INCH-POUND

MIL-DTL-24251C
20 May 2003
SUPERSEDING
MIL-S-24251B
17 September 1979

DETAIL SPECIFICATION

SHIELDS, RETAINERS (BASES), AND ADAPTERS,
ELECTRON TUBE, HEAT DISSIPATING

GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for heat dissipating electron tube shields, associated retainer (bases), and adapters for use in electronic equipment (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

FEDERAL

WW-T-700/6	-	Tube, Aluminum Alloy, Drawn, Seamless, 6061.

DEPARTMENT OF DEFENSE

MIL-PRF-1	-	Electron Tubes, General Specification for.
MIL-C-5541	-	Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
MIL-A-8625	-	Anodic Coatings, for Aluminum and Aluminum Alloys.
MIL-DTL-12883	-	Sockets and Accessories for Plug-in Electronic Components, General Specification for.
MIL-DTL-13924	-	Coating, Oxide, Black, for Ferrous Metals.

(See supplement 1 for list of associated detail specifications and specification sheets.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC/VAT, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5960

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-130	-	Identification Marking of U.S. Military Property.
MIL-STD-202	-	Test Method Standard Electronic and Electrical Component Parts.
MIL-STD-889	-	Dissimilar Metals
MIL-STD-1285	-	Marking of Electrical and Electronic Parts.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Automation and Production Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

National Conference of Standards Labs (NCSL)

NCSL-Z540.1	-	Calibration Laboratories and Measuring and Test Equipment – General Requirements.

(Applications for copies should be addressed to the National Conference of Standards Labs (NCSL), 1800 30th Street, Suite 305B, Bolder, CO. 80301.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-B209	-	Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM-A342/A342M	-	Materials, Feebly Magnetic, Permeability of.

(Applications for copies should be addressed to the American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA-209	-	Electron Tubes.

(Applications for copies should be addressed to the Electronics Industries Alliance (EIA), 2500 Wilson Boulevard, Arlington, VA 22201-3834.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE-AMS-QQ-A-250	-	Aluminum and Aluminum Alloy, Plate and Sheet.
SAE-AMS-QQ-A-591	-	Aluminum Alloy Die Castings.
SAE-AMS-QQ-P-416	-	Plating, Cadmium (Electrodeposited).

(Applications for copies should be addressed to the Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, PA 15096.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications, specification sheets, or MS sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual part requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between requirements of this specification and the individual specification sheet, the latter shall govern.

3.2 Material. The material shall be as specified (see 3.1). When a definite material is not specified, a material shall be used which will enable the tube shields, retainers (bases), and adapters to meet the requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.2.1 Dissimilar metals. Where dissimilar metals are used in intimate contact with each other, protection against corrosion shall be provided. Dissimilar metals must be as recommended in MIL-STD-889.

3.3 Design, construction, and physical dimensions. The tube shields, retainers (bases), and adapters shall be of the design, construction, and physical dimensions specified (see 3.1). The design shields, retainers (bases), and adapters shall be such that they will mount to the chassis using the same hardware (including screws), as that of the applicable tube socket.

3.3.1 Finish. Unless otherwise specified (see 3.1), tube shields, retainers (bases), and adapters shall be treated with a black matte finish. That portion of the mating shield and retainer (base) or retainer (base) and chassis where low electrical resistance is required may be finished with other than black matte.

3.3.2 Liners. Shields shall be constructed in such a way that the liners are securely retained in position within the shield (see 3.5.3). Liners with circumferential corrugations or other configurations that could allow tube breakage and that do not permit spring action within the shield to allow for maximum tube diameter variations are not acceptable.

3.3.3 Installation and removal. Design of the shield shall be such that installation and removal of the shield from a seated electron tube shall not scratch or damage the electron tube envelope when tested as specified in 4.5.3.4. Unless otherwise specified, no tool shall be required for installation or removal of the shield from the tube or retainer (base) or adapter.

3.3.4 Spring retention. When used (see 3.1), the coil spring shall be securely retained within the shield. The free end of the spring, or the loop that makes contact with the electron tube envelope shall be at least seven-eighths of a complete turn and the spring tip shall not touch the tube envelope.

3.3.5 Retainer (base) and adapter. The retainer (base) and adapter design shall be such that it rigidly retains the tube shield during all tests and examination of this specification.

3.4 Permeability. All parts shall be made from materials that are classed as nonmagnetic. The permeability of the tube shield assembly shall be less than 2 (air = 1.0) (see 4.5.2).

3.5 Installation, locking and unlocking torque or load, and removal force.

3.5.1 Initial force. The installation, locking and unlocking torque or load, and removal forces necessary to install and remove the shield over the applicable slug (see figure 1) and retainer (base), and adapter shall be not greater than specified on the applicable specification sheet (see 3.1), when tested in accordance with 4.5.3.1.

3.5.2 Force at temperature extremes. The installation, locking and unlocking torque or load, and removal force shall be not greater than 150 percent nor less than 50 percent of the initial force when tested at 85°C ± 5°C and -55°C ± 5°C, in accordance with 4.5.3.2.

3.5.3 Fatigue. When tested in accordance with 4.5.3.3, the installation or removal force shall be not greater than 125 percent nor less than 50 percent of the initial force and the liner shall remain in position within the shield.

3.6 Vibration. When tested in accordance with 4.5.4, the shield shall not loosen from the retainer (base) or adapter. There shall be no evidence of damage to the shield, or retainer (base), and adapter, nor the glass envelope of the electron tube, during installation, during the test, or upon removal after the test.

3.7 Shock. When tested in accordance with 4.5.5, the shield shall not loosen from the retainer (base) or adapter as applicable, and there shall be no evidence of damage to the shield, tube socket, shield retainer (base), or the glass envelope of the electron tube.

3.8 Heat resistance. When shields, retainers (bases) and adapters are tested in accordance with 4.5.6, there shall be no peeling, blistering, chipping, or pitting of the finish.

3.9 Heat dissipation. The average reduction of a minimum of two surface temperature readings of the instrumented tube shall be not less than the value specified (see 3.1), when tested in accordance with 4.5.7.1.

3.10 Salt spray (corrosion). When shields, retainers (bases) and adapters are tested as specified in 4.5.8, there shall be no evidence of corrosion and the finish shall not peel, blister, chip, or pit.

3.11 Electrical contact. The dc resistance from the shield to the chassis shall be not greater than 1 ohm when tested in accordance with 4.5.9.

3.12 Marking. Each tube shield, retainer (base), or adapter shall be permanently and legibly marked in accordance with MIL-STD-130 with the following:

a. Military Part or Identifying Number (PIN).

b. Date and source code in accordance with MIL-STD-1285.

3.13 Workmanship. Shields and associated parts shall be processed in such a manner as to be uniform in quality and shall be free from pits, corrosion, cracks, rough edges, chips, spalls and other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Test equipment and inspection facilities. The contractor shall establish and maintain a calibration system in accordance with ANSI-Z540.1.

4.2 Classification of inspection. The inspection and testing of electron tube shields, retainers (bases), and adapters shall be classified as conformance inspection (see 4.4).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be made in accordance with the general requirements of MIL-STD-202.

4.4 Conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection.

4.4.1.1 Inspection lot. An inspection lot shall consist of tube shields, retainers (bases), or adapters of the same design and size, produced under essentially the same conditions and offered for inspection at one time.

4.4.1.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.4.1.3 Group A inspection. Group A inspection shall consist of the inspections specified in table I, in the order shown.

TABLE I. Group A inspection.

Examination	Requirements paragraph	Method paragraph
Visual and mechanical examination - - - - - - - - - - -	3.2 through 3.3.5 and 3.13	4.5.1

4.4.1.3.1 Sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis with a random sample of components selected in accordance with table II. The acceptance levels shall be based upon the zero defective sampling plan. No failures shall be permitted.

TABLE II. Group A sampling plan.

Lot size	Sample size
1 - 13	100 percent
14 - 150	13
151 - 280	20
281 - 500	29
501 - 1,200	34
1,201 - 3,200	42
3,201 - 10,000	50
10,001 - 35,000	60
35,001 - 150,000	74
150,001 - 500,000	90
500,001 and over	102

4.4.1.4 Group B inspection. Group B inspection shall consist of the inspections specified in table III, in the order shown, and the sample shall be selected from inspection lots that have passed group A inspection. NOTE: If the following group B tests have previously been performed by the tube shield manufacturer, and if the material, manufacturing process, and test requirements are the same as when these tests were initially performed, the subject test(s) need not be performed again.

TABLE III. Group B inspection.

Test	Requirement paragraph	Method paragraph
Heat resistance -	3.8	4.5.6
Heat dissipation -	3.9	4.5.7
Permeability -	3.4	4.5.2
Installation and removal - - - - - - - - - - - - - - - - - - -	3.4.3.3	4.5.3.4
Salt spray (corrosion) -	3.10	4.5.8
Electrical contact -	3.11	4.5.9
Installation, locking and unlocking torque or load, and removal force -	3.5	4.5.3
Initial force at 25°C -	3.5.1	4.5.3.1
Force at temperature extremes - - - - - - - - - - - - -	3.5.2	4.5.3.2
Fatigue -	3.5.3	4.5.3.3
Vibration -	3.6	4.5.4
Shock -	3.7	4.5.5

4.4.1.4.1 Sampling plan. Sample units shall be selected from tube shields, retainers (bases), or adapters that have passed group A inspection. Two sample units shall be selected and tested every 24 months. The period shall start the date the last test was satisfactorily completed on each of the individual units and run for 24 months.

4.4.1.4.2 Test routine. Group B inspection shall be performed at the start of production, and each 24-month period thereafter. If production of a particular shield, retainer (base), or adapter has been suspended for 24 months or more, group B inspection shall be again required at the time production is started. In such a case, inspection shall be performed on sample units selected from the first lot of the new production presented for acceptance, and after each subsequent 24-month period.

4.4.1.4.3 Acceptance criteria. No failures shall be permitted.

4.4.1.4.4 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on contract or order.

4.5 Method of examination and tests.

4.5.1 Visual and mechanical examination. Shields and associated parts shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements specified herein (see 3.2, 3.3, 3.12, and 3.13).

4.5.2 Permeability. The permeability of the tube shield assembly shall be measured with an indicator conforming to ASTM-A342 to determine conformance with 3.4.

4.5.3 Installation, locking and unlocking torque, or load and removal force.

4.5.3.1 Initial force at 25°C. The force necessary to place, lock, unlock, and remove the shield over the applicable slug and retainer (base) or adapter shall be measured at 25°C ± 5°C (see figure 1 and 3.5.1).

4.5.3.2 Force at temperature extremes (see 3.5.2). The slug shown on figure 1, the shield and retainer (base) or adapter shall be conditioned at 85°C ± 5°C for 2 hours after which the test of 4.5.3.1 (at this temperature extreme) shall be performed within 1 minute after opening the chamber. After completion of the 85°C test, the slug, shield, and retainer (base) or adapter shall then be conditioned at -55°C ± 5°C for 2 hours after which the test specified in 4.5.3.1 (at this temperature extreme) shall be repeated within 1 minute after opening the chamber.

4.5.3.3 Fatigue test. After the shield is properly installed and removed from the slug and applicable retainer (base) or adapter 100 times, the tests specified in 4.5.3.1 shall again be performed (see figure 1 and 3.5.3).

4.5.3.4 Installation and removal. The shield with all associated parts shall be installed and removed 25 times over a mounted tube or proper size (see table V). The electron tubes, liner, and coil springs (when used) shall be examined after the test for compliance with 3.3.2, 3.3.3, and 3.3.4.

4.5.4 Vibration (see 3.6). The shields and the retainer (base) or adapter (when applicable) shall be tested in accordance with method 204 of MIL-STD-202. The following details shall apply:

a. Mounting method: Normal mounting (with a tube in the socket).

b. Test condition: B.

c. Electrical load: None.

d. Measurements during and after vibration: None.

After the test, shields, retainers (bases), or adapters and electron tube glass envelopes shall be examined for evidence of damage or loosening from the base.

4.5.5 Shock (see 3.7). The shields and the retainer (base) or adapter (when used) shall be tested in accordance with method 213 of MIL-STD-202. The following details shall apply:

a. Mounting method: Normal mounting (with a tube in the socket).

b. Test condition: A.

c. Electrical load: None.

d. Measurements after shock: None.

After the test, the shields, retainers (bases), or adapters and electron tube glass envelopes shall be examined for evidence of damage or loosening from the base.

4.5.6 Heat resistance (see 3.8). The shields, retainers (base), or adapters shall be subjected to an ambient temperature of 200°C ± 5°C for 48 hours. The shields, retainers (base), or adapters shall then be conditioned for 1 hour at room ambient temperature (see 4.3). At the end of this 1-hour interval, the shields and associated parts shall be examined for evidence of damage to the body finish (peeling, blistering, chipping, or pitting).

4.5.7 Heat dissipation (see 3.9). An instrumented glass tube (see appendix A and figure 3) shall be used. The glass material and dimensions shall be identical to those of the envelope size for which the tube shield is designed (see table V). The instrumented tube shall be mounted vertically in the appropriate MIL-PRF-12883 socket, which is mounted with the proper retainer (base) or adapter (when applicable), on a heat sink which is maintained at a temperature of 25°C ± 5°C.

4.5.7.1 Envelope stabilization. These measurements shall be made in an ambient temperature of 25°C ± 5°C, and with no draft on the test setup. Temperature shall be measured with a bridge null detecting device with the tube mounted in the socket on a constant temperature (25°C ± 5°C) heat sink under a 1 x 1 x 1 foot plastic cover. The instrumented tube (see appendix A) shall be wired into the circuit shown on figure 2 with the heater voltage adjusted to the required nominal voltage. Plate voltage shall be as shown in table IV. The grid bias shall be adjusted to increase the plate current until both the total dissipation watts (within the range specified in table IV) and the bare bulb temperature (within the tolerance specified in table IV), are reached. The stabilized bulb temperature as indicated by the bulb thermocouple shall be recorded. The shield assembly shall be mounted on its base. The stabilized bulb temperature with the shield mounted shall again be recorded. The shield shall be rotated to at least two other different positions, except those shields which have only two rotatable positions, which shall be only one other position. Measurements shall be repeated for each increment of rotation. During the test, the heat sink and ambient temperatures for each separate shield test shall be recorded.

4.5.8 Salt spray (corrosion). Shields and associated parts shall be tested in accordance with method 101, test condition B, of MIL-STD-202. Upon completion of the test, the shields and associated parts shall be examined for evidence of corrosion or other defects as specified in 3.10.

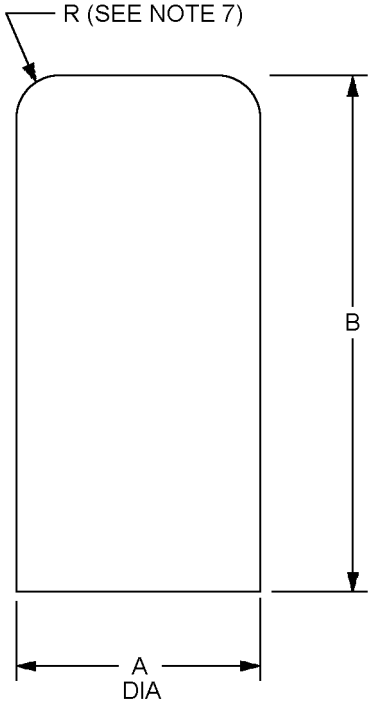
4.5.9 Electrical contact. The shield retainer (base), adapter, and socket shall be mounted to a bare metal chassis in the normal manner. An appropriate tube shall be mounted in the assembly. The protective coating may be removed from a point on the upper part of the shield so that good electrical contact may be made with the ohmmeter probe. The resistance shall be measured between shield and chassis using an ohmmeter having an accuracy of ±3 percent of indication or better (see 3.11).

TABLE IV. Instrument tube parameters.

Envelope size 1/	Tube type	Test circuit	Plate voltage Ep-dc volts maximum	Plate current dc milli-amps (max/plate)	Total dissipation (filament and plate) Nominal-watts ±10%	Bare bulb temperature (± 5°C)
T2x3 (flat bulb) - - - -	6029	7	135	---	1.14	100
T3 (round bulb, 8 pin)	5902	7	150	---	6.19	220
T3 (flat press, 7 pin-in-line) - - - - - - - - -	5702WB	7	150	---	2.67	145
T5-1/2 short - - - - - -	5654	1	130	---	3.1	115
T5-1/2 medium - - - -	6AN5WA	1	130	---	9.1	215
T5-1/2 long - - - - - - -	6005	2	250	---	12.9	240
T6-1/2 short - - - - - -	5670	3	250	---	4.8	130
T6-1/2 medium - - - -	5687WA	4	200	---	13.2	225
T6-1/2 long - - - - - - -	6216	5	200	---	18	230
T6-1/2 ex-long- - - - -	7189A	6	250	---	19.5	235
T9 - - - - - - - - - - - -	5Y3WGTA	8	2/	290	23.5	225
T11 - - - - - - - - - - - -	6L6WGB	7	300	---	33.1	250
T12 - - - - - - - - - - - -	5U4GB	8	2/	700	32.7	200
T14 - - - - - - - - - - - -	5R4WGB	8	2/	490	45.5	250
T16 - - - - - - - - - - - -	6336A	9	300	---	54.3	250

1/ Conforming EIA-209.

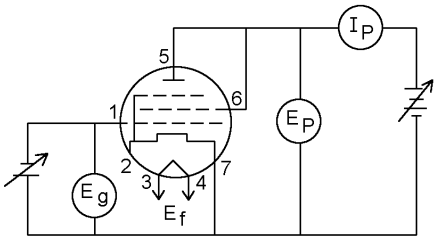
2/ Current limitation.



Tube outline	Inches		
	A ±.001 (0.03)	B ±.010 (0.25)	R ±.031 (0.79)
T3	.380 (9.65)	1.100 (27.94) 1.400 (35.56) 1.625 (41.28)	.080 (2.03)
T5 1/2	.730 (18.54)	1.125 (28.58) 1.500 (38.10) 2.000 (50.80)	.156 (3.96)
T6 1/2	.840 (21.34)	1.125 (28.58) 1.562 (39.67) 2.000 (50.80) 2.437 (61.90)	.281 (7.14)
T9	1.150 (29.21)	1.750 (44.45) 2.062 (52.37) 2.312 (58.72) 2.500 (63.50) 2.688 (68.28) 2.750 (69.85) 3.062 (77.77) 3.250 (82.55)	.400 (10.16)
T11	1.410 (35.81)	2.937 (74.60) 3.312 (84.12) 3.687 (93.65) 4.062 (103.17)	.470 (11.94)
T12	1.560 (39.62)	2.375 (60.33) 2.500 (63.50) 2.625 (66.68) 2.750 (69.85) 2.938 (74.63) 3.000 (76.20) 3.125 (79.38) 3.250 (82.55) 3.312 (84.12) 3.500 (88.90) 3.688 (93.68) 3.750 (95.25) 3.875 (98.43)	.500 (12.70)
T14	1.830 (46.48)	4.125 (104.78) 4.813 (122.20)	.590 (14.99)
T16	2.050 (52.07)	4.175 (106.05) 4.750 (120.65)	.650 (16.51)

NOTES:
1. Dimensions are in inches.
2. Millimeters are in parentheses.
3. Metric equivalents are given for general information only and are based upon 1.00 inch = 2.54 mm.
4. Material: Tool steel, hardened to 56-61C.
5. Finish: Hard chrome plate.
6. Mounting method optional (screw and pins).
7. Radius shall be blended smoothly into A diameter.

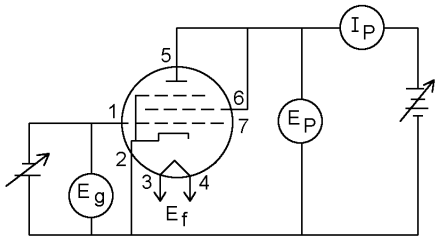
FIGURE 1. Test slugs for installation and removal force tests.



E_f = 6.3 VAC OR VDC

E_g = 0 – 35 VDC

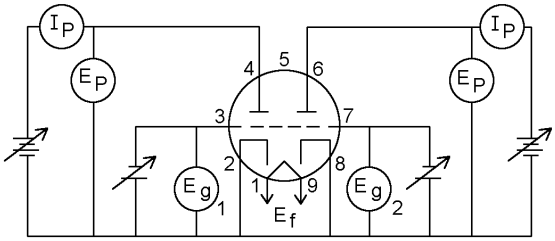
CIRCUIT 1 - FOR TUBE TYPE 5654 AND 6AN5WA



E_f = 6.3 VAC OR VDC

E_g = 0 – 35 VDC

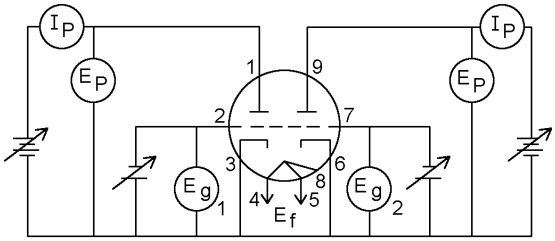
CIRCUIT 2 - FOR TUBE TYPE 6005



E_f = 6.3 VAC OR VDC

E_{g1}, E_{g2} = 0 – 35 VDC

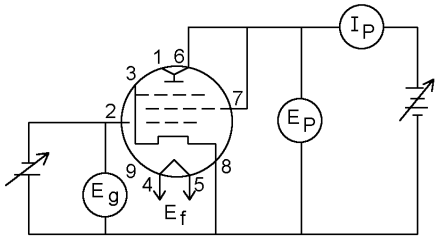
CIRCUIT 3 - FOR TUBE TYPE 5670



E_f = 6.3 VAC OR VDC

E_{g1}, E_{g2} = 0 – 35 VDC

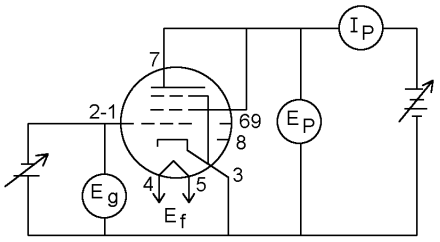
CIRCUIT 4 - FOR TUBE TYPE 5687WA



E_f = 6.3 VAC OR VDC

E_g = 0 – 35 VDC

CIRCUIT 5 - FOR TUBE TYPE 6216

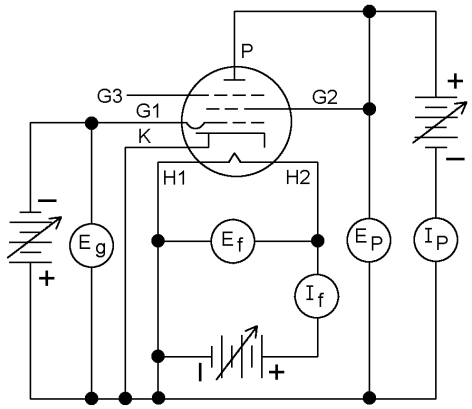


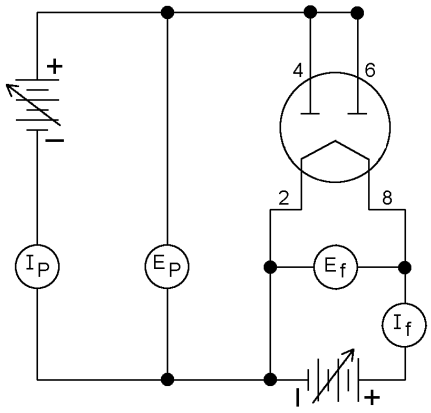
E_f = 6.3 VAC OR VDC

E_g = 0 – 35 VDC

CIRCUIT 6 - FOR TUBE TYPE 7189A

FIGURE 2. Test circuits.





E_f = 5.0 ±.5 VDC

CIRCUIT 8 – FOR TUBE TYPES 5Y3WGTA, 5U4GB AND 5R4WGB

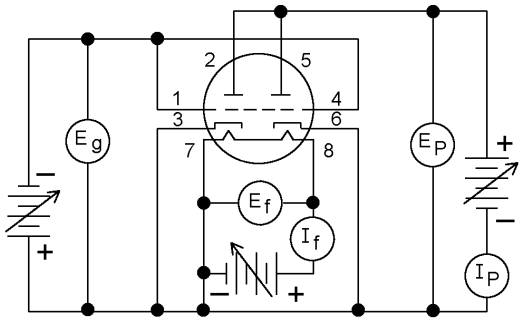
	ELEMENT								
TUBE	H1	H2	K	G1	G2	G3	P	——	E_f(VDC)
6L6WGB	2	7	8	5	4	I.C*	3	TUBE PIN NO.	6.3 ±.6
6029	2(–)	4(+)	–	3	–	–	1		1.25 ±.05
5902	3	6	2	1	7	I.C*	5		6.3 ±.3
5702WB	3	4	6	7	2	5	1		6.3 ±.6

E_g = 6L6WGB(–20VDC); 6029(–20VDC); 5902(–25VDC); 5702WD(– 15VDC)

NOTES:
1. OBSERVE POLARITY OF 6029 FILAMENT CONNECTIONS: H1(–); H2(+).
2. (*) I.C. MEANS ELEMENT INTERNALLY CONNECTED.
3. FOR TUBE 5702WB CONNECT G3 TO K DURING TEST (SEE 4.5.7.1)

CIRCUIT 7 – FOR TUBE TYPES 6L6WGB, 6029, 5902, AND 5702WB

GRID VOLTAGE SHALL BE INITIALLY SET AT MAXIMUM VALUE TO AVOID DAMAGE TO THE TUBE. AFTER REACHING MAXIMUM PLATE VOLTAGE, SLOWLY DE-CREASE GRID VOLTAGE UNTIL EITHER MAXIMUM TOTAL POWER, PLATE CURRENT OR BULB TEMPERATURE IS OBTAINED. CARE SHALL BE TAKEN TO PREVENT THE TUBE FROM OSCILLATING. IT MAY BE NECESSARY TO SHIELD THE PLATE AND GRID LEAD. IF THE TUBE OSCILLATES, ERRONEOUS READINGS MAY BE OBTAINED. BOTH HALVES OF DUAL TRIODE TUBES SHALL BE SET AT EQUAL POWER LEVELS.



E_f = 6.3 ±.6 VDC

E_g = – 200 VDC

CIRCUIT 9 – FOR TUBE TYPE 6336A

FIGURE 2. Test circuits - Continued.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Heat dissipating electron tube shields are used primarily for lowering the envelope operating temperature, but in addition, may be used to provide electrostatic shielding and retention under shock and vibration.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification.

b. Title, number, and date of the applicable specification sheet.

c. Complete military PIN.

d. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).

e. Packaging requirements (see 5.1).

6.3 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table V lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see Section 3).

Table V. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and compounds	Lead and compounds	Toluene
Carbon tetrachloride	Mercury and compounds	1,1,1 - Trichoroethane
Chloroform	Methyl ethyl ketone	Trichloroethylene
Chromium and compounds	Methyl isobutyl ketone	Xylenes
Cyanide and compounds	Nickel and compounds	

6.4 Subject term (key word) listing.

Bias
Fatigue
Glass envelope
Grid
Permeability
Plate
Salt spray
Shock
Thermocouple
Vibration
Watts

6.4 Cross index. Tube shields, retainers (bases), and adapters contained herein are cross-indexed to those formerly covered by MIL-S-19786, MIL-S-9372, and applicable military standards, as shown in table VI.

TABLE VI. Cross index of superseded types.

Shield	MIL-DTL-24251/ Retainer (base)	MIL-S-19786	MIL-S-9372
1-1		S0761AV01	
1-2	2-1	S0762AV01	
1-3		S0765AV01	
1-4		S0966AV02	
1-5	2-2	S0967AV02	
1-6		S0968AV02	
3-1		S0761AV01	
3-2		S0762BV01	
3-3		S0765BV01	
3-4		S0966AV02	
3-5		S0967BV02	
3-6		S0968BV02	
3-7			MS24230
	4-1		MS24231-1
	4-2		MS24231-2
5-1			MS24232-1
5-2			MS24232-2
5-3			MS24232-3
5-4			MS24232-4
5-5			MS24232-5
5-6			MS24232-6
6-1		S0761CV0D and SO761XV00	MS24233-1
6-2		S0762CV00 and S0762XV00	MS24233-2
6-3		S0765CV00 and S0765XV00	MS24233-3
6-4		S0966CV00 and S0966XV00	MS24233-4
6-5		S0967CV00 and S0966XV00	MS24233-5
6-6		S0968CV00 and S0968XV00	MS24233-6
6-7			MS24233-7
7-1			MS24270-1
7-2			MS24270-2
7-3			MS24270-3
7-4			MS24270-4
7-5			MS24270-5
7-6			MS24270-6
7-7			MS24270-7
7-8			MS24270-8
	8-1		MS24271-1
	8-2		MS24271-2
9-1			MS24272-1
9-2			MS24272-2
9-3			MS24272-3
9-4			MS24272-4
	10-1		MS24273-1

TABLE VI. Cross-index of superseded types - Continued.

Shield	MIL-DTL-24251/ Retainer (base)	MIL-S-19786	MIL-S-9372
11-1			MS24274-1
11-2			MS24274-2
11-3			MS24274-3
11-4			MS24274-4
11-5			MS24274-5
11-6			MS24274-6
11-7			MS24274-7
11-8			MS24274-8
12-1			MS24275-1
12-2			MS24275-2
12-3			MS24275-3
12-4			MS24275-4
12-5			MS24275-5
12-6			MS24275-6
12-7			MS24275-7
12-8			MS24275-8
12-9			MS24275-9
13-1			MS24276-1
13-2			MS24276-2
13-3			MS24276-3
13-4			MS24276-4
13-5			MS24276-5
13-6			MS24276-6
13-7			MS24276-7
13-8			MS24276-8
	14-1		MS24277-1
	14-2		MS24277-2
15-1			MS24278-1
16-1			MS24279-1
	17-1		MS24280-1

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

Review activities:
Army - AR
Navy - AS, CG, MC
Air Force - 99

Preparing activity:
DLA - CC

(Project 5960-3599)

APPENDIX A

INSTRUMENTED TUBES

10. SCOPE.

10.1 Scope. This appendix covers the instrumented tubes for use in the heat dissipation tests specified in 4.5.7. The tube type recommended to represent each bulb type was chosen for its high power dissipation. The tube types are listed in table IV. This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

10.2 Tube thermocouple instrumentation.

10.2.1 Locating hot spots. A temperature sensitive paint shall be applied to the tube envelope. The appropriate value paint shall be determined by trial and error to provide an accurate indication of the hot spot location when the tube is operated at or near its maximum power dissipation rating and the hot spot is located by visual observation.

10.2.2 Preparing the bulb. The tube envelope diameter shall be measured with a micrometer and recorded. The tube shall be prepared for grooving by masking the entire bulb with masking tape, leaving only a .062 inch (1.57 mm) ± .016 inch (0.41 mm) strip uncovered, running lengthwise along the bulb, and through the hot spot. The upper end of the bare strip shall stop .125 inch (3.18 mm) to .188 inch (4.78 mm) from the beginning of the curved shoulder at the top of the tube. The bare strip shall be allowed to run out at the bottom of the tube.

10.2.3 Etching the groove. A sand blaster with a .250 inch (6.35 mm) to .500 inch (12.70 mm) diameter nozzle may be used. The etching material may be No. 120 or 220 grit aluminum oxide powder. Air pressure may be 45 psi. The nozzle may be positioned 4-inches (101.6 mm) from the tube surface, so that the etching powder will impinge at right angles to the surface to be etched.

10.2.3.1 Etching technique. Approximately 25 to 50 passes may be required with the nozzle over the exposed glass. Each pass shall be extended beyond both ends of the tube envelope to prevent over etching at the ends of the groove. On the 6336A tube, it may be necessary to roughen (by sandblasting) a small surface area, delta in shape, at the lower end of the groove on the outside of the glass, to serve as a better anchor for the thermocouple and protective tube.

10.2.3.2 Depth of the groove. The depth of the groove shall be .010 inch (0.25 mm) + .003-inch (0.08 mm) - .001 inch (0.03 mm). Periodic measurements of groove depth shall be made, as the speed of etching will vary with the cleanliness, age, and moisture content of the etching material.

10.2.4 Thermocouple installation. The thermocouple used shall be a welded junction of 36 gauge iron and constantan wire. The thermocouple shall be laid into the groove with its junction on the hot spot of the tube, held down with a spring or other means and the leads running out of the lower end of the groove. The groove shall be filled with Sauereisen, Insalute #1 cement, or equivalent, and the cement allowed to dry at 100°C for 24 hours or 36 to 48 hours at room temperature. The excess shall then be scraped off to restore the original contour of the tube envelope.

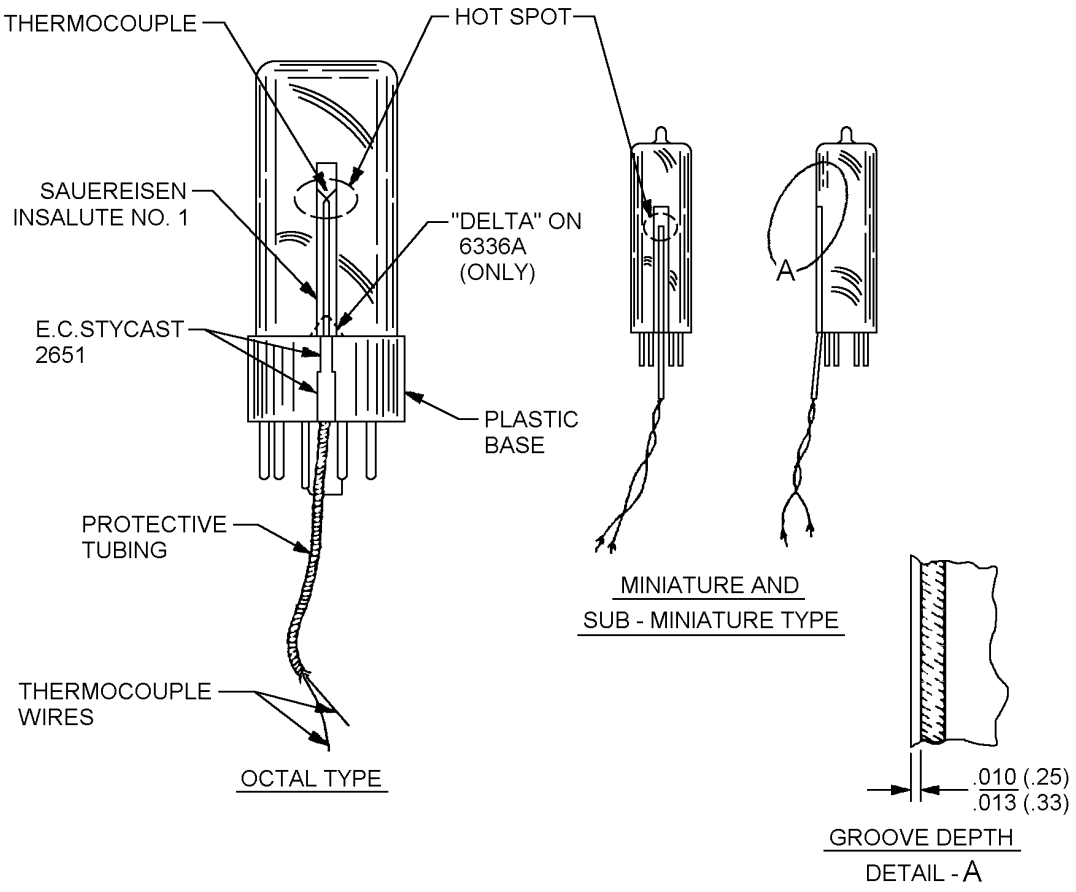


FIGURE 3. Instrumented tubes.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-24251	2. DOCUMENT DATE (YYMMDD) 030520

3. DOCUMENT TITLE
SHIELDS, RETAINERS (BASES), AND ADAPTERS, GENERAL SPECIFICATION FOR

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2)DSN (if applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY		
a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial 614-692-0510	(2) DSN 850-0510
c. ADDRESS (Include Zip Code)	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888	