

IPC-TM-650-MDP-A

2020 - March

IPC Test Method Development Packet

Supersedes IPC-TM-650-MDP

May 2012

An international standard developed by IPC



BUILD ELECTRONICS BETTER

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Standards Should:

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

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IPC Test Method Development Packet

Developed by the IPC Test Methods Subcommittee (7-11) of the Testing Committee (7-10) of IPC

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

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Acknowledgment

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IPC Test Method Development Packet

1 SCOPE

This packet defines the elements that **shall** be included in an IPC-TM-650 Test Method and used to assist the IPC 7-11 Test Methods Subcommittee (TMSC) in their reviewing process. The goal is to evolve a coordinated and standardized approach for drafting and validating an IPC test Method.

1.1 Background The purpose of the following is to help in defining criteria that will yield better test methods for use by the electronics and all related industries. With the ever-increasing demand for improved accuracy, precision and documentation, it is the responsibility of the IPC TMSC to regularly request better evaluation of the methods that IPC publishes and maintains. This not only aids the user achieving a higher quality standard, but also keeps IPC in leading the way in its continuous improvement endeavors. As such, the TMSC has compiled, from multiple sources, the criteria believed to assist in achieving a higher standard in IPC test methods without sacrificing from originating task groups (OTGs) their ability to utilize shared expertise.

1.2 Terms and Definitions

1.2.1 Quantitative Method A method by which an objective measurement is being made.

1.2.2 Qualitative Method A method by which a subjective measurement is being made.

2 APPLICABLE DOCUMENTS

2.1 IPC¹

IPC-TM-650 Test Methods Manual, Section 1, Reporting and Measurement Analysis Methods²

IPC-QL-653 Certification of Facilities that Inspect/Test Printed Boards, Components and Materials

IPC Metric Policy³

IPC Test Methods Approval Form

IPC Test Methods Flow Chart⁴

IPC Patent Policy⁵

2.2 ISO/IEC⁶

ISO / IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories (Sections 5.4.5.1 and 5.4.5.2)

ISO 5725-1 Accuracy (trueness and precision) of measurement methods and results – Part 1: General principles and definitions

ISO 5725-2 Accuracy (trueness and precision) of measurement methods and results – Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method

ISO 5725-3 Accuracy (trueness and precision) of measurement methods and results – Part 3: Intermediate measures of the precision of a standard measurement method

1. www.ipc.org

2. www.ipc.org/test-methods.aspx

3. The IPC Metric Policy and Patent Policy are contained within the Standardization Process of the IPC, available at www.ipc.org/standards

4. www.ipc.org/test-methods.aspx

5. The IPC Metric Policy and Patent Policy are contained within the Standardization Process of the IPC, available at www.ipc.org/standards

6. www.iso.org/www.iec.ch

ISO 5725-4 Accuracy (trueness and precision) of measurement methods and results – Part 4: Basic methods for the determination of the trueness of a standard measurement method

ISO 5725-5 Accuracy (trueness and precision) of measurement methods and results – Part 5: Alternative methods for the determination of the precision of a standard measurement method

ISO 5725-6 Accuracy (trueness and precision) of measurement methods and results – Part 6: Use in practice of accuracy values

ISO 21748 Guidance for the use of repeatability, reproducibility, and trueness estimates in measurement uncertainty evaluation

ISO 17000, Conformity assessment Vocabulary and general principles VIM, International vocabulary of basic and general terms in metrology

ISO/IEC Guide 43-1 Proficiency testing by interlaboratory comparisons – Part 1: Development and operation of proficiency testing schemes

ISO/IEC Guide 43-2 Proficiency testing by interlaboratory comparisons – Part 2: Selection and use of proficiency testing schemes by laboratory accreditation bodies

2.3 The International Bureau of Weights and Measure (BIPM)⁷

GUM Guide to the Expression of Uncertainty in Measurement¹

3 DEVELOPING AND RE-AFFIRMING AN IPC TEST METHOD (QUANTITATIVE AND QUALITATIVE)

Each IPC test method, prior to its submission to the TMSC, **shall** include the items described in the following paragraphs:

3.1 Test Method Format The test method format **shall** conform to the IPC-TM-650 Test Method Template (see Appendix A).

3.2 Measurements and Values In accordance with the IPC Metric Policy, any measurements or values found within an IPC test method **shall** be defined metrically with imperial soft values contained in brackets as mandated by the IPC Technical Activities Executive Committee (TAEC). Explanations and examples of the metrics policies can be found within the IPC Metric Policy document and IPC-TM-650, Method 1.6.

3.3 Test Method Validation There are two key objectives to validating an IPC test method. The first objective, as described in 3.3.1, is to provide objective evidence that the elements defined within a method fulfill the intended use. The second objective, as described in 3.3.2, is a Gauge R&R study, to show that a method yields repeatable and reproducible results when executed by multiple facilities, which are preferably separate entities. The following describes the items that the TMSC requires when any method is submitted for review.

3.3.1 IPC Test Method Validation The OTG **shall validate** that any submitted IPC test method meets the requirements identified by that group and clearly defines the procedures used for validation and the collecting of relevant data. Additionally, the OTG **shall** define variables that may influence the outcome of the data, the method detection limits (MDL's) and the statistical impacts of all variables on the data (where practicable). IPC-TM-650, Methods 1.8 and 1.9, have procedures defined to help with the evaluation of measurement variables (see also ISO 5725 – Part 1 through Part 6 and/or GUM).

The validation procedure, all collected data, measurement variables, MDL's, statistical impacts and a statement from the OTG that the IPC test method does meet the intended requirements **shall** be submitted to the TMSC for review upon submission of any such method. No IPC test method will be approved by TMSC until all validation testing is completed by the OTG. Further, the OTG **shall** have a minimum of three independent task group members perform the validation protocol and report their results.

7. www.bipm.org

3.3.2 Multiple Facility Gauge R&R The OTG **shall** support the IPC test method with proven Gauge R&R that **shall** be appropriate for the proposed test method. The Gauge R&R **shall** be performed by a minimum of three independent facilities as a blind study. In addition, Cpk values supported by data **shall** be provided where applicable as determined by the originating task group (OTG).

4 IPC TEST METHODS FOR A SINGLE MANUFACTURER OF TEST EQUIPMENT

A minimum of three independent facilities, defined by the OTG, **shall** perform a study of the instrument to validate the ability of the equipment to objectively carry out the method and generate data considered as reasonable by the OTG. Where practicable the output of the equipment **shall** be traceable to SI (le Système international d'unités [International System of Units]) or SI derived units. Additionally, the OTG **shall** follow the same criteria defined in Section 3 when validating the equipment and method and reporting the results to the TMSC.

5 IPC TEST METHODS INVOLVING PATENTED EQUIPMENT, MATERIALS OR PROCESSES

For IPC test methods utilizing patented equipment, materials or processes, IPC's patent policy **shall** be adhered to. The OTG **shall** follow the same criteria defined in Section 3 when validating the patented items and reporting the results to the TMSC.

Additionally, the OTG **shall** include an accompanying statement in the IPC test method noting that proper license has been obtained. The following language taken from IPC's patent policy is an example:

“The user’s attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights. By publication of this standard, no positions taken with respect to the validity of this claim or of any patent rights in connection therewith. The patent holder has, however, filed a statement of willingness to grant license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license. Details may be oriented from the standards developer.”

6 EXISTING IPC TEST METHODS

Existing methods are those that have already been adopted into the TM-650 Test Methods Manual. Existing methods **shall** be reviewed and reaffirmed every five years to ensure that a test method is still current. If an existing method is kept active, then the TMSC requires that the OTG make an effort to validate the method per Section 3, assuming no prior effort to validate the test method has taken place. If the data from a previous validation effort is already available, it should be reviewed and provided to the TMSC to ensure that it is still valid.

Note: There is no requirement to gather historical data from their independent sources each time an IPC test method is submitted for its five-year review if such data was previously submitted.

APPENDIX A

IPC-TM-650 Test Method Template

Test Method ##Title:

Stage:

Date: Month 200X

Originating Task Group: Group Name (Code)

**Working Task Group: Group
Name (Code)**

1 Scope The Scope Section defines the purpose of the test method, as well as giving an overall view of the test method. This section should be written in summary fashion and include any limitations that might cause erroneous test results. It should also include a general statement regarding any cautions, hazards, or warning about the test method, referencing section 6 Notes for detailed information. The scope should also indicate who typically would be performing the test as well as providing information on where (scenarios, such as a type of lot) the test is to be employed.

2 Applicable Documents The Applicable Documents Section should include a list of all applicable documents and may show where to obtain these documents. Applicable documents are defined as documents that are specifically called out within the test method, and do not include other reference documents. Reference documents may be included in Section 6 Notes of the test method.

3 Test Specimens Test Specimens Section should include the type, size, and quantity of specimens required to conduct the test. Preparation of the specimens should be detailed in this section. If preparation is covered by another IPC-TM-650 test method (i.e., microsection preparation), then that method should be referenced here. Necessary considerations for storage preservation and handling of test specimens must also be made in this section.

4 Apparatus or Material This section should include all apparatus or materials utilized in the test method. It should include the technical data, accuracy requirements, and range capabilities of the equipment or materials necessary to adequately complete the test. This section should also include reference drawings for any specialized equipment or test fixtures required. If chemical reagents, purified water, or other specialized materials are to be used, purity, concentration, and/or special formulas required must be detailed. Specific brand names or trademarks should be avoided unless they are required for a well-defined reason. In this case utilize a footnote giving the required information along with either of the following phrases: “has been found satisfactory for this purpose”; “or equivalent.”

5 Procedure The Procedure Section is to be used to detail all of the specific steps necessary to perform the actual test. It **shall** include any specific conditioning requirements, or other specimen preparation not previously detailed. It **shall** then describe in detail the successive steps of the procedure, grouping related operations into logical divisions in a concise manner. It **shall** include times, temperatures, voltages, pressures, concentrations, linear measurements and quantitative criteria when necessary in applicable units (both Metric and English).

It **shall** then state any detailed information required in reporting the test results. When two or more procedures are described in the same test method, the report **shall** indicate which of the procedures was used. When a test method allows variations in operating or other conditions, the report **shall** state the particular conditions utilized for the test.

6 Notes The Notes Section is to be used to discuss any special considerations, or detail other reference documents necessary or recommended for the test. This section should include any safety precautions, hazard information, or warning statements necessary for the safe completion of the test method. This section should also be used to show sources of obtaining specialized test apparatus or materials for the test.



ANSI/IPC-T-50 Terms and Definitions for Interconnecting and Packaging Electronic Circuits Definition Submission/Approval Sheet

The purpose of this form is to keep current with terms routinely used in the industry and their definitions. Individuals or companies are invited to comment. Please complete this form and return to:

IPC
 3000 Lakeside Drive, Suite 105N
 Bannockburn, IL 60015-1249
 Fax: 847 615.7105

SUBMITTOR INFORMATION:

Name: _____
 Company: _____
 City: _____
 State/Zip: _____
 Telephone: _____
 Date: _____

- This is a **NEW** term and definition being submitted.
- This is an **ADDITION** to an existing term and definition(s).
- This is a **CHANGE** to an existing definition.

Term	Definition

If space not adequate, use reverse side or attach additional sheet(s).

Artwork: Not Applicable Required To be supplied
 Included: Electronic File Name: _____

Document(s) to which this term applies: _____

Committees affected by this term: _____

Office Use	
IPC Office	Committee 2-30
Date Received: _____	Date of Initial Review: _____
Comments Collated: _____	Comment Resolution: _____
Returned for Action: _____	Committee Action: <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected
Revision Inclusion: _____	<input type="checkbox"/> Accept Modify
IEC Classification	
Classification Code • Serial Number	
Terms and Definition Committee Final Approval Authorization: Committee 2-30 has approved the above term for release in the next revision.	
Name: _____ Committee: <u>IPC 2-30</u> Date: _____	



Standard Improvement Form

IPC-TM-650-MDP-A

The purpose of this form is to provide the Technical Committee of IPC with input from the industry regarding usage of the subject standard.

Individuals or companies are invited to submit comments to IPC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

IPC
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Fax: 847 615.7105
E-mail: answers@ipc.org
www.ipc.org/standards-comment

1. I recommend changes to the following:

- Requirement, paragraph number _____
- Test Method number _____, paragraph number _____

The referenced paragraph number has proven to be:

- Unclear
- Too Rigid
- In Error
- Other _____

2. Recommendations for correction:

3. Other suggestions for document improvement:

Submitted by:

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Telephone

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