

EMS Firm Ensures Quality with X-ray Inspection

by Kathryn Cramer

Walk onto the factory floor of any electronic manufacturing service (EMS) company, anywhere in the world, and there's a rhythm that can be sensed as circuit boards advance through the assembly line, moving from one machine or process to the next and, at the end, delivering assembled boards that will power any number of different products used in a variety of industries. When disruptions to this rhythm occur, they can present a significant challenge to the company's overall performance.

In the case of CADService, a medium-sized EMS company located in Sao Paulo, Brazil, the rhythm of circuit board assembly has been established for more than thirty years. Founded in 1982, the company began designing layouts for printed circuit boards, then moved into manufacturing single, double and multilayer boards. In 1997, CADService began assembling PCBs and, since then, has focused exclusively on PCB assembly. With four automated assembly lines and more than 90 employees, the company has a nominal capacity of 150,000 electronic component placements per hour.

"We are capable of assembling any type of board," says Product Manager Paulo Afonso, "from simple ones to boards with thousands of components. We specialize in the assembly of highly complex boards with large numbers of components. The



The factory floor of CADService in Sao Paulo, Brazil, where four automatic assembly lines can place up to 150,000 components per hour.



Sao Paulo-based EMS provider CADService has ensured assembly quality since 2008 with a Jewel Box 70T real-time X-ray inspection system supplied by Glenbrook Technologies of Randolph, New Jersey.

components we place range from 01005 to 200x110 millimeters, including BGAs, connectors and odd components, using lead-free technology and complying with ROHS regulations." CADService's customers include companies in the telecommunications, medical, transport, energy, security and automation industries.

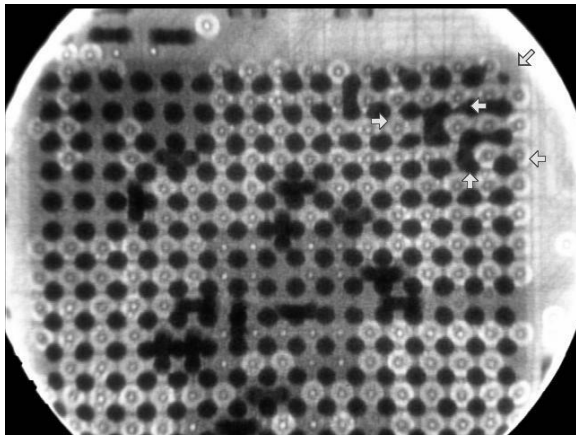
For one of those companies in the medical field, CADService has assembled electronic boards used in ventilators since 1997. Normally, the customer orders 1,000 boards per year, and assembling them is just one part of the ongoing process that establishes the rhythm of the factory floor. But then the Covid-19 pandemic arose, and CADService received

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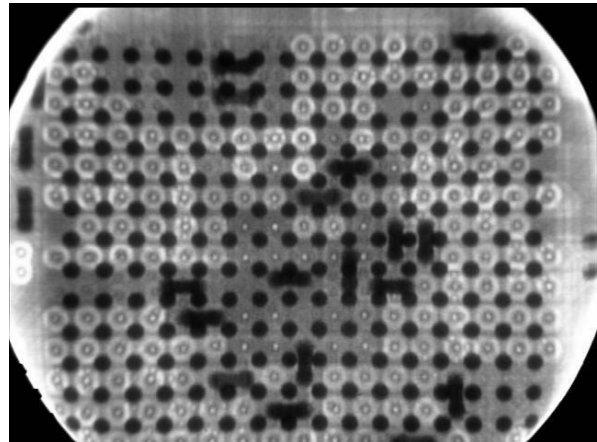
X-RAY TECHNOLOGY LIKE NO OTHER

a rush order for 6,000 of the ventilator boards, an order it had to fulfill without setting aside the assembly of all its other customers' orders.

At the same time, an ongoing issue – the prevalence of counterfeit components – became more acute. On occasion, Afonso notes, “we had to buy from suppliers without sufficient qualifications.” More recently, he adds, “the problem has lessened but still exists. We have managed to overcome this situation by purchasing only from reliable sources with quality certificates.”



An X-ray image reveals solder bridging (at the arrows), an unacceptable condition, underneath this BGA.



An X-ray image of the same BGA shows that proper welding has occurred.

CADService was able to meet the dual challenges of the rush order for 6,000 ventilators, plus an increase in counterfeit components, without affecting the quality of its overall output, thanks in part to the company's reliance on [real-time X-ray inspection](#) for all its assembled boards. One hundred percent X-ray inspection maintains the quality of its production, particularly for the numerous Ball Grid Array (BGA) components used on its most complex boards. “Ensuring the quality of the solder melt between the components' pads and the surface of the printed surface board is very important to guarantee the quality of the assembly,” Afonso explains.

As he describes the various benefits of the inspection process, real-time X-ray “enables us to inspect blind and buried vias, making it easy for the inspector to analyze the board connections, components and hidden solder joints.” And when inspecting BGA assemblies, in which the solder joints are underneath the component body, “we can look for electrical shorts, bad solder joints and solder voids. The inspector can make measurements and take pictures of the assembly features, and identify spin-hole fills caused by gas escaping during soldering. This gas is often water vapor, which causes a poor electrical connection. If there is an error in soldering, the connection will be faulty and the end product might not work properly.”

Glenbrook Technologies, Inc.

11 Emery Ave., Randolph, NJ 07869, USA • Tel: 973-361-8866 • Fax: 973-361-9286
www.GlenbrookTech.com

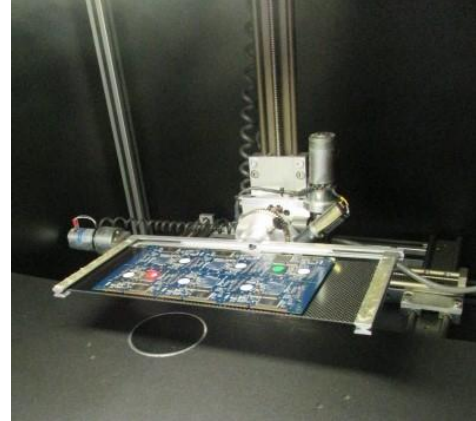
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To ensure the quality of all its assemblies, particularly those with BGAs, CADService acquired a real-time X-ray inspection system in 2008, and is still using the same unit 15 years later – a [JewelBox-70T](#) supplied by Glenbrook Technologies of Randolph, New Jersey. The unit provides magnification from 7X to 2000X, using patented X-ray camera technology, with resolution of 100 line pairs per millimeter. The camera's sensitivity allows imaging of low-density materials, as well as very small parts, while the system's powerful 90kV micro-focus X-ray tube ensures deep penetration of dense materials. A five-axis manipulator provides 360-degree rotation and 45-degree tilt, and an image processing workstation includes software to view, capture and archive images.

Afonso states that the JewelBox “is easy to operate and has good inspection features. We have the ability to take pictures and measurements, and send them to our customers. It's a very reliable machine and we've never had a problem with its running.” But long-term reliability is nothing new for CADService's experience with X-ray inspection systems. In 1997 the company purchased an earlier-generation machine, an RTX Dual-Vu, from Glenbrook to inspect the inner layers of the multi-layer boards it was then producing. “This machine is still in working order,” he says, calling it “incredible.”

In assessing the contribution of real-time X-ray inspection to the company's overall quality assurance program, Afonso concludes that CADService considers it “one of the main tools in quality inspection of assemblies. It is a non-destructive method of inspection, helps us improve our assembly process and saves the unnecessary cost of failures and recalls after products have been shipped out.” With the reliability of its real-time X-ray inspection system ensuring quality output through rush orders, pandemic disruptions and other challenges, CADService continues to maintain the rhythm of production on its assembly lines.



Real-time X-ray inspection ensures that solder welds underneath BGA components are inspected rapidly and accurately.

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Contacts: CADService, Rua Pedro Stancato 250/290, Campinas, Sao Paulo, 13082-050, Brazil; Tel. (19) 3716-8656; Fax (19) 3716-8650; www.cadservice.com.br.

Glenbrook Technologies, Inc., 11 Emery Avenue, Randolph, NJ 07869 USA; Tel: 973-361-8866; Fax: 973-361-9286; www.glenbrooktech.com.

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www.GlenbrookTech.com