BROCHURE

THE HIGH SPEED, HIGH PRODUCTIVITY
STENCIL PRINTER

The Productivity Standard for High Volume Printing

With the largest installed base of any printer in the industry, the AP HiE automatic stencil printer has earned its reputation for rock-solid, dependable productivity. Extremely fast cycle times, leading-edge process control tools and unmatched upgrade capability make the AP HiE the printer of choice for high volume production applications. Features such as the Balanced Control Print Head and Rheometric Pump deliver speed and accuracy, while user-friendly software makes setup and operation fast and easy. The AP HiE is an unparalleled solution that helps our customers keep a competitive edge in today's demanding manufacturing environment while ensuring long-term productivity.

Like all Speedline **MPM** products, the AP HiE is a direct response to industry demands and needs. At Speedline, we listen carefully to our customers and create the products they want, building them to the highest standards of mechanical, electrical and software engineering.

The printer of choice for high volume production

SPEED AND ACCURACY

- Balanced Control Print Head provides true closed-loop print pressure control for repeatable, precise printing.
- Rheometric Pump Print Head delivers high print speeds and superior paste management performance.
- High speed air bearings enable the industry's fastest vision movement.
- Less than 8 second cycle times.

- Patented alignment system provides unparalleled accuracy (+/- 0.001") and repeatability (+/- 0.0005") at 6 sigma.
- Tactile sensor accurately calculates and sets squeegee height and snap-off distance for each board type.

SUPERIOR PROCESS CONTROL

- Advanced 2D Verification provides fast, on-board paste coverage percentages for fine pitch and CSP devices.
- Low Contrast features allow alignment and inspection of optically challenging substrates (ceramics, flex circuits).
- 3D Verification offers real-time paste height feedback.
- SPC Software allows automatic process adjustment using "Adaptive Intelligence".
- Optimized Device Path ensures the lowest possible verification times.

USER-FRIENDLY SOFTWARE MAXIMIZES UPTIME

- Interactive board profiler and automated paste/pad offset features minimize setup time.
- Programmable parameters are easily accessed through just three menu screens.
- Message Log facilitates quick system maintenance.
- Multiple language capability for worldwide operation.

UPGRADES ENSURE LONG-TERM PRODUCTIVITY
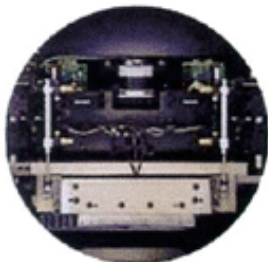
Balanced Control Head ensures accuracy

Retrofitable hardware options guarantee continuous technology advancement. Software upgrades provide cost-effective and easy-to-install enhancements. Speed Enhancement and Productivity upgrades boost performance of non-HiE machines.

Standard Features

Balanced Control Print Head Frictionless electropneumatic controls ensure the most accurate and repeatable pressure control for precise paste deposition. Print speed, blade attack angle, squeegee downstop, and left and right print pressures all can be independently adjusted for both front and rear squeegee blades. Actual print pressures are monitored *five times per second* during the print stroke and adjusted real-time using closed-loop feedback control. Automatic downstop allows controlled compliance to board topography and eliminates stencil coining and "snap-back".
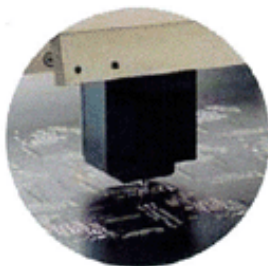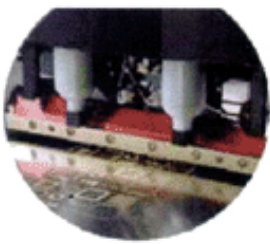

Tactile Sensor

Tactile Sensor Ensures proper board-to-stencil gasketing for repeatable contact printing by precisely locating stencil position. Integrated into the print head assembly, the tactile sensor allows accurate leveling of squeegee blades and automatically sets squeegee height and snap-off distance.

Patented Vision System Advanced vision algorithms quickly process fiducials "On-The-Move" for efficient image capture. Patented look-up/look-down illumination and optics technology provide advanced closed-loop feedback. Custom motion control optimizes camera transit to ensure the fastest and most accurate board-to-stencil alignment in the industry.

Powerful Software Exceptional functionality allows tailoring of machine parameters to meet critical process requirements. Pull-down menus and live video images provide fast and easy setups. Unique access control features ensure print program integrity. Software upgrades are also available for machines currently installed at customer locations. Standard software features include:

- **Board/Stencil Teach Function** Facilitates quick setup through interactive board

without the use of vacuum. Side-snugger bars adjust automatically, allowing fast changeover with no manual intervention. Z-Grip fingers eliminate board warpage and retract to allow for true contact printing.
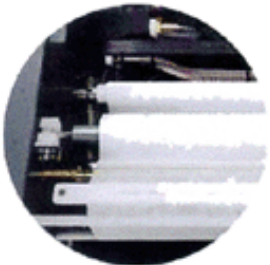
Stencil UltraWiper Provides automatic, unassisted cleaning of the bottom side of the stencil. A lint-free paper wiping system removes material bleed-out. A powerful, independently programmable venturi vacuum system (optional) removes stubborn solder paste from fine pitch stencil apertures, eliminating "opens" on the final assembly. The paper-over-plenum design reduces maintenance by filtering out particles, while a constant-speed paper feeder minimizes paper consumption. Vacuum UltraWiper is also available as an

Rheometric Pump Print Head upgrade.
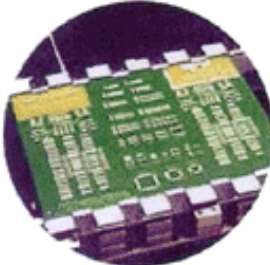
Automatic Paste Dispensing System Uses industry-standard cartridges to release programmable amounts of solder paste, adhesive or encapsulant in a clean bead across the stencil. The system initiates dispensing at operator defined intervals. A disposable nozzle simplifies cleanup and minimizes operator exposure to materials. The paste dispenser is also available as an upgrade.

Temperature Control Unit Controls temperature and monitors humidity within the print area to ensure consistent, repeatable print results. The system maintains temperature at a tolerance of +/- 2 degrees F. On-line SPC tracking alerts the operator to temperature and humidity fluctuations. This option is also available as an upgrade.

Y-Snugger Tooling

GEMComm/GEMHost Software Provides remote communication with MPM printers, monitoring, obtaining and storing process program information and SPC data via RS-232 or TCP/IP protocols to assist in maintaining process control. GEMHost is an ODBC compliant, Windows® based system using Microsoft Access as the native database. SPC or variable reports can be created real-time or scheduled to run automatically.

Off-Line Programming Makes it possible to download setup print parameters and fiducials from a remote computer to the printer. New product setup can occur at a remote location minimizing printer downtime during changeover and increasing process efficiency. Information for up to five fiducials can be exported, including location, shape, size and color. Programs can be downloaded via host printer or floppy disk.

*Stencil UltraWiper minimizes defects*

Upgrades

Software and hardware options are available as upgrades for AP HiE and non-HiE printers currently installed at customer locations. In addition, non-HiE AP users can extend the life of their machines and boost performance to near-HiE levels with these productivity enhancement upgrades:

- **Speed Enhancement Upgrade** Provides software and HiE motion control hardware for reduced cycle times and faster performance.

- **High Throughput Upgrade** Adds pre-board stop and camera park sensors to the Speed Enhancement upgrade. Minimized detent move and camera travel distance result in the lowest possible cycle times for non-HiE AP printers.

- **High Yield Upgrade** Adds 2D Post-Print Verification to the High Throughput upgrade. If printer cycle time is not critical to throughput, the extra time gained can be used to reduce defects through additional paste coverage verification or stencil wiping.

programming. Stencil teach increases verification accuracy by eliminating interference from vias and traces on the device. The Auto Gain Offset (AGO) feature can be activated to highlight poorly contrasted pads during teach and alignment.

- **Auto Print Offset** Automatically calculates the amount of X, Y and Theta adjustment necessary for perfect printing, minimizing operator involvement in the determination of paste to pad alignment.

- **Statistical Process Control (SPC)** Tracks critical print parameters to help manage the process and minimize downtime.

Standard Options
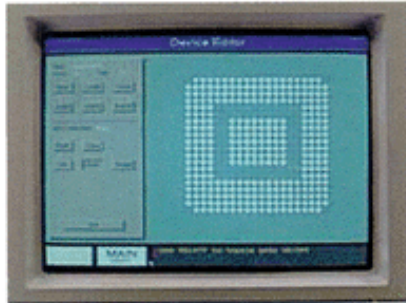
Unlimited BGA flexibilty

Post-Print Verification/Adaptive Control 2D and 3D Verification options provide quantitative performance of actual paste coverage and height immediately following the print cycle. Using the printer's vision system, state-of-the-art software minimizes verification times by determining the shortest path between devices, providing instant, efficient confirmation of print quality.

Adaptive control is achieved via built-in SPC data collection software. The system continuously monitors and analyzes current process status and can instantly self-adjust print parameters for optimum performance. Post-Print Verification is also available as an upgrade. Features include:

- **2D Paste Coverage** The percentage of pad coverage is quickly calculated and compared to user-defined limits, highlighting pads with insufficient coverage. Enhanced BGA capability provides verification of pads down to 0.010" diameter at 0.020" pitch. In-line and QFP devices down to 0.012" pitch are supported. The new Background Mask feature minimizes variability caused by vias and traces on the board. The Adaptive Control option triggers a wipe-on-reject cycle for optimum process control.

- **Custom BGA Template** Enables the user to teach and inspect a device with any pad array configuration. Files for device sizes up to 50 x 50 (2500 total pads) can be created and stored.
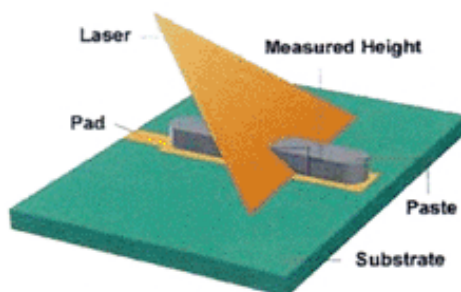
3D Paste Height

Low Contrast 2D The Background Mask and advanced vision technology allow measurement of paste coverage on pads that are indistinguishable from the substrate and cannot be seen by standard vision systems. The adjustable mask "blacks out" the area surrounding the pad to provide the resolution necessary to obtain accurate readings for any device type. Coupled with the optional low contrast alignment feature, Low Contrast 2D enables paste coverage verification on optically challenging substrates such as ceramics or flex circuits.

3D Paste Height Analyzes solder paste height and profile via laser scan of the printed pad at rates of up to 14 pads per second. The Adaptive Control option adjusts print pressures based on trend data generated by the SPC software.

Rheometric Pump Print Head A quantum leap in the printing process, providing precise control of the material application. Because paste is no longer exposed to air, consistent paste dynamics are applied to the product with each print. Compared to standard squeegee blades, paste savings of up to 90 percent can be achieved using the Rheometric Pump. Multiple head sizes allow the pump to adapt to different board sizes.

Y-Snugger Tooling Provides a physical holding system for securing boards

AP HiE	
BOARD HANDLING	
Minimum/maximum size	2" x 2" (50 x 50mm) to 20" x 16" (508 x 406mm) (16" or greater board lengths require dedicated workholder)
Thickness range	0.015" - 0.50"
Underside component clearance	0.50"
Machine transport speed	Programmable up to 60"/sec (1524mm/sec)
Transport height (adjustable)	Standard: 33.9" - 41" (861mm - 1041mm) With Y-Snuggers: 34.5" - 41" (876mm - 1041mm)
Board Support	Magnetic pins and blocks, optional dedicated workholders
Board Hold-down	Underside vacuum, Y-axis or X-axis snuggers
PRINT PARAMETERS	
Print area	18" x 16" (457 x 406mm)
Snap-Off	-0.05" to +0.10" (-1.3 to +2.5mm)
Squeegee pressure	1 - 60 lb (0.4 kg - 27 kg)
Squeegee speed	0.25" - 12"/sec to 16"/sec (6.35 - 406mm/sec)
VISION	
Fiducial method	2 to 5 models standard fiducials or pads
Fiducial type	All conventional fiducials accepted
Camera system	MPM unique high speed linear drive system with patented optics
PERFORMANCE	
Alignment repeatability	+/- 0.0005" at 6 Sigma, verified by glass plate test
Alignment accuracy	+/- 0.001" at 6 Sigma
Cycle time	< 8 seconds (excludes print stroke)