



amateur service newsletter W6SAI

GROUNDING SCREEN OPERATION OF TETRODE AMPLIFIERS

One of the design problems encountered in tetrode amplifiers is ensuring that the screen element of the tube is at rf ground even though a dc potential is applied to it. The problem arises because the perfect screen bypass capacitor has not yet been invented. Even the best capacitor contains residual inductance which (when added to the inductance of the screen lead of the tube) inhibits neutralization and encourages VHF parasitics. One solution to this problem is to eliminate the screen bypass capacitor by rearranging the circuit.

Figure 1 shows the conventional dc return paths wherein all power supplies are returned to the grounded cathode of the stage. Meters are placed in the common return leads, and each meter reads only the current flowing in the particular circuit.

The dc ground connection is removed from the cathode in figure 2 and placed at the screen terminal of the tube. Circuit operation is still the same as all power supply returns are still made to the cathode of the tube. The only change is that the screen rf ground and dc ground are now the same. The cathode circuit is at a negative potential with respect to the chassis by an amount equal to the screen voltage. Also, the return of the high voltage plate supply and the grid bias supply are now negative with respect to ground by the screen potential. The cathode is bypassed to ground, as shown.

A practical version of this circuit is shown in figure 3. The grid bias and screen supplies are incorporated in the amplifier and terminals are provided for positive and negative connections to the high voltage supply. A "tune-operate" switch is added which removes the screen potential for tune-up purposes. The negative of the plate supply "floats" below ground by the value of the screen voltage. A resistor is placed across the plate milliammeter as a safety device to prevent the circuit from being accidentally opened by chance failure of the meter. Note that the cathode bypass capacitor must be rated to withstand the full screen voltage.

Operation of this circuit is normal in all respects and it may be applied to any form of tetrode amplifier with good results.

Another version of this circuit is shown in figure 4. The screen supply is placed between the cathode and ground, and the supply must be capable of passing the dc plate current. The screen current is thus "swamped" by the plate current. Aside from the extra complication of high current screen supply, the advantage of an extremely stable screen voltage source is gained, plus the fact that the screen potential is added to that of the plate power supply. The plate voltage, therefore, is the sum of the plate and screen supply voltages.

Screen current and plate current should be monitored separately, because screen current is still the best indicator of loading in a tetrode amplifier stage, and also because the screen dissipation rating must be observed.

The resistors "R" serve to tie the plate and screen supplies to ground in the event of meter burn-out. The resistors are just large enough so that they do not materially affect the accuracy of the meters. The grid meter and power supply are "off ground" by the amount of the dc screen voltage and must be adequately insulated.

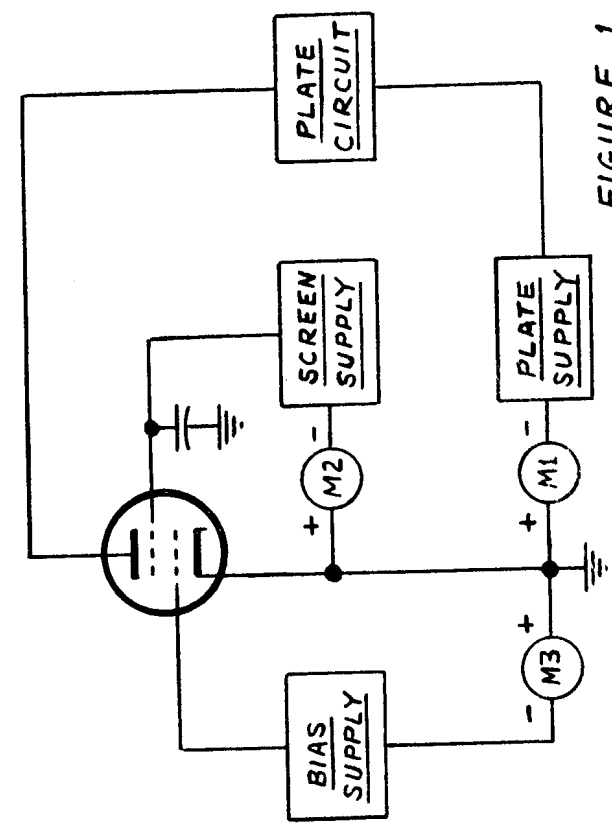


FIGURE 1

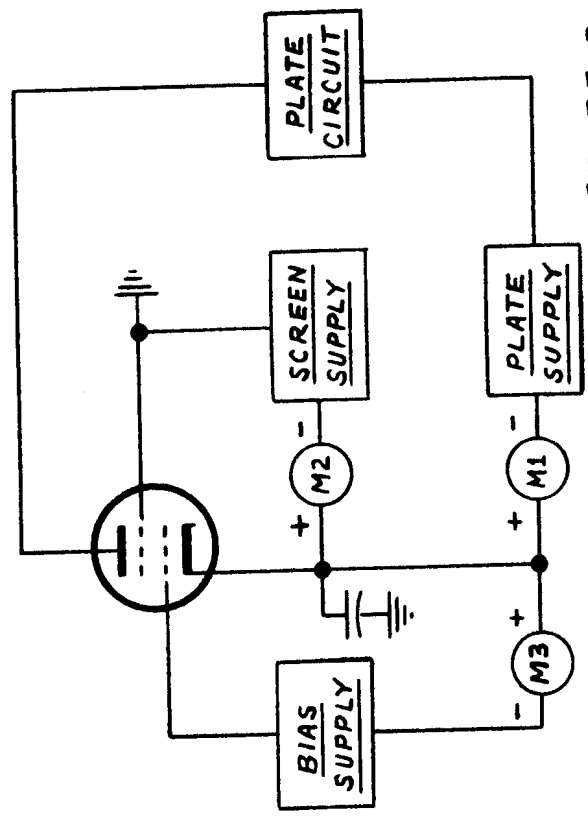


FIGURE 2

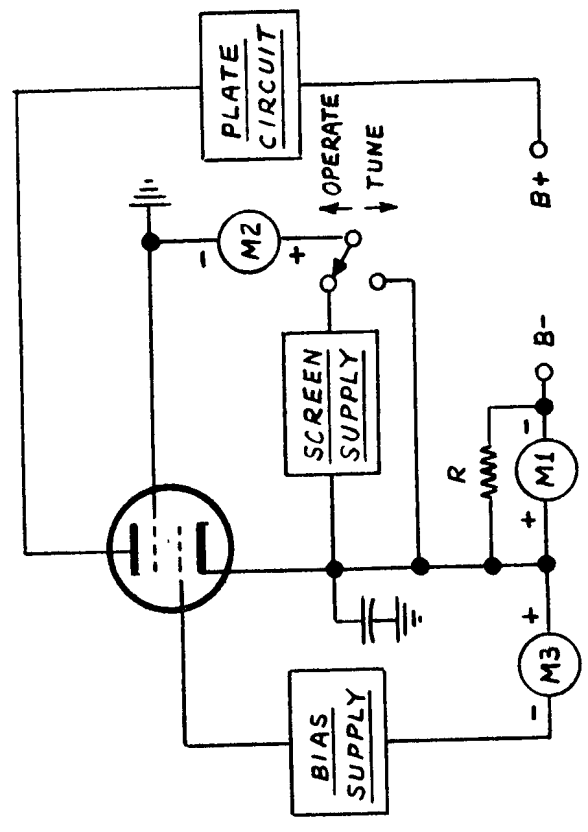


FIGURE 3

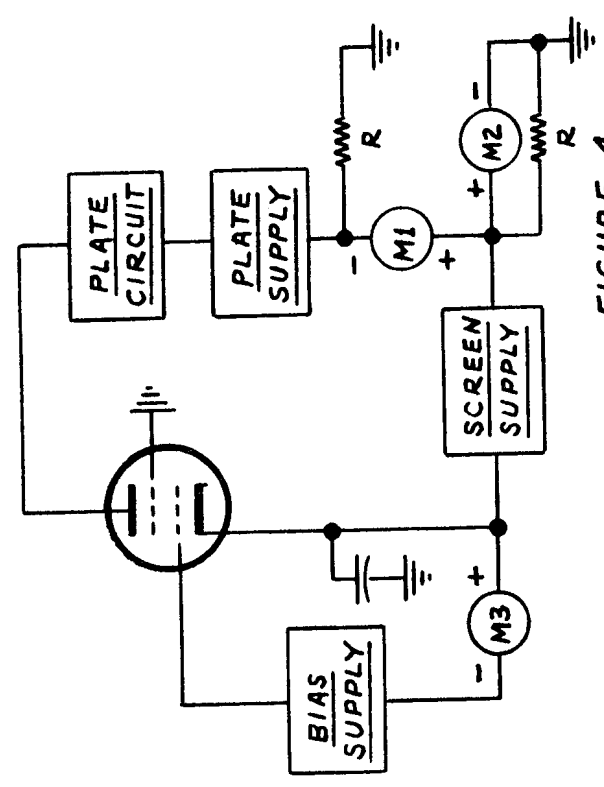


FIGURE 4