MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DC
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude[2]	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage[3]	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[4]	Unshielded
Grid No. 1 to Plate	0.015	0.030 μμf Max.
Grid No. 3 to Plate	1.10	1.10 μμf Max.
Grid No. 1 to All Other Electrodes	4.00	4.00 μμf
Grid No. 3 to All Other Electrodes	4.00	3.80 μμf
Plate to All Other Electrodes	3.40	1.90 μμf
Grid No. 1 to Grid No. 3	0.15	0.17 μμf Max.

RATINGS[1 & 5] (Absolute Maximum)

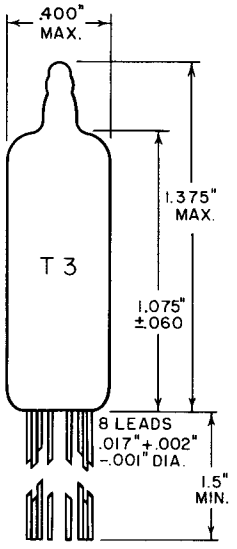
Plate Voltage	165 Vdc
Peak Plate Forward Voltage[6]	330 v
Grid No. 2 Voltage	155 Vdc
DC Grid No. 3 Voltage	
Positive Value	30 Vdc
Negative Value	55 Vdc
DC Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.7 W
Plate Current	11 mAdc
Grid No. 3 Current	2 mAdc
Grid No. 2 Current	7 mAdc
Grid No. 1 Current	2 mAdc
Cathode Current	16 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid No. 1 Circuit Resistance	1.1 Meg

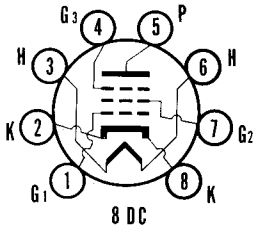
CHARACTERISTICS

	Dual Control Amplifier		Mixer
Plate Voltage	100	100	100 Vdc
Grid No. 2 Voltage	100	100	100 Vdc
Grid No. 3 Voltage	−1	Note 7	0 Vdc
			15 Vac
Cathode Resistor	150	150	150 Ohms
Plate Current	4.0	5.3	3.5 mAdc
Grid No. 2 Current	5.8	3.6	5.7 mAdc
Grid No. 1 Transconductance	1950	3200	— μmhos

QUICK REFERENCE DATA

The Premium Subminiature Type 5636 is a sharp cutoff, dual control pentode intended for use as a gated amplifier. The Type 5636 is designed for operation under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA

FEBRUARY 1957

CHARACTERISTICS (Continued)

Grid No. 3 Transconductance	950	500	— μmhos
Plate Resistance	50000	110000	320000 Ohms
Grid No. 1			
Voltage for Ib = 100 μAdc	—	-7.5	— Vdc Max.
Grid No. 3			
Voltage for Ib = 100 μAdc	-8	—	— Vdc Max.
Conversion Transconductance	—	—	1400 μmhos

NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded reduction of instantaneous voltage (Ef excluded) may be required.*
3. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.*
4. *External shield of 0.405 inch diameter connected to cathode.*
5. *Values shown are as registered with RETMA.*
6. *Per MIL-E-1C Par. 6.5 and General Section of this Sylvania Subminiature Tube Manual titled Specifications and Ratings.*
7. *Grid No. 3 connected to cathode.*

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage	6.3 V	Grid No. 3 Voltage MIL-E-1 Par. 3.2.2.1	0 V
Plate Voltage	100 Vdc	Heater-Cathode Voltage MIL-E-1 Par. 3.2.2.1	0 V
Grid No. 1 Voltage	0 V	Cathode Resistor	150 Ohms
Grid No. 2 Voltage	100 Vdc		

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7	(Method A)							
4.10.8	Heater Current: ALD = 12	—	—	144	150	156	—	mA
4.10.8	Heater Current:	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage:	0.65	—	—	—	—	—	
	Ehk = +100 Vdc	—	—	—	—	—	5.0	μAdc
	Ehk = -100 Vdc	—	—	—	—	—	5.0	μAdc
4.10.6.1	Grid No. 1 Current: Icl Rgl = 1.0 Meg	0.65	0	—	—	—	-0.3	μAdc
4.1.1.7	(Method A)							
4.10.4.1	Plate Current (1): ALD = 2.0	—	—	4.6	5.3	6.0	—	mAdc
4.10.4.1	Plate Current (1):	0.65	3.7	—	—	—	6.9	mAdc
4.1.1.7	(Method A)							
4.10.9	Transconductance (1): ALD = 900 Sm (g1-p)	—	—	2900	3200	3500	—	μmhos
4.10.9	Transconductance (1): Sm (g1-p)	0.65	2700	—	—	—	4000	μmhos
4.10.4.1	Plate Current (2): Ecl = -7.5 Vdc; Rk = 0 Ohms	0.65	—	—	—	—	100	μAdc
4.7.5	Continuity and Shorts (Inoperatives):	0.4	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1)	—	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 2								
4.8.2	Insulation of Electrodes:	2.5	—	—	—	—	—	
	g1-all	—	100	—	—	—	—	Meg
	p-all	—	100	—	—	—	—	Meg
4.10.4.3	Screen Grid Current: Ic2	2.5	2.8	—	—	—	5.4	mAdc
4.10.4.1	Plate Current (3): Note 5 Ec3 = −8.0 Vdc	2.5	—	—	—	—	100	μAdc
4.10.9	Transconductance (2): $\triangle$ Sm (g1-p) Ef = 5.7 V $\triangle$ Ef	2.5	—	—	—	—	15	%
4.10.9	Transconductance (3): Note 5 Sm (g3-p) Ec3 = −1.0 Vdc	2.5	500	—	—	—	1800	μmhos
4.10.6.2	Grid No. 1 Emission: Note 4 Ic1 Ef = 7.5 V; Ec1 = −7.5 Vdc; Rg1 = 1.0 Meg; Rk = 0 Ohms	2.5	0	—	—	—	−0.5	μAdc
4.10.3.2	AF Noise: Esig = 70 mVac; Ec2 = 19 Vdc; Rp = 0.2 Meg; Rg1 = 0.1 Meg; Rg2 = 1000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	17	VU
4.10.14	Capacitance:	6.5	—	—	—	—	—	
	0.405 In. Dia. Shield Cg1p	—	—	—	—	—	0.020	μμf
	0.405 In. Dia. Shield Cg3p	—	—	—	—	—	1.10	μμf
	0.405 In. Dia. Shield Cg1-g3	—	—	—	—	—	0.15	μμf
	0.405 In. Dia. Shield Cg1-all	—	3.5	—	—	—	4.5	μμf
	0.405 In. Dia. Shield Cg3-all	—	3.5	—	—	—	4.5	μμf
	0.405 In. Dia. Shield Cp-all	—	2.9	—	—	—	3.9	μμf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 20 ±5 mm Hg.; Voltage = 300 Vac	6.5	—	—	—	—	—	
4.9.20.3	Vibration (1): No Voltages; Post Shock and Fatigue Test End Points Apply	10.0	—	—	—	—	—	
4.9.19.1	Vibration (2): F = 40 cps; G = 15; Rp = 10,000 Ohms; Ck = 1000 μf	2.5	—	—	—	—	60	mVac
4.9.19.1	White Noise: Note 6; Rp = 10,000 Ohms; Ck = 1000 μf;	2.5	—	—	—	—	500	mv pk-pk
	Peak Acceleration = 15 G	2.5	—	—	—	—	75	mVac
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max	6.5	—	—	—	—	—	
	Post Shock and Fatigue Test End Points:							
	Vibration (2)	—	—	—	—	—	200	mVac
	Heater-Cathode Leakage							
	Ehk = +100 Vdc	—	—	—	—	—	20	μAdc
	Ehk = −100 Vdc	—	—	—	—	—	20	μAdc
	Change in Transconductance (1) of Individual Tubes $\triangle_t$ Sm (g1-p)	—	—	—	—	—	20	%
4.9.6.3	Glass Strain:	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; Ec1 = Ec2 = Ec3 = Eb = O V	2.5	—	—	—	—	
4.11.3.1	Stability Life Test: (1 Hour) Ehk = +200 Vdc; Rg1 = 1.0 Meg; TA = Room	1.0	—	—	—	—	
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of Individual Tubes Δ_t Sm (g1-p)	—	—	—	—	15	%
4.11.3.1							
4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65	—	—	—	—	
	Transconductance (1) Sm (g1-p)	1.0	—	—	2350	—	μmhos
4.11.5							
4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions: T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply	—	—	—	—	—	
4.11.3.1							
4.11.4	Intermittent Life Test End Points: (500 Hours)						
	Inoperatives	—	1	3	—	—	
	Grid Current Ic1	—	1	3	0	−0.9	μAdc
	Heater Current	—	2	5	138	164	mA
	Change in Transconductance (1) of Individual Tubes Δ_t Sm (g1-p)	—	1	3	—	20	%
	Transconductance (2) Δ_{Ef} Sm (g1-p)	—	2	5	—	15	%
	Heater-Cathode Leakage	—	2	5	—	—	
	Ehk = +100 Vdc	—	—	—	—	10	μAdc
	Ehk = −100 Vdc	—	—	—	—	10	μAdc
	Insulation of Electrodes	—	2	5	—	—	
	g1-all	—	—	—	50	—	Meg
	p-all	—	—	—	50	—	Meg
	Transconductance (1) Average Change Avg Δ_t Sm (g1-p)	—	—	—	—	15	%
	Total Defectives	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

1: The AQL for the combined defectives for atributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.

2: Tubes subjected to the following destructive tests are not to be accepted under this specification.

4.9.5.3	Subminiature lead fatigue
4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater cycling life test
4.11.5	Intermittent life test

3: Envelope temperature shall be defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey Ib (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

4: Prior to this test tubes shall be preheated five (5) minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission Test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	Ohms	Meg
7.5	0	100	0	100	150	1.0

5: The reference point for grid number 3 potentials on this test shall be the negative side of the cathode resistor.

6: The tube shall be rigidly mounted on a table vibrating such that the instantaneous values of acceleration shall constitute approximately

CHARACTERISTICS (Continued)

a "White Noise" spectrum which is free from discontinuities from 100 cps to 5000 cps. The spectrum of instantaneous acceleration shall be such that each octave of bandwidth delivers 2.3 G's rms acceleration. With this the case, the rms value of acceleration for any bandwidth within the specified spectrum is equal to

$$G\ rms = 2.3\ G \sqrt{3.32 \log_{10} (f2/f1)}$$

f2 and f1 are the upper and lower frequencies respectively of the band under consideration. The degree of clipping of the peak accelerations shall be such that the peak value of acceleration is at least 15 G's.

The voltage (ep) produced across the resistor (Rp) as a result of vibration shall be coupled through a compensating amplifier to a low pass filter. The compensating amplifier shall have a high input impedance (0.25 megohm or more) and shall be adjusted to compensate for any insertion losses in the filter. The combined frequency response of amplifier and filter shall be flat within ±0.5 db from 50 cps to 8000 cps, shall be down no more than 5 db at 10,000 cps and at 20 cps, and down at least 40 db at 13,000 cps. For reading the peak to peak value of output voltage the filter output shall be fed directly to the input of a Ballantine Model 305 peak to peak electronic voltmeter or equal, while the rms value shall be measured with a Hewlett-Packard Model 400C or equal.

APPLICATION DATA

The 5636 is a Premium Subminiature dual control pentode similar to the Type 6AS6. It is designed to provide reliable operation under conditions of severe shock, vibration, high altitude and high temperature.

Both No. 1 and No. 3 grids have sharp cutoff characteristics and are intended for control purposes thus making the 5636 particularly useful in a variety of gated amplifier applications. This type may also be used as a mixer at frequencies up to 400 mc. The oscillator voltage is injected into grid No. 3.

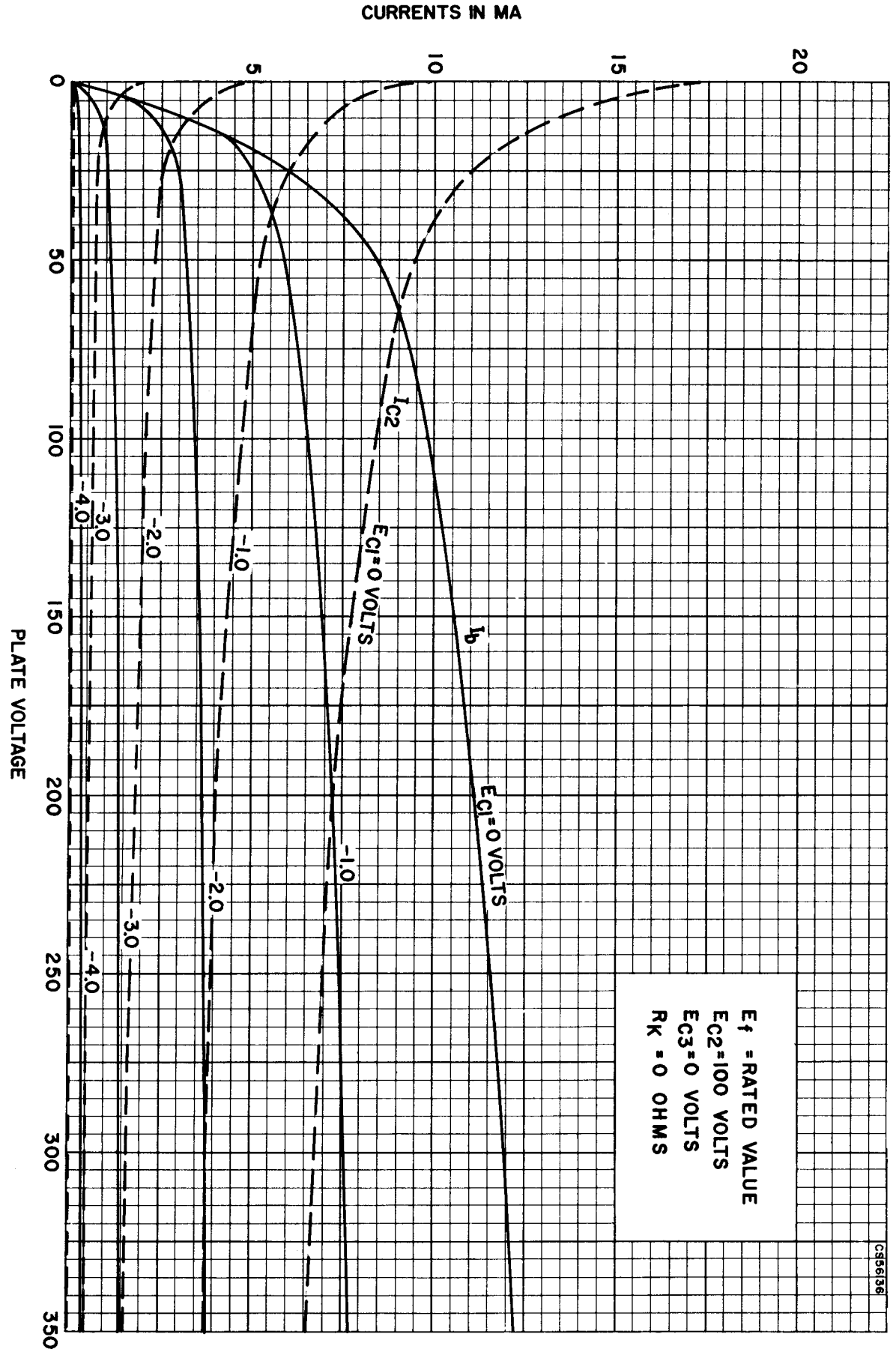
To insure correlation with actual field conditions and thereby enhance equipment reliability, vibrational noise output is controlled by the "white noise test" as shown in the acceptance criteria. Briefly, this test consists of subjecting the tube to a white noise vibration spectrum covering the frequency band of 100 to 5000 cps at a rms level of 2.3 g's per octave and a peak level of 15 g's. Limits are shown for both peak and rms output. A further discussion of the white noise vibrational test is included in the frontal section of this manual.

The 5636 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy (reference should be made to the frontal section of this manual).

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



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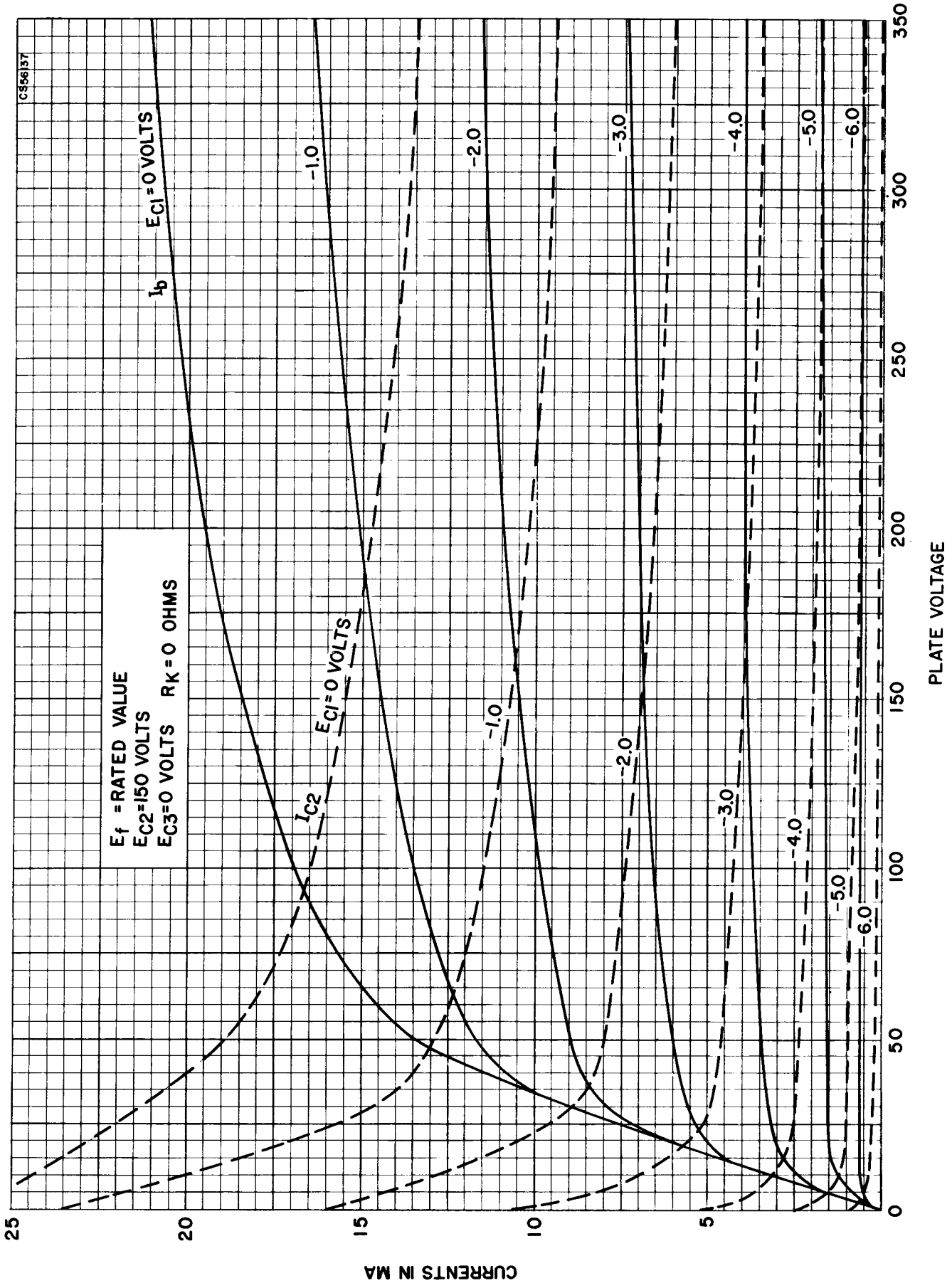

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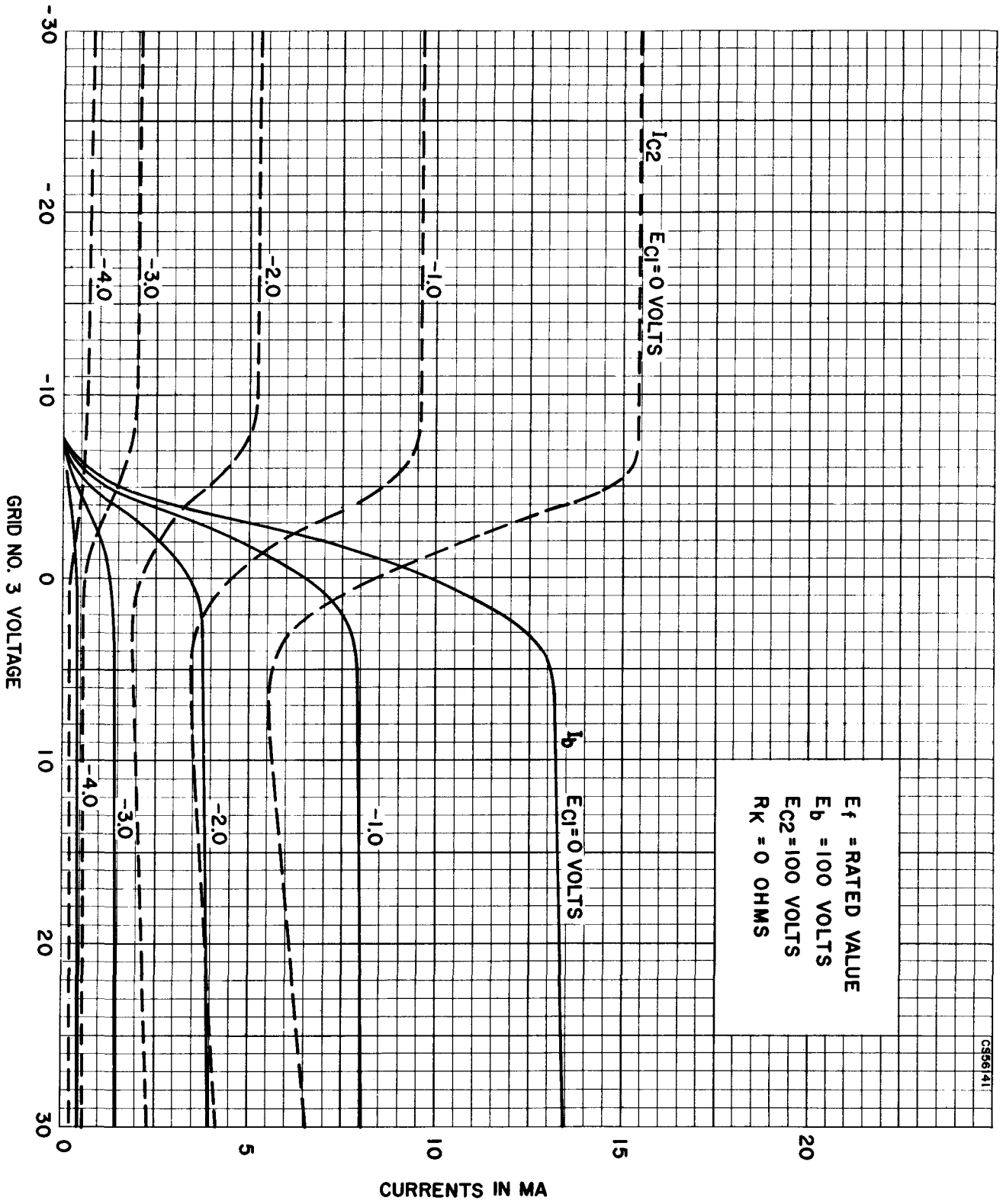

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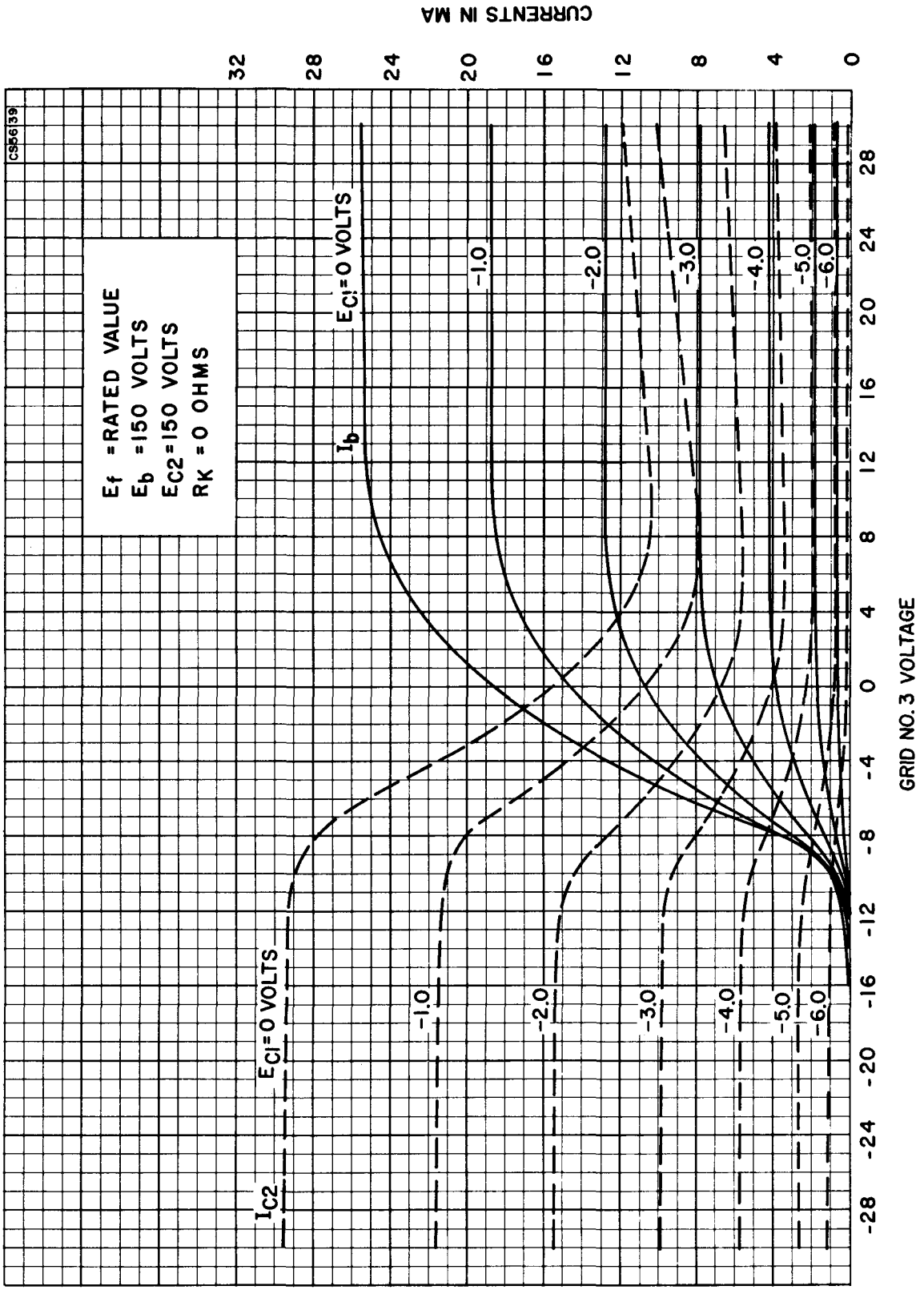

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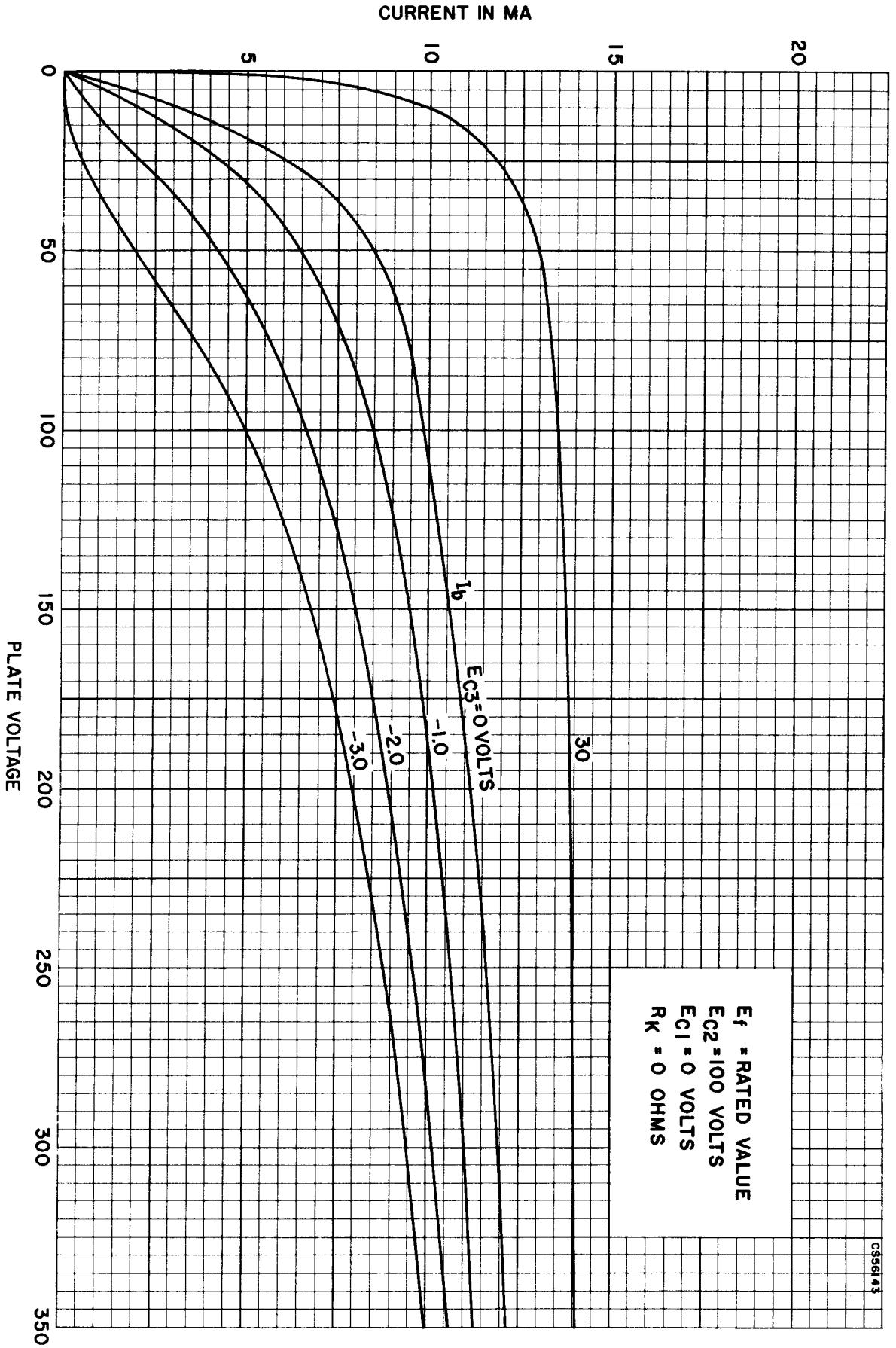

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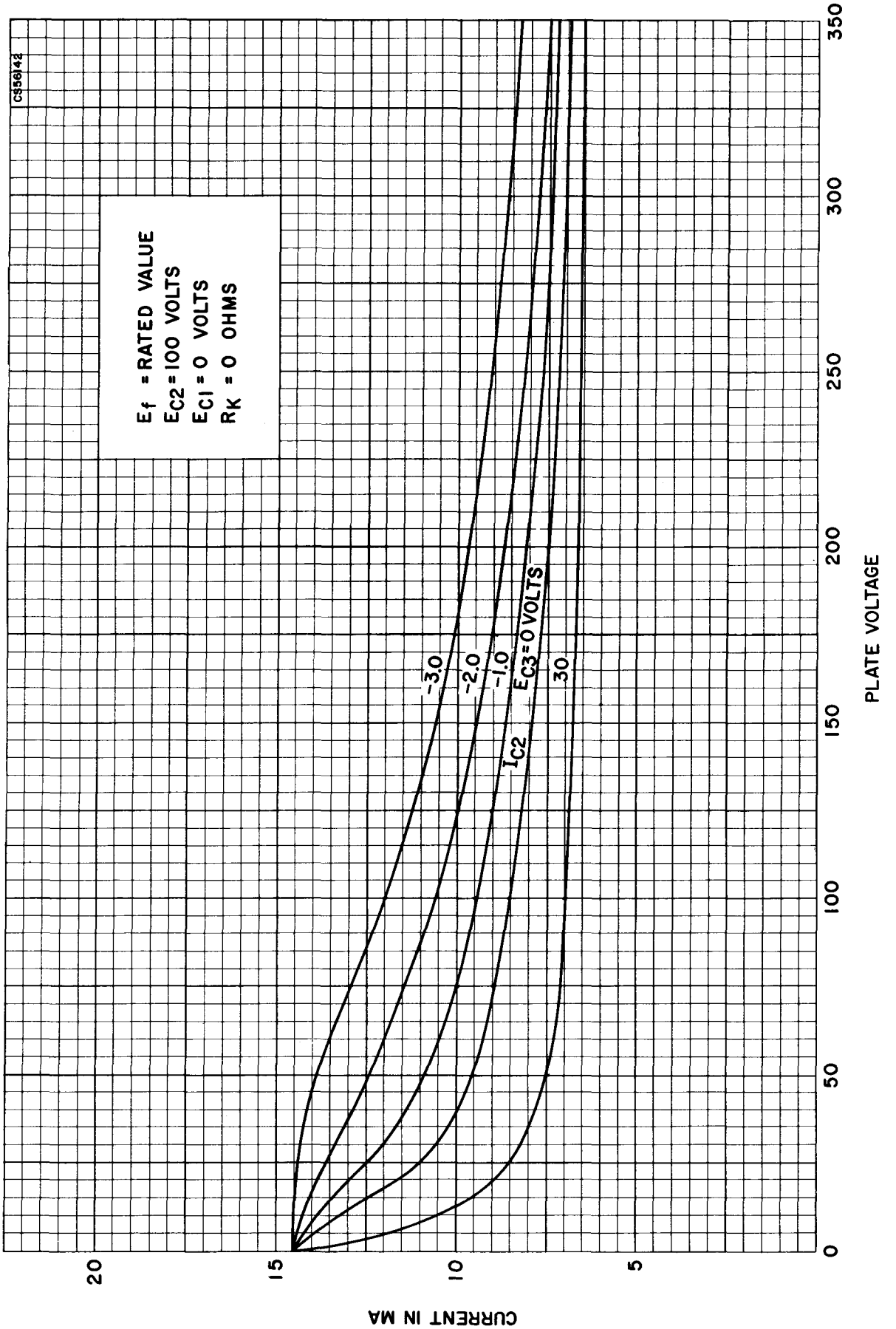

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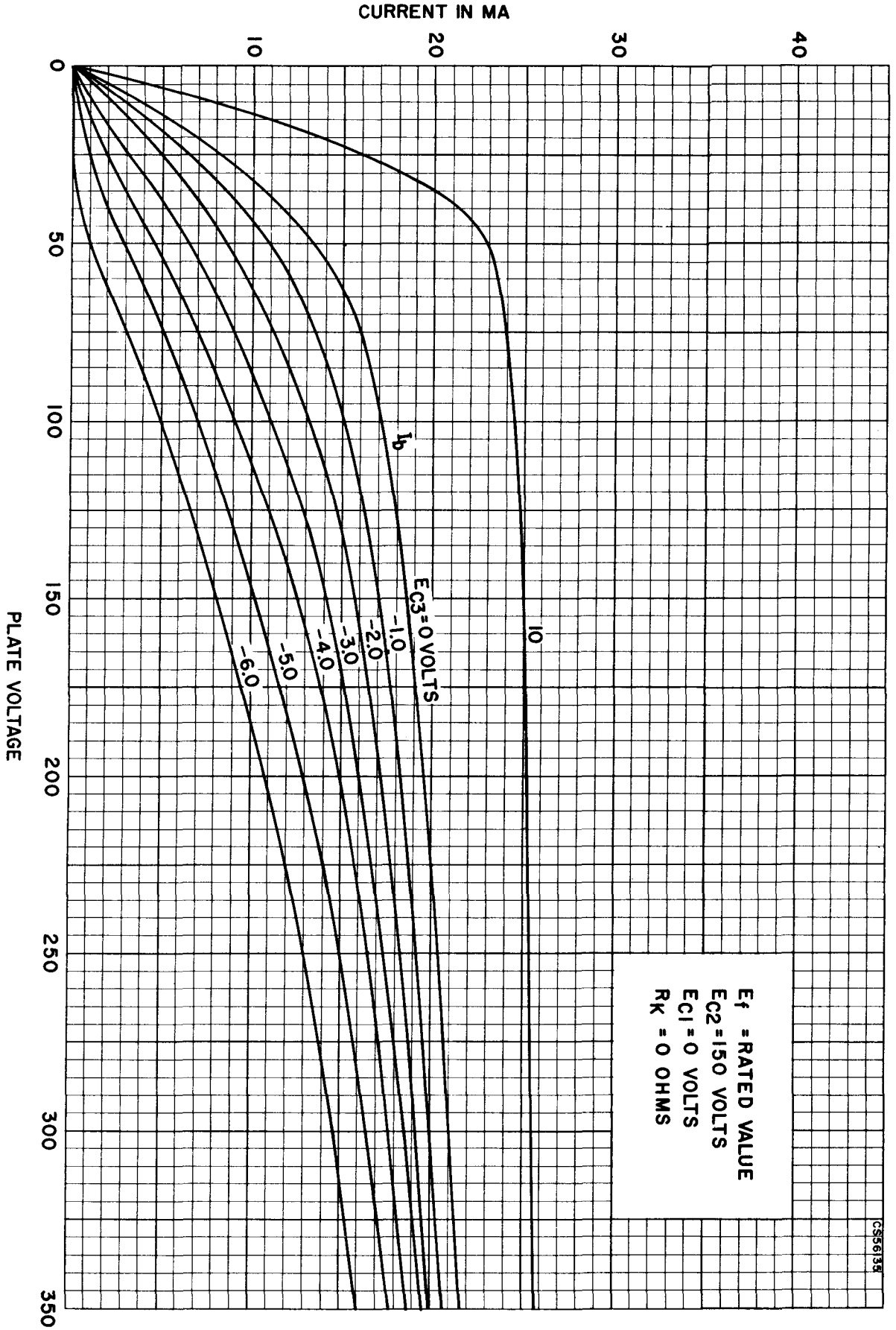

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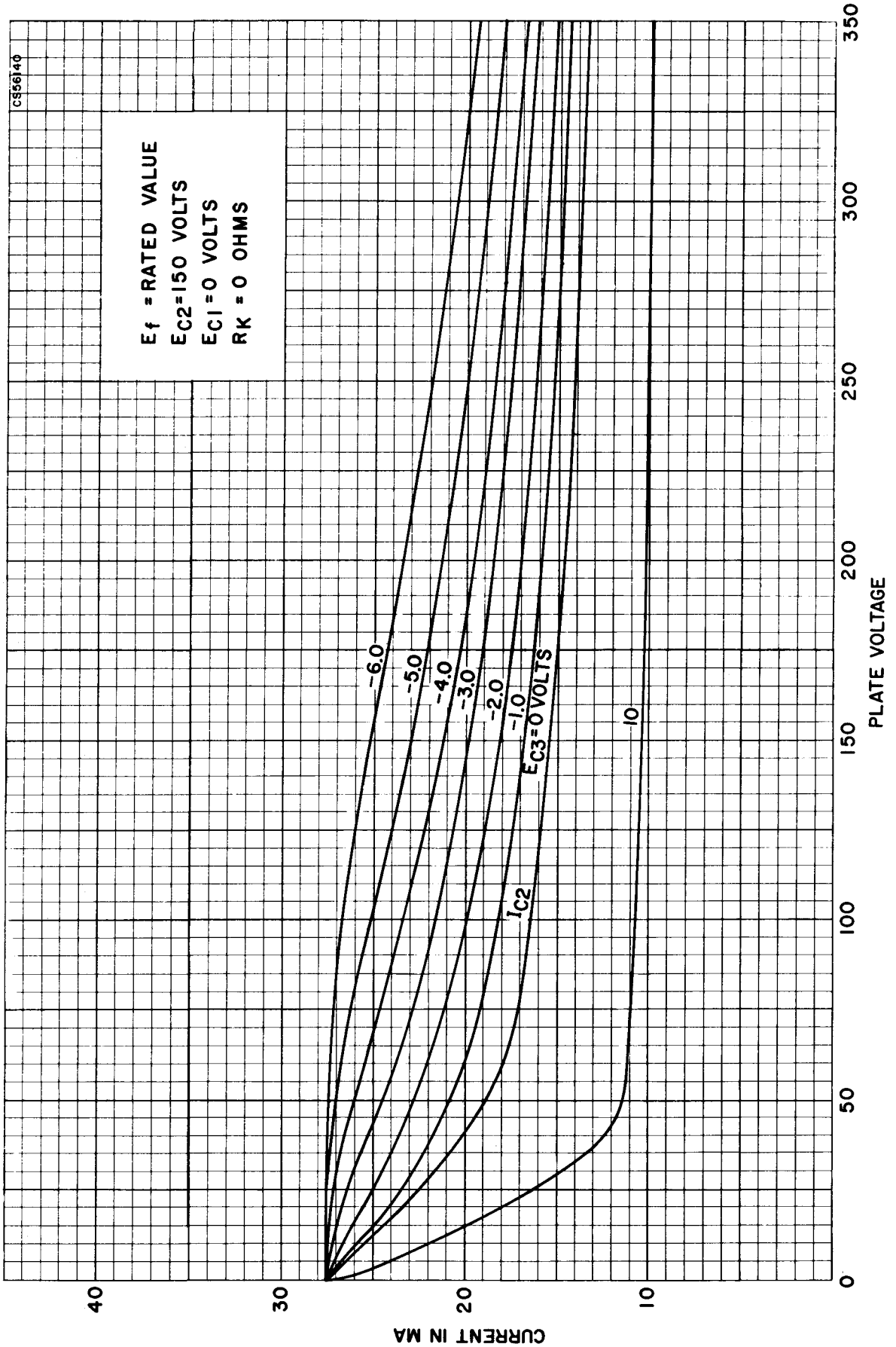
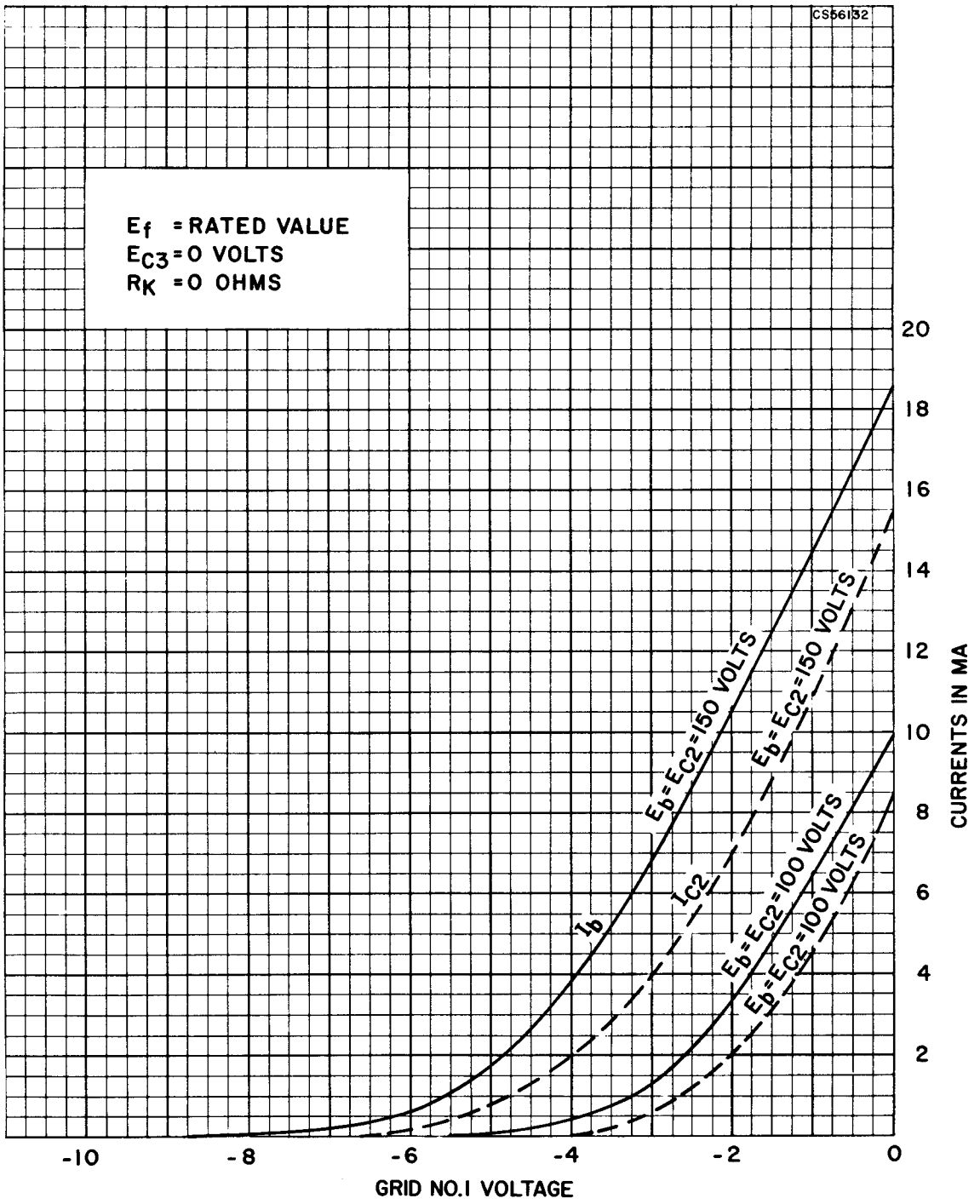


AVERAGE TRANSFER CHARACTERISTICS



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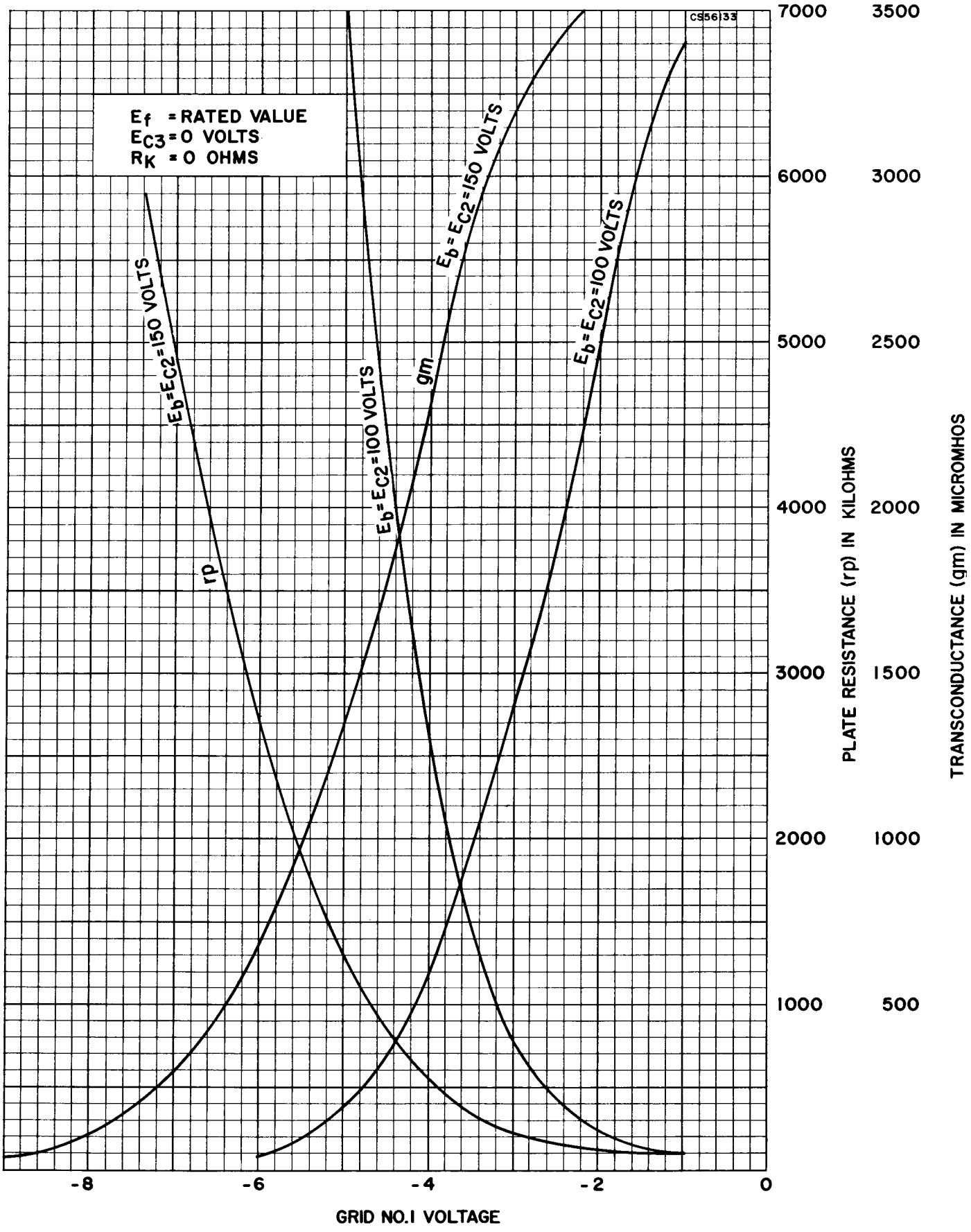

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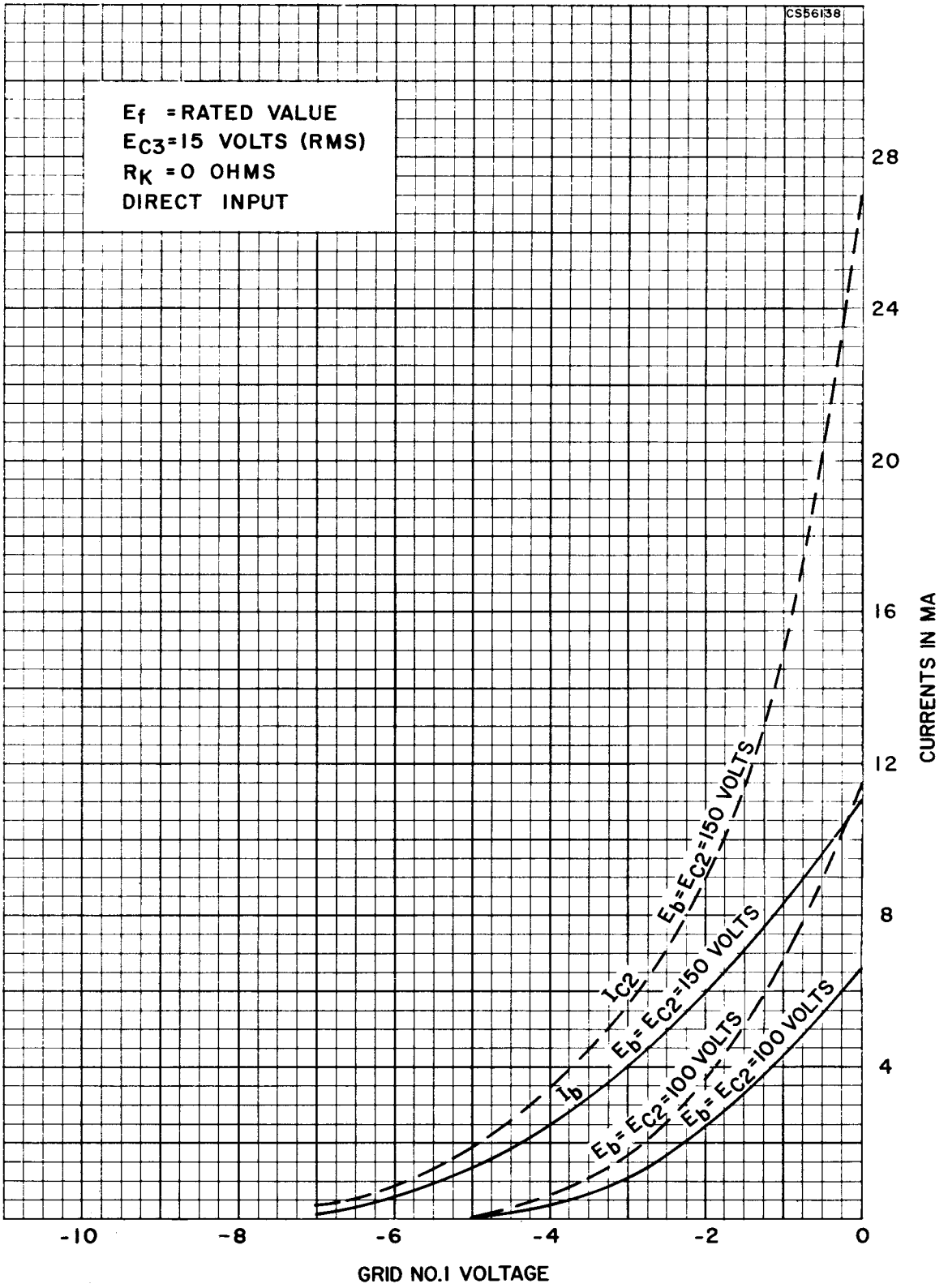

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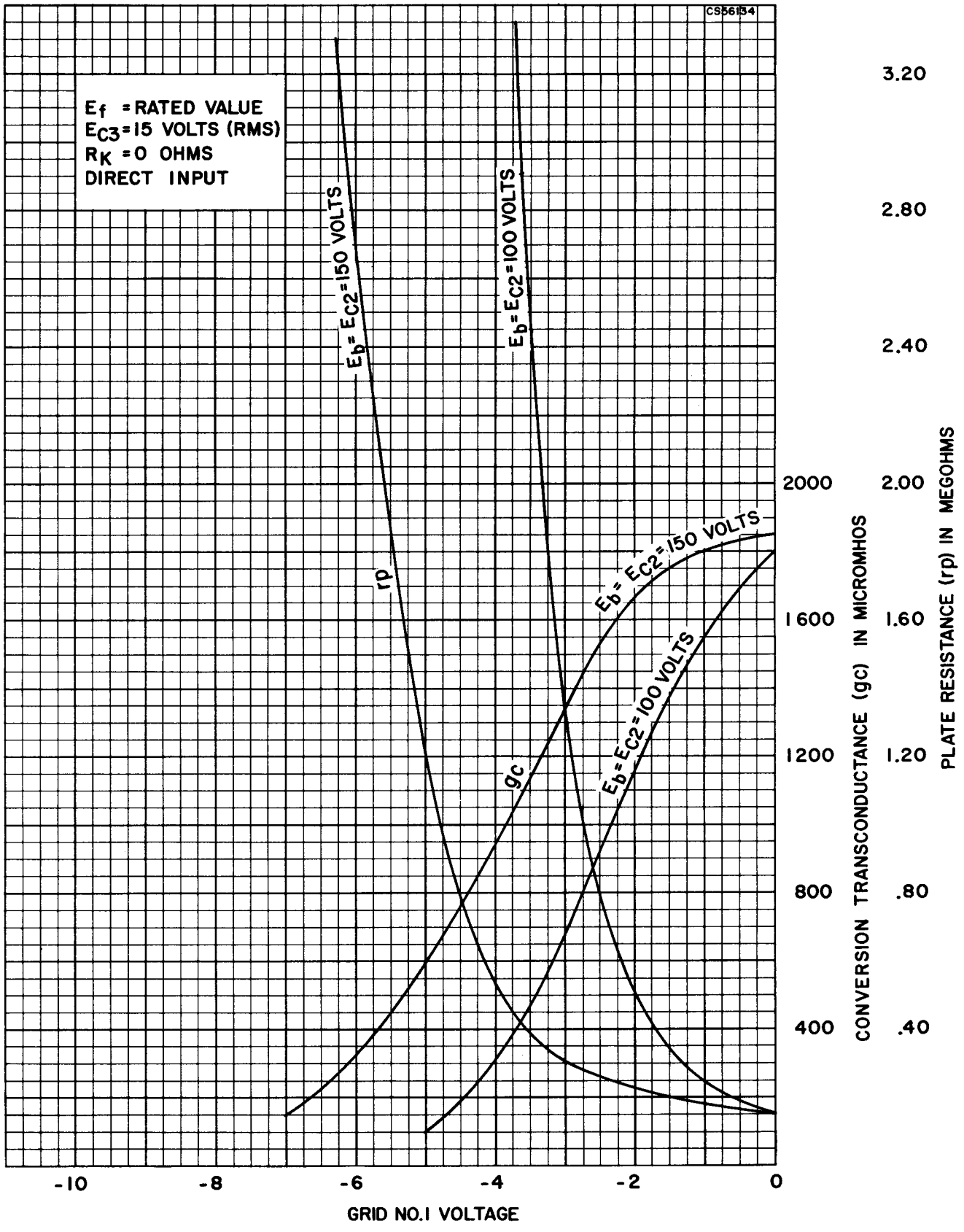

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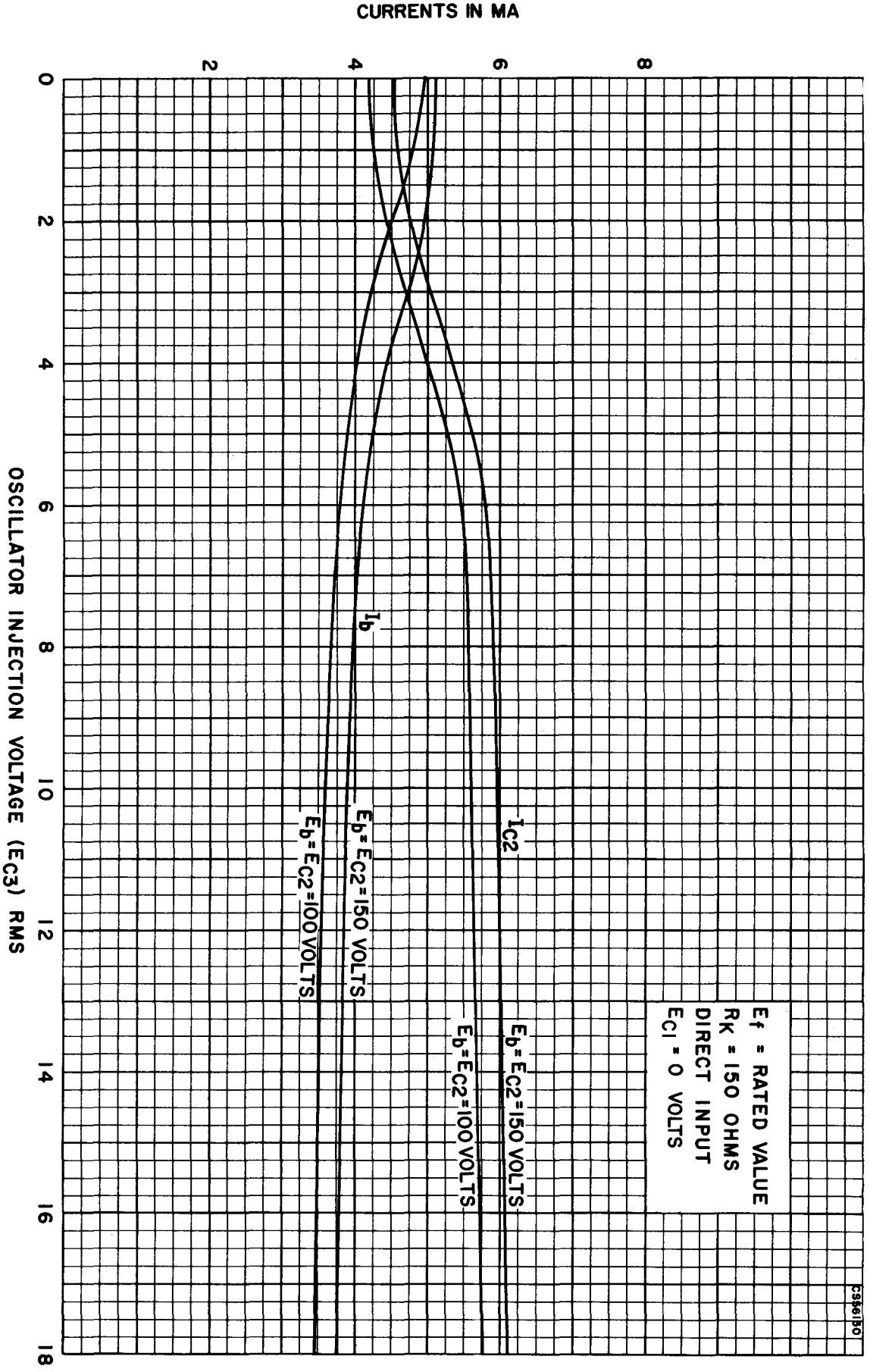
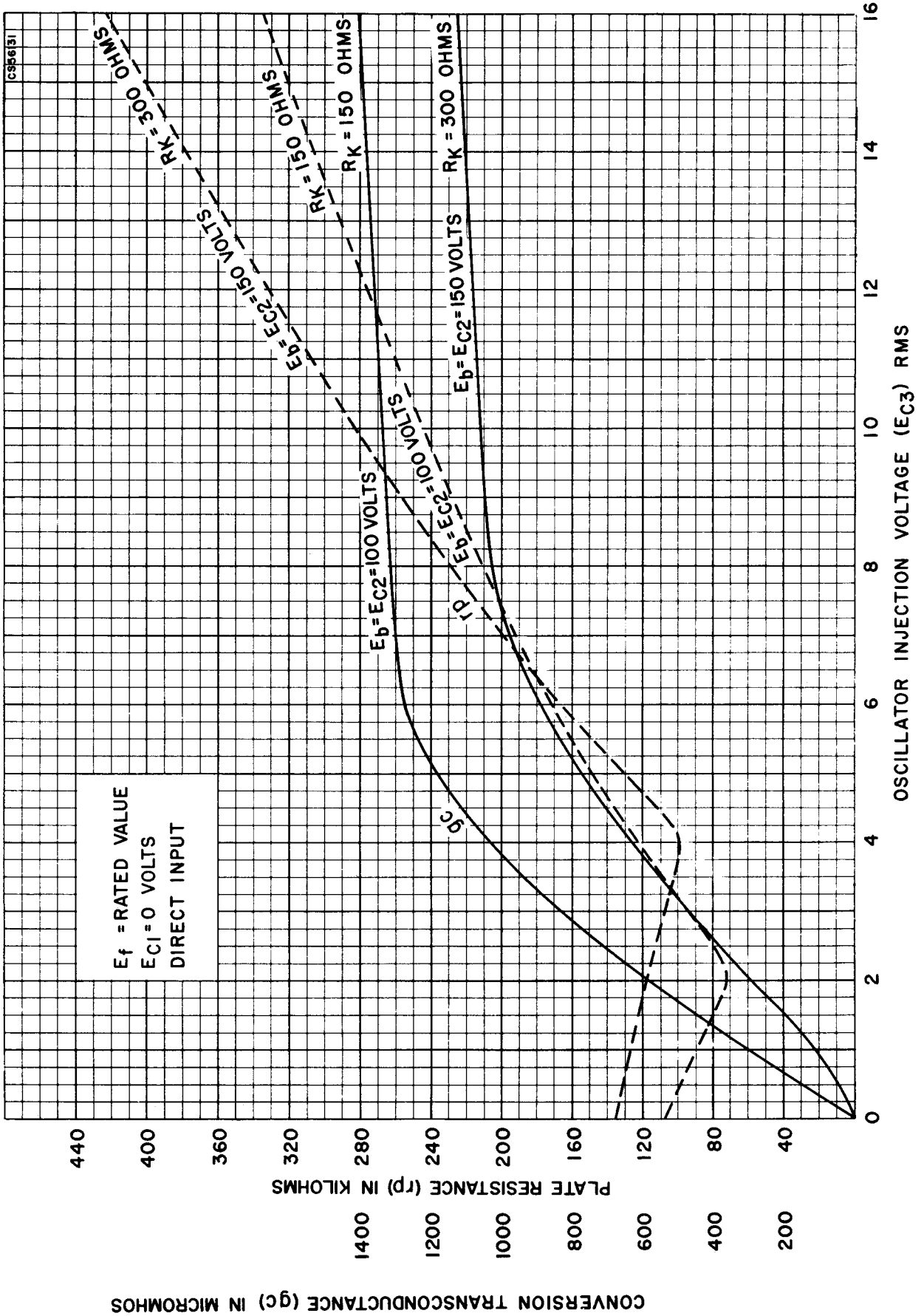
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