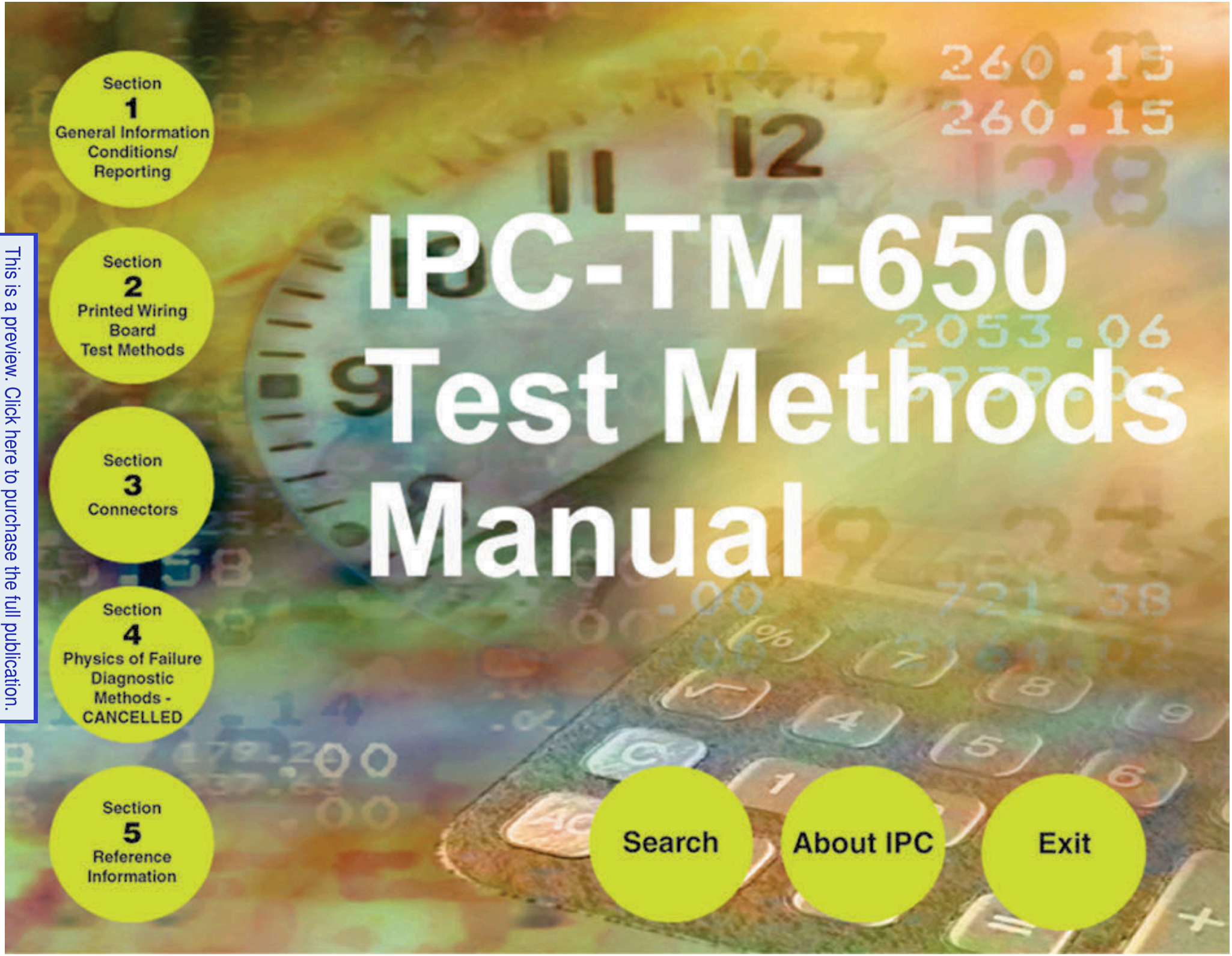


BACKGROUND INFORMATION

IPC-TM-650

The IPC formed in 1957

Because of a need for technical information, and to develop standards in the field of printed wiring, the IPC was organized in 1957 by independent producers of PWBs and began as *The Institute of Printed Circuits.*

The IPC continued to grow and expanded into areas besides PWBs, thus making it essential to include other aspects of the industry. The IPC officially changed its name in 1977 to *The Institute for Interconnecting and Packaging Electronic Circuits* to reflect the range of products associated with electronic interconnections.

The IPC has since further expanded its horizons and has become involved with flat cable, flexible circuits, connectors, discrete wiring, hybrid circuits, and assembly services.

Yet to this day, the IPC is a not-for-profit organization dedicated to the technological advancement of the printed wiring industry.

The programs of the IPC are made possible only through the active, voluntary support of its membership. The membership of the IPC is made up of representatives of companies from a broad cross-section of industry and qualified technical experts from government agencies, colleges, and universities. Membership in the IPC is on a company basis, with members being companies that produce printed wiring boards for sale or internal use, or suppliers of material or equipment used in the industry. As a result of this broad cross-section, the technical information and documents published by the IPC reflect the consensus of all segments of the industry.

The specific programs of the IPC

Following are the specific types of programs undertaken by the IPC:

1) Through the IPC, the industry develops and publishes standards and specifications to establish common terminology and promote optimum application, minimize confusion, and provide an intelligent path to productivity.
2) The IPC sponsors seminars and technical workshops to enable all segments of the industry to study new ideas in the technology.
3) The IPC, in its monthly member magazine, the IPC *Review*, provides the industry with news on the IPC programs and technical standards.
4) The IPC provides a forum for cooperative technical research. An example: A Round Robin to study board solderability, in which members would voluntarily submit or sample test boards. The test results can then be made available to the entire industry.
5) The IPC publishes several manuals and handbooks containing major technical documentation on key aspects of our technology, including standards, technical reports, and guidelines. All manuals and handbooks are developed through the cooperative and voluntary efforts of the membership.
6) Through the exchange of ideas at various sessions of our 150 different committee, subcommittee, or task groups, as well as by attending the IPC semiannual meetings, where over 70 new technical papers are presented, you can better keep your finger on the pulse of new developments in the industry.

Because the IPC programs are undertaken on a voluntary basis and shared by all in the industry, member companies have saved millions of dollars that would have been required for each company to duplicate that effort. This voluntary exchange of technical information has been an important factor in the high productivity of the industry.

Purpose of the IPC Test Methods Manual

The IPC Test Methods Manual, IPC-TM-650, typifies the objectives of the IPC. The IPC-TM-650 provides useful information to designers and users of printed wiring boards to help with problems they may encounter in the application of printed wiring test methods.

The purpose of the IPC-TM-650 is to keep you abreast on industry-approved test techniques and procedures for chemical, mechanical, electrical, and environmental tests on all forms of printed wiring and connectors.

The IPC maintains a list of the individuals who have purchased a copy of the IPC-TM-650. As new material is developed by our technical committees, all IPC-TM-650 holders who remain part of our updating service will be sent the material for inclusion in their manual.

The scope of this manual is broad. Refer to the Table of Contents, which specifies the material now included in the IPC-TM-650. The IPC-TM-650 is a living document in that the IPC, through the input of various technical committees and individual efforts of technical experts, will continue to develop and revise data so that the manual stays current.

The IPC and the future

With the continued voluntary, cooperative activity of the membership, it is anticipated that, through the IPC, we can undertake programs and activities which will be of mutual benefit to representatives from both the printed wiring and electronics industries. The IPC will provide a forum through which the objectives of the industry can be attained with the greatest efficiency and economy.

THE INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS
3000 LAKESIDE DRIVE, SUITE 309 S • BANNOCKBURN, IL 60015 • TEL 847/615/7100 • FAX 847/615/7105

FORMALITY PROCEDURE OF AN IPC-TM-650 TEST METHOD

An IPC test method is a concise way of providing a procedure by which the properties or constituents of a material, an assembly of materials, or a product can be examined. It is not intended that these test procedures contain acceptability levels for performance. Specific acceptability criteria should be detailed in the individual performance specification.

An IPC test method is intended to provide a uniform system of testing that can be utilized by a variety of IPC, commercial, and military performance specifications. It should therefore represent a consensus as to the best available test procedure for the intended use. It should be supported by experience and adequate data obtained from cooperative tests. It should be precise enough so that when a procedure is performed by an operator, the results will be found satisfactory for judging the compliance of material with the specification.

The IPC test methods are typically generated or revised by a performance specification group, which needs a tool to measure product performance. Since this generated or revised method will certainly affect other performance specifications, special care must be taken to ensure that all affected performance specification groups are involved at some stage of the method's writing or revision.

The IPC has empowered the Test Methods Subcommittee with the task of assuring that comprehensive, well detailed test procedures are produced. This subcommittee has developed a format for test method generation, which must be strictly followed. On the following pages is the format for developing a test method, as well as a flow chart detailing how test method generation should take place.

SECTION 1.0

SCOPE The Scope section defines the purpose and gives 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 warnings about the test method, referencing Section 6.0 NOTES for detailed information.

SECTION 2.0

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 6.0 NOTES of the test method.

SECTION 3.0

TEST SPECIMENS The 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., microsectional preparation), that method should be referenced here. Necessary considerations for storage, preservation, and handling of test specimens must also be made in this section.

SECTION 4.0

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.''

SECTION 5.0

PROCEDURE The procedure section is to be used to detail the specific steps necessary to perform the actual test. It will include any specific conditioning requirements, or other specimen preparation not previously detailed. It will then detail the successive steps of the procedure, grouping related operations into logical divisions in a concise manner. It will include times, temperatures, voltages, pressures, concentrations, linear measurements, and quantitative criteria when necessary in metric units.

It will then describe how to evaluate the samples under test, providing examples when necessary. It will also include any calculations or conversion tables necessary to complete or evaluate the test. The calculations should use numerical values for any physical constants and letter symbols to describe variables. The letter symbols must then be immediately identified under the equation.

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

SECTION 6.0

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.

IPC Test Methods Manual

The IPC Test Methods Manual, IPC-TM-650, is divided into several major sections to provide a systematic means of displaying a variety of information pertinent to testing all types of printed circuits and connectors. The following is a general description of the information contained in each major section of the IPC-TM-600. A more detailed listing of the contents of each major section appears as the Table of Contents at the beginning of each major section.

SECTION ONE — INTRODUCTION

Section One contains a listing of the Test Methods Subcommittee members, an explanation of the use of this volume, information of general interest relative to calibration of test equipment, reporting formats and practices, organizational abbreviations and sources, compliance certification, and review board procedures.

SECTION TWO — TEST METHODS FOR PRINTED WIRING BOARDS

Section Two contains the specific test methods, together with appropriate illustrations, sketches, and tables necessary for the performance of chemical, mechanical, electrical, and environmental tests on all forms of printed circuits. It is divided into subsections so that each test method can be found easily under the broad titles mentioned above. These test methods are also intended for use by adapting them for testing materials or end products similar to those for which these test methods were specifically written.

SECTION THREE — TEST METHODS FOR CONNECTORS

Section Three contains the specific test methods, together with appropriate illustrations, sketches, and tables necessary for the performance of chemical, mechanical, electrical, and environmental tests on connectors used in printed circuitry. These test methods are abstracted from the EIA-IPC agreed upon test methods appearing in the EIA-RS-364 Standard.

SECTION FOUR — PHYSICS OF FAILURE DIAGNOSTIC METHODS

Section Four contains information on diagnostic techniques for failure analyses. These are not standard test methods because the methods and procedures vary, depending on the condition or behavior of the test specimen. This section is intended to provide a feel for the capabilities of diagnostic testing for the relatively sophisticated equipment and training required, as well as the cost of diagnostic analyses. Most of these analytical test techniques are not feasible for routine incoming inspection, in-process inspection, or end-product evaluation.

SECTION FIVE — REFERENCE INFORMATION

Section Five contains related information to supplement and support the previous sections. It provides a listing of related test methods that may be utilized even though not yet officially concurred with by the IPC, a listing of related publications, a subsection dedicated to the metric system, information on preparing samples for testing, and specifications and sketches of test pattern artwork for all forms of printed circuitry.

IPC Procedure for Approving Test Methods for IPC-TM-650

Development and/or revision of test methods is encouraged. This procedure has been developed to simplify the process, and to assure timely and efficient processing.

Every newly proposed or revised proposal to an existing test method must have a cover sheet. The cover sheet can be found in the front of the IPC Test Methods Manual, IPC-TM-650, or can be obtained from the IPC.

1. Complete the heading with the appropriate information. If the method is new, a number will be assigned by the IPC.

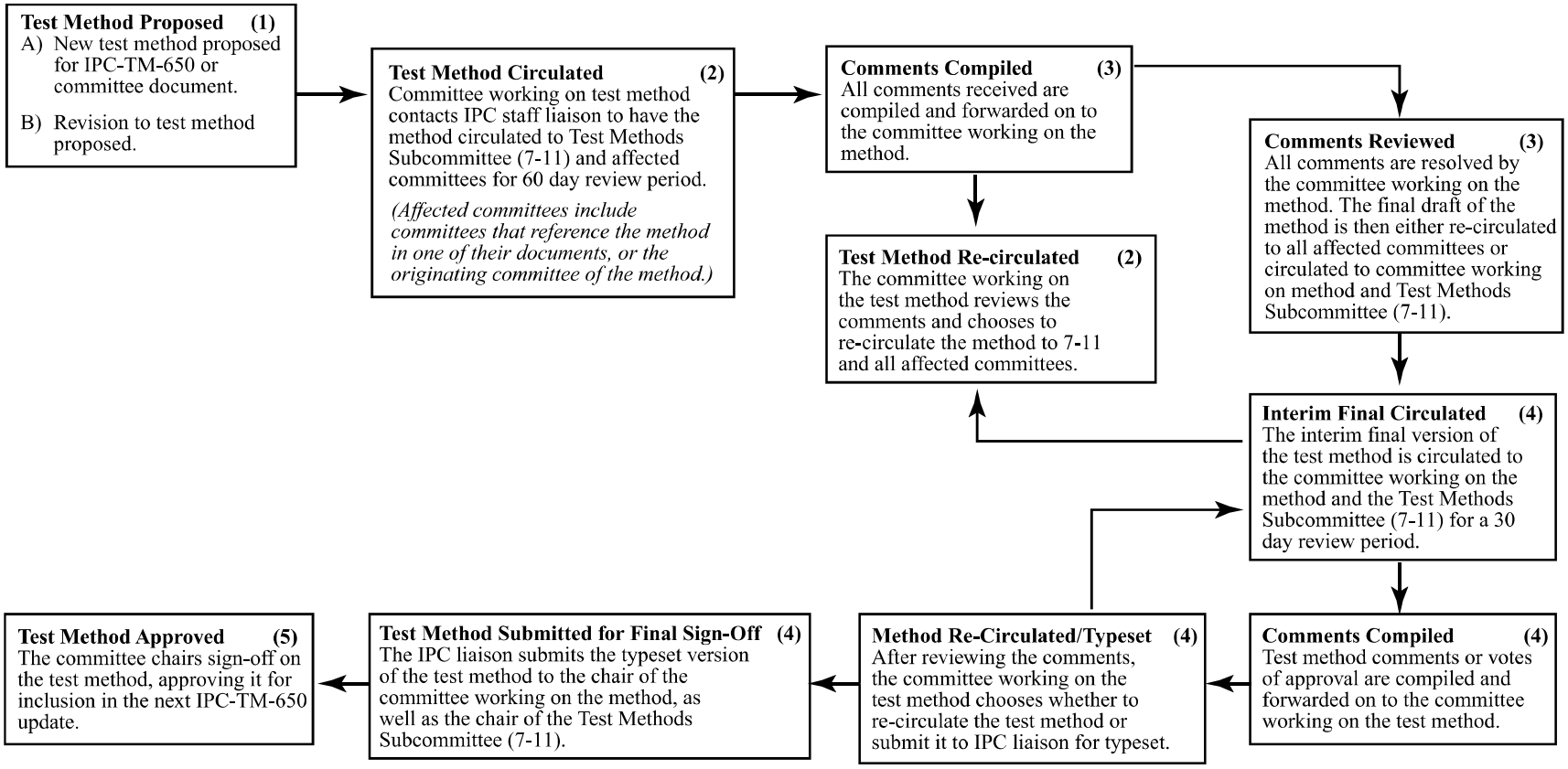
2. Section 1 needs to be filled out and returned to the IPC. You need the following information for this section.
   - Reason for initiating or revising the test method(s). Include whether the test method(s) was the result of a round robin program.
   - All standards/specifications that the originating task group is aware of that will be affected by the method(s).

3. The cover sheet will be returned to the originating committee with a number assigned to the new method(s)s and a disk containing the template and test method outline that needs to be followed. The IPC will verify that all affected groups have been identified and notify the chairman of all affected groups.

   The originating task group can now set up as many meetings as they feel necessary to work on the test method(s). The test method(s) will be circulated among the task group as many times as needed until the task group is satisfied.

4. Section 3 of the cover sheet is then filled out and returned to the IPC along with the test method(s). The following will then occur:
   - The test method(s) are sent to the Test Methods Subcommittee and all subcommittees and task groups affected by the test method(s) for comment. Any test method(s) revising any current method(s) will be circulated with the current method for comparison purposes.
   - The comments are then compiled and returned to the originating task group for disposition. All of those who comment will be informed of the schedule for this meeting so that they may attend.
   - Depending upon the level of comments or if the originating task group makes significant technical changes to the method(s) as a result of these comments, a second circulation may be necessary. The IPC staff and the Test Methods Subcommittee Chairman will make this determination.
   - Test method(s) accepted by one committee and rejected by another will be returned to the Test Methods Subcommittee. The subcommittee will then schedule a meeting to resolve the conflicts and disposition of the method(s).
   - If approved or if no comments are received, then the test method(s) will be submitted for typesetting.

5. The final typeset version of the test method(s) must be reviewed and released by the originating task group chairman and the chairman of the Test Methods Subcommittee prior to its printing in the IPC-TM-650.



IPC TEST METHODS MANUAL

FOREWORD

The purpose of this test methods manual is to contain, in one document, pertinent information on test methods that will be useful to manufacturers and users of printed boards, electronic assemblies, hybrid circuits, discrete wiring, and flat cable. It provides an organized reference source for test methods, which can be utilized by the testing laboratories of manufacturers and users of products of the electronic interconnection industry. In addition, this document provides an organized reference source of test methods that can be utilized by the technical committees of the IPC, in their work to develop new standards and specifications.

TELLS HOW TO TEST — NOT REQUIREMENTS FOR ACCEPTANCE

This test methods manual is designed to provide specific information on test methods. It does not attempt to establish acceptability levels for performance. Details of performance requirements can be found in appropriate IPC specifications, which are referenced in the manual.

ABOUT THE TEST METHODS IN THIS MANUAL

Each test method includes a brief description of its purpose and provides a listing of all equipment, apparatus, and other required materials necessary to perform the specified procedures. The test method may also include brief mention of limitations and/or specific areas of non-applicability.

Procedures for performing each test method are detailed in this publication. They include information on specific conditioning, curing, or other specimen preparation, as well as the specific procedure for conducting the test. Each procedure is sufficiently detailed so that the test can be accomplished by a technician familiar with standard laboratory practices and procedures.

SOURCE OF TEST METHODS IN THIS MANUAL

Most of the test methods published in this manual have been taken from previously approved standards and specifications of the IPC. Therefore, these test methods have been reviewed and approved by the entire membership of the IPC. Since the IPC membership represents both manufacturers and users, and since they represent technical representatives from supplier member companies and technical experts from many government agencies, the standards and specifications approved by the IPC have a broad base of acceptance.

In the event of a dispute over details of an IPC test method, the details of the test method published in the individual IPC standards and specifications should be considered the governing document.

Other test methods included in this manual have been taken from government standards or other standards that have extensive use in the electronic interconnection industry.

FUTURE TEST METHODS

The IPC will continue its efforts to maintain an awareness of all new developments in test methods. As new requirements for testing are developed, they will be studied by the IPC Test Methods Subcommittee and by other appropriate technical committees of the IPC. Where appropriate, such test methods will be approved and formatted for inclusion in the IPC-TM-650.

With regard to new test methods, the IPC seeks ideas and recommendations from all who are concerned with printed board and related interconnection products. If you have ideas for new tests that are needed, or information on new tests that are available for use in our industry, contact the IPC at 3000 Lakeside Drive, Suite 309 S, Bannockburn, IL 60015, Tel 847/615/7100, Fax 847/615/7105.

ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES ®

3000 Lakeside Dr., Suite 309 S
Bannockburn, IL 60015

Number	
Subject	
Date	Revision
Originating Task Group	

IPC-TM-650
TEST METHODS MANUAL

_____ **New Test Method** _____ **Revision to Current Test Method**

1. The attached test method is being worked on by:

Committee Name _____ Committee Number _____

Chairman _____ Is this the originating task group? ___ yes ___ no

Reason _____

The affected committees/documents are: _____

_____

If this is a new test method, the new number is: _____

Completed by: _____ Date: _____
IPC Personnel

2. Test Method is now ready to be reviewed by the 7-11 Test Methods Subcommittee and all affected committees.

This test method has been submitted for comment to all affected committees and the 7-11 Test Methods Subcommittee for review and comments.

Completed by: _____ Date: _____
IPC Personnel

3. All comments received need to be compiled and sent to originating task group for review.

All comments received have been compiled and forwarded to the originating task group.

Completed by: _____ Date: _____
IPC Personnel

4. All comments are to be resolved by originating committee and a final draft either recirculated or submitted for typesetting.

Interim final draft is submitted for circulation to affected committee and Test Methods Subcommittee.

Completed by: _____ Date: _____
IPC Personnel

Final draft is submitted for typesetting.

Completed by: _____ Date: _____
IPC Personnel

5a. The originating task group chair of this test method approves typeset version.

APPROVED BY: _____ **Date:** _____
Originating Task Group Chair

5b. The 7-11 Test Methods Subcommittee has approved this test method for publication.

APPROVED BY: _____ **Date:** _____
Test Methods Subcommittee Chairman

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2215 Sanders Road
Northbrook, IL 60062-6135

Number	
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IPC-TM-650
TEST METHODS MANUAL

_____ **New Test Method** _____ **Revision to Current Test Method**

1. The attached test method is being worked on by:

Committee Name _____ Committee Number _____

Chairman _____ Is this the originating task group? ___ yes ___ no

Reason _____

The affected committees/documents are: _____

_____

If this is a new test method, the new number is: _____

Completed by: _____ Date: _____
IPC Personnel

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Completed by: _____ Date: _____
IPC Personnel

3. All comments received need to be compiled and sent to originating task group for review.

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Completed by: _____ Date: _____
IPC Personnel

4. All comments are to be resolved by originating committee and a final draft either recirculated or submitted for typesetting.

Interim final draft is submitted for circulation to affected committee and Test Methods Subcommittee.

Completed by: _____ Date: _____
IPC Personnel

Final draft is submitted for typesetting.

Completed by: _____ Date: _____
IPC Personnel

5a. The originating task group chair of this test method approves typeset version.

APPROVED BY: _____ **Date:** _____
Originating Task Group Chair

5b. The 7-11 Test Methods Subcommittee has approved this test method for publication.

APPROVED BY: _____ **Date:** _____
Test Methods Subcommittee Chairman