EIMAC
Division of Varian
301 INDUSTRIAL WAY • SAN CARLOS, CALIF. 94070
PHONE: (415) 592-1221 • CABLE: "EIMAC" SAN CARLOS

4CV250000

Vapor Cooled
Power Tetrode
TENTATIVE

The EIMAC 4CV250,000 is a ceramic-metal, vapor-cooled power tetrode intended for use at the 250 to 500 kilowatt output power level. It is recommended for use as a Class-C r-f amplifier or oscillator, a Class-AB r-f linear amplifier or a Class AB push-pull a-f amplifier or modulator. The 4CV250,000 is also useful as a plate and screen modulated Class-C r-f amplifier.

The vapor-cooled anode is rated at 250 kilowatts of plate dissipation when mounted in the EIMAC BR-600 series boiler.

GENERAL CHARACTERISTICS

ELECTRIC

Filament: Thoriated Tungsten		
Voltage	12	volts
Current	640	amps
Amplification Factor (Grid-Screen) (average)	4.5	
Direct Interelectrode Capacitances, Grounded Cathode:		
Input	875	pf
Output	115	pf
Feedback	1.2	pf
Frequency for Maximum Ratings	30	MHz

MECHANICAL

Base		Special
Maximum Seal Temperature	250	°C
Maximum Anode Flange Temperature	130	°C
Recommended Boiler	EIMAC BR-600	Series
Operating Position	Vertical,	base up
Maximum Dimensions:		
Height	27-1/2	inches
Diameter	13	inches
Cooling	Vapor &	water
Net Weight	180	pounds
Shipping Weight (approximate)	300	pounds

eff. date 5-19-66

4CV250,000

Vapor-Cooled, Power Tetrode

Tentative Data

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telegraphy or FM Telephony (Key-down Conditions)

MAXIMUM RATINGS

DC Plate Voltage	25,000	Max. Volts
DC Screen Voltage	2,500	Max. Volts
DC Plate Current	50	Max. Amps
Plate Dissipation	250,000	Max. Watts
Screen Dissipation	3,500	Max. Watts
Grid Dissipation	1,500	Max. Watts

TYPICAL OPERATION
(Frequencies below 30 megacycles)

DC Plate Voltage	14	24	kv
DC Screen Voltage	1,200	800	volts
DC Grid Voltage	-800	-900	volts
DC Plate Current	26	30.4	amps
DC Screen Current	2.4	3.1	amps
DC Grid Current	1	1.6	amps
Driving Power	1.3	2.2	kW
Plate Output Power	255	600	kW

PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER

Class-C Telephony (Carrier Conditions Except Where Noted)

MAXIMUM RATINGS

DC Plate Voltage	18,000	Max. Volts
DC Screen Voltage	2,000	Max. Volts
DC Plate Current	40	Max. Amps
Plate Dissipation*	67,000	Max. Watts
Screen Dissipation	3,500	Max. Watts
Grid Dissipation	1,500	Max. Watts

*Corresponds to 250,000 watts at 100 per cent sine wave modulation

TYPICAL OPERATION
(Frequencies below 30 Megacycles)

DC Plate Voltage	14	kv
DC Screen Voltage	800	volts
Peak AF Screen Voltage (For 100% Modulation)**	800	volts
DC Grid Voltage	-800	volts
DC Plate Current	29	Amps
DC Screen Current	3.6	Amps
DC Grid Current	1.8	Amps
Peak RF Grid Voltage	1,200	volts
Grid Driving Power	2.5	kW
Plate Output Power	292	kW

**Approximate Value

AUDIO-FREQUENCY AMPLIFIER OR MODULATOR

Class AB_1

MAXIMUM RATINGS (Per Tube)

DC Plate Voltage	25,000	Max. Volts
DC Screen Voltage	2,500	Max. Volts
DC Plate Current	40	Max. Amps
Plate Dissipation	250,000	Max. Watts
Screen Dissipation	3,500	Max. Watts
Grid Dissipation	1,500	Max. Watts

TYPICAL OPERATION (Two Tubes)

DC Plate Voltage	15	22	kv
DC Screen Voltage	1.8	1.8	kv
DC Grid Voltage	-700	-780	volts
Max-Signal Plate Current	37	35	amps
Max-Signal Screen Current**	1.5	1.3	amps
Peak AF Driving Voltage*	700	780	volts
Driving Power	0	0	watts
Max-Signal Plate Output Power	420	615	kW

* Per Tube
**Approximate Value

4CV250,000

Vapor-Cooled, Power Tetrode

Tentative Data

APPLICATION

Mechanical

Mounting

The 4CV250,000 must be mounted vertically, anode down, in an EIMAC BR-600 series boiler. Care must be exercised to insure that the axis of the tube/boiler combination is perfectly vertical and that water in the boiler is at the level indicated. The anode flange on the tube must seat securely against the rubber "O" ring, forming a vapor-tight seal between tube and boiler.

Cooling

Cooling is accomplished by immersing the anode of the 4CV250,000 in a "Boiler" filled with distilled water. Energy dissipated by the anode causes the water to boil at the anode surfaces, be converted into steam and be carried away to an external condenser. The condensate is then returned to the boiler, completing the cycle.

This boiling action maintains the anode surfaces at a fairly constant temperature near 100°C. In a properly designed tube/boiler system (such as the EIMAC BR-600) it is extremely unlikely that anode surface temperature will exceed 110°C - well below the 130°C maximum - at full dissipation ratings. The vapor-cooled tube has good overload capabilities; excess dissipation for moderate periods only causes more water to boil.

Since the tube anode and boiler are usually at high potential to ground, water and steam connections to the boiler are made through insulating tubing. These insulating sections may be rather short - two to three feet is sufficient for most applications.

An equalizer line is needed between the steam side of the system and the top of the control box. Its function is to provide the same pressure characteristics in the control box as those in the boiler. In this way, errors in water level sensing due to pressure differentials are eliminated.

Separate water cooling of the tube base is required. Approximately .8 GPM at 40 psi (series connected) is sufficient to cool the filament and grid terminals.

APPLICATION

Electrical

Filament

The rated filament voltage for the 4CV250,000 is 12 volts. Filament voltage, as measured at the socket, should be maintained at this value, ±2 volts, to obtain maximum life and consistent performance.

Control-Grid Operation

The 4CV250,000 control grid is rated at 1,500 watts of dissipation and protective measures should be included in circuitry to insure that this rating is not exceeded. Grid dissipation is the approximate product of grid current and peak positive grid voltage.

Screen Dissipation

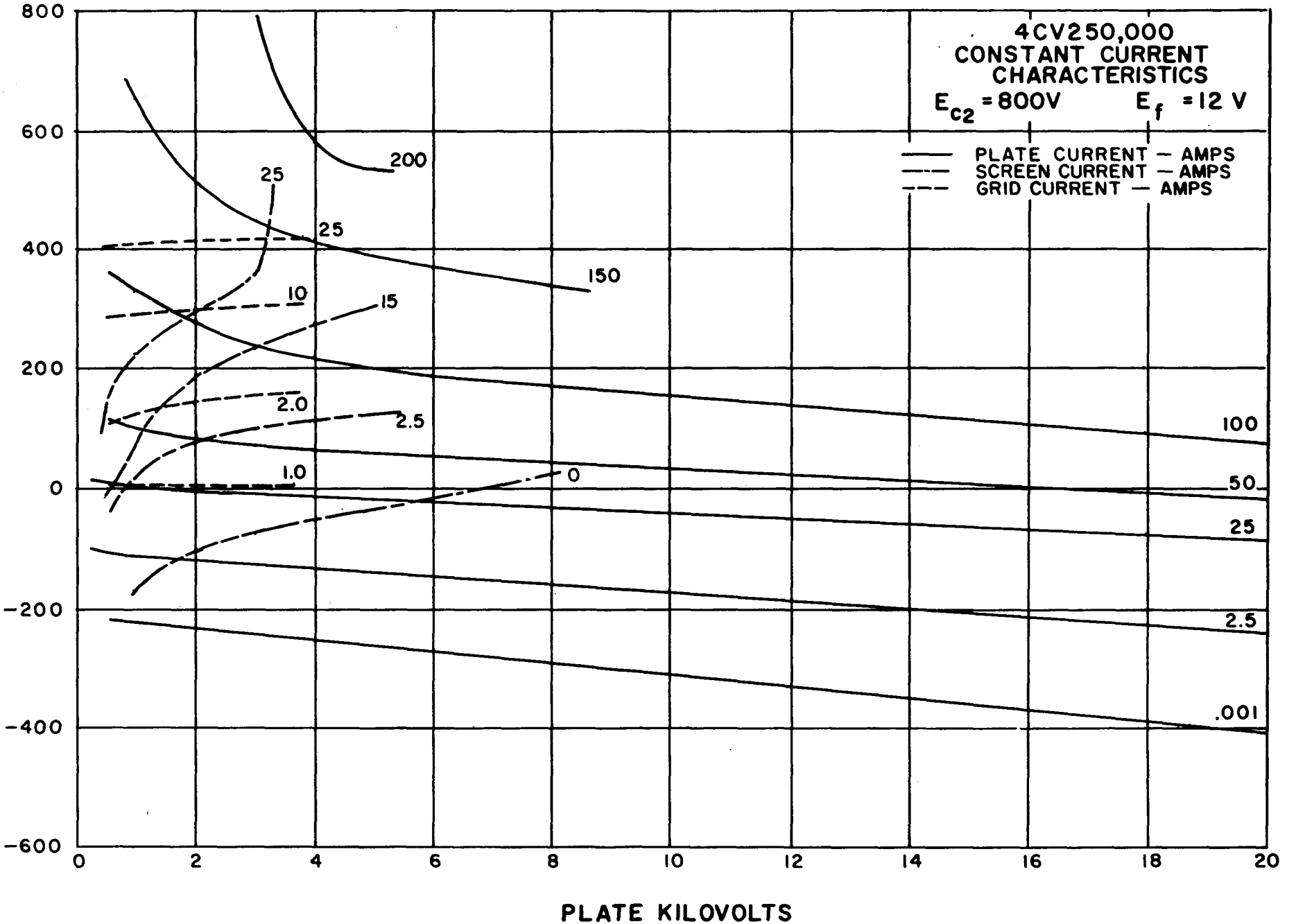
The power applied to the screen grid must not exceed 3,500 watts. Where no a-c is applied to the screen, dissipation is the product of d-c screen voltage and d-c screen current. With screen modulation the dissipation is dependent on loading, driving power, and screen voltages. Plate voltage, plate load or bias voltage must never be removed while filament and screen voltages are present since the screen dissipation rating will be exceeded. Suitable protective means must be provided to prevent any of these conditions.

Plate Dissipation

The plate dissipation of 250 kilowatts attainable through vapor cooling provides a large margin of safety in most applications. The rating may be exceeded for brief periods during tuning. When the 4CV250,000 is used as a plate-modulated r-f amplifier, plate dissipation under carrier conditions is limited to 167,000 watts.

Special Application

Where it is desired to operate this tube under conditions widely different from those listed here, write to Power Grid Tube Product Manager, EIMAC-Division of Varian, 301 Industrial Way, San Carlos, California, for information and recommendations.


4CV250,000
CONSTANT CURRENT
CHARACTERISTICS
E_{c2} = 800V
E_f = 12 V
PLATE CURRENT — AMPS
SCREEN CURRENT — AMPS
GRID CURRENT — AMPS
GRID VOLTS
PLATE KILOVOLTS
800
600
400
200
0
-200
-400
-600
0
2
4
6
8
10
12
14
16
18
20
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100
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25
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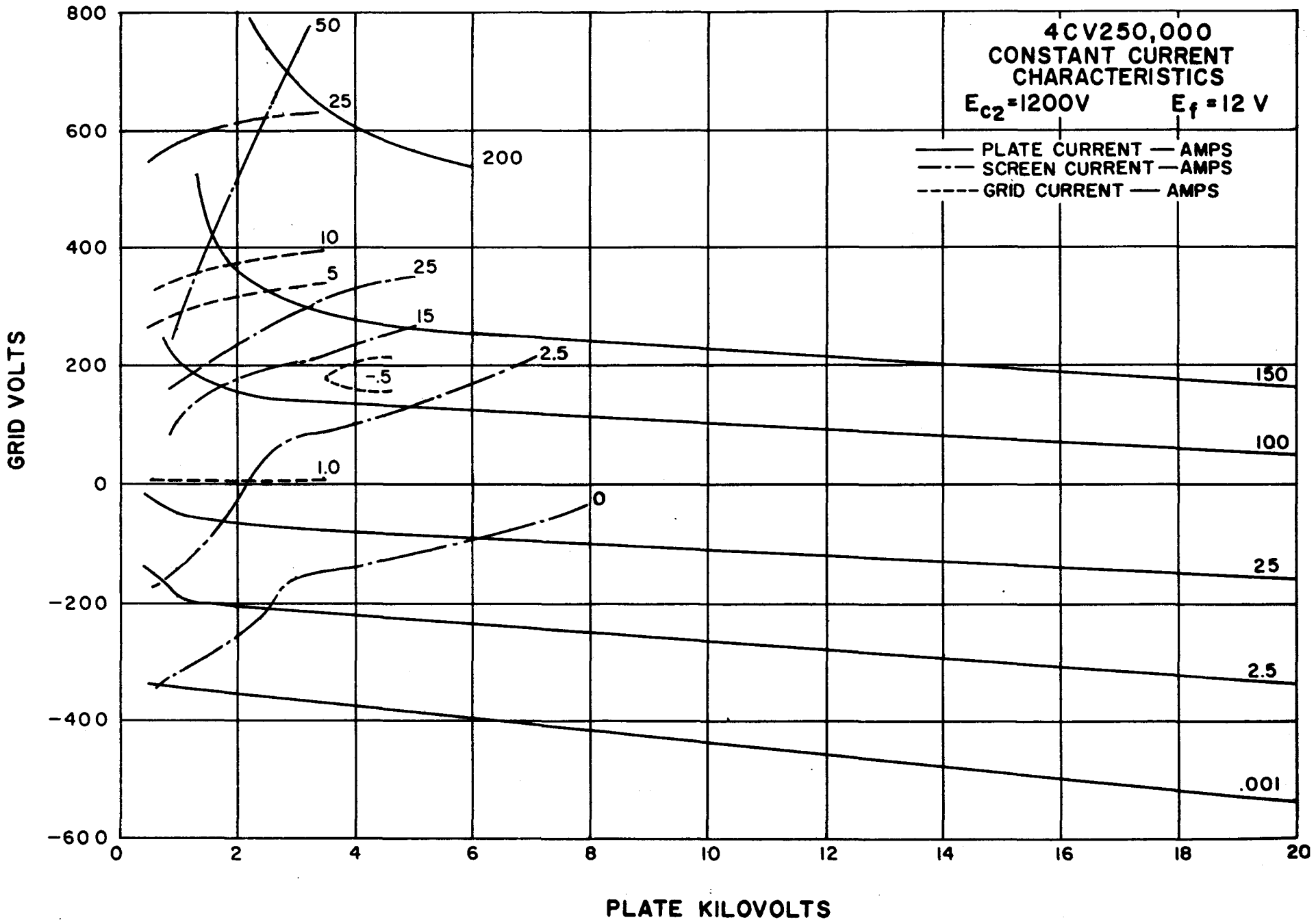
4CV250,000
CONSTANT CURRENT
CHARACTERISTICS
E_{c2}=1200V
E_f = 12 V
PLATE CURRENT — AMPS
SCREEN CURRENT — AMPS
GRID CURRENT — AMPS
GRID VOLTS
PLATE KILOVOLTS
800
600
400
200
0
-200
-400
-600
0
2
4
6
8
10
12
14
16
18
20
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2.5
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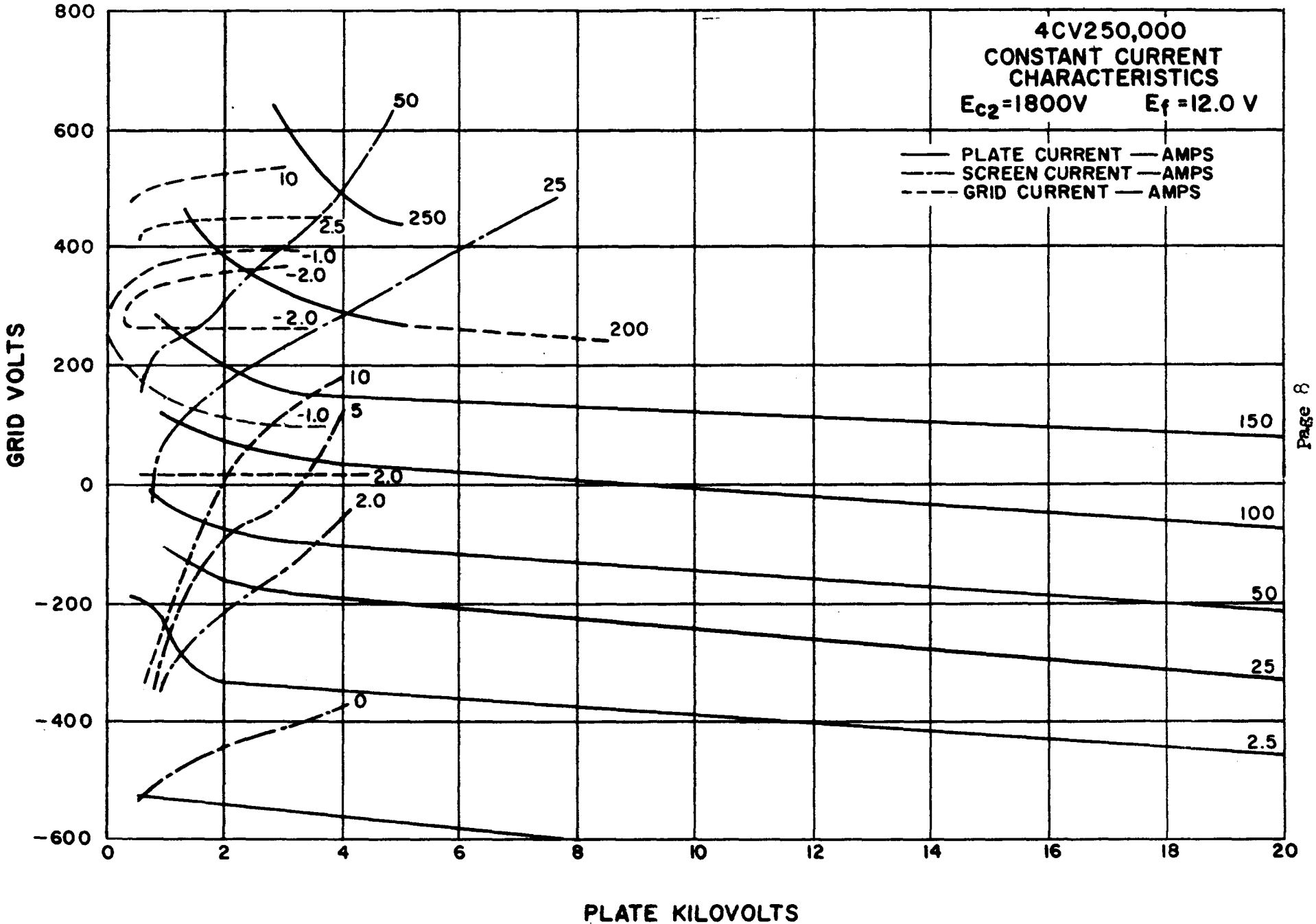
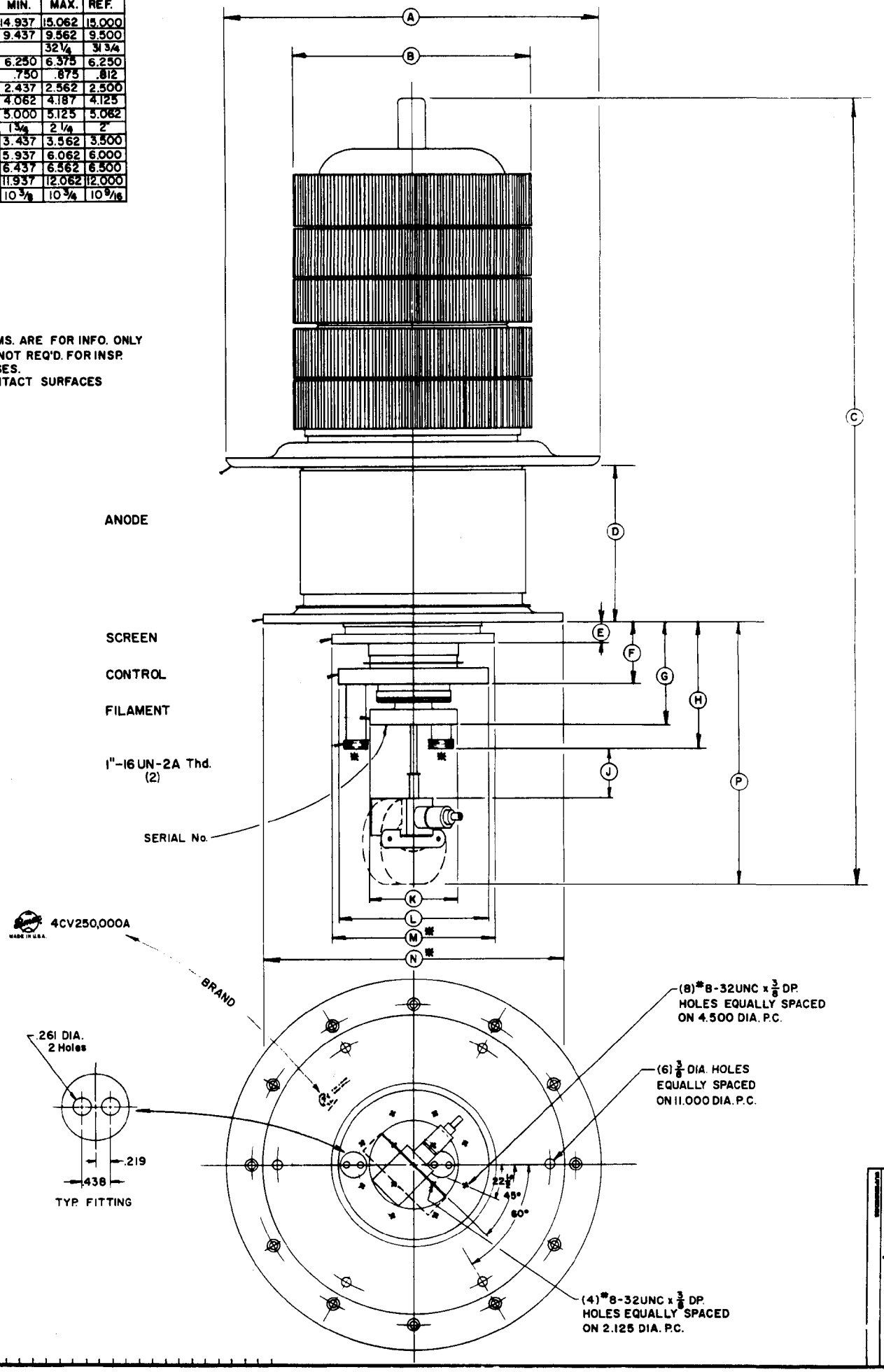

4CV250,000
CONSTANT CURRENT
CHARACTERISTICS
Ec2=1800V Ef =12.0 V
PLATE CURRENT — AMPS
SCREEN CURRENT — AMPS
GRID CURRENT — AMPS
GRID VOLTS
PLATE KILOVOLTS
800
600
400
200
0
-200
-400
-600
0
2
4
6
8
10
12
14
16
18
20
50
250
25
10
2.5
-1.0
-2.0
-2.0
200
10
5
-1.0
2.0
2.0
0
150
100
50
25
2.5

DIMENSIONS IN INCHES

DIMENSIONAL DATA			
DIM.	MIN.	MAX.	REF.
A	14.937	15.062	15.000
B	9.437	9.562	9.500
C		32 1/4	31 3/4
D	6.250	6.375	6.250
E	.750	.875	.812
F	2.437	2.562	2.500
G	4.062	4.187	4.125
H	5.000	5.125	5.062
J	1 3/4	2 1/4	2"
K	3.437	3.562	3.500
L	5.937	6.062	6.000
M	6.437	6.562	6.500
N	11.937	12.062	12.000
P	10 3/8	10 3/4	10 9/16

NOTE:
1. REF. DIMS. ARE FOR INFO. ONLY & ARE NOT REQ'D. FOR INSP. PURPOSES.
2. (*) CONTACT SURFACES



NO.	DESCRIPTION OF CHANGE	ECO	DATE	BY

NO.	DESCRIPTION OF CHANGE	ECO	DATE	BY

QTY	PRODUCT	NEXT ASSY. DWGL.

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64 DECIMALS ± .010 ANGLES ± 1°

DO NOT SCALE DRAWING

DRAWN D.H. 11-16-66 SCALE NONE

CHECKED — ENGR. — PROJ. ENGR. — MFG. ENGR. — MATL. — MATL. SPEC. NO. — FINISH

ITEM | QTY | PART NUMBER

CODE IDENT 06980

PART No. 4CV250,000A

DESCRIPTION

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EITEL-MCCULLOUGH, INC. SAN CARLOS CALIFORNIA

ELECTRON TUBE

NO. C 4CV250,000A-60 — CHANGE

NO. 4CV250,000A-60

SUPERSEDES