

$$R = E_{og} X I_{000} / I_p = 29.5 X I_{000} / 17.3 = 1705 \text{ ohms}$$

The tricky part is determining the actual operating conditions of the tube or tubes in question when manufacturers data is not available. Remember the plate and screen voltages are not the supply voltages but the actual voltages at the tube elements. This is always true, but especially for high resistance circuits. For my example I used the RCA handbook and you'll see we agree within 5 ohms. The + bias voltage applied to the filament (cathode) makes the control grid negative with respect to the filament (cathode). I know you knew that! I leave it to the reader to check the formula for multiple tube applications.

Herman Gross

Ed's Tech Tip

Replacing the 6U5/6G5/6E5 with a 1629/VT-138 in a Parallel String Transformer Operated Radio

In the last issue of the Bulletin I discussed how to replace the 6U5/6G5/6E5 in your series string radio with a 1629/VT-138. In this issue I will discuss how to replace the 6U5/6G5/6E5 with the 1629/VT-138 in your AC transformer operated radio, without making modifications to the radio itself. The modifications will be in the adapter. The idea of using a voltage doubler for doing this has been around for many years and I tried it 20 years or more ago. One gentleman on the internet is using a half wave voltage doubler, but I prefer using a full wave voltage doubler because it is more efficient and the voltage across each capacitor is half the output voltage, which means smaller capacitors can be used.

First, a review of the specs of these tuning eyes from my previous article. The 6U5/6G5/6E5 have 6.3 volt filaments at .3 amp and the 1629 has a 12.6 volt filament at .15 amp. The 6E5 and the 1629 are more sensitive than the 6U5/6G5 in that less AVC voltage is required for eye movement. In some cases where I have replaced a 6U5 with a 6E5, I will have overlap of the eye on strong stations. This won't hurt the tube, but may be annoying to a purist. The 1629's heater is 12.6 volts at .15 amp and so it will require a 6.3 boost in voltage for proper operation. This can be easily achieved by one of two methods: an additional filament transformer which requires modifying the radio or a voltage doubler circuit. I will discuss the full wave voltage doubler technique, because it does not require modifying or removing the chassis on most radios. I used 1N4004 diodes because I have lots of them, but any of the 1N4000 series diodes

will work for this circuit, since the voltage is so low. Any surplus power supply diodes out of junk TV's should work just fine. I experimented with the capacitors and I found 470 MFD capacitors are the minimum values that can be used to maintain 12 volts across the 1629 heater and 1000 MFD and up will work better, but the bigger values get bigger physically. Using smaller than 470 MFD capacitors will result in a decrease in the heater voltage to the 1629. I used 470 MFD 10 volt capacitors and they work just fine. Do not use capacitors rated below 10 volts as there is about 6 volts on each capacitor in the operating circuit. The adapter I made is spread out so you can see it, but with some patience and smaller capacitors a smaller adapter can be made with the capacitors housed in the 6 pin socket. Here are the steps to do the conversion:

1. Obtain a bad 6 pin tube, preferably a 43 or 42 because the base is bigger and provides more room to put capacitors in. Wrap a rag around it and break the glass to the point where there are no jagged pieces. Wear safety glasses and gloves when you do this.
2. Using needlenose pliers, clean out the rest of the glass and dried glue in the base.
3. Unsolder the wires going to the pins and using a solder sucker, remove the rest of the solder. The pin should be clear of solder and ready to accept new wires.
4. Run jumper wires from the 6 pin socket to the octal socket, but do not attach the heater/filament wires coming from the 6pin socket to the octal socket. Leave pin 6 of the 6 pin socket empty. See the chart.
5. Insert the negative lead of one capacitor, C2, into pin 6 of the 6 pin socket. Insert the positive lead of the other capacitor, C1, into pin 6 of the 6 pin socket. At this point you realize it is important to have pin 6 cleared of excess solder to enable inserting two wires into one pin. Solder the pin.
6. Solder the positive end of C2 and the cathode end of D2 to pin 2 of the 1629 octal socket.
7. Solder the negative end of C1 and the anode end of D1 to pin 7 of the 1629 octal socket.
8. Solder the wire from pin 6 of the 6 pin socket to the junction of C1 and C2.
9. Plug it in and try it out.

	6U5/6G5/6E5	1629/VT-138
HEATER	1	2
HEATER	6	7
GRID TRIODE	3	5
PLATE TRIODE	2	3
TARGET ANODE	4	4
CATHODE	5	8