PROJECT NAME

HADRON

aion
DIY GUITAR EFFECTS

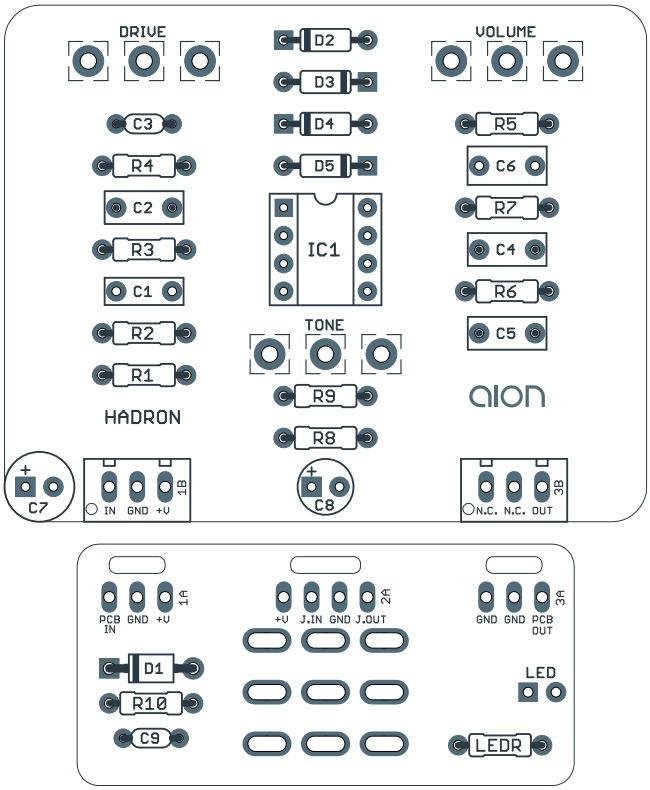
BASED ON
Lovepedal Eternity

BUILD DIFFICULTY
▮▯▯▯▯ Beginner

EFFECT TYPE
Overdrive

DOCUMENT VERSION
1.0.0 (2019-08-04)

PROJECT SUMMARY
An early entry in the minimalist Tube Screamer category, this was one of the circuits that kicked off the hand-built boutique pedal industry.



Actual size is 2.3” x 1.86” (main board) and 1.79” x 0.86” (bypass board).

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INTRODUCTION

The Hadron Dynamic Overdrive is a recreation of the Lovepedal Eternity, first released in 2005. There have been several versions of the Eternity throughout the years, with names like Burst, Fuse, Kanji, D-Mod, and Roadhouse. However, they all have the same basic circuit. The provided parts list is based on the original Eternity, but you should be able to build almost any version if you know what changes to make. The differences are typically only in the component values used and the number of clipping diodes.

Like the Zendrive, the Eternity can be seen as a stripped-down Tube Screamer, based on the original 1997 “Son of Screamer” circuit by Jack Orman. It’s essentially a Tube Screamer without input & output buffers. This makes it interact better with a guitar’s volume & tone knobs, but on the flip side it also interacts with the pedals that come before & after.

Alongside the Azimuth, the Hadron has among the lowest parts count of any Aion FX project and is a very good starting point for new builders.

USAGE

The Hadron has the following controls:

- **Drive** controls the amount of gain in the op-amp feedback diode clipping stage.
- **Tone** controls the treble response of the effect. The center point (12:00) is flat. When turned to the left, it cuts treble, and when turned to the right, it boosts treble.
- **Volume** controls the overall output.

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
C1	47n	Film capacitor, 7.2 x 2.5mm	
C2	220n	Film capacitor, 7.2 x 2.5mm	
C3	OMIT	MLCC capacitor, NP0/C0G	Omit for base version of Eternity. 47-100pF is used for some variants.
C4	150n	Film capacitor, 7.2 x 2.5mm	
C5	150n	Film capacitor, 7.2 x 2.5mm	Use 220n for Burst version.
C6	1uF	Film capacitor, 7.2 x 3.5mm	
C7	100uF	Electrolytic capacitor, 6.3mm	
C8	47uF	Electrolytic capacitor, 5mm	
C9	100n	MLCC capacitor, X7R	
R1	1M	Metal film resistor, 1/4W	
R2	1M	Metal film resistor, 1/4W	
R3	1k	Metal film resistor, 1/4W	
R4	10k	Metal film resistor, 1/4W	
R5	1k	Metal film resistor, 1/4W	
R6	470R	Metal film resistor, 1/4W	Use 330R for Burst version.
R7	1k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
R9	10k	Metal film resistor, 1/4W	
R10	330R	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	
D1	1N5817	Schottky diode, DO-41	
D2	JUMPER	Fast-switching diode, DO-35	Jumper for base Eternity version. 1N914 for Burst version.
D3	1N914	Fast-switching diode, DO-35	
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
IC1	LM833N	Operational amplifier, DIP8	Exact IC is unknown. See build notes.
IC1-S	DIP-8 socket	IC socket, DIP-8	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
DRIVE	100kB	Potentiometer, 16mm right-angle	Use 500kB for Burst version.
TONE	5kB	Potentiometer, 16mm right-angle	
VOL	100kA	Potentiometer, 16mm right-angle	Use 500kA for Burst version.
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.
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.

BUILD NOTES

Variants

The Eternity has dozens of variations, many of which were given names such as Burst, Kanji, Roadhouse, D-Mod, etc., but most of which were not named at all and just sold as the Eternity.

The parts list in this project comes from an early version of the original Eternity that was traced in 2007, which Sean from Lovepedal verified as being a "V3".

The Eternity Burst can be built by changing out the following parts:

C5: 150n → 220n
R6: 470R → 330R
D2: jumper → 1N914
Drive: 100kB → 500kB

Some variants also had 20k for R4 (which sets the minimum drive level), 1MB for the Drive control (which increases max available gain at the expense of fine-tuning at lower gain settings), or 2kB for the Tone control.

IC selection

The exact IC is not known since the markings are sanded off in original units. However, based on reviewing the photos and comparing the physical IC package, the consensus in the DIY community is that the original Eternity used either an LM833 or LM1458, with others suggesting the LF353 as another possibility.

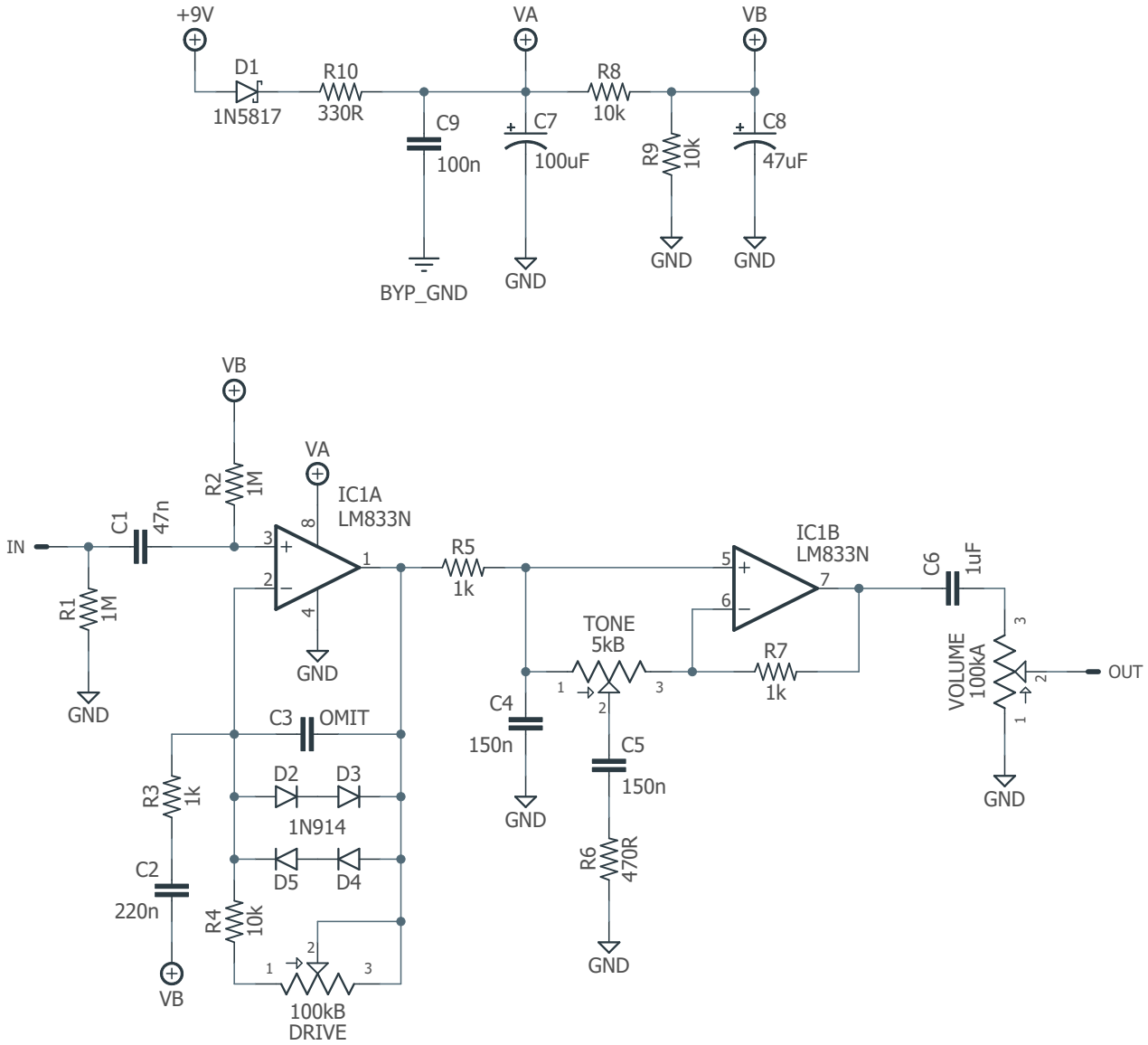
Early versions of the Eternity shipped with an additional TL072 (unsanded) so the player could swap it out if they wanted. Chip-swapping in the Eternity became something of a cottage industry in the early years after its release. Forum discussions were endless, and there were even people on eBay selling packs of alternate Eternity chips. It's not idle speculation, either—it's a simple enough circuit that chip selection really does make a difference in tone.

Any dual op-amp will work here, so feel free to experiment. Others have had great luck with the NE5532, OPA2604, NJM2043DD (marked as JRC2043DD), and NJM4560D (marked as JRC4560D), or TLC2262.

According to the manufacturer, other variants of the Eternity used different op-amps. All of them were sanded down, so nothing is known for sure beyond that, but it's possible that several of the above suggestions were used "officially" at one point.

Power supply resistor

The 330R resistor in series with the power supply will drop the voltage to the pedal and is part of the key to the sound. Some variants of the Eternity used 390R here. However, due to the slight ~0.2V voltage drop from D1 that was not present in the original, it's recommended to stick with 330R.


+9V
VA
VB
D1
1N5817
R10
330R
C9
100n
C7
100uF
R8
10k
R9
10k
C8
47uF
BYP_GND
GND
GND
GND
VB
VA
R2
1M
IC1A
LM833N
IN
C1
47n
R1
1M
GND
GND
R5
1k
IC1B
LM833N
C6
1uF
TONE
5kB
R7
1k
VOLUME
100kA
OUT
GND
C4
150n
C5
150n
R6
470R
GND
C3
OMIT
R3
1k
D2
D3
1N914
D5
D4
C2
220n
R4
10k
VB
100kB
DRIVE

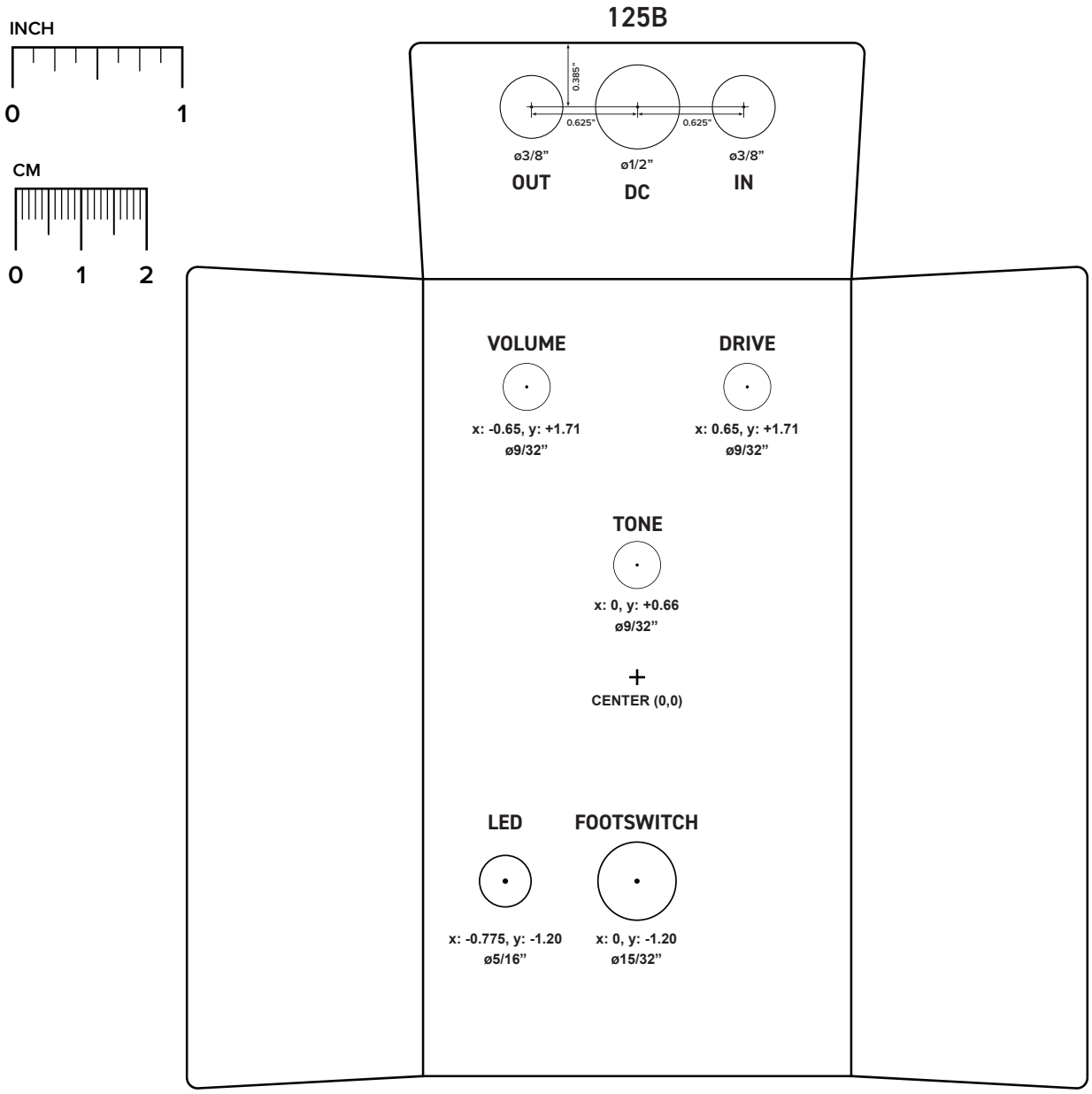
DRILL TEMPLATE

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.

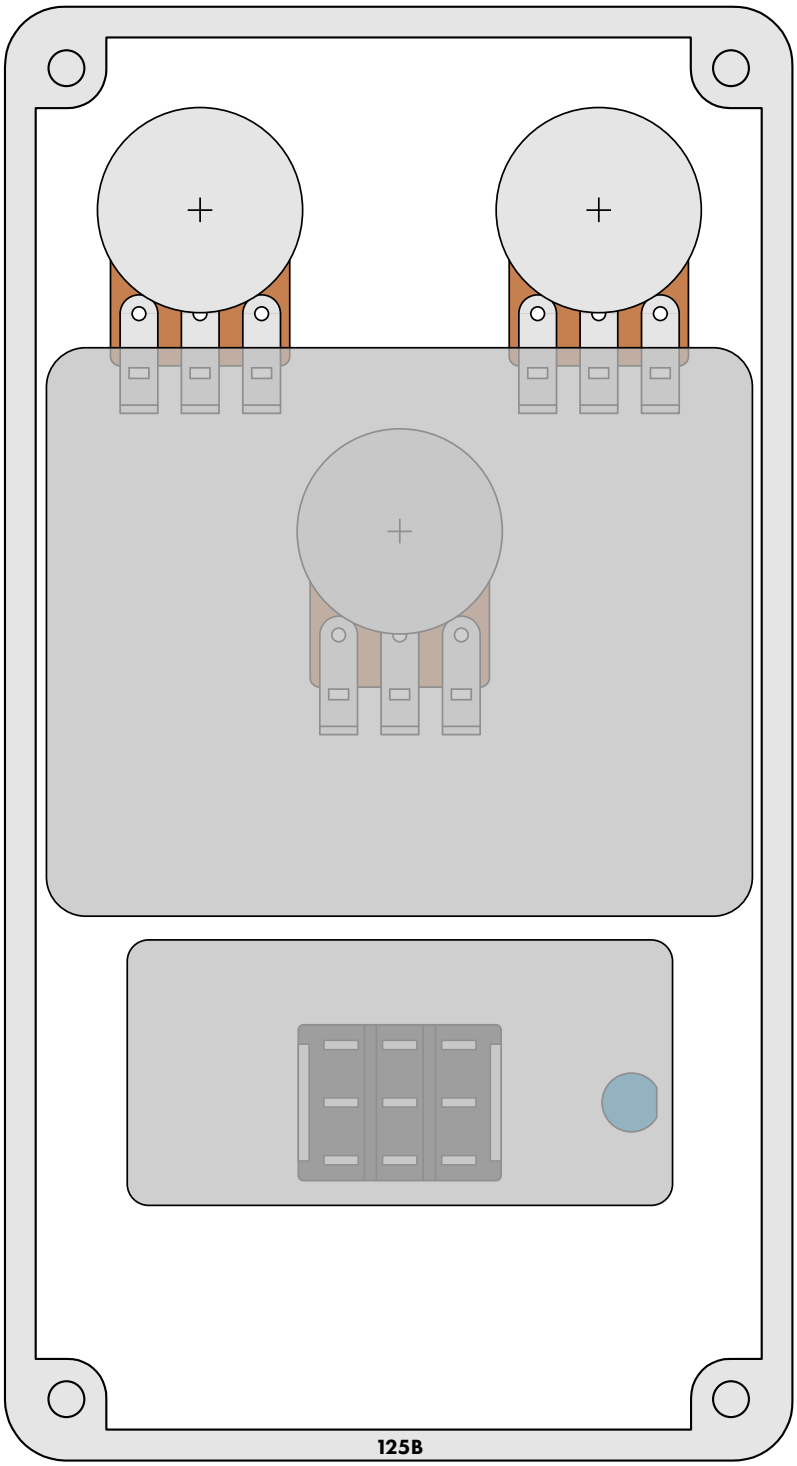
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

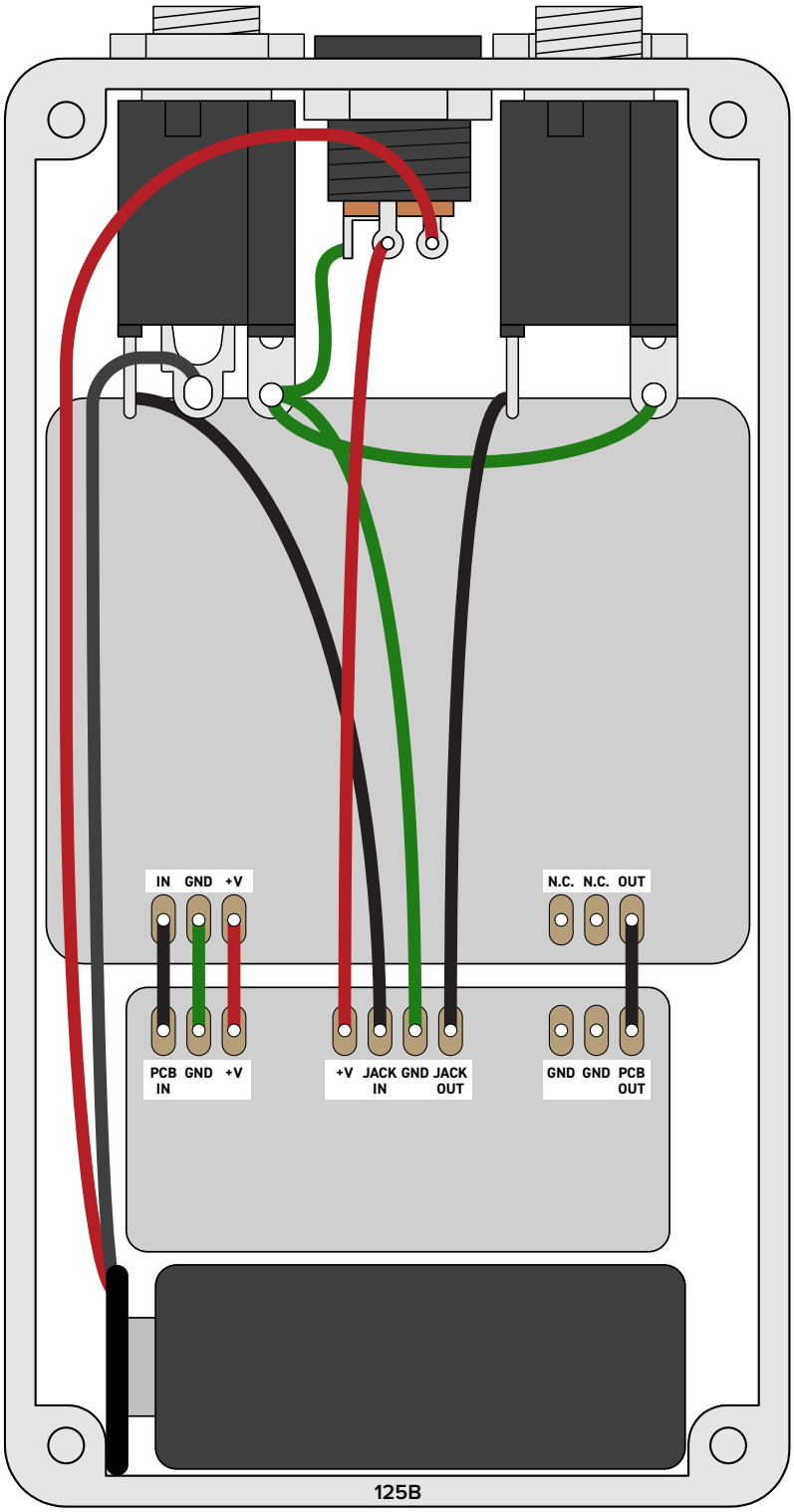


ENCLOSURE LAYOUT

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 cannotbe 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 (2019-08-04)
Initial release.