PROJECT NAME

# OBELISK

aion DIY GUITAR EFFECTS

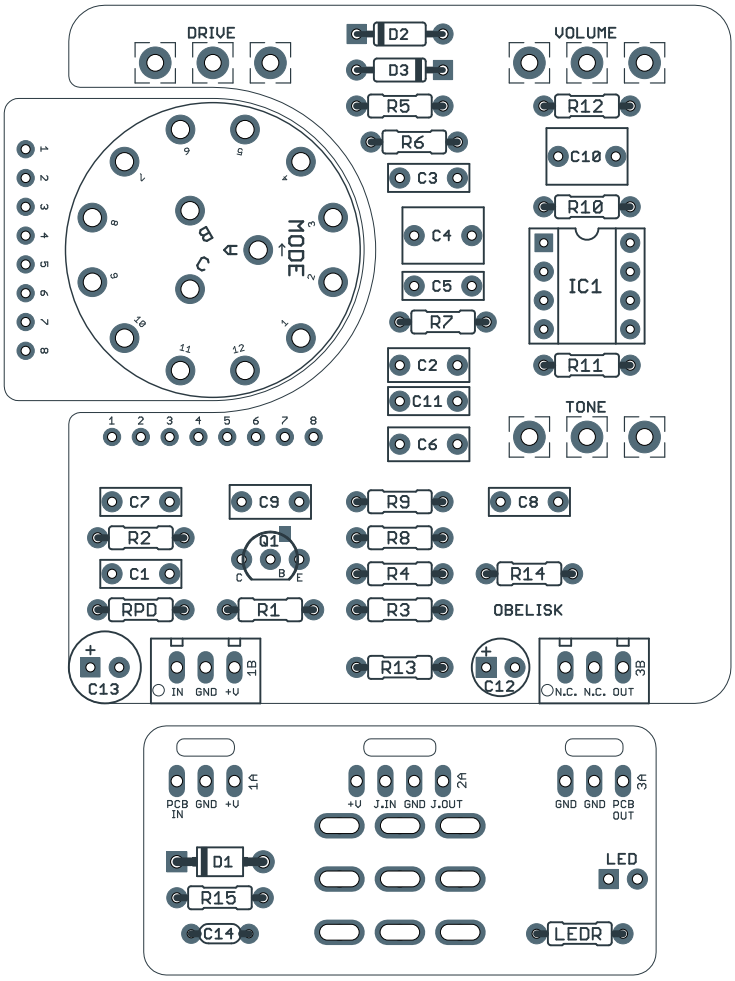
**BASED ON**
Lovetone® Brown Source

**BUILD DIFFICULTY**
Intermediate

**EFFECT TYPE**
Overdrive

**DOCUMENT VERSION**
1.0.3 (2021-08-02)

**PROJECT SUMMARY**
An op-amp overdrive voiced to achieve the legendary “brown sound” tone of the 1960s and 70s, notably used by James Hetfield, Kirk Hammett and Johnny Marr among others.




*Actual size is 2.3” x 2.42” (main board), 1.78” x 0.87” (bypass board), and 1.05” x 1.23” (rotary switch daughterboard).*

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# INTRODUCTION

The Obelisk Vintage Drive is an adaptation of the Lovetone Brown Source, a distortion/overdrive pedal that was first released in 1995, and which also forms the second half of the Cheese Source dual pedal that came later in 1999.

The Brown Source was intended to capture the “brown sound” guitar tone tones from the 1960s and 70s. At first glance it’s a fairly simple diode clipper, but as usual it has a generous dose of Lovetone’s secret sauce for tone-shaping.

As in other Lovetone circuits, it uses a 4-position rotary control for three different parameters: tone control frequency, tonestack bypass, and a treble cut at the end of the circuit that “warms up” the tone and provides a midrange emphasis.

While each of these parameters could be given their own toggle, we found that there were not really any useful sounds to be had in these extra modes and it really worked best with just the four positions of the original. A daughterboard for the rotary switch is included for easy wiring.


Special thanks to Ian (LaceSensor / Gigahearts FX), the DIY community’s resident Lovetone expert, for help verifying the Obelisk prototype against an original Brown Source for accuracy.


# USAGE

The Obelisk has three controls and one rotary switch:

- **Drive** controls the amount of gain in the op-amp soft clipping stage.
- **Tone** is similar to a Big Muff tone control, panning between a bass emphasis on one side and a treble emphasis in the other direction.
- **Volume** is the output volume of the effect.
- **Mode** is a rotary switch that selects between four different tone modes: Off (tone bypass), and 1 through 3 which change the high-end response of the tone control.

# 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 | 1M2 | Metal film resistor, 1/4W | |
| R2 | 1M2 | Metal film resistor, 1/4W | |
| R3 | 3k9 | Metal film resistor, 1/4W | |
| R4 | 220R | Metal film resistor, 1/4W | |
| R5 | 1k | Metal film resistor, 1/4W | |
| R6 | JUMPER | | Early version uses 1k. See build notes. |
| R7 | 3k9 | Metal film resistor, 1/4W | |
| R8 | 3k9 | Metal film resistor, 1/4W | |
| R9 | 1M2 | Metal film resistor, 1/4W | Early version uses 330k. See build notes. |
| R10 | 22k | Metal film resistor, 1/4W | Early version uses 18k. See build notes. |
| R11 | 3k9 | Metal film resistor, 1/4W | |
| R12 | 220R | Metal film resistor, 1/4W | |
| R13 | 22k | Metal film resistor, 1/4W | |
| R14 | 22k | Metal film resistor, 1/4W | |
| R15 | 100R | Metal film resistor, 1/4W | Power supply filter resistor. |
| LEDR | 4k7 | Metal film resistor, 1/4W | LED current-limiting resistor. Adjust value to change LED brightness. |
| RPD | 2M2 | Metal film resistor, 1/4W | Input pulldown resistor. Can be as low as 1M. |
| C1 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C2 | 470n | Film capacitor, 7.2 x 3mm | |
| C3 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C4 | 2.2uF | Film capacitor, 7.2 x 5mm | Can also use 1uF with no change in tone. |
| C5 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C6 | 220n | Film capacitor, 7.2 x 2.5mm | |
| C7 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C8 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C9 | 220n | Film capacitor, 7.2 x 2.5mm | |
| C10 | 2.2uF | Film capacitor, 7.2 x 5mm | Can also use 1uF with no change in tone. |
| C11 | 33n | Film capacitor, 7.2 x 2.5mm | |
| C12 | 47uF | Electrolytic capacitor, 5mm | Reference voltage filter capacitor. |
| C13 | 100uF | Electrolytic capacitor, 6.3mm | Power supply filter capacitor. |

# PARTS LIST, CONT.

| PART | VALUE | TYPE | NOTES |
|---|---|---|---|
| C14 | 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 | |
| Q1 | BC549C | BJT transistor, NPN, TO-92 | |
| IC1 | TL072 | Operational amplifier, DIP8 | |
| IC1-S | DIP8 socket | IC socket, DIP-8 | |
| DRIVE | 25kB | 16mm right-angle PCB mount pot | Can substitute 50kB or 100kB for more available drive. |
| TONE | 100kB | 16mm right-angle PCB mount pot | |
| VOL. | 10kA | 16mm right-angle PCB mount pot | |
| MODE | 3P4T rotary | Rotary switch, 3 pole / 4 position | Must be Alpha SR2612F. See parts spreadsheet (2nd tab) for sources. |
| LED | 5mm | LED, 5mm, red diffused | |
| 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

## Rotary switch selection

The rotary switch sub-PCB is designed for the Alpha SR2612F 3P4T PCB-mount rotary switch. We are not aware of any other brands with this form factor, so there are no substitutes. It's available from Mouser, Small Bear, Tayda and several more. See the parts list spreadsheet (2nd tab) for links.

## Rotary switch orientation

The silkscreen of the initial release of the Obelisk mistakenly shows the rotary switch oriented with the "A" pole pointing up. It should instead be rotated 120 degrees so the "B" pole is pointing up. Each of the three poles is identical, so it makes no electronic difference which way it's positioned, but this way it keeps the black standoffs from pressing against the side of the enclosure since it's already a tight fit.

If you follow the drill template including the anti-rotation pin, there's only one way to install it—but just be aware of the discrepancy that on the earliest PCBs the rotary won't line up with the "A-B-C" notation on the daughterboard. This will be corrected in the next restock.

## Soldering the rotary switch

The drill template includes holes for the anti-rotation pins. Precise drilling is needed in order for the anti-rotation pins to work. If you need to drill the hole a size larger because it's slightly out of alignment, then it loses its anti-rotation function.

The rotary switch has a daughterboard that snaps off the main board. It's recommended to solder this in place once the main PCB has been installed into the enclosure. This way, everything will be at the correct height and will not cause any stress to the joints after everything is together. Think of it as a PCB-mounted pot that requires some assembly.

When soldered to the rotary switch, the pads on the daughterboard should line up perfectly with the pads on the main PCB if the drilling is precise. However, be aware that there is not a lot of clearance between the top PCB and bottom PCB.

The easiest method for connecting the sub-PCB to the main PCB is via 0.1" snap-apart wire headers. Solder the header to the main PCB first, then thread the daughterboard through the pins and down onto the rotary switch. Solder the daughterboard to the rotary pins, then solder the pins of the header.

Be careful—this will be extremely difficult to desolder if you make any mistakes!

Alternately, you can add another 3/8" hex nut (e.g. from 1/4" jack) on the inside of the rotary switch to mount it higher inside the enclosure. You will lose the use of the anti-rotation pin, so it's possible that the rotary switch can come loose over time due to the rotational force, but it gives enough space to run flexible wires between the main board and daughterboard in case they are slightly out of alignment.

## Trimming the rotary shaft

You will likely need to cut the shaft of the rotary switch by around 0.4" to match the height of the potentiometer shaft so the knobs sit at the same level.

A rotary tool cutoff wheel works great, but you can do it with normal snippers as well—it just won't be a clean cut this way so it may need some sanding or filing to level it off.

## Transistor outlines

The original Brown Source used a European BC-series transistor, and since these are still widely available, the Obelisk PCB uses this pinout. The 2N5088/5089 is essentially identical and can be used as a substitute with no changes to the circuit. However, if you use a 2N5088, you will need to install the transistor backwards (rotated 180 degrees from the outline). If you're not sure, check the datasheet. And if your unit makes no sound when first powered up, the transistor orientation is the most likely culprit, so look there first.

You can also use a SMD transistor if you want. The extra SMD pad above the "B" and "E" pads is for the collector, which follows the pinout for all standard SMD transistors.

## Early vs. late specs

There have been two traces of the Brown Source, one early unit (labeled V1 on the PCB) and one later one (labeled V4). There are only three extremely minor differences in resistor values, so it's most probable that these version designations just refer to PCB layout revisions rather than Lovetone seeing them as notable product updates.

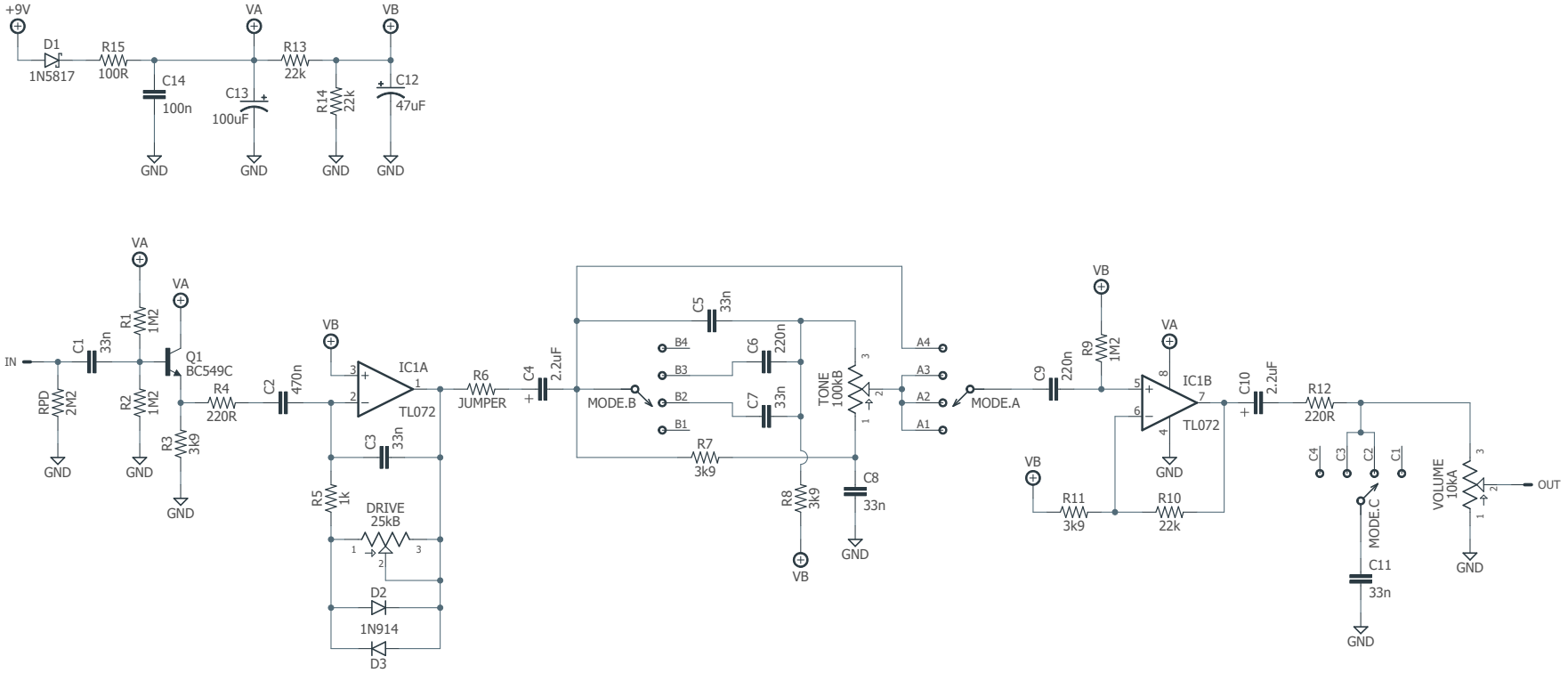
The default parts list is for the V4 version. The tonal differences should be negligible, but here are the resistor changes if you want to build the early version.

- **R6:** 1k (jumper in V4)
- **R9:** 330k (1M2 in V4)
- **R10:** 18k (22k in V4)

## Drive range increase

If you find that you want more range on the higher-gain side of the rotation, you can increase the value of the Drive pot from 25kB to 50kB.

# SCHEMATIC


+9V
D1
1N5817
R15
100R
C14
100n
GND
VA
C13
100uF
R13
22k
R14
22k
VB
C12
47uF
IN
C1
33n
R1
1M2
RPD
2M2
R2
1M2
R3
3k9
Q1
BC549C
R4
220R
C2
470n
IC1A
TL072
C3
33n
R5
1k
DRIVE
25kB
D2
1N914
D3
R6
JUMPER
C4
2.2uF
C5
33n
B4
B3
B2
B1
C6
220n
C7
33n
R7
3k9
TONE
100kB
R8
3k9
C8
33n
A4
A3
A2
A1
MODE.B
MODE.A
C9
220n
R9
1M2
IC1B
TL072
R11
3k9
R10
22k
C10
2.2uF
R12
220R
C4
C3
C2
C1
MODE.C
C11
33n
VOLUME
10kA
OUT

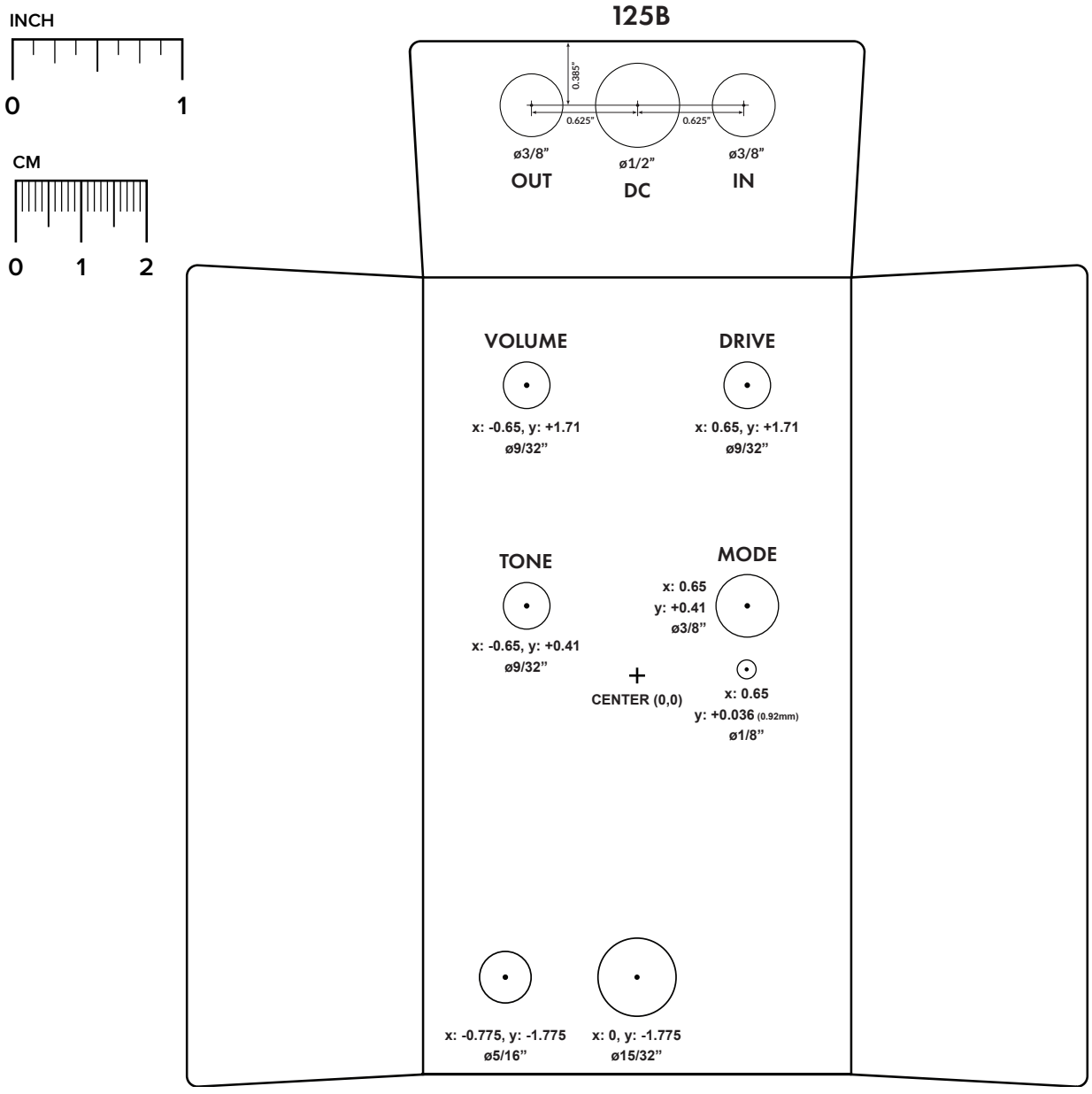
# DRILL TEMPLATE

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.

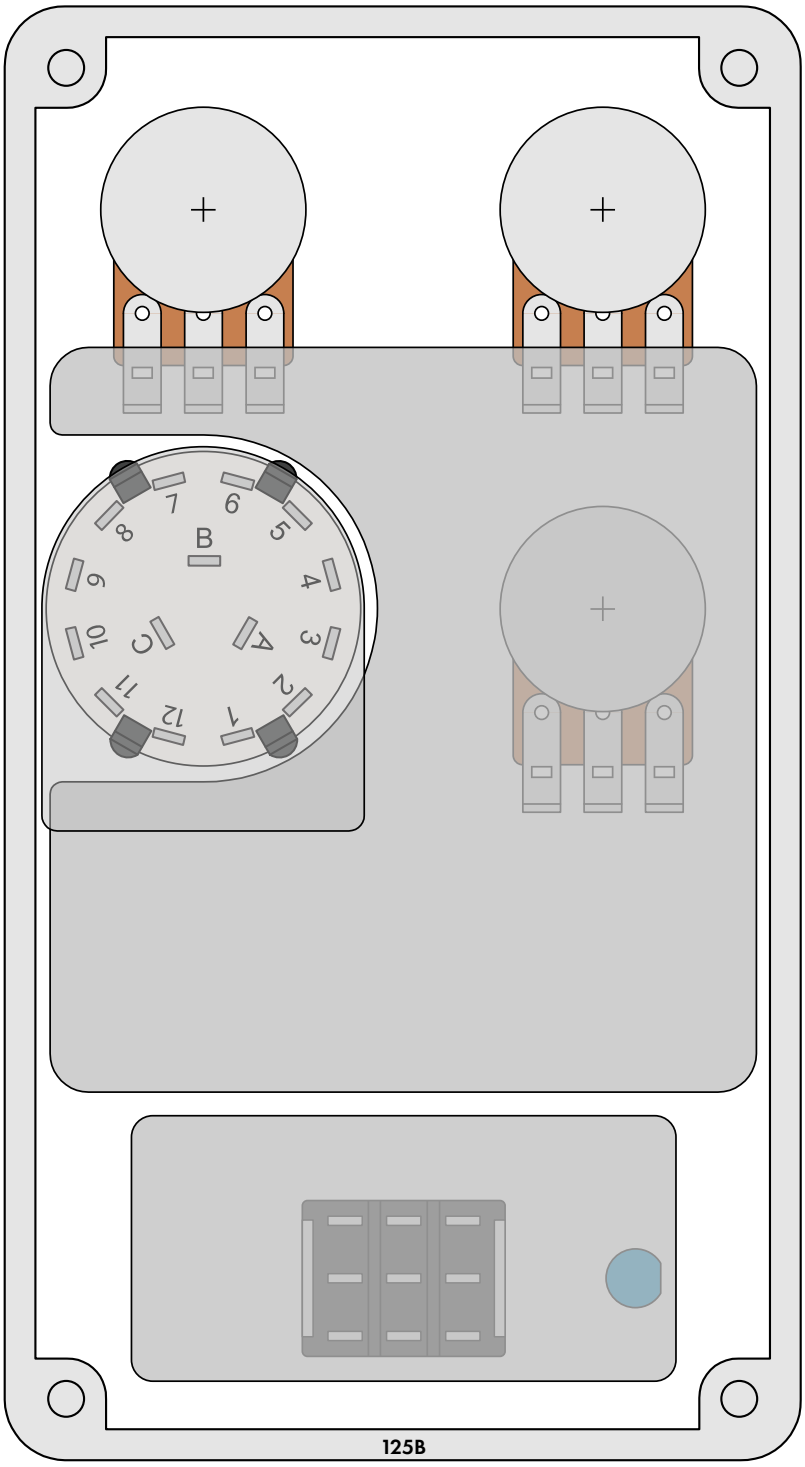
**LED hole drill size** assumes the use of a 5mm LED bezel, available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



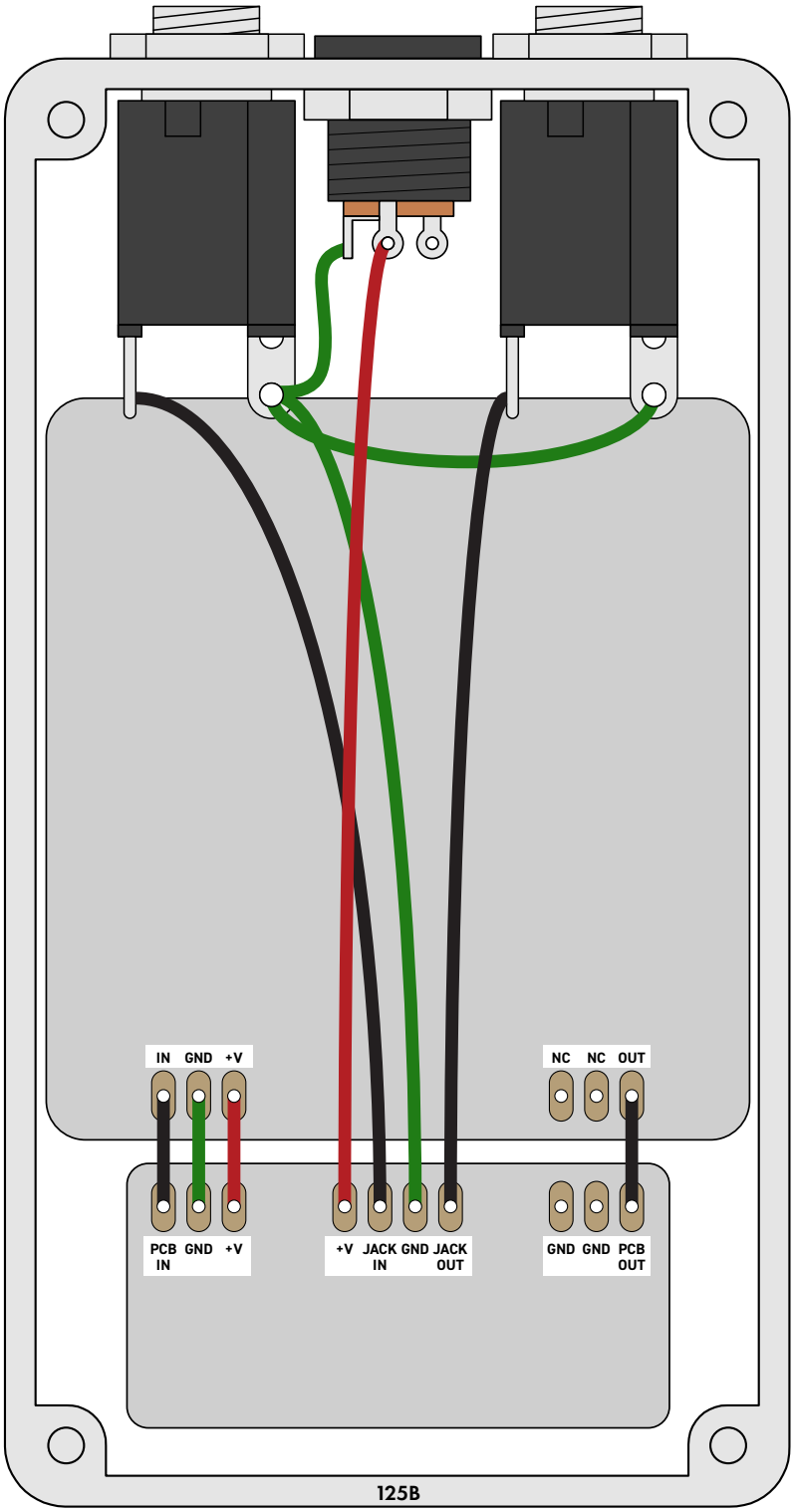
# ENCLOSURE LAYOUT

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

Note that the rotary switch is rotated so the “B” pole is on the top. This keeps the black standoffs from touching the sides of the enclosure. In the initial release, the daughterboard PCB shows the “A” pole on top, but this should be ignored. It will be corrected in subsequent runs.



# 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 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

**1.0.3 (2021-08-02)**
Corrected y-coordinate of the rotary anti-rotation pin in drill template (0.036", not 0.364"). The physical position was correct.

**1.0.2 (2021-07-21)**
Clarified the type of rotary switch required.

**1.0.1 (2021-07-12)**
Added missing resistor RPD (2M2) to parts list.

**1.0.0 (2021-07-02)**
Initial release.