ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES®

IPC-9850

Surface Mount Placement Equipment Characterization

Developed by the SMT Component Placement Equipment Subcommittee (5-41) of the Assembly Equipment Committee (5-40) of IPC

Approved American National Standard

ANSI

September 16, 2002

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

Contact:

IPC
2215 Sanders Road
Northbrook, Illinois
60062-6135
Tel 847 509.9700
Fax 847 509.9798

Table of Contents

Figures

Tables

Surface Mount Placement Equipment Characterization

1 INTRODUCTION

1.1 Scope This standard establishes the procedures to characterize the capability of surface mount assembly equipment in specification documents, as well as in documentation used to verify a specific machine's placement capability conformance to the specification, while maintaining a placement accuracy to placement speed relationship.

1.2 Purpose IPC-9850 has been developed to standardize the parameters, measurement procedures, and the methodologies used for the specification, evaluation, and continuing verification of assembly equipment characterization parameters. These standardized tools **shall** be used to develop and report the information called out in this standard.

1.3 Background With the proliferation of Surface Mount Technology (SMT), placement equipment users have struggled with the question of which machine will perform best in a given manufacturing environment. The advantage of the SMT assembly process to rapidly place components in precise alignment to the land patterns on the printed wiring board (PWB) was the initial yardstick by which machines were selected. Machines that could place components the quickest and with the least amount of scrap were considered the best.

Initially, the most common evaluation method was placement yield. For this evaluation, a machine is made to populate a large number of the user product where visible placement errors are counted as defects. Machines with the least defects and the most robust operation were considered best. The high yield and reliability of modern SMT placement systems require that very large amounts of data be collected to meaningfully assess yield and reliability. This standard provides new tools for gauging the yield and reliability of placement equipment yet presents performance results in the traditional metrics.

In addition to the high yield and reliability expected of modern placement equipment, the SMT assembly process has become significantly more demanding. Components have decreased in size, component terminations are smaller, and placement locations have moved closer together. All this while the number of components on the PWB and product volumes have increased significantly. Placement equipment must now place components more rapidly and with extreme precision to be financially viable. This has made requirements on placement machines more demanding.

Historically, placement equipment vendors have selected their own parameters and methodologies to present the specification of their machines' throughput and placement capabilities. The many representations of this information have made the comparison between similar types of placement machines very difficult. To obtain comparable data, users have been forced to conduct on-location evaluations of various machines under the same conditions. This type of methodology is very time consuming for users and very capital intensive for suppliers.

This standard simplifies the evaluation process by standardizing the performance parameters that describe the placement machines' capabilities. It also couples placement throughput and placement quality so speed and accuracy parameters are dependent on each other. This standard also specifies the methodologies by which the capability parameters are measured. This reduces potential user-vendor friction created when the user believes the equipment is not functioning properly. The methodologies specified herein are consistent and verifiable, thus providing common-ground-methodologies between users and vendors.

These methodologies were achieved by separating machine performance from the rest of the SMT process variables, which include paste printing, component quality, packaging type and PWB quality. The speed and quality evaluation methods of this standard specify that measurements will be made by placement of standardized components into sticky media on clear glass panels. Experience shows that surface mount equipment must perform well on sticky media before it can perform well in production. Furthermore, improved process capability on sticky tape usually translates into enhanced process capability in production. Although this method does not provide information that can be utilized to perfectly predict production quality, this methodology was selected in order to remove as much of the variation as possible between facilities, products, process, and operators.

While the ultimate goal is to evaluate a machine's capability to place components in paste on actual PWBs, it is not currently possible to make such measurements at the required precision and speed. It is anticipated that future in-line inspection systems will improve in their ability to measure component location and orientation. In the future it may become possible to use in-line post-placement (pre-reflow) automatic optical inspection (AOI) systems to measure the placement machine capabilities.

Due to the convergence of high-speed and fine pitch machines, this standard makes no attempt to separate the two types of machines. The user is empowered to decide if