

PROJECT NAME

HALO DELUXE

BASED ON
Cornish P-1

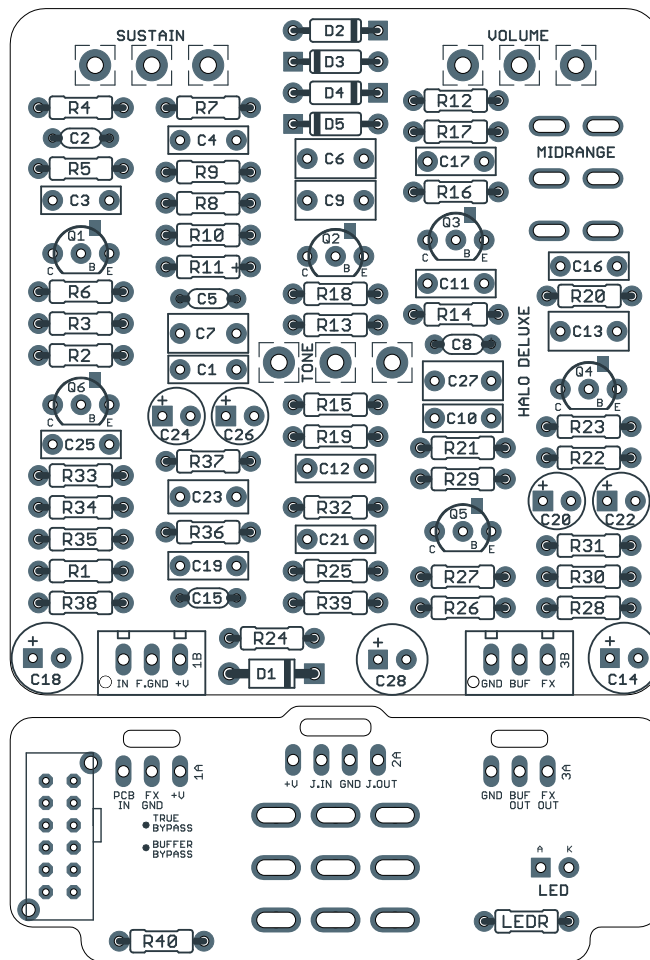
BUILD DIFFICULTY
■■■■□ Intermediate

EFFECT TYPE
Distortion / sustainer, fuzz

DOCUMENT VERSION
1.0.0 (2024-04-19)

PROJECT SUMMARY

An adaptation of David Gilmour's favorite Ram's Head Big Muff with added transistor buffers for lower noise and cleaner switching.



Actual size is 2.3" x 2.43" (main board) and 2.3" x 0.91" (bypass board).

TABLE OF CONTENTS

1	Project Overview	9	Drill Template
2	Introduction & Usage	10	Enclosure Layout
3-5	Parts List	11	Wiring Diagram
6-7	Build Notes	12	Licensing
8	Schematic	12	Document Revisions

INTRODUCTION

The Halo Deluxe Distortion/Sustainer is based on the Cornish P-1, an adaptation of the EHX Big Muff Pi V2 (Ram's Head) with two transistor buffers added to the front of the circuit to reduce noise and improve the signal isolation.

The P-1 started life as a circuit called the "Custom Fuzz" designed for David Gilmour in 1976 as part of his integrated pedalboard. It was a part-for-part clone of Gilmour's favorite Big Muff with high-quality transistor buffers added. It was known as the Custom Fuzz all the way up until 2006, when it was renamed to the P-1 to better indicate its relationship to the P-2.

The [P-2](#) (and its sister circuit, the G-2) are also largely Big Muff clones, but the major difference is the tone control. The original BMP bass/treble panning control is responsible for its signature mid-scoop. The P-2 and G-2 replace this control with a standard treble-cut control, which significantly changes the voicing. The P-1 leaves the tone section intact.

Broadly speaking, the Halo Deluxe is a hybrid of our [Cygnus](#) and [Halo](#) projects. The core circuit is a standard Big Muff, to which we've added the Cornish buffers and the true bypass slide switch. The Halo Deluxe also includes the midrange switch from the original Halo. We have kept the part numbering the same for the core circuit, so you can use our spreadsheet to build a Cornish-buffered deluxe version of your favorite Big Muff.

USAGE

The Halo Deluxe has the following controls:

- **Sustain** controls the amount of drive or distortion, which also affects the amount of sustain.
- **Tone** is a control that pans between a low-pass filter (high cut) and a high-pass filter (low cut). At the 12:00 position, the bass and treble are flat, and the midrange tone response is based on the setting of the Mids switch.
- **Volume** is the overall output.
- **Mids** allows you to switch between Mid Scoop (the stock setting), Mid Hump, or Flat Mids.

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	10M	Metal film resistor, 1/4W	
R2	33k	Metal film resistor, 1/4W	
R3	47k	Metal film resistor, 1/4W	
R4	470k	Metal film resistor, 1/4W	
R5	120R	Metal film resistor, 1/4W	
R6	10k	Metal film resistor, 1/4W	
R7	1k	Metal film resistor, 1/4W	
R8	10k	Metal film resistor, 1/4W	
R9	100k	Metal film resistor, 1/4W	
R10	470k	Metal film resistor, 1/4W	
R11	150R	Metal film resistor, 1/4W	
R12	10k	Metal film resistor, 1/4W	
R13	10k	Metal film resistor, 1/4W	
R14	100k	Metal film resistor, 1/4W	
R15	470k	Metal film resistor, 1/4W	
R16	150R	Metal film resistor, 1/4W	
R17	15k	Metal film resistor, 1/4W	
R18	22k	Metal film resistor, 1/4W	
R19	33k	Metal film resistor, 1/4W	
R20	430k	Metal film resistor, 1/4W	
R21	100k	Metal film resistor, 1/4W	
R22	15k	Metal film resistor, 1/4W	
R23	3k3	Metal film resistor, 1/4W	
R24	100R	Metal film resistor, 1/4W	Power supply filter resistor.
R25	1k	Metal film resistor, 1/4W	
R26	120k	Metal film resistor, 1/4W	
R27	120k	Metal film resistor, 1/4W	
R28	200k	Metal film resistor, 1/4W	
R29	7k5	Metal film resistor, 1/4W	
R30	10k	Metal film resistor, 1/4W	
R31	51R	Metal film resistor, 1/4W	
R32	1M	Metal film resistor, 1/4W	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
R33	1k	Metal film resistor, 1/4W	
R34	120k	Metal film resistor, 1/4W	
R35	120k	Metal film resistor, 1/4W	
R36	200k	Metal film resistor, 1/4W	
R37	15k	Metal film resistor, 1/4W	
R38	300R	Metal film resistor, 1/4W	
R39	100R	Metal film resistor, 1/4W	
R40	220k	Metal film resistor, 1/4W	
LEDR	10k	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	OMIT	Film capacitor, 7.2 x 2.5mm	Omit for P-1. Otherwise, use the value specified for the Big Muff variant.
C2	470pF	MLCC capacitor, NP0/C0G	
C3	100n	Film capacitor, 7.2 x 2.5mm	
C4	100n	Film capacitor, 7.2 x 2.5mm	
C5	470pF	MLCC capacitor, NP0/C0G	
C6	1uF	Film capacitor, 7.2 x 3.5mm	
C7	100n	Film capacitor, 7.2 x 2.5mm	
C8	470pF	MLCC capacitor, NP0/C0G	
C9	1uF	Film capacitor, 7.2 x 3.5mm	
C10	3n9	Film capacitor, 7.2 x 2.5mm	
C11	10n	Film capacitor, 7.2 x 2.5mm	
C12	100n	Film capacitor, 7.2 x 2.5mm	
C13	1uF	Film capacitor, 7.2 x 3.5mm	
C14	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C15	100n	MLCC capacitor, X7R	Power supply filter capacitor.
C16	10n	Film capacitor, 7.2 x 2.5mm	
C17	3n9	Film capacitor, 7.2 x 2.5mm	
C18	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C19	100n	Film capacitor, 7.2 x 2.5mm	
C20	4.7uF	Electrolytic capacitor, 4mm	
C21	1n	Film capacitor, 7.2 x 2.5mm	
C22	22uF	Electrolytic capacitor, 5mm	
C23	220n	Film capacitor, 7.2 x 2.5mm	
C24	2.2uF	Electrolytic capacitor, 4mm	
C25	10n	Film capacitor, 7.2 x 2.5mm	
C26	10uF	Electrolytic capacitor, 5mm	P-1 only. Omit for any other Big Muff version.
C27	1uF	Film capacitor, 7.2 x 3.5mm	
C28	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.

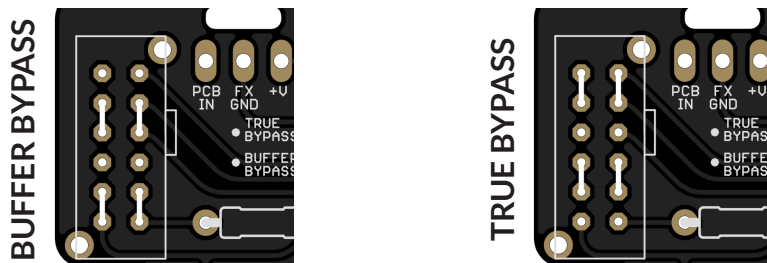
PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
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	
Q1	BC549C	BJT transistor, NPN, TO-92	
Q2	BC549C	BJT transistor, NPN, TO-92	
Q3	BC549C	BJT transistor, NPN, TO-92	
Q4	BC549C	BJT transistor, NPN, TO-92	
Q5	BC549C	BJT transistor, NPN, TO-92	
Q6	BC549C	BJT transistor, NPN, TO-92	
SUSTAIN	100kB	16mm right-angle PCB mount pot	
TONE	100kB	16mm right-angle PCB mount pot	
VOLUME	100kB	16mm right-angle PCB mount pot	
MIDRANGE	DPDT on-on-on	Toggle switch, DPDT on-on-on	
TB-BUF	4PDT slide	Slide switch, 4PDT	E-Switch EG4208 (4mm lever) or EG4208A (6mm lever)
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

Bypassing the true bypass / buffer switch

The E-Switch EG4208 slide switch used for the true bypass/buffer selector is available from Mouser Electronics but may not be accessible to everyone. If you are unable to obtain it, you can hard-wire the switch to either true bypass mode or buffered mode by soldering jumpers to the switch pads.



Transistor substitutions

The BC549C and BC550C (used in the P-2) are interchangeable with no difference in sound, so either can be used. If you want to substitute a different transistor, you'll want one with very high hFE (600+).

The PCB layout uses the C-B-E transistor pinout, which is the opposite of the E-B-C convention used by transistors with a "2N" prefix such as the 2N3904. The closest substitute in this series is the 2N5089. If using these, rotate them 180 degrees. Use a multimeter to check the pinout if you're not sure.

The transistor outlines also include a rectangular collector pad above the "B" and "E" pins so that a SMD transistor such as the BC849C can be used.

Big Muff variants

The Big Muff is well known for having dozens of variations that sound very different from each other, and Kit Rae's fantastic [Big Muff \$\pi\$ Page](#) is the best source documenting these variations.

When designing the Halo Deluxe, we intentionally kept all of the schematic numbering the same as the original [Halo](#) for the core Big Muff portion of the circuit, with the idea that the PCB would allow you to build a Cornish-buffered version of any Big Muff, not just the P-1 or Ram's Head V2. (This is why the schematic starts with Q5 and Q6 at the beginning before Q1-4.)

Our [Big Muff Versions spreadsheet](#) compiles all of the Kit Rae schematics into one reference so that you can easily retrieve a list of values for a particular variant and build the Halo Deluxe to those specifications.

Note that for all versions, the transistors, diodes and potentiometers are the same, so only the resistor and capacitor values are provided. All other parts not listed in the spreadsheet are part of the Cornish buffers and would be the same regardless of which variant you are building.

BUILD NOTES, CONT.

C1 and C26

C1 and C26 are in parallel. In this circuit, they comprise the output capacitor of the buffer and the input capacitor of the main Big Muff portion of the circuit. The P-1 uses a 10uF electrolytic here, while most Big Muff versions use 47n or 100n.

We included outlines for both an electrolytic and a film capacitor. It doesn't matter very much which one you use—they should both sound pretty much the same since the output impedance from Q6 is fixed and the buffer ensures there is no interaction with pedals that come before. For a straight P-1 build, use C26 and omit C1. For any other variant, omit C26 and use whatever value is specified for C1.

Midrange switch

The midrange switch is a DPDT on-on-on. For this type of switch, depending on the manufacturer, there are two different types of configurations for the center position:



Fortunately, the way the switch is used in this circuit, it doesn't matter which type of switch you have. The EQ response will still be flat in the middle. Just make sure not to use an on-off-on switch.

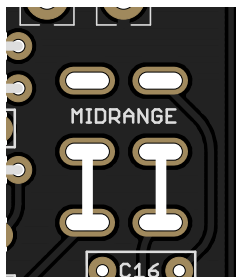
If you aren't able to find a DPDT on-on-on switch, you can also just use a standard DPDT on-on switch. You will still have the mid hump and mid scoop modes, but you will not have the flat mode.

Note: If you are building a variant other than the default P-1, you may need to adjust C16 and C17.

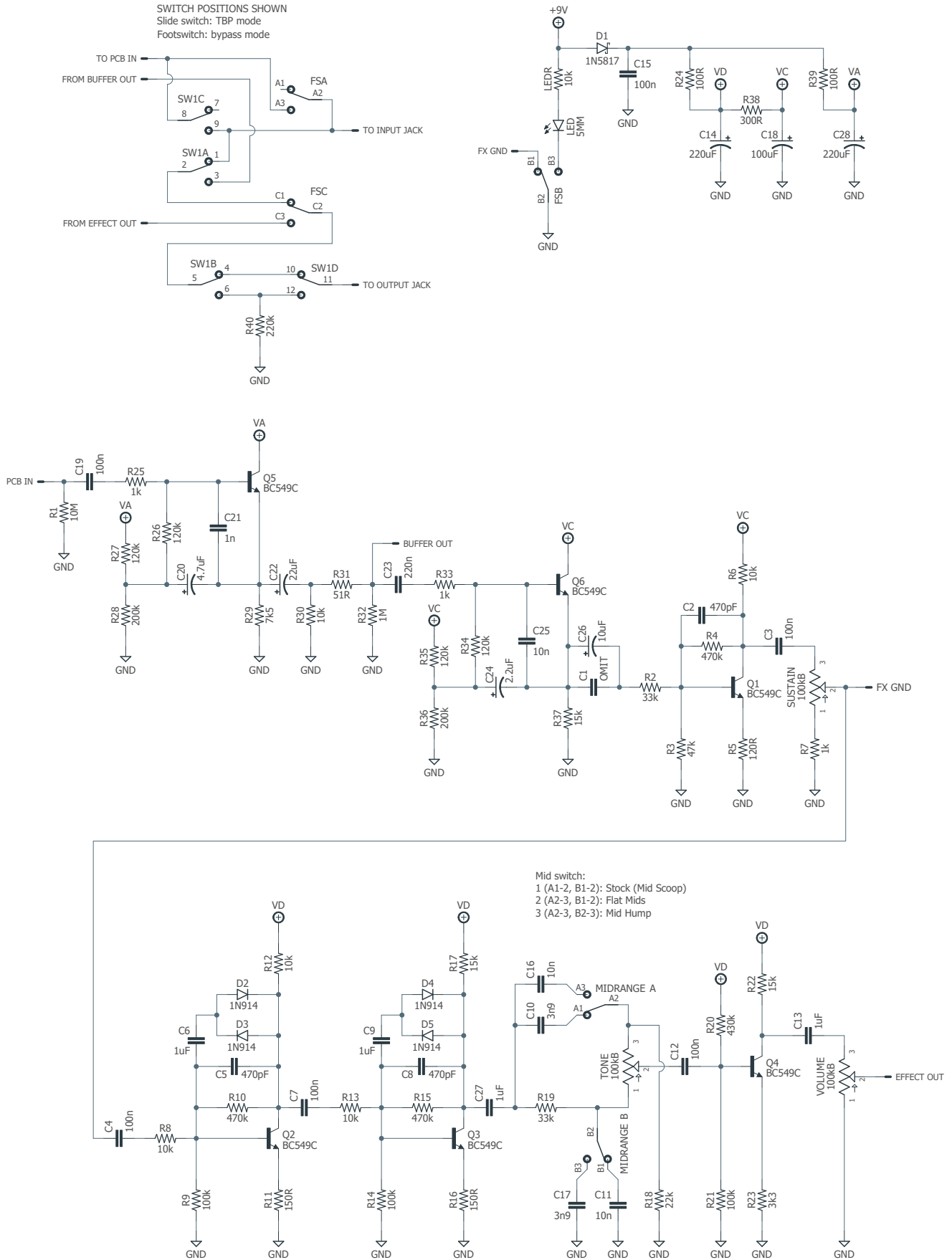
- C16 should always be the same value as **C11**
- C17 should always be the same value as **C10**

Hardwiring the midrange switch

If you'd like to leave off the midrange switch and hardwire it in the stock mid-scoop position, install wire jumpers as follows:



SCHEMATIC



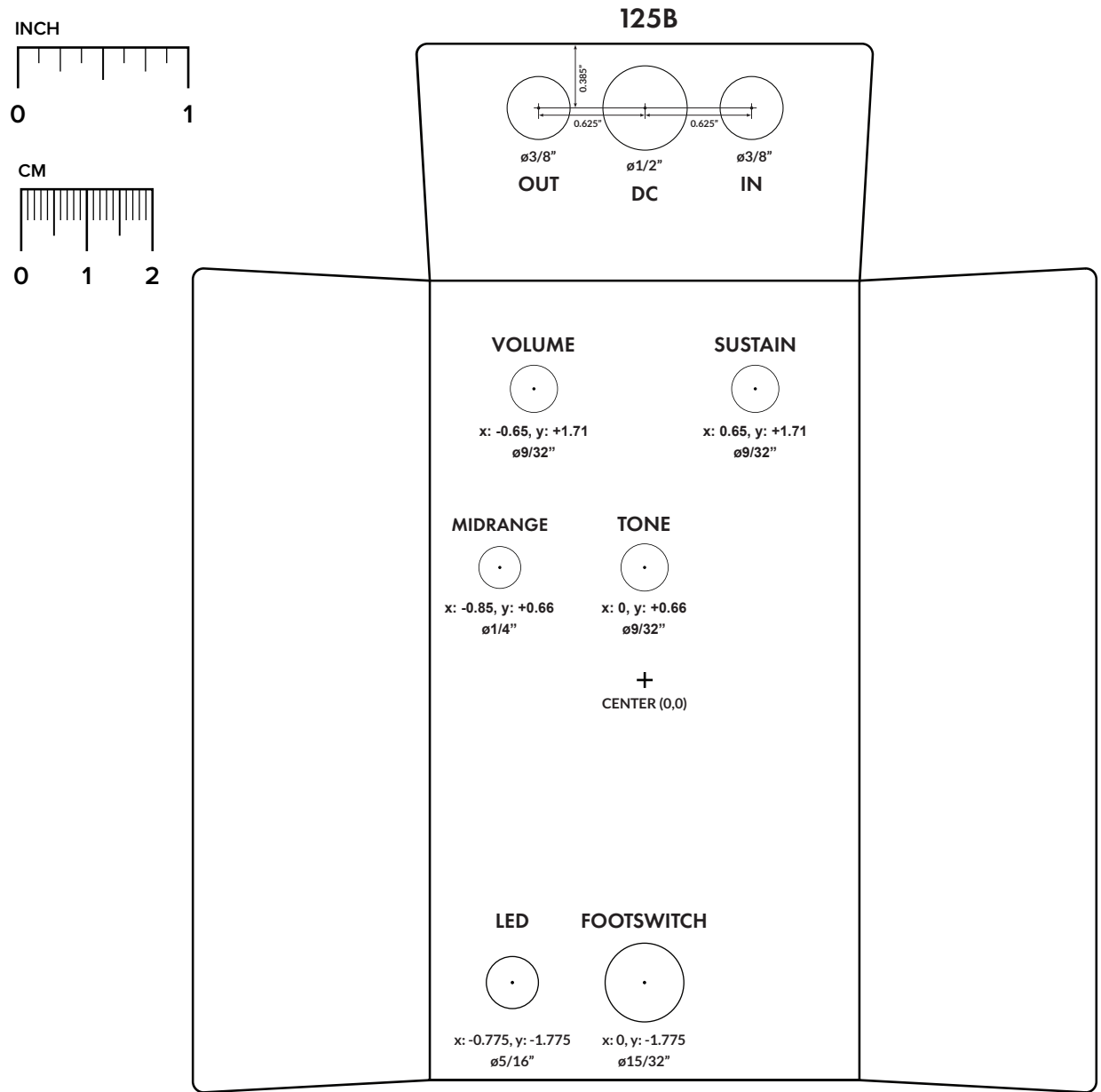
DRILL TEMPLATE

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.

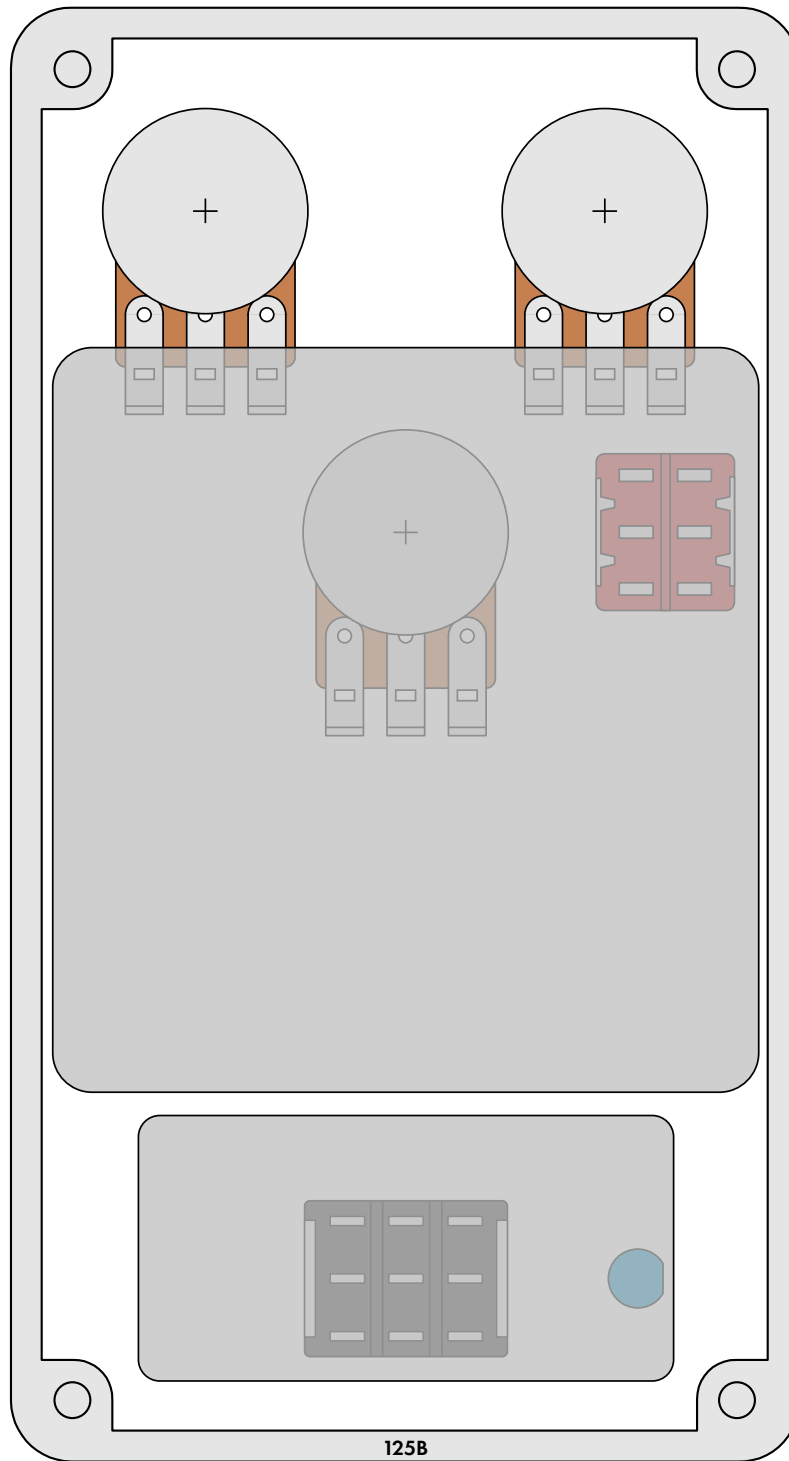
Top jack layout assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the [Open-Frame Jack Drill Template](#) for the top side.

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.

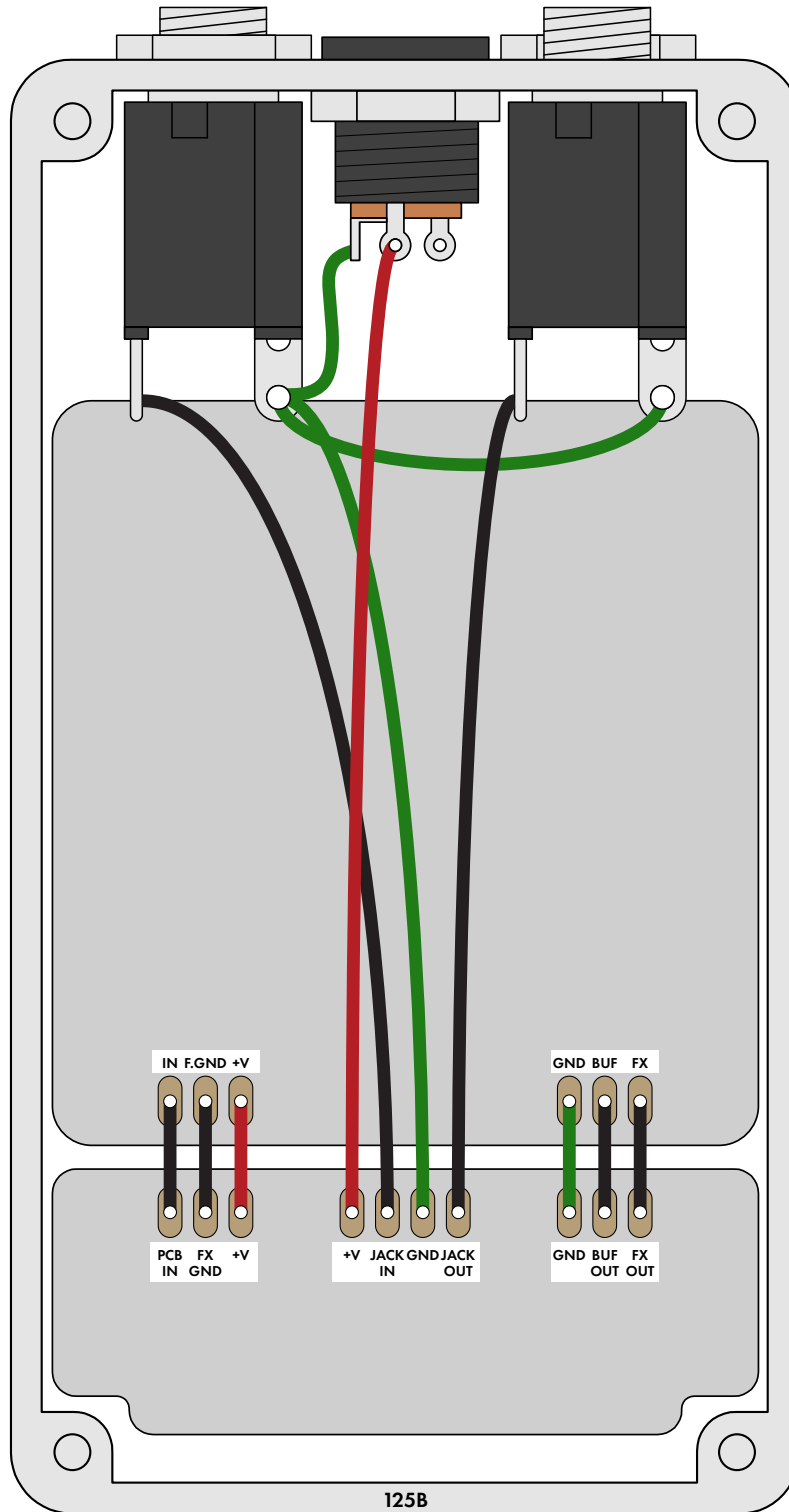


ENCLOSURE LAYOUT

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



WIRING DIAGRAM



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.