

Lessons learned building a 5VDC Power Supply for a 300B heater

My 300B amplifier had too much hum for my needs, so I built a nasty looking C-L-C power supply by taping two 10,000uf caps on a chunk of plywood, wired in a 3mH 1.5A choke, two 22R resistor in series served as a bleeder and the tap for the 300B cathode R&C.

Worked like a charm... hum went way, way down.

But I just couldn't live with this crappy looking dc psu, so I decided to make my first PCB. It turned out professional looking, but my hum level went UP.

Here is the lesson learned part:

The location (order) of the electrical connections matters.

(I know... basic electronics)

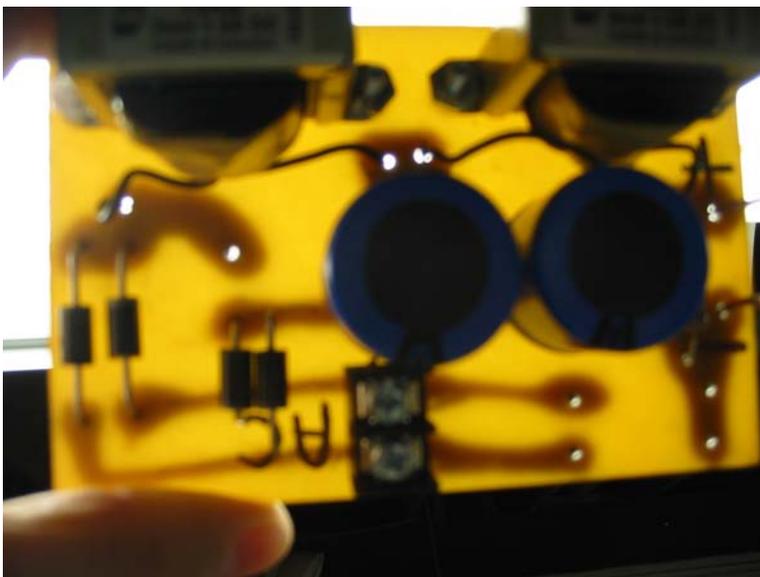
Picture the typical power supply schematic, the diode full wave bridge is on the left, then the first capacitor, the choke, the 2nd capacitor. The + and - output are at the right.

What I did wrong (when I made the PCB) was to put the two diodes that provide the negative side of the dc voltage on the right end of my PCB (instead of the left end).

Ground is ground.....Right? Wrong!

You have to think of electrons like plumbing, you want all the water (electrons) flowing in the same direction.

When I tested the psu on the scope, I found a very strange looking sine wave. I moved the diodes to the left side of the PCB. Now my DC output has a normal looking sine wave with about 20mv ripple.



This is the modified PCB board. Initially I had the 2 diodes for ground side on the in the lower right corner. To correct my problem, I removed the first cap and relocated the diodes on the left end of the ground rail. This is now wired as a LC-LC power supply.

There are some results of psu's I've been testing:

I'm using a 6.3V 1.2A transformer, 10,000uf caps and 3mH 1.5A chokes.

The diodes are 31DQ09; you drop about .8V over each diode at 1.2A

The goal is 5VDC at 1.2A, with just a C-L-C psu

1. 30,000uf no choke 5.42V, 190mV p-p ripple, saw tooth wave patter (not good)
2. 10,000uf ,3mH,10,000uf 5.8V, 50mV ripple, normal sine wave
3. 10,000uf ,6mH,10,000uf 5.4V, 25mV ripple, normal sine wave (better)
4. 20,000uf ,6mH,10,000uf 5.2V, 7mV ripple, normal sine wave (best so far)
5. 10,000uf ,3mH,10,000uf,3mH,10,000uf same as #4

At this point I don't know how little ripple is good enough... my plan is to start with example #4, since that gets the voltage the closest and has the least amount of ripple.



This is what you get with only 10,000uf.... 700mV Pk-Pk ripple. I have seen a few schematics that just use 4 diodes and one 10,000uf capacitor.

This is what I meant by "saw tooth" waveform



This is the result from 10,000uf-3mH-10,000uf
40mV pk-pk ripple with a normal looking sine wave



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Here is the best so far

T2 6.3vac 2.6A

This is an LC-LC power supply
3mH-10,000uf-3mH-10,000uf

5.14V @ 1.25A, 40mV pk-pk ripple