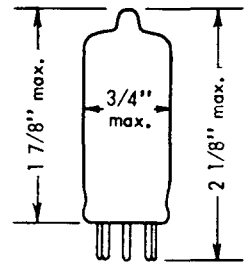
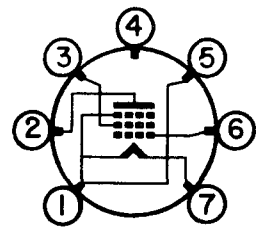
PENTODE

TYPE 1U4WA

The 1U4WA is a filament type sharp cut-off pentode of miniature construction designed for RF and AF applications in portable equipment. It is intended for service where extreme conditions of mechanical shock or vibration are encountered. It is particularly useful in voltage amplifier circuits where its low microphonic noise and vibration output are essential for specialized military electronic equipment.





BOTTOM VIEW

6AR

MECHANICAL DATA

ENVELOPE: T-5½ Glass

BASE: Miniature Button 7-Pin

TERMINAL CONNECTIONS:

Pin 1 Filament, Negative, Grid #3, Shield
Pin 2 Plate
Pin 3 Grid #2
Pin 4 No Connection
Pin 5 Filament, Negative, Grid #3, Shield
Pin 6 Grid #1
Pin 7 Filament, Positive

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test—Note 2)	450 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test—Note 3)	2.5 G

MOUNTING POSITION: Any

ELECTRICAL DATA

CAUTION---To Electron 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 5)	NORMAL OPERATION (Note 4)	DESIGN MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 6)	Ef:	1.00	1.25	1.25	1.50	Vdc
Plate Voltage (Note 7)	Eb:	----	90	90	135	Vdc
Grid Voltage	Ec1:	----	0	0	----	Vdc
Grid Voltage #2 (Note 7)	Ec2:	----	90	90	135	Vdc
Plate Dissipation	Pp:	----	----	----	0.17	Watts
Grid #2 Dissipation	Pg2:	----	----	----	0.05	Watts
Grid Resistance	Rg(1):	----	----	----	2.0	Meg.
Transconductance	Sm:	----	----	900	----	μmhos
Plate Current	Ib1:	----	----	1.6	----	mAdc
Cathode Current	Ik:	----	----	----	3.0	mAdc

Tentative Data

ELECTRICAL DATA (Cont'd)

CHARACTERISTICS AND QUALITY CONTROL (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								
Grid Current (1):	Eb = Ec2 = 135 Vdc; Ec1 = −2.0 Vdc	0.65	Ic1:	0	----	----	----	−1.0	----	μAdc
Plate Current (1):		0.65	Ib1:	1.0	----	----	----	2.1	----	mAdc
Screen Grid Current:		0.65	Ic2:	0.28	----	----	----	0.62	----	mAdc
Transconductance (1):		0.65	Sm (1):	720	----	----	----	1080	----	μmhos
Noise and Microphonics:	Ebb = Ecc2 = 90 Vdc; Ecal = 10.0 mVac; Rp = 1.0 Meg.; Rg2 = 4.7 Meg.; Cg2 = 0.1μf	0.65	EB:	----	----	----	----	17	----	VU
Continuity and Shorts: (Inoperatives)		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope Outline (6−2)	----	----	----	----	----	----	----	----	----
MEASUREMENTS ACCEPTANCE TESTS, Part 2										
Insulation of Electrodes:	g-all = −100 Vdc p-all = −100 Vdc	4.0	Rg-all: Rp-all:	100 100	---- ----	---- ----	---- ----	---- ----	---- ----	Meg. Meg.
Plate Current (2):	Ec1 = −4.5 Vdc	6.5	Ib:	0	----	----	----	30	----	μAdc
Transconductance (2):	Ef = 1.0 Vdc	6.5	Sm (2):	610	----	----	----	1080	----	μmhos
Filament Current:		6.5	If:	44	----	----	----	56	----	mA
Capacitance:	Shield #316	6.5	Cg1p:	----	----	----	----	0.02	----	μμf
Capacitance:	Shield #316		Cin:	3.0	----	----	----	4.2	----	μμf
Capacitance:	Shield #316		Cout:	5.6	----	----	----	7.6	----	μμf
Vibration (1):	Rp = 10,000 ohms; 40 cps; 15 g	6.5	Ep:	----	----	----	----	10	----	mVac
Vibration (2):	f = 50 cps − 3500 cps; Rp = 10,000 ohms (Note 8)	6.5	Ep (2):	----	----	----	----	15	----	mVac
DEGRADATION RATE ACCEPTANCE TESTS										
Shock:	Hammer Angle = 30° (Note 2)	----	----	----	----	----	----	----	----	----
Fatigue:	G = 2.5; F = 25 cps min; 60 cps max; Fixed Frequency (Note 3)	6.5	----	----	----	----	----	----	----	----
Post Shock and Fatigue Test End Points:										
Transconductance (1)		----	Sm:	540	----	----	----	----	----	μmhos
Vibration		----	Ep:	----	----	----	----	15	----	mVac
Miniature Tube Base Strain:		----	----	----	----	----	----	----	----	----
Glass Strain (Thermal Shock):		2.5	----	----	----	----	----	----	----	----

ELECTRICAL DATA (Cont'd)

CHARACTERISTICS AND QUALITY CONTROL (Note 1) (Cont'd)

TEST	CONDITIONS	AQL %	MIL-E-1 SYMBOL	MIN	MAX	MIL-E-1 UNITS	Allowable Defects per Characteristics 1st Sample	Combined Samples
ACCEPTANCE LIFE TESTS								
Intermittent Life Test:	Ef=1.25 Vdc; or Vac with equivalent bias; Group A	----	t:	500	----	Hours	----	----
Intermittent Life Test End Points:								
Transconductance (1)		----	Sm (1):	540	----	μmhos	----	----
Grid Current		----	Ic (1):	----	-1.0	μAdc	----	----

NOTES:

Note 1: Characteristics, Quality Control Procedures, and Inspection Levels are made according to the appropriate paragraph of MIL-E-1, and MIL-STD-105A.

Note 2: Test Conditions and Acceptance Criteria per Shock Test procedures of MIL-E-1 basic specifications.

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

Note 4: These normal values represent conditions at which control of reliability may be expected.

Note 5: These normal test conditions are used for all characteristics unless otherwise stated under the individual test item.

Note 6: 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, and improvement in reliability will be realized.

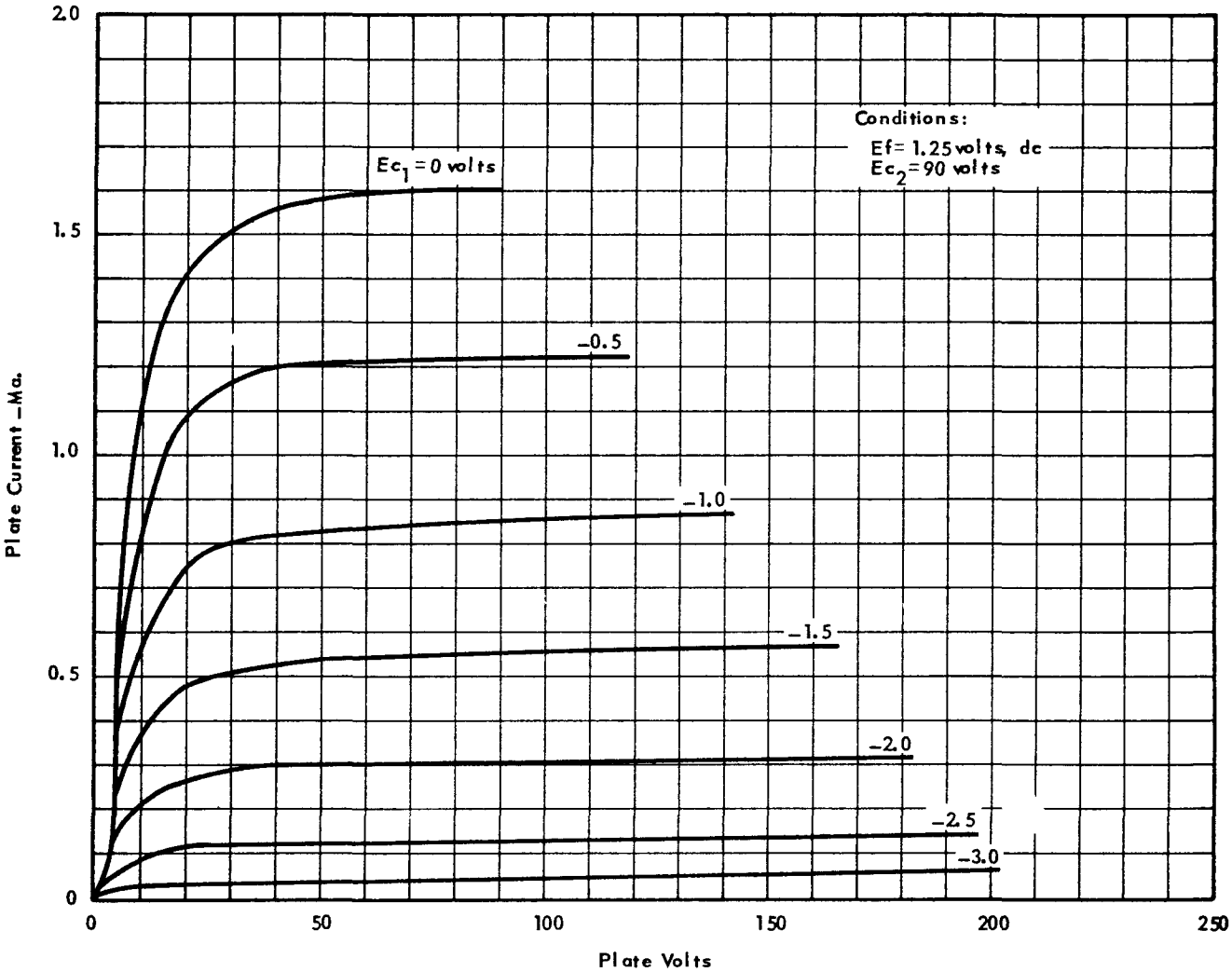
Note 7: Plate and Screen Voltages should not exceed these values under any circumstances.

Note 8: The tube under test shall be rigidly mounted on a vibration table vibrating with simple harmonic motion. The test conditions of paragraph 4.9.19.1 of MIL-E-1 shall be applied and Ep monitored while the frequency of vibration is continuously swept from 50 – 3500 cps and the peak acceleration controlled constant at 2G. A low pass filter which follows the load resistor of the tube under test shall have a cut-off frequency of 3500 cps. The total time of sweep shall not be less than one (1) minute.

RAYTHEON

PENTODE

AVERAGE PLATE CHARACTERISTICS



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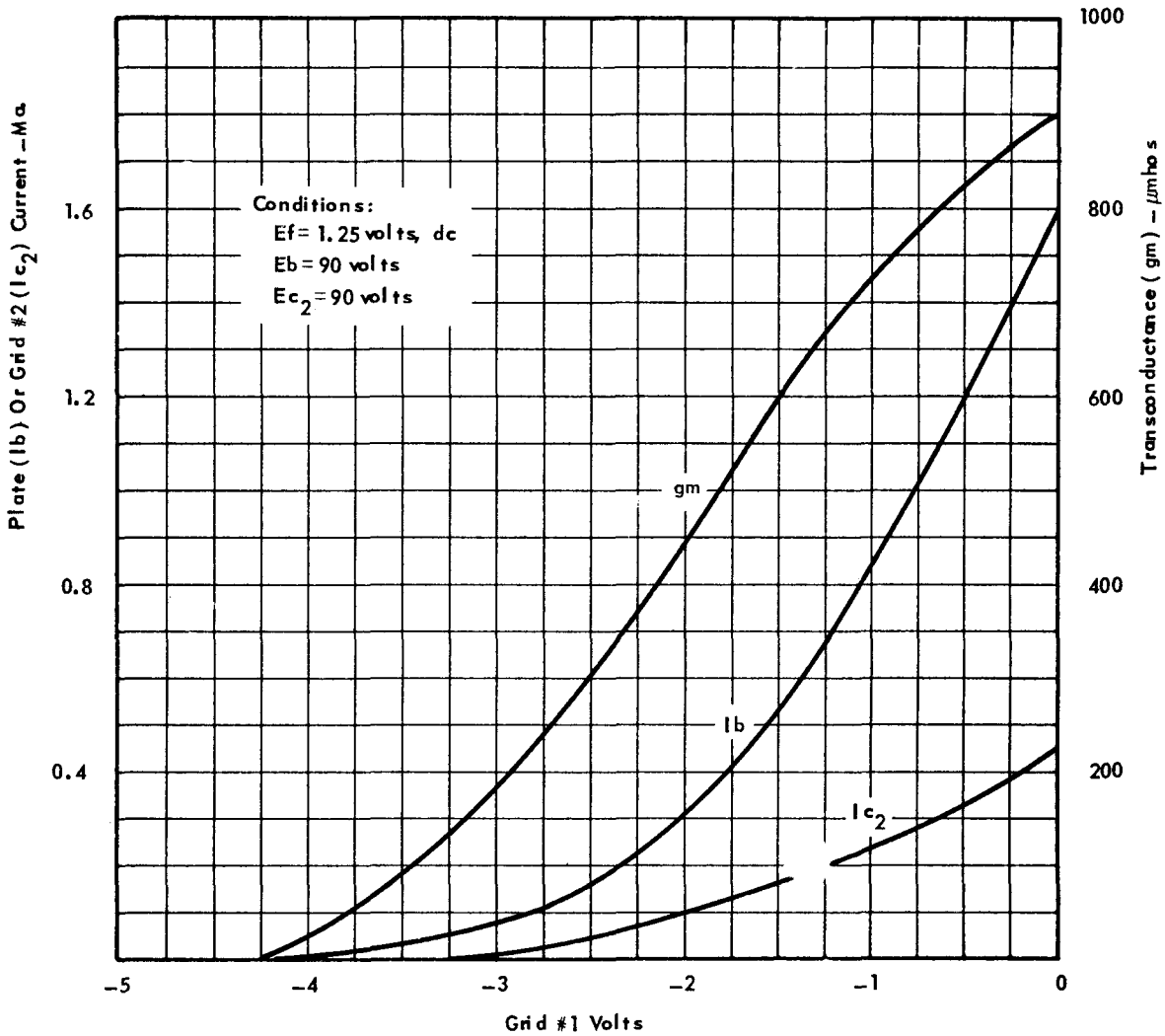
AVERAGE CHARACTERISTICS