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EIA STANDARD

EIA-364-22B

TP-22B

Simulated Life Test Procedure for Electrical Connectors

EIA-364-22B

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ELECTRONIC INDUSTRIES ALLIANCE

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(From Standards Proposal No. 4415, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

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TEST PROCEDURE No. 22B

SIMULATED LIFE TEST PROCEDURE FOR ELECTRICAL CONNECTORS

(From EIA Standards Proposal No. 4415, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-22A.)

1 Introduction

1.1 Scope

This standard establishes test methods to determine the adequacy of a connector or socket to perform its operational function on land (general and heavy duty), aircraft, marine or underwater for the representative time period of application. This method shall not be used prior to low level measurement per EIA-364-23.

2 Test resources

2.1 Test equipment

2.1.1 Separate chambers may be used to conduct the tests noted for extreme temperature conditions. Chambers shall recover within 2 minutes after specimen transfer. Room temperature shall be 21 °C ± 3 °C (70 °F ±5 °F).

2.1.2 Pressure vessels used to conduct the hydrostatic pressure tests shall be designed in accordance with the ASME Pressure Vessel Code.

2.1.3 Vibration test equipment shall be specified.

3 Test specimen

3.1 Description

A test specimen shall consist of a mateable assembly.

3.2 Preparation

3.2.1 The test specimens shall be visually examined for chips, cracks, tears, loose or missing parts, proper lubrication, proper assembly and mateability. Any specimen that shows degradation, wear or any other physical defect shall be replaced before testing.

3.2.2 The test specimens shall be wired and assembled according to the manufacturer's or military recommendations. Maintenance aging preconditioning shall be conducted in accordance with prescribed procedures on all connectors having removable contacts and shall consist of one removal and insertion of all of the contacts in each plug and receptacle.

3.2.3 Unless otherwise specified, the test specimens shall be wired with conductor sizes matching the contact size in the connector. The wire type and configuration shall be that specified, or that recommended by the connector manufacturer when no military specification exists.

3.2.4 Alternate contacts of the connector shall be wired in a series circuit, see figure 1, between a source and a load such that adjacent contacts are at opposite potential wherever possible. In the event that the connectors have more than one size contact, each contact size shall be wired as separate connectors.

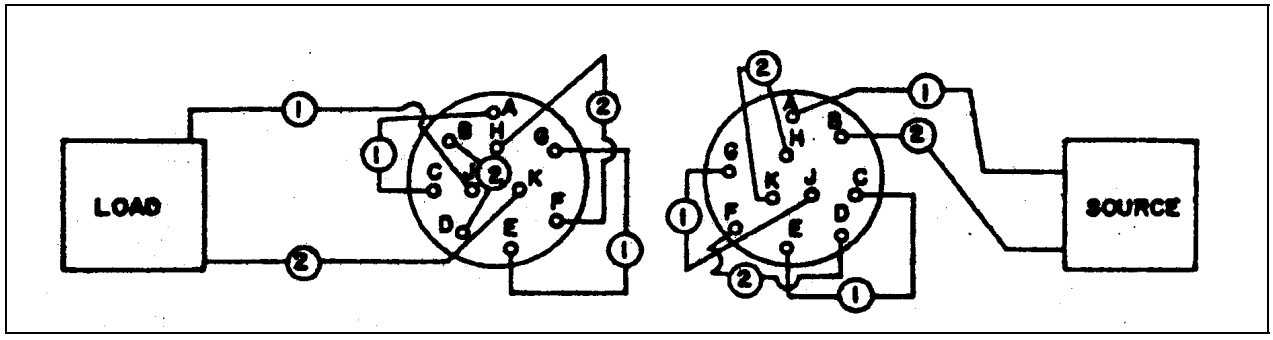

Figure 1 - Wiring diagram typical

3.2.5 The mated, wired connectors shall be connected between a source and a load such that each circuit will be continuously carrying the maximum operating voltage. The operating voltage and rated current shall be that specified or that recommended by the manufacturer when no military specification exists.

3.2.6 The test cycles described herein represent a particular area of connector application and are complete within themselves. Testing of one connector specimen shall be limited to one application category although this cycle may be run as many times as required to provide the necessary number unit hours.

3.2.7 The criteria for failure of the test specimen shall be determined by the following: The test specimens shall operate the load specified in 3.2.5 throughout the entire cycle. The total life of the connector shall then be the total number of unit hours the load is operated.

4 Test procedure

4.1 Test condition A, general duty land

The test specimens initially at room temperature shall be divided into two equal groups, placed in suitable chambers, and subjected to the following cycles:

4.1.1 Group I

4.1.1.1 Initial chamber conditions to be 21 °C ± 3 °C (70 °F ± 5 °F), 50% ± 5% relative humidity; maintain for 11 hours.

4.1.1.2 Raise chamber condition to 39 °C ± 3 °C (100 °F ± 5 °F), 80% ± 5% relative humidity to be accomplished over 1 hour period; maintain conditions for 11 hours.

4.1.1.3 Return to initial specimen condition (room temperature), with drop accomplished over a 1 hour period.

4.1.2 Group II, see table 1

4.1.2.1 Initial chamber conditions to the specified limit of T_1 ± 3 °C (± 5 °F) with uncontrolled humidity; maintain for 10 hours.

4.1.2.2 Drop chamber conditions to the same applicable limit of T_2 ± 3 °C (± 5 °F), with uncontrolled humidity; drop to be accomplished over a 2-hour period; maintain condition for 10 hours.

4.1.2.3 Return to initial specimen condition (room temperature with rise accomplished over a 2 hour period.

4.1.3 After each group completed one cycle as described above, the specimens are unmated, remated, and switched so that group II goes through the group I cycle and group I goes through group II cycle. This provides a 48-hour cycle fore each group. The transfer of specimens shall be accomplished within the first hour of the first phase of each cycle. Provisions shall be made to remove power from the connectors while they are unmated and remated.

Table 1 - Temperature limits for use in test cycles

Limit	Temperature (T_1)	Temperature (T_2)
I	74 °C (165 °F)	-55 °C (-67 °F)
II	105 °C (221 °F)	-55 °C (-67 °F)
III	150 °C (302 °F)	-55 °C (-67 °F)
IV	200 °C (392 °F)	-55 °C (-67 °F)

4.2 Test condition B, heavy duty

The test specimens initially at room temperature shall be divided into three groups, placed in suitable chambers and fixtures and subjected to the following cycles:

4.2.1 Group I

4.2.1.1 Initial chamber conditions 21 °C ± 3 °C (70 °F ± 5 °F), 50% ± 5% relative humidity; maintain for 11 hours.

4.2.1.2 Within 1 hour change chamber conditions to 38 °C ± 3 °C (100 °F ± 5 °F), 80% ± 5% relative humidity; maintain for 11 hours.

4.2.1.3 Within 1 hour, return to initial conditions.

4.2.2 Group II

4.2.2.1 Initial chamber conditions 74 °C ± 3 °C (165 °F ± 5 °F), humidity uncontrolled.

4.2.2.2 With 2 hours, change to -55 °C ± 3 °C (-67 °F ± 5 °F), humidity uncontrolled; maintain for 10 hours.

4.2.3 Group III

4.2.3.1 Mount specimens, for vibration, in plane specified.

4.2.3.2 Vibrate as specified in continuous cycles for a duration of 24 hours.

4.2.4 After each group of specimens has completed the 24-hour phase, they shall be rotated and tested to the next higher phase (group I goes to group II, group II goes to group III, group III goes to group I). This is continued until each group of specimens has been through each group of tests for a total of a 72-hour cycle. Each connector shall be unmated and remated during the transfer from group to group. Provisions shall be made to remove power from the connectors while they are unmated and remated.

4.3 Test condition C, aircraft

The test specimens shall be placed in a sealed chamber of such size that can readily be attached to a vibrator table. The wiring of the connectors, see 3.2.2, between the load and the connector, and between the source and the connector shall be such as to maintain the sealed condition of the chamber. The chamber conditions shall provide the following cycle:

4.3.1 Reduce chamber pressure to 4.39×10^3 Pa ± 0.68×10^3 Pa (1.3 inches of mercury ± 0.2 inch of mercury). Maintain for 8 hours.

4.3.2 Inject air, at atmospheric pressure, into the top of the chamber. The injected air shall be 88 °C ± 3 °C (190 °F ± 5 °F) and shall bubble through water at 88 °C ± 3 °C (190 °F ± 5 °F). Maintain for 4 hours at atmospheric pressure.

4.3.3 During the last hour of 4.3.2 vibrate chamber and connector package through one complete cycle as specified. This provides a 12 hour cycle.

4.4 Test condition D, marine

The test specimens, initially at room temperature, shall be placed in suitable chambers and subjected to the following cycle:

4.4.1 Initial chamber contains 21 °C ± 3 °C (70 °F ± 5 °F), 50% ± 5% relative humidity; maintain for 10 hours.

4.4.2 Within 1 hour change chamber conditions to 49 °C ± 3 °C (120 °F ± 5 °F), 80% ± 5% relative humidity; maintain for the remainder of a 10 hour period.

4.4.3 Immediately upon completion of 4.4.2 remove specimens and submerge immediately in synthetic ocean water, (see ASTM D 1141-52) at room temperature. (Specimens shall be removed as soon as entire connector has passed beneath the surface).

4.4.4 Within 1/2 hour from completion of 4.4.2, place specimens in a chamber -55 °C ± 3 °C (-67 °F ± 5 °F), maintain for 2 hours.

4.4.5 The test specimens shall carry the load specified in 3.2.5 through 4.4.1, 4.4.2 and 4.4.4 of this cycle. At the end of the cycle, connectors shall be allowed to warm to room temperature and shall be unmated and remated. This provides a 23 hour cycle. Provisions shall be made to remove power from connectors while they are unmated and remated.

4.5 Test condition E, underwater

The test specimens initially at room temperature shall be divided into two groups and subjected to the following cycles:

4.5.1 Group I

4.5.1.1 Initial chamber conditions 21 °C ± 3 °C (70 °F ± 5 °F), 50% ± 5% relative humidity; maintain for 10 hours.

4.5.1.2 Within 1 hour change chamber conditions to 49 °C ± 3 °C (120 °F ± 5 °F), 80% ± 5% relative humidity; maintain for the remainder of a 10 hour period.

4.5.1.3 With 1/2 hour place specimens in a chamber at -55 °C ± 3 °C (-67°F ± 5 °F), maintain for the remainder of a 4 hour period.

4.5.2 Group II

4.5.2.1 Submerge specimens in synthetic ocean water, see ASTM D 1141-52, at room temperature to the specified pressure limit of P ± 5%; see table 2; maintain for 23 hours.

Table 2 - Pressure level

Level	Pressure (P) ± 5%, Pa (lb/in^2)
I	6.89 x 10^6 (1,000)
II	2.41 x 10^7 (3,500)
III	6.89 x 10^7 (10,000)
IV	1.10 x 10^8 (16,000)

4.5.2.2 Remove specimens from pressure vessel and allow 1 hour for air drying.

4.5.3 After each group has completed one cycle as described above, the group II specimens are unmated, remated and switched so group I specimens go through group II test and group II specimens go through group I tests to provide a 48 hour cycle. The transfer of specimens shall be accomplished within the first hour of the first phase of each group. Provisions shall be provided to remove power from connectors while they are unmated and remated.

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Number of specimens to be tested

5.2 Conductor size, if not matched to the contact size; see 3.2.3

5.3 Wire type and configuration; see 3.2.3

5.4 Operating voltage and rated current; see 3.2.5

5.5 Number of unit cycles required; see 3.1 6

5.6 Related test condition to be tested to; see 4.1, 4.2, 4.3, 4.4 and 4.5

5.7 Temperature limits, where applicable; see table 1 and 4.1.2

5.8 Pressure limits; where applicable; see table 2 and 4.5 2.1

5.9 Vibration mounting and test condition, where applicable: see 4.2.3 and 4.3.3

6 Documentation

Documentation shall contain the details specified in clause 5, with any exceptions, and the following:

6.1 Title of test

6.2 Specimen description, including fixturing if applicable

6.3 Test equipment used, and date of last and next calibration

6.4 Test procedure

6.5 Values and observations

6.6 Name of operator and date of test

EIA Document Improvement Proposal

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