PROJECT NAME

TACHYON

aion DIY GUITAR EFFECTS

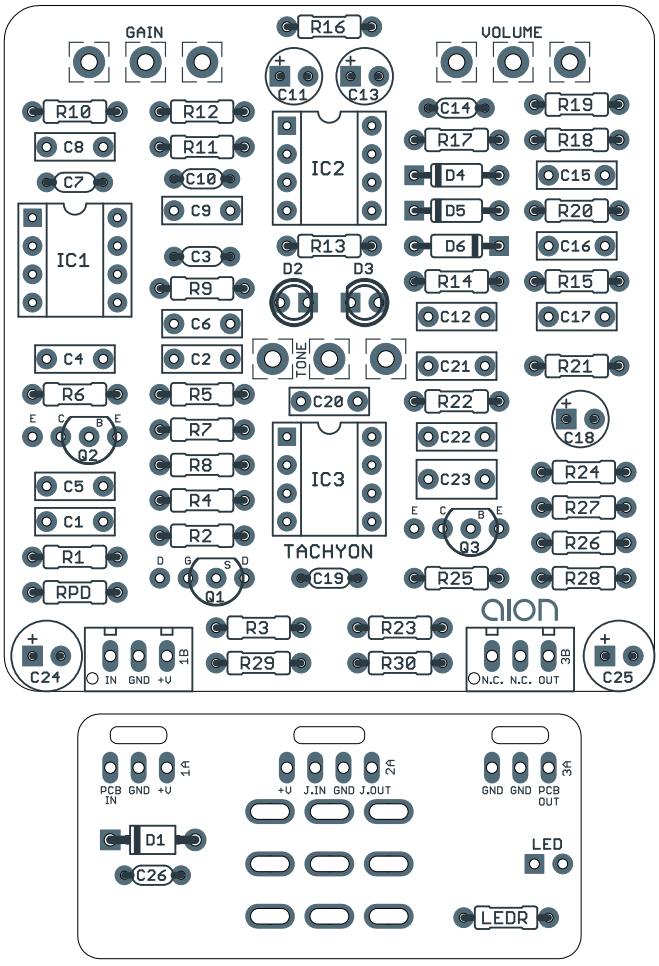
BASED ON
BOSS® SD-2 Lead Channel

BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Overdrive / Distortion

DOCUMENT VERSION
1.0.0 (2019-03-03)

PROJECT SUMMARY
This heavy overdrive is a hidden gem in the pantheon of BOSS pedals, offering creamy lead tones and biting rhythm in an easy-to-use package that is surprisingly complex under the hood.



Actual size is 2.3” x 2.43” (main board) and 1.78” x 0.86” (bypass board).

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INTRODUCTION

The Tachyon Amp Overdrive is a recreation of the "Lead" mode of the BOSS SD-2 Dual Overdrive, originally sold from 1993 to 1998.

The SD-2 is interesting in that it's two fully separate pedals in one box. The "Crunch" and "Lead" modes each use dual-concentric potentiometers allowing for separate settings for Gain, Tone and Volume. The mode can be changed via either a rotary switch selector, the on-board footswitch in A-B mode, or a remote switch.

Unfortunately for BOSS, the Crunch mode was pretty weak and brittle-sounding, and so the pedal was largely ignored. However, the Lead mode really shines. It's one of BOSS's best drive effects—while also being one of the most obscure, since it's buried inside a pedal that was otherwise overlooked.

Despite only having three very basic controls, the SD-2 has a lot going on under the hood. It's very linear, using five distinct op-amp stages for setting the gain, clipping the signal and shaping the EQ—a similar approach taken by Friedman for the BE-OD and Dirty Shirley pedals, or by the Amptweaker Tight Metal.

The Tachyon extracts the Lead mode from the SD-2 with no other modifications or changes.

USAGE

The Tachyon has the following controls:

- **Gain** sets the amount of drive or distortion.
- **Tone** is a simple treble-cut filter.
- **Volume** controls the overall output of the effect.

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	1M	Metal film resistor, 1/4W	
R3	4k7	Metal film resistor, 1/4W	
R4	220k	Metal film resistor, 1/4W	
R5	2k2	Metal film resistor, 1/4W	
R6	2k2	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	47k	Metal film resistor, 1/4W	
R9	220k	Metal film resistor, 1/4W	
R10	4k7	Metal film resistor, 1/4W	
R11	15k	Metal film resistor, 1/4W	
R12	1M	Metal film resistor, 1/4W	
R13	1k	Metal film resistor, 1/4W	
R14	1k	Metal film resistor, 1/4W	
R15	10k	Metal film resistor, 1/4W	
R16	100k	Metal film resistor, 1/4W	
R17	100k	Metal film resistor, 1/4W	
R18	47k	Metal film resistor, 1/4W	
R19	2k2	Metal film resistor, 1/4W	
R20	22k	Metal film resistor, 1/4W	
R21	12k	Metal film resistor, 1/4W	
R22	33k	Metal film resistor, 1/4W	
R23	100k	Metal film resistor, 1/4W	
R24	4k7	Metal film resistor, 1/4W	
R25	470k	Metal film resistor, 1/4W	
R26	10k	Metal film resistor, 1/4W	
R27	100k	Metal film resistor, 1/4W	
R28	1k	Metal film resistor, 1/4W	
R29	100k	Metal film resistor, 1/4W	
R30	100k	Metal film resistor, 1/4W	

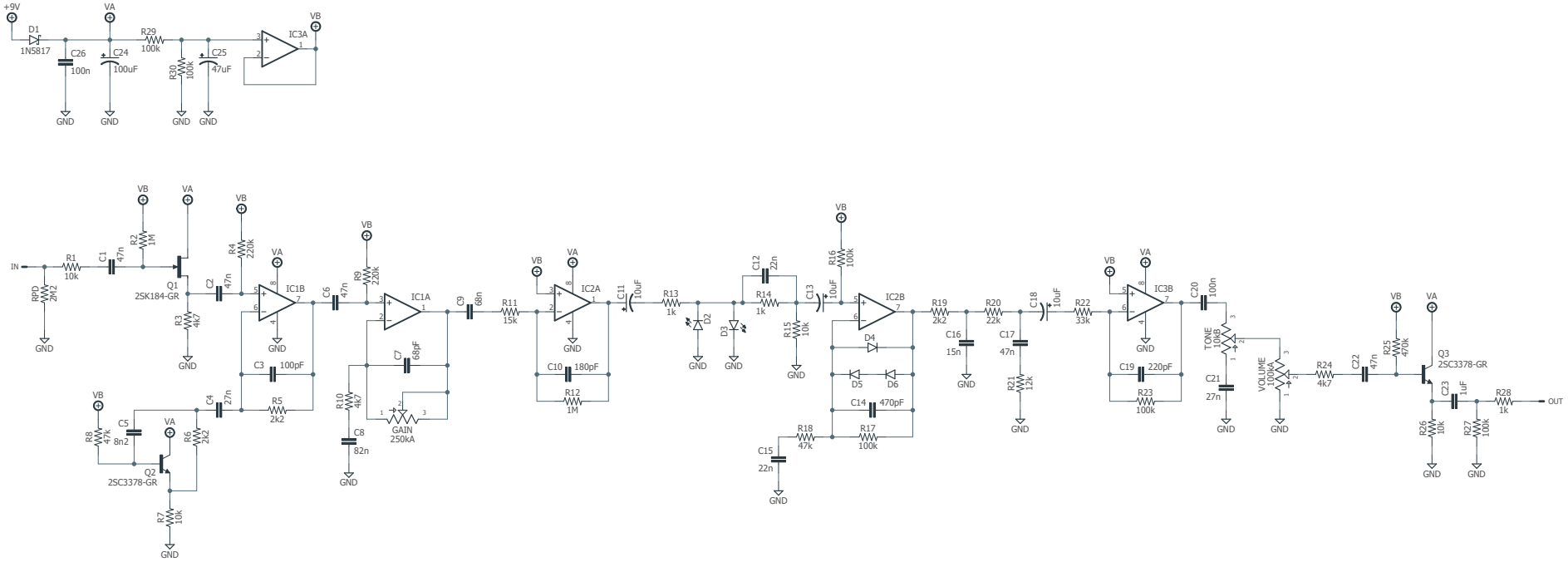
PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor. Can be as low as 1M.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	47n	Film capacitor, 7.2 x 2.5mm	
C2	47n	Film capacitor, 7.2 x 2.5mm	
C3	100pF	MLCC capacitor, NP0/C0G	
C4	27n	Film capacitor, 7.2 x 2.5mm	
C5	8n2	Film capacitor, 7.2 x 2.5mm	
C6	47n	Film capacitor, 7.2 x 2.5mm	
C7	68pF	MLCC capacitor, NP0/C0G	
C8	82n	Film capacitor, 7.2 x 2.5mm	
C9	68n	Film capacitor, 7.2 x 2.5mm	
C10	180pF	MLCC capacitor, NP0/C0G	
C11	10uF	Electrolytic capacitor, 5mm	
C12	22n	Film capacitor, 7.2 x 2.5mm	
C13	10uF	Electrolytic capacitor, 5mm	
C14	470pF	MLCC capacitor, NP0/C0G	
C15	22n	Film capacitor, 7.2 x 2.5mm	
C16	15n	Film capacitor, 7.2 x 2.5mm	
C17	47n	Film capacitor, 7.2 x 2.5mm	
C18	10uF	Electrolytic capacitor, 5mm	
C19	220pF	MLCC capacitor, NP0/C0G	
C20	100n	Film capacitor, 7.2 x 2.5mm	
C21	27n	Film capacitor, 7.2 x 2.5mm	
C22	47n	Film capacitor, 7.2 x 2.5mm	
C23	1uF	Film capacitor, 7.2 x 3.5mm	
C24	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C25	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C26	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	3mm	LED, 3mm, red diffused	Can also use 5mm.
D3	3mm	LED, 3mm, red diffused	Can also use 5mm.
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
Q1	2N5457	JFET, N-channel, TO-92	Any general purpose JFET will be fine here (2N5458, MPF102).
Q2	2N5088	BJT transistor, NPN, TO-92	
Q3	2N5088	BJT transistor, NPN, TO-92	
IC1	JRC4558D	Operational amplifier, DIP-8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	JRC4558D	Operational amplifier, DIP-8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
IC3	JRC4558D	Operational amplifier, DIP-8	
IC3-S	DIP-8 socket	IC socket, DIP-8	
GAIN	250kA	16mm right-angle PCB mount pot	
TONE	10kB	16mm right-angle PCB mount pot	
VOL	100kA	16mm right-angle PCB mount pot	
IN	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X 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	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

SCHEMATIC


+9V
VA
VB
D1
1N5817
C26
100n
C24
100uF
R29
100k
R30
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C25
47uF
IC3A
GND
IN
R1
10k
C1
47n
R2
1M
RPD
2M2
Q1
2SK184-GR
R3
4k7
C2
47n
R4
220k
IC1B
C3
100pF
R5
2k2
C4
27n
C5
8n2
R6
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GAIN
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R13
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C17
47n
R21
12k
C18
10uF
R22
33k
IC3B
C19
220pF
R23
100k
C20
100n
TONE
10kB
C21
27n
VOLUME
100kA
R24
4k7
C22
47n
R25
470k
Q3
2SC3378-GR
C23
1uF
R26
10k
R27
100k
R28
1k
OUT

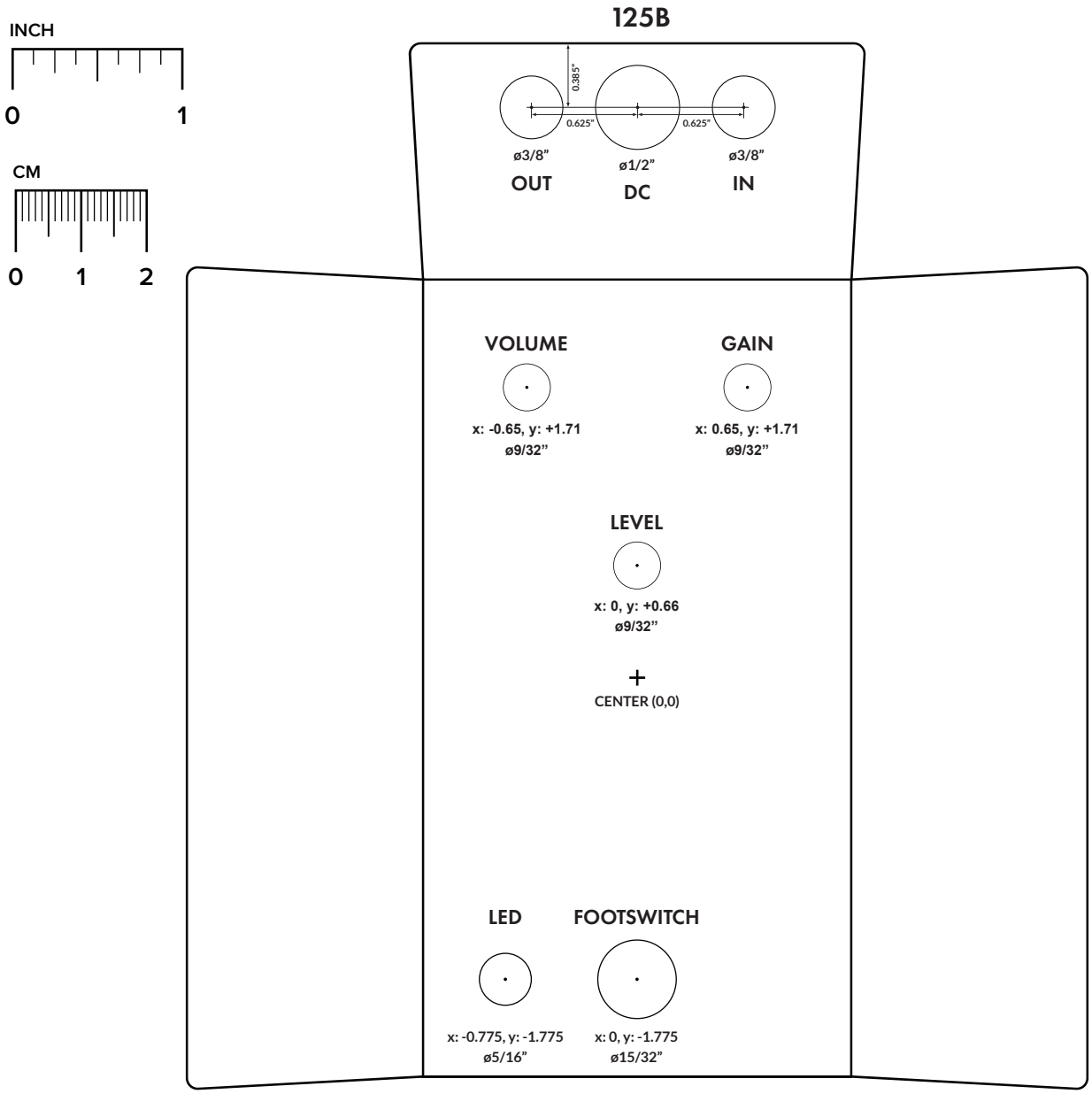
DRILL TEMPLATE

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.

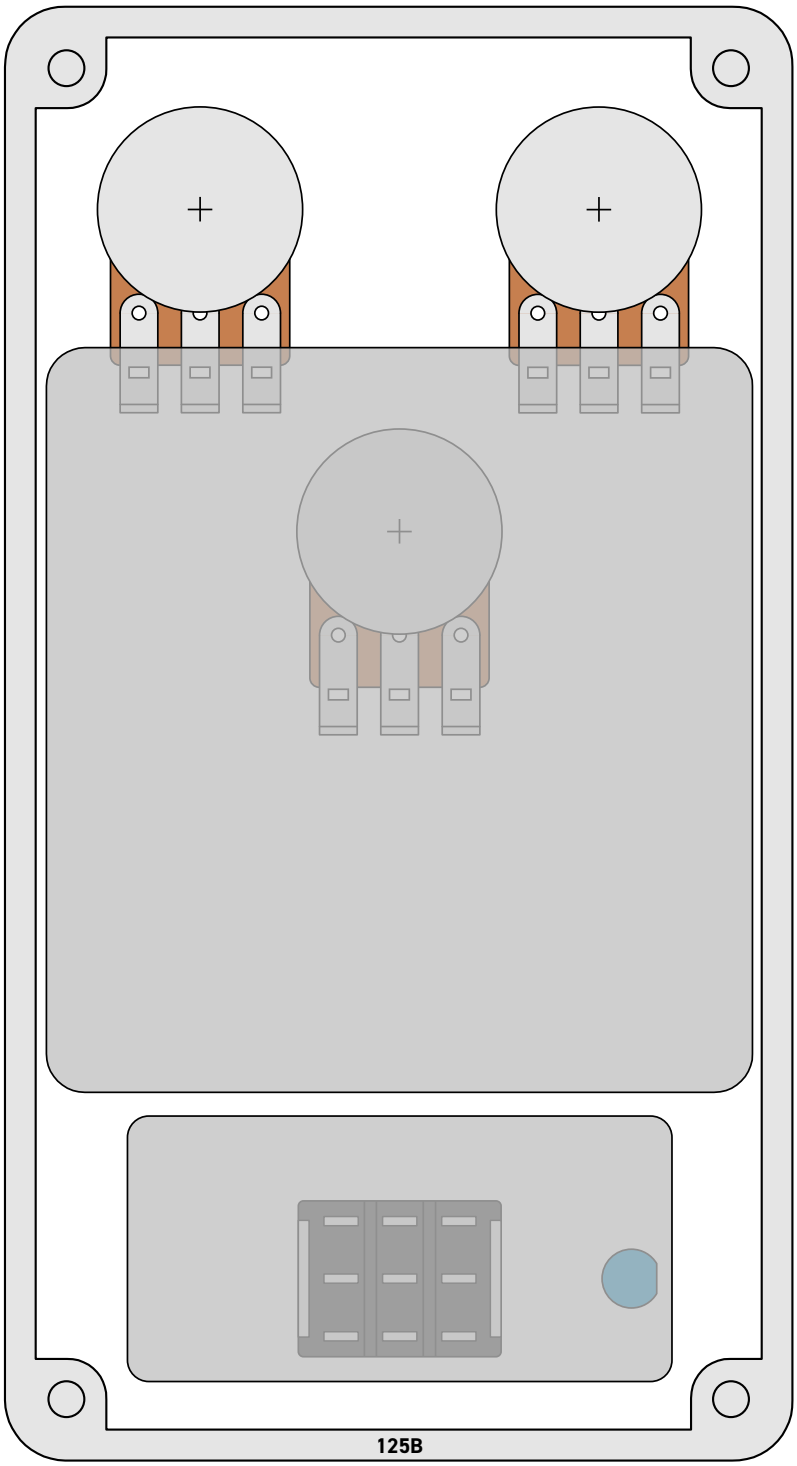
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

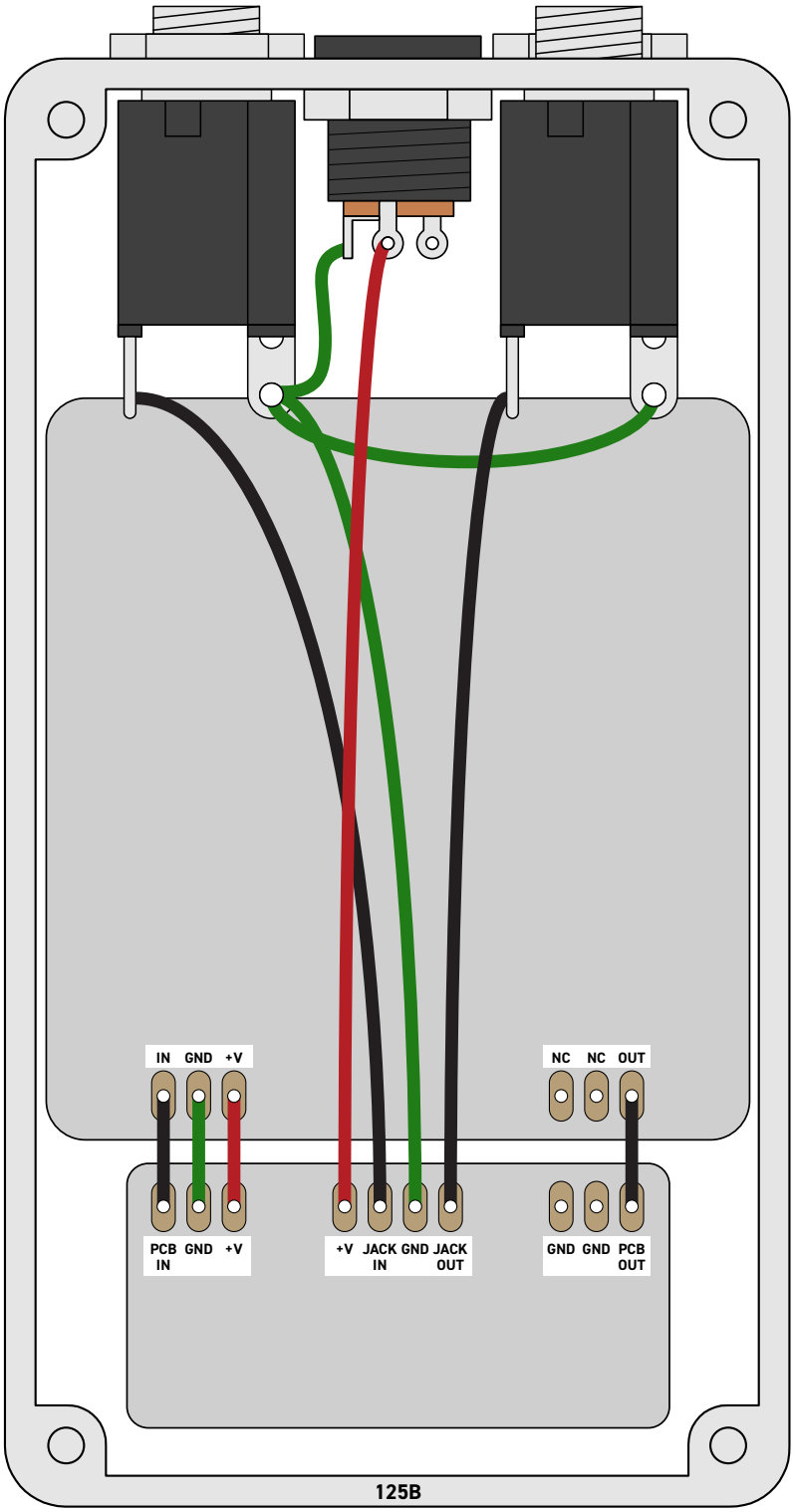


ENCLOSURE LAYOUT

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



WIRING DIAGRAM



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 (2019-03-03)
Initial release.