



The 3-500Z in Amateur Service

Here's a new zero-bias triode from Eimac that features increased plate dissipation.

The **3-500Z** is a heavy-duty power triode of 500 watts plate dissipation. It is exceptionally well suited for use as a class-B amplifier in rf or audio application. It may be used in zero-bias linear-amplifier service at plate potentials up to 3000 volts, eliminating bulky and expensive screen and bias power supplies.

Of particular interest to the radio amateur is the use of the 3-500Z as a grounded-grid (cathode-driven) amplifier for ssb service. One 3-500Z is capable of a PEP input of over 1100 watts, requiring only 30 watts PEP drive power. Intermodulation distortion products at this power level are 30 dB or more below one tone of a two-tone test signal. At 2000 volts, moreover, over 500 watts of power output are obtainable with distortion products better than 38 dB below one tone of a two-tone signal. Typical operating characteristics for the 3-500Z are listed in **table 1**. A data sheet covering operation of the 3-500Z may be obtained at no cost by writing to me.

In cases requiring additional plate dissipation, the 3-500Z may replace the 3-400Z. The forced-air requirements for the two tubes are approximately equal and a blower capable of 13 cubic feet per minute at a back pressure of 0.2 inch is satisfactory for a single 3-500Z. (Use blower size #3 at 1600 rpm. For two 3-500Z's, use blower size #3 at 3100 rpm, or size #2½ at 6000 rpm.)

The zero-signal plate current of the 3-500Z is somewhat higher than that of the 3-400Z. When the 3-500Z is used to replace the 3-400Z, a means of reducing the zero-signal plate current is recommended, particularly if the equipment is power-supply limited. Only a few volts of bias from a low impedance source are required. The simplest way of obtaining well-regulated bias voltage is to place a zener diode in the filament return circuit of the 3-500Z (**fig. 1**).

The 1N4551 zener diode has a nominal voltage drop of 4.7 volts and an impedance of 0.1 ohm, making it ideal for this service. At this value of bias, the zero-signal plate current of the 3-500Z at a plate potential of 3250 volts is reduced from 160 to approximately 90 milliamperes.

The zener diode may be bolted directly to a cool area of the chassis which will act as a heat sink. Additional VOX-selective bias may be placed in series with this zener diode to reduce standby current of the 3-500Z to nearly zero in order to eliminate "diode noise" during reception and conserve standby power (**fig. 2**).

the grid-current meter

It is advisable to monitor the grid current of the 3-500Z as an indicator of correct drive and antenna loading. Too much grid current indicates underloading or overdriving and too little grid current indicates underdriving or overloading, other things being equal. As the grid must be held at rf ground, the grid meter must be introduced in such a manner as not to disrupt this circuit. A simple grid meter scheme is shown in **fig. 1**. Each grid pin is grounded through a .01-pF mica capacitor paralleled with a 3.3-ohm, 2-watt composition resistor. A small dc voltage drop exists across the resistor under normal tube operation. The voltage drop is read by a simple dc voltmeter (M1) calibrated in terms of grid current.

In the example shown, it is desired that the grid meter have a full scale indication of 200 milliamperes. The dc grid-to-ground resistance is about 1.1 ohm and, at a current of 200 mA, a voltage drop of 0.22 volts will be developed. The 0-1 dc milliammeter is converted to read 0.22 volts full scale by the inclusion of a series multiplier resistor. The sum of the resistor plus the meter resistance should total 220 ohms.

3-500Z circuitry

No specific circuits are shown for the 3-500Z, since published 3-400Z circuitry applies equally well to this tube. Two 3-500Z's may be used in place of a single 3-1000Z with appropriate corrections in air flow, filament power requirements and zener bias (if necessary).

ham radio

table 1. Typical operation of the 3-500Z in grounded-grid rf linear-amplifier service.

DC plate voltage	3000	2500	2000	V
Zero-signal dc plate current	160	130	95	mA
Single-tone dc plate current	370	400	400	mA
Single-tone dc grid current	115	120	130	mA
PEP input power	1110	1000	800	W
PEP useful output power	750	600	500	W
Resonant load impedance	5000	3450	2750	ohms
Cathode input impedance	115	100	100	ohms
Intermodulation products (3rd order)	-30	-33	-38	dB

fig. 1. Zener diode bias circuit for the 3-500Z. A 1N4551, 4.7-volt, 50-watt zener diode provides cathode bias for the 3-500Z. Meter M1 (0-1 mA dc) reads grid current of the tube in terms of the voltage drop across the three grid resistors. Meter M2 reads plate current. The multiplier resistor plus internal resistance of meter M1 should total 220 ohms. Grid and filament bypass capacitors are 600-volt mica units (M). Other bypass capacitors are ceramic discs.

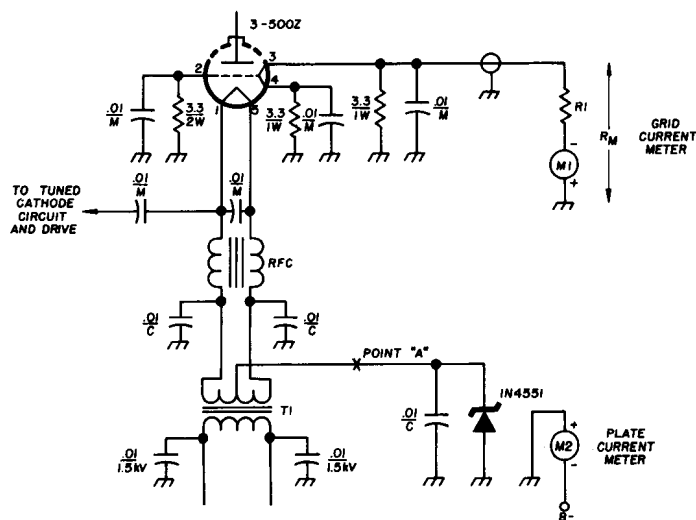


fig. 2. VOX-selective cutoff bias circuit. Additional cutoff cathode bias is added by the VOX relay to reduce standby plate current to near-zero, eliminating "diode noise" in a nearby receiver. The bias is added at point A in fig. 1.

