

How to Build the Time Manipulator Guitar Pedal.

This document will guide you to build and test your Time Manipulator guitar pedal. With all the materials on hand, it takes around 3-4 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 strongly recommend reviewing the entire instructions before starting. It takes 2 minutes to get a global idea of the build and may save you hours of frustration.

This guide aims to build and test the circuit at the same time in a logical order: placing the components from small to big and testing.

STEP 0 – Prepare the Material:

You would need:

- Soldering iron with a small tip.
- Solder wire.
- Cutting pliers.
- Multimeter.
- Time Manipulator Kit.

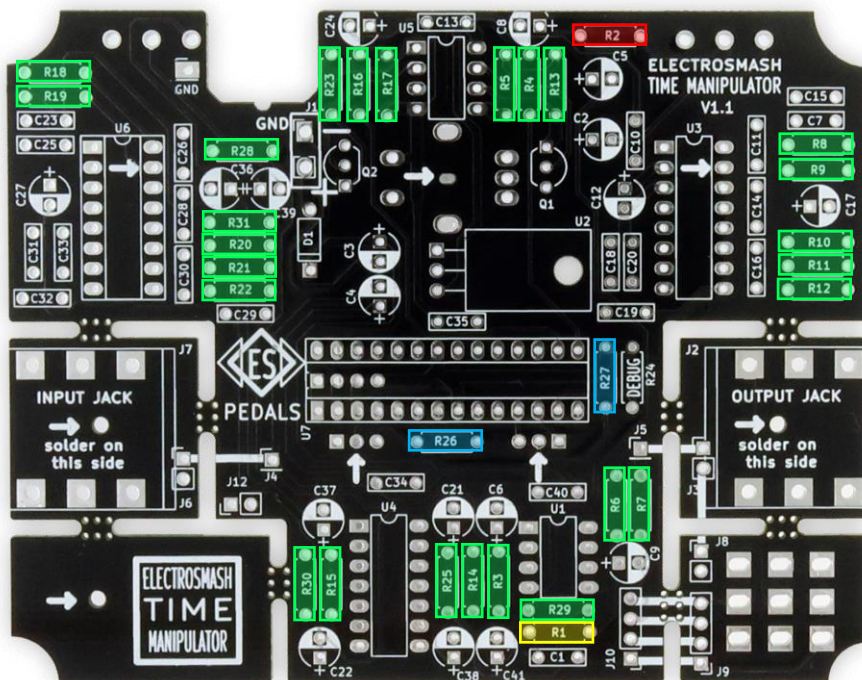


Keep in short hand the PCB plan and the Bill of Materials.

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

STEP 1 – Soldering Resistors:

There are 30 resistors to be placed.

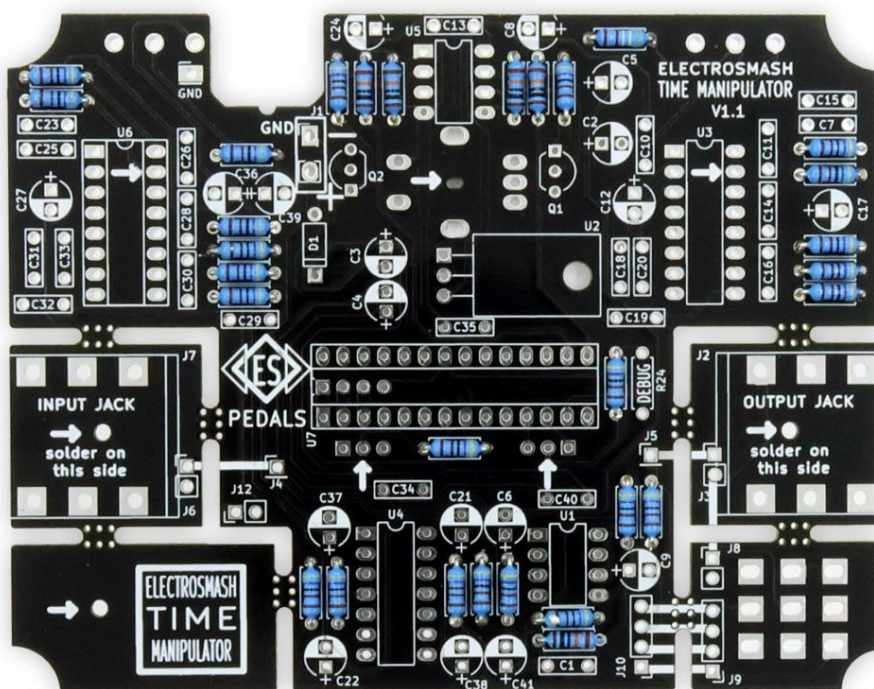


4.7KΩ Resistors (x26): █
 R3, R4, R5, R6, R7, R8, R9,
 R10, R11, R12, R13, R14,
 R15, R16, R17, R18, R19,
 R20, R21, R22, R23, R25,
 R28, R29, R30, R31

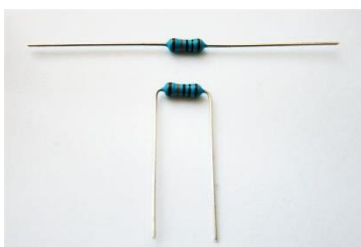
470Ω Resistor (x2): █
 R26, R27

5KΩ Resistor (x1): █
 R2

1MΩ Resistor (x1): █
 R1



Tips before soldering:

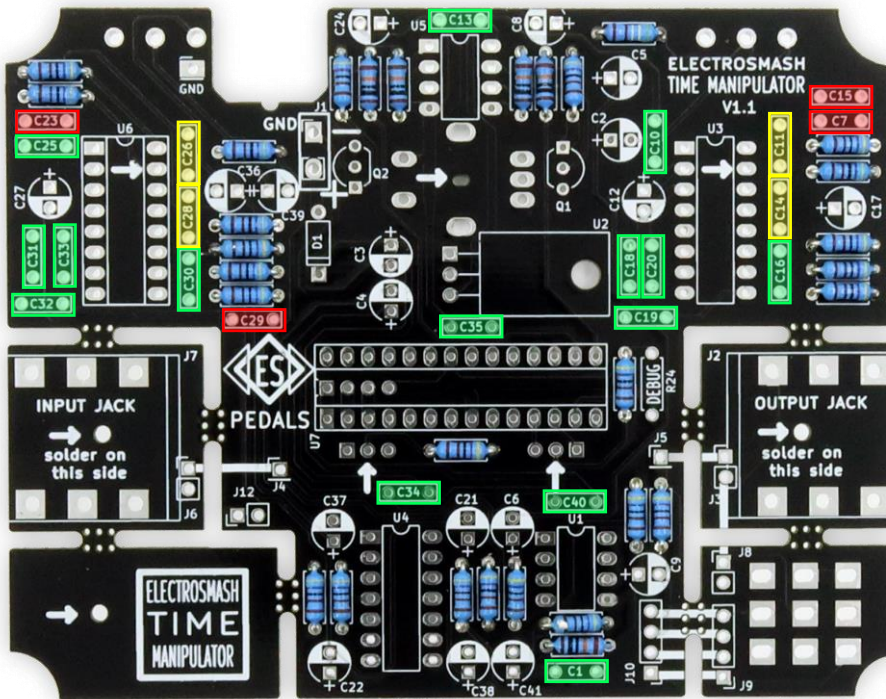


Bend the resistor leads as close to the body as possible, fit them in the footprint and once soldered cut the excess of lead as short as possible to avoid short circuits.

Once the legs are cut, touch again with the soldering iron the joint to secure the connection.

STEP 2 – Soldering Small Caps:

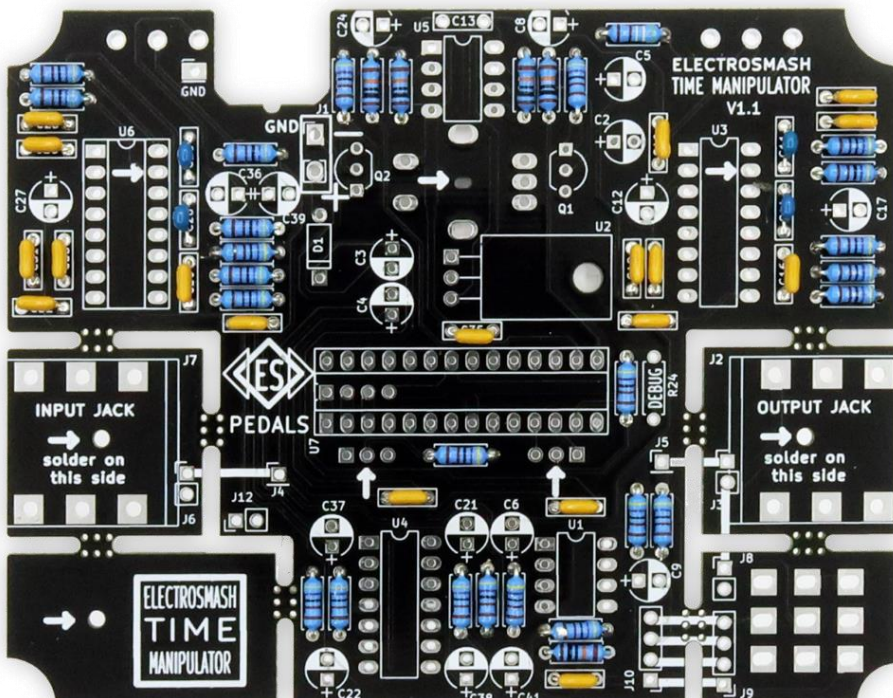
There are 23 ceramic capacitors to be placed.



100nF capacitors (x15): ■
 C1, C10, C13, C16, C18, C19,
 C20, C25, C30, C31, C32,
 C33, C34, C35, C40

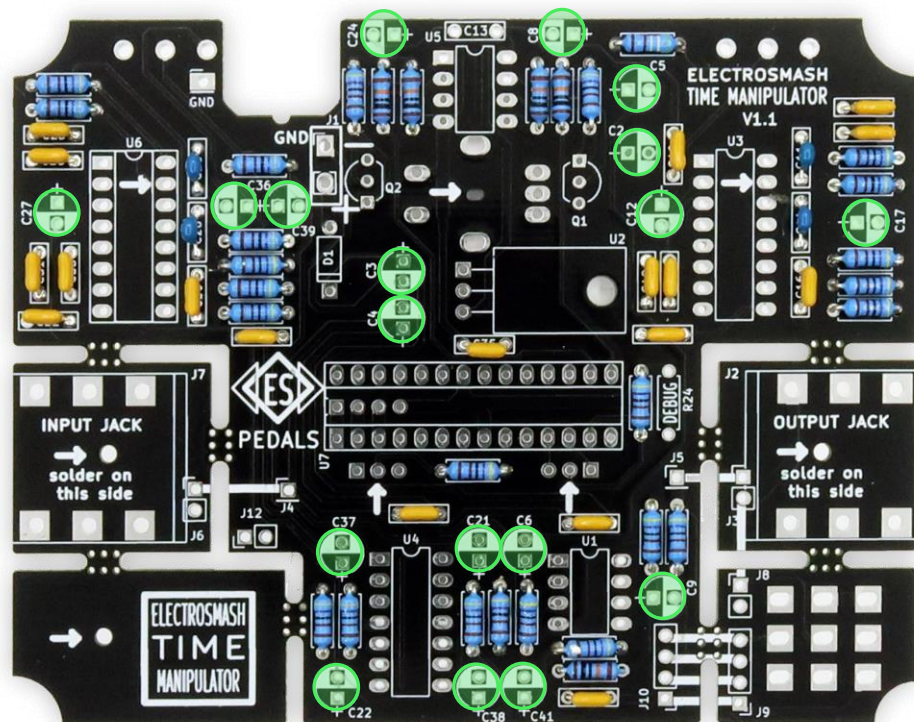
3nF caps (x4): ■
 C11, C14, C26, C28


6.8nF caps (x4): ■
 C7, C15, C23, C29

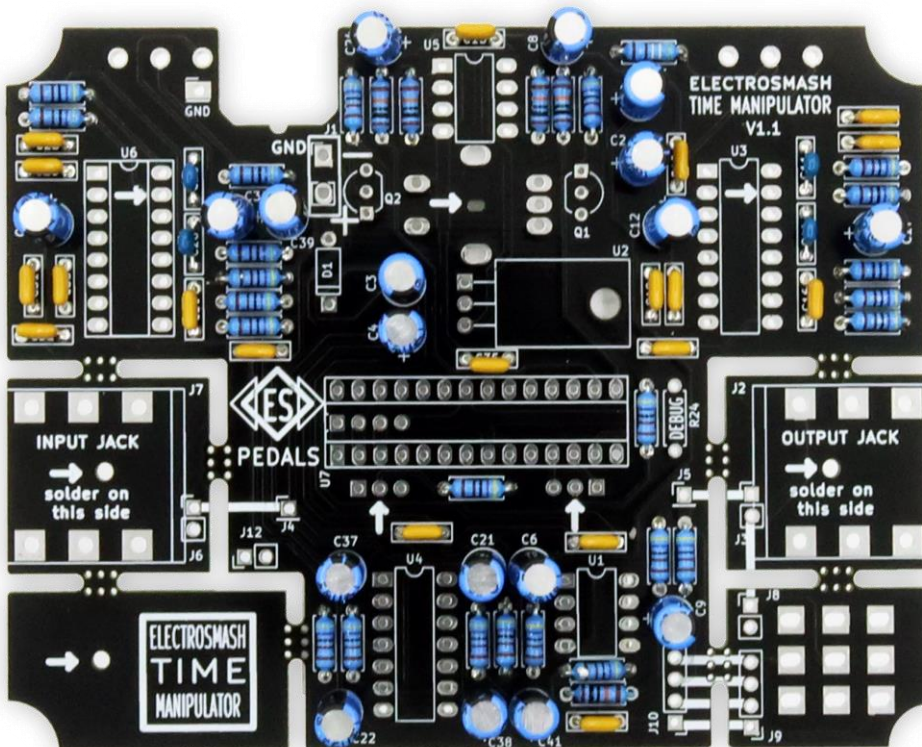


STEP 3 – Soldering Big Caps:

There are 18 electrolytic capacitors to be placed.



47uF capacitors (x18): 
 C2, C3, C4, C5, C6, C8, C9,
 C12, C17, C21, C22, C24,
 C27, C36, C37, C38, C39,
 C41



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

Line marked on the negative side

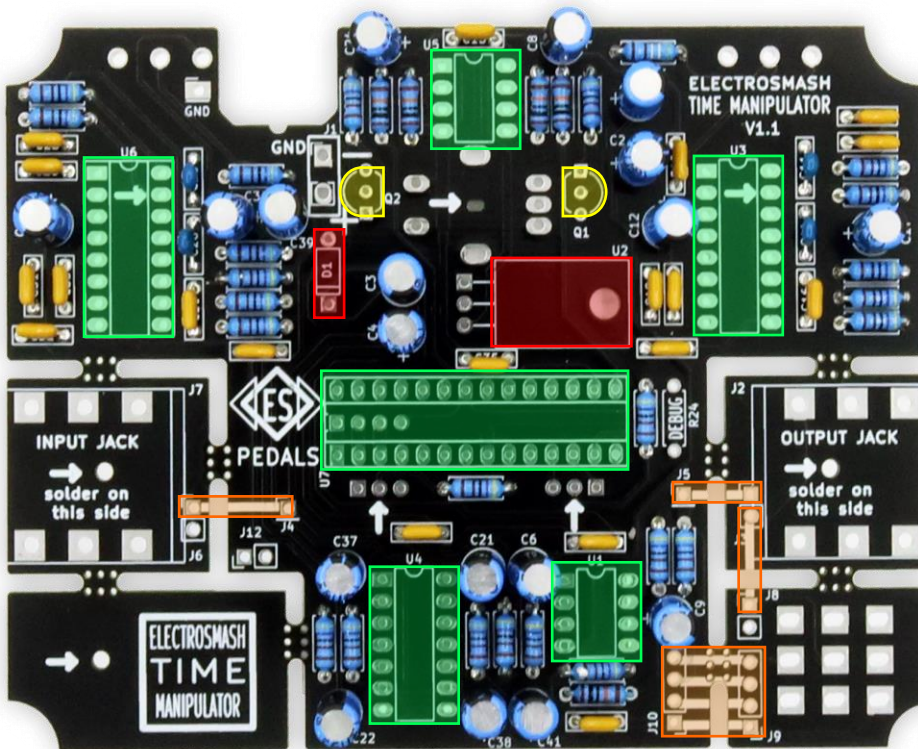
Short lead, negative -


Long lead, positive +




STEP 4 – Soldering Small Components:

There are 14 small components to be placed.



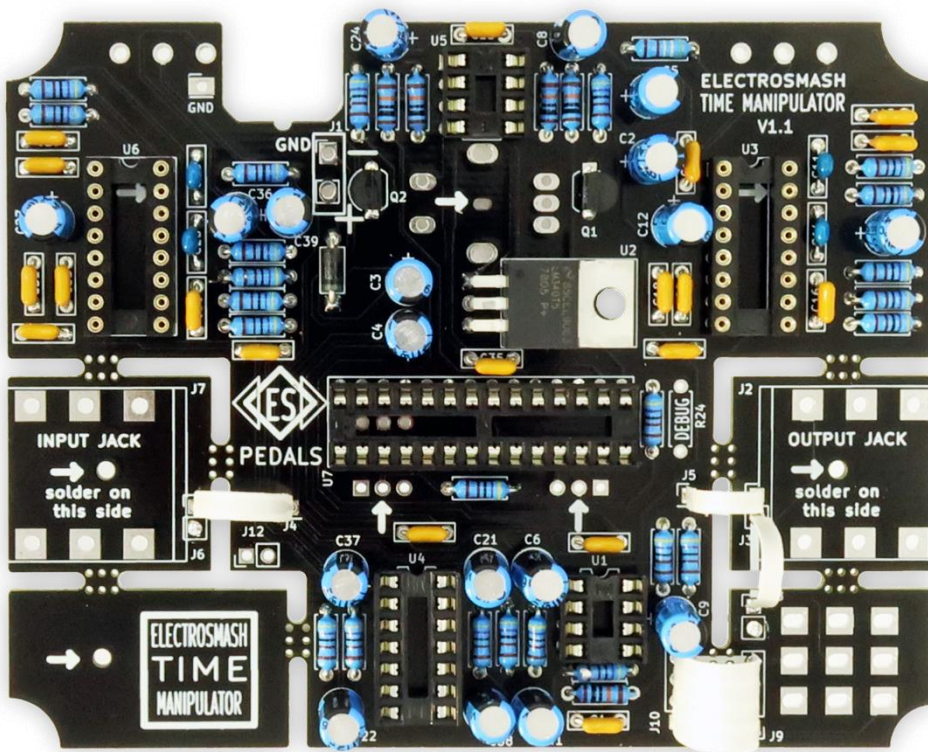
IC sockets (x6): 
U1, U3, U4, U5, U6, U7

Transistors (x2): 
Q1, Q2

Regulator and Diode 
D1, U2

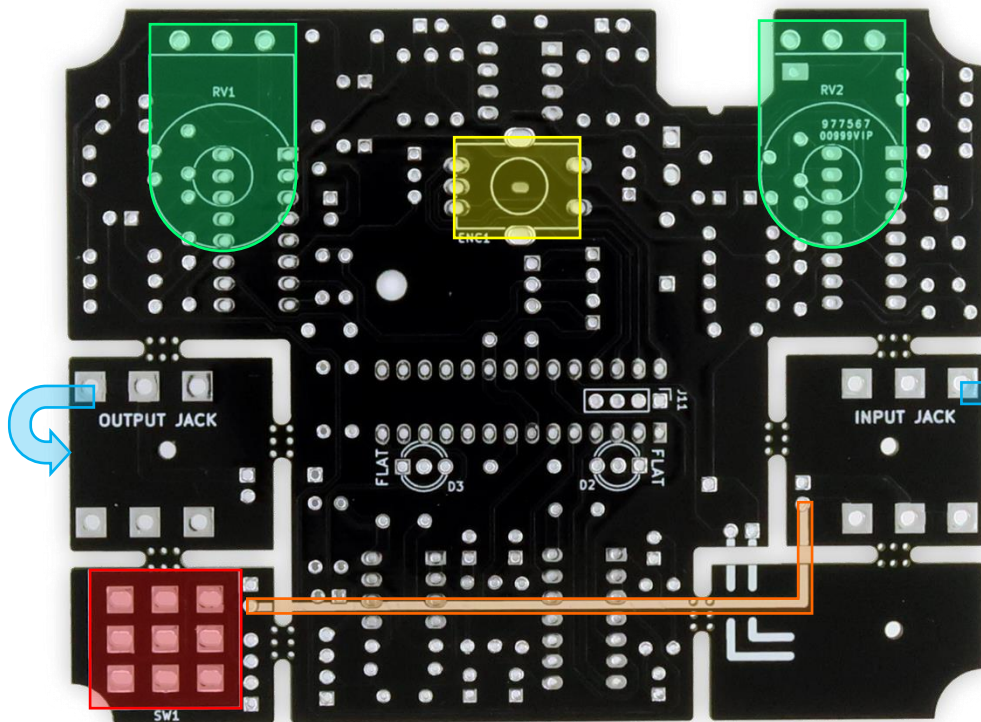
Wires 
J4, J5, J8, J9


Note: U1 is preferred to be a TL072 and U5 a MCP6002 although you can use a MCP6002 for both U1 and U5.





STEP 5 – Soldering Big Components:


There are 5 big components to be placed. Make sure that you solder them **on the correct side** of the board (top or bottom).




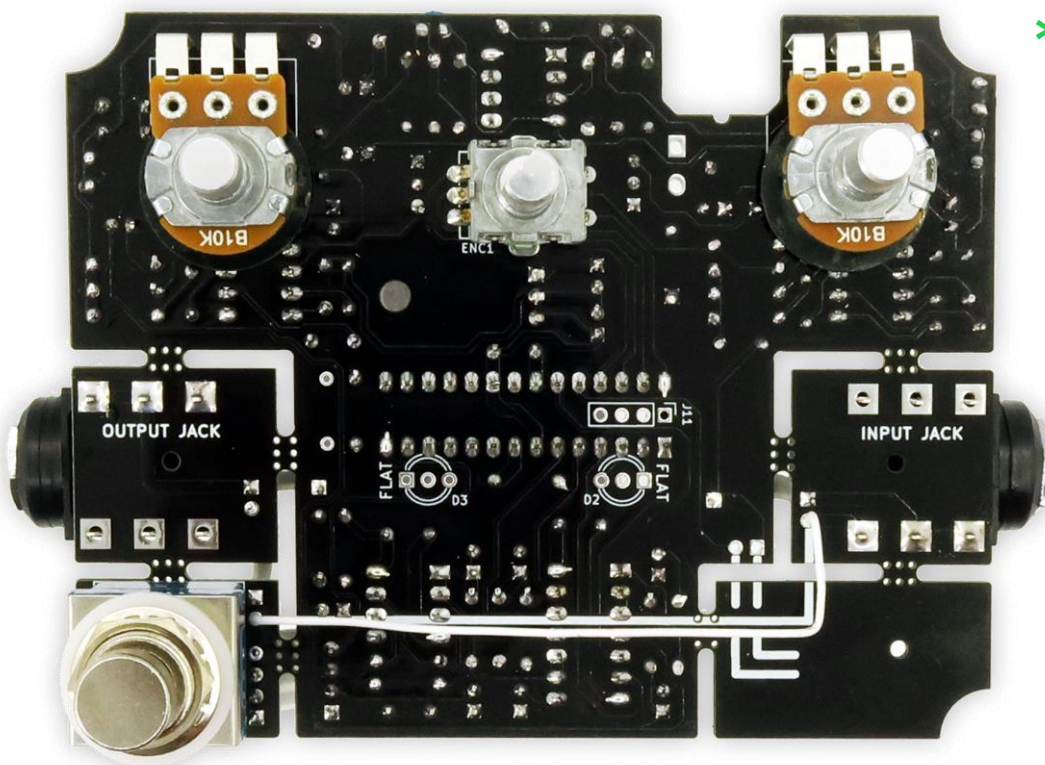
Potentiometers (x2) *
RV1, RV2

Encoder (x1): 
ENC1

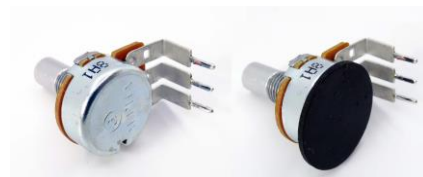
Footswitch 3PDT (x1) 
SW1

Audio Jacks (x2) 
J2, J7 (on the other side)

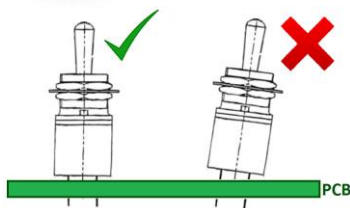
Wire (x1) 
J6 to J8



* Isolate the bottom part of the potentiometer with a rubber disc:



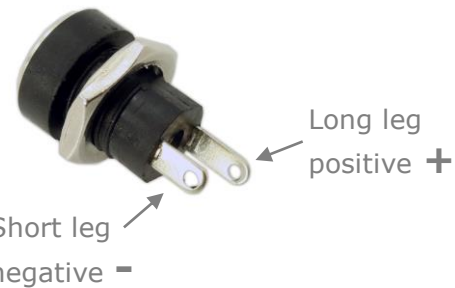
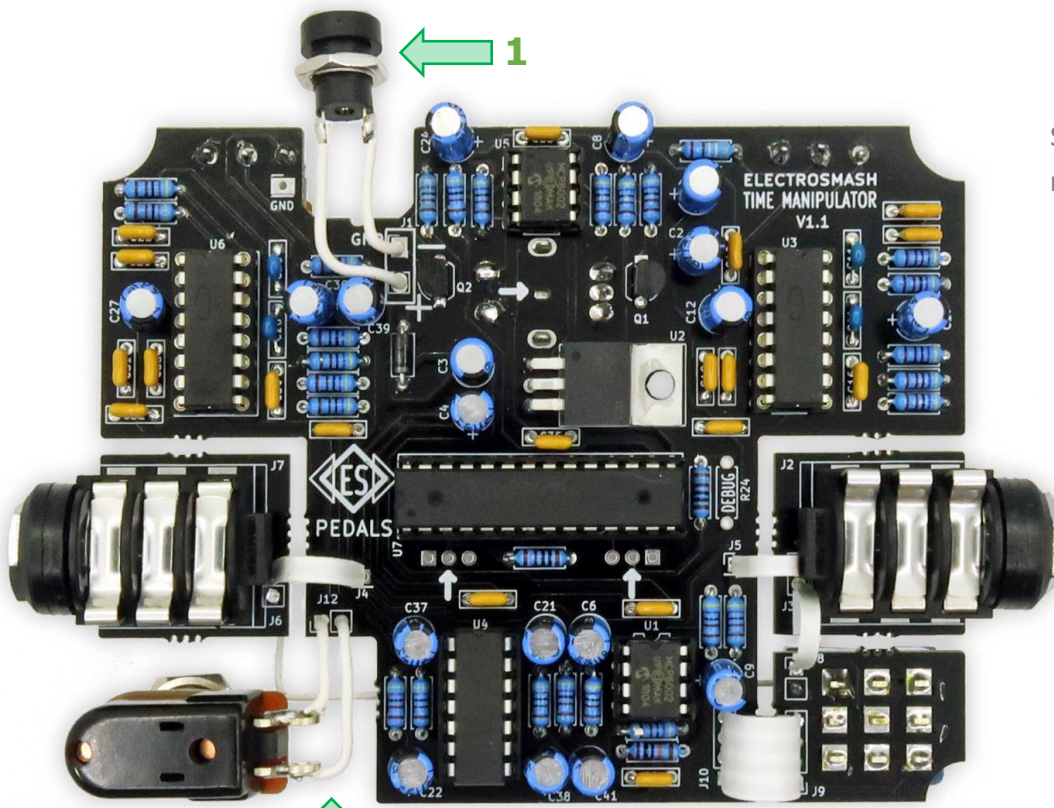
The potentiometer rests on top of the PCB, so the rubber will avoid short-circuits.



Note: 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.

STEP 6 – Finish the Assembly:

Top side:



- 1 Using 2 short wires (3cm) connect the 2.1mm power jack connector to the - and + pads of the board.

Make sure that the short lead goes to - and the long lead to + this will make the power supply centre negative (boss style).

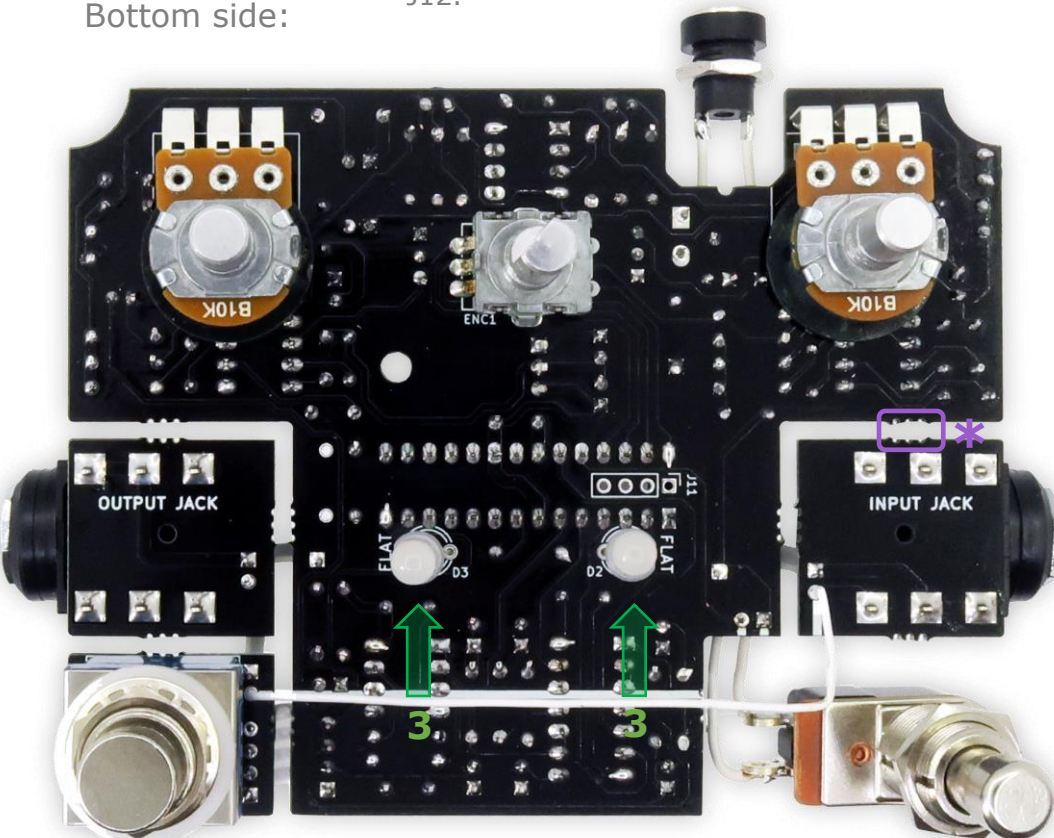


If you want to use a "normal" 9 to 12Vdc centre positive adapter, just invert the connection.



You will need to solder this power jack again when boxing the pedal, so don't lose time make the soldering perfect just yet.

Bottom side:



- 3 Put the 2 LEDs through the holes, they will stay in place without the need of soldering.

The LEDs have to be soldered once the PCB goes into the enclosure, so

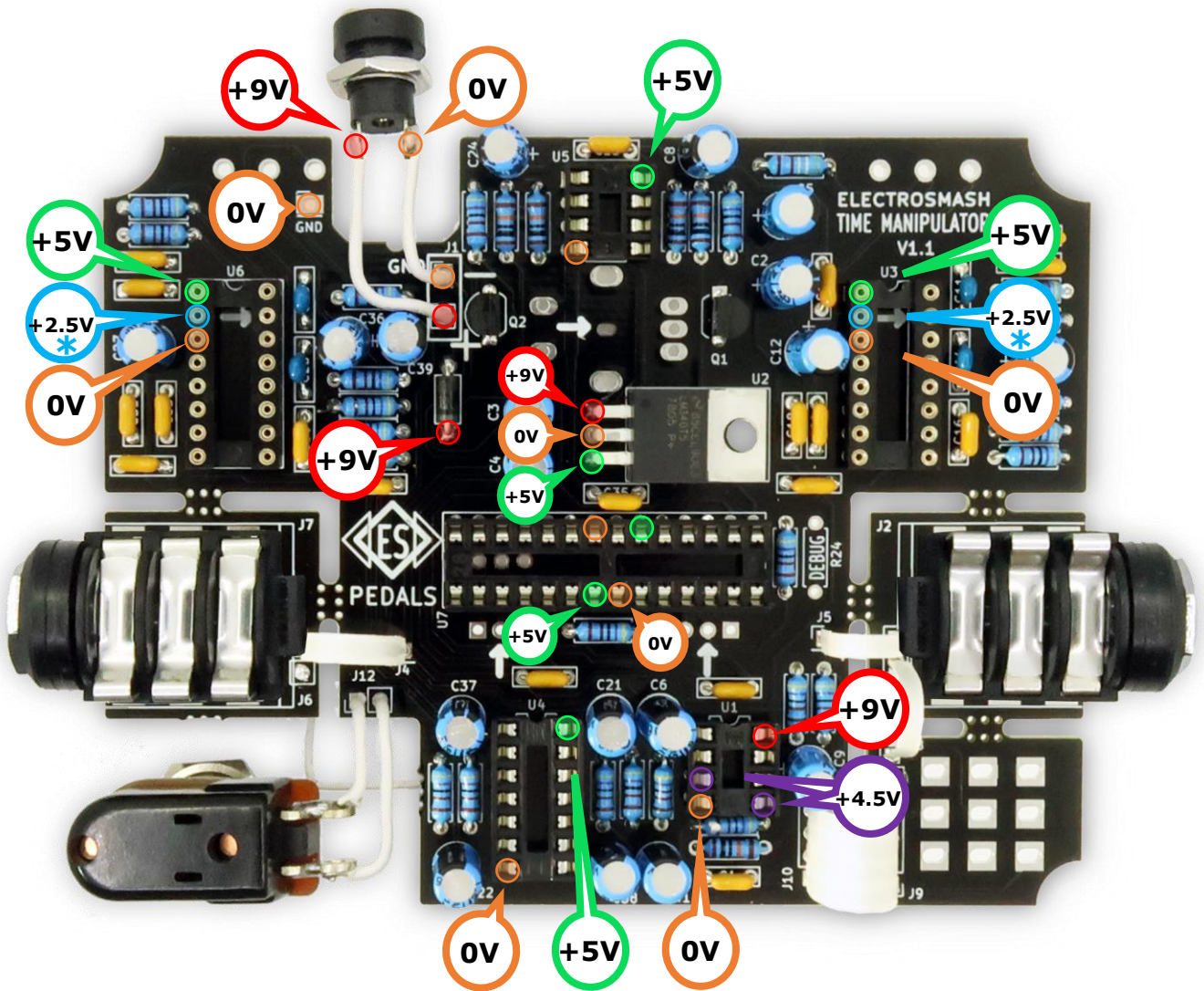
DON'T SOLDER THE LEDs YET.

- * It is better to break the mousebites (separate the PCB) later, in Step 10

STEP 7 – Checking the Board:

The first thing to check is the power supply:

- Do not place any IC, keep the sockets empty.
- Connect the +9V (centre positive) power supply.

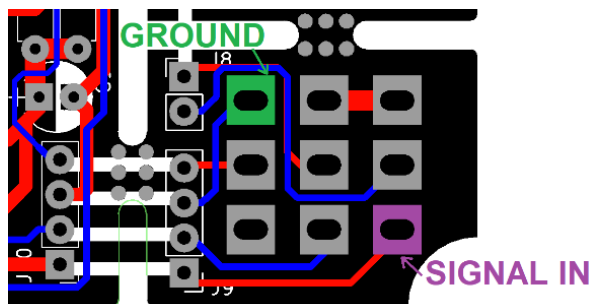
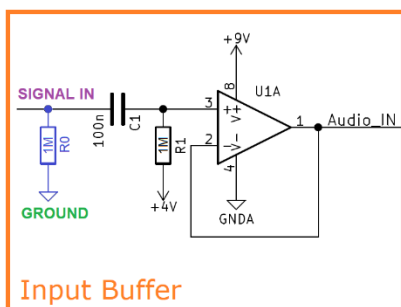


With a multimeter, measure the highlighted points. Make sure that the bias voltages reach every chip and they are correct.

*Note: These 2.5V are generated by the PT2399 chips, so you will not see it yet. Once you measure that all the voltages are OK, place the PT2399s and you will see the 2.5V.

Reduce POP mod:

In order to reduce the *pop* sounds when the pedal is engaged, an optional 1M to 2.2M pull down resistor could be placed at the input of the circuit:



Note: This optional resistor will not affect the sound performance of the pedal. It will only attenuate the engaging clicks of the footswitch.

STEP 8 – Going into DEBUG MODE:

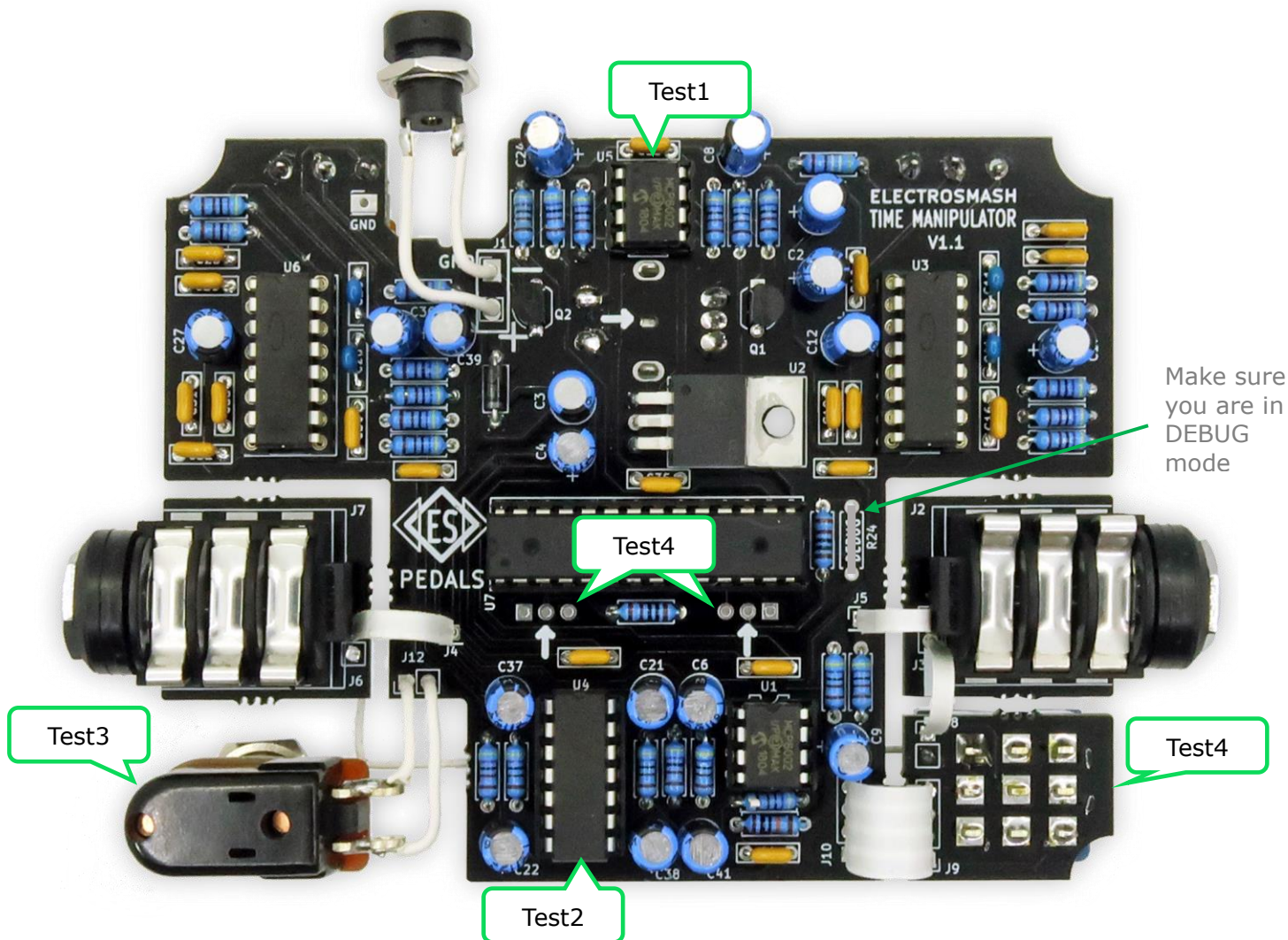
The debugging mode is designed to check every system in the board, it will allow you to make a series of tests and verify the build.



Enter DEBUG mode: Just use a wire or a resistor leg to connect the R24 DEBUG pads. The pedal will go into debug mode.

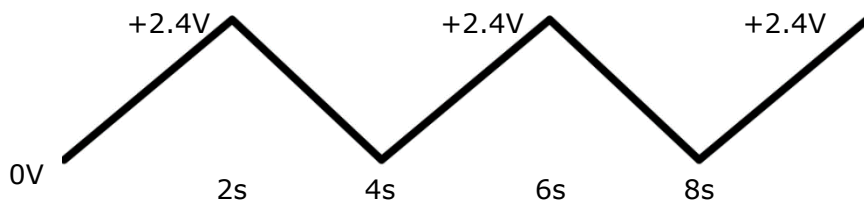


Normal mode: When you finish doing the debug tests, just desolder or cut the wire across R24. The pedal will stay in normal mode. This is the mode you will use 99.9% of the time.

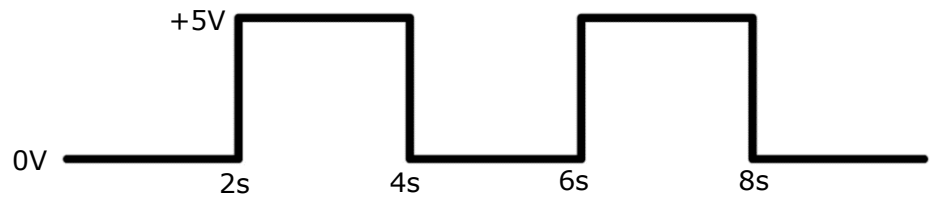


Debug Mode Tests:

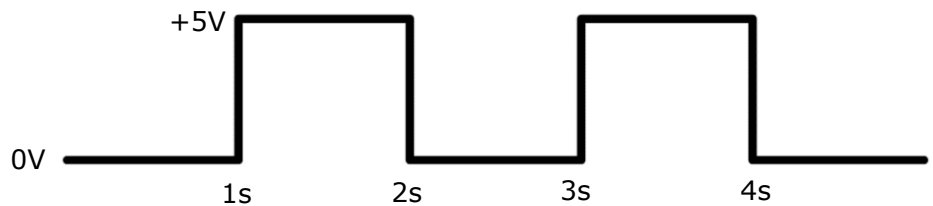
- Test1: measure with a multimeter the U5 pins 2 and 6, they should be ramping up and down from 0 to 2.4 volts.



- **Test2:** measure with a multimeter U4 pins 5, 6, 12 and 13, they should be going ON(+5V) and OFF(0V) every 2 seconds:



- **Test3:** While pushing the tap footswitch (connected to J12), measure again U4 pins 5, 6, 12 and 13 they should be going ON(+5V) and OFF(0V) every 1 second:



- **Test4:** When in debugging mode, the LEDs should light in loop: GREEN - RED - OFF
 - If you activate the pedal pushing the 3PDT footswitch SW1, the LEDs will do the loop at double the speed.

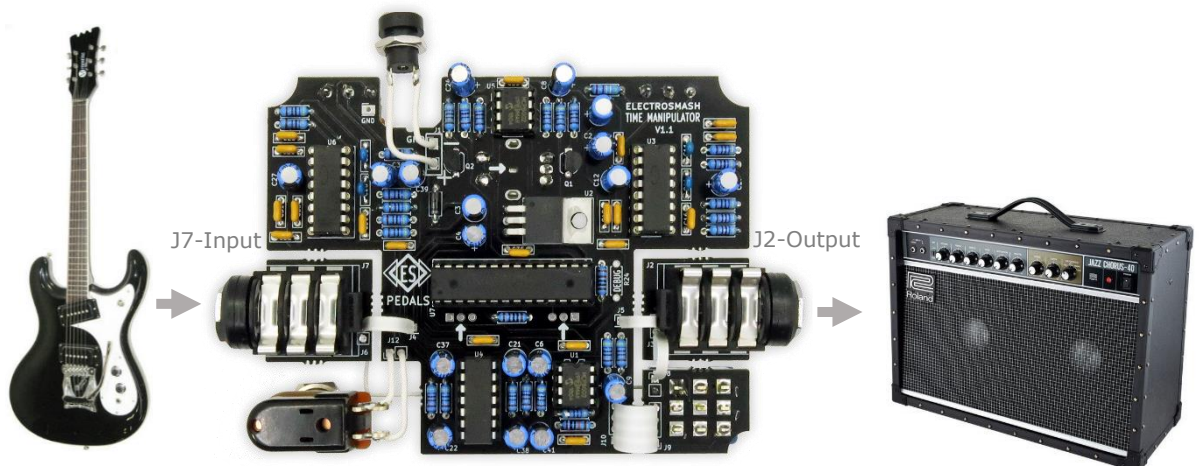
NOTE: Once you finish, disconnect the R24 DEBUG wire, so the pedal can do to normal mode.

STEP 9 – Check the Pedal:

At this point, you are ready to use the pedal. It is designed to be checked before being boxed, so makes everything easier to fix and mod.

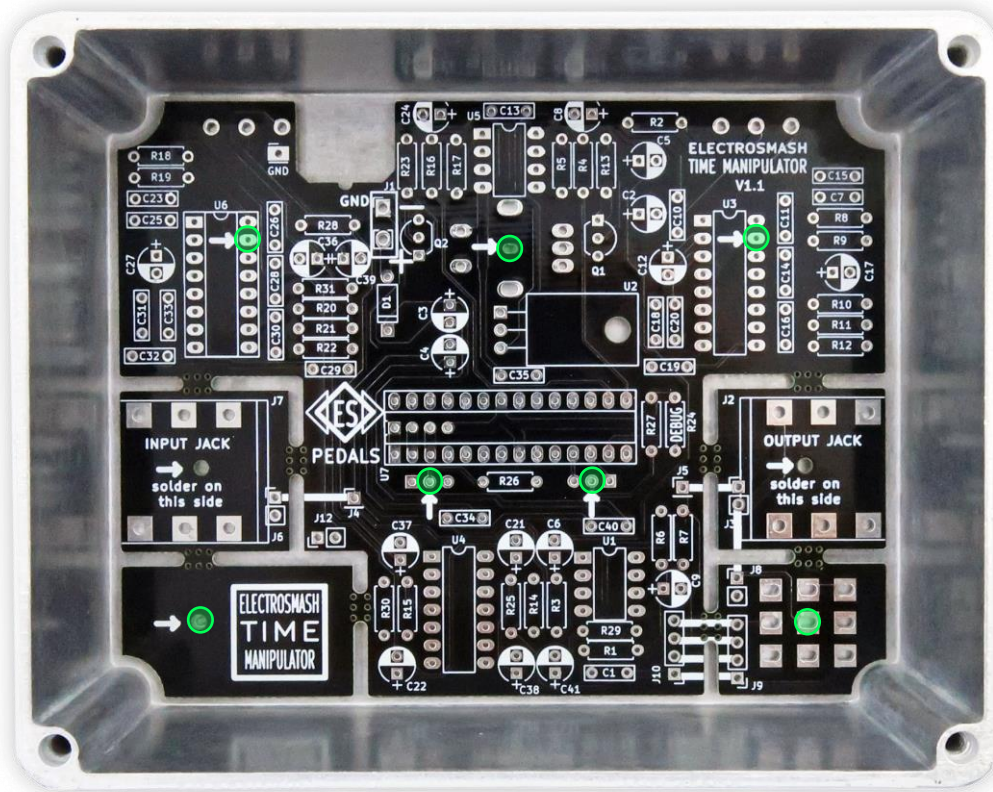
Have a look at the [Time Manipulator Instructions](#) if you have any question about the functionality. At this point, you can also easily reprogram the microcontroller if you want to experiment with sounds.

Note: The board is upside down, so the amp and guitar connect to opposite sides (see below):

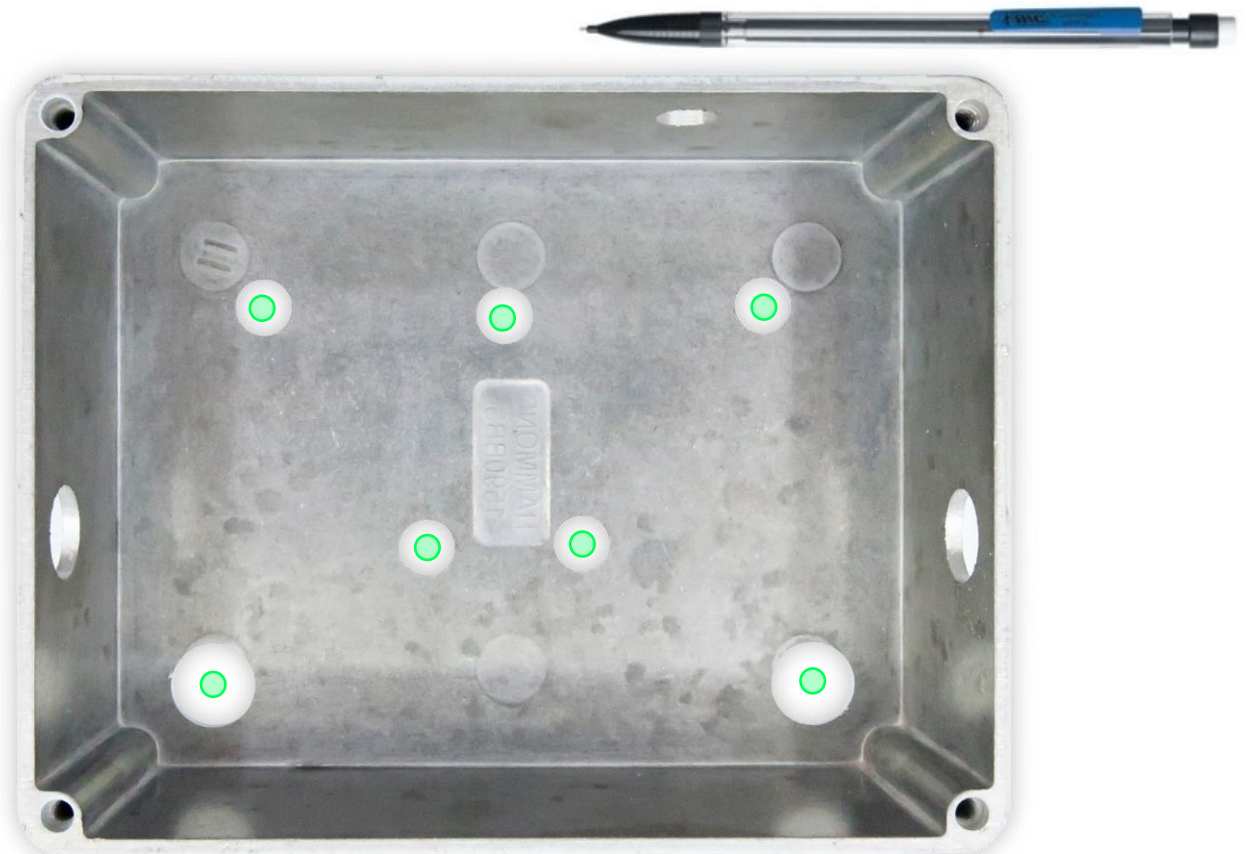


STEP 10 – Boxing the Electronics:

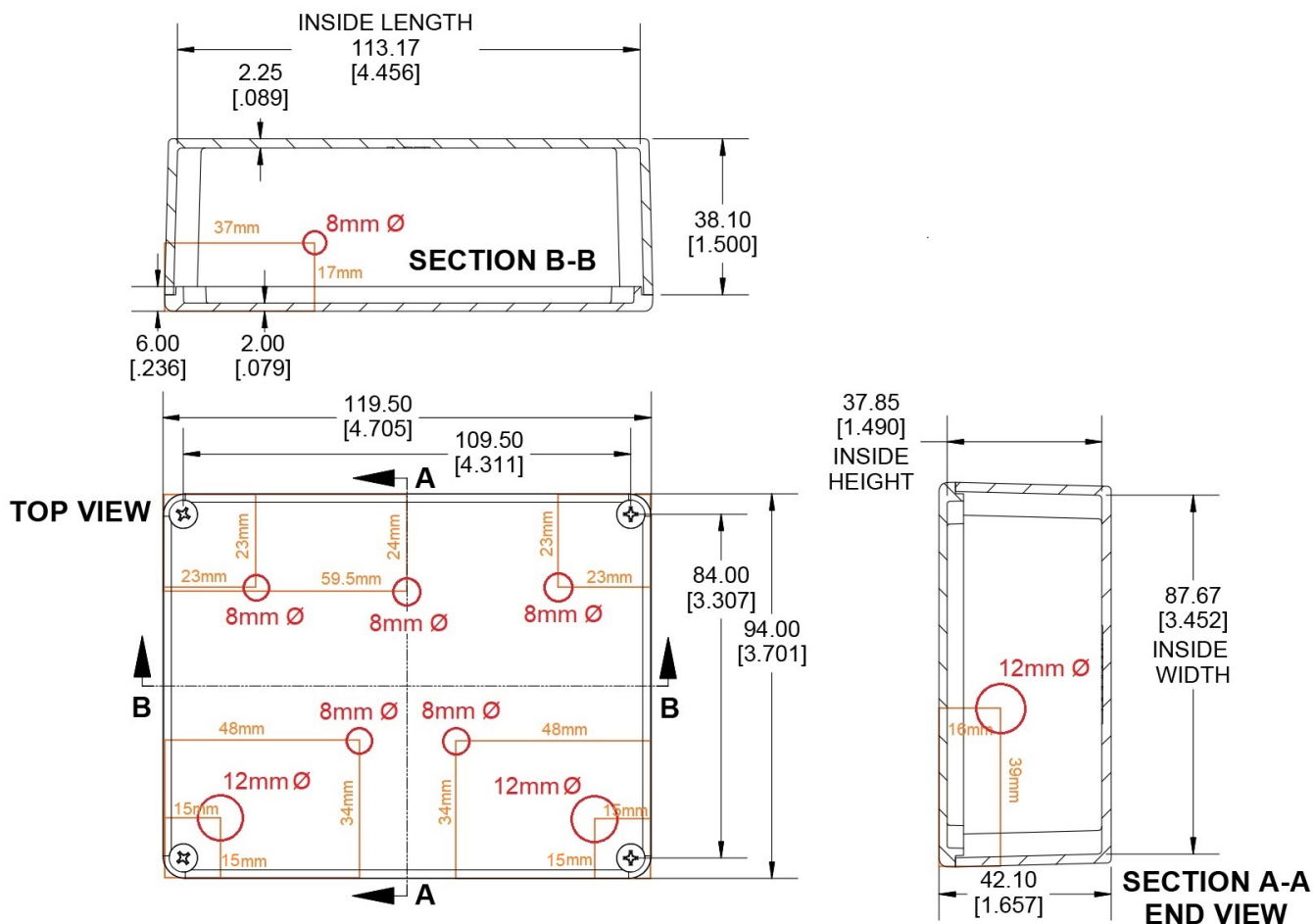
The bare PCB can be used to mark the holes at the exact point:



The arrows on the PCB are showing where to mark the 7 holes (●). They are small so you would need a thin pencil to go through the board.



This is the Hammond 1590BBS drill stencil.



Use a cutter to separate the stickers:



Note: At the last page of this document, you can see how the stickers are placed.



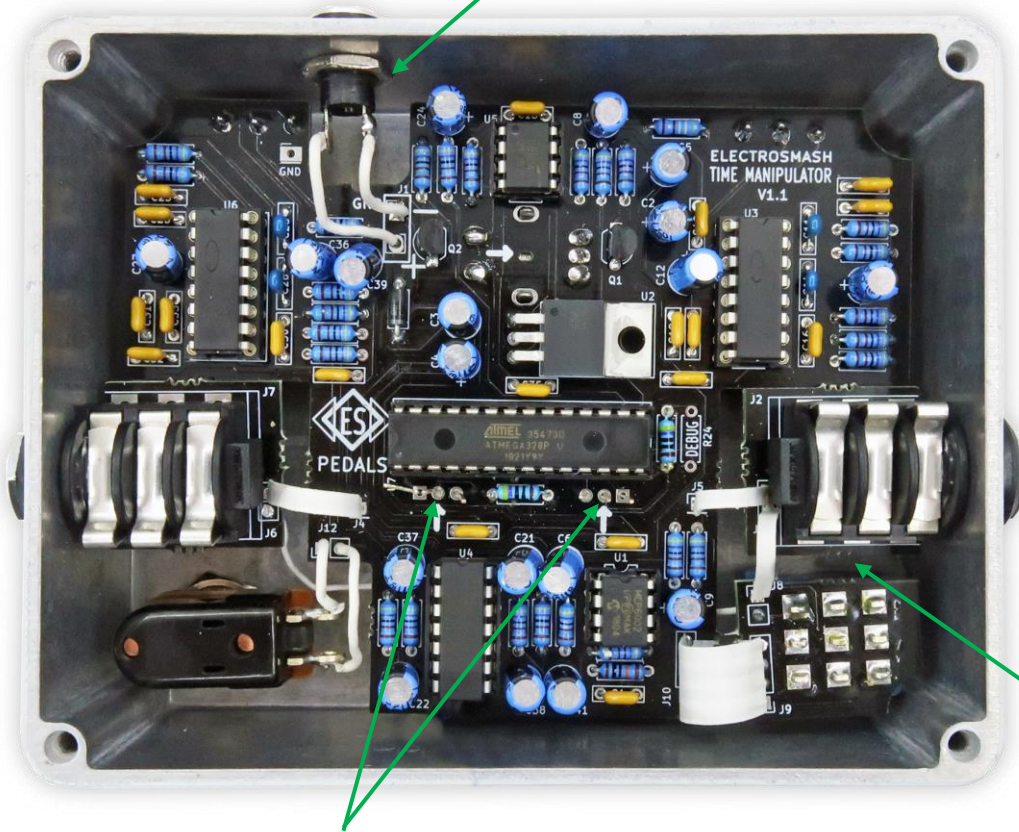
Boss style power supply sticker

Boxing:

- 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 their holes at the same time (not simply inserting one jack after the other).



Don't forget the nut before soldering



You can separate the PCB with your hands or use pair of small pliers to do it.

The LEDs are not soldered yet, so you can move them up/down, left/right and once they are in position solder them.

Time Manipulator Finished:

