# MG-1

## Manufacturing Flexibility
## Maximum Versatility
## Multiple Setups

## Assembléon

Leaders in Electronic Manufacturing Technology

# MG-1

Offering the ultimate in multifunctionality, the MG-1 delivers a perfect balance between high mix and high accuracy. Placement capabilities range from 01005 and large, fine-pitch QFPs to tall components and odd form parts.

Thanks to its high precision single placement beam that carries 8 independent Z-Servo controlled heads, the MG-1 provides the perfect balance of chip and IC shooting. With chip placement speeds of 24,000 cph, and IC speeds of 10,000 ICs per hour, there is nothing the MG-1 cannot handle.

The MG-1 uses a Graphical User Interface to maximize ease of operation under Windows XP™ control. The MG-1 also allows for up to 96 smart feeders, or 160 Twin Tape Feeders, along with stick, bulk and many new tray feeding solutions holding up to 60 trays in quick change magazines. The smart feeders are equipped with the latest RFID technology to speed up and simplify machine setup, and to provide a real-time component inventory check. At the same time, feeder indicators provide the operator with all the essential information regarding the feeder status.

## The ultimate solution if versatility and flexibility are your priorities

**17.4K / 24K cph** *(IPC 9850 / Rated)*

**01005 - 45 mm sq.** *(1.8" sq.)* **Fine Pitch**

**Max Component Height: 15 mm**

**Accuracy: 30 Microns @ 3 Sigma**

**100 mm** *(4")* **Long Connectors**

**Max 96 Reels & 60 Trays**

**Standard Board Size** *(L x W):* **460 mm x 440 mm** *(18" x 17.2")*

**Optional Board Size** *(L x W):* **500 mm x 570 mm** *(19.7" x 22.4")*

**Centralized Network Database**

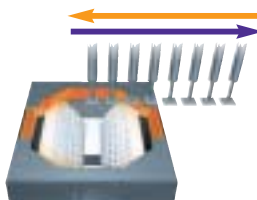**On-Machine Inventory Tracking**

**Remote Diagnostics**

# Maximum Versatility

## Standard Heads (SF)

- 8 in–line Z servo controlled heads for high-speed IC mounting
- CSPs can be placed continuously in sets of eight

## High Resolution Digital Camera

- 8 in-line multi-heads move non-stop over the camera
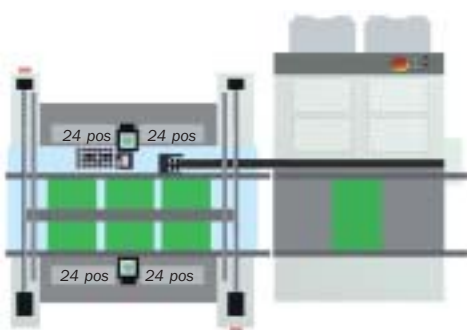
## Flying Nozzle Change Heads (FNC)

- Four of the eight heads are equipped with nozzle exchange on the-fly
- FNC occurs during return to next pick position
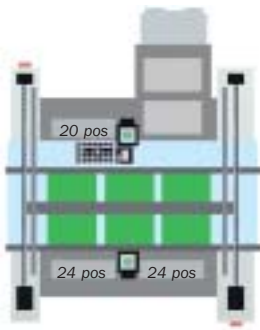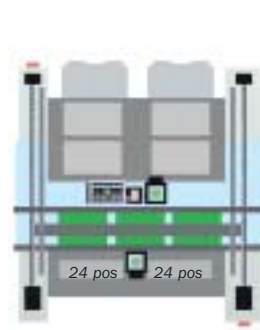- FNC component range: 01005 through SO20

OR

## Machine Top Views

24 pos  24 pos
24 pos  24 pos

- Optional Double Shuttle Tray Sequencer

20 pos
24 pos  24 pos

- Optional Single ATS Tray Feeder

24 pos  24 pos

- Optional Dual ATS Tray Feeder

## Feeder Exchange Trolley

- Facilitates fast production run changeover
- Allows offline setup and verification
- Automatic cable and air connection
- Heavy duty pneumatic cylinders lift feeder plate
- Self aligning mechanism provides optimal pick reliability

## Nozzle Station

- 32 position nozzle station
- 6 nozzle types cover the complete component range
- Custom nozzle positions available

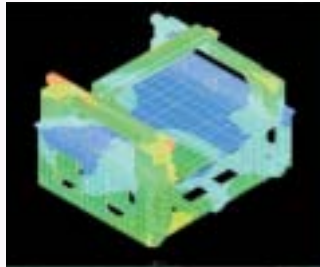## Nozzles on FNC Heads

| No. | Nozzle type | Examples of components | | |
|-----|-------------|------------------------|---|---|
| 1 | 71F | 0201 0402 | | |
| 2 | 72F·79F | 0603 1206 | MTR | Cylindrical chip 72F |
| 3 | 73F | 1810 | AL/C PTR | SOP Ta |

## 1 High-Rigidity Frame

- High precision monocoque frame
- Computer aided structural analysis and years of experience
- Unsurpassed stability for optimal placement accuracy

## 2 Three Stage Conveyor

- Double segment PCB conveyor belts make it possible to transport two PCBs independently from each other
- Substop, two Main stops and Exit stop
- Substop and Exit stop provide buffer function
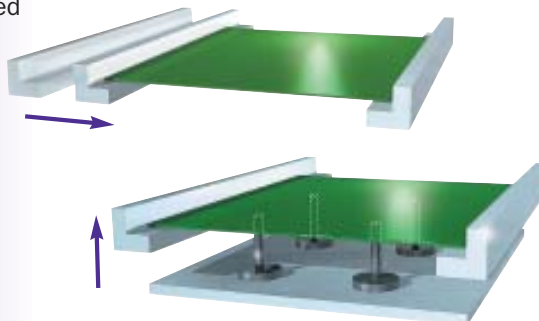- Pick process begins before board is fixed (precede pick)
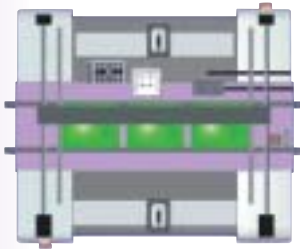
## 3 Board Clamping System

- Double independent board clamp and push-up system
- Stable board positioning for maximum placement accuracy
- Minimizes board warpage
- Eliminates the need for tooling holes in the board
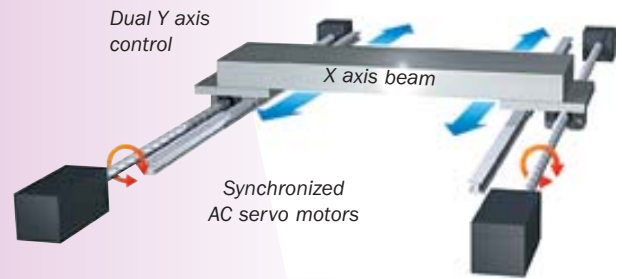- Allows component mounting to the extreme edge of the board

## 5 Extremely Rigid Dual Drive

- Dual synchronized Y axis motors
- NSK guide rails and ball screws for maximum durability
- AC servo motors for minimum maintenance
- Selectable X / Y axis speed per component type

*Dual Y axis control*

*X axis beam*

*Synchronized AC servo motors*

## 6 Common Feeders

- Smart Feeders CLi/CL for legacy compatibility
- Smart Feeders ITF for compatibility with AX, AQ, FCM, ACM
- Single handed operation for fast setup
- Alternate feeder pick-up for maximum uptime

## 4 Automatic Conveyor Width Adjustment

- Mounting program initiated adjustments for fast changeover
- Servo controlled board width adjustment

## Automatic Board Thickness Compensation

- Servo controlled board support
- Magnetic support pins for easy re-configuration
- Mounting program initiated adjustments for fast changeover

# ... For Outstanding Flexibility

## 7 User Interface

- Standard front and rear side, user interface flatscreen and operation panel
- Optional flat panel touchscreen display



## 8 Feeder Lock Verification

- Lasers ensure proper attachment of feeders
- Helps prevent downtime
- Improves pick performance



## 9 Feeder Indicators

- Provides information about feeder status with multi color LEDs
- Facilitates easy setup
- Decreases feeder setup time



## 10 Fiducial Camera

- Multi angle white and IR illumination for any PCB material
- Recognizes regular fiducials or artwork
- 4 point fiducial correction compensates for distorted boards
- Bad mark recognition and teaching



## 11 Fiducial Recovery Function

- Operator can "teach" location of damaged fiducial
- Eliminates the need to remove and clean the board
- Keeps production running even through marginal boards



## 12 Automatic Nozzle Exchange Station

- 32 position nozzle station
- 6 nozzle types cover the complete component range
- Custom nozzle positions available
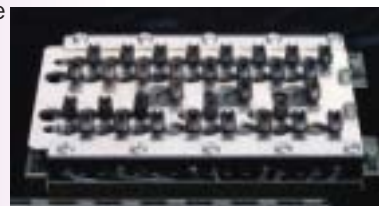


## 13 Nozzle Cleaning Station

- Automatic cleaning of Nozzles with air
- Preventive maintenance
- Increased pick and mount performance



## 14 Double Board Support System

- Decreases board transfer time by half
- 190 mm long board maximum

## 15 High-Resolution Digital Line Array Camera

- Mounting accuracy for 01005: 50 micron
- Mounting accuracy for QFP: 30 micron
- Multi-angled side illumination for any component background
- Automatic detection of any missing balls or damaged leads





*QFP image with multi-angle illumination on line array camera*

## 16 New Vision System

- High-speed image processing
- Camera vision compensates for off-center picking (adaptive pick-up)
- Comprehensive library of component vision files
- Sophisticated editor to program irregular ball/bump patterns





*BGA image with side illumination on line array camera*

## 17 Accuracy Enhancing Features

- Gantry Mapping compensates for localized nonlinearities
- Automatic Temperature Feedback adjusts for temperature variations
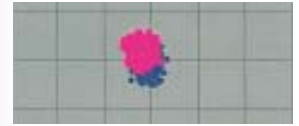


## 18 On-Machine Program Generation

- Teach mount locations using fiducial camera
- Computer guided placement verification for first article run
- Import mount and package data via "CAD-to-CAD" utility
- Create vision files directly in user interface
- Machine resident optimization package



## 19 Intuitive Graphical Windows XP User Interface

- Intuitive graphics simplify operation
- Easy to navigate
- User defined password for multiple users
- Multi language support
- Easily networkable
- Program while running
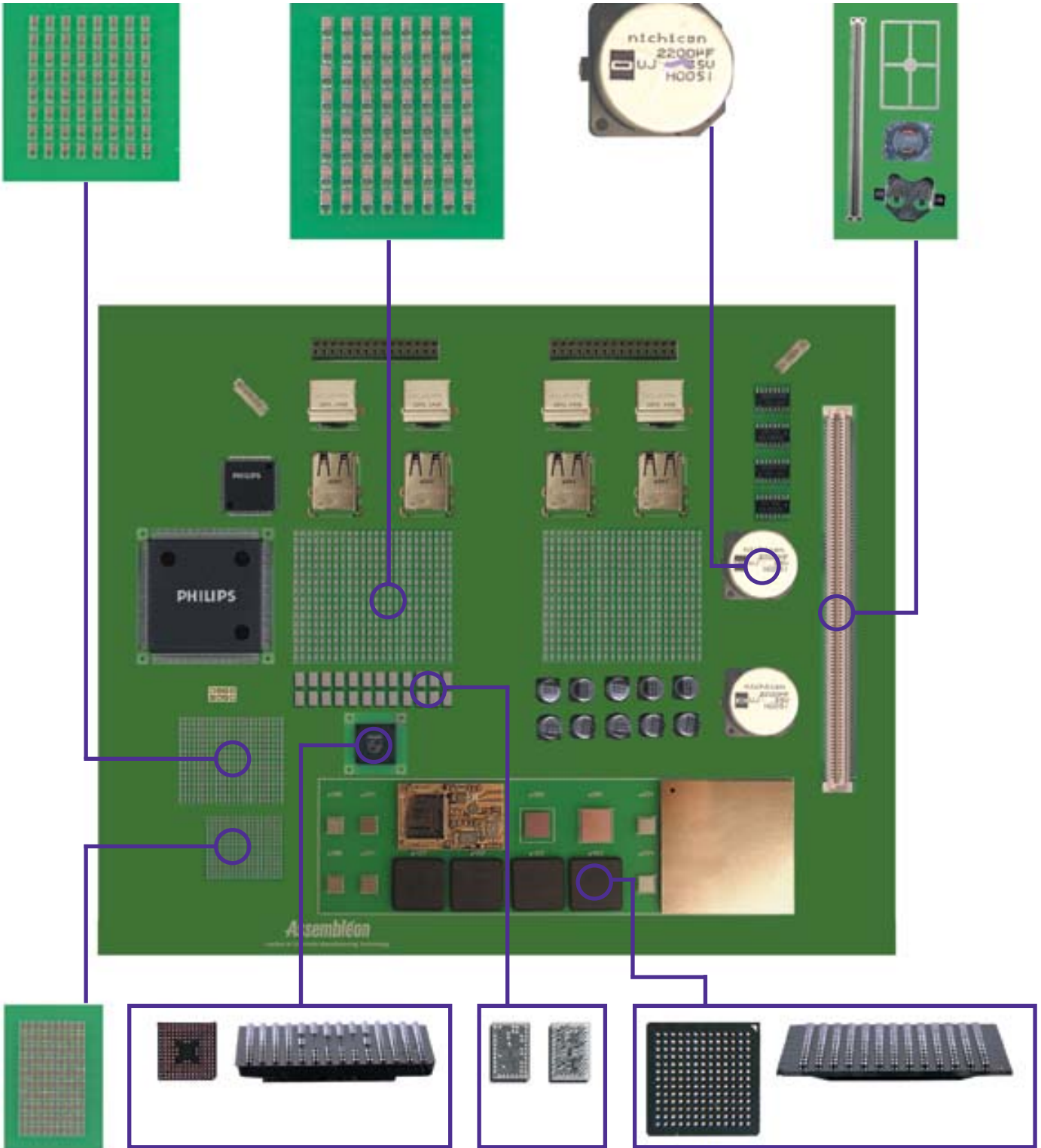- Management Information System (MIS) to gather production history data

# Example of Mounted Components

Actual example of
0201 chips mounted
(50 μm interspacing)

Actual example of
0402 chips mounted
(50 μm interspacing)

Actual example
of aluminium capacitor
(15.5 mm height)

Actual example of
max. 4" long
connectors and odd
form components



Actual example
of mounted
01005 chips
(30 μm interspacing)

Reverse side of CSP (micro BGA)

Flip Chips

Reverse side of BGA
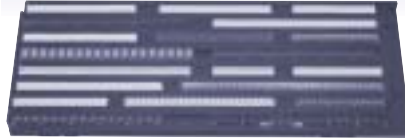
# Options and Accessories

## Internal Tray Feeder

- For one or two trays
- Mounted inside work envelope of machine
- No impact on number of feeder positions

## Strip Component Feeder

- For many small strips of components
- Mounted between rear feeder bar and rear conveyor rail
- Significantly increases number of unique components on the machine

## Single ATS Tray Feeder

- Mounted on rear side of machine
- Holds a maximum of 2 x 15 trays / unit
- No impact on board width
- Mounting heads pick directly from trays

## Dual ATS Tray Feeder

- Mounted on rear side of machine
- Holds a maximum of 4 x 15 trays / unit
- Maximum board width is 330 mm (13")
- Mounting heads pick directly from trays

## Double Shuttle Tray Sequencer

- 4 x 15 trays / unit
- Tray replenishment on-the-fly
- Built-in inspection conveyor
- No impact on board width or feeder slots

## Double Shuttle Traverser

- Two components per shuttle head
- Transposes tray components to temporary station in the mounting machine
- Eliminates waiting time for component pick-up

## QFP Recovery Conveyor

- Components rejected by vision system accumulate on conveyor belt for inspection
- Available in pneumatic and ITF versions
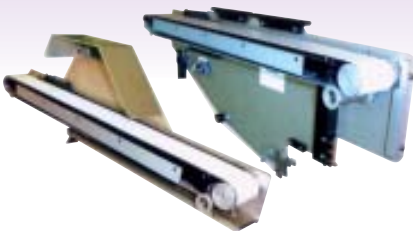
## Tray Magazine

- Allows offline setup of trays
- Easily exchangeable
- Can hold max. 15 pallets

## Second Line Array Camera

- Mounted in rear between two 24 position feeder bars
- Improves output for components picked from rear feeders

## Side View Camera

- Improving pick and mounting reliability
- Detecting component presence and orientation at the nozzle in Z direction
- Especially for small components
- In combination with the line array camera
- No effect on recognition time

## 3D Vision System

- Measures the coplanarity of QFPs and BGAs
- Cost effective 3D vision system solution
- Checks coplanarity on-the-fly

## CL/CLi Tape Feeders

- Pneumatic indexing
- For 8 - 72 mm tapes
- 15" reel holders
- Easy pitch change
- Optional RFID intelligence

## ITF Tape Feeders

- Electrical indexing
- For 8 - 56 mm tapes
- 13" reel holders
  (15" optional)
- Easy pitch change
- Tape holder allows easy tape
  splicing

## Twin Tape Feeders

- Electrical indexing
- DTSS™ (Dual Tape Single Slot)
- Two 8 mm tapes in one feeder slot
- Easy pitch change
- Tape holder allows easy
  tape splicing
- Effectively doubles
  number of
  unique
  8 mm
  components

## Vibratory Feeders

- Occupies 5 or 6 feeder slots
- Number of component lanes
  depends on component type
- Available in pneumatic and ITF
  versions
- Example shown
  with blank top
  plate with cut
  tubes for
  maximum setup
  flexibility
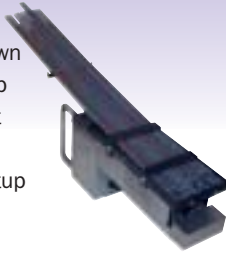
## Stick Feeders

- Available in pneumatic and
  ITF versions
- Belt and vibratory feeder available
- Number of component lanes
  depends on component type
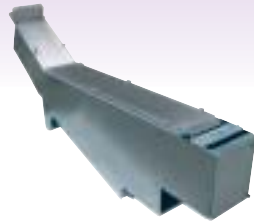
## Bulk Feeder

- Occupies one 8 mm feeder slot
- Automatic component detection
- Hopper mechanism provides
  reliable component supply
- Environmentally friendly
- Replenishment
  on-the-fly
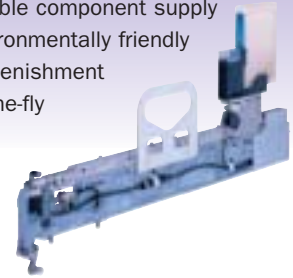
## Feeder Exchange Trolley

- Facilitates fast production
  run changeover
- Allows offline setup and
  verification
- Automatic cable and air
  connection
- Heavy duty
  pneumatic cylinders
  lift feeder plate
- Self aligning
  mechanism provides
  optimal pick reliability

## Splicing Tool

- For 8 - 56 mm tapes
- Provides reliable tape connection
- Minimizes production
  interruptions
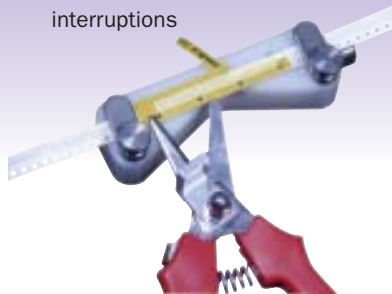
## Feeder Storage Cart

- Stores up to 100 tape feeders
- Includes feeder stand for
  tape loading
- Available in
  CL / CLi
  and ITF
  versions

## Touch Screen Interface

- Available for front
  and rear side
- Graphical user
  interface
  for easy
  learning and
  operation

## Custom Nozzles / Grippers

- Any variety of components can
  be picked and placed
- Vacuum nozzles and gripper
  nozzles can be designed
- Custom automatic exchangeable
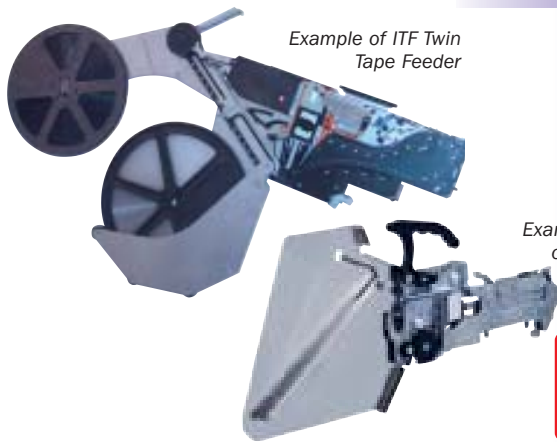  or on-the-fly nozzles available

## Multi-Language Support

- Many languages supported
- All user interface elements
  presented in native languages,
  including help screens
- English, Spanish, German,
  French, Japanese, Chinese,
  Russian, Italian and many more

# Production Enhancements



*Example of ITF Twin Tape Feeder*

*Example of RFID tag on CLi Feeder*

## Smart Feeders

- For compatibility with AX, AQ and FCM:
  - Smart ITF feeders
- For compatibility with legacy systems:
  - Smart CLi feeders
- Assures foolproof setup of jobs, offline & online
- Component Meter monitors component quantities in real time
- Pre-Empty warning: allows timely operator alerts when feeders are about to run empty. Operator feedback:
  - Amount of production time left
  - Number of components left
  - Number of boards left that can still be produced

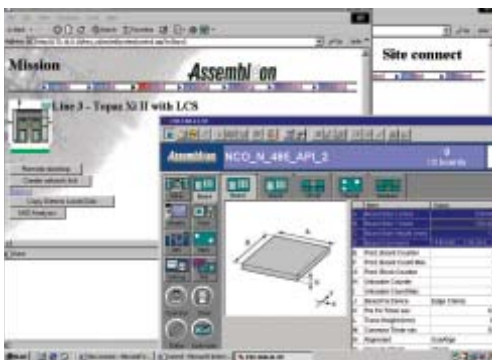## Adaptive Feeder Trolleys

Preserves your feeder Investment
- Allows easy migration to the MG-1 platform by utilizing your existing third party feeders
- When third party feeders wear out, convert your adaptive feeder trollies to accept new Assembléon feeders



*Example with vendor "A" feeders*



*Example with vendor "B" feeders*

## Mission Control



- Remote diagnostics of pick & place equipment
- Allows Assembléon to monitor up-time and performance of your manufacturing equipment
- Allows skilled engineers to remotely take control of your machine and diagnose issues

## Label Feeders

- Hover-Davis label feeder attaches directly to feeder bar
- Available in pneumatic and ITF versions
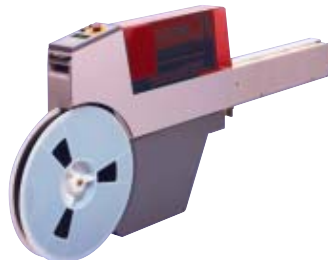


## Flash Memory Programming

- Data IO Proline Roadrunner mounts directly to machine
- Allows just-in-time programming of flash memory prior to placement
- Reduces inventory of pre-programmed flash memory

# Advanced Manufacturing Suite 2.0

*Enter
Data Manually*

*Import CAD Data*
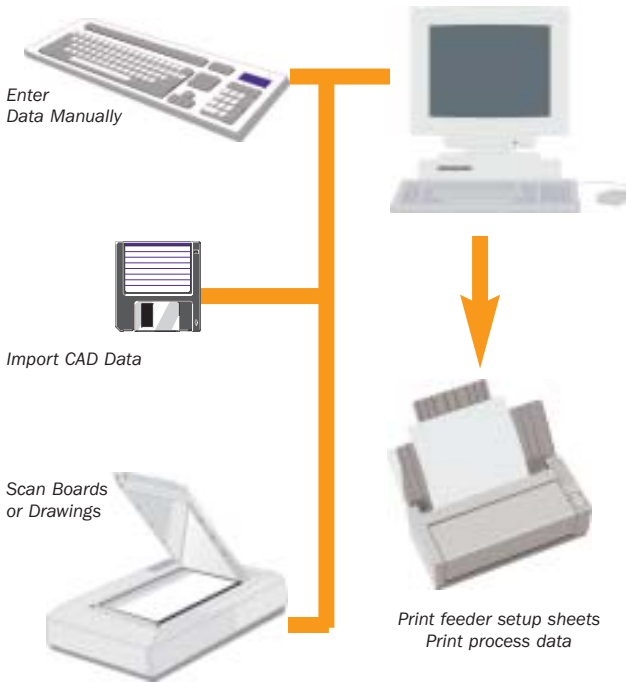
*Scan Boards
or Drawings*

*Print feeder setup sheets
Print process data*

## Import

- Convert CAD data by using flexible importer tool
- Utilize Data Converter to convert programs of 3rd party pick and place machines
- Scan boards when no CAD data is available
  - Allows generation of placement files without teaching on a machine
  - Allows comparison of scanned board to CAD generated image

## Optimization

- Single Machine Optimizer:
  - Generate optimal mounting sequence & feeder setup
  - Match required feeders to available feeders
  - Generate feeder setup sheets
- Line Balancing and data distribution for multiple machines
- Setup optimization (optimized feeder setup for multiple boards, common setup)

## Communication with Machines

- Automatic program download to all machines
  - Ethernet LAN communication
  - RS232 communication
  - Floppy drive
- Automatically run production schedules without operator interaction (line control)

## Data Management

- Uploads MIS machine performance data:
  - iMonitor
  - Mission Control
- Store placement programs on network
- Improve data integrity by not storing data on individual machines
- Convenient operator access

## Machine Level

- Modify programs on machine to include last minute changes
- Teach mount locations using fiducial camera
- Create vision files directly in user interface
- Machine resident optimization package (data generator)
- Computer guided placement verification for first article run

## Central Component Database

- Share component library globally
- All MG-1 machines can be easily networked
- User can choose between machine resident library or centralized component library
- Change a vision file at one location and have it immediately available for all other machines
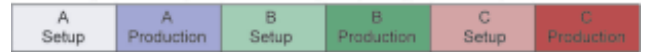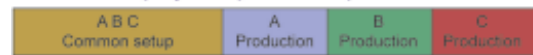
## Setup Optimization

- Optimized feeder setup for multiple boards (common setup)
- Eliminates changeover time because all feeders for multiple boards are resident on machine(s)
- Optimize boards sequentially to reach common setup for all boards or optimize boards together by first combining CAD data of individual boards



Used for multiple PCBs
Used for PCB "A" only
Used for PCB "B" only
Used for PCB "C" only

Setup for every model change by single PCB optimization

| A Setup | A Production | B Setup | B Production | C Setup | C Production |

Setup by multiple PCBs optimization

| A B C Common setup | A Production | B Production | C Production |

Time

## Offline Setup Verification

- Verification of feeder setup:
  - Scan barcode(s) on component reels
  - Smart feeders automatically verify match between component ID and corresponding feeder slot
- Component Meter tracks component quantities
  - Scan and store component quantities
  - Track component usage in real time
  - Print barcode representing remaining component quantity for future reel use

## Offline Electrical Component Verification

- Verifies component values electrically
- Done offline to eliminate production impact
- Can verify R, C, & L components

## Offline Vision Preparation Tool

- Generate vision files offline while machine is running
- Auto-Teach function
- Networkable to machine
- Guarantees 'no problem' first article run

## Online Setup Verification

- Graphical feeder representation:
  - Feeder location
  - Feeder status
- Tracks component quantities
- Also tracks number of components in trays
- Guides feeder setup process

## Pre-Empty Warning

- Monitors component quantities on all feeders in real time
- Operator feedback:
  - Amount of production time left
  - Number of components left
  - Number of boards left that can be produced before one or more feeders run empty

# Manufacturing Flexibility

## Feeder Exchange Trolley

- Facilitates fast production run changeover
- Allows offline set-up and verification
- Automatic cable and air connection
- Heavy duty cylinders self align feeder plate for optimal pick reliability
- Optional battery back-up enables feeder pitch verification offline
- Feeder positions
  - CLi: 24 positions
  - ITF: 20 positions

## Compliant Auto SMT Tooling System

- Allows fast changeover by eliminating the need to move support pins or adjust their height
- Improves mounting quality by ensuring board flatness
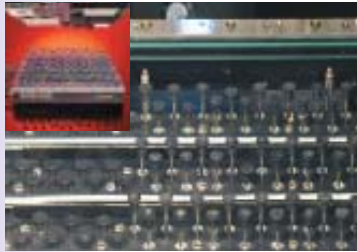
## Barcode or 2D Code Triggered Changeover

- Hawkeye or Omron 2D reader directly connected to machine
- Alternatively, a barcode reader can be used
- Reader initiates automatic program changeover
- Fast changeover is achieved because no operator action is required

*Example of 2D QR code*

## Automatic Board Width & Board Thickness Adjustment

- Conveyor width and board support are servo controlled
- Mounting program initiates adjustments for fast changeover
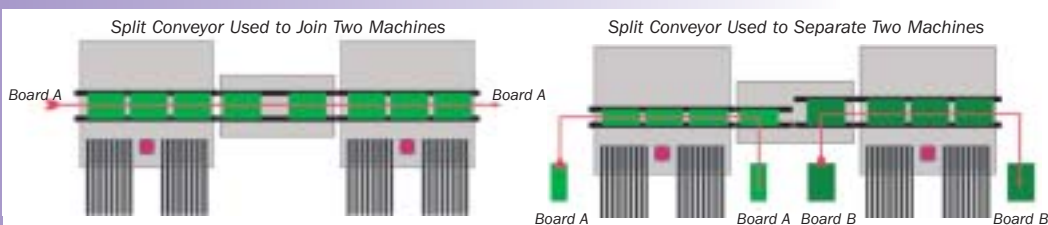- No operator action required
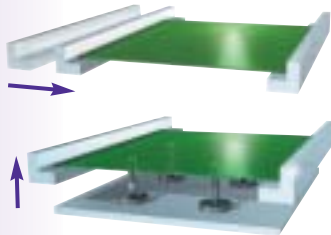
## Board Clamping

- Eliminates the need to move board location pins
- Reduces board cost by eliminating the need for board location holes
- Allows for robust board fixation
- By "sandwiching" the board (= clamping the board on top and bottom), the chance for warpage is minimized

## Turn One Production Line Into Two Lines with a Split Conveyor!

- Allows a line to function as one continuous line or as two separate lines

*Split Conveyor Used to Join Two Machines*

Board A                                    Board A

*Split Conveyor Used to Separate Two Machines*

Board A                                    Board A

Board A         Board A   Board B          Board B

# Standard & Optional Features

| Machine Model | MG-1 SF/FNC |
|---|---|
| **Recognition system** | |
| Line Array camera | ● |
| Second line Array camera | ☐ |
| 3d Vision System | ☐ |
| Side View System | ☐ |
| Nozzle exchange station | ● |
| Special order nozzles | S |
| Fiducial camera | ● |
| **Feeding** | |
| Smart Tape Feeder interface CLi | ☐ |
| Smart Tape Feeder interface ITF | ☐ |
| Bulk Feeder | ☐ |
| Stick Feeder | ☐ |
| Double Shuttle Tray Sequencer | ☐ |
| Reject station | ☐ |
| Single ATS Tray Feeder | ☐ |
| Dual ATS Tray Feeder | S |
| Feeder Indicators | ● |
| Feeder Exchange System (FES 24) | ☐ |
| **PCB positioning/ transport** | |
| Main Stopper | ● |
| Nozzle Cleaning Station | ● |
| Double independent Z servo controlled Push Up Plate | ● |
| Double independent Board Clamp System | ● |
| Entrance Sub Stopper | ● |
| Exit Sub Stopper | ● |
| Automatic Width Adjustment | ● |
| High Speed soft-stop conveyor | ● |
| Reverse transfer Right to Left | ☐ |
| Ceramic PCBs | ☐ |
| Special sized PCBs | ☐ |
| **Safety** | |
| Feeder Floating Detection | ● |
| Conveyor Entrance/Exit covers | ● |
| Safety cover for feeder exchange | ● |
| Dummy Feeders | ● |
| Safety specifications according CE standards | ● |
| Spare parts kit + tools | ● |
| SMEMA kit | ● |
| Front and rear anti-static covers | ● |
| Signal tower + warning buzzer | ● |
| **Software** | |
| Windows XP Graphical User interface | ● |
| Operating monitor flat screen front & rear side | ● |
| Operating monitor touch screen front & rear side | ☐ |
| Operation panel front & rear side | ● |
| Multiple Accuracy Compensation System | ● |
| Fiducial Recovery function | ● |
| Bad Mark / Master Mark Sensing | ● |
| Online teaching | ● |
| Adaptive Pick | ● |
| Alternative Feeder Function | ● |
| Self production control | ● |
| Variable XY axis speed per component | ● |
| Online Help function | ● |
| Management Information System | ● |
| Template (pattern matching) | ● |
| Automatic rework cycle | ● |
| Online data generator | ● |

● = Standard   ☐ = Optional   S = Special order   – = Not applicable

# Specifications

| Machine Model | MG-1 |
|---|---|
| Optimal output per hour | 24,000 |
| IPC-9850 output per hour | 17,400 |
| Placing accuracy at 3 Sigma | 30 micron |
| Alignment principle | Line array |
| Footprint (L x W) | 1650 x 1562 mm |
| Min. component size | 01005 |
| Max. component size | 45 x 100 mm |
| Max. component height | 15 mm |
| Nozzle exchange for MG-1 FNC | automatic and on-the-fly nozzle exchange |
| Nozzle exchange for MG-1 SF | automatic nozzle exchange |
| Min. board size (L x W) | 50 x 50 mm |
| Max. board size (L x W) Optional board size (L x W) | 460 x 440 mm 570 x 500 mm |
| Board thickness | 0.4 to 4.0 mm |
| Tape feeding positions (8 mm) | 96 |
| Other feeder options | tape, stick, tray tube, waffle pack, etc |
| Feeder trolleys | tape feeder trolley |

# Assembléon
Leaders in Electronic Manufacturing Technology