



IPC-TM-650 TEST METHODS MANUAL

1.0 Scope

1.1 To determine the effect on the connector of prolonged exposure to conditions of high humidity at various temperatures. Two conditions of test are provided as follows:

Steady State Test Used to evaluate the hygroscopic nature of insulating materials as evidenced by deteriorated physical properties (dimensions, mechanical strength, etc.) or degraded electrical properties (e.g., insulation resistance).

Humidity—Temperature Cycling Test Used to evaluate the effectiveness of seals and gaskets in the presence of a pressure differential induced by varying temperatures; the corrosion resistance of metals and finishes exposed to alternate periods of condensation and drying; and the hygroscopic nature of insulating materials, with any degradation accelerated by the “breathing” action imposed by varying temperatures. Optional exposures to sub-freezing temperatures and to mechanical vibration exaggerate any structural deterioration of insulating materials.

2.0 Reference Documents

2.1 Information in this section is intended to parallel the test method described in EIA-RS-364/TP-31.

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 or unmated as specified in the individual connector specification.

3.2 Neither the plug nor the receptacle shall be mounted or terminated during the 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 may be conformal coated to reduce the effect of their deterioration due to moisture on the connector characteristic(s) under evaluation. The coating shall not be applied to any portion of the connector under test.

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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, corrosion resisting steel, etc.)). The technique utilized shall not impede the flow of circulating air over and around the test specimen.

4.0 Apparatus

4.1 A temperature-humidity chamber capable of maintaining dry bulb temperatures from + 25°C to + 65°C within ± 2°C of the set temperatures and relative humidity greater than 90% during ascending or constant temperature operation and greater than 80% during descending temperature operation. Circulation of air within the chamber shall be at a minimum cubic rate equivalent to five times of non-corrosive material and shall prevent the dripping of condensate onto the test specimen.

4.2 A temperature chamber, when required, capable of maintaining a temperature of -10°C +0, -4°C.

4.3 A temperature measuring device, when required, of suitable range for the specified test condition.

4.4 A vibration system, when required, capable of producing approximately simple harmonic motion at a double amplitude of 0.60 inch in the frequency range from 10 to 55 Hz.

5.0 Procedure

5.1 **Pre-Conditioning** The test specimen shall be conditioned in a dry oven at a temperature of 50°C ± 5°C for a minimum period of twenty-four hours. After stabilization at room ambient conditions, the test specimen shall be subjected to the pre-test measurements specified in the individual connector specification.

5.2 Steady-State Test

5.2.1 The test specimen shall be suspended within the humidity chamber and subjected to a relative humidity of 90-95% at a temperature of 40°C ± 2°C for a period of time corresponding to one of the test conditions shown in Table 1. Unless otherwise specified, Test Condition D shall apply.

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Table I Test Duration

| Condition | Length of Test (Days) |
|-----------|-----------------------|
| A | 56 |
| B | 21 |
| C | 10 |
| D | 4 |

5.2.2 Final Measurements

5.2.2.1 At High Humidity (See 6.2) Upon completion of the exposure period, and while test specimen is still in the chamber, the measurements specified in the individual connector specification shall be performed.

5.2.2.2 During Recovery Period After removal from the test chamber, and while maintained at room ambient conditions, the test specimen shall be subjected to the specified measurements during the specified recovery period.

5.2.2.3 After Recovery Period After being maintained at room ambient conditions for five hours (or as otherwise specified) the required measurements shall be performed.

5.3 Humidity-Temperature Cycling Test

5.3.1 The test specimen shall be suspended within the humidity chamber and subjected to the humidity-temperature

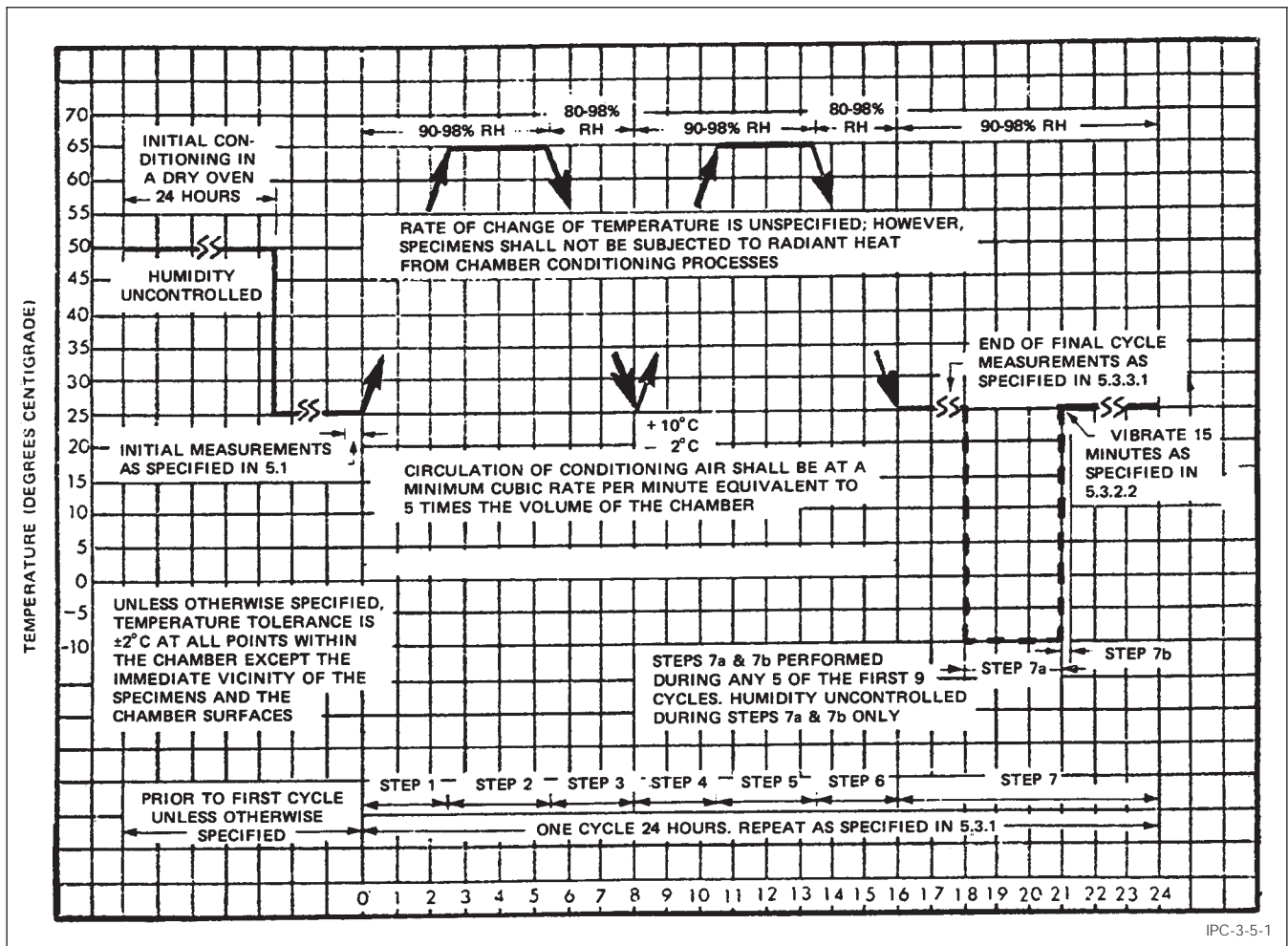


Figure 1 Graphical Representation of Moisture-Resistance Test

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variations shown in Figure 1 for a period of time corresponding to one of the test conditions shown in Table 1. Unless otherwise specified, Test Condition B shall apply.

5.3.2 Sub-Cycle (See 6.3) During any five of the first nine humidity temperature cycles, the test specimen shall be subjected to the following sub-cycle, if specified.

5.3.2.1 Step 7a Within one to four hours after the beginning of Step 7, the test specimen shall be exposed to a temperature of $-10^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for a minimum period of three hours.

5.3.2.2 Step 7b Within fifteen minutes after completion of Step 7a, the test specimen shall be subjected to the following vibration along any one axis.

- Motion — Simple Harmonic (approx.)
- Amplitude — 0.60 inch DA
- Frequency Range — 10 to 55 Hz
- Sweep Rate — 10 to 55 to 10 Hz in 60 seconds (approx.)
- Test Duration — 15 minutes

5.3.3 Final Measurements

5.3.3.1 At High Humidity (See 6.2) Upon completion of Step 6 of the final cycle, the test specimen shall be maintained at a temperature of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a relative humidity of 90-98% for a period of 1-1/2 to 3-1/2 hours, after which the measurements specified in the individual connector specification shall be performed.

5.3.3.2 During Recovery Period After removal from the test chamber, and while maintained at room ambient conditions, the test specimen shall be subjected to the specified measurements during the specified recovery period.

5.3.3.3 After Recovery Period Upon completion of Step 6 of the final cycle, or following the specified measurements at high humidity and/or during a recovery period, the test specimen shall be maintained at room ambient conditions for twenty-four hours (or as otherwise specified); the required measurements shall then be performed.

6.0 Notes

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

- A. The minimum insulation resistance during or after the test.
- B. Dimensional changes affecting the functionality of the test specimen.
- C. Corrosion of metals.
- D. Structural damage or deterioration.

6.2 Due to the difficulty in making measurements under high humidity conditions, the individual connector specification shall specify the particular precautions to be followed in making measurements under such conditions.