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Agilent 5DX Automated X-ray Inspection Test System

Better Test. Better Coverage. Better Products.



Agilent Technologies



Industry-Leading Technology for Catching Defects and Improving Processes

The Best Test, Period

The Agilent 5DX is more effective at finding manufacturing defects on printed circuit board assemblies (PCBAs) than any other test solution on the market today.

By itself, this automated X-ray test system catches over 97 percent of all solder related defects (such as opens, shorts, voids, and insufficient or excess solder) and over 90 percent of *all* manufacturing defects on PCBAs. Combined with other test solutions such as automated optical inspection (AOI), in-circuit test (ICT) and functional test, the Agilent 5DX provides virtually failsafe defect coverage on today's complex boards. And it provides that coverage fast, scanning both sides of a double-sided PCBA with one pass, inspecting thousands of solder joints per minute.

Total solder joint coverage

X-ray test is the only technology capable of inspecting BGA, CCGA, CSP, and other area array solder joints. With its patented 3D technology, the Agilent 5DX is able to zero-in on specific layers of a PCBA to inspect surface features with extreme accuracy. It literally sees through obstructions such as BGA packages, RF shields and component packages to inspect hidden solder joints on both sides of a PCBA. Of course, it also inspects traditional SMT and through-hole components such as QFPs, SSOPs, connectors, and chip components. The result is a fast, repeatable test that catches more defects earlier in the assembly process, and provides actionable information for faster repairs.

Automatic analysis, actionable information

The Agilent 5DX doesn't just capture X-ray images. It transforms images into useful, “actionable” information. The Agilent 5DX uses a suite of patented algorithms to isolate open solder joints, solder bridges, misaligned and missing components, insufficient and excess solder, and solder voids. The defect data, including component, pin number, defect type, and X-ray image, are then reported to the Agilent Repair Tool (ART) for easy, effective repair.

Simple programming

The Agilent 5DX includes a suite of tools to simplify most day-to-day development tasks in X-ray test.

- CAD files are translated automatically.
- Program thresholds are tuned by the system to increase call accuracy.
- A program advisor checks your tests and provides recommendations to improve accuracy and fault coverage.
- Defect coverage reports tell you the coverage you're getting and indicate where coverage can be improved.

This kind of built-in intelligence allows you to get the full value out of your Agilent 5DX and take advantage of its inherent power. Most test professionals can begin working productively with the system in one day, even if they have no prior experience with X-ray test.

Provable ROI

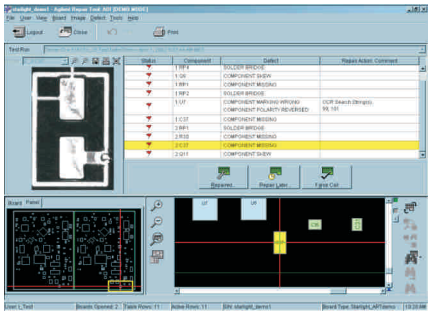
Every board defect has a cost, either in time, money, or product quality. The Agilent 5DX keeps those costs to a minimum. It catches defects early so you get a higher yield of good boards moving down the line. The results can be dramatic. Fewer boards to repair. Fewer bottlenecks at ICT and functional test. Less scrap. Less repair time. Lower warranty costs. Higher end-product quality. And, ultimately, happier customers. Those are some of the reasons why the Agilent 5DX is used by hundreds of electronics manufacturers worldwide, including the world's ten largest OEMs and 20 largest contract electronics manufacturers (CEMs).



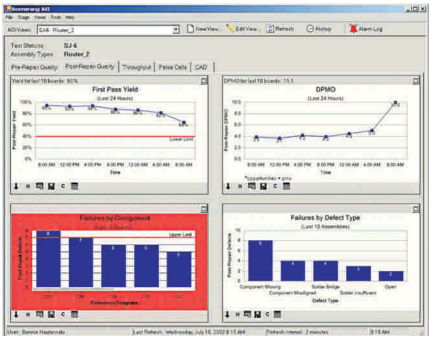
Complete solution for production test

The Agilent 5DX supports automatic inline operation with SMEMA compatibility to reduce operator intervention, and integrated repair and quality tools get actionable information in the right hands. It's a complete end-to-end toolset for real-world production test environments.

Agilent Repair Tool (ART): ART software for Agilent X-ray test, ICT and AOI systems provides direct access to Agilent 5DX test results, and displays the results in a graphical format, so calls are easier to validate, problems are easier to pinpoint, and repairs are made faster. Even someone with limited training can use ART software to quickly verify defects and identify where and how repairs should be made. Operators get a clear view of test data, along with images of defective parts and corresponding board CAD data, so they can repair boards faster. That means less repair WIP, lower repair overhead, and fewer downstream escapes, reducing time and costs at functional test.





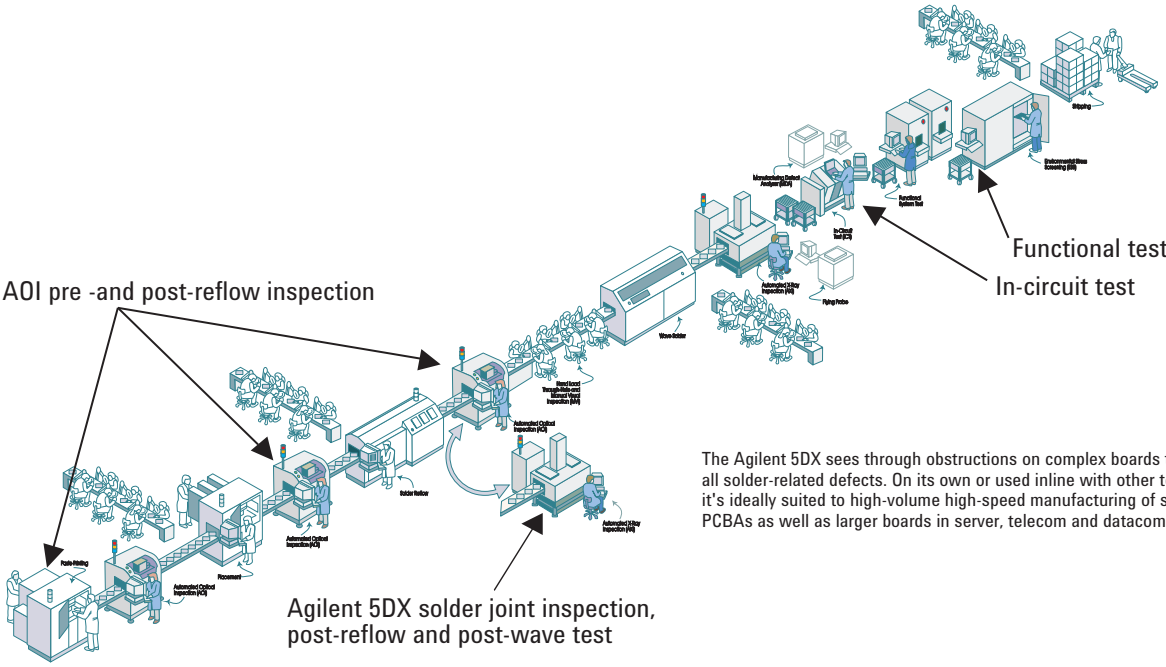


Agilent Quality Tool: This patent pending data analysis tool uses Agilent 5DX test data to quickly identify process and quality issues on PCBAs. It provides real-time access to data from Agilent 5DX and SJ platforms, allowing comprehensive, immediate information for process analysis, statistical process control, and test/repair effectiveness evaluations.

- Custom views, or dashboards, allow you to get real-time access to pre- and post-repair quality information, test and repair throughput, work-in-process information, and historical quality information. This provides identification and lower false calls which result in a more efficient test and repair loop. Since the dashboard provides "live" views, alarms can be set-up for real-time process control.

- From any dashboard or historical chart, data can be broken down to actionable items. With just a mouse click, intelligent drill downs gives you an analysis of your data for incredible speed to actionable information.

- With its XML export tool, the Agilent Quality Tool offers easy access to data within the test and repair loops. The spreadsheet export tool allows you to filter and export data to any spreadsheet application for data analysis, or connect to MES and other data gathering tools. The Agilent Quality Tool automatically generates XML files and distributes them enterprise-wide as test or repair actions occur on your Agilent products.



The Agilent 5DX sees through obstructions on complex boards to catch over 97% of all solder-related defects. On its own or used inline with other test technologies, it's ideally suited to high-volume high-speed manufacturing of small, complex PCBAs as well as larger boards in server, telecom and datacom applications.

The Agilent 5DX



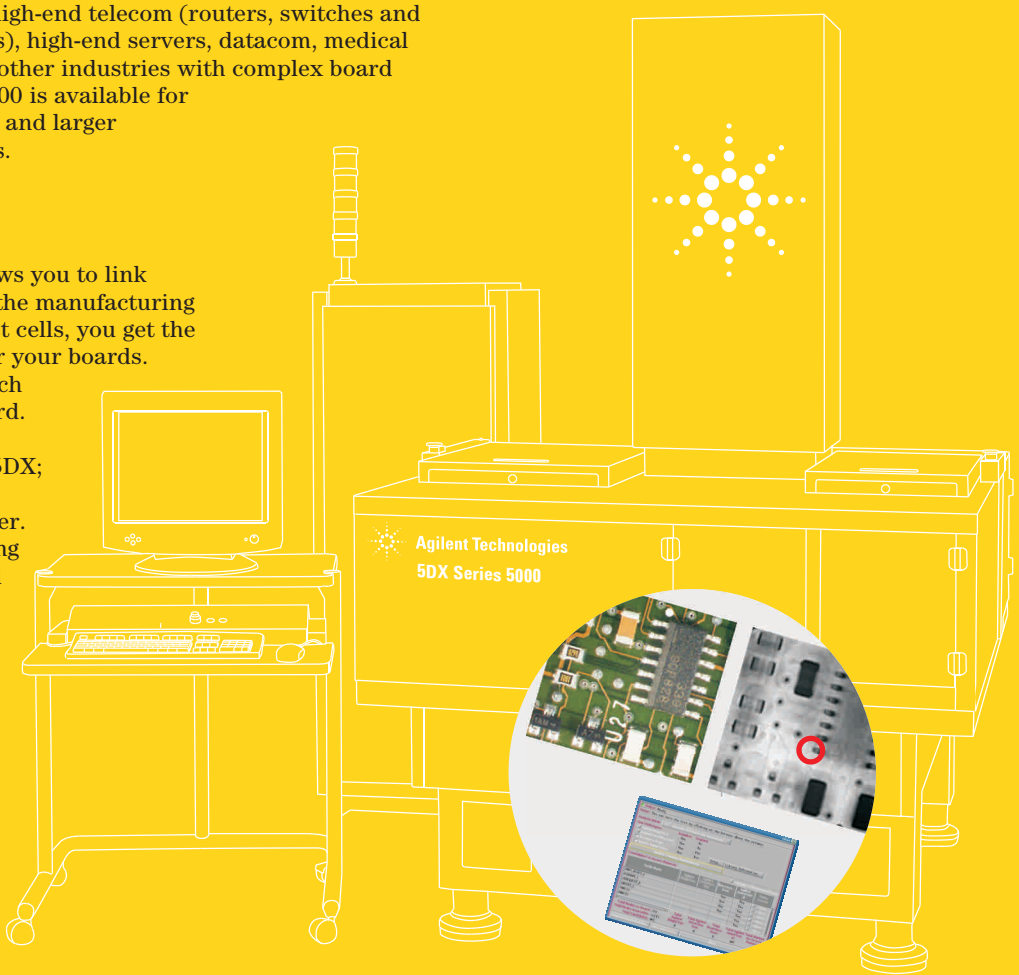
The Agilent 5DX makes sense in an age where boards, budgets and timelines continue to shrink. It accelerates programming with step-by-step tools and a point-and-click graphical user interface. It finds hidden defects on advanced PCBA packages such as BGAs, CSPs, CCGAs, press fit connectors and more. It keeps AXI simple, effective and cost-effective, and solves everyday challenges on the test floor.

Agilent 5DX Series 5000

The Agilent 5DX Series 5000 outperforms other test technologies for testing complex PCBAs. It's faster and more repeatable than manual X-ray or manual visual inspection. It's more accurate and provides greater coverage than 2D X-ray and AOI. It overcomes electrical access limitations and provides much higher defect coverage than in-circuit test, and does it with simpler programming and without the time or cost of fixture development. The 5DX is a good fit for manufacturing environments that need to ramp-up fast and keep complex, fully tested boards moving down the line and out the door. It's especially well suited to high-end telecom (routers, switches and servers including active backplanes), high-end servers, datacom, medical products, military, aerospace, and other industries with complex board designs. The Agilent 5DX Series 5000 is available for board sizes of up to 18 x 24 inches, and larger heavier boards up to 24 x 40 inches.

AwareTest xi technology

Agilent AwareTest xi software allows you to link an Agilent 5DX tester with ICT on the manufacturing floor. Instead of having isolated test cells, you get the benefit of two technologies to cover your boards. The technologies work together, each testing different aspects of the board. Components that cannot be easily probed are tested with an Agilent 5DX; parts that can be probed are tested with an Agilent 3070 in-circuit tester. The test load is distributed, reducing node count, programming time and fixture costs in ICT. Since each system does what it does best, coverage is improved and diagnostics are more accurate, reducing repair costs.



Worldwide professional services

Agilent has a deep talent pool of engineers, programmers, consultants, technicians, trainers and more who are available to work for you anywhere, anytime. Agilent resources can fill the manpower gap created by peaks and valleys on the production line, so you always have access to technical resources that help you get a higher return on your test system investment. They can help you optimize programs, streamline application development, train new operators, diagnose problems, and avoid downtime with preventive maintenance and occasional upgrades. Agilent experts can be part of your team whenever you need them. To learn more, visit

www.agilent.com/see/5DXservices.



Technical consulting

Specialized consulting services bring hands-on expertise into your organization whenever you need it. Agilent consultants are available to help you plan system installation, install and debug programs, ensure that programs are running correctly, make sure repair cells are set up properly, provide image interpretation training, and much more. You can even get help with post-implementation monitoring to tune the performance of your test and repair operations. Agilent will be there before, during and after the sale to make sure your Agilent 5DX gets into production, stabilizes and stays there. To learn more, visit

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Flexible financing

Only Agilent offers a range of financing options including long-term leases, short-term rentals, step-down leases, lease-to-buy, trade-ins/trade-ups, and pre-owned systems. We're working to reduce your cost of test and help you keep test expenditures in line with cash flow.



Technology Comparison Matrix	Automated Board Handling and Inspection/Test	Full Single Pass Inspection of Both sides of board?	Capability to inspect partially hidden solder joints (QFP heels, J-Leads etc.)	Capability to inspect totally hidden solder joints (BGA, CSP etc.)
Agilent 5DX-Automated 3D X-ray Test	Yes	Yes	Yes	Yes
Automated 2D X-ray Systems	Yes	No*	Yes**	Yes**
Post-Reflow AOI	Yes	No	No	No
Manual 2D X-ray Systems	No	No***	Yes***	Yes***

* For most double sided applications component and/or solder joint overlap or "shadowing" will prevent full inspection.
** If joints overlap or "shadow" between both sides of the board this capability will be limited.
*** Available features of the specific system will determine level of capability.

Which technology is right for you?

Let board complexity and test needs decide. The Agilent 5DX Series 5000 is a good fit for high complexity, high density, double-sided boards with a significant number of hidden joints or array-type packages, or where there's limited test coverage and nodal access at in-circuit test. Compared to other test technologies, the Agilent 5DX has a provable advantage in speed, accuracy, defect coverage and test repeatability. Virtually all Agilent 5DX owners also cite a companion improvement in first-pass yields and a decrease in repair time and warranty returns.

X-ray Test: Simply Better

X-ray test has the most complete fault coverage of any test technology. Coupled with its unmatched defect detection capability, its step-by-step programming and point-and-click graphical user interface, the Agilent 5DX Series 5000 is the most effective PCBA tester available.

World-class defect detection

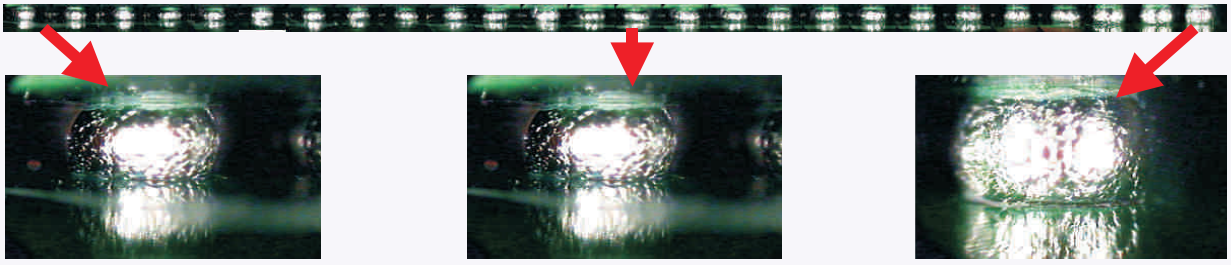
BGA Opens Detector: Printed circuit boards and packages almost always have some degree of warp, which occurs when boards and packages cool after the reflow soldering process. Warp distorts the shape of solder balls as well as the boards themselves, making it impossible to detect open solder joints with traditional X-ray systems. The Agilent 5DX with patented BGA Opens Detector technology counteracts the effects of board warp. The system automatically compensates for normal, acceptable solder joint variation, and accurately differentiates between good joints and open joints. With this patented technology, the Agilent 5DX consistently catches more BGA opens than any other test solution.

Press-Fit Connector: Bent or missing pins on solderless press-fit connectors are difficult to find visually, and typically occur downstream of AOI. The Agilent 5DX easily finds and isolates these defects.

Surface Mount Connectors: More designs are using more SMT connectors. These connectors experience extreme stress in the field, so a marginal joint that has insufficient solder, poor wetting or other irregularity will eventually cause an expensive field failure. The Agilent 5DX SMT Connector algorithm family finds these marginal joints, even if they are hidden by the connector body.

Defect Analyzer: Defect Analyzer evaluates all board views and automatically triggers a retest to confirm defect calls. Views are recaptured at slightly different heights to compensate for board warp or variations in board thickness. Defect Analyzer can be toggled on for highest call sensitivity, off for highest throughput. Studies show that Defect Analyzer dramatically improves call accuracy and significantly reduces escapes at the end of the line.

BGA Opens Detector: Ensuring Call Accuracy



Boards and packages that are heated during solder reflow almost always warp as they cool. Warping distorts solder balls on BGAs, causing the diameter of the balls to vary outside the set parameters of a test. The Agilent 5DX, with its patented BGA Opens Detector, counteracts the effects of warping by comparing each joint's diameter with that of its nearest neighbors. If warping has caused ball joints to vary, the tester will see a progression of steadily increasing or decreasing diameters, and appropriately pass the joints as good. If the tester sees a sudden or non-uniform change in ball diameter, it flags the joint as a possible open. This comparative analysis allows the BGA Opens Detector to cancel out the effects of warp and reduce measurement “noise” so true defects stand out clearly. Measurement accuracy is increased, false calls are reduced.

Program development suite

CAMCAD Professional: This powerful tool quickly and automatically translates native CAD data into correctly formatted files that can be used on Agilent X-ray systems (and Agilent ICT and AOI systems too). It accelerates programming by importing Gerber and Intelligent CAD data automatically, and generates complete programs in the correct syntax, using the naming conventions you provide. A graphical point-and-click interface means CAD data can be turned into production-ready files in minutes, and complete programs can often be generated in an hour or less.

Test Link: This integrated programming tool makes it easy to develop programs for the Agilent 5DX. The key is ASAP, the Agilent Supported Application Program, a collection of Agilent procedures and best practices that enable fast, easy, consistent programming. ASAP captures three generations of X-ray test knowledge in the form of test methods and practices, training, documentation, interfaces and tools. Test Link turns that knowledge into system features:

- A step-by-step programming process guides programmers through each phase of test development with clear visual cues.
- A design rule checker works in the background constantly, so if there's a conflict between a program and the CAD file, you know it immediately.
- An integrated package library simplifies and accelerates test development for today's complex packaging technologies.
- Graphical views of panels, boards and packages make it easy to visualize progress while addressing both sides of a board.

Algorithm Tuner: With the Agilent 5DX you can run and tune tests in the same environment, from the same graphical user interface. The built-in Algorithm Tuner allows you to select components, run programs, view results and modify thresholds without exiting the controller interface. You can adjust thresholds, reset defaults, and fine-tune programs on the fly. It happens easily with point-and-click settings, explanatory threshold names, and an integrated help section that defines thresholds and describes how they affect measurements.

Program Advisor: The integrated Program Advisor checks Agilent 5DX programs against ASAP best practices to verify the quality of programs. It evaluates test parameters such as thresholds, views and algorithm selections, and recommends modifications that can improve call accuracy and fault coverage. It eliminates guesswork, and tells you how your programs compare to industry best practices. The end result: better programs, higher coverage, and higher call accuracy.

Defect Coverage Reports: The Agilent 5DX can tell you the precise level of coverage you're getting with your programs and identify where coverage is lacking, including specific pins and components that are not being tested. You get pin and component counts and coverage percentages in a brief report with top-and-bottom totals for double-sided boards.

The Agilent portfolio

The Agilent test portfolio goes beyond X-ray test to include automated optical inspection (AOI), in-circuit test and functional test, plus all the software, accessories, training and support to use powerful Agilent systems productively. Agilent has the deepest offering in manufacturing test, with solutions that address limited-access test, on-board programming, Bluetooth™ and wireless networking, No-Wire fixturing, lead-free processes and much more. Agilent develops these technologies to make you more successful. It's the sign of a great partner and an Agilent hallmark. No one does it better.



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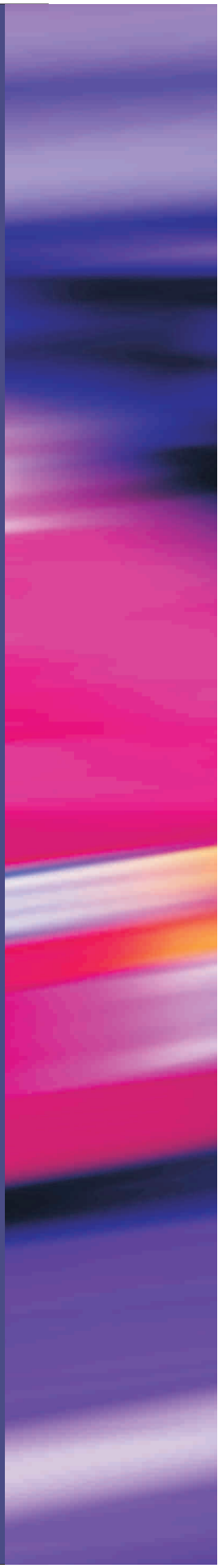
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Printed in the U.S.A. October 10, 2003
5989-0268EN

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