

How to Build a Germanium Fuzz Guitar Effect.

This document will guide you to build and test your Germanium Fuzz guitar pedal. With all the materials on hand, it takes around 2-4 hours to build it. Try not to rush and take your time. Play your favourite background music and enjoy the fine art of building your own guitar effects.

We have a YouTube video in the ElectroSmash channel that will help you during the assembly.

We strongly recommend reviewing the entire instructions before starting. It takes 2 minutes and may save you hours of frustration.

This guide aims to build and test the circuit at the same time in a logical order. Following all the steps will ensure a successful assembly.

STEP 0 – Prepare the Materials.

You would need:

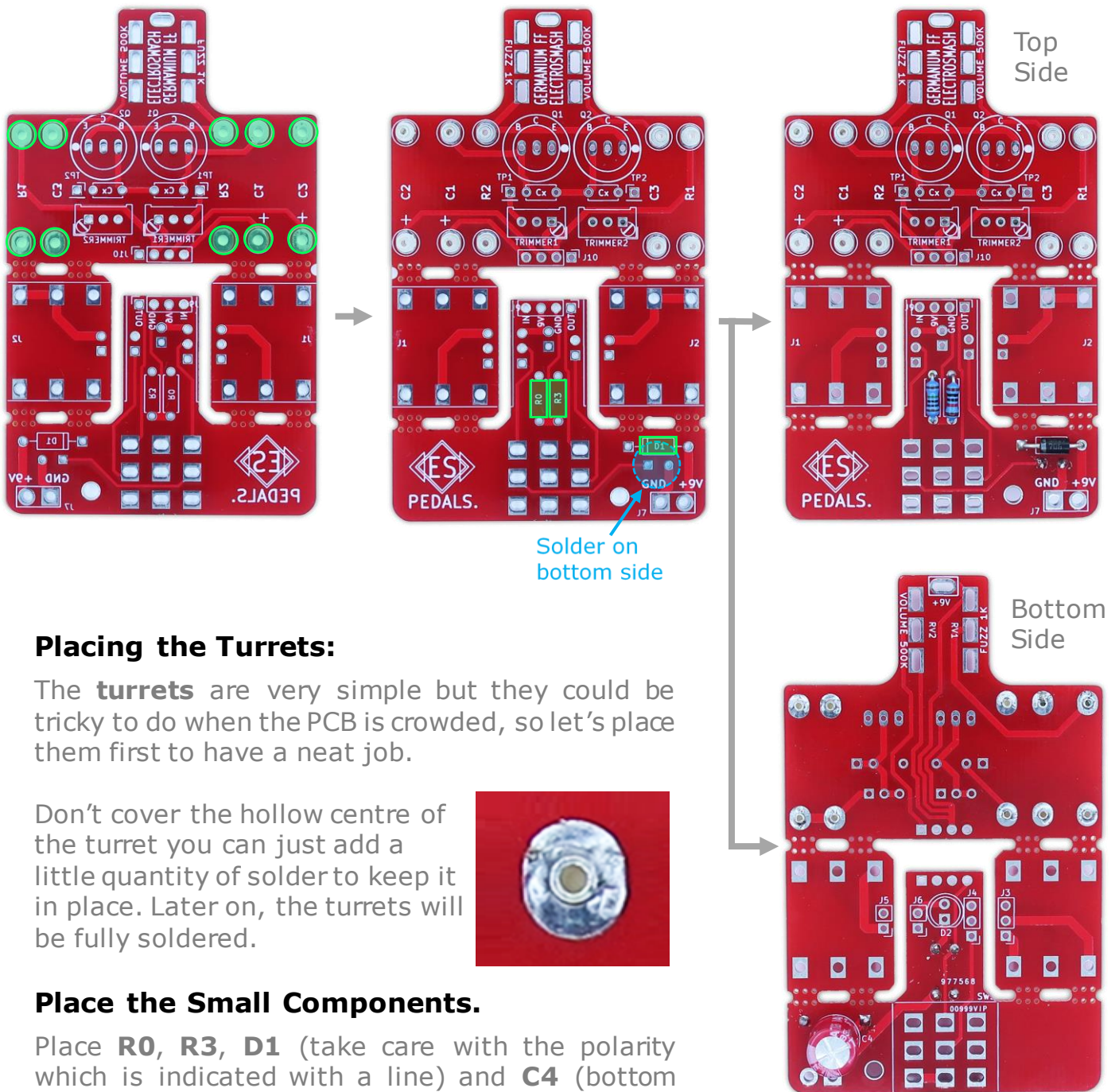
- Soldering iron with a small tip.
- Solder wire.
- Cutting pliers.
- Multimeter.
- Germanium Fuzz Kit.



Keep in short hand the PCB plan and the Bill of Materials.

- [PCB Plan PDF.](#)
- [Schematic PDF.](#)
- [Bill of Materials PDF.](#)
- [1590B Fuzz Drilling Stencil PDF.](#)

STEP 1 – PCB Assembly: Turrets & Small Components



Placing the Turrets:

The **turrets** are very simple but they could be tricky to do when the PCB is crowded, so let's place them first to have a neat job.

Don't cover the hollow centre of the turret you can just add a little quantity of solder to keep it in place. Later on, the turrets will be fully soldered.



Place the Small Components.

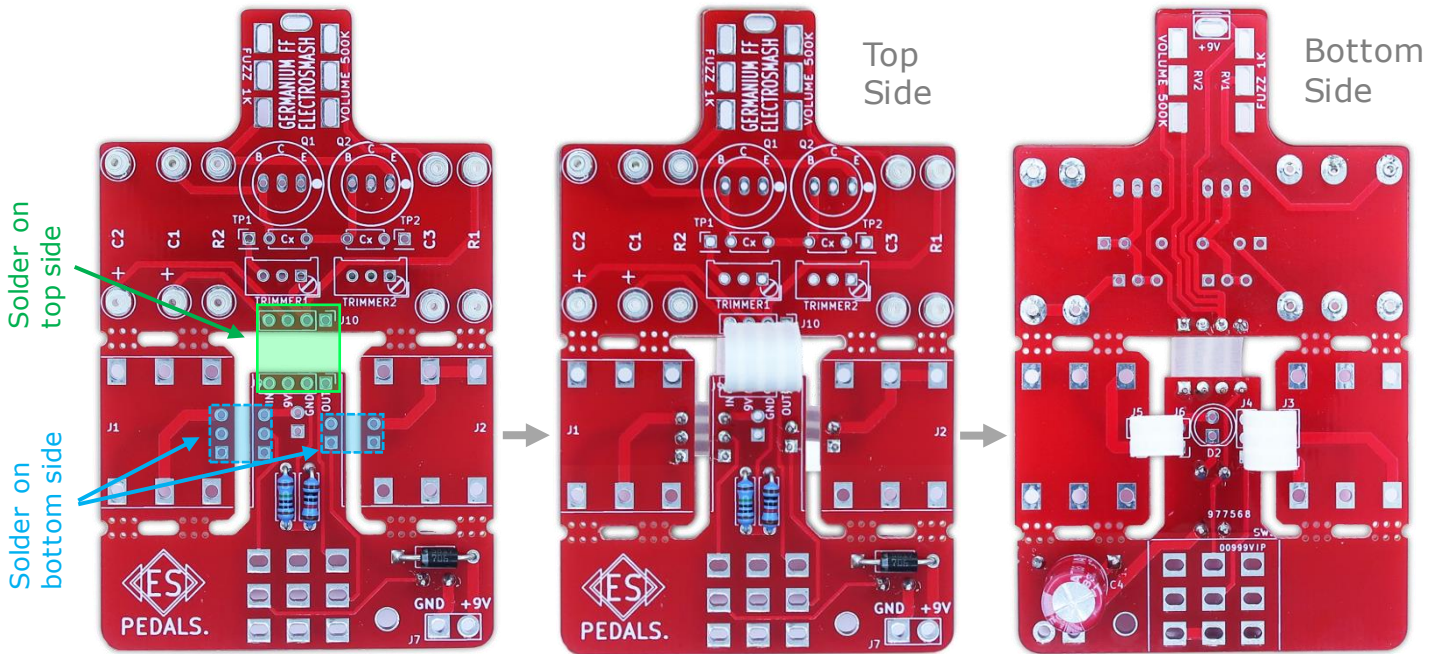
Place **R0**, **R3**, **D1** (take care with the polarity which is indicated with a line) and **C4** (bottom side, also with polarity*).

Once soldered, cut the legs as close as possible to the PCB because the electronics fit tight into the box and you will need those millimetres.

***Note:** The electrolytic caps have polarity, insert the long lead into the hole labeled with "+"

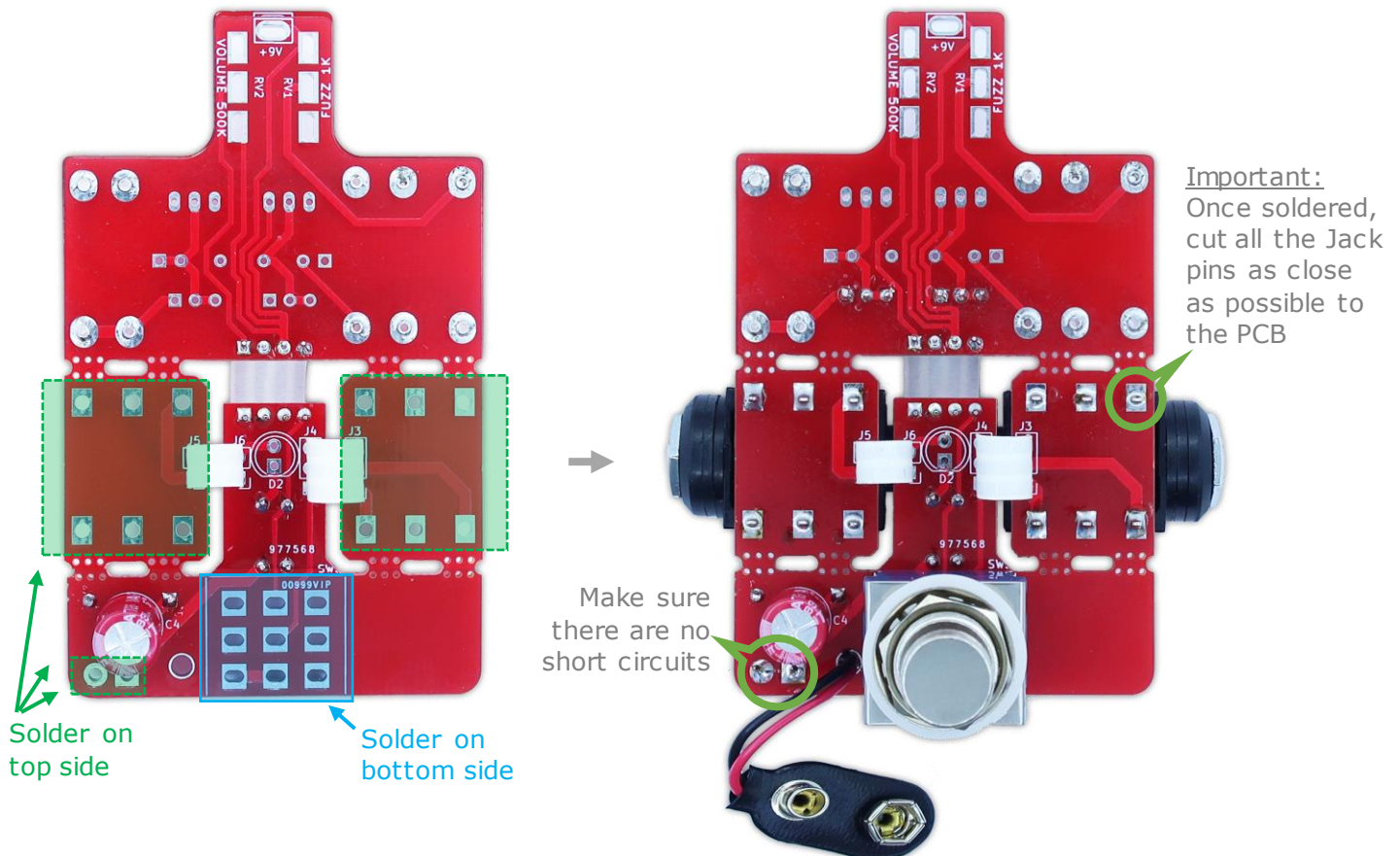


STEP 2 – Place the bridge cables.



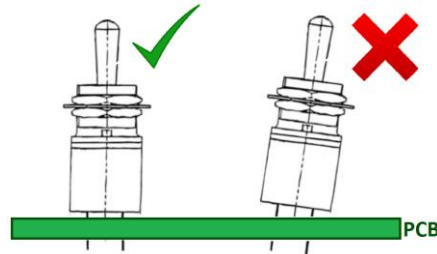
Note: These cables will connect the PCBs between them. You can pre-form the cables in a round and smooth "U" shape by bending them with a curved object (pen). Don't force the cables many times or do hard bends, they may break.

STEP 3 – Place the big components.



Solder the input/output jacks (**J1**, **J2**), the 3PDT True Bypass footswitch (**SW5**), and the 9V battery clip.

Note: The big components tend to tilt when soldered. Make sure they are straight: A good idea is to solder only one pin and once you are sure that it is perpendicular, solder the rest of the pins.



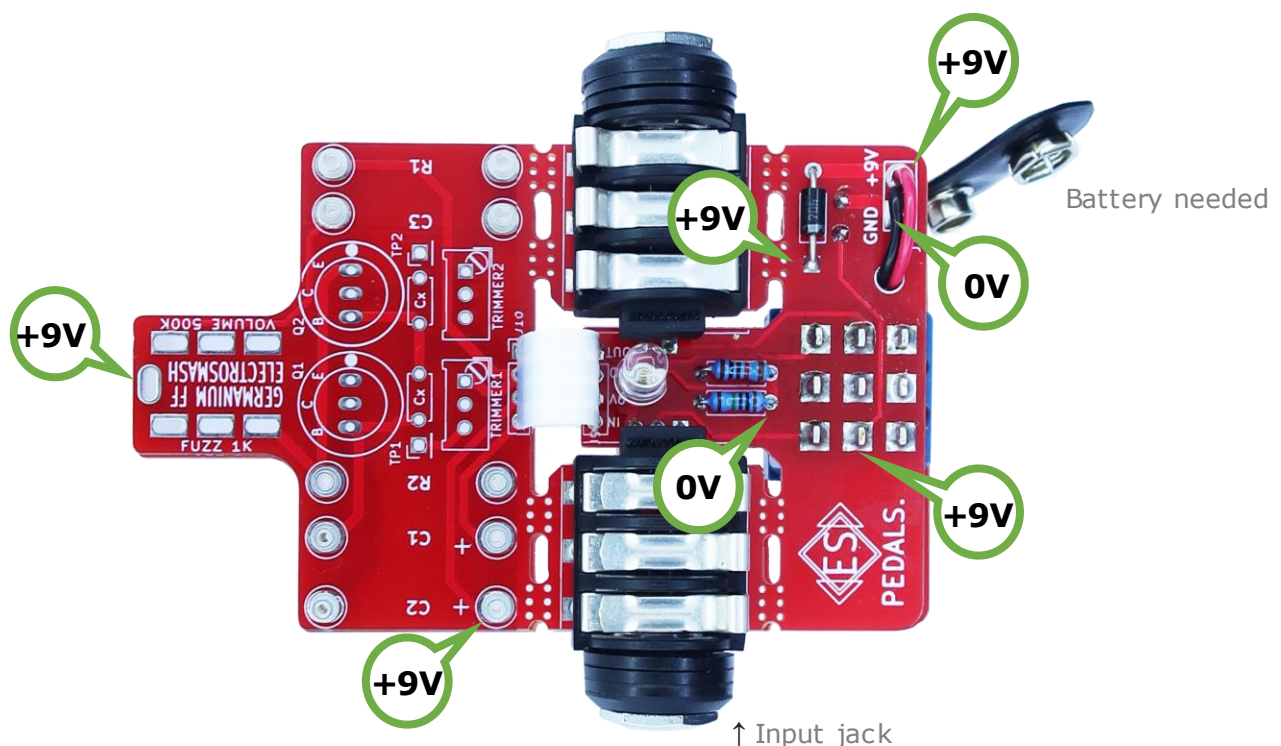
Note: This is a detail of how the battery cables have to be soldered:



Red to +9V and
black to GND

STEP 4 – Testing the Power Supply.

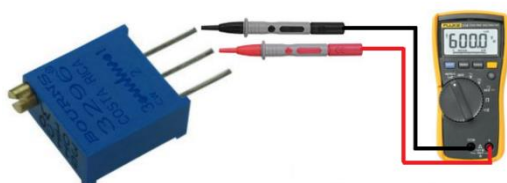
At this point, the power supply of the circuit could be checked. Place a mono guitar cable at the input jack, a 9V battery and make sure that the footswitch is activating the pedal. The led should light and the following voltages read:



STEP 5 – Place the Audio Components:

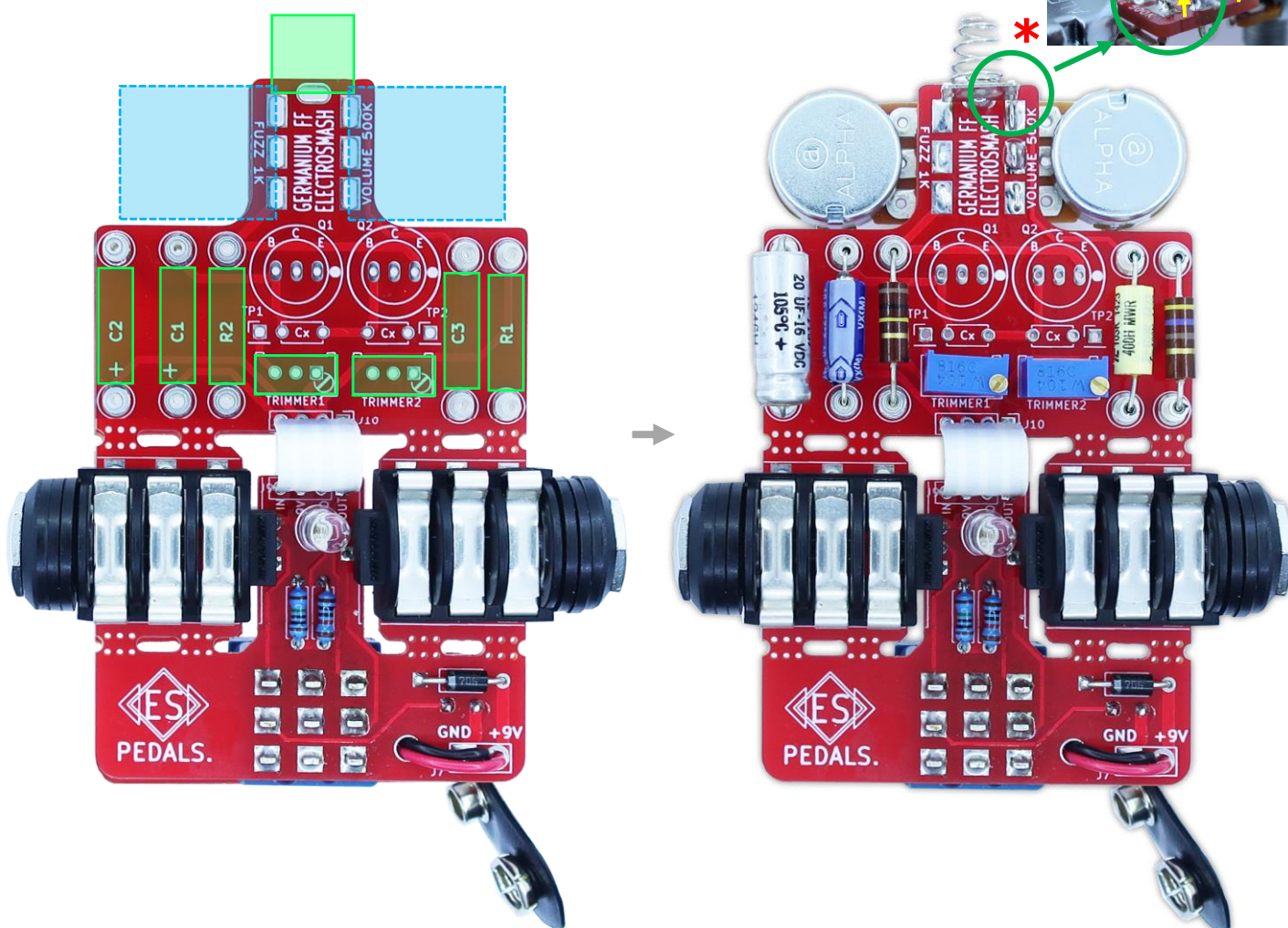
These are the most important components for the sound. You have to place **R1, R2, C1, C2, C3, Trimmer1, Trimmer2, RV1 (1K pot), RV2 (500K pot)**, and the **spring**.

Note: Before placing the Trimmers, you have to pre-set them to a good value. Using a multimeter in resistor mode (Ω) measure between pins 1 and 2, adjusting them to:



- Trimmer1: 33K Ω
- Trimmer2: 8.2K Ω

Note: It is a good idea to mark where the turret board components need to be bent using a marker pen.



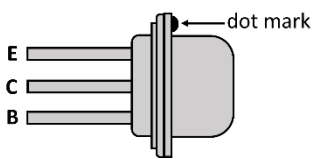
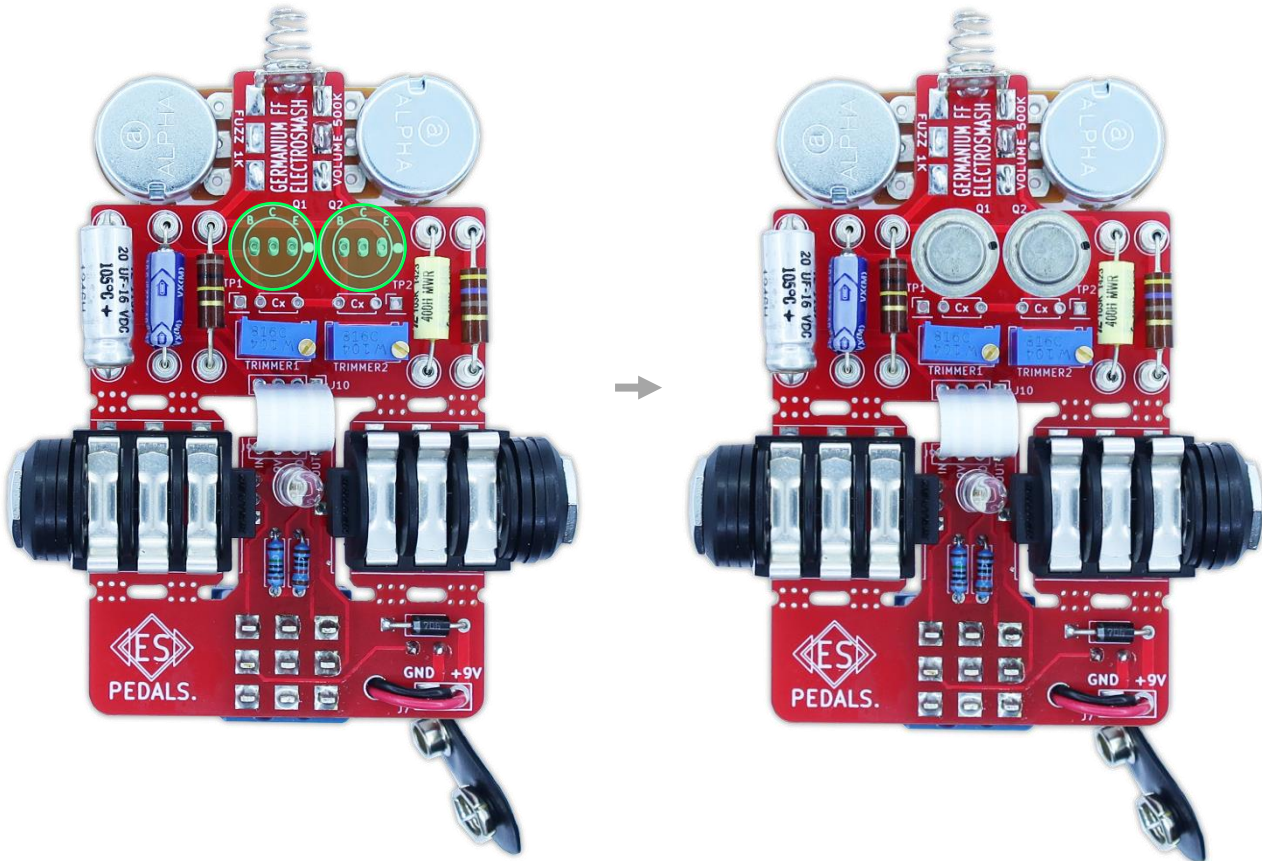
***Note:** Take care that the spring does not touch any pads; it has to be raised 3mm.

Note: Do not solder the LED, just place it in the holes, but don't solder it yet.

Axial electrolytic cap polarity:



STEP 6 – Place the Germanium PNP Transistors.



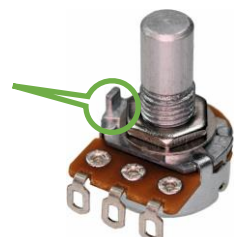
The germanium transistors have a dot that indicate polarity, place them on the PCB following the same dot.

Note: The transistors have to be close but not touching each other.

If you have transistors with different gains (H_{fe}), it is better to use the one with lower gain as Q1 and the one with higher gain on Q2.

- Q1 = lower gain.
- Q2 = higher gain.

Note: The potentiometer little leg is not needed, so you can cut it



Bias the Q1 & Q2 Transistors:

Although we pre-set the trimmer resistors to a good value in the Step 5. Now it is time to make sure that the Fuzz is biased to the perfect point.

Multimeter on Voltage setting, Negative probe attached to the spring (+9V) and Positive probe to TP1 or TP2

- With **Trimmer1** adjust **TP1** to $-0.7 \sim -0.5V$
- With **Trimmer2** adjust **TP2** to $-4.5V$

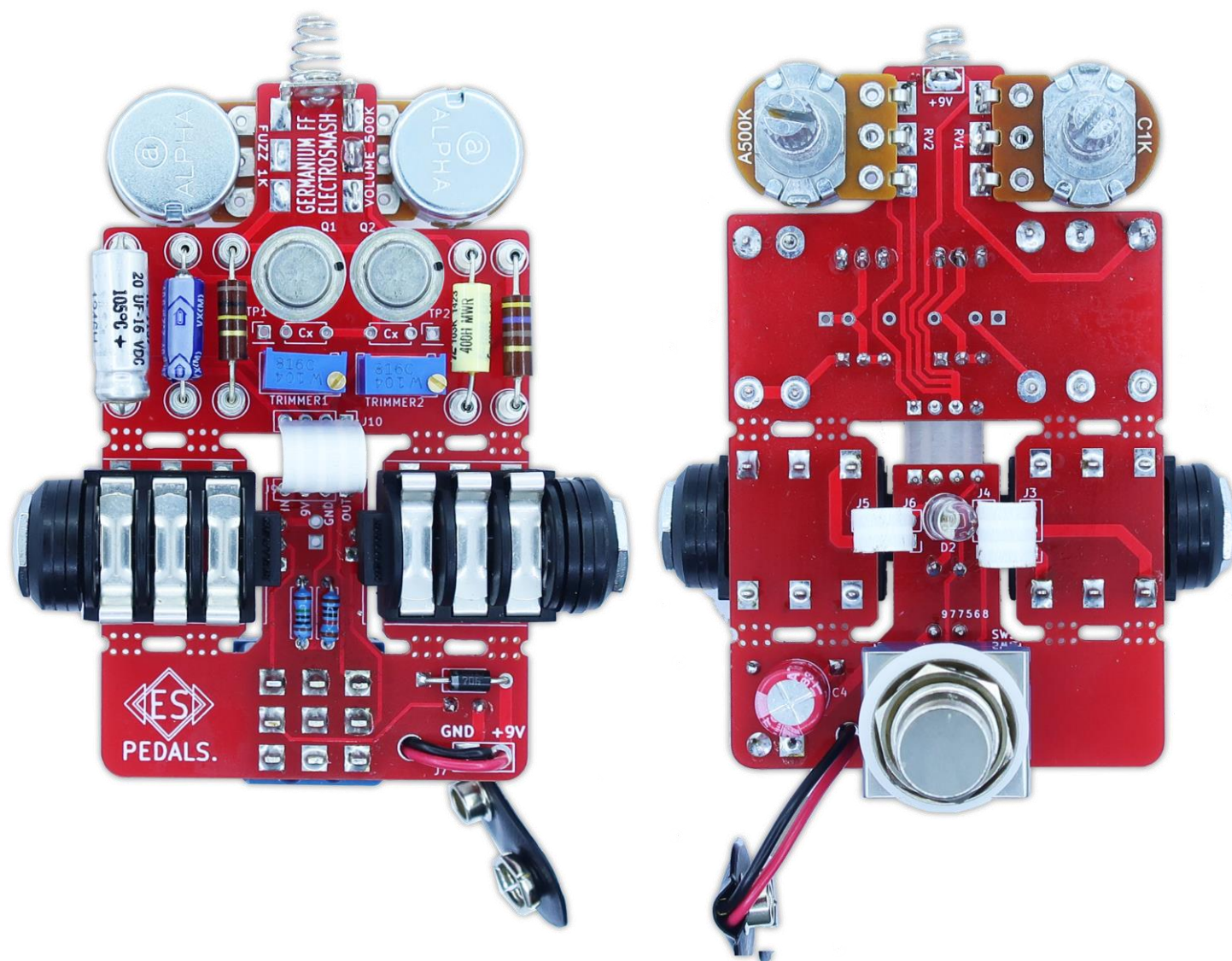
Input jack needed to power it up

9V Battery needed

Note: The bias point will depend on the temperature, so it may change during the time. So, don't try to get a super-accurate bias level. As far as the values are close to -0.7 and $-4.5V$ it will be great.

STEP 7 – Check the Board:

Make sure that your board looks exactly like the one below:



Note: The LED is still not soldered, once inside the enclosure you can adjust the perfect length for the leads and solder it.

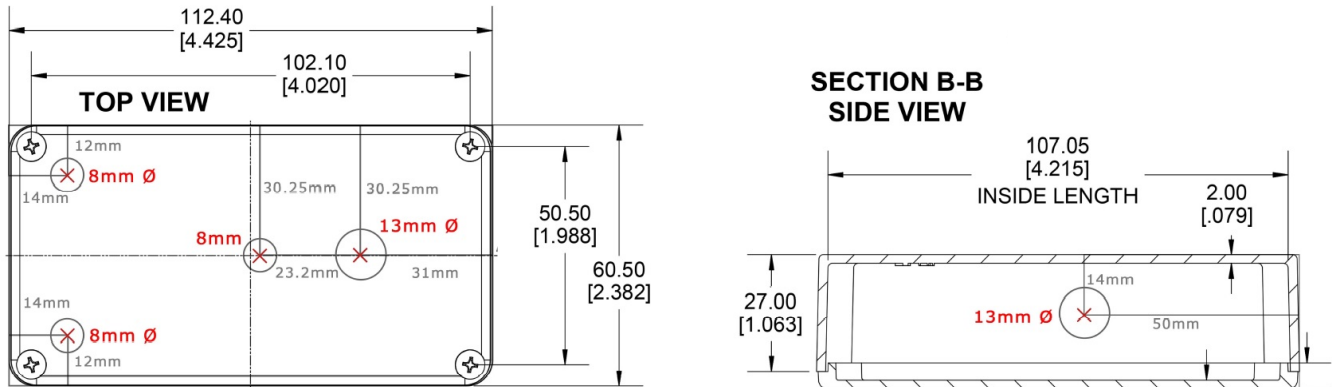
Note: The 100pF Cx Miller capacitors are optional. They help to reduce the noise of the pedal but also may affect the fuzz tone. You can try them, although the original Fuzz did not include these parts as the effect was made to be organically noisy.

This is the perfect time to try the pedal and make sure that works and sounds good.

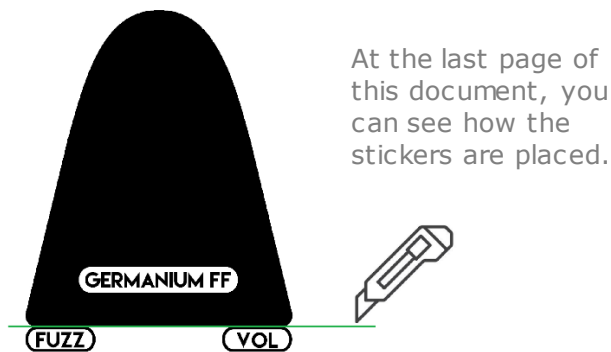
STEP 8 – Boxing

Now that the electronics are finished, let's prepare the enclosure.

The Germanium Fuzz uses a standard Hammond 1590B. You can use a pre-drilled box or drill your own using the 1590B Germanium Fuzz Stencil.



Use a cutter to separate the stickers and place the black pad on the bottom:



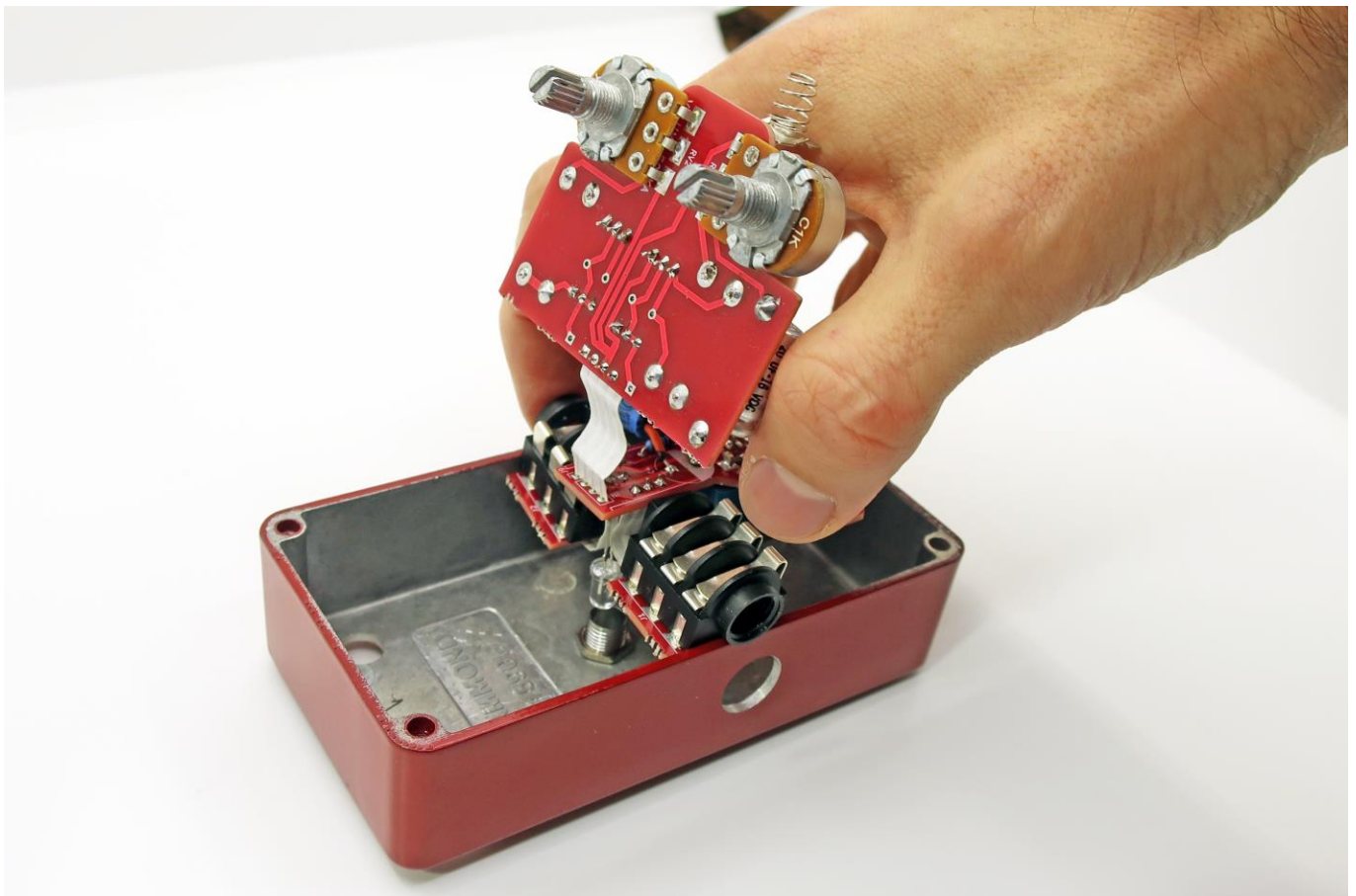
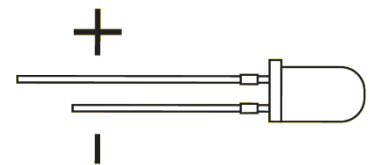
Place the 2 plastic insulators (one need to be cut following the stencil) using double side tape, they will protect the electronics:



After placing the 5mm metal LED holder, you need to box the electronics, take your time and be patient:

- Make sure that all the soldered parts have their legs cut as close as possible to the PCB
- Don't force the parts into the holes –be gentle- , they are designed to be tight but not forced. If they seem to be stuck, remove the electronics and start again.
- The best way to enclose the board is to try to fit all the parts through the holes at the same time (not simply inserting one jack after the other).
- It is easier if you start with the 2 jacks, the LED and the footswitch (inserting the 4 of them on the holes at the same time).

Note: The LED has to be placed but not soldered yet. The negative pin (shorter on the flat side of the LED) goes into the square hole, and the positive pin into the upper round hole.



When all is in place, you can finally fit the washers & nuts and solder the red LED.

This is the final finished project:

