An AC-Isolated High Voltage Vacuum Tube Power Supply
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There have been a surprising number of vacuum tube circuits described in QST, CQ, and WorldRadio recently. In most cases, these vacuum tube circuits require a high DC plate voltage. While you can still buy high voltage plate or isolation transformers, these are quite expensive now-a-days (as are the filament transformers). A popular alternative to a plate transformer is to just rectify the AC wall-outlet source directly. However, this can be very dangerous in that you must ensure that the AC hot, neutral, and ground connections are ALWAYS correctly connected or a shock hazard **will** occur. So how can you inexpensively generate an AC-isolated high voltage DC power supply for that vacuum tube receiver or low power vacuum tube transmitter?

I was recently faced with this power supply problem, as I had obtained an old military ARC-5/BC-455 6-9 MHz receiver that I wanted to bring to life. These are neat little receivers that were used in bombers and fighters during WWII. The ARC-5 receiver uses 6-tubes with 12-volt filaments, with the tubes paired up and each pair's filaments wired in series so as to operate from 26VDC. Since virtually all hams have a 13.8VDC power supply, the filament problem can be solved by rewiring all the tube filaments in parallel for operation directly from a 13.8V power supply. But I still had to generate the 125-250VDC plate voltage needed by the receiver.

As I was flipping through my All Electronics catalog recently, the solution presented itself. I saw one of those inexpensive 12VDC/120VAC inverters normally used for powering AC appliances from an automobile battery. Since my 13.8VDC power supply is already being used for the receiver tube filaments, why not use this same source to power an inverter and rectify the inverter output for the high voltage DC needed? This would give me the AC-isolated DC output that I want! So with a few key-strokes, my All Electronics order was placed.

Upon receiving the inverter, I opened up the plastic box and removed the inverter printed circuit board assembly. I remounted this assembly in a larger plastic box (5.6x3.25x1.9") so that I could easily fit everything. With a little work, you could probably fit the rectifier/filter circuitry (shown in Figure 1) in the original box after removing the AC output connector, but I elected to use the larger box. Of course, your plastic box size will depend on the dimensions of the inverter you choose to use. Photo A shows my new box/old box comparison. Photo B shows the All Electronics inverter mounted in the new box with the added rectifier circuitry, and Photo C shows a close-up of the rectifier circuitry. The in-line fuse is not visible in Photo C as I decided to put it inside the ARC-5 receiver. Table 1 details the power supply parts and the part sources. The ARC-5 receiver works great with a plate supply of 125-250 VDC, so the full-wave bridge is perfect for this application as this provides about 170VDC. For other applications, you may wish to half-wave rectify the AC output, or use voltage doublers or triplers depending on your particular high-voltage requirements.

This power supply works great. It is inexpensive, and gives you an AC-isolated high voltage DC supply. If you need to generate a high DC voltage for a vacuum tube receiver or transmitter, give this idea a try.

Table 1 – High Voltage Power Supply Components

QTY	Description	Source/Part Number	Price ea.
1	Molex 2-pin plug	Mouser 538-03-06-2024	$0.20
2	Molex 0.062 pins	Mouser 538-02-06-2103	$0.18
1	Molex 2-pin recept.	Mouser 538-03-06-1011	$0.20
2	Molex 0.062 sockets	Mouser 538-02-06-1103	$0.18
1	68K 1-watt resistor	Mouser 594-5073NW-68K00J	$0.16
1	0.375 amp fuse	Mouser 576-0251.375MXL	$0.62
1	Plastic Box	Mouser 635-053-B	$8.00
1	Terminal Strip	Mouser 158-1005	$0.55
1	12V/120V inverter	All Electronics INV-80	$17.00
1	120uf/315V cap.	All Electronics EC-1235	$1.10
1	Bridge rectifier	All Electronics FWB-15	2/$1.00
2-pair	Anderson connectors	Powerwerx PP-RB-15-10	10/$10.00

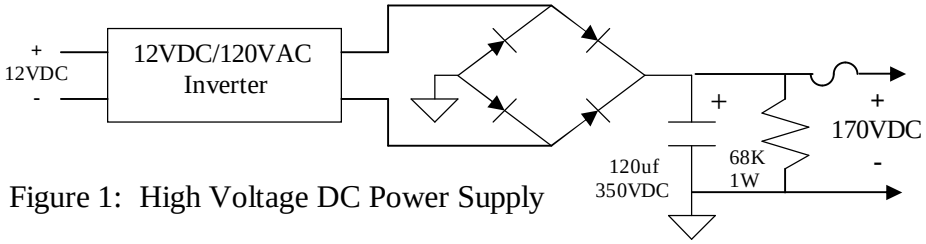

Figure 1: High Voltage DC Power Supply

Photo A: Old box/New box comparison

Photo B: Remounted 12V/120VAC inverter

Photo C: Close-up of rectifier circuitry