

INCH-POUND

MIL-PRF-1/1006E  
9 March 1998  
SUPERSEDING  
MIL-E-1/1006D  
3 January 1977

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, CATHODE RAY  
TYPE 4DP7

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: Square face, two gun, electrostatic deflection and focus.

DIMENSIONS AND PIN CONNECTIONS: See figure 1.

ABSOLUTE RATINGS:

Parameter:	Ef	Ec1	Eb1	Eb2	Eb3	ed	Rg	Zd	Ehk	Eb3/Eb2
Unit:	V	V dc	V dc	V dc <u>1/</u>	V dc	v	Meg	Meg <u>2/</u>	V dc	Ratio <u>3/</u>
Maximum	6.9	0	1,500	3,000	6,000	750	1.5	1.0	±180	2.0
Minimum	5.7	-200	----	1,000	2,000	----	----	----	----	2.0
Test <u>4/</u> Condition:	6.3	Adjust	Focus	2,000	4,000	----	----	----	----	2.0

- 1/ Accelerator power input (average) should be limited to 6 watts.
- 2/ It is recommended that the deflection electrode circuit resistance be approximately equal. Higher resistance values up to 5.0 megohms may be used for low-beam current operation.
- 3/ This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity, pattern distortion, and tracking accuracy.
- 4/ All tests except capacitance, vibration, and interaction factor shall be made on each unit separately. Each deflection plate shall be connected to A2 through a resistance of 1 megohm.

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GENERAL:

Qualification - Required.

TABLE I. Testing and inspection.

Inspection	Method	Conditions	Symbol	Limits		Unit
				Min	Max	
<u>Qualification inspection</u>						
Vibration	5111		---	---	1.0	mm
Cathode illumination <u>3/</u>	5216		---	---	0.154	mftL
Neck and bulb alignment (electrostatic types)	5101		---	---	3.2	Inch
Deflection-factor uniformity	5248		---	---	2.5	%
Direct-interelectrode <u>7/</u> capacitance	1331	g1 to all	Cg1	---	6.0	pF
		k to all	Ck	---	5.0	pF
		D1 to D2	C1D2	---	2.3	pF
		D3 to D4	C3D4	---	2.3	pF
		D1 to all	CD1	---	5.3	pF
		D2 to all	CD2	---	5.3	pF
		D3 to all	CD3	---	6.5	pF
		D4 to all	CD4	---	6.5	pF
Pressure (implosion)	1141		---	---	---	---
Interaction factor	5250		---	---	$5 \times 10^{-5}$	in/V
Base material insulating quality	1216		---	---	---	---
<u>Conformance inspection, part 1</u>						
Voltage breakdown	5201		---	---	---	---
Voltage breakdown (electrostatic types)	5201		---	---	---	---
Gas "cross" <u>10/</u>	5206	lb3 = 25 $\mu$ A dc	---	---	---	---
Screen and faceplate blemishes	5106		---	---	---	---
Modulation	5223	lb3 = 25 $\mu$ A dc	$\Delta$ Ec1	---	30	V dc
Spot position <u>5/</u> (electrostatic deflection)	5231		---	---	13	mm
Spot displacement (leakage)	5231		Displ	---	5	mm
Grid-cutoff voltage	5241		Ec1	-52	-87	V dc
Tracking error <u>8/ 9/</u>	---		---	---	0.043	Inch
Minimum useful scan <u>6/</u>	---		---	---	---	---
<u>Conformance inspection, part 2</u>						
Heater current	1301		If	540	660	mA dc
Electrode current (anode No. 1)	5201		lb1	-15	+5	$\mu$ A dc
Electrode current (cathode)	5201	lb3 = 25 $\mu$ A dc	lk		200	$\mu$ A dc

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method	Conditions	Symbol	Limits		Unit
				Min	Max	
<u>Conformance inspection, part 2 - Continued</u>						
Base alignment (electrostatic types)	5101	+1D2, pin No. 4	---	---	---	---
Side terminal alignment (electrostatic types)	5101	+1D2	---	---	---	---
Side terminal and base alignment (electrostatic types)	5101	Pin No. 4	---	---	---	---
Neck and base alignment (electrostatic types)	5101		---	---	---	---
Trace and bulb alignment <u>1/</u> (electrostatic types)	---		---	---	1	Degree
Angle between traces	5101		---	89.5	90.5	Degrees
Trace alignment <u>2/</u>	---		---	---	1	Degree
Trace curvature radius	---		Rad	40	---	Inches
Stray light emission	5216	Eb2 = 3,000 V dc; Eb3 = 6,000 V dc	---	---	---	---
Screens <u>4/</u>	5221		---	---	---	---
Line width "A" (electrostatic deflection)	5226	Ib3 = 25 $\mu$ A dc	Width	---	0.5	mm
Line width "B" (electrostatic deflection)	5226	Ib3 = 25 $\mu$ A dc	Width	---	0.6	mm
Focusing voltage at cutoff	5246		Eb1	---	550	V dc
Focusing voltage at modulation condition	5246		Eb1	350	---	V dc
Deflection factor	5248	1D2	DF	115	140	V dc/in.
Deflection factor	5248	3D4	DF	90	115	V dc/in.
Heater-cathode leakage current	5251		---	---	15	$\mu$ A dc
Grid No. 1 leakage current	5251		---	---	3	$\mu$ A dc
Anode No. 1 leakage current	5251		---	---	3	$\mu$ A dc
Anode No. 2 leakage current	5251		---	---	5	$\mu$ A dc
Secureness of base, cap, or insert	1101		---	---	---	---
Base pin solder depth	1111		---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method	Conditions	Symbol	Limits		Unit
				Min	Max	
<u>Conformance inspection, part 2 - Continued</u>						
Permanence of marking	1105		---	---	---	---
<u>Conformance inspection, part 3</u>						
Life test	----	Group C; t = 500 hours (min); Ib3 = 15 $\mu$ A dc; Eb2 = 3,000 V; Eb3 = 6,000 V; both guns operating	----	----	----	----
Life test end points:						
Modulation	5223	Ib3 = 20 $\mu$ A dc	$\Delta$ Ec1	----	30	V dc
Line width "A"	5226		Width	----	0.5	mm
Line width "B"	5226		Width	----	0.6	mm

- 1/ Alignment between any trace and the parallel edge of the faceplate shall not exceed the indicated value.
- 2/ The angle between corresponding traces of each gun shall not exceed the indicated value.
- 3/ The measurement shall be made with both filaments operating simultaneously.
- 4/ The raster size shall be 4.1 x 4.1 cm. The screen current shall be adjusted to 20  $\mu$ A dc. Add 48 cB to the reading to correct for the smaller raster area.
- 5/ With focused, undeflected spot and the tube shielded against external influences the spots will fall within a 13 mm square, the center of which coincides with the geometric center of the tube face and the sides of which are parallel to the traces produced by the various deflecting electrodes.
- 6/ The useful scan will be a 2.875 inches (73.03 mm) - inch square having rounded corners. The maximum radius of curvature of the rounded corners of the square screen area shall be 0.6 inch (15.24 mm).
- 7/ All other electrodes contained within the envelope are to be tied together.
- 8/ The measurement of tracking error shall be made as follows:  
  
The focused spots of both guns shall be moved by means of a common dc voltage along the 1D2 axis until the spot of gun A is at +.719 inch (+18.26 mm) from the geometric center of the tracking area. Then by means of a small correction voltage the spot of gun B shall be moved to the same distance. The spots then shall be moved by means of the common dc voltage in the opposite direction from the geometric center until the spot of the less sensitive gun reaches -.719 inch (-18.26 mm). The difference in deflection factor of the more sensitive gun is then compensated for by moving its spot back to -.719 inch (-18.26 mm) inch by means of a voltage divider. This entire procedure is to be duplicated along the 3D4 axis with a distance from the geometrical center of  $\pm .562$  inch ( $\pm 14.29$  mm). Then by means of the two common dc voltages the spots shall be tracked over the entire tracking area, a 2.875 inch (73.03 mm) (1D2) x 2.25 inches (57.15 mm) (3D4) rectangle, and the greatest distance between the spots shall not exceed the limit specified.
- 9/ The maximum distance along the vertical or horizontal axis shall not exceed the value specified.
- 10/ This test to be performed at the conclusion of the holding period.



MIL-PRF-1/1006E

Custodians:

Army - CR  
Navy - EC  
Air Force - 85

Review activities:

Army - CR4  
Navy - AS, CG, MC, OS,  
Air Force - 17, 99

Preparing activity:

DLA - CC

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