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XStation MX™ Automated X-Ray Inspection System

Revolutionary multi-angle X-ray solution provides maximum coverage, throughput, and reliability using ClearVue™ and TraX™ technologies

KEY FEATURES

- Multi-angle X-ray inspection designed for: high-complexity PCBs, high-product reliability environments, and applications involving loss of visual and electrical access
- Features Teradyne's unique, patented ClearVue Tomosynthesis-based X-ray image-acquisition and analysis technology
- Provides full 3D X-ray capabilities
- Lead-free capable
- Field proven
- High-resolution AXI for 0201and CSP inspection
- Fixtureless non-contact test
- Excellent diagnostic resolution for fast debug and repair
- Proven in-line operation



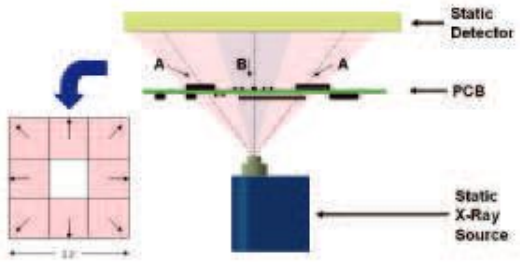
The XStation MX (multi-angle X-ray) system uses Teradyne's patented ClearVue and TraX technologies to simplify X-ray inspection, increase fault coverage, and reduce WIP through accurate fault diagnosis.

Simplicity, Reliability, Quality: A Breakthrough in AXI Technology

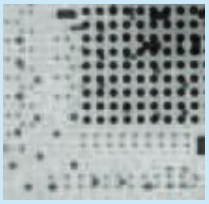
The XStation MX offers a revolutionary breakthrough in 3D X-ray inspection technology to set a new standard for coverage, quality, and reliability. Until now, 3D X-ray systems have been highly complex machines, requiring many moving parts, rotating detectors, expensive steerable X-ray sources, and movement of the board both the in X-Y and Z axes. The result has been unreliable performance, high false call rates, and limited defect coverage. By contrast, Teradyne's XStation MX effectively removes these complexities by using a unique, patented technique called ClearVue. Based on Off-Center Tomosynthesis, ClearVue is a significant technology advance that increases the throughput, quality, and reliability of Automated X-ray Inspection (AXI) defect detection far beyond the capabilities provided by other automated 3D techniques. Unlike other 3D techniques, ClearVue's image reconstruction requires only one moving part during board inspection, the board itself. And the board is stationary during image capture.

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All the required images are generated from a static X-ray source and detector. The multi-angled images are digitally recombined providing 3D slicing capability at increments at the highest resolution and image quality.



Transmission image of a BGA. Some balls cannot be inspected because of the overlapping capacitors on the opposite side of the board. Notice the resistors below the BGA can be fully tested in transmission mode.



Using Teradyne's patented reconstruction techniques the overlapping capacitors can be totally removed from the image. ClearVue techniques allow for the complete dynamic range of the image to be retained, providing maximum fault coverage on this BGA and all other component types.

Because there is no motion, no blurring, and no Z-axis movement during the high-resolution image capture, ClearVue acquires higher-quality images than conventional 3D techniques. As a result, the XStation MX delivers very low false fail rates and more reliable fault coverage. The low false call rates allow users to reduce WIP over current inspection processes, lowering the operational costs of deploying AXI.

In addition to employing ClearVue's patented technology, the XStation MX is also equipped with TraX 2D X-ray technology. This combination enables the system to use both ClearVue and TraX on a board under inspection thereby optimizing throughput.

X-ray techniques take high-resolution images at large fields-of-view. The result is the highest quality inspection for solder joints at increased throughput, allowing for in-line operation.

With the XStation MX system, Teradyne takes AXI to a new level, providing AXI with high fault coverage, low false call rates, high uptime, higher throughput, and reduced cost of ownership. Current users of other AXI systems will discover that the XStation MX performance makes AXI a truly effective and economical inspection solution.

High-Performance Test Strategy

The XStation MX can be used along with in-circuit test (ICT)as part of a high-throughput, reliable, and low-cost test strategy on PCB assemblies with constrained electrical access. Teradyne's Strategist™ software helps plan the coverage of each test and inspection solution early in the product design. Strategist then helps implement the chosen test strategy on the production floor by generating the required data inputs for the relevant test and inspection systems.

Defect Coverage		AOI	AXI	ICT
Solder Defects	Opens	■	■	■
	Bridges	■	■	■
	Shorts	■	■	■
Solder Quality	Insufficient Toe	■	■	
	Heel		■	
	Void		■	
	Excess	■	■	
	Misc. Solder		■	
	Solder Quality		■	
Components	Lifted Lead	■	■	■
	Missing Component	■	■	■
	Misalign	■	■	■
	Misplaced Part	■	■	■
	Wrong Part			■
	Non-Functional			■
Area Array /BGA	Shorts		■	■
	Opens		■	■
	VCC/GND		■	

AXI provides the highest level of process defect detection combined with hidden joints and solder reliability.

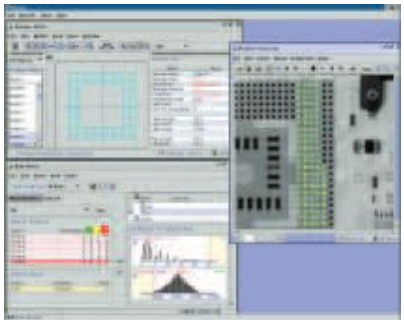
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Programming and Analysis Software Tools

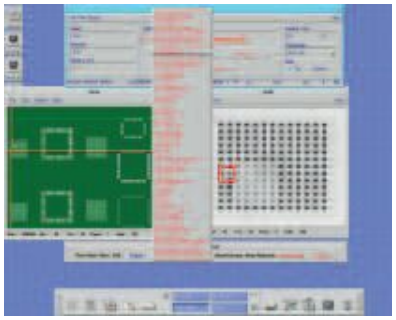
The XStation MX comes equipped with a productive toolset of programming and in-line analysis software to lower AXI development costs and increase product quality.

XFrame™ —Integrated Program Development Environment

The XFrame Integrated Program Development Environment significantly reduces program-generation time and improves the consistency and quality of AXI inspection programs for XStation AXI systems. The PC-based XFrame software allows all programming to be performed off-line, enabling maximum utilization of your equipment.



All the tools are provided to allow the highest quality inspection program to be created.



Defects are easily located and identified. All data is stored for statistical processing.

XVer™ repair verification module

XVer software — Teradyne's repair verification module — facilitates paperless fault diagnosis and repair by providing graphical CAD-based views and X-ray images of failed regions. The software enables operators to save suspect failures for corrective action by repair operators and programmers.

XStat™ statistical process control module

XStat statistical process control module provides real-time and off-line reporting of defect and false call information compiled by the XVer module. XStat enables effective measurement of both the X-ray inspection and surface mount assembly processes. It provides detailed actionable information and graphical reporting for continuous improvement activities such as false fail reduction, program optimization, and defect-reduction initiatives.



XStat allows for real-time root cause analysis of solder, placement or reflow defects.

Specifications:

- **Test Speed**
  - Load/unload: Average 5 seconds
  - Per fiducial recognition: < 1 second
  - Test rate[3,4] (Sq in/S): ClearVue up to 0.64, TraX up to 6.0
  - Surface map time: Not required
- **Performance**
  - Max Field-of-view (FOV) 3D: 0.860" / 21.84mm
  - Min Field-of-view (FOV) 3D: 0.719" / 18.26mm
  - Field-of-view 2D: 2.20" / 55.88mm
  - Standard inspectable size[2]: 14" x 17.7" (355mm x 449mm)
  - Optional inspectable size[2]: 20" x 17.7" (508mm x 449mm)
  - Max PCB size[2]: 20" x 18" (508mm x 457mm)
  - Min PCB size[2]: 2.0" x 2.0" (51mm x 51mm)
  - Edge clearance: 0.15" / 3.8mm
  - Max board thickness: 0.25" / 6.3mm
  - Min board thickness: 0.020" / 0.51mm
  - Top side clearance: 1.3" / 33.02mm
  - Bottom side clearance: 1.0" / 25.4mm
  - False Call Rate: 500ppmJ
  - Resolution: .008"/.20mm
  - Max. solder joints: >50,000
  - SMEMA 1.2: Fully compliant
- **Algorithms are included for all standard joint types, with defect detection capabilities including:**
  - Shorts
  - Opens
  - Insufficient solder
  - Excess solder
  - Passives
  - Misaligned
  - Presence/Absence
  - Tombstones/Billboards
  - Solder ball
  - BGA
  - Void
  - Leaded components
  - Lifted leads
  - Reversed tantalum capacitor
- **Physical dimensions**
  - Footprint: 112" x 70" (285cm x 178cm)
  - Service area: 208" x 205" (528cm x 521cm)
  - Weight[1]: 5,575 lbs. / 2,534 kg
- **Facility requirements**
  - Air: 100-120 psi compressed
  - Power: 208 or 230 10% VAC Single Phase 30A
- **Options**

  Single-sided board option
  - Provides transmission X-ray-only capabilities for single-sided products

[1]Shipping weight add 455 kg or 1000 lbs. Quoted weight is without conveyors, with conveyors add 909 kg or 2,000 lbs.
[2]Board handling edge is length-wise
[3]To estimate test time = (board length x width / Test rate) + Load/unload + Fiducials Maximum throughput rates have been specified and may vary by application.
[4]Useable FOV and inspection speed can vary by application

Teradyne's AXI technologies are protected by U.S. and international patents including:

4,521,902	4,809,308
re 35,423	4,536,239
4,688,241	4,835,379
5,020,086	5,111,406
5,491,737	5,500,886
5,541,856	5,594,770
6,748,046	

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