

INCH-POUND

MIL-R-15109C(SH)

17 February 1989

SUPERSEDING

MIL-R-15109B(SHIPS)

8 August 1962

(See 6.9)

## MILITARY SPECIFICATION

## RESISTORS AND RHEOSTATS, NAVAL SHIPBOARD

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers Class III shockproof resistors and rheostats for Naval shipboard service.

1.2 Classification. Resistors and rheostats shall be of the following forms, as specified (see 6.2):

## Resistors:

Form EW - Exposed wire or ribbon  
 Form IW - Embedded wire or ribbon  
 Form G - Grids or strips  
 Form R - Ribbon

## Rheostats:

Form EW - Exposed wire or ribbon  
 Form P - Plate

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards 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).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

MILITARY

- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-R-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts): Packaging of.

STANDARDS

MILITARY

- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Non-Government publications. The following documents 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).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- B 117 - Standard Method of Salt Spray (Fog) Testing.  
(DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ICS 1 - General Standards for Industrial Control and Systems.  
(DoD adopted)

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street NW, Washington, DC 20037.)

UNIFORM CLASSIFICATION COMMITTEE AGENT

- Uniform Freight Classification Ratings, Rules and Regulations

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, 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 Qualification. Resistors and rheostats furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.4).

3.2 General requirements. Resistors and rheostats shall conform to MIL-E-917 and NEMA ICS 1 (see 6.3).

3.2.1 Tolerance. The total resistance of resistors and rheostats shall not differ from the design value by more than 10 percent. A variation of 20 percent will be permitted from the design values of any step or section.

3.2.2 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.3 Characteristics. Resistors and rheostats shall have the following characteristics, as specified (see 6.2).

3.3.1 Voltage. Resistors and rheostats shall be designed for a maximum circuit voltage of 150, 300 or 600 volts alternating current (ac) root mean square (rms) or direct current (dc) (see 6.2).

3.3.2 Mounting. Resistor assemblies and rheostats shall be constructed for bulkhead, deck, or switchboard mounting, as specified (see 6.2). Individual resistor units shall be furnished with mounting brackets, mounting bolts for single-end mounting, or without mounting hardware, as specified (see 6.2).

3.3.3 Duty. Unless otherwise specified (see 6.2), resistors and rheostats shall be constructed for continuous duty. If other duty, in the case of resistor applications, is required, NEMA ICS 1 standards for the specified duty shall apply (see 6.2).

3.3.4 Ambient temperature. Unless otherwise specified (see 6.2), resistors and rheostats shall be constructed for a 50 degrees Celsius ( $^{\circ}\text{C}$ ) ambient. Where the normal temperature of the surrounding atmosphere exceeds  $50^{\circ}\text{C}$ , the rating shall be based on the specified ambient (see 6.2).

3.3.5 Enclosures. Enclosures shall be open or dripproof, as specified (see 6.2). Enclosures shall be furnished for resistors only when specified (see 6.2). If not specified, dripproof enclosures shall be furnished for bulkhead mounted

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rheostats and open enclosures for switchboard mounted rheostats. Dripproof enclosures shall meet requirements of NEMA ICS 1 when inclined to any angle not greater than 45 degrees from the normal position and conform to the requirements of 3.5.4.

3.3.6 Temperature rise. Temperature rises shall not exceed the values specified in NEMA ICS 1.

3.4 Construction.

3.4.1 Internal connections. Connections which are embedded in resistors and rheostats shall be soldered, welded, or brazed. Low melting solders which would be adversely affected by the operating temperature of the resistor or rheostat shall not be used. Connections shall be mechanically secure and electrically continuous. External connections to the resistors or rheostat shall be so that the heat from the resistor will not adversely affect the connection.

3.4.2 Rheostats. Rheostats shall be constructed to ensure reliable operation under severe service. Springs shall not be stressed near or beyond their fatigue limits. Springs shall not carry current. Exposed metallic parts, other than terminals of plate type rheostats, shall be grounded. Two-terminal type rheostats shall be so connected internally that chatter under vibration or shock will not cause an open circuit. Rheostats shall be so arranged that speed, voltage, or other function being controlled is increased will clockwise rotation of the handwheel. Dual purpose rheostats shall increase speed with clockwise rotation and increase voltage with counter-clockwise rotation.

3.4.2.1 Brushes. The sliding brushes of plate type rheostats shall be easily renewable and so constructed as not to be blocked by slight projections on the fixed contact buttons.

3.4.2.2 Remote operation. When remote operation is required, a motor-driven operating mechanism shall be provided consisting of the motor, gearing, limit switches, necessary shafting, and connections. An emergency manual operating feature shall be provided.

3.4.2.3 Interpolating. When interpolating rheostats (see 6.5.5) are required to obtain the necessary fineness of control, the resistance of the interpolating plate shall be not less than the three steps of the main plate, having the highest ohmic value. The ohms per step shall not exceed 0.4 percent of the total resistance of the main plate.

3.4.2.4 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance and strength.

3.5 Operational requirements.

3.5.1 Life. Resistors and rheostats shall be capable of withstanding the required electrical and mechanical life tests without a resistance change in excess of 10 percent (see 4.6.8).

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3.5.1.1 Electrical life. Continuously rated resistors and rheostats shall withstand 100 cycles of operation at 125 percent of the continuous duty watt rating of the resistor or rheostat. Each cycle shall consist of 2 hours on and 2 hours off. Intermittently rated devices shall withstand 100 cycles of operation at 125 percent of the intermittent duty watt rating for the duty cycle specified.

3.5.1.2 Mechanical life. Rheostats, mechanically operated or motor driven, shall withstand 25,000 cycles of operation at rated load. Each operation shall cover at least 90 percent of the movement possible.

3.5.2 Salt-spray. Resistors and rheostats shall withstand exposure to salt spray (see 4.6.9). The change in resistance shall not exceed 25 percent.

3.5.3 Vibration. Resistors and rheostats shall withstand type I vibration tests of MIL-STD-167-1, without mechanical damage or malfunctioning (see 4.6.10).

3.5.4 Shock. Resistors and rheostats shall withstand the shock tests specified in MIL-S-901 (see 4.6.11).

3.5.5 Insulation resistance. Insulation resistance, after completion of the electrical life and vibration tests, shall be not less than 50 megohms for resistors and 5 megohms for rheostats.

3.6 Identification and information plates. Rheostats and resistors or rheostat assemblies shall be provided with an identification plate containing the manufacturer's name and catalog number, voltage, maximum and minimum amperes and ohms. Plates shall be brass or corrosion-resistant steel marked by etching, engraving, or stamping not less than 0.003 inch deep. Alternate methods of marking individual resistors shall be approved by the Command or agency concerned. Such marking shall contain the manufacturer's name or trademark, ohms, and watts.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.3).
- (b) Comparison inspection (see 4.4).
- (c) Quality conformance inspection (see 4.5).

4.3 Qualification inspection. Qualification inspection shall consist of the applicable examination and tests of table I. Inspection shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command (NAVSEA).

TABLE I. Qualification, comparison, and quality conformance inspections.

Description and order of tests	Qualification inspection	Comparison inspection	Quality conformance inspection	Requirement	Test method
Examination	X	X	X	3.2	4.6.1
Weight	X	X			4.6.2
Creepage and clearance	X	X			4.6.3
Resistance	X	X	X	3.2.1	4.6.4
General operation	X	X	X		4.6.5
Enclosures	X	X		3.3.5	4.6.6
Temperature rise	X	X		3.3.6	4.6.7
Life	X			3.5.1	4.6.8
Vibration	X			3.5.3	4.6.10
Insulation resistance	X	X		3.5.5	4.6.12
Dielectric	X	X	X		4.6.13
Shock	X	X		3.5.4	4.6.11
Salt spray	X			3.5.2	4.6.9

4.3.1 Number of samples. Three resistors or rheostats of each size and wattage shall be furnished. Minimum, median, and maximum resistance values shall be represented.

4.4 Comparison inspection. One year after qualification testing, and at 1-year intervals thereafter, one resistor and rheostat of each size and wattage shall be subjected to the comparison inspection specified in table I. In the event that qualification tests are made on preproduction units, the first comparison inspection shall be made on samples from the first production run. The tests are not required to be conducted on more than 1 out of 50 resistors or rheostats of a given design manufactured over a period of 3 years.

4.5 Quality conformance inspection. Each resistor and rheostat shall be subjected to the quality conformance inspection specified in table I. If this inspection reveals variations beyond normal manufacturing tolerances, the Government may require that any portion, or all of the comparison inspections be repeated to demonstrate conformance with this specification.

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4.6 Test methods.

4.6.1 Examination. Each resistor or rheostat shall be subjected to examination to ascertain that the fit, materials and workmanship conform to this specification.

4.6.2 Weight. The weight of the equipment shall be taken and recorded. The weight shall not differ from the design value by more than 10 percent.

4.6.3 Creepage and clearance distances. Creepage and clearance distances shall be demonstrated by actual measurement to be in accordance with MIL-E-917.

4.6.4 Resistance. The overall resistance of resistors and rheostats shall be measured to determine that they are within plus or minus 10 percent of the design values. The temperature at which resistance readings are taken shall be recorded.

4.6.5 General operation. General operation shall include any tests necessary to ascertain that the required operating requirements have been met.

4.6.6 Enclosures. No tests are required. Drip-proof enclosures shall be given an examination to determine that falling moisture or dirt will not interfere with the mechanical or electrical operation of the equipment enclosed when inclined to any angle not exceeding 45 degrees from the vertical.

4.6.7 Temperature rise. The test methods to be employed and the precautions to be observed in conducting temperature rise tests shall be in accordance with NEMA ICS 1 and the following:

4.6.7.1 General. Temperature rise tests shall be made under conditions equivalent to normal operating conditions at rated voltage, frequency load, and the duty specified to determine that the rises specified in 3.3.6 are not exceeded.

4.6.7.2 Ambient temperature. Resistors and rheostats shall be tested at any convenient room temperature above 10°C, but whatever the value of this ambient temperature, the maximum permissible temperature rises specified herein shall not be exceeded.

4.6.7.3 Ambient measurement. The ambient temperature shall be measured by means of two or more thermometers placed at different points around and on a level with the resistor or rheostat and at a distance of 3 to 6 feet therefrom. The thermometers shall be inserted in oil filled cups not less than 1 inch in external diameter and 2 inches high, and shall be protected from drafts and from heat radiation from the item under test or from outside sources. The value to be adopted for the room temperature during the test shall be the mean of the readings of the several thermometers, placed as stated, taken at four equal intervals of time during the last quarter of the duration of the test. The resistor or rheostat under test shall be protected from drafts and from heat radiation from outside sources.

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4.6.7.4 Ambient variations. A variation of more than 10°C, during a period of 6 hours, or a proportional change for runs of shorter duration, shall not be permitted. If the ambient variations are excessive or if the ambient changes rapidly at the end, the test shall be repeated.

4.6.7.5 Starting temperature. Temperature rise tests shall not be started if the ambient differs more than 5°C from the ambient where the equipment has stood during the preceding 2 hours.

4.6.8 Life. Life tests shall be as specified in 3.5.1. The resistance of the resistor or rheostat shall be measured and recorded at the end of the tests.

4.6.9 Salt spray. Resistors and rheostats shall be exposed to 4 hours of salt spray in accordance with ASTM B 117, washed in tap water, external surfaces dried and the resistance measured immediately. After completion of this 4-hour test, resistors and rheostats shall be exposed to 100 hours of salt spray in accordance with ASTM B 117. The condition of the finish shall be recorded at the end of this test.

4.6.10 Vibration. Resistors and rheostats shall be subjected to the vibration tests specified in MIL-STD-167-1, type I tests, under load. Rheostats shall be adjusted to approximately the mid-position. Operation shall be checked at each frequency of vibration.

4.6.11 Shock. Shock tests shall be conducted under load. Rheostats shall be adjusted to approximately the mid-position. MIL-S-901 and the following apply:

4.6.11.1 Method of mounting.

4.6.11.1.1 Resistors. Standard mounting for electrical controller components (contactors, relays, resistors, and so forth) type C light weight equipment figure of MIL-S-901 shall be used for individual resistors or sub-assemblies. The number of resistors to be tested at one time shall depend on the size of the panel and the condition that there be sufficient clearance between adjacent resistors to prevent impact between samples under shock. Individual resistors shall be supported at one end, mounted on brackets supplied by the manufacturer or mounted on sharp-edge L-shaped brackets of at least 3/32-inch thickness or heavier, as necessary, to prevent bracket distortion under shock. The choice of brackets is dependent upon the manner in which the resistors are normally mounted. Standard mounting for bulkhead mounted equipment type A test light weight equipment figure of MIL-S-901 shall be used for resistor assemblies intended for bulkhead mounting.

4.6.11.1.2 Rheostats. Standard mounting for bulkhead mounted equipment type A test light weight equipment figure of MIL-S-901 shall be used for bulkhead mounted rheostats. Standard mounting for electrical indicating switchboard instruments and other panel mounted equipment type C test light weight equipment figure of MIL-S-901 shall be used for switchboard mounted rheostats. Figure 1, herein, shall be used for double end mounted, multiplate rheostats.

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4.6.11.2 Definition of failure. Definition of failure shall be as follows:

- (a) Breakage or appreciable distortion of any parts, including mounting bolts.
- (b) Mechanical malfunctioning of rheostats. Movement of the contact arm more than 10 percent of its total travel in any one blow when tested with the contact arm in any intermediate position. Contact chatter is permissible, provided there is no contact welding.
- (c) Low insulation resistance. After shock tests, the insulation resistance shall conform to 3.5.4.
- (d) Low dielectric strength. After shock tests, the dielectric test shall be conducted at a voltage (equal to 65 percent of the voltage required by 4.6.13).
- (e) Failure to pass inspection. Following checks (a) through (d), the equipment shall be disassembled to the point necessary to ascertain its condition and examined for damage. Any observed effects of the shock shall be recorded.

4.6.12 Insulation resistance. Insulation resistance shall be as specified in 3.5.5. The measurement shall be made with an insulation-resistance-indicating meter with a full scale reading of 100 or 200 megohms, an open circuit voltage of 500 volts and a voltage of at least 450 volts across a resistance of 1 megohm. The temperature shall be measured and recorded. Insulation resistance tests shall be made after the device has cooled to room temperature and as soon as practicable after completion of electric life and vibration tests. The relative humidity shall be measured and recorded.

4.6.13 Dielectric. Dielectric tests shall be conducted in accordance with NEMA ICS 1. The tests shall be made upon the completely assembled items after completion of all tests except the shock test.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

## 5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.6.)

5.1 Domestic shipment and early equipment installation and for storage of shipboard repair parts.

5.1.1 Basic equipment or item.

5.1.1.1 Preservation. Preservation shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

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5.1.1.2 Packing. Packing shall be accomplished in a manner which will ensure acceptance by common carrier and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or methods of packing shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

5.1.1.3 Marking. Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, National stock number or manufacturer's part number, contract or order number, contractor's name, and destination.

5.2 Domestic shipment and storage or overseas shipment. The requirements and levels of preservation, packing, and marking for shipment shall be as specified by the contracting activity (see 6.2).

5.2.1 The following provides various levels of protection during domestic shipment and storage or overseas shipment, which may be required when acquisition is made.

5.2.1.1 Preservation, packing, and marking. Resistors and rheostats shall be preserved and packaged, packed, and marked for the level specified (see 6.2) in accordance with MIL-E-17555.

## 6. NOTES

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

6.1 Intended use. The class HI resistors and rheostats are intended for use for Naval shipboard service.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (c) Application.
- (d) Quantity required.
- (e) Form required (see 1.2).
- (f) Rating (watts or summation watts, ohms, and amperes) (see 3.3).
- (g) Voltage (see 3.3.1).
- (h) Mounting (see 3.3.2).
- (i) Duty (see 3.3.3).
- (j) Ambient temperature (see 3.3.4).
- (k) Enclosure (see 3.3.5).
- (l) Preservation, packing, or marking requirements other than those required by 5.1 (see 5.2).
- (m) Taper (see 6.5.3).

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6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/ provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.2 and appendix	DI-DRPR-80651	Engineering drawings	

The above DID's were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List No. 15109 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.4.1).

6.4.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.5 Definitions. The following definitions apply to terms used in this specification.

6.5.1 Minimum current rating. Minimum current rating is the current a rheostat can carry without exceeding the temperature limits of this specification when the entire resistance element is in the circuit.

6.5.2 Maximum current rating. Maximum current rating is the current a rheostat can carry without exceeding the temperature limits of this specification when only one step of resistance is in the circuit.

6.5.3 Current taper. Current taper is the ratio of maximum current rating to minimum current rating of a rheostat.

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6.5.4 Sigma (Summation) watts. Sigma watts is the product of the maximum current rating, the minimum current rating, and resistance of a rheostat.

6.5.5 Vernier (interpolating) rheostat. A vernier rheostat is a rheostat that, in addition to one or more main plates, has an interpolating plate controlled by a separate knob or handwheel on a shaft concentric to the operating shaft of the main plates.

6.6 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.7 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.7.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.8 Subject term (key word) listing.

Circuit voltage  
Interpolating plate  
Sliding brush

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:  
Navy - SH  
(Project 5905-N299)



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## APPENDIX

## ENGINEERING DRAWINGS TECHNICAL CONTENT REQUIREMENTS

## 10. SCOPE

10.1 Scope. This appendix covers information that should be included in the drawings when specified in the contract or order. This appendix is applicable only when data item description DI-DRPR-80651 is cited on the DD Form 1423.

## 20. APPLICABLE DOCUMENTS

20.1 Government document.

20.1.1 Specification. The following specification forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of this document shall be that listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

## SPECIFICATION

## MILITARY

DOD-D-1000 - Drawings, Engineering and Associated Lists.

(Unless otherwise indicated, copies of federal and military specifications are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

## 30. DRAWINGS

30.1 Drawings. When required by the contract or order, drawings shall be in accordance with DOD-D-1000 and shall contain the following minimum data, as applicable:

- (a) List of material.
- (b) Manufacturer's name and catalog number.
- (c) Descriptive data including the following, as applicable:
  - (1) Enclosure.
  - (2) Rating (watts or summation watts, ohms and amperes).
  - (3) Duty.
  - (4) Ambient temperature.
  - (5) Number and size of plates and points per plate.
  - (6) Number and description of individual resistor units in resistor assemblies.
- (d) Weight.
- (e) Wiring diagram.
- (f) Dimensioned front and side views.

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-R-15109C(SH)		2. DOCUMENT TITLE RESISTORS AND RHEOSTATS, NAVAL SHIPBOARD	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
3b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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