INCH-POUND

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1 December 1978

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, MAGNETRON

TYPE 8943

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: Coaxial fixed frequency, 16.5 GHz, integral magnet, pulsed, 65 kW minimum peak power output.

ABSOLUTE RATINGS:

Parameter:	Ef	ib	Pi	pi	tpc	rrv	Anode T	Bushing T	Altitude
Unit:	V	a	W	kW	μs	kV/μs	°C	°C	feet
Maximum:	14.0	17	210	305	1.2	180	160	170	70,000
Minimum:	---	---	---	---	---	---	-62	-62	---

PHYSICAL CHARACTERISTICS:	
Dimensions:	See figure 2.
Mounting position:	Any.
Coupling:	Output flange compatible with UG541A/U.
Cooling:	Forced air. 9/
Weight:	5.75 pounds (maximum).

TEST CONDITIONS:
Test frequency: 16,500 ± 35 MHz

Parameter:	Ef	If	tk	tpc	prf	rrv	Du	Ib	VSWR
Unit:	V ac 1/	A	sec	μs	pps	kV/μs 4/	---	mA dc	---
Test 1									
Maximum:	7.0	2.0	180	0.24	4,500	180	---	---	1.5
Minimum:	6.0	---	---	0.16	3,240	140	.00072	11.5	---
Test 2									
Maximum:	10.0	2.0	180	1.2	720	180	---	---	1.5
Minimum:	9.0	---	---	0.8	648	140	.00072	11.5	---
Test 3									
Maximum:	13.0	2.5	180	0.24	720	180	---	---	1.5
Minimum:	12.0	---	---	0.16	648	140	.00014	2.31	---

See footnotes at end of table I.

GENERAL:

Qualification: Required.

Replaces: TI Part Number 516994-1.
Varian type SFD-342.
Litton type L4419.

TABLE I. Testing and inspection.

Inspection	Method	Conditions	Test	Symbol	Limits		Unit
					Min	Max	
Qualification inspection							
Humidity	1011	MIL-STD-202, method 103A, test condition B	1	---	---	---	---
Barometric pressure (altitude)	---	MIL-STD-202, method 105C, test condition C	1	---	---	---	---
Temperature cycling	---	MIL-STD-202, method 102A, test condition C	1	---	---	---	---
Conformance inspection, part 1							
Heater current	4289	Ef = 12.5 ± 0.5 V ac		If	1.8	2.5	A
Pulse voltage	4306		1	epy	14.0	18.0	kV
Power output	4250		1	Po	46.8	61.2	W
RF bandwidth (1)	4308		1	BW	---	$\frac{1.9}{tpc}$	MHz
Minor lobe ratio (1)	4308		1	Ratio	9.0	---	dB
Frequency pulling factor	4310		1	ΔF	---	15	MHz
RF bandwidth (2)	4308		2	BW	---	$\frac{1.9}{tpc}$	MHz
Frequency	---		3	F	16,465	16,535	MHz
Minor lobe ratio (2)	4308		2	Ratio	9.0	---	dB
Pulse stability	4315	5/	2	MP	---	.25	%
Conformance inspection, part 2							
Pressurizing	4003	40 pounds-force per square inch, input and output assemblies. 3/	1	---	---	---	---
RF bandwidth (3)	4308		3	BW	---	$\frac{1.9}{tpc}$	MHz

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method	Conditions	Test	Symbol	Limits		Unit
					Min	Max	
Conformance inspection, part 3							
Life test	---	Group D; 11/	2	t	500	---	hours
Life test end points:							
Power output	4250		2	Po	43	---	W
Pulse stability	4315		2	MP	---	0.5	%
Vibration, mechanical	1032	7/	2	ΔF	---	0.5	MHz
Shock	1042	8/	2	---	---	---	---
Temperature	4027	2/	2	$\frac{\Delta F}{\Delta T}$	---	0.4	$\frac{MHz}{^\circ C}$

1/ Prior to the application of high voltage, the cathode shall be heated to the required initial operating temperature. This may be done by applying 12.5 volts ± 5 percent for three minutes. On the application of anode power, the heater voltage should be lowered to the voltage specified, and for various power inputs, it should be adjusted within ±0.5 V ac, according to the following formula:

$$Ef = 12.5 - 0.0232 (Pi)$$

The tube heater may be protected against arcing by use of a connector that places a minimum capacitance of 4,000 pF across the heater directly at the input terminals.

2/ The temperature is to be measured at the point indicated on the outline drawing.

3/ The mechanical design of the mounting plate shall provide for cathode terminal pressurization of 25 ± 2 pounds-force per square inch gauge and leak rate not to exceed 0.1 standard cubic inch per minute. The surface of the output flange shall be capable of pressurization with an “O” ring in the mating flange.

The cathode terminals shall operate in air pressurized to at least 12 pounds-force per square inch. The output window shall operate in air pressurized to at least 20 pounds-force per square inch when the output mismatch is higher than 1.3 VSWR or 15 pounds-force per square inch when the output mismatch is less than 1.3 VSWR.

The magnetron may receive forced air cooling, to keep it within the temperature rating during test.

4/ The rate of rise of voltage (rrv) shall be expressed in kilovolts (kV) per microsecond (μs) defined by the steepest tangent to the leading edge of the voltage pulse above 50 percent amplitude. Any capacitance used in viewing shall not exceed 6.0 pF. The minimum value for test shall be the maximum value of rrv for equipment use.

5/ A missing RF pulse is defined as an RF pulse whose energy content (integrated power) within a ±1 percent frequency range of the normal operating frequency is 70 percent or less than that of a normal pulse. The measurement shall be made during any three minute interval of a six minute test period.

6/ The magnetron will be operated both intermittently and continuously at relative humidities up to and including 100 percent at temperatures up to 71°C including those conditions wherein condensation takes place on magnetron.

TABLE I. Testing and inspection - Continued.

7/ The magnetron shall be supported on normal mount plate, and subjected to the specified vibration in each of the three (3) orthogonal axes. The performance of the magnetron shall be monitored, and the points of maximum deviation of performance and/or resonances shall be individually tested for a period of 30 minutes each. The total vibration time in each axis shall be three hours. The total cycling time will depend upon the number of resonances, but will not be less than one hour. The maximum ΔF measured at the resonances shall be 0.5 MHz. See figure 1.

8/ The magnetron shall be capable of specified performance subsequent to the following shock tests:

Under normal conditions, the magnetron will be subjected to 18 impact shocks of 15 g each, consisting of three shocks each in opposite directions along each of three (3) orthogonal axes, each shock impulse being a half sine wave of 11 ± 1 milliseconds time duration. The g value shall be within ± 10 percent when measured with a 250 Hz low pass filter, and the maximum g shall occur at approximately 5.5 milliseconds.

The magnetron under normal mounting conditions shall be subjected to 12 impact shocks of 30 g, consisting of two shocks in opposite directions along each of three (3) orthogonal axes. Each shock impulse shall have a time duration of 11 ± 1 milliseconds, and the g value shall be within ± 10 percent when measured with a 250 Hz low pass filter. The maximum g value shall occur at approximately 5.5 milliseconds.

9/ With the magnetron properly mounted on a suitable heat sink and with 20 cubic feet per minute air flowing around the body, the peak temperature shall not exceed the maximum rating. The anode temperature shall be measured at that point on the anode block specified in the outline drawing. The input terminal temperature shall be determined at that point specified on the outline drawing.

10/ Reclaimed materials shall be utilized to the maximum extent possible.

11/ Cycle tests of 30 minutes ON preceded by three minutes maximum filament schedule and followed by 27 minutes OFF shall be made until the total accumulated ON time equals the specified life.

During the ON periods, a VSWR of 1.5:1 maximum shall be introduced into the external load circuit and the phase shall be automatically adjusted at least four times during each ON period to include those points of maximum and minimum power and frequency.

Cooling during ON and OFF periods shall be adjusted so that:

a. The anode block temperature during the ON cycle approaches but does not exceed the maximum rating (however no heat source will be required to force temperature above the value resulting from zero air flow).

b. The anode block temperature at termination of the OFF cycle shall be no higher than room temperature plus 20°C (Both OFF time and air quantity may be adjusted.)

12/ Unless otherwise specified, the acceptance level for all tests listed under conformance inspection, part 1 shall be 1.0 percent, inspection level II.

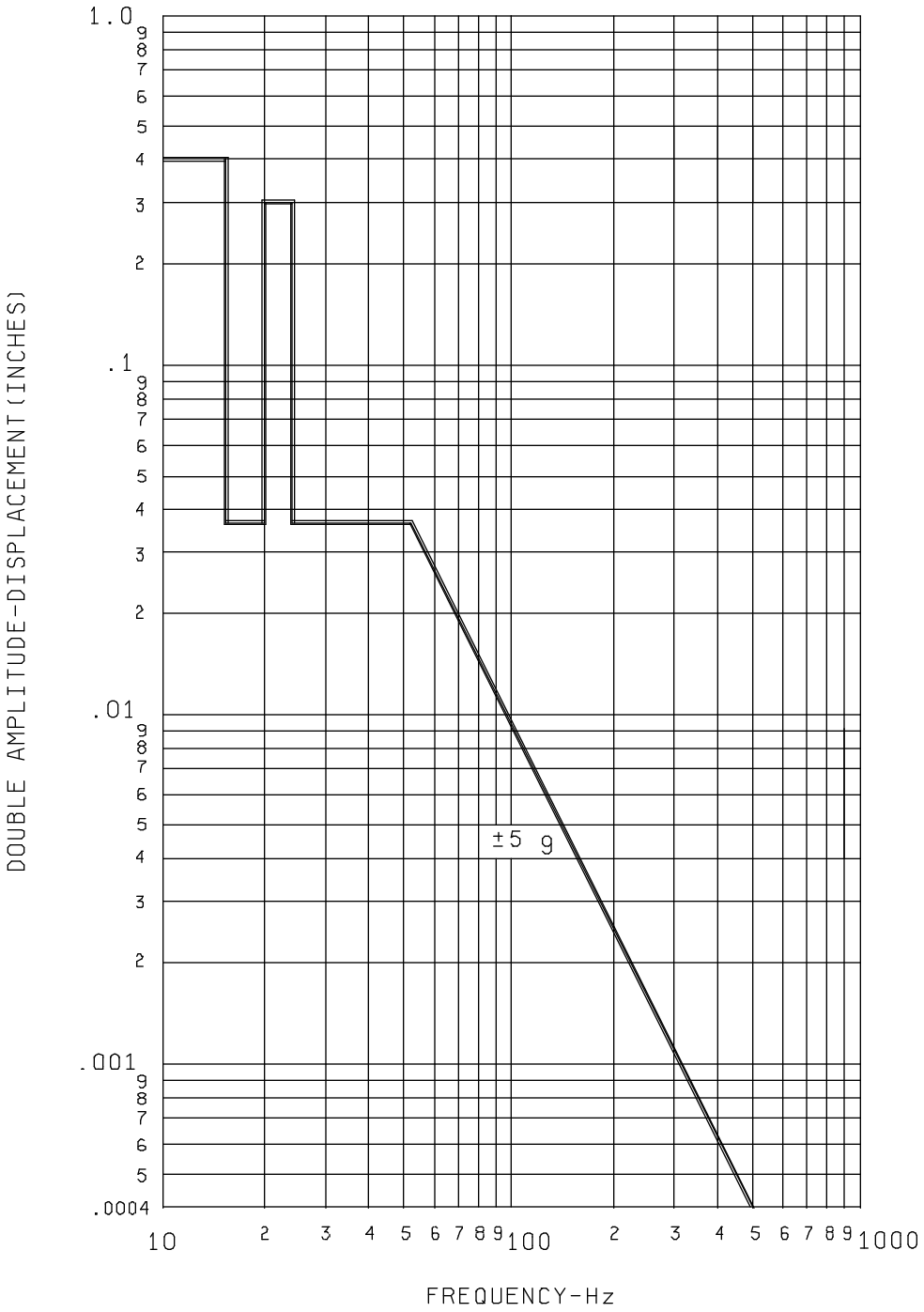
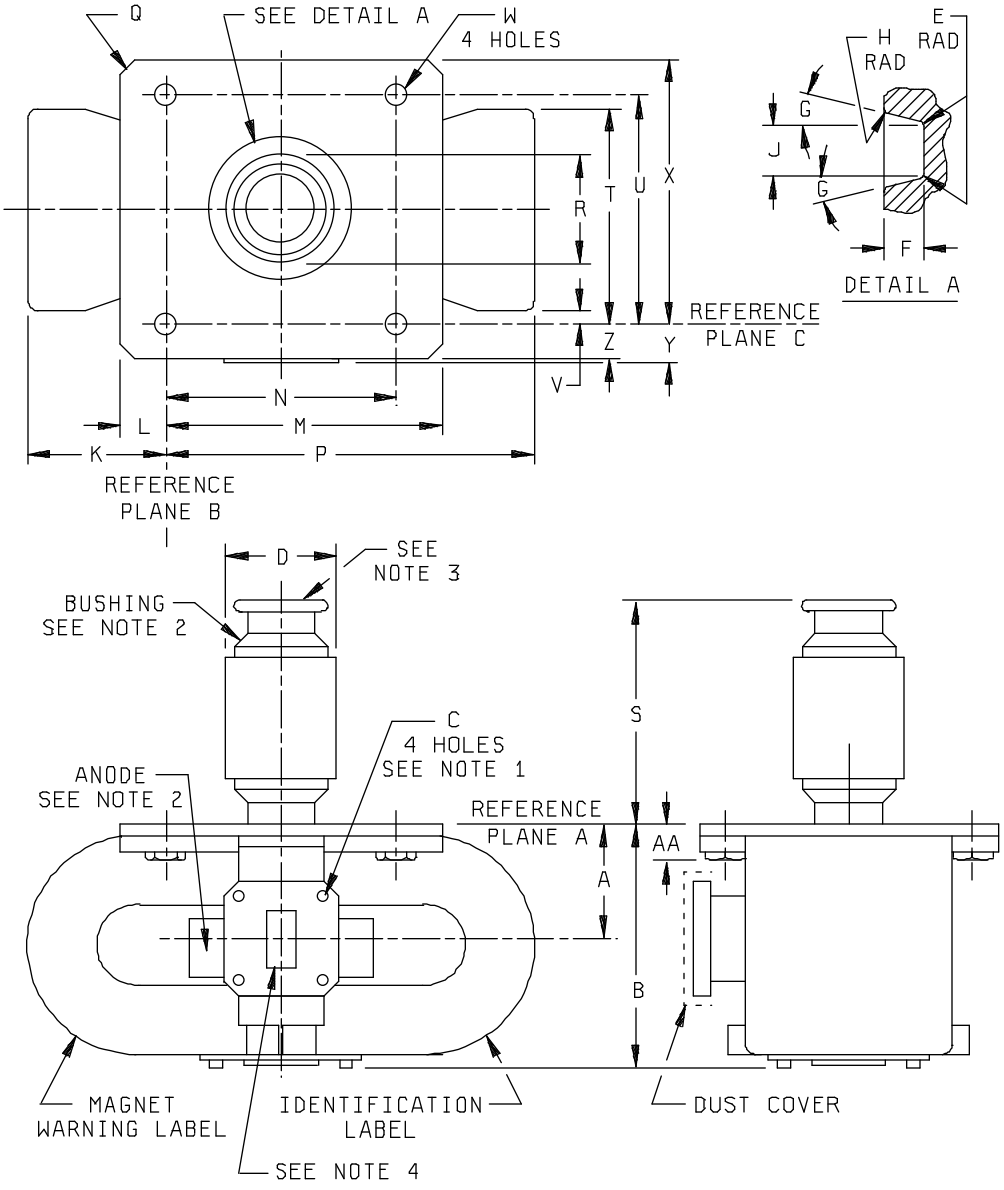


FIGURE 1. Vibration requirements.



NOTES:

1. Mate with UG-541A/U waveguide.
2. Measure temperatures at these points.
3. Mates with connector TI 518609 (Jettron 9000-C) or equal.
4. Ceramic type output window.

FIGURE 2. Outline drawing of electron tube type 8943.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 1				
A	1.22	1.42	30.99	36.07
B	---	3.0	---	76.2
C	.138-32 UNC-2B thread (4 HOLES)			
D	---	1.10	---	27.94
T	---	2.625	---	66.68
W	0.297	0.307	7.54	7.80
Y	0.395	0.455	10.04	11.56
S	---	2.625	---	66.68
AA	0.455	0.495	11.56	12.57
Conformance inspection, part 3 (periodic)				
E	0.027	0.037	0.69	0.94
F	0.070	0.090	1.78	2.29
G	---	5°	---	5°
H	0.005	---	0.13	---
J	0.185	0.205	4.70	5.21
K	---	1.625	---	41.28
L	---	0.545	---	13.84
M	---	3.295	---	83.69
N	2.740	2.760	69.50	70.10
P	---	4.375	---	111.13
Q	---	0.125 x 45°	---	3.18 x 45°
R	1.343	1.363	34.11	34.62
U	2.815	2.835	71.50	72.01
V	0.200	---	5.08	---
X	---	3.192	---	81.08
Z	---	0.365	---	9.27

FIGURE 2. Outline drawing of electron tube type 8943 - Continued.

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

Review activities:
Navy - AS, CG, MC, OS, SH
Air Force - 11, 99

Preparing activity:
DLA - CC

(Project 5960-3476-07)