Given unlimited time and money, any manufacturer can produce high-quality printed circuit board assemblies (PCBAs). But in the real world of electronics manufacturing—where time and money are in short supply, where component miniaturization is rampant, and where profit margins are threatened like never before—the most successful manufacturers are those that achieve consistently high quality on a budget. For these manufacturers, Automated Optical Inspection (AOI) is almost always part of the equation.

Early Inspection, Tactical Advantage

AOI brings tactical advantages to electronics manufacturers with fast, automated, cost-effective inspection early in the production and assembly process. AOI is flexible technology for controlling processes and pinpointing board defects that are introduced during paste printing, component placement, and the solder process. It has been proven to eliminate many of the common and costly defects that slip into PCBAs, generating significant cost reductions downstream, especially at board repair.

Industry-Leading Technology for Catching Defects and Improving Processes
Automated Test, Higher Yields

AOI can measure the application of solder paste, the placement of components at pick-and-place, and the quality of solder connections post-reflow and post-wave. Unlike manual visual inspection, AOI is fast, accurate, repeatable, and automated, so it catches more defects and increases your yield of good boards. Also, unlike manual inspection, AOI produces measurement and attribute data for statistical process control and analysis, so you get the information you need for constant process improvement to eliminate defects before they happen.

The Best AOI Technology Available, Period

The Agilent AOI portfolio includes the best-in-class Agilent SJ50 and SP50 systems featuring the AOI industry’s most advanced imaging technologies. Only Agilent provides revolutionary solid-shape modeling (for lifelike visualization with the Agilent SJ50 Series II), industry-leading resolution with no speed penalty, and a unified platform architecture that allows the systems to be converted easily for multiple uses in the line. Agilent provides these capabilities within a new cost structure, so you get Agilent quality at competitive prices.

Accelerated ROI

Agilent AOI systems increase first-pass yields to produce bottom-line results. Fewer boards to repair. Less scrap. Less repair time and cost. Lower warranty and return costs. Higher product quality, happier customers, and greater customer loyalty and retention. These are true deliverable advantages that improve your operating margins and make Agilent AOI systems a strategic competitive investment with a fast return.

The Agilent SJ50 Series II and SP50 provide early and accurate defect detection while delivering actionable information to improve front-end processes and back-end repair. A unified platform architecture means that a single system can be moved back and forth from pre/post-reflow to 3D paste inspection as needed—ideal for unpredictable workflows and changing test requirements.
Fast, Flexible, and Innovative

Agilent’s AOI family combines affordable PCBA inspection with highly effective technologies for reducing the true cost of PCBA manufacturing. These systems catch defects early, provide actionable information for repair and process control, and increase the yield of good boards moving down the line, so better PCBAs are delivered faster.

State-of-the-Art AOI

The biggest breakthroughs in AOI are available today from Agilent. Both the Agilent SJ50 Series II and SP50 integrate key enabling technologies that allow a degree of accuracy and flexibility not previously seen in AOI. If you’re challenged by component- and solder-related defects, Agilent’s AOI offering provides cost-effective access to the most advanced technologies in AOI today.

Solid-Shape Modeling

The Agilent SJ50 Series II is the world’s first AOI system to offer solid-shape modeling technology, a true breakthrough in optical inspection. The SJ50’s lighting head uses LEDs to project red/green/blue (RGB) light from different angles onto the surface features of a PCBA. A single high-speed, high-resolution camera then acquires multiple images of the same field of view, using the different angles and colors to build a solid-shape model of components and solder joints. The result is a remarkably lifelike three-dimensional (3D) view of devices and board features. Solid-shape modeling ensures industry-leading call accuracy along with a companion decrease in mean time-to-repair: Agilent AOI systems provide 3D images of defects, allowing repair technicians to verify defects without a microscope. Rather than searching for the source of a defect call, they get a precise repair recommendation from the Agilent system so they can quickly confirm the defect and make the repair.

Benefits of solid-shape modeling include:
- Lifelike 3D image detail
- Industry-leading call accuracy and defect detection
- Faster repairs with repair recommendations
- Better information for process control.
The Agilent Unified Platform

The Agilent SJ50 Series II and SP50 share a unified platform that allows the systems to switch functions quickly, providing industry-leading flexibility for in-line AOI. The 3D paste inspection system can be turned into a pre- or post-reflow system, and vice versa, by simply swapping the interchangeable lighting head. For example, you can put an Agilent SP50 in your line for 100 percent 3D solder paste inspection, then once the paste process is tuned, simply swap the head and move the machine to a new location for post-reflow solder joint inspection or pre-reflow component location measurement. The head conversion can be performed at any time, as often as required by your in-house engineers. Only Agilent AOI systems provide this capability.

The benefits include:
• Exceptional flexibility for investment protection
• Increased return on assets (ROA) and return on investment (ROI)
• Less training for operators and maintenance engineers.

Speed and Resolution

Both the Agilent SJ50 Series II and SP50 use a single high-resolution camera to capture images with constant resolution of 20 to 25 micrometers per pixel. The Agilent SJ50 captures lifelike 3D optical images at speeds that meet virtually any SMT line-beat rate, so you get the advantages of 3D AOI for diagnostics and defect detection with no line bottlenecks. And the Agilent SP50 provides high-resolution 3D laser-based triangulation at full line rates, allowing extremely precise height, offset, and volume measurements, even on the smallest components and lead pitches. Only Agilent AOI systems offer high speed and high resolution with zero tradeoff.
The Agilent Family of AOI Solutions

Agilent SJ50 Series II

The optical-based Agilent SJ50 uses breakthrough solid-shape modeling—an industry first—to measure and characterize components and solder joints with lifelike 3D visualization. The SJ50 works at multiple locations in the SMT line, including post-reflow solder joint inspection, pre-reflow component location measurement, and post-paste 2D solder paste inspection. It combines competitive pricing with features and capabilities that other AOI systems cannot match.

• **Call Accuracy:** Revolutionary 3D solid-shape modeling delivers lifelike images for the highest call accuracy, along with defect analysis and recommendations to accelerate repair cycles.

• **Platform Flexibility:** Unified platform architecture with an interchangeable lighting head allows an Agilent SJ50 to be converted into a 3D paste inspection system and back again.

• **Simple Programming:** A Microsoft® Windows® 2000 operating system, interactive click-and-drag GUI, universal part programming, self-learning algorithms, and two complete algorithm engines (an industry first) for geometric pattern matching allow most users to generate programs in an hour or less.

• **Localizable Interface:** A Chinese-language interface is available to simplify setup, repairs, and operation.

• **Optical Character Recognition:** Included OCR software allows text on components to be read and stored.

• **High Speed with High Resolution:** 20 to 25µm/pixel resolution at all times with a single high-resolution digital camera and high-speed precision gantry means there is no tradeoff between speed and resolution.

• **Low Repair Costs:** Detailed measurement data shows where defects are, reducing mean time-to-repair.

• **Tailored Solutions:** The Agilent SJ50 Series II XL can accommodate boards up to 24 inches (620 mm) square, while the Agilent SJ50 Series II Value provides a low-cost solution for post-reflow only.
Agilent SP50

The laser-based Agilent SP50 is the world’s first AOI system capable of providing 100 percent 2D and 3D inspection of solder paste at line speeds with high data resolution. It uses 3D laser triangulation to accurately measure not just paste presence but also paste volume, providing a key indicator of long-term product reliability. The Agilent SP50 uses advanced digital imaging and high-speed sensors to quickly capture 2D and 3D data, and determine precisely how much solder paste is on a given pad—critical information when monitoring processes.

- **High Speed with High Resolution:** 20µm/pixel resolution at all times with a single high-resolution digital camera and high-speed precision gantry; no tradeoff between speed and resolution.

- **Call Accuracy:** Dynamic z-axis warp compensation provides accurate measurements, even on boards with a high degree of warp.

- **Statistical Process Control:** SPC capabilities allow operators to view defect data in real time, and chart process effectiveness at the board or even the individual pad level.

- **Platform Flexibility:** Unified platform architecture with an interchangeable lighting head allows an Agilent SP50 to be converted into a pre- or post-reflow inspection system and back again.

- **Simple Programming:** An intuitive, familiar interface allows most programmers to generate programs in about an hour, and makes the system easy for operators and maintenance personnel to use as well.

- **Higher Yields:** Early inspection and real-time process control help reduce defects and increase yields, reducing repair time and warranty returns.
End-to-End AOI Integration

The innovation that begins with Agilent AOI system architecture continues with cross-platform applications and back-end support. This is where Agilent AOI systems become a true asset and make a day-to-day difference for those who use them.

CAMCAD Professional

CAMCAD Professional quickly and automatically translates native CAD data into correctly formatted files that can be used on Agilent AOI systems (and Agilent ICT and X-ray systems, too). It accelerates programming by importing Gerber and Intelligent CAD data automatically, and generating 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.

Agilent Repair Tool (ART)

ART software for Agilent AOI, X-ray, and ICT systems provides direct access to measurements obtained with the Agilent SJ family of systems, and displays the results in a graphical format to accelerate repairs. 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.

- Graphical displays and an intuitive interface make it easy to view and understand defect data. Calls are easier to validate, problems are easier to pinpoint, and repairs are made faster.

- Repair operators use the same repair interface in AOI, X-ray, and ICT repair loops, so they can be redeployed with minimal re-training. A built-in tutorial and self-guided training tools help new operators get up to speed quickly.
Agilent Quality Tool (AQT)

This patent-pending data-analysis tool uses Agilent SJ family measurement data to quickly identify process and quality issues on boards. It provides real-time access to data from Agilent test platforms, allowing comprehensive, immediate information for process analysis, process control, and test/repair effectiveness evaluations.

- Custom views, or dashboards, allow you to freely combine test and inspection platforms and assembly types, and get real-time access to pre- and post-repair quality information, test and repair throughput, work-in-process information, and historical quality information. 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.

- The AQT offers easy access to data outside the test and repair loops. It exports comma-delimited data that can be imported into any spreadsheet application, a manufacturing execution system (MES), and other data-gathering tools. It also includes an XML export tool, a feature of the Intelligent Test Framework that automatically generates XML files and distributes them enterprise-wide as test or repair actions occur on your Agilent products.
The Agilent Portfolio: Industry-Leading Performance Right Down the Line

The Agilent test portfolio goes beyond AOI to include ICT, automated X-ray test, and functional test, plus all the software, accessories, training, and support to use our powerful systems productively. Agilent has the deepest offering in the industry. Our solutions address limited-access test, on-board programming, Bluetooth™ and wireless networking, No-Wire fixturing, lead-free processes, and much more. The Agilent portfolio constantly drives the state of the art in manufacturing test and inspection, and allows us to deliver a steady stream of new technologies to make you more successful. That’s the sign of a great test partner and an Agilent hallmark. No one does it better.

AOI Success Package

Every Agilent AOI system warranty includes training and professional services to help you get the most from your AOI system. Choose from a range of services to support your in-house teams. You decide when and how the credits will be used, and you can even transfer credits from one site to another, so you get assistance where it’s needed most. Services vary by region and AOI system. Please contact your Agilent representative for details.

Worldwide Professional Services

Agilent has a deep talent pool, including engineers, programmers, consultants, technicians, and trainers who are available to work for you anywhere, anytime. Agilent’s support infrastructure gives you access to technical experts who can help you get the most out of your AOI 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.

Classroom Education

Agilent provides a variety of educational options and training classes to support different levels of systems expertise. You get the knowledge you need to learn fundamentals, hone advanced skills, get trained in new technologies, or simply replace knowledge that has been lost through attrition. Our training offering is extensive and constantly growing. Chances are, there’s a class near you. To learn more, visit www.agilent.com/find/education.

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.
Cut costs. Build profits. Compete to win.

Agilent’s AOI portfolio can help you catch and eliminate the board defects that cost you money. You’ll optimize your processes, accelerate your time to market, and ensure consistently high quality with your finished products. To learn how this powerful portfolio of systems, software, and services can improve your margins and make your company more competitive, please contact your Agilent representative today.

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