

IEEE Standard for Military Module, Format E Form Factor

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Abstract: The mechanical design requirements for a military module, format E form factor are established. The specifications of dimensions and tolerances are intended to ensure the mechanical intermateability of military modules within associated sub racks. Mechanical characteristics for military applications are also included.

Keywords: backplane, module, module interface plane, printed wiring board (PWB), 396-pin connector, 250-pin connector

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Introduction

(This introduction is not a part of IEEE Std 1101.4-1993, IEEE Standard for Military Module, Format E Form Factor.)

The IEEE Computer Society Technical Committee on Microprocessors and Microcomputers found it appropriate to form a separate IEEE standard for military and ruggedized applications based on a module with the same envelope as the Standard Hardware Acquisition and Reliability Program (SHARP) Standard Electronic Module (SEM) Format E. This standard is the result of a desire to develop a specification providing dimensions and tolerances necessary to ensure mechanical function and interchangeability.

This standard is a specification implementation and provides detailed dimensions and tolerances specific to the use of a 250-pin connector and a 396-pin connector. The specification covers dimensions of racks, modules, printed circuit boards, backplanes, and connector-related dimensions.

It is not possible to acknowledge everyone who contributed to the development of this standard; however, the following individuals deserve special mention for their contributions: Harrison Beasley for his support during the initial phase of development and his support as BASC chair at the completion of the standard. Jim Lockwood who acted as the first draft editor during the earlier stages of the working group. Technical support has been submitted by Andrew Brough, Eric Nickerson, Andrew Capobianco, Robert Fluhrer, Jim Madison, Harry Andreas, Dennis Smith, and Dean Van De Walker. Extensive technical input has been submitted by Jim Simon.

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1. Overview

This standard is divided into six clauses. Clause 1 provides the scope and purpose of this standard as well as the mechanical characteristics this standard covers, the environmental requirements, and the terminology used. Clause 2 lists references to other standards that form a part of this standard. Clause 3 provides definitions of terms. Clause 4 describes the general requirements to which the module shall conform. Clause 5 describes the module interface requirements. Clause 6 contains information and recommendations that may be useful in the use of this standard.

1.1 Scope

This standard establishes the design requirements for a military module, format E form factor. The requirements herein serve to specify the mechanical design of the module. This standard is designed for use in conjunction with other IEEE standards.

1.2 Purpose

The purpose of this standard is the specification of dimensions and tolerances that will ensure the mechanical intermateability of military modules within associated subracks. In addition, mechanical characteristics for military applications are also included. This standard covers the basic dimensions, frames, PWBs, materials, assembly, and chassis interface of single-sided and double-sided military modules.

1.3 Environmental requirements

The module shall meet the environmental requirements specified in IEEE Std 1156.1-1993.¹ The performance level shall be specified by the procurement activity. This standard is primarily intended for military applications using performance levels 1 and 2 of IEEE Std 1156.1-1993, but does not exclude other applications using other performance levels.

¹Information on references can be found in clause 2.

1.4 Terminology

The word *shall* indicates a mandatory requirement. For example, “Designers shall implement all such mandatory requirements to ensure interoperability with other IEEE Std 1101.3-1993 conformant products.”

The word *should* indicates flexibility of choice with a strongly preferred implementation. The phrase *it is recommended* is used interchangeably with the key word *should*.

The word *may* indicates flexibility of choice with no implied preference.

2. References

The following publications form a part of this standard to the extent referenced herein. In the event of conflict between the documents referenced herein and the contents of this standard, the contents of this standard will be considered a superseding requirement. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

ANSI/IPC D-275-1991, Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies.²

ANSI/IPC RB-276-1992, Qualification and Performance Specification for Rigid Printed Boards.

ANSI Y14.5M-1982 (R1988), American National Standard for Dimensioning and Tolerancing.

EIA PN-2933 Rev B (23 April 1993), Two-Part High-Density Blade and Backplane Tuning Fork Connector.³

IEC 50, Second edition, International Electrotechnical Vocabulary, Terms and definitions for electronic packaging.⁴

IEEE Std 1156.1-1993, IEEE Standard for Microcomputer Environmental Specifications for Computer Modules.⁵

MIL-A-8625E, Anodic Coatings for Aluminum and Aluminum Alloys.⁶

MIL-C-26074E, Coatings, Electroless Nickel Requirements For.

MIL-C-28754D, Connectors, Electrical, Modular, and Component Parts, General Specification For.

MIL-HDBK-217E, Reliability Prediction of Electronic Equipment.

MIL-I-46058C, Insulating Compound, Electrical (For Coating Printed Circuit Assemblies).

MIL-P-50884C, Printed Wiring, Flexible and Rigid-Flex.

MIL-STD-130G, Identification Marking of U.S. Military Property.

MIL-STD-202F, Test Methods for Electronic and Electrical Component Parts.

MIL-STD-454M, Standard General Requirements for Electronic Equipment.

MIL-STD-889B, Dissimilar Metals.

MIL-STD-1389D, Design Requirements for Standard Electronic Modules.

MIL-STD-2000A, Standard Requirements for Soldering Electrical and Electronic Assemblies.

NAVSEA TE000-AB-GTP-010-1991, Parts Application and Reliability Information Manual for Navy Electronic Equipment.

NAVSEA TE000-AB-GTP-020-1992, Environmental Stress Screening Requirements and Application for Navy Electronic Equipment.

²ANSI publications are available from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

³EIA publications are available from Global Engineering, 1990 M Street NW, Suite 400, Washington, DC, 20036, USA.

⁴IEC publications are available from IEC Sales Department, Case Postale 131, 3 rue de Varembe 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.

⁵IEEE publications are available from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

⁶MIL and NAVSEA publications are available from the Director, U.S. Navy Publications and Printing Service, Eastern Division, 700 Robbins Avenue, Philadelphia, PA 19111, USA.

3. Definitions

3.1 alpha end: The end of the module nearest the lowest-numbered contact.

3.2 beta end: The end of the module nearest the highest-numbered contact.

3.3 chassis: A subrack as specified in IEC 50.

3.4 direct air-impingement cooling: A way to implement cooling, using forced air across the components.

3.5 gravitational acceleration unit (g): A unit of acceleration that is approximately 32.2 ft/s² [9.8 m/s²].

3.6 guide rib: The alpha and beta ends of the module. These form the heat transfer paths and the mounting for the module retainers and provide for initial module alignment.

3.7 insertion/extraction levers: A generic term meaning levers that insert and extract the module.

3.8 key code: An alpha or alphanumeric designator used to identify the style and angular position of the keying pins.

3.9 key pin: A hardware implementation that prevents mating of incompatible modules.

3.10 module: A plug-in unit per IEC 50.

3.11 module header: A structure attached to or integral to the top of the frame used for structural performance, marking, and component mounting.

3.12 module interface plane: An assigned plane on the bottom surface of the connector, from which the connector's electrical pins protrude, forming the mating surface. This surface is used as a reference for module dimensions.

3.13 module retainer/expansion element: The device used to secure the module in the chassis and to hold module guide ribs against the chassis webs to attain a good thermal interface.

3.14 pitch: The spacing from the side A surface of the guide rib on a module to the side A surface of the guide rib on an adjacent module.

3.15 profile: The thickness of the module.

3.16 printed wiring board (PWB): A generic term that includes any interconnection board.

3.17 side A: By convention, the side of the module closest to the connector "A" row, and the same side as the keying pins.

3.18 side B: By convention, the side of the module farthest from the connector "A" row, and the opposite side from the keying pins.

4. Module requirements

The module shall conform to the following general requirements.

4.1 Module description

A module consists of one or more printed wiring board(s), with retainers mounted to side B in the guide rib area, with insertion levers mounted at the top of the module and a connector mounted at the bottom of the module. The recommended implementation of this module includes the above components and uses a frame that has a PWB mounted to it on both sides. This standard does not preclude other implementations that meet the interface requirements specified herein. Headers, crossovers, covers, frame and test points are options on modules.

4.2 Module construction

Modules shall conform to the design, construction, and physical dimensions specified herein. All solder joints shall be in compliance with MIL-STD-2000.