PROJECT NAME

YACANA

aion DIY GUITAR EFFECTS

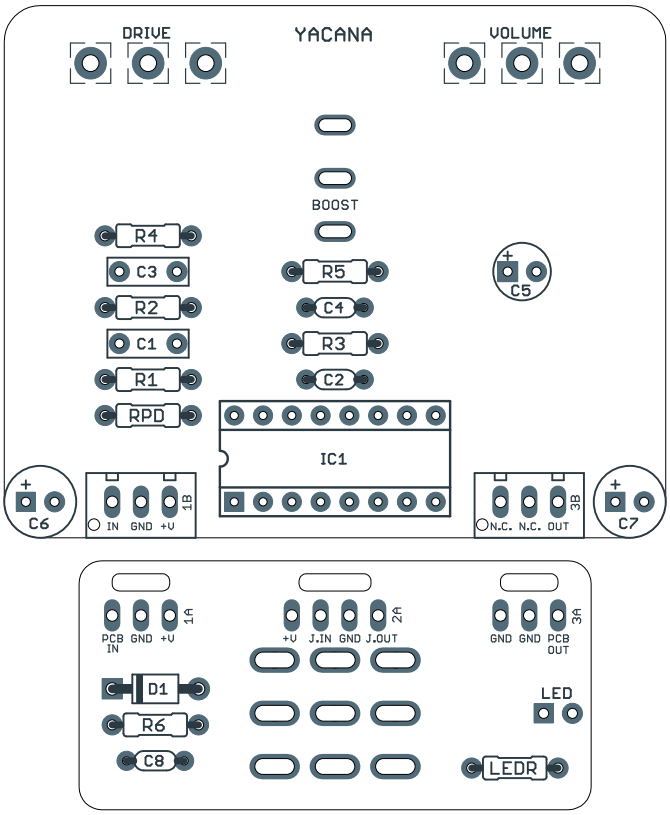
BASED ON
Way Huge Red Llama

BUILD DIFFICULTY
▮▯▯▯▯ Beginner

EFFECT TYPE
Overdrive / distortion

DOCUMENT VERSION
1.0.0 (2021-11-12)

PROJECT SUMMARY
A classic CMOS inverter overdrive tracing its origins back to DIY project designed by Craig Anderton in 1978.



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

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INTRODUCTION

The Yacana CMOS Drive is based on the Way Huge Red Llama, the first commercial pedal from Way Huge originally released in 1992.

Jeorge Tripps has not hidden the fact that he was inspired to start building pedals after reading Craig Anderton's 1978 book Electronics Projects for Musicians. The Red Llama is almost part-for-part identical to the "Tube Sound Fuzz" circuit from this book. The schematic is identical but some of the part values have been tweaked.

The Tube Sound Fuzz circuit actually dates back even earlier. When Craig published it in the February 1977 issue of Guitar Player Magazine, it was the first known usage of a CMOS hex inverter (in this case a CD4049) to generate overdrive tones. Each stage acts as an op-amp in inverting configuration. Unlike op-amps, though, they are very easily overloaded—and also unlike op-amps, they sound fantastic when this happens.

Craig later simplified the circuit for his "Electronic Projects for Musicians" book by dropping the input op-amp stage. This has the effect of making it more sensitive to input impedance and thus a lot more reactive with the guitar's volume if the pedal is first in the chain.

The Yacana is based on the Red Llama with a gain switch adapted from the EFPM version of the Tube Sound Fuzz. This switch shifts the between two gain modes (which Craig called "Rhythm" and "Lead") with a third position added in between the two. Otherwise, it allows either version of the circuit to be built, with the default values being for the Red Llama version and alternate values provided for the Tube Sound Fuzz.

USAGE

The Yacana has two controls and one toggle:

- **Drive** controls the gain of the first CMOS inverter stage.
- **Volume** sets the overall output of the effect.
- **Boost** (toggle) selects between two additional gain ranges. Due to the large difference in resistance, the drive knob has much less range in the middle gain setting, and almost no range at all in the high gain setting.

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	100k	Metal film resistor, 1/4W	
R2	10M	Metal film resistor, 1/4W	
R3	2M2	Metal film resistor, 1/4W	
R4	100k	Metal film resistor, 1/4W	
R5	1M	Metal film resistor, 1/4W	
R6	1k	Metal film resistor, 1/4W	Tube Sound Fuzz uses 100R here.
RPD	1M	Metal film resistor, 1/4W	Input pull-down resistor.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	68n	Film capacitor, 7.2 x 2.5mm	Tube Sound Fuzz uses 100n here.
C2	47pF	MLCC capacitor, NP0/C0G	Tube Sound Fuzz uses 10pF here.
C3	33n	Film capacitor, 7.2 x 2.5mm	Tube Sound Fuzz uses 47n here.
C4	100pF	MLCC capacitor, NP0/C0G	Tube Sound Fuzz uses 10pF here.
C5	10uF	Electrolytic capacitor, 5mm	
C6	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C7	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C8	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
IC1	CD4049UBE	CMOS hex inverter, 6 circuit, DIP16	
IC1-S	DIP-16 socket	IC socket, DIP-16	
DRIVE	1MB	16mm right-angle PCB mount pot	
VOL.	10kA	16mm right-angle PCB mount pot	
BOOST	SPDT cntr off	Toggle switch, SPDT on-off-on	
LED	5mm	LED, 5mm, red diffused	
IN	1/4" stereo	1/4" phone jack, closed frame	Switchcraft 111BX 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.

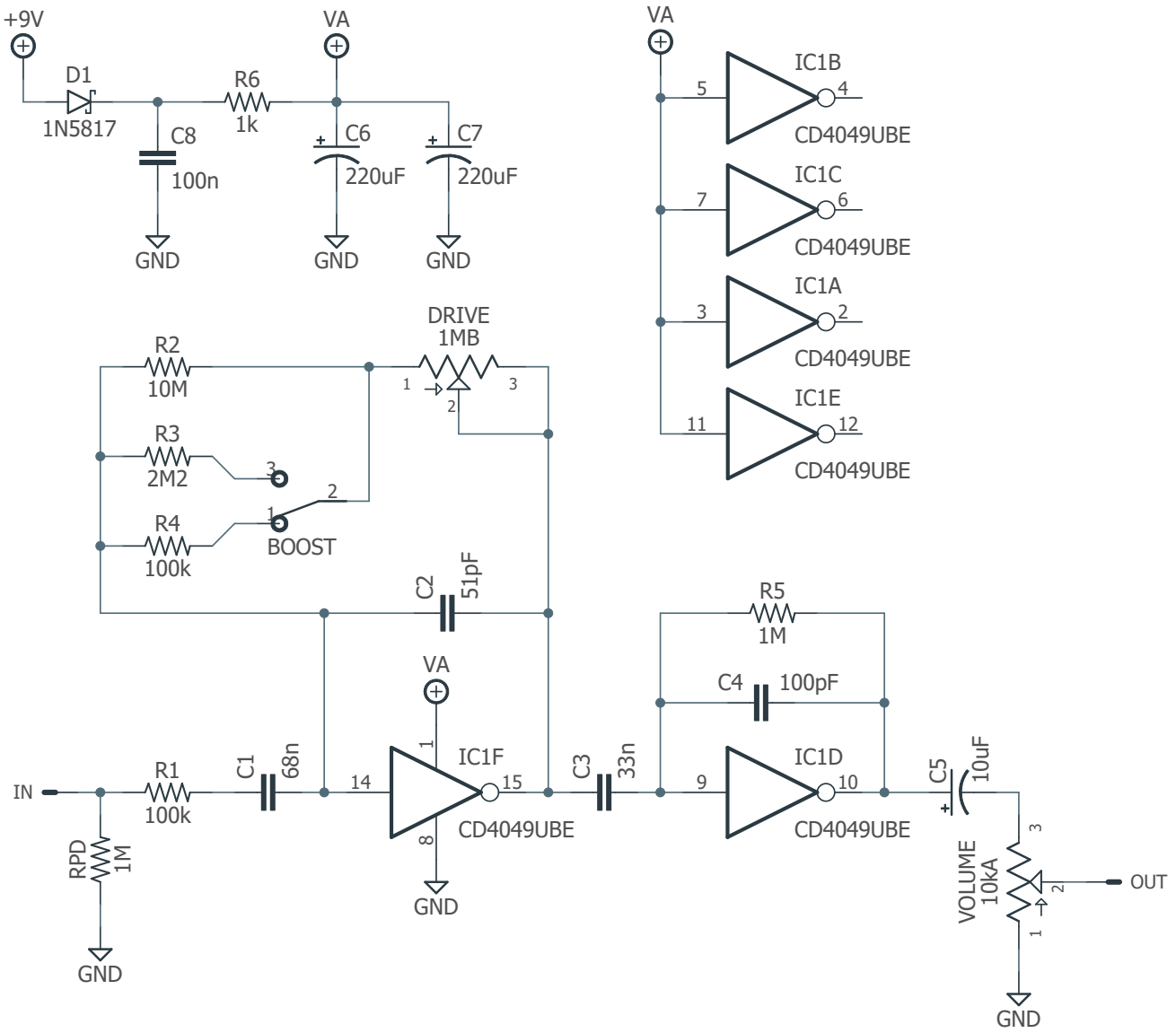
Boost switch

The Boost switch was part of Craig Anderton's EFPM version of the Tube Sound Fuzz. It has two settings, "Rhythm" and "Lead", with Lead switching a 10M resistor in place of the default 100k.

The 10M mode sounds great, but it does have the side effect of rendering the gain knob almost useless, since it now adjusts between 10M and 11M (10% change) rather than between 100k and 1.1M (10x change).

The Yacana adds a third mode, which is intended to be in between the rhythm and lead modes. We found that 2.2M for R3 provided a useful gain setting while keeping the drive knob somewhat functional, but you could also experiment with 3.3M, 4.7M, or 6.8M. Any resistance between 1.1M and 10M is not covered by either of the other two settings, so find what works best for you.

SCHEMATIC


+9V
D1
1N5817
C8
100n
GND
R6
1k
VA
C6
220uF
GND
C7
220uF
GND
VA
IC1B
5
4
CD4049UBE
IC1C
7
6
CD4049UBE
IC1A
3
2
CD4049UBE
IC1E
11
12
CD4049UBE
DRIVE
1MB
R2
10M
R3
2M2
R4
100k
BOOST
C2
51pF
R5
1M
C4
100pF
VA
IN
R1
100k
C1
68n
IC1F
CD4049UBE
C3
33n
IC1D
CD4049UBE
C5
10uF
RPD
1M
GND
GND
VOLUME
10kA
OUT
GND

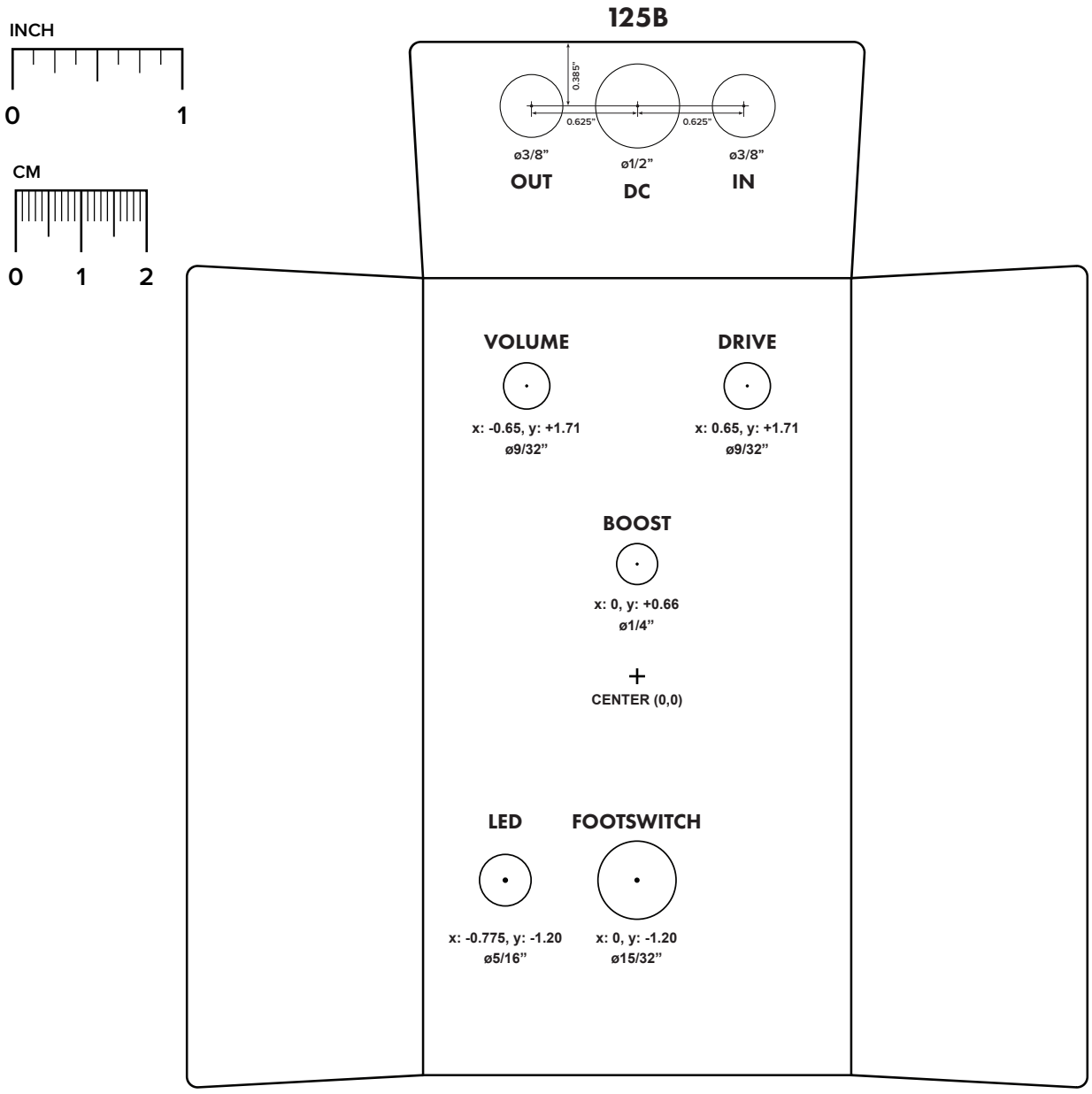
DRILL TEMPLATE

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.

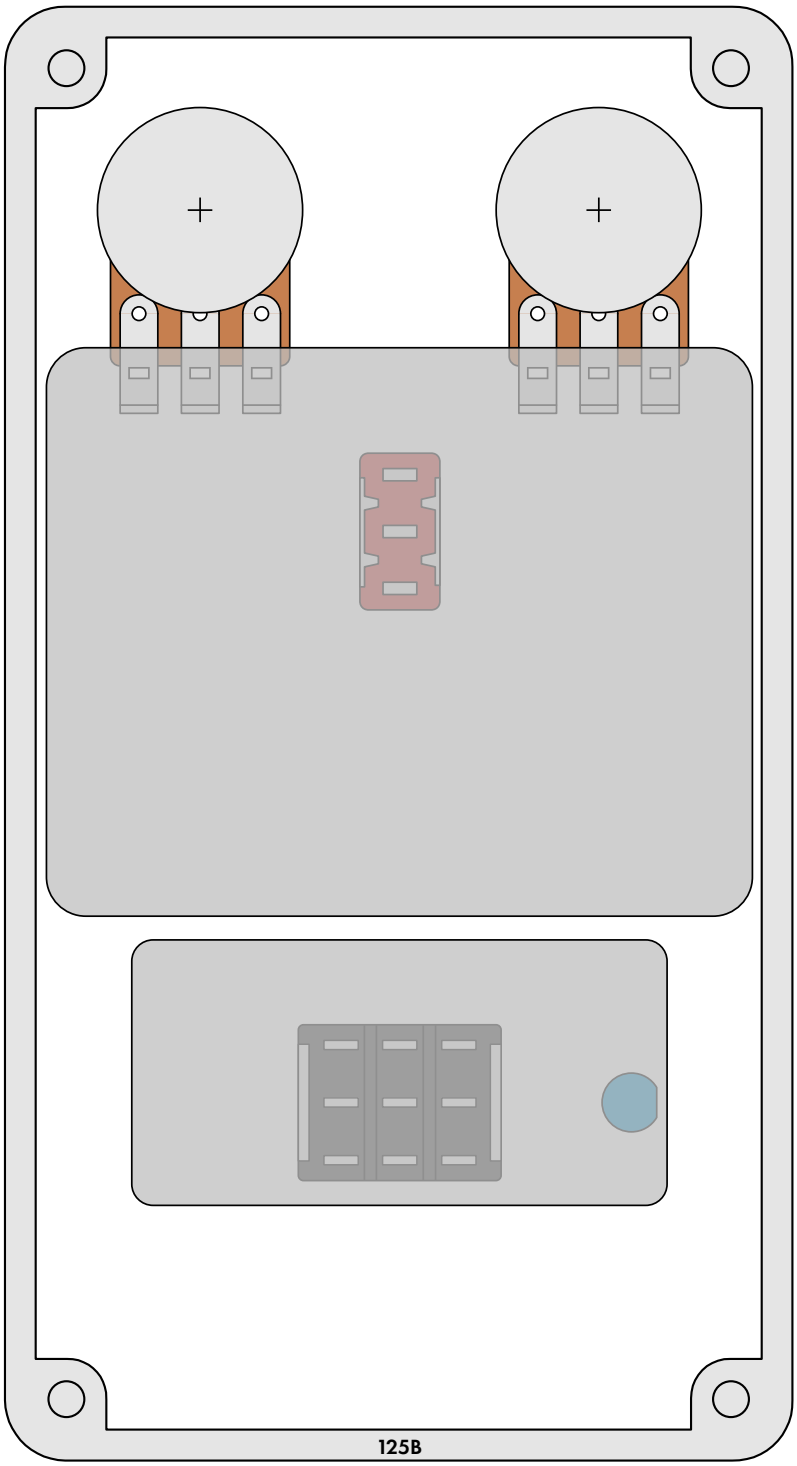
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

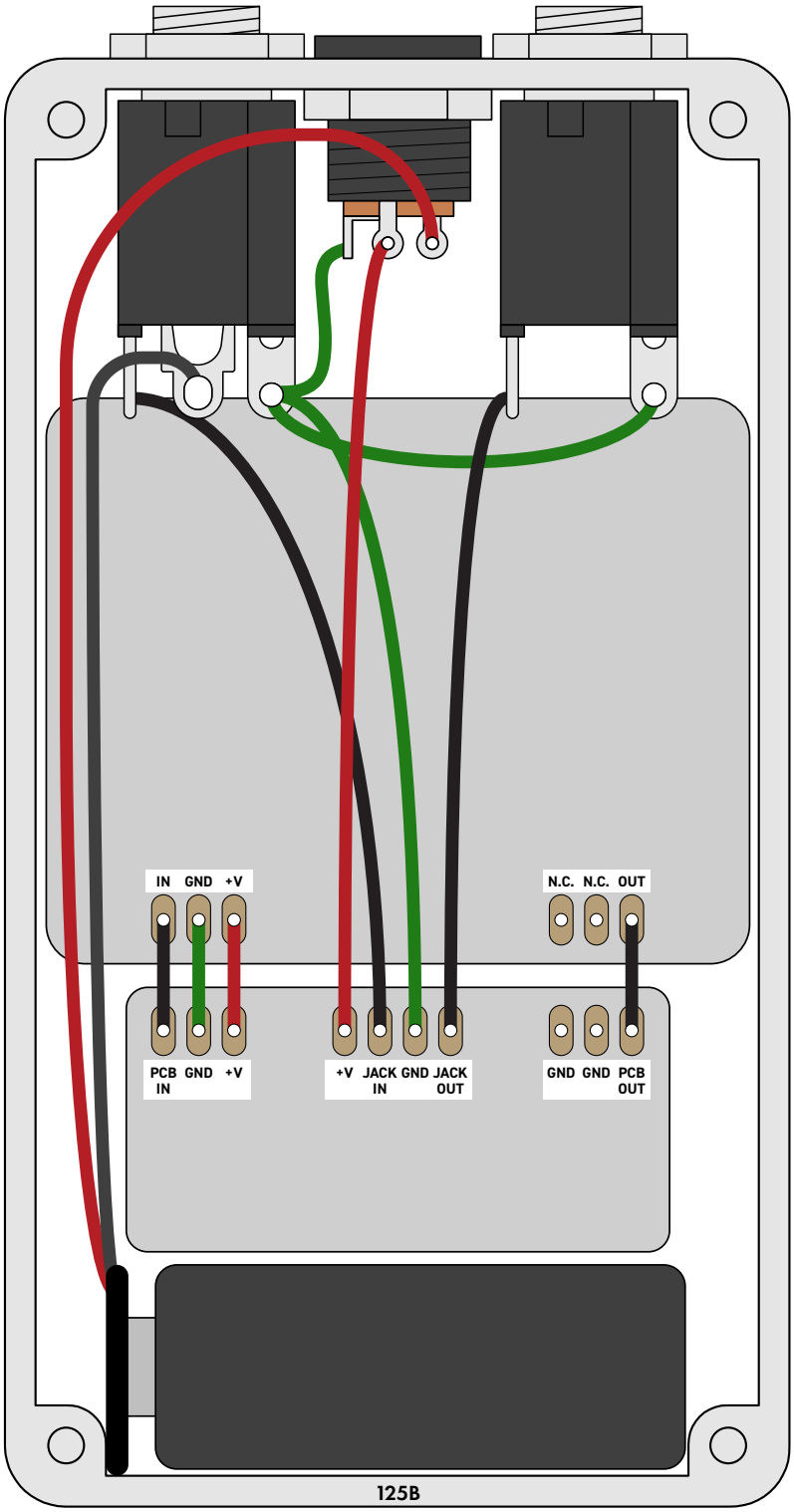


ENCLOSURE LAYOUT

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 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 (2021-11-12)
Initial release.