

Effect of power line voltage variation on frequency output of the R-390A PTO (70H-12)

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There are two VFOs in the R-390A, i.e. the BFO and the PTO. Frequency stability among other things is heavily influenced by supply voltages. Collins engineers spent a regulated power supply for B+ voltages (+150 VDC) for both VFO tubes. For the stabilization of the tube heating a current regulator (3TF7) is used.

Whereas voltage stabilization of B+ is very effective regulation of the filament current using the 3TF7 shows poor results. Experiments of Dallas Lankford showed that stabilization of the filament voltage by far is the better alternative. Unfortunately at that time (2004) his voltage regulator (+12 VDC, 300 mA) was quite clumsy.

I built a plug-in device that replaces the original 3TF7 and delivers stabilized 12 VDC to the filaments of both tubes. I compared the effects of power supply variations on frequency output of the PTO using either the 3TF7 or the 3TF7 replacement.

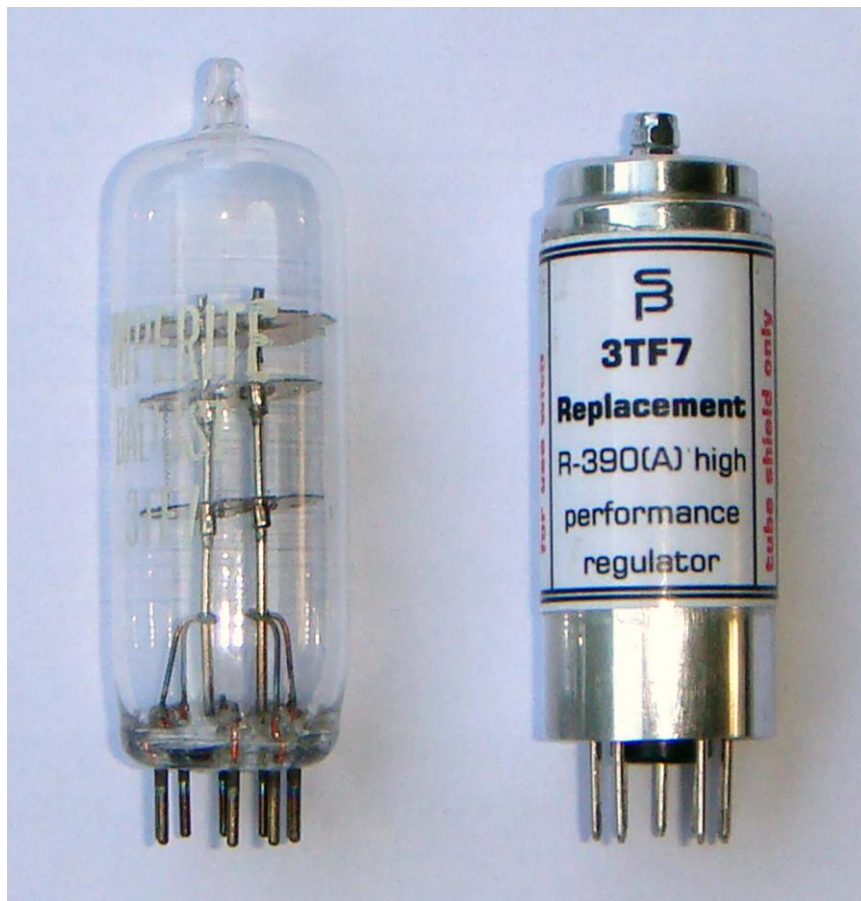


Fig. 1: 3TF7 side by side with the 3TF7 replacement

The line input of the R-390A receiver was connected to a VARIAC that could be switched from 230 VAC (normal European line voltage) to 210 VAC. With a chart recorder (Gould TA 240) the line voltage, the regulated +150 VDC, and the output frequency of the PTO were registered. The latter one was measured with a frequency counter connected to a digital-to-analogue converter (1 Hz resolution). PTO frequency was set to about midrange.

Measurements confirmed that the regulated 150 VDC is stabilized perfectly. In the R-390A where all measurements were taken B+ remained constant at +149,6 VDC independent of line voltage variations from 230 VAC to 210 VAC and back to 230 VAC. Therefore this trace is not included in the following chart.



Fig. 2: Effects of power liner voltage changes on PTO frequency
A,B with 3TF7 C,D with 3TF7 replacement module

Traces A & B show results with the original 3TF7 current regulator. Traces C & D show results with the 3TF7 replacement inserted into socket RT510 in the IF chassis. Traces B & D show the line voltage (lower part partly suppressed). The VARIAC was switched to low voltage (210 VAC) for 1,25 min.

When the original 3TF7 was in place decrease of the line voltage was followed by a delayed increase in PTO frequency (A). Maximum increase was about 12 Hz. When the 3TF7 was replaced by the module (C) and the line voltage was decreased no frequency change was observable.

Conclusion: Power line voltage variations induced changes in output frequency of the 70H-12 PTO do not result from B+ changes but from heater current changes. My measurement confirm the early results of Dallas Lankford.

A COSMOS manufactured PTO showed similar results. Measurements on the BFO have not been performed, yet.