MILITARY SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING

TYPE 5R4WGB

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: Full-wave rectifier, high vacuum

Outline --- See figure 1

Envelope --- T14

Cathode --- Coated filament

Base connections:

Pin No.	1	2	4	6	8
Element	nc	f	2a	1a	f

ABSOLUTE RATINGS:

Parameter:	Ef	Epp/a	epx	Rl	Cl
Unit:	Vac	Vac	v (Note 1)	Ohms	µf
Maximum:	5.0 ±10%	---	1,850	--	4
	5.0 ±10%	---	2,150	--	--
	5.0 ±10%	---	2,300	--	--
	5.0 ±10%	---	2,800	--	4
	5.0 ±10%	---	2,900	--	--
		---			--
Minimum:	----		---	--	
TEST CONDITIONS:	5.0	850	---	3,500	4

ABSOLUTE RATINGS:

Parameter:	Io	ib/a	tk	TE	Alt
Unit:	mAdc	ma	sec	°C	ft (Note 4 and 5)
Maximum:	275	---	10	260	60,000
	275	700	10	260	40,000
	275	Note 2	10	260	40,000
	165	---	10	260	40,000
	190	Note 3	10	260	35,000
Minimum:	---	---	--	---	---
TEST CONDITIONS:	---	---	--	---	---

GENERAL:

Qualification - Not required

Reliable tube

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						Min	Max	
	Quality conformance inspection, part 1							
----	Stabilization	See note 6	---	---	---	---	---	---
1201	Short and discontinuity detection		0.4	II	---	---	---	---
1231	Emission (1)	Eb = 75 Vdc See note 7	0.65	II	Is	240	400	mAdc
1301	Filament current		0.65	II	If	1.95	2.2	A
1353	Operation of rectifiers (1)	Full wave; tk = 10 See notes 8 and 9	0.65	II	Io	245	260 (bogey)	mAdc
	Quality conformance inspection, part 2							
1002	Barometric pressure, reduced (1)	Pressure = 140 ±10 mmHg; Ef = 5.0 Vac; Epp/a = 1,050 Vac; full wave; Rl/Io = 165 mAdc; tk = 10; Cl = 4 µF; Zp/a = 500 ohms; including transformer; See note 10	6.5	---	---	---	---	---
1002	Barometric pressure, reduced (2)	Pressure = 55 ±5 mmHg; Ef = 5.0 Vac; epx = 1,850 v; Cl = 4 µF; tk = 10; Rl/Io = 275 mAdc; Zp/a = 200 ohms; including transformer See note 10	6.5	---	---	---	---	---
1031	Low-frequency vibration	No voltages	6.5	Code H	---	---	---	---
1231	Emission (2)	Ef = 4.5 Vac; Ep = 75 Vdc See notes 7 and 11	2.5	I	ΔIs Ef	---	15	%
1353	Operation of rectifiers (2)	epx = 2,800 Vac; full wave; Zp/a = 500 ohms; Cl = 4 µF; tk = 10; Rl = 7,000 ohms	---	---	Io	140	---	mAdc
----	Alinement	See note 12	----	---	---	---	---	---
1041	Shock	900G; Ef = 5.0 Vac (only voltage applied)	---	---	---	---	---	---
1031	Vibration fatigue	2.5 G; fixed frequency; F = 25 Hz (min), 60 Hz (max) See note 10	6.5	---	---	---	---	---
	Post-shock and vibration fatigue test end point:							
1353	Operation of rectifiers (1)		---	---	Io	240	---	mAdc

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (Percent Defective)	Insp Level or Code	Allowable Defectives Per Characteristic		Sym	LIMITS		Unit
					1st sample	Combined samples		Min	Max	
	Quality conformance inspection, part 3									
1506	Heater-cycling life	Ef = 5.5 Vac	---	---	---	---	---	---	---	---
----	Heater-cycling life test end point:									
1501	Intermittent life	Ef = 5.0 Vac; Epp = 750 Vac; C1 = 4 µF; adjust R1 to obtain Io = 275 mAdc; tk = 10; TE = 260°C See notes 13 and 14	---	---	---	---	---	---	---	---
----	Intermittent life test end points (100 hours):									
----	Inoperatives		---	---	1	2	---	---	---	---
1353	Operation of rectifiers (1)		---	---	0	0	Io	245	---	mAdc
----	Blown fuses	See note 15	---	---	1	2	---	---	---	---
----	Total defectives		---	---	1	2	---	---	---	---
----	Intermittent life test end points (500 hours):									
----	Inoperatives		---	---	2	5	---	---	---	---
1353	Operation of rectifiers (1)		---	---	0	1	Io	240	---	mAdc
----	Blown fuses	See note 15	---	---	2	5	---	---	---	---
----	Total defectives		---	---	3	7	---	---	---	---
	Intermittent life test end points (1,000 hours):									
----	Inoperatives		---	---	3	7	---	---	---	---
1353	Operation of rectifiers (1)		---	---	1	2	Io	240	---	mAdc
----	Blown fuses	See note 15	---	---	4	9	---	---	---	---
----	Total defectives		---	---	5	10	---	---	---	---

NOTES:

1. The maximum voltage appearing between any pair of pins shall be no greater than the peak inverse anode voltage rating.

2. Input choke filter 5-Henries minimum required for 60 Hz power supply.

3. Input choke filter 10-Henries minimum required for 60 Hz power supply.

4. The tube shall be operated in a vertical position. If mounted in a horizontal position, pins No. 1 and No. 4 shall be in a vertical plane.

5. Satisfactory operation of this tube under conditions falling within area I may be obtained without preheating the filament. For satisfactory operation under the conditions falling within area II, preheat the filament for 10 seconds before the anode voltage is applied. (See figure 2.)

6. Inoperatives shall be defined in accordance with the requirements of method 1201. The product shall be stabilized 100 percent at the following conditions for 6 hours as a full-wave rectifier: Ef = 5.0 Vac; Epp/a = 800 Vac; Zp/a = 100-ohms maximum; Rl = 2,700; tk = 0; Cl = 4 µF. (Under these conditions Io should equal approximately 300 milliamperes dc). Inoperative control is a triple sampling plan performed on all tubes in the lot. The procedure is: All tubes shall be stabilized as explained herein. The lot shall then be tested 100 percent for inoperatives. If the percent inoperative during and immediately following the stabilization period is not more than the acceptance requirements, the lot shall be subjected to the remaining tests. Otherwise, the stabilization operation shall be repeated. The acceptance requirements for the three stabilization operations are 3 percent, 2-1/2 percent, and 2 percent inoperatives, respectively. If the lot does not meet the acceptance requirements after the third test it shall be scrapped. The 6-hour stabilization period includes the "off" time accumulated during cycling of approximately 15 minutes "on" and 5 minutes "off." Both filament and anode voltages shall be applied simultaneously at the end of the "off" period.

7. Test each unit section separately.

8. This test to be performed at the conclusion of the holding period.

9. In a full-wave circuit, adjust Zp/a so that a bogey tube gives an Io equal to 260 mAdc and ib not less than 630 ma per anode. A bogey tube is defined as a tube with a voltage drop of Etd = 75 Vdc at Is = 320 mAdc per anode.

10. This test shall be conducted on the initial lot and thereafter on a lot approximately every 6 months. When one lot has passed, the 6-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.

11. Preheat tubes with Ef = 5.0 V for 5 minutes minimum prior to testing for Is at Ef = 5.0 V.
Preheat tubes with Ef = 4.5 V for 5 minutes minimum prior to testing for Is at Ef = 4.5 V.

12. The plane of the filament shall be parallel to the plane passing through the centerline of pins No. 1 and No. 4 within ±22-1/2 degrees.

13. 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 Etd (±10 percent) under normal test conditions, is determined to operate at or above minimum specified temperature at any position in the life-test rack.

14. Intermittent life test.

    (a) The intermittent life-test sample shall consist of 20 tubes. At the completion of 500 hours (+48, -24 hours), the first 10 serially marked operative tubes shall continue on for the 1,000-hour life test. The 1,000-hour life test shall be conducted on a minimum of 1 sample of 10 tubes each month of production.

NOTES: -Continued

14. Cont'd

(b) In the event of failure of the first sample on intermittent life test, a completely fresh sample of 40 tubes shall be selected. At the completion of 500 hours (+48, -24 hours), the first 20 serially marked operative tubes shall continue on for the 1,000-hour test.

(c) Life-test samples shall be selected from a lot at random in such a manner as to be representative of the lot. If such selection results in a sample containing tubes which are outside the initial limits of this specification sheet for the relevant life-test end point characteristics, such tubes shall be replaced by randomly selected acceptable tubes.

(d) Serially mark all tubes from the sample.

(e) *Record referenced characteristic measurements after a maximum operation* of 15 minutes under specified voltage and current conditions on the entire sample.

(f) The life-test sample shall be read at the following times:

100 hours (+50, -10)
300 hours (+48, -24)
500 hours (+48, -24)
1,000 hours (+48, -24)

Additional reading periods may be used at the discretion of the electron tube manufacturer. Tubes which fail to meet the acceptance criteria at 100 hours may not be continued further on life test.

(g) Acceptance. The lot shall be considered satisfactory for acceptance provided that the allowable defectives specified herein are not exceeded.

(h) A resubmitted lot shall be subjected to all quality conformance inspection, part 1 tests, except visual and mechanical inspection criteria, vibration, and barometric pressure, reduced.

(i) Not more than one accidental breakage shall be allowed in the life-test sample. If one life-test tube is accidentally broken, acceptability of the life-test sample shall be based upon the remaining tube in the sample, provided that the broken tube was not known to be defective.

15. A separate SLO-BLO fuse that blows at 1.3 amperes shall be used in each anode circuit. A tube which blows fuses more frequently than once during the 500-hour life test, or twice during the 1,000-hour life test, shall be considered a life-test defect.

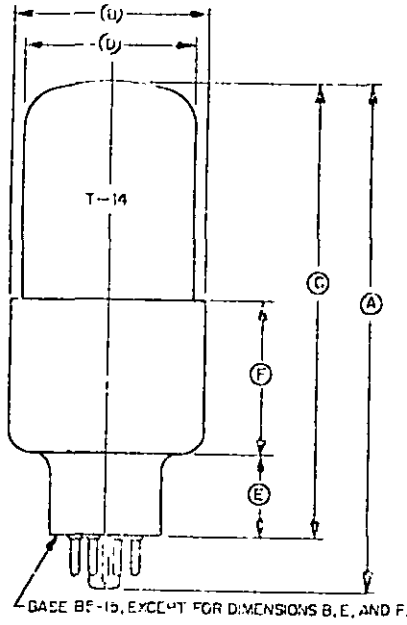
Custodians:
Army - EL
Navy - EC
Air Force - 85

Preparing activity:
Air Force - 85

Review activities:
Army - MI, MU
Air Force - 99
DSA - ES

(Project No. 5960-3126)

User activities:
Army - WC
Navy - AS, OS, MC, CG, SH
Air Force - 11



Ltr	Dimensions in inches with metric equivalents (min) in parentheses	
	MINIMUM	MAXIMUM
Quality conformance inspection, part 1		
A		5.375 (136.53)
C		4.813 (122.25)
D	1.688 (42.88)	1.813 (46.05)
Quality conformance inspection, part 3 (See Note a)		
B		2.063 (52.40)
E	.875 (22.23	
F		1.625 (41.28)

NOTE a: These dimensions shall be checked annually

FIGURE 1. Outline drawing of electron tube type 5R4WGB.

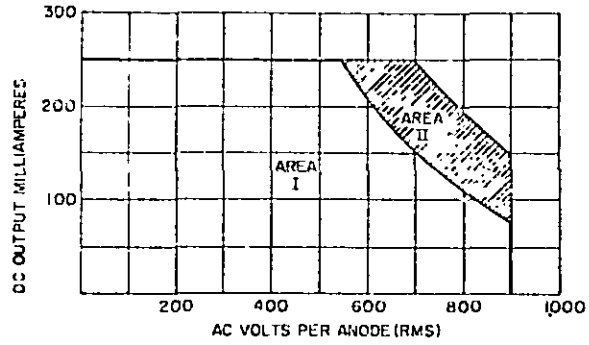


FIGURE 2. Rating chart.

FOLD

POSTAGE AND FEES PAID
DEPARTMENT OF AIR FORCE
DOD-316

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

AFLC/LOIE/Standardization
Wright-Patterson AFB OH 45433

FOLD

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MIL-E-1/924G Electron Tube, Receiving Type 5R4WGB FSC 5960

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