

MILITARY SPECIFICATION SHEET
 ELECTRON TUBE, RECEIVING
 TYPE 12AT7WC

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: Twin triode, miniature, high 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	1a	1g	1k	hct

ABSOLUTE-MAXIMUM RATINGS:

Normal

Parameter:	Ef	Eb	Ec	Ehk	Rk/k	Rg/g	Pp/p	TE	A1t
Unit:	V	Vdc	Vdc	v	Ohms	Meg	W	°C	ft
Maximum:	13.9	330	0,-55	135	---	0.25	2.7	165	(see note 4)
Minimum:	6.9	---	---	---	---	(see note 1)	---	---	---
	11.4	---	---	---	---	---	---	---	---
	5.7	---	---	---	---	---	---	---	---

TEST CONDITIONS (1): 12.6 250 --- --- 200 --- --- --- ---

Pulse service

Parameter:	Ef	Eb	Ec	eb	egk	Pg/g	Du	fk/k	tp	pr	ehk	Pp/p
Unit:	V	Vdc	Vdc	v	v	W	%	ma	µs		v	W
Maximum:	13.9	330	---	660	50,-100	0.1	[See figure 1]	100	100	2.7
Minimum:	6.9	---	---	---	---	---						
	11.4	---	---	---	---	---						
	5.7	---	---	---	---	---	1.0	---	10	1,000	---	---

TEST CONDITIONS (2): 12.6 250 -30 --- 30 --- 1.0 --- 10 1,000 --- ---

GENERAL:

Qualification - Required

Reliable tube

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						MIN	MAX	
	<u>Quality conformance inspection, part 1</u>							
1301	Heater current		0.4	II	If	142	158	mA
1336	Heater-cathode leakage	See note 8	0.4	II	Ihk	---	7	μ Adc
1266	Total grid current	Test condition (1); Rg = 0.5 Meg (see notes 3 and 8)	0.4	II	Ic	0	-0.7	μ Adc
1256	Electrode current (1) (anode)	Test condition (1) (see note 8)	0.4	II	Ib	7.0	14.0	mAdc
1256	Electrode current (2) (anode)	Test condition (1); Ec = -20 Vdc; Rp = 0.1 Meg; Rk = 0; Ck = 0 (see note 8)	0.4	II	Ib	---	100	μ Adc
1306	Transconductance (1)	Test condition (1) (see note 8)	0.4	II	Sm	4,500	6,500	μ mhos
1201	Short and discontinuity detection		0.4	II	---	---	---	---
	<u>Quality conformance inspection, part 2</u>							
1211	Insulation of electrodes	See note 8	2.5	I	R	500	---	Meg
1256	Electrode current (1) (anode) (difference between sections)	Test condition (1)	2.5	I	Ib	---	3.2	mAdc
1256	Electrode current (3) (anode)	Test condition (1); Ec = -6.5 Vdc; Rp = 0.1 Meg; Rk/k = 0 (see note 8)	2.5	I	Ib	5	---	μ Adc
1306	Transconductance (2)	Test condition (1); Ef = 11.4 V (see note 8)	2.5	I	Δ Sm Ef	---	15	%
1266	Grid emission	Ef = 15.0 V; Ec = -20 Vdc; Rg/g = 0.5 Meg; Rk = 0; Ck = 0 (see notes 7 and 8)	2.5	I	Ic	0	-1.5	μ Adc
2201	Noise and microphonics	Ebb = 300 Vdc; Ecal = 100 mVac; Rk = 200 ohms; Rp = 10,000 ohms; grid grounded (see note 2)	2.5	I	---	---	---	---
1296	Pulse current (1) (cathode)	Test condition (2); Rk = 1.0 ohm (see notes 8 and 11)	2.5	Code H	$\left\{ \begin{array}{l} ik \\ \Delta ik \\ (tp) \end{array} \right.$	300	---	mA
1296	Pulse current (2) (cathode)	Test condition (2); Ef = 11.4 V; Rk = 1.0 ohm (see notes 8 and 11)				---	260	---
1316	Amplification factor	Test condition (1) (see note 8)	6.5	S3	Mu	50	70	---

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						MIN	MAX	
	<u>Quality conformance inspection, part 2</u> -Continued							
1331	Direct-interelectrode capacitance	No shield No shield No shield; section 1 No shield; section 2 No shield No shield	} 6.5	Code E	{ Cgp Cin Cout Cout Cpp Chk	1.30	1.90	pF
						2.00	3.00	pF
						0.20	0.70	pF
						0.16	0.60	pF
						0.15	0.33	pF
						2.10	3.50	pF
1031	High-frequency vibration	Ec = -3 Vdc; Ebb = 250 Vdc; Rp = 2,000 ohms; Rk = 0; Ck = 0; (see note 2)	6.5	Code H	Ep	---	100	mVdc
1041	Shock	Test condition (1); 630 G; Ehk = 100 Vdc (see note 9)	6.5	See note 6	---	---	---	---
1031	Vibration fatigue		6.5	See note 6	---	---	---	---
---	Post-shock and vibration-fatigue test end points:							
1031	Low-frequency vibration		---	---	Ep	---	150	mVac
1336	Heater-cathode leakage		---	---	Ihk	---	20	μ Adc
1306	Transconductance (1)		---	---	Sm	3,800	---	μ mhos
1266	Total grid current		---	---	Ic	0	-1.5	μ Adc
1121	Base strain	See note 12	---	---	---	---	---	---
2126	Envelope strain		2.5	I	---	---	---	---
1105	Permanence of marking		---	---	---	---	---	---

METHOD	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS		UNIT
				MIN	MAX	
	<u>Quality conformance inspection, part 3</u>					
1506	Heater-cycling life	Ef = 7.5 V; heaters in parallel; Ehk = 135 Vdc	---	---	---	---
---	Heater-cycling life-test end point:					
1336	Heater-cathode leakage		Ihk	---	15	μ Adc
1516	Stability life	Test condition (1); Ehk = 135 Vdc; Rg/g = 0.5 Meg; TA = room	---	---	---	---
---	Stability life-test end point:					
1306	Change in transconductance (1) of individual tubes		ΔS_m t	---	10	%
1501	Intermittent life	Test condition (1); Ehk = 135 Vdc; Rg/g = 0.5 Meg; TA = room TE = 165°C (min) (see note 5) Group E	---	---	---	---

METHOD	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS		UNIT
				MIN	MAX	
	<u>Quality conformance inspection, part 3</u> -Continued					
---	Intermittent life-test end points (1,000 hours):					
---	Inoperatives		---	---	---	---
1266	Total grid current		Ic	0	-0.7	μ Adc
1301	Heater current		If	142	164	mA
1306	Change in transconductance (1) of individual tubes		Δ Sm t	---	25	%
1306	Transconductance (2)		Δ Sm Ef	---	20	%
1336	Heater-cathode leakage		Ihk	---	7	μ Adc
1211	Insulation of electrodes		R	100	---	Meg
---	Total defectives		---	---	---	---
1501	Intermittent life (pulse)	Test condition (2); Eb = 300 Vdc; Rb/p = 150 ohms (see note 10) Group E	---	---	---	---
---	Intermittent pulse life-test end points (1,000 hours):					
---	Inoperatives		---	---	---	---
1296	Pulse current (1) (cathode)		ik	280	---	mA
1511	Cathode interface life	Ef= 6.9 V; heaters in parallel; (see note 8)	Ri	---	50	ohms

NOTES:

1. This value is for operation under fixed-bias conditions. With cathode bias, Rg may be 0.5 Meg maximum.
2. Tie 1k to 2k; 1g to 2g; and 1a to 2a.
3. This test shall be performed at the conclusion of the holding period.
4. See "Reduced pressure (altitude) rating", and altitude, maximum peak voltage.
5. 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.
6. 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.
7. 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	Ecl	Rk/k	Rg/g
V	Vdc	Vdc	Ohms	Meg
15.0	250	0	200	0.5

8. Test each unit separately.
9. A grid resistor of 0.1 Meg shall be added to each section.
10. 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."
11. The grid pulse shall be a square wave meeting the pulse shape requirement of method 1296, and in addition the maximum amplitude shall occur within the first 20 percent of t_p , $t_p = 10 \mu s$, and $prr = 1,000$ pps. 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 positive end of the cathode resistor. 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 the pulse amplitude. The variation of the output pulse amplitude between 20 and 80 percent t_p shall not exceed the specified limits for $\Delta i_k(t_p)$.

12. 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 "A", "B", or "C" defects respectively, or if a total of three or more defectives are found in the sample.
13. 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

Preparing activity:

Navy - EC

Agent:

DLA - ES

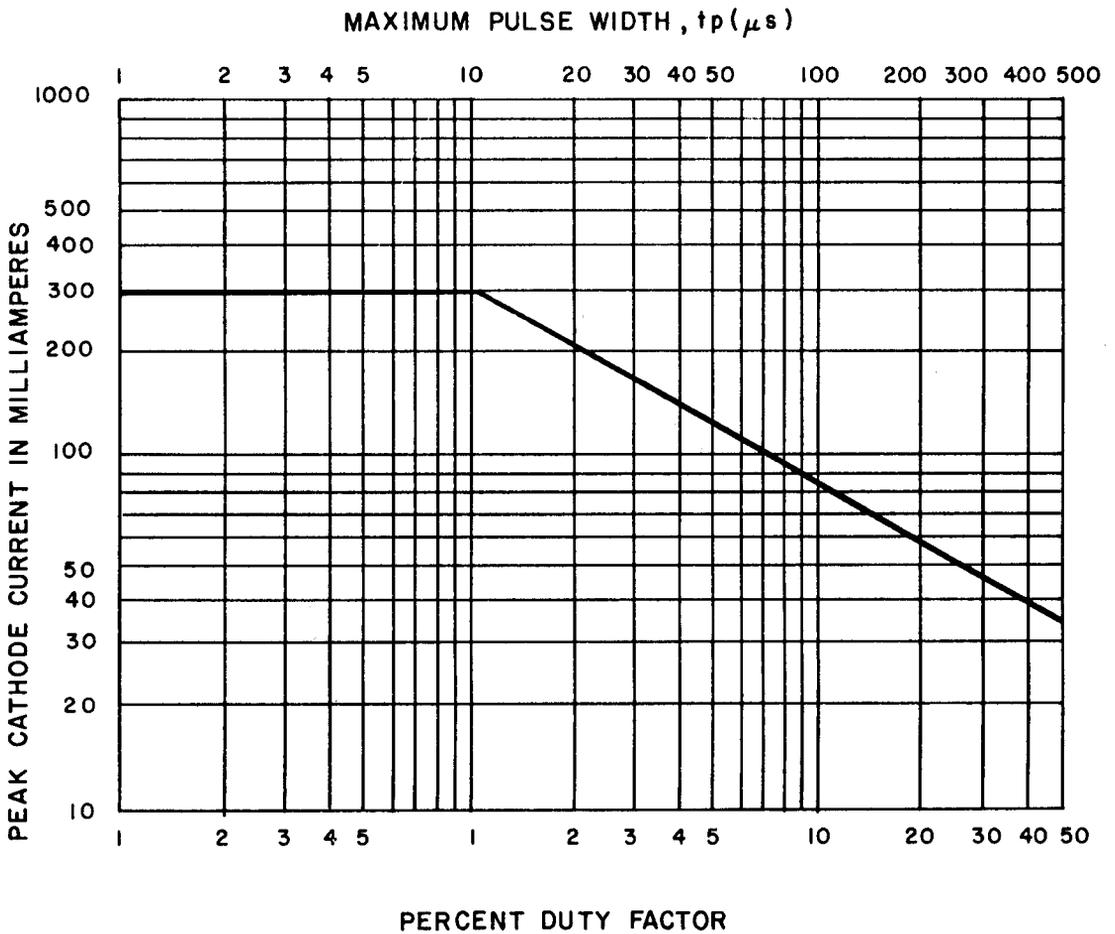
Review activities:

Army - MI
Air Force - 99
DLA - ES

(Project 5960-3225)

User activities:

Army - AR, ME
Navy - AS, CG, MC, OS, SH
Air Force - 11



NOTE: The area below and to the left of the line is the area of permissible operation. Three hundred milliamperes is the maximum peak current at 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 for tube type 12AT7WC.