

PROJECT NAME
SYNAPSE

BASED ON
Systemch Overdrive

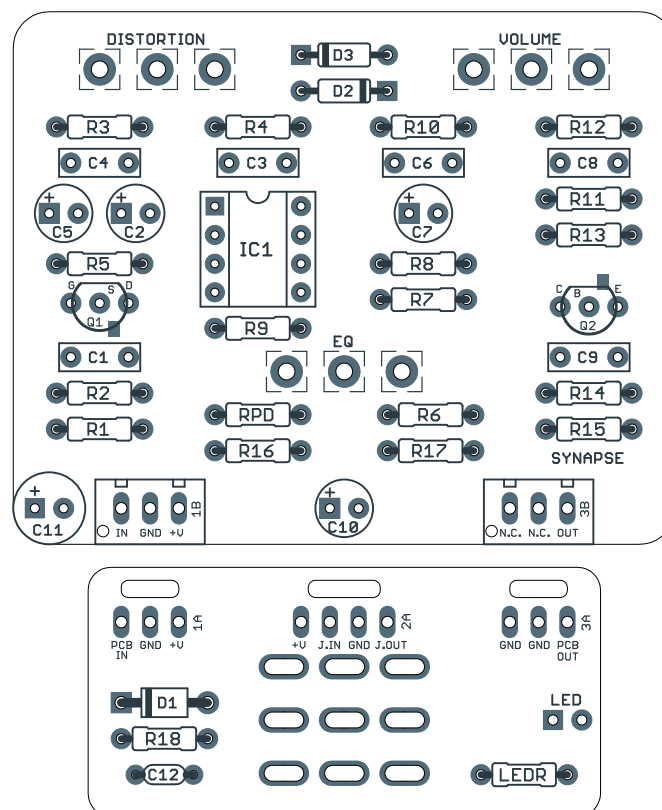
BUILD DIFFICULTY
■■■■■ Beginner

EFFECT TYPE
Resonant filter fuzz

DOCUMENT VERSION
1.0.1 (2021-07-19)

PROJECT SUMMARY

A rare fuzz pedal that combines hard-clipping distortion with an extreme resonant filter that lends a vocal “stuck wah” quality.



Actual size is 2.3" x 1.86" (main board) and 1.78" x 0.86" (bypass board).

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INTRODUCTION

The Synapse Resonant Drive is based on the Systech Overdrive, a fuzz pedal released in the early 1970s before the idea of “overdrive” had become distinct from “distortion” and “fuzz”.

Today, Systech’s most well-known circuit is the Harmonic Energizer (available from Aion FX as the Parsec), which is similar in its frequency-sweepable filter but lacks any of its own clipping. The Harmonic Energizer was most notably used by Frank Zappa.

It’s not known whether the Overdrive was derived from the Harmonic Energizer or the other way around—but either way, they’re similar in concept, and the Overdrive is very unique among drive pedals. It doesn’t have the Zappa association, but it’s interesting enough that it’s worth your time.

The resonant filter can be tuned from 133 Hz to 900 Hz, but unlike a wah, its Q is very sharp, and it has a definite “tuned” quality that can either complement the notes being played or collide in a dissonant way.

There is no way to disable the filter or reduce its gain, so it’s definitely not an always-on effect, but very useful as a quirky effect to get some spaced-out filter tones are hard to come by in such a small package.

The Synapse is a straight clone of the Systech Overdrive with no changes except changing Systech’s standard polarity protection for a simple Schottky diode as in other Aion FX projects.

USAGE

The Synapse has three controls:

- **EQ** sets the frequency of the resonant filter.
- **Distortion** is the drive control. Since it is set up as an inter-stage volume control with no minimum-setting resistor, there is no sound when it’s turned all the way down.
- **Volume** (called Gain on the original unit) is the output volume 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—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	10M	Metal film resistor, 1/4W	
R3	3k3	Metal film resistor, 1/4W	
R4	15k	Metal film resistor, 1/4W	
R5	300k	Metal film resistor, 1/4W	
R6	220R	Metal film resistor, 1/4W	
R7	5k1	Metal film resistor, 1/4W	
R8	2M	Metal film resistor, 1/4W	
R9	100k	Metal film resistor, 1/4W	
R10	22k	Metal film resistor, 1/4W	
R11	300k	Metal film resistor, 1/4W	
R12	100k	Metal film resistor, 1/4W	
R13	10k	Metal film resistor, 1/4W	
R14	5k1	Metal film resistor, 1/4W	
R15	1M	Metal film resistor, 1/4W	
R16	10k	Metal film resistor, 1/4W	
R17	10k	Metal film resistor, 1/4W	
R18	100R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	1n	Film capacitor, 7.2 x 2.5mm	
C2	10uF	Electrolytic capacitor, 5mm	
C3	22n	Film capacitor, 7.2 x 2.5mm	
C4	22n	Film capacitor, 7.2 x 2.5mm	
C5	10uF	Electrolytic capacitor, 5mm	
C6	100n	Film capacitor, 7.2 x 2.5mm	
C7	10uF	Electrolytic capacitor, 5mm	
C8	100n	Film capacitor, 7.2 x 2.5mm	
C9	100n	Film capacitor, 7.2 x 2.5mm	
C10	47uF	Electrolytic capacitor, 5mm	Voltage reference filter capacitor.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C11	100uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C12	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
Q1	2N5457	JFET, N-channel, TO-92	Substitute. Original uses 2N5458.
Q2	2N5088	BJT transistor, NPN, TO-92	
IC1	LM1458	Operational amplifier, DIP8	Consider substituting for a lower-noise IC. See build notes.
IC1-S	DIP-8 socket	IC socket, DIP-8	
DIST.	50kC	16mm right-angle PCB mount pot	
EQ	50kC	16mm right-angle PCB mount pot	
VOL.	50kA	16mm right-angle PCB mount pot	
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	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

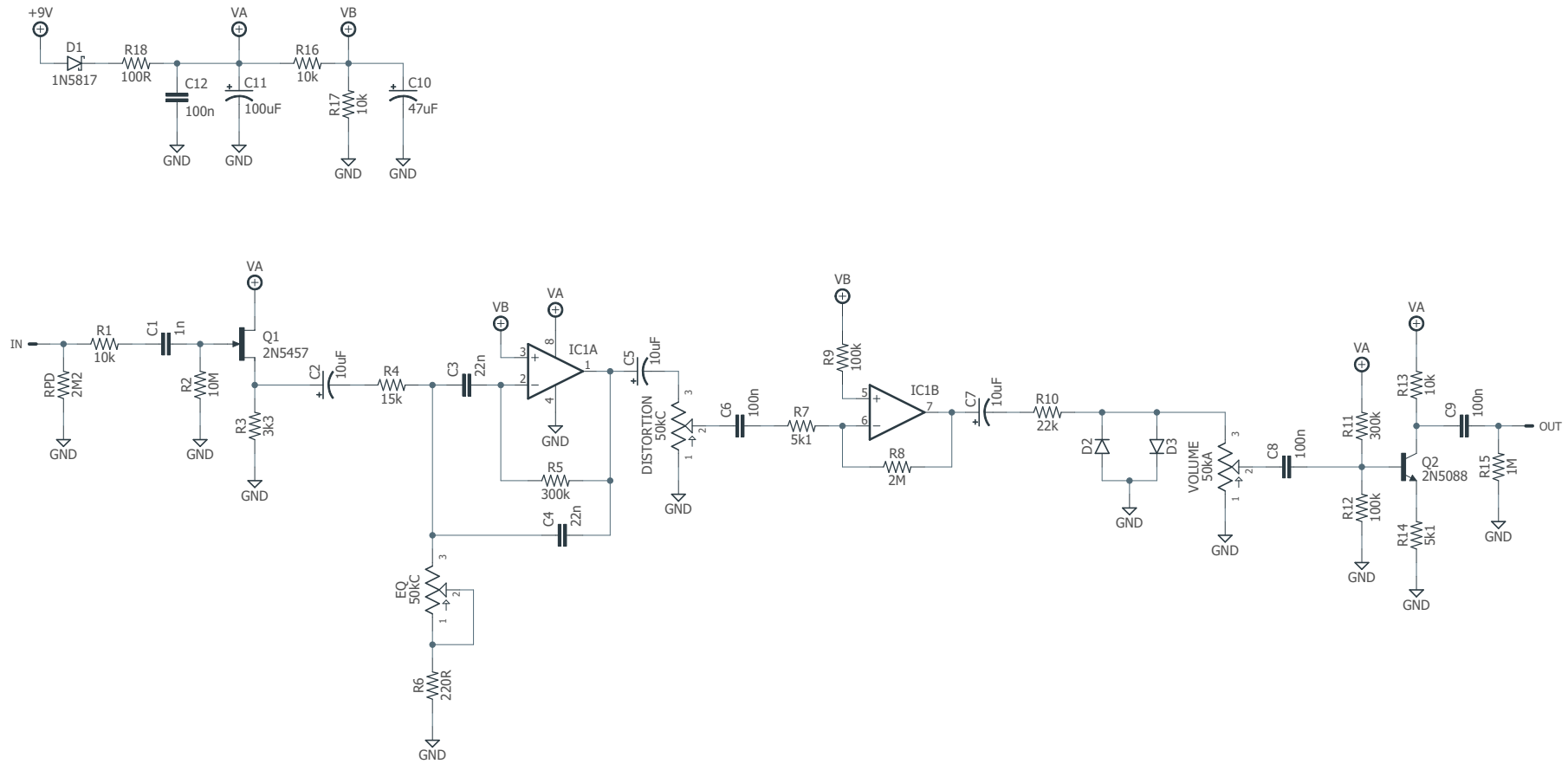
BUILD NOTES

Op-amp selection and noise reduction

The original Systech Overdrive uses the MC1458 (LM1458) op-amp, which is essentially the dual version of the LM741. This is by no means a low-noise IC, and since this circuit is configured for extremely high gain, there is an audible noise floor.

If this is bothersome, you could swap it out for something better like a TL072. You could also try soldering a 100nF capacitor between pins 4 and 8 of the IC in order to provide better localized filtering.

SCHEMATIC



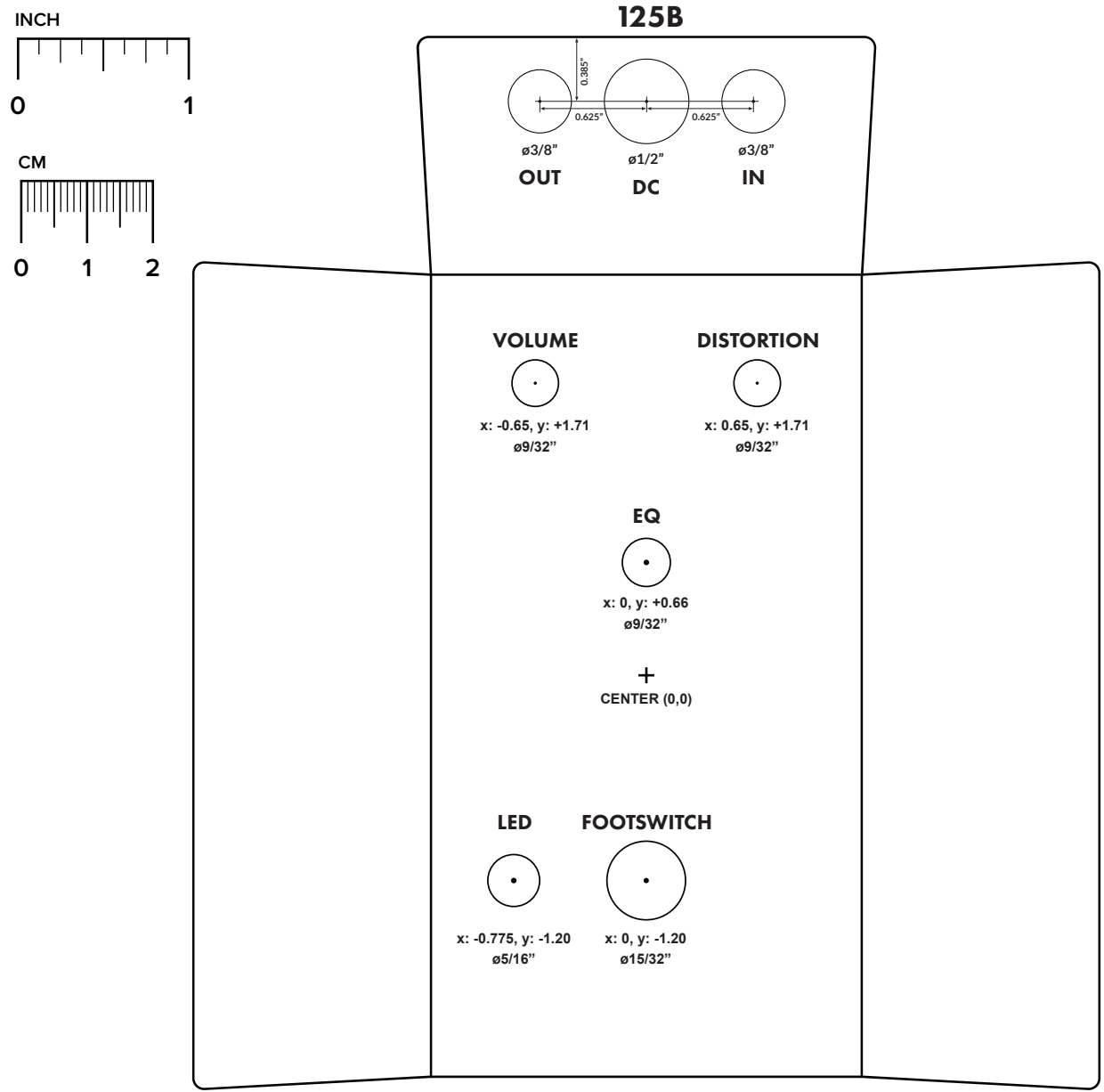
DRILL TEMPLATE

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.

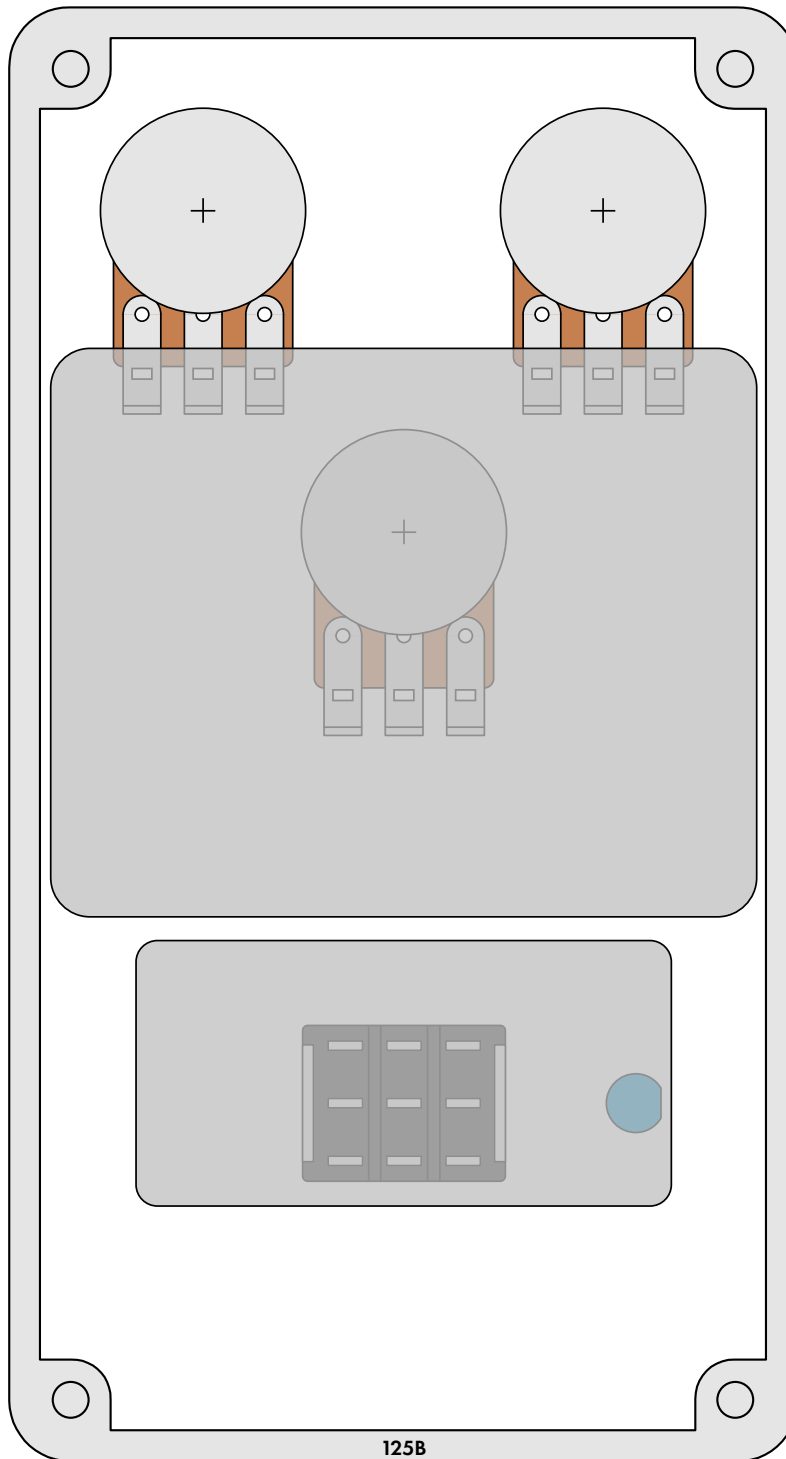
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

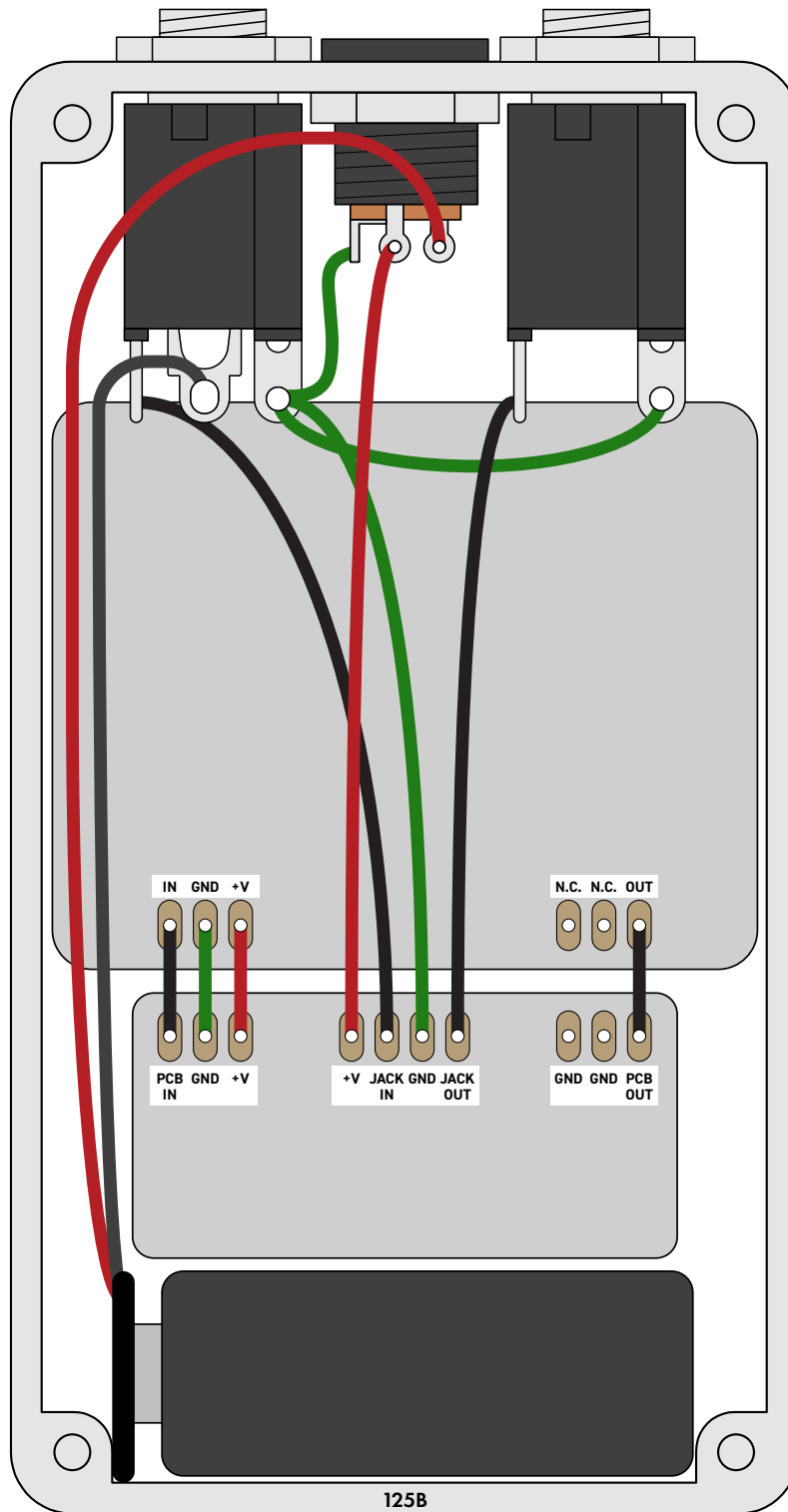


ENCLOSURE LAYOUT

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 (2021-07-19)

Corrected capacitors in parts list, mistakenly carried over from the Parsec documentation. The schematic was correct.

1.0.0 (2021-07-02)

Initial release.