



IPC-9202A

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

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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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 Characterizations*, 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.

2.0 APPLICABLE DOCUMENTS

2.1 IPC¹

IPC-A-24-G Surface Insulation Resistance Artwork

IPC-B-24 Standard Test board

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

IPC-B-52 Standard Test Board and Assembly

IPC-TM-650 Test Methods Manual

- **2.3.28** Ionic Analysis of Circuit Boards, Ion Chromatography Method
- **2.6.3.7** Surface Insulation Resistance

IPC-9201 Surface Insulation Resistance Handbook

IPC-WP-008A Setting Up Ion Chromatography Capability

IPC-J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies

2.2 International Electrotechnical Commission (IEC)²

IEC-TB-57 National Physical Laboratory (NPL) Test Board 57 (TB57)

3.0 TEST SPECIMENS

This test protocol uses the IPC-B-52 standard test assembly, which is the same as the IEC-TB-57 standard test vehicle. If alternate test vehicles or test protocols are desired, they **shall** be as agreed between User and Manufacturer.

3.1 IPC-B-52 Standard Test Assembly

The IPC-B-52 test board/assembly is shown in Figure 3-1. The full assembly consists of the following:

- Main surface insulation resistance (SIR) test board
- Ion chromatography coupon
- Solder mask adhesion coupons (2)
- Surface insulation resistance mini coupons (2)

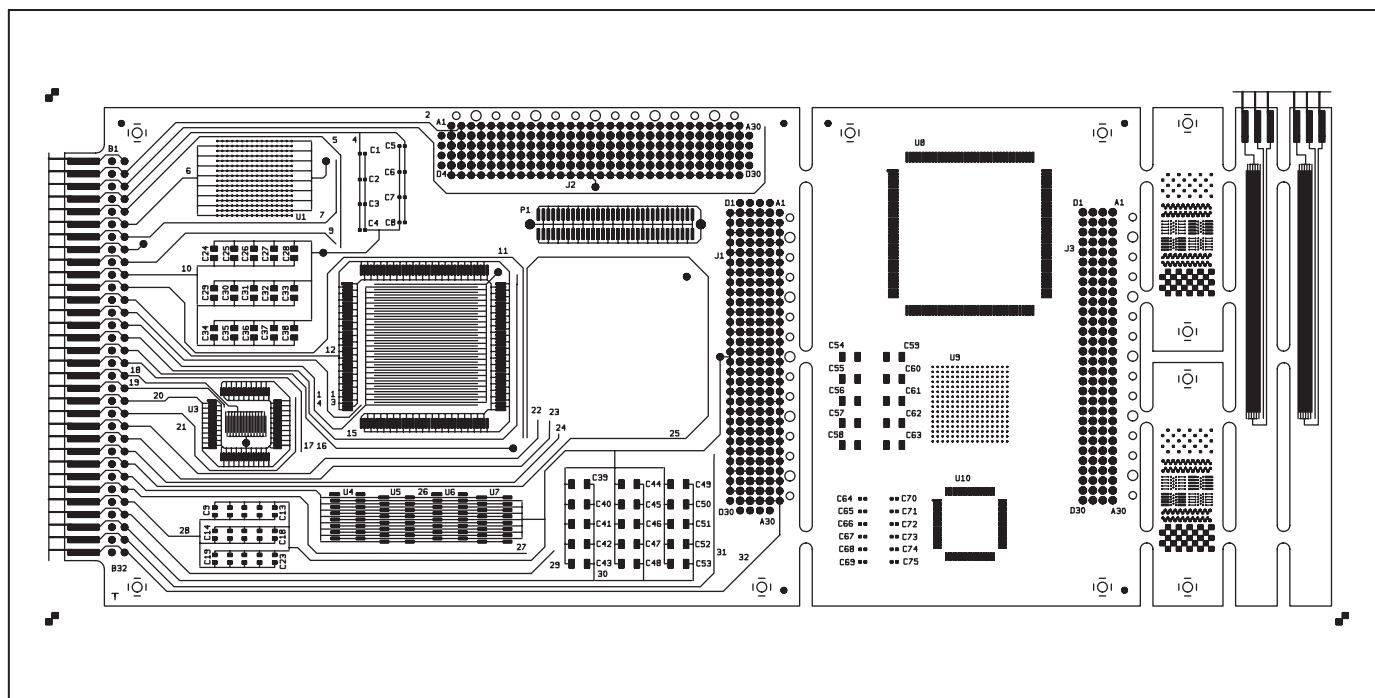


Figure 3-1 IPC-B-52 Standard Test Assembly – Main SIR Board Patterns

¹ www.ipc.org
² <https://iec.ch>