PROJECT NAME

TETHYS

aion DIY GUITAR EFFECTS

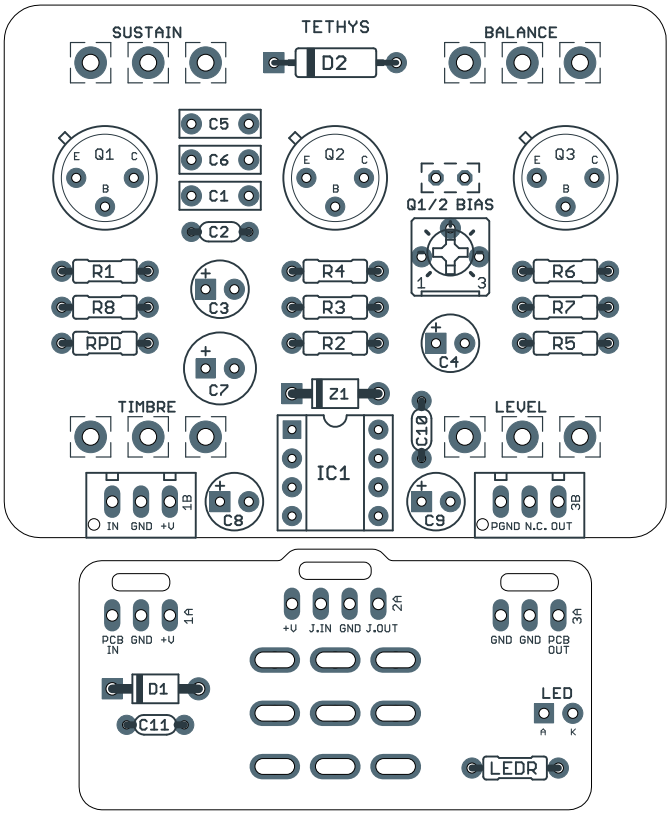
BASED ON
Baldwin-Burns Buzzaround

BUILD DIFFICULTY
▮▮▯▯▯ Easy

EFFECT TYPE
Germanium fuzz

DOCUMENT VERSION
1.0.0 (2023-03-23)

PROJECT SUMMARY
An early version of the Tone Bender Mk. III with a completely different voicing and transistor bias control, sold by the Baldwin-Burns company in London.



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

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INTRODUCTION

The Tethys Germanium Fuzz is an adaptation of the Baldwin-Burns Buzzaround, a germanium transistor fuzz first sold in 1966 and best known as Robert Fripp's fuzz of choice in the late 1960s.

The Buzzaround is very similar to the third version of the Tone Bender (3-knob, often called the Mk. 3) and for that reason it's often believed to have been a clone. However, the Buzzaround actually came earlier and the Mk. 3 was the derivative circuit, not releasing until 1967.

Despite persistent rumors that the Buzzaround was designed Gary Hurst (the inventor of the first two versions of the Tone Bender), it was discovered more recently that it was probably copied from an earlier effect called the Harmonic Generator from G. P. Electronics in Devon. No known examples of the Harmonic Generator survive to know for certain, but the control layout is the same and the advertising copy makes the similarities very clear.

The major difference between the Buzzaround and Tone Bender is the volume control, called Balance. This is actually a bias control on the third transistor and changes the tone throughout the travel, not just the signal level. Because of this, builders will generally add a true volume control in DIY Buzzaround implementations, which we've included here. You can use either of the controls or both in combination.

The two other notable differences from the Tone Bender Mk3 are in the gain and tone controls. The Buzzaround's gain control is set up as a voltage divider (inter-stage volume control) rather than a variable resistor as in the Tone Bender, and the tone control is also voiced differently. These changes along with the Balance control make it a very different pedal, even though at first glance the schematics appear almost identical.

USAGE

The Tethys has four controls:

- **Sustain** controls the amount of gain from the input stage that is sent to the third transistor where the clipping occurs. It's wired as a volume control, so unlike the Mk. III Tone Bender, it completely kills the signal at zero.
- **Tone** pans between two filters, with a treble emphasis on to the left and a bass emphasis to the right.
- **Balance** sets the bias of the last transistor, which affects the signal level. This is the only volume control on the original unit.
- **Volume** is the output volume of the effect. This is an addition to the original circuit and allows the signal to be leveled out without impacting the 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—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	100k	Metal film resistor, 1/4W	
R2	470k	Metal film resistor, 1/4W	
R3	1k	Metal film resistor, 1/4W	
R4	10k	Metal film resistor, 1/4W	
R5	3k3	Metal film resistor, 1/4W	
R6	15k	Metal film resistor, 1/4W	
R7	27k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
RPD	1M	Metal film resistor, 1/4W	Input pulldown resistor.
LEDR	10k	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	100pF	MLCC capacitor, NP0/C0G	
C3	4.7uF	Electrolytic capacitor, 4mm	
C4	4.7uF	Electrolytic capacitor, 4mm	
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	1n	Film capacitor, 7.2 x 2.5mm	
C7	100uF	Electrolytic capacitor, 6.3mm	
C8	10uF	Electrolytic capacitor, 5mm	
C9	47uF	Electrolytic capacitor, 5mm	
C10	470n	MLCC capacitor, X7R	
C11	100n	MLCC capacitor, X7R	
Z1	1N4742A	Zener diode, 12V, DO-41	
D1	1N5817	Schottky diode, DO-41	
D2	Germanium	Germanium diode, DO-07	Original uses 1N270, but part number isn't important. Just use any NOS germanium diode.
Q1	Germanium	Germanium transistor, PNP	Recommended to buy a selected set. See build notes.
Q1-S	TO-5 socket	Transistor socket, TO-5	
Q2	Germanium	Germanium transistor, PNP	Recommended to buy a selected set. See build notes.
Q2-S	TO-5 socket	Transistor socket, TO-5	
Q3	Germanium	Germanium transistor, PNP	Recommended to buy a selected set. See build notes.
Q3-S	TO-5 socket	Transistor socket, TO-5	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
IC1	TC1044SCPA	Voltage inverter, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
Q1-2B	50k trimmer	Trimmer, 10%, 1/4"	Bias trimmer for Q1 and Q2. See build notes.
SUSTAIN	100kB	16mm right-angle PCB mount pot	
TIMBRE	100kB	16mm right-angle PCB mount pot	
BALANCE	10kB	16mm right-angle PCB mount pot	
VOLUME	100kA	16mm right-angle PCB mount pot	
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

Transistor notes

For this circuit, as with many other vintage fuzzes, it's not so much the part number of the germanium transistor as it is the properties—specifically, gain (hFE) and leakage.

The Buzzaround is less finicky about transistors than the Tone Bender Mk. II, but still moreso than other germanium circuits like the Fuzz Face or Rangemaster. You can save a lot of time by just buying a matched set from Small Bear Electronics or eBay. You may not be able to find a Buzzaround set specifically, but you can look for a Mk. III set since the transistor specs are the same as a Buzzaround.

If you don't have access to pre-matched transistors or you just want to source your own, here's what to look for.

Characteristics

This is just a general guideline. There may be some transistors that meet these characteristics that won't sound right, and others that are outside this nominal range that will work just fine.

- **Q1:** hFE 50-100, low leakage (<100µA)
- **Q2:** hFE 50-100, low leakage (<100µA)
- **Q3:** hFE 90-120, medium leakage (100-300µA)

The characteristics of Q1 and Q2 are less important than Q3 due to their Darlington configuration. In fact, many people have even used low-gain silicons for Q1/2 with no reported change in tone, since this stage just boosts the signal and all the actual fuzz comes from overloading Q3.

Biasing

As a starting point, set the bias trimmers to around 9:00 (approximately 10k total resistance when combined with R3). Then, with a multimeter, touch the black and red leads to the pads marked "Q1/2 TEST", which is the shared collector of Q1/2. Rotate the trimmer until the multimeter reads **-3.5V**. This voltage may be positive if the test leads are reversed, but what's important is the absolute value.

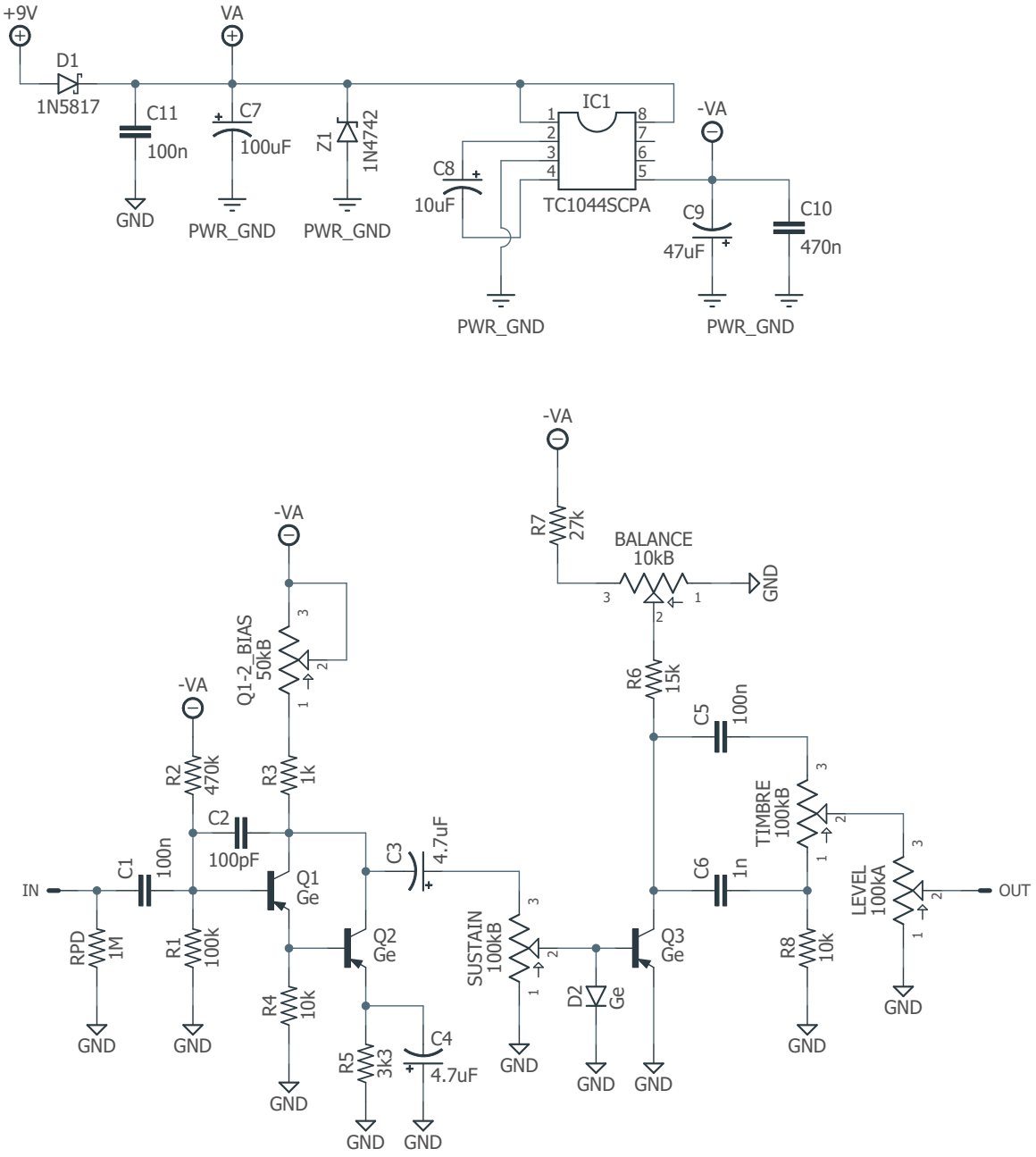
Then, with the black lead touching ground, touch each leg of both of the transistors and see how they line up with these target voltages.

- **Q1:** Collector -3.5V, Base -1.5V, Emitter -1.4V
- **Q2:** Collector -3.5V, Base -1.5V, Emitter -1.4V

The collector voltages are just a baseline. Anything from 3V to 7V will work fine and will sound roughly the same.

Q3 does not need to be biased since the Balance control works by biasing the transistor directly. However, if you do want to make some adjustments, set the Balance control to full (the loudest setting) and tweak the value of either R6 or R7 until it sounds the way you want.

SCHEMATIC


+9V
VA
D1
1N5817
C11
100n
C7
100uF
Z1
1N4742
GND
PWR_GND
PWR_GND
IC1
C8
10uF
TC1044SCPA
-VA
C9
47uF
C10
470n
PWR_GND
PWR_GND
-VA
R7
27k
BALANCE
10kB
GND
-VA
Q1-2 BIAS
50kB
R6
15k
C5
100n
-VA
R2
470k
R3
1k
C2
100pF
C3
4.7uF
TIMBRE
100kB
C1
100n
C6
1n
LEVEL
100kA
OUT
IN
Q1
Ge
Q2
Ge
Q3
Ge
RPD
1M
R1
100k
R4
10k
SUSTAIN
100kB
D2
Ge
R8
10k
GND
GND
GND
GND
GND
GND
GND
R5
3k3
C4
4.7uF
GND
GND
GND
GND

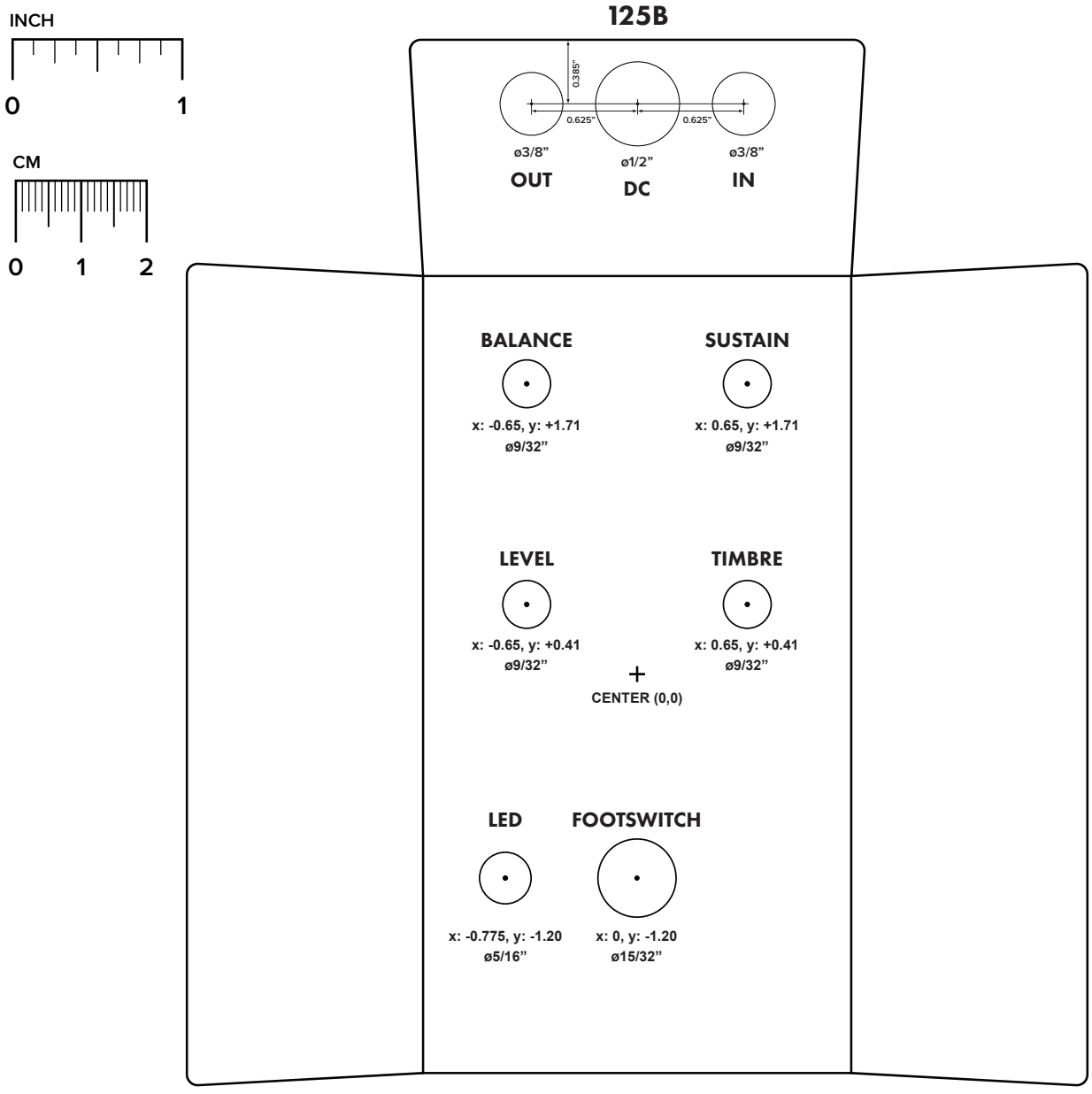
DRILL TEMPLATE

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.

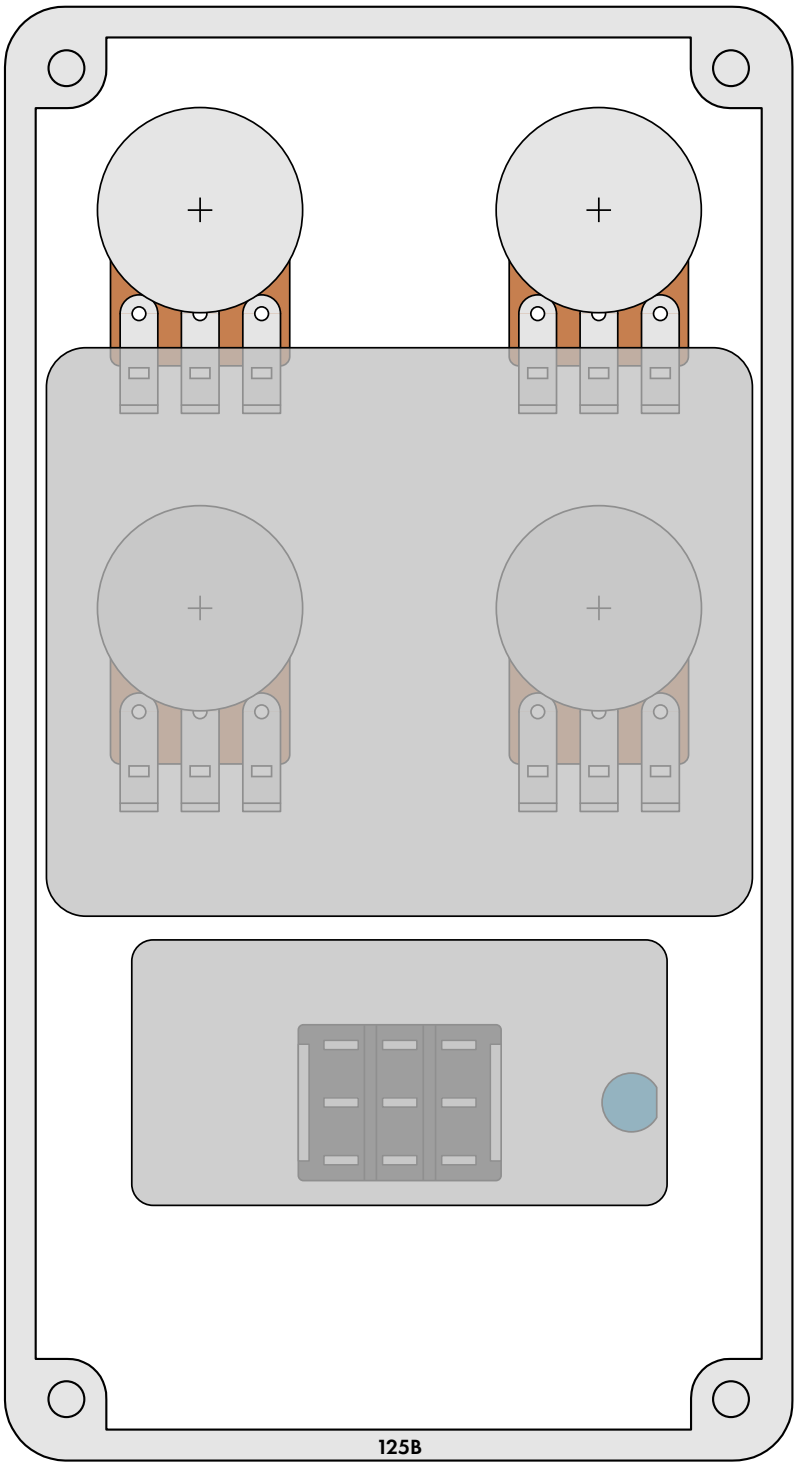
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

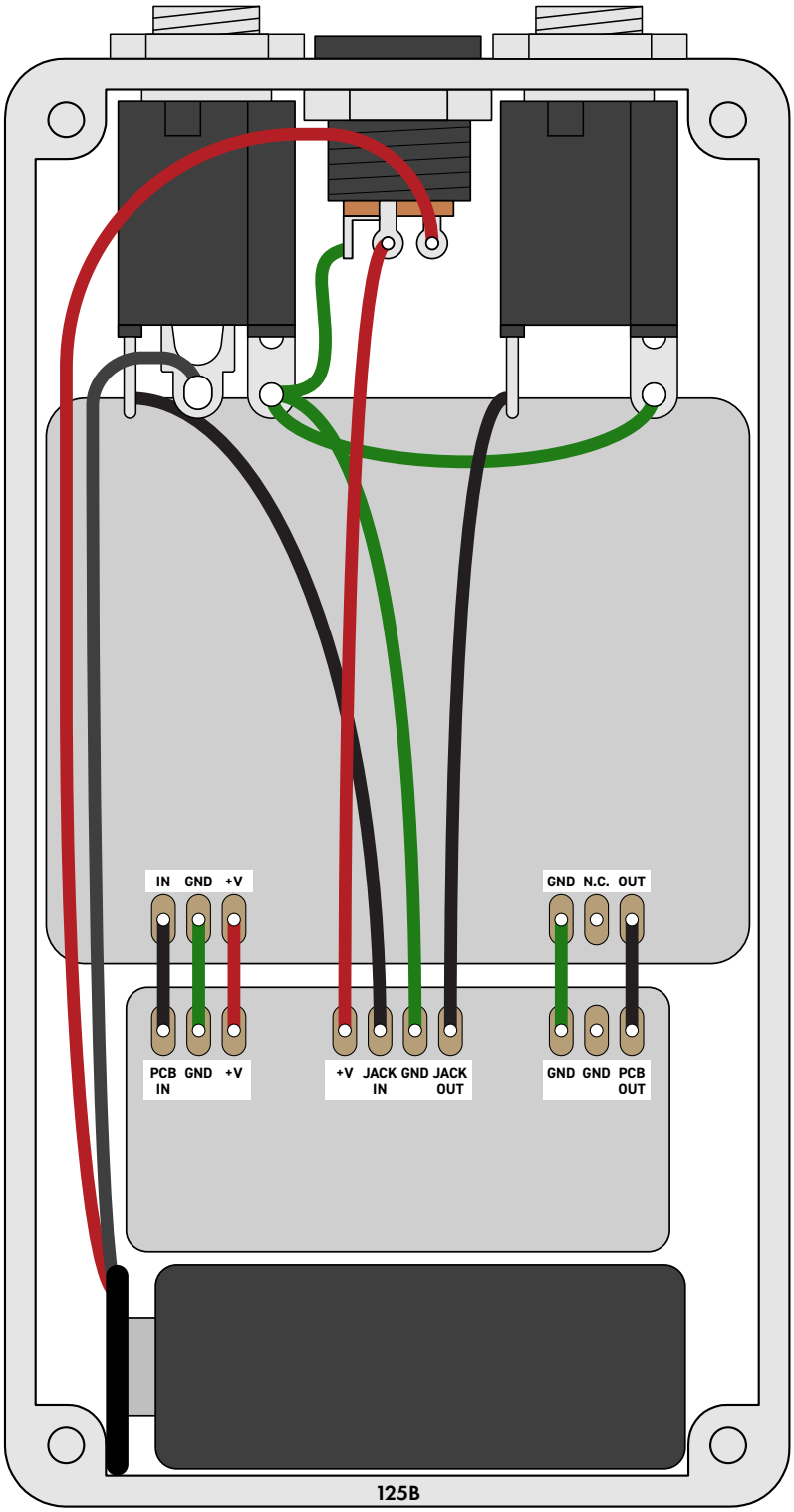


ENCLOSURE LAYOUT

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 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 (2023-03-24)
Initial release.