

# MAKING A PROTOTYPING RIG

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This tutorial is not so much a detailed “how to” but simply a documentation of how I make prototyping rigs. What is a prototyping rig? It’s a set-up that allows you to easily test builds and/or circuits before you put them in an enclosure. It also lets you breadboard circuit snippets or ideas without having to solder anything. All-in-all it is an incredibly powerful tool to make your DIY pedal making more professional and efficient. Plus, it costs less than \$35 to make one!

Here are the specs on the rig I will be assembling. This is not the only way to make one of these, or even the best way. But, it’s fast and it gets the job done most of the time.

## **Three breadboards side-by-side**

I use three because I like to spread everything out. You don’t have to use this many...even one is enough. These are the most expensive part actually, being \$8 each from Mouser.

## **1590B enclosure w/ 3PDT footswitch and all the necessary I/O connections**

Easy way to install all the switching and I/O stuff and it simulates very accurately what your build will do when it is finally assembled.

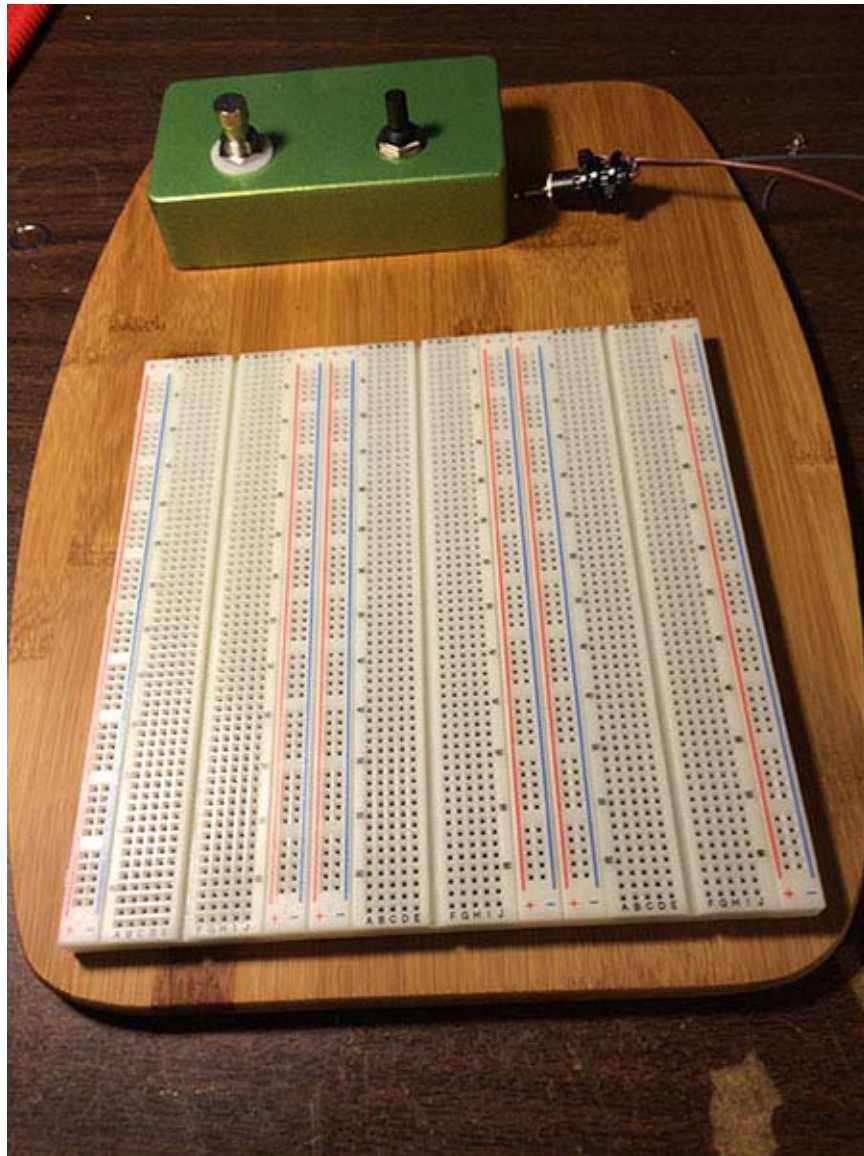
## **Voltage selector**

I’ll be using Road Rage with a 1P12T rotary switch to select between +9, +15 (regulated), +18 (unregulated) and -9v DC. The one limitation here is that the max output on the +15 and 18v options will tap out at 100mA because of the charge pump.

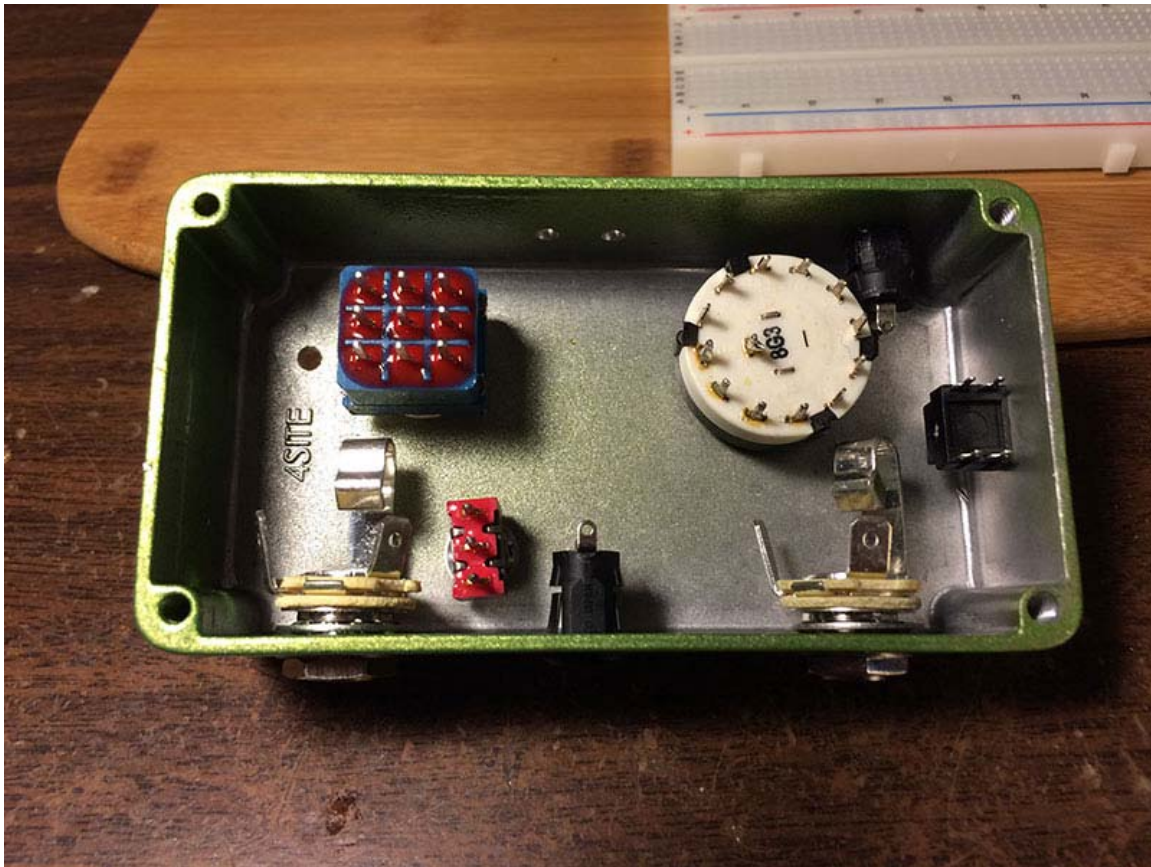
## **Audio probe and grounding clip**

These are imperative. The audio probe lets you test output points on circuits to isolate what a particular component is doing. For example, listening to the audio output at a certain transistor or IC. The grounding clip is used to attach the black lead of a multi-meter so the red lead can probe for voltages.

*All these connections will require, err, connectors on the enclosure and you’ll see what these are later on.*

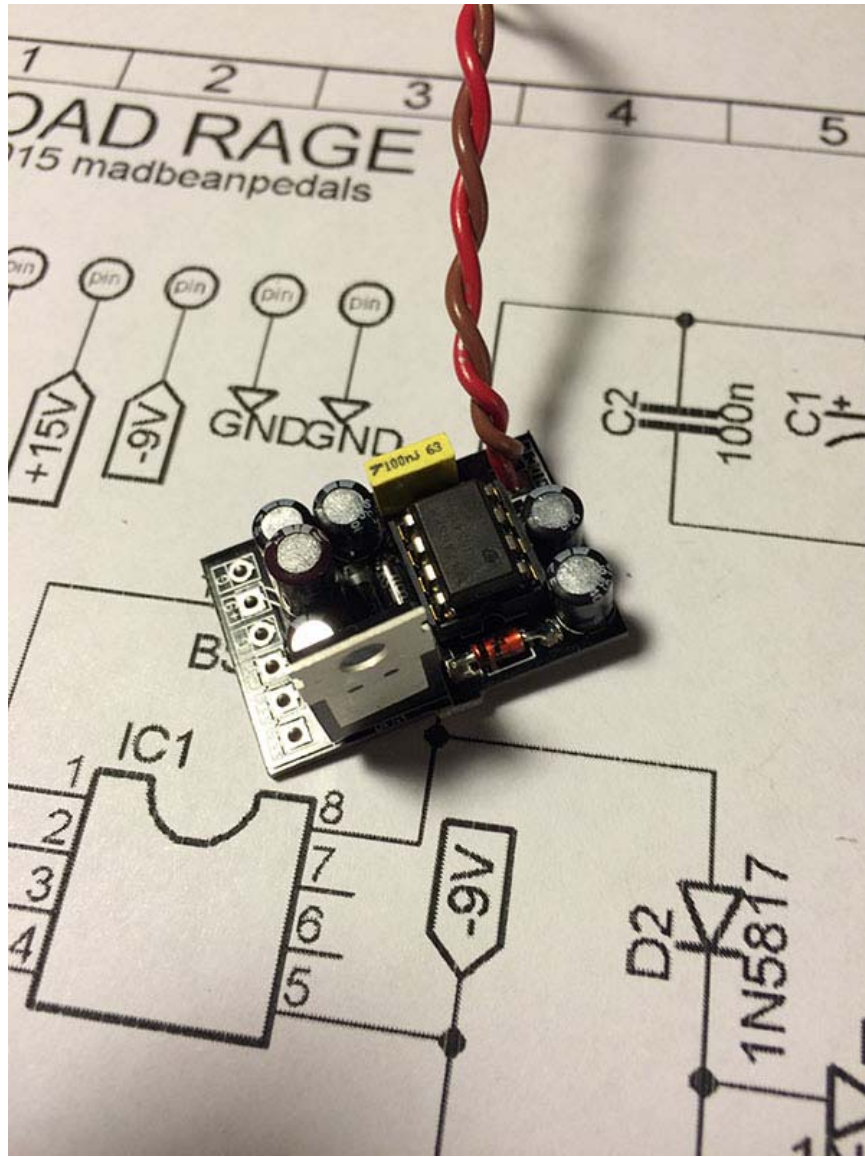


Here's the basic layout. I bought a \$4 cutting board from WalMart. The 1590B box I had left over from another project and it already had some drilling. I'll need to add some drilling for additional hardware. The jack on the right is from the audio probe I build later on in this tutorial.

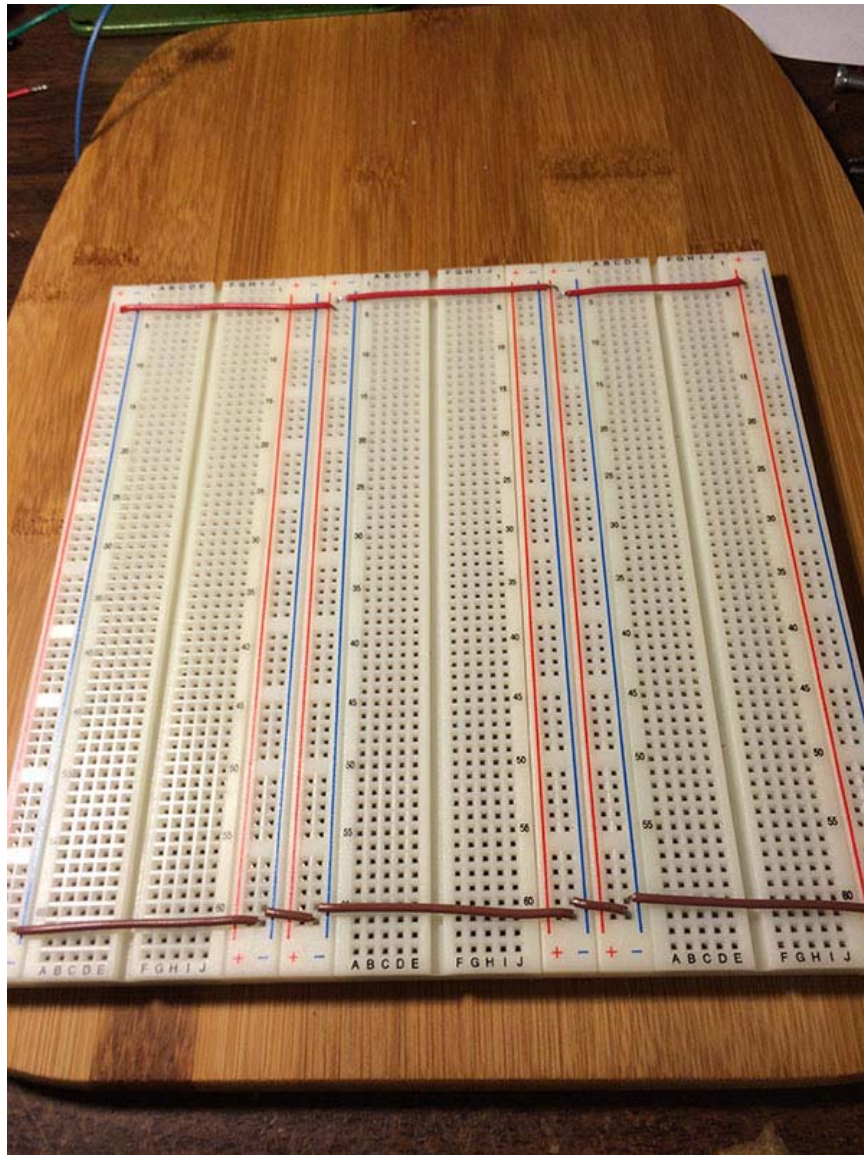


All the drilling is done and hardware loaded in. The bottom portion has the in and out jacks for guitar and amp, the DC input jack and a toggle switch. The switch is to select between circuit and audio probe output. This is a time saver because when you probe the output of a component on a PCB or breadboard, you need to disconnect the effect circuit output.

On the top we have the 3PDT for bypass and circuit switching, the rotary for voltage selection, the DC output to the breadboard and a mini-jack to plug in the audio probe.



The assembled Road Rage. All the voltage outputs were tested to ensure they are working properly before it goes in the enclosure.



The breadboards have sticky foam tape on the back and I've mounted them to the cutting board. On the top I've connected the "+" ends together for voltage and the bottom for ground. Now all the breadboards can pull power and ground. I did leave two "+" strips unconnected. These can be used to create VB rails when I am breadboarding that I can connect to multiple components.



I make my audio probes out of ink pens. It's cheap and easy to do. I'm going to use an old miniature flathead screwdriver for the tip of the audio probe. These are metal all the way through so it's fine as a conductor.



I removed the end cap from the screwdriver. This is actually a PITA but by filing the end barb and cursing a bit I was able to get it off. You can see the spring is a good fit for the screwdriver shaft. The spring isn't totally necessary to keep but I find it allows for a little "give" in the probe so if you push to hard on it the component you are testing won't get messed up or ruined.

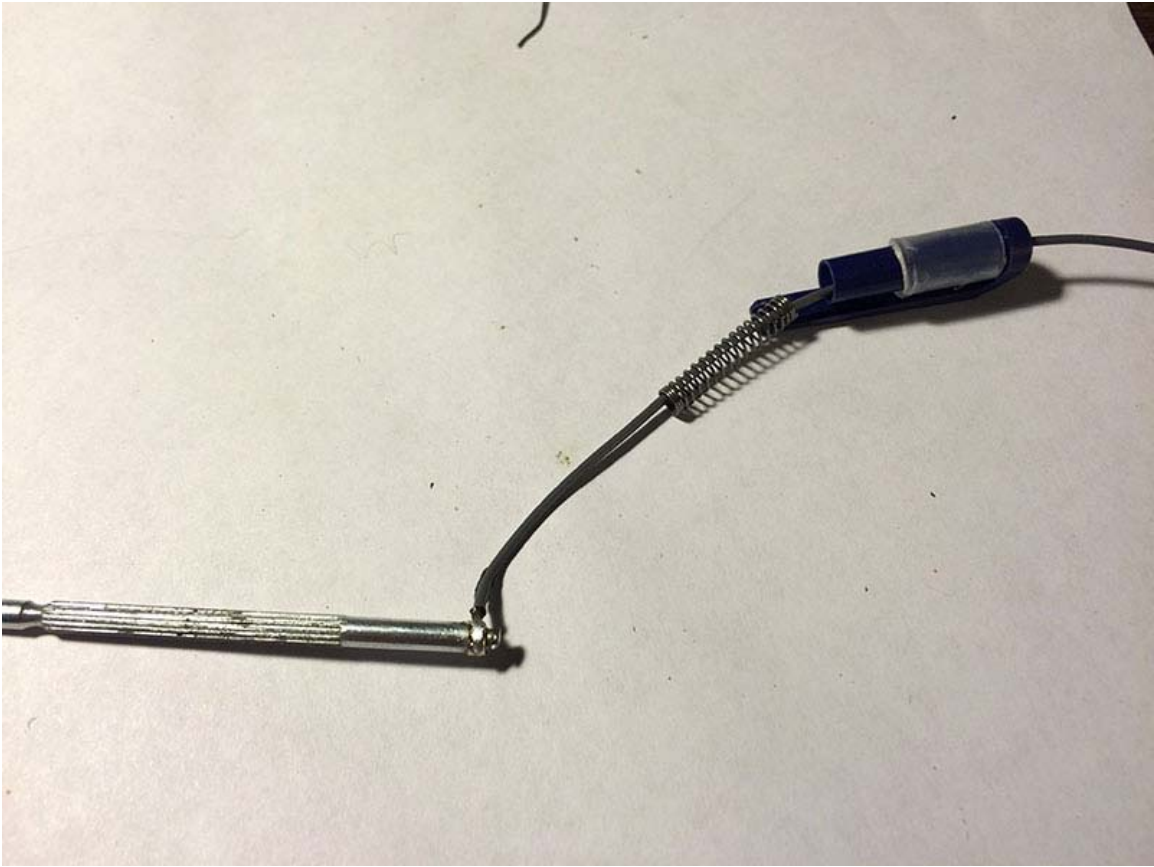


Test fitting the screwdriver shaft in the pen casing. I'll trim some of the excess plastic that extends beyond the spring later on so the end cap compresses everything together.





Here I've used some 220 grit sandpaper to file down the ends of the screw tip. This ensures good connectivity from end to end on the audio probe.

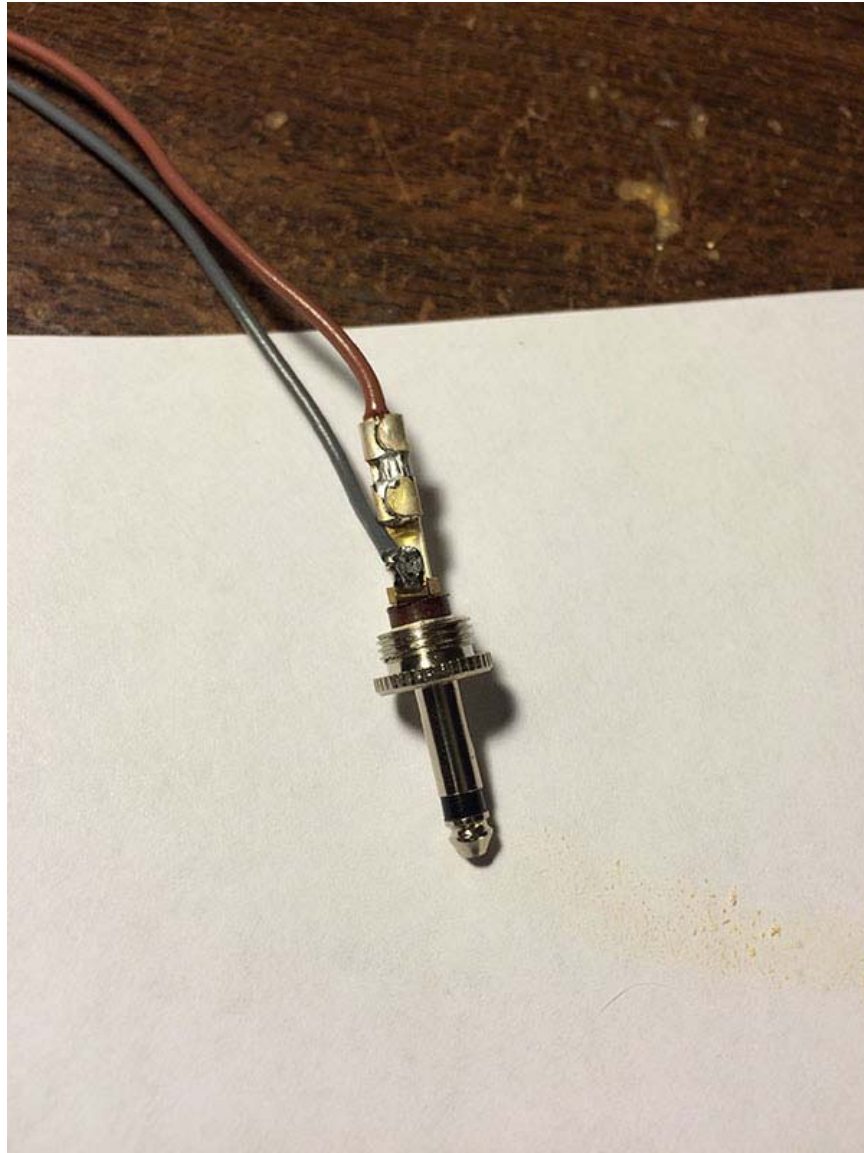


A wire has been soldered to the screwdriver shaft and the pen is ready for final assembly. I used the continuity checker on my DMM to make sure the screwdriver tip and the wire had good connectivity. I ended up putting a small piece of the plastic shaft I cut off earlier back on the pen top because I cut too much off.



The probe assembly. I dropped a bit of super glue on the end cap of the pen so everything stays locked down. I've used some painter's tape for strain relief between the attached wire and pen assembly. Not pretty, but hey it works.

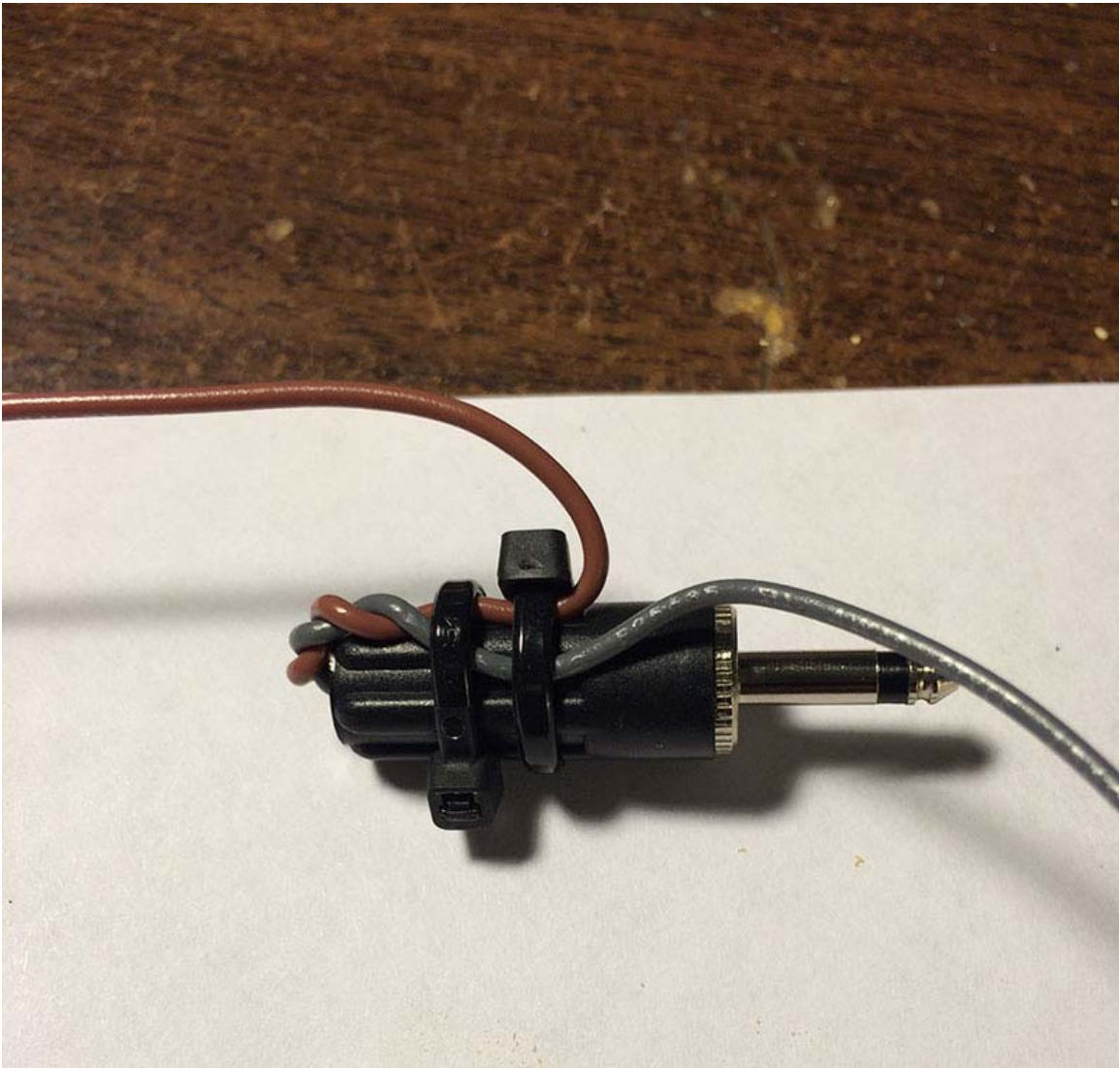
One important part not shown here is that the audio probe needs to be coupled to the output with a cap. This ensure no DC leaks out into the amp when you are audio probing. I'll use a 100n film cap soldered directly from the wire of the audio probe to the toggle switch later on.



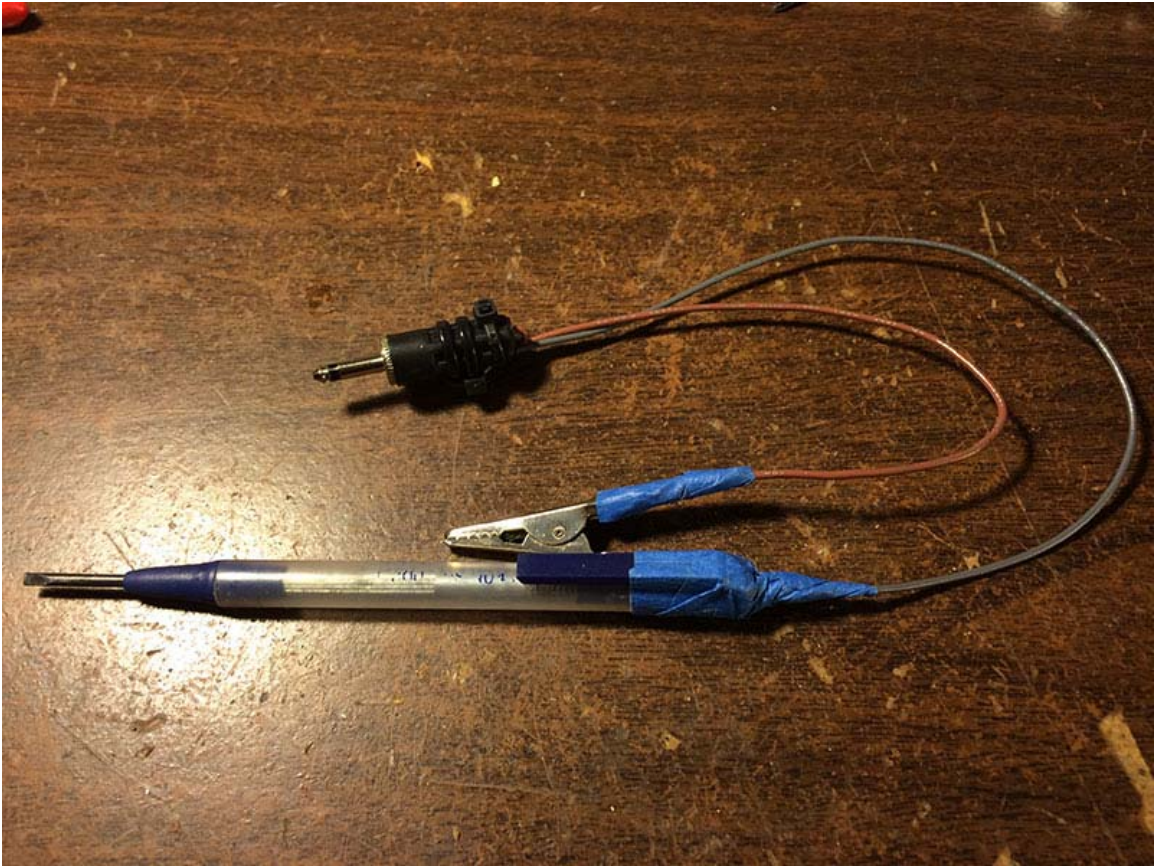
The mini-jack getting assembled. The gray wire from the audio probe goes to the tip. A brown wire is attached to ground. This is the wire I will use for the exterior grounding clip.



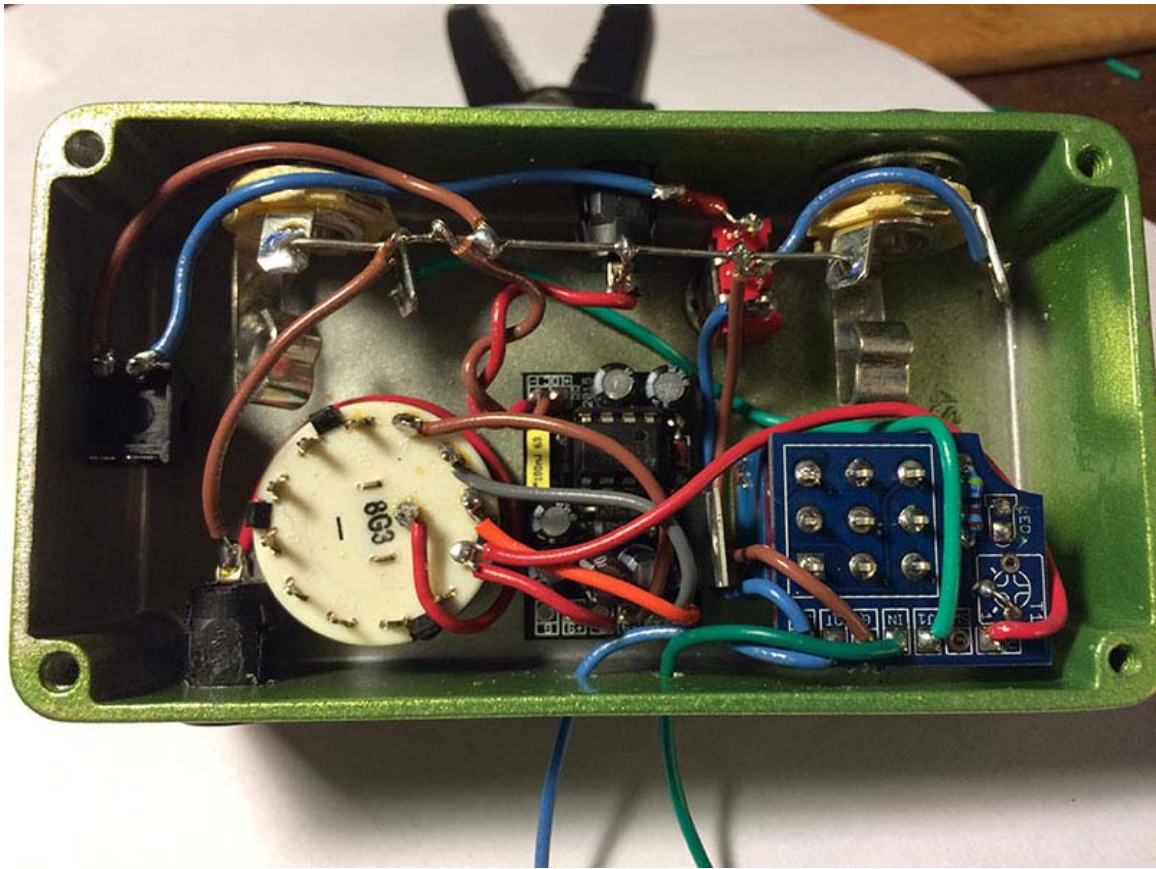
The brown wire soldered to the grounding clip. I pulled this clip off a broken "Helping Hands". It's perfect for grabbing the black lead of a multimeter which frees up a hand when checking voltages with the DMM.



The audio probe jack assembled with strain relief.

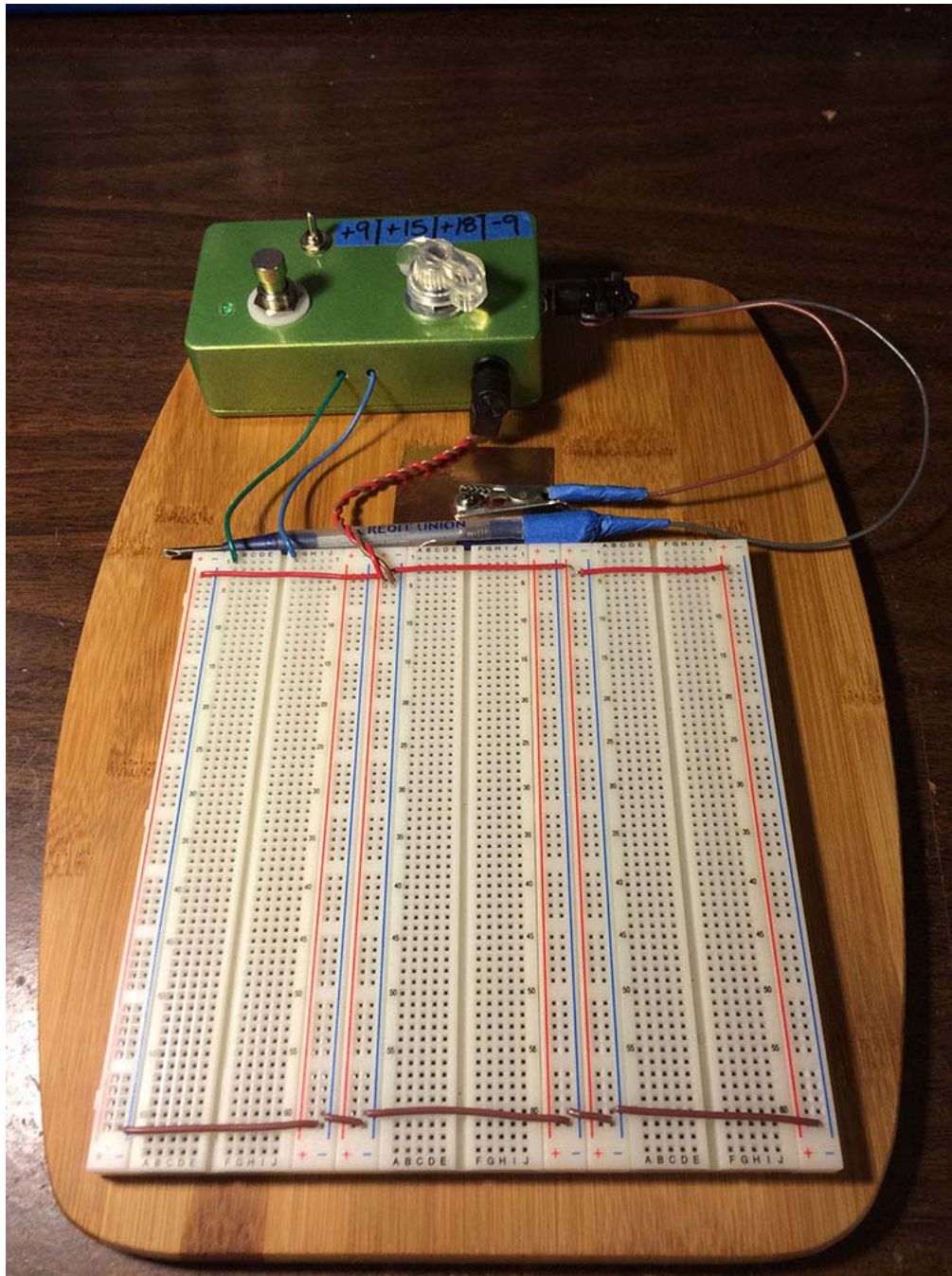


The final audio probe/ground clip assembly. I may have shorted the gray wire a little but that's not a big deal. I can always splice in an extra length of wire later on if I need more.



The assembled and wired enclosure. This took the most time, of course. I'm using a little 3PDT board we made for prototyping in Function  $f(x)$ . Not necessary but it made the wiring a little cleaner. If you look in the upper right you can sort of see the 100n film cap I've soldered between the audio probe and toggle switch. The Road Rage was fitted into place with some double-sided foam tape to keep it secure. Lastly, the blue and green wires at the bottom are for circuit input and output. I did not strain relief these because they will stay in one spot on the breadboard.





The final rig assembled. The input and output wires are in the upper left. I'll use jumpers to connect those to circuit boards or breadboarded circuits. The DC output is right next to that. I used a bit of copper shielding tape under the grounding clip to make a grounding plane. This is helpful if I need to discharge a cap. It's also perfect for un-locking PT2399s (grounding all the pins usually fixes that quickly). The toggle switch is wired so when it points toward the breadboard the audio probe is selected for output. The voltage selector is clearly labeled on the enclosure. This rig is ready to go!