Building on core strengths and leveraging technologies from other product lines, TRI has introduced significant upgrades to both AOI and SPI platforms. TRI now has 3D + 2D inspection for both AOI and SPI that increases coverage while lowering false calls, all while maintaining the industry’s fastest throughput rates. The TR7007 SII series solder paste inspection system has added low angle lighting, a 2D image algorithm for detecting low bridge defects, and an all-new touchscreen-capable interface featuring 5-step easy programming. TRI has also released the company’s first 3D (+2D) AOI system, the TR7730. Featuring a laser used for height inspection and 3D reconstruction of all board components, the TR7730 is a robust yet economic solution for using 3D technology to detect lifted BGAs and components on dense boards alongside standard optical inspection.

**The TR7007 SII 3D+2D SPI Solution**

The latest version of the TR7007 SII provides significant upgrades that improve coverage, and lower false calls with a new lighting setting and 3D + 2D simultaneous inspection. What’s more, the series now offers a new touch-screen enabled interface that’s so easy to use and program, you can finish creating an inspection program by the time it takes to read the rest of this page. The programming wizard simplifies the process down to 5 easy steps and automates the rest. And with an optional touch-screen interface, your smartphone and tablet-addicted workforce will find the new GUI intuitive and easy to operate.

![Figure 1: Don’t have the board dimensions? The new GUI and 5 step Programming Wizard even provides users with an on-screen ruler](image)

**Low-Angle Lighting**

Using standard lighting to inspect flux can cause of high number of false calls. Light reflected by flux at high-angles makes it difficult for a program to perform an accurate defect assessment. TRI has added low-angle lighting to the TR7007 SII family to take on this...
false call magnet. The results clearly indicate the advantage of using low angle lighting as a solution to eliminate these types of false calls.

Figure 2: A view of flux with standard lighting (left) and low-angle lighting (right)

**Low Bridge Detection**

3D solder paste inspection does have limitations, especially when detecting low bridge defects. The TR7007 SII is capable detecting these types of defects by leveraging a proprietary TRI bare board PCB AOI algorithm that uses 2D imaging to identify low bridge defects that are impossible to pick up using 3D inspection. These fine-short defects are caused by solder residue that is lower than the 3D detection threshold, and therefore cannot be identified. However, using TRI’s 2D imaging algorithm, these defects are easily distinguishable by contrast in brightness and color.

Figure 3: Comparison of inspection results without (left) and with (right) low bridge detection
Faster Speed = Clearer Images

TRI’s dynamic imaging offers unrivaled inspection speed at a higher optical resolution. To compete with this cycle time, other SPI systems are forced to downgrade to a lower optical resolution to narrow the gap with TRI’s SPI cycle time. In doing this, 2D image quality is sacrificed, leading to higher false call rates. In the images below, TRI’s SPI out performed a 25 µm system with its own 15 µm solution both in terms of cycle time and image clarity.

Figure 4: 25 µm system (left) and TRI’s SPI at 15 µm (right) at the same cycle time. Note the difference in image clarity
The TR7730 3D + 2D AOI Solution

TRI’s new generation of AOI systems brings the power of 3D inspection to overcome obstacles encountered by other inspection technologies. By combining the best of both 2D and 3D inspection, the TR7730 opens new possibilities for both automotive and high density electronics manufacturers requiring accurate measurement of lifted BGAs and various other components without implementing costly X-ray inspection.

High Dynamic Range
One of the critical obstacles presented to fringe pattern inspection technologies are reflective and black components, which commonly overload the dynamic range of the inspection camera. This combination of glossy and opaque objects interferes with fringe pattern detection and prevents this otherwise advanced technology from taking accurate measurements.

TRI overcomes this problem with the TR7730 by incorporating a laser 3D system that can inspect high dynamic range components and accurately determine any lifted component problems.

Figure 5: Opaque and reflective components that cannot be inspected using conventional imaging

High Measurement Range
Another issue faced by fringe pattern inspection systems is the limited measurement range, preventing accurate inspection of large and tall components, connectors and switches. TR7730’s laser system offers an extended measurement range of 0-20 mm with high resolution across the entire scope. This allows TR7730 to inspect both commonly encountered components using the high performance 2D inspection and extend coverage of problematic parts using the 3D laser system.

Figure 6: Comparison of 2D (left) and 3D (right) inspection results obtained by the two technologies
In addition to tall components, TR7730’s unique capabilities allow it to inspect and visualize connectors, switches and a variety of mechanical components that can become a problematic source of product failures. By leveraging 3D laser inspection’s unique strong points, the TR7730 further extends AOI inspection capabilities to these components.

![Figure 7: Combined 2D+3D inspection results of large connectors and switches](image)

**Innovative 3D User Interface**

Traditional AOI systems present a top view of the inspected board with components, which is a limiting factor when reviewing identified defects. By combining 2D and 3D data, the TR7730 presents operators with photographic real view 3D models that enable quick and accurate review of suspected failed components. The offered height profile and cross section views further simplify the review and rework process and minimize required operator time.

![Figure 8: Intuitive photographic 3D models that enable quick and accurate defect review](image)

**Summary**

TRI has successfully incorporated 2D and 3D inspection methodology into both AOI and SPI product lines while making programming and operating these systems easier than ever. The result is improved inspection capability through faster and more accurate identification of defects. To learn more about the TR7007M SII or the TR7730, please visit [www.tri.com.tw](http://www.tri.com.tw) or write to [sales@tri.com.tw](mailto:sales@tri.com.tw).