PROJECT NAME

CIRRUS

aion DIY GUITAR EFFECTS

BASED ON
Ibanez® ST-9 Super Tube Screamer

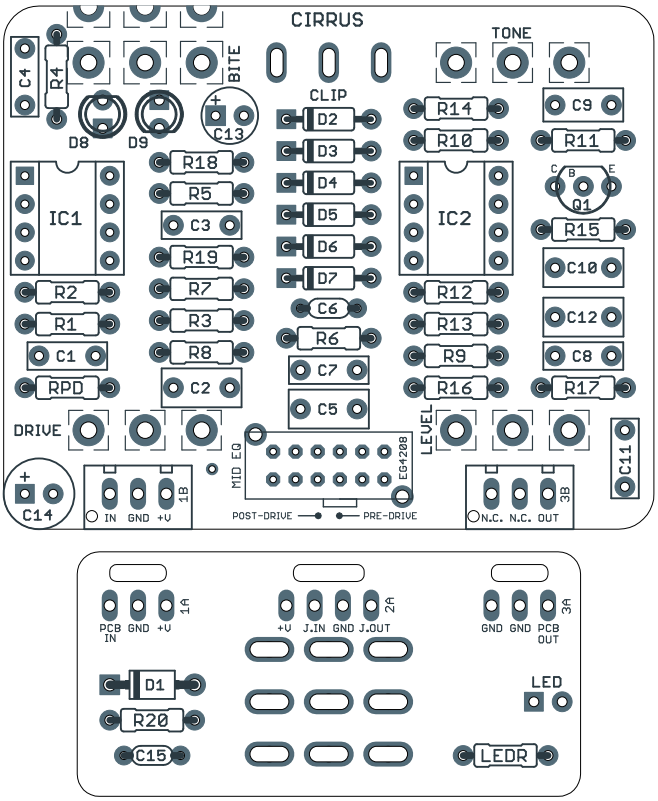
BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Overdrive

DOCUMENT VERSION
1.0.0 (2021-03-19)

PROJECT SUMMARY

An updated version of the Tube Screamer featuring a frequency-adjustable midrange boost that can be placed either before or after the drive stage.



Actual size is 2.3” x 1.86” (main board) and 1.78” x 0.86” (bypass board).

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INTRODUCTION

The Cirrus Dynamic Overdrive project is a clone of the Ibanez ST-9 Super Tube Screamer, an incredibly rare Tube Screamer variant only produced from 1983-84. It's essentially a stock Tube Screamer with an added stage, a semi-parametric midrange control that delivers a fixed boost at a variable frequency.

The ST-9 was introduced near the end of the original run of the 9-series and was quickly discontinued along with the rest of the series. However, the circuit reappeared the next year in 1985 as part of the Master Series, this time called the STL Super Tube. This series had broader distribution and so the STL version is much easier to find.

Curiously, the STL version made one major change to the circuit: transplanting the mid-boost stage after the clipping instead of before, where the original ST-9 put it before. There are no other changes to the circuit, but there is a notable difference between pre-clipping and post-clipping mid boost.

The Cirrus project incorporates both versions, allowing the mid-boost section to be placed either before or after the clipping using an on-board slide switch. (This is the main update from the original 1590B version of the Cirrus, which uses on-board jumpers to set the mid-boost location but can't be toggled.)

In addition to the mid-boost slide switch, the Cirrus also includes a clipping diode switch so you can select between three different sets of diodes.

USAGE

The Cirrus has the following controls:

- **Drive** controls the amount of gain in the op-amp feedback diode clipping stage.
- **Bite** is a semi-parametric midrange control with fixed boost.
- **Tone** controls the treble response of the effect. The center point (12:00) is flat. When turned to the left, it cuts treble, and when turned to the right, it boosts treble.
- **Volume** controls the overall output of the effect.
- **Clip** (toggle switch) selects between three sets of diodes: 1x silicon (stock), 2x silicon, and LEDs.
- **Mid EQ** (slide switch) selects the location of the mid-boost section, either before the drive stage (ST-9 mode) or after (STL mode).

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	1k	Metal film resistor, 1/4W	
R2	510k	Metal film resistor, 1/4W	
R3	220k	Metal film resistor, 1/4W	
R4	7k5	Metal film resistor, 1/4W	1k5 if using 20kC midrange pot. See build notes.
R5	7k5	Metal film resistor, 1/4W	1k5 if using 20kC midrange pot. See build notes.
R6	10k	Metal film resistor, 1/4W	
R7	51k	Metal film resistor, 1/4W	
R8	4k7	Metal film resistor, 1/4W	
R9	1k	Metal film resistor, 1/4W	
R10	10k	Metal film resistor, 1/4W	
R11	220R	Metal film resistor, 1/4W	
R12	1k	Metal film resistor, 1/4W	
R13	1k	Metal film resistor, 1/4W	
R14	510k	Metal film resistor, 1/4W	
R15	10k	Metal film resistor, 1/4W	
R16	10k	Metal film resistor, 1/4W	
R17	470R	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	
RPD	2M2	Metal film resistor, 1/4W	Input pulldown resistor.
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	47n	Film capacitor, 7.2 x 2.5mm	
C2	1uF	Film capacitor, 7.2 x 3.5mm	
C3	5n6	Film capacitor, 7.2 x 2.5mm	27n if using 20kC midrange pot. See build notes.
C4	15n	Film capacitor, 7.2 x 2.5mm	68n if using 20kC midrange pot. See build notes.
C5	1uF	Film capacitor, 7.2 x 3.5mm	
C6	47pF	MLCC capacitor, NP0/C0G	
C7	47n	Film capacitor, 7.2 x 2.5mm	
C8	100n	Film capacitor, 7.2 x 2.5mm	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C9	220n	Film capacitor, 7.2 x 2.5mm	
C10	1uF	Film capacitor, 7.2 x 3.5mm	
C11	100n	Film capacitor, 7.2 x 2.5mm	
C12	1uF	Film capacitor, 7.2 x 3.5mm	
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	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	3mm LED	LED, 3mm, red diffused	
D9	3mm LED	LED, 3mm, red diffused	
Q1	2N5088	JFET, N-channel, TO-92	Original uses 2SC1815-BL.
IC1	JRC4558D	Operational amplifier, DIP-8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	JRC4558D	Operational amplifier, DIP-8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
DRIVE	500kA	16mm right-angle PCB mount pot	
TONE	20kW	16mm right-angle PCB mount pot	
BITE	100kC dual	16mm dual pot, right angle	Original ST-9 uses 20kC, but values have been scaled for 100kC. See build notes for more information.
LEVEL	100kB	16mm right-angle PCB mount pot	
MIDEQ	4PDT slide	Slide switch, 4PDT, E-Switch EG4208	
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.

Mid-boost resistor & capacitor values

The original ST-9 and STL used a 20kC dual pot for the midrange control. This value is hard to find, at this time only available from Tayda Electronics in straight-pin knurled shaft format. It can be made to work for this PCB, but it's not easy.

Fortunately, this type of parametric filter can easily be adjusted for different potentiometer values. In fact, most other circuits that use this type of parametric EQ use 100kC—for example, the Lab Series L5 Preamp and the Pearl OD-05 Overdrive.

Accordingly, for this project, the surrounding values in the parametric filter have been modified so you can instead use a 100kC dual pot, which is much easier to find. By increasing the resistor values and reducing the capacitor values in the mid-boost section by a factor of 5, it will preserve the same frequency characteristics.

If you do find a 20kC potentiometer and want to use it, here are the original values:

- **C3:** 27n
- **C4:** 68n
- **R4:** 1k5
- **R5:** 1k5

Boost level

The Ibanez ST-9 Super Tube Screamer product manual says that the midrange supplies a +25 dB boost. However, some who have played it have noted that it doesn't sound like it's anywhere near +25 dB, and in fact others have calculated it at +8 dB, which seems more accurate.

If you don't feel like +8 dB is enough, the gain boost can be adjusted by increasing the difference between C3 and C4. The only side effect is that in this type of parametric circuit, by increasing the frequency gain, you also increase the Q (width). If the Q is too wide it won't sound very good at all.

To get the full 25 dB with the same available frequency range, use the following values:

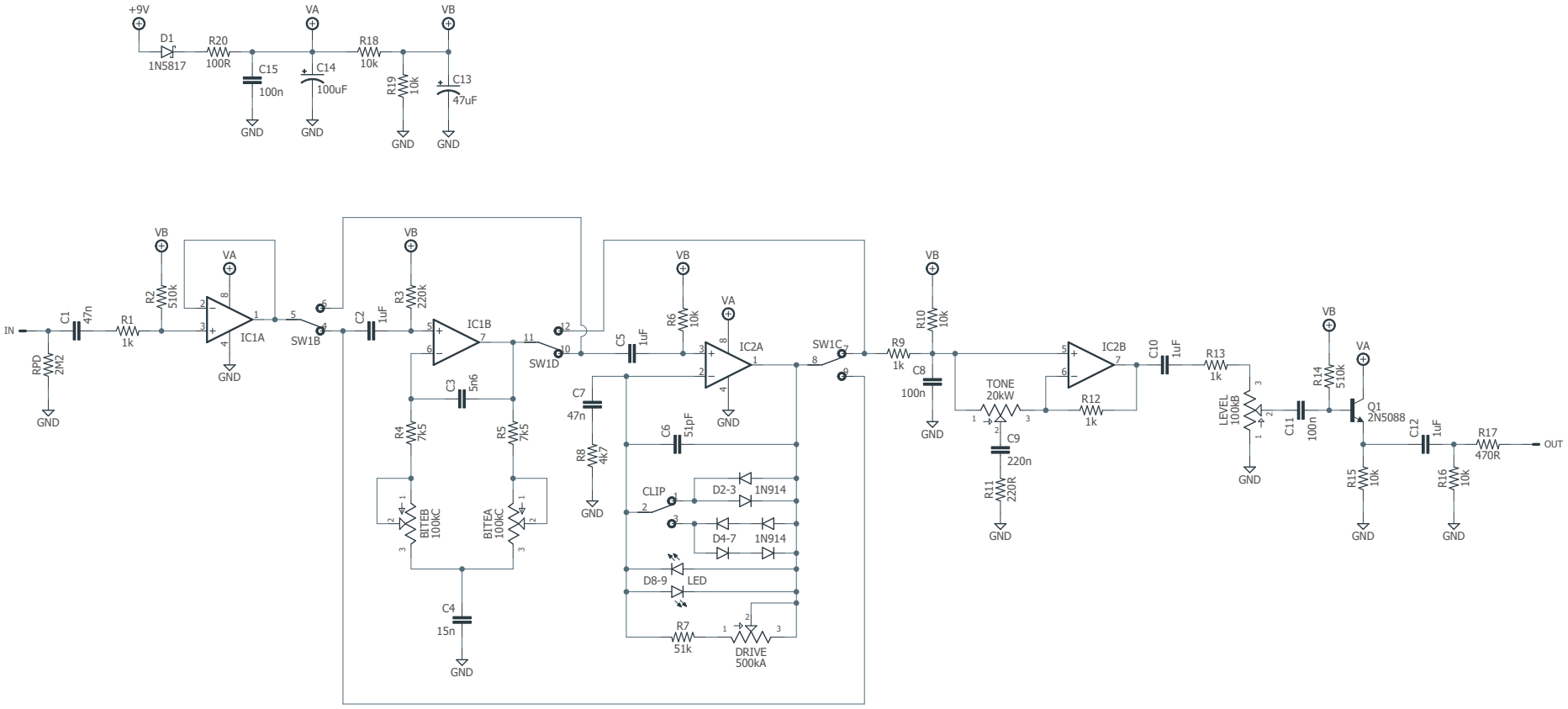
- **C3:** 5n6
- **C4:** 270n

If you want more than stock but not that much more, use the values from the Pearl OD-05, which at +15 dB is right in the middle:

- **C3:** 4n7
- **C4:** 68n

Note that these are changes from the 100kC adjusted values, not the stock 20kC values. Scale accordingly if using a 20kC boost pot.

SCHEMATIC


+9V
D1
1N5817
R20
100R
C15
100n
VA
C14
100uF
R18
10k
R19
10k
VB
C13
47uF
GND
IN
C1
47n
R1
1k
RPD
2M2
R2
510k
IC1A
SW1B
C2
1uF
R3
220k
IC1B
SW1D
C3
5n6
R4
7K5
R5
7K5
BITEB
100kC
BITEA
100kC
C4
15n
C5
1uF
R6
10k
IC2A
SW1C
C7
47n
R8
4k7
C6
51pF
CLIP
D2-3
1N914
D4-7
1N914
D8-9
LED
R7
51k
DRIVE
500kA
R9
1k
R10
10k
C8
100n
C9
220n
R11
220R
TONE
20kW
IC2B
R12
1k
C10
1uF
R13
1k
LEVEL
100kB
C11
100n
R14
510k
Q1
2N5088
C12
1uF
R15
10k
R16
10k
R17
470R
OUT

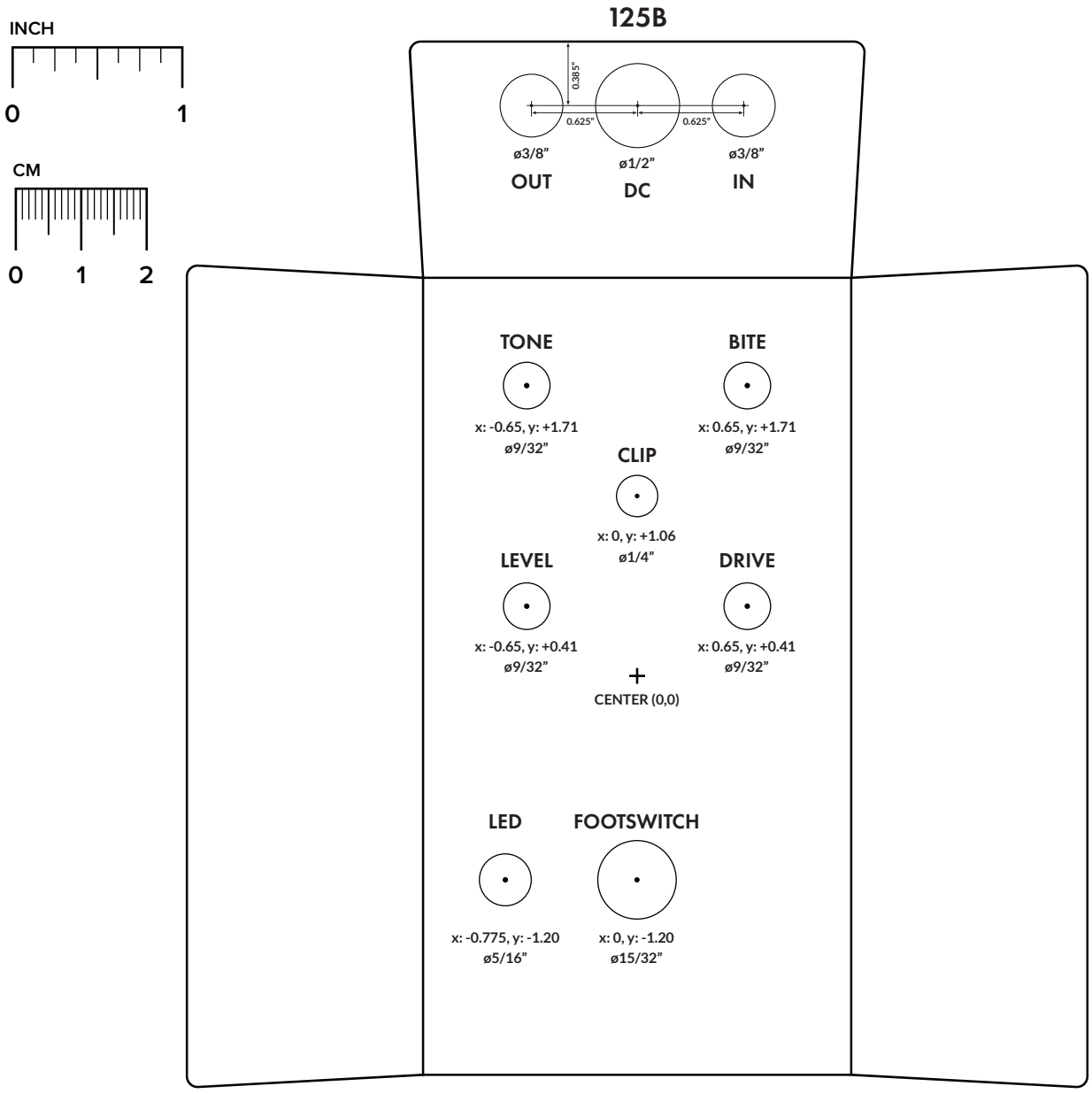
DRILL TEMPLATE

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.

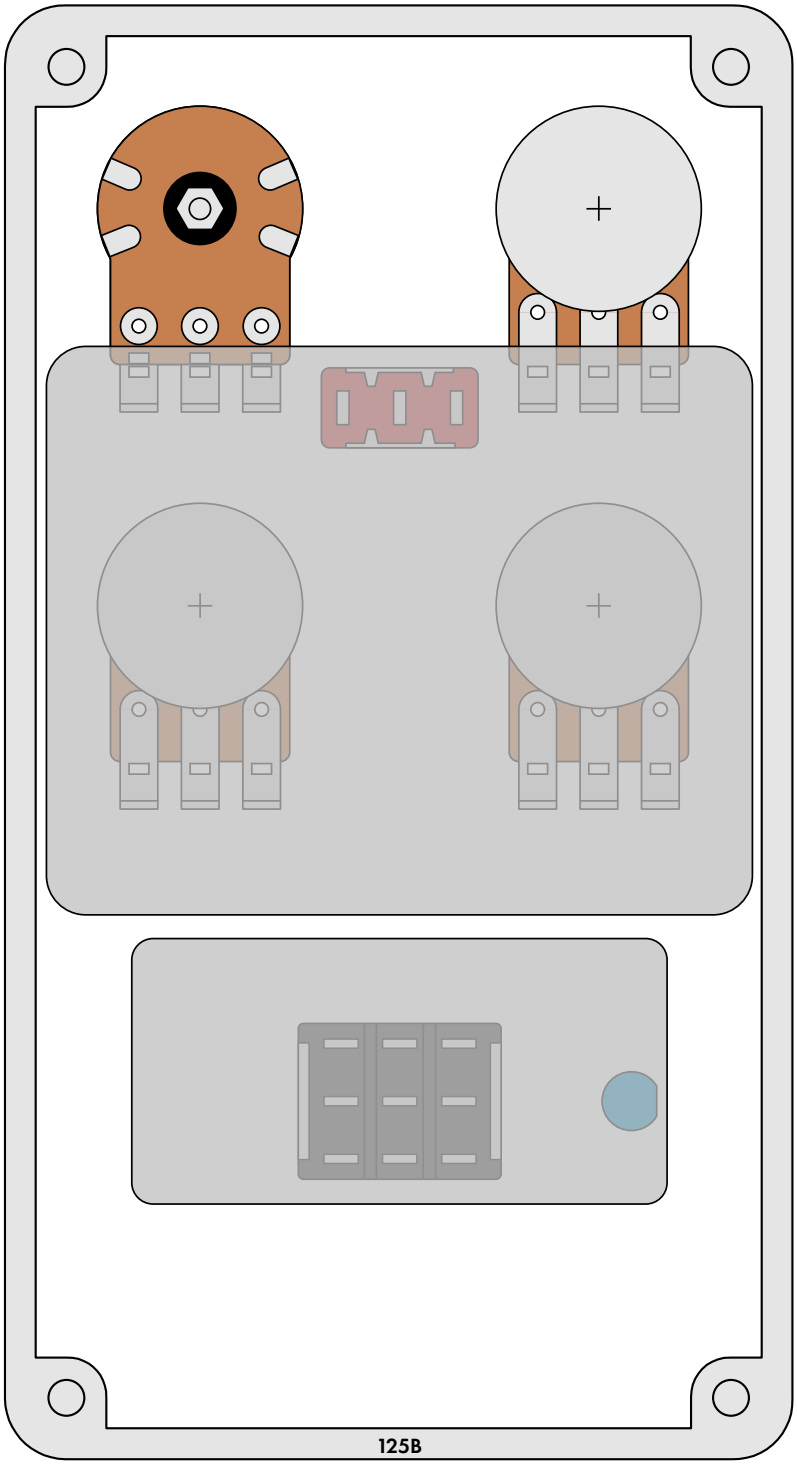


ENCLOSURE LAYOUT

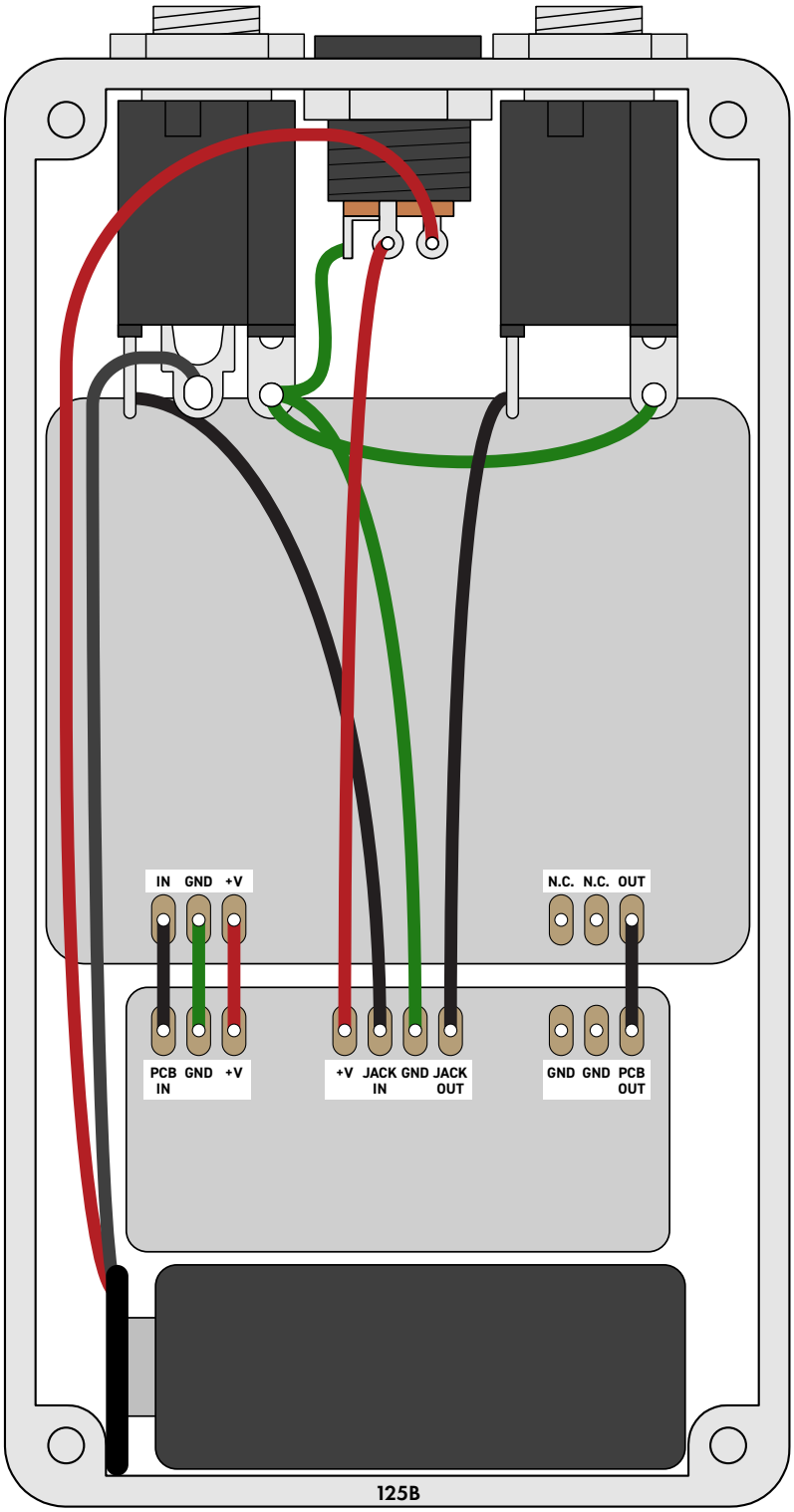
Enclosure is shown without jacks. See next page for jack layout and wiring.

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 to make room for the dual pot.

Solder it like you would if they were normal pads, but bend the small set of pins forward slightly so they make contact with the edge of the pads. The solder will flow easily into the half-holes.



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 (2021-03-19)
Initial release.