VCD/Sequencer 8
Axial Sequencer/Inserter
(6241F)

CE

Universal Part Number: GS-394-02
Reference Configuration #47609501
Issued: 04/03

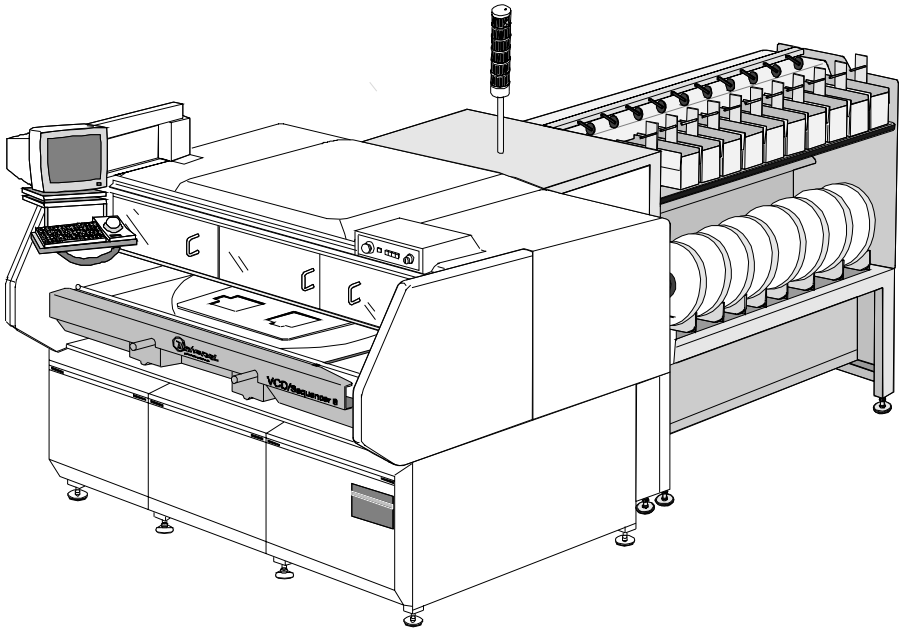
General Specification

Insertion Machine Division of Universal Instruments
Automation in Electronic Assembly

Universal

Insertion Machine Division
Product Line

VCD / Sequencer 8
Axial Sequencer / Inserter
6241F
Manual Board Load "Non Pass Through"
Not CE-Compliant



VCD/Sequencer 8 Features

- High-performance insertion machine with insertion rates up to 25,000 components per hour, and insertion PPM of 200 or better
- Insertion span capabilities from 5mm (0.197") to 24.13mm (0.950") with standard tape input, depending on tooling selected
- VME-based control system with embedded P.C.
- IM-Universal Platform Software with graphical user interface
- Servo-motor driven insertion head, clinch, component centering, insertion span axis, sequencer chain, and X and Y table
- Uninterruptable Power Supply (UPS) included with each machine
- Expandable to 220 component inputs

Universal

Insertion Machine Division
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Axial Sequencer / Inserter
6241F
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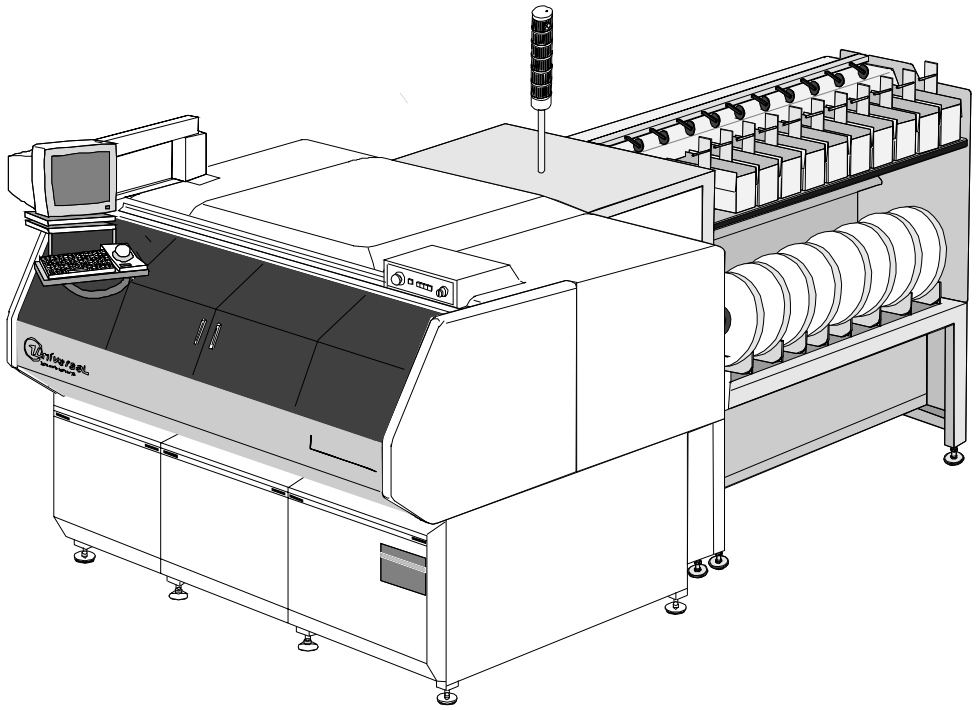
CE-Compliant



Non-Pass Through CE Machine Highlights

- Powered covers leave operator's hands free to load/unload boards
- New circuitry improves interlock recovery time optimizing throughput
- Compatible with existing "stand alone" workboard holders
- Less floor space required compared to machine with automatic board handling

Universal

Insertion Machine Division
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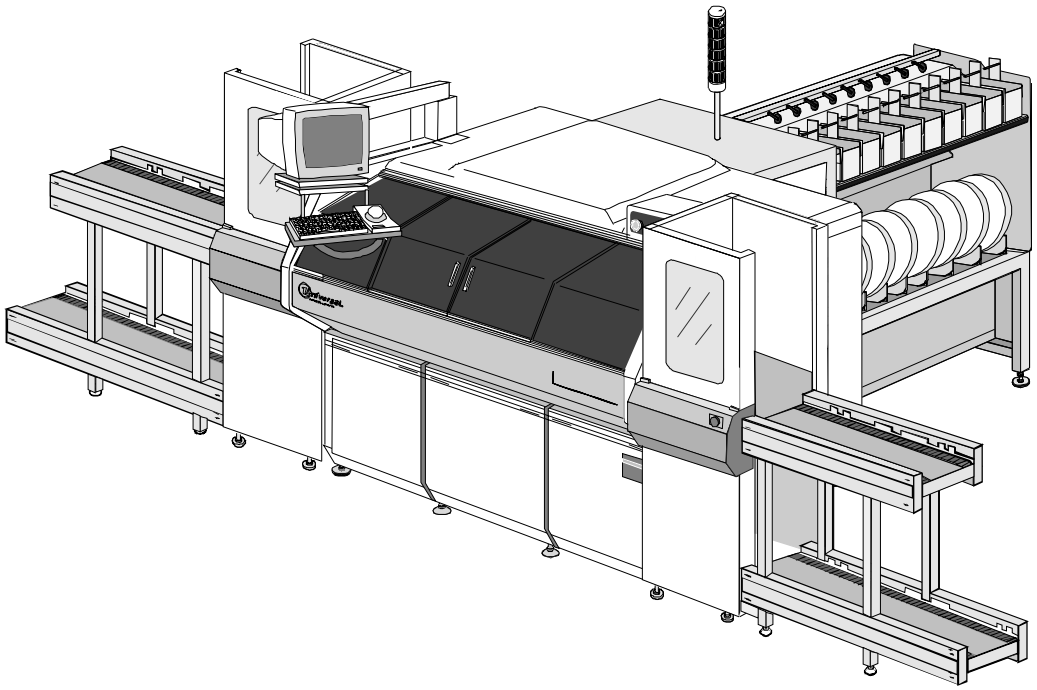
VCD / Sequencer 8
Axial Sequencer / Inserter
6241F

(Shown as Loader/Unloader: Magazine-to-Magazine Configuration)

CE-Compliant with Optional Protective Covers



Board Handling System Configurations

All the features of VCD/SEQ 8 with manual board handling, plus...

- Fast, Reliable PC Board Transfer
- Automatic Internal Board Handling System (BHS)
- Magazine Loader/Unloader, with Motorized Magazine Staging Buffers
- CE Mark

Contents

Contents

All specifications are subject to periodic review and may be changed without notice. Illustrations may not be drawn to scale.

Indicates a change from the previous edition of this document. Bar alongside text indicates entire section reflects change from the previous edition.

Glossary of Acronyms and Specialized Terms

Acronym/Term	Meaning
AC	Alternating Current: type of electrical power generation
APE	Advanced Product Editor (Universal brand name)
ASCII	American National Standard Code for Information Interchange
AWG	American Wire Gauge: wire size standard
BEC	Board Error Correction (Universal brand name)
BHS	Board Handling System: means of transporting PCBs
CAD	Computer-Aided Design
CD-ROM	Compact Disc-Read Only Memory
CE	Conformité Europeanne: European safety standard
CFM	Cubic Feet per Minute: measurement of air flow
CTA	Component Transfer Assembly
DC	Direct Current: type of electrical power generation
ERV	Expanded Range Component Verifier (Universal brand name)
GEM	Generic Equipment Model
GS	General Specification (Universal brand name)
GUI	Graphical User Interface
HSMS	High Speed SECS Message Service: implements SECS2 messaging over a network link
Hz	Hertz (cycles per second): measurement of electrical frequency
IM	Insertion Machine: equipment for through hole component insertion
IMC	Insertion Machine Components
IM-UPS	Insertion Machine-Universal Platform Software (Universal brand name): operating software for Universal Series 8 through hole equipment
I/O	Input/Output
IP	Index of Protection: resistance of machine to contamination by foreign objects
LED	Light Emitting Diode: electrical component
MIT	Machine Interface Translator (VME to I/O bus)
MMIT	Mini Machine Interface Translator (VME to I/O bus)
OS/2®	Operating System 2 (IBM Corp. brand name)
PAC	Positive Axis Control
P.C.	Personal Computer
PCB (or PC board)	Printed Circuit Board
PPM	Parts Per Million: measurement of machine performance
SCFM	Standard Cubic Feet per Minute: measurement of air flow
SECS	Semiconductor Equipment Communications Standard: interface between host computer and assembly machines
SEMI	Semiconductor Equipment & Materials International
SMC	Surface Mount Components
SMEMA	Surface Mount Equipment Manufacturers Association
TCP/IP	Transfer Control Protocol/Internet Protocol: network communication protocol
UCT	Universal Control Terminal (Universal brand name): personal computer for operating IM equipment
UICS	Universal Instruments Control Software (Universal brand name)
UPS	Uninterruptible Power Supply
VA	Volt-Amps: measurement of electrical power consumption
VAC	Volts Alternating Current
VCD	Variable Center Distance
VDC	Volts Direct Current
VGA	Video Graphics Array: type of CRT monitor standard
VME®	Versa Module Eurocard (Motorola brand name): industry standard for 32-bit computer bus

Introduction

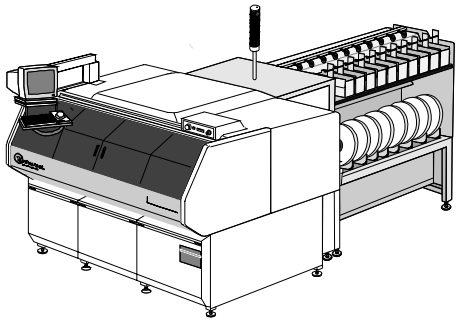
The VCD/Sequencer 8 (Model 6241F) automatically sequences and inserts class A—52mm axial leaded components into printed circuit boards (PCB).

The VCD/Sequencer 8 is available with automatic PCB handling, Loader/Unloader. See Appendix A for Board Handling details (Mag-to-Mag, Raw Card-to-Mag and Destacker-to-Mag).

Insertion rates up to 25,000 components per hour can be achieved by the VCD/Sequencer 8. (See "Insertion Rate Determination.")

Selected configurations of the VCD/Sequencer 8 are CE marked.

Functional Description



The VCD/Sequencer 8 is a single head axial lead component sequencer/inserter that automatically inserts components from taped input into printed circuit boards (PC boards). A product (pattern program) is created with information pertaining to the components, PC boards, and processing requirements. When this product is loaded, machine operation can be started.

The VCD/Sequencer 8 sequencer modules contain dispensing heads which cut axial lead components from input tape reels or ammo packs and place them on the sequencer chain. The component sequence is predetermined by a pattern program (product). The components are then transferred to the VCD head chain for delivery to the insertion tooling. The pattern program controls the location and orientation of component insertion.

After insertion through the PC board, the component leads are cut and formed (clinched) to mechanically secure them to the board. The process continues until the product is completed and all required axial components are in place. When the pattern program is complete, the PC board is removed or transferred from the machine.

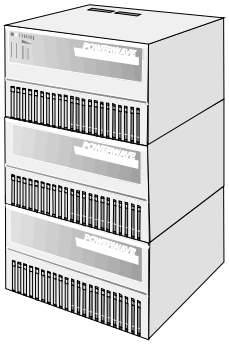
Standard Features

Machine Control System

VME Machine Controller

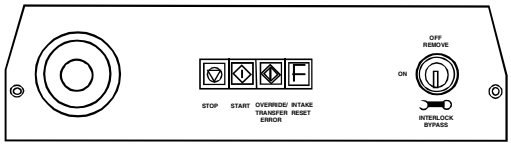
The VME machine controller is a rack-mounted multi-processor system with an embedded Intel-based P.C. to support the main operator interface. The operator interface is provided through a color monitor, keyboard, and trackball. The main machine controller is a Power P.C.-based unit, which handles all machine functions and timing.

Two four-axis micro-processor based motion controllers are used for Positive Axis Control (PAC) of the insertion head, cut and clinch, sequencer chain drive, and X-Y positioning system. A third four-axis motion controller is used with the optional loader/unloader.



Uninterruptible Power Supply (UPS)

External to the machine, the Uninterruptable Power Supply provides filtered, stable, and continuous power of 230 VAC to the machine. In the event of a power interruption, its fully-charged battery can run the machine for up to 10 minutes. This allows time for a controlled, orderly, manual shut-down of the machine.



Operator Push Button Panel

The PB panel includes the Emergency-Stop switch, the Interlock Reset button, the Start and Stop buttons, the Override or Transfer Error button, and the Interlock Bypass Key Switch. All other machine functions are accessed through the graphical user interface via the keyboard, trackball, and monitor.

Rear Start/Stop Switches

Start/stop switches are located at the transfer cabinet adjacent to Sequencer Module 1 and at the last sequencer module. These are conveniently located to minimize downtime when reloading components.

Network Kit

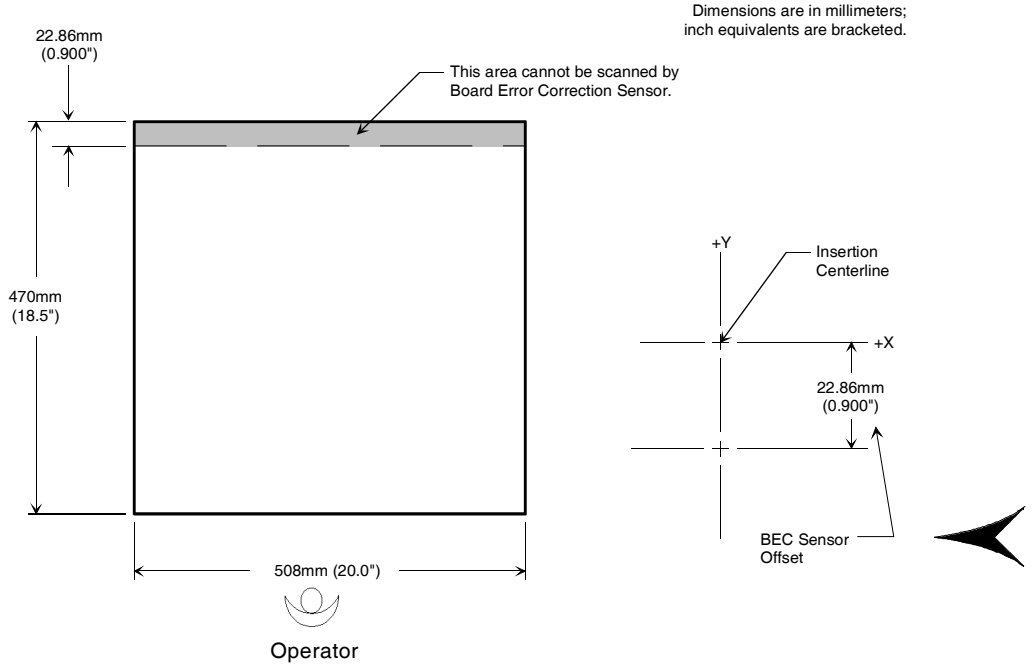
Standard with each machine is a package for computer network connection capability that includes an Ethernet network card and IBM OS/2 TCP/IP client software. This provides high speed, reliable communications and data transfer to all computers connected to the network.

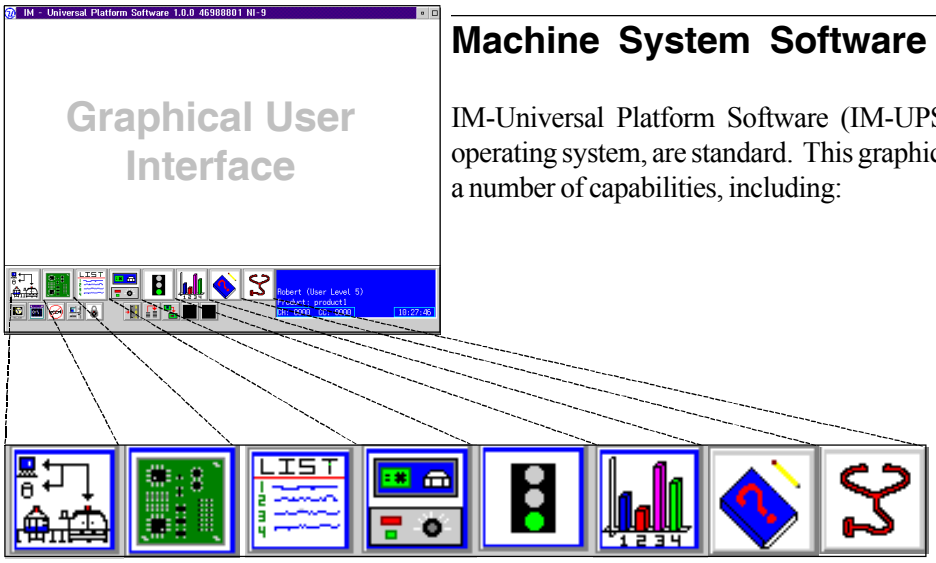
Board Error Correction (BEC)

Board Error Correction allows the positioning system to compensate for lead hole location variations between printed circuit board lots. A light source and sensor are used to sense the variation and make these corrections.

Board Error Correction Detection Area

Due to the position of the Board Error Correction sensor relative to the insertion point, there is an area which cannot be scanned by the sensor. The non-scannable area is at the rear of the positioning system regardless of rotary table rotation.





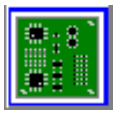
Machine System Software

IM-Universal Platform Software (IM-UPS), and an OS/2 WARP operating system, are standard. This graphical user interface provides a number of capabilities, including:

System Setup Icon

System Setup

- Machine Configuration — User configuration of machine options, such as board handling and tooling.
- Event Configuration — Configuration of events for display and control of machine status light.
- Security may be configured based on user/function.



APE Icon

Advanced Product Editor (APE)

- Graphical Program Generation and Editing — Component location can be programmed/edited in either text or graphical format. Graphically displays all component insertions relative to PC board.
- Import of CAD Data for Program Generation (see following section).

Product Changeover Icon

Product Changeover

- Load Product — User selection of previously stored product programs.

Production Control Icon

Production Control

- Counts — Allows setting inserter counts.
- Manual Control — Manually controls (zero, move) all axes of the machine.

Machine Status Icon

Machine Status

- Current Messages — Displays current controller messages and events.

  Product Status — Displays status of running product.
- Analytic Information:
  - Discrete I/O — Ability to read each input and set each output individually.
  - Message History — Ability to view message log.
- Operations — Sets machine modes: Step, Single Cycle, Insert, Pattern.
- Error Recovery — Recovery processes for operational errors, i.e., mis-insertion.

Management Information Icon

Management Information

- Timers — Collection and display of machine timers.
- Counters — Count of machine events: insertions, insert errors, boards, Bad Board Reject, Board Error Correction, circuits.
- Component Data — Counts by component ID: placements, errors.

From these databases, a variety of reports can be created.

IM Diagnostics Icon

IM Diagnostics

- IM Diagnostics — Ability to exercise machine sub-systems on an individual or combined basis outside of machine control software.
- B.E.C. Set-Up/Analysis.
- Machine Set-Up Support.

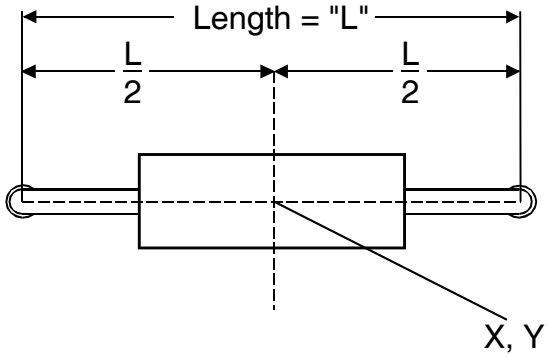
On-Line Documentation Icon

On-Line Documentation

- IM-UPS documentation is available on-line.

CAD Data Requirements

ASCII File Format — Incoming CAD files must conform to the American National Standard Code for Information Interchange (ASCII). In order to accommodate a wide variety of CAD file formats, the APE uses either a generic columnar or separator data translation technique. All data contained in the CAD file is identified by a position in a definition created by the user.



Centroid (Top View)

CAD File Requirements

X Coordinate: The X centroid coordinate location on the board.

Y Coordinate: The Y centroid coordinate location of the component insertion.

Theta: The rotation of the component on the board.

Insertion Lead Span: The distance between the centerlines of the component leads.

Reference ID: The name assigned to the component makes it unique to all other components in the product.

Component ID: The name of the component as it is found in the component database.

Alias ID: The name of a component in the database to which this component is aliased (optional).

BOM-CAD Link: A user-defined alphanumeric string which links a line of data in the CAD file to a component ID in the Bill of Material (BOM) file.

Ignore: If the CAD file contains data that does not fit any of the fields, IM-UPS may be configured to ignore this data.

A sample CAD file format is given with a brief explanation. This file format is provided for reference only and is an example of a typical CAD output.

This is a typical CAD file which may be output from a wide variety of different CAD systems.

This file includes SMC and IMC information, with component information stored for the IMC components. The component information for Surface Mount components will be obtained from the master .DEF files. IMC component information will be obtained from this file and placed into the Component Library.

Information in the CAD file:

A = REFERENCE DESIGNATOR
B = X COMPONENT CENTROID COORDINATE
C = Y COMPONENT CENTROID COORDINATE
D = ORIENTATION
E = PART NUMBER/COMP ID
F = SPAN
G = NUMBER OF LEADS
H = AXIAL BODY DIAMETER
I = MACHINE TYPE
J = DIP SOCKET
K = AXIAL LEAD DIAMETER

```
**  <= <= <= <= <= <= <= <= <= <=  NOTE 1  => => => => => => => => => =>  **
**  Each line represents a placement/insertion on the board                **
*************************************************************************
  A       B       C    D          E          F    G    H    K        I   J
  |       |NOTE 3 |    |  |       |          |  |    |    |  |        |   |
000000000011111111112222222222333333333344444444445555555555666666666677777777777
123456789012345678901234567890123456789012345678901234567890123456789012345678901
*************************************************************************
C1        276    586   90  1206-CAP                                      *
IC1      5170    887   90  8-SOIC                                        *
C2        276   2288   90  1206-CAP                                      *
C3        276   2387   90  1206-CAP                                      *
C4        576    687   90  1206-CAP                                      *
IC2      1900   3200  270  DIP-300-16      300   16          DIP        *
IC3      4000   7000   90  DIP-300-8       300    8          DIP        *
T1        877   2789    0  SOT-89                                       *
C5        877   1987  180  805-CAP                                      *
C6        877   2087  180  805-CAP                                      *
J1        180   2250  180  TEKA-CONN                                    *
IC4      3000   1600    0  68PLCC                                       *
IC5      2000   5250    0  DIP-600-24      600   24          DIP        *
XIC5     2000   5250    0  DIP-600-24-SOC  600   24          DIP SOC    *
T2        877   2288   90  SOT-89                                       *
R1       3550   3200    0  RES-RAD-50      200    2          RAD        *
IC6       877   2488  180  14-SOIC                                      *
IC7      1177   2488  180  14-SOIC                                      *
R3       7000   5000    0  RES-1/4W        500        095  025  AX       *
IC9      3520    950   90  8-SOIC                                       *
R4       5555   4444  180  RES-1/8W        300        080  020  AX       *
C7       3900   6690  270  CAP-RAD-25      100    2          RAD        *
R5       9000   8000   90  RES-RAD-25      100    2          RAD        *
CR1      3100   8500  270  DIODE-AX-2      600        100  025  AX       *
IC10     1177   2388   90  20-SOIC                                      *
```

NOTE 4

NOTE 5

NOTE 6

Sample CAD File Format

Sample CAD File Format Notes

1. Maximum file width can not exceed 256 columns.
2. Headerlines, often output by the CAD system, may be used. The CAD Translator allows the user to define the quantity of lines containing the file header. This information is for operator use only and is not used by the CAD Translator.
3. **Format Type:** The format of file. This can be either Table or Separator format (Table is the default).

Table format uses predefined columns for each data type. For example, the reference ID column may be defined as 10 characters. The actual reference ID in the CAD file can contain up to 10 characters. It does not matter if there is data in every column.

Separator format uses a character (comma, space, dash, etc.) to separate data fields. Each line of data must contain the same data types in order for auto detect to work.

# of Fields: The number of fields in the file.

# of Lines: The total number of lines in the file.

4. The CAD file must be devoid of all special control characters such as Tabs. (Note that special characters shown are for illustration purposes only and cannot be contained in the actual CAD file. These characters include boxes, arrows.)
5. CAD data is limited to one component per data file line or row. Additional components are specified on additional lines of the CAD file. There must be no blank lines or rows between any rows of CAD data. Markers such as {EOF} must not be present at the end of the CAD file.

Additional APE Features

- Import of Existing UICS Patterns — UICS patterns are converted to IM-UPS products.
- Program Optimization — Optimization via "Nearest Neighbor" insertion path.
- Component Identifier (part number) and Reference Designator are now included in Product Information — the addition of component identifier and reference designator in programs supports improved status message reporting and management data tracking by component identifier.

Off-Line Pattern Programming Specifications

The creation of a "product" (pattern program) can be completed on-line, utilizing the machine's embedded P.C., or off-line, using a suitable stand-alone P.C. loaded with IM-UPS software.

Note**:** IM-UPS software supplied with the machine is licensed only for use in the machine. Software for use in an off-line P.C. is available at an extra cost option.

Universal recommends pattern programming be generated off-line to eliminate production interruptions. This can be done in one of two ways:

- Dedicated P.C. running the OS/2 operating system and Universal's IM-UPS software.
- A standard Windows P.C. with Universal's Virtual P.C. (VPC) and IM-UPS.

The Virtual P.C. option is a Windows application that creates and emulated P.C. using software. This emulated P.C. runs OS/2 and IM-UPS just as a standard P.C. would. VPC runs, along with other standard Windows applications such as the Microsoft Office suite, on a standard desktop PC. Some of the advantages to this are;

- OS/2 and IM-UPS can run along with standard Windows applications on the same P.C.
- No complex configuration (partitioning and dual boot) is required.

The VPC option is available from Universal as a software package that can be installed on any P.C. meeting the minimum standards described below. Universal also offers a package that includes a new P.C. with the Virtual P.C. and IM-UPS pre-installed.

Minimum Requirements for a Dedicated (OS/2) only P.C.:
Minimum P.C. requirements for creating the product off-line (pattern programming) include:

- 486 processor
- 12 megabyte memory
- CD-ROM drive
- IBM OS/2 Warp 4.0
- 200 megabyte available disc space, on OS/2-compatible partition

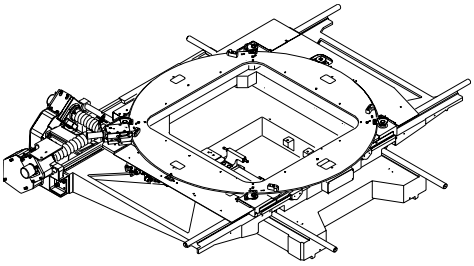
Minimum Hardware/software requirements to run the Virtual P.C. (OS/2 and Windows) option:
Software requirements:

- Windows 98 (restrictions apply)
- Windows ME
- Windows NT 4
- Windows 2000
- Windows XP

Hardware requirements:

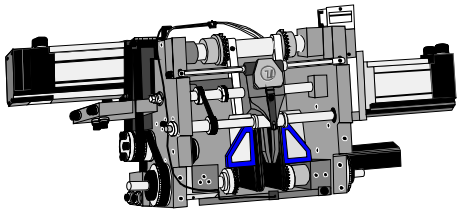
- 256 MB memory
- 500 MHz or better Pentium class processor with level 2 cache or better

Machine Mechanical Systems



X-Y Positioning System

The X-Y positioning system locates the printed circuit board under the insertion tooling and may be equipped with a rotary indexing table that indexes in 90° increments, from 0° to 360° in a clockwise rotation. When the machine is configured with automatic board handling, the table can rotate a full 180° or 270° without 90° stops. This rotary table is air motor driven under pattern program control and requires less than one second to execute each 90° rotation.



Insertion Head

The insertion head includes the necessary tooling for cutting components from the head chain, forming the leads, and inserting them into the PCB, at rates up to 25,000 components per hour.

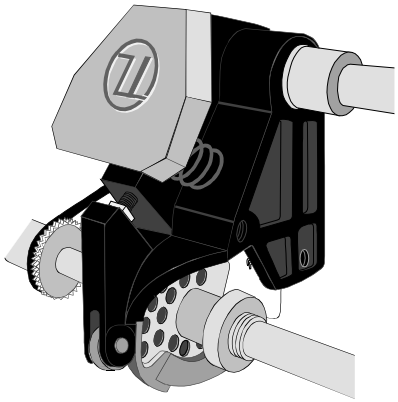
Close coupled software provides controlled acceleration/deceleration and velocity during the insertion process for increased reliability and reduced noise.

The machine handles varying component body diameters by software selectable depth stops via the Advanced Product Editor and based on component size, programmable in 0.03mm (0.001") increments, from 0mm to 5.49mm (0" - 0.216").

Insertion Hole Span

Both the head and clinch component insertion spans are automatically calculated by the Advanced Product Editor, and based on lead diameter and center to center hole spacing on the PC board. Insertion hole span range is dependent upon head tooling configuration.

Refer to Technical Specifications section for insertion hole span ranges.



Component Centering

Before insertion into the PCB, each component in the head chain is accurately centered. Component centering is achieved by using a servo driven cam system. The unique cam design allows both rapid positioning of the centering fingers and precise centering action prior to component insertion.

The centering device is belt driven by the tooling insertion axis, and requires no air cylinders or sensors to operate. Only four simple set-up adjustments are required.

Insertion Tooling

Universal offers two types of insertion tooling: standard and 5mm. Tooling type is selected to provide optimum performance depending upon board density (footprint), component lead wire size and material, component body size, hole spans, and board configurations.

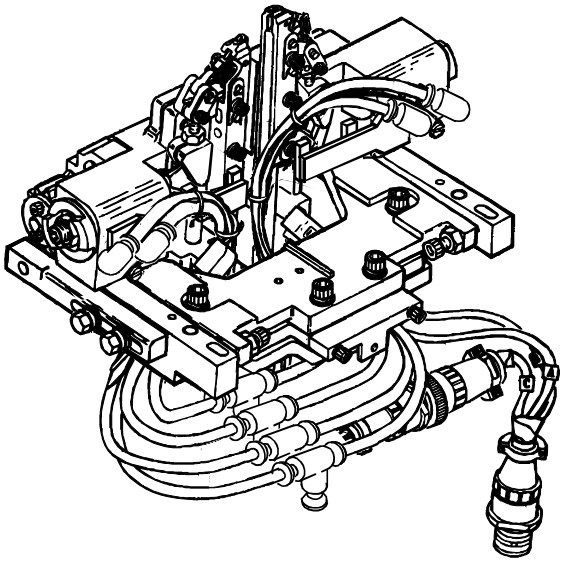
Compared to pre Generation 8 machines, the current tooling has been designed for improved reliability, longer tooling life, and better handling of bent lead component input. This tooling incorporates generous amounts of carbide inserts and has increased cross-sections for greater robustness.

Refer to Technical Specifications section for tooling specifications.

Above board clearance beneath the retracted tooling is approximately 20.32mm (0.800"). See Tooling Footprints and Component Clearances sections relating to tooling footprints.

Scrap Lead Removal

Scrap leads remaining in the head chain clips after component insertion are released automatically in the chain-to-chain cabinet before the chain returns to pick up new components. Scrap drops into a waste basket in the left bottom side of the transfer cabinet.



Cut and Clinch

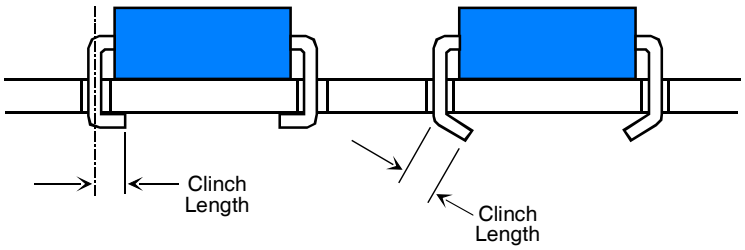
Once a component has been inserted into the PCB, the cut and clinch mechanism clinches the two leads to a repeatable angle, and then cuts the leads to an adjustable length. The cut and clinch contains a servo-driven rocker/slide up/down mechanism and provides PC board support during the insertion cycle, then trims and clinches the component leads to the underside of the PC board with a pneumatic actuated cutter.

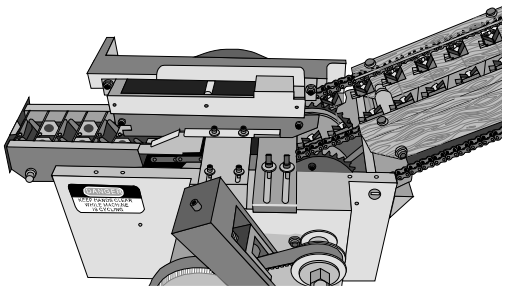
Two-step operation allows the clinch to return to its lowest position during a table rotation and only half the distance during the insertion process, saving time and wear on mechanical parts. Insertion span is servo controlled over the same span as the insertion head, and left and right anvils are coupled.

Clinch angle is inward and may be adjusted over a range from 0º to 45º from the PC board bottomside. Clinch lead length is adjustable from 1.28mm (0.050") to 1.80mm (0.071"). Lead length is measured from the center of the insertion hole to the end of the lead. The tolerance on the lead length is ±0.29mm (0.011").

The VCD/Sequencer 8 cut and clinch uses a dual lead continuity check to verify component insertion. The failure of either lead to pass through the PC board and be clinched will generate an insert error and cause the machine to stop.

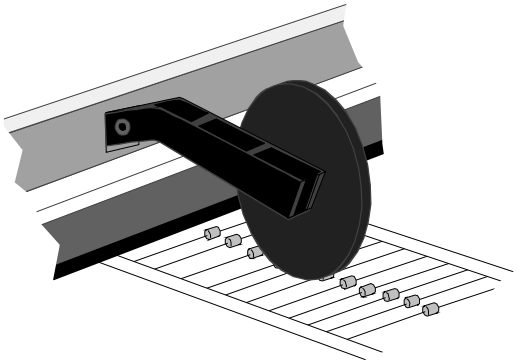
Finished Clinch Example





Chain-to-Chain Transfer

The chain-to-chain system transfers components from the sequencing chain to the insertion head chain. The design minimizes set-ups and adjustments and uses a servo motor belt drive system, with position feedback encoder, to provide a highly reliable component transfer. Automatic belt tensioning assures that belts are properly adjusted.

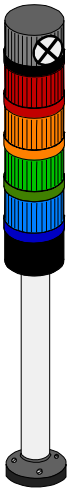


Low Part Sensing/Display

The low part sensing feature provides the operator with a visual alarm display whenever any input tape station nears empty within each add-on module. Each input station contains a roller-type sensor flag assembly that interrupts a light beam when the tape runs out. The main machine tower light illuminates, and an audible alarm is sounded, when a low part condition is sensed. The tower light is reset when a new reel or box of components is installed and the sensor is reset on top of the new tape. In addition, an error message is displayed on the monitor to inform the operator of the location of the low part condition.

Scrap Tape Removal

The two scrap tapes from each dispense head drop down into the removable scrap bins located beneath the dispense heads. These scrap bins are open on both ends so that tape can be swept through all add-on modules and removed in one location.

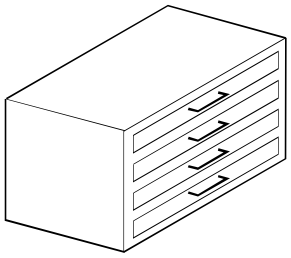


Machine Status Light/Audible Alarm

The machine status light/audible alarm indicates the status of machine operation. Each of the lights are user configurable via the machine software.

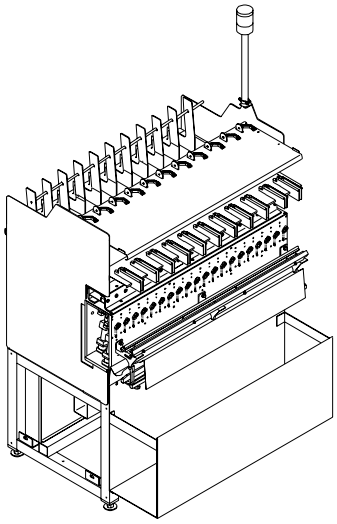
- Red
- Yellow
- Green
- Blue
- Audible alarm

Tool Kits



- A kit containing basic hand tools and common hardware items is included with each machine.
- An optional Site Calibration Tool Kit contains special tools required for machine calibration, only one kit is required per customer site.

Optional Features

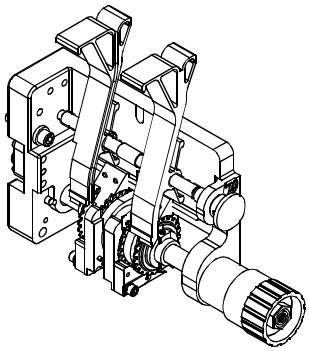


Add-On Sequencer Module

The capacity of each add-on module is 20 dispensing stations, for processing 20 discrete component types or values. Each station must be equipped with a dispensing head. An unused dispensing station does not affect normal machine operation, but must contain a blank dispensing head.

All add-on sequencer modules are identical. Interface cables and pneumatic connections are "daisy-chained" from module to module. This speeds installation and simplifies trouble-shooting.

When a head runs out of components, a "pop-up" screen is displayed on the monitor, indicating which head needs to be reloaded.



Dispensing Heads with Optical Refire

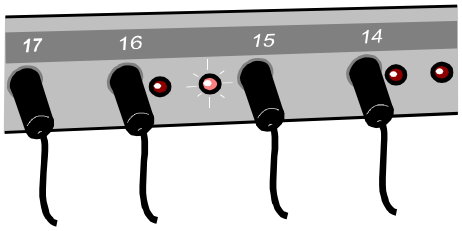
The VCD/Sequencer 8 uses rotary dispensing heads to cut and drop components on the sequencer chain. Rotary dispensing heads are available in two models: 5mm (0.200") pitch and 10mm (0.400") pitch, with optical refire for each of the pitch variables.

Dispensing heads are not included with add-on modules and must be ordered separately to meet individual machine requirements.

The rotary dispensing head has several unique features:

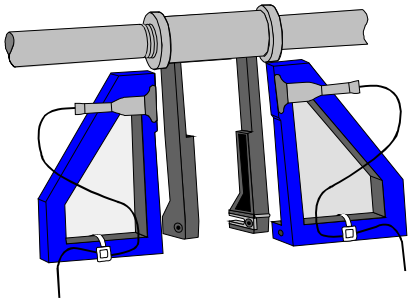
- High operating speed of 25,000 cycle/hour.
- Input tape class changeover requires 30 seconds by adjusting the input tape guides.
- Only one cut component is staged during component load, reducing scrap and simplifying changeover.
- Symmetrical cutter provides two cutting surfaces for an increased life.
- Low friction assembly requires minimal lubrication.
- Tape guide setting with lead screw allows fine adjustment of tape guides.
- Detent provides a method of determining component position.

The optical refire circuit in the dispensing head senses a missing component from the input tape and recycles (refires) the dispensing head index mechanism to bring a component into position for programmed dispensing. Because of its ability to cycle through blank areas of the input tape, it reduces the need for operator attention, thus increasing the effective output rate. This refire feature is most useful when processing pre-inspected component reels, in which gaps are left because of the removal of defective components.



Each refire dispensing head is equipped with a light source and an optical sensor. As a taped component is indexed into position for dispensing onto the conveyor chain, one of its leads interrupts the light beam.

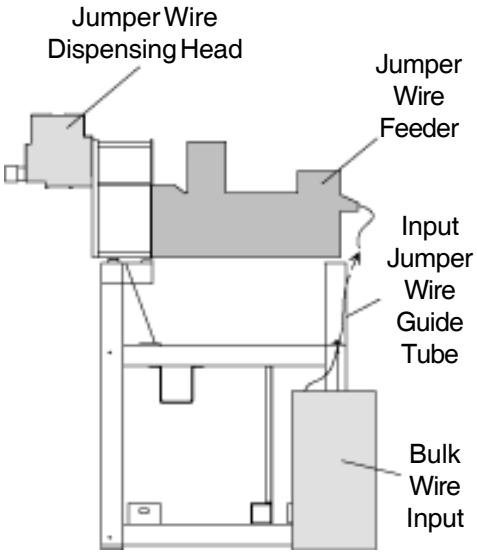
If the light beam is not interrupted, a “part missing” signal is generated causing the dispensing head to automatically index on the next machine cycle which requires a part from that head. This “refire” action repeats until a component is detected at the dispensing position or a programmed maximum count is reached. Any missing components in the input tape will cause refiring of the dispensing head, reducing effective machine cycle rate.



Expanded Range Component Verifier

The Expanded Range Component Verifier, Model 2864A, provides for the on-line verification of component value and polarity. It is capable of verifying most axial leaded components including capacitors (value only), refer to GS-167, "Expanded Range Component Verifier," for specific component values. The verifier station is located on the insertion head assembly. Verification parameters are entered as part of the pattern program commands. The verifier halts the machine for components failing verification and allows them to be replaced at the manual load/replace station of the insertion head if the REPAIR function is selected.

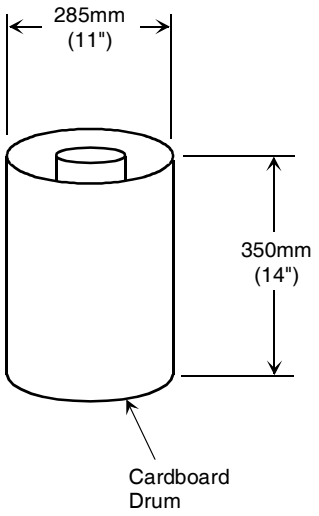
Using the verifier option greatly reduces the possibility of inserting defective, out-of-sequence, or incorrectly oriented components.



Jumper Wire Dispenser System

A jumper wire dispensing head and feeder assembly included in this option processes jumper wires from a continuous spool of wire, eliminating dispensing from reels of previously taped and reeled jumper wires. It dispenses accurate lengths of cut wire and conveniently changes to various wire gages and lengths. It is available as a factory installed option and as a retrofit kit. **A maximum of two Jumper Wire Dispenser Systems may be installed in any machine configuration.**

The Jumper Wire Dispenser System operates by drawing wire from bulk input; a cardboard drum package works best. The wire feeder assembly straightens and then feeds the wire to the dispensing head. Pattern program control cycles the dispensing head, cutting a length of wire from the continuous strand, and dispensing it onto the sequencer chain.



Wire Input — Quality of jumper wire input is critical to reliable machine operation. The wire must be able to be drawn from its package without tangling and without excessive drag. The preferred package is a cardboard drum measuring 350mm (14") high by 285mm (11") diameter which may be placed on the floor next to the machine.

Wire is also available on reels, and the optional dereeler assembly must be purchased to allow use of small reels up to 178mm (7") diameter. There are some potential issues when using reel type packaging:

- The optional reel holder will work with reels up to 178mm (7") diameter. If a larger reel will be used, the wire must be able to feed smoothly if the reel is placed directly on the floor.
- Smaller reel packages require more frequent changeover.
- Some types of reel packages will not feed properly and may not allow the machine to run at all.

The suggested source for wire input is Hitachi Cable America Inc. (White Plains, NY; 1-800-394-0234). Specify part number "1TPA 0.60***5BP". This part number indicates 0.60mm diameter (0.024") solder coated copper wire in a 22 kilogram (approx. 48 pound) cardboard drum package.

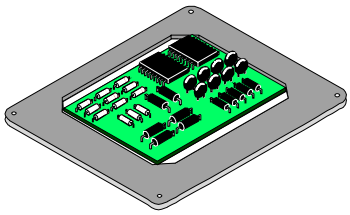
The Hitachi wire is also available through Universal's spare parts division by ordering Universal part number 45126001.

Cut wire length — Class A: 50.80mm ±0.25mm (2.000" ± 0.010"), with thumbwheel increments of 0.10mm (0.004").

Wire diameter — 0.6mm (0.024") solder coated copper wire is standard. The wire sizes below are tested with the expected results listed. Consult a Universal Sales Engineer for details.

Wire Specifications

Wire Diameter	Tensile Strength	Maximum Elongation	Insertion Hole Span	Comments
0.6mm	27-35 kg/mm^2	4%	5mm-33mm	Recommended for optimal performance
0.5mm	27-35 kg/mm^2	4%	5mm-20mm	Expect higher PPM when insertion span increases to 21mm-33mm range
0.45mm	22-30 kg/mm^2	20%	5mm-20mm	Expect higher PPM when insertion span increases to 21mm-33mm range



Workboard Holder

Workboard holders are required to accurately secure PC boards to the rotary table during the insertion process when manual PCB load/unload is being considered. Universal provides a wide range of workboard holder products which can be ordered separately or with a new machine purchase. When the machine is equipped with internal BHS, a workboard holder is not required.

Automatic Board Handling Configurations

The VCD/Sequencer 8 is available in several material handling configurations (left-to-right, or right-to-left):

- Magazine-to-Magazine (CE-compliant), with extra cost covers.
- Vacuum Bare Board-to-Magazine (not CE-compliant).
- PCB Destacker-to-Magazine.
  - Destacker on 29" Conveyor (not CE-compliant).
  - Destacker on 44" Conveyor (not CE-compliant).
  - Destacker on 58" Conveyor (CE-compliant) with extra cost covers.
- Magazine to PCB Destacker-to-Magazine.
  - Destacker on 29" Conveyor (not CE-compliant).
  - Destacker on 44" or 58" Conveyor. Input PCBs including any installed components can not exceed 25.4mm (1") thickness (CE-compliant with extra cost covers).
- Internal Board Handling System (BHS) - Internal BHS for inline systems integration is also available. Transfer direction may be specified when ordering the machine. The front fixed rail is standard and all operator PC board changeover adjustments are readily accessible.

Rear Monitor

A rear monitor option is provided to allow operators and maintenance personnel to view “on-screen” information from the back of the machine. The rear monitor, which is identical to the front, is set on a pivoting monitor arm attached to the top of the transfer cabinet. The additional screen will aid operators in back of the machine by displaying missing part head locations, as well as other machine status messages. The monitor can also assist in maintenance functions by displaying diagnostic I/O activity.

Host Computer Interface Kit

This kit is used to interface VCD/Sequencer 8 with a Host computer using the SECS/GEM Standard. The Generic Equipment Model (GEM) Standard defines a standard implementation of the SECS II (Semi Equipment Communications Standard 2) communications interface for all semiconductor manufacturing equipment. See SEMI International Standards document E30-93 for details. Note: Requires customer's Host computer to be compliant with SECS/GEM standard SEMI E37, HSMS.

CE Non Pass Through Cover Package

- In normal run mode, front covers open when board is complete to allow PCB unload/load.
- After operator changes the board, a button is pressed to close the covers and reset the interlock and start button is pressed to resume operation.
- The covers may be opened at any time by pressing the stop button then the open cover button.
- The covers may be configured through software to open if an error caused the machine to stop, i.e. missing part or misinsertion.
- Circuitry and software unique to CE NPT cover package improves interlock recovery time after the covers have been opened (interlocks violated) to load/unload the PC board.
- When interlock bypass key is switched to "maintenance mode", air is removed from the cover air cylinders and the covers may be opened and closed manually.
- Compatible with existing "stand alone" workboard holders.

Supporting Documents

GS-061	Lead Tape Reel Packaging of Axial Components, Series 2500
GS-134	Workboard Holders, Series 6810
GS-354-01	Through Hole Design Guidelines
EIA RS-296-E	Lead Taping of Components in Axial Configuration for Automatic Insertion
GS-167	Expanded Range Component Verifier, Series 2860

Technical Specifications

Input Specification

The axial lead components prepared and taped to the requirements established in GS-061 "Lead Tape Reel Packaging of Axial Lead Components," which is an adaptation of EIA standard RS-296-E, may be processed by the VCD/Sequencer 8. The standard input for this machine is Class I.

Class II input may be located in only eight designated stations per add-on module, exclusive of the Jumper Wire option. (See table on following page.)

Class III input is not recommended for use in this machine.

Input stations are designed to accept reel or ammo pack component packages.

Sequencer Input Configuration for Each Add-On Module

Location of Dispensing Stations by Component Class

Station	Class I 5.08mm (0.200") & 10.16mm (0.400") Pitch	Class II 5.08mm (0.200") Pitch*	Notes
1	✓		
2	✓		
3	✓	✓	Without Jumper Wire
3			With Jumper Wire
4	✓		
5	✓	✓	If no Jumper Wire in Station 3
5	✓	✓	If Jumper Wire in Station 3
6	✓		
7	✓		
8	✓		
9	✓		
10	✓		
11	✓	✓	Any Combination
12	✓		
13	✓	✓	Any Combination
14	✓		
15	✓	✓	Any Combination
16	✓		
17	✓	✓	Any Combination
18	✓		
19	✓	✓	Any Combination
20	✓		
With Jumper Wire:		14 stations for Class I only 5 stations for Class I or II 1 station for Jumper Wire only	
Without Jumper Wire:		13 stations for Class I only 5 stations for Class I or II 2 stations for Class I or II	
*10.16mm (0.400") pitch is not recommended.			

Dispensing Head Component Input Specifications

Distance Between Tapes (A)

Class I	52.4mm ± 1.5mm (2.063" ± 0.059")
Class II	63.54mm ± 1.5mm (2.50" ± 0.059")

Wire Size and Component Sizes

	Standard	5mm
Steel Wire Size [1,3] (B)		
Minimum	0.38mm (0.15")	0.38mm (0.015")
Maximum	0.81mm (0.032")	0.81mm[3] (0.032")
Copper Wire Size [1,3] (B)		
Minimum	0.38mm (0.15")	0.38mm (0.015")
Maximum	0.81mm (0.032")	0.81mm[3] (0.032")
Component Body Diameter [4] (C)		
Minimum	wire dia.	wire dia.
Maximum	8.4mm (0.330") Minus 2 times board thickness	8.9mm (0.350") Minus 2 times board thickness
Component Body Length [6] (D)		
Minimum	0mm (0")	0mm (0")
Maximum	15.75mm (0.620")	15.75mm (0.620")

Standard Input Pitch Distances (E)

5.08mm (0.200") or 10.16mm (0.400")

Tape Width (F)

Standard	6.4mm (0.25")

1. Component lead diameters are for optimum performance using the listed tooling. Consult a Universal Sales Engineer for deviations from the figures listed.
2. Increased insertion span is possible with reduction in maximum body diameter and board thickness. Consult a Universal Sales Engineer for optional tooling.
3. When inserting components at 5mm (0.197") and 5.5mm (0.216") insertion spans, maximum lead diameter is 0.61mm (0.024").
4. At 5mm and insertion span, the maximum component body diameter is 2.29mm (0.090").
5. Minimum printed circuit board hole diameter is nominally 0.48mm ± 0.08mm (0.019" ± 0.003") + lead diameter.
6. Body length is dependent on the insertion span. See “Component Body Length Considerations” for additional information.

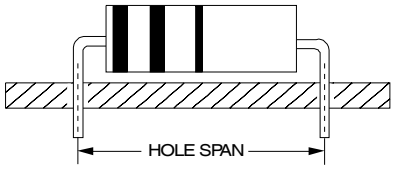
Insertion Head Input Specifications

Insertion Tooling Specification[1]

		Tooling Type	
		Standard	**5mm**
Minimum Hole Span[2] (with minimum lead diameter)		7.62 (0.300)	5.00 (0.197)
Maximum Hole Span[2] (with maximum lead diameter)		24.13 (0.950)	21.59 (0.850)
Steel Wire Lead Size	**Minimum**	0.38 (0.015)	0.38 (0.015)
	Maximum	0.81 (0.032)	0.81 (0.032)
Copper Wire Lead Size	**Minimum**	0.38 (0.015)	0.38 (0.015)
	Maximum	0.81 (0.032)	0.81 (0.032)
Component Body Diameter	**Minimum**	Wire lead dia.	Wire lead dia.
	Maximum[3]	10.69 (0.420) minus 2 X board thickness	11.68 (0.460) minus 2 X board thickness

[1] Dimensions are given in millimeters; inches are in parentheses.
[2] Insertion hole span is defined as the hole center distance.
[3] At 5mm hole spans, maximum component body diameter is 2.29mm (0.090").

Component Body Length Considerations



After the tooling type and the variables have been determined from the Insertion Tooling Specification table, the minimum allowable hole span can be determined for a known body length.

Machine capabilities allow components to be inserted using the minimum hole span formulas below. Due to body length variations, it is recommended to design hole spans greater than the calculated minimum.

Use the following formulas, depending on tooling type -- standard, large lead, 5mm, or 5.5mm -- to calculate the minimum insertion hole span for a known body length. The formulas apply to the body length ranges shown and are based on a ±0.41mm (0.016") component centering accuracy on the input tape. Component centering must meet requirements stated in GS-061.

Minimum Insertion Hole Span Formulas for Maximum Body Lengths

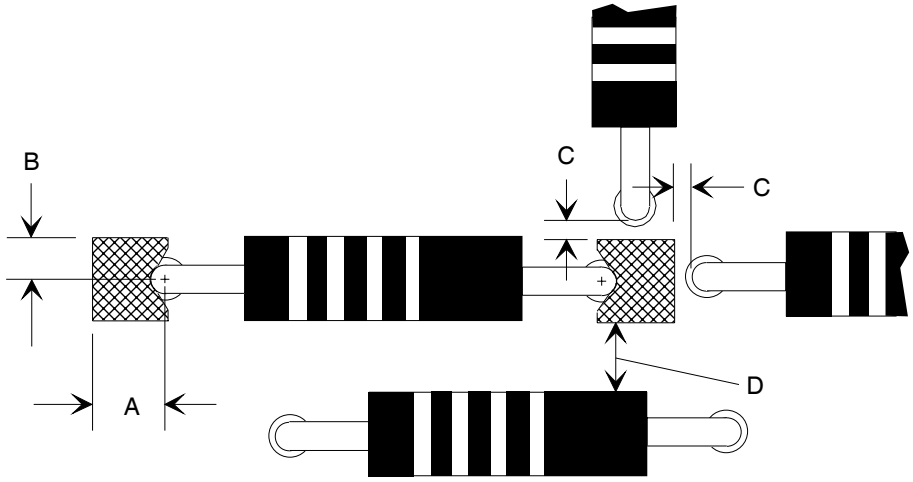
Standard Tooling	[Body Length Range: 0 to 15.75mm (0.620")]
Metric Formula:	Minimum Hole Span = [(Component Body Length[1] x 1.112) + 2.36mm] - Lead Diameter
Inch Formula:	Minimum Hole Span = [(Component Body Length[1] x 1.112) + 0.093"] - Lead Diameter
5mm Tooling	[Body Length Range: 0 to 15.75mm (0.620")]
Metric Formula:	Minimum Hole Span = [(Component Body Length[1] x 1.109) + 1.40mm] - Lead Diameter
Inch Formula:	Minimum Hole Span = [(Component Body Length[1] x 1.109) + 0.055"] - Lead Diameter

[1] Subtract an additional 0.41mm (0.016") from the maximum body length for non-symmetrically shaped components.

Recommended Component Clearances[1]

	Standard and 5mm tooling	
Lead Diameter	0.38 (0.015)	0.81 (0.032)
A Dimension[2]	0.97 (0.038)	1.22 (0.048)
B Dimension	1.14 (0.045)	
C Dimension	0.25 (0.010)	
D Dimension	0.76 (0.030)	

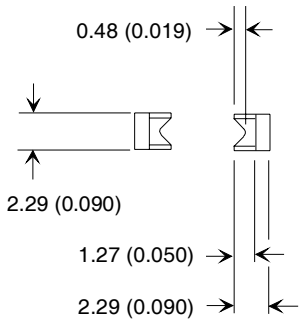
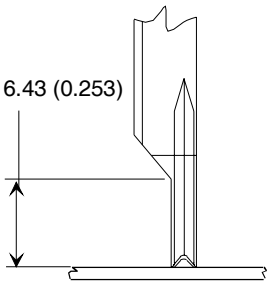
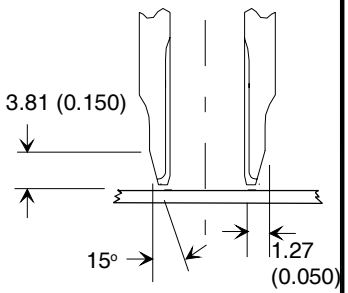
[1] Dimensions are given in millimeters; inches are in parentheses.
[2] Dimension A is measured at the smallest possible footprint for standard, and 5mm tooling.
See Tooling Footprints for related dimensions.



Insertion Tooling Footprint

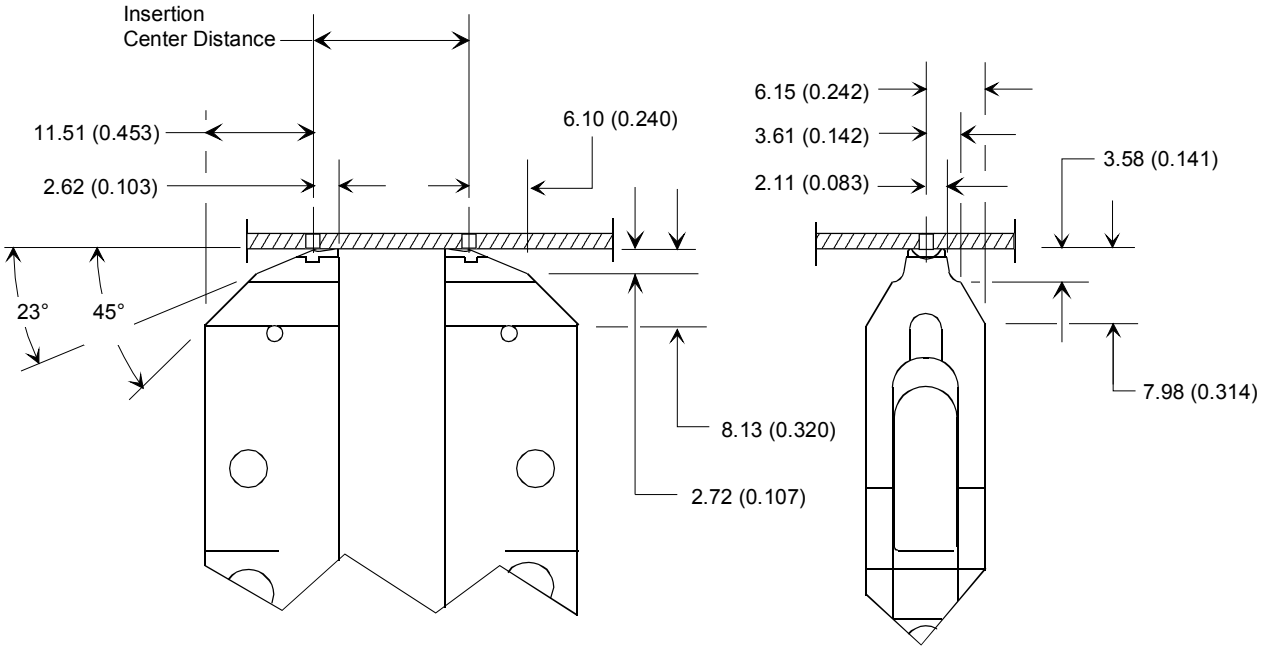
The table below provides tooling information for determining component clearances relating to tooling footprints.

Dimensions are in millimeters;
inch equivalents are bracketed.

	Standard and 5mm Tooling
Bottom View	
Side View	
Front View	

Cut and Clinch Footprint

Dimensions are in millimeters;
inch equivalents are bracketed.



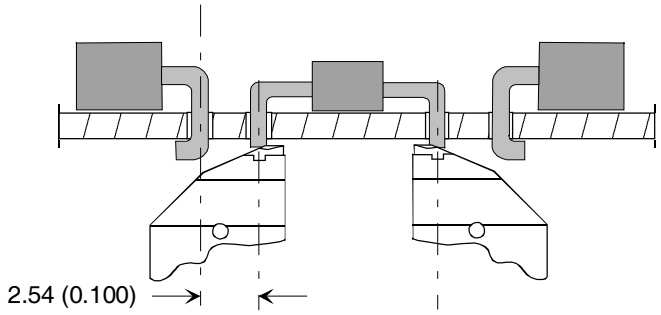
Component Clearances for Cut and Clinch Anvil Assemblies

Continuity Style Lead Sense

Dimensions are in millimeters;
inch equivalents are bracketed.

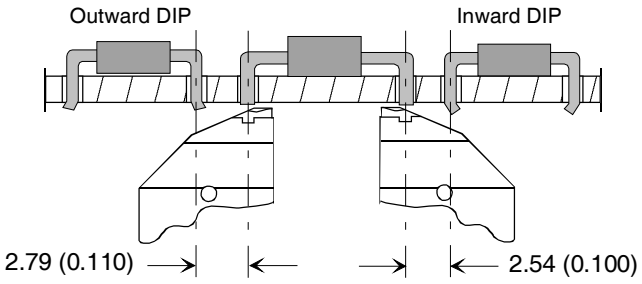
Side View

Axial leaded components to previously inserted axial leaded components.



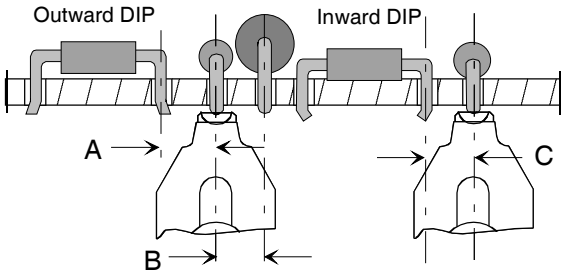
Side View

Axial leaded components to previously inserted DIP components, with both outward and inward clinch.



End View

Axial leaded components to previously inserted axial leaded and DIP components shown with both outward and inward clinch.



A	B	C
3.68mm 0.125"	2.54mm 0.100"	2.54mm 0.100"

Insertion Specifications

Type	VCD (Variable Center Distance)	
Hole Span	**Minimum**	**Maximum**
Standard Tooling	7.62mm (0.300")	24.13mm(0.950")
5.0mm Tooling	5.0mm(0.197")	21.59mm(0.850")
Programmable Span Increments	0.01mm (0.001")	
Depth Stops	Programmable from 0.2mm to 5.28mm (0.008" to 0.208") in 0.2mm (0.001") increments.	
Board to Tooling Clearance	20mm (0.8") maximum with tooling in full up position	
Cut and Clinch	Adjustable from 45° to 90° clinch angle.	
Insertion Rate	Up to 25,000 insertions per hour with factory test specifications. Refer to Insertion Rate Determination section.	

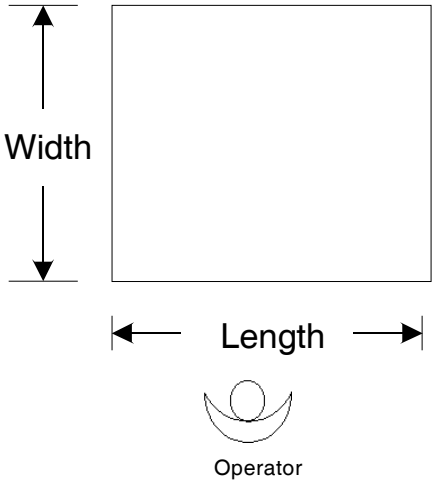
Positioning System

Accuracy	±0.05mm (±0.002")
Repeatability	±0.025mm (±0.001")
Table Capacity	22.7 kg (50 lbs) maximum, including workboard holder
Programming Capability	±0.01mm (metric dimensioning) ±0.001" (inch dimensioning)
Speed	368mm (14.5") per second

Sequencer Specifications

Input	Class I (52mm), standard. Per EIA Standard RS-296-E and this General Specification. Also, limited class II. See “Input Specification.”
Dispensing Heads	Required, must be ordered separately. Refer to the Optical Refire Dispensing Head section.
Sequencer Modules	Up to 11 sequencer modules in multiples of 20 dispensing stations (220 stations maximum); two optional jumper wire dispensing heads can be installed.

Printed Circuit Board Specifications



PC boards must meet the requirements outlined below.

- Minimum Board Thickness: 0.79mm (0.0312").
- Maximum Board Thickness: 2.36mm (0.0937").
- Allowable Board Dimensions: See tables below.

Board Size - Non Board Handling Machine		
	Length	Width
Maximum	559mm (22")	470mm (18.5")
Minimum	51mm (2")	51mm (2")
Insertable Area *	508mm (20.0")	470mm (18.5")

Board Size - Board Handling Machine		
	Length	Width
Maximum	483mm (19")	406mm (16")
Minimum	102mm (4")	80mm (3.1")
Insertable Area	483mm (19.0")	406mm (16")

* Insertable area is reduced if special Dynapert/Amistar compatible rotary disk is selected.

Component Lead Hole Specifications

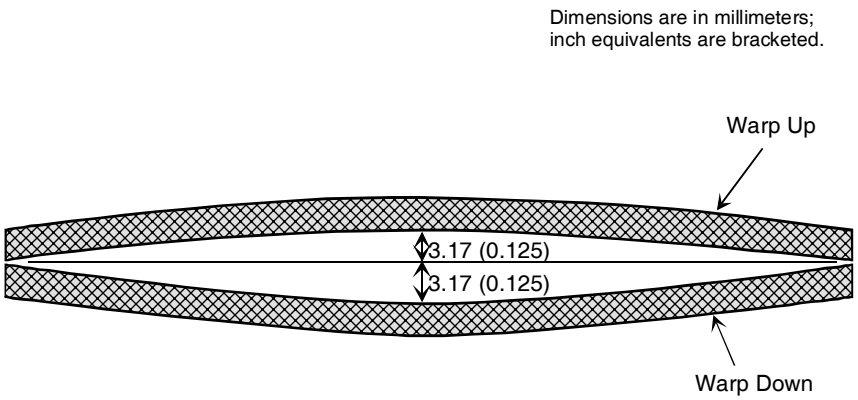
Recommended hole diameters for optimum performance:

- HOLE DIAMETER = LEAD DIAMETER + 0.483mm (0.019") + 0.08mm (0.003")

Holes smaller than the recommended size may result in reduced insertion reliability. Holes larger than the recommended size may result in loose components.

Holes used for board error correction should be 1.0 mm + 0.5 mm (0.040" + 0.020"). Plated holes or translucent PCBs may affect performance.

- Allowable board warpage



Maximum Allowed Warp Up or Down: 0.07 mm/cm, up to 3.17 mm (0.007"/inch, up to 0.125")

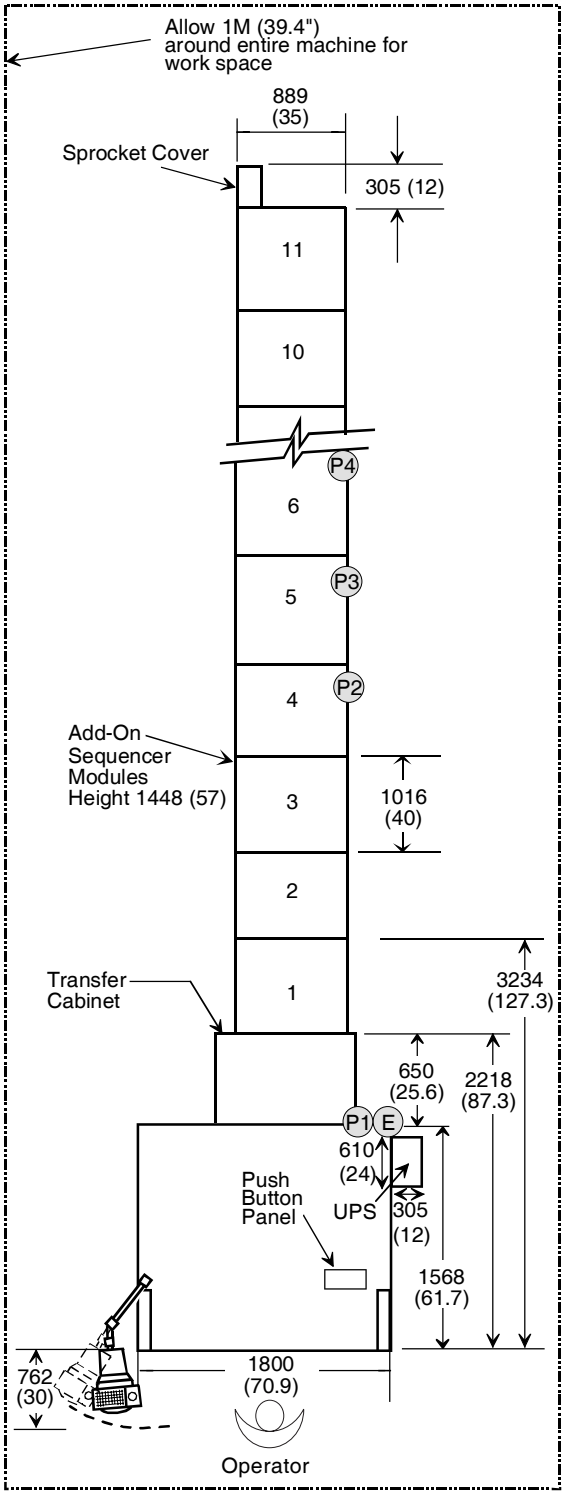
Insertion Rate Determination

The component insertion rate of the VCD/Sequencer 8 is up to 25,000 insertions per hour using standard and 5mm tooling, and factory test specifications. This insertion rate includes an insertion PPM of 200 or better.

To attain the maximum insertion rate, the X and Y axis move between consecutive pattern steps must be no more than 7.6mm (0.300"). An insertion span move greater than 5.08mm (0.200") will reduce speed.

In the Production Operation mode the machine will automatically calculate the insertion rate for each PCB processed and display this value when the PCB population is complete. This actual insertion rate includes all table rotations from first insert to last insert of a product (program). It does not include Load/Unload time.

VCD/Sequencer 8 Non Pass Through (Stand-Alone): Front View



Dimensions are in millimeters; inch equivalents are bracketed.

Additional pneumatic connections required for

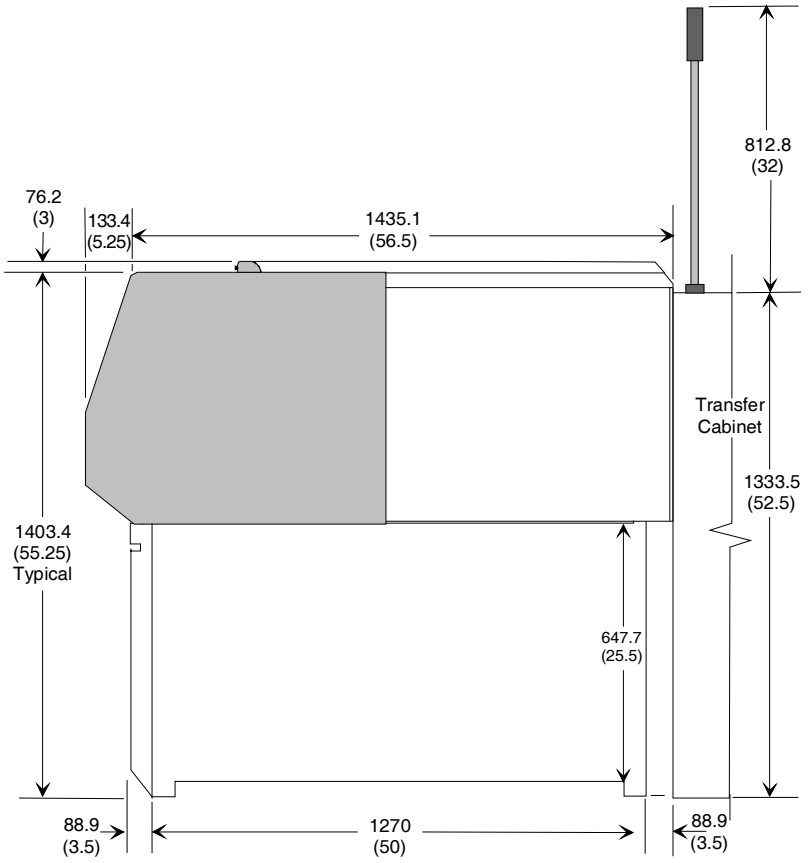
- 120 Stations: use P1 + P2
- 140 Stations: use P1 + P2
- 160 Stations: use P1 + P3
- 180 Stations: use P1 + P3
- 200 Stations: use P1 + P4
- 220 Stations: use P1 + P4

P1 VCD Inserter and up to 100 station Pneumatic Connection

E Electrical Connection

VCD/Sequencer 8 Non Pass Through (Stand-Alone): Side View

Dimensions are in millimeters;
inch equivalents are bracketed.



Machine Dimensions & Weights[1]

(See Appendix for Loader/Unloader configurations)

	Uncrated (no skid or crating material)		**Air Ride Van** (skidded and plastic covering banded over machine)	
	L X D X H[1]	**Weight[1, 2]**	**L X D X H[1]**	**Weight[1, 2]**
Inserter [3] (crated separately)	1800 x 1575 x 1594 (70.88 x 62 x 62.75)	1025 (2260)	2210 x 1829 x 1727 (87 x 72 x 68)	1191 (2625)
Transfer Cabinet (crated separately)	991 x 635 x 1321 (39 x 25 x 52)	159 (350)	1168 x 864 x 1473 (46 x 34 x 58)	209 (460)
Add-On Module (each crated separately)	1016 x 889 x 1448 (40 x 35 x 57)	218 (480)	1193 x 1067 x 1600 (47 x 42 x 63)	268 (590)
Last Add-On Module (one per machine, has chain tensioner on end)	1346 x 889 x 1448 (53 x 35 x 57)	227 (500)	1727 x 1066 x 1600 (68 x 42 x 63)	318 (700)

	Air Crating (partial wood crating)		**Ocean Crating** (full wood crating)	
	L X D X H[1]	**Weight[1, 2]**	**L X D X H[1]**	**Weight [1,2]**
Inserter [3] (crated separately)	2235 x 1854 x 1905 (88 x 73 x 75)	1340 (2955)	2235 x 1854 x 1905 (88 x 73 x 75)	1456 (3210)
Transfer Cabinet (crated separately)	1194 x 889 x 1676 (47 x 35 x 66)	254 (560)	1194 x 889 x 1676 (47 x 35 x 66)	272 (600)
Add-On Module (each crated separately)	1219 x 1092 x 1676 (48 x 43 x 66)	290 (640)	1219 x 1092 x 1676 (48 x 43 x 66)	300 (660)
Last Add-On Module (one per machine, has chain tensioner on end)	1753 x 1092 x 1676 (69 x 43 x 66)	336 (740)	1753 x 1092 x 1676 (69 x 43 x 66)	390 (860)

Notes:

1. Measurements and weights are in metric figures; inch and pound equivalents are bracketed. Measurements are rounded to the nearest whole number.
2. Weight varies as a result of pallet construction and moisture content of wood.
3. The dimension, 953.5mm (37.54") measured from the floor to the top of the rotary table, must be maintained at installation.

Floor Space	A minimum clear area of one meter (39.4") around the machine perimeter is recommended for machine operation and servicing.

Service Requirements (including Uninterruptible Power Supply)

Electrical (insertion machine)

	Machine is shipped with a power cord from machine to Uninterruptible Power Supply. A mating connector is supplied to attach the user provided power cord to the UPS.
	The UPS has an external 5mm ground stud which must be permanently connected to earth/building ground with a 14 AWG or 2.5mm^2 wire that is appropriately protected from mechanical damage.
	A circuit breaker is the overcurrent device for both the machine and the UPS. The machine breaker has a short circuit interrupting capacity of 10,000A, and the UPS breaker has a short circuit interrupting capacity of 1000A. The branch circuit supplying the machine must be protected by an approved 15 amp circuit breaker with a delay suitable for "high inrush current" or "transformer loads."
Air Consumption	A quick disconnect with a male barbed fitting for 12.7mm (0.50") ID flexible hose is shipped with each machine. Pneumatic connection located in the back of the machine, 228mm (9") from the right side and 558mm (22") from the floor.
Air Quality	Non-lubricated, dry air, dewpoint must be at 11°C (20°F) below ambient temperature. Dust contamination: particle size of 5.0 microns or smaller. Oil contamination: Lubricant should not exceed 0.08 ppm at 28°C (82°F).

Note:

- Without loader, for voltages other than 230 VAC, current is 1150/ (input voltage). Power factor may vary with input voltage.
- With loader, for voltages other than 230 VAC, current is 1725 / (input voltage). Power factor may vary with input voltage.
- CFM (Cubic Feet per Minute): Volumetric flow rate at a specified pressure. This is used to describe the air flow requirement. This is used to determine input air line requirements.
- SCFM (Standard Cubic Feet per Minute): Cubic foot of air at 20° C (68º F) at atmospheric pressure. This is used to describe the average air consumption flow requirement needed to determine compressor capacity requirements.

	PNEUMATIC REQUIREMENTS		ELECTRICAL REQUIREMENTS				
	Minimum Air Flow Requirements of Machine	Air Consumption of Compressor	Input Voltage	Input Frequency	Input Breaker	Actual Power Draw Without Loader/Unloader	Actual Power Draw With Loader/Unloader
Insertion Machine Location	85 liters per minute @ 6.2 bar 3.0 CFM @ 90 PSI	7.6 SCFM	180 - 264 VAC	47 - 63Hz	15A	1150 VA 5A @ 230 VAC	1725 VA 7.5A @ 230 VAC
Additional Sequencer Location	64 liters per minute @ 6.2 bar 2.25 CFM @ 90 PSI	No Additional Air Consumption					

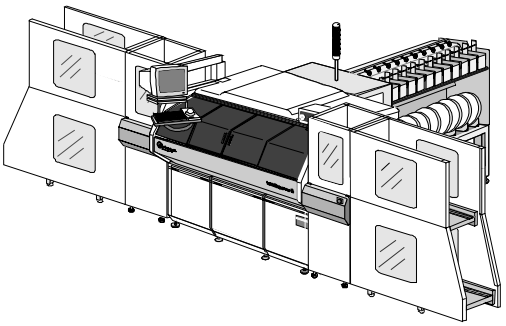
Environmental Requirements

Ambient Temperature	10° C. to 35° C. (50° F. to 95° F.)
Operating Humidity	10% to 90%, non-condensing
Contaminants	The machine, UPS included, carries an IP code rating of 20. IP 20 signifies that the equipment has limited protection against ingress of solid foreign objects and is not protected against the ingress of water. Consequently, the intended environment is that of manufacturing/office where the machine is not subject to such elements.
Transportation and Storage	-25° C to +55° C. (-13° F. to +131° F.); not exceeding 24 hours up to 70° C. (158° F.), 10% to 95%, non-condensing humidity. Universal provides suitable means to prevent damage from humidity, vibration, stress and shock during transport.
Noise Level, Pass Through Configuration	76.3 dbA in accordance with National Machine Toolbuilders Assoc. Noise Measurement Technique Standard — June 1986. Note: Maximum noise level measured at the Sequencer, while the noise level in front of the machine, at the operator controls, is 74 dbA.
Noise Level, Non Pass Through Configuration	80.7 dbA in accordance with National Machine Toolbuilders Assoc. Noise Measurement Technique Standard — June 1986.

Appendix: Automatic Board Handling Systems

Index

Introduction



The VCD/Sequencer 8 (Model 6241F) is available in a number of automatic board handling configurations:

- **Magazine-to-Magazine Configuration:** Magazines containing PC boards are placed on the input Elevator (Loader) and the PC boards are then automatically transferred into the machine for component insertion. Once completed, the boards are unloaded into an output magazine Elevator (Unloader). Each Elevator includes a magazine Buffer.
  - **Long Buffer:** 1270mm (50") for magazines 21" long (CE-compliant)
- **Vacuum Bare Board-to-Magazine Configuration:** Bare PC boards are placed in a Vacuum Bare Board Loader and the PC boards are then automatically transferred onto a 559mm (22") conveyor, which transports them into the machine for component insertion. Once completed, the boards are unloaded into an output magazine Elevator (Unloader). **Note: This unit is best suited for PC boards with eyelets. This configurations is not CE compliant.**
- **Destacker/Conveyor-to-Magazine Configuration:** Bare PC boards are placed in a Destack Loader and the PC boards are then automatically dropped onto a 736mm (29"), 1118mm (44"), or 1473mm (58") conveyor, which transports them into the machine for component insertion. Once completed, the boards are unloaded into an output magazine Elevator (Unloader). The output Elevator includes a Long or Short Buffer (as above); only the systems incorporating the Destack Loader with the 1118mm (44") or 1473mm (58") conveyor, are CE-compliant. **Note: This unit will not function properly when eyelets are present on the PC board.**

- **Magazine- OR Destacker/Conveyor-to-Magazine Configuration:** Magazines containing partially populated PC boards are placed on the input Elevator/Buffer (Loader) and the PC boards are automatically transferred into the machine for component insertion. In addition, a second input from a Destack Loader, mounted on either a 736mm (29"), 1118mm (44"), or 1473mm (58") conveyor, can be placed in-line after the Elevator/Buffer. This permits the flexibility of loading unpopulated PC boards from a stack, or populated PC boards from a magazine. Once completed, the boards are unloaded into an output Elevator/Buffer (Unloader). Only the systems incorporating the Destack Loader with the 1118mm (44") or 1473mm (58") conveyor, and PC boards with installed components not exceeding 25.4mm (1") thickness, are CE-compliant.
- **In-Line Configuration:** Machines can be connected in-line using the internal Board Handling System (BHS) and interconnecting conveyors. The BHS transfers two PC boards at a time: an unpopulated board in, and a populated board out. All Board Handling Systems are factory configurable for either left-to-right or right-to-left direction. This configuration is CE-compliant.

For detailed vacuum bare board loader and destacker specifications, see product information sheets for these products.

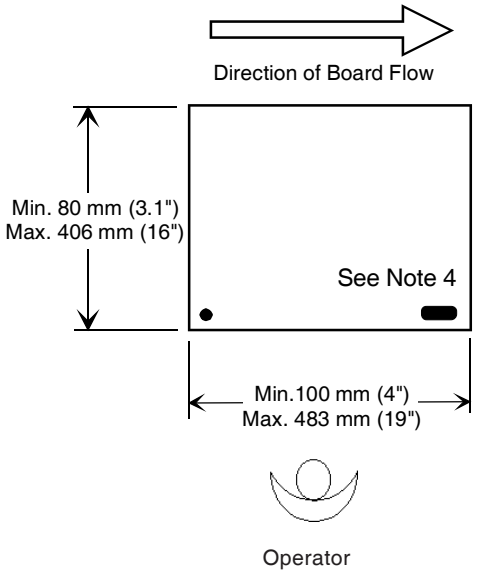
Technical Specifications for Internal Board Handling System (BHS)

Board Handling System Specifications

	Minimum	Maximum
Transfer Height[1]	1001.5 mm (39.43") to 955.8 mm (37.63") to	1014.2 mm (39.93"), or 968.5 mm (38.13")
Above Board Clearance	—	20.3 mm (0.800"), restricted by VCD/SEQ 8
Board Changeover	Manual	
Direction	Select right-to-left or left-to-right.	
Edge Clearance	5 mm (0.197") or 3 mm (0.118")[2]	
Fixed Edge	Front	
Locator Pins	Front	
Front Edge Distance	The front edge of the PC Board is fixed at 266.7mm (10.5") from the front of the machine. (The back rail of the board handling is adjustable.)	
Transfer Time[3]	2.5 seconds, maximum for 1007.9 mm (39.68") transfer height (upper level) 5.5 seconds, maximum for 962.2 mm (37.88") transfer height (lower level)	

Notes:

1. Transfer height can be configured, and alters transfer time. See transfer time specification.
2. Set at factory to 3 mm.



PC Board Specifications

	Minimum	Maximum
Length[1] **x Width**	102mm x 80mm (4" x 3.1")[2]	483mm x 406mm (19" x 16")[2, 3]
Length to Width Ratio	>1:1 is recommended	
Thickness	0.8mm (0.032")	2.36mm (0.093")
Cutouts	Continguous edges	
Datum Hole Diameter	3.18mm (0.125")[2]	6.35mm (0.25")[2]
Datum Hole Location	See note 4.	
Weight	2.27kg (5 lbs.), maximum	

Notes:

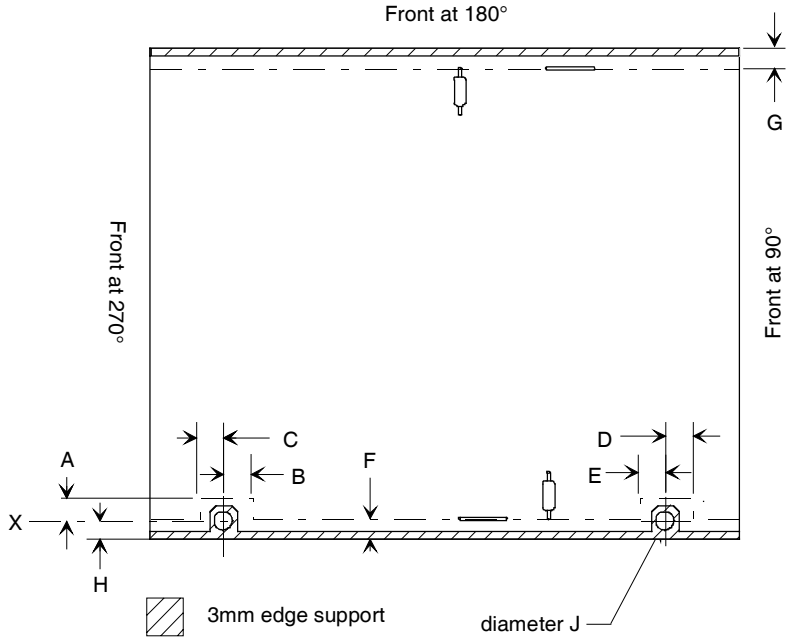
1. Length is in the direction of board flow.
2. Consult a Universal Sales Engineer for other than stated sizes.
3. Two datum holes are required. For ease of setup, the workboard holder locator pins feature detents for PC board datum holes located 3.5, 4.0, 5.0, 6.35, or 7.62 mm from the front edge of the board. The maximum distance from the front edge of the PC board to the center of the datum holes is 9.0mm.
4. A slot rather than a round hole is recommended for one locating hole.

Workboard Clearances at Table Rotation Locations

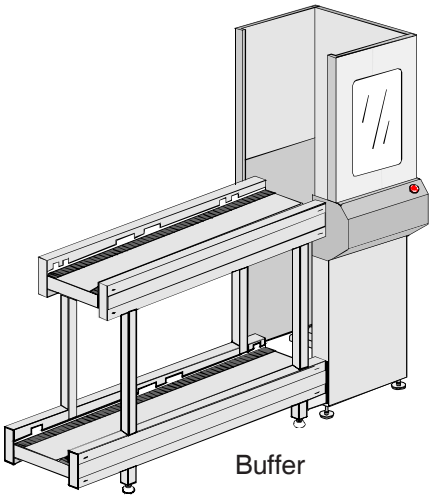
(Table Rotation Dimensions shown are for standard tooling)

	0°	90°	180°	270°
A	5.99mm (0.236") [1]	7.59mm (0.299") [2]	9.27mm (0.365") [1]	7.59mm (0.299") [2]
B	7.09mm (0.279") [2]	5.49mm (0.216") [1]	7.09mm (0.279") [2]	5.49mm (0.216") [1]
C	7.09mm (0.279") [2]	8.76mm (0.345") [1]	7.09mm (0.279") [2]	8.76mm (0.345") [1]
D	7.09mm (0.279") [2]	5.49mm (0.216") [1]	7.09mm (0.279") [2]	5.49mm (0.216") [1]
E	7.09mm (0.279") [2]	8.76mm (0.345") [1]	7.09mm (0.279") [2]	8.76mm (0.345") [1]
F	5.33mm (0.210") [1, 3]	5.38mm (0.212") [2, 3]	5.33mm (0.210") [1, 3]	5.38mm (0.212") [2, 3]
G	5.33mm (0.210") [1, 3]	5.38mm (0.212") [2, 3]	5.33mm (0.210") [1, 3]	5.38mm (0.212") [2, 3]
H	3.17mm (0.125") minimum 6.35mm (0.250") recommended 7.62mm (0.300") maximum			
J	3.17mm (0.125") minimum 3.96mm (0.156") recommended 6.35mm (0.250") maximum			

1. Dimensions are to centerline of lead.
2. Dimensions are to the bottom of the 'V' groove in the former.
3. Dimension shown is for 3mm edge support. If using a 5mm edge support, add 2mm



Dimensions shown are minimum distances from either the board edge or the tooling pin hole, to either the standard tooling or the clinch.



Buffer

Technical Specifications for Loader/ Unloader: Elevator/Buffer Configuration

Changeover Time	Magazine, 20 seconds
PC Board	The insertion machine determines board size.

Magazine Elevators

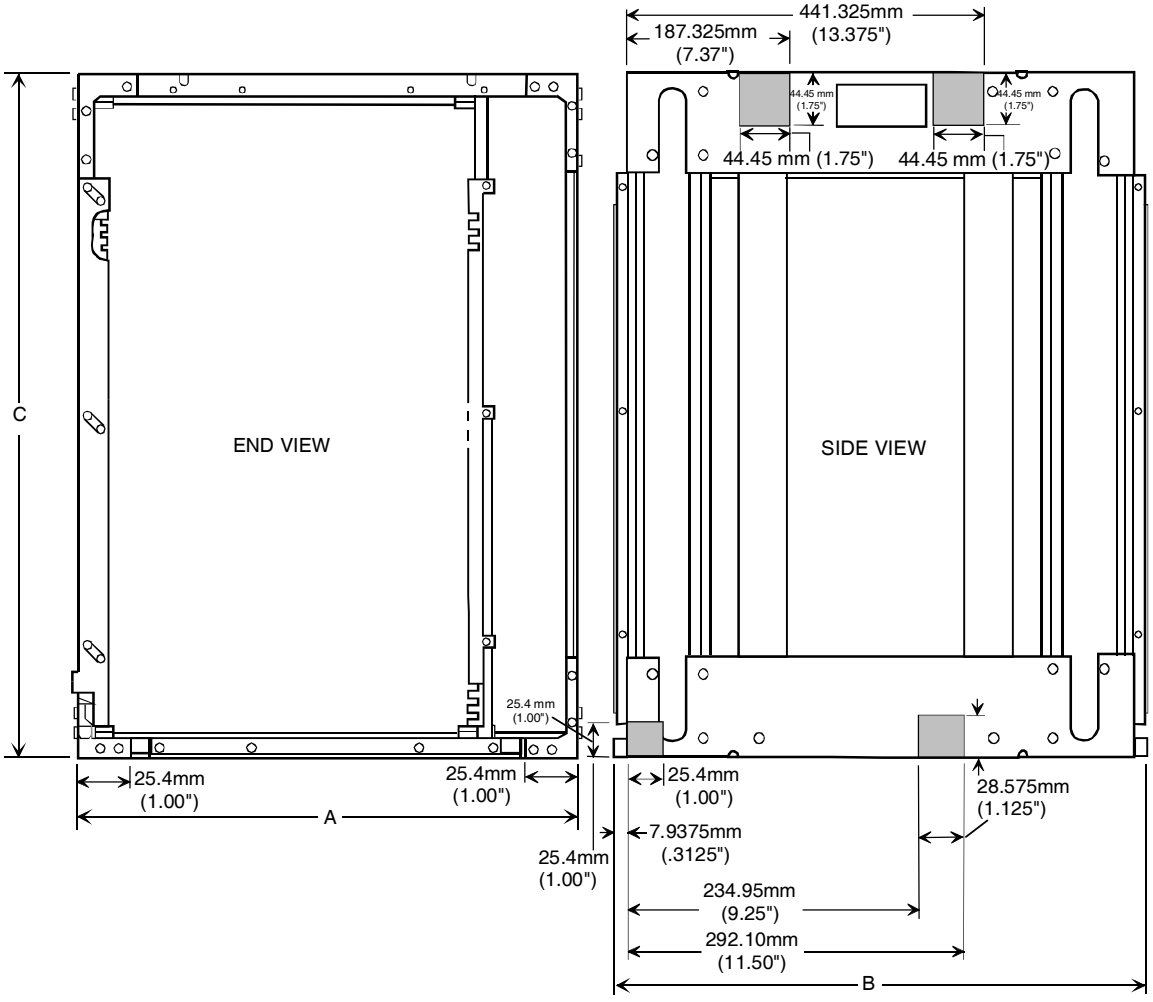
Magazine Elevator	Controlled through insertion machine software. Power and air are supplied through the insertion machine. Elevators are equipped with emergency stops.		
Elevator Dimensions	**Length** 635mm (25")	**Depth** 838mm (33")	**Height** 1,835mm (72")

Magazine Input/Output Buffers

Buffer	The Buffer accomodates 2 magazines (in and out) that are up to 533mm (21") in length each. Buffers are available either with CE-compliant Buffer covers or without the covers. Covers must be affixed to the Buffers in order for the Buffers to be CE-compliant.		
Buffer Dimensions With Full Covers (CE-compliant)	**Length** 1,270mm (50")	**Depth** 546mm (22")	**Height** 1,835mm (72")
Buffer Dimensions Without Covers (Not CE-compliant)	**Length** 1,270mm (50")	**Depth** 546mm (22")	**Height** 1,095mm (43")
Magazine Transfer Height	Upper level magazine transfer height is 1,056mm (42"). Lower level Magazine transfer height is 292mm (12").		

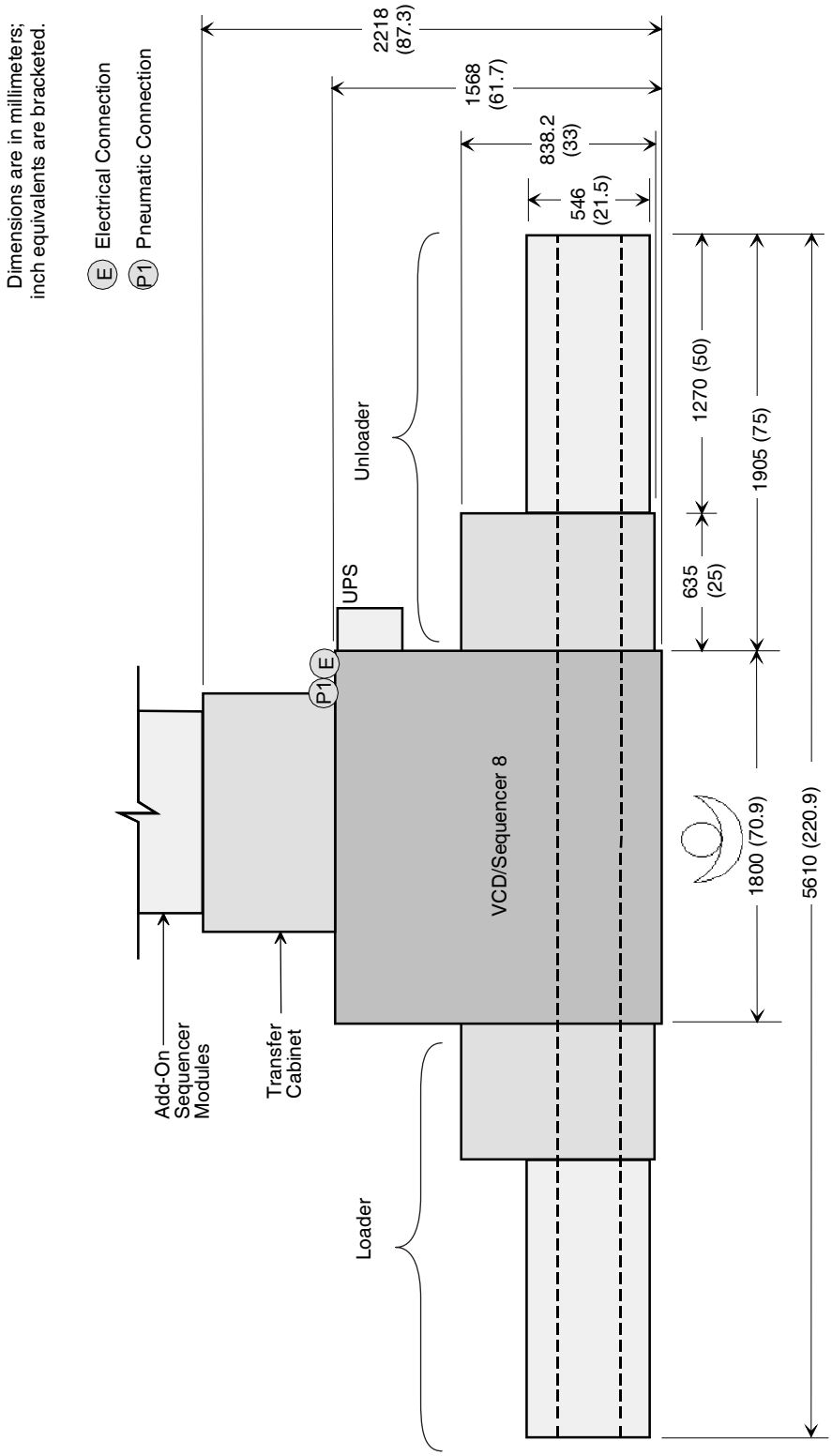
Magazine Specifications for use in Elevator Buffer System

Maximum Magazine Weight	45kg (100lbs) for PC boards plus magazines. Compatible with most commonly-used magazines. Consult a Universal Sales Engineer.			
Maximum Magazine Dimensions	**Maximum Length (B)**	**Maximum Depth (A)**	**Maximum Height (C)**	**Maximum Weight (including PC boards)**
	533mm (21")	460mm (18")	606mm (24")	45kg (100lbs)
Magazine Gate Control	If magazines have gates that must be opened by the machine, a sample magazine and a request for quote must be submitted.			



MAGAZINE VIEWS

Note: Highlighted area must be solid to allow detection and registration.



Plan View: VCD/Sequencer 8, Magazine-to-Magazine Configuration, with Buffers

System shown in left-to-right board-flow configuration with fixed front rail.

Installation Considerations: Loader/ Unloader

Magazine-to-Magazine Configuration

Dimensions—Magazine Elevator (x2)

	Length [1]	Depth	Height	Weight
Shipping Dimensions	635mm (25")	838mm (33")	1835mm (72.25")	154 kg (340 lbs.)

[1] Length is in the direction of board flow.

Dimensions—Buffer (x2)

Shipping Dimensions Not CE-compliant	1270mm (50")	546mm (21")	1095mm (43")	91 kg (200 lbs.)
Shipping Dimensions CE-Compliant	1270mm (50")	546mm (21")	1835mm (72")	118 kg. (260 lbs.)

Service Requirements for Machines with Optional Board Handling

Machine Description	Pneumatic Requirements		Electrical Requirements
	Minimum Air Flow Requirement	Air Consumption	Voltage
VCD/Sequencer 8 with BHS	3.0 CFM @ 90 PSI	7.6 SCFM	230 VAC (50/60Hz)
VCD/Sequencer 8 with BHS and Loader/Unloader	3.2 CFM @ 90 PSI	8.4 SCFM	230 VAC (50/60Hz) Loader/unloader supplied from insertion machine
IM Elevator (Loader or Unloader)	0.2 CFM @ 90 PSI	0.80 SCFM	120 VAC (50/60Hz) Supplied from insertion machine
Vacuum Bare Board Loader	1.5 CFM @ 90 PSI	9.3 SCFM	120 VAC (50/60Hz) Supplied from insertion machine
Destacker/Conveyor Loader	0.4 CFM @ 90 PSI	1.4 SCFM	120 VAC (50/60Hz) Supplied from insertion machine
22" Conveyor	None required	None required	120 VAC (50/60Hz) Supplied from insertion machine
29" Conveyor	None required	None required	120 VAC (50/60Hz) Supplied from insertion machine
44" Conveyor	None required	None required	120 VAC (50/60Hz) Supplied from insertion machine
58" Conveyor	None required	None required	120 VAC (50/60Hz) Supplied from insertion machine

Note:

- CFM (Cubic Feet per Minute): Volumetric flow rate at a specified pressure. This is used to describe the air flow requirement.
- SCFM (Standard Cubic Feet per Minute): Cubic foot of air at 20°C (68° F) at atmospheric pressure. This is used to describe average air consumption flow requirement.