INCH-POUND

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SUPERSEDING
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PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING

TYPE 2DF4

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

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

DESCRIPTION: Pentode, miniature, power amplifier (100 MHz, class C).

Outline: 6-2(EIA).

Base: E9-1.

Envelope: T6-1/2.

Cathode: Coated filament.

Mounting: 1/

Base connections:

Pin No.	1	2	3	4	5	6	7	8	9
Element	g2	int con	a	f- (+prl)	f+	nc	int con	g1	g3, fct (-prl)

ABSOLUTE MAXIMUM RATINGS:

Parameter:	Ef	Eb	Ec1	Ec2	Ik	Ic1	Pa	Pg2	Alt
Unit:	V dc	V dc	V dc	V dc	mA dc	mA dc	W	W	ft
Maximum:	1.44 (pr1) or 2.88 (ser)	250	-75	125	50	4	4.5	1.5	2/
Minimum:	1.06 (pr1) or 2.12 (ser)	---	---	---	---	---	---	---	---
Test conditions:	2.5 (ser)	120	-3.6	120	---	---	---	---	---

See footnotes at the end of table I.

GENERAL:

First article testing: Required. 11/

TABLE I. Testing and inspection.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 12/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 1								
Total grid current	1266	4/		0.65	Ic1	0	-1.0	µA dc
Electrode current (1) (anode)	1256	4/		0.65	Ib	28	52	mA dc
Operation current (1)	---	5/		0.65	Ip	60	72	mA ac
Operation current (2)	---	5/	Ef = 2.125 V dc	0.65	Ip	55	---	mA ac
Short and discontinuity detection	1201	---		0.4	---	---	---	---
Conformance inspection, part 2								
Electrode current (screen)	1256	---		---	Ic2	0	7.0	mA dc
Electrode current (2) (anode)	1256	---	Ec1 = -20 V dc	---	Ib	---	2.0	mA dc
Amplification factor (triode)	1316	---	Screen grid tied to anode	---	Mu	8	14	---
Primary grid emission (screen)	1266	6/	If = 2.5 V ac; Eb = 0; Ec2 = 150 V ac; t = 300 (max)	---	Is	---	200	µA dc
Heating time	---	7/	Ef = 2.5 V ac; Ebb = 150 V dc; Ecc2 = 120 V dc; Ecc1 = 0; Rg1 = 20,000 ohms; Eg1 = 13 V ac; Rℓ = 1,000 ohms; Rg2 = 470 ohms; Ib = 17 mA dc; C1 = 16 µF; (see figure 2)	---	t	---	0.5	sec
Direct-interelectrode capacitance	1331	---	No shield	---	Cgp Cin Cout	--- 5.8 3.9	0.25 8.8 6.9	pF pF pF

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 12/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 2 - Continued								
Power oscillation (1)	1236	---	F = 70 MHz; Ef = 2.5 V dc; Rℓ = 2,000 ohms; Ecc1 = 0; Eg1 = 13 V ac; Rg2 = 1,800 ohms; Rg1 = 3,300 ohms	---	Po Ic1	2.0 0.2	--- 3.0	W mA dc
Power oscillation (2)	1236	---	F = 70 MHz; Ef = 2.125 V dc; Rℓ = 2,000 ohms; Ecc1 = 0; Rg1 = 3,300 ohms; Rg2 = 1,800 ohms; Eg1 = 13 V ac	---	Po Ic1	1.5 0.2	--- 3.0	W mA dc
Power oscillation (3)	1236	---	F = 100 MHz; Ef = 1.25 V dc; Rℓ = 2,500 ohms; Ecc1 = 0; Ebb = 150 V dc; Ecc2 = 90 V dc; Rg1 = 15,000 ohms; Eg1 = 37 V ac	---	Po	1.5	---	W
Low frequency (25 Hz) vibration	1031	---	Rp = 2,000 ohms; Rg1 = 0.1 MegΩ	---	Ep	---	500	mV ac
Resonance	---	8/	Rp = 2,000 ohms; Rg1 = 0.1 MegΩ	---	Ep	---	3,800	mV ac
Shock	1041	---	450 G; Ef = 2.5 V ac (no other voltages applied)	---	---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Notes	Conditions	Acceptance Level 12/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 2 - Continued								
Post-shock test end-points:	---							
Filament current (1)	1301	---		---	If	300	---	mA dc
Electrode current (1) (anode)	1256	----		---	Ib	26	---	mA dc
Total grid current	1266	---		---	Ic1	---	-1.5	µA dc
Transconductance	1306	---		---	Sm	5,300	---	µmhos
Vibration fatigue	---	3/ 9/	No voltages applied	---	---	---	---	---
Post-vibration fatigue test end points:	---							
Filament current (1)	1301	---		---	If	300	---	mA dc
Electrode current (1) (anode)	1256	---		---	Ib	26	----	mA dc
Total grid current	1266	---		---	Ic1	---	-1.5	µA dc
Transconductance	1306	---		---	Sm	5,300	---	µmhos
Filament current (1)	1301	---	Ef = 2.5 V dc (series connected)	1.0	If	320	370	mA dc
Filament current (2)	1301	---	Ef = 1.25 V dc (parallel connected)	4.0	If	640	740	mA dc
Transconductance	1306	---		4.0	Sm	5,800	9,200	µmhos
Base strain	1121	---		---	---	---	---	---
Glass strain	2126	---		2.5	---	---	---	---
Insulation of electrodes	1211	---		4.0	---	---	---	---
Permanence of marking	1105	---		---	---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Conditions	Acceptance Level 12/	Symbol	Limits		Unit
					Min	Max	
Conformance inspection, part 3							
Heater-cycling life	1506	Ef = 3.0 V ac (series connected)	---	---	5,000	---	Cycles
Heater-cycling life-test end point:	---						
Filament current (1)	1301		---	If	320	370	mA dc
Intermittent life	1501	Ef = 2.5 V ac; F = 60 Hz; Ebb = 150 V dc; Ecc2 = 125 V dc; Ecc1 = -10 V dc; Rℓ = 1,000 ohms; Rg2 = 470 ohms; Eg1 = 13 V ac; Rg1 = 4,700 ohms; C1 = 16 µF (see figure 2) 10/	---	---	---	---	---
Intermittent life-test end points (500 hours):	---						
Operation current (1)	---		0.65	Ip	47	---	mA ac
Power oscillation (2)	1236		0.65	Po	1.4	---	W
Periodic-check test							
Filament burnout	1202		---	---	---	---	---

1/ Vertical mounting is preferred. For horizontal mounting, pins No. 4 and No. 5 shall be in the same horizontal plane.

2/ See "Reduced pressure (altitude) rating", and altitude, maximum peak voltage in the basic document.

3/ This is essentially a variable-frequency vibration test. The tubes under test shall be mounted rigidly on a table vibrating, at simple harmonic motion, over a frequency range of 10 to 2,000 Hz. The amplitude shall be kept constant at 0.04 inch (1.00 mm) from 10 to 55 Hz; and, from 55 to 2,000 Hz, the peak acceleration shall be kept constant at 10 G. Each tube shall be subjected to vibration cycles in orientations X, Y, and Z. The time for one complete cycle: 10 to 2,000 to 10 Hz, shall be 6 minutes ± 1 minute. The time of vibration for each tube in each of the three orientations shall be 30 minutes ± 5 minutes.

4/ This test is to be performed at the conclusion of the holding period.

5/ Test at power line frequency (see figure 1). Tubes shall not be preheated immediately before this test.

6/ With the voltages applied as specified, adjust Ec1 to provide Ic2 = 9 mA dc on the positive half-cycles.

TABLE I. Testing and inspection - Continued.

7/ The time, from the application of the filament voltage until the anode current attains the minimum value specified, shall be within the time limit specified. (A relay is switched into the anode circuit, which stops the timer when the anode current reaches predetermined value. The timer starts with application of filament voltage.)

8/ This is essentially a sweep-frequency vibration test. The tube under test shall be mounted on a vibration table vibrating at simple harmonic motion. Low-frequency (25 Hz) vibration test conditions shall be applied, and Ep monitored while the frequency of vibration is continuously swept from 50 to 5,000 Hz and back, with the peak acceleration controlled constant at 2 G. Total time for each sweep cycle shall be not less than 1 minute.

9/ This test shall be conducted on the initial lot submitted under a contract or order, and shall be conducted again after 12 months of continued production under a contract or order.

10/ Acceptance shall be based upon the following double sampling plan with an accept on zero defect criteria consistent with MIL-PRF-1.

Double sampling plan.

	Sample size	Cumulative sample size	Cumulative Acceptance Number
1st sample - - - - -	10	10	zero
2nd sample- - - - -	20	30	one

In the event of failure, the test shall be made as a part of conformance inspection, part 2, acceptance level 0.65, inspection level II. The regular double sampling plan may be reinstated after three consecutive samples have been accepted.

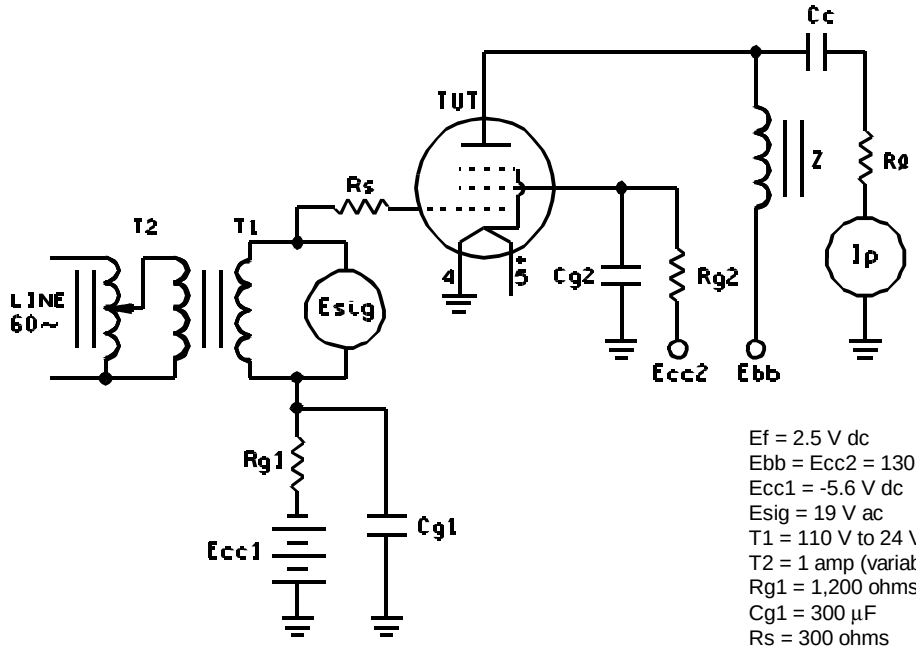
Eligibility for reduced-hours life test shall be consistent with MIL-STD-1311, method 1501 criteria. Larger life-test samples may be selected from initial life-test lots in accordance with the following:

a. The number of tubes from any lot shall not exceed 20.

b. In those instances where more than 10 tubes are selected, the tubes shall be subsequently numbered and the first 10 tubes shall be considered the first sample for evaluation of the lot they represent.

11/ First article inspection shall consist of performing all tests listed on this TSS. The sample size and allowable defects shall be in accordance with MIL-PRF-1, Qualification, Samples and Acceptance Criteria. Three copies of the test report shall be forwarded to the purchasing activity.

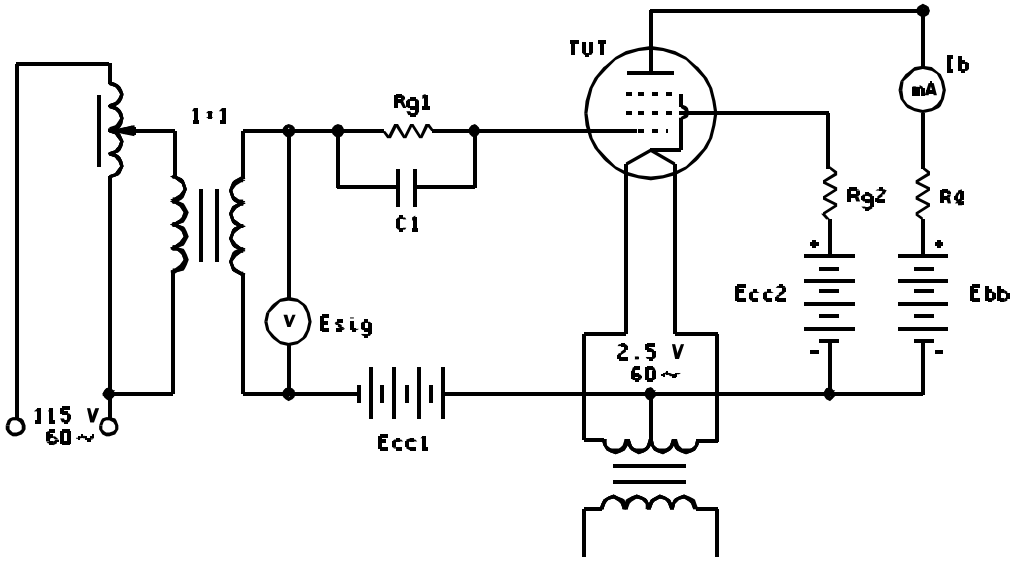
12/ This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.



NOTE: Ip meter shall read RMS current and reactance shall be less than 100 ohms.

Ef = 2.5 V dc
Ebb = Ecc2 = 130 V dc
Ecc1 = -5.6 V dc
Esig = 19 V ac
T1 = 110 V to 24 V, 1 amp (isolation transformer)
T2 = 1 amp (variable transformer)
Rg1 = 1,200 ohms
Cg1 = 300 µF
Rs = 300 ohms
Rg2 = 2,200 ohms
Cg2 = 80 µF
Rℓ = 500 ohms (meter plus resistor)
Cc = 20 µF (oil filled)
Z = 60 H (200 ohms)

FIGURE 1. Operation current test circuit.



NOTE: The resistance Rℓ shall include the resistance of the anode current indicator.

FIGURE 2. Heating time and intermittent life-test circuit.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet sheet references MIL-STD-1311.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

Custodian:
Army - CR
Navy - EC
Air Force - 99
DLA - CC

Preparing activity:
DLA - CC

(Project 5960-3740)

Review activities:
Army - AR
Navy - AS, CG, MC, OS, SH
Air Force - 11

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.