## Ultra Discovery™ F1+
Automated Optical Inspection (AOI) System

**PCB Production Solutions**

**Specifications**

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<th>Specifications</th>
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<td>Technology Range</td>
<td>Down to 7 µm (0.28 mil) line and space</td>
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<td>Products Inspected</td>
<td>Inner layers: signal, power and ground, mixed, cross shielding, inner layers with holes, Inner layers with holes, inner traces, outer traces, copper fill, buildups, inner layers with plated through holes, Chip carrier panels: FC-BGA, PBGA, FC-CSP, COF, Buildup layers: laser vias (conformal and Laser Direct Drilling)</td>
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<td>Materials Inspected</td>
<td>Conductors: bare copper (shiny, matte and oxidized), reverse treated foil (RTF), gold-plated Convolutional laminates: FR4, Tetra function, Teflon, Rogers etc., Flex material: polyimide, polyester, Advanced build up board materials: RCC, ABF, BT, ALIVH, Photosensitive: blue, purple and brown</td>
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<td>Defects Detected</td>
<td>Shorts, opens, minimum line/space violations, nicks, protrusions, dishing, copper splashes, pinholes, missing or excess features, wrong size and position of features, clearances and split plane violations, blocked holes, annular ring violations, SMT violations, black spots, wire bonding pad defects, flip chip pad defects, defects in through blind vias</td>
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<td>Inspection Methods</td>
<td>Full reference comparison, Full multilayer panel understanding, SIF - model-based and contour comparison, Specific criteria per feature</td>
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<td>Panel Dimensions</td>
<td>Thickness range: 1-300mil (25-7500 µm), Max. panel size/inspected area: 26&quot; x 24&quot; (660 x 610 mm)</td>
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<td>Throughput</td>
<td>Line width (mil) &gt; 1 0.6 0.5 0.4 0.28 (µm) &gt; 25 15 12 10 7, Sides/hour 105 90 60 38 30, Based on typical panel size: 18&quot; x 16&quot; (457 mm x 406 mm) with 1&quot; margin</td>
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<td>Setup Data Sources</td>
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<td>Options</td>
<td>Automation ready (including inkjet support), Stamper, Marker</td>
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Specifications are subject to change without notice. Ultra Discovery F1+ is a Class-1 laser product.
Ultra Discovery™ F1+

Orbotech’s Ultra Discovery F1+ delivers Simple, Intelligent and Powerful (SIP) Technology™ with 7µm line/space inspection capability for FC-BGA, FC-CSPs and COF production. Combining super-clear image acquisition for capturing the finest defects with advanced panel understanding algorithms, the system provides best-in-class detection capabilities with minimal false calls. Ultra Discovery F1+ takes AOI performance another step forward with a new set of features, including higher inspection speed, a new vacuum design and a cutting-edge video camera.

**Benefits**
- Superior detection with minimal false calls
- Highest throughput – up to 50% higher than previous models
- Line and space resolution down to 7µm
- Quick and simple setup with Push-to-Scan™
- Built-in video microscope for setup and verification
- New vacuum table for firm grip on the panel

**Powerful Design**
Ultra Discovery F1+ is equipped with a new optical head specifically developed for inspection of complex IC substrates down to 7µm lines and spaces at highest throughput. A robust casting base design and enhanced motion control deliver super-clear images that capture the finest defects at exceptionally fast speed. A new vacuum table enables a firm grip on the most sensitive IC substrate panels.

**Visual Intelligence**
Using Orbotech’s SIP Technology, Ultra Discovery F1+ delivers the advanced inspection capabilities needed for the complex designs of fine-line FC-BGA, FC-CSP, PBGA/CSP and COF production. Stronger computing power complies with ultra-fast processing rates to inspect the highest pattern densities of future IC substrate panels. With the Visual Intelligence detection engine, specially designed for these applications, there is no need to waste time on non-critical defects.

**Push-to-Scan™**
Ultra Discovery F1+ features a very easy and user-friendly interface (GUI) that ensures top AOI results with minimal effort or training. A new video microscope supports the finest pattern and defect display. Full ‘Step and Repeat’ functions and a new powerful processing computer enable an efficient and short setup time for new jobs.
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Specifications

Technology Range
Down to 7 µm (0.28 mil) line and space

Products Inspected
- Inner layers: signal, power and ground, mixed, cross shielding, inner layers with holes
- Outer layers: signal, mixed, cross shielding, buildup
- Chip carrier panels: FC-BGA, PBGA, FC-CSP COF
- Buildup layers: laser via (conformal and Laser Direct Drilling)

Materials Inspected
- Conductor surface: bare copper (shiny, matte and oxidized), reverse treated foil (RTF), gold-plated
- Conventional laminates: FR4, Tetra function, Teflon, Rogers etc.
- Flex material: polyimide, polyester
- Advanced buildup board materials: RCC, ABF, BT, ALIVH
- Photoresist: blue, purple and brown

Defects Detected
- Shorts, opens, minimum line/space violations, nicks, protrusions, dishing, copper splashes, pinholes, missing or excess features, wrong size and position of features, clearance and split plane violations, blocked holes, annular ring violations, SMT violations, black spots, wire bonding pad defects, flip chip pad defects, defects in through blind via

Inspection Methods
- Full reference comparison
- Full multilayer panel understanding
- SIF – model-based and contour comparison
- Specific criteria per feature

Panel Dimensions
- Thickness range: 1-300mil (25-7500 µm)
- Max. panel size/inspected area: 26" x 24" (660 x 610 mm)

Throughput
- Line width (mil) > 1: 0.6, 0.5, 0.4, 0.28
  - µm) > 25: 15, 12, 10, 7
- Sides/hour: 105, 90, 60, 38, 30
- Based on typical panel size: 18" x 16" (457 mm x 406 mm) with 1" margin

Defect Verification
- Verification and repair stations: VeriFine™, VeriFine™-A, Ultra VeriFine™-A
- On-system verification: built-in video microscope

Setup Data Sources
- CAM

Panel Registration Method
- Pinless registration – panel edge alignment
- Pin registration

Options
- Automation ready (including inkjet support)
- Stamper
- Marker

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