

INCH-POUND

MIL-PRF-1/779K
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SUPERSEDING
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PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING

TYPE 5687WB

This specification is approved for use by all Departments and Agencies of the Department of Defense.

Inactive for new design
after 7 March 1997.

The requirements for acquiring the electron tube described herein shall consist of this document and MIL-PRF-1.

DESCRIPTION: Double triode, miniature, low Mu.
Outline --- 6-2 (EIA).
Base --- E9-1.
Envelope --- T6-1/2.
Cathode --- Coated unipotential.
Base connections:

Pin no.	---	1	2	3	4	5	6	7	8	9
Element	---	2a	2g	2k	h	h	1k	1g	hct	la

ABSOLUTE-MAXIMUM RATINGS:

<u>Normal</u>												
Parameter:	Ef	Eb	Ec	Ehk	Rg/g	Ic/g	Ik/k	Pp/p	TE	Alt		
Unit:	V	V dc	V dc	v	Meg Ω	mA dc	mA dc	W	°C	ft		
Maximum:	6.6	330	0, -200	135	0.1	6.0	65	3.75	225	(see note 3)		
Minimum:	13.2	---	---	---	(see note 1)	---	---	(see note 2)	---	---		
	6.0	---	---	---	---	---	---	---	---	---		
	12.0	---	---	---	---	---	---	---	---	---		
<u>TEST CONDITION (1):</u>	12.6	120	-2	0	---	---	---	---	---	---		

Pulse service

Parameter:	Ef	Eb	Ec	eb	egk	ehk	Pg/g	Pp/p	ik/k	Du	tp	Prr
Unit:	V	V dc	V dc	v	v	v	W	W	mA	%	μs	
Maximum:	6.6	330	---	660	50,-100	100	0.1	4.0				
Minimum:	13.2	---	---	---	---	---	---	---	See figure 1			
	6.0	---	---	---	---	---	---	---				
	12.0	---	---	---	---	---	---	---				
<u>TEST CONDITIONS (2):</u>	12.6	300	-40	---	40	---	---	---	---	1.0	10	1,000

GENERAL:

Qualification – Not Required.

Reliable tube.

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TABLE I. Testing and inspection.

MIL-STD-1311 method	Requirement or test	Conditions	Acceptance Level 16/	Symbol	Limits		Unit
					Min	Max	
	<u>Conformance inspection, part 1</u>						
1256	Electrode current (1) (anode)	Test condition (1) (see notes 4 and 5)	0.4	I _b	27	45	mAdc
1266	Total grid current	Test condition (1) (see notes 4 and 5)	0.4	I _c	0	-1.5	μAdc
1301	Heater current		0.4	I _f	410	470	mA
1306	Transconductance (1)	Test condition (1) (see note 4)	0.4	S _m	8,500	14,500	μmhos
1336	Heater-cathode leakage	See note 4	0.4	I _{hk}	---	30	μAdc
1201	Short and discontinuity detection		0.4	---	---	---	---
	<u>Quality conformance inspection, part 2</u>						
1211	Insulation of electrodes	E(g to all) = -300 V E(a to all) = -500 V (see note 4)	} 2.5	---	---	---	---
1031	Low-frequency vibration	Test condition (1); F=40 Hz; 10 G; R _p = 2,000 ohms (see note 4)		E _p	---	100	mVac
2201	Noise and microphonics	E _{bb} = 300 Vdc; E _c = 0; E _{sig} = 70 mVac R _k = -680 ohms; R _g = 1.9 MegΩ; R _p = 2,000 ohms (see note 6)	2.5	---	---	---	---
1256	Electrode current (2) (anode)	Test condition (1); E _b = 300 V dc; E _c = -20 V dc (see note 4)	2.5	I _b	---	6.0	mAdc
1256	Electrode current (3) (anode)	Test condition (1); E _b = 300 Vdc; E _c = -25 Vdc (see note 4)	2.5	I _b	---	1.0	mAdc

See notes at end of table I.

TABLE I. Testing and inspection - Continued.

MIL-STD-1311 method	Requirement or test	Conditions	Acceptance Level 16/	Symbol	Limits		Unit
					Min	Max	
	<u>Conformance inspection, part 2</u> -Continued						
1266	Grid emission	Ef = 14.0 V; Eb = 120 Vdc; Ec = -25 Vdc (see notes 4 and 8)	2.5	Is	0	-5.0	μAdc
1296	Pulse current (1) (cathode)	Test condition (2); Rk/k = 1.0 ohm (see notes 4 and 9)	2.5	ik	900	---	ma
1296	Pulse current (2) (cathode)	Test condition (2); Ef = 12.0 V; Rk/k = 1.0 ohm (see notes 4 and 9)	6.5	ik	800	---	ma
1306	Transconductance (2)	Test condition (1); Ef = 11.4 V (see note 4)	2.5	ΔSm Ef	---	15	%
1316	Amplification factor	Test condition (1) (see note 4)	2.5	Mu	16	21	---
1331	Direct-interelectrode capacitance	No shield (see note 4) No shield (see note 4) No shield (triode No. 1) No shield (triode No. 2) No shield (see note 4)	6.5	Cgp Cin Cout Cout Chk	2.8 2.8 0.42 0.34 ---	5.2 5.2 0.78 0.66 9.7	pF pF pF pF pF
1231	Emission current (anode)	Epp = 195 Vac; Ec = 0; Rk/lb = 10.5 mAdc (see note 10)	2.5	Is	---	25	μAdc
1121	Base strain	See note 11	---	---	---	---	---
2126	Glass strain		2.5	---	---	---	---
1041	Shock	Test condition (1); 450 G; Ehk = 100 Vdc (see note 12)	6.5	---	---	---	---
1031	Vibration fatigue	2.5 G; F = 25 (min) ,60 (max); fixed frequency	6.5	---	---	---	---
---	Post-shock and vibration-fatigue test end points		---	Ep	---	150	mAdc
1031	Low-frequency vibration		---	lhk	---	50	μAdc
1336	Heater-cathode leakage		---	Sm	---	---	μmhos
1306	Transconductance (1)		---	Ic	---	-3.0	μAdc
1266	Total grid current		---	---	---	---	---
1105	Permanence of marking		---	---	---	---	---

See notes at end of table I.

TABLE I. Testing and inspection - Continued.

MIL-STD-1311 method	Requirement or test	Conditions	Symbol	Limits		Unit
				Min	Max	
	<u>Conformance inspection, part 3</u>					
1506	Heater-cycling life	Ef = 7.5 V; 1 min "on", 4 min "off"; Ehk = 135 Vdc; Eb = Ec = 0 (see note 7)	---	---	---	---
---	Heater-cycling life-test end point					
1336	Heater-cathode leakage		Ihk	---	30	μAdc
1516	Stability life	Test condition (1); Ec = 0; Rk/k = 68 ohms; Enk = 135 Vdc; Rg/g = 1.0 MegΩ; TA = room	---	---	---	---
0078	Stability life-test end point					
1306	Change in transconductance (1) of individual tubes		ΔS_{m_t}	---	10	%
1501	Intermittent life	Stability life-test conditions; TE = 225°C (min) (see notes 14 and 16)	---	---	---	---
---	Intermittent life-test end points (1,000 hours)					
---	Inoperatives		---	---	---	---
1266	Total grid current		Ic	0	-2.5	μAdc
1301	Heater current		If	400	480	mA
1306	Change in transconductance (1) of individual tubes		ΔS_{m_t}	---	25	%
1306	Transconductance (2)		$\Delta S_{m_{E_f}}$	---	30	%
1336	Heater-cathode leakage		Ihk	---	50	μAdc
1211	Insulation of electrodes E (g to all) = -300 V E (a to all) = -500 V		R	25	---	Meg
1501	Intermittent life (pulse)	Test condition (2); Rb/p = 50 ohms (see note 15)	---	---	---	---
---	Intermittent pulse life-test end points					
	Inoperative		---	---	---	---
1296	Pulse cathode current (1)		ik	750	---	ma

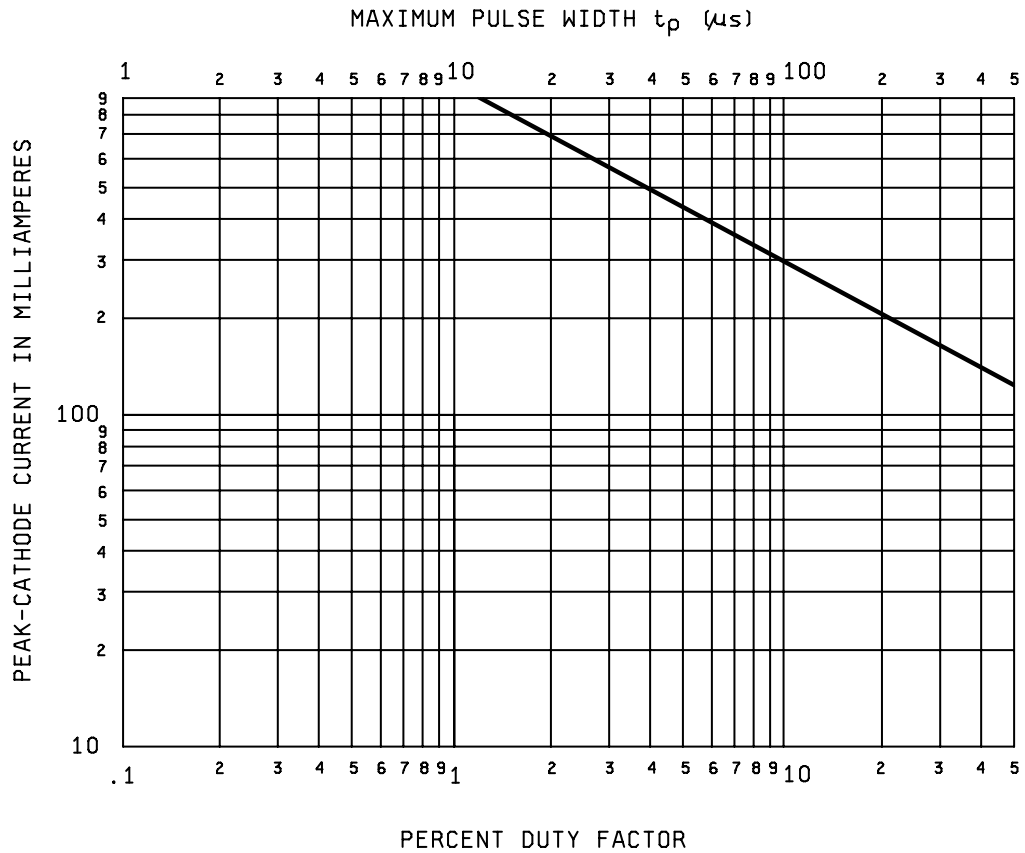
See notes at top of next page.

NOTES:

1. This value is for operation under fixed-bias conditions. With cathode bias, Rg/g may be 1.0 megohm maximum.
2. Pp/p on one section may be as great as 4.2 watts maximum providing that the total for both sections does not exceed 7.5 watts.
3. See "Reduced pressure (altitude) rating", and altitude, maximum peak voltage.
4. Test each section separately.
5. This test shall be performed at the conclusion of the holding period.
6. Tie 1k to 2k; 1g to 2g; and 1a to 2a.
7. Operate heaters in parallel.
8. Prior to this test, tubes shall be preheated a minimum of 5 minutes with all sections operating at the conditions specified below. Test at specified conditions within 3 seconds after preheating. The 3-minute test shall not be permitted. Grid emission shall be the last test performed on the sample selected for the grid-emission test.

Ef	Eb	Ec1	Rk/k	Rg/g
V	V dc	V dc	Ohms	Meg Ω
14.0	120	-2	0	1.0

9. The positive portion of the grid pulse shall be a square wave meeting pulse shape requirement of method 1296 and, in addition, the maximum amplitude shall occur within the first 20 percent of tp. The pulse shall be applied to the grid by means of a driving circuit which produces the specified peak pulse voltage directly at the grid terminal with respect to cathode. Grid resistance, not exceeding 50 ohms may be inserted to prevent oscillation, provided readjustment of grid drive is made to maintain the specified pulse amplitude directly at the grid terminal. Peak currents shall be measured by means of a high impedance oscilloscope, or equivalent device, connected across a cathode resistor of 1.0 ± 0.1 ohm. The specified limit refers to the maximum of pulse amplitude.
10. Test each unit separately with test voltages applied to opposite section. Tie grids to negative end of individual Rk through individual 100-ohm resistors. Adjust individual Rk for specified forward anode current ± 5 percent as measured on the forward half cycles of anode voltage. After a minimum of 5 minutes operation as above, measure reverse anode current on the reverse half cycles of anode voltage. See figure 2.
11. Acceptance sampling procedure shall be in accordance with "Base-strain test, miniature, sampling (method 1121)", except that data covered in "Acceptance and rejection criteria" shall be modified as follows:
 - (a) Accepted if no defects for class "A", "B", or "C", respectively (see method 1121), or if no defectives are found in the sample.
 - (b) Rejected if any defectives for class "A", "B", or "C", respectively, or if any defectives are found in the sample.
12. A grid resistor of 0.1 Meg Ω shall be added.
13. This test shall be conducted on the initial lot and thereafter on a lot approximately every 12 months. When one lot has passed, the 12-month rule shall apply. In the event of lot failure, the lot shall be rejected and the succeeding lots shall be subjected to this test until a lot passes.
14. Envelope temperature (TE) requirements, when measured in accordance with the temperature by conduction-band measurement (method 1226), will be satisfied if a tube having bogey Ib (± 5 percent) under normal test conditions, is determined to operate at or above minimum specified temperature at any position in the life-test rack.
15. The positive portion of the grid pulse shall be a rectangular wave meeting pulse shape requirement of method 1296. The pulse shall be applied to the grid by means of a driving circuit which produces the specified peak pulse voltage directly at the grid terminal with respect to the cathode. Grid resistance not exceeding 50 ohms may be inserted to prevent oscillation, provided readjustment of grid drive is made to maintain the specified pulse amplitude directly at the grid terminal. The pulse width, tp, shall be 10 ± 2 μ s, and the duty factor, 0.9 percent to 1.1 percent. Self-excited life-test circuitry is permissible, provided any additional anode voltage drops during the time of the pulse are compensated for by increasing Ebb. No fixed Ec1 need be applied under self-excited conditions.
16. This specification sheet utilizes accept on zero defect sampling plan in accordance with MIL-PRF-1, table III.
17. The life-test sample shall consist of the lesser of 20 tubes or 10 percent of lot size and no tube failures shall be permitted.



The area below and to the left of the line is the area of permissible operation. Nine hundred milliamperes is the maximum peak current at any duty factor less than 1 percent. For any tube operating under the worst possible conditions, the point indicating peak cathode current and percent duty factor and the point indicating peak-cathode current and pulse width should both be in the area of permissible operation. Duty factor is defined as the ratio of the average current to the maximum peak current occurring in any 1,000-microsecond period.

FIGURE 1. Pulse rating chart.

