

INCH-POUND

MIL-PRF-1/973E
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SUPERSEDING
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16 December 2002

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, RADIATION COUNTER
TYPES 5980 AND 5980A

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: Halogen-filled, low sensitivity, self-quenching for detection of gamma radiation.

See figures 1 and 1A.

Mounting position: Any.

Weight: .22 ounce, nominal.

ABSOLUTE RATINGS:

Parameter: Unit:	Ebb V dc	TA °C	Rp Meg
Maximum:	725	75	---
Minimum:	675	-40	---
Test conditions:	700	---	1.0

See footnotes at the end of table I.

GENERAL: Qualification - Required. 1/

Marking 2/ 17/ - Tubes sold under service-life guarantee shall be marked with contract number and with the number of operating hours (500 hours minimum) guaranteed.

Response characteristics 3/

Service-life guarantee (MIL-PRF-1) - With qualifying activity approval manufacturer may provide service-life guarantee, in lieu of life test. Guaranteed tube operating time shall be 500 hours minimum.

Comments, suggestions or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: DSCC-VAT, P.O. Box 3990, Columbus, OH 43216-5000 or e-mailed to TubesFiberOptic@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

MIL-PRF-1/973E

TABLE I. Testing and inspection.

Inspection	MIL-STD-1311 Method	Notes	Conditions	Acceptance Level 15/	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u>								
Background, contamination, and photosensitivity	6201	5/ 6/ 10/	t = 2 minutes	0.65	N/t	---	10	Npm
Starting voltage	6211	10/	Pulse amplitude = 1 volt; Nps = 200 (max); R2 = 1 Meg ± 10%; R1 = C1 = C2 = 0; C3 = 0.01 μF ± 10%	0.65	Es	---	640	V dc
Relative plateau slope	6216	12/	Voltage range = 660 to 760 V dc	0.65	Ps	---	0.2	%/V dc
End-of-plateau voltage	6216	12/	Ps = 0.3 %/V dc	0.65	Ee	780	---	V dc
Response count rate and current (gamma)	6221	Z/ 10/	t = 2 minutes	0.65	N/t	75	125	Nps
<u>Conformance inspection, part 2</u>								
Response count rate and current	6221	10/	Gamma (radium); rate = 500 mr/hr; Ebb = 710 V dc	---	lb	---	10.0	μA dc
Pulse amplitude (1)	6226	10/	Ebb = 675 V dc; Nps = 200 (max); R1 = 0.9 Meg ± 10%; R2 = 0.1 Meg ± 10%; C1 = 330 pF ± 10%; C2 = 3,000 pF ± 10%; C3 = 0.01 μF ± 10%; multiply oscilloscope reading by 10	---	eo	2.5	---	v
Pulse amplitude (2)	6226	---	Ebb = 725 V dc; pulse amplitude (1)	---	eo	---	65	v

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	MIL-STD-1311 Method	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 3</u>							
Life-test provisions	---	17/	Group A; counting rate = 1,000 Nps (min); t = 500 hrs	---	---	---	---
Life-test end points	---	9/ 17/		---	---	---	---
Variable-frequency vibration	1031	4/ 11/ 16/		---	---	---	---
Temperature cycling	---	8/ 14/		---	---	---	---
Leakage current	6205	14/	Ebb = 500 V dc	Lib	---	0.5	μA dc
Shock	1041	4/ 13/ 16/	Hammer angle = 40°	---	---	---	---

- 1/ A minimum of 28 samples shall be submitted for qualification testing. The samples to be submitted for qualification testing will be broken down into the following subgroups:
- a. Shelf life only 6
 - b. Electrical, including life test 6
 - c. Shock test only 10
 - d. Variable-frequency vibration 6
- 2/ Each tube shall have an individual serial number permanently marked on the tube.
- 3/ The response characteristics, current, and count rate versus field intensity of a typical type 5980 or 5980A radiation counter tube shall be shown on figure 3. In determining tube response, Ebb = 700 V dc and Rp = 1 Meg ± 10%. Tube current shown as measured by means of a microammeter in series with the tube cathode, and the count rates as determined using a scaler having a resolving time of 0.8 microseconds and a discrimination level of 0.25 volts.

TABLE I. Testing and inspection - Continued.

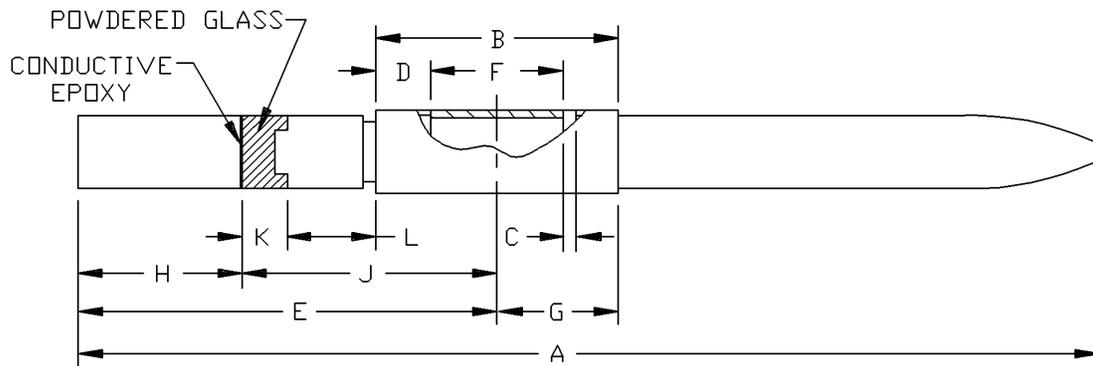
- 4/ Criterion for passing this test shall be compliance after test of at least 80 percent of the sample tubes with the requirements for:
- a. Starting voltage.
 - b. Response count rate (gamma).
 - c. Pulse amplitude (1) and (2).
 - d. End-of-plateau voltage.
 - e. Relative plateau slope.
- 5/ In determining tube response (count rate) $E_{bb} = 700$ V dc and $R_p = 1$ Meg $\pm 10\%$. Tube count rates shall be determined using a scaler having a resolving time of 5 microseconds and a discrimination level of 0.25 volts.
- 6/ The tube shall be exposed to radiation from a General Electric 15-watt germicidal lamp and a General Electric 15-watt fluorescent lamp, or equivalents, with relative positions as shown on figure 2.
- 7/ Use Government approved standard gamma-test unit.
- 8/ With the tube in a field giving 100 ± 10 Nps at 700 V dc, the tube response (count rate) at 675, 700, and 725 V dc shall be determined at each of the following temperatures and in the order shown:
- a. Room temperature.
 - b. -40°C .
 - c. Room temperature.
 - d. 75°C .
 - e. Room temperature.

A minimum stabilization time of 30 minutes shall be allowed at each temperature. The absolute count rate at 700 V dc, and the average relative plateau slope as determined by the readings at the 3 voltages (best average position of straight line), shall not differ from the initial readings at room temperature by more than 10 percent and ± 0.1 percent/volt, respectively, at any of the four subsequent temperatures shown.

- 9/ The limits for acceptability shall be as follows:
- a. Background, contamination, and photosensitivity: 12 Npm, maximum.
 - b. Starting voltage: Initial value ± 10 volts.
 - c. Plateau length: 125 volts, minimum.
 - d. Relative plateau slope: 0.25 percent/V dc, maximum.

TABLE I. Testing and inspection - Continued.

- e. End-of-plateau voltage: 750 volts, minimum.
 - f. Response count rate (gamma): Initial value \pm 10 percent.
 - g. Pulse amplitude (1) and (2): Initial limits.
- 10/ This test to be performed at the conclusion of the holding period.
- 11/ The tube shall be mounted with its longitudinal axis horizontal and perpendicular to the direction of motion by means of a rigid lamp at the center of the cathode. The time for gradually covering the frequency range shall be 15 minutes.
- 12/ Method B (test method 6216); the scaler of note 5 may be utilized for this test.
- 13/ The tube shall be rigidly mounted in positions X and Z by means of a clamp at the center of the cathode. The tube shall be given 10 blows at the X position and 5 at the Z position.
- 14/ This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. A sampling plan shall be used, with six 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 15/). The regular "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.
- 15/ This specification sheet utilizes an accept on zero ($c = 0$) sampling plan in accordance with MIL-PRF-1, table III.
- 16/ The manufacturer, with the approval of the qualifying activity, may perform this test on a periodic basis, versus performing the test on every lot. Approval will be based on demonstrating to the qualifying activity the capability of the design to meet this requirement. If the design, material construction or processing of the tube is changed or if there are any quality problems, the qualifying activity may require resumption of the original testing frequency. This allowance does not relieve the manufacturer from meeting the test requirements in case of dispute.
- 17/ With qualifying activity approval the manufacturer may provide, in accordance with MIL-PRF-1, service-life guarantee, in lieu of performing life testing. Life test endpoints specified shall apply to service-life guarantee conformance as well as to life test conformance. The number of hours of system-deployed, accumulated tube-operating time shall be approved by the qualifying activity and shall be a minimum of 500 hours. Service-life guarantee shall define tube operating life and not time from purchase or delivery. Tubes sold under service-life guarantee shall be marked with contract number and with the number of tube operating hours guaranteed.

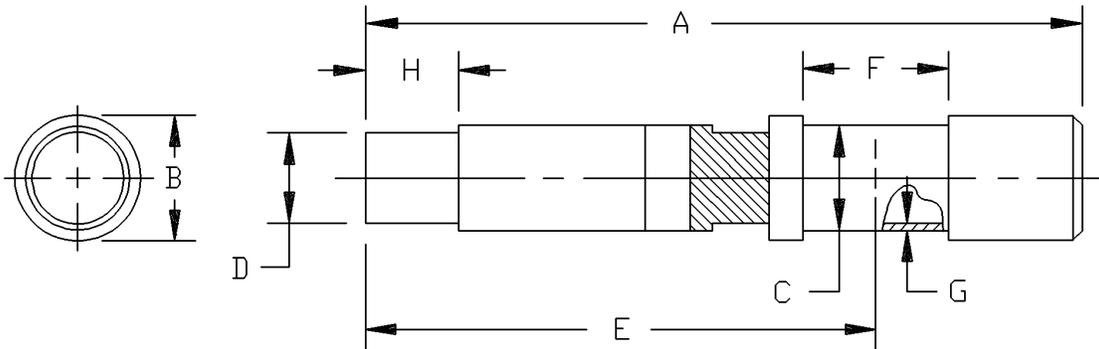


Ltr	Dimensions (see note 2)			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	3.500	---	88.90
B	.825	.835	20.96	21.21
C	.058	.068	1.47	1.73
D	.151	.161	3.84	4.09
E	1.344	1.468	34.14	37.29
F	.450	.460	11.43	11.68
G	.442	.452	11.23	11.48
H	.558	.568	14.17	14.43
J	.816	.826	20.73	20.98
K	.151	.161	3.84	4.09
L	.296	.306	7.52	7.77

NOTES:

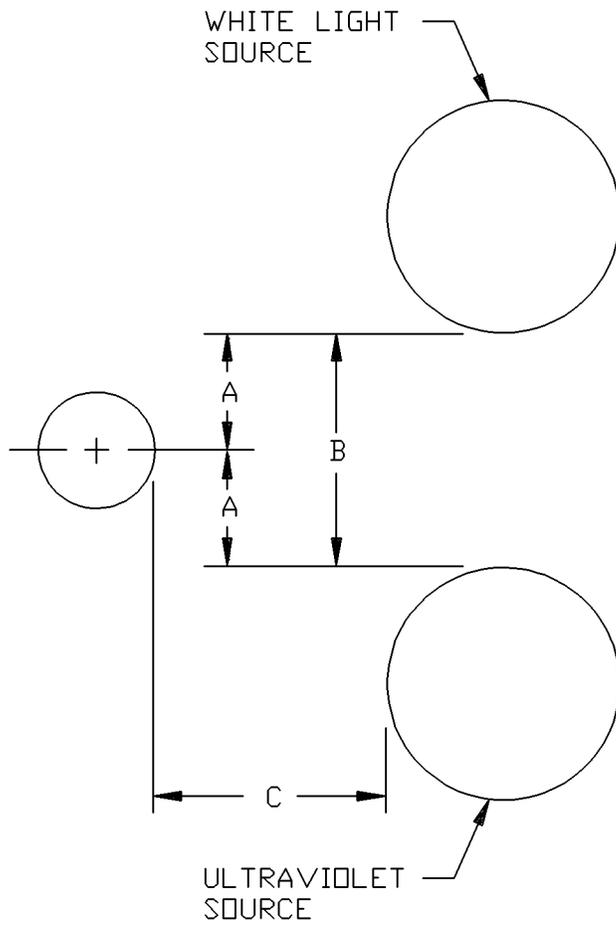
1. Spray with semi-gloss black enamel after pretest.
2. This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. A sampling plan shall be used with a sample of six tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, with an acceptance level of 6.5 (see 15/). The regular "12-calendar month" sampling plan shall be reinstated after three consecutive samples have been accepted.

FIGURE 1. Counter tube assembly (type 5980).



Ltr	Dimensions (see figure 1, note 2)			
	Inches		Millimeters	
	Min	Max	Min	Max
A	1.964	1.974	49.88	50.14
B	.339	.349	8.61	8.86
C	.288	.290	7.32	7.37
D	.245	.250	6.22	6.35
E	1.344	1.468	34.14	37.29
F	.390	.410	9.91	10.41
G	.018	.022	0.46	0.56
H	.250	.260	6.35	6.60

FIGURE 1A. Halogen quenched GM counter tube (type 5980A).



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.45	.55	11.4	14.0
B	---	1.00	---	25.4
C	---	1.00	---	25.4

NOTE: Center of sensitive volume of tube and centers of lamps lie in plane of paper.

FIGURE 2. Position of tube for photosensitivity test.

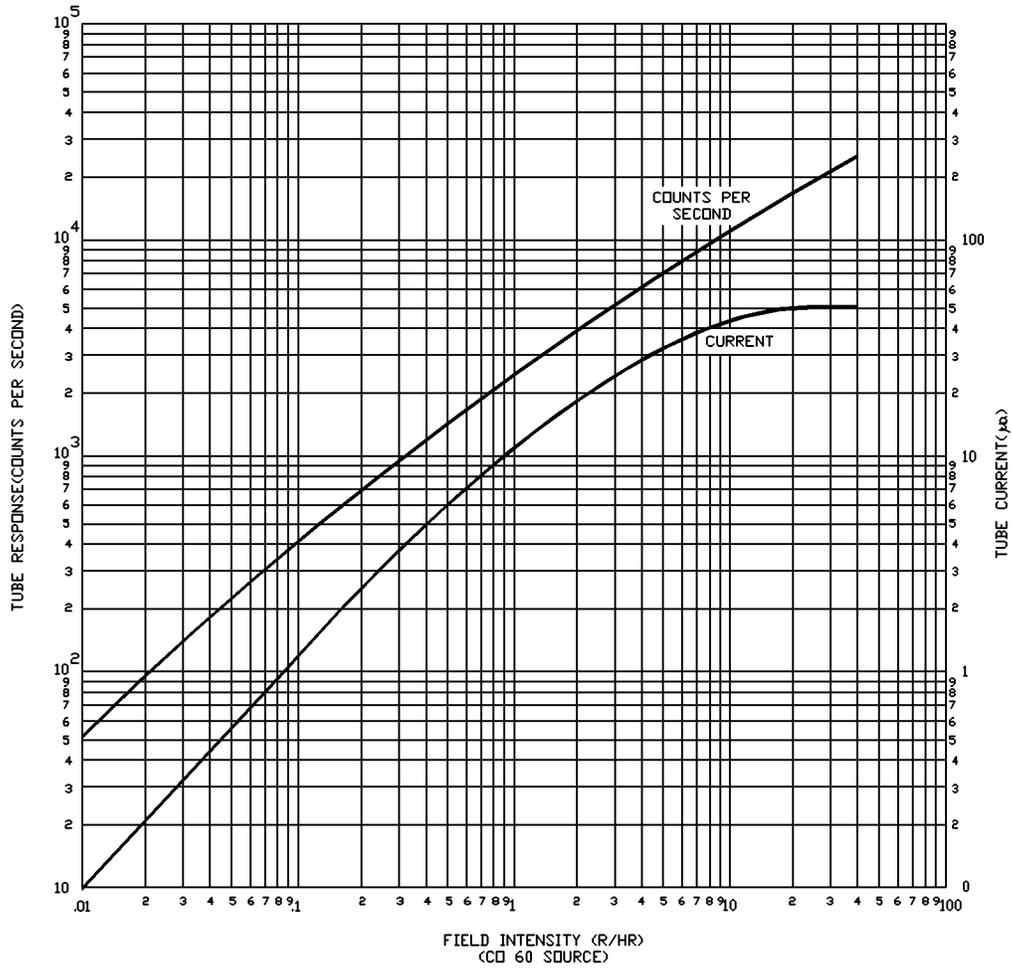


FIGURE 3. Response characteristics of typical type 5980 or 5980A counter tube.

NOTES

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

Changes from previous issue. The margins of this specification sheet 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 last previous issue.

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Navy - EC
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Preparing activity:
DLA - CC

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Review activities:

Army - CR4, MI
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