HEXINVERTER ÉLECTRONIQUE

Mutant Snare

eurorack modular analog snare drum synthesis

DIY ASSEMBLY MANUAL v1.05

CONTENTS

INTRODUCTION

Thank you for your interest in/purchase of the Mutant Snare DIY project! It is my hope that you find this design a useful addition to your modular synthesizer.

This assembly manual will show you how to build your Mutant Snare module in the eurorack modular format. This project is designed as a eurorack module and thus **there are no provisions made for other formats, though, adapting is not impossible for the skilled builder.**

The Mutant Snare is not especially difficult to assemble. Many of the passive components are already pre-soldered for you in surface mount on the bottoms of the PCBs.

The regular assortment of hand tools are needed: a 2.5mm hex allen key, various sockets, a knurled nut driver for the jacks, solder, a good bench-top soldering station (50 to 70W recommended). Besides that, you may find a Dave Jones O'Tool or oscilloscope and multimeter helpful for calibration and build troubleshooting, although in most cases these are not necessary.

A huge thank you to Hannes Pasqualini of **papernoise.net** for his excellent graphics design and artwork used for this project! (http://papernoise.net)

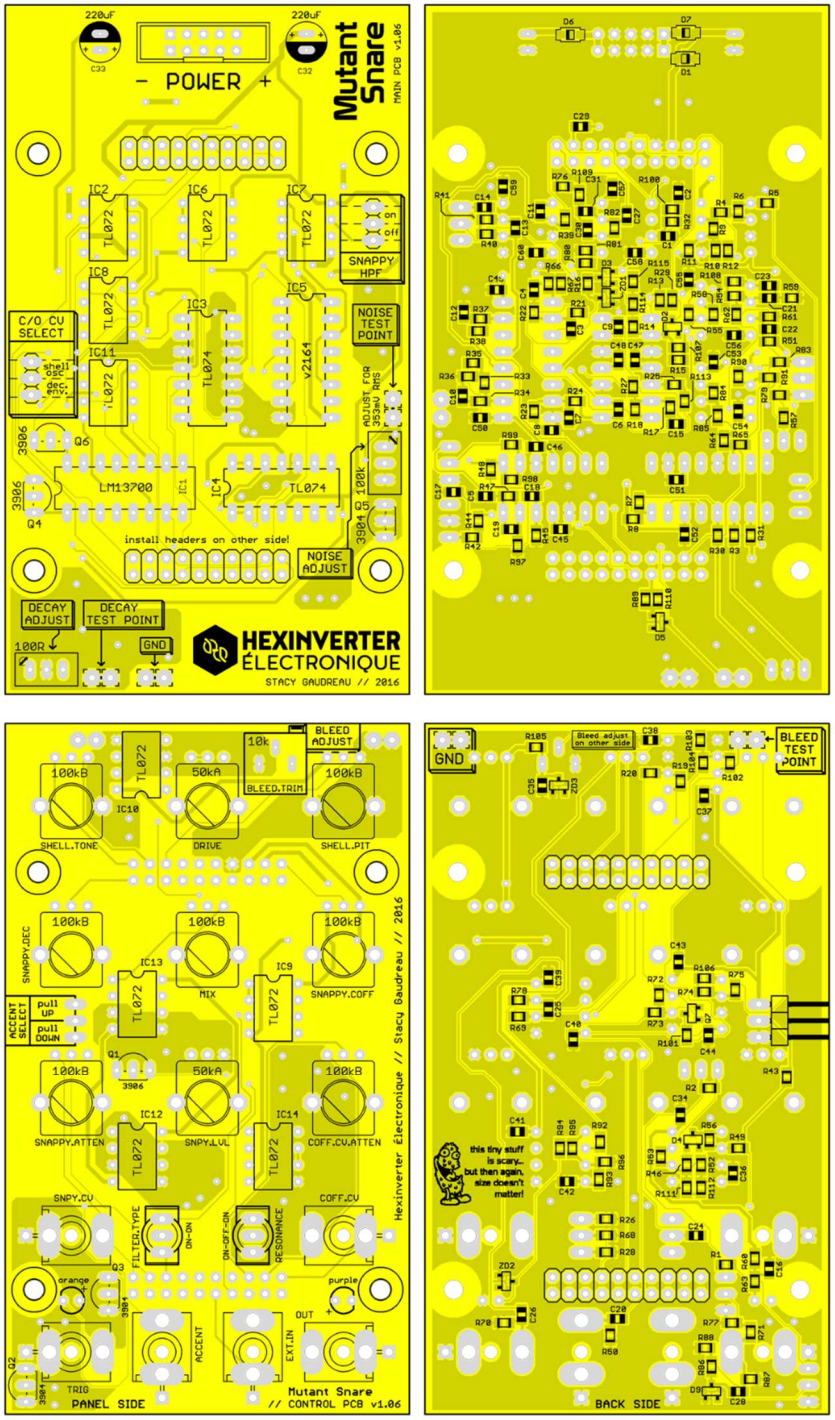
> **If you are building a PCB+panel set for which you sourced your own components**, please note that your parts may not exactly match ours shown in the following procedures. Because the Snare is a full kit project, our focus will primarily be to aid the kit builders in this manual.

EURORACK KIT ASSEMBLY

I recommend following the steps outlined here if you haven't built many modules before. If you are an experienced builder, you could probably just give a read through these steps to catch any possible traps ahead of time.

> **We're going to be assembling both of the PCBs at the same time**, so get your tools and parts ready and let's go!

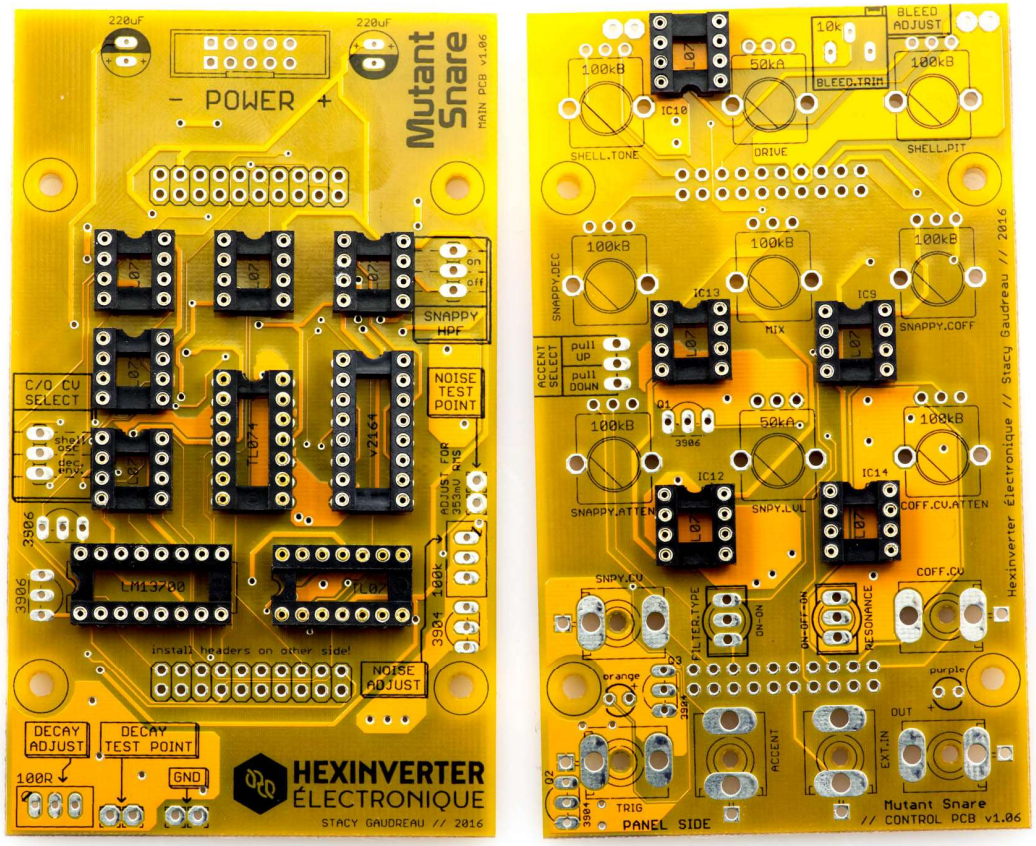
STEP_00: Inspect the PCBs



- While every effort has been made to carefully manufacture and package the PCBs with surface mount parts on them, it is a good idea to look over them for any damage before you begin. This may save future headaches.
- **Throughout the entire assembly process, be careful not to flex the PCBs too much during handling or when installing parts or bolting the panel on later. Doing so could develop fractures in the soldering of the SMT parts assembled onto the back of the PCBs. This caution goes for any surface mount electronics really, and isn't unique to this project!**

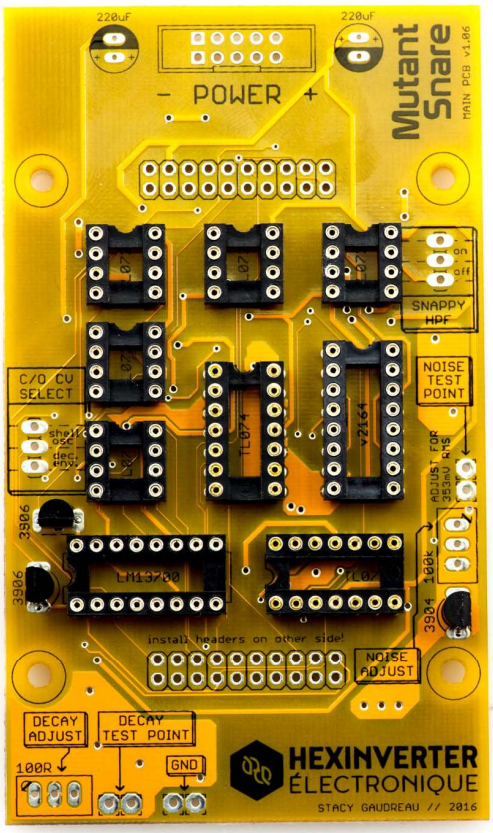
STEP_01: IC Sockets

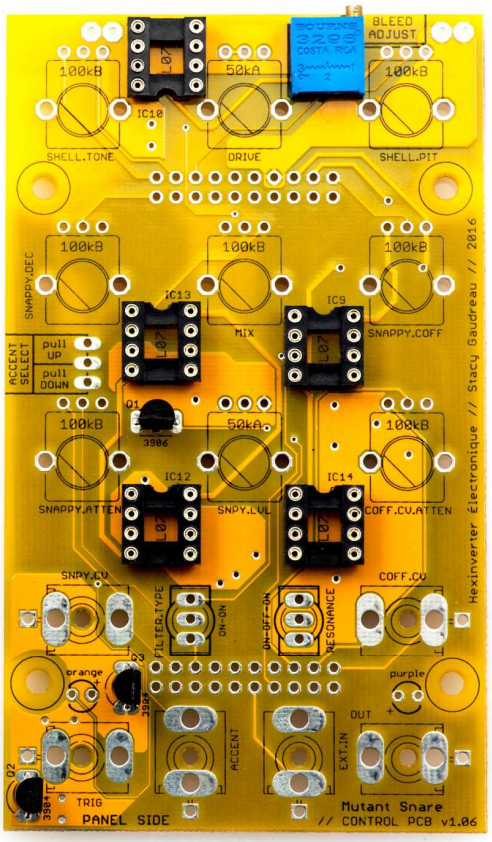
- **Install the IC sockets, being careful to orient them correctly**. I find it easiest to put a book or something else with a flat surface on them once they're installed, then flip the PCB and book over for soldering. This keeps the IC sockets nice and flat while you solder them in.



STEP_02: Transistors + Flat Trim Pot

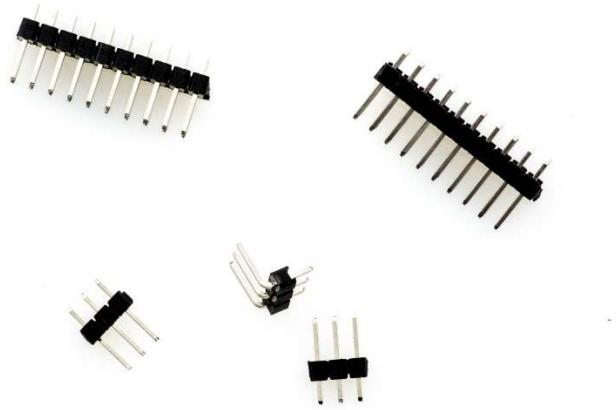
- Install the 2N3904 and 2N3906 transistors, being careful not to overheat them. If you've kept the iron on a transistor leg for awhile trying to get the joint to flow, remove the iron and move to a different area and let it cool down for at least a minute before trying again. **Double check that you have installed the part numbers in their correct places. The module will *not* work right if a 3906 and 3904 are swapped!**
- There are 3 trim pots in the Snare, but for height reasons we'll just install the one which lays flat on the Control PCB for now.



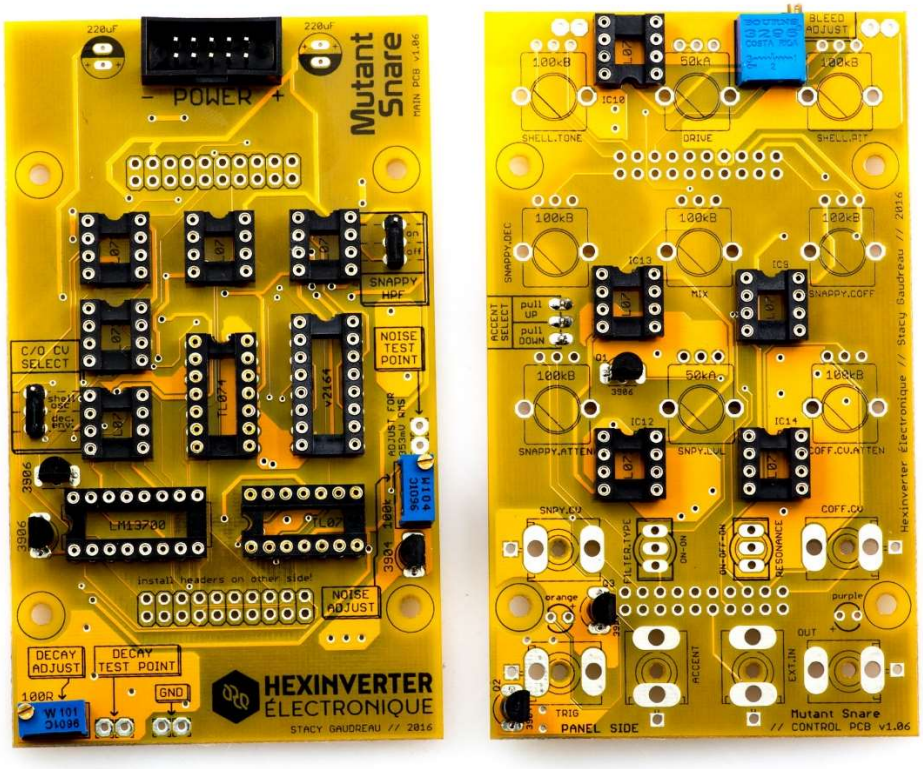


STEP_03: Jumpers, Power Header and Trim Pots

- Use some pliers to snap the male headers into their correct sizes, as follows:
  - [2] 2x10 headers (made from the 2x40 strip)
  - [2] 1x3 headers (made from the 1x40 **straight** strip)
  - [1] 1x3 header (made from the 1x40 **right angle** strip)

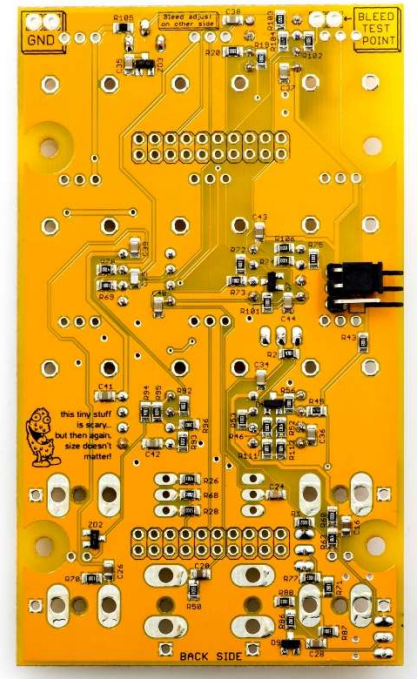


- Install all but the 2x10 headers in the PCBs.
- It helps to put the little 2 pin jumper caps on the headers when soldering so you have something to seat the jumper straight in the PCB while soldering, without burning your fingers!
- You can also install the keyed power header at this time, making sure that it is oriented correctly.
- Install the two vertical trim pots (**100R is marked on the case as "100" and 100k is marked as "104"**)

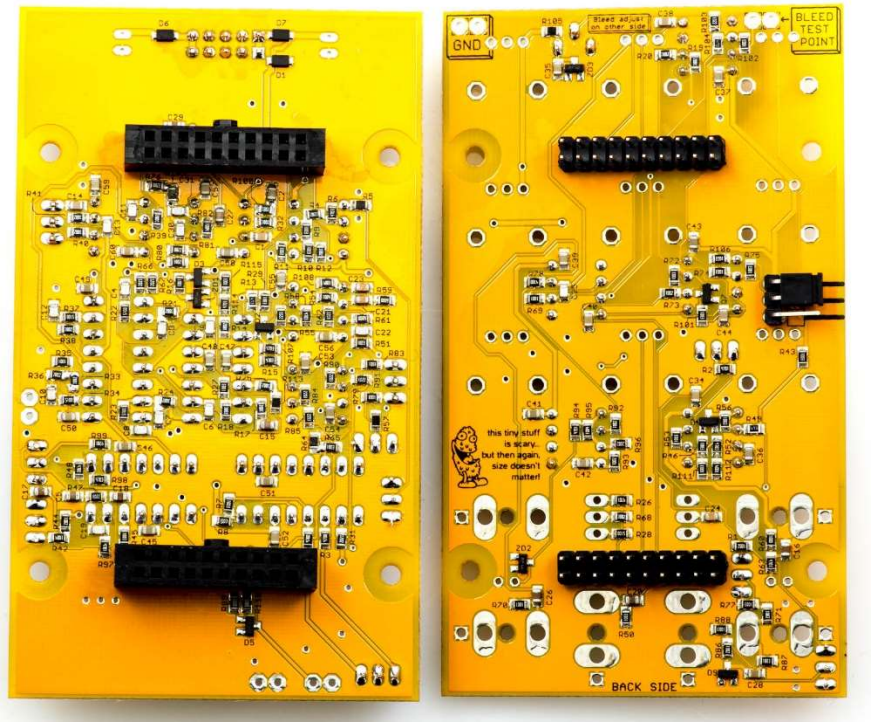


STEP_04: More jumpers + PCB headers

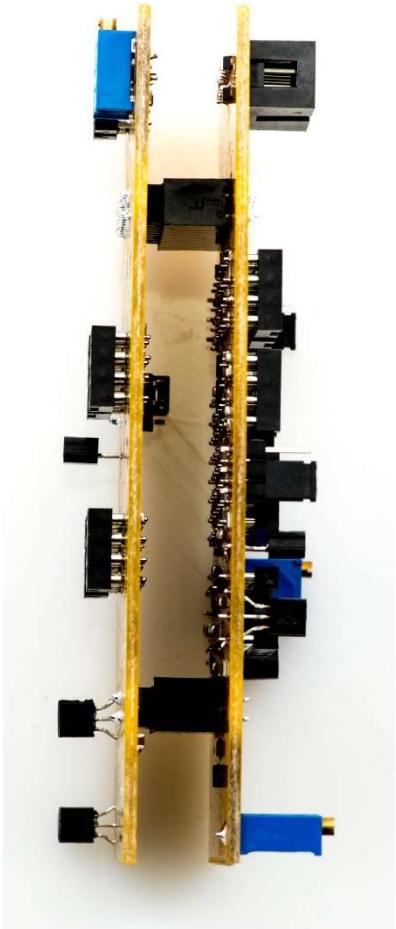
- Install the right angle header with 2pin jumper on the back of the Control PCB.



- The headers that connect the PCBs together can now be installed. The female headers are best installed on the Main PCB and the male headers on the Control PCB. Connect the two boards together and then solder the headers, making sure that the two boards' mounting holes are lined up nicely.

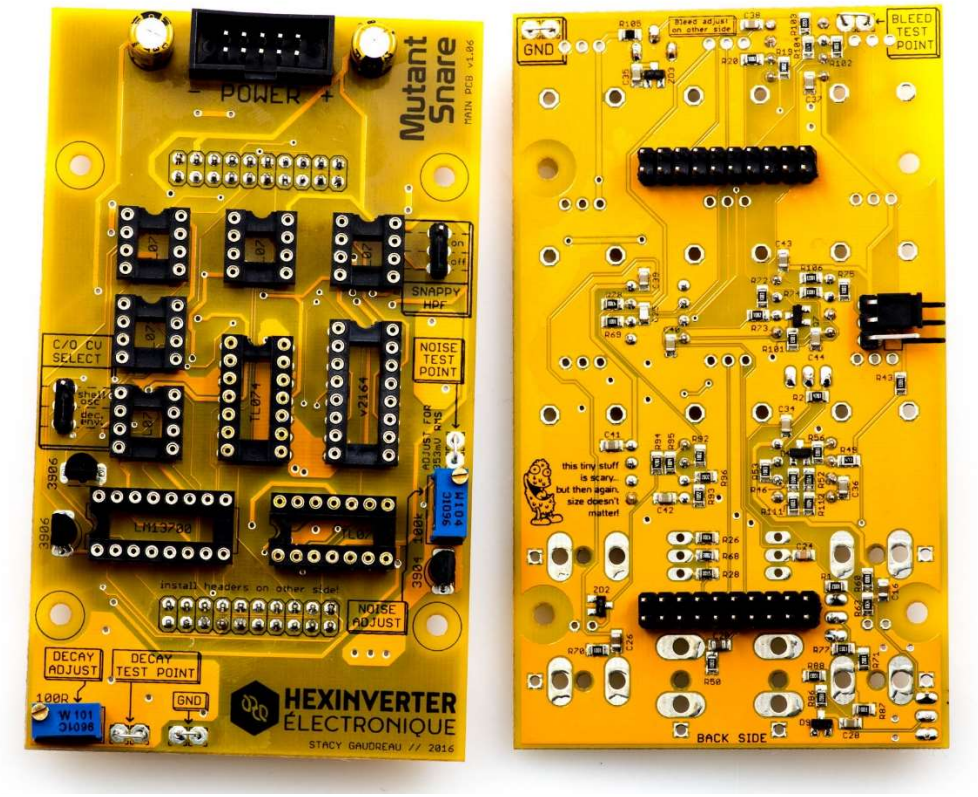


- It should wind up looking something like this when the boards are sandwiched together:



STEP_05: Electrolytic capacitors + test points

- Install the two electrolytic capacitors, being careful to orient them with correct polarity. Put the negative stripe on the capacitor overtop of the black shaded area of the circle on the PCB.
- Using the clippings from the legs of the capacitors after soldering them in, bend the legs to make some wires to solder into the test point locations. If you lost the clippings from the capacitors or cut them too long to get all five test points, don't worry! You can use some left over bits from the headers you cut up as posts to clip to. **Both of the pins for each test point do not need to have wire in them to function. There are two pads per test point just to make it easy to make a "U" shape if bending wire to fit in them.**



STEP_06: Take a break!

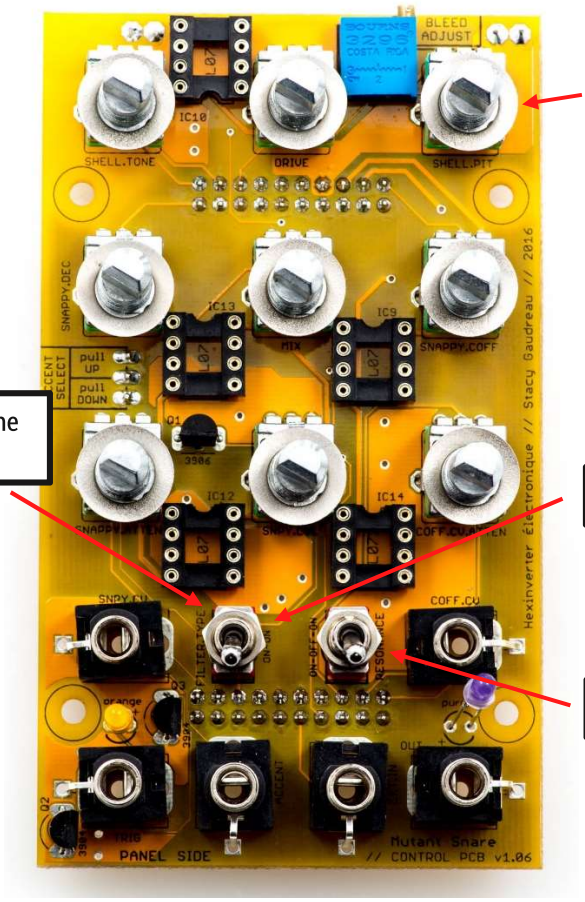
- It is almost time to assemble the control surface (yay)!
- But, first: look over the two PCBs you just populated and make sure there are no missing or shorted solder joints. You don't want to put it all together and then find out you missed a few spots with the iron! If you're anything like me, it happens more often than you'd like to admit.
- If you are feeling tired or rushed, it might be a good idea to rest up before coming at it again. The control board is for sure the hardest part of assembly and you don't want to mess it up! So have a fresh, well-rested mind for this final section.

STEP_07: Prepare the Potentiometers

- The included BI Technologies potentiometers all need their clip cut off. Grab a pair of sharp cutting pliers and clip off the little tab of metal on each pot, as shown. **Wear eye protection and try to prevent the clippings from flying all over, by cupping your hand over the cut as you make it! These little bits go flying off in all directions when clipping them.**

STEP_08: Place the Control Surface Parts

- Place the 3.5mm jacks, LEDs, potentiometers and toggle switches into the CONTROL PCB but **don't solder them in yet!**
- There are two different types of toggle switches. Be careful not to mix them up!



Each pot should have a washer on it

Install *one* of the two nuts onto the toggle switches for now

2 position switch (ON-ON)

3 position switch (ON-OFF-ON)

STEP_08: Panel Fitment

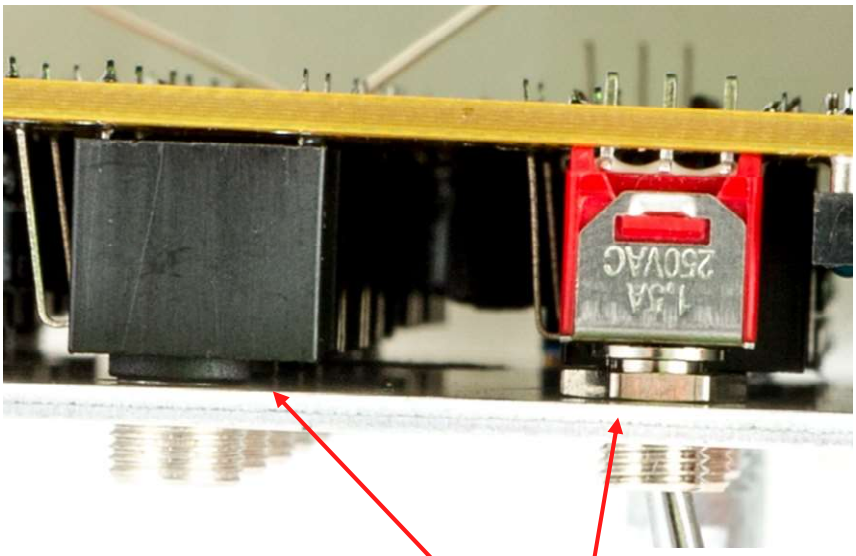
Remove the protective covering from the panel and install it on the loose-fitting control board components. Finger tighten the nuts for a few of the potentiometers. Do not solder anything yet!

> The potentiometers set the height the panel is at. That is, all of the other components follow the height of the potentiometers. This means you have to align and solder the potentiometers **first, before the other components are soldered!**

Make sure everything is sitting nice and flat on the PCB **and especially that the pots are seated flat**. Once you are happy, flip the assembly over and solder one leg of each pot. Then inspect and reheat any pots that aren't perfectly flat, pushing them down flat on the PCB with your finger while you reheat the one leg you soldered.

STEP_09: Jacks + Toggle Switch

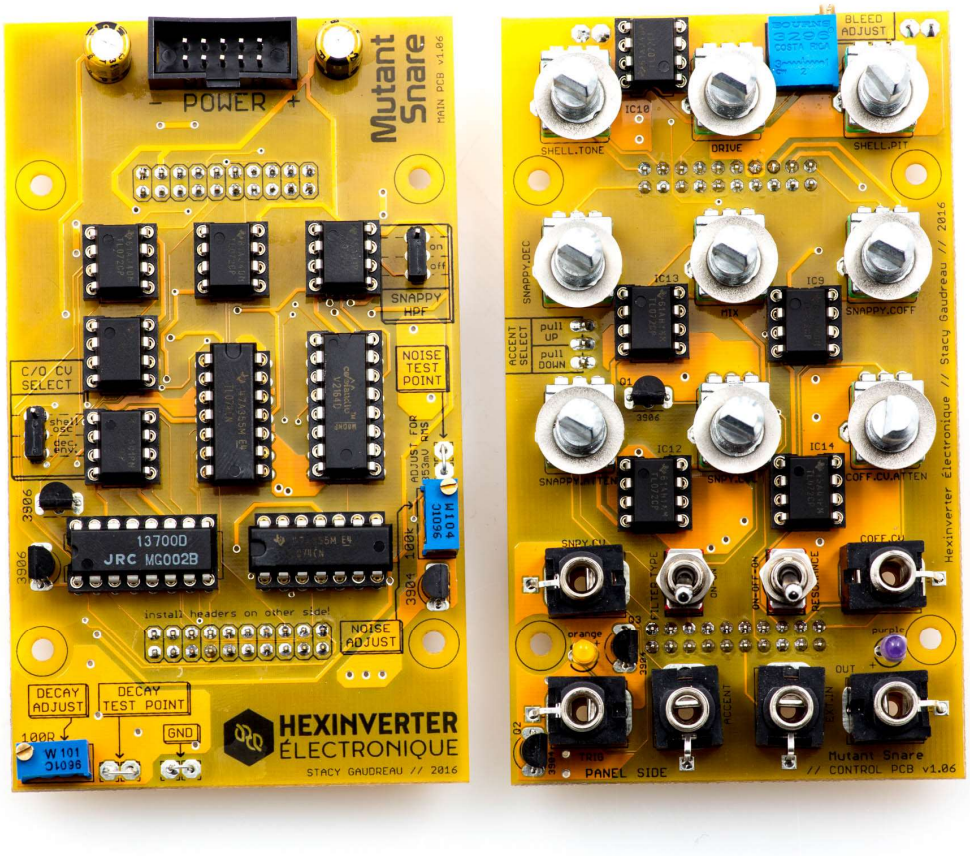
- Gently flip the control board with panel attached over so that the jacks fall down with gravity against the panel. Sit the assembly gently on your desk and **inspect to see that each jack is flush with the back of the panel**.
- The jacks will be slightly lifted off of the PCB. Try to ensure that they are flush with the panel.
- Unscrew the nut for the toggle switch slightly, to raise it to the same height as the panel.
- When you are happy with the fit, solder each jack and toggle switch, going back to check that they are nicely against the panel each time.
- Finish up the remainder of the soldering for the control surface components once you are happy with their fitment.



This image is taken from a different build to illustrate the way the switches and jacks should be flush against the panel (since you cannot see the switches easily to illustrate on the Mutant Snare, due to their location)

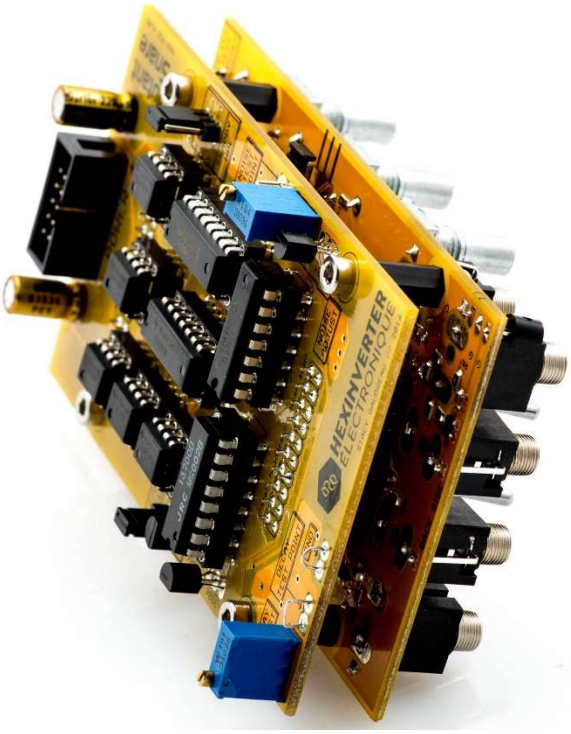
STEP_0A: Install the ICs in their sockets

- It's time to install the ICs in their sockets!
- Be careful to install them in their correct orientation. If they are reversed when you power on the module, the chips may be destroyed.



STEP_0B: Put together the PCB sandwich

- It's probably a good idea to give each PCB a final inspection for obvious errors before moving on!
- Using the (8x) M3 screws and (4x) black nylon standoffs, it's time to put the PCB sandwich together. Use an M2.5 hex driver or allen key to secure the screws.
- It is recommended to first mount the standoffs tightly onto the Control PCB, and then you can place the Main PCB on top of that and screw it in a little more gently. *This will make it easier should you have to unscrew the Main PCB later – it should help to avoid accidentally loosening the Control PCB's screws from the standoffs at the same time as the Main PCB's screws.*

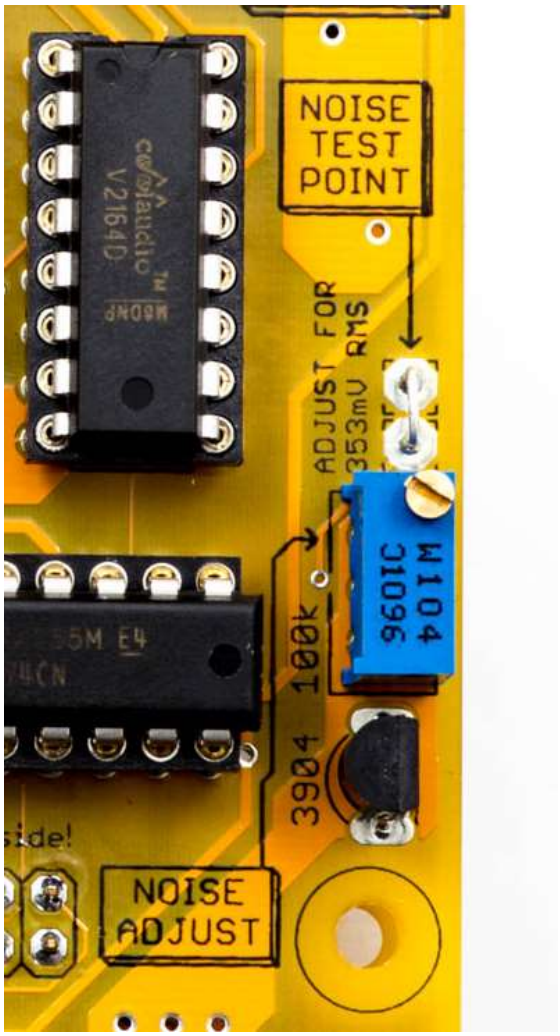


STEP_0C: Almost testing time!

- So far so good! Now you can install the panel to the PCB sandwich. Don't forget to put the washers back on the potentiometers if some of them fell off.
- It is recommended to put on just enough of the nuts to hold the panel there while you test and calibrate, in case you run into troubles and need to take it apart again. **Don't install the knobs yet – they're a pain to remove if you need to take it apart to troubleshoot a build problem!**
- Almost done! Sit back and enjoy your work for a second.
- Apply power to your module to make sure nothing gets hot or lights on fire. Does everything work okay?
- Next we are going to calibrate!

STEP_0D: Noise level calibration

- Attach a multimeter probe to the **NOISE TEST POINT** location on the Main PCB. Make sure you've also connected the ground probe of the multimeter to a ground point ("GND") on either the Main or Control PCB (any indicated ground point will work!)
- With the Snare powered up, set the multimeter to read **AC voltage** and calibrate for **1 volt RMS**. *The PCB says 353mV RMS but actually 1V RMS is better.* If you can't reach 1V RMS perfectly, don't worry. The exact value is not entirely critical. You can always turn it up a bit if you find that when using the Snare, the SNAPPY volume is not enough for your taste.

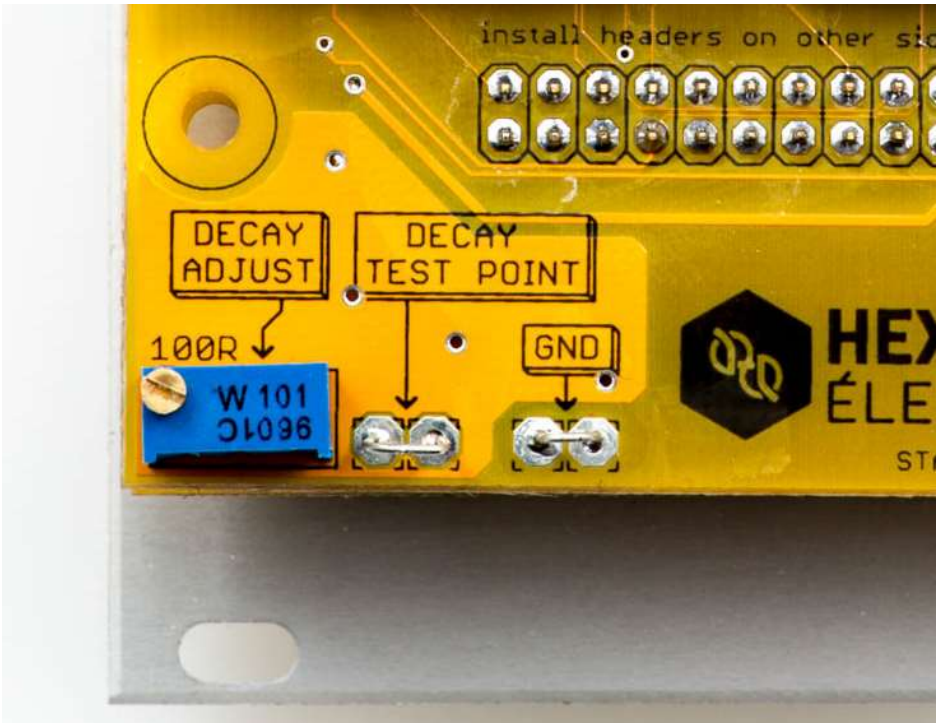


STEP_0E: Decay calibration

- If desired, you can clip a multimeter or oscilloscope probe to the DECAY TEST POINT to monitor the voltage level while you're calibrating. **It is not absolutely necessary though and you can do this by ear alone if you like!**
- Plug a trigger source into the module but don't actually send it a trigger yet. Monitor the output of the Snare with speakers or an amplifier by plugging into the OUT jack.
- Turn the SNAPPY volume control to maximum.
- Turn the DRIVE about half way up.
- Turn the MIX control all the way to "SNPY".
- Set the filter controls to HP (high pass) and turn the CUTOFF to a low setting so you know sound is capable of getting through.
- Now, it is time to calibrate the Decay. Don't apply a trigger until it is suggested!:

    1. Turn the DECAY control to maximum
    2. Turn the DECAY ADJUST trim until you start to hear constant noise
    3. Now, turn the DECAY ADJUST back in the other direction, **just a little bit**
    4. Turn down the DECAY control just a little bit – does the noise fade out and stop?
    5. If the noise does not fade out and stop, go to step 1 and try again, but turn the DECAY ADJUST down **a little bit more this time.**
    6. Apply a trigger to the Snare and play with the DECAY control. At maximum it should decay for a very long time. When you turn the DECAY control down a bit from maximum it should fade out.

This is a bit of a tricky calibration to wrap your head around, so don't get frustrated! You'll get it!!! The trim pots are **12 or 20 turns** so that means that it can be awhile of turning until you hear a large difference. Note that the trim pots make a very faint "click, click, click" when they are at their limit of range. This is a good way to start at one end of the trim pot's range and then work your way down.



STEP_0F: Bleed calibration

- You'll be using your ears for this procedure, so go ahead and get ready to listen to the output of the module by plugging into the OUT jack on the panel of the Snare. **We are going to remove the bleed that is present on the output of the module when no trigger is activating the Snare drum sound.**
- Turn the SNAPPY volume control to maximum.
- Turn the DRIVE about half way up.
- Turn the MIX control all the way to "SNPY".
- Set the filter so that sounds will pass through (high pass mode, cutoff set low)
- Now it is time to calibrate the bleed. **Do this procedure without a trigger input!**
    1. Listen to the output of the Snare while no trigger is present. There is probably some noise leaking through when there is no trigger. You might need to turn your volume fairly high to hear it.
    2. Turn the BLEED ADJUST trim screw until the bleed begins to lower, and then disappears to your ears. Don't turn it too far past when it disappears or it will distort the signal in the Snappy circuit too much.
    3. It's just that easy! Don't forget that the trim pots have many turns to them (see note in the previous page's calibration step)

The BLEED TEST POINT and GND connections on the back of the Control PCB are for advanced troubleshooting and are not actually necessary to complete this procedure. Don't try and listen to the audio at the BLEED TEST POINT – it's actually a voltage signal; not an audio signal.

STEP_10: Knobs, Shafts + Nuts

- Once you are confident that your Mutant Snare is working well, the next step is to tighten down all the nuts. Be careful not to scratch the soft aluminum panel with your hard tools of course!
- Once the nuts are on, it's time to press the knobs firmly onto all the potentiometer shafts.

STEP_11: R.T.F.M.

- If you have not already – go check out the User Manual from the HEXINVERTER website! If you're too busy noodlin' with your new Mutant Snare to do that, then maybe print it out and leave it by the toilet for some bathroom reading.
- I sincerely hope you enjoy your new Mutant Snare eurorack module!