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Material and Process Characterization/Qualification Test Protocol for Assessing Electrochemical Performance Using the IPC-B-52 Test Assembly

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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.

Contact:

IPC
3000 Lakeside Drive, Suite 105 N
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105

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5-30 Cleaning and Coating Committee

Chair
Jason Keeping
Celestica

Vice Chair
Graham Naisbitt
Gen3 Systems Limited

5-32g Residue Assessment Task Group

Co Chairs
Eric Camden
Foresite, Inc.

Emma Hudson
Emma Hudson Technical Consultancy Ltd.

Co Vice Chairs
Hans L. Shin
Pacific Testing Laboratories, Inc.

Hannah Nelson
Valparaiso University

Technical Liaisons of the IPC Board of Directors

Bob Neves
Microtek (Changzhou) Laboratories

Residue Assessment Task Group

William Adams
Motorola Solutions

Elizabeth A. Allison
NTS - Baltimore

Martin W. Bayes
TE Connectivity

Kevin Belisario
NTS - Anaheim

Jennifer Bennett
IBM Corporation

Dianna Benson
Raytheon Missile Defense

Scott A. Bowles
Lockheed Martin Corporation

Eric Camden
Foresite, Inc.

William Capen
Honeywell FM&T

Reinaldo Chacon
FEMTO-ST

Zhiman Chen
ZHUZHOU CRRC TIMES ELECTRIC CO., LTD

Beverley Christian
VIDP User Group

Benoit Dagenais
Innovative Vehicle Institute

Francesco Di Maio
GESTLABS S.r.l.

James Fowler
James Fowler

Tim Gallagher
BAE Systems

William Fox
Lockheed Martin Missile & Fire Control

Mahendra S. Gandhi
Northrop Grumman Space Systems

Emmanuelle Guene
Inventec Performance Chemicals

Ben Gumpert
Lockheed Martin Missile & Fire Control

Catherine J. Hanlin
Precision Manufacturing Company, Inc.

Lothar Henneken
Robert Bosch GmbH

Andreas Hogg
Coat-X

Emma Hudson
Emma Hudson Technical Consultancy Ltd

Christopher Hunt
Gen3 Systems Limited

Joseph E. Kane
BAE Systems

Jason M. Keeping
Celestica International L.P.

Jeff K. Kennedy
ZESTRON Americas

Russell Kido
Practical Components Inc.

Phil Kinner
Electrolube

Christina Landon
NSWC Crane

Susan (Yi) Le
Microtek Laboratories China

Minsu Lee
Korea Packaging Integration Association

Andrew LeVesque
Gentex Corporation

Nicolas Jean-Charles Magnin
Valtronic Technologies (suisse) SA

Julien Magnin-Feysot
Valtronic Technologies (suisse) SA

Mark T. McMeen
STI Electronics, Inc.

Graham K. Naisbitt
Gen3 Systems Limited

Hannah Glorianne Nelson
Valparaiso University

Timothy O'Neill
AIM Solder

Catalina Pamatmat
Temic Automotive (Phils.) Inc.

Ravi Parthasarathy
ZESTRON Americas

Jigar Patel
ZESTRON Americas

Douglas O Pauls
Collins Aerospace

Stanton Rak
SF Rak Company

Yaoru Ren
Shengyi Electronics Co. Ltd.

Joseph Russeau
Precision Analytical Laboratory, Inc.

Keith Sellers
NTS - Baltimore

Jose Ma Servin Olivares
Vitesco Technologies Automotive Cuautia, S.A. de C.V.

Hans L. Shin
Pacific Testing Laboratories, Inc.

Geok Ang Tan
DSO National Laboratories

Umut Tosun
ZESTRON Americas

Hector A. Valladares
Honeywell Aerospace

Axel Vargas
Axel Vargas

Dan White
Collins Aerospace

Lamar Young
Specialty Coating Systems Inc.

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Material and Process Characterization/Qualification Test Protocol for Assessing Electrochemical Performance Using the IPC-B-52 Test Assembly

1.0 SCOPE/INTRODUCTION

This Material and Process Characterization/Qualification Test records changes in Surface Insulation Resistance (SIR) on a representative sample of a printed circuit assembly (PCA). It quantifies any deleterious effects that might arise from solder flux or other process residues left on external surfaces after soldering, which can cause unwanted electro-chemical reactions that grossly affect reliability.

It uses test vehicles that are intended to be representative of the electronic circuits that are in production. It is a test yielding both quantitative and qualitative data.

This test may be used for *Process Qualification*, demonstrating that a proposed manufacturing process or process change can produce hardware with acceptable end-item performance related to electrochemical risk. Changes may involve any assembly process step, or a change in the printed board supplier, solder mask or metallization, soldering material supplier, conformal coating, etc. The test vehicle construction will vary depending upon the type of change being evaluated.

NOTE: The decision to levy this protocol on individual manufacturing sites **shall** be As Agreed Between User and Manufacturer. See IPC-9203 for further guidance (As of the publication of this document, IPC-9203 Rev A is under development. Contact the IPC for status and availability). Vehicles **shall** be prepared at the Manufacturer's location using production processes and equipment whenever possible. Care **shall** be taken to ensure that the processed test vehicles are kept free from any secondary contamination while in transit to the test site. Testing of the prepared vehicles can be performed by the User or at a suitable independent laboratory.

There is no single test that can guarantee acceptable electrochemical performance for all products, applications, and in-service environments. While there are several methods that may be used to determine materials and process compatibility, this test protocol may be used to generate objective evidence of electrochemical compatibility. IPC-J-STD-001 does not require testing to this specific method to qualify a manufacturing process.

It is strongly recommended that a subset of the unpopulated, unprocessed coupons be tested for SIR before investing the time and money to manufacture the test vehicles. If the unprocessed controls do not return acceptable SIR results because of some undiscovered fault in the design or construction of the vehicles, the populated PCAs are likely to fail also.

This test may also be used for *Process Characterization*, including development of new processes or improvements to an existing process.

This test protocol is specific to the IPC-B-52 standard test assembly. The use of alternative test vehicles and associated pass-fail requirements **shall** be as agreed between User and Manufacturer.

The IPC-B-52 standard test assembly contains both surface mount and through-hole technologies. Only the applicable portions of the IPC-B-52 assembly are processed. I.e., only the surface mount patterns are processed for a surface mount only assembly process; however, *all* surface mount patterns **shall** be processed. For a process investigation, a User may elect to test as many or as few patterns as they desire.

1.1 Terms and Definitions

1.1.1 Unprocessed Control A test vehicle that has not been exposed to candidate assembly manufacturing material/processes. These are in the "as-received" condition from the supplier.

1.1.2 Process Characterization A comparative examination of the interaction of materials and process parameters. Example: A comparison of different solder masks, or a comparison of cleaning processes.

1.1.3 Process Qualification The generation of "objective evidence" for the purposes of demonstrating materials and process compatibility for an assembly standard (e.g., IPC-J-STD-001).

1.1.4 Manufacturer The individual, organization, or company responsible for the production assembly process, and preparation of test specimens to ensure full compliance to this test protocol.

1.1.5 User The individual, organization, contractually designated authority, or agency responsible for the procurement or design of electrical/electronic hardware, and having the authority to define any variation or restrictions to the requirements in this test protocol. The User is the originator/custodian of the contract and specifies process controls and acceptance requirements for the hardware.