PROJECT NAME

ELITE

DIY GUITAR EFFECTS

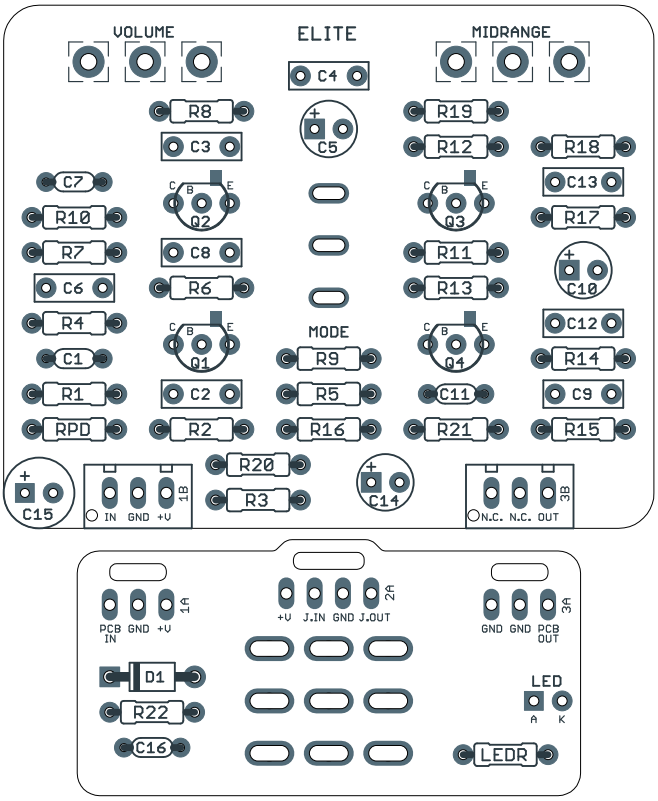
BASED ON
Fender® Elite/Clapton Preamp

BUILD DIFFICULTY
Easy

EFFECT TYPE
Clean boost & midrange boost

DOCUMENT VERSION
1.0.0 (2024-04-19)

PROJECT SUMMARY
A pedal conversion of the MDX mid-boost/preamp circuit originally developed for the Fender Elite Stratocaster in 1983, later redesigned for the Eric Clapton signature Strat.



Actual size is 2.3” x 1.86” (main board) and 2.3” x 0.91” (bypass board).

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INTRODUCTION

The Elite Boost/Preamp is based on the active preamp of the Fender Elite Stratocaster, originally produced from 1983-1985, often referred to by Fender as the "MDX" circuit. A modified version of the same circuit was used for both the Eric Clapton and Richie Sambora signature Stratocasters after the Elite went out of production.

The preamp circuit is divided into two halves, each with its own function. The first stage is a straight transistor boost that provides around +12dB of gain. In the original circuit, the guitar's volume knob is wired between the two halves of the circuit. This means that with the volume knob at full, the gain is boosted, and unity gain is found down around 7 or 8.

The second stage is a discrete op-amp topology using transistors, similar to those found in the BOSS BD-2 Blues Driver, OD-2 and OD-3. The gain is boosted and the highs and lows are cut, resulting in a midrange emphasis. A potentiometer at the output blends between the mid-boost stage (an additional +6dB on the Elite and +15dB on the Clapton variant) and the clean boost.

Our Elite Boost/Preamp project is a direct pedal conversion of the preamp circuit. You can build the original Elite version, which was most notably used by Ty Tabor in conjunction with the Lab Series L5 Preamp, or the later Clapton version.

In converting this circuit to a pedal, some of the characteristics are necessarily different, since it doesn't have the same type of direct interaction with the guitar's pickups. However, as long as it is connected directly to the guitar as the first pedal in the chain, it should perform pretty closely, with the main difference being the lack of an integrated volume knob for direct adjustment of the boost.

We have also developed a set of modifications that change the character and push the midrange frequency a bit higher, which some may find more useful now that it has been converted to pedal format. This is the column labeled "M" in the parts list, and is described further in the build notes.

USAGE

The Elite has two knobs and one toggle switch:

- **Volume** controls the amount of gain in the first transistor gain stage, before the midrange boost. This is equivalent to the volume knob on the guitars with the integrated preamp.
- **Midrange** blends between the clean boost and the fixed midrange boost.
- **Mode** (toggle switch) sets the gain of the first boost stage. It is frequency-dependent, so the two added boost modes will add low-end as well.

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 (C)	VALUE (E)	VALUE (M)	TYPE	NOTES
R1	464R	1k	1k	Metal film resistor, 1/4W	
R2	1M5	1M5	1M5	Metal film resistor, 1/4W	
R3	332k	332k	330k	Metal film resistor, 1/4W	
R4	21k5	46k4	47k	Metal film resistor, 1/4W	
R5	4k64	10k	10k	Metal film resistor, 1/4W	
R6	1k78	1k78	1k8	Metal film resistor, 1/4W	
R7	2k15	3k01	3k	Metal film resistor, 1/4W	
R8	3k32	(jumper)	(jumper)	Metal film resistor, 1/4W	
R9	332k	332k	220k	Metal film resistor, 1/4W	
R10	21k5	21k5	22k	Metal film resistor, 1/4W	
R11	(jumper)	21k5	22k	Metal film resistor, 1/4W	
R12	82k5	82k5	82k	Metal film resistor, 1/4W	
R13	100k	100k	47k	Metal film resistor, 1/4W	
R14	15k	46k4	10k	Metal film resistor, 1/4W	
R15	33k2	33k2	33k	Metal film resistor, 1/4W	
R16	46R4	46R4	47R	Metal film resistor, 1/4W	
R17	46k4	46k4	10k	Metal film resistor, 1/4W	
R18	46k4	46k4	68k	Metal film resistor, 1/4W	
R19	(omit)	(omit)	620k	Metal film resistor, 1/4W	
R20	133k	133k	133k	Metal film resistor, 1/4W	
R21	215k	215k	215k	Metal film resistor, 1/4W	
R22	100R	100R	100R	Metal film resistor, 1/4W	Power supply filter resistor.
RPD	2M2	2M2	2M2	Metal film resistor, 1/4W	Input pulldown resistor. Can be as low as 1M.
LEDR	10k	10k	10k	Metal film resistor, 1/4W	LED current-limiting resistor.
C1	330pF	120pF	120pF	MLCC capacitor, NP0/C0G	
C2	47n	15n	15n	Film capacitor, 7.2 x 2.5mm	
C3	6n8	6n8	6n8	Film capacitor, 7.2 x 2.5mm	
C4	68n	68n	68n	Film capacitor, 7.2 x 2.5mm	
C5	1uF	1uF	1uF	Electrolytic capacitor, 4mm	
C6	100n	100n	100n	Film capacitor, 7.2 x 2.5mm	
C7	120pF	(omit)	(omit)	MLCC capacitor, NP0/C0G	

PARTS LIST, CONT.

PART	VALUE (C)	VALUE (E)	VALUE (M)	TYPE	NOTES
C8	22n	22n	33n	Film capacitor, 7.2 x 2.5mm	
C9	1n	1n	1n8	Film capacitor, 7.2 x 2.5mm	
C10	10uF	10uF	10uF	Electrolytic capacitor, 5mm	
C11	10pF	10pF	10pF	MLCC capacitor, NP0/C0G	
C12	100n	100n	82n	Film capacitor, 7.2 x 2.5mm	
C13	1n	1n	820pF	Film capacitor, 7.2 x 2.5mm	Mod value is MLCC, not film.
C14	47uF	47uF	47uF	Electrolytic capacitor, 5mm	
C15	100uF	100uF	100uF	Electrolytic capacitor, 6.3mm	
C16	100n	100n	100n	MLCC capacitor, X7R	
D1	1N5817	1N5817	1N5817	Fast-switching diode, DO-35	
Q1	MPSA18	MPSA18	MPSA18	Fast-switching diode, DO-35	
Q2	MPSA18	MPSA18	MPSA18	LED, 5mm, red diffused	
Q3	MPSA18	MPSA18	MPSA18	LED, 5mm, red diffused	
Q4	2N5087	2N5087	2N5087	JFET, N-channel, TO-92	
MIDRANGE	250kB	50kB	100kB	16mm right-angle PCB mount pot	
VOLUME	50kA	50kA	50kA	16mm right-angle PCB mount pot	
MODE	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	Lumberg NEB/J 21 C or equivalent.
BATT	Battery snap			9V battery snap	Optional. Use the soft plastic type.
FSW	3PDT			Stomp switch, 3PDT	Available from Aion FX.
ENC	125B			Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

BUILD NOTES

Version differences

All versions of the preamp share the input boost section, which is generally the same across each version except for a bit more low-end in the Clapton. From there, the midrange section differs significantly between the Elite and Clapton. Both versions were designed to make the most of the pickups that they were paired with in their respective guitars.

Elite pickups & mid-boost circuit

The Elite had a unique single-coil AlNiCo II pickups without visible pole pieces, similar in appearance to Lace Sensors but actually predating them by two years. They were wound a little hotter than typical Strat pickups, around 7.2 to 7.5k, and potted in solid resin, but otherwise seem to be fairly standard pickups internally.

Contrary to persistent rumors, the Elite pickups are not related to Lace Sensors in anything but appearance. Don Lace used a patented "micro comb" method as an alternative to traditional bobbins, and because of this, Lace pickups are largely noiseless. Elite pickups utilized a dummy pickup underneath the pickguard that acted as a parallel coil for hum-canceling in all positions.

The Elite mid-boost circuit adds around 6dB of boost centered at 300 Hz. The original goal of the mid-boost was to make the single-coil pickups sound like humbuckers, which is the reason that it doesn't have much gain—they weren't thinking of the midrange portion as a boost, just as a frequency compensation, and it does that job suitably enough.

Clapton pickups & mid-boost circuit

The original Clapton Strat was released in 1988. Fender's original prototype was very close to the Elite, but over the course of the three-year development cycle, Eric made enough changes that it became its own model with very little in common the Elite.

The pickups were changed to Lace Sensor Gold pickups, which were brand new at the time. The dummy coil was removed since Lace pickups are nearly noiseless. In 2001, the pickups were changed to Vintage Noiseless, which are still being used today.

He did want to keep the active mid-boost circuit, but asked for more gain from it, so Fender revised the circuit to give it around 10dB of extra boost to the midrange compared to the Elite. (It is often called a +27dB mid-boost circuit, and it's true that the total boost is around 27dB, but this includes the clean boost in the first stage.)

They also re-voiced the tone of the circuit, so all told, the Clapton version adds around 15dB of boost with a very broad Q factor, with peak gain spanning from 100 to 600 Hz.

Aion FX modded values

In developing this project, it was clear that the circuit would have some limitations when used as a pedal. The Elite version was too subtle and the Clapton version was too extreme. So, we played around in LTSpice until we had a circuit that was more versatile.

Our version is similar to the Elite characteristics, but with more of it. The midrange peak has been

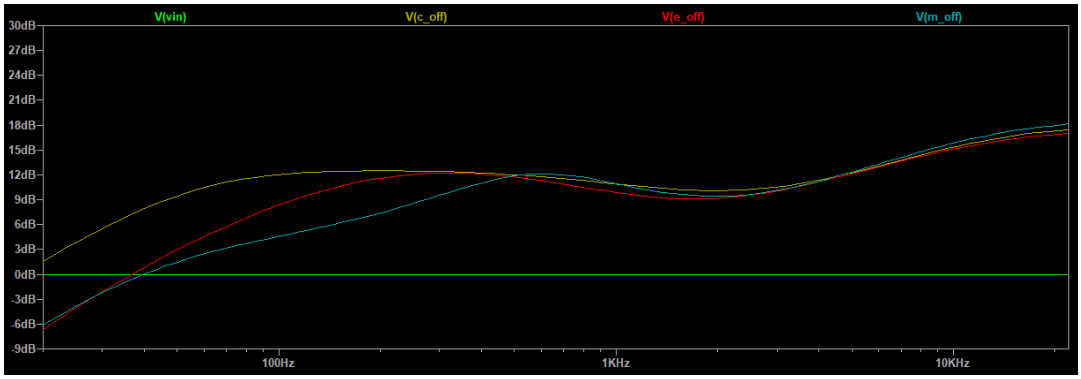
shifted upwards to around 600 Hz, and the low-mids have been reduced slightly to cut back on muddiness. It's a little lighter but more articulate, and the midrange knob actually impacts the midrange frequencies directly instead of just being a second boost control with slightly reduced top-end.

These modded values can be found in the "M" column of the parts list, and is shown in the third schematic later on. There is also a separate tab in the Mouser parts spreadsheet called "Mod Parts List".

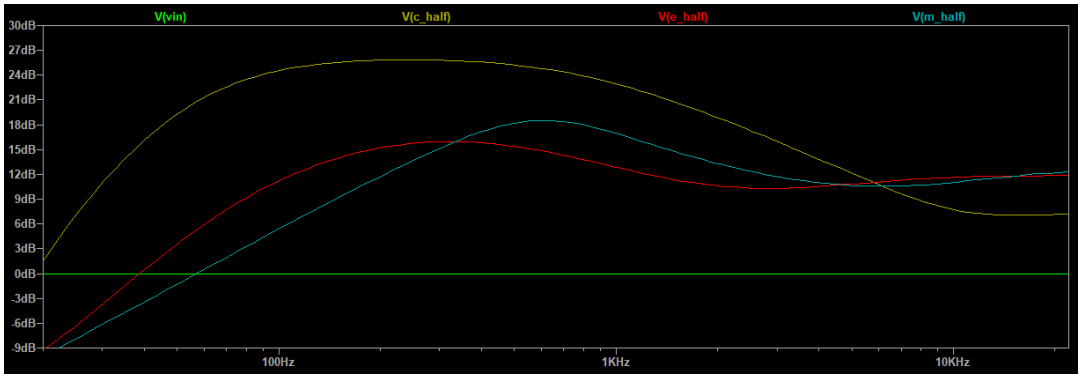
EQ comparison

To help visualize the difference between the three versions of the circuit, we plotted them in LTSpice, showing three positions of the Midrange knob: off (input boost only), halfway up, and full. The gold line is the Clapton circuit, red is Elite, and teal is our modded version.

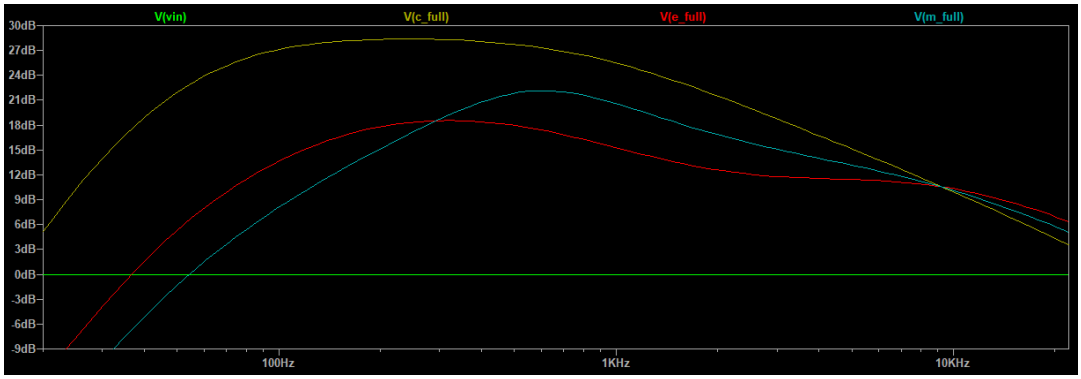
MID-BOOST OFF



MID-BOOST 50%



MID-BOOST FULL



As you can see, there's not a huge difference between 50% and full for any of the three circuits. Substituting a reverse-audio (C) taper pot for the Midrange control would probably make it smoother, though we have not tried this ourselves.

Modifying the tone

We spent a long time experimenting with modifications for the circuit, so we wanted to share some of our experience with this if you want to do the same.

The circuit seems simple enough, as we described it earlier: a clean boost followed by a fixed-gain midrange boost, with a potentiometer to balance between the output of the midrange circuit and just the boost by itself.

However, once you begin tweaking, you'll find it's a lot more complicated than that. The Midrange potentiometer is not just a blend—it also acts as a sort of global feedback path back to the input, which has a big impact on the overall EQ curve of the circuit. In order to adjust the center frequency or gain, you have to do a lot more than just change a couple of capacitors like you would in a more basic circuit.

There is a careful balancing act between the gain of the mid-boost stage and the value of the blend potentiometer that determines the actual sonic characteristics of the circuit, and if you're not careful you will end up with a huge spike in a very narrow frequency band.

The R19 resistor has been added to help with this, adapted from the Fender Deluxe Powerhouse Stratocaster. This was a MIM model produced from 1998 through 2008, and it had a lot in common with the Elite, including the return of the hum-canceling dummy pickup underneath the pickguard.

The active midrange circuit was scaled back from the extremes of the Clapton model, but it still had significantly more gain than the original Elite. They accomplished this very efficiently by using the stock Clapton mid-boost PCB and just adding a resistor to ground on the midrange pot to cut the signal level. It didn't take long for word to spread among owners that they could restore the full Clapton boost by simply cutting out the resistor.

During testing, we found that 620k was just right for our mods. But as with the value of the pot itself, everything in the circuit is a very careful balancing act, and any changes to the EQ or gain will typically involve changes to the pot value as well as this resistor.

Mode switch

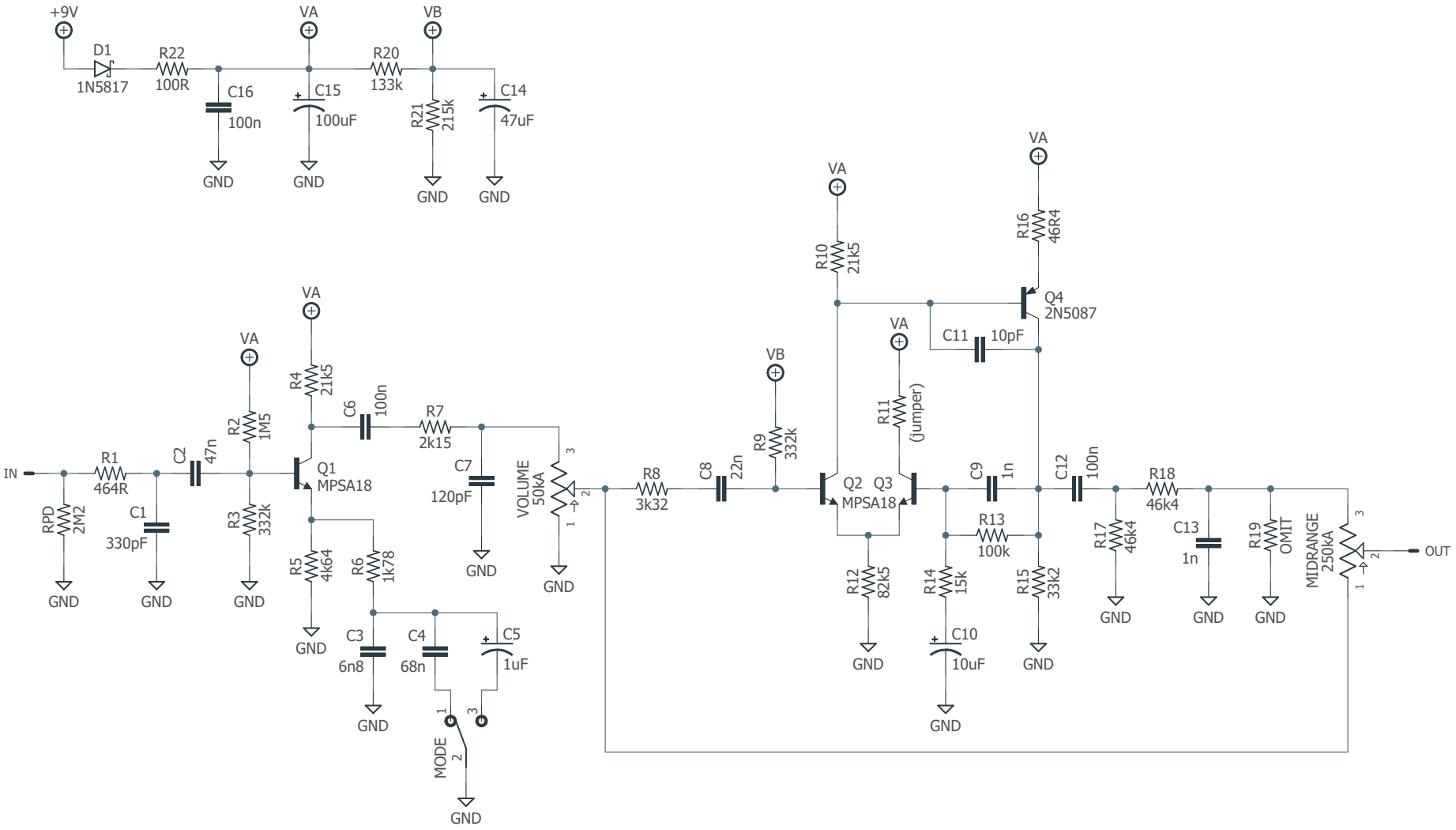
For the pedal adaptation, we added a 3-position mode switch that increases the gain and low-end of the clean boost stage. The stock position is in the center, and the other two positions increase the value of the source bypass capacitor. 68n (C4) and 1uF (C5) were good values for the two added positions in our testing, but you can tweak these values to your own preference.

Resistor values

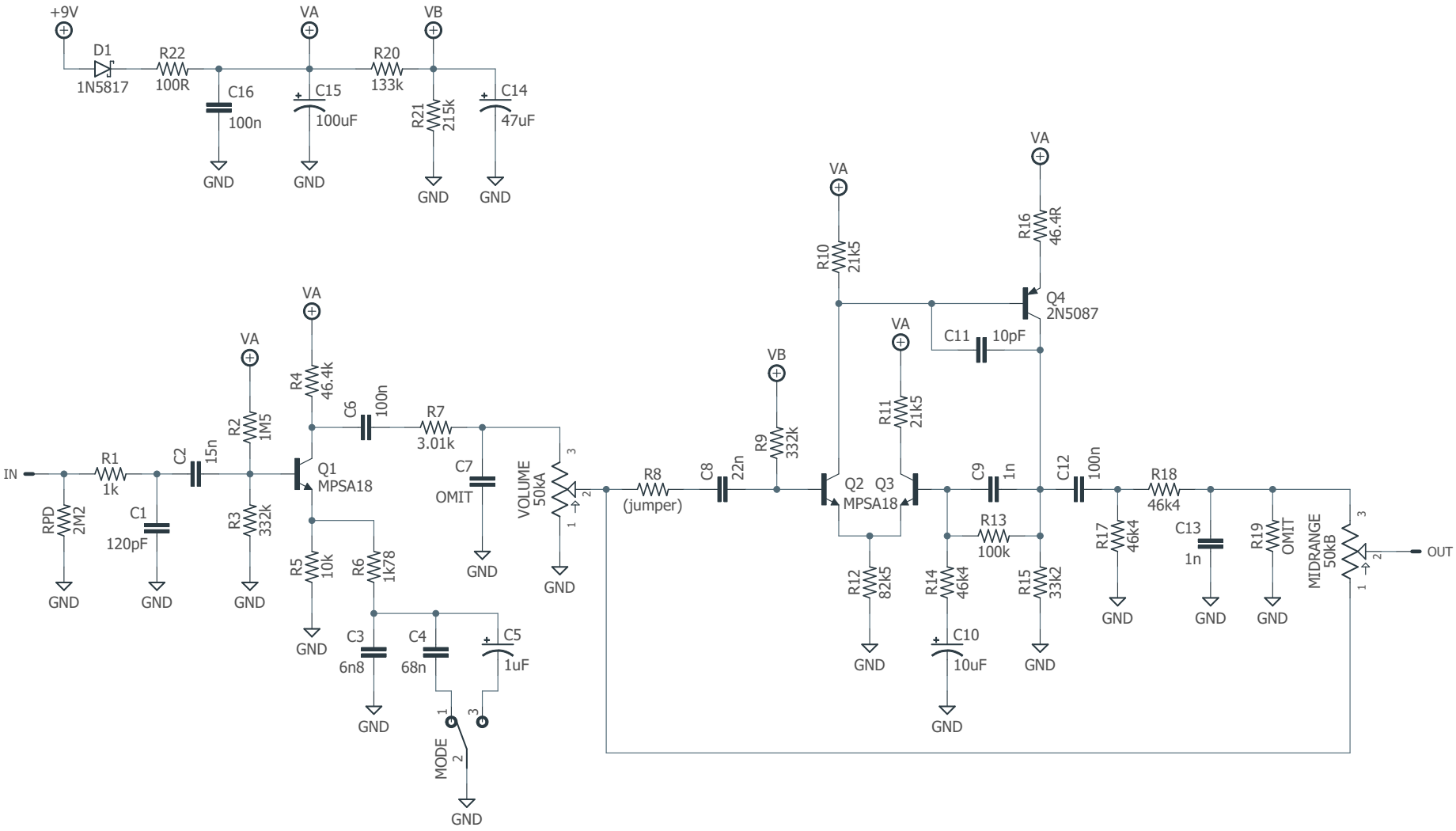
The Elite and Clapton circuits use high-precision E96 resistor values such as 3.32k and 46.4k rather than the more common E12 values that we see in most other circuit designs. For this project, we've kept all of these parts the same in the default parts list, and if you're using our Mouser parts list to order parts, you may as well stick with the original values since they all cost the same.

But, if you're building one with parts on hand already, the nearest E12 value will perform the same at any position in the circuit. For example, you can substitute 22k for 21.5k, or 330k for 332k.

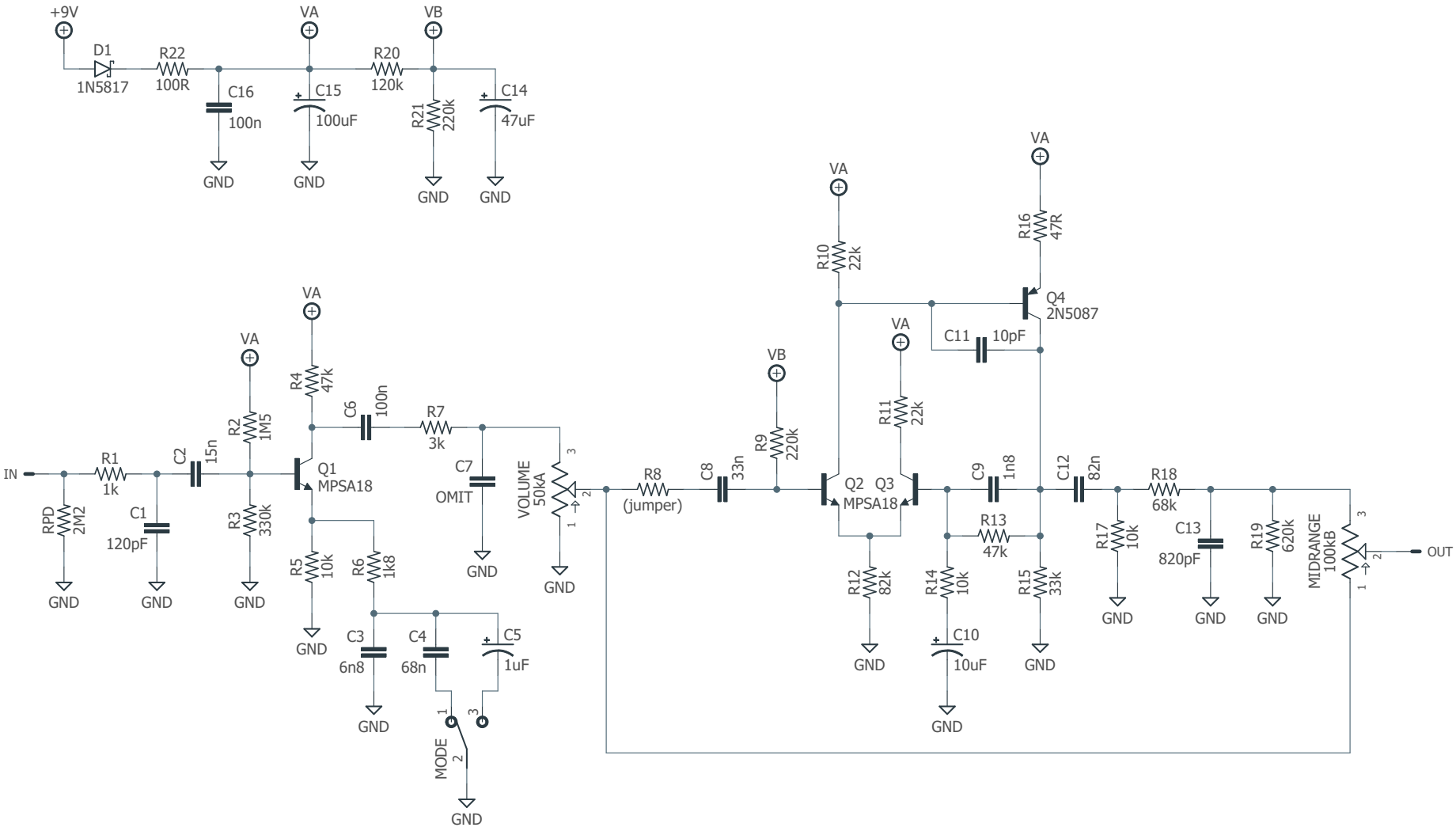
SCHEMATIC (CLAPTON)



SCHEMATIC (ELITE)



SCHEMATIC (MOD)



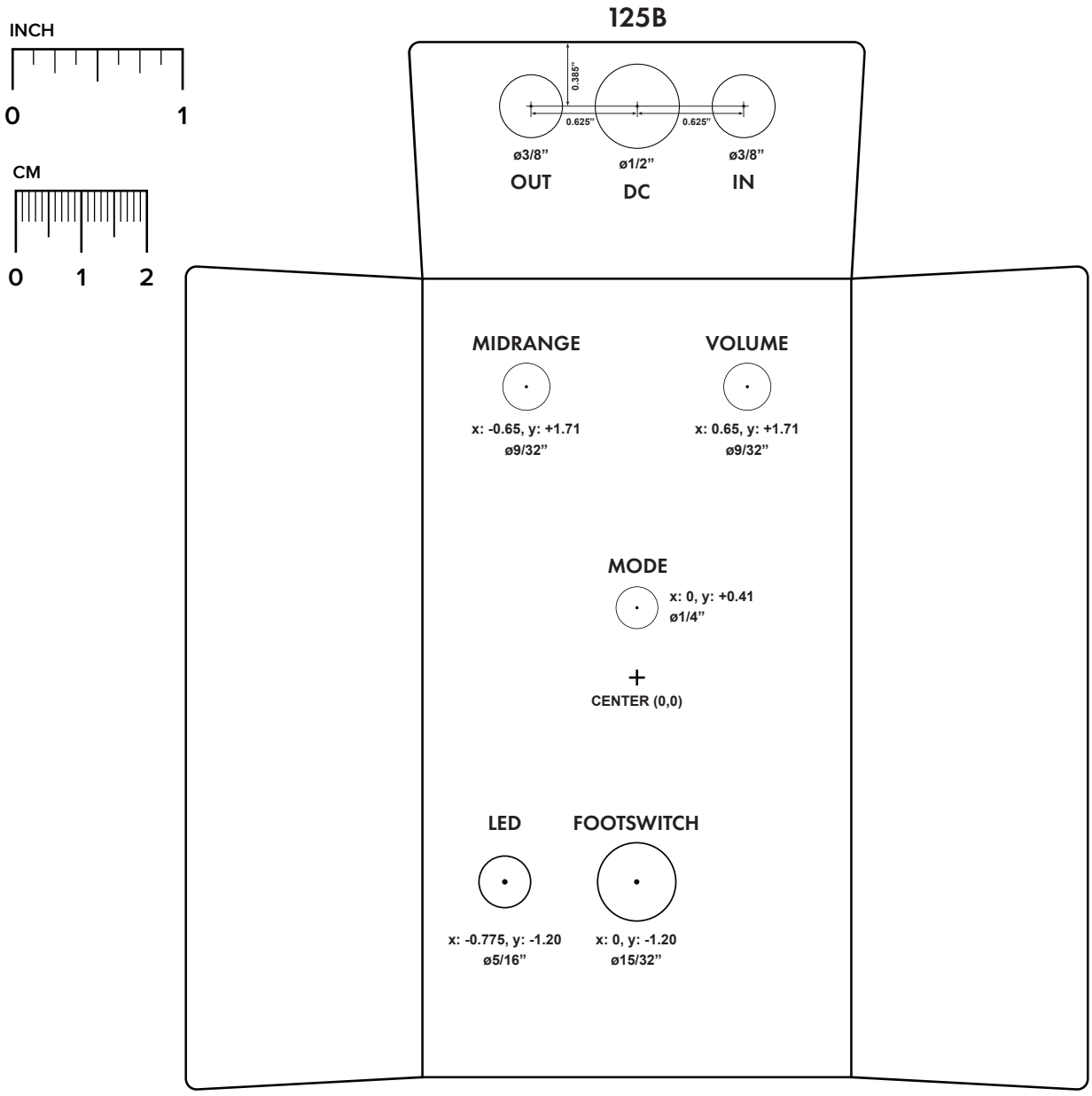
DRILL TEMPLATE

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.

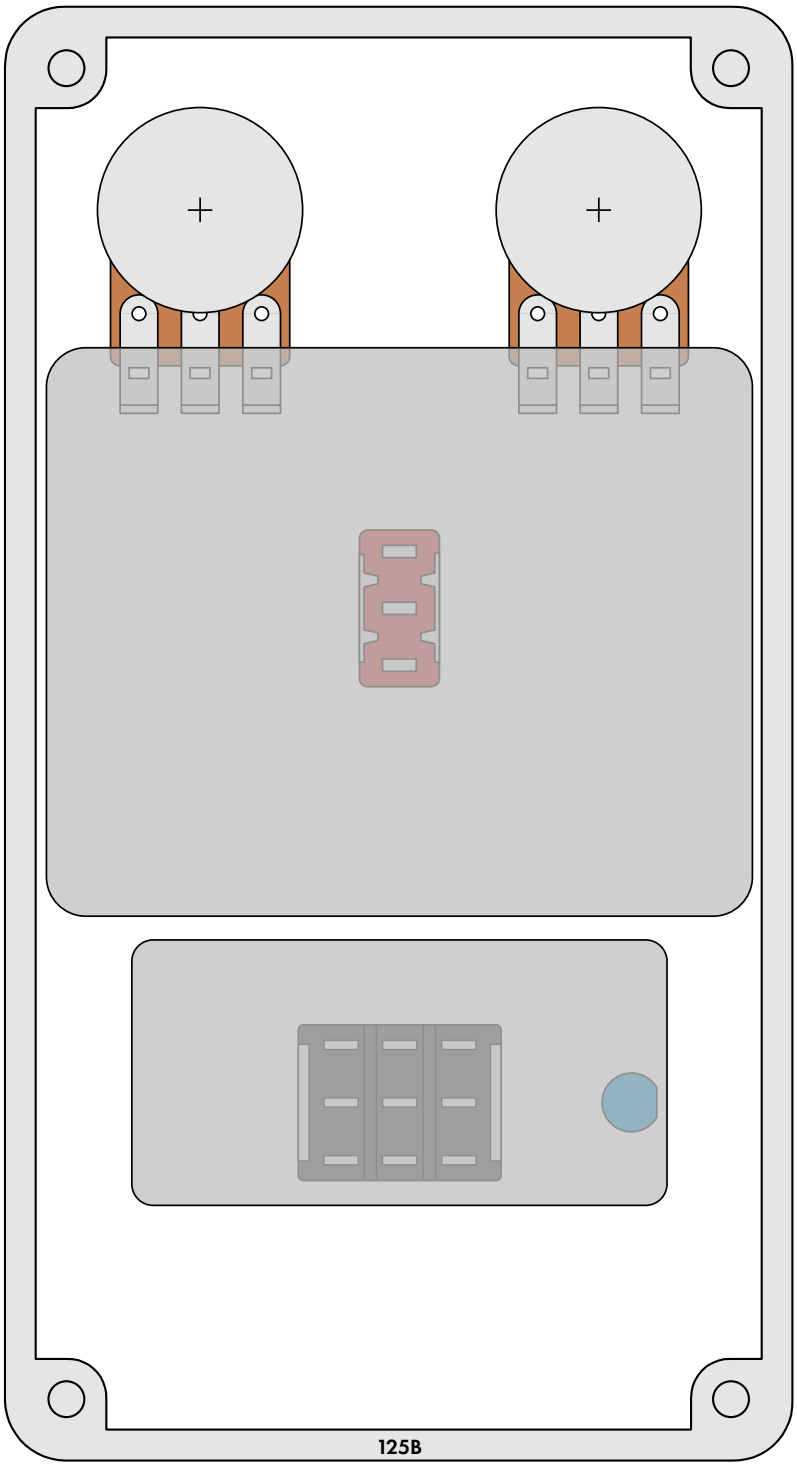
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

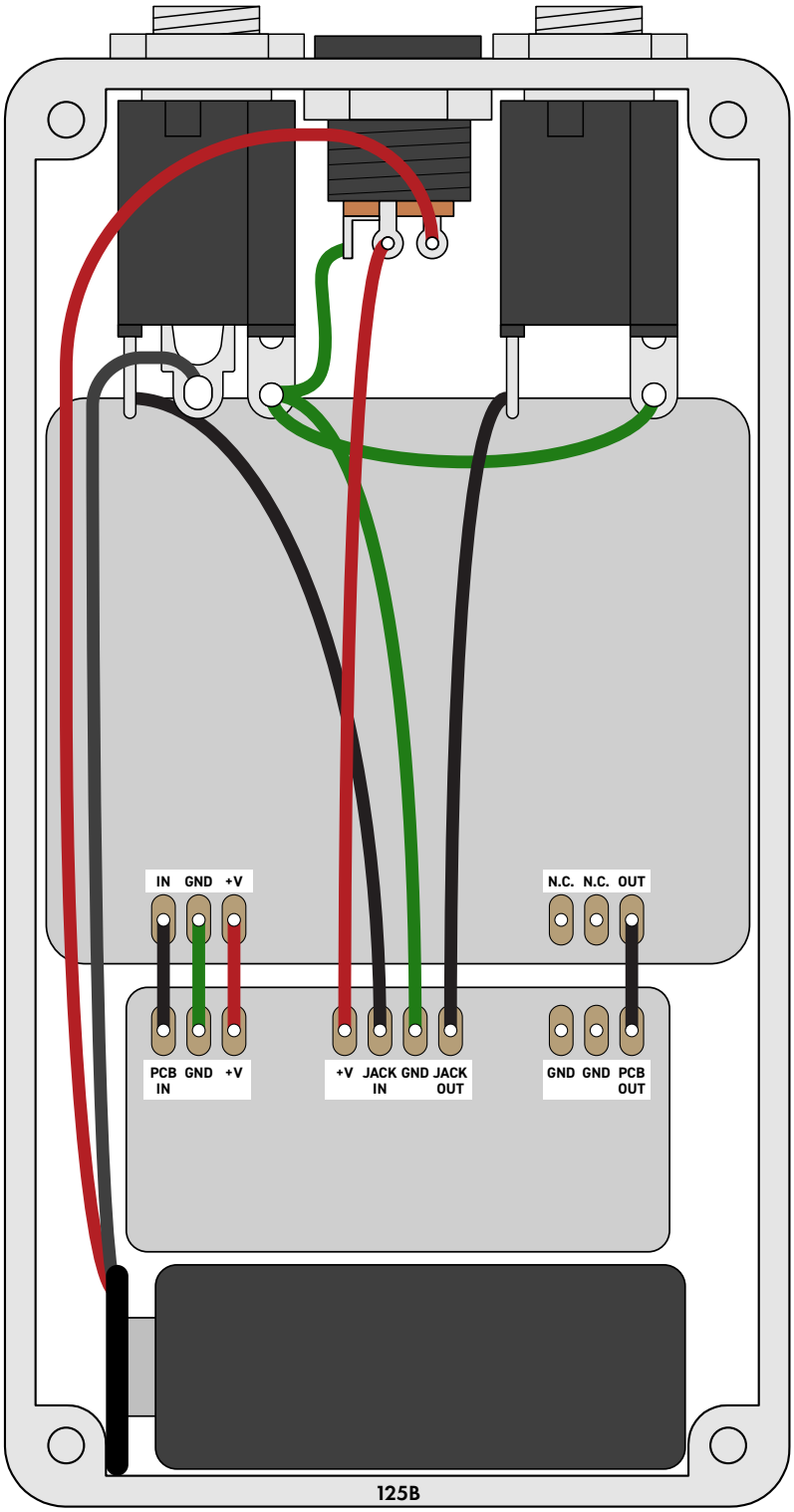


ENCLOSURE LAYOUT

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 (2024-04-19)
Initial release.