PROJECT NAME

SOLSTICE

aion DIY GUITAR EFFECTS

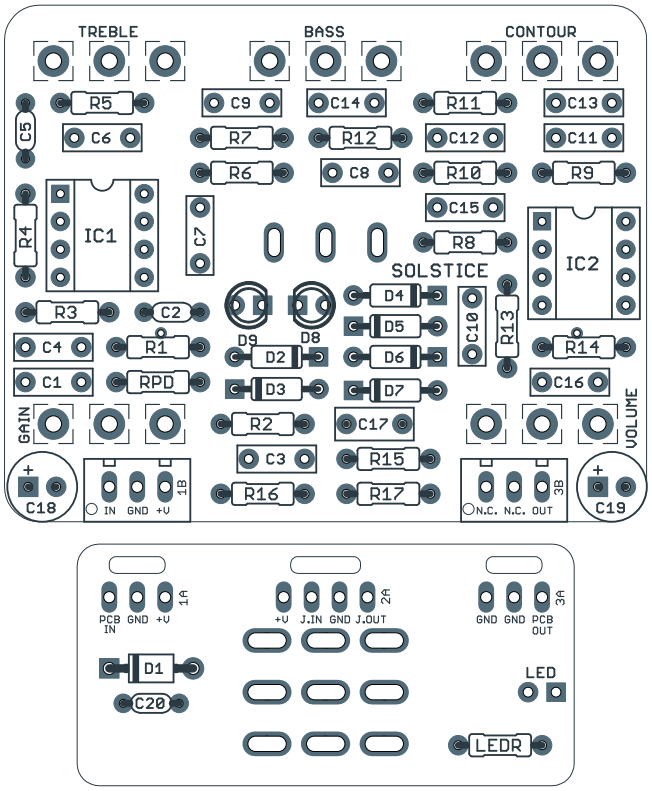
BASED ON
Marshall Shredmaster

BUILD DIFFICULTY
▮▮▯▯▯ Easy

EFFECT TYPE
Overdrive / Amp-Like Distortion

DOCUMENT VERSION
1.0.0 (2018-12-15)

PROJECT SUMMARY
A great mid-gain amp-like distortion with a 3-band EQ. Most notably used by Jonny Greenwood of Radiohead and Kevin Shields of My Bloody Valentine.



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

TABLE OF CONTENTS

INTRODUCTION

The Solstice Amp Distortion is a recreation of the Marshall Shredmaster, first released in 1991 alongside the Bluesbreaker and the Guv'nor, which was previously released in 1988 as the Drivemaster.

Despite its name, the Shredmaster is not an ultra-gain metal monster like the Boss Metal Zone. Unlike the Guv'nor, it does have the ability to scoop the mids, so you can get some sounds out of it that approach the metal territory—but for the most part, the name is misleading.

The Shredmaster has a lot in common with the Guv'nor / Drivemaster, and in fact the first half of both circuits are nearly identical. However, the Shredmaster has an additional gain recovery stage, and even though the three tone knobs appear to be the same on the outside, the tone stack is very different.

The Solstice is faithful to the original, but with one added modification: a switch that lets you go between different clipping diodes. The original has a pretty low clipping threshold with just one 1N914 diode in each direction, meaning its clipping character is more gainy and compressed. But some different sounds can be coaxed out of it if you stack two additional diodes (as in the Bluesbreaker) or use LEDs (as in the Guv'nor) to get a higher threshold.

USAGE

The Solstice has the following controls:

- **Treble** and **Bass** form a passive 2-band tonestack similar to the type found on an amp. It's the same as the classic "FMV" (Fender/Marshall/Vox) arrangement, but with a 1k resistor in place of the mid knob, essentially fixing the midrange control at a specific setting.
- **Contour** pans between a mid scoop on one side and a lowpass (treble cut) filter on the other side. It serves the function of a midrange control while being a little unique in its tone-shaping properties.
- **Gain** controls the amount of gain in the op-amp gain stages that is fed into the clipping stage.
- **Volume** controls the overall output of the effect.
- **Clipping** (toggle switch) selects the clipping diodes which changes the character of the drive tone.

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	3k3	Metal film resistor, 1/4W	
R3	9k1	Metal film resistor, 1/4W	Nearest common value. The original has two 4.7k resistors in series.
R4	680k	Metal film resistor, 1/4W	
R5	10k	Metal film resistor, 1/4W	
R6	6k8	Metal film resistor, 1/4W	
R7	1k	Metal film resistor, 1/4W	
R8	47k	Metal film resistor, 1/4W	
R9	220k	Metal film resistor, 1/4W	
R10	100R	Metal film resistor, 1/4W	
R11	33k	Metal film resistor, 1/4W	
R12	33k	Metal film resistor, 1/4W	
R13	100k	Metal film resistor, 1/4W	
R14	100k	Metal film resistor, 1/4W	
R15	1M	Metal film resistor, 1/4W	
R16	47k	Metal film resistor, 1/4W	
R17	47k	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 value to change LED brightness.
C1	10n	Film capacitor, 7.2 x 2.5mm	
C2	100pF	MLCC capacitor, NP0/C0G	
C3	47n	Film capacitor, 7.2 x 2.5mm	
C4	68n	Film capacitor, 7.2 x 2.5mm	The original has 220n and 100n capacitors in series, which makes 68n.
C5	47pF	MLCC capacitor, NP0/C0G	
C6	100n	Film capacitor, 7.2 x 2.5mm	
C7	22n	Film capacitor, 7.2 x 2.5mm	
C8	220n	Film capacitor, 7.2 x 2.5mm	
C9	22n	Film capacitor, 7.2 x 2.5mm	
C10	220n	Film capacitor, 7.2 x 2.5mm	
C11	2n2	Film capacitor, 7.2 x 2.5mm	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C12	100n	Film capacitor, 7.2 x 2.5mm	
C13	47n	Film capacitor, 7.2 x 2.5mm	
C14	1n	Film capacitor, 7.2 x 2.5mm	
C15	220n	Film capacitor, 7.2 x 2.5mm	
C16	1n	Film capacitor, 7.2 x 2.5mm	Try 470pf or 330pf here to reduce the steep treble cut. See build notes.
C17	220n	Film capacitor, 7.2 x 2.5mm	
C18	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C19	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C20	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	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	3mm	LED, 3mm, red diffused	
D9	3mm	LED, 3mm, red diffused	
IC1	TL072	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	TL072	Operational amplifier, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
TREBLE	25kB	16mm right-angle PCB mount pot	
BASS	100kA	16mm right-angle PCB mount pot	
CONT.	100kB	16mm right-angle PCB mount pot	
GAIN	100kB	16mm right-angle PCB mount pot	
VOL	100kA	16mm right-angle PCB mount pot	
CLIP	SPDT cntr off	Toggle switch, SPDT on-off-on	
LED	5mm	LED, 5mm, red diffused	
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

Clipping switch

The clipping switch allows you select between different sets of diodes.

The downward position of the toggle switch is the stock Shredmaster clipping arrangement, which has one silicon diode in each direction. The upward position of the toggle is two diodes in each direction, a higher clipping threshold with a more open sound. The center position leaves only the LEDs for a more dynamic and transparent tone.

If you look at the schematic, you'll see that the LEDs, D8 and D9, are always connected. However, in either the up or down switch positions, the lower-threshold diodes are connected and so the LEDs have no effect—there's no signal remaining for them to clip.

Feel free to experiment, For example, you could jumper D7 for asymmetrical clipping. Or, you could omit the two clipping LEDs for a diode-lift mode in the center position.

Treble cut capacitor

Many people feel that the biggest flaw with the stock Shredmaster is the steep treble cut introduced near the end. C16 is a 1nF capacitor that forms a low-pass filter right before the volume control and is solely responsible for this cut. The common consensus is that the circuit will perform much better if this capacitor is dropped down to 330pF or 470pF to allow more treble through this stage.

Schematic notes

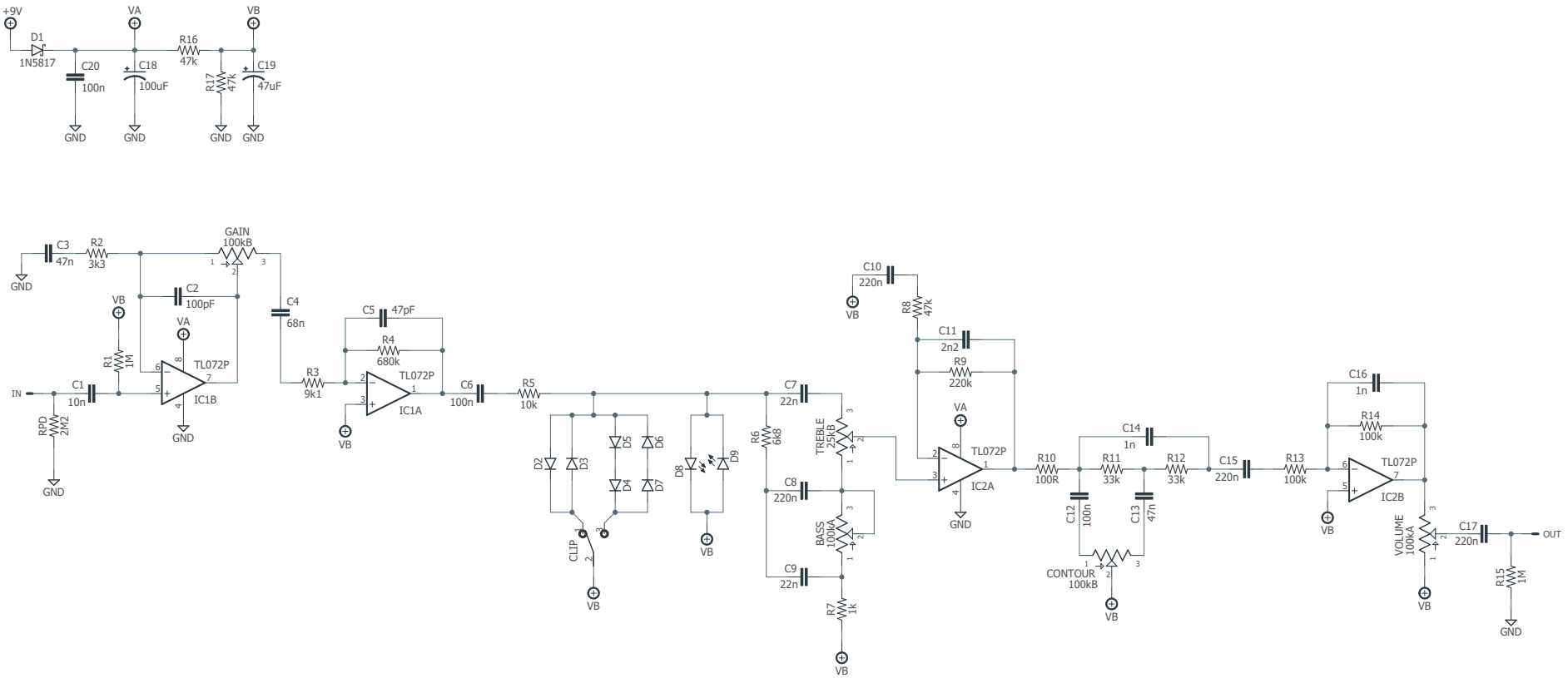
If you search online for Shredmaster schematics, you could pull up five of them and each one would probably be slightly different. Early traces of the pedal were all over the map, and there was especially a lot of confusion surrounding the portion near C4 and R3 where the effect was grounded in bypass mode. The two capacitors and two resistors in series should be simplified down in a true-bypass setup, but it was often not done correctly.

The correct schematic is the one in this post from FSB. From here you can see why the different values were circulating around. The series value of C15 and C6 (using the PhnomPenh2004 schematic's numbering), 220n in series with 100n, is 68n. So some schematics correctly show the capacitor as 68n, while others show it as 220n, dropping the second capacitor entirely. Some DIY Shredmaster projects maintain both capacitors, but this is really not necessary at all—especially since 68n is a standard value and easy to find.

Some schematics show 4.1k for R7 and R8 (again, using the PhnomPenh2004 schematic numbering) for 8.2k total. It's possible that some variants used this value. However, the unit shown in the photos is definitely 4.7k. Two of these in series is 9.4k total, with 9.1k being the nearest common value. 10k is also fine if that's all you have—it basically just reduces the minimum gain setting by a tiny amount.

Another common discrepancy is R1, the 47k resistor in the second-to-last op-amp stage (R8 in this project). Some schematics show this as 39k. It's possible that some versions of the pedal used 39k there, but based on the photos in the FSB thread, it's definitely 47k in that unit.

SCHEMATIC


+9V
VA
VB
D1
1N5817
R16
47k
C20
100n
C18
100uF
R17
47k
C19
47uF
GND
GAIN
100kB
C3
47n
R2
3k3
C2
100pF
C4
68n
R1
1M
TL072P
IC1B
IN
C1
10n
RPD
2M2
C5
47pF
R4
680k
R3
9k1
IC1A
C6
100n
R5
10k
D2
D3
D4
D5
D6
D7
D8
D9
CLIP
R6
6k8
C7
22n
C8
220n
C9
22n
TREBLE
25kB
BASS
100kA
R7
1k
C10
220n
R8
47k
C11
2n2
R9
220k
IC2A
R10
100R
C14
1n
R11
33k
R12
33k
C12
100n
C13
47n
CONTOUR
100kB
C15
220n
R13
100k
C16
1n
R14
100k
IC2B
VOLUME
100KA
C17
220n
OUT
R15
1M

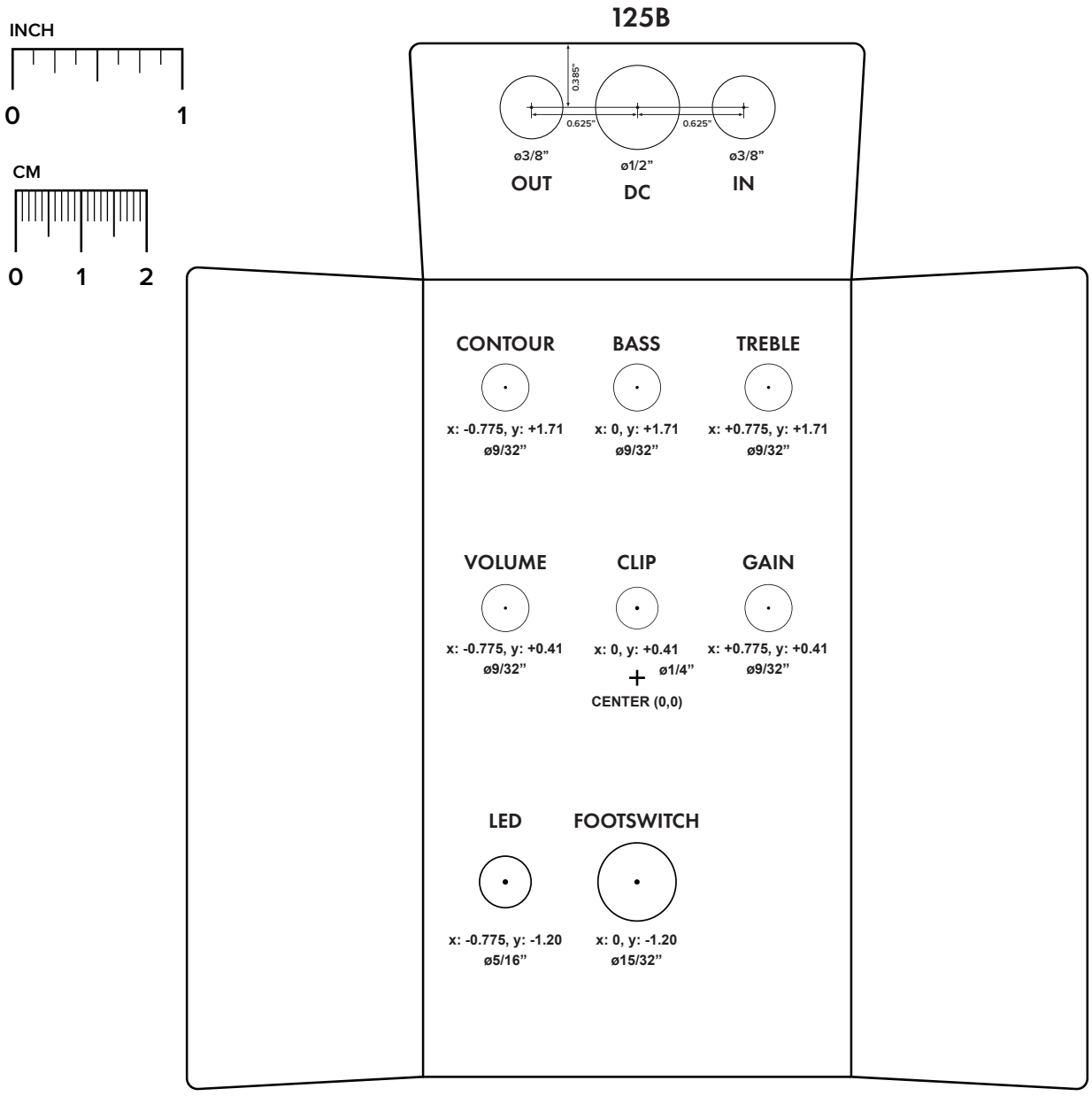
DRILL TEMPLATE

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.

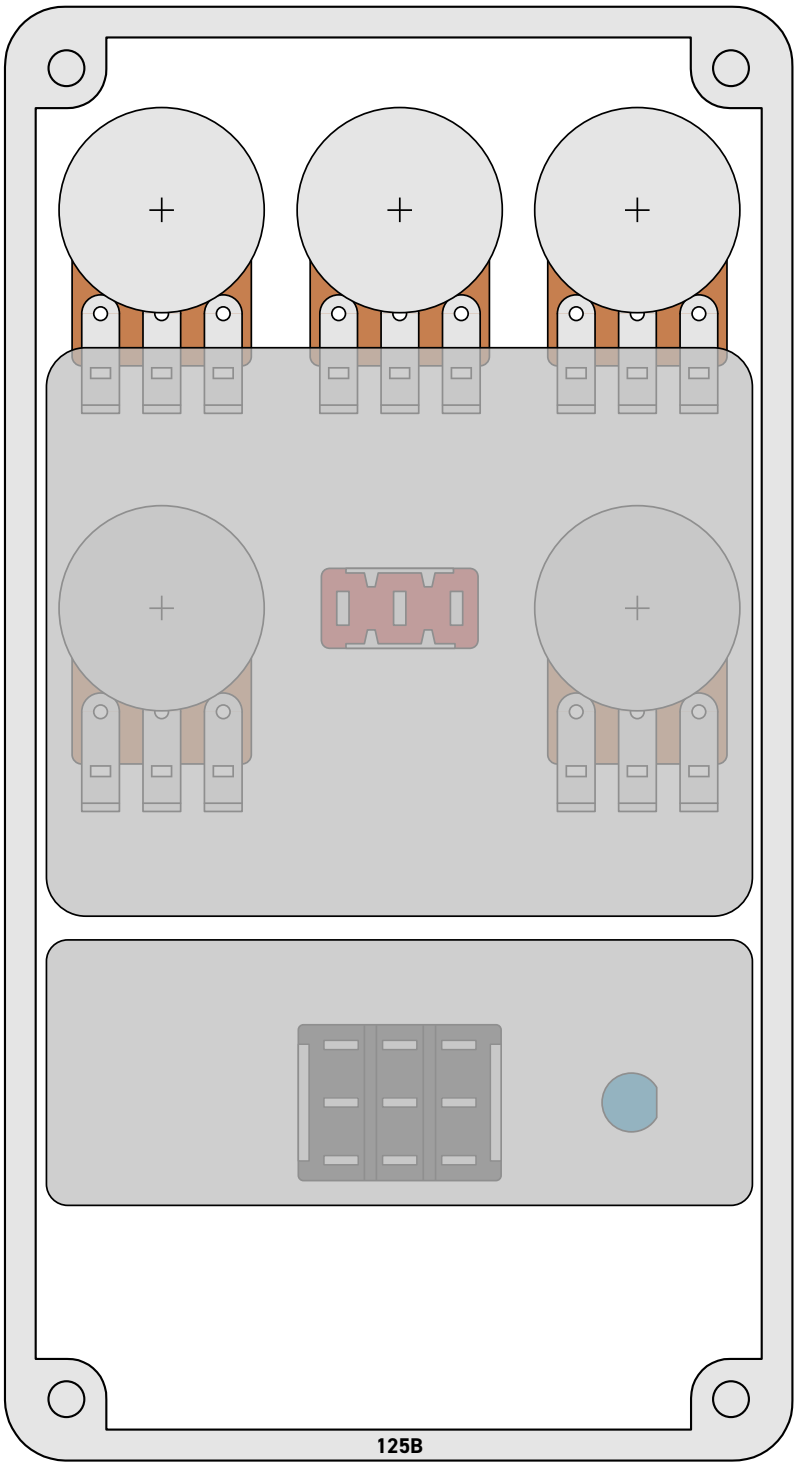
Top jack layout requires the use of closed-frame jacks like the Switchcraft 111X. Open-frame jacks will not fit in layouts with 5 or more knobs due to the placement of the DC jack.

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.

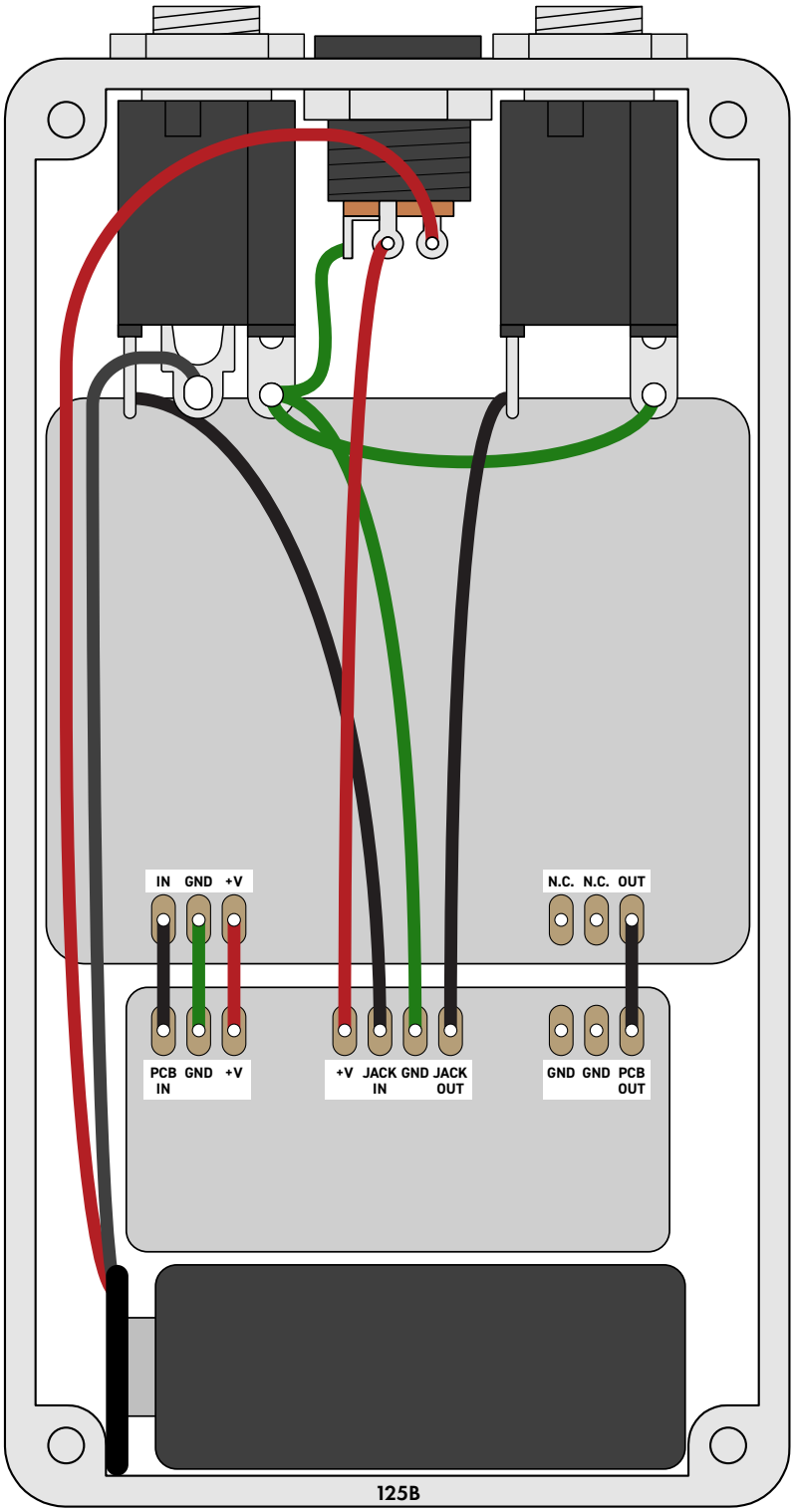


ENCLOSURE LAYOUT

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 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 (2018-12-15)
Initial release.