



IPC-TM-650 TEST METHODS MANUAL

1.0 Scope

1.1 To determine the effects of a controlled salt laden atmosphere on connector components, finishes and mechanisms. This test is intended to explore the corrosion resisting properties of various materials and finishes and not to simulate climatic conditions of a seacoast or shipboard environment.

2.0 Reference Documents

2.1 Information in this section is intended to parallel the test method described in EIA-RS-364/TP-26.

3.0 Test Specimen

3.1 A connector (plug and receptacle) complete with applicable guide, keying, and engaging hardware or a card-edge receptacle and mating printed circuit board (if required by the individual connector specification). The connector or receptacle shall be mated unless otherwise specified in the individual connector specification.

3.2 Neither the plug nor receptacle shall be mounted or terminated during this test, unless such mounting (or termination) is necessary (1) to insure the mechanical integrity of the component, (2) to measure the specified electrical characteristic(s), (3) was a requirement of previously imposed environmental or functional tests.

3.3 Printed circuit boards and electrical connections to the test specimen, except those connections considered under test, may be coated with a suitable wax to inhibit corrosion. The coating shall not be applied to any termination or portion of the connector under test.

3.4 The plug, receptacle, or mated connector shall be suspended or supported within the test chamber in a normal (or typical) mounting attitude using non-corrosive material (e.g., plastic rods, hooks, waxed string, etc.). The test specimens shall be positioned so that they do not shield each other from the freely settling fog, and so that corrosion products and condensate from one specimen do not fall upon another.

4.0 Apparatus

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4.1 A chamber capable of maintaining a dry bulb temperature of +35°C (+1.1, -1.7°C) within the exposure zone. Satisfactory methods for controlling the temperature are: (1) housing the chamber in a properly controlled constant-temperature room; (2) insulating the chamber and pre-heating the air to the proper temperature prior to atomization; (3) jacketing the chamber and controlling the temperature of the water or air within the jacket.

NOTE: The use of immersion heaters within the exposure zone to maintain temperature is prohibited.

The chamber and all accessories exposed to the salt fog atmosphere shall be constructed of non-reactive material (e.g., glass, hard rubber, plastic, or wood other than plywood). The exposure zone shall be vented to prevent a pressure build-up affecting test conditions.

4.2 A compressed air supply free from all impurities such as oil and dirt. Means shall be provided to humidify and warm the compressed air as required to meet the operating conditions. The air pressure shall be suitable to produce a finely divided dense fog with the atomizer(s) used. To insure against clogging of the atomizer(s) by salt deposition, the air should have a relative humidity at the point of release from the nozzle greater than 85 percent for the 20 percent solution and greater than 95 percent for the 5 percent solution. A satisfactory method of humidification is to pass the air in very fine bubbles through a tower containing heated water. The temperature of the water should be 35°C or higher, as necessitated by increasing volume of air flow or increasing heat loss through the chamber walls; it should not exceed a value above which an excess of moisture is introduced into the chamber or a value which makes it impossible to maintain the operating temperature.

4.3 Atomizer(s) capable of an approximate atomization rate of 3 quarts of salt solution per 10 cubic feet of exposure zone volume per 24-hour period of test. The atomization and dispersion shall be such that a suitable receptacle at any point in the exposure zone will collect 0.5 to 3.0 milliliters of solution per hour for each 80 square centimeters of horizontal collecting area (10 centimeters diameter) based on a minimum collection period of 16 hours. The specific gravity of collected solution shall meet the specified requirements of paragraph 4.4.

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4.4 Salt solution of 20 percent or 5 percent concentration as specified in the individual connector specification. The salt used shall be sodium chloride, and in the dry state must be equal to USP purity or purer. The distilled or deionized water shall not contain more than 200 parts per million of total solids. The solution shall be kept free from solids by filtration or decantation. The 20 percent solution shall be prepared by dissolving 20 ± 2 parts (by weight) of salt in 80 parts (by weight) of distilled or deionized water. The 5 percent solution shall be prepared by dissolving 5 ± 1 parts (by weight) of salt in 95 parts (by weight) of distilled or deionized water. The specific gravity of the prepared solutions shall be 1.126 to or deionized water. The specific gravity of the prepared solutions shall be 1.126 to 1.157 for the 20 percent solution and 1.0268 to 1.0413 for the 5 percent solution when measured at a temperature of $35^{\circ}\text{C} \pm 1.1^{\circ}\text{C}$. The pH of the solutions shall be adjusted to within 6.5 to 7.2 at the same temperature. Only cp grade hydrochloric acid or sodium hydroxide shall be used to adjust the pH.

4.5 Hydrometer of appropriate range

4.6 pH meter capable of electrometrically measuring the pH of the prepared or collected solutions using a glass electrode with a saturated potassium chloride bridge.

5.0 Procedure

5.1 Pre-Cleaning Specimens soiled with oil, dirt, or grease shall be cleaned as necessary. The cleaning method shall not include the use of corrosive solvents nor solvents which deposit either corrosive or protective films, nor the use of abrasives other than a paste of pure magnesium oxide. Specimens having an organic coating shall not be solvent cleaned. Cleaned specimens shall be given a minimum of handling, particularly on the significant surfaces.

5.2 The test specimen shall be continuously exposed to the salt fog atmosphere for a period of time corresponding to one of the test conditions shown in Table 1. Unless otherwise specified, Test Condition 8 shall apply.

Table 1 Test Duration

Condition	Length of Test (Hours)
A	96
B	48

5.3 Post-Cleaning Immediately after exposure, the test specimen shall be dipped in running tap water not warmer than 37.8°C for a period not to exceed 5 minutes and dried for 12 hours (maximum) in a circulating air oven at a temperature of $38^{\circ}\text{C} \pm 3^{\circ}\text{C}$.

NOTE: If measurement of contact resistance or low level circuit resistance is specified as part of the post-test evaluation, the test specimen shall not be unmated prior to measurement of these parameters.

If closer examination of a plated or treated surface is required, the corrosion products may be removed using any method which will not affect the integrity of the plating or finish.

6.0 Notes

6.1 Acceptance criteria shall be established in terms of one, or any combination, of the following:

- A. The maximum low level circuit resistance after the test or the maximum change in this parameter as a result of the exposure.

NOTE: When low level circuit resistance is specified as an acceptance criterion, its measurement shall precede any other evaluation.
- B. The maximum contact resistance after the test or the maximum change in this parameter as a result of the exposure.
- C. Pitting, porosity, or other defects in the plating or finish.
- D. Corrosion products sufficient to interfere with normal connector mating.
- E. If a contact resistance failure occurs when a connector is mated to a printed circuit board, care must be taken to determine whether the failure was of the connector or of the printed circuit pads deteriorating.