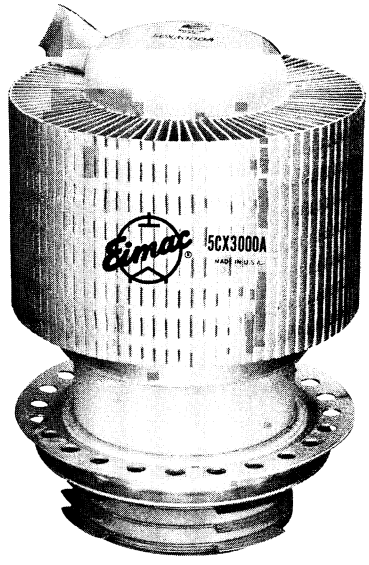
EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

5CX3000A

RADIAL-BEAM POWER PENTODE

The EIMAC 5CX3000A is a ceramic and metal power pentode designed to be used as a Class-AB$_1$ 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

	Min.	Nom.	Max.	
Filament: Thoriated Tungsten				
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 Telegraphy 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

Printed in U.S.A.

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 AB_1

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 intermodultaion 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 AB_1 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.

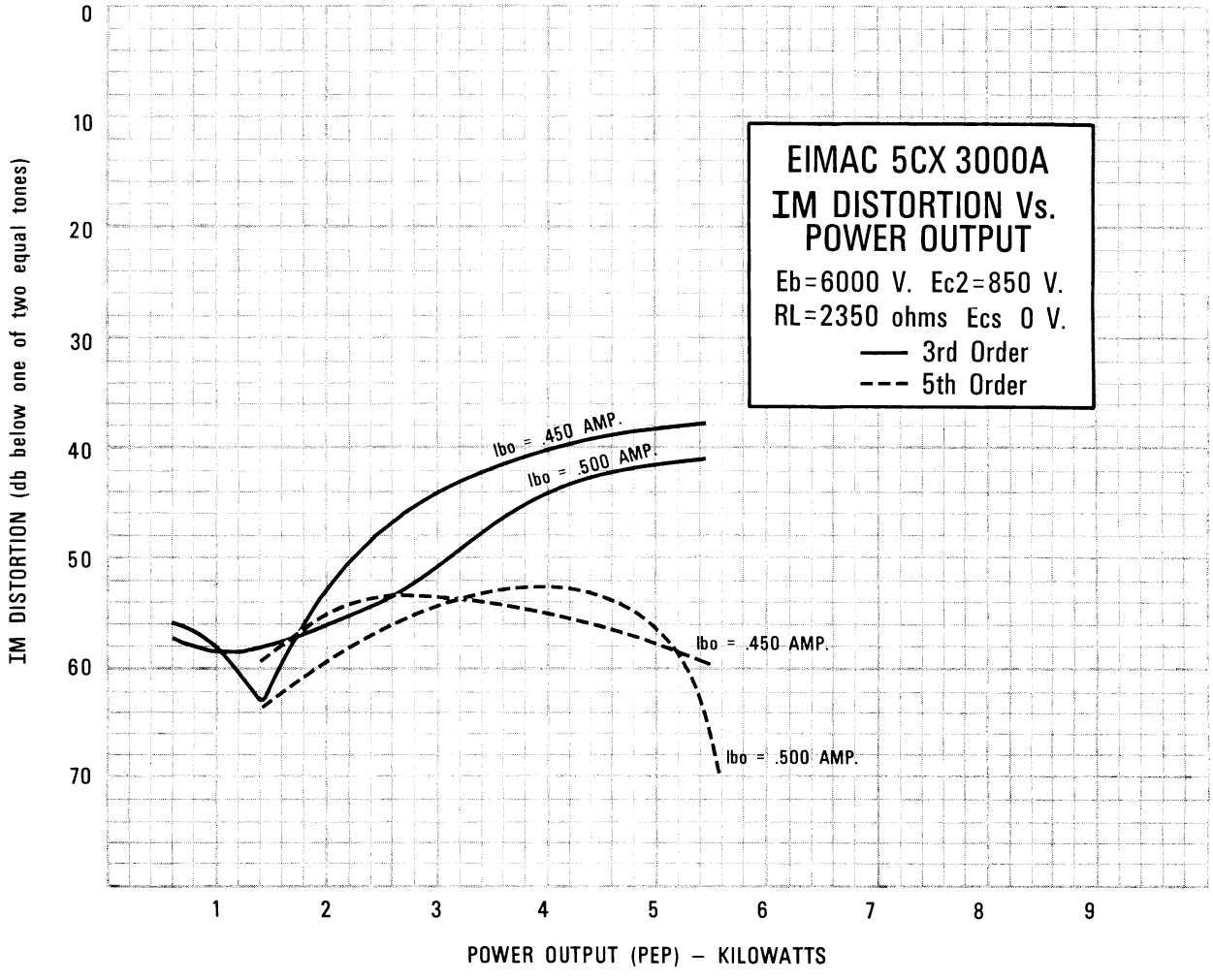
Screen dissipation, in cases where there is no ac applied to the screen, is the simple product of the screen voltage and the screen current. If the screen voltage is modulated, the screen dissipation will depend upon loading, driving power, and carrier screen voltage.

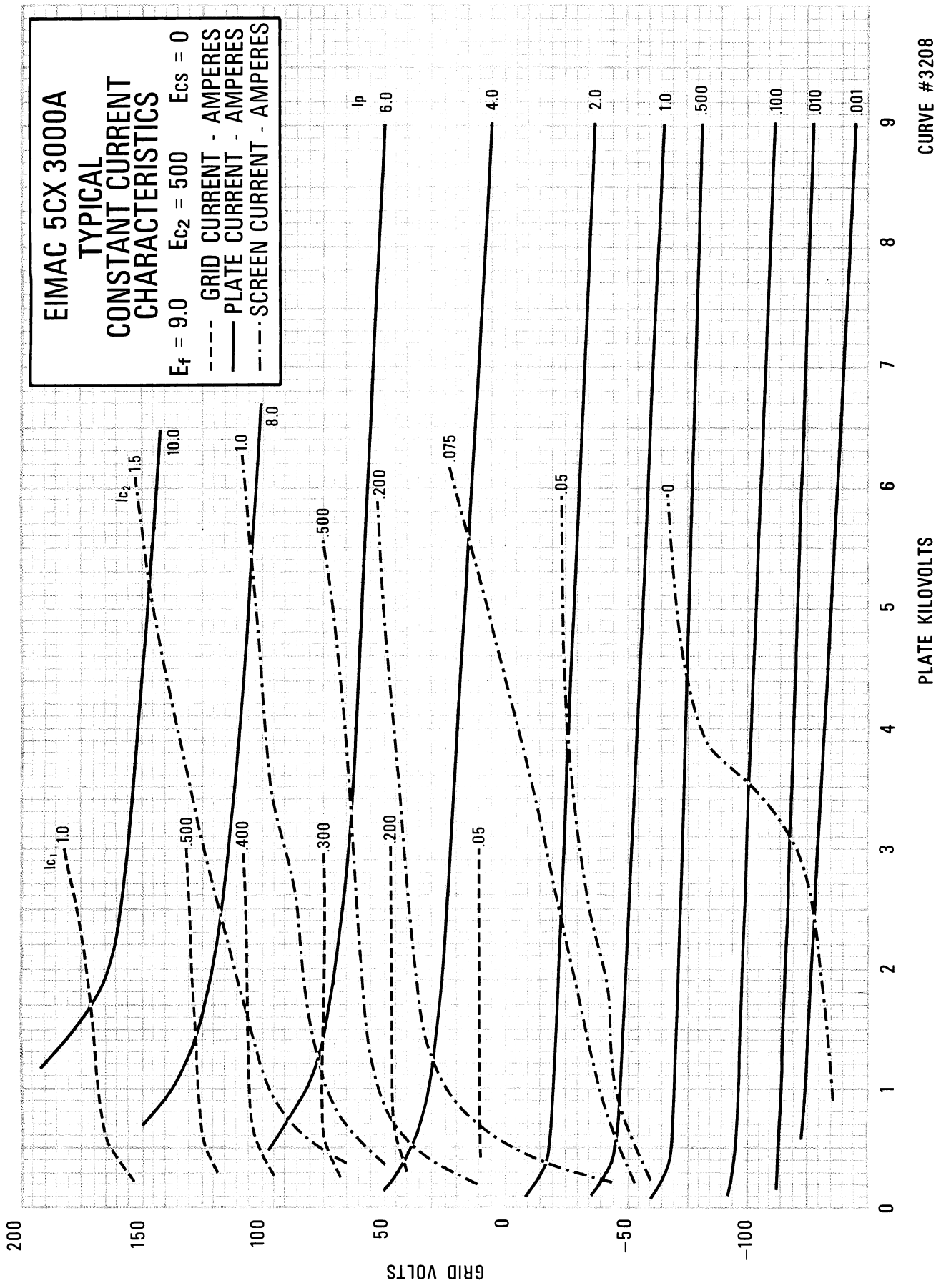
Screen dissipation is likely to rise to excessive values when the plate voltage, bias voltage, or plate load are removed with filament and screen voltages applied. Suitable protective means must be provided to limit the screen dissipation to 175 watts in the event of circuit failure.

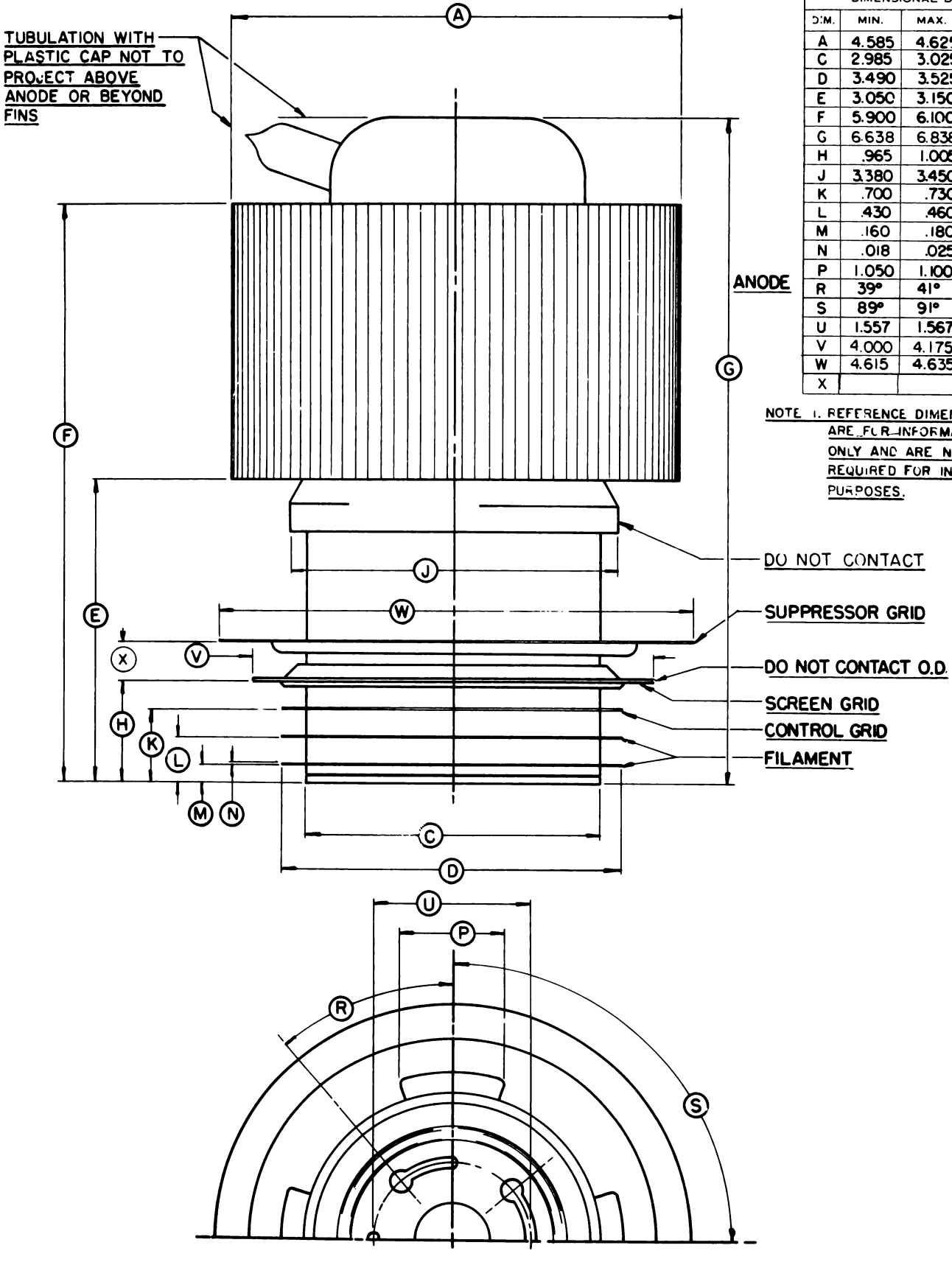
Suppressor Grid — The rated dissipation of the suppressor grid is 100 watts. Suppressor current will be zero or very nearly zero for all typical operating conditions specified. The 5CX-3000A has been designed for zero voltage operation of the suppressor grid for most applications.

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.



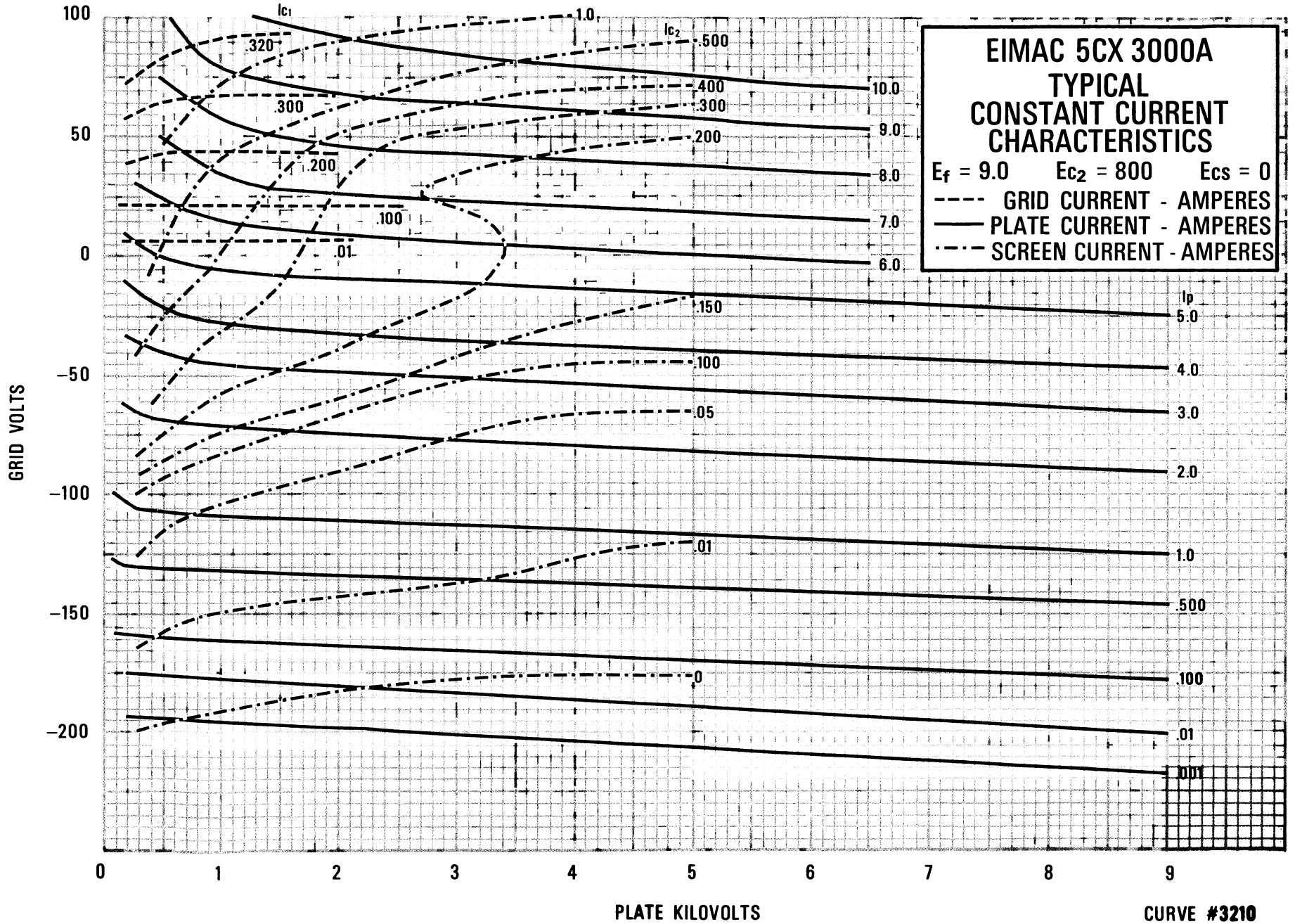

EIMAC 5CX 3000A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
Ef = 9.0 Ec2 = 500 Ecs = 0
GRID CURRENT - AMPERES
PLATE CURRENT - AMPERES
SCREEN CURRENT - AMPERES
Ip
Ic1
Ic2
GRID VOLTS
PLATE KILOVOLTS
CURVE #3208



DIMENSIONS IN INCHES

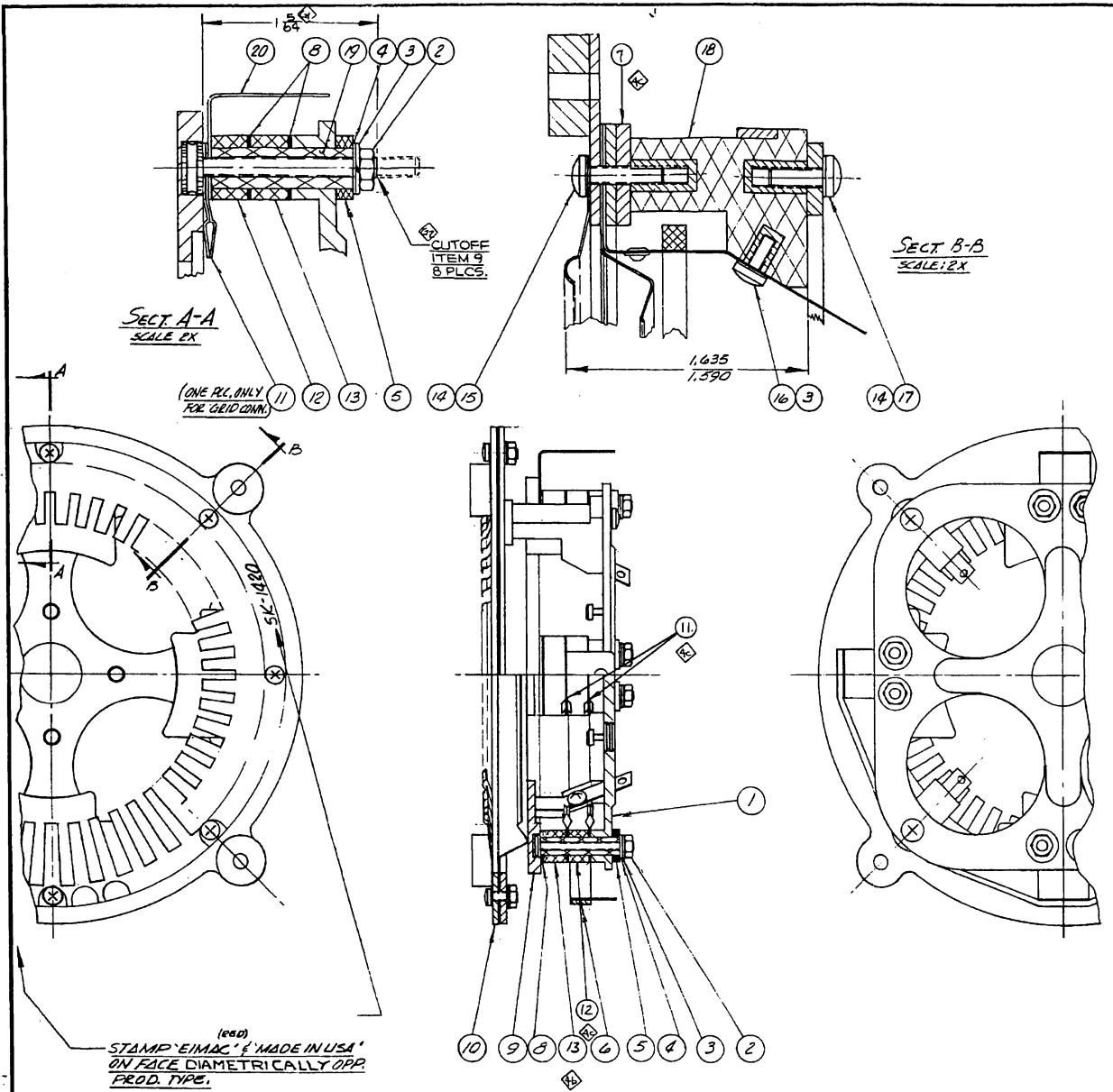
DIMENSIONAL DATA			
DIM.	MIN.	MAX.	REF.
A	4.585	4.625	
C	2.985	3.025	
D	3.490	3.525	
E	3.050	3.150	
F	5.900	6.100	
G	6.638	6.838	
H	.965	1.005	
J	3.380	3.450	
K	.700	.730	
L	.430	.460	
M	.160	.180	
N	.018	.025	
P	1.050	1.100	
R	39°	41°	
S	89°	91°	
U	1.557	1.567	
V	4.000	4.175	
W	4.615	4.635	
X			.375

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


EIMAC 5CX 3000A
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
Ef = 9.0 Ec2 = 800 Ecs = 0
GRID CURRENT - AMPERES
PLATE CURRENT - AMPERES
SCREEN CURRENT - AMPERES
Ic1
Ic2
Ip
1.0
.320
.500
.400
.300
10.0
.300
.200
9.0
.200
8.0
.100
7.0
.01
6.0
.150
5.0
.100
4.0
.05
3.0
2.0
.01
1.0
.500
0
.100
.01
.001
100
50
0
−50
−100
−150
−200
GRID VOLTS
0
1
2
3
4
5
6
7
8
9
PLATE KILOVOLTS
CURVE #3210

NO. 149529
SUPERSEDES

NOTE:
1. CAPACITANCE: 2000 PF ± 20%
VOLTAGE BREAKDOWN: 2000 VDC FOR 5 SEC.



ITEM	QTY	PART NUMBER	DESCRIPTION
20	1	115746	TERMINAL STRAP
19	8	115838	SPACER
18	4	115826	MTG. STANDOFF
17	4	124319N	SCREW, P.H., BRASS, 6-32 × 3/8 LG
16	4	051505N	SCREW, P.H., BRASS, 4-40 × 3/16 LG
15	4	515286N	SCREW, BD. HD., S.S., 6-32 × 1/2 LG
14	8	124559N	LOCKWASHER, BRZ, #6
13	4	011638	CERAMIC SPACER
12	4	011920	SPACER
11	14	149062	CONTACT FINGERS
10	1	149530	CAPACITOR ASSY
9	1	115824	GUIDE
8	5	115513	SPACER
7	4	149259	WASHER
6	1	149567	TERM. STRAP ASSY
5	8	115839	BUSHING
4	8	517442N	WASHER, FL., BRASS, #4
3	12	124567N	LOCKWASHER, BRZ, #4
2	8	051395N	NUT, HEX., BRASS, #4
1	1	115833	BASE

NO.	DESCRIPTION OF CHANGE	ECO	DATE	BY
K	ITEM 4 WAS 519271N	24845	7-27-98	KA/DB
J	ADD VARIAN LOGO	23209	8-3-93	SK/AS
H	NOTE 1 WAS 1800 ± 20% PF	21686	5-10-88	BC/DB
G	D&Z ADD. P/N ITEM 9. WAS 149536	27575	6-30-76	WM
F	PICT. CHG. LOCATION OF ITEMS 11. & 20	26044	3-21-72	JPD/DB
E	ADD NOTE 1	24626	3-20-69	WM
4	a) WAS QTY 1 b) WAS 11 c) ADDED	23318	6-22-66	TK/DB
3	REQR. W/LABEL & DIM. 1" 7/16 3 115942	23299	5-21-66	AM

NO.	DESCRIPTION OF CHANGE	ECO	DATE	BY

SK-1420

QTY	PRODUCT	NEXT ASSY. DWG.

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1°
DO NOT SCALE DRAWING

DRAWN BM	5-23-66	SCALE FULL	
CHKD.		PROCN. CHKD.	
ENG. APPD.		PROCN. APPD.	
MAT'L NOTED			
MAT'L SPEC. NO.			
FINISH		BLK.	

DIVISION: PGT

EITEL-McCULLOUGH, INC.
SAN CARLOS, CALIFORNIA

FINAL ASSEMBLY
SK-1420

NO. C149529 CHANGE -K

PRINTED ON DIEPO NO. 1020-10 CLEARPRINT FADE-OUT

SOCKET NO.	CHIMNEY NO.	BYPASS CAPACITOR	pF	DCWV	FOR TUBE TYPE EIA#	CATALOG #	COMMENT
(Cont'd)							
	SK-1306				8159	3CX10,000A3	149297 Grid collet spring
	SK-1306				8160	3CX10,000A7	115596 Post Insulator (4 used)
	SK-1306				-	3CX15,000A3	115595 Sleeve Insulator (4 used)
	SK-1306				-	3CX15,000A7	
	SK-1326				-	3CX20,000A3	
	SK-1336				-	3CX20,000A7	
SK-1310	none req'd	-	-	-	-	3CV30,000A1	Modified SK-1300: no mounting flange; opening in cup base for cooling air path. PARTSKIT-1300 is available for user repair. Repair parts shown for SK-1300 applicable.
	none req'd					3CV30,000A3	
SK-1320	same as SK-1300	-	-	-	-	same as SK-1300	Air-system socket. Grid contacts grounded to shell. Repair parts shown for SK-1300 applicable except post insulator is P/N 154280.
SK-1330	same as SK-1300	-	-	-	-	same as SK-1300	Not an air-system socket. No bypass capacitor(s). Low filament/grid capacitance. For grounded grid applications. Use of chimney shown is dependent on mounting arrangement.
SK-1360	none req'd	-	-	-	-	3CW45,000H3	Water jacket (same as SK-2050 except for P/N)
SK-1400A	SK-1406	g2	1800	1000	8169	4CX3000A	Air-system socket. No contacts grounded. Available from EIMAC for maintenance/repair: P/N 149062 Contact finger (24 per socket) 115855 Bypass capacitor ass'y, which includes contact finger ring.
Y330A	same as SK-1400A	-	-	-	-	same as SK-1400A	Modified SK-1400A: screen grid connected to frame. Low-inductance base contact arrangement. Improved airflow characteristics.
Y383	same as SK-1400A	-	-	-	-	same as SK-1400A	Modified SK1400A: abbreviated version; no mounting plate or bypass capacitor; mounting is by means of 4 tapped insulated posts; insertion guide is retained.
Y412	same as SK-1400A	-	-	-	-	same as SK-1400A	Modified SK1400A: control grid connecting screws forshortened.
SK-1420	SK-1426	g2	1800	1000	8966	5CX3000A	Air-system socket. Suppressor grid grounded. Available from EIMAC for maintenance/repair: P/N 149062 Contact finger (14 per socket) 149530 Bypass capacitor ass'y
SK-1470A	SK-1406	-	-	-	8169	4CX3000A	Modified SK-1400A: screen contacts grounded. No bypass capacitor.
SK-1490	none req'd	-	-	-	-	4CV8000A	Modified SK-1400A: mounting flange removed. No bypass capacitor. No grounded contacts. Available from EIMAC for maintenance/repair: P/N 149062 Contact finger (24 per socket)
Note:	BR-101 boiler required for anode cooling, plus associated accessories such as water lines, water level controller, condenser, water reservoir, etc.						
SK-1500	Discontinued socket; no repair parts are available.						
SK-1500A	non avail	-	-	-	8349	4CX35,000C	Not an air-system socket but includes attachment for tube stem cooling. Mounting flange common to screen grid contact ring. No tube seating device included. PARTSKIT-1500 is available for user repair. Available from EIMAC for maintenance/repair: P/N 149129 Inner filament collet ass'y 149130 Outer filament collet ass'y 149132 Control grid collet ass'y 149131 Screen grid collet ass'y
	none req'd				8351	4CV100,000C	
	none req'd				-	4CW100,000D	
					-	Y-546	
					-	Y-647	
Note: P/N	Screen grid bypass capacitor components are available from EIMAC as follows:						
	149089	g2	2300	5000	-	-	Bypass capacitor dielectric (one supplied).
	149088	-	-	-	-	-	Set of insulator bushings (six supplied).
	149090	g2	1100	5000	-	-	Bypass capacitor dielectric (one supplied).