3TF7 Substitutes

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The standard 3TF7 substitutes, (1) using a 42 or 43 ohm 10 watt resistor in place of the 3TF7, and (2) using an appropriate tube, like a 12BY7A, with a 12.6 volt filament in place of the 3TF7 are both acceptable substitutes. Using a 10 MHz rubidium standard I determined, somewhat to my surprise, that the power resistor is generally a more stable substitute than a 12BY7A. Recently while examining the long term frequency stability of one of my R-390A's with the BFO turned ON (for SSB, ECSS, or CW) using a rubidium standard, I found that the 3TF7 does not do a very good job of stabilizing the BFO and PTO frequencies when the AC line is varied. A change of only 2 or 3 VAC in the line voltage (I used a VARIAC to vary the AC input voltage to the R-390A) causes a substantial (4 or 5 or 6 Hz or more) departure from zero beat. Next, I removed the 3TF7, inserted a 9 pin tube test extender into the 3TF7 socket, and powered the BFO and PTO filaments with an external regulated 12 VDC supply (12 VDC was found to give almost exactly 300 mA filament current). With this arrangement, no change in zero beat was observed as the AC line voltage was varied from 120 VAC nominal down to 100 VAC and back up to 120 VAC. WOW. Whoever designed the original BFO and PTO filament stabilizition circuit was on the right track. They just used the wrong method to stabilize it. Current regulation is the wrong approach; voltage regulation is the correct approach.

Rather than rewire the 3TF7 socket, I opted to make the mod "plug-in" in so far as it was possible. I cut the metal flange off a miniature 9 pin ceramic tube socket, pushed 9 pieces of #18 tinned solid copper wire in each receptacle, soldered them, cut off the ends to the appropriate length for a 9 pin tube, deburred and polished the tips, drilled out the cylindrical center piece of metal and removed it. I ground off most of the head of a 6-32 brass screw of the appropriate length and attached an inch long (or somewhat longer) insulated spacer, and mounted an insulated standoff on the threaded end. This provided me with a home made tube socket extender on which I could build most of a 12 VDC regulator. There is a nut on the front of the IF deck where I added a ground lug. I ran a 1N4003 diode (200 PIV 1 amp) from the #2 pin lug of the adapter to the standoff, and a 1000 mF 50 volt electrolytic from the standoff to the ground lug. The ground tab of a 3 pin 12 volt 1 amp regulator was attached to the RF deck corner nearest the IF deck using one of the green screws that hold the oscillator deck to the RF deck plate; the regulator pins stick up above the top edge of the RF deck plate. The input and output pins of the regulator were bypassed to the ground pin with 0.1 mF 50 volt capacitors, and the regulator ground pin was wired to the added ground lug on the IF deck. An insulated wire from the standoff to the regulator input pin and an insulated wire from the regulator output pin to lug 7 of the plug-in adapter completed the modification. Well almost... three (3) complete wraps around the lugs of the home made adapter with Scotch Glass Cloth Electrical Tape and heat shrink tubing on the standoff protected the plug-in adapter from shorts.

This mod is not 100% plug-in because to remove it you have to (1) remove the nut on the front of the IF deck to remove the ground lug, and (2) remove the green screw on the RF deck to remove the 3 pin regulator.

I have now had the mod running continuously for about 48 hours. No problems were expected and no problems have been experienced. Not only does this mod give you improved frequency stability for ECSS, SSB, and CW, it should also provide a permanent solution for the 3TF7 replacement problem. There is still some very slow frequency drift, as much as 1 Hz per hour, sometimes more. I currently do not know the cause of this drift.

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