

STRINGED THINGS

Bi-polar power the easy way

When I started out making DIY electronic projects, I did projects from Craig Anderson's classic book *Electronic Projects for Musicians*. Most of the projects in the book required bi-polar power.

The typical stomp box uses one battery to provide what I would call "single-sided power." This works well for most stompboxes because of good design. The power provided to the effect is positive and negative. Simple enough.

Bi-polar power is positive, negative, and ground. In a circuit that uses operational amps, or op-amps, bi-polar power provides more headroom and better performance. However, providing bi-polar power is more complicated than using single-sided power.

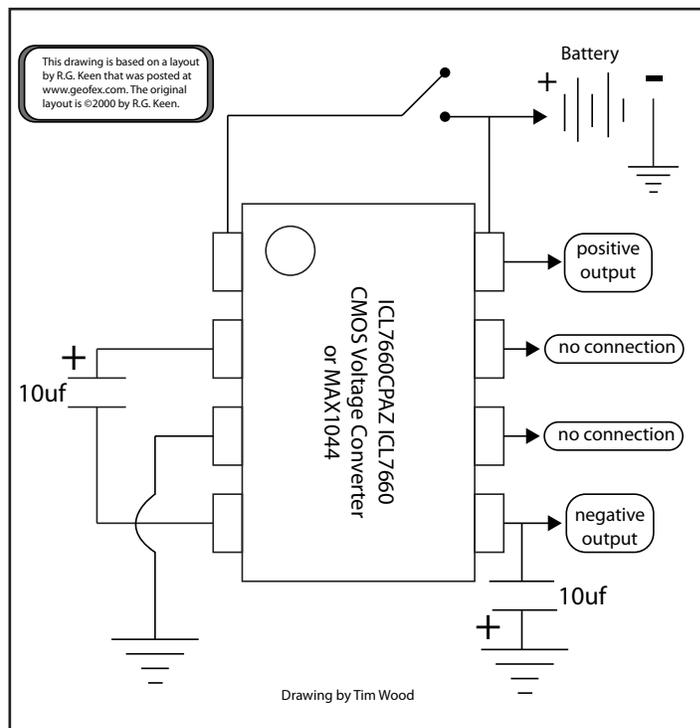
The most basic way is to use two nine-volt batteries. When connected correctly, you can get +/-9 volts (nine volts bi-polar power). For a project that doesn't consume much power and has plenty of room in the enclosure, this works well.

The next option is to build a power supply. *EPFM* has a project to build a nine-volt, AC-powered bi-polar power supply. A WORD OF CAUTION: this project involves connecting an AC power cord (the kind that plugs into the wall) to a transformer. You've got to be very confident in your skills to build this. I built one on a perfboard for a multi-effects project and lived to tell the story. Later, I built one in a plastic box using a printed circuit board. That was much easier and less harrowing to do. Still, it required caution and great care.

One of my favorite *EPFM* projects was the Phase Shifter. It had several operational amps and other power-using circuitry. It was not practical to run it on two batteries. I ran it using a power connection from the aforementioned *EPFM* power supply. It was inconvenient to lug that big plastic box around and connect it to the phase shifter box, which was not too small itself.

Before I took a hiatus from DIY electronics many years ago, I decided to find a way to run that phase shifter on something more convenient. A few years ago, I briefly resurrected the hobby to try to find a solution. As it turned out, either my *EPFM* power supply or my phase shifter died, because I couldn't get the phase shifter to work. That left me dead in the water.

I dug out a few old studio DIY projects from the attic a few days ago. They included a Paia dual compressor and "HissWhacker" (a noise reduction device). Both had power connections to a 15-volt bi-polar power supply which I also



had built. It apparently didn't survive one of my residential moves, because I can't find it.

So, if I want to play with those devices, I'll need to find a good source of bi-polar power.

I have set my sights on a wall-wart based power supply. Wall-wart is a slang term for a wall transformer, one of those black boxes into which the plugs are built in. They're used in all sorts of electronic devices. You probably have several. You might even run your stomp boxes off of one.

There are a couple of options: a wall-wart with AC output or one with DC output. The typical wall-wart has DC output. That's probably what your stomp box uses. (However, some musical devices use AC output wall warts. I have an ART tube pre-amp that uses one.)

Many Paia electronics projects use an AC-output wall wart. Circuitry to turn the AC signal into a bi-polar supply was designed into the circuitry. I suppose one could analyze those schematics and build the circuitry to use an AC-output wall wart for a project that requires bi-polar power.

However, my plan is to use a DC-output wall wart. They are easier to obtain than a VAC-output wall wart. However, the key to doing this is building the circuitry to turn a single-sided DC current into bi-polar value.

Fortunately, there are magic chips that make that possible, and in a simple circuit to boot! Meet the MAX1044 and

the ICL7660. Both can take a 9VDC current and output bi-polar +/- 9 volts.

How do these chips do it? I don't know. I tried to figure it out from the data sheet, but it's beyond my knowledge.

Still, the circuit is simple:

All you need is a chip, two 10uf electrolytic capacitors and a power source.

I breadboarded the circuit to see if I could get it to work. Over the years, I have mangled many a good circuit beyond recognition. I used a ICL7660 chip. It and the MAX1044 basically do the same thing, but the ICL7660 is less expensive.

Above is the breadboarded circuit with a 9-volt battery connected. After I carefully laid out the circuit, I connected the battery and tested it with a digital multi-meter. It worked as advertised! It put out bi-polar nine-volt power! Yes!

However, working with a battery wouldn't solve the problem of the phase shifter and the other devices. So, I set it up to test the current from a wall wart.

My breadboarding setup has a power jack and breadboard power connections. So, I plugged in my trusty Boss nine-volt wall transformer. Nothing blew up, so I figured I was OK to that point.

Out came the multi-meter. I checked and double-checked. Yes again! It worked! Whoopee!

Now, my excitement may be premature. I don't know if the setup will power the phase shifter or any of the other bi-polar-power-gobbling devices in my arsenal. I'll dig out that phase shifter, solder up a little power board with the ICL7660, and see what happens!