INCH-POUND

MIL-PRF-1/1400D
21 June 2011
SUPERSEDING
MIL-PRF-1/1400C(NAVY)
18 June 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, CATHODE RAY

TYPE 12ATP28

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: Electrostatic deflection and focus, three beams, with aluminized screen.

Outline: Figure 1.

ABSOLUTE-MAXIMUM RATINGS:

Parameter:	Ef	Ec1	Eb1	Ec2	Eb2	Eb3
Unit:	V	V dc	V dc	V dc	V dc	V dc
Maximum:	6.3 +10%	0	2,000	6,000	6,000	15,000
Minimum:	6.3 -10%	-200	---	---	---	---
Test conditions: 1/	6.3	Adj	Focus	5,000	Adj	10,000

ABSOLUTE-MAXIMUM RATINGS:

Parameter:	Ed	Rg	Zd	Ehk	Eb3/Eb2
Unit:	V	MegΩ	MegΩ	V dc	Ratio
Maximum:	1,250	1.5	1.0	+180	2.0
Minimum:	---	---	2/	-180	3/
Test conditions: 1/	---	---	1.0	---	2.0

See footnotes at end of table I.

GENERAL:

Qualification - Required

Container drop: Method 1136.

TABLE I. Testing and inspection.

Inspection	Method MIL-STD-1311	Conditions	Symbol	Limits		Unit
				Min	Max	
Qualification Inspection		14/				
Alignment, neck and bulb	5101	---	---	---	4.375	inch
Cathode illumination	5216	---	---	---	---	---
Deflection factor uniformity	5248	1D2	---	---	2	%
		3D4	---	---	2.5	%
Interaction factor	5250		---	---	$6x10^{-5}$	inch/V dc
Low temperature operation	1026	---	---	-65	---	°C
High temperature operation	1026		---	---	+85	°C
Direct interelectrode capacitances	1331	Cathode to all	C	---	7.0	pF
		Grid 1 to all	C	---	7.0	pF
		D1 to D2	C	---	5.0	pF
		D3 to D4	C	---	5.0	pF
		D1 to all	C	---	9.9	pF
		D2 to all	C	---	9.9	pF
		D3 to all	C	---	8.6	pF
		D4 to all	C	---	8.6	pF
Pressure	1141	---	---	---	---	---
Vibration	5111	---	Width	---	2	mm
Conformance inspection, part 1 13/						
Cathode current	5201	Ib3 = 5 μA dc	IK	---	500	μA dc
Voltage breakdown	5201	---	---	---	---	---
Gas	5206	Ib3 = 5 μA dc 12/	---	---	---	---
Alignment base	5101	+1D2, base key	---	---	±10	degrees
Alignment side terminal	5101	+1D2	---	---	±5	degrees
Alignment side terminal and base	5101	Base key	---	---	---	---
Angle between traces	5101	4/	---	---	1	degrees
		Guns A and B	---	89	91	degrees
		Gun C	---	88	92	degrees
Trace alignment	5010	5/	---	---	---	---
Stray emission	5216	Ec2 = 6,000 V dc; Eb2 = 6,000 V dc; Eb3 = 15,000 V dc	---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Conditions	Symbol	Limits		Unit
				Min	Max	
Conformance inspection, part 1 - Continued 13/						
Blemishes	5106	---	---	---	---	---
Modulation	5223	Ib3 = 5 μA dc	ΔEc1	15	30	V dc
Line width A	5226	Ib3 = 5 μA dc 6/	---	---	.013	inch
Line width B	5226	Ib3 = 5 μA dc 6/ 7/	---	---	.018	inch
Spot position	5231	8/	---	---	.438	inch
Spot displacement	5251	---	---	---	.2	inch
Grid cutoff voltage	5236	---	Ec1	-64	-86	V dc
Focusing voltage	5246	---	Eb1	---	1,725	V dc
Focusing voltage	5246	---	Eb1	1,275	---	V dc
Deflection factor	5248	1D2, Guns A and B 9/	DF	103	127	V dc/inch
Deflection factor	5248	3D4, Guns A and B	DF	81	99	V dc/inch
Deflection factor	5248	1D2, Gun C 9/	DF	103	127	V dc/inch
Deflection factor	5248	3D4, Gun C	DF	67	83	V dc/inch
Grid #1 leakage	5251	---	Ic1	---	3	μA dc
Accelerator	5251	---	Ic2	---	5	μA dc
Anode #2 leakage current	5251	---	Ib2	---	5	μA dc
Useful scan	---	10/	---	---	---	---
Pattern distortion	5103	11/	---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Conditions	Symbol	Limits		Unit
				Min	Max	
Conformance inspection, part 2						
Heater current	1301	---	If	1,620	1,980	mA
Electrode current (anode)	5201	Ec1 = 0	Ib1	-15	+10	μA dc
Alignment base and neck	5101	---	---	---	---	---
Light output	5221	Ib3 = 5 μA dc	---	25	---	fL
Heater-cathode leakage	5251	---	---	---	10	μA dc
Base, cap, and insert secureness	1101	---	---	---	---	---
Conformance inspection, part 3						
Life test	---	Group C; Ec2 = Eb2 = 6,000 V dc; Eb3 = 15,000 V dc; Ib3 = 5 μA dc;	---	---	---	---
Life-test end point (500 hours)	---	Ib3 = 5 μA dc; Modulation; Line width A Line width B	 ΔEc1 --- ---	 --- --- ---	 30 .0013 .0018	 V dc inch inch

1/ All tests except vibration and interaction factor shall be made on each unit separately.

2/ It is recommended that the deflection electrode circuit resistances be 1 MΩ or less and approximately equal; otherwise beam shift at high drives can be expected. Higher resistance values up to 5 MΩ 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 and pattern distortion.

4/ With the horizontal traces of guns A and B passing through the tube face center, and the horizontal trace of gun C passing through its undeflected spot point, all three traces shall be within 1 degree maximum angle.

5/ Corresponding horizontal traces of each unit shall be within 1 degree of each other.

6/ With focus (Eb1) and astigmatism (Eb2) voltages adjusted for the best center line width, line widths "A" and "B" shall be not greater than .013 inch (0.33 mm) and .018 inch (0.46 mm), respectively. The specified spot position for each gun shall be used to locate the points for line widths "A" and "B".

At no point within the specified scan area of any gun shall the line width exceed .080 inch (2.03 mm) with focus and astigmatism voltages adjusted for the best center line width.

At no point within the specified scan area of any gun shall the line width exceed .030 inch (0.76 mm) when compromise focus and astigmatism correction are used.

TABLE I. Testing and inspection - Continued.

7/ Line width "B" shall be measured at 1.6 inches (40.6 mm) from the undeflected spot position for guns A and B and at .8 inch (20.3 mm) for gun C. The test shall then be repeated for guns A and B with the roles of horizontal and vertical plates reversed so that measurements shall be made at 5 points for each gun; center, 1.6 inches (40.6 mm) to right and left of center, and 1.6 inches (40.6 mm) above and below center.

8/ Each spot shall fall within a circle of .438 inch (11.11 mm) radius, centered about the specified spot position (see figure 2.)

9/ The 1D2 deflection factor of each gun shall be within 5 percent of that of the other guns.

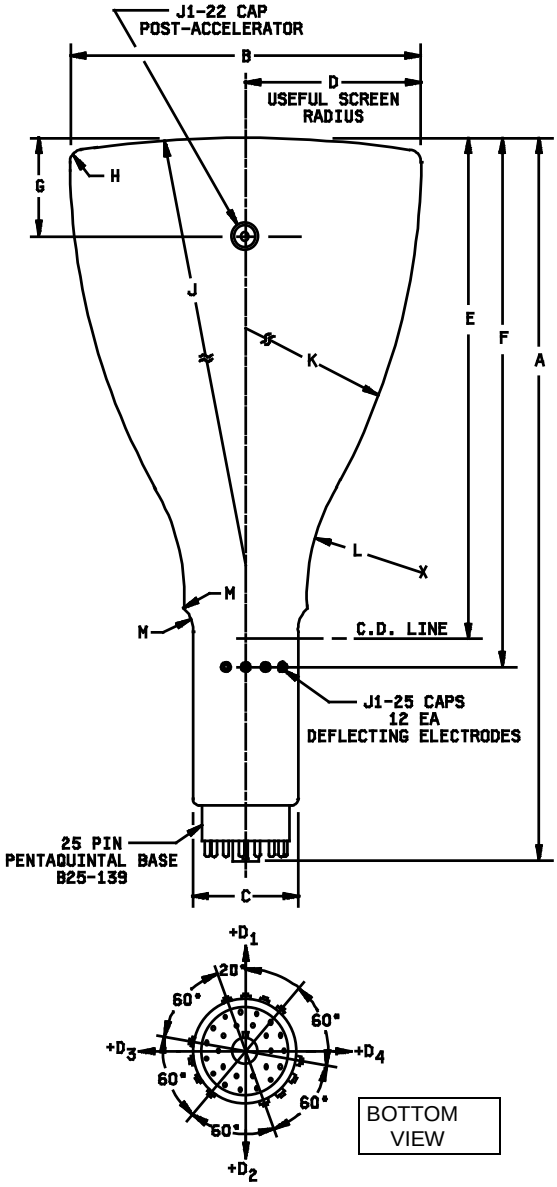
10/ The useful scan of each gun shall be as shown on figure 2.

11/ The trace from each gun, when deflected with a rectangular raster so that its widest points just touch the outside rectangle as shown on figure 3, shall fall entirely within the outside rectangle, but entirely outside the inscribed rectangle. Note that the horizontal trace from gun A, when passing through the tube face center, and when deflected to the full useful width, falls entirely within a rectangle 6.95 inches (176.5 mm) wide and .062 inch (1.57 mm) high.

12/ Test shall be performed at the conclusion of the holding period.

13/ Inspection shall be 100 percent.

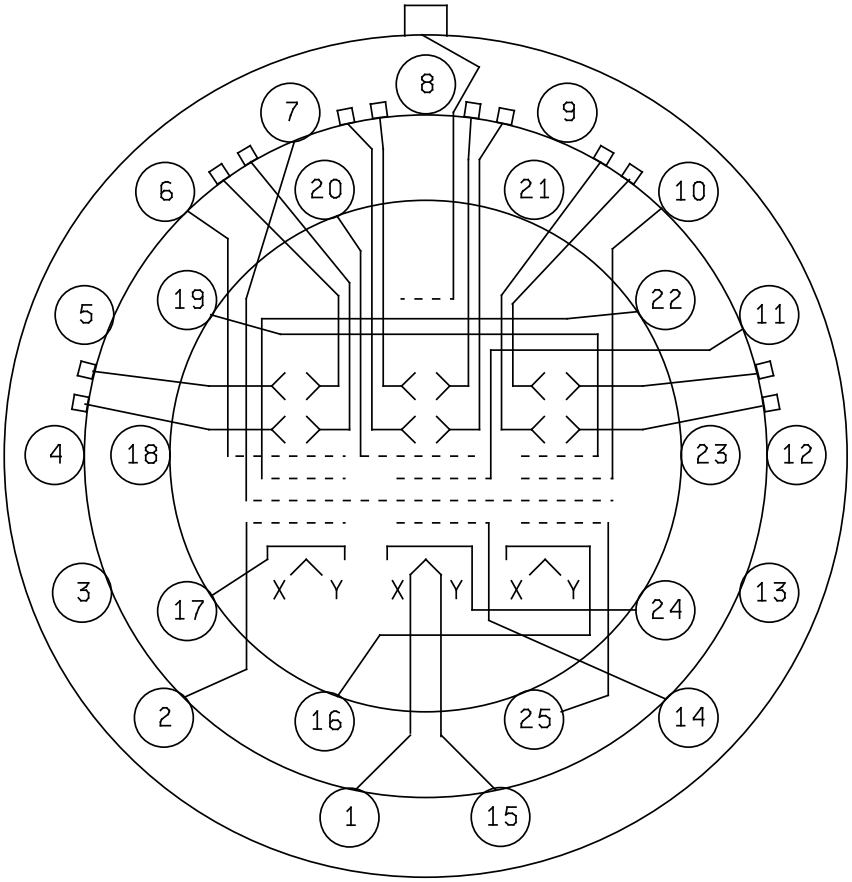
14/ This specification sheet uses accept on zero defect sampling plan in accordance with MIL-PRF-1, table III.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	25.25	26.00	641.4	660.4
B	12.38	12.50	314.5	317.5
C	---	3.75	---	95.3
D	5.5	---	139.7	---
E	17.38	18.13	441.5	460.5
F	18.5	19.0	469.9	482.6
G	3.25	3.75	82.6	95.3
H	.438 R		11.13 R	
J	40 R		1016 R	
K	24 R		610 R	
L	7.438 R		188.93 R	
M	1 R		25.4 R	

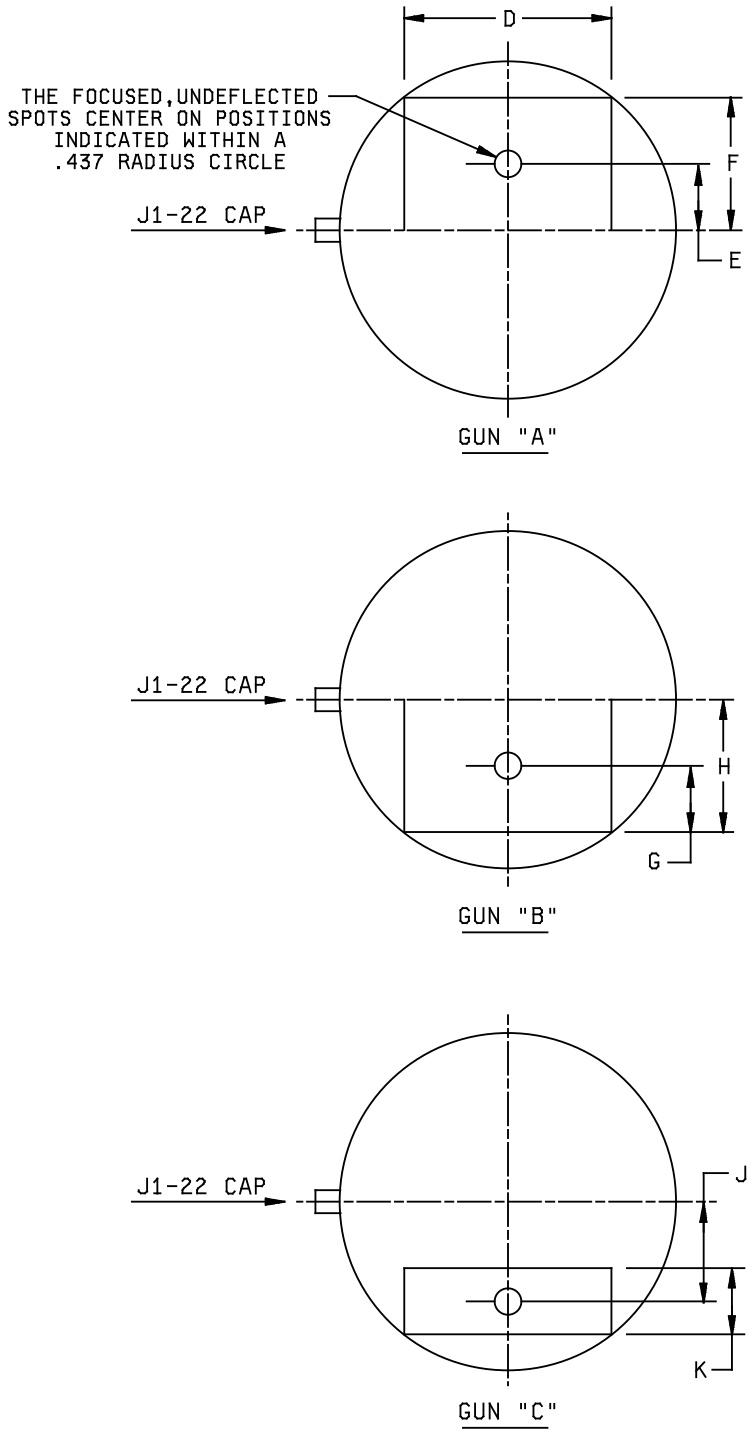
NOTES:
1. J1-22 cap aligns with ID2 trace ± 5°.
2. Unless otherwise specified, J1-25 caps 20° apart.
3. Base key aligns with ID2 trace ± 10°.

FIGURE 1. Outline dimensions of tube type 12ATP28.



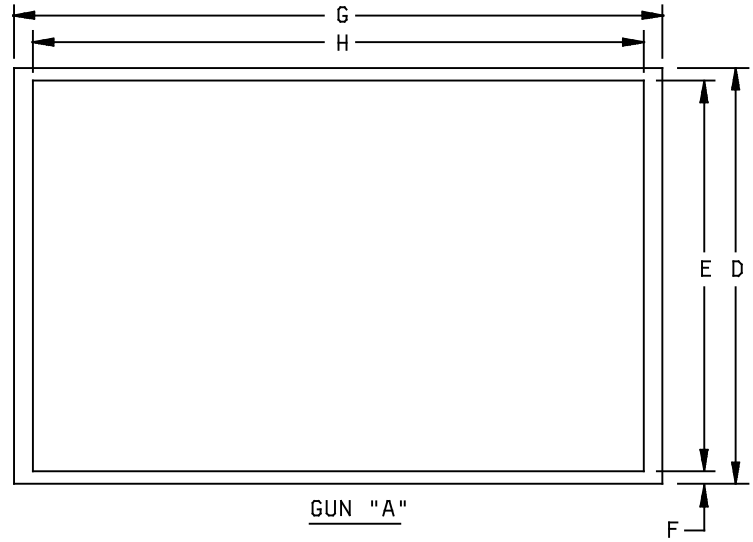
Element	PIN NUMBERS Unit A	Unit B	Unit C
Heater (common)	1	1	1
Heater (common)	15	15	15
Cathode	17	24	16
Focusing electrode	22	11	10
Accelerator (common)	7	7	7
Astigmatism adjustment electrode	6	20	19
Grid No. 1	2	14	25

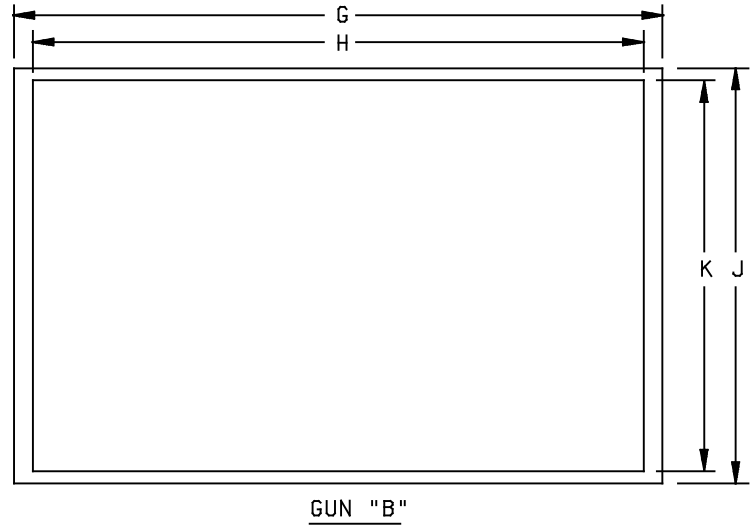
FIGURE 1. Outline dimensions of tube type 12ATP28 - Continued.

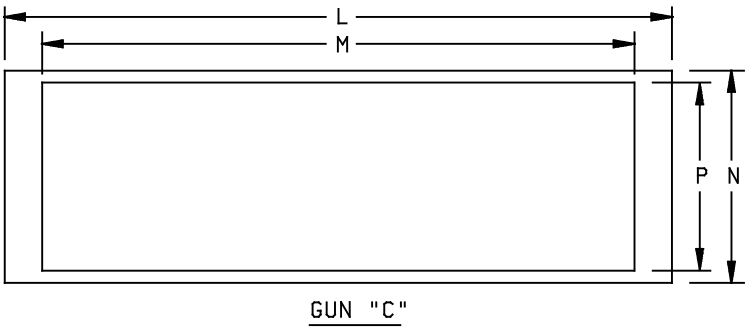


Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
D	6.70	6.80	170.2	172.7
E	2.11	2.21	53.6	56.1
F	4.26	4.36	108.2	110.7
G	2.11	2.21	53.6	56.1
H	4.26	4.36	108.2	110.7
J	3.20	3.30	81.3	83.8
K	2.10	2.20	53.3	55.9

FIGURE 2. Useful area of guns A, B, and C.







Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
D	4.36	4.46	110.7	113.3
E	4.16	4.26	105.7	108.2
F	---	.062	---	1.6
G	6.90	7.00	175.3	177.8
H	6.50	6.60	165.1	167.6
J	4.39	4.49	111.5	114.1
K	4.13	4.23	104.9	107.4
L	7.10	7.20	180.3	182.9
M	6.30	6.40	160.0	162.6
N	2.22	2.32	56.4	58.9
P	1.96	2.06	49.8	52.3

FIGURE 3. Pattern distortion diagram.

Referenced documents. In addition to MIL-PRF-1, this document references the following:
MIL-STD-1311

Custodian:
Navy - EC
DLA - CC

Preparing activity:
DLA - CC

Review activities:
Navy - AS, CG, MC, OS

(Project 5960-2009-018)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil/.