



E I M A C
Division of Varian
SAN CARLOS
CALIFORNIA

5CX3000A

**RADIAL-BEAM
POWER PENTODE**

The EIMAC 5CX3000A is a ceramic and metal power pentode designed to be used as a Class-AB₁ linear amplifier in audio or radio-frequency applications. Its characteristics of low intermodulation distortion make it especially suitable for single side-band service.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Thoriated Tungsten	<u>Min.</u>	<u>Nom.</u>	<u>Max.</u>	
Voltage - - - - -		9.0		volts
Current - - - - -	39.5		43.5	amps
Amplification Factor (Grid Screen) - - - - -		5.5		
Frequency for Maximum Ratings - - - - -			150	MHz
Direct Interelectrode Capacitances, Grounded Cathode:				
Input - - - - -	125		145	pF
Output - - - - -	18		24	pF
Feedback - - - - -			.60	pF
Direct Interelectrode Capacitances, Grounded Grid and Screen:				
Input - - - - -	55		67	pF
Output - - - - -	18		24	pF



MECHANICAL

Base - - - - -	-	Special ring and breechblock terminal surfaces
Maximum Seal Temperature - - - - -	-	250°C
Maximum Anode Core Temperature - - - - -	-	250°C
Recommended Socket - - - - -	-	EIMAC SK-1420 series
Recommended Air Chimney - - - - -	-	EIMAC SK-1426
Operating Position - - - - -	-	Axis vertical, base up or down
Maximum Dimensions:		
Height - - - - -	-	6.8 inches
Diameter - - - - -	-	4.6 inches
Cooling - - - - -	-	Forced air
Net Weight - - - - -	-	5.5 pounds
Shipping Weight (Approximate) - - - - -	-	10 pounds

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telephony or FM Telephony
(Key-down conditions)

MAXIMUM RATINGS

DC PLATE VOLTAGE - - - - -	7000 VOLTS
DC SCREEN VOLTAGE - - - - -	1000 VOLTS
DC PLATE CURRENT - - - - -	2.0 AMPS
PLATE DISSIPATION - - - - -	4000 WATTS
SCREEN DISSIPATION - - - - -	175 WATTS
GRID DISSIPATION - - - - -	50 WATTS
SUPPRESSOR DISSIPATION - - - - -	100 WATTS

TYPICAL OPERATION

DC Plate Voltage - - - - -	6800 volts
DC Screen Voltage - - - - -	500 volts
DC Grid Voltage - - - - -	-200 volts
Suppressor Grid - - - - -	0 volts
DC Plate Current - - - - -	1.64 amps
DC Screen Current - - - - -	276 mA
DC Grid Current - - - - -	72 mA
Peak RF Grid Voltage - - - - -	300 volts
Driving Power - - - - -	52 watts
Plate Dissipation - - - - -	2600 watts
Plate Output Power - - - - -	8500 watts

**AUDIO-FREQUENCY AMPLIFIER
OR MODULATOR**

Class-AB

MAXIMUM RATINGS (Per Tube)

DC PLATE VOLTAGE	-	-	-	-	7000 VOLTS
DC SCREEN VOLTAGE	-	-	-	-	1000 VOLTS
DC PLATE CURRENT	-	-	-	-	2.0 AMPS
PLATE DISSIPATION	-	-	-	-	4000 WATTS
SCREEN DISSIPATION	-	-	-	-	175 WATTS
GRID DISSIPATION	-	-	-	-	50 WATTS
SUPPRESSOR GRID	-	-	-	-	100 WATTS

*Per Tube

**Approximate Values

TYPICAL OPERATION (Two Tubes), Class AB₁

DC Plate Voltage	-	-	-	-	-	6000 volts
DC Screen Voltage	-	-	-	-	-	850 volts
DC Grid Voltage*	-	-	-	-	-	-147 volts
DC Suppressor Grid Voltage	-	-	-	-	-	0 volts
Max-Signal Plate Current	-	-	-	-	-	2.9 amps
Zero-Signal Plate Current	-	-	-	-	-	1.0 amp
Max-Signal Screen Current**	-	-	-	-	-	200 mA
Zero-Signal Screen Current	-	-	-	-	-	0 mA
Peak AF Driving Voltage*	-	-	-	-	-	138 volts
Driving Power	-	-	-	-	-	0 watts
Load Resistance, Plate-to-Plate	-	-	-	-	-	4700 ohms
Max-Signal Plate Dissipation*	-	-	-	-	-	3000 watts
Max-Signal Plate Output Power	-	-	-	-	-	11,000 watts

Note: In Class AB operation, maximum plate voltage and plate current must not be applied simultaneously, as plate dissipation will be exceeded.

RADIO-FREQUENCY LINEAR AMPLIFIER

Class-AB

MAXIMUM RATINGS

DC PLATE VOLTAGE	-	-	-	-	7000 VOLTS
DC SCREEN VOLTAGE	-	-	-	-	1000 VOLTS
DC PLATE CURRENT	-	-	-	-	2.0 AMPS
PLATE DISSIPATION	-	-	-	-	4000 WATTS
SCREEN DISSIPATION	-	-	-	-	175 WATTS
GRID DISSIPATION	-	-	-	-	50 WATTS
SUPPRESSOR DISSIPATION	-	-	-	-	100 WATTS

*Adjust to the specified Zero-Signal Ib

**The intermodulation distortion products will be as specified or better for all levels from zero-signal to maximum output power and are referenced against one tone of a two equal tone signal.

TYPICAL OPERATION Class AB₁ Grid Driven

DC Plate Voltage	-	-	-	-	3800	6000 volts
DC Screen Voltage	-	-	-	-	800	850 volts
DC Grid Voltage*	-	-	-	-	-128	-147 volts
DC Suppressor Voltage	-	-	-	-	0	0 volts
Zero-Signal DC Plate Current	-	-	-	-	.600	.500 amps
Single-Tone DC Plate Current	-	-	-	-	1.510	1.445 amps
Single-Tone DC Screen Current	-	-	-	-	.136	.092 mA
Two-Tone DC Plate Current	-	-	-	-	1.770	1.010 amps
Two-Tone DC Screen Current	-	-	-	-	.072	.041 mA
Peak RF Grid Voltage	-	-	-	-	116	128 volts
Peak Envelope Useful Output Power	-	-	-	-	3300	5500 watts
Resonant Load Impedance	-	-	-	-	1300	2350 ohms
Intermodulation Distortion Products** (no negative feedback)						
3rd Order	-	-	-	-	-46	-41 dB
5th Order	-	-	-	-	-50	-53 dB

Note: "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance is made for circuit losses. Adjustment of the rf grid drive to obtain the specified plate current at the specified grid bias, screen voltage, and plate voltage is assumed.

APPLICATION**MECHANICAL**

Mounting — The 5CX3000A must be operated with its axis vertical. The base of the tube may be down or up at the convenience of the circuit designer.

Socket — The EIMAC SK-1420 socket and SK-1426 chimney have been designed especially for the 5CX3000A. The use of recommended air-flow rates through this socket provides effective forced-air cooling of the tube. Air forced into the bottom of the socket passes over the tube terminals through an Air Chimney, the SK-1426, and through the anode cooling fins.

Cooling — The maximum temperature rating for the 5CX3000A is 250°C. Sufficient forced-air circulation must be provided to keep the temperature of the anode at the base of the cooling fins and the temperature of the ceramic-metal seals below 250°C. Air-flow requirements to maintain seal temperature at 200°C in 50°C ambient air are tabulated below (for operation below 30 MHz).

Plate Dissipation* (Watts)	SEA LEVEL		5,000 FEET	
	Air Flow (CFM)	Pressure Drop (Inches of Water)	Air Flow (CFM)	Pressure Drop (Inches of Water)
2500	67	1.24	80	1.5
3500	100	2.4	121	3.2
4000	117	3.1	140	4.3

*Since the power dissipated by the filament represents about 450 watts and since grid-plus-screen dissipation can, under some conditions, represent another 225 watts, allowance has been made in preparing this tabulation for an additional 675 watts dissipation.

The blower selected in a given application must be capable of supplying the desired air flow at a back pressure equal to the pressure drop shown above plus any drop encountered in ducts and filters.

At other altitudes and ambient temperatures the flow rate must be modified to obtain equivalent cooling. The flow rate and corresponding pressure differential must be determined individually in such cases, using rated maximum temperatures as the criteria for satisfactory cooling.



ELECTRICAL

Filament Operation — The rated filament voltage for the 5CX3000A is 9 volts. Filament voltage, as measured at the socket, should be maintained at this value to obtain maximum tube life. In no case should it be allowed to deviate by more than plus or minus five percent from the rated value.

Intermodulation Distortion — The operating conditions including distortion data are the results of actual operation in a neutralized, grid-driven amplifier. A plot of IM distortion versus power output under two-tone condition for a typical tube is shown on the next page.

Control Grid Operation—The rated dissipation of the grid is 50 watts. This is approximately the product of dc grid current and peak positive grid voltage. Operation at bias and drive levels near those listed will insure safe operation.

Screen-Grid Operation—The power dissipated by the screen of the 5CX3000A must not exceed 175 watts.

Screen dissipation, in cases where there is no ac applied to the screen, is the simple product of the screen voltage and the screen current. If the screen voltage is modulated, the screen dissipa-

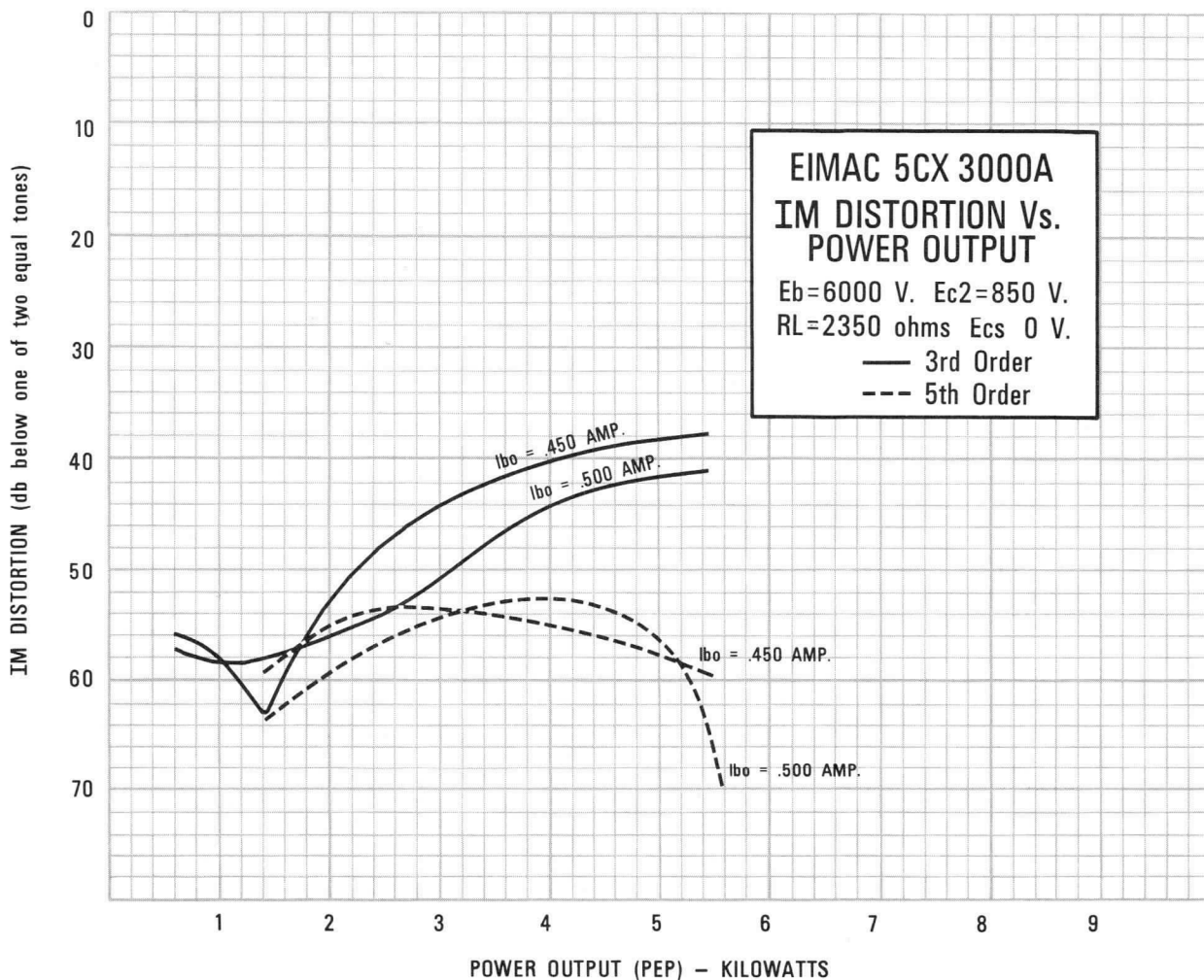
tion will depend upon loading, driving power, and carrier screen voltage.

Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage, or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit the screen dissipation to 175 watts in the event of circuit failure.

Suppressor Grid — The rated dissipation of the suppressor grid is 100 watts. Suppressor current will be zero or very nearly zero for all typical operating conditions specified. The 5CX-3000A has been designed for zero voltage operation of the suppressor grid for most applications.

Plate Dissipation — The plate-dissipation ratings for the 5CX3000A are 2650 watts for Class-C plate-modulated service and 4000 watts for Class-C telegraphy and Class-AB operation. In any Class-AB application maximum plate current and maximum plate voltage should not be applied simultaneously as the plate-dissipation rating would be exceeded.

Special Applications—If it is desired to operate this tube under conditions widely different from those given here, write to the Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California, for information and recommendations.





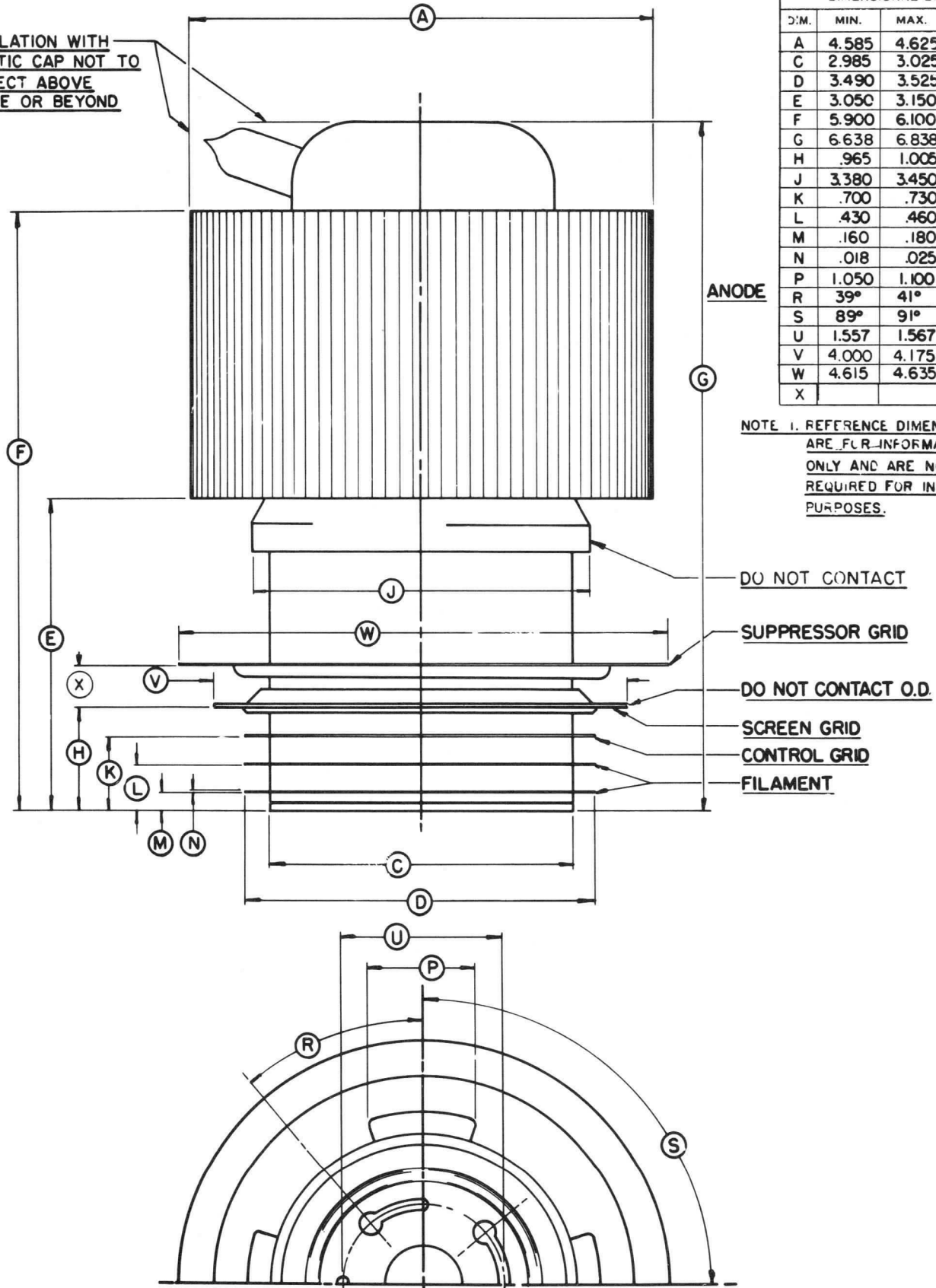
DIMENSIONS IN INCHES

DIMENSIONAL DATA

DIM.	MIN.	MAX.	REF.
A	4.585	4.625	
C	2.985	3.025	
D	3.490	3.525	
E	3.050	3.150	
F	5.900	6.100	
G	6.638	6.838	
H	.965	1.005	
J	3.380	3.450	
K	.700	.730	
L	.430	.460	
M	.160	.180	
N	.018	.025	
P	1.050	1.100	
R	39°	41°	
S	89°	91°	
U	1.557	1.567	
V	4.000	4.175	
W	4.615	4.635	
X			.375

NOTE 1. REFERENCE DIMENSIONS
ARE FOR INFORMATION
ONLY AND ARE NOT
REQUIRED FOR INSPECTION
PURPOSES.

TUBULATION WITH
PLASTIC CAP NOT TO
PROJECT ABOVE
ANODE OR BEYOND
FINS





EIMAC 5CX 3000A

TYPICAL CONSTANT CURRENT CHARACTERISTICS

$E_f = 9.0$ $E_{c2} = 800$ $E_{cs} = 0$

--- GRID CURRENT - AMPERES

— PLATE CURRENT - AMPERES

--- SCREEN CURRENT - AMPERES

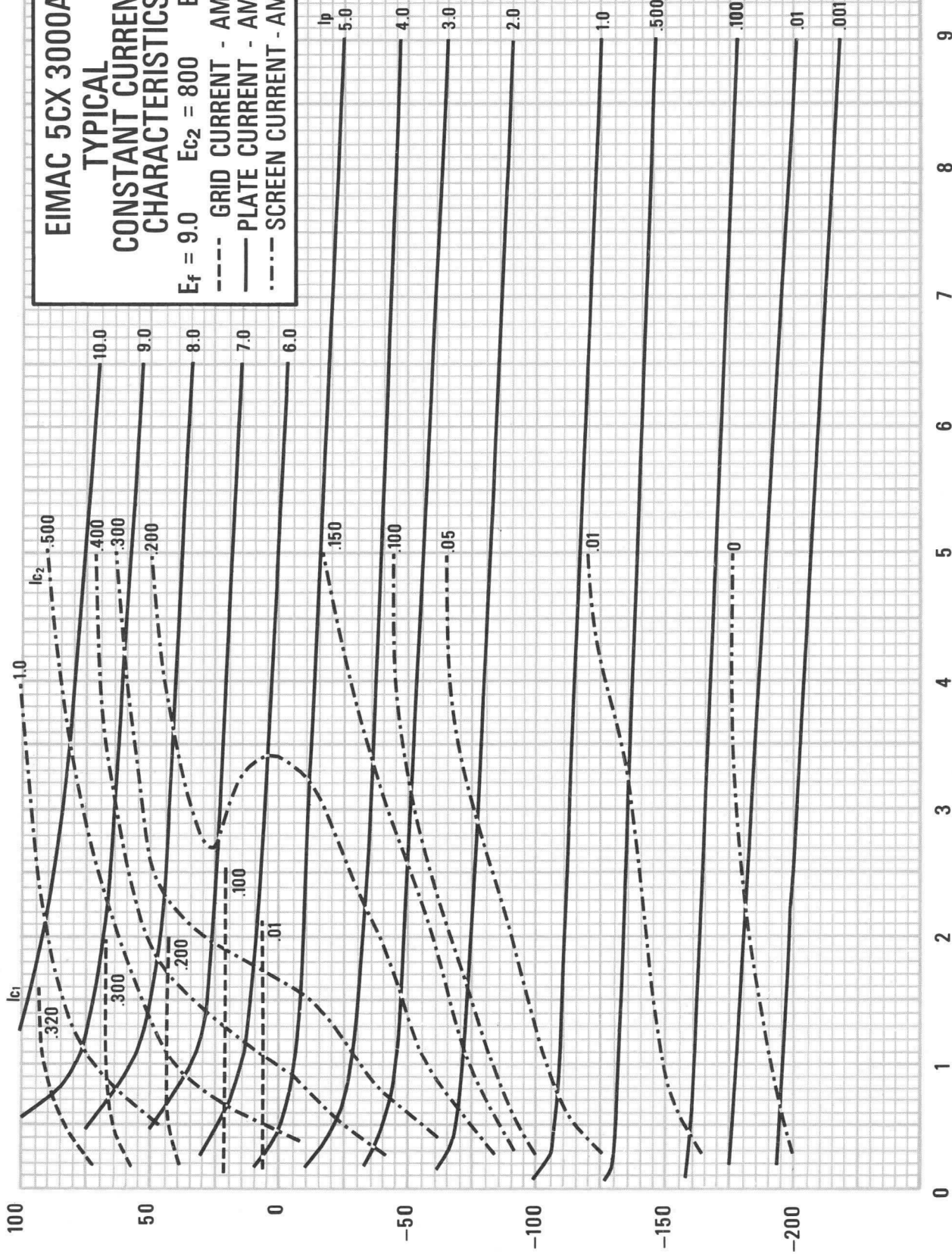


PLATE KILOVOLTS

CURVE #3210

GRID VOLTS



5CX3000A

EIMAC 5CX 3000A

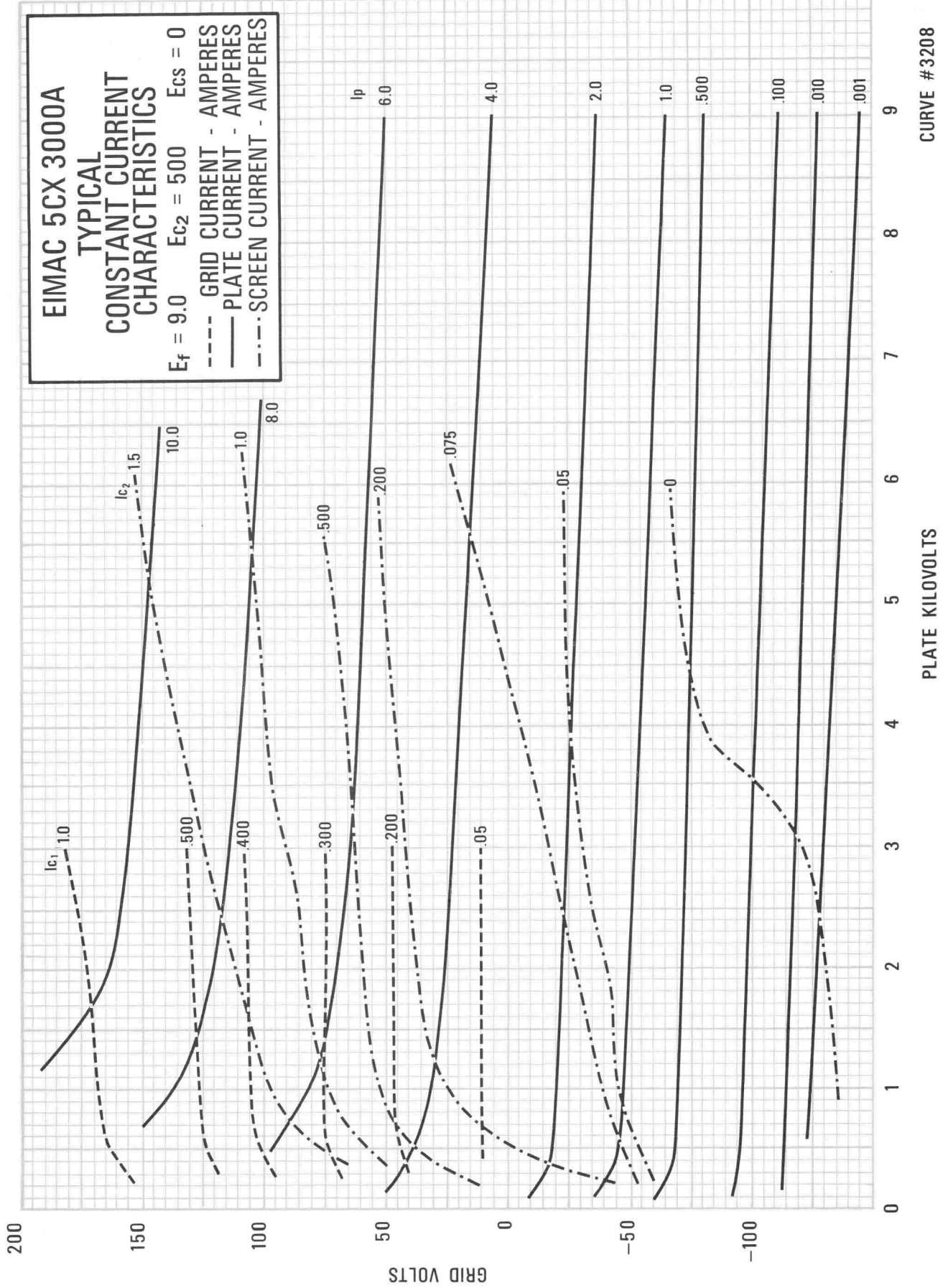
TYPICAL CONSTANT CURRENT CHARACTERISTICS

$E_f = 9.0$ $E_{c2} = 500$ $E_{cs} = 0$

--- GRID CURRENT - AMPERES

— PLATE CURRENT - AMPERES

--- SCREEN CURRENT - AMPERES



CURVE #3208