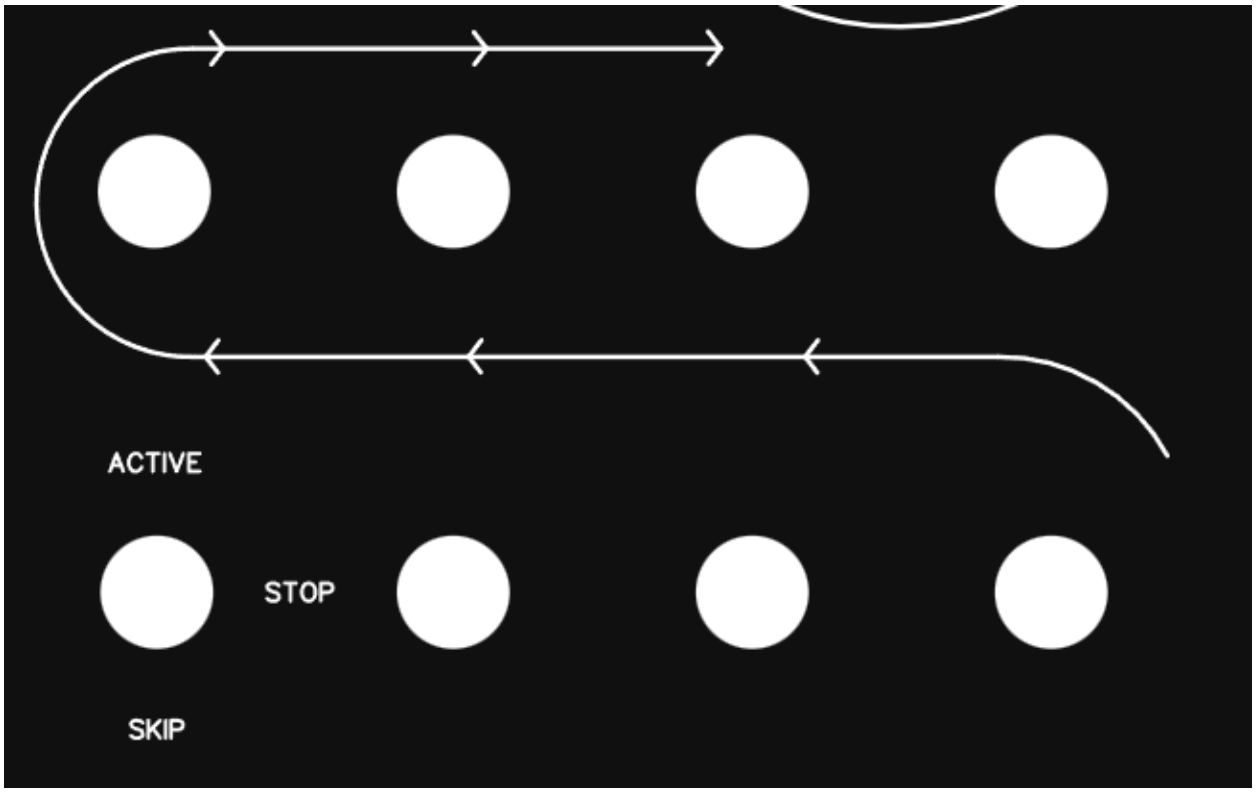
There are additional control voltage outputs named "**ABCD**" and "**DCBA**"; together with the vertical clock input "**DOWN**" and the vertical clock reset input "**RESET**", you can have 4x4, 2x8, and even 2x16 step sequences! At the same time that the control voltage is outputting at the "**ABCD**" output, the inverse sequence is outputting simultaneously at the "**DCBA**" output. With the vertical clock input "RESET" you can also separate them by resetting every vertical clock

divided by two, conveniently also provided in the output "**/2**" so you can self-patch it into the reset input. Automatically you have two separate 8-step sequences while simultaneously, you still have the four individual CVs and gate outputs to play with.

The module has three clock inputs, "**LEFT**", "**RIGHT**" and "**DOWN**" each one operating independently from the other, which means you can have three clocks pinging simultaneously and create infinite variations of a sequence.

You'll notice a lot of mechanical switches on the module, which make it highly playful, the four switches below each stage are to either mute or unmute a stage; if a stage is muted, the gate output in "**ALL**" will be muted, as well.

Now for the other eight switches, things get more interesting.



Here you can determine what happens at each stage depending on the direction in which the sequence moves. If you have a clock input at the "**RIGHT**" input, the sequence will move from left to right as opposed to the "**LEFT**" input and the vertical clock input "**DOWN**" will go through each line in a loop by default unless a "**RESET**" is provided.

For each direction that the sequence is moving, you can select if the stage will play, be skipped, or stop the sequence. You have four switches to determine these rules for when the clock is moving from left to right, as indicated by the arrows on the panel, and another four switches to

determine what happens at each stage for when the clock is moving from right to left. They are entirely independent of each other.

Last but not least, we have the switch to cascade into another Leo Leo.

When active, the sequence will move into the other sequencer; notice that they will share the same current, meaning the clocks, CVs, and gate outputs are not automatically cascaded into the next sequencer, only the current. Think of this current as a ball that a group of people is playing, there's only one ball, but you can add more people to the game.

The module consumes:

- 40 mA from the positive rail (+12v)
- 20 mA from the negative rail (-12v)

Materials

To build this module, you'll need to acquire all the components mentioned in the BOM file, plus the following tools:

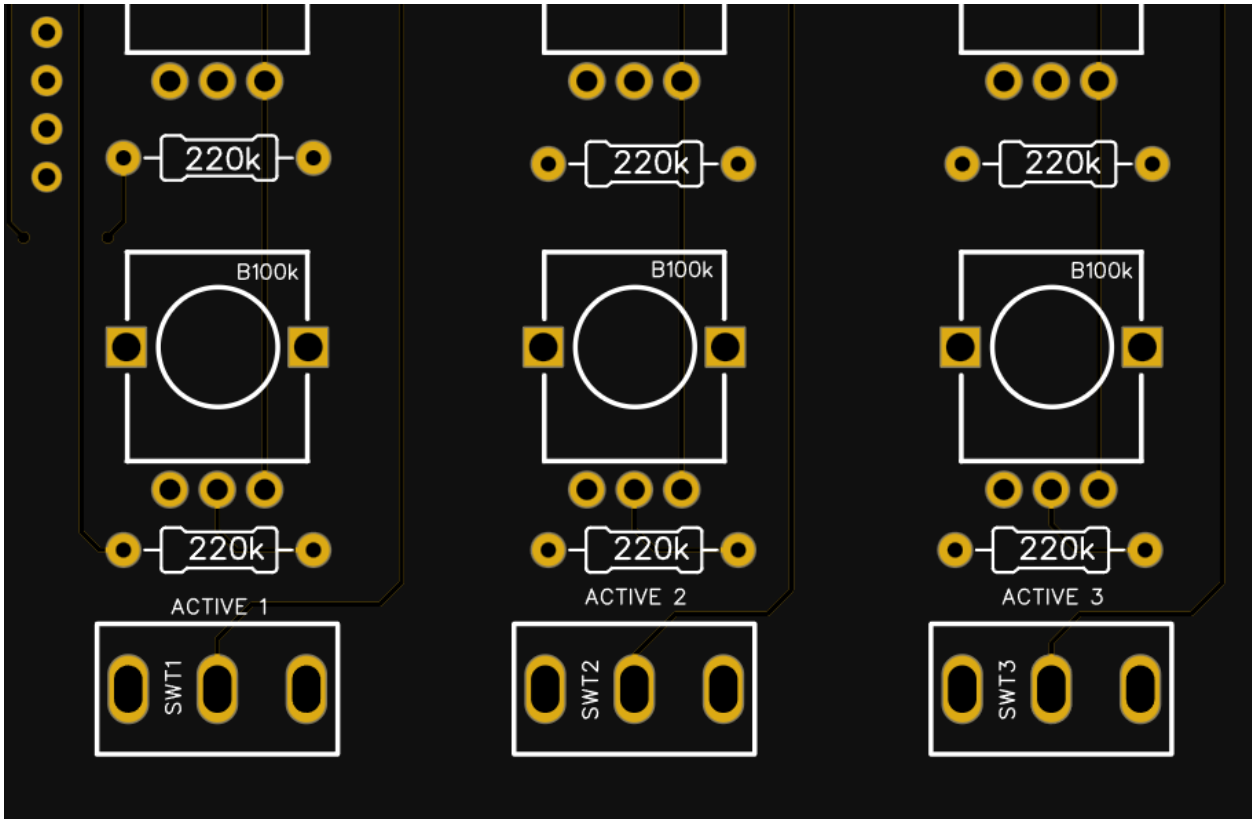
- Solder
    - I recommend using 60/40 at 0.8mm
- Soldering Iron
    - I recommend using it at 350 degrees Celsius
- 0.8mm slotted Screwdriver to screw in the knobs
- Cutting pliers
    - To clean the soldered component legs
- Clear Gorilla Glue (or similar and appropriate)
    - For connecting the boards (details in "**Connecting the boards"** section)

You will also need a Eurorack power cable (the module uses a 5x2 pin header) and four screws or knurlies to add it to your rack.

If you intend to build a second one and use the cascading feature, you'll also need five regular jumper cables.

Control Board & Front-panel

It should be easy to spot on the board itself the component value or identifier; for example, the resistors all have the value written on the board as the potentiometers as well.



Others will have the identifier as the picture below, you'll just need to open the BOM file and look for the reference:

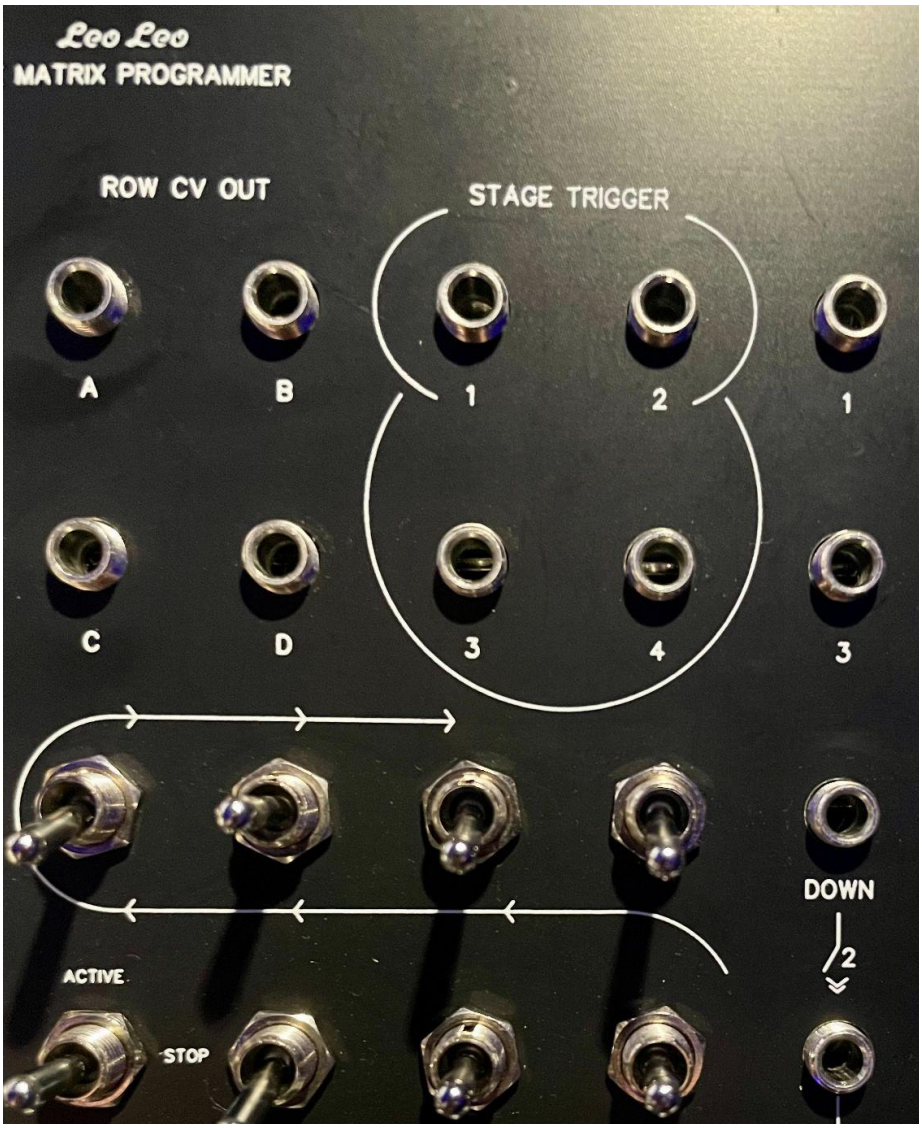
1. Board

2. BOM file

	POTSCONN		SINGLE ROW 16 MALE PIN HEADER STRIP	
4	STEPTRG1, STEPTRG2, STEPTRG3, STEPTRG4, V1, V2, V3, V4	LD1, LD2, LD3, LD4, LD5, LD6, LD7, LD8	3MM RED LED	8

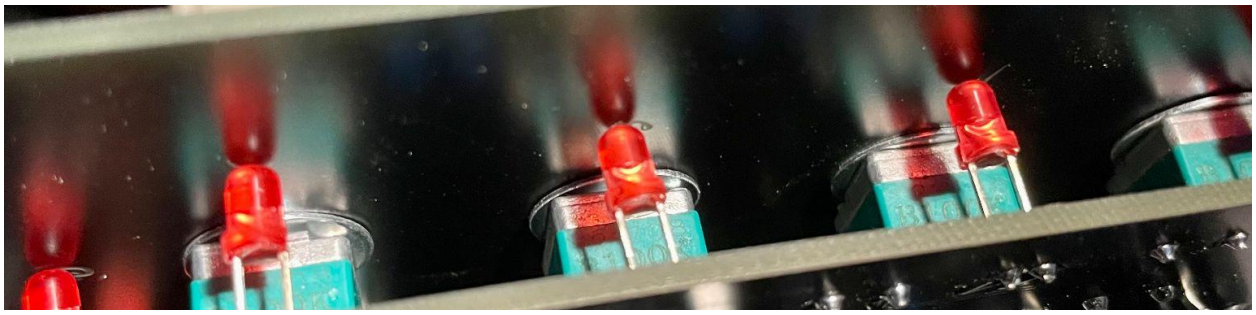
Now you can start by soldering the resistors for this board; after that, I recommend you place all hardware components, including the LEDs, without soldering at first. This will allow everything to fall into the right place without a more significant effort.

Place also the nuts to connect the board and the front panel through the jack inputs and potentiometers; this will take some time and patience as it's a giant board with many different components; just take your time to adjust one by one if needed; your goal should be to have the front panel, and the control board joined together firmly without any soldering just yet.



Here the board and front panel are being held just with the nuts on the hardware components initially.

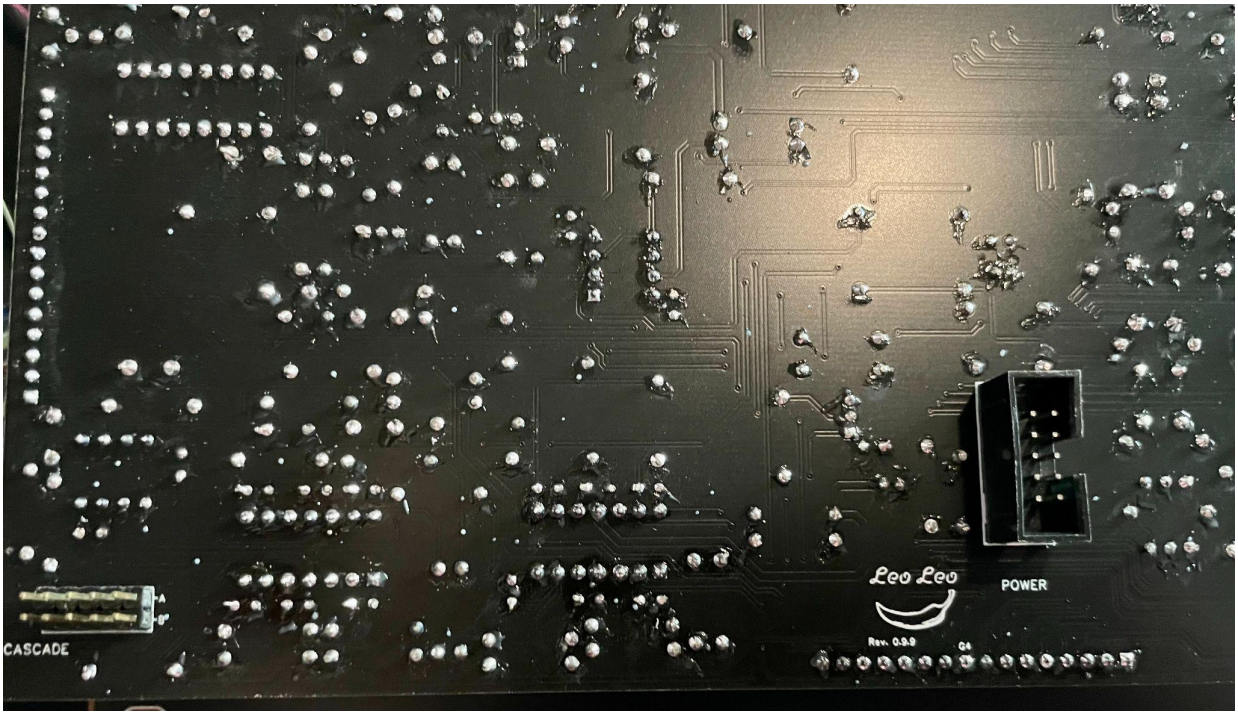
After that, you can just solder everything through the back, all the hardware components, and the LEDs as well; notice that the LEDs have to match the position with the front panel as they illuminate through the panel opening itself; so you'll need to solder the LEDs with a bit of a height to the point where they are touching or almost touching the front panel.



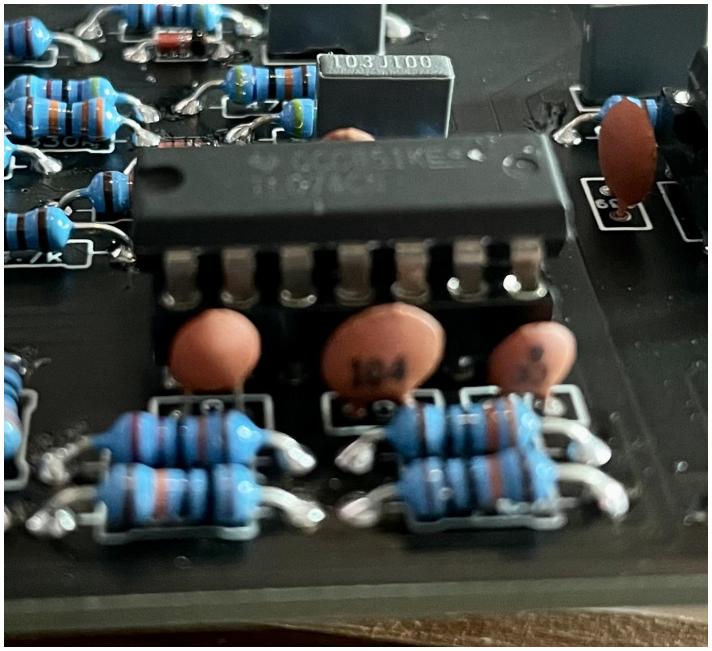
Main Board

The main board is marked the same way as the control board; components like resistors will have their value directly written on the board, while others will have an identifier/designator that you can check on the BOM file.

You'll notice that the only components that are soldered in the back of the board are the power supply connector and the cascade connector; everything else is soldered on the front side of the board:

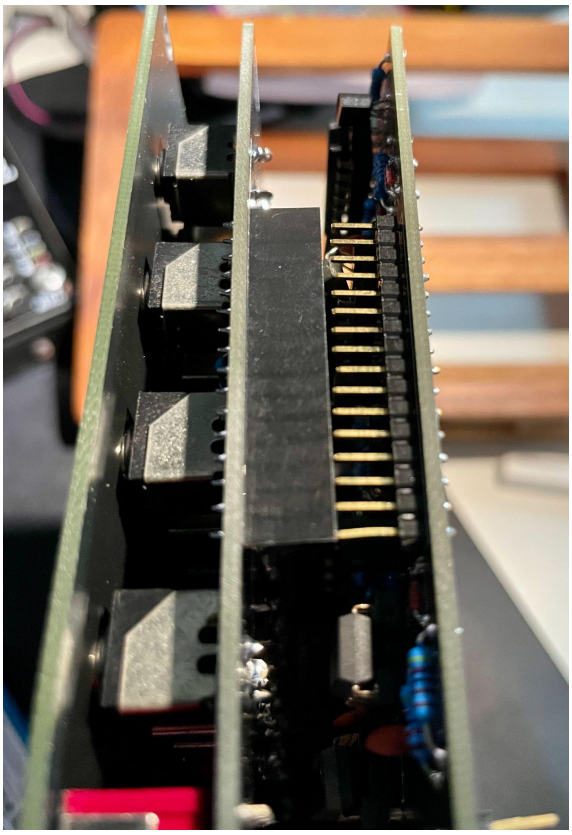


For the ICs, I recommend you use the pin connectors; this way, you can easily replace a damaged IC at any moment in time; my recommendation is that you add the socket to the IC before soldering it to the board:



Connecting the boards

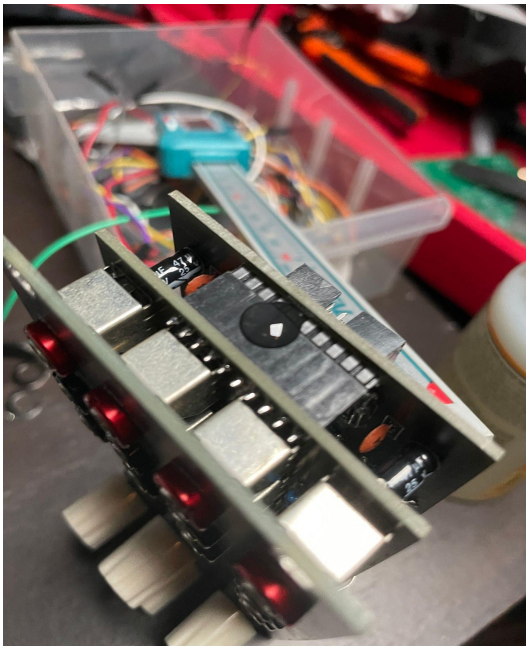
Connect the boards by the pin headers softly and gently until it's in the right place; they are all 16 pin headers, male and female versions; it doesn't matter which one you use on each board, they will connect the same way.



For making a solid connection, I have learned this method with a very well-known Eurorack module manufacturer, and their modules are some of the most robust builds I've seen, so I believe it works great as an alternative to metal screws.

You want to use glue like the one on the image; this is the exact one I'm using; it's a special glue that holds on very tight even in hot temperature operation.

Be very careful and just gently add one tiny drop of glue as indicated in the image below for both the top, left, right, and bottom connections:



Enjoy! - Voxmachina