



ASSOCIATION CONNECTING
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IPC-TM-650 TEST METHODS MANUAL

1 Scope This test is used to determine the total ionic content extractable from on, and absorbed within, the surface of printed wiring boards (PWBs), for the purposes of process control. The conductivity of the extract solution is measured and the results are expressed as sodium chloride equivalence per unit area.

2 Applicable Documents

IPC-TM-650 Test Method 2.3.25, Detection and Measurement of Ionizable Surface Contaminants by Resistivity of Solvent Extract (ROSE)

3 Test Specimens

The test specimen may be any unpopulated PWB. The number of specimens depends on the process control plan or product drawings/prints.

4 Apparatus or Material

- An automated Resistivity of Solvent Extract (ROSE) tester
- Conductivity dip probe with appropriate meter with temperature compensation
- Hydrometer (0.800 - 0.900) for ROSE tester calibration
- Thermometer for ROSE tester calibration
- Clean room (non-ionic) gloves or forceps
- KAPAK™ plastic bags or equivalents (see 6.9)
- Bag sealing equipment
- Water bath, capable of sustaining an 80°C ± 2°C [176°F ± 3.6°F] temperature
- Second water bath capable of sustaining a 25°C ± 1°C [77°F ± 1.8°F] temperature
- Precision solvent measurement equipment, such as class A pipettes
- Volumetric glassware
- Plastic ware - high density polyethylene, polymethylpentene (polypropylene) or equivalent.
- Extract solution: 25% v/v deionized water (18 MΩ-cm nominal resistivity), 75% v/v 2-propanol (electronic or HPLC grade). No alternative solution or composition is allowed.

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Originating Task Group Bare Board Cleanliness Assessment Task Group 5-32c	

- Sodium chloride - reagent grade
- Analytical balance accurate to 0.0001 grams

WARNING: 2-propanol is a flammable material. The 2-propanol / water mixture is also flammable. Exercise caution when using this solution.

5 Procedure

5.1 Extraction

NOTE: Throughout this procedure, do not touch the sample boards with bare hands. Use the clean room gloves specified or use clean forceps.

5.1.1 Calculate the surface area of the PWB using:
Area (in cm²) = Length x Width x 2

5.1.2 Prepare a volume of extract solution specified in 4.

5.1.3 Using clean room gloves or clean forceps, place the PWB into virgin KAPAK™ bags. Choose the bag size to give at least an additional 2.5 cm [1.0 in] on each side of the board to minimize the amount of extract solution used. Allow at least an additional 5 cm [2.0 in] above the board top.

5.1.4 Using a pipette or graduated cylinder, add a volume of the extract solution into the bag. The amount will depend on the area of the board surface. This usually varies from 0.8 mL/cm² [5.2 mL/in²] up to about 3 mL/cm² [19 mL/in²]. For example, a 10 cm x 11.5 cm [3.94 in x 4.53 in] board would require about 100 mL of solution. The amount of solution should just cover the board completely when most of the air is forced out of the bag.

5.1.5 Force most of the air from the bag and heat seal the bag. This involves contact with a hot metal bar. Take reasonable precautions to keep extract solution from contacting the hot bar. Alternatively, the top of the bag may be folded over and clipped shut.

5.1.6 Place the bag(s) vertically in a water bath which has stabilized at 80°C [176°F]. Make sure that the boards do not float above the water line. Do not allow the water from the bath to enter the bag or for extract solution to leak out of the bag.

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5.1.7 Allow the boards to extract in this manner for a period of time of 60 ± 5 minutes.

5.1.8 Following the extraction of 5.1.7, remove the bags from the water bath and allow the extract solution to cool for at least 30 minutes, with the specimen still in the bag.

5.1.9 Using clean tongs or forceps, remove the PWB from the bag.

5.2 Measurement – DIP Probe Method

5.2.1 Calibration of Bridge This is essential in this method because there can be no correlation between resistivity/conductivity readings and NaCl equivalents without calibration.

5.2.1.1 Prepare a standard NaCl solution from a weight of dry reagent grade NaCl salt dissolved in deionized water to produce a final diluted concentration of 0.06 g/liter NaCl (5 mL equals 300 µg NaCl).

5.2.1.2 Place 1 liter of the 2-propanol water solution (at the calibration temperature of the bridge in use) in a plastic beaker.

NOTE: The 75 % v/v 2-propanol solution must be used in this calibration. Water cannot be used since it is not the test solution used in the procedure. The test solution used in this calibration can be recleaned by passing through the DI column until the required resistivity/conductivity is obtained.

5.2.1.3 From a 50 mL burette, add to the liter of test solution, 5 mL of the standard 0.06 g/liter NaCl solution. Stir and measure resistivity/conductivity.

5.2.1.4 From a 50 mL burette, add to the liter of test solution, 20 additional mL of the standard 0.06 g/liter NaCl solution, for a total of 25 mL. Stir and measure resistivity/conductivity.

5.2.1.5 From a 50 mL burette, add to the liter of test solution, 25 additional mL of the standard 0.06 g/liter NaCl solution, for a total of 50 mL. Stir and measure resistivity/conductivity.

5.2.1.6 Plot a three point nomogram of Conductivity vs. Solution Concentration (in µg/liter NaCl). See Figure 1 for example. You should get a linear relationship. Use a best fit line obtained with a piecewise linear method.

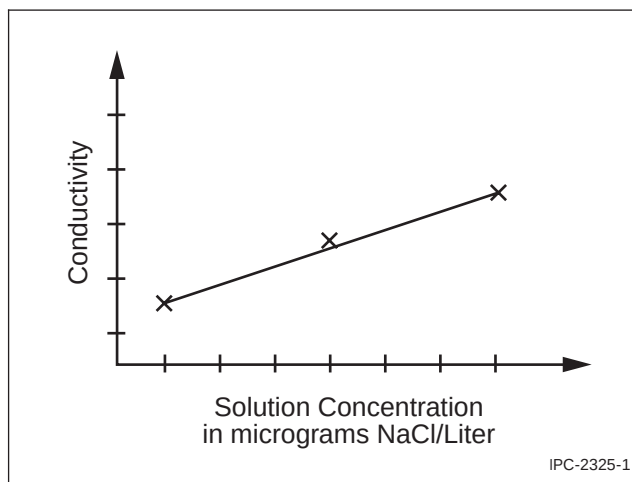


Figure 1 Nomogram of Conductivity vs. Solution Concentration

5.2.2 Test Procedure - DIP Probe

NOTE: If desired, this test can be run at other temperatures; however, the calibration process must be repeated for the alternative temperature. This calibration process need only be done once, providing the conductivity cell has not been exposed to harsh chemicals which would alter the cell constants. If the conductivity cell is routinely used on harsh chemical solutions (e.g., plating baths), then the calibration should be repeated before every test run.

5.2.2.1 Place the Kapak™ bags containing the extract solutions into the 25°C [77°F] water bath and allow the extract solutions to reach 25°C [77°F].

5.2.2.2 Insert the conductivity probe into the Kapak™ bag containing the room-temperature extract solution. It is important that the extract solution be measured at the same temperature used for the calibration solutions. Immerse the probe to a suitable depth.

NOTE: A "suitable depth" is one which covers the cell electrodes, but not an immersion which covers the wiring. Many cells are marked with a scribed line which indicates the proper immersion depth.

5.2.2.3 Gently agitate the solution. Read the conductivity of the solution. The time between immersion of the cell and taking the reading should be the same as used for the calibration curve. Sufficient time should be allowed for the reading to come to equilibrium (no change for two minutes).