PROJECT NAME

PRISM

DIY GUITAR EFFECTS

BASED ON
BOSS® FA-1 FET Amplifier

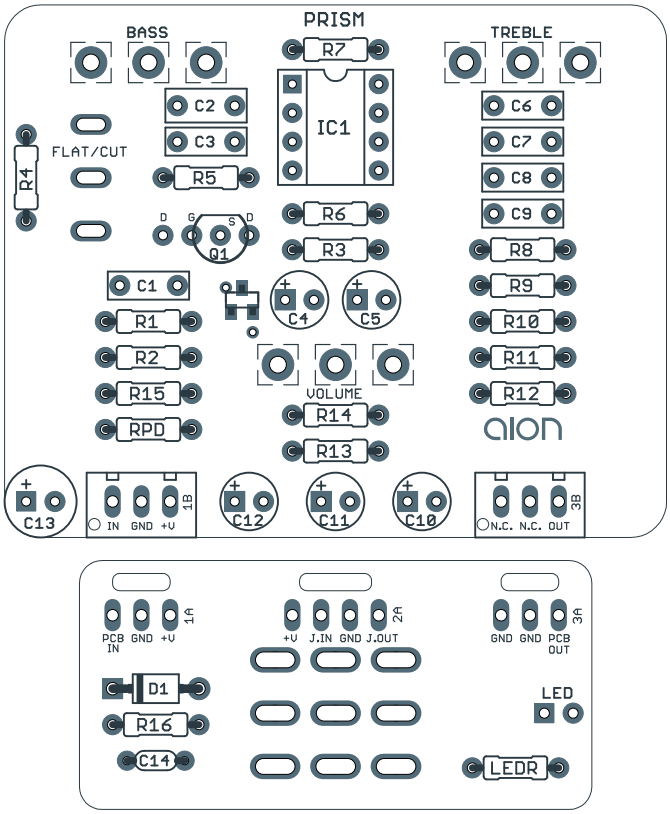
BUILD DIFFICULTY
Easy

EFFECT TYPE
Boost / Preamplifier

DOCUMENT VERSION
1.0.2 (2024-08-08)

PROJECT SUMMARY

An extremely loud and tonally-flexible boost/preamp with a two-band EQ, most notably used by The Edge of U2.



Actual size is 2.3" x 1.86" (main board) and 2.3" x 0.86" (bypass board).

IMPORTANT NOTE

This documentation is for the **PCB-only** version of the project. If you are building the full kit from Aion FX, please use the kit build documentation instead. The instructions are more detailed and may differ in some areas due to the specialized parts and assembly methods used in our kits.

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INTRODUCTION

The Prism FET Amplifier is a pedal conversion of the obscure but highly sought-after BOSS® FA-1 FET Amplifier. The original, which was manufactured from 1980 to 1984, was an always-on effect that clipped to your belt and ran on a 9-volt battery.

It's a solid circuit, but the non-standard implementation prevented it from getting much attention—although it was famously used by The Edge which caused vintage prices to skyrocket.

The Prism is the same circuit in an alternate format, converting it to a standard pedal with a footswitch, LED and 9V adapter jack.

The original FA-1 used the long-obsolete HA1457W chip, which is a single version of the LM1458 (as evidenced by the similarity of "1457" and "1458", and similar datasheet specifications). For the updated version of the Prism, extensive A/B testing was done to verify that the LM1458 performs exactly the same as two HA1457Ws and is sonically indistinguishable.

As a result, this new version eliminates the option to use the HA1457W and only supports dual op-amps. However, the previous version of the Prism is still available if you really do want to use the HA1457W.

USAGE

The Prism has the following controls:

- **Treble** and **Bass** form a Baxandall EQ allowing for adjustment of the respective frequencies.
- **Volume** controls the overall output of the effect, from zero to approximately 26dB of gain.
- **Low Cut** toggle engages a filter that cuts bass frequencies below 200 Hz at -6dB/octave.

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 (most notably potentiometers) so the second tab lists all the non-Mouser parts as well as sources for each.

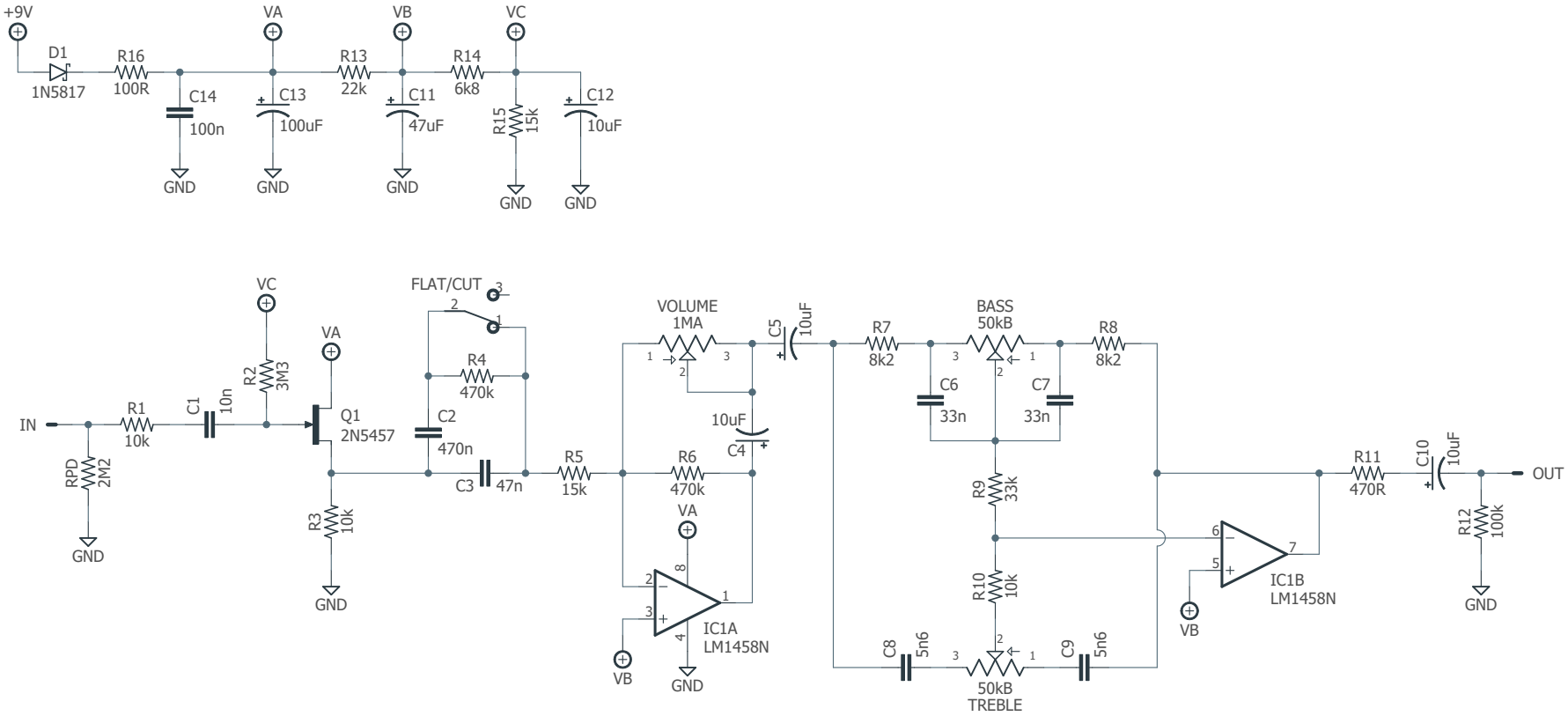
View parts list spreadsheet →

PART	VALUE	TYPE	NOTES
R1	10k	Metal film resistor, 1/4W	
R2	3M3	Metal film resistor, 1/4W	
R3	10k	Metal film resistor, 1/4W	
R4	470k	Metal film resistor, 1/4W	
R5	15k	Metal film resistor, 1/4W	
R6	470k	Metal film resistor, 1/4W	
R7	8k2	Metal film resistor, 1/4W	
R8	8k2	Metal film resistor, 1/4W	
R9	33k	Metal film resistor, 1/4W	
R10	10k	Metal film resistor, 1/4W	
R11	470R	Metal film resistor, 1/4W	
R12	100k	Metal film resistor, 1/4W	
R13	22k	Metal film resistor, 1/4W	
R14	6k8	Metal film resistor, 1/4W	
R15	15k	Metal film resistor, 1/4W	
R16	100R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	
LEDR	10k	Metal film resistor, 1/4W	
C1	10n	Film capacitor, 7.2 x 2.5mm	
C2	470n	Film capacitor, 7.2 x 3mm	
C3	47n	Film capacitor, 7.2 x 2.5mm	
C4	10uF	Electrolytic capacitor, 5mm	
C5	10uF	Electrolytic capacitor, 5mm	
C6	33n	Film capacitor, 7.2 x 2.5mm	
C7	33n	Film capacitor, 7.2 x 2.5mm	
C8	5n6	Film capacitor, 7.2 x 2.5mm	
C9	5n6	Film capacitor, 7.2 x 2.5mm	
C10	10uF	Electrolytic capacitor, 5mm	
C11	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C12	10uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C13	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C14	100n	MLCC capacitor, X7R	Power supply filter capacitor.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
D1	1N5817	Schottky diode, DO-41	
Q1	2N5457	JFET, N-channel, TO-92	Original uses 2SK246(GR). Any general purpose JFET will work the same here (2N5458, MPF102, etc.).
IC1	LM1458	Operational amplifier, DIP-8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
TREBLE	50kB	16mm right-angle PCB mount pot	
BASS	50kB	16mm right-angle PCB mount pot	
VOL.	1MA	16mm right-angle PCB mount pot	
FL/CUT	SPDT	Toggle switch, SPDT on-on	
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.
BATT	Battery snap	9V battery snap	Optional. Use the soft plastic type—the hard-shell type will not fit.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

SCHEMATIC


+9V
D1
1N5817
R16
100R
C14
100n
GND
VA
C13
100uF
GND
R13
22k
VB
C11
47uF
GND
R14
6k8
VC
R15
15k
GND
C12
10uF
GND
VC
VA
FLAT/CUT
R4
470k
IN
R1
10k
C1
10n
R2
3M3
Q1
2N5457
C2
470n
C3
47n
R5
15k
RPD
2M2
GND
R3
10k
GND
VOLUME
1MA
C5
10uF
R6
470k
10uF
C4
VA
IC1A
LM1458N
VB
GND
R7
8k2
BASS
50kB
C6
33n
C7
33n
R8
8k2
R9
33k
R10
10k
C8
5n6
C9
5n6
50kB
TREBLE
VB
IC1B
LM1458N
R11
470R
C10
10uF
R12
100k
GND
OUT

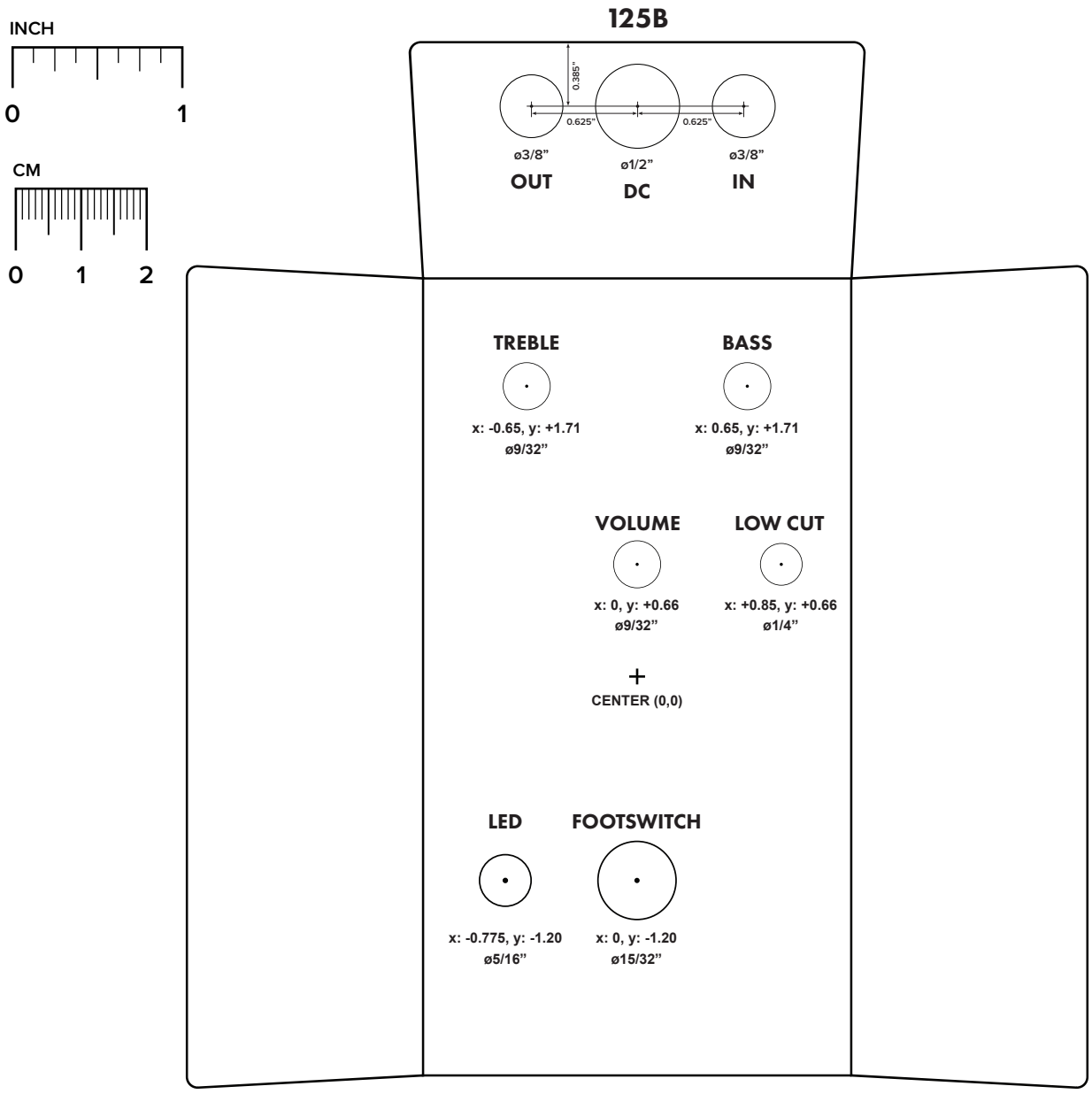
DRILL TEMPLATE

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.

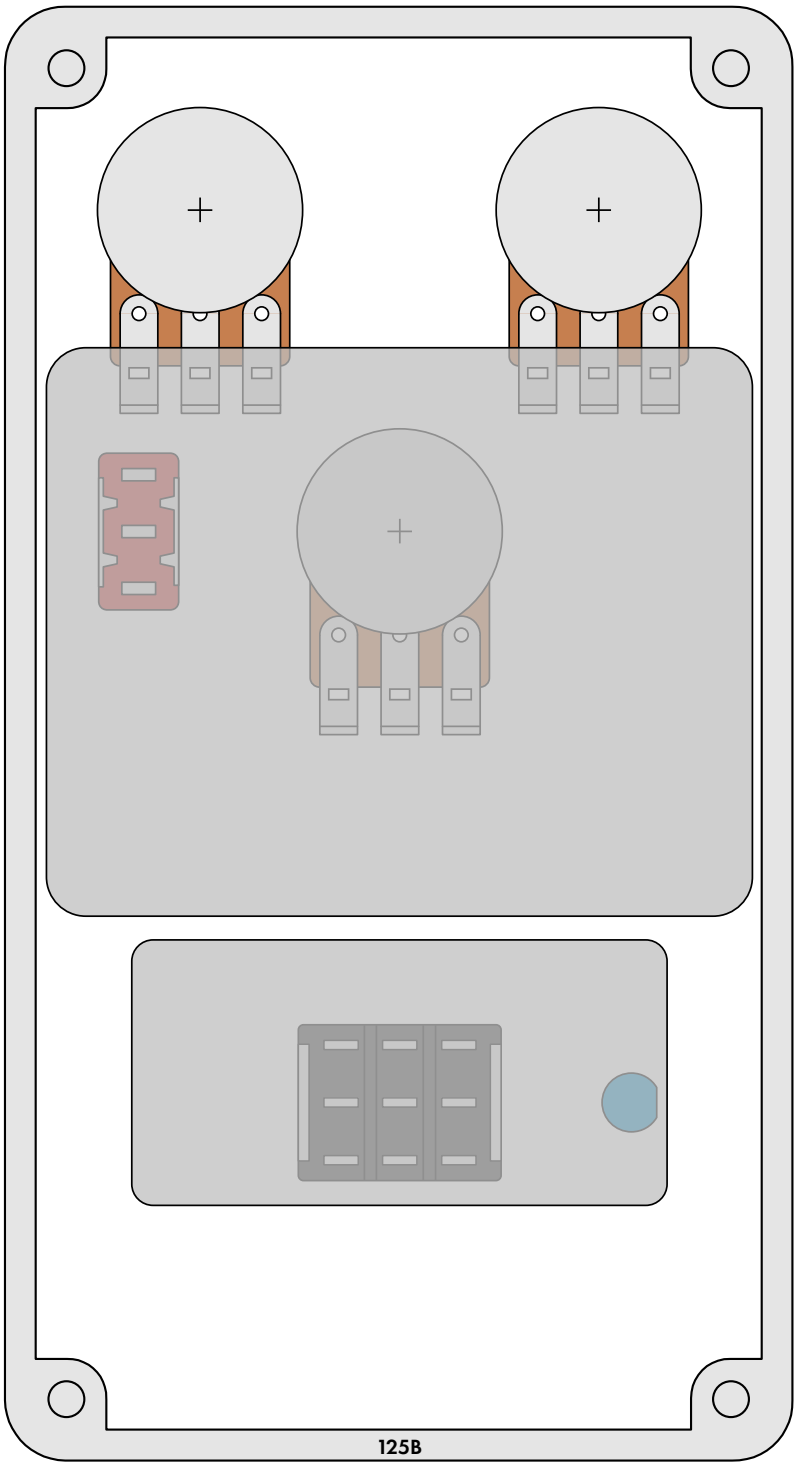
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

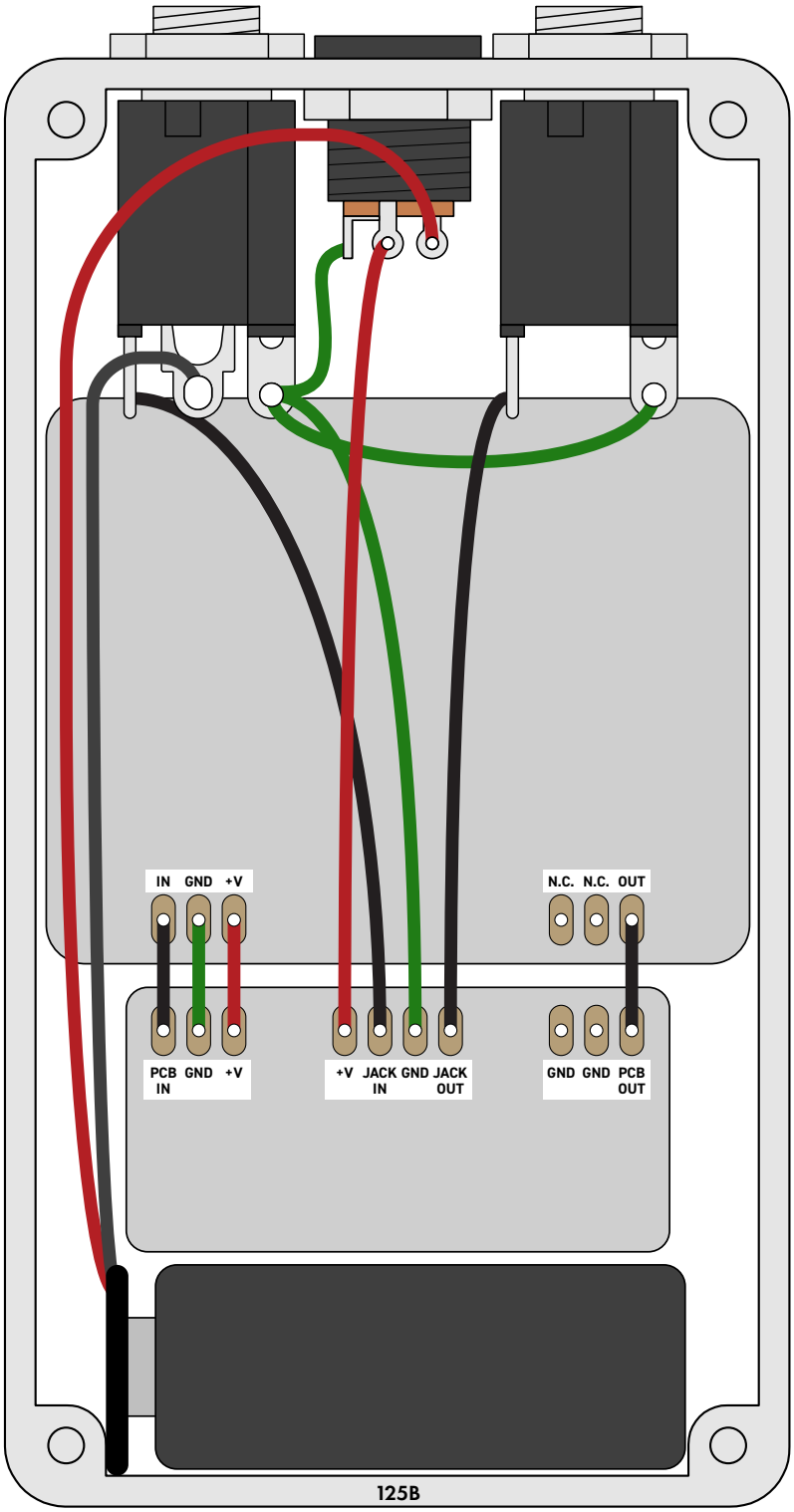


ENCLOSURE LAYOUT

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



WIRING DIAGRAM



Shown with optional 9V battery. If battery is omitted, both jacks can be mono rather than one being stereo. Leave the far-right lug of the DC jack unconnected.

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

1.0.2 (2024-08-08)
Changed LEDR to 10k to work with a wider variety of LEDs.

1.0.1 (2021-02-25)
Fixed mistake in capacitor part numbering in the parts list. The schematic and spreadsheet were correct.

1.0.0 (2020-07-03)
Initial release.