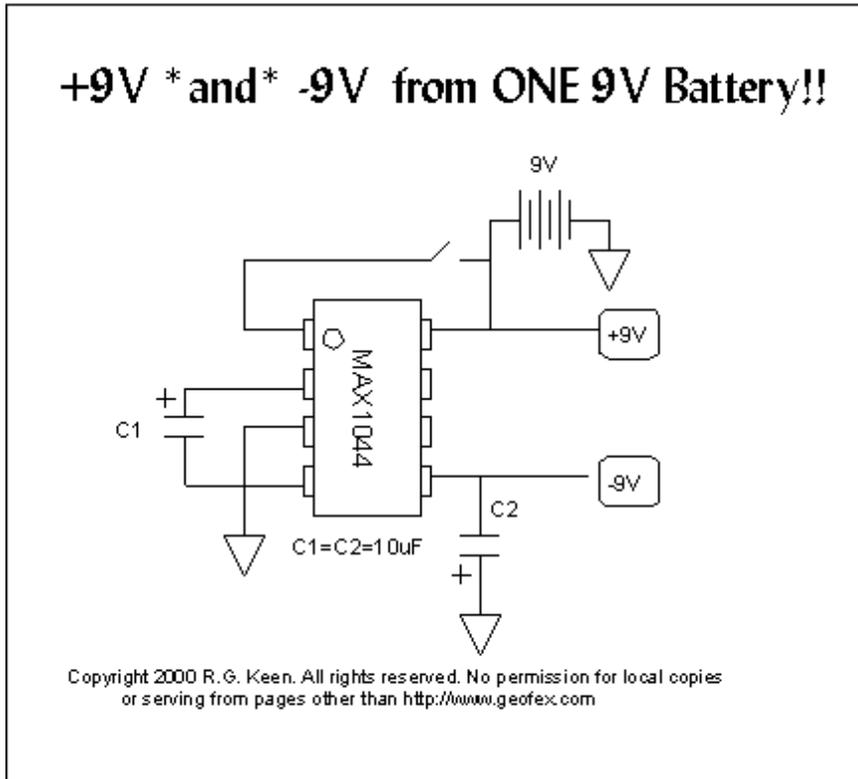


## +9V \*and\* -9V from one battery!



The MAX1044 is a *charge pump converter* - it uses a capacitor as a "bucket" to pump charge from one place to another. In this case, the 1044 connects the + terminal of C1 to +9V from the battery and its negative terminal to ground. C1 charges up to 9V from the battery. The 1044 then connects the + terminal of C1 to ground, and the - terminal to pin 5. This lets C1 dump the charge into C2. The - terminal of C2 is tied to pin 5, so it gets a negative voltage equal to the voltage across C1.

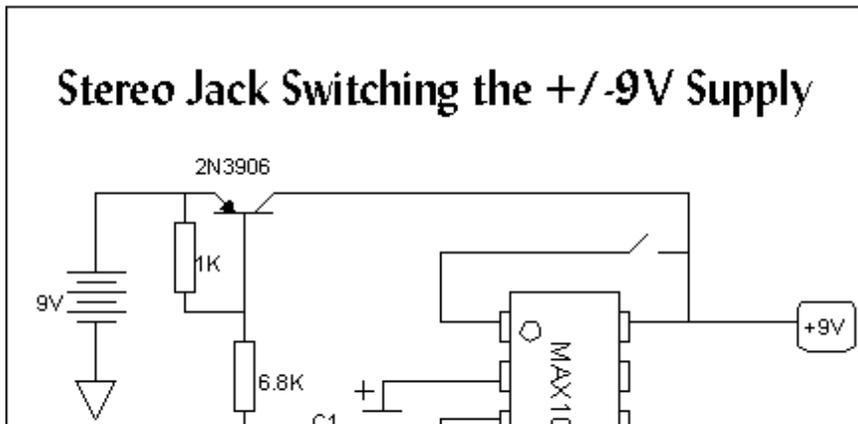
This charge pumping is a very efficient way to convert voltages. The only power lost is that power dissipated in the resistances of the switches inside the 1044 and the series resistance of the capacitors, as well as the power to run the internal oscillator that flips the switches when needed.

All by itself, the 1044 runs at about 7-10kHz, so there will be ripple of that amount on the C2 output and on the +9V output from the battery as well. Audio equipment that uses this voltage could have a "whine" audible if you're not careful. However, the 1044 has a frequency boost feature. If you connect pin 1 to the power supply (shown by the little open switch) then the oscillator frequency goes up by about 6:1. The oscillator then works well above the audio region. Any whine is then going to be inaudible.

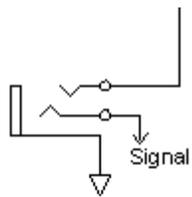
The MAX1044 is about \$2.68 in unit quantities at Digikey.

You can do the same thing with the cheaper TLC7660CPA(\$1.58), LMC7660 (\$1.19), NJU7660D (\$0.46!) chips from Digikey and/or Mouser.

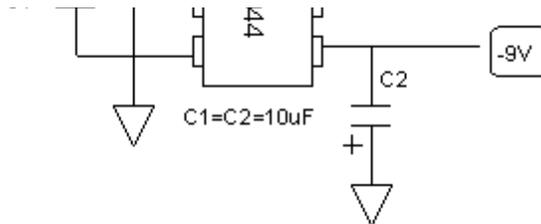
These chips all work in exactly the same circuit, except that pin 1 should not connect to +9v, and even if you connect it, it will not change the oscillator frequency, so you will have to wire carefully to keep whine out of your audio circuits. This can be done, it's just easier if you don't have to think about it.



You may want to use the stereo-jack trick to make power switching easier on your stompbox pedals; you'll find that this is not a good idea with a charge pump converter running your -9V supply. This is because in the standard stompbox setup, that wire is the circuit's power \*and\* signal ground. The current pulses from the switching converter run on that wire, and will cause the signal ground of your effects circuit to hop up and down at the



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switching frequency - and you'll hear it!

Better, wire in the transistor switching circuit shown at left. The stereo jack switches the base drive of a transistor, and that transistor switches the battery into and out of the circuit. The high-current pulses can now go on wires that do NOT share the signal ground, and the whining is avoided.