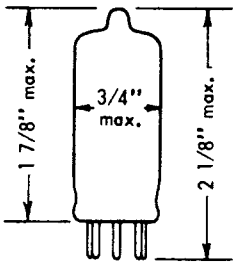
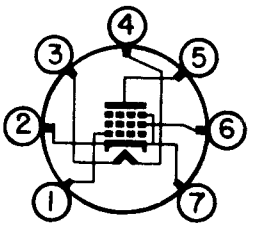
Excellence in Electronics

TYPE 6AN5WA

The 6AN5WA is a heater-cathode type, pentode power amplifier of miniature construction. This tube is characterized by long life and stable performance. The design features of low triode mu, high transconductance, high pervience, high plate current, and relatively low interelectrode capacitances make it suitable for service as a wide band, RF or video power amplifier in equipment with low plate supply voltages. It is especially designed for frequency-divide and pulse amplifier circuits in electronic computers, and other "on-off" control applications requiring long periods of operation under cutoff conditions.





BOTTOM VIEW

7BD

MECHANICAL DATA

ENVELOPE: T-5½ Glass

BASE: Miniature Button 7-Pin

TERMINAL CONNECTIONS:

Pin 1 Grid #1	Pin 5 Plate
Pin 2 Cathode, Grid #3	Pin 6 Grid #2
Pin 3 Heater	Pin 7 Cathode, Grid #3
Pin 4 Heater	

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test-Note 3)	450 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test-Note 4)	2.5 G
Maximum Bulb Temperature	200 °C

MOUNTING POSITION: Any

ELECTRICAL DATA

CAUTION-----To Electronic Equipment Design Engineers. Special attention should be given to the temperature 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 and performance will be jeopardized if filament voltage ratings are exceeded. Life and 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 6)	NORMAL OPERATION CLASS A (Note 5)	DESIGN MAXIMUM CLASS A (Note 9) (1)	(2)	MIL-E-1 UNITS
Heater Voltage (Note 7)	Ef:	5.7	6.3	6.3	6.9	6.9	V
Plate Voltage	Eb:	----	120	120	135	330	Vdc
Grid #1 Voltage	Ec1:	----	0	0	----	----	Vdc
Grid #2 Voltage	Ec2:	----	120	120	135	330	Vdc
Plate Dissipation	Pp:	----	----	4.0	4.6	----	W
Grid #2 Dissipation	Pg2:	----	----	1.3	1.55	----	W
Heater-Cathode Voltage	Ehk:	-200	----	100	200	200	v
Cathode Current	Ik:	----	----	44	55	55	mAdc
Cathode Resistance	Rk:	----	125	125	----	----	ohms
Useful Power Output	Po:	----	----	1.25	----	----	W
Plate Current (1)	Ib(1):	----	----	33	----	----	mAdc
Transconductance (1)	Sm(1):	----	----	8500	----	----	μmhos

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
MEASUREMENTS ACCEPTANCE TESTS – PART 1			**Combined AQL = 1.0% excluding Mechanical and Inoperatives**							
Heater Current:		0.65	If:	420	432	450	468	480	36	mA
Heater-Cathode Leakage:	Ehk = +100 Vdc	0.65	Ihk:	----	----	----	----	20	----	μAdc
	Ehk = –100 Vdc		Ihk:	----	----	----	----	20	----	μAdc
Grid Current (1):	Rg = 0.5 Meg. Min.	0.65	Ic1:	----	----	----	----	–2.0	----	μAdc
Plate Current (1):		0.65	Ib(1):	25	28	33	38	43	8	mAdc
Power Output:	Esig = 4.25 Vac; RL = 2500 ohms	0.65	Po:	1.0	1.1	1.25	----	----	----	W
Continuity and Shorts (Inoperatives):		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope T – 5½(6–2)	----	----	----	----	----	----	----	----	----
MEASUREMENTS ACCEPTANCE TESTS – PART 2										
Insulation of Electrodes:	Ef = 6.3 V E (g1 – all) = –100 Vdc E (p – all) = –300 Vdc	2.5	R (g1 – all): R (p – all):	100 100	---- ----	---- ----	---- ----	---- ----	---- ----	Meg. Meg.
Screen Current (1):		2.5	Ic2(1):	6	8	11	14	16	3.5	mAdc
Plate Current (2):	Ec1 = –20 Vdc	2.5	Ib(2):	----	----	----	----	1.0	----	mAdc
Transconductance (1):		2.5	Sm (1):	7000	7500	8500	9500	10000	1200	μmhos
Grid Emission:	After 5 min. preheat at Ef = 7.5 V; measure Grid Emission at Ef = 7.5 V; Ec1 = –45 Vdc; Rg1 = 0.01 Meg. Min.	2.5	Isg1:	----	----	----	----	–4.0	----	μAdc
Transconductance (2):	Ef = 5.7 V (Note 8)	2.5	Δ_{Ef}Sm (2):	----	----	----	----	15	----	%
Emission:	Eb = Ec2 = Ec1 = 15 Vdc	2.5	Is:	100	----	----	----	----	----	mAdc
Noise and Microphonics:	Esig = 500 mVac; Rp = 2000; Rg1 = 0.1 Meg.	2.5	EB:	----	----	----	----	17	----	VU
Capacitance			Cg1P:	----	----	----	----	0.075	----	μμf
Capacitance	Note 2	6.5	Cin:	6.0	----	9.0	----	12.0	----	μμf
Capacitance			Cout:	4.0	----	5.5	----	7.0	----	μμf
Low Pressure Voltage Breakdown:		6.5	----	500	----	----	----	----	----	Vac
Vibration (2):	F = 25 cps; G = 2.5; Rp = 2000 ohms	2.5	Ep:	----	----	----	----	100	----	mVac
Plate Current (3):	Eb = Ec2 = 60 Vdc; Ec1 = 0; Rk = 0	6.5	Ib (3):	25	----	----	----	----	----	mAdc
Screen Current (2):	Eb = Ec2 = 60 Vdc; Ec1 = 0; Rk = 0	6.5	Ic2 (2):	6.5	----	----	----	15.5	----	mAdc
DEGRADATION RATE ACCEPTANCE TESTS										
Fatigue:	96 Hours; G = 2.5; Fixed Frequency; F = 25 min., 60 max. (Note 4)	6.5	----	----	----	----	----	----	----	----
Shock:	Hammer Angle = 30°; Ehk = +100 Vdc; Rg1 = 0.1 Meg; (Note 3)	20	----	----	----	----	----	----	----	----
Post Shock and Fatigue Test End Points:										
Vibration (2):	F = 25 cps; G = 2.5; Rp = 2000 ohms	----	Ep:	----	----	----	----	500	----	mVac
Heater-Cathode Leakage:	Ehk = +100 Vdc	----	Ihk:	----	----	----	----	50	----	μAdc
	Ehk = –100 Vdc	----	Ihk:	----	----	----	----	50	----	μAdc
Grid Current (1):	Rg = 0.5 Meg.	----	Ic1:	0	----	----	----	–4.0	----	μAdc

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	Allowable Defects per characteristic Combined Samples
DEGRADATION RATE ACCEPTANCE TESTS (cont'd.)								
Power Output:	Esig=4.25 Vac; RL=2500 ohms	----	Po:	0.8	----	W		
Miniature Tube Base Strain		----	----	----	----	----		
Glass Strain (Thermal Shock):		2.5	----	----	----	----		
ACCEPTANCE LIFE TESTS								
Heater Cycle:	Ef=7.5 V; Eb=Ec2=Ec1=0 V; Ehk=100 V; 1 min. on, 4 min. off	1.0	----	2000	----	cycles		
1 Hour Stability Life Test:	TA=Room; Ehk=+135 Vdc; Rg1=0.1 meg.	----	----	----	----	----		
1 Hour Stability Life Test End Points:								
Change in Trans-conductance (1) of individual tubes:	(Typical Sample Size=50 tubes)	1.0	Δ_tSm(1):	----	10	%		
100 Hour Survival Rate Life Test:	TA=Room; Ehk=+135 Vdc; Rg1=0.1 Meg.	----	----	----	----	----		
100 Hour Survival Rate Life Test End Points:								
Continuity and Shorts (Inoperatives):	(Typical Sample Size=200 tubes)	0.65	----	----	----	----		
500 and 1000 Hour Intermittent High Temperature Life Test:	T Bulb=+200°C; Ehk=+135 Vdc; Rg1=0.1 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	-2.0	μAdc	1	3
Heater Current:		----	If:	410	490	mA	2	5
Change in Trans-conductance (1) of individual tubes:		----	Δ_tSm(1):	----	20	%	1	3
Power Output (1):		----	Po(1):	0.75	----	W	1	3
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=-100 Vdc	---- ----	Ihk: Ihk:	---- ----	75 75	μAdc μAdc	2	5
Insulation of Electrodes:								
g1-all p-all		---- ----	Rg1-all: Rp-all:	50 50	---- ----	Meg. Meg.	2	5
Plate Current (1):		----	Ib(1):	25	----	mAdc	2	5
Transconductance (1) Average Change:		----	Avg.Δ_tSm(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

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	Allowable Defects per characteristic Combined Samples
ACCEPTANCE LIFE TESTS (cont'd.)								
Grid Current (1):		----	Ic (1):	0	–4.0	μAdc	2	5
Heater-Current:		----	If:	410	490	mA	2	5
Change in Trans-conductance (1) of individual tubes:		----	Δ_t Sm (1):	----	20	%	2	5
Power Output (1):		----	Po (1):	0.5	----	W	2	5
Heater-Cathode Leakage:	Ehk=+100 Vdc Ehk=–100 Vdc	---- ----	Ihk: Ihk:	---- ----	75 75	μAdc μAdc	2	5
Insulation of Electrodes:								
g1–all: p–all:		---- ----	Rg1–all: Rp–all:	40 40	---- ----	Meg. Meg.	2	5
Plate Current (1):		----	Ib (1):	25	----	mAdc	2	5
Total Defectives:		----	----	----	----	----	5	10
500 Hour Cathode Interface Resistance Life Test:	TA=Room; Ef=7.5 Vac; Ehk=0; g1,g2, and P Floating	----	----	----	----	----	---	---
500 Hour Cathode Interface Resistance Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample 40 tubes 2nd sample)	----	----	----	----	----	---	---
Interface Resistance:	Ef=5.7 V; Rk=0; Ec1/Ib=4.0 mAdc	----	ri:	----	25	ohms	1	3

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 cylindrical shield No. 316 connected to cathode lead.

Note 3: Test Conditions and Acceptance Criteria per Shock Test Procedures of MIL-E-1 basic specifications.

Note 4: Test Conditions and Acceptance Criteria per Fatigue Test Procedures of MIL-E-1 basic specifications.

Note 5: These normal values represent conditions at which control of reliability may be expected.

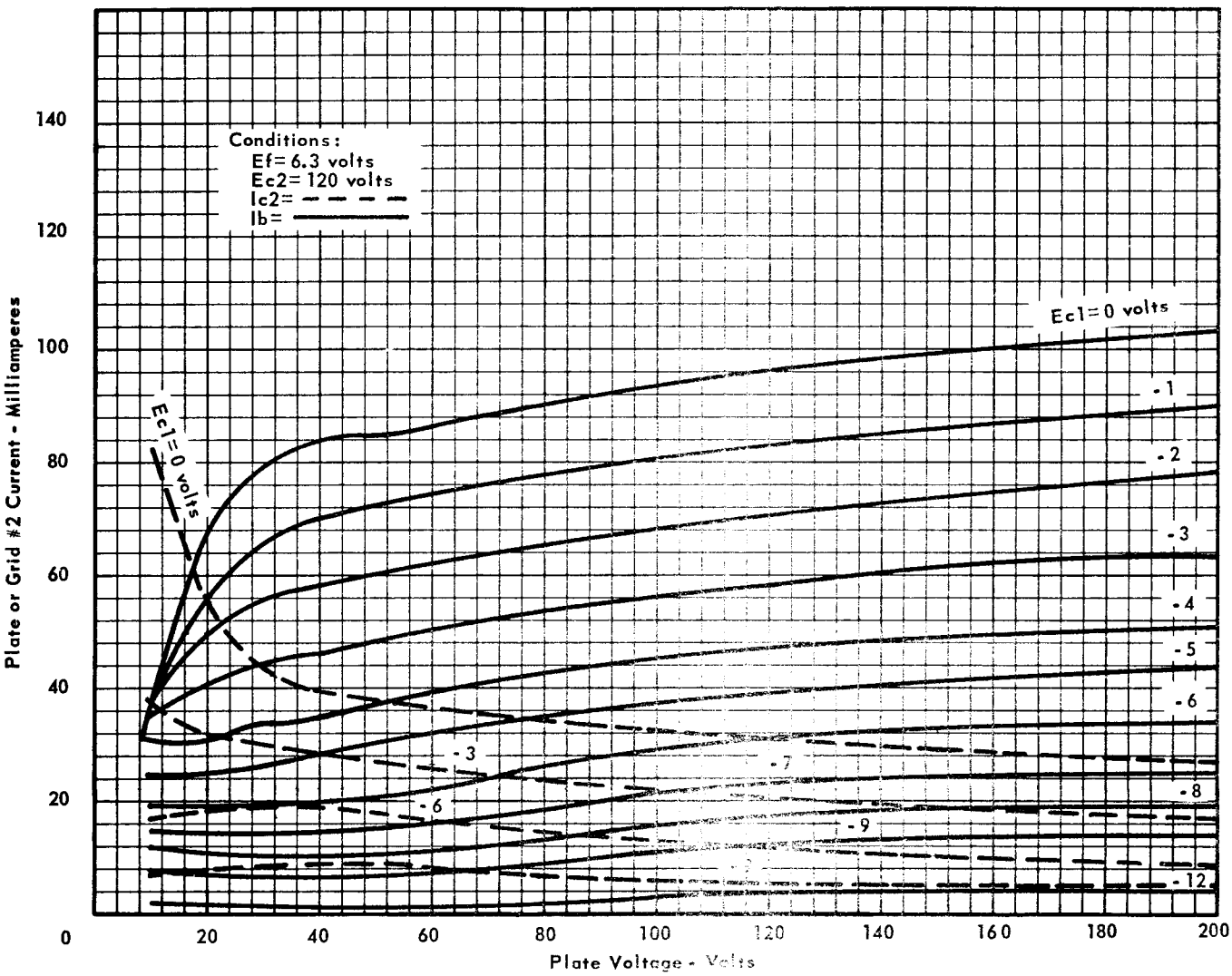
Note 6: These normal test conditions are used for all characteristic tests unless otherwise stated under individual test items.

Note 7: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

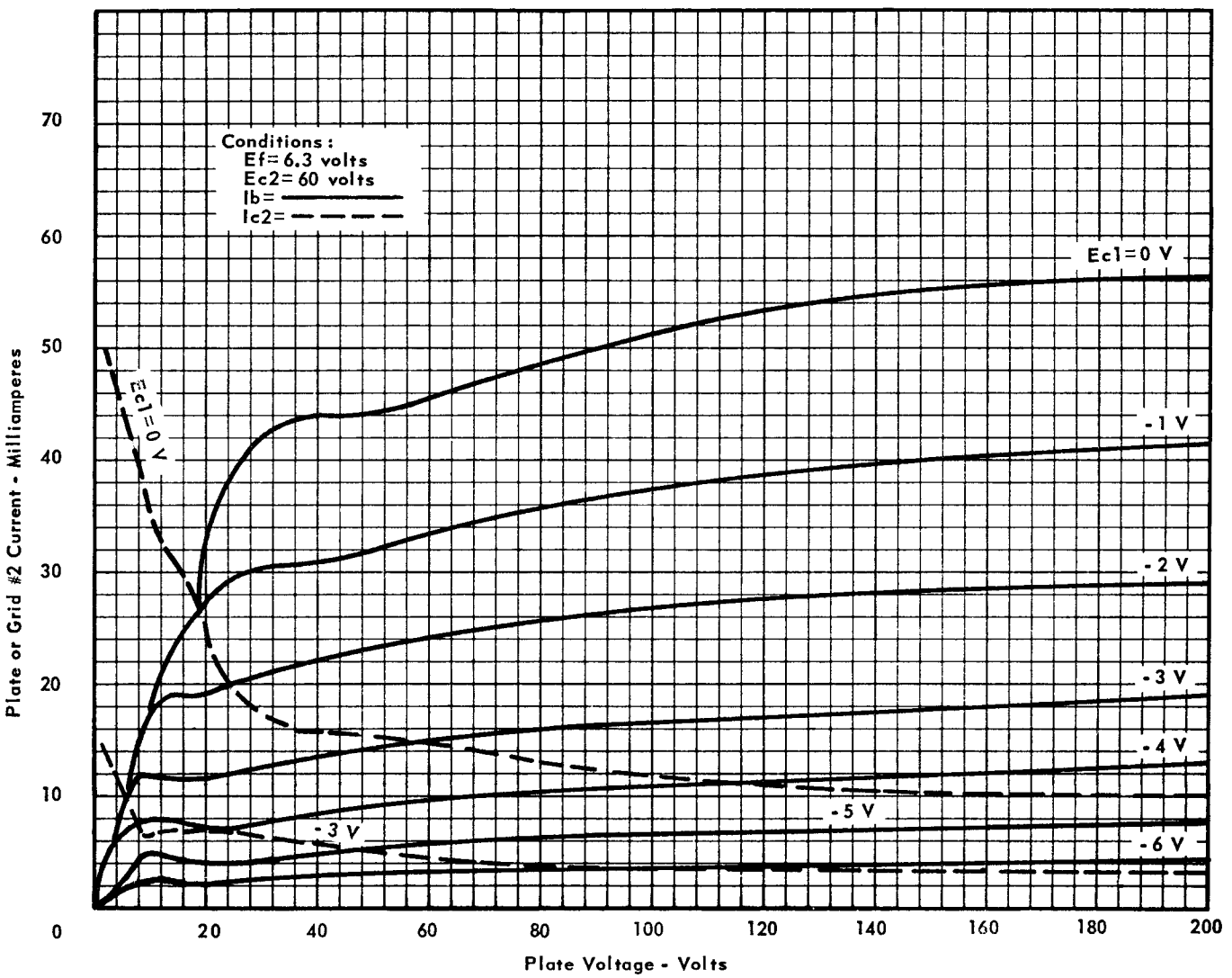
Note 8: Change of transconductance for individual tubes from that value measured at Ef=6.3 V to that value measured at Ef=5.7 V.

Note 9: The voltages at the plate or screen may be as high as rating (2) provided the following condition is met: When the average voltage at the electrode (taken over any (1) second interval exceeds rating (1) dc voltage for that electrode, the average dissipation for that electrode shall not exceed the rating (1) dissipation divided by the ratio of the average voltage to the rating (1) dc voltage.

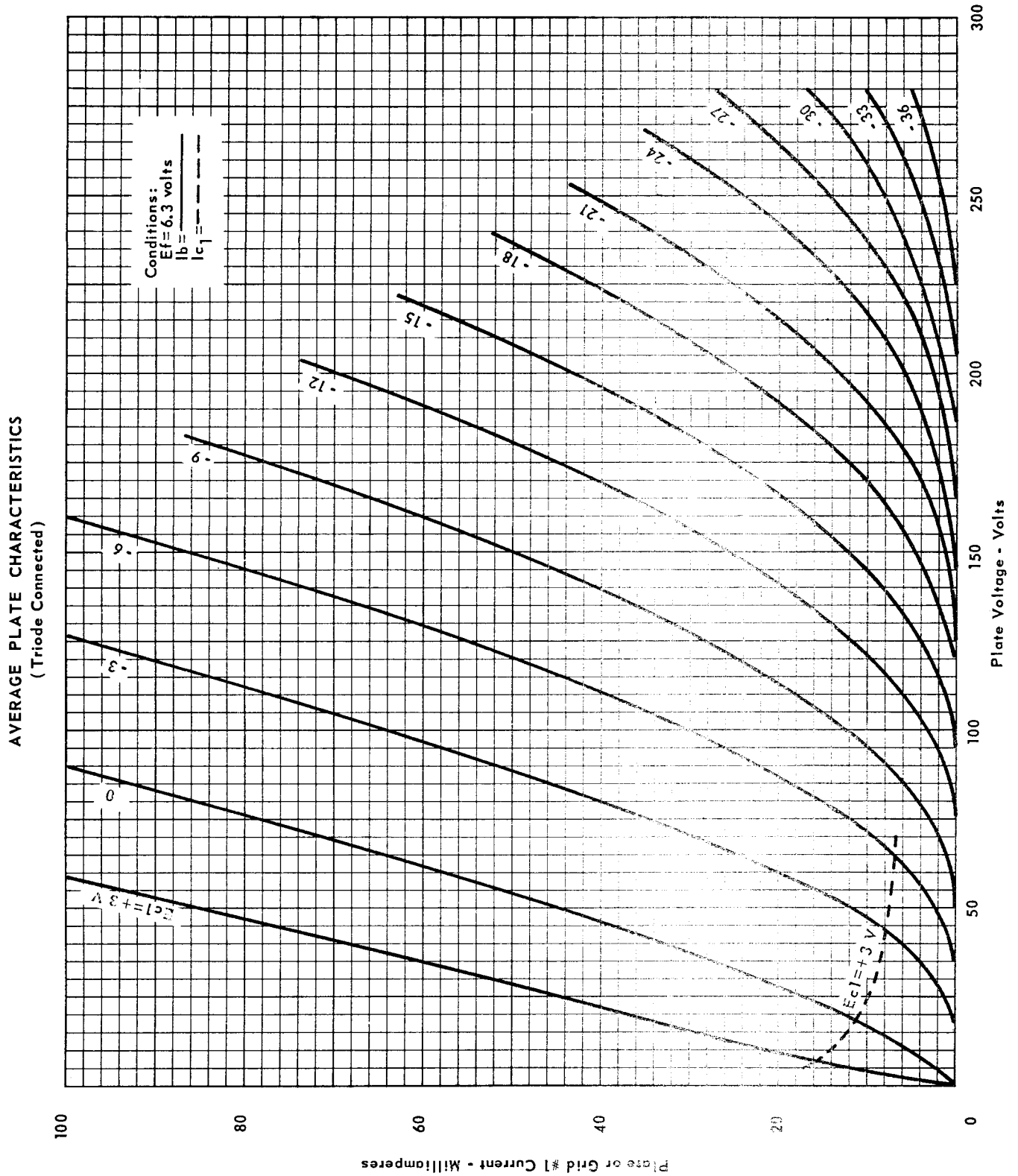
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



RELIABLE PENTODE



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