

PROJECT NAME

PARTICLE



BASED ON

Interfax Harmonic Percolator

BUILD DIFFICULTY



EFFECT TYPE

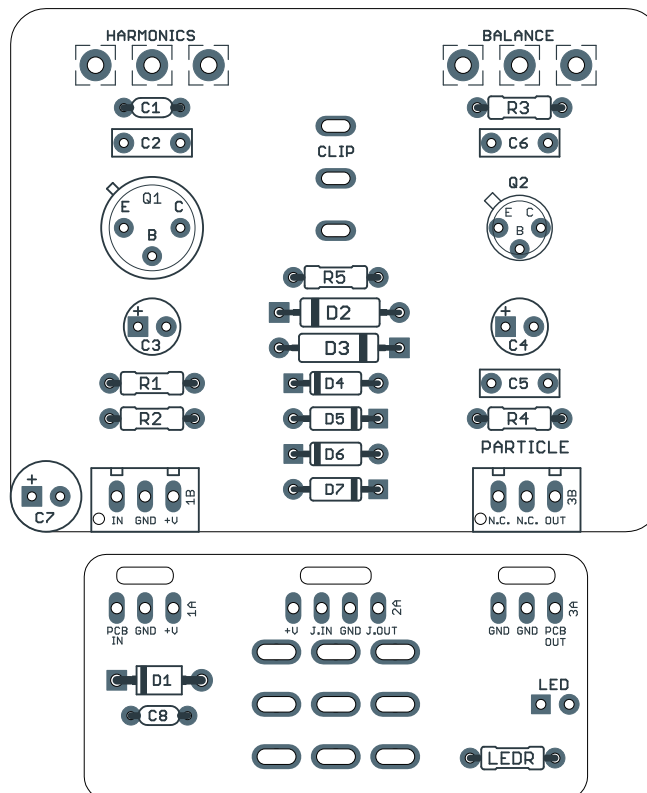
Fuzz / Overdrive

DOCUMENT VERSION

1.0.1 (2021-03-14)

PROJECT SUMMARY

An obscure and very unique germanium fuzz/drive circuit from the 1970s, famously used and revered by Steve Albini.



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

IMPORTANT NOTE

The initial release of the Particle had the silkscreen labels for Q1's emitter and collector reversed. The left pad is the emitter and the right pad is the collector. The image above shows how it should be, labeled E-B-C. If your PCB is labeled C-B-E, the silkscreen should be ignored. This only impacts the first 50 PCBs and will be fixed in the next run.

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INTRODUCTION

The Particle Germanium Fuzz is an adaptation of the Interfax HP-1 Harmonic Percolator, an extremely rare and highly sought-after fuzz/overdrive from the mid-1970s. Not much is known about the history of the unit other than that they were made in Milwaukee, Wisconsin by Ed Geise, owner of an electronics repair shop called Interfax Electronics.

The Harmonic Percolator is a two-transistor fuzz, but it bears no resemblance to any other of its contemporary pedals such as the Fuzz Face or any of the Tone Bender variants. It uses a PNP germanium transistor paired with an NPN silicon, allowing it to run in a standard negative-ground configuration.

The transistors and some of the components were gooped or obscured in the original. To add the mystery, there were several circuit changes made throughout the run, so even if you manage to find one, there's no guarantee that it's one of the "good" ones.

The Particle is an exact replica of the known schematics of the Harmonic Percolator, but with one addition. The Harmonic Percolator uses clipping diodes (unlike most germanium fuzzes) and so as with other Aion FX projects, we've added a diode switch to go between two different sets of diodes, or to disengage the diodes entirely.

The Harmonic Percolator was also the basis for the Catalinbread Karma Suture, which is available in both germanium and all-silicon versions. The Karma Suture was traced by Aion FX and adapted as the [Calliope Vintage Fuzz](#).

USAGE

The Particle has the following controls:

- **Harmonics** controls the signal level coming into the transistor fuzz stage. Its effect is nearly identical to rolling back the guitar volume.
- **Balance** is an output volume control.
- **Diodes** selects between three sets of clipping diodes.

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	51k	Metal film resistor, 1/4W	Albini specs. Use 220k for stock version. See build notes for more info.
R2	91k	Metal film resistor, 1/4W	Albini specs. Use 20k for stock version. See build notes for more info.
R3	3M9	Metal film resistor, 1/4W	Albini specs. Use 750k for stock version. See build notes for more info.
R4	91k	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	
C1	100pF	MLCC capacitor, NP0/C0G	
C2	47n	Film capacitor, 7.2 x 2.5mm	
C3	47uF	Electrolytic capacitor, 5mm	
C4	2.2uF	Electrolytic capacitor, 4mm	Albini specs. Use 1uF for stock version. See build notes for more info.
C5	1n5	Film capacitor, 7.2 x 2.5mm	Albini specs. Use 1n for stock version. See build notes for more info.
C6	100n	Film capacitor, 7.2 x 2.5mm	
C7	100uF	Electrolytic capacitor, 6.3mm	
C8	100n	MLCC capacitor, X7R	
D1	1N5817	Schottky diode, DO-41	
D2	Ge	Germanium diode, DO-07	Any NOS germanium diode will work here.
D3	Ge	Germanium diode, DO-07	Any NOS germanium diode will work here.
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
Q1	2N404A	Germanium transistor, PNP	Original uses 2N404A, available from Small Bear Electronics, but just about any good germanium transistor will work. See build notes.
Q2	2N3904	BJT transistor, NPN, TO-92	Original uses 2N3565. 2N3904 is a near-exact substitute.
HARM.	100kA	16mm right-angle PCB mount pot	
BAL.	50kA	16mm right-angle PCB mount pot	
CLIP	SPDT cntr off	Toggle switch, SPDT on-off-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.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

Germanium transistor

The original Harmonic Percolator used 2N404A PNP germanium transistors for Q1. These are not impossible to find on eBay and other vintage parts sellers, and NTE makes a new-production version with the same part number. But as with most germanium transistors, the exact part number isn't important, so don't spend too much time or money hunting down something that says 2N404A. Just about any germanium transistor will work fine here.

You're looking for something that is low gain (30-100 hFE). The circuit is pretty tolerant of leakage, so even something with a decent amount of leakage (150-300ua) will work fine. Many germaniums that are sold as Rangemaster transistors will meet these characteristics, so that's a good place to start.

Many people have used higher-gain transistors in this circuit and liked the result, so if you have a few different types of germanium transistors, use a socket and experiment with them!

Silicon transistor

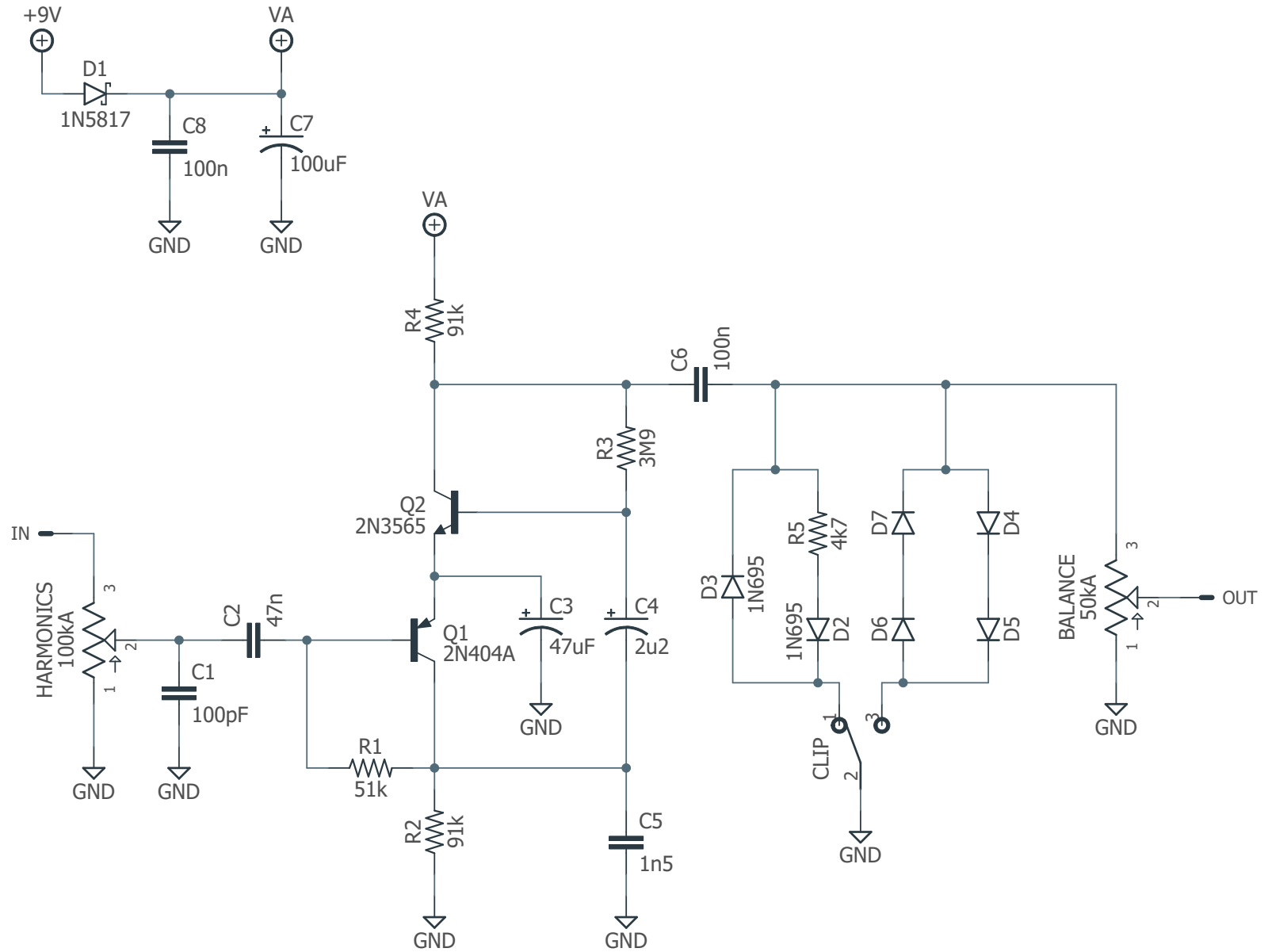
The original circuit used 2N3565 NPN silicon transistors for Q2. These are nearly identical to the 2N3904 ("real world" typical hFE range of 180 to 220) so there is absolutely nothing special about this part. It's recommended to just use a 2N3904 here, although if you want some extra cosmetic style points, you can use a metal can silicon transistor such as the 2N2222.

"Albini" specs

The Percolator was perhaps most famously associated with producer & musician Steve Albini as one of his "secret sauce" effect units. Curiously, his unit seemed to sound different from other Percolators, and when it was dissected, it was found to have several different values than others that had been traced. His is the only known unit to use these values.

Because of this, there are really two different versions of the Percolator, the "stock" version and the "Albini" version. Many people prefer the Albini version, and so those values are provided as the default configuration for the Particle in the parts list and schematic. However, the alternate values for the stock version are provided as well. The sounds are very different to the point where they're almost two different pedals, so you may want to build both if you're curious.

SCHEMATIC



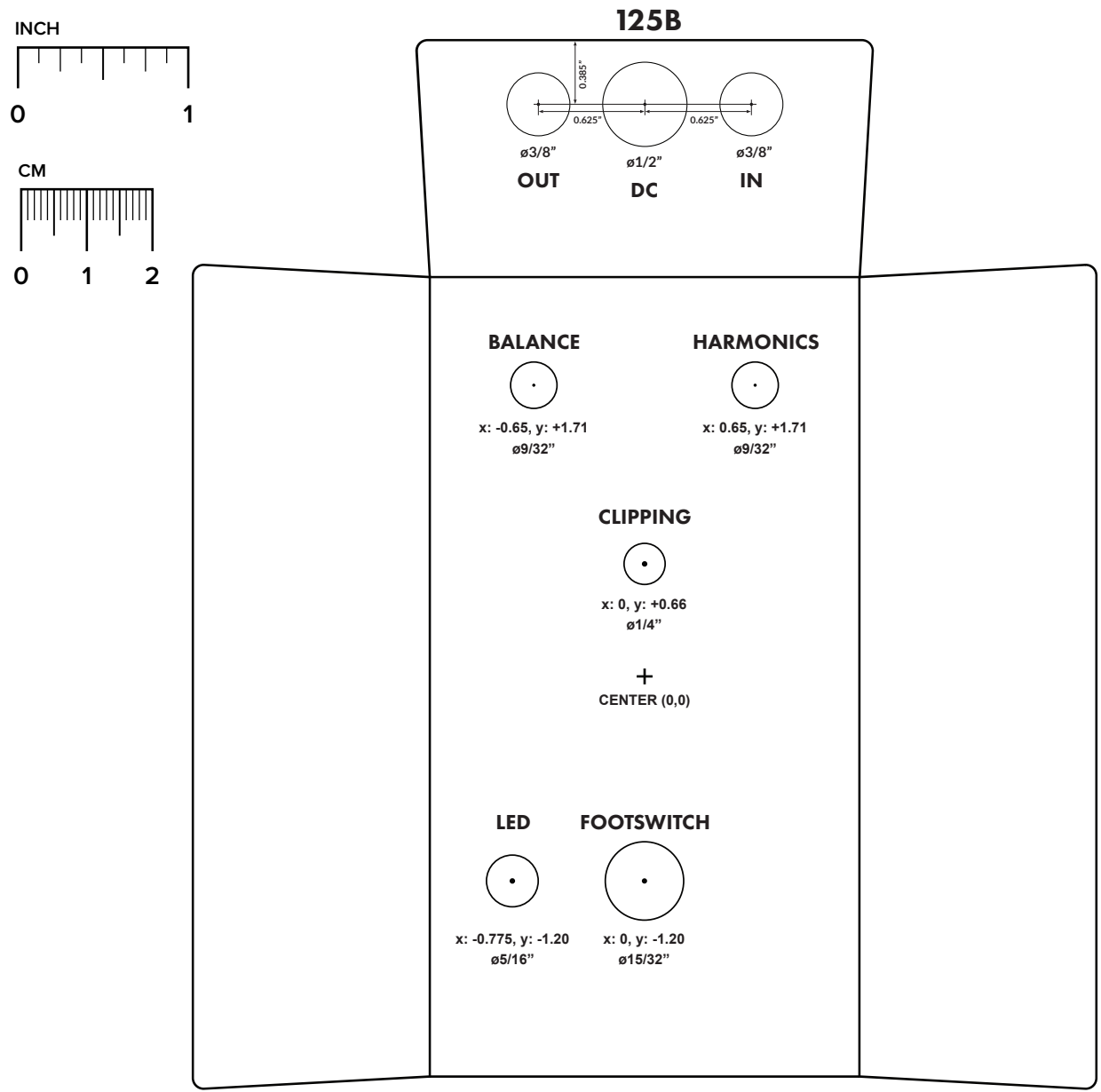
DRILL TEMPLATE

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.

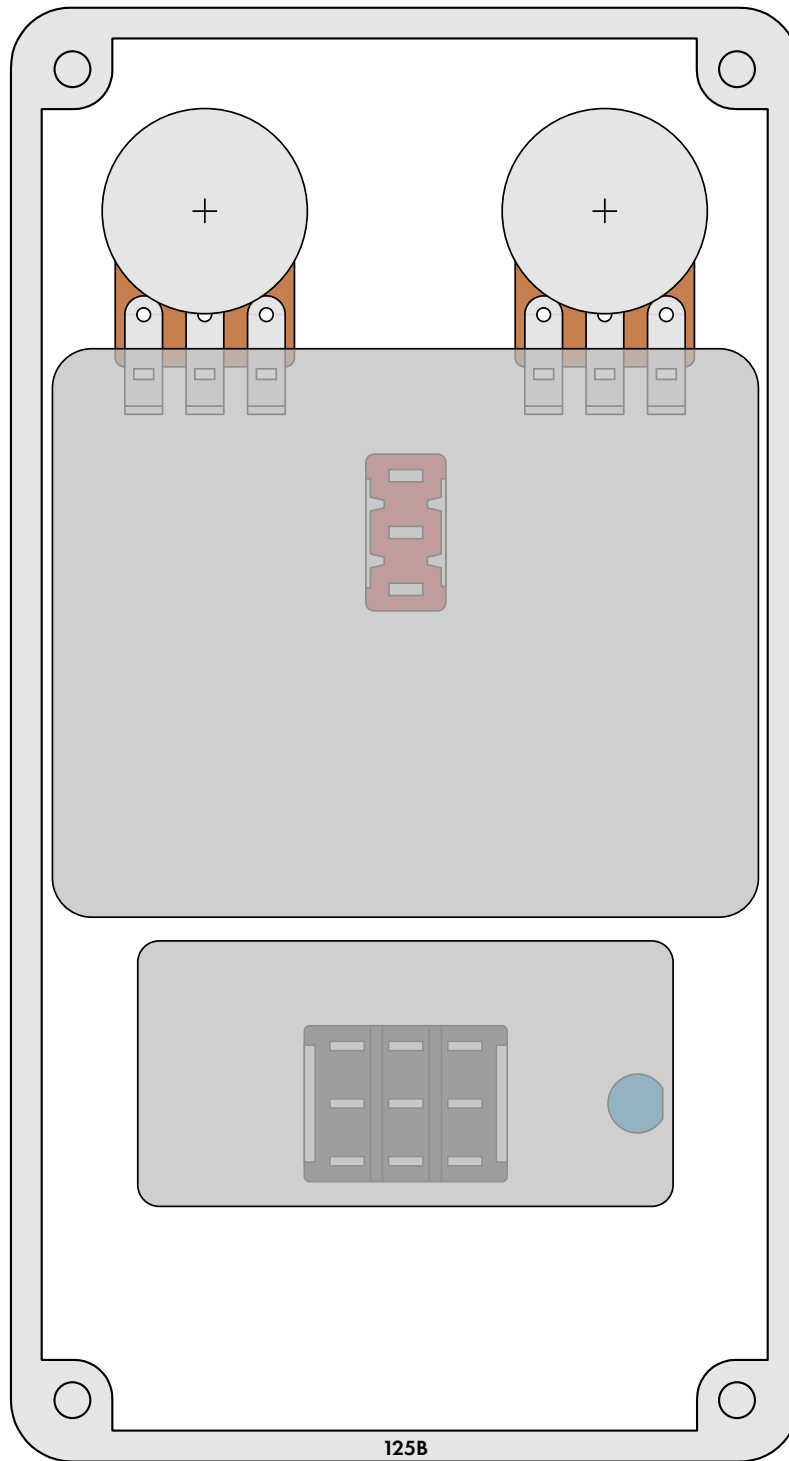
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

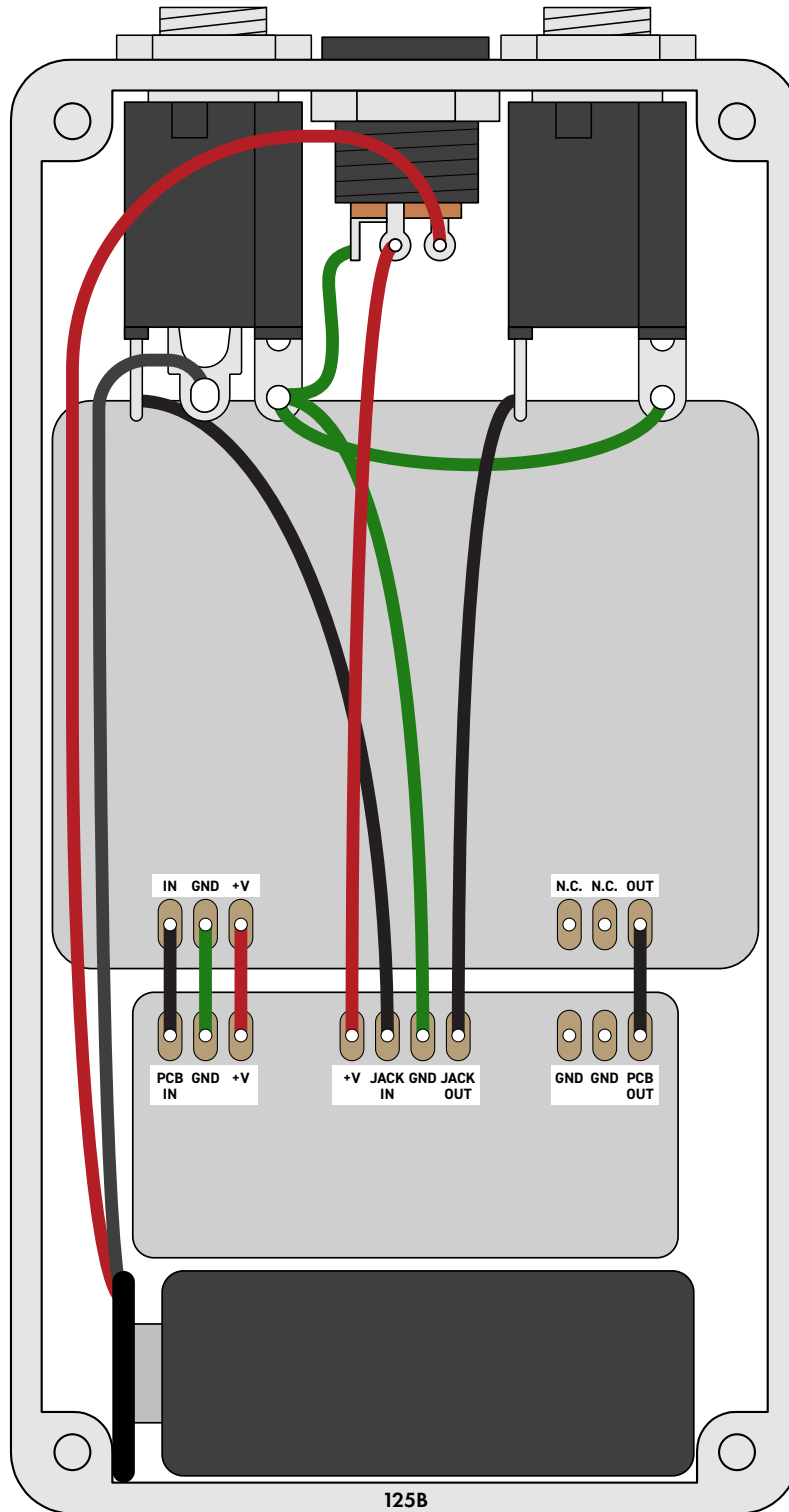


ENCLOSURE LAYOUT

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

1.0.1 (2021-03-14)

Added note about Q1's emitter and collector being mistakenly reversed on the PCB silkscreen.

1.0.0 (2021-02-19)

Initial release.