NOTICE OF CHANGE

INCH-POUND

MIL-STD-202G
NOTICE 1
18 July 2003

DEPARTMENT OF DEFENSE

TEST METHOD STANDARD
ELECTRONIC AND ELECTRICAL COMPONENT PARTS

TO ALL HOLDERS OF MIL-STD-202G:

1. THE FOLLOWING PAGES OF MIL-STD-202G HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

METHOD	NEW PAGE	DATE	SUPERSEDED PAGE	DATE
	7	18 July 2003	7	8 February 2002
106G	1	8 February 2002	1	REPRINTED WITHOUT CHANGE
106G	2	18 July 2003	2	8 February 2002
107G	3	28 March 1984	3	REPRINTED WITHOUT CHANGE
107G	4	18 July 2003	4	28 March 1984
112E	7	18 July 2003	7	11 October 1988
112E	8	11 October 1988	8	REPRINTED WITHOUT CHANGE

2. THE FOLLOWING TEST METHODS OF MIL-STD-202G HAVE BEEN REVISED AND SUPERSEDE THE TEST METHODS LISTED:

NEW METHOD	DATE	SUPERSEDED METHOD	DATE
303A	18 July 2003	303	6 February 1956
305A	18 July 2003	305	24 October 1956

3. RETAIN THIS NOTICE PAGE AND INSERT BEFORE THE TABLE OF CONTENTS.

4. Holders of MIL-STD-202G will verify that the changes indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the standard is completely revised or canceled.

5. The margins of this notice are marked with asterisks to indicate where changes were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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

Preparing activity:
DLA - CC

(Project 59GP-0186)

Review activities:
Army - AR, AT, AV, CR4, MI, SM, TE
Navy - AS, OS, SH
Air Force - 19, 99
NSA - NS

AMSC N/A

FSC 59GP

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NUMERICAL INDEX OF TEST METHODS

	Test Method Number	Date	Title	
			Environmental tests (100 class)	
	101E	8 February 2002	Salt atmosphere (corrosion)	(formerly called salt spray)
	102A	Cancelled	Superseded by Method 107	(see note on Method 102)
	103B	12 September 1963	Humidity (steady state)	
	104A	24 October 1956	Immersion	
	105C	12 September 1963	Barometric pressure (reduced)	
	106G	8 February 2002	Moisture resistance	
	107G	28 March 1984	Thermal shock	
	108A	12 September 1963	Life (at elevated ambient temperature)	
	109C	8 February 2002	Explosion	
	110A	16 April 1973	Sand and dust	
	111A	16 April 1973	Flammability (external flame)	
	112E	11 October 1988	Seal	
			Physical characteristics tests (200 class)	
	201A	24 October 1956	Vibration	
	202D	Cancelled	Superseded by Method 213	(see note on Method 202)
	203C	8 February 2002	Random drop	
	204D	1 April 1980	Vibration, high frequency	
	205E	Cancelled	Superseded by Method 213	(see note on Method 205)
	206	12 September 1963	Life (rotational)	
	207B	8 February 2002	High-impact shock	
	208H	31 January 1996	Solderability	
	209	18 May 1962	Radiographic inspection	
	210F	8 February 2002	Resistance to soldering heat	
	211A	14 April 1969	Terminal strength	
	212A	16 April 1973	Acceleration	
	213B	16 April 1973	Shock (specified pulse)	
	214A	28 March 1984	Random vibration	
	215K	8 February 2002	Resistance to solvents	
	216	Cancelled	Superseded by Method 210	(see note on Method 216)
	217A	8 February 2002	Particle impact noise detection (PIND)	
			Electrical characteristics tests (300 class)	
	301	6 February 1956	Dielectric withstanding voltage	
	302	6 February 1956	Insulation resistance	
*	303A	18 July 2003	DC resistance	
	304	24 October 1956	Resistance temperature characteristic	
*	305A	18 July 2003	Capacitance	
	306	24 October 1956	Quality factor (Q)	
	307	24 October 1956	Contact resistance	
	308	29 November 1961	Current-noise test for fixed resistors	
	309	27 May 1965	Voltage coefficient of resistance determination procedure	
	310	20 January 1967	Contact-chatter monitoring	
	311	14 April 1969	Life, low level switching	
	312	16 April 1973	Intermediate current switching	

METHOD 106G

MOISTURE RESISTANCE

1. PURPOSE. The moisture resistance test is performed for the purpose of evaluating, in an accelerated manner, the resistance of component parts and constituent materials to the deteriorative effects of the high-humidity and heat conditions typical of tropical environments. Most tropical degradation results directly or indirectly from absorption of moisture vapor and films by vulnerable insulating materials, and from surface wetting of metals and insulation. These phenomena produce many types of deterioration, including corrosion of metals, physical distortion and decomposition of organic materials, leaching out and spending of constituents of materials; and detrimental changes in electrical properties. This test differs from the steady-state humidity test (method 103 of this standard) and derives its added effectiveness in its employment of temperature cycling, which provides alternate periods of condensation and drying essential to the development of the corrosion processes and, in addition, produces a "breathing" action of moisture into partially sealed containers. Increased effectiveness is also obtained by use of a higher temperature, which intensifies the effects of humidity. The test includes low temperature and vibration subcycles (when applicable, see 3.4.2) that act as accelerants to reveal otherwise indiscernible evidence of deterioration since stresses caused by freezing moisture and accentuated by vibration tend to widen cracks and fissures. As a result, the deterioration can be detected by the measurement of electrical characteristics (including such tests as dielectric withstanding voltage and insulation resistance) or by performance of a test for sealing. Provision is made for the application of a polarizing voltage across insulation to investigate the possibility of electrolysis, which can promote eventual dielectric breakdown. This test also provides for electrical loading of certain components, if desired, in order to determine the resistance of current-carrying components, especially fine wires and contacts, to electro-chemical corrosion. Results obtained with this test are reproducible and have been confirmed by investigations of field failures. This test has proven reliable for indicating those parts which are unsuited for tropical field use.

2. APPARATUS.

2.1 Chamber. A test chamber shall be used which can meet the temperature and humidity cycling specified on figure 106-1. The material used to fabricate the platforms and standoffs, which support the specimens, shall be non-reactive in high humidity. Wood or plywood shall not be used because they are resiniferous. Materials shall not be used if they contain formaldehyde or phenol in their composition. Provisions shall be made to prevent condensate from the chamber ceiling dripping onto the test specimens.

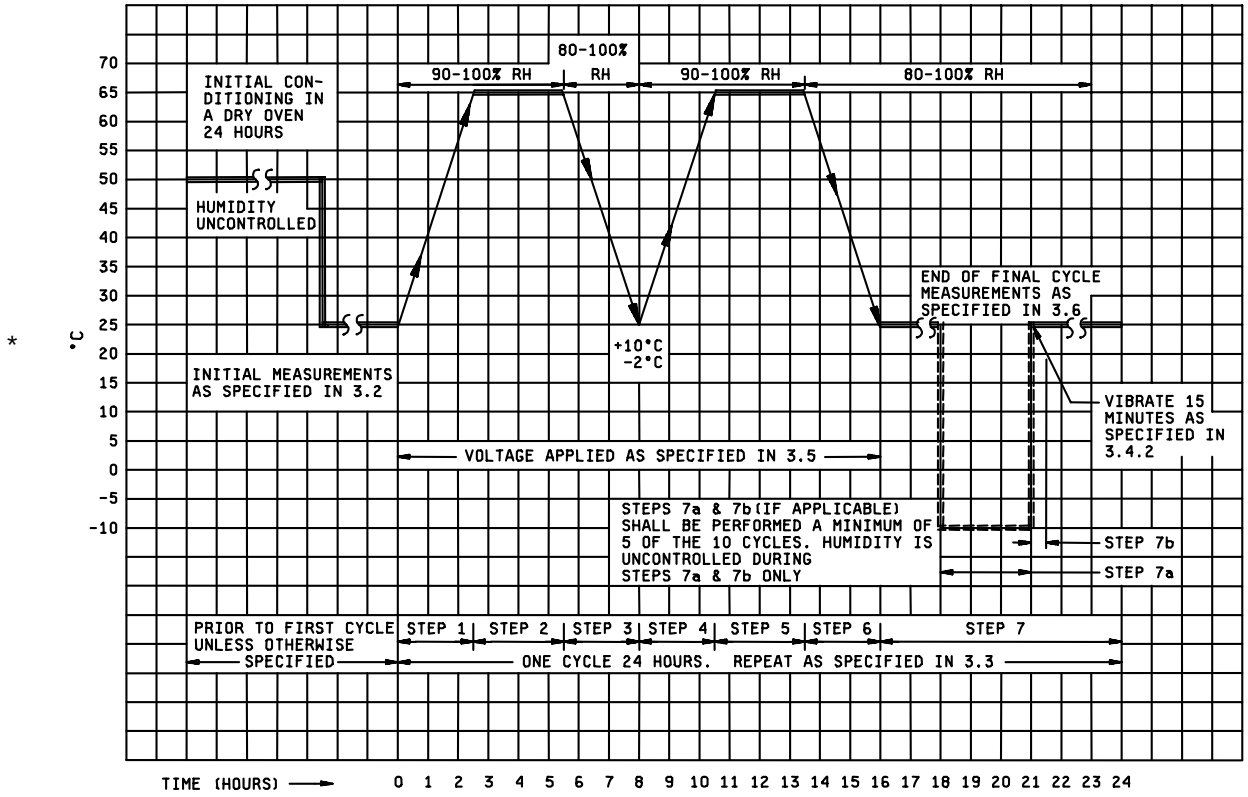
2.1.1 Opening of the chamber door. During the periods when the humidity is ascending or descending, the chamber door should not be opened. If the chamber door must be opened, it should be opened during the 16th hour through the 24th hour of an individual cycle. While the chamber is at 25°C (77°F), and the relative humidity tolerance must be maintained, the chamber door should be opened only for a short period of time.

2.1.2 Water. Steam, or distilled and demineralized, or deionized water, having a pH value between 6.0 and 7.2 at 23°C (73.4°F) shall be used to obtain the specified humidity. No rust or corrosive contaminants shall be imposed on the test specimens by the test facility.

3. PROCEDURE.

3.1 Mounting. Specimens shall be mounted by their normal mounting means, in their normal mounting position, but shall be positioned so that they do not contact each other, and so that each specimen receives essentially the same degree of humidity.

3.2 Initial measurements. Prior to step 1 of the first cycle, the specified initial measurements shall be made at room ambient conditions, or as specified.



NOTES:

1. Allowance of 100 percent RH is intended to avoid problems in reading values close to 100 percent RH, but actual chamber operation shall be such so as to avoid condensation.
2. Unless otherwise specified, the steady state temperature tolerance is ±2°C at all points within the immediate vicinity of the specimens and the chamber surfaces.
3. Rate of change of temperature is unspecified; however, specimens shall not be subjected to radiant heat from chamber-conditioning processes.
4. Circulation of air in the chamber shall be at a minimum cubic rate per minute equivalent to 5 times the volume of the chamber.

FIGURE 106-1. Graphical representation of moisture-resistance test.

TABLE 107-II. Exposure time in air at temperature extremes.

Weight of specimen	Minimum time (for steps 1 and 3)
	Hours
1 ounce (28 grams and below)	1/4 (or as specified)
Above 1 ounce (28 grams) to .3 pound (136 grams), inclusive	½
Above .3 pounds (136 grams) to 3 pounds (1.36 kilograms), inclusive	1
Above 3 pounds (1.36 kilograms) to 30 pounds (13.6 kilograms), inclusive	2
Above 30 pounds (13.6 kilograms) to 300 pounds (136 kilograms), inclusive	4
Above 300 pounds (136 kilograms)	8

TABLE 107-III. Thermal shock conditions (liquid).

Step	Test condition	Number of cycles		Test condition	Number of cycles		Test condition	Number of cycles		Test condition	Number of cycles
	AA	5		BB	5		CC	5		DD	5
	AA-1	15		BB-1	15		CC-1	15		DD-1	15
	AA-2	25		BB-2	25		CC-2	25		DD-2	25
	Temperature	Time		Temperature	Time		Temperature	Time		Temperature	Time
	°C			°C			°C			°C	
1	-0 +2, -10	See table 107-V		-65 +0, -10	See table 107-V		-65 +0, -10	See table 107-V		-65 +0, -10	See table 107-V
2	100 +10, -2	See table 107-V		125 +10, -0	See table 107-V		150 +10, -0	See table 107-V		200 +10, -0	See table 107-V

TABLE 107-IV. Suggested thermal fluids. 1/ 2/

Test condition	AA, AA-1, AA-2 fluids	BB, BB-1, BB-2 Fluids	CC, CC-1, CC-2 fluids	DD, DD-1, DD-2 fluids
Step 1	FC40 4/ or Water 3/ D02, D02-TS, D/80 } 6/	FC77 4/ D02, D02-TS, D/80 } 6/	FC77 4/ D02, D02-TS, D/80 } 6/	FC77 4/ D02, D02-TS, D/80 } 6/
Step 2	FC40 4/ Water 3/ D02, D02-TS, D03 } 6/	FC70, FC40 } 4/ UCON-WS 5/ D02, D02-TS, D03 } 6/	FC70, FC40 } 4/ UCON-WS 5/ D02, D02-TS, D03 } 6/	FC70 4/ UCON-WS } 5/ D05, LS/230, LS/215 } 6/

1/ See 2.2.

2/ Ethylene glycol shall not be used as a thermal shock test fluid.

3/ Tap water is indicated as an acceptable fluid for this temperature range. Its suitability chemically shall be established prior to use. A mixture of water and alcohol may be used to prevent freezing at the low temperature extreme. The water shall not be allowed to boil at the upper temperature extreme.

4/ FC77, FC70, FC40 are the registered trademark of 3M.

5/ UCON-WS process fluid is the registered trademark of Union Carbide Corporation.

6/ D02, D02-TS, D03, D05, D/80, LS/215 and LS/230 are the registered trademark of Ausimont (Division of Montedison).

TABLE 107-V. Exposure time in liquid at temperature extremes.

Weight of specimen	Minimum time (for steps 1 and 2)
	Minutes
.05 ounce (1.4 grams) and below	½
Above .05 ounce (1.4 grams) to .5 ounce (14 grams)	2
Above .5 ounce (14 grams) to 5 ounces (140 grams)	5

*

Supersedes page 4 of MIL-STD-202G

5.4.3.2.1 Procedure IIIa. The device(s) shall be tested using the appropriate conditions specified in table I for the internal cavity volume of the package under test. The time (t) is the time under pressure and time (t_z) is the maximum time allowed after release of pressure before the device(s) shall be read. This method shall not be used if the maximum equivalent standard leak rate limit given in the procurement document is less than the limits specified herein for procedure IIIc. Upon completion of this procedure, the specimen shall be checked for gross leaks by subjecting the specimen either to test condition A, B, or D. Water, at room ambient temperature and a pressure of 2.5 inches (63.5 mm) of mercury, may be used in place of silicone oil, if test condition B is used to verify gross leaks.

TABLE I. Fixed conditions procedure IIIa.

	Volume of package (cm^3)	Bomb condition			R1 Reject limit (atm cm^3/s He)
		1bf/in^2 gage	Exposure time hours	Maximum dwell hours	
	V < 0.40	60 ±2	2 +0.2, -0	1	5×10^{-8}
	V ≥ 0.40	60 ±2	2 +0.2, -0	1	2×10^{-7}
*	V ≥ 0.40	30 ±2	4 +0.4, -0	1	1×10^{-7}

5.4.3.2.2 Procedure IIIb.

5.4.3.2.2.1 Activation parameters. The activation pressure and soak time shall be determined in accordance with the following equation:

$$Q_S = \frac{R}{skT\bar{P}t}$$

The parameters of equation (1) are defined as follows:

Q_S = The maximum calculated leak rate allowable, in atm cm^3/sKr, for the devices to be tested.

R = Counts per minute above the ambient background after activation if the device leak rate were exactly equal to Q_S. This is the reject count above the background of both the counting equipment and the component, if it has been through prior radioactive leak tests.

s = The specific activity, in microcuries per atmospheric cubic centimeter, of the krypton 85 tracer gas in the activation system.

k = The overall counting efficiency of the scintillation crystal in counts per minute per microcurie of krypton 85 in the internal void of the specific component being evaluated. This factor depends upon component configuration and dimensions of the scintillation crystal. The counting efficiency shall be determined in accordance with 5.4.3.2.2.2.

T = Soak time, in hours, that the devices are to be activated.

$\bar{P}$ = $P_e^2 - P_i^2$, where P_e is the activation pressure in atmospheres absolute and P_i is the original internal pressure of the devices in atmospheres absolute. The activation pressure (P_e) may be established by specification or if a convenient soak time (T) has been established, the activation pressure (P_e) can be adjusted to satisfy equation (1).

t = Conversion of hours to seconds and is equal to 3,600 seconds per hour.

5.4.3.2.2.2 Determination of counting efficiency (k). The counting efficiency (k) of equation in 5.4.3.2.2.1 shall be determined as follows:

a. Five representative units of the device type being tested shall be tubulated and the internal void of the device shall be backfilled through the tubulation with a known volume and known specific activity of krypton 85 tracer gas and the tubulation shall be sealed off.

b. The counts per minute shall be directly read in the shielded scintillation crystal of the counting station in which the devices are read. From this value, the counting efficiency, in counts per minute per microcurie, shall be calculated.

5.4.3.2.2.3 Evaluation of surface sorption. All device encapsulations consisting of glass, metal, and ceramic or combinations thereof, including coatings and external sealants, shall be evaluated for surface sorption of krypton 85 before establishing the leak test parameters. Representative samples of the questionable material shall be subjected to the predetermined pressure and time conditions established for the device configuration as specified by 5.4.3.2.2.1. The samples shall then be counted every 10 minutes, with count rate noted, until the count rate becomes asymptotic with time. (This is the point in time at which surface sorption is no longer a problem.) This time lapse shall be noted and shall determine the "wait time" specified in 5.4.3.2.2.4.

5.4.3.2.2.4 Specific procedure IIIb. The devices shall be placed in radioactive tracer gas activation tank. The activation chamber may be partially filled with inert material to reduce pumpdown time. The tank shall be evacuated to 0.5 torr. The devices shall be subjected to a minimum of 2 atmospheres absolute pressure of krypton 85/dry nitrogen mixture for the time necessary to satisfy the equation. Actual pressure and soak time shall be determined in accordance with 5.4.3.2.2.1. The R value in counts per minute shall be not less than 600 above ambient background. The krypton 85/dry nitrogen gas mixture shall be evacuated to storage until 0.5 torr vacuum exists in the activation tank. This evacuation shall be completed within 3 minutes maximum. The activation tank shall then be backfilled with air (air wash). The devices shall then be removed from the activation tank and leak tested within 1 hour after gas exposure with a scintillation-crystal-equipped counting station. Device encapsulations that come under the requirements of 5.4.3.2.2.3 shall be exposed to ambient air for a time not less than the "wait time" determined by 5.4.3.2.2.3. In no case will the time between removal from the activation chamber and test exceed 1 hour. This exposure shall be performed after gas exposure but before determining leak rate with the counting station. Device encapsulations that do not come under the requirements of 5.4.3.2.2.3 may be tested without a "wait time". (The number of devices removed from pressurization for leak testing shall be limited such that the test of the last device can be completed within 1 hour.) The actual leak rate of the component shall be calculated with the following equation:

$$Q = \frac{(ACTUAL\ READOUT\ IN\ NET\ COUNTS\ PER\ MINUTE)\ X\ Q_S}{R}$$

Where Q = Actual leak rate in atm cm^3/s, and Q_S and R are defined in 5.4.3.2.2.1.

Unless otherwise specified, devices that exhibit a leak rate equal to or greater than 1×10^{-8} atmospheric cubic centimeters of krypton 85 per second shall be considered a failure.

Upon completion of this procedure, the specimen shall be checked for gross leaks by subjecting the specimen either to test condition A, B, or D. Water, at room ambient temperature and a pressure of 2.5 inches (63.5 mm) of mercury, may be used in place of silicone oil, if test condition B is used to verify gross leaks.

5.4.3.2.2.5 Personnel precautions. A Nuclear Regulatory Commission (NRC) license is necessary for possession and use of the krypton 85 leak-test equipment. In the use of gas, code of Federal regulations Nuclear Regulatory Commission Rules and Regulations, Title 10, Chapters 1, 20, 30, 31, and 32 should be followed and the maximum permissible tolerance levels prescribed by the National Committee on Radiological Protection should be observed.

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METHOD 112E
11 October 1988

METHOD 303A

DC RESISTANCE

1. PURPOSE. The purpose of this test is to measure the direct-current (dc) resistance of resistors, electromagnetic windings of components, and conductors. It is not intended that this test apply to the measurement of contact resistance.

1.1. Precautions. The temperature at which the dc resistance measurement is made will affect the final value of resistance. In addition, resistance values may vary with the measuring voltage.

2. PROCEDURE. DC resistance shall be measured with a resistance bridge or other suitable test equipment. The limit of error in the bridge or other test equipment shall not exceed one-tenth of the specified tolerance on the measured resistance (for example, the limit of error in the bridge or other test equipment shall not exceed ± 0.5 percent if the specified tolerance on the measured resistance is ± 5 percent), unless otherwise specified. For inplant quality conformance testing, the accuracy of the measurement shall be such to insure that the resistance value is within the required tolerance. If a plus or minus tolerance is not specified, the limit of error in the bridge or other test equipment shall not exceed ± 2 percent. The test current through the specimen shall be as small as practical considering the sensitivity of the indicating instruments, unless the test current or voltage is specified. When it is important that the temperature of the specimen shall not rise appreciably during the measurement, the test voltage shall be applied uninterruptedly for as short a time as practicable, but in no case for more than 5 seconds, unless
* otherwise specified. Unless otherwise specified, the measurement shall be made at a temperature of 25°C ± 5°C. In the case of measurement dispute, dc resistance measurements shall be made at or corrected to 25°C**.**

3. SUMMARY. The following details are to be specified in the individual specification:

a. Limit of error of measuring apparatus, if other than one-tenth of specified tolerance (see 2).

b. Test voltage or current, if applicable (see 2).

c. Maximum period of uninterrupted test-voltage application, if other than 5 seconds (see 2).

* d. Test temperature, if other than that specified (see 2).

METHOD 305A

CAPACITANCE

1. PURPOSE. The purpose of this test is to measure the capacitance of component parts. Preferred test
* frequencies for this measurement are 60 Hz, 100 Hz, 120 Hz, 1 kHz, 100 kHz, and 1 MHz.

2. PROCEDURE. The capacitance of the specimen shall be measured with a capacitance bridge or other suitable method at the frequency specified. Unless otherwise specified, the measurement shall be made at a temperature of
* 25°C ± 5°C. In the case of measurement dispute, capacitance measurements shall be made at or corrected to 25°C. The inherent accuracy of the measurement shall be ±(0.5 percent +0.2 picofarad) unless otherwise specified. Suitable measurement technique shall be used to minimize errors due to the connections between the measuring apparatus and the specimen. The alternating-current (ac) voltage actually impressed across the specimen shall be as low as practicable. When a direct-current (dc) polarizing voltage is required, it shall be as specified and shall exceed the peak ac voltage impressed across the specimen; however, the sum of the peak ac and the dc voltages shall not exceed the voltage rating of the specimen.

SUMMARY. The following details are to be specified in the individual specification:

a. Test frequency (see 2).

* b. Test temperature, if other than that specified (see 2).

c. Limit of accuracy, if other than that specified (see 2).

d. Magnitude of polarizing voltage, if applicable (see 2).

e. Magnitude of AC rms test signal, if applicable (see 2).