Product Description

Amistar

Revised - 11/30/99

PLACEPRO® 7100

General Description

The PlacePro® Model 7100 employs 6 touchless centering placement heads mounted on a single gantry and offers the flexibility to place a wide range of component package types at rates up to 18,180 cph. A high-speed "scan" camera mounted on the gantry below the head assembly provides on-the-fly vision alignment of components as the gantry moves from the pick point to the placement position. Touchless component centering is performed using the high-speed vision processing system and either the Scan Camera or one of three optional frame-mounted cameras. Accurate, repeatable component placement is achieved using Class 5 ball-screw driven XY gantry control. Each head provides independent, servo-driven Z-axis control, adjustable Z-axis stroke speed, and spring compliant placement force.

Component package types include SOIC, PLCC, TSOP, QFP, BGA, µBGA, CSP, Flip Chip, DCA, Odd-Form, and SMD connectors. Component sizes range from 0402s to 54mm^2 QFPs or 80mm long connectors. Components up to 20mm^2 with lead/ball pitches as fine as 0.5mm may be placed using the standard Scan Camera. Components up to 54mm^2 and lead/ball pitches as fine as 0.3mm are supported using one of four optional frame-mounted cameras.

Up to 120 tape feeders may be attached to the machine or optional Feeder Bank Changers with additional flexibility being provided by optional tray feeders (the MX-40B, MX-20F, or MX-ST2), stick feeders, and Murata bulk cassette feeders. Nozzle changes are accomplished using the Automatic Nozzle Changer (ANC). The ANC holds up to 12 nozzles and offers automatic recognition of nozzle types using the Nozzle ID Function.

Head Characteristics

General Specifications

Number of Placement Heads	6 Heads
Component Centering	Vision alignment using a gantry-mounted "scan" camera or frame-mounted "fixed position" cameras
X, Y, Z, and Theta Axis Control	Brushless AC Servo Motors / Semi-closed Loop Control / High-Resolution Glass Scale Encoders
Linear Actuator	Class 5 Recirculating Ball Screw Drive (for XY motion)
XY-Axis Repeatability	±0.02mm (0.00079")
XY-Axis Resolution	0.005mm (0.00020")
Z-Axis Resolution	0.006mm (0.00024")
Theta-Axis Resolution	0.018°
Pickup Method	Vacuum suction by internal venturi vacuum generator
Pickup Detection	Sensed via negative air pressure measurement and vision system recognition (any camera)
Component Pick Retry	Programmable to a maximum of 10 retries
Placement Pressure	Z-axis controlled by component thickness (240-280g compliant spring)
Auto Nozzle Changer (ANC)	Holds 12 Nozzles / Auto Nozzle ID Recognition (2.5 seconds per nozzle change)
Auto Nozzle ID Recognition	Vision system identification of nozzles in the ANC using targets (labels) applied to nozzles

Cycle Rates (max)

Component	Placement Rate	Camera	Comments
Chip (0402)	0.198 sec/part (18,180 cph)	Scan Camera (std)	Simultaneous Picks / 6 Heads[1]
µBGA/CSP (46 ball / 0.75mm pitch)	0.970 sec/part (3,710 cph)	Scan Camera (std)	Independent Picks / 1 Head[2]
µBGA/CSP (46 ball / 0.75mm pitch)	0.600 sec/part (6,000 cph)	Scan Camera (std)	Continuous Picks / 6 Heads[3]
QFP (100 pin / 0.65mm pitch)	1.350 sec/part (2,670 cph)	Frame-Mounted Camera (opt)[4]	Independent Picks / 1 Head[2]
QFP (100 pin / 0.65mm pitch)	0.750 sec/part (4,800 cph)	Frame-Mounted Camera (opt)[4]	Continuous Picks / 6 Heads[3]

Note 1 - Pick 6 components with 6 heads simultaneously from 6 different feeder locations and perform 6 independent component placements in succession.
Note 2 - Pick 1 component with 1 head and perform 1 component placement.
Note 3 - Pick 6 components in succession from 1 feeder location and perform 6 independent component placements in succession.
Note 4 - Using the optional 05L frame-mounted camera. See the Optional Items section for additional details about optional cameras.

Placement Accuracy

Component	Accuracy[1]	Camera
Chip (0402 and up)	±0.10mm (0.0039")	Scan Camera (std)
IC (QFP / TSOP / SOIC / PLCC)	±0.05mm (0.0020")	Scan Camera (std)
IC (QFP / TSOP / SOIC / PLCC)	±0.05mm (0.0020")	Frame-Mounted Camera – 05L / 04M (opt)[2]
IC (QFP / TSOP / SOIC / PLCC)	±0.04mm (0.0016")	Frame-Mounted Camera – 03S (opt)[2]
BGA	±0.10mm (0.0039")	Scan Camera (std)
BGA	±0.10mm (0.0039")	Frame-Mounted Camera – 05L / 04M / 03S (opt)[2]
µBGA/CSP	±0.10mm (0.0039")	Scan Camera (std)

Note 1 - Accuracy values are based on 3 standard deviation precision using the centerline of the component and position relative to a fiducial mark.
Note 2 - 05L, 04M, and 03S refers to optional frame-mounted cameras. See the Optional Items section for additional details.

Scan Camera Capability (std)

Camera Functions	Component Centering & Inspection / Vision Test / Automatic Data Acquisition (ADA) / Nozzle Check
Field of View (X,Y)	24.6 x 23mm (0.969 x 0.906")
Maximum Component Size	20mm^2 (0.787"^{2}) or 22 x 17mm (0.866 x 0.669")
Minimum Component Size	0.50mm^2 (0.020"^{2})
Minimum Lead Pitch	0.50mm
Minimum Ball Pitch	0.50mm
Minimum Ball Diameter	0.25mm
Maximum Component Height	10.5mm (0.413")

Frame-Mounted 05L Camera Capability (std)

Camera Functions	Component Centering & Inspection
Field of View (X,Y)	38.4mm^2 (1.512"^{2})
Maximum Component Size	Single View: 34mm^2 (1.339"^{2}) / Four View: 54mm^2 (2.126"^{2}) / Three View: 80 x 34mm (3.150 x 1.339")
Minimum Lead Pitch	0.50mm
Minimum Ball Pitch	1.00mm
Minimum Ball Diameter	0.80mm

Teach Camera Capability (std)

Camera Functions	Manual Teaching / Bad Board Detect / Fiducial Sensing / Nozzle ID Recognition
Field of View	20 x 20mm (0.787" x 0.787")
Fiducial Mark Size	SMEMA Compliant – 5.0mm (0.197") Diameter (max) 0.5mm to 2.0mm (0.020 to 0.079") Diameter Recommended

Board Handling Characteristics

Board Specifications

Maximum Board Size (X,Y)	460 x 410mm (18.11 x 16.14")
Minimum Board Size (X,Y)	50 x 30mm (1.97 x 1.18")
Maximum Board Thickness	7.0mm (0.276")
Minimum Board Thickness	0.5mm (0.020")
Maximum Board Warp (up)	0.2mm (0.008") per 50mm or 0.5mm (0.020") per 460mm
Maximum Board Warp (down)	0.2mm (0.008") per 50mm or 1.5mm (0.059") per 460mm
Maximum Placement Area[1]	460 x 404mm (18.11 x 15.91")
Above Board Clearance (min)	10.5mm (0.413")
Below Board Clearance (min)	30.0mm (1.181")
Board Positioning[1]	Edge Positioning using Fiducials Tooling Holes and Pins (using 3mm, 4mm, or 0.125" pins / adjustable in X and Y axes)

Note 1 - See Figures 1 and 2 for details regarding allowable placement areas, tooling pin sizes, and tooling pin locations.

Conveyor Specifications

Conveyor Type	Belt Conveyor with Antistatic Belt
Conveyor Speed	420mm/sec (16.5"/sec) at 60 Hz or 350mm/sec (13.8"/sec) at 50 Hz
Conveyor Height	900 ± 20mm (35.43 ± 0.79") or 950 ± 20mm (37.40 ± 0.79") for SMEMA Compliance
Conveyor Width Adjust	Adjustable by Crank (std) or Auto-Width Adjust (opt)
Board Transfer Direction	Left to Right (std) or Right to Left (opt)
Board Transfer Rate	420mm/sec (max) with variable speed and soft stop function
Board Positioning Time	4.0 seconds for 460mm board (3.5 sec without Buffer Stop)
Board Supports	An adjustable bridge/pier support system and support pins are provided for use with board thicknesses of 0.5mm, 0.8mm, 1.0mm, 1.2mm, 1.6mm, and 2.0mm. Boards over 2.0mm thick (up to 7.0mm) must be supported using the bridge/pier support. Board supports may be used throughout the entire placement area.

Feeder Capabilities

Tape Feeders

Tape Feeders (total)	120 Feeders using PS-82 or PS-84 (8mm) Feeders (max)
Tape Feeders (front)	60 Feeders using PS-82 or PS-84 (8mm) Feeders (max)
Tape Feeders (rear)	60 Feeders using PS-82 or PS-84 (8mm) Feeders (max)[1]
Tape Feeder Sizes	8 / 12 / 16 / 24 / 32 / 44 / 56mm (any pitch)
Tape Reel Size (8mm)	177.8mm (7.0") or optional 330.2mm (13.0")
Tape Reel Size (12-56mm)	177.8mm (7.0"), 330.2mm (13.0"), and 381.0mm (15")
Tape Reel Force	20 to 70g (EIA Standard)

Note 1 - Maximum number of feeders installable on rear of machine if, MX-20F, or MX-40B tray feeders are not installed.

Stick Feeders

Stick Feeder Types (opt)	Single Tube / Multiple Tube / Vibrating Feeders / Belt Transport Multi-Lane Feeders
Stick Feeder Sizes	For all sizes (SO8 to PLCC100)

Bulk Feeders

Murata Bulk Cassette (opt)	0402 to 1210 Components

Tray Feeders

Internal Tray (2 sizes)	60 Feeders (front) + 60 Feeders (back) + 1 Tray (internal) = 121 Component Types (max)
MX-ST2 Tray Changer (opt)	60 Feeders (front) + 25 Feeders (back) + 2 Trays (MX-ST2) = 87 Component Types (max)
MX-20F Tray Changer (opt)	60 Feeders (front) + 20 Feeders (back) + 40 Trays (MX-20F) = 120 Component Types (max)
MX-40B Tray Changer (opt)	60 Feeders (front) + 20 Feeders (back) + 80 Trays (MX-40B) = 160 Component Types (max)
MX-40B Tray Change Time	4.3 seconds (adjustable from 3 to 8 seconds)
MX-40B Tray Sizes	JEDEC – 200 x 115mm (min) to 335 x 140mm (max) / 7.87 x 4.53" (min) to 13.19 x 5.51" (max) Custom – 200 x 115mm (min) to 335 x 310mm (max) / 7.87 x 4.53" (min) to 13.19 x 12.20" (max)

Machine Control and Interface

Programming

Placement Programming Method	The TOPS-Pro offline programming software (opt) is used to import CAD data, and to create and plan efficient placement programs. Programs may be taught or edited at the machine using the vision system with the keyboard and mouse or the teach pendant.
Automatic Data Acquisition (ADA)	Automatic creation of vision data models for parts not residing in the standard component database
Position Correction Adjust (PCA)	Semi-automatic placement coordinate checking and adjustment
Data Input Increment	X, Y, and Z axes – 0.01mm or 0.01 mil / Theta-axis – 0.01° (metric or imperial values)
Data Input Method	Manual Data Input / Teaching Input / Offline Programming Software
Program Storage Capacity	3000 steps per program (max) / 500 programs (max internal storage)
Teach Pendant	Pendant-Style Operator Keypad

Computer	
Computer Processing Unit (CPU)	Pentium-Based 32-bit Processor
Computer Operating System	Windows® NT / Y2K Compliant
Computer Memory	Machine Face-Mounted Floppy Drive / Computer Internal Hard Drive
Computer Display	Machine Top-Mounted 15" Color Monitor (CRT)
Computer Input Devices	Mouse / Mini-Keyboard / Machine Control Switches

Network	
Network Standard	IEEE 802.3 (Ethernet)
Network Interface	RJ-45 Connector (10Base-T)
Network Data Rate	10Mbps

Safety / Error Handling	
Alarm Device	Buzzer (std) and/or Light Tower (opt)
Emergency Stops	Located on the front panel above the keyboard and on the rear of the unit
Cover Interlocks	Tilt-up transparent covers with interlocks stop machine when covers are opened
CE Mark (opt)	Covers, guards, and interlocks are available as an option

Physical Characteristics

Footprint (W x D x H)	1650 x 1500 x 1450mm (64.96 x 59.06 x 57.09")
Crated Size (W x D x H)	2007 x 1803 x 1727mm (79.0 x 71.0 x 68.0")
Weight (no feeders)	1550 kg (3417 lb.)
Air Requirements	Clean, dry air at 0.49 to 0.68 Mpa (74 to 103 psi) and 69 l/min (2.44 cfm)
Power Requirements	200 to 440 VAC ±10% / 3 Phase / 50 or 60 Hz / 5 kVA (8 kVA with MX-40B) / 2000 W
Operating Temperature	15° to 35°C (59° to 95°F)
Operating Humidity	45 to 65% Non-Condensing
Color	DIC 15/547 (light gray)

Optional Items

Frame-Mounted Camera Options

Model[1]	View Process	Field of View	Part Size (max)	Part Specs (min)
Camera 05L	Single View	38.4mm² (1.512"²)	34mm² (1.339"²)	Lead Pitch – 0.5mm
	Four View		54mm² (2.126"²)	Ball Pitch – 1.0mm
	Three View		80 x 34mm (3.150 x 1.339")	Ball Diameter – 0.8mm
Camera 04M	Single View	28mm² (1.102"²)	24mm² (0.945"²)	Lead Pitch – 0.4mm
	Four View		42mm² (1.654"²)	Ball Pitch – 1.0mm
	Three View		60 x 24mm (2.362 x 0.945")	Ball Diameter – 0.8mm
Camera 03S	Single View	24mm² (0.945"²)	20mm² (0.787"²)	Lead Pitch – 0.3mm
	Four View		35mm² (1.378"²)	Ball Pitch – 1.0mm
	Three View		50 x 20mm (1.969 x 0.787")	Ball Diameter – 0.8mm
Camera 03B (for CSP)	Single View	24mm² (0.945"²)	20mm² (0.787"²)	Ball Pitch – 0.5mm
				Ball Diameter – 0.25mm

Note 1 - Up to 3 cameras can be mounted in any combination on the machine.

Feeder Options

Feeder Type	Model	Req'd Inputs	Description
Tape Feeders	PS-82	1	8mm / Paper Tape / Pneumatic Advance / 2mm Feed Pitch
	PS-84	1	8mm / Paper Tape / Pneumatic Advance / 4mm Feed Pitch
	PS-12	2	12mm / Paper Tape / Pneumatic Advance
	PS-16	2	16mm / Paper Tape / Pneumatic Advance
	PS-24	3	24mm / Plastic Tape / Electric Advance
	PS-32E	3	32mm / Plastic Tape / Electric Advance
	PS-32A	3	32mm / Adhesive Tape / Electric Advance
	PS-44	4	44mm / Plastic Tape / Electric Advance
	PS-56	5	56mm / Plastic Tape / Electric Advance
Stick Feeders	PS-T1S	3	S-Type / SO8 to SO28
	PS-T1M	3	M-Type / PLCC44
	PF-LIF	5	Multi-Lane Vibratory / SO8 to SO28W and PLCC20 to PLCC84
	UVBELT	8	Belt Transport Multi-Lane / SO8 to SO44 and PLCC18 to PLCC100
Tray Feeders	MX-ST2	35	Sliding Tray / 2 JEDEC Tray Capacity / Rear Mount / Occupies 35 Feeder Slots
	MX-20F	40-44	20 Pallet / 40 JEDEC Tray Capacity / Rear Mount / Occupies 40-44 Feeder Slots
	MX-40B	40-44	40 Pallet / 80 JEDEC Tray Capacity / Rear Mount / Occupies 40-44 Feeder Slots
	Internal	na	1 JEDEC Tray Capacity / Internally Mounted / Occupies No Feeder Slots
Bulk Feeder	MSCF-XX	1	Murata Bulk Cassette / 0402 to 1210
Label Feeder	PL1500	12	Labels 0.093" to 0.562" (width) and 0.375" to 1.875" (length) with 0.695" liner
Feeder Bank Changer	CFB-1	60	Change Feeders in Batches / 60 Feeders per Feeder Bank Changer (max)
CartPro Feeder Setup	PFS-3	na	Feeder Storage Cart / 120 Feeder Capacity (max)
Feeder Tape Cutter	TCM-1	na	Automatically Trims Tape Waste / Includes Waste Box
Set Master	PCJ-1	na	Feeder Pickup Point Calibration Tool

Conveyor Options

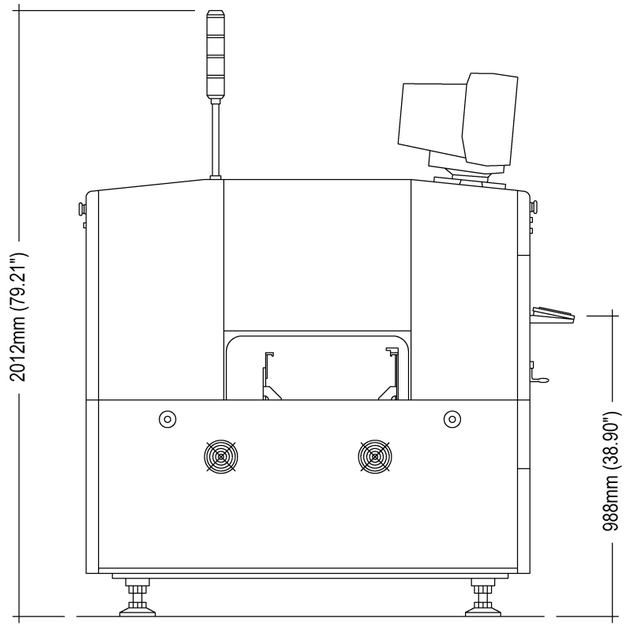
SMEMA Spacer Blocks	50mm spacers for raising conveyor height to 950±20mm (37.40±0.79") for SMEMA compliance
Buffer Stops	Input / Output / Both (input stop buffer requires 120mm conveyor extension for 340 - 460mm board)
Conveyor Extensions	120mm or 200mm extensions for input and/or output sides
Conveyor Auto-Width Adjust	Motor-driven, software programmable conveyor width adjustment
Rear Reference Conveyor	Fixed Rear Rail
Adjustable PCB Locating Pins	Pin location adjustable in X and Y directions
Magnetic Support Pins	Repositionable underboard support pins with magnetic base

TOPS-Pro Offline Programming Software Options

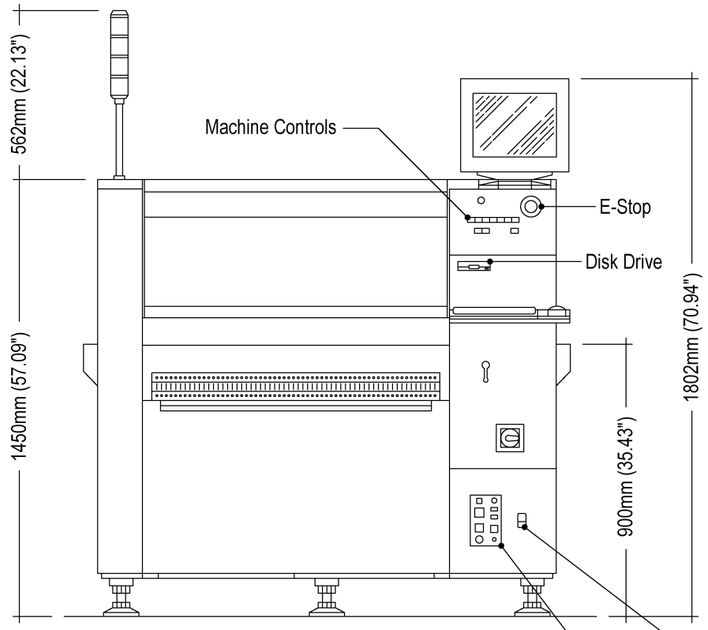
Offline Program Editor (TP-4E)	Edits Placement Programs
CAD Converter (TP-3E)	Converts CAD Files
Tact Time Simulator (TP-2E)	Simulates Machine Throughput
Program Planner (TP-1E)	Automatically Plans Placement Programs

Miscellaneous Options

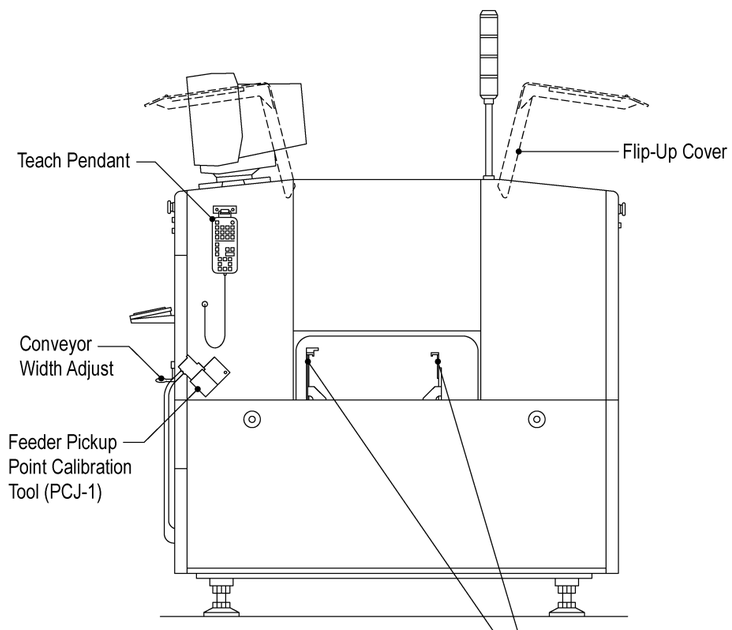
CE Mark	Covers, guards, and interlocks for compliance with CE directives
Light Tower / Alarm Beacon	3-Color (green / yellow / red)
Custom Machine Color	Painted to Customer Specification



Left View

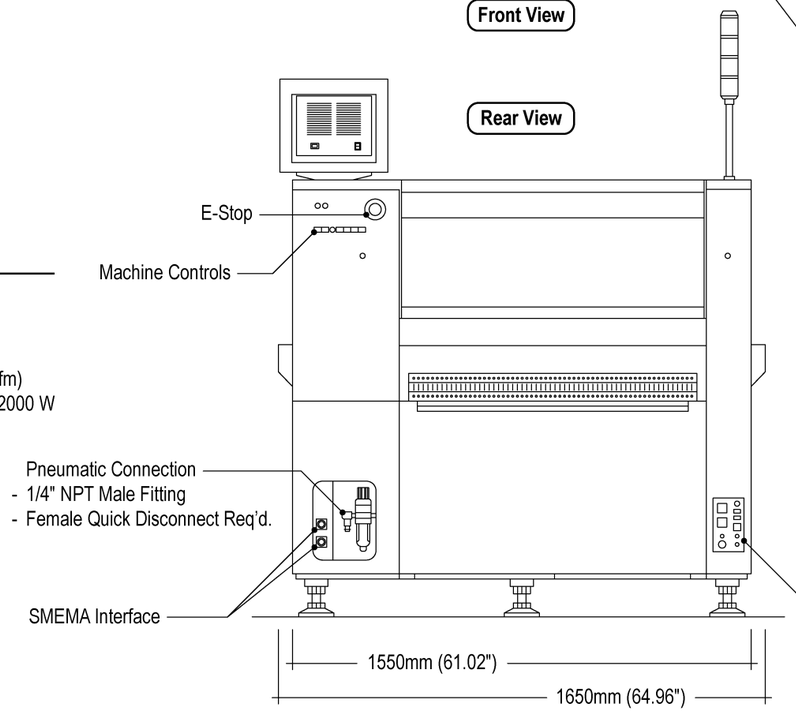


Front View

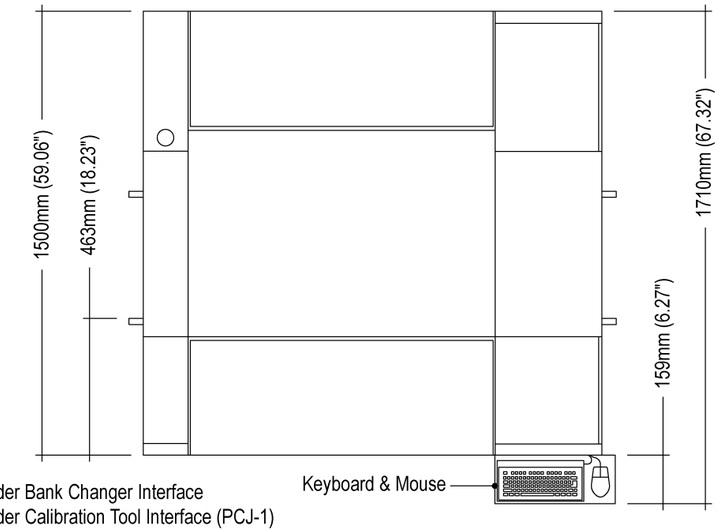


Right View

Figure 1 - PlacePro 7100 Illustrations and Dimensions



Rear View



Top View

PLACEPRO® 7100

Footprint (W x D x H)	1650 x 1500 x 1450mm (64.96 x 59.06 x 57.09")
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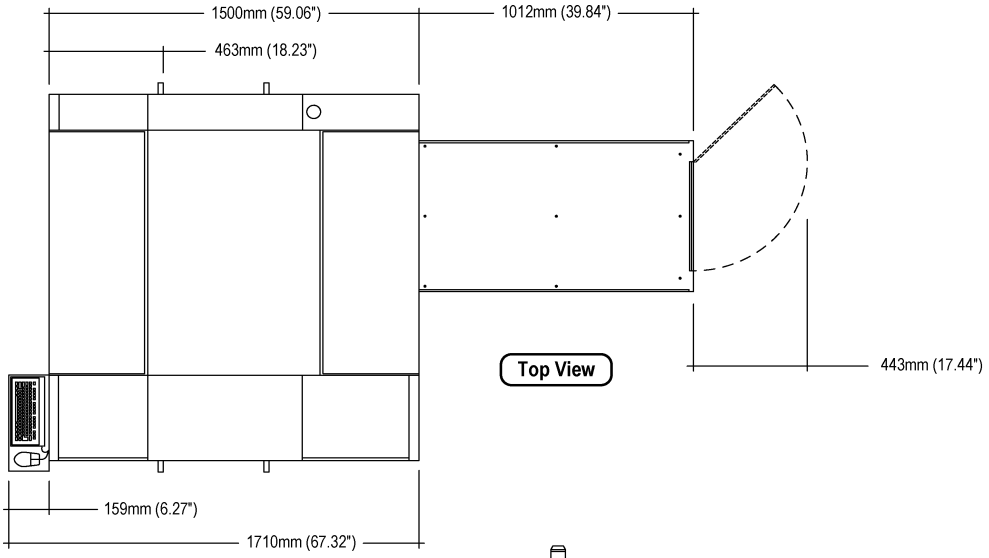
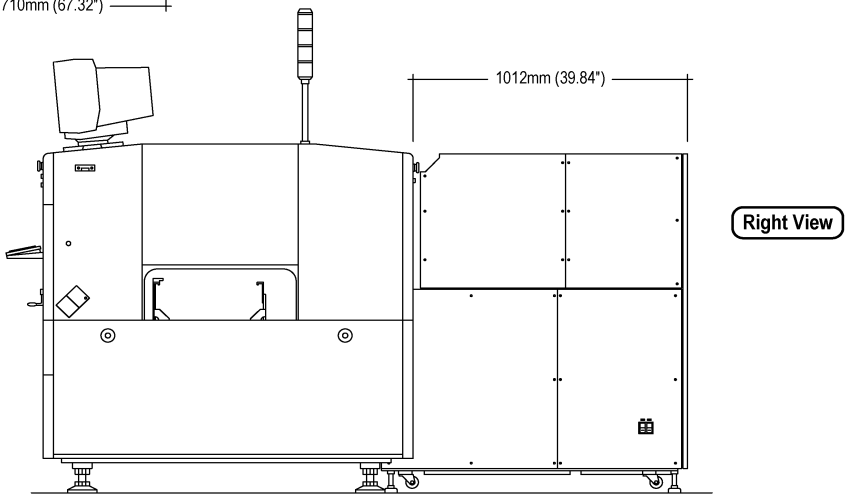
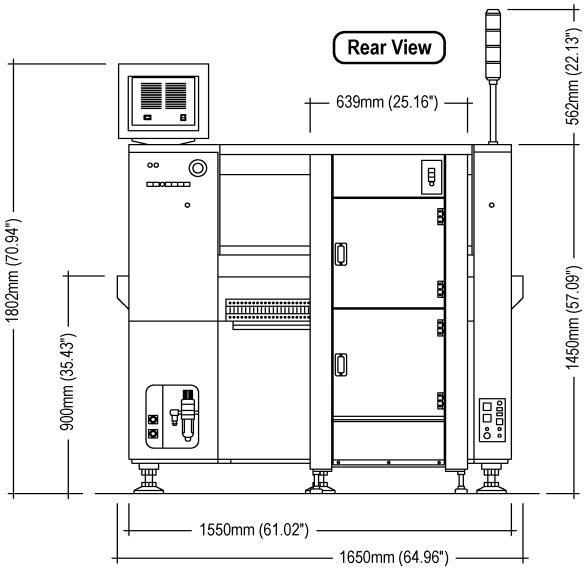
Power Requirements	200 to 440 VAC / 3 Phase / 50 or 60 Hz / 5 KVA / 2000 W
Operating Temperature	15° to 35°C (59° to 95°F)
Operating Humidity	45% to 65% Non-Condensing
Color	DIC 15/547 (light gray)







MX-40B Matrix Tray Changer

(shown with PlacePro Model 7100)

Feeder Capacity	80 Trays (JEDEC Standard)
Feeder Trade-Off	Occupies 40 to 44 Feeder Slots
Tray Change Time	4.3 seconds (adjustable from 3 to 8 seconds)
Tray Sizes (JEDEC)	200 x 115mm (min) to 335 x 140mm (max) 7.87 x 4.53" (min) to 13.19 x 5.51" (max)
Tray Sizes (Custom)	200 x 115mm (min) to 335 x 310mm (max) 7.87 x 4.53" (min) to 13.19 x 12.20" (max)
Feeder Mounting	Rear Mounted

Figure 2 - MX-40B Matrix Tray Changer Illustrations and Dimensions

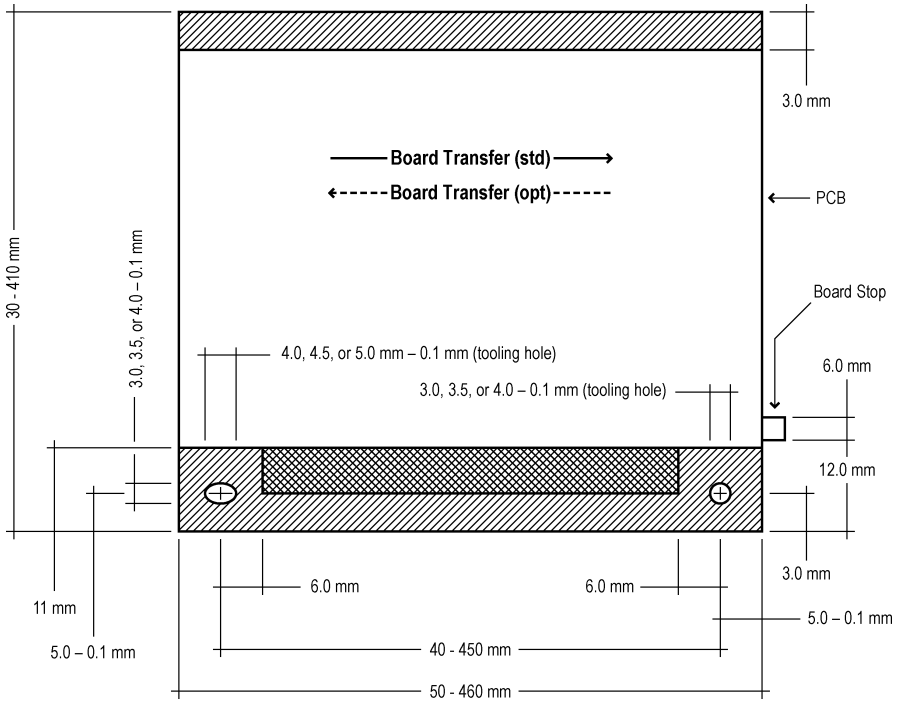


Figure 3 - PCB Unplaceable Area (using pin positioning)

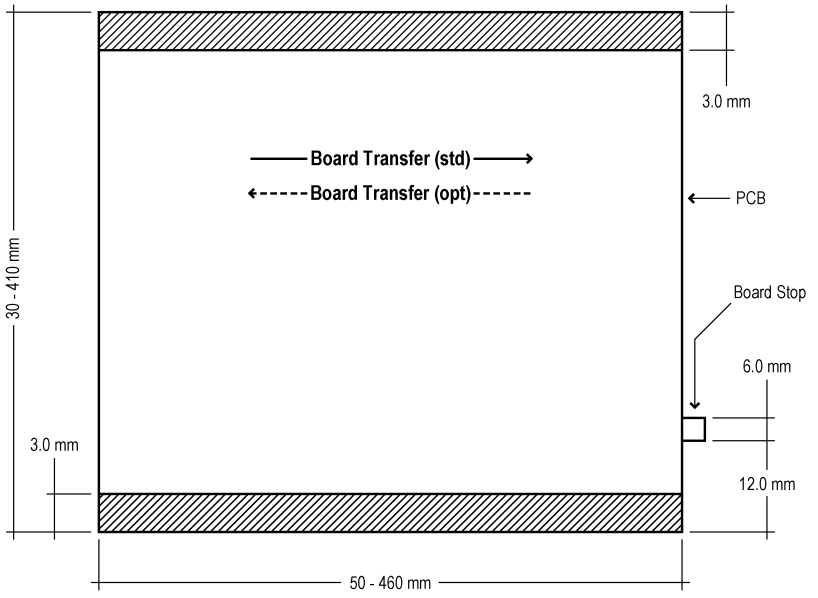


Figure 4 - PCB Unplaceable Area (using edge positioning)

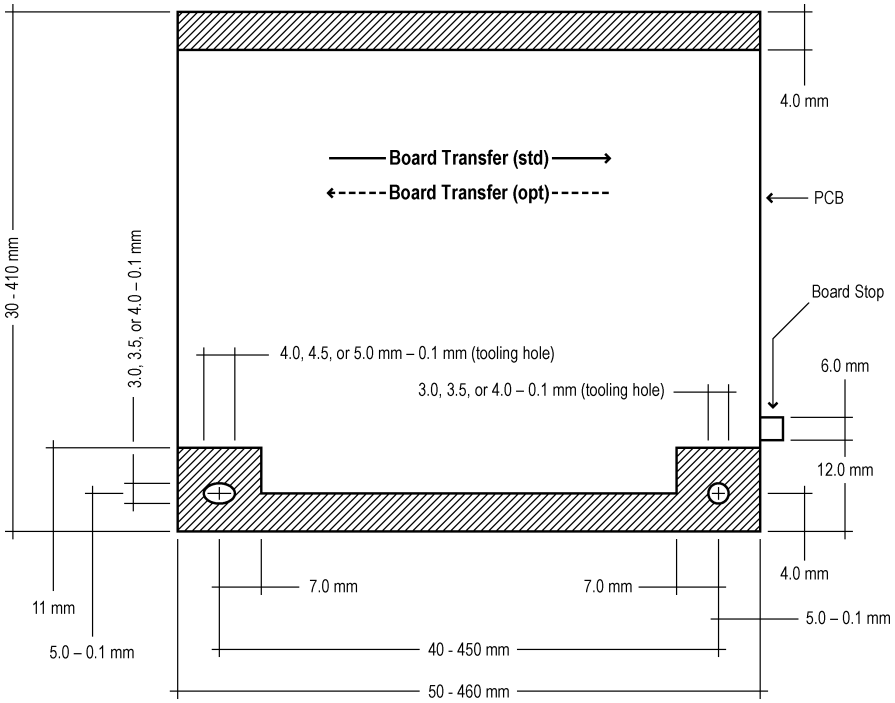
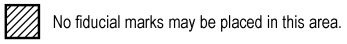


Figure 5 - PCB Fiducial Mark Unallowable Area (using pin positioning)



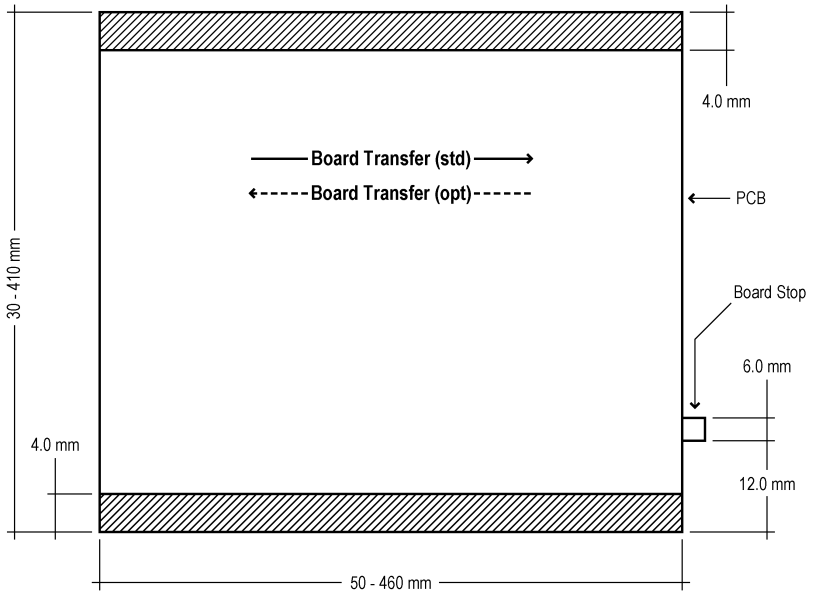


Figure 6 - PCB Fiducial Mark Unallowable Area (using edge positioning)

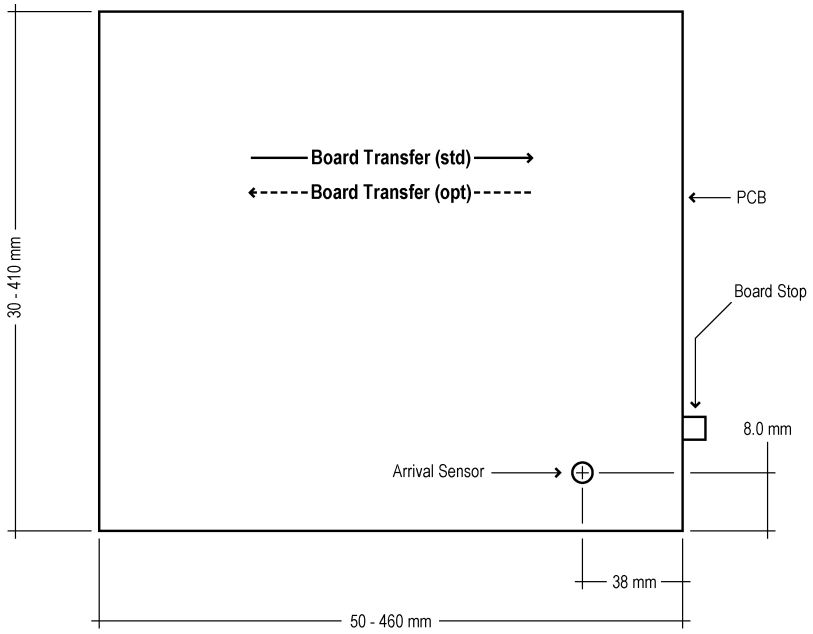


Figure 7 - PCB Arrival Sensor Location

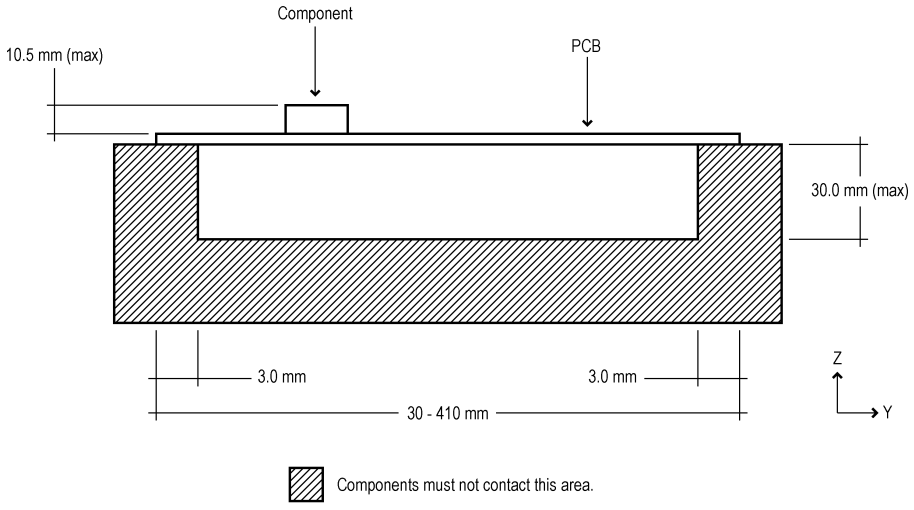


Figure 8 - Above and Below Board Clearance

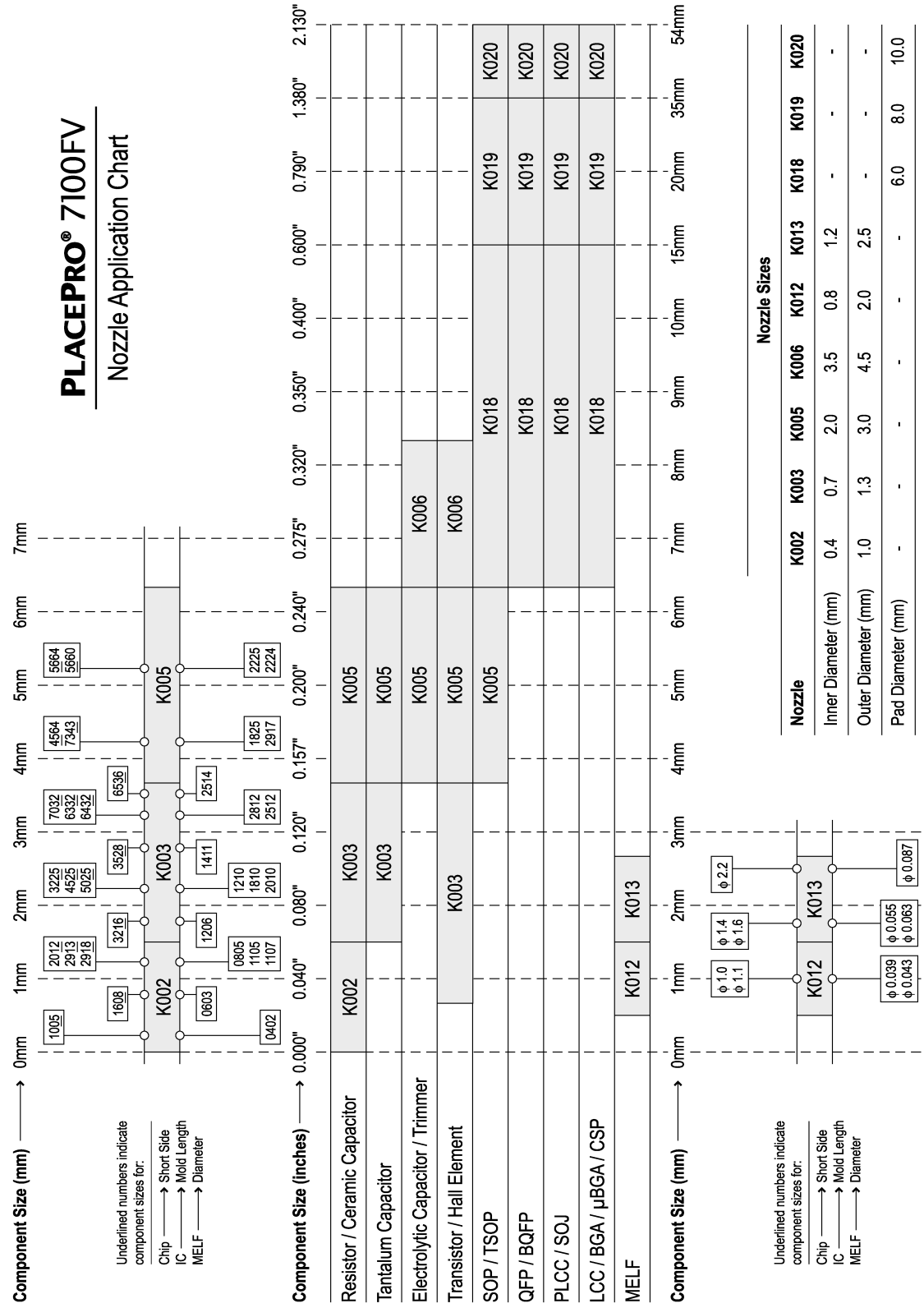


Figure 9 - PlacePro® 7100FV Nozzle Application Chart