

PROJECT NAME

PROTEUS

BASED ON

Dallas-Arbiter Fuzz Face

EFFECT TYPE

Germanium fuzz

BUILD DIFFICULTY

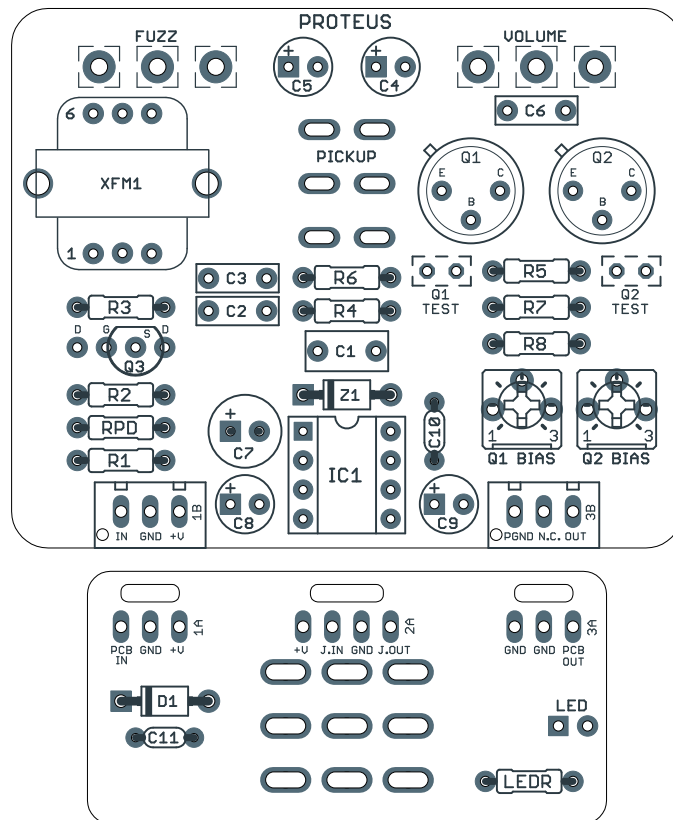
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DOCUMENT VERSION

1.0.1 (2020-12-10)

PROJECT SUMMARY

A no-frills adaptation of the classic fuzz pedal made famous by Jimi Hendrix.



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

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INTRODUCTION

The Proteus Germanium Fuzz is an adaptation of the classic Dallas-Arbiter Fuzz Face circuit released in 1966. The Fuzz Face was copied directly from the Tone Bender Mk. 1.5 that was released earlier in the year, but its association with Jimi Hendrix led to its own fame and prominence, and today it's the better-known circuit of the two.

The Proteus is similar to the [Solaris](#), another Aion FX project based on the Fuzz Face, but the Proteus is more basic while the Solaris is has several added modifications. If you just want to build a basic Fuzz Face with no frills then this is the one you want.

With that said, there are still two modifications to the circuit. The first is a charge pump allowing -9V operation from a normal +9V supply, which allows it to play nice with other pedals and standard power supplies. (Unlike most effects that came after, germanium PNP transistors require a negative supply.)

The second modification is a switchable pickup simulator at the input. The Fuzz Face was originally designed to connect directly to an electric guitar, and as a result it is notoriously picky about where it's placed in the signal chain. If it's fed a low-impedance signal (e.g. if there's another pedal before it) then it loses much of its character.

The pickup simulator solves this problem by adding a transformer, resistor and capacitor to convert the source signal into the higher impedance that the Fuzz Face likes. This pickup simulator was invented by [Jack Orman of AMZ](#) and has been used in commercial pedals such as the Earthquaker Devices Erupter.

The pickup simulator won't provide the same interactivity with the guitar's tone & volume as if it was connected directly, but it will help retain the tonal character. When turned off, the pickup simulator is fully bypassed and out of the circuit, so you should only enable it if you want to place the Proteus in a position other than first in your signal chain.

USAGE

The Proteus has two controls and one toggle:

- **Fuzz** controls the amount of gain from the second transistor where the clipping occurs.
- **Volume** is the output volume of the effect.
- **Pickup** enables or disables the pickup simulator.

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	1M	Metal film resistor, 1/4W	
R2	1M	Metal film resistor, 1/4W	
R3	10k	Metal film resistor, 1/4W	
R4	1k	Metal film resistor, 1/4W	
R5	10k	Metal film resistor, 1/4W	
R6	100k	Metal film resistor, 1/4W	
R7	1k	Metal film resistor, 1/4W	
R8	470R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	1uF	Film capacitor, 7.2 x 3.5mm	
C2	100n	Film capacitor, 7.2 x 2.5mm	
C3	1n	Film capacitor, 7.2 x 2.5mm	
C4	2.2uF	Electrolytic capacitor, 4mm	
C5	22uF	Electrolytic capacitor, 5mm	
C6	10n	Film capacitor, 7.2 x 2.5mm	
C7	100uF	Electrolytic capacitor, 6.3mm	
C8	10uF	Electrolytic capacitor, 5mm	
C9	47uF	Electrolytic capacitor, 5mm	
C10	100n	MLCC capacitor, X7R	
C11	100n	MLCC capacitor, X7R	
Z1	1N4742A	Zener diode, 12V, DO-41	
D1	1N5817	Schottky diode, DO-41	
Q1	Germanium	Germanium transistor, PNP	Recommended to buy a selected Fuzz Face set. See build notes.
Q1-S	TO-5 socket	Transistor socket, TO-5	
Q2	Germanium	Germanium transistor, PNP	Recommended to buy a selected Fuzz Face set. See build notes.
Q2-S	TO-5 socket	Transistor socket, TO-5	
Q3	2N5457	JFET, N-channel, TO-92	Any equivalent general-purpose JFET will work here.
IC1	TC1044SCPA	Voltage inverter, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
XFM1	42TL019	Transformer, audio, 10KCT/600CT	
Q1BIAS	100k trimmer	Trimmer, 10%, 1/4"	
Q2BIAS	10k trimmer	Trimmer, 10%, 1/4"	
FUZZ	1kC	16mm right-angle PCB mount pot	Original uses linear (B) taper, but reverse (C) gives better control range.
VOL.	500kA	16mm right-angle PCB mount pot	
PICKUP	DPDT	Toggle switch, DPDT	
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

Transistors

For this circuit, as with other vintage fuzzes, it's not so much the part number of the germanium transistor as it is the properties—specifically, gain (hFE) and leakage.

The Fuzz Face isn't as picky about its transistors as other germanium fuzzes like the Tone Bender, but you can save a lot of time by just buying a [matched set from Small Bear Electronics](#) or somewhere else. However, if you don't have access to pre-matched transistors or you just want to sort your own, here's what to look for.

Characteristics

This is just a general guideline. There are some transistors that meet these characteristics that won't sound right, and others that are outside this nominal range that will work just fine.

- **Q1:** hFE 70-90, low to high leakage (not more than 300 μ A)
- **Q2:** hFE 110-140, low to high leakage (not more than 300 μ A)

Biasing

The Proteus is set up to allow for easy biasing via trim pots without having to swap out resistors.

As a starting point, turn the Q1 bias trimmer to 9:00 and the Q2 trimmer to around 2:00. Then, with a multimeter, touch the black and red leads to the two pads marked "TEST" below Q1. Turn the Q1 trimmer until the multimeter reads -0.7V (either positive or negative depending on which lead is touching which pad).

Next, moving to the test pads under Q2, turn the Q2 bias trimmer until the multimeter shows -4.5V (again, either positive or negative). Then, measure each leg on all three of the transistors. You're looking for something near these voltages.

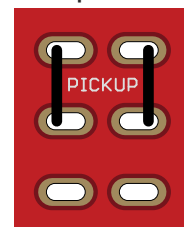
- **Q1:** Collector -0.7V, Base -0.2V, Emitter 0V
- **Q2:** Collector -4.5V, Base -0.7V, Emitter -0.5V

The voltages don't need to be anywhere near exact, this is just a benchmark. Let your ears be the judge. Some people prefer the Q2 voltage to be higher, around 5.5V.

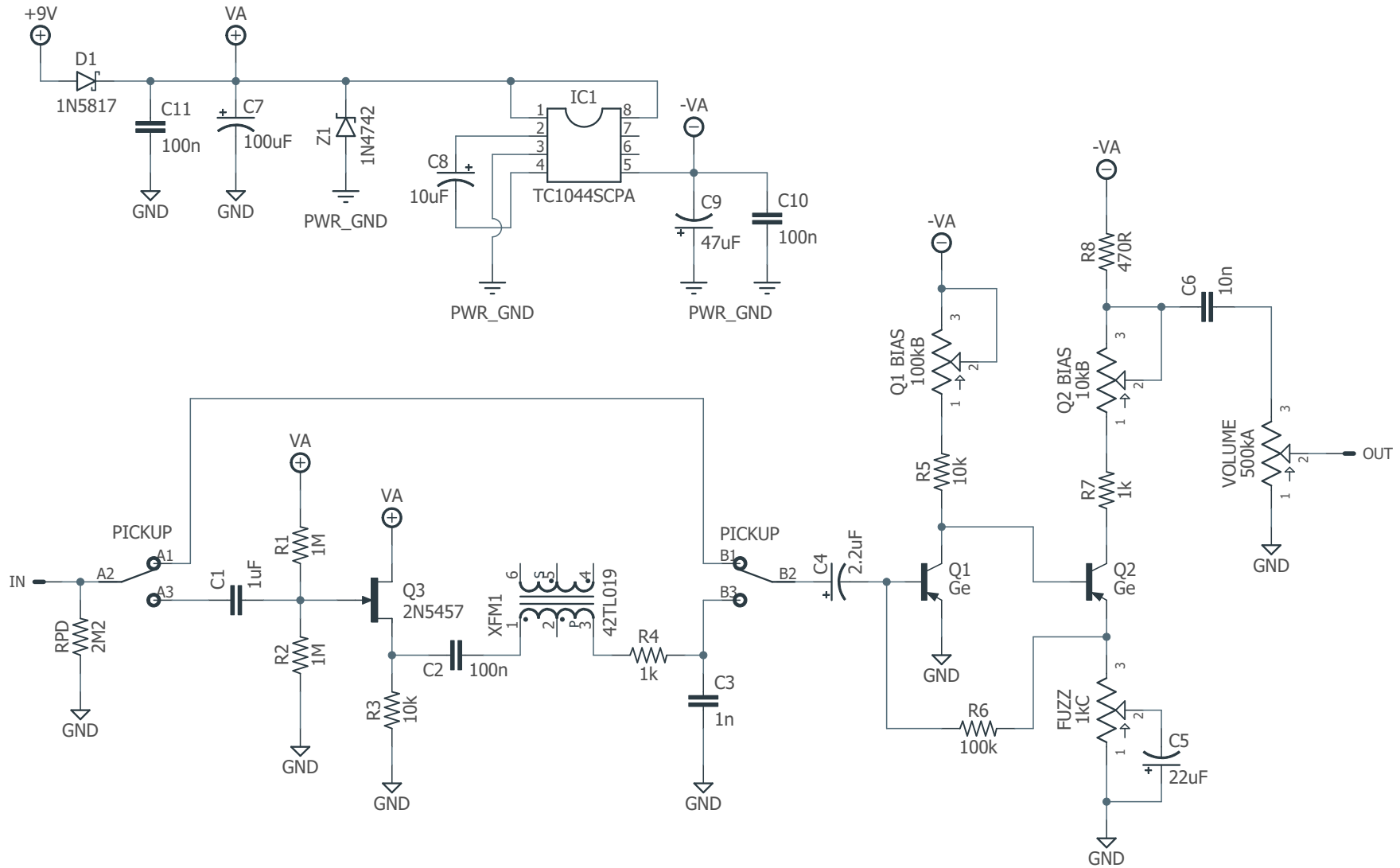
Omitting the pickup simulator

It is not recommended to leave off the pickup simulator. With only two potentiometers at the top and no third point to mount, the PCB will not be secure and the solder joints could break as it flexes. So if you don't want the pickup simulator, make sure to find another way to mount the PCB securely. It's better to include it and just leave it turned off.

With that said: if you do still want to omit the pickup simulator, leave off **C1-3**, **R1-4**, **Q3**, and the transformer. Then, solder jumpers across the toggle switch pads as shown in the diagram to the right.



SCHEMATIC



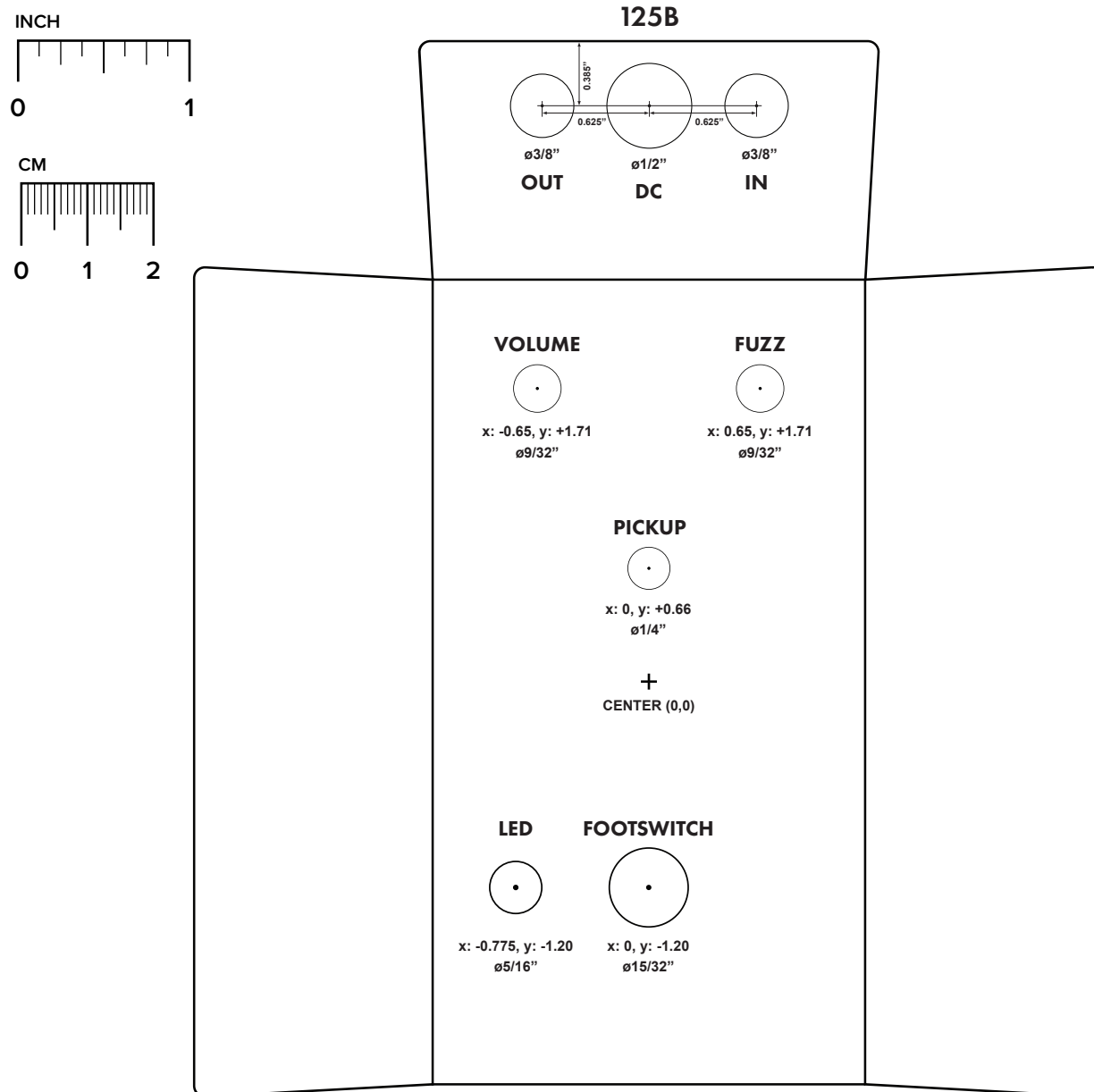
DRILL TEMPLATE

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.

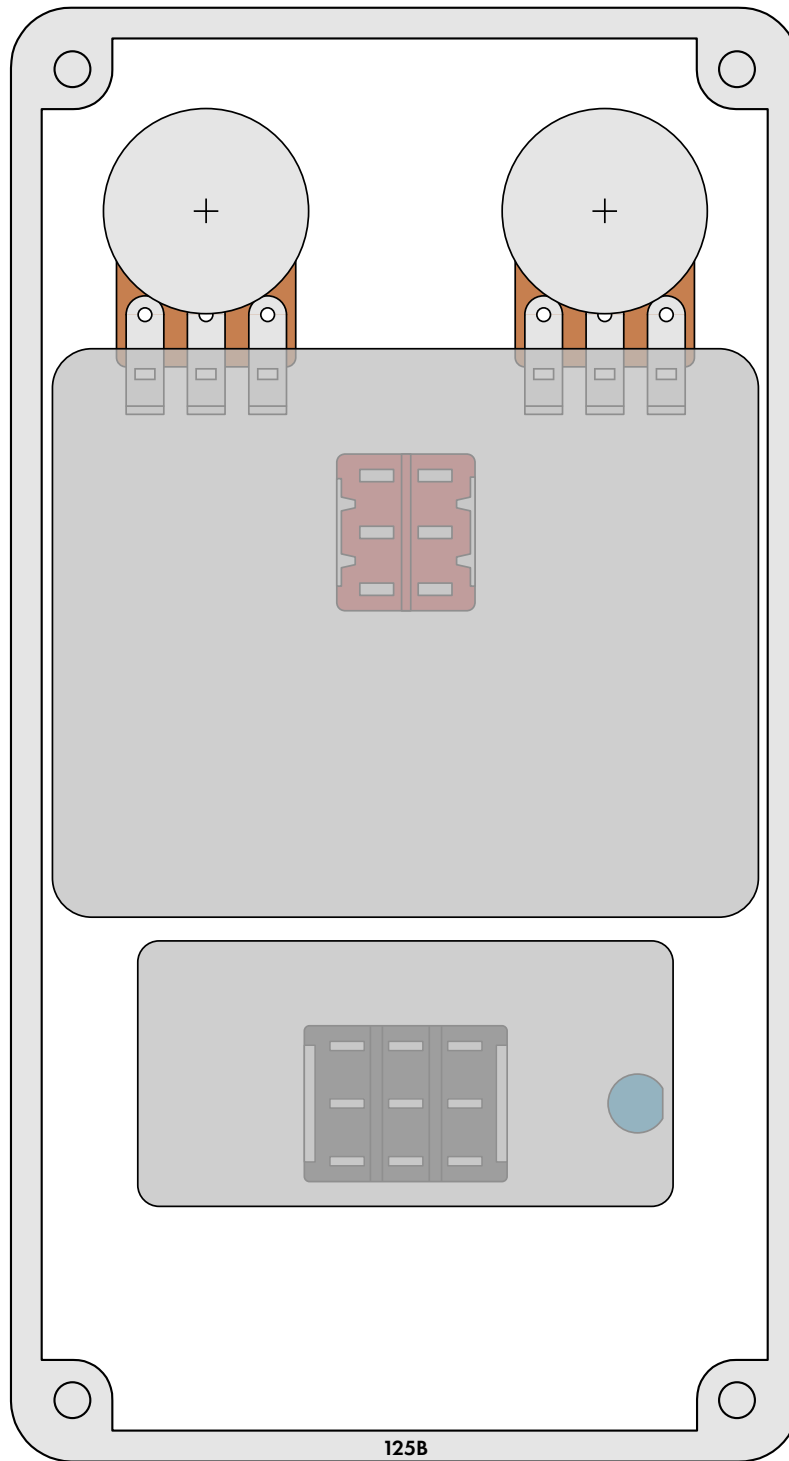
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

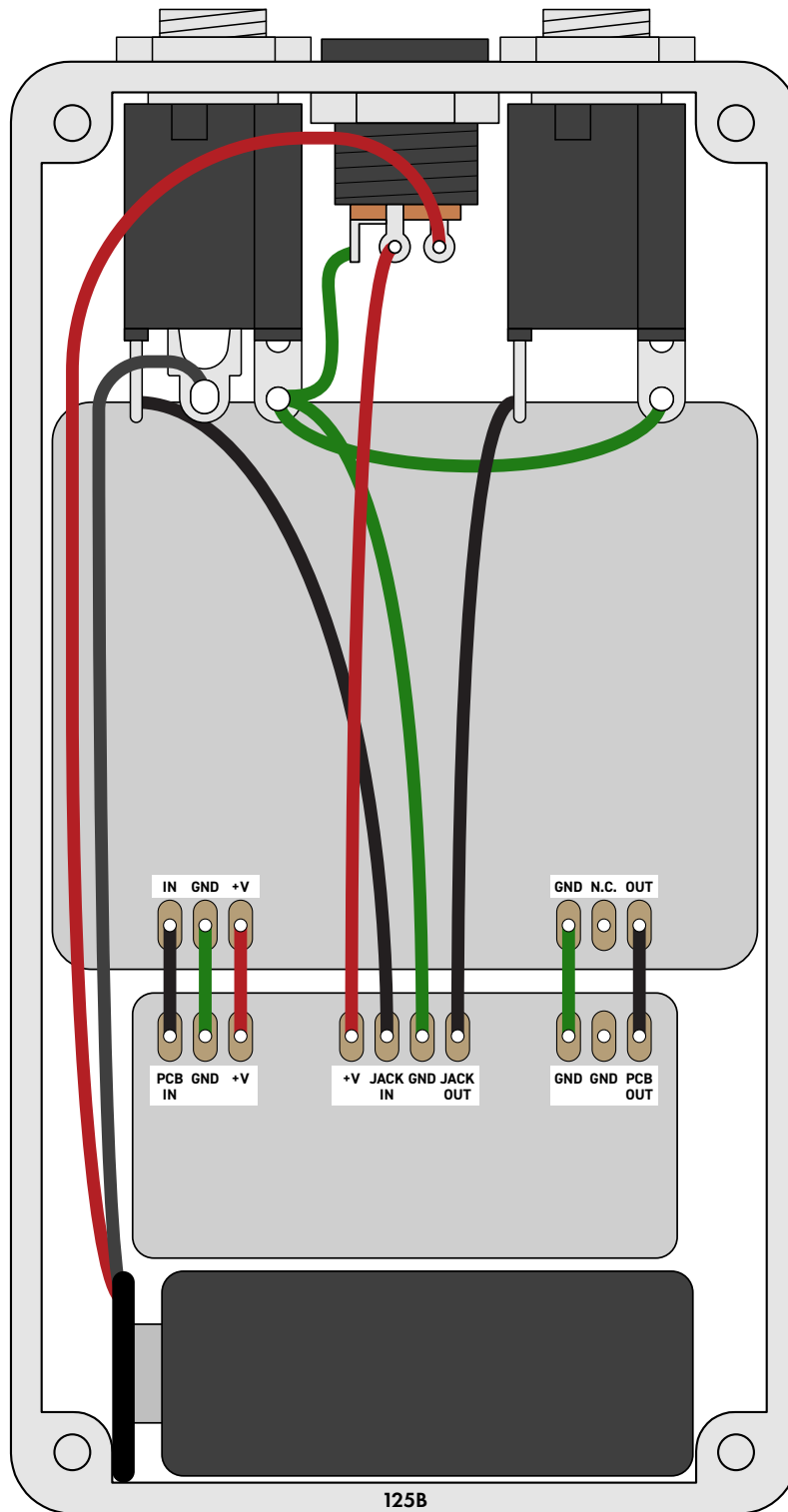


ENCLOSURE LAYOUT

Enclosure is shown without jacks. See next page for jack layout and wiring.



WIRING DIAGRAM



*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 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 (2020-12-10)

Updated capacitor types in parts list.

1.0.0 (2020-07-03)

Initial release.