PROJECT NAME

STRATUS DELUXE

DIY GUITAR EFFECTS

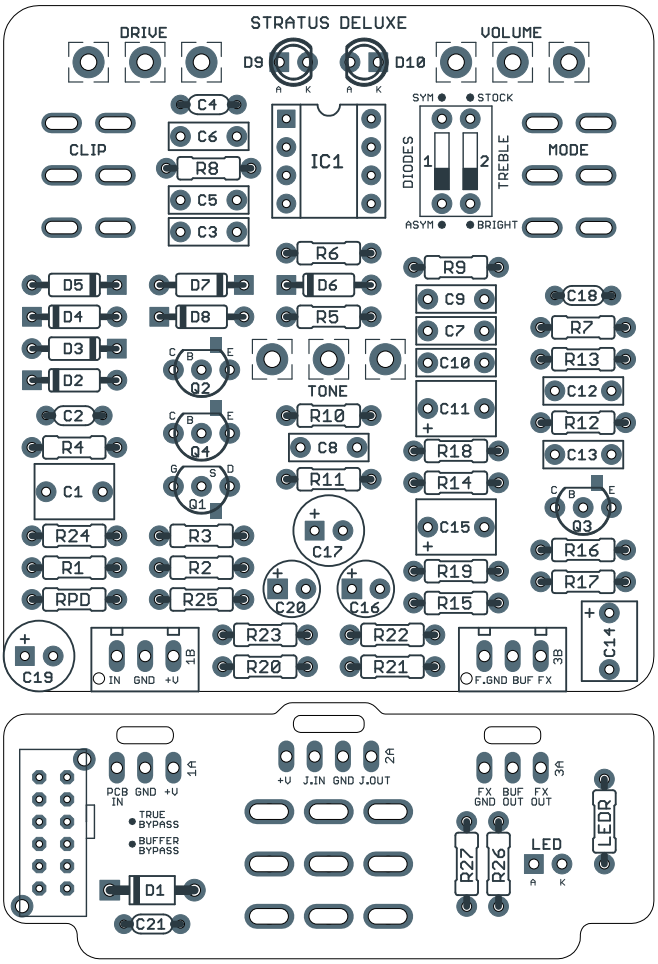
BASED ON
BOSS® SD-1W Super Overdrive

BUILD DIFFICULTY
Intermediate

EFFECT TYPE
Overdrive

DOCUMENT VERSION
1.0.0 (2025-03-28)

PROJECT SUMMARY
An adaptation of BOSS's premium upgrade to the classic SD-1 circuit, featuring a high-quality buffer along with a new "Custom" mode that adds gain and shifts the midrange frequencies.



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

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INTRODUCTION

The Stratus Deluxe Overdrive is loosely based on the BOSS SD-1W Waza Craft Super Overdrive, released in 2014 as an upgraded version of the classic SD-1. In addition to higher-fidelity buffers, it also includes a new "Custom" mode that adds gain and shift the EQ. The IC op-amps were also replaced with discrete op-amp stages similar to other BOSS circuits such as the Blues Driver and OD-3.

The original SD-1, released in 1981, was BOSS's response to the Ibanez Tube Screamer. While the circuits are very similar, they have a very different sound due to the parts selection. But with a handful of component swaps, you can modify a Tube Screamer into an SD-1 and vice versa.

The Stratus Deluxe is a similar project to the Halo Deluxe, which wraps the classic Big Muff circuit in Cornish buffers so you can build a Cornish-flavored version of your favorite Muff.

Likewise, this project wraps the Stratus circuit in the Waza Craft buffers and enables an optional buffered bypass mode. We did not go so far as to replicate the discrete op-amp, and the Custom mode is different in implementation, so it's more of an adaptation than a clone.

There is also an internal DIP switch to select symmetrical (Tube Screamer) or asymmetrical (SD-1) clipping modes, and another that disables the steep treble cut capacitor in the stock SD-1 that many people remove in order to open up the sound.

USAGE

The Stratus Deluxe has the following controls:

- **Drive** controls the amount of gain in the op-amp feedback diode clipping stage.
- **Tone** controls the treble response of the effect. The center point (12:00) is flat. When turned to the left, it cuts treble, and when turned to the right, it boosts treble.
- **Volume** controls the overall output of the effect.

In addition, there are two switch modifications included for added flexibility:

- **Clipping** selects between three sets of clipping diodes: stock (bottom position), double diodes (middle), and LED (top position).
- **Mode** selects between standard (bottom position) and custom (top position) modes. The Custom mode adds gain and bass along with a slightly different midrange contour.

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	10k	Metal film resistor, 1/4W	
R2	1M	Metal film resistor, 1/4W	
R3	470R	Metal film resistor, 1/4W	
R4	33k	Metal film resistor, 1/4W	
R5	100k	Metal film resistor, 1/4W	10k for Tube Screamer specs.
R6	4k7	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	33k	Metal film resistor, 1/4W	51k for Tube Screamer specs.
R9	10k	Metal film resistor, 1/4W	1k for Tube Screamer specs.
R10	470R	Metal film resistor, 1/4W	220R for Tube Screamer specs.
R11	10k	Metal film resistor, 1/4W	1k for Tube Screamer specs.
R12	10k	Metal film resistor, 1/4W	1k for Tube Screamer specs.
R13	3k9	Metal film resistor, 1/4W	
R14	8k2	Metal film resistor, 1/4W	
R15	100k	Metal film resistor, 1/4W	510k for Tube Screamer specs.
R16	10k	Metal film resistor, 1/4W	
R17	100k	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	100k	Metal film resistor, 1/4W	
R20	47R	Metal film resistor, 1/4W	Power supply filter resistor.
R21	10k	Metal film resistor, 1/4W	
R22	10k	Metal film resistor, 1/4W	
R23	47R	Metal film resistor, 1/4W	Power supply filter resistor.
R24	33k	Metal film resistor, 1/4W	
R25	33k	Metal film resistor, 1/4W	
R26	1k	Metal film resistor, 1/4W	
R27	1k	Metal film resistor, 1/4W	
RPD	2M2	Metal film resistor, 1/4W	Input pull-down resistor. Can be as low as 1M.
LEDR	10k	Metal film resistor, 1/4W	LED current-limiting resistor.
C1	2.2uF	Film capacitor, 7.2 x 5mm	
C2	150pF	MLCC capacitor, NP0/C0G	
C3	18n	Film capacitor, 7.2 x 2.5mm	1uF for Tube Screamer specs.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C4	47pF	MLCC capacitor, NP0/C0G	
C5	47n	Film capacitor, 7.2 x 2.5mm	
C6	33n	Film capacitor, 7.2 x 2.5mm	
C7	18n	Film capacitor, 7.2 x 2.5mm	220n for Tube Screamer specs.
C8	27n	Film capacitor, 7.2 x 2.5mm	220n for Tube Screamer specs.
C9	1n8	Film capacitor, 7.2 x 2.5mm	Part of the Treble DIP switch mod. See build notes.
C10	8n2	Film capacitor, 7.2 x 2.5mm	Part of the Treble DIP switch mod. See build notes.
C11	2.2uF	Film capacitor, 7.2 x 5mm	1uF for Tube Screamer specs.
C12	15n	Film capacitor, 7.2 x 2.5mm	
C13	100n	Film capacitor, 7.2 x 2.5mm	
C14	2.2uF	Film capacitor, 7.2 x 5mm	
C15	2.2uF	Film capacitor, 7.2 x 5mm	
C16	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C17	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C18	100n	MLCC capacitor, X7R	Power supply filter capacitor.
C19	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C20	47uF	Electrolytic capacitor, 5mm	Reference voltage filter capacitor.
C21	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	
D4	1N914	Fast-switching diode, DO-35	
D5	1N914	Fast-switching diode, DO-35	
D6	1N914	Fast-switching diode, DO-35	
D7	1N914	Fast-switching diode, DO-35	
D8	1N914	Fast-switching diode, DO-35	
D9	3mm LED	LED, 3mm, red diffused	
D10	3mm LED	LED, 3mm, red diffused	
Q1	J112	JFET, N-channel	Can use any general-purpose JFET such as 2N5457.
Q2	2N5088	BJT transistor, NPN, TO-92	
Q3	2N5088	BJT transistor, NPN, TO-92	
Q4	2N5088	BJT transistor, NPN, TO-92	
IC1	JRC4558D	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
DRIVE	1MB	16mm right-angle PCB mount pot	500kA or 500kB for Tube Screamer specs.
TONE	20kW	16mm right-angle PCB mount pot	
VOL.	10kB	16mm right-angle PCB mount pot	100kA or 100kB for Tube Screamer specs.

PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
MODE	DPDT on-on	Toggle switch, DPDT on-on	
CLIP	DPDT on-on-on	Toggle switch, DPDT on-on-on	See build notes for switch selection.
TB-BUF	4PDT slide	Slide switch, 4PDT	E-Switch EG4208 (4mm lever) or EG4208A (6mm lever)
SW1	DIP, 2-pos.	DIP switch, 2-position	
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.

DESIGN NOTES

Original schematic

We are indebted to the work of kanengomibako, a Japanese DIYer who has traced a number of complex circuits and posted the information to his blog. His SD-1W trace is not only extremely thorough, but also contains a lot of useful analysis of the circuit, and his work was the inspiration for this project. (It's all in Japanese, so Google Translate is essential, but it's well worth the effort.)

SD-1W design process

The trace contains some interesting insights into the design process. When Boss was developing the SD-1W, they added a full discrete op-amp stage that is switched into the circuit when Custom mode is engaged (Q21-24). If you look at the partial schematic near the bottom of the blog post, you can see that this stage originally included a gyrator coming off of R67, but the parts are left unpopulated in the production version.

The gyrator would have justified the inclusion of all the additional circuitry, since gyrators need an active stage in order to effectively boost or cut by their tuned frequency. However, in the final version, the op-amp stage does almost nothing, only boosting the frequencies below 1k by around 2dB (as shown in this LTSpice simulation). Almost all of the effect of the Custom switch is coming from the first op-amp stage, where it adds a second R-C pair that boosts the gain and adds bass. This indicates that Boss originally wanted to make Custom mode a bit more distinctive, but settled for a subtler approach.

Custom mode workalike

In the Stratus Deluxe, we followed kanengomibako's recommendation in another blog post and used a series of resistors and capacitors to passively shape the tone in the same way as the active shaping in the original—in other words, a 2dB rolloff above 1k, instead of a 2dB boost below 1k.

A very slight tweak of the volume knob can compensate for the difference, but if you happen to be comparing the Stratus Deluxe with a real SD-1W, and you've perfectly matched the tone in standard mode, the effect of engaging the Custom mode will be slightly different between the two.

Tube Screamer specs

The Stratus Deluxe can be built to Tube Screamer specs with a few part substitutions. This will add the Waza buffer and the "Custom" mode to the base TS-9 if you prefer that circuit to the SD-1.

PART	SD-1	TS-9
R5	100k	10k
R8	33k	51k
R9	10k	1k
R10	470R	220R
R11	10k	1k

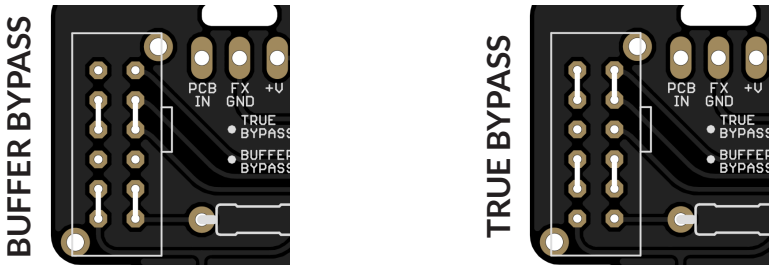
PART	SD-1	TS-9
R12	10k	1k
R15	100k	510k
C3	18n	1uF
C7	18n	220n
C8	27n	220n

PART	SD-1	TS-9
C9	1n8	(omit)
C10	8n2	10n *(see note)*
C11	2.2uF	1uF
DRIVE	1MB	500kB
VOL.	10kB	100kA

Note: C10 sets the amount of treble rolloff when using the "stock" DIP switch setting, which is stock only in the SD-1. The "bright" mode is the TS-9's stock setting, which bypasses C10. See page 8 for more information.

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.



Clipping switch

The clipping 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:

The Stratus Deluxe requires the **Type 2** configuration, which is used by most major manufacturers such as Taiway. If you're considering a different brand, make sure you know the configuration of the center position. Many of the off-brand on-on-on switches such as the ones sold by Tayda Electronics are Type 1 and will not work in this circuit.

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 stock mode and LED modes, but you will not have the mode with an extra pair of diodes in series.

Transistor substitutions

Q1, the JFET, is a 2SK880-GR in the original. This is a smaller version of the 2SK209-GR, which is available from Aion FX with through-hole TO-92 adapters. There is nothing special about this JFET, so you can use any general-purpose substitute such as the J112.

Q2-4 are 2SC4117-GR in the original. These are medium-gain BJT transistors, with a gain spec of 200 to 400. The 2N5088 is an excellent substitute with the same specs. You can also use the BC549C, but it needs to be rotated 180 degrees from the silkscreen outline.

Asymmetric clipping

The original SD-1 added a second clipping diode in only one direction. This means the waveform is clipped asymmetrically (i.e. more clipping on one half of the waveform than the other half) and the perceived clipping threshold is raised by half a diode drop, meaning it will be a bit louder.

The “Diodes” DIP switch adds this extra diode when set to the “ASYM” position. This diode is added to both diode clipping modes (the bottom and center positions of the switch), meaning that mode 1 has two diodes in one direction and one in the other, and mode 2 has three diodes in one direction and two in the other. The LED mode (top position) is the same regardless of the DIP seting.

In an SD-1 build, the stock mode is asymmetrical. In a TS-9 build, the stock mode is symmetrical.

Treble cut capacitor

The original SD-1 was a direct response to the Ibanez Tube Screamer. The circuits are nearly identical, and almost all of the difference in sound is due to different component values. But, there is one significant addition: a 10n capacitor in the feedback loop of the tone control op-amp in parallel with the resistor, which is 10k in the SD-1 and 1k in the Tube Screamer.

This capacitor cuts a significant amount of treble, and SD-1 users will commonly remove this capacitor (labeled C6 in the original SD-1, and C9 in the Stratus Deluxe) by desoldering it or just cutting it out. This opens up the top end significantly, at the expense of some of the characteristic midrange emphasis.

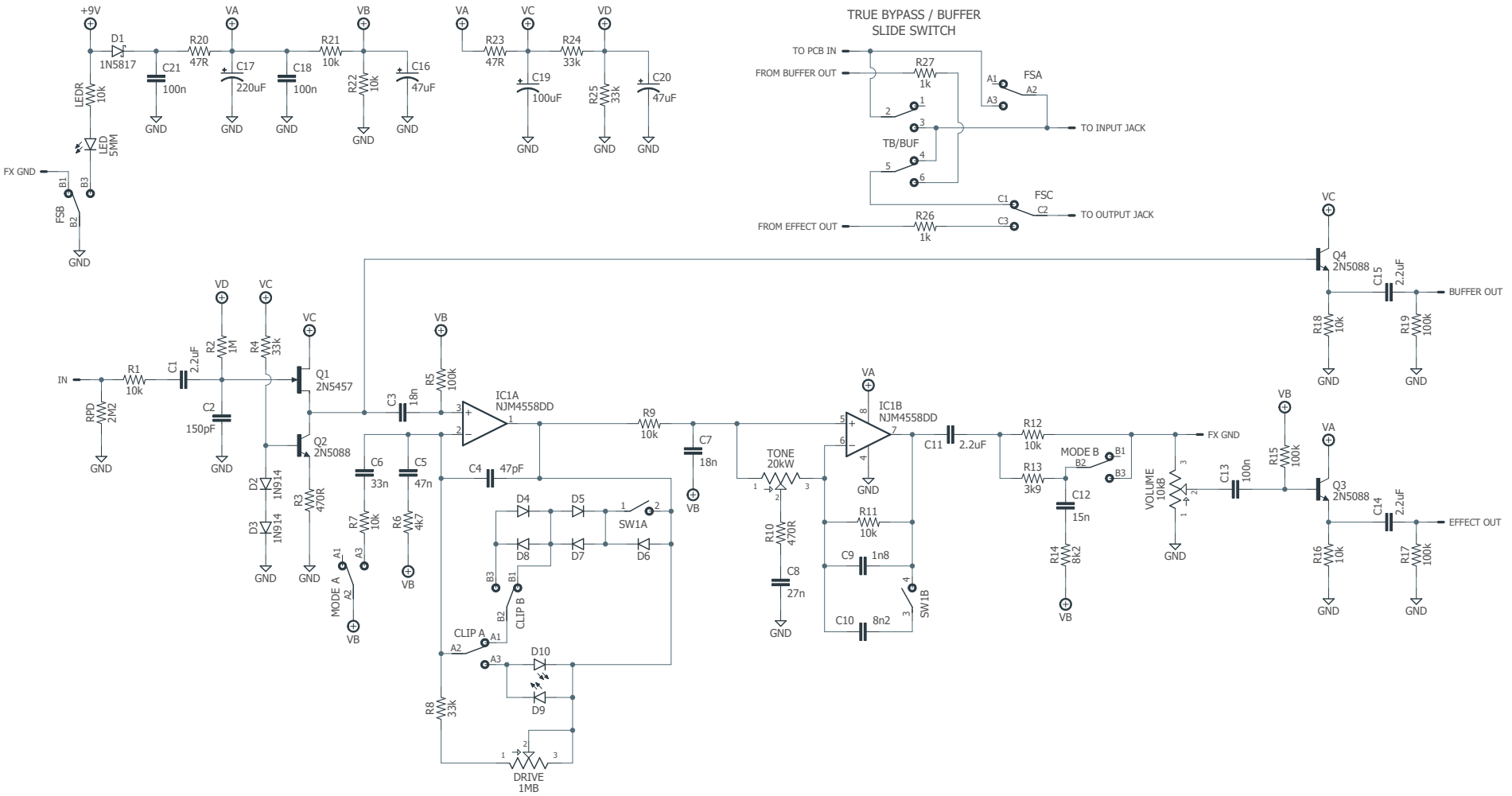
On the Stratus Deluxe, we added a “Treble” DIP switch so it could be easily disabled. This setting is labeled “Bright” on the PCB.

Some SD-1 users like to keep a small-value capacitor here, since the rest of the circuit was tuned around the treble cut and it may get harsh if the capacitor is removed entirely. Our implementation includes one always-connected capacitor (C9), which is intended to be a low value, and a switch-dependent capacitor (C10), which should be the difference between 10n and the smaller capacitor.

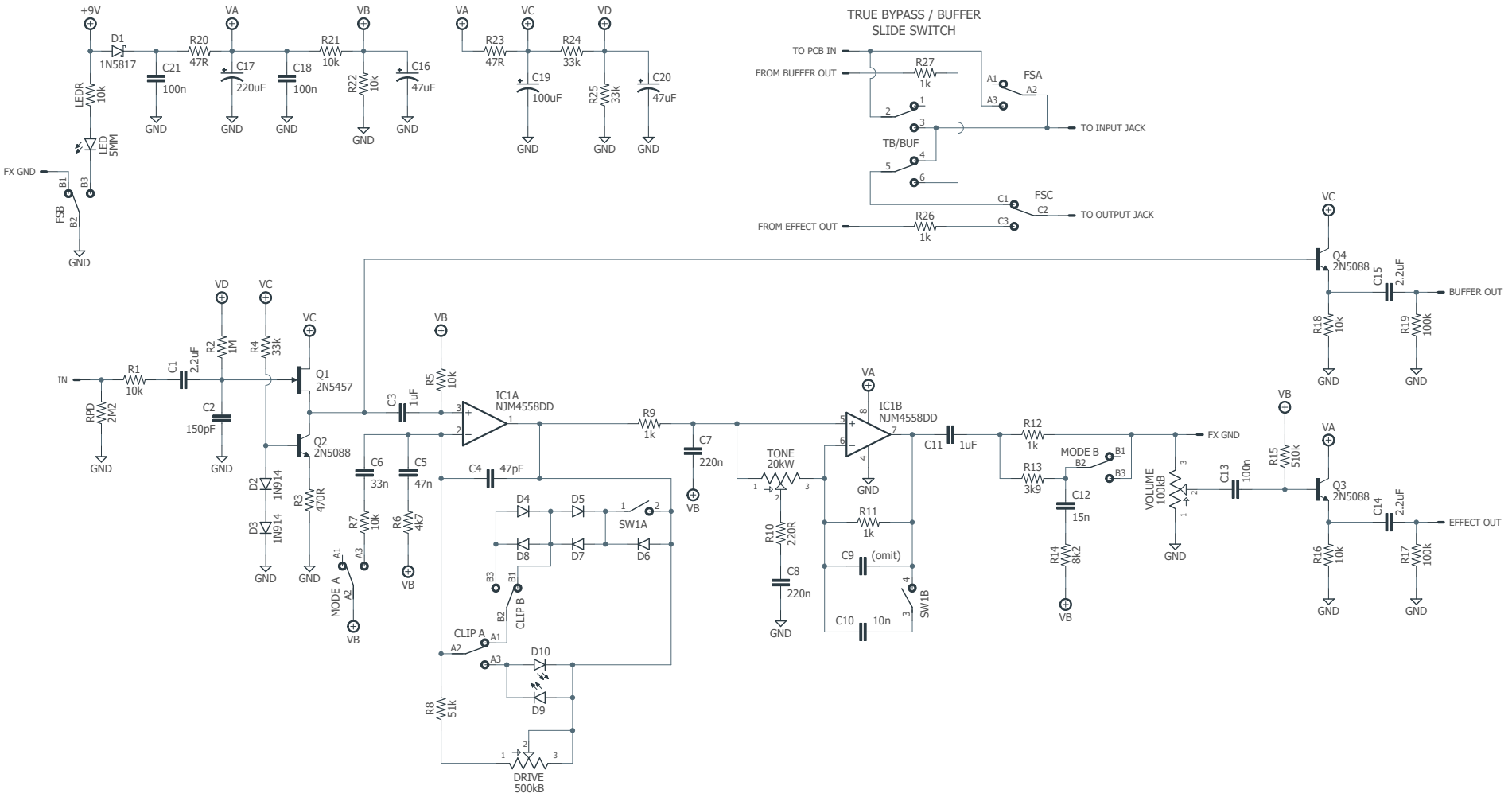
It’s recommended to use 1n8 for C9 and 8n2 for C10, but you can also use 3n3/6n8 or 4n7/4n7. You can also omit C9 and use 10n for C10, which makes the “bright” mode equivalent to clipping the capacitor.

If you’re building to Tube Screamer specs as described on page 6, you should omit C9. Be aware that the DIP position labeled “bright” on the PCB is now the stock mode, since the Tube Screamer does not have this capacitor. For C10, we recommend keeping it at 10n or even raising it to 15n. Since the parallel resistor is reduced to 1k, the treble cut frequency is raised by a factor of 10, so with 10n, it should not be overly dark. That said, you probably won’t find that the treble cut setting is useful in the TS-9 circuit since you already have a tone knob that does the same thing.

SCHEMATIC (SD-1)



SCHEMATIC (TS-9)



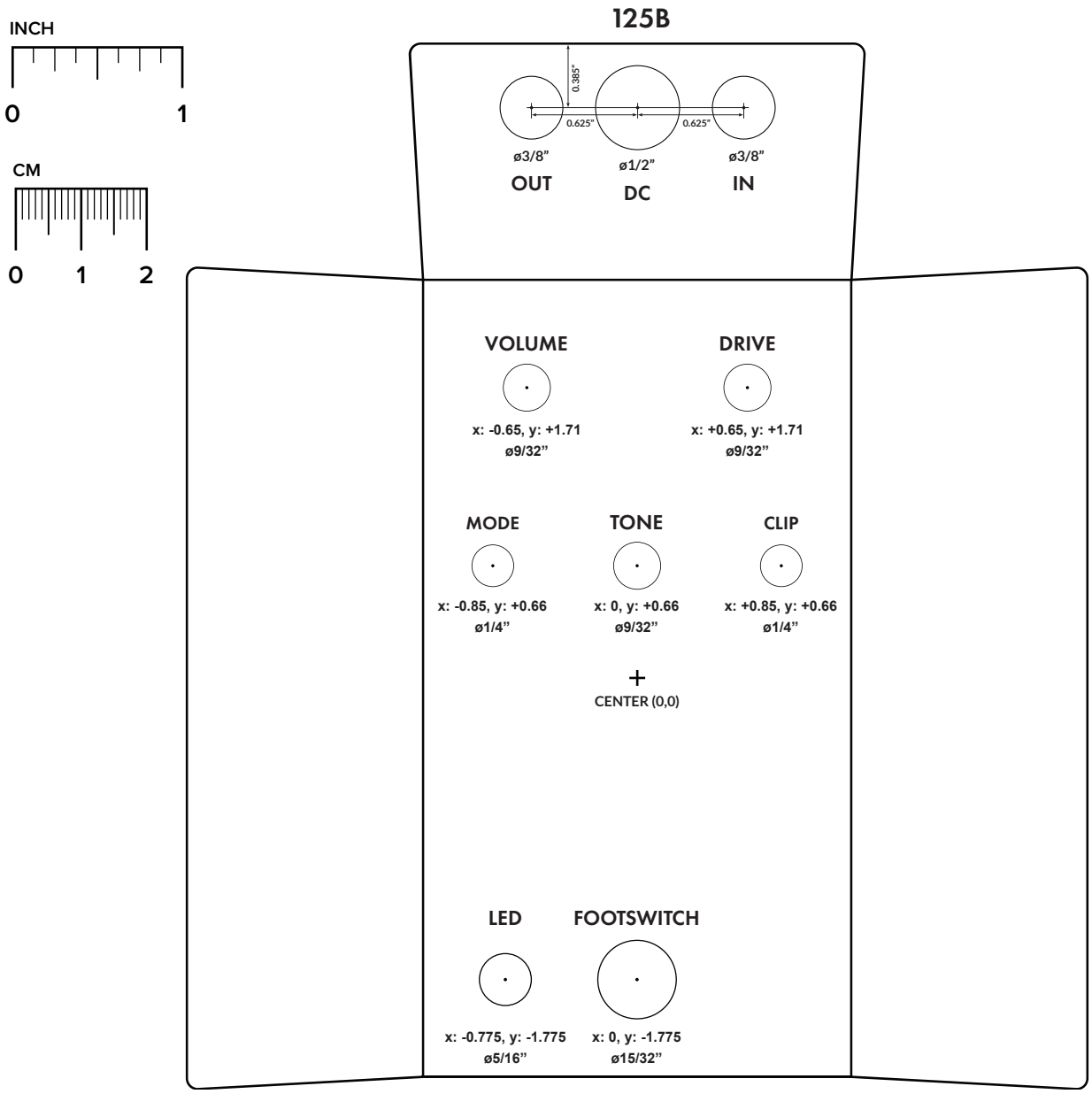
DRILL TEMPLATE

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.

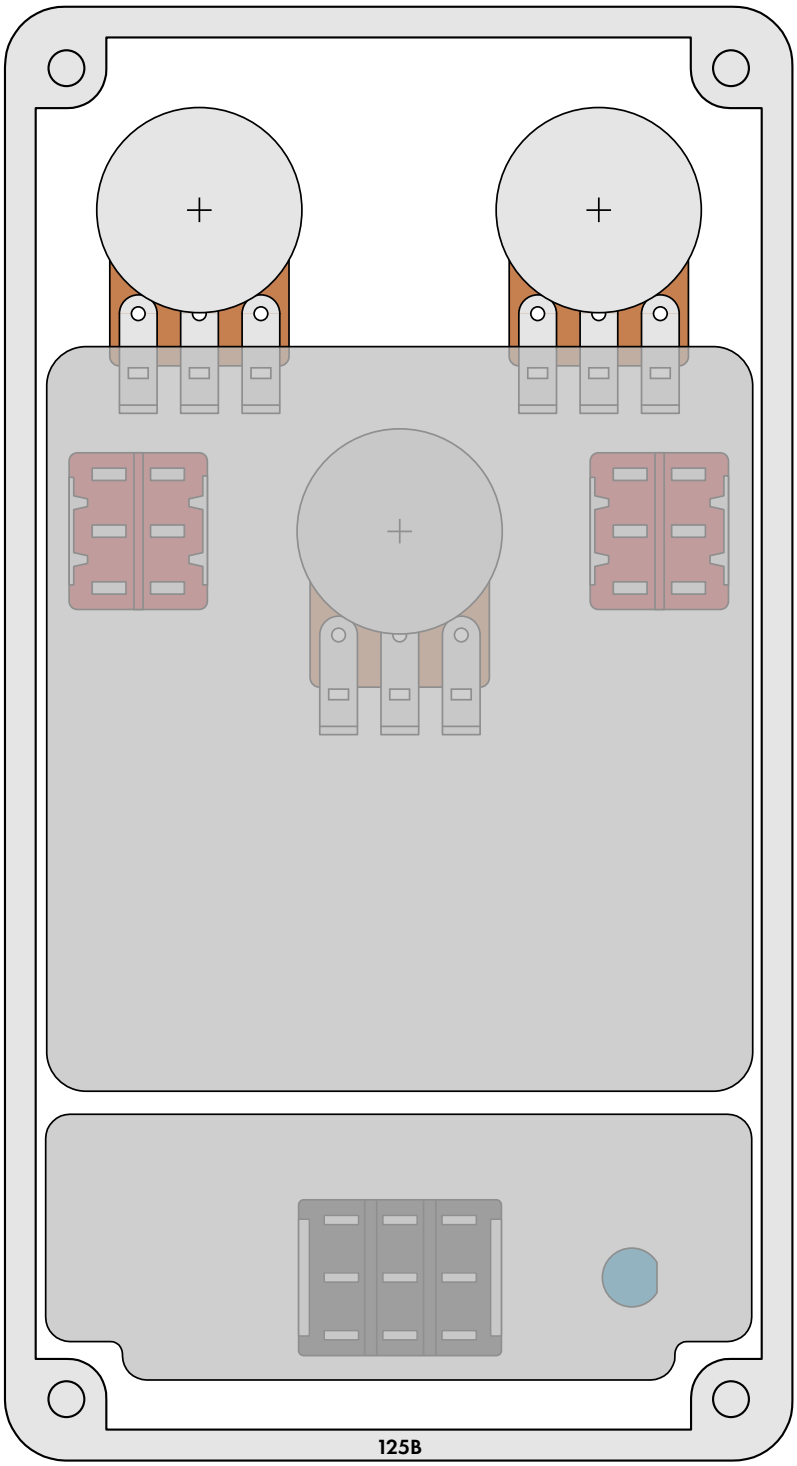
Top jack layout assumes the use of closed-frame jacks like the Switchcraft 111X. If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

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.

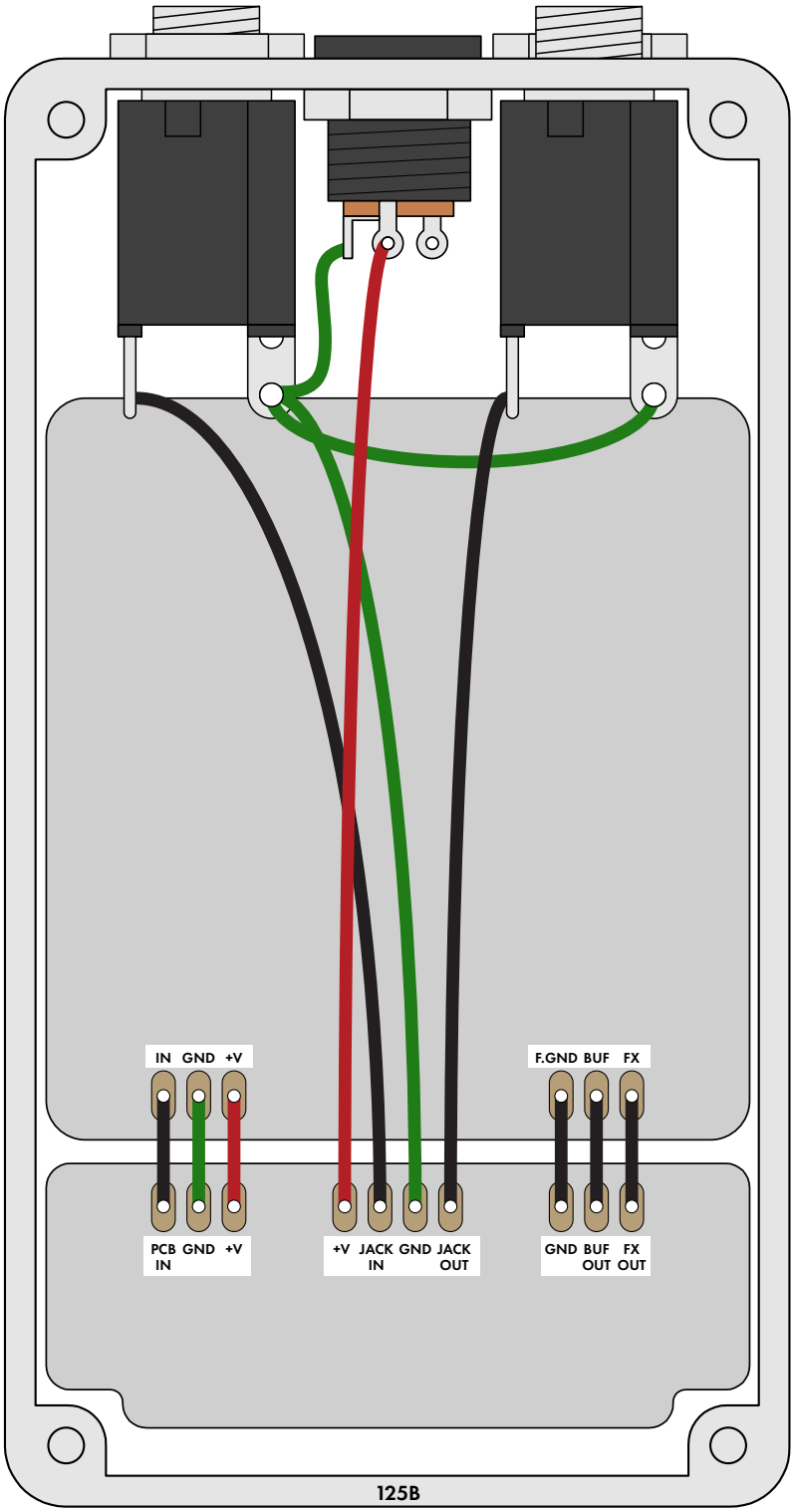


ENCLOSURE LAYOUT

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.

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DOCUMENT REVISIONS

1.0.0 (2025-03-28)
Initial release.