PROJECT NAME

AURORA

aion
DIY GUITAR EFFECTS

BASED ON
Ross Compressor / MXR Dyna Comp

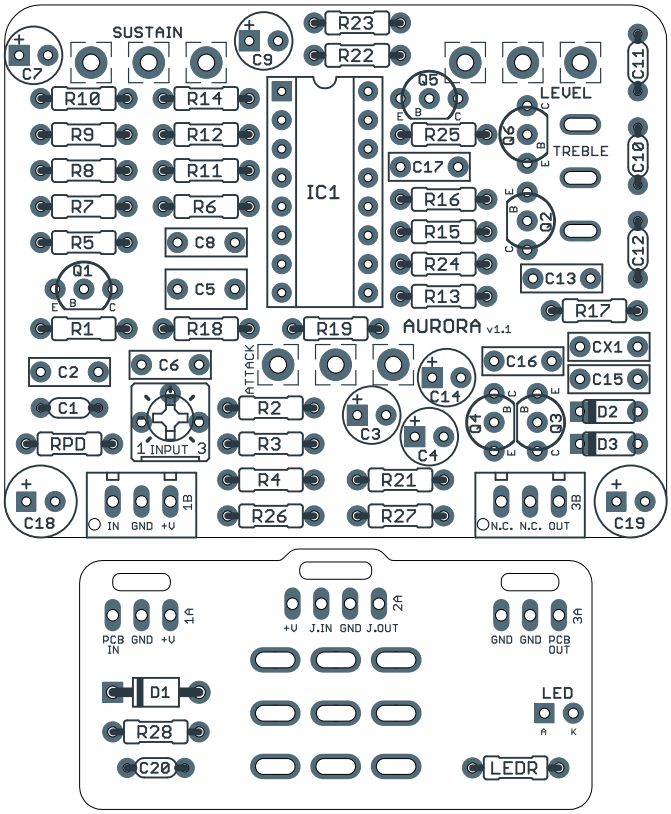
BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Compressor / sustainer

DOCUMENT VERSION
1.1.0 (2023-12-06)

PROJECT SUMMARY

The original guitar compressor, still a favorite of guitarists after over 40 years. The Aurora makes several improvements to the original circuit as well as adding a few new features.



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

IMPORTANT NOTE

This documentation is for the **v1.1** version of the project, which started shipping in late 2023. This update makes a few minor tweaks to the circuit that affects the parts list. If your PCB is not labeled v1.1, then follow the v1.0 documentation from the project page.

TABLE OF CONTENTS

INTRODUCTION

The Aurora Compressor/Sustainer is an updated version of the MXR Dyna Comp and the Ross Compressor. One of the first compressor circuits designed for guitar, the MXR Dyna Comp has been a consistent favorite among guitarists, and the circuit is legendary in the DIY community.

The Ross Compressor was an updated clone of the Dyna Comp that got a lot of attention when it was "rediscovered" in the 1990s by Trey Anastasio of Phish. It has better power supply filtering and thus lower noise, but is otherwise very similar to the Dyna Comp.

The Aurora takes things a step further by adding a couple of modifications. First, the obsolete CA3080 has been replaced by the LM13700, which is essentially just a dual CA3080 but with the advantage of still being in production and easy to find.

The output section has also been modified to take the signal from a different part of the envelope detector. This results in drastically reduced ripple (which is perceived as distortion on the otherwise clean signal). Some people like this distortion, so the Aurora was designed so you can still build the "stock" version and use the classic output stage. See the build notes for more details.

USAGE

The Aurora has the following controls:

- **Sustain** controls the amount of compression. As you turn it up, it increases the sustain but also the noise level. If you keep it down lower than 12:00, the effect acts more like a limiter.
- **Release** allows you to set the amount of time after the input signal falls below the threshold before the compressor "resets" and is ready to compress again. It's also called an "Attack" control in the Boss CS-2 and Keeley Compressor.
- **Level** is the overall output volume of the effect.
- **Treble** controls the amount of treble attenuation immediately after the signal is compressed.
- **Input** is an internal trimmer that attenuates the signal going into the compressor stage, allowing it to be used with high-output instruments such as keyboards or active pickups without clipping. At zero, it's out of the circuit.

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	470k	Metal film resistor, 1/4W	
R4	10k	Metal film resistor, 1/4W	
R5	10k	Metal film resistor, 1/4W	
R6	1M	Metal film resistor, 1/4W	
R7	1k	Metal film resistor, 1/4W	
R8	1k	Metal film resistor, 1/4W	
R9	220k	Metal film resistor, 1/4W	
R10	220k	Metal film resistor, 1/4W	
R11	1M	Metal film resistor, 1/4W	
R12	15k	Metal film resistor, 1/4W	
R13	150k	Metal film resistor, 1/4W	
R14	27k	Metal film resistor, 1/4W	
R15	10k	Metal film resistor, 1/4W	
R16	10k	Metal film resistor, 1/4W	
R17	1M	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	390k	Metal film resistor, 1/4W	Parallel resistor to change the 250kC release pot into 150kC. Omit (leave empty) if using a real 150kC pot.
R20	10k	Metal film resistor, 1/4W	
R21	1M	Metal film resistor, 1/4W	
R22	1k	Metal film resistor, 1/4W	Part of Q6 mod. See build notes.
R23	10k	Metal film resistor, 1/4W	Part of Q6 mod. See build notes.
R24	10k	Metal film resistor, 1/4W	Part of Q6 mod. See build notes.
R25	10k	Metal film resistor, 1/4W	
R26	56k	Metal film resistor, 1/4W	
R27	27k	Metal film resistor, 1/4W	
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.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C1	220pF	MLCC capacitor, NP0/C0G	Omit for Dyna Comp. Keeley Compressor uses 150pF.
C2	10n	Film capacitor, 7.2 x 2.5mm	
C3	1uF	Electrolytic capacitor, 4mm	
C4	1uF	Electrolytic capacitor, 4mm	
C5	1uF	Film capacitor, 7.2 x 3.5mm	
C6	2n2	Film capacitor, 7.2 x 2.5mm	
C7	1uF	Electrolytic capacitor, 4mm	
C8	10n	Film capacitor, 7.2 x 2.5mm	
C9	1uF	Electrolytic capacitor, 4mm	
C10	180pF	MLCC capacitor, NP0/C0G	
C11	330pF	MLCC capacitor, NP0/C0G	
C12	820pF	MLCC capacitor, NP0/C0G	
C13	10n	Film capacitor, 7.2 x 2.5mm	
C14	10uF	Electrolytic capacitor, 5mm	
C15	10n	Film capacitor, 7.2 x 2.5mm	
C16	100n	Film capacitor, 7.2 x 2.5mm	Part of Q6 mod. See build notes.
C17	1n	Film capacitor, 7.2 x 2.5mm	Optional. Allows a slight treble boost above 3kHz at the output.
C18	47uF	Electrolytic capacitor, 5mm	Power supply filter capacitor.
C19	10uF	Electrolytic capacitor, 5mm	Voltage reference filter capacitor.
C20	100n	MLCC capacitor, X7R	Power supply filter capacitor.
CX1	OMIT	Film capacitor, 7.2 x 2.5mm	See build notes for when to use this.
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
IC1	LM13700N	Transconductance amplifier, DIP16	
Q1	2N5088	BJT transistor, NPN, TO-92	
Q2	2N5088	BJT transistor, NPN, TO-92	
Q3	2N5088	BJT transistor, NPN, TO-92	
Q4	2N5088	BJT transistor, NPN, TO-92	
Q5	2N5088	BJT transistor, NPN, TO-92	
Q6	2N5088	BJT transistor, NPN, TO-92	Part of Q6 mod. See build notes.
INPUT	100k trimmer	Trimmer, 10%, 1/4"	Allows the input signal to be attenuated for use with high input levels.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
SUSTAIN	500kC	16mm right-angle PCB mount pot	Stock Ross/Dyna uses 500kB, but C (reverse audio) works better.
RELEASE	250kC	16mm right-angle PCB mount pot	R19 is used in parallel to get a final value of 150kC.
LEVEL	50kA	16mm right-angle PCB mount pot	Stock Ross/Dyna uses 50kB, but A (audio or log) works better.
TREBLE	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

Q6 modification

One little-known modification to the Ross/Dyna circuit is to change the output section so it takes its signal from a different place in the envelope detector. By doing this, you eliminate the ripple on the compressed signal which is heard as a slight distortion. It's a vast improvement on the original circuit without changing the characteristics of the tone.

The default configuration of the Aurora is to use this Q6 mod. However, if you do want to build a fully-stock Ross or Dyna Comp, you can use a 47n film capacitor for **CX1** and omit **R22-24** and **Q6**.

C17 modification

One way of getting a little more "snappiness" to the circuit is to use a **1n** capacitor for **C17** to bypass the R25 resistor. This will give a slight increase in treble content above 3kHz at the output of the effect. You can increase this value to lower the frequency. For example, 1.5n will increase the treble above 2.2kHz.

Release control

The default configuration of the Aurora includes a "Release" control which is adapted from the Boss CS-2. (Boss called it "Attack", which is not entirely wrong, but it's more accurate to say that it controls the release at the decay of the signal rather than the attack at the beginning.) When this pot is turned all the way down, it's the stock Ross/Dyna circuit.

The optimal pot value for this is 150k reverse audio (antilog) taper, but this value is very uncommon (only Stompbox Parts carries one). Instead, this project uses a more common 250kC pot with a parallel resistor to drop the value down to 150k.

If you are using an actual 150kC pot, you can omit R19 entirely (no jumper).

Treble switch

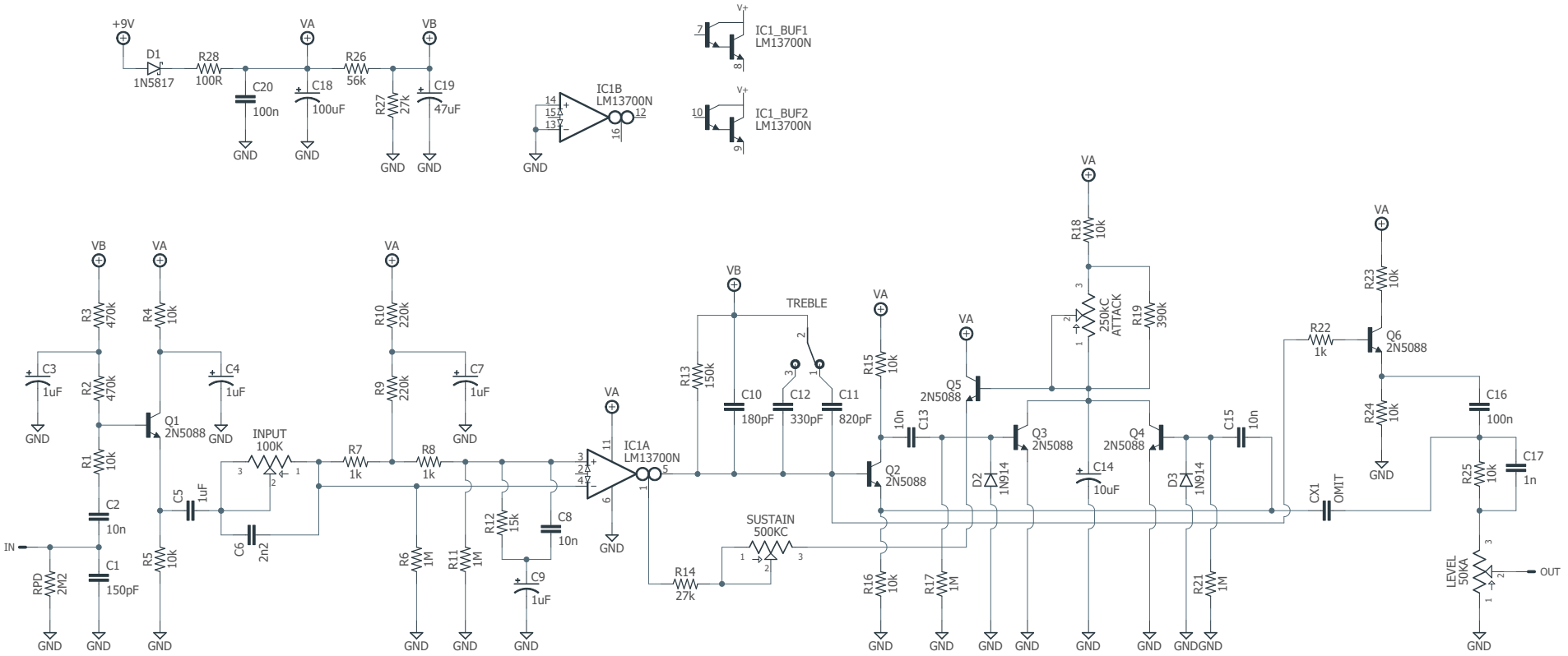
The Treble switch is adapted from the Janglebox. In the original Ross/Dyna circuit, the treble is boosted before the OTA and then cut by the same amount afterward, similar to a BBD circuit like the Boss CE-2. This way, the noise added by this stage can be eliminated when the EQ is returned to normal.

By reducing the value of this treble-cut capacitor after the OTA stage, we can add a small amount of treble at the expense of a little extra noise. Since frequency attentenuation is perceived differently at different sound levels, compressors can sometimes come across as dull, and so this modification can compensate for that.

The Janglebox actually omits C10 entirely so there's no treble attenuation after the OTA, but after testing out a number of different combinations, we found it was best to have at least a very small capacitor connected at all times.

These three capacitor values (180pF, 330pF and 820pF) are the ones that we selected after testing. With the switch in the "up" position, the result is the stock value of 1n. The "down" position is 510pF (a bit of treble boost) and the center position is 180pF (a bit more treble boost).

SCHEMATIC


+9V
D1
1N5817
R28
100R
C20
100n
VA
C18
100uF
R26
56k
R27
27k
VB
C19
47uF
GND
IC1B
LM13700N
IC1_BUF1
LM13700N
IC1_BUF2
LM13700N
R3
470k
R4
10k
C3
1uF
R2
470k
C4
1uF
Q1
2N5088
R1
10k
C2
10n
C1
150pF
RPD
2M2
IN
C5
1uF
R5
10k
INPUT
100K
C6
2n2
R7
1k
R8
1k
R10
220k
R9
220k
C7
1uF
R6
1M
R11
1M
R12
15k
C8
10n
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1uF
IC1A
LM13700N
R13
150k
C10
180pF
C12
330pF
C11
820pF
TREBLE
R14
27k
SUSTAIN
500KC
R15
10k
C13
10n
Q2
2N5088
R16
10k
R17
1M
Q5
2N5088
R18
10k
250kC
ATTACK
R19
390k
Q3
2N5088
Q4
2N5088
D2
1N914
D3
1N914
C14
10uF
C15
10n
CX1
OMIT
R21
1M
R22
1k
R23
10k
Q6
2N5088
R24
10k
C16
100n
C17
1n
R25
10k
LEVEL
50KA
OUT

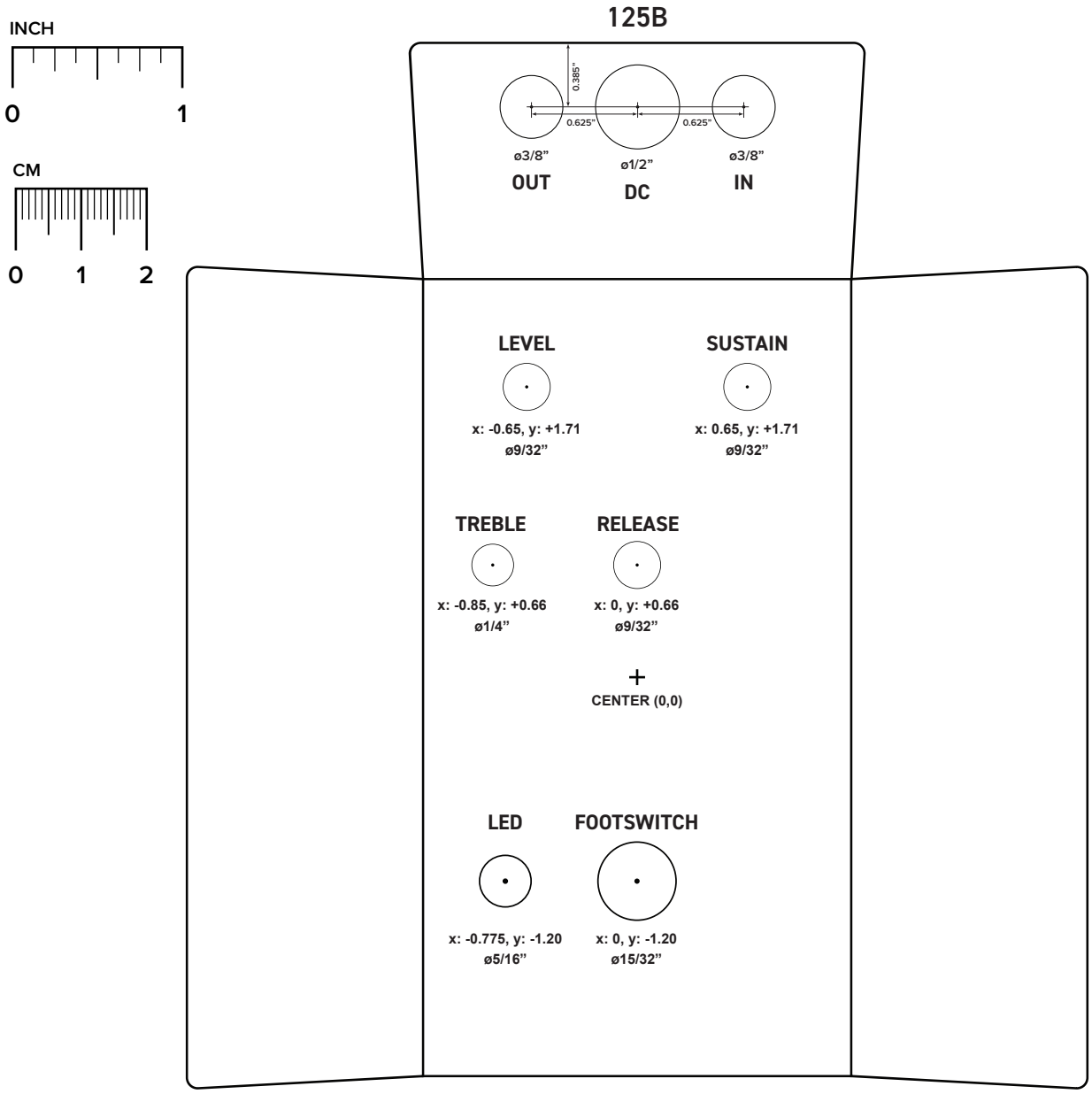
DRILL TEMPLATE

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.

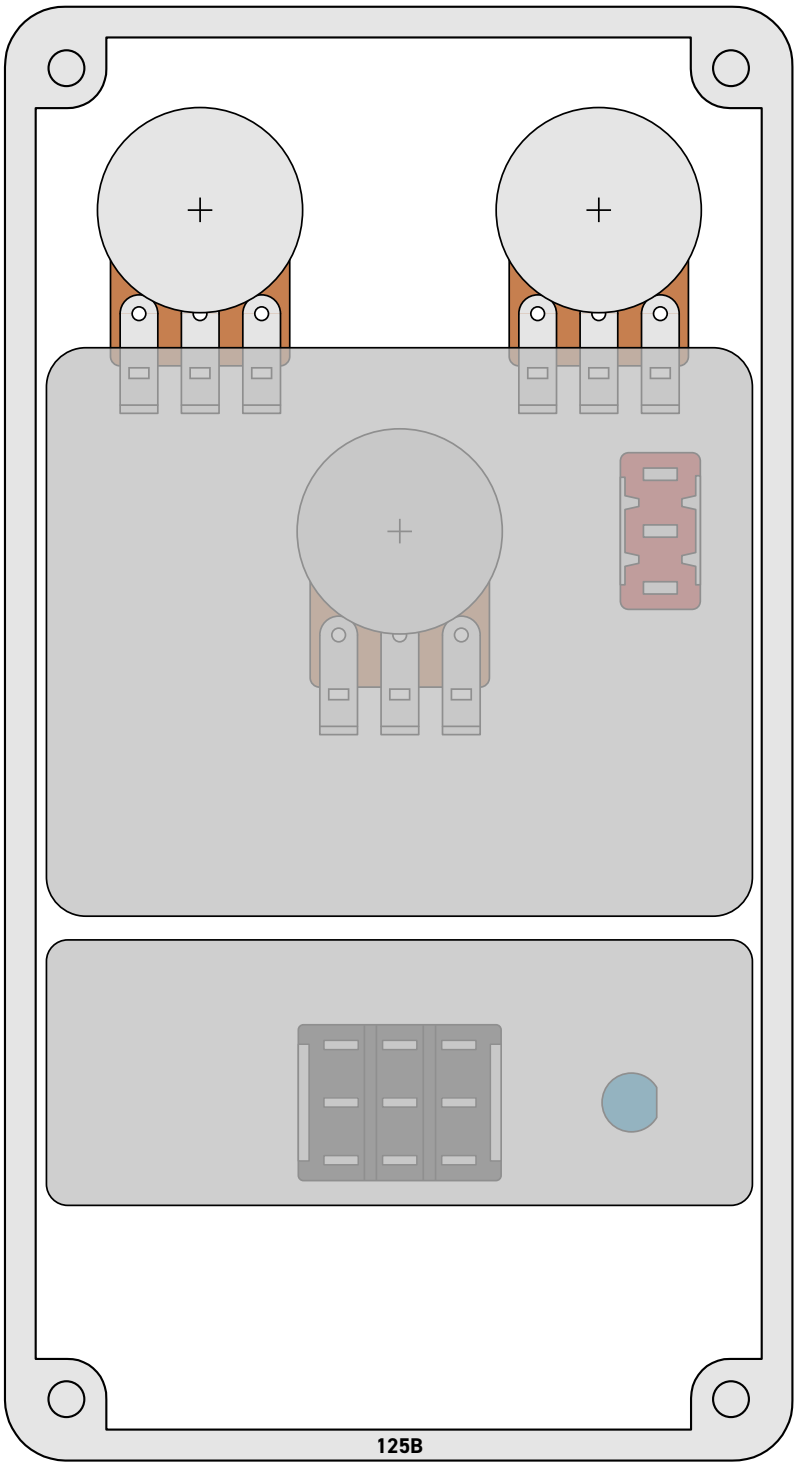
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

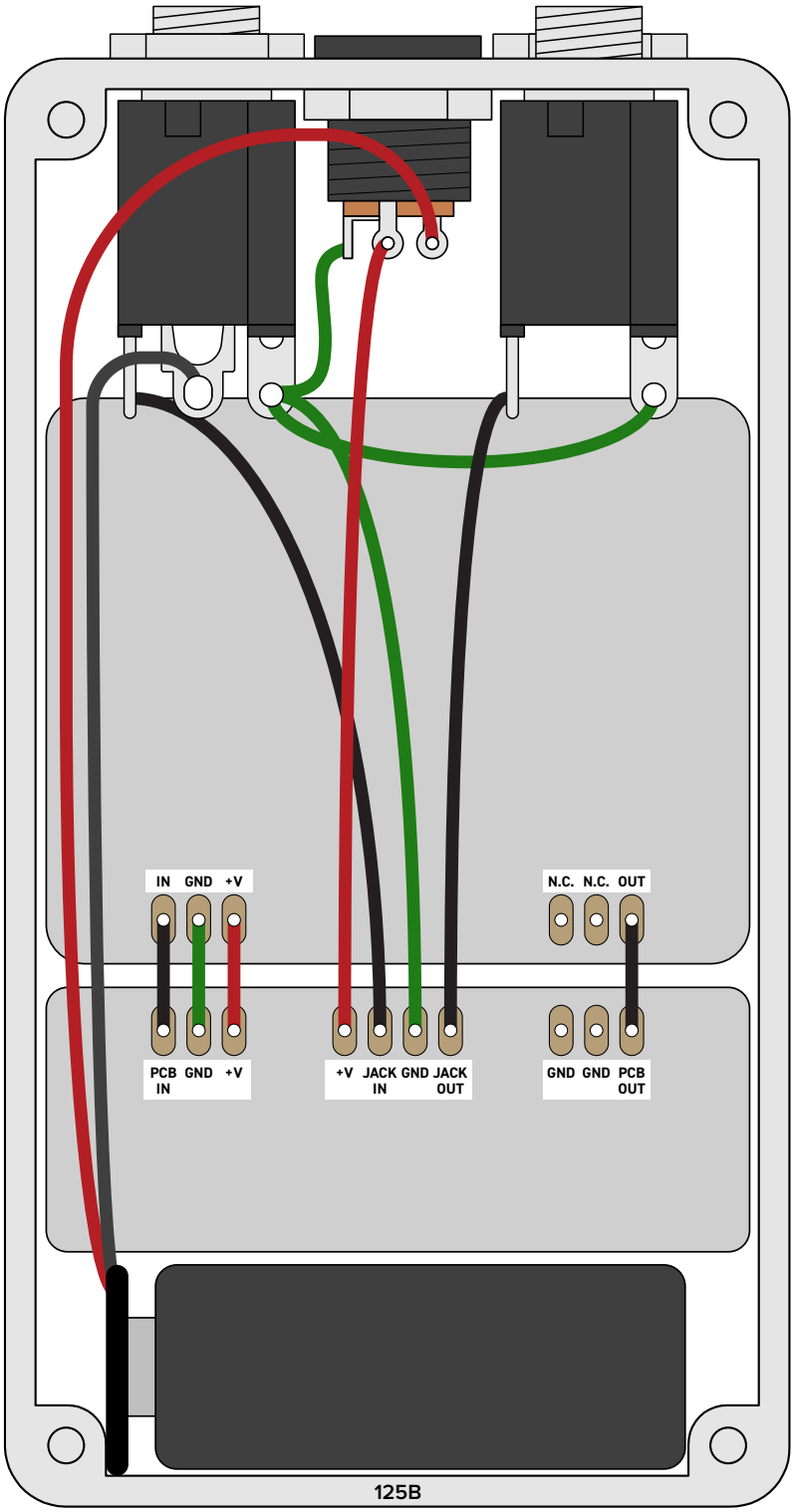


ENCLOSURE LAYOUT

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



WIRING DIAGRAM



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

1.1.0 (2023-12-06)

- Changed Release pot value to 250kC and merged R19 and R20 into a single 390k resistor for improved taper performance.
- Reversed the direction of the Input trimmer so that there is no attenuation at zero and the attenuation increases as it is turned up.
- Changed Level pot to audio taper (50kA).
- Changed LEDR to 10k (lower current).

1.0.1 (2020-12-17)
Added note about 150kC potentiometer availability.

1.0.0 (2018-07-04)
Initial release.