REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVAL
---	Original Release	01/07/91	
A	Complete Rewrite per RN A-108	07/02/96	
B	Incorporated Changes per RN A-122	07/05/01	Vinod Patel

SHEET REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REV	B	A	B	A	A	B	A	B	B	A	A	A	B			-				
SH	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
REV																				

ORIGINATOR: T. J. Perry/Unisys	**DATE** 11/16/90	**FSC:** 5905
APPROVED: M. A. Garrison/Unisys	11/16/90	
CODE 311 APPROVAL: P. J. Jones/GSFC	1/3/91	Resistor, Fixed, Precision High Voltage (Caddock Type MG and HG)
CODE 311 SUPERVISORY APPROVAL: D. G. Cleveland/GSFC	1/7/91	
ADDITIONAL APPROVAL:		**S-311-P-683**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND 20771

CAGE CODE: 25306

1. SCOPE

1.1 Scope. This specification covers the procurement requirements for fixed, metal oxide, precision high voltage resistors. These resistors are intended for use in GSFC space system electronic circuits requiring high voltages and high resistance values with good stability.

1.2 Goddard part number. Parts procured in complete compliance with the requirements of this specification shall be identified by a Goddard part number of the following form.

G311P683	-750	1006	D
Goddard Designator	Style (See 1.3)	Resistance Value (See 1.4)	Tolerance (See 1.5)

1.3 Style. The style shall be identified by the first three digits of the dash number and specifies resistors of a type and size listed in Figure 1 and Table I.

1.4 Resistance value. The nominal resistance value is specified by the four digits in the fourth, fifth, sixth, and seventh positions of the dash number. The first three digits (fourth, fifth, and sixth) represent significant figures, the last digit (seventh) specifies the number of zeroes to follow.

example: 1006 = 100 megohm

The resistance value selected may be any value within the standard resistance range listed in Table I.

1.5 Tolerance. The resistance tolerance is identified by a single letter in accordance with Table II.

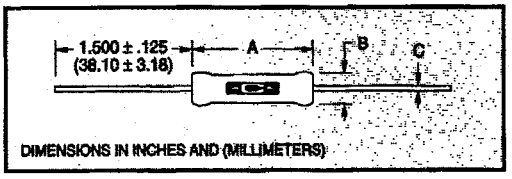

Figure 1. - Resistor outline drawing (see Table I).

Table I. - Styles.

Style 1/	Power Rating @ 125°C (watts)	Maximum Working Voltage (volts)	Tolerance 2/	Resistance 3/		Dielectric Strength (volts)	Dimensions in Inches (Millimeters)		
				Minimum	Maximum		A	B	C
650	0.50 0.25	600 300	D, F B, C	200Ω	5M	750	.313±.020 (7.95±.51)	.094±.015 (2.39±.38)	.025±.002 (.64±.05)
655	0.50 0.25	600 300	D, F B, C	200Ω	8M	750	.313±.030 (7.95±.76)	.109±.025 (2.77±.64)	.025±.002 (.64±.05)
660	0.60 0.30	1,000 500	D, F B, C	400Ω	10M	750	.500±.030 (12.70±.76)	.094±.015 (2.39±.38)	.025±.002 (.64±.05)
680	0.80 0.40	2,000 1,000	D, F B, C	600Ω	20M	750	.750±.030 (19.05±.76)	.094±.015 (2.39±.38)	.025±.002 (.64±.05)
710	1.0 0.5	4,000 2,000	D, F B, C	800Ω	50M	750	1.000±.040 (25.40±1.02)	.094±.015 (2.39±.38)	.025±.002 (.64±.05)
712	0.60 0.30	1,000 500	D, F B, C	800Ω	20M	750	.400±.060 (10.16±1.52)	.140±.030 (3.56±.76)	.025±.002 (.64±.05)
714	1.0 0.5	1,000 500	D, F B, C	200Ω	20M	750	.562±.060 (14.27±1.52)	.150±.030 (3.81±.76)	.032±.002 (.81±.05)
715	1.0 0.5	2,000 1,000	D, F B, C	400Ω	50M	750	.750±.060 (19.05±1.52)	.140±.030 (3.56±.76)	.025±.002 (.64±.05)
716	1.5 0.75	4,000 2,000	D, F B, C	600Ω	75M	750	1.000±.060 (25.40±1.52)	.140±.030 (3.56±.76)	.025±.002 (.64±.05)
717	1.5 0.75	2,000 1,000	D, F B, C	600Ω	75M	750	0.710±.050 (18.03±1.27)	.240±.030 (6.10±.76)	.040±.002 (1.02±.05)
720	2.0 1.0	6,000 3,000	D, F B, C	1kΩ	150M	750	1.500±.080 (38.10±2.03)	.140±.030 (3.56±.76)	.025±.002 (.64±.05)
721	2.0 1.0	4,000 2,000	D, F B, C	200Ω	100M	750	1.000±.050 (25.40±1.27)	.240±.030 (6.10±.76)	.040±.002 (1.02±.05)
725	2.5 1.25	10,000 5,000	D, F B, C	1.5kΩ	200M	750	2.000±.080 (50.80±2.03)	.140±.030 (3.56±.76)	.025±.002 (.64±.05)
730	3.0 1.5	6,000 3,000	D, F B, C	500Ω	250M	1,000	1.500±.080 (38.10±2.03)	.240±.030 (6.10±.76)	.040±.002 (1.02±.05)
731	2.6 1.3	4,000 2,000	D, F B, C	200Ω	150M	1,000	1.000±.060 (25.40±1.52)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
735	3.6 1.8	10,000 5,000	D, F B, C	750Ω	300M	1,000	2.000±.080 (50.80±2.03)	.240±.030 (6.10±.76)	.040±.002 (1.02±.05)
740	3.6 1.8	6,000 3,000	D, F B, C	300Ω	300M	1,000	1.500±.060 (38.10±1.52)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
745	5.0 2.5	15,000 7,500	D, F B, C	1kΩ	500M	1,000	3.000±.100 (76.20±2.54)	.240±.030 (6.10±.76)	.040±.002 (1.02±.05)
750	5.0 2.5	10,000 5,000	D, F B, C	400Ω	500M	1,000	2.125±.060 (53.98±1.52)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
780	7.5 3.75	15,000 7,500	D, F B, C	600Ω	750M	1,000	3.125±.060 (79.38±1.52)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
785	8.0 4.0	20,000 10,000	D, F B, C	800Ω	1,000M	1,000	4.000±.120 (101.60±3.05)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
810	10.0 5.0	25,000 12,500	D, F B, C	1kΩ	1,250M	1,000	5.000±.120 (127.00±3.05)	.315±.030 (8.00±.76)	.040±.002 (1.02±.05)
815	15.0 7.5	30,000 15,000	D, F B, C	1kΩ	2,000M	1,000	6.000±.120 (152.40±3.05)	.350±.040 (8.89±1.02)	.040±.002 (1.02±.05)

1/ See 6.1
2/ See 1.5
3/ M = megohm

Table II. - Resistance tolerance.

Letter	Resistance Tolerance
B	± 0.1%
C	± 0.25%
D	± 0.5%
F	± 1%

1.6 Temperature characteristic. The resistance temperature characteristic is independent of style or resistance value within the given standard resistance ranges (see Table I). The temperature characteristic is listed in Table III.

Table III. - Temperature characteristic.

Temperature Range	Temperature Characteristic (referenced at +25°C)
+15°C to +45°C	± 40 ppm/°C
-15°C to +105°C	± 80 ppm/°C
-55°C to +125°C	± 140 ppm/°C

1.7 Performance characteristics. The performance of resistors procured to this specification shall be as specified in Table IV.

2. APPLICABLE DOCUMENTS

2.1 Documents. The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MIL-I-45208	Inspection Systems Requirements
MIL-R-39032	Resistors, Packaging of
QQ-S-571	Solder; Tin Alloy, Tin-Lead Alloy, and Lead Alloy

STANDARDS

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-1285	Marking of Electrical and Electronic Parts

Table IV. - Performance characteristics.

Test	All Styles
Thermal Shock (see 3.5)	ΔR ± 0.25%
Dielectric Withstanding Voltage (see 3.6)	ΔR ± 0.15%
Insulation Resistance (see 3.7)	10,000 MEG (min) dry
Overload/Overvoltage (see 3.8)	ΔR ± 0.50%
Voltage Conditioning (see 3.9)	ΔR ± 0.50%
Load Life (see 3.10)	ΔR ± 0.50%
Shock (see 3.12)	ΔR ± 0.25%
Vibration (see 3.13)	ΔR ± 0.25%
Terminal Strength (see 3.15)	ΔR ± 0.20%

OTHER PUBLICATIONS

ASTM E595	Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment, Standard Test Method for
SP 270-02 (Caddock)	Test Methods and Screening Procedure for Type HG, HG(-15), HM, HS, and HV Resistors
GSFC S-311-533	Screening Procedure for Fixed Film, Precision High Voltage, High Impedance Resistors Caddock MG Style

2.2 Order of precedence. In the event of any conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. However, nothing in this text shall supersede applicable laws and regulations unless a specific exemption has been obtained.

2.3 Copies of documents. Copies of federal and military documents can be obtained from the Standardization Document Order Desk, 700 Robbins Avenue, Building #4-Section D, Philadelphia, PA 19111-5094. Copies of ASTM publications are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

3. REQUIREMENTS

3.1 Qualification. Resistors furnished to this specification shall be product which has been granted qualification approval by NASA/GSFC. Qualification approval shall be based on the following criteria.

3.1.1 Design and source approval. Prior to qualification, the manufacturer's facility shall be subjected to survey at the option of GSFC. Compliance with MIL-I-45208 is required. In addition, the history and detailed engineering of the specific resistor design will be reviewed, as will the documented manufacturing and quality control procedures. Only those sources approved in the design and source approval phase shall be eligible for qualification or award of contract under this specification. Source approval and design approval do not constitute part qualification or an equivalent thereof.

3.1.2 Part qualification. Resistor product granted qualification shall be that which has passed the qualification inspection requirements of this specification. This requirement may be satisfied by passing the qualification inspection (see 4.4).

3.2 Materials.

3.2.1 Materials. Materials 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 requirement of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of finished product.

3.2.2 Thermal outgassing. Materials must meet outgassing requirements of 1.0% total mass loss (TML) maximum and 0.1% collected volatile condensable materials (CVCM) maximum when tested in accordance with 4.6.15.

3.3 Design and construction. Resistors shall be of the design, construction and dimensions depicted in Figure 1.

3.3.1 Terminal leads. Terminal leads shall consist of nickel plated, oxygen-free, solid copper conductors covered with a hot solder finish (Type S, 60/40 or 63/37 per QQ-S-571) to meet the solderability requirement (see 4.6.14).

3.3.2 Insulation. Resistors shall be coated with a high temperature silicone conformal coating to provide suitable protection to the resistor body.

3.3.3 Resistance material. The metal oxide shall be uniformly deposited and free of blisters, thin spots, discolorations or any other types of anomalies likely to cause chips, pits, or voids when parts are abrasively tailored.

3.3.4 End caps. The misalignment of the cap with respect to the core shall not exceed 5 degrees.

3.3.5 Power rating. Power rating is based on continuous full load operation at a rated ambient temperature of ±125°C as specified in Table I. For higher temperatures, derating shall be in accordance with Figure 2.

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

$$E = \sqrt{PR}$$

Where:

E = rated dc or rms continuous working voltage
P = power rating (see 3.3.5)
R = nominal resistance

In no case shall the rated dc or rms continuous working voltage exceed the value specified in Table I.

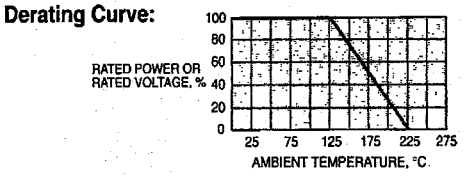

Figure 2. - Resistor derating.

3.4 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.

3.5 Thermal shock. When resistors are tested as specified in 4.6.3, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed the performance requirement in Table IV.

3.6 Dielectric withstanding voltage. When resistors are tested as specified in 4.6.4, there shall be no evidence of flashover, arcing, insulation breakdown, or any type of mechanical damage. The change in resistance shall not exceed the performance requirement in Table IV.

3.7 Insulation resistance. When resistors are tested as specified in 4.6.5, the insulation resistance shall meet the performance requirement in Table IV.

3.8 Overload/overvoltage. When resistors are tested as specified in 4.6.6, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed the performance requirement in Table IV.

3.9 Voltage conditioning. When resistors are tested as specified in 4.6.7, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed the performance requirement in Table IV.

3.10 Load life. 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 exceed the performance requirement in Table IV.

3.11 Resistance temperature characteristic. When resistors are tested as specified in 4.6.9, the resistance temperature characteristic shall meet the requirements in Table III.

3.12 Shock. When resistors are tested as specified in 4.6.10, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed the performance requirement in Table IV.

3.13 Vibration. When resistors are tested as specified in 4.6.11, there shall be no evidence of mechanical damage, and the change in resistance shall not exceed the performance requirement in Table IV.

3.14 Resistance to solvents. When resistors are tested as specified in 4.6.12, there shall be no evidence of mechanical damage, and the marking shall remain legible.

3.15 Terminal strength. 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 exceed the performance requirement in Table IV.

3.16 Solderability. When resistors are tested as specified in 4.6.14, the criteria for wire-lead terminal evaluation that is contained in the referenced test method shall be met.

3.17 Marking. Each resistor shall be marked with the Goddard part number, source code, manufacturer's name or symbol (optional), and date code. Date and source code shall be in accordance with MIL-STD-1285. The location and number of lines shall be at the discretion of the manufacturer. The following is an example of the complete marking:

Caddock	-	Manufacturer's name or symbol (optional)
19647	-	Source code
G311P683	-	Goddard designator
7501006D	-	Style, resistance value and tolerance
9626	-	Date code

The date code shall be the date of the final assembly operation for the production lot, which for purposes of this specification, is the same as the inspection lot (4.5.2). The common manufacturing record shall include the same date code as that placed on parts covered by the record. When the physical size of the resistor precludes the marking of all of the above information, the Goddard designator may be abbreviated to P683. However, the complete part number must be marked on the shipping container.

3.18 Workmanship. Resistors shall be processed in such a manner to be uniform in quality when inspected in accordance with 4.6.1. Resistors shall also be free of any defects affecting life, serviceability or performance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. The manufacturer is responsible for the performance of all inspection requirements, as specified herein, using his own or any other suitable facility acceptable to Goddard Space Flight Center unless specifically stated otherwise. In instances where the manufacturer does not possess the necessary test equipment or facilities to perform a test, GSFC may elect to perform the test. Upon receipt of product, Goddard reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to verify conformance to prescribed requirements.

4.2 Classification of inspection. 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 herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.4 Qualification inspection (see 4.2). Qualification inspection shall be performed by the manufacturer on sample units produced with equipment, processes and procedures normally used in production. At the option of the qualifying activity, data from an established reliability program subjecting same or similar parts to equivalent or more stringent testing may be submitted for part or all of the qualification requirements.

4.4.1 Sample. The number of sample units comprising a sample of resistors submitted for qualification inspection shall be 75.

4.4.2 Sample selection. Sample units submitted for qualification shall consist of 25 high, 25 critical, and 25 low resistance values. The high and low values submitted will determine the range of resistance values qualified. Critical values permit testing at both full rated power and full rated voltage and are determined by solving the formula in 3.3.6 for R using E at maximum working voltage and P at power rating per Table I. Qualification of resistors to tolerance code D (± 0.5%) also qualifies tolerance code F (± 1%), to tolerance code B (± 0.1%) also qualifies tolerance code C (± 0.25%).

4.4.3 Test routine. Sample units shall be subjected to the qualification inspection specified in Table V in the order shown. All sample units will be subjected to the inspections of Group 1. The samples shall then be subdivided as specified in Table V and subjected to the inspections of Groups 2 through 7.

4.4.4 Failures. Failures in excess of those allowed in Table V shall be cause for refusal to grant qualification.

4.4.5 Inspection report. Qualification test data and the qualification test samples shall be submitted to the following activity:

NASA/GSFC
Greenbelt, MD 20771
Attn: QPLD Administrator
Code 562

4.5 Quality conformance inspection (see 4.2). Quality Conformance Inspection (QCI) shall be performed on all product furnished to this specification.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the QCI per Table VI in the order shown.

4.5.2 Inspection lot. An inspection lot shall consist of all resistor product of the same style, resistance value and tolerance, manufactured at essentially the same time under the same manufacturing process conditions and identified by a common date code (see 3.17).

Table V. - Qualification inspection.

Inspection	Requirement Paragraph	Method Paragraph	Number of Sample Units	Number of Defects Allowed 1/
Group 1				
Visual and Mechanical	3.2.1, 3.3, 3.3.1, 3.17, 3.18	4.6.1	All Samples	0
DC Resistance	3.4 3.9	4.6.2		
Voltage Conditioning		4.6.7		
Group 2				
Solderability	3.16	4.6.14	12 Units	1
Resistance to Solvents	3.14	4.6.12	Any Value	
Group 3				
Thermal Shock	3.5	4.6.3	15 2/	1
Terminal Strength	3.15	4.6.13		
Group 4				
Dielectric Withstanding Voltage	3.6	4.6.4	15 2/	1
Insulation Resistance	3.7	4.6.5		
Overload/Overvoltage	3.8	4.6.6		
Thermal Shock	3.5	4.6.3		
Group 5				
Load Life	3.10	4.6.8	15 2/	1
Resistance Temp. Characteristic	3.11	4.6.9		
Group 6				
Shock	3.12	4.6.10	15 2/	1
Vibration	3.13	4.6.11		
Group 7				
Thermal Outgassing	3.2.2	4.6.15	3 Any Value	0

1/ The aggregate total shall not exceed 2 defective units for the qualification samples.
2/ Sample selection of 5 high, 5 critical, and 5 low resistance values as specified in 4.4.2.

4.5.3 Sample. The QCI shall be performed on 100% of the product furnished to this specification.

4.5.4 Failures. Resistors that do not pass the QCI shall be removed from the inspection lot and shall not be furnished to this specification.

4.5.5 Lot rejection. Only lots containing not more than 15% rejects shall be furnished to this specification.

4.5.6 Inspection record. The manufacturer shall be required to maintain a record of all QCI inspection results (see 4.5.7).

Table VI. - Quality conformance inspection.

Inspection	Requirement Paragraph	Method Paragraph	Criteria
Workmanship	3.18	4.6.1	As stated
DC Resistance	3.4	4.6.2	As stated
Overload/Overvoltage	3.8	4.6.6	
DC Resistance	3.4	4.6.2	ΔR per Table IV
Voltage Conditioning	3.9	4.6.7	
DC Resistance	3.4	4.6.2	ΔR per Table IV
Insulation Resistance	3.7	4.6.5	Table IV

4.5.7 Retention of qualification. As a basis for retention of qualification, the manufacturer shall be requested to furnish a summary of QCI inspection results annually. The test summary shall be submitted to the activity specified in 4.4.5.

4.6 Methods of inspection.

4.6.1 Visual and mechanical inspection (see 3.2.1, 3.3, 3.3.1, 3.17 and 3.18). Resistors shall be examined to verify that materials, design, construction, physical dimensions, marking and workmanship are in accordance with the applicable requirements.

4.6.2 DC resistance (see 3.4). Resistors shall be tested in accordance with Method 303 of MIL-STD-202. The applicable test voltage shall not exceed 100 vdc.

4.6.3 Thermal shock (see 3.5). Resistors shall be tested in accordance with Method 107 of MIL-STD-202 at Test Condition C.

4.6.4 Dielectric withstanding voltage (see 3.6). Resistors shall be tested in accordance with Method 301 of MIL-STD-202. The applicable test voltage shall be as Specified in Table I. The test voltage shall be applied between a conductive foil at circuit ground, that is wrapped around the resistor body, and the lead wires electrically shorted together.

4.6.5 Insulation resistance (see 3.7). Resistors shall be tested in accordance with Method 302 of MIL-STD-202 at Test Condition A.

4.6.6 Overload/overvoltage (see 3.8).

4.6.6.1 Tolerance codes D (0.5%) and F (1%). Resistors shall be subjected to 5 times rated power (see 3.3.5) with applied voltage not to exceed 1.5 times maximum working voltage (see 3.3.6) for 5 seconds. Refer to Table I for applicable power and voltage ratings.

4.6.6.2 Tolerance codes B (0.1%) and C (0.25%). The load applied during overload/overvoltage shall be 2 times rated power with applied voltage not to exceed 2 times maximum working voltage (see 3.3.6) for 5 seconds. Refer to Table I for applicable power and voltage ratings.

4.6.7 Voltage conditioning (see 3.9). Resistors may be mounted in any position in a chamber at a controlled test ambient temperature of +125°C (±2°C). The load applied shall be the maximum rated power (see 3.3.5) not to exceed maximum working voltage (see 3.3.6). The applied voltage may be dc or rms ac and shall be cycled 90 minutes on, 30 minutes off for a duration of 100 hours minimum. [Note that power and voltage ratings for tolerance codes D (0.5%) and F (1%) differ from tolerance codes B (0.1%) and C (0.25%). Refer to Table I for the applicable ratings.]

4.6.8 Load life (see 3.10). Resistors may be mounted in any position in a chamber at a controlled test ambient temperature of +125°C (±2°C). The load applied shall be the maximum rated power (see 3.3.5) not to exceed maximum working voltage (see 3.3.6) for a continuous duration of 1000 hours. DC resistance shall be measured and recorded prior to the beginning of the life test and at 100, 250, 500 and 1000 hours. The change in resistance at any interval shall not exceed the requirement in Table IV. [Note that power and voltage ratings for tolerance codes D (0.5%) and F (1%) differ from tolerance codes B (0.1%) and C (0.25%). Refer to Table I for the applicable ratings.]

4.6.9 Resistance temperature characteristic (see 3.11). Resistors shall be tested in accordance with Method 304 of MIL-STD-202 except as modified herein. The first series of standard test temperatures shall be 25°C, 0°C, -15°C, and -55°C; the second series shall be 25°C, 50°C, 75°C, 105°C and 125°C.

4.6.10 Shock (see 3.12). Resistors shall be tested in accordance with Method 213 of MIL-STD-202 at Test Condition I.

4.6.11 Vibration (see 3.13). Resistors shall be tested in accordance with Method 204 of MIL-STD-202 at Test Condition D.

4.6.12 Resistance to solvents (see 3.14). Resistors shall be tested in accordance with Method 215 of MIL-STD-202.

4.6.13 Terminal strength (see 3.15). Resistors shall be tested in accordance with Method 211 of MIL-STD-202 at Test Conditions A and D except as follows: the applicable applied force for Test Condition A shall be 2.5 pounds.

4.6.14 Solderability (see 3.16). Resistors shall be tested in accordance with Method 208 of MIL-STD-202.

4.6.15 Thermal outgassing (see 3.2.2). Resistors shall be tested in accordance with ASTM E595.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-R-39032.

6. NOTES

6.1 Style numbers. Style numbers correspond to Caddock's model numbers for Type MG or Type HG (high reliability) precision high voltage resistors. Parts in this specification are recommended replacements for either type since QCI combines the requirements in GSFC S-311-533 and those imposed in Caddock Quality Control Procedure SP270-02.

6.2 Inductance considerations. All resistor styles provided to this specification are manufactured using resistance patterns referred to by Caddock as the "non-inductive" construction which minimize the inductance of the component. Users who consult Caddock's data sheets for this device type will note that the commercial version of the smaller styles (650, 655, 660 and 680) may be supplied with a "low-inductance" construction. However, all parts ordered per this S311 specification will be manufactured using the "non-inductive" construction only. For further information, consult the manufacturer's catalog or contact Caddock Electronics, Incorporated, 1717 Chicago Avenue, Riverside, CA 92507-2364.

6.3 Ordering data. Acquisition documents should specify the following:

a. Number, title, and revision of this specification.
b. Goddard Part Number
c. Quantity

6.4 Qualification provisions. With respect to product requiring qualification, awards will be made only for product which have been tested and approved by GSFC before the time for opening of bids. The attention of the suppliers is called to the following requirement: manufacturers should arrange to have qualification tests made on product which they propose to offer to GSFC to become eligible for awards of contracts or orders for product covered by this specification. The manufacturer shall bear the cost of qualification inspection to this specification. Information pertaining to qualification of product may be obtained from the activity whose address is listed in 4.4.5.

6.5 NOTICE. When GSFC drawings, specifications, or other data are sent for any purpose other than in connection with a definitely related GSFC procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever. The fact that GSFC might have formulated, furnished or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any person or corporation, or conveying any right or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

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Greenbelt, MD 20771

Attn: Document Administrator Code 562

1. DISTRIBUTION	NAME CODE	NAME CODE		1. RN NUMBER
	Vinod Patel/562	Jay Brusse (QSS Group)/562	NASA COMPONENT TECHNOLOGIES AND RADIATION EFFECTS BRANCH (CTRE) CODE 562	A-122
	Peter Jones/562			
	Michael Sampson/306			
	Tom Perry (QSS Group)/562			

3. SPECIFICATION NUMBER	S-311-P-683	4. REVISION	A
5. SPECIFICATION TITLE	Resistor, Fixed, Precision High Voltage (Caddock Type MG and HG)		

6. ACTIONS

Page 1: Change FSC: from "5095" to "5905"
Rationale: Typographical error

Page 3: For Style 655 Change the B dimension from "0.109 ± 0.015 (2.77 ± 0.38)" to "0.109 ± 0.025 (2.77 ± 0.64)"
Rationale: Manufacturer indicates that the tolerance needs to be relaxed based on their production process capabilities

Page 3: Remove reference to Note 4 in five places
Rationale: Manufacturer stipulates that ALL resistor styles supplied to this specification (now including styles 650, 655, 660 and 680) use resistance patterns which minimize the inductance of the component.

Page 6: Remove phrase "by the Office of Flight Assurance, GSFC"
Rationale: manufacturer survey may be performed by different GSFC organizations.

SEE CONTINUATION SHEET FOR ADDITIONAL CHANGES

7. REASON	See Block 6 for Rationale of Changes		
8. ORIGINATOR EXT. DATE Jay Brusse/QSS Group, Inc. June 13, 2001 301-286-2019 Jay a. Brusse		10. APPROVALS A. CODE 562 DATE Vinod Patel 7/10/01	
9. REV TO B		B. CODE 562 CONFIGURATION CONTROL DATE Pete Jones 7/10/01	
Form 562-PG-8700.2.7.3	Goddard Space Flight Center Greenbelt, MD 20771	11. VAULT ADMINISTRATOR Jay a Brusse	12. REL DATE 7/10/01