PROJECT NAME

NYSIAD GERMANIUM

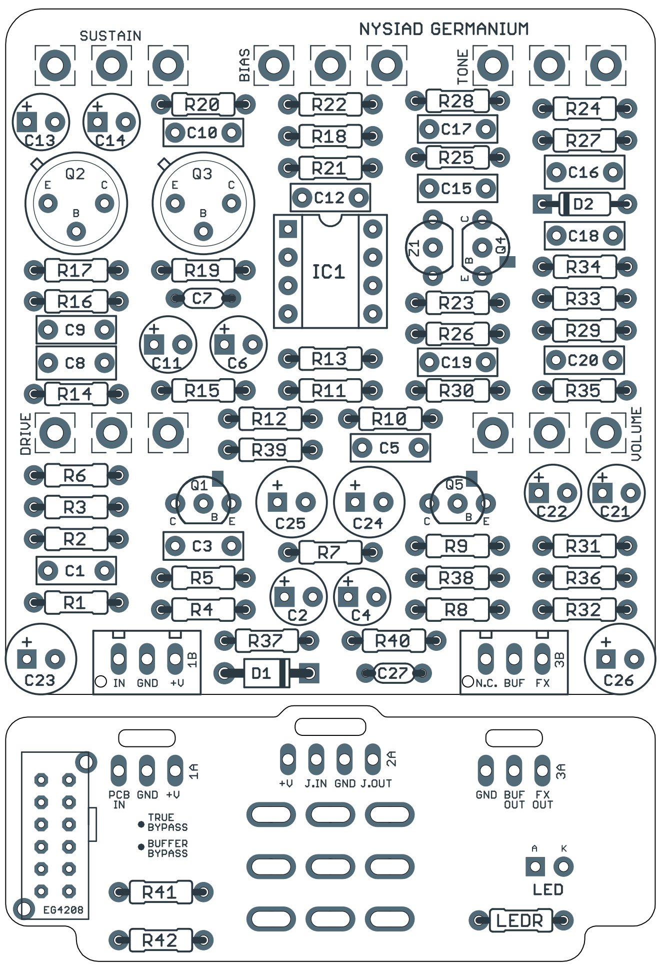
BASED ON
Cornish NG-2

BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Misbiased silicon/germanium fuzz

DOCUMENT VERSION
1.0.0 (2024-11-29)

PROJECT SUMMARY
A variable-bias silicon & germanium fuzz designed to emulate “imminent amp death”, the sound of a blown power tube or output transformer right before it all goes up in smoke.



Actual size is 2.3” x 2.43” (main board) and 2.3” x 0.87” (bypass board).

IMPORTANT NOTE

This documentation is for the **germanium** version of the project. There is also a silicon version, based on the NG-3. While the names are similar, the schematic and part numbering are different. Confirm your PCB looks like the one above and is labeled “Nysiad Germanium” before proceeding.

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INTRODUCTION

The Nysiad Germanium Fuzz is an adaptation of the Cornish NG-2, originally traced by Aion FX in 2024. While it has a lot in common with the later NG-3 (available as our Nysiad Silicon project), there are enough substantial differences that we split them into two different projects.

Like the NG-3, the NG-2 is designed to simulate "imminent amp death", the sound of a bad output transformer or power tube right before the fuse blows (or worse). You can get some fairly traditional sounds from it if the bias knob is all the way up, but once you start to dial it down, the tone quickly turns into a glitchy mess, complete with gating, sag, feedback, velcro, instability, and anything else you'd associate with a misbiased fuzz.

The main difference in the NG-2 is the use of germanium transistors for the clipping stage, as compared to the silicon transistors in the NG-3. On the original NG-2, the bias control was an internal trimmer, but in this adaptation we made it external like the NG-3, which means that the transistors are the main difference between the two projects.

Other than the bias control, the Nysiad Germanium is identical to the NG-2 unit that we traced. As with our other Cornish-based projects, we have added an internal slide switch for a true bypass mode not found in the original.

USAGE

The Nysiad Germanium has the following controls:

- **Drive** is the amount of clean boost from the op-amp gain stage at the beginning. As it's boosted, it overloads the first transistor stage, creating the initial fuzz tone.
- **Sustain** controls the signal level coming out of the first transistor gain stage, which affects how much the second transistor gain stage is overloaded, adding to the fuzz tone.
- **Bias** sets the bias of the second transistor stage, which sets how much of the signal is amplified. At full clockwise, the bias is normal and full signal is passed. As it's turned down, gating effects and "velcro" artifacts start to appear.
- **Tone** is a basic bass/treble filter identical to the type found in a Big Muff.
- **Volume** is the overall output.

(continued on next page)

Overview

The NG-2 is great at what it does, but it's very important to understand what exactly that is. The circuit is intended to sound like it's broken, but it's been designed to get these broken sounds in reliable and repeatable ways. This means it can be difficult to tell whether it's been built successfully, especially if you've never played one before.

The two best things you can do to understand the circuit are 1) watch a demo video such as this one from Shnobel Tone—which is for the NG-3, but the controls are the same—and 2) study the schematic to see exactly how the circuit is arranged, particularly what each control is supposed to do, since the control labels are not overly intuitive.

Beyond that, we're including a few notes from our own experience to help you get the most out of it.

Bias control

When you first complete the Nysiad build, the bias control should be turned all the way up (clockwise). This provides the most "normal" fuzz tone. Drive, Sustain and Tone should be around 12:00.

As you turn down the bias control, the circuit becomes more and more unstable and glitchy, especially at higher Drive and Sustain settings.

Drive vs. Sustain

These controls seem redundant at first glance, but think of them as inter-stage gain controls. Drive is the signal level going into transistor stage 1, and Sustain is the signal level going into transistor stage 2. The first transistor stage overloads differently than the second, so high Drive and low Sustain sounds very different than low Drive and high Sustain.

Generally speaking, the Sustain control has a stronger interaction with the Bias control. For example, with Bias at 12:00 and Sustain toward the bottom half of the rotation, there's a very strong "sag" effect, almost like an over-eager compressor that reduces the gain too much before swelling back to normal. The Drive level has much less of an impact on this effect.

Noise

The noise floor will be amplified a great deal at higher Drive and Sustain levels, so if you have single-coil pickups, you'll have better luck with one of the noise-canceling positions. This is less of an issue as Bias is turned down since there's a noise-gating effect when nothing is being played.

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	1k	Metal film resistor, 1/4W	
R3	120k	Metal film resistor, 1/4W	
R4	120k	Metal film resistor, 1/4W	
R5	200k	Metal film resistor, 1/4W	
R6	7k5	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	51R	Metal film resistor, 1/4W	
R9	100k	Metal film resistor, 1/4W	
R10	1M	Metal film resistor, 1/4W	
R11	1M	Metal film resistor, 1/4W	
R12	3k9	Metal film resistor, 1/4W	
R13	10k	Metal film resistor, 1/4W	
R14	1k5	Metal film resistor, 1/4W	
R15	470k	Metal film resistor, 1/4W	
R16	51k	Metal film resistor, 1/4W	
R17	10k	Metal film resistor, 1/4W	
R18	1k	Metal film resistor, 1/4W	
R19	3k9	Metal film resistor, 1/4W	
R20	30k	Metal film resistor, 1/4W	
R21	75R	Metal film resistor, 1/4W	
R22	220k	Metal film resistor, 1/4W	
R23	10k	Metal film resistor, 1/4W	
R24	68k	Metal film resistor, 1/4W	Jumper in original, but 68k gives better control range for external pot.
R25	30k	Metal film resistor, 1/4W	
R26	12k	Metal film resistor, 1/4W	
R27	27k	Metal film resistor, 1/4W	
R28	27k	Metal film resistor, 1/4W	
R29	330k	Metal film resistor, 1/4W	
R30	100k	Metal film resistor, 1/4W	
R31	120k	Metal film resistor, 1/4W	
R32	120k	Metal film resistor, 1/4W	

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
R33	200k	Metal film resistor, 1/4W	
R34	5k1	Metal film resistor, 1/4W	
R35	10k	Metal film resistor, 1/4W	
R36	91R	Metal film resistor, 1/4W	
R37	100R	Metal film resistor, 1/4W	
R38	100R	Metal film resistor, 1/4W	
R39	100R	Metal film resistor, 1/4W	
R40	100R	Metal film resistor, 1/4W	
R41	91R	Metal film resistor, 1/4W	
R42	51k	Metal film resistor, 1/4W	
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	4.7uF	Electrolytic capacitor, 4mm	
C3	1n	Film capacitor, 7.2 x 2.5mm	
C4	22uF	Electrolytic capacitor, 5mm	
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	4.7uF	Electrolytic capacitor, 4mm	
C7	100pF	MLCC capacitor, NP0/C0G	
C8	220n	Film capacitor, 7.2 x 2.5mm	
C9	1n	Film capacitor, 7.2 x 2.5mm	
C10	1n	Film capacitor, 7.2 x 2.5mm	
C11	47uF	Electrolytic capacitor, 5mm	
C12	47n	Film capacitor, 7.2 x 2.5mm	
C13	4.7uF	Electrolytic capacitor, 4mm	
C14	4.7uF	Electrolytic capacitor, 4mm	
C15	1n	Film capacitor, 7.2 x 2.5mm	
C16	220n	Film capacitor, 7.2 x 2.5mm	
C17	10n	Film capacitor, 7.2 x 2.5mm	
C18	10n	Film capacitor, 7.2 x 2.5mm	
C19	100n	Film capacitor, 7.2 x 2.5mm	
C20	1n	Film capacitor, 7.2 x 2.5mm	
C21	4.7uF	Electrolytic capacitor, 4mm	
C22	22uF	Electrolytic capacitor, 5mm	
C23	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C24	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C25	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C26	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.

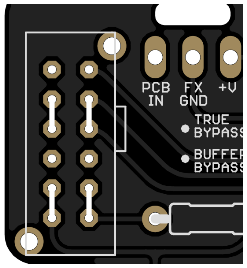
PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C27	100n	MLCC capacitor, X7R	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
Q1	BC549C	BJT transistor, NPN, TO-92	
Q2	NPN Ge	BJT transistor, germanium, NPN	See build notes for germanium transistor selection.
Q3	NPN Ge	BJT transistor, germanium, NPN	See build notes for germanium transistor selection.
Q4	BC549C	BJT transistor, NPN, TO-92	
Q5	BC549C	BJT transistor, NPN, TO-92	
Z1	LM4040DIZ-5.0	Zener / voltage reference, TO-92	Can also use LM4040CIZ-5.0.
IC1	TL071	BJT transistor, NPN, TO-92	
IC1-S	DIP-8 socket	BJT transistor, NPN, TO-92	
DRIVE	100kA	16mm right-angle PCB mount pot	
SUSTAIN	100kB	16mm right-angle PCB mount pot	
TONE	100kB	16mm right-angle PCB mount pot	
BIAS	100kB	16mm right-angle PCB mount pot	
VOLUME	250kA	16mm right-angle PCB mount pot	
TB-BUF	4PDT slide	Slide switch, 4PDT	E-Switch EG4208 (4mm lever) or EG4208A (6mm lever)
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.

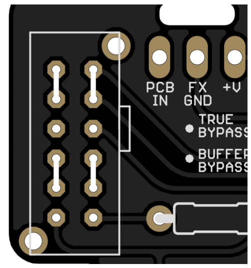
Bypassing the true bypass / buffer switch

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.

BUFFER BYPASS



TRUE BYPASS



Germanium transistor selection

In the unit we traced, both germanium transistors measured around 370 h_{FE} and 1400µA leakage. These specs would typically be considered unusable for other fuzz circuits, but due to the way they are configured here, the actual specs don't matter very much and you can get away with just about anything. Just make sure they are NPN. If you inadvertently use a PNP here, it will barely pass signal. For our prototype, we used Russian NPNs with h_{FE} around 140 and leakage <100µA and they worked great.

Silicon transistor substitutions

The BC549C and BC550C 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, in the 600s.

The PCB layout uses the B-C-E transistor pinout, which is the opposite of the E-B-C convention used by transistors with a "2N" prefix. 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.

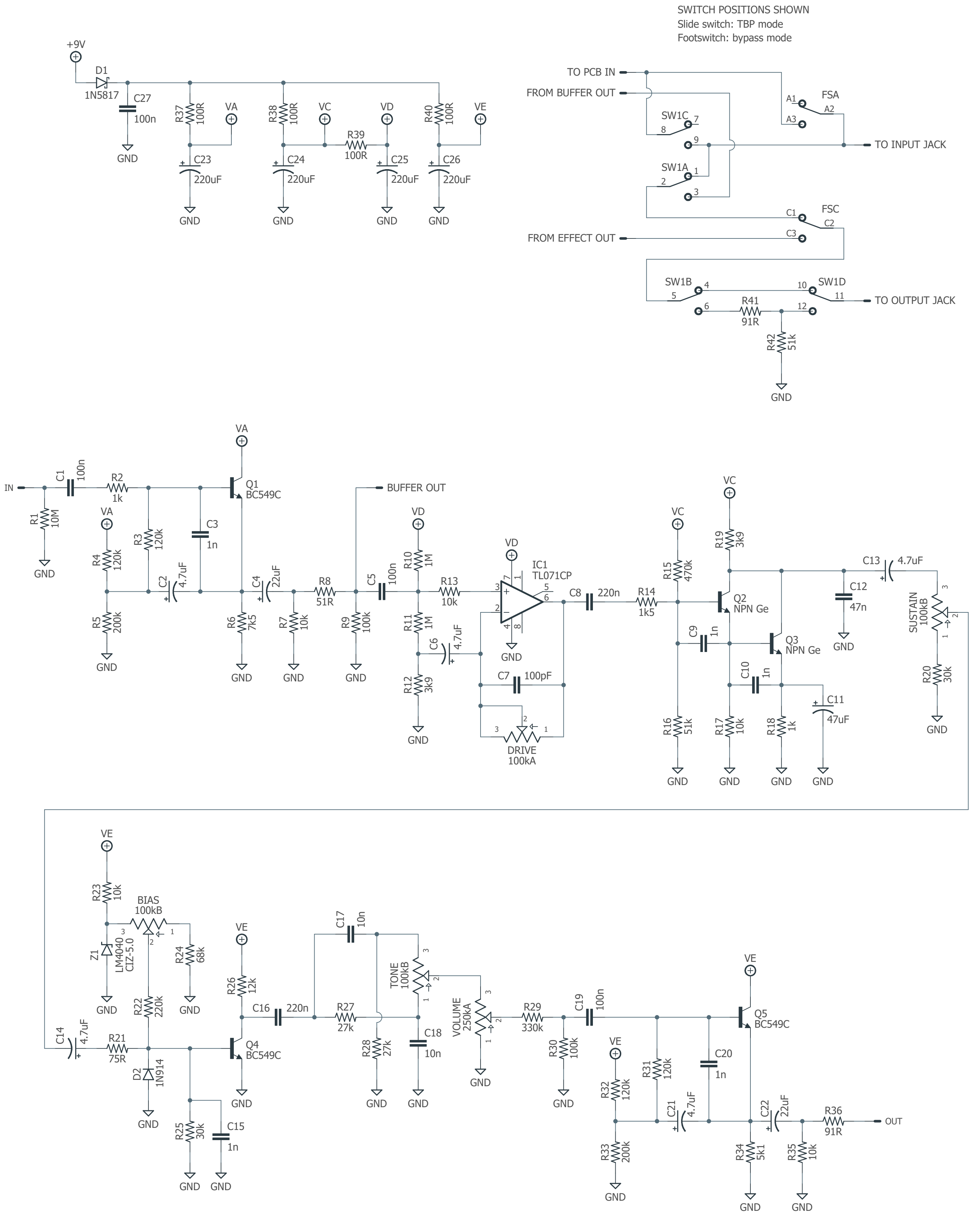
Z1 zener/reference voltage

Z1 (LM4040DIZ-5.0) is a micropower zener diode in a TO-92 transistor package, intended for high-precision voltage references at low operating currents. Accordingly, the bias resistors (R22-24 and the Bias pot) are a lot larger than you'd expect.

These micropower types are designed to be extremely stable at low currents and they do not need a filter capacitor according to the datasheet. If Z1 was a standard zener diode, it would likely not drop its full 5V voltage and would be noisy or unstable without a filter capacitor.

The LM4040 is the only part that will work properly without circuit modifications. The tolerance grade suffix (A = 0.1%, B = 0.2%, C = 0.5%, or D = 1%) is unimportant, so you can substitute whichever type is easiest to find as long as it's 5.0V. The traced NG-2 used the LM4040DIZ-5.0, which is the cheapest type, but the CIZ has been used in the Cornish OC-1.

SCHEMATIC



SWITCH POSITIONS SHOWN
Slide switch: TBP mode
Footswitch: bypass mode
+9V
D1
1N5817
C27
100n
R37
100R
VA
R38
100R
VC
VD
R39
100R
R40
100R
VE
C23
220uF
C24
220uF
C25
220uF
C26
220uF
GND
TO PCB IN
FROM BUFFER OUT
FSA
A1
A2
A3
SW1C
SW1A
TO INPUT JACK
FSC
C1
C2
C3
FROM EFFECT OUT
SW1B
SW1D
R41
91R
TO OUTPUT JACK
R42
51k
IN
C1
100n
R2
1k
R1
10M
Q1
BC549C
R3
120k
C3
1n
R4
120k
C2
4.7uF
R5
200k
C4
22uF
R6
7k5
R8
51R
R7
10k
BUFFER OUT
C5
100n
R9
100k
R10
1M
R11
1M
R13
10k
C6
4.7uF
R12
3k9
IC1
TL071CP
C7
100pF
DRIVE
100kA
C8
220n
R14
1k5
R15
470k
R16
51k
R19
3k9
Q2
NPN Ge
Q3
NPN Ge
C9
1n
C10
1n
R17
10k
R18
1k
C11
47uF
C12
47n
C13
4.7uF
SUSTAIN
100kB
R20
30k
R23
10k
BIAS
100kB
Z1
LM4040
CIZ-5.0
R24
68k
R22
220k
C14
4.7uF
R21
75R
D2
1N914
R25
30k
C15
1n
R26
12k
C16
220n
Q4
BC549C
C17
10n
R27
27k
R28
27k
TONE
100kB
C18
10n
VOLUME
250kA
R29
330k
C19
100n
R30
100k
R31
120k
R32
120k
R33
200k
C20
1n
C21
4.7uF
Q5
BC549C
R34
5k1
C22
22uF
R35
10k
R36
91R
OUT

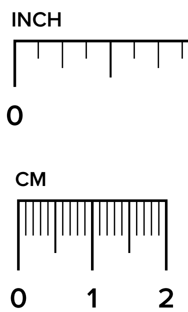
DRILL TEMPLATE

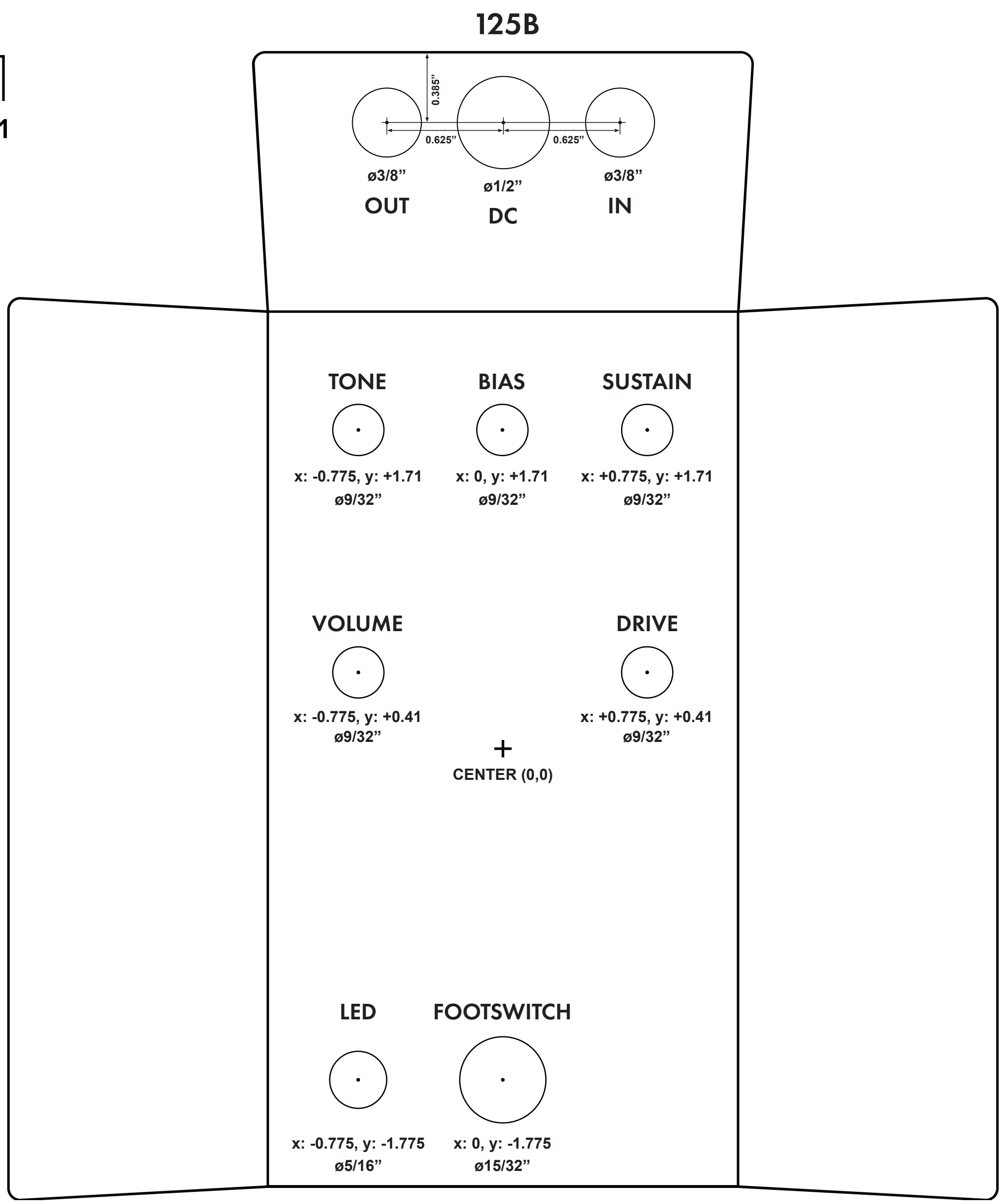
Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

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. Open-frame jacks will not fit in layouts with 5 or more knobs due to the placement of the DC jack.

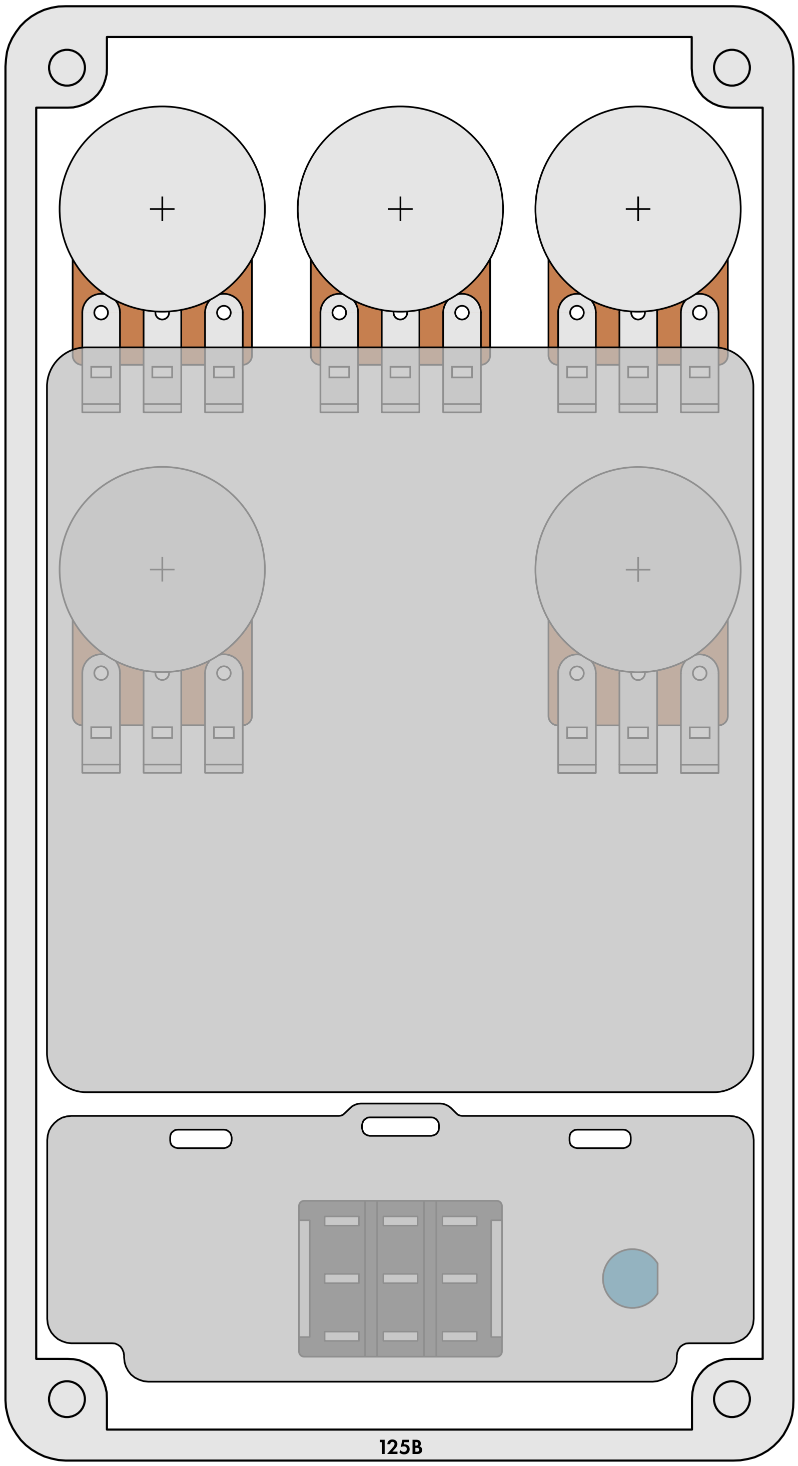
LED hole drill size assumes the use of a 5mm LED bezel, available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



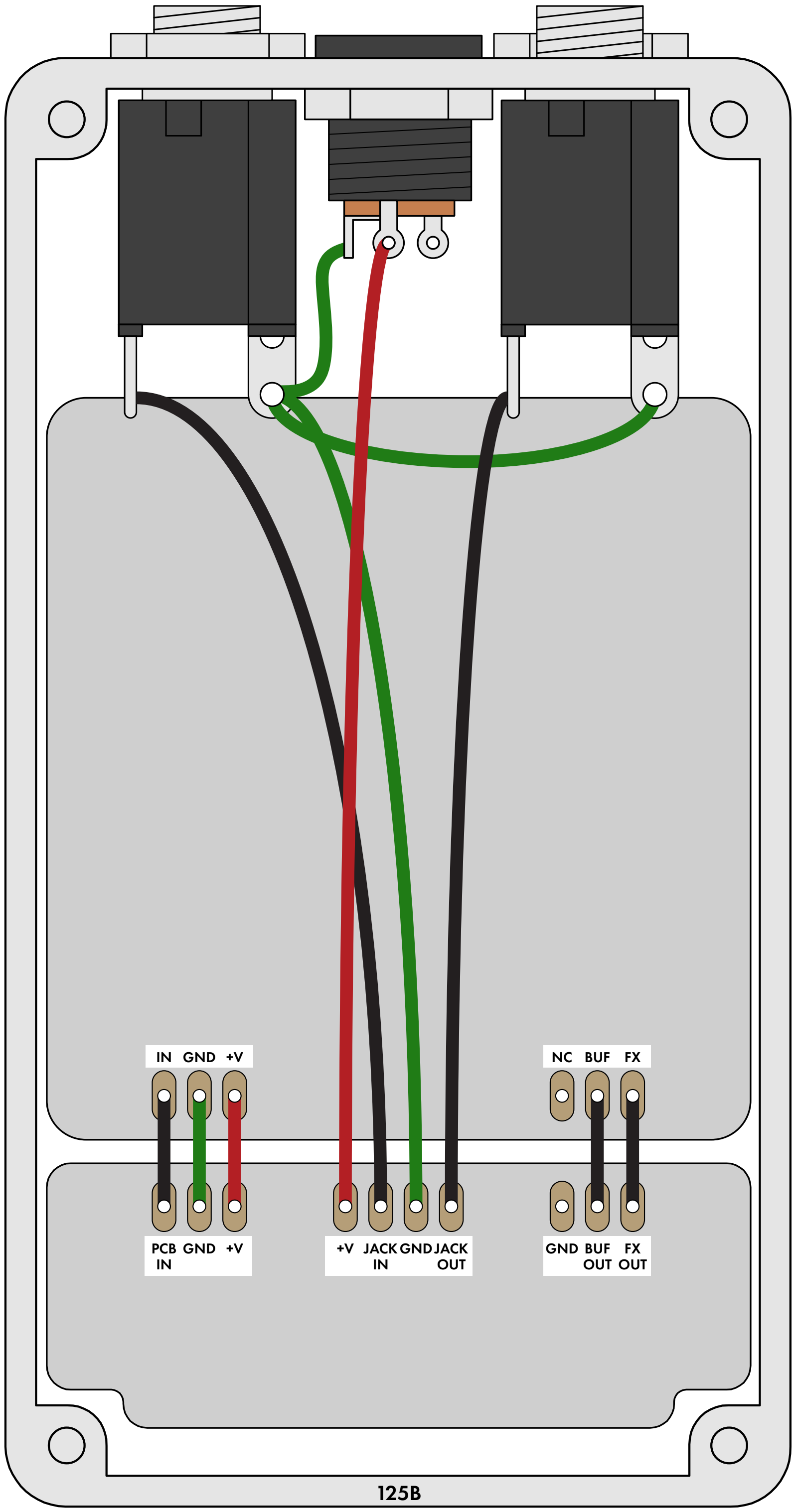


ENCLOSURE LAYOUT

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 (2024-11-29)
Initial release.