

PROJECT NAME
FUSION

BASED ON
Suhr® Riot™

EFFECT TYPE
Distortion

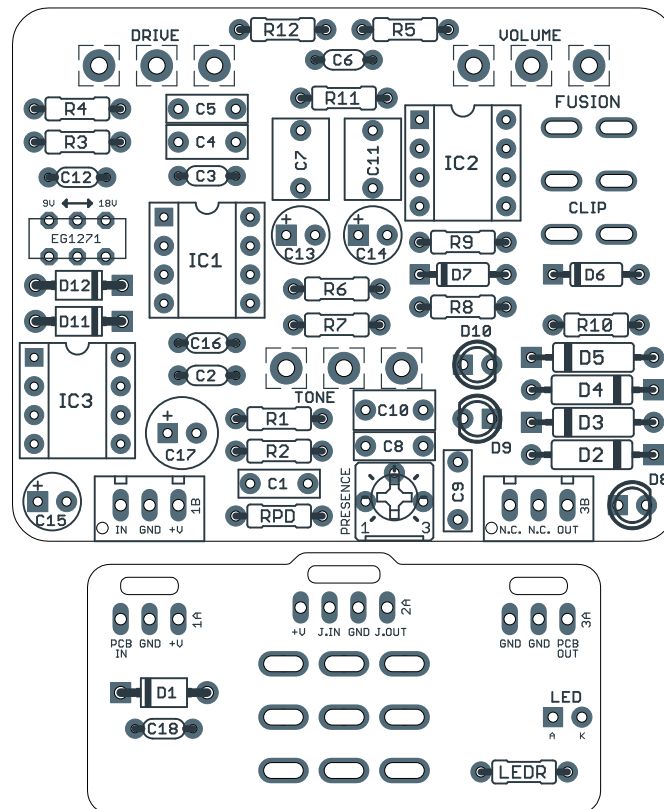
PROJECT SUMMARY

A versatile distortion/overdrive noted for its Marshall-like “stack of amps” tone.



BUILD DIFFICULTY
■■■■■ Easy

DOCUMENT VERSION
1.0.0 (2023-03-24)



Actual size is 2.3" x 1.86" (main board) and 1.78" x 0.87" (bypass board).

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INTRODUCTION

The Fusion Dynamic Distortion is an adaptation of the Suhr® Riot™ Distortion, originally released in 2009. The Riot is in the family of Marshall-like pedals and is lauded for its high gain “stack of amps” tone.

The Riot was developed as a modified clone of the [MI Audio Crunch Box](#) from 2006, which in turn was a derivative of the [Marshall Bluesbreaker](#) along with some inspiration from the [Fulltone® OCD®](#).

The updated version of the Fusion is very similar to the [legacy PCB](#), but with the addition of an internal slide switch so that 9V and 18V modes can both be used instead of being hardwired for one or the other.

As in the legacy project, we’ve also brought over the internal Presence trimmer from the Crunch Box. The Riot never had one, though it had two fixed resistors that simulated a 20k trimmer set at around 1:00 (58% rotation). You can always set it to be exactly like the original, but by having the trimmer available, you have access to an expanded range of tones not found in the original Riot.

USAGE

The Fusion has the typical controls of a 3-knob overdrive:

- **Drive** controls the amount of gain pushed into the hard-clipping diodes.
- **Tone** controls the treble response via a passive filter.
- **Volume** controls the overall output.

There is also one toggle switch, one internal trimmer and one internal slide switch:

- **Clipping** (toggle switch) selects between three different combinations of clipping diodes.
- **Presence** (trimmer) adjusts some of the fixed treble cut that comes after the tone control.
- **Voltage** (slide switch) selects between 9V and 18V power.

PARTS LIST

This parts list is also available in a spreadsheet format which can be imported directly into Mouser for easy parts ordering. Mouser doesn't carry all the parts—notably potentiometers—so the second tab lists all the non-Mouser parts as well as sources for each.

[View parts list spreadsheet](#) →

PART	VALUE	TYPE	NOTES
R1	1M	Metal film resistor, 1/4W	
R2	1k	Metal film resistor, 1/4W	
R3	1k	Metal film resistor, 1/4W	
R4	10k	Metal film resistor, 1/4W	
R5	1M	Metal film resistor, 1/4W	
R6	470R	Metal film resistor, 1/4W	
R7	470R	Metal film resistor, 1/4W	
R8	220R	Metal film resistor, 1/4W	
R9	100k	Metal film resistor, 1/4W	
R10	100R	Metal film resistor, 1/4W	
R11	22k	Metal film resistor, 1/4W	
R12	22k	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	Input pull-down resistor.
LEDR	10k	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	22n	Film capacitor, 7.2 x 2.5mm	
C2	33pF	MLCC capacitor, NP0/C0G	
C3	100pF	MLCC capacitor, NP0/C0G	
C4	220n	Film capacitor, 7.2 x 2.5mm	
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	100pF	MLCC capacitor, NP0/C0G	
C7	2.2uF	Film capacitor, 7.2 x 5mm	
C8	22n	Film capacitor, 7.2 x 2.5mm	
C9	22n	Film capacitor, 7.2 x 2.5mm	
C10	1uF	Film capacitor, 7.2 x 3.5mm	
C11	2.2uF	Film capacitor, 7.2 x 5mm	
C12	470n	MLCC capacitor, X7R	Power supply filter capacitor.
C13	10uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C14	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C15	10uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C16	470n	MLCC capacitor, X7R	Power supply filter capacitor.
C17	100uF	Electrolytic capacitor, 6.3mm	Reference voltage filter capacitor.
C18	100n	MLCC capacitor, X7R	Power supply filter capacitor. Mistakenly labeled C19 on initial release.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
D1	1N5817	Schottky diode, DO-41	
D2	Ge	Germanium diode, DO-7	
D3	Ge	Germanium diode, DO-7	Any germanium diode should work the same in this circuit, so use whatever you can find. See build notes for precautions about polarity.
D4	Ge	Germanium diode, DO-7	
D5	Ge	Germanium diode, DO-7	
D6	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	3mm blue	LED, 3mm, blue water-clear	
D9	3mm red	LED, 3mm, red diffused	
D10	3mm red	LED, 3mm, red diffused	
D11	1N5817	Schottky diode, DO-41	
D12	1N5817	Schottky diode, DO-41	
IC1	JRC4580D	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	JRC4580D	Operational amplifier, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
IC3	TC1044SCPA	Operational amplifier, DIP8	Can also use LT1054.
IC3-S	DIP-8 socket	IC socket, DIP-8	
DRIVE	100kB	16mm right-angle PCB mount pot	
TONE	10kC	16mm right-angle PCB mount pot	
VOL.	10kA	16mm right-angle PCB mount pot	
CLIP	DPDT on-on-on	Toggle switch, DPDT on-on-on	See build notes for correct switch configuration.
VOLT.	DPDT slide	DPDT slide, micro	E-Switch EG1271
LED	5mm	LED, 5mm, red diffused	
IN	1/4" stereo	1/4" phone jack, closed frame	Switchcraft 112BX or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
FSW	3PDT	Stomp switch, 3PDT	
BATT.	9V	9V battery snap	Soft vinyl type. The hard-shell type will not fit.
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

Clipping switch

The clipping switch is a DPDT on-on-on toggle. For this type of switch, depending on the manufacturer, there are two different types of configurations for the center position, which are as follows:



The Fusion requires the **Type 2** configuration, which is used by most major manufacturers such as Taiway. If you're considering a different brand, make sure to check the configuration of the center position. Many of the on-on-on switches sold by Tayda or Love My Switches are Type 1 and will not work.

In addition, make sure you're using an on-*on*-on switch and not an on-*off*-on switch, which has the same appearance and also has 3 positions, but will not work in this circuit.

Germanium diodes

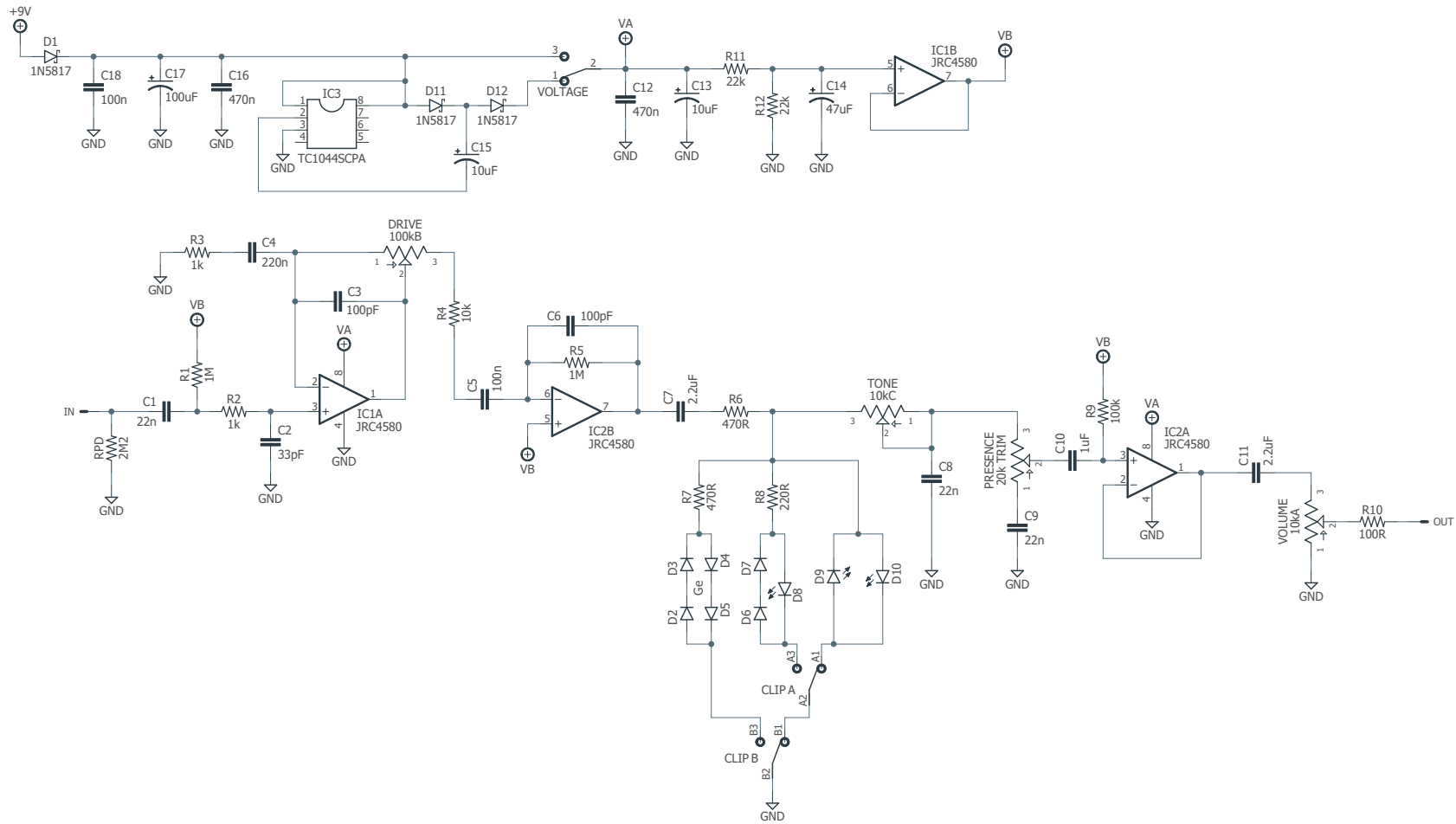
The Riot uses four germanium diodes as part of the clipping combinations. These days, the Russian D9 series are probably the most readily-available NOS germaniums, and will sound great in this circuit. But be aware that these Russian diodes have the stripe on the anode rather than the cathode, meaning they should be inserted backwards according to the PCB silkscreen.

This isn't an issue for circuits like the Klon or Distortion+ that just use two germanium diodes, since it's electronically identical whether they're both the right way or both backwards. However, since these are in series with other diodes, if the germaniums are reversed in relation to the other diodes then the path to ground will be blocked and only half the waveform will be clipped.

C19 capacitor

The initial run of Fusion PCBs had the capacitor on the footswitch PCB labeled C19 instead of C18. This will be fixed in subsequent orders, but for now, just know that the MLCC capacitor on the footswitch PCB should be 100n (0.1uF).

SCHEMATIC



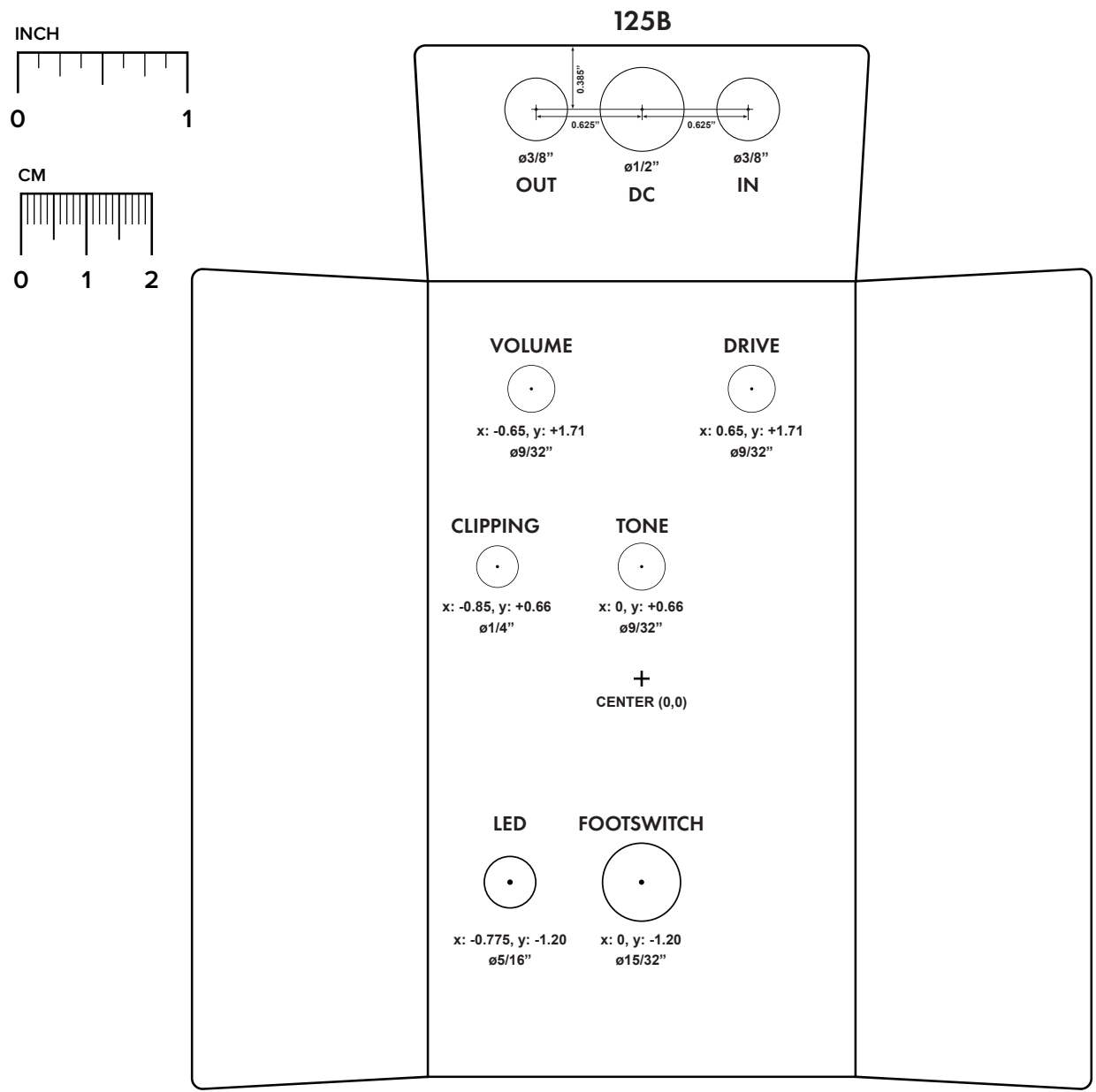
DRILL TEMPLATE

Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

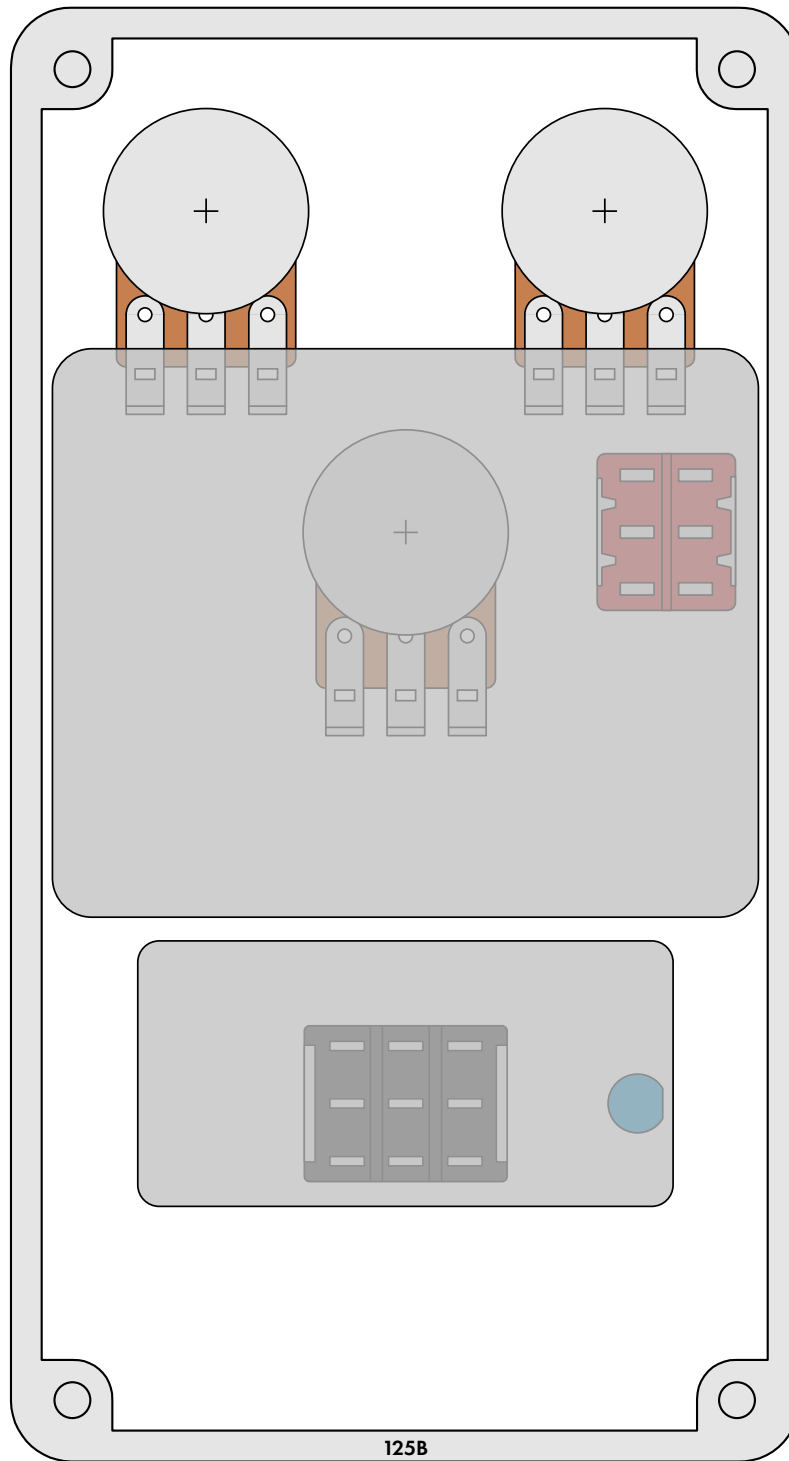
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

LED hole drill size assumes the use of a [5mm LED bezel](#), available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.

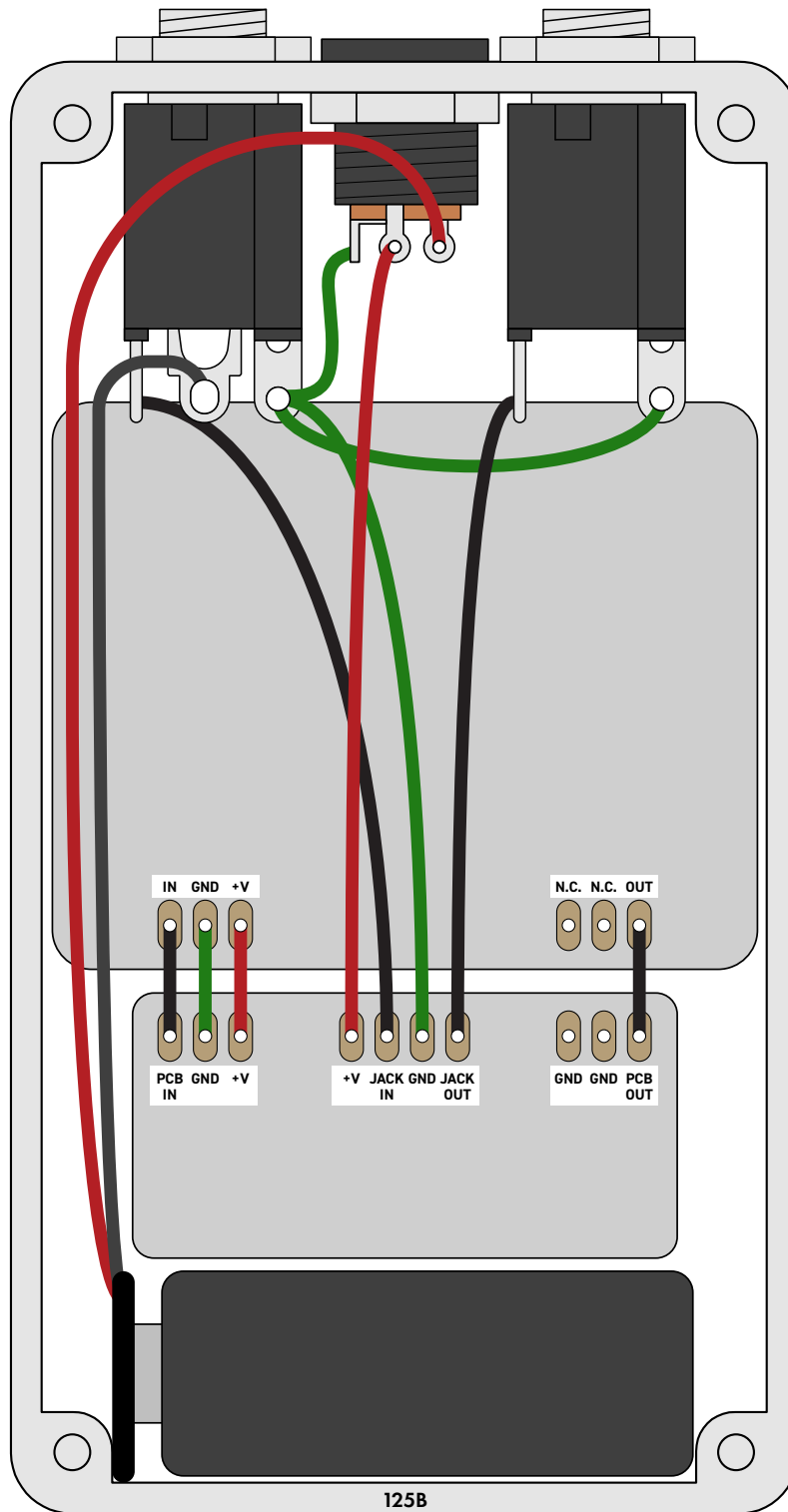


ENCLOSURE LAYOUT

Enclosure is shown without jacks. See next page for jack layout and wiring.



WIRING DIAGRAM



LICENSE & USAGE

No direct support is offered for these projects beyond the provided documentation. It's assumed that you have at least some experience building pedals before starting one of these. Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error.

All of these circuits have been tested in good faith in their base configurations. However, not all the modifications or variations have necessarily been tested. These are offered only as suggestions based on the experience and opinions of others.

Projects may be used for commercial endeavors in any quantity unless specifically noted. No attribution is necessary, though a link back is always greatly appreciated. The only usage restrictions are that **(1) you cannot resell the PCB as part of a kit without prior arrangement, and (2) you cannot "goop" the circuit, scratch off the screenprint, or otherwise obfuscate the circuit to disguise its source.** (In other words: you don't have to go out of your way to advertise the fact that you use these PCBs, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!)

DOCUMENT REVISIONS

1.0.0 (2023-03-24)

Initial release.