PROJECT NAME

SOMA

aion
DIY GUITAR EFFECTS

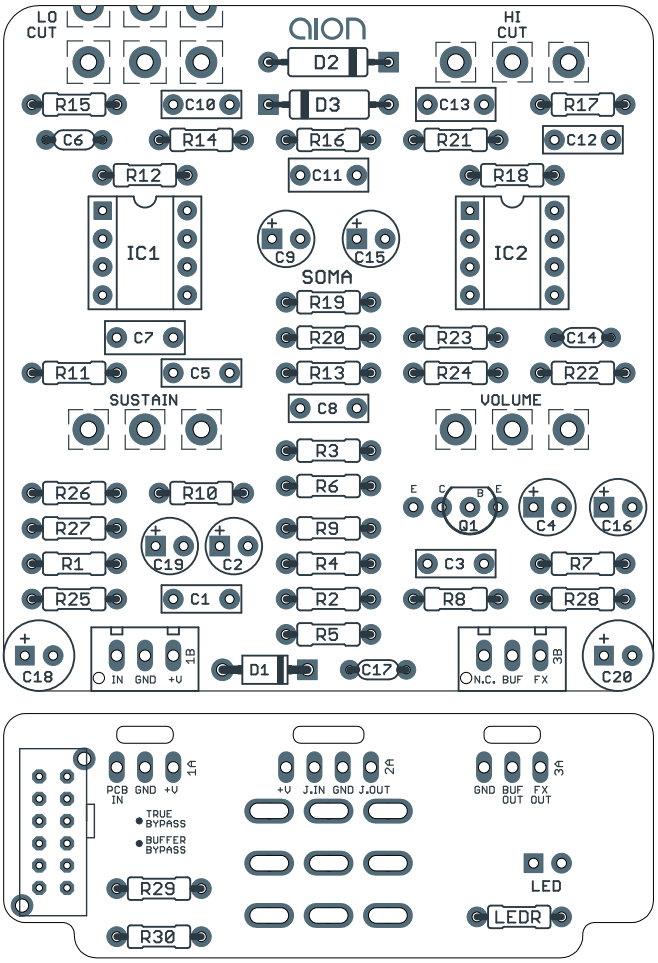
BASED ON
Cornish SS-3 Soft Sustain

BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Overdrive

DOCUMENT VERSION
1.0.0 (2019-11-15)

PROJECT SUMMARY
An evolution of the MXR Distortion+ that adds two passive tone-cut controls as well as the classic Cornish input buffer.



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

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INTRODUCTION

The Soma Vintage Overdrive is adapted from the Pete Cornish SS-3, traced by Aion FX in 2019.

Cornish pedals are best known for being extremely expensive. There are two reasons for this. First, the build quality and reliability is unmatched. Second, the mysterious nature of them, partially due to the fact that the circuit is obscured and partially because of the A-list of clients such as Brian May and Pete Townshend.

The SS-3 in particular is owned by Jeff Beck, David Gilmour, Keith Urban and Carlos Santana among many others. It's an update to the earlier SS-2 that adds a low-cut control, since the original was fairly bass-heavy. With the low cut control set fully clockwise, the circuit is identical to the SS-2.

Under the hood, the SS-3 appears to have originated from the MXR Distortion+ circuit and then had passive low & hi-cut tone controls added, along with the classic Cornish buffer at the input.

The Soma is a faithful reproduction of the SS-3 circuit, but with one major addition: an internal slide switch allowing the pedal to be used in true-bypass mode instead of buffered bypass. As with the Klon KTR, the buffered mode is "almost always better", but with this feature, you can determine for yourself.

USAGE

The Soma has the following controls:

- **Sustain** controls the amount of drive or distortion, which also affects the amount of sustain.
- **Low Cut** is a two-stage filter that cuts bass at 60 Hz when counter-clockwise. When this control is fully clockwise, the low-end response is identical to the SS-2.
- **Hi Cut** is a basic passive treble control, starting with a steep 6KHz cut at minimum, and a slight boost when fully clockwise.
- **Volume** is the overall output.

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	10M	Metal film resistor, 1/4W	
R2	1k	Metal film resistor, 1/4W	
R3	120k	Metal film resistor, 1/4W	
R4	120k	Metal film resistor, 1/4W	
R5	200k	Metal film resistor, 1/4W	
R6	7k5	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	51R	Metal film resistor, 1/4W	
R9	1M	Metal film resistor, 1/4W	
R10	10k	Metal film resistor, 1/4W	
R11	1M	Metal film resistor, 1/4W	
R12	100k	Metal film resistor, 1/4W	
R13	510R	Metal film resistor, 1/4W	
R14	15k	Metal film resistor, 1/4W	
R15	1k6	Metal film resistor, 1/4W	
R16	1k6	Metal film resistor, 1/4W	
R17	1M	Metal film resistor, 1/4W	
R18	1M	Metal film resistor, 1/4W	
R19	1M	Metal film resistor, 1/4W	
R20	2k4	Metal film resistor, 1/4W	
R21	10k	Metal film resistor, 1/4W	
R22	6k8	Metal film resistor, 1/4W	
R23	10k	Metal film resistor, 1/4W	
R24	91R	Metal film resistor, 1/4W	
R25	100R	Metal film resistor, 1/4W	
R26	150k	Metal film resistor, 1/4W	
R27	180k	Metal film resistor, 1/4W	
R28	100R	Metal film resistor, 1/4W	
R29	91R	Metal film resistor, 1/4W	
R30	51k	Metal film resistor, 1/4W	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	100n	Film capacitor, 7.2 x 2.5mm	
C2	4.7uF	Electrolytic capacitor, 4mm	
C3	1n	Film capacitor, 7.2 x 2.5mm	
C4	22uF	Electrolytic capacitor, 5mm	
C5	10n	Film capacitor, 7.2 x 2.5mm	
C6	220pF	MLCC capacitor, NP0/C0G	
C7	470n	Film capacitor, 7.2 x 3mm	
C8	3n3	Film capacitor, 7.2 x 2.5mm	
C9	10uF	Electrolytic capacitor, 5mm	
C10	10n	Film capacitor, 7.2 x 2.5mm	
C11	220n	Film capacitor, 7.2 x 2.5mm	
C12	10n	Film capacitor, 7.2 x 2.5mm	
C13	220n	Film capacitor, 7.2 x 2.5mm	
C14	220pF	MLCC capacitor, NP0/C0G	
C15	10uF	Electrolytic capacitor, 5mm	
C16	22uF	Electrolytic capacitor, 5mm	
C17	100n	MLCC capacitor, X7R	Power supply filter capacitor.
C18	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C19	10uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C20	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	1N34A	Germanium diode, NOS	Exact part number is unimportant, any NOS germanium diode should work about the same here. Can also substitute BAT46 Schottky diode.
D3	1N34A	Germanium diode, NOS	
Q1	2N5088	BJT transistor, NPN, TO-92	Substitute. Original uses BC549C.
IC1	TL071	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	TL071	Operational amplifier, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
SUST.	50kC	16mm right-angle PCB mount pot	
LO CUT	10kB dual	16mm right-angle PCB mount pot	Available from Tayda Electronics (see parts list spreadsheet).
HI CUT	25kB	16mm right-angle PCB mount pot	
VOL.	10kA	16mm right-angle PCB mount pot	
TB-BUF	4PDT slide	Slide switch, 4PDT	E-Switch EG4208 (4mm lever) or EG4208A (6mm lever)

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
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.

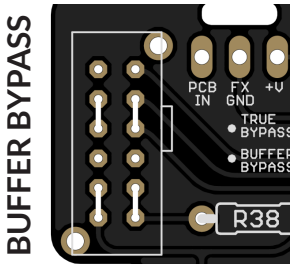
BUILD NOTES

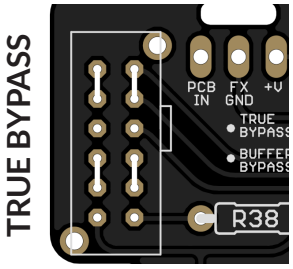
Transistor selection

The original SS-3 uses a BC549C transistor. The pinout on the Soma PCB is for the USA “E-B-C” convention, e.g. 2N3904 and 2N5088. The 2N5088 will operate identically to the BC549C, but if you do want to use the original transistors, just note that the pinout is different. Typically they would need to be rotated 180 degrees, but check the datasheet for your brand as they do vary.

Bypassing the true bypass / buffer switch

The E-Switch EG4208 slide switch used for the true bypass/buffer selector is available from Mouser Electronics but may not be accessible to everyone. If you are unable to obtain it, you can hard-wire the switch to either true bypass mode or buffered mode by soldering jumpers to the switch pads.

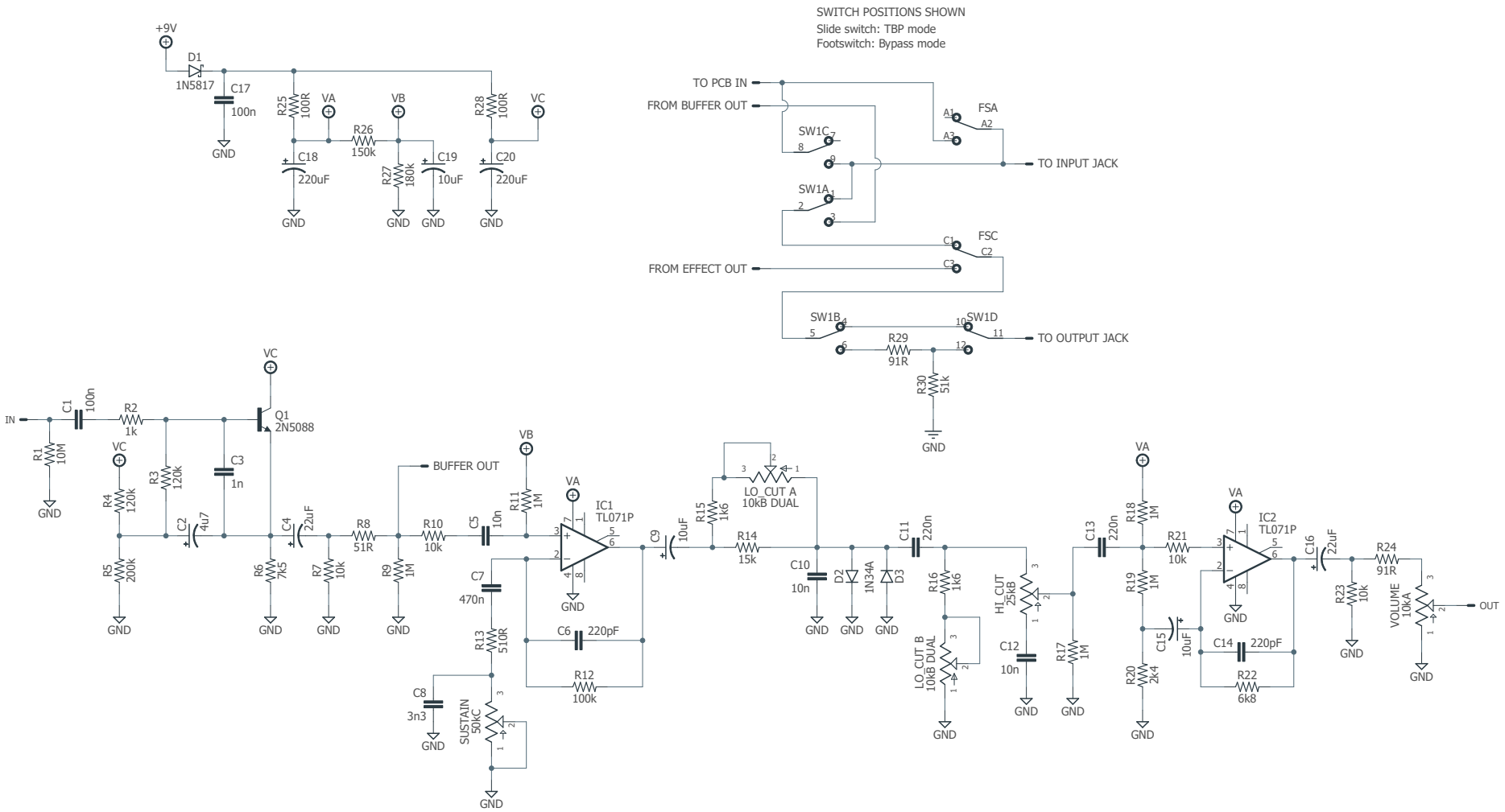




Low Cut potentiometer

The 10kB dual potentiometer used by the Low Cut control is an uncommon value and not carried by any of the major distributors. However, Tayda Electronics has it available here with very cheap worldwide shipping.

SCHEMATIC


SWITCH POSITIONS SHOWN
Slide switch: TBP mode
Footswitch: Bypass mode
+9V
D1
1N5817
C17
100n
GND
R25
100R
VA
R26
150k
VB
R28
100R
VC
C18
220uF
R27
180k
C19
10uF
C20
220uF
TO PCB IN
FROM BUFFER OUT
SW1C
SW1A
FSA
TO INPUT JACK
FSC
FROM EFFECT OUT
SW1B
SW1D
R29
91R
R30
51k
TO OUTPUT JACK
IN
C1
100n
R2
1k
Q1
2N5088
R1
10M
R3
120k
R4
120k
C3
1n
C2
4u7
R5
200k
C4
22uF
R6
7k5
R7
10k
R8
51R
BUFFER OUT
R9
1M
R10
10k
C5
10n
R11
1M
IC1
TL071P
C7
470n
R13
510R
C8
3n3
SUSTAIN
50kC
C6
220pF
R12
100k
C9
10uF
R15
1k6
LO_CUT A
10kB DUAL
R14
15k
C10
10n
D2
1N34A
D3
C11
220n
R16
1k6
LO_CUT B
10kB DUAL
HI_CUT
25kB
C12
10n
R17
1M
C13
220n
R18
1M
R19
1M
R20
2k4
C15
10uF
R21
10k
IC2
TL071P
C14
220pF
R22
6k8
C16
22uF
R24
91R
R23
10k
VOLUME
10kA
OUT

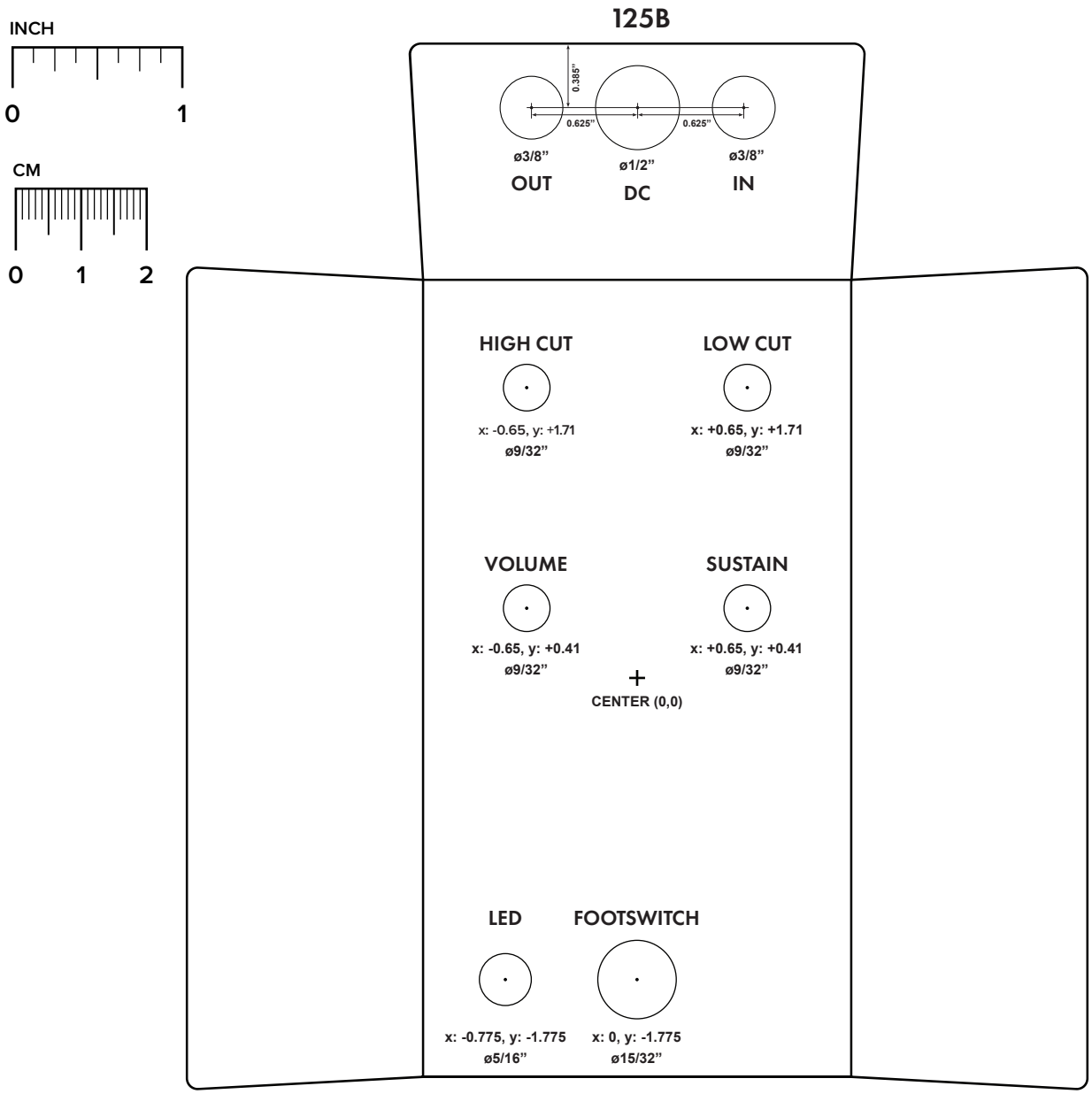
DRILL TEMPLATE

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.

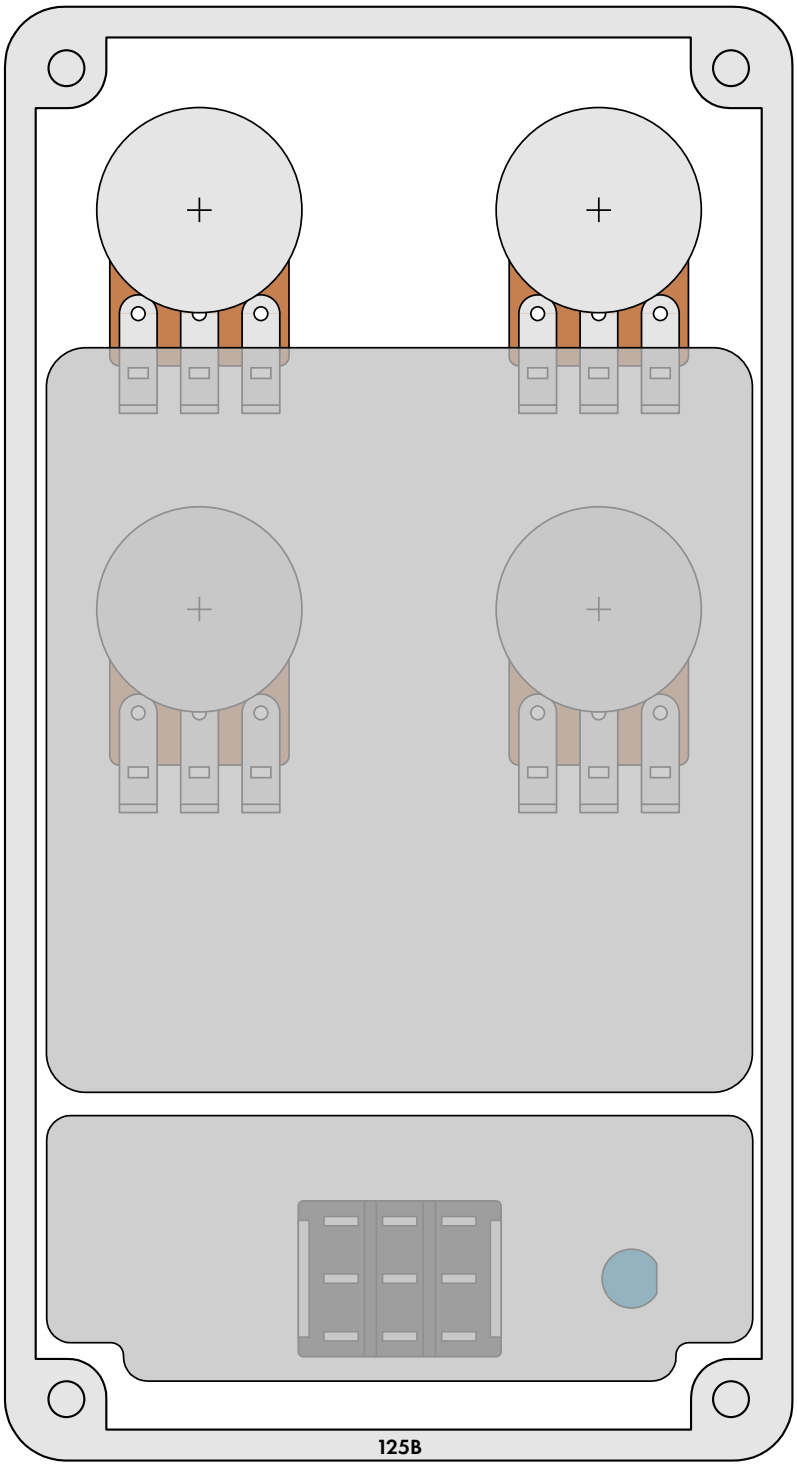
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

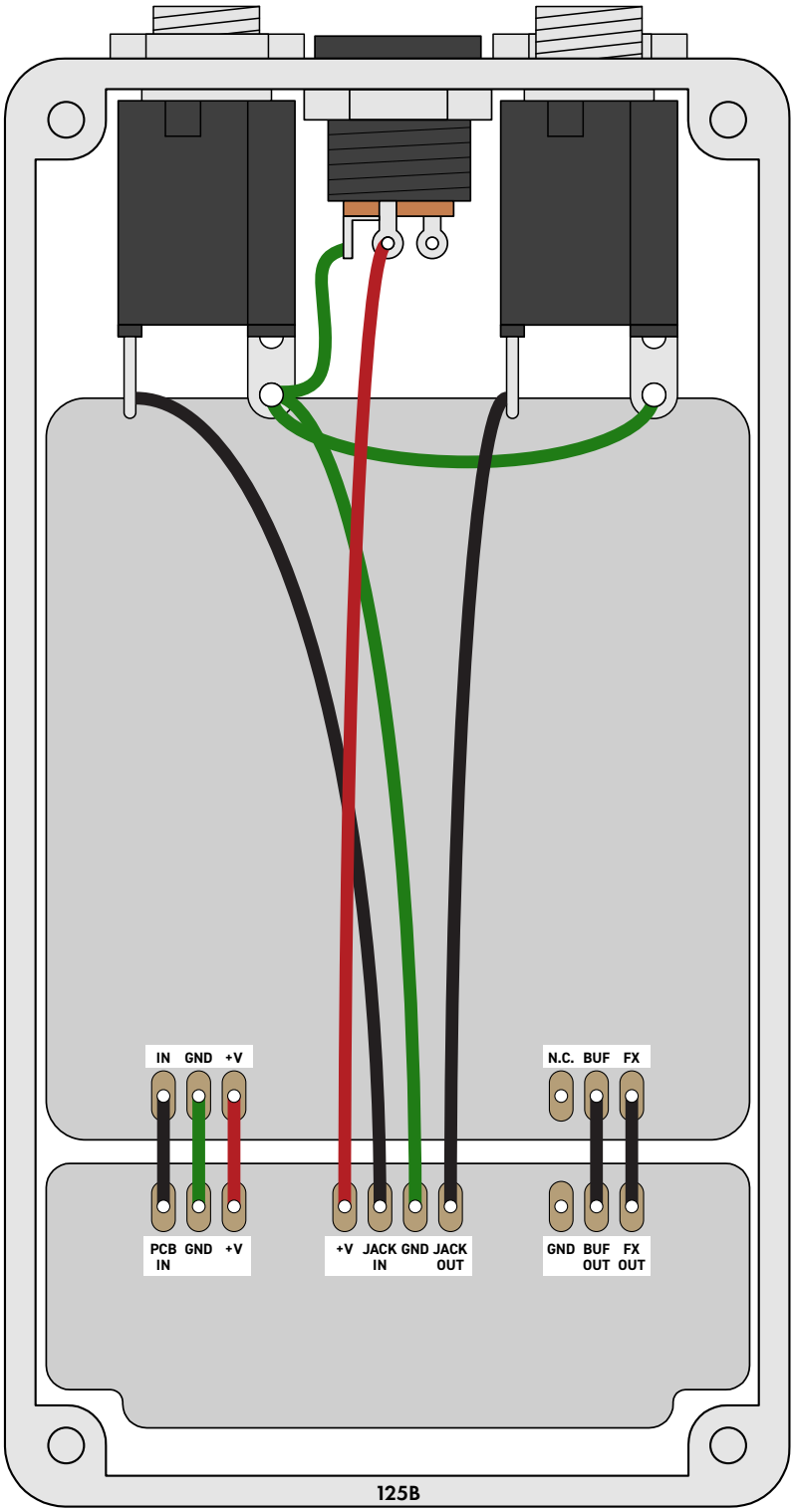


ENCLOSURE LAYOUT

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 (2019-11-15)
Initial release.