

INCH-POUND

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2 July 2004
SUPERSEDING
MIL-PRF-1/1260H
19 July 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON
TYPES 7190 AND 7191

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: Triode, hydrogen.
See figures 1 and 2.
Mounting position: Any.
Weight: 0.5 ounce (14.2 grams) nominal.

ABSOLUTE RATINGS:

Parameter:	Ef	epy	epx	Ebb	Ecc	egx	egy	ib	Ip
Unit:	V	kv	kv	V dc	V dc	v	v	a	A ac
Maximum:	1/	1.2 2/	1.0 3/	---	---	200	400	20	1.0
Minimum:	---	---	---	300	---	---	175 4/	---	---
Test conditions:	6.3	1.2	---	---	0	---	130	---	---

ABSOLUTE RATINGS:

Parameter:	lb	tj	tk	$\frac{dik}{dt}$	Pb	Ehk	pr	TA	Barometric pressure, reduced
Unit:	mA dc	ns	sec	$\frac{a}{\mu s}$	---	V	---	°C	mmHg
Maximum:	50	5 5/	---	400	0.1×10^9	+25	6/	+125	---
Minimum:	---	---	30	---	---	-100	---	-60	20
Test conditions:	---	---	30	---	---	---	5,000	---	---

See footnotes at end of table I.

GENERAL:

Qualification: Required.

TABLE I. Testing and inspection.

Inspection	Method MIL-STD- 1311	Notes	Conditions	Acceptance Level <u>21/</u>	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u>								
Direct current holdoff	---	<u>9/</u>	egy = 0; Rp = Rg = 1,000 ohms; tk = 30	0.65	Ebb	1,600	---	V dc
Grid short and continuity	---	<u>10/</u>	Ecc = +200 V dc; Rg/lc = 5 mA dc (max); epy = 0	0.65	---	---	---	---
Short and discontinuity detection	1201	---		0.40	---	---	---	---
Heater current	3241	---		0.65	lf	1.5	2.0	A
Instantaneous starting	3267	<u>7/ 12/ 19/</u>	epy = 1,000 v	0.65	---	---	---	---
DC anode voltage for conduction	3247	<u>13/</u>		0.65	Ebb	---	100	V dc
Operation (1)	3246	<u>7/ 14/ 19/</u>	epy = 1.4 kv (min); ib = 20a (min)	0.65	egy	---	130	v
Voltage drop	3204	<u>7/ 15/</u>	tp = 1.0 μ s \pm 10 percent; prr = 2,000	0.65	etd	---	90	v
<u>Conformance inspection, part 2</u>								
Sweep-frequency vibration (1)	1031	<u>8/ 11/</u>	t = 4 minutes; Ebb = 1,600 V; egy = 0; Rp = Rg = 1,000 ohms; Ehk = -100 V	---	---	---	---	---
Sweep-frequency vibration end points:	---							
Operation (1)	3246	---		---	egy	---	130	v
Time jitter	3261	---	epy = 500 v (max)	---	tj	---	4.0	ns
Shock	1041	---	Ef = 6.3 V; no voltages applied; 720 G at 1 ms	---	---	---	---	---
Shock end points:	---							
Operation (1)	3246	<u>7/</u>		---	egy	---	130	v
Time jitter	3261	<u>7/</u>	epy = 500 v (max)	---	tj	---	5.0	ns
Heater current	3241	---	Ef = 7.5 V	---	lf	1.6	2.2	A

See footnotes at end of table.

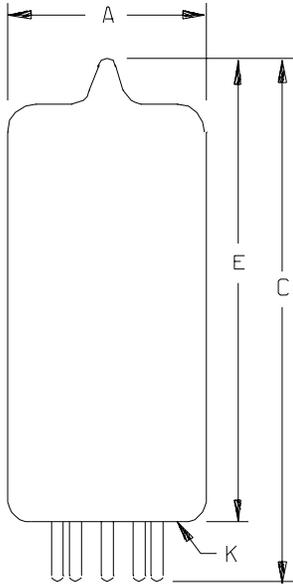
TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD- 1311	Notes	Conditions	Acceptance Level <u>21/</u>	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 2</u> - Continued								
Heater-cathode leakage	1336	---	Ehk = -100 V dc Ehk = +50 V dc	---	lhk	---	100	μA dc
Anode delay time	3256	---	Operation (1); t = 120	---	tad	---	0.6	μs
Anode delay time drift	3256	<u>16/</u>	Anode delay time	---	Δtad	---	0.15	μs
Time jitter	3261	<u>7/</u>	epy = 500 v (max); egy = 175 v	---	tj	---	4.0	ns
<u>Conformance inspection, part 3</u>								
Life test	---	<u>7/ 17/</u>	Group C; epy = 1,200 v; egy = 140 v; ib = 20a; pr = adjust for Ip = 1.0 A ac; t = 500 hours	---	---	---	---	---
Group C, establishment of prerelease eligibility	---	---		---	---	---	---	---
Life-test end points:	---							
Operation (1)	3246	---		---	egy	---	140	v
Anode delay time drift	3256	---	egy = 140 v	---	Δtad	---	0.2	μs
Time jitter	3261	---	egy = 175 v	---	tj	---	5.0	ns
Voltage drop	3204	---		---	etd	---	130	v
Heater-cycling life	1506	<u>18/</u>	Ef = 7.0 V; 10 tubes Ehk = -100 V dc; Ec = Ebb = 0	---	---	---	---	---
Heater-cycling life-test end points:	---	---						
Heater-cathode leakage	1336	---	Ehk = +50 V dc Ehk = -100 V dc	---	lhk	---	125	μA
Barometric pressure, reduced (type 7191)	1002	<u>20/</u>	Pressure = 20 ± 5 mmHg; Ebb = 1,400 V; egy = 0; Rp = Rg = 1,000 ohms; Ehk = -100 V	---	---	---	---	---
Sweep-frequency vibration (2)	1031	<u>7/ 8/</u> <u>20/</u>	t = 120 minutes in 3 planes; 40 min/plane	---	---	---	---	---
Vibration fatigue	1031	<u>20/</u>	No voltages applied	---	---	---	---	---
Operation at elevated ambient temperature	3246	<u>7/ 20/</u>	TA = +125°C; t = 300 (min)	---	egy	---	130	v

See footnotes at top of next page.

TABLE I. Testing and inspection - Continued.

- 1/ It is recommended that a heater voltage, as determined from figure 3, be utilized whenever I_p is less than 0.75 A ac. The heater voltage must be held within ± 5 percent of the values shown on figure 3.
- 2/ For cold-starting applications, where anode voltage is applied instantaneously, the power-supply filter design shall be such that the maximum permissible epy is 1,000 v and cannot be attained in less than 0.04 second. It is recommended that the driver pulse be applied prior to the application of anode voltage.
- 3/ In pulsed operation, the peak inverse voltage shall not exceed 500 v during the first 25 μ s after the pulse.
- 4/ The value shown is valid only for the following pulse shape: Time of rise = 0.5 μ s maximum, grid pulse duration = 2.0 μ s minimum. Impedance of drive circuit = 1,000-ohms maximum.
- 5/ The rated time jitter of 5 ns is applicable only at peak forward anode voltages in excess of 500 v epy, and with a driver pulse in excess of 250 v egy. At values of epy less than 500 v or egy less than 250 v, the time jitter maximum is 10 ns.
- 6/ Under reduced ratings, operating frequencies up to 50 kHz are feasible.
- 7/ The circuit constants shall be chosen so that at epy = 1.2 kv under resonant charging conditions: $di/dt = 400a/\mu$ s minimum, $i_b = 20a$, $t_p = 0.50 \mu$ s ± 10 percent, $prr = 5,000$ and $R_{g1} = 10,000$ to 30,000 ohms. The grid pulse characteristics shall be $t_p = 2.0 \mu$ s maximum, $t_r = 0.5 \mu$ s, and driver impedance = 1,000 ohms minimum.
- 8/ Heater-cathode shorts for 100,000 ohms or less, having a duration of 100 μ s or more, are cause for rejection.
- 9/ Inability to hold off dc anode voltage, when tapped with a cork hammer using 3.0-inch (76 mm) strokes constitutes a failure.
- 10/ Monitor grid-cathode voltage to indicate short or open when tube is tapped with a cork hammer using 3.0-inch (76 mm) strokes. Indication of short or open is cause for rejection.
- 11/ Failure to hold off dc anode voltage during the vibration period shall constitute a failure.
- 12/ The tube shall operate satisfactorily on pushbutton starting within three attempts when anode voltage is applied in such a manner as to rise from 0 to 1,000 v within 0.03 second (the filter design shall be such that at least 500 v is reached within 0.015 second). Any tube failing to start within three attempts shall be considered a failure.
- 13/ No voltages shall be applied to the grid or anode of the tube under test for at least 10 minutes prior to performing this test.
- 14/ The tube shall operate continuously for 5 minutes without evidence of continuous conduction, anode heating, or loss of control.
- 15/ Using a calibrated oscilloscope, adjust epy for a peak cathode current of 20 amperes. Measure the voltage drop between anode and cathode from the zero reference line to the center of the tube drop porch (see figure 4).
- 16/ During the interval between 2 minutes and 7 minutes of the tad test, the anode delay time drift relative to the tad value observed on the anode delay time test, shall not exceed the value specified herein.
- 17/ Life test shall be operated with the tube in a horizontal position. Operation shall consist of 12 minutes of operation (heater, trigger, and anode voltage) and 12 minutes off. The application of anode voltage may be delayed a maximum of 60 seconds after the application of heater voltage. Only anode operating time shall be considered test time. The average life of the sample shall be not less than 90 percent of the duration of the test.
- 18/ No defects are allowed.
- 19/ This test is to be the first test performed at the conclusion of the holding period.
- 20/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. A regular sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 21/). The regular "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.
- 21/ This specification sheet uses accept on zero defect sampling plan in accordance with MIL-PRF-1, table III.



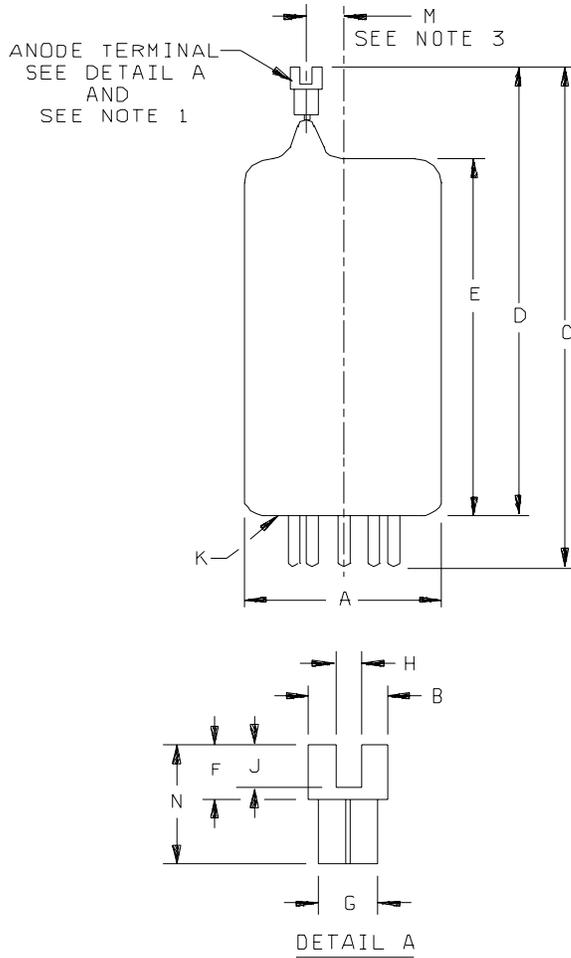
Pin connections	
1	Grid
2	Cathode
3	Heater
4	Heater
5	Cathode
6	Anode
7	Cathode

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	.804	.844	20.42	21.44
C	---	2.125	---	53.98
E	---	1.875	---	47.63
Conformance inspection, part 3 (see note 4)				
K	Base: E7-1			

NOTES:

1. Anode terminal material shall be nickel.
2. Pins must be gold plated, if made of tungsten.
3. This dimension lies in a plane passing through the centerline of the tube and pin 6.
4. Dimensions shall be checked during the initial production and once each succeeding 12-calendar months in which there is production. A sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 21). The regular "12-calendar months" sampling plan shall be reinstated after three consecutive samples have been accepted.

FIGURE 1. Outline drawing of electron tube type 7190.



Pin connections	
1	Grid
2	Cathode
3	Heater
4	Heater
5	Cathode
6	No connection (do not use No. 6 pin socket terminal as tie point)
7	Cathode

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	.804	.844	20.42	21.44
C	---	2.478	---	62.94
D	---	2.228	---	56.54
Conformance inspection, part 3 (see note 4)				
B	.115	.135	2.92	3.43
E	---	1.593	---	40.46
F	.090	.110	2.29	2.79
G	.087	.101	2.21	2.57
H	.037	.047	0.94	1.19
J	.070	.090	1.78	2.29
K	Base: E7-1			
M	.075	.175	1.91	4.45
N	.210	.230	5.33	5.84

NOTES:

1. Anode terminal material shall be nickel.
2. Pins must be gold plated, if made of tungsten.
3. This dimension lies in a plane passing through the centerline of the tube and pin 6.
4. Dimensions shall be checked during the initial production and once each succeeding 2-calendar months in which there is production. A sampling plan shall be used, with the first sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 21/). The regular "12-calendar months" sampling plan shall be reinstated after three consecutive samples have been accepted.

FIGURE 2. Outline drawing of electron tube type 7191.

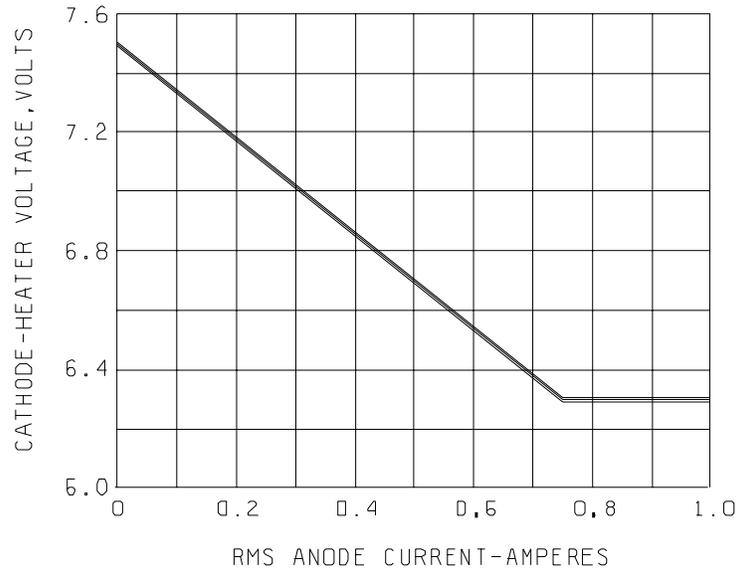


FIGURE 3. Recommended cathode heater voltage, electron tube types 7190 and 7191.

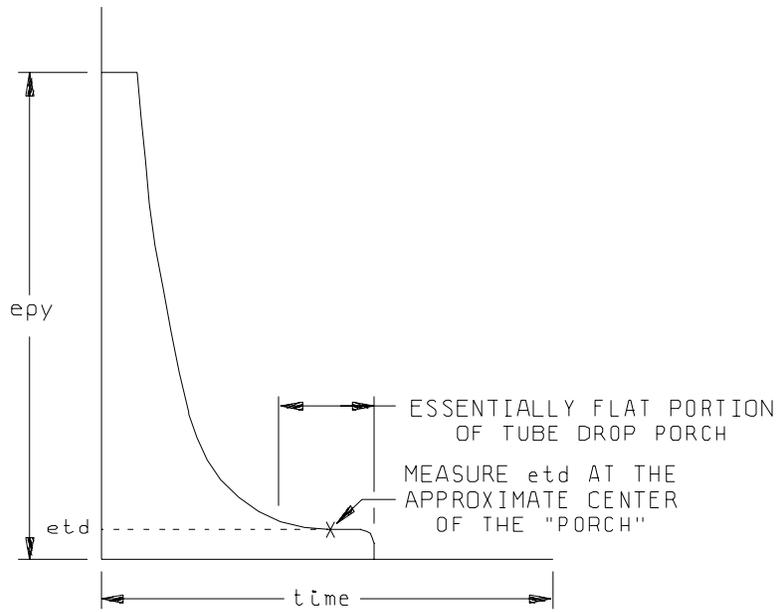


FIGURE 4. Tube drop porch.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet sheet references MIL-STD-1311.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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Navy - EC
Air Force - 11
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DLA - CC

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Review activities:

Army - AR
Navy - AS, CG, MC, OS, SH
Air Force - 99

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