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TABLE II. Resistance temperature characteristic.

Nominal resistance	Maximum allowable change in resistance from resistance at ambient temperature of 25°C.	
	Symbol F	
	-55°C (ambient)	105°C (ambient)
<u>Ohms</u>	<u>Percent (±)</u>	<u>Percent (±)</u>
1,000 and under	6.5	5.0
1,100 to 10,000, inclusive	10.0	6.0
11,000 to 0.1 megohm, inclusive	13.0	7.5
<u>Megohms</u>		
0.11 to 1.0, inclusive	15.0	10.0
1.1 to 10, inclusive	20.0	15.0
11 and over	25.0	15.0

1.2.1.3 Resistance. The nominal resistance value expressed in ohms is identified by a three digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow. When resistance values less than 10 ohms are required, the letter "R" is substituted for one of the significant digits to represent the decimal point. When the letter "R" is used, succeeding digits of the group represent significant figures as shown as follows: 2R7 = 2.7 ohms.

The standard resistance values for every decade should follow the sequence demonstrated for the "10 to 100" decade in table III. Resistance values not listed should be considered as not conforming to the specification.

TABLE III. Standard resistance values for the 10 to 100 decade.

Tolerance - percent		Tolerance - percent	
5.0	10.0	5.0	10.0
10.0	10.0	33.0	33.0
11.0		36.0	
12.0	12.0	39.0	39.0
13.0		43.0	
15.0	15.0	47.0	47.0
16.0		51.0	
18.0	18.0	56.0	56.0
20.0		62.0	
22.0	22.0	68.0	68.0
24.0		75.0	
27.0	27.0	82.0	82.0
30.0		91.0	

1.2.1.4 Resistance tolerance. The resistance tolerance is identified by a single letter in accordance with table IV.

TABLE IV. Resistance tolerance.

Symbol	Resistance tolerance
	<u>Percent (±)</u>
J	5
K	10

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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).

SPECIFICATIONS

MILITARY

MIL-R-11/3	- Resistor, Fixed, Composition (Insulated), Style RC20. *
MIL-R-11/6	- Resistor, Fixed, Composition (Insulated), Style RC32. *
MIL-R-11/7	- Resistor, Fixed, Composition (Insulated), Style RC42. *
MIL-R-11/8	- Resistor, Fixed, Composition (Insulated), Style RC07. *
MIL-R-11/11	- Resistor, Fixed, Composition (Insulated), Style RC05. *
MIL-R-39032	- Resistor, Packaging of.

STANDARDS

MILITARY

MIL-STD-202	- Test Methods for Electronic and Electrical Component Parts.
MIL-STD-810	- Environmental Test Methods and Engineering Guidelines.
MIL-STD-1276	- Leads for Electronic Component Parts.
MIL-STD-1285	- Marking of Electrical and Electronic Parts.
MIL-STD-45662	- Calibration System Requirements.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office, Bldg. 4D (Customer Service), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

* INACTIVE FOR NEW DESIGN

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets, or MS standards), 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 Associate detail specifications. The individual part requirements shall be as specified herein and in accordance with the applicable associated detail specifications. In the event of a conflict between requirements of this specification and the detail specifications, the latter shall govern (see 6.1).

3.2 Qualification. Resistors furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List (QPL) at the time set for opening of bids (see 4.4 and 6.3).

3.3 Material. The material shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the resistors to meet the performance 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.

3.4 Design and construction. Resistors shall be of the design, construction, and physical dimensions specified (see 3.1). Each resistor shall consist of a composition resistance element protected against exposure to humidity and temperature conditions by an enclosure or a coating of moisture resistant, insulating material.

3.4.1 Terminals. All terminals shall be suitably treated to facilitate soldering.

3.4.1.1 Solder dip (retinning) leads. The manufacturer may solder dip/retin the leads of the product supplied to this specification provided the solder dip process has been approved by the qualifying activity. The manufacturer shall maintain a solder purity in accordance with table V, during the tinning process.

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3.4.1.1.1 Qualifying activity approval. Approval of the solder dip process will be based on one of the following options:

- a. When the original lead finish qualified was hot solder dip lead finish 52 of MIL-STD-1276, (NOTE: The 200 microinch maximum thickness is not applicable.) the manufacturer shall use the same solder dip process for reflowing as is used in the original manufacture of the product.
- b. When the lead originally qualified was not hot solder dip finish 52 of MIL-STD-1276 as prescribed in 3.4.1.1.1a, approval for the process to be used for solder dip shall be based on the following test procedures.
 - (1) Thirty samples of any resistance value for each style and lead finish are subjected to the manufacturer's solder dip process. Following the solder dip process, the resistors are subjected to the DC resistance test (and other group A electricals). No defects are allowed.
 - (2) Ten of the 30 samples are then subjected to the solderability test. No defects are allowed.
 - (3) The remaining 20 samples are subjected to the resistance to soldering heat test followed by the moisture resistance test. No defects are allowed.

TABLE V. Contamination limits.

Contamination	Tinning percent by weight ^{1/}
Copper	0.750
Gold	0.500
Cadmium	0.010
Zinc	0.008
Aluminum	0.008
Antimony	0.500
Iron	0.020
Arsenic	0.030
Bismuth	0.250
Silver	0.750
Nickel	0.250

^{1/} This is a fixed percentage by weight of the solder.

3.4.1.1.2 Solder dip reflowing options. The manufacturer may solder dip/reflow as follows:

- a. After group A tests: Following the solder dip/reflowing process, the electrical measurements required in group A, subgroup 1, tests shall be repeated on the lot. The group A, subgroup 1, lot rejection criteria shall be used. Following these tests, the manufacturer shall submit the lot to the group A solderability test as specified in 4.6.16.
- b. As a corrective action if the lot fails the group A solderability test.

3.5 Power rating. Resistors shall have a power rating as specified (see 3.1), based on continuous full load operation at an ambient temperature of 70°C. This power rating is dependent on the ability of resistors to meet the applicable life requirements in 3.16. For resistors operated at ambient temperatures in excess of 70°C, the load shall be derated in accordance with the specified curve (see 3.1).

3.6 Voltage rating. Resistors shall have a rated direct current (dc) continuous working voltage or an approximate sine wave root mean square (rms) alternating current (ac) continuous working voltage at commercial line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$\text{Where: } E = \sqrt{PR}$$

E = Rated dc or root mean square (rms) continuous working voltage.

P = Power rating.

R = Nominal total resistance.

In no case shall the rated dc or rms ac continuous working voltage be greater than the applicable maximum value (see 3.1 and table VI).

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TABLE VI. Maximum continuous working voltage.

Power rating	Maximum continuous working voltage (dc or rms)
<u>Watts</u>	<u>Volts</u>
0.125	150
0.250	250
0.500	350
1.000	500
2.000	500

3.7 DC resistance. When resistors are tested as specified in 4.6.2, the dc resistance shall be within the specified tolerance of the nominal resistance (see 1.2.1.4).

3.8 Resistance temperature characteristic. When resistors are tested as specified in 4.6.3, the change in resistance at any temperature, referred to an ambient temperature of 25°C, shall not be more than the limits specified for the applicable temperature and resistance values specified in table II. The change in resistance at the intermediate temperatures shall not be greater than the value proportional to the maximum values specified in table II.

3.9 Voltage coefficient (applicable only to resistors of 1,000 ohms and over). When resistors are tested as specified in 4.6.4, voltage coefficient measurements which result in a total resistance change of 2 percent or less shall be considered satisfactory. However, if the change is greater than 2 percent, the voltage coefficient shall not exceed 0.05 percent per volt, for resistors rated at 0.125 watt, 0.035 percent per volt for resistors rated at 0.250 watt and 0.500 watt, and 0.02 percent per volt for resistors rated above 0.500 watt.

3.10 Dielectric withstanding voltage. When resistors are tested as specified in 4.6.5, there shall be no evidence of mechanical damage, arcing, or breakdown.

3.11 Insulation resistance. When resistors are tested as specified in 4.6.6, the insulation resistance shall not be less than 10,000 megohms.

3.12 Low temperature operation. When resistors are tested as specified in 4.6.7, there shall be no evidence of mechanical damage and the change in resistance between the initial and final measurements at 25°C \pm 5°C shall not be greater than \pm 3 percent or as specified (see 3.1).

3.13 Thermal shock. When resistors are tested as specified in 4.6.8, there shall be no evidence of mechanical damage and the change in resistance shall not be more than \pm 4 percent or as specified (see 3.1).

3.14 Moisture resistance. When resistors are tested as specified in 4.6.9, there shall be no evidence of mechanical damage or products of corrosion except for normal discoloration, and the change in resistance shall not be greater than the values specified (see 3.1). When computing the average change in resistance, the sign (plus or minus) of the individual change shall be disregarded. The insulation resistance shall be 100 megohms, minimum.

3.15 Short time overload. When resistors are tested as specified in 4.6.10, there shall be no evidence of arcing, burning, or charring, and the change in resistance shall not be greater than \pm 2.5 percent or as specified (see 3.1).

3.16 Life. When resistors are tested as specified in 4.6.11, there shall be no evidence of mechanical damage; the change in resistance between the initial and each of the succeeding measurements shall not be more than the average value specified for each group of ten resistors tested, nor the maximum value specified for any individual resistor (see 3.1). When computing the average change in resistance, the sign (plus or minus) of the individual changes shall be disregarded.

3.17 Terminal strength.

3.17.1 Pull test. When resistors are tested as specified in 4.6.12.1, resistors shall withstand the specified load (see 3.1) without mechanical damage.

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3.17.2 Twist (when applicable). When resistors are tested as specified 4.6.12.2, there shall be no evidence of breakage or other mechanical damage and the change in resistance shall not be more than $\pm(1.0$ percent $+0.05$ ohm).

3.18 Resistance to soldering heat. When resistors are tested as specified in 4.6.13, there shall be no evidence of mechanical damage and the change in resistance shall not be more than the value specified (see 3.1).

3.19 Shock, specified pulse. When resistors are tested as specified in 4.6.14, there shall be no evidence of mechanical or electrical damage. There shall be no electrical discontinuity during the test.

3.20 Vibration, high frequency. When resistors are tested as specified in 4.6.15, there shall be no evidence of mechanical or electrical damage and the change in resistance from the initial measurement of 3.20 shall not be more than $\pm(2.0$ percent $+0.05$ ohm). There shall no electrical discontinuity during the test.

3.21 Solderability. When resistors are tested as specified in 4.6.16, the dipped surface of the leads shall be at least 95 percent covered with a new solder coating. The remaining 5 percent of the lead surface may show only small pinholes or voids. These shall not be concentrated in one area. Bare base metal and areas where the solder dip failed to cover the original coating are indications of poor solderability, and shall be cause for failure. In case of dispute, the percent of coverage with pinholes or voids shall be determined by actual measurement of these areas, as compared to the total area.

3.22 Marking. Resistors shall be free of missing, illegible, incorrect, mixed or smeared color markings, and shall be permanently colored coded in accordance with MIL-STD-1285. Marking shall remain legible at the end of all tests.

3.22.1 Unit package. The unit package shall be marked with the PIN, date code, and the manufacturer's name, trademark or code symbol. Date code and source code shall be in accordance with MIL-STD-1285.

3.23 Soldering. When soldering is employed, only noncorrosive flux shall be used, unless it can be shown that corrosive elements have been satisfactorily removed after soldering. Electrical connections shall be electrically continuous after soldering.

3.24 Fungus. All external materials including the color coding material, shall be nonnutrient to fungus or shall be suitably treated to retard fungus growth. The manufacturer shall verify by certification that all external materials, including the color coding material, are fungus resistant or shall test resistors as specified in 4.6.17. There shall be no evidence of fungus growth on the external surfaces.

3.25 Workmanship. Resistors shall be processed in such a manner as to be uniform in quality and shall meet the requirements of 3.3 to 3.4.1 inclusive, 3.22, and 3.23, as applicable, and shall be free from other defects that will affect life, serviceability, or appearance. The bodies of the resistors shall be free from cracks, holes, chips, or malformation. The wire leads shall be unbroken, and shall not be crushed or nicked.

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 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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4.1.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring equipment shall be in accordance with MIL-STD-45662.

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

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

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.3.1 Precautions. Adequate precautions shall be taken during inspection to prevent condensation of moisture on resistors, except during the low temperature operation, thermal shock, and moisture resistance tests.

4.3.2 Mounting of resistors. Unless otherwise specified herein, suitable clips shall be used whenever resistors are mounted for test purposes.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3).

4.4.1 Sample. The number of sample units comprising a sample of resistors to be submitted for qualification inspection shall be as specified in the appendix to this specification. The sample shall be taken from a production run and shall be produced with equipment and procedures normally used in production.

4.4.2 Test routine. Sample units shall be subjected to the qualification inspection specified in table VII, in the order shown. All sample units, except units to be subjected to group VII, shall be subjected to the inspection of group I. Fifty sample units shall then be divided equally into five groups for groups II through VI. Ten or 20 sample units, at the option of the manufacturer (see 30.1) shall be submitted for group VII. All sample units shall then be conditioned for 96 hours \pm 4 hours except style RC05. For style RC05 the conditioning shall be 25 hours \pm 4 hours in a dry oven at a temperature of 100°C \pm 5°C. After conditioning, sample units shall be subjected to the inspection for their particular group. Sample units shall be stored in desiccators using a suitable desiccant, such as activated silica gel, from the time of removal from the oven until the beginning of subsequent tests.

4.4.3 Defectives. Defectives in excess of those allowed in table VII shall be cause for refusal to grant qualification.

4.4.4 Retention of qualification. To retain qualification, the manufacturer shall forward a report at 6 month intervals, to the qualifying activity. The qualifying activity shall establish the initial reporting data. The report shall consist of the following:

- a. A summary of the results of the tests performed for inspection of product for delivery (group A), indicating as a minimum the number of lots which have failed. The results of tests of all reworked lots shall be identified and accounted for.
- b. A summary of the results of tests performed for qualification verification inspection (group B), including the number and mode of failures. The summary shall include results of all qualification verification inspection tests performed and completed during the 6 month period. If the summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the QPL.

Failure to submit the report within 30 days after the end of each 6 month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the manufacturer shall immediately notify the qualifying activity at any time during the 6 month period that the inspection data indicates failure of the qualified product to meet the requirement of this specification.

In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If, during two consecutive reporting periods, there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified products to testing in accordance with the qualification inspection requirements.

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TABLE VII. Qualification inspection.

Inspection	Requirement paragraph	Method paragraph	Number of defectives allowed ^{1/}
<u>Group I</u>			
Visual and mechanical inspection ^{2/} ^{3/}	3.1, 3.3, 3.4, 3.4.1, and 3.21 to 3.25 inclusive	4.6.1	1
DC resistance ^{3/}		4.6.2	
<u>Group II</u>			
Resistance temperature characteristic ^{3/}	3.8	4.6.3	2
Voltage coefficient (applicable only to resistors of 1,000 ohms and over) ^{3/}	3.9	4.6.4	
Dielectric withstanding voltage ^{3/}	3.10	4.6.5	
Insulation resistance ^{3/}	3.11	4.6.6	
<u>Group III</u>			
Low temperature operation	3.12	4.6.7	2
Thermal shock	3.13	4.6.8	
Moisture resistance ^{4/}	3.14	4.6.9	
Short time overload	3.15	4.6.10	
<u>Group IV</u>			
Life ^{4/}	3.16	4.6.11	2
<u>Group V</u>			
Terminal strength	3.17	4.6.12	1
Resistance to soldering heat	3.18	4.6.13	
<u>Group VI</u>			
Shock, specified pulse	3.19	4.6.14	2
Vibration, high frequency	3.20	4.6.15	
<u>Group VII</u>			
Solderability ^{5/}	3.21	4.6.16	1

- ^{1/} Failure of an individual resistor in one or more tests in group I through group VI inclusive, will be charged as a single failure. Failure for each resistance value shall be permitted as specified in each group, but not more than four failures shall be permitted in group I through group VI combined.
- ^{2/} Marking shall be considered defective only if marking is illegible.
- ^{3/} Nondestructive inspections.
- ^{4/} When a group of resistors fails to meet the specified average percent change in resistance requirement, three failures shall be charged; however, a failure shall be charged for each resistor of the group which exceeds the specified maximum percent change in resistance requirement, and these resistors shall not be considered in computing the average.
- ^{5/} Ten or 20 sample units, at the option of the manufacturer, shall be submitted to this test. If ten sample units are submitted, both terminal leads of each resistor shall be subjected to the test. If 20 sample units are submitted, only one terminal of each resistor shall be subjected to the test. Failure of two terminal leads on the same resistor subjected to the solderability test shall be considered as two separate defectives.

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4.4.5 Alternate inspection. For the purposes of retention of qualification and quality conformance inspection (see 4.4 and 4.4.4), test data on identical items covered by MIL-R-39008 may be used.

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A.

4.5.1.1 Inspection lot. An inspection lot as far as practicable, shall consist of all the resistors of the same style.

4.5.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table VIII in the order shown.

TABLE VIII. Group A inspection.

Inspection	Requirement paragraph	Method paragraph	Sampling plan
<u>Subgroup 1</u>			
DC resistance	3.7	4.6.2	See 4.5.1.2.1.1
<u>Subgroup 2</u>			
Visual and mechanical inspection:			See 4.5.1.2.1.2
Material	3.3		
Design and construction	3.4		
Terminals	3.4.1		
Marking	3.22		
Workmanship	3.25		
<u>Subgroup III</u>			
Solderability	3.21	4.6.16	See 4.5.1.2.1.3

4.5.1.2.1 Sampling plan.

4.5.1.2.1.1 Subgroup 1. A sample of parts from each inspection lot shall be randomly selected in accordance with table IX. If one or more defects are found, the lot shall be screened and defects removed. After screening and removal of defects a new sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this specification.

4.5.1.2.1.2 Subgroup 2. A sample of parts from each inspection lot shall be randomly selected in accordance with table IX. If one or more defects are found, the lot shall be screened and defects removed. After screening and removal of defects, a new sample of parts shall be randomly selected in accordance with table IX. If one or more defects are found in the second sample, the lot shall be rejected and shall not be supplied to this specification.

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TABLE IX. Group A sampling plan.

Lot size	Subgroup 1 sampling size	Subgroup 2 sampling size
2 to 13	100%	100%
14 to 125	100%	13
126 to 150	125	13
151 to 280	125	20
281 to 500	125	29
501 to 1200	125	34
1201 to 3200	125	42
3201 to 10000	192	50
10001 to 35000	294	60
35001 to 150000	294	74
150001 to 500000	345	90
500001 and over	435	102

4.5.1.2.1.3 Subgroup 3 (solderability).

4.5.1.2.1.3.1 Sampling plan. Thirteen samples shall be selected randomly from each inspection lot and subjected to the subgroup 3 solderability test. If there are one or more defects, the lot shall be considered to have failed.

4.5.1.2.1.3.2 Rejected lots. In the event of one or more defects, the inspection lot is rejected. The manufacturer may use one of the following options to rework the lot.

- a. Each production lot that was used to form the failed inspection lot shall be individually submitted to the solderability test as required in 4.6.16. Five samples shall be selected from each production lot that formed the failed inspection lot. Production lot samples that pass the solderability test are available for shipment. Production lots failing the solderability test can be reworked only if submitted to the solder dip procedure in 4.5.1.2.1.3.2b.
- b. The manufacturer submits the failed lot to a 100 percent solder dip using an approved solder dip process in accordance with 3.4.1.1. Following the solder dip, dc resistance test shall be repeated on 100 percent of the lot. Lot acceptance for electrical measurements shall be as for subgroup 1 of group A. A sample of parts shall be randomly selected in accordance with table IX and subjected to the solderability test with zero defects allowed. If the lot fails this solderability test, the lot shall be considered rejected and shall not be furnished against the requirements of this specification.

4.5.1.2.1.3.3 Disposition of samples. The solderability test is considered a destructive test and samples submitted to the solderability test shall not be supplied on the contract.

4.5.1.3 Group B inspection. Group B shall consist of the tests specified in table X, in the order shown and shall be made on sample units selected from resistors specifically designated for this specification, for the periods specified in table X. Before being subjected to any of the tests listed, all sample units shall be conditioned for 96 hours \pm 4 hours except for style RC05. For RC05 the time shall be 25 hours \pm 4 hours in a dry oven at a temperature of 100°C \pm 5°C.

4.5.1.3.1 Sampling plan.

4.5.1.3.1.1 Monthly. Twenty sample units of each style and of any resistance value shall be inspected monthly in accordance with table X.

4.5.1.3.1.2 Semiannually. Sample units selected for semiannual inspection shall be of the same style. Ten sample units of the lowest resistance value, ten of the critical or value closest to the critical value (see table X), and ten of the highest resistance value, which were produced during the previous 6 month period, shall be subjected to the tests of subgroup 1 in accordance with table X. Ten sample units of the lowest resistance and ten of the critical or the value closest to the critical value shall be subjected to the tests of subgroup 2. Ten sample units of the lowest, ten of the critical or the value closest to the critical value, and ten of the highest resistance value shall be subjected to the tests of subgroup 3. Ten sample units of any value between critical and the highest values shall be subjected to the tests of subgroup 4. A separate sample shall be selected for each subgroup listed.

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TABLE X. Group B inspection.

Inspection	Requirement paragraph	Method paragraph	Number of sample units to be inspected
<u>Monthly</u>			
<u>Subgroup 1</u>			
Voltage coefficient (applicable only to resistors of 1,000 ohms and over)	3.9	4.6.4	}—10
Dielectric withstanding voltage (atmospheric pressure)	3.10	4.6.5.1	
Insulation resistance	3.11	4.6.6	
<u>Subgroup 2</u>			
Terminal strength	3.17	4.6.12	}—10
Resistance to soldering heat	3.18	4.6.13	
<u>Semiannual</u>			
<u>Subgroup 1</u>			
Low temperature operation	3.12	4.6.7	}—30 — 10 high 10 critical 10 low
Thermal shock	3.13	4.6.8	
Moisture resistance ^{1/}	3.14	4.6.9	
Short time overload	3.15	4.6.10	
<u>Subgroup 2</u>			
Life ^{1/}	3.16	4.6.11	20 — 10 critical 10 low
<u>Subgroup 3</u>			
Resistance temperature characteristic	3.8	4.6.3	}—30 — 10 high 10 critical 10 low
Dielectric withstanding voltage (barometric pressure)	3.10	4.6.5.2	
<u>Subgroup 4</u>			
Shock, specified pulse	3.19	4.6.14	}—10
Vibration, high frequency	3.20	4.6.15	

^{1/} When a group of resistors fail to meet the specified average percent of change in resistance requirement, three failures shall be charged; however, a failure shall be charged for each resistor of the group which exceeds the specified maximum percent change in resistance requirement, and these resistors shall not be considered in computing the average.

4.5.1.3.2 Defective. One defective shall be allowed in any group of ten resistors of the same resistance value within a subgroup. If this number is exceeded, an additional group of ten resistors of the same resistance value may be tested and a total of three defectives shall be allowed for the 20 resistors. In the semiannual inspection, only one resubmission shall be allowed in any of subgroup 1, subgroup 2, and subgroup 3; i.e., only one resistance value shall be retested per subgroup. If more than one resistance value fails in any of these groups, it shall be considered that the resistors have failed to pass group B inspection.

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

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4.5.1.3.4 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the failure. Acceptance of the product shall be discontinued until corrective action, acceptable to the Government, has been taken. After corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection which the original failed, at the option of the Government). Group A inspection may be withheld until the group B reinspection has shown that the information concerning the failure and the corrective action taken shall be furnished to the contracting officer and to the qualifying activity.

4.5.2 Inspection of preparation for delivery. Sample packages and packs and the inspection of preservation, packaging, packing, and marking for shipment and storage shall be in accordance with MIL-R-39032.

4.6 Method of inspection and test.

4.6.1 Visual and mechanical inspection. Resistors shall be inspected to verify that materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements. General workmanship defects shall be classified in accordance with table XI (see 3.1, 3.3 to 3.4.1 inclusive, and 3.21 to 3.25 inclusive).

TABLE XI. Classification of defects.

Classification	Defect
Construction (resistor body)	Cracks, holes, or chips, except end chipping, shall not be more than 0.333 of the distance to axial wire leads. Wire leads broken, crushed, or nicked which would cause probable failure in use. Malformation of body due to improper molding. End chipping not exceeding 0.333 distance to axial wire lead.
Marking	Wrong, mixed, or missing color. Illegible or smeared color.
Resistance	Greater than 125 percent of tolerance.

4.6.2 DC resistance (see 3.7). Resistors shall be tested in accordance with method 303 of MIL-STD-202. The following details and exceptions shall apply.

- a. Measuring apparatus: The same measuring instrument shall be used for any one test, but not necessarily for all tests.
- b. Combined limit of error of measuring apparatus: Shall not be more than 0.5 percent.
- c. Test voltage: Table XII gives the recommended test voltage to be impressed across the resistor in making resistance measurements. Other test voltages may be used; however, in no event shall the test voltage exceed the voltage shown in table XII. In the event of conflict in results, attributable to the test voltage used, the nominal voltage specified in table XII shall be used to resolve the conflict.
- d. Temperature: The dc resistance test specified in group I of table VII shall be performed at 25°C ±2°C. For all other tests, unless otherwise specified herein, the temperature at which subsequent and final measurements are made shall be within ±2°C of the temperature at which the first resistance measurement was made.

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TABLE XII. DC resistance test voltages.

Nominal resistance	Test potential
<u>Ohms</u>	<u>Volts</u>
1 to 9.1 inclusive	0.50 ±0.10
10 to 91 inclusive	0.75 ±0.25
100 to 910 inclusive	2.75 ±0.25
1,000 to 9,100 inclusive	9.00 ±1.00
10,000 to 91,000 inclusive	27.00 ±3.00
0.1 megohm or higher	90.00 ±10.0

4.6.3 Resistance temperature characteristic (see 3.8). The resistors shall be maintained at each of the ambient temperatures listed in table XIII. Resistance measurements shall be made at each temperature, 30 minutes to 45 minutes after resistors have attained that temperature. The temperature adjustment shall be accurate within 1°C. The percent change in resistance, referred to a reference temperature of 25°C, shall be computed by the following formula.

$$\text{Percent change in resistance} = \frac{(R-r) 100}{r}$$

Where:

R = resistance at test temperature.

r = Resistance at reference temperature.

Resistance values at temperatures B and C of table XIII shall be referred to the resistance value at temperature A, resistance values at temperatures E, F, and G shall be referred to the resistance value at temperature D.

TABLE XIII. Resistance temperature characteristic test temperature.

Sequence	Temperature
	°C
A	1/ 25
B	-15
C	-55
D	1/ 25
E	65
F	105

1/ This temperature shall be considered the reference temperature for each of the succeeding temperatures.

NOTE: At the option of the manufacturer the reverse sequence may be as follows.

1. Room temperature.
2. +150 ±3°C.
3. Room temperature.
4. -55 ±3°C.

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4.6.4 Voltage coefficient (applicable only to resistors of 1,000 ohms and over)(see 3.9). Resistance shall be measured at the rated continuous working voltage specified in 3.6 and one-tenth the rated continuous working voltage. The voltage coefficient shall be computed as follows.

$$\text{Voltage coefficient} = \frac{100 (R-r)}{r} \times \frac{1}{0.9E}$$

Where:

- R = resistance at rated continuous working voltage.
- r = resistance at 0.1 rated continuous working voltage.
- E = rated continuous working voltage.

4.6.5 Dielectric withstanding voltage (see 3.10).

4.6.5.1 Atmospheric pressure. Resistors shall be tested in accordance with method 301 of MIL-STD-202. The following details and exceptions shall apply.

- a. Special preparations: Resistors shall be placed in a conductive material which will conform to the resistor surface so that 90 percent and 100 percent of the outer periphery is contacted. The conductive material shall be centered on the resistor body. Care should be taken that any part of the resistor body lead is as far away from conductive material as possible.
- b. Magnitude of test voltage: Twice the maximum rms continuous working voltage specified in table VI for all styles.
- c. Nature of potential: An ac supply at commercial line frequency (not more than 100 Hz) and wave form.
- d. Duration of application of test voltage: 5 seconds.
- e. Rate of application of test voltage: 100 volts per second.
- f. Points of application of test voltage: Between the resistor terminals connected together and the conductor material.
- g. Inspection after test: Resistors shall be inspected for evidence of mechanical damage, arcing, and breakdown.

4.6.5.2 Barometric pressure. Resistors shall be tested in accordance with method 105 of MIL-STD-202. The following details and exceptions shall apply.

- a. Method of mounting: As specified in 4.6.5.1a.
- b. Tests condition: B.
- c. Test voltages during subjection to reduced pressure: As specified in table XIV.
- d. Nature of potential: As specified in 4.6.5.1c.
- e. Duration of application of test voltage: 5 seconds.
- f. Rate of application: 100 volts per second.
- g. Points of application of test voltage: As specified in 4.6.5.1f.
- h. Inspection after test: As specified in 4.6.5.1g.

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TABLE XIV. Voltage to be applied at barometric pressure.

<u>Resistor wattage</u>	<u>Voltage to be applied</u>
	<u>Volts</u>
0.125	200
0.250	325
0.500	450
1.000	625
2.000	625

4.6.6 Insulation resistance (see 3.11). Resistors shall be tested in accordance with method 302 of MIL-STD-202. The following details and exceptions shall apply.

- a. Special preparations: As specified in 4.6.9a.
- b. Test condition: A - for all styles excepts RC20, RC32, and RC42. B - for styles RC20, RC32 and RC42.
- c. Points of measurement: Between the resistor terminals connected together and mounting strap.

4.6.7 Low temperature operation (see 3.12).

4.6.7.1 Mounting. Resistors shall be mounted by their terminals so that there is at least 1 inch of free air space around each resistor and mounting is in such a position with respect to the air that it offers substantially no obstruction to the flow of air across and around the resistors.

4.6.7.2 Procedure. DC resistance shall be measured as specified in 4.6.2. Within 1 hour after this measurement, the resistors shall be placed in a cold chamber at room temperature. The temperature shall be gradually decreased to -65°C , $+0^{\circ}\text{C}$, -5°C within the period of not less than 1 hour and 30 minutes. For quality conformance inspection only, and at the option of the manufacturer, the resistors may be placed in the cold chamber when the chamber is already at the extreme low temperature. After 1 hour of stabilization at this temperature, the full rated continuous working voltage (see 3.6), shall be applied for 45 minutes. The resistors may be loaded individually or in parallel. Fifteen minutes \pm 5 minutes, -0 minutes after removal of voltage, the temperature in the chamber shall be gradually increased to room temperature within a period of not more than 8 hours. The resistors shall have been removed from the chamber and maintained at a temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for a period of approximately 24 hours. The dc resistance shall then be measured as specified in 4.6.2. Resistors shall then be inspected for evidence of mechanical damage.

4.6.8 Thermal shock (see 3.13). Resistors shall be tested in accordance with method 102 of MIL-STD-202. The following details and exceptions shall apply.

- a. Special mounting: As specified in 4.6.7.1.
- b. Measurement of air temperature: The air temperature shall be measured by a suitable means and as near to the center of the group as possible. If a thermometer is used, it shall be mounted parallel to the axis of the resistors.
- c. Test condition: D.
- d. Measurements before and after cycling: DC resistance shall be measured as specified in 4.6.2, prior to the first cycle and within 24 hours after completion of the fifth cycle.
- e. Inspection after test - Resistors shall be inspected for evidence of mechanical damage.

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4.6.9 Moisture resistance (see 3.14). Resistors shall be tested in accordance with method 106 of MIL-STD-202. The following details and exceptions shall apply.

- a. Resistors shall be soldered by their leads to stand-off insulators on a suitable panel so that there will be at least 1 inch of free air space around each resistor. The spacing of the mounts shall be such that the length of each resistor lead is .375 inch (9.53 mm) \pm .0625 inch (1.59 mm) when measured from the edge of the supporting terminal to the resistor body. In addition, all sample units shall be covered with a flat, noncorrosive, metal strap whose width is equal to the length of the resistors and of sufficient thickness to be rigid. A .075 inch (1.91 mm) thick layer of resilient, moisture resistant material, having a resistivity of less than 1,000 ohm-centimeters, shall be bonded to the surface of the strap next to the resistors. Sufficient contact pressure shall be maintained between this material and the resistor in order that all color code bands shall be completely imbedded in the material. This shall be done by applying a compressive force between the strap and a cylindrical, nonconducting rod held beneath the resistors (see figure 1). The mounting straps may be used to cover one or more resistors at a time and may be applied after the last cycle. ^{1/}
- b. Initial measurements: Initial measurements shall not be less than 1 hour and 30 minutes after resistors have been removed from the drying oven. The dc resistance shall be measured as specified in 4.6.2.
- c. Loading voltage: During the first two hours of step 1 and step 4, a test potential equivalent to 100 percent rated wattage, but not exceeding the maximum rated voltage shall be applied to 50 percent of the resistors. The remaining 50 percent of the resistors shall be tested without any application of voltage.
- d. Final measurements: Upon completion of step 6 of the final cycle, the resistors shall be conditioned at a temperature of 25°C \pm 2°C and at a relative humidity of 90 percent to 95 percent for a period of 1 hour and 30 minutes to 3 hours and 30 minutes. Upon removal from the chamber, resistors shall be permitted to dry for a maximum of 4 hours at 25°C \pm 5°C at no less than 50 percent relative humidity. The sample units shall not be subjected to forced circulating air during this test. DC resistance and insulation resistance shall be measured as specified in 4.6.2 and 4.6.6, respectively.

4.6.10 Short time overload (see 3.15). Resistors shall be conditioned at 50°C, +3°C, -0°C for 1 hour \pm 5 minutes. DC resistance shall then be measured as specified in 4.6.2. Following this measurement, a potential of 2.5 times the rated continuous working voltage (see 3.6) shall be applied for 5 seconds \pm 0.5 seconds to the resistor terminals. (NOTE: Test potential should be established by use of a dummy load in order to avoid excessive stress on the test specimens.) In no case shall the voltage be more than the applicable value listed in table XV. Thirty minutes after removal of the test potential, the dc resistance shall again be measured as specified in 4.6.2.

TABLE XV. Maximum overload voltage.

Power rating	Maximum overload voltage (dc or peak ac)
<u>Watts</u>	<u>Volts</u>
0.125	200
0.250	400
0.500	700
1.000	1,000
2.000	1,000

^{1/} Standoff insulators of polytetrafluoroethylene are preferred for use with resistors of high resistance values.

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4.6.11 Life (see 3.16). Resistors shall be tested in accordance with method 108 of MIL-STD-202. The following details and exceptions shall apply.

- a. Method of mounting: Resistors shall be mounted and soldered to lightweight terminals (see figure 2). The effective length of each lead shall be 1 inch (25.4 mm) \pm 0.1875 inch (4.76 mm). Resistors shall be so arranged that the temperature of any one resistor shall not appreciably influence the temperature of any other resistor. There shall be no circulation of air directly over the resistors other than that caused by the heat of the resistors.
- b. Test temperature and tolerance: 70°C \pm 5°C.
- c. Initial measurements: Measurements may be made inside or outside the chamber.
 - (1) Inside the chamber: When measurements are to be made inside the chamber, the initial dc resistance shall be measured after mounting at the applicable test temperature, after temperature stabilization, and within 8 hours of exposure of the resistors to the test temperature. The initial measurement shall be used as the reference temperature for all subsequent measurements under the same conditions.
 - (2) Outside the chamber: When measurements are to be made outside the chamber, the initial dc resistance shall be measured after the mounting at room temperature. This initial measurement shall be used as the reference resistance for all subsequent measurements under the same conditions.
- d. Operating condition: One hundred percent rated dc continuous working voltage (see 3.6), or filtered or nonfiltered full wave rectified ac voltage shall be applied intermittently, 1 hour and 30 minutes "on" and 30 minutes "off" for 1,000 hours. "On time" shall be three quarters of the total elapsed time. During the "on" cycle, the voltage shall be regulated and controlled to maintained \pm 5 percent of the rated continuous working voltage. In case of conflict, a referee potential of nominal one percent shall be used. (NOTE: If rectified ac is employed, a voltmeter capable of measuring true rms shall be used to prevent overloading of the test specimen.)
- e. Test condition: D.
- f. Measurements during test: DC resistance shall be measured at the end of the 30 minutes off periods, after 50 hours \pm 8 hours, 100 hours \pm 12 hours, 250 hours \pm 48 hours, -0 hours, 500 hours \pm 48 hours, -0 hours, and 1,000 hours \pm 48 hours, -0 hours have elapsed.
- g. Inspection after test: Resistors shall be inspected for evidence of mechanical damage.

4.6.12 Terminal strength.

4.6.12.1 Pull test (see 3.17.1). Resistors shall be tested in accordance with method 211 of MIL-STD-202. The following details shall apply.

- a. Test condition: A.
- b. Measurement before test: DC resistance shall be measured as specified in 4.6.2.
- c. The resistors shall be clamped by one terminal lead.
- d. The applied load shall be as specified (see 3.1).
- e. Inspection after test: Resistors shall be inspected for evidence of mechanical damage.

4.6.12.2 Twist test (when applicable) (see 3.17.2). Resistors shall be tested in accordance with method 211 of MIL-STD-202. The following details shall apply.

- a. Test condition: D.
- b. Test to be performed following tests specified in 4.6.12.1.
- c. Following the test, dc resistance shall be measured as specified in 4.6.2, and resistors shall be inspected for evidence of breakage and other mechanical damage.

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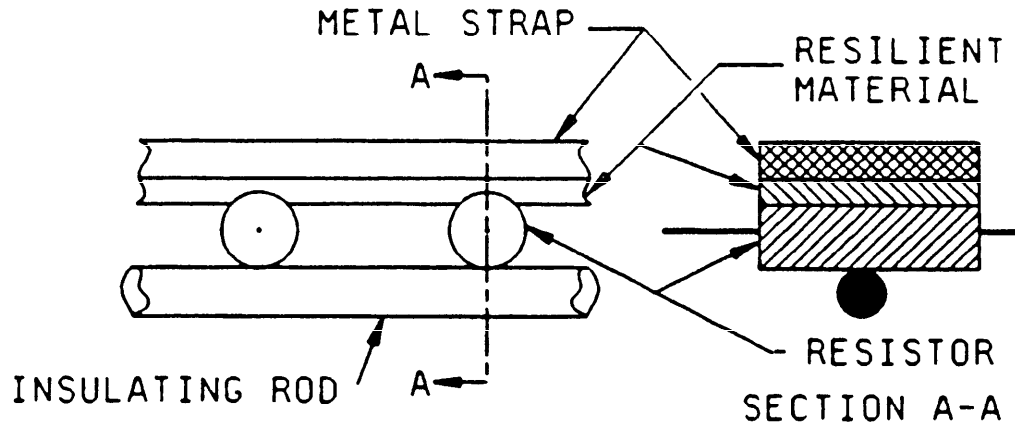


FIGURE 1. Resistor contacting assembly for insulation resistance measurements.

4.6.13 Resistance to soldering heat (see 3.18). Resistors shall be tested in accordance with method 210 of MIL-STD-202. The following details shall apply.

- a. Measurement before test: DC resistance shall be measured as specified in 4.6.2.
- b. Test condition A: For all styles except RC05. For RC05, the temperature of the solder shall be $250^{\circ}\text{C} \pm 10^{\circ}\text{C}$ for a period of 3 seconds ± 0.5 second.
- c. Special preparation of specimen: Sample units shall not have been soldered during any of the previous tests.
- d. Depth of immersion in molten solder: To a point within 0.125 inch (3.18 mm) to 0.1875 inch (4.76 mm) from the resistor body at the temperature specified (see 3.1) for a duration of 3 seconds $+0.5$ second, -0 second.
- e. Measurement after test: Within 24 hours ± 4 hours after completion of test, the dc resistance shall be measured as specified in 4.6.2. Resistors shall be inspected for evidence of mechanical damage.

4.6.14 Shock, specified pulse (see 3.19). Resistors shall be tested in accordance with method 213 of MIL-STD-202. The following details and exceptions shall apply.

- a. Special mounting means: Resistors shall be mounted on appropriate jig fixtures and supported by their leads at a distance 0.250 inch (6.35 mm) from the resistor body. These fixtures shall be constructed in a manner to insure that the points of the resistor mounting supports shall have the same motion as the shock table. Resistors shall be mounted in relation to the test equipment in such a manner that the stress applied is in the direction which would be most detrimental. Test leads used during this test shall be no larger than AWG size 22 stranded wire, so that the influence of the test lead on the resistor shall be held to a minimum strength. The test lead shall be no longer than necessary.
- b. Measurement before shock: DC resistance shall be measured as specified in 4.6.2.
- c. Test condition: C.

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- d. **Number and direction of applied shocks:** The resistors shall be subjected to a total of ten shocks in each of two mutually perpendicular planes, one perpendicular and the other parallel to the longitudinal axis of the resistor.
- e. **Measurement during shock:** Each resistor shall be monitored to determine electrical discontinuity by a method which shall at least be sensitive enough to monitor or register, automatically, any electrical discontinuity of 0.1 millisecond or greater duration.
- f. **Inspection after test:** Resistors shall be inspected for evidence of mechanical and electrical damage.

4.6.15 Vibration, high frequency (see 3.20). Resistors shall be tested in accordance with method 204 of MIL-STD-202. The following details and exceptions shall apply.

- a. **Mounting of specimens:** Resistors shall be mounted on appropriate jig fixtures and supported by their leads at a distance 0.250 inch (6.35 mm) from the resistor body. These fixtures shall be constructed in a manner to insure that the points of the resistor mounting supports shall have the same motion as the vibration table. The arrangement of the mounting shall be such that the body of the resistor is not restrained in any manner, but is allowed to respond to the vibration forces applied. Test lead used using this test shall be no larger than AWG size 22 stranded wire, so that the influence of the test lead on the resistor shall be held to a minimum. The test lead length shall be no greater than is absolutely necessary. A shielded cable, which may be necessary because of the field surrounding the vibration table, shall be clamped to the resistor mounting jig. In all cases, the resistor shall be mounted in relation to the test equipment in such a manner that the stress applied is in the direction which would be considered most detrimental.
- b. **Test condition:** B.
- c. **Direction of motion:** In each of two mutually perpendicular directions; one perpendicular and the other parallel to the longitudinal axis of the resistor.
- d. **Duration of motion:** Six hours in each direction for a total of 12 hours.
- e. **Measurement during test:** Each resistor shall be monitored to determine electrical discontinuity by a method which shall at least be sensitive enough to monitor or register, automatically, any electrical discontinuity of 0.1 millisecond or greater duration.
- f. **Measurement after vibration:** DC resistance shall be measured as specified in 4.6.2.
- g. **Inspection after test:** Resistors shall be inspected for evidence of mechanical and electrical damage.

4.6.16 Solderability (see 3.21). Resistors shall be tested in accordance with method 208 of MIL-STD-202. The following shall apply: Either one or two of the leads shall be tested, as applicable (see table VII).

4.6.17 Fungus (see 3.24). Resistors shall be tested in accordance with method 508 of MIL-STD-810. Resistors shall be inspected for evidence of mechanical damage.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-R-30932.

6. NOTES

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

6.1 Intended use. Resistors are intended to be used in circuits which encounter slow duty cycle pulse conditions and high frequencies.

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6.2 Acquisition requirements. Acquisition documents must specify the following:

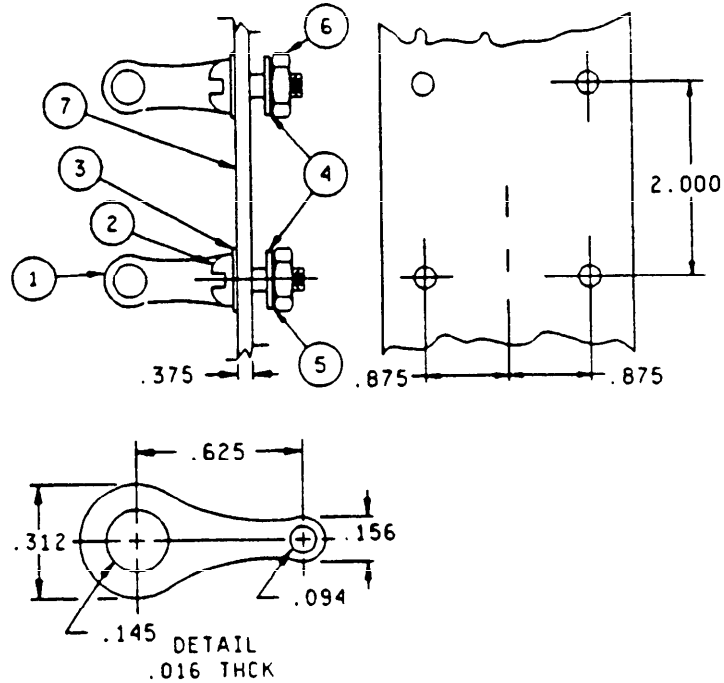
- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1 and 3.1).
- c. Title, number, and date of the applicable associated detail specification, and the complete PIN (see 1.2.1 and 3.1)
- d. Marking requirement for failure rate level (see 3.22).
- e. Lead length: Specify 1.00 inch (2.54 mm) \pm .625 inch (15.9 mm), -.000 inch (0.00 mm) for tape and reel packaging. If not specified, 1.5 inch (38.1 mm) \pm .125 inch (3.18 mm) lead length will be supplied.

6.3 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 the applicable QPL 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 QPL is the U.S. Army Research Laboratory, Electronics and Power Sources Directorate, ATTN: AMSRL-EP-RD, Fort Monmouth, NJ 07703-5302; however information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), 1507 Wilmington Pike, Dayton, OH 45444.

6.4 High altitude. All tests in this specification, with the exception of the dielectric withstanding voltage at reduced barometric pressure, are performed at ambient atmospheric pressure. This fact should be considered when the use of these resistors for high altitude conditions is contemplated.

6.5 Replacement data. Characteristic BF and tolerance M have been deleted. Resistors having characteristic BF may be replaced by resistors having characteristic GF. Resistors with tolerance M may be replaced by resistors with resistance tolerance K or resistance tolerance J. The deleted characteristic BF and tolerance M were specified in superseded MIL-R-11A, dated 17 February 1953.

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Inches	mm	Inches	mm
.094	2.39	.375	9.53
.145	3.68	.625	15.88
.156	3.96	.875	22.23
.312	7.92	2.000	50.80

No.	Description
1	Solder lug, in accordance with catalog no. 2441, Cinch Mfg. Corp., Chicago, IL, or equal, tinned brass.
2	RDHD MS#6-32 x 9/16 long brass.
3	Shakeproof washer steel, parkerized.
4	Flatwasher, brass for #6-32 MS.
5	Lockwasher, brass for #6-32 MS.
6	Hexagonal nut, brass for #6-32 STD.
7	Rack, phenolic.

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Tolerance is $\pm .005$ (± 0.13 mm).

FIGURE 2. Suggested mounting lug arrangement for life test.

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6.6 Deletion of styles. Styles RC06, RC09, and RC30 have been deleted from this specification. For replacement purposes use styles RC05, RC07, and RC32, respectively.

6.7 Substitution data. Styles which have been deleted from this specification and their replacement styles are as follows.

<u>Deleted style</u>	<u>Replacement style</u>
RC06	RC05
RC09	RC07
RC30	RC32
RC08	2/ RCR05, RLR05
RC12	2/ RCR07, RLR07
RC22	2/ RCR20, RLR20

6.8 Selection and use information. Equipment designers should refer to MIL-STD-199, "Resistors, Selection and Use of" for a selection of standard resistor types and values for new equipment design. Applications and use information concerning these resistors is also provided in MIL-STD-199.

6.9 Performance characteristics. The performance characteristics should be in accordance with table XVI.

TABLE XVI. Performance characteristics.

Style	RC20	RC32	RC42	RC07	RC05
Maximum ambient temperature at rated wattage (see 3.1)	70°C	70°C	70°C	70°C	70°C
Maximum ambient temperature at zero wattage derating (see 3.1)	130°C	130°C	130°C	150°C	130°C
Power rating in watts (see 3.5)	1/2	1	2	1/4	1/8
Maximum percent change in resistance (±) 1/					
Low temperature operation (see 3.12)	3	3	3	3	3
Thermal shock (see 3.13)	4	4	4	4	4
Moisture resistance (see 3.14)					
Maximum	15	15	15	15	15
Average	10	10	10	10	12
Short time overload (see 3.15)	2.5	2.5	2.5	2.5	2.5
Life (see 3.16)					
Maximum	10	10	10	10	8
Average	6	6	6	6	6
Terminal strength (see 3.17)	±(1 percent +.05 ohm)	±(1 percent +.05 ohm)	±(1 percent +.05 ohm)	±(1 percent +.05 ohm)	±(1 percent +.05 ohm)
Resistance to soldering heat (see 3.18)	±(3 percent +.05 ohm)	±(3 percent +.05 ohm)	±(3 percent +.05 ohm)	±(3 percent +.05 ohm)	±(3 percent +.05 ohm)
Shock (specified pulse) (see 3.19)	2	2	2	2	2
Vibration, high frequency (see 3.20)	2	2	2	2	2
Resistance tolerance (± percent) (see table IV)	See 3.1	See 3.1	See 3.1	See 3.1	See 3.1

1/ Where total resistance change is 1 percent or less, it shall be considered as ±(percent +0.05 ohm).

2/ See MIL-R-39017 and MIL-R-39008 for precise substitution data.

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6.10 Subject term (key word) listing. The key word listing shall be as follows.

Coefficient
Insulator
Standoff

6.11 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.

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APPENDIX

PROCEDURE FOR QUALIFICATION INSPECTION

10. SCOPE

10.1 Scope. This appendix details the procedure for submission of samples, with related data, for qualification inspection of resistors covered by this specification. The procedure for extending qualification of the required sample to other resistors covered by this specification is also outlined herein. This appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS. This section is not applicable to this document.

30. SUBMISSION

30.1 Sample. A sample consisting of 60 sample units, each of the lowest and highest resistance values in each style for which qualification is sought, shall be submitted. At the option of the manufacturer, 70 sample units may be supplied to allow 20 sample units to be submitted for group VII of table VII. When the lowest and highest resistance values submitted are respectively below and above the critical value specified in table XVI, 60 or 70 sample units, as applicable, of the critical value shall also be submitted in each style. One additional sample unit of each resistance value shall be submitted to permit substitution for the allowed defect in group I inspection. All sample units for which qualification is sought shall have resistance tolerance J (± 5 percent) or G (± 2 percent) as applicable. If approval for 2 percent resistance tolerance is sought, in addition to the 5 percent tolerance already approved, 10 additional sample units of this tolerance (2 percent) shall be submitted and subjected to group I inspection of table VII.

30.2 Test data. When inspections and tests are to be performed at a Government laboratory, prior to submission, all sample units shall be subjected to all of the inspections and tests indicated as nondestructive in table VII. Each submission shall be accompanied by the test data obtained from these inspections and tests. The performance of the destructive tests by the supplier on a duplicate set of sample units is encouraged, although is not required. All test data shall be submitted in duplicate.

30.3 Description of items. The supplier shall submit a detailed description of the resistors being submitted for inspection, including materials used for the resistance element and protective enclosure or coating.

TABLE XVI. Critical resistance values for qualification inspection. 1/

Style	Critical resistance value 2/
	<u>Megohm</u>
RC05	0.18
RC07	0.27
RC20	0.27
RC32	0.27
RC42	0.12

1/ Maximum continuous working voltage shall be applied (see table VI).

2/ The critical resistance value is the maximum standard resistance value which will dissipate full wattage when the maximum continuous working voltage is applied.

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CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities:

Army - AR, AT, AV, ME, MI
Navy - AS, CG, MC, OS
Air Force - 17, 19, 85
DLA - ES

Preparing activity:

Army - ER

Agent:

DLA - ES

(Project 5905-1313)

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.
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-R-11G

2. DOCUMENT DATE (YYMMDD)
14 November 1994

3. DOCUMENT TITLE

RESISTORS, FIXED, COMPOSITION (INSULATED), 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)

7. DATE SUBMITTED
(YYMMDD)

(1) Commercial

(2) AUTOVON
(if applicable)

8. PREPARING ACTIVITY

a. NAME

US Army Research Laboratory

b. TELEPHONE (Include Area Code)

(1) Commercial
(908) 554-3441/

(2) AUTOVON
995-3441/

c. ADDRESS (Include Zip Code)

Electronics and Power Sources
Directorate

ATTN: AMSRL-EP-RD
Fort Monmouth, NJ 07703-5601

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:

Defense Quality and Standardization Office
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
Telephone (703) 756-2340 AUTOVON 289-2340