PROJECT NAME

OCTAHEDRON

aion DIY GUITAR EFFECTS

BASED ON
Roger Mayer Octavia

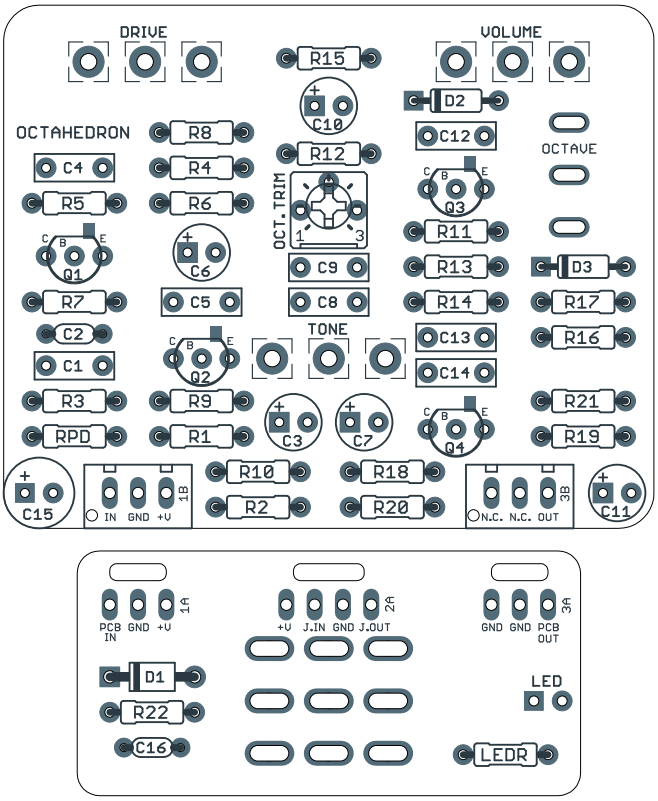
BUILD DIFFICULTY
▮▮▯▯▯ Easy

EFFECT TYPE
Octave fuzz

DOCUMENT VERSION
1.0.0 (2024-07-04)

PROJECT SUMMARY

An all-transistor redesign of the fuzz effect made famous by Jimi Hendrix, which adds an octave-up overtone to the harmonics.



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

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INTRODUCTION

The Octahedron Octave Fuzz is based on the Mayer Octavia, a transistor-based octave fuzz pedal originally designed in 1970 as an overhaul of the transformer version.

The circuit was designed by Roger Mayer who had built all of Jimi Hendrix's octave units going back to 1967. The original used a transformer as the phase splitter, and underwent many iterations between 1967 and 1969, with Roger making tweaks and Jimi providing feedback, often after playing it live. The transformer Octavia was never sold commercially, so there was no standard version of the circuit.

Roger Mayer was never satisfied with any of the transformer versions and by 1970 he had redesigned the circuit to use all silicon transistors with no transformer. Jimi did play one of these new versions before his passing, but it has not been linked with any actual recordings.

The transistor Octavia was finally released commercially in 1980 in the distinctive "space ship" enclosure. Roger has produced versions of the transistor Octavia ever since, but he has never revisited the transformer version because he felt it was inferior.

In 2003, Roger released an updated version called the Vision Octavia, which used a more modern enclosure design and added a passive treble-cut tone control to counteract the harshness of the octave.

The Octahedron project is based on this version with the tone control, although the control can be omitted if you'd prefer to build the stock version. We have also included a switch to disable the octave-up effect and turn it into a more typical fuzz.

The two Octavias don't have much in common and don't sound alike, but both are worth building if you like octave fuzz. The transformer Octavia is available as our Octagon project.

USAGE

The Octahedron has three knobs and one toggle switch:

- **Sustain** is the overall distortion or fuzz level of the effect.
- **Tone** controls a passive hi-cut filter before the octave stage.
- **Volume** is the output volume at the end of the effect.
- **Octave** (toggle switch) selects between octave, no octave (original) and no octave (modified). See build notes for information on the modified non-octave mode.

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	820k	Metal film resistor, 1/4W	
R2	180k	Metal film resistor, 1/4W	
R3	680k	Metal film resistor, 1/4W	
R4	100k	Metal film resistor, 1/4W	
R5	(omit)	Metal film resistor, 1/4W	220R for vintage version.
R6	39k	Metal film resistor, 1/4W	
R7	220R	Metal film resistor, 1/4W	
R8	100R	Metal film resistor, 1/4W	Modification to make the gain range easier to dial in. See build notes.
R9	47k	Metal film resistor, 1/4W	
R10	39k	Metal film resistor, 1/4W	
R11	470k	Metal film resistor, 1/4W	
R12	270k	Metal film resistor, 1/4W	Part of the octave trim mod. Normally 330k. See build notes.
R13	10k	Metal film resistor, 1/4W	
R14	10k	Metal film resistor, 1/4W	
R15	2M2	Metal film resistor, 1/4W	
R16	820k	Metal film resistor, 1/4W	
R17	(omit)	Metal film resistor, 1/4W	100k for vintage version.
R18	1M	Film capacitor, 7.2 x 2.5mm	2M2 for vintage version.
R19	1M	Film capacitor, 7.2 x 2.5mm	2M2 for vintage version.
R20	10k	Film capacitor, 7.2 x 2.5mm	
R21	150k	Film capacitor, 7.2 x 2.5mm	
R22	100R	Film capacitor, 7.2 x 3.5mm	Power supply filter resistor.
RPD	2M2	Electrolytic capacitor, 6.3mm	Input pulldown resistor.
LEDR	10k	Electrolytic capacitor, 5mm	LED current-limiting resistor.
C1	10n	Film capacitor, 7.2 x 2.5mm	
C2	470pF	MLCC capacitor, NP0/C0G	
C3	22uF	Electrolytic capacitor, 5mm	
C4	(omit)	Film capacitor, 7.2 x 2.5mm	1n film capacitor for vintage version.
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	22uF	Electrolytic capacitor, 5mm	
C7	22uF	Electrolytic capacitor, 5mm	Jumper for vintage version.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C8	10n	Film capacitor, 7.2 x 2.5mm	Omit (leave empty) for vintage version.
C9	100n	Film capacitor, 7.2 x 2.5mm	10n for vintage version.
C10	22uF	Electrolytic capacitor, 5mm	
C11	22uF	Electrolytic capacitor, 5mm	
C12	(jumper)	Film capacitor, 7.2 x 2.5mm	10n for vintage version.
C13	100n	Film capacitor, 7.2 x 2.5mm	10n for vintage version.
C14	100n	Film capacitor, 7.2 x 2.5mm	
C15	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C16	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	2N3906	BJT transistor, PNP, TO-92	
Q2	KSP13	Darlington BJT transistor, NPN	Current-production MPSA13 equivalent.
Q3	KSP13	Darlington BJT transistor, NPN	Current-production MPSA13 equivalent.
Q4	KSP13	Darlington BJT transistor, NPN	Current-production MPSA13 equivalent.
OCTAVE	100k trimmer	Trimmer, 10%, 1/4", 3362P	Part of the octave trim mod. See build notes.
DRIVE	10kC	16mm right-angle PCB mount pot	Reverse audio (reverse log or antilog) taper.
TONE	50kC	16mm right-angle PCB mount pot	Reverse audio (reverse log or antilog) taper.
VOLUME	100kA	16mm right-angle PCB mount pot	Audio (log) taper.
OCT SW.	SPDT center 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.
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

Octave switch

The octave in this effect is generated by splitting the signal into two, one in-phase and one out of phase, and then rectifying the signals to cancel out half of the waveform of each. The signals are then combined back together which emphasizes the octave overtone.

The octave switch lets you disable half of the phase splitter to cancel out the octave effect. However, the non-octave signal still passes through a series diode which introduces something called “crossover distortion”. While this crossover distortion is part of the sound of the Octavia, it sounds very good without it as well and justifies having its own setting.

As a result, the octave switch has been modified to have Octave, No Octave (original) and No Octave (modified) settings.

Setting the octave trimmer

The bias voltage at the base of Q3 is responsible for some of the octave characteristics. The original Octavia uses a 330k resistor to ground here. We reduced the fixed resistor to 270k and added a 100k trimmer, so the bias voltage can be raised or lowered from the default. This is adapted from the Catalinbread Octapussy, which is based in part on the transistor Octavia.

There’s no science here, just set it to around 60% rotation and then turn it back and forth while listening to the octave to see if you notice any difference, and leave it where it sounds best.

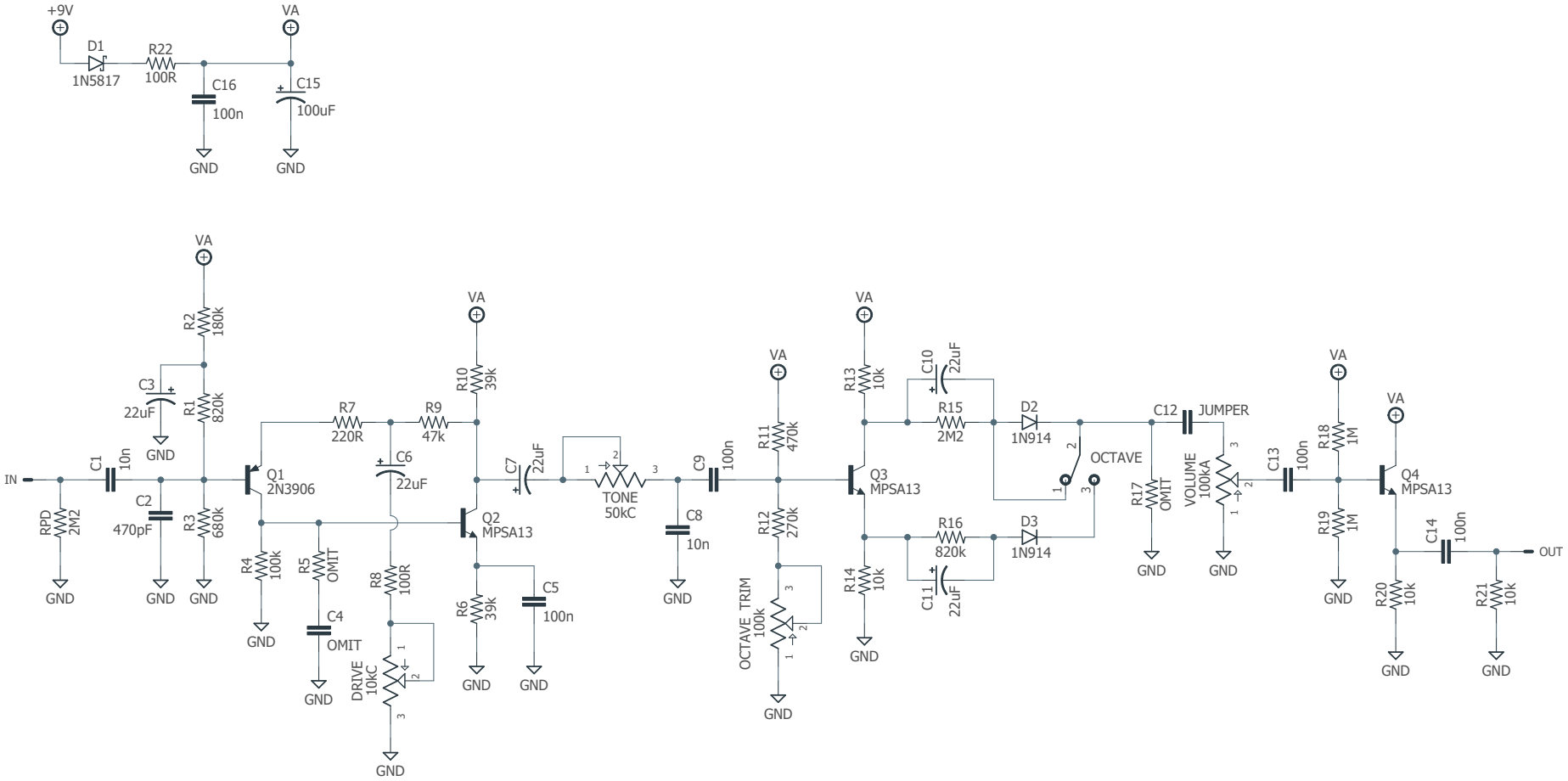
If you want to omit the trimmer entirely, jumper the top and left pads together and use 330k for R12.

Vintage specs

This project is based on the Vision Octavia, which adds a tone control and changes several values. The vintage version of the Octavia can be built on this PCB with the following substitutions and additions:

- **C4:** omit → 1n
- **C7:** 22uF → jumper
- **C8:** 10n → omit
- **C9:** 100n → 10n
- **C12:** jumper → 10n
- **C13:** 100n → 10n
- **R5:** omit → 220R
- **R17:** omit → 100k
- **R18:** 1M → 2M2
- **R19:** 1M → 2M2
- **Volume:** 100kA → 1MA
- **Tone:** 50kC → omit and jumper pads 2 & 3

SCHEMATIC


+9V
D1
1N5817
R22
100R
C16
100n
C15
100uF
VA
GND
IN
C1
10n
RPD
2M2
C2
470pF
R3
680k
R2
180k
R1
820k
C3
22uF
Q1
2N3906
R4
100k
R5
OMIT
C4
OMIT
R7
220R
R8
100R
DRIVE
10kC
C6
22uF
R9
47k
R10
39k
Q2
MPSA13
R6
39k
C5
100n
C7
22uF
TONE
50kC
C8
10n
C9
100n
R11
470k
R12
270k
OCTAVE TRIM
100k
R13
10k
R14
10k
Q3
MPSA13
C10
22uF
R15
2M2
D2
1N914
R16
820k
D3
1N914
C11
22uF
OCTAVE
C12
JUMPER
R17
OMIT
VOLUME
100kA
C13
100n
R18
1M
R19
1M
Q4
MPSA13
C14
100n
R20
10k
R21
10k
OUT

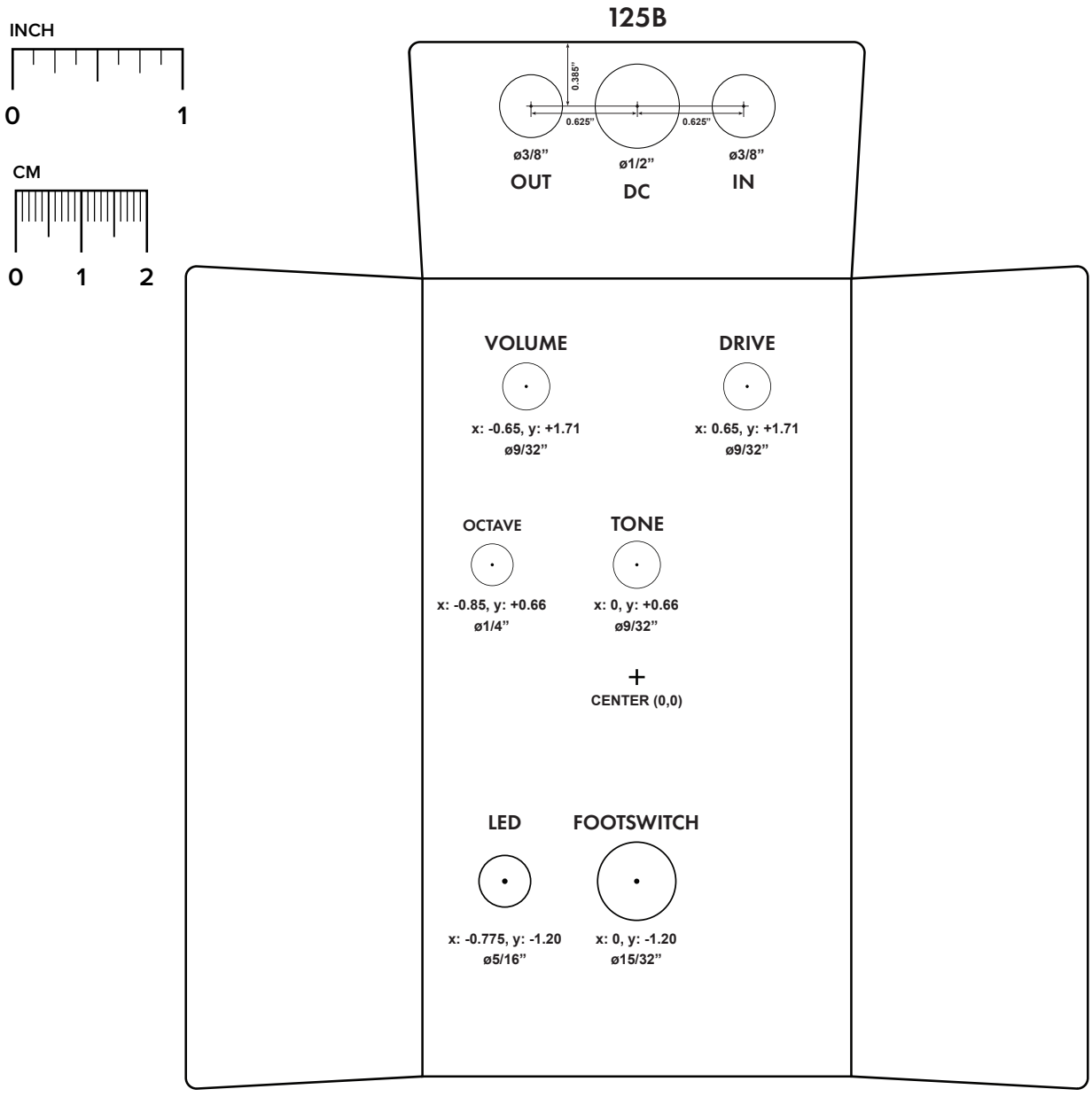
DRILL TEMPLATE

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.

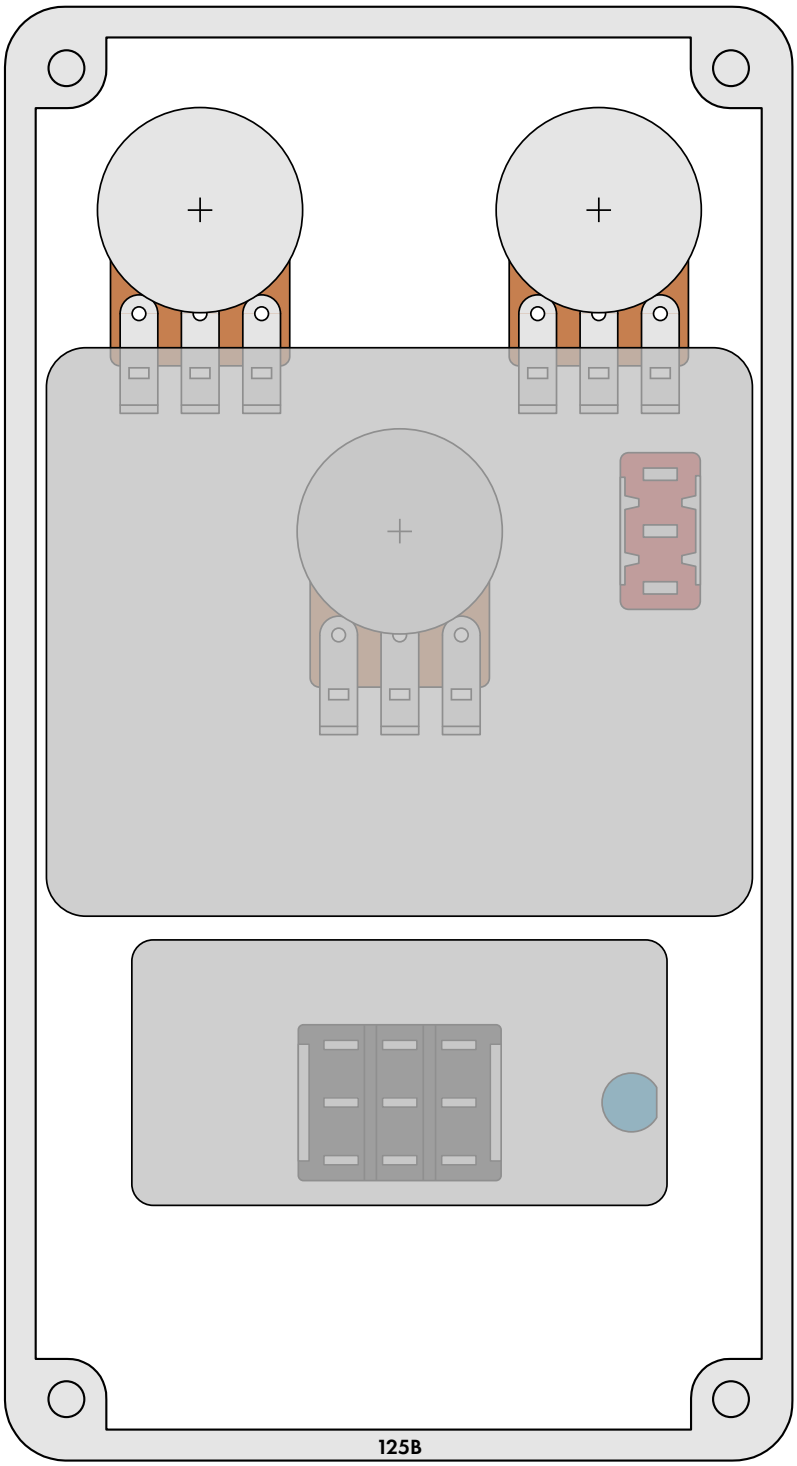
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

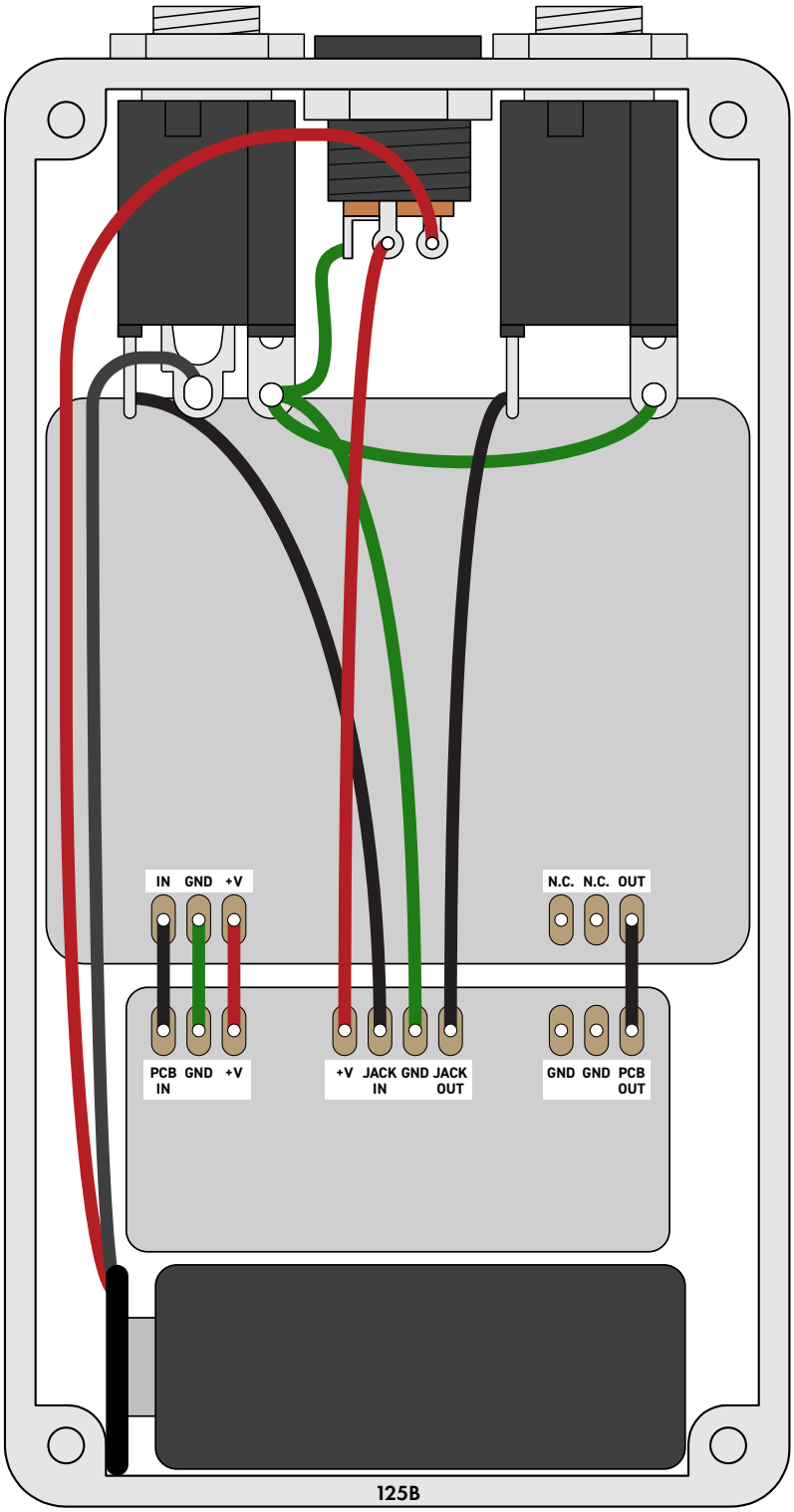


ENCLOSURE LAYOUT

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 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 (2024-07-04)

Initial release.