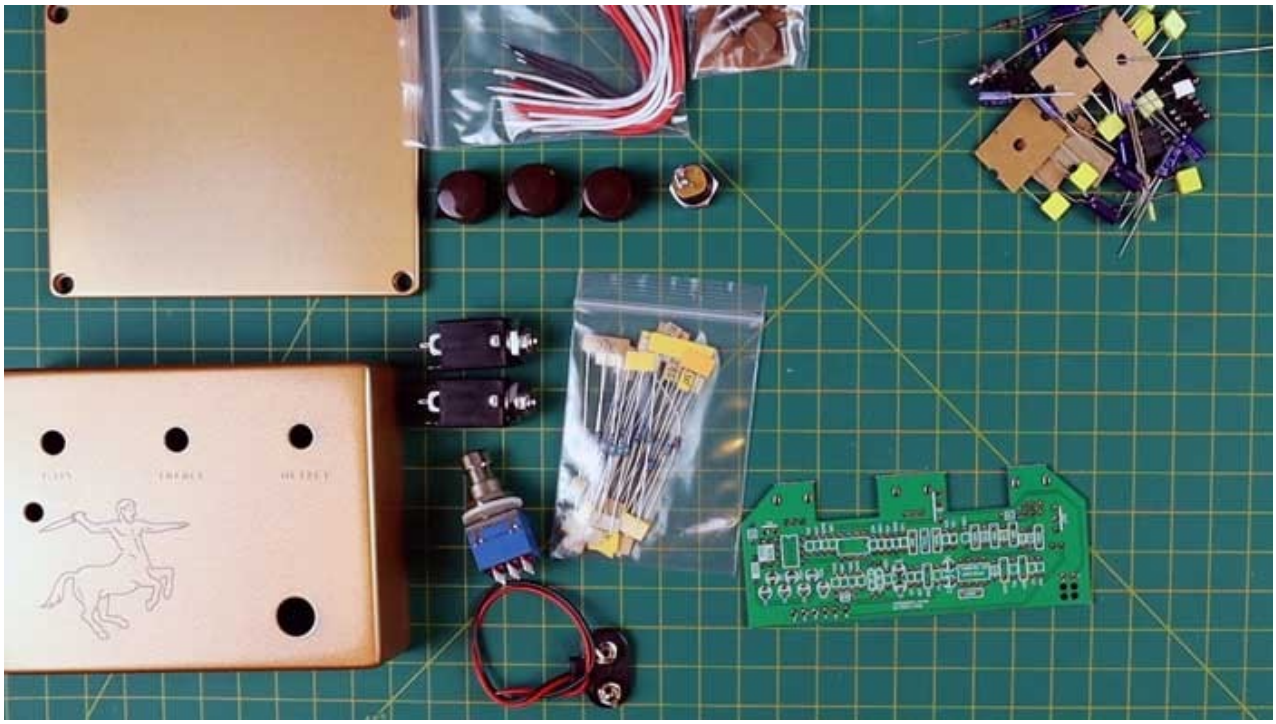
How to build the Klon Centaur Overdrive Step-by-step



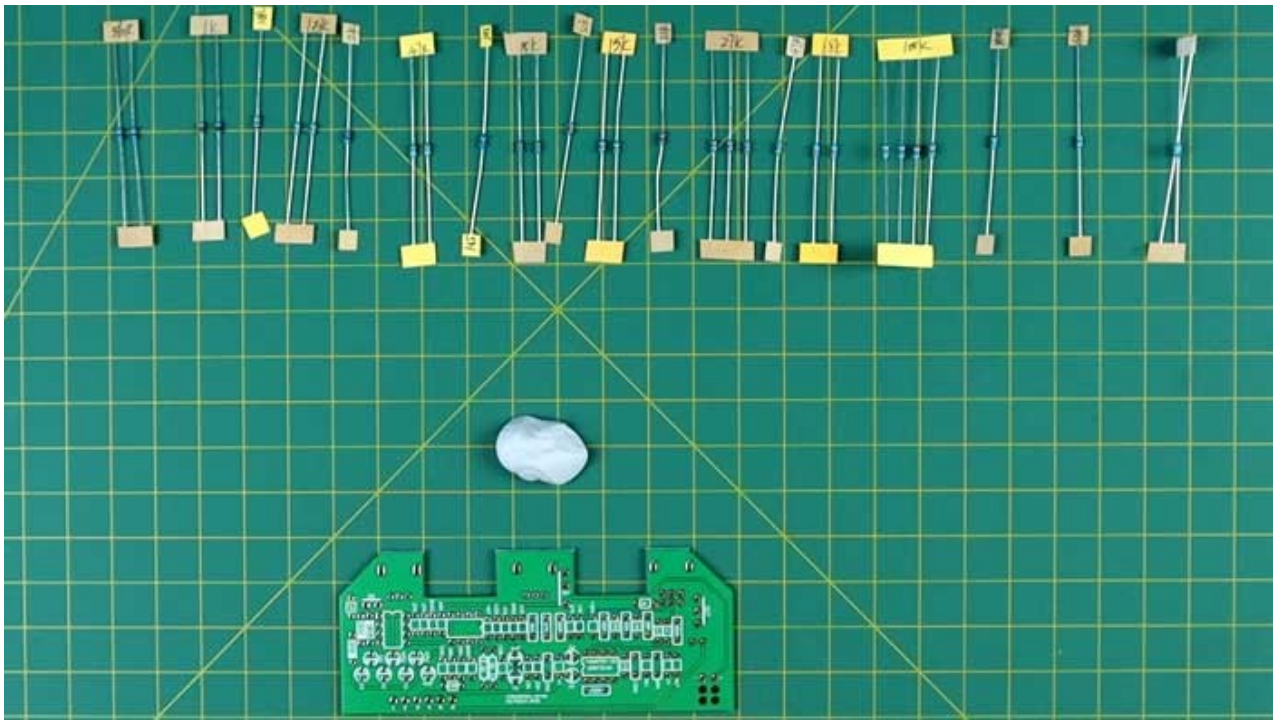
Step 1: Resistors

The general best practice with building guitar pedals is to start with the lowest height components, then work your way to the taller components.

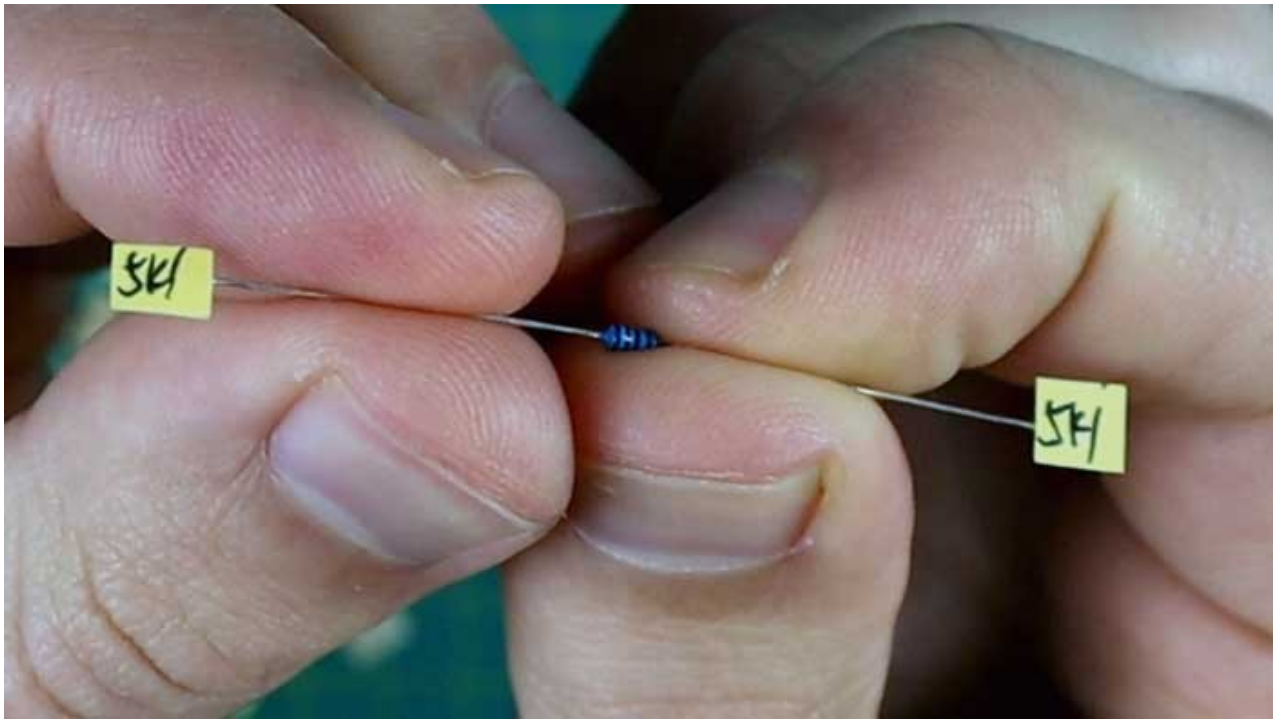
Let’s start with the resistors, which are the blue components with colored-lines. These colored lined are codes for the value of the resistor. You can easily look up any resistor color chart if you want to double-check a resistor’s value.

Sorting Resistors

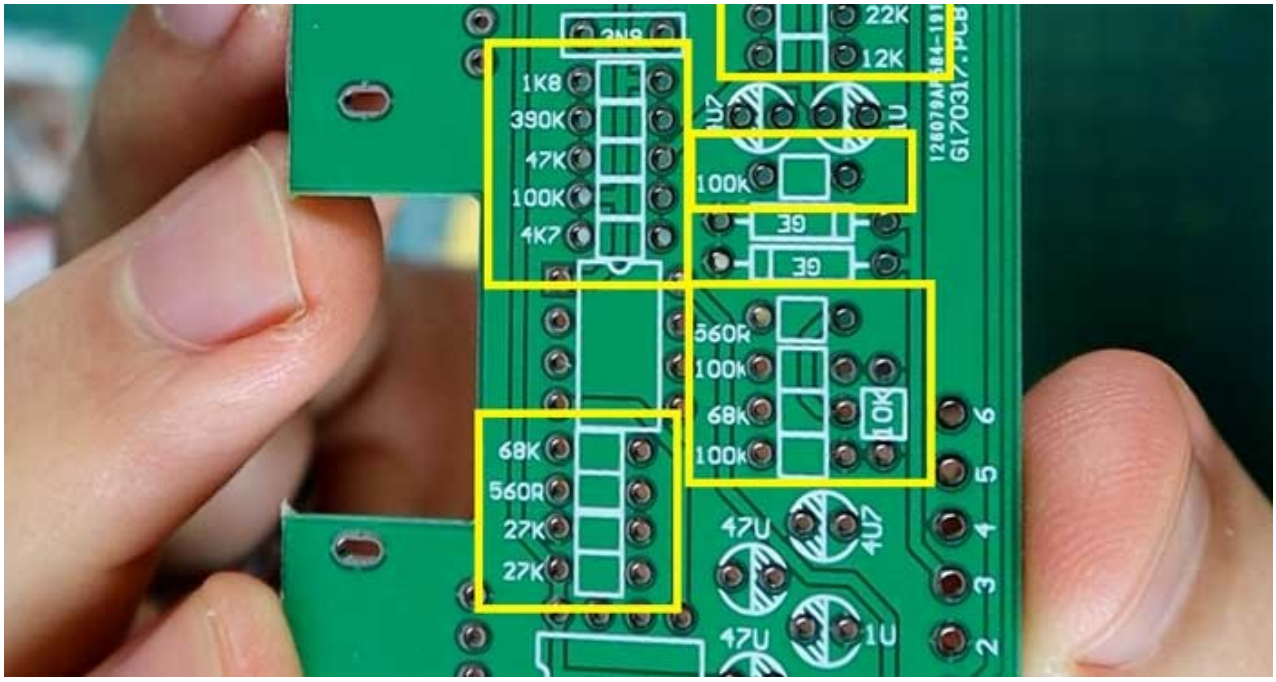
Start by sorting out all of your resistors. Line them all up on your table from lowest to highest value. This makes it easier to find them as you populate your PCB.



The resistor values will be labeled as shown below:



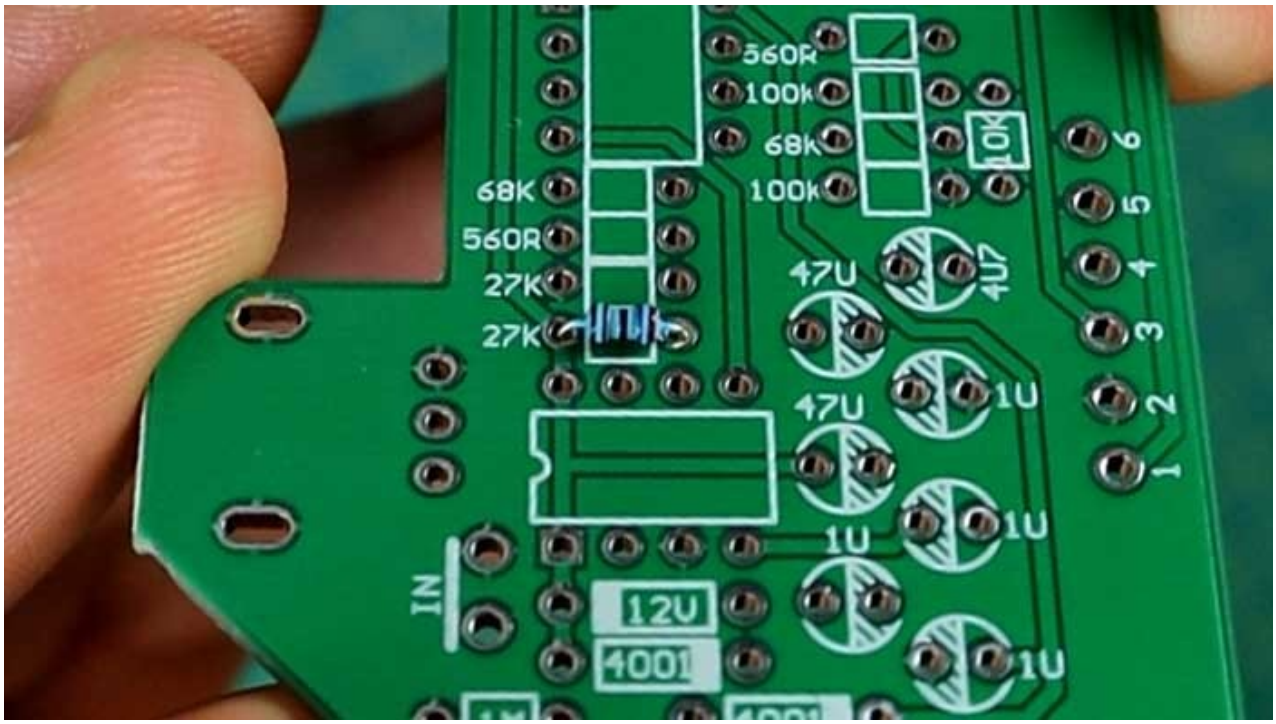
The resistors will be labeled with numbers and either a R, K, or M. Resistors are labelled on the PCB with a small box in between two holes. Take a look at the PCB for these letters and the small boxes to identify resistor components:



The resistors is highlighted in this section in the yellow boxes. An important thing to pay attention to is the difference between a resistor like 4K7 and 47K. The 4K7 means 4.7K, so don’t mix these up. You’ll notice this same way of labeling the decimal point with the capacitors (4U7 and 47U shown above on the right circles).

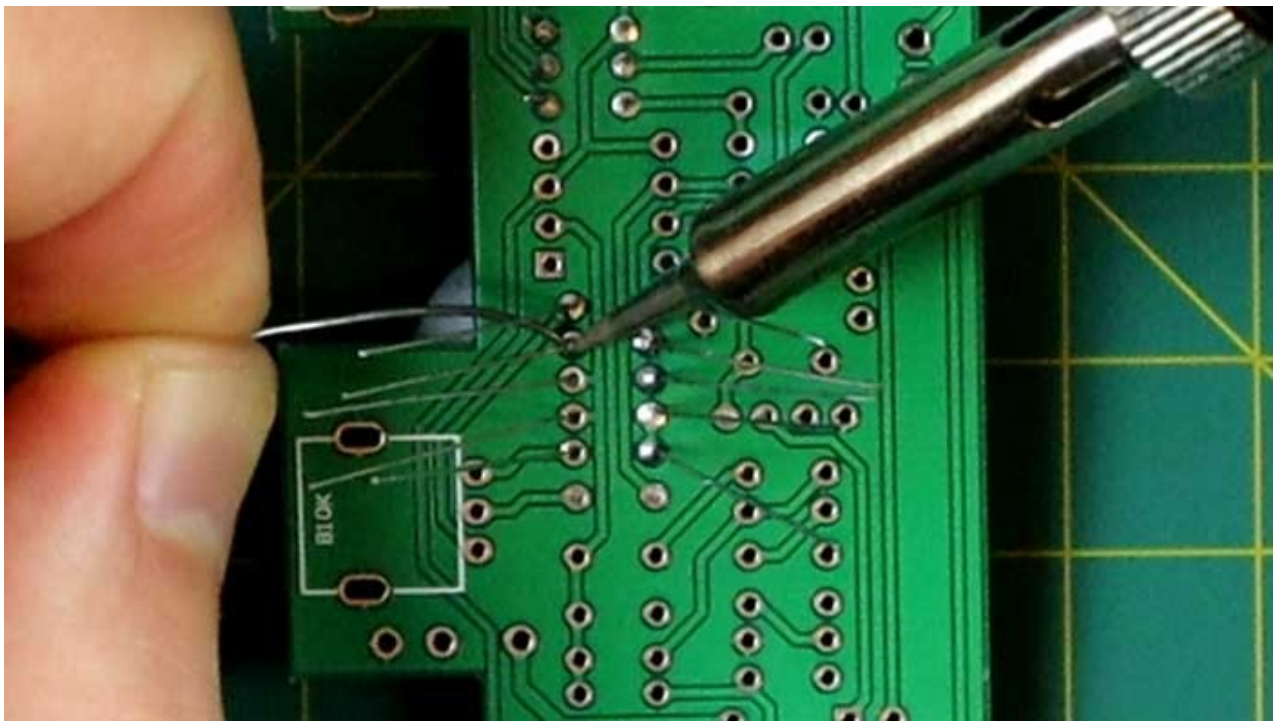
Soldering Resistors

Once you have sorted your resistors out, it’s time to add them to your PCB and solder them.You can either solder one at a time, working in blocks of a few at a time, or position all of them at once and solder all of them in one hit. We suggest starting with one at a time if this is your first pedal build. Match up a resistor then bend the wires so it rests nicely against the PCB as shown below:

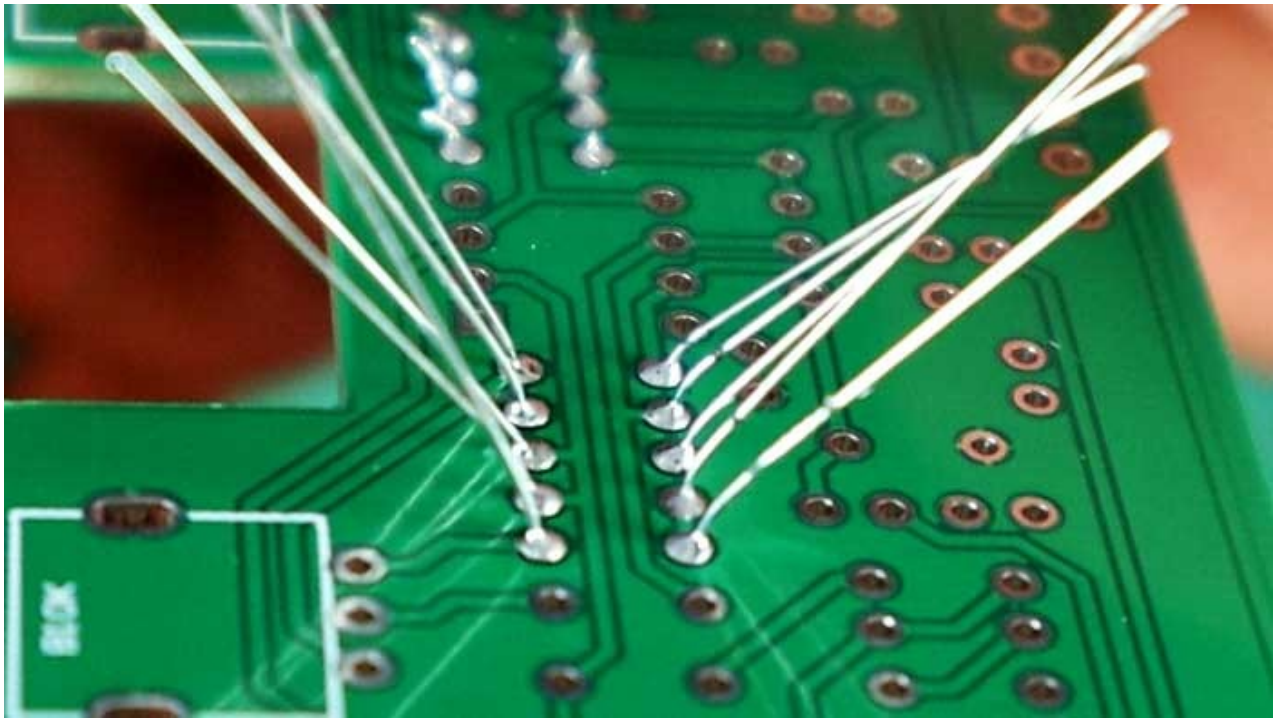


Note: it doesn’t matter which way the resistors go. Other components need to be orientated in the correct direction, but you don’t need to worry about that with resistors.

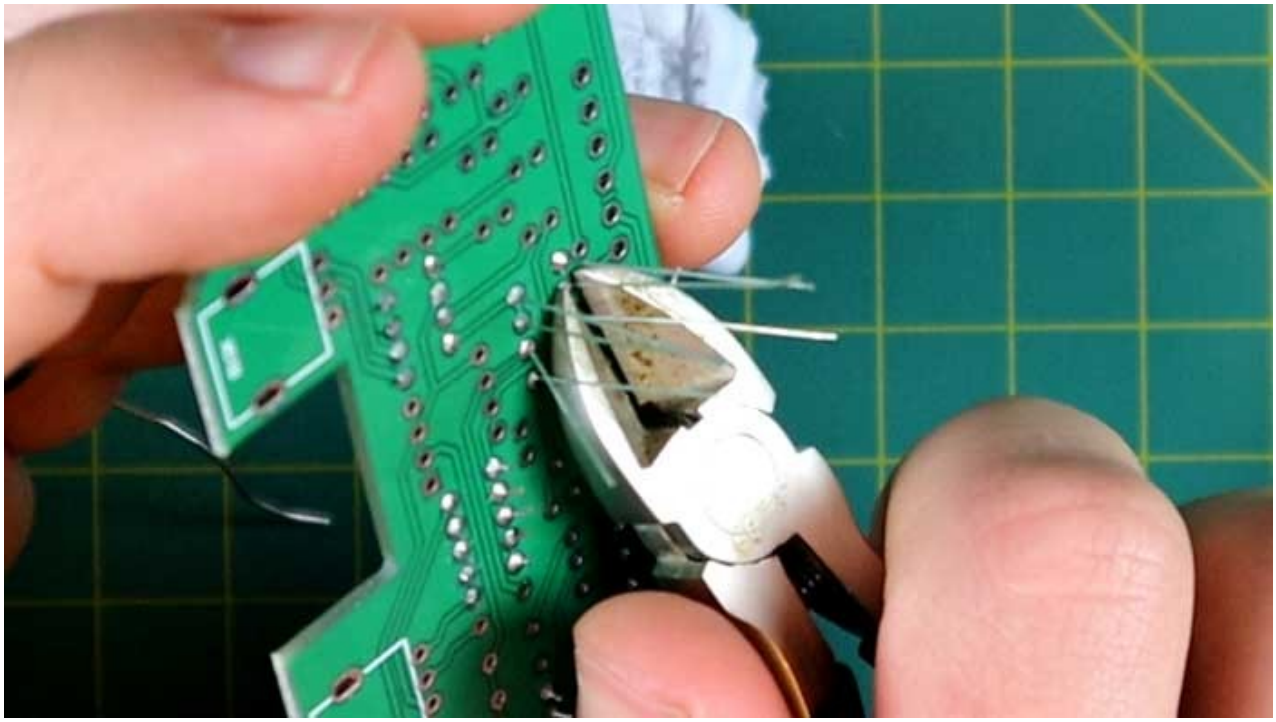
You can slightly bend the wires at the back to hold the resistor in position. This is handy if you want to solder a few components at once. You definitely don’t want them to all fall out before you solder them! When you solder the resistors, heat up one side of the wire with the soldering iron and add the solder from the other side. Try to avoid touching the solder directly on the iron.



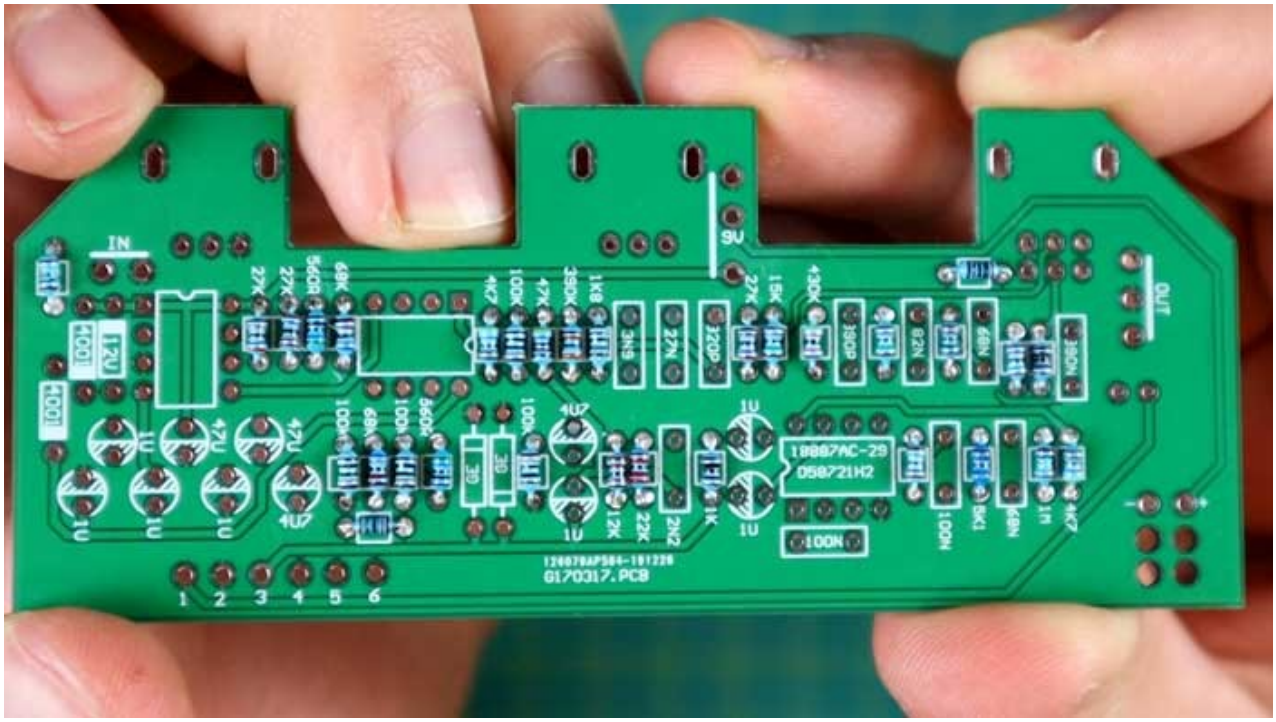
The aim is for the solder to melt from the heat of the component's wire and not from direct contact with the solder. This takes some practice, but once you can do this, you'll end up with much better quality solder joints. Here's what your solder joints should look like:



Trim the back of the wires off as you go and try to keep the ends short to avoid possible shorts.



Remember that the resistors are the small boxes, so the larger boxes are for different components. Here’s what your board should look like once you have soldered all of the resistors:



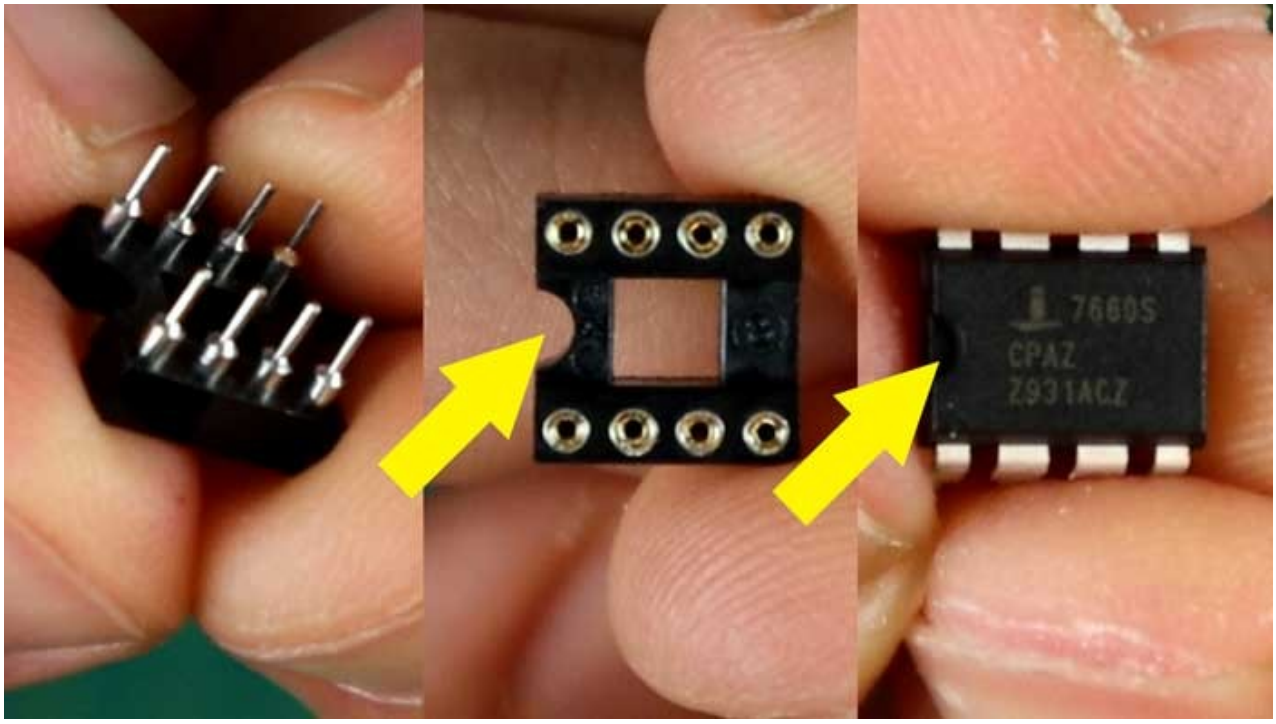
Don’t forget the resistors on the far left, the bottom left, and the top right. It took me a while to find these positions because they don’t line up like the others.

Step 2: Diodes and Sockets

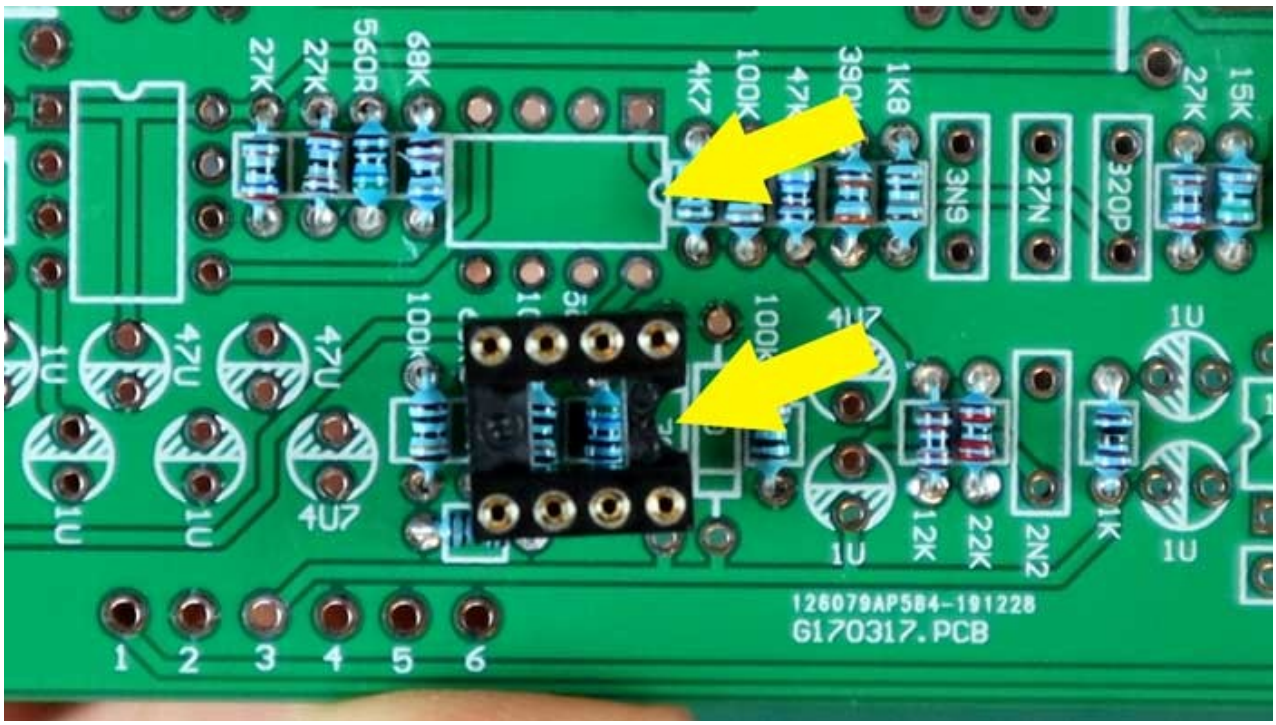
The Klon Centaur uses three chips held onto the PCB using sockets. These sockets ensure you don’t damage the chip by overheating during soldering.

Sockets and Chips

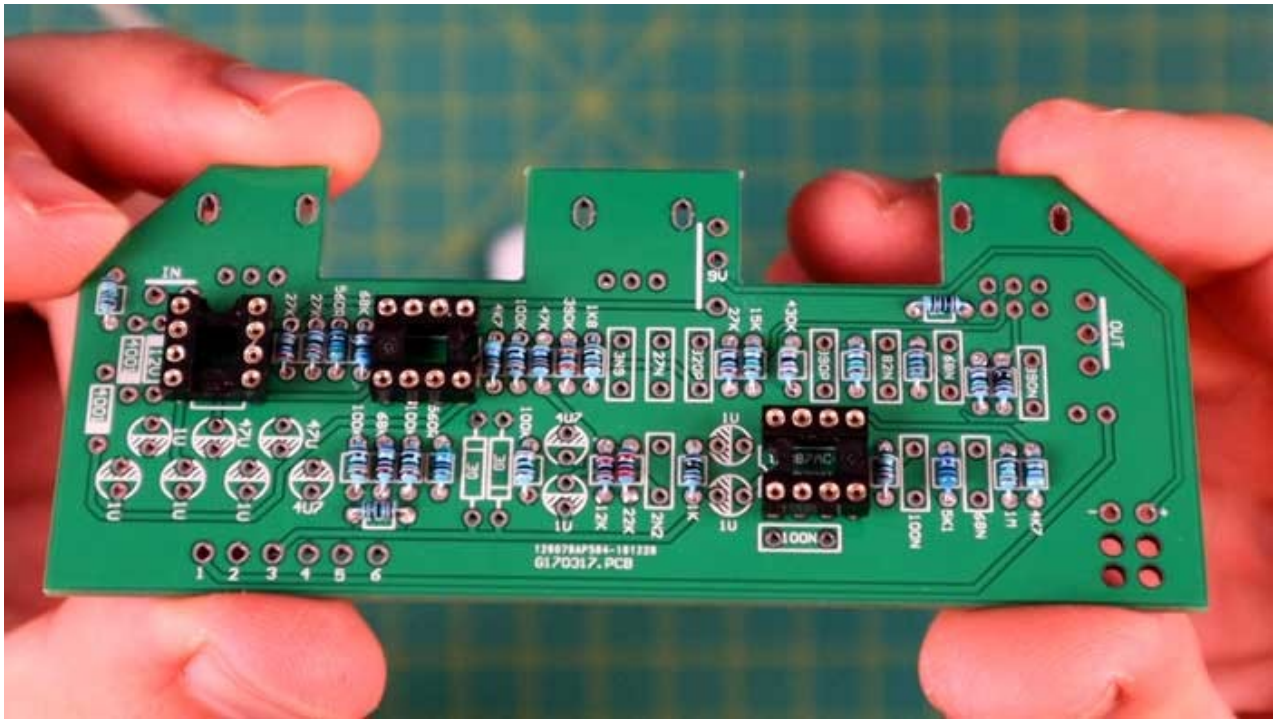
The important point to remember with the sockets and chips is that they have a semicircle cutout to help you identify which way to install them.



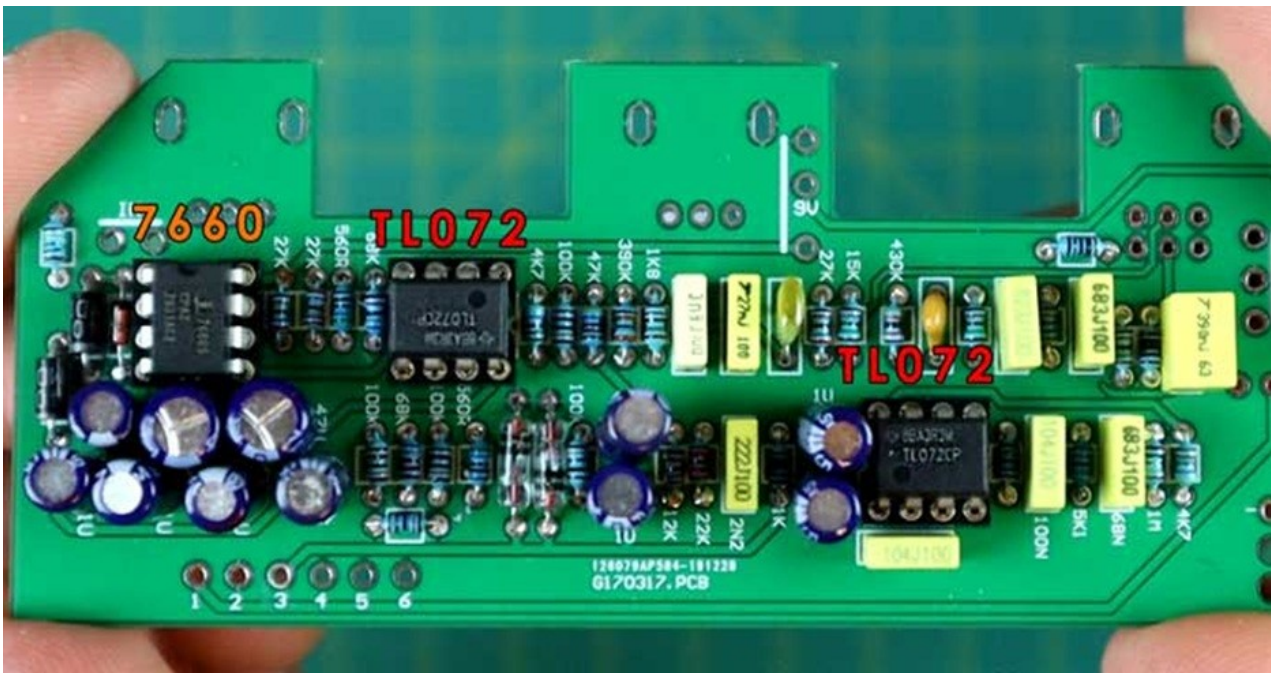
Notice that in the above photo, the semicircle on the chip matches the semicircle on the socket. Two of the chips in the kit will have a circle towards one end of the chip instead of a semicircle. On the PCB, you’ll see this same semicircle to show which way to install the sockets.



While it doesn't really matter which way you install the sockets (don't panic if you put them in the wrong way), it does help you line up the chips properly. Make sure the chip direction matches the direction shown on the PCB or your pedal won't work. Make sure the socket is resting fully against the PCB as you solder it in to avoid it sitting crooked. Here's what your sockets should look like after you solder them in:



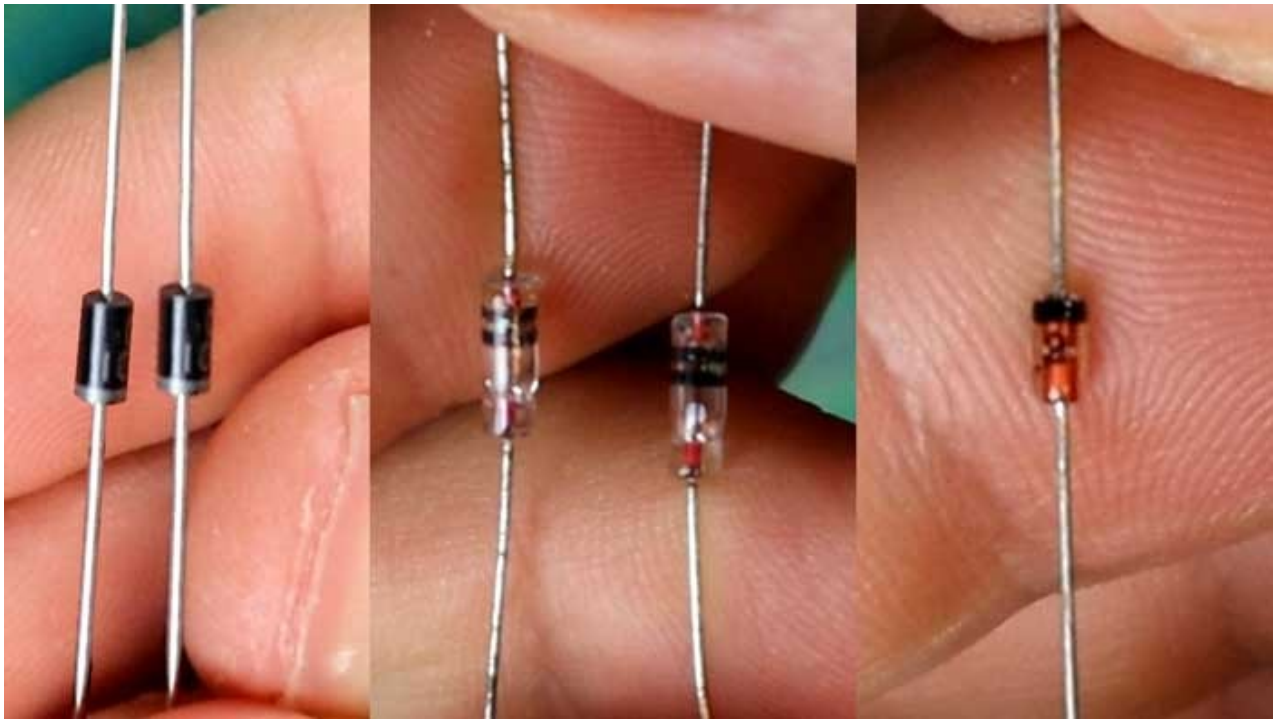
We recommend installing the chips later on after everything else is installed. There are three op-amp chips to install. Two TL072 chips (with a circle to show direction) and one 7660 chip (with a semicircle cutout). The 7660 chip is installed on the far left position (aligned vertically). The other two chips go in the middle and right positions.



Notice the circles on the two TL072 chips. Make sure those circles are closest to the notch in the socket. Push the chips in all the way but be careful not to bend any of the pins.

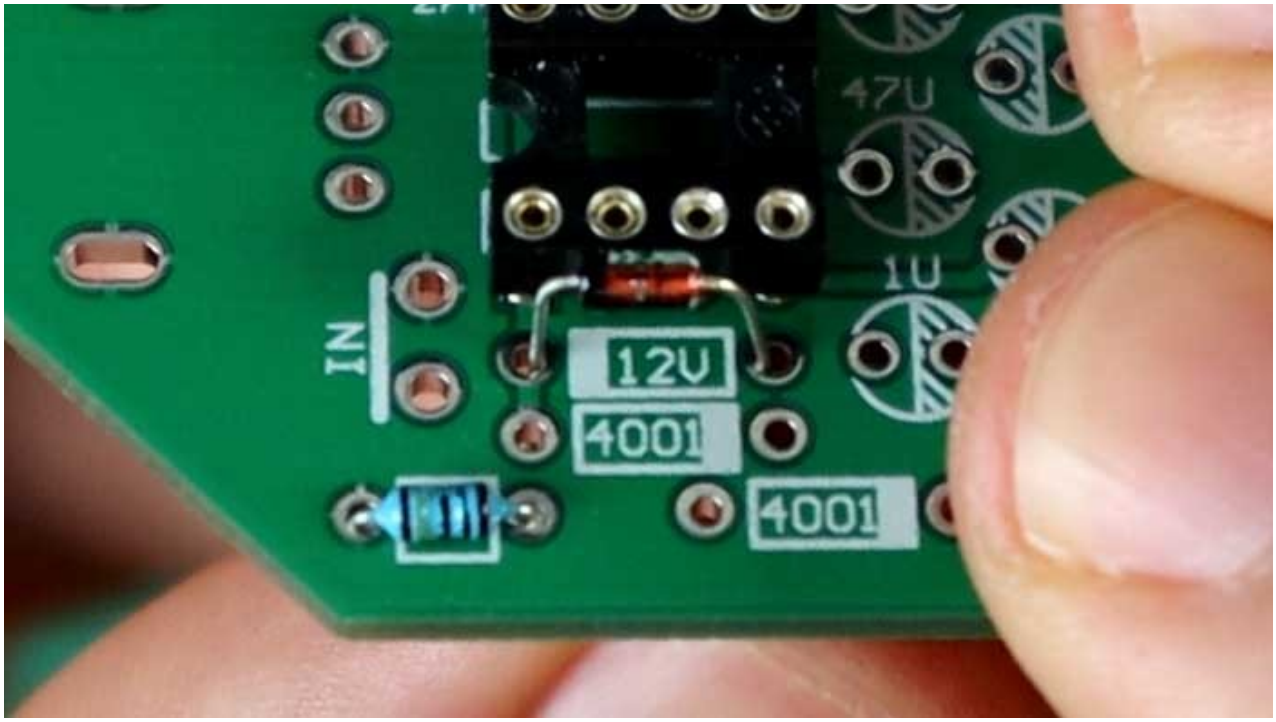
Diodes

There are three different diodes used in the Klon kit, which can cause some confusion. The odd one out is the one on the far right in the below photo. This diode is installed in the position labeled ’12V’.

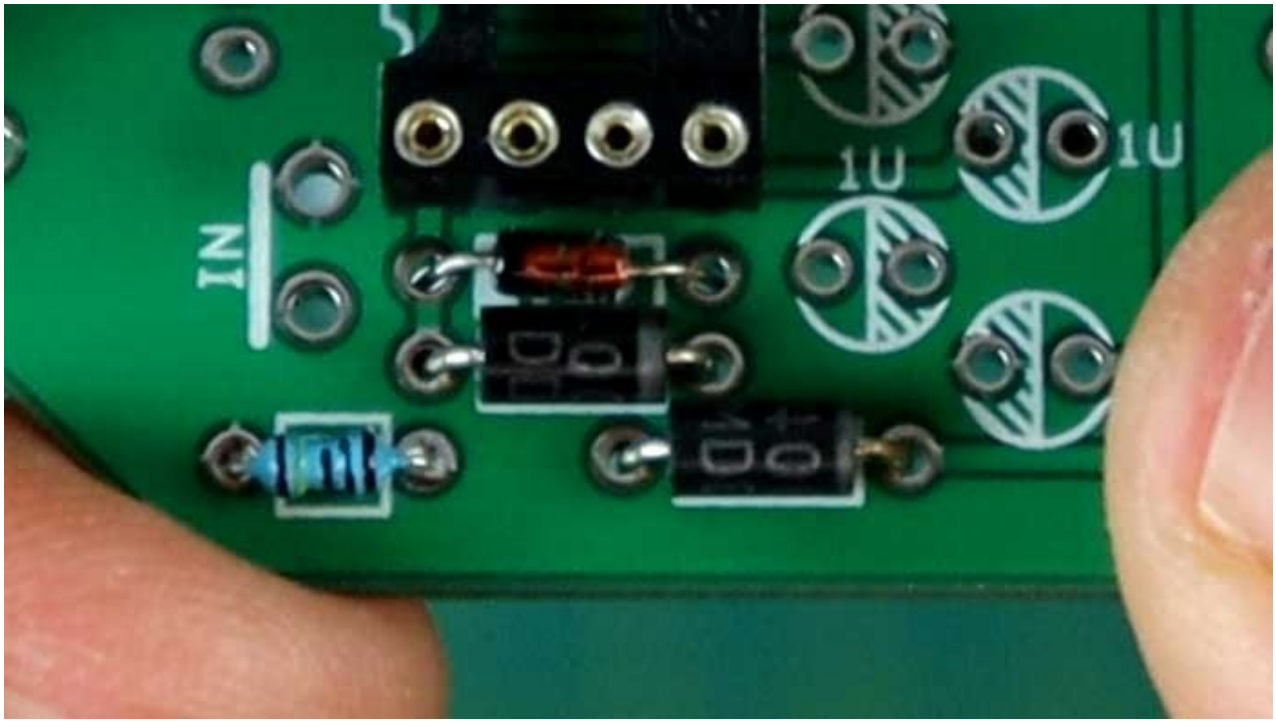


The important thing to remember with diodes is that they must be installed in the correct direction. All diodes have a line (or two lines) on one end that must align with the instructions on the PCB.

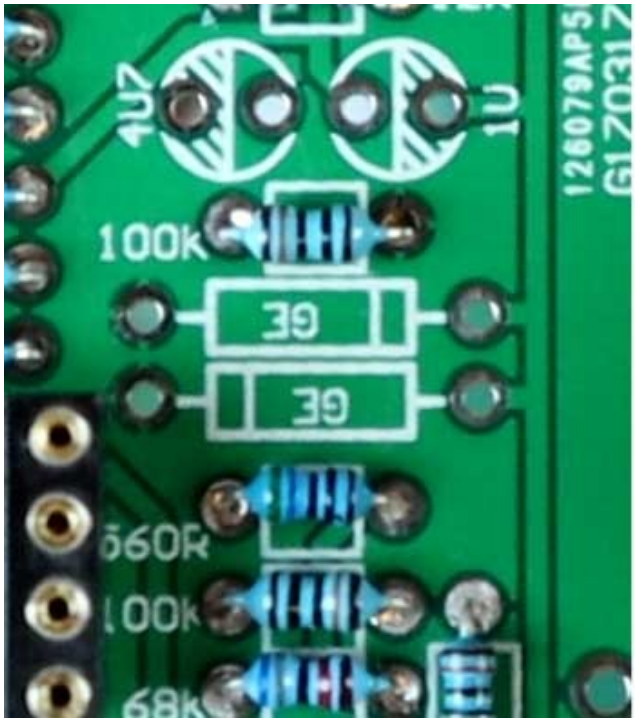
In the below photo, you can see that I have lined up the black line with the line on the PCB.



The two diodes labeled 4001 below the 12V diode are the silver and black diodes (silicon). Line the silver lines up to the right as shown in the above PCB.



The last two diodes are installed in the positions labeled ‘GE’ for germanium. Align the double lines as shown below:



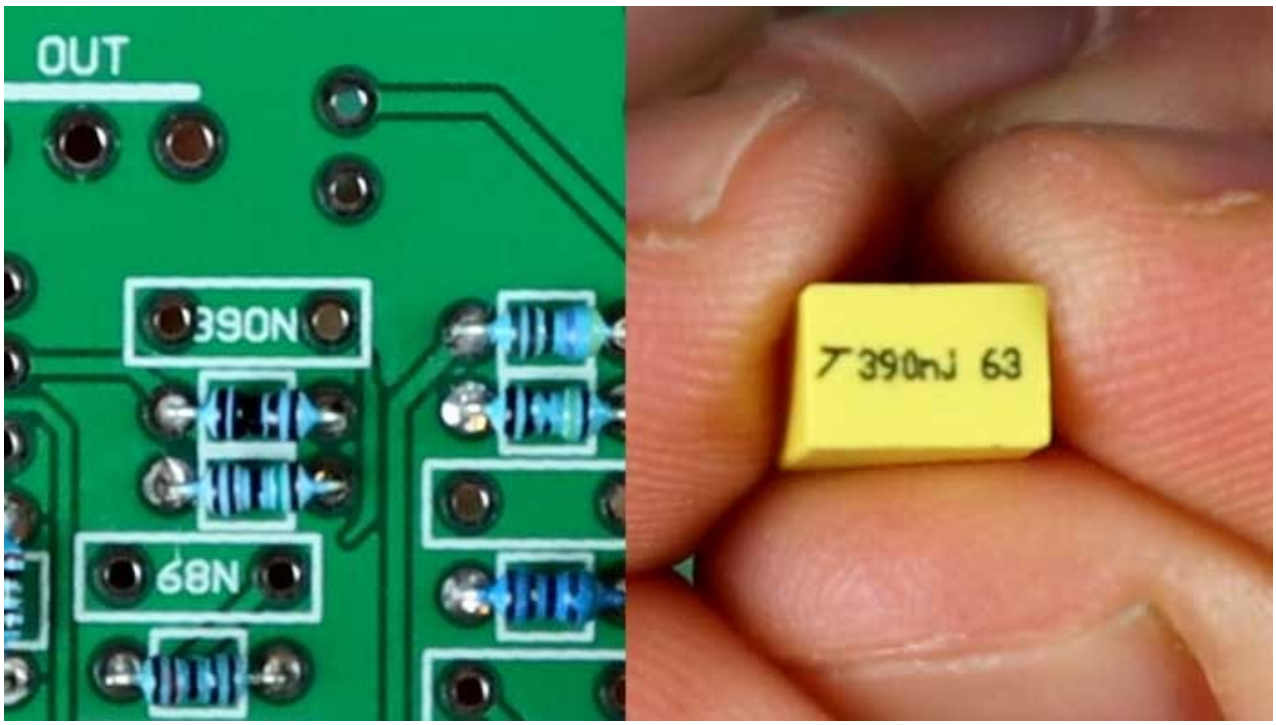
Once you have correctly soldered in the diodes, you can move on to the last components that need to be installed.

Step 3: Capacitors

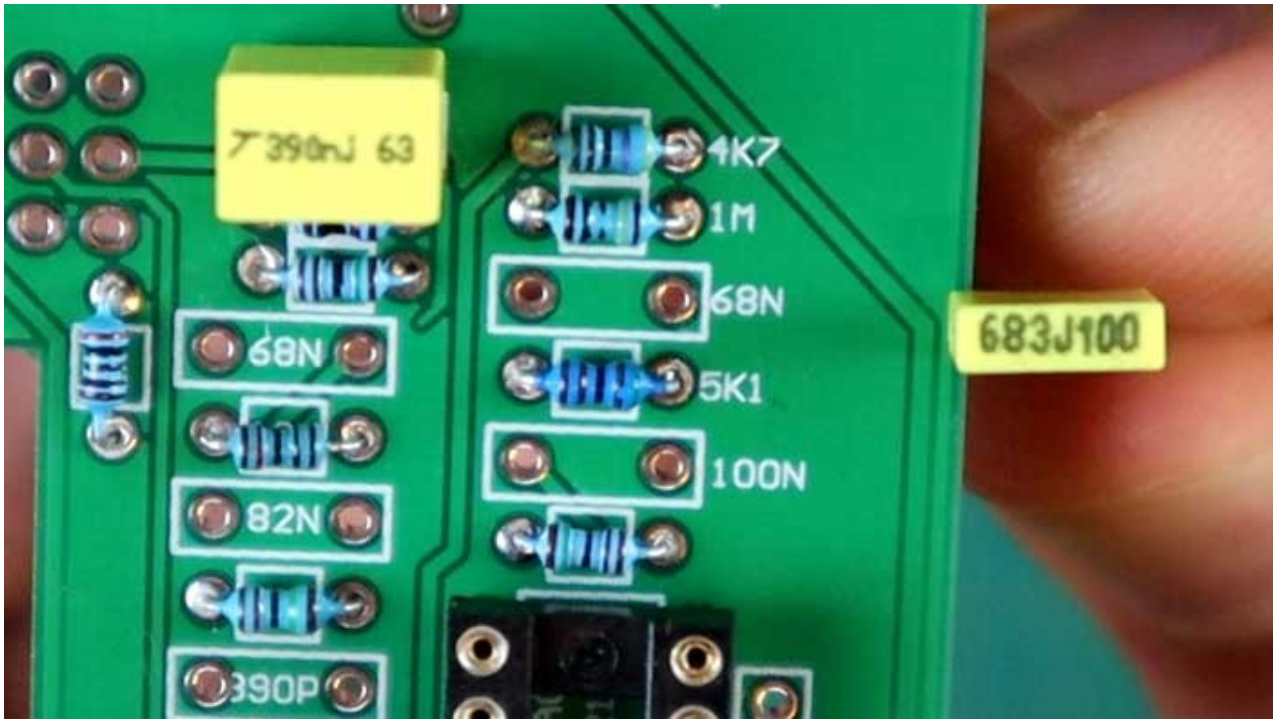
There are two main types of capacitors to install in your Klon kit – electrolytic and polyester box capacitors. There will likely be a couple of odd-looking capacitors if your kit is like mine, so I’ll go through them.

Yellow Box

Start with the yellow box capacitors. These are labeled on the PCB with the large rectangles and a number such as 390N or 68N.



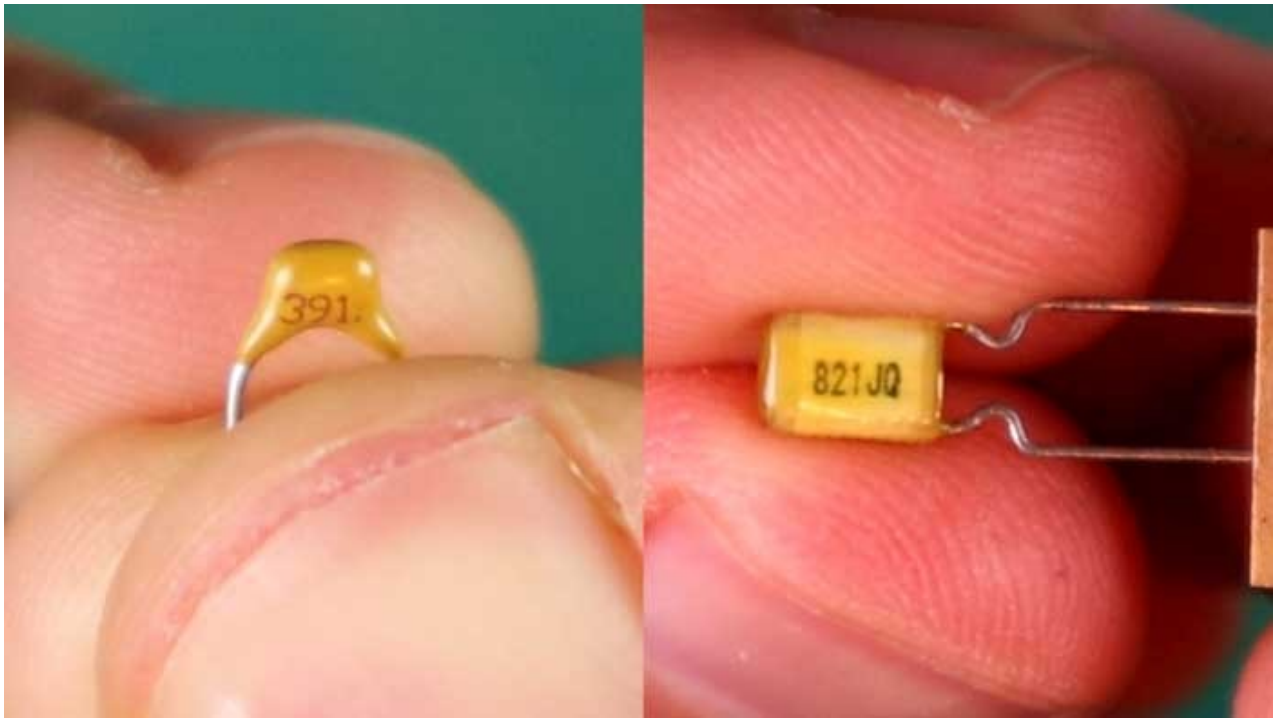
Some of the numbers will match up perfectly like the above 390N, while others may slightly vary. For example, the 68N reads as 683J100 on the box as shown below:



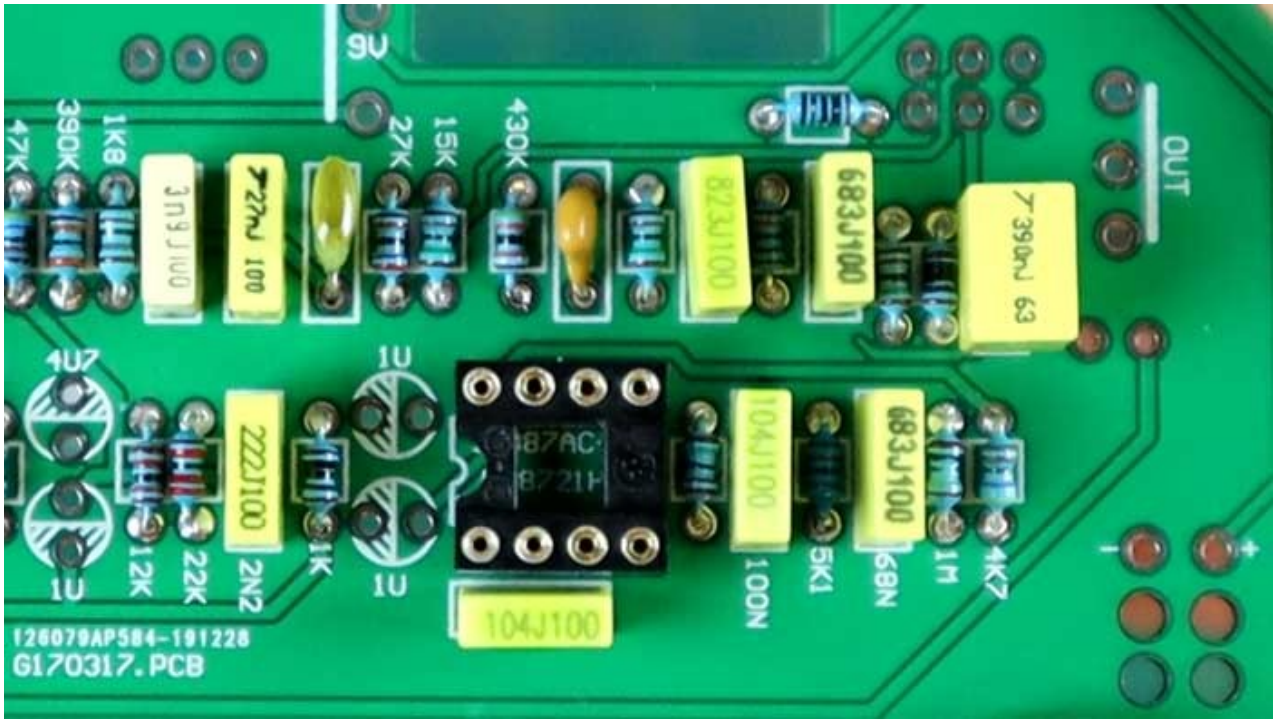
If you’re ever unsure, simply Google the code on the capacitor to find out what the value is. **The yellow box capacitors can be installed in either direction.**

Be careful not to heat the component legs too long or it may damage the capacitor.

Once you have installed all the yellow box capacitors, you may or may not end up with two that look like these:



The 391 ceramic capacitor is for the position labeled 390P on the PCB.
The 821JQ capacitor is for the position labeled 820P. The ‘8’ on the PCB is cut off, so it may look like 320P. Don’t worry if your capacitors look different than these. Google the codes if they differ from these to double-check that you have the correct values. Here are all the yellow capacitors installed so you can double-check the codes and positions:



While it doesn’t matter which way you install these capacitors, it helps if you install them all in the same direction so you can easily read the codes.

Electrolytic

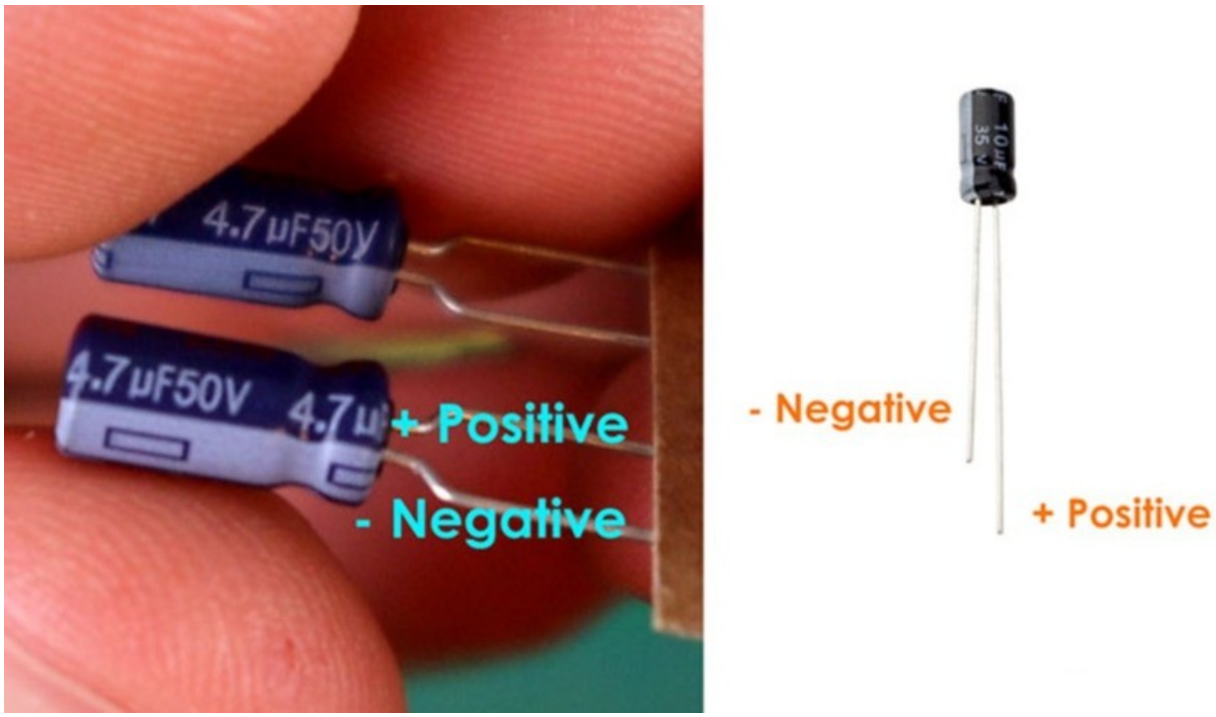
Electrolytic capacitors are the bigger cylindrical components and they can come in a few different colors. Most common dark blue or black, but don’t worry if yours differ.

Electrolytic capacitors must be installed in the correct orientation or your pedal won’t work.

There are two ways to read the orientation of an electrolytic capacitor:

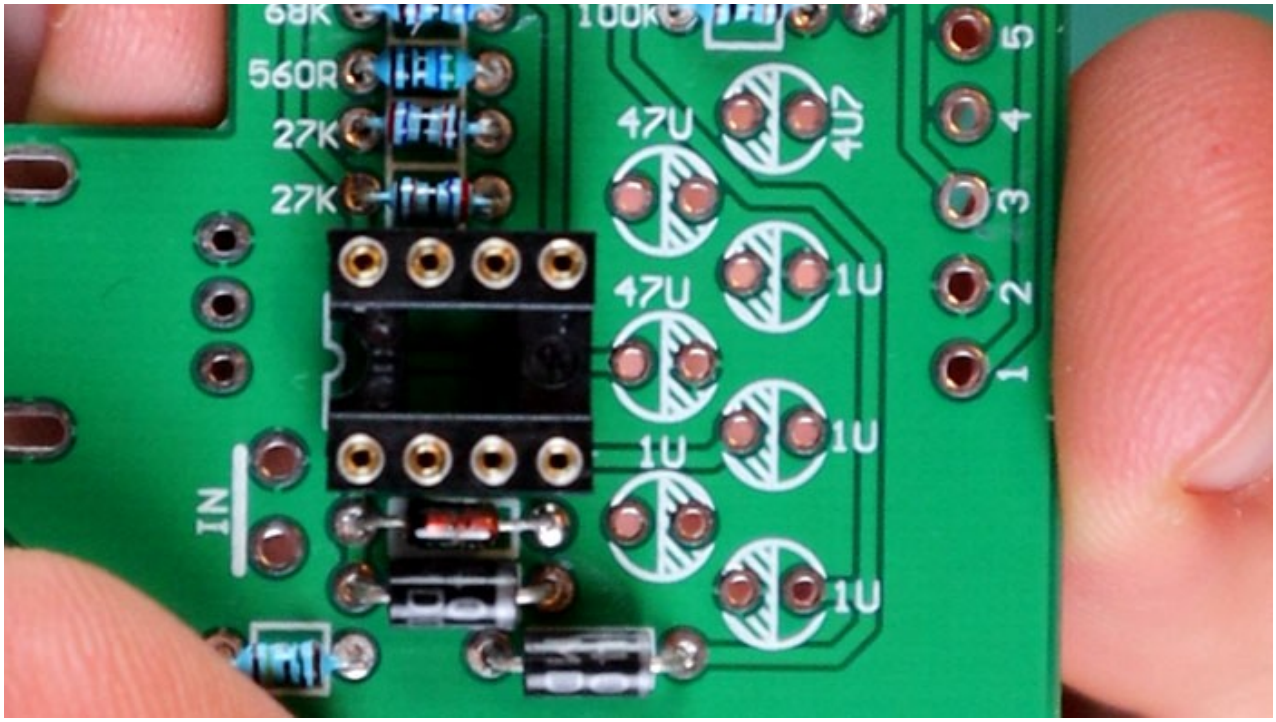
- One side of the capacitor will have a thick line running down with a negative symbol (-)
- The longer leg is positive (+)

The below diagram shows what to look for:



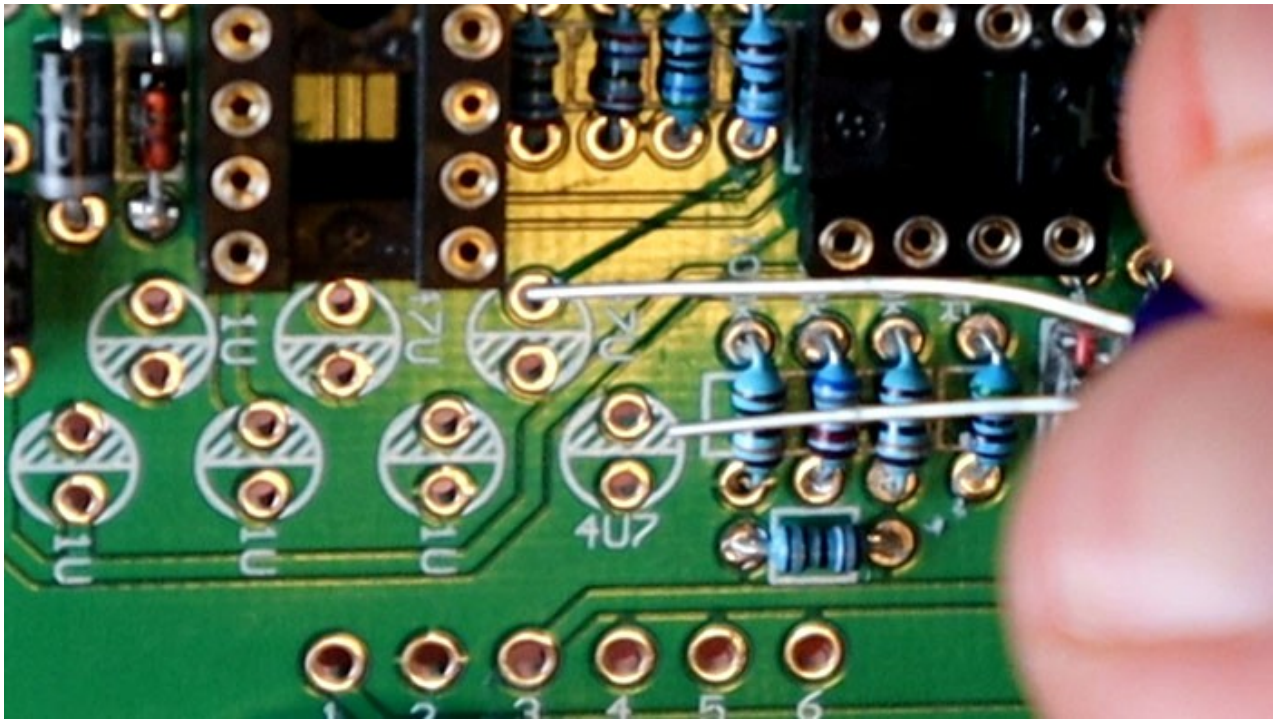
While some electrolytic capacitors may look different, they all follow these two ways of identifying which side is positive and which side is negative. The value of the capacitor will also be written on the side. The above-left capacitor shows as 4.7µF. On the PCB, 4.7 is shown as 4U7 (this is similar to how resistors with decimal points are displayed).

On your PCB, the electrolytic capacitors are the circles and should be the only positions without components at this point:



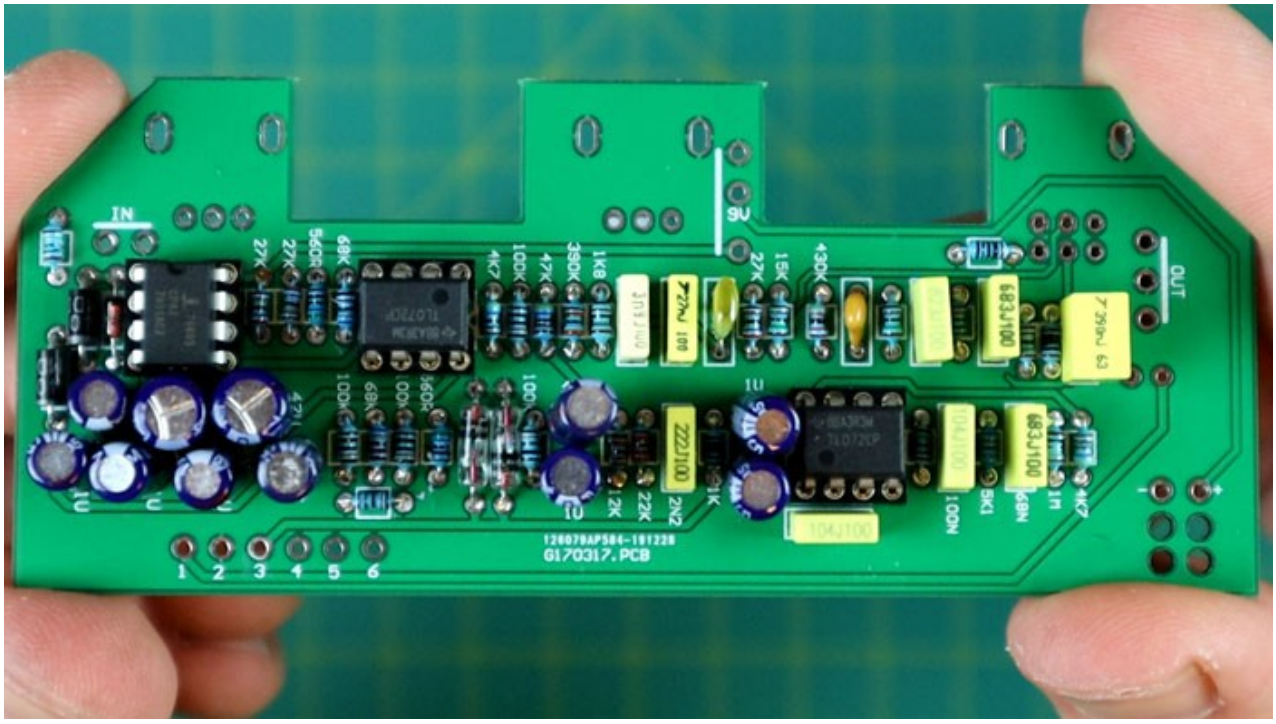
Notice the 4U7 capacitor on the top right. This is for the 4.7µF capacitor. Don't mix up the 4.7µF and the 47µF capacitors!

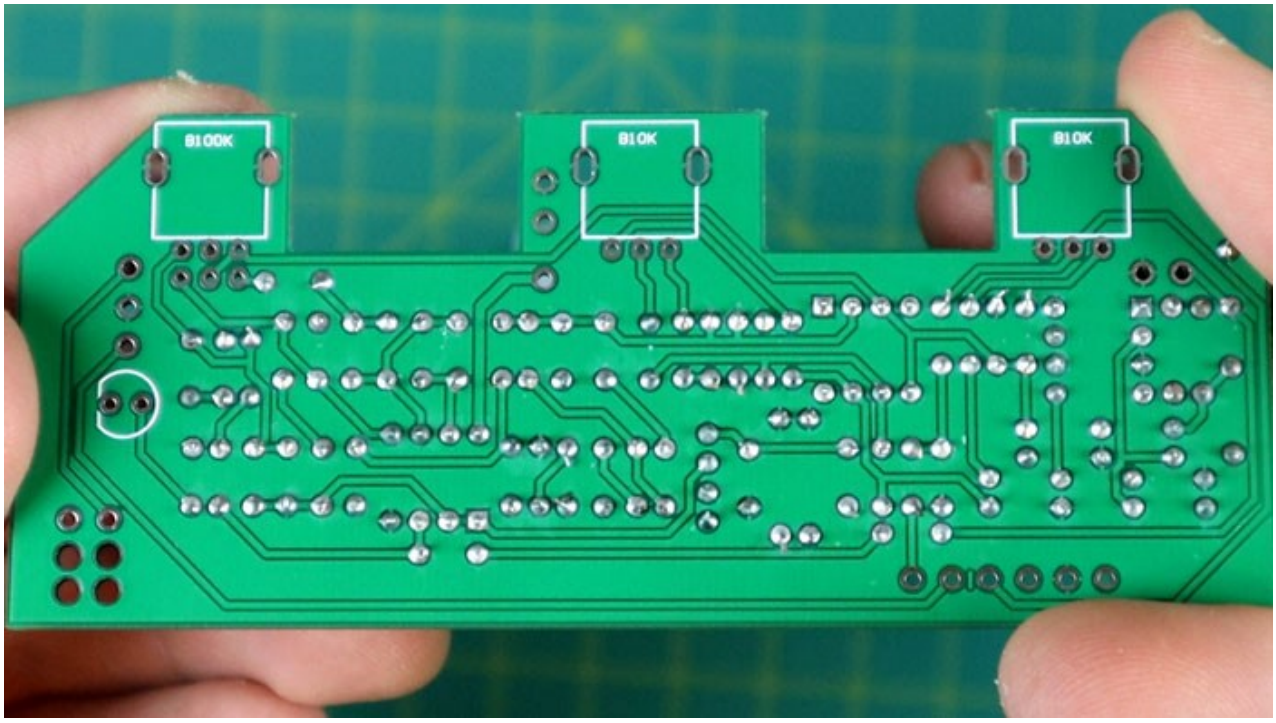
The side of the circle with the striped lines is the negative side. This means the long leg is inserted into the blank side of the circle as shown below:



You'll find after installing a couple of these that there's not much room between each one. They quickly become cramped and press against each other (which is okay).

Once you have installed all of these capacitors, you have completely populated the PCB. Insert the op-amp chips if you haven't already done so and your board should look like this:

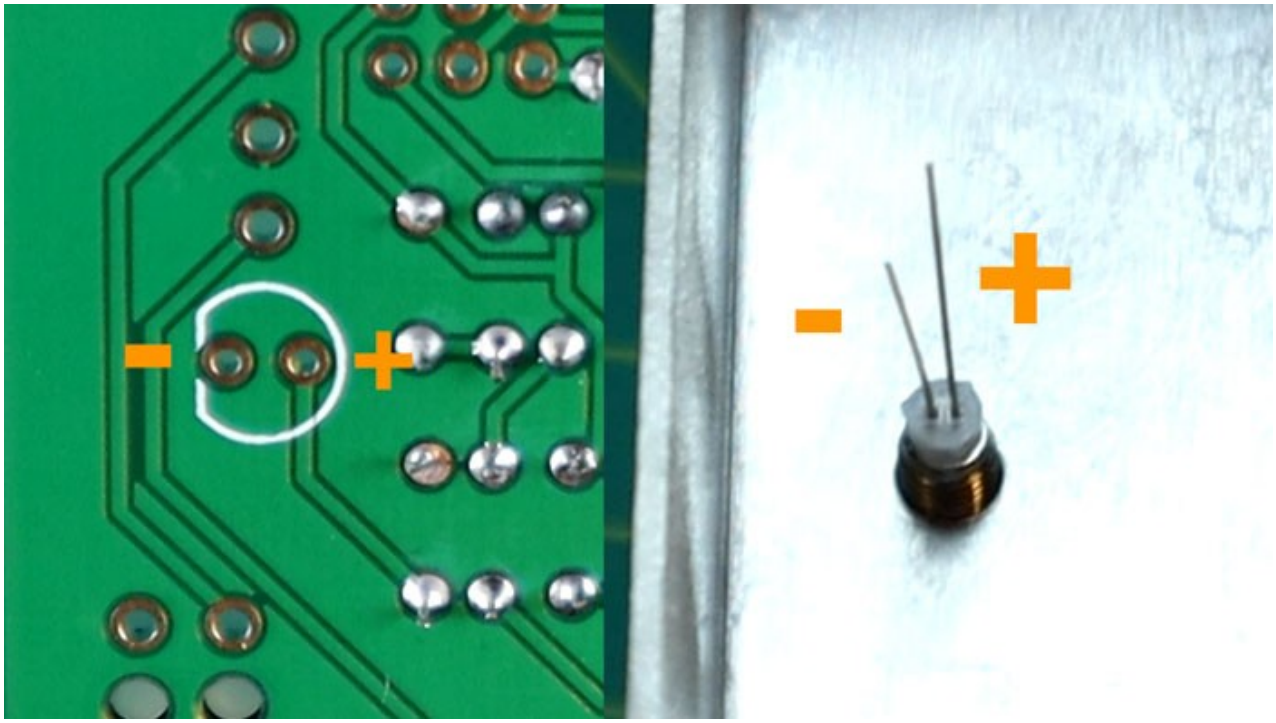




Step 4: Mounting Pedal Hardware

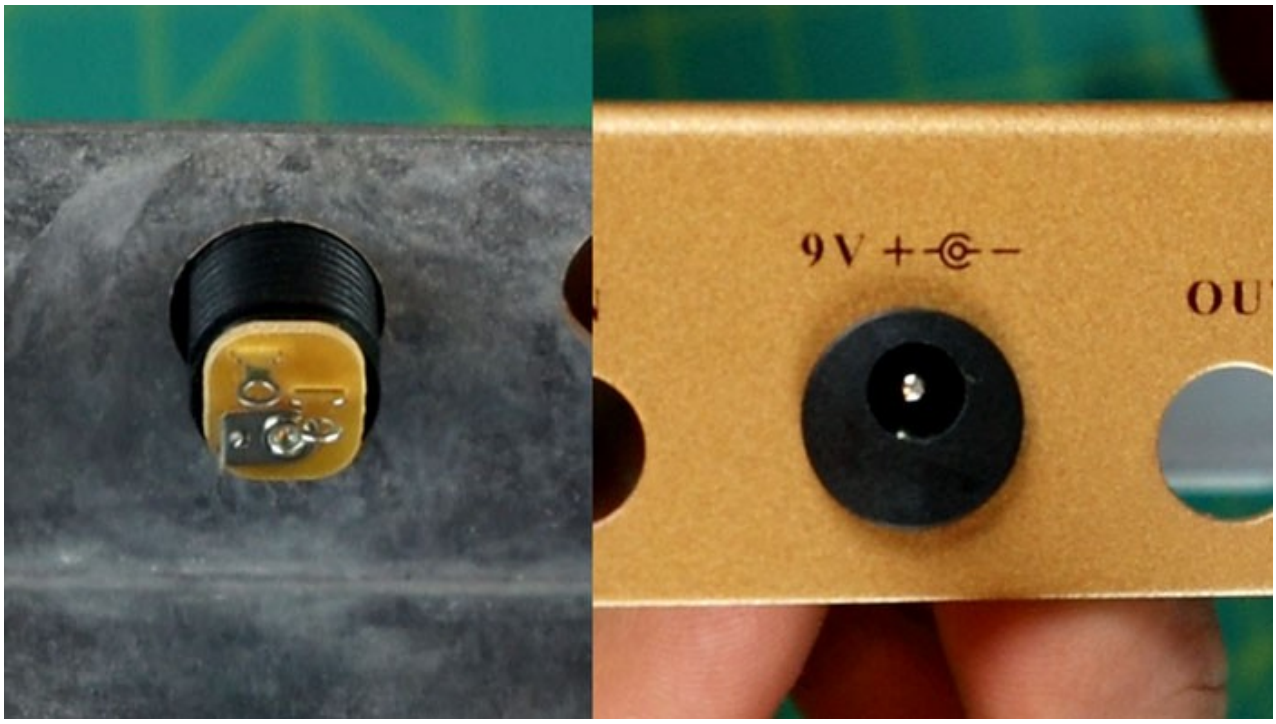
Now it’s time to mount some of the parts into the pedal enclosure. It’s important to do this before you solder the potentiometers onto the PCB. Start by installing the mounted LED. Remove the screw and insert the LED into the correct position.

Add the screw back onto the LED but don’t completely tighten it until the LED is orientated the correct way. The LED needs to be soldered onto the PCB, so we need to make sure it lines up with the correct holes. On the back of the PCB, you’ll see a symbol for the LED as shown below:



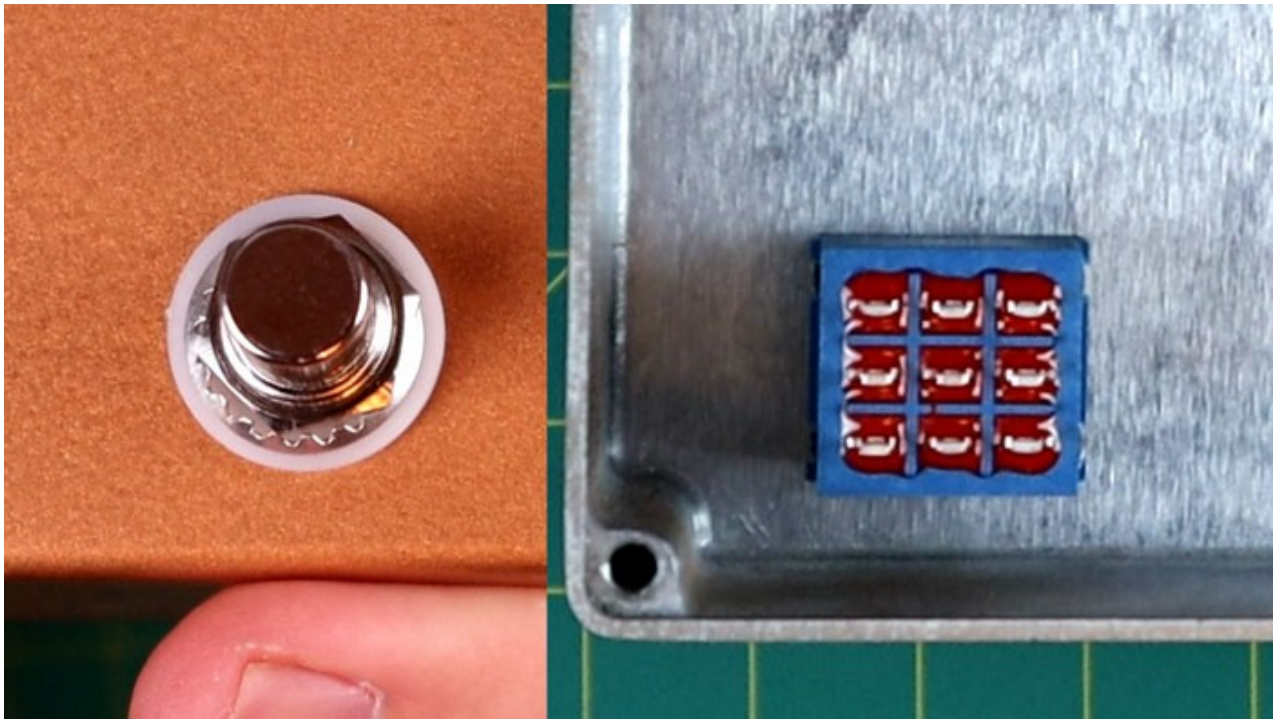
The flat side of the LED symbol is negative, which matches the short leg of the LED. Line up the LED so the short leg (negative) points towards the edge of the enclosure. Tighten the nut once the legs are lined up as shown in the above photo.

Remove the power jack's nut and insert it into the enclosure as shown below.



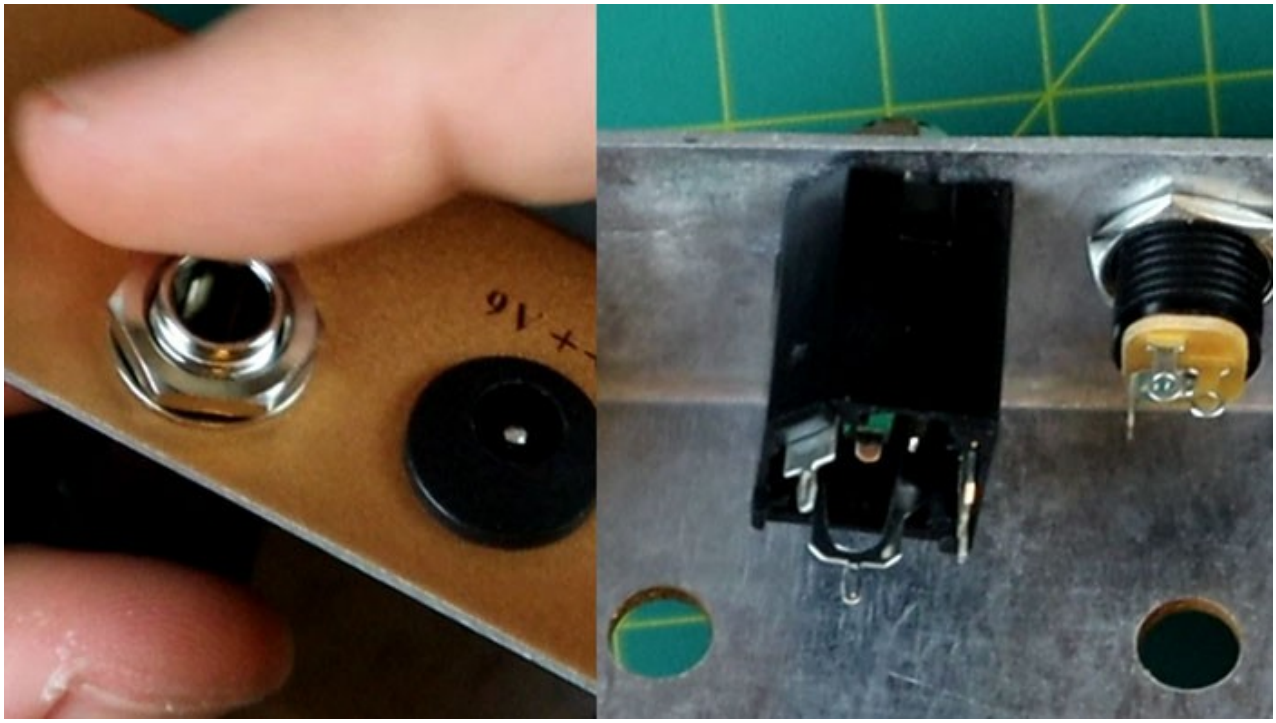
Tighten the nut once you're happy with how it lines up. I suggest keeping it the same as you see above so you can follow along with my wiring instructions.

Install the footswitch and line it up so the inside lugs match the below photo:



It’s important that the footswitch lines up this way or you may have issues with wiring. The holes in the nine connection points should be pointing up and down, not side to side.

It doesn’t really matter which way the input and output jacks line up. But we suggest you to orientated them both the same way to make wiring easier.



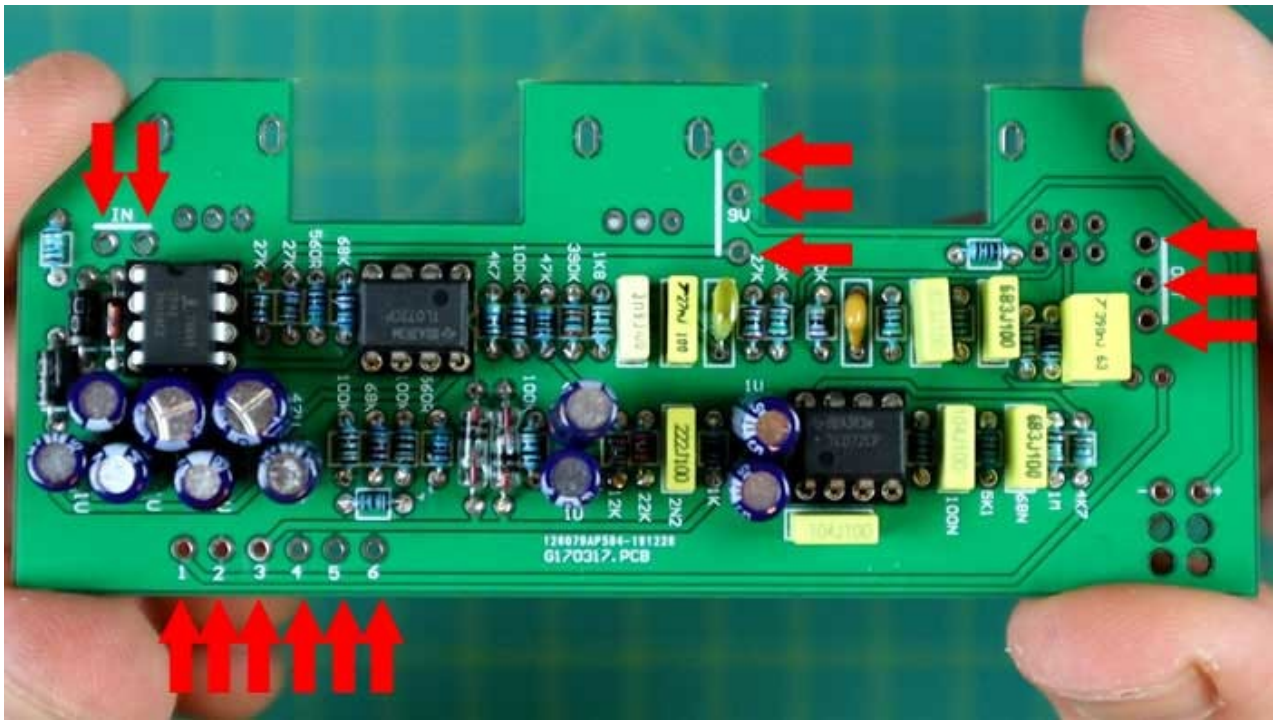
Once you have all of these parts mounted, your pedal enclosure should look like this:

Step 5: Wiring

Wiring is the most confusing part of building this kit. If you follow this guide, you won't have to worry. The kit comes with three colored wires: red, black, and white. Other kits only had one color for all of the wires. Regardless of the colors of your wires, pay extra attention to how you wire up your pedal.

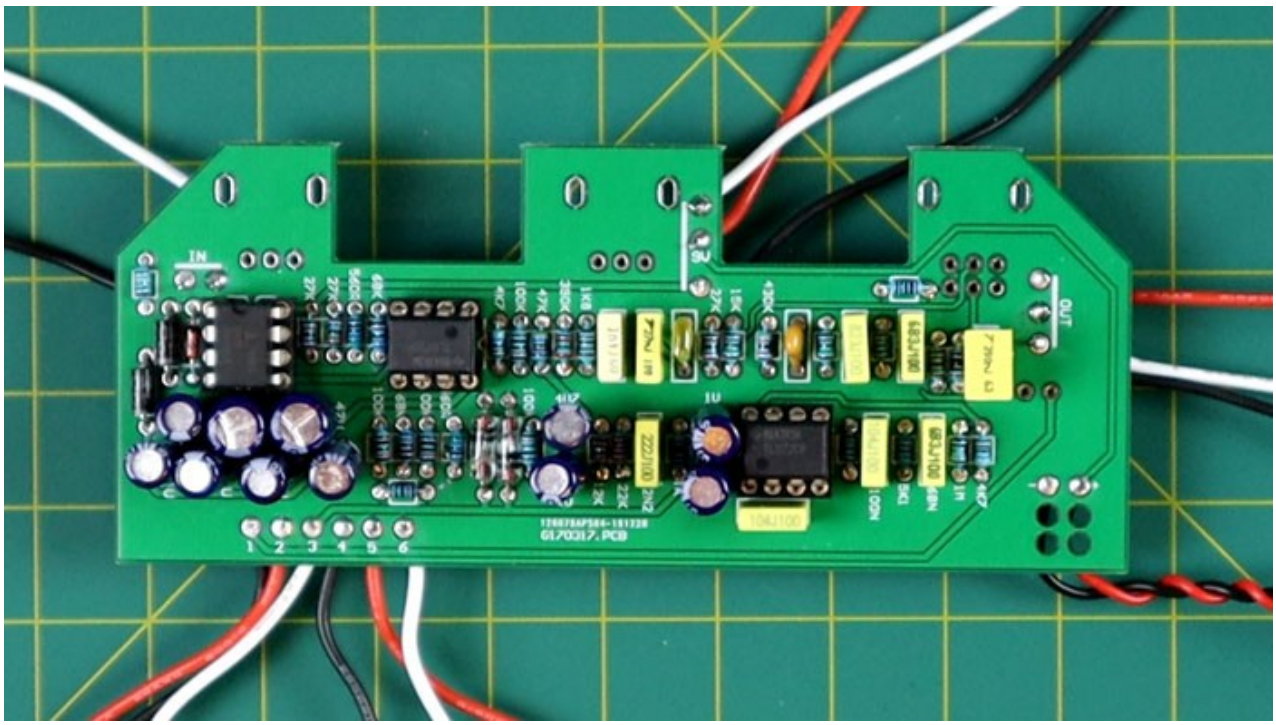
Add Wires to PCB

The first step is to add wires to all of the points on the PCB.
There are 14 points you need to add wire to your PCB (and another two for the battery clip).



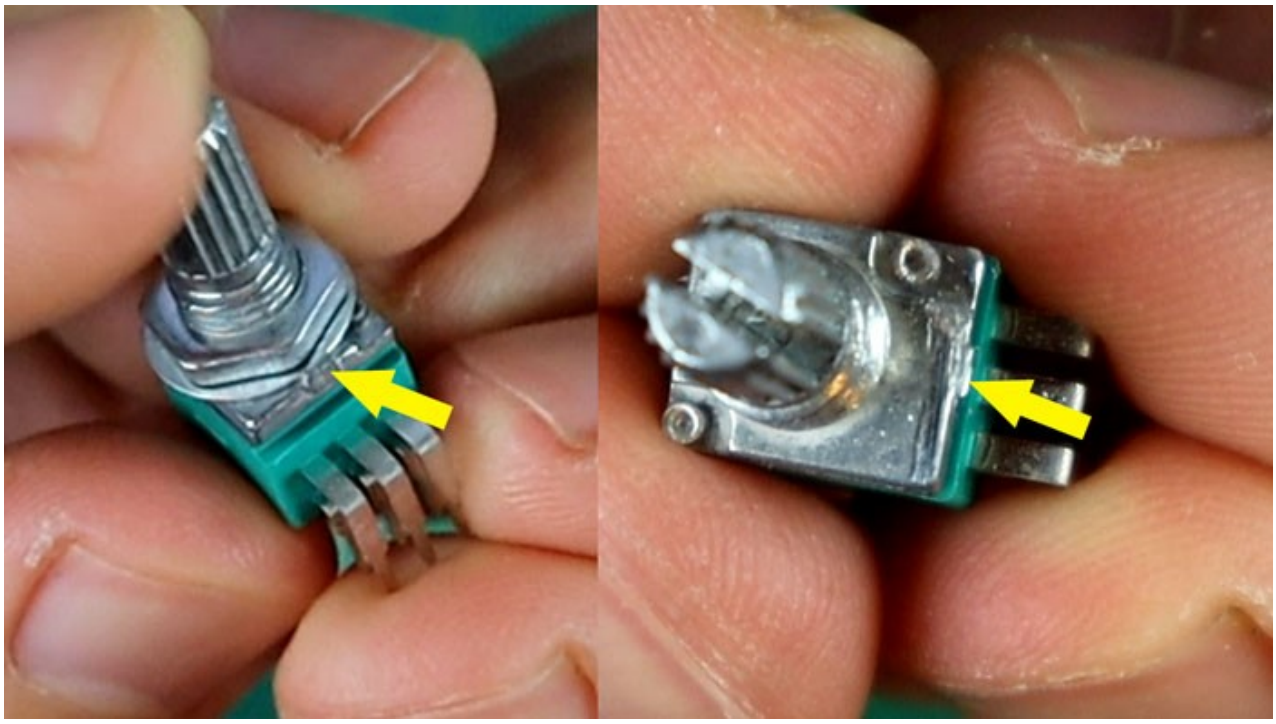
The top left is for the input jack, bottom left for the footswitch, middle for power, and right for the output jack.

In the photo below is the wiring added from the underside. We recommend to add wires from the top of the PCB. Its more easy to see the connections. It's up to you which side you add the wire to the PCB. Here's the wired PCB with the battery clip wired up on the bottom right:



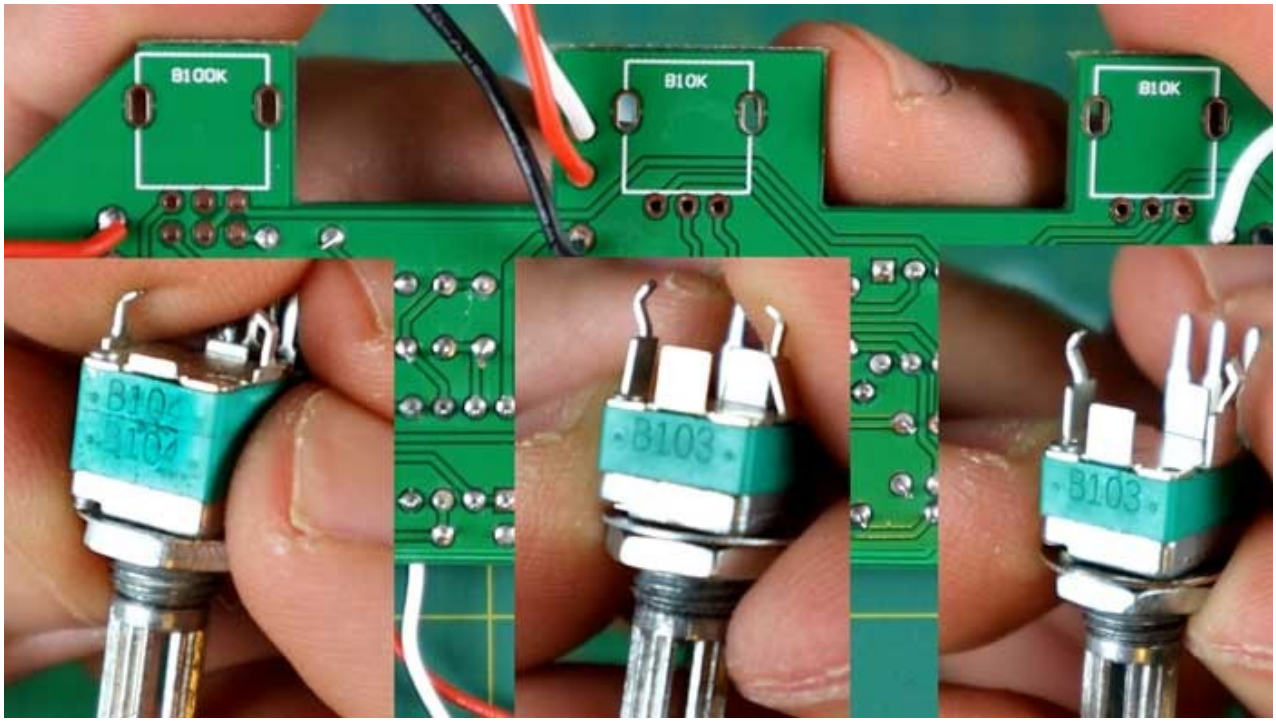
Potentiometers

Once your PCB is completely wired up, it’s time to mount the potentiometers.
Before you mount your potentiometers, there’s a little positioning nub you need to file or grind off. These nubs prevent the potentiometers from sitting flush against the pedal enclosure. So if you don’t file them off, you’ll end up with crooked knobs.

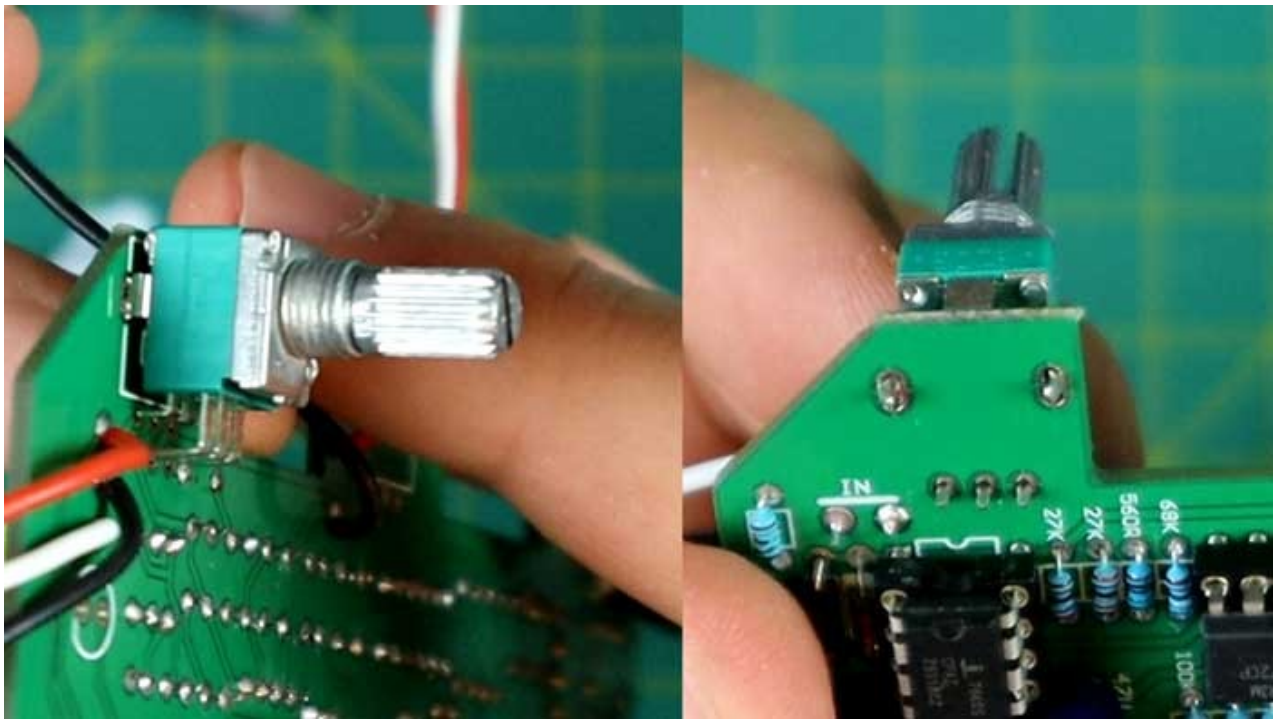


Use a file or grinder to carefully remove the nub. Remove the nut and washer before you try to grind the nub off. You can see on the above right what it should look like after

removing the nub. There are three potentiometers to install and you need to install them in the correct positions. The PCB labels each potentiometer position as shown below:



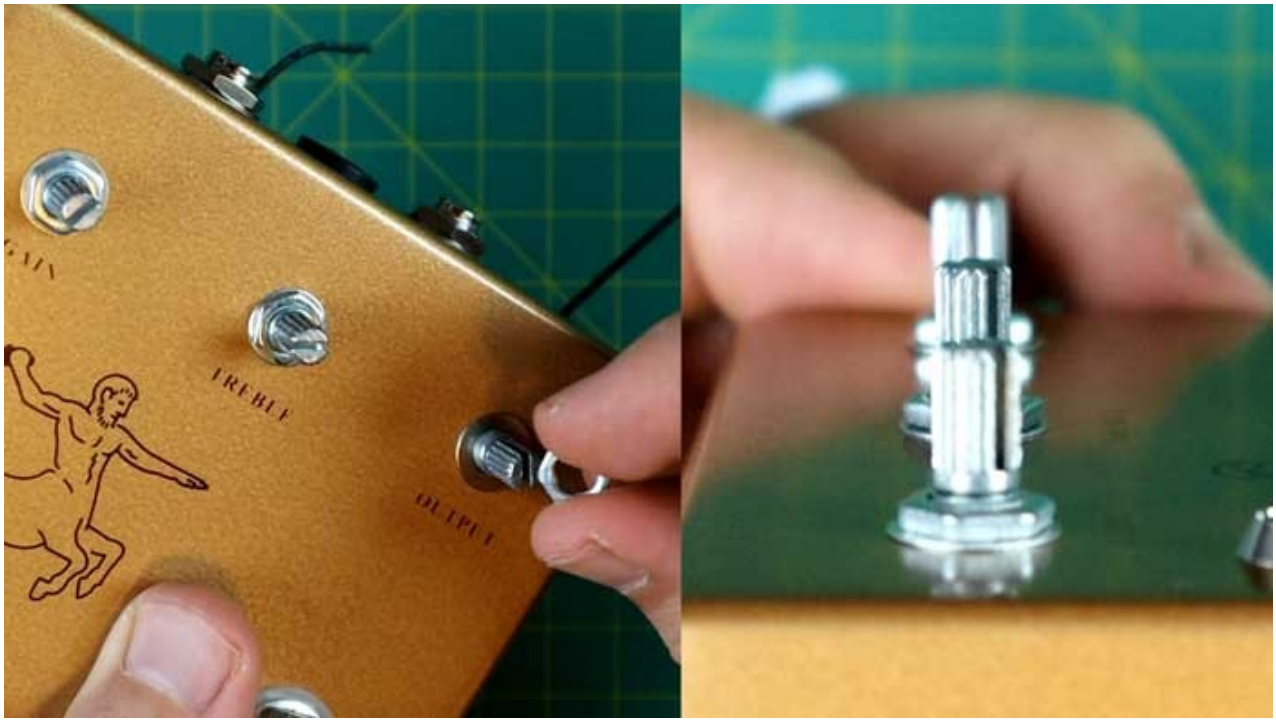
B104 is the B100K potentiometer (far left), and B103 is the B10K potentiometers.
The easy way to tell these apart is that the B100K potentiometer has six legs, while the other two only have three. Carefully mount the potentiometers from the underside of the PCB. You may need to use some pliers to gently bend the support legs if needed.



Once these are mounted, don’t solder them yet.

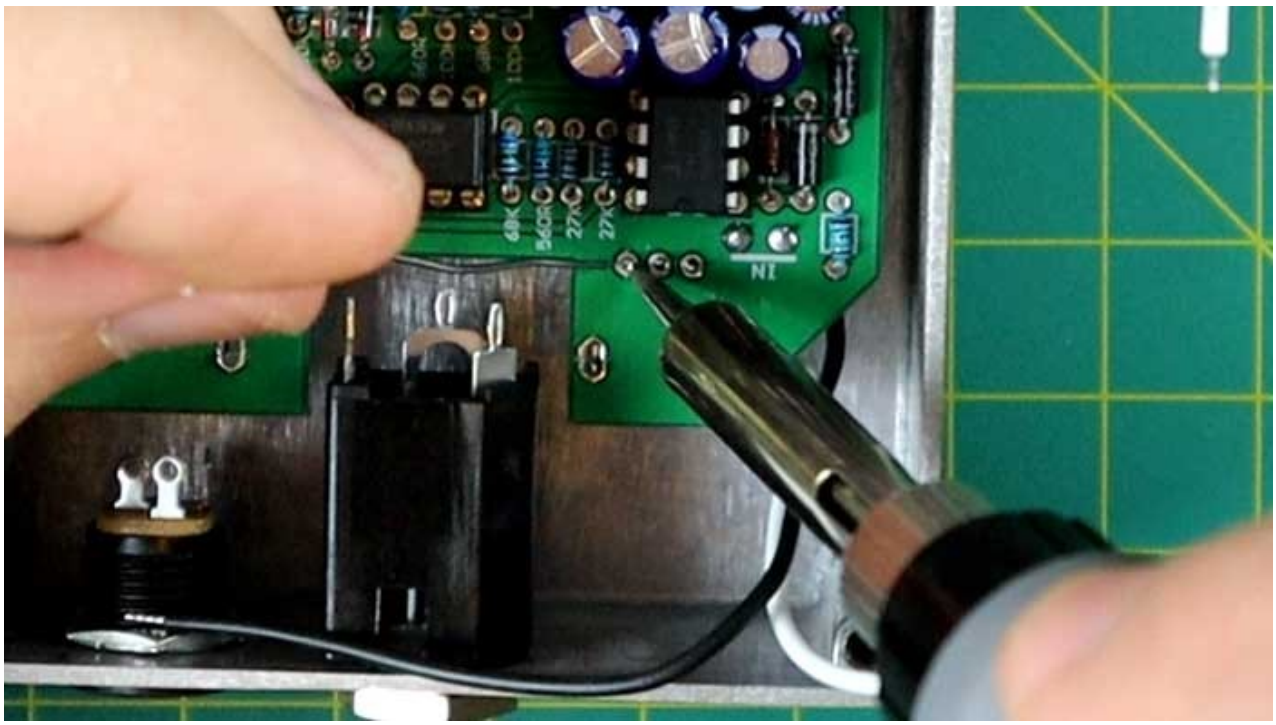
If you were to solder these in now, there’s a slight chance that they don’t perfectly line up with the holes in the pedal enclosure. Trying to force the potentiometers into the holes after they have been soldered puts stress on the solder joints and the PCB. To avoid this issue, mount the PCB and poke the potentiometers through the holes.

Note: as you push the potentiometers through the holes, make sure the two legs from the LED go through the two holes on the PCB. This is a little tricky, so start by poking the longer leg through the first hole, then follow with the shorter leg.
Tighten the nut and washer on each potentiometer.



Notice that the potentiometers are perfectly straight in the above photos. This may not have been the case if I soldered them to the PCB beforehand.

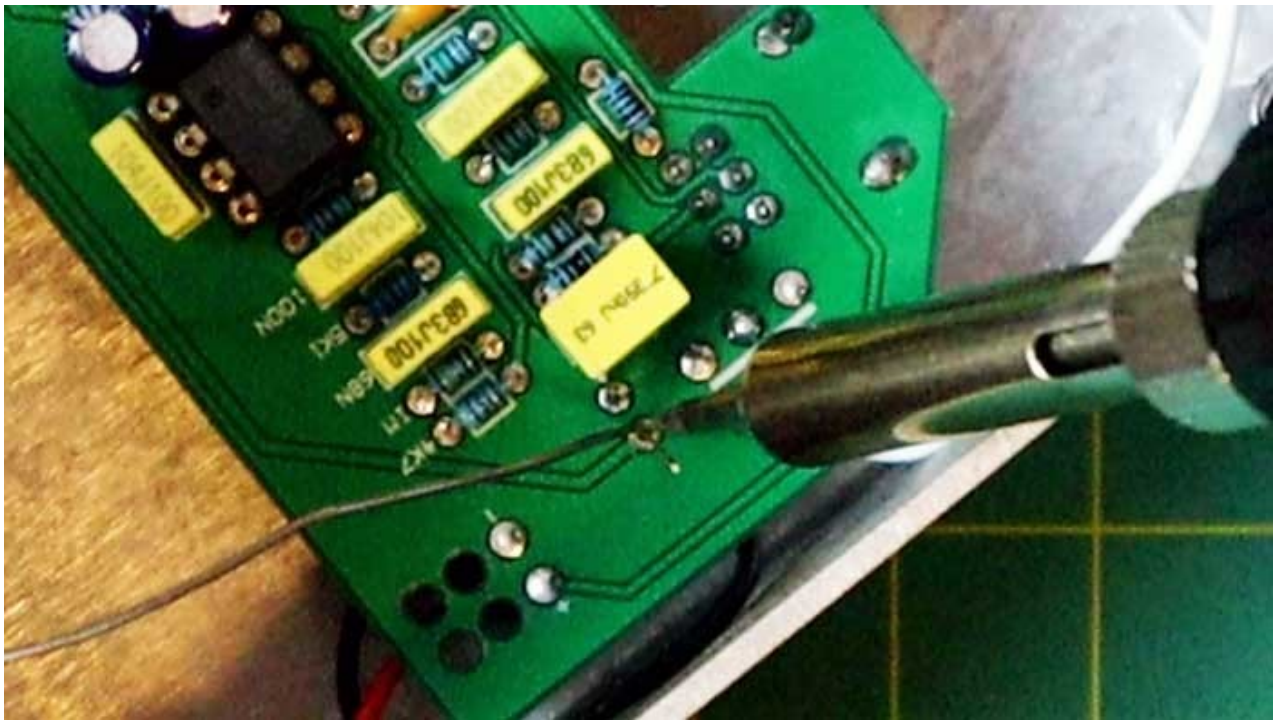
Now that the potentiometers are perfectly straight, you can solder them onto the PCB. Make sure the PCB is pressed right up against the potentiometers before you start soldering.



Solder the main leg points, then also solder the two larger support connections. These points help add stability and prevent any damage to the PCB.

Solder LED

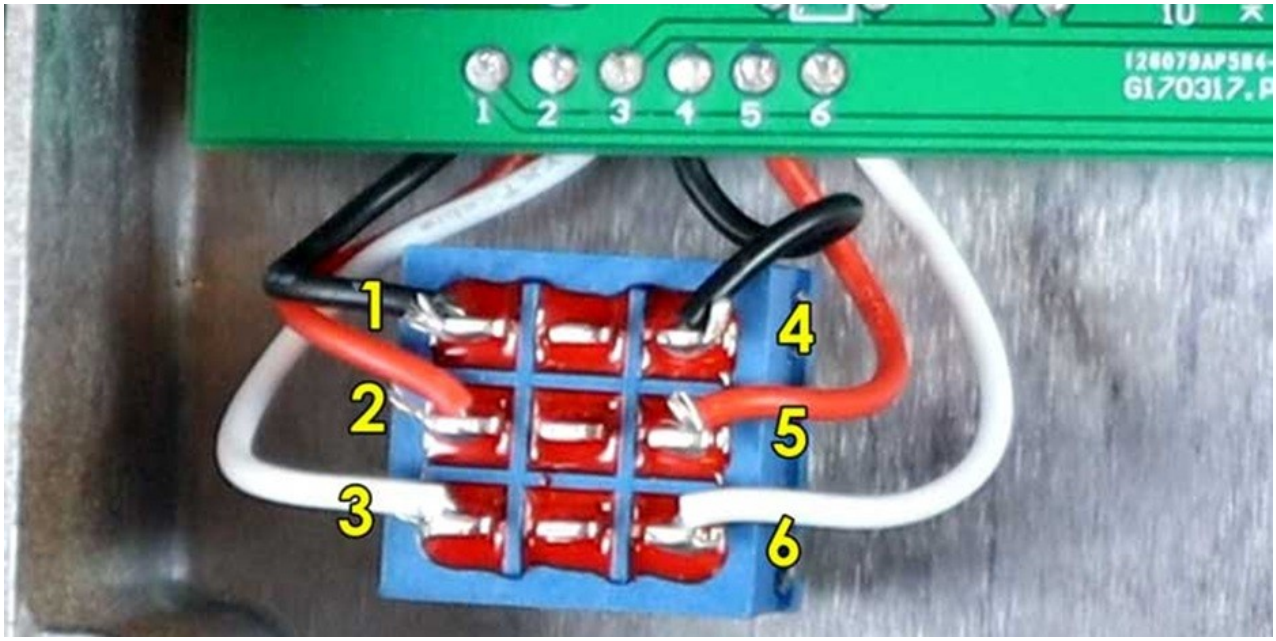
Now that the potentiometers are soldered, you can solder the LED in position. The two wires should be poking through as shown below:



Cut the ends of the LED wires after you solder it to the PCB.If you ever need to remove the PCB from the enclosure, the LED should slide out from the mounting ring.

Footswitch Wiring

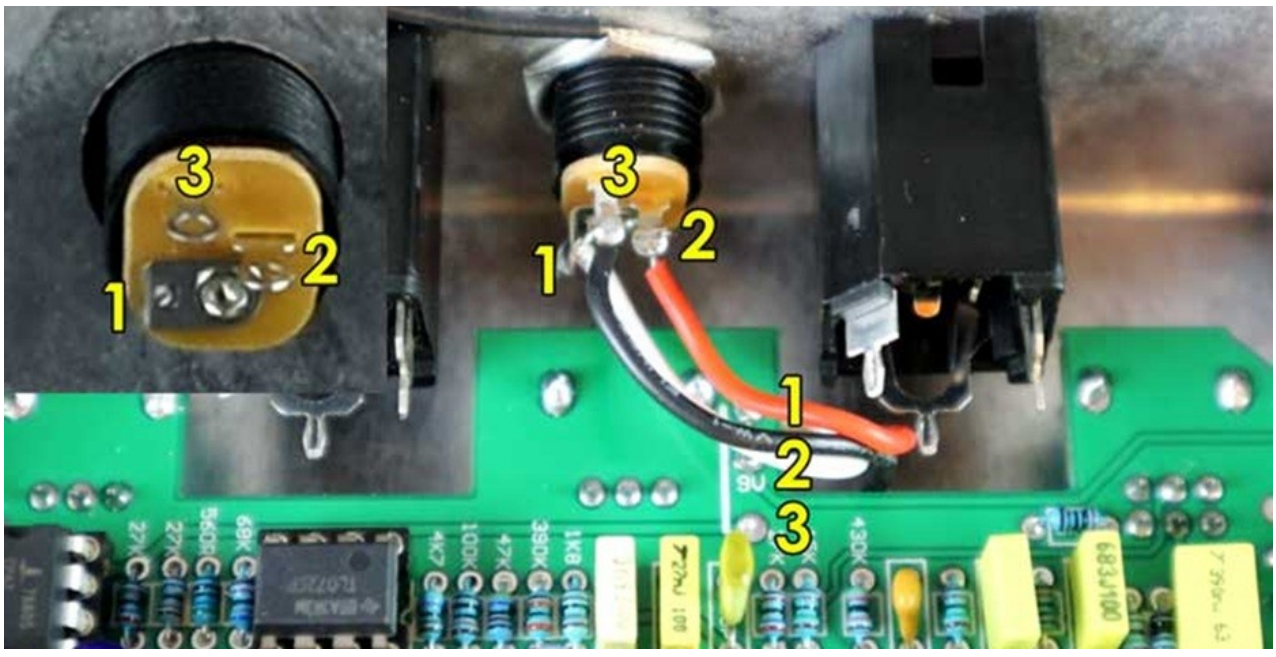
Here is a clear diagram showing how to wire the Klon's footswitch:



It doesn't matter what color wires you use, as long as you correctly match up the positions 1-6 in this order.

Power Jack Wiring

To wire up the power jack, the important point to remember is that there is a leg with a flat section. That leg is wired to the top connection point on the PCB.
Once that wire is in place, use the below diagram to wire the other legs.

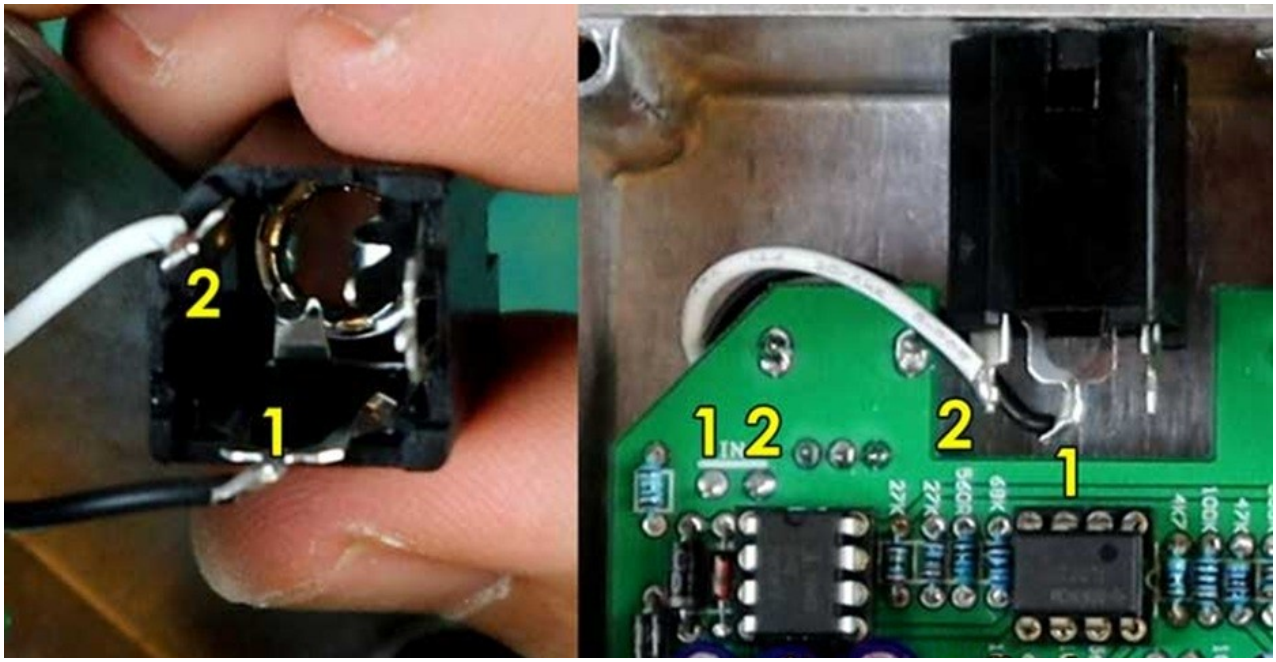


The leg opposite the larger leg is the middle connection point on the PCB and the other leg is the bottom connection point.

Input Jack Wiring

The input jack only uses two wires, but the actual jack has three connection points (it's a stereo jack). Make sure you wire to the correct points or you won't get any sound out of your pedal.

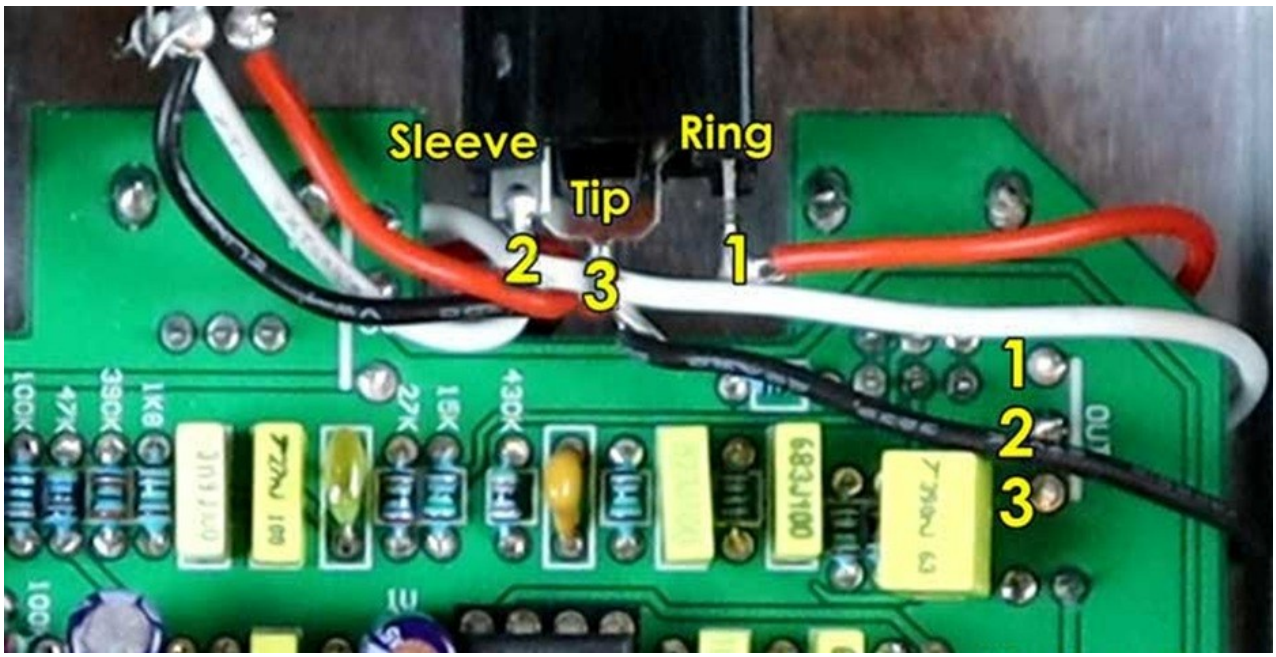
Tip: you can remove the jacks from the enclosure if you have trouble threading the wires into the correct positions. The leg with the angled corner connects to the right connection point on the PCB. The other wire connects to the leg anti-clockwise from the first leg.



The above diagram should make it clear which legs you need to use.
The above photo also shows why connecting the wires to the other side of the board wasn't the best idea. It can quickly get confusing if you can't see exactly which wire is connected to each point. If you ever do something like this, just use a multimeter to double-check the connections before you wire anything up.

Output Jack Wiring

The output jack uses three wires. This is standard for guitar pedals that use a battery (some pedals do this on the input jack instead). When the cable is unplugged, it disconnects the battery so it doesn't drain. This photo shows the correct wiring:



Quick Power Test

Before you hook everything up, try a quick power test by connecting the battery and a cable to the output jack (the cable doesn't need to be plugged in your amp yet).
If both the output cable and battery are connected, the LED should immediately light up or after pressing the footswitch once.

If the LED lights up, congratulations! At least it means power is flowing through your pedal. Unplug the battery and connect an external power source to the pedal if you have one. If your power jack is wired up properly, you should also see the LED light up.
If these quick power tests work, you can move on to testing your pedal out.

Final Touches

If you test out your pedal and everything works, congratulations!
It's rare for a DIY pedal to work perfectly on the very first attempt, so well done if you actually get a signal and the effect works as it should. You can finish your pedal off by tightening all of the nuts, attaching the backplate, then add the knobs.

Troubleshooting Problems With Your Kit

If you followed the instructions in this guide perfectly, you should have avoided a lot of issues other people experienced due to incorrect wiring. It can be really frustrating to plug in a DIY pedal and it not work properly (or at all). So if your pedal doesn't work straight away, don't panic or get frustrated. You will solve the issues. It will just take some time to locate the problem.

Here is a step-by-step list of what we recommend to try and find problems with your pedal:

1. Make sure the cables are plugged in the correct way and your amp and guitar are properly connected with appropriate volume levels (this might seem obvious, but this is often the cause of problems)
2. Check the pedal's power is turned on (or battery connected)
3. Look through your pedal's wiring and compare them to the diagrams in this guide
4. Look for any possible shorts or bridges between solder joints
5. Check voltage and continuity throughout your circuit using a multimeter
6. Build an audio probe and use it to test your entire circuit one component at a time

Here are some things you can check with your multimeter to try and find any problems:

- Voltage level of battery used
- Voltage throughout your circuit
- Continuity between all ground connections

Here are some other tips based on the type of problem you're having:

- If you get no signal at all, check the wiring on your input and output jacks. The signal isn't reaching the output jack, so find where the connection fails
- If you're getting a loud humming sound but no signal (pedal on or off), the wiring on the input/output jack may be reversed (this was the problem I encountered)

Almost all issues in general with building pedals comes down to problems with wiring something incorrectly or bad solder joints. Focus on those areas to identify the problem.