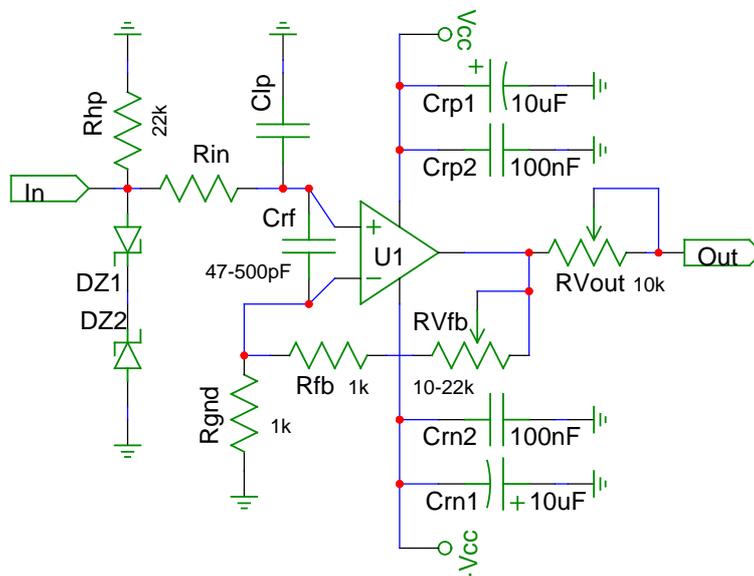


Brain Tickler Booster

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This is a simple amplifier capable of handling frequencies down to DC. I use it to boost signals coming out of my various CES signal generator sources. This circuit is only one channel (make another if stereo output is used). This requires a dual rail power supply (not shown). For CES, a voltage divider will work. The Zener diode values are typically 3-9v and protect against over voltage on inputs. Rin+C1p is optional to round off the edges of the square wave (low pass filter). This will also remove some of the high frequency harmonics (noise). Rounding off too much will turn it into a sine wave. C1p is usually in the pF range. Rin should probably be between 100 and 10k if C1p is in the pF range (higher is more filtering). Equation: $\text{corner_frequency} = 1 / (2 * \text{Pi} * R * C)$ C1p is in the middle pF range or lower to block radio signal reception. The op-amp can be any signal level one within reason (I use NE5532's). Not all op-amps are unity gain stable and may require Rfb to be higher. Be warned that this may increase the output voltage to something higher than desired or safe. Gain is set to be variable (RVfb) to allow for different output levels. RVout reduces the amperes to something more suitable for human levels. RVout should be put in series with another resistor of 100ohm if safety is a concern. Calibrating. At the very least, a 50-60Hz sine wave should be played through this with an AC volt meter on the output. Gain (RVfb) should be set so the voltage is about 1 volt (do not go over 10v). Change the volt meter to amperes mode and adjust RVout to 1mA or less. An oscilloscope could also be used but cannot measure the amps part. These settings are generally considered safe, but see your neurologist first. As always, you do all this at your own risk. Output DC Offset. There shouldn't be any with this circuit, but try decreasing Rhp if there is. Note that DC offset may come from the signal source, too. Trying to remove DC offset with capacitors is a bad idea for square waves. This circuit also makes a nice pre-amp or small headphone amp.

Standard warning: Persons who are epileptic, pregnant, nursing, on prescription drugs, have pace makers, or any other bioelectric device or medical condition should consult with their doctor before using CES devices. CES devices are not recommended for general usage for persons under 21 due to continuing brain development (although it may have far fewer long term side effects compared to prescription drugs, consult your doctor). If one of these units is used in a medical or mission critical situation, build it to reflect that: use military grade parts, capacitors with 2-3x voltage ratings (maybe even paralleled), increase resistor wattage, increase diode reverse voltage and amp ratings, use a strong shielded box, waterproof the box, shock proof the box, all wires should not be thin and scrawney, and use gold plated connectors and switches. In short, use your head, be paranoid, plan for disaster, and build it like a tank. My schematics are not for resale nor commercial use. My schematics are for educational and private use only.