

MILITARY SPECIFICATION SHEET
 ELECTRON TUBE, RECEIVING
 TYPE 5687WB

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

The complete requirements for procuring the electron tube described herein shall consist of this document and the latest issue of Specification MIL-E-1.

DESCRIPTION: Double triode, miniature, low Mu
 Outline --- 6-2 (E1A)
 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 1a

ABSOLUTE-MAXIMUM RATINGS:

Normal

Parameter:	Ef	Eb	Ec	Ehk	Rg/g	Ic/g	Ik/k	Pp/p	TE	Alt
Unit:	V	Vdc	Vdc	v	Meg	mAdc	mAdc	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	---	---	---	---	---	---	---	---	---

TEST CONDITION (1):

	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	Vdc	Vdc	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	---	---	---	---	---	---					

TEST CONDITIONS (2):

	12.6	300	-40	---	40	---	---	---	---	1.0	10	1,000
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GENERAL:

Qualification - Required

Reliable tube

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL PERCENT DEFECTIVE	INSP LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						MIN	MAX	
	<u>Quality conformance inspection, part 1</u>							
1256	Electrode current (1) (anode)	Test condition (1) (see notes 4 and 5)	0.4	II	Ib	27	45	mAdc
1266	Total grid current	Test condition (1) (see notes 4 and 5)	0.4	II	Ic	0	-1.5	μ Adc
1301	Heater current		0.4	II	II	410	470	mA
1306	Transconductance (1)	Test condition (1) (see note 4)	0.4	II	Sm	8500	14500	μ mhos
1336	Heater-cathode leakage	See note 4	0.4	II	Ihk	---	30	μ Adc
1201	Short and discontinuity detection		0.4	II	---	---	---	---
	<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	I	---	---	---	---
1031	Low-frequency vibration	Test condition (1); F = 40 Hz; 10 G; Rp = 2,000 ohms (see note 4)	6.5	Code H	Ep	---	100	mVac
2201	Noise and microphonics	Ebb = 300 Vdc; Ec = 0; Esig = 70 mVac; Rk = 680 ohms; Rg = 1.0 Meg; Rp = 2,000 ohms (see note 8)	2.5	I	---	---	---	---
1256	Electrode current (2) (anode)	Test condition (1); Eb = 300 Vdc; Ec = -20 Vdc (see note 4)	2.5	I	Ib	---	5.0	mAdc
1256	Electrode current (3) (anode)	Test condition (1); Eb = 300 Vdc; Ec = -25 Vdc (see note 4)	2.5	I	Ib	---	1.0	mAdc

METHOD	REQUIREMENT OR TEST	CONDITIONS	ACT. PERCENT DEFECTIVE	INSP LEVEL OR CODE	SYMBOL	Limits		Unit
						Min	Max	
	<u>Quality conformance inspection, part 2</u> -Continued							
1266	Grid emission	$E_f = 14.0 \text{ V}$; $E_b = 120 \text{ Vdc}$; $E_c = -25 \text{ Vdc}$ (see notes 4 and 8)	2.5	I	I_s	0	-5.0	μAdc
1296	Pulse current (1) (cathode)	Test condition (2); $R_k/k = 1.0 \text{ ohm}$ (see notes 4 and 9)	2.5	Code H	i_k	900	---	ma
1296	Pulse current (2) (cathode)	Test condition (2); $E_f = 12.0 \text{ V}$; $R_k/k = 1.0 \text{ ohm}$ (see notes 4 and 9)	6.5	Code H	i_k	800	---	ma
1306	Transconductance (2)	Test condition (1); $E_f = 11.4 \text{ V}$ (see note 4)	2.5	I	ΔS_m E_f	---	15	%
1316	Amplification factor	Test condition (1) (see note 4)	2.5	I	μ	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	Code E	C_{gp} C_{in} C_{out} C_{out} C_{hk}	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)	$E_{pp} = 195 \text{ Vac}$; $E_c = 0$; $R_k/I_b = 10.5 \text{ mAdc}$ (see note 10)	2.5	I	I_s	---	25	μAdc
1121	Base strain	See note 11	---	---	---	---	---	---
2126	Glass strain		2.5	I	---	---	---	---
1041	Shock	Test condition (1); 450 G; $E_{hk} = 100 \text{ Vdc}$ (see note 12)	6.5	See note 13	---	---	---	---
1031	Vibration fatigue	2.5 G; $F = 25$ (min), 60 (max); fixed frequency	6.5	See note 13	---	---	---	---
---	Post-shock and vibration-fatigue test end points							
1031	Low-frequency vibration		---	---	E_p	---	150	mVac
1338	Heater-cathode leakage		---	---	I_{hk}	---	50	μAdc
1306	Transconductance (1)		---	---	S_m	6500	---	μmhos
1266	Total grid current		---	---	I_c	---	-3.0	μAdc
1105	Permanence of marking		---	---	---	---	---	---

METHOD OR PARAGRAPH	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS		UNIT
				MIN	MAX	
	<u>Quality conformance inspection, part 3</u>					
1506	Heater-cycling life	$E_f = 7.5 \text{ V}$; 1 min "on", 4 min "off"; $E_{hk} = 135 \text{ Vdc}$; $E_b = E_c = 0$ (see note 7)	---	---	---	---
---	Heater-cycling life-test end point					
1336	Heater-cathode leakage		I_{hk}	---	30	μAdc
1516	Stability life	Test condition (1); $E_c = 0$; $R_k/k = 68 \text{ ohms}$; $E_{nk} = 135 \text{ Vdc}$; $R_g/g = 1.0 \text{ Meg}$; $T_A = \text{room}$	---	---	---	---
---	Stability life-test end point					
1306	Change in transconductance (1) of individual tubes		ΔS_m t	---	10	%
1501	Intermittent life	Stability life-test conditions; $T_E = 225^\circ\text{C}$ (min) (see notes 14 and 16)	---	---	---	---
---	Intermittent life-test end points (1,000 hours)					
---	Inoperatives		---	---	---	---
1266	Total grid current		I_c	0	-2.5	μAdc
1301	Heater current		I_f	400	480	mA
1306	Change in transconductance (1) of individual tubes		ΔS_m t	---	25	%
1306	Transconductance (2)		ΔS_m E_f	---	30	%
1336	Heater-cathode leakage		I_{hk}	---	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); $R_b/p = 50 \text{ ohms}$ (see note 15)	---	---	---	---
---	Intermittent pulse life-test end points					
---	Inoperative		---	---	---	---
1296	Pulse cathode current (1)		I_k	750	---	ma

NOTES:

1. This value is for operation under fixed-bias conditions. With cathode bias, R_g/g may be 1.0 megohm maximum.
2. P_p/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.

NOTES: -Continued

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	Vdc	Vdc	Ohms	Meg
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 t_p . 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 ± 0.01 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 R_k through individual 100-ohm resistors. Adjust individual R_k 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 not more than one defective for class "A", "B", or "C" defects, respectively (see method 1121), or if not more than a total of two defectives are found in the sample.
 - (b) Rejected if two or more defectives for class "A", "B", or "C" defects, respectively, or if a total of three or more defectives are found in the sample.
12. A grid resistor of 0.1 megohm 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. MIL-STD-105, sample size code letter E, shall apply.
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.

NOTES: -Continued

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, t_p , shall be $10 \pm 2 \mu s$, 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 Ecl need be applied under self-excited conditions.
16. The life-test sample shall consist of 20 tubes per lot and not more than 1 tube failure shall be permitted. In the event of rejection of the first sample, due to failure of more than 1 tube, a second sample of 40 tubes shall be selected from the lot. Acceptance shall then be based on the combined first and second samples. The total tube failures from the combined first and second samples shall not exceed three.
17. Revision letters are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - ER
 Navy - EC
 Air Force - 85

Review activities:

Army - AR, MI
 Air Force - 99
 DLA - ES

User activities:

Army - ME, AV
 Navy - AS, OS, MC
 Air Force - 11

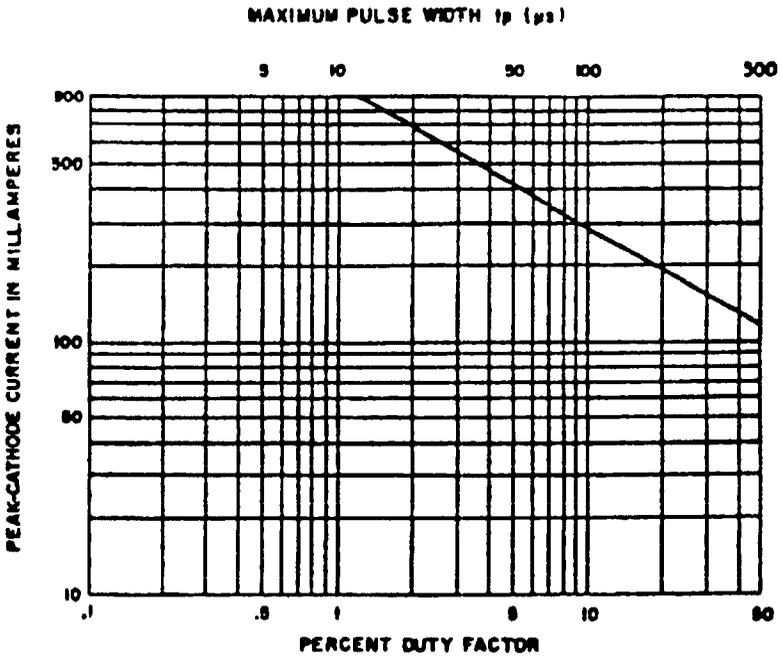
Preparing activity:

Navy - EC

Agent:

DLA - ES

(Project 5960-3224)



(H)

The area below and to the left of the line is the area of permissible operation. Nine hundred milliamperes is the maximum peak current of any duty factor less than 1 percent. For any tube operating under the worst probable 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.

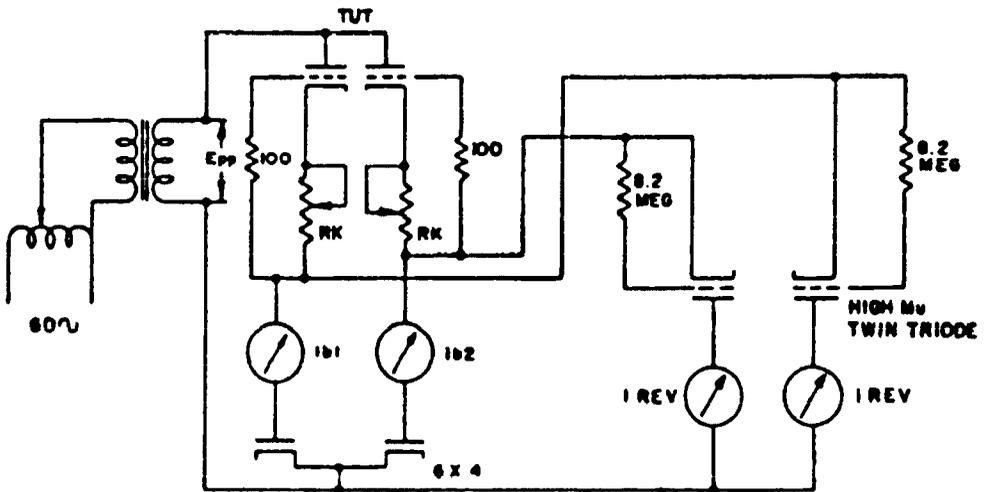


FIGURE 2. Anode emission test circuit.