

INCH-POUND

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 SUPERSEDING
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PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, MAGNETRON

TYPE DOD-011 *

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: Pulsed, coaxial, tunable frequency range 15,400 to 15,700 MHz, rated peak power output 2.5 kw, with integral magnet.

ABSOLUTE RATINGS:

Parameter:	if (surge)	tk	VSWR	Tuner stop torque	T (body)	T (anode)	T (Input bushing)	Cak	tsrv	Alt
Unit:	a	sec	---	inch/ounce	°C	°C	°C	pF	μs	ft
Maximum:	6	---	1.3:1	20	+71	+150	+175	35	0.150	10,000
Minimum:	---	60	---	---	-54	-54	-54	20	0.06	---

ABSOLUTE RATINGS:

Parameter:	Ef	If	eb	ib	Pi	pi	Du	tpc
Unit:	V	A	v	a	W	kw	---	μs
Maximum:	7	2.5	3,800	3.1	60	12	0.005	0.5
Minimum:	6	1.5	---	---	---	---	0.001	0.2

PHYSICAL CHARACTERISTICS:

Dimensions:	See figure 1.	Marking:	2/
Mounting position:	Any.	Magnet isolation:	1/
Mounting support:	See figure 1.	Weight:	4 pounds (maximum).
Input coupling:	See figure 1.	Handling:	1/
Output coupling:	See figure 1.	Cooling:	Conduction and convection.

TEST CONDITIONS:

Parameter:	Ef	ib	Du	tpc	trc
Unit:	V	a	---	μs	μs
Tolerance:	±0.1	---	---	±0.05	±0.01
Test condition 1 3/	6.3	3	.005	0.3	0.07
Test condition 2 4/	6.3	3	.001	0.3	0.07
Test condition 3 5/	6.3	3	.005	0.3	0.07
Test condition 4 6/	6.3	3	.001	0.3	0.07

Frequency	
F	MHz
F1	15,412
F2	15,436
F3	15,484
F4	15,508
F5	15,532
F6	15,568
F7	15,592
F8	15,616
F9	15,664
F10	15,688

GENERAL:

Qualification - Required.

* Replaces AIL P/N 395964-1, Litton type L-5328, and Varian type VMU-1018.

MIL-PRF-1/1719B

TABLE I. Testing and inspection.

Inspection	Method MIL-STD- 1311	Notes	Test	Conditions	Symbol	Limits		Unit
						Min	Max	
<u>Qualification inspection</u>		---	---	F = F1 through F10				
Temperature range operating (high)	1026	<u>18/</u>	1, 2	TA = +71°C	MP	---	0.1	%
Temperature range operating (low)	1026	<u>18/</u>	1, 2	TA = -54°C	MP	---	0.1	%
Barometric pressure, reduced	1002	<u>18/</u>	1, 2		---	---	---	---
Spurious output ratio	4243	<u>9/</u>	---		po	---	-30	dBm
Shock, specified pulse (nonoperating)	1042	<u>7/</u>	---	200 G; t = 3 ms	F	---	1.5	MHz
Direct-interelectrode capacitance	1331	<u>8/</u>	---		C	20	35	pF
Tuner stop endurance	4223	<u>17/</u>	---		---	50	---	inch- ounce
Temperature coefficient	4027	<u>18/</u>	1, 2	TA = +25°C to -54°C to +71°C to +25°C	ΔF	---	±3	MHz
Mechanical tuning fatigue	4223	<u>10/</u>	---		---	1,500	---	Cycles
Frequency change (warmup)	4302	<u>18/</u>	3, 4		ΔF	---	14	MHz
Power output (pulse train)	---	<u>11/ 18/</u>	1, 2		Δpo	---	0.5	dB
Frequency stability (pulse train)	---	<u>12/ 18/</u>	1, 2		ΔF	---	1	MHz
Frequency stability (filament)	---	<u>13/ 18/</u>	3, 4	Ef = 6.3 V ±5%	ΔF	---	1	MHz
<u>Conformance inspection, part 1</u>		<u>19/</u>	---	F = F1, F4, F7, 10				
Heater current	1301	---	---	Ef = 6.3 V; tk = 60 sec	If	1.5	2.5	A
Warmup time (cathode)	4303	---	---	Ef = 6.3 V; tk = 60 sec (max)	---	---	---	---
Pulse voltage (anode)	4306	---	---		eb	3,400	3,700	v
Power output	4250	<u>18/</u>	3, 4		po	2,500	3,500	w

See footnotes at end of table.

MIL-PRF-1/1719B

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Notes	Test	Conditions	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u> - Continued		<u>19/</u>	---	F = F1, F4, F7, F10				
Frequency pulling figure	4310	<u>18/</u>	3, 4	VSWR = 1.3:1 (min)	ΔF	---	5	MHz
Frequency pushing figure	4311	<u>18/</u>	3, 4	$\Delta ib = \pm 5\%$	ΔF	---	± 0.5	MHz
Mechanical tuning range	4223	<u>18/</u>	3, 4		F	15,400	15,700	MHz
Resettability	4223	<u>18/</u>	3, 4		ΔF	---	± 5	MHz
RF bandwidth	4308	<u>15/ 18/</u>	3, 4		F	---	2.5/tpc	MHz
Minor lobe ratio	4308	<u>15/ 18/</u>	3, 4		Ratio	8	---	dB
Stability	4315	<u>16/ 18/</u>	3, 4		MP	---	0.1	%
<u>Conformance inspection, part 2</u>		---	---	F = F1, F4, F7, F10				
Operation vibration	1031	<u>7/ 18/</u>	1, 2		ΔF	---	1	MHz
Tuner torque	4223	---	---	TA = -54°C to +71°C	---	---	20	inch-ounce
<u>Conformance inspection, part 3</u>		---	---	F = F1, F4, F7, F10				
Life test	---	<u>14/</u>	---		t	2,000	---	hrs
Life test end points:	---							
Power output	4250	<u>18/</u>	1, 2		po	2,000	---	w
Pulse voltage (anode)	4306	---	---		eb	3,400	3,800	v
Mechanical tuning range	4223	---	---		F	15,400	15,700	MHz
Resettability	4223	---	---		ΔF	---	± 5	MHz
RF bandwidth	4308	<u>15/ 18/</u>	3, 4		F	---	3.0/tpc	MHz
Minor lobe ratio	4308	<u>15/ 18/</u>	3, 4		Ratio	6	---	dB
Stability	4315	<u>16/ 18/</u>	1, 2		MP	---	0.2	%

See footnotes at top of next page.

TABLE I. Testing and inspection - Continued.

- 1/ In handling and mounting the tube, care should be exercised to prevent demagnetization. Ferromagnetic materials or energized magnets shall not be brought within 2 inches of the tube.
- 2/ A calibrated tuner with appropriate dial markings shall be incorporated on the tube. The tuner mechanism shall be capable of setting the tube's frequency within ± 5 MHz when the tube is operating at test condition 1 conditions, TA = 25°C, and when the effects of frequency pushing and pulling are neglected. The tuner is to be rotated in a clockwise direction for each new setting. A tuner calibration chart shall be provided for each of the 10 frequencies specified below:

<u>Channel No.</u>	<u>Frequency</u>
1.....	F1
2.....	F2
3.....	F3
4.....	F4
5.....	F5
6.....	F6
7.....	F7
8.....	F8
9.....	F9
10.....	F10

- 3/ High burst duty. The test shall be performed with a pulse train of 1,667 pulse pairs with a pulse pair spacing of 8 μ s, and an interpair interval of 60 μ s. This provides a pulse train of 99.96 ms duration. Pulse trains shall be generated every 200 ms.
- 4/ Low burst duty. The test shall be performed with a pulse train of 333 pulse pairs with a pulse pair spacing of 8 μ s, and an interpair interval of 60 μ s. This provides a pulse train of 19.92 ms duration. Pulse trains shall be generated every 200 ms.
- 5/ High average duty. The test shall be performed with constant repetition rate single pulses spaced 60 μ s.
- 6/ Low average duty. The test shall be performed with constant repetition rate single pulses spaced 300 μ s.
- 7/ After the performance of the specified test, the tube shall meet the requirements of conformance inspection, part 3, life-test end points.
- 8/ The input capacitance shall be measured between the cathode terminal and a mounting plate .25 inch (6.35 mm) thick with the minimum cut-out required to flush mount the tube.
- 9/ Spurious emissions shall not have peak power exceeding the specified amount on the tube specification sheet (TSS) within the frequency range of 7.5 GHz and 20 GHz. This limit not applicable within either the designed emission bandwidth or ± 5 percent of the center frequency in this TSS.
- 10/ Tubes shall meet the tuner torque requirements after the specified number of cycles.
- 11/ The difference in amplitude between the first and last rf pulse in the pulse train shall not exceed 0.5 dB under the condition that peak current variation of these two pulses be less than 5 percent total.
- 12/ The difference in frequency between the third and last pulse in the pulse train shall not exceed the specified value under the condition that peak current variation of these two pulses be less than 5 percent total.
- 13/ When the filament voltage is varied as specified, the measured frequency shall not change more than the specified amount.

TABLE I. Testing and inspection - Continued.

14/ A life-test cycle shall consist of the following:

<u>Duration</u>	<u>Condition</u>
5 minutes	Off
1 minute	Filament voltage applied
60 minutes	Tube operating

The frequency shall be shifted starting at F1 to the next higher channel each eight operating hours.

15/ The tube shall be operated into a transmission line with a VSWR of 1.3:1 minimum, adjusted in phase to produce the maximum spectrum degradation. A suitable spectrum is considered one in which the major lobe has a shape such that its slope does not change sign more than once for power levels greater than the specified dB below its peak.

16/ Stability shall be measured in terms of the average number of output pulses missing, expressed as a percent of the number of input pulses applied during the period of observation. The missing pulses (MP), due to any causes, are considered to be "missing" if the rf energy is less than 70 percent of the normal energy level. A VSWR = 1.3:1 (minimum) shall be adjusted to that phase producing maximum instability and the missing pulses counted during any consecutive 5-minute interval of a 10-minute test interval.

17/ Tuner stops shall be provided to limit rotation of the tuner mechanism. The lower frequency limit shall not be less than 15.375 GHz and the upper frequency limit shall not exceed 15.725 GHz, with the tuner mechanism "set" against the upper or lower stop.

18/ This test shall be performed using the requirements of either of the specified test conditions.

19/ Unless otherwise specified, the acceptance level for all tests listed under conformance inspection, part 1, shall be 1.0, in accordance with MIL-PRF-1, table III.

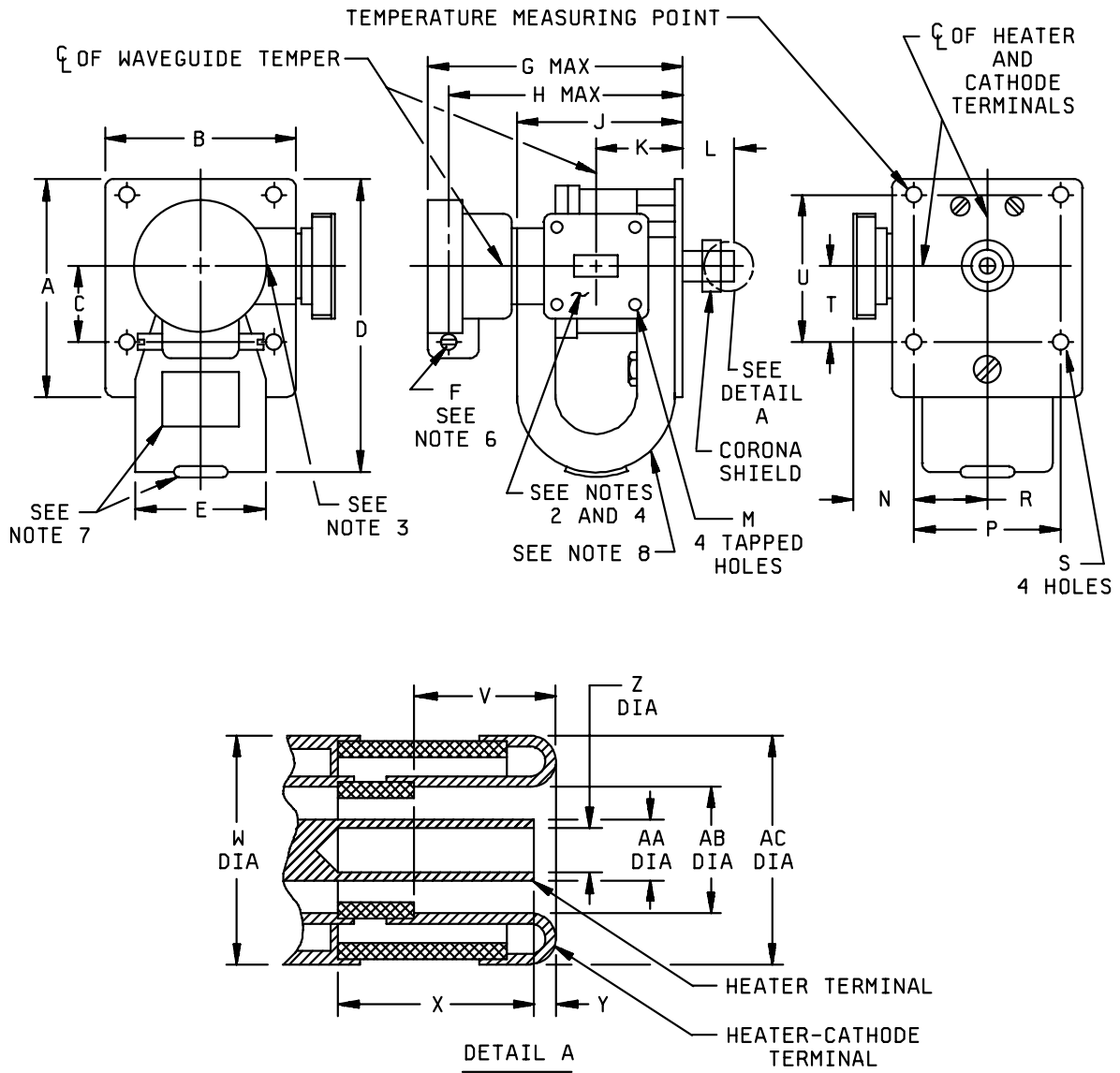


FIGURE 1. Outline drawing of electron tube type DOD-011.

MIL-PRF-1/1719B

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Qualification inspection				
B	2.490	2.510	63.25	63.75
E	---	2.000	---	50.80
F	.185	.189	4.70	4.80
U	1.990	2.010	50.55	51.05
Conformance inspection, part 1 19/				
D	---	5.000	---	127.00
G	---	3.550	---	90.17
H	3.170	3.270	80.52	83.06
L	.620	.740	15.75	18.80
N	.690	.750	17.53	19.05
P	1.990	2.010	50.55	51.05

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	2.990	3.010	75.95	76.45
J	2.262	2.362	57.45	59.99
K	1.157	1.217	29.39	30.91
M	6-32 UNC-2B (4 tapped holes)			
R	.995	1.005	25.27	25.53
S	.276	.286	7.01	7.26
T	.995	1.005	25.27	25.53
V	.312	---	7.92	---
X	.312	---	7.92	---
Y	.045	---	1.14	---
AB	.283	.293	7.19	7.44
Conformance inspection, part 3				
Z	.095	.101	2.41	2.57
AA	.120	.130	3.05	3.30
AC	.500		12.70	
Nominal dimensions				
C	1.000		25.40	
W	.500		12.70	

NOTES:

1. The mounting flange shall be brass in accordance with ASTM-B36 and ASTM-B121, bright alloy finish or aluminum alloy, chemically treated in accordance with MIL-C-5541, class 3.
2. The waveguide flange shall have an electrically conductive finish.
3. The location of tuner calibration indicator specified in 2/ of table I shall be viewed through a sealed window.
4. Waveguide flange mates with UG-541/U or equal modified with clearance mounting holes.
5. Cathode-heater terminals mate with Jettron connector No. 90-050 or equal.
6. Slot is $.0425 \pm .0020$ inch ($1.08 \pm .05$ mm) wide by $.125 \pm .010$ inch ($3.18 \pm .25$ mm) deep.
7. The tube labels shall include tube type, serial number, magnet warning data, and calibration markings.
8. Magnet coated with Silastic or equal.

FIGURE 1. Outline drawing of electron tube type DOD-011 - Continued.

MIL-PRF-1/1719B

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet references MIL-STD-1311, ASTM-B36, ASTM-B121, and MIL-C-5541.

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Navy - EC
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DLA - CC

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Army - AR
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