

Clever Girl: Build Document

Carcharias Effects

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1. About This Circuit

If you've spent enough time around guitar players who are obsessed with the Fuzz Face like I have, you'll quickly learn that there are about as many flavors of the Fuzz Face as there are people who are obsessed with the Fuzz Face. And as a guitar player, why wouldn't you be? This circuit has almost single-handedly defined both the quintessential fuzz tone, as well as what it means to be playing your guitar through a fuzz. It responds to your playing dynamics and on-board guitar controls, and it is a simple enough circuit to build as well as to modify.

I honestly could go on and on, but if you're here already then I'd be preaching to the choir. My story with it goes that one of my best friends/pedal guru ([@leibo.plays.guitar](#) on IG if you want to give him a follow) asked me to build him the ultimate Fuzz Face, catered to all of his specific tastes, and flexible enough to be able to be modified as needed. Thus was born the **Clever Girl Fuzz**, a pedal project designed for Fuzz Face lovers and their discerning tastes.

Since Arbiter issued the first Fuzz Face in 1966, many pedal circuits bore a similar topology to the Fuzz Face. So depending on what kind of flavor you're going after, this PCB can be used to build a multitude of these circuits. Try the classic or any of its variants with a similar schematic—I've provided a table in this Build Document which outlines parts for the original Arbiter Fuzz Face, DAM Dark Meathead, Axis Face, and Sola Sound Tonebender MkII.

You can also use this PCB as a development platform to mix and match parts and create your ideal Fuzz Face variant. Experiment with silicon, germanium, or a hybrid mix of the two. Hard-wire some of the pot values or implement internal trimmers. Create a one-, two-, three-, or four-knob fuzz monster. Fill in the missing parts with spliced amphibian DNA. The possibilities are truly endless.

If you want to read more about the Fuzz Face, I recommend starting with [ElectroSmash's](#) excellent technical analysis of the Fuzz Face circuit, as well as [Fuzz Central's](#) blog for a brief history of the original circuits.

In short, the **Clever Girl Fuzz** is not just a fuzz circuit—it's a project in and of itself, where you can get so preoccupied with whether or not you *could*, that you don't stop to think if you *should*.

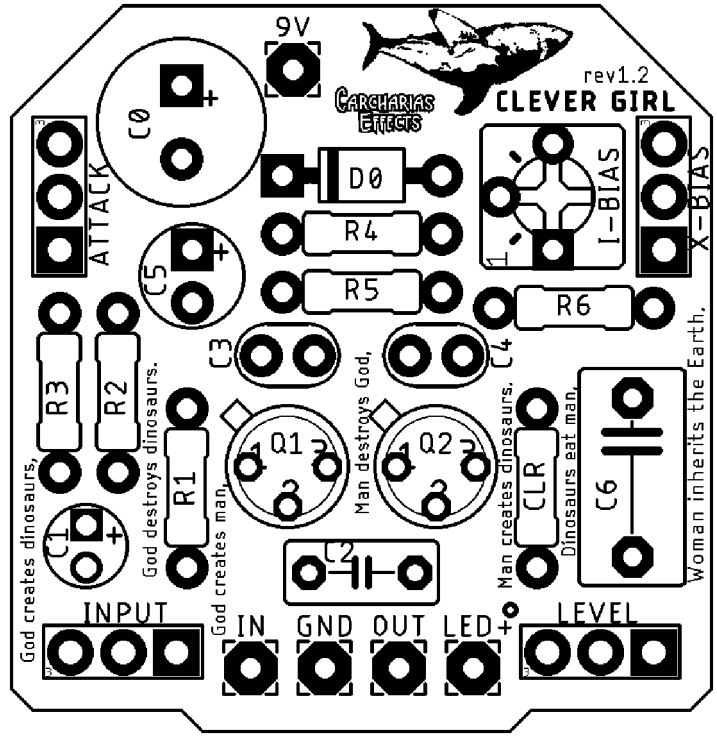
2. Controls

The following are the standard external controls for this pedal:

- **Attack** — Controls the amount of fuzz in the circuit by increasing or reducing the transistor gain.
- **Input** — Allows you to adjust the signal input volume into the circuit. This is meant for guitarists who always roll back their guitar volume knob a hair when turning on their fuzzes.
- **Bias** — Biases the Q2 transistor. Fuzz Face purists will set this to a specific point and forget it, but because certain transistors can be finicky, especially depending on the ambient temperature (which is always changing), then an external biasing control can be particularly advantageous. In practice, even unbiased transistors have a certain aesthetic to them, so the Bias control essentially gives you different fuzz characteristics.
- **Level** — Controls the amount of output volume from the circuit.

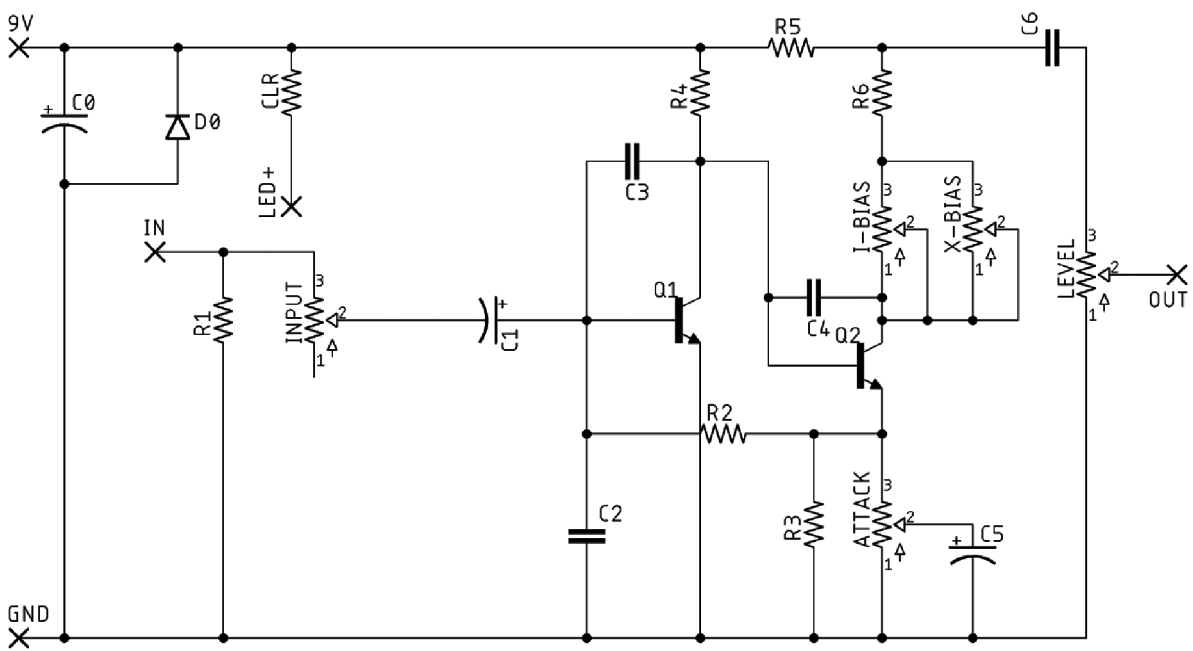
3. Circuit Board

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

Depending on what kind of Fuzz Face you want to build, check the components that you will need to complete your build from the table below. You could also use the schematic to breadboard your own and experiment with values of your choosing! In any case, remember that **if you are using PNP transistors** to flip the orientation of all your polar components (the PCB silkscreen shows polar components in consideration of NPN transistors).

Part	Type	Value			
		Fuzz Face (PNP)	Axis Face	DAM Dark Meathead	Sola Sound Tonebender MkII (PNP)
C0	Capacitor - Electrolytic	47u+*	100u+	47u+	47u+*
C1	Capacitor - Electrolytic	2.2u+	220n	470n	4.7u+
C2	Capacitor	Omit	Omit	Omit	Omit
C3	Capacitor - Ceramic	Omit	Omit	470p	220p
C4	Capacitor - Ceramic	Omit	100p	47p	10p
C5	Capacitor - Electrolytic	20u+	15u+	10u+	22u+
C6	Capacitor	10n	10n	100n	100n
D0	Diode	1N4001+*	1N4002+	1N4001+*	1N4001+*
CLR	Resistor	1.5K	1.5K	1.5K	1.5K
R1	Resistor	1.5M*	1M	2M	1.5M*
R2	Resistor	100K	100K	120K	100K
R3	Resistor	Omit	Omit	1K	Omit
R4	Resistor	33K	33K	18K	47K
R5	Resistor	470R	1.2K w/ 33n cap (in parallel)	820R	470R
R6	Resistor	8.2K	Jumper	4.7K	8.2K
Q1	Transistor	AC128	PN2369A	BC107	AF127
Q2	Transistor	AC128	BD139	BC108	AF127
ATTACK	Potentiometer	B1K	B1K	Jumper	B1K
INPUT	Potentiometer	Jumper	B100K	Jumper	Jumper
LEVEL	Potentiometer	A500K	A100K	A500K	A100K
X-BIAS or I-BIAS	Potentiometer	Jumper	B10K	Jumper	Jumper

+ = polar components

* = optional

6. Build Notes

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

- **Transistors** — Germanium or Silicon (or both), matched or hybrid pairs, really, just go nuts here. Just remember that whatever you choose, it'll make your life a whole lot easier (with this PCB anyway) if both transistors are NPN or PNP. Just note that the silkscreen printing on the PCB indicates that polarized components (caps and diodes, which are denoted with a “+” in the table above) are oriented in consideration of NPN transistors. That means that if you want to use PNP transistors (like the original *Fuzz Face* and the *Sola Sound Tonebender MkII*), just reverse the orientation of your caps and diodes, and also make sure to be wire your power connections accordingly.
- All of the **solder pads for the potentiometers** can be soldered to either 9mm potentiometers, or for [25-turn, top-adjusting cermet trim pots](#). Depending on whether you want to externalize a control or keep it adjustable but on the inside of the pedal, you can choose whether to implement it as either a trimmer or a pot. Also, it might be a little hard to read on the PCB, but the **square pad** represents **lug 1** of each potentiometer/trim control.
- **Jumpering Potentiometer pads** — If you want to omit/bypass the **Attack** or **Input** pots, simply jumper lugs 2 and 3. If you want to omit either of the **Bias** controls, jumper pads 2 and 3 of one of them and do not do anything to the other one. No need to jumper them both.
- **X-Bias and I-Bias** — I've implemented them both on the PCB as both a trimmer (I-Bias, or “internal bias”) and a potentiometer (X-Bias, or “external bias”). If you want to implement this, I would recommend adding a 1K resistor to R6 and using a 10K trimmer. **Remember:** you only need to add a single trimmer to either X-Bias or I-Bias—**not both!**
- **C2** — I've seen this component added to a few schematics, but none of the ones I've included in the table above. Supposedly it helps filtering a bit of noise. Experiment with it; a good place to start would be around 10n.

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.

I do not claim any cloned circuit (whether partially or entirely) as the intellectual property of Carcharias Effects, nor am I in the business of intentionally violating any copyrights. Unless otherwise noted, many of the circuits available on [carchariaseffects.com](#) are based on schematics that represent the works of many hardworking people who came before me, who have designed many wondrous and unique electronics for musicians. I am just one guy with

a hobby and love for these electronics, and designing and selling these PCB's is simply one way that I can ensure that my hobby continues to be self-sustaining.

Change Log

- **Rev1 (August 19, 2020):** First draft of this document, includes all standard features. This document corresponds to **PCB rev1.2**.

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!