Rebuilding a Stewart Warner “Schubert”

Gord Rabjohn, December/January 2022/23

I received a request from a club member to restore their Stewart-Warner “Schubert” radio, chassis R185. It is a handsome mid 1930’s 3-band radio with a large round face, and dial lamps that light up the band in use. The cabinet had been restored, all that was needed was electrical repair. I was immediately intrigued by the first pictures he sent me of this radio: It had blue selenium rectifiers, decidedly not original!

Figure 1: Front of the Stewart Warner

Figure 2: Corner of Chassis with Innovative Power Suply

When I received the radio and compared it to the circuit diagram, I was fascinated and a bit frightened to see that the original power transformer and rectifier (which had been a very standard configuration) had been replaced. The filaments were supplied by a dedicated 6V filament transformer. The B+ was generated with a selenium rectifier voltage doubler (with each selenium rectifier shunted by a silicon diode), directly from the line voltage! Which means that one side of the AC line was tied to the chassis. I assume that the power transformer burnt out at some time in the past, and a repair person with more creativity than common sense did not want to pay for the correct replacement transformer, and opted instead to use whatever he had in his junk box.

Now, I never like radios with the line tied to the chassis, though that was common practice in the early days of AC-DC sets. It is, of course, an electrical safety issue. But, respectable AC-DC sets took great pains to make sure the chassis was never exposed: they used knobs without set-screws, mounting screws were insulated with bushings, and the chassis was protected with an insulated cabinet on all sides. However, none of these precautions would have been taken with this Stewart-Warner. So, I decided that the creative repair had to go, and I would need to find an appropriate transformer so that I could restore the original circuitry.

Since I did not have an exact replacement transformer, this was going to be a big job. I decided to determine if it was worthwhile, and powered the set up with an external power supply. If something terrible was wrong, then I might wave the white flag and admit defeat. However, with an external B+ and filament supply, it received AM radio stations. As always, some capacitors needed to be replaced, and I did that while connected to the external power supply. One way to determine if decoupling capacitors (from a high voltage supply to ground) are leaky is to apply high voltage B+ without the filaments lit (or with tubes removed). Usually, the only current flow should be thru the bleeder resistor. Any other current flow, as seen by the voltage drop across a B+ dropping resistor, is caused by a leaky capacitor. It's easier to do this with an external supply, though you could also remove all the tubes and proceed that way.

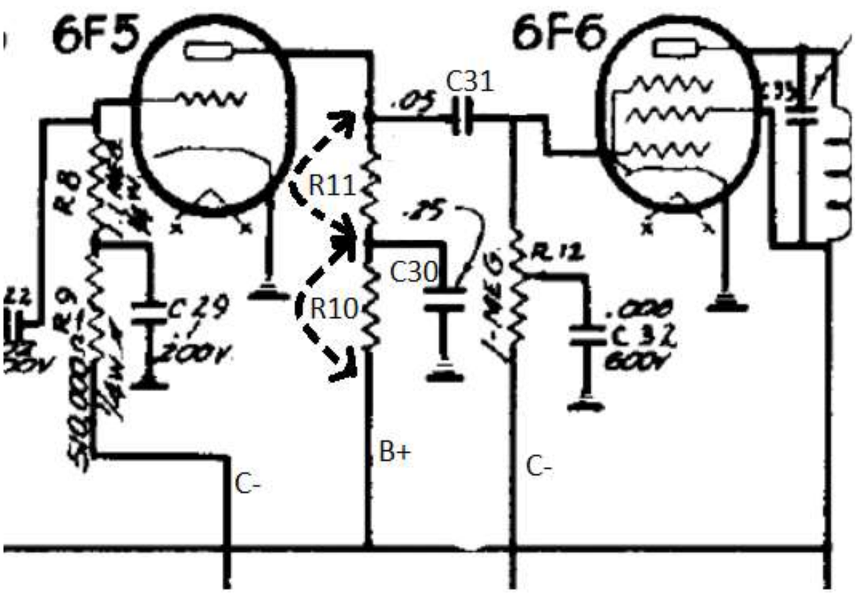

Figure 3 Schematic of Audio Section of Radio

For example, consider the schematic of the audio amplifier. With the 6F5 and 6F6 tubes removed (or filaments not energised), the DC current thru R10 and R11 should be zero. If it is not, then C30 (the decoupling capacitor) or C31 (the coupling capacitor to the grid of the 6F6) is leaky. C31 is especially critical, because if it is leaky, then the 6F6 grid bias will be too high, the 6F6 will run too "hard", and it could burn out prematurely. Measure the voltage across these 2 resistors (as shown with the dotted lines) with the filaments off or tubes removed. If it is not zero (let's say less than a half a volt), then replace C30 and/or C31. There are several places in the radio where this test can be done; the B+ for the screen grids of the RF tubes, and the AGC line, for example.

Having replaced the most obvious capacitors, I proceeded to work on mounting the "new" power transformer. The original transformer was mounted entirely above the chassis, but the only appropriate transformer I had required a large square hole in the chassis. I cut said hole with a Dremel tool heavy-duty cut-off wheel. Even though the transformer is not the correct style for this radio, it is properly and securely mounted, and "looks" correct. I restored the original 5Y3GT rectifier and other power supply components (it now matches the published schematic), and installed a 3-prong cord and a fuse. I replaced some wires that had degrading insulation, including the wires to the speaker and dial lamps.

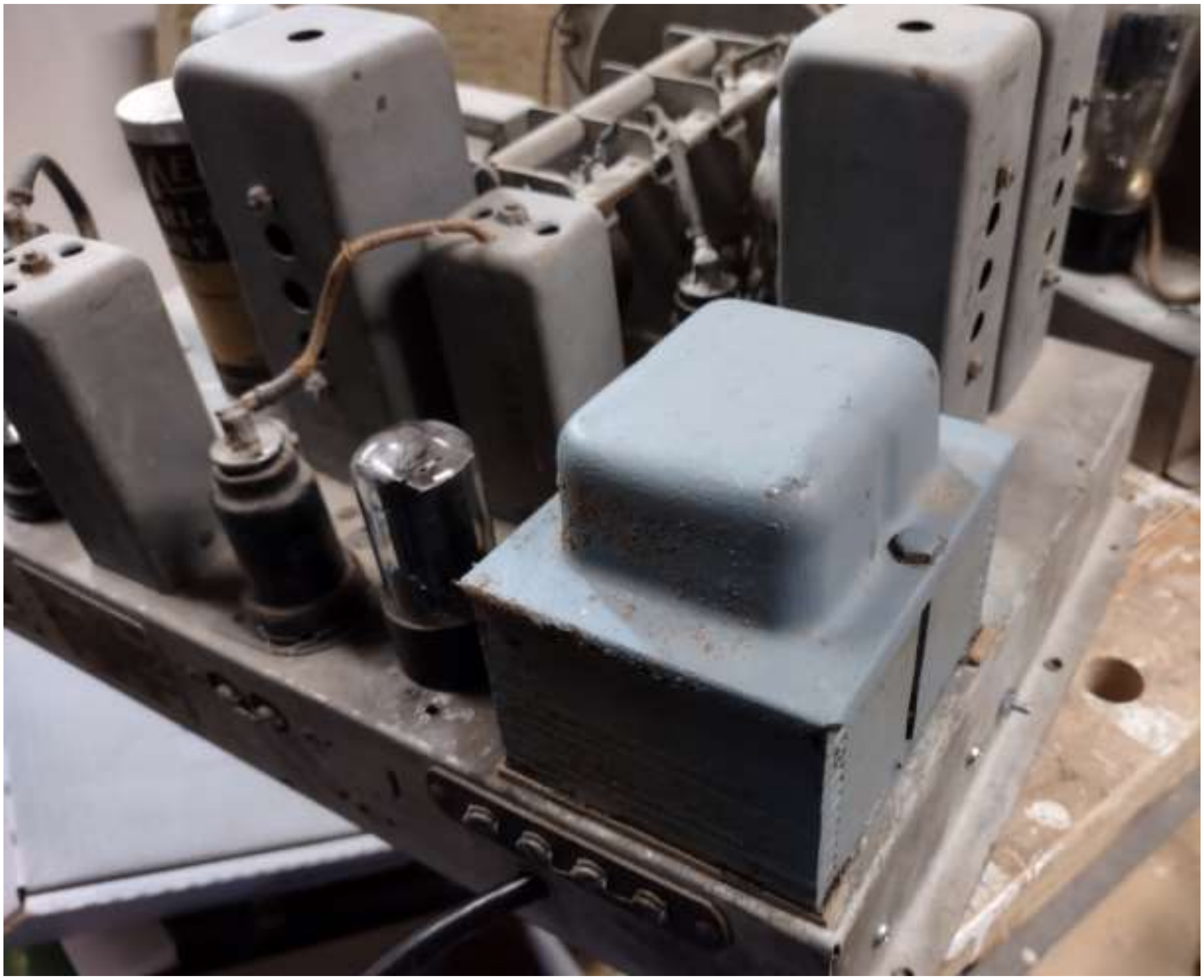

Figure 4 Chassis with new power transformer installed.

The tone control is a mystery to me! The tone control's shaft is concentric with the volume/on/off control, as is common in receivers of this vintage. However, the tone control resistance unit that is concentric with the volume control has been disconnected (and is the wrong value anyway, I suspect that this was another junk-box find). Instead, a fibre gear links the outside shaft to a separate tone control. It appears to me that the repair guy who was creative with the selenium rectifier was also creative with his tone control replacement! However, it is professionally done, so I left it.

Figure 5 Tone Control Kluge

After giving the radio alignment a touch-up, it appeared to work, but I was not satisfied with the short-wave performance; I heard almost nothing in the 6-18MHz band at night with an antenna. The radio has a 6K7 RF stage, a 6A8 converter, and a 6K7 IF stage so should work quite well. I rolled up my sleeves and dug deeper into the radio.

I started by doing a proper alignment of the short-wave band. I discovered that AGC voltage was quite high (-11V, it should be close to 0V without signal) even with no signal, but only when tuned to the vicinity of 15MHz, one of the alignment frequencies. It turns out that the 6A8 local oscillator was behaving strangely. The 6A8 is controlled by AGC, but a large negative voltage was being *generated* by the 6A8 over part of the band, and this was desensitizing the radio by biasing down the RF and IF amplifiers, and mis-biasing the detector. Furthermore, when tuning slowly around 15MHz, there was a little “pop”, which corresponded to a point where the frequency of oscillation was unstable. Why was the 6A8 doing this? I spent way too much time looking at decoupling, resistance values, unwanted resonances, only to discover that the 6A8 was actually a 6K8! Often, these two tubes are considered interchangeable. However, replacing the 6K8 with a good 6A8 rectified the problem, and alignment proceeded normally. (I found another radio with a similar short-wave band that uses a 6A8, I replaced it with a 6K8 and saw no odd behaviour.)

The radio now matches the schematic (albeit with modifications to make it safe), and is working on all bands now when connected to an antenna. It’s not a fantastic performer, especially on short wave, but I am satisfied that it is working as intended. I hope to write an article someday on radios that I “almost” fixed; radios that work but not as well as hoped they would.