BlackBender

V1.3 Rev. B/C

Circuit Notes

NOTE: A few component names changed between Rev. B and Rev. C – check BOM and schematic carefully.

Fuzz

The fuzz section is a straight NPN Tone Bender; part value substitutions or other mods for Tone Benders should work here. I used BC109s but any NPN will work, and the PCB offers EBCE pinouts to accommodate (hopefully) whatever transistors you want to try.

EQ

The EQ section is lifted from the Boss HM-2 Heavy Metal distortion pedal, using the original component values for the high, mid, and low EQ. The switch selects whether the mid EQ is controlled by MID or HIGH.

EQ Pots

The schematic uses B10K pots but W10K might give a smoother response if you can find them.

That Really Big Cap (C201)

The original HM-2 called for a 1u5 electrolytic cap, and because I didn't read the eBay listing carefully I ended up with a bag of 400V caps. Call it mojo. At any rate, that's what's footprinted on the Rev B boards.

Rev C boards have two options for C201: the large 1u5 electrolytic or two film caps in parallel, 680n and 820n. The silkscreens overlap because you will only use one of these, not both. **The unused pads should be left open, not jumpered.**

EQ Foot Switch Mod

My BlackBenders have a toggle switch for the mids, but you could easily wire up a DPDT stomp switch instead if you wanted to be able to engage MID while playing.

Mid-Wah Mod

I haven't tried this yet but it's on my to-do list. If you connect a switched, insulated TRS jack so that the switches connect to MID and the jack lugs connect to the MID pads on the board, you will be able to sweep the mid EQ with an expression pedal and get a wah-like effect. With the jack switches connected to MID, the pedal will function normally if the expression jack is unplugged.

LEDs

The board has spots for three LEDs. LEDL and LEDH serve as status indicators – they come on when the pedal is engaged. LEDM tracks the mid switch: it turns on when the mid EQ knob is active, and turns off when mid EQ is linked to the high knob.

All of the LEDs are in series with a single CLR. If you're using LEDs with a forward voltage around 1.9V, the specified CLR value of 2k7 will be sufficiently bright without a big difference between two and three LEDs active. If you use LEDs with a higher V_F, you might want to adjust the CLR value. Because all 3 LEDs sit in series, LEDs with a high V_F (near 3V) might not turn on.

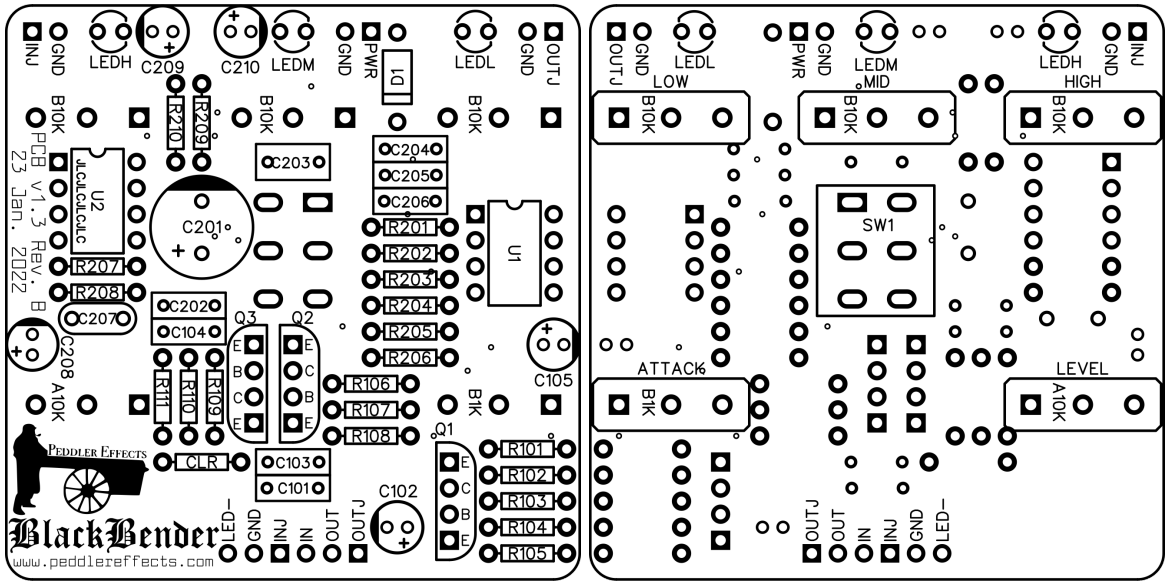
If you just want a single status led, use the pads for LEDL or LEDH and jumper (short) both of the remaining LED pads.

Drill Template and Pot Alignment – Rev B Boards Only

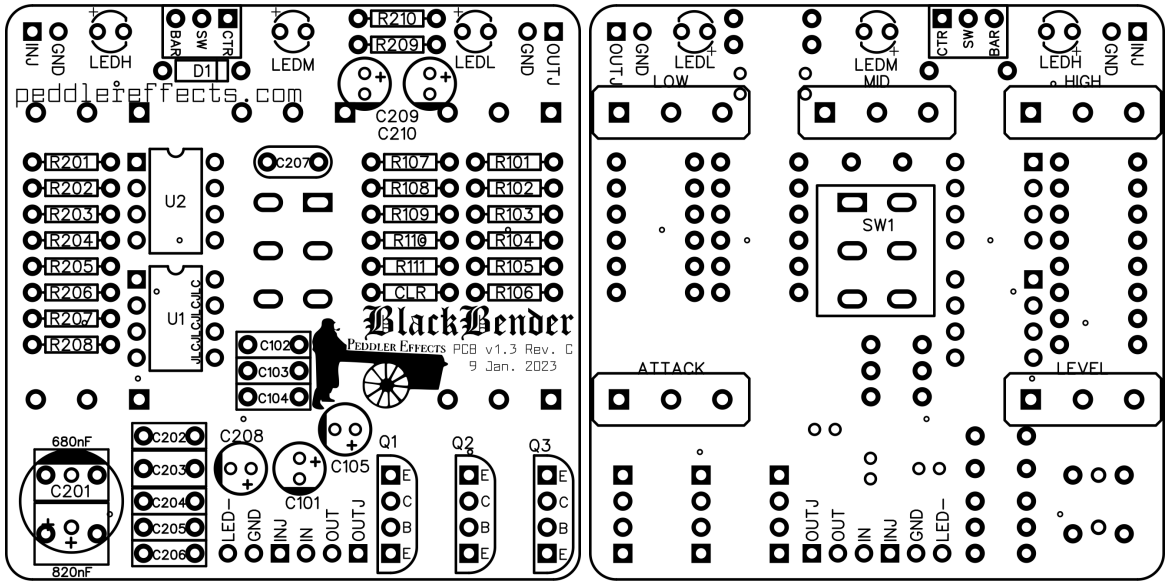
It takes a bit of fidgeting and pushing to get the pots into the drilled holes. At first I thought I wasn't drilling accurately but later discovered a slight error in the PCB-mounted pot footprints for the PCB. It will fit, just takes a little elbow grease. *This has been corrected on Rev C boards.*

PCB Layout

Rev B



Rev C

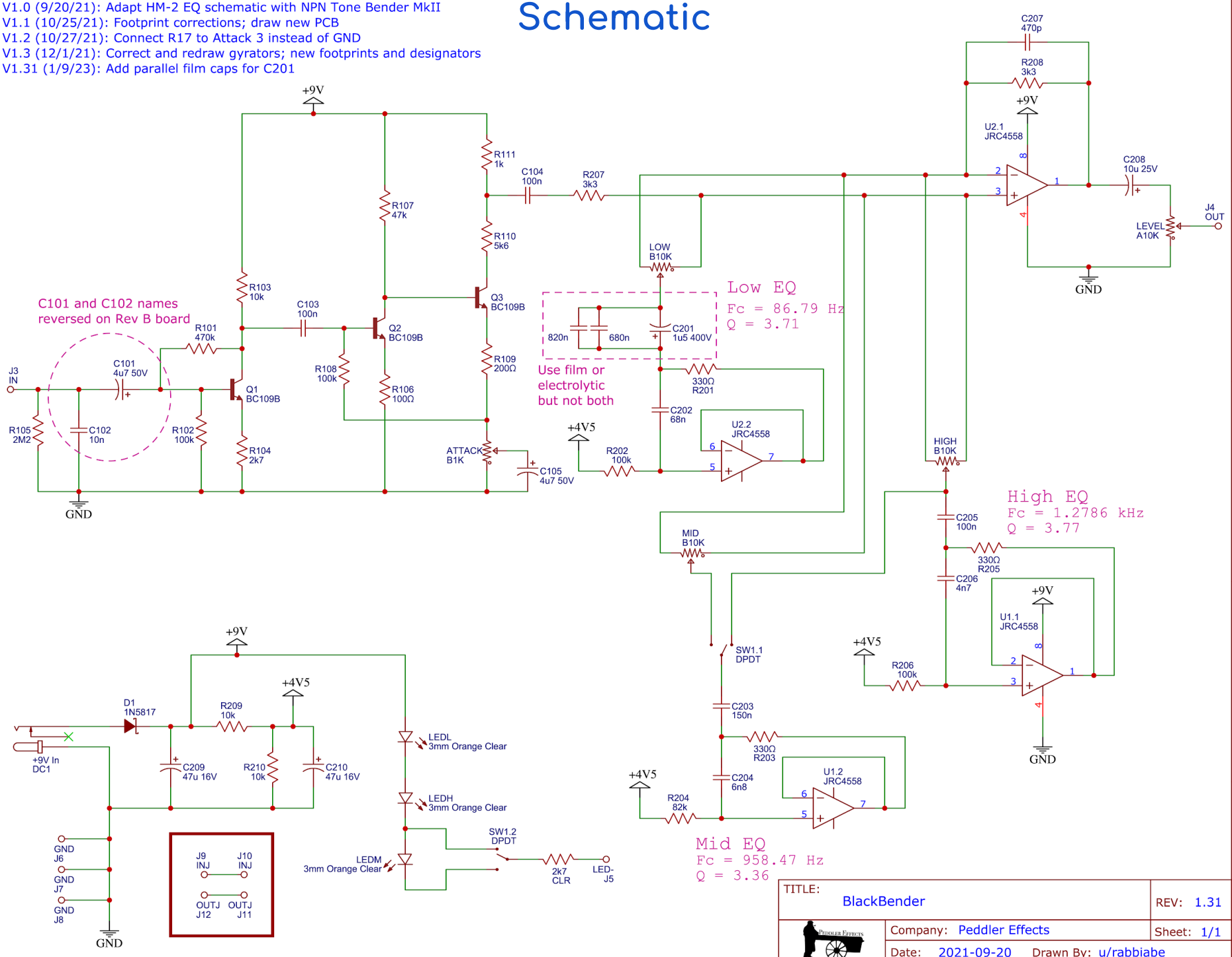


Off-Board Wiring

Pad	Connection
IN	Circuit Input connection to 3PDT Switch
OUT	Circuit Output connection to 3PDT Switch
INJ	Input Jack / Input Jack connection to 3PDT Switch
OUTJ	Output Jack / Output Jack connection to 3PDT Switch
LED-	LED connection on 3PDT Switch
PWR	(Rev. B) +9V
BAR	(Rev. C) DC Jack Barrel (+9V)
CTR	(Rev. C) DC Jack Center Pin (Ground)
GND	Ground

Changelog:
V1.0 (9/20/21): Adapt HM-2 EQ schematic with NPN Tone Bender MkII
V1.1 (10/25/21): Footprint corrections; draw new PCB
V1.2 (10/27/21): Connect R17 to Attack 3 instead of GND
V1.3 (12/1/21): Correct and redraw gyrators; new footprints and designators
V1.31 (1/9/23): Add parallel film caps for C201

Schematic



TITLE: BlackBender		REV: 1.31
	Company: Peddler Effects	Sheet: 1/1
	Date: 2021-09-20 Drawn By: u/rabbiabe	

Bill of Materials

[Click here for spreadsheet]

Resistors			
R106	100Ω	R103	10k
R109	200Ω	R209	10k
R201	330Ω	R210	10k
R203	330Ω	R107	47k
R205	330Ω	R204	82k
R111	1k	R102	100k
CLR	2k7*	R108	100k
R104	2k7	R202	100k
R207	3k3	R206	100k
R208	3k3	R101	470k
R110	5k6	R105	2M2

Capacitors		
C207	470p	Ceramic
C206	4n7	Film (Box-type)
C204	6n8	Film (Box-type)
C102[△]	10n	Film (Box-type)
C202	68n	Film (Box-type)
C103	100n	Film (Box-type)
C104	100n	Film (Box-type)
C205	100n	Film (Box-type)
C203	150n	Film (Box-type)
C201[§]	1u5 400V	Electrolytic
or	680n, 820n	Film (Box-type)
C101[△]	4u7	Electrolytic
C105	4u7	Electrolytic
C208	10u	Electrolytic
C209	47u	Electrolytic
C210	47u	Electrolytic

Diodes	
D1	1N5817
LEDH,LEDM,LEDL[§]	

Potentiometers & Switches	
SW1	DPDT
ATTACK	B1K
LEVEL	A10K
HIGH	B10K[§]
LOW	B10K[§]
MID	B10K[§]

Transistors & ICs	
Q1-Q3	BC109 or other NPN
U1,U2	4558 or equivalent

[△] Component Names for Rev. C boards, reversed on Rev. B boards (C101 = 10n, C102 = 4u7)

*Assumes three LEDs with forward voltage ≈1.9V. For different V_F or different number of LEDs, adjust CLR accordingly.

[§]See Circuit Notes.

Suggested Drill Template

Check scale reference to ensure 1:1 printing