

**4796A/B/R/L
High Speed SMC
Placement System**





**Surface Mount
Product Line**

4796 HSP High Speed SMC Placement System



The SMC Solution

- 16 position rotary turret with five nozzles per head
- Down to 0.1 second per placement — 36,000 component placements per hour
- Automatic X and Y axis correction at pickup
- 160 and 80 feeder capacity configurations

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All specifications are subject to periodic review and may be changed without notice.

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Introduction

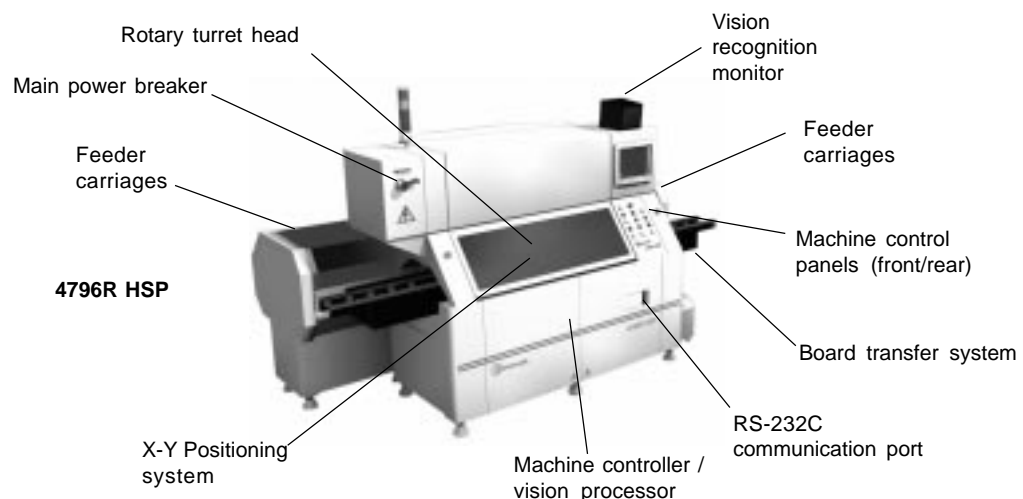
Universal's 4796 HSP is a high-speed surface mount component (SMC) placement machine. It can place a wide range of components on a printed circuit board (PCB) at a maximum placement speed of 0.10 seconds/component, approximately 36,000 components per hour (cph). The 4796 HSP is best suited to:

- Bottomside board manufacture in combination with a glue dispenser, or topside in combination with the GSM platform.
- High volume placement where chip parts dominate the circuit board.
- Medium-volume, high-mix placement when used in-line with a flexible machine such as a GSM platform.

The 4796 HSP uses random-access feeder carriages, a servo-driven cam-actuated rotary turret, Direct Drive individually controlled placement heads, a precision X-Y positioning table, a gray scale vision recognition system, and an antistatic belt-driven board transfer system.

The 4796 HSP can be integrated with other SMC equipment to form a complete in-line SMC assembly system. It can also be used in a stand-alone workcell environment.

In consideration of essential health and safety requirements, the 4796 HSP is CE marked.



Functional Description

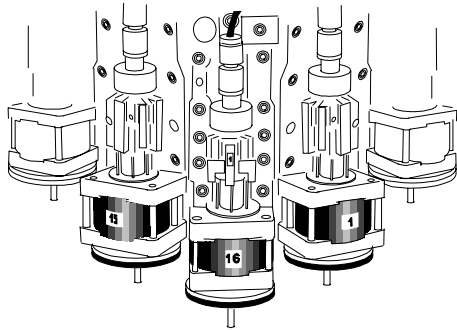
The 4796 HSP sequentially picks, visually recognizes, and places components on a PCB. The actual placement sequence however, is fully programmable depending upon user preference and component pick/place requirements.

Typically, a PCB is presented to the machine XY positioning system by machine conveyors, where it is firmly located using front left-edge, topside registration. The actual location of artwork on the surface of the PCB is determined through the use of locator pins and/or recognition of board resident fiducials.

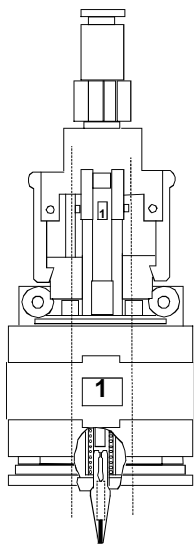
At the start of the component placement sequence, machine feeder carriages are moved into place under the rotary turret. Components are sequentially picked, visually recognized, and placed according to the indicated steps of the pattern program developed and inputted by the machine user.

At the conclusion of all placements steps, the PCB is moved onto the machine output conveyors and transferred out onto external conveyors and/or downline machines for further processing. At the same time this action is taking place, the next PCB is transferred into the X-Y positioning system and the cycle continues.

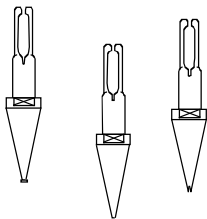
Standard Features



4796 Turret Assembly



**One of Sixteen
Placement Heads**



Nozzles

Turret Assembly

The machine's rotary turret is cam-actuated and controlled by means of a servo-driven motor. The turret has 16 placement heads which move in an up/down direction with regard to the PCB and/or feeder axis along a linear slide. The placement heads move about the turret precisely to perform the various functions that prepare components for placement. Refer to the 4796 Turret and Stations illustration.

Direct Drive Placement Head

Each of the machine's sixteen Direct (motor) Drive placement heads is equipped with five different component pick/place nozzles. During operation, the machine automatically selects nozzles to match components programmed for each cycle. Theta corrections are made by rotating the individual placement head in conjunction with corresponding X-Y table adjustment.

It is not necessary to configure each placement head with the same combination of five nozzles, however, actual throughput will be decreased if nozzle configurations are not the same on all sixteen heads.

Nozzle Tooling

Placement head nozzles are designed to handle specific component shapes and sizes. Eight standard nozzles are available, however, specialized nozzles may be provided on the basis of the machine's capability to handle the component in question. Refer to page 13 for nozzle specifications.

Board Handling

PCBs are transported through the machine via an antistatic belt-driven board transport system in a left-to-right or right-to-left direction. Board registration is accomplished through firm topside registration with location against the front, left side of the XY positioning system. Specialized board handling registration is available for unique board shapes and compositions.

Programmable Width Control

Input and output conveyor rails, as well as X-Y Positioning System table rail width, is automatically adjusted when a new pattern program is actuated.

Switchable Direction Board Transfer

Permits user to change direction of board transfer on the factory floor.

Auto Board Thickness

The distance between underside board support pins and the PCB is automatically adjusted when a new pattern program is activated. Pin position and its relationship to the X-Y table grid is manual.

Positioning System

The machine utilizes a precision XY table positioning system to locate a PCB under the turret during placement steps. Both X and Y-axis movements are controlled by AC servo-driven motors.

Vision Centering System

The 4796 HSP vision system provides contact-free component recognition and centering using either front or back lighting illumination methods. The vision processor uses 256 level gray-scale image analysis to accurately locate the component and calculate the appropriate X, Y, and theta adjustments.

High intensity fiber optic light is used to produce a sharp frontlit or backlit image, providing for precision placement and feeder pick location (X and Y axis) updating. The image is captured by one of two high-resolution CCD cameras and optics (high and low magnification) and processed by the machine vision controller. Largest applicable component is 20m (0.787") square.

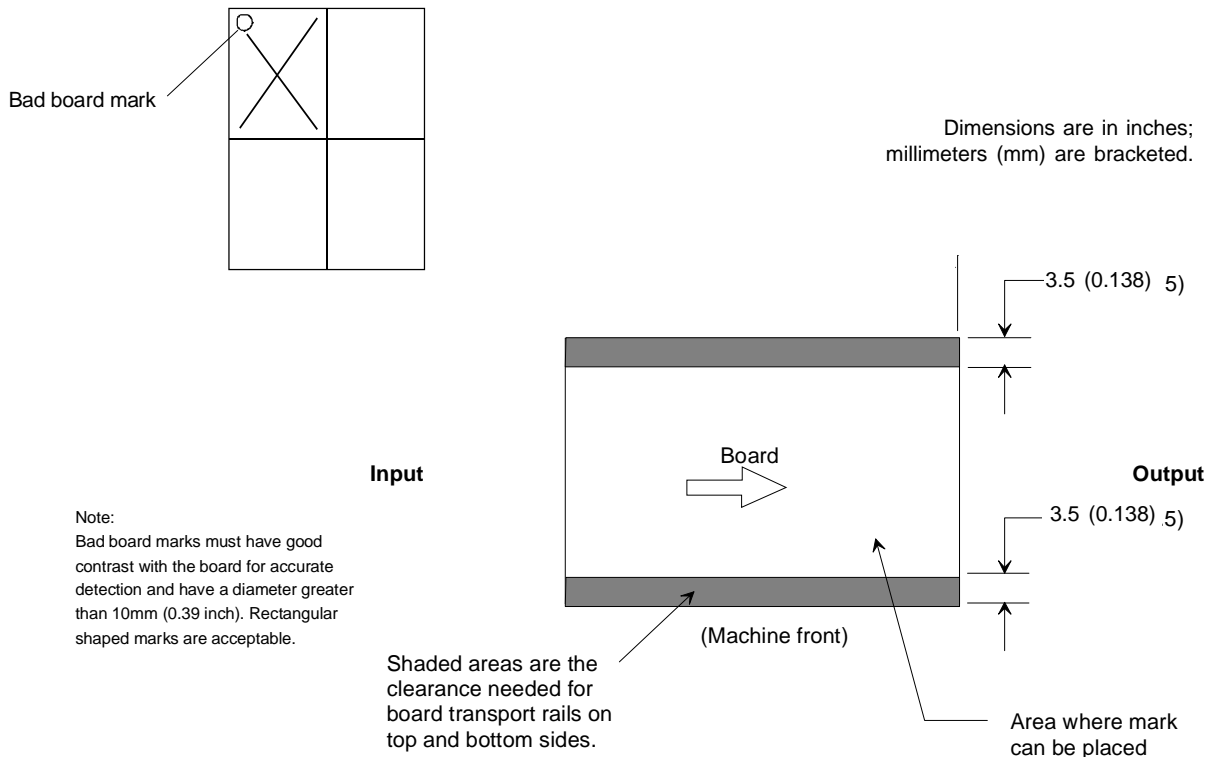
Fiducial Inspection

Fiducial inspection is used to register the PCB in the machine and compensate for linear board distortions (stretch, shrink and non-orthogonality). Fiducial recognition may be selected for single boards or individual boards in a breakaway.

The downward-looking (P.E.C. pattern error correction) fiducial inspection camera is mounted near the front of the turret. The field of view for this camera is approximately 12 x 12mm (0.47 x 0.47") with a window size of approximately 1mm (0.0394") square to 5mm (0.197") square. See the Technical Specifications section for fiducial shapes, dimensions, and overall specifications of this feature.

Bad Board Reject (BBR)

Bad board reject allows good breakaway boards to be populated while bad boards, individually marked, are detected and bypassed in the placement sequence. The drawing below shows a typical area where the bad board reject mark can be placed.



Random Access Feeder Carriage System

The feeder delivery system consists of two random access feeder carriages located in the rear of the machine. Each feeder carriage is automatically controlled by the machine and pattern program. See the Technical Specifications section for information regarding feeder capacity.

Feeders

The machine utilizes tape (paper and embossed) or bulk cassette style feeders. All feeder types are mechanically actuated by the machine and do not require any electrical or pneumatic connection to the machine itself. See Technical Specifications section for more information

Bulk Feeder Capability

Bulk Feeders may be loaded with bulk cases containing chip. This capability greatly reduces overall component replenishment time while eliminating issues related to paper and embossed carrier tape scrap disposal. Bulk feeders do not require special mounting assemblies.

Note: Bulk cases must meet specification EIAJ ET-7201A

Component Recognition Test

Provides the online ability to accurately test vision recognition data and determine the appropriate speed data for maximum throughput.

Pattern Programming

Pattern programs may be generated off-line using one of four methods:

- Utilizing Universal's optional HSP Universal Platform Software (UPS) package to generate and optimize patterns originating from CAD or manually entered information.
- Utilizing manual keyboard entry on a personal computer loaded with WINDOWS® -based UCT52 software. (UCT52 is provided free-of-charge with each machine.)
- Utilizing Universal's Technomatix-Unicam to convert various CAD system outputs to HSP-ready pattern programs.
- Utilizing Universal's UniScan® Machine Programming Station to create pattern programs when there is no CAD or hard-copy data available. (See GS-356-XX.)

Pattern programs may be generated for individual boards or breakaway boards with up to 500 pattern offsets.

Note: The number of pattern offsets multiplied by the number of placements per offset cannot exceed 5,000 steps.

UCT52 Software

In addition to providing pattern creation capability and optimization, UCT52 software also provides the ability to communicate between the machine and the pattern programs, management data, and device data may be transferred between each by an RS-232C serial port and cable.

UCT52 software also contains a component library database containing parameters for each component used in the vision recognition and placement process. Entries in the component library may be copied, edited, and transferred between the machine and off-line component library ID names may coincide with user's internal part numbers.

Program and Data Storage

Active machine memory stores up to 24 pattern programs or 7,600 placement/offset steps as well as up to 800 component ID records. Additional pattern program and component library storage is available with the off-line personal computer.

Control System and Machine Software

The control system and machine software regulate machine operations using a 68,000-based microprocessor with VMEbus architecture. The machine control software initiates, monitors, and reports operations through the touch screen machine control panel (MCP) interface and vision system monitor.

Hard Disk Drive (HDD) Floppy Disk Drive (FDD)

The machine is provided with an FDD and the machine data can be loaded from or saved on to a diskette.

- The device, management, pattern program, and component library data can be saved from the machine side to a diskette and later reloaded into the machine.
- All back-up data can be saved from the machine side to diskettes.

Note: A loading function of all back-up data is not available.

Optional Features

Note: For options or applications not listed, please contact the HSP RFQ Gatekeeper through your Universal Sales Engineer.

Auto Board Length Adjust

Mechanical assemblies on the X-Y table used to locate the board, based on board length, are automatically adjusted when a new pattern program is activated.

Pattern Program Coordinate Teaching

Pattern program coordinate and offset data (component and fiducial locations) can be taught using the machine's downward-looking camera.

Component Library Data Teaching

Vision recognition data, pertinent to a given component, can be taught using a component, picked by or placed on a nozzle, the machine's vision recognition camera system, and a trackball.

Generic Equipment Model Interface (GEM)

GEM provides an industry standard machine communication protocol over a TCP-IP based network. GEM compliance is based on SEMI International Standard E30-93.

Barcode Validation System (BVS)

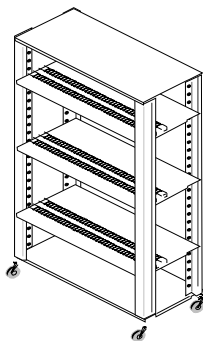
The Barcode Validation System is used to insure that the feeder set up is correct prior to the start of a production run. During feeder set up, which is performed off-line, barcode data is scanned from the component reels and simultaneously written to memory tags located in each feeder handle. After the feeders are loaded on the machine, the BVS system reads the stored feeder handle data while the feeder carriages are being transferred to the pick area. Production is allowed to occur only after BVS verifies that each component feeder is in the correct location, according to the active pattern program.

Barcode Product Change

When a specific barcode is put on the P.C.B., this function makes it possible for the machine to automatically perform the program change during automatic operation according to the results of the barcode reading. As a result, the time for program change and set-up operations can be reduced.

HSP Universal Platform Software (UPS)

Designed to provide a common pattern programming interface among Universal's platform and HSP product offerings, HSP UPS provides all the advantages of platform-based UPS software, with the added benefit of functionality unique to the 4795 and 4796 line of HSP machines. Operating on an off-line PC, HSP UPS delivers superior programming and optimization results which are easily transferable to machines operating in a production line environment.



Feeder Storage Cart

Feeder Storage Setup Cart

- This moveable cart features three shelves for off-line storage of up to 180, 8mm tape feeders.
- Single tier cart for production setup handles 80, 8mm feeders per cart. (Not Shown)

Feeder Reload Tool

This free standing fixture may be placed on any flat surface. It is used to aid in the replenishment of empty feeders by holding the feeder securely while new component reels are mounted.

Applied Conveyor Engineering® Conveyors

A variety of configurations and styles of conveyor systems are available to perform required system functions.

Power Transformer

This transformer allows for conversion of input power between individual machines within a system.

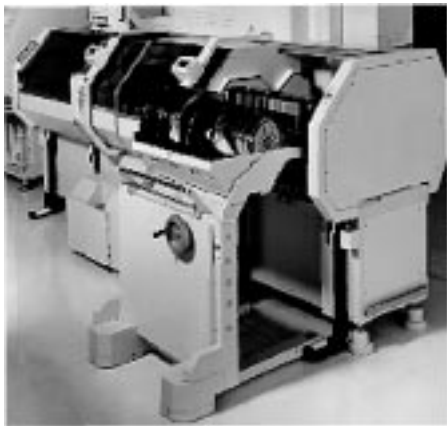
Ceramic Applications

These substrates require special anti-wear components and may require fiducial backlighting. Consult the HSP RFQ Gatekeeper through your Universal Sales Engineer.

Optional Features (4796R model only)

Transfer / Inspect Switches

4796R machines are often configured in a line without interconnecting board conveyor systems. With the Transfer / Inspect Switch option mounted, boards may be stopped while traveling on the machine's internal input and/or output conveyors, providing the ability to inspect them before they are transferred from or to adjacent line equipment.



Bank Feeder Change (BFC)

4796R machines fitted with the Bank Feeder Change option feature removeable feeder pallets that may be quickly changed to accomodate machine feeder reconfiguration requirements. Feeder pallets are removed and/or remounted using moveable feeder carts, a process that typically takes 2-3 minutes per pallet (each pallet contains up to 40 8mm feeders). A minimum of three removeable pallets (two pallets are provided with the base machine) and two carts (purchased separately) are required to operate in a bank feeder change mode. The use of additional pallets and carts increases the flexibility of the bank feeder change option.

Bank Feeder Change is available as a “factory installed” option only.

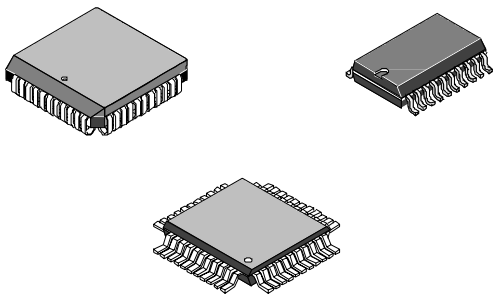
Bank Feeder Change (BFC) Pallet Docking Station

A useful means to store additional pallets. Stations are modular connecting together within minimum space.

Supporting Documents

GS-256	Quality Assurance Terms and Applications Standards, Series 0000
GS-283	Standard Machine Parallel Interface (SMPI) Board Processing Protocol (BPP), Series 8000
GS-284	Standard Machine Parallel Interface (SMPI), Series 6000
GS-356-XX	UniScan Machine Programming Station, Model 86741
EIAJ	EIA Standard for Taping Surface Mount Components for Automatic Placement. (Japan Issue)
EIA-481	EIA Standard for Taping Surface Mount Components for Automatic Placement
JIS CO806-1990	Embossed Carrier Taping Standard
QAP4791A	Quality Assurance Criteria
SMEMA	Standards 1.1(Interface) and 3.1(Fiducial Mark)
SEMI	E30-93

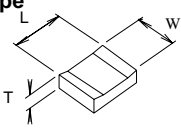
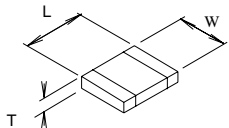
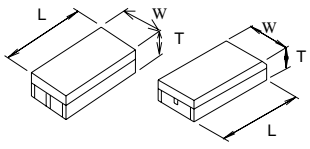
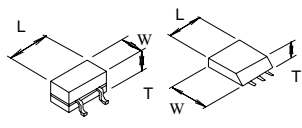
Technical Specifications

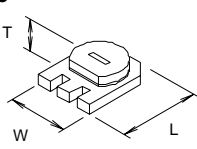
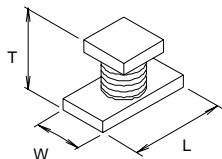
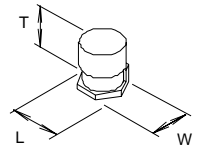
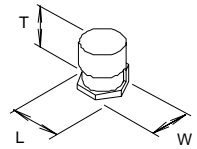
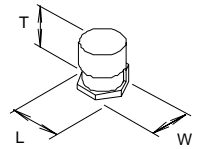
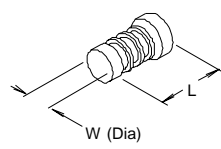


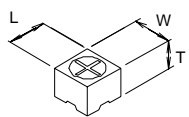
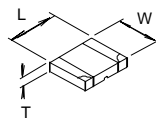
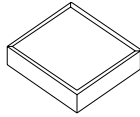
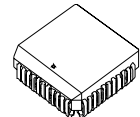
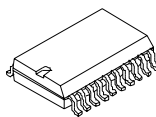
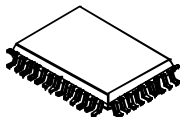
Component for Tape Feeder Applications (chips/ICs)*

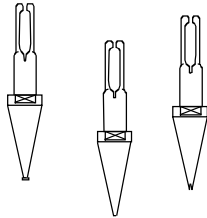
	Minimum	Maximum
Width	0.6mm (0.020")	20mm (0.787")
Length	0.3mm (0.010")	20mm (0.787")
Thickness	0.3mm (0.012")	6.5mm (0.256")
Lead pitch	0.5mm (0.020")	1.27mm (0.050")
Lead width	0.18mm (0.007")	Not Specified
MELF diameter	0.8mm (0.031")	2.2mm (0.087")
MELF length	1.6mm (0.063")	5.9mm (0.232")

* 0201 component on 4796L currently under development

	Flat Chip Resistors		Ceramic Capacitors		Tantalum Capacitors		Small Outline Transistors	
Shape								
Tape Size	8mm	8mm	12mm	8mm	12mm	8mm	12mm	
L Min.	0.6mm (0.02)	0.6mm (0.02)	4.5mm (0.18)	3.2mm (0.13)	4.7mm (0.19)	2.0mm (0.08)	4.5mm (0.18)	
Max.	4.0mm (0.16)	4.0mm (0.16)	5.7mm (0.22)	3.8mm (0.15)	7.3mm (0.28)	2.9mm (0.11)		
W Min.	0.3mm (0.01)	0.3mm (0.01)	3.2mm (0.13)	1.6mm (0.06)	2.6mm (0.10)	1.25mm (0.05)	4.3mm (0.17)	
Max.	3.0mm (0.12)	3.0mm (0.12)	5.0mm (0.20)	2.8mm (0.11)	4.3mm (0.17)	1.5mm (0.06)		
T Min.	0.3mm (0.012)	0.3mm (0.012)	2.0mm (0.08)	1.6mm (0.06)	2.1mm (0.08)	0.9mm (0.03)	1.5mm (0.06)	
Max.	2.5mm (0.10)	2.5mm (0.10)	2.0mm (0.08)	1.9mm (0.07)	2.8mm (0.11)	1.1mm (0.04)		

	Trimmer Potentiometer	Coil	Aluminum Electrolytic Capacitors			Cylindrical Chip	
Shape							
Tape Size	12mm	8mm	12mm	12mm	16mm	8mm	12mm
L	4.5mm (0.18)	3.2mm (0.13)	4.5mm (0.18)	4.3mm (0.17)	6.6mm (0.26)	2.0mm (0.08)	5.9mm (0.23)
W	3.8mm (0.15)	2.5mm (0.10)	3.2mm (0.13)	4.3mm (0.17)	6.6mm (0.26)	1.0mm (0.04)	2.2mm (0.09)
T	2.25mm (0.09)	2.0mm (0.08)	2.6mm (0.10)	5.7mm (0.22)	5.7mm (0.22)		

	Trimmer Capacitors	Ceramic Chip Filter	LCC	PLCC	SOP/SOIC	QFP
Shape						
Tape Size	12mm	12mm	12mm, 16mm, 24mm, 32mm			24mm, 32mm
L	4.5mm (0.18)	6.9mm (0.27)	Variable	18p, 20p, 22p, 28p, 32p, 44p, 52p	8p, 10p, 14p, 16p, 20p, 24p, 28p	Up to 20mm (0.787) square
W	4.0mm (0.16)	4.6mm (0.18)	4.3mm (0.17)	6.6mm (0.26)	1.0mm (0.04)	2.2mm (0.09)
T	3.0mm (0.12)	1.6mm (0.06)	5.7mm (0.22)	5.7mm (0.22)		



Nozzles

Nozzle Specifications

Nozzle Type Number	Applicable Components	Typical Component Thickness	Nozzle end diameter (mm)
11	0603 (1608) Chips	0.45 to 0.8mm (0.018 to 0.031)	0.9
21	1206 (3216), 1210 (3225) Chips SOT-23, Tantalum A	0.45 to 2.5mm (0.018 to 0.098)	1.8
31	SOIC 14+, QFP, PLCC	1.0 to 5.0mm (0.039 to 0.197)	6.0
41	Tantalum B, C, D, SOIC 8	1.0 to 6.5mm (0.039 to 0.256)	3.0
52	Small MELF	2.0 x 1.0mm (0.078 x 0.039) 2.0 x 1.25mm (0.078 x 0.049) 3.5 x 1.4mm (0.138 x 0.055)	1.3
62	Large MELF	3.5 x 1.4mm (0.138 x 0.055) 5.9 x 2.2mm (0.23 x 0.087)	2.5
71	0805 (2125)	0.45 to 1.25mm (0.018 to 0.049)	1.3
81	0402 (1005)	0.3 to 0.6mm (0.011 to 0.023)	0.6
93	0402 (1005) to 0805 (2125) Front Lighting	0.3mm to 0.8mm (0.011 to 0.031)	1.9
94	0402 (1005) to 0805 (2125) Front Lighting	0.3mm to 0.8mm (0.011 to 0.031)	1.9
115	0201 Chips Front Lighting	0.2mm to 0.3mm (0.008 to 0.011)	1.4
901	Semi-fixed variable resistor	1mm to 3.5mm (0.039 to 0.138)	2.6

Placement Specifications (16 Station Turret)

Placement Rate	36,000 components/hour
Placement Tact Time	0.10 seconds/component Within the X, Y table movement of 16.8mm (4796B/R) or 15mm (4796L) with picks within the same feeder
Feeder Axis Tact Time (movement to adjacent feeder)	0.11 seconds - one lane movement (4796B/R) 0.18 seconds - two lane movement (4796B/R) 0.12 seconds - one lane movement (4796L) 0.22 seconds - two lane movement (4796L)
Programmable Orientation	0 - 359.9° in 0.01 degree increments
Placement Pressure	Not programmable, however component Z-height is automatically adjusted by machine and each nozzle maintains a nominal 100-150g spring-loaded placement force.
Final Placement Performance	100 ppm, 99.99%
Intrinsic Availability	95%
Placement Accuracy	X,Y Axis, Melfs ±0.15mm (0.006") Chips ±0.10mm (0.004") Leaded parts ±0.10mm (0.004")

Board Specifications

		English	Metric
Width (4796B/R)	Min	1.968"	50mm
	Max	14.016"	356mm
Length (4796B/R)	Min	1.968"	50mm
	Max	17.992"	457mm
Width (4796L)	Min	1.968"	50mm
	Max	20.079"	510mm
Length (4796L)	Min	1.968"	50mm
	Max	18.110"	460mm
Thickness	Min	0.032" ¹	0.8mm
	Max	0.197"	5.0mm
Weight	Min	N/A	N/A
	Max	4.4 pounds	2.0 kg
Top side clearance ²		0.256"	6.5mm
Standard bottom side clearance ²		1.1811"	30.0mm
Allowable warp	Not to exceed 0.2mm (0.008") in 50mm (1.968"), 1.0mm (0.039") maximum. If greater warpage is expected, contact Universal for appropriate board testing.		

For pallet applications, it is recommended that the top surface of the board in process be in the same plane as the top surface of the pallet it is mounted on. Board support pins must be sized to support the pallet and the board. For applications where the surface of the board and pallet are not in the same plane, refer to component height restrictions for actual component clearance allowable.

Note:

¹ PCMCIA and ceramic board applications require factory review and quote.

² See Bottomside Board Clearance illustration.

Experienced Operator Activity Time Estimates

Activity	Approximate Time
Change board width	30 seconds (PWC)
Change feeder	15 seconds
Replace feeder reel	approximately 1 minute

Tape Feeder Installation

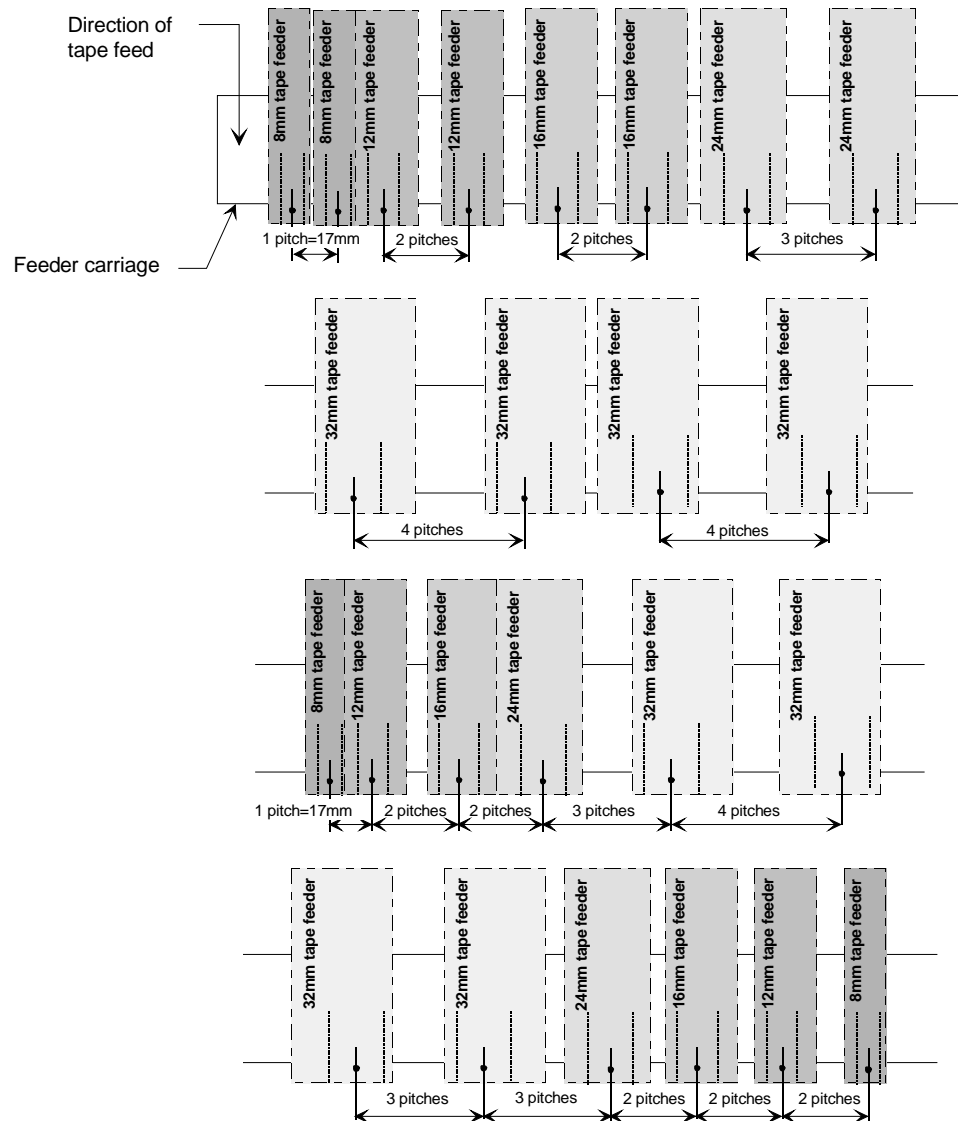
Installed tape feeders	8mm tape feeder	12mm tape feeder	16mm tape feeder	24mm tape feeder	32mm embossed tape feeder	32mm adhesive tape feeder
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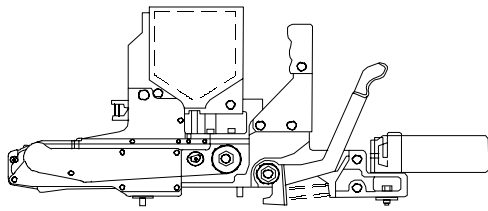
Then install these tape feeders at the pitch shown

8mm	1	2	2	2	3	2
12mm	1	2	2	2	3	2
16mm	2	2	2	2	3	3
24mm	2	2	2	3	3	3
32mm (emb)	2	2	3	3	4	3
32mm (adh)	3	3	3	4	4	4

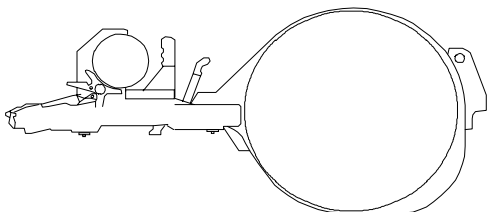
For example, installing a new 32mm embossed tape feeder next to an existing 24mm tape feeder requires 3 pitches (51mm). The illustration below shows other combinations.

Examples of Tape Feeder Installation

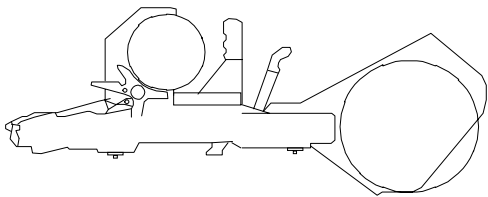




Bulk Feeder



8mm Large



8mm Small

Feeder Inputs		4796A/B/L	4796R
Tape Size	Carrier Type	Maximum	Maximum
8mm x 2 - 4mm	Paper	160	80
8mm x 4 - 8mm	Embossed	160	80
12mm x 4 - 12mm	Embossed	80	40
16mm x 4 - 16mm	Embossed	78	39
24mm x 8 - 24mm	Embossed	52	26
32mm x 12 - 24mm	Embossed	40	20
32mm x 12 & 24mm	Adhesive	40	20
Bulk Feeder	Cassette	160	80

Feeder Carriage Weight Guidelines

The following feeder carriage weight guidelines are recommended in order to maintain optimum long-term machine performance and reliability. Exceeding these guidelines, while operating the machine at maximum placement speeds may produce vibration and/or premature wear and damage to internal operating mechanisms.

Feeder Configuration	Weight Guidelines	
	0.11 second tact time per component ¹	0.15 second tact time per component ²
80 Lane Mode ³	Maximum 160 kg/carriage ⁴	Maximum 215 kg/carriage
160 Lane Mode ³	Maximum 160 kg/carriage (Maximum 320 kg on two carriages)	Maximum 215 kg/carriage (Maximum 430 kg on two carriages)

¹ A tact time of 0.11 second for the 4796B/R, and 0.12 second for the 4796L, is maintained when picking from adjacent feeders, an operation that involves a one-lane movement of the feeder carriage. A maximum tact time of 0.10 second is maintained when picking from a single feeder without feeder axis movement. A tact time of 0.18 second for the 4796B/R, and 0.22 second, for the 4796L, is maintained for two-lane feeder movements.

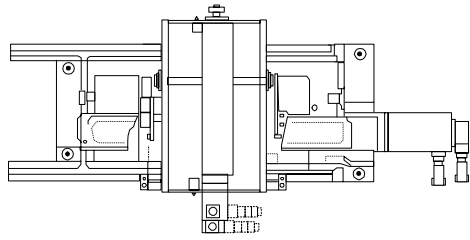
² 0.15 second tact time restriction is for customer sites unable to properly absorb vibrations from feeder carriage weight and movement. This tact time reduction may be required to forego machine errors.

³ When two carriages are used together, the carriages do not physically connect, but operate in harmony with each other during picking operations.

⁴ This is the heaviest conceivable combination of mounted feeders. 160 kg weight is equivalent to 40 mounted 8mm small pan feeders + 40 mounted 8mm large pan feeders. (Note: 40 mounted 8mm large pan feeders weigh approximately 108 kg.)

Approximate Loaded Feeders Weight (with Components)

Tape size	8mm (S) (tape)	8mm (L) (tape)	12mm (S) (tape)	12mm (L) (tape)	16mm (L) (tape)	24mm (L) (tape)	32mm (L) (tape)	Bulk Cassette
Pounds	2.93	5.91	3.09	6.08	6.22	6.48	6.94	1.87
Kilograms	1.33	2.68	1.40	2.76	2.82	2.94	3.15	0.85



X-Y Positioning System

Positioning System (4796B/R)

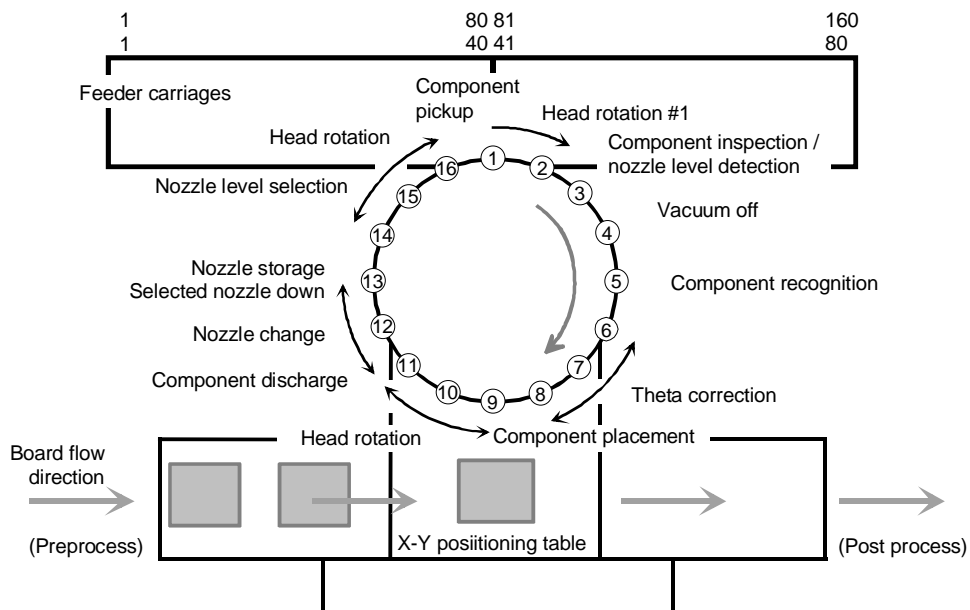
X-axis travel	647.5mm (25.5")
Y-axis travel	495mm (19.5")
Resolution	1 Pulse = 0.01mm (1 Pulse = 0.0004")

Positioning System (4796L)

X-axis travel	657.5mm (25.9")
Y-axis travel	530mm (20.9")
Resolution	1 Pulse = 0.01mm (1 Pulse = 0.0004")

Board Handling

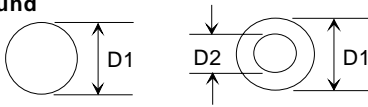
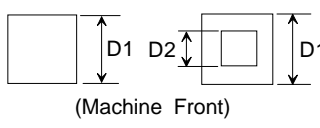
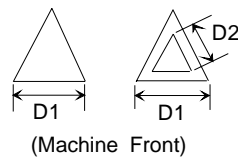
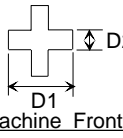
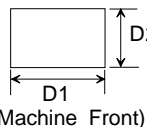
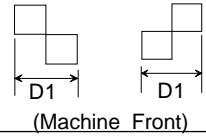
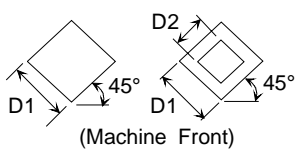
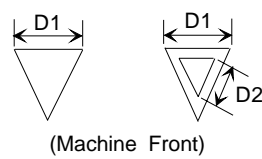
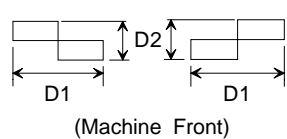
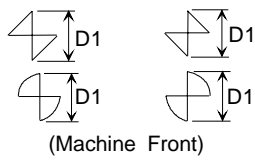
		Available	
		Yes	No
Board registration	Top edge register	X	
	Front edge register	X	
	Tooling pin	X	
	Vision (P.E.C.)	X	
Board transfer direction	Left to right	X	
	Switchable right-to-left/left-to-right	X	
Transfer height	962.2 ^{+3.0mm} _{-22.4mm} (37.88 ^{+0.12"} _{-0.88})	SMEMA	
Board transfer time	approximately 3.5 seconds, standard. Belt speed is programmable. Under certain process conditions, transfer speed may be adjusted above or below 3.5 seconds (2.9 to 5.1 seconds).		
Note: SMEMA communication to upline/downline equipment is standard.			



4796 Turret and Stations

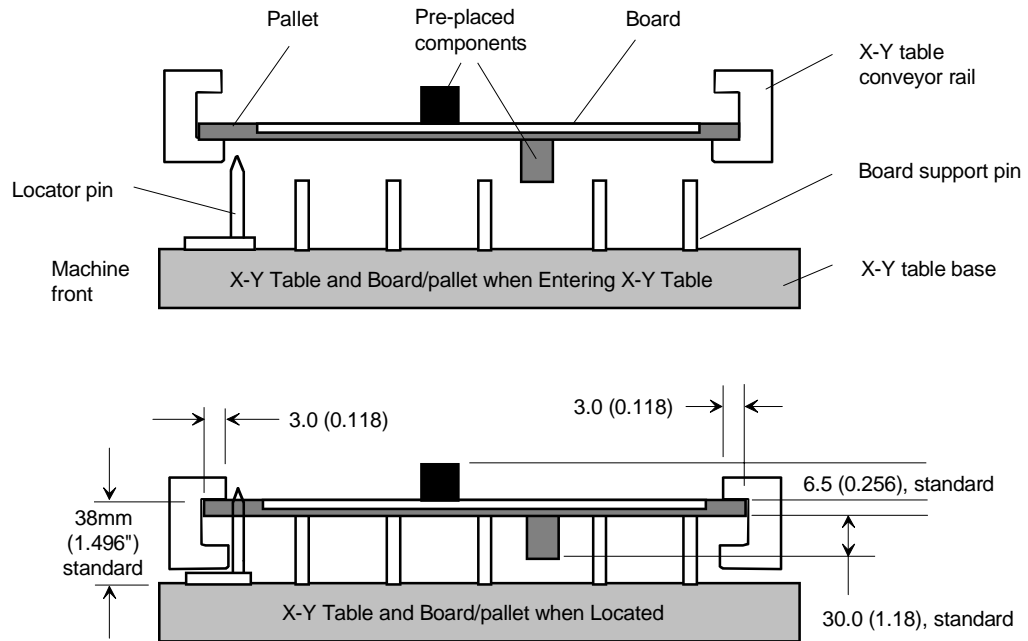
Right to left transfer is shown. Left to right is optional.

Acceptable Fiducial Shapes (Industry Standard)

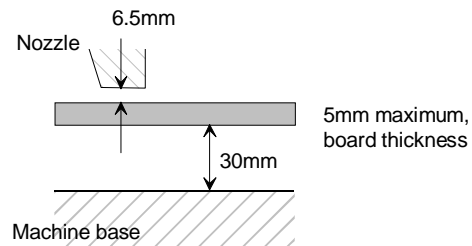
Shapes	D1	D2	Remarks
Round 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0 - 1.8mm (0 - 0.0709") ±10% [D1 minus 0.2mm >D2] [D1 minus 0.0079" >D2]	Fiducial Reference: Center D2: Size of a punched hole
Square 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0 - 1.8mm (0 - 0.0709") ±10% [D1 minus 2.0mm >D2] [D1 minus 0.0079" >D2]	Fiducial Reference: Center D2: Size of a punched hole
Equilateral Triangle 	0.5 - 2.0mm ±10% (0.0197 - 0.0787")	0 - 1.8mm (0 - 0.0709") ±10% [D1 - 0.2mm (0.0079")>D2]	Fiducial Reference: Center D2: Size of a punched hole
Cross 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0.2-1.0mm (0.0079 - 0.0394") ±10% (D1/2>D2)	Fiducial Reference: Center
Rectangle 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0.2 - 2.0mm (0.0079 - 0.0787") ±10%	Fiducial Reference: Center
Double Box 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	—	Fiducial Reference: Contact of two squares
Diamond 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0 - 1.8mm (0 - 0.0709") ±10% [D1 - 0.2mm (0.0079")>D2]	Fiducial Reference: Center
Equilateral Triangle 	0.5 - 2.0mm (0.0197 - 0.0787") ±10%	0 - 1.8mm (0 - 0.0709") ±10% [D1 - 0.2mm (0.0079")>D2]	Fiducial Reference: Center D2: Size of a punched hole
Double Rectangle 	0.5-2.0mm (0.0197-0.0787") ±10%	0.5-2.0mm (0.0197-0.0787") ±10%	Fiducial Reference: Contact of two rectangles
Bow Tie 	0.5-2.0mm (0.0197-0.0787") ±10%	—	Fiducial Reference: Two triangles or two sectors D1: Diameter of a fiducial size

Note: The preferred fiducial material is copper plated. Nickel, gold and silver plated fiducials are also acceptable as long as good contrast is obtained. Highly reflective mirror surfaces cannot be used. Board patterns, similar to the actual fiducial mark cannot exist within the fiducial recognition window.

Dimensions are in inches;
metric (mm) dimensions
are bracketed.



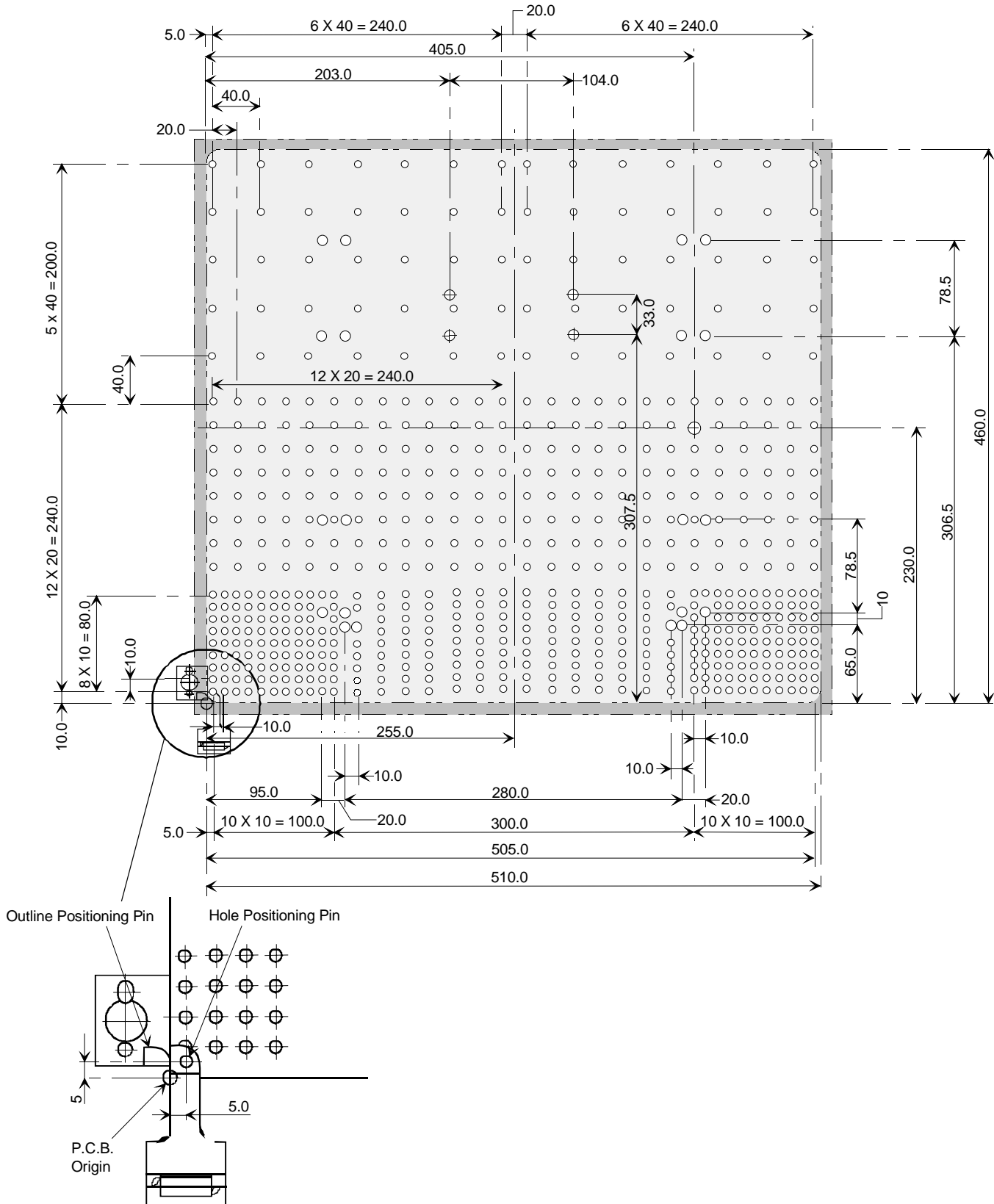
Topside/bottomside Board Clearance



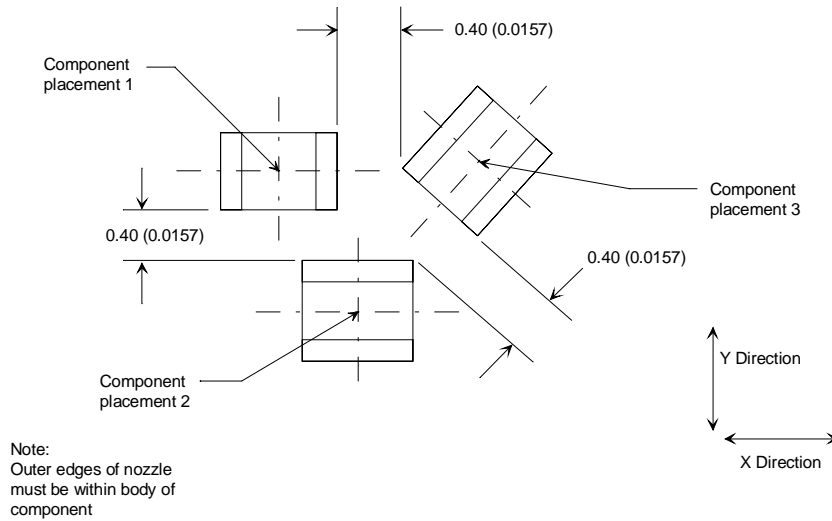
Maximum board thickness is 5mm. A thinner board increases below board clearance. For example, a 2.5mm board increases below-board clearance to a total of 32.5mm

Bottomside Board Clearance

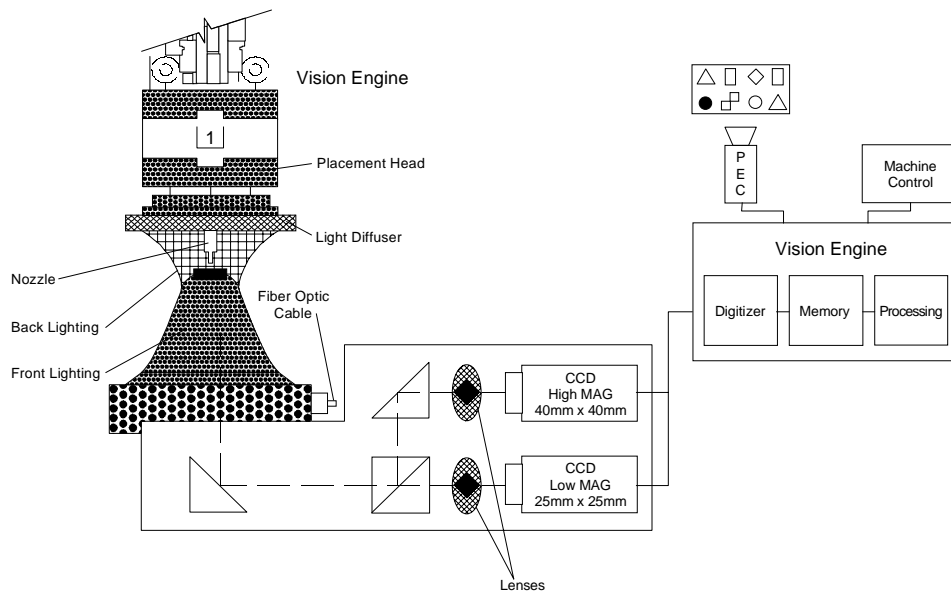
Board Support Pin Layout on X-Y Table Base 4796L



Dimensions are in inches;
metric (mm) dimensions
are bracketed.



Minimum Distance between Components



Vision Recognition System

Component Recognition Camera

Fields of view	High: 10 x 10mm (0.394 x 0.394")
	Low: 25 x 25mm (0.984 x 0.984")

Camera resolution	High: 20 micrometer/pixel
	Low: 54 micrometer/pixel

Pattern Error Correction Camera

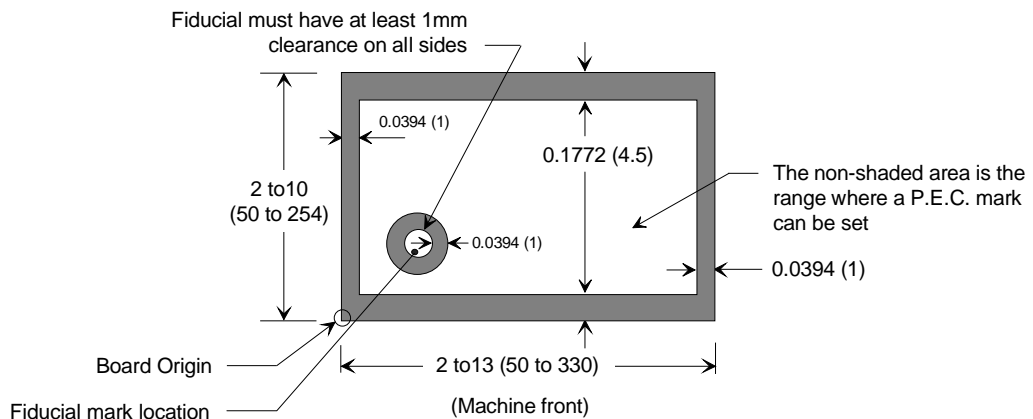
Field of view	12 x 12mm (0.47 x 0.47")
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Camera resolution	27 micrometer/pixel (0.001"/pixel)
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Window size	1 x 1mm (0.0394 x 0.0394")
	to 5 x 5mm (0.197 x 0.197")

Recognition time	Approximately 200 ms/mark
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Dimensions are in inches;
metric (mm) dimensions
are bracketed.



Pattern Error Correction

Recommended Computer Specifications

Processor	80486 66 MHz (or faster)
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RAM	16 MB (or more)
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Hard drive capacity	500 MB free space
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Graphics adapter	PCI SVGA w/1 MB
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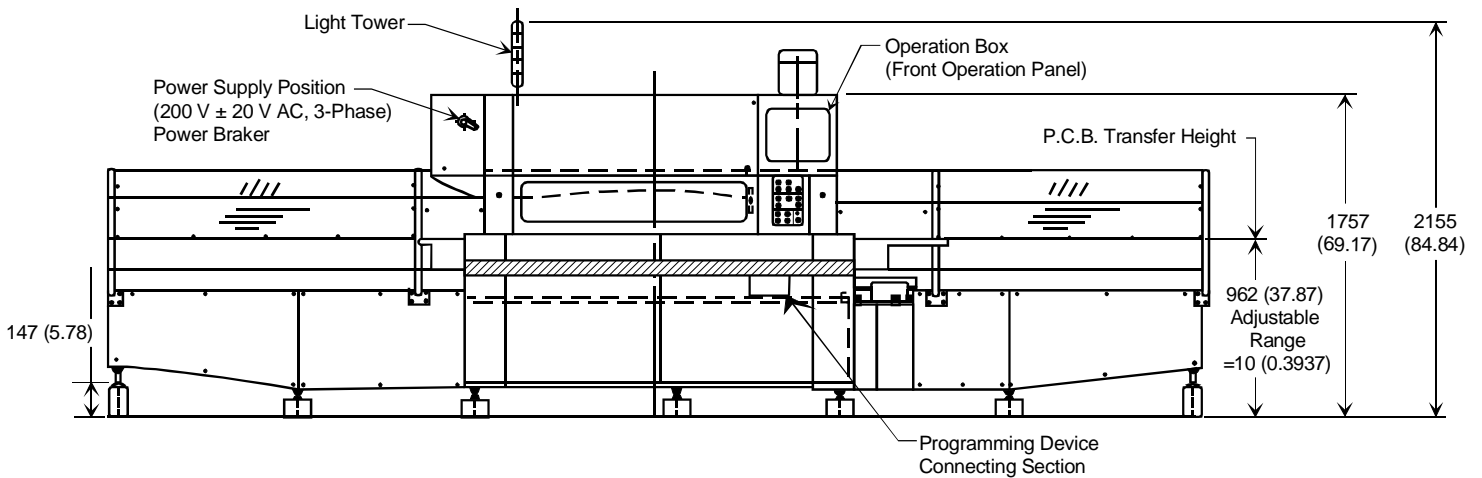
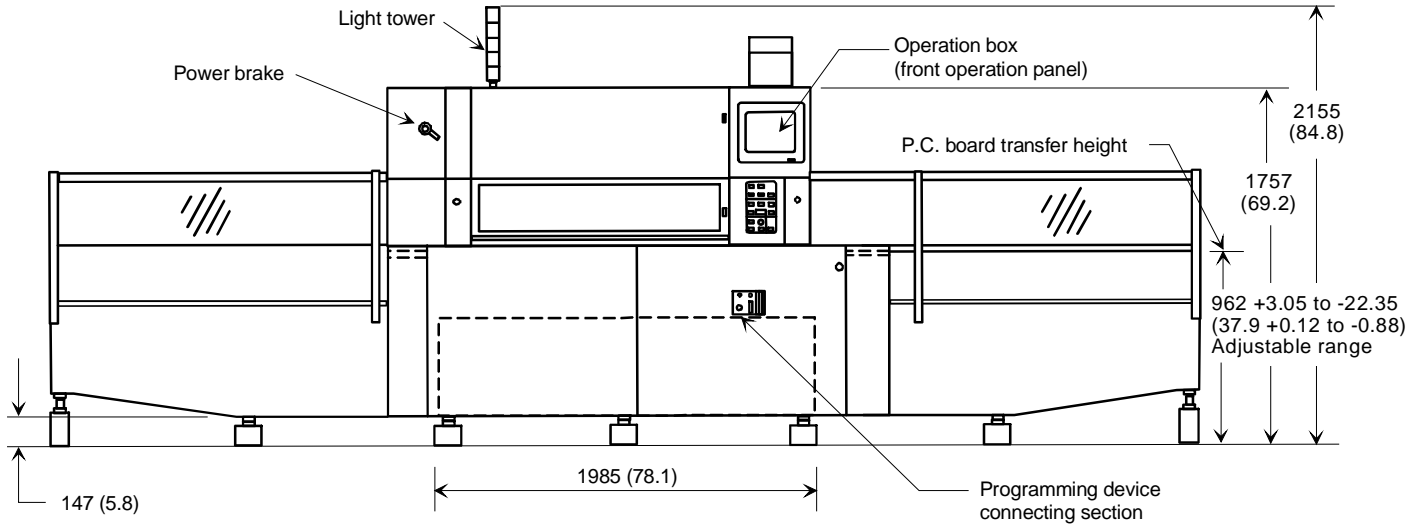
Parallel ports/ Serial ports	1 free "COM1" port
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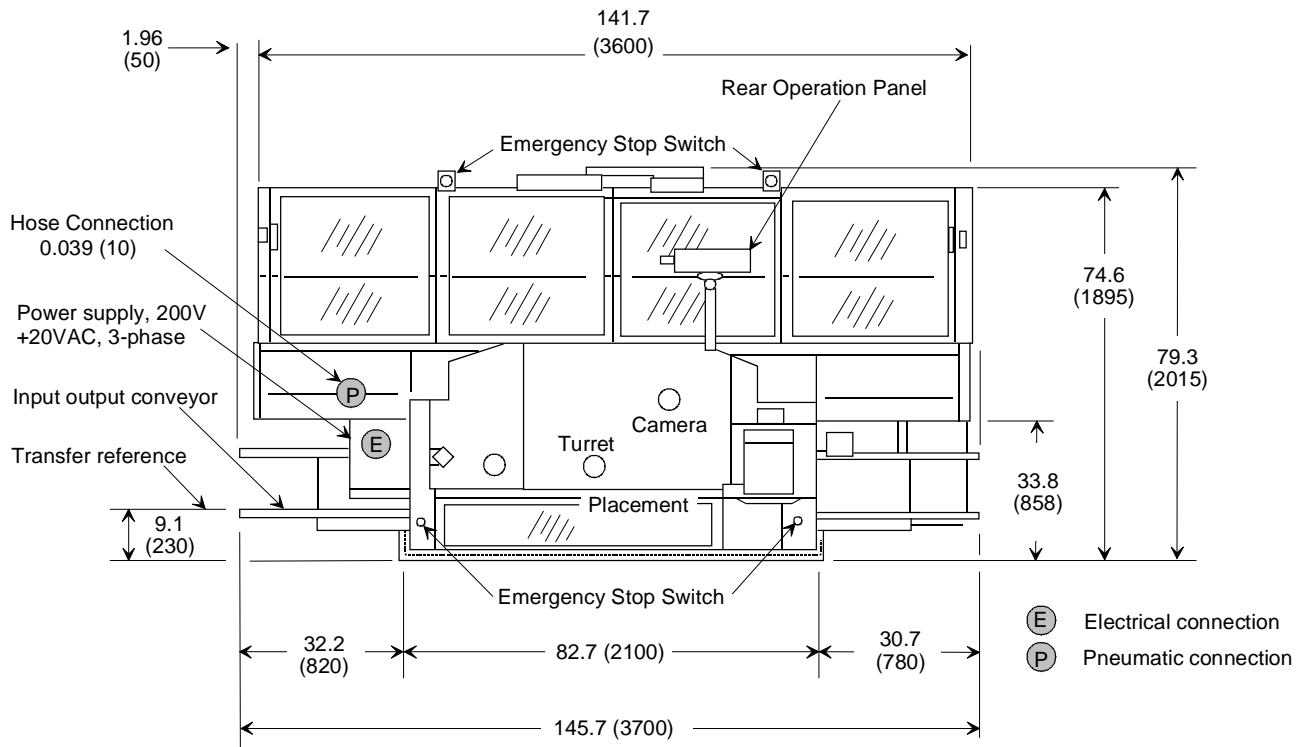
Operating software	MS DOS 6.2.2
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Application software	Windows 3.11
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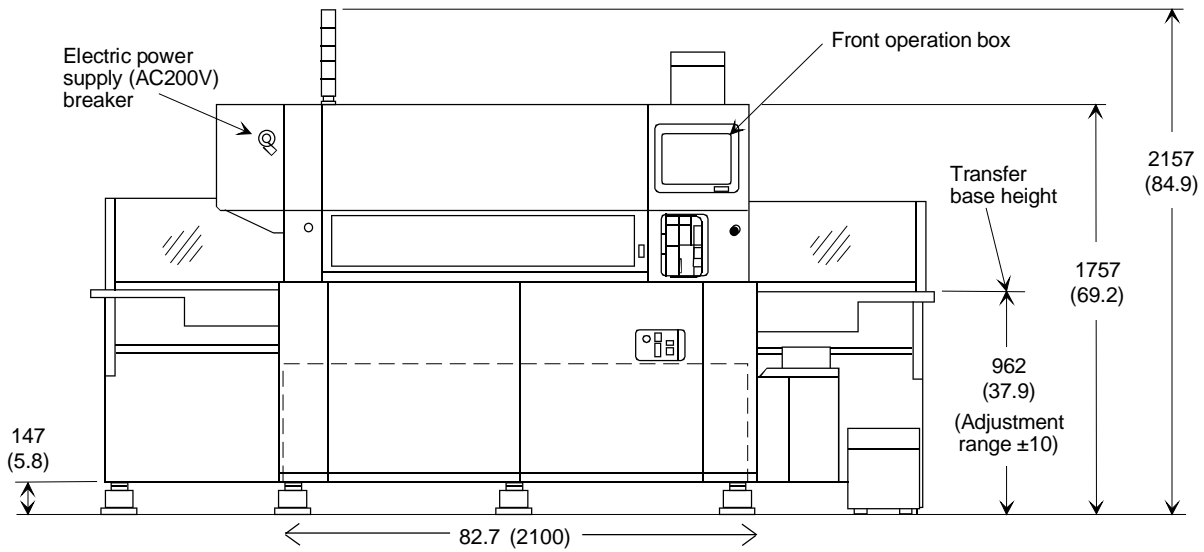
Installation Considerations

Dimensions are in inches;
metric (mm) dimensions
are bracketed.





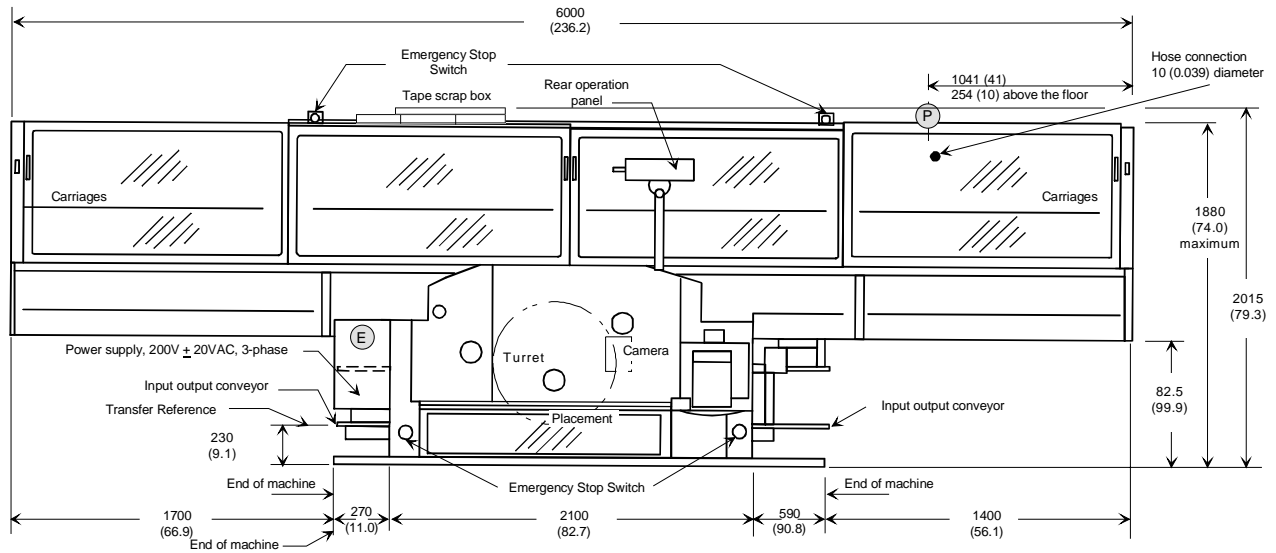
4796R HSP Top View



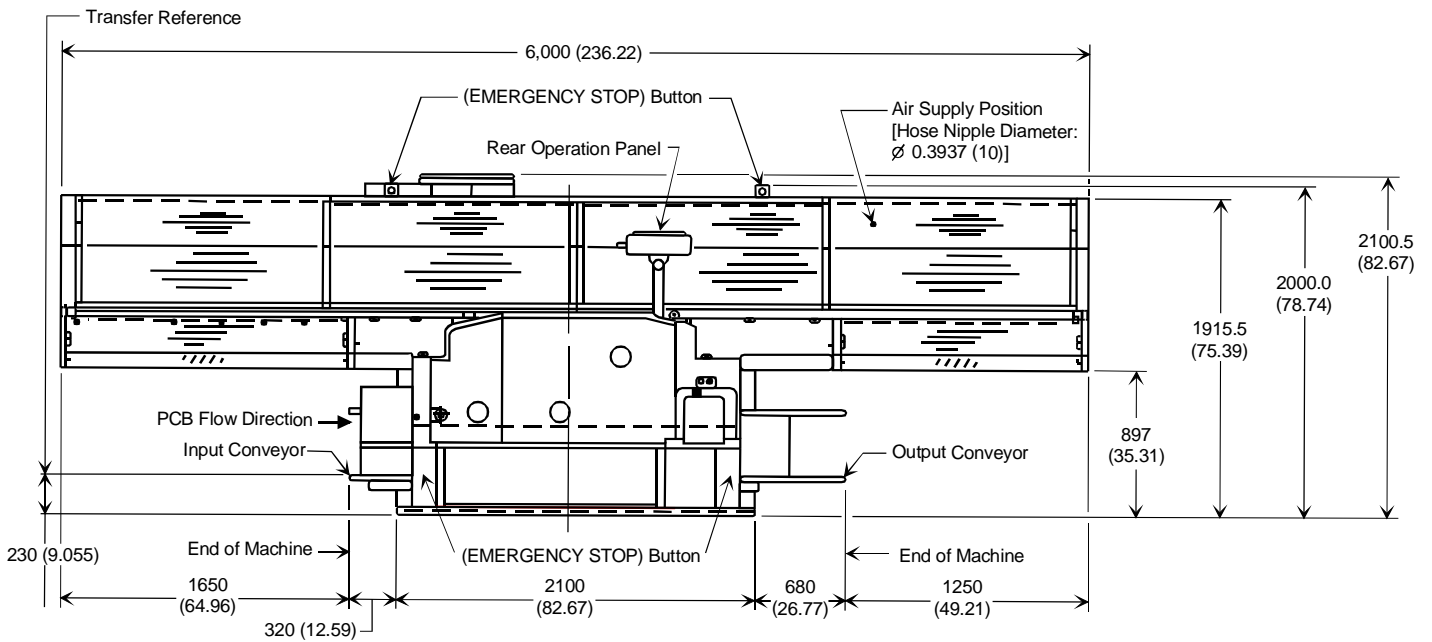
4796R HSP Front View

Dimensions are in inches;
metric (mm) dimensions
are bracketed.

- (E) Electrical connection
- (P) Pneumatic connection

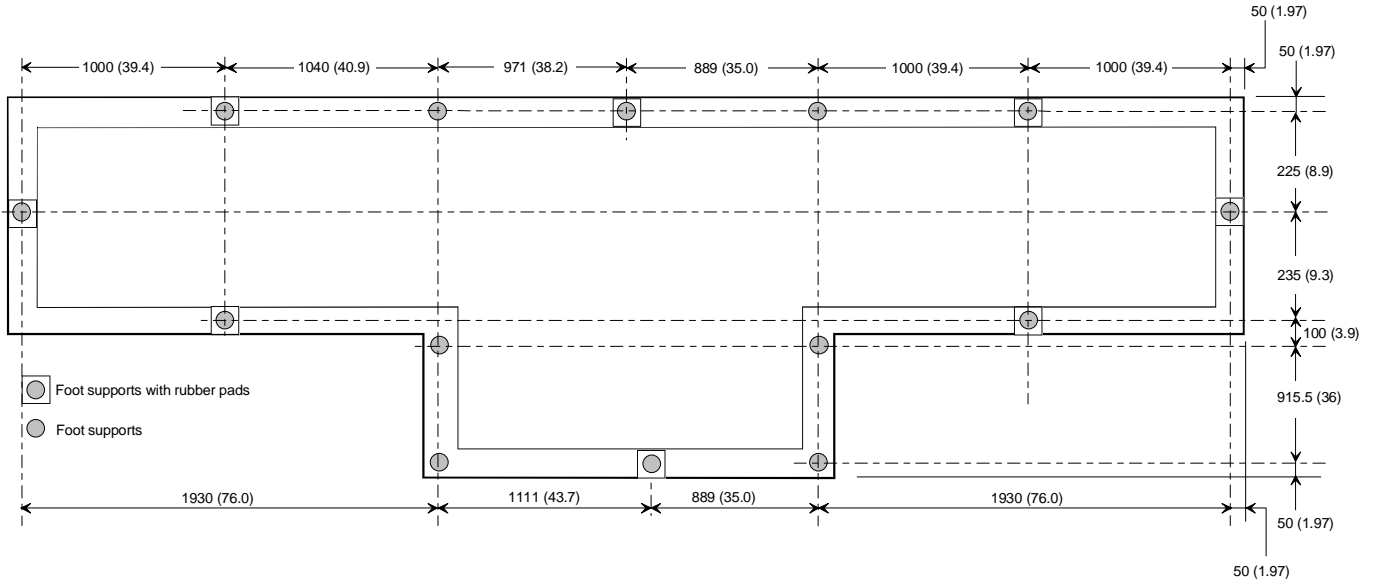


4796A/B HSP Top View

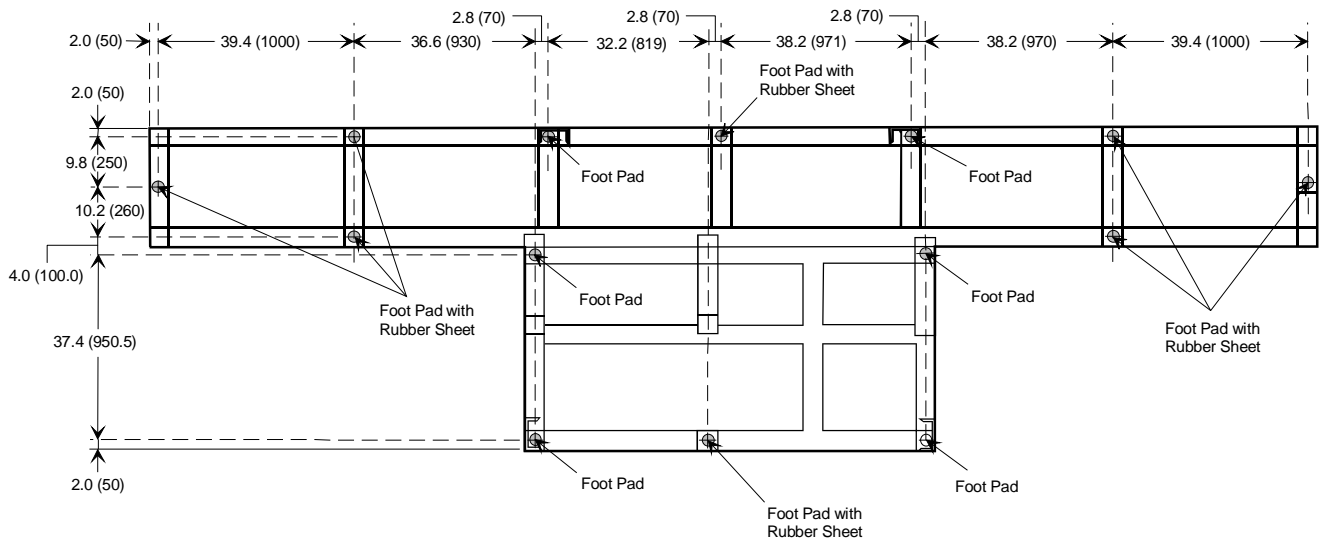


4796L HSP Top View

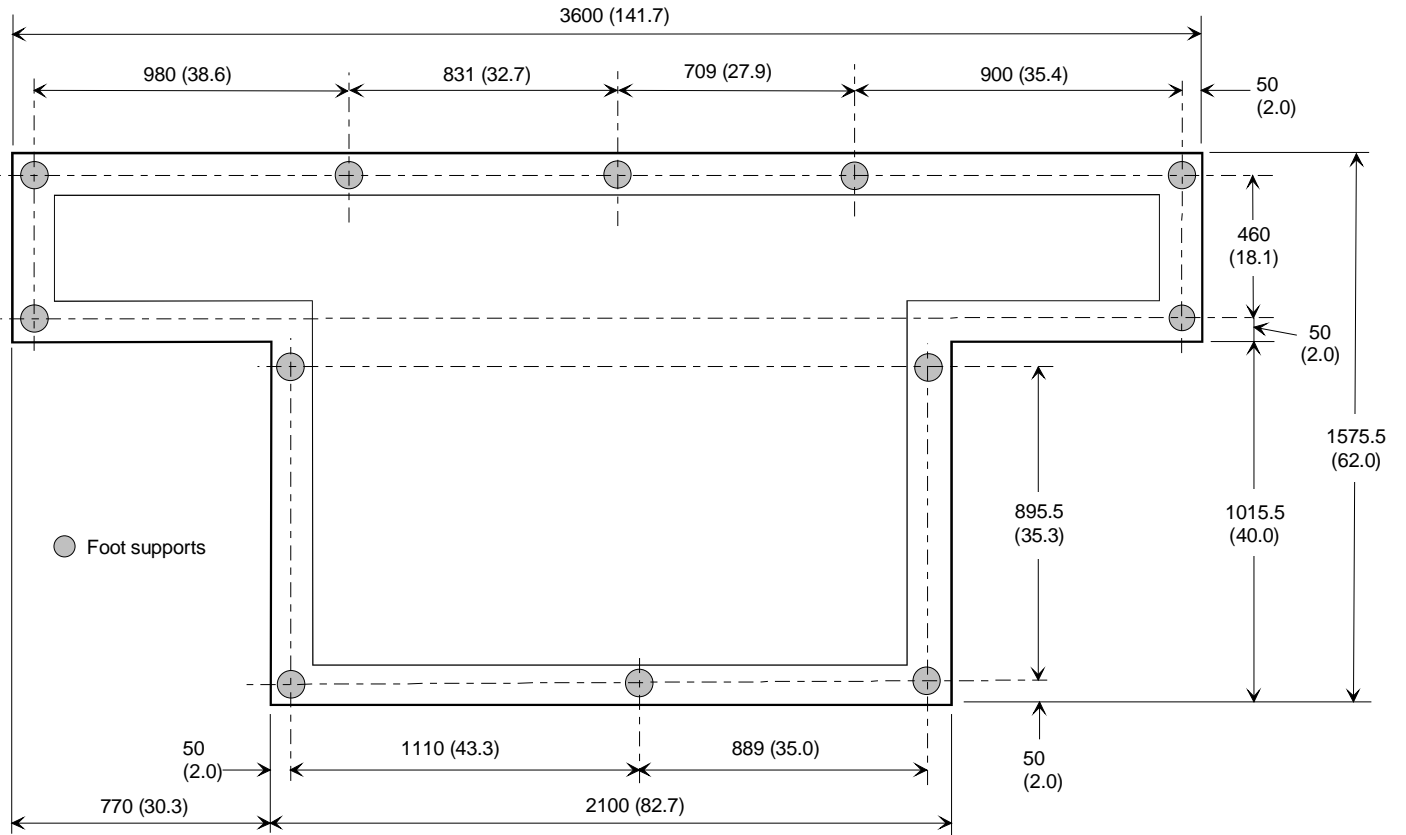
Dimensions are in millimeters;
inch dimensions
are bracketed.



4796A/B HSP Location of Leveling Foot Supports and Pads



4796L HSP Location of Leveling Foot Supports and Pads



4796R HSP Location of Leveling Foot Supports and Pads

Machine Dimensions

	Length	Depth	Height	Weight
4796A/B	6000mm (236.2")	2017mm (79.4")	2155mm (84.8")	3795kg (8360 pounds)
Air Freight	6350mm (250")	2151mm (84.7")	2169mm (85.4")	4932kg (10864 pounds)

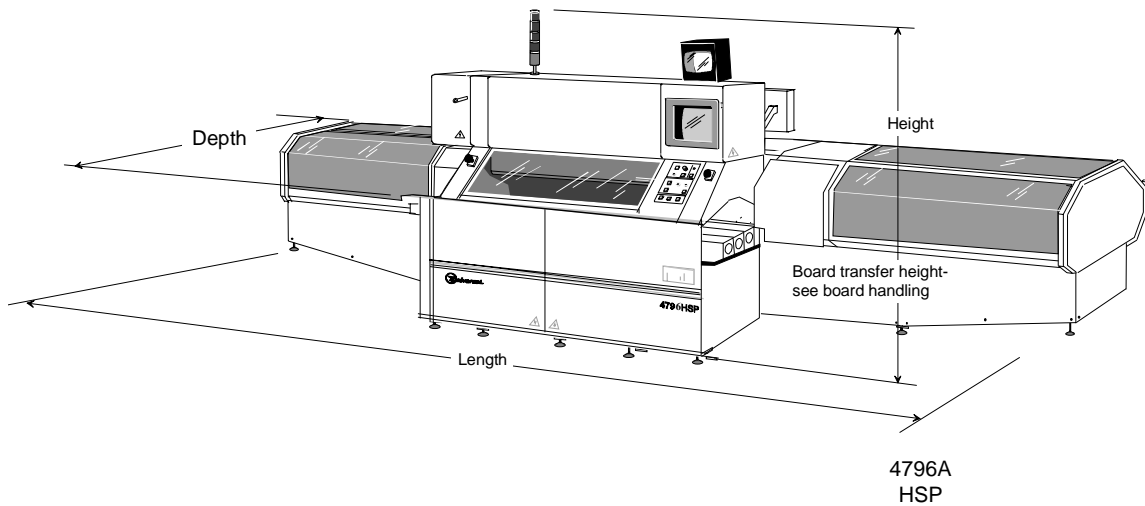
Shipping dimensions of crate.

4796R	3700mm (145.67")	2017mm (79.4")	2155mm (84.8")	3600kg (7938 pounds)
Air Freight	4572mm (180")	2164mm (85.2")	2195mm (86.4")	4500kg (9000 pounds)

Shipping dimensions of crate.

4796L	6000mm (236.2")	2100mm (82.7")	2155mm (84.8")	4200kg (9252 pounds)
Air Freight	6350mm (250")	2151mm (84.7")	2169mm (85.4")	5620kg (12380 pounds)

Shipping dimensions of crate.



Service Requirements

Electrical	200 VAC (± 20 VAC) When calculating the minimum and maximum voltage requirements, consider the power utility voltage fluctuation, line losses, transformer losses, and a safety margin. The minimum voltage of 180 volts does not infer that connecting a 180 volt service is acceptable.
Frequency	50 or 60 Hz
Phases	3
Number of wires	4 (three phase lines and ground)
Branch circuit size	30 amps
Power consumption	Approximately 6 kVA (7 kVA maximum)

Pneumatics

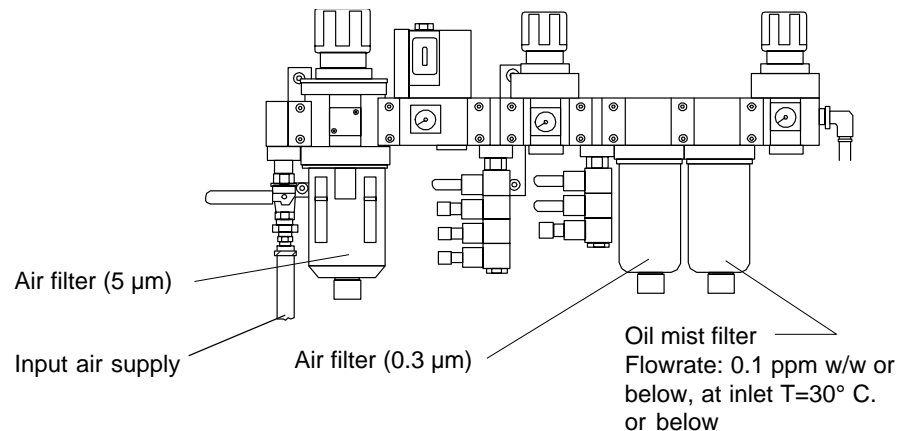
Air supply (clean air *)	60 to 100 psi (4 to 7 kgf/cm ² or 4.1 to 6.9 bar)
Air pressure	60 psi (4 kgf/cm ² or 4.1 bar)
Air consumption	Approximately, 1 scfm at 60 psi (28 liters per minute at 4.1 bar)

*Clean air is defined as:

Water: -17° or less (dew point less than atmospheric pressure)

Oil: 0.08 ppm at 28° C.

Dust (solid): 0.01 micron



Air Filtration Unit

Environmental Requirements

	Minimum	Maximum
Operating Temperature	50° F (10° C)	86° F (30° C)
Storage Temperature	50° F (10° C)	86° F (30° C)
Operating Humidity	30% non-condensing	80% non-condensing
Noise Level	60 dbA	80 dbA