wo tubes draw about 50 mA resting rrent. This may be reduced to near placement of a zener diode at point e filament return circuit. A 3.9-volt device (HEP-Z3500 or equivalent) be used with the positive terminal ed to the centertap of the filament mer.

ing is accomplished in the negative eads and the negative circuit of the ltage supply is raised above ground 0-ohm 10-watt resistor placed across r circuitry. The potential difference B-minus and ground is less than a the negative circuit of the power must not be grounded, otherwise the rcuitry will be shorted out.

the amplifier is wired and checked d cathode circuit (L_1-C_1) should ted to midband frequency with the dip meter. Plate circuit resonance roughly established in this fashion when loading capacitor C_3 remains set at maximum capacitance.

Initial tuneup should be done at reduced plate voltage, say, 1500 volts. Drive is applied and tuning capacitor C_2 is adjusted for maximum power output as indicated by an external wattmeter or SWR meter. Capacitor C_3 (load) is then adjusted for maximum output.

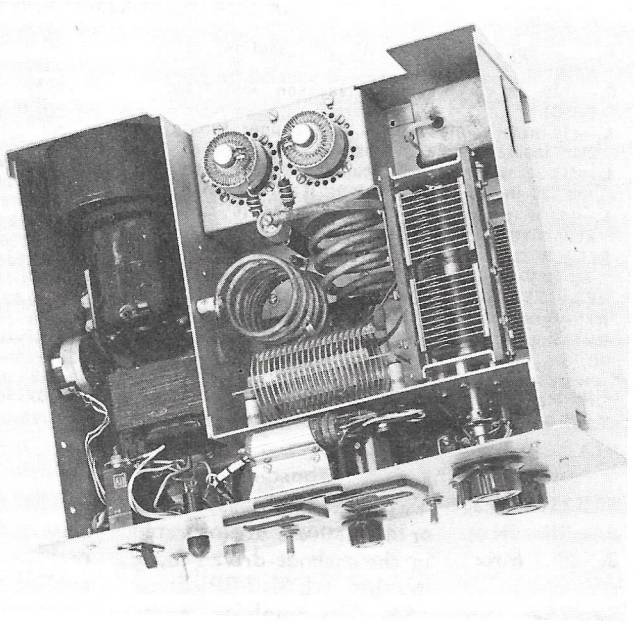
Plate voltage is now raised to the operating value and drive power advanced until plate current is near 400 mA. The tuning and loading capacitors are adjusted for maximum power output and minimum plate current, which should be about 400 mA. Tuning adjustments should be limited to periods of less than 30 seconds in order to allow the tubes to cool. During normal operation, the anodes of the tubes will approach a dull red color on voice peaks.

It is important that proper ventilation be maintained about the tubes. The small axial fan is positioned to blow across the glass envelopes and the warm air is exhausted out the top of the amplifier cabinet.

Because these tubes are running at near maximum allowable input, the use of speech compression or clipping is not recommended.

Figure 5

VIEW OF 4CX250B EAR AMPLIFIER



ter compartment contains main r-f components. At rear are the two 4CX300A es mounted on a small ssis adjacent to the blower. the right of the tubes is the ll drawn aluminum case taining the output reflec- eter. Plate loading and tun- capacitors are mounted at right of the compartment the front subpanel. Central contains the three plate- uit inductors and the band- ch. Low- and medium-fre- ncy inductors are mounted the sides of the compart- t with small ceramic stand- insulators, and the high- uency coil is supported by tswitch and tuning capaci- The plate r-f choke is ed vertically at the rear he compartment with the e-blocking capacitor atop The blower, filament trans- er, and auxiliary compo- s are mounted to the left he r-f compartment. The uit breaker overload po- iometer (R_3) is mounted to outer wall of the inclosure. tron tuning tube is mount- to the front panel by a ket which encircles the tube.

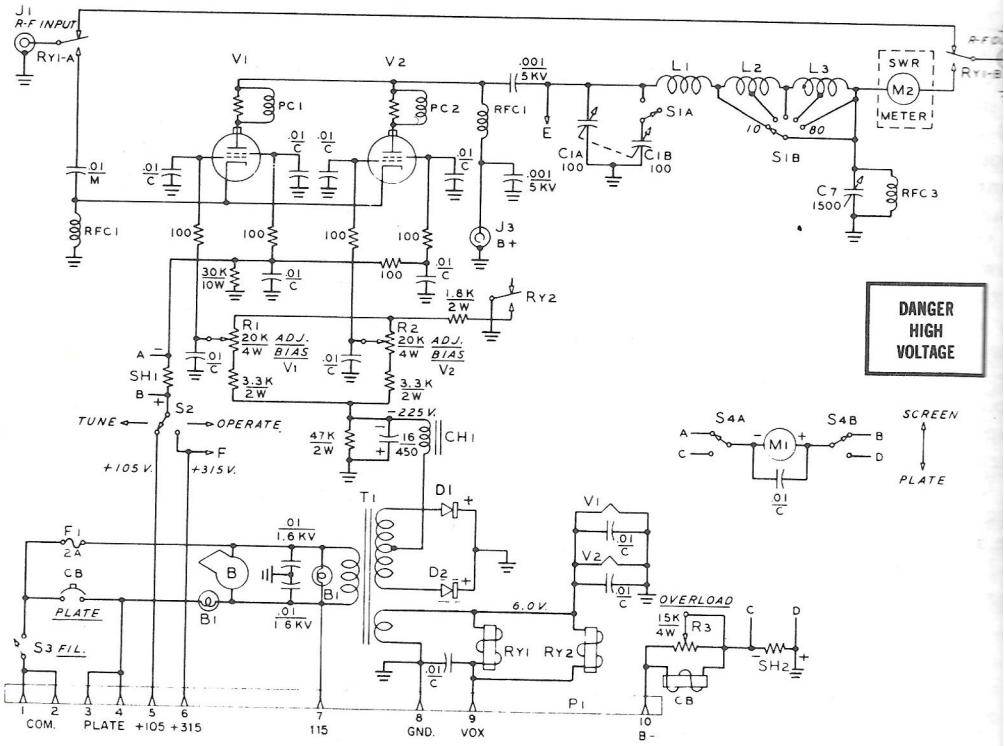


Figure 6

SCHEMATIC, 4CX250B AMPLIFIER

$C_{1A, B}$—Split stator, 100-pF per section, .07" spacing.
C_2—1500 pF, .03" spacing. Jackson 4595/3/380 (LE-3).
L_1—(10-meter coil) 4 turns, 3/16" copper tubing, 2¼" inside diam., 3" long
L_2—(15-20 meter coil) 6½ turns, ⅛" copper tubing, 2" inside diam., 3" long. Tap at center
L_3—(40-80 meter coil) 20 turns #14 (6 t.p.i.), 2¼" diam., 3¼" long. Tap at center
RFC_1, RFC_2—(84 μH) rated at 600 mA. J.W. Miller RFC-14
RFC_3—2.5 mH. J. W. Miller 4537
RY_1—Dpdt, ceramic insulation, 6.3-volt coil
RY_2—Spst, 6.3-volt coil
PC_1, PC_2—3 turns #16 spaced around 47-ohm, 2-watt composition resistor
CH_1—12 H, 30 mA. Stancor C-2318
T_1—460-volt, center tapped at 50 mA, 6.3 volts at 5 amp, Stancor P-8155. Remove turns from filament winding to provide 6.0 volts under load
B—Ripley 81 (left hand) with 2¾" impeller, 3100 r.p.m., 58 c.f.m.
J_1, J_2—coaxial receptacle, SO-239
$S_{1A, B}$—2-pole, 6-position. Radio Switch Corp. (Marlboro, N. J.) Model 86 with two style A Rotors (standard)
SH_1—10 ohms, 1-watt
SH_2—500-mA shunt to match meter movement
CB—500-mA circuit breaker (Heinemann), 15-amp service.
M_1—0-50 dc milliamperes. Calibrate scale for 0-50 and 0-500 mA ranges
D_1, D_2—1N4005, 600-volt PIV, 1 amp
Sockets—Eimac SK-760 for 4CX300A. Eimac SK-640 plus SK-606 chimney for 4X150A and 4CX250B

4CX250B Linear Amplifier for 3.5-29.7 MHz

Two 4CX250Bs, 4X150As, or 4CX300As are operated in the cathode-driven mode in this 1-kW PEP linear amplifier (figure 5). The amplifier is designed for continuous service and may be run at full input for RTTY or SSTV service.

The two high-gain tetrodes are run in class AB_1 mode with drive applied to the cathodes and normal dc operating potentials applied to the screen and grid elements from an external power supply (figures 6 and 7). Individual bias potentiometers (R_1, R_2) are provided to electrically balance the tubes to draw equal values of resting plate current.

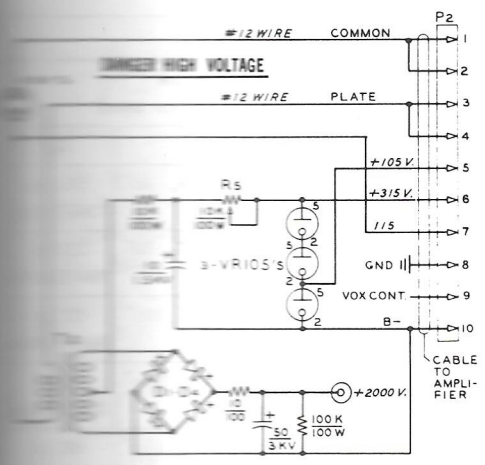


Figure 7

PLATE AND SCREEN POWER SUPPLY

—1000-volt center tap, 500-mA secondary. Center tap insulated for 3kV. 117-volt primary bridge. Each leg requires six silicon diodes, 500-volt PIV at 1 ampere in series. Each diode is shunted by a ceramic capacitor and a 470K, 1-watt

built-in bias supply provides —225 volts and the VOX relay permits plate current cutoff in the receive mode.

The electron-ray peak indicator (figure 8) is incorporated in the amplifier which samples the instantaneous r-f plate voltage, a portion of which is used for ALC voltage. The electron-ray tuning tube is used to establish proper plate loading. With no drive signal, the pattern of the tube is open, gradually closing with increased signal voltage until at the optimum plate load condition the pattern is closed, showing a solid green area on the viewing portion of the tube.

In the standby mode, the linear amplifier is biased to cutoff by relay RY_2, permitting the use of an intermittent voice service-rated power supply (see Power Supply chapter).

The amplifier is built on a chassis measuring 14" × 10" × 3" and fits within a matching enclosure. The main bandswitch and pi-network loading capacitor are contained in separate areas in the chassis. The tubes are mounted in a small box at the chassis rear which measures about 5¼" × 3¼" × 2" high. Sockets and auxiliary components are mounted on the box, one end of which has a flange cut in to match the opening of the blower. Cooling air is exhausted through the sockets and chimneys. The three sections of the plate tank coil are placed in the center area of the chassis behind the bandswitch. The electron-ray tube is mounted horizontally at the rear of the panel behind a thin cutout.

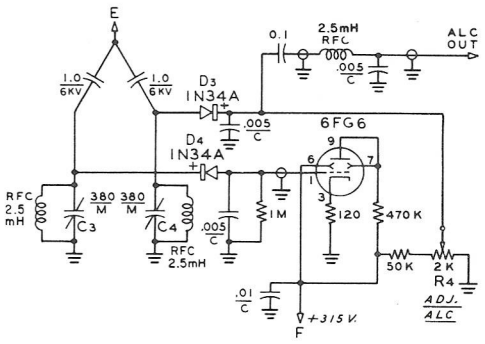


Figure 8

ELECTRON-EYE PEAK INDICATOR AND ALC CIRCUITRY

The 6FG6/EM-84 tuning indicator is used for an r-f peak-level indicator in the linear amplifier. R-f voltage is sampled, rectified, and applied to the gate (pin 1) of the indicator. The pattern is formed between the deflection elements (pins 6 and 7) and appears as a horizontal line. Amplitude of indication is adjustable by means of mica compression capacitor C_3. ALC control voltage is taken from plate circuit and magnitude established by capacitor C_4. Control point may be set by adjusting diode bias voltage with "Adjust ALC" potentiometer R_4.

Filament voltage is checked at 6.0 volts. The amplifier inclosure is closed and high voltages are applied. One tube at a time is run with no drive signal and the bias adjusted for a resting plate current of 100 mA. Carrier is now inserted and the amplifier loaded and tuned for a maximum peak plate current of 500 mA. Screen current will be 20 to 30 mA, which includes the bleeder current flowing through the 30K screen resistor. Power output will run about 650 watts on all bands.

Once the amplifier is operating properly, the electron-ray tube is adjusted to completely close at maximum PEP power input by adjustment of capacitor C_3. Once set, voice peaks will just cause the eye to close. The magnitude of the ALC voltage is set by adjustment of capacitor C_4 and potentiometer R_4 (which controls the threshold volt-

age). For c-w operation, the amplifier is loaded to a current of 500 mA.

A 4-1000A Grounded-grid Amplifier The 4-1000A tetrode makes an excellent grounded-grid triode when the grid and screen are strapped together (figure 9). At a plate potential of 3.5 kV to 4 kV the 4-1000A will operate at 2 kW PEP input with a driving power of only 110 watts, PEP.

An L-network is used to match the input impedance of the tube (about 100 ohms) to a 50-ohm drive source. Data for the network is given in Table 3. Heavy duty, transmitting-type mica capacitors are suggested for cathode capacitor C_3.

Gride and plate current metering is done in the ground return circuits. If cutoff bias is desired during standby periods, a 25 K, 50-watt resistor may be placed in the filament return circuit at X. The resistor is then shorted out by contacts on the VOX relay during transmissions.

A pi-L plate circuit is used for maximum harmonic attenuation. The plate load impedance of the 4-1000A is 3000 ohms at a plate potential of 3.5 kV and 3500 ohms for a potential of 4 kV. Data to design the plate circuit is given in chapter 11 of this Handbook. Typical operating values for the amplifier are given in Table 3.

Table 3.

Cathode Network (Dip to center of amateur	
Band	**L_3**
80	(2.3 μH) 20 turns #14, 3 diam. 2¼" long
40	(1.2 μH) 12 turns #10, 3 diam. 1½" long
20	(0.6 μH) 5 turns #10, 1 diam. 1½" long
15	(0.4 μH) 4 turns #10, 1 diam. 1¼" long
10	(0.3 μH) 4 turns #10, 1 diam. 1½" long
Typical Operating Characte	
Plate Voltage	3.0
Resting Plate Current	100
Single Tone Plate Current	700
Single Tone $G_1 + G_2$ Current	275
Single Tone Drive Power	120

22-3 The KW-1 Mark III Linear Amplifier Using the 8875

This compact desktop linear amplifier, is a third generation descendant of the popular 1000-watt PEP amplifier featured in various forms in the last three editions of this Handbook. This new version operates on all amateur bands between 3.5 MHz and 29.7 MHz with good efficiency. The KW-1 amplifier features a single 8875 ceramic high-μ power triode with a 300-watt anode dissipation rating operating in a class-B, cathode-driven configuration. Peak power input is 1000 watts for SSB voice operation, 800 watts for intermittent c-w operation, and 500 watts for continuous RTTY service.

The 8875 anode has a transverse cooler requiring forced-air cooling directed cross-ways. Maximum dissipation is n ducted air to the cooler from noise blower mounted near the tu

The 8875 is rated for 250 tinuous anode current. In interm service or keyed c-w operation term duty does not exceed 5 anode current may be 500 mA "on" time. During very short the tube may be operated at the value but care must be taken "on" time as short as possible, wi "off" time to allow for tube cooli

The KW-1, Mark III linear small enough to be placed on t table next to an SSB transceive (figure 10). At 2500 volts ano third-order products are better decibels below one tone of a tw signal.

The Amplifier Circuit The schematic of amplifier is show 11. The 8875 is a cathode-driven mode using