PROJECT NAME

SILVANUS

aion DIY GUITAR EFFECTS

BASED ON
Xotic SL Drive

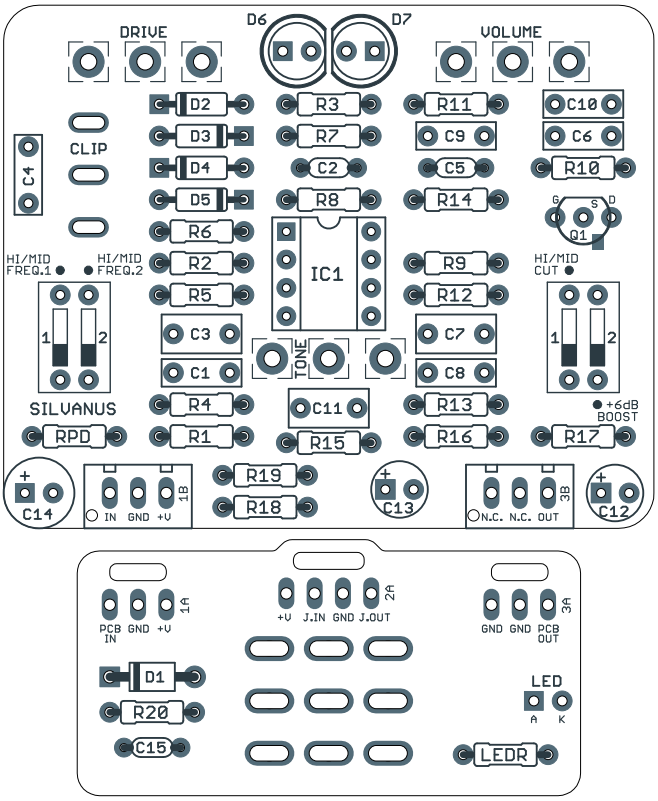
BUILD DIFFICULTY
Easy

EFFECT TYPE
Amp-like overdrive

DOCUMENT VERSION
1.0.1 (2023-11-27)

PROJECT SUMMARY

An overdrive inspired by the Marshall Super Lead Model 1959 and Super Bass amplifiers, famously used by Jimmy Page and Jimi Hendrix.



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

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INTRODUCTION

The Silvanus Amp Drive is based on the Xotic SL Drive, first released in the summer of 2013 and traced by Aion FX in 2023.

The SL Drive was designed to emulate the tone of an overdriven Marshall Super Lead (hence SL) Model 1959 or Super Bass amplifier, calling to mind famous users of these amps such as Jimmy Page and Jimi Hendrix. It's an original circuit, though it has enough similarities to the RAT that they probably referenced that circuit in the design process.

Internally, there are four DIP switch settings to change between the Super Lead and Super Bass modes as well as a few other parameters. We've included a redrawn reference for these settings in the build notes later on.

The Silvanus Amp Drive is a close adaptation of the SL Drive, including the DIP switches. The one addition is that we added a clipping toggle switch, so you can engage the stock diodes or two other extra settings. Other than that, it has the same controls as the originals, both inside and out.

USAGE

The Silvanus has the same control layout as a typical overdrive or distortion effect:

- **Drive** controls the amount of gain in the op-amp gain stage that precedes the diode clipping.
- **Tone** controls the treble response of the effect.
- **Volume** controls the overall output.

There are also four internal DIP switches and one external toggle:

- **Hi-Mid Freq. 1** and **Hi-Mid Freq. 2** set the midrange frequency response of the op-amp gain stage, along with changing the overall amount of gain. Between the two switches, there are a total of four different frequency & gain settings.
- **Hi-Mid Cut** changes the frequency of the tone control's hi cut. The effect is more noticeable as the tone control is turned down.
- **+6dB Boost** adds more gain in the post-clipping recovery stage. (Active when switch is OFF)
- **Clipping** (toggle switch) lets you choose between two combinations of silicon diodes (one in each direction or two in each direction) or LEDs.

See build notes for more information on setting the DIP switches for certain amp models.

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	10k	Metal film resistor, 1/4W	
R2	470k	Metal film resistor, 1/4W	
R3	4k7	Metal film resistor, 1/4W	
R4	3k3	Metal film resistor, 1/4W	
R5	4k7	Metal film resistor, 1/4W	
R6	1k5	Metal film resistor, 1/4W	
R7	15k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
R9	180k	Metal film resistor, 1/4W	
R10	82k	Metal film resistor, 1/4W	
R11	47k	Metal film resistor, 1/4W	
R12	390R	Metal film resistor, 1/4W	
R13	4k7	Metal film resistor, 1/4W	
R14	470k	Metal film resistor, 1/4W	
R15	22k	Metal film resistor, 1/4W	
R16	22k	Metal film resistor, 1/4W	
R17	1k	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	10k	Metal film resistor, 1/4W	
R20	100R	Metal film resistor, 1/4W	Power supply filter resistor.
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	15n	Film capacitor, 7.2 x 2.5mm	
C2	390pF	MLCC capacitor, NP0/C0G	
C3	150n	Film capacitor, 7.2 x 2.5mm	
C4	3n3	Film capacitor, 7.2 x 2.5mm	
C5	47pF	MLCC capacitor, NP0/C0G	
C6	100n	Film capacitor, 7.2 x 2.5mm	
C7	1uF	Film capacitor, 7.2 x 3.5mm	
C8	10n	Film capacitor, 7.2 x 2.5mm	
C9	10n	Film capacitor, 7.2 x 2.5mm	

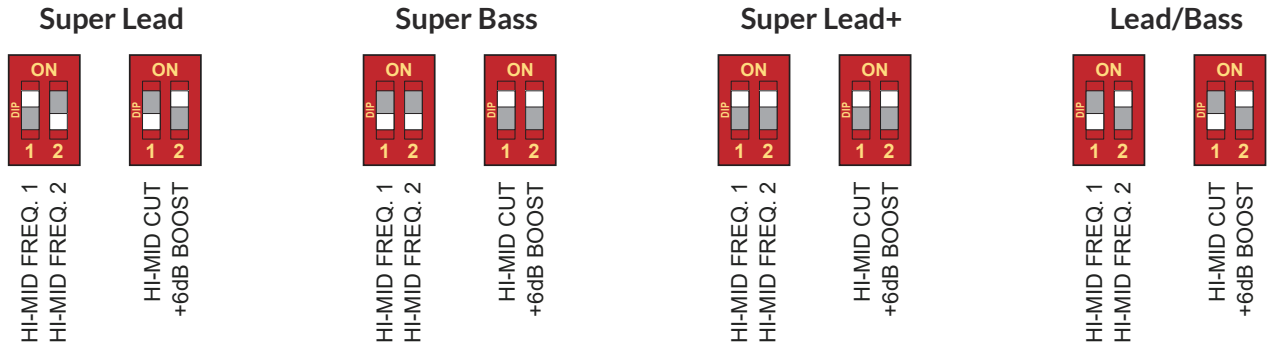
PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C10	100n	Film capacitor, 7.2 x 2.5mm	
C11	1uF	Film capacitor, 7.2 x 3.5mm	Can omit and use 10uF for C12. See build notes.
C12	OMIT	Electrolytic capacitor, 5mm	Can use 10uF here and leave C11 empty. See build notes.
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	
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	
D6	5mm red	LED, 5mm, red diffused	Can also use 3mm.
D7	5mm red	LED, 5mm, red diffused	Can also use 3mm.
Q1	2N5457	JFET, N-channel, TO-92	Can substitute any general-purpose JFET.
IC1	JRC4558D	Operational amplifier, dual, DIP8	See build notes for IC selection.
IC1-S	DIP-8 socket	IC socket, DIP-8	
SW1	DIP switch, 2-pos.	DIP switch, 2-position	
SW2	DIP switch, 2-pos.	DIP switch, 2-position	
DRIVE	500kB	16mm right-angle PCB mount pot	Linear taper.
TONE	50kC	16mm right-angle PCB mount pot	Reverse audio (reverse log or antilog) taper.
VOLUME	100kA	16mm right-angle PCB mount pot	Audio (log) taper.
CLIP	SPDT on-off-on	Toggle switch, SPDT center off	
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

Amp settings

The internal DIP switches allow the pedal to more closely emulate the Super Lead or Super Bass amplifiers depending on the settings. Here are the positions Xotic recommends for each amp model:



Xotic also includes recommended drive and tone positions for each of these, but since these are very much rig-dependent (not to mention the original amplifiers having drive and tone knobs of their own!) they aren't as crucial to capturing the tone.

IC selection

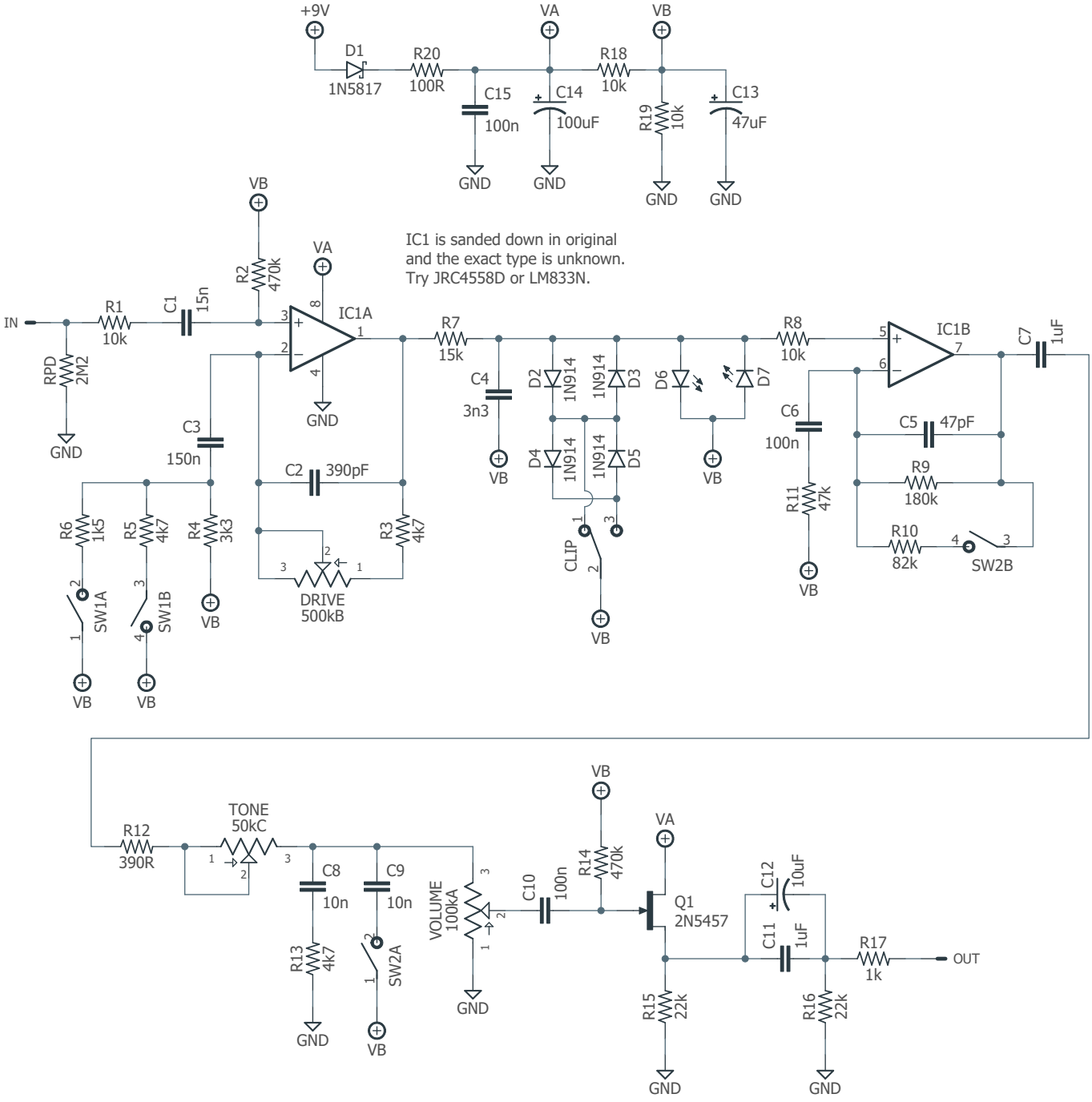
The IC is sanded down in the original SL Drive and it's not known exactly what type they used. However, based on our other traces, most Xotic circuits use the JRC4558D and at least one uses the LM833. We recommend starting with the JRC4558D. From there, you can experiment with any standard dual type, including the TL072, NE5532, or JRC4580.

Output capacitor

The SL Drive uses a 10uF capacitors (C12) as a signal coupler immediately after the JFET stage at the output. We recommend keeping electrolytic capacitors out of the signal path wherever possible. This PCB includes space for an alternate film capacitor (C11) in each of these positions.

Due to the low output impedance of Q1, 1uF is more than enough to pass all useful bass frequencies, so it's recommended to use a 1uF film capacitor in this position and omit C12. (1uF is the value used in the RAT, which the SL Drive is loosely based on.) However, if you want to stick as closely as possible to the original circuit, use 10uF for C12 and omit C11.

SCHEMATIC


+9V
D1
1N5817
R20
100R
VA
VB
R18
10k
C15
100n
C14
100uF
R19
10k
C13
47uF
GND
GND
GND
GND
VB
VA
R2
470k
IC1 is sanded down in original
and the exact type is unknown.
Try JRC4558D or LM833N.
IN
R1
10k
C1
15n
RPD
2M2
GND
IC1A
C3
150n
C2
390pF
R6
1k5
R5
4k7
R4
3k3
R3
4k7
SW1A
SW1B
DRIVE
500kB
VB
VB
VB
R7
15k
C4
3n3
D2
1N914
D3
D4
D5
D6
D7
CLIP
R8
10k
IC1B
C6
100n
C5
47pF
R9
180k
R10
82k
SW2B
R11
47k
C7
1uF
R12
390R
TONE
50kC
C8
10n
C9
10n
R13
4k7
SW2A
VOLUME
100kA
C10
100n
R14
470k
Q1
2N5457
C12
10uF
C11
1uF
R17
1k
OUT
R15
22k
R16
22k

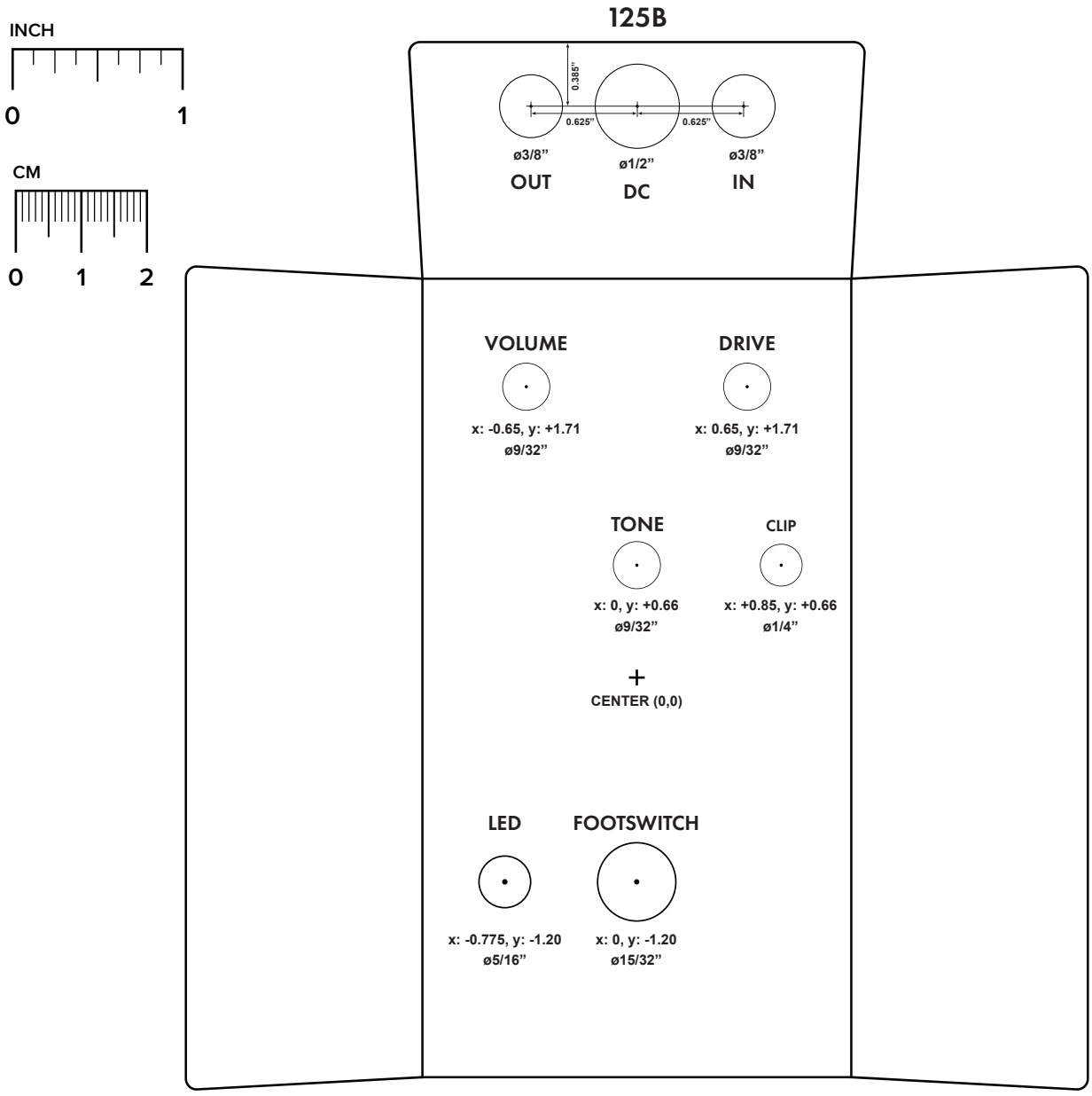
DRILL TEMPLATE

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.

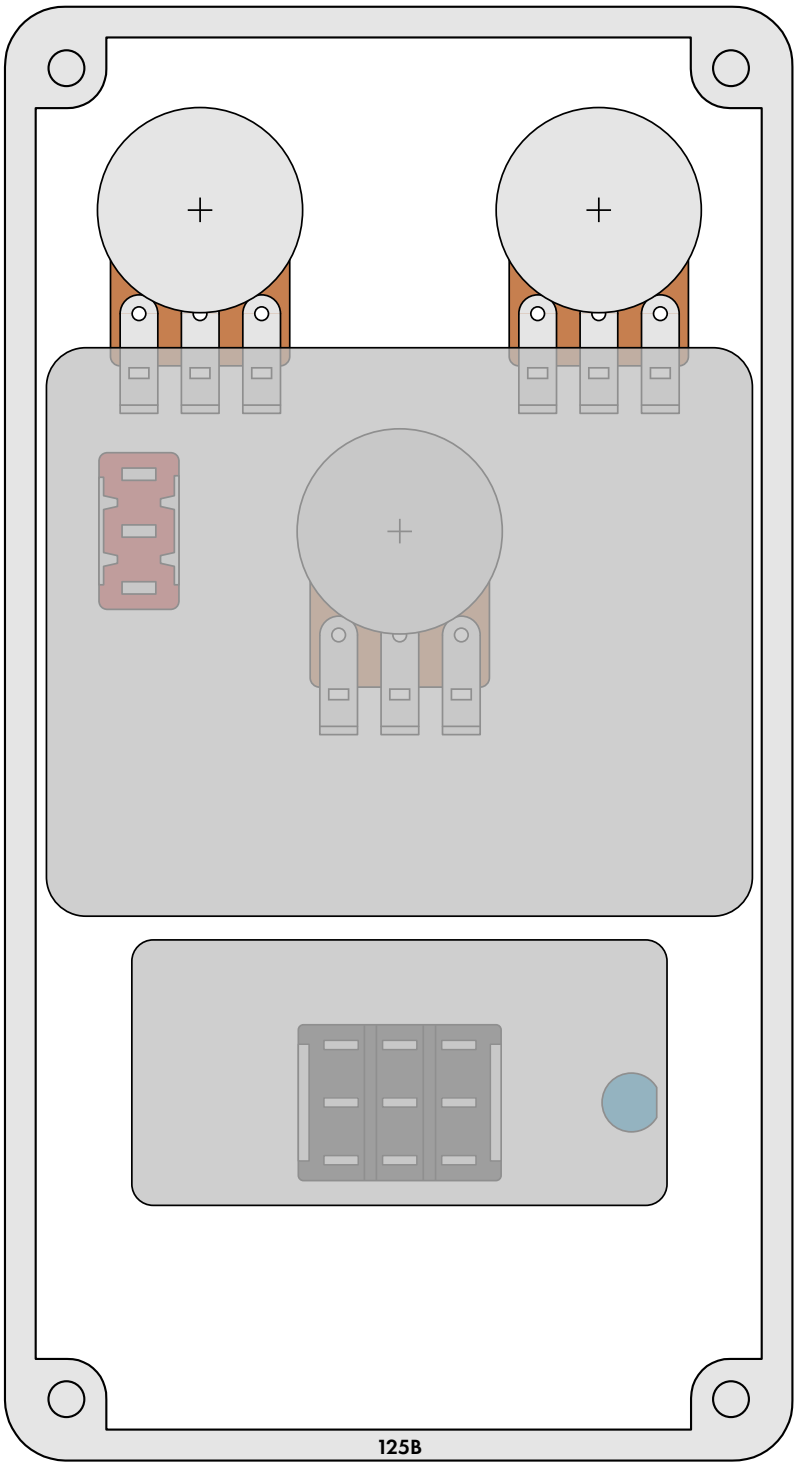
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

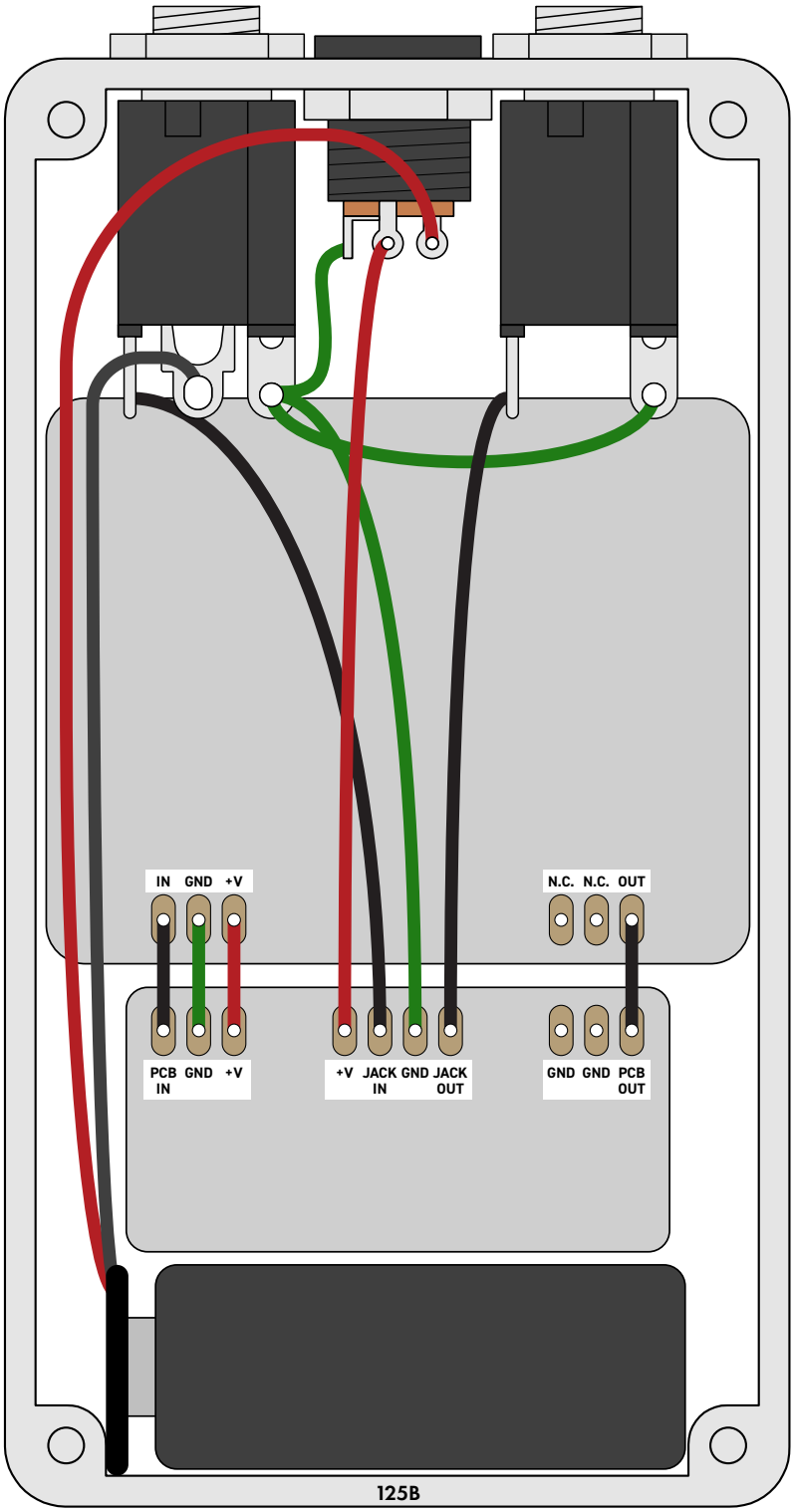


ENCLOSURE LAYOUT

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 cannotbe 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

1.0.1 (2023-11-27)

Added note about IC selection.

1.0.0 (2023-11-24)

Initial release.