

PROJECT NAME

GAIA MK. I



BASED ON

Catalinbread® CB30

BUILD DIFFICULTY

■■■■□ Intermediate

EFFECT TYPE

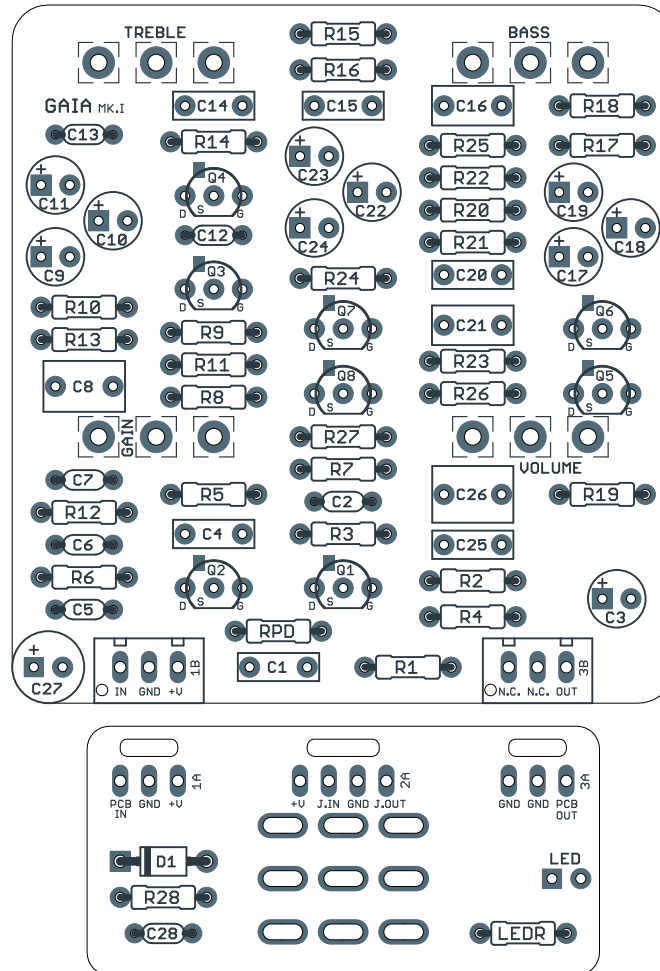
Overdrive / Amp Emulation

DOCUMENT VERSION

1.0.0 (2021-05-28)

PROJECT SUMMARY

An adaptation of the Vox® AC30, a legendary British amplifier responsible for the signature guitar tones of the 60s and 70s. It uses cascaded mu-amp stages in place of tubes for amp-like tone in a small box.



Actual size is 2.3" x 2.42" (main board) and 1.78" x 0.87" (bypass board).

IMPORTANT NOTE

This documentation is for the **Mk. I** version of the project. There is also a [Mk. II](#) version, based on the Galileo. While the name is similar, the circuit and part numbering are different. Please be sure your PCB is labeled "Gaia Mk. I" before proceeding with this build document.

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INTRODUCTION

The Gaia Preamp Drive Mk. I is an adaptation of the Catalinbread CB30, their pedal emulation of a Vox® AC30 amplifier.

The CB30 was originally released in 2011. Curiously, there were two different versions, although there's no official record from Catalinbread of a V1 and V2. [Aion FX traced a version with eight JFETs](#) in 2021, and the PCB was dated 2011. However, [the Freestompboxes.org community traced one](#) during the first month it was released (June 2011) and the photos show a completely different PCB layout and a circuit with only five JFETs.

You can read more about this in the tracing journal post, including theories on why there was a redesign—but it's sufficient to say that anyone building a CB30 DIY clone in the past ten years was not hearing the improved version.

The original CB30 used 2N5457 JFETs, which are no longer available in through-hole format. Extra pads have been provided if you want to use surface-mount JFETs (part number MMBF5457), which perform identically to those used in Catalinbread pedals. Aion FX also offers [pre-soldered MMBF5457s](#) on adapter boards if you find surface-mount parts intimidating. See build notes for more details.

In 2012, the CB30 was incorporated into the Galileo, a dual pedal containing a Rangemaster-derived Naga Viper treble booster in the same enclosure, emulating Brian May's treble-boosted AC30 guitar tone. In 2014, the second version of the Galileo was released, this time a single pedal that internally contained the Naga Viper and a redesigned CB30 using MPF4393 JFETs, but with only three knobs and one footswitch. This is available from Aion FX as the [Gaia Mk. II](#).

The Gaia Mk. I can be run at 18V for increased volume and clarity, but it is not compatible with the [18V Voltage Doubler / Bypass module](#) due to the larger format of the PCB.

USAGE

The Gaia Mk. I has the following controls:

- **Gain** controls the amount of gain in the first amplifier stage.
- **Bass** and **Treble** form a two-band tone stack arranged the same as the original Vox amplifiers.
- **Volume** is the overall output level.

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	100k	Metal film resistor, 1/4W	
R2	470k	Metal film resistor, 1/4W	
R3	680k	Metal film resistor, 1/4W	
R4	390R	Metal film resistor, 1/4W	
R5	1M	Metal film resistor, 1/4W	
R6	1M	Metal film resistor, 1/4W	
R7	100k	Metal film resistor, 1/4W	
R8	100k	Metal film resistor, 1/4W	
R9	470k	Metal film resistor, 1/4W	
R10	2M2	Metal film resistor, 1/4W	
R11	390R	Metal film resistor, 1/4W	
R12	1M	Metal film resistor, 1/4W	
R13	1M	Metal film resistor, 1/4W	
R14	100k	Metal film resistor, 1/4W	
R15	12k	Metal film resistor, 1/4W	
R16	470k	Metal film resistor, 1/4W	
R17	470k	Metal film resistor, 1/4W	
R18	2M2	Metal film resistor, 1/4W	
R19	390R	Metal film resistor, 1/4W	
R20	1M	Metal film resistor, 1/4W	
R21	1M	Metal film resistor, 1/4W	
R22	470k	Metal film resistor, 1/4W	
R23	470k	Metal film resistor, 1/4W	
R24	3M3	Metal film resistor, 1/4W	
R25	1k	Metal film resistor, 1/4W	
R26	1M	Metal film resistor, 1/4W	
R27	1M	Metal film resistor, 1/4W	
R28	100R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor. Can be as low as 1M.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust to change LED brightness.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C1	100n	Film capacitor, 7.2 x 2.5mm	
C2	470pF	MLCC capacitor, NP0/COG	
C3	2.2uF	Electrolytic capacitor, 4mm	
C4	47n	Film capacitor, 7.2 x 2.5mm	
C5	470pF	MLCC capacitor, NP0/COG	
C6	470pF	MLCC capacitor, NP0/COG	
C7	47pF	MLCC capacitor, NP0/COG	
C8	680n	Film capacitor, 7.2 x 4.5mm	
C9	2.2uF	Electrolytic capacitor, 4mm	
C10	10uF	Electrolytic capacitor, 5mm	
C11	2.2uF	Electrolytic capacitor, 4mm	
C12	470pF	MLCC capacitor, NP0/COG	
C13	47pF	MLCC capacitor, NP0/COG	
C14	22n	Film capacitor, 7.2 x 2.5mm	
C15	22n	Film capacitor, 7.2 x 2.5mm	
C16	1uF	Film capacitor, 7.2 x 3.5mm	
C17	47uF	Electrolytic capacitor, 5mm	
C18	2.2uF	Electrolytic capacitor, 4mm	
C19	1uF	Electrolytic capacitor, 4mm	
C20	2n2	Film capacitor, 7.2 x 2.5mm	
C21	1uF	Film capacitor, 7.2 x 3.5mm	
C22	22uF	Electrolytic capacitor, 5mm	
C23	2.2uF	Electrolytic capacitor, 4mm	
C24	2.2uF	Electrolytic capacitor, 4mm	
C25	1n	Film capacitor, 7.2 x 2.5mm	
C26	2.2uF	Film capacitor, 7.2 x 5mm	
C27	100uF	Electrolytic capacitor, 6.3mm	
C28	100n	MLCC capacitor, X7R	
D1	1N5817	Schottky diode, DO-41	
Q1	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.
Q2	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.
Q3	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.
Q4	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.
Q5	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.
Q6	MMBF5457	JFET, N-channel, TO-92	Substitute for 2N5457 (TO-92). See build notes.

PARTS LIST, CONT.

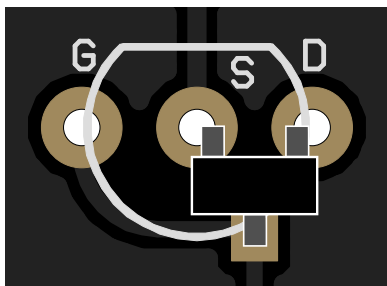
PART	VALUE	TYPE	NOTES
Q7	MMBF5457	JFET, N-channel, SOT-23	Substitute for 2N5457 (TO-92). See build notes.
Q8	MMBF5457	JFET, N-channel, SOT-23	Substitute for 2N5457 (TO-92). See build notes.
GAIN	1MB	16mm right-angle PCB mount pot	
BASS	1MA	16mm right-angle PCB mount pot	
TREBLE	1MA	16mm right-angle PCB mount pot	
VOL.	100kA	16mm right-angle PCB mount pot	
IN	1/4" mono	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

Using SMD JFETs

The 2N5457 JFET is no longer available in through-hole format. This PCB uses a hybrid through-hole/SMD outline for each JFET. An extra “G” (gate) pad is included to accommodate surface-mount devices without the need for adapters.

SMD JFETs should be oriented as follows:



All surface-mount JFETs use the same pinout, so this configuration will fit any type that we’re aware of. However, always check the datasheet if you’re uncertain—they’re difficult to desolder if you make a mistake.

Using through-hole adapters

If you’re not confident in your ability to work with surface-mount parts, Aion FX offers [2N5457 \(MMBF5457\) JFETs](#) that come pre-soldered to adapters for use in through-hole designs. These are from the same manufacturer as those used in the original Catalinbread pedals and will perform identically.

Using old-stock JFETs

JFETs are an odd category of component because their manufacturing process is highly inconsistent. The datasheet for a given part number will usually show an enormous range for crucial specifications such as $V_{GS(off)}$ and I_{DSS} .

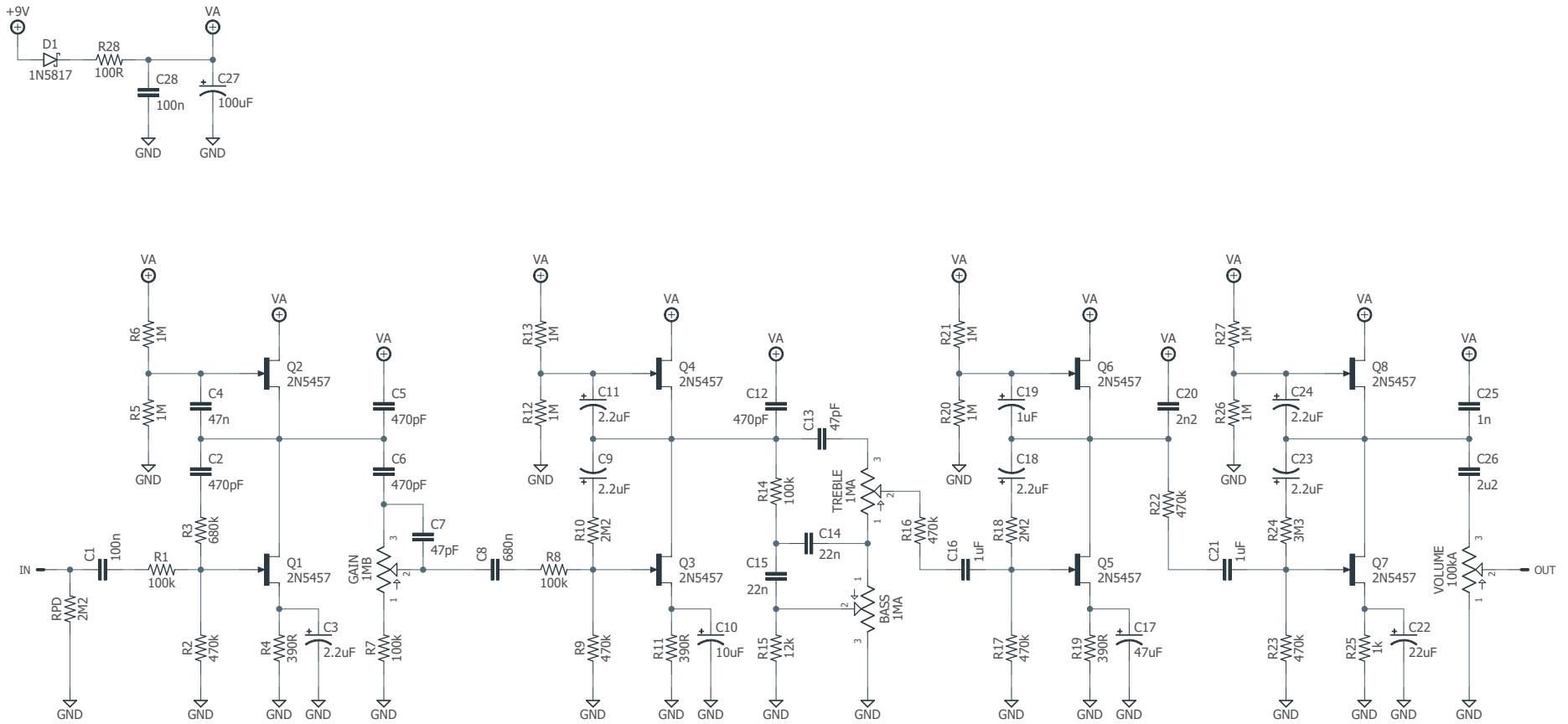
However, in practice, parts from the same manufacturer are usually much tighter in specification. So while the 2N5457 has a $V_{GS(off)}$ range of -0.5V to -6.0V, devices from ON Semiconductor (Fairchild) will usually be between -1V and -2V. This is the brand of JFETs used by Catalinbread in this pedal.

This means that the part number itself is not usually enough to go by if you’re trying to replicate a circuit that uses JFETs in certain types of applications, notably when they’re used for overdrive.

So while the 2N5457 is sometimes available from manufacturers such as Central Semiconductor or InterFET, the ones we’ve tested have been very far outside the ON Semi range and will perform very differently in this circuit. Therefore, **it is not recommended to use 5457 JFETs from any manufacturer except ON Semiconductor**—although it makes no difference whether it’s an old-stock through-hole type or the current-production MMBF5457 SMD type.

Conversely, if you find a different type of JFET that measures in the -1V to -2V range for $V_{GS(off)}$, it should work just as well as the 2N5457.

SCHEMATIC



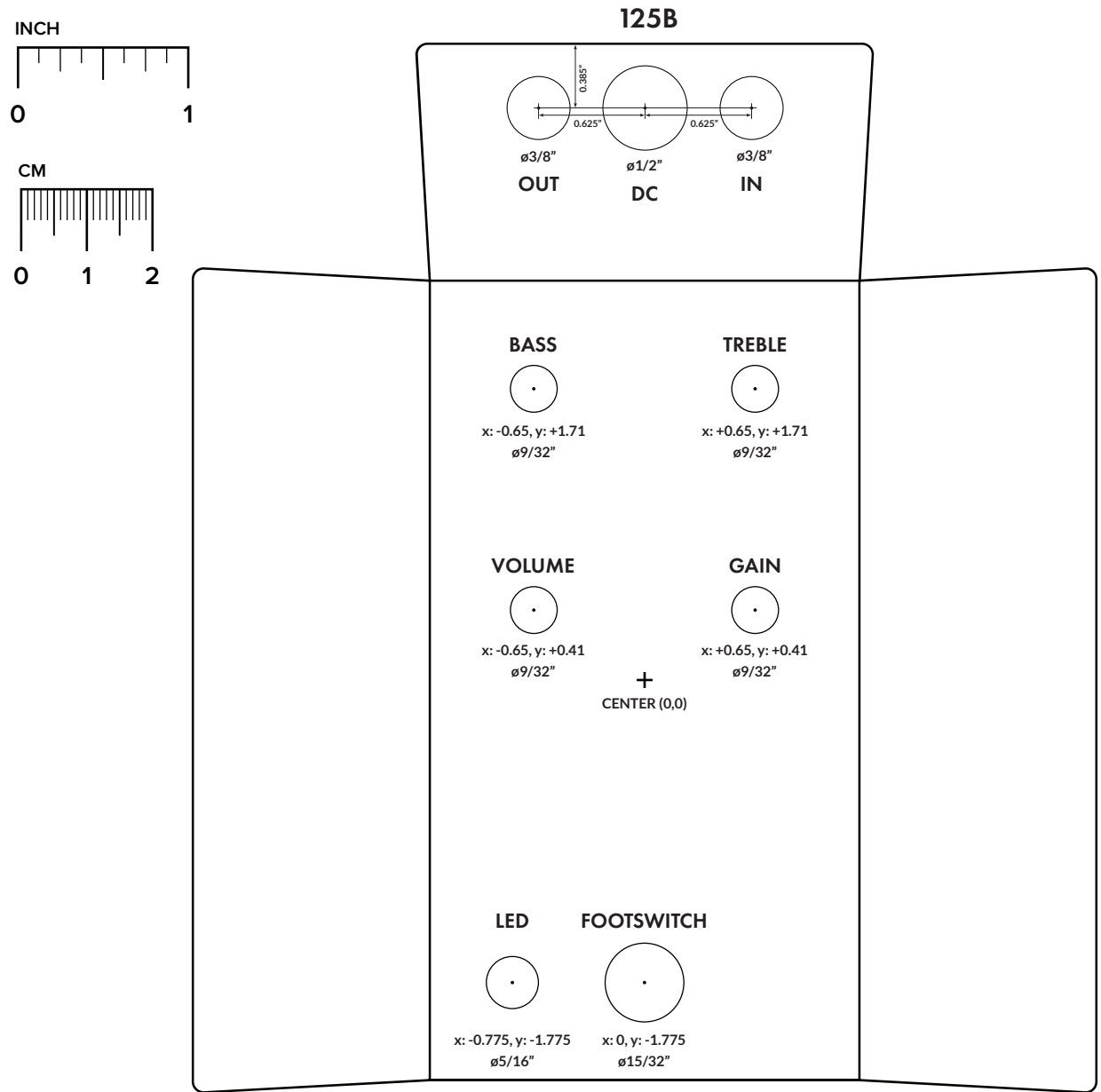
DRILL TEMPLATE

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.

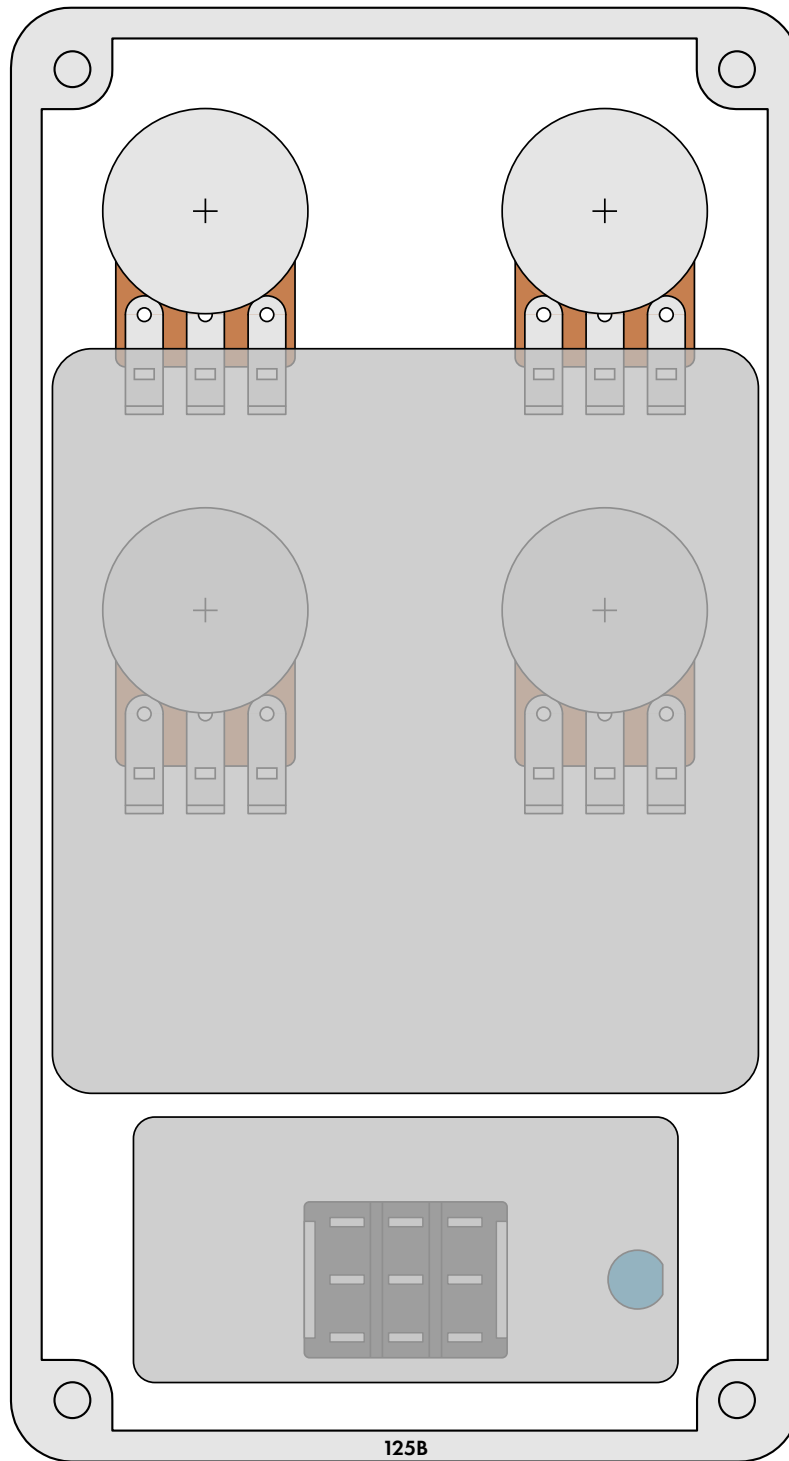
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

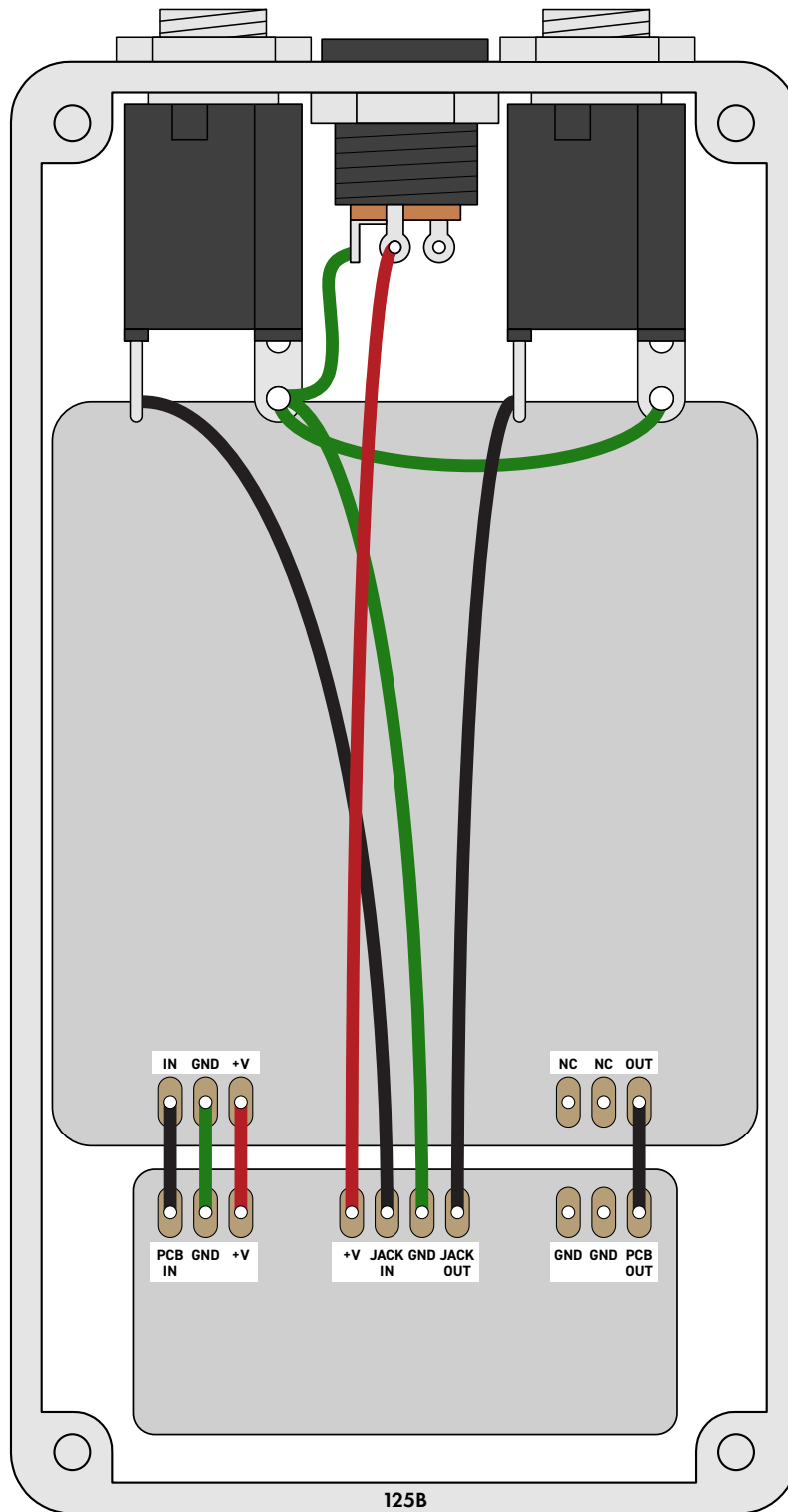


ENCLOSURE LAYOUT

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

1.0.0 (2021-05-28)

Initial release.