



*Excellence in Electronics*

**TYPE  
CK5702WB**

The CK5702WB is a heater-cathode type sharp-cutoff pentode of subminiature construction capable of operation in the VHF region. This tube is characterized by long life and stable performance. It is designed for service where severe conditions of high temperature and mechanical shock or vibration are encountered. A separate terminal connection is provided for Grid #3, which under self-bias conditions can be connected directly to ground, permitting the cathode by-pass capacitor to be omitted for lower grid loading. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.

**MECHANICAL DATA**

ENVELOPE: T-3 Glass

BASE: None (0.016" tinned flexible leads. Length: 1.5" min.  
Spacing: 0.048" center-to-center)

TERMINAL CONNECTIONS: (Red Dot is adjacent to Lead 1)

- Lead 1 Plate
- Lead 2 Grid #2
- Lead 3 Heater
- Lead 4 Heater
- Lead 5 Grid #3
- Lead 6 Cathode
- Lead 7 Grid #1

MECHANICAL RATINGS:

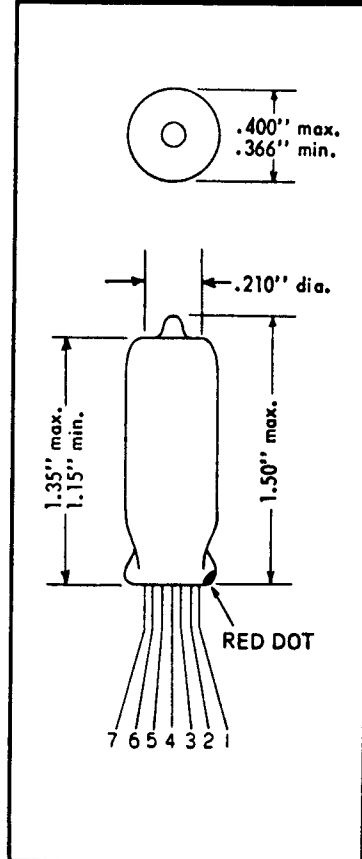
- Maximum Impact Acceleration (Shock Test-Note 3)
- Maximum Uniform Acceleration (Centrifuge Test-Note 4)
- Maximum Vibrational Acceleration (96 Hour Fatigue Test-Note 5)
- Maximum Bulb Temperature

- 450 G
- 1000 G
- 2.5 G
- 220 °C

MOUNTING POSITION: Any

**ELECTRICAL DATA**

CAUTION - To Electronic Equipment Design Engineers: Special attention should be given to the temperatures at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.



RATINGS AND NORMAL OPERATION:	MIL-E-1 SYMBOL	DESIGN MINIMUM	NORMAL TEST CONDITIONS (Note 7)	NORMAL OPERATION (Note 6)	DESIGN MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 8)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	----	120	120	165	Vdc
Grid #1 Voltage	Ec1:	-55	0	0	----	Vdc
Grid #2 Voltage	Ec2:	----	120	120	155	Vdc
Grid #3 Voltage	Ec3:	----	0	0	0	Vdc
Plate Dissipation	Pp:	----	----	0.9	1.10	W
Grid #2 Dissipation	Pg2:	----	----	0.3	0.40	W
Grid #1 Circuit Resistance	Rg1:	----	----	1.0	1.2	Meg.
Heater-Cathode Voltage	Ehk:	-200	----	100	+200	v
Cathode Current	Ik:	----	----	----	16.5	mAdc
Cathode Resistance	Rk:	----	200	200	----	ohms
Plate Current (1)	Ib(1):	----	----	7.5	----	mAdc
Grid #2 Current	Ic2:	----	----	2.6	----	mAdc
Transconductance (1)	Sm(1):	----	----	5000	----	μmhos
Plate Resistance	rp:	----	----	0.34	----	Meg.

Tentative Data

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RECEIVING TUBE AND SEMICONDUCTOR OPERATIONS



ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL-E-1 UNITS
<b>MEASUREMENTS ACCEPTANCE TESTS PART 1</b>										
Combined AQL=1.0% excluding Mechanical and Inoperatives										
Heater Current:		0.65	lf:	190	----	200	----	210	----	mA
Heater - Cathode Leakage:	Ehk=+100 Vdc } Ehk=-100 Vdc }	0.65	lhk: ihk:	----	----	----	----	5 5	----	$\mu$ Adc $\mu$ Adc
Grid Current (1):		0.65	lc1 (1):	----	----	----	----	-0.1	----	$\mu$ Adc
Plate Current (1):		0.65	lb (1):	5.5	6.9	7.5	8.1	9.5	2.3	mAdc
Plate Current (2):	Ec1=-9.0 Vdc	0.65	lb (2):	----	----	----	----	50	----	$\mu$ Adc
Screen Current:		0.65	lc2:	1.7	----	2.6	----	3.5	----	mAdc
Transconductance (1):		0.65	Sm (1):	4200	4775	5000	5225	5800	860	$\mu$ mhos
Continuity and Shorts (Inoperatives):		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope (8-7) (Note 10)									
<b>MEASUREMENTS ACCEPTANCE TEST PART 2</b>										
Insulation of Electrodes:	Ef=6.3 V Eg-all=-100 Vdc } Ep-all=-300 Vdc }	2.5	Rg1-all: Rp-all:	250	----	----	----	----	----	Meg. Meg.
Transconductance (2):	Ef=5.7 V (Note 9)	2.5	$\Delta_{Ef} Sm(2)$ :	----	----	----	----	5	----	%
Grid Emission:	Ef=7.5 V; preheat 5 minutes at Ec1=0; Test at Ec1=-10Vdc	6.5	lc(2):	----	----	----	----	-0.5	----	$\mu$ Adc
AF Noise:	Esig=70 mVac; Ec2=25 Vdc; Rg1=0.1 Meg; Rg2=1000 ohms; Rp=0.2 Meg; Ck=1000 $\mu$ f; Rk=4000 ohms.	2.5	EB:	----	----	----	----	17	----	VU
Plate Resistance:		6.5	rp:	0.15	----	----	----	----	----	Meg.
Capacitance: } Capacitance: } Capacitance: }	(Note 2)	6.5	Cgp: Cin: Cout:	----	----	----	----	0.03 5.5 4.1	----	$\mu$ f $\mu$ f $\mu$ f
Low Pressure Voltage Breakdown:	Pressure=55 $\pm$ 5 mm Hg; Voltage=300 Vac	6.5	----	----	----	----	----	----	----	----
Operation Time:	(Note 11)	4.0	t:	----	----	----	----	20	----	sec.
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	2.5	Ep:	----	----	----	----	50	----	mVac
Vibration (3):	F=30-1000 cps; G=15; Rp=10,000 ohms; t=3 minutes; positions X1 and X2 only	4.0	Ep:	----	----	----	----	240 peak to peak	----	mv
<b>DEGRADATION RATE ACCEPTANCE TESTS</b>										
Subminiature Lead Fatigue:		2.5	----	4.0	----	----	----	----	----	arcs
Shock (1):	Ehk=+100 Vdc; Rg=0.1 Meg. Hammer Angle=30° (Note 3)	20	----	----	----	----	----	----	----	----
Fatigue (1):	96 hours; G=2.5; Fixed frequency; F=25 min. 60 max. (Note 5)	6.5	----	----	----	----	----	----	----	----
Fatigue (2):	6 hours; G=10; Fixed frequency; F=25 min, 60 max. (Note 12)	----	----	----	----	----	----	----	----	----
Post Shock (1) and Fatigue Tests (1) and (2) End points:										
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	----	Ep:	----	----	----	----	75	----	mVac



RELIABLE SUBMINIATURE PENTODE

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL - E - 1 SYMBOL	MIN	MAX	MIL - E - 1 UNITS	Allowable Defects per Characteristic	
							1st Sample	Combined Samples
<b>DEGRADATION RATE ACCEPTANCE TESTS (cont'd)</b>								
Heater - Cathode Leakage:	Ehk = +100 Vdc Ehk = -100 Vdc	----	lhk: lhk:	----	10 10	$\mu$ Adc $\mu$ Adc		
Change in Transconductance (1) of individual tubes:	Ef = 6.3 V	----	$\Delta_t$ Sm (1):	----	10	%		
Grid Current (1):		----	Ic (1):	----	-1.0	$\mu$ Adc		
Shock (2):	Ehk = +100 Vdc; Rg = 0.1 Meg.; G = 75; (hammer angle = 120° + rubber pad); t = 10 milliseconds duration (note 13)	----	----	----	----	----		
Post Shock Test (2) End Points:								
Vibration (2):	F = 40 cps; G = 15; Rp = 10,000 ohms	----	Ep:	----	75	mVac		
Heater - Cathode Leakage:	Ehk = +100 Vdc Ehk = -100 Vdc	----	lhk: lhk:	----	10 10	$\mu$ Adc $\mu$ Adc		
Change in Transconductance (1) of individual tubes:	Ef = 6.3 V	----	$\Delta_t$ Sm (1):	----	10	%		
Grid Current (1):		----	Ic (1):	----	-1.0	$\mu$ Adc		
Glass Strain (Thermal Shock):		6.5	----	----	----	----		
<b>ACCEPTANCE LIFE TESTS</b>								
Heater Cycle:	Ef = 7.5 V; Eb = Ec1 = Ec2 = Ec3 = 0 V; Ehk = 140 Vac; 1 min. on, 1 min. off.	1.0	----	2000	----	cycles		
Heater Cycling Life Test End Points:								
Heater - Cathode Leakage:	Ehk = +100 Vdc Ehk = -100 Vdc	----	lhk: lhk:	----	20 20	$\mu$ Adc $\mu$ Adc		
1 Hour Stability Life Test:	TA = room; Ehk = +200 Vdc; Rg1 = 1.0 Meg.	----	----	----	----	----		
1 Hour Stability Life Test End Points:								
Change in Transconductance (1) of individual tubes:	(Typical sample size = 50 tubes)	1.0	$\Delta_t$ Sm (1):	----	10	%		
100 Hour Survival Rate Life Test:	TA = room; Ehk = +200 Vdc; Rg1 = 1.0 Meg.	----	----	----	----	----		
100 Hour Survival Rate Life Test End Points:	(Typical sample size = 200 tubes)	----	----	----	----	----		
Inoperatives:		0.65	----	----	----	----		
Transconductance (1):		1.0	Sm (1):	3800	----	$\mu$ mhos		
Intermittent High Temperature Life Tests:	T Bulb = 220°C; Ehk = +200 Vdc; Rg1 = 1.0 Meg.	----	----	----	----	----		
500 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size = 20 tubes 1st sample 40 tubes 2nd sample)	----	----	----	----	----		
Inoperatives:		----	----	----	----	----	1	3
Grid Current (1):		----	Ic (1):	----	-0.5	$\mu$ Adc	1	3
Heater Current:		----	If:	180	220	mA	1	3
Change in transconductance (1) of individual tubes:		----	$\Delta_t$ Sm (1):	----	20	%	1	3

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RECEIVING TUBE AND SEMICONDUCTOR OPERATIONS



RELIABLE SUBMINIATURE PENTODE

ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)(cont')

TEST	CONDITIONS	AQL %	MIL - E - 1 SYMBOL	MIN	MAX	MIL - E - 1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
<b>ACCEPTANCE LIFE TESTS (cont'd)</b>								
Transconductance (2):	(Note 9)	----	$\Delta_{Ef}S_m(2)$ :	----	15	%	2	5
Heater - Cathode Leakage:	Ehk = +100 Vdc Ehk = -100 Vdc	----	lhk: lhk:	----	10 10	$\mu\text{Adc}$ $\mu\text{Adc}$	2	5
Insulation of Electrodes: g1 - all p - all		----	Rg1 - all: Rp - all:	50 50	----	Meg. Meg.	2	5
Transconductance (1) Average Change:		----	Avg. $\Delta_{t}S_m(1)$ :	----	15	%	---	---
Total Defectives:		----		----	----		4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size = 20 tubes 1st sample 40 tubes 2nd sample)	----		----	----		---	---
Inoperatives:		----		----	----		2	5
Grid Current (1):		----	lc (1):	----	-1.0	$\mu\text{Adc}$	2	5
Heater Current:		----	If:	177	223	mA	2	5
Change in transcon - ductance (1) of in - dividual tubes:		----	$\Delta_{t}S_m(1)$ :	----	30	%	2	5
Heater - Cathode Leakage:	Ehk = +100 Vdc Ehk = -100 Vdc	----	lhk: lhk:	----	15 15	$\mu\text{Adc}$ $\mu\text{Adc}$	2	5
Total Defectives		----		----	----		5	10

NOTES

- Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL - E - 1 "Inspection Instructions for Electron Tubes" and MIL - STD - 105A.
- Note 2: With a cylindrical shield (0.405" I.D. - 1 7/8" long) connected to lead 6.
- Note 3: Test conditions and acceptance criteria per Shock Test Procedures of MIL - E - 1 basic specification.
- Note 4: Centrifuge Test with forces applied in any direction.
- Note 5: Test conditions and acceptance criteria per Fatigue Test Procedures of MIL - E - 1 basic specifications.
- Note 6: These normal values represent conditions at which control of reliability may be expected.
- Note 7: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.
- Note 8: For most applications the performance will not be adversely affected by  $\pm 10\%$  heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.
- Note 9: Change of transconductance for individual tubes from that value measured at  $E_f = 6.3\text{ V}$  to that value measured at  $E_f = 5.7\text{ V}$ .
- Note 10: In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by appendix B of "Inspection Instructions for Electron Tubes."
- Note 11: Operation time is the time in seconds required for the plate current to attain a value within plus or minus 10 percent of the three minute plate current (1) value using a cold tube. No preheating before this test will be allowed.
- Note 12: The tubes shall be rigidly mounted on a table vibrating with simple harmonic motion. The tubes shall be vibrated for a total of 6 hours, 2 hours in each of three positions, X1, X2, and Y1. Only rated heater voltage shall be applied. Tubes which show one or more of the following defects shall be considered failures.
  - (a) Tubes which show permanent or tap shorts or open circuits following fatigue test, when tested as specified in 4.7.2 and 4.7.3.
  - (b) Tubes which do not comply with post fatigue limits. This is a destructive test.
- Note 13: The provisions of paragraph 4.9.20.5 of Specification MIL - E - 1 shall apply, except for test conditions listed for shock test (2).

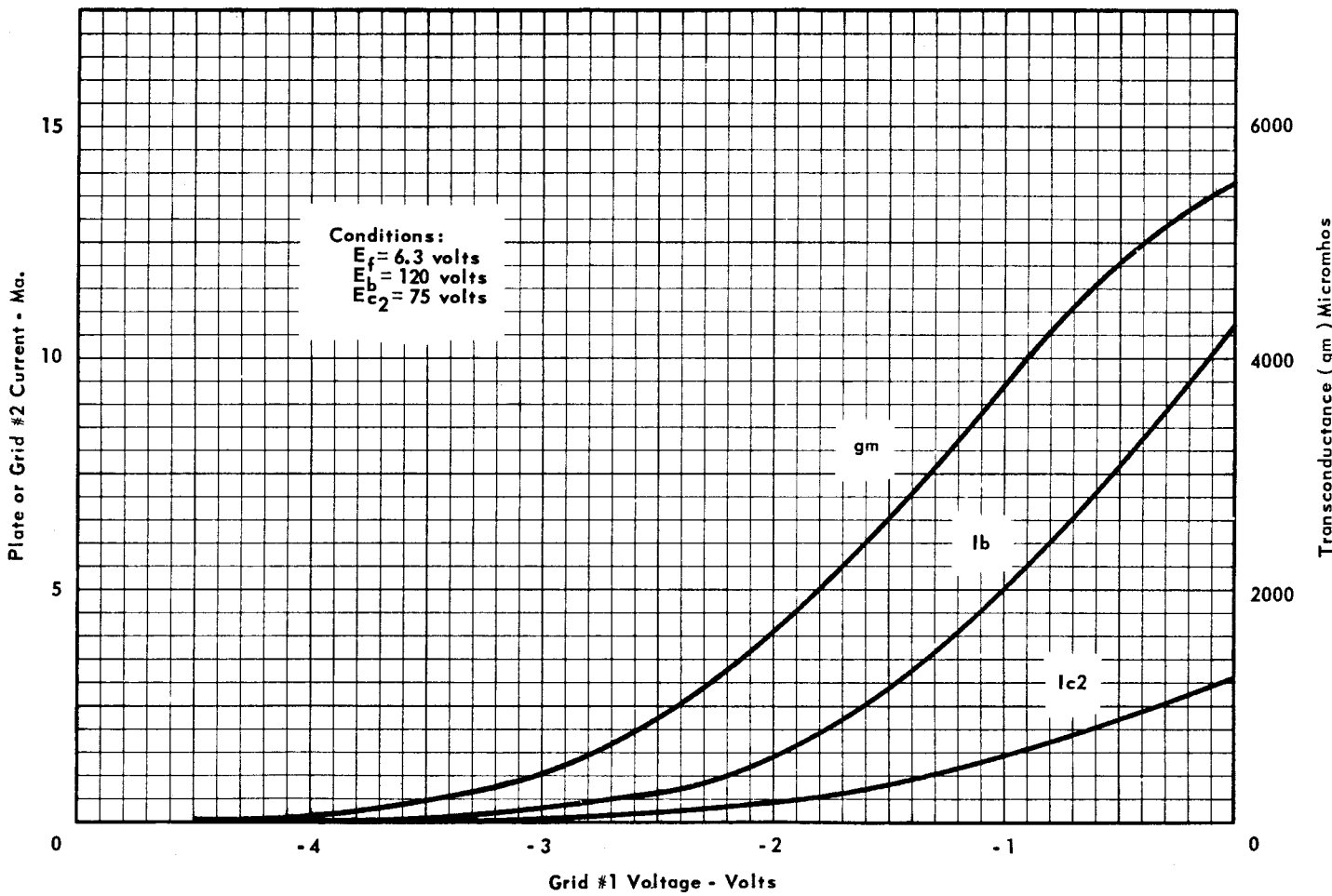
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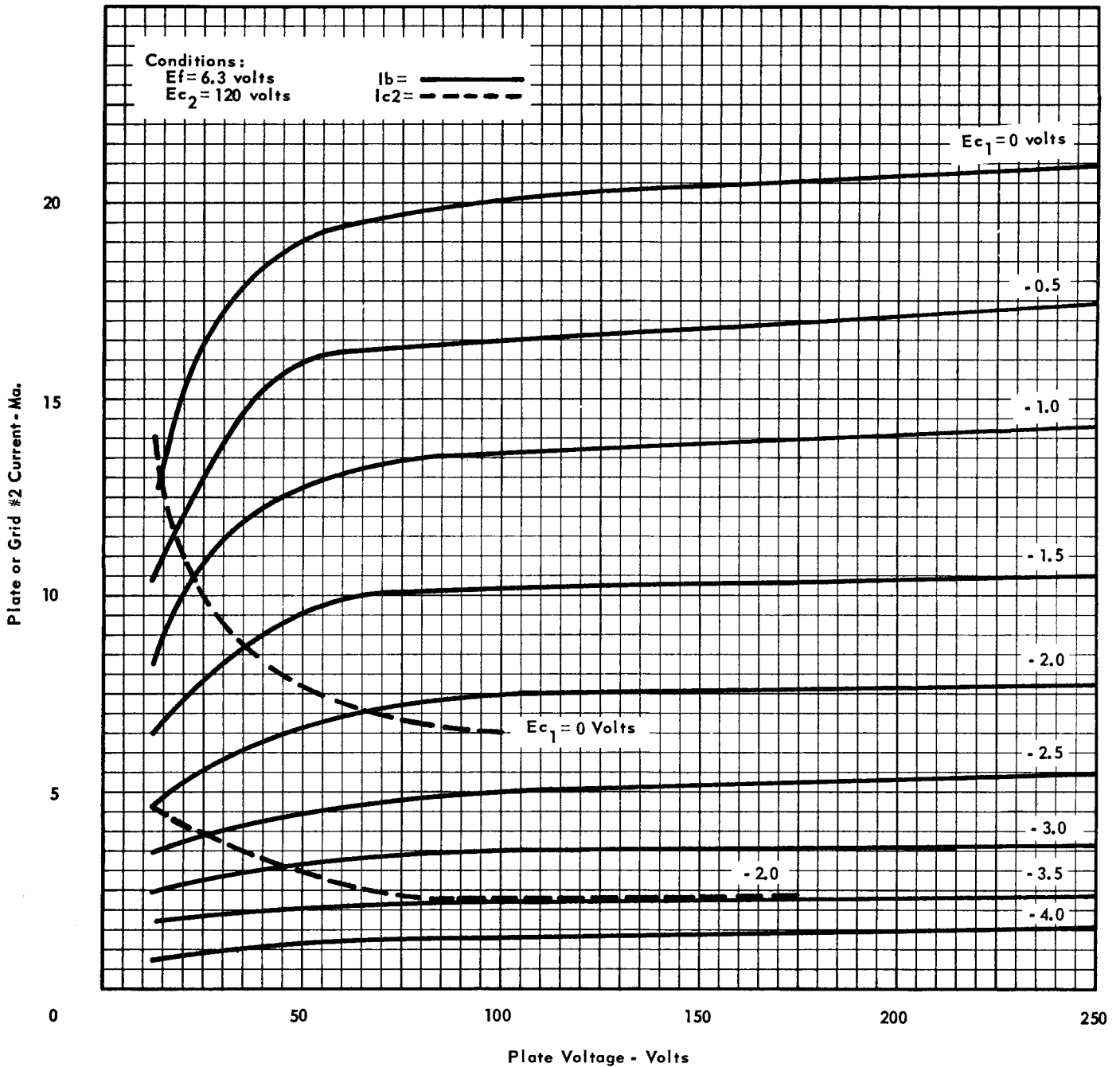
AVERAGE CHARACTERISTICS





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AVERAGE PLATE CHARACTERISTICS



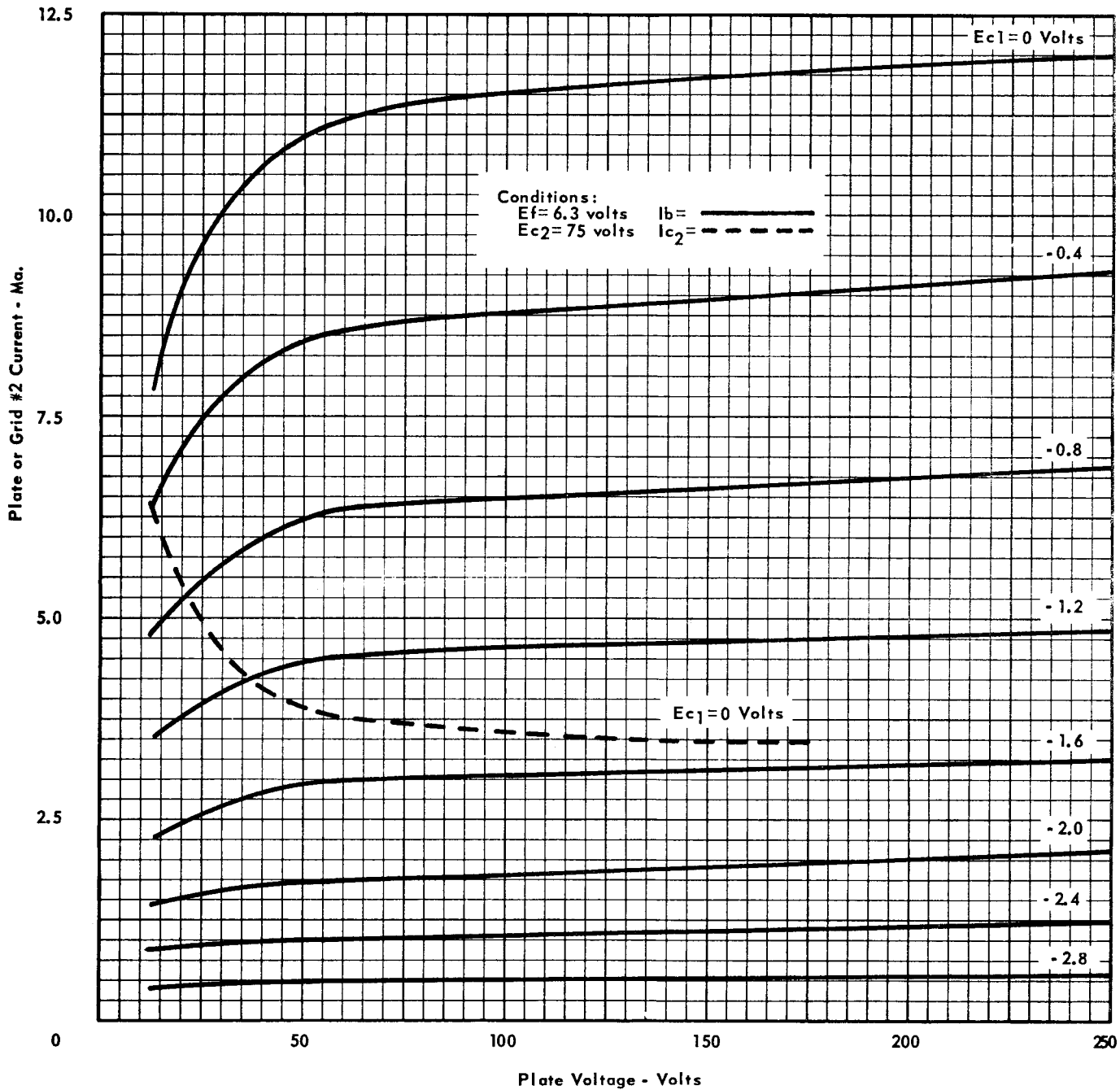
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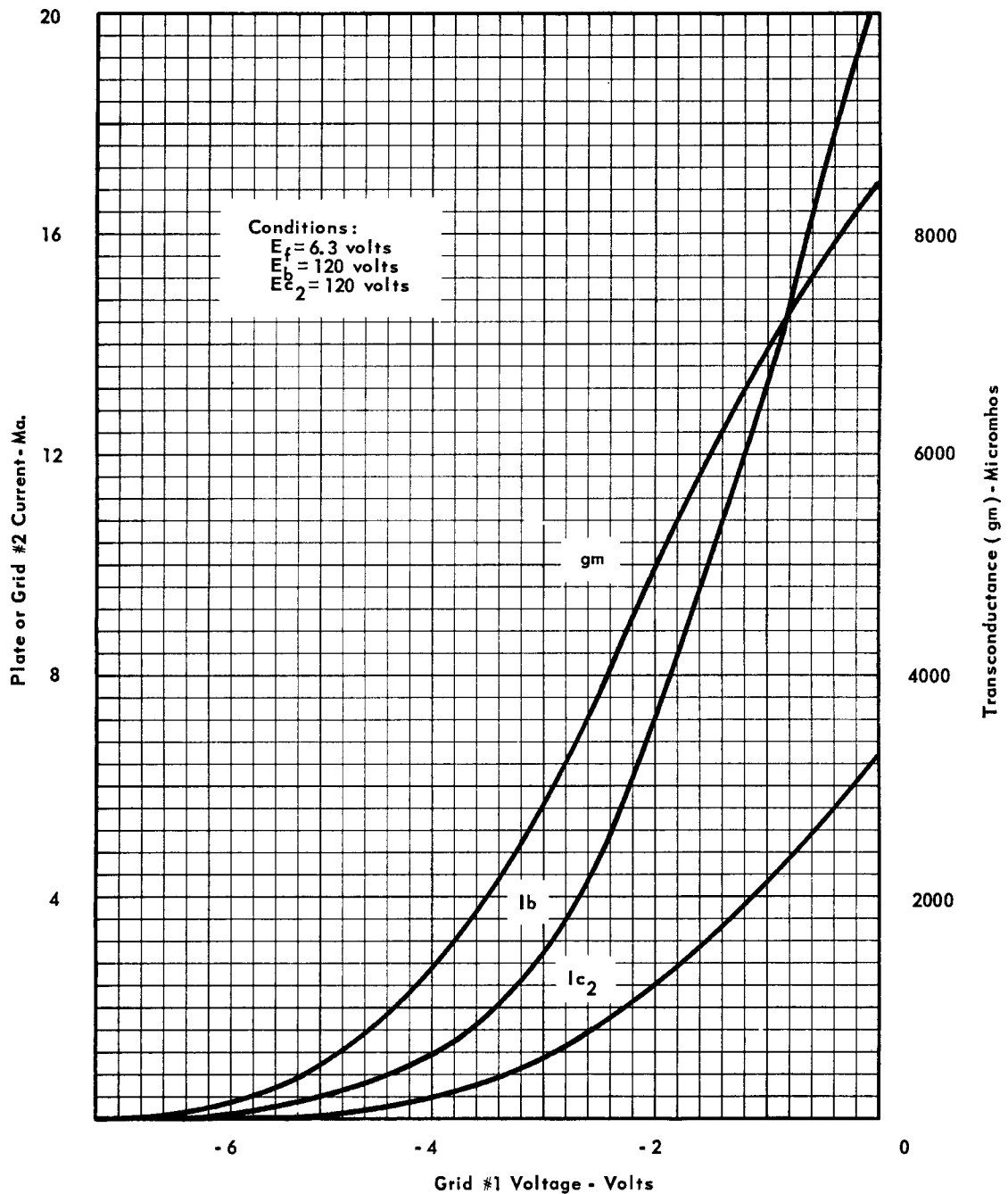
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AVERAGE PLATE CHARACTERISTICS





AVERAGE CHARACTERISTICS



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RELIABLE SUBMINIATURE PENTODE

