



obsolete  
4/62

4X150A

4X150A

# BEAM POWER TUBE

FORCED-AIR COOLED

Useful at frequencies up to 500 Mc

## GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode:

Voltage§ . . . . .	6.0 ± 10%	. . . . .	ac or dc volts
Current at 6.0 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 . . . . .	5

Direct Interelectroue Capacitances:<sup>0</sup>

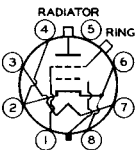
Grid No.1 to plate . . . . .	0.02	μμf
Grid No.1 to cathode, grid No.2, and heater. . . . .	16	μμf
Plate to cathode, grid No.2, and heater. . . . .	4.2	μμf

### Mechanical:

Mounting Position. . . . .	. . . . .	Any
Maximum Overall Length . . . . .	. . . . .	2-15/32"
Maximum Seated Length. . . . .	. . . . .	1.912"
Maximum Diameter . . . . .	. . . . .	1.635"
Weight (Approx.) . . . . .	. . . . .	5 oz
Radiator . . . . .	. . . . .	Integral part of tube
Socket . . . . .	Eimac 4X150A Air-System Socket, or equivalent	
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 Surface
- Terminal - Grid No.2

### Air Flow:

**Through Radiator**—Under any condition, the air flow must be adequate to limit the temperature of the radiator to its specified maximum value. The air flow must be applied before or simultaneously with electrode voltages and may be removed simultaneously with them. Typical values of air flow for various plate dissipations are shown in the table below.

Percentage of Max. Rated Plate Dissipation for				
Each Class of Service	100	80	60	per cent
Minimum Air flow. . . . .	5.6	4.1	2.5	cfm
Static Pressure . . . . .	0.26	0.14	0.05	in. of water

§ 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.

- ♦ For use at lower frequencies.
- For use at higher frequencies.

<sup>0</sup>: See next page.

← Indicates a change.

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To Base--Forced-air cooling of the base end of the tube must be provided to limit the temperature of the base seals to the specified value.

Through Eimac 4X150A Air System Socket--This fitting directs the air over the base seals, past the grid-No.2 seal and glass envelope, and through the radiator to provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation, a minimum air flow of 7.5 cfm is required through the socket and radiator. The corresponding pressure drop is 0.6 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 and must be adequate to limit the radiator and seal temperatures to 150°C.

Radiator Temperature (Measured on metal surface between radiator core and glass envelope) . . . . . 150 max. °C  
 Temperature of Base Seals and Envelope Seals. 150 max. °C

AF POWER AMPLIFIER & MODULATOR - Class AB<sub>1</sub>♦

## Maximum CCS\* Ratings, Absolute Values:

DC PLATE VOLTAGE. . . . . 1250 max. volts  
 DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . . 400 max. volts  
 MAX.-SIGNAL DC PLATE CURRENT\* . . . . . 250 max. ma  
 PLATE DISSIPATION\* . . . . . 150 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 Operation:

Values are for 2 tubes

DC Plate Voltage. . . . .	600	800	1000	1250	volts
DC Grid-No.2 Voltage. . . . .	300	300	300	300	volts
DC Grid-No.1 (Control-Grid) Voltage . . . . .	-44	-47	-47	-48	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage . . . . .	88	94	94	96	volts
Zero-Signal DC Plate Current . . . . .	160	120	120	115	ma
Max.-Signal DC Plate Current . . . . .	380	380	380	390	ma
Zero-Signal DC Grid-No.2 Current. . . . .	0	0	0	0	ma
Max.-Signal DC Grid-No.2 Current. . . . .	65	65	60	40	ma

♦ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

0, \*, \* : See next page.

→ Indicates a change.



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## BEAM POWER TUBE

Effective Load Resistance (Plate to plate) . . . . .	3550	4625	5850	7200	ohms
Max.-Signal Driving Power (Approx.) . . .	0	0	0	0	watts
Max.-Signal Power Output (Approx.) . . .	140	195	240	310	watts

### Maximum Circuit Values:

Grid-No.1-Circuit Resistance (Per tube) . .	0.1 max.	megohm
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### AF POWER AMPLIFIER & MODULATOR - Class AB<sub>2</sub><sup>#</sup>

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

DC PLATE VOLTAGE . . . . .	1250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE . . . .	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT* . . . . .	250 max.	ma
PLATE DISSIPATION* . . . . .	150 max.	watts
GRID-No.2 DISSIPATION* . . . . .	12 max.	watts
GRID-No.1 (CONTROL-GRID) 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 Operation:

Values are for 2 tubes

DC Plate Voltage . . . . .	600	800	1000	1250	volts
DC Grid-No.2 Voltage . . . . .	300	300	300	300	volts
DC Grid-No.1 Voltage . . . . .	-41	-43	-43	-44	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage . . . . .	94	96	98	100	volts
Zero-Signal DC Plate Current . . . . .	185	160	165	180	ma
Max.-Signal DC Plate Current . . . . .	485	490	495	475	ma
Zero-Signal DC Grid-No.2 Current . . . . .	0	0	0	0	ma
Max.-Signal DC Grid-No.2 Current . . . . .	80	75	70	65	ma
Effective Load Resistance (Plate to plate) . . . . .	2600	3500	4600	5600	ohms
Max.-Signal Driving Power (Approx.) . . .	0.15	0.15	0.15	0.15	watt
Max.-Signal Power Output (Approx.) . . .	170	240	315	425	watts

\* Averaged over any audio-frequency cycle of sine-wave form.  
 # Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

○, ●: See next page. ← Indicates a change.

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## BEAM POWER TUBE

## RF POWER AMPLIFIER - Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

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

	54 to 216 Mc		
DC PLATE VOLTAGE . . . . .	1250	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE . . .	400	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . .	-250	max.	volts
DC PLATE CURRENT (AVERAGE)*. . . . .	250	max.	ma
PLATE DISSIPATION. . . . .	150	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 Operation (With bandwidth of 5 Mc):

DC Plate Voltage . . . . .	750	1000	1250	volts
DC Grid-No.2 Voltage . . . . .	300	300	300	volts
DC Grid-No.1 Voltage . . . . .	-60	-65	-70	volts
Peak RF Grid-No.1 Voltage:				
Synchronizing level. . . . .	85	95	100	volts
Pedestal level . . . . .	65	70	75	volts
DC Plate Current:				
Synchronizing level. . . . .	335	330	305	ma
Pedestal level . . . . .	245	240	230	ma
DC Grid-No.2 Current:				
Synchronizing level. . . . .	50	45	45	ma
Pedestal level . . . . .	20	15	10	ma
DC Grid-No.1 Current:				
Synchronizing level. . . . .	15	20	25	ma
Pedestal level . . . . .	4	4	4	ma
Driver Power Output (Approx.):↓				
Synchronizing level. . . . .	7	8	9	watts
Pedestal level . . . . .	4.25	4.7	5.5	watts
Useful Power Output (Approx.):				
Synchronizing level. . . . .	135	200	250	watts
Pedestal level . . . . .	75	110	140	watts

## PLATE-MODULATED RF POWER AMPLIFIER -- Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

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

	Up to 500 Mc		
DC PLATE VOLTAGE . . . . .	1000	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE . . . .	300	max.	volts

\* Averaged over any frame.

○, ●, ↓: See next page.

→ Indicates a change.



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DC GRID-No.1 (CONTROL-GRID) VOLTAGE . . .	-250 max.	volts
DC PLATE CURRENT . . . . .	200 max.	ma
PLATE DISSIPATION . . . . .	100 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 Operation at Frequencies up to 165 Mc:

DC Plate Voltage. . . . .	400	600	800	1000	volts
DC Grid-No.2 Voltage (Modulated approx. 55%) <sup>▲</sup> . . . . .	250	250	250	250	volts
DC Grid-No.1 Voltage. . . . .	-90	-95	-100	-105	volts
Peak AF Grid-No.2 Voltage (For 100% modulation) . . . . .	140	150	160	170	volts
Peak RF Grid-No.1 Voltage . . . . .	110	120	120	125	volts
DC Plate Current. . . . .	200	200	200	200	ma
DC Grid-No.2 Current. . . . .	40	35	25	20	ma
DC Grid-No.1 Current (Approx.) . . . . .	7	8	10	15	ma
Driving Power (Approx.) . . . . .	1	1	1.5	2	watts
Power Output (Approx.) . . . . .	55	80	100	140	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance. . . . .	25000 max.	ohms
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RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy†  
and  
RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS\* Ratings, Absolute Values:

	Up to 500 Mc	
DC PLATE VOLTAGE. . . . .	1250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . .	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE . . . . .	-250 max.	volts
DC PLATE CURRENT. . . . .	250 max.	ma
PLATE DISSIPATION . . . . .	150 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

▲ The dc grid-No.2 voltage must be modulated approximately 55% in phase with the plate modulation in order to obtain 100% modulation of the 4X150A. The use of a series grid-No.2 resistor or reactor may not give satisfactory performance and is therefore not recommended.

\* Continuous Commercial Service.

† Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

⊙, ⊕: See next page.

← Indicates a change.



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## Typical Operation at Frequencies up to 165 Mc:

DC Plate Voltage . . . . .	600	750	1000	1250	volts
DC Grid-No.2 Voltage . . . . .	250	250	250	250	volts
DC Grid-No.1 Voltage . . . . .	-75	-80	-80	-90	volts
Peak RF Grid-No.1 Voltage. . . . .	91	96	95	106	volts
DC Plate Current . . . . .	200	200	200	200	ma
DC Grid-No.2 Current . . . . .	37	37	31	20	ma
DC Grid-No.1 Current (Approx.) . . . . .	11	11	10	11	ma
Driving Power (Approx.) . . . . .	1	1	1	1.2	watts
Power Output (Approx.) . . . . .	85	110	150	195	watts

## Typical Operation at Frequency of 500 Mc with Coaxial Cavity:

DC Plate Voltage . . . . .	600	800	1000	1250	volts
DC Grid-No.2 Voltage . . . . .	250	250	250	280	volts
DC Grid-No.1 Voltage . . . . .	-110	-110	-110	-115	volts
DC Plate Current . . . . .	170	200	200	200	ma
DC Grid-No.2 Current . . . . .	6	7	7	5	ma
DC Grid-No.1 Current (Approx.) . . . . .	6	10	10	10	ma
Driver Power Output (Approx.) <sup>1</sup> . . . . .	15	20	25	30	watts
Useful Power Output (Approx.) . . . . .	50	95	120	140	watts

## Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . .	25000 max.	ohms
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## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current . . . . .	1,5	2.3	2.9	amp
Direct Interelectrode Capacitances: <sup>o</sup>				
Grid No.1 to plate . . . . .	-	-	0.06	$\mu\mu\text{f}$
Grid No.1 to cathode, grid No.2, and heater. . . . .	-	14.2	17.2	$\mu\mu\text{f}$
Plate to cathode, grid No.2, and heater . . . . .	-	3.8	4.8	$\mu\mu\text{f}$
Grid-No.1 Voltage . . . . .	1,2,5,6	-30	-46	volts
Grid-No.2 Current . . . . .	1,2,5,6	-7	+3	ma
Mu-Factor, Grid No.2 to Grid No.1. . . . .	1,3,5,6	4	6	
Power Output . . . . .	4,5,6	100	-	watts

<sup>o</sup> With cylindrical shield having inside diameter of 1-13/16" completely surrounding radiator, and insulated from the top and sides of it by a 1/16" thickness of insulating material; and with a cylindrical shield having inside diameter of 1.460" and length of 5/16" surrounding the grid-No.2 ring terminal and insulated from it. Both shields are connected to ground.

<sup>1</sup> Notes 1 to 6: See next page.

→ Indicates a change.



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### BEAM POWER TUBE

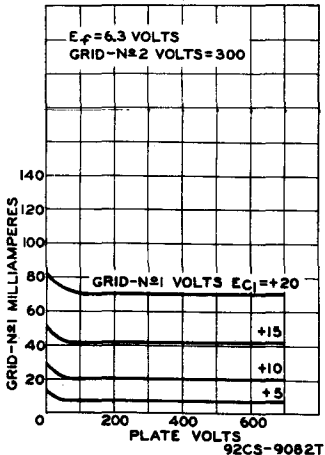
- Note 1: With 6.0 volts on heater.
- Note 2: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 voltage adjusted to give plate current of 150 ma.
- Note 3: With dc grid-No.2 voltage of 300 volts, and grid-No.2 current of 50 ma.
- Note 4: With heater voltage of 5.5 volts and with dc plate voltage of 1000 volts, dc grid-No.2 voltage of 250 volts, dc grid-No.1 bias of -90 volts, dc grid-No.1 current of 20 ma. maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 200 ma, and a frequency of 475 Mc.
- Note 5: With Forced-Air Cooling as specified under GENERAL DATA.
- Note 6: Heater voltage must be applied for at least 30 seconds before application of other voltages.

The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

#### MAXIMUM RATINGS vs OPERATING FREQUENCY

FREQUENCY	500	Mc
MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE AND PLATE INPUT: Class C Telegraphy	100	%

#### TYPICAL CHARACTERISTICS



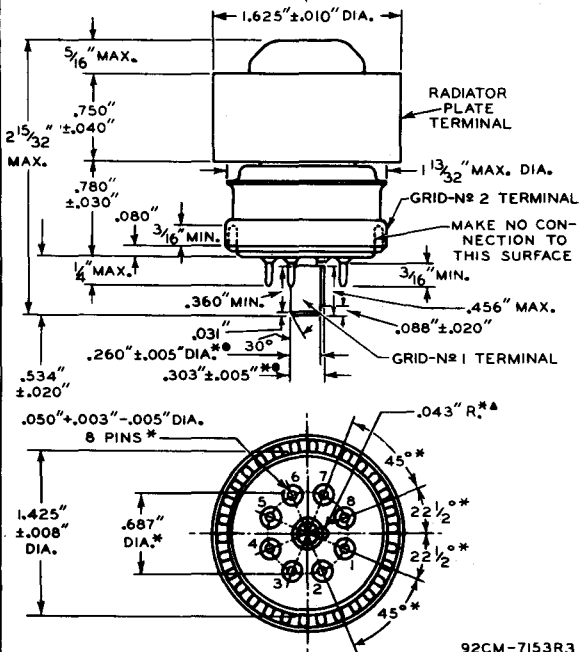
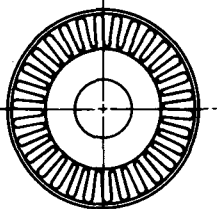
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## BEAM POWER TUBE



92CM-7153R3

GRID-No. 1 PLUG DIMENSIONS ARE MEASURED BY THE USE OF THE SERIES OF GAUGES SHOWN IN SKETCHES G<sub>1</sub> AND G<sub>2</sub>. 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:

\* , \* , \* : see next page.





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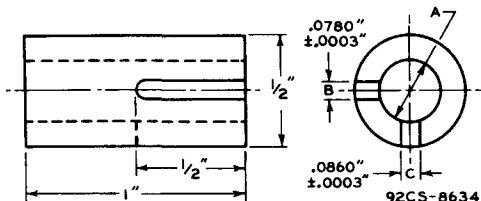
## BEAM POWER TUBE

▲ GAUGES  $G_1-1$ ,  $G_1-2$ ,  $G_1-3$ , AND  $G_1-4$ :

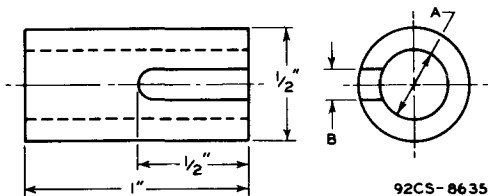
USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-NO. 1 PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-NO. 1 PLUG IN SLOT B.

● 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  $G_2-3$ .

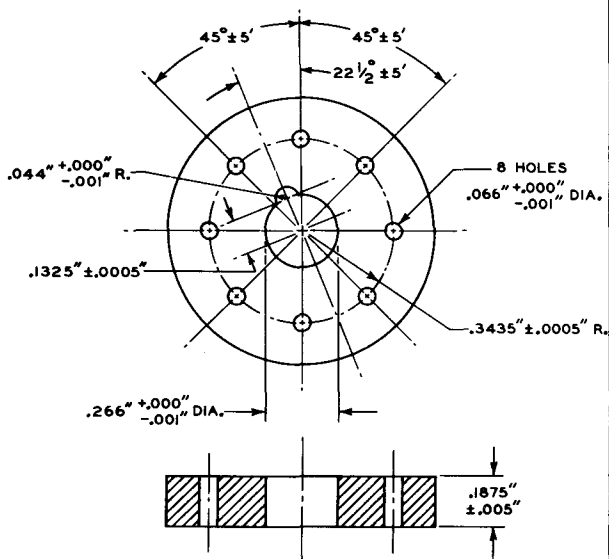
\* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE SHOWN IN SKETCH  $G_3$ .GAUGE SKETCH  $G_1$ 

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"

GAUGE SKETCH  $G_2$ 

## BEAM POWER TUBE

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

GAUGE SKETCH G<sub>3</sub>

TOLERANCES ARE NOT CUMULATIVE

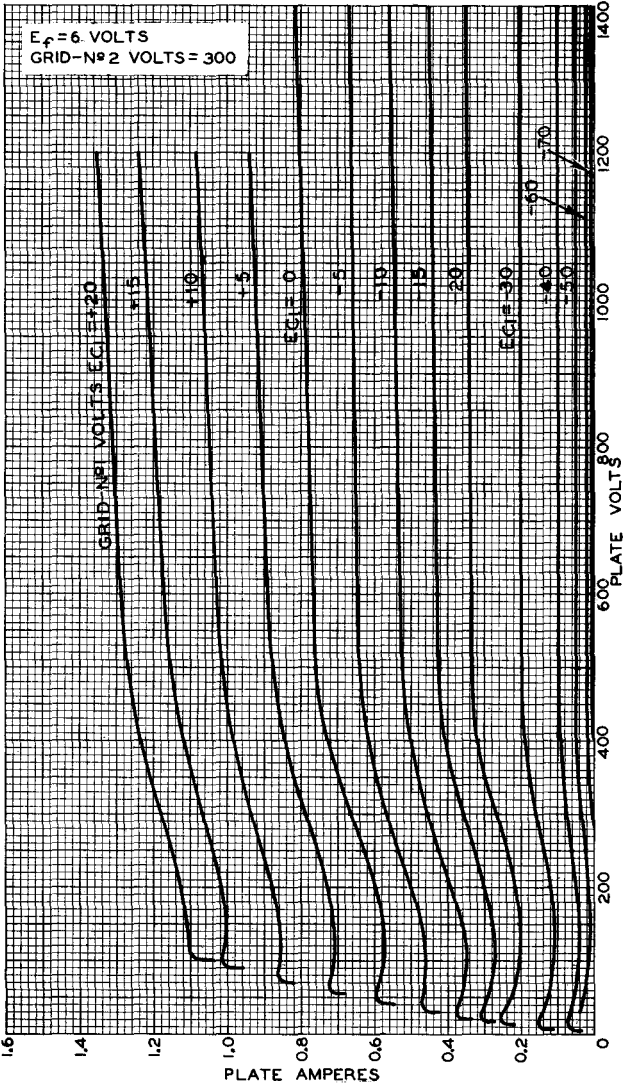
92CS-7975



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### AVERAGE PLATE CHARACTERISTICS



TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

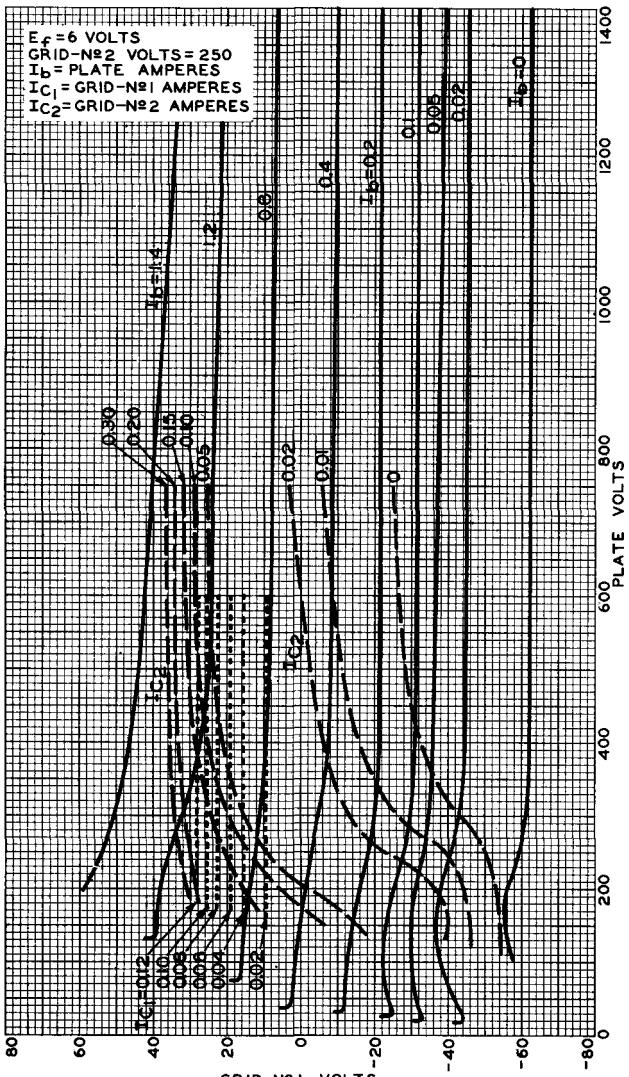
92CM-7950

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### AVERAGE CONSTANT-CURRENT CHARACTERISTICS





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TYPICAL CHARACTERISTICS

