The Eimac 4CX300A is an integral-finned external-anode miniature power tetrode having a plate dissipation rating of 300 watts. The 4CX300A may be operated at full ratings at frequencies up to 500 megacycles. The all-ceramic-and-metal construction and the internally-utilized electrode structure combine to make the 4CX300A especially durable and free of mechanically-induced noise under conditions of severe acceleration caused by shock or vibration.

**GENERAL CHARACTERISTICS**

**ELECTRICAL**
- Cathode: Unipotential, Oxide-coated
- Heater Voltage: 6.0 volts
- Heater Current: 2.75 amperes
- Heating Time (Minimum): 30 seconds
- Grid-Screen Amplification Factor: 5.0
- Transconductance (at Ia = 0.2 Ampere): 12,000 u-mhos
- Direct Interelectrode Capacitances:
  - Input: 29.5 uufds
  - Output: 4.8 uufds
  - Feedback: 0.04 uufds
- Highest Frequency for Maximum Ratings: 500 megacycles

**MECHANICAL**
- Base: Special, breechlock terminal surfaces
- Recommended Socket: Eimac X-648
- Operating Position: Any
- Max Rated Body Temperature: 250°C
- Cooling: Forced Air
- Maximum Over-all Dimensions:
  - Height: 2.4 inches
  - Diameter: 1.65 inches
  - Net Weight: 3.75 ounces
  - Shipping Weight: 1.5 pounds

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### RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

**Class-C Telegraphy or FM Telephony**  
(Key-down conditions, per tube)

#### MAXIMUM RATINGS
- **D-C PLATE VOLTAGE**: 2000 MAX. VOLTS
- **D-C SCREEN VOLTAGE**: 300 MAX. VOLTS
- **D-C GRID VOLTAGE**: -250 MAX. VOLTS
- **D-C PLATE CURRENT**: 250 MAX. MA
- **PLATE DISSIPATION**: 300 MAX. WATTS
- **SCREEN DISSIPATION**: 12 MAX. WATTS
- **GRID DISSIPATION**: 2 MAX. WATTS

#### TYPICAL OPERATION (Frequencies up to 175 Mc, per tube)
- **D-C Plate Voltage**: 500 1000 1500 2000 volts
- **D-C Screen Voltage**: 250 250 250 250 volts
- **D-C Grid Voltage**: -90 -90 -90 -90 volts
- **D-C Plate Current**: 250 250 250 250 ma
- **D-C Screen Current**: 45 45 30 25 ma
- **D-C Grid Current**: 32 28 28 27 ma
- **Peak R-F Grid Voltage (approx.)**: 116 116 116 115 volts
- **Driving Power**: 3.6 3.2 3.2 2.8 watts
- **Plate Power Input**: 125 250 375 500 watts
- **Plate Power Output**: 85 195 300 410 watts

### PLATE-MODULATED RADIO-FREQUENCY AMPLIFIER

**Class-C Telephony (Carrier conditions, per tube)**

#### MAXIMUM RATINGS
- **D-C PLATE VOLTAGE**: 1500 MAX. VOLTS
- **D-C SCREEN VOLTAGE**: 300 MAX. VOLTS
- **D-C GRID VOLTAGE**: -250 MAX. VOLTS
- **D-C PLATE CURRENT**: 200 MAX. MA
- **PLATE DISSIPATION**: 200 MAX. WATTS
- **SCREEN DISSIPATION**: 12 MAX. WATTS
- **GRID DISSIPATION**: 2 MAX. WATTS

#### TYPICAL OPERATION (Frequencies up to 175 Mc, per tube)
- **D-C Plate Voltage**: 500 1000 1500 volts
- **D-C Screen Voltage**: 250 250 250 volts
- **D-C Grid Voltage**: -100 -100 -100 -100 volts
- **D-C Plate Current**: 200 200 200 200 ma
- **D-C Screen Current**: 45 45 30 25 ma
- **D-C Grid Current**: 22 19 17 17 ma
- **Peak R-F Grid Input Voltage**: 124 122 121 volts
- **Driving Power**: 2.7 2.3 2.1 watts
- **Plate Power Input**: 100 200 300 300 watts
- **Plate Power Output**: 75 160 250 watts

### CLASS-AB POWER AMPLIFIER OR MODULATOR

**Class-AB, Audio Amplifier**  
(Sinusoidal wave, two tubes unless otherwise noted)

#### MAXIMUM RATINGS (Per tube)
- **D-C PLATE VOLTAGE**: 2000 MAX. VOLTS
- **D-C SCREEN VOLTAGE**: 400 MAX. VOLTS
- **D-C PLATE CURRENT**: 250 MAX. MA
- **PLATE DISSIPATION**: 300 MAX. WATTS
- **SCREEN DISSIPATION**: 12 MAX. WATTS
- **GRID DISSIPATION**: 2 MAX. WATTS

#### TYPICAL OPERATION
- **Class-AB, R-F Linear Amplifier (Frequencies to 175 Mc, per tube)**
  - **D-C Plate Voltage**: - - 1000 1500 2000 volts
  - **D-C Screen Voltage**: - - 350 350 350 volts
  - **D-C Grid Voltage (approx.)***: - - -90 -90 -90 volts
  - **Zero-Signal D-C Plate Current**: 200 200 200 ma
  - **Max-Signal D-C Plate Current**: 500 500 500 ma
  - **Max-Signal D-C Screen Current**: 50 50 50 50 ma
  - **Effective Load, Plate-to-Plate**: 3240 5760 8160 ohms
  - **Peak A-F Grid Input Voltage (per tube)**: 50 50 50 volts
  - **Driving Power**: 0 0 0 0 watts
  - **Max-Signal Plate Dissipation (per tube)**: 125 150 175 watts
  - **Max-Signal Plate Power Output**: 250 450 650 watts
  - **Third-Harmonic Distortion**: 4.6 4.5 4.5 pct

  *Adjust grid voltage to obtain specified zero-signal plate current

Note: Typical operation data are based on conditions of adjusting the r-f grid drive to a specified plate current, maintaining fixed conditions of grid bias and screen voltage. It will be found that if this procedure is followed, there will be little variation in power output between tubes even though there may be some variation in grid and screen currents. Where grid bias is obtained principally by means of a grid resistor, to control plate current it is necessary to make the resistor adjustable.
APPLICATION

MECHANICAL

Mounting—The 4CX300A may be operated in any position. The recommended socket for the 4CX300A is the Eimac Air-System Socket type X-648. This socket provides low-inductance connections to all the external circuits except the plate circuit, and incorporates a screen by-pass capacitor in its structure. The breech-block terminal arrangement provides firm mechanical retention of the tube when subjected to shock or vibration.

Cooling—The maximum rated surface temperature for any part of the 4CX300A is 220°C. Adequate forced-air cooling facilities must be provided to assure that this maximum temperature rating is not exceeded. At sea level with an ambient temperature of 20°C adequate cooling for 300 watts plate dissipation can be obtained with an airflow rate of 6.5 C.F.M., corresponding to a pressure drop of 0.35 inches of water column across the X-648 socket and the cooling-fin assembly of the tube. (Air flow rate in C.F.M. is approximately eleven times the square root of the pressure differential across tube and socket.)

At high altitudes and high ambient temperatures the flow rates must be increased to obtain equivalent cooling. The flow rate and corresponding pressure differential must be determined individually in such cases, using the maximum rated temperature as the criterion for satisfactory cooling.

Cooling effectiveness should also be determined on an individual basis if the 4CX300A is operated immersed in an insulating fluid such as silicone oil, again using the maximum rated temperature as the criterion.

Impact and Vibration—The 4CX300A is designed to operate without failure under impact or vibration conditions capable of disabling a conventional tube of similar power capabilities. Impact forces up to 50g with 1 milli-second duration time, or vibratory accelerations up to 20g at frequencies from 20 to 2000 cycles per second, will not cause a normal 4CX300A to malfunction.

It is not suggested that the 4CX300A be subjected to abusive treatment unnecessarily, but in applications where operation under severe environmental conditions is unavoidable the 4CX300A will provide more reliable service than with conventional tubes.

ELECTRICAL

Heater Operation—The rated heater voltage for the 4CX300A is 6.0 volts, and the corresponding heater current is 2.75 amperes. At frequencies higher than 300 megacycles the heater voltage should be reduced according to the following schedule:

<table>
<thead>
<tr>
<th>Frequency (Mc)</th>
<th>Heater Voltage (Volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 300</td>
<td>6.00</td>
</tr>
<tr>
<td>300 to 400</td>
<td>5.75</td>
</tr>
<tr>
<td>400 to 500</td>
<td>5.50</td>
</tr>
</tbody>
</table>

The heater voltage must be maintained within ±5% of the selected operating voltage if variations in circuit performance are to be minimized and best tube life obtained.

Cathode Operation—The 4CX300A employs a cylindrical indirectly-heated oxide-coated unipotential cathode. The minimum warm-up time is 30 seconds when rated heater voltage is applied.

Grid Operation—The 4CX300A control grid has a maximum dissipation rating of 2.0 watts, and precautions should be observed to avoid exceeding this rating. The grid bias and driving power should be kept near the values shown in the Typical Operation sections of the data sheet whenever possible.

At frequencies higher than 300 Mc, the driving power required by the circuits associated with the tube begins to increase, until at 500 Mc, as much as 30 watts driving power may be required. The power dissipated by the control grid increases only slightly, however, in spite of the greatly increased driving power required by the circuit.

In stable amplifiers, where the bias is not unnecessarily high, d-c grid current values below approximately 15 milliamperes indicate safe grid operation. In class-A and class AB amplifiers, where no grid current flows, the grid bias voltage may be applied through a resistor. The maximum permissible series resistance per tube is 100,000 ohms.

Screen Operation—The maximum rated screen dissipation for the 4CX300A is 12 watts. The maximum rated d-c screen supply voltage rating is 300 volts when the tube is operated in class-C amplifier or oscillator service, and 400 volts when the tube is operated in class-AB or class-B amplifier service.

Under certain operating conditions the screen current of a tetrode may reverse. This makes it dangerous to rely on a screen dropping resistor or a series regulator to supply the screen voltage unless a bleeder or regulator tube is connected from screen to cathode. The bleeder should draw at least 15 milliamperes per tube connected to the screen supply.

The power input to the screen can be calculated from the voltage and current whenever the screen to cathode potential does not vary. Screen modulation or cathode driving of tetrode amplifiers can lead to errors in measurement of screen input when the effective voltage and current exceed the indicated d-c values. When there is reason to suspect that the screen input exceeds the indicated value it is advisable to maintain the indicated screen power input below approximately 75% of the rated screen dissipation.

An 1100-ufd screen by-pass capacitance is incorporated into the body of the recommended Eimac Air-System Socket for use with 4CX300A for normal amplifier operation at high- and ultra-high radio frequencies. Operation at low radio frequencies and at audio frequency may require additional capacitance to be connected externally. In the latter case the screen by-pass capacitance within the socket helps to eliminate the high-frequency parasitic oscillations occasionally encountered in tetrode amplifiers.

The self-neutralizing frequency of the 4CX300A is above the useful audio frequency limit for tube when the recommended socket is used.

Plate Operation—The 4CX300A has a finned external anode for forced-air cooling. Connection to the anode may be made to the 9/16-inch diameter top cap or to the 1-5/8-inch diameter cylindrical cooler shell.

The latter is usually used when the tube is installed in coaxial lines or cavities.

The absolute maximum plate dissipation rating for the 4CX300A is 300 watts, which is also the rated maximum dissipation for class-C and class-A amplifier applications and for class-B and class-AB amplifier applications. When the 4CX300A is used in plate-modulated amplifier applications, the plate dissipation rating is 200 watts under carrying conditions, rising to 300 watts under 100% sine-wave modulation. Plate dissipation may be permitted to exceed the maximum rated value for brief periods, such as may occur while tuning.

The absolute maximum rated plate voltage is 2000 volts for all except plate modulated amplifier applications, for which the rated maximum is 1500 volts.

Modulation—The 4CX300A can be modulated by any of the methods commonly used with tetrode tubes. Its large reserve plate dissipation makes it especially suited for use in screen-modulated and linear amplifiers in which the plate efficiency is low.

Plate modulation can be applied to the 4CX300A when it is operated as a class-C amplifier. To obtain 100% modulation with minimum distortion the screen voltage supply should be modulated in phase with the modulation applied to the plate supply voltage. Screen voltage modulation factors between 0.75 and 1.00 may be used.

Self-modulation of the screen by means of a resistor or retrace in series with the screen supply line is not recommended, because of the effects which require a bleeder from screen to cathode as described under "Screen Operation," above.

Special Applications—If it is desired to operate this tube under conditions widely different than those given here, write to Eitel-McCullough, Inc., San Bruno, California, for information and recommendations.