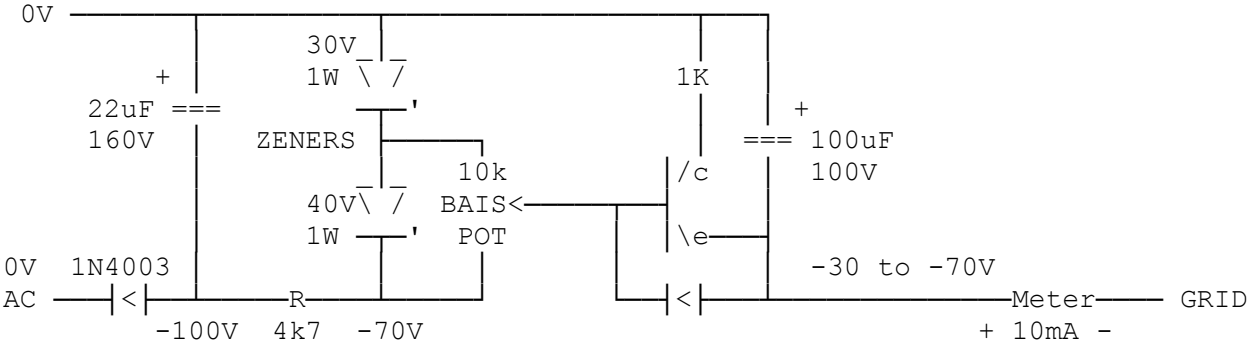
4CX250B PA Regulated Supplies

By G8MNY (Updated May 13)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

In the tetrode valve PAs like the 4CX250Bs a hard (stiff) grid & screen power rails are needed for optimum power & linearity, e.g. >400W @ >-20dB intermod products, or better than a bank of RF transistors can do.
I found that a simple NPN emitter follower with a diode does a very good job both for the screen & grid supplies.

GRID 1 BIAS SUPPLY

For good class AB2 working the negative grid supply needs to be able to handle grid currents (more -ve voltages generated from rectified RF drive) without any significant change in the bias voltage. In this design the sudden peak current from the grid RF drive is safely conducted to ground without upsetting the bias pot voltage. So the optimum no crossover distortion valve bias for about 100mA anode current can be accurately maintained.

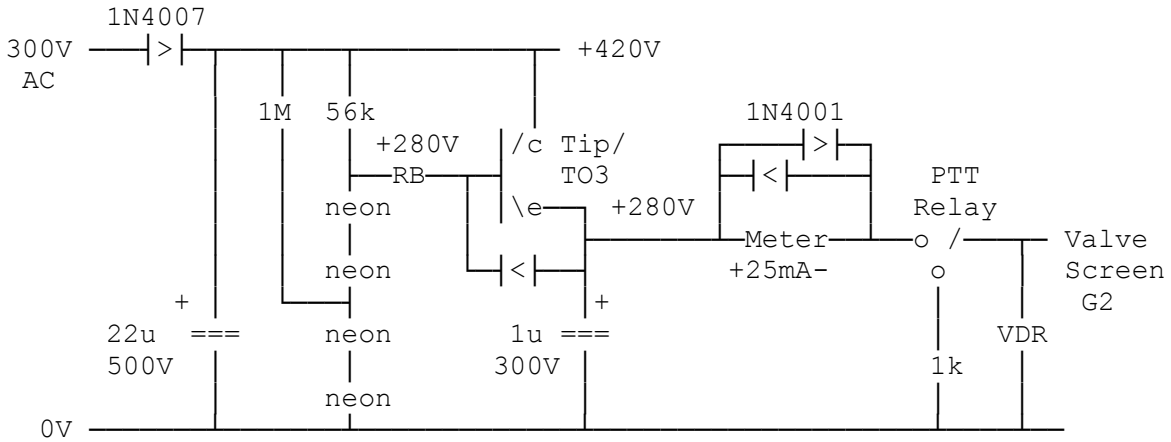


The 100V 20mA NPN transistor, current amplifies the bias pot, so that the peaks of grid current flow to ground through the NPN transistor & the 1k, the 1k dumps some of the power enabling the use of a small low power transistor.

A diode from the pot to the grid (base-emitter) routes -ve volts through to the grid when there is no grid current. No sudden AC step change from the transistor to diode voltage is allowed due to the 100uF on the grid output. The DC must be fed to the grid via an RF choke (or low value wire wound R) & not via a high value resistor (other wise you waste all the effort of this design) if the peak drive grid current is going to drive the valve properly. Grid current meter of 10mA can be put in series with the grid power supply note the polarity!

N.B. on a 4CX250B a mean grid current of 2.5mA (0mA on a 4CX350!) is the recommended value for minimum 3rd order IP product. So in class AB2 with a 4CX250B there could be half RF cycle peak current of about 50mA (2.5mA Mean), which is needed to give a good half cycle drive.

SCREEN G2 SUPPLY
In this design the NPN device follows the voltage across a 4 neon bulb stack (or a less reliable Zener stack), to give a regulated voltage of approx +280V. A diode across the base-emitter also provides -ve current dumping ability from the screen into neon stack under certain tuning/load conditions.



Again no sudden AC change from the transistor to diode step voltage is allowed due to the 1uF on the screen output. A normal mains 300V VDR is recommended on the valve base to dump any spikes from the anode 2kV supply that occasionally appear on the screen grid! (this is why neons are more reliable than Zeners)

As the neons usually provide a -ve impedance characteristic, a series base resister RB of a few K ohms can make the O/P impedance actually 0 ohms. And limit any excesive current into/from the base & diode. A simple DC 10mA load test can fine the best value for RB.

Screen Grid current meter of 25mA can be put in series with this power supply, but should be protected with 2 1N4001 diodes.

The PTT relay should connect the power to the valve to turn the valve on for TX. It is recommended that this relay operates after the aerial C/O relay, but releases before the aerial C/O. Suitable diode steered CRs can do this.

Also note that the screen power should not be connected if the valve...
1/ has not warmed up. (takes 1min),
2/ has No Anode supply,
3/ has no bias supply.
Again simple relay inhibit electronics can do all this.

See "4CX250B PA Timing & Control" Bul for more details..

Why Don't U send an Interesting Bul?

73 De John, G8MNY @ GB7CIP