Derringer Fuzz: Build Document

Carcharias Effects
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1. About This Circuit

The Derringer Fuzz PCB is based on one of the heaviest, most iconic fuzzboxes to ever exist—the Univox Super-Fuzz. There are certain circuits that are inextricably a part of the songs with which they were written. The Super-Fuzz is definitively one of them. The original had three controls: a knob for changing the texture of the fuzz (called "Expander"), another for the amount of volume (called "Balance"), and a switch for two different tonal voicings. It is an incredible, supersaturated, six-silicon transistor fuzzy beast of a pedal perfect for bass and guitar.

This circuit gets its name from the FreeStompboxes user Derringer, who made several excellent suggestions for modifications. This circuit replaces the original model's switch with a Tone pot, which enables panning between two tone capacitors. Derringer also added two small-value capacitors at the first and last transistors, and encouraged experimentation with their values. You can find some of my own own findings and suggestions in the build document. There is also an internal trim pot for modifying the balance between transistors Q4 and Q5, in case you want to experiment with non-identical transistors.

Rev2.2 of this circuit includes some fun changes—most notably the two separate rows of transistors, for those who want to experiment with BCE-pinout transistors. It also externalizes the Brutal control, which effectively lets you modify the connection of the octave-up diodes to ground. I've also taken care to lay out the PCB intuitively, which lends to a faster and more enjoyable time building.

2. Controls

The following are the standard external controls for this pedal:

- **Balance** — Controls the output volume of the circuit.
- **Tone** — Controls the panning between capacitors in the tone stack.
- **Brutal** — Connects the asymmetrical diodes to ground. At 100% CCW, the diodes are connected to ground, giving you more compression, and therefore a slightly more reasonable dynamic range to play with on the Balance control. At 100% CW, there is a larger resistance between the diodes and ground, which gives you a louder, darker, and bassier type of clipping.
- **Expander** — Controls the fuzz amount.

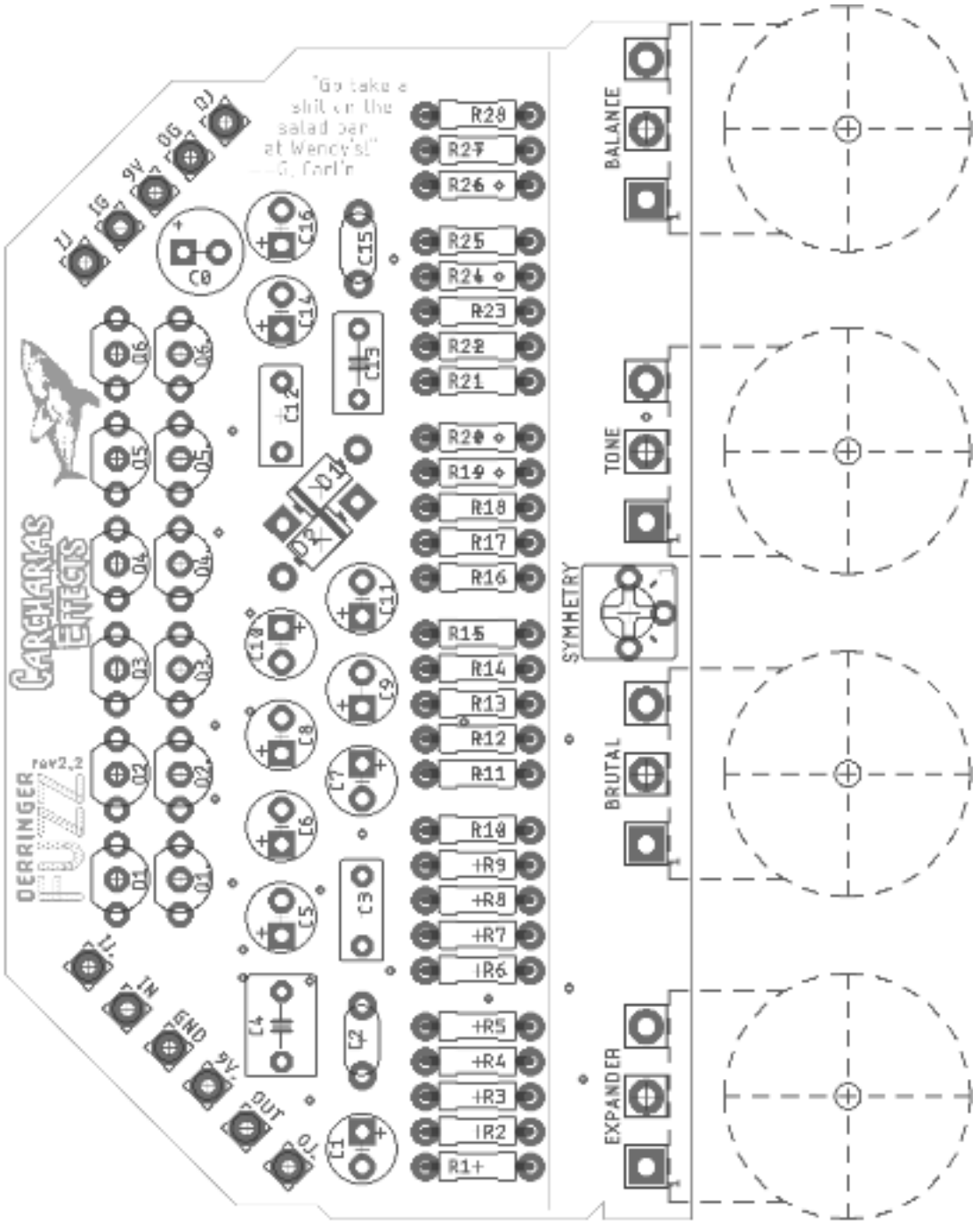
Optional:

- **T1** — This trimmer tapers the balance between the gain stages based around transistors Q4 and Q5, effectively allowing you to fine-tune the octave effect for which the Super-Fuzz is known. I kept it as a trim rather than an external control because I

found its effect on the overall sound of the circuit to be more subtle. After experimenting with it, I decided that I liked it pretty much at dead center, which is equivalent to omitting the control altogether. If you want to omit this control, simply jumper all three pads to one another (e.g., jumper pads 1 and 3 to pad 2). This connects R18 and C10 directly to ground as in the original Super-Fuzz circuit.

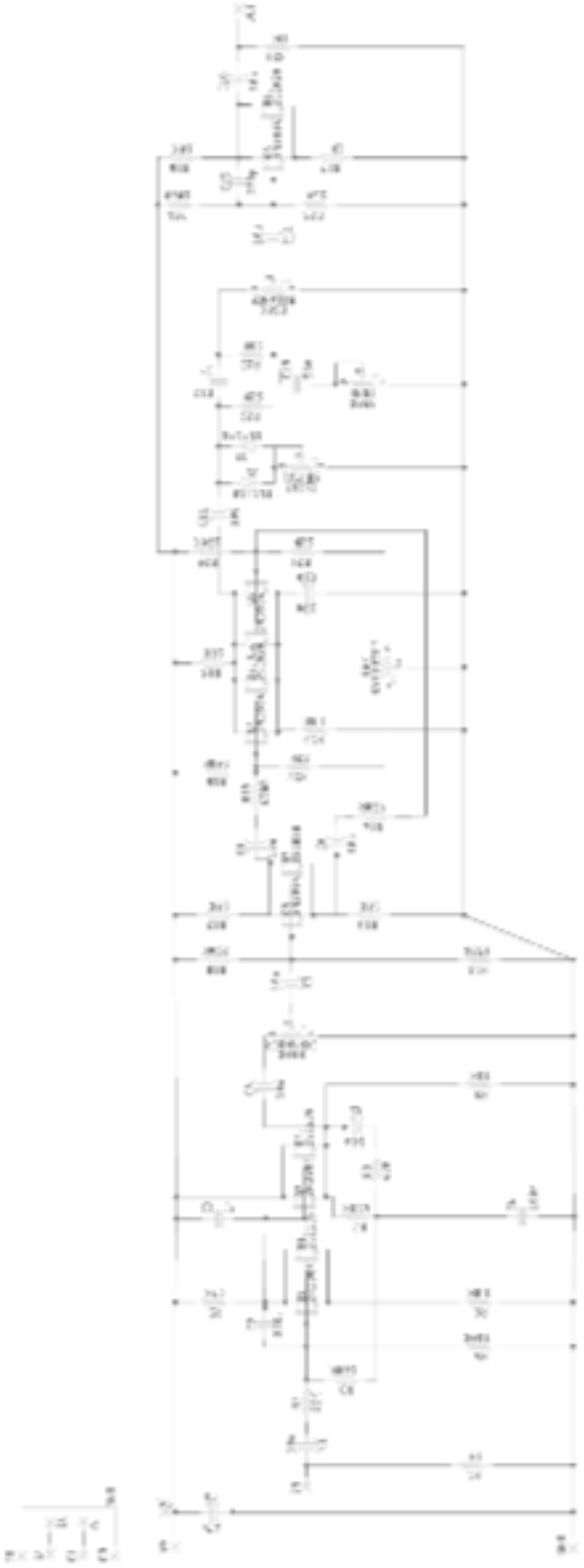
3. Circuit Board

The following is a screen capture of the printed circuit board (PCB):



4. Schematic

The following is a screen capture of this circuit's schematic, which can be used for reference when debugging:



5. Bill of Materials

You will need the following components to complete your build:

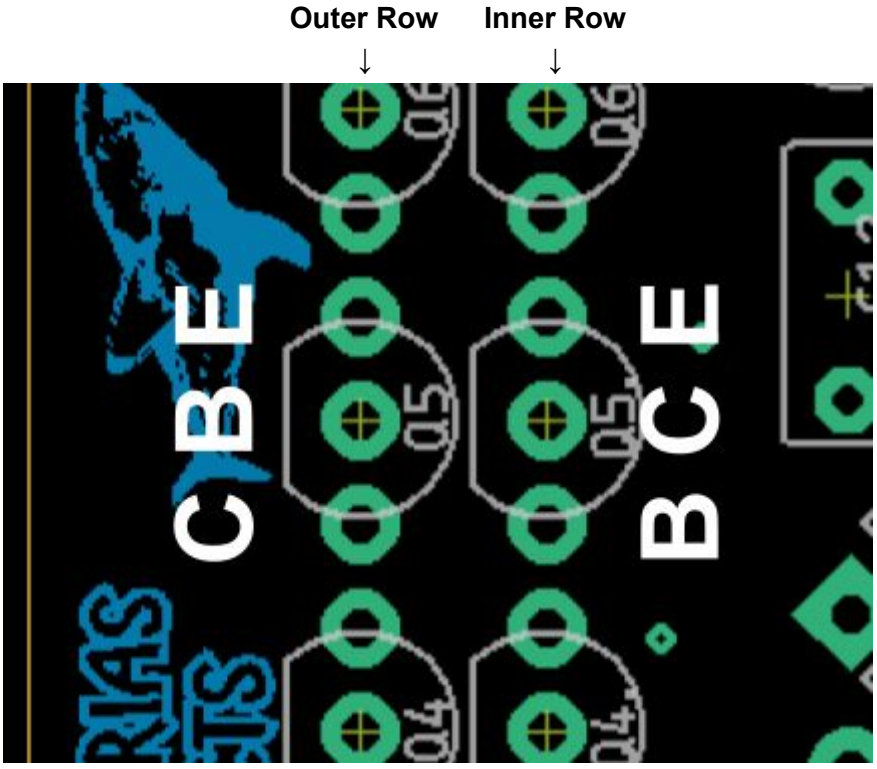
Qty	Value	Parts	Description
2	220p*	C2, C15	Capacitor - Ceramic
10	10u	C1, C5, C6, C7, C8, C9, C10, C11, C14, C16	Capacitor - Electrolytic
1	47u	C0	Capacitor - Electrolytic
1	100n	C4	Capacitor - Mylar
2	1n	C3, C12	Capacitor - Mylar
1	56n	C13	Capacitor - Mylar
2	B10K	TONE, BRUTAL	Potentiometer
2	B50K	BALANCE, EXPANDER	Potentiometer
2	1.8K	R6, R18	Resistor
5	100K	R3, R4, R16, R20, R24	Resistor
6	10K	R9, R12, R13, R19, R23, R26	Resistor
1	150K	R11	Resistor
1	15K	R25	Resistor
1	1K	R27	Resistor
2	1M	R1, R28	Resistor
1	220K	R10	Resistor
4	22K	R2, R17, R21, R22	Resistor
1	470K	R7	Resistor
2	470R	R14, R15	Resistor
2	47K	R5, R8	Resistor
2	1N4148*	D1, D2	Silicon Diode
6	2N3904*	Q1, Q2, Q3, Q4, Q5, Q6	Silicon Transistor (CBE pinout)
2	2SC539*	Q1., Q2.	Silicon Transistor (BCE pinout)
4	2SC828*	Q3., Q4., Q5., Q6.	Silicon Transistor (BCE pinout)
2	10K	T1, T2	Trimmer

** See **Build Notes** for more details*

6. Build Notes

The following are a collection of notes, comments, and tips about this circuit.

- The biggest change to this circuit from the first Derringer PCB is the double rows for transistors. I heavily recommend socketing, because it's easier to figure out if you have a faulty transistor. For ease of assembly, you can simply use a single strip of 18 sockets for each row (instead of soldering 12 individual 3-pin sockets). Here are the difference between the two rows:
    - The **outer row** — i.e., the one closest to the "Carcharias Effects" logo, leftmost when looking at the component side — is dedicated for transistors with pinout CBE.
    - The **inner row** — i.e., the one closer to the center of the PCB, rightmost when looking at the component side — is dedicated for transistors with pinout BCE.



- Capacitors C2 and C15 are noted as 220pF, but you can socket them and try out any values from 50pF to 1nF. There are benefits and drawbacks to any combinations you can think of, but it's all to taste. You can even attach a switch and add multiple capacitors. The higher the value, the more bass you introduce into that part of the circuit. Omitting them altogether (without jumpering them) brings the circuit closer to the original SF schematic.
- The Brutal knob currently uses a linear (B10K) pot, but according to your taste you might want to use a different taper. **Try A10K or C10K.** If you want to omit this control, simply jumper pad 2 to pad 1. This connects the asymmetrical diodes directly to ground as in the original Super-Fuzz circuit.

- T1 can be externalized if you solder in pots instead of trimmers. (see the *Controls* section above). To omit T1, jumper all three pads to one another (e.g., jumper pads 1 and 3 to pad 2). This connects R18 and C10 directly to ground as in the original SF circuit.
- From personal experience, this circuit feeds back heavily (i.e., high-pitched squeals) if you don't keep the cable connecting the PCB to the power line on the 9V jack short.If you experience squealing, check this.
- Diodes D1 and D2 are noted as 1N4148, but feel free to experiment with different types of diodes (silicon, germanium, schottky, LEDs, etc.)
- For the most part, this PCB was designed to fit in a 125B (1590N1) size enclosure with top-mounted jacks and side-mounted pots, which is how I like to lay out my personal Derringer (check the site for some images). I use pots with board-mounted lugs as in the image below. This makes the shaft of the pot face out away from the center of the PCB when attached. If you don't want to use this layout, you might want to use a 1590BB, but make sure that the lugs of the pots still line up to the indicated pads on the PCB.

Terms of Use

The printed circuit board (PCB) discussed herein may be used for DIY purposes, such as personal builds or small commercial operations. This PCB may not be resold as part of a commercial kit. Resale from peer to peer is approved.

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Change Log

- **Rev1 (June 16, 2019):** First draft of this document, includes all standard features (corresponds to PCB rev1.1)
- **Rev2 (June 27, 2019):** Minor changes, added proper control names.
- **Rev3 (January 13, 2021):** Updated to accommodate for changes to new PCB version. This build doc corresponds to **PCB rev2.2**.

Contact

If you encounter any problems or issues with the PCB, or have any questions or comments, feel free to reach out to me anytime. I will try my best to be as responsive as possible. Here are the best ways to reach me:

- Instagram/Facebook (DM): **Carcharias.Effects**
- Email: carcharias.effects@gmail.com
- Web: www.carchariaseffects.com/contact

I **love** seeing pictures of other peoples' builds, so feel free to tag me (**carcharias.effects**) on Instagram or Facebook.

Best of luck and happy building!