

AMERICAN NATIONAL
STANDARD

ANSI/IEEE Std 1101-1987

IEEE Standard for Mechanical Core Specifications for Microcomputers



Published by
The Institute of Electrical and
Electronics Engineers, Inc



Distributed in cooperation with
Wiley-Interscience, a division
of John Wiley & Sons, Inc

SH11585

An American National Standard

IEEE Standard for Mechanical Core Specifications for Microcomputers

1. Scope

1.1 Basic Dimensions of Subracks. This standard covers the basic dimensions of a range of modular subracks conforming to IEC 297-3-1984 [10], for mounting in equipment according to IEC 297-1-1986 [9], and ANSI/EIA RS-310 [1], together with the basic dimensions of a compatible range of plug-in units, printed boards, and backplanes.

1.2 Dimensions of Plug-In Units and Connectors. This standard will give the dimensions of associated plug-in units and connectors standardized by IEC 603-2-1980 [12], together with applicable detail dimensions of the subrack.

1.3 Environmental Requirements of Subracks. This standard will state environmental requirements of subracks and their associated plug-in units.

2. Object

The purpose of this standard is the specification of dimensions that will ensure the mechanical interchangeability and environmental requirements of subracks and of plug-in units.

3. References

The following publications shall be used in conjunction with this standard.

[1] ANSI/EIA RS-310, Racks, Panels, and Associated Equipment.²

²ANSI/EIA publications can be obtained from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018, or from the Standards Sales Office, Electronics Industries Association, 2001 I Street, NW, Washington, DC 20006.

- [2] CFR (Code of Federal Regulations), Title 47: Telecommunications, part 15J, published by Office of the Federal Register (FCC Rules and Regulations are contained within this document).³
- [3] IEC 50-1982, International Electrotechnical Vocabulary.⁴
- [4] IEC 68-2-1-1974, Tests A: Cold.
- [5] IEC 68-2-2-1974, Tests B: Dry Heat.
- [6] IEC 68-2-6-1982, Test Fc and Guidance: Vibration (Sinusoidal).
- [7] IEC 68-2-11-1981, Test Ka: Salt Mist.
- [8] IEC 68-2-27-1972, Test Ea: Shock.
- [9] IEC 297-1-1986, Dimensions of Mechanical Structures of the 482.6 mm Series. Part 1: Panels and Racks.
- [10] IEC 297-3-1984, Dimensions of Mechanical Structures of the 482.6 mm Series. Part 3: Subracks and Associated Plug-In Units.
- [11] IEC 348-1978, Safety Requirements for Electronic Measuring Apparatus.
- [12] IEC 603-2-1980, Two-Part Connectors for Printed Boards, for Basic Grid of 2.54 mm (0.1 in), With Common Mounting Features.
- [13] IEC 651-1979, Sound Level Meters.
- [14] IEC 707-1981, Methods of Test for the Determination of the Flammability of Solid Electrical Insulating Materials When Exposed to an Igniting Source.
- [15] IEC 916-1987, Terminology for Mechanical Structures for Electronics Equipment.
- [16] ISO TC-10 series on Technical Drawings, Dimensioning, and Tolerancing.⁴

4. General Arrangement

Subracks may be mounted one above another or in combination with suitable instruments and panels in equipment complying with the rack and panel dimensions given in IEC 297-1-1986 [9] and ANSI/EIA RS-310-1977 [1]. See Fig 1.

³This document is available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

⁴Both IEC and ISO publications are available in the US from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.

NOTES: (1) Generally, subracks are equipped with printed board or rack and panel type connectors at the rear side, and have guides for locating or supporting, or both, printed boards or plug-in units.

(2) In principle the connector is mounted on the right side of the printed board as viewed from the front of the subrack.

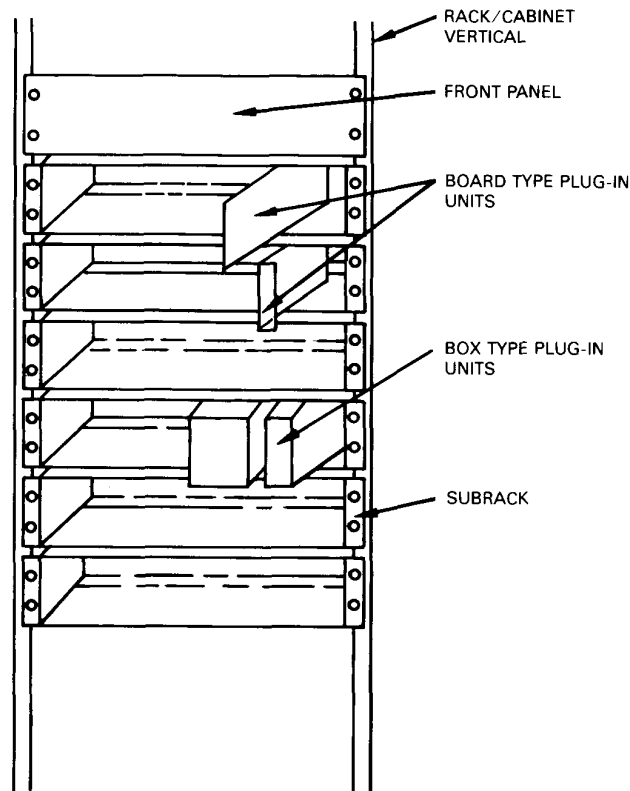
(3) Table 5 defines the dimensions required for mechanical interchangeability of plug-in units.

(4) The drawings in this specification are not intended to indicate details of design. All dimensions are given in millimeters (with inches in brackets).

(5) All drawings in this specification are shown in the first angle projection according to ISO/TC 10 [16].

(6) Terminology is as per IEC 916-1987, Terminology for Mechanical Structures for Electronics Equipment [15], and IEC 50-1982, International Electrotechnical Vocabulary [3].

Fig 1
General Arrangement



5. Euroboard Matrix

All references to board heights in this document are in units of 3U (133.35 mm, or 5.25 in). A board commonly called single height can be housed in a 3U high subrack or box type plug-in unit and may have a single connector (see IEC 603-2 [12]) on its rear edge.

NOTES: (1) For the 9 U/12 U high configuration the use of fixtures to mount the connectors will be required to guarantee intermateability.

(2) Board heights may be incremented in units of 133.35 mm (5.25 in) after the initial 100 mm (3.937 in).

6. Euroboard Sizes

6.1 Euroboard Height

Table 1
Euroboard Height

U	3U	6U	9U	12U
Hb $\begin{matrix} +0 \\ -0.3 \\ (+0/-0.012) \end{matrix}$	100.0 (3.937)	233.35 (9.187)	366.7 (14.437)	500.05 (19.687)

6.2 Euroboard Depth

Table 2
Euroboard Depth

Db $\begin{matrix} +0 \\ -0.3 \\ (+0/-0.012) \end{matrix}$	100 (3.937)	160 (6.299)	220 (8.661)	280 (11.024)	360 (14.173)	400 (15.748)
Da $\begin{matrix} \pm 0.1 \\ (\pm 0.004) \end{matrix}$	93.67 (3.688)	153.67 (6.05)	213.67 (8.412)	273.67 (10.774)	333.67 (13.137)	393.67 (15.499)

6.3 Euroboard Thickness. The thickness of printed boards of plug-in units shall be 1.6 ± 0.2 mm (0.063 ± 0.008 in) in the area of the guides.

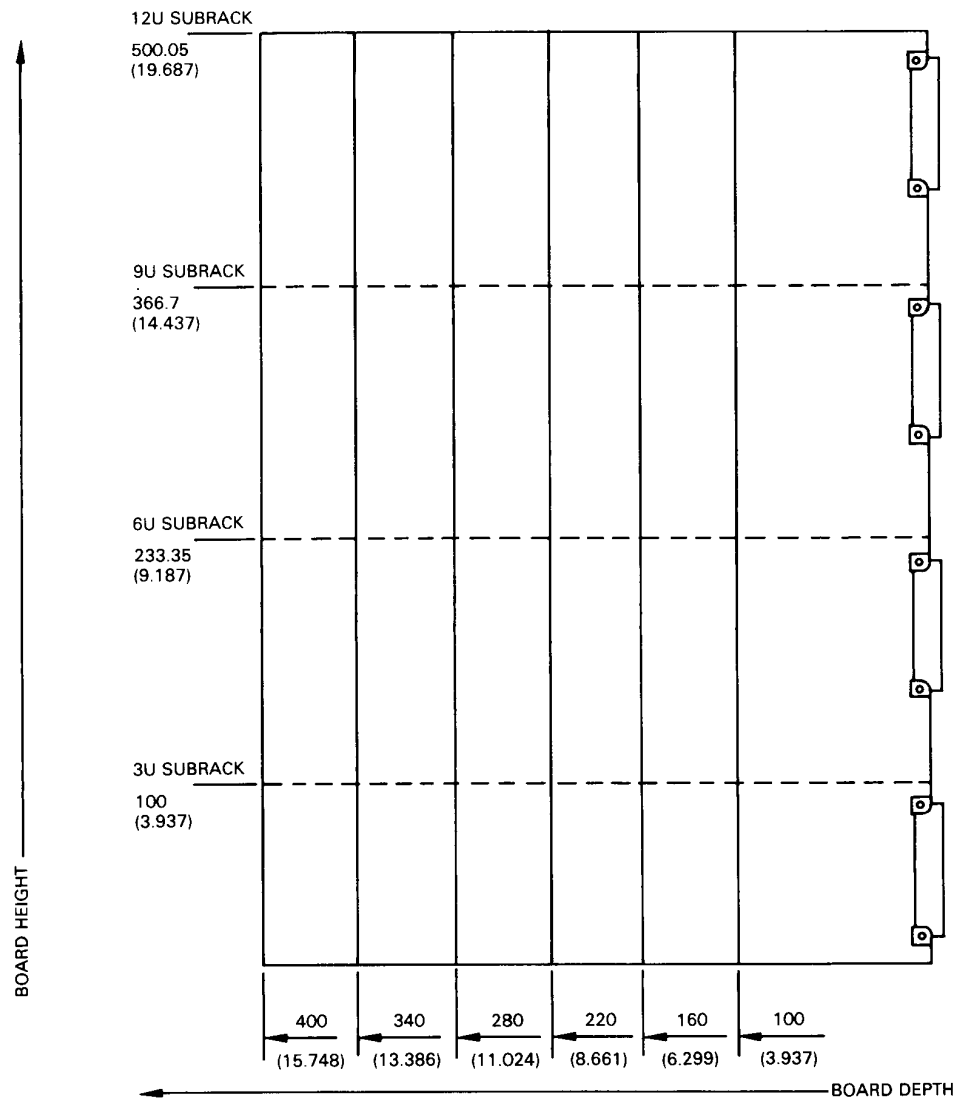
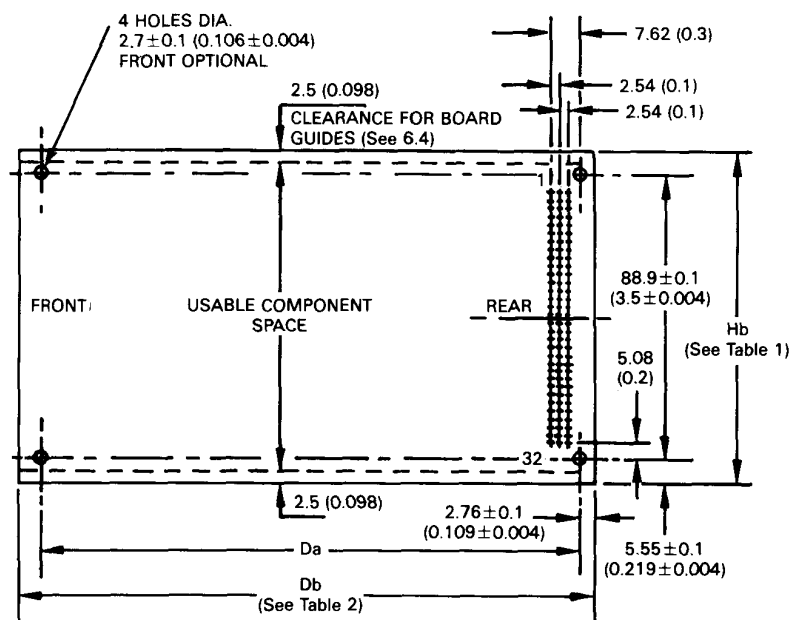


Fig 2
Euroboard Matrix

6.4 Tracks and Guides. Copper tracks are not to extend beyond the usable component space on the outer planes. If metallic guides are used, board clearance may have to be increased. Printed circuits and components must be placed on the board in accordance with their electrical features.

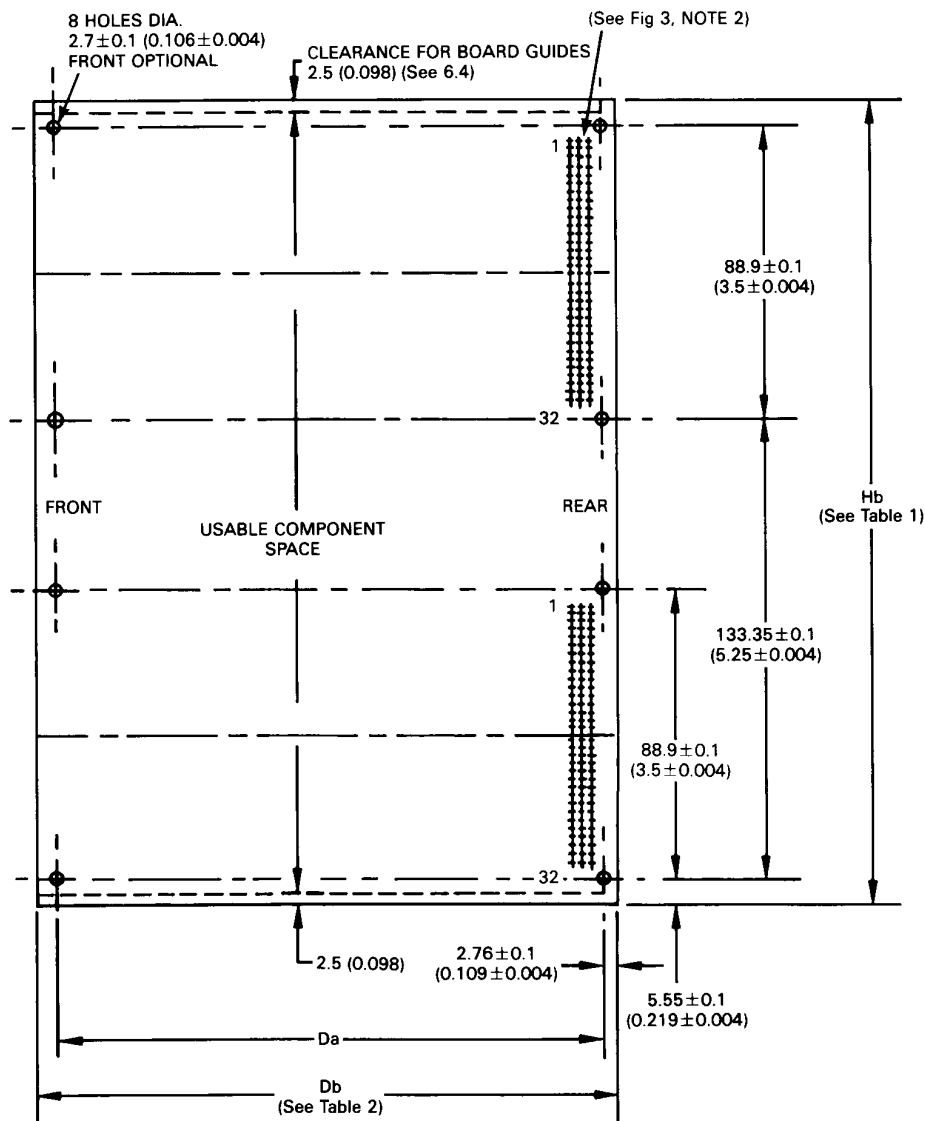
NOTE: The clearance area for board guides may be used to provide a metallic contact between the subrack and the board in order to reduce EMI/RFI emissions, or to provide heat sinking capability to the board, or both.

Fig 3
Single Height Board, Component Side View



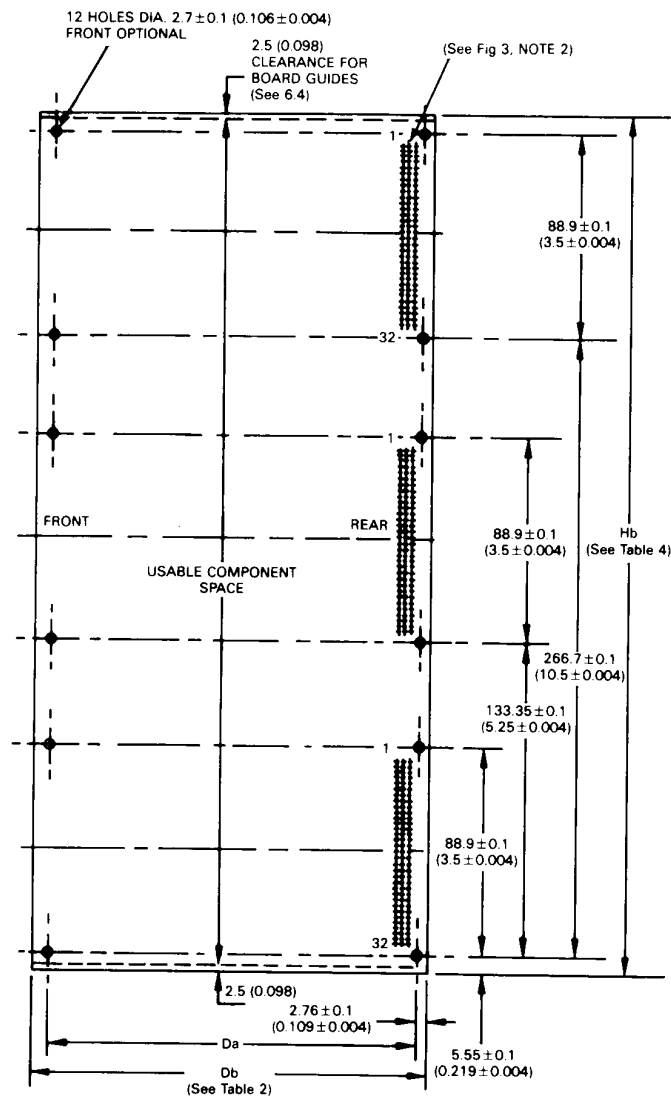
NOTES: (1) For board thickness, see 6.3.

(2) This connector pattern refers to IEC 603-2-1980 [12] Type C connectors, but does not indicate tolerance. Recommended tolerance is ±0.05 mm (0.002 in).



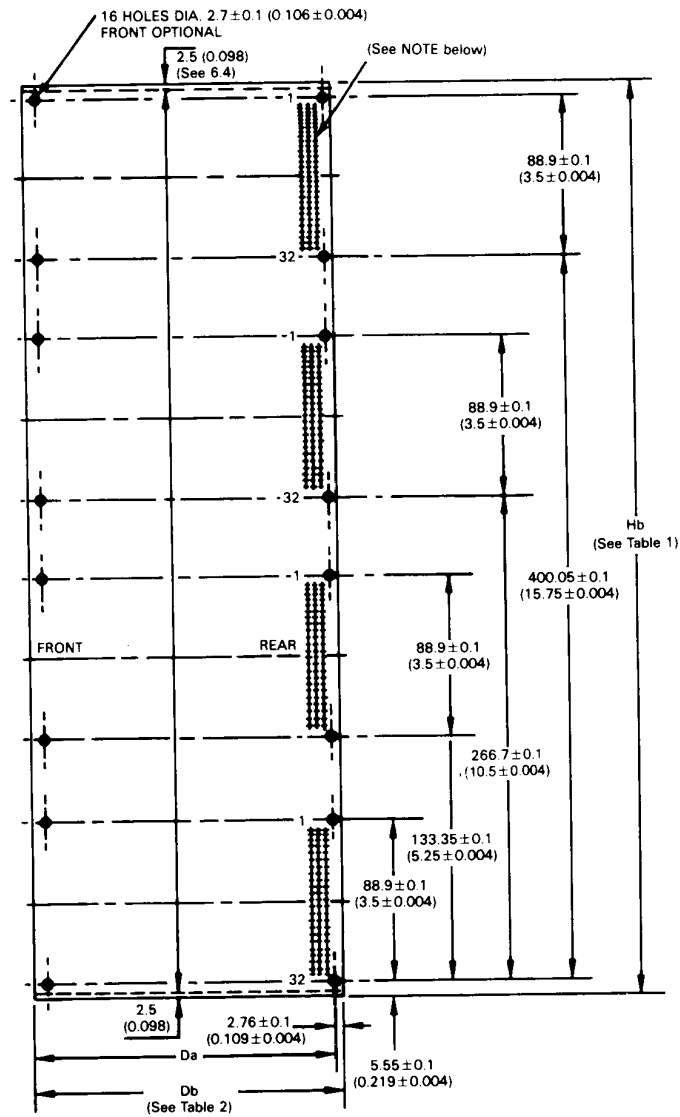
NOTE: For board thickness, see 6.3.

Fig 4
Double Height Board, Component Side View



NOTE: Use fixtures to mount connectors. For board thickness, see 6.3.

Fig 5
Triple Height Board, Component Side View



NOTE: Use fixtures to mount connectors. For board thickness, see 6.3.

Fig 6
Quadruple Height Board, Component Side View

7. Position of Plug-In Unit Mounted Connectors (Board Type and Box Type)

Table 3
Position of Plug-In Unit Mounted Connectors, Board/Box Type

Connector Type (see IEC 603-2-1980 [12])	T^*	l_1	l_2
B + C (See Fig 7)	0.05 (0.002)		$85.2 \begin{smallmatrix} +0.2 \\ -0 \end{smallmatrix} \left(3.354 \begin{smallmatrix} +0.008 \\ -0 \end{smallmatrix} \right)$
Q + R (See Fig 8)	0.05 (0.002)	$85.2 \begin{smallmatrix} +0.2 \\ -0 \end{smallmatrix} \left(3.354 \begin{smallmatrix} +0.008 \\ -0 \end{smallmatrix} \right)$	

*The positional tolerance T is to be derived from the play between the plug-in unit mounted connector and the subrack mounted connector.

Table 4
Position of Plug-In Unit Mounted Connectors

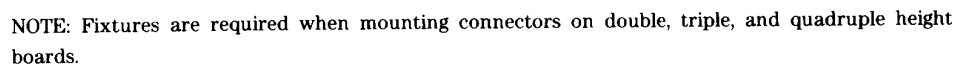
$n \times U^*$	3U	6U	9U	12U
a ± 0.1 (0.004)	0	66.67 (2.625)	133.35 (5.25)	200.02 (7.875)
$b_1 \pm 0.1$ (0.004)			133.35 (5.25)	
$b_2 \pm 0.1$ (0.004)			133.35 (5.25)	
$b_3 \pm 0.1$ (0.004)				133.35 (5.25)

*Subracks are dimensioned in heights of U. 1U = 44.45 mm (1.75 in).
See IEC 297-1-1986 [9], and ANSI/EIA RS-310-1977 [1].

8. Plug-In Unit Description

A plug-in unit can be of various types, as is shown in Fig 1. It usually consists of a printed board assembly with connector(s), and optionally, handles(s), ejector(s), front panel, rear panel, mounting rails, and covers.

A plug-in unit can itself house a plurality of different types of plug-in units. Box type plug-in units may house board type plug-in units or other subassemblies.



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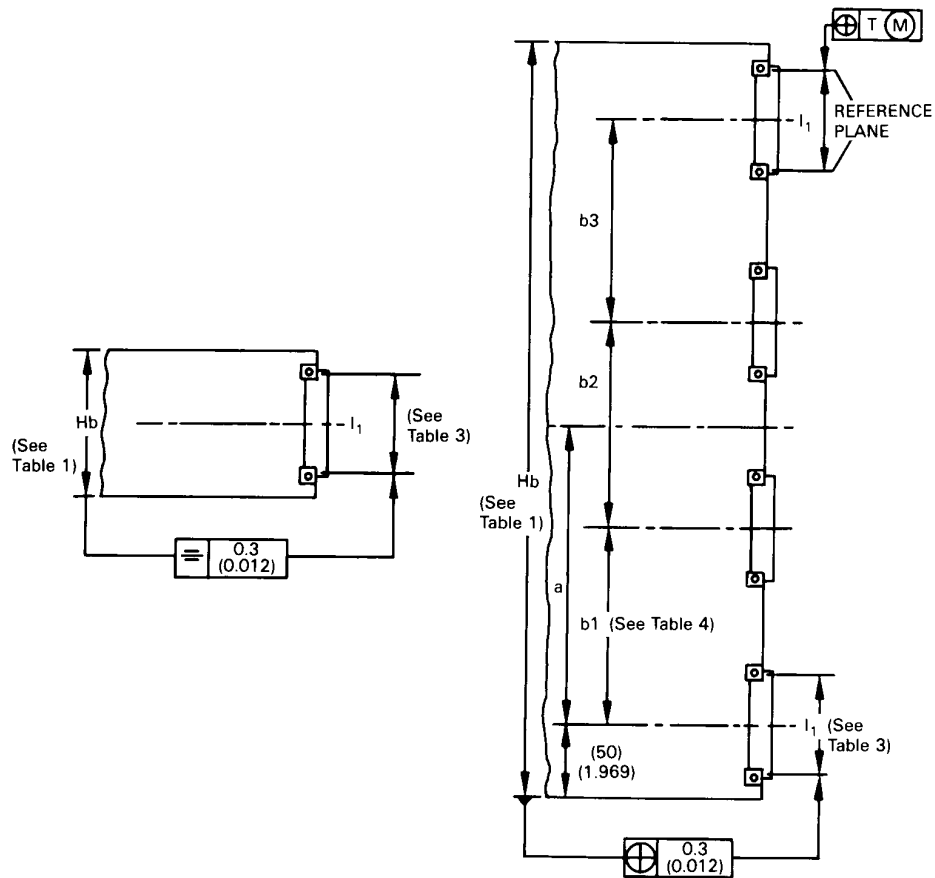


Fig 8
Position of Inverse Connectors On Plug-In Units

9. Plug-In Unit Dimensions

9.1 Board Type Plug-In Units

- (1) DT 2 in Table 5 is the inspection dimension to ensure reliable connector mating.
- (2) For connector detail see IEC 603-2 [12].
- (3) For a nominal 5.08 mm (0.2 in) width filler panel (see Fig 16), the 7.62 mm (0.3 in) dimension is reduced to 2.5 mm (0.1 in).
- (4) Maximum dimensions for location features for front panel alignment, or screw retention, or both (Figs 15 and 16). The standard M 2.5 screw mounting does not exclude other means of retention or quick release fasteners (to be agreed upon by vendor and user). Slotted or plus-type screw heads are permitted.
- (5) Double-sided surface mounted devices (SMD) mounting on plug-in boards may result in changes of the relationship of front panel, guide rail, and back plane positioning relative to the subrack (see Fig 17).
- (6) The injector/ejector design detail can be derived from Figs 9 and 10, and can be manufactured of various materials (see 12.6.2). This detail is restricted to individual boards plugged into the subrack, and is not suitable for front panel mounted boards or within a box type plug-in unit (see Fig 21).
- (7) The dimension between front attachment plane and the beginning of the board guide is ≥ 6 mm (0.236 in) as specified in IEC 297-3-1984 [10] (see Figs 31-37), in order to allow for injector/ejector operation.
- (8) Board type plug-in units with front panels may require handles. The details of handles and their positioning on the front panels are to be agreed upon by supplier and user, or are specified in the individual application standard.
- (9) The recommended plug-in unit front panel thickness is 2.5 mm (0.098 in).

9.2 Box Type Plug-In Units

- (1) DT 2 is the inspection dimension to ensure reliable connector mating. For inspection dimensions see Table 5.
- (2) For connector details see IEC 603-2-1980 [12].
- (3) Box type plug-in units are designed to interface with the subrack as specified in Section 11 via a single board, as specified in Figs 3-6, with connectors attached. Additionally, the box type plug-in units are to house large components.
- (4) Box/board type plug-in units are designed to interface with the subrack as specified in Section 11 via one or more board type plug-in unit, as specified in Figs 3-6 and 11-14, with connector(s) (see IEC 603-2) attached. Individual front panels can be replaced by single plug-in unit front panels, or in other combinations of $N \times 5.08$ mm (0.2 in).
- (5) Box and box/board type plug-in units may require handles. Dimensions of

these are to be agreed upon by supplier and user, or are specified in the individual application standard (see 9.1 (8)).

10. Back Plane Design and Mounting Positions

10.1 Rigidity. Back plane and subrack mounting positions must be sufficiently rigid to withstand the insertion and withdrawal forces of the connectors, as in IEC 603-2-1980 [12].

10.2 Dimension. The dimension 7.62 mm (0.3 in) is the minimum dimension to the first mounting hole. This dimension can be increased by increments of $N \times 5.08$ mm (0.2 in).

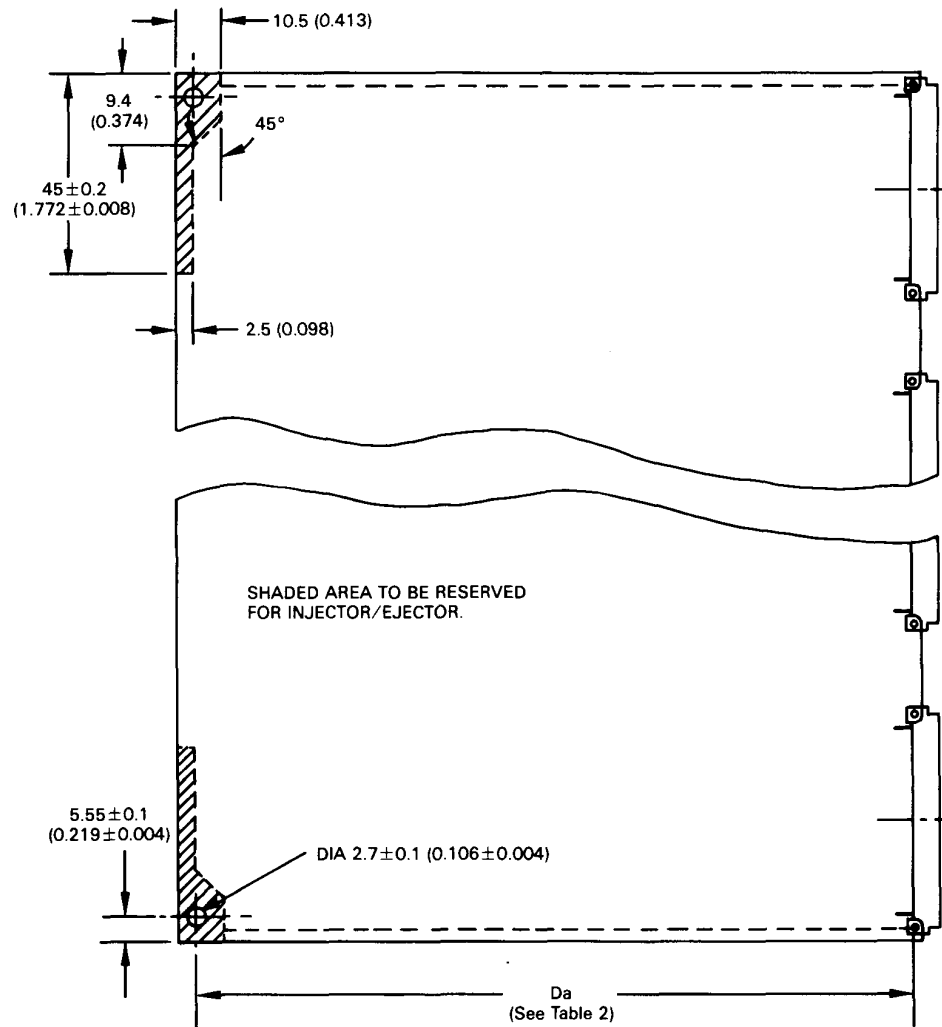
NOTE: For backplane, connector, board, and front panel relationships, see Fig 17.

Table 5
Inspection Dimensions, Figs 11-14

Board Depth	100	160	220	280	340	400
DT 2 ± 0.4 (± 0.016)	109.93 (4.328)	169.93 (6.690)	229.93 (9.052)	289.93 (11.415)	349.93 (13.777)	409.93 (16.139)

Table 6
Front Panel Dimensions, Figs 15, 16, 19, 21, 23-26;
Back Plane Dimensions, Figs 27-30

Subrack Heights	3U	6U	9U	12U
G +0, -0.3 (+0, -0.012)	128.7 (5.067)	262.05 (10.317)	395.40 (15.567)	528.75 (20.817)
F1	122.5 (4.823)			
F2 ± 0.2 (± 0.008)		255.85 (10.073)		
F3			389.20 (15.323)	
F4				522.55 (20.573)



NOTES: (1) Single height boards may use either one or two injectors/ejectors. Double, triple, and quadruple height boards require two injectors/ejectors.

(2) If metallic injectors/ejectors are used, printed circuits and components must be placed in accordance with their electrical features (see 9.1 (6)).

Fig 9
Injector/Ejector Mounting Positions