

INCH-POUND

  
MIL-PRF-1/1047D  
26 April 2013  
SUPERSEDING  
MIL-PRF-1/1047C  
10 April 2007

PERFORMANCE SPECIFICATION SHEET  
ELECTRON TUBE, NEGATIVE GRID (MICROWAVE)  
TYPE 2C41

INACTIVE FOR NEW DESIGN  
AFTER 30 APRIL 1997.

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 MIL-PRF-1.

DESCRIPTION: Triode, planar, glass and metal.

See figure 1.

Mounting position: Any.

Weight: 2.25 ounces nominal.

ABSOLUTE RATINGS: Anode pulsed oscillator

Parameter:	F1	Ef	Ec	epy	ib	ic	ik	tp	Du	Pp	Pg	Rg	tk	TE
Unit:	MHz	V	V dc	kv	a	a	a	μs	---	W	W	Ohms	sec	°C
Maximum:	3,000	<u>1/</u> 6.6	-150	3.5	4	2.5	6.5	3	0.0025	35	2	---	---	175
Minimum:	---	5.7	---	---	---	---	<u>2/</u> ---	---	---	---	---	20	60	---
Test conditions:														
Parameter:	Ef	Eb	Rk	Ck	tk									
Unit:	V	V dc	Ohms	μF	sec									
	6.3	600	30	1,000	300									

GENERAL:

Qualification: Not required.

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

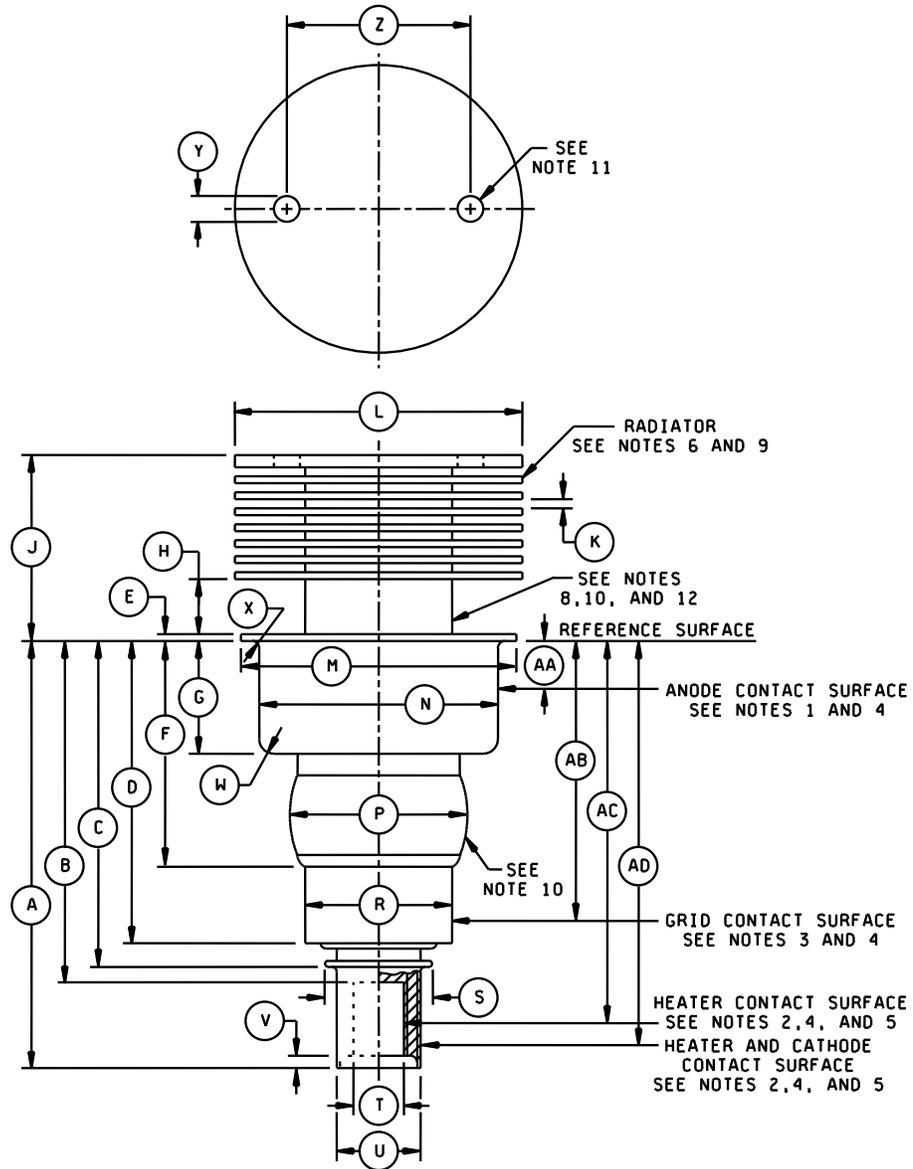


FIGURE 1. Outline drawing of electron tube type 2C41.

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Dimensions				
Ltr	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	1.815	1.875	46.10	47.63
B	---	1.534	---	38.96
C	---	1.475	---	37.47
D	1.289	1.329	32.74	33.76
F	---	.980	---	24.89
G	.462	.477	11.73	12.12
J	.766	.826	19.46	20.98
N	1.025	1.035	26.04	26.29
R	.655	.665	16.64	16.89
T	.213	.223	5.41	5.66
U	.315	.325	8.00	8.26
Conformance inspection, part 3 (see note 13)				
E	---	.040	---	1.02
H	.125	.185	3.18	4.70
K	.025	.046	0.64	1.17
L	1.234	1.264	31.34	32.11
M	1.180	1.195	29.97	30.35
P	---	.812	---	20.62
S	---	.545	---	13.84
V	---	.086	---	2.18
W	---	.100	---	2.54
X	---	.035	---	0.89
Y	.105	.145	2.67	3.68
Z	.650	.850	16.51	21.59
Electrode contact areas (see note 14)				
AA	.035	.361	0.89	9.17
AB	1.185	1.265	30.10	32.13
AC	1.534	1.728	38.96	43.89
AD	1.475	1.815	37.47	46.10

FIGURE 1. Outline drawing of electron tube type 2C41 - Continued.

NOTES:

1. The total indicated runout of the anode contact surface with respect to the cathode contact surface shall not exceed .020 (0.51 mm).
2. The total indicated runout of the cathode contact surface with respect to the heater contact surface shall not exceed .012 (0.30 mm).
3. The total indicated runout of the grid contact surface with respect to the cathode contact surface shall not exceed .020 (0.51 mm).
4. Measure total indicated runout at the centerline dimension for the applicable contact area. Diameters N, R, T, and U shall apply throughout the entire contact area as defined by dimensions AA, AB, AC, and AD, respectively.
5. Inner edge of heater and outer edge of cathode rf connection shall be free from burrs and sharp edges.
6. Distortion of fins permissible provided distance between adjacent fins at any point around the circumference meets dimension K.
7. Silver plate 30 MSI on all external metal surfaces.
8. Radiator and radiator support need not be plated when made of copper, aluminum, or equivalent, approved by the bureau or agency concerned.
9. Fin at outer end of tube shall have sufficient strength to withstand a drop test from a 6-inch (152.40 mm) height without distortion as judged by ability to maintain dimension K and not loosening. Test 10 tubes per month. If one tube fails, test reverts to acceptance level (see note 15) of 6.5 for all lots in process.
10. Do not clamp or locate on this surface.
11. Hole provided for tube extractor through top fin only.
12. Measure anode shank temperature on this surface.
13. These dimensions, and the dimensions in notes 1, 2, 3, and 7, shall be checked during the initial production and once each succeeding 12-calendar month period in which there is production.
14. Dimensions in electrode contact areas tables are for socket design purposes and are not intended for inspection purposes.

FIGURE 1. Outline drawing of electron tube type 2C41 - Continued.

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TABLE I. Requirement or test.

MIL-STD-1311 method	Requirement or test	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
	<u>Conformance inspection, part 1</u>						
1266	Total grid current	<u>3/ 5/</u>		Ic	---	-8.0	μA dc
1256	Electrode current (1) (anode)	<u>3/</u>		Ib	60	95	mA dc
1306	Transconductance			Sm	20,000	30,000	μmhos
1211	Insulation of electrodes		Eb = Ek = 0; Ec = -500 V dc	R	50	---	MegΩ
1231	Pulsing emission		prf = 600 (max); tp = 3 μs (max); eb = ec = etd/is = 6a	etd	---	225	v
1236	Power oscillation (1) (pulse)	<u>6/ 7/</u>	F = 3,000 MHz (min); epy = 3.5 kv; Rg/Ib = 4a or Ib = 10 mAdc with Ic = 6 mA dc (max); Ec = -1.5 V (min); Ef = 5.8 V	Po(1)	7	---	W (useful)
1301	Heater current			If	0.95	1.10	A
	<u>Conformance inspection, part 2</u>						
---	Resonance	<u>6/ 8/</u>	No voltages applied	---	---	---	---
---	Grid arcing	<u>9/</u>	eb = 0; egz = 400 v; (60 Hz); Rg/Ic = 100 mAdc	---	---	---	---
1236	Power oscillation (2) (pulse)	<u>6/ 7/</u>	F = 3,000 MHz (min); epy = 3.5 kv; Rg/Ib = 3a or Ib = 7.5 mAdc with Ic = 4.5 mAdc (max); Ec = -1.5 V (min); Ef = 5.9 V	Po(2)	4	---	W (useful)
1261	Electrode voltage (grid)	<u>3/</u>	Ec/Ib = 1.0 mAdc	Ec	---	-15	V dc
---	Bandwidth, rf	<u>10/</u>	Power oscillation (1) (pulse)	Bandwidth	---	1.0	MHz
1331	Direct-interelectrode capacitance	<u>6/</u>	Use fixture in accordance with Drawing 158-JAN	Cgk Cgp Cpk	5.60 1.86 ---	7.60 2.16 0.035	pF pF pF

See footnotes at end of table.

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TABLE I. Requirement or test - Continued.

MIL-STD-1311 method	Requirement or test	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
	<u>Conformance inspection, part 3</u>						
---	Life (1)		Group C; power oscillation (1) (pulse); t = 100 hours	---	---	---	---
---	Life (1) - test end point:						
1236	Power oscillation (1) (pulse)	<u>6/ 7/</u>	F = 3,000 MHz (min); epy = 3.5 kv; Rg/ib = 4a or lb = 10 mA dc with lc = 6 mA dc (max); Ec = -1.5 V (min); Ef = 5.8 V	$\Delta Po(1)$	---	30	%
---	Life (2)		Group D; power oscillation (2) (pulse); Ef = 6.1 V $\pm$ 1%; t = 200 hours	---	---	---	---
---	Life (2) - test end point:						
1236	Power oscillation (2) (pulse)	<u>6/ 7/</u>	F = 3,000 MHz (min); epy = 3.5 kv; Rg/ib = 3a or lb = 7.5 mA dc with lc = 4.5 mA dc (max); Ec = -1.5 V (min); Ef = 5.7 V $\pm$ 1%	$\Delta Po(2)$	---	30	%
1031	Low-frequency vibration	<u>6/ 11/</u>	Ec/lb = 10 mA dc; Rp = 10,000 ohms; Ebb = 300 V dc	Ep	---	100	mV ac
---	Torque	<u>6/ 11/ 12/</u>	No voltages applied	---	---	---	---
---	Torque-test end point:						
1266	Total grid current	<u>3/</u>		lc	---	-10	$\mu A$ dc
1042	Shock, specified pulse	<u>6/ 11/ 13/</u>	Condition A	---	---	---	---
---	Shock, specified pulse-test end point:						
1266	Total grid current	<u>3/</u>		lc	---	-10	$\mu A$ dc

See footnotes at top of next page.

TABLE I. Requirement or test - Continued.

- 1/ The transit-time heating effect of the cathode shall be compensated for by a reduction in heater voltage after dynamic operation of the tube has started. The back heating is a function of frequency, grid current, grid bias, anode current, duty cycle, and circuit design and adjustment. There is an optimum heater voltage which will maintain the cathode at the correct operating temperature for a particular set of operating conditions. A maximum variation of  $\pm 5$  percent from optimum is permitted. No reduction in heater voltage is required up to and including 500 MHz.
- 2/ The regulation or series-anode-supply impedance, or both, shall limit the instantaneous peak current, with the tube considered as a short circuit, to a maximum of 10 times the specified maximum current rating.
- 3/ Sufficient conduction and convection cooling shall be provided to limit the radiator and envelope temperature to the specified maximum at 175°C under all operating conditions. Reliability will be seriously impaired if this maximum temperature is exceeded.
- 5/ This test shall be the first test performed at the conclusion of the holding period.
- 6/ Other tube contact configurations may be used provided the tube contact area remains unchanged and the socket, jig, or cavity gives equal performance. Mounting of the jig, socket, or cavity may be at the option of the manufacturer.
- 7/ The applied voltage pulse shape shall be measured with a non-inductive resistor of 1,150 ohms  $\pm 2$  percent inserted in place of the tube. The pulse shape shall be  $t_p = 3.0 \mu s \pm 10$  percent,  $t_r = 0.4 \mu s$  maximum,  $t_f = 0.7 \mu s$  maximum. The pulse repetition rate shall be adjusted so that  $D_u = 0.0025 \pm 5$  percent with the above measured pulse length. Test in cavity in accordance with Drawing 279-JAN. The cavity shall be connected to a load with a VSWR less than 1.5. The oscillator output coupling and grid or cathode resistor may be adjusted for maximum power output.
- 8/ Grid-anode resonance: Test in cavity in accordance with Drawing 278-JAN. Cavity shall resonate at  $1,354 \pm 2.0$  MHz with tuning slug in accordance with Drawing 277-JAN at  $TA = 25^\circ C \pm 5^\circ C$ .

Grid-cathode resonance: Test in cavity in accordance with Drawing 283-JAN. Cavity shall resonate at  $1,719 \pm 2.0$  MHz with tuning slug in accordance with Drawing 277-JAN at  $TA = 25^\circ C \pm 5^\circ C$ .

When plotted on graphs of resonant frequency versus grid-anode capacitance and resonant frequency versus grid-cathode capacitance, the tube under test shall be represented by a point within a parallelogram whose four corners are located by the following points:

Points	Capacitance (pF)		Frequency (MHz)	
	<u>C-gp</u>	<u>C-gk</u>	<u>F-gp</u>	<u>F-gk</u>
1	1.86	5.60	1927.5	1745
2	1.86	5.60	1997.5	1815
3	2.16	7.60	1842.5	1700
4	2.16	7.60	1912.5	1770

- 9/ There shall be no evidence of grid to cathode arcing or grid current instability when tested in a circuit in accordance with Drawing 255-JAN. This test shall be performed before the pulsing emission and power oscillation (pulse) tests. Initial arcing is permitted if followed by a 15-second period with no indications of subsequent arcing.
- 10/ The rf bandwidth measured at one-quarter power by means of an rf spectrometer shall be within the limits specified.

TABLE I. Requirement or test - Continued.

- 11/ This test shall be performed during the initial production and once each succeeding 12-calendar month period in which there is production.
- 12/ Torque test shall be performed as follows:
- (a) The tube shall be held securely at the cathode connection. A force of 5 pounds shall be applied to the heater cup without perceptible shock. This test may be made by applying the force at right angles to the inside of the cup at a point .109 (2.77 mm)  $\pm$ .016 inch (0.41 mm) from the cathode end of the tube. An approved equivalent method may be used. The heater cup shall not loosen or short circuit on the cathode connection. This part of the test shall not be required if the space between the heater cup and the cathode sleeve is completely filled with insulating material.
  - (b) A torque of 15 inch-pounds shall be applied between anode and cathode without shock.
- 13/ Test in jig in accordance with Drawing 159-JAN.

Referenced documents. In addition to MIL-PRF-1, this document references MIL-STD-1311, 158-JAN, 159-JAN, 255-JAN, 277-JAN, 278-JAN, 279-JAN, and 283-JAN.

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