

**Multiline
redefines
multilayer
registration
technology
with
the new**

OPTILINE PE™

 **MULTILINE
TECHNOLOGY INC.**





OPTILINE PE™ Multilayer Registration System with Statistical Process Control

- **More Accurate
Multilayer
Registration**
- **Increased Yields**
- **Improved
Productivity**
- **On-line Statistical
Process Control**

**From
Multiline Technology**

Multilayer Registration Doesn't Have to Be Like Trying To Hit A Moving Target!

Traditional methods of registration for multilayer manufacturing involve pre-punching materials with registration holes, pinning artwork to the laminate, exposing, etching . . . then using the pre-punched registration holes to assemble the layers. Unfortunately, because of the dimensional instability of epoxy glass laminates, materials expand and shrink — especially during etching. The result, all too often, is that layers won't register properly, making it impossible to meet today's demands for boards with more and more layers and tighter dimensional tolerances. Satisfactory product yields are harder than ever to achieve.

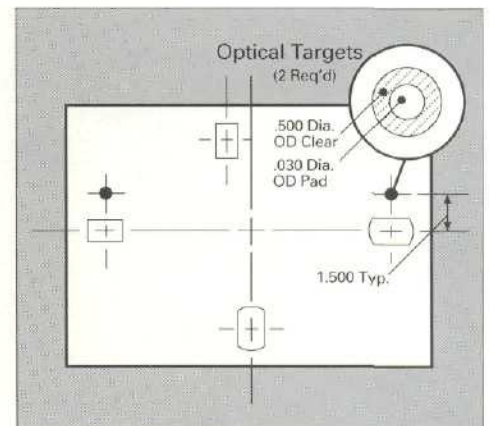
The Answer, "Wait until the target stops moving before you try to hit it!" The new *Optiline PE* is an advanced, automated system for precise Post-Etch punching of inner layers. **After etching - which means after most dimensional changes have occurred - The OPTILINE PE system punches tooling slots or holes optically**

The result is that tooling slots or holes are in the right place. And this means layers that register properly. There is no stretching or buckling of layers to make them fit the lamination plate pins.

Increased yields and improved productivity proves once again that Multiline Technology brings you closer to the perfect multilayer.

The process begins by imaging without tooling holes. Either automatic exposure equipment or aligned photobook tooling that registers front-to-back is used. There's no need to pre-punch film or laminate. Phototools last longer. Imaging is faster.

The artwork is generated with two fiducial targets at specified locations



which are then etched onto the panel. These targets are located along the long axis of the panel, equidistant from the centerline. (See diagram) If targets cannot be computer generated then other methods of target placement can be custom tailored to your production needs.

The OPTILINE PE system involves three separate operations:

- **initial positioning of the layers**
- **precise computer-aided optical alignment of the image**

Initial positioning is done by first locating the panel against left and rear material stops, either manually, or by means of an optional automatic loader.

Then material crowdiers align the panel so that targets etched on the panel are within view of the video cameras. The panel is held in place on the positioning table by a cushioned top platen, and target clips insure that the targets are held in proper focus.

Precise image alignment is achieved by means of two high-resolution, CCD, miniature video cameras.

Fiber optic light sources illuminate either the top or bottom of the panel, depending on the type of material being processed. Based on the cameras "seeing" the two targets etched on the panel, the micro processor directs "X", "Y", and "Ø" motors to position the table. An algorithm is used whereby any deviation in target locations due to dimensional changes in the material or the phototool are averaged, and the system splits the difference, automatically. This results in optimum positioning of the panel. The normal accumulation of tolerance errors, which can render a finished board useless, is avoided.

Precision punching of the tooling slots or holes in the

panels occurs once the system is correctly positioned. The standard *Optiline PE* uses the conventional four-slot, center-zeroing, tooling configuration. Additional holes or different configurations can be accommodated.

After punching, unloader belts feed the panel out the rear of the punch ready for the next operation.

The *Optiline PE* is also available with automatic load and unload for operator-free processing

This whole process happens quickly and accurately.

The *Optiline PE* is capable of punching four to five panels per minute. And the accuracy between the targets and the punched slots or holes is ± 0.001 ", with an image to hole repeatability of ± 0.0007 panel to panel.

The OPTILINE PE is easy to operate. The system even prompts the operator through the few steps involved in set-up. Punch and die blocks are easily positioned by means of a convenient adjustment handle, and the cameras are aligned directly to reference targets in the die blocks. During operation, safety interlocks protect the operator allowing single-hand punching. A series of lighted indicators and an LCD readout keep the operator informed of the system's status. Although usually run in the Automatic mode, Semi-automatic and

Manual modes are available.

The four-post hydraulic press design of the standard *Optiline PE* can accommodate panels from 10"x 12" to 24"x 28". Panel thicknesses can vary from 0.003" to 0.125" by a simple change of punch & die blocks. Systems for larger panel sizes can be supplied.

The OPTILINE PE's SPC Package provides a real time statistical process analysis of production lots.

The "spread" (stretch or shrink compared to the reference targets) is shown on the LCD display, in mils or millimeters. And the system continually updates and displays the average spread value and standard deviation as the run progresses. This allows definition of a maximum allowable spread. Panels which exceed this maximum spread will not be punched.

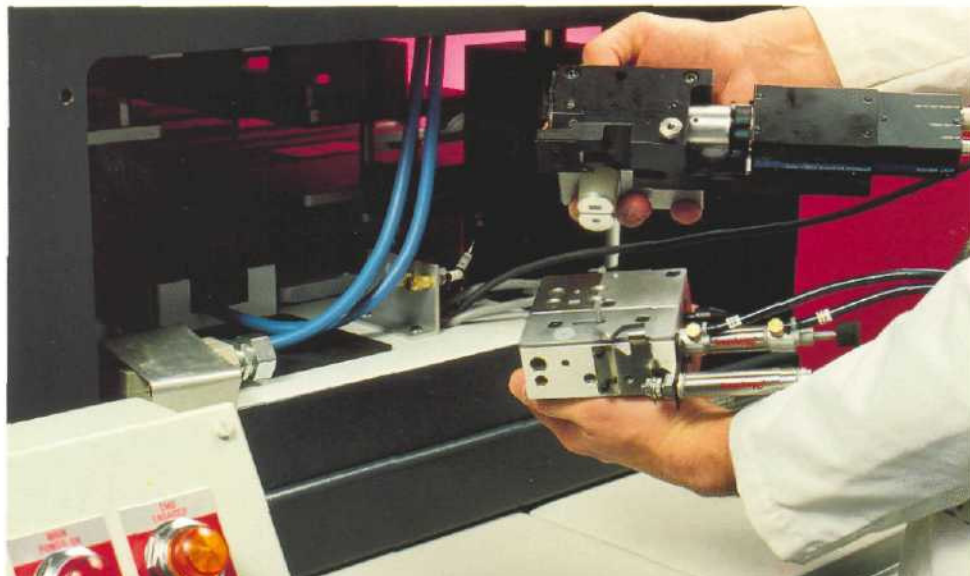
Applications for the SPC Package include:

- Layer by layer phototool compensation
- Evaluation of laminate material stability
- Determining source of registration problems in the total process
- Sorting for the best possible yield prior to lamination
- Accept — Reject decisions
- Process control evaluations; trends, tendencies, and capabilities

A panel-mounted printer provides a hard copy record of spread data for: all panels, panels at selected intervals, or panels that exceed the specified maximum allowable spread.

At the end of a run, a summary report provides:

- Run identification number
- Spread (each panel or selected intervals)
- Number of panels exceeding allowable spread
- Number of panels in lot
- Range of spread, mean, and standard deviation
- Number of panels *nulled* or *not nulled*



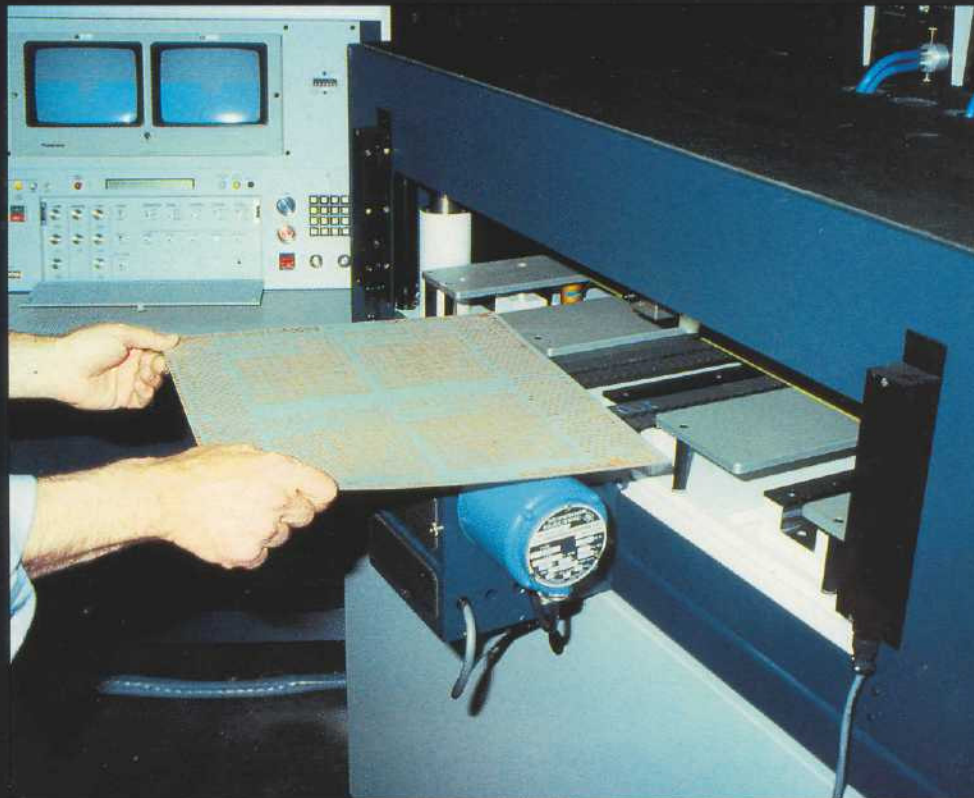
Additional Applications

The OPTILINE PE can also improve accuracy in other processes, such as solder mask registration, and the placement of surface mount devices on a board by an automatic SMD assembly machine. Buried via layers can be punched before imaging in registration to drilled targets. And panels where secondary drilling must be registered to the primary image can be handled easily. Tooling holes provided by the Optiline PE are more accurately positioned in relationship to the image because of the system's ability to average the deviation between the targets before punching.

Summary

Post-etch punching provides very real benefits. By avoiding the accumulation of tolerance errors that occur during processing, the Optiline PE post-etch punching system greatly increases accuracy. This means layers that are properly registered. The end result — improved yields and increased productivity. In addition, the system is automated, flexible, and easy to use.

The Optiline PE is manufactured by Multiline Technology of Farmingdale, New York, leaders in the design and manufacture of tooling systems for the printed circuit industry. Multiline Technology offers a full line of equipment to meet the ever-increasing need for improved productivity in printed circuit manufacturing.



Specifications

Panel Size: From 10" X 12" to 24" X 28", adjustable on 1/2 inch increments. (12" X 12" minimum on autoloader systems.)

Punch Position Accuracy: $\pm 0.001"$ X or Y position to datum over 28".

Punch Repeatability: $\pm 0.0005"$

Image to Punch Accuracy: $\pm 0.001"$ at center of panel.

Hydraulic Power Output: 12 tons minimum.

Power Requirement: 220 V or 460 V, 3 phase, Y configuration, 60 Hz, (20A/phase @ 220 V).

Pneumatic Requirement: 10 cfm at 100 PSI, 1/4" line.

Dimensions: Punch 63"W, 53"D, 60"H; Console 34"W, 38"D, 50"H

System Weight: 3400 lbs.

For more information call or write

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