



5604-A

# 5604-A POWER TRIODE

FORCED-AIR COOLED

## GENERAL DATA

### Electrical:

Filament, Multistrand Tungsten:

Voltage. . . . .	11	. . . . .	ac or dc volts
Current. . . . .	176	. . . . .	amp
Starting current: The filament current must never exceed a value of 270 amperes, even momentarily.			
Cold resistance. . . . .	0.0052	. . . . .	ohm

NOTE: This tube can often be operated with reduced filament voltage as explained on sheet TYPES OF CATHODES in the General Section.

Amplification Factor, for  
plate current = 1.25 amp  
and grid volts = -100. . . . . 20

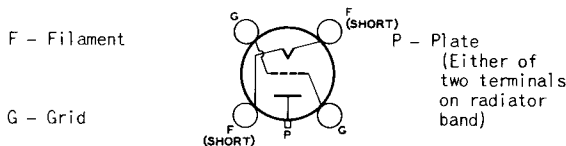
Direct Interelectrode Capacitances:

Grid to plate. . . . .	24	. . . . .	$\mu\mu\text{f}$
Grid to filament . . . . .	27	. . . . .	$\mu\mu\text{f}$
Plate to filament. . . . .	1.25	. . . . .	$\mu\mu\text{f}$

### Mechanical:

Terminal Connections:

TOP VIEW



Mounting Position. . . . .	Vertical, filament end up
Maximum Overall Length . . . . .	13-3/4"
Maximum Diameter (Including radiator handles). . . . .	11"
Radiator . . . . .	Integral part of tube

**Air Flow:**  
*Through Radiator*—Typical flow values of incoming air at a temperature not exceeding 45°C for various plate dissipations, are indicated in the tabulation below. The air should be delivered by a blower vertically upward through the radiator during the application of any voltages. Under any condition, the air flow must be adequate to limit the temperature of the radiator to its specified maximum value. See *Cooling Requirements curves*.

Percentage of max. rated plate dissipation for each class of service . . . . .	100	80	60	per cent
Air flow . . . . .	650	460	310	cfm
Static pressure. . . . .	2	1	0.45	in. of water

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*To Bulb and Seals*--At frequencies below 15 Mc, adequate cooling of the bulb and seals is provided by the air flow through the radiator. At frequencies above 15 Mc, however, additional air flow directed onto the filament end of the tube should be supplied by a blower providing 50 cfm through a 3" nozzle in order to limit the temperature of the grid seals, filament seals, and bulb to 160°C.

Incoming-Air Temperature (To radiator) . . . . .	45 max.	°C
Radiator Temperature (Measured on core at end adjacent to bulb) . . . . .	230 max.	°C
Bulb Temperature . . . . .	160 max.	°C
Seal Temperature (Filament, grid, and plate) . . . . .	160 max.	°C
Weight (Approx.) . . . . .	32	lbs

**Fittings:**

Air Jacket . . . . .	RCA-211F1
Connector Wrench (2 required) . . . . .	RCA-212F1
Grid or Filament Connector (4 required) . . . . .	RCA-216F1
Bracelet . . . . .	RCA-232F1
Air Manifold . . . . .	RCA-234F1

**AF POWER AMPLIFIER & MODULATOR--Class B****Maximum CCS\* Ratings, Absolute Values:**

DC PLATE VOLTAGE . . . . .	12500 max.	volts
MAX.-SIGNAL DC PLATE CURRENT* . . . . .	2.75 max.	amp
MAX.-SIGNAL PLATE INPUT* . . . . .	32500 max.	watts
PLATE DISSIPATION* . . . . .	10000 max.	watts

**Typical Operation:***Values are for 2 tubes*

DC Plate Voltage . . . . .	8000	10000	12000	volts
DC Grid Voltage . . . . .	-370	-480	-600	volts
Peak AF Grid-to-Grid Voltage . . . . .	1620	2020	2380	volts
Zero-Signal DC Plate Current . . . . .	0.4	0.5	0.6	amp
Max.-Signal DC Plate Current . . . . .	2.6	3.7	4.5	amp
Effective Load Resistance (Plate to plate) . . . . .	7200	6100	5900	ohms
Max.-Signal Driving Power (Approx.) . . . . .	140	150	160	watts
Max.-Signal Power Output (Approx.) . . . . .	14500	25000	36000	watts

\* Averaged over any audio-frequency cycle of sine-wave form.

•: See next page.

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TENTATIVE DATA 1

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**POWER TRIODE****RF POWER AMPLIFIER--Class B Telephony***Carrier conditions per tube with  
a max. modulation factor of 1.0***Maximum CCS\* Ratings, Absolute Values:**

DC PLATE VOLTAGE. . . . .	12500	max.	volts
DC PLATE CURRENT. . . . .	1.4	max.	amp
PLATE INPUT . . . . .	16000	max.	watts
PLATE DISSIPATION . . . . .	10000	max.	watts

**Typical Operation:**

DC Plate Voltage. . . . .	8000	10000	12000	volts
DC Grid Voltage . . . . .	-400	-500	-610	volts
Peak RF Grid Voltage. . . . .	410	490	590	volts
DC Plate Current. . . . .	0.6	0.8	1.0	amp
DC Grid Current (Approx.) . . . . .	0	0	0	amp
Driving Power (Approx.)** . . . . .	75	70	65	watts
Power Output (Approx.). . . . .	1700	2800	4400	watts

**PLATE-MODULATED RF POWER AMPLIFIER--Class C Telephony***Carrier conditions per tube with  
a max. modulation factor of 1.0***Maximum CCS\* Ratings, Absolute Values:**

DC PLATE VOLTAGE. . . . .	8000	max.	volts
DC GRID VOLTAGE . . . . .	-2000	max.	volts
DC PLATE CURRENT. . . . .	1.5	max.	amp
DC GRID CURRENT . . . . .	0.45	max.	amp
PLATE INPUT . . . . .	12000	max.	watts
PLATE DISSIPATION . . . . .	6600	max.	watts

**Typical Operation:**

DC Plate Voltage. . . . .	6000	8000	volts
DC Grid Voltage . . . . .	-740	-1000	volts
Peak RF Grid Voltage. . . . .	1140	1540	volts
DC Plate Current. . . . .	0.7	1.1	amp
DC Grid Current (Approx.) . . . . .	0.09	0.13	amp
Driving Power (Approx.) . . . . .	100	200	watts
Power Output (Approx.). . . . .	3400	7100	watts

**RF POWER AMPLIFIER & OSCILLATOR--Class C Telegraphy***Key-down conditions per tube without amplitude modulation* □**Maximum CCS\* Ratings, Absolute Values:**

DC PLATE VOLTAGE. . . . .	12500	max.	volts
DC GRID VOLTAGE . . . . .	-2000	max.	volts

\* continuous commercial service.

\*\* □: See next page.

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TENTATIVE DATA 2

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## POWER TRIODE

DC PLATE CURRENT . . . . .	3 max.	amp
DC GRID CURRENT . . . . .	0.45 max.	amp
PLATE INPUT . . . . .	32500 max.	watts
PLATE DISSIPATION . . . . .	10000 max.	watts

**Typical Operation:**

DC Plate Voltage . . . . .	8000	10000	12000	volts
DC Grid Voltage . . . . .	-680	-870	-1170	volts
Peak RF Grid Voltage . . . . .	1300	1620	2130	volts
DC Plate Current . . . . .	1.5	2.0	2.5	amp
DC Grid Current (Approx.) . . . . .	0.19	0.20	0.22	amp
Driving Power (Approx.) . . . . .	250	320	470	watts
Power Output (Approx.) . . . . .	9200	15000	22500	watts

**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

	Note	Min.	Max.	
Filament Current . . . . .	1	168	184	amp
Amplification Factor . . . . .	1,2	17.5	22.5	
Grid-Plate Capacitance . . . . .	-	21	27.5	$\mu\text{mf}$
Grid-Filament Capacitance . . . . .	-	23	31	$\mu\text{mf}$
Plate-Filament Capacitance . . . . .	-	-	2	$\mu\text{mf}$
DC Grid Voltage . . . . .	1,3	-480	-600	volts
DC Plate Voltage (1) . . . . .	1,4	3000	4000	volts
DC Plate Voltage (2) . . . . .	1,5	6700	8300	volts
Peak Cathode Current . . . . .	6	11.5	-	amp
Power Output . . . . .	1,7	22.5	-	kw

Note 1: With 11 volts rms on filament.

Note 2: With dc grid voltage of -100 volts and dc plate current of 1.25 amperes.

Note 3: With dc plate voltage of 10000 volts, and dc plate current of 0.020 ampere.

Note 4: With dc grid voltage of 0 volts, and dc plate current of 1.25 amperes.

Note 5: With dc grid voltage of -200 volts, and dc plate current of 1.25 amperes.

Note 6: Designers should limit the maximum useable cathode current (plate current and grid current) to this value under any condition of operation.

Note 7: In amplifier or oscillator service at a frequency of 1.6 Mc, and with dc plate voltage of 12500 volts, dc plate current of 2.6 amperes, grid resistor of  $6000 \pm 10\%$  ohms, and dc grid current of 0.225 ampere.

□ Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

**MAXIMUM RATINGS vs OPERATING FREQUENCY**

FREQUENCY	25	35	50	Mc
MAX. PERMISSIBLE PERCENTAGE OF MAX. RATED PLATE VOLTAGE AND PLATE INPUT:				
Class B Telephony	100	85	70	per cent
Class C Telephony	100	80	50	per cent
Class C Telegraphy	100	80	50	per cent

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TENTATIVE DATA 2

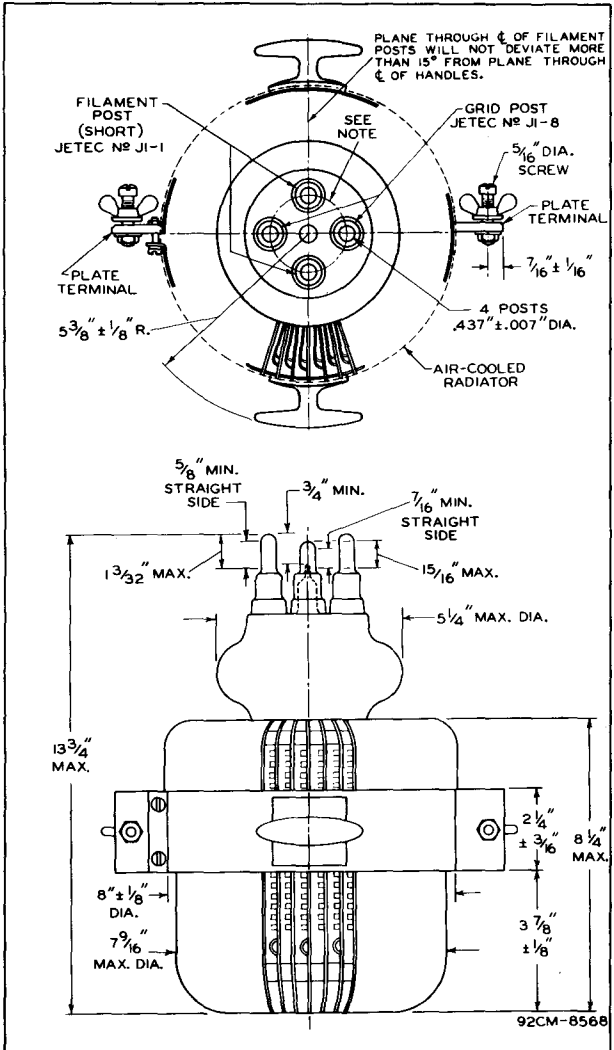
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**NOTE:** ANGULAR VARIATIONS BETWEEN POSTS AND VARIATION IN POST-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE STRAIGHT-SIDE LENGTH OF THE POSTS WILL ENTER A 5/8" THICK FLAT-PLATE GAUGE HAVING 4 HOLES 0.536"  $\pm$  0.001" DIAMETER ARRANGED ON A 2.125"  $\pm$  0.001" DIAMETER CIRCLE AT ANGLES OF 90°  $\pm$  10', AND HAVING A CENTER CLEARANCE HOLE WITH DIAMETER OF 1" APPROX.

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CE-8568B

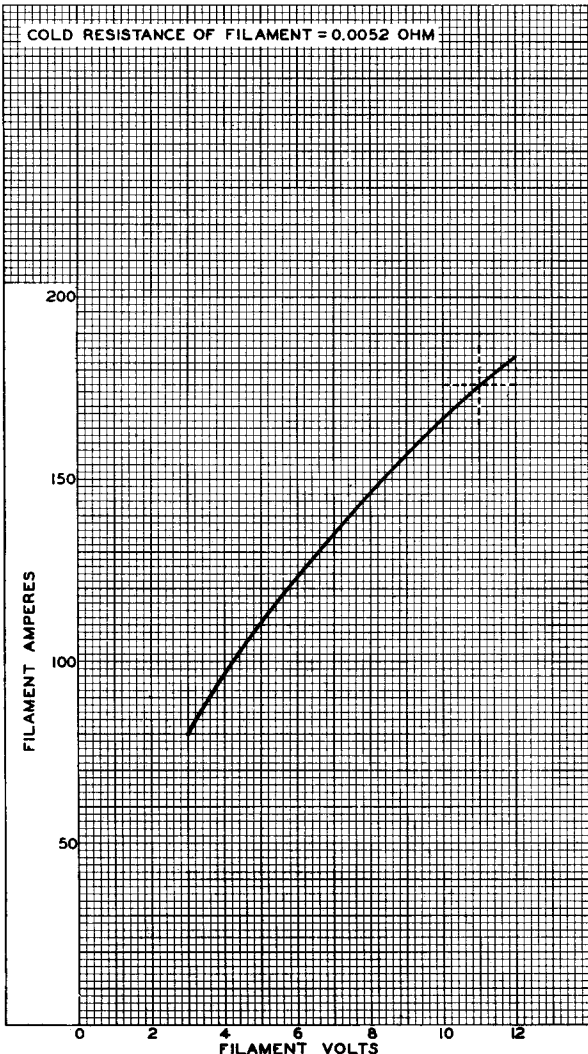


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### AVERAGE FILAMENT CHARACTERISTIC

COLD RESISTANCE OF FILAMENT = 0.0052 OHM



MAR. 2, 1955

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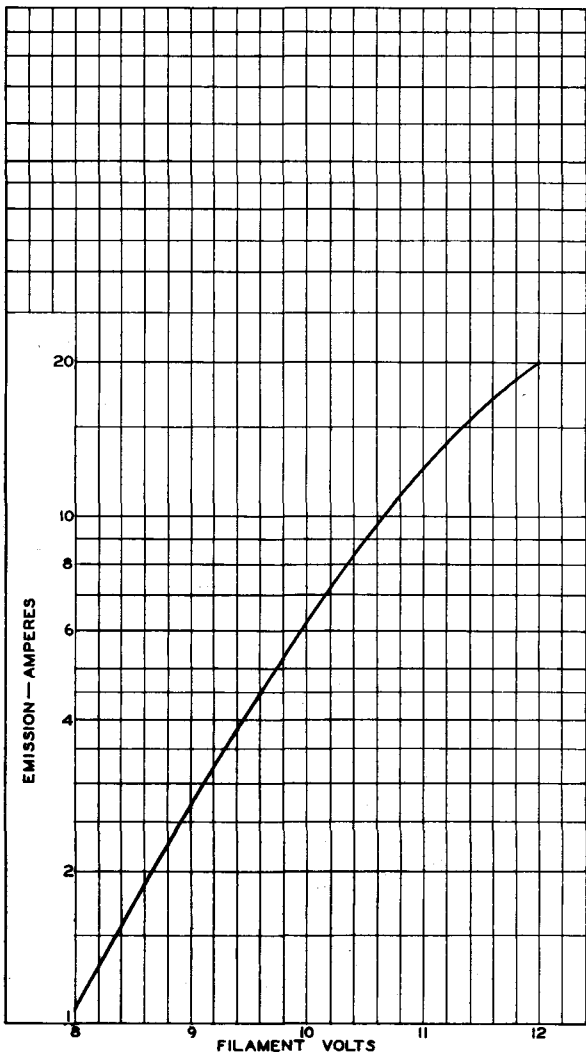
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### AVERAGE FILAMENT-EMISSION CHARACTERISTIC



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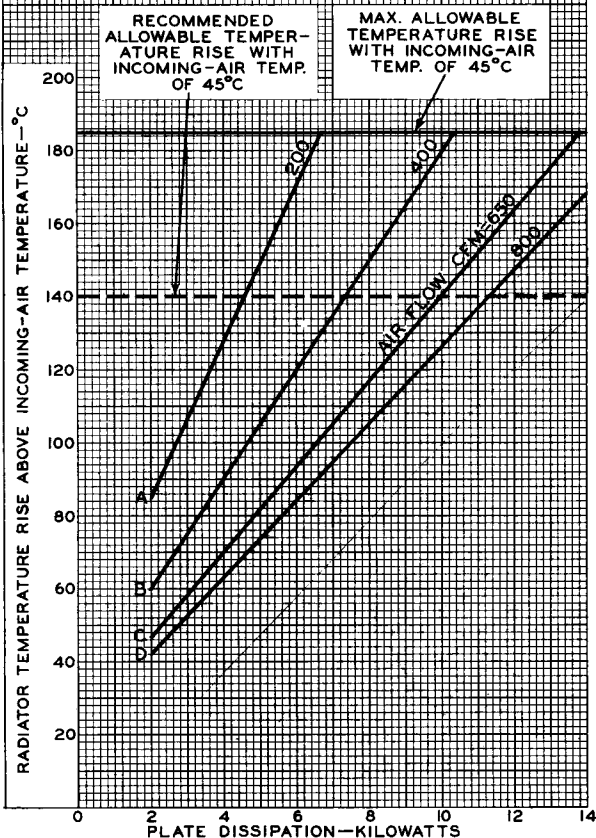
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### COOLING REQUIREMENTS

MAXIMUM RADIATOR TEMPERATURE = 230°C

CURVE	PRESSURE DROP INCHES OF WATER
A	0.2
B	0.7
C	2.0
D	2.8

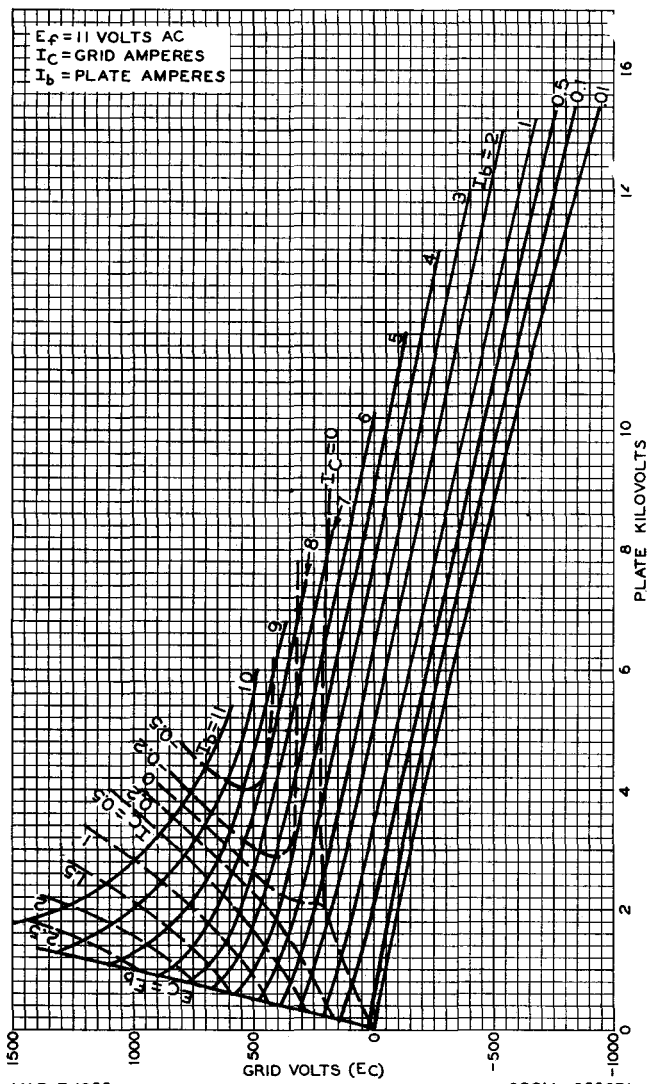


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# AVERAGE CONSTANT-CURRENT CHARACTERISTICS



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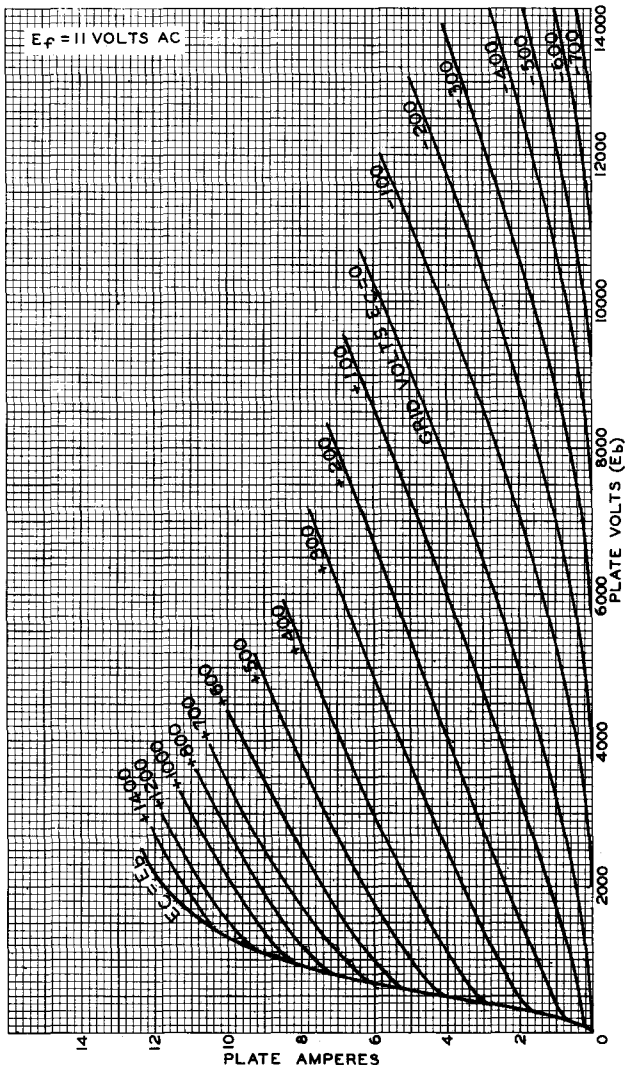
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### AVERAGE PLATE CHARACTERISTICS



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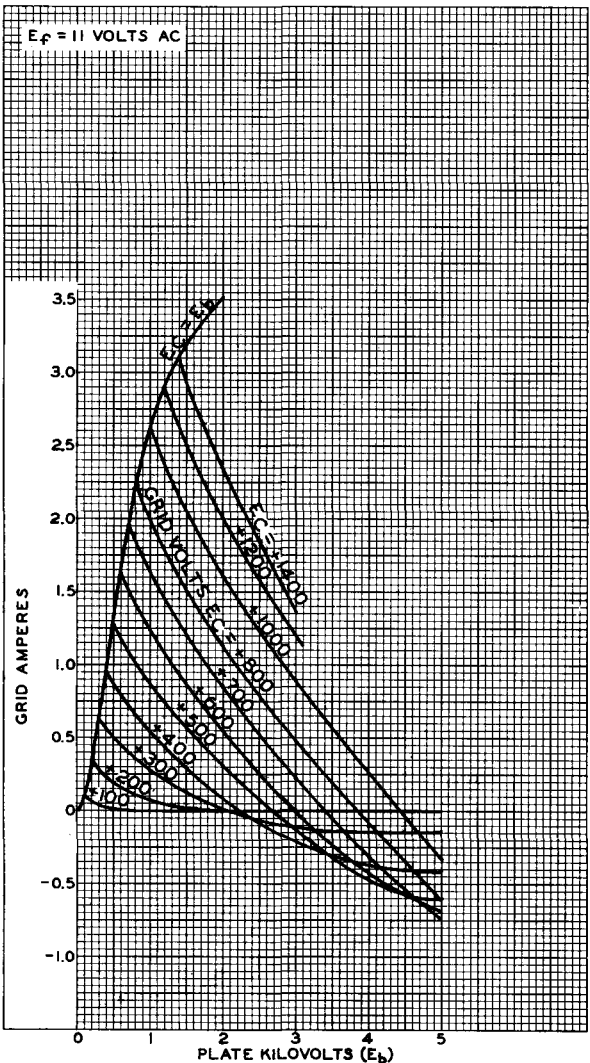
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### TYPICAL CHARACTERISTICS



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