Repairing an Odd Sparton

Gord Rabjohn
August 2025

I was given a Sparton model 255C chassis to repair. This is a 5-tube, 3-band superheterodyne circa 1935 using a 6A7, 6D6, 75, 42, and 80 tubes. It needed many of the usual things: electrolytic capacitors, a few paper capacitors, 2 resistors, and the rubber bushings under the variable capacitor had decomposed and needed to be replaced. (Did you know that those bushings are used to prevent microphonics?) Some wiring to the grid caps was too brittle and needed replacement, and of course I added a new line cord and fuse.

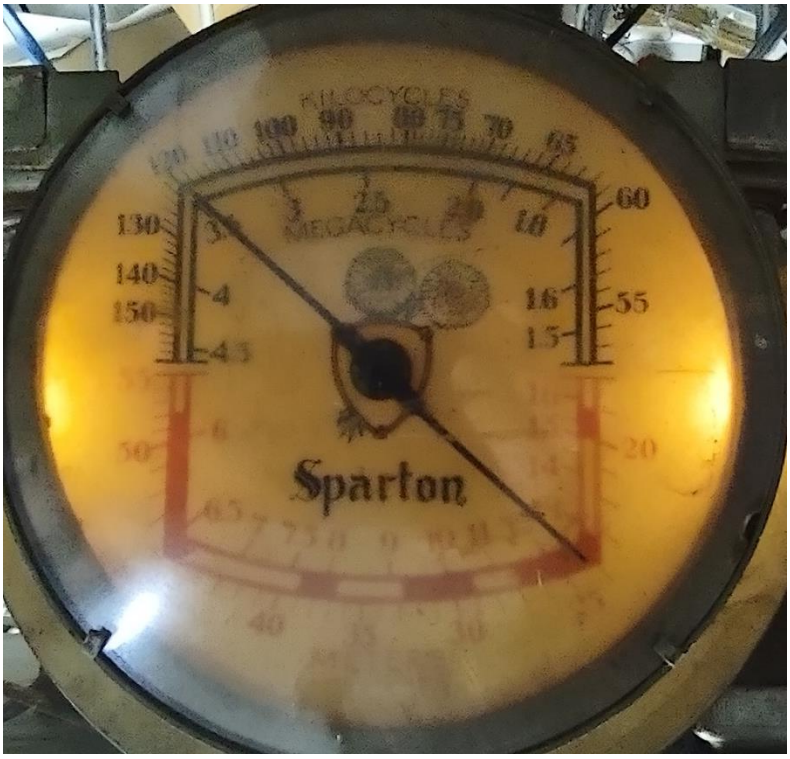

Figure 1 The Sparton's Dial

According the RCC service data, this radio set uses the very unusual (unique?) IF frequency of 345kHz. I discovered that the IF had been tuned up to 455kHz; probably a repairman without access to the proper service documents tuned it the way he thought it should be tuned. The radio was working OK, but I decided to tune the IF to 345kHz as intended. This meant that the rest of the alignment needed to be touched up. Alignment on the broadcast band was straight-forward, but I discovered oscillation when I tuned the shortwave antenna trimmer. How did I know? At the high end of the shortwave band, the AVC voltage jumped up to -21V, even with no signal injected into the radio. I discovered that the oscillation (the high AVC voltage) remained even if the 6D6 IF amplifier tube and the 75 detector tube were removed, so it was the 6A7 converter that was oscillating. “Wait”, you might say, “isn’t a 6A7 *supposed to* oscillate, as it is the ‘Local Oscillator’ ” ? The 6A7 is like 2 tubes in one, one part (the 2 grids closest to the cathode) acting as the local oscillator, and the other part (the grids farther from the cathode and the plate) acting as a “mixer”. In this radio, both parts were oscillating quite independent of each other; only

the LO part should oscillate. The unwanted oscillation ran anywhere from 600kHz to much higher, depending on the tuning. This oscillation generated a large DC voltage on the grid (because the grid behaves like a diode), which appeared on the AVC line. Usually, the AVC voltage comes from the detector (the 75, which I had removed), not the converter!

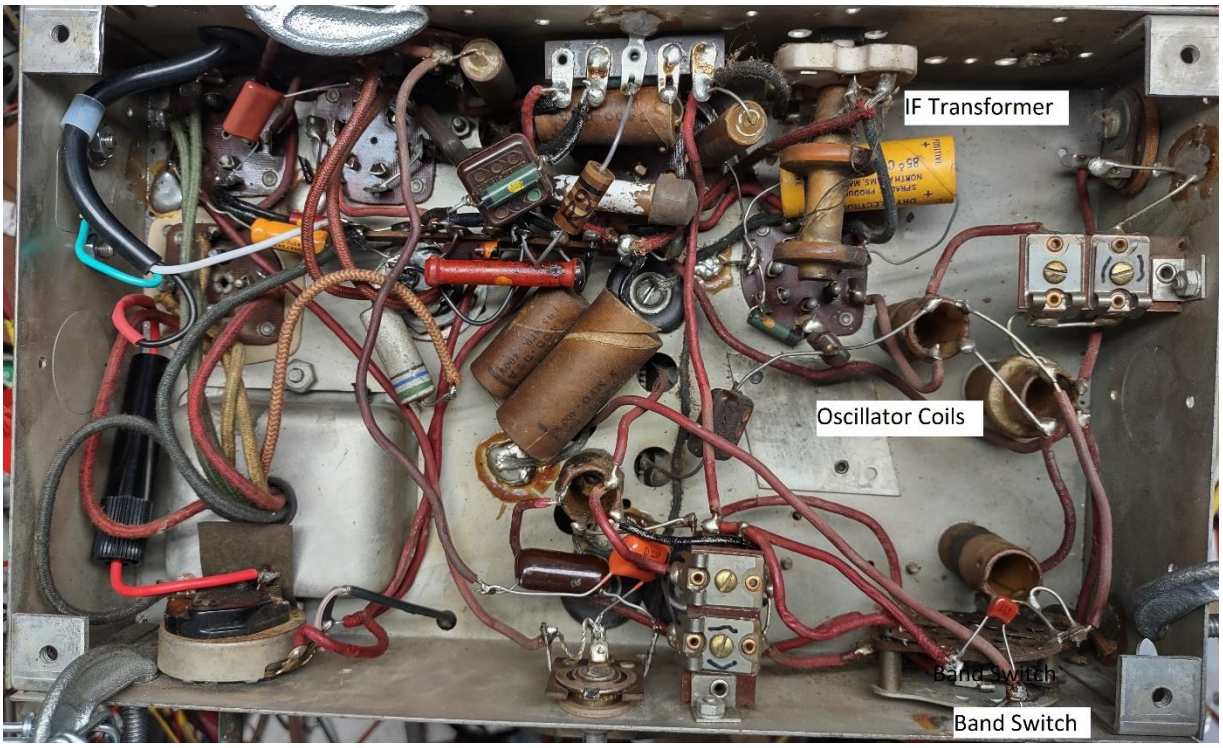

Figure 2 The underside of the Sparton.

I looked for the cause of this oscillation. I verified that the tube shields were in place. I shunted every decoupling capacitor with a known good capacitor but the oscillation remained. I shorted the IF transformer, and it made little difference. As I was looking into this radio, I noticed some unusual features: The first IF transformer is unshielded and located under the chassis, not far from the other coils. In most radios, this transformer would be well shielded and mounted on top of the chassis. Also, the band switch is unusually simple. Often, band switches in radios like this employ multiple wafers with complex switching schemes. This one has a simple one-wafer “4 pole triple throw” switch. Another odd feature: it uses a 3-gang tuning capacitor, which is usually only seen in radios with an RF amplifier; this radio does not have an RF amplifier.

Figure 3 The simple band switch.

The solution to my oscillating radio problem appeared in the radio's documentation. The alignment instructions from RCC included the phrase: *"Adjust the RF trimmer to point of greatest output. The trimmer should be turned a very small amount (1/16 of a turn) to the right to increase capacity slightly"* . When I did this, the oscillation stopped, and the radio worked well. So, what gives?

Multiband radios need different RF and LO coils for each band. Most multi-band radios use a complex switching arrangement that shorts out (or otherwise disables) unused coils. If left open, a coil can resonate. A high Q resonating coil can easily couple to other coils and cause "suck-outs" over narrow frequencies. (If you have ever used a grid-dip meter, you will have observed this) A resonant coil can cause resonances in other coils that can cause rapid changes in impedance over frequency, and one of these impedances can create the condition for oscillation. I traced the schematic of this Sparton, and indeed some BC coils are left connected in the circuit when the radio is switched to shortwave. (The triple-gang tuning capacitor is used in a complex double-tuned antenna circuit that requires more coils than usual) I believe that these unused coils, and perhaps the unshielded IF transformer, are coupling to each other or causing unwanted coupling that leads to oscillation. Detuning ("dumbing down") the shortwave antenna circuit tames the radio. This is an arm-waving explanation at best, but I tried everything else. Explaining the oscillation more precisely would be difficult (and would probably require that the radio be dismantled and reassembled).

In my professional life, I have been burned by unwanted oscillations many times, so I have some sympathy for the designer of this Sparton. I suspect that he was under pressure to release this design, and discovered this quick and dirty "detuning" solution, and let it go. In my opinion though, this would have been a better radio, and probably stable, if the IF transformer had been shielded, and the band switch had been wired to tame any unused coils. In any case, the radio now works nicely and is stable on all bands.