Philco Fam Radio and Power Supply

Gord Rabjohn

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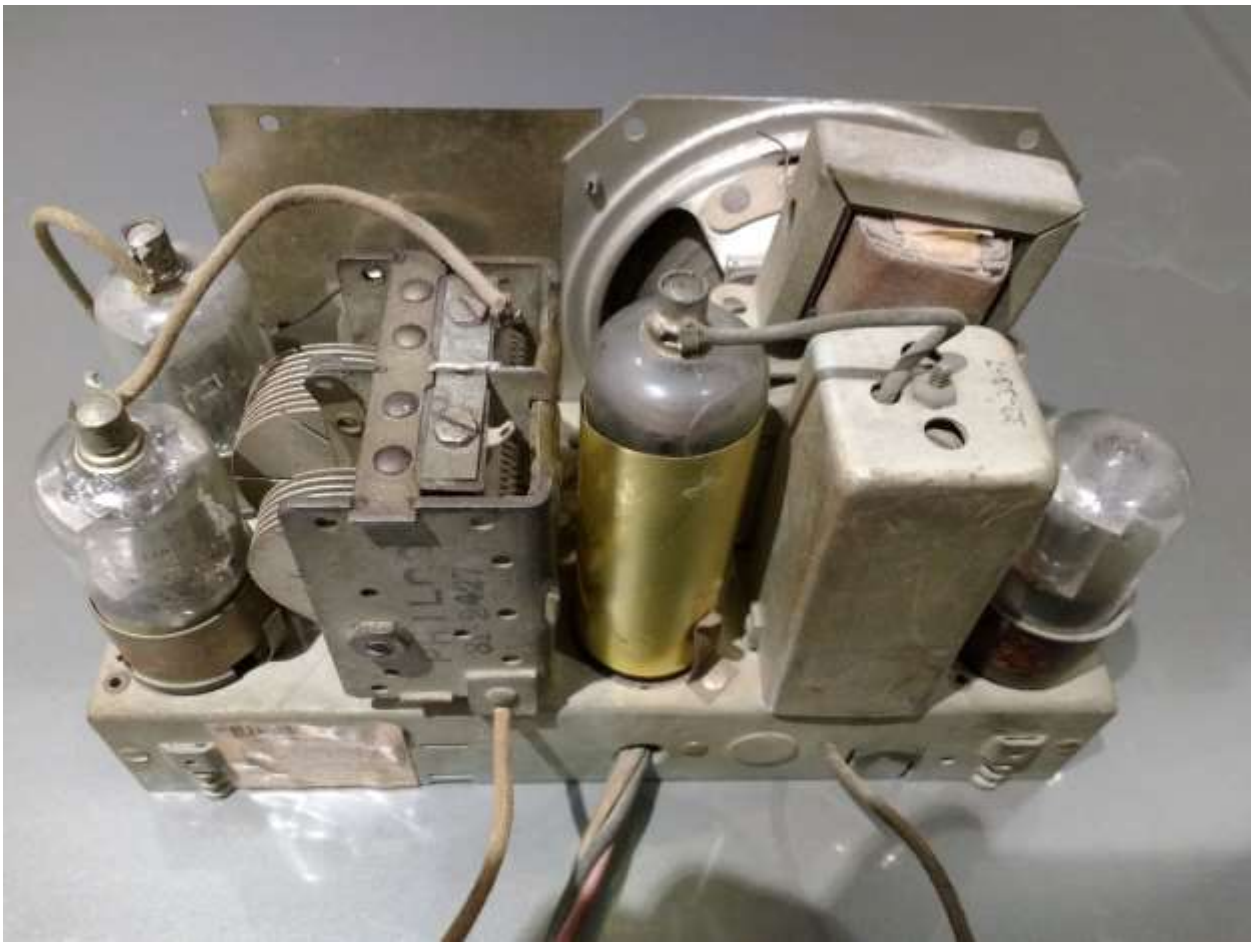
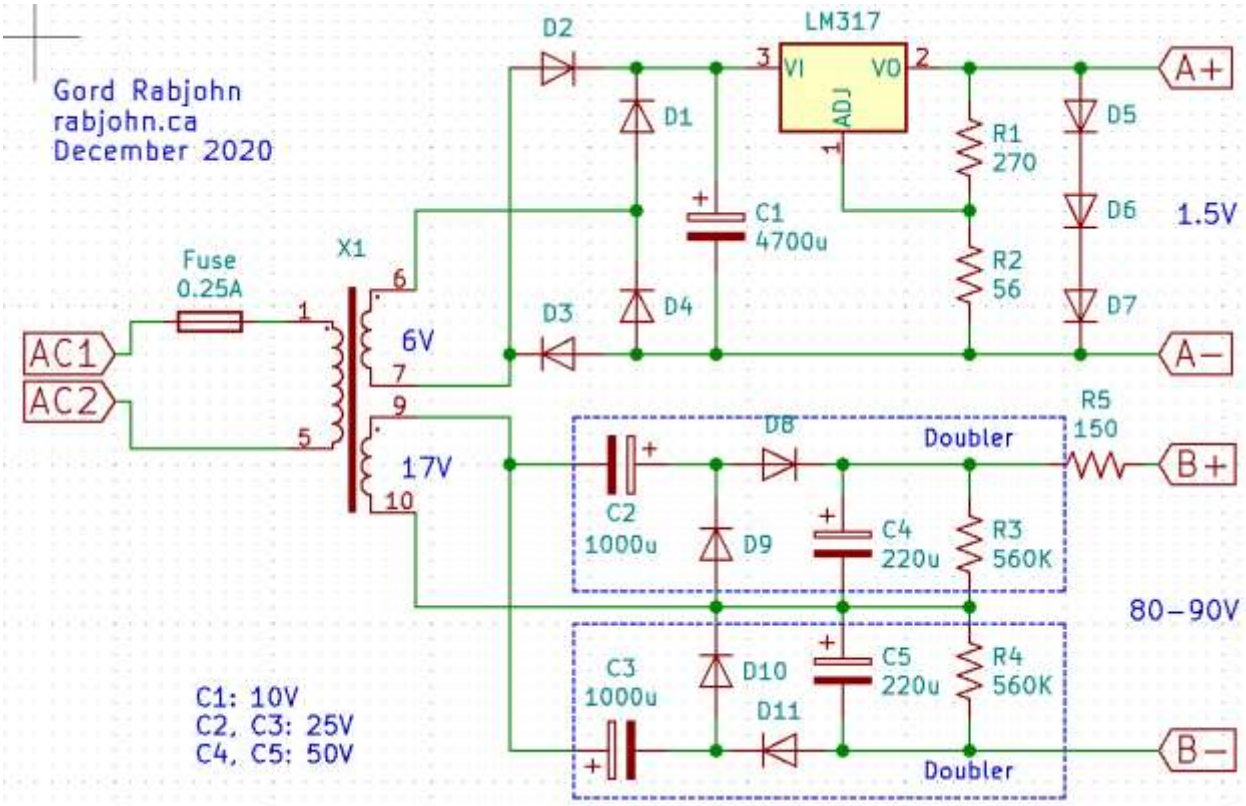
I received a request to repair a Philco model 206 battery-operated radio. I said that I would look at it, but warned the owner that he would need a power supply for it. The owner replied that he thought he would make a supply, and had purchased some parts for it already. Well, I'm not in the power supply business, but I was horrified at the schematic he proposed to use for the supply, as it did not use a transformer. I got thinking about it, and I somehow got seduced into making a supply, and I thought I'd share the experience with you.



The radio repair was fairly easy. It squealed, and this was fixed by replacing the B+ electrolytic capacitor. Now, it worked but was very distorted. The coupling capacitor to the output stage was leaky and causing the output tube to draw too much current. The capacitor was replaced, and this fixed the distortion. The IF tube needed a shield to prevent it from oscillating at one end of the band (I believe it must have had one in the past). A shield was formed from brass shim stock. I restrung the dial cord, and cleaned the volume control.

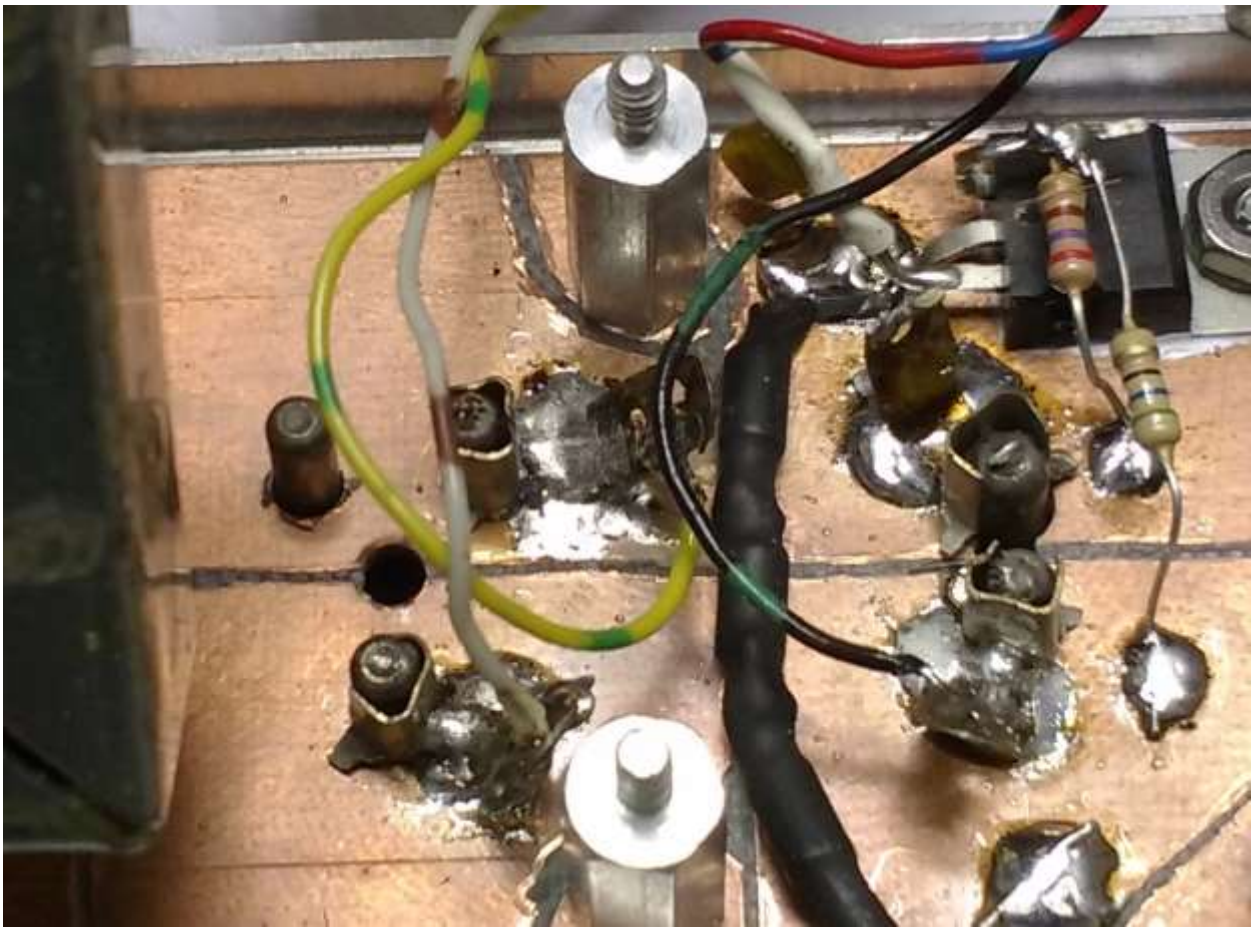
This radio requires 1.5V for the filament supply and 90V for the B+. For a safe farm radio, you really want a transformer-based power supply. However, transformers with high voltage secondaries are getting hard to come by. (A viable alternative to a transformer with a high-voltage secondary is two similar low-voltage transformers back-to-back. One transforms down to (say) 6 VAC, the other transforms back up to a high voltage) I was inspired by another alternative I saw on the web (can't recall where), where they used a relatively common low voltage transformer and a voltage multiplier. I had a transformer with windings of 6V and 17V that fit the bill nicely. The result is shown in the schematic below. The filament supply is a very straight-forward bridge rectifier followed by a LM317 regulator running from the 6V winding. The three diodes at the output are a "crowbar" circuit that limits the output voltage in case the regulator fails. An alternative for the 1.5V filament supply would be to use a 5V USB charger/supply (and we seem to have many of them) with the 317 regulator. The B+ side uses two voltage doublers, one generating a positive voltage, the other generating a negative voltage, for a

total boost of a factor of 4. In fact, the circuit gives a boost of a factor of >5 when you consider the 1.41 you get from the sine wave RMS to peak factor.



Your exact circuit will depend on the transformer that you use. Generally, you will need a transformer with dual secondary windings so the two supplies are independent of each other. Transformers with dual 16V or 20V windings would work well (the extra voltage on the filament side is of no consequence as long as you use adequate capacitor voltage, and heat sink the LM317). On B+ side, you can use any combination of “regular” rectifiers, doublers, triplers, or quadruplers, to build up the voltage as needed. This radio only requires 10mA from the B+ supply (which is fairly typical), and regulation is not at all important, so the voltage multiplication approach works. Suitable transformers are not difficult to find, and you might already have one. Of course, you could also use 2 transformers. For all these capacitors: bigger is better (both Farads and voltage). The diodes are common 1amp silicon rectifier diodes like the 1N4003.

The battery connectors on the radio require female receptacles, which are not easily available. I wanted to retain the original battery connectors, so I made sockets for them to interface with. I drilled holes matching the battery connectors in a copper clad board, and soldered pin connectors from an octal socket to interface with the pins. I cut the coper to isolate the socket pins appropriately. This connector assembly was installed on one wall of a Hammond box along side everything else. The whole assembly fits nicely into the back of the radio. It is probably no bigger than the original set of batteries.

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