ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

2215 Sanders Road
Northbrook, IL 60062-6135

Number	
2.3.28	
Subject	
Ionic Analysis of Circuit Boards, Ion Chromatography Method	
Date	Revision
05/04	**A**
Originating Task Group	
Ionic Conductivity/Ion Chromatography Task Group 5-32a	

IPC-TM-650
TEST METHODS MANUAL

1 Scope This test procedure is designed to measure the level of anionic (including weak organic acid anions) and cationic contamination on the surface of circuit boards and circuit board assemblies by ion chromatography.

2 Applicable Documents

IDEMA M13-99 Measurement of Extractable/Leachable Anion Contamination Levels on Drive Components by Ion Chromatography (IC)

IPC-TP-1043 Cleaning and Cleanliness Test Program, Phase III, Water Soluble Fluxes, Part 1: B-24, Interactions of Water Soluble Fluxes with Metal/Substrates

IPC-TP-1044 Cleaning and Cleanliness Test Program, Phase III, Water Soluble Fluxes, Part 2: B-36, Comparison to Phase 1 Rosin Benchmark

IPC-TR-583 An In-Depth Look at Ionic Cleanliness Testing

IPC-5701 Users Guide for Cleanliness of Unpopulated Printed Boards

3 Test Specimen

3.1 Printed Circuit Board (PCB) and/or Printed Circuit Assembly (PCA) for extraction

4 Apparatus and Material

4.1 Ion Chromatograph capable of 50 ppb or better ion detection. The equipment and chemistry should be set up and standardized per the manufacturer's instructions.

4.2 Hot Water Bath capable of maintaining 80 °C ± 5 °C [176 °F ± 9 °F].

4.3 Use a clean heat sealable bag, i.e. KAPAK® 500 series or equivalent, with less than 250 ppb extractable contaminants.

4.4 Cleanroom vinyl gloves. (<3 ppm of Cl).

4.5 Deionized water with a resistivity of at least 18.0 megohm-centimeter.

4.6 HPLC or ASC grade chemicals for eluent and regenerant preparation.

4.7 NIST traceable standards (see 6.1).

4.8 2-Propanol (IPA), Electronic grade or better.

5 Procedure

5.1 Extraction

5.1.1 Use clean gloves when handling the samples to be tested. Place each sample in an extraction bag.

5.1.2 Prepare a 75/25 v/v IPA/H_20 solution for the extraction.

5.1.3 Add a known volume of the extraction solution to the extraction bag covering the PCB/PCA (approximately 1/2 mL/cm^2 of surface area).

5.1.4 Add the same volume of extraction solution to an empty bag of the same lot for use as a blank.

5.1.5 Heat seal all sample and blank extraction bags and place in an 80 °C [176 °F] water bath for one hour (-0 min., +5 min.).

5.1.6 Allow the solution within the bag to cool to ambient temperature before opening.

5.1.8 Record the surface area of PCB (length x width x 2) or PCA. As a general rule for assemblies, the surface area is estimated as: (length x width x 2) + 10%. Great caution should be taken in interpretation and comparison of these results as assembly surface areas will often deviate by more than 10% of its' unpopulated state.

5.2 Standard and Sample Analysis

5.2.1 Inject the sample extracts into the Ion Chromatograph (IC) and calculate against known standards (a three to five level calibration is recommended).

5.2.2 Values from the IC are typically reported in ppm.

5.2.3 Results are to be expressed as µg of ion per square centimeter based on the extraction volume and the calculated sample surface area.

$$\mu g/cm^2 = \frac{[ppm\ from\ IC\ (\mu g/mL)]\ x\ [final\ volume\ (mL)]}{[surface\ area\ (cm^2)]}$$

Note: ''ppm'' value is actually specimen value minus blank value.

6 Notes

6.1 Ions which may be included for evaluation are as follows:

Anions:
Bromide
Chloride
Fluoride
Nitrate
Nitrite
Phosphate
Sulfate

Cations:
Ammonium
Calcium
Lithium
Magnesium
Potassium
Sodium

Weak Organic Acids:
Acetate
Adipate
Formate
Glutamate
Malate
Methane Sulfonate
Succinate
Phthalate

Other ions of interest may be present.

6.2 Alternate extraction techniques (change in time, temperature, or extraction solution) may be used when agreed upon between user and vendor.

6.2.1 Examples of alternate extraction times include the following:

- Ten-minute extraction (IDEMA specification for metal parts)
- Twenty-four hour extraction

6.2.2 Examples of alternate extraction temperatures include the following:

- Ambient temperature (22 °C ± 3 °C [72 °F ± 5 °F])

6.2.3 Examples of alternate extraction solutions include the following:

- 10/90 v/v IPA/H_2O
- Deionized water

6.3 Ion Chromatography may be a destructive test for printed circuit assemblies due the high temperature liquid extraction and lack of electrostatic discharge (ESD) protection. Caution should be taken when testing samples that are intended to be deliverable production assemblies.