

INCH-POUND

MIL-PRF-1/1099H  
 16 June 2004  
 SUPERSEDING  
 MIL-PRF-1/1099G  
 18 July 1997

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON  
 TYPES 5948A, 5948B, AND 5948C

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:** Triode, hydrogen  
 See figures 1, 2, 3, and 4  
 Mounting position: Vertical, base down  
 Weight: 4.6 pounds (2.1 kg) nominal

**ABSOLUTE RATINGS:**

|                  |                   |                  |                  |                       |                   |                 |                       |                     |                     |
|------------------|-------------------|------------------|------------------|-----------------------|-------------------|-----------------|-----------------------|---------------------|---------------------|
| Parameter:       | Ef<br><u>V ac</u> | epy<br><u>kv</u> | epx<br><u>kv</u> | Ebb<br><u>Kv dc</u>   | Ip<br><u>A ac</u> | egy<br><u>v</u> | egx<br><u>v</u>       | Ecc<br><u>V dc</u>  | Ib<br><u>a</u>      |
| Maximum:         | 6.6               | 25.0 <u>1/</u>   | 25.0 <u>2/</u>   | ---                   | 30                | ---             | 650                   | ---                 | 1,000               |
| Minimum:         | 6.0               | 10.0             | 5% epy           | 5.0                   | ---               | <u>3/</u>       | ---                   | 0                   | ---                 |
| Test conditions: | 6.3               | 25.0             | ---              | ---                   | ---               | 550             | ---                   | 0                   | ---                 |
| Parameter:       | Ib<br><u>A dc</u> | pr               | tj<br><u>μs</u>  | pb                    | tk<br><u>sec</u>  | TA<br><u>°C</u> | dik/dt<br><u>a/μs</u> | Eres<br><u>V ac</u> | Ires<br><u>A ac</u> |
| Maximum:         | 1.0               | ---              | 0.005 <u>4/</u>  | 9.0 x 10 <sup>9</sup> | ---               | +75             | 5,000                 | 5.5 <u>5/</u>       | 8.0                 |
| Minimum:         | ---               | ---              | ---              | ---                   | 600               | -55             | ---                   | 2.5                 | ---                 |
| Test conditions: | ---               | 360              | ---              | ---                   | 600               | ---             | ---                   | <u>6/</u>           | ---                 |

- 1/ Instantaneous starting is not recommended. When it is absolutely necessary, however, the maximum permissible epy is 18.0 kv and shall not be attained in less than 0.04 seconds.
- 2/ The peak inverse voltage, exclusive of a spike of 0.05 μs maximum duration, shall not exceed 5 kv during the first 25 μs following the anode pulse.
- 3/ The driver pulse, measured at the tube socket with thyatron grid disconnected, shall be: egy = 700 volts minimum, 1,000 volts maximum; tr = 0.35 μs maximum; tp = 2.0 μs maximum; impedance of driver circuit 50 to 200 ohms.
- 4/ Rated time jitter of 0.005 μs applies at a peak forward voltage of 15.0 kv or greater. At peak forward anode voltages between 10 and 15 kv, the tube is rated at a time jitter of 0.01 μs.
- 5/ The optimum reservoir voltage for operation in accordance with operation (1) conditions is inscribed on the base of the tube and must be held to within ± 5 percent.
- 6/ Adjust reservoir voltage to value indicated on tube to within ± 5 percent.

**GENERAL:** Qualification - Required

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TABLE I. Group A inspection.

| Inspection                                    | MIL-STD-1311 Method | Conditions  | Acceptance level 9/ | Symbol | min  | Limits |      |
|---|---------------------|---|---------------------|--------|------|--------|------|
|   |                     |   |                     |        |      | max    | Unit |
| <u>Conformance inspection, part 1</u>         |                     |   |                     |        |      |        |      |
| Heater current                                | 3241                |   | 0.65                | lf     | 14.0 | 33.0   | Aac  |
| Heater current                                | 3241                | Eres = 4.5 Vac  | 0.65                | lres   | 3.0  | 6.0    | Aac  |
| DC anode voltage for conduction               | 3241                | Eres = inscribed value -5 percent   | 0.65                | Ebb    | ---- | 4000   | Vdc  |
| Instantaneous starting 1/ 4/                  | 3267                | epy = 180 kv(min); Eres = inscribed value +5 percent  | 0.65                | ----   | ---- | ----   |      |
| Operation (1) 1/                              | 3246                | epy = 27.5 kv; Eres = inscribed value -5 percent; t = 30 minutes  | 0.65                | egy    | ---- | 550    | v    |
| Operation (2) 5/ 6/                           | 3246                | epy = 15 kv; prr = 1,500; Eres = 95 percent of optimum value  | 0.65                | egy    | ---- | 550    | v    |
| Operation of optimum reservoir voltage (1)    | 3246                | Operation (1)   | 0.65                | Eres   | 2.5  | 5.5    | Vac  |
| Operation of optimum 6/ reservoir voltage (2) | 3246                | Operation (2)   | 0.65                | Eres   | 2.5  | 5.5    | Vac  |
| Pulse emission                                | 3251                | ik = 1,500 a; tp = 5.0 μs ±10 percent; prr = 60 ±10 percent; tr = 0.5 μs (max); Eres = inscribed value; starting time of current pulse = 2.5 μs | 0.65                | egk    | ---- | 400    | v    |
| <u>Conformance inspection, part 2</u>         |                     |   |                     |        |      |        |      |
| Operation (3)                                 | 3246                | Operation (1), except Eres = inscribed value +5 percent; tk = 900 sec; t = 1,200 sec  | ----                | egy    | ---- | 550    | v    |
| Operation (4)                                 | 3246                | Operation (2), except Eres = 105 percent; optimum value   | ----                | egy    | ---- | 550    | v    |
| Anode delay time                              | 3256                | Operation (1); t = 120 sec  | ----                | tad    | ---- | 1.0    | μs   |
| Anode delay time drift 7/                     | 3256                | Anode delay time  | ----                | -tad   | ---- | 0.25   | μs   |
| Time jitter 8/                                | 3261                | Operation (1); except epy = 12.5 kv   | ----                | tj     | ---- | 0.004  | μs   |
| <u>Conformance inspection, part 3</u>         |                     |   |                     |        |      |        |      |
| Life test (1) 1/                              | ----                | Group C; t = 96 hours "on" and 1 hour "off"; t = 500 hours  | ----                | ----   | ---- | ----   | ---- |

TABLE I. Group A inspection.

| Inspection                                       | MIL-STD-1311 Method | Conditions  | Acceptance level 9/ | Limits |         | Unit     |
|--|---------------------|---|---------------------|--------|---------|----------|
|  |                     |   |                     | Symbol | min max |          |
| <u>Conformance inspection, part 3 -Continued</u> |                     |   |                     |        |         |          |
| Life test (2) 6/                                 | ----                | Life test (1); operation (2)<br>Zg = 250 Ω; t = 500 hours | ----                | ----   | ----    | ----     |
| Life test (1) and (2) endpoints:                 |                     |   |                     |        |         |          |
| Operation (1)                                    | 3246                |   | ----                | egy    | ----    | v        |
| DC anode voltage for conduction                  | 3247                | egy = 500 v   | ----                | Ebb    | ----    | Vdc      |
| Time Jitter                                      | 3261                | egy = 500 v; Zg = 250 Ω                                   | ----                | tj     | ----    | 0.005 μs |
| Operation at elevated ambient temperature 1/ 2/  | 3246                | TA = 75°C; t = 5 hours                                    | ----                | egy    | ----    | 550 v    |
| Life test (3) 1/ 3/                              | ----                | t = 500 hours   | ----                | ----   | ----    | ----     |
| Life test (3) endpoints:                         |                     |   |                     |        |         |          |
| Operation (1)                                    | 3246                |   | ----                | egy    | ----    | 675 v    |
| DC anode voltage for conduction                  | 3247                |   | ----                | Ebb    | ----    | 4500 Vdc |
| Time Jitter                                      | 3261                | egy = 650 v   | ----                | tj     | ----    | 0.01 μs  |

- 1/ The circuit constants shall be chosen so that at epy = 25.0 kv under charging conditions: dik/dt = 5,000 a/μs minimum; ib = 1,000 a minimum; tp = 2.5 ± 0.25μs; prr = 500 minimum. The grid pulse characteristics shall be: tp = 2.0 μ maximum; tr = 0.35 μs minimum; internal impedance of driver = 250 ohms minimum.
- 2/ This test shall be conducted for a total of 5 consecutive hours with no more than three kickouts and with no evidence of anode heating. The tube shall be started at Eres = 105 percent of the inscribed value and operate at this value for 4 hours. At the start of the fifth hour and while the tube is still operating, the reservoir voltage shall be lowered to 95 percent of the inscribed value and remain there for the final 1 hour of operation.
- 3/ The life test shall be intermittent, with the tube operating approximately half the total elapsed time, and held without reservoir voltage or cathode-heater voltage approximately half the total time. The tube shall make a minimum of four starts during each 24-hour period. The life-test duration is measured in operating hours. Failure of the tube to operate following the minimum allowable cathode and reservoir heater warmup time constitutes failure of the test.
- 4/ The tube shall operate satisfactorily on push-button starting within three attempts when the anode voltage (epy) is applied to the tube under test in such a manner as to rise from 0 to 18 kv within 0.03 second. (The filter in the rectifier shall be designed so that the epy reaches at least 9 kv within 0.015 second.) Any tube failing to start within three attempts will be considered a failure.
- 5/ The anode circuit constants shall be so chosen that a resonant charging conditions; epy = 15 kv; ib = 500 a minimum; dik/dt = 5,000 a/μs minimum. Output pulse; tp = 1.3 μs ±10 percent; prr = 1,500 minimum; epx = 5.0 kv. Grid pulse the same as note 1. Adjust reservoir voltage to optimum value for these test conditions. The tube shall operate continuously for 20 minutes without continuous conduction.
- 6/ The optimum reservoir voltage for operation in accordance with operation (2) conditions shall be so determined that the tube shall operate at 95 to 105 percent of the established reservoir voltage for these conditions.
- 7/ This test shall be performed simultaneously with the operation (1) test. An anode delay time measurement shall be made at the end of 2 minutes, 4 minutes, and 30 minutes of the operation (1) test. The -tad measurement is the numerical difference between the 2-minute and 4-minute, or 2-minute and 30-minute anode delay time readings, whichever is greater.
- 8/ The tj shall be not greater than the amount specified after 120 seconds of anode operation.
- 9/ This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.

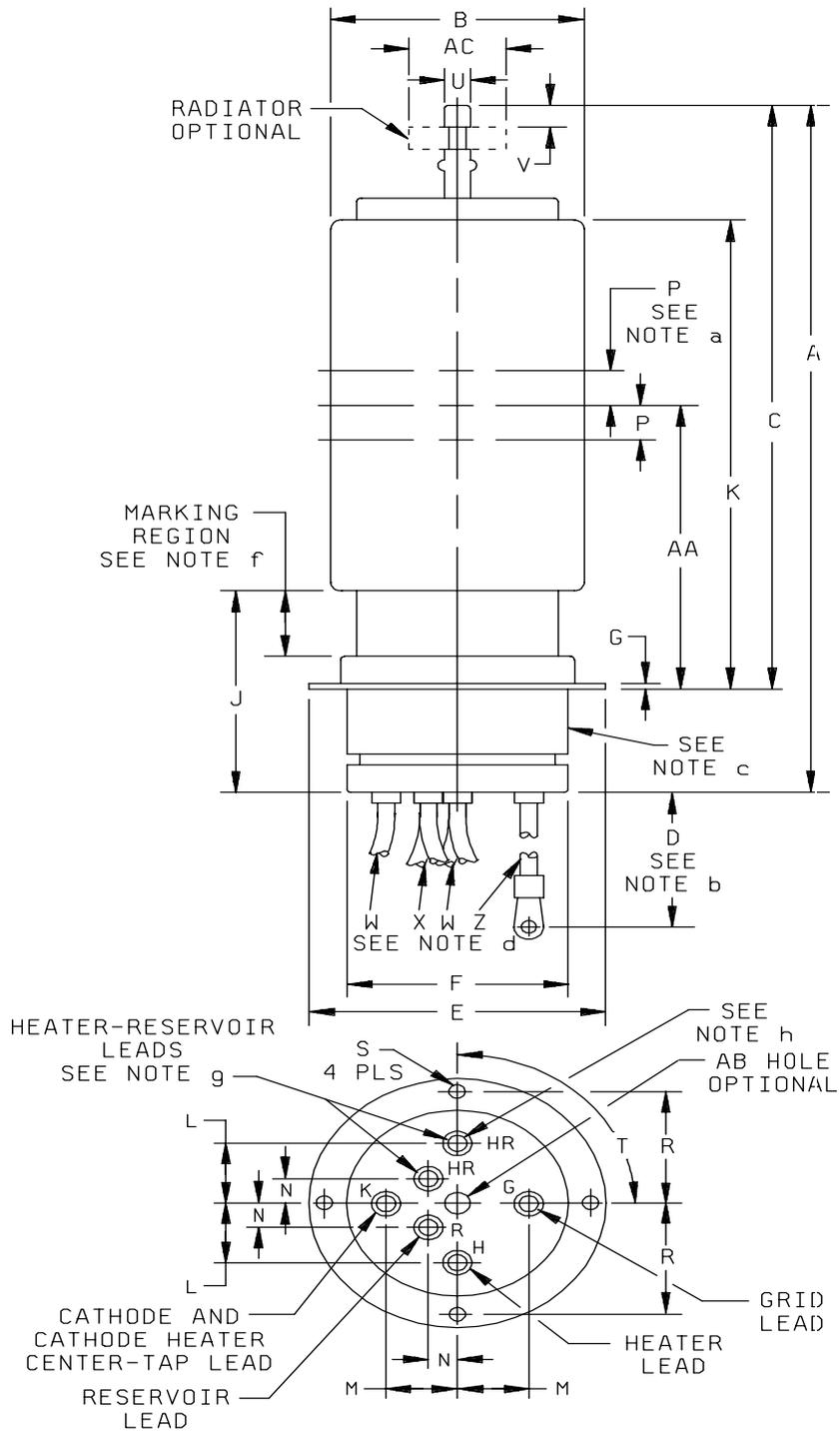


FIGURE 1. Outline drawing of electron tube type 5948A (glass version).

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| LTR                            | Dimensions            |        |             |        |
|--------------------------------|-----------------------|--------|-------------|--------|
|                                | Inches                |        | Millimeters |        |
| Conformance inspection, part 2 |                       |        |             |        |
|                                | Min                   | Max    | Min         | Max    |
| A                              | 15.250                | 16.250 | 387.35      | 412.75 |
| B                              | 4.875                 | 5.125  | 123.83      | 130.18 |
| C                              | 13.125                | 13.875 | 333.38      | 352.42 |
| F                              | 4.438                 | 4.562  | 112.73      | 115.87 |
| R                              | 2.662                 | 2.682  | 67.61       | 68.12  |
| T                              | 89.6°                 |        | 90.4°       |        |
| Conformance inspection, part 3 |                       |        |             |        |
| See note k                     |                       |        |             |        |
| D                              | 5.000                 | 6.000  | 127.00      | 152.40 |
| E                              | 5.938                 | 6.062  | 150.83      | 153.97 |
| J                              | 4.344                 | 4.656  | 110.34      | 118.26 |
| K                              | 9.938                 | 11.062 | 252.43      | 280.97 |
| L                              | 1.438                 | 1.562  | 36.53       | 39.67  |
| M                              | 1.312                 | 1.438  | 33.32       | 36.53  |
| N                              | 0.438                 | 0.562  | 11.13       | 14.27  |
| S                              | 0.309                 | 0.315  | 7.85        | 8.00   |
| U                              | 0.559                 | 0.573  | 14.20       | 14.55  |
| V                              | 0.500                 |        | 12.70       |        |
| AC                             | -----                 | 2.000  | -----       | 50.80  |
| P                              | -----                 | 1.000  | -----       | 25.40  |
| AA                             | -----                 | 6.500  | -----       | 175.10 |
| Reference dimensions           |                       |        |             |        |
| G                              | 0.094                 |        | 2.39        |        |
| AB                             | 0.500                 |        | 12.70       |        |
| W                              | 4,500 (circular mils) |        |             |        |
| X                              | 1,500 (circular mils) |        |             |        |
| Z                              | 2,000 (circular mils) |        |             |        |

NOTES:

- a. Dimension P designates the area to be used for clamping.
- b. Dimension D is measured from bottom of base insert to center of lead lug hole.
- c. Base, metal shell, with mounting flange and phenolic insert. Flange secured to base with rivets, or equivalent. Insert shall be low-loss phenolic wafer or laminated phenolic resin, permanently marked as follows: G (grid), H (heater), R (reservoir), HR (heater-reservoir), and K (cathode). All feed-through fittings shall be equipped with setscrews, or equivalent.
- d. Leads shall be flexible. Dimensions W, X, and Z apply to cross-sectional area. Lead identification insulation sleeving and lugs shall be as follows:

| Lead                        | Color                    | Sleeving          | Lugs (see note j) |
|-----------------------------|--------------------------|-------------------|-------------------|
| G (grid)                    | Green                    | H-A-1(see note e) | SAE-AS25036-108   |
| H (heater)                  | Yellow                   | H-A-1 or H-B-1    | SAE-A25036-157    |
| HR (heater) (see note g)    | Yellow with black sleeve | H-A-1 or H-B-1    | SAE-AS25036-157   |
| HR (reservoir) (see note g) | Red with yellow sleeve   | H-A-1 or H-B-1    | SAE-AS25036-108   |
| R (reservoir)               | Red                      | H-A-1 or H-B-1    | SAE-AS25036-108   |
| K (cathode)                 | Black                    | H-A-1 or H-B-1    | SAE-AS25036-157   |

- e. As specified in specification MIL-I-3190.
- f. Reservoir voltage shall be inscribed once above each mounting hole on base wall.
- g. Heater lead internally connected to reservoir lead.
- h. Cathode heater connection to this lead.
- j. Lugs shall be permanently identified with symbols as follows: G (grid), K (cathode), H (heater), R (reservoir), and HR (heater-reservoir).
- k. Holes S shall be inspected for orientation by using the base gage outlined in figure 4.

FIGURE 1. Outline drawing of electron tube type 5948A (glass version) - Continued.

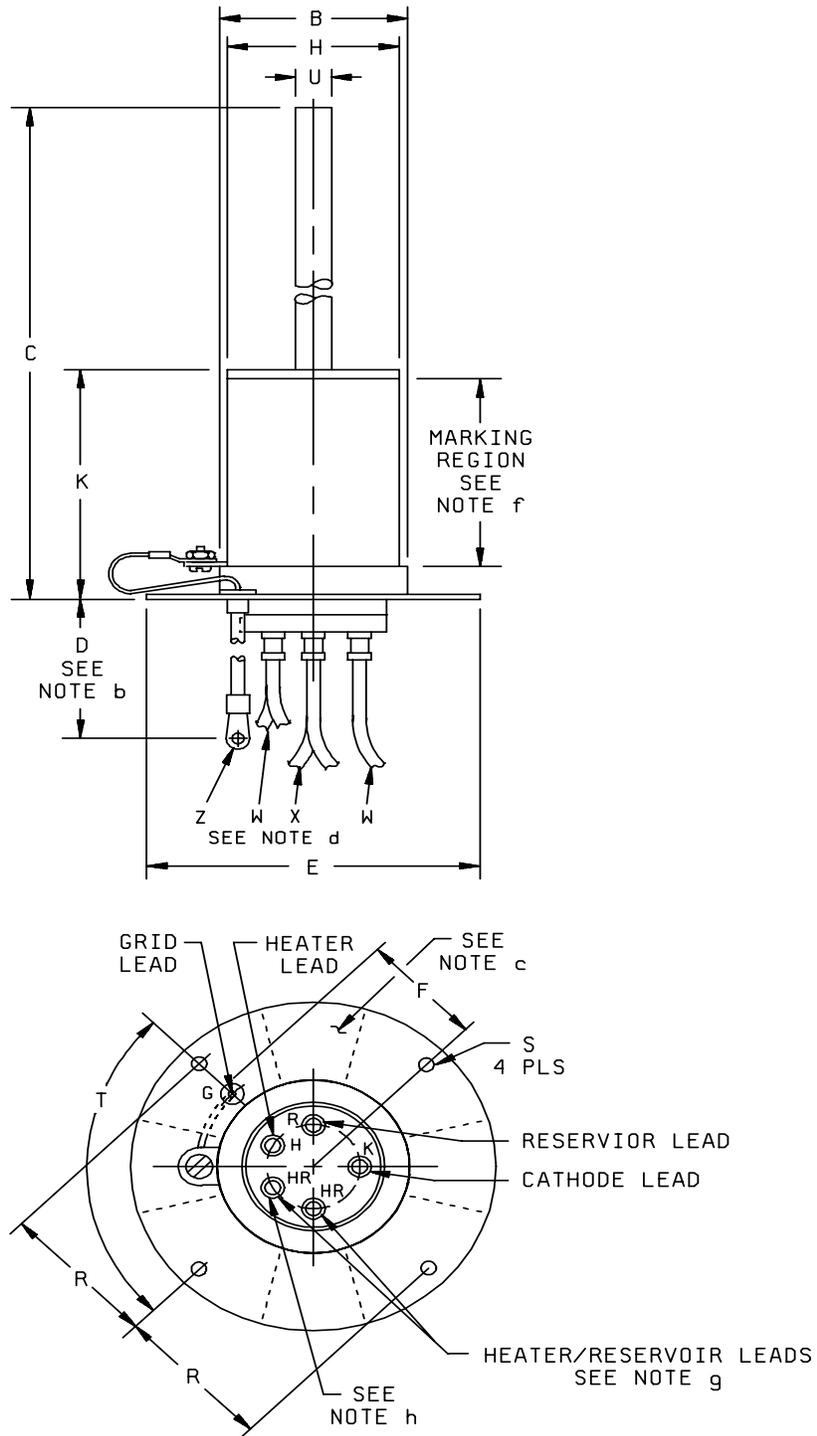


FIGURE 2. Outline drawing of electron tube type 5948B (ceramic version).

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| LTR                            | Dimensions            |        |             |        |
|--------------------------------|-----------------------|--------|-------------|--------|
|                                | Inches                |        | Millimeters |        |
| Conformance inspection, part 2 |                       |        |             |        |
|                                | Min                   | Max    | Min         | Max    |
| B                              | 3.125                 | 3.375  | 79.37       | 85.73  |
| C                              | 12.532                | 13.875 | 318.31      | 352.43 |
| F                              | -----                 | 2.281  | -----       | 57.94  |
| R                              | 2.662                 | 2.682  | 67.61       | 68.12  |
| T                              | 89.6°                 | 90.4°  | ----        | ----   |
| Conformance inspection, part 3 |                       |        |             |        |
| See note k                     |                       |        |             |        |
| D                              | 8.000                 | 9.000  | 203.20      | 228.60 |
| E                              | 5.938                 | 6.062  | 150.83      | 153.97 |
| H                              | 2.875                 | 3.125  | 73.03       | 79.38  |
| K                              | 3.925                 | 5.000  | 99.70       | 127.00 |
| S                              | 0.309                 | 0.315  | 7.85        | 8.00   |
| U                              | 0.552                 | 0.572  | 14.02       | 14.53  |
| Reference dimensions           |                       |        |             |        |
| W                              | 4,500 (circular mils) |        |             |        |
| X                              | 1,500 (circular mils) |        |             |        |
| Z                              | 2,000 (circular mils) |        |             |        |

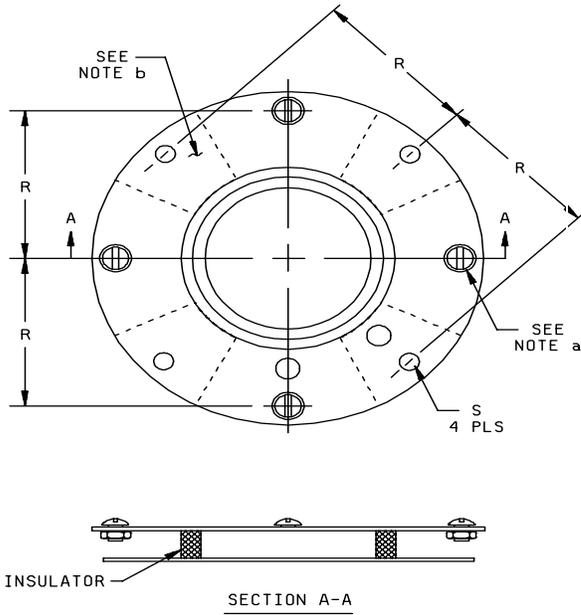
NOTES:

- a. A socket adapter (figure 3) is supplied with each thyratron for applications that required electrical isolation of the thyratron mounting flange from the cathode (K) lead.
- b. Dimension D is measured from bottom of flange to center of lead lug hole.
- c. Flange cutouts are optional.
- d. Leads shall be flexible. Leads shall be identified as follows:

| <u>Lead</u>                 | <u>Color</u>             | <u>Sleeving</u>   | <u>Lugs (see note i)</u> |
|-----------------------------|--------------------------|-------------------|--------------------------|
| G (grid)                    | Green                    | H-A-1(see note e) | SAE-AS25036-108          |
| H (heater)                  | Yellow                   | H-A-1 or H-B-1    | SAE-AS25036-157          |
| HR (heater) (see note g)    | Yellow with black sleeve | H-A-1 or H-B-1    | SAE-AS25036-157          |
| HR (reservoir) (see note g) | Red with yellow sleeve   | H-A-1 or H-B-1    | SAE-AS25036-108          |
| R (reservoir)               | Red                      | H-A-1 or H-B-1    | SAE-AS25036-108          |
| K (cathode)                 | Black                    | H-A-1 or H-B-1    | SAE-AS25036-157          |

- e. As specified in specification MIL-I-3190.
- f. Reservoir voltage shall be inscribed once above each mounting hole on base wall.
- g. Heater lead internally connected to reservoir lead.
- h. Cathode heater connection to this lead.
- j. Lugs shall be permanently identified with symbols as follows:  
G (grid), K (cathode), H (heater), R (reservoir), and HR (heater-reservoir).
- k. Holes S shall be inspected for orientation by using the base gage outlined in figure 4.

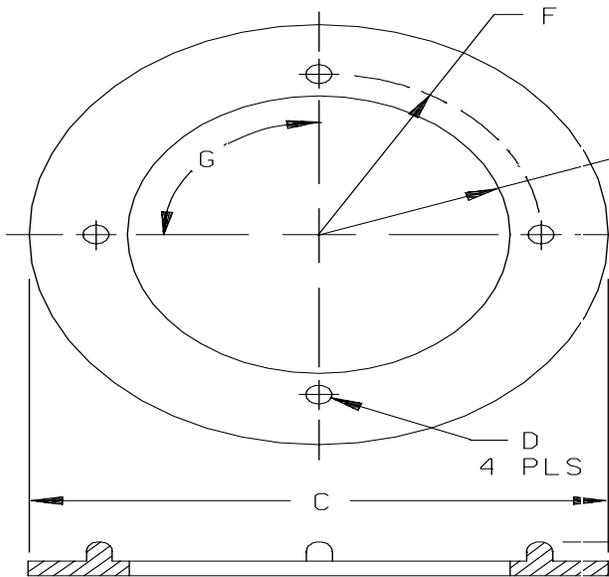
FIGURE 2. Outline drawing of electron tube type 5948B (ceramic version) - Continued.



| Ltr | Dimensions |       |             |       |
|-----|------------|-------|-------------|-------|
|     | Inches     |       | Millimeters |       |
|     | Min        | Max   | Min         | Max   |
| R   | 2.662      | 2.682 | 67.61       | 68.12 |
| S   | .309       | .315  | 7.85        | 8.00  |

NOTE:  
a. 10-32 X .250 truss head machine screws.  
b. Flange cutouts are optional.

FIGURE 3. Socket adapter.



| Ltr | Dimensions    |               |             |             |
|-----|---------------|---------------|-------------|-------------|
|     | Inches        |               | Millimeters |             |
|     | Min           | Max           | Min         | Max         |
| A   | .238          | .262          | 6.05        | 6.65        |
| B   | .296          | .328          | 7.52        | 8.33        |
| C   | 6.650         | 7.350         | 168.91      | 186.69      |
| D   | 0.2765<br>DIA | 0.2775<br>DIA | 7.02<br>DIA | 7.05<br>DIA |
| E   | 2.312 R       | 2.314 R       | 58.72 R     | 58.76 R     |
| F   | 2.671 R       | 2.673 R       | 67.84 R     | 67.89 R     |
| G   | 89.08°        | 90.02°        | -----       | -----       |

FIGURE 4. Base gage.

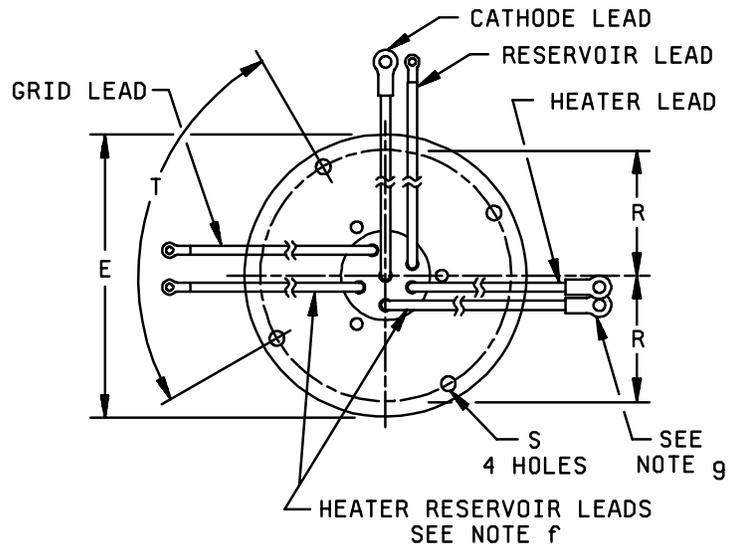
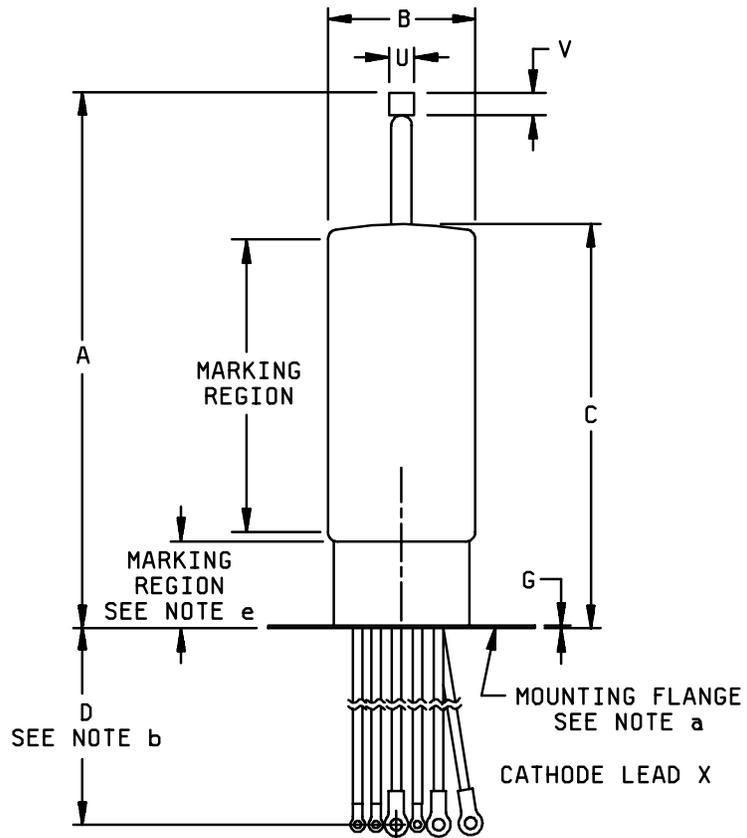


FIGURE 5. Outline drawing of electron tube type 5948C (alternate glass version).

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| Ltr   | Dimensions |        |                     |        |
|---|------------|--------|---------------------|--------|
|   | Inches     |        | Millimeters         |        |
|   | Min        | Max    | Min                 | Max    |
| Conformance inspection, part 2              |            |        |                     |        |
| A   | 11.530     | 12.281 | 292.87              | 311.93 |
| B   | ---        | 3.312  | ---                 | 84.12  |
| C   | 8.343      | 9.469  | 211.90              | 240.50 |
| R   | 2.662      | 2.682  | 67.61               | 68.12  |
| T   | 89°60'     | 90°40' | 89°60'              | 90°40' |
| Conformance inspection, part 3 (see note j) |            |        |                     |        |
| D   | 7.500      | 8.500  | 190.50              | 215.90 |
| E   | 5.938      | 6.062  | 150.83              | 153.97 |
| S   | .309       | .315   | 7.85                | 8.00   |
| U   | .559       | .573   | 14.20               | 14.55  |
| V   | .500       | ---    | 12.70               | ---    |
| Reference dimensions                        |            |        |                     |        |
| G   | .063       |        | 1.60                |        |
| W   | 14 AWG     |        | 2.5 mm <sup>2</sup> |        |
| X   | 10 AWG     |        | 6.0 mm <sup>2</sup> |        |

NOTES:

- a. Mounting flange is electrically isolated.
- b. Dimension D is measured from bottom of flange to center of lead lug hole.
- c. Leads shall be flexible. Leads shall be identified as follows:

| <u>Lead</u>                 | <u>Color</u>             | <u>Sleeving</u>    | <u>Reference dimension</u> | <u>Lug (see note h)</u> |
|-----------------------------|--------------------------|--------------------|----------------------------|-------------------------|
| G (grid)                    | Green                    | H-A-1 (see note d) | W                          | SAE-AS25036-108         |
| H (heater)                  | Yellow                   | H-A-1 or H-8-1     | W                          | SAE-AS25036-157         |
| HR (heater) (see note f)    | Yellow with black sleeve | H-A-1 or H-8-1     | W                          | SAE-AS25036-157         |
| HR (reservoir) (see note f) | Red with yellow sleeve   | H-A-1 or H-8-1     | W                          | SAE-AS25036-108         |
| R (reservoir)               | Red                      | H-A-1 or H-8-1     | W                          | SAE-AS25036-108         |
| K (cathode)                 | Black                    | H-A-1 or H-8-1     | X                          | SAE-AS25036-157         |

- d. As specified in MIL-I-3190.
- e. Reservoir voltage shall be inscribed once above each mounting hole on aluminum base shell.
- f. Heater lead HR internally connected to reservoir lead HR.
- g. Cathode heater connection to this lead.
- h. Lugs shall be permanently identified with symbols as follows:  
G (grid), K (cathode), H (heater), R (reservoir), and HR (heater-reservoir).
- i. Holes shall be inspected for orientation by using the base gauge outlined in figure 4.

FIGURE 5. Outline drawing of electron tube type 5948C (alternate glass version) - Continued.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet references MIL-STD-1311, MIL-I-3190 and SAE-AS25036.

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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