

INCH POUND

MIL-PRF-1/272E
26 June 1998
SUPERSEDING
MIL-E-1/272D
11 May 1976

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, CATHODE RAY
TYPES 2BP1 AND 2BP11

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.

DIMENSIONS AND PIN CONNECTIONS: See figure 1.

ABSOLUTE RATINGS:

| Parameter: | Type phosphor | Ef | Ec1 | ed | Eb1 | Eb2 | Light output | Rg | Zd | Ehk | Alt |
|------------------|---------------|-----|------|-----|-------|---------------|--------------|-----|-----|-------|--------|
| Unit: | | V | V dc | v | V dc | V dc | ftL | Meg | Meg | V dc | ft |
| Maximum: | P1, P11 | 6.9 | -200 | 550 | 1,100 | 2,750 | --- | 1.5 | 1.0 | ± 125 | 30,000 |
| Minimum: | P1 | 5.7 | 0 | --- | --- | 500 Note 2 | 4.0 | --- | --- | --- | --- |
| Minimum: | P11 | 5.7 | 0 | --- | --- | 1,100 | 2.25 | --- | --- | --- | --- |
| Test conditions: | P1, P11 | 6.3 | Adj | --- | Focus | 1,000 | --- | --- | --- | --- | --- |

GENERAL:

Qualification - Required (see Note 1 at end of Table I).

MIL-PRF-1/ 272E

TABLE I. Testing and inspection.

| Inspection | Method | Types | Notes | Conditions | Symbol | Limits Min | Limits Max | Unit |
|--|--------|-----------|-------|---|--------------|---------------|---------------|------|
| <u>Qualification inspection</u> | | | | | | | | |
| Vibration | 5111 | P1, P11 | --- | | Width | --- | 1.0 | mm |
| Barometric pressure, reduced | 1002 | P1, P11 | 6 | | --- | --- | --- | --- |
| Neck and bulb alignment (electrostatic types) | 5101 | P1, P11 | --- | | Diameter | --- | 1.63 | Inch |
| Cathode illumination | 5216 | P1, P11 | --- | | --- | --- | --- | --- |
| Focusing voltage at modulation condition | 5246 | P1, P11 | --- | | Eb1 | 150 | 280 | V dc |
| Deflection-factor uniformity | 5248 | P1, P11 | --- | | --- | --- | --- | --- |
| Direct-interelectrode capacitance | 1331 | P1, P11 | --- | g1 to all D1 to D2 D3 to D4 D1 to all D2 to all D3 to all D4 to all | Cg1 | --- | 11.0 | pF |
| | | | | | C1D2 | --- | 4.0 | pF |
| | | | | | C3D4 | --- | 4.0 | pF |
| | | | | | CD1 | --- | 15.0 | pF |
| | | | | | CD2 | --- | 11.0 | pF |
| | | | | | CD3 | --- | 10.0 | pF |
| | | | | | CD4 | --- | 11.0 | pF |
| Pressure (implosion) | 1141 | P1, P11 | --- | | --- | --- | --- | --- |
| Base material insulating quality | 1216 | P1, P11 | --- | | --- | --- | --- | --- |
| <u>Conformance inspection, part 1</u> | | | | | | | | |
| Voltage breakdown | 5201 | P1, P11 | --- | | --- | --- | --- | --- |
| Voltage breakdown (electrostatic types) | 5201 | P1, P11 | --- | | --- | --- | --- | --- |
| Gas "cross" | 5206 | P1 P11 | 7 | Light = 4.0 ftL Light = 2.25 ftL | --- | --- | --- | --- |
| | | | 7 | | --- | --- | --- | --- |
| Bulb, screen, and faceplate quality | 5106 | P1, P11 | --- | | --- | --- | --- | --- |
| Light output | 5221 | P1 P11 | 7 | | Light | 4.0 | --- | ftL |
| | | | 5, 7 | | Light | 2.25 | --- | ftL |
| Modulation | 5223 | P1 P11 | --- | Light = 4.0 ftL Light = 2.25 ftL | $\Delta Ec1$ | --- | 48 | V dc |
| | | | --- | | $\Delta Ec1$ | --- | 48 | V dc |
| Spot position (electrostatic deflection) | 5231 | P1, P11 | --- | | --- | --- | 10 | mm |
| Spot displacement (leakage) | 5231 | P1, P11 | --- | | Displ | --- | 6 | mm |
| Grid cutoff voltage | 5241 | P1, P11 | --- | | Ec1 | --- | -67.5 | V dc |

See notes at end of Table I.

TABLE I. Testing and inspection - Continued.

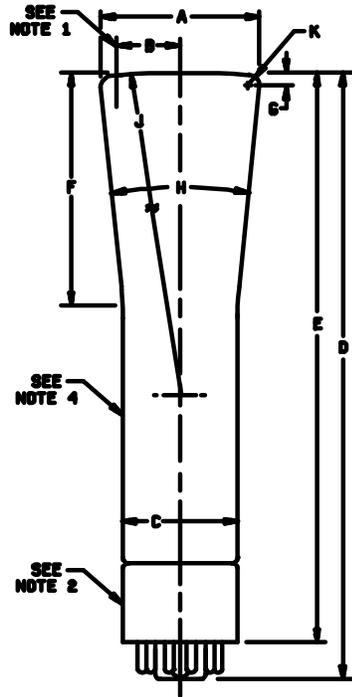
| Inspection | Method | Types | Notes | Conditions | Symbol | Limits Min | Limits Max | Unit |
|--|--------|---------|-------|------------------|--------|---------------|---------------|----------|
| <u>Conformance inspection, part 2</u> | | | | | | | | |
| Heater current | 1301 | P1, P11 | --- | | If | 540 | 660 | mA |
| Electrode current (anode No. 1) | 5201 | P1, P11 | --- | Ec1 = 0 | Ib1 | -15 | 10 | μA dc |
| Electrode current (cathode) | 5201 | P1 | --- | Light = 4.0 ftL | Ik | --- | 1,000 | μA dc |
| | | P11 | --- | Light = 2.25 ftL | Ik | --- | 1,000 | μA dc |
| Base alignment (electrostatic types) | 5101 | P1, P11 | --- | 3D4; pin No. 1 | --- | --- | --- | --- |
| Angle between traces | 5101 | P1, P11 | --- | | Angle | 87 | 93 | Degrees |
| Neck and base alignment (electrostatic types) | 5101 | P1, P11 | --- | | --- | --- | --- | --- |
| Stray light emission | 5216 | P1, P11 | --- | | --- | --- | --- | --- |
| Line width "A" (electrostatic types) | 5226 | P1 | 3 | Light = 4.0 ftL | Width | --- | 0.45 | mm |
| | | P11 | --- | Light = 2.25 ftL | Width | --- | 0.45 | mm |
| Line width "B" (electrostatic deflection) | 5226 | P1 | 4 | Light = 4.0 ftL | Width | --- | 0.45 | mm |
| | | P11 | 4 | Light = 2.25 ftL | Width | --- | 0.45 | mm |
| Focusing voltage | --- | P1 | --- | Light = 4.0 ftL | Eb1 | 150 | 280 | V dc |
| | | P11 | --- | Light = 2.25 ftL | Eb1 | 150 | 280 | V dc |
| Deflection factor (1D2) | 5248 | P1,P11 | --- | | DF | 115 | 155 | V dc/in. |
| Base pin solder depth | 1111 | P1, P11 | --- | | --- | --- | --- | --- |
| Deflection factor (3D4) | 5248 | P1, P11 | --- | | DF | 74 | 100 | V dc/in. |
| Heater-cathode leakage current | 5251 | P1, P11 | --- | | --- | --- | --- | --- |
| Grid No. 1 leakage current | 5251 | P1, P11 | --- | | --- | --- | --- | --- |
| Anode No. 2 leakage current | 5251 | P1, P11 | --- | | --- | --- | --- | --- |
| Secureness of base, cap, or insert | 1101 | P1, P11 | --- | | --- | --- | --- | --- |
| Permanence of marking | 1105 | P1, P11 | --- | | --- | --- | --- | --- |

See notes at end of Table I.

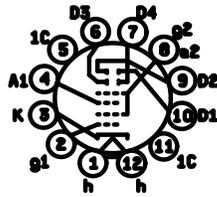
TABLE I. Testing and inspection - Continued.

| Inspection | Method | Types | Notes | Conditions | Symbol | Limits Min | Limits Max | Unit |
|---------------------------------------|--------|-------|-------|---|--------------|------------|------------|------|
| <u>Conformance inspection, part 3</u> | | | | | | | | |
| Life test | --- | P1 | --- | Group C; t = 500 hours (min); light = 4.0 ftL; Eb2 = 2,750 V dc | --- | --- | --- | --- |
| | | P11 | --- | Group C; t = 500 hours (min); light = 2.25 ftL; Eb2 = 2,750 V dc | --- | --- | --- | --- |
| Life-test end points: | --- | | | | | | | |
| Line width "A" | 5226 | P1 | --- | Light = 3.4 ftL | Width | --- | 0.45 | mm |
| Line width "B" | 5226 | P1 | --- | Light = 3.4 ftL | Width | --- | 0.45 | mm |
| Modulation | 5223 | P1 | --- | Light = 3.4 ftL | ΔE_c | --- | 48 | V dc |
| Life-test end points: | | | | | | | | |
| Line width "A" | 5226 | P11 | --- | Light = 2.25 ftL | Width | --- | 0.45 | mm |
| Line width "B" | 5226 | P11 | --- | Light = 2.25 ftL | Width | --- | 0.45 | mm |
| Modulation | 5223 | P11 | --- | Light = 2.25 ftL | ΔE_c | --- | 48 | V dc |

- The construction of this gun shall be of the zero Ib1 type. The following information and material are to be forwarded with the four regular samples when application for qualification approval is made:
 - 1 each gun drawings with significant dimensions.
 - 1 each sample of gun to be used in manufacture of tubes.
- This value is recommended only for low-velocity deflecting and low-ambient light levels.
- The deflecting plates shall be returned to anode No. 2 through a minimum of 2.5 m Ω resistors. Ib3, the beam current, shall be set at 50 μ A dc. The high-frequency scanning shall be applied to the deflecting plates nearest the screen and the amplitude shall be adjusted to give a line 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. Readjustment may be made for best overall focus. The tube shall be observed for deflection defocusing, astigmatism, or spot ellipticity observable to the eye as evidenced by fuzziness due to lack of sharpness of trace (usually around edges), bow-tying (irregular widths of any single line when observed at different points), bowing of trace other than that normally caused by curvature of bulb. 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 3 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 adjustment of focus from conditions in note 3. An examination for defocusing, astigmatism, or spot ellipticity shall be made as in note 3.
- As measured by a 2 x 2-inch (50.8 x 50.8 mm) raster using a type 3 photronic cell without eye correction, calibrated in footcandles of illumination from a light source having color temperature of 2,700°K.
- The test is made with maximum voltage (Egl maximum negative voltage) applied to the base pins, and deflection electrodes if applicable, only; and pressure of 30,000 feet (225 mmHg). Connections should be made in a manner that does not degrade the tube's electrical voltage breakdown characteristics. Satisfactory operation is the absence of arc-over and corona.
- This test to be performed at the conclusion of the holding period.



| Dimensions in inches with metric equivalents (mm) in parentheses | | |
|--|----------------|----------------|
| Ltr | Minimum | Maximum |
| Conformance inspection, part 2 | | |
| A | 1.938 (49.23) | 2.063 (52.40) |
| B | 0.875 (22.23) | |
| C | 1.312 (33.43) | 1.438 (36.53) |
| D | 7.438 (188.93) | 7.812 (198.42) |
| E | 6.938 (176.23) | 7.312 (185.72) |
| Reference dimensions (see note 3) | | |
| F | 3.062 (77.77) | |
| G | 0.225 (5.72) | |
| H | 12° 37' | |
| J | 8.00 R | |
| K | 0.188 (4.78) R | |



NOTES:

1. The minimum useful screen radius.
2. The base shall be a small shell duodecal 12 pin or small shell duodecal minus pins 5 and 11 (JEDEC B10-75).
3. Reference dimensions are for information only and are not required for inspection purposes.
4. The bulb shall be a J16A type. Either clear or filter glass may be used.

FIGURE 1. Outline drawing of electron tube types 2BP1, 2BP11.

MIL-PRF-1/272E

Custodians:

Army - CR
Navy - EC
Air Force - 85

Preparing activity :
DLA - CC

(Project 5960-3449)

Review activities :

Army - AR, MI
Navy - AS, CG, MC, OS
Air Force - 11, 17, 99