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Dear Richard,

It looks like you have a nice collection of Collins equipment. Hope that you are getting a lot of enjoyment out of it.

Yes, I invented the 30S-1 circuit using the new Eimac 4CX1000A tube back in about 1957. Art Collins had placed a requirement that all SSB equipment would have distortion products down at least 35 dB - and that was one IM product to one of the two tones. Now most ham manufacturers list IM products relative to PEP - which gives a 6 dB better sounding spec - so the 30S-1 when driven with the S-Line met 41 Db specified that way! I built and tested an engineering model to prove the circuit but others did the detail design for putting it into production.

I had to use several "tricks" to meet that requirement. One was to use a low screen voltage, another was to use some RF feedback and another was to use some multiple of 180 degrees electrical length from the driver plates to the 4CX1000A cathode. (That is the reason for the special length of coax from the driver to the 30S-1.)

In those days, the FCC power limit for SSB was 1000 watts input as read on the plate voltage and plate current meters - and if grounded grid - you were to include the driver plate power input also. The plate current meter has some damping so that the instantaneous peaks on voice were higher. Some have said that they get about 1100 to 1200 watts instantaneous PEP output in the original configuration. The FCC limit now is of course 1500 watts PEP output.

I agree that the grid in the 4XC1500B is much less subject to damage from overdrive - although the ALC should prevent that. The 4CX1500B has a much denser cooling fin structure on the anode. You have to use a much higher pressure cooling fan or blower to get 1500 watts dissipation. My estimate from looking at the properties of the two tubes and the blower is that - with the installed cooling fan - the 4CX1000A can dissipate 1000 watts but the 4CX1500B probably only about 850 watts. Therefore, if you choose to use the 4CX1500B, you should use a higher pressure blower.

Now about the screen voltage.

Eimac lists 325 volts for the typical grid-driven operating condition on the data sheet. (The absolute max is 400 Volts DC.) When you drive the cathode, the peak RF voltage on the cathode ADDS to the DC screen-to-cathode voltage. The RF feedback to the control grid increases the cathode RF voltage by an equal amount. The peak RF voltage on the cathode is probably on the order of 70 to 90 volts. **THAT IS WHY YOU DO NOT NEED AND SHOULD NOT USE 325 V DC (OR HIGHER) ON THE SCREEN FOR 1500 WATTS PEP OUTPUT!**

The DC regulation of the cathode DC supply is rather poor - mostly because of the 40 ohms resistance in the DC filter choke. A 10 ohm choke would be much better but would have to be designed to resonate at 120 Hz with the 0.5 UF capacitor across it with just bleeder and tube idling current flowing through it. It probably would be about 4 times as big. I suggest that it be left as is but that the 10 ohm resistor R232 be removed or shorted. To get up to 1500 watts PEP output, you would probably have to add a boost voltage of about 50 V AC in series with terminal 10 on transformer T201.

Before all of the above I suggest that a good stiff 240 V AC power source be provided. The rig is rated for 230 V AC input but the transformers are rated for 50/60 Hz, therefore they can handle 240 V AC, 60 Hz OK.

Boosting the power is probably not worth it because it stresses the components more. Increasing power output 20% causes 44% more heating of some components. I could go on but I have already probably said more than you cared to hear.

Hope I have been of some help.

Sincerely and 73,

Warren