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# BEAM POWER TUBE

FORCED-AIR COOLED

CERAMIC-METAL SEALS 400 WATTS PEP\* OUTPUT AT 30 Mc  
 COAXIAL-ELECTRODE STRUCTURE 360 WATTS PEP OUTPUT AT 500 Mc  
 COMPACT DESIGN INTEGRAL RADIATOR

*Useful at frequencies up to 500 Mc*

## GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC)§ . . . . .	6 ± 10%	volts
Current at 6 volts. . . . .	2.6	amp
Minimum heating time. . . . .	30	sec

Mu-Factor, Grid No.2 to Grid No.1,  
 for grid-No.2 volts = 300 and  
 grid-No.2 ma. = 50. . . . .

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Direct Interelectrode Capacitances(Approx.):<sup>o</sup>

Grid No.1 to plate. . . . .	0.03	μf
Grid No.1 to cathode, grid No.2, and heater. . . . .	17	μf
Plate to cathode, grid No.2, and heater. . . . .	4.5	μf

### Mechanical:

Operating Position. . . . .	Any
Maximum Overall Length. . . . .	2.464"
Maximum Seated Length. . . . .	1.910"
Maximum Diameter. . . . .	1.640"
Weight (Approx.). . . . .	4 oz
Radiator. . . . .	Integral part of tube
Socket. . . . .	Air-System Socket, such as Johnson No.124-110-1 <sup>••</sup> (Supplied with Air Chimney)
Base. . . . .	Special 8-Pin

### BOTTOM VIEW

Pin 1 - Grid No.2\*

Pin 2 - Cathode

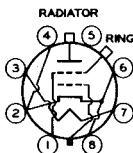
Pin 3 - Heater

Pin 4 - Cathode

Pin 5 - Internal

Connection—  
Do Not Use

Pin 6 - Cathode



Pin 7 - Heater

Pin 8 - Cathode

Base Index Plug-

Grid No.1

Radiator-Plate

Ring Terminal-<sup>■</sup>

Grid No.2

### Air Flow:

**Through indicated air-system socket**—This fitting directs the air over the base seals; past the grid-No.2 seal, envelope, and plate seal; and through the radiator to provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum plate air flow of 3.8 cfm through the system is required. The corresponding pressure drop is approximately 0.3 inch of water. These requirements are for operation at sea level and at an



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ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

*Without air-system socket*—if an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 3.6 cfm must pass through the radiator. The corresponding pressure drop is approximately 0.1 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on base end of plate surface at junction with fins) . . . . .	250 max.	°C
Temperature of Plate Seal, Grid-No.2 Seal, and Base Seals. . . . .	250 max.	°C

### LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

*Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2*

#### Maximum CCS\* Ratings, Absolute-Maximum Values:

*For altitudes up to 20,000 feet and frequencies up to 500 Mc*

DC PLATE VOLTAGE. . . . .	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . .	500 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . . . .	-250 max.	volts
DC PLATE CURRENT AT PEAK OF ENVELOPE. . . . .	350 max.†	ma
PLATE DISSIPATION . . . . .	250 max.	watts
GRID-No.2 DISSIPATION . . . . .	12 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode. . . . .	150 max.	volts
Heater positive with respect to cathode. . . . .	150 max.	volts

#### Typical CCS Operation with "Two-Tone Modulation":<sup>▲</sup>

	At 30 Mc	At 500 Mc	
DC Plate Voltage. . . . .	2000	2000	volts
DC Grid-No.2 Voltage† . . . . .	400	400	volts
DC Grid-No.1 Voltage:			
With fixed-bias source. . . . .	-77	-77	volts
Zero-Signal DC Plate Current. . . . .	70	70	ma
Effective RF Load Resistance. . . . .	3050	3050	ohms



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	At 30 Mc	At 500 Mc	
DC Plate Current:			
Peak envelope . . . . .	350	350	ma
Average . . . . .	225	225	ma
DC Grid-No.2 Current:			
Peak envelope . . . . .	35	25	ma
Average . . . . .	16	10	ma
Average DC Grid-No.1 Current. . . . .	0.05 <sup>®</sup>	0.05 <sup>®</sup>	ma
Peak-Envelope Driver Power			
Output (Approx.) <sup>00</sup> . . . . .	1	12	watts
Output-Circuit Efficiency (Approx.) . . . . .	95	85	%
Distortion Products Level: <sup>1</sup>			
Third order . . . . .	21	-	db
Fifth order . . . . .	29	-	db
Useful Power Output (Approx.):			
Peak envelope . . . . .	400*	360*	watts
Average . . . . .	200*	180*	watts

**Maximum Circuit Values:**

Grid-No.1-Circuit Resistance under any condition:			
With fixed bias . . . . .	25000 max.		ohms
With cathode bias . . . . .	Not recommended		

**LINEAR RF POWER AMPLIFIER — AM Telephony**

Carrier conditions per tube for use  
with a maximum modulation factor of 1

**Maximum CCS<sup>®</sup> Ratings, Absolute-Maximum Values:**

For altitudes up to 20,000 feet  
and frequencies up to 500 Mc

DC PLATE VOLTAGE . . . . .	2000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . .	500 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . . . . .	-250 max.	volts
DC PLATE CURRENT. . . . .	180 max.	ma
PLATE DISSIPATION . . . . .	250 max.	watts
GRID-No.2 DISSIPATION . . . . .	12 max.	watts
GRID-No.1 DISSIPATION . . . . .	2 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	150 max.	volts
Heater positive with respect to cathode.	150 max.	volts

**Typical CCS Operation:**

	At 30 Mc	At 500 Mc	
DC Plate Voltage. . . . .	2000	2000	volts
DC Grid-No.2 Voltage† . . . . .	400	400	volts
DC Grid-No.1 Voltage:			
With fixed-bias source. . . . .	-77	-77	volts
DC Plate Current. . . . .	175	175	ma
DC Grid-No.2 Current. . . . .	6	4	ma



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	At 30 Mc	At 500 Mc	
Effective RF Load Resistance. . . . .	3050	3050	ohms
Driver Power Output (Approx.) <sup>oo</sup>	0.25	3	watts
Output-Circuit Efficiency (Approx.) . . . . .	95	85	%
Useful Power Output (Approx.) . . . . .	100*	90*	watts

**Maximum Circuit Values:**

Grid-No.1-Circuit Resistance

under any condition:

With fixed bias . . . . . 25000 max. ohms

With cathode bias . . . . . Not recommended

\* Peak-envelope power.

§ Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

o With cylindrical shield JEDEC No.320 surrounding radiator, and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.

• Available from E.F. Johnson Co., Waseca, Minnesota.

★ For use at lower frequencies.

■ For use at higher frequencies.

● Continuous Commercial Service.

† The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 250 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 350 ma.

▲ *Two-Tone Modulation* operation refers to that class of amplifier service in which the input consists of two equal monofrequency rf signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant amplitude audio frequencies are applied to the input of the system.

‡ Obtained preferably from a fixed supply.

⊕ This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

oo Driver power output represents circuit losses and is the actual power measured at input to grid-No.1 circuit of the 7580. The actual power required depends on the operating frequency and the circuit used. The tube driving power is approximately zero watts.

↓ Without the use of feedback to enhance linearity.

• This value of useful power is measured at load of output circuit having indicated efficiency.

**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	Min.	Max.	
Heater Current. . . . .	1	2.3	2.9	amp
Direct Interelectrode Capacitances: <sup>o</sup>				
Grid No.1 to plate. . . . .	-	-	0.06	μf
Grid No.1 to cathode, grid No.2, and heater . . . . .	-	16	18.5	μf
Plate to cathode, grid No.2, and heater. . . . .	-	4.	5	μf



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	Note	Min.	Max.	
Grid-No.1 Voltage:				
Negative . . . . .	1,2,5,6	55	100	volts
Positive . . . . .	1,5,6,7	3	12	volts
Grid-No.2 Current (1) . . . . .	1,3,5,6	-7	+3	ma
Grid-No.2 Current (2) . . . . .	1,5,6,7	-	260	ma
Grid-No.1 Current . . . . .	1,5,6,7	-	150	ma
Useful Power Output . . . . .	4,5,6	225	-	watts

Note 1: With 6 volts on heater.

Note 2: With dc plate voltage of 2000 volts, dc grid-No.2 voltage of 400 volts, and grid-No.1 voltage adjusted to give plate current of 67 ma.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and grid-No.1 voltage adjusted to give plate current of 150 ma.

Note 4: With heater voltage of 5.5 volts, dc plate voltage of 2000 volts, dc grid-No.2 voltage of 300 volts, dc grid-No.1 bias of -90 volts, dc grid-No.1 current of 25 ma. maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., and coaxial-cavity amplifier circuit operating at a frequency of 475 Mc.

Note 5: With Forced-Air Cooling as specified under GENERAL DATA—*Air System Socket*.

Note 6: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 7: With dc plate voltage of 250 volts, dc grid-No.2 voltage of 250 volts, and grid-No.1 voltage adjusted to give peak plate current of 1 ampere. This test is performed using pulse technique to prevent tube damage. Square pulses of 4500  $\mu$ s duration at a repetition rate of  $11 \pm 1$  pps are used.

## SPECIAL PERFORMANCE DATA

## Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for *Air System Socket*. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.1 and grid No.2 . . . . .	10 min. megohms
Grid No.1 and cathode . . . . .	10 min. megohms
Grid No.2 and cathode . . . . .	10 min. megohms

## OPERATING CONSIDERATIONS

The *socket* for the 7580 should be of a type (such as that indicated in the tabulated data) which permits adequate air-cooling of the tube. Although the base will fit a conventional lock-in socket, the latter does not permit adequate cooling and its use is therefore not recommended.

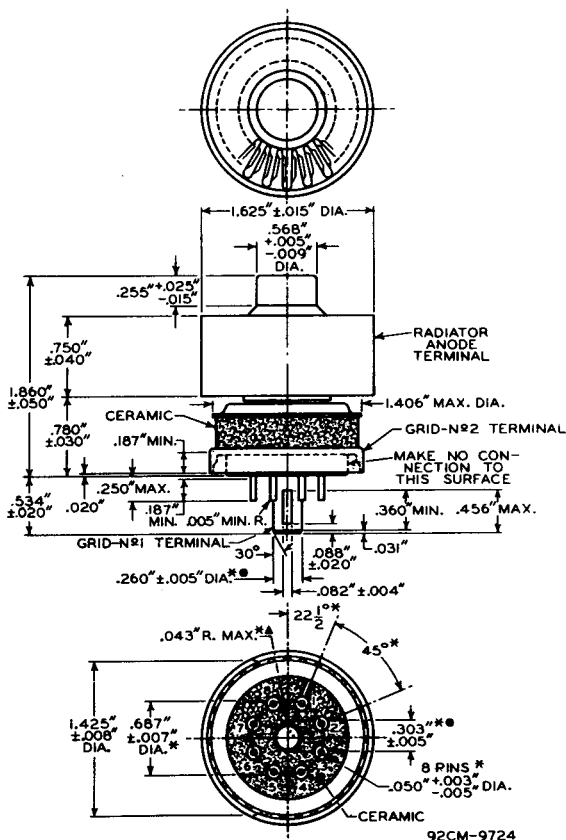
The *plate connection* is made by a metal band or spring contacts to the cylindrical surface of the radiator. It is essential that the contact areas be kept clean to minimize rf losses especially at the higher frequencies.

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GRID-No. 1-PLUG DIMENSIONS ARE MEASURED BY GAUGES  $G_1$  AND  $G_2$ . IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES, "GO" INDICATES THAT THE ENTIRE GRID-No. 1-PLUG KEY WILL ENTER THE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-No. 1-PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN  $1/16"$ . INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

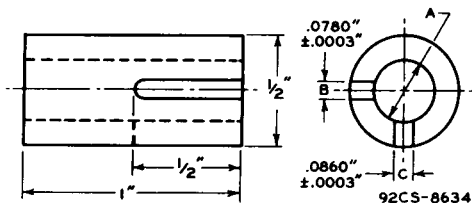
▲ GAUGES  $G_{1-1}$ ,  $G_{1-2}$ ,  $G_{1-3}$ , AND  $G_{1-4}$ :

USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-No. 1 PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-No. 1 PLUG IN SLOT B.

● GAUGES  $G_{2-1}$ ,  $G_{2-2}$ , AND  $G_{2-3}$ :

THE GRID-No. 1 PLUG WILL BE REJECTED BY GAUGES  $G_{2-1}$  AND  $G_{2-2}$ , BUT WILL BE ACCEPTED BY GAUGE  $G_{2-3}$ .

\* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE  $G_3$ .

GAUGE  $G_1$ 

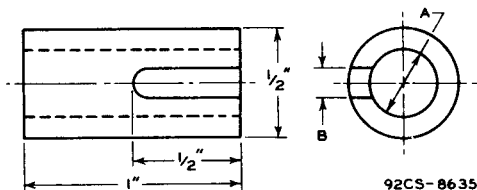
Gauge	Dimension A
$G_1 - 1$	$.2575" + .0000"$ $- .0005"$
$G_1 - 2$	$.2600" + .0000"$ $- .0005"$
$G_1 - 3$	$.2625" + .0000"$ $- .0005"$
$G_1 - 4$	$.2650" + .0000"$ $- .0005"$

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## BEAM POWER TUBE

GAUGE G<sub>2</sub>

92CS-8635

Gauge	Dimension	
	A	B
G <sub>2</sub> -1	.2550" + .0000" - .0005"	.125"
G <sub>2</sub> -2	.2980" + .0000" - .0005"	none
G <sub>2</sub> -3	.3080" + .0000" - .0005"	none

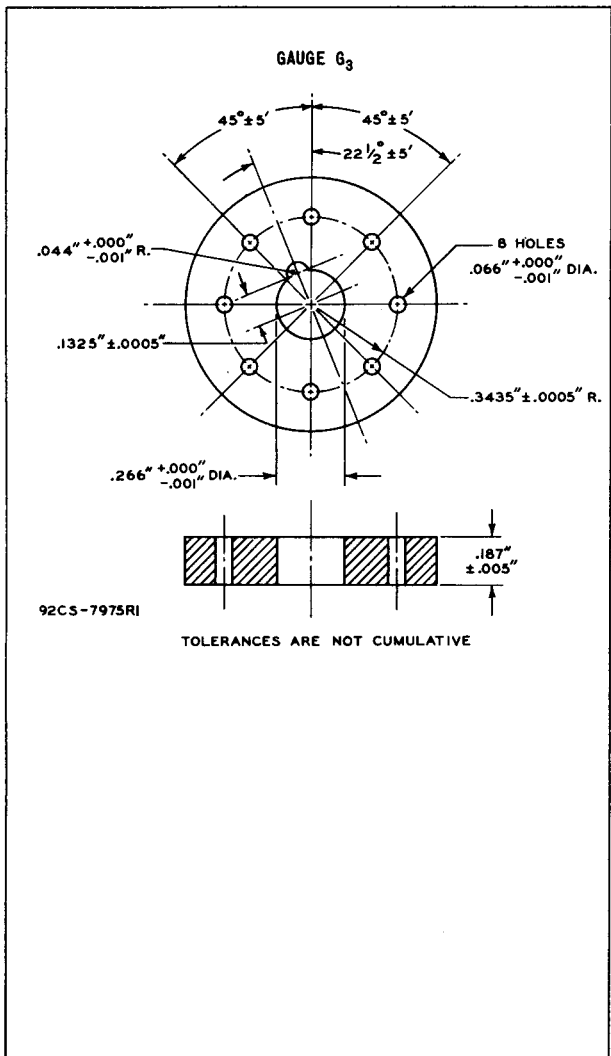




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## TYPICAL PLATE CHARACTERISTICS

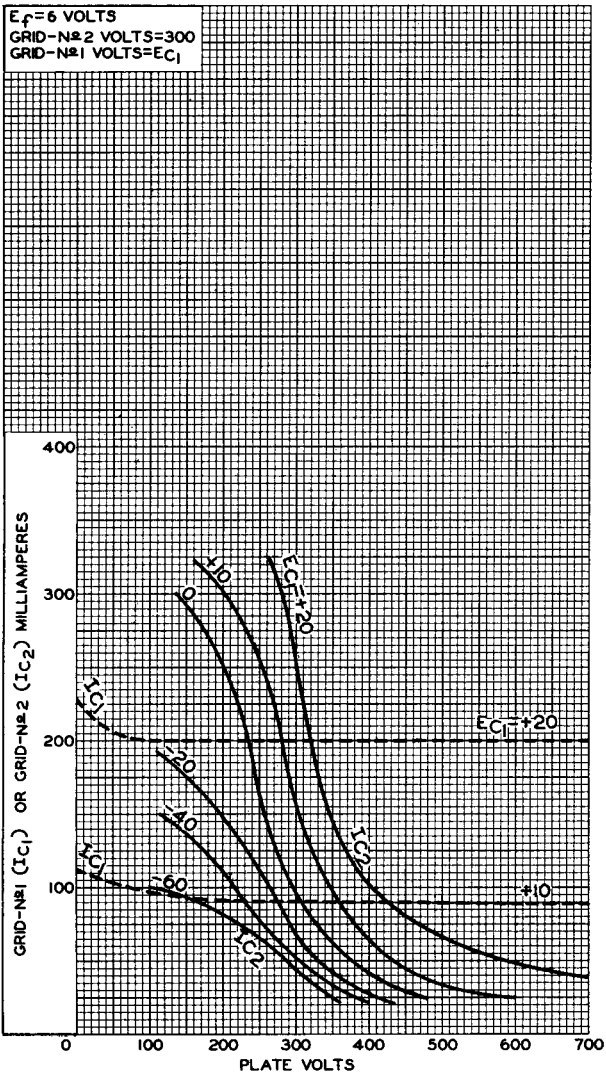




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### TYPICAL CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-10331

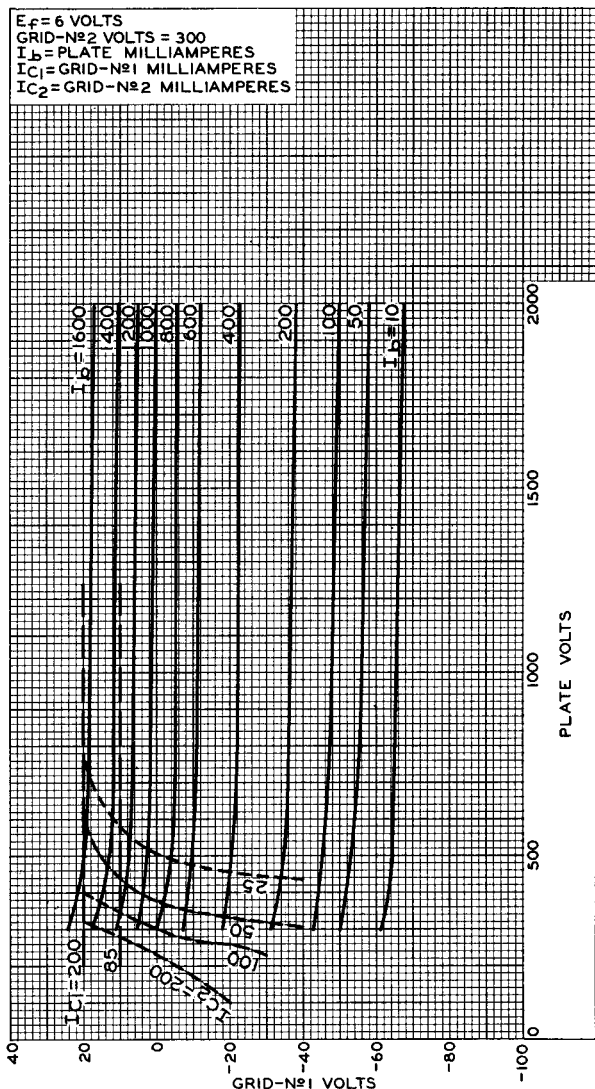
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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## TYPICAL CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10332



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### TYPICAL PLATE CHARACTERISTICS

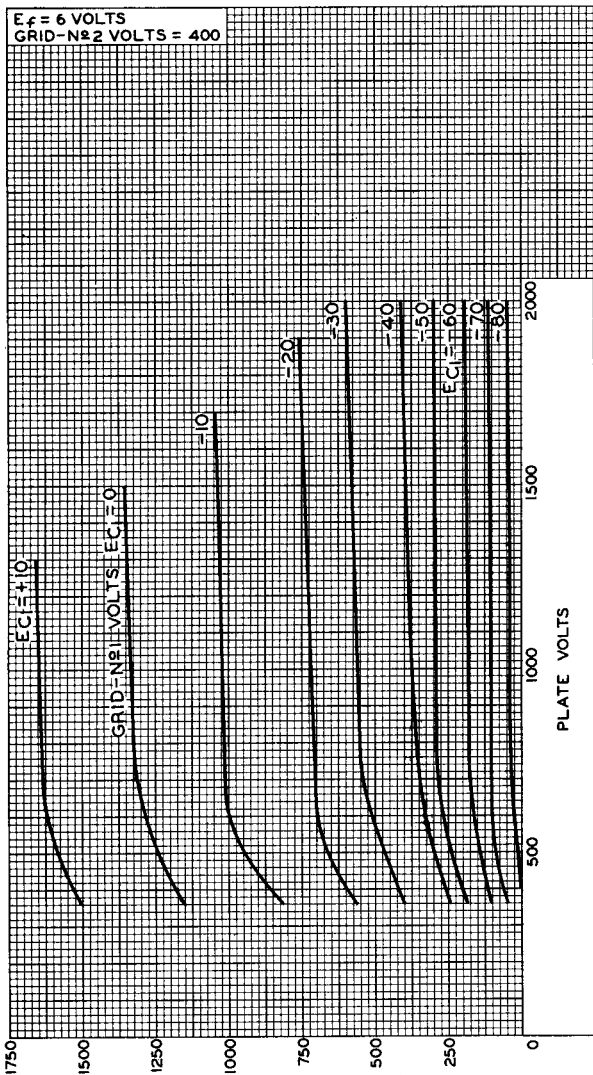


PLATE MILLIAMPERES  
ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

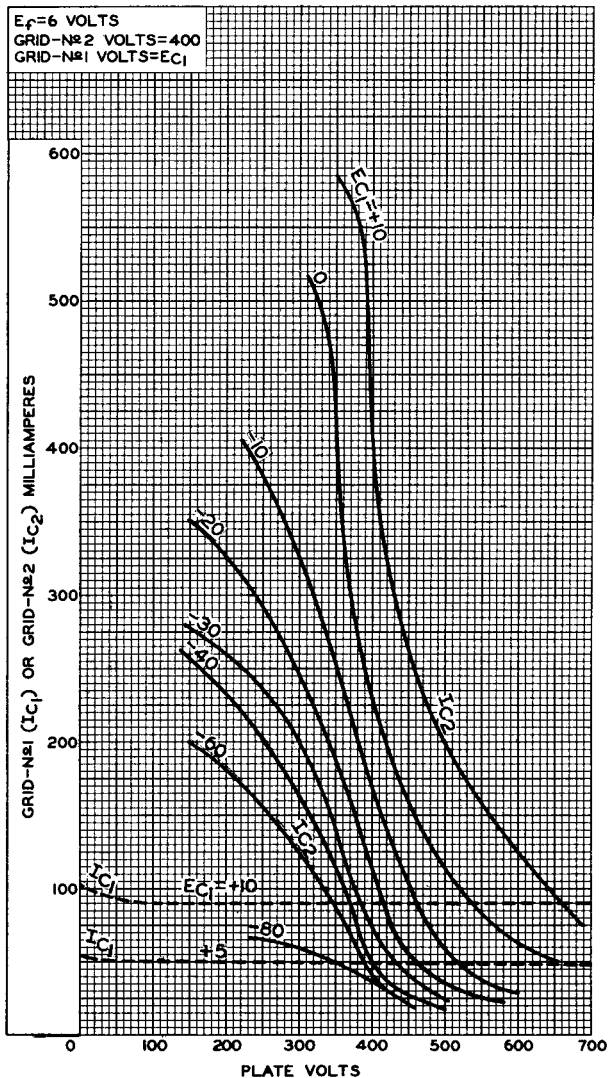
92CM-10333

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## TYPICAL CHARACTERISTICS





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# TYPICAL CONSTANT-CURRENT CHARACTERISTICS

$E_f = 6$  VOLTS  
 GRID-№2 VOLTS = 400  
 $I_b$  = PLATE MILLIAMPERES  
 $I_{C1}$  = GRID-№1 MILLIAMPERES  
 $I_{C2}$  = GRID-№2 MILLIAMPERES

