8121

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS — 170 WATTS PEP OUTPUT AT 30 MHz

COAXIAL-ELECTRODE STRUCTURE — 235 WATTS CW OUTPUT AT 470 MHz

UNIPOTENTIAL CATHODE — INTEGRAL RADIATOR

Full Ratings up to 500 MHz

ELECTRICAL

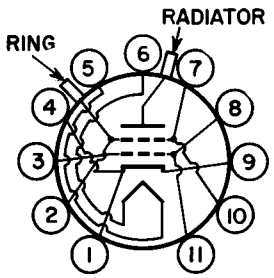
Heater, for Unipotential Cathode		
Voltage (AC or DC)[a]	13.5 ± 10%	V
Current at 13.5 volts	1.3	A
Minimum heating time	60	s
Mu-Factor, Grid No.2 to Grid No.1	12	
Plate volts = 450, grid No.2 volts = 325, plate A = 1.2		
Direct Interelectrode Capacitances[b]		
Grid No.1 to plate	0.13 max	pF
Grid No.1 to cathode	16	pF
Plate to cathode	0.011	pF
Grid No.1 to grid No.2	24	pF ←
Grid No.2 to plate	6.5	pF
Grid No.2 to cathode	2.6	pF ←
Cathode to heater	3.4	pF

MECHANICAL

Operating Position	Any
Maximum Overall Length	2.196 in
Seated Length	1.850 ± 0.065 in
Greatest Diameter	1.460 ± 0.015 in ←
Weight (Approx.)	3 oz
Socket	Mycalex[c] No.CP464-2, or equivalent
Base	Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

TERMINAL DIAGRAM (Bottom View)

Pin 1 – Cathode
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Cathode
Pin 5 – Heater
Pin 6 – Heater
Pin 7 – Grid No.2
Pin 8 – Grid No.1
Pin 9 – Cathode



Pin 10 – Grid No.2
Pin 11 – Grid No.1
RADIATOR – Plate Terminal
RING[d] – Grid-No.2 Terminal Contact Surface

THERMAL

Terminal Temperature (All Terminals)	250	°C
Radiator Core Temperature		
See *Dimensional Outline*	250	°C
Air Flow		
See accompanying *Typical Cooling Requirements* curve.		

← Indicates a change.

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

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

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
DC Plate Voltage	2200	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
DC Plate Current at Peak of Envelope	450[e]	mA
DC Grid-No.1 Current	100	mA
Plate Dissipation	150	W
Grid-No.2 Dissipation	8	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Typical CCS Operation with "Two-Tone Modulation"

	At 30 MHz		
DC Plate Voltage	1000	1500	V
DC Grid-No.2 Voltage[f]	250	250	V
DC Grid-No.1 Voltage[f]	-20	-20	V
Zero-Signal DC Plate Current	100	100	mA
Effective RF Load Resistance	2270	3800	Ω
DC Plate Current			
Peak of envelope	210	210	mA
Average	160	160	mA
DC Grid-No.2 Current			
Peak of envelope	10	10	mA
Average	7	7	mA
Average DC Grid-No.1 Current	0.05[g]	0.05[g]	mA
Peak-of-Envelope Driver Power Output (Approx.)[h]	0.3	0.3	W
Output-Circuit Efficiency (Approx.)	90	85	%
Distortion Products Level[j]			
Third order	35	35	dB
Fifth order	40	40	dB
Useful Power Output (Approx.)			
Peak of envelope	110[k]	170[k]	W
Average	55[k]	85[k]	W

Maximum Circuit Values

Grid-No.1-Circuit Resistance Under Any Condition		
With fixed bias	25000	Ω
With fixed bias (In Class AB_1 operation)	100000	Ω
With cathode bias	Not recommended	
Grid-No.2-Circuit Impedance	10000	Ω
Plate-Circuit Impedance	m	

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values

	Up to 500 MHz	
→ DC Plate Voltage	1800	V
DC Grid-No.2 Voltage	400	V
DC Grid-No.1 Voltage	-100	V
→ DC Plate Current	250	mA
DC Grid-No.1 Current	100	mA
→ Grid-No.2 Input	5	W
→ Plate Dissipation	105	W
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode	150	V
Heater positive with respect to cathode	150	V

Typical CCS Operation

In grid-drive circuit at frequency of	*50*			*470*			*MHz*
DC Plate Voltage	700	1000	1500	700	1000	1500	V
DC Grid-No.2 Voltage	175	200	200	200	200	200	V
DC Grid-No.1 Voltage	-10	-30	-30	-30	-30	-30	V
DC Plate Current	300	300	300	300	300	300	mA
DC Grid-No.2 Current	25	20	20	10	10	5	mA
DC Grid-No.1 Current	50	40	40	30	30	30	mA
Driver Power Output (Approx.)[h]	1.2	2	2	5	5	5	W
Useful Power Output	120[k]	175[k]	275[k]	100[p]	165[p]	235[p]	W

Maximum Circuit Values

Grid-No.1-Ciruit Resistance Under Any Condition		
With fixed bias	25000 max	Ω
Grid-No.2-Circuit Impedance	10000 max	Ω
Plate-Circuit Impedance	m	

[a] Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz, heater volts = 12.5 (Approx.).

[b] Measured with special shield adapter.

[c] Mycalex Corporation of America, 125 Clifton Boulevard, Clifton, New Jersey.

[d] For use at higher frequencies.

[e] 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 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

[f] Obtained preferably from a separate, well regulated source.

[g] 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.

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

[j] With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

[k] This value of useful power is measured at load of output circuit.

→ Indicates a change.

[m] The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

[n] Driver power output includes circuit losses and is the actual power measured as the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

[p] Measured in a typical coaxial-cavity circuit.

CHARACTERISTICS RANGE VALUES

Test No.	*Note*	*Min*	*Max*	
1. Heater Current	1	1.15	1.45	A
2. Direct Interelectrode Capacitances	2			
Grid No.1 to plate	-	-	0.13	pF
Grid No.1 to cathode	-	14.3	17.7	pF
Plate to cathode	-	0.0065	0.0155	pF
Grid No.1 to grid No.2	-	20.8	25.2	pF
Grid No.2 to plate	-	5.7	7.1	pF
Grid No.2 to cathode	-	2.0	3.0	pF
Cathode to heater	-	2.5	4.1	pF
3. Grid-No.1 Voltage	1,3	-8	-19	V
4. Reverse Grid-No.1 Current	1,3	-	-25	μA
5. Grid-No.2 Current	1,3	-7	+6	mA
6. Peak Emission	1,4	13	-	peak A
7. Interelectrode Leakage Resistance	5	1	-	MΩ

Note 1: With 13.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 p/s. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

Note 5: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.

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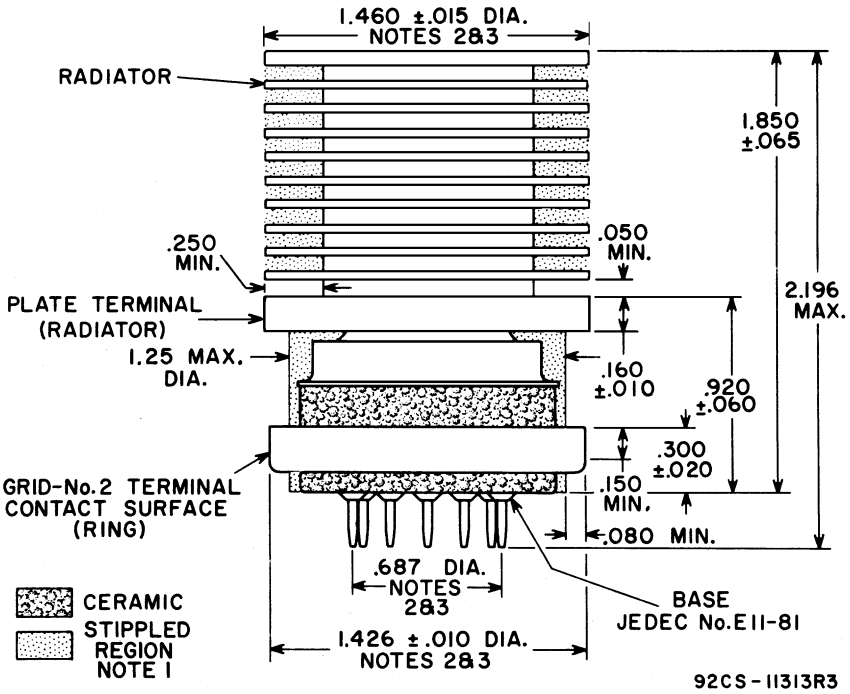
DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

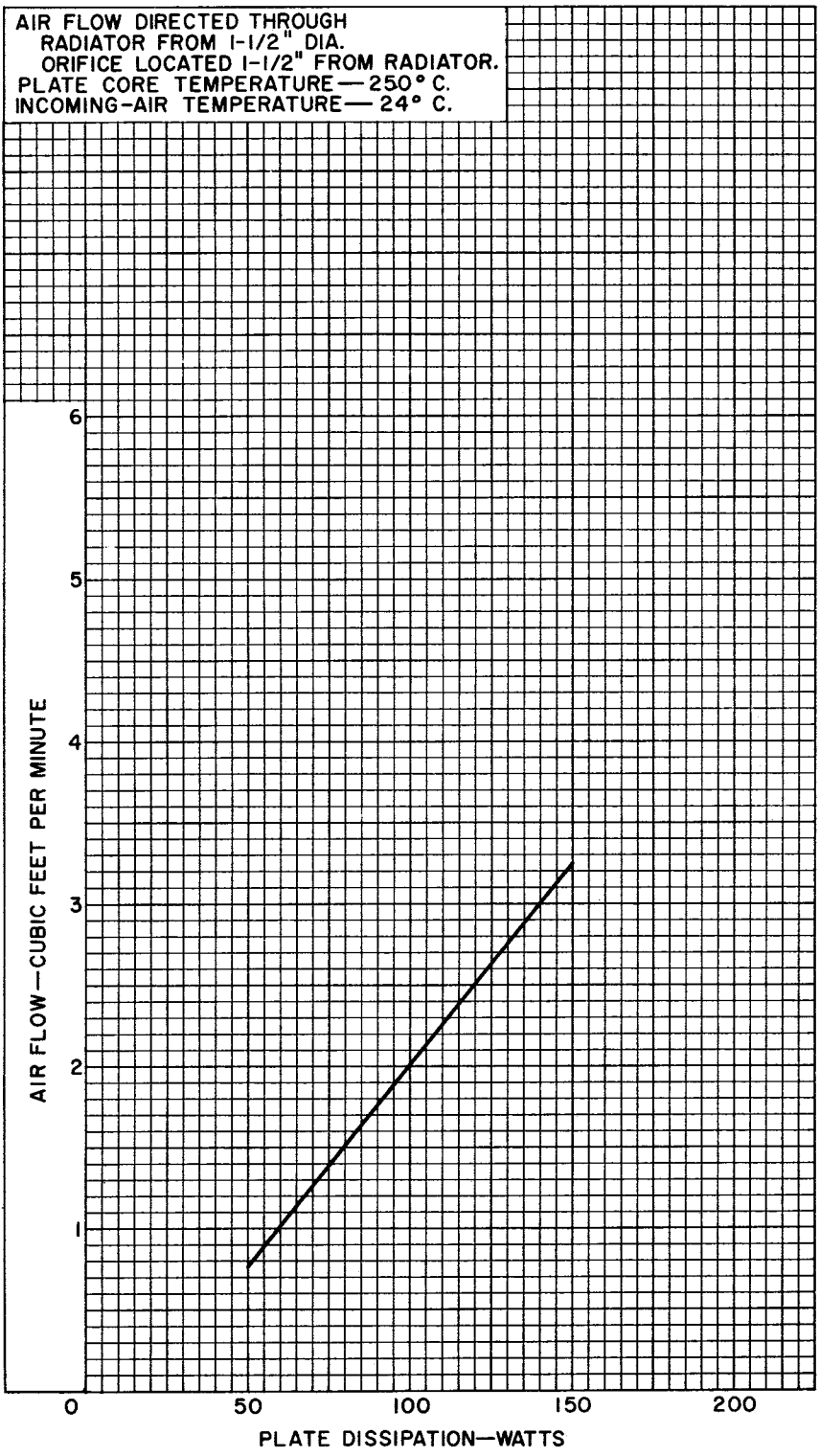
Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Note 2: The diameters of the radiator, grid-No. 2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

Radiator to Grid-No. 2 Terminal Contact Surface	0.030 inch max
Radiator to Pin Circle	0.040 inch max
Grid-No. 2 Terminal Contact Surface to Pin Circle	0.030 inch max

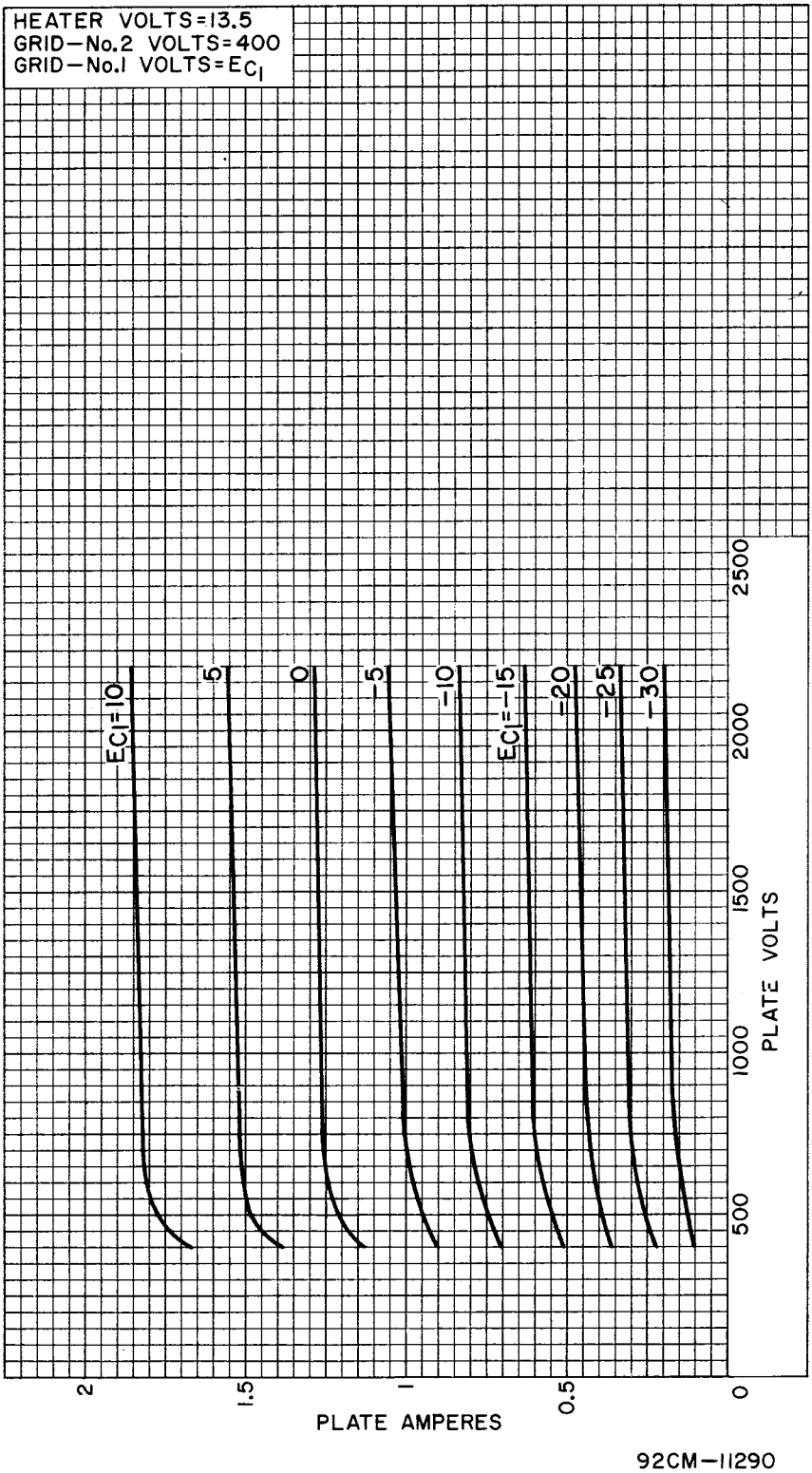
Note 3: The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of run-out and ellipticity.

TYPICAL COOLING REQUIREMENTS



92CM-11298

TYPICAL PLATE CHARACTERISTICS



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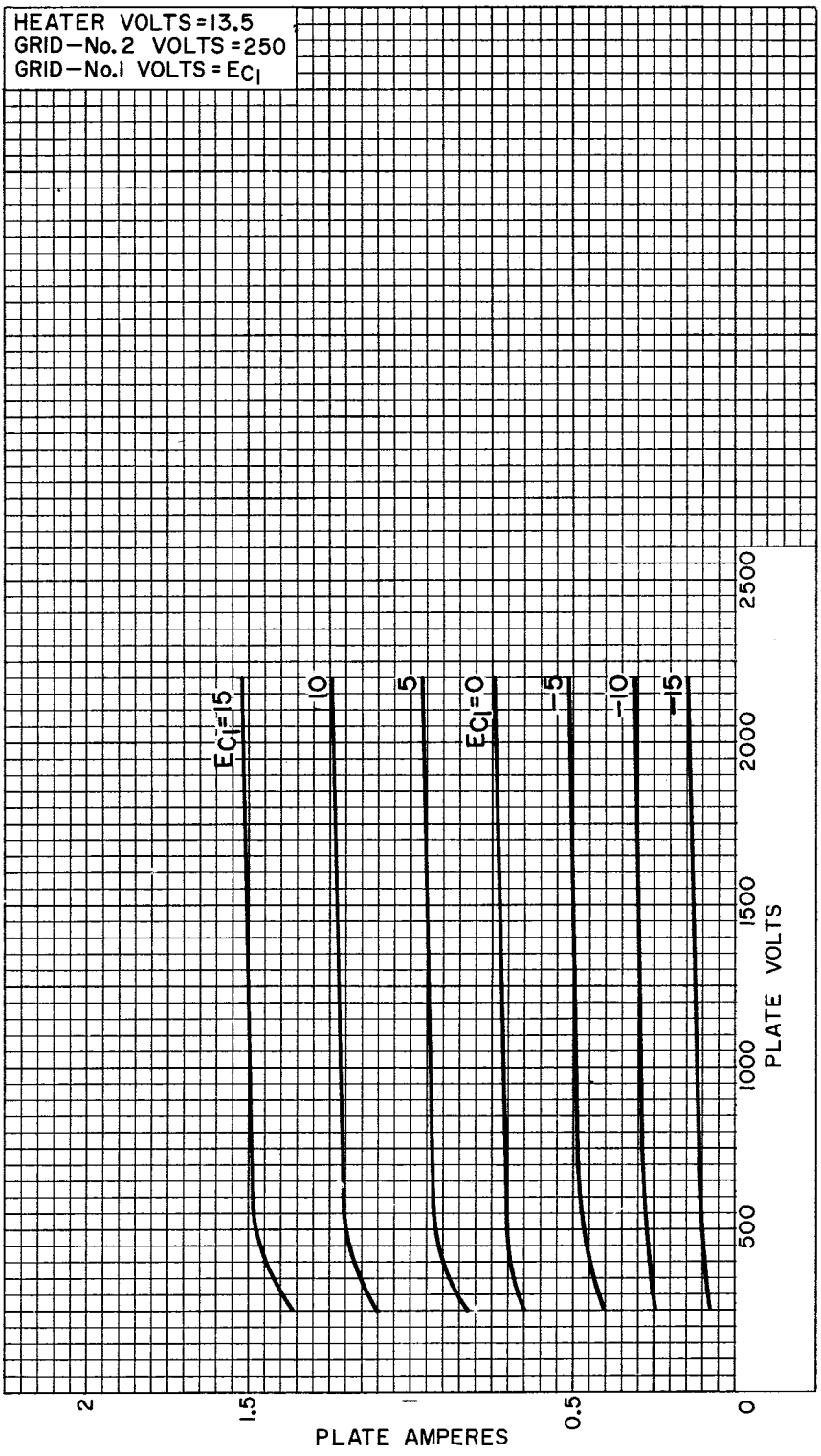
TYPICAL PLATE CHARACTERISTICS



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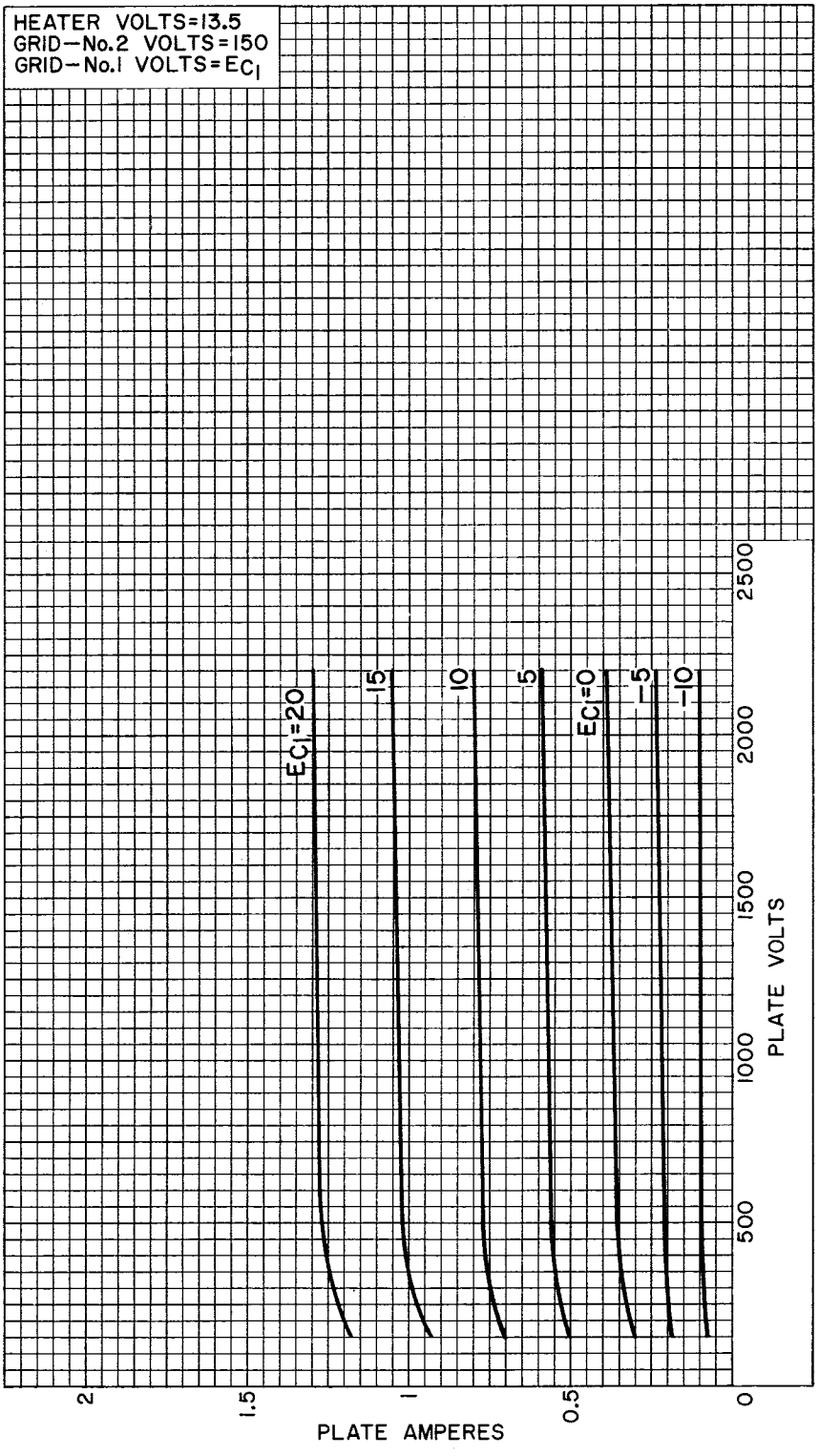
TYPICAL PLATE CHARACTERISTICS



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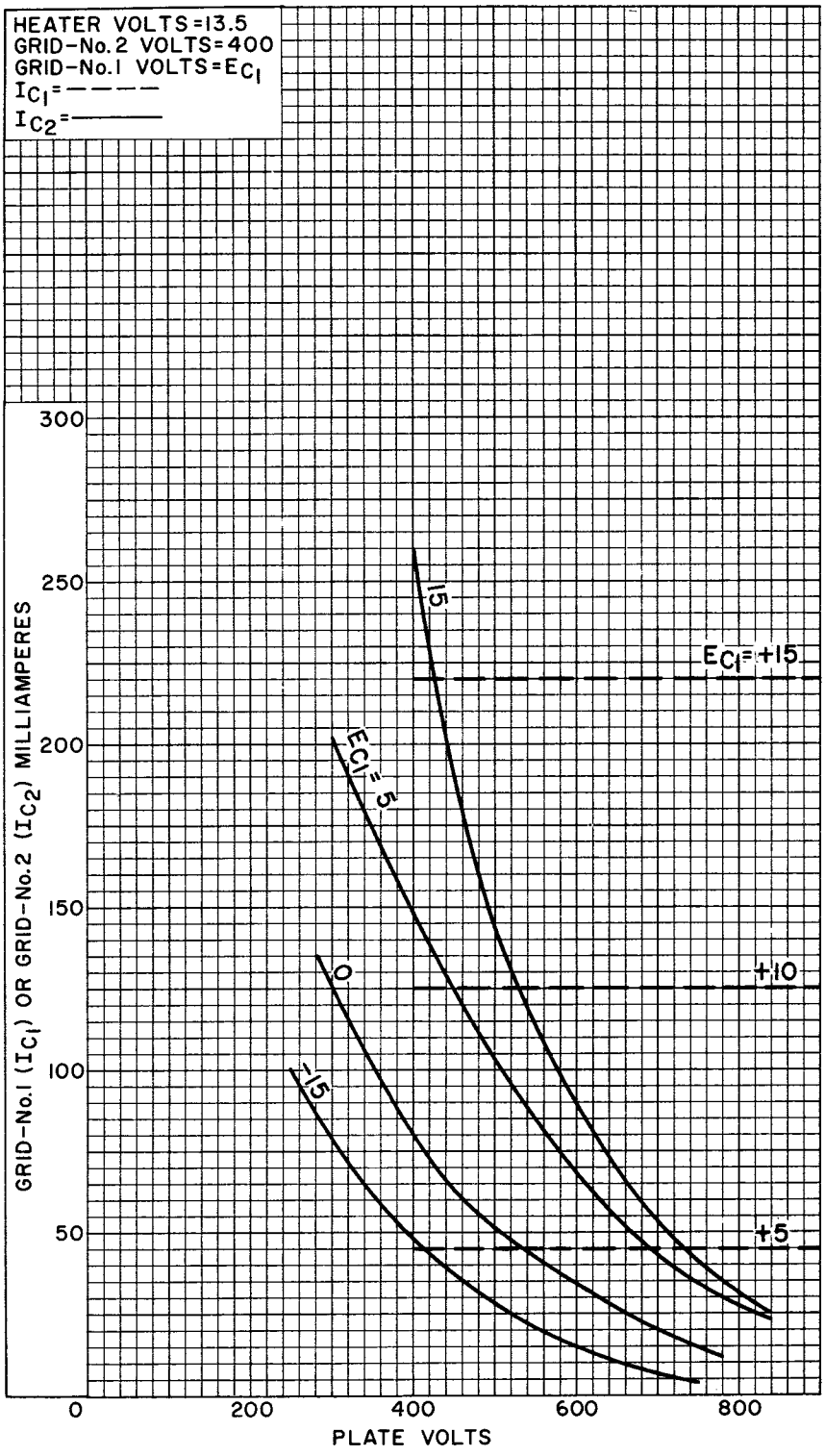
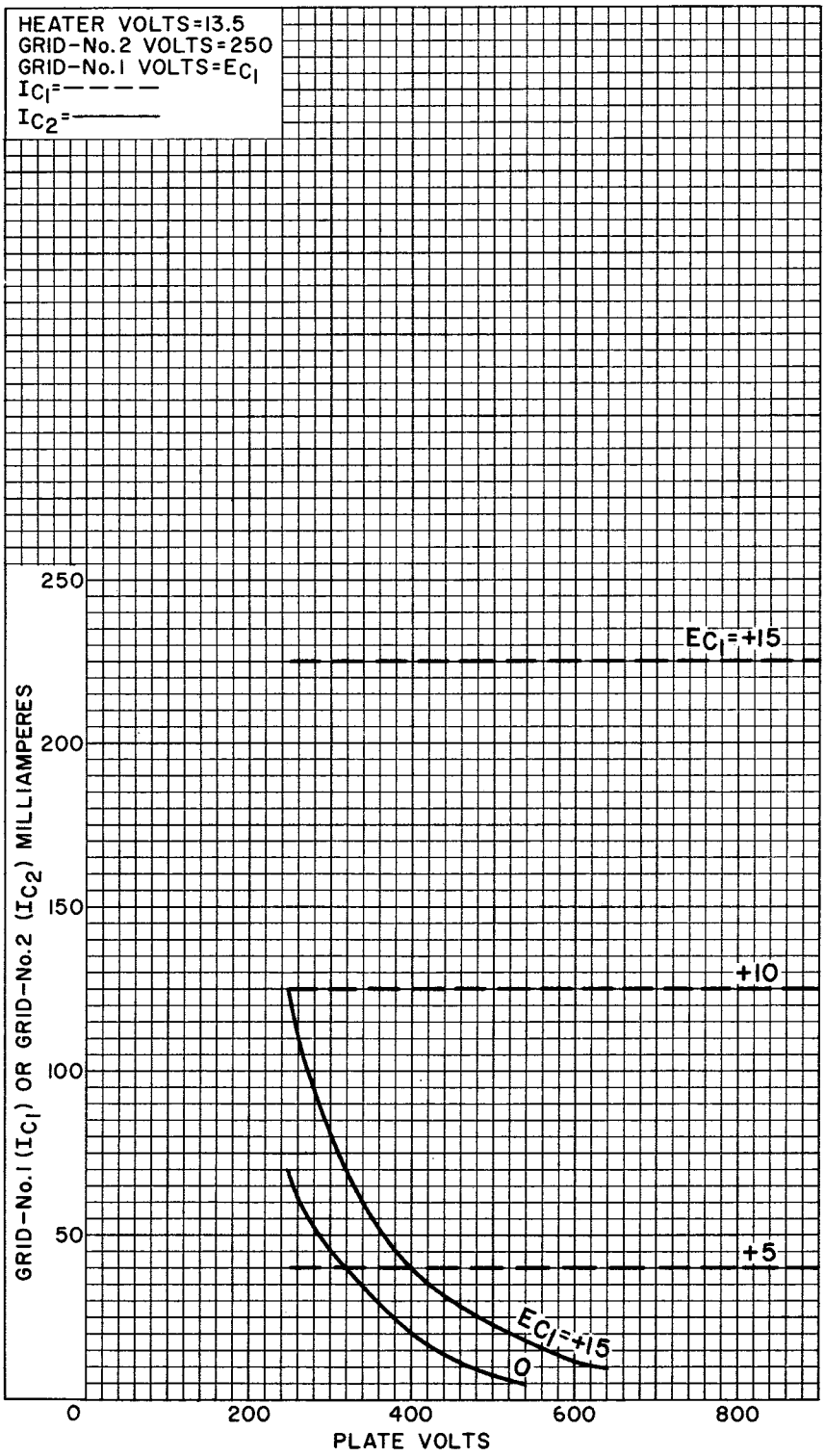
TYPICAL CHARACTERISTICS



92CM-11293RI

TYPICAL CHARACTERISTICS



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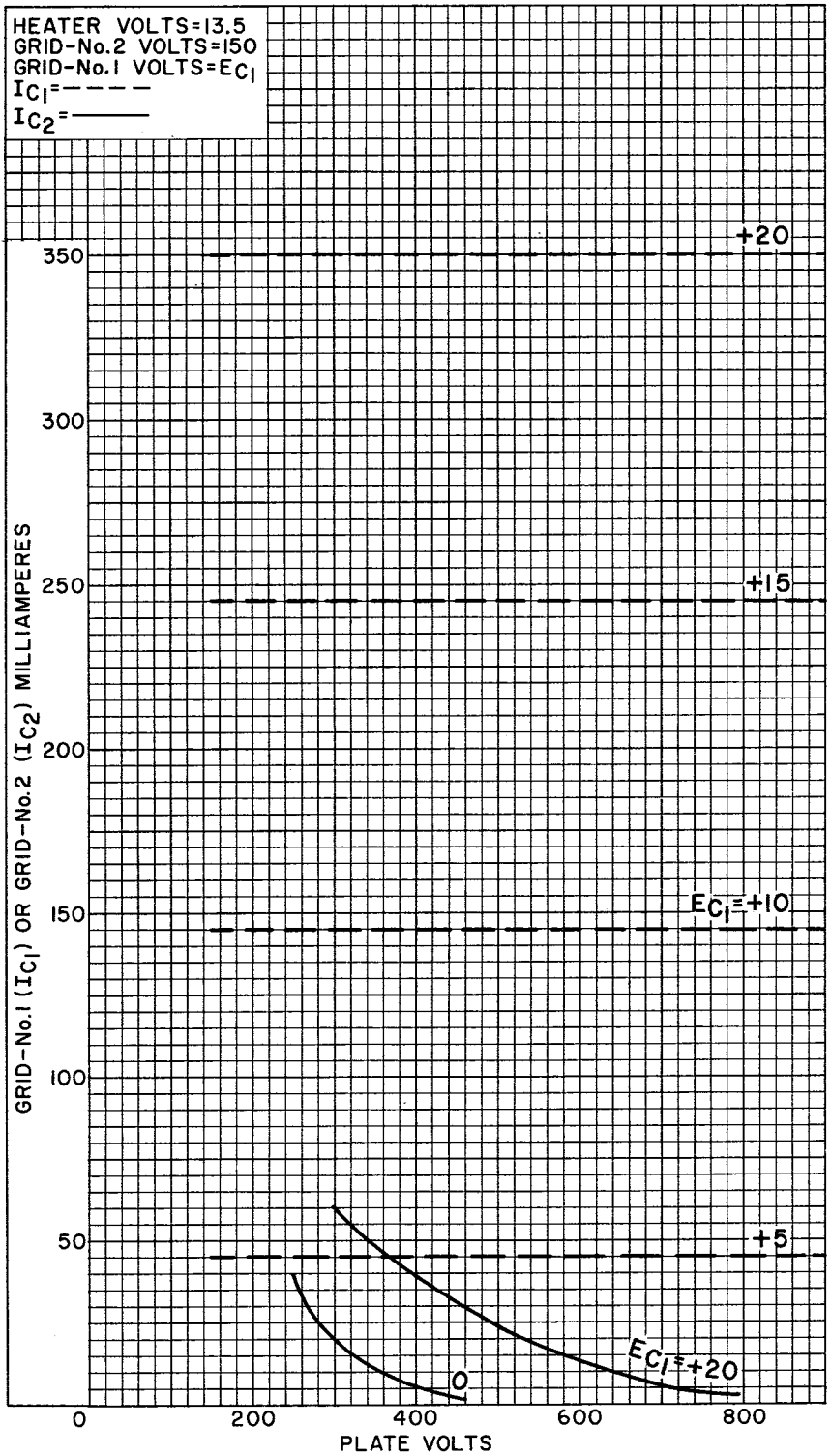
TYPICAL CHARACTERISTICS



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