

PROJECT NAME

POLARIS

BASED ON

Human Gear Animato

BUILD DIFFICULTY

■■■■□ Intermediate

EFFECT TYPE

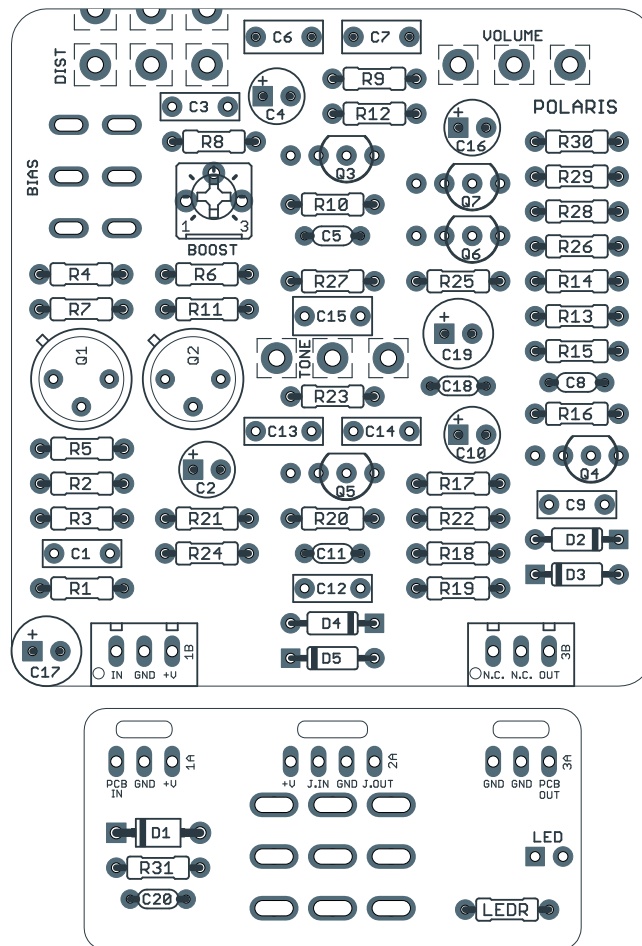
Distortion / Sustainer, Fuzz

DOCUMENT VERSION

1.0.0 (2019-03-14)

PROJECT SUMMARY

Based on the classic Big Muff circuit, this pedal adds a Rangemaster-based treble booster to the frontend as well as some other tweaks. Most famously used by Chris Wolstenholme of Muse.



Actual size is 2.3" x 2.43" (main board) and 2.3" x 0.87" (bypass board).

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INTRODUCTION

The Polaris Distortion/Sustainer is adapted from the Human Gear Animato, a mysterious and very expensive distortion pedal from Japan which gained attention by being used by Chris Wolstenholme, the bassist of Muse.

Originally released in 2007, the Animato was finally traced in 2014 and it was revealed that it was essentially just a Big Muff with a Rangemaster added to the front. Nevertheless, it's a great-sounding Big Muff variant and certainly a unique take on the circuit.

The Rangemaster portion of the circuit uses something called a Sziklai pair for the transistors with both NPN and PNP transistors in a piggyback arrangement, allowing the Rangemaster circuit (normally positive ground) to be run in a negative-ground scenario.

One final note: while the Animato claims to work well for bass, most bassists find that the Rangemaster input cuts too many of the low frequencies. As a result, many people using the Animato for bass (including Chris Wolstenholme) will opt to use a clean-blend pedal such as the Boss LS-2 to blend the unaffected bass signal back in and restore the low frequencies.

USAGE

The Polaris has the following controls:

- **Sustain** controls the amount of drive or distortion, which also affects the amount of sustain. This is a dual potentiometer that simultaneously controls the volume of the Rangemaster stage and the first Big Muff boost stage.
- **Tone** is a control that pans between a low-pass filter (high cut) and a high-pass filter (low cut). At the 12:00 position, the bass and treble are flat.
- **Volume** is the overall output.
- **Bias** is a two-position toggle that switches in two parallel resistors on the transistors that impact the bias. This control was unlabeled on the original Animato and it's not known what they intended it to mean for the user, but the overall effect is a very slight shift in EQ and gain.
- **Boost** is an internal trimmer that corresponds to the Rangemaster's boost control.

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	100k	Metal film resistor, 1/4W	
R3	680k	Metal film resistor, 1/4W	
R4	100k	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
R6	4k7	Metal film resistor, 1/4W	
R7	470k	Metal film resistor, 1/4W	
R8	33k	Metal film resistor, 1/4W	
R9	100k	Metal film resistor, 1/4W	
R10	470k	Metal film resistor, 1/4W	
R11	10k	Metal film resistor, 1/4W	
R12	470R	Metal film resistor, 1/4W	
R13	10k	Metal film resistor, 1/4W	
R14	100k	Metal film resistor, 1/4W	
R15	470k	Metal film resistor, 1/4W	
R16	10k	Metal film resistor, 1/4W	
R17	100R	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	100k	Metal film resistor, 1/4W	
R20	470k	Metal film resistor, 1/4W	
R21	15k	Metal film resistor, 1/4W	
R22	100R	Metal film resistor, 1/4W	
R23	39k	Metal film resistor, 1/4W	
R24	100k	Metal film resistor, 1/4W	
R25	470k	Metal film resistor, 1/4W	
R26	100k	Metal film resistor, 1/4W	
R27	10k	Metal film resistor, 1/4W	
R28	2k2	Metal film resistor, 1/4W	
R29	12k	Metal film resistor, 1/4W	
R30	100k	Metal film resistor, 1/4W	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
R31	47R	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	
C1	10n	Film capacitor, 7.2 x 2.5mm	
C2	2.2uF	Film capacitor, 7.2 x 5mm	
C3	6n8	Film capacitor, 7.2 x 2.5mm	
C4	10uF	Electrolytic capacitor, 5mm	
C5	470pF	MLCC capacitor, NP0/C0G	
C6	470n	Film capacitor, 7.2 x 3mm	
C7	470n	Film capacitor, 7.2 x 3mm	
C8	470pF	MLCC capacitor, NP0/C0G	
C9	100n	Film capacitor, 7.2 x 2.5mm	
C10	10uF	Electrolytic capacitor, 5mm	
C11	470pF	MLCC capacitor, NP0/C0G	
C12	100n	Film capacitor, 7.2 x 2.5mm	
C13	4n7	Film capacitor, 7.2 x 2.5mm	
C14	10n	Film capacitor, 7.2 x 2.5mm	
C15	1uF	Film capacitor, 7.2 x 3.5mm	
C16	10uF	Electrolytic capacitor, 5mm	
C17	100uF	Electrolytic capacitor, 6.3mm	
C18	100n	MLCC capacitor, X7R	
C19	100uF	Electrolytic capacitor, 6.3mm	
C20	100n	MLCC capacitor, X7R	
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
Q1	NTE103	Germanium transistor, NPN, TO-5	See build notes for germanium transistor selection.
Q2	NTE102	Germanium transistor, PNP, TO-5	See build notes for germanium transistor selection.
Q3	2N5088	BJT transistor, NPN, TO-92	The original uses 2SC2240, but 2N5088 is the U.S. equivalent.
Q4	2N5088	BJT transistor, NPN, TO-92	The original uses 2SC2240, but 2N5088 is the U.S. equivalent.
Q5	2N5088	BJT transistor, NPN, TO-92	The original uses 2SC2240, but 2N5088 is the U.S. equivalent.
Q6	2N5088	BJT transistor, NPN, TO-92	The original uses 2SC2240, but 2N5088 is the U.S. equivalent.
Q7	2N5088	BJT transistor, NPN, TO-92	The original uses 2SC2240, but 2N5088 is the U.S. equivalent.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
DIST.	100kA dual	16mm right-angle PCB mount pot	Audio taper, dual right-angle PCB mount.
TONE	100kB	16mm right-angle PCB mount pot	Linear taper.
VOL.	100kB	16mm right-angle PCB mount pot	Linear taper.
BIAS	DPDT	Toggle switch, DPDT on-on	
BOOST	10k trimmer	Trimmer, 1/4"	
IN	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X 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.

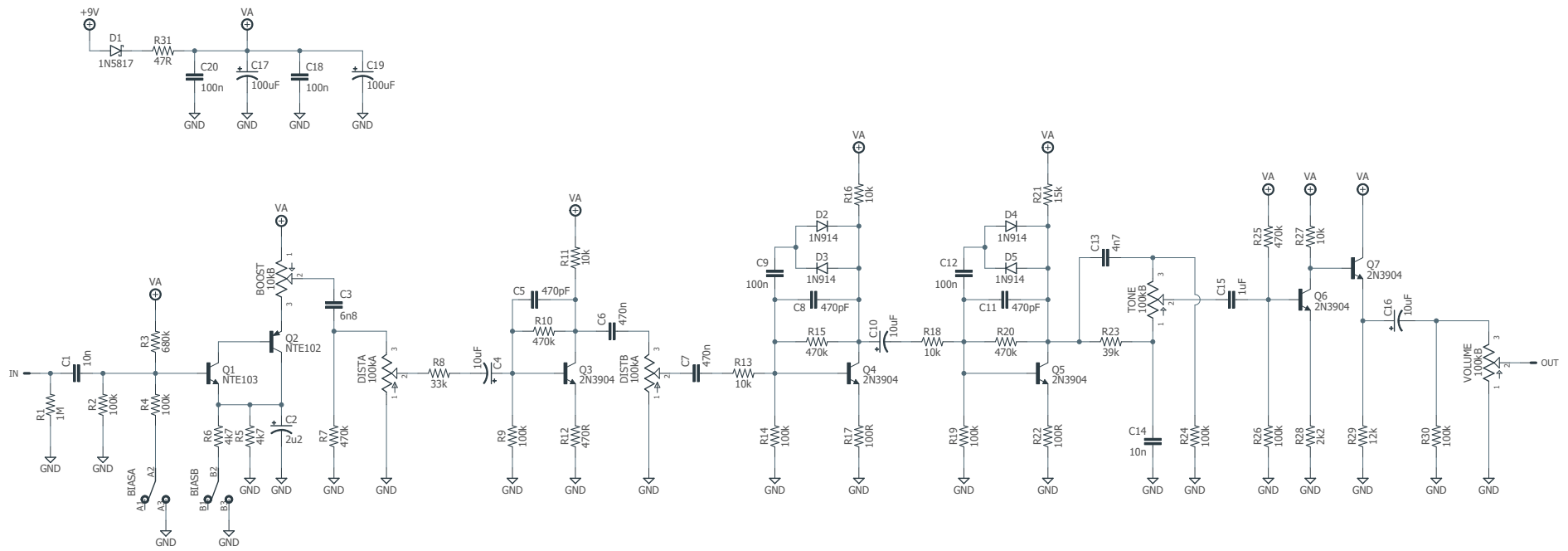
BUILD NOTES

Transistor selection

The original Animato uses current-production NTE102 and NTE103, a pair of complementary PNP and NPN germanium transistors, readily available from several places such as Newark, Farnell, Parts Express, Amazon, eBay, etc. They're not cheap, but neither are old-stock germanium transistors.

Small Bear Electronics has an [article on the Sziklai-pair Rangemaster](#) that is very close to the input stage of the Animato. They also sell a [Sziklai pair of germanium transistors](#) for the project. These should work, but note that the exact bias resistor values are specified for each transistor set, so you will want to use those resistor values instead of the ones from the Animato.

SCHEMATIC



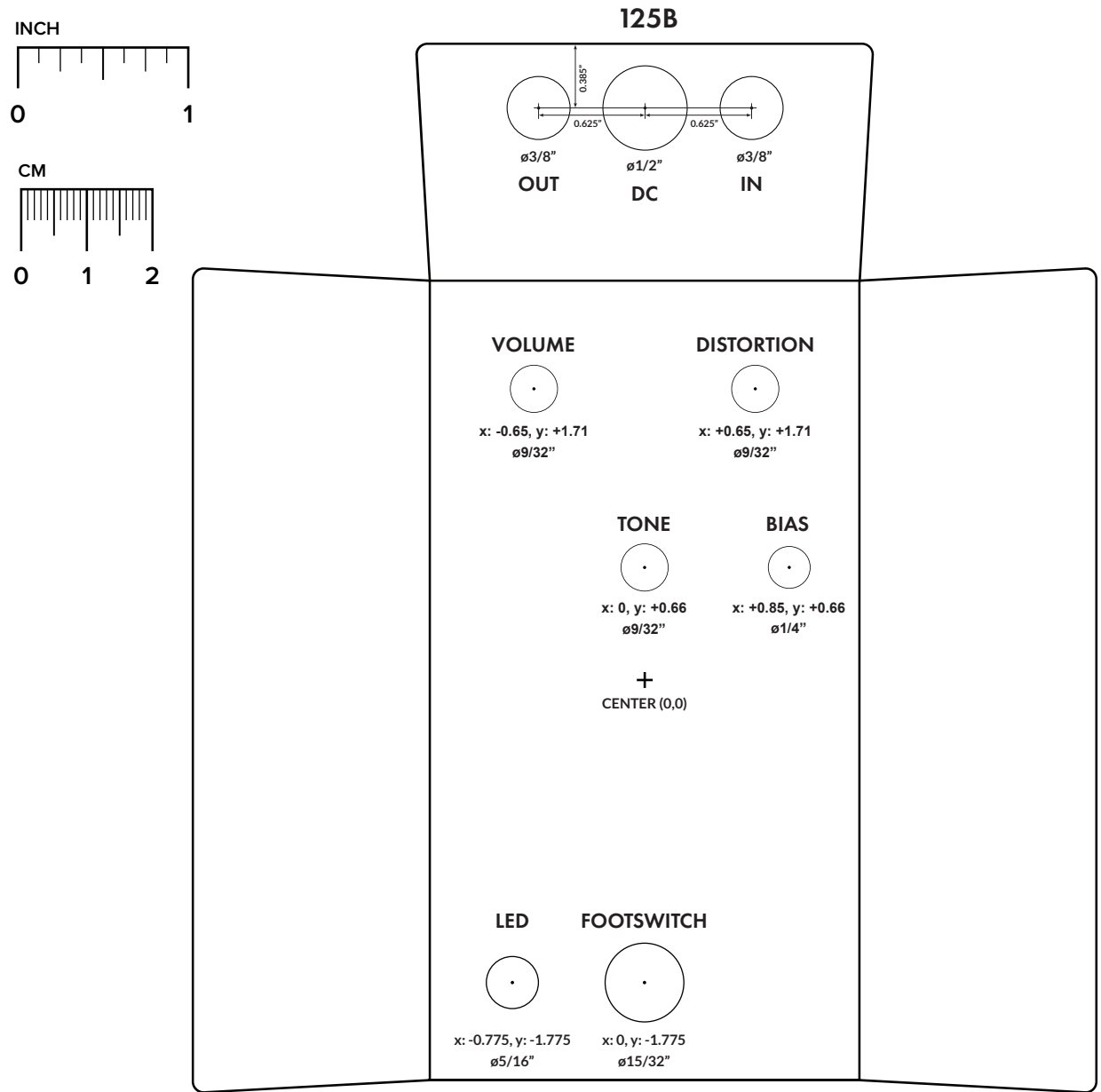
DRILL TEMPLATE

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.

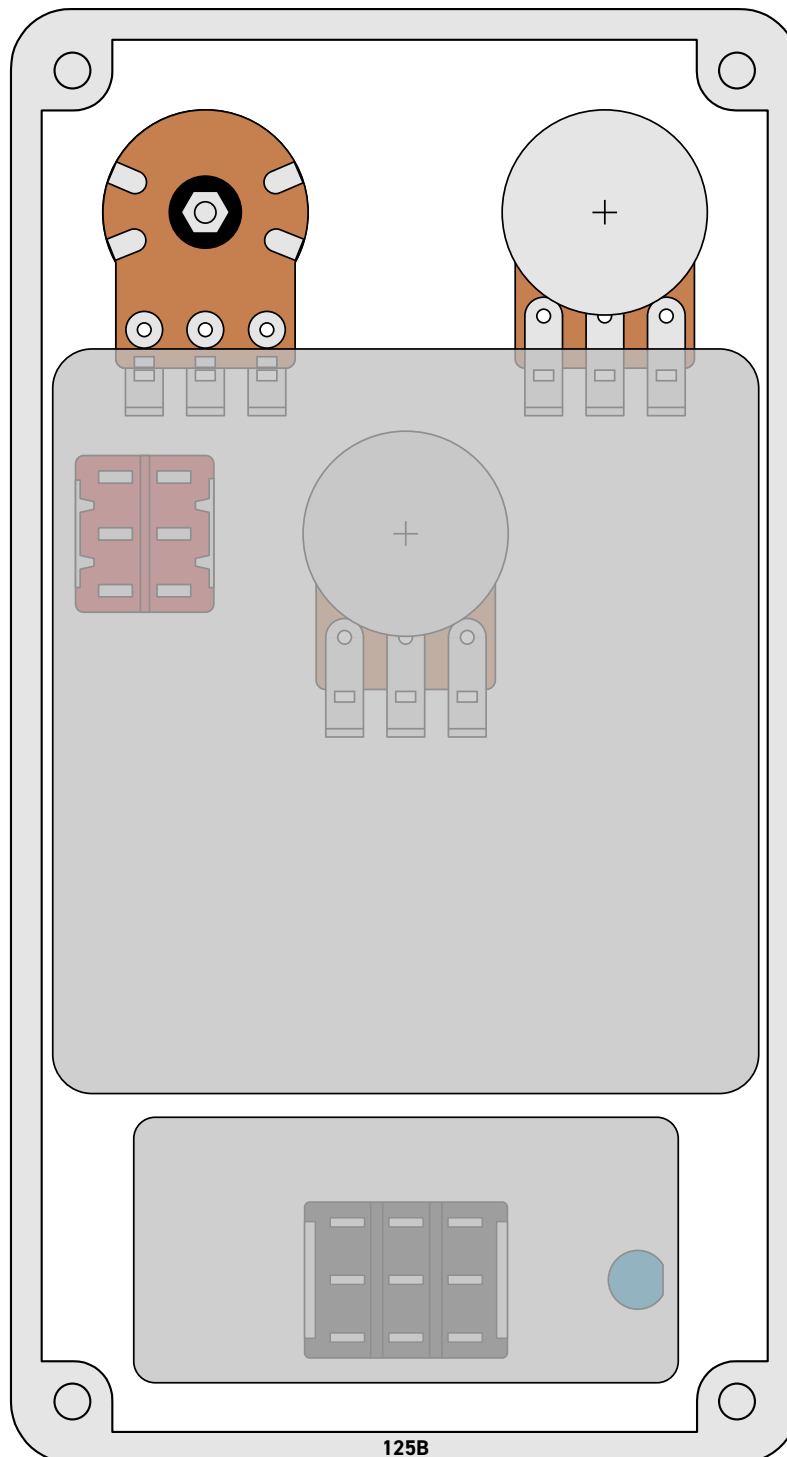


ENCLOSURE LAYOUT

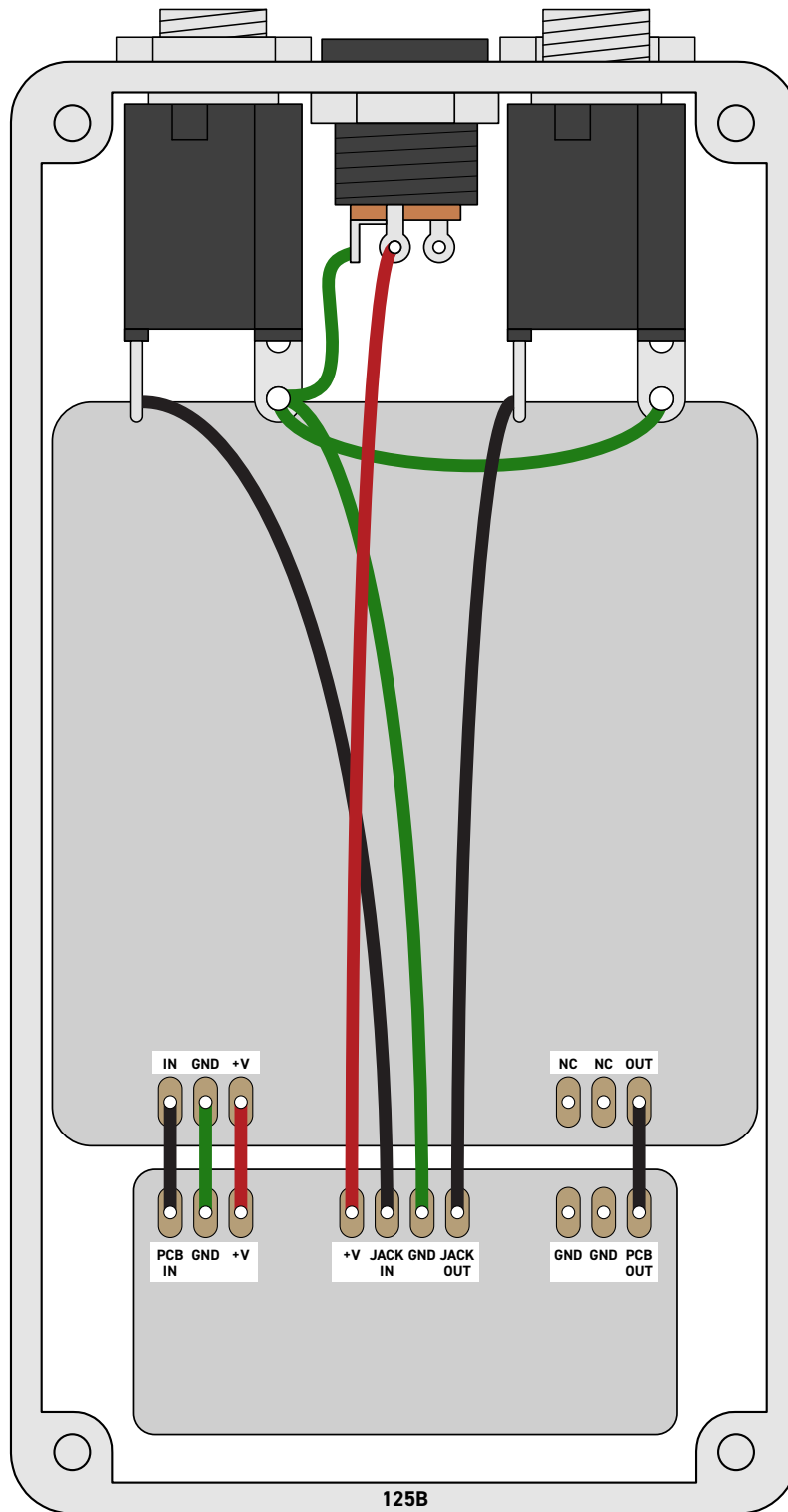
Enclosure is shown without jacks. See next page for jack layout and wiring.

Note: The upper pads for the dual-gang gain potentiometer appear to be cut in half. **This is intentional!** It's called a *plated half-hole* or *castellated hole*, and it's used so that the PCB can lay flat across the pots instead of angling upward for the dual pot.

Solder it like you would if they were normal pads, but bend the top pins forward slightly so they make contact with the edge of the pads.



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 (2019-03-14)

Initial release.