

INCH POUND

MIL-PRF-1/273K  
 16 June 2003  
 SUPERSEDING  
 MIL-PRF-1/273J  
 26 June 1998

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBES, CATHODE RAY  
 TYPES 5CP1A , 5CP1B , AND 5CP12

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tubes described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Electrostatic deflection and focus with post accelerator.

See figure 1.

Mounting position: Any.

ABSOLUTE RATINGS:

Parameter:	Type phosphor	Ef	Ec1	ed	Eb1	Eb2	Eb3
Unit:		V	V dc	v	V dc	V dc	V dc
Maximum:	ALL	6.9	0	550	1,100	2,200	4,400
Minimum:	1A, 1B 12	5.7 ---	-200 -200	--- ---	--- ---	1,500 1,500	1,500 1,500

Parameter:	Type phosphor	Light output	Rg	Zd	Ehk	Eb3/Eb2	Barometric pressure reduced
Unit:		fL (cd/m <sup>2</sup> )	Megohm	Megohm	V dc	Ratio	mmHg
Maximum:	ALL		1.5	1.0	-125	2:3	87
Minimum:	1A, 1B 12	15 (51.4)	--- ---	--- ---	--- ---	--- ---	--- ---

Parameter:	Type phosphor	Ef	Ec1	ed	Eb1	Eb2	Eb3
Test conditions:		V	V dc	v	V dc	V dc	V dc
	1A, 1B	6.3	Adjust	---	Focus	1,500	3,000
	12 note 7	6.3	Adjust	---	Focus	2,000	4,000

GENERAL:

Qualification - Required (note 1).

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TABLE I. Testing and inspection.

Inspection	Method	Type	Conditions	Acceptance level (see note 9)	Symbol	Limits Min	Limits Max	Unit
<u>Qualification inspection</u>								
Pressure (implosion)	1141	All		---	---	---	---	---
Barometric pressure, reduced	1002	All	see note 3	---	---	---	---	---
Vibration	5111	All		---	Width	---	1	mm
Direct-interelectrode capacitance	1331	All	G1 to all	---	Cg1	---	12	pF
		All	k to all	---	Ck	---	13.5	pF
		All	D1 to D2	---	C1D2	---	3.5	pF
		All	D3 to D4	---	C3D4	---	3.5	pF
		All	D1 to all	---	CD1	---	15	pF
		1A, 12	D3 to all	---	CD3	---	15	pF
		1B	D3 to all	---	CD3	---	13	pF
		All	D1 to all except D2	---	C	---	13	pF
		All	D2 to all except D1	---	C	---	13	pF
All	D3 to all except D4	---	C	---	13	pF		
All	D4 to all except D3	---	C	---	13	pF		
Neck and bulb alignment (electrostatic types)	5101	All		---	dia	---	2.25	in.
Cathode illumination	5216	All		---	---	---	---	---
Focusing voltage (zero bias)	5246	1A, 1B 12		---	Eb1	300	515	V dc
				---	Eb1	374	690	V dc
Deflection factor	5248	1A, 1B 12	1D2; Eb3 = Eb2 = 1,500 V dc	---	DF	47	63	V dc/in.
			1D2; Eb3 = Eb2 = 2,000 V dc	---	DF	58	88	V dc/in.
Deflection factor	5248	1A, 1B 12	3D4; Eb3 = Eb2 = 1,500 V dc	---	DF	41	55	V dc/in.
			3D4; Eb3 = Eb2 = 2,000 V dc	---	DF	51	77	V dc/in.
Deflection-factor uniformity	5248	all		---	---	---	---	---
<u>Conformance inspection, part 1</u>								
Electrode current (cathode)	5201	1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> ); Ib3 = 50 μA dc Ib3 = 60 μA dc see note 4	0.65	Ik	---	1,000	μA dc
		12		0.65	Ik	---	1,000	μA dc
Voltage breakdown	5201	All		0.65	---	---	---	---
Voltage breakdown (electrostatic types)	5201	All		0.65	---	---	---	---

See footnotes at end of table I.

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TABLE I. Testing and inspection - Continued.

Inspection	Method	Type	Conditions	Acceptance level (see note 9)	Symbol	Limits Min	Limits Max	Unit
<u>Conformance inspection, part 1 -continued</u>								
Gas "cross" (electrostatic deflection)	5206	1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> ), see note 2	0.65	---	---	---	---
		12	lb3 = 60 μA dc see note 2	0.65	---	---	---	---
Bulb, screen and faceplate blemishes	5106	All		0.65	---	---	---	---
Light output	5221	1A, 1B	see note 2	0.65	Light	15 (51.4)	---	fL (cd/m <sup>2</sup> )
Modulation	5223	1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> )	0.65	ΔEc	---	45	V dc
		12	lb3 = 60 μA dc see note 4	0.65	ΔEc	---	55	V dc
Spot position (electrostatic deflection)	5231	All		0.65	---	---	25	mm
Spot displacement (leakage)	5231	All		0.65	displ	---	10	mm
Grid-cutoff voltage	5241	1A, 1B		0.65	Ec1	-22.5	-71	V dc
		12		0.65	Ec1	-30	-95	V dc
Grid No. 1 leakage current	5251	All		0.65	---	---	---	---
Anode No. 2 leakage current	5251	All		0.65	---	---	---	---
<u>Conformance inspection, part 2</u>								
Secureness of base, cap, or insert	1101	All		---	---	---	---	---
Heater current	1301	All		---	If	540	660	mA
Electrode current (anode No. 1)	5201	1A, 1B	Ec1 = 0	---	lb1	-50	10	μA dc
		12	lb3 = 60 μA dc see note 4	---	lb1	-50	10	μA dc
Base alignment (electrostatic types)	5101	All	1D2; pin No. 5	---	---	---	---	---
Side terminal alignment (electrostatic types)	5101	All	1D2	---	---	---	---	---
Neck and base alignment (electrostatic types)	5101	All		---	---	---	---	---

See footnotes at end of table I.

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TABLE I. Testing and inspection - Continued.

Inspection	Method	Type	Conditions	Symbol	Limits Min	Limits Max	Unit
<u>Conformance inspection, part 2</u> <u>-continued</u>							
Angle between traces	5101	1A, 12		---	---	---	---
		1B		---	89.5	90.5	degrees
Stray light emission (conventional types)	5216	All	Eb2 = 2,200 V dc Eb3 = 4,400 V dc Ec1 = cutoff	---	---	---	---
Screen	5221	12		cbf	550	---	cb
				D0.1(E) -D0.3(E)	80	100	cb
Line width A (electrostatic deflection)	5226	1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> ) see note 5 Ib3 = 5 μA dc see notes 4 and 6	Width	---	0.75	mm
		12		Width	---	0.40	mm
Line width B (electrostatic deflection)	5226	1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> ) see note 6 Ib3 = 5μA dc see notes 4 and 7	Width	---	0.85	mm
		12		Width	---	0.45	mm
Focusing voltage at cutoff	5246	1A, 1B		Eb1	345	515	V dc
		12		Eb1	460	690	V dc
Deflection factor	5248	1A, 1B	1D2	DF	58	80	V dc/in.
		12	1D2	DF	77	106	V dc/in.
Deflection factor	5248	1A, 1B	3D4	DF	50	68	V dc/in.
		12	3D4	DF	66	90	V dc/in.
Heater-cathode leakage current	5251	All		---	---	---	---
<u>Conformance inspection, part 3</u>							
Life test provisions	---	All	Group C; Eb2 = 2,200 V dc t = 500 hours	---	---	---	---
		1A, 1B	Light = 15 fL (51.4 cd/m <sup>2</sup> ); Eb3 = 4,400 V dc	---	---	---	---
		12	Eb3 = 4,400 V dc Ib3 = 5 μA dc	---	---	---	---

See footnotes at end of table I.

TABLE I. Testing and inspection - Continued.

Inspection	Method	Type	Conditions	Symbol	Limits Min	Limits Max	Units	
<u>Conformance inspection, part 3 continued</u>								
Life test end points	---	1A, 1B	Line width A	Width	---	0.75	mm	
			Line width B	Width	---	0.85	mm	
			Modulation	$\Delta E_c$	---	45	V dc	
		12	lb3 = 60 $\mu$ A dc;	$\Delta E_c$	---	55	V dc	
			modulation					
			lb3 = 5 $\mu$ A dc;	Width	---	0.40	mm	
Line width A								
lb3 = 5 $\mu$ A dc;	Width	---	0.45	mm				
Line width B								

## NOTES:

- The construction of this gun shall be the zero lb1 type. The following information and materials are to be available with the four regular samples when application for qualification approval is made.
  - The electron gun drawing with significant dimensions.
  - A sample of the electron gun to be used in manufacture of tubes.
- This test to be performed at the conclusion of the holding period.
- The test is made with maximum voltage (Eg1 maximum negative voltage) applied to the base pins, and deflection electrodes if applicable, only; and pressure of 87 mmHg. Connections should be made in a manner that does not degrade the tubes electrical voltage breakdown characteristics. Satisfactory operation is the absence of arc-over and corona.
- P12 screen. The tube can be severely and permanently damaged if the current density on the screen is allowed to rise too high in static tests of this sort. For this reason the length of time during which the screen is bombarded should be kept as short as possible compatible with the readings of specified current limits.
- The deflecting plates shall be returned to anode No. 2 through a minimum of 2.5-megohm resistors. The light output shall be set at 15-ft lamberts (51.4 cd/m<sup>2</sup>). The high-frequency scanning shall be applied to the deflecting plates nearest to the screen and the amplitude shall be adjusted to give a length of approximately 90 percent of the maximum tube diameter. The low-frequency scanning amplitude shall be expanded to approximately 90 percent of the maximum tube diameter, in the direction perpendicular to the direction of high-frequency scanning. Readjustments may be made for best overall focus. The tubes shall be observed for deflection focusing, astigmatism, or spot ellipticity observable to the eye as evidenced by fuzziness due to the lack of sharpness of trace (usually around edges), bow-tying (irregular width of any single line when observed at different points), bowing of trace, other than that caused by curvature of bulb. Such defects shall not be excessive as determined by the government representative. This test for focus is to be made in addition to the line width measurements.
- The same conditions shall be set up as described in note 5, except that the connection of deflecting elements to the low- and high-frequency scanning supplies shall be interchanged and the amplitudes adjusted to 90 percent of the maximum tube diameter in both directions without any adjustments of focus. An examination for defocusing, astigmatism, or spot ellipticity shall be made as in note 6 and the defocusing, astigmatism, etc., shall not be excessive as determined by a Government representative.
- P12 screen. All tests except screen persistence and fluorescent brightness can be made at 50 percent duty cycle pulsing.
- Revision letters are not used to denote changes due to the extensiveness of the changes.
- This specification sheet uses accept on zero defect sampling plan in accordance with MIL-PRF-1, table III.



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Custodians:

Army - CR  
Navy - EC  
Air Force - 11  
DLA - CC

Preparing activity:

DLA - CC

(Project 5960-3674)

Review activities :

Army - AR, MI  
Navy - AS, CG, MC, OS  
Air Force - 19, 99