

PROJECT NAME

# ASTERIA MK. III



BASED ON

Catalinbread® Formula 55

BUILD DIFFICULTY

■■■■□ Intermediate

EFFECT TYPE

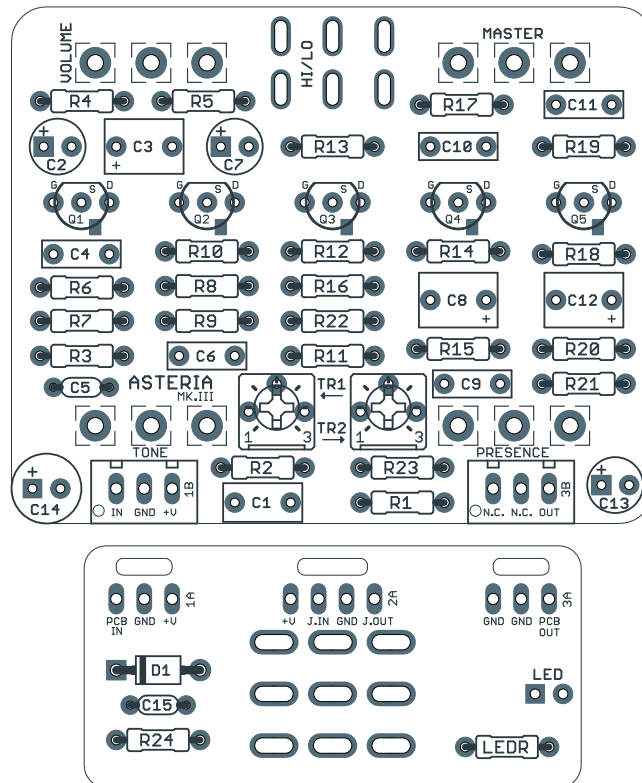
Overdrive / Amp Emulation

DOCUMENT VERSION

1.0.1 (2020-12-10)

## PROJECT SUMMARY

An adaptation of the Fender® Deluxe 5E3 amplifier from 1955, a classic low-wattage amplifier noted for its harmonically-rich breakup that can be achieved at low volumes.



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

### IMPORTANT NOTE

This documentation is for the **Mk. III** version of the project. There is also a [Mk. I](#) version, based on the Formula No. 5 V1, and a [Mk. II](#) version, based on the Formula No. 5 V2. While the names are similar, the circuit and part numbering are different. Please be sure your PCB is labeled "Asteria Mk. III" before proceeding with this build document.

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## INTRODUCTION

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The Asteria Preamp Drive Mk. III is an adaptation of the Catalinbread Formula 55, based on the Fender 5E3 Tweed Deluxe amplifiers from the 1950s. It was originally released in 2017, the third version of the original Formula No. 5, but different enough that they changed the name.

The Formula 55 replicates the quirks of the original Deluxe amp, including a tone control whose effect diminishes as the gain is turned up, with almost no change across the sweep at maximum drive. While the original amp only had Gain and Tone knobs, this circuit adds a master volume, Presence control, and a toggle switch to increase the gain.

Like several other Catalinbread pedals, this circuit blurs the line between a preamp and an overdrive. Like a true preamplifier, it's very reactive to what comes before it, so it's best placed after other drive pedals but before modulation. However, it also generates more than enough drive on its own and can be used as a standalone overdrive pedal just like any other.

The Formula 55 was preceded by two versions of the Formula No. 5 in 2010 and 2011. These are available from Aion FX as the [Asteria Mk. I](#) and [Asteria Mk. II](#).

The original Formula 55 used MPF4393 JFETs, which are no longer produced. Aion FX sells the [original MPF4393](#) in sets of 5. The PCB also has an extra pad so that surface-mount JFETs can be used (part number MMBF4393), which are still in production and perform identically to those used in Catalinbread pedals. See build notes for more details.

The Asteria Mk. III is compatible with the [18V Voltage Doubler / Bypass module](#) if you want to run the circuit at 18V without an external adapter. The higher voltage provides increased volume and clarity.

## USAGE

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The Asteria Mk. III has the following controls:

- **Volume** controls the amount of gain in the first amplifier stage.
- **Tone** is a treble-cut control. Its function changes with the gain control position, and has no effect with the gain all the way up.
- **Presence** is a treble-cut control at the end of the circuit.
- **Master** 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	1M	Metal film resistor, 1/4W	
R2	33k	Metal film resistor, 1/4W	
R3	15k	Metal film resistor, 1/4W	
R4	56k	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
R6	1k	Metal film resistor, 1/4W	
R7	1M	Metal film resistor, 1/4W	
R8	1M	Metal film resistor, 1/4W	
R9	1M	Metal film resistor, 1/4W	
R10	68k	Metal film resistor, 1/4W	
R11	10k	Metal film resistor, 1/4W	
R12	5k1	Metal film resistor, 1/4W	
R13	3k9	Metal film resistor, 1/4W	
R14	1k	Metal film resistor, 1/4W	
R15	1M	Metal film resistor, 1/4W	
R16	1M	Metal film resistor, 1/4W	
R17	100R	Metal film resistor, 1/4W	
R18	1M	Metal film resistor, 1/4W	
R19	5k6	Metal film resistor, 1/4W	
R20	15k	Metal film resistor, 1/4W	
R21	100R	Metal film resistor, 1/4W	
R22	10k	Metal film resistor, 1/4W	
R23	10k	Metal film resistor, 1/4W	
R24	100R	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	
C1	1uF	Film capacitor, 7.2 x 3.5mm	
C2	22uF	Electrolytic capacitor, 5mm	
C3	2.2uF	Film capacitor, 7.2 x 5mm	Can also substitute electrolytic (polarity marked on PCB)
C4	100n	Film capacitor, 7.2 x 2.5mm	
C5	470pF	MLCC capacitor, NPO/COG	

## PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C6	4n7	Film capacitor, 7.2 x 2.5mm	
C7	22uF	Electrolytic capacitor, 5mm	
C8	2.2uF	Film capacitor, 7.2 x 5mm	Can also substitute electrolytic (polarity marked on PCB)
C9	22n	Film capacitor, 7.2 x 2.5mm	
C10	3n3	Film capacitor, 7.2 x 2.5mm	
C11	100n	Film capacitor, 7.2 x 2.5mm	
C12	2.2uF	Film capacitor, 7.2 x 5mm	Can also substitute electrolytic (polarity marked on PCB)
C13	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C14	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C15	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
Q1	MMBF4393	JFET, N-channel, SOT-23	Substitute for MPF4393 (TO-92). See build notes.
Q2	MMBF4393	JFET, N-channel, SOT-23	Substitute for MPF4393 (TO-92). See build notes.
Q3	MMBF4393	JFET, N-channel, SOT-23	Substitute for MPF4393 (TO-92). See build notes.
Q4	MMBF4393	JFET, N-channel, SOT-23	Substitute for MPF4393 (TO-92). See build notes.
Q5	MMBF4393	JFET, N-channel, SOT-23	Substitute for MPF4393 (TO-92). See build notes.
VOL.	1MA	16mm right-angle PCB mount pot	
TONE	1MA	16mm right-angle PCB mount pot	
PRES.	50kB	16mm right-angle PCB mount pot	
MAST.	250kA	16mm right-angle PCB mount pot	
HI/LO	DPDT on-on	Toggle switch, DPDT on-on	
TR1	10k trimmer	Trimmer, 10%, 1/4"	See build notes.
TR2	10k trimmer	Trimmer, 10%, 1/4"	See build notes.
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	<a href="#">Lumberg NEB/J 21 C</a> or equivalent.
FSW	3PDT	Stomp switch, 3PDT	Available from <a href="#">Aion FX</a> .
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

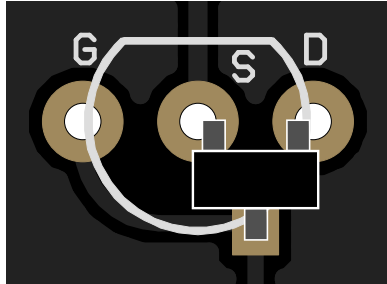
## BUILD NOTES

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### Using SMD JFETs

The MPF4393 JFET is no longer available from the original manufacturer 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 the MMBF4393 surface-mount version 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.

### MPF4393s from Aion FX

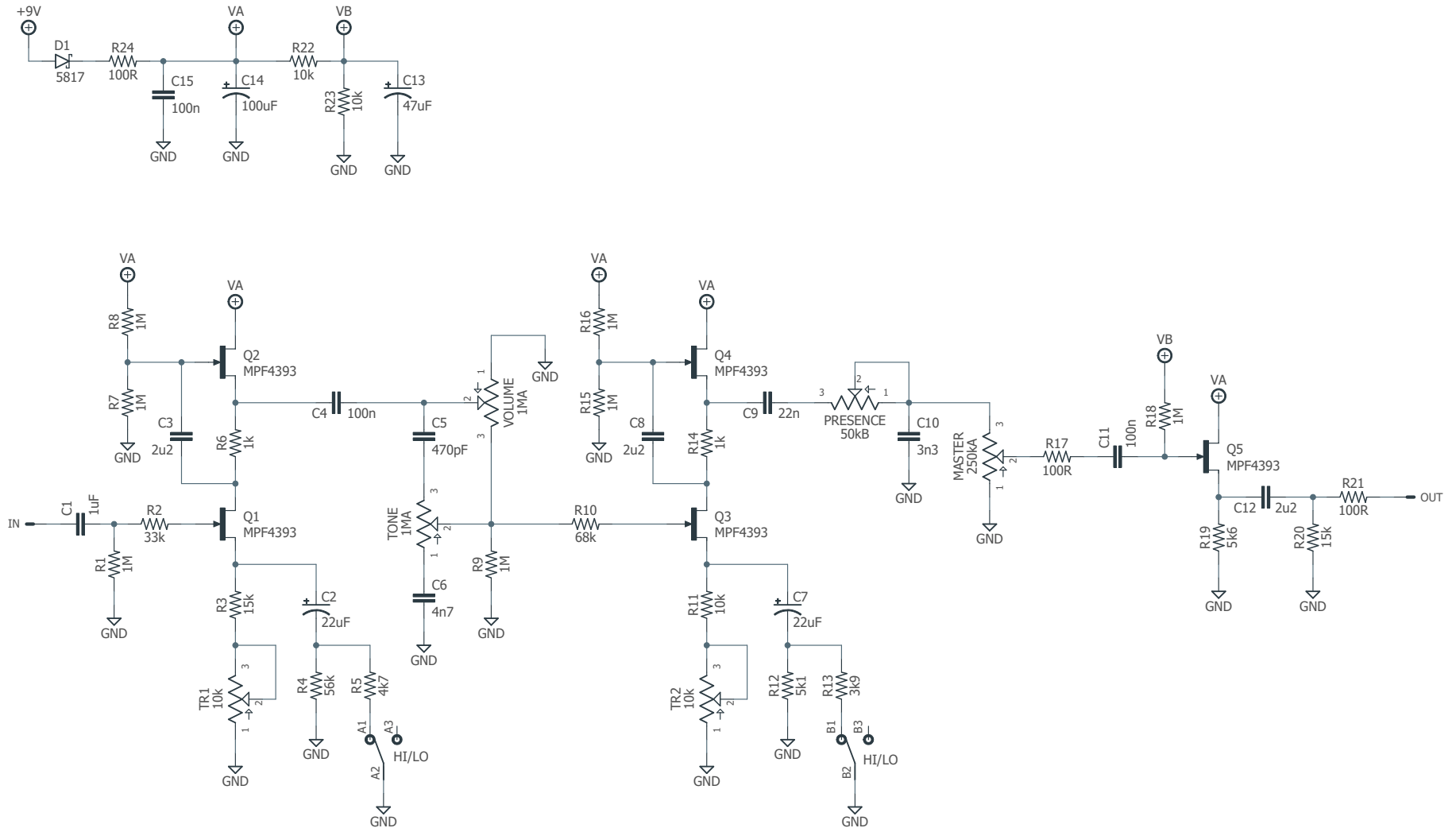
We have a large quantity of [through-hole MPF4393](#) and should be able to provide them in hobbyist quantities for the foreseeable future. They are available in sets of 5. They are manufactured by ON Semiconductor, the same as those used in the original Catalinbread pedal. They test in the same range and will perform identically.

### Setting bias trimmers TR1 and TR2

Trimmers TR1 and TR2 allow adjustment of the gain of the two main amplifier stages. According to Catalinbread’s customer support (relayed in [this thread at The Gear Page](#)) the trimmers are set at noon during manufacturing. In the unit we traced, they were both set to zero, so it’s possible they changed this practice at some point.

Whatever the case, start with each trimmer to noon and then adjust to taste. Setting it lower will increase the gain and setting it higher will reduce the gain.

# SCHEMATIC



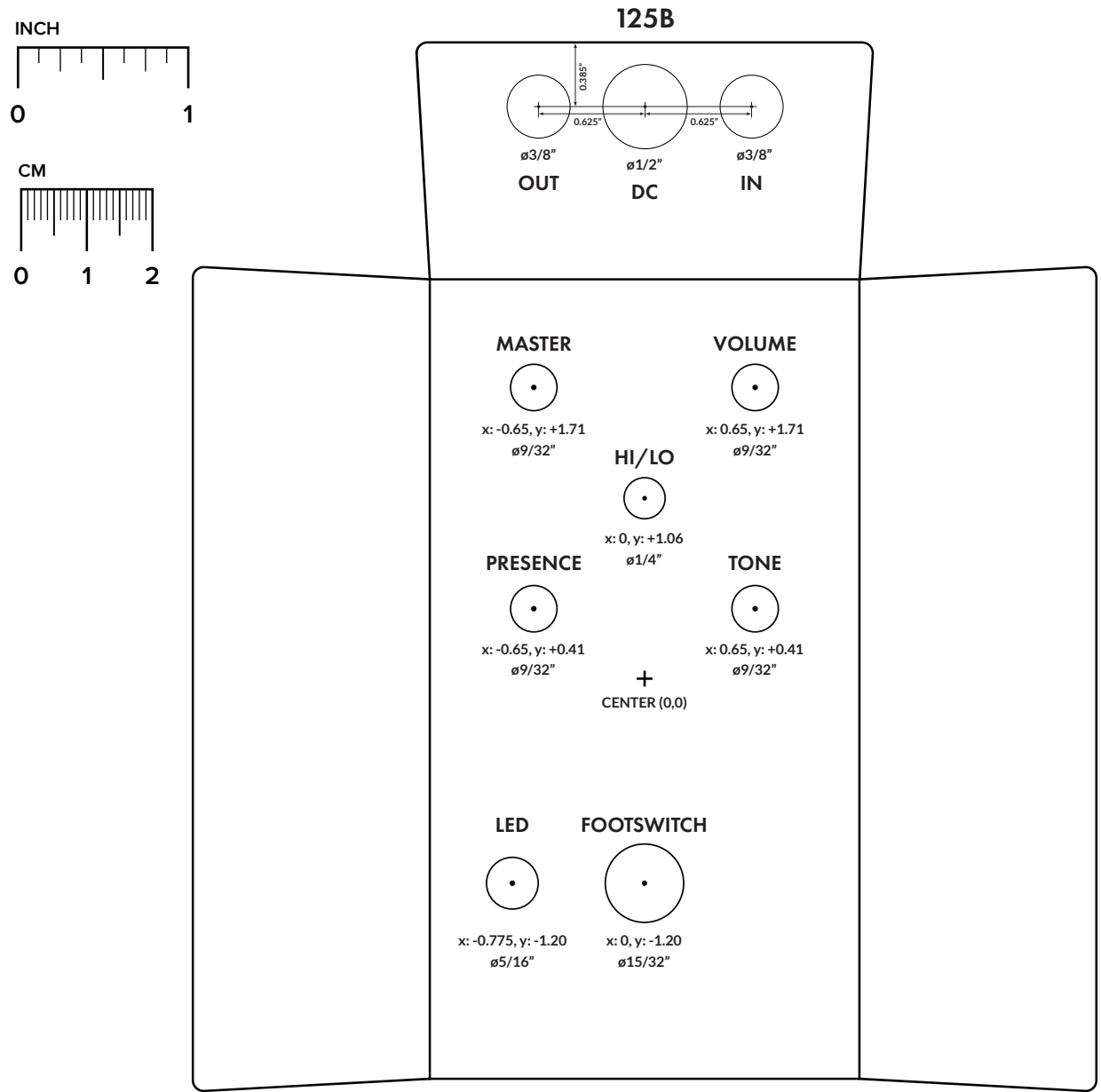
# DRILL TEMPLATE

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.

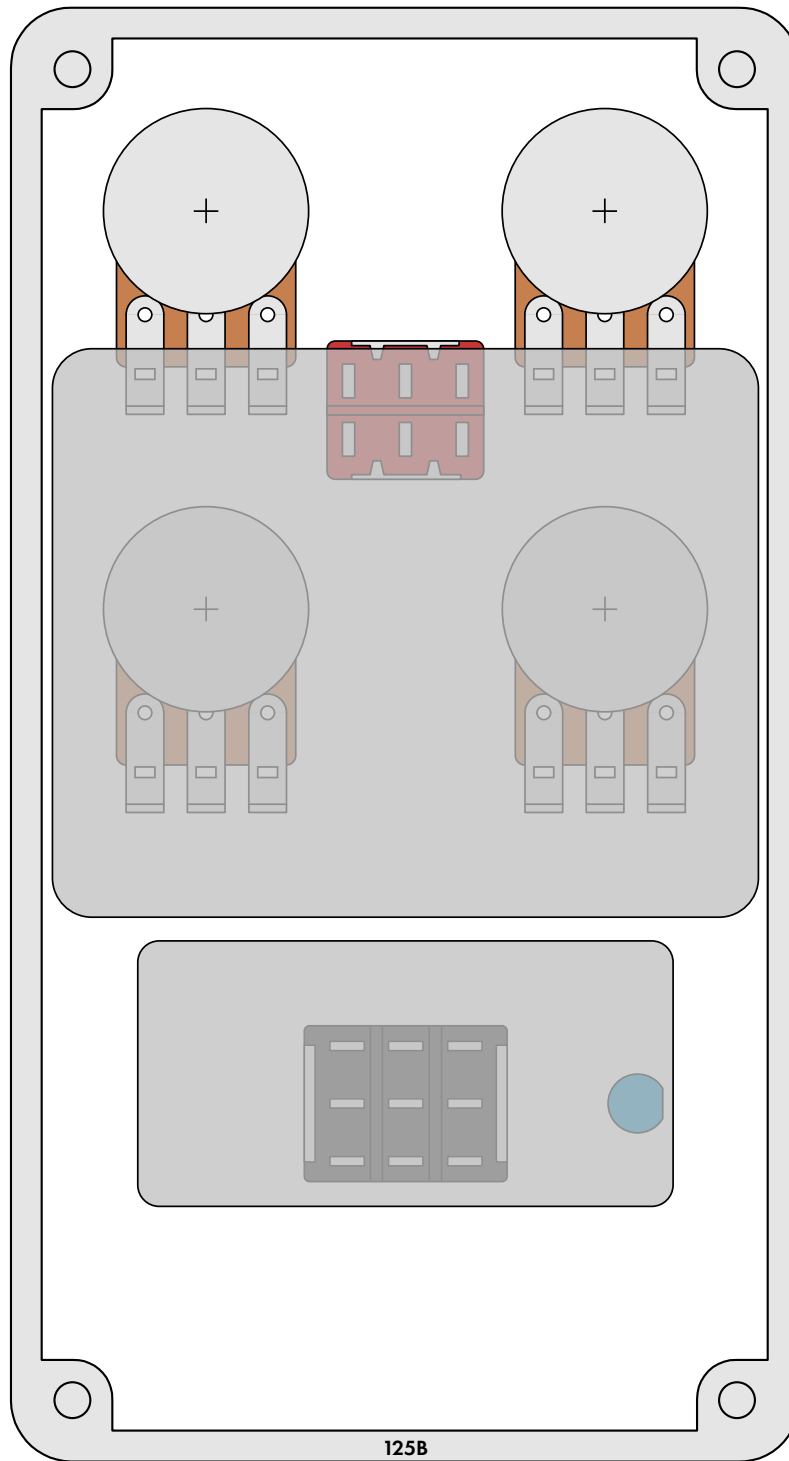
**LED hole drill size** assumes the use of a [5mm LED bezel](#), available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



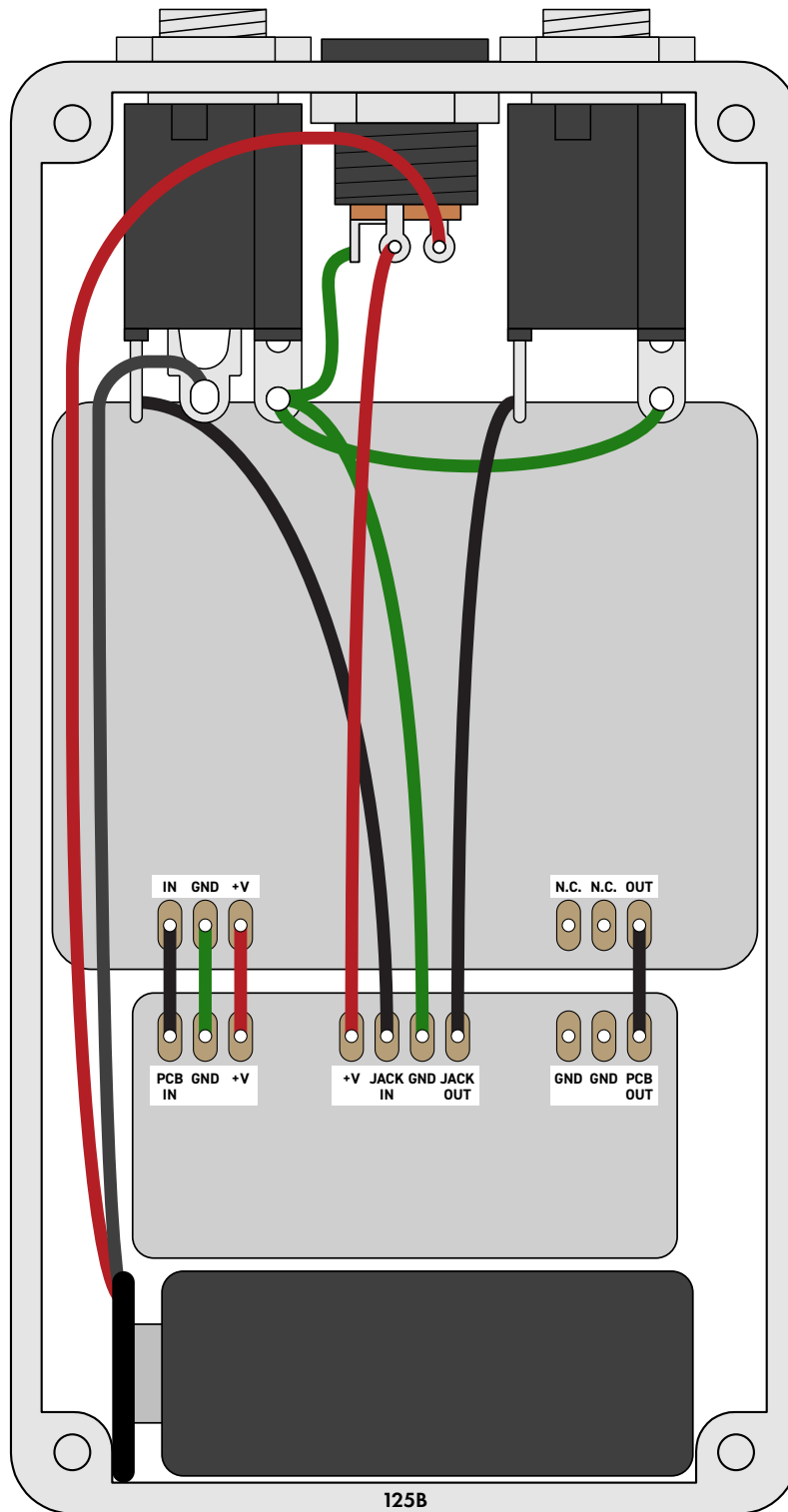
# ENCLOSURE LAYOUT

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



# WIRING DIAGRAM



## LICENSE & USAGE

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**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

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### 1.0.1 (2020-12-10)

Removed RPD from parts list which was included by mistake. (R1 acts as the pulldown resistor.)

### 1.0.0 (2020-11-27)

Initial release.