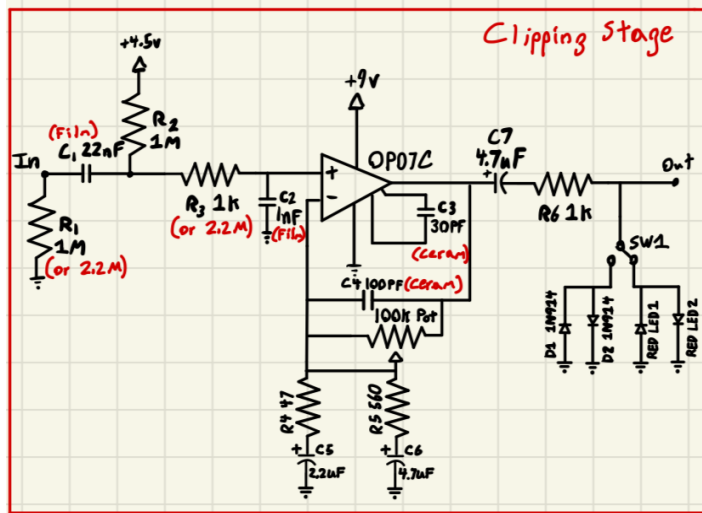


Pro Co Rat Pedal (Notes taken from Electrosmash.com)



Input Impedance:

$$Z_{in} = (R_1 \parallel R_2) \parallel (R_3 + Z_{inOP07C})$$

$$= (1M \parallel 1M) \parallel (1k + 33M)$$

$$= 492,537 \Omega$$

C2 adds resistance at higher freqs (around 1kHz) making the input impedance fall to 157kΩ. Lowering C2 improves input impedance at 1kHz, ex: C2 → 470pF makes it 248kΩ at 1kHz.

150k-280kΩ as high input impedance values can be considered fairly good for distortion pedals. However, best practice is to keep the input impedance at least in 1MΩ, avoiding tone sucking. Increasing R1 and R2 to 2.2MΩ makes input impedance to 1.0645MΩ.

Voltage Gain:

The voltage gain is trimmed with the distortion knob. In non-inverting topology it can be calculated as:

$$G_v = 1 + \frac{R_{dist}}{R_4 \parallel R_5}$$

$$\therefore G_{vmin} = 1 + \frac{0}{R_4 \parallel R_5} = 1 (0dB)$$

$$G_{vmax} = 1 + \frac{100k}{47 \parallel 560} = 2305 (67dB)$$

- R1 is a Pull down Resistor which prevents Popping sounds when pedal is turned ON. This resistor becomes the max input impedance.
- C1 blocks DC and provides high pass filtering. Harmonics below 7.2Hz are attenuated $f_{c1} = \frac{1}{2\pi R_1 C_1} = 7.2Hz$
- R2 acts as an RC filter with C1 but also as a bias resistor for the op-amp.
- R3 and C3 protects the op-amp from input over currents while also forming an RC filter with C2 which shunts high freqs to ground and out mellowing the signal. $f_{c2} = \frac{1}{2\pi R_3 C_2} = 160kHz$
- C3 acts as a compensator for the op amp to help with slew rate.
- C4 used as an RC filter in the negative feedback loop of the op-amp.
- R4 and C5 used as an RC Filter.
- R5 and C6 used as an RC filter.
- Distortion 100k Pot sets the variable gain of op-amp along with R4 or R5.
- C7 coupling cap that removes DC signals coming from R6.
- R6 forms RC filter with C7 and limits amount of current through the diodes.
- SW1 allows to switch between two different sets of clipping diodes.
- D1 and D2 used for hard clipping, can be any kind of diode. ex: standard silicon non-switching diodes (1N4148), rectifier diodes (1N4001), Schottky diodes (1N5817), or Germanium diodes (1N34A)
- Red LED1 and 2 used for hard clipping.

Figure 1: Notes and schematic to get a better understanding of the circuit.

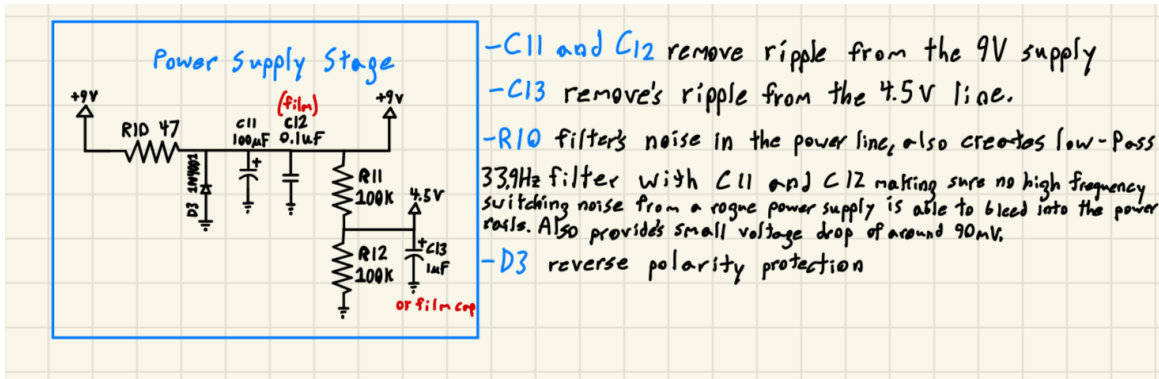


Figure 2: Notes and schematic to get a better understanding of the circuit.

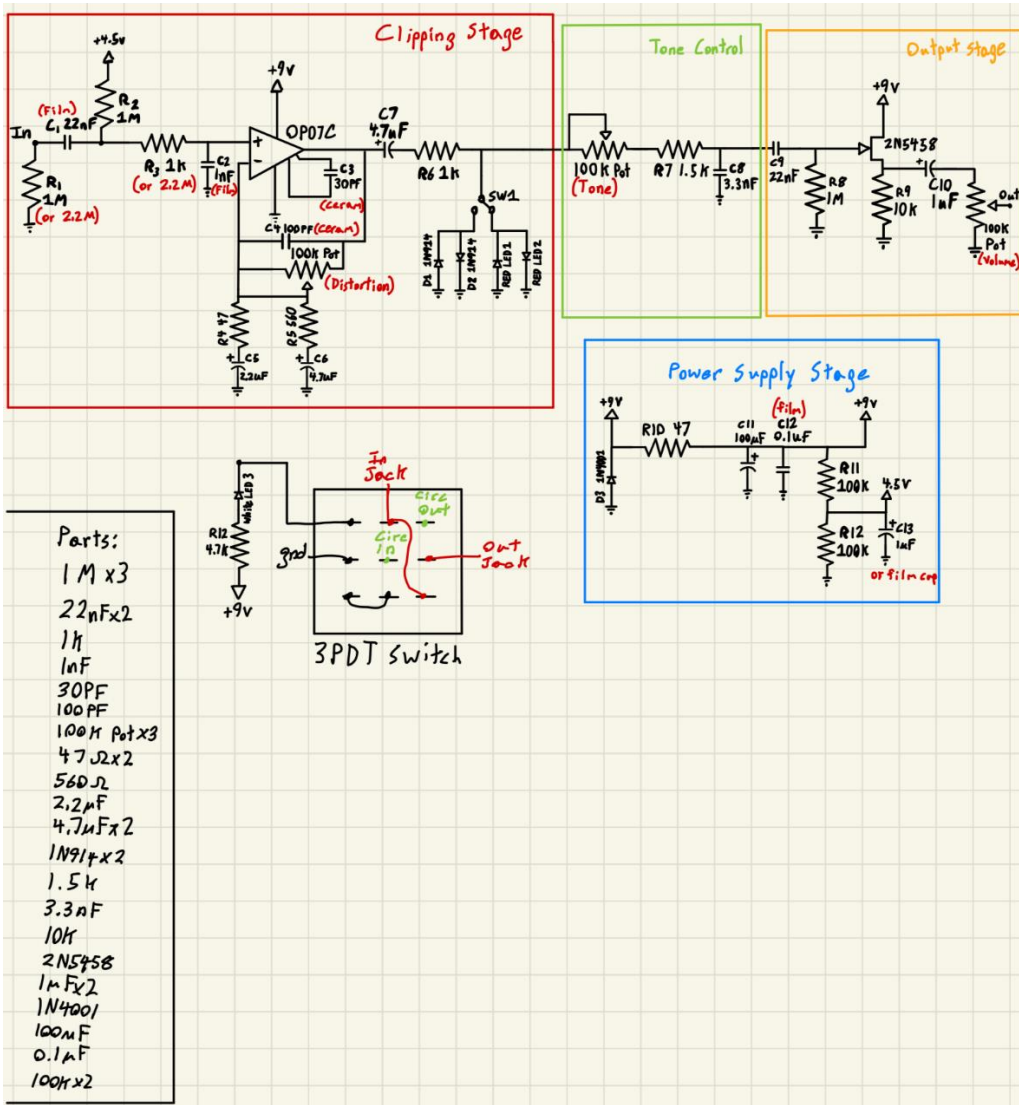


Figure 3: Notes of full circuit.

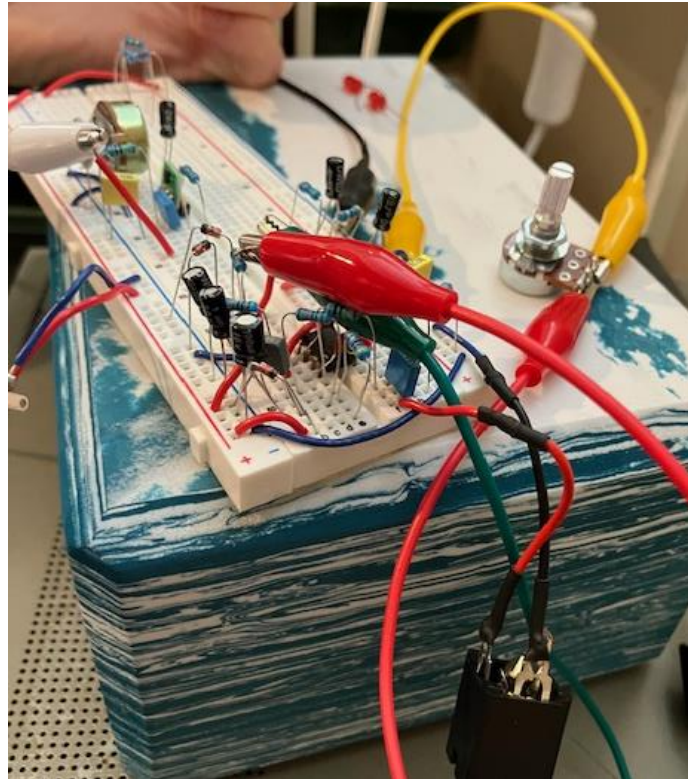


Figure 4: Prototype Circuit on Breadboard.

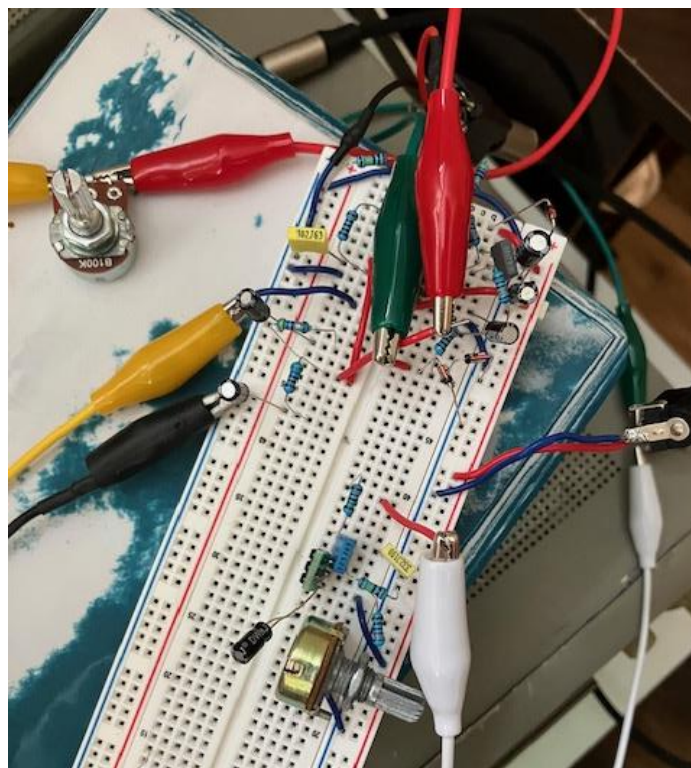


Figure 5: Prototype Circuit on Breadboard (Top View).

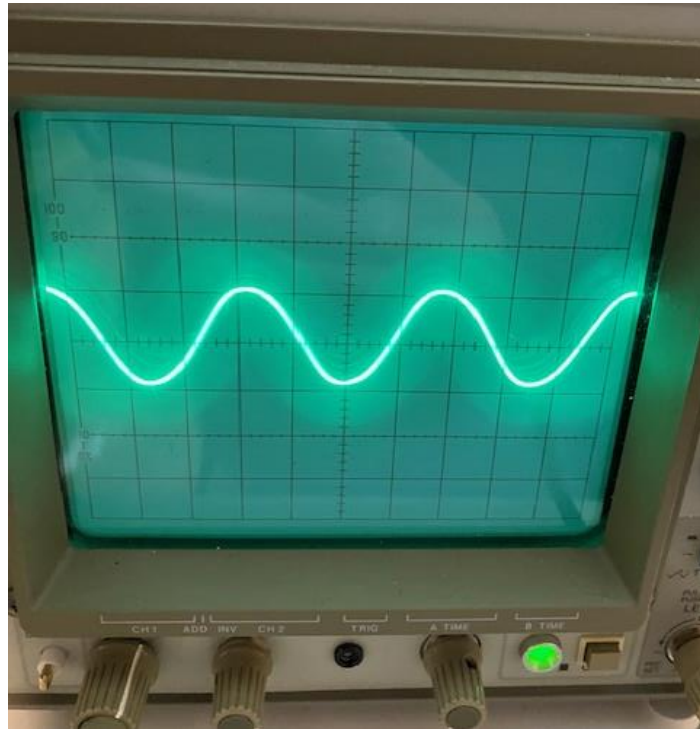


Figure 6: Input (1KHz sine wave).

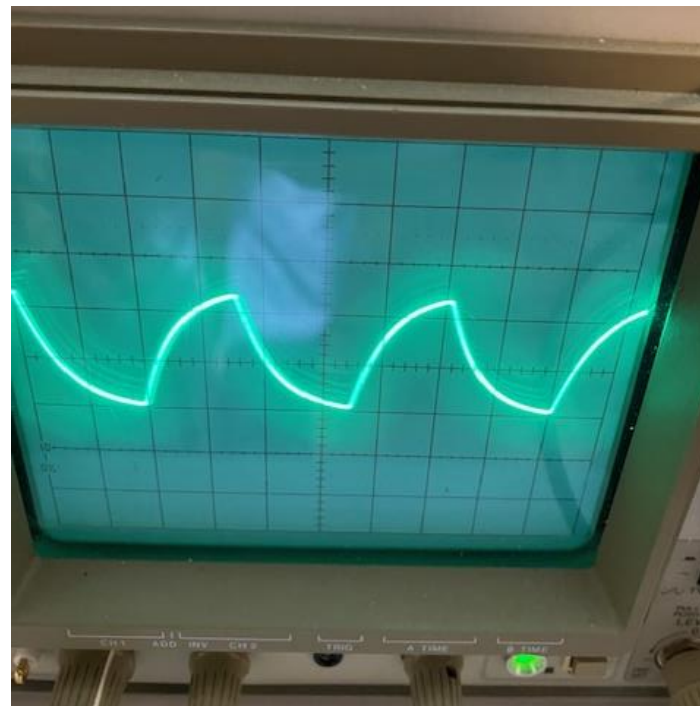


Figure 7: Hard Clipped Output.

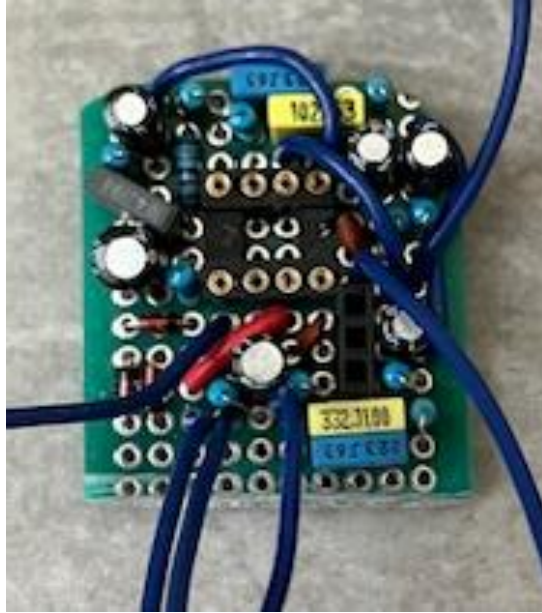


Figure 8: Completed PCB (Front View).

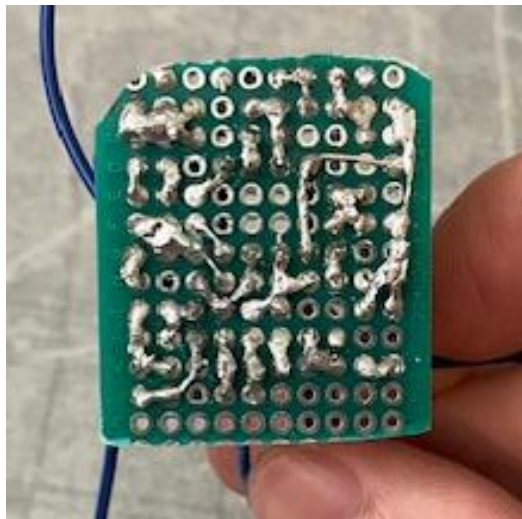


Figure 9: Completed PCB (Back View).

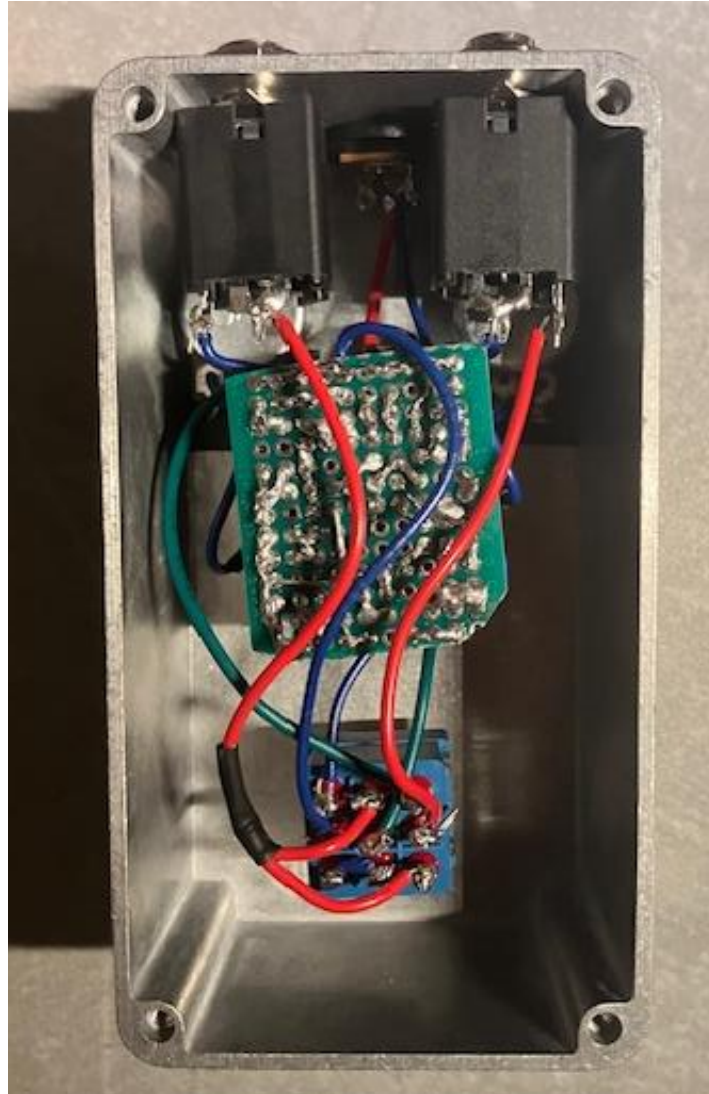


Figure 10: Assembled Electronics in Enclosure.



Figure 11: Final Design.