



ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

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Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards

ANSI/IPC-ET-652

A standard developed by IPC

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Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards

Developed by the Electrical Continuity Testing Task Group of the
Product Assurance Committee of IPC

APPROVED OCTOBER 31, 1990 BY



AMERICAN NATIONAL STANDARDS INSTITUTE

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

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Guidelines and Requirements for Electrical Testing of Unpopulated Printed Boards

1.0 SCOPE

This document is presented to assist in selecting the test analyzer, test parameters, test data, and fixturing required to perform electrical test(s) on all unpopulated printed boards and innerlayers.

The users must determine the test parameters and fixturing requirements to test for continuity (open), isolation (leakage/short), and other special characteristics (i.e., impedance, hipot, capacitance, current carrying capacity, etc.) that will satisfactorily evaluate the critical electrical characteristics of specific printed boards.

1.1 Purpose Electrical testing verifies that the printed networks on the boards carry signals according to design requirements.

Electrical test does not ensure that the board can be assembled nor that the board meets all of the customer's requirements. Many physical characteristics of the board (dimensional accuracy, solder mask and nomenclature registration, presence of holes, etc.) cannot be determined by electrical test. Other checks should be employed to confirm these characteristics.

1.2 Introduction Electrical testing of unpopulated printed boards assures that the board conforms to the electrical design requirements. In addition, electrical testing data can be used to control and improve the printed board manufacturing process.

Electrical testing requires both initial capital investments as well as ongoing recurrent costs. Initially, electrical testing requires an investment in properly trained personnel, hardware, and software. Following this initial investment, handling, testing, performance diagnostics, and rework all affect the recurring cost of electrical tests. In selecting the appropriate test technology, equipment, and associated fixturing, a suitable compromise between productivity, features, and costs, can be found.

The costs associated with electrical testing can vary dramatically, from a few cents for fixture test probes to hundreds of thousands of dollars. Costs alone, however, should never be the only criteria for selecting an ATE system. As shown in Figure 1-1, many other important areas require consideration. For example, spacing and density may be of paramount importance to one user, while another may be concerned with testing parameters and service reliability. Look carefully at all areas of concern and how they may affect each other, not just how they perform individually.

Whatever the selection criteria may be, qualifying "benchmarks" should be performed on known product. Furthermore, contingencies covering specific requirements should be included in any purchase order prior to any major equipment purchase.

Certain technical factors will affect test comprehensiveness. For example, when selecting test voltages and resistances for the PCB, you must take into account both the final application of the board and the level of defect analysis needed to insure acceptable product. Electrical testing parameters that allow high productivity could also allow high defect escape rates and therefore result in higher assembly rework costs. On the other hand, unnecessarily stringent test parameters necessitate excessive capital equipment costs but may not be justified by the potentially higher defect capture rate and lower yields.

2.0 APPLICABLE AND REFERENCE DOCUMENTS

The following documents, of the issue currently in effect, are applicable to the extent specified herein, or can be used for additional reference.

2.1 Applicable Documents

IPC-T-50 Terms and Definitions

IPC-D-275 Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies

IPC-D-356 Bare Board Electrical Test Information in Digital Form

MIL-STD-45662 Calibration Systems Requirements

2.2 Reference Documents

IPC-AI-642 Users Guidelines for AOI of A/W, Innerlayers and Unpopulated PWBs

IPC-TM-650 Test Methods Manual

3.0 TERMS, DEFINITIONS, AND ACRONYMS

3.1 Terms and Definitions The definitions of terms used herein **shall** be in accordance with IPC-T-50 and the following:

Adjacent Features Features that are closest in proximity to the feature being evaluated.