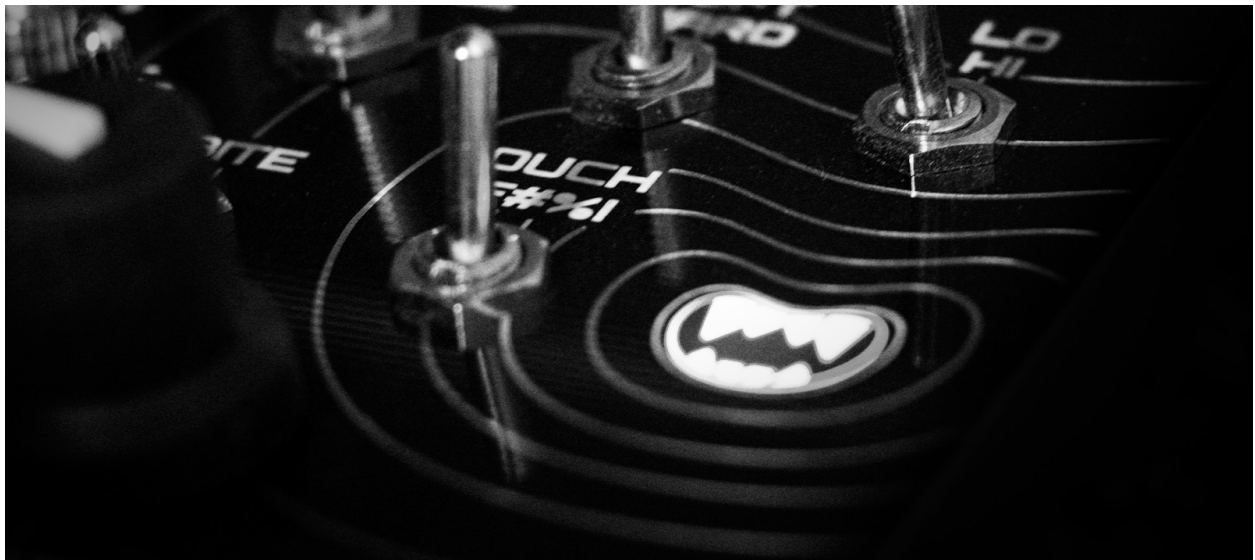




NERMAL v1.1

by neutral labs



Build Guide

Congratulations on your decision to build a Nermal module! Nermal is a fairly easy build with a moderate component count, but please go through this guide at least quickly to make sure you're not missing anything.

Important!

DO NOT EMPTY ANY OF THE COMPONENT BAGS NOW! The components are grouped into the bags so that all of them can be identified without having to look up resistor ring codes. Rather leave everything inside the bags and take out what you need while soldering.

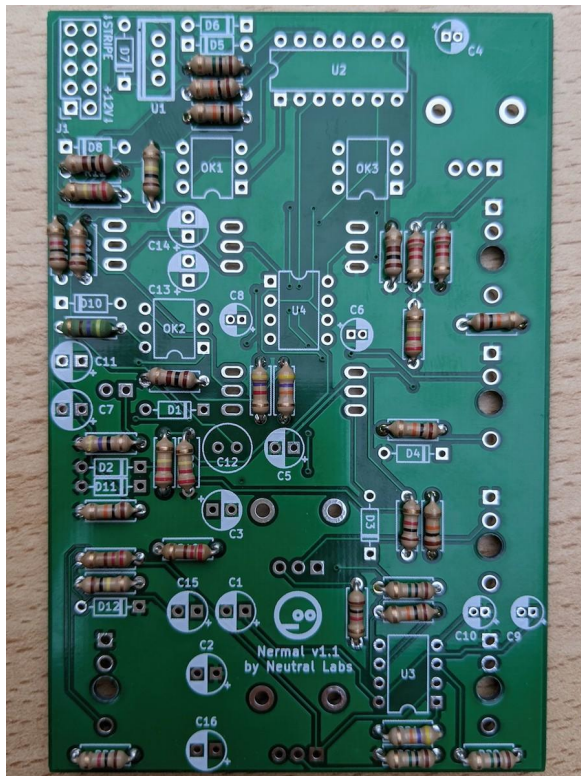
Component List

This list of components is for reference. The part IDs are also indicated on labels on each of the bags, which is why it's a good idea to keep the parts in the bags or empty the bags onto separate piles.

Part	Count	Type
C1, C2, C14-C16	5	electrolytic 10 μ F
C3, C11	2	electrolytic 1 μ F
C4, C6, C8-C10	5	electrolytic 0.1 μ F
C5	1	electrolytic 47 μ F
C7	1	electrolytic 4.7 μ F
C12	1	electrolytic bipolar 1 μ F
C13	1	electrolytic 2.2 μ F
D1-D8, D11, D12	10	BAT85 Schottky diode
D9	1	LED 3 mm orange
D10	1	1N4148 signal diode
R1-R3, R9, R10, R16, R20, R25	8	10 k Ω
R4, R32	2	2.2 k Ω
R5-R8	4	220 k Ω
R11	1	47 Ω
R12-R14	3	100 Ω
R15, R29, R33, R34	4	1 k Ω
R17, R30	2	100 k Ω
R18	1	4.7 k Ω
R19, R27	2	220 Ω
R21, R31	2	47 k Ω

R22	1	470 Ω
R23, R24, R26, R28	4	1 M Ω
SW1-SW5	5	SPDT switch
J1	1	Eurorack 10-pin power header
J2-J6	5	ThonkiConn mono 3.5 mm switching jack
RV1-RV3	3	10 k Ω linear potentiometer
U1	1	L7805 voltage regulator
U2	1	MCP6004 quad op-amp
U3	1	TL072 dual op-amp
U4	1	NE555P precision timer
OK1-OK3	3	H11F1M bilateral analog FET optocoupler

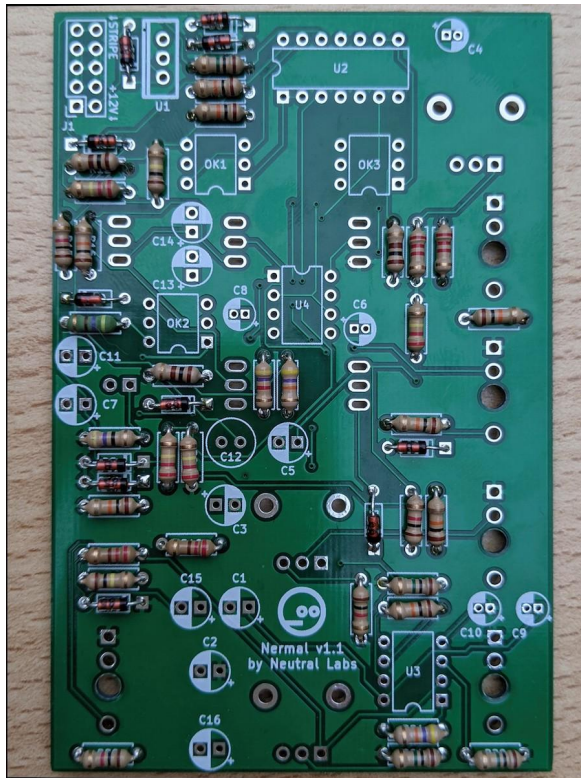
Step-by-step instructions



Solder all the resistors first. Polarity doesn't matter for them, so you can orient them in whichever way you choose.

In case you haven't noticed: You do NOT have to read ring codes or use a multimeter to determine the resistor values. Each bag contains unique sets of resistors, so you will not find e.g. two sets of 4 resistors in the same bag. The information on the bag labels is enough to be able to tell the resistor value.

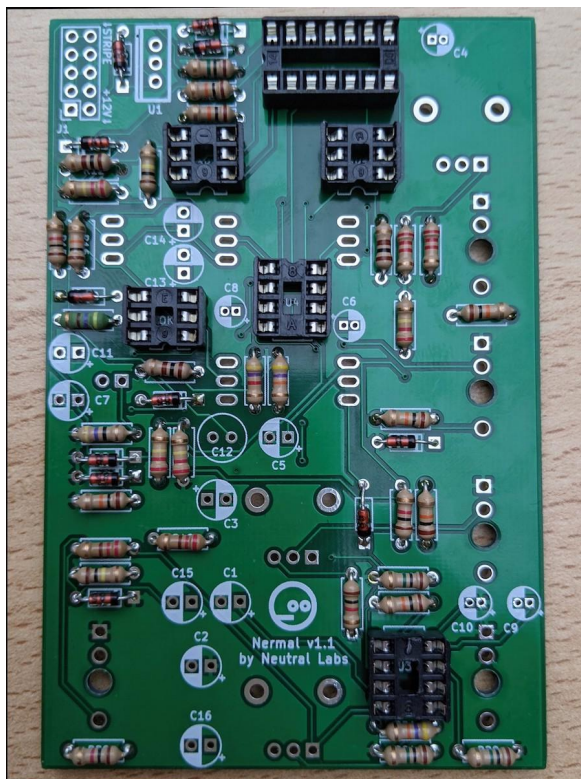
Some of the resistors in your kit may be white, green or blue instead of beige as shown here. Don't worry, they all work pretty much the same.



Now on to most of the diodes, except the LED (D9), which goes on the other side and will be added later.

There are 2 types of diodes used: 1N4148 (a single one) and BAT85.

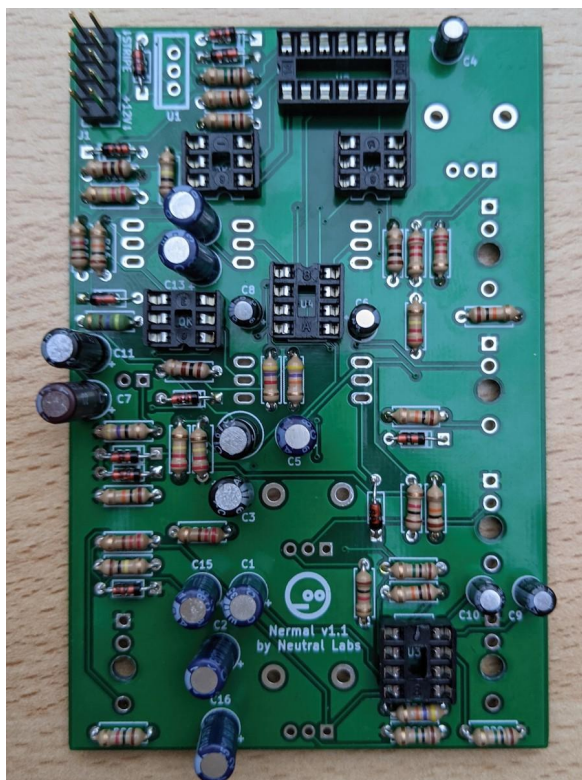
Pay attention to the polarity: **The black line on each diode must match the white line on the PCB.** In case of reversed polarity, you may damage your module when plugging it in!



Next, solder in the IC sockets.

They all have a little notch on one side which should match the notch of the white outline on the PCB. (It's not harmful if you put one in the other way around by accident, as long as you make sure the IC is facing the right way when you plug it in later.)

An easy way to solder those sockets is to set all of them into the PCB holes, lay the front panel or a piece of cardboard on top and flip the whole thing over. Now solder one pin of each of them and you can freely move the PCB to solder the rest of the pins.

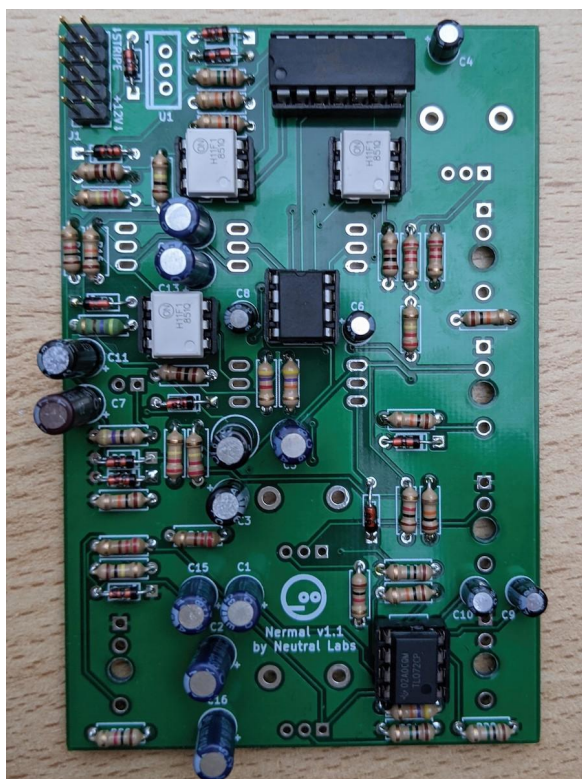


Add the 2x5 pin power header in the top left and the capacitors.

You can solder the small ($0.1\ \mu\text{F}$) capacitors first, so they won't fall out after fitting the larger ones and flipping the board for soldering. Or just fit them all at once and bend their legs slightly.

Polarity matters for almost all of the capacitors except for C12, which is a bipolar electrolytic one. It does have one short and one long leg, but the orientation doesn't matter. However, make sure **not to confuse C12 with any of the other $1\ \mu\text{F}$ capacitors!**

The long legs go on the plus side as indicated on the PCB.



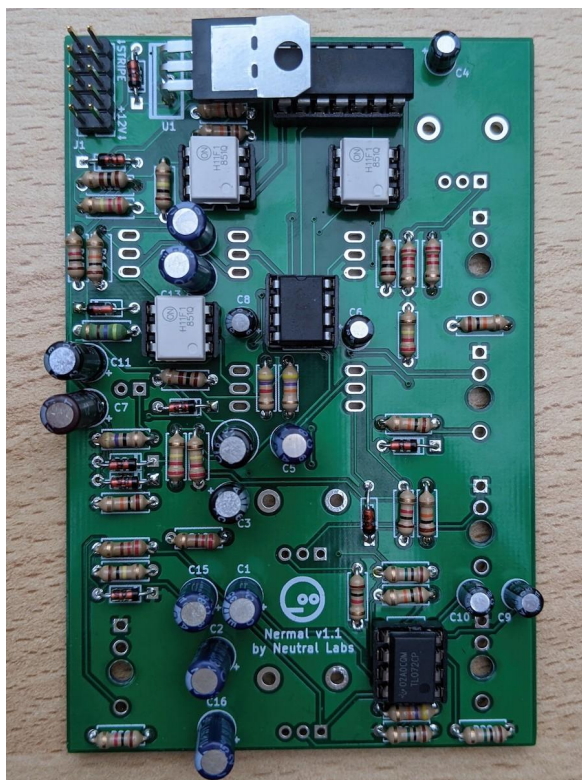
Now for the easiest part: Plug the ICs into their sockets.

They all have a little dot on them which should match the little notch on the IC socket (and the notch in the white outline on the PCB).

Bend their legs slightly inward if you have trouble fitting them in.

Make sure not to confuse the NE555P with the TL072, as both have 8 legs.

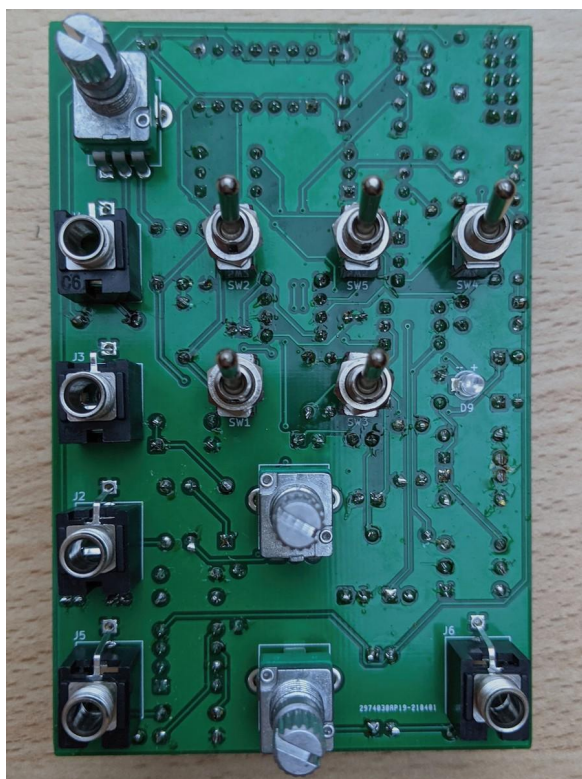
The H11F1M in your kit may not be white, but black instead. Don't worry, they work the same.



Now as the last component on this side, solder in the L7805. Make sure it's correctly oriented: The heat sink (metal) side should match the double line of the white outline on the PCB.

The recommended way to do it is not to insert the legs into the PCB holes too far, but just a bit, solder them in and then bend the legs at a 90 degree angle as shown in the picture. This will lower the depth of the completed module, so it looks more tidy. But it shouldn't be necessary as most Eurorack cases offer far more depth.

After bending make sure it doesn't touch the surface of the MCP6004!



Now flip the PCB over.

Solder in D9 (the LED) after pushing it in all the way, long leg on the side marked with a plus sign on the PCB.

Remove the washers from the pots and the outer nuts and washers from all the switches. Leave the lower nuts on the switches and lightly tighten them.

Fit all the remaining components on the PCB without soldering yet.

Now put on the front panel. Add and lightly tighten the washers of the 3 pots to hold the panel in place. Carefully flip everything back over and solder.



Now plug in and test your module. Refer to the manual if needed.

If something's not right, it may be best to unplug the module from Eurorack power immediately so as not to damage the PSU.

Most problems can easily be fixed by reheating all solder joints so the solder can reflow. Also visually inspect joints and see if you can spot accidental solder bridges.

When everything is working correctly, you can add the remaining washers and tighten them. If using a wrench or pliers, be careful not to scratch the front panel surface.

As the final step, put the knobs on the pot shafts.

If you need help troubleshooting or want to share photos, audio and/or video of your creations (please do), send a message to admin@neutral-labs.com