

## X-Ray Supports Quality Assurance, Counterfeit Detection

by Kathryn Cramer

When CNN posted a story headlined “China shuts world’s largest electronics market as Shenzhen imposes more lockdowns” in late August 2022, it wasn’t news to Brett Greer, Vice-President of Operations at Delta Group Electronics, Inc. (DGEI) He’s been dealing with worldwide Covid-related supply chain issues since early 2020, and doesn’t expect them to stop any time soon.

As an electronics manufacturing services (EMS) provider headquartered in Albuquerque, New Mexico, with additional facilities in Arkansas, California, Florida and Texas, DGEI has delivered high-mix, medium- to low-volume assembly services to customers in numerous industries – including aerospace, defense, energy and capital equipment – since 1987.

Over more than three decades of operation, the company has developed a network of secure distribution channels with its component suppliers but, once “the world shut down,” as Greer says, “there wasn’t enough product in the pipeline. Initially, I think, there was a fear that they would build more product than they could sell. And when the economy began to pick up, they didn’t have enough people to ramp production back up quickly, particularly in Asia, where many components are manufactured. It definitely put a damper on being able to get components in, put them on products and ship them out to our customers. To this day, we’re still seeing a pretty dramatic effect.”

The resulting component shortages, which have affected the entire industry, forced DGEI to look beyond its network of existing suppliers. “We had to widen our net, and look at many different distribution channels,” Greer states. “We had to look in the broker market. Obviously, to do that we needed to get approval from our customers, which we did.” However, as components began arriving from those new and untested sources, so did problems, in the form of counterfeit parts, “and that’s when we started amping up our incoming inspection processes.”

The appearance of counterfeit components “created some havoc for DGEI and its customers,” Tod Cummins, the company’s Director of Corporate Quality Assurance, admits. “There were multiple

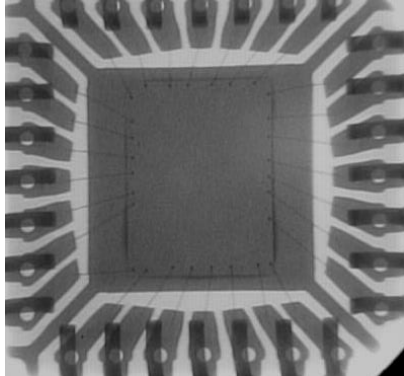


*Delta Group Electronics, Inc. uses Glenbrook Technologies’ Jewel Box 70T real-time X-ray system for both quality assurance and counterfeit detection. With the addition of a reel-to-reel accessory, DGEI can verify the authenticity of incoming tape and reel components quickly and easily.*

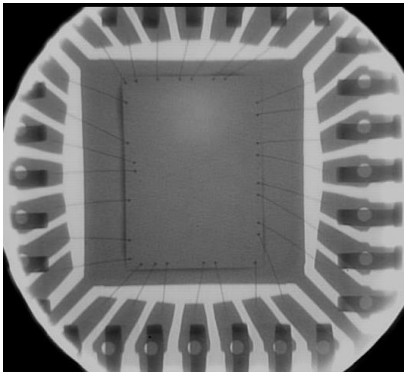
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instances in four of our five facilities where we identified counterfeit parts.” Some of the most frequent counterfeits were found in ICs supplied in waffle trays – not the most commonly used components, but among the more expensive parts. To authenticate these and other types of IC packages, the company used its existing real-time X-ray systems.



*Real-time X-ray inspection of an IC reveals the difference between a known good part (above) and a suspected counterfeit part (below).*



For more than twenty years, the company has relied on real-time X-ray inspection systems supplied by Glenbrook Technologies of Randolph, New Jersey. Today DGEI uses three Glenbrook Jewel Box 70T systems, to identify solder voids and check the quality of solder bonds on bottom termination components (BTCs) and BGAs. As Cummins explains, “X-ray has transitioned into a required process. If you’re going to be a small to mid-sized contract manufacturer, it’s just something you have to have.” Adding counterfeit detection on an as-needed basis to the real-time X-ray inspection system’s ongoing duties of troubleshooting and quality assurance proved easy to do.

Sometimes, the company’s inspection procedures revealed that issues were occurring at earlier stages in the supply chain. In one case, Cummins recalls, “we had an IC that comes in on trays to our Arkansas facility, where we build battery charging equipment. When we inspected it as part of our normal incoming process, it looked a little bit different. So we X-rayed it with the comparison software, and it appeared to have no internal wire bonding. This part came through a normal distribution channel, and it comes in all the time, which really concerned us. Everything came to a halt. We stopped the process so we could figure out what was going on.”

DGEI was able to trace the part back to a Chinese manufacturer that had shut down their fab in China and, instead, sent ICs from one of their fabs in the Philippines, where a different metallic was used. Usually, Cummins explains, it’s very difficult to get a manufacturer to say that they’ve changed a source or procedure but, with the X-ray evidence, DGEI was able to “raise the red flag.”

He recalls “several other instances where there wasn’t that good of an outcome” but, whenever a counterfeit issue arose, “X-ray was one step of the problem-solving process.”

However, most components are purchased not in trays, but in large quantities and pose a different type of challenge. Greer notes that, “if we’re going to buy 3,000 ICs, they’re more likely to come on tape and reel.” When counterfeiting takes place, there might be some good parts at the beginning and end of a reel, but not in the middle. Or authentic parts might be scattered randomly throughout a reel of counterfeits.

As counterfeit components began to appear on reels, Cummins explains, “at first, we started sending reels out to external labs for X-ray inspection, but that got very expensive very quickly,” particularly if the inspecting lab removed the components from the reel, tested them and then replaced them on the reel. That process was not only expensive, but also time-consuming and problematic. “That

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leaves a lot of room for error,” says Cummins. “You’re introducing the possibility of error when it wasn’t there initially, because those parts are all placed by automatic equipment. It’s not a good situation.”

DGEI’s solution was to bring reel-to-reel testing capability in-house, by adding it onto the existing real-time X-ray inspection systems. Designed for automated inspection of reels to check for component authenticity, Glenbrook’s option includes software to compare the lead frames, die size and wire bonds of each part on the reel to a known good part. The software identifies any part outside the tolerance and saves an image of each part. “You can do every part, or you can do sampling,” Cummins says. “It’s programmable, so you can set it up any way you want.”

When DGEI started researching reel-to-reel testing, Cummins recalls, “Glenbrook was the only company offering a solution.” In fact, he adds, “some test labs we went to were using it.” So rather than incur costs of \$2,500 or more each time an external test procedure is required, “now it just costs us however much time it takes to run the machine.” Even though DGEI’s need for reel-to-reel testing has abated recently, Cummins concludes that “it’s good to have that capability.”

Adding the reel-to-reel option also builds on a legacy of cost-effective operation. The Jewel Box 70T is “one of the lower-cost units and they do everything we need for a good cost,” Greer says. “The systems are easy to use and very reliable. That’s why we chose them.” Both men anticipate a continuing need for ongoing vigilance against counterfeiting, as they see no rapid resolution of the industry’s supply chain issues.

“Only time is going to sort this out,” Greer says. “I’ve heard distribution people say it will happen in 2023. Other people say it’s going to be another two to three years.” Cummins notes that the federal government is putting money into establishing new fabs in the United States, and that fabs are being built in parts of Asia that are not in the Chinese sphere of influence – but fab building is a two- to four-year-long process. He’s also pragmatic about the relative standing of the contract manufacturing sector relative to high-volume consumer product and automotive manufacturing, “companies that are building thousands and thousands of products.”

At DGEI, he says, “we deal with a tight little niche market of aerospace, defense and some commercial customers. We don’t necessarily build large quantities, but focus on a very high reliability, higher-margin type business.” He cites one of the company’s products that uses a camera chip – the same one that car manufacturers use – and realizes that “we’re kind of on the back burner” when supplies of that particular chip are limited. “That’s one more hurdle we have to get over.”

But Delta Group Electronics, Inc. has met, and will continue to meet, those and other marketplace challenges. Open communication with customers is one crucial step in navigating supply chain issues, Greer emphasizes. “We’ve had discussions about what we’re doing with a lot of our customers,” he explains. “In the conversations we’ve had, it seems to me that we’re well out in front of this issue. We’re definitely doing the right thing and the customers appreciate it.”

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