

FlyScan and Flying Probe Platform

Short Notes of History and Philosophy of test

When at the end of the 80's the first flying probe testers appeared on the market coming from Japan, nobody could figure out that that type of ATE would reach the reliability and sophistication average as nowadays, both on the point of view of mechanics and of the electrical measurements, holding an increasingly strategic and essential position in the test units of electronic boards manufacturers worldwide. Actually, there's been a huge evolution of Flying Probers ATE in the last 15 years, in terms of performance, test speed and capability to implement different test techniques, to which Seica contributed considerably being the first European Company to design and manufacture this type of systems since 1994. Seica has constantly introduced important innovations along the years on flying probers, among which we mention:

1. the virtual bed of nails with the concept of measurements guarding
2. the possibility to power up the UUT to perform functional tests,
3. the enlargement of the test area equipped with an automatic conveyor for board loading/downloading
4. the vertical architecture up to 8 flying probes, essential for the double-side simultaneous test.

The continuous growth in terms of performances and test capabilities offered to its customers, brought the Seica flying probe systems to be applied not only for prototype and low/medium volumes, but also for repair of electronic boards coming from the field and reverse engineering, when the board repair is difficult due to the lack of incoming data such as schematics or CAD files.

The attention paid by Seica to the problem of faulty boards repair, combined to the thread of testing newly manufactured boards, further enriched the **Pilot** systems platform with innovative options, unique in their genre, granting multiple test solutions which can be applied with the same ATE. The Pilot system user has today available a powerful platform, which maximizes the system capability to detect all the possible faults on the board, combined with a considerable decrease of test setup times and execution, thanks to the VIVA management software automatism, common to all Seica ATEs.

On the wake of the continuous aforementioned innovation, Seica has recently presented to its customers five brand new additional capabilities dedicated to the Pilot platform, described below:

FlyScan: the true integration between Boundary Scan and Flying Probe

Aiming to further enrich the offer for test and repair of electronic boards and finally supplying a comprehensive solution also for the boundary scan test, Seica has integrated since a few months in its flying probers the **FlyScan module**, designed and manufactured in partnership with Temento Systems, which grants the following capabilities:

- ◆ Automatic creation of the test program starting from the unique Seica VIVA environment

- ◆ Automatic creation of the boundary scan program also for the non JTAG-type nets, using the function “*extended test*” which turns the nets into JTAG type through the flying probes
- ◆ Automatic elimination of test redundancies
- ◆ Automatic error diagnostic, with real time creation of additional tests performed by the flying probes for the accurate detection of the faulty component.
- ◆ Single test report in VIVA environment
- ◆ Management of the errors detected by the boundary scan test in the Seica Repair Station software environment
- ◆ Cost reduction

The basic idea of the FlyScan module is very simple and consists in exploiting the mutual benefits which ATE flying probers and boundary scan testers may exchange, ***creating the test program knowing they are both available and are not two separate identities working independently!*** The immediate advantages coming from the use of FlyScan are, for example:

1. In the phase of program creation, the CAD data import is performed once only and this benefits both the automatic creation of MDA/ICT/AOI/ and functional measurements of the flying probes and the automatic creation of the boundary scan type tests (***saving programming time***)
2. The shorts and open tests on JTAG-type nets may be executed by the boundary scan much faster than a flying prober (***test time saving***)
3. The nets physically inaccessible for the flying prober and related to components equipped with JTAG port (let’s think of a net which connects only two pins of BGA components and where a test point has not been scheduled) are testable for the boundary scan (***increase of test coverage***)
4. The nets not related to JTAG components may become JTAG type nets if contacted by the flying probe tester: hence the possibility to include them in the automatic creation of the boundary scan program, with no need of manual cluster tests (***saving of time needed for programming and increase of fault test coverage***)
5. In case of error detected by the boundary scan test, diagnostic checks are created real-time scheduling the use of flying probes to locate the single faulty component on the net, with much more accuracy with regard to the classic boundary scan (not able to recognize two nets connected to a buffer or to a serial resistance) (***increase of fault diagnostic capability***)

The FlyScan implies considerable advantages with regard to decrease of test time, and to increase quality and fault coverage of the test executed, proving that the combined and integrated use of the two test methods boundary scan and flying probe, provides a result much higher than the trivial algebraic sum of the single results achieved .

Power Probes: power supply through flying probes

Through the same VIP platform common to all the Seica functional testers, also the Pilot systems can easily power up the UUT with fixed probes and perform analog and digital or mixed functional tests, even combined with fixed analog or hybrid measurement channels. However, the Pilot V8 system can do much more, since when it is equipped with the new ***Power Probes module***, the UUT power up is granted by two additional flying probes

(one on each side) which may be connected to any of the user plugs available on the system, thus eliminating the need of a fixed cable to be connected to the board under test. Hence, the Power Probes function, completely eliminates the need of connecting cables to the UUT, releasing it from any fixed connection to the measurement resources and helping the full automation of the test also in case of functional tests requiring high power. Thanks to the Power Probes function, the Pilot V8 test system becomes to all effects a 10 flying probes test system, of which 8 can be used for all the hardware resources for stimuli and measurement, while 2 are dedicated exclusively to the power up of the product to be tested.

Parallel test: pay one, test two

A test system equipped with 8 flying probes (4 on each side of the UUT) like the Pilot V8, is useful not only to those who need accessing the two sides of the board simultaneously to maximize the fault coverage average of the test programs, but can be extremely interesting also for those who have to test boards fully accessible on one side only. Thanks to the **Parallel Test** function, those who scheduled to access all the board nets on one side, compliant with the design for testability directives, will be enabled to **test two boards simultaneously**, by assigning the probes on one side of the system to the first board and the probes on the opposite side to the second board! From here, a considerable advantage also for the less skilled, with halvened test times and **double ATE throughput!** Moreover, if we consider that the operator will manage the whole through a single test program, while the test report perfectly recognizes the error messages related to one or to the other board, it is easy to understand how innovative is this performance in its genre and it represents the true way of speeding up the flying probe tests.

Quick Test: one way to flying probe functional test

Another great innovation in the world of flying probe test is Quick Test, the nice graphical software which enables all users of the Pilot systems to edit and perform functional tests in minimum time **programming all the system resources correctly with no knowledge of their internal architecture or a specific programming language.** To use Quick Test and possibly enrich the classical in-circuit test program with a set of functional tests, the user simply needs the functional test specification of the UUT and describe it in the Quick Test graphic environment, which is extremely simple, intuitive and, as usual, integrated in the VIVA environment. Quick Test is useful also to use the ATE as a lab instrument, hence to set up functional measurements very quickly, also in lack of a complete test program, being thus very useful for the expert users who perform board repair and want to quickly interact with the test system, maintaining the control of operations coming from their own experience in the field. Here, we are facing the overcoming of a chronic limit of the flying probe systems: regardless of their manufacturer and of the software applied, until nowadays, the implementation of functional tests on flying probers has represented a true challenge for the less expert users, since this required a deep knowledge of a proprietary programming language and of the system hardware architecture. All this is no longer required when the Quick Test is available; in a few seconds and through its user friendly graphic interface, it automatically selects and routes the instruments, moves the probes to execute the functional tests required, including the management of UUT power up.

Thermal Scan: UUT automatica thermal analysis

Another innovative technique available for board repair on Pilot systems is the ***Thermal Scan***, which enables the user **to monitor in a fully automated way the temperature of every electronic component mounted on the UUT**, hence to detect faults through the comparison of a correctly operating sample and the lot of boards to be tested. During the Thermal Scan, the UUT is powered up by the ATE and a pyrometer mounted on one of the mobile probes (one on each side for double side systems) reads the different temperatures. As for any other test technique available on Seica systems, also the Thermal Scan can be easily integrated in a standard test program managed by the VIVA software and, if the operator wants to execute a manual inspection, the Thermal Scan provides the thermal scan of the UUT, giving an image where colors correspond to different temperature range, for an immediate identification of the potential faulty areas on of the board.

Continuous innovation, modularity and enrichment of the common test platform are the basic elements of Seica philosophy to provide comprehensive and complete test solutions. New performances are forecast for next fall 2010 to meet, and possibly anticipate, the growing demand of innovation in today's market remaining a leading company in the test environment where Italy has a definitely strong position worldwide.