# INTERNATIONAL STANDARD

# ISO/IEC 14536

# ANSI/IEEE Std 896.5

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## Information technology – Microprocessor systems – Futurebus+™, Profile M (military)

*Technologies de l'information – Systèmes à microprocesseurs – Futurebus+™, Profil M (militaire)*


Reference number
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Std 896.5, 1995 Edition

**Abstract:** This International Standard provides a set of tools with which to implement a Futurebus+™ achitecture. This high-performance bus-based system architecture provides a wide range of performance and cost scalability over time for multiple generations of single- and multiple-bus multiprocessor systems. This document, a companion standard to ISO/IEC 10857:1994 [ANSI/IEEE Std 896.1, 1994 Edition], builds on the logical layer by adding requirements for three military profiles. It is to these profiles that products will claim conformance. Other specifications that may be required in conjunction with this International Standard are [ISO/IEC Std 10857:1994 [ANSI/IEEE Std 896.1, 1994 Edition], IEEE Std 896.2-1991, IEEE Std 896.2a-1994, IEEE Std 896.3-1993, IEEE Std 896.4-1993, IEEE P896.4a, IEEE Std 896.9-1994, IEEE Std 1101.3-1993, IEEE Std 1101.4-1993, IEEE Std 1212-1991, IEEE Std 1194.1-1991, IEEE P1394, IEEE Std 1301-1991, and IEEE Std 1301.1-1991.

**Keywords:** bus architecture, error logging, fault logging, Futurebus+, live insertion, military profiles, multiprocessor systems, node management, open architecture, Serial Bus, software debug



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The Institute of Electrical and Electronics Engineers, Inc.
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**Bus Architecture Standards Committee of the IEEE Computer Society**

**Adopted as an International Standard by the International Organization for Standardization and by the International Electrotechnical Commission**

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In 1995, ANSI/IEEE Std 896.5-1993, together with IEEE Std 896.5a-1994, *Errata, Corrections, and Clarifications,* was adopted by ISO/IEC JTC 1, as draft International Standard ISO/IEC DIS 14536:1995. This edition incorporates IEEE Std 896.5a-1994 into the text of ANSI/IEEE Std 896.5-1993.




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# Introduction

[This introduction is not a normative part of ISO/IEC 14536 : 1995, but is included for information only.]

IEEE Std 896.5-1993, IEEE Standard for Futurebus+,™ Profile M (Military) culminates a several year effort to define a standard for military use of Futurebus+. It is the result of the combined efforts of a large number of people in industry and in government who felt that the military should adapt commercial standards rather than invent its own. In the adaptation process, special consideration was given to military needs in the following areas: a) harsh environments, b) real time usage, c) security, d) reliability and fault tolerance, e) testing and maintenance, f) software debugging and system integration, and g) analog/RF components. This standard intends to meet these needs.

At the time this standard was completed, the P896.5 Working Group had the following membership:

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IEEE Std 896.5-1993 was approved by the American National Standards Institute on November 24, 1993.

The following is a list of those who were members of the 896.5a Working Group at the time this standard was approved:

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# Contents

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# Information technology—Microprocessor systems—Futurebus+™, Profile M (Military)



## 1. Overview

### 1.1 Scope

The initial work in development of the Futurebus+™ specification was done under the auspices of the IEEE Computer Society Microprocessor Standards Committee. In 1988, both the United States Navy's Next Generation Computer Resources (NGCR) Backplane Standards Committee and the VFEA International Trade Association (VITA), a trade association of both VME64 manufacturers and users, agreed to join the IEEE in revising ISO/IEC 10857:1994 [ANSI/IEEE Std 896.1, 1994 Edition].[1] In early 1989, the Multibus Manufacturers Group (MMG), a trade association of both Multibus I and Multibus II manufacturers and users, also agreed to join this effort.

The primary goal of all four groups (IEEE, U.S. Navy, VITA, and MMG) was to provide a new microprocessor bus standard that would be commercially viable and that would be acceptable to the two manufacturer groups and the three user communities.

This work resulted in the IEEE 896 family of standards, of which two have become International Standards. ISO/IEC 10857:1994 defines the logical functionality of the set of signals that make up the bus. IEEE Std 896.2-1991 describes and specifies the physical layer (i.e., electrical characteristics, pinouts, connector locations, module sizes, etc.) required. It also contains the first three application environment profiles. IEEE Std 896.3-1993 describes Futurebus+ recommended practices and specifies system-level concerns when using a Futurebus+ backplane in the design of a system. IEEE Std 896.4-1993 describes conformance test requirements for Futurebus+. IEEE Std 896.9-1994 [B3][2] defines extensions to the base Futurebus+ standards that are used in extremely fault-tolerant systems. This International Standard describes and specifies the physical layer required for harsh environments that require rugged, fault-tolerant, survivable systems, as in military applications. The three profiles in this International Standard describe functional requirements with pointers to existing standards that select and bind options within those standards. It is these profiles, not the component standards, to which manufacturers may claim conformance. An end user who then purchases modules complying to a given profile from a range of suppliers has a higher assurance of interoperability.

Three physical form factors are incorporated into the military profiles included in this International Standard at the time of publication. Additional profiles that address other aspects of the Futurebus+ computer spectrum are being developed by the working group. These will appear in companion standards. As new physical

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

[2]The numbers in brackets preceded by the letter B correspond to those of the bibliography in annex E.

or electrical layer requirements (e.g., a different connector type or driver technology) emerge, new profiles will be developed to address the enhanced capabilities available from newer technologies; this is part of the reason for layering the Futurebus+ standards.

The scope of this International Standard has been restricted to exclude some of the higher level system requirements associated with bus-based computer systems. These are addressed in companion standards such as IEEE Std 896.3-1993, IEEE Std 896.4-1993, and IEEE Std 896.9-1994 [B3]. The software interface to common-node capabilities as shared by Futurebus+ and Serial Bus (IEEE P1394) is defined by ISO/IEC 13213:1994. This interface provides the framework for defining processor, memory, and I/O nodes on the Futurebus+, as well as bridges to other buses (see IEEE P1014.1 [B4]).

### 1.2 Applicability

This interface International Standard establishes a modular open architecture for military mission critical systems that employ digital computers, processors, and other electronic modules. This International Standard provides for integration and interoperability of diverse sets of electronic and computer modules for the purpose of configuring various types of computer systems, command/control systems, communications systems and/or weapon systems. This International Standard specifies the electrical, protocol, mechanical, thermal, and input/output interfaces necessary to allow modules, developed to this International Standard, to operate together in an integrated system or subsystem. Where necessary for module interoperability, portions of cabinet or rack interfaces dealing with the mounting of modules and their thermal interfaces are also specified. This common interface International Standard allows development of cost effective, reliable, maintainable, and highly available systems and subsystems. Because the various military systems have differing requirements, multiple form factors for different "lines" of modules are specified herein.

## 2. Normative references

The following standards contain provisions that, through references in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEEE Std 896.2-1991, IEEE Standard for Futurebus+™—Physical Layer and Profile Specification (ANSI).[3]

IEEE Std 896.2a-1994, IEEE Standard for Futurebus+™ —Physical Layer and Profile Specification: Errata, Corrections, and Clarifications.

IEEE Std 896.3-1993, IEEE Recommended Practices for Futurebus+™ (ANSI).

IEEE Std 896.4-1993, IEEE Standard for Conformance Test Requirements for Futurebus+™ (ANSI).

IEEE P896.4a, Draft Standard Supplement to IEEE Standard for Conformance Test Requirements for Futurebus+™ —Errata, Corrections, and Clarifications. D1.0/June 20, 1995.[4]

IEEE Std 1101.3-1993, IEEE Mechanical Standard for Conduction-Cooled and Air-Cooled 10SU Modules (ANSI).

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

[4]Authorized standards projects, indicated by a P, were not approved by the IEEE Standards Board at the time this standard went to press. They are available from the IEEE.

IEEE Std 1101.4-1993, IEEE Standard for Military Modules, Format E Form Factor (ANSI).

IEEE P1101.5, Draft Standard Mechanical Interface for a Military Module, Air-Flow-Through-Cooled, Format E Form Factor, D1.2/Mar. 2, 1995.

IEEE P1101.6, Draft Standard Mechanical Interface for an Air-Flow-Through-Cooled Module, 10SU Form Factor, D1.0/Oct. 20, 1993.

IEEE P1101.8, Draft Standard for Information Technology—Mechanical Interface for Liquid-Flow-Through-Cooled Electronic Printed Wiring Assemblies, 10SU, D1.0/Oct. 1993.

IEEE P1101.9, Draft Standard for Information Technology—Mechanical Interface for Liquid-Flow-Through-Cooled Electronic Printed Wiring Assemblies, Format E (396-pin connector only), D2.0/Dec. 7, 1994.

IEEE Std 1156.1-1993, IEEE Standard for Microcomputer Environmental Specifications for Computer Modules (ANSI).

IEEE Std 1194.1-1991, IEEE Standard Electrical Characteristics of Backplane Transceiver Logic (BTL) Interface Circuits (ANSI).

IEEE Std 1212.1-1993, IEEE Standard for Communicating Among Processors and Peripherals Using Shared Memory (Direct Memory Access —DMA) (ANSI).

IEEE Std 1275-1994, IEEE Standard for Boot (Initialization Configuration) Firmware: Core Requirements and Practices (ANSI).

IEEE Std 1275.4-1995, IEEE Standard for Boot (Initialization Configuration) Firmware: Bus Supplement for IEEE 896 (Futurebus+™).

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

IEEE Std 1301.1-1991, IEEE Standard for a Metric Equipment Practice for Microcomputers—Convection-Cooled with 2 mm Connectors (ANSI).

IEEE P1394, Draft Standard for a High Performance Serial Bus. D7.1/Aug. 1994.

ISO/IEC 10857 : 1994 [ANSI/IEEE Std 896.1, 1994 Edition], Information technology—Microprocessor systems—Futurebus+—Logical protocol specification.[5]

ISO/IEC 13213 : 1994 [ANSI/IEEE Std 1212, 1994 Edition], Information technology—Microprocessor systems—Control and Status Register (CSR) Architecture for microcomputer buses.

MIL-HNBK-217, Reliability of Electronic Equipment.[6]

NAVSEA TE000-AB-GTP-010, Parts Application and Reliability Information Manual for Navy Electronic Equipment.[7]

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[5]ISO/IEC publications are available from ISO, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO/IEC [ANSI/IEEE] publications are also available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

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

[7]See footnote 6.