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Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle

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Association Connecting Electronics Industries

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Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle

Developed by the IPC Surface Insulation Resistance Task Group (5-32b) of the Cleaning and Coating Committee (5-30) of IPC

Users of this publication are encouraged to participate in the development of future revisions.

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FOREWORD

The electronics manufacturing process is often very complex, with dozens of variables that impact the quality and reliability of the manufactured assemblies in the end use environment. Two of the important variables for consideration are the kinds of residues which remain on the electronic assembly and the effects that these residues have on reliability. These two variables are most often referred to in discussions on assembly "cleanliness". While there are several different ways to measure residues and their effects on electrical performance, the two most common approaches in the industry are ionic cleanliness testing, for determination of ionic residues, and surface insulation resistance (SIR) testing, for the evaluation of electrochemical failures in humid environments.

This document focuses on the IPC-B-52 standard test assembly and how it is used as an evaluation tool for electronics manufacturing processes from a "cleanliness" perspective.

1 INTRODUCTION

Of the various methods for the determination of ionic residues, the method of choice is ion chromatography, which determines both the type of ionic residue and the amount present. The IPC method for ion chromatography is IPC-TM-650, Method 2.3.28. For surface insulation resistance (SIR) testing, the most modern test method, involving frequent or continuous monitoring, is IPC-TM-650, Method 2.6.3.7.

The difficulty with any of these test methods is that there are no generic pass fail levels which can be levied against all test data to differentiate "good/acceptable" from "bad/unacceptable". There are far too many variables involved. What is acceptable for consumer electronics may be inadequate for life-sustaining medical equipment. High frequency assemblies may have different critical parameters than those for power supplies. Assemblies which function in the harsh environment of space may have different requirements than those which function in a harsh industrial gas atmosphere.

There are a variety of test vehicles in the electronics industry that have been used to examine materials compatibility or materials interactions, such as the IPC-B-24 standard test board used to examine SIR performance of fluxes and solder pastes. All of the available test boards leave something to be desired as there is often a dramatic difference in materials between these standard test vehicles and produced assemblies. As an example, the IPC-B-24 test board is a single sided, FR-4 laminate vehicle with no solder mask and bare copper metallization, and no through-holes. It is often a difficult task correlating the results from such a vehicle to an assembly made of polyimide laminate, liquid photoimageable solder mask, and mixed technology mounting pads, with immersion silver finish.

Consequently, a test vehicle was needed which could be used for both ion chromatography and SIR testing, that would be more representative of mainstream manufacturing materials and processes. The IEC-TB-57 test board, designed by the National Physical Laboratory and Gen3 System Ltd., both in the United Kingdom, was the result. In a subsequent effort between NPL, Gen 3, and Rockwell Collins, the IPC-B-52 test board, mirroring many of the features of the IEC-TB-57, was produced. As developmental work continued on the IPC-B-52 board, the IEC-TB-57 was modified accordingly, with a goal of having a world standard for process characterization and qualification. Version 8 of the IEC-TB-57 is identical to the IPC-B-52 standard test assembly.

The IPC-B-52 test vehicle can be used to evaluate and optimize a manufacturing process, or to provide objective evidence that a chosen manufacturing material set and manufacturing process are compatible, from a cleanliness standpoint. This latter use is often considered as a "process qualification", suitable for international specifications such as IPC J-STD-001 or IEC-1189-5. Such efforts are not trivial, and often an engineering analysis is required to determine the meaning of the resulting data set.

This Users Guide was developed to assist the process professional in evaluating a candidate manufacturing process and determining acceptability guidelines for that process. It has also been written as a companion document to IPC-9202.

2 APPLICABLE DOCUMENTS

2.1 IPC[1]

IPC-A-24-G Surface Insulation Resistance Artwork

IPC-A-52-G Cleanliness and Residue Evaluation Test Board Artwork

IPC-TR-467 Supporting Data and Numerical Examples for J-STD-001B (Control of Fluxes)

IPC-5704 Cleanliness Requirements for Unpopulated Printed Boards

1. www.ipc.org