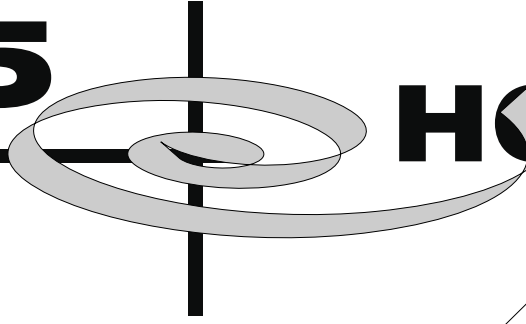


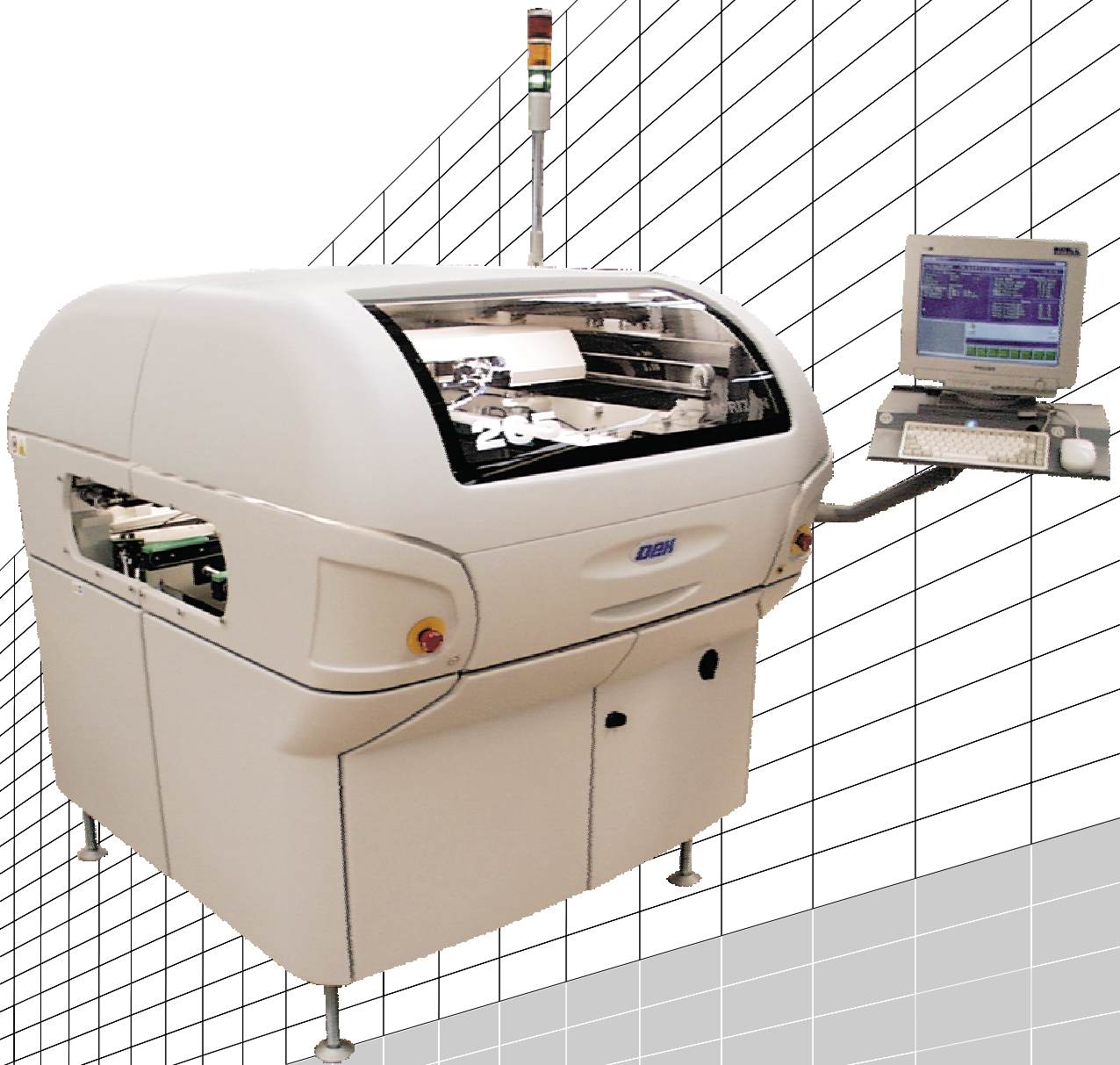
**DEK**<sup>®</sup>  
+ v o i #

**265**



**HORIZON**

**Engineering Specification**



<http://www.dek.com>

A **DOVER** TECHNOLOGIES COMPANY

**DEK Part No. 156935**



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**HORIZON ENGINEERING SPECIFICATION**

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**ENGINEERING SPECIFICATION**

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**ENGINEERING SPECIFICATION**

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**GENERAL DESCRIPTION**

Using a world wide installed base of thousands of 265 printers, DEK has engineered the evolution of the industry's most successful screen printer platform to create the Horizon – a printing machine focused on improving flexibility, yield and price/performance.

The Horizon adds more features and greater choice, blending proven technology options and utilization-based process innovation to deliver unique manufacturing advantages. It is an engineered evolution precisely optimized for functionality, flexibility, cost-effectiveness and longevity.

Common features evolved from DEK's 265 family provide immediate user confidence. In turn, a minimal learning curve and easy transfer of existing product files result in faster process improvements. Horizon's intuitive Windows NT™ operating system, is the globally accepted user interface to achieve better productivity effectively.

Horizon's precision-engineered mechanical assemblies, advanced electronic control systems and ISO9001 manufacturing procedures combine to deliver maximum efficiency and quality through high yields, product flexibility and fast changeover. The Horizon conforms to the following standards:

- CE: 89/392/EEC, 89/336/EEC and 73/23/EEC
- UL 1950, 3rd Edition 1995
- CAN/CSA C22.2 No950-95

Advanced equipment utilization programs to fine tune the process, together with DEK's applications resource, extend the reliability production engineers and line operators can expect from the Horizon. The Horizon package addresses future capacity requirements through its range of expansion options, process enhancements and documented upgrade paths.

**TECHNICAL SPECIFICATION**

<b>Screen Frames</b>	<b>Specification</b>		
	Type	External (w x l x t)	Internal (w x l)
Standard	DEK 265	736 x 736 x 38/40mm (29" x 29")	660 x 660mm (26" x 26")
Optional Chase Adaptors	DEK 260	585 x 585 x 38mm (23" x 23")	508 x 508mm (20" x 20")
	Sanyo	550 x 650 x 38mm	
Optional Screen Adaptors	All common stencil sizes available: Sanyo, Ekra, Fuji, Panasonic, MPM etc.		
Image Position	Centre, Front, Custom		
<b>Board Handling</b>	<b>Specification</b>		
Minimum Size	40 x 50mm		
Maximum Size	510 x 508mm (620 x 508mm)*		
Thickness	0.2 - 6mm		
Warpage	Up to 8mm including PCB thickness		
Underside Component Clearance	Programmable 3 - 42mm		
Transport Conveyors	Programmable motorized		
Transport Direction	Left to Right Right to Left Left to Left Right to Right		
Interface Protocols	All popular interfaces available		
Board Location	Patented Over the Top Clamps Edge clamping* Vacuum* Foil-less Clamps with vacuum*		
Registration	Fully Automatic Vision		
<b>Process Parameters</b>	<b>Specification</b>		
Print Speed	2 - 150mm/sec		
Print Pressure	0 -20kg Programmable (Closed Loop Feedback)*		
Print Gap	0 - 6mm		
Stencil Separation	Speed: 0.1 - 20mm/sec Distance: 0 - 3mm		
Print Modes	ProFlow Print Print Print Flood Flood Print Adhesive		
Paste Knead	Programmable: Number, Period, On Demand		
<b>Vision</b>	<b>Specification</b>		
Vision System	Cognex 8100 Vision System		
Camera Lighting	Software Controlled Programmable Lighting		



Fiducials	2 or 3
Fiducials Types	Synthetic fiducial library or unique pattern recognition
Fiducial Size	0.5 - 3mm
Fiducial Position	Anywhere on PCB (see Fiducials, Key Features)
Fiducial Error Recovery	Auto Lighting Adjustment Auto Fiducial Search Smart Fiducial
<b>Performance</b>	<b>Specification</b>
Alignment	Stencil to Board Repeatability 6 sigma @ 25µm
Cycle Time	12.5 secs 10.0 secs*
Product Changeover	2 minutes#
New Product Set Up	<10 minutes
<b>Operator Interface</b>	<b>Specification</b>
Hardware	Colour VGA Touch Screen Display, keyboard and mouse
Software Operating System	Windows NT
Manuals	Electronically on CD-ROM Hard Copies Available*
<b>Options</b>	<b>Specifications</b>
ProFlow	Fully enclosed, high speed DirEKt Imaging system Optional Temperature Control Unit
2D Inspection	Full inspection capability of screen and board: Basic Advanced Automatically triggered recovery sequences Inspection outputs available to Statistical Process Control software
Tooling	Magnetic Pillars Form-Flex AutoFlex programmable tooling (35mm pitch) MultiFlex with or without vacuum Dedicated Vacuum Plates
Under Screen Cleaner	Paper - Fully programmable wet, dry and vacuum assisted paper under screen cleaner Vortex - Fully programmable wet/dry and vacuum assisted foam cassette under screen cleaner
Paste Dispenser	Fully programmable automatic paste dispensing system. Available for 1kg and 500g cartridges
Temperature and Humidity Sensor	Sensor to measure and display temperature and humidity with in the printing area. SPC output available
Environmental Control	Temperature Control Unit (TCU): Controls the temperature of the printing area Temperature and Humidity Control Unit (ECU): Controls the temperature and humidity of the printing area
Statistical Process Control	On board package to collect, manage and display critical process parameters
Board Clamps Alternatives	Edge Clamps Foil-less Clamps

Remote Event Monitoring	Desktop application for remote status monitoring and reliability analysis of printer
Generic Equipment Model	On board package for communications with host using TCP/IP interface
Selective Print Pass	This option enables selective print or pass through of boards
Flexible Board Printing	Option enables printing of thin flexible boards
Remote Board Stop	Optional alternative to camera board stop for use with large and/or heavy boards or carriers
Speed Up	Option to reduce machine cycle time from 12.5sec to 10sec.
Remote Product Changeover	Stand alone database program controlling and monitoring the product file loaded, matches current board input
Off Line Editor	Off line software package to generate and edit product files. Available on board or via network
Network	LAN package to transfer data within the factory network. Package includes DEK netfile software, which can target product and SPC files to location on the network
<b>Certification</b>	<b>Specification</b>
CE	89/392/EEC 89/336/EEC 73/23/EEC Subsequent Amendments
ETL	UL 1950, 3rd Edition 1995 CAN/CSA C22.2 No 950-95
<b>Services</b>	<b>Specification</b>
Power Supply	100, 110, 120, 200, 210, 210, 220, 230, 240 volt Single Phase 50/60Hz Current: 110V - 16 Amps 120V - 15 Amps 200 - 220V - 8 Amps 230 - 240V - 7 Amps
Air Supply	Air to ISO 8573.1 standard quality class 2.3.3 Pressure 5 -8 bar at 5 Litres/min
<b>Shipping Information</b>	<b>Specification</b>
Approx Weight	900kg
Approx Dimensions	1314 x 1325 x 1592mm (51.7" x 52.1" x 62.6")

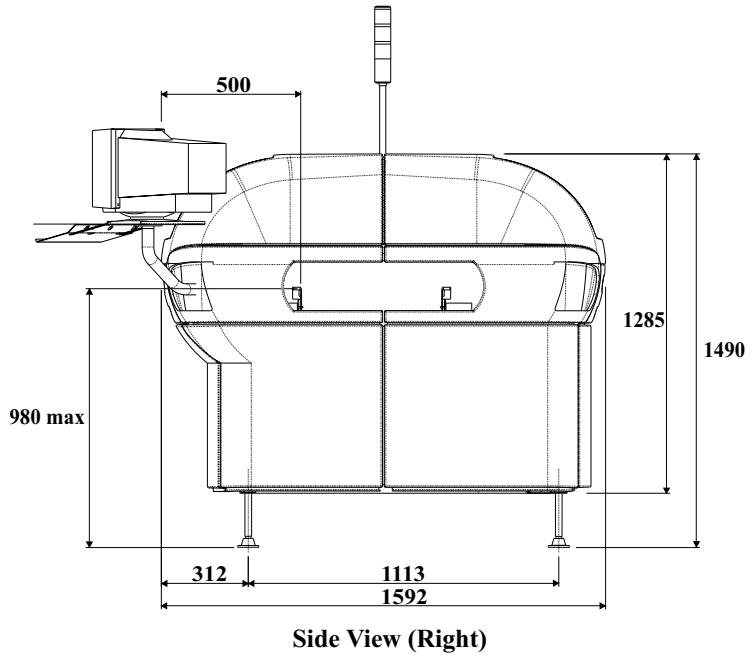
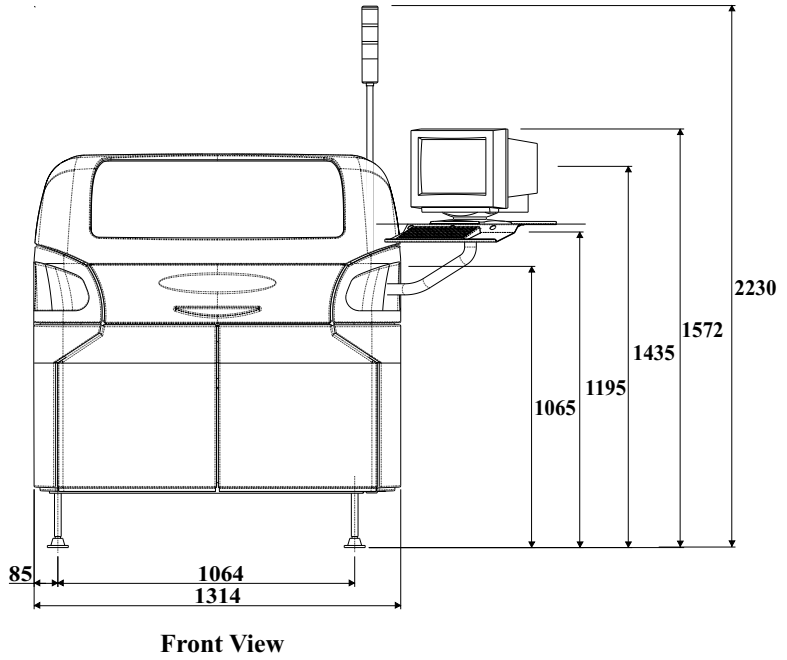
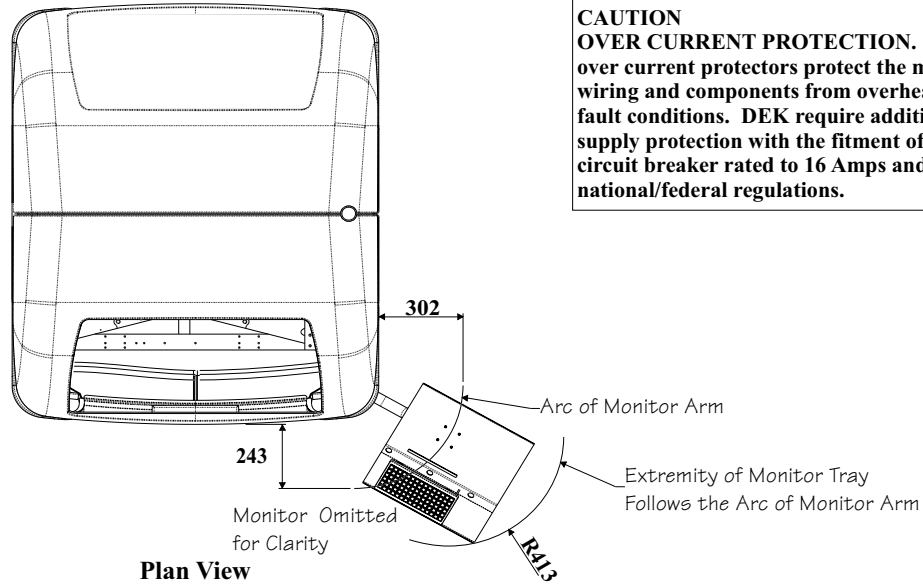
\* Options

# Timed using AutoFlex

**CAUTION**  
**OVER CURRENT PROTECTION.** Magnetic/thermal over current protectors protect the machines' internal wiring and components from overheating/fire during fault conditions. DEK require additional machine supply protection with the fitment of a wall mounted circuit breaker rated to 16 Amps and conforming to national/federal regulations.

**Services Required**  
Voltage:  
100/110/120/200/210/220/230/240V Single Phase  
50/60Hz  
Current:  
110V - 16 Amps  
120V - 15 Amps  
200 - 220V - 8 Amps  
230 - 240V - 7 Amps  
Air Supply:  
Air to ISO 8573.1 standard quality class 2.3.3  
Pressure 5 - 8 Bar at 5 Litre/min  
Weight 900 Kg

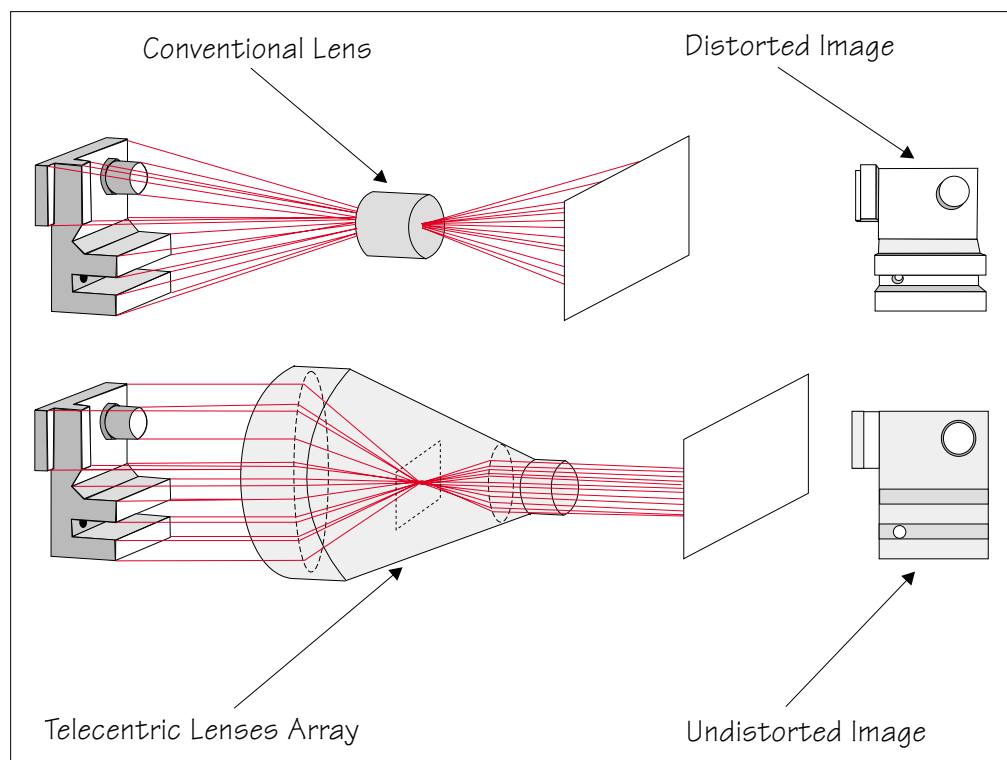
**NOTE**  
All dimensions in millimetres  
Board Transfer Height 820 - 980 mm  
Screen Load Height 905 - 1065 mm



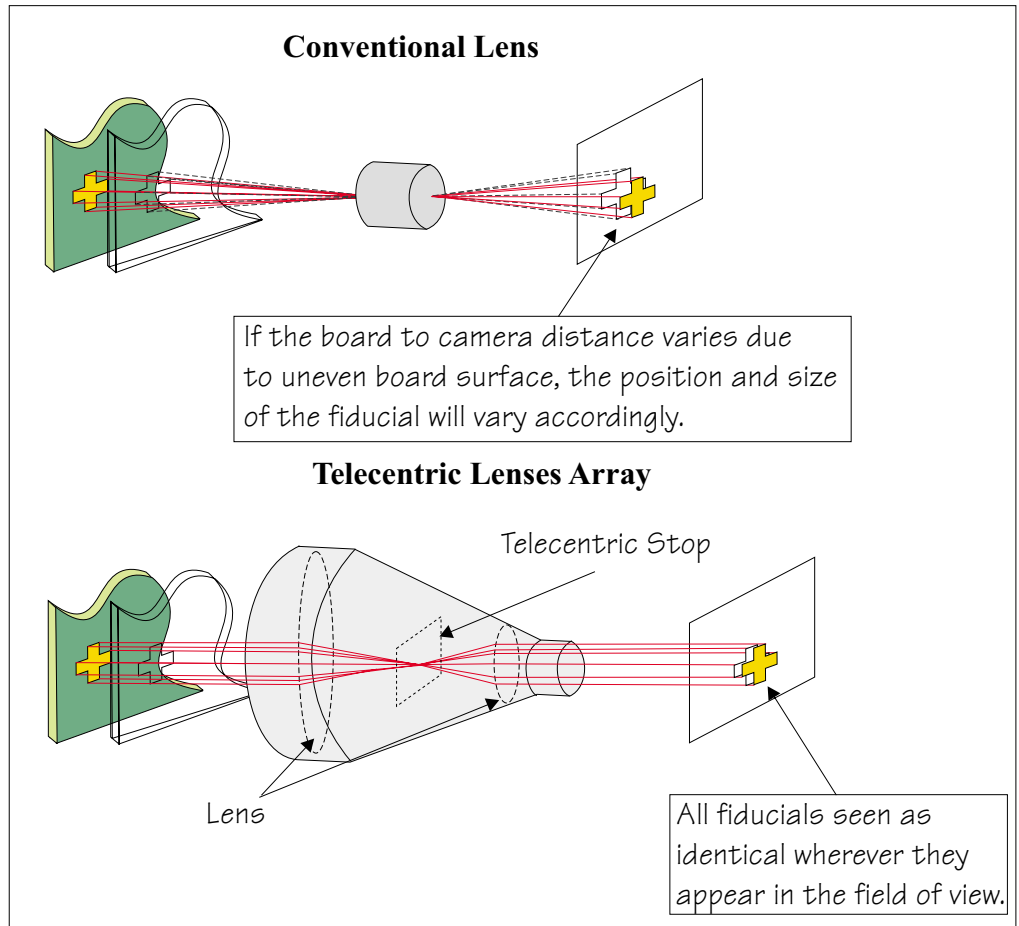
KEY FEATURES

**Camera System** The camera assembly integrated into the Horizon is a compact assembly of optics, lighting and a standard CCIR camera. The camera is fitted with a split optic unit to allow the camera to capture the image from the stencil and board at the same time. Thereby, eliminating the relative movement between the images captured. The camera assembly incorporates ‘Telecentric Lenses’ and ‘Flat Lighting’.

**Telecentric Lens** The optic unit within the camera assembly uses telecentricity to ensure that board warping, distance between camera and board and the actual position of the fiducials within the field of view do not affect the alignment accuracy.



Variations in the distance between the optic unit and the board fiducials due to uneven board surface are transparent when using telecentric lenses. With a standard lens the diameter, centroid and position of a fiducial varies with this distance, hence key elements in determining alignment of the board vary depending on where the fiducials lie in the field of view.

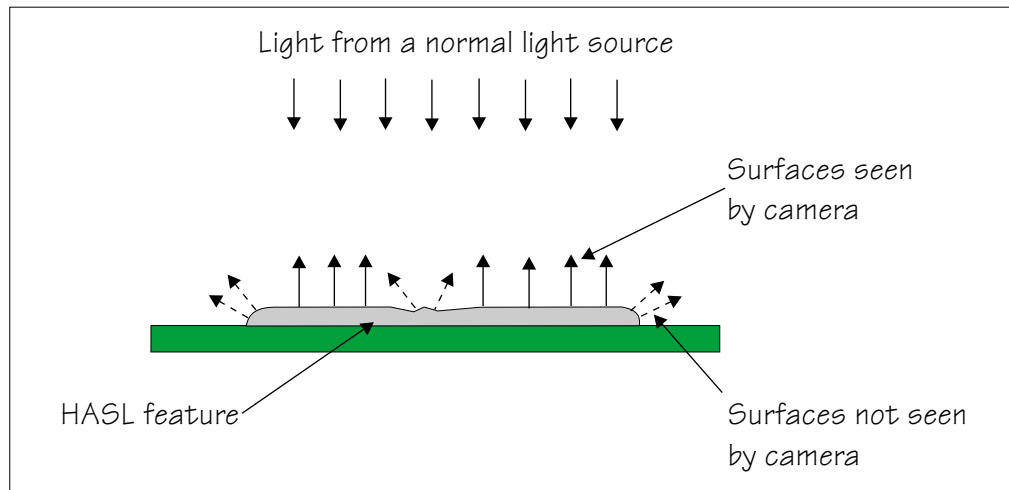


Without DEK's use of telecentric lenses, a pre-alignment stage would have to be added to bring the fiducials into the centre of the field of view, before carrying out a final alignment stage.

Flat Lighting

Essential for any vision system is to have the highest quality images with which to process. Poor quality images may result in a degradation of image processing leading to less accurate alignment and if inspection is used, misleading results.

DEK's camera assembly fitted to the Horizon has been specifically designed to enable low quality boards to be aligned and inspected with equal accuracy as gold/copper boards. The lower quality boards have uneven Hot Air Solder Levelled (HASL) pads and features.

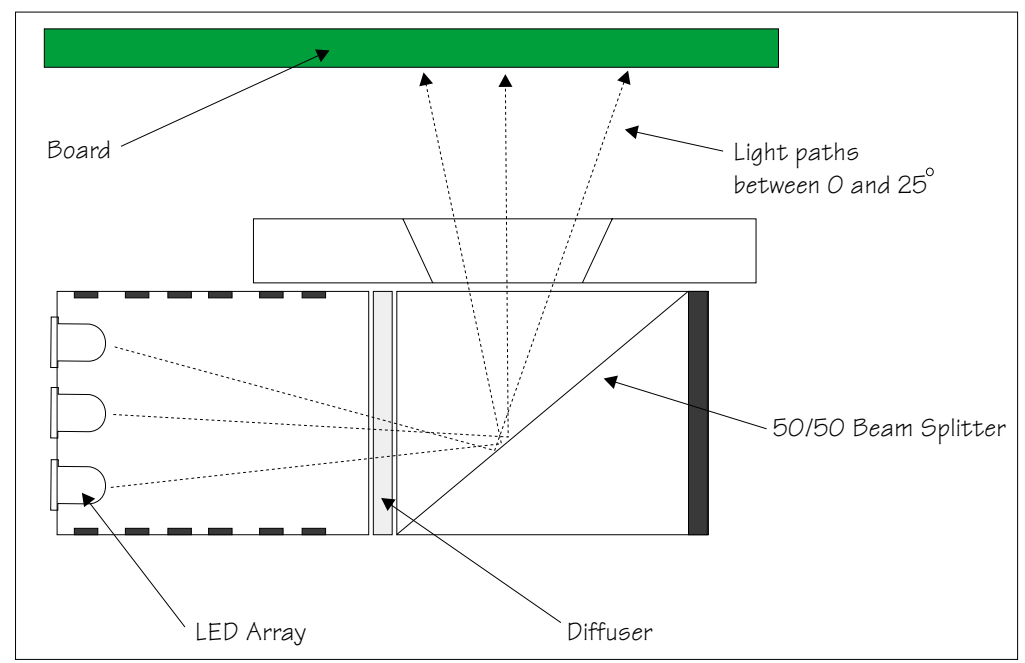


The uneven surface texture and irregularities of these features and pads would cause dead zones, ie areas where there is no light and hot spots of light caused by reflection of light from solder pads and wet solder paste.

For high accuracy and reliable image processing DEK has incorporated a flat lighting design within the camera assembly. This is achieved by utilizing two light sources:

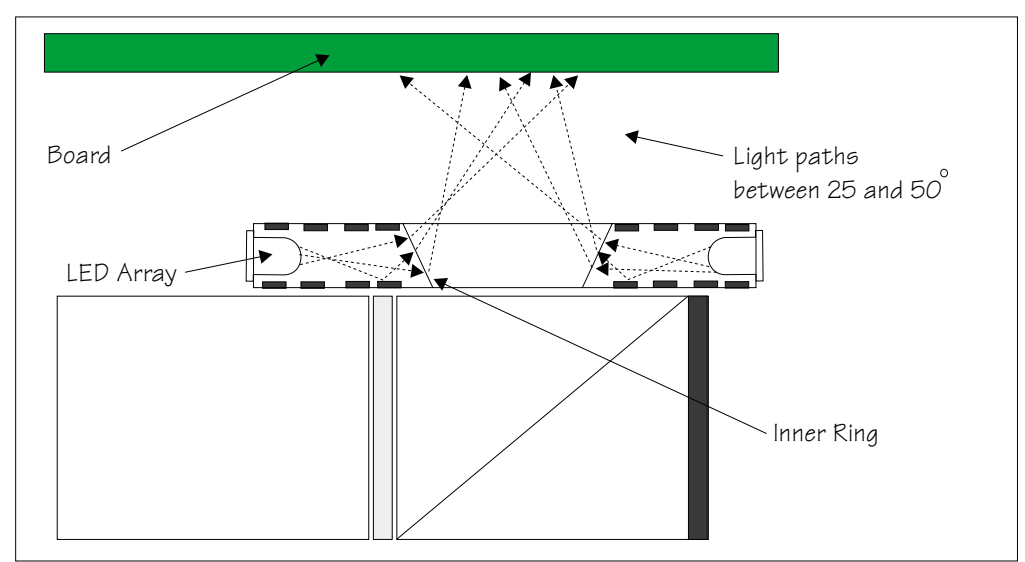
- Direct lighting - producing normal incidence and angles up to 25°
- Indirect/Oblique lighting - producing angles from 25° - 50°

Direct lighting is achieved by a block of six LEDs shining through a diffuser to produce a very uniform light source. The light is passed through a cube beam splitter which increases the illumination and the range of angles reaching the board.



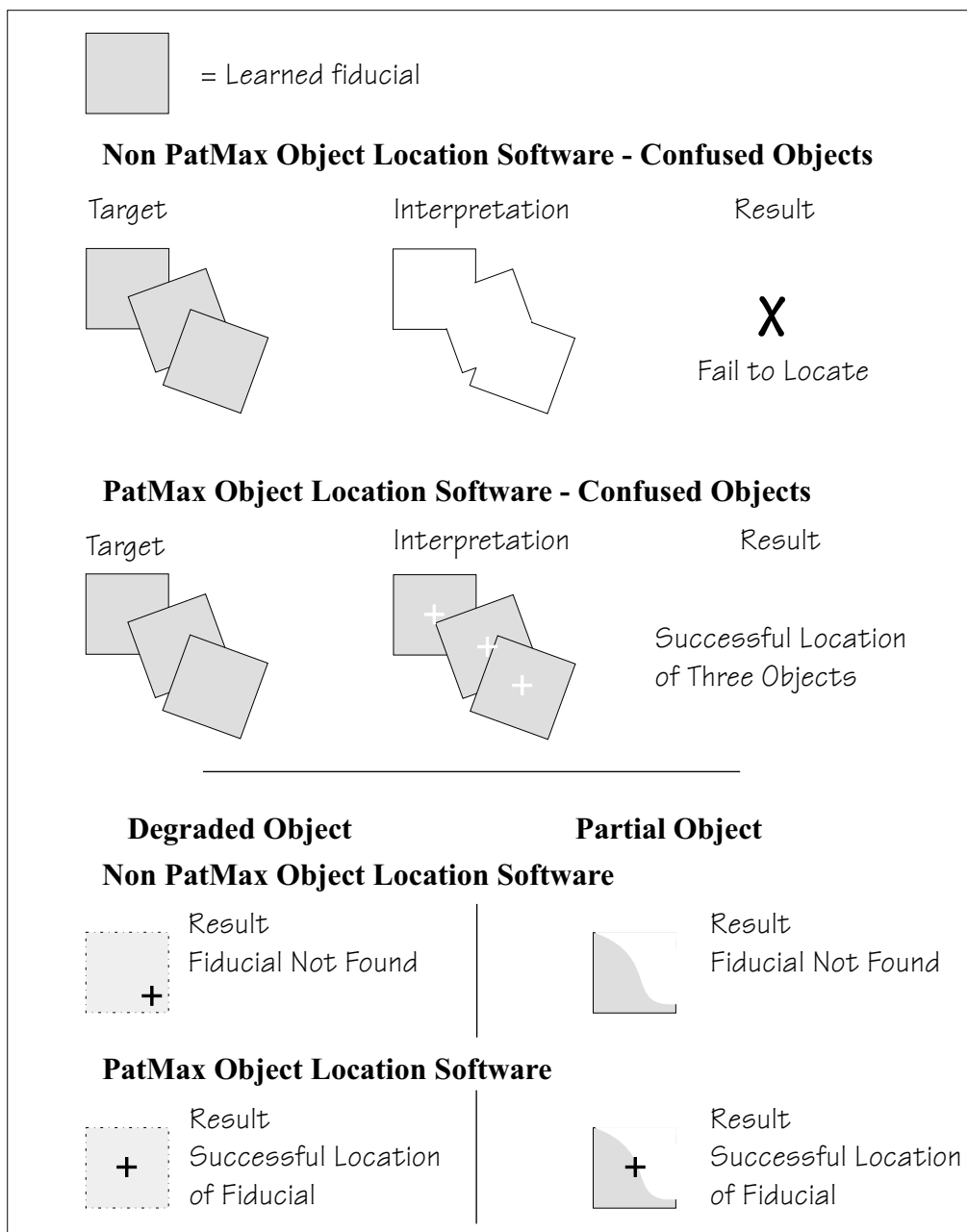
Indirect /Oblique lighting is used in addition to direct lighting to produce light paths between 25° and 50° to create uniform illumination, eliminating hot spots of light.

An array of 12 LEDs sited in a polished ring around the lens aperture produce a light source which is reflected and scattered by the polished surface and the white paint of the assembly to the fine ground conical inner ring. This produces very uniform illumination which is radiated in all directions providing a very balanced illumination of the board.



PatMax

The Horizon machine uses PatMax® object location software to produce accurate repeatable stencil to board alignment. PatMax interprets geometric shapes within objects. A square fiducial is interpreted by PatMax as four separate line segments. The advantages of the system are greater accuracy at lower image quality. The object can be a different size, or different orientation to the object learned. The target can be partly obscured and degraded.





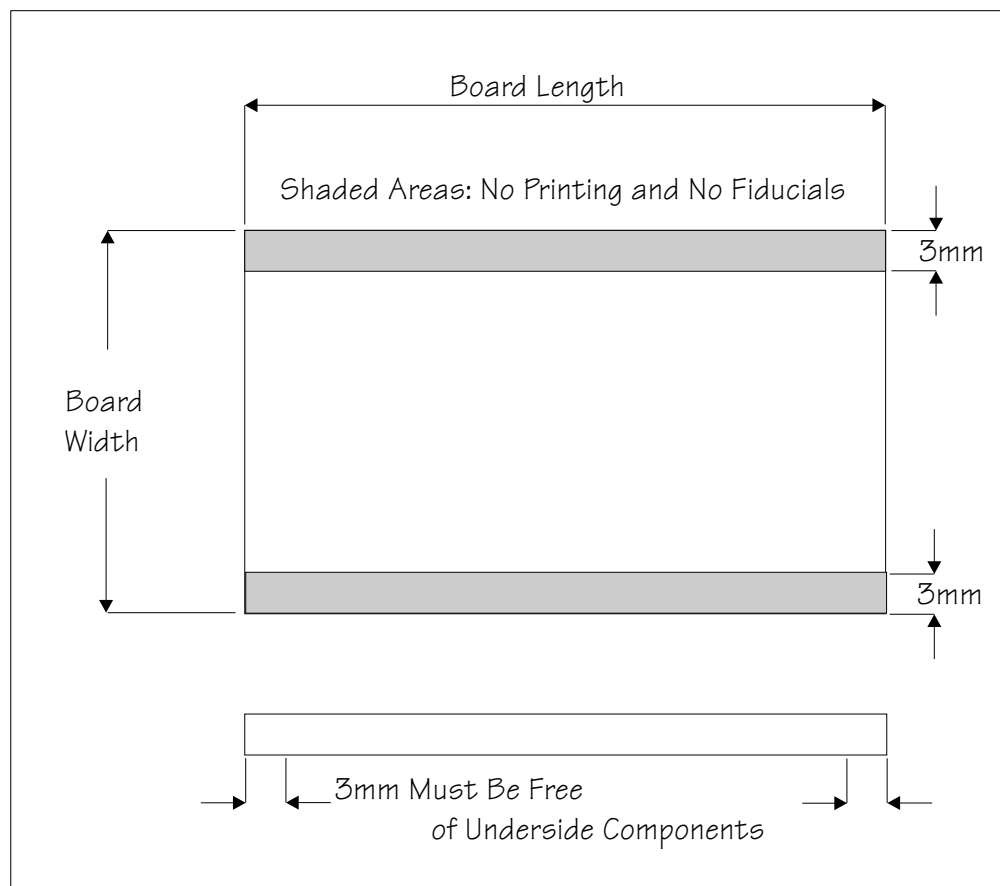
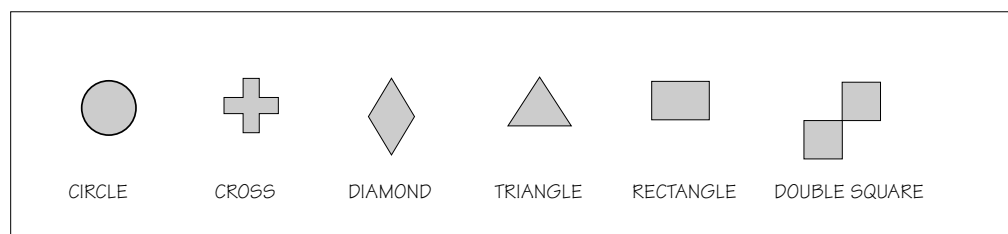
## Fiducials

The Horizon uses the vision system to capture and process alignment marks or fiducials to align the stencil to each board before it is printed. The alignment marks or fiducials are produced as part of the artwork of the board and stencil, in the same relative position. The information processed is used to correct stencil to board alignment.

The Horizon has a library of synthetic fiducials of the most commonly found shapes. The dimensions of these fiducials can be tailored by the operator to fit the fiducials on the board and stencil. The fiducial on the stencil can be different from the fiducial on the board. After the vision system has been taught these fiducial parameters, it is able to search the field of view of the camera and recognize any features which resemble fiducials.

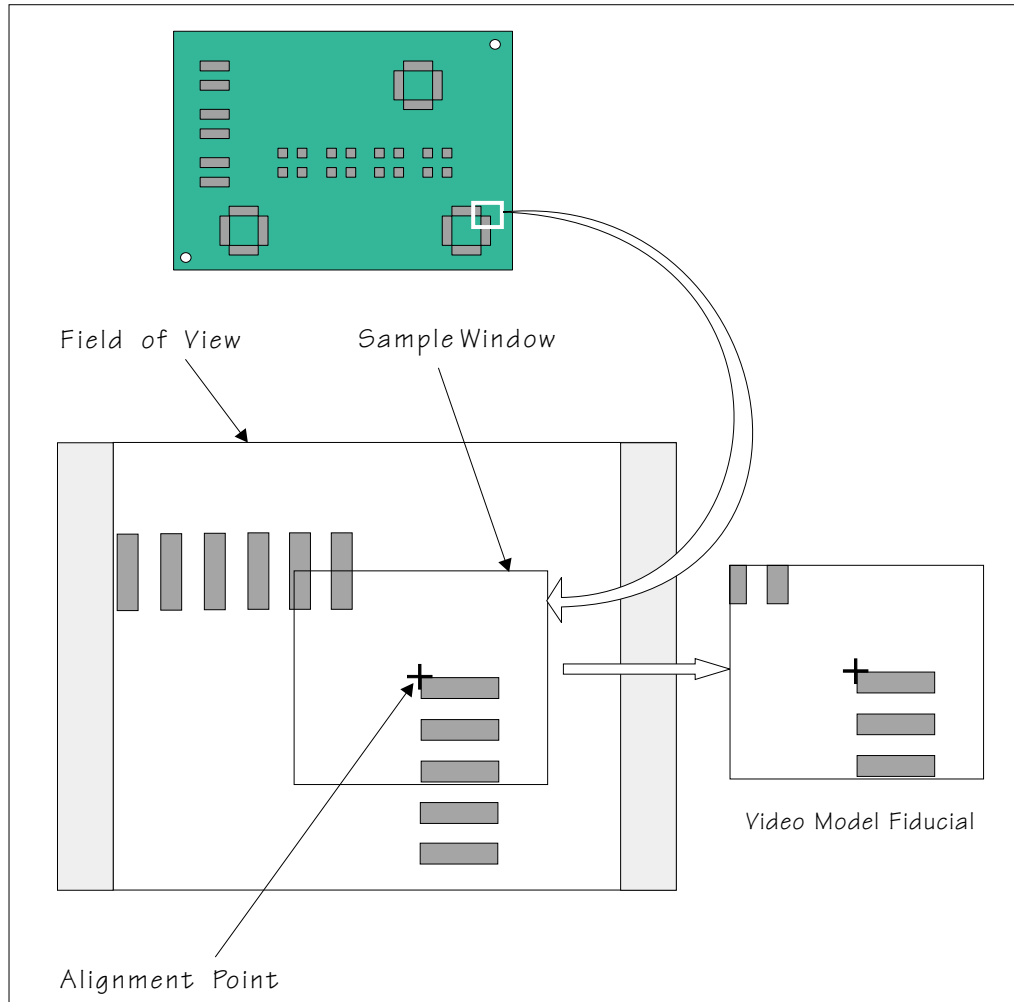
After finding a shape it is assigned a score comparing its shape and size to the shape and size of the fiducial in the vision system library. This score is set between 1 and 999, the better the fit the higher the score.

The fiducial shapes available is shown below:



Video Model

The video model is an alternative to using fiducials for stencil to board alignment. Video model uses the correlation between the image of an area of the stencil and the image of the same area of the board to align the two. This is useful if the board or stencil has no fiducials or the condition of the fiducials does not allow satisfactory recognition.

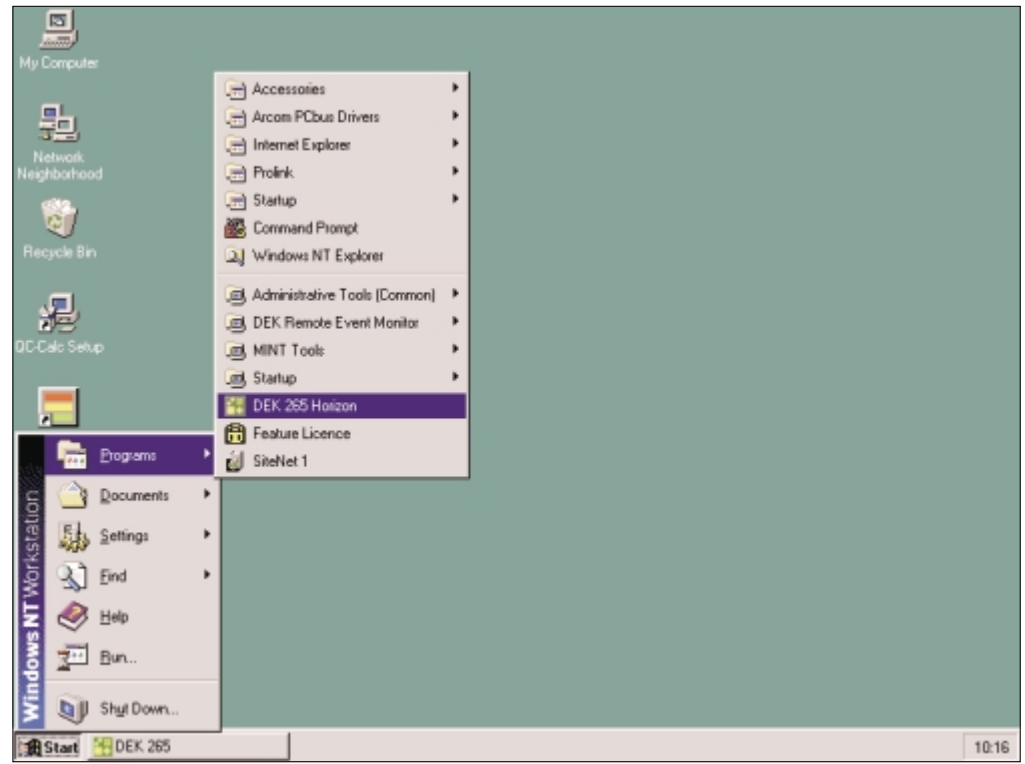


**Windows NT**

The Horizon uses Windows NT operating system due to its inherent robust nature. It is a globally accepted and industry standard user and programming interface.

The main printer control, vision and user interface modules run under Windows NT with the time critical, board handling and axis jogging routines running on the real time operating system of the Baldor® Optimized Control NextMove ISA card.

The Windows NT operating system provides built in networking compatible with all industry standard networks as well as allowing standalone applications such as QC Calc to be run onboard alongside the printer control system.



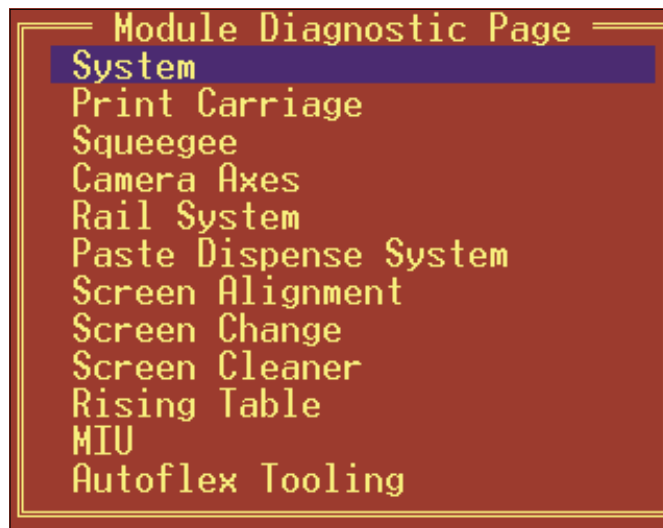
## Diagnostics

The Horizon machine contains a diagnostic module which enables the following functions:

- Calibration of the machine
- Aid to machine fault diagnosis by means of
  - Individual access and control of modules
  - Access to the machine I/Os

This module can be password protected and can be enabled without the need to initialize the Horizon. It allows the user to control the sequence of the machine so that a particular module can be exercised.

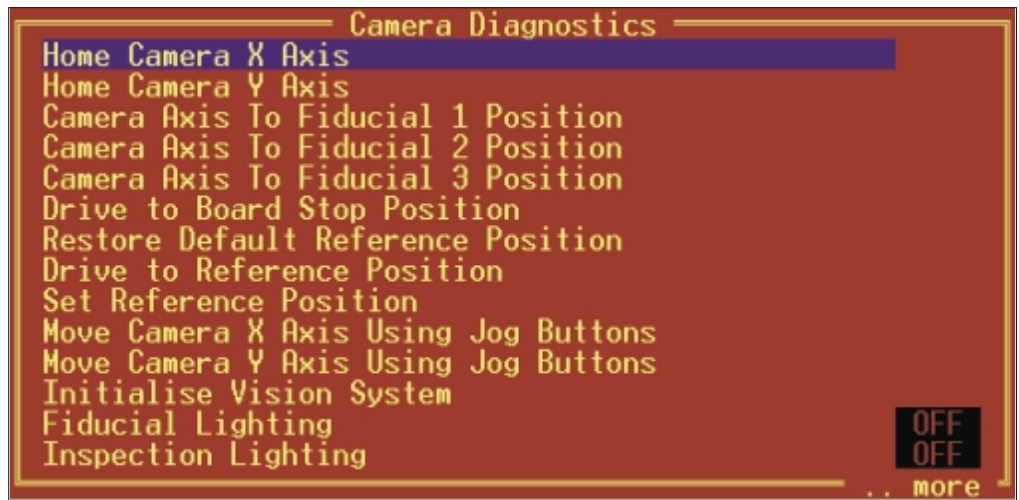
Initiating the diagnostic module allows the user access to the following menu options:



Selecting System allows access to the following functions:

- Digital and analogue I/Os
- Functioning of tricoloured beacon
- Facility to change various machine passwords

Selecting a particular module accesses the following typical menu:



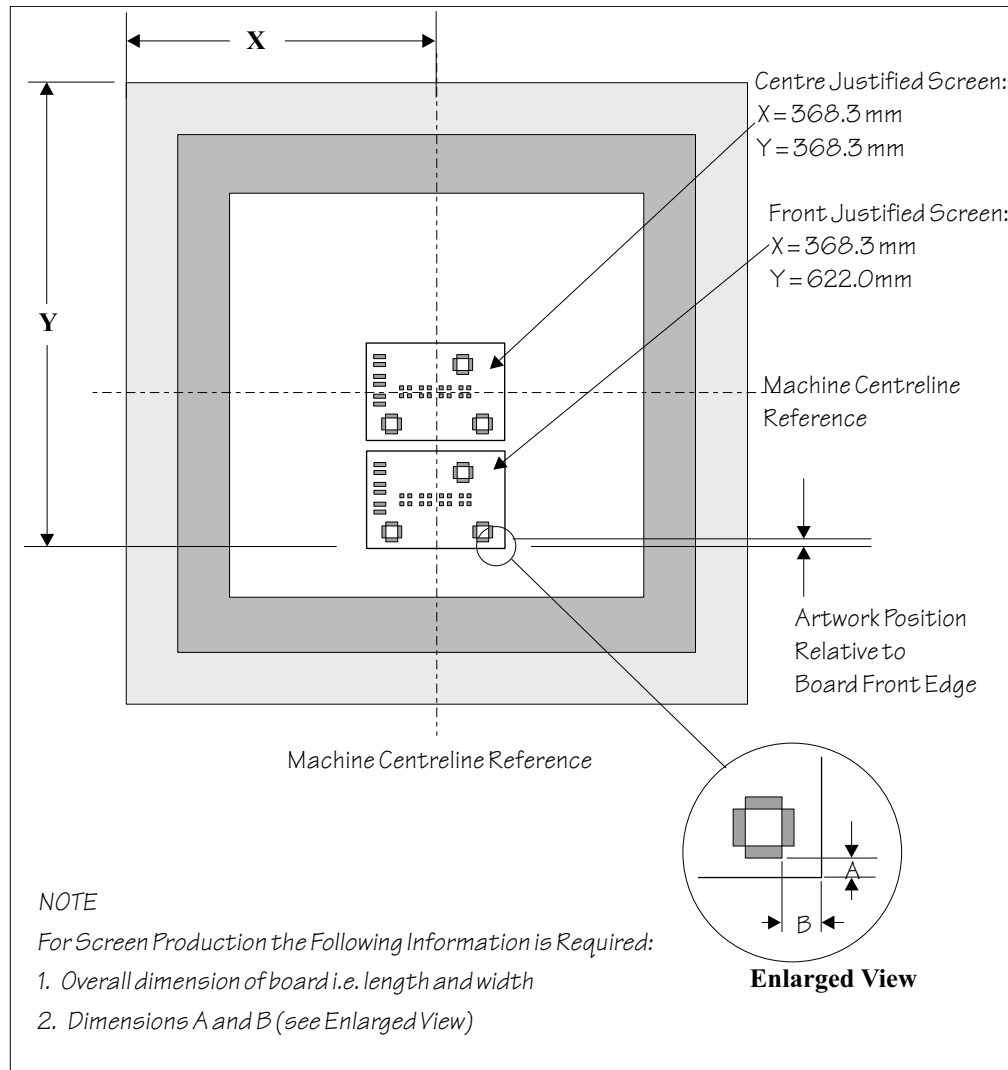
From the menu a user can carry out the following:

- Independently control each module axis
- Module calibrations
- Cycle the complete module
- Verify the operation of sensors

SCREEN IMAGE POSITIONING

To allow the Horizon to be set up consistently, it is important the image in the screen frame is accurately positioned. The screen image can be either:

- Centre justified - The image is positioned such that the centre of the board coincides with the centre of the screen.
- Front justified - The image is positioned on the screen such that the front edge of the board coincides with the front rail.



**MACHINE OPTIONS****ProFlow**

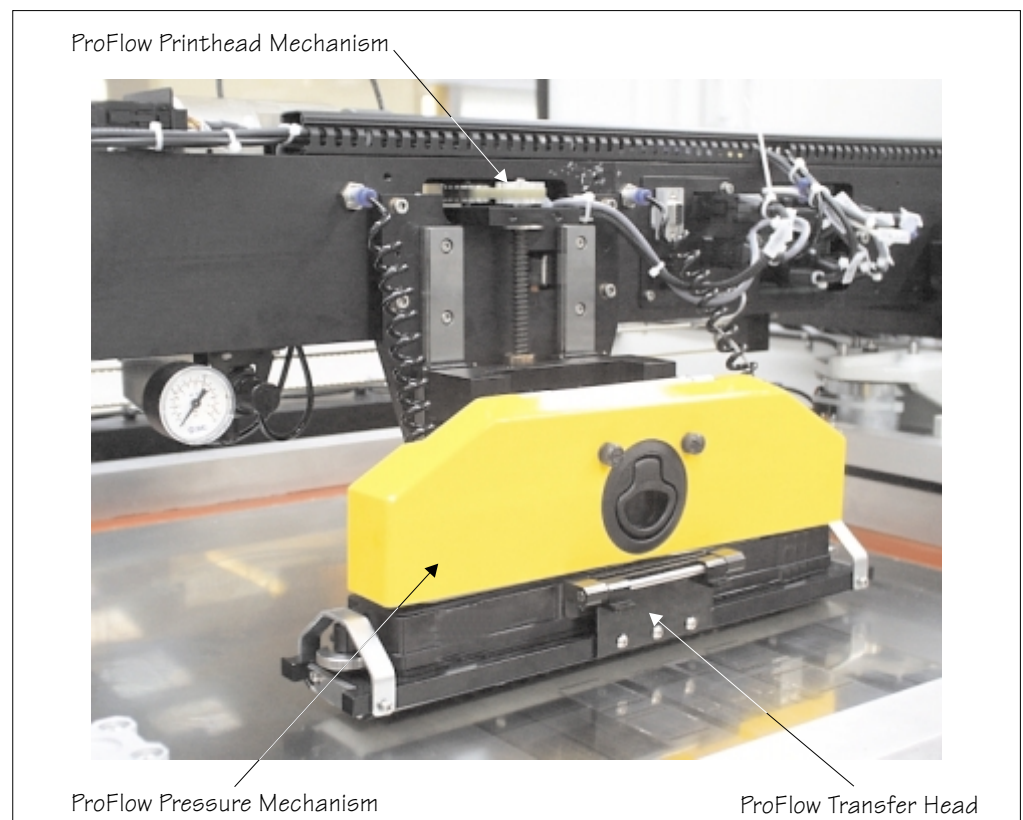
ProFlow is an optional print material transfer system which applies the printable material directly onto the stencil alleviating the need for squeegees and a paste dispenser.

ProFlow is a self contained unit with the following advantages:

- Fully sealed unit keeping the printable material in optimum condition
  - Cassette option easily changed for replacement units
  - Rechargeable unit option
- Retention system keeping stencil surfaces clean
- Reduction in the printable material wastage
- Reduction in under screen cleaner usage

The main units of ProFlow comprise :

- ProFlow Printhead Mechanism
- ProFlow Pressure Mechanism
- ProFlow Transfer Head



ProFlow operates in the horizontal and vertical planes.

The unit is raised and lowered to the stencil by means of the ProFlow printhead mechanism stepper motor.

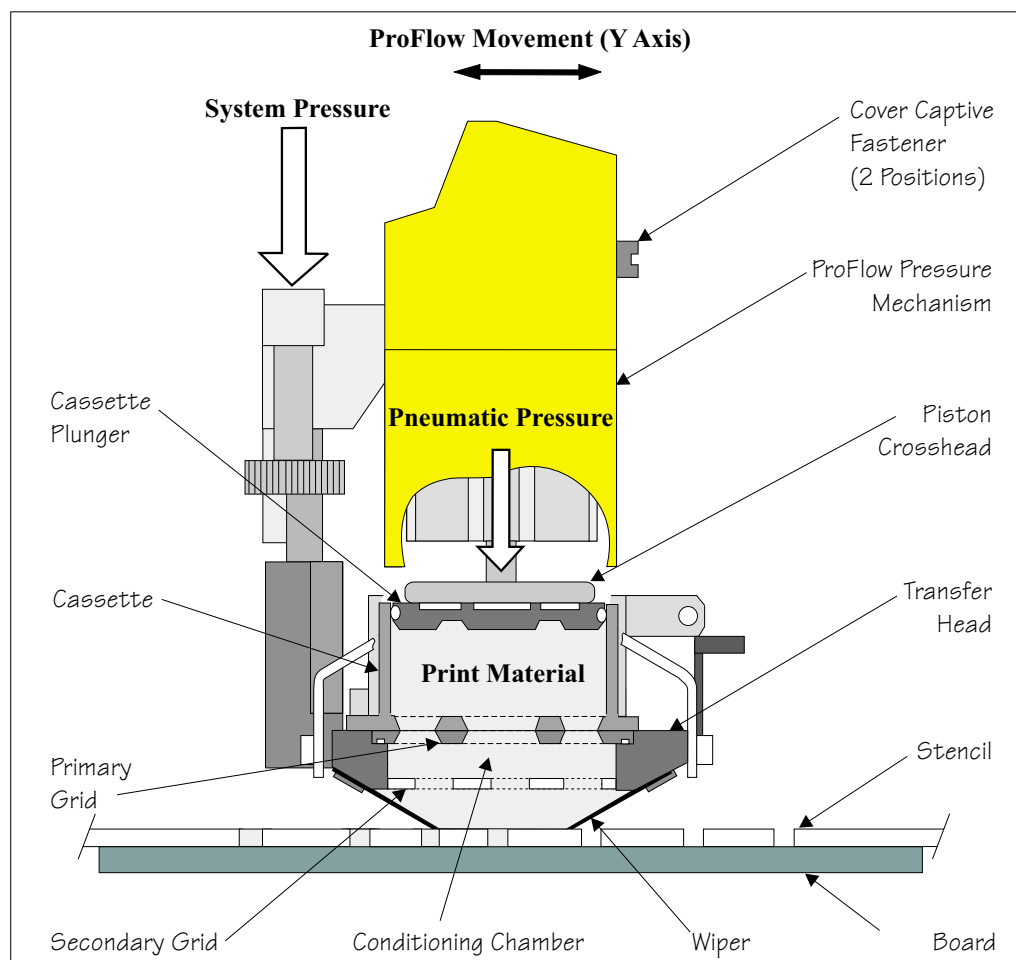
A downward force is applied to the ProFlow transfer head directly onto the stencil which provides:

- A positive seal between the transfer head and stencil eliminating leakage above the stencil.
- Improved gasketing effect to give the best possible seal between stencil and board

The horizontal movement, driven by the machine print carriage motor, moves the unit across the stencil in a forward and reverse direction (Y axis). A print cycle may consist of a single movement in the Y axis, (forward or backwards).

Pneumatic pressure controlled by either an optional software or manually controlled pressure regulator is applied to the piston crosshead exerting a force onto the print material. This forces print material into the ProFlow conditioning chamber and into the stencil apertures.

As the unit moves across the stencil, the trailing wiper within the transfer head, lifts the print material from the screen surface creating a rolling movement of material within the conditioning chamber. The volume of material, under pressure from the cassette, is kept at a constant level within the chamber.





Paste Cassette Size	300mm (192cc) (900gms approx)
Transfer Head Type	Cassette - in three sizes 300mm 350mm 400mm
	Rechargeable - in five sizes 300mm 350mm 400mm 450mm 500mm

**2D Inspection**

2D inspection (2Di) ensures the quality of the print by monitoring the printing process. 2Di determines when a stencil clean or paste dispense is required and if licensed, to warn for bridging, misalignment and reduced paste volume. 2Di optimizes the cycle time by eliminating unnecessary stencil cleaning and paste dispensing operations. To achieve this the system inspects various areas of the board and/or stencil (sites) to detect the following:

- Stencil Blockage - solder paste remaining inside stencil apertures.
- Stencil Smear - solder paste on the stencil.
- Board: Paste Present - amount of the pad covered by solder paste, as a % of the aperture size.
- Board: Alignment - accuracy of paste positioning compared to the learnt site image.
- Board: Bridging - distance between adjacent deposits of paste.

**Paste Volume Prediction**

Using the stencil aperture, blockage and paste present information the system can calculate the volume of paste on the pad.

**Inspection Licenses**

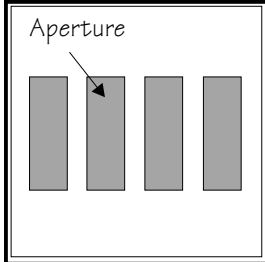
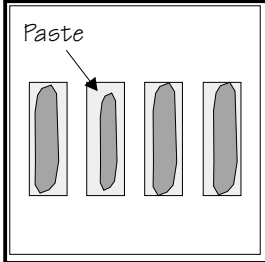
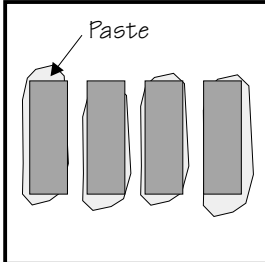
The following types of inspection licenses are available:

- Basic
- Advanced

Inspection of the board and stencil is licensed as a separate feature for each, and specifies the maximum level of inspection that may be selected, as follows:

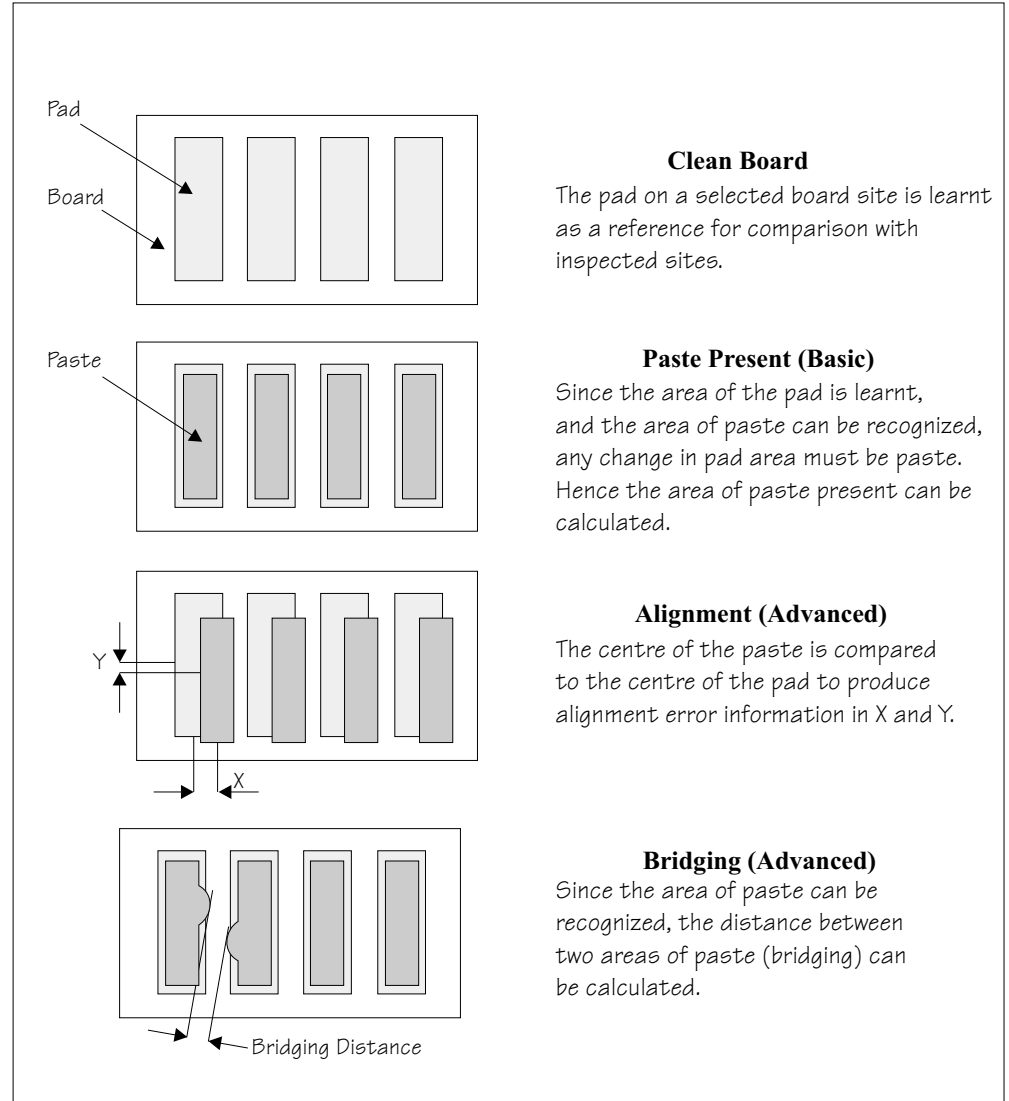
	<b>Basic</b>	<b>Advanced</b>
<b>Board</b>	Paste on Pad	Basic + Bridging and Alignment
<b>Stencil</b>	Blockage	Basic + Smear

Stencil Inspection    The vision system carries out various stencil inspections and are shown below:

<b>Stencil</b>	
	<p><b>Clean Stencil</b></p> <p>The position and area of apertures within the screen site are learnt as a reference.</p>
	<p><b>Blockage (Basic)</b></p> <p>Any change to the area of the aperture must be paste, hence the percentage of blockage can be calculated.</p>
	<p><b>Smear (Advanced)</b></p> <p>Any change to the area of the stencil must be paste, hence the area of smear can be calculated.</p>

**Board Inspection**

The vision system carries out various board inspections and are shown below:



**Clean Board**

The pad on a selected board site is learnt as a reference for comparison with inspected sites.

**Paste Present (Basic)**

Since the area of the pad is learnt, and the area of paste can be recognized, any change in pad area must be paste. Hence the area of paste present can be calculated.

**Alignment (Advanced)**

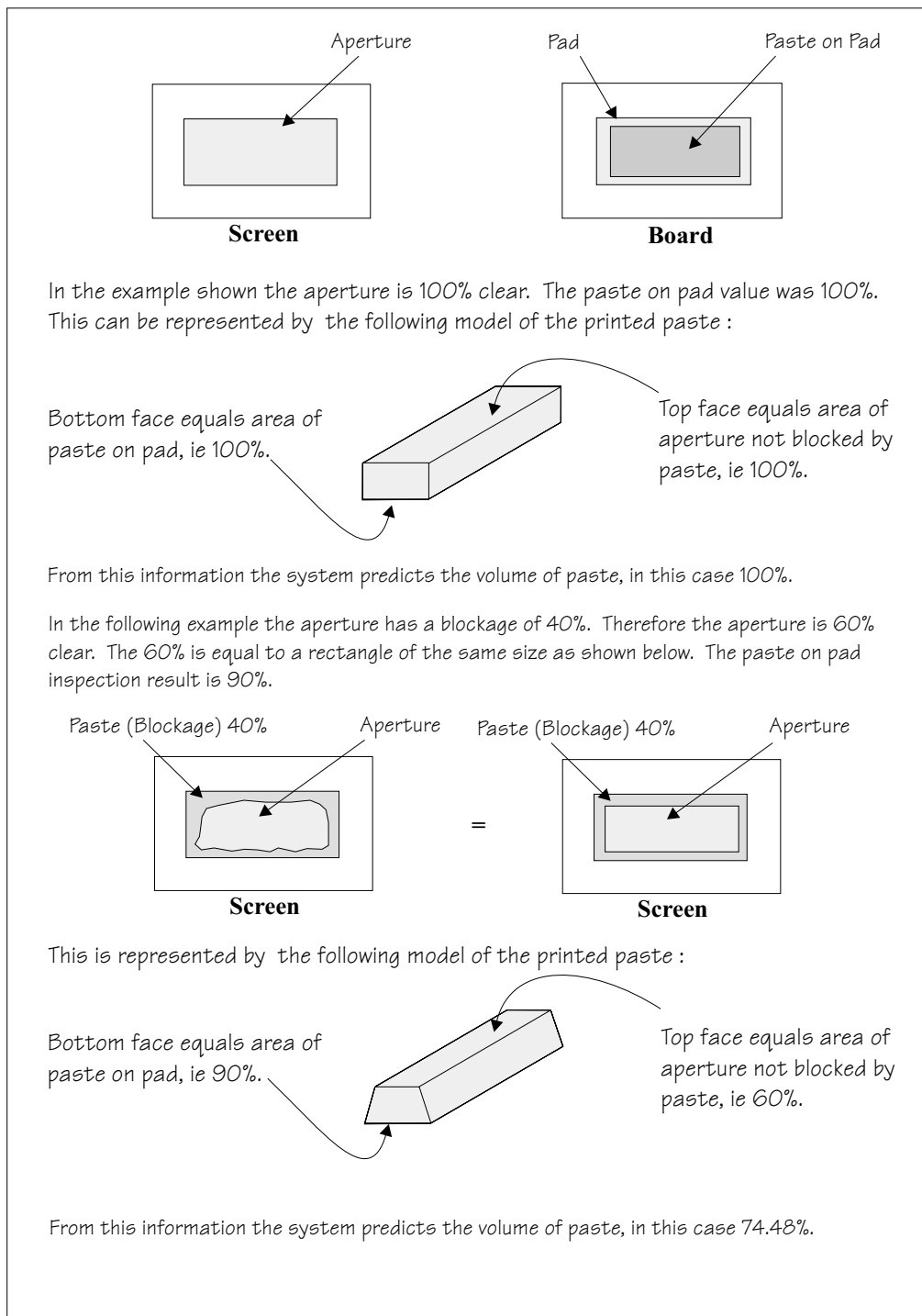
The centre of the paste is compared to the centre of the pad to produce alignment error information in X and Y.

**Bridging (Advanced)**

Since the area of paste can be recognized, the distance between two areas of paste (bridging) can be calculated.

Paste Volume Prediction

2Di combines the results of board and stencil inspections, and using a propriety formula calculates the predicted paste volume. This is only available while the inspection is set to advanced for both board and stencil.



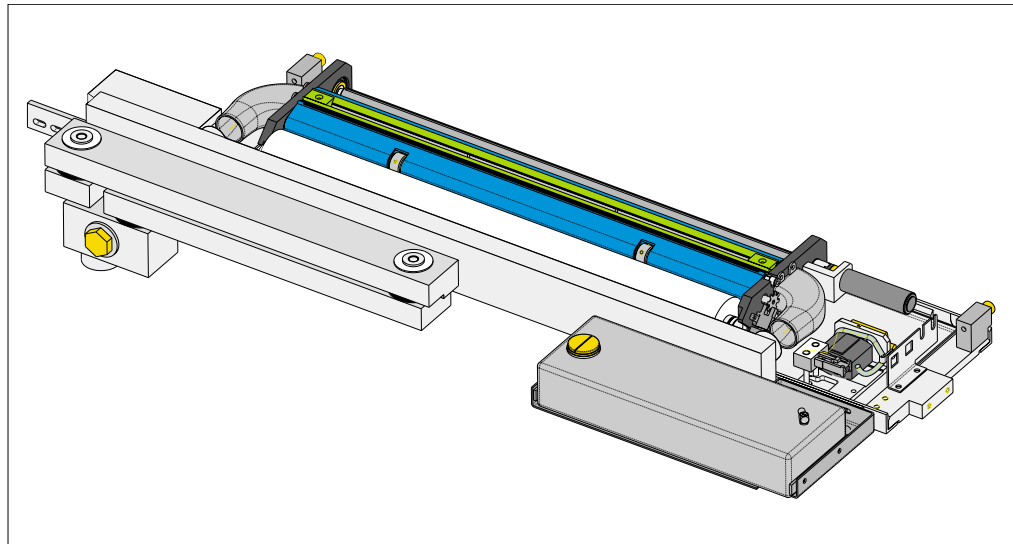
Specification

<b>Inspection</b>	<b>Specification</b>	
Maximum Number of Sites	500 sites	
Maximum Site Size	4 mm by 4 mm	
Automatic Learn	Single Site	
	Rows	
	Columns	
	QFP	
	BGA	
	BGA Frame	
<b>Stencil Inspection</b>	<b>Accuracy (Within)</b>	<b>Repeatability</b>
Aperture Blockage	±6%	±5%
Stencil Smear	±0.1mm <sup>2</sup>	±0.05mm <sup>2</sup>
<b>Board Inspection</b>		
Paste on Pad	±5%	±5%
Bridging	±0.05mm	±0/02mm
Paste Alignment	±0.01mm	±0/01mm
<b>Predictions</b>		
Programmable Inspection Rate	±6%	
	±5%	
General Inspection Parameters	All sites inspected every cycle	
	Selected sites inspected every cycle	
	Inspection of sites every n cycles	
Programmable Action on Alarm	Individual site limits	
	Individual site naming option	
	Each inspection site can be given a unique name to make it traceable	
	Programmable warning and alarm levels for individual sites	
	Reprint after low paste detection	
	Under screen clean after blockage or smear detection	

### Under Screen Cleaner

**Paper Under Screen Cleaner** The optional paper under screen cleaner is a fully programmable cleaner with an additional vacuum option, if desired. The unit wipes lint free cleaning paper, dry or wet across the underside of the screen to minimize paste build up and operator intervention. Available in three widths 300, 400 and 520mm. The frequency and mode (wet/dry) is programmable in the product file.

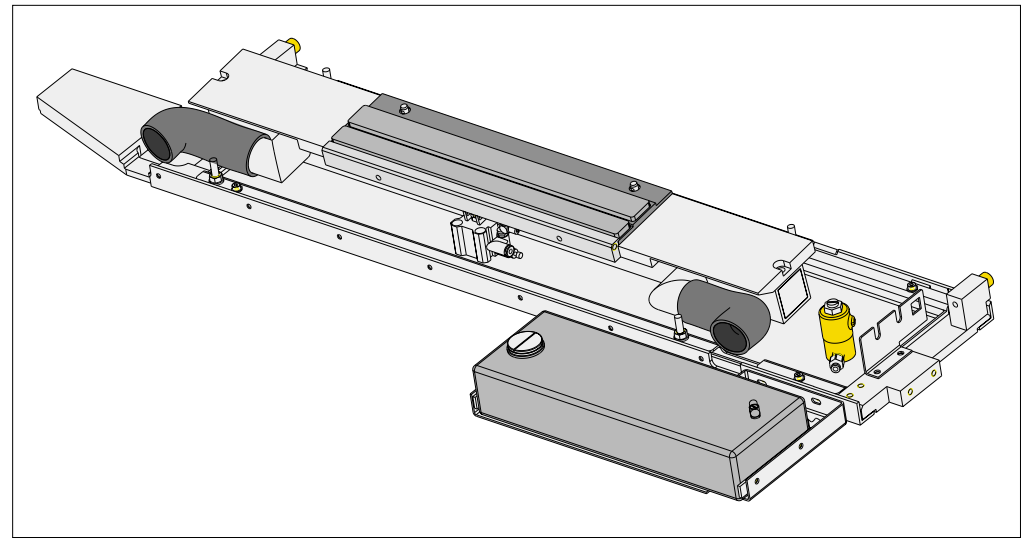
When a screen cleaner operation is required, the cleaner paper is wetted by solvent, if selected. The paper is incremented across two rubber wiper blades on a manifold assembly. The manifold is raised to contact the screen and the cleaner paper is wiped across the underside. The rubber wipers form the inlet of a vacuum cleaner. Used solvent fumes and excess solder are drawn from the underside of the screen onto the cleaner paper by the vacuum created in the manifold between the two blades.



Cleaning Options	Wet/Dry/Vacuum
Cleaning Cycle	Multi-pass
Refill Type	Paper
Cleaner Size	300/400/520mm

**Vortex Under Screen Cleaner** The optional Vortex under screen cleaner is a programmable cleaner with additional vacuum option, if desired. The unit wipes the Vortex foam cleaning cassette, consisting of both a wet and a dry cell, across the underside of the screen to minimize paste build up and operator intervention. The cleaner is available in two widths, 320 and 520mm. The frequency of cleaning cycle is programmable in the product file.

The Vortex cleaning programme comprises a single return stroke. On the rearward stroke the cleaner does not contact the screen and no cleaning takes place. On the forward stroke the cleaner is raised to contact the screen enabling cleaning to take place. The cleaning stroke consists of both a wet and dry wipe, with or without vacuum. Used solvent fumes and excess solder are drawn from the underside of the screen, through the dry cell of the Vortex cleaning cassette and filter cassette, by the vacuum created in the vacuum channel beneath the filter cassette.



Cleaning Options	Wet/Dry/Intrusive
Cleaning Cycle	Single pass
Refill Type	Foam Cassette
Refill Capacity	Programmable
Cleaner Size	320/520mm

### Paste Dispenser

The optional paste dispenser is only utilized when the machine is fitted with squeegees. The paste dispenser dispenses a precise quantity of solder paste equal in length to the print width and along a line calculated from the print stroke start position and the size of board.

The paste is dispensed by applying pneumatic pressure to a paste cartridge installed in a special holder. The paste dispenser is mounted on a pivot which is driven by a dc motor to the vertical position for dispensing paste.

The paste dispenser mechanism is driven along the horizontal rail of the paste dispense carriage, which is mounted on the rear of the print carriage. This drive together with the movement of the print carriage enables the paste dispenser to be moved parallel to the squeegee blades in order to dispense paste anywhere on the stencil.

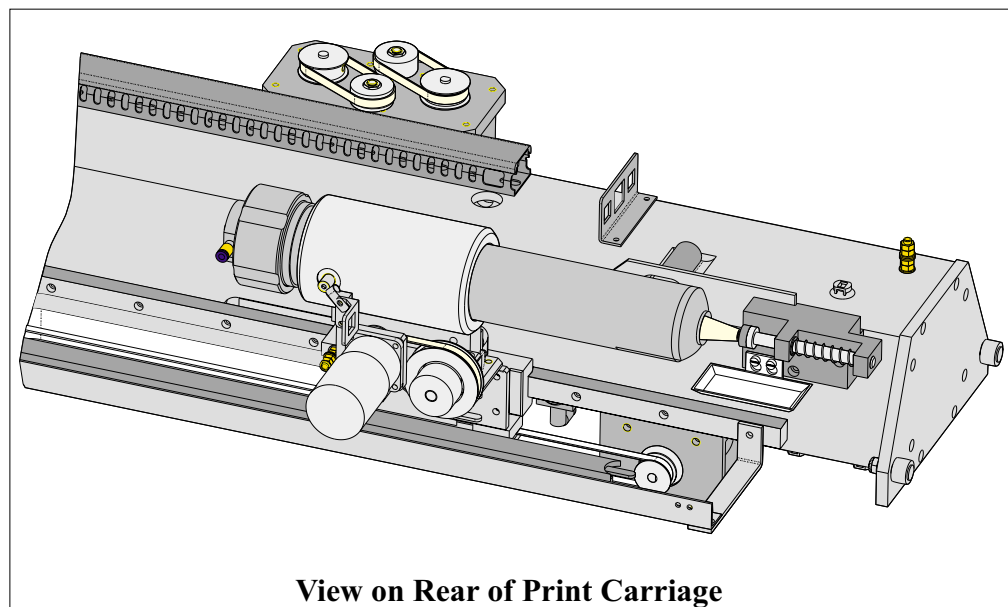
The system can fully control the quantity of paste dispensed in the following ways:

Machine programmable:

- Dispense speed
- Dispense rate
- Start and stop positions

User setting:

- Dispense air pressure
- Nozzle size

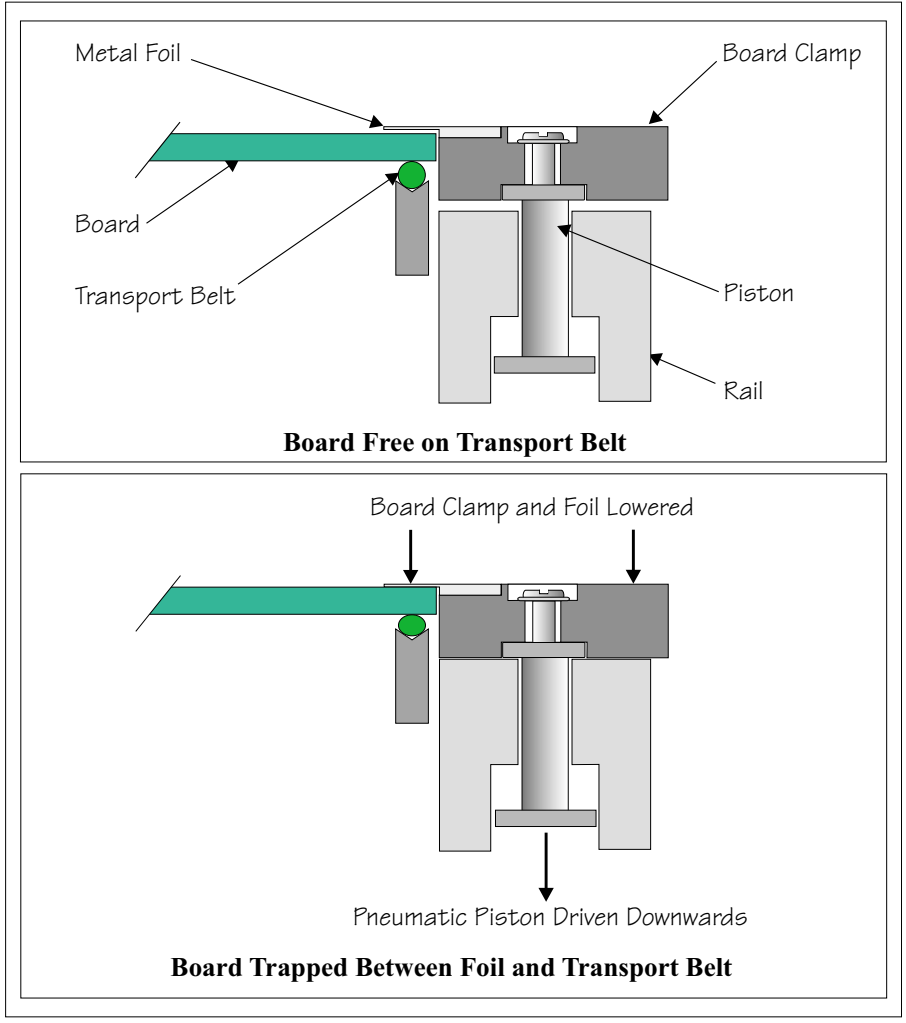




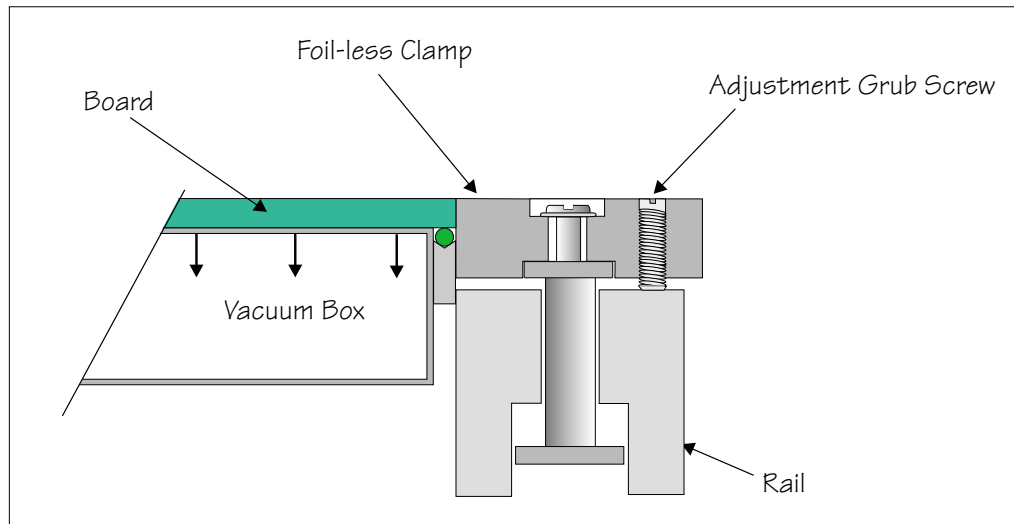
**Board Clamp Options**

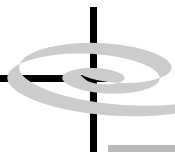
**Board Clamps**

This traditional method of securing a board during the print stroke, utilizes a thin foil mounted on the board clamp assembly trapping the board on the transport belts. A pneumatically operated piston lowers the board clamp and foil, securing the board during the print stroke. On completion of the print stroke the board is released by the activation of the pneumatic solenoid.



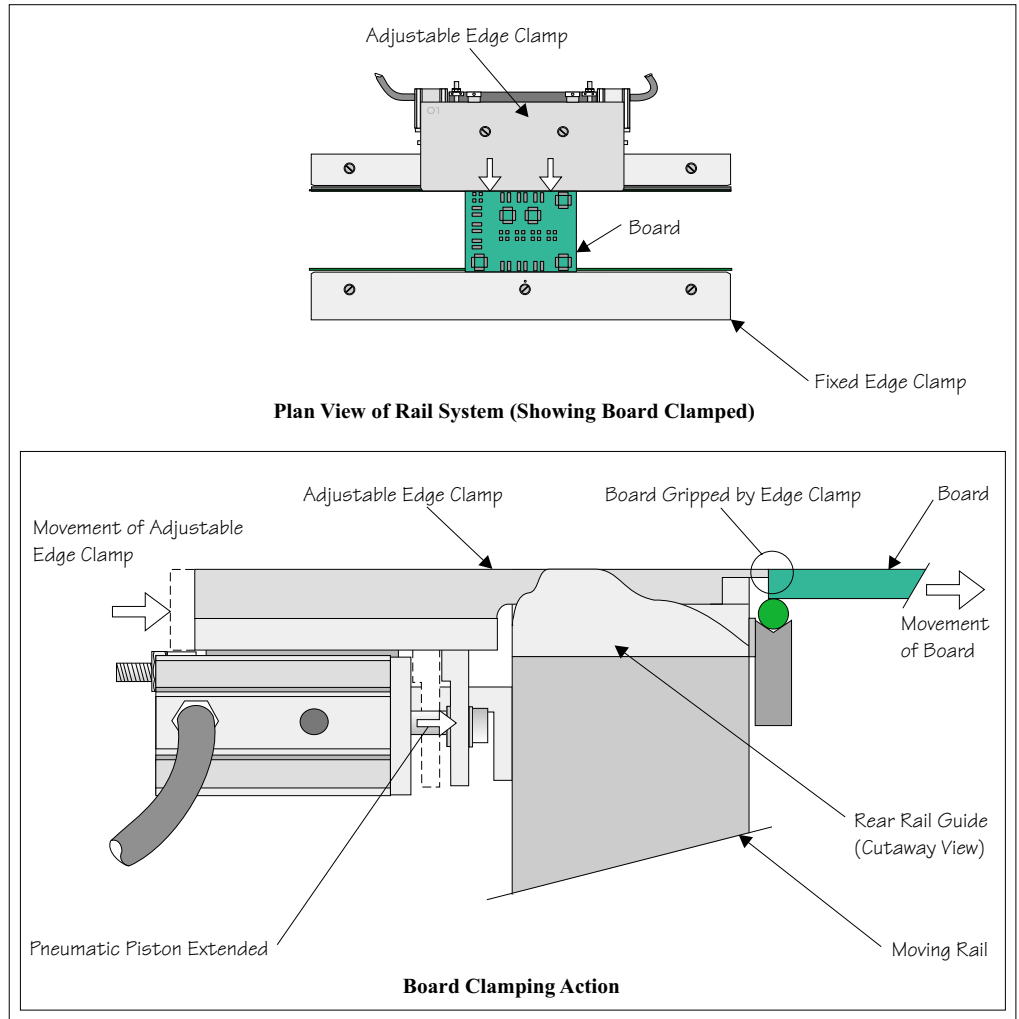
**Foil-less Clamps** This option is used on thin boards when there is a requirement to print close to the edge of the board for traditional board clamps. The board is secured during the print stroke by the use of vacuum. The clamps are perpendicular to the board maintaining a good gasket between the stencil and the board. The clamps are adjusted in height for differing thickness' of board by two grub screws.





Edge Clamps

This option is utilized when there is a requirement to print close to the board edge. During the print stroke, the board is secured between an adjustable and a fixed edge clamps by the action of a pneumatically operated piston. On completion of the print stroke the pneumatic solenoid is de-activated, allowing the spring loaded piston to retract releasing the board.



**Tooling**

The tooling support options available for the Horizon are described briefly in this section. The specifications for the various options are tabulated below:

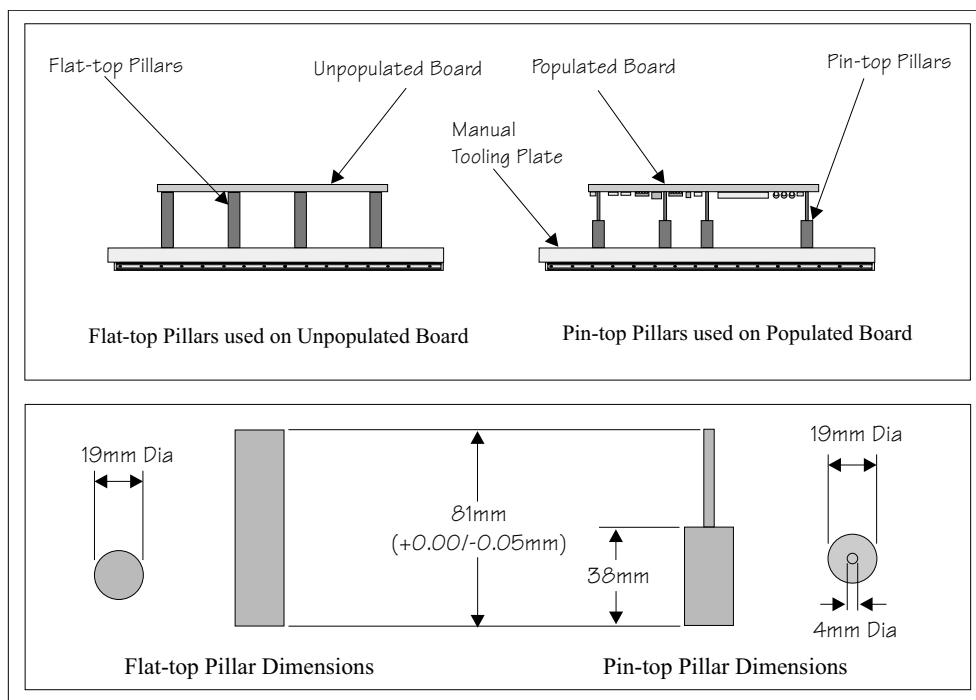
Tooling	PCB Support	Pin Diameter	Remarks
Magnetic Support Pillars	Magnetic Pins	19mm (0.75") 4mm (0.16")	Manual Changeover
Dedicated Tooling	Dedicated machined plate	N/A	Manual Changeover
MultiFlex	Pins	3mm (0.12") one end tapered to 1mm diameter	5mm matrix of support pins, manual setting and changeover, optional vacuum hold down
AutoFlex	Pneumatically driven, electro-magnetically held pin set	4mm (0.16")	Programmable matrix
Form-Flex	Self forming, pneumatically driven pin matrix	6mm	5 -18 modules Each module - 36 x 2 rows of pins at 12mm pitch

**Magnetic Support Pillars**

The magnetic support pillars are positioned on the manual tooling plate by the operator. These pillars can be positioned anywhere under the board to provide board support.

Two types of support pillar are provided:

- Standard flat-top pillars (19mm diameter) for supporting boards which are not populated on the underside.
- Pin-top pillars (4mm diameter) for supporting boards populated on the underside. The pins are positioned so they fit between the components on the underside of the board.



**Dedicated Tooling** The Dedicated Tooling system is uniquely tailored to fully support the board whilst being printed. The system consists of the following elements:

- Plate Assembly (1) - consists of an upper and lower section. The upper section is machined using customer gerber files and component profile data to accommodate underside board components. The lower section can be rebated to accommodate a chamber to supply vacuum hold to the board during printing.
- Tower (2) - provides support to the plate assembly at the standard tooling height of 81mm. The tower is located on the tooling plate by means of dowels and is secured to the tooling plate by magnets. The tower is available in 2 widths, 3 inches, 5 inches and 2 heights, standard tooling height and an AutoFlex option.
- Magnetic tooling pins (3) - provides support for the plate assembly for wider boards.

*NOTE*

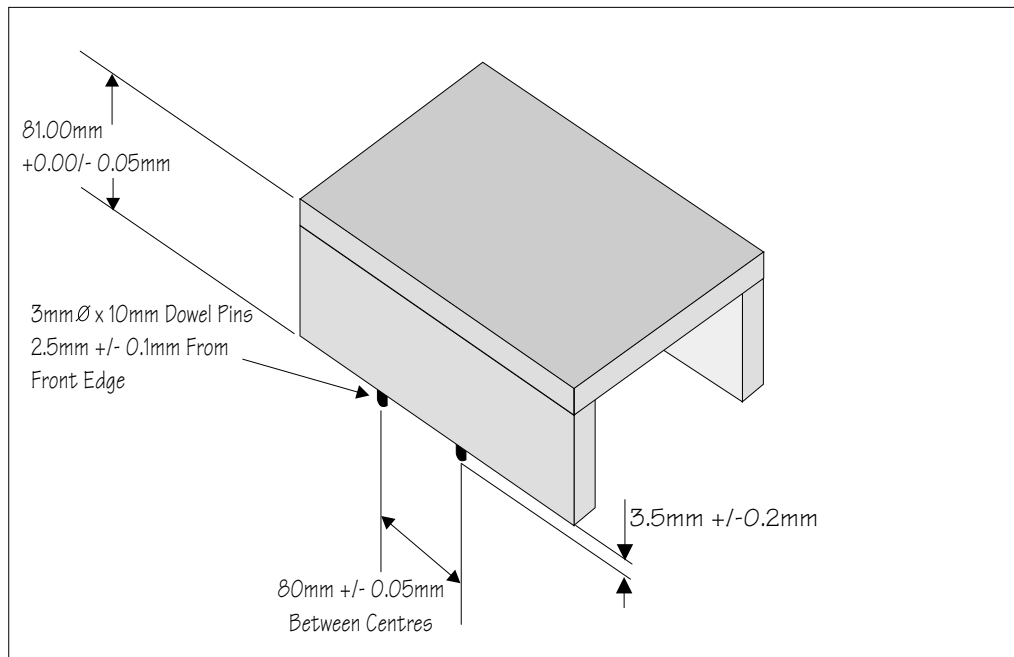
*Numbers in brackets refer to figure below.*



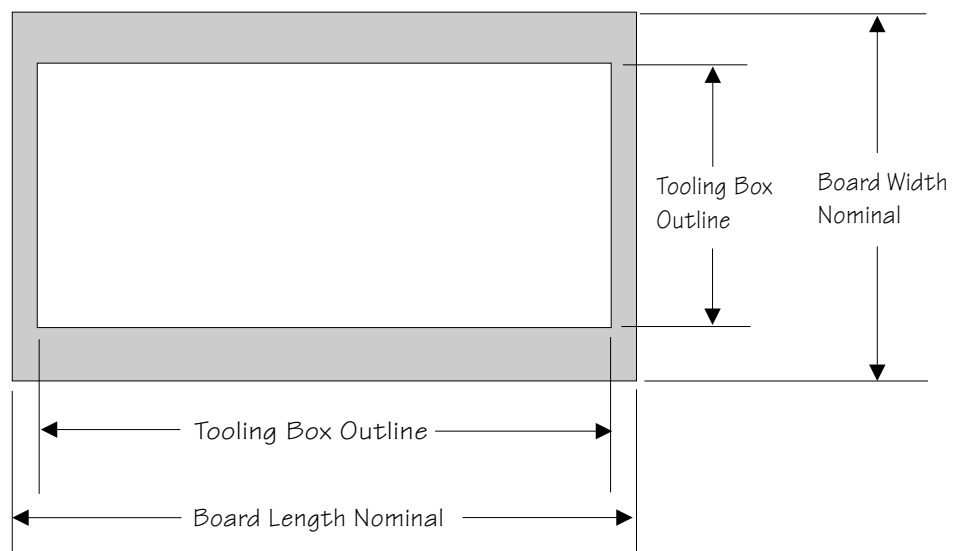
**Dedicated Tooling Plate**

The dedicated tooling plate is a 3 piece construction comprising two vertical supports and a flat top board support. It is manufactured to the same height as the magnetic pins irrespective of board thickness, ie 81mm (+0.00mm, -0.05mm).

The assembly has dowel registration and is held in position on the manual tooling plate by magnets located on the vertical supports. If required the top plate can be machined to accommodate underside components.



For correct design of tooling, the following rules apply:



Formulae

Width of Tooling = (Board width - 12mm)

Length of Tooling = (Board Length - 4mm)

## MultiFlex

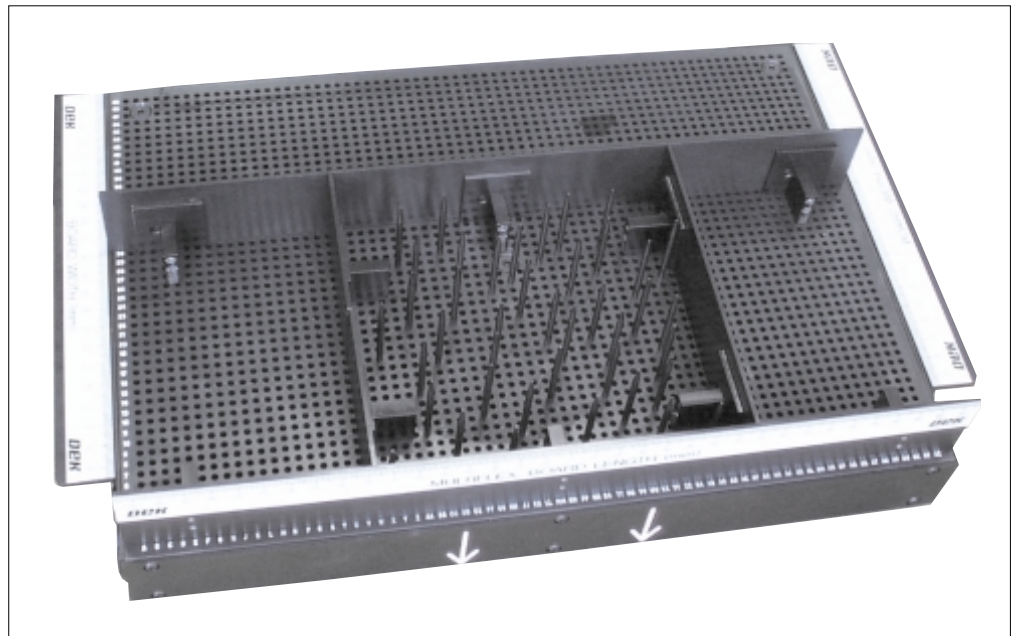
The MultiFlex tooling plate hardware consists of a hollow box constructed from four adjustable side plates. The side plates are secured to the MultiFlex tooling plate using magnets. The tooling plate is located on the tooling table by means of dowels.

Board support is provided by double ended steel pins on a 5mm matrix. One end is 3mm tapering down to 1mm to allow for support of densely populated boards.

The MultiFlex tooling plate is 14 inches x 10 inches. The tooling height is the same as a standard magnetic tooling pin, ie 81mm.

The 3mm diameter tooling pins are placed on the 5mm pitch matrix according to the particular board configuration, to support the board, and yet miss any components, or features present.

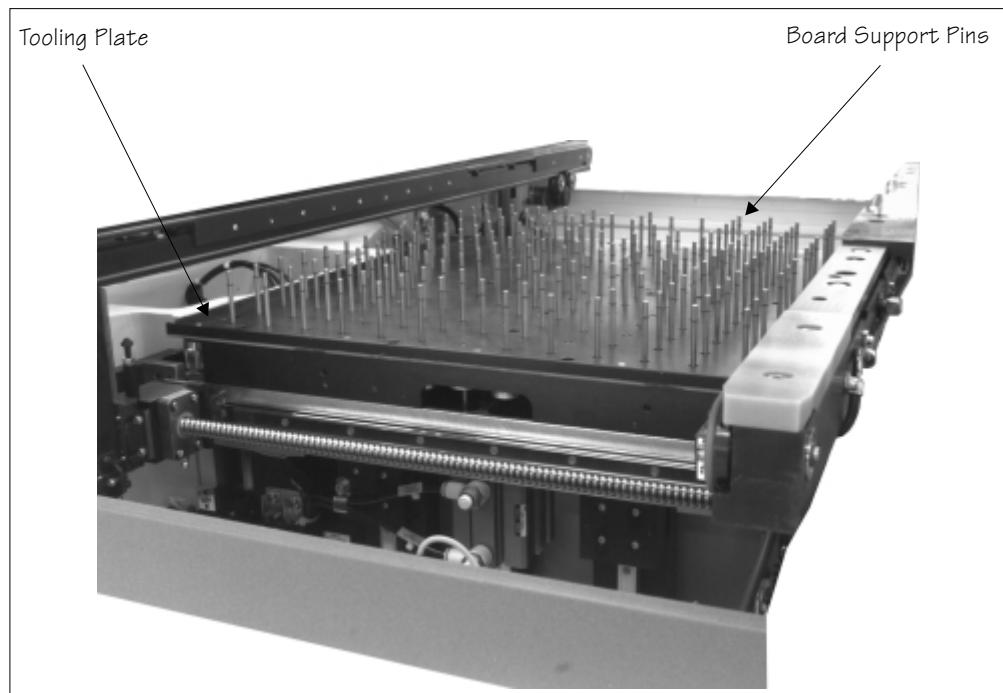
Vacuum hold of the board whilst being printed is optional.



AutoFlex

AutoFlex tooling is a fully automatic tooling facility, which allows board support for each product to be programmed into a product file. The correct board support pins for each product are selected automatically when the board parameters are programmed into the product file. The pins are raised and lowered pneumatically and clamped electro-magnetically once in position. Additional magnetic pins can be added to improve board support.

Pictorial display of the AutoFlex tooling matrix and soft key menus allows the user to easily amend the pin configuration for a particular product file, if required. Additional Diagnostic pages allow for full testing of the AutoFlex tooling facility.



Maximum Board Size	510mm x 508mm
Pin Diameter	4mm
Pin Spacing	35mm
Number of Pins	210 (15 x 14 array)
Lowered Pin Clearance	Maximum 40mm
Electrical Power	Derived from internal supply, maximum load 750VA
Pneumatic Power	Derived from internal supply, maximum usage 0.5 litres/change

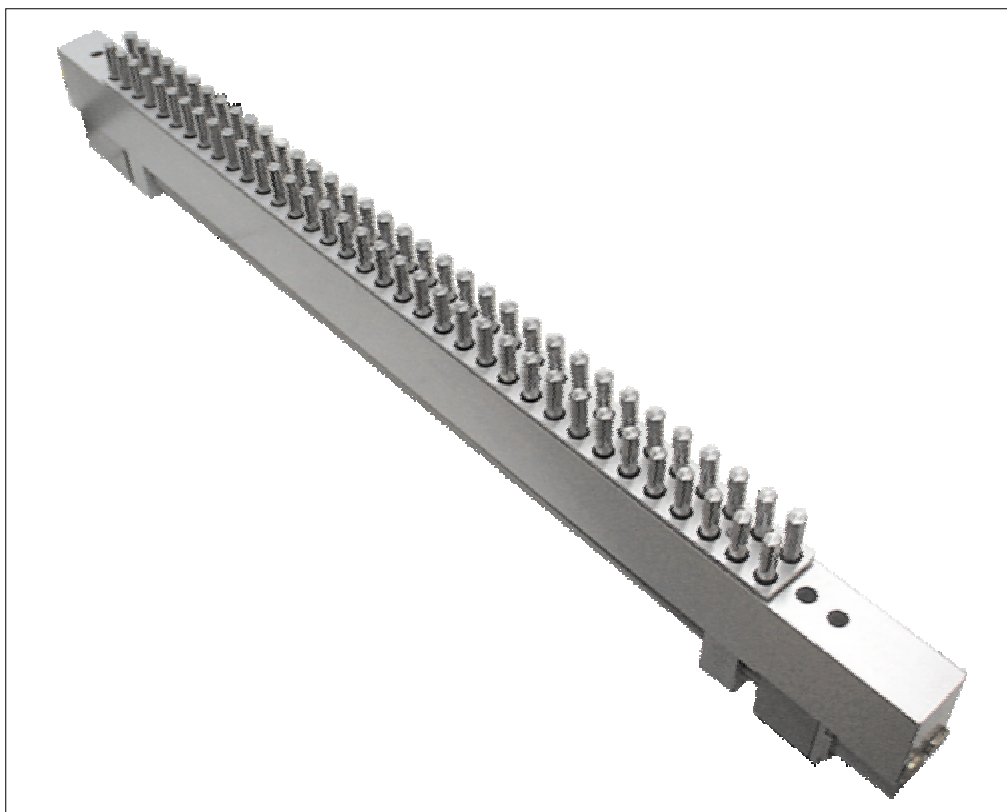


**Form-Flex**

Form-Flex tooling is a fully automated tooling facility that conforms to any given board profile, fully supporting the underside of a populated board and stencil.

Form-Flex tooling consists of 5 -20 pin modules with pin up/down control and each module contains 36 pins in two rows. The Form-Flex array is held magnetically to the manual tooling plate. The tooling height is the same as standard magnetic tooling pins, ie 81mm.

With the board loaded in the Horizon and raised to print height, all the Form-Flex pins are extended using fluid pressure until they meet the underside of the board, stencil or component. Once all the pins are in contact the pin support pressure is automatically locked at 0.2kg. Variations in the board layout can be accommodated as the single pin pressure is small enough to vary the height of the supporting pin without damaging the component. At product changeover the Form-Flex pins are positively retracted and reset.



Maximum Board Size	400mm (l) x 300mm (w)
Maximum Board Thickness	5mm
Maximum Component Height	15mm
Pin Diameter	6mm
Pin Spacing	12.5mm
Number of Pins per Module	36 x 2 rows

## **Networking**

The Horizon can be networked using standard network interfaces to connect to dedicated or corporate networks. Utilizing the network, products and data can be exchanged between the Horizon and other equipment.

DEK Network Files option allows the machine control software to access remote product and data directories on a server. Once product files are present on the server, they can be shared by all printers and PCs on the network.

## **Generic Equipment Model**

The Generic Equipment Model (GEM) is an industry standard communications model that has been defined by the SEMI organization. Its objective is to create a standard in the field of Factory Automation.

GEM is an option on the Horizon and allows a GEM compliant host system to communicate with the printer in order to facilitate one or more of the following:

- Data collection
- Remote control and process program management
- Automated material movement
- Fully automated production - 'Lights Out'

The GEM option is installed on the Horizon using TCP/IP network interface for communications with the host.

Using the GEM interface, a compliant host system is able to remotely monitor machine downtime, monitor machine throughput and other equipment data, upload and download product files (process programs), monitor machine events and send remote commands such as Start Print and End Batch.

## **Special Board Handling Options**

**Selective Print Pass** This option enables the Horizon to decide whether to print a loaded board or pass it through unprinted. A board is printed if the board fiducial called the 'Print Select Mark' is successfully located.

When a board is loaded, fiducial acquisition is carried out. If the fiducial 'Print Select Mark' is successfully acquired and located the board is printed normally. If location is unsuccessful the board is passed down line through the Horizon without being printed.

## **Flexible Board Printing**

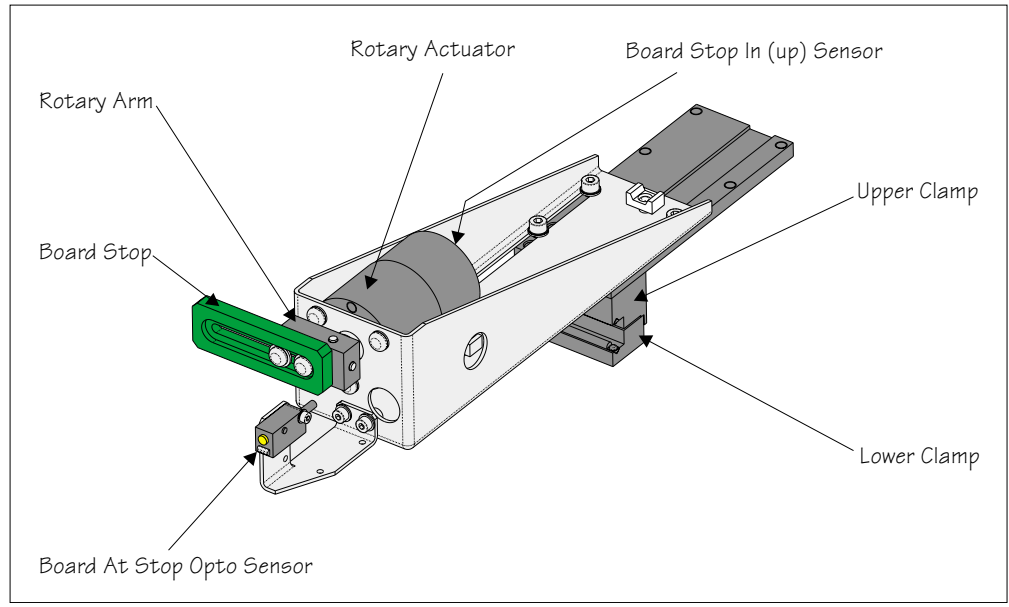
This option enables the Horizon to print flexible boards that may not be flat when loaded to the machine. The board is loaded and brought up to print height to flatten against the screen. Vacuum is applied to the tooling holding the board flat the table is lowered to vision height whilst alignment is being carried out. The board is raised to print height and vacuum is removed for the duration of the print stroke. Once complete, vacuum is reapplied and the board is transported down line.

**Speed Up**

The speed option is a combination of software and firmware enhancements which reduce the Horizon cycle time from 12.5 seconds to 10 seconds.

**Remote Board Stop**

The Remote Board Stop (RBS) is an optional alternative to the existing camera board stop for use with large and/or heavy boards or component carriers. The RBS is simply clamped to either the left or right rising table THK rail using a single clamp screw. The RBS is manually positioned, connected and enabled by the operator.



**Board Handling Limits (RBS in use):**

Minimum Board Length - 130mm

Maximum Board Length - 620mm

Minimum Board Width \*- 119mm (Under Board Clearance - 42mm)

Maximum Board Width - 508mm

\* Minimum Board Width - 100mm (Under Board Clearance - 23mm)

### **Statistical Process Control**

DEK use Statistical Process Control (SPC) techniques to verify the quality of the Horizon machine at build, during training courses, at installation and at any time the machine accuracy is suspect. To be of good quality the products of a process must conform to predetermined expectations and must be consistent, ie the paste apply to a printed circuit board.

DEK use an optional standalone software program, QC Calc to collect and analyse various outputs from the machine to achieve this.

SPC data can be used to improve the yield of the Horizon by:

- Qualifying the Horizon
- Optimizing the process
- Continuously monitoring the process
- Rejecting defects before they enter the rest of the line

### **Remote Product Changeover**

The Remote Product Changeover system is an optional software package installed on a stand-alone PC connected to a bar code scanner and the Horizon via a network connection. The software package uses GEM interface to send commands to, or receive data on events from the Horizon. The package uses its own database to relate products with bar codes. The bar codes can be set up with wildcard characters to limit the scope of checking to certain characters within the bar code.

The system monitors the bar codes of boards before they enter the printer. When the system detects that the board that has just been scanned is not related to the product currently being printed, the batch is stopped. Once the last board of the batch is downloaded, the new product file is automatically loaded. The operator is prompted to replace the screen and tooling before proceeding with the new batch of boards.

The system also stops boards entering the Horizon if the bar code read does not relate to any of the products in the database or if a bar code cannot be read on a board.

Whilst the system is in use the stand-alone PC displays the following information:

- Current scanned bar code
- Product being printed
- Printer status

### **Long Board**

This software option enables the Horizon printer to print boards up to 620mm long.

**Off Line Editor**

The Off Line Editor (OLE) is an optional desktop application which can operate under Windows 95/98 or NT. The OLE has an easy to use graphical user interface available in English, French or German.

Facilities exist in this application for the creation and editing of product files off the printer. When using a network, product files can be created/edited and made available to all printers on the network.

The advanced features of the OLE allows the tooling panel to display scanned board images or Gerber files whilst editing AutoFlex tooling pins, ensuring that any underside components are not damaged.

**Remote Event Monitor**

The Remote Event Monitor (REM) is an optional desktop application which operates under Windows 95/98 or NT. This package allows remote status monitoring and reliability analysis of any number of printing machines across a network. The REM constantly scans the event log of each printer and from the information displays the current status of the printer.

A pseudo beacon is displayed on the desktop showing the current status of printer, this is also repeated in the application icon. This allows a user to minimize the program but still be informed immediately the status of the printer changes. The REM displays the most recent machine events and highlights the last significant event. Significance of events can be fully configured by the user if particular emphasis is required on selected events.

Any event log files can be analyzed, either live across a network or from archived files. All reliability calculations are performed according to SEMI E- 10 standard.

**Temperature Control Unit**

This optional standalone unit delivers conditioned air at controlled levels of temperature and airflow velocity to maintain optimum solder paste operating conditions within the Horizon printer. The unit operates throughout a wide spectrum of ambient conditions, providing process control within 1°C.

The TCU uses a forced air principle to create a positive pressure within the printhead to supply treated air to the printhead area. The airflow is controlled to minimize the airflow across the screen to reduce any paste drying.

### **Environmental Control Unit**

This optional standalone unit delivers conditioned air at controlled levels of temperature, relative humidity and airflow velocity to maintain optimum solder paste operating conditions within the Horizon printer. The unit operates throughout a wide spectrum of ambient conditions, providing process control within 1°C and 5%RH.

A combined temperature and humidity sensor fitted to the printhead closely monitors the conditioned air delivered to the print area. Any deviations from the values set by the operator are fed back to the ECU's electronic controller to correct the conditioned air.

The ECU uses a forced air principle to create a positive pressure within the printhead to supply treated air to the printhead area. The airflow is controlled to minimize the airflow across the screen to reduce any paste drying.