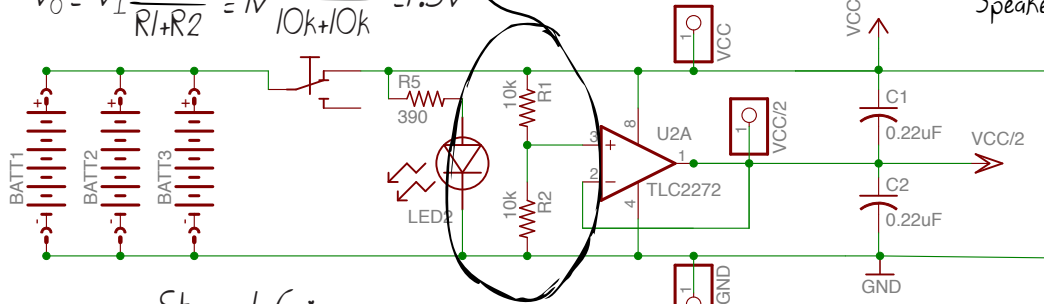


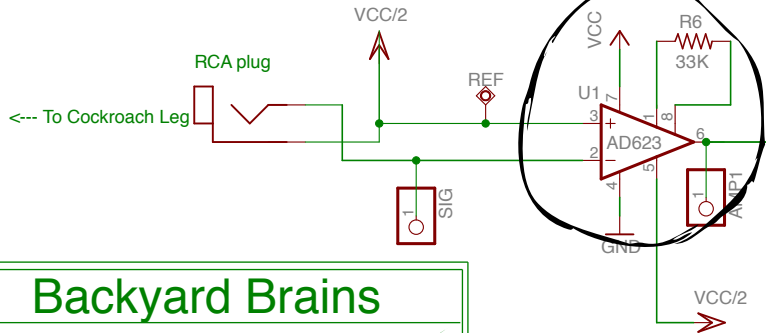
This turns 9V into +/- 4.5v

$$v_o = v_i \frac{R_2}{R_1 + R_2} = 9v \frac{10k}{10k + 10k} = 4.5v$$



Stage 1 Gain

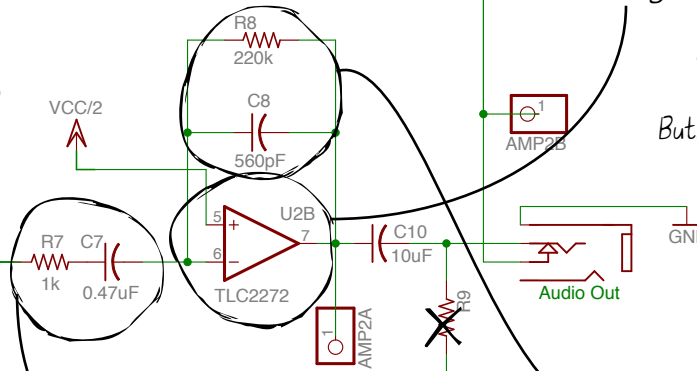
$$\text{gain} = 1 + \frac{100k\Omega}{33k\Omega} = 4.03x$$



High-Pass filter

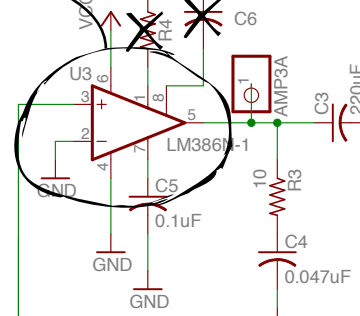
$$f_c = \frac{1}{2\pi \cdot R_7 \cdot C_7} = \frac{1}{2\pi \cdot 1k \cdot 0.47 \times 10^{-6}} = 338 \text{ Hz}$$

174x Band-Pass Filter Stage



Stage 3 Gain
Speaker Amp default
20x

20x Gain Audio Amplifier



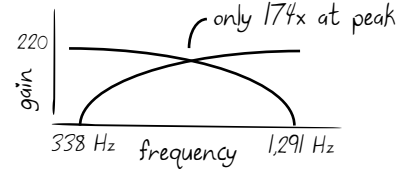
Total Gain

$$\begin{aligned} \text{Headphone Out} &= 4x \cdot 174x \\ &= 696x \\ \text{Speaker} &= 4x \cdot 174x \cdot 20 \\ &= 13,920x \end{aligned}$$

Stage 2 Gain Calculation

$$\text{gain} = R_8 / R_7 = 220k / 1k = 220x$$

But... In reality it's lower due to roll off:



Low-pass Filter

$$f_c = \frac{1}{2\pi \cdot R_8 \cdot C_8} = \frac{1}{2\pi \cdot 220 \times 10^3 \cdot 560 \times 10^{-12}} = 1,291 \text{ Hz}$$

Backyard Brains

SpikerBox v. 1.3c
Dec 22, 2011

open source hardware