IEEE Standard for a Metric Equipment Practice for Microcomputers—Coordination Document for Mezzanine Cards

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Abstract: This standard establishes the metric modular order and coordination dimensions for mezzanine cards for use on host modules.
Keywords: front panel, host module, metric, mezzanine, module

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Introduction

(This introduction is not part of IEEE Std 1301.4, IEEE Standard for a Metric Equipment Practice for Microcomputers—Coordination Document for Mezzanine Cards.)

This generic standard has been developed as a follow-on to IEEE Std 1301-1991. This standard was developed in response to the recognition of the need for a small form factor board to be applied to a host module, with the ability to support multiple functionality. Initially it was assumed that this need would be driven entirely by desktop usage. However, as this standard was developed, it became obvious that desktop applications were only part of the potential system architectures. These small form factor units, or mezzanine cards, would also see usage on other host modules, such as in industrial application of subrack plug-in units. This standard will add to the modular order, initiated by IEEE Std 1301-1991, the concept of a standardized mezzanine card with the appropriate dimensions and features defined.

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IEEE Standard for a Metric Equipment Practice for Microcomputers—Coordination Document for Mezzanine Cards

1. Overview

1.1 Scope

This generic standard may be applied in all fields of electronics where equipment and installations are required to conform to a metric modular order. This standard establishes the metric modular order for parallel mounted, interconnected electronic circuit assemblies, hereafter referred to as mezzanine cards, and may be applied in other applications. The choice of coordination dimensions for the mechanical structure lies within a homogeneous, metric, modular, three-dimensional grid as specified in IEC 917.2-1992 and referenced in IEEE Std 1301-1991.[1] Optimum conditions are thereby created for the application of computer-assisted methods throughout design and manufacturing, e.g., computer-assisted planning, development, manufacturing, testing, and installation. Due to the application-specific nature of mezzanine cards, the electrical and mechanical interconnect implementation will require definition that is beyond the scope of this document.

1.2 Purpose

This generic standard has been generated to establish a metric modular order nomenclature for mezzanine cards, thereby providing a universal document that makes a mezzanine card easier to specify and that can be used to foster and support many specific applications.

1.3 Dimensions

All dimensions in this document are in millimeters as per ISO 1000: 1992 and ISO 31-1: 1992, unless otherwise specified.

[1]Information on references can be found in clause 2.

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1.4 Coordination dimensions

IEEE Std 1301-1991 defines the actual dimensions of a 25 mm metric equipment practice. These actual dimensions are derived from coordination dimensions using the principles of boundary and axis references illustrated in IEC 917.2-1992 and IEEE Std 1301-1991.

Overall dimensions and internal subdivisions are determined by using mounting pitches (mp_1 = 25 mm, mp_2 = 5 mm, mp_3 = 2.5 mm, mp_4 = 0.5 mm, and mp_5 = 0.05 mm) to derive the dimensions given in this standard. They are also used when extending this standard with additional dimensions (where such extensions are permitted) and when alternative positions of piece parts are described (in such cases, the relationships between involved dimensions shall be maintained).

A subscript “c” has been used in this document to indicate coordination dimensions.

1.5 Environmental requirements

The appropriate environmental requirements will be defined by other related standards or application-specific standards.

1.6 Conformance

Conformance with this standard can be claimed provided that

a) The required values are used.
b) Allowed but non-preferred dimensions and options, as indicated in this standard, are implemented.

2. References

The following publications shall be used conjunction with this standard:

IEC 50:—, International Electrotechnical Vocabulary.[2]

IEC 149: 1988, Terms and Definitions for Printed Circuits.

IEC 916:1988, Mechanical structures for electronics equipment—Terminology

IEC 917-2: 1992, Modular order for the development of mechanical structures for electronic equipment practices—Part 2: Sectional specification—Interface coordination dimensions for the 25 mm equipment practice.

IEC 917-2-2: 1994, Modular order for the development of mechanical structures for electronic equipment practices—Part 2: Sectional specification—Interface coordination dimensions for the 25 mm equipment practice—Section 2: Detail specification—Dimensions for subracks, chassis, backplanes, front panels, and plug-in units.

IEEE Std 100-1996, The IEEE Standard Dictionary of Electrical and Electronics Terms.[3]

[2]IEC publications are available from IEC Sales Department, Case Postale 131, 3, rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. IEC publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.
[3]As this standard goes to press, IEEE Std 100-1996 is approved but not yet published. Anticipated publication date is April 1996. IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

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IEEE Std 1301-1991, IEEE Standard for Metric Equipment Practice for Microcomputers—Coordinating Document (ANSI).

IEEE Std 1301.2-1993, IEEE Recommended Practices for the Implementation of a Metric Equipment Practice (ANSI).

ISO 31-1: 1992, Quantities and units—Part 1: Space and time.

ISO 1000: 1992, SI units and recommendations for the use of their multiples and of certain other units.

ISO/DIS 1101, Geometrical Product Specifications (GPS)—Geometrical tolerancing—Generalities, definitions, symbols, indication on drawings. (Revision of ISO 1101: 1983).[4]

3. Word usage, definitions, and abbreviations

3.1 Special word usage

may: A key word indicating flexibility of choice with no implied preference. The phrase *is optional* is used interchangeably with the key word *may.*

shall: A key word indicating a mandatory requirement. Designers shall implement such mandatory requirements to insure interchangeability and to claim conformance with the specification. The phrase *is required* is used interchangeably with the key word *shall.*

should: A key word indicating flexibility of choice with strongly preferred implementation. The phrase *is recommended* is used interchangeably with the key word *should.*

3.2 Definitions

Common terms are defined in IEEE Std 100-1996. The terms defined in this clause are specific to this standard.

3.2.1 aperture dimension: The usable space between standardized features.

3.2.2 coordination dimension: A reference dimension used to coordinate mechanical interfaces. This is not a manufacturing dimension with a tolerance.

3.2.3 host: In general, the host is an electronic circuit assembly, e.g., a plug-in unit, a back-plane, a motherboard, or another mezzanine card that provides electrical and/or mechanical connections to a subordinate assembly.

3.2.4 mezzanine card: An electronic card assembly mounted parallel to, and with electrical and/or mechanical connections to, a host.

3.2.5 mezzanine card boundary envelope: A three-dimensional set of separation planes within which a mezzanine card and all its components reside. It will be treated as a single unit.

3.2.6 n: A multiplier having integer values (e.g., 0, 1, 2, 3…).

3.2.7 reference plane: A theoretical plane not having thickness or tolerance.

3.2.8 separation plane: A reference plane used to separate two objects. This plane shall not be encroached upon by the object on either side except in clearly specified interface areas.

3.2.9 stack height: A dimension used to define the spacing between adjacent surfaces of mezzanine cards or a mezzanine card and its host.

3.2.10 system unit (SU): The equipment reference increment or mounting pitch (mp_1), used for length and width (1 SU = 25 mm = mp_1).

[4]ISO publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

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3.3 Abbreviations

The following abbreviations are used in this standard:

alt	Alternate
Dm	Mezzanine card depth dimension
Hm	Mezzanine card height dimension
I/O	Input/output
MC	Mezzanine card
mm	Millimeter
mp	Mounting pitch
PB	Printed board
SH	Stack height
SU	System unit
Wm	Mezzanine card width dimension

3.4 Dimensional location nomenclature

The following location key is used to specify the document responsible for assigning ,values to the defined dimensional parameters:

⟨1⟩ IEEE Std 1301-1991 contains all the generic dimensions that are not connector-related.
⟨2⟩ IEEE Std 1301.4-1996 contains the dimensions that are specific to mezzanine cards.
⟨3⟩ Application-specific parameters are product-related and have not been assigned values by IEEE Std 1301-1991, or by this standard.

3.4.1 Dimensional nomenclature, heights

The following is a list of identifying abbreviations, the document location where values are assigned, and a description of the height nomenclature used in this standard.

Nom	Location	Description
Hm_c	⟨3⟩	Mezzanine card coordination dimension, boundary envelope, $Hm_c = n \times p_5$
Hm_e	⟨3⟩	Mezzanine card reference surface to boundary envelope
Hm_o	⟨3⟩	Mezzanine card maximum PB dimension
Hm_1	⟨3⟩	The maximum component dimension on one side of a mezzanine card
Hm_2	⟨3⟩	The maximum component dimension on the opposite side of a mezzanine card
Hm_3	⟨3⟩	Host maximum component dimension under a mezzanine card
SH_x	⟨3⟩	Stack height, where x = 1, 2, 3…, an identification number, $SH_X = n \times 2 \times mp_4$

3.4.2 Dimensional nomenclature, widths

Following is a list of identifying abbreviations, the document location where they are assigned values, and a description of width nomenclature used in this standard:

Nom	Location	Description
Wm_c	⟨3⟩	Mezzanine card coordination dimension, boundary envelope, $Wm_c = n \times mp_1$
Wm_o	⟨3⟩	Mezzanine card maximum PB dimension

3.4.3 Dimensional nomenclature, depths

Following is a list of identifying abbreviations, the document location where they are assigned values, and a description of depth nomenclature used in this standard:

Nom	Location	Description
Dm_c	⟨3⟩	Mezzanine card coordination dimension, boundary envelope, $Dm_c = n \times mp_1$
Dm_o	⟨3⟩	Mezzanine card maximum PB dimension

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4. General arrangement

Mezzanine cards are intended to be mounted with electrical and/or mechanical connections to the host. In general, the host is an electronic circuit assembly, e.g., a plug-in unit, a backplane, a motherboard, or another mezzanine card. Figures 1a and 1a depict two common mezzanine card applications.

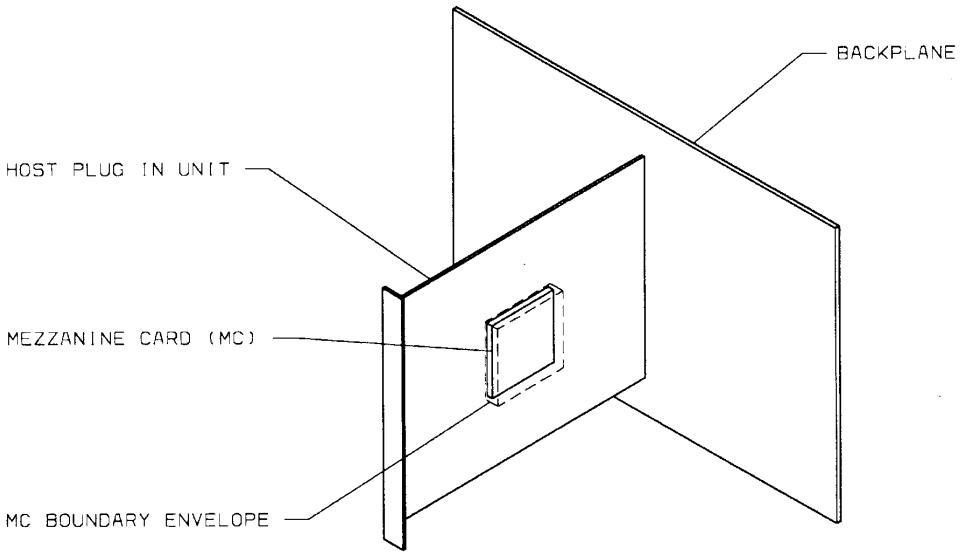


Figure 1a —Plug-in unit application

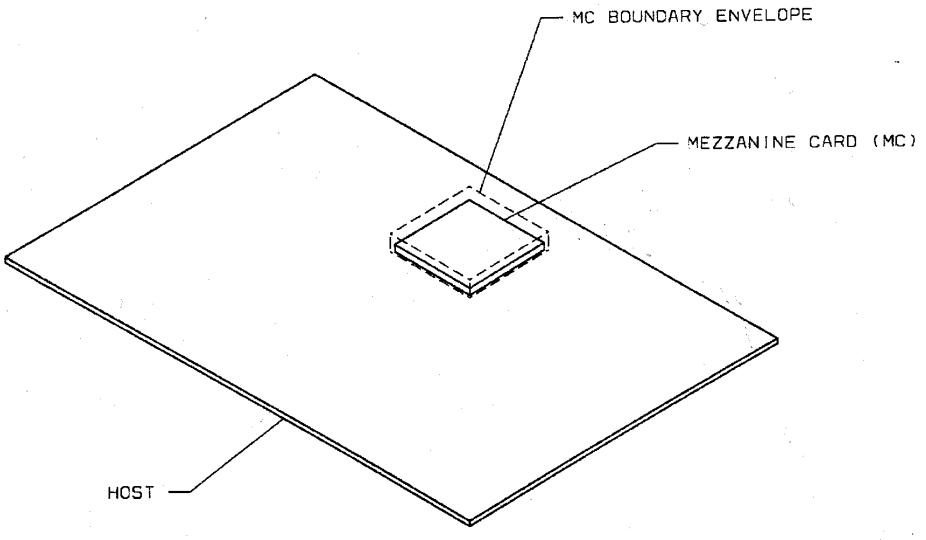


Figure 1b —Motherboard application

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4.1 Mezzanine card coordination dimensions

Mezzanine cards may be of many sizes. These sizes are derived from the modular order established in IEEE Std 1301-1991 and IEC 917.2-1992 and are based on a standard system unit of 25 mm. Figure 2 shows examples of mezzanine card sizes (dashed grid lines are on a 25 mm pitch.).

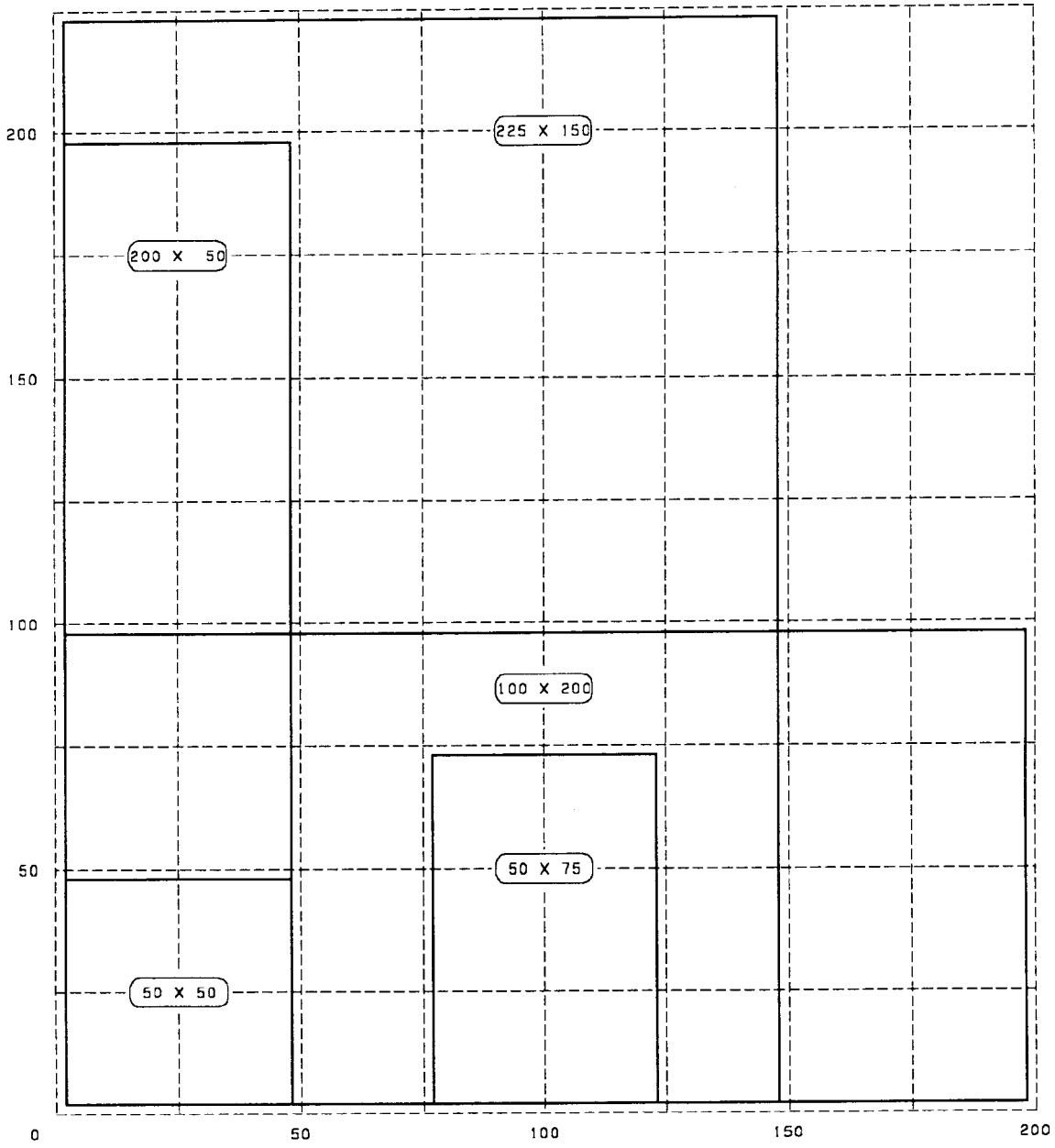


Figure 2 —Examples of mezzanine card sizes (coordination dimensions 25 mm dotted grid)

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4.2 Mezzanine card boundary envelope

The mezzanine card size and space allotment are bounded by the mezzanine card boundary envelope as seen in Figure 3. This boundary envelope is made up of separation planes used to separate the mezzanine card from its host and shall not be encroached upon by the object on either side except in specified interface areas. The mezzanine card and all its components shall reside within this boundary envelope and clearance areas shall be maintained between the mezzanine and its neighbors on any side. Exception shall be allowed for those portions of the mezzanine card assembly that directly interface with the host or with other mezzanine cards, such as connectors, standoffs, keying pins, and front panels.

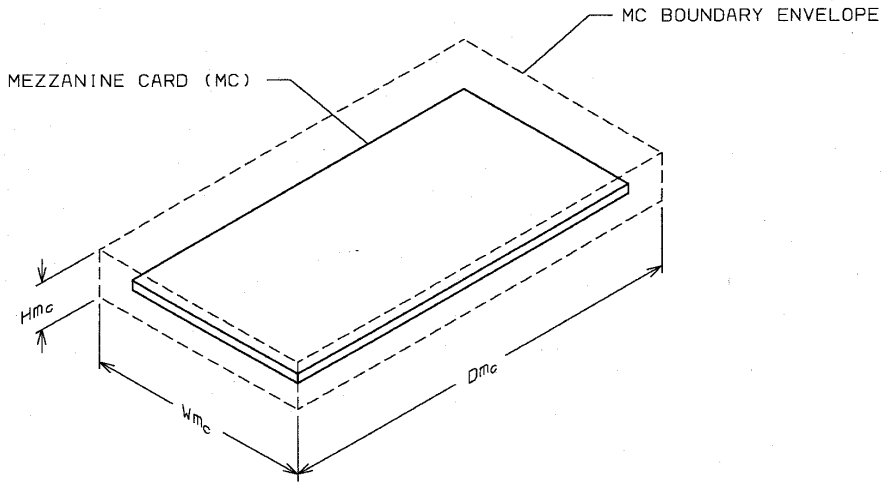


Figure 3 —Mezzanine card boundary envelope

In establishing the size of the mezzanine card boundary envelope, the Dm_c and Wm_c dimensions will be established as multiples of mp_1(= 25 mm) as established in IEEE Std 1301-1991. The Hm_c dimension of the boundary envelope, as seen in Figure 4a, shall be established as multiples of mp_5 (= 0.05 mm). The mezzanine card reference surface is the mounting surface and is an important reference to the electrical and/or mechanical interface. Similar reference in the other two axes will be required in any specific design and will be defined in the detail specification.

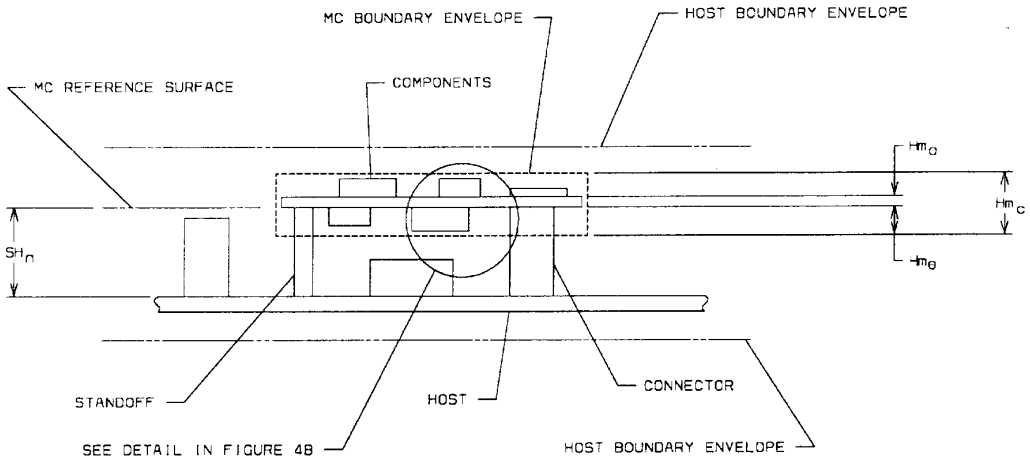


Figure 4a —Mezzanine card and boundary envelope, side view

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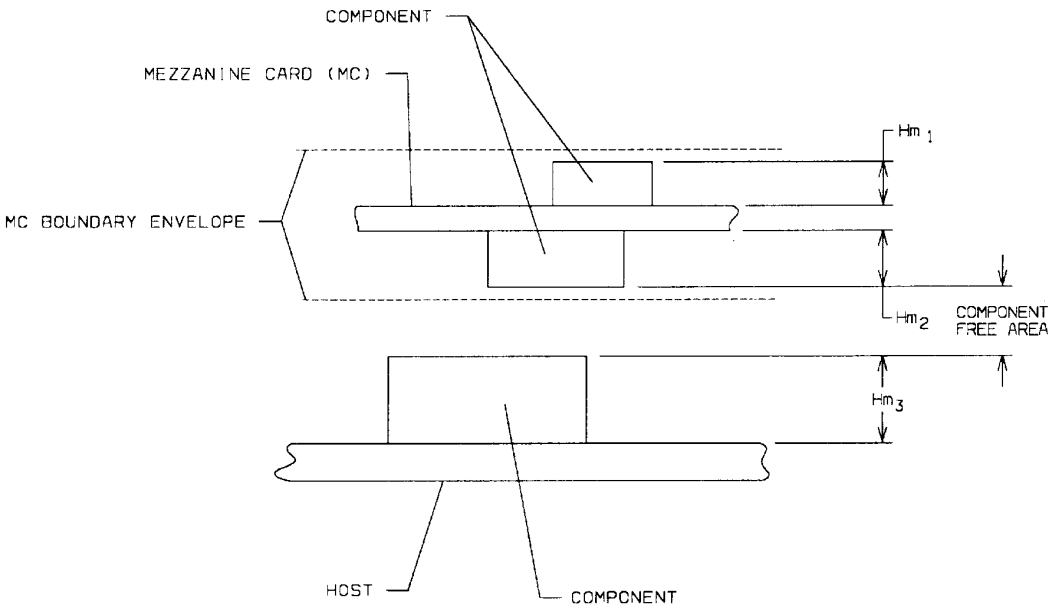


Figure 4b —Detail view of component-free area at boundary envelope separation plane

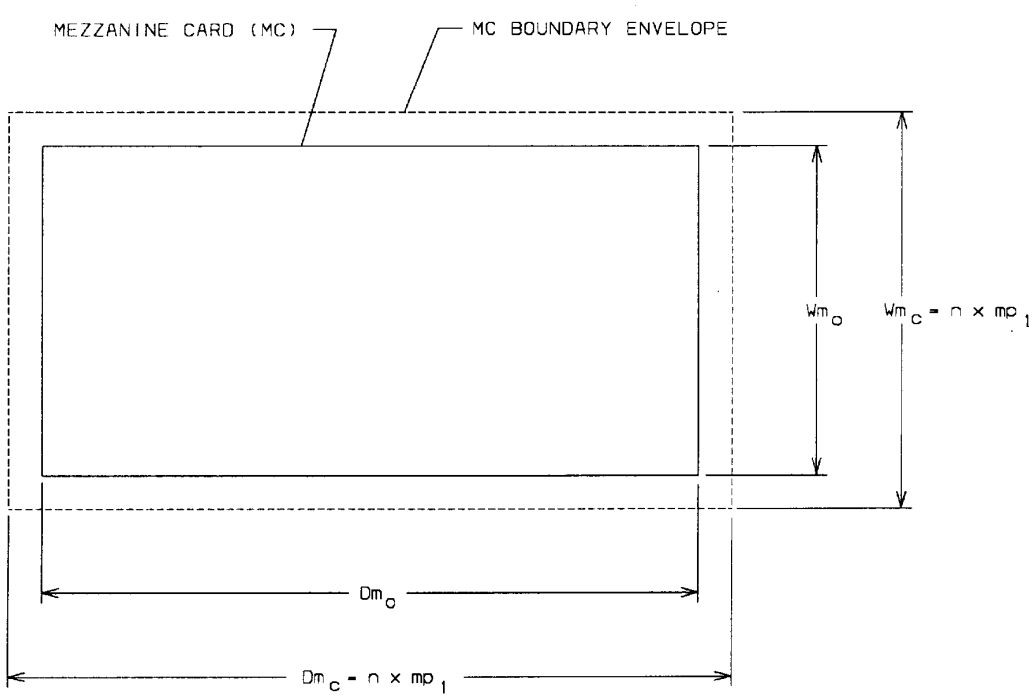


Figure 4c —Mezzanine card boundary envelope, top view

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4.3 Mezzanine card spacing

In any specific design, the host manufacturer shall establish the relationship between the mezzanine card boundary envelope and the host. The stack height shall be an even multiple of mp_4. The dimension Hm_e is application dependent and shall be a multiple of mp_5. The host boundary envelope is defined by the documents controlling the host. Mezzanine cards may be located on either side of a host but shall reside within the host boundary envelope. Figure 5 shows an example of mezzanine card spacing.

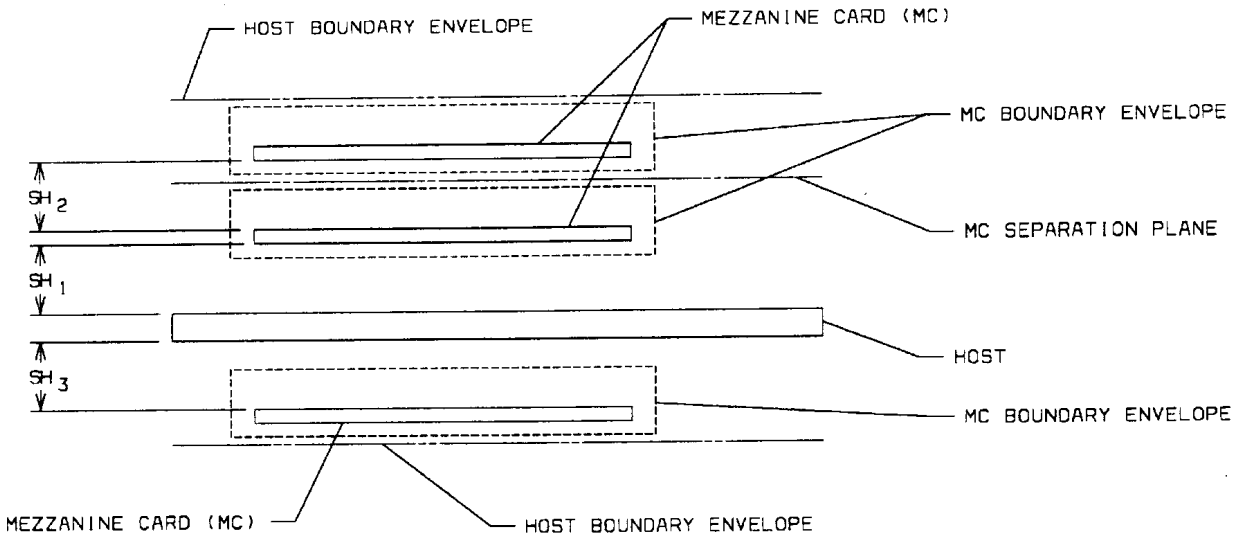


Figure 5 —Mezzanine card stack heights and spacing

4.4 Mezzanine card types

Mezzanine cards may be of different styles and have different interconnect schemes, as shown in Figure 6.

a) *Type 1.* The mezzanine card attaches to the front panel for I/O connection.
b) *Type 2.* The mezzanine card is independent from the front panel and backplane connection.
c) *Type 3.* The mezzanine card connects to the backplane connectors.
d) *Type 4.* The mezzanine card attaches to the front panel for I/O interconnection and to the backplane interconnection.

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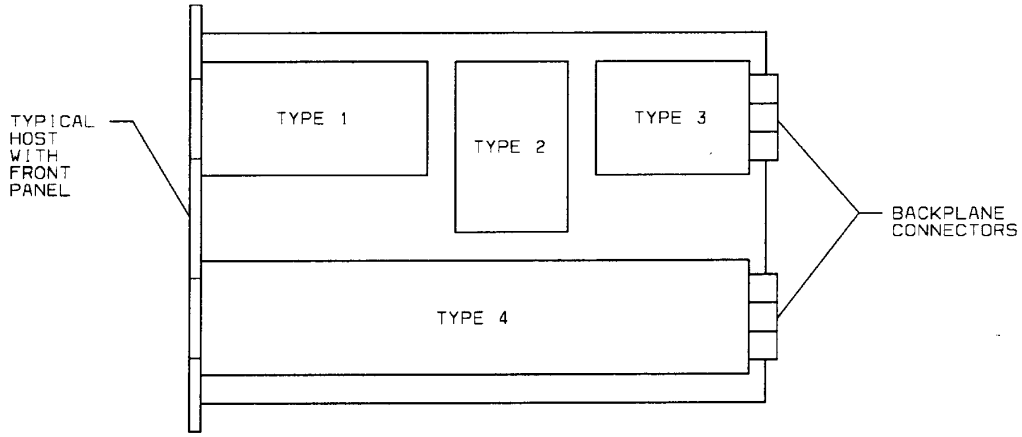


Figure 6 —Examples of mezzanine card types

4.5 Mezzanine card elements

There are several elements that make up a mezzanine card assembly and support its ability to mount to and interface with a host. Some of these elements reside on the mezzanine card, some on the host, and some on both. These elements will be defined by the application and/or application-specific specification. The basic elements are as follows:

a) *Mechanical supports/standoffs.* Mezzanine cards may require mechanical supports to establish the stack height and to carry all mating and unmating forces of any front panel or back panel connectors.
b) *Mezzanine card connectors.* Mezzanine cards shall use connectors appropriate to the specific electrical and mechanical application.
c) *Keying.* Some designs of mezzanine cards may require keying.
d) *Front panels.* Some designs of mezzanine cards may require front panels and/or any associated components.
e) *Backplane connectors.* Some designs of mezzanine cards may require backplane connectors.

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