

Title: Flying Probe test of Printed Circuit Boards  
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To learn more: Seica

## **Introduction**

The need to provide products which meet high quality standards is a fact of life in today's market, which requires ever-increasing reliability over time. The use of sophisticated systems for electrical test is important to achieve this goal.

## **Text**

The increasing demand for devices with high-tech content, is the result of the requirement for high-density interconnections, capable of providing higher performances in a smaller space.

The European market has been working to find the balance between its technological and manufacturing capability, while continuing to contain costs. The levels of technology and innovation in Europe are addressed toward the optimization of the manufacturing process, to increase performances, quality and reliability.

The general objectives range from decreasing the number of manufacturing processes to lowering the number of defective product. This should lead to a significant and positive impact on production costs.

Electrical test was, and still is today, the most effective tool for bare board testing, a field where Seica has made considerable investments in the form of its BBT (Bare Board Test) Platform, a line of high performance systems with high performance which meet the different needs of the industry, offering a range of models with either horizontal or vertical architecture, and 4 or 8 independent probes.

The design of the new probes guarantees extended life with no maintenance (over 8 million hits). Particular attention has been dedicated to minimize the probes' electrical impact on the measurements, making it possible to verify even the very low values of the trace parameters in an accurate and repetitive manner.

## **Flying probe in PCB testing**

As in assembled board test and with respect to a traditional test system, a Flying prober offers unparalleled versatility.

There is no need to manufacture a dedicated fixture for every type of board, thus considerably reducing the time and costs needed for test setup. It is perfectly suited to the requirements of prototype and pre-series testing, and production lots characterized by continuous variability. Tests can be immediately adapted to accommodate design modifications or variations made on work in progress. Since it is not constrained to a specific PCB layout, it can perform tests on any geometry and adapt to any possible requirement, covering all types of tests, including parametrical, continuity and isolation tests over a wide range of voltages.

## **Different architectures for different requirements**

To better meet the requirements of different manufacturing contexts, two complementary system architectures are offered: horizontal and vertical.

The former is oriented toward an in-line configuration for complete automation of the test process, eliminating the need for operator presence. The integrated, automated conveyor, compliant with the SMEMA standards, allows the deployment in-line or combined with the loading/downloading module (MTBH), for the automatic loading of boards of different sizes.

The ergonomics and reduced footprint of the vertical systems make them suitable for multiple requirements: in environments where a reduced footprint and easy operator access is required. The quick manual loading/downloading, combined with quick test program turnaround, allow to profitably test down to a single PCB, even with continuous program modifications.

The systems are based on the VIP platform, a high performance and user friendly software environment fully integrated with the advanced DSP technology of the measurement system, connected via a digital, fiber-optic communication link, making the signal exchange immune to noise, thus ensuring high accuracy and repeatability of measurements.

### **The horizontal systems**

Two horizontal systems are available: S280 and S240. The former offers the highest performances in terms of throughput and test potential. It is equipped with 8 completely independent measurement probes (4 on each side), allowing a speed of up to 9000 contacts per minute and precise measurements on both sides of the PCB. All the different types of test are available: from the standard electrical test, to Kelvin, all the way up to the measurement and test of active and passive embedded components. The high throughput of these systems facilitates their integration in the production line; with the automated integrated conveyor they become an unparalleled tool, achieving the optimum balance of automation, speed, accuracy and versatility.

The S240 system has all the advantages of the horizontal BBT Line in a cost-effective solution. With 4 fully independent probes, (two on each side), the system offers the versatility of a flying prober, while maintaining the integration features of the production line; it is the ideal solution for all those situations where the manufacturing requirements are characterized by variable lots and focused on PCBs with a lower intrinsic value, and where faster return on investment is required. Test programs developed on this system can easily be transferred to a higher configuration, since the same VIVA software is used. In this context, the S240 test systems represent a good entry level, which protects investments in training and test program development over time.

### **Less space with the vertical architecture**

The S260 vertical system combines the features of versatility and ease of use with high performance standards. The system is provided with 8 completely independent measurement probes, allowing to reach high test speed or, alternatively, to test two PCBs simultaneously.

8 probes, 4 on each side, enable precise measurements on both sides of the PCB; even in this case, as for the horizontal version, all types of tests are available, up to the measurement and test of active and passive embedded components.

This system is particularly suitable where very short test setup times are needed to ensure the minimum time to market of products, to test sophisticated prototypes, small volume (up to a single unit) or for the service and repair labs.

Compact dimensions and rationality, combined with the ease of use of the VIVA software, are the guiding features used by Seica in the development of an instantly ready-to-use system. In the case requiring a compromise between versatility and cost effectiveness, the answer is provided by the S220 system. Equipped with 4 fully independent probes (two on each side of the board) it is suitable to check the essential operational features of a PCB. Thanks to the VIP platform and the simplicity of the VIVA software, the time needed for training is very low, and no specifically skilled personnel is requested. The S220 system makes Flying probe test available for everyone: small manufacturers, prototype labs, certification and quality assurance entities.

## **Some design Features**

Special attention was devoted to the mechanics of the Z axes motion control, which includes linear motors with position feedback directly on the slider, allowing absolute control of the dynamics and the position of probes. In addition, thanks to the fiber-optic communication system of the digital drives, it is possible to select different contact modes very simply via the VIVA graphic interface, without requiring any electrical or mechanical calibration of the drives and heads.

The check of the essential operational functions of the printed circuits can be tested on any type of board layout. Even the most critical layouts and the smallest size pads can be accessed thanks to the mechanical geometry, accuracy and repeatability offered by the BBT Line systems.

## **Precision and accuracy in test**

The accuracy and independency of motion of the probes in the Seica flying probers enable high-precision measurements to verify the tracks of the PCB tracks: Kelvin tests with 4-wire voltage and current measurements, even using two probes on the same pad, the Barrel test used for the continuity and parametric tests of the PCB through-hole nets, which can be determined thanks to the simultaneous positioning of two probes on each side. The Trace capacity test allows the autolearn and re-verification of the capacitive values between the tracks and the ground planes, while the Component test checks the values of the passive components embedded in the printed circuits and performs functional tests on any active components present.

The test of flexible PCBs has been simplified thanks to the vacuum table, which can be inserted into the work area, to enable the test of even the thinnest board. The innovative mechanical clamping system reduces board deformation thanks to the easy to install stretch clamps.

All of the BBT systems are equipped with CCD cameras to check both sides of the PCB. Apart from simplifying the test and program debug activities, the VIVA software is provided with routines for the optical inspection of the probes during the test execution.

With just a few simple operations the program is easily adapted for multipanel PCBs and Parallel test. The tests defined for a single printed circuit are multiplied through simple visual translations, with the possibility to check the outputs of every single test. The 8-probe test system can perform the parallel test of two boards simultaneously.

The Link to Grid Test is the tool used to perform the Retest of boards previously tested on bed of nails systems.

Statistical monitoring tools are essential for quality analysis and defects reports; the BBT systems provide the user with a range of different functions needed to collect data on batch defects, which include automatically generated reports containing statistical information in either graphical or text format.

## **For a higher operational versatility**

The horizontal test systems can be combined with the Seica MTBH (Multi Type Board Handler) capable of holding up to 150 PCBs at a time, even of different type and size. A simple menu is used to select the test sequence so that the system, upon loading the selected test program, automatically adjusts the board handler rail width. Once the test is completed, the board is downloaded and stored in the storage unit of the tested boards, on a different shelf according to the test result.

VIVA is equipped with a graphical environment to view and locate the fault data output by the test, making it very easy to carry out repair activities directly at the test system, or to send the test information to a remote PC for off-line repair.

In fact, via the Programming station option, the VIVA environment can also be installed on a remote PC, away from the test system. This enables test program development in emulation mode, reducing to a minimum the time needed to set up the test on the BBT system, thus maintaining high levels of test throughput.