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

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Developed by the Residue Assessment Task Group (5-32g) of the Cleaning and Coating Committee (5-30) of IPC

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

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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. Of concern are the kinds of residues remaining on the electronic assembly and the effects that these residues have on the electro-chemical reliability of the end-product.

Surface Insulation Resistance testing measures changes to the surface insulation resistance. By its very nature, such testing must be conducted on a test coupon that should be representative of the intended end-product.

Apart from commonplace ionic residues, most modern process chemistries include non-ionic surfactant additives that are not detectable using ionic extract test methods such as Ion chromatography or Resistivity of Solvent Extracted (ROSE).

This document focuses on the IPC-B-52 standard test assembly and how it is used as a representative example of the intended end-product.

1.0 INTRODUCTION

In order to determine acceptable electro-chemical performance, the most suitable test is to run SIR using a test coupon that is representative of the intended end-product material set.

The advantage of this approach is that it does not differentiate between ionic nor non-ionic matter that may be deleterious to end-product performance. Other test methods, such as Ion Chromatography or ROSE are not able to detect or measure non-ionic contaminants.

There are many other test methods that are used to ascertain what is present as and when an SIR "failure" is detected.

The IPC-B-52 test vehicle is intended to be used to evaluate and optimize a manufacturing process, and to provide objective evidence that a chosen manufacturing material set, and manufacturing process is electro-chemically compatible. This latter use is often considered as a "process validation", suitable for international specifications such as IPC J-STD-001 or IEC-61189-5-502. Such efforts are not trivial, and often an engineering analysis is required to determine the meaning of the resulting data set.

The predecessor to the IPC-B-52 was the IEC TB-57 test coupon. This was originally designed by the National Physical Laboratory in the United Kingdom and was created as part of a major EU funded research program to develop SIR testing for both material characterization (e.g., conformal coatings, solder masks, solder fluxes and pastes) as well as process material set evaluations.[a]

Following this research effort, Rockwell Collins evolved the TB-57 to reflect certain industry needs prevalent at that time. This became the IPC-B-52 and adopted in the original IPC 9202 and IPC 9203 specifications. It is important to note that the original design was intended to be a "worst case" example of process residue entrapment. The intended goal was of having a World standard for process characterization and validation. In the test method IEC 61189-5-502 Surface Insulation Resistance Testing Assemblies now calls out the IPC-B-52 test coupon.

This document has been written as a companion document to IPC-9202.

In the event that the user wishes to design their own test coupon for the purpose of examining their material set, then it is recommended that reference be made to IPC 9201, SIR Test Handbook, Section 3.3.8 that outlines some important design rules.

The coupon **shall** be manufactured using the same manufacturing process and surface finish intended for the end-product. This is especially important in respect to the PTH sections that are intended to replicate the requirements of thru-hole headers, vias or perhaps press-fit connectors. The user should be aware that laminate choice may impact whether or not conductive anodic filament (CAF) failures (a sub-surface electrochemical migration failure) appear in SIR testing for the IPC-B-52 assemblies. Lower quality laminates have a higher risk of CAF failures.

1.1 Definitions Throughout IPC-9202 and IPC-9203 documents, the words "qualification", "characterization", and "validation" are used with respect to candidate manufacturing processes. These words mean different things to different people, and so a discussion of these terms is pertinent to these documents.

1.1.1 Process Characterization Process Characterization refers to any examination of the effects of a manufacturing process. This may include screening studies, small scale investigations of parameter effects, etc. The goal is to generate data characteristic of that process.

1.1.2 Qualification Qualification is a more formal term. For qualification, the goal of the data generation is to show that the process meets the criteria of a specification or standard, such as IPC-J-STD-001.

1.1.3 Validation Validation is work subsequent to the qualification. Validation is testing that shows the data generated in the qualification proved to be acceptable on actual product.