INCH-POUND

MIL-PRF-1/1329A
16 July 1999
SUPERSEDING
MIL-E-1/1329(SigC)
14 January 1960

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, MAGNETRON, PULSE
TYPE 7521

This specification is approved for use by the Department of the Army and is available 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: Magnetron, pulsed type, mechanically tunable frequency range 8,900 to 9,400 MHz, minimum peak power output .80 kw, integral magnet, convection and conduction air cooled, unipotential cathode.

ABSOLUTE MAXIMUM RATINGS: 1/

INDEPENDENT 1/(a)

Parameter: Unit:	Ef V	eb kv	tk sec	VSWR ---	T(anode) °C	Tuner torque inch-ounce
Maximum:	5.5	5.0	---	1.5	100	60
Minimum:	4.5 2/ 3/	---	60	--- 3/	--- 5/	--- 4/

DEPENDENT 1/(b)

Parameter: Unit:	Ib mA dc	ib a	Pi W	pi kw	Du ---	tpc µs
Maximum:	2.0	1.05	7.5	5.0	.002	1.5
Minimum:	---	-0.5	---	---	---	---

See footnotes at the end of table I.

STORAGE, HANDLING, AND INSTALLATION:

Cooling:	Convection and conduction.	Preparation for shipment:	23/
Magnet isolation:	6/	Output coupling:	UG-39/U: See figure 1.
Mounting support:	See figure 1.	Input connections:	UG-290A/U: See figure 1.
Mounting position:	Any.	Vibration, shock:	10/ 11/
Tuner drive mechanism	13/	Weight:	Approximately 1.5 pounds.

GENERAL:

Qualification - Required.

TABLE I. Testing and inspection.

Inspection	Reference number (MIL-PRF-1)	Conditions	Symbol	Limits		Unit
				Min	Max	
Qualification	3.2	Not required 21/	---	---	---	---
Performance	3.6		---	---	---	---
Marking	3.7	22/	---	---	---	---
Holding period	4.5	t = 168 hours	---	---	---	---
Dimensions	4.9.2	See figure 1	---	---	---	---
Moisture-vaporproof barrier pack	4.9.7		---	---	---	---
Carton drop	4.9.18	Package group 9, container size A, drop test 1	---	---	---	---
Vibration	4.9.19.1	No voltages 10/ F = 25	---	---	---	---
Vibration	4.9.19.2	No voltages 10/ F = 55	---	---	---	---
Shock test	---	G = 15 11/	---	---	---	---
Tuner drive torque	---	T = 25°C (approximate)	Torque	10	55	inch-ounce
Tuner drive torque	---	T = -55°C to +85°C 12/	Torque	10	55	inch-ounce
Mechanical fatigue	4.9.17	T = 25°C (Approximate) 16/	---	2,500	---	cycles
Heater current	4.10.8	Ef = 5.0 V tk = 60 seconds (min)	If	.40	.50	A
Oscillation (1)	4.16.3		---	---	---	---
Standing wave ratio	---	VSWR = 1.1:1 maximum except as otherwise noted.	---	---	---	---
Heater cathode warmup time	4.16.3.2	tk = 60 seconds max at Ef = 5.0 V Ef = 5.0 V for test 8/	---	---	---	---
Pulse characteristics	4.16.3.3	tpc = 0.2 ± 0.02 µs; Du = .001 trv = 0.09 to 0.11 µs 2/ 7/	---	---	---	---
Anode current	4.16.3.4	ib = .90 a	---	---	---	---
Pulse voltage	4.16.3.5	F1, F2, F3	epy	4.0	4.5	kv
Power output	---	F1 = 8,900 MHz F2 = 9,150 MHz F3 = 9,400 MHz VSWR = 1.5:1 Minimum power phase	Po	.80	---	W
RF bandwidth	4.16.3.7	F1, F2, F3; VSWR = 1.5:1; Worst phase ib = .85 to 1.05 a	BW	---	2.2/tpc	MHz

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Reference number (MIL-PRF-1)	Conditions	Symbol	Limits		Unit
				Min	Max	
Pulling factor	4.16.5	F1, F2, F3	ΔF	---	20	MHz
Pushing factor	4.16.6	F1, F2, F3 17/	ΔF	---	3.5	MHz
Tunable frequency	4.10.7.3.2		F	8,900	9,400	MHz
Tunable frequency	4.10.7.3.2	13/	F	8,900	9,400	MHz
Stability test	---	14/ VSWR = 1.5:1 minimum F1, F2, F3	M.P.	---	0.25	%
Temperature coefficient	4.9.14	Anode T, 5/ T = 25°C to 100°C; F1, F3	ΔF/°C	---	.20	MHz/°C
Low temperature operation	4.9.15.1	F3; -65°C ambient tk = 60 seconds (max)	M.P.	---	0.5	%
High temperature operation	4.9.15.2	+75°C ambient; F3	M.P.	---	0.5	%
Anode-cathode capacitance	---		C	---	10	μμF
Shelf life stability	---	t = 30 days; VSWR = 1.5:1 14/ 18/ tk = 60 maximum	M.P.	---	.5	%
Intermittent life test	4.11.5	Osc (1); F2, Group D 15/ VSWR = 1.5:1 minimum cycles through λ G in about 30 mins.	t	1,500	---	cycles
Life test end point:	4.11.4	19/				
RF bandwidth			BW	---	3.0/tpc	MHz
Pulse voltage			epy	---	4.9	kv
Power output			Po	0.680	---	W
Stability			M.P.	---	0.5	%

1/ For the assistance of designers of electronic equipment, the absolute ratings have been divided into two groups as follows:

a. Independent. These ratings shall not be exceeded. They are limiting values beyond which the serviceability of any individual tubes may be impaired.

b. Dependent. These ratings are interrelated, but it does not necessarily follow that combinations of limits can be attained simultaneously.

2/ The characteristics of the applied pulse must be those which result in proper starting and oscillation. The rate of pulse voltage rise, the percentage of pulse voltage ripple, and the rate of pulse voltage fall are among the more important considerations. The pulse characteristics listed under Oscillation 1, (4.16.3.3), are those obtained with modulators used in manufacturing processes and are not necessarily applicable with field type modulators.

3/ Frequency skipping or unstable operation may be encountered at some phase position when the mismatch occurs at the end of a "long" line (two meters or longer.)

TABLE I. Testing and inspection - Continued.

4/ The maximum tuner torque specified cannot be exceeded without causing permanent damage to the tube.

5/ The temperature shall be measured at the point indicated on figure 1. Temperature coefficient measurements shall be taken at 25° intervals across the indicated temperature range. The normal anode temperature during operation is 20°C greater than ambient temperature. At no time shall frequency change more than the specified temperature coefficient limit.

6/ In handling and mounting the magnetron, care must be exercised to prevent demagnetization. Ferromagnetic materials or energized magnets shall not be brought within two inches of the tube.

7/ The pulse characteristics of Oscillation (1) shall be as follows: No spike or ripple shall exceed ± 7 percent of the average peak value of voltage or current. The current pulse fall time shall not exceed 0.2 μs (max) as measured between 0 and 85 percent levels. Pulse shall be applied directly to plates of oscilloscope.

8/ See figure 1. Heater-cathode power is applied to the BNC type connector as specified on the outline drawing. The center conductor is the cathode connector.

9/ Reasonable care should be used in the storage, installation, and use of the tube to avoid imparting vibration or shock in excess of the values for which it is designed to withstand.

10/ The tube shall be mounted on a test plate and vibrated along each of three (3) mutually perpendicular axes at the specified frequency at .08 inches (2.03 mm) total excursion for 60 seconds. The tube shall meet the requirements of Oscillation 1 after vibration.

11/ The magnetrons shall be mounted on a test plate and dropped 10 times on each of three (3) mutually perpendicular axes parallel to the reference planes shown on figure 1. The shock pulse shall have a duration of approximately 11 milliseconds as measured at the quarter amplitude points of the acceleration shock wave. The tube shall meet the requirements of oscillation 1 after this shock.

12/ The tuner drive mechanism shall not be "set" against either mechanical stop.

13/ The tube shall be capable of being mechanically tuned from 8,900 to 9,400 MHz by turning the tuner shaft 1.68 turns ± 17 percent with the anode current held constant.

14/ Stability shall be measured with the VSWR adjusted to that phase which produces maximum instability. The missing pulses (M.P.) shall be counted during the last three minutes of a test interval not to exceed six minutes, and shall not exceed the limit specified. A missing pulse is defined as one whose energy is less than 70 percent of a normal pulse, within ± 1 percent frequency range of the normal test frequency.

15/ Life test shall be conducted in accordance with the following operational cycle:

Condition	Duration	Ef	ib
(1)	5 minutes	0 V	0
(2)	1 minute	5.0 V	0
(3)	12 minutes	5.0 V	.90 a

The above cycle shall be repeated until the accrued time of condition (3) is 300 hours; the tube shall meet end of life requirements at that time.

16/ A tuning cycle consists of two complete excursions each in opposite directions through the tuning range of the magnetron. The tube shall meet end of life requirements at completion of this test.

17/ The anode current shall be varied between .85 and 1.0 peak amperes at a rate sufficient to prevent thermal effects.

TABLE I. Testing and inspection - Continued.

18/ This test shall be performed on four tubes per month when the tube is in continuous production, but shipments of that month's production shall not be held pending completion of this test. So long as three of the four tubes for each of the first three months of a production run pass the test and 75 percent of the cumulative quantity of tubes tested pass the test, tubes shall be considered to conform to this specification. If either of the conditions are not met, shipments shall be halted until three of four tubes of current production conform to the test.

19/ The tube shall pass all applicable production tests at the end of the specified life, with the condition that the criteria for acceptance be modified in accordance with the life test end points listed.

20/ Referenced documents shall be of the issue in effect on the date of invitation of bids.

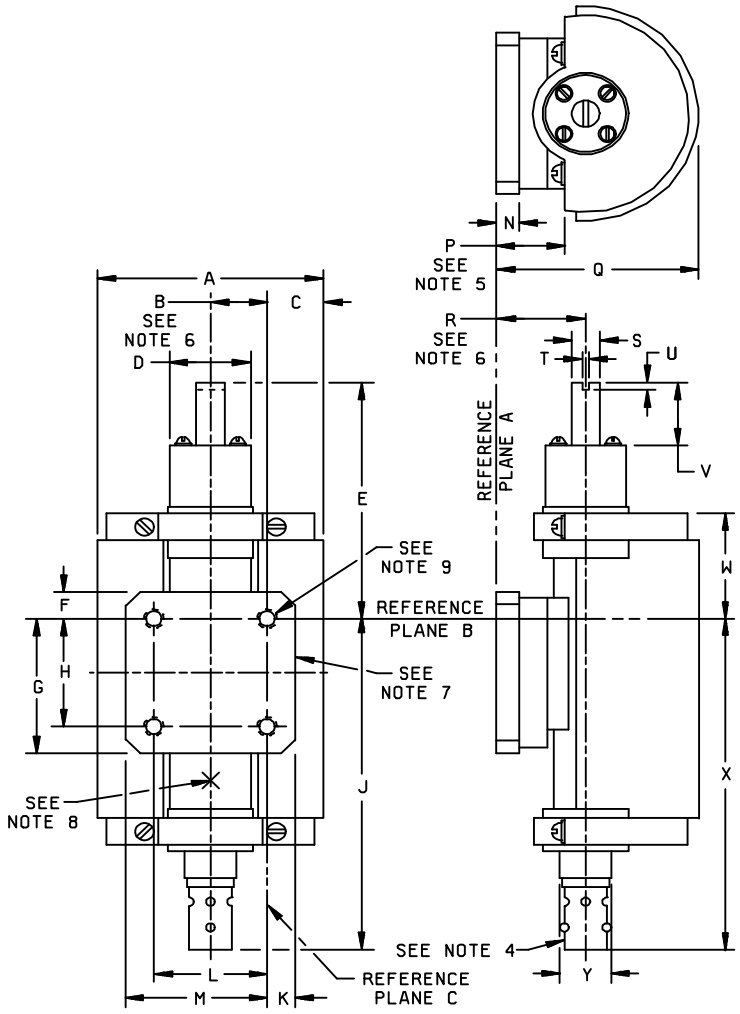
21/ The preproduction sample approval requirements in U. S. Army Electronics Command Drawing, SC-A-46600B hereby replace any qualification requirements referable to the product covered herein. However, the requirements of 3.1.2.1, 3.1.2.2, 3.1.3, and 4.4 in Drawing SC-A-46600B shall be considered not applicable to the product covered herein.

(Copies of U. S. Army Electronics Command Drawing SC-A-46600B, 19 March 1965, "Preproduction Sample Approval in Lieu of Qualification Requirements in Specifications for Semiconductor Devices and Electron Tubes" may be obtained from the acquiring activity or as directed by the contracting officer.)

22/ Product-identification marking shall be in accordance with MIL-PRF-1. If any document waiver has been granted, the product-identification marking shall consist of the tube-type designation only.

23/ Tubes shall be prepared for domestic or overseas shipment, as specified in the contract or order, in accordance with MIL-PRF-75/1. (See 20/)

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government acquisition operation, the United Stated Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patent invention that may in any way be related thereto.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	1.640	---	41.66
B	.635	.645	16.13	16.38
C	---	.360	---	9.14
D	.790	.850	20.07	21.59
E	---	2.500	---	63.50
F	---	.225	---	5.71
G	---	1.450	---	36.83
H	1.213	1.223	30.81	31.06
J	---	2.265	---	57.53
K	---	.200	---	5.08
L	1.275	1.285	32.39	32.64
M	---	1.475	---	37.47
N	.207	.217	5.26	5.51
P	.6825	.6925	17.34	17.58
Q	---	1.843	---	46.81
R	.797	.807	20.24	20.50
S	.245	.255	6.22	6.48
T	.035	.045	.89	1.14
U	.065	.075	1.65	1.91
V	.70	.80	17.8	20.3
W	---	1.093	---	27.76
X	---	2.406	---	61.11
Y	---	.650 DIA	---	16.51 DIA

NOTES:
1. Reference plane "A" is defined as a plane along the face of the wave guide flange.
2. Reference plane "B" is defined as a plane perpendicular to plane "A" passing through the center of the holes as shown.
3. Reference plane "C" is defined as a plane perpendicular to planes "A" and "B" passing through the center of the holes as shown.
4. AN-UG 290A/U BNC panel jack.
5. Includes angular as well as lateral deviation.
6. Parts on this centerline may vary from true location by .125 inch (3.17 mm).
7. To be coupled to an AN-UG-40A/U standard choke flange coupling.
8. Measure anode temperature at this point.
9. Pitch diameter to accept #8-32NC 60 GA only minor diameter of thread .140 inch (3.56 mm) (max).

FIGURE 1. Outline drawing of electron tube type 7521.

Custodians:
Army - CR
Air Force - 11
DLA - CC

Review activities:
Army - MI
Air Force - 99

Preparing activity:
DLA - CC

(Project 5960-3548)