

# *PerFix™ Automated Optical Repair (AOR) System*



# Major Benefits for Advanced HDI Production

PerFix™ is a fully Automated Optical Repair (AOR) solution delivering unrivaled repair performance. For the first time, excess copper can be removed automatically while ensuring accurate, reliable and repeatable repair results for advanced HDI applications.

## Scrapped Panel Cost Savings

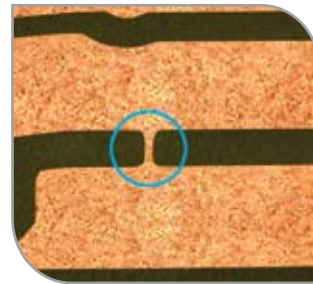
With today's fine-line products, manual repair of shorts frequently damages the adjacent conductors and the laminate. With the precise repair capabilities of PerFix, you can save costs by significantly minimizing your scrapped panels and increasing your yield.

- **High Quality Repair of Every Short** – no more low quality repair results
- **Precise Repair** – complete repair of all defects on the panel is achieved without damaging any adjacent conductors or the laminate
- **Perfect Repair** – no damage to the laminate, ensuring smooth transition to the next production processes

Manual repair



PerFix AOR repair



Before



After

## Accurate, Repeatable and Reliable Solution

- **Accurate Repair** – repair results perfectly match the original CAM design
- **Repeatable, High-Quality Repair** – no more compromising repair quality due to human limitations - repair is now accurate and consistent



Reference



Before repair

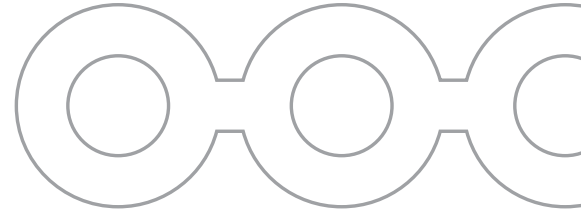


Successful repair with PerFix

# The Way to Repair

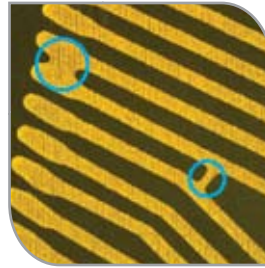
## Repair of All Shorts

With PerFix, all shorts are repairable.



Before repair

A short between lines



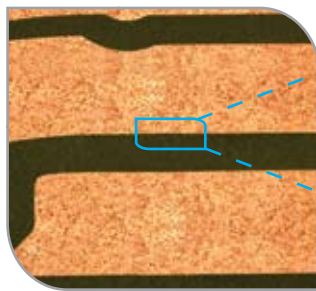
A short between fine lines



Successful repair with PerFix

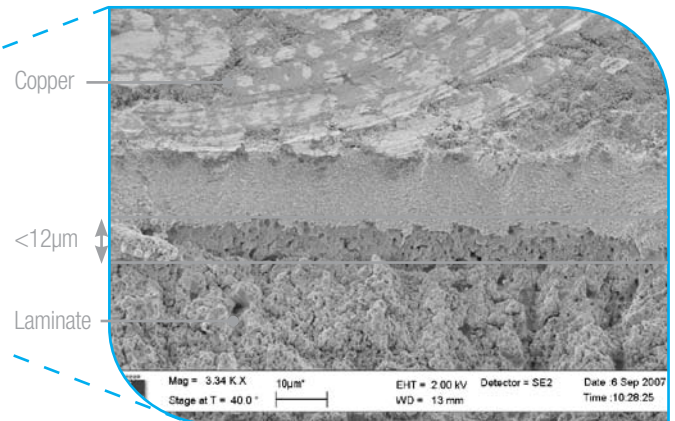


Penetration to the laminate is minimal



After repair

An example:



Scanning electron microscope picture after repair.  
Repair of 0.5 oz. copper on FR4 laminate

## Enabling New Opportunities

With PerFix, you can achieve new levels of performance in your operation and expand your production opportunities

- PerFix increases yields and profitability
- PerFix has an excellent success rate of short repairs on the most challenging PCBs (such as high layer count PCBs) - providing a significant cost saving
- PerFix optimizes QTA/FAI production by eliminating the need to produce spare PCBs

# The Way to Repair

## Closed Loop Repair (CLR) Technology™

Orbotech's unique, patent-pending CLR technology uses an automatic closed-loop of iterative processes that consist of three parts: image acquisition, image processing and laser ablation. Together, they provide superior performance for highly accurate, repeatable and reliable results - any time, every time - which is not possible with manual repair.

### Image Acquisition

**Superior Image View** - captures accurate images of the inspected defect for:

- Sharp and clear-cut distinction between the copper and the laminate
- Accurate identification of the ablation area with high resolution images

**Unexcelled Image Quality** - PerFix is equipped with an advanced high resolution camera offering a flexible illumination control system that combined provide sharp magnification and high quality images.

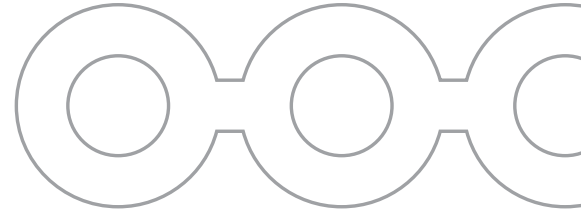
### Image Processing

Orbotech field-proven SIP Technology™, is utilized to accurately identify the ablation area of the excess copper. This area is defined through a series of image processing steps which include: analyzing the high quality defect images to find the actual area of the copper, using CAM reference data and activating the powerful panel-understanding algorithms.

SIP Technology panel-understanding capabilities which include pattern excess copper analysis have been customized for CLR Technology to meet the challenging requirements of defining the precise ablation area.

## CLR Technology Benefits

- **Accuracy** – complete and accurate ablation of all excess copper with no damage to the adjacent conductors
- **Repeatability** – an automatic and accurate process that eliminates human error
- **Reliability** – the repaired panel is qualified for the next step of PCB manufacturing



Before



After



## Laser Ablation

Employing superior laser control, to support the ablation paradigm - finding the optimal working point for high accuracy and minimal penetration in the shortest repair time. All aspects of laser activity are fully managed including laser energy, spot size and spot position.

The customized ablation parameters are automatically selected for each individual ablation cycle, which ensures accurate and reliable repair in the fastest manner.



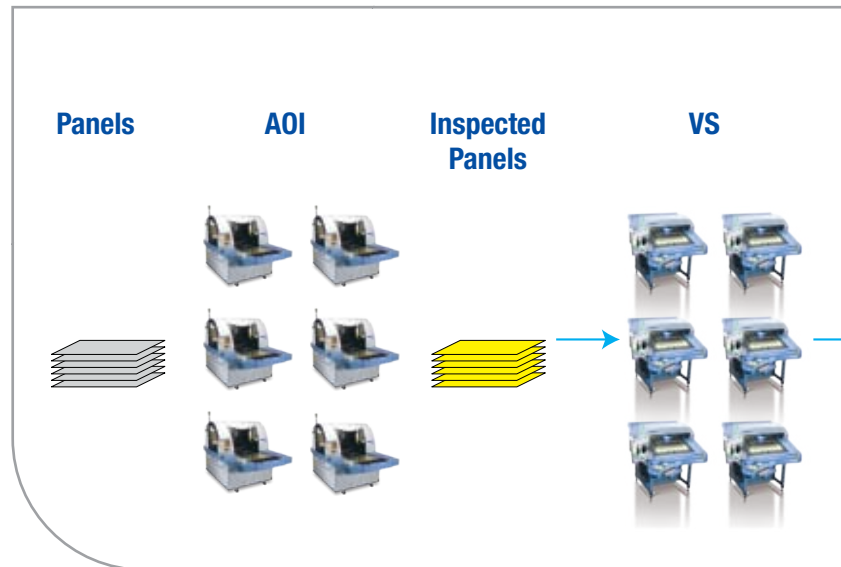
# AOI Room Workflow

With PerFix, greater AOI operational efficiency can be achieved without changing the AOI room workflow.

Panels are still transferred from the AOI system to the verification station.

Only those panels requiring repair of shorts are then sent to PerFix.

Data is automatically communicated between all of the systems via the network.



## Panel Flow

Following inspection of a batch of panels on the AOI system, the panels are checked by the verification station. Those panels that require repair of shorts are sent to the PerFix Automatic Optical Repair system.

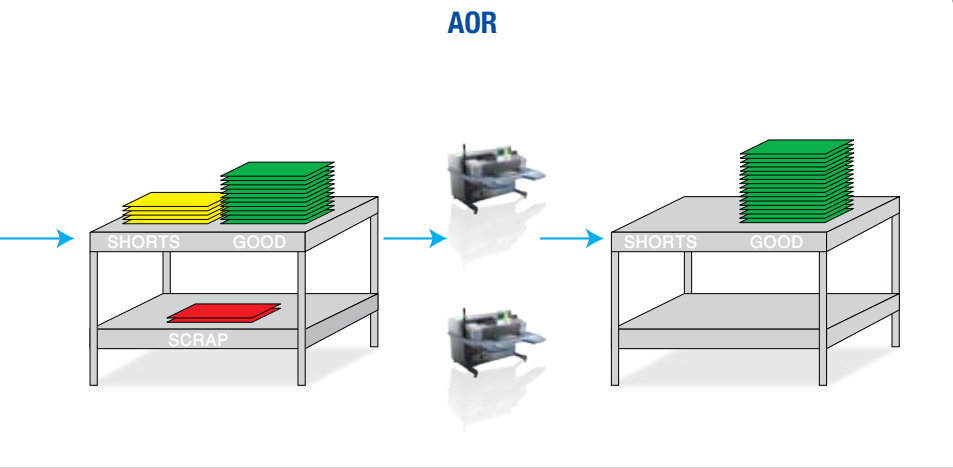
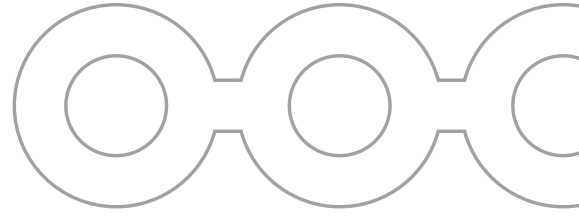
At the PerFix system, the operator simply loads the panel onto the system and pushes one button. Within seconds, the system automatically images the defect area, defines the ablation area and then repairs the short accurately and reliably.

## Data Flow

All the data required for the AOR process is transferred automatically from the AOI systems and the verification station to the AOR system via the network.

Once a defect is classified at the verification station as having excess copper (for example: shorts, protrusions, splashes, etc.), all of the necessary information for the automatic repair to be performed is available for the AOR system.

# The Way to Repair



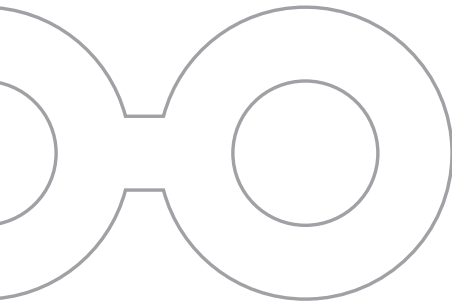
Repair is now simple - just push the button and an accurate, repeatable and reliable repair is automatically performed.



## Specifications:

Technology Range	Down to 1.4mil (35µm) line & space
Repaired Products	<b>Inner layers:</b> signal, power & ground, mixed, cross shielding, inner with holes, build-up <b>Outer layers:</b> signal, mixed, cross-shielding, build-up
Material	<b>Laminate type:</b> FR4, FR5, Tetra function <b>Minimum laminate thickness:</b> 40 Microns <b>Copper:</b> 0-50 Microns
Repaired Defects	Any excess copper including: shorts, protrusions, copper splashes, minimum space violations, excess features, wrong-larger size of features, under-etched features
Panel Dimensions	Max. panel size/repaired area: 26" x 24" (660mm x 610mm) Panel thickness: 50-3000µm
Image Processing Methods	Full reference comparison <ul style="list-style-type: none"> <li>• SIP Technology</li> <li>• Specific criteria per feature</li> </ul>
Ablation Method	Orbotech's CLR (Closed Loop Repair) Technology
Setup Data Sources	CAM Inspection and classification criteria from AOI and verification stations
Panel Registration Method	Pinless registration – panel edge alignment Pin alignment
Verification Stations Supported	Orbotech VeriSmart™, VeriSmart™-A, VeriFine™, VeriFine™-A, VeriWide™, VeriWide™-A, VRS-5, VRS-4Pro

Specifications are subject to change without notice.  
The PerFix system is a class 1 Laser/LED product.



PCB045(E)\_0408U



[www.orbotech.com/pcb](http://www.orbotech.com/pcb)

**Orbotech Ltd.**  
P.O. Box 215  
Yavne 81102  
Israel  
Tel. (972) 8-942-3533  
Fax. (972) 8-942-3966

**Orbotech Japan Ltd.**  
LS Bldg., 1-1-17,  
Kami-Osaki Shinagawa-ku,  
Tokyo 141-0021  
Japan  
Tel. (81) 3-3280-1300  
Fax. (81) 3-3280-1121

**Orbotech Inc.**  
44 Manning Road  
Billerica, MA 01821  
U.S.A.  
Tel. (978) 667-6037  
Fax. (978) 667-9969

**Orbotech S.A.**  
62, Rue de la Fusee  
1130 Brussels  
Belgium  
Tel. (32) 2-727-4811  
Fax. (32) 2-727-4848

**Orbotech Pacific Ltd.**  
Room 2206-10  
China Resources Bld.  
26 Harbour Rd., Wanchai  
Hong Kong  
Tel. (852) 2827-6688  
Fax. (852) 2827-6699