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POWER TRIODE

FORCED-AIR COOLED, GROUNDED-GRID TYPE

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GENERAL DATA**Electrical:**

Filament, Thoriated Tungsten:

Voltage. 12.6 $\pm$ 0.6 ac or dc volts

Current. 29 amp

Starting Current: The filament current must never exceed 175 amperes, even momentarily

Cold Resistance. 0.052 ohm

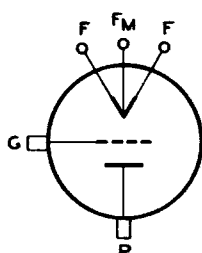
Amplification Factor 29

Direct Interelectrode Capacitances:

Grid to Plate. 18.5 μ fGrid to Filament 19 μ fPlate to Filament. 0.5 μ f**Mechanical:**

Terminal Connections:

F - Filament

FM - Filament
Mid-TapG - Grid Terminal
(Flange)P - Plate Terminal
(Radiator)

Mounting Position. Vertical, filament end up or down

Maximum Overall Length (Excluding flexible leads). . . 7-1/8"

Maximum Diameter 4-11/16"

Radiator Integral Part of Tube

Air Flow:

Through Radiator:

The specified flow of incoming air at a temperature of 45°C for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower through the radiator before and during the application of any voltages. Filament power, plate power, and air may be removed simultaneously.

Percentage of Max. Rated

Plate Dissipation for

Each Class of Service. 100 80 60 per cent

Minimum Air Flow. 190 125 75 cfm

Static Pressure 1.21 0.58 0.26 in. of water

To Header and Filament Seals 10 min. cfm

The specified air flow from a 1"-diameter nozzle should be directed into the filament header before and during the application of any voltages in order to limit the temperature of the filament seals and the grid seal to their maximum value.

Incoming Air Temperature. 45 max. °C

Radiator Temperature (Measured on the core
at end away from incoming air). . 180 max. °C

Bulb Temperature (At hottest part) 180 max. °C

Seal Temperature:

Filament, Grid, and Plate 180 max. °C

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→ **Fittings:**

Air Jacket	RCA-229F1
Air Manifold	RCA-230F1
Bracelet	RCA-231F1

→ **AF POWER AMPLIFIER & MODULATOR--Class B****Maximum CCS[®] Ratings, Absolute Values:**

DC PLATE VOLTAGE	6200 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*	1.5 max.	amp
MAX.-SIGNAL PLATE INPUT*	8700 max.	watts
PLATE DISSIPATION*	3000 max.	watts

Typical Operation:*Values are for 2 tubes*

DC Plate Voltage	4700	volts
DC Grid Voltage	-200	volts
Peak AF Grid-to-Grid Voltage	900	volts
Zero-Signal DC Plate Current	0.3	amp
Max.-Signal DC Plate Current	2.8	amp
Effective Load Resistance (Plate to plate).	3640	ohms
Max.-Signal Driving Power (Approx.)	195	watts
Max.-Signal Power Output (Approx.)	8800	watts

→ **RF POWER AMPLIFIER--Class B Television Service***Synchronizing-level conditions unless otherwise specified***Maximum CCS[®] Ratings, Absolute Values:***54 to 216 Mc*

DC PLATE VOLTAGE	3700 max.	volts
DC PLATE CURRENT	1.9 max.	amp
DC GRID CURRENT (Pedestal Level)	0.225 max.	amp
PLATE INPUT	6500 max.	watts
PLATE DISSIPATION	3000 max.	watts

Typical Operation in Grounded-Grid Circuit:*Bandwidth [▲] of 10 Mc 8.5 Mc*

DC Plate Voltage	3000	3200	volts
DC Grid Voltage	-105	-110	volts
Peak RF Grid Voltage:			
Synchronizing Level	380	435	volts
Pedestal Level	290	310	volts
DC Plate Current:			
Synchronizing Level	1.8	1.8	amp
Pedestal Level	1.36	1.35	amp

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

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	Bandwidth [▲] of 10 Mc	8.5 Mc	
DC Grid Current:			
Synchronizing Level.	0.265	0.400	amp
Pedestal Level.	0.115	0.130	amp
Driving Power (Approx.):#			
Synchronizing Level.	625	770	watts
Power Output (Approx.):			
Synchronizing Level.	3150	4000	watts
Pedestal Level.	1800	2300	watts

GRID-MODULATED RF POWER AMPLIFIER--Class C Television Service ←

*Synchronizing-level conditions unless otherwise specified*Maximum CCS[●] Ratings, Absolute Values:

	54 to 216 Mc	
DC PLATE VOLTAGE	3700 max.	volts
DC GRID VOLTAGE (White Level).	-800 max.	volts
DC PLATE CURRENT	1.9 max.	amp
DC GRID CURRENT (Pedestal Level)	0.225 max.	amp
PLATE INPUT.	6500 max.	watts
PLATE DISSIPATION.	3000 max.	watts

Typical Operation in Grounded-Grid Circuit:

	Bandwidth [▲] of 8.5 Mc	
DC Plate Voltage	3200	volts
DC Grid Voltage:		
Synchronizing Level.	-110	volts
Pedestal Level.	-220	volts
White Level.	-520	volts
Peak RF Grid Voltage	435	volts
DC Plate Current:		
Synchronizing Level.	1.8	amp
Pedestal Level.	1.25	amp
DC Grid Current (Approx.):		
Synchronizing Level.	0.400	amp
Pedestal Level.	0.130	amp
Driving Power (Approx.):#		
Synchronizing Level.	770	watts
Power Output (Approx.):		
Synchronizing Level.	4000	watts
Pedestal Level.	2300	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[●] Ratings, Absolute Values: [□]

DC PLATE VOLTAGE	5000 max.	volts
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[▲] Computed between half-power points and based on tube output capacitance only.

Computed value to supply grid losses and feed-through power. Additional power will be required to supply circuit losses.

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DC GRID VOLTAGE**	...	-1000 max.	volts
DC PLATE CURRENT	...	1 max.	amp
DC GRID CURRENT**	...	0.3 max.	amp
PLATE INPUT	...	5000 max.	watts
PLATE DISSIPATION	...	2000 max.	watts

Typical Operation in Grounded-Filament Circuit:

Up to 30 Mc At 110 Mc

DC Plate Voltage	4700	4000	volts
DC Grid Voltage	-400	-350	volts
From a grid resistor of	1425	1460	ohms
Peak RF Grid Voltage ^o	675	600	volts
DC Plate Current	0.96	0.93	amp
DC Grid Current (Approx.) ^{□□}	0.28	0.24	amp
Driving Power (Approx.) ^{□□}	170	130	watts
Power Output (Approx.)	3700	2800	watts

Typical Operation in Grounded-Grid Circuit:

DC Plate Voltage	4700	4000	volts
DC Grid Voltage	-400	-350	volts
From a grid resistor of	1425	1460	ohms
Peak RF Grid Voltage	675	600	volts
DC Plate Current	0.96	0.93	amp
DC Grid Current (Approx.) ^{□□}	0.28	0.24	amp
Driving Power (Approx.) ^{□□■}	720	600	watts
Power Output (Approx.)	4200	3200	watts

→ RF POWER AMPLIFIER & OSCILLATOR--Class C Telegraphy^{▲▲}
and

RF POWER AMPLIFIER--Class C FM Telephony

Maximum CCS^o Ratings, Absolute Values:[□]

DC PLATE VOLTAGE	6200 max.	volts
DC GRID VOLTAGE**	-1000 max.	volts
DC PLATE CURRENT	1.4 max.	amp
DC GRID CURRENT**	0.3 max.	amp
PLATE INPUT	8700 max.	watts
PLATE DISSIPATION	3000 max.	watts

Typical Operation in Grounded-Filament Circuit:

Up to 30 Mc

DC Plate Voltage	6000	volts
DC Grid Voltage:		
From a fixed supply of	-550	volts
From a grid resistor of	1900	ohms
From a cathode resistor of	360	ohms

^o Driver modulated approximately 30%.[□] Carrier power of driver modulated 100%.

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

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Up to 30 Mc

Peak RF Grid Voltage	875	volts
DC Plate Current	1.25	amp
DC Grid Current (Approx.) ^{□□}	0.290	amp
Driving Power (Approx.) ^{□□}	225	watts
Power Output (Approx.)	6000	watts

Typical Operation in Grounded-Grid Circuit:

	Up to 30 Mc	At 110 Mc	At 220 Mc	
DC Plate Voltage	6000	5000	3000	volts
DC Grid Voltage:				
From a fixed supply of	-550	-1000	-160	volts
From a grid resistor of	1900	4100	670	ohms
From a cathode resistor of	360	740	110	ohms
Peak RF Grid Voltage	875	1350	410	volts
DC Plate Current	1.25	1.1	1.25	amp
DC Grid Current (Approx.) ^{□□}	0.290	0.245	0.240	amp
Driving Power (Approx.) ^{□□}	1225	1680	510	watts
Power Output (Approx.)	7000	5500	2650	watts

SELF-RECTIFYING OSCILLATOR or AMPLIFIER--Class C

Maximum CCS[•] Ratings, Absolute Values: [□]

AC PLATE VOLTAGE (RMS)	7000 max.	volts
DC GRID VOLTAGE**	-300 max.	volts
DC PLATE CURRENT	0.635 max.	amp
DC GRID CURRENT**	0.135 max.	amp
PLATE INPUT†	4900 max.	watts
PLATE DISSIPATION	3000 max.	watts

Typical Operation

AC Plate Voltage (RMS)	6600	volts
DC Grid Voltage	-127	volts
DC Plate Current	0.625	amp
DC Grid Current (Approx.) ^{□□}	0.105	amp
Driving Power (Approx.) ^{• □□}	60	watts
Power Output (Approx.)	3350	watts

AMPLIFIER or OSCILLATOR--Class C

With separate, rectified, unfiltered, single-phase,
full-wave plate supply

Maximum CCS[•] Ratings, Absolute Values:

DC PLATE VOLTAGE	5600 max.	volts
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† Plate input is 1.11 times the product of the ac voltage (rms) and the dc plate current.

• From a self-rectified driver.

□ These ratings hold for operation up to 30 Mc. For ratings at higher frequencies, see RATINGS vs FREQUENCY on next sheet.

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DC GRID VOLTAGE**		-600 max.	volts
DC PLATE CURRENT		1.25 max.	amp
DC GRID CURRENT**		0.270 max.	amp
PLATE INPUT ††		8600 max.	watts
PLATE DISSIPATION		3000 max.	watts

Typical Operation:

DC Plate Voltage		5000	volts
DC Grid Voltage		-260	volts
DC Plate Current		1.2	amp
DC Grid Current (Approx.) □□		0.260	amp
Driving Power (Approx.) ♦ □□		150	watts
Power Output (Approx.)		5650	watts

● Continuous Commercial Service.

** See RATINGS VS FREQUENCY—*Max. Permissible Percentage of Max. Rated DC Grid Voltage and DC Grid Current* on next page.

□□ For effect of load resistance on grid current and driving power, refer to TUBE RATINGS—*Grid Current and Driving Power* in the General Section.

†† Plate input is 1.23 times the product of the dc plate voltage and the dc plate current.

♦ From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	27	31	amp
Filament Starting Current	—	—	175	amp
Amplification Factor	1,2	25	33	
Grid-Plate Capacitance	—	16.5	20.5	μuf
Grid-Filament Capacitance	—	15.5	22.5	μuf
Plate-Filament Capacitance	—	0.38	0.62	μuf
Grid Voltage	1,3	—	+450	volts
Grid Voltage	1,4	-125	-190	volts
Grid Current	1,3	—	3	amp
Plate Voltage	1,5	1350	1750	volts
Plate Voltage	1,6	2600	3400	volts
Peak Cathode Current	7	10	—	amp
Useful Power Output	1,8	3	—	kw

Note 1: With 12.6 volts rms on filament.

Note 2: With dc grid voltage of -25 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

Note 3: With dc plate voltage of 500 volts, and instantaneous plate current of 6 amperes.

Note 4: With dc plate voltage of 4000 volts, and dc grid voltage adjusted to give dc plate current of 0.05 ampere.

Note 5: With dc grid voltage of 0 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.



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Note 6: With dc grid voltage of -50 volts measured from center tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

Note 7: Designers should limit the maximum useable cathode current (plate current and grid current) to this value under any condition of operation.

Note 8: In a self-excited, coaxial, oscillator circuit and with dc plate voltage of 5000 volts, dc plate current of 1.1 amperes, grid resistor of $1500 \pm 10\%$ ohms, dc grid current of 0.250 to 0.300 ampere, and frequency of 110 Mc.

RATINGS vs FREQUENCY

FREQUENCY	30	110	220	Mc
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MAX. PERMISSIBLE PERCENTAGE
OF MAX. RATED PLATE VOLTAGE
AND PLATE INPUT:

Class B Television Service	Full Ratings--54 to 216 Mc			
Class C Television Service	Full Ratings--54 to 216 Mc			
Class C Telephony, Plate Modulated	100	84	52	per cent
Class C Telegraphy and FM Telephony	100	84	52	per cent
Class C Amplifier or Osc., Self-Rectifying	100	84	52	per cent
Class C Amplifier or Osc. with Separate, Rectified, Unfiltered Plate Supply	100	84	52	per cent

MAX. PERMISSIBLE PERCENTAGE
OF MAX. RATED DC GRID VOLT-
AGE AND DC GRID CURRENT:

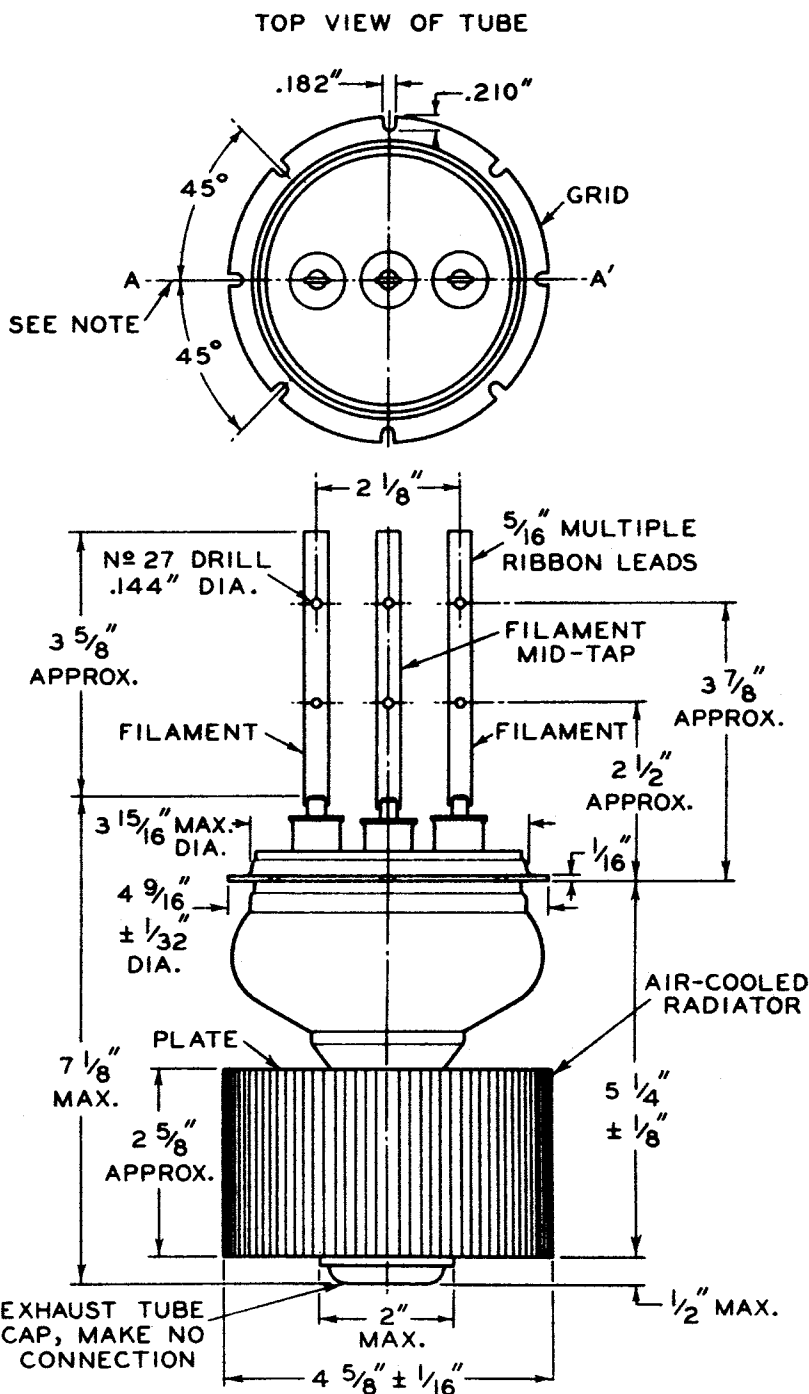
Class B Television Service	Full Ratings--54 to 216 Mc				
Class C Television Service	Full Ratings--54 to 216 Mc				
			<i>Volt.</i>	<i>Cur.</i>	
Class C Telephony, Plate-Modulated	100	100	60	83	per cent
Class C Telegraphy and FM Telephony	100	100	60	83	per cent
Class C Amplifier or Osc., Self-Rectifying	100	100	60	83	per cent
Class C Amplifier or Osc. with Separate, Rectified, Unfiltered Plate Supply	100	100	60	83	per cent

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NOTE: PLANE OF FILAMENT LEADS WILL NOT DEVIATE MORE THAN $3-1/2^\circ$ FROM PLANE PASSING THROUGH AA' NORMAL TO GRID FLANGE.



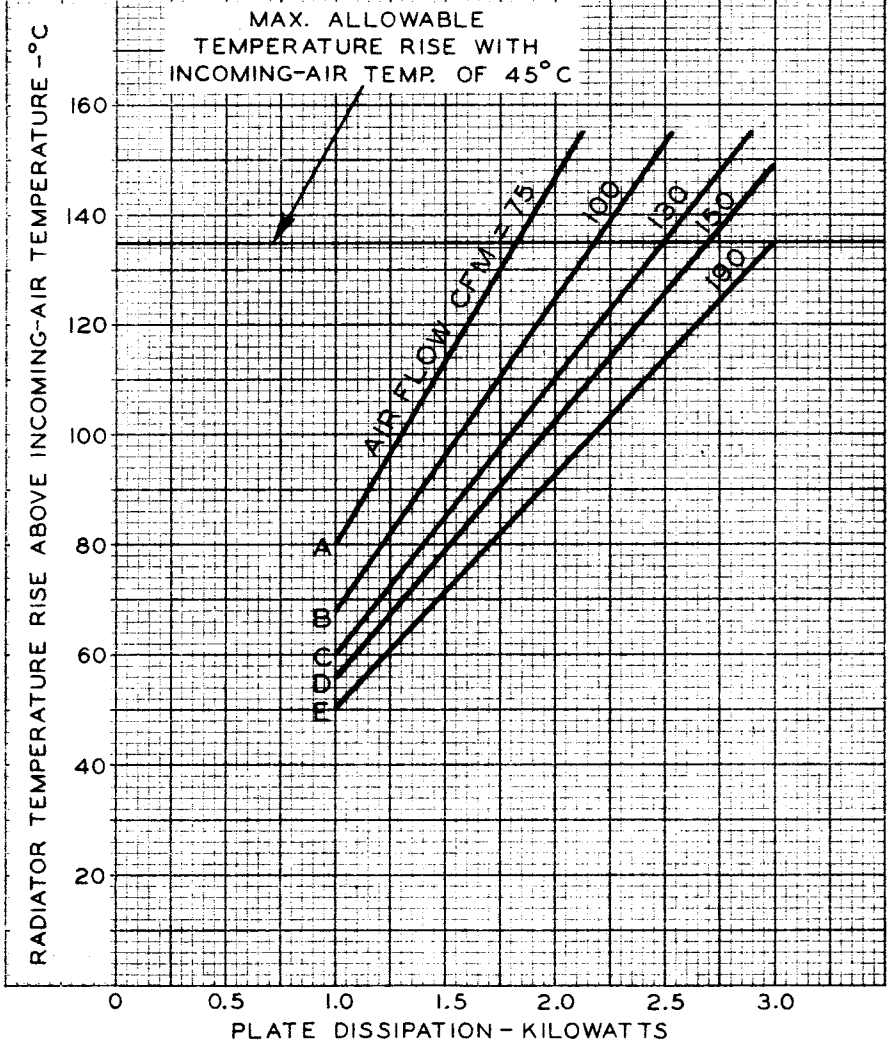
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COOLING REQUIREMENTS

 $E_f = 12.6$ VOLTS ACMAXIMUM RADIATOR TEMPERATURE = 180°C

CURVE	PRESSURE DROP INCHES OF WATER	CURVES TAKEN ACCORD- ING TO NAFM* STAND- ARDS - BULLETIN N° 103 *NATIONAL ASSOCIATION OF FAN MFRS., GENERAL MOTORS BLDG., DETROIT, MICH.
A	0.26	
B	0.40	
C	0.61	
D	0.80	
E	1.21	

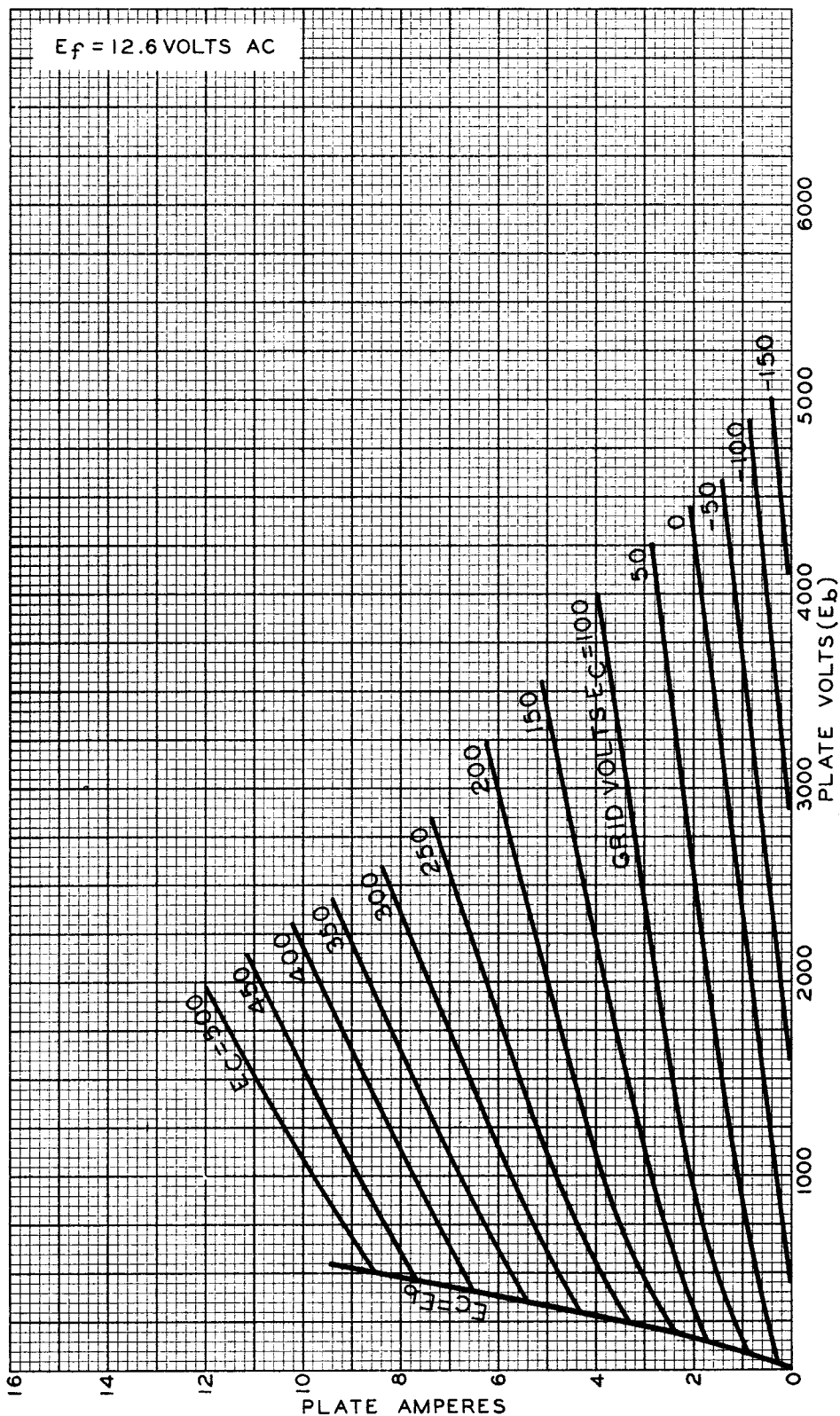


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AVERAGE PLATE CHARACTERISTICS



SEPT. 24, 1948

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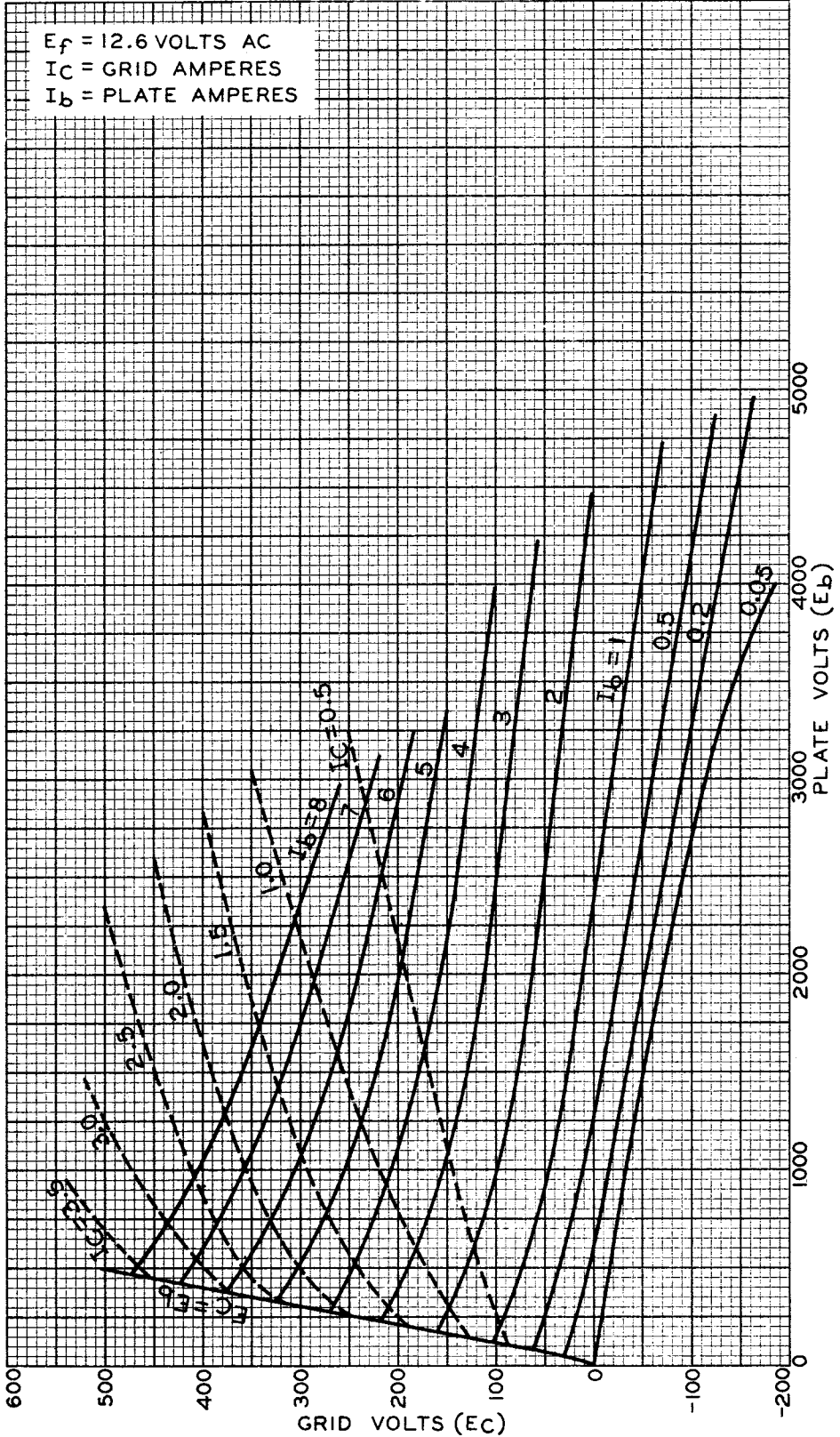
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AVERAGE CONSTANT-CURRENT CHARACTERISTICS



OCT. 1, 1948

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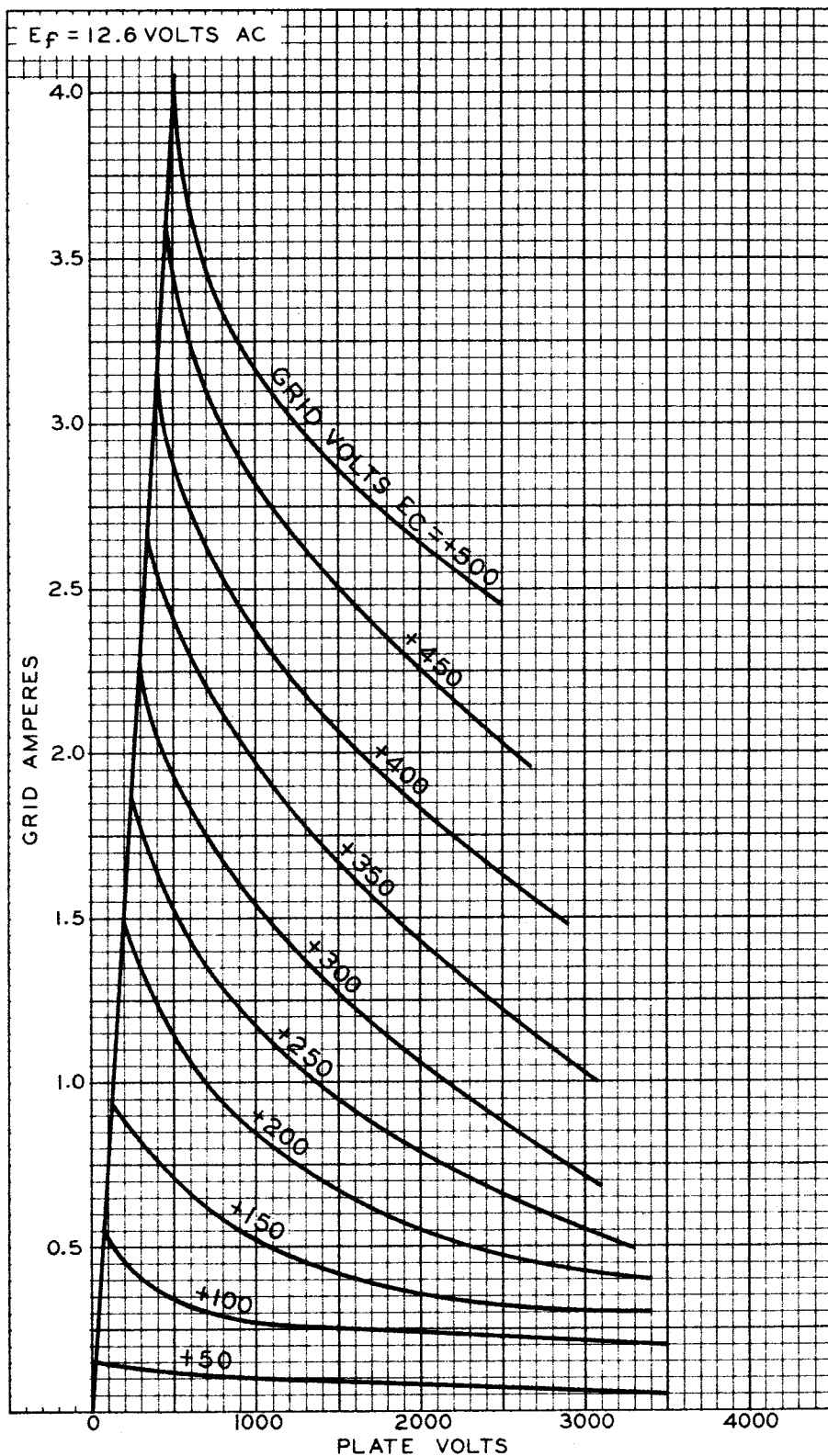
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TYPICAL GRID CHARACTERISTICS



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