

PROJECT NAME
VECTOR

BASED ON
Mad Professor Deep Blue Delay

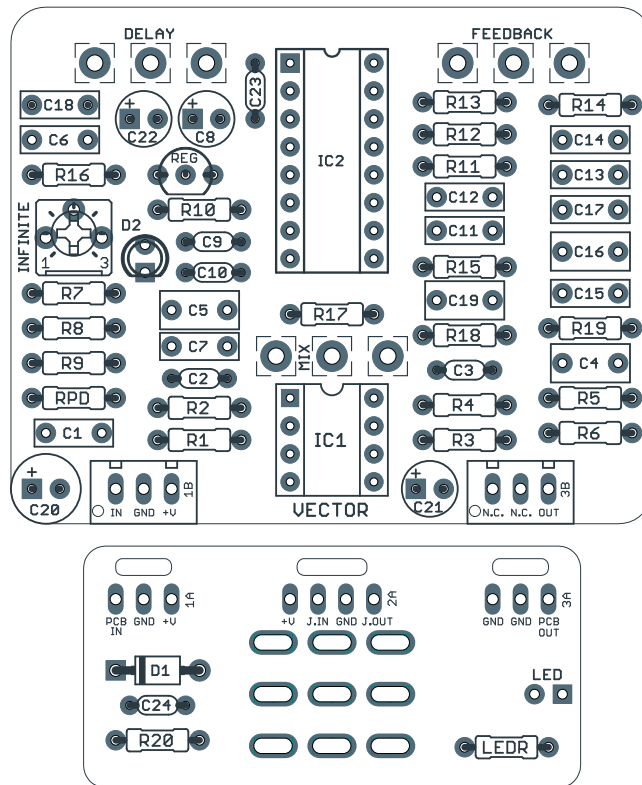
BUILD DIFFICULTY
■■■■□ Intermediate

EFFECT TYPE
Delay

DOCUMENT VERSION
1.0.2 (2024-08-08)

PROJECT SUMMARY

With similar frequency bandwidth to a tape unit, this analog-voiced digital delay is a favorite even among analog purists.



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

IMPORTANT NOTE

This documentation is for the **PCB-only** version of the project. If you are building the full kit from Aion FX, please use the [kit build documentation](#) instead. The instructions are more detailed and may differ in some areas due to the specialized parts and assembly methods used in our kits.

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INTRODUCTION

The Vector Ambient Delay is an easy delay project based on the Mad Professor Deep Blue Delay with a few modifications and improvements added.

The circuit is based around the PT2399 delay chip. While the PT2399 is technically digital, it doesn't have the sterile sound characteristics associated with modern digital delays, but is instead much warmer and analog-voiced, with similar characteristics to a tape delay unit. It's equally suited for short slapback effects or longer rhythmic repeats.

Your ears can be the final judge, but even most analog purists give high praise to this circuit. With the overall complexity being much lower and the cost of parts being far cheaper than a BBD-based delay, you owe it to yourself to try this one before jumping straight into a true analog delay!

The new version of the Vector removes compatibility with the Rebote 2.5 in favor of a simplified build process. The [previous version of the Vector](#) is still available if you want this option.

USAGE

The Vector has the following controls:

- **Delay** is the time between repeats, from short slapback to longer rhythmic settings.
- **Feedback** controls the number of repeats. Using the inner “infinite” trimmer, the feedback knob can be tuned so that repeats are infinite at the upper end of the range.
- **Mix** sets the volume level of the repeats.

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	180k	Metal film resistor, 1/4W	
R2	360k	Metal film resistor, 1/4W	
R3	22k	Metal film resistor, 1/4W	
R4	12k	Metal film resistor, 1/4W	
R5	1k	Metal film resistor, 1/4W	
R6	100k	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
R9	10k	Metal film resistor, 1/4W	
R10	2k7	Metal film resistor, 1/4W	
R11	10k	Metal film resistor, 1/4W	
R12	10k	Metal film resistor, 1/4W	
R13	20k	Metal film resistor, 1/4W	
R14	1k	Metal film resistor, 1/4W	
R15	2k	Metal film resistor, 1/4W	
R16	5k1	Metal film resistor, 1/4W	
R17	20k	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	10k	Metal film resistor, 1/4W	
R20	33R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor. Can be as low as 1M.
LEDR	10k	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	22n	Film capacitor, 7.2 x 2.5mm	
C2	47pF	MLCC capacitor, NP0/C0G	
C3	100pF	MLCC capacitor, NP0/C0G	
C4	1uF	Film capacitor, 7.2 x 3.5mm	
C5	1uF	Film capacitor, 7.2 x 3.5mm	
C6	4n7	Film capacitor, 7.2 x 2.5mm	
C7	2n2	Film capacitor, 7.2 x 2.5mm	
C8	47uF	Electrolytic capacitor, 5mm	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C9	100n	MLCC capacitor, X7R	
C10	100n	MLCC capacitor, X7R	
C11	100n	Film capacitor, 7.2 x 2.5mm	
C12	100n	Film capacitor, 7.2 x 2.5mm	
C13	15n	Film capacitor, 7.2 x 2.5mm	
C14	2n2	Film capacitor, 7.2 x 2.5mm	
C15	10n	Film capacitor, 7.2 x 2.5mm	
C16	1uF	Film capacitor, 7.2 x 3.5mm	
C17	47n	Film capacitor, 7.2 x 2.5mm	
C18	22n	Film capacitor, 7.2 x 2.5mm	
C19	1uF	Film capacitor, 7.2 x 3.5mm	
C20	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C21	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C22	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor. (5V)
C23	100n	MLCC capacitor, X7R	Power supply filter capacitor. (5V)
C24	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	3mm green	LED, 3mm, green diffused	Optional current-limiting diode to prevent harsh clipping.
REG	78L05	Regulator, +5V, TO-92	
IC1	TL072	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	PT2399	Digital echo IC, DIP16	
IC2-S	DIP16 socket	IC socket, DIP-16	
INF	10k trimmer	Trimmer, 10%, 1/4"	
DELAY	50kB	16mm right-angle PCB mount pot	
FDBK	50kB	16mm right-angle PCB mount pot	
MIX	50kB	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.
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

Infinite repeats trimmer

An internal infinite repeats trimmer is included to allow you to set the upper end of the feedback range, either allowing infinite repeats at the Feedback knob's highest position or stopping just short of it, depending on your preference.

To calibrate it, first turn the Feedback knob all the way up. Then, adjust the trimmer until you have the range you want. The stock Deep Blue Delay circuit is the equivalent of having this trimmer turned all the way CCW (5.1k total resistance).

For infinite repeats without getting into "runaway" territory, you'll want the trimmer about halfway up—in other words, 10-12k total resistance once you include include R16, the 5.1k base resistor. It's recommended to use that position as a starting point.

PT2399 chip

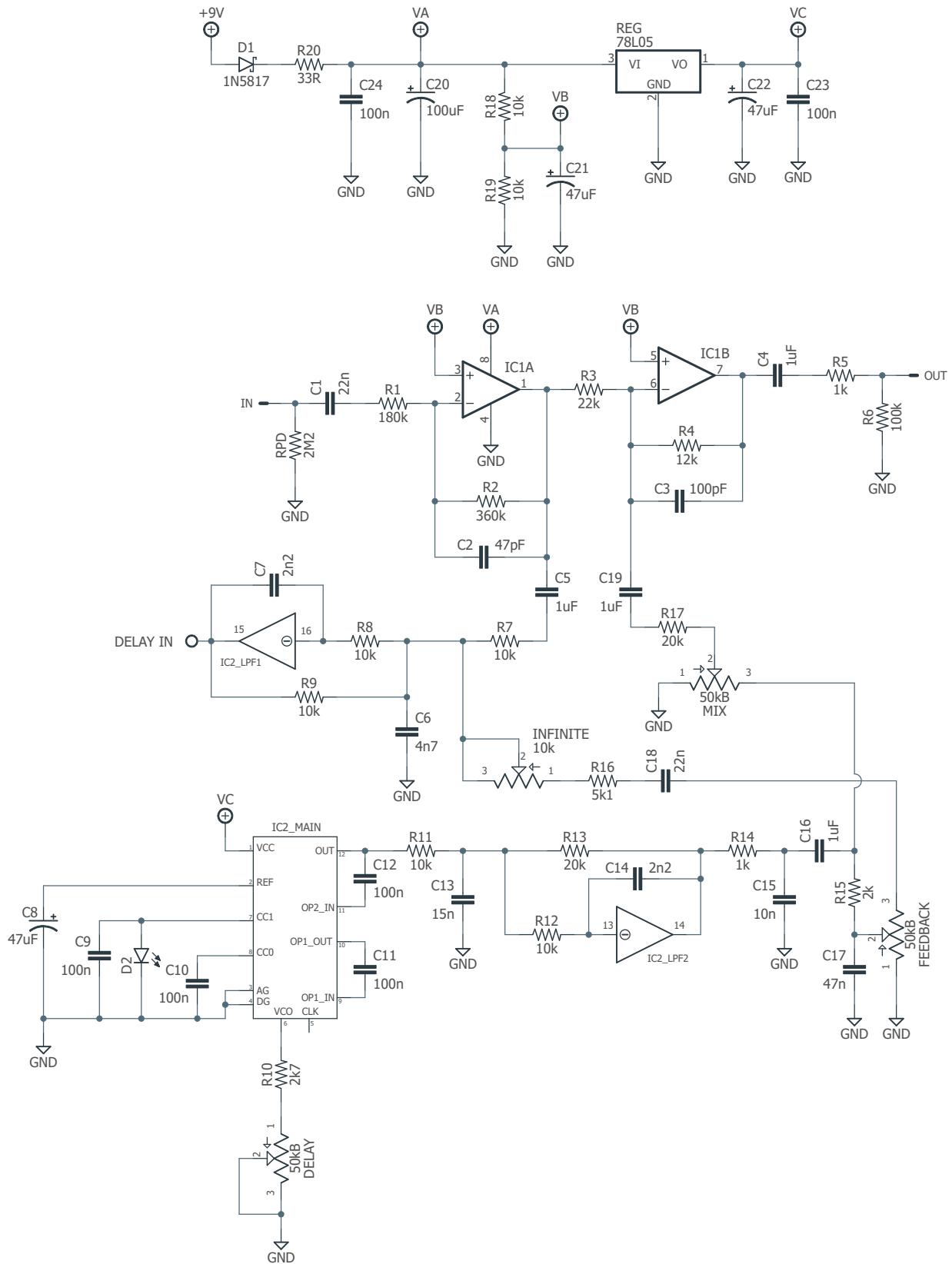
Make sure you get your PT2399 chip from a reputable source. The [PT2399s from Aion FX](#) are sourced directly from the manufacturer, as are those from [Small Bear Electronics](#).

You can find them from other places like Tayda and eBay for much cheaper, but more often than not, these are either fakes or factory rejects. As a result, they may behave oddly, have higher noise, or just not work at all.

Current-control LED

An optional current-control LED is included to prevent the PT2399 from going into clipping with large input signals (around 20dB or higher), as discussed in this thread on [DIYStompboxes](#). For D2, you'll want to use a water-clear green LED with a forward voltage of 2V to 2.3V for best results. The goal is to get as high of a clipping threshold as you can get without reaching the point where the PT2399 will clip, which is harsh and un-musical.

SCHEMATIC



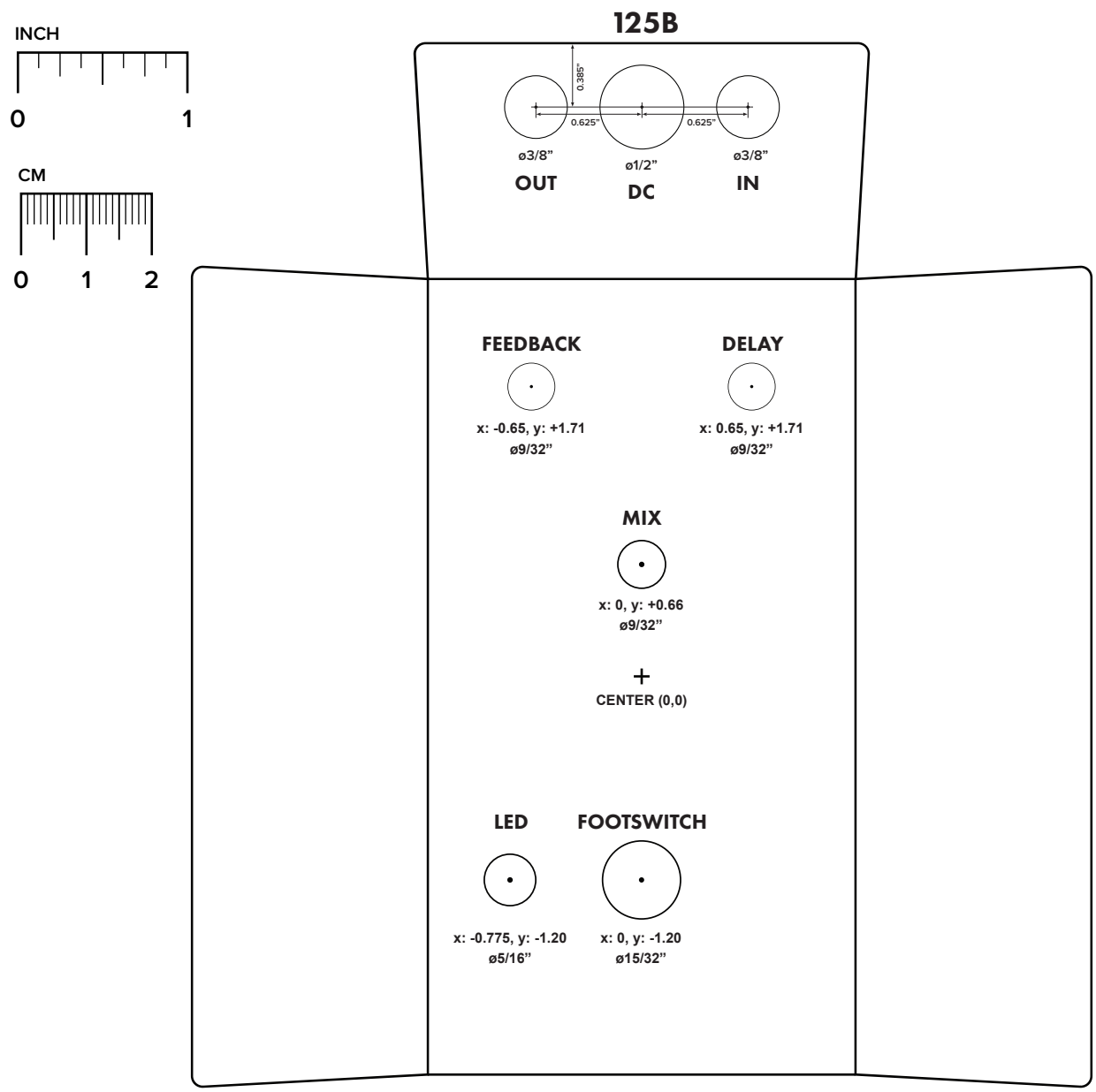
DRILL TEMPLATE

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.

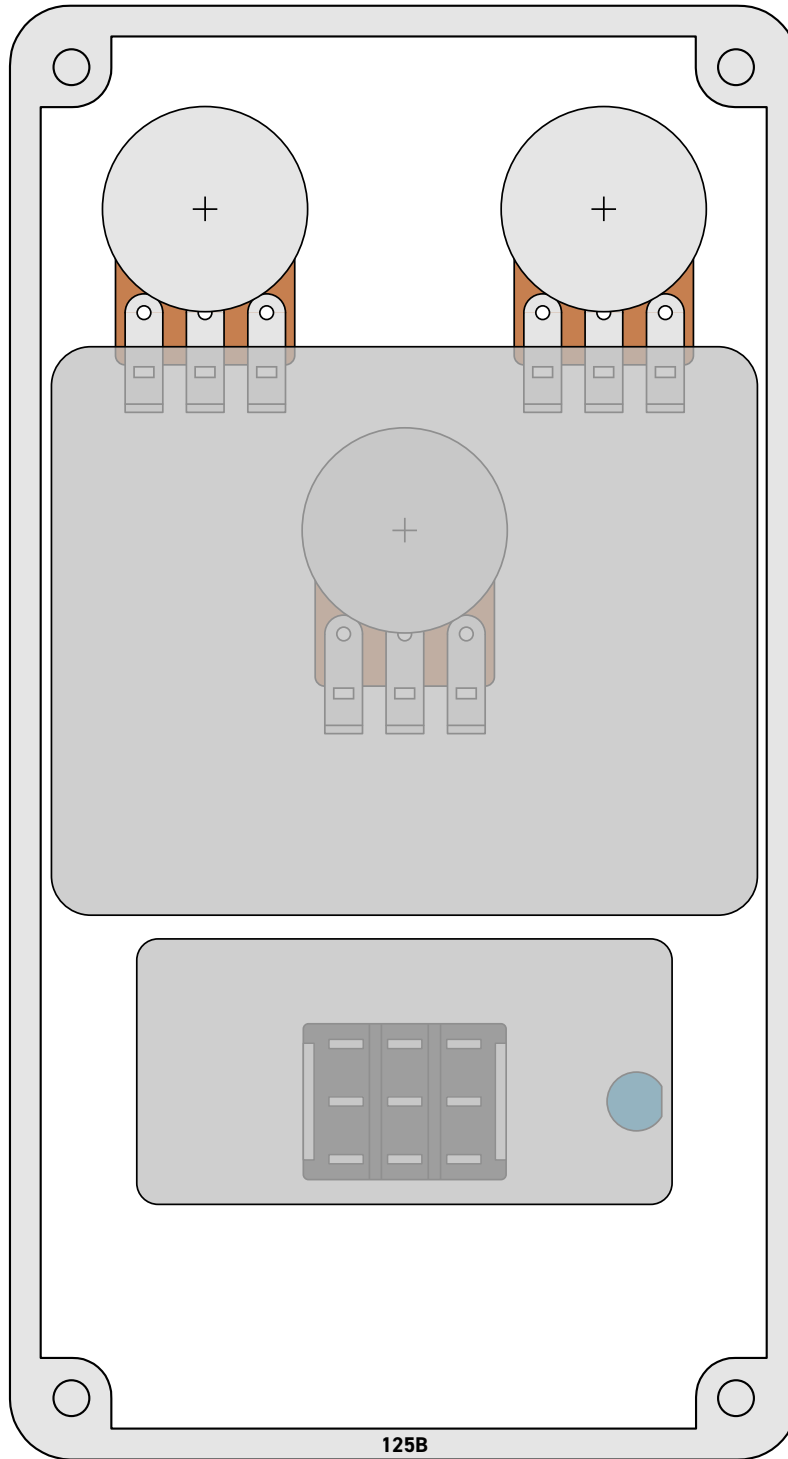
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

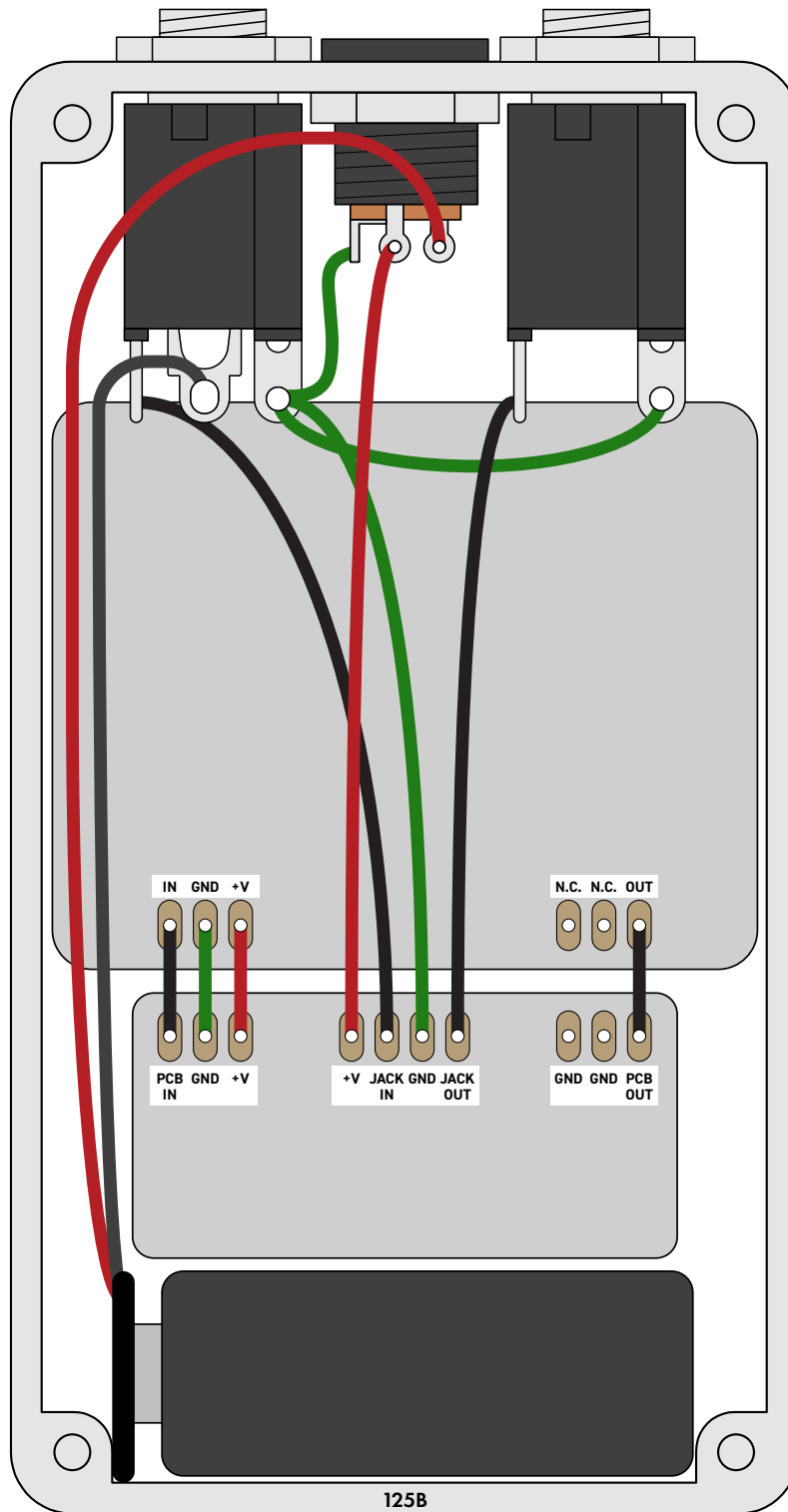


ENCLOSURE LAYOUT

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

1.0.2 (2024-08-08)

Changed LEDR to 10k to work with a wider variety of LEDs.

1.0.1 (2019-04-10)

Updated incorrect PCB graphic.

1.0.0 (2019-03-03)

Initial release.