


12BW4 Rectifier Tubes in the Collins R-390/390A

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When I finally added a Motorola R-390 to my collection (S.N. 960) I found that the power supply needed a full rebuild. Rather than stay with the increasingly rare and costly 26Z5Ws, I decided to try to find a less expensive and more common full wave rectifier tube. A pair of nine pin miniatures, with 12 or 13 volt filaments in series, with similar base connections to the 26Z5W, would be perfect. The 1964 RCA Tube Data book (RC-23) indicated that the 12BW4 was a good candidate, having a similar base diagram and a 25% higher peak plate current capacity. The only big "hitches" were the differences in the base connection diagrams; The 12BW4's cathode connection is on pin 9, the 26Z5's cathodes are on pins 3 & 8. The 12BW4's plates are on pins 1 & 7, the 26Z5W's plates are on pins 1 & 6. If not for the 26Z5's filament center-tap, you could just connect pin 1 to pins 6 and 7, pin 3 to pins 8 and 9 and rewire the filament supply to provide 12 volts.

26Z5W Characteristics

(From GE "Essential Characteristics")

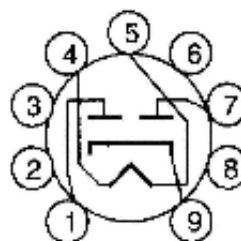
Base: 9BS Envelope Height: 1 15/16" Filament: 26.5 V @ 200 ma. (Total 400 ma. load on supply.) Voltage Drop: 22 Volts at 100 ma. Max DC current: 50 ma. (per plate) PIV: 1250 Volts. Max Peak Current: 300 ma.(per plate) RMS supply voltage: 325 (per plate)	 <p>26Z5W Base Connections</p>
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Note that a 26Z5 (9BS) has two separate cathodes with a pin for each (3&8) while the 12BW4 (9DJ) has one cathode connection (pin 9). The R-390 did not take advantage of the center-tapped filament (pin 9) on the 26Z5W by connecting it to the center-tap of the 25.2 volt filament winding of the power supply. (Pin 9)

12BW4 Characteristics

(From RCA Data book RC-27)

Base: 9DJ
 Envelope Height: 2 3/8"
 Filament: 12.6 V @ 450 ma.
 (Estimated from 6BW4 specs as the data book shows 6.3 V @900 ma.!!!)
 Max DC current per plate: 62.5 ma.
 PIV: 1275 Volts.
 Peak Current: 350 ma. (per plate)



12BW4 Base Connections

The 26Z5W had an internal resistance of 220 ohms at 100 ma. ($22V = 0.100\text{ A} \times 220\text{ ohms}$). The 12BW4 has a total impedance of 82 ohms per plate or 41 ohms for two plates in parallel, so it appears the voltage drop across the 12BW4's should be lower than the 26Z5W's.

Details

Since my R-390's power supply was completely carbonized, I decided to disconnect all the wires to the sockets clean it all up and start fresh. The R-390 power supply can be removed from the chassis, so the changes are fairly easy to do.

Move the wires on both sockets from pin 6 to pin 7 and pin 8 to pin 9. Add a jumper from pin 1 to pin 7. Move the filament circuit feed wire from pin 4 on one socket to pin 5 of the other socket, and break the connection from pin 5 to pin 5 between the sockets. (This will put the filaments in series.)

George Rancourt tells me he has also done this mod on one of his R-390A's and that it worked very well. The measured plate voltages are right on spec @ 240 Volts.

After nearly 50 years of modifications and "improvements" to the R-390 it was gratifying to find a "new" one that increases the reliability of the power supply, reduces stress on the tubes, and is fairly easy to do. Using less expensive tubes than the 26Z5W was a welcome bonus.