Regulated Grid Voltage

Regulated grid voltage makes the tester less susceptible to supply voltage variations and inaccuracy of pre use calibration. The waveform of the regulated voltage must remain sinusoidal in order to maintain the overall accuracy of the tester. The circuit described here regulates the full wave rectified mean DC with both half waves having the same amplitude. This differs from the original circuit which uses half waves with different amplitudes, the lower being used for grid control and the higher being supplied to the grid to suppress grid current during the negative anode/screen cycle. However tests have shown that different half cycle amplitudes are not necessary and equal amplitudes do suppress grid current equally well. This simplifies the regulator circuit.

Circuit description

The 55 VAC raw grid voltage is full wave rectified and fed to the grid volts network. A BC238 npn transistor acts as an actuator for the excess voltage drop. The network voltage is measured by a voltage divider and differential amplifier. An integral regulator compares the actual voltage with the DC nominal value and controls the actuator transistor accordingly. The resulting grid network voltage has the original sinusoidal shape with rounded maxima adjusted to the mean DC setpoint value (41.6 V).

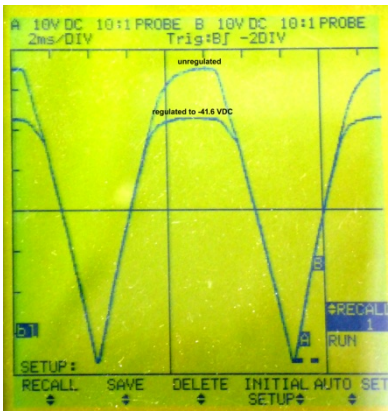
The differential amplifier stage is not compensated for the varying common mode error caused by the transistor actuator because the corresponding error voltage at the amplifier output can be regarded as constant and is taken into account by adjusting the set point accordingly. Common mode compensation can be accomplished with the improved circuit shown but has turned out to be unnecessary.

Results

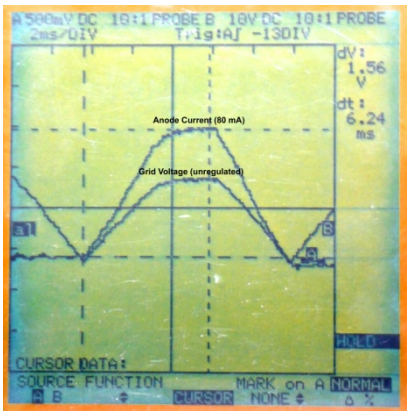
Grid voltage remains constant within +- 10% mains voltage variation.

Extensive $I_a = f(U_g)$ and mutual conductance measurements with unregulated and regulated U_g were carried out with a 6L6 valve. The results showed no significant difference so AVO's 4% fudge factor (41.6 VDC for 40 V max. U_g) can be maintained.

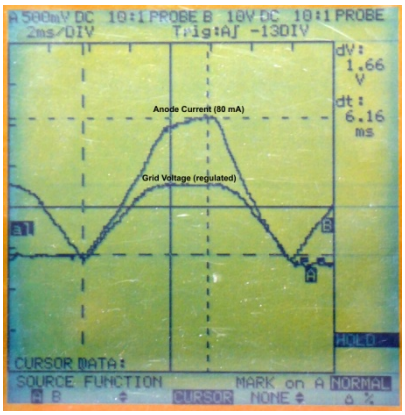
Due to the compressed form of the grid voltage curve anode current peaks with grid voltage regulation are approx. 10% higher than without regulation (135/127 mA @ 80 mA mean anode current).



Effect of grid voltage regulation on curve shape



Anode current @ unregulated grid voltage:
peak at 1.56 V == 127 mA



Anode current @ regulated grid voltage:
peak at 1.66 V == 135 mA

(Ende)