

PROJECT NAME

OBSIDIAN



BASED ON

BOSS® MZ-2 Metalizer

BUILD DIFFICULTY

■■■■□ Intermediate

EFFECT TYPE

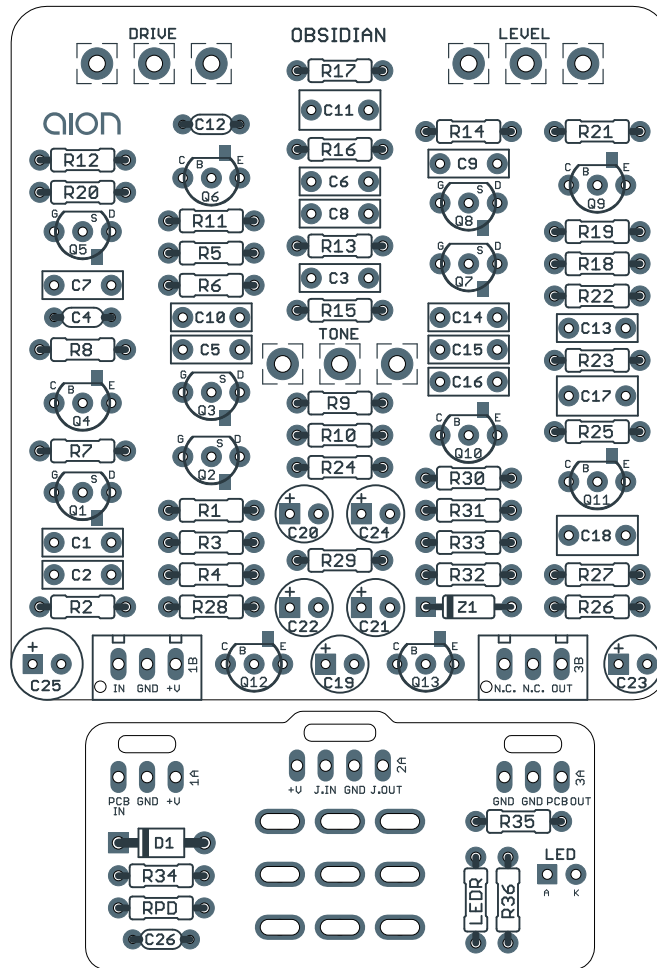
Overdrive / distortion

DOCUMENT VERSION

1.0.0 (2023-09-08)

PROJECT SUMMARY

The analog section of an obscure all-in-one digital metal pedal, featuring a JFET circuit very similar to the BD-2 Blues Driver and OD-2 Overdrive.



Actual size is 2.3" x 2.42" (main board) and 1.78" x 0.86" (bypass board).

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INTRODUCTION

The Obsidian Metal Drive is based on the analog section of the BOSS® MZ-2 Digital Metalizer, first released in 1987. Not to be confused with the Metal Zone (MT-2), the MZ-2 was an attempt at an all-in-one metal pedal that includes onboard chorus and delay to replicate popular tones of the 1980s. However, inside this digital pedal is an all-JFET analog drive circuit that bears a strong resemblance to the BD-2 Blues Driver.

To play historian for a moment: the very first appearance of this JFET topology was in the OD-2 Overdrive, released in 1985, and the MZ-2 is only the second time it was utilized (at least tied with the DS-2 Turbo Distortion, which also appeared in 1987). The BD-2 didn't arrive until 1995, which means the MZ-2 predated it by a full eight years.

Be aware that the analog circuit on its own is not very metal, especially compared to other BOSS circuits such as the MT-2 or HM-2. The maximum gain is not terribly saturated and the tone control is just a passive hi-cut with no ability to shape the midrange. It seems they were relying mostly on the digital effects to sell the concept. But if you remove the pretense of metal, it's a killer drive circuit on its own and more than worth your time if you like the BD-2, OD-2 or OD-3.

We did make one circuit change in extracting the analog circuit from the MZ-2. The original unit uses an op-amp at the output to mix together the analog and digital signals, which also acts as a buffer. Since the rest of the analog circuit is all discrete, we opted to replace this op-amp stage with the transistor output buffer from the BD-2 to keep the discrete topology intact. Having studied dozens of BOSS circuits, we're confident that this is how the engineers would have done it if there was no mixing requirement.

USAGE

The Obsidian has three knobs:

- **Drive** increases the gain of the second discrete op-amp stage, pushing it into clipping.
- **Tone** is a passive treble cut right before the output.
- **Volume** sets the overall output of the effect signal.

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	4k7	Metal film resistor, 1/4W	
R3	470k	Metal film resistor, 1/4W	
R4	2k2	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
R6	4k7	Metal film resistor, 1/4W	
R7	270k	Metal film resistor, 1/4W	
R8	2k2	Metal film resistor, 1/4W	
R9	470k	Metal film resistor, 1/4W	
R10	33k	Metal film resistor, 1/4W	
R11	33k	Metal film resistor, 1/4W	
R12	4k7	Metal film resistor, 1/4W	
R13	470k	Metal film resistor, 1/4W	
R14	4k7	Metal film resistor, 1/4W	
R15	470k	Metal film resistor, 1/4W	
R16	4k7	Metal film resistor, 1/4W	
R17	6k8	Metal film resistor, 1/4W	
R18	2k2	Metal film resistor, 1/4W	
R19	4k7	Metal film resistor, 1/4W	
R20	10k	Metal film resistor, 1/4W	
R21	2k2	Metal film resistor, 1/4W	
R22	47k	Metal film resistor, 1/4W	
R23	15k	Metal film resistor, 1/4W	
R24	470k	Metal film resistor, 1/4W	
R25	4k7	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	2k2	Metal film resistor, 1/4W	
R30	4k7	Metal film resistor, 1/4W	
R31	4k7	Metal film resistor, 1/4W	
R32	4k7	Metal film resistor, 1/4W	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
R33	4k7	Metal film resistor, 1/4W	
R34	10k	Metal film resistor, 1/4W	
R35	1k	Metal film resistor, 1/4W	
R36	100k	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	
LEDR	10k	Metal film resistor, 1/4W	
C1	22n	Film capacitor, 7.2 x 2.5mm	
C2	3n9	Film capacitor, 7.2 x 2.5mm	
C3	100n	Film capacitor, 7.2 x 2.5mm	
C4	100pF	MLCC capacitor, NP0/COG	
C5	10n	Film capacitor, 7.2 x 2.5mm	
C6	22n	Film capacitor, 7.2 x 2.5mm	
C7	1n	Film capacitor, 7.2 x 2.5mm	
C8	18n	Film capacitor, 7.2 x 2.5mm	
C9	68n	Film capacitor, 7.2 x 2.5mm	
C10	4n7	Film capacitor, 7.2 x 2.5mm	
C11	1uF	Film capacitor, 7.2 x 3.5mm	
C12	100pF	MLCC capacitor, NP0/COG	
C13	10n	Film capacitor, 7.2 x 2.5mm	
C14	47n	Film capacitor, 7.2 x 2.5mm	
C15	10n	Film capacitor, 7.2 x 2.5mm	
C16	10n	Film capacitor, 7.2 x 2.5mm	
C17	1uF	Film capacitor, 7.2 x 3.5mm	
C18	1uF	Film capacitor, 7.2 x 3.5mm	
C19	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C20	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C21	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C22	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C23	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C24	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C25	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C26	100n	MLCC capacitor, X7R	Power supply filter capacitor.
Z1	1N5232B	Zener diode, 5.6V, DO-35	
D1	1N5817	Schottky diode, DO-41	
Q1	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.
Q2	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.
Q3	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.

PARTS LIST, CONT.

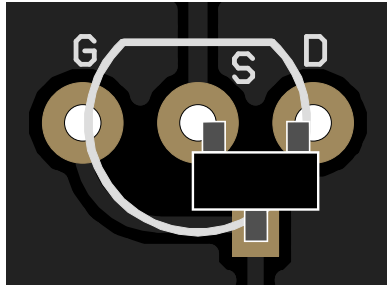
PART	VALUE	TYPE	NOTES
Q4	2N3906	BJT transistor, PNP, TO-92	Substitute. Original uses 2SA970-GR.
Q5	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.
Q6	2N5088	BJT transistor, NPN, TO-92	Substitute. Original uses 2SC2240-GR.
Q7	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.
Q8	2SK209-GR	JFET, N-channel, SOT-23	Original uses 2SK117-GR. 2SK209-GR is the SMD equivalent.
Q9	2N3906	BJT transistor, PNP, TO-92	Substitute. Original uses 2SA970-GR.
Q10	2N5088	BJT transistor, NPN, TO-92	Substitute. Original uses 2SC2240-GR.
Q11	2N5088	BJT transistor, NPN, TO-92	
Q12	2N5088	BJT transistor, NPN, TO-92	Substitute. Original uses 2SC2458-GR.
Q13	2N5088	BJT transistor, NPN, TO-92	Substitute. Original uses 2SC2458-GR.
DRIVE	250kA	16mm right-angle PCB mount pot	
TONE	10kB	16mm right-angle PCB mount pot	
LEVEL	100kA	16mm right-angle PCB mount pot	
LED	5mm	LED, 5mm, red diffused	
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

Using SMD JFETs

The 2SK117-GR 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:

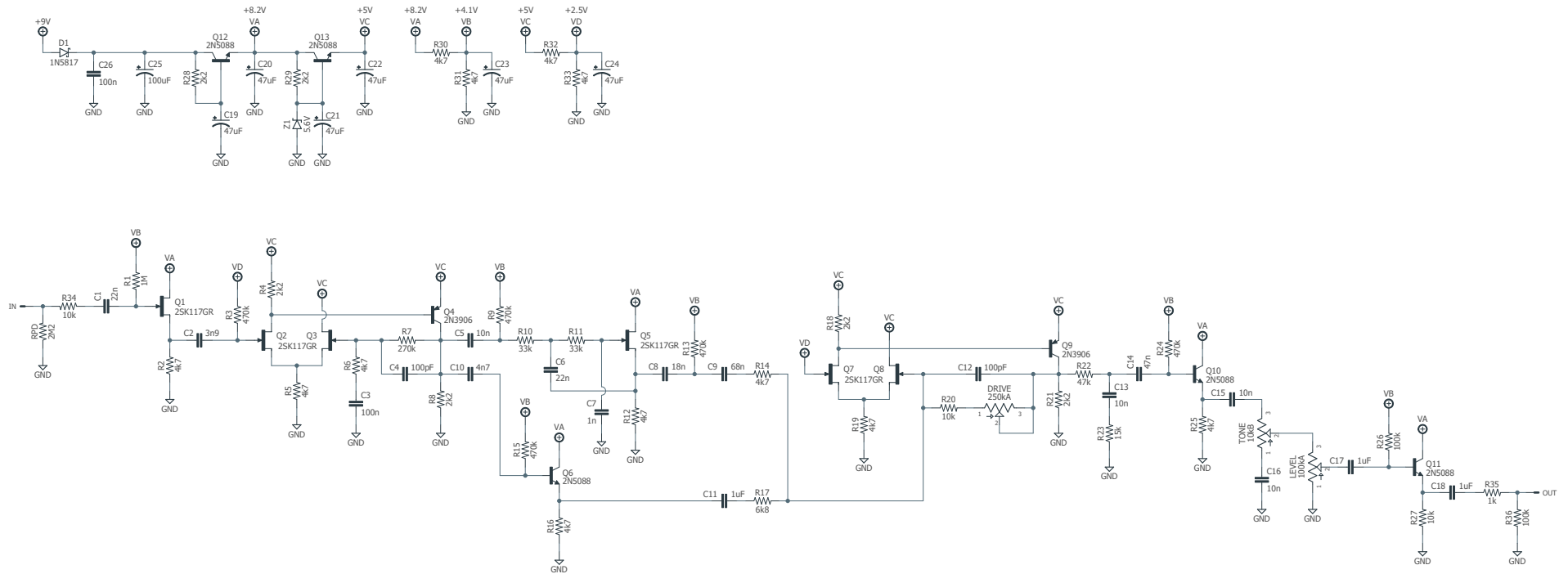


All surface-mount JFETs use the same pinout, so this configuration will fit any type that we’re aware of. However, always check the datasheet if you’re uncertain—they’re difficult to desolder.

Using through-hole adapters

If you’re not confident in your ability to work with surface-mount parts, Aion FX offers [2SK209-GR JFETs](#) (the SMD version of 2SK117-GR and 2SK184-GR) that come pre-soldered to adapters for use in through-hole designs. These are from the same manufacturer as the ones used in the original BOSS pedals and will perform identically.

SCHEMATIC



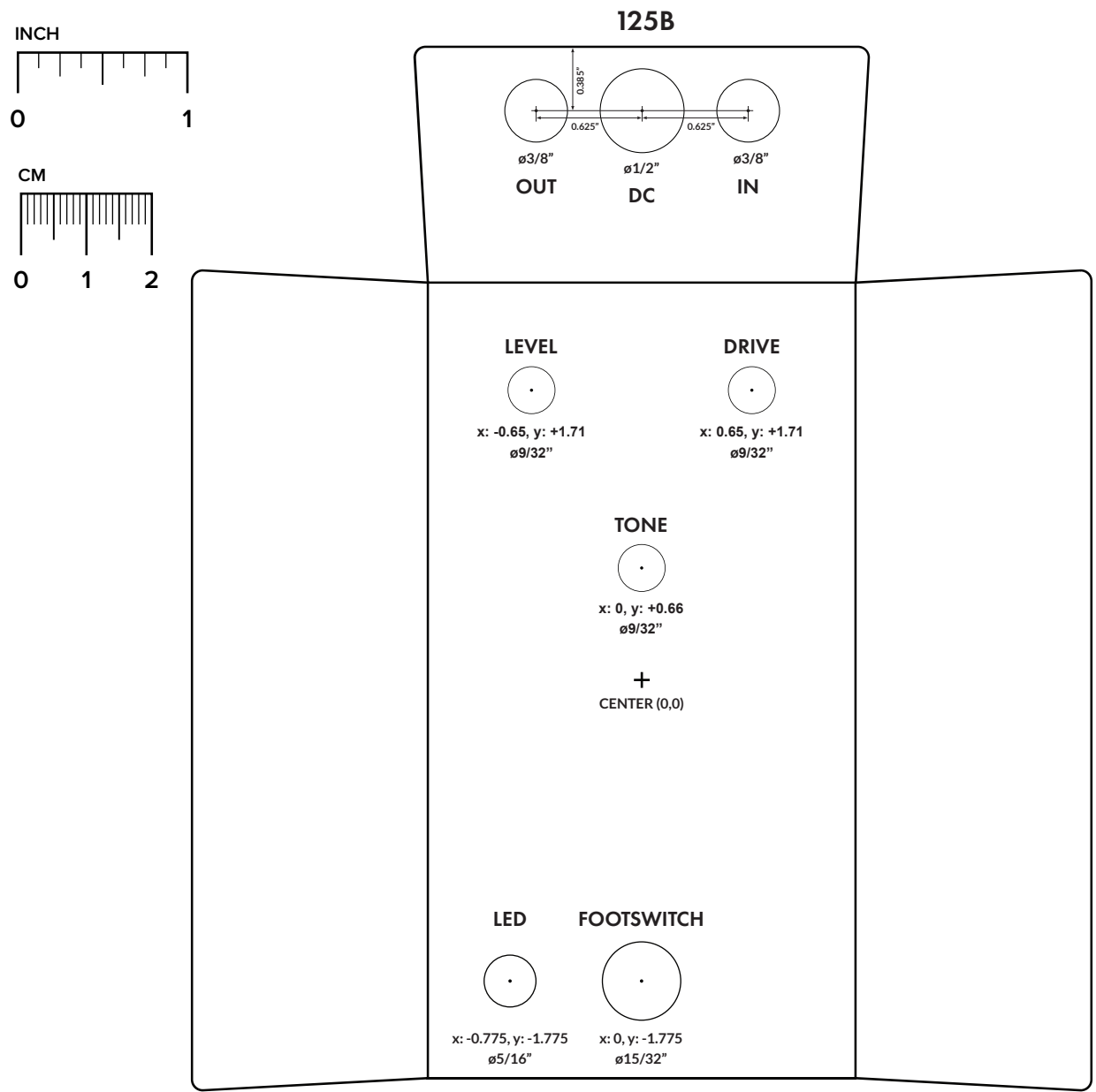
DRILL TEMPLATE

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.

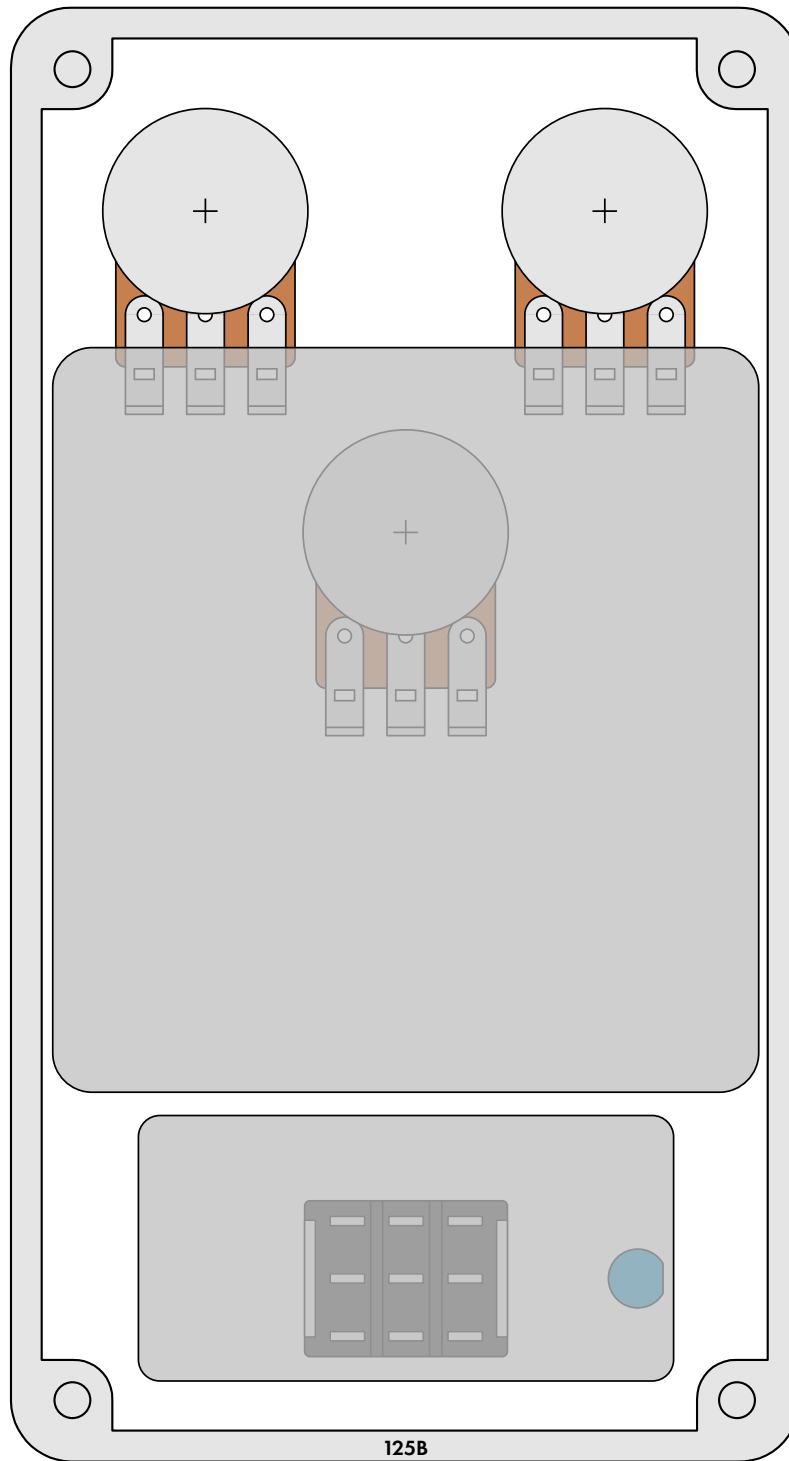
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

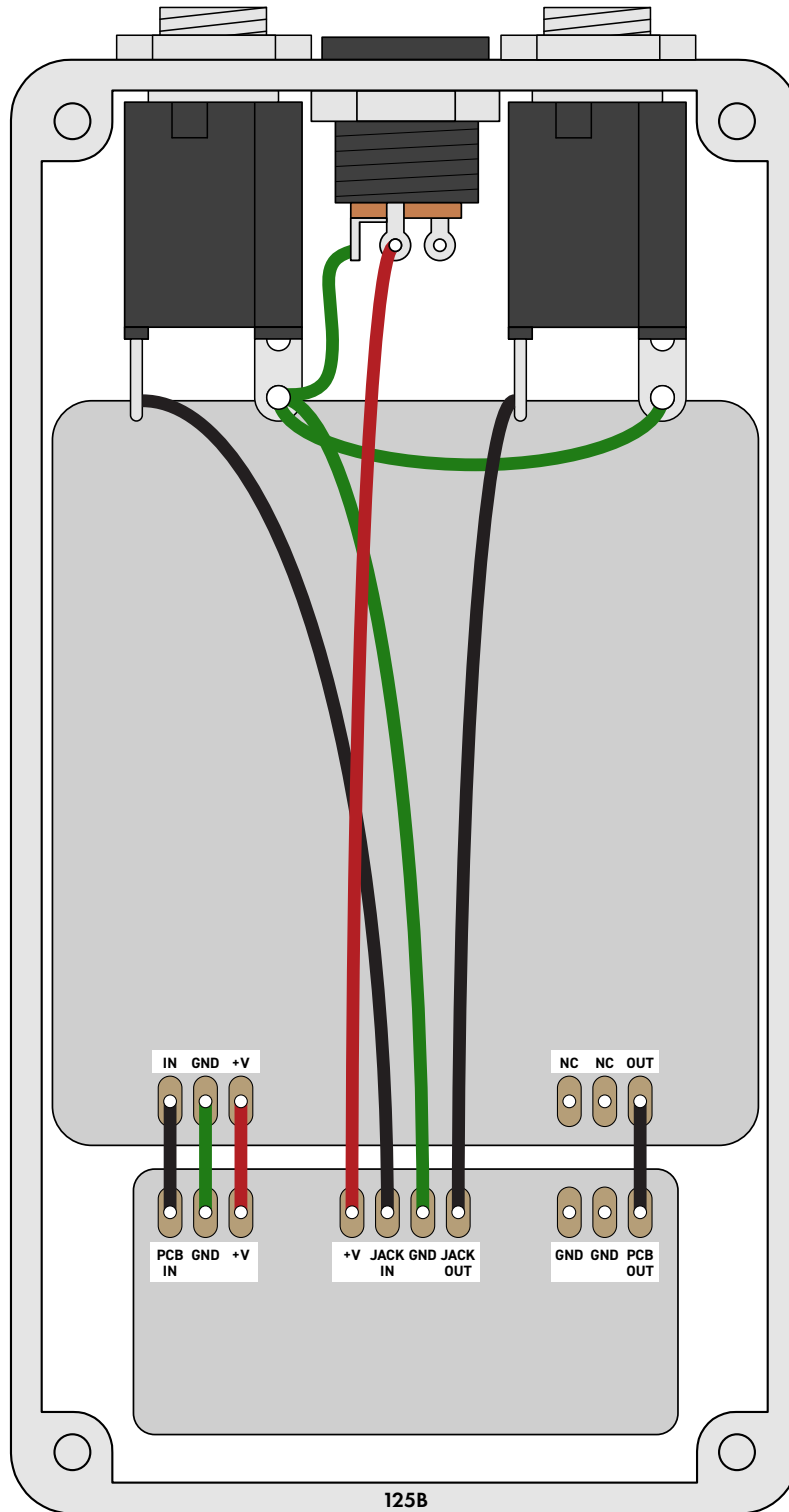


ENCLOSURE LAYOUT

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 (2023-09-08)

Initial release.