

Drake R4B Audio Output Tube Alternative

In looking for an alternative to the 6EH5 Audio Output tube used in the Drake R4B receiver, I considered several tubes which fall into the Power Pentode family of tubes. A priority was to maintain the 7 pin socket and minimize any rewiring or part changes. There are always compromises to be made and after looking at various tube data sheets and plate current vs grid voltage curves I settled on the 6AS5 Beam Pentode.

A quick note about using the popular 6AQ5. It is very common and readily available. However, it really is not the best choice for the Drake R4B. The R4B uses a 150 volt power supply which would be near the low end of voltage for the 6AQ5 which typically will use a 250 volt power supply. It also is overkill in terms of output power and requires rewiring the pin connections to the socket.

The 6AS5 Beam Pentode was commonly used for audio output in radios in days past and seems to more readily available and lower cost than the 6EH5 used in the Drake R4B receiver. Further, it is designed to work with a 150 volt power supply, the pin out for the tube is the same and only a couple of resistor value changes are required.

There are two resistor value changes to make. Both are easily accessible in the receiver. An optional third resistor change can be made if desired but is not required. More on this later.

1. Change R136, from 1K to 6.8K 1W. This resistor sets the screen voltage at pin 6 of the tube.
2. Change R44, from 120 to 180 $\frac{1}{2}$ W. This resistor sets the cathode bias voltage for the tube.

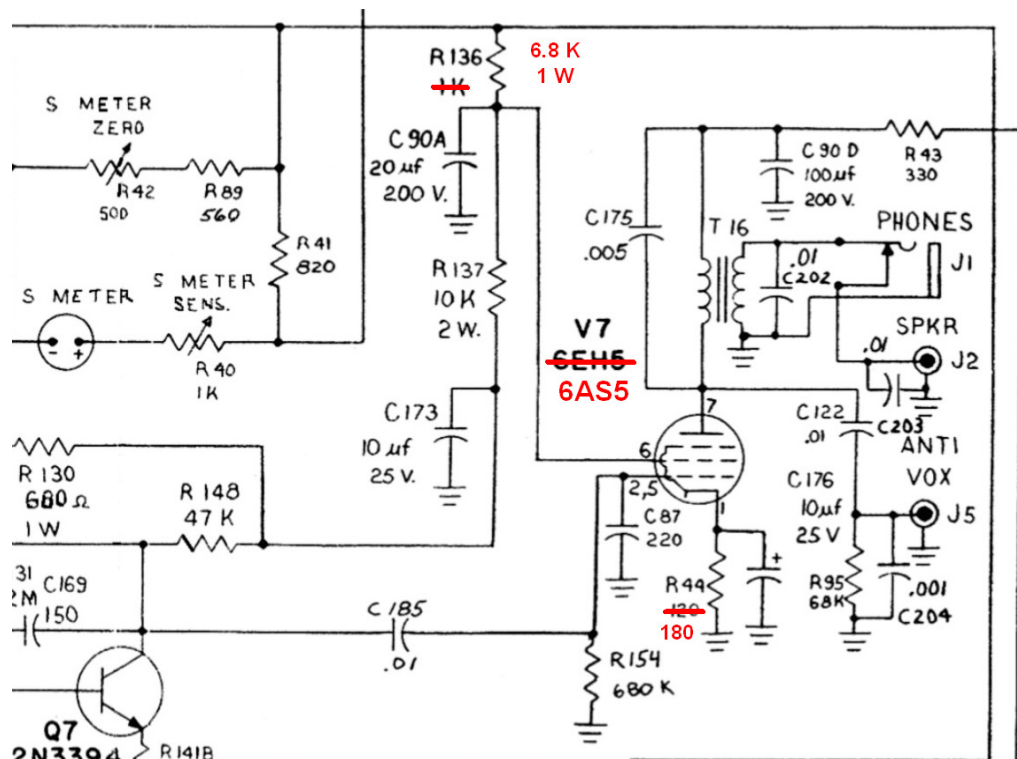
With these two changes made, plug in the tube and operate the receiver as normal. The following voltages measurements were made on my receiver and may vary a few percent on individual receivers.

Plate, pin 7: 148 VDC

Screen, Pin 6: 90 VDC

Cathode, Pin 1: 5.5 VDC

Cathode current runs about 30.5 ma. (5.5 VDC / 180 Ohms)



Measured performance using an HP 8656B Signal generator, HP 334A Distortion Analyzer and General Radio 583-A Output Power Meter.

RF level to receiver: 30 μ V (approximately S9 reading on S meter)

Modulation: 1 KHz at 50 %

Audio load: 4 Ohms

Audio output: 100 mW

Measured Distortion: 4.7 %

RF level to receiver: 30 μ V (approximately S9 reading on S meter)

Modulation: 1 KHz at 99 %

Audio load: 4 Ohms

Audio output: 100 mW

Measured Distortion: 9.4 %

This modification will reduce the audio output of the receiver by approximately 3 dB. This is due to R136 being more than just a screen dropping resistor. It is also part of a voltage divider consisting of R136, R137 and R148. This provides the supply voltage to the collector of Q7 which is the audio driver for the output tube. A third, optional, resistor change is to replace R137 with a 8.2 K 1 W. I found that the receiver has more than enough audio output with the slight reduction and I chose not to change R137.

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